



SAMSUNG ELECTRONICS Co., Ltd.,  
Regulatory Compliance Group  
IT R&D Center  
416 Maetan3-Dong,  
Yeongtong-gu, Suwon city,  
Gyeonggi-Do, Korea 443-742

## FCC CFR47 PART 24 SUBPART CERTIFICATION REPORT

**Model Tested** : **SGH-E420**  
**Additional Model** : **SGH-E428**  
**FCC ID(Requested)** : **A3LSGHE420**  
**Report No** : **FD-129-R1**  
**Job No** : **FD-129**  
**Date issued** : **July 28, 2006**

- Abstract -

All measurement reported herein accordance with FCC Rules, 47CFR Part2, Part24.

**Prepared By**

**Date** 2006.07.28

YE PARK – Test Engineer

**Checked By**

**Date** 2006.07.28

WW JANG – Manager

**Authorized By**

**Date** 2006.07.28

SH PARK – Senior Manager

# TABLE OF CONTENT

| MEASUREMENT REPORT                                                        | Page      |
|---------------------------------------------------------------------------|-----------|
| <b>1. FCC CERTIFICATION INFORMATION .....</b>                             | <b>3</b>  |
| 1.1. §2.1033 General Information .....                                    | 3         |
| <b>2. INTRODUCTION .....</b>                                              | <b>4</b>  |
| 2.1. General .....                                                        | 4         |
| <b>3. MEASURING INSTRUMENT CALIBRATION .....</b>                          | <b>5</b>  |
| <b>4. TEST EQUIPMENT LIST .....</b>                                       | <b>6</b>  |
| <b>5. DESCRIPTION OF TESTS .....</b>                                      | <b>7</b>  |
| 5.1. Effective Radiated Power / Equivalent Isotropic Radiated Power ..... | 7         |
| 5.2. Radiated Spurious & Harmonic Emission .....                          | 8         |
| 5.3. Occupied Bandwidth .....                                             | 10        |
| 5.4. Spurious and Harmonic Emission at Antenna Terminal .....             | 10        |
| 5.4.1. Occupied Bandwidth Emission Limits .....                           | 10        |
| 5.4.2. Conducted Spurious Emission .....                                  | 12        |
| 5.5. Frequency Stability / Temperature Variation .....                    | 13        |
| <b>6. TEST DATA .....</b>                                                 | <b>14</b> |
| 6.1. Equivalent Isotropic Radiated Power (E.I.R.P.) .....                 | 14        |
| 6.2. GSM1900 Radiated Spurious & Harmonic measurement .....               | 15        |
| 6.3. GSM1900 Radiated Spurious & Harmonic Conversion Table .....          | 16        |
| 6.4. Frequency Stability .....                                            | 17        |
| 6.4.1. GSM1900 Frequency Stability Table .....                            | 17        |
| 6.4.2. GSM1900 Frequency Stability Graph .....                            | 18        |
| <b>7. CONCLUSION .....</b>                                                | <b>20</b> |
| <b>8. TEST PLOTS .....</b>                                                | <b>21</b> |



# **MEASUREMENT REPORT**

## **1. FCC Certification Information**

The following information is in accordance with FCC Rules, 47CFR Part2, Subpart J, Sections 2.1033 – 2.1055.

### **1.1. §2.1033 General Information**

- Applicant Name : SAMSUNG ELECRONICS CO., LTD.
- Address : 416 Maetan3-Dong, Yeongtong-gu, Suwon City  
Gyeonggi-Do, Korea 443-742
- Attention : SungJoo KIM, Engineering Manager (QA Lab)
- FCC ID : A3LSGHE420
- Additional Model : SGH-E428
- Quantity : Quantity production is planned
- Emission Designators : 242KGXW(GSM1900)
- Tx Freq. Range : 1850.2MHz -1909.8MHz (GSM1900)
- Rx Freq. Range : 1930.2MHz - 1989.8MHz (GSM1900)
- Max. Power Rating : 0.752 W EIRP GSM1900 (28.76dBm)
- FCC Classification(s) : Licensed Portable Tx Held to Ear (PCE)
- Equipment (EUT) Type : Single-Band PCS GSM Phone
- Frequency Tolerance :  $\pm 0.00025\%$  (2.5ppm)
- FCC Rule Part(s) : §24(E), §2.
- Dates of Test : July 20-21, 2006
- Place of Test : SAMSUNG Lab,
- Test Report S/N : FD-129-R1

## 2. INTRODUCTION

### 2.1. General

These measurement test were conducted at **SAMSUNG ELECTRONICS CO., LTD(SUWON)**. The site address is 416 Maetan3-Dong, Yeongtong-gu, Suwon City, Gyeonggi-Do, Korea 443-742. The site have 1 Fully-anechoic chamber and measurement facility.



Figure1. Map of the Suwon City area.

### Measurement Procedure

The radiated and spurious measurements were made Fully-anechoic chamber at a 3-meter test range (see Figure2). The equipment under testing was placed on a Non-conducted turntable 3-meters from the receive antenna. The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer. The substitution antenna will replace the EUT antenna at the same position and in vertical polarization. The frequency of the signal generator shall be set to the frequencies that were measured on the EUT. The test antenna shall be raised and lowered, if necessary, to ensure that the maximum signal is still being received. The signal generator, output level, shall be adjusted until an equal or a known related level to what was measured from the EUT is obtained in the spectrum analyzer. This level was recorded.

For readings above 1 GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.

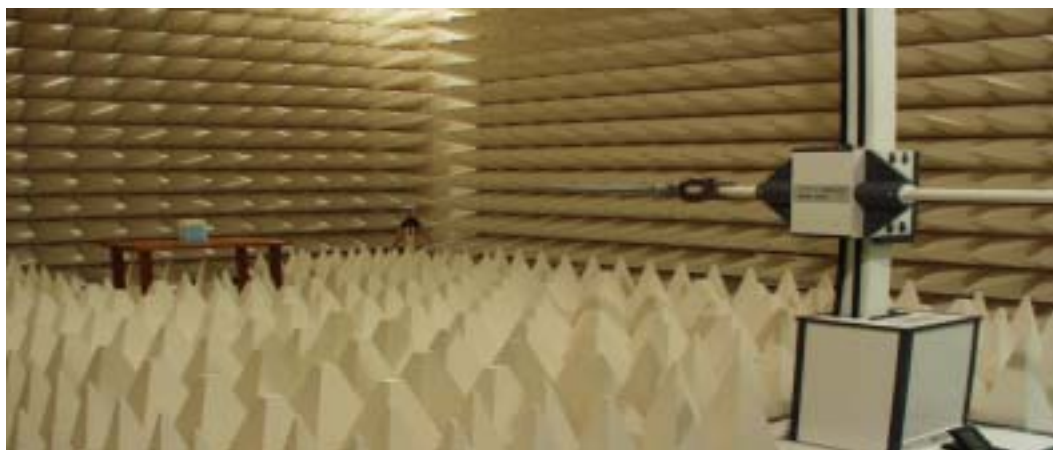


Figure2. Photograph of 3m Fully-Anechoic Chamber

### **3. MEASURING INSTRUMENT CALIBRATION**

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

#### 4. TEST EQUIPMENT LIST

| Name Of Equipment               | Model               | Serial No. | Due Date     |
|---------------------------------|---------------------|------------|--------------|
| Spectrum Analyzer               | ESI26               | 836119/010 | 2006-09-26   |
|                                 | E4440A(3Hz~26.5GHz) | MY41000236 | 2007-04-14   |
|                                 | E4440A(3Hz~26.5GHz) | MY41000233 | 2007-04-05   |
| Signal Generator                | SMIQ03B             | 83824/021  | 2006-12-07   |
|                                 | SMR20               | 835197/030 | 2007-01-10   |
| Network Analyzer                | 8753E               | JP38160590 | 2007-06-26   |
| Power Meter                     | E4419B              | GB41293846 | 2006-09-07   |
| Power Sensor                    | 8481B               | 3318A10325 | 2006-09-08   |
|                                 | 8485A               | 3318A19924 | 2006-09-08   |
| Amplifier                       | 5S1G4               | 304866     | 2006-10-18   |
| Pre-Amplifier                   | 8449B               | 3008A00691 | 2007-01-02   |
| Communication test set          | 8960                | GB42230535 | 2007-01-02   |
|                                 | 8960                | GB42360886 | 2007-07-03   |
| Antenna Master                  | MA240               | 240/618    | Not Required |
| Controller                      | HD100               | 100/756    | Not Required |
| Environmental Chamber           | SH-241              | 92000548   | 2006-11-22   |
|                                 | SH-241              | 92000549   | 2006-11-22   |
| Horn Antenna                    | HF906               | 360306/011 | 2007-03-31   |
| Communication test set          | CMU200              | 109162     | 2006-10-18   |
| Dipole Antenna                  | 3121C-DB4           | 9007-587   | 2006-12-02   |
|                                 | 3121C-DB4           | 9007-588   | 2007-05-29   |
| Receive Antenna                 | HL040               | 353255/019 | 2006-08-24   |
|                                 | HL040               | 353255/020 | 2007-04-25   |
| Power Supply                    | E3640A              | MY40003594 | 2007-06-28   |
|                                 | E3640A              | MY40003595 | 2007-05-19   |
| Divider                         | 11636B              | 51946      | Not Required |
|                                 | 11636B              | 51942      | Not Required |
| High Pass Filter                | WHK1.0/15G-10SS     | 1          | Not Required |
|                                 | WHK3.5/18G-10SS     | 4          | Not Required |
| Shielded Fully Anechoic Chamber | CHAMBER             | ANT0001    | Not Required |

## 5. DESCRIPTION OF TESTS

### 5.1. Effective Radiated Power / Equivalent Isotropic Radiated Power

#### Test Set-up for the ERP/EIRP TEST

Effective Radiated Power Output and Equivalent Isotropic Radiated Power Measurements by Substitution Method according to ANSI/TIA/EIA-603-C-2004:

