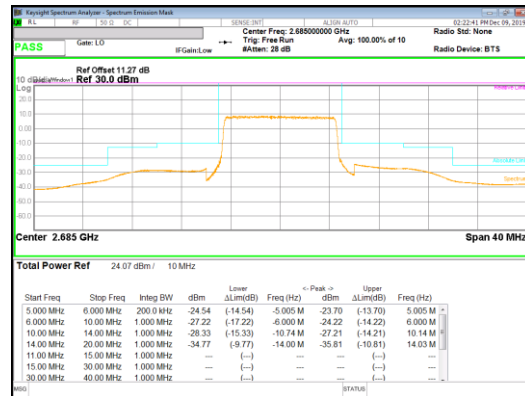
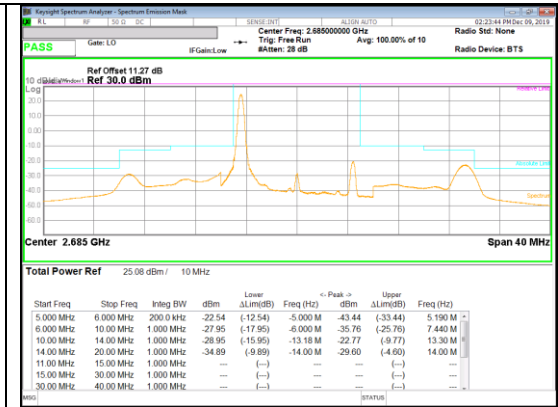


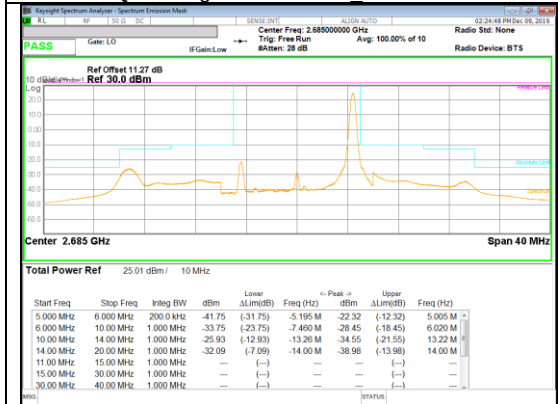
Band 41  
10MHz  
QPSK



QPSK High channel FRB

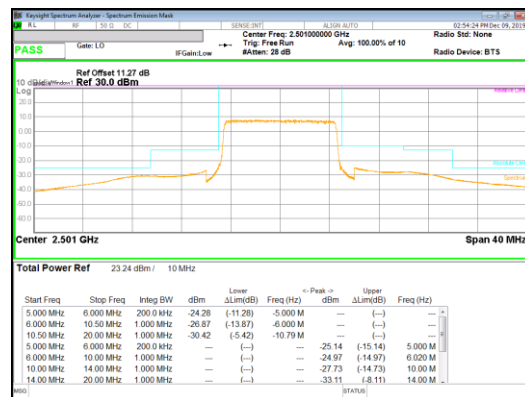


QPSK High channel 1RB Offset Low

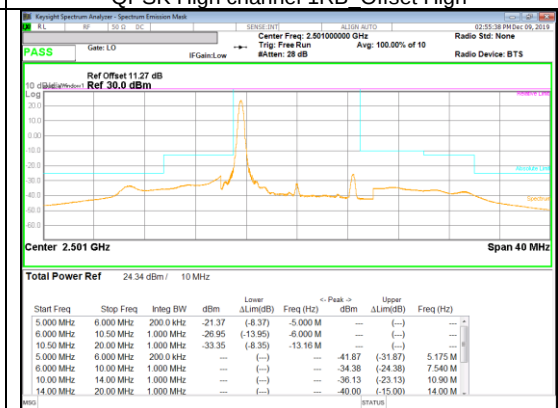


QPSK High channel 1RB Offset High

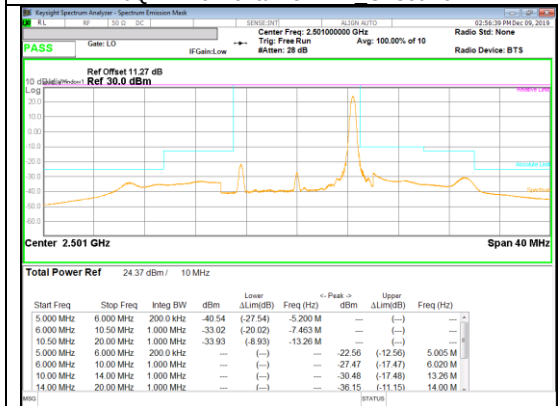
Band 41  
10MHz  
16QAM



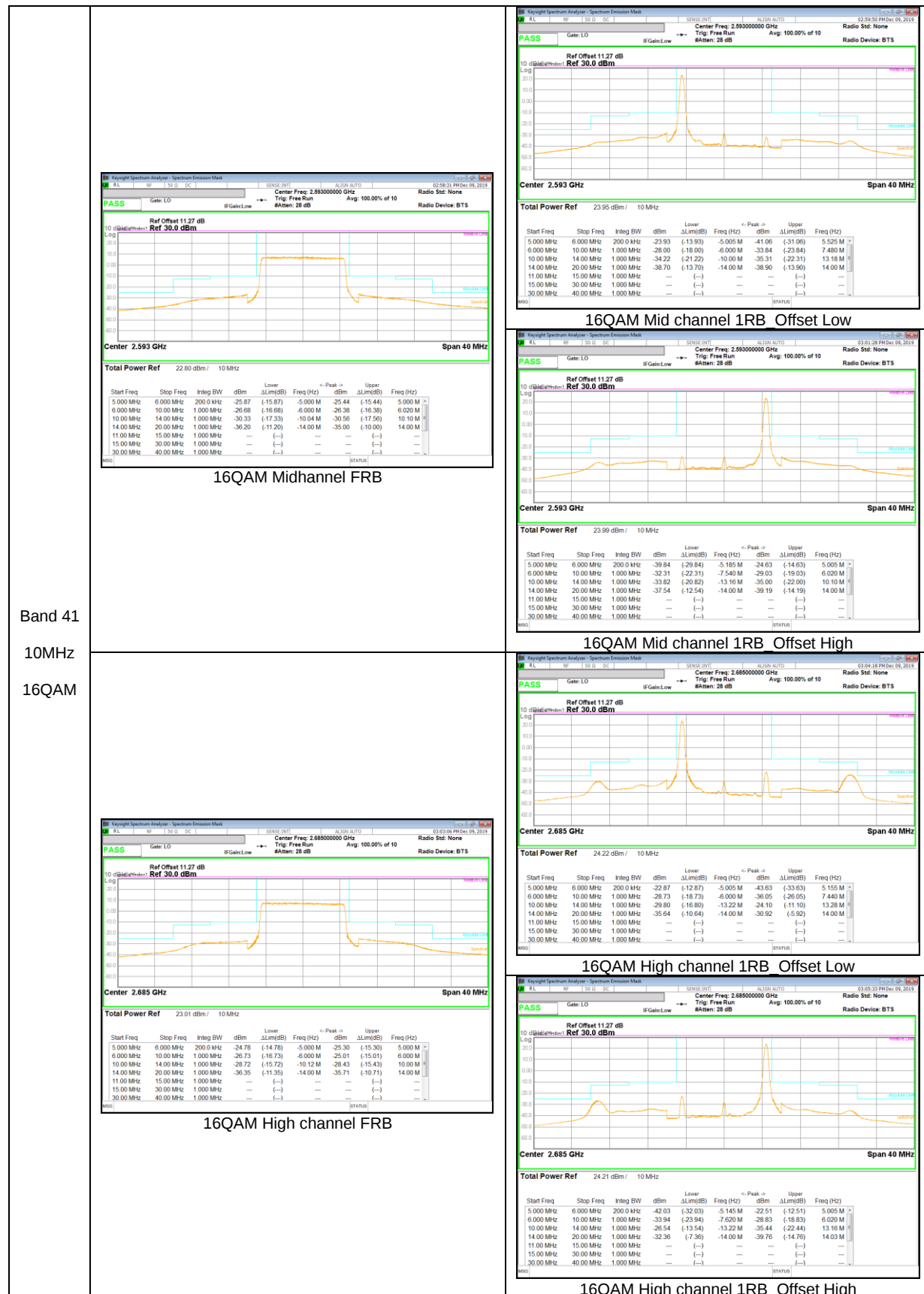
16QAM Low channel FRB

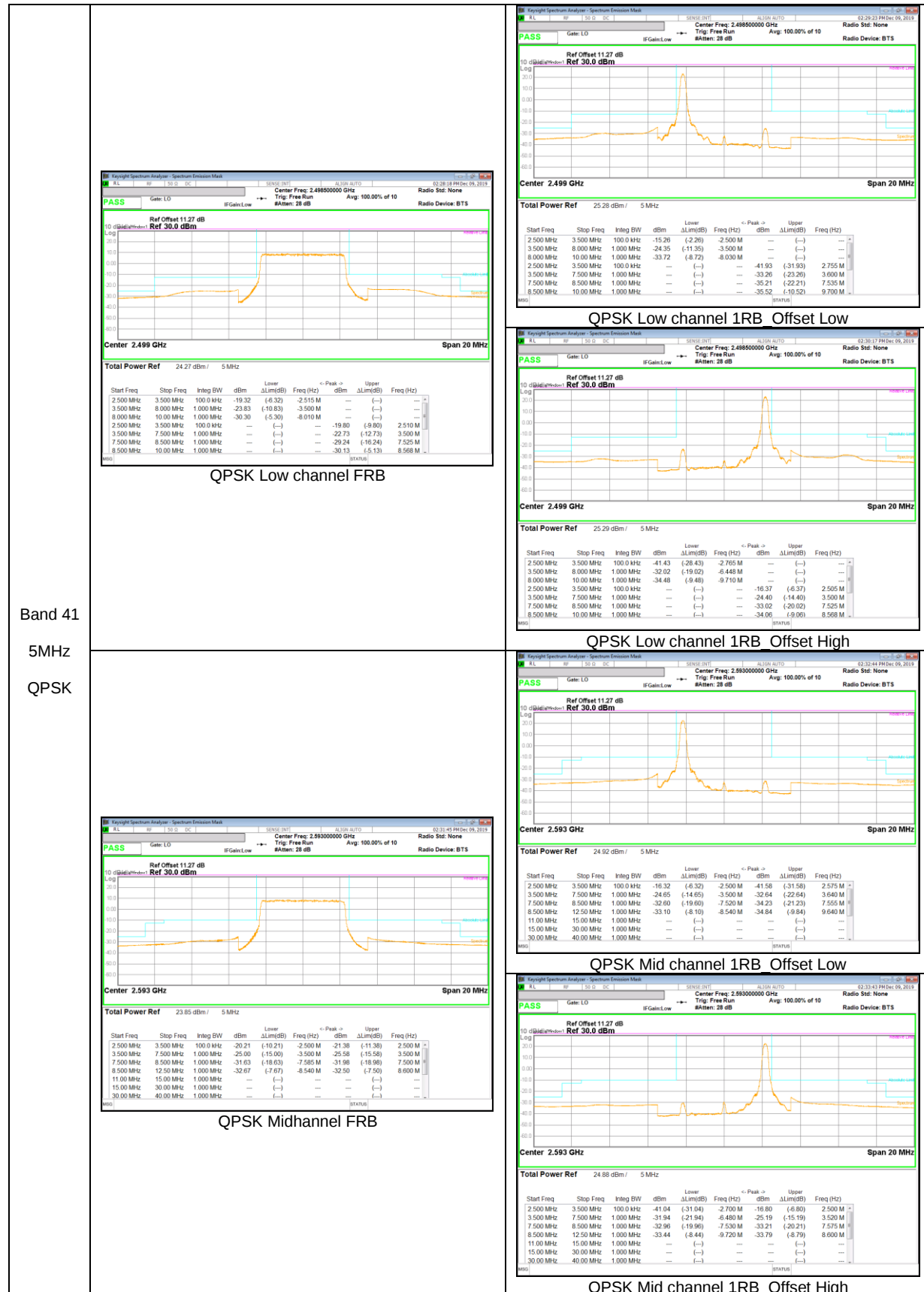


16QAM Low channel 1RB Offset Low

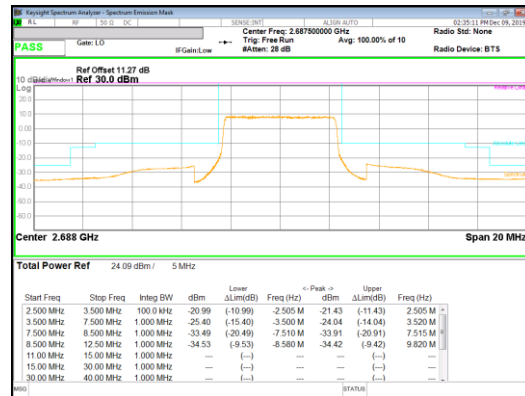


16QAM Low channel 1RB Offset High

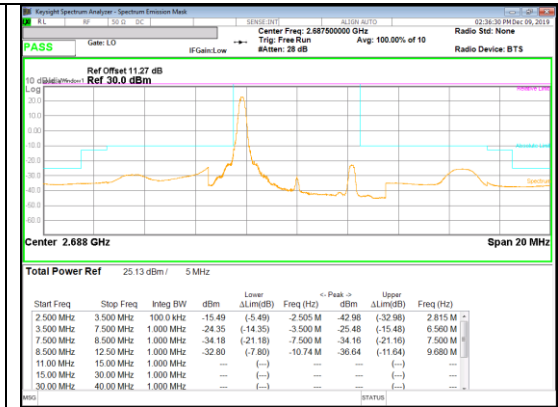




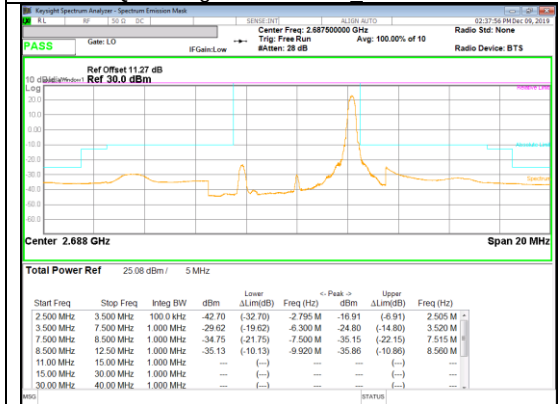
Band 41  
5MHz  
QPSK



QPSK High channel FRB

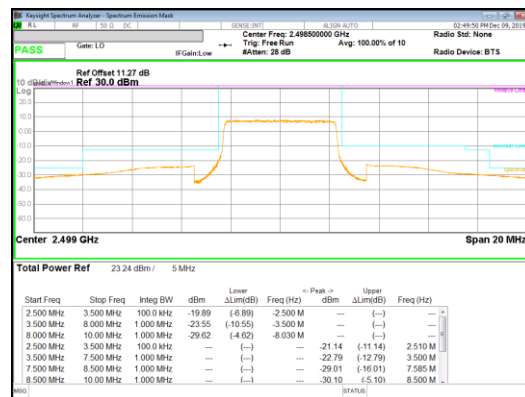


QPSK High channel 1RB Offset Low

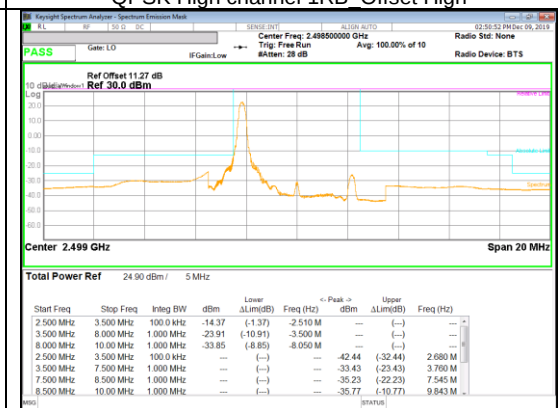


QPSK High channel 1RB Offset High

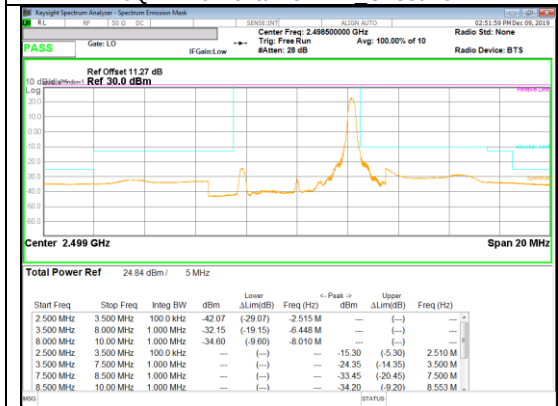
Band 41  
5MHz  
16QAM



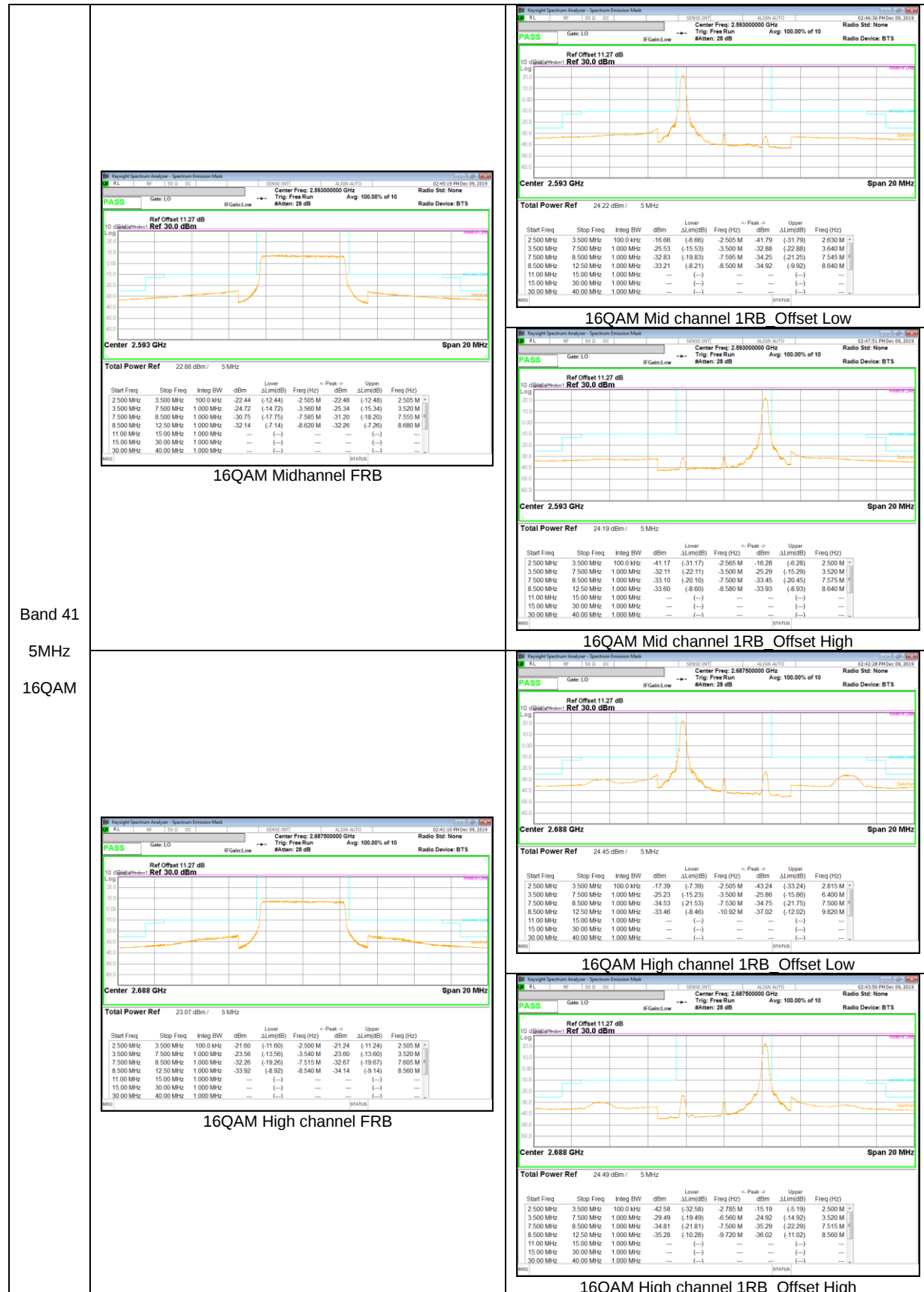
16QAM Low channel FRB



16QAM Low channel 1RB Offset Low



16QAM Low channel 1RB Offset High



**LTE Band 2**

LTE Band 2(Frequency range: 1850-1910 MHz) is covered by LTE Band 25 (Frequency range: 1850-1915 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 4**

LTE Band 4 (Frequency range: 1710-1755 MHz) is covered by LTE Band 66 (Frequency range: 1710-1780 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 5**

LTE Band 5 (Frequency range: 824-849 MHz) is covered by LTE Band 26 (Frequency range: 814-849 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 17**

LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band41(PC3)**

LTE Band 41(PC3, Frequency range : 2496-2690 MHz) is covered by LTE Band 41(PC2) (Frequency range: 2496-2690 MHz) due to same frequency range, same channel bandwidth and maximum tune-up limit is higher than LTE Band41(PC3).

### 9.3. OUT OF BAND EMISSIONS

#### RULE PART(S)

FCC: §2.1051, §22.901, §22.917, §27.53 and 90.691

#### LIMITS

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log (P)$  dB.

Part 27.53:

(c)(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB.

(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least  $43 + 10 \log (P)$  dB.

(h) The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10} (P)$  dB.

(m) (4) For mobile digital stations, the attenuation factor shall be not less than  $40 + 10 \log (P)$  dB on all frequencies between the channel edge and 5 megahertz from the channel edge,  $43 + 10 \log (P)$  dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and  $55 + 10 \log (P)$  dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than  $43 + 10 \log (P)$  dB on all frequencies between 2490.5 MHz and 2496 MHz and  $55 + 10 \log (P)$  dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

Part 90.691(a):

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $116 \log_{10}(f/6.1)$  decibels or  $50 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz. (NOTE : Use 100kHz reference bandwidth)

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

## **TEST PROCEDURE**

Per KDB 971168 D01 Power Meas License Digital Systems v03r01

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

- a) Set the RBW = 100KHz for emission below 1GHz and 1MHz for emissions above 1GHz  
(Tests were performed 1MHz [Worst case], to sweep 1 time for all frequency range)
- b) Set VBW  $\geq 3 \times$  RBW;
- c) Set span  $\geq 1.5$  times the OBW;
- d) Sweep time = auto couple;
- e) Detector = rms;
- f) Ensure that the number of measurement points = Max (40001);
- g) Trace mode = average(WCDMA, LTE), Maxhold(GSM, LTE Band41);

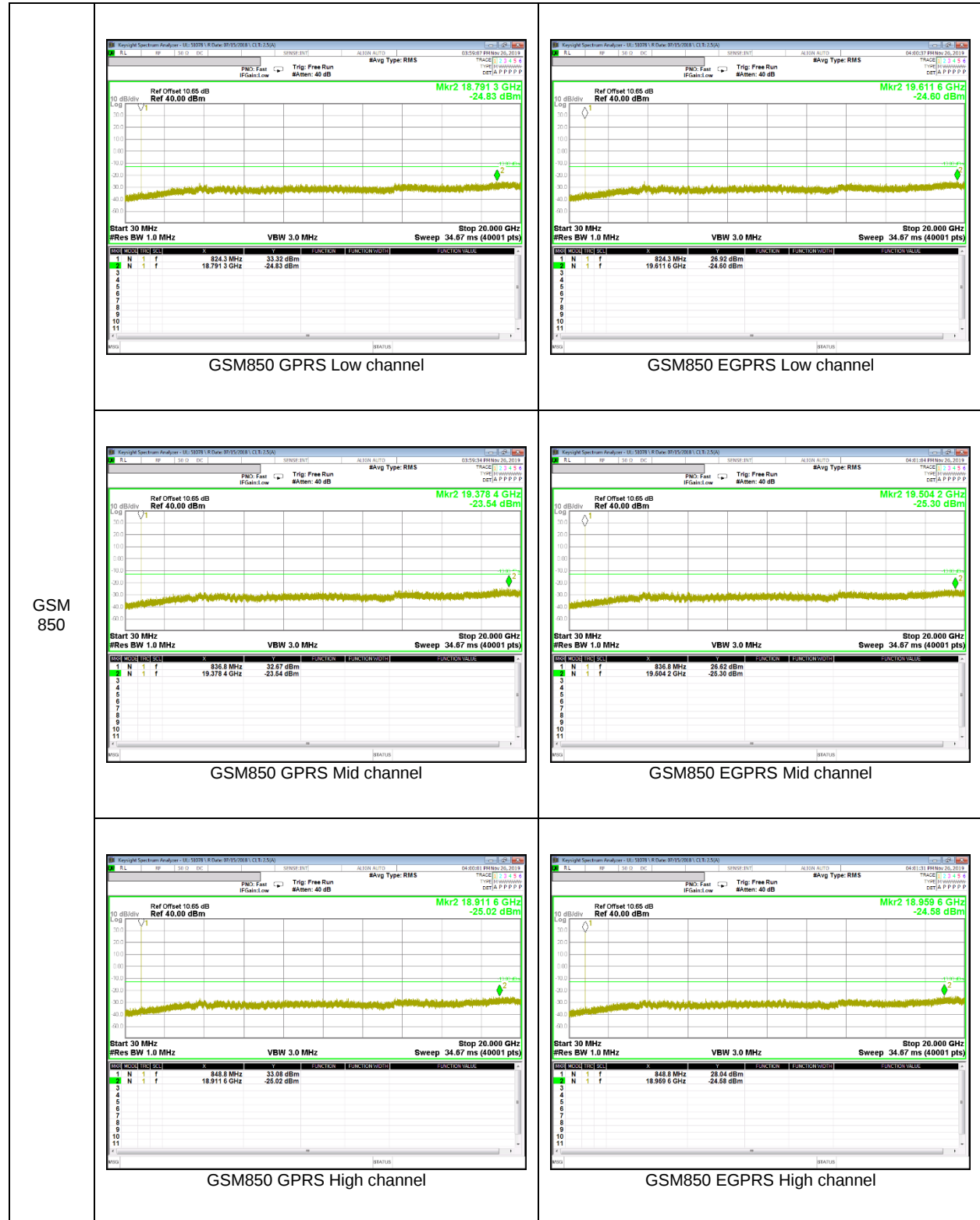
## **RESULTS**

See the following pages.

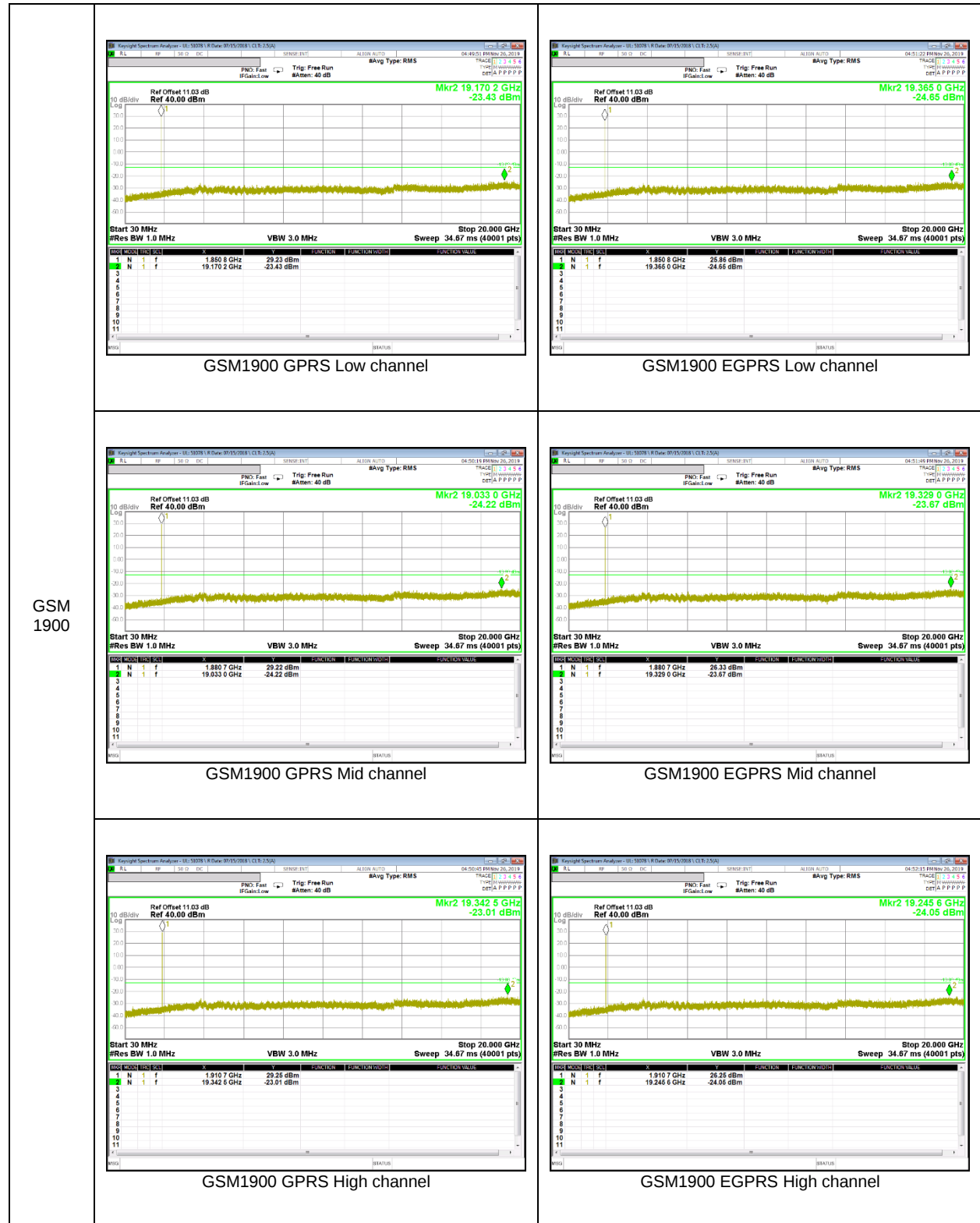
NOTE : Please refer to section 5.4 for bandwidth and RB setting about LTE bands.

### 9.3.1. OUT OF BAND EMISSIONS RESULT

#### GSM 850



**GSM 1900**



# WCDMA Band 5



WCDMA Band 4



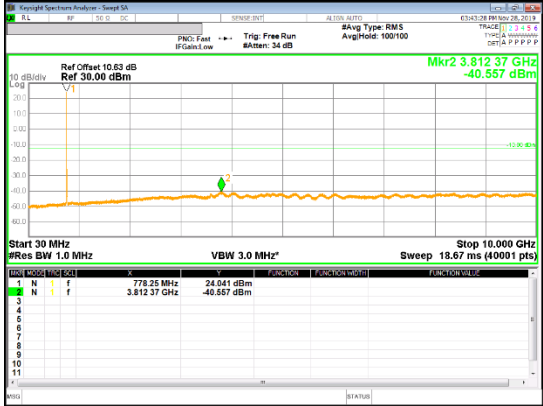
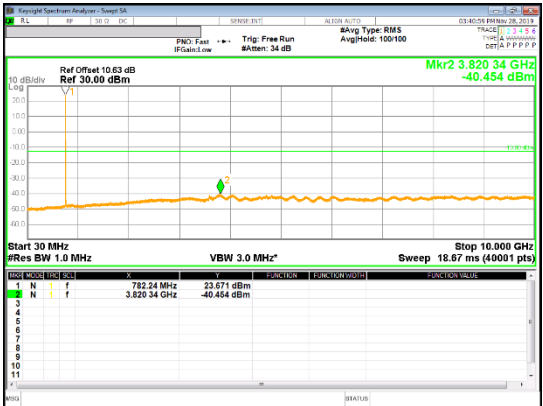
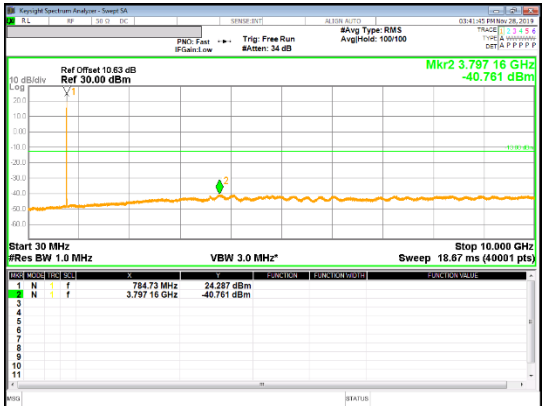
## WCDMA Band 2



# **LTE Band 12**



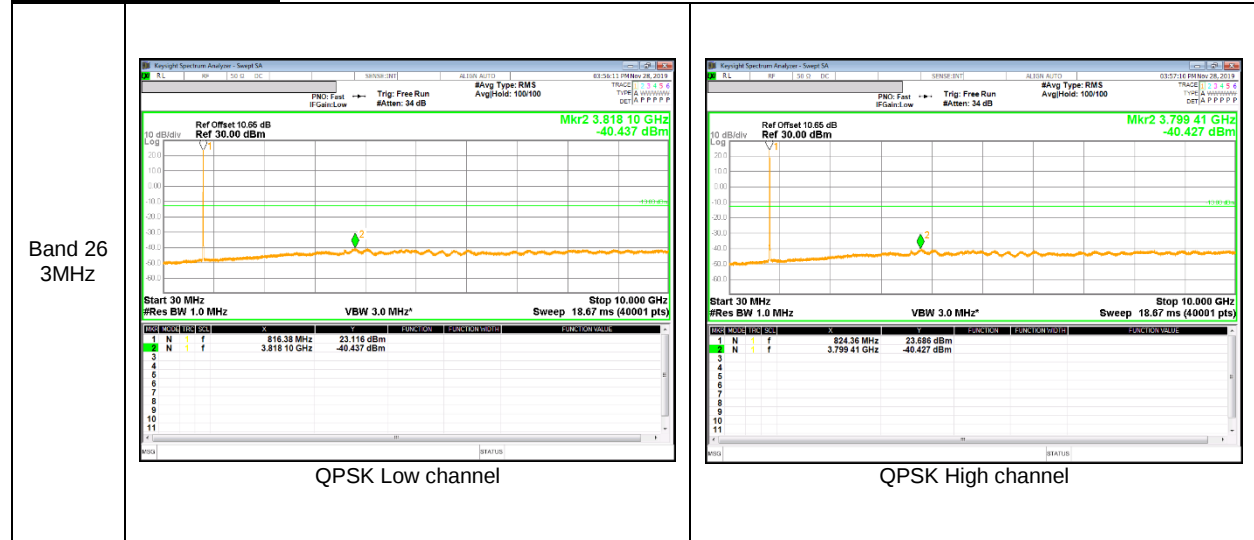
**LTE Band 13**

|                          |                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Band 13<br/>10MHz</p> |  <p>QPSK Mid channel</p>                                                                                                                                                                                                                                                  |
| <p>Band 13<br/>5MHz</p>  | <div style="display: flex; justify-content: space-around;"> <div style="width: 48%;">  <p>QPSK Low channel</p> </div> <div style="width: 48%;">  <p>QPSK Mid channel</p> </div> </div> |
|                          |  <p>QPSK High channel</p>                                                                                                                                                                                                                                               |

# **LTE Band 25**



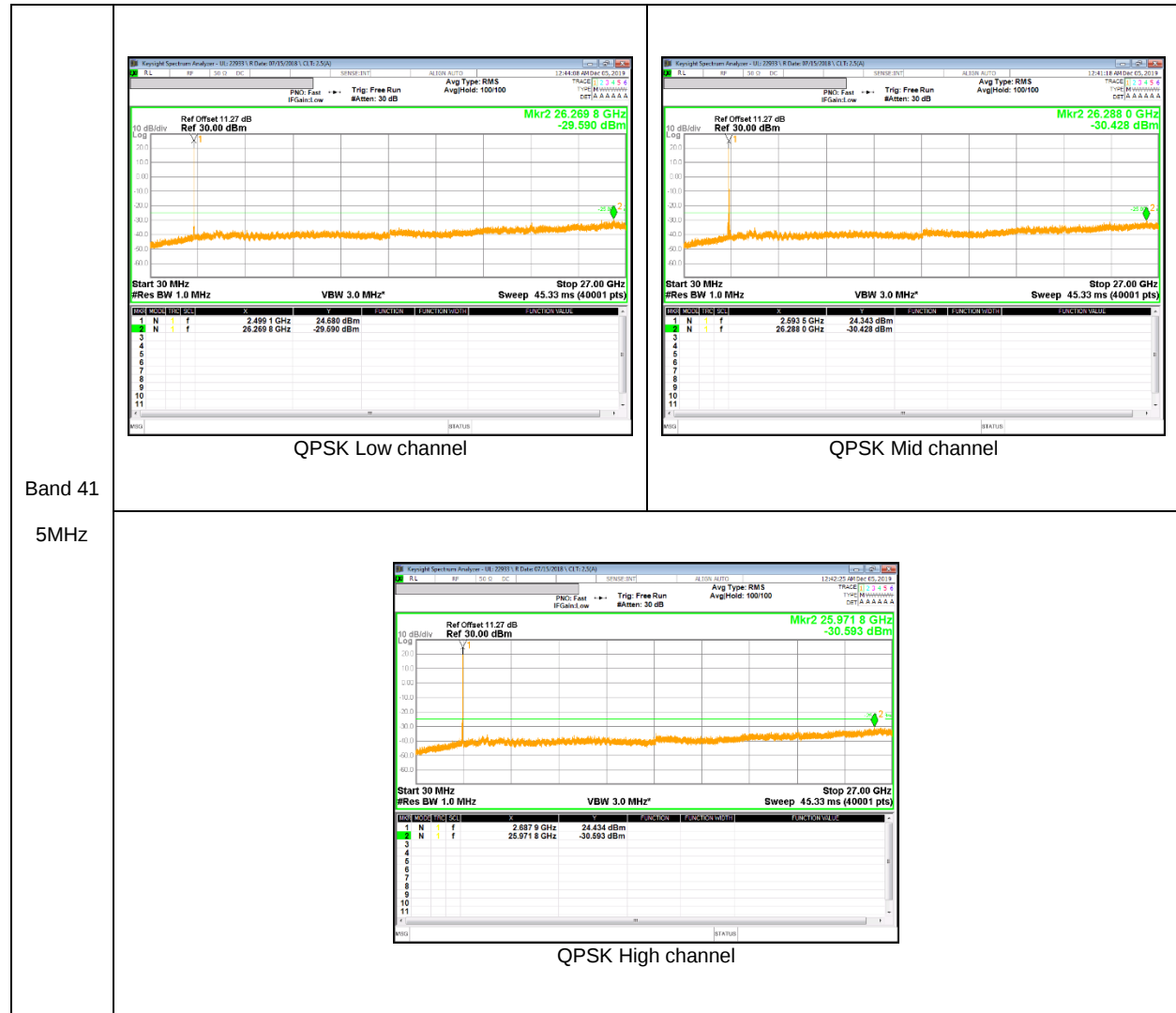
# LTE Band 26(Part 90)



# LTE Band 26(Part 22)



# **LTE Band 41(PC2)**



# LTE Band 66



**LTE Band 2**

LTE Band 2(Frequency range: 1850-1910 MHz) is covered by LTE Band 25 (Frequency range: 1850-1915 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 4**

LTE Band 4 (Frequency range: 1710-1755 MHz) is covered by LTE Band 66 (Frequency range: 1710-1780 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 5**

LTE Band 5 (Frequency range: 824-849 MHz) is covered by LTE Band 26 (Frequency range: 814-849 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 17**

LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band41(PC3)**

LTE Band 41(PC3, Frequency range : 2496-2690 MHz) is covered by LTE Band 41(PC2) (Frequency range: 2496-2690 MHz) due to same frequency range, same channel bandwidth and maximum tune-up limit is higher than LTE Band41(PC3).

## **9.4. FREQUENCY STABILITY**

### **RULE PART(S)**

FCC: §2.1055, §22.355, §24.235, §27.54 and §90.213

### **LIMITS**

§22.355 - The carrier frequency shall not depart from the reference frequency in excess of  $\pm 2.5$  ppm for mobile stations.

§24.235 - The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

§27.54 - The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

§90.213 - The carrier frequency shall not depart from the reference frequency in excess of  $\pm 2.5$  ppm for mobile stations.

### **TEST PROCEDURE**

Per KDB 971168 D01 Power Meas License Digital Systems v03r01

### **RESULTS**

See the following pages.

**NOTE** : Test were performed each lowest or highest frequency on the modulation condition of more wide bandwidth. (Please refer to section 9.1.1 OBW results)

### 9.4.1. FREQUENCY STABILITY RESULTS

#### GSM 850, Channel 128/251, Frequency 824.2/848.8 MHz

| Reference Frequency : GSM850 Low Channel 824.2 MHz / High Channel 848.8 MHz @ 20°C |                              |                                               |              |                     |              |             |
|------------------------------------------------------------------------------------|------------------------------|-----------------------------------------------|--------------|---------------------|--------------|-------------|
| Limit: +/- 2.5 ppm =                                                               |                              | Low Channel                                   | 2060.500     | Hz                  | High Channel | 2122.000    |
|                                                                                    |                              | Frequency Deviation Measured with Time Elapse |              |                     |              |             |
| Power Supply [Vdc]                                                                 | Environment Temperature [°C] | Low Channel                                   |              | High Channel        |              | Limit [ppm] |
|                                                                                    |                              | [MHz]                                         | Delta [ppm]  | [MHz]               | Delta [ppm]  |             |
| 3.86                                                                               | 50                           | 824.19998693                                  | 0.007        | 848.79998746        | 0.005        | 2.5         |
| 3.86                                                                               | 40                           | 824.19998983                                  | 0.004        | 848.79998815        | 0.004        | 2.5         |
| 3.86                                                                               | 30                           | 824.19999037                                  | 0.003        | 848.79999160        | 0.000        | 2.5         |
| <b>3.86</b>                                                                        | <b>20</b>                    | <b>824.19999309</b>                           | <b>0.000</b> | <b>848.79999157</b> | <b>0.000</b> | <b>2.5</b>  |
| 3.86                                                                               | 10                           | 824.19999306                                  | 0.000        | 848.79999289        | -0.002       | 2.5         |
| 3.86                                                                               | 0                            | 824.19999699                                  | -0.005       | 848.79999522        | -0.004       | 2.5         |
| 3.86                                                                               | -10                          | 824.19999466                                  | -0.002       | 848.79999388        | -0.003       | 2.5         |
| 3.86                                                                               | -20                          | 824.19999285                                  | 0.000        | 848.79999202        | -0.001       | 2.5         |
| 3.86                                                                               | -30                          | 824.19999036                                  | 0.003        | 848.79999088        | 0.001        | 2.5         |

| Reference Frequency : GSM850 Low Channel 824.2 MHz / High Channel 848.8 MHz @ 20°C |                              |                                               |             |                     |              |             |
|------------------------------------------------------------------------------------|------------------------------|-----------------------------------------------|-------------|---------------------|--------------|-------------|
| Limit: +/- 2.5 ppm =                                                               |                              | Low Channel                                   | 2060.500    | Hz                  | High Channel | 2122.000    |
|                                                                                    |                              | Frequency Deviation Measured with Time Elapse |             |                     |              |             |
| Power Supply [Vdc]                                                                 | Environment Temperature [°C] | Low Channel                                   |             | High Channel        |              | Limit [ppm] |
|                                                                                    |                              | [MHz]                                         | Delta [ppm] | [MHz]               | Delta [ppm]  |             |
| <b>3.86</b>                                                                        | <b>20</b>                    | <b>824.19999309</b>                           | <b>0</b>    | <b>848.79999157</b> | <b>0</b>     | <b>2.5</b>  |
| 4.43                                                                               | 20                           | 824.19999116                                  | 0.002       | 848.79999069        | 0.001        | 2.5         |
| 3.60                                                                               | 20                           | 824.19999156                                  | 0.002       | 848.79999215        | -0.001       | 2.5         |

#### GSM 1900, Channel 512/810, Frequency 1850.0/1910.0 MHz (Lowest Frequency:EGPRS / Highest Frequency: GPRS)

| Limit          |           | 1850               | 1910                | Delta (Hz) | Frequency Stability (ppm) |
|----------------|-----------|--------------------|---------------------|------------|---------------------------|
| Condition      |           | F low @ End of OBW | F high @ End of OBW |            |                           |
| Temperature    | Voltage   | (MHz)              | (MHz)               |            |                           |
| Normal (20C)   | Normal    | 1850.0760          | 1909.9233           |            |                           |
| Extreme (50C)  |           | 1850.0761          | 1909.9233           | 20.6       | 0.011                     |
| Extreme (40C)  |           | 1850.0761          | 1909.9233           | 23.7       | 0.013                     |
| Extreme (30C)  |           | 1850.0761          | 1909.9233           | 24.6       | 0.013                     |
| Extreme (10C)  |           | 1850.0761          | 1909.9233           | 23.5       | 0.012                     |
| Extreme (0C)   |           | 1850.0760          | 1909.9233           | 19.9       | 0.011                     |
| Extreme (-10C) |           | 1850.0760          | 1909.9233           | 18.8       | 0.010                     |
| Extreme (-20C) |           | 1850.0761          | 1909.9233           | 21.4       | 0.011                     |
| Extreme (-30C) |           | 1850.0760          | 1909.9233           | 19.9       | 0.011                     |
|                |           |                    |                     |            |                           |
| 20C            | 15%       | 1850.0761          | 1909.9233           | 26.4       | 0.014                     |
|                | -15%      | 1850.0761          | 1909.9233           | 28.1       | 0.015                     |
|                | End Point | 1850.0761          | 1909.9233           | 24.4       | 0.013                     |

## WCDMA Band 5

| Reference Frequency : WCDMA Band 5 Low Channel 826.4 MHz / High Channel 846.6 MHz @ 20°C |                              |                                               |              |                     |              |             |
|------------------------------------------------------------------------------------------|------------------------------|-----------------------------------------------|--------------|---------------------|--------------|-------------|
| Limit: $\pm 2.5$ ppm =                                                                   |                              | Low Channel                                   | 2066.000     | Hz                  | High Channel | 2116.500    |
|                                                                                          |                              | Frequency Deviation Measured with Time Elapse |              |                     |              |             |
| Power Supply [Vdc]                                                                       | Environment Temperature [°C] | Low Channel                                   |              | High Channel        |              | Limit [ppm] |
|                                                                                          |                              | [MHz]                                         | Delta [ppm]  | [MHz]               | Delta [ppm]  |             |
| 3.86                                                                                     | 50                           | 826.39998637                                  | 0.006        | 846.59998615        | 0.002        | 2.5         |
| 3.86                                                                                     | 40                           | 826.39998548                                  | 0.007        | 846.59998412        | 0.004        | 2.5         |
| 3.86                                                                                     | 30                           | 826.39998933                                  | 0.002        | 846.59998795        | -0.001       | 2.5         |
| <b>3.86</b>                                                                              | <b>20</b>                    | <b>826.39999107</b>                           | <b>0.000</b> | <b>846.59998746</b> | <b>0.000</b> | <b>2.5</b>  |
| 3.86                                                                                     | 10                           | 826.39999216                                  | -0.001       | 846.59999104        | -0.004       | 2.5         |
| 3.86                                                                                     | 0                            | 826.39998931                                  | 0.002        | 846.59998857        | -0.001       | 2.5         |
| 3.86                                                                                     | -10                          | 826.39999141                                  | 0.000        | 846.59998742        | 0.000        | 2.5         |
| 3.86                                                                                     | -20                          | 826.39998843                                  | 0.003        | 846.59999001        | -0.003       | 2.5         |
| 3.86                                                                                     | -30                          | 826.39998943                                  | 0.002        | 846.59998609        | 0.002        | 2.5         |

| Reference Frequency : WCDMA Band 5 Low Channel 826.4 MHz / High Channel 846.6 MHz @ 20°C |                              |                                               |             |              |              |             |
|------------------------------------------------------------------------------------------|------------------------------|-----------------------------------------------|-------------|--------------|--------------|-------------|
| Limit: $\pm 2.5$ ppm =                                                                   |                              | Low Channel                                   | 2066.000    | Hz           | High Channel | 2116.500    |
|                                                                                          |                              | Frequency Deviation Measured with Time Elapse |             |              |              |             |
| Power Supply [Vdc]                                                                       | Environment Temperature [°C] | Low Channel                                   |             | High Channel |              | Limit [ppm] |
|                                                                                          |                              | [MHz]                                         | Delta [ppm] | [MHz]        | Delta [ppm]  |             |
| 3.86                                                                                     | 20                           | 826.39999107                                  | 0           | 846.59998746 | 0            | 2.5         |
| 4.43                                                                                     | 20                           | 826.39999096                                  | 0.000       | 846.59998643 | 0.001        | 2.5         |
| 3.60                                                                                     | 20                           | 826.39998320                                  | 0.010       | 846.59998548 | 0.002        | 2.5         |

## WCDMA Band 4 (Lowest Frequency:HSDPA / Highest Frequency: Rel99)

| Limit          |           | 1710               | 1755                | Delta (Hz) | Frequency Stability (ppm) |
|----------------|-----------|--------------------|---------------------|------------|---------------------------|
| Condition      |           | F low @ End of OBW | F high @ End of OBW |            |                           |
| Temperature    | Voltage   | (MHz)              | (MHz)               |            |                           |
| Normal (20C)   | Normal    | 1710.3139          | 1754.6865           |            |                           |
| Extreme (50C)  |           | 1710.3139          | 1754.6865           | 21.5       | 0.012                     |
| Extreme (40C)  |           | 1710.3139          | 1754.6865           | 20.0       | 0.012                     |
| Extreme (30C)  |           | 1710.3139          | 1754.6865           | 19.3       | 0.011                     |
| Extreme (10C)  |           | 1710.3139          | 1754.6865           | 19.8       | 0.011                     |
| Extreme (0C)   |           | 1710.3139          | 1754.6865           | 23.5       | 0.014                     |
| Extreme (-10C) |           | 1710.3139          | 1754.6865           | 22.2       | 0.013                     |
| Extreme (-20C) |           | 1710.3139          | 1754.6865           | 19.6       | 0.011                     |
| Extreme (-30C) |           | 1710.3139          | 1754.6865           | 20.5       | 0.012                     |
|                |           |                    |                     |            |                           |
| 20C            | 15%       | 1710.3139          | 1754.6865           | 24.4       | 0.014                     |
|                | -15%      | 1710.3139          | 1754.6865           | 21.2       | 0.012                     |
|                | End Point | 1710.3139          | 1754.6865           | 21.6       | 0.012                     |

**WCDMA Band 2 (HSDPA)**

| Limit          |           | 1850                  | 1910                   | Delta<br>(Hz) | Frequency<br>Stability<br>(ppm) |
|----------------|-----------|-----------------------|------------------------|---------------|---------------------------------|
| Condition      |           | F low @<br>End of OBW | F high @<br>End of OBW |               |                                 |
| Temperature    | Voltage   | (MHz)                 | (MHz)                  |               |                                 |
| Normal (20C)   | Normal    | 1850.3111             | 1909.6840              |               |                                 |
| Extreme (50C)  |           | 1850.3111             | 1909.6840              | 22.5          | 0.012                           |
| Extreme (40C)  |           | 1850.3111             | 1909.6840              | 21.7          | 0.012                           |
| Extreme (30C)  |           | 1850.3111             | 1909.6840              | 17.9          | 0.010                           |
| Extreme (10C)  |           | 1850.3111             | 1909.6840              | 19.0          | 0.010                           |
| Extreme (0C)   |           | 1850.3111             | 1909.6840              | 17.7          | 0.009                           |
| Extreme (-10C) |           | 1850.3111             | 1909.6840              | 20.6          | 0.011                           |
| Extreme (-20C) |           | 1850.3111             | 1909.6840              | 23.7          | 0.013                           |
| Extreme (-30C) |           | 1850.3111             | 1909.6840              | 24.8          | 0.013                           |
|                |           |                       |                        |               |                                 |
| 20C            | 15%       | 1850.3111             | 1909.6840              | 24.9          | 0.013                           |
|                | -15%      | 1850.3111             | 1909.6840              | 25.3          | 0.013                           |
|                | End Point | 1850.3111             | 1909.6840              | 20.7          | 0.011                           |

**LTE Band 12 (Lowest Frequency:16QAM / Highest Frequency: QPSK)**

| Limit          |           | 699                | 716                 | Delta (Hz) | Frequency Stability (ppm) |
|----------------|-----------|--------------------|---------------------|------------|---------------------------|
| Condition      |           | F low @ End of OBW | F high @ End of OBW |            |                           |
| Temperature    | Voltage   | (MHz)              | (MHz)               |            |                           |
| Normal (20C)   | Normal    | 699.1565           | 715.8441            |            |                           |
| Extreme (50C)  |           | 699.1565           | 715.8441            | 0.6        | 0.001                     |
| Extreme (40C)  |           | 699.1565           | 715.8441            | 0.7        | 0.001                     |
| Extreme (30C)  |           | 699.1565           | 715.8441            | 0.7        | 0.001                     |
| Extreme (10C)  |           | 699.1565           | 715.8441            | 0.9        | 0.001                     |
| Extreme (0C)   |           | 699.1564           | 715.8441            | -0.4       | -0.001                    |
| Extreme (-10C) |           | 699.1565           | 715.8441            | 0.2        | 0.000                     |
| Extreme (-20C) |           | 699.1565           | 715.8441            | 1.0        | 0.001                     |
| Extreme (-30C) |           | 699.1565           | 715.8441            | 0.8        | 0.001                     |
|                |           |                    |                     |            |                           |
| 20C            | 15%       | 699.1565           | 715.8441            | 0.5        | 0.001                     |
|                | -15%      | 699.1565           | 715.8441            | 0.6        | 0.001                     |
|                | End Point | 699.1565           | 715.8441            | -0.2       | 0.000                     |

**LTE Band 13 (QPSK)**

| Limit          |           | 777                   | 787                    | Delta<br>(Hz) | Frequency<br>Stability<br>(ppm) |
|----------------|-----------|-----------------------|------------------------|---------------|---------------------------------|
| Condition      |           | F low @<br>End of OBW | F high @<br>End of OBW |               |                                 |
| Temperature    | Voltage   | (MHz)                 | (MHz)                  |               |                                 |
| Normal (20C)   | Normal    | 777.2556              | 786.7486               |               |                                 |
| Extreme (50C)  |           | 777.2556              | 786.7486               | 1.0           | 0.001                           |
| Extreme (40C)  |           | 777.2556              | 786.7486               | 1.2           | 0.002                           |
| Extreme (30C)  |           | 777.2556              | 786.7486               | 0.8           | 0.001                           |
| Extreme (10C)  |           | 777.2556              | 786.7486               | 1.1           | 0.001                           |
| Extreme (0C)   |           | 777.2555              | 786.7486               | -0.2          | 0.000                           |
| Extreme (-10C) |           | 777.2556              | 786.7486               | 0.5           | 0.001                           |
| Extreme (-20C) |           | 777.2556              | 786.7486               | 1.4           | 0.002                           |
| Extreme (-30C) |           | 777.2556              | 786.7486               | 0.9           | 0.001                           |
|                |           |                       |                        |               |                                 |
| 20C            | 15%       | 777.2556              | 786.7486               | 1.0           | 0.001                           |
|                | -15%      | 777.2556              | 786.7486               | 0.7           | 0.001                           |
|                | End Point | 777.2556              | 786.7486               | 1.3           | 0.002                           |

**LTE Band 25 (Lowest Frequency:16QAM / Highest Frequency: QPSK)**

| Limit          |           | 1850               | 1915                | Delta (Hz) | Frequency Stability (ppm) |
|----------------|-----------|--------------------|---------------------|------------|---------------------------|
| Condition      |           | F low @ End of OBW | F high @ End of OBW |            |                           |
| Temperature    | Voltage   | (MHz)              | (MHz)               |            |                           |
| Normal (20C)   | Normal    | 1850.1554          | 1914.8478           |            |                           |
| Extreme (50C)  |           | 1850.1554          | 1914.8478           | 3.3        | 0.002                     |
| Extreme (40C)  |           | 1850.1554          | 1914.8478           | 2.6        | 0.001                     |
| Extreme (30C)  |           | 1850.1554          | 1914.8478           | 2.2        | 0.001                     |
| Extreme (10C)  |           | 1850.1554          | 1914.8478           | 1.1        | 0.001                     |
| Extreme (0C)   |           | 1850.1554          | 1914.8478           | 1.4        | 0.001                     |
| Extreme (-10C) |           | 1850.1554          | 1914.8478           | 1.1        | 0.001                     |
| Extreme (-20C) |           | 1850.1554          | 1914.8478           | 1.6        | 0.001                     |
| Extreme (-30C) |           | 1850.1554          | 1914.8478           | 2.2        | 0.001                     |
|                |           |                    |                     |            |                           |
| 20C            | 15%       | 1850.1554          | 1914.8478           | 3.5        | 0.002                     |
|                | -15%      | 1850.1554          | 1914.8478           | 2.5        | 0.001                     |
|                | End Point | 1850.1554          | 1914.8478           | 1.1        | 0.001                     |

**LTE Band 26**

| Reference Frequency : LTE Band 26 Low Channel 814.7 MHz / High Channel 848.3 MHz @ 20°C |                              |                                               |             |              |              |             |
|-----------------------------------------------------------------------------------------|------------------------------|-----------------------------------------------|-------------|--------------|--------------|-------------|
| Limit: +/- 2.5 ppm =                                                                    |                              | Low Channel                                   | 2036.750    | Hz           | High Channel | 2120.750    |
|                                                                                         |                              | Frequency Deviation Measured with Time Elapse |             |              |              |             |
| Power Supply [Vdc]                                                                      | Environment Temperature [°C] | Low Channel                                   |             | High Channel |              | Limit [ppm] |
|                                                                                         |                              | [MHz]                                         | Delta [ppm] | [MHz]        | Delta [ppm]  |             |
| 3.86                                                                                    | 50                           | 814.70000449                                  | -0.002      | 848.30000506 | -0.003       | 2.5         |
| 3.86                                                                                    | 40                           | 814.70000369                                  | -0.001      | 848.30000157 | 0.002        | 2.5         |
| 3.86                                                                                    | 30                           | 814.70000342                                  | -0.001      | 848.30000228 | 0.001        | 2.5         |
| 3.86                                                                                    | 20                           | 814.70000290                                  | 0.000       | 848.30000292 | 0.000        | 2.5         |
| 3.86                                                                                    | 10                           | 814.70000411                                  | -0.001      | 848.30000435 | -0.002       | 2.5         |
| 3.86                                                                                    | 0                            | 814.70000336                                  | -0.001      | 848.30000194 | 0.001        | 2.5         |
| 3.86                                                                                    | -10                          | 814.70000215                                  | 0.001       | 848.30000173 | 0.001        | 2.5         |
| 3.86                                                                                    | -20                          | 814.70000369                                  | -0.001      | 848.30000419 | -0.001       | 2.5         |
| 3.86                                                                                    | -30                          | 814.70000319                                  | 0.000       | 848.30000322 | 0.000        | 2.5         |

| Reference Frequency : LTE Band 26 Low Channel 814.7 MHz / High Channel 848.3 MHz @ 20°C |                              |                                               |             |              |              |             |
|-----------------------------------------------------------------------------------------|------------------------------|-----------------------------------------------|-------------|--------------|--------------|-------------|
| Limit: +/- 2.5 ppm =                                                                    |                              | Low Channel                                   | 2036.750    | Hz           | High Channel | 2120.750    |
|                                                                                         |                              | Frequency Deviation Measured with Time Elapse |             |              |              |             |
| Power Supply [Vdc]                                                                      | Environment Temperature [°C] | Low Channel                                   |             | High Channel |              | Limit [ppm] |
|                                                                                         |                              | [MHz]                                         | Delta [ppm] | [MHz]        | Delta [ppm]  |             |
| 3.86                                                                                    | 20                           | 814.70000290                                  | 0           | 848.30000292 | 0            | 2.5         |
| 4.43                                                                                    | 20                           | 814.70000410                                  | -0.001      | 848.30000159 | 0.002        | 2.5         |
| 3.60                                                                                    | 20                           | 814.70000254                                  | 0.000       | 848.30000396 | -0.001       | 2.5         |

### LTE Band 41 PC2 (QPSK)

| Limit          |           | 2496                  | 2690                   | Delta<br>(Hz) | Frequency<br>Stability<br>(ppm) |
|----------------|-----------|-----------------------|------------------------|---------------|---------------------------------|
| Condition      |           | F low @<br>End of OBW | F high @<br>End of OBW |               |                                 |
| Temperature    | Voltage   | (MHz)                 | (MHz)                  |               |                                 |
| Normal (20C)   | Normal    | 2496.2520             | 2689.7480              |               |                                 |
| Extreme (50C)  |           | 2496.2520             | 2689.7480              | 21.0          | 0.008                           |
| Extreme (40C)  |           | 2496.2520             | 2689.7480              | 25.6          | 0.010                           |
| Extreme (30C)  |           | 2496.2520             | 2689.7480              | 19.9          | 0.008                           |
| Extreme (10C)  |           | 2496.2520             | 2689.7480              | 21.1          | 0.008                           |
| Extreme (0C)   |           | 2496.2520             | 2689.7480              | 17.5          | 0.007                           |
| Extreme (-10C) |           | 2496.2520             | 2689.7480              | 19.9          | 0.008                           |
| Extreme (-20C) |           | 2496.2520             | 2689.7480              | 18.5          | 0.007                           |
| Extreme (-30C) |           | 2496.2520             | 2689.7480              | 20.7          | 0.008                           |
|                |           |                       |                        |               |                                 |
| 20C            | 15%       | 2496.2520             | 2689.7480              | 21.4          | 0.008                           |
|                | -15%      | 2496.2520             | 2689.7480              | 19.5          | 0.008                           |
|                | End Point | 2496.2520             | 2689.7480              | 18.8          | 0.007                           |

### LTE Band 66 (QPSK)

| Limit          |           | 1710                  | 1780                   | Delta<br>(Hz) | Frequency<br>Stability<br>(ppm) |
|----------------|-----------|-----------------------|------------------------|---------------|---------------------------------|
| Condition      |           | F low @<br>End of OBW | F high @<br>End of OBW |               |                                 |
| Temperature    | Voltage   | (MHz)                 | (MHz)                  |               |                                 |
| Normal (20C)   | Normal    | 1710.1546             | 1779.8450              |               |                                 |
| Extreme (50C)  |           | 1710.1546             | 1779.8450              | 2.7           | 0.002                           |
| Extreme (40C)  |           | 1710.1546             | 1779.8450              | 2.4           | 0.001                           |
| Extreme (30C)  |           | 1710.1546             | 1779.8450              | 1.7           | 0.001                           |
| Extreme (10C)  |           | 1710.1546             | 1779.8450              | 2.1           | 0.001                           |
| Extreme (0C)   |           | 1710.1546             | 1779.8450              | 1.7           | 0.001                           |
| Extreme (-10C) |           | 1710.1546             | 1779.8450              | 2.2           | 0.001                           |
| Extreme (-20C) |           | 1710.1546             | 1779.8450              | 1.7           | 0.001                           |
| Extreme (-30C) |           | 1710.1546             | 1779.8450              | 1.9           | 0.001                           |
|                |           |                       |                        |               |                                 |
| 20C            | 15%       | 1710.1546             | 1779.8450              | 2.5           | 0.001                           |
|                | -15%      | 1710.1546             | 1779.8450              | 3.0           | 0.002                           |
|                | End Point | 1710.1546             | 1779.8450              | 1.2           | 0.001                           |

**LTE Band 2**

LTE Band 2(Frequency range: 1850-1910 MHz) is covered by LTE Band 25 (Frequency range: 1850-1915 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 4**

LTE Band 4 (Frequency range: 1710-1755 MHz) is covered by LTE Band 66 (Frequency range: 1710-1780 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 5**

LTE Band 5 (Frequency range: 824-849 MHz) is covered by LTE Band 26 (Frequency range: 814-849 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 17**

LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band41(PC3)**

LTE Band 41(PC3, Frequency range : 2496-2690 MHz) is covered by LTE Band 41(PC2) (Frequency range: 2496-2690 MHz) due to same frequency range, same channel bandwidth and maximum tune-up limit is higher than LTE Band41(PC3).

## 10. RADIATED TEST RESULTS

### 10.1. RADIATED POWER (ERP & EIRP)

#### RULE PART(S)

FCC: §2.1046, §22.913, §24.232, §27.50 and §27.53

#### LIMITS

22.913(a) - The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

24.232(c) - Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

27.50:

(b)(10) Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.

(c) (10) - Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

(d) (4) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

(h) The following power limits shall apply in the BRS and EBS:

(2) Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13dB.