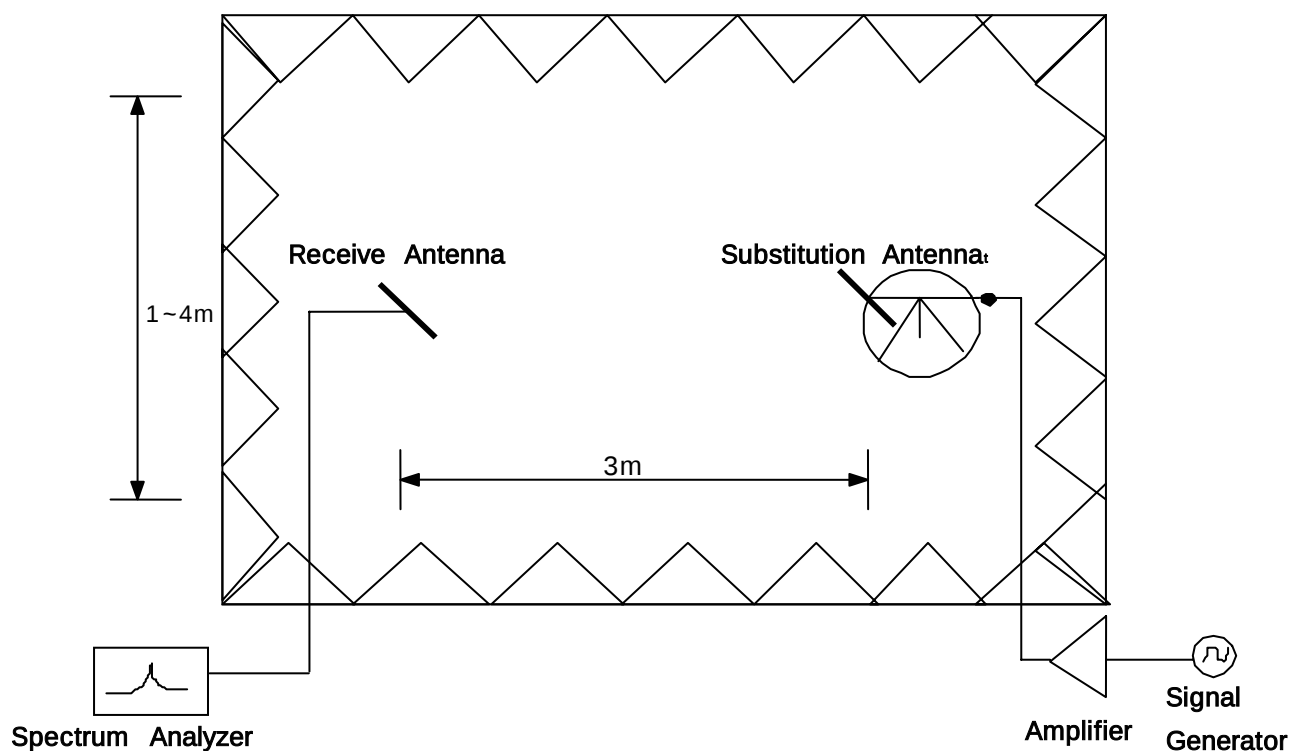


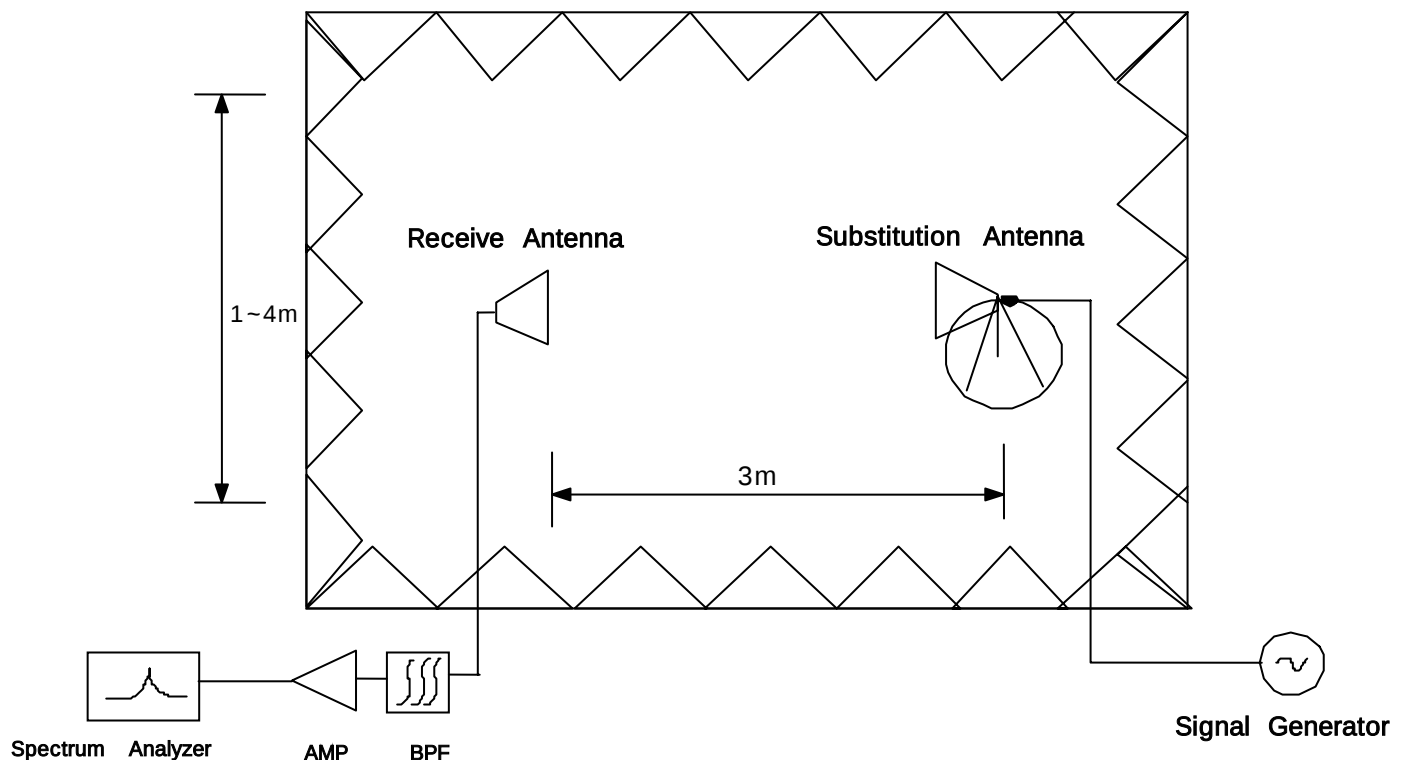
Figure 3. Diagram of ERP/EIRP test Set-up

The EUT was placed on a Non-conducted turntable 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For GSM signals, an average detector is used, with RBW=VBW=3MHz, SPAN=10MHz. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminals of dipole is measured. The ERP and EIRP are recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

## 5.2. Radiated Spurious & Harmonic Emission

### Test Set-up for the Radiated Emission TEST

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-C-2004



**Figure 4. Diagram of Radiated Spurious & Harmonic test Set-up**

The EUT was placed on a Non-conducted turntable 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. The Spectrum was investigated from 30MHz to the 10<sup>th</sup> Harmonic of the fundamental. A peak detector is used, with RBW=VBW=1MHz. The value that we could measure was only reported. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This spurious level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

## **SAMPLE CALCULATION**

### **Example: Channel 661 , Second Harmonic(3760.00MHz)**

The receive analyzer reading at 3meters with the EUT on the turntable was  $-81.0\text{dBm}$ . The gain of the substituted antenna is  $8.1\text{dBi}$ . The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of  $-81.0\text{dBm}$  of the receive analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is  $2.0\text{dB}$  at  $3760.00\text{MHz}$ . So  $6.1\text{dB}$  is added to the signal generator reading of  $-30.9\text{dBm}$  yielding  $-24.8\text{dBm}$ . The fundamental EIRP was  $25.5\text{dBm}$  so this harmonic was  $25.5\text{dBm} - (-24.8) = 50.3\text{dBc}$ .

### **5.3. Occupied Bandwidth**

#### **Test Procedure**

The EUT was setup to maximum output power at its lowest channel. The occupied bandwidth was measured using a spectrum analyzer. The measurements are repeated for the highest and a middle channel. The EUT's occupied bandwidth is measured as the width of the signal between two points, one below the carrier center frequency and one above the carrier frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power.

Plots of the EUT's occupied bandwidth are shown herein.

### **5.4. Spurious and Harmonic Emission at Antenna Terminal**

#### **5.4.1. Occupied Bandwidth Emission Limits**

- (a) On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB.
- (b) Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.
- (c) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.
- (d) The measurement of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

| BLOCK | Freq. Range (MHz)<br>Transmitter (Tx) | Freq. Range (MHz)<br>Receiver (Rx) |
|-------|---------------------------------------|------------------------------------|
| A     | 1850 – 1865                           | 1930 – 1945                        |
| B     | 1870 – 1885                           | 1950 – 1965                        |
| C     | 1895 – 1910                           | 1975 – 1990                        |
| D     | 1865 – 1870                           | 1945 – 1950                        |
| E     | 1885 – 1890                           | 1965 – 1970                        |
| F     | 1890 – 1895                           | 1970 – 1975                        |

**Table 1. Broadband PCS Service Frequency Blocks**

| BLOCK      | Freq. Range (MHz)<br>Transmitter (Tx) | Freq. Range (MHz)<br>Receiver (Rx) |
|------------|---------------------------------------|------------------------------------|
| A* Low + A | 824 ~ 835                             | 869 ~ 880                          |
| B          | 835 ~ 845                             | 880 ~ 890                          |
| A* High    | 845 ~ 846.5                           | 890 ~ 891.5                        |
| B*         | 846.5 ~ 849                           | 891.5 ~ 894                        |

**Table 2. Cellular Service Frequency Blocks**

### 5.4.2. Conducted Spurious Emission

#### **Minimum standard:**

On any frequency outside a license frequency block, the power of any emission shall be attenuated below the transmitter power(P) by at least  $43+10\log(P)$ dB. Limit equivalent to -13dBm, calculation shown below.

$$43 + 10\log(0.752 \text{ W}) = 41.76 \text{ dB}$$

$$28.76 \text{ dBm} - 41.76 \text{ dB} = -13 \text{ dBm}$$

Compliance with the out-of-band emissions requirement is based on test being performed with an analyzer resolution bandwidth of 1MHz. However in the 1MHz band immediately outside and adjacent to the frequency block a resolution bandwidth of at least 1% of the fundamental emissions bandwidth may be employed.

In case of GSM :  $0.01 * 273\text{KHz} = 2.73\text{KHz}$   
A Resolution BW of 3KHz was used for measurement at the band edges.

#### **Test Procedure:**

The EUT was setup to maximum output power at its lowest channel. The Resolution BW of the analyzer is set to 1% of the emission bandwidth to show compliance with the -13dBm limit, in the 1MHz bands immediately outside and adjacent to the edge of the frequency block. The measurements are repeated for the EUT's highest channel. For the Out-of-Band measurements a 1MHz RBW was used to scan from 10MHz to 10GHz. (GSM1900 Mode : 10MHz to 20GHz). A display line was placed at -13dBm to show compliance. The high, lowest and a middle channel were tested for out of band measurements.

Plots are shown herein.