#### TEST PROCEDURE

ANSI / TIA / EIA 603 E Clause 2.2.17; ESU40 setting reference to 971168 D01 v03r01

For radiated output power measurement with a ESU40:

a) Set the RBW  $\geq$  OBW; b) Set VBW  $\geq 3 \times$  RBW; c) Set span  $\geq 2 \times$  RBW; d) Sweep time = auto couple; e) Detector = rms; f) Ensure that the number of measurement points  $\geq$  span/RBW; g) Trace mode = max hold(GSM, WCDMA), average(LTE);

#### TEST RESULTS

### 10.1.1. ERP/EIRP Results

#### GSM

| Band    | Mode  | Channel | f [MHz] | ERP / EIRP   |                |
|---------|-------|---------|---------|--------------|----------------|
|         |       |         |         | [dBm]        | [mW]           |
| GSM850  | GPRS  | 512     | 824.2   | 30.72        | 1180.32        |
|         |       | 661     | 836.6   | 30.83        | 1210.60        |
|         |       | 810     | 848.8   | <b>31.16</b> | <b>1306.17</b> |
|         | EGPRS | 512     | 824.2   | 23.35        | 216.27         |
|         |       | 661     | 836.6   | 23.58        | 228.03         |
|         |       | 810     | 848.8   | <b>24.00</b> | <b>251.19</b>  |
| GSM1900 | GPRS  | 512     | 1850.2  | 28.48        | 704.69         |
|         |       | 661     | 1880    | <b>28.48</b> | <b>704.86</b>  |
|         |       | 810     | 1909.8  | 27.78        | 599.79         |
|         | EGPRS | 512     | 1850.2  | <b>24.47</b> | <b>279.90</b>  |
|         |       | 661     | 1880    | 23.25        | 211.35         |
|         |       | 810     | 1909.8  | 24.18        | 261.82         |

#### WCDMA

| Band   | Mode  | Channel | f [MHz] | ERP / EIRP   |               |
|--------|-------|---------|---------|--------------|---------------|
|        |       |         |         | [dBm]        | [mW]          |
| Band 5 | REL99 | 4132    | 826.4   | 19.73        | 93.97         |
|        |       | 4183    | 836.6   | 19.90        | 97.72         |
|        |       | 4233    | 846.6   | <b>20.90</b> | <b>123.03</b> |
|        | HSDPA | 4132    | 826.4   | 18.07        | 64.12         |
|        |       | 4183    | 836.6   | 17.76        | 59.70         |
|        |       | 4233    | 846.6   | <b>18.57</b> | <b>71.94</b>  |
| Band 4 | REL99 | 1312    | 1712.4  | 21.03        | 126.77        |
|        |       | 1413    | 1732.6  | 22.35        | 171.79        |
|        |       | 1513    | 1752.6  | <b>23.29</b> | <b>213.30</b> |
|        | HSDPA | 1312    | 1712.4  | 19.29        | 84.92         |
|        |       | 1413    | 1732.6  | 20.55        | 113.50        |
|        |       | 1513    | 1752.6  | <b>21.28</b> | <b>134.28</b> |
| Band 2 | REL99 | 9262    | 1852.4  | <b>20.72</b> | <b>118.03</b> |
|        |       | 9400    | 1880.0  | 19.81        | 95.72         |
|        |       | 9538    | 1907.6  | 19.51        | 89.33         |
|        | HSDPA | 9262    | 1852.4  | <b>17.61</b> | <b>57.68</b>  |
|        |       | 9400    | 1880.0  | 17.56        | 57.02         |
|        |       | 9538    | 1907.6  | 16.88        | 48.75         |

**LTE Band 12**

| Band    | BW [MHz] | Mode  | RB Size/<br>RB Offset | f [MHz] | ERP / EIRP   |              |
|---------|----------|-------|-----------------------|---------|--------------|--------------|
|         |          |       |                       |         | [dBm]        | [mW]         |
| Band 12 | 10       | QPSK  | 1 / 0                 | 704.0   | 16.76        | 47.42        |
|         |          |       | 1 / 0                 | 707.5   | 17.04        | 50.58        |
|         |          |       | 1 / 0                 | 711.0   | <b>17.36</b> | <b>54.45</b> |
|         |          | 16QAM | 1 / 0                 | 704.0   | 15.82        | 38.19        |
|         |          |       | 1 / 0                 | 707.5   | <b>16.38</b> | <b>43.45</b> |
|         |          |       | 1 / 0                 | 711.0   | 16.30        | 42.66        |
|         | 5        | QPSK  | 1 / 12                | 701.5   | 16.93        | 49.32        |
|         |          |       | 1 / 24                | 707.5   | <b>17.40</b> | <b>54.95</b> |
|         |          |       | 1 / 24                | 713.5   | 17.36        | 54.45        |
|         |          | 16QAM | 1 / 24                | 701.5   | 15.62        | 36.48        |
|         |          |       | 1 / 12                | 707.5   | 16.23        | 41.98        |
|         |          |       | 1 / 12                | 713.5   | <b>16.63</b> | <b>46.03</b> |
|         | 3        | QPSK  | 1 / 8                 | 700.5   | 16.80        | 47.86        |
|         |          |       | 1 / 0                 | 707.5   | 17.33        | 54.08        |
|         |          |       | 1 / 8                 | 714.5   | <b>17.47</b> | <b>55.85</b> |
|         |          | 16QAM | 1 / 8                 | 700.5   | 15.95        | 39.36        |
|         |          |       | 1 / 0                 | 707.5   | 16.34        | 43.05        |
|         |          |       | 1 / 8                 | 714.5   | <b>16.39</b> | <b>43.55</b> |
|         | 1.4      | QPSK  | 1 / 5                 | 699.7   | 16.84        | 48.31        |
|         |          |       | 1 / 0                 | 707.5   | <b>17.35</b> | <b>54.33</b> |
|         |          |       | 1 / 3                 | 715.3   | 17.18        | 52.24        |
|         |          | 16QAM | 1 / 5                 | 699.7   | 15.82        | 38.19        |
|         |          |       | 1 / 0                 | 707.5   | 16.34        | 43.05        |
|         |          |       | 1 / 0                 | 715.3   | <b>16.49</b> | <b>44.57</b> |

**LTE Band 13**

| Band    | BW [MHz] | Mode  | RB size /<br>RB Offset | f [MHz] | ERP / EIRP   |               |
|---------|----------|-------|------------------------|---------|--------------|---------------|
|         |          |       |                        |         | [dBm]        | [mW]          |
| Band 13 | 10       | QPSK  | 1 / 0                  | 782.0   | <b>20.30</b> | <b>107.15</b> |
|         |          | 16QAM | 1 / 49                 | 782.0   | 18.93        | 78.16         |
|         | 5        | QPSK  | 1 / 12                 | 779.5   | 19.99        | 99.77         |
|         |          |       | 1 / 0                  | 782.0   | <b>20.06</b> | <b>101.39</b> |
|         |          |       | 1 / 12                 | 784.5   | 19.77        | 94.84         |
|         |          | 16QAM | 1 / 24                 | 779.5   | <b>19.13</b> | <b>81.85</b>  |
|         |          |       | 1 / 0                  | 782.0   | 18.97        | 78.89         |
|         |          |       | 1 / 0                  | 784.5   | 18.73        | 74.64         |

**LTE Band 25**

| Band    | BW<br>[MHz] | Mode  | RB Size/<br>RB Offset | f [MHz] | ERP / EIRP   |               |
|---------|-------------|-------|-----------------------|---------|--------------|---------------|
|         |             |       |                       |         | [dBm]        | [mW]          |
| Band 25 | 20          | QPSK  | 1 / 0                 | 1860.0  | 21.27        | 133.97        |
|         |             |       | 1 / 0                 | 1882.5  | 21.44        | 139.32        |
|         |             |       | 1 / 0                 | 1905.0  | <b>23.32</b> | <b>214.78</b> |
|         |             | 16QAM | 1 / 0                 | 1860.0  | 21.84        | 152.76        |
|         |             |       | 1 / 0                 | 1882.5  | 22.41        | 174.18        |
|         |             |       | 1 / 0                 | 1905.0  | <b>23.28</b> | <b>212.81</b> |
|         | 15          | QPSK  | 1 / 37                | 1857.5  | 23.11        | 204.64        |
|         |             |       | 1 / 0                 | 1882.5  | 22.72        | 187.07        |
|         |             |       | 1 / 74                | 1907.5  | <b>24.03</b> | <b>252.93</b> |
|         |             | 16QAM | 1 / 0                 | 1857.5  | 21.92        | 155.60        |
|         |             |       | 1 / 37                | 1882.5  | 22.00        | 158.49        |
|         |             |       | 1 / 0                 | 1907.5  | <b>23.65</b> | <b>231.74</b> |
|         | 10          | QPSK  | 1 / 0                 | 1855.0  | 22.94        | 196.79        |
|         |             |       | 1 / 0                 | 1882.5  | 22.97        | 198.15        |
|         |             |       | 1 / 49                | 1910.0  | <b>23.99</b> | <b>250.61</b> |
|         |             | 16QAM | 1 / 0                 | 1855.0  | 21.87        | 153.82        |
|         |             |       | 1 / 0                 | 1882.5  | 22.23        | 167.11        |
|         |             |       | 1 / 0                 | 1910.0  | <b>23.25</b> | <b>211.35</b> |
|         | 5           | QPSK  | 1 / 12                | 1852.5  | 22.87        | 193.64        |
|         |             |       | 1 / 24                | 1882.5  | 22.95        | 197.24        |
|         |             |       | 1 / 24                | 1912.5  | <b>24.05</b> | <b>254.10</b> |
|         |             | 16QAM | 1 / 24                | 1852.5  | 21.99        | 158.12        |
|         |             |       | 1 / 24                | 1882.5  | 21.67        | 146.89        |
|         |             |       | 1 / 12                | 1912.5  | <b>22.68</b> | <b>185.35</b> |
|         | 3           | QPSK  | 1 / 8                 | 1851.5  | 22.67        | 184.93        |
|         |             |       | 1 / 0                 | 1882.5  | 23.06        | 202.30        |
|         |             |       | 1 / 0                 | 1913.5  | <b>24.39</b> | <b>274.79</b> |
|         |             | 16QAM | 1 / 8                 | 1851.5  | 21.62        | 145.21        |
|         |             |       | 1 / 8                 | 1882.5  | 22.09        | 161.81        |
|         |             |       | 1 / 8                 | 1913.5  | <b>23.17</b> | <b>207.49</b> |
|         | 1.4         | QPSK  | 1 / 0                 | 1850.7  | 22.61        | 182.39        |
|         |             |       | 1 / 0                 | 1882.5  | 22.92        | 195.88        |
|         |             |       | 1 / 0                 | 1914.3  | <b>24.28</b> | <b>267.92</b> |
|         |             | 16QAM | 1 / 3                 | 1850.7  | 21.80        | 151.36        |
|         |             |       | 1 / 0                 | 1882.5  | 21.66        | 146.55        |
|         |             |       | 1 / 0                 | 1914.3  | <b>23.18</b> | <b>207.97</b> |

**LTE Band 26**

| Band    | BW<br>[MHz] | Mode  | RB Size/<br>RB Offset | f [MHz] | ERP/EIRP     |              |
|---------|-------------|-------|-----------------------|---------|--------------|--------------|
|         |             |       |                       |         | [dBm]        | [mW]         |
| Band 26 | 15          | QPSK  | 1 / 0                 | 821.5   | 19.39        | 86.90        |
|         |             |       | 1 / 37                | 831.5   | <b>18.82</b> | <b>76.21</b> |
|         |             |       | 1 / 37                | 841.5   | 18.67        | 73.62        |
|         |             | 16QAM | 1 / 0                 | 821.5   | 18.16        | 65.46        |
|         |             |       | 1 / 37                | 831.5   | <b>18.46</b> | <b>70.15</b> |
|         |             |       | 1 / 37                | 841.5   | 17.54        | 56.75        |
|         | 10          | QPSK  | 1 / 0                 | 819.0   | 19.39        | 86.90        |
|         |             |       | 1 / 0                 | 829.0   | 19.31        | 85.31        |
|         |             |       | 1 / 0                 | 831.5   | <b>19.57</b> | <b>90.57</b> |
|         |             |       | 1 / 0                 | 844.0   | 18.96        | 78.70        |
|         |             | 16QAM | 1 / 0                 | 819.0   | 18.28        | 67.30        |
|         |             |       | 1 / 25                | 829.0   | 18.41        | 69.34        |
|         |             |       | 1 / 0                 | 831.5   | <b>18.57</b> | <b>71.94</b> |
|         |             |       | 1 / 0                 | 844.0   | 18.01        | 63.24        |
|         |             |       | 1 / 0                 | 844.0   | 18.01        | 63.24        |
|         | 5           | QPSK  | 1 / 12                | 816.5   | 19.02        | 79.80        |
|         |             |       | 1 / 12                | 821.5   | <b>19.49</b> | <b>88.92</b> |
|         |             |       | 1 / 12                | 826.5   | 19.34        | 85.90        |
|         |             |       | 1 / 0                 | 831.5   | 19.23        | 83.75        |
|         |             |       | 1 / 0                 | 846.5   | 18.64        | 73.11        |
|         |             | 16QAM | 1 / 12                | 816.5   | 18.12        | 64.86        |
|         |             |       | 1 / 24                | 821.5   | 18.05        | 63.83        |
|         |             |       | 1 / 24                | 826.5   | <b>18.25</b> | <b>66.83</b> |
|         |             |       | 1 / 0                 | 831.5   | 18.23        | 66.53        |
|         |             |       | 1 / 12                | 846.5   | 17.28        | 53.46        |
|         | 3           | QPSK  | 1 / 14                | 815.5   | 18.96        | 78.70        |
|         |             |       | 1 / 0                 | 822.5   | 19.32        | 85.51        |
|         |             |       | 1 / 0                 | 825.5   | <b>19.47</b> | <b>88.51</b> |
|         |             |       | 1 / 8                 | 831.5   | 19.55        | 90.16        |
|         |             |       | 1 / 8                 | 847.5   | 18.28        | 67.30        |
|         |             | 16QAM | 1 / 14                | 815.5   | 17.85        | 60.95        |
|         |             |       | 1 / 0                 | 822.5   | <b>18.57</b> | <b>71.94</b> |
|         |             |       | 1 / 14                | 825.5   | 18.46        | 70.15        |
|         |             |       | 1 / 0                 | 831.5   | 18.29        | 67.45        |
|         |             |       | 1 / 8                 | 847.5   | 17.25        | 53.09        |
|         | 1.4         | QPSK  | 1 / 0                 | 814.7   | 18.56        | 71.78        |
|         |             |       | 1 / 0                 | 823.3   | <b>19.42</b> | <b>87.50</b> |
|         |             |       | 1 / 0                 | 824.7   | 19.26        | 84.33        |
|         |             |       | 1 / 0                 | 831.5   | 19.16        | 82.41        |
|         |             |       | 1 / 0                 | 848.3   | 18.37        | 68.71        |
|         |             | 16QAM | 1 / 0                 | 814.7   | 17.65        | 58.21        |
|         |             |       | 1 / 0                 | 823.3   | 18.22        | 66.37        |
|         |             |       | 1 / 0                 | 824.7   | <b>18.24</b> | <b>66.68</b> |
|         |             |       | 1 / 0                 | 831.5   | 18.28        | 67.30        |
|         |             |       | 1 / 0                 | 848.3   | 17.47        | 55.85        |

**LTE Band 41(PC2)**

| Band    | BW<br>[MHz] | Mode  | RB Size/<br>RB Offset | f [MHz] | ERP / EIRP   |               |
|---------|-------------|-------|-----------------------|---------|--------------|---------------|
|         |             |       |                       |         | [dBm]        | [mW]          |
| Band 41 | 20          | QPSK  | 1 / 99                | 2506.0  | <b>27.45</b> | <b>555.90</b> |
|         |             |       | 1 / 0                 | 2593.0  | 27.15        | 518.80        |
|         |             |       | 1 / 0                 | 2680.0  | 26.64        | 461.32        |
|         |             | 16QAM | 1 / 0                 | 2506.0  | 26.34        | 430.53        |
|         |             |       | 1 / 0                 | 2593.0  | <b>27.69</b> | <b>587.49</b> |
|         |             |       | 1 / 0                 | 2680.0  | 26.08        | 405.51        |
|         | 15          | QPSK  | 1 / 37                | 2503.5  | <b>28.42</b> | <b>695.02</b> |
|         |             |       | 1 / 37                | 2593.0  | 27.24        | 529.66        |
|         |             |       | 1 / 0                 | 2682.5  | 26.99        | 500.03        |
|         |             | 16QAM | 1 / 0                 | 2503.5  | 26.89        | 488.65        |
|         |             |       | 1 / 0                 | 2593.0  | <b>27.65</b> | <b>582.10</b> |
|         |             |       | 1 / 0                 | 2682.5  | 25.94        | 392.64        |
|         | 10          | QPSK  | 1 / 25                | 2501.0  | <b>28.32</b> | <b>679.20</b> |
|         |             |       | 1 / 0                 | 2593.0  | 28.00        | 630.96        |
|         |             |       | 1 / 25                | 2685.0  | 27.49        | 561.05        |
|         |             | 16QAM | 1 / 25                | 2501.0  | 27.60        | 575.44        |
|         |             |       | 1 / 0                 | 2593.0  | <b>27.78</b> | <b>599.79</b> |
|         |             |       | 1 / 25                | 2685.0  | 27.07        | 509.33        |
|         | 5           | QPSK  | 1 / 0                 | 2498.5  | 26.45        | 441.57        |
|         |             |       | 1 / 12                | 2593.0  | <b>27.02</b> | <b>503.50</b> |
|         |             |       | 1 / 0                 | 2687.5  | 26.31        | 427.56        |
|         |             | 16QAM | 1 / 24                | 2498.5  | 26.57        | 453.94        |
|         |             |       | 1 / 0                 | 2593.0  | <b>27.25</b> | <b>530.88</b> |
|         |             |       | 1 / 0                 | 2687.5  | 26.84        | 483.06        |

**LTE Band 66**

| Band    | BW<br>[MHz] | Mode  | RB Size/<br>RB Offset | f [MHz] | ERP / EIRP   |               |
|---------|-------------|-------|-----------------------|---------|--------------|---------------|
|         |             |       |                       |         | [dBm]        | [mW]          |
| Band 66 | 20          | QPSK  | 1 / 0                 | 1720.0  | 23.14        | 206.06        |
|         |             |       | 1 / 0                 | 1745.0  | <b>23.92</b> | <b>246.60</b> |
|         |             |       | 1 / 0                 | 1770.0  | 23.29        | 213.30        |
|         |             | 16QAM | 1 / 0                 | 1720.0  | 21.76        | 149.97        |
|         |             |       | 1 / 0                 | 1745.0  | <b>22.75</b> | <b>188.36</b> |
|         |             |       | 1 / 0                 | 1770.0  | 22.19        | 165.58        |
|         | 15          | QPSK  | 1 / 37                | 1717.5  | 23.25        | 211.35        |
|         |             |       | 1 / 0                 | 1747.5  | <b>23.90</b> | <b>245.47</b> |
|         |             |       | 1 / 0                 | 1772.5  | 22.88        | 194.09        |
|         |             | 16QAM | 1 / 37                | 1717.5  | 21.44        | 139.32        |
|         |             |       | 1 / 37                | 1747.5  | <b>22.49</b> | <b>177.42</b> |
|         |             |       | 1 / 37                | 1772.5  | 21.55        | 142.89        |
|         | 10          | QPSK  | 1 / 0                 | 1715.0  | 22.98        | 198.61        |
|         |             |       | 1 / 0                 | 1745.0  | <b>23.95</b> | <b>248.31</b> |
|         |             |       | 1 / 0                 | 1775.0  | 22.97        | 198.15        |
|         |             | 16QAM | 1 / 0                 | 1715.0  | 22.04        | 159.96        |
|         |             |       | 1 / 0                 | 1745.0  | <b>22.49</b> | <b>177.42</b> |
|         |             |       | 1 / 0                 | 1775.0  | 22.14        | 163.68        |
|         | 5           | QPSK  | 1 / 12                | 1712.5  | 23.09        | 203.70        |
|         |             |       | 1 / 12                | 1745.0  | <b>23.80</b> | <b>239.88</b> |
|         |             |       | 1 / 24                | 1777.5  | 23.60        | 229.09        |
|         |             | 16QAM | 1 / 24                | 1712.5  | 22.19        | 165.58        |
|         |             |       | 1 / 12                | 1745.0  | <b>22.55</b> | <b>179.89</b> |
|         |             |       | 1 / 12                | 1777.5  | 22.50        | 177.83        |
|         | 3           | QPSK  | 1 / 8                 | 1711.5  | 22.66        | 184.50        |
|         |             |       | 1 / 0                 | 1745.0  | 23.27        | 212.32        |
|         |             |       | 1 / 8                 | 1778.5  | <b>23.60</b> | <b>229.09</b> |
|         |             | 16QAM | 1 / 8                 | 1711.5  | 21.92        | 155.60        |
|         |             |       | 1 / 0                 | 1745.0  | <b>22.74</b> | <b>187.93</b> |
|         |             |       | 1 / 8                 | 1778.5  | 22.07        | 161.06        |
|         | 1.4         | QPSK  | 1 / 0                 | 1710.7  | 22.84        | 192.31        |
|         |             |       | 1 / 0                 | 1745.0  | 23.22        | 209.89        |
|         |             |       | 1 / 0                 | 1779.3  | <b>23.40</b> | <b>218.78</b> |
|         |             | 16QAM | 1 / 0                 | 1710.7  | 21.94        | 156.31        |
|         |             |       | 1 / 5                 | 1745.0  | 22.22        | 166.72        |
|         |             |       | 1 / 0                 | 1779.3  | <b>22.36</b> | <b>172.19</b> |

**LTE Band 2**

LTE Band 2(Frequency range: 1850-1910 MHz) is covered by LTE Band 25 (Frequency range: 1850-1915 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 4**

LTE Band 4 (Frequency range: 1710-1755 MHz) is covered by LTE Band 66 (Frequency range: 1710-1780 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 5**

LTE Band 5 (Frequency range: 824-849 MHz) is covered by LTE Band 26 (Frequency range: 814-849 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 17**

LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band41(PC3)**

LTE Band 41(PC3, Frequency range : 2496-2690 MHz) is covered by LTE Band 41(PC2) (Frequency range: 2496-2690 MHz) due to same frequency range, same channel bandwidth and maximum tune-up limit is higher than LTE Band41(PC3).

## 10.1.2. ERP/EIRP DATA

### GSM850

| GSM850<br><br>GPRS  | <p style="text-align: center;"><b>UL Verification Services, Inc.</b><br/><b>High Frequency Substitution Measurement</b></p> <p> <b>Company:</b> Samsung<br/> <b>Project #:</b> 4789219881<br/> <b>Date:</b> 2019-11-25<br/> <b>Test Engineer:</b> 20882<br/> <b>Configuration:</b> EUT, Z-Position<br/> <b>Location:</b> Chamber 2<br/> <b>Mode:</b> GPRS 850 MHz Fundamentals </p> <p> <b>Test Equipment:</b><br/> Receiving: VULB9163-749, and Chamber 2 SMA Cables<br/> Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable </p> <table> <tr> <th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr> <tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>824.20</td><td>34.68</td><td>V</td><td>3.0</td><td>-1.0</td><td>30.72</td><td>38.5</td><td>-7.8</td><td></td></tr> <tr><td>824.20</td><td>25.06</td><td>H</td><td>3.0</td><td>-1.0</td><td>21.10</td><td>38.5</td><td>-17.4</td><td></td></tr> <tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>836.60</td><td>34.77</td><td>V</td><td>3.0</td><td>-0.9</td><td>30.83</td><td>38.5</td><td>-7.7</td><td></td></tr> <tr><td>836.60</td><td>23.96</td><td>H</td><td>3.0</td><td>-0.9</td><td>20.02</td><td>38.5</td><td>-18.5</td><td></td></tr> <tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>848.80</td><td>35.07</td><td>V</td><td>3.1</td><td>-0.9</td><td>31.16</td><td>38.5</td><td>-7.3</td><td></td></tr> <tr><td>848.80</td><td>24.93</td><td>H</td><td>3.1</td><td>-0.9</td><td>21.02</td><td>38.5</td><td>-17.5</td><td></td></tr> </table>     |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 824.20 | 34.68 | V | 3.0 | -1.0 | 30.72 | 38.5 | -7.8  |  | 824.20 | 25.06 | H | 3.0 | -1.0 | 21.10 | 38.5 | -17.4 |  | Mid Ch |  |  |  |  |  |  |  |  | 836.60 | 34.77 | V | 3.0 | -0.9 | 30.83 | 38.5 | -7.7  |  | 836.60 | 23.96 | H | 3.0 | -0.9 | 20.02 | 38.5 | -18.5 |  | High Ch |  |  |  |  |  |  |  |  | 848.80 | 35.07 | V | 3.1 | -0.9 | 31.16 | 38.5 | -7.3  |  | 848.80 | 24.93 | H | 3.1 | -0.9 | 21.02 | 38.5 | -17.5 |  |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|-------|------|-------|--|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|-------|------|-------|--|---------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|-------|------|-------|--|
| f MHz               | SG reading (dBm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| Low Ch              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 824.20              | 34.68                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | V               | 3.0             | -1.0               | 30.72     | 38.5        | -7.8       |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 824.20              | 25.06                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H               | 3.0             | -1.0               | 21.10     | 38.5        | -17.4      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| Mid Ch              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 836.60              | 34.77                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | V               | 3.0             | -0.9               | 30.83     | 38.5        | -7.7       |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 836.60              | 23.96                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H               | 3.0             | -0.9               | 20.02     | 38.5        | -18.5      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| High Ch             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 848.80              | 35.07                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | V               | 3.1             | -0.9               | 31.16     | 38.5        | -7.3       |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 848.80              | 24.93                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H               | 3.1             | -0.9               | 21.02     | 38.5        | -17.5      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| GSM850<br><br>EGPRS | <p style="text-align: center;"><b>UL Verification Services, Inc.</b><br/><b>High Frequency Substitution Measurement</b></p> <p> <b>Company:</b> Samsung<br/> <b>Project #:</b> 4789219881<br/> <b>Date:</b> 2019-11-25<br/> <b>Test Engineer:</b> 20882<br/> <b>Configuration:</b> EUT, Z-Position<br/> <b>Location:</b> Chamber 2<br/> <b>Mode:</b> EGPRS 850 MHz Fundamentals </p> <p> <b>Test Equipment:</b><br/> Receiving: VULB9163-749, and Chamber 2 SMA Cables<br/> Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable </p> <table> <tr> <th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr> <tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>824.20</td><td>27.31</td><td>V</td><td>3.0</td><td>-1.0</td><td>23.35</td><td>38.5</td><td>-15.2</td><td></td></tr> <tr><td>824.20</td><td>17.96</td><td>H</td><td>3.0</td><td>-1.0</td><td>14.00</td><td>38.5</td><td>-24.5</td><td></td></tr> <tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>836.60</td><td>27.52</td><td>V</td><td>3.0</td><td>-0.9</td><td>23.58</td><td>38.5</td><td>-14.9</td><td></td></tr> <tr><td>836.60</td><td>17.66</td><td>H</td><td>3.0</td><td>-0.9</td><td>13.72</td><td>38.5</td><td>-24.8</td><td></td></tr> <tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>848.80</td><td>27.91</td><td>V</td><td>3.1</td><td>-0.9</td><td>24.00</td><td>38.5</td><td>-14.5</td><td></td></tr> <tr><td>848.80</td><td>17.77</td><td>H</td><td>3.1</td><td>-0.9</td><td>13.86</td><td>38.5</td><td>-24.6</td><td></td></tr> </table> |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 824.20 | 27.31 | V | 3.0 | -1.0 | 23.35 | 38.5 | -15.2 |  | 824.20 | 17.96 | H | 3.0 | -1.0 | 14.00 | 38.5 | -24.5 |  | Mid Ch |  |  |  |  |  |  |  |  | 836.60 | 27.52 | V | 3.0 | -0.9 | 23.58 | 38.5 | -14.9 |  | 836.60 | 17.66 | H | 3.0 | -0.9 | 13.72 | 38.5 | -24.8 |  | High Ch |  |  |  |  |  |  |  |  | 848.80 | 27.91 | V | 3.1 | -0.9 | 24.00 | 38.5 | -14.5 |  | 848.80 | 17.77 | H | 3.1 | -0.9 | 13.86 | 38.5 | -24.6 |  |
| f MHz               | SG reading (dBm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| Low Ch              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 824.20              | 27.31                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | V               | 3.0             | -1.0               | 23.35     | 38.5        | -15.2      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 824.20              | 17.96                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H               | 3.0             | -1.0               | 14.00     | 38.5        | -24.5      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| Mid Ch              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 836.60              | 27.52                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | V               | 3.0             | -0.9               | 23.58     | 38.5        | -14.9      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 836.60              | 17.66                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H               | 3.0             | -0.9               | 13.72     | 38.5        | -24.8      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| High Ch             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 848.80              | 27.91                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | V               | 3.1             | -0.9               | 24.00     | 38.5        | -14.5      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 848.80              | 17.77                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H               | 3.1             | -0.9               | 13.86     | 38.5        | -24.6      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |

**GSM1900**

GSM1900

GPRS

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company: Samsung

Project #: 4789219881

Date: 2019-11-25

Test Engineer: 20882

Configuration: EUT, X-Position

Location: Chamber 2

Mode: GPRS 1900 MHz Fundamentals

Test Equipment:

Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables

Substitution: Horn 3115[00167451], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1850.20 | 15.45            | V               | 4.5             | 9.4                | 20.37      | 33.0        | -12.6      |       |
| 1850.20 | 23.56            | H               | 4.5             | 9.4                | 28.48      | 33.0        | -4.5       |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1880.00 | 19.09            | V               | 4.5             | 9.2                | 23.75      | 33.0        | -9.3       |       |
| 1880.00 | 23.82            | H               | 4.5             | 9.2                | 28.48      | 33.0        | -4.5       |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1909.80 | 19.75            | V               | 4.6             | 8.9                | 24.11      | 33.0        | -8.9       |       |
| 1909.80 | 23.42            | H               | 4.6             | 8.9                | 27.78      | 33.0        | -5.2       |       |

GSM1900

EGPRS

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company: Samsung

Project #: 4789219881

Date: 2019-11-25

Test Engineer: 20882

Configuration: EUT, X-Position

Location: Chamber 2

Mode: EGPRS 1900 MHz Fundamentals

Test Equipment:

Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables

Substitution: Horn 3115[00167451], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1850.20 | 8.65             | V               | 4.5             | 9.4                | 13.57      | 33.0        | -19.4      |       |
| 1850.20 | 19.55            | H               | 4.5             | 9.4                | 24.47      | 33.0        | -8.5       |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1880.00 | 14.32            | V               | 4.5             | 9.2                | 18.98      | 33.0        | -14.0      |       |
| 1880.00 | 18.59            | H               | 4.5             | 9.2                | 23.25      | 33.0        | -9.8       |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1909.80 | 15.73            | V               | 4.6             | 8.9                | 20.09      | 33.0        | -12.9      |       |
| 1909.80 | 19.82            | H               | 4.6             | 8.9                | 24.18      | 33.0        | -8.8       |       |

**WCDMA Band 5**

| WCDMA<br><br>Band 5<br>REL99 | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-23<br/>Test Engineer: 20882<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 2<br/>Mode: Rel99 Band 5 Fundamentals</div> <div>Test Equipment:<br/>Receiving: VULB9163-749, and Chamber 2 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>826.40</td><td>23.69</td><td>V</td><td>3.0</td><td>-0.9</td><td>19.73</td><td>38.5</td><td>-18.8</td></tr><tr><td>826.40</td><td>14.19</td><td>H</td><td>3.0</td><td>-0.9</td><td>10.23</td><td>38.5</td><td>-28.3</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>836.60</td><td>23.84</td><td>V</td><td>3.0</td><td>-0.9</td><td>19.90</td><td>38.5</td><td>-18.6</td></tr><tr><td>836.60</td><td>13.67</td><td>H</td><td>3.0</td><td>-0.9</td><td>9.73</td><td>38.5</td><td>-28.8</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>846.60</td><td>24.81</td><td>V</td><td>3.1</td><td>-0.9</td><td>20.90</td><td>38.5</td><td>-17.6</td></tr><tr><td>846.60</td><td>14.14</td><td>H</td><td>3.1</td><td>-0.9</td><td>10.23</td><td>38.5</td><td>-28.3</td></tr></table> |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  | 826.40 | 23.69 | V | 3.0 | -0.9 | 19.73 | 38.5 | -18.8 | 826.40 | 14.19 | H | 3.0 | -0.9 | 10.23 | 38.5 | -28.3 | Mid Ch |  |  |  |  |  |  |  | 836.60 | 23.84 | V | 3.0 | -0.9 | 19.90 | 38.5 | -18.6 | 836.60 | 13.67 | H | 3.0 | -0.9 | 9.73 | 38.5 | -28.8 | High Ch |  |  |  |  |  |  |  | 846.60 | 24.81 | V | 3.1 | -0.9 | 20.90 | 38.5 | -17.6 | 846.60 | 14.14 | H | 3.1 | -0.9 | 10.23 | 38.5 | -28.3 |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--------|-------|---|-----|------|-------|------|-------|--------|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--------|-------|---|-----|------|------|------|-------|---------|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--------|-------|---|-----|------|-------|------|-------|
|                              | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |
|                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |
|                              | 826.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 23.69            | V               | 3.0             | -0.9               | 19.73     | 38.5        | -18.8      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |
|                              | 826.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 14.19            | H               | 3.0             | -0.9               | 10.23     | 38.5        | -28.3      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |
|                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |
|                              | 836.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 23.84            | V               | 3.0             | -0.9               | 19.90     | 38.5        | -18.6      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |
|                              | 836.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 13.67            | H               | 3.0             | -0.9               | 9.73      | 38.5        | -28.8      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |
|                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |
|                              | 846.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 24.81            | V               | 3.1             | -0.9               | 20.90     | 38.5        | -17.6      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |
| 846.60                       | 14.14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | H                | 3.1             | -0.9            | 10.23              | 38.5      | -28.3       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |
| WCDMA<br><br>Band 5<br>HSDPA | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-23<br/>Test Engineer: 20882<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 2<br/>Mode: HSDPA Band 5 Fundamentals</div> <div>Test Equipment:<br/>Receiving: VULB9163-749, and Chamber 2 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>826.40</td><td>22.03</td><td>V</td><td>3.0</td><td>-0.9</td><td>18.07</td><td>38.5</td><td>-20.4</td></tr><tr><td>826.40</td><td>12.24</td><td>H</td><td>3.0</td><td>-0.9</td><td>8.28</td><td>38.5</td><td>-30.2</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>836.60</td><td>21.70</td><td>V</td><td>3.0</td><td>-0.9</td><td>17.76</td><td>38.5</td><td>-20.7</td></tr><tr><td>836.60</td><td>12.18</td><td>H</td><td>3.0</td><td>-0.9</td><td>8.24</td><td>38.5</td><td>-30.3</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>846.60</td><td>22.48</td><td>V</td><td>3.1</td><td>-0.9</td><td>18.57</td><td>38.5</td><td>-19.9</td></tr><tr><td>846.60</td><td>12.07</td><td>H</td><td>3.1</td><td>-0.9</td><td>8.16</td><td>38.5</td><td>-30.3</td></tr></table>   |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  | 826.40 | 22.03 | V | 3.0 | -0.9 | 18.07 | 38.5 | -20.4 | 826.40 | 12.24 | H | 3.0 | -0.9 | 8.28  | 38.5 | -30.2 | Mid Ch |  |  |  |  |  |  |  | 836.60 | 21.70 | V | 3.0 | -0.9 | 17.76 | 38.5 | -20.7 | 836.60 | 12.18 | H | 3.0 | -0.9 | 8.24 | 38.5 | -30.3 | High Ch |  |  |  |  |  |  |  | 846.60 | 22.48 | V | 3.1 | -0.9 | 18.57 | 38.5 | -19.9 | 846.60 | 12.07 | H | 3.1 | -0.9 | 8.16  | 38.5 | -30.3 |
|                              | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |
|                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |
|                              | 826.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 22.03            | V               | 3.0             | -0.9               | 18.07     | 38.5        | -20.4      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |
|                              | 826.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 12.24            | H               | 3.0             | -0.9               | 8.28      | 38.5        | -30.2      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |
|                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |
|                              | 836.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 21.70            | V               | 3.0             | -0.9               | 17.76     | 38.5        | -20.7      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |
|                              | 836.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 12.18            | H               | 3.0             | -0.9               | 8.24      | 38.5        | -30.3      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |
|                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |
|                              | 846.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 22.48            | V               | 3.1             | -0.9               | 18.57     | 38.5        | -19.9      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |
| 846.60                       | 12.07                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | H                | 3.1             | -0.9            | 8.16               | 38.5      | -30.3       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |       |      |       |