## 5.5. Frequency Stability / Temperature Variation

The frequency stability of the transmitter is measured by:

- a.) Temperature: The temperature is carried from -30°C to +60°C using an environmental chamber.
- b.) Primary Supply Voltage: The primary supply voltage is varied from 85% to 115% of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

Specification- The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within  $\pm 0.00025$  ( $\pm 2.5\text{ppm}$ ) of the center frequency.

Time Period and Procedure:

1. The carrier frequency of the transmitter and the individual oscillators is measured at room temperature (25°C to 27°C to provide a reference).
2. The equipment is subjected to an overnight "soak" at -30°C without any power applied.
3. After the overnight "soak" at -30°C (Usually 14~16 hours), the equipment is turned on in a "standby" condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter and the individual oscillators is made within a three minute interval after applying to the transmitter.
4. Frequency measurements are made at 10°C interval up to room temperature. At least a period of one and one half-hour is provided to allow stabilization of the equipment at each temperature level.
5. Again the transmitter carrier frequency and the individual oscillators is measured at room temperature to begin measurement of the upper temperature levels.
6. Frequency measurements are at 10 intervals starting at -30°C up to +60°C allowing at least two hours at each temperature for stabilization. In all measurements the frequency is measured within three minutes after re-applying power to the transmitter.
7. The artificial load is mounted external to the temperature chamber.

NOTE : The EUT is tested down to the battery endpoint.

## 6. TEST DATA

### 6.1. Equivalent Isotropic Radiated Power (E.I.R.P.)

Supply Voltage : 3.7VDC

Modulation : PCS 1900

#### ■ Reference level

| Frequency<br>(MHz) | Output<br>(dBm) | Polarization<br>(H/V) | S/A<br>(dBm) | Ant gain<br>(dBi) | Ref level<br>(dBm) |
|--------------------|-----------------|-----------------------|--------------|-------------------|--------------------|
| 1850.20            | 27.00           | H                     | -14.09       | 8.13              | -22.22             |
|                    |                 | V                     | -14.16       | 8.13              | -22.29             |
| 1880.00            | 27.00           | H                     | -14.56       | 8.11              | -22.67             |
|                    |                 | V                     | -14.57       | 8.11              | -22.68             |
| 1909.80            | 27.00           | H                     | -14.16       | 8.33              | -22.49             |
|                    |                 | V                     | -14.28       | 8.33              | -22.61             |

#### ■ Result

| Frequency<br>(MHz) | Tested level<br>(dBm) | Polarization<br>(H/V) | Azimuth<br>(angle) | EIRP<br>(dBm) | EIRP<br>(W) | Battery  |
|--------------------|-----------------------|-----------------------|--------------------|---------------|-------------|----------|
| 1850.20            | -20.46                | H1                    | 65                 | 28.76         | 0.752       | Standard |
| 1880.00            | -20.92                | V                     | 126                | 28.76         | 0.752       | Standard |
| 1909.80            | -22.13                | H1                    | 66                 | 27.36         | 0.545       | Standard |

**NOTE :** Standard batteries are the only battery options for this phone

**Radiated measurements at 3 meters by Substitution Method**

## 6.2. GSM1900 Radiated Spurious & Harmonic measurement

Operating Frequency : 1850.2 MHz(Low), 1880.00 MHz(Middle), 1909.80 MHz(High)

Measured Output Power : 28.76 dBm = 0.752 W

Modulation Signal : GSM1900

Limit :  $43 + 10\log_{10}(P) = 41.76 \text{ dBc}$

### ■ Result

| Channel | Harmonic | Frequency (MHz) | From EUT Tested level (dBm) | POL (H/V) | Result (dBc) |
|---------|----------|-----------------|-----------------------------|-----------|--------------|
| 512     | 2        | 3700.40         | -51.48                      | H1        | 52.79        |
|         | 3        | 5550.60         | -52.81                      | H2        | 48.90        |
|         | 4        | 7400.80         | -63.34                      | H2        | 56.07        |
|         | 5        | 9251.00         | -55.31                      | H2        | 45.08        |
|         | 6        | 11101.20        | -68.08                      | H1        | 53.03        |
|         | 7        | 12951.40        | -                           | -         | -            |
| 661     | 2        | 3760.00         | -56.27                      | H1        | 54.20        |
|         | 3        | 5640.00         | -60.43                      | H2        | 54.56        |
|         | 4        | 7520.00         | -65.75                      | H2        | 55.36        |
|         | 5        | 9400.00         | -61.45                      | H2        | 48.03        |
|         | 6        | 11280.00        | -68.23                      | H2        | 53.21        |
|         | 7        | 13160.00        | -                           | -         | -            |
| 810     | 2        | 3819.60         | -53.67                      | H1        | 55.03        |
|         | 3        | 5729.40         | -60.87                      | H2        | 56.82        |
|         | 4        | 7639.20         | -63.69                      | H2        | 55.24        |
|         | 5        | 9549.00         | -59.59                      | H2        | 48.67        |
|         | 6        | 11458.80        | -68.32                      | H1        | 52.53        |
|         | 7        | 13368.60        | -                           | -         | -            |

### NOTE :

1. “-” Indicates the spurious emission could not be detected due to noise limitations or ambients.
2. The spectrum is measured from 30MHz to the 10<sup>th</sup> harmonic and the worst-case emissions and reported.

### Radiated Spurious Emission measurements at 3 meters by Substitution Method

### 6.3. GSM1900 Radiated Spurious & Harmonic Conversion Table

Date : 2006. 07. 20

Test Engineer : YE PARK

Tx Cable loss  
 Tx Horn Ant Gain  
 Rx Cable loss + HPF Insertion loss + Attenuator  
 Pre-Amp gain  
 Air loss  
 Tested Level from EUT  
 = + + -  
 = EIRP -

| CH  | Har | Frequency (MHz) | Tx CL (dB) | Horn Gain (dB) | Tx Level @ (S/G 10dBm) | Tested Level EUT : H (dBm) | Tested Level EUT : V (dBm) | Amplitude of Emission EUT : H (dBm) | Amplitude of Emission EUT : V (dBm) | Result EUT : H (dBc) | Result EUT : V (dBc) |
|-----|-----|-----------------|------------|----------------|------------------------|----------------------------|----------------------------|-------------------------------------|-------------------------------------|----------------------|----------------------|
| 512 | 2   | 3700.40         | 12.22      | 9.73           | 7.51                   | -51.48                     | -54.32                     | -24.03                              | -26.81                              | 52.79                | 55.57                |
|     | 3   | 5550.60         | 16.91      | 11.55          | 4.64                   | -52.81                     | -58.25                     | -20.14                              | -26.69                              | 48.90                | 55.45                |
|     | 4   | 7400.80         | 20.66      | 11.44          | 0.78                   | -63.34                     | -66.73                     | -27.31                              | -32.63                              | 56.07                | 61.39                |
|     | 5   | 9251.00         | 24.06      | 12.17          | -1.89                  | -55.31                     | -57.86                     | -16.32                              | -19.28                              | 45.08                | 48.04                |
|     | 6   | 11101.20        | 27.70      | 13.66          | -4.04                  | -68.08                     | -68.63                     | -24.27                              | -25.39                              | 53.03                | 54.15                |
|     | 7   | 12951.40        | 31.86      | 13.27          | -8.59                  | -                          | -                          | -                                   | -                                   | -                    | -                    |
| 661 | 2   | 3760.00         | 12.40      | 9.73           | 7.33                   | -52.23                     | -56.27                     | -25.44                              | -29.11                              | 54.20                | 57.87                |
|     | 3   | 5640.00         | 16.83      | 11.55          | 4.72                   | -58.26                     | -60.43                     | -25.80                              | -28.33                              | 54.56                | 57.09                |
|     | 4   | 7520.00         | 21.17      | 11.44          | 0.27                   | -62.12                     | -65.75                     | -26.60                              | -31.83                              | 55.36                | 60.59                |
|     | 5   | 9400.00         | 24.51      | 12.17          | -2.34                  | -58.58                     | -61.45                     | -19.27                              | -22.80                              | 48.03                | 51.56                |
|     | 6   | 11280.00        | 28.38      | 13.66          | -4.72                  | -68.23                     | -68.37                     | -24.45                              | -24.79                              | 53.21                | 53.55                |
|     | 7   | 13160.00        | 33.20      | 13.27          | -9.93                  | -                          | -                          | -                                   | -                                   | -                    | -                    |
| 810 | 2   | 3819.60         | 13.76      | 9.73           | 5.97                   | -53.67                     | -58.12                     | -26.27                              | -30.12                              | 55.03                | 58.88                |
|     | 3   | 5729.40         | 17.34      | 11.55          | 4.21                   | -60.87                     | -62.76                     | -28.06                              | -30.29                              | 56.82                | 59.05                |
|     | 4   | 7639.20         | 21.14      | 11.44          | 0.30                   | -63.69                     | -66.32                     | -26.48                              | -30.30                              | 55.24                | 59.06                |
|     | 5   | 9549.00         | 26.03      | 12.17          | -3.86                  | -59.59                     | -62.73                     | -19.91                              | -24.31                              | 48.67                | 53.07                |
|     | 6   | 11458.80        | 28.52      | 13.66          | -4.86                  | -68.32                     | -68.76                     | -23.77                              | -25.07                              | 52.53                | 53.83                |
|     | 7   | 13368.60        | 32.87      | 13.27          | -9.60                  | -                          | -                          | -                                   | -                                   | -                    | -                    |

## 6.4. Frequency Stability

### 6.4.1. GSM1900 Frequency Stability Table

Operating Frequency : 1,880,000,000 Hz

Channel : 661

Reference Voltage : 3.7VDC

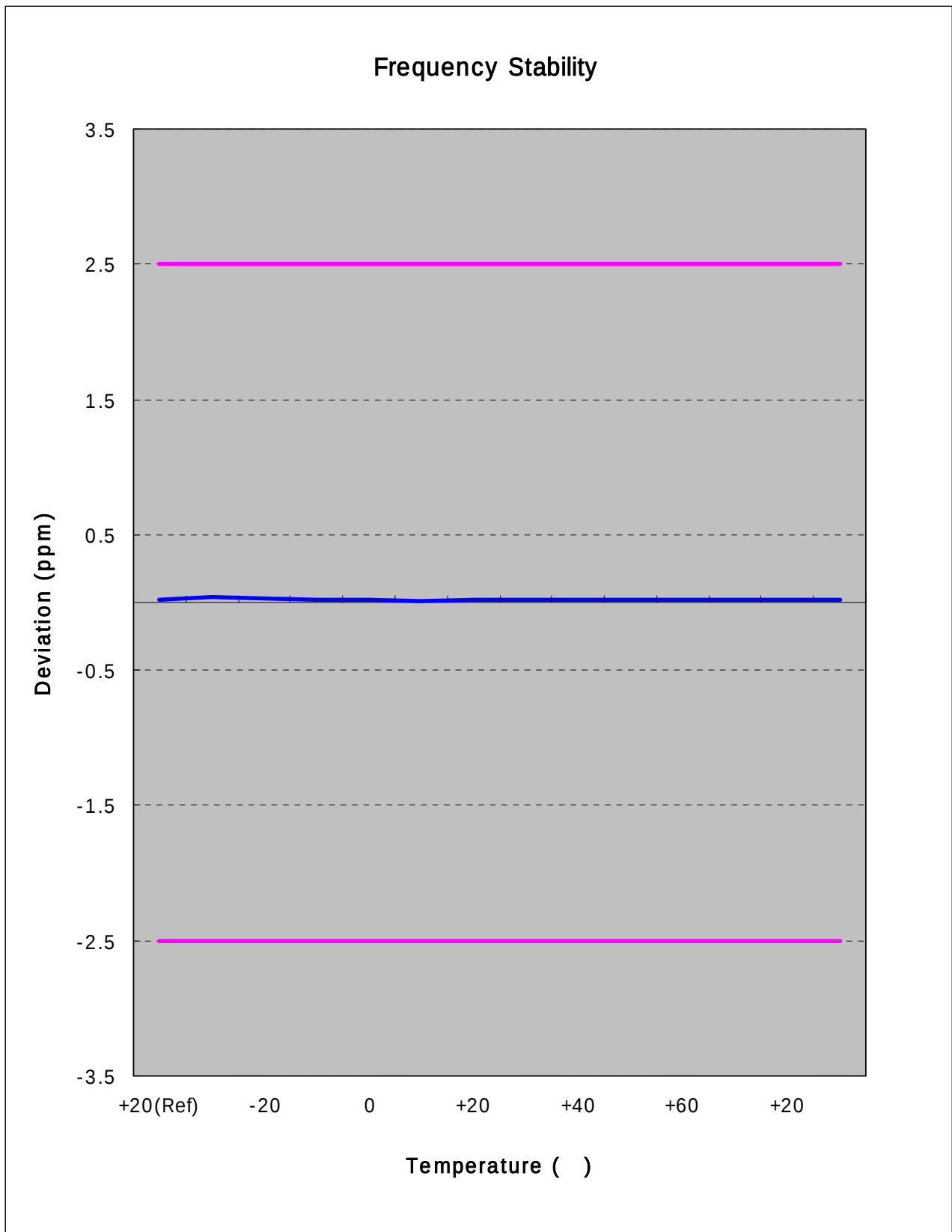
Deviation Limit :  $\pm 0.00025$  % or 2.5ppm

| Voltage (%)   | Power (VDC) | Temp. (°C) | Frequency Error (Hz) | Frequency (Hz) | Deviation (%) | ppm   |
|---------------|-------------|------------|----------------------|----------------|---------------|-------|
| 100%          | 3.70        | +20(Ref)   | 28.48                | 1,880,000,028  | 0.000002      | 0.015 |
| 100%          |             | -30        | 73.46                | 1,880,000,073  | 0.000004      | 0.039 |
| 100%          |             | -20        | 53.38                | 1,880,000,053  | 0.000003      | 0.028 |
| 100%          |             | -10        | 44.86                | 1,880,000,045  | 0.000002      | 0.024 |
| 100%          |             | 0          | 36.90                | 1,880,000,037  | 0.000002      | 0.020 |
| 100%          |             | +10        | 22.11                | 1,880,000,022  | 0.000001      | 0.012 |
| 100%          |             | +20        | 28.48                | 1,880,000,028  | 0.000002      | 0.015 |
| 100%          |             | +30        | 34.79                | 1,880,000,035  | 0.000002      | 0.019 |
| 100%          |             | +40        | 38.28                | 1,880,000,038  | 0.000002      | 0.020 |
| 100%          |             | +50        | 28.54                | 1,880,000,029  | 0.000002      | 0.015 |
| 100%          |             | +60        | 31.86                | 1,880,000,032  | 0.000002      | 0.017 |
| 85%           | 3.40        | +20        | 32.38                | 1,880,000,032  | 0.000002      | 0.017 |
| 115%          | 4.26        | +20        | 37.35                | 1,880,000,037  | 0.000002      | 0.020 |
| Batt.Endpoint | 3.40        | +20        | 32.38                | 1,880,000,032  | 0.000002      | 0.017 |

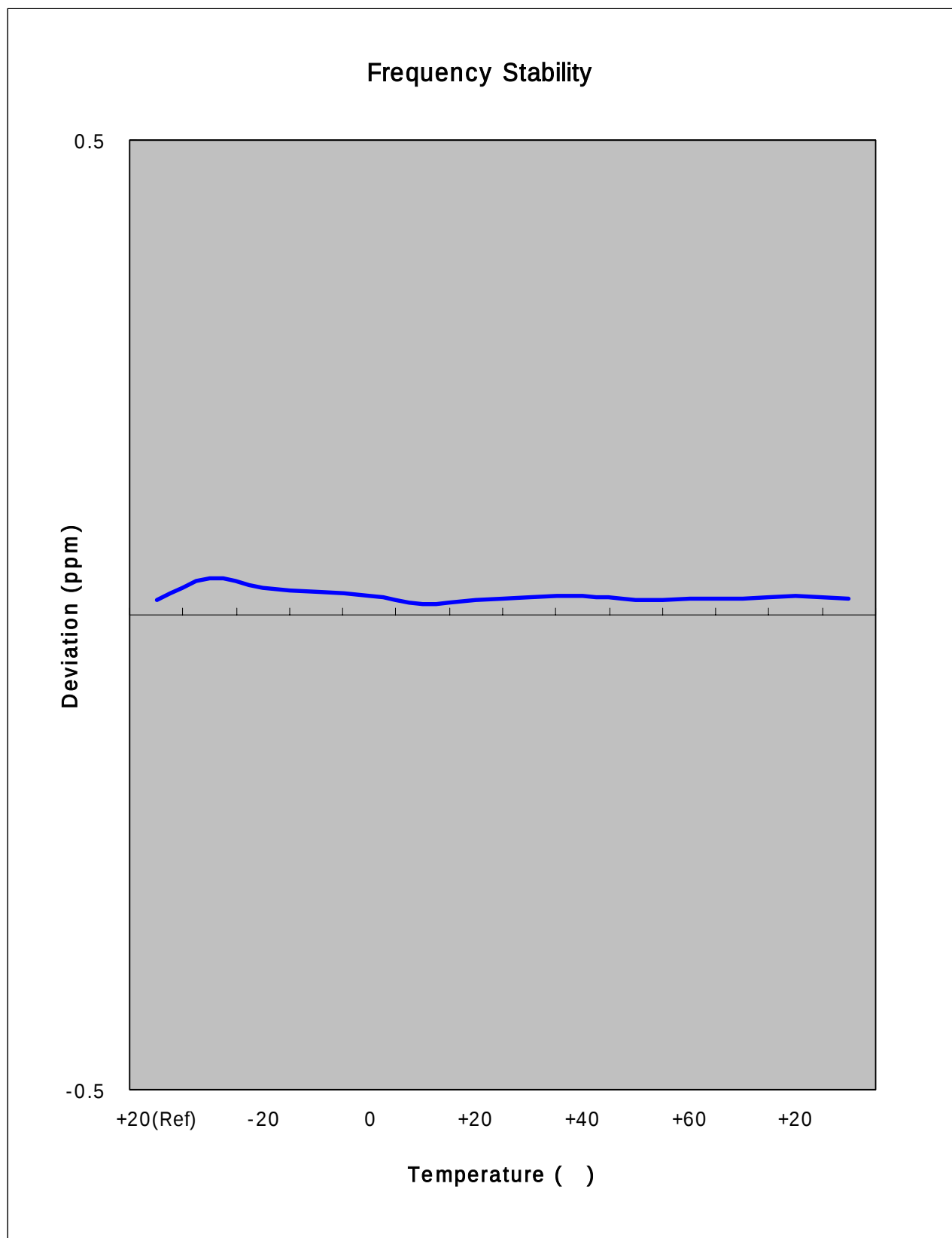
Note : The temperature is varied from -30 °C to +60 °C using an environmental chamber.

The EUT is tested down to the battery end point.

### 6.4.2. GSM1900 Frequency Stability Graph



**Zoom IN**





## 7. CONCLUSION

The data collected shows that the SAMSUNG Single-Band PCS GSM Phone.

FCC ID : A3LSGHE420 complies with all the requirements of Parts 2,24 of the FCC Rules.