**WCDMA Band 4**

| WCDMA<br><br>Band 4<br>REL99 | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-23<br/>Test Engineer: 20882<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 2<br/>Mode: Rel99 Band 4 Fundamentals</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00167451], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1712.40</td><td>13.26</td><td>V</td><td>4.3</td><td>9.3</td><td>18.27</td><td>30.0</td><td>-11.7</td></tr><tr><td>1712.40</td><td>16.02</td><td>H</td><td>4.3</td><td>9.3</td><td>21.03</td><td>30.0</td><td>-9.0</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1732.60</td><td>13.19</td><td>V</td><td>4.3</td><td>9.4</td><td>18.24</td><td>30.0</td><td>-11.8</td></tr><tr><td>1732.60</td><td>17.30</td><td>H</td><td>4.3</td><td>9.4</td><td>22.35</td><td>30.0</td><td>-7.6</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1752.60</td><td>14.43</td><td>V</td><td>4.4</td><td>9.5</td><td>19.53</td><td>30.0</td><td>-10.5</td></tr><tr><td>1752.60</td><td>18.18</td><td>H</td><td>4.4</td><td>9.5</td><td>23.29</td><td>30.0</td><td>-6.7</td></tr></table>  |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  | 1712.40 | 13.26 | V | 4.3 | 9.3 | 18.27 | 30.0 | -11.7 | 1712.40 | 16.02 | H | 4.3 | 9.3 | 21.03 | 30.0 | -9.0  | Mid Ch |  |  |  |  |  |  |  | 1732.60 | 13.19 | V | 4.3 | 9.4 | 18.24 | 30.0 | -11.8 | 1732.60 | 17.30 | H | 4.3 | 9.4 | 22.35 | 30.0 | -7.6 | High Ch |  |  |  |  |  |  |  | 1752.60 | 14.43 | V | 4.4 | 9.5 | 19.53 | 30.0 | -10.5 | 1752.60 | 18.18 | H | 4.4 | 9.5 | 23.29 | 30.0 | -6.7 |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|--------|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|---------|-------|---|-----|-----|-------|------|-------|--------|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|---------|-------|---|-----|-----|-------|------|------|---------|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|---------|-------|---|-----|-----|-------|------|------|
|                              | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1712.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 13.26            | V               | 4.3             | 9.3                | 18.27      | 30.0        | -11.7      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1712.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 16.02            | H               | 4.3             | 9.3                | 21.03      | 30.0        | -9.0       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1732.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 13.19            | V               | 4.3             | 9.4                | 18.24      | 30.0        | -11.8      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1732.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 17.30            | H               | 4.3             | 9.4                | 22.35      | 30.0        | -7.6       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1752.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 14.43            | V               | 4.4             | 9.5                | 19.53      | 30.0        | -10.5      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
| 1752.60                      | 18.18                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | H                | 4.4             | 9.5             | 23.29              | 30.0       | -6.7        |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
| WCDMA<br><br>Band 4<br>HSDPA | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-23<br/>Test Engineer: 20882<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 2<br/>Mode: HSDPA Band 4 Fundamentals</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00167451], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1712.40</td><td>12.23</td><td>V</td><td>4.3</td><td>9.3</td><td>17.24</td><td>30.0</td><td>-12.8</td></tr><tr><td>1712.40</td><td>14.28</td><td>H</td><td>4.3</td><td>9.3</td><td>19.29</td><td>30.0</td><td>-10.7</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1732.60</td><td>11.51</td><td>V</td><td>4.3</td><td>9.4</td><td>16.56</td><td>30.0</td><td>-13.4</td></tr><tr><td>1732.60</td><td>15.50</td><td>H</td><td>4.3</td><td>9.4</td><td>20.55</td><td>30.0</td><td>-9.4</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1752.60</td><td>12.83</td><td>V</td><td>4.4</td><td>9.5</td><td>17.93</td><td>30.0</td><td>-12.1</td></tr><tr><td>1752.60</td><td>16.17</td><td>H</td><td>4.4</td><td>9.5</td><td>21.28</td><td>30.0</td><td>-8.7</td></tr></table> |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  | 1712.40 | 12.23 | V | 4.3 | 9.3 | 17.24 | 30.0 | -12.8 | 1712.40 | 14.28 | H | 4.3 | 9.3 | 19.29 | 30.0 | -10.7 | Mid Ch |  |  |  |  |  |  |  | 1732.60 | 11.51 | V | 4.3 | 9.4 | 16.56 | 30.0 | -13.4 | 1732.60 | 15.50 | H | 4.3 | 9.4 | 20.55 | 30.0 | -9.4 | High Ch |  |  |  |  |  |  |  | 1752.60 | 12.83 | V | 4.4 | 9.5 | 17.93 | 30.0 | -12.1 | 1752.60 | 16.17 | H | 4.4 | 9.5 | 21.28 | 30.0 | -8.7 |
|                              | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1712.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 12.23            | V               | 4.3             | 9.3                | 17.24      | 30.0        | -12.8      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1712.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 14.28            | H               | 4.3             | 9.3                | 19.29      | 30.0        | -10.7      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1732.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 11.51            | V               | 4.3             | 9.4                | 16.56      | 30.0        | -13.4      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1732.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 15.50            | H               | 4.3             | 9.4                | 20.55      | 30.0        | -9.4       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1752.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 12.83            | V               | 4.4             | 9.5                | 17.93      | 30.0        | -12.1      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
| 1752.60                      | 16.17                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | H                | 4.4             | 9.5             | 21.28              | 30.0       | -8.7        |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |

**WCDMA Band 2**

| WCDMA<br><br>Band 2<br>REL99 | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-22<br/>Test Engineer: 20882<br/>Configuration: EUT, Y-Position<br/>Location: Chamber 2<br/>Mode: Rel99 Band 2 Fundamentals</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00167451], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1852.40</td><td>15.82</td><td>V</td><td>4.5</td><td>9.4</td><td>20.72</td><td>33.0</td><td>-12.3</td></tr><tr><td>1852.40</td><td>10.16</td><td>H</td><td>4.5</td><td>9.4</td><td>15.06</td><td>33.0</td><td>-17.9</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1880.00</td><td>15.15</td><td>V</td><td>4.5</td><td>9.2</td><td>19.81</td><td>33.0</td><td>-13.2</td></tr><tr><td>1880.00</td><td>8.72</td><td>H</td><td>4.5</td><td>9.2</td><td>13.38</td><td>33.0</td><td>-19.6</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1907.60</td><td>15.12</td><td>V</td><td>4.6</td><td>9.0</td><td>19.51</td><td>33.0</td><td>-13.5</td></tr><tr><td>1907.60</td><td>10.21</td><td>H</td><td>4.6</td><td>9.0</td><td>14.60</td><td>33.0</td><td>-18.4</td></tr></table> |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  | 1852.40 | 15.82 | V | 4.5 | 9.4 | 20.72 | 33.0 | -12.3 | 1852.40 | 10.16 | H | 4.5 | 9.4 | 15.06 | 33.0 | -17.9 | Mid Ch |  |  |  |  |  |  |  | 1880.00 | 15.15 | V | 4.5 | 9.2 | 19.81 | 33.0 | -13.2 | 1880.00 | 8.72 | H | 4.5 | 9.2 | 13.38 | 33.0 | -19.6 | High Ch |  |  |  |  |  |  |  | 1907.60 | 15.12 | V | 4.6 | 9.0 | 19.51 | 33.0 | -13.5 | 1907.60 | 10.21 | H | 4.6 | 9.0 | 14.60 | 33.0 | -18.4 |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|--------|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|---------|-------|---|-----|-----|-------|------|-------|--------|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|---------|------|---|-----|-----|-------|------|-------|---------|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|---------|-------|---|-----|-----|-------|------|-------|
|                              | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |      |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |      |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                              | 1852.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 15.82            | V               | 4.5             | 9.4                | 20.72      | 33.0        | -12.3      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |      |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                              | 1852.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.16            | H               | 4.5             | 9.4                | 15.06      | 33.0        | -17.9      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |      |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |      |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                              | 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 15.15            | V               | 4.5             | 9.2                | 19.81      | 33.0        | -13.2      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |      |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                              | 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 8.72             | H               | 4.5             | 9.2                | 13.38      | 33.0        | -19.6      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |      |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |      |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                              | 1907.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 15.12            | V               | 4.6             | 9.0                | 19.51      | 33.0        | -13.5      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |      |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
| 1907.60                      | 10.21                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | H                | 4.6             | 9.0             | 14.60              | 33.0       | -18.4       |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |      |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
| WCDMA<br><br>Band 2<br>HSDPA | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-22<br/>Test Engineer: 20882<br/>Configuration: EUT, Y-Position<br/>Location: Chamber 2<br/>Mode: HSDPA Band 2 Fundamentals</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00167451], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1852.40</td><td>12.71</td><td>V</td><td>4.5</td><td>9.4</td><td>17.61</td><td>33.0</td><td>-15.4</td></tr><tr><td>1852.40</td><td>8.25</td><td>H</td><td>4.5</td><td>9.4</td><td>13.15</td><td>33.0</td><td>-19.9</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1880.00</td><td>12.90</td><td>V</td><td>4.5</td><td>9.2</td><td>17.56</td><td>33.0</td><td>-15.4</td></tr><tr><td>1880.00</td><td>6.61</td><td>H</td><td>4.5</td><td>9.2</td><td>11.27</td><td>33.0</td><td>-21.7</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1907.60</td><td>12.49</td><td>V</td><td>4.6</td><td>9.0</td><td>16.88</td><td>33.0</td><td>-16.1</td></tr><tr><td>1907.60</td><td>7.79</td><td>H</td><td>4.6</td><td>9.0</td><td>12.18</td><td>33.0</td><td>-20.8</td></tr></table>   |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  | 1852.40 | 12.71 | V | 4.5 | 9.4 | 17.61 | 33.0 | -15.4 | 1852.40 | 8.25  | H | 4.5 | 9.4 | 13.15 | 33.0 | -19.9 | Mid Ch |  |  |  |  |  |  |  | 1880.00 | 12.90 | V | 4.5 | 9.2 | 17.56 | 33.0 | -15.4 | 1880.00 | 6.61 | H | 4.5 | 9.2 | 11.27 | 33.0 | -21.7 | High Ch |  |  |  |  |  |  |  | 1907.60 | 12.49 | V | 4.6 | 9.0 | 16.88 | 33.0 | -16.1 | 1907.60 | 7.79  | H | 4.6 | 9.0 | 12.18 | 33.0 | -20.8 |
|                              | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |      |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |      |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                              | 1852.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 12.71            | V               | 4.5             | 9.4                | 17.61      | 33.0        | -15.4      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |      |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                              | 1852.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 8.25             | H               | 4.5             | 9.4                | 13.15      | 33.0        | -19.9      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |      |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |      |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                              | 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 12.90            | V               | 4.5             | 9.2                | 17.56      | 33.0        | -15.4      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |      |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                              | 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6.61             | H               | 4.5             | 9.2                | 11.27      | 33.0        | -21.7      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |      |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |      |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                              | 1907.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 12.49            | V               | 4.6             | 9.0                | 16.88      | 33.0        | -16.1      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |      |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
| 1907.60                      | 7.79                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | H                | 4.6             | 9.0             | 12.18              | 33.0       | -20.8       |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |      |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |

**LTE Band 12**

| LTE<br>Band 12<br><br>10MHz<br><br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-25<br/>Test Engineer: 20882<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_QPSK Band 12 Fundamentals, 10MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>704.00</td><td>20.60</td><td>V</td><td>2.8</td><td>-1.1</td><td>16.76</td><td>34.8</td><td>-18.0</td><td></td></tr><tr><td>704.00</td><td>5.96</td><td>H</td><td>2.8</td><td>-1.1</td><td>2.12</td><td>34.8</td><td>-32.7</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>707.50</td><td>20.88</td><td>V</td><td>2.8</td><td>-1.1</td><td>17.04</td><td>34.8</td><td>-17.8</td><td></td></tr><tr><td>707.50</td><td>6.67</td><td>H</td><td>2.8</td><td>-1.1</td><td>2.82</td><td>34.8</td><td>-32.0</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>711.00</td><td>21.22</td><td>V</td><td>2.8</td><td>-1.1</td><td>17.36</td><td>34.8</td><td>-17.4</td><td></td></tr><tr><td>711.00</td><td>6.92</td><td>H</td><td>2.8</td><td>-1.1</td><td>3.06</td><td>34.8</td><td>-31.7</td><td></td></tr></table>  |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 704.00 | 20.60 | V | 2.8 | -1.1 | 16.76 | 34.8 | -18.0 |  | 704.00 | 5.96 | H | 2.8 | -1.1 | 2.12 | 34.8 | -32.7 |  | Mid Ch |  |  |  |  |  |  |  |  | 707.50 | 20.88 | V | 2.8 | -1.1 | 17.04 | 34.8 | -17.8 |  | 707.50 | 6.67 | H | 2.8 | -1.1 | 2.82 | 34.8 | -32.0 |  | High Ch |  |  |  |  |  |  |  |  | 711.00 | 21.22 | V | 2.8 | -1.1 | 17.36 | 34.8 | -17.4 |  | 711.00 | 6.92 | H | 2.8 | -1.1 | 3.06 | 34.8 | -31.7 |  |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|------|---|-----|------|------|------|-------|--|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|------|---|-----|------|------|------|-------|--|---------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|------|---|-----|------|------|------|-------|--|
|                                          | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |
|                                          | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |
|                                          | 704.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 20.60            | V               | 2.8             | -1.1               | 16.76     | 34.8        | -18.0      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |
|                                          | 704.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 5.96             | H               | 2.8             | -1.1               | 2.12      | 34.8        | -32.7      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |
|                                          | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |
|                                          | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 20.88            | V               | 2.8             | -1.1               | 17.04     | 34.8        | -17.8      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |
|                                          | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 6.67             | H               | 2.8             | -1.1               | 2.82      | 34.8        | -32.0      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |
|                                          | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |
|                                          | 711.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 21.22            | V               | 2.8             | -1.1               | 17.36     | 34.8        | -17.4      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |
| 711.00                                   | 6.92                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | H                | 2.8             | -1.1            | 3.06               | 34.8      | -31.7       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |
| LTE<br>Band 12<br><br>10MHz<br><br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-25<br/>Test Engineer: 20882<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_16QAM Band 12 Fundamentals, 10MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>704.00</td><td>19.66</td><td>V</td><td>2.8</td><td>-1.1</td><td>15.82</td><td>34.8</td><td>-19.0</td><td></td></tr><tr><td>704.00</td><td>4.83</td><td>H</td><td>2.8</td><td>-1.1</td><td>0.99</td><td>34.8</td><td>-33.8</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>707.50</td><td>20.22</td><td>V</td><td>2.8</td><td>-1.1</td><td>16.38</td><td>34.8</td><td>-18.4</td><td></td></tr><tr><td>707.50</td><td>5.61</td><td>H</td><td>2.8</td><td>-1.1</td><td>1.76</td><td>34.8</td><td>-33.0</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>711.00</td><td>20.16</td><td>V</td><td>2.8</td><td>-1.1</td><td>16.30</td><td>34.8</td><td>-18.5</td><td></td></tr><tr><td>711.00</td><td>6.01</td><td>H</td><td>2.8</td><td>-1.1</td><td>2.15</td><td>34.8</td><td>-32.6</td><td></td></tr></table> |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 704.00 | 19.66 | V | 2.8 | -1.1 | 15.82 | 34.8 | -19.0 |  | 704.00 | 4.83 | H | 2.8 | -1.1 | 0.99 | 34.8 | -33.8 |  | Mid Ch |  |  |  |  |  |  |  |  | 707.50 | 20.22 | V | 2.8 | -1.1 | 16.38 | 34.8 | -18.4 |  | 707.50 | 5.61 | H | 2.8 | -1.1 | 1.76 | 34.8 | -33.0 |  | High Ch |  |  |  |  |  |  |  |  | 711.00 | 20.16 | V | 2.8 | -1.1 | 16.30 | 34.8 | -18.5 |  | 711.00 | 6.01 | H | 2.8 | -1.1 | 2.15 | 34.8 | -32.6 |  |
|                                          | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |
|                                          | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |
|                                          | 704.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 19.66            | V               | 2.8             | -1.1               | 15.82     | 34.8        | -19.0      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |
|                                          | 704.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 4.83             | H               | 2.8             | -1.1               | 0.99      | 34.8        | -33.8      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |
|                                          | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |
|                                          | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 20.22            | V               | 2.8             | -1.1               | 16.38     | 34.8        | -18.4      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |
|                                          | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 5.61             | H               | 2.8             | -1.1               | 1.76      | 34.8        | -33.0      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |
|                                          | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |
|                                          | 711.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 20.16            | V               | 2.8             | -1.1               | 16.30     | 34.8        | -18.5      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |
| 711.00                                   | 6.01                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | H                | 2.8             | -1.1            | 2.15               | 34.8      | -32.6       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |      |   |     |      |      |      |       |  |

| LTE<br>Band 12<br><br>5MHz<br><br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-25<br/>Test Engineer: 20882<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_QPSK Band 12 Fundamentals, 5MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>701.50</td><td>20.76</td><td>V</td><td>2.8</td><td>-1.1</td><td>16.93</td><td>34.8</td><td>-17.9</td></tr><tr><td>701.50</td><td>6.02</td><td>H</td><td>2.8</td><td>-1.1</td><td>2.18</td><td>34.8</td><td>-32.6</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>707.50</td><td>21.24</td><td>V</td><td>2.8</td><td>-1.1</td><td>17.40</td><td>34.8</td><td>-17.4</td></tr><tr><td>707.50</td><td>6.78</td><td>H</td><td>2.8</td><td>-1.1</td><td>2.93</td><td>34.8</td><td>-31.9</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>713.50</td><td>21.23</td><td>V</td><td>2.8</td><td>-1.1</td><td>17.36</td><td>34.8</td><td>-17.4</td></tr><tr><td>713.50</td><td>6.88</td><td>H</td><td>2.8</td><td>-1.1</td><td>3.02</td><td>34.8</td><td>-31.8</td></tr></table>  |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  | 701.50 | 20.76 | V | 2.8 | -1.1 | 16.93 | 34.8 | -17.9 | 701.50 | 6.02 | H | 2.8 | -1.1 | 2.18 | 34.8 | -32.6 | Mid Ch |  |  |  |  |  |  |  | 707.50 | 21.24 | V | 2.8 | -1.1 | 17.40 | 34.8 | -17.4 | 707.50 | 6.78 | H | 2.8 | -1.1 | 2.93 | 34.8 | -31.9 | High Ch |  |  |  |  |  |  |  | 713.50 | 21.23 | V | 2.8 | -1.1 | 17.36 | 34.8 | -17.4 | 713.50 | 6.88 | H | 2.8 | -1.1 | 3.02 | 34.8 | -31.8 |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--------|------|---|-----|------|------|------|-------|--------|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--------|------|---|-----|------|------|------|-------|---------|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--------|------|---|-----|------|------|------|-------|
|                                         | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | 701.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 20.76            | V               | 2.8             | -1.1               | 16.93     | 34.8        | -17.9      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | 701.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6.02             | H               | 2.8             | -1.1               | 2.18      | 34.8        | -32.6      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 21.24            | V               | 2.8             | -1.1               | 17.40     | 34.8        | -17.4      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6.78             | H               | 2.8             | -1.1               | 2.93      | 34.8        | -31.9      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | 713.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 21.23            | V               | 2.8             | -1.1               | 17.36     | 34.8        | -17.4      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
| 713.50                                  | 6.88                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H                | 2.8             | -1.1            | 3.02               | 34.8      | -31.8       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
| LTE<br>Band 12<br><br>5MHz<br><br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-25<br/>Test Engineer: 20882<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_16QAM Band 12 Fundamentals, 5MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>701.50</td><td>19.45</td><td>V</td><td>2.8</td><td>-1.1</td><td>15.62</td><td>34.8</td><td>-19.2</td></tr><tr><td>701.50</td><td>4.65</td><td>H</td><td>2.8</td><td>-1.1</td><td>0.81</td><td>34.8</td><td>-34.0</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>707.50</td><td>20.07</td><td>V</td><td>2.8</td><td>-1.1</td><td>16.23</td><td>34.8</td><td>-18.6</td></tr><tr><td>707.50</td><td>5.80</td><td>H</td><td>2.8</td><td>-1.1</td><td>1.95</td><td>34.8</td><td>-32.8</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>713.50</td><td>20.50</td><td>V</td><td>2.8</td><td>-1.1</td><td>16.63</td><td>34.8</td><td>-18.2</td></tr><tr><td>713.50</td><td>6.01</td><td>H</td><td>2.8</td><td>-1.1</td><td>2.15</td><td>34.8</td><td>-32.7</td></tr></table> |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  | 701.50 | 19.45 | V | 2.8 | -1.1 | 15.62 | 34.8 | -19.2 | 701.50 | 4.65 | H | 2.8 | -1.1 | 0.81 | 34.8 | -34.0 | Mid Ch |  |  |  |  |  |  |  | 707.50 | 20.07 | V | 2.8 | -1.1 | 16.23 | 34.8 | -18.6 | 707.50 | 5.80 | H | 2.8 | -1.1 | 1.95 | 34.8 | -32.8 | High Ch |  |  |  |  |  |  |  | 713.50 | 20.50 | V | 2.8 | -1.1 | 16.63 | 34.8 | -18.2 | 713.50 | 6.01 | H | 2.8 | -1.1 | 2.15 | 34.8 | -32.7 |
|                                         | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | 701.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 19.45            | V               | 2.8             | -1.1               | 15.62     | 34.8        | -19.2      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | 701.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 4.65             | H               | 2.8             | -1.1               | 0.81      | 34.8        | -34.0      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 20.07            | V               | 2.8             | -1.1               | 16.23     | 34.8        | -18.6      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 5.80             | H               | 2.8             | -1.1               | 1.95      | 34.8        | -32.8      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | 713.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 20.50            | V               | 2.8             | -1.1               | 16.63     | 34.8        | -18.2      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
| 713.50                                  | 6.01                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H                | 2.8             | -1.1            | 2.15               | 34.8      | -32.7       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |

| LTE<br>Band 12<br><br>3MHz<br><br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-25<br/>Test Engineer: 20882<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_QPSK Band 12 Fundamentals, 3MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>700.50</td><td>20.63</td><td>V</td><td>2.8</td><td>-1.1</td><td>16.80</td><td>34.8</td><td>-18.0</td></tr><tr><td>700.50</td><td>6.04</td><td>H</td><td>2.8</td><td>-1.1</td><td>2.21</td><td>34.8</td><td>-32.6</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>707.50</td><td>21.17</td><td>V</td><td>2.8</td><td>-1.1</td><td>17.33</td><td>34.8</td><td>-17.5</td></tr><tr><td>707.50</td><td>6.74</td><td>H</td><td>2.8</td><td>-1.1</td><td>2.89</td><td>34.8</td><td>-31.9</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>714.50</td><td>21.33</td><td>V</td><td>2.8</td><td>-1.1</td><td>17.47</td><td>34.8</td><td>-17.3</td></tr><tr><td>714.50</td><td>6.91</td><td>H</td><td>2.8</td><td>-1.1</td><td>3.05</td><td>34.8</td><td>-31.7</td></tr></table>  |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  | 700.50 | 20.63 | V | 2.8 | -1.1 | 16.80 | 34.8 | -18.0 | 700.50 | 6.04 | H | 2.8 | -1.1 | 2.21 | 34.8 | -32.6 | Mid Ch |  |  |  |  |  |  |  | 707.50 | 21.17 | V | 2.8 | -1.1 | 17.33 | 34.8 | -17.5 | 707.50 | 6.74 | H | 2.8 | -1.1 | 2.89 | 34.8 | -31.9 | High Ch |  |  |  |  |  |  |  | 714.50 | 21.33 | V | 2.8 | -1.1 | 17.47 | 34.8 | -17.3 | 714.50 | 6.91 | H | 2.8 | -1.1 | 3.05 | 34.8 | -31.7 |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--------|------|---|-----|------|------|------|-------|--------|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--------|------|---|-----|------|------|------|-------|---------|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--------|------|---|-----|------|------|------|-------|
|                                         | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | 700.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 20.63            | V               | 2.8             | -1.1               | 16.80     | 34.8        | -18.0      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | 700.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6.04             | H               | 2.8             | -1.1               | 2.21      | 34.8        | -32.6      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 21.17            | V               | 2.8             | -1.1               | 17.33     | 34.8        | -17.5      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6.74             | H               | 2.8             | -1.1               | 2.89      | 34.8        | -31.9      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | 714.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 21.33            | V               | 2.8             | -1.1               | 17.47     | 34.8        | -17.3      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
| 714.50                                  | 6.91                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H                | 2.8             | -1.1            | 3.05               | 34.8      | -31.7       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
| LTE<br>Band 12<br><br>3MHz<br><br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-25<br/>Test Engineer: 20882<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_16QAM Band 12 Fundamentals, 3MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>700.50</td><td>19.78</td><td>V</td><td>2.8</td><td>-1.1</td><td>15.95</td><td>34.8</td><td>-18.9</td></tr><tr><td>700.50</td><td>5.30</td><td>H</td><td>2.8</td><td>-1.1</td><td>1.47</td><td>34.8</td><td>-33.3</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>707.50</td><td>20.18</td><td>V</td><td>2.8</td><td>-1.1</td><td>16.34</td><td>34.8</td><td>-18.5</td></tr><tr><td>707.50</td><td>5.73</td><td>H</td><td>2.8</td><td>-1.1</td><td>1.88</td><td>34.8</td><td>-32.9</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>714.50</td><td>20.25</td><td>V</td><td>2.8</td><td>-1.1</td><td>16.39</td><td>34.8</td><td>-18.4</td></tr><tr><td>714.50</td><td>5.81</td><td>H</td><td>2.8</td><td>-1.1</td><td>1.95</td><td>34.8</td><td>-32.8</td></tr></table> |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  | 700.50 | 19.78 | V | 2.8 | -1.1 | 15.95 | 34.8 | -18.9 | 700.50 | 5.30 | H | 2.8 | -1.1 | 1.47 | 34.8 | -33.3 | Mid Ch |  |  |  |  |  |  |  | 707.50 | 20.18 | V | 2.8 | -1.1 | 16.34 | 34.8 | -18.5 | 707.50 | 5.73 | H | 2.8 | -1.1 | 1.88 | 34.8 | -32.9 | High Ch |  |  |  |  |  |  |  | 714.50 | 20.25 | V | 2.8 | -1.1 | 16.39 | 34.8 | -18.4 | 714.50 | 5.81 | H | 2.8 | -1.1 | 1.95 | 34.8 | -32.8 |
|                                         | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | 700.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 19.78            | V               | 2.8             | -1.1               | 15.95     | 34.8        | -18.9      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | 700.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 5.30             | H               | 2.8             | -1.1               | 1.47      | 34.8        | -33.3      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 20.18            | V               | 2.8             | -1.1               | 16.34     | 34.8        | -18.5      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 5.73             | H               | 2.8             | -1.1               | 1.88      | 34.8        | -32.9      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                         | 714.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 20.25            | V               | 2.8             | -1.1               | 16.39     | 34.8        | -18.4      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
| 714.50                                  | 5.81                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H                | 2.8             | -1.1            | 1.95               | 34.8      | -32.8       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |

| LTE<br>Band 12<br>1.4MHz<br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-25<br/>Test Engineer: 20882<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_QPSK Band 12 Fundamentals, 1.4MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>699.70</td><td>20.67</td><td>V</td><td>2.8</td><td>-1.1</td><td>16.84</td><td>34.8</td><td>-18.0</td></tr><tr><td>699.70</td><td>6.01</td><td>H</td><td>2.8</td><td>-1.1</td><td>2.17</td><td>34.8</td><td>-32.6</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>707.50</td><td>21.19</td><td>V</td><td>2.8</td><td>-1.1</td><td>17.35</td><td>34.8</td><td>-17.5</td></tr><tr><td>707.50</td><td>6.87</td><td>H</td><td>2.8</td><td>-1.1</td><td>3.02</td><td>34.8</td><td>-31.8</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>715.30</td><td>21.04</td><td>V</td><td>2.8</td><td>-1.1</td><td>17.18</td><td>34.8</td><td>-17.6</td></tr><tr><td>715.30</td><td>6.41</td><td>H</td><td>2.8</td><td>-1.1</td><td>2.55</td><td>34.8</td><td>-32.3</td></tr></table>  |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  | 699.70 | 20.67 | V | 2.8 | -1.1 | 16.84 | 34.8 | -18.0 | 699.70 | 6.01 | H | 2.8 | -1.1 | 2.17 | 34.8 | -32.6 | Mid Ch |  |  |  |  |  |  |  | 707.50 | 21.19 | V | 2.8 | -1.1 | 17.35 | 34.8 | -17.5 | 707.50 | 6.87 | H | 2.8 | -1.1 | 3.02 | 34.8 | -31.8 | High Ch |  |  |  |  |  |  |  | 715.30 | 21.04 | V | 2.8 | -1.1 | 17.18 | 34.8 | -17.6 | 715.30 | 6.41 | H | 2.8 | -1.1 | 2.55 | 34.8 | -32.3 |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--------|------|---|-----|------|------|------|-------|--------|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--------|------|---|-----|------|------|------|-------|---------|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--------|------|---|-----|------|------|------|-------|
|                                   | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                   | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                   | 699.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 20.67            | V               | 2.8             | -1.1               | 16.84     | 34.8        | -18.0      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                   | 699.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 6.01             | H               | 2.8             | -1.1               | 2.17      | 34.8        | -32.6      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                   | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                   | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 21.19            | V               | 2.8             | -1.1               | 17.35     | 34.8        | -17.5      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                   | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 6.87             | H               | 2.8             | -1.1               | 3.02      | 34.8        | -31.8      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                   | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                   | 715.30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 21.04            | V               | 2.8             | -1.1               | 17.18     | 34.8        | -17.6      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
| 715.30                            | 6.41                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | H                | 2.8             | -1.1            | 2.55               | 34.8      | -32.3       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
| LTE<br>Band 12<br>1.4MHz<br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-25<br/>Test Engineer: 20882<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_16QAM Band 12 Fundamentals, 1.4MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>699.70</td><td>19.65</td><td>V</td><td>2.8</td><td>-1.1</td><td>15.82</td><td>34.8</td><td>-19.0</td></tr><tr><td>699.70</td><td>5.18</td><td>H</td><td>2.8</td><td>-1.1</td><td>1.34</td><td>34.8</td><td>-33.5</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>707.50</td><td>20.18</td><td>V</td><td>2.8</td><td>-1.1</td><td>16.34</td><td>34.8</td><td>-18.5</td></tr><tr><td>707.50</td><td>5.59</td><td>H</td><td>2.8</td><td>-1.1</td><td>1.74</td><td>34.8</td><td>-33.1</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>715.30</td><td>20.35</td><td>V</td><td>2.8</td><td>-1.1</td><td>16.49</td><td>34.8</td><td>-18.3</td></tr><tr><td>715.30</td><td>5.44</td><td>H</td><td>2.8</td><td>-1.1</td><td>1.58</td><td>34.8</td><td>-33.2</td></tr></table> |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  | 699.70 | 19.65 | V | 2.8 | -1.1 | 15.82 | 34.8 | -19.0 | 699.70 | 5.18 | H | 2.8 | -1.1 | 1.34 | 34.8 | -33.5 | Mid Ch |  |  |  |  |  |  |  | 707.50 | 20.18 | V | 2.8 | -1.1 | 16.34 | 34.8 | -18.5 | 707.50 | 5.59 | H | 2.8 | -1.1 | 1.74 | 34.8 | -33.1 | High Ch |  |  |  |  |  |  |  | 715.30 | 20.35 | V | 2.8 | -1.1 | 16.49 | 34.8 | -18.3 | 715.30 | 5.44 | H | 2.8 | -1.1 | 1.58 | 34.8 | -33.2 |
|                                   | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                   | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                   | 699.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 19.65            | V               | 2.8             | -1.1               | 15.82     | 34.8        | -19.0      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                   | 699.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 5.18             | H               | 2.8             | -1.1               | 1.34      | 34.8        | -33.5      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                   | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                   | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 20.18            | V               | 2.8             | -1.1               | 16.34     | 34.8        | -18.5      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                   | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 5.59             | H               | 2.8             | -1.1               | 1.74      | 34.8        | -33.1      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                   | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
|                                   | 715.30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 20.35            | V               | 2.8             | -1.1               | 16.49     | 34.8        | -18.3      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |
| 715.30                            | 5.44                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | H                | 2.8             | -1.1            | 1.58               | 34.8      | -33.2       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |

**LTE Band 13**

LTE  
Band 13  
10MHz  
QPSK

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung  
Project #: 4789219881  
Date: 2019-11-25  
Test Engineer: 20882  
Configuration: EUT, Z-Position  
Location: Chamber 1  
Mode: LTE\_QPSK Band 13 Fundamentals, 10MHz Bandwidth

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables  
Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|----------|---------------------|--------------------|--------------------|-----------------------|--------------|----------------|---------------|-------|
| Mid Ch   |                     |                    |                    |                       |              |                |               |       |
| 782.00   | 24.29               | V                  | 2.9                | -1.1                  | 20.30        | 34.8           | -14.5         |       |
| 782.00   | 12.71               | H                  | 2.9                | -1.1                  | 8.72         | 34.8           | -26.1         |       |

LTE  
Band 13  
10MHz  
16QAM

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung  
Project #: 4789219881  
Date: 2019-11-25  
Test Engineer: 20882  
Configuration: EUT, Z-Position  
Location: Chamber 1  
Mode: LTE\_16QAM Band 13 Fundamentals, 10MHz Bandwidth