## 8. TEST PLOTS

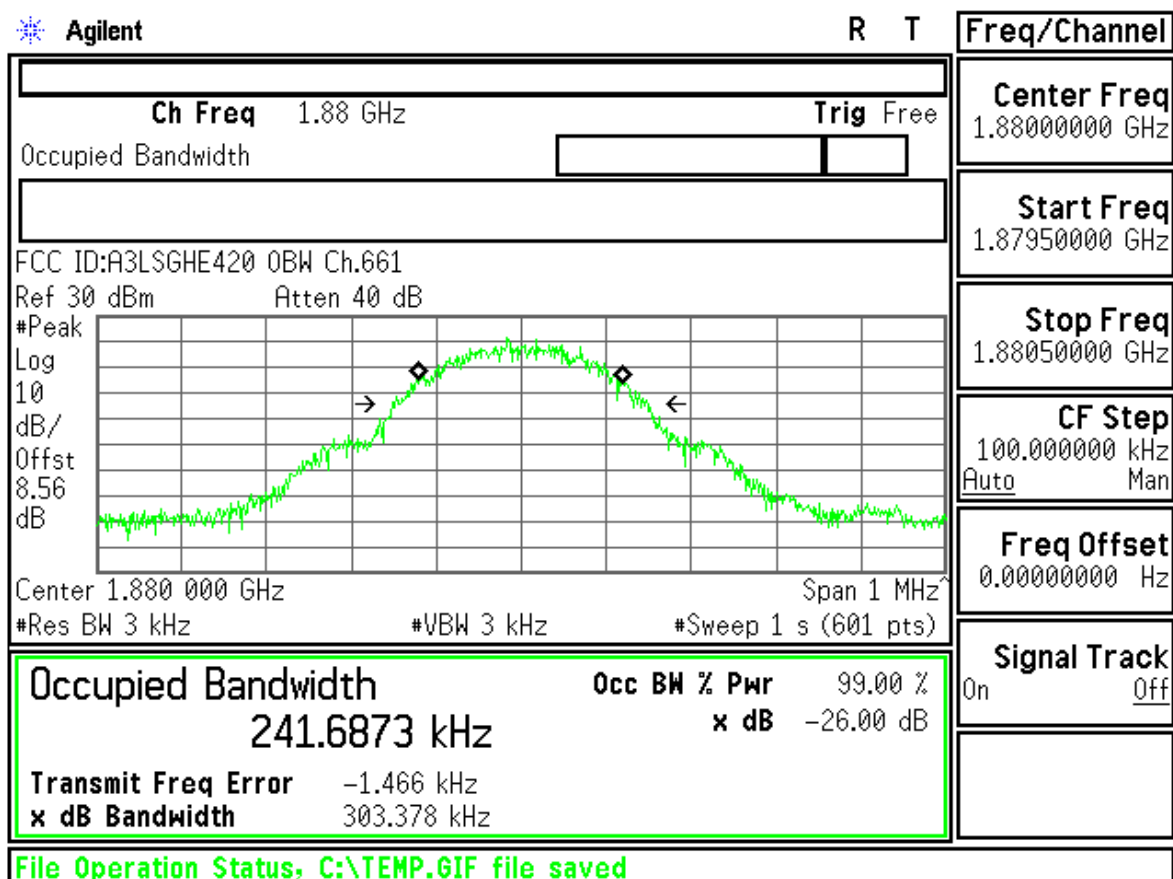
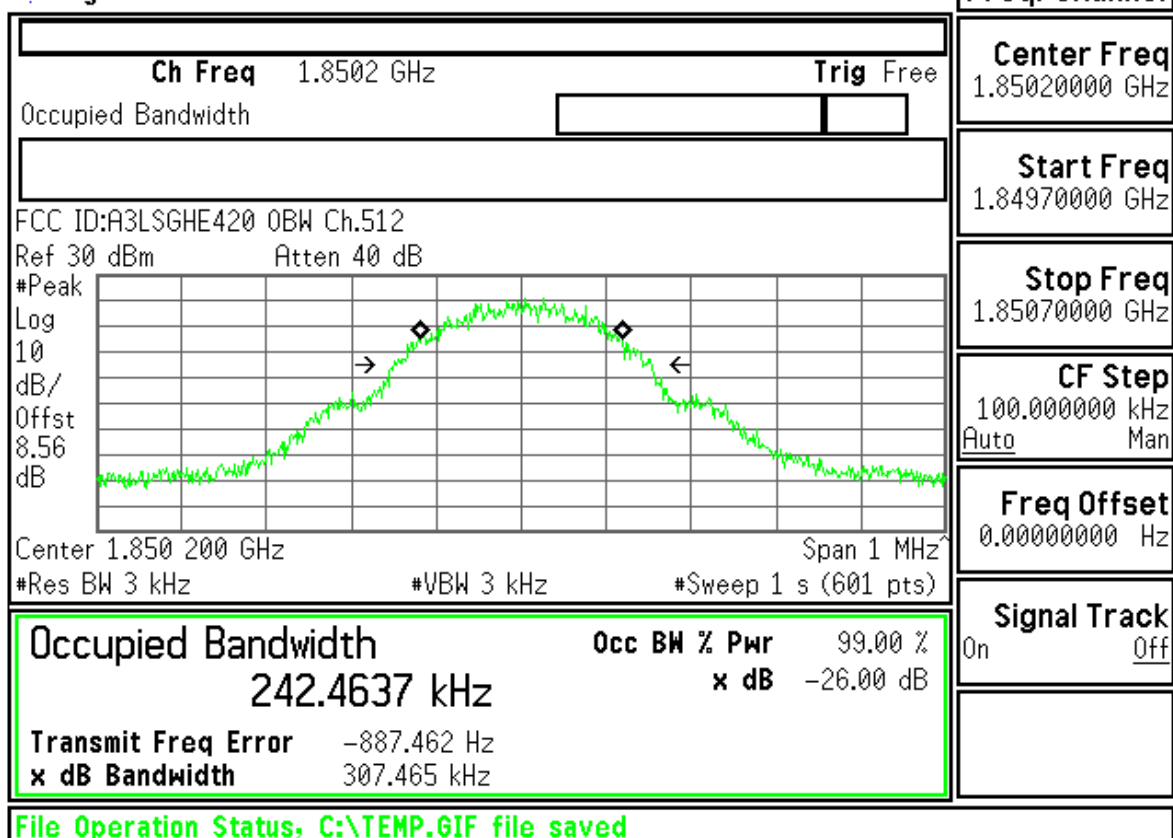
GSM1900