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables  
Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|----------|---------------------|--------------------|--------------------|-----------------------|--------------|----------------|---------------|-------|
| Mid Ch   |                     |                    |                    |                       |              |                |               |       |
| 782.00   | 22.92               | V                  | 2.9                | -1.1                  | 18.93        | 34.8           | -15.8         |       |
| 782.00   | 11.47               | H                  | 2.9                | -1.1                  | 7.48         | 34.8           | -27.3         |       |

| LTE<br>Band 13<br><br>5MHz<br><br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-25<br/>Test Engineer: 20882<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_QPSK Band 13 Fundamentals, 5MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>779.50</td><td>23.97</td><td>V</td><td>2.9</td><td>-1.1</td><td>19.99</td><td>34.8</td><td>-14.8</td><td></td></tr><tr><td>779.50</td><td>12.20</td><td>H</td><td>2.9</td><td>-1.1</td><td>8.22</td><td>34.8</td><td>-26.5</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>782.00</td><td>24.05</td><td>V</td><td>2.9</td><td>-1.1</td><td>20.06</td><td>34.8</td><td>-14.7</td><td></td></tr><tr><td>782.00</td><td>12.34</td><td>H</td><td>2.9</td><td>-1.1</td><td>8.35</td><td>34.8</td><td>-26.4</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>784.50</td><td>23.76</td><td>V</td><td>2.9</td><td>-1.1</td><td>19.77</td><td>34.8</td><td>-15.0</td><td></td></tr><tr><td>784.50</td><td>12.61</td><td>H</td><td>2.9</td><td>-1.1</td><td>8.62</td><td>34.8</td><td>-26.2</td><td></td></tr></table>  |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 779.50 | 23.97 | V | 2.9 | -1.1 | 19.99 | 34.8 | -14.8 |  | 779.50 | 12.20 | H | 2.9 | -1.1 | 8.22 | 34.8 | -26.5 |  | Mid Ch |  |  |  |  |  |  |  |  | 782.00 | 24.05 | V | 2.9 | -1.1 | 20.06 | 34.8 | -14.7 |  | 782.00 | 12.34 | H | 2.9 | -1.1 | 8.35 | 34.8 | -26.4 |  | High Ch |  |  |  |  |  |  |  |  | 784.50 | 23.76 | V | 2.9 | -1.1 | 19.77 | 34.8 | -15.0 |  | 784.50 | 12.61 | H | 2.9 | -1.1 | 8.62 | 34.8 | -26.2 |  |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|------|------|-------|--|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|------|------|-------|--|---------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|------|------|-------|--|
|                                         | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                         | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                         | 779.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 23.97            | V               | 2.9             | -1.1               | 19.99     | 34.8        | -14.8      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                         | 779.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 12.20            | H               | 2.9             | -1.1               | 8.22      | 34.8        | -26.5      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                         | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                         | 782.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 24.05            | V               | 2.9             | -1.1               | 20.06     | 34.8        | -14.7      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                         | 782.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 12.34            | H               | 2.9             | -1.1               | 8.35      | 34.8        | -26.4      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                         | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                         | 784.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 23.76            | V               | 2.9             | -1.1               | 19.77     | 34.8        | -15.0      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| 784.50                                  | 12.61                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | H                | 2.9             | -1.1            | 8.62               | 34.8      | -26.2       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| LTE<br>Band 13<br><br>5MHz<br><br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-25<br/>Test Engineer: 20882<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_16QAM Band 13 Fundamentals, 5MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>779.50</td><td>23.11</td><td>V</td><td>2.9</td><td>-1.1</td><td>19.13</td><td>34.8</td><td>-15.6</td><td></td></tr><tr><td>779.50</td><td>11.27</td><td>H</td><td>2.9</td><td>-1.1</td><td>7.29</td><td>34.8</td><td>-27.5</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>782.00</td><td>22.96</td><td>V</td><td>2.9</td><td>-1.1</td><td>18.97</td><td>34.8</td><td>-15.8</td><td></td></tr><tr><td>782.00</td><td>11.23</td><td>H</td><td>2.9</td><td>-1.1</td><td>7.24</td><td>34.8</td><td>-27.5</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>784.50</td><td>22.72</td><td>V</td><td>2.9</td><td>-1.1</td><td>18.73</td><td>34.8</td><td>-16.0</td><td></td></tr><tr><td>784.50</td><td>11.31</td><td>H</td><td>2.9</td><td>-1.1</td><td>7.32</td><td>34.8</td><td>-27.5</td><td></td></tr></table> |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 779.50 | 23.11 | V | 2.9 | -1.1 | 19.13 | 34.8 | -15.6 |  | 779.50 | 11.27 | H | 2.9 | -1.1 | 7.29 | 34.8 | -27.5 |  | Mid Ch |  |  |  |  |  |  |  |  | 782.00 | 22.96 | V | 2.9 | -1.1 | 18.97 | 34.8 | -15.8 |  | 782.00 | 11.23 | H | 2.9 | -1.1 | 7.24 | 34.8 | -27.5 |  | High Ch |  |  |  |  |  |  |  |  | 784.50 | 22.72 | V | 2.9 | -1.1 | 18.73 | 34.8 | -16.0 |  | 784.50 | 11.31 | H | 2.9 | -1.1 | 7.32 | 34.8 | -27.5 |  |
|                                         | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                         | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                         | 779.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 23.11            | V               | 2.9             | -1.1               | 19.13     | 34.8        | -15.6      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                         | 779.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 11.27            | H               | 2.9             | -1.1               | 7.29      | 34.8        | -27.5      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                         | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                         | 782.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 22.96            | V               | 2.9             | -1.1               | 18.97     | 34.8        | -15.8      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                         | 782.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 11.23            | H               | 2.9             | -1.1               | 7.24      | 34.8        | -27.5      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                         | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                         | 784.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 22.72            | V               | 2.9             | -1.1               | 18.73     | 34.8        | -16.0      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| 784.50                                  | 11.31                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | H                | 2.9             | -1.1            | 7.32               | 34.8      | -27.5       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |

**LTE Band 25**

LTE  
Band 25  
20MHz  
QPSK

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung  
Project #: 4789219881  
Date: 2019-11-22  
Test Engineer: 20882  
Configuration: EUT, Z-Position  
Location: Chamber 1  
Mode: LTE\_QPSK Band 25 Fundamentals, 20MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables  
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1860.00 | 13.76            | V               | 4.5             | 9.4                | 18.69      | 33.0        | -14.3      |       |
| 1860.00 | 16.35            | H               | 4.5             | 9.4                | 21.27      | 33.0        | -11.7      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1882.50 | 11.33            | V               | 4.5             | 9.3                | 16.08      | 33.0        | -16.9      |       |
| 1882.50 | 16.69            | H               | 4.5             | 9.3                | 21.44      | 33.0        | -11.6      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1905.00 | 16.09            | V               | 4.6             | 9.1                | 20.64      | 33.0        | -12.4      |       |
| 1905.00 | 18.77            | H               | 4.6             | 9.1                | 23.32      | 33.0        | -9.7       |       |

LTE  
Band 25  
20MHz  
16QAM

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung  
Project #: 4789219881  
Date: 2019-11-22  
Test Engineer: 20882  
Configuration: EUT, Z-Position  
Location: Chamber 1  
Mode: LTE\_16QAM Band 25 Fundamentals, 20MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables  
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1860.00 | 12.54            | V               | 4.5             | 9.4                | 17.47      | 33.0        | -15.5      |       |
| 1860.00 | 16.92            | H               | 4.5             | 9.4                | 21.84      | 33.0        | -11.2      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1882.50 | 13.46            | V               | 4.5             | 9.3                | 18.21      | 33.0        | -14.8      |       |
| 1882.50 | 17.66            | H               | 4.5             | 9.3                | 22.41      | 33.0        | -10.6      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1905.00 | 15.01            | V               | 4.6             | 9.1                | 19.56      | 33.0        | -13.4      |       |
| 1905.00 | 18.73            | H               | 4.6             | 9.1                | 23.28      | 33.0        | -9.7       |       |

| LTE<br>Band 25<br><br>15MHz<br><br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-22<br/>Test Engineer: 20882<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_QPSK Band 25 Fundamentals, 15MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br/>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div> <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBi)</th><th>EIRP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1857.50</td><td>14.05</td><td>V</td><td>4.5</td><td>9.5</td><td>19.00</td><td>33.0</td><td>-14.0</td><td></td></tr><tr><td>1857.50</td><td>18.16</td><td>H</td><td>4.5</td><td>9.5</td><td>23.11</td><td>33.0</td><td>-9.9</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1882.50</td><td>14.41</td><td>V</td><td>4.5</td><td>9.3</td><td>19.16</td><td>33.0</td><td>-13.8</td><td></td></tr><tr><td>1882.50</td><td>17.97</td><td>H</td><td>4.5</td><td>9.3</td><td>22.72</td><td>33.0</td><td>-10.3</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1907.50</td><td>15.82</td><td>V</td><td>4.6</td><td>9.1</td><td>20.34</td><td>33.0</td><td>-12.7</td><td></td></tr><tr><td>1907.50</td><td>19.51</td><td>H</td><td>4.6</td><td>9.1</td><td>24.03</td><td>33.0</td><td>-9.0</td><td></td></tr></table>   |                     |                    |                    |                       |               |                |               |       | f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1857.50 | 14.05 | V | 4.5 | 9.5 | 19.00 | 33.0 | -14.0 |  | 1857.50 | 18.16 | H | 4.5 | 9.5 | 23.11 | 33.0 | -9.9  |  | Mid Ch |  |  |  |  |  |  |  |  | 1882.50 | 14.41 | V | 4.5 | 9.3 | 19.16 | 33.0 | -13.8 |  | 1882.50 | 17.97 | H | 4.5 | 9.3 | 22.72 | 33.0 | -10.3 |  | High Ch |  |  |  |  |  |  |  |  | 1907.50 | 15.82 | V | 4.6 | 9.1 | 20.34 | 33.0 | -12.7 |  | 1907.50 | 19.51 | H | 4.6 | 9.1 | 24.03 | 33.0 | -9.0 |  |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|----------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|------|--|
|                                          | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | 1857.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 14.05               | V                  | 4.5                | 9.5                   | 19.00         | 33.0           | -14.0         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | 1857.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 18.16               | H                  | 4.5                | 9.5                   | 23.11         | 33.0           | -9.9          |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 14.41               | V                  | 4.5                | 9.3                   | 19.16         | 33.0           | -13.8         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 17.97               | H                  | 4.5                | 9.3                   | 22.72         | 33.0           | -10.3         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | 1907.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 15.82               | V                  | 4.6                | 9.1                   | 20.34         | 33.0           | -12.7         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1907.50                                  | 19.51                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | H                   | 4.6                | 9.1                | 24.03                 | 33.0          | -9.0           |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| LTE<br>Band 25<br><br>15MHz<br><br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-22<br/>Test Engineer: 20882<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_16QAM Band 25 Fundamentals, 15MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br/>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div> <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBi)</th><th>EIRP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1857.50</td><td>12.59</td><td>V</td><td>4.5</td><td>9.5</td><td>17.54</td><td>33.0</td><td>-15.5</td><td></td></tr><tr><td>1857.50</td><td>16.97</td><td>H</td><td>4.5</td><td>9.5</td><td>21.92</td><td>33.0</td><td>-11.1</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1882.50</td><td>13.46</td><td>V</td><td>4.5</td><td>9.3</td><td>18.21</td><td>33.0</td><td>-14.8</td><td></td></tr><tr><td>1882.50</td><td>17.25</td><td>H</td><td>4.5</td><td>9.3</td><td>22.00</td><td>33.0</td><td>-11.0</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1907.50</td><td>15.38</td><td>V</td><td>4.6</td><td>9.1</td><td>19.90</td><td>33.0</td><td>-13.1</td><td></td></tr><tr><td>1907.50</td><td>19.13</td><td>H</td><td>4.6</td><td>9.1</td><td>23.65</td><td>33.0</td><td>-9.4</td><td></td></tr></table> |                     |                    |                    |                       |               |                |               |       | f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1857.50 | 12.59 | V | 4.5 | 9.5 | 17.54 | 33.0 | -15.5 |  | 1857.50 | 16.97 | H | 4.5 | 9.5 | 21.92 | 33.0 | -11.1 |  | Mid Ch |  |  |  |  |  |  |  |  | 1882.50 | 13.46 | V | 4.5 | 9.3 | 18.21 | 33.0 | -14.8 |  | 1882.50 | 17.25 | H | 4.5 | 9.3 | 22.00 | 33.0 | -11.0 |  | High Ch |  |  |  |  |  |  |  |  | 1907.50 | 15.38 | V | 4.6 | 9.1 | 19.90 | 33.0 | -13.1 |  | 1907.50 | 19.13 | H | 4.6 | 9.1 | 23.65 | 33.0 | -9.4 |  |
|                                          | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | 1857.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 12.59               | V                  | 4.5                | 9.5                   | 17.54         | 33.0           | -15.5         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | 1857.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 16.97               | H                  | 4.5                | 9.5                   | 21.92         | 33.0           | -11.1         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 13.46               | V                  | 4.5                | 9.3                   | 18.21         | 33.0           | -14.8         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 17.25               | H                  | 4.5                | 9.3                   | 22.00         | 33.0           | -11.0         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | 1907.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 15.38               | V                  | 4.6                | 9.1                   | 19.90         | 33.0           | -13.1         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1907.50                                  | 19.13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | H                   | 4.6                | 9.1                | 23.65                 | 33.0          | -9.4           |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |

LTE  
Band 25  
10MHz  
QPSK

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung  
Project #: 4789219881  
Date: 2019-11-22  
Test Engineer: 20882  
Configuration: EUT, Z-Position  
Location: Chamber 1  
Mode: LTE\_QPSK Band 25 Fundamentals, 10MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables  
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1855.00 | 13.75            | V               | 4.5             | 9.5                | 18.72      | 33.0        | -14.3      |       |
| 1855.00 | 17.97            | H               | 4.5             | 9.5                | 22.94      | 33.0        | -10.1      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1882.50 | 13.78            | V               | 4.5             | 9.3                | 18.53      | 33.0        | -14.5      |       |
| 1882.50 | 18.22            | H               | 4.5             | 9.3                | 22.97      | 33.0        | -10.0      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1910.00 | 15.75            | V               | 4.6             | 9.1                | 20.23      | 33.0        | -12.8      |       |
| 1910.00 | 19.50            | H               | 4.6             | 9.1                | 23.99      | 33.0        | -9.0       |       |
|         |                  |                 |                 |                    |            |             |            |       |

LTE  
Band 25  
10MHz  
16QAM

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung  
Project #: 4789219881  
Date: 2019-11-22  
Test Engineer: 20882  
Configuration: EUT, Z-Position  
Location: Chamber 1  
Mode: LTE\_16QAM Band 25 Fundamentals, 10MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables  
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1855.00 | 12.70            | V               | 4.5             | 9.5                | 17.67      | 33.0        | -15.3      |       |
| 1855.00 | 16.90            | H               | 4.5             | 9.5                | 21.87      | 33.0        | -11.1      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1882.50 | 12.68            | V               | 4.5             | 9.3                | 17.43      | 33.0        | -15.6      |       |
| 1882.50 | 17.48            | H               | 4.5             | 9.3                | 22.23      | 33.0        | -10.8      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1910.00 | 14.81            | V               | 4.6             | 9.1                | 19.29      | 33.0        | -13.7      |       |
| 1910.00 | 18.76            | H               | 4.6             | 9.1                | 23.25      | 33.0        | -9.8       |       |
|         |                  |                 |                 |                    |            |             |            |       |

| LTE<br><br>Band 25<br><br>5MHz<br><br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-22<br/>Test Engineer: 20882<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_QPSK Band 25 Fundamentals, 5MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br/>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div> <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBi)</th><th>EIRP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>1852.50</td><td>13.66</td><td>V</td><td>4.5</td><td>9.5</td><td>18.65</td><td>33.0</td><td>-14.4</td><td></td></tr><tr><td>1852.50</td><td>17.88</td><td>H</td><td>4.5</td><td>9.5</td><td>22.87</td><td>33.0</td><td>-10.1</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>1882.50</td><td>13.53</td><td>V</td><td>4.5</td><td>9.3</td><td>18.28</td><td>33.0</td><td>-14.7</td><td></td></tr><tr><td>1882.50</td><td>18.20</td><td>H</td><td>4.5</td><td>9.3</td><td>22.95</td><td>33.0</td><td>-10.1</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>1912.50</td><td>15.81</td><td>V</td><td>4.6</td><td>9.0</td><td>20.27</td><td>33.0</td><td>-12.7</td><td></td></tr><tr><td>1912.50</td><td>19.59</td><td>H</td><td>4.6</td><td>9.0</td><td>24.05</td><td>33.0</td><td>-9.0</td><td></td></tr></table>   |                     |                    |                    |                       |               |                |               |       | f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1852.50 | 13.66 | V | 4.5 | 9.5 | 18.65 | 33.0 | -14.4 |  | 1852.50 | 17.88 | H | 4.5 | 9.5 | 22.87 | 33.0 | -10.1 |  | Mid Ch |  |  |  |  |  |  |  |  | 1882.50 | 13.53 | V | 4.5 | 9.3 | 18.28 | 33.0 | -14.7 |  | 1882.50 | 18.20 | H | 4.5 | 9.3 | 22.95 | 33.0 | -10.1 |  | High Ch |  |  |  |  |  |  |  |  | 1912.50 | 15.81 | V | 4.6 | 9.0 | 20.27 | 33.0 | -12.7 |  | 1912.50 | 19.59 | H | 4.6 | 9.0 | 24.05 | 33.0 | -9.0  |  |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|----------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|
|                                             | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | 1852.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 13.66               | V                  | 4.5                | 9.5                   | 18.65         | 33.0           | -14.4         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | 1852.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 17.88               | H                  | 4.5                | 9.5                   | 22.87         | 33.0           | -10.1         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 13.53               | V                  | 4.5                | 9.3                   | 18.28         | 33.0           | -14.7         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 18.20               | H                  | 4.5                | 9.3                   | 22.95         | 33.0           | -10.1         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | 1912.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 15.81               | V                  | 4.6                | 9.0                   | 20.27         | 33.0           | -12.7         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
| 1912.50                                     | 19.59                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | H                   | 4.6                | 9.0                | 24.05                 | 33.0          | -9.0           |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
| LTE<br><br>Band 25<br><br>5MHz<br><br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-22<br/>Test Engineer: 20882<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_16QAM Band 25 Fundamentals, 5MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br/>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div> <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBi)</th><th>EIRP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>1852.50</td><td>12.85</td><td>V</td><td>4.5</td><td>9.5</td><td>17.84</td><td>33.0</td><td>-15.2</td><td></td></tr><tr><td>1852.50</td><td>17.00</td><td>H</td><td>4.5</td><td>9.5</td><td>21.99</td><td>33.0</td><td>-11.0</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>1882.50</td><td>12.46</td><td>V</td><td>4.5</td><td>9.3</td><td>17.21</td><td>33.0</td><td>-15.8</td><td></td></tr><tr><td>1882.50</td><td>16.92</td><td>H</td><td>4.5</td><td>9.3</td><td>21.67</td><td>33.0</td><td>-11.3</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>1912.50</td><td>14.64</td><td>V</td><td>4.6</td><td>9.0</td><td>19.10</td><td>33.0</td><td>-13.9</td><td></td></tr><tr><td>1912.50</td><td>18.22</td><td>H</td><td>4.6</td><td>9.0</td><td>22.68</td><td>33.0</td><td>-10.3</td><td></td></tr></table> |                     |                    |                    |                       |               |                |               |       | f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1852.50 | 12.85 | V | 4.5 | 9.5 | 17.84 | 33.0 | -15.2 |  | 1852.50 | 17.00 | H | 4.5 | 9.5 | 21.99 | 33.0 | -11.0 |  | Mid Ch |  |  |  |  |  |  |  |  | 1882.50 | 12.46 | V | 4.5 | 9.3 | 17.21 | 33.0 | -15.8 |  | 1882.50 | 16.92 | H | 4.5 | 9.3 | 21.67 | 33.0 | -11.3 |  | High Ch |  |  |  |  |  |  |  |  | 1912.50 | 14.64 | V | 4.6 | 9.0 | 19.10 | 33.0 | -13.9 |  | 1912.50 | 18.22 | H | 4.6 | 9.0 | 22.68 | 33.0 | -10.3 |  |
|                                             | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | 1852.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 12.85               | V                  | 4.5                | 9.5                   | 17.84         | 33.0           | -15.2         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | 1852.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 17.00               | H                  | 4.5                | 9.5                   | 21.99         | 33.0           | -11.0         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 12.46               | V                  | 4.5                | 9.3                   | 17.21         | 33.0           | -15.8         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 16.92               | H                  | 4.5                | 9.3                   | 21.67         | 33.0           | -11.3         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | 1912.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 14.64               | V                  | 4.6                | 9.0                   | 19.10         | 33.0           | -13.9         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
| 1912.50                                     | 18.22                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | H                   | 4.6                | 9.0                | 22.68                 | 33.0          | -10.3          |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |

| LTE<br>Band 25<br><br>3MHz<br><br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-22<br/>Test Engineer: 20882<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_QPSK Band 25 Fundamentals, 3MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br/>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>1851.50</td><td>13.96</td><td>V</td><td>4.5</td><td>9.5</td><td>18.96</td><td>33.0</td><td>-14.0</td><td></td></tr><tr><td>1851.50</td><td>17.67</td><td>H</td><td>4.5</td><td>9.5</td><td>22.67</td><td>33.0</td><td>-10.3</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>1882.50</td><td>13.86</td><td>V</td><td>4.5</td><td>9.3</td><td>18.61</td><td>33.0</td><td>-14.4</td><td></td></tr><tr><td>1882.50</td><td>18.31</td><td>H</td><td>4.5</td><td>9.3</td><td>23.06</td><td>33.0</td><td>-9.9</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>1913.50</td><td>16.03</td><td>V</td><td>4.6</td><td>9.0</td><td>20.47</td><td>33.0</td><td>-12.5</td><td></td></tr><tr><td>1913.50</td><td>19.95</td><td>H</td><td>4.6</td><td>9.0</td><td>24.39</td><td>33.0</td><td>-8.6</td><td></td></tr></table>   |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1851.50 | 13.96 | V | 4.5 | 9.5 | 18.96 | 33.0 | -14.0 |  | 1851.50 | 17.67 | H | 4.5 | 9.5 | 22.67 | 33.0 | -10.3 |  | Mid Ch |  |  |  |  |  |  |  |  | 1882.50 | 13.86 | V | 4.5 | 9.3 | 18.61 | 33.0 | -14.4 |  | 1882.50 | 18.31 | H | 4.5 | 9.3 | 23.06 | 33.0 | -9.9  |  | High Ch |  |  |  |  |  |  |  |  | 1913.50 | 16.03 | V | 4.6 | 9.0 | 20.47 | 33.0 | -12.5 |  | 1913.50 | 19.95 | H | 4.6 | 9.0 | 24.39 | 33.0 | -8.6 |  |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|------|--|
|                                         | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                         | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                         | 1851.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 13.96            | V               | 4.5             | 9.5                | 18.96      | 33.0        | -14.0      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                         | 1851.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 17.67            | H               | 4.5             | 9.5                | 22.67      | 33.0        | -10.3      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                         | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                         | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 13.86            | V               | 4.5             | 9.3                | 18.61      | 33.0        | -14.4      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                         | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 18.31            | H               | 4.5             | 9.3                | 23.06      | 33.0        | -9.9       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                         | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                         | 1913.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 16.03            | V               | 4.6             | 9.0                | 20.47      | 33.0        | -12.5      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1913.50                                 | 19.95                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | H                | 4.6             | 9.0             | 24.39              | 33.0       | -8.6        |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| LTE<br>Band 25<br><br>3MHz<br><br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-22<br/>Test Engineer: 20882<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_16QAM Band 25 Fundamentals, 3MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br/>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>1851.50</td><td>12.56</td><td>V</td><td>4.5</td><td>9.5</td><td>17.56</td><td>33.0</td><td>-15.4</td><td></td></tr><tr><td>1851.50</td><td>16.62</td><td>H</td><td>4.5</td><td>9.5</td><td>21.62</td><td>33.0</td><td>-11.4</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>1882.50</td><td>12.77</td><td>V</td><td>4.5</td><td>9.3</td><td>17.52</td><td>33.0</td><td>-15.5</td><td></td></tr><tr><td>1882.50</td><td>17.34</td><td>H</td><td>4.5</td><td>9.3</td><td>22.09</td><td>33.0</td><td>-10.9</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>1913.50</td><td>14.98</td><td>V</td><td>4.6</td><td>9.0</td><td>19.42</td><td>33.0</td><td>-13.6</td><td></td></tr><tr><td>1913.50</td><td>18.73</td><td>H</td><td>4.6</td><td>9.0</td><td>23.17</td><td>33.0</td><td>-9.8</td><td></td></tr></table> |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1851.50 | 12.56 | V | 4.5 | 9.5 | 17.56 | 33.0 | -15.4 |  | 1851.50 | 16.62 | H | 4.5 | 9.5 | 21.62 | 33.0 | -11.4 |  | Mid Ch |  |  |  |  |  |  |  |  | 1882.50 | 12.77 | V | 4.5 | 9.3 | 17.52 | 33.0 | -15.5 |  | 1882.50 | 17.34 | H | 4.5 | 9.3 | 22.09 | 33.0 | -10.9 |  | High Ch |  |  |  |  |  |  |  |  | 1913.50 | 14.98 | V | 4.6 | 9.0 | 19.42 | 33.0 | -13.6 |  | 1913.50 | 18.73 | H | 4.6 | 9.0 | 23.17 | 33.0 | -9.8 |  |
|                                         | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                         | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                         | 1851.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 12.56            | V               | 4.5             | 9.5                | 17.56      | 33.0        | -15.4      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                         | 1851.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 16.62            | H               | 4.5             | 9.5                | 21.62      | 33.0        | -11.4      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                         | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                         | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 12.77            | V               | 4.5             | 9.3                | 17.52      | 33.0        | -15.5      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                         | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 17.34            | H               | 4.5             | 9.3                | 22.09      | 33.0        | -10.9      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                         | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                         | 1913.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 14.98            | V               | 4.6             | 9.0                | 19.42      | 33.0        | -13.6      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1913.50                                 | 18.73                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | H                | 4.6             | 9.0             | 23.17              | 33.0       | -9.8        |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |

| LTE<br>Band 25<br>1.4MHz<br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-22<br/>Test Engineer: 20882<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_QPSK Band 25 Fundamentals, 1.4MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br/>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1850.70</td><td>13.70</td><td>V</td><td>4.5</td><td>9.5</td><td>18.70</td><td>33.0</td><td>-14.3</td><td></td></tr><tr><td>1850.70</td><td>17.60</td><td>H</td><td>4.5</td><td>9.5</td><td>22.61</td><td>33.0</td><td>-10.4</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1882.50</td><td>13.18</td><td>V</td><td>4.5</td><td>9.3</td><td>17.93</td><td>33.0</td><td>-15.1</td><td></td></tr><tr><td>1882.50</td><td>18.17</td><td>H</td><td>4.5</td><td>9.3</td><td>22.92</td><td>33.0</td><td>-10.1</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1914.30</td><td>15.91</td><td>V</td><td>4.6</td><td>9.0</td><td>20.34</td><td>33.0</td><td>-12.7</td><td></td></tr><tr><td>1914.30</td><td>19.85</td><td>H</td><td>4.6</td><td>9.0</td><td>24.28</td><td>33.0</td><td>-8.7</td><td></td></tr></table>  |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1850.70 | 13.70 | V | 4.5 | 9.5 | 18.70 | 33.0 | -14.3 |  | 1850.70 | 17.60 | H | 4.5 | 9.5 | 22.61 | 33.0 | -10.4 |  | Mid Ch |  |  |  |  |  |  |  |  | 1882.50 | 13.18 | V | 4.5 | 9.3 | 17.93 | 33.0 | -15.1 |  | 1882.50 | 18.17 | H | 4.5 | 9.3 | 22.92 | 33.0 | -10.1 |  | High Ch |  |  |  |  |  |  |  |  | 1914.30 | 15.91 | V | 4.6 | 9.0 | 20.34 | 33.0 | -12.7 |  | 1914.30 | 19.85 | H | 4.6 | 9.0 | 24.28 | 33.0 | -8.7 |  |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|------|--|
|                                   | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                   | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                   | 1850.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 13.70            | V               | 4.5             | 9.5                | 18.70      | 33.0        | -14.3      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                   | 1850.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 17.60            | H               | 4.5             | 9.5                | 22.61      | 33.0        | -10.4      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                   | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                   | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 13.18            | V               | 4.5             | 9.3                | 17.93      | 33.0        | -15.1      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                   | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 18.17            | H               | 4.5             | 9.3                | 22.92      | 33.0        | -10.1      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                   | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                   | 1914.30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 15.91            | V               | 4.6             | 9.0                | 20.34      | 33.0        | -12.7      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1914.30                           | 19.85                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | H                | 4.6             | 9.0             | 24.28              | 33.0       | -8.7        |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| LTE<br>Band 25<br>1.4MHz<br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-22<br/>Test Engineer: 20882<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_16QAM Band 25 Fundamentals, 1.4MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br/>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1850.70</td><td>12.57</td><td>V</td><td>4.5</td><td>9.5</td><td>17.57</td><td>33.0</td><td>-15.4</td><td></td></tr><tr><td>1850.70</td><td>16.79</td><td>H</td><td>4.5</td><td>9.5</td><td>21.80</td><td>33.0</td><td>-11.2</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1882.50</td><td>12.12</td><td>V</td><td>4.5</td><td>9.3</td><td>16.87</td><td>33.0</td><td>-16.1</td><td></td></tr><tr><td>1882.50</td><td>16.91</td><td>H</td><td>4.5</td><td>9.3</td><td>21.66</td><td>33.0</td><td>-11.3</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1914.30</td><td>14.77</td><td>V</td><td>4.6</td><td>9.0</td><td>19.20</td><td>33.0</td><td>-13.8</td><td></td></tr><tr><td>1914.30</td><td>18.75</td><td>H</td><td>4.6</td><td>9.0</td><td>23.18</td><td>33.0</td><td>-9.8</td><td></td></tr></table> |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1850.70 | 12.57 | V | 4.5 | 9.5 | 17.57 | 33.0 | -15.4 |  | 1850.70 | 16.79 | H | 4.5 | 9.5 | 21.80 | 33.0 | -11.2 |  | Mid Ch |  |  |  |  |  |  |  |  | 1882.50 | 12.12 | V | 4.5 | 9.3 | 16.87 | 33.0 | -16.1 |  | 1882.50 | 16.91 | H | 4.5 | 9.3 | 21.66 | 33.0 | -11.3 |  | High Ch |  |  |  |  |  |  |  |  | 1914.30 | 14.77 | V | 4.6 | 9.0 | 19.20 | 33.0 | -13.8 |  | 1914.30 | 18.75 | H | 4.6 | 9.0 | 23.18 | 33.0 | -9.8 |  |
|                                   | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                   | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                   | 1850.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 12.57            | V               | 4.5             | 9.5                | 17.57      | 33.0        | -15.4      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                   | 1850.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 16.79            | H               | 4.5             | 9.5                | 21.80      | 33.0        | -11.2      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                   | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                   | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 12.12            | V               | 4.5             | 9.3                | 16.87      | 33.0        | -16.1      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                   | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 16.91            | H               | 4.5             | 9.3                | 21.66      | 33.0        | -11.3      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                   | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                   | 1914.30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 14.77            | V               | 4.6             | 9.0                | 19.20      | 33.0        | -13.8      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1914.30                           | 18.75                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | H                | 4.6             | 9.0             | 23.18              | 33.0       | -9.8        |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |

**LTE Band 26**

LTE

Band 26

15MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789219881

2019-11-25

20881

EUT, X-Position

Chamber 1

LTE\_QPSK Band 26 Fundamentals, 15MHz Bandwidth

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes   |
|----------|---------------------|--------------------|--------------------|-----------------------|--------------|----------------|---------------|---------|
| Low Ch   |                     |                    |                    |                       |              |                |               |         |
| 821.50   | 15.02               | V                  | 3.0                | -1.0                  | 11.05        | 50.0           | -38.9         | Part 90 |
| 821.50   | 23.36               | H                  | 3.0                | -1.0                  | 19.39        | 50.0           | -30.6         | Part 90 |

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789219881

2019-11-25

20881

EUT, X-Position

Chamber 1

LTE\_QPSK Band 26 Fundamentals, 15MHz Bandwidth

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|----------|---------------------|--------------------|--------------------|-----------------------|--------------|----------------|---------------|-------|
| Mid Ch   |                     |                    |                    |                       |              |                |               |       |
| 831.50   | 15.68               | V                  | 3.0                | -0.9                  | 11.74        | 38.5           | -26.8         |       |
| 831.50   | 22.77               | H                  | 3.0                | -0.9                  | 18.82        | 38.5           | -19.7         |       |
| High Ch  |                     |                    |                    |                       |              |                |               |       |
| 841.50   | 16.06               | V                  | 3.0                | -0.9                  | 12.14        | 38.5           | -26.4         |       |
| 841.50   | 22.59               | H                  | 3.0                | -0.9                  | 18.67        | 38.5           | -19.8         |       |

LTE  
Band 26  
15MHz  
16QAM

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung

Project #: 4789219881

Date: 2019-11-25

Test Engineer: 20881

Configuration: EUT, X-Position

Location: Chamber 1

Mode: LTE\_16QAM Band 26 Fundamentals, 15MHz Bandwidth

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes   |
|----------|---------------------|--------------------|--------------------|-----------------------|--------------|----------------|---------------|---------|
| Low Ch   |                     |                    |                    |                       |              |                |               |         |
| 821.50   | 13.45               | V                  | 3.0                | -1.0                  | 9.48         | 50.0           | -40.5         | Part 90 |
| 821.50   | 22.13               | H                  | 3.0                | -1.0                  | 18.16        | 50.0           | -31.8         | Part 90 |

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung

Project #: 4789219881

Date: 2019-11-25

Test Engineer: 20881

Configuration: EUT, X-Position

Location: Chamber 1

Mode: LTE\_16QAM Band 26 Fundamentals, 15MHz Bandwidth

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|----------|---------------------|--------------------|--------------------|-----------------------|--------------|----------------|---------------|-------|
| Mid Ch   |                     |                    |                    |                       |              |                |               |       |
| 831.50   | 14.65               | V                  | 3.0                | -0.9                  | 10.71        | 38.5           | -27.8         |       |
| 831.50   | 22.41               | H                  | 3.0                | -0.9                  | 18.46        | 38.5           | -20.0         |       |
| High Ch  |                     |                    |                    |                       |              |                |               |       |
| 841.50   | 13.88               | V                  | 3.0                | -0.9                  | 9.96         | 38.5           | -28.5         |       |
| 841.50   | 21.46               | H                  | 3.0                | -0.9                  | 17.54        | 38.5           | -21.0         |       |

LTE

Band 26

10MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes   |
|----------|---------------------|--------------------|--------------------|-----------------------|--------------|----------------|---------------|---------|
| Low Ch   |                     |                    |                    |                       |              |                |               |         |
| 819.00   | 15.09               | V                  | 3.0                | -1.0                  | 11.11        | 50.0           | -38.9         | Part 90 |
| 819.00   | 23.37               | H                  | 3.0                | -1.0                  | 19.39        | 50.0           | -30.6         | Part 90 |