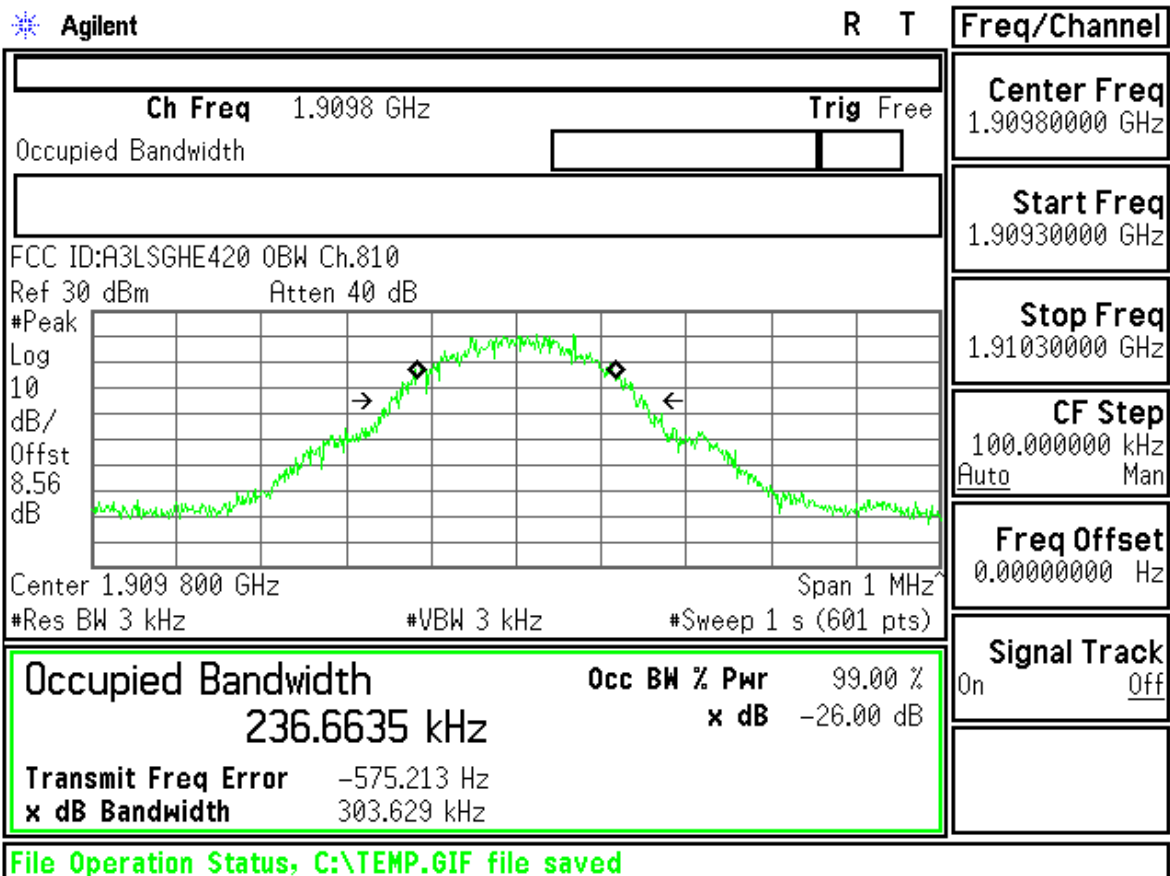


Agilent

R T

Freq/Channel

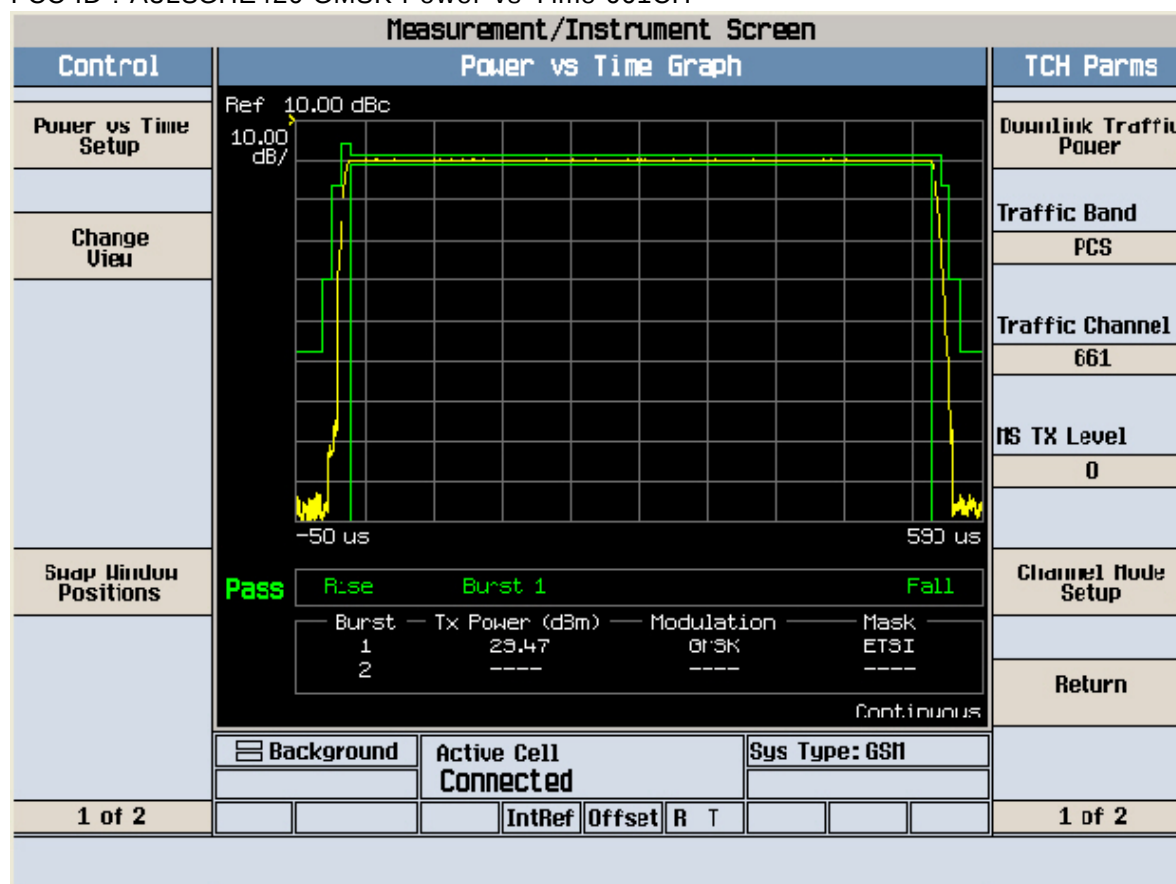
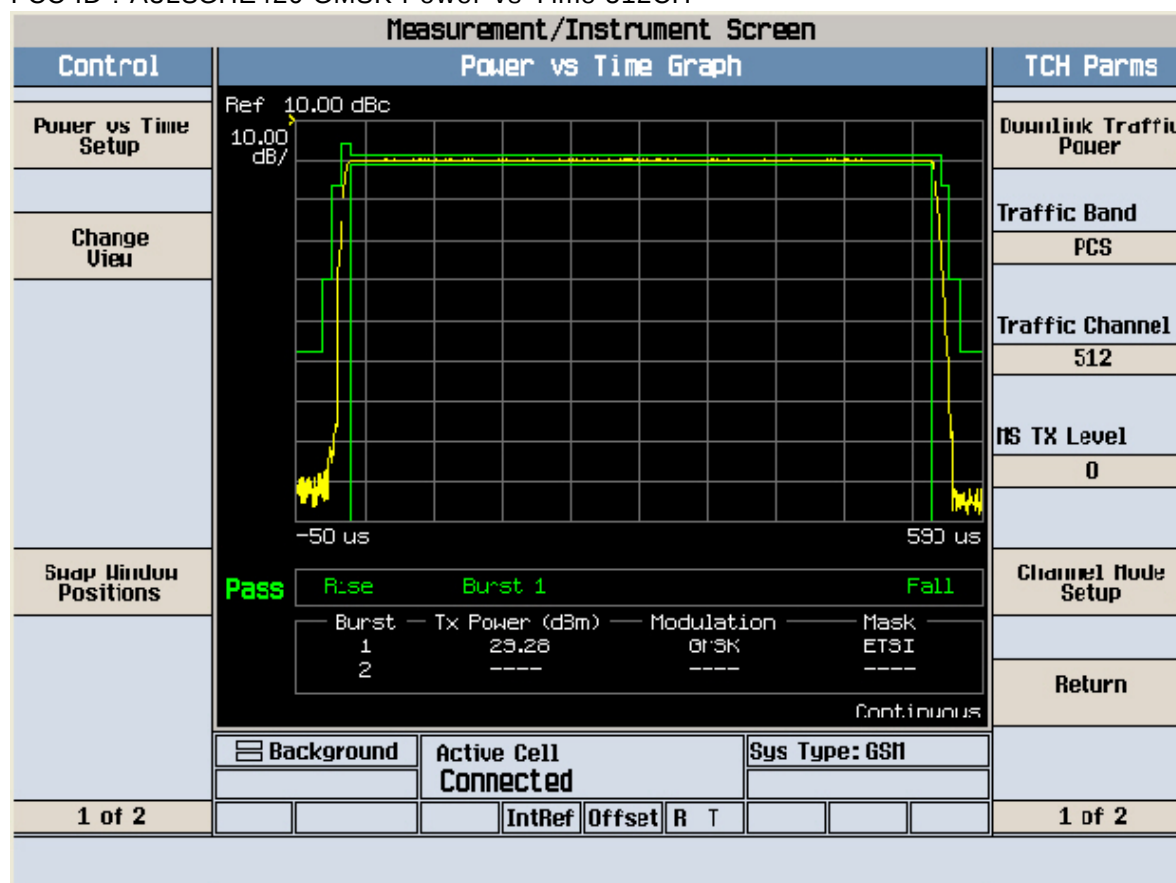


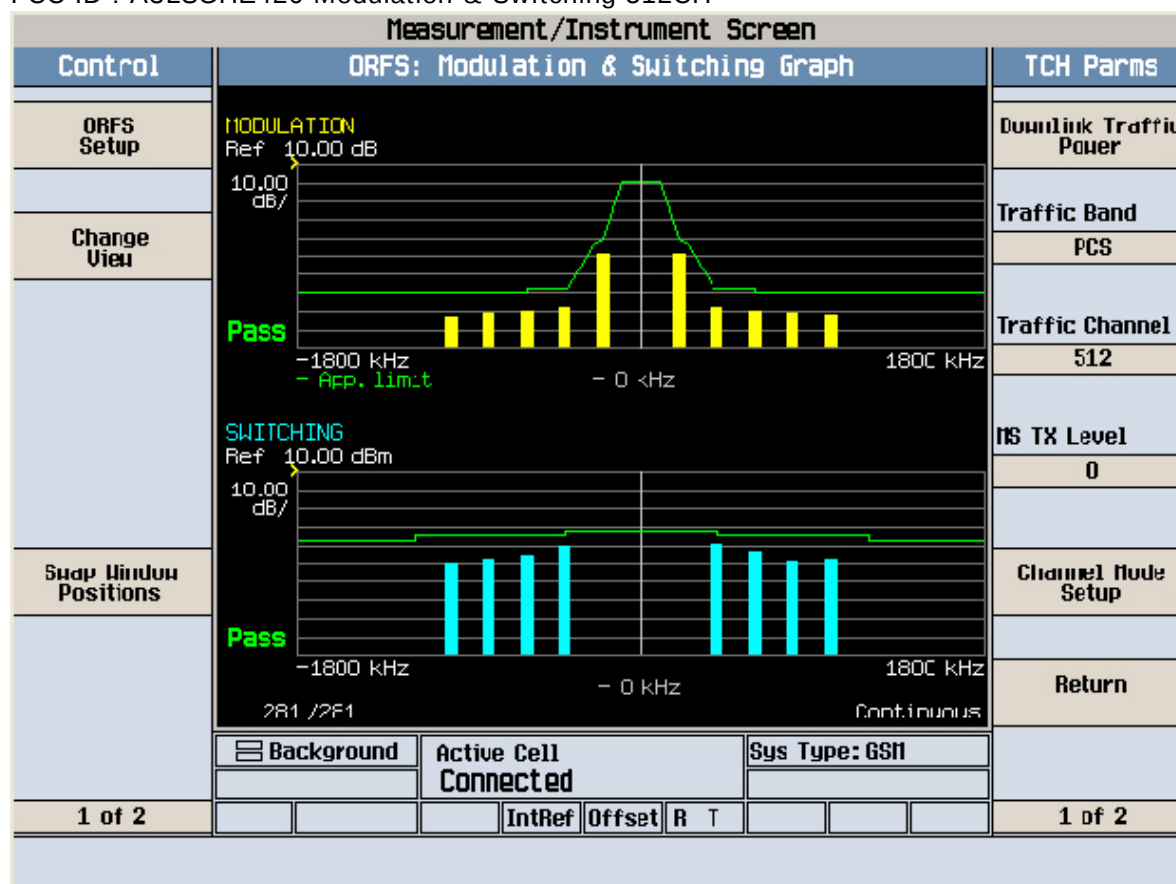
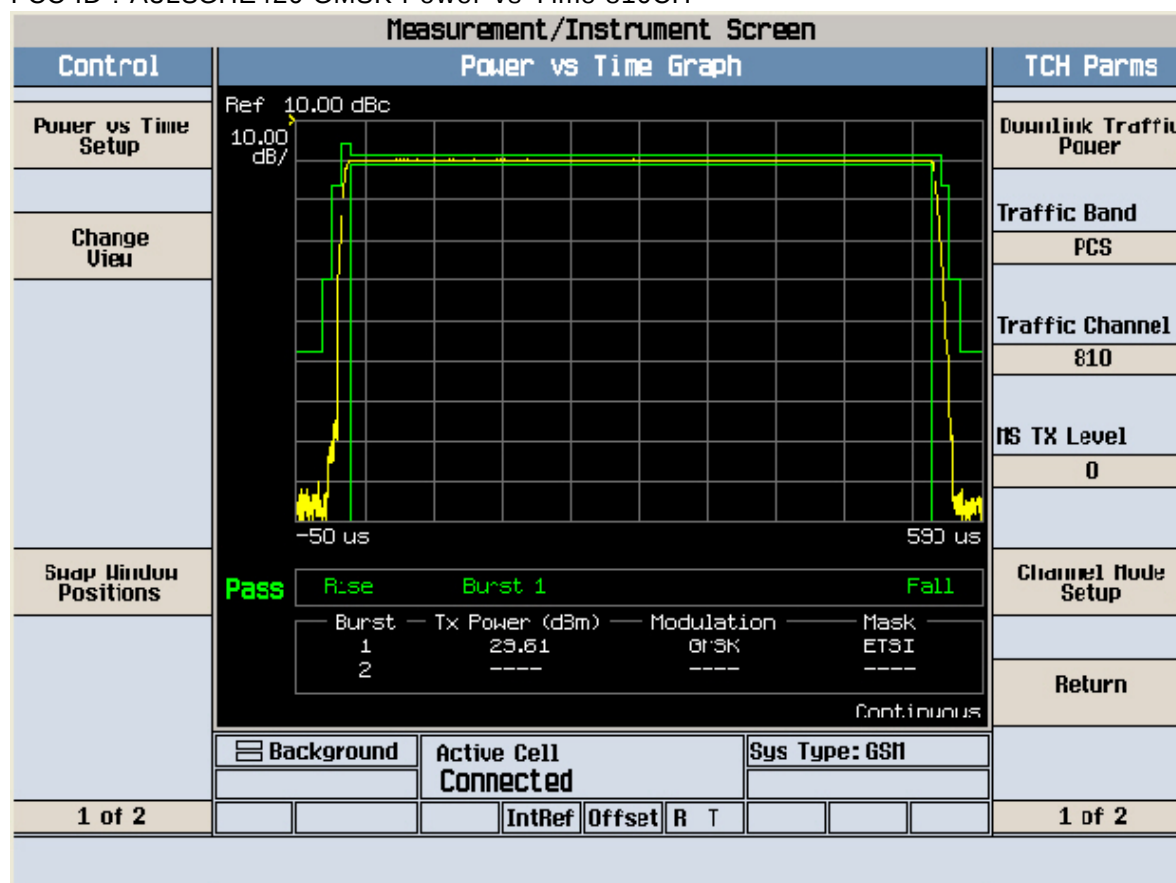