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|----------|---------------------|--------------------|--------------------|-----------------------|--------------|----------------|---------------|-------|
| Low Ch   |                     |                    |                    |                       |              |                |               |       |
| 829.00   | 15.59               | V                  | 3.0                | -0.9                  | 11.63        | 38.5           | -26.9         |       |
| 829.00   | 23.26               | H                  | 3.0                | -0.9                  | 19.31        | 38.5           | -19.2         |       |
| Mid Ch   |                     |                    |                    |                       |              |                |               |       |
| 831.50   | 15.74               | V                  | 3.0                | -0.9                  | 11.80        | 38.5           | -26.7         |       |
| 831.50   | 23.52               | H                  | 3.0                | -0.9                  | 19.57        | 38.5           | -18.9         |       |
| High Ch  |                     |                    |                    |                       |              |                |               |       |
| 844.00   | 14.08               | V                  | 3.0                | -0.9                  | 10.16        | 38.5           | -28.3         |       |
| 844.00   | 22.88               | H                  | 3.0                | -0.9                  | 18.96        | 38.5           | -19.5         |       |

LTE  
Band 26  
  
10MHz  
  
16QAM

| UL Verification Services, Inc.<br>High Frequency Substitution Measurement |                     |                                                 |                    |                       |              |                |               |         |
|---------------------------------------------------------------------------|---------------------|-------------------------------------------------|--------------------|-----------------------|--------------|----------------|---------------|---------|
| Company:                                                                  |                     | Samsung                                         |                    |                       |              |                |               |         |
| Project #:                                                                |                     | 4789219881                                      |                    |                       |              |                |               |         |
| Date:                                                                     |                     | 2019-11-25                                      |                    |                       |              |                |               |         |
| Test Engineer:                                                            |                     | 20881                                           |                    |                       |              |                |               |         |
| Configuration:                                                            |                     | EUT, X-Position                                 |                    |                       |              |                |               |         |
| Location:                                                                 |                     | Chamber 1                                       |                    |                       |              |                |               |         |
| Mode:                                                                     |                     | LTE_16QAM Band 26 Fundamentals, 10MHz Bandwidth |                    |                       |              |                |               |         |
| <u>Test Equipment:</u>                                                    |                     |                                                 |                    |                       |              |                |               |         |
| Receiving: VULB9163-750, and Chamber 1 SMA Cables                         |                     |                                                 |                    |                       |              |                |               |         |
| Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable                        |                     |                                                 |                    |                       |              |                |               |         |
| f<br>MHz                                                                  | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                              | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes   |
| Low Ch                                                                    |                     |                                                 |                    |                       |              |                |               |         |
| 819.00                                                                    | 14.17               | V                                               | 3.0                | -1.0                  | 10.19        | 50.0           | -39.8         | Part 90 |
| 819.00                                                                    | 22.26               | H                                               | 3.0                | -1.0                  | 18.28        | 50.0           | -31.7         | Part 90 |

| UL Verification Services, Inc.<br>High Frequency Substitution Measurement |                     |                                                 |                    |                       |              |                |               |       |
|---------------------------------------------------------------------------|---------------------|-------------------------------------------------|--------------------|-----------------------|--------------|----------------|---------------|-------|
| Company:                                                                  |                     | Samsung                                         |                    |                       |              |                |               |       |
| Project #:                                                                |                     | 4789219881                                      |                    |                       |              |                |               |       |
| Date:                                                                     |                     | 2019-11-25                                      |                    |                       |              |                |               |       |
| Test Engineer:                                                            |                     | 20881                                           |                    |                       |              |                |               |       |
| Configuration:                                                            |                     | EUT, X-Position                                 |                    |                       |              |                |               |       |
| Location:                                                                 |                     | Chamber 1                                       |                    |                       |              |                |               |       |
| Mode:                                                                     |                     | LTE_16QAM Band 26 Fundamentals, 10MHz Bandwidth |                    |                       |              |                |               |       |
| <u>Test Equipment:</u>                                                    |                     |                                                 |                    |                       |              |                |               |       |
| Receiving: VULB9163-750, and Chamber 1 SMA Cables                         |                     |                                                 |                    |                       |              |                |               |       |
| Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable                        |                     |                                                 |                    |                       |              |                |               |       |
| f<br>MHz                                                                  | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                              | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| Low Ch                                                                    |                     |                                                 |                    |                       |              |                |               |       |
| 829.00                                                                    | 14.46               | V                                               | 3.0                | -0.9                  | 10.50        | 38.5           | -28.0         |       |
| 829.00                                                                    | 22.36               | H                                               | 3.0                | -0.9                  | 18.41        | 38.5           | -20.1         |       |
| Mid Ch                                                                    |                     |                                                 |                    |                       |              |                |               |       |
| 831.50                                                                    | 14.63               | V                                               | 3.0                | -0.9                  | 10.69        | 38.5           | -27.8         |       |
| 831.50                                                                    | 22.52               | H                                               | 3.0                | -0.9                  | 18.57        | 38.5           | -19.9         |       |
| High Ch                                                                   |                     |                                                 |                    |                       |              |                |               |       |
| 844.00                                                                    | 13.05               | V                                               | 3.0                | -0.9                  | 9.13         | 38.5           | -29.4         |       |
| 844.00                                                                    | 21.93               | H                                               | 3.0                | -0.9                  | 18.01        | 38.5           | -20.5         |       |

LTE

Band 26

5MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789219881

2019-11-25

20881

EUT, X-Position

Chamber 1

LTE\_QPSK Band 26 Fundamentals, 5MHz Bandwidth

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz  | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes   |
|--------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|---------|
| Low Ch |                  |                 |                 |                    |           |             |            |         |
| 816.50 | 14.59            | V               | 3.0             | -1.0               | 10.61     | 50.0        | -39.4      | Part 90 |
| 816.50 | 23.00            | H               | 3.0             | -1.0               | 19.02     | 50.0        | -31.0      | Part 90 |
| Mid Ch |                  |                 |                 |                    |           |             |            |         |
| 821.50 | 15.18            | V               | 3.0             | -1.0               | 11.21     | 50.0        | -38.8      | Part 90 |
| 821.50 | 23.46            | H               | 3.0             | -1.0               | 19.49     | 50.0        | -30.5      | Part 90 |

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789219881

2019-11-25

20881

EUT, X-Position

Chamber 1

LTE\_QPSK Band 26 Fundamentals, 5MHz Bandwidth

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |           |             |            |       |
| 826.50  | 15.16            | V               | 3.0             | -0.9               | 11.20     | 38.5        | -27.3      |       |
| 826.50  | 23.30            | H               | 3.0             | -0.9               | 19.34     | 38.5        | -19.2      |       |
| Mid Ch  |                  |                 |                 |                    |           |             |            |       |
| 831.50  | 14.64            | V               | 3.0             | -0.9               | 10.70     | 38.5        | -27.8      |       |
| 831.50  | 23.18            | H               | 3.0             | -0.9               | 19.23     | 38.5        | -19.3      |       |
| High Ch |                  |                 |                 |                    |           |             |            |       |
| 846.50  | 15.77            | V               | 3.0             | -0.9               | 11.85     | 38.5        | -26.6      |       |
| 846.50  | 22.56            | H               | 3.0             | -0.9               | 18.64     | 38.5        | -19.9      |       |

LTE  
Band 26  
  
5MHz  
  
16QAM

| UL Verification Services, Inc.<br>High Frequency Substitution Measurement |                     |                                                |                    |                       |              |                |               |         |
|---------------------------------------------------------------------------|---------------------|------------------------------------------------|--------------------|-----------------------|--------------|----------------|---------------|---------|
| Company:                                                                  |                     | Samsung                                        |                    |                       |              |                |               |         |
| Project #:                                                                |                     | 4789219881                                     |                    |                       |              |                |               |         |
| Date:                                                                     |                     | 2019-11-25                                     |                    |                       |              |                |               |         |
| Test Engineer:                                                            |                     | 20881                                          |                    |                       |              |                |               |         |
| Configuration:                                                            |                     | EUT, X-Position                                |                    |                       |              |                |               |         |
| Location:                                                                 |                     | Chamber 1                                      |                    |                       |              |                |               |         |
| Mode:                                                                     |                     | LTE_16QAM Band 26 Fundamentals, 5MHz Bandwidth |                    |                       |              |                |               |         |
| Test Equipment:                                                           |                     |                                                |                    |                       |              |                |               |         |
| Receiving: VULB9163-750, and Chamber 1 SMA Cables                         |                     |                                                |                    |                       |              |                |               |         |
| Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable                        |                     |                                                |                    |                       |              |                |               |         |
| f<br>MHz                                                                  | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                             | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes   |
| Low Ch                                                                    |                     |                                                |                    |                       |              |                |               |         |
| 816.50                                                                    | 13.77               | V                                              | 3.0                | -1.0                  | 9.79         | 50.0           | -40.2         | Part 90 |
| 816.50                                                                    | 22.10               | H                                              | 3.0                | -1.0                  | 18.12        | 50.0           | -31.9         | Part 90 |
| Mid Ch                                                                    |                     |                                                |                    |                       |              |                |               |         |
| 821.50                                                                    | 13.65               | V                                              | 3.0                | -1.0                  | 9.68         | 50.0           | -40.3         | Part 90 |
| 821.50                                                                    | 22.02               | H                                              | 3.0                | -1.0                  | 18.05        | 50.0           | -32.0         | Part 90 |

| UL Verification Services, Inc.<br>High Frequency Substitution Measurement |                     |                                                |                    |                       |              |                |               |       |
|---------------------------------------------------------------------------|---------------------|------------------------------------------------|--------------------|-----------------------|--------------|----------------|---------------|-------|
| Company:                                                                  |                     | Samsung                                        |                    |                       |              |                |               |       |
| Project #:                                                                |                     | 4789219881                                     |                    |                       |              |                |               |       |
| Date:                                                                     |                     | 2019-11-25                                     |                    |                       |              |                |               |       |
| Test Engineer:                                                            |                     | 20881                                          |                    |                       |              |                |               |       |
| Configuration:                                                            |                     | EUT, X-Position                                |                    |                       |              |                |               |       |
| Location:                                                                 |                     | Chamber 1                                      |                    |                       |              |                |               |       |
| Mode:                                                                     |                     | LTE_16QAM Band 26 Fundamentals, 5MHz Bandwidth |                    |                       |              |                |               |       |
| Test Equipment:                                                           |                     |                                                |                    |                       |              |                |               |       |
| Receiving: VULB9163-750, and Chamber 1 SMA Cables                         |                     |                                                |                    |                       |              |                |               |       |
| Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable                        |                     |                                                |                    |                       |              |                |               |       |
| f<br>MHz                                                                  | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                             | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| Low Ch                                                                    |                     |                                                |                    |                       |              |                |               |       |
| 826.50                                                                    | 14.36               | V                                              | 3.0                | -0.9                  | 10.40        | 38.5           | -28.1         |       |
| 826.50                                                                    | 22.21               | H                                              | 3.0                | -0.9                  | 18.25        | 38.5           | -20.3         |       |
| Mid Ch                                                                    |                     |                                                |                    |                       |              |                |               |       |
| 831.50                                                                    | 14.64               | V                                              | 3.0                | -0.9                  | 10.70        | 38.5           | -27.8         |       |
| 831.50                                                                    | 22.18               | H                                              | 3.0                | -0.9                  | 18.23        | 38.5           | -20.3         |       |
| High Ch                                                                   |                     |                                                |                    |                       |              |                |               |       |
| 846.50                                                                    | 14.67               | V                                              | 3.0                | -0.9                  | 10.75        | 38.5           | -27.7         |       |
| 846.50                                                                    | 21.20               | H                                              | 3.0                | -0.9                  | 17.28        | 38.5           | -21.2         |       |

LTE

Band 26

3MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz  | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes   |
|--------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|---------|
| Low Ch |                  |                 |                 |                    |           |             |            |         |
| 815.50 | 14.23            | V               | 3.0             | -1.0               | 10.24     | 50.0        | -39.8      | Part 90 |
| 815.50 | 22.94            | H               | 3.0             | -1.0               | 18.96     | 50.0        | -31.0      | Part 90 |
| Mid Ch |                  |                 |                 |                    |           |             |            |         |
| 822.50 | 15.15            | V               | 3.0             | -1.0               | 11.18     | 50.0        | -38.8      | Part 90 |
| 822.50 | 23.28            | H               | 3.0             | -1.0               | 19.32     | 50.0        | -30.7      | Part 90 |

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |           |             |            |       |
| 825.50  | 15.28            | V               | 3.0             | -0.9               | 11.32     | 38.5        | -27.2      |       |
| 825.50  | 23.43            | H               | 3.0             | -0.9               | 19.47     | 38.5        | -19.0      |       |
| Mid Ch  |                  |                 |                 |                    |           |             |            |       |
| 831.50  | 15.83            | V               | 3.0             | -0.9               | 11.89     | 38.5        | -26.6      |       |
| 831.50  | 23.50            | H               | 3.0             | -0.9               | 19.55     | 38.5        | -19.0      |       |
| High Ch |                  |                 |                 |                    |           |             |            |       |
| 847.50  | 13.92            | V               | 3.1             | -0.9               | 10.01     | 38.5        | -28.5      |       |
| 847.50  | 22.19            | H               | 3.1             | -0.9               | 18.28     | 38.5        | -20.2      |       |

LTE  
Band 26  
  
3MHz  
  
16QAM

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung

Project #: 4789219881

Date: 2019-11-25

Test Engineer: 20881

Configuration: EUT, X-Position

Location: Chamber 1

Mode: LTE\_16QAM Band 26 Fundamentals, 3MHz Bandwidth

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz  | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes   |
|--------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|---------|
| Low Ch |                  |                 |                 |                    |           |             |            |         |
| 815.50 | 13.35            | V               | 3.0             | -1.0               | 9.36      | 50.0        | -40.6      | Part 90 |
| 815.50 | 21.83            | H               | 3.0             | -1.0               | 17.85     | 50.0        | -32.2      | Part 90 |
| Mid Ch |                  |                 |                 |                    |           |             |            |         |
| 822.50 | 14.18            | V               | 3.0             | -1.0               | 10.21     | 50.0        | -39.8      | Part 90 |
| 822.50 | 22.53            | H               | 3.0             | -1.0               | 18.57     | 50.0        | -31.4      | Part 90 |

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung

Project #: 4789219881

Date: 2019-11-25

Test Engineer: 20881

Configuration: EUT, X-Position

Location: Chamber 1

Mode: LTE\_16QAM Band 26 Fundamentals, 3MHz Bandwidth

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |           |             |            |       |
| 825.50  | 14.21            | V               | 3.0             | -0.9               | 10.25     | 38.5        | -28.3      |       |
| 825.50  | 22.42            | H               | 3.0             | -0.9               | 18.46     | 38.5        | -20.0      |       |
| Mid Ch  |                  |                 |                 |                    |           |             |            |       |
| 831.50  | 14.76            | V               | 3.0             | -0.9               | 10.82     | 38.5        | -27.7      |       |
| 831.50  | 22.24            | H               | 3.0             | -0.9               | 18.29     | 38.5        | -20.2      |       |
| High Ch |                  |                 |                 |                    |           |             |            |       |
| 847.50  | 13.12            | V               | 3.1             | -0.9               | 9.21      | 38.5        | -29.3      |       |
| 847.50  | 21.16            | H               | 3.1             | -0.9               | 17.25     | 38.5        | -21.3      |       |

LTE

Band 26

1.4MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company: Samsung

Project #: 4789219881

Date: 2019-11-25

Test Engineer: 20881

Configuration: EUT, X-Position

Location: Chamber 1

Mode: LTE\_QPSK Band 26 Fundamentals, 1.4MHz Bandwidth

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz  | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes   |
|--------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|---------|
| Low Ch |                  |                 |                 |                    |           |             |            |         |
| 814.70 | 14.34            | V               | 3.0             | -1.0               | 10.36     | 50.0        | -39.6      | Part 90 |
| 814.70 | 22.55            | H               | 3.0             | -1.0               | 18.56     | 50.0        | -31.4      | Part 90 |
| Mid Ch |                  |                 |                 |                    |           |             |            |         |
| 823.30 | 15.08            | V               | 3.0             | -1.0               | 11.11     | 50.0        | -38.9      | Part 90 |
| 823.30 | 23.39            | H               | 3.0             | -1.0               | 19.42     | 50.0        | -30.6      | Part 90 |

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company: Samsung

Project #: 4789219881

Date: 2019-11-25

Test Engineer: 20881

Configuration: EUT, X-Position

Location: Chamber 1

Mode: LTE\_QPSK Band 26 Fundamentals, 1.4MHz Bandwidth

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |           |             |            |       |
| 824.70  | 15.12            | V               | 3.0             | -1.0               | 11.15     | 38.5        | -27.3      |       |
| 824.70  | 23.22            | H               | 3.0             | -1.0               | 19.26     | 38.5        | -19.2      |       |
| Mid Ch  |                  |                 |                 |                    |           |             |            |       |
| 831.50  | 15.82            | V               | 3.0             | -0.9               | 11.88     | 38.5        | -26.6      |       |
| 831.50  | 23.11            | H               | 3.0             | -0.9               | 19.16     | 38.5        | -19.3      |       |
| High Ch |                  |                 |                 |                    |           |             |            |       |
| 848.30  | 15.43            | V               | 3.0             | -0.9               | 11.52     | 38.5        | -27.0      |       |
| 848.30  | 22.28            | H               | 3.0             | -0.9               | 18.37     | 38.5        | -20.1      |       |

LTE  
Band 26  
1.4MHz  
16QAM

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung

Project #: 4789219881

Date: 2019-11-25

Test Engineer: 20881

Configuration: EUT, X-Position

Location: Chamber 1

Mode: LTE\_16QAM Band 26 Fundamentals, 1.4MHz Bandwidth

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz  | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes   |
|--------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|---------|
| Low Ch |                  |                 |                 |                    |           |             |            |         |
| 814.70 | 13.22            | V               | 3.0             | -1.0               | 9.24      | 50.0        | -40.8      | Part 90 |
| 814.70 | 21.64            | H               | 3.0             | -1.0               | 17.65     | 50.0        | -32.3      | Part 90 |
| Mid Ch |                  |                 |                 |                    |           |             |            |         |
| 823.30 | 13.93            | V               | 3.0             | -1.0               | 9.96      | 50.0        | -40.0      | Part 90 |
| 823.30 | 22.19            | H               | 3.0             | -1.0               | 18.22     | 50.0        | -31.8      | Part 90 |

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung

Project #: 4789219881

Date: 2019-11-25

Test Engineer: 20881

Configuration: EUT, X-Position

Location: Chamber 1

Mode: LTE\_16QAM Band 26 Fundamentals, 1.4MHz Bandwidth

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |           |             |            |       |
| 824.70  | 14.21            | V               | 3.0             | -1.0               | 10.24     | 38.5        | -28.3      |       |
| 824.70  | 22.20            | H               | 3.0             | -1.0               | 18.24     | 38.5        | -20.3      |       |
| Mid Ch  |                  |                 |                 |                    |           |             |            |       |
| 831.50  | 14.57            | V               | 3.0             | -0.9               | 10.63     | 38.5        | -27.9      |       |
| 831.50  | 22.23            | H               | 3.0             | -0.9               | 18.28     | 38.5        | -20.2      |       |
| High Ch |                  |                 |                 |                    |           |             |            |       |
| 848.30  | 14.47            | V               | 3.0             | -0.9               | 10.56     | 38.5        | -27.9      |       |
| 848.30  | 21.38            | H               | 3.0             | -0.9               | 17.47     | 38.5        | -21.0      |       |

**LTE Band 41(PC2)**

| LTE<br>Band 41<br><br>20MHz<br><br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-29<br/>Test Engineer: 20881<br/>Configuration: EUT, X-Position<br/>Location: Chamber 1<br/>Mode: LTE_QPSK Band 41 Fundamentals, 20MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br/>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>2506.00</td><td>17.84</td><td>V</td><td>5.2</td><td>9.9</td><td>22.51</td><td>33.0</td><td>-10.5</td><td></td></tr><tr><td>2506.00</td><td>22.78</td><td>H</td><td>5.2</td><td>9.9</td><td>27.45</td><td>33.0</td><td>-5.6</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>2593.00</td><td>18.14</td><td>V</td><td>5.3</td><td>9.8</td><td>22.60</td><td>33.0</td><td>-10.4</td><td></td></tr><tr><td>2593.00</td><td>22.68</td><td>H</td><td>5.3</td><td>9.8</td><td>27.15</td><td>33.0</td><td>-5.9</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>2680.00</td><td>19.24</td><td>V</td><td>5.4</td><td>9.8</td><td>23.60</td><td>33.0</td><td>-9.4</td><td></td></tr><tr><td>2680.00</td><td>22.28</td><td>H</td><td>5.4</td><td>9.8</td><td>26.64</td><td>33.0</td><td>-6.4</td><td></td></tr></table> |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 2506.00 | 17.84 | V | 5.2 | 9.9 | 22.51 | 33.0 | -10.5 |  | 2506.00 | 22.78 | H | 5.2 | 9.9 | 27.45 | 33.0 | -5.6 |  | Mid Ch |  |  |  |  |  |  |  |  | 2593.00 | 18.14 | V | 5.3 | 9.8 | 22.60 | 33.0 | -10.4 |  | 2593.00 | 22.68 | H | 5.3 | 9.8 | 27.15 | 33.0 | -5.9 |  | High Ch |  |  |  |  |  |  |  |  | 2680.00 | 19.24 | V | 5.4 | 9.8 | 23.60 | 33.0 | -9.4  |  | 2680.00 | 22.28 | H | 5.4 | 9.8 | 26.64 | 33.0 | -6.4 |  |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|------|--|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|------|--|---------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|------|--|
|                                          | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | 2506.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 17.84            | V               | 5.2             | 9.9                | 22.51      | 33.0        | -10.5      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | 2506.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 22.78            | H               | 5.2             | 9.9                | 27.45      | 33.0        | -5.6       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | 2593.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 18.14            | V               | 5.3             | 9.8                | 22.60      | 33.0        | -10.4      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | 2593.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 22.68            | H               | 5.3             | 9.8                | 27.15      | 33.0        | -5.9       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | 2680.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 19.24            | V               | 5.4             | 9.8                | 23.60      | 33.0        | -9.4       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 2680.00                                  | 22.28                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | H                | 5.4             | 9.8             | 26.64              | 33.0       | -6.4        |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| LTE<br>Band 41<br><br>20MHz<br><br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-29<br/>Test Engineer: 20881<br/>Configuration: EUT, X-Position<br/>Location: Chamber 1<br/>Mode: LTE_16QAM Band 41 Fundamentals, 20MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br/>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>2506.00</td><td>18.64</td><td>V</td><td>5.2</td><td>9.9</td><td>23.31</td><td>33.0</td><td>-9.7</td><td></td></tr><tr><td>2506.00</td><td>21.67</td><td>H</td><td>5.2</td><td>9.9</td><td>26.34</td><td>33.0</td><td>-6.7</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>2593.00</td><td>18.90</td><td>V</td><td>5.3</td><td>9.8</td><td>23.36</td><td>33.0</td><td>-9.6</td><td></td></tr><tr><td>2593.00</td><td>23.22</td><td>H</td><td>5.3</td><td>9.8</td><td>27.69</td><td>33.0</td><td>-5.3</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>2680.00</td><td>18.56</td><td>V</td><td>5.4</td><td>9.8</td><td>22.92</td><td>33.0</td><td>-10.1</td><td></td></tr><tr><td>2680.00</td><td>21.72</td><td>H</td><td>5.4</td><td>9.8</td><td>26.08</td><td>33.0</td><td>-6.9</td><td></td></tr></table> |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 2506.00 | 18.64 | V | 5.2 | 9.9 | 23.31 | 33.0 | -9.7  |  | 2506.00 | 21.67 | H | 5.2 | 9.9 | 26.34 | 33.0 | -6.7 |  | Mid Ch |  |  |  |  |  |  |  |  | 2593.00 | 18.90 | V | 5.3 | 9.8 | 23.36 | 33.0 | -9.6  |  | 2593.00 | 23.22 | H | 5.3 | 9.8 | 27.69 | 33.0 | -5.3 |  | High Ch |  |  |  |  |  |  |  |  | 2680.00 | 18.56 | V | 5.4 | 9.8 | 22.92 | 33.0 | -10.1 |  | 2680.00 | 21.72 | H | 5.4 | 9.8 | 26.08 | 33.0 | -6.9 |  |
|                                          | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | 2506.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 18.64            | V               | 5.2             | 9.9                | 23.31      | 33.0        | -9.7       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | 2506.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 21.67            | H               | 5.2             | 9.9                | 26.34      | 33.0        | -6.7       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | 2593.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 18.90            | V               | 5.3             | 9.8                | 23.36      | 33.0        | -9.6       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | 2593.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 23.22            | H               | 5.3             | 9.8                | 27.69      | 33.0        | -5.3       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                          | 2680.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 18.56            | V               | 5.4             | 9.8                | 22.92      | 33.0        | -10.1      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 2680.00                                  | 21.72                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | H                | 5.4             | 9.8             | 26.08              | 33.0       | -6.9        |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |

LTE

Band 41

15MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789219881

2019-11-29

20881

EUT, X-Position

Chamber 1

LTE\_QPSK Band 41 Fundamentals, 15MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables

Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 2503.50 | 17.38            | V               | 5.2             | 9.9                | 22.05      | 33.0        | -11.0      |       |
| 2503.50 | 23.74            | H               | 5.2             | 9.9                | 28.42      | 33.0        | -4.6       |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 2593.00 | 19.78            | V               | 5.3             | 9.8                | 24.24      | 33.0        | -8.8       |       |
| 2593.00 | 22.77            | H               | 5.3             | 9.8                | 27.24      | 33.0        | -5.8       |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 2682.50 | 19.56            | V               | 5.4             | 9.8                | 23.92      | 33.0        | -9.1       |       |
| 2682.50 | 22.63            | H               | 5.4             | 9.8                | 26.99      | 33.0        | -6.0       |       |

LTE

Band 41

15MHz

16QAM

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789219881

2019-11-29

20881

EUT, X-Position

Chamber 1

LTE\_16QAM Band 41 Fundamentals, 15MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables

Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 2503.50 | 17.81            | V               | 5.2             | 9.9                | 22.48      | 33.0        | -10.5      |       |
| 2503.50 | 22.21            | H               | 5.2             | 9.9                | 26.89      | 33.0        | -6.1       |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 2593.00 | 19.13            | V               | 5.3             | 9.8                | 23.59      | 33.0        | -9.4       |       |
| 2593.00 | 23.18            | H               | 5.3             | 9.8                | 27.65      | 33.0        | -5.4       |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 2682.50 | 19.27            | V               | 5.4             | 9.8                | 23.63      | 33.0        | -9.4       |       |
| 2682.50 | 21.58            | H               | 5.4             | 9.8                | 25.94      | 33.0        | -7.1       |       |

LTE

Band 41

10MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789219881

2019-11-29

20881

EUT, X-Position

Chamber 1

LTE\_QPSK Band 41 Fundamentals, 10MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables

Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|----------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| Low Ch   |                     |                    |                    |                       |               |                |               |       |
| 2501.00  | 16.43               | V                  | 5.2                | 9.9                   | 21.11         | 33.0           | -11.9         |       |
| 2501.00  | 23.64               | H                  | 5.2                | 9.9                   | 28.32         | 33.0           | -4.7          |       |
| Mid Ch   |                     |                    |                    |                       |               |                |               |       |
| 2593.00  | 19.79               | V                  | 5.3                | 9.8                   | 24.25         | 33.0           | -8.7          |       |
| 2593.00  | 23.53               | H                  | 5.3                | 9.8                   | 28.00         | 33.0           | -5.0          |       |
| High Ch  |                     |                    |                    |                       |               |                |               |       |
| 2685.00  | 21.20               | V                  | 5.5                | 9.8                   | 25.56         | 33.0           | -7.4          |       |
| 2685.00  | 23.13               | H                  | 5.5                | 9.8                   | 27.49         | 33.0           | -5.5          |       |

LTE

Band 41

10MHz

16QAM

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789219881

2019-11-29

20881

EUT, X-Position

Chamber 1

LTE\_16QAM Band 41 Fundamentals, 10MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables

Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|----------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| Low Ch   |                     |                    |                    |                       |               |                |               |       |
| 2501.00  | 17.82               | V                  | 5.2                | 9.9                   | 22.50         | 33.0           | -10.5         |       |
| 2501.00  | 22.92               | H                  | 5.2                | 9.9                   | 27.60         | 33.0           | -5.4          |       |
| Mid Ch   |                     |                    |                    |                       |               |                |               |       |
| 2593.00  | 18.26               | V                  | 5.3                | 9.8                   | 22.72         | 33.0           | -10.3         |       |
| 2593.00  | 23.31               | H                  | 5.3                | 9.8                   | 27.78         | 33.0           | -5.2          |       |
| High Ch  |                     |                    |                    |                       |               |                |               |       |
| 2685.00  | 19.74               | V                  | 5.5                | 9.8                   | 24.10         | 33.0           | -8.9          |       |
| 2685.00  | 22.71               | H                  | 5.5                | 9.8                   | 27.07         | 33.0           | -5.9          |       |

LTE

Band 41

5MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789219881

2019-11-29

20881

EUT, X-Position

Chamber 1

LTE\_QPSK Band 41 Fundamentals, 5MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables

Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 2498.50 | 19.69            | V               | 5.2             | 9.9                | 24.38      | 33.0        | -8.6       |       |
| 2498.50 | 21.77            | H               | 5.2             | 9.9                | 26.45      | 33.0        | -6.5       |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 2593.00 | 18.94            | V               | 5.3             | 9.8                | 23.40      | 33.0        | -9.6       |       |
| 2593.00 | 22.55            | H               | 5.3             | 9.8                | 27.02      | 33.0        | -6.0       |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 2687.50 | 19.95            | V               | 5.5             | 9.8                | 24.31      | 33.0        | -8.7       |       |
| 2687.50 | 21.95            | H               | 5.5             | 9.8                | 26.31      | 33.0        | -6.7       |       |

LTE

Band 41

5MHz

16QAM

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789219881

2019-11-29

20881

EUT, X-Position

Chamber 1

LTE\_16QAM Band 41 Fundamentals, 5MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables

Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 2498.50 | 19.28            | V               | 5.2             | 9.9                | 23.97      | 33.0        | -9.0       |       |
| 2498.50 | 21.89            | H               | 5.2             | 9.9                | 26.57      | 33.0        | -6.4       |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 2593.00 | 20.18            | V               | 5.3             | 9.8                | 24.64      | 33.0        | -8.4       |       |
| 2593.00 | 22.78            | H               | 5.3             | 9.8                | 27.25      | 33.0        | -5.8       |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 2687.50 | 20.44            | V               | 5.5             | 9.8                | 24.80      | 33.0        | -8.2       |       |
| 2687.50 | 22.48            | H               | 5.5             | 9.8                | 26.84      | 33.0        | -6.2       |       |

**LTE Band 66**

| LTE<br><br>Band 66<br><br>20MHz<br><br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-25<br/>Test Engineer: 20890<br/>Configuration: EUT / Y-Position<br/>Location: Chamber 2<br/>Mode: LTE_QPSK Band 66 Fundamentals, 20MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1720.00</td><td>18.04</td><td>V</td><td>4.3</td><td>9.4</td><td>23.14</td><td>30.0</td><td>-6.9</td><td></td></tr><tr><td>1720.00</td><td>12.45</td><td>H</td><td>4.3</td><td>9.4</td><td>17.55</td><td>30.0</td><td>-12.5</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1745.00</td><td>18.76</td><td>V</td><td>4.4</td><td>9.5</td><td>23.92</td><td>30.0</td><td>-6.1</td><td></td></tr><tr><td>1745.00</td><td>13.13</td><td>H</td><td>4.4</td><td>9.5</td><td>18.29</td><td>30.0</td><td>-11.7</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1770.00</td><td>18.12</td><td>V</td><td>4.4</td><td>9.6</td><td>23.29</td><td>30.0</td><td>-6.7</td><td></td></tr><tr><td>1770.00</td><td>10.97</td><td>H</td><td>4.4</td><td>9.6</td><td>16.14</td><td>30.0</td><td>-13.9</td><td></td></tr></table> |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1720.00 | 18.04 | V | 4.3 | 9.4 | 23.14 | 30.0 | -6.9 |  | 1720.00 | 12.45 | H | 4.3 | 9.4 | 17.55 | 30.0 | -12.5 |  | Mid Ch |  |  |  |  |  |  |  |  | 1745.00 | 18.76 | V | 4.4 | 9.5 | 23.92 | 30.0 | -6.1 |  | 1745.00 | 13.13 | H | 4.4 | 9.5 | 18.29 | 30.0 | -11.7 |  | High Ch |  |  |  |  |  |  |  |  | 1770.00 | 18.12 | V | 4.4 | 9.6 | 23.29 | 30.0 | -6.7 |  | 1770.00 | 10.97 | H | 4.4 | 9.6 | 16.14 | 30.0 | -13.9 |  |
|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|------|--|---------|-------|---|-----|-----|-------|------|-------|--|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|------|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|------|--|---------|-------|---|-----|-----|-------|------|-------|--|
|                                              | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1720.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 18.04            | V               | 4.3             | 9.4                | 23.14      | 30.0        | -6.9       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1720.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 12.45            | H               | 4.3             | 9.4                | 17.55      | 30.0        | -12.5      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 18.76            | V               | 4.4             | 9.5                | 23.92      | 30.0        | -6.1       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 13.13            | H               | 4.4             | 9.5                | 18.29      | 30.0        | -11.7      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1770.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 18.12            | V               | 4.4             | 9.6                | 23.29      | 30.0        | -6.7       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
| 1770.00                                      | 10.97                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H                | 4.4             | 9.6             | 16.14              | 30.0       | -13.9       |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
| LTE<br><br>Band 66<br><br>20MHz<br><br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-25<br/>Test Engineer: 20890<br/>Configuration: EUT / Y-Position<br/>Location: Chamber 2<br/>Mode: LTE_16QAM Band 66 Fundamentals, 20MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1720.00</td><td>16.66</td><td>V</td><td>4.3</td><td>9.4</td><td>21.76</td><td>30.0</td><td>-8.2</td><td></td></tr><tr><td>1720.00</td><td>9.46</td><td>H</td><td>4.3</td><td>9.4</td><td>14.56</td><td>30.0</td><td>-15.4</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1745.00</td><td>17.59</td><td>V</td><td>4.4</td><td>9.5</td><td>22.75</td><td>30.0</td><td>-7.3</td><td></td></tr><tr><td>1745.00</td><td>11.90</td><td>H</td><td>4.4</td><td>9.5</td><td>17.06</td><td>30.0</td><td>-12.9</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1770.00</td><td>17.02</td><td>V</td><td>4.4</td><td>9.6</td><td>22.19</td><td>30.0</td><td>-7.8</td><td></td></tr><tr><td>1770.00</td><td>10.01</td><td>H</td><td>4.4</td><td>9.6</td><td>15.18</td><td>30.0</td><td>-14.8</td><td></td></tr></table> |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1720.00 | 16.66 | V | 4.3 | 9.4 | 21.76 | 30.0 | -8.2 |  | 1720.00 | 9.46  | H | 4.3 | 9.4 | 14.56 | 30.0 | -15.4 |  | Mid Ch |  |  |  |  |  |  |  |  | 1745.00 | 17.59 | V | 4.4 | 9.5 | 22.75 | 30.0 | -7.3 |  | 1745.00 | 11.90 | H | 4.4 | 9.5 | 17.06 | 30.0 | -12.9 |  | High Ch |  |  |  |  |  |  |  |  | 1770.00 | 17.02 | V | 4.4 | 9.6 | 22.19 | 30.0 | -7.8 |  | 1770.00 | 10.01 | H | 4.4 | 9.6 | 15.18 | 30.0 | -14.8 |  |
|                                              | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1720.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 16.66            | V               | 4.3             | 9.4                | 21.76      | 30.0        | -8.2       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1720.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 9.46             | H               | 4.3             | 9.4                | 14.56      | 30.0        | -15.4      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 17.59            | V               | 4.4             | 9.5                | 22.75      | 30.0        | -7.3       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 11.90            | H               | 4.4             | 9.5                | 17.06      | 30.0        | -12.9      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1770.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 17.02            | V               | 4.4             | 9.6                | 22.19      | 30.0        | -7.8       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
| 1770.00                                      | 10.01                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H                | 4.4             | 9.6             | 15.18              | 30.0       | -14.8       |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |

| LTE<br><br>Band 66<br><br>15MHz<br><br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-25<br/>Test Engineer: 20890<br/>Configuration: EUT / Y-Position<br/>Location: Chamber 2<br/>Mode: LTE_QPSK Band 66 Fundamentals, 15MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1717.50</td><td>18.16</td><td>V</td><td>4.3</td><td>9.4</td><td>23.25</td><td>30.0</td><td>-6.7</td><td></td></tr><tr><td>1717.50</td><td>12.50</td><td>H</td><td>4.3</td><td>9.4</td><td>17.59</td><td>30.0</td><td>-12.4</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1745.00</td><td>18.74</td><td>V</td><td>4.4</td><td>9.5</td><td>23.90</td><td>30.0</td><td>-6.1</td><td></td></tr><tr><td>1745.00</td><td>10.05</td><td>H</td><td>4.4</td><td>9.5</td><td>15.21</td><td>30.0</td><td>-14.8</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1772.50</td><td>17.71</td><td>V</td><td>4.4</td><td>9.6</td><td>22.88</td><td>30.0</td><td>-7.1</td><td></td></tr><tr><td>1772.50</td><td>12.34</td><td>H</td><td>4.4</td><td>9.6</td><td>17.51</td><td>30.0</td><td>-12.5</td><td></td></tr></table> |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1717.50 | 18.16 | V | 4.3 | 9.4 | 23.25 | 30.0 | -6.7 |  | 1717.50 | 12.50 | H | 4.3 | 9.4 | 17.59 | 30.0 | -12.4 |  | Mid Ch |  |  |  |  |  |  |  |  | 1745.00 | 18.74 | V | 4.4 | 9.5 | 23.90 | 30.0 | -6.1 |  | 1745.00 | 10.05 | H | 4.4 | 9.5 | 15.21 | 30.0 | -14.8 |  | High Ch |  |  |  |  |  |  |  |  | 1772.50 | 17.71 | V | 4.4 | 9.6 | 22.88 | 30.0 | -7.1 |  | 1772.50 | 12.34 | H | 4.4 | 9.6 | 17.51 | 30.0 | -12.5 |  |
|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|------|--|---------|-------|---|-----|-----|-------|------|-------|--|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|------|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|------|--|---------|-------|---|-----|-----|-------|------|-------|--|
|                                              | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1717.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 18.16            | V               | 4.3             | 9.4                | 23.25      | 30.0        | -6.7       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1717.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 12.50            | H               | 4.3             | 9.4                | 17.59      | 30.0        | -12.4      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 18.74            | V               | 4.4             | 9.5                | 23.90      | 30.0        | -6.1       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 10.05            | H               | 4.4             | 9.5                | 15.21      | 30.0        | -14.8      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1772.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 17.71            | V               | 4.4             | 9.6                | 22.88      | 30.0        | -7.1       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
| 1772.50                                      | 12.34                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H                | 4.4             | 9.6             | 17.51              | 30.0       | -12.5       |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
| LTE<br><br>Band 66<br><br>15MHz<br><br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-25<br/>Test Engineer: 20890<br/>Configuration: EUT / Y-Position<br/>Location: Chamber 2<br/>Mode: LTE_16QAM Band 66 Fundamentals, 15MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1717.50</td><td>16.35</td><td>V</td><td>4.3</td><td>9.4</td><td>21.44</td><td>30.0</td><td>-8.6</td><td></td></tr><tr><td>1717.50</td><td>10.69</td><td>H</td><td>4.3</td><td>9.4</td><td>15.78</td><td>30.0</td><td>-14.2</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1745.00</td><td>17.33</td><td>V</td><td>4.4</td><td>9.5</td><td>22.49</td><td>30.0</td><td>-7.5</td><td></td></tr><tr><td>1745.00</td><td>9.39</td><td>H</td><td>4.4</td><td>9.5</td><td>14.55</td><td>30.0</td><td>-15.5</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1772.50</td><td>16.38</td><td>V</td><td>4.4</td><td>9.6</td><td>21.55</td><td>30.0</td><td>-8.5</td><td></td></tr><tr><td>1772.50</td><td>10.85</td><td>H</td><td>4.4</td><td>9.6</td><td>16.02</td><td>30.0</td><td>-14.0</td><td></td></tr></table> |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1717.50 | 16.35 | V | 4.3 | 9.4 | 21.44 | 30.0 | -8.6 |  | 1717.50 | 10.69 | H | 4.3 | 9.4 | 15.78 | 30.0 | -14.2 |  | Mid Ch |  |  |  |  |  |  |  |  | 1745.00 | 17.33 | V | 4.4 | 9.5 | 22.49 | 30.0 | -7.5 |  | 1745.00 | 9.39  | H | 4.4 | 9.5 | 14.55 | 30.0 | -15.5 |  | High Ch |  |  |  |  |  |  |  |  | 1772.50 | 16.38 | V | 4.4 | 9.6 | 21.55 | 30.0 | -8.5 |  | 1772.50 | 10.85 | H | 4.4 | 9.6 | 16.02 | 30.0 | -14.0 |  |
|                                              | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1717.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 16.35            | V               | 4.3             | 9.4                | 21.44      | 30.0        | -8.6       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1717.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 10.69            | H               | 4.3             | 9.4                | 15.78      | 30.0        | -14.2      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 17.33            | V               | 4.4             | 9.5                | 22.49      | 30.0        | -7.5       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 9.39             | H               | 4.4             | 9.5                | 14.55      | 30.0        | -15.5      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1772.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 16.38            | V               | 4.4             | 9.6                | 21.55      | 30.0        | -8.5       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
| 1772.50                                      | 10.85                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H                | 4.4             | 9.6             | 16.02              | 30.0       | -14.0       |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |

| LTE<br><br>Band 66<br><br>10MHz<br><br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-25<br/>Test Engineer: 20890<br/>Configuration: EUT / Y-Position<br/>Location: Chamber 2<br/>Mode: LTE_QPSK Band 66 Fundamentals, 10MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1715.00</td><td>17.89</td><td>V</td><td>4.3</td><td>9.4</td><td>22.98</td><td>30.0</td><td>-7.0</td><td></td></tr><tr><td>1715.00</td><td>7.75</td><td>H</td><td>4.3</td><td>9.4</td><td>12.84</td><td>30.0</td><td>-17.2</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1745.00</td><td>18.79</td><td>V</td><td>4.4</td><td>9.5</td><td>23.95</td><td>30.0</td><td>-6.1</td><td></td></tr><tr><td>1745.00</td><td>12.71</td><td>H</td><td>4.4</td><td>9.5</td><td>17.87</td><td>30.0</td><td>-12.1</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1775.00</td><td>17.80</td><td>V</td><td>4.4</td><td>9.6</td><td>22.97</td><td>30.0</td><td>-7.0</td><td></td></tr><tr><td>1775.00</td><td>12.20</td><td>H</td><td>4.4</td><td>9.6</td><td>17.37</td><td>30.0</td><td>-12.6</td><td></td></tr></table>  |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1715.00 | 17.89 | V | 4.3 | 9.4 | 22.98 | 30.0 | -7.0 |  | 1715.00 | 7.75 | H | 4.3 | 9.4 | 12.84 | 30.0 | -17.2 |  | Mid Ch |  |  |  |  |  |  |  |  | 1745.00 | 18.79 | V | 4.4 | 9.5 | 23.95 | 30.0 | -6.1 |  | 1745.00 | 12.71 | H | 4.4 | 9.5 | 17.87 | 30.0 | -12.1 |  | High Ch |  |  |  |  |  |  |  |  | 1775.00 | 17.80 | V | 4.4 | 9.6 | 22.97 | 30.0 | -7.0 |  | 1775.00 | 12.20 | H | 4.4 | 9.6 | 17.37 | 30.0 | -12.6 |  |
|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|------|--|---------|------|---|-----|-----|-------|------|-------|--|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|------|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|------|--|---------|-------|---|-----|-----|-------|------|-------|--|
|                                              | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |      |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |      |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1715.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 17.89            | V               | 4.3             | 9.4                | 22.98      | 30.0        | -7.0       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |      |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1715.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 7.75             | H               | 4.3             | 9.4                | 12.84      | 30.0        | -17.2      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |      |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |      |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 18.79            | V               | 4.4             | 9.5                | 23.95      | 30.0        | -6.1       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |      |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 12.71            | H               | 4.4             | 9.5                | 17.87      | 30.0        | -12.1      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |      |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |      |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1775.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 17.80            | V               | 4.4             | 9.6                | 22.97      | 30.0        | -7.0       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |      |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
| 1775.00                                      | 12.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H                | 4.4             | 9.6             | 17.37              | 30.0       | -12.6       |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |      |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
| LTE<br><br>Band 66<br><br>10MHz<br><br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-25<br/>Test Engineer: 20890<br/>Configuration: EUT / Y-Position<br/>Location: Chamber 2<br/>Mode: LTE_16QAM Band 66 Fundamentals, 10MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1715.00</td><td>16.95</td><td>V</td><td>4.3</td><td>9.4</td><td>22.04</td><td>30.0</td><td>-8.0</td><td></td></tr><tr><td>1715.00</td><td>6.64</td><td>H</td><td>4.3</td><td>9.4</td><td>11.73</td><td>30.0</td><td>-18.3</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1745.00</td><td>17.33</td><td>V</td><td>4.4</td><td>9.5</td><td>22.49</td><td>30.0</td><td>-7.5</td><td></td></tr><tr><td>1745.00</td><td>11.70</td><td>H</td><td>4.4</td><td>9.5</td><td>16.86</td><td>30.0</td><td>-13.1</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1775.00</td><td>16.97</td><td>V</td><td>4.4</td><td>9.6</td><td>22.14</td><td>30.0</td><td>-7.9</td><td></td></tr><tr><td>1775.00</td><td>10.88</td><td>H</td><td>4.4</td><td>9.6</td><td>16.05</td><td>30.0</td><td>-13.9</td><td></td></tr></table> |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1715.00 | 16.95 | V | 4.3 | 9.4 | 22.04 | 30.0 | -8.0 |  | 1715.00 | 6.64 | H | 4.3 | 9.4 | 11.73 | 30.0 | -18.3 |  | Mid Ch |  |  |  |  |  |  |  |  | 1745.00 | 17.33 | V | 4.4 | 9.5 | 22.49 | 30.0 | -7.5 |  | 1745.00 | 11.70 | H | 4.4 | 9.5 | 16.86 | 30.0 | -13.1 |  | High Ch |  |  |  |  |  |  |  |  | 1775.00 | 16.97 | V | 4.4 | 9.6 | 22.14 | 30.0 | -7.9 |  | 1775.00 | 10.88 | H | 4.4 | 9.6 | 16.05 | 30.0 | -13.9 |  |
|                                              | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |      |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |      |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1715.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 16.95            | V               | 4.3             | 9.4                | 22.04      | 30.0        | -8.0       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |      |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1715.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6.64             | H               | 4.3             | 9.4                | 11.73      | 30.0        | -18.3      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |      |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |      |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 17.33            | V               | 4.4             | 9.5                | 22.49      | 30.0        | -7.5       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |      |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 11.70            | H               | 4.4             | 9.5                | 16.86      | 30.0        | -13.1      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |      |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |      |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                              | 1775.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 16.97            | V               | 4.4             | 9.6                | 22.14      | 30.0        | -7.9       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |      |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
| 1775.00                                      | 10.88                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H                | 4.4             | 9.6             | 16.05              | 30.0       | -13.9       |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |      |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |

| LTE<br><br>Band 66<br><br>5MHz<br><br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-26<br/>Test Engineer: 20896<br/>Configuration: EUT / Y-Position<br/>Location: Chamber 2<br/>Mode: LTE_QPSK Band 66 Fundamentals, 5MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00167451], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1712.50</td><td>18.09</td><td>V</td><td>4.3</td><td>9.3</td><td>23.09</td><td>30.0</td><td>-6.9</td><td></td></tr><tr><td>1712.50</td><td>11.82</td><td>H</td><td>4.3</td><td>9.3</td><td>16.82</td><td>30.0</td><td>-13.2</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1745.00</td><td>18.71</td><td>V</td><td>4.4</td><td>9.4</td><td>23.80</td><td>30.0</td><td>-6.2</td><td></td></tr><tr><td>1745.00</td><td>12.75</td><td>H</td><td>4.4</td><td>9.4</td><td>17.84</td><td>30.0</td><td>-12.2</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1777.50</td><td>18.50</td><td>V</td><td>4.4</td><td>9.5</td><td>23.60</td><td>30.0</td><td>-6.4</td><td></td></tr><tr><td>1777.50</td><td>12.20</td><td>H</td><td>4.4</td><td>9.5</td><td>17.30</td><td>30.0</td><td>-12.7</td><td></td></tr></table>  |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1712.50 | 18.09 | V | 4.3 | 9.3 | 23.09 | 30.0 | -6.9 |  | 1712.50 | 11.82 | H | 4.3 | 9.3 | 16.82 | 30.0 | -13.2 |  | Mid Ch |  |  |  |  |  |  |  |  | 1745.00 | 18.71 | V | 4.4 | 9.4 | 23.80 | 30.0 | -6.2 |  | 1745.00 | 12.75 | H | 4.4 | 9.4 | 17.84 | 30.0 | -12.2 |  | High Ch |  |  |  |  |  |  |  |  | 1777.50 | 18.50 | V | 4.4 | 9.5 | 23.60 | 30.0 | -6.4 |  | 1777.50 | 12.20 | H | 4.4 | 9.5 | 17.30 | 30.0 | -12.7 |  |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|------|--|---------|-------|---|-----|-----|-------|------|-------|--|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|------|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|------|--|---------|-------|---|-----|-----|-------|------|-------|--|
|                                             | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                             | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                             | 1712.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 18.09            | V               | 4.3             | 9.3                | 23.09      | 30.0        | -6.9       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                             | 1712.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 11.82            | H               | 4.3             | 9.3                | 16.82      | 30.0        | -13.2      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                             | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                             | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 18.71            | V               | 4.4             | 9.4                | 23.80      | 30.0        | -6.2       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                             | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 12.75            | H               | 4.4             | 9.4                | 17.84      | 30.0        | -12.2      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                             | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                             | 1777.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 18.50            | V               | 4.4             | 9.5                | 23.60      | 30.0        | -6.4       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
| 1777.50                                     | 12.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H                | 4.4             | 9.5             | 17.30              | 30.0       | -12.7       |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
| LTE<br><br>Band 66<br><br>5MHz<br><br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-26<br/>Test Engineer: 20896<br/>Configuration: EUT / Y-Position<br/>Location: Chamber 2<br/>Mode: LTE_16QAM Band 66 Fundamentals, 5MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1712.50</td><td>17.11</td><td>V</td><td>4.3</td><td>9.4</td><td>22.19</td><td>30.0</td><td>-7.8</td><td></td></tr><tr><td>1712.50</td><td>11.30</td><td>H</td><td>4.3</td><td>9.4</td><td>16.38</td><td>30.0</td><td>-13.6</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1745.00</td><td>17.39</td><td>V</td><td>4.4</td><td>9.5</td><td>22.55</td><td>30.0</td><td>-7.5</td><td></td></tr><tr><td>1745.00</td><td>12.01</td><td>H</td><td>4.4</td><td>9.5</td><td>17.17</td><td>30.0</td><td>-12.8</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1777.50</td><td>17.33</td><td>V</td><td>4.4</td><td>9.6</td><td>22.50</td><td>30.0</td><td>-7.5</td><td></td></tr><tr><td>1777.50</td><td>11.13</td><td>H</td><td>4.4</td><td>9.6</td><td>16.30</td><td>30.0</td><td>-13.7</td><td></td></tr></table> |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1712.50 | 17.11 | V | 4.3 | 9.4 | 22.19 | 30.0 | -7.8 |  | 1712.50 | 11.30 | H | 4.3 | 9.4 | 16.38 | 30.0 | -13.6 |  | Mid Ch |  |  |  |  |  |  |  |  | 1745.00 | 17.39 | V | 4.4 | 9.5 | 22.55 | 30.0 | -7.5 |  | 1745.00 | 12.01 | H | 4.4 | 9.5 | 17.17 | 30.0 | -12.8 |  | High Ch |  |  |  |  |  |  |  |  | 1777.50 | 17.33 | V | 4.4 | 9.6 | 22.50 | 30.0 | -7.5 |  | 1777.50 | 11.13 | H | 4.4 | 9.6 | 16.30 | 30.0 | -13.7 |  |
|                                             | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                             | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                             | 1712.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 17.11            | V               | 4.3             | 9.4                | 22.19      | 30.0        | -7.8       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                             | 1712.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 11.30            | H               | 4.3             | 9.4                | 16.38      | 30.0        | -13.6      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                             | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                             | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 17.39            | V               | 4.4             | 9.5                | 22.55      | 30.0        | -7.5       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                             | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 12.01            | H               | 4.4             | 9.5                | 17.17      | 30.0        | -12.8      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                             | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                             | 1777.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 17.33            | V               | 4.4             | 9.6                | 22.50      | 30.0        | -7.5       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
| 1777.50                                     | 11.13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H                | 4.4             | 9.6             | 16.30              | 30.0       | -13.7       |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |

LTE

Band 66

3MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789219881

2019-11-26

20896

EUT / Y-Position

Chamber 2

LTE\_QPSK Band 66 Fundamentals, 3MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables

Substitution: Horn 3115[00167451], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1711.50 | 17.65            | V               | 4.3             | 9.3                | 22.66      | 30.0        | -7.3       |       |
| 1711.50 | 12.23            | H               | 4.3             | 9.3                | 17.24      | 30.0        | -12.8      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1745.00 | 18.18            | V               | 4.4             | 9.4                | 23.27      | 30.0        | -6.7       |       |
| 1745.00 | 13.02            | H               | 4.4             | 9.4                | 18.11      | 30.0        | -11.9      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1778.50 | 18.50            | V               | 4.4             | 9.5                | 23.60      | 30.0        | -6.4       |       |
| 1778.50 | 12.43            | H               | 4.4             | 9.5                | 17.53      | 30.0        | -12.5      |       |

LTE

Band 66

3MHz

16QAM

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789219881

2019-11-26

20896

EUT / Y-Position

Chamber 2

LTE\_16QAM Band 66 Fundamentals, 3MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables

Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1711.50 | 16.84            | V               | 4.3             | 9.4                | 21.92      | 30.0        | -8.1       |       |
| 1711.50 | 10.33            | H               | 4.3             | 9.4                | 15.41      | 30.0        | -14.6      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1745.00 | 17.58            | V               | 4.4             | 9.5                | 22.74      | 30.0        | -7.3       |       |
| 1745.00 | 11.51            | H               | 4.4             | 9.5                | 16.67      | 30.0        | -13.3      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1778.50 | 16.90            | V               | 4.4             | 9.6                | 22.07      | 30.0        | -7.9       |       |
| 1778.50 | 11.11            | H               | 4.4             | 9.6                | 16.28      | 30.0        | -13.7      |       |

| LTE<br><br>Band 66<br><br>1.4MHz<br><br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-26<br/>Test Engineer: 20896<br/>Configuration: EUT / Y-Position<br/>Location: Chamber 2<br/>Mode: LTE_QPSK Band 66 Fundamentals, 1.4MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00167451], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1710.70</td><td>17.84</td><td>V</td><td>4.3</td><td>9.3</td><td>22.84</td><td>30.0</td><td>-7.2</td><td></td></tr><tr><td>1710.70</td><td>11.49</td><td>H</td><td>4.3</td><td>9.3</td><td>16.49</td><td>30.0</td><td>-13.5</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1745.00</td><td>18.13</td><td>V</td><td>4.4</td><td>9.4</td><td>23.22</td><td>30.0</td><td>-6.8</td><td></td></tr><tr><td>1745.00</td><td>12.63</td><td>H</td><td>4.4</td><td>9.4</td><td>17.72</td><td>30.0</td><td>-12.3</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1779.30</td><td>18.30</td><td>V</td><td>4.4</td><td>9.5</td><td>23.40</td><td>30.0</td><td>-6.6</td><td></td></tr><tr><td>1779.30</td><td>11.99</td><td>H</td><td>4.4</td><td>9.5</td><td>17.09</td><td>30.0</td><td>-12.9</td><td></td></tr></table> |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1710.70 | 17.84 | V | 4.3 | 9.3 | 22.84 | 30.0 | -7.2 |  | 1710.70 | 11.49 | H | 4.3 | 9.3 | 16.49 | 30.0 | -13.5 |  | Mid Ch |  |  |  |  |  |  |  |  | 1745.00 | 18.13 | V | 4.4 | 9.4 | 23.22 | 30.0 | -6.8 |  | 1745.00 | 12.63 | H | 4.4 | 9.4 | 17.72 | 30.0 | -12.3 |  | High Ch |  |  |  |  |  |  |  |  | 1779.30 | 18.30 | V | 4.4 | 9.5 | 23.40 | 30.0 | -6.6 |  | 1779.30 | 11.99 | H | 4.4 | 9.5 | 17.09 | 30.0 | -12.9 |  |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|------|--|---------|-------|---|-----|-----|-------|------|-------|--|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|------|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|------|--|---------|-------|---|-----|-----|-------|------|-------|--|
|                                               | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                               | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                               | 1710.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 17.84            | V               | 4.3             | 9.3                | 22.84      | 30.0        | -7.2       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                               | 1710.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 11.49            | H               | 4.3             | 9.3                | 16.49      | 30.0        | -13.5      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                               | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                               | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 18.13            | V               | 4.4             | 9.4                | 23.22      | 30.0        | -6.8       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                               | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 12.63            | H               | 4.4             | 9.4                | 17.72      | 30.0        | -12.3      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                               | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                               | 1779.30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 18.30            | V               | 4.4             | 9.5                | 23.40      | 30.0        | -6.6       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
| 1779.30                                       | 11.99                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | H                | 4.4             | 9.5             | 17.09              | 30.0       | -12.9       |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
| LTE<br><br>Band 66<br><br>1.4MHz<br><br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789219881<br/>Date: 2019-11-26<br/>Test Engineer: 20896<br/>Configuration: EUT / Y-Position<br/>Location: Chamber 2<br/>Mode: LTE_16QAM Band 66 Fundamentals, 1.4MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00167451], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1710.70</td><td>16.94</td><td>V</td><td>4.3</td><td>9.3</td><td>21.94</td><td>30.0</td><td>-8.1</td><td></td></tr><tr><td>1710.70</td><td>9.41</td><td>H</td><td>4.3</td><td>9.3</td><td>14.41</td><td>30.0</td><td>-15.6</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1745.00</td><td>17.13</td><td>V</td><td>4.4</td><td>9.4</td><td>22.22</td><td>30.0</td><td>-7.8</td><td></td></tr><tr><td>1745.00</td><td>11.37</td><td>H</td><td>4.4</td><td>9.4</td><td>16.46</td><td>30.0</td><td>-13.5</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1779.30</td><td>17.26</td><td>V</td><td>4.4</td><td>9.5</td><td>22.36</td><td>30.0</td><td>-7.6</td><td></td></tr><tr><td>1779.30</td><td>10.80</td><td>H</td><td>4.4</td><td>9.5</td><td>15.90</td><td>30.0</td><td>-14.1</td><td></td></tr></table> |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1710.70 | 16.94 | V | 4.3 | 9.3 | 21.94 | 30.0 | -8.1 |  | 1710.70 | 9.41  | H | 4.3 | 9.3 | 14.41 | 30.0 | -15.6 |  | Mid Ch |  |  |  |  |  |  |  |  | 1745.00 | 17.13 | V | 4.4 | 9.4 | 22.22 | 30.0 | -7.8 |  | 1745.00 | 11.37 | H | 4.4 | 9.4 | 16.46 | 30.0 | -13.5 |  | High Ch |  |  |  |  |  |  |  |  | 1779.30 | 17.26 | V | 4.4 | 9.5 | 22.36 | 30.0 | -7.6 |  | 1779.30 | 10.80 | H | 4.4 | 9.5 | 15.90 | 30.0 | -14.1 |  |
|                                               | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                               | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                               | 1710.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 16.94            | V               | 4.3             | 9.3                | 21.94      | 30.0        | -8.1       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                               | 1710.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 9.41             | H               | 4.3             | 9.3                | 14.41      | 30.0        | -15.6      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                               | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                               | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 17.13            | V               | 4.4             | 9.4                | 22.22      | 30.0        | -7.8       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                               | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 11.37            | H               | 4.4             | 9.4                | 16.46      | 30.0        | -13.5      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                               | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
|                                               | 1779.30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 17.26            | V               | 4.4             | 9.5                | 22.36      | 30.0        | -7.6       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |
| 1779.30                                       | 10.80                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | H                | 4.4             | 9.5             | 15.90              | 30.0       | -14.1       |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |       |  |

## 10.2. FIELD STRENGTH OF SPURIOUS RADIATION

### RULE PART(S)

FCC: §2.1053, §22.917, §24.238, §27.53 and §90.691

### LIMIT

Part 22.917(a) & Part 24.238(a) & Part 27.53(h) The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log (P)$  dB.

Part 27.53:

(c)(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB.

(f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to  $-70$  dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and  $-80$  dBW EIRP for discrete emissions of less than 700 Hz bandwidth.

(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least  $43 + 10 \log (P)$  dB.

(h) The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10} (P)$  dB.

(m) (4) For mobile digital stations, the attenuation factor shall be not less than  $40 + 10 \log (P)$  dB on all frequencies between the channel edge and 5 megahertz from the channel edge,  $43 + 10 \log (P)$  dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and  $55 + 10 \log (P)$  dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than  $43 + 10 \log (P)$  dB on all frequencies between 2490.5 MHz and 2496 MHz and  $55 + 10 \log (P)$  dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

Part 90.691(a):

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $116 \log_{10}(f/6.1)$  decibels or  $50 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz. (NOTE : Use 100kHz reference bandwidth)

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

## **TEST PROCEDURE**

ANSI / TIA / EIA 603 E Clause 2.2.12; ESU40 setting reference to 971168 D01 v03r01

For peak power measurement with a ESU40:

- a) Set the RBW = 100 KHz for emission below 1GHz and 1MHz for emissions above 1GHz
- b) Set VBW  $\geq 3 \times$  RBW;
- c) Set span  $\geq 1.5$  times the OBW;
- d) Sweep time = auto couple;
- e) Detector = rms;
- f) Ensure that the number of measurement points  $\geq$  span/RBW;
- g) Trace mode = average(WCDMA, LTE), Maxhold(GSM, LTE Band41);;

## **RESULTS**

See the following pages.

NOTE : Please refer to section 5.4 for bandwidth and RB setting about LTE bands.

## 10.2.1. SPURIOUS RADIATION PLOTS

### GSM850

| UL Verification Services, Inc.<br>Above 1GHz High Frequency Substitution Measurement |                     |                              |                 |                |                |               |                |               |       |
|--------------------------------------------------------------------------------------|---------------------|------------------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| Company:                                                                             |                     | Samsung                      |                 |                |                |               |                |               |       |
| Project #:                                                                           |                     | 4789219881                   |                 |                |                |               |                |               |       |
| Date:                                                                                |                     | 2019-11-25                   |                 |                |                |               |                |               |       |
| Test Engineer:                                                                       |                     | 20882                        |                 |                |                |               |                |               |       |
| Configuration:                                                                       |                     | EUT / AC Adapter, X-Position |                 |                |                |               |                |               |       |
| Location:                                                                            |                     | Chamber 2                    |                 |                |                |               |                |               |       |
| Mode:                                                                                |                     | GPRS 850 MHz Harmonics       |                 |                |                |               |                |               |       |
| f<br>MHz                                                                             | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)           | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| Low Ch, 824.2MHz                                                                     |                     |                              |                 |                |                |               |                |               |       |
| 1648.40                                                                              | -14.3               | V                            | 3.0             | 40.7           | 1.0            | -54.0         | -13.0          | -41.0         |       |
| 2472.60                                                                              | -11.3               | V                            | 3.0             | 41.3           | 1.0            | -51.6         | -13.0          | -38.6         |       |
| 3296.80                                                                              | -9.3                | V                            | 3.0             | 42.0           | 1.0            | -50.4         | -13.0          | -37.4         |       |
| 4121.00                                                                              | -8.9                | V                            | 3.0             | 42.1           | 1.0            | -50.1         | -13.0          | -37.1         |       |
| 4945.20                                                                              | -7.8                | V                            | 3.0             | 42.7           | 1.0            | -49.5         | -13.0          | -36.5         |       |
| 1648.40                                                                              | -13.9               | H                            | 3.0             | 40.7           | 1.0            | -53.6         | -13.0          | -40.6         |       |
| 2472.60                                                                              | -11.0               | H                            | 3.0             | 41.3           | 1.0            | -51.2         | -13.0          | -38.2         |       |
| 3296.80                                                                              | -8.8                | H                            | 3.0             | 42.0           | 1.0            | -49.9         | -13.0          | -36.9         |       |
| 4121.00                                                                              | -9.7                | H                            | 3.0             | 42.1           | 1.0            | -50.8         | -13.0          | -37.8         |       |
| 4945.20                                                                              | -7.7                | H                            | 3.0             | 42.7           | 1.0            | -49.4         | -13.0          | -36.4         |       |
| Mid Ch, 836.6MHz                                                                     |                     |                              |                 |                |                |               |                |               |       |
| 1673.20                                                                              | -14.1               | V                            | 3.0             | 40.7           | 1.0            | -53.7         | -13.0          | -40.7         |       |
| 2509.80                                                                              | -11.4               | V                            | 3.0             | 41.3           | 1.0            | -51.8         | -13.0          | -38.8         |       |
| 3346.40                                                                              | -9.0                | V                            | 3.0             | 42.0           | 1.0            | -50.1         | -13.0          | -37.1         |       |
| 4183.00                                                                              | -8.4                | V                            | 3.0             | 42.2           | 1.0            | -49.6         | -13.0          | -36.6         |       |
| 5019.60                                                                              | -7.3                | V                            | 3.0             | 42.8           | 1.0            | -49.0         | -13.0          | -36.0         |       |
| 1673.20                                                                              | -12.6               | H                            | 3.0             | 40.7           | 1.0            | -52.2         | -13.0          | -39.2         |       |
| 2509.80                                                                              | -11.5               | H                            | 3.0             | 41.3           | 1.0            | -51.8         | -13.0          | -38.8         |       |
| 3346.40                                                                              | -8.8                | H                            | 3.0             | 42.0           | 1.0            | -49.8         | -13.0          | -36.8         |       |
| 4183.00                                                                              | -9.3                | H                            | 3.0             | 42.2           | 1.0            | -50.5         | -13.0          | -37.5         |       |
| 5019.60                                                                              | -7.4                | H                            | 3.0             | 42.8           | 1.0            | -49.1         | -13.0          | -36.1         |       |
| High Ch, 848.8MHz                                                                    |                     |                              |                 |                |                |               |                |               |       |
| 1697.60                                                                              | -13.8               | V                            | 3.0             | 40.7           | 1.0            | -53.4         | -13.0          | -40.4         |       |
| 2546.40                                                                              | -10.5               | V                            | 3.0             | 41.4           | 1.0            | -50.9         | -13.0          | -37.9         |       |
| 3395.20                                                                              | -8.8                | V                            | 3.0             | 42.0           | 1.0            | -49.8         | -13.0          | -36.8         |       |
| 4244.00                                                                              | -9.3                | V                            | 3.0             | 42.2           | 1.0            | -50.6         | -13.0          | -37.6         |       |
| 5092.80                                                                              | -7.4                | V                            | 3.0             | 42.8           | 1.0            | -49.2         | -13.0          | -36.2         |       |
| 1697.60                                                                              | -13.4               | H                            | 3.0             | 40.7           | 1.0            | -53.1         | -13.0          | -40.1         |       |
| 2546.40                                                                              | -11.0               | H                            | 3.0             | 41.4           | 1.0            | -51.4         | -13.0          | -38.4         |       |
| 3395.20                                                                              | -8.5                | H                            | 3.0             | 42.0           | 1.0            | -49.5         | -13.0          | -36.5         |       |
| 4244.00                                                                              | -9.5                | H                            | 3.0             | 42.2           | 1.0            | -50.7         | -13.0          | -37.7         |       |
| 5092.80                                                                              | -7.7                | H                            | 3.0             | 42.8           | 1.0            | -49.4         | -13.0          | -36.4         |       |