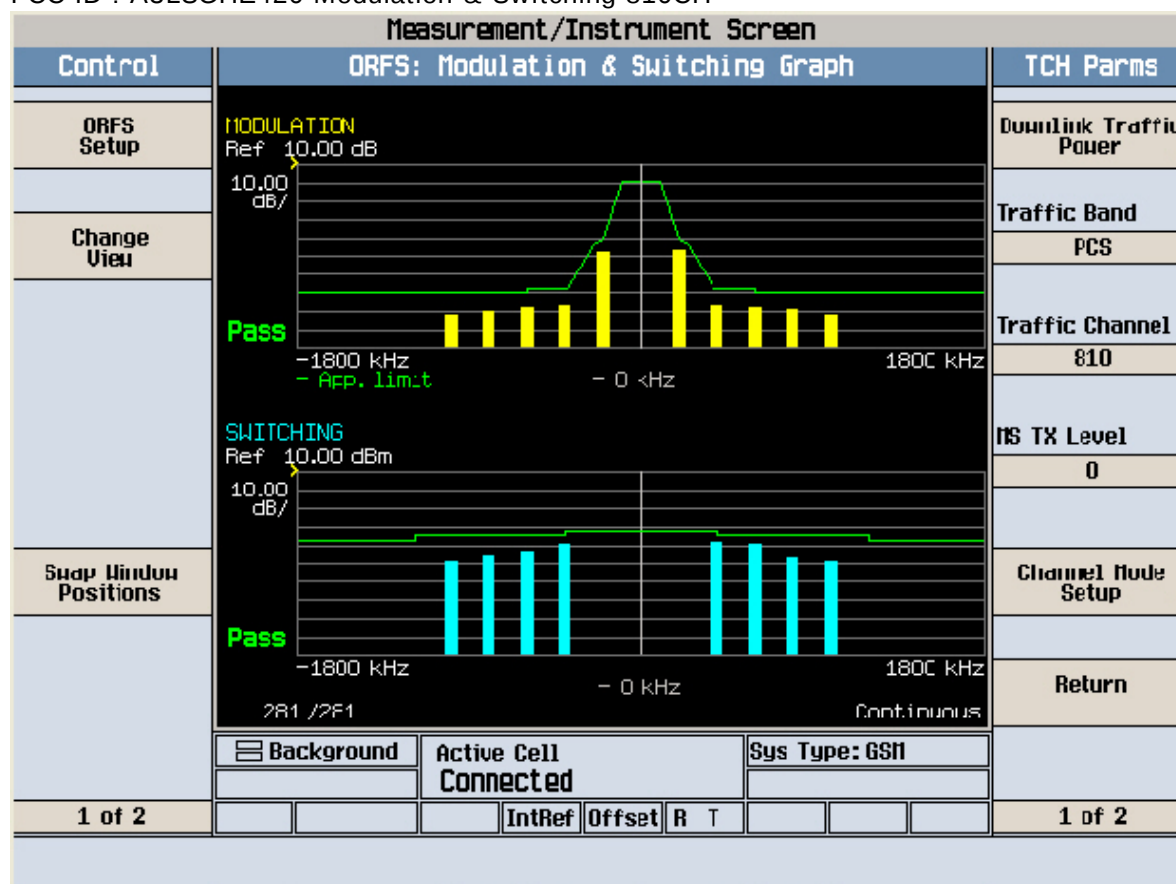
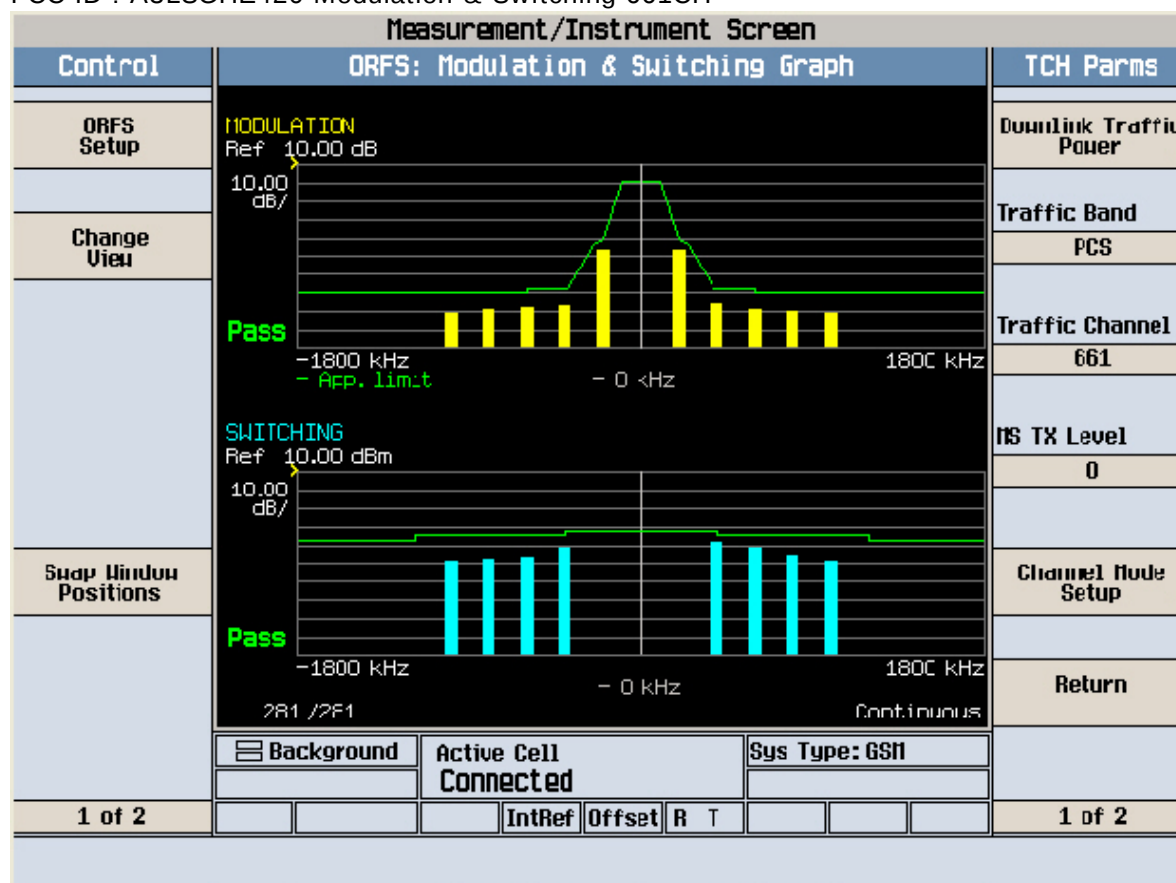
FCC ID : A3LSGHE420 Transmit Power 512CH

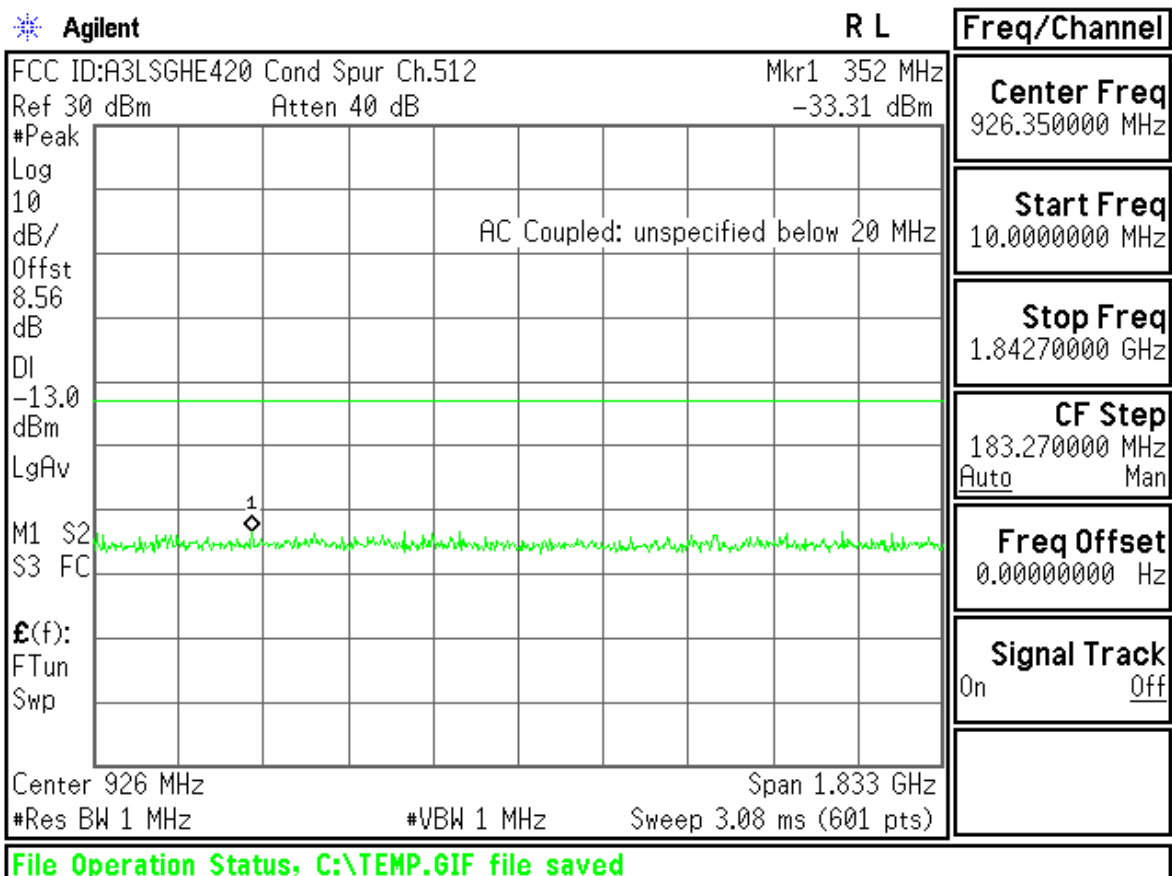
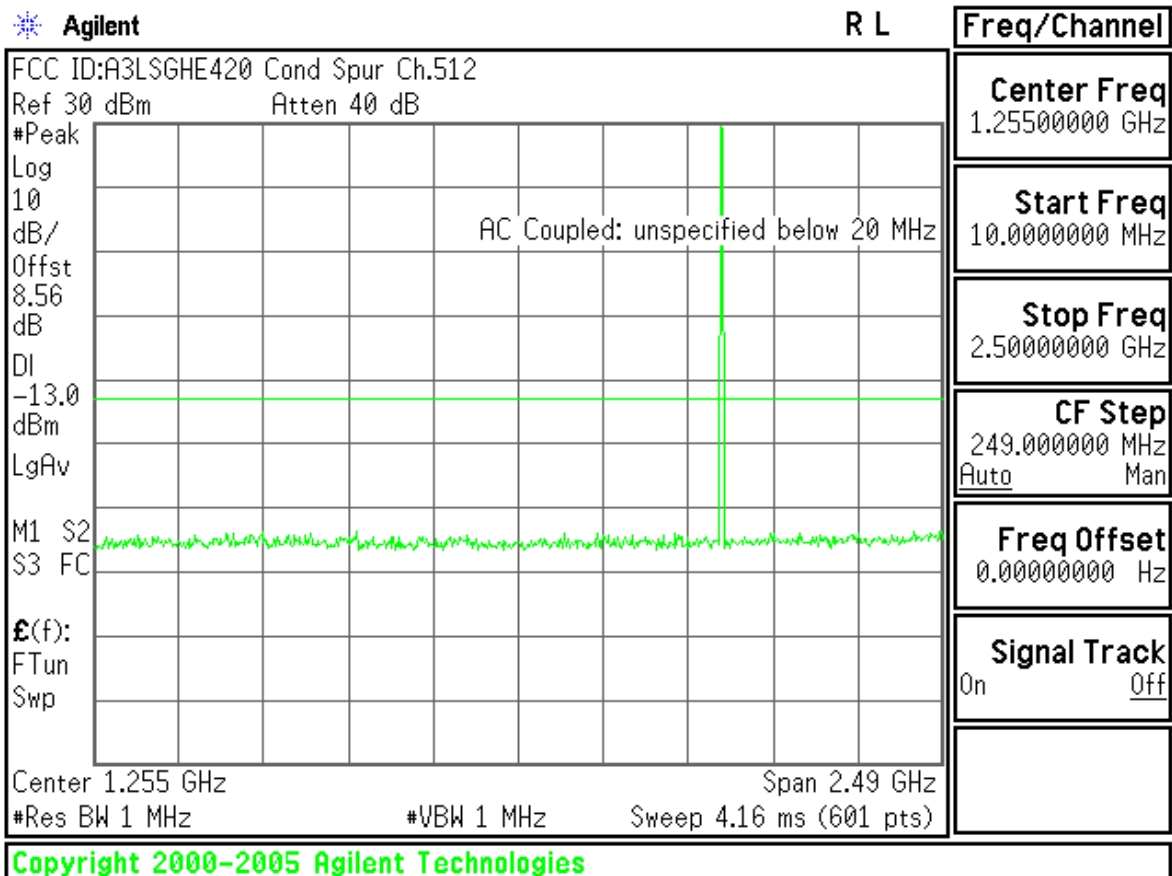
| Measurement/Instrument Screen |              |                                                                                                                                                                                                                                                                                                                                                                                                   |       |                       |        |        |               |                          |              |             |              |         |      |      |       |         |      |      |      |         |      |      |       |           |      |      |      |
|-------------------------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----------------------|--------|--------|---------------|--------------------------|--------------|-------------|--------------|---------|------|------|-------|---------|------|------|------|---------|------|------|-------|-----------|------|------|------|
| Control                       |              | GSM/GPRS Transmit Power                                                                                                                                                                                                                                                                                                                                                                           |       |                       |        |        |               | TCH Parms                |              |             |              |         |      |      |       |         |      |      |      |         |      |      |       |           |      |      |      |
| GSM/GPRS TX Power Setup ▾     |              | GMSK Transmit Power<br><b>29.28</b> dBm                                                                                                                                                                                                                                                                                                                                                           |       |                       |        |        |               | Downlink Traffic Power ▾ |              |             |              |         |      |      |       |         |      |      |      |         |      |      |       |           |      |      |      |
|                               |              |                                                                                                                                                                                                                                                                                                                                                                                                   |       |                       |        |        |               | Traffic Band             |              |             |              |         |      |      |       |         |      |      |      |         |      |      |       |           |      |      |      |
|                               |              | PCS                                                                                                                                                                                                                                                                                                                                                                                               |       |                       |        |        |               |                          |              |             |              |         |      |      |       |         |      |      |      |         |      |      |       |           |      |      |      |
|                               |              | Traffic Channel                                                                                                                                                                                                                                                                                                                                                                                   |       |                       |        |        |               |                          |              |             |              |         |      |      |       |         |      |      |      |         |      |      |       |           |      |      |      |
|                               |              | 512                                                                                                                                                                                                                                                                                                                                                                                               |       |                       |        |        |               |                          |              |             |              |         |      |      |       |         |      |      |      |         |      |      |       |           |      |      |      |
| Swap Window Positions         |              | Phase & Frequency Error                                                                                                                                                                                                                                                                                                                                                                           |       |                       |        |        |               | MS TX Level              |              |             |              |         |      |      |       |         |      |      |      |         |      |      |       |           |      |      |      |
|                               |              | <table><thead><tr><th></th><th>Peak Phase °</th><th>RMS Phase °</th><th>Frequency Hz</th></tr></thead><tbody><tr><td>Minimum</td><td>4.69</td><td>1.79</td><td>-8.97</td></tr><tr><td>Maximum</td><td>7.47</td><td>2.12</td><td>3.82</td></tr><tr><td>Average</td><td>5.77</td><td>1.97</td><td>-2.42</td></tr><tr><td>Pass/Fail</td><td>Pass</td><td>Pass</td><td>Pass</td></tr></tbody></table> |       |                       |        |        |               |                          | Peak Phase ° | RMS Phase ° | Frequency Hz | Minimum | 4.69 | 1.79 | -8.97 | Maximum | 7.47 | 2.12 | 3.82 | Average | 5.77 | 1.97 | -2.42 | Pass/Fail | Pass | Pass | Pass |
|                               | Peak Phase ° |                                                                                                                                                                                                                                                                                                                                                                                                   |       |                       |        |        |               | RMS Phase °              | Frequency Hz |             |              |         |      |      |       |         |      |      |      |         |      |      |       |           |      |      |      |
| Minimum                       | 4.69         |                                                                                                                                                                                                                                                                                                                                                                                                   |       |                       |        |        |               | 1.79                     | -8.97        |             |              |         |      |      |       |         |      |      |      |         |      |      |       |           |      |      |      |
| Maximum                       | 7.47         |                                                                                                                                                                                                                                                                                                                                                                                                   |       |                       |        |        |               | 2.12                     | 3.82         |             |              |         |      |      |       |         |      |      |      |         |      |      |       |           |      |      |      |
| Average                       | 5.77         | 1.97                                                                                                                                                                                                                                                                                                                                                                                              | -2.42 |                       |        |        |               |                          |              |             |              |         |      |      |       |         |      |      |      |         |      |      |       |           |      |      |      |
| Pass/Fail                     | Pass         | Pass                                                                                                                                                                                                                                                                                                                                                                                              | Pass  |                       |        |        |               |                          |              |             |              |         |      |      |       |         |      |      |      |         |      |      |       |           |      |      |      |
|                               |              | 20 / 50                                                                                                                                                                                                                                                                                                                                                                                           |       |                       |        |        |               | Return                   |              |             |              |         |      |      |       |         |      |      |      |         |      |      |       |           |      |      |      |
|                               |              | Continuous                                                                                                                                                                                                                                                                                                                                                                                        |       |                       |        |        |               |                          |              |             |              |         |      |      |       |         |      |      |      |         |      |      |       |           |      |      |      |
| 1 of 2                        |              | Background                                                                                                                                                                                                                                                                                                                                                                                        |       | Active Cell Connected |        |        | Sys Type: GSM |                          |              |             |              |         |      |      |       |         |      |      |      |         |      |      |       |           |      |      |      |
|                               |              |                                                                                                                                                                                                                                                                                                                                                                                                   |       |                       |        |        |               |                          |              |             |              |         |      |      |       |         |      |      |      |         |      |      |       |           |      |      |      |
|                               |              |                                                                                                                                                                                                                                                                                                                                                                                                   |       |                       | IntRef | Offset | R             | T                        |              |             |              |         |      |      |       |         |      |      |      |         |      |      |       |           |      |      |      |
|                               |              |                                                                                                                                                                                                                                                                                                                                                                                                   |       |                       |        |        |               |                          |              | 1 of 2      |              |         |      |      |       |         |      |      |      |         |      |      |       |           |      |      |      |

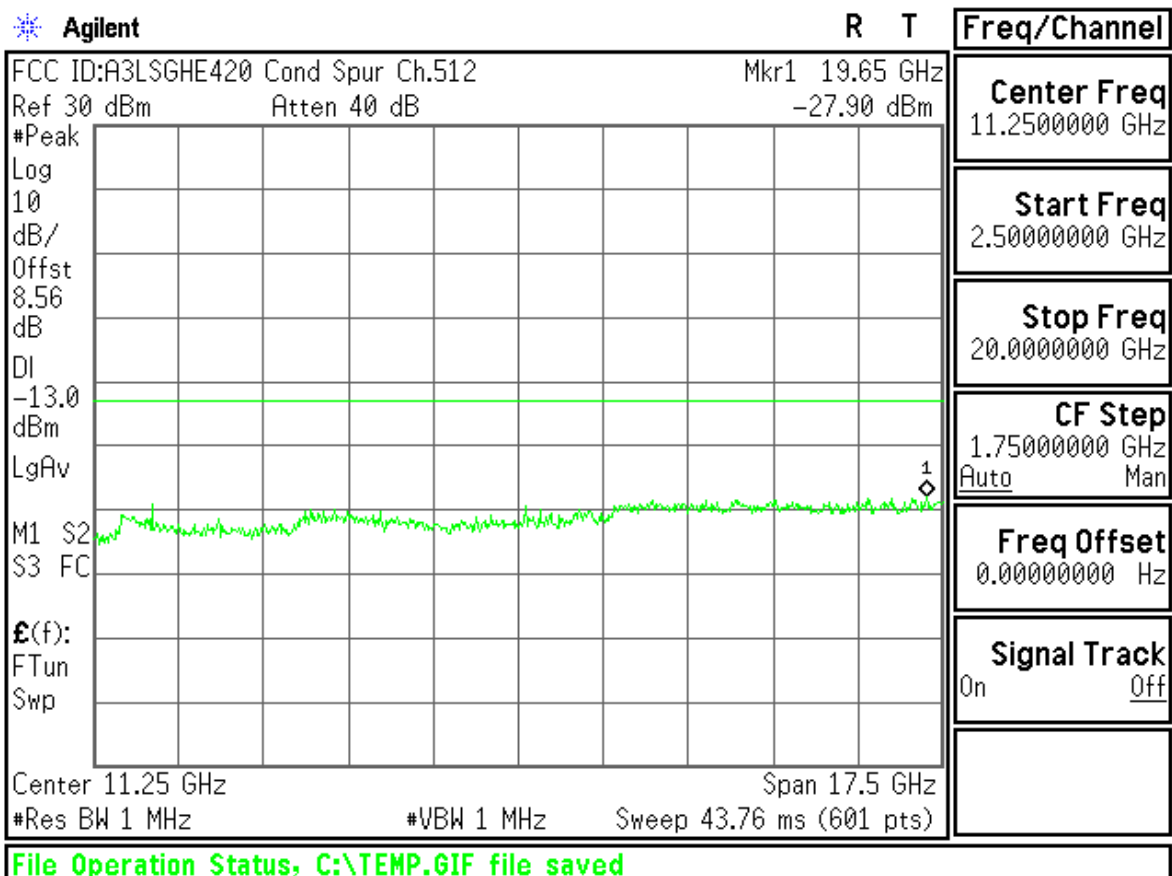