| UL Verification Services, Inc.<br>Above 1GHz High Frequency Substitution Measurement |                     |                              |                 |                |                |               |                |               |       |
|--------------------------------------------------------------------------------------|---------------------|------------------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                      |                     | Samsung                      |                 |                |                |               |                |               |       |
| <b>Project #:</b>                                                                    |                     | 4789219881                   |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                                         |                     | 2019-11-25                   |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                                |                     | 20882                        |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                                |                     | EUT / AC Adapter, X-Position |                 |                |                |               |                |               |       |
| <b>Location:</b>                                                                     |                     | Chamber 2                    |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                                         |                     | EGPRS 850 MHz Harmonics      |                 |                |                |               |                |               |       |
| f<br>MHz                                                                             | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)           | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, 824.2MHz</b>                                                              |                     |                              |                 |                |                |               |                |               |       |
| 1648.40                                                                              | -14.5               | V                            | 3.0             | 40.7           | 1.0            | -54.2         | -13.0          | -41.2         |       |
| 2472.60                                                                              | -11.6               | V                            | 3.0             | 41.3           | 1.0            | -51.8         | -13.0          | -38.8         |       |
| 3296.80                                                                              | -9.2                | V                            | 3.0             | 42.0           | 1.0            | -50.3         | -13.0          | -37.3         |       |
| 4121.00                                                                              | -9.9                | V                            | 3.0             | 42.1           | 1.0            | -51.1         | -13.0          | -38.1         |       |
| 4945.20                                                                              | -7.8                | V                            | 3.0             | 42.7           | 1.0            | -49.6         | -13.0          | -36.6         |       |
| 1648.40                                                                              | -15.1               | H                            | 3.0             | 40.7           | 1.0            | -54.8         | -13.0          | -41.8         |       |
| 2472.60                                                                              | -11.7               | H                            | 3.0             | 41.3           | 1.0            | -52.0         | -13.0          | -39.0         |       |
| 3296.80                                                                              | -9.0                | H                            | 3.0             | 42.0           | 1.0            | -50.1         | -13.0          | -37.1         |       |
| 4121.00                                                                              | -10.0               | H                            | 3.0             | 42.1           | 1.0            | -51.2         | -13.0          | -38.2         |       |
| 4945.20                                                                              | -7.9                | H                            | 3.0             | 42.7           | 1.0            | -49.6         | -13.0          | -36.6         |       |
| <b>Mid Ch, 836.6MHz</b>                                                              |                     |                              |                 |                |                |               |                |               |       |
| 1673.20                                                                              | -14.2               | V                            | 3.0             | 40.7           | 1.0            | -53.9         | -13.0          | -40.9         |       |
| 2509.80                                                                              | -11.9               | V                            | 3.0             | 41.3           | 1.0            | -52.2         | -13.0          | -39.2         |       |
| 3346.40                                                                              | -9.0                | V                            | 3.0             | 42.0           | 1.0            | -50.0         | -13.0          | -37.0         |       |
| 4183.00                                                                              | -9.2                | V                            | 3.0             | 42.2           | 1.0            | -50.4         | -13.0          | -37.4         |       |
| 5019.60                                                                              | -7.8                | V                            | 3.0             | 42.8           | 1.0            | -49.6         | -13.0          | -36.6         |       |
| 1673.20                                                                              | -15.1               | H                            | 3.0             | 40.7           | 1.0            | -54.8         | -13.0          | -41.8         |       |
| 2509.80                                                                              | -11.6               | H                            | 3.0             | 41.3           | 1.0            | -52.0         | -13.0          | -39.0         |       |
| 3346.40                                                                              | -9.0                | H                            | 3.0             | 42.0           | 1.0            | -50.0         | -13.0          | -37.0         |       |
| 4183.00                                                                              | -9.5                | H                            | 3.0             | 42.2           | 1.0            | -50.7         | -13.0          | -37.7         |       |
| 5019.60                                                                              | -7.5                | H                            | 3.0             | 42.8           | 1.0            | -49.3         | -13.0          | -36.3         |       |
| <b>High Ch, 848.8MHz</b>                                                             |                     |                              |                 |                |                |               |                |               |       |
| 1697.60                                                                              | -14.1               | V                            | 3.0             | 40.7           | 1.0            | -53.7         | -13.0          | -40.7         |       |
| 2546.40                                                                              | -11.5               | V                            | 3.0             | 41.4           | 1.0            | -51.8         | -13.0          | -38.8         |       |
| 3395.20                                                                              | -8.6                | V                            | 3.0             | 42.0           | 1.0            | -49.6         | -13.0          | -36.6         |       |
| 4244.00                                                                              | -9.1                | V                            | 3.0             | 42.2           | 1.0            | -50.3         | -13.0          | -37.3         |       |
| 5092.80                                                                              | -7.7                | V                            | 3.0             | 42.8           | 1.0            | -49.4         | -13.0          | -36.4         |       |
| 1697.60                                                                              | -14.8               | H                            | 3.0             | 40.7           | 1.0            | -54.5         | -13.0          | -41.5         |       |
| 2546.40                                                                              | -11.1               | H                            | 3.0             | 41.4           | 1.0            | -51.5         | -13.0          | -38.5         |       |
| 3395.20                                                                              | -8.6                | H                            | 3.0             | 42.0           | 1.0            | -49.6         | -13.0          | -36.6         |       |
| 4244.00                                                                              | -9.6                | H                            | 3.0             | 42.2           | 1.0            | -50.9         | -13.0          | -37.9         |       |
| 5092.80                                                                              | -7.7                | H                            | 3.0             | 42.8           | 1.0            | -49.4         | -13.0          | -36.4         |       |

GSM850  
EGPRS

**GSM1900**

|                  |                                                                                                                                                                                                                                                                                                                                                                                                            |                     |                    |                 |                |                |               |                |               |       |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| GSM1900<br>GPRS  | <p style="text-align: center;"><b>UL Verification Services, Inc.</b><br/><b>Above 1GHz High Frequency Substitution Measurement</b></p> <p> <b>Company:</b> Samsung<br/> <b>Project #:</b> 4789219881<br/> <b>Date:</b> 2019-11-25<br/> <b>Test Engineer:</b> 20882<br/> <b>Configuration:</b> EUT / AC Adapter, Z-Position<br/> <b>Location:</b> Chamber 2<br/> <b>Mode:</b> GPRS 1900 MHz Harmonics </p>  |                     |                    |                 |                |                |               |                |               |       |
|                  | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                   | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| GSM1900<br>EGPRS | Low Ch, 1850.2MHz                                                                                                                                                                                                                                                                                                                                                                                          |                     |                    |                 |                |                |               |                |               |       |
|                  | 3700.40                                                                                                                                                                                                                                                                                                                                                                                                    | -10.6               | V                  | 3.0             | 42.0           | 1.0            | -51.6         | -13.0          | -38.6         |       |
|                  | 5550.60                                                                                                                                                                                                                                                                                                                                                                                                    | -6.8                | V                  | 3.0             | 42.9           | 1.0            | -48.7         | -13.0          | -35.7         |       |
|                  | 7400.80                                                                                                                                                                                                                                                                                                                                                                                                    | -5.3                | V                  | 3.0             | 42.5           | 1.0            | -46.8         | -13.0          | -33.8         |       |
|                  | 3700.40                                                                                                                                                                                                                                                                                                                                                                                                    | -9.4                | H                  | 3.0             | 42.0           | 1.0            | -50.4         | -13.0          | -37.4         |       |
|                  | 5550.60                                                                                                                                                                                                                                                                                                                                                                                                    | -4.0                | H                  | 3.0             | 42.9           | 1.0            | -45.9         | -13.0          | -32.9         |       |
|                  | 7400.80                                                                                                                                                                                                                                                                                                                                                                                                    | -5.4                | H                  | 3.0             | 42.5           | 1.0            | -46.8         | -13.0          | -33.8         |       |
|                  | Mid Ch, 1880MHz                                                                                                                                                                                                                                                                                                                                                                                            |                     |                    |                 |                |                |               |                |               |       |
|                  | 3760.00                                                                                                                                                                                                                                                                                                                                                                                                    | -9.9                | V                  | 3.0             | 42.1           | 1.0            | -51.0         | -13.0          | -38.0         |       |
|                  | 5640.00                                                                                                                                                                                                                                                                                                                                                                                                    | -6.9                | V                  | 3.0             | 42.9           | 1.0            | -48.8         | -13.0          | -35.8         |       |
|                  | 7520.00                                                                                                                                                                                                                                                                                                                                                                                                    | -5.4                | V                  | 3.0             | 42.4           | 1.0            | -46.8         | -13.0          | -33.8         |       |
|                  | 3760.00                                                                                                                                                                                                                                                                                                                                                                                                    | -9.1                | H                  | 3.0             | 42.1           | 1.0            | -50.2         | -13.0          | -37.2         |       |
|                  | 5640.00                                                                                                                                                                                                                                                                                                                                                                                                    | -3.9                | H                  | 3.0             | 42.9           | 1.0            | -45.8         | -13.0          | -32.8         |       |
|                  | 7520.00                                                                                                                                                                                                                                                                                                                                                                                                    | -5.6                | H                  | 3.0             | 42.4           | 1.0            | -47.0         | -13.0          | -34.0         |       |
|                  | High Ch, 1909.8MHz                                                                                                                                                                                                                                                                                                                                                                                         |                     |                    |                 |                |                |               |                |               |       |
|                  | 3819.60                                                                                                                                                                                                                                                                                                                                                                                                    | -10.3               | V                  | 3.0             | 42.1           | 1.0            | -51.4         | -13.0          | -38.4         |       |
|                  | 5729.40                                                                                                                                                                                                                                                                                                                                                                                                    | -6.3                | V                  | 3.0             | 42.9           | 1.0            | -48.3         | -13.0          | -35.3         |       |
|                  | 7639.20                                                                                                                                                                                                                                                                                                                                                                                                    | -5.5                | V                  | 3.0             | 42.3           | 1.0            | -46.8         | -13.0          | -33.8         |       |
|                  | 3819.60                                                                                                                                                                                                                                                                                                                                                                                                    | -9.9                | H                  | 3.0             | 42.1           | 1.0            | -50.9         | -13.0          | -37.9         |       |
|                  | 5729.40                                                                                                                                                                                                                                                                                                                                                                                                    | -5.4                | H                  | 3.0             | 42.9           | 1.0            | -47.3         | -13.0          | -34.3         |       |
|                  | 7639.20                                                                                                                                                                                                                                                                                                                                                                                                    | -5.6                | H                  | 3.0             | 42.3           | 1.0            | -46.9         | -13.0          | -33.9         |       |
| GSM1900<br>EGPRS | <p style="text-align: center;"><b>UL Verification Services, Inc.</b><br/><b>Above 1GHz High Frequency Substitution Measurement</b></p> <p> <b>Company:</b> Samsung<br/> <b>Project #:</b> 4789219881<br/> <b>Date:</b> 2019-11-25<br/> <b>Test Engineer:</b> 20896<br/> <b>Configuration:</b> EUT / AC Adapter, Z-Position<br/> <b>Location:</b> Chamber 2<br/> <b>Mode:</b> EGPRS 1900 MHz Harmonics </p> |                     |                    |                 |                |                |               |                |               |       |
|                  | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                   | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|                  | Low Ch, 1850.2MHz                                                                                                                                                                                                                                                                                                                                                                                          |                     |                    |                 |                |                |               |                |               |       |
|                  | 3700.40                                                                                                                                                                                                                                                                                                                                                                                                    | -10.8               | V                  | 3.0             | 42.0           | 1.0            | -51.9         | -13.0          | -38.9         |       |
|                  | 5550.60                                                                                                                                                                                                                                                                                                                                                                                                    | -7.0                | V                  | 3.0             | 42.9           | 1.0            | -48.9         | -13.0          | -35.9         |       |
|                  | 7400.80                                                                                                                                                                                                                                                                                                                                                                                                    | -5.4                | V                  | 3.0             | 42.5           | 1.0            | -46.9         | -13.0          | -33.9         |       |
|                  | 3700.40                                                                                                                                                                                                                                                                                                                                                                                                    | -10.8               | H                  | 3.0             | 42.0           | 1.0            | -51.8         | -13.0          | -38.8         |       |
|                  | 5550.60                                                                                                                                                                                                                                                                                                                                                                                                    | -6.9                | H                  | 3.0             | 42.9           | 1.0            | -48.8         | -13.0          | -35.8         |       |
|                  | 7400.80                                                                                                                                                                                                                                                                                                                                                                                                    | -5.5                | H                  | 3.0             | 42.5           | 1.0            | -46.9         | -13.0          | -33.9         |       |
|                  | Mid Ch, 1880MHz                                                                                                                                                                                                                                                                                                                                                                                            |                     |                    |                 |                |                |               |                |               |       |
|                  | 3760.00                                                                                                                                                                                                                                                                                                                                                                                                    | -10.2               | V                  | 3.0             | 42.1           | 1.0            | -51.3         | -13.0          | -38.3         |       |
|                  | 5640.00                                                                                                                                                                                                                                                                                                                                                                                                    | -6.9                | V                  | 3.0             | 42.9           | 1.0            | -48.8         | -13.0          | -35.8         |       |
|                  | 7520.00                                                                                                                                                                                                                                                                                                                                                                                                    | -5.4                | V                  | 3.0             | 42.4           | 1.0            | -46.8         | -13.0          | -33.8         |       |
|                  | 3760.00                                                                                                                                                                                                                                                                                                                                                                                                    | -10.3               | H                  | 3.0             | 42.1           | 1.0            | -51.4         | -13.0          | -38.4         |       |
|                  | 5640.00                                                                                                                                                                                                                                                                                                                                                                                                    | -6.2                | H                  | 3.0             | 42.9           | 1.0            | -48.1         | -13.0          | -35.1         |       |
|                  | 7520.00                                                                                                                                                                                                                                                                                                                                                                                                    | -5.5                | H                  | 3.0             | 42.4           | 1.0            | -46.9         | -13.0          | -33.9         |       |
|                  | High Ch, 1909.8MHz                                                                                                                                                                                                                                                                                                                                                                                         |                     |                    |                 |                |                |               |                |               |       |
|                  | 3819.60                                                                                                                                                                                                                                                                                                                                                                                                    | -10.4               | V                  | 3.0             | 42.1           | 1.0            | -51.5         | -13.0          | -38.5         |       |
|                  | 5729.40                                                                                                                                                                                                                                                                                                                                                                                                    | -7.0                | V                  | 3.0             | 42.9           | 1.0            | -48.9         | -13.0          | -35.9         |       |
|                  | 7639.20                                                                                                                                                                                                                                                                                                                                                                                                    | -5.3                | V                  | 3.0             | 42.3           | 1.0            | -46.7         | -13.0          | -33.7         |       |
|                  | 3819.60                                                                                                                                                                                                                                                                                                                                                                                                    | -10.5               | H                  | 3.0             | 42.1           | 1.0            | -51.6         | -13.0          | -38.6         |       |
|                  | 5729.40                                                                                                                                                                                                                                                                                                                                                                                                    | -6.7                | H                  | 3.0             | 42.9           | 1.0            | -48.6         | -13.0          | -35.6         |       |
|                  | 7639.20                                                                                                                                                                                                                                                                                                                                                                                                    | -5.4                | H                  | 3.0             | 42.3           | 1.0            | -46.7         | -13.0          | -33.7         |       |

|                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |                    |                 |                |                |               |                |               |       |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| WCDMA<br><br>Band 5<br>REL99 | <div> <div>UL Verification Services, Inc.</div> <div>Above 1GHz High Frequency Substitution Measurement</div> <div> <div>Company:</div> <div>Project #:</div> <div>Date:</div> <div>Test Engineer:</div> <div>Configuration:</div> <div>Location:</div> <div>Mode:</div> </div> <div> <div>Samsung</div> <div>4789219881</div> <div>2019-11-23</div> <div>20882</div> <div>EUT / AC Adapter, Z-Position</div> <div>Chamber 2</div> <div>Rel99 Band 5 Harmonics</div> </div> </div> |                     |                    |                 |                |                |               |                |               |       |
|                              | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|                              | Low Ch, 826.4MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |                    |                 |                |                |               |                |               |       |
|                              | 1652.80                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -14.3               | V                  | 3.0             | 40.7           | 1.0            | -54.0         | -13.0          | -41.0         |       |
|                              | 2479.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -11.9               | V                  | 3.0             | 41.3           | 1.0            | -52.2         | -13.0          | -39.2         |       |
|                              | 3305.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -10.1               | V                  | 3.0             | 42.0           | 1.0            | -51.2         | -13.0          | -38.2         |       |
|                              | 1652.80                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -16.1               | H                  | 3.0             | 40.7           | 1.0            | -55.8         | -13.0          | -42.8         |       |
|                              | 2479.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -11.9               | H                  | 3.0             | 41.3           | 1.0            | -52.2         | -13.0          | -39.2         |       |
|                              | 3305.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -9.7                | H                  | 3.0             | 42.0           | 1.0            | -50.7         | -13.0          | -37.7         |       |
|                              | Mid Ch, 836.6MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |                    |                 |                |                |               |                |               |       |
|                              | 1673.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -14.5               | V                  | 3.0             | 40.7           | 1.0            | -54.1         | -13.0          | -41.1         |       |
|                              | 2509.80                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -12.3               | V                  | 3.0             | 41.3           | 1.0            | -52.6         | -13.0          | -39.6         |       |
|                              | 3346.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -10.0               | V                  | 3.0             | 42.0           | 1.0            | -51.1         | -13.0          | -38.1         |       |
|                              | 1673.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -15.1               | H                  | 3.0             | 40.7           | 1.0            | -54.8         | -13.0          | -41.8         |       |
|                              | 2509.80                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -12.3               | H                  | 3.0             | 41.3           | 1.0            | -52.6         | -13.0          | -39.6         |       |
|                              | 3346.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -9.5                | H                  | 3.0             | 42.0           | 1.0            | -50.6         | -13.0          | -37.6         |       |
|                              | High Ch, 846.6MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                     |                    |                 |                |                |               |                |               |       |
|                              | 1693.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -14.3               | V                  | 3.0             | 40.7           | 1.0            | -54.0         | -13.0          | -41.0         |       |
|                              | 2539.80                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -12.5               | V                  | 3.0             | 41.4           | 1.0            | -52.9         | -13.0          | -39.9         |       |
|                              | 3386.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -9.8                | V                  | 3.0             | 42.0           | 1.0            | -50.8         | -13.0          | -37.8         |       |
|                              | 1693.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -14.9               | H                  | 3.0             | 40.7           | 1.0            | -54.6         | -13.0          | -41.6         |       |
|                              | 2539.80                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -12.3               | H                  | 3.0             | 41.4           | 1.0            | -52.6         | -13.0          | -39.6         |       |
|                              | 3386.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -9.5                | H                  | 3.0             | 42.0           | 1.0            | -50.6         | -13.0          | -37.6         |       |
| WCDMA<br><br>Band 5<br>HSDPA | <div> <div>UL Verification Services, Inc.</div> <div>Above 1GHz High Frequency Substitution Measurement</div> <div> <div>Company:</div> <div>Project #:</div> <div>Date:</div> <div>Test Engineer:</div> <div>Configuration:</div> <div>Location:</div> <div>Mode:</div> </div> <div> <div>Samsung</div> <div>4789219881</div> <div>2019-11-23</div> <div>20882</div> <div>EUT / AC Adapter, Z-Position</div> <div>Chamber 2</div> <div>HSDPA Band 5 Harmonics</div> </div> </div> |                     |                    |                 |                |                |               |                |               |       |
|                              | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|                              | Low Ch, 826.4MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |                    |                 |                |                |               |                |               |       |
|                              | 1652.80                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -14.9               | V                  | 3.0             | 40.7           | 1.0            | -54.5         | -13.0          | -41.5         |       |
|                              | 2479.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -12.4               | V                  | 3.0             | 41.3           | 1.0            | -52.7         | -13.0          | -39.7         |       |
|                              | 3305.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -10.1               | V                  | 3.0             | 42.0           | 1.0            | -51.1         | -13.0          | -38.1         |       |
|                              | 1652.80                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -15.2               | H                  | 3.0             | 40.7           | 1.0            | -54.8         | -13.0          | -41.8         |       |
|                              | 2479.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -12.1               | H                  | 3.0             | 41.3           | 1.0            | -52.4         | -13.0          | -39.4         |       |
|                              | 3305.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -9.7                | H                  | 3.0             | 42.0           | 1.0            | -50.7         | -13.0          | -37.7         |       |
|                              | Mid Ch, 836.6MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |                    |                 |                |                |               |                |               |       |
|                              | 1673.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -14.3               | V                  | 3.0             | 40.7           | 1.0            | -54.0         | -13.0          | -41.0         |       |
|                              | 2509.80                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -12.8               | V                  | 3.0             | 41.3           | 1.0            | -53.1         | -13.0          | -40.1         |       |
|                              | 3346.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -10.1               | V                  | 3.0             | 42.0           | 1.0            | -51.1         | -13.0          | -38.1         |       |
|                              | 1673.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -15.7               | H                  | 3.0             | 40.7           |                |               |                |               |       |

**WCDMA Band 4**

|                          |                                                                                                                                                                                                                                                                                                                                                                                                         |                            |                           |                        |                       |                       |                      |                       |                      |              |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------|------------------------|-----------------------|-----------------------|----------------------|-----------------------|----------------------|--------------|
| WCDMA<br>Band 4<br>REL99 | <p style="text-align: center;"><b>UL Verification Services, Inc.</b><br/><b>Above 1GHz High Frequency Substitution Measurement</b></p> <p> <b>Company:</b> Samsung<br/> <b>Project #:</b> 4789219881<br/> <b>Date:</b> 2019-11-23<br/> <b>Test Engineer:</b> 20882<br/> <b>Configuration:</b> EUT/ AC Adapter, Z-Position<br/> <b>Location:</b> Chamber 2<br/> <b>Mode:</b> Rel99 Band 4 Harmonics </p> |                            |                           |                        |                       |                       |                      |                       |                      |              |
|                          | <b>f</b><br>MHz                                                                                                                                                                                                                                                                                                                                                                                         | <b>SG reading</b><br>(dBm) | <b>Ant. Pol.</b><br>(H/V) | <b>Distance</b><br>(m) | <b>Preamp</b><br>(dB) | <b>Filter</b><br>(dB) | <b>EIRP</b><br>(dBm) | <b>Limit</b><br>(dBm) | <b>Delta</b><br>(dB) | <b>Notes</b> |
|                          | <b>Low Ch, 1712.4MHz</b>                                                                                                                                                                                                                                                                                                                                                                                |                            |                           |                        |                       |                       |                      |                       |                      |              |
|                          | 3424.80                                                                                                                                                                                                                                                                                                                                                                                                 | -8.8                       | V                         | 3.0                    | 42.0                  | 1.0                   | -49.9                | -13.0                 | -36.9                |              |
|                          | 5137.20                                                                                                                                                                                                                                                                                                                                                                                                 | -8.3                       | V                         | 3.0                    | 42.8                  | 1.0                   | -50.1                | -13.0                 | -37.1                |              |
|                          | 6849.60                                                                                                                                                                                                                                                                                                                                                                                                 | -5.7                       | V                         | 3.0                    | 42.7                  | 1.0                   | -47.4                | -13.0                 | -34.4                |              |
|                          | 3424.80                                                                                                                                                                                                                                                                                                                                                                                                 | -8.7                       | H                         | 3.0                    | 42.0                  | 1.0                   | -49.7                | -13.0                 | -36.7                |              |
|                          | 5137.20                                                                                                                                                                                                                                                                                                                                                                                                 | -8.0                       | H                         | 3.0                    | 42.8                  | 1.0                   | -49.7                | -13.0                 | -36.7                |              |
|                          | 6849.60                                                                                                                                                                                                                                                                                                                                                                                                 | -5.5                       | H                         | 3.0                    | 42.7                  | 1.0                   | -47.2                | -13.0                 | -34.2                |              |
|                          | <b>Mid Ch, 1732.6MHz</b>                                                                                                                                                                                                                                                                                                                                                                                |                            |                           |                        |                       |                       |                      |                       |                      |              |
|                          | 3465.20                                                                                                                                                                                                                                                                                                                                                                                                 | -8.7                       | V                         | 3.0                    | 42.0                  | 1.0                   | -49.8                | -13.0                 | -36.8                |              |
|                          | 5197.80                                                                                                                                                                                                                                                                                                                                                                                                 | -7.9                       | V                         | 3.0                    | 42.8                  | 1.0                   | -49.7                | -13.0                 | -36.7                |              |
|                          | 6930.40                                                                                                                                                                                                                                                                                                                                                                                                 | -6.2                       | V                         | 3.0                    | 42.7                  | 1.0                   | -47.8                | -13.0                 | -34.8                |              |
|                          | 3465.20                                                                                                                                                                                                                                                                                                                                                                                                 | -8.7                       | H                         | 3.0                    | 42.0                  | 1.0                   | -49.8                | -13.0                 | -36.8                |              |
|                          | 5197.80                                                                                                                                                                                                                                                                                                                                                                                                 | -7.9                       | H                         | 3.0                    | 42.8                  | 1.0                   | -49.7                | -13.0                 | -36.7                |              |
|                          | 6930.40                                                                                                                                                                                                                                                                                                                                                                                                 | -5.6                       | H                         | 3.0                    | 42.7                  | 1.0                   | -47.2                | -13.0                 | -34.2                |              |
|                          | <b>High Ch, 1752.6MHz</b>                                                                                                                                                                                                                                                                                                                                                                               |                            |                           |                        |                       |                       |                      |                       |                      |              |
|                          | 3505.20                                                                                                                                                                                                                                                                                                                                                                                                 | -7.5                       | V                         | 3.0                    | 42.0                  | 1.0                   | -48.5                | -13.0                 | -35.5                |              |
|                          | 5257.80                                                                                                                                                                                                                                                                                                                                                                                                 | -7.9                       | V                         | 3.0                    | 42.8                  | 1.0                   | -49.7                | -13.0                 | -36.7                |              |
|                          | 7010.40                                                                                                                                                                                                                                                                                                                                                                                                 | -6.3                       | V                         | 3.0                    | 42.7                  | 1.0                   | -47.9                | -13.0                 | -34.9                |              |
|                          | 3505.20                                                                                                                                                                                                                                                                                                                                                                                                 | -8.0                       | H                         | 3.0                    | 42.0                  | 1.0                   | -49.1                | -13.0                 | -36.1                |              |
|                          | 5257.80                                                                                                                                                                                                                                                                                                                                                                                                 | -8.1                       | H                         | 3.0                    | 42.8                  | 1.0                   | -49.9                | -13.0                 | -36.9                |              |
|                          | 7010.40                                                                                                                                                                                                                                                                                                                                                                                                 | -5.4                       | H                         | 3.0                    | 42.7                  | 1.0                   | -47.1                | -13.0                 | -34.1                |              |
| WCDMA<br>Band 4<br>HSDPA | <p style="text-align: center;"><b>UL Verification Services, Inc.</b><br/><b>Above 1GHz High Frequency Substitution Measurement</b></p> <p> <b>Company:</b> Samsung<br/> <b>Project #:</b> 4789219881<br/> <b>Date:</b> 2019-11-23<br/> <b>Test Engineer:</b> 20882<br/> <b>Configuration:</b> EUT/ AC Adapter, Z-Position<br/> <b>Location:</b> Chamber 2<br/> <b>Mode:</b> HSDPA Band 4 Harmonics </p> |                            |                           |                        |                       |                       |                      |                       |                      |              |
|                          | <b>f</b><br>MHz                                                                                                                                                                                                                                                                                                                                                                                         | <b>SG reading</b><br>(dBm) | <b>Ant. Pol.</b><br>(H/V) | <b>Distance</b><br>(m) | <b>Preamp</b><br>(dB) | <b>Filter</b><br>(dB) | <b>EIRP</b><br>(dBm) | <b>Limit</b><br>(dBm) | <b>Delta</b><br>(dB) | <b>Notes</b> |
|                          | <b>Low Ch, 1712.4MHz</b>                                                                                                                                                                                                                                                                                                                                                                                |                            |                           |                        |                       |                       |                      |                       |                      |              |
|                          | 3424.80                                                                                                                                                                                                                                                                                                                                                                                                 | -9.0                       | V                         | 3.0                    | 42.0                  | 1.0                   | -50.0                | -13.0                 | -37.0                |              |
|                          | 5137.20                                                                                                                                                                                                                                                                                                                                                                                                 | -8.4                       | V                         | 3.0                    | 42.8                  | 1.0                   | -50.2                | -13.0                 | -37.2                |              |
|                          | 6849.60                                                                                                                                                                                                                                                                                                                                                                                                 | -6.1                       | V                         | 3.0                    | 42.7                  | 1.0                   | -47.8                | -13.0                 | -34.8                |              |
|                          | 3424.80                                                                                                                                                                                                                                                                                                                                                                                                 | -8.5                       | H                         | 3.0                    | 42.0                  | 1.0                   | -49.5                | -13.0                 | -36.5                |              |
|                          | 5137.20                                                                                                                                                                                                                                                                                                                                                                                                 | -8.2                       | H                         | 3.0                    | 42.8                  | 1.0                   | -50.0                | -13.0                 | -37.0                |              |
|                          | 6849.60                                                                                                                                                                                                                                                                                                                                                                                                 | -5.6                       | H                         | 3.0                    | 42.7                  | 1.0                   | -47.3                | -13.0                 | -34.3                |              |
|                          | <b>Mid Ch, 1732.6MHz</b>                                                                                                                                                                                                                                                                                                                                                                                |                            |                           |                        |                       |                       |                      |                       |                      |              |
|                          | 3465.20                                                                                                                                                                                                                                                                                                                                                                                                 | -8.6                       | V                         | 3.0                    | 42.0                  | 1.0                   | -49.7                | -13.0                 | -36.7                |              |
|                          | 5197.80                                                                                                                                                                                                                                                                                                                                                                                                 | -7.7                       | V                         | 3.0                    | 42.8                  | 1.0                   | -49.5                | -13.0                 | -36.5                |              |
|                          | 6930.40                                                                                                                                                                                                                                                                                                                                                                                                 | -5.8                       | V                         | 3.0                    | 42.7                  | 1.0                   | -47.4                | -13.0                 | -34.4                |              |
|                          | 3465.20                                                                                                                                                                                                                                                                                                                                                                                                 | -8.8                       | H                         | 3.0                    | 42.0                  | 1.0                   | -49.8                | -13.0                 | -36.8                |              |
|                          | 5197.80                                                                                                                                                                                                                                                                                                                                                                                                 | -7.6                       | H                         | 3.0                    | 42.8                  | 1.0                   | -49.4                | -13.0                 | -36.4                |              |
|                          | 6930.40                                                                                                                                                                                                                                                                                                                                                                                                 | -5.7                       | H                         | 3.0                    | 42.7                  | 1.0                   | -47.4                | -13.0                 | -34.4                |              |
|                          | <b>High Ch, 1752.6MHz</b>                                                                                                                                                                                                                                                                                                                                                                               |                            |                           |                        |                       |                       |                      |                       |                      |              |
|                          | 3505.20                                                                                                                                                                                                                                                                                                                                                                                                 | -7.5                       | V                         | 3.0                    | 42.0                  | 1.0                   | -48.6                | -13.0                 | -35.6                |              |
|                          | 5257.80                                                                                                                                                                                                                                                                                                                                                                                                 | -8.2                       | V                         | 3.0                    | 42.8                  | 1.0                   | -50.0                | -13.0                 | -37.0                |              |
|                          | 7010.40                                                                                                                                                                                                                                                                                                                                                                                                 | -5.7                       | V                         | 3.0                    | 42.7                  | 1.0                   | -47.3                | -13.0                 | -34.3                |              |
|                          | 3505.20                                                                                                                                                                                                                                                                                                                                                                                                 | -7.4                       | H                         | 3.0                    | 42.0                  | 1.0                   | -48.4                | -13.0                 | -35.4                |              |
|                          | 5257.80                                                                                                                                                                                                                                                                                                                                                                                                 | -7.9                       | H                         | 3.0                    | 42.8                  | 1.0                   | -49.7                | -13.0                 | -36.7                |              |
|                          | 7010.40                                                                                                                                                                                                                                                                                                                                                                                                 | -5.3                       | H                         | 3.0                    | 42.7                  | 1.0                   | -46.9                | -13.0                 | -33.9                |              |

**WCDMA Band 2**

|                          |                                                                                                                                                                                                                                                                                                                                                                                                          |                     |                    |                 |                |                |               |                |               |       |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| WCDMA<br>Band 2<br>REL99 | <p style="text-align: center;"><b>UL Verification Services, Inc.</b><br/><b>Above 1GHz High Frequency Substitution Measurement</b></p> <p> <b>Company:</b> Samsung<br/> <b>Project #:</b> 4789219881<br/> <b>Date:</b> 2019-11-22<br/> <b>Test Engineer:</b> 20882<br/> <b>Configuration:</b> EUT / AC Adapter, Y-Position<br/> <b>Location:</b> Chamber 2<br/> <b>Mode:</b> Rel99 Band 2 Harmonics </p> |                     |                    |                 |                |                |               |                |               |       |
|                          | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                 | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| WCDMA<br>Band 2<br>HSDPA | <p style="text-align: center;"><b>UL Verification Services, Inc.</b><br/><b>Above 1GHz High Frequency Substitution Measurement</b></p> <p> <b>Company:</b> Samsung<br/> <b>Project #:</b> 4789219881<br/> <b>Date:</b> 2019-11-22<br/> <b>Test Engineer:</b> 20882<br/> <b>Configuration:</b> EUT / AC Adapter, Y-Position<br/> <b>Location:</b> Chamber 2<br/> <b>Mode:</b> HSDPA Band 2 Harmonics </p> |                     |                    |                 |                |                |               |                |               |       |
|                          | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                 | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |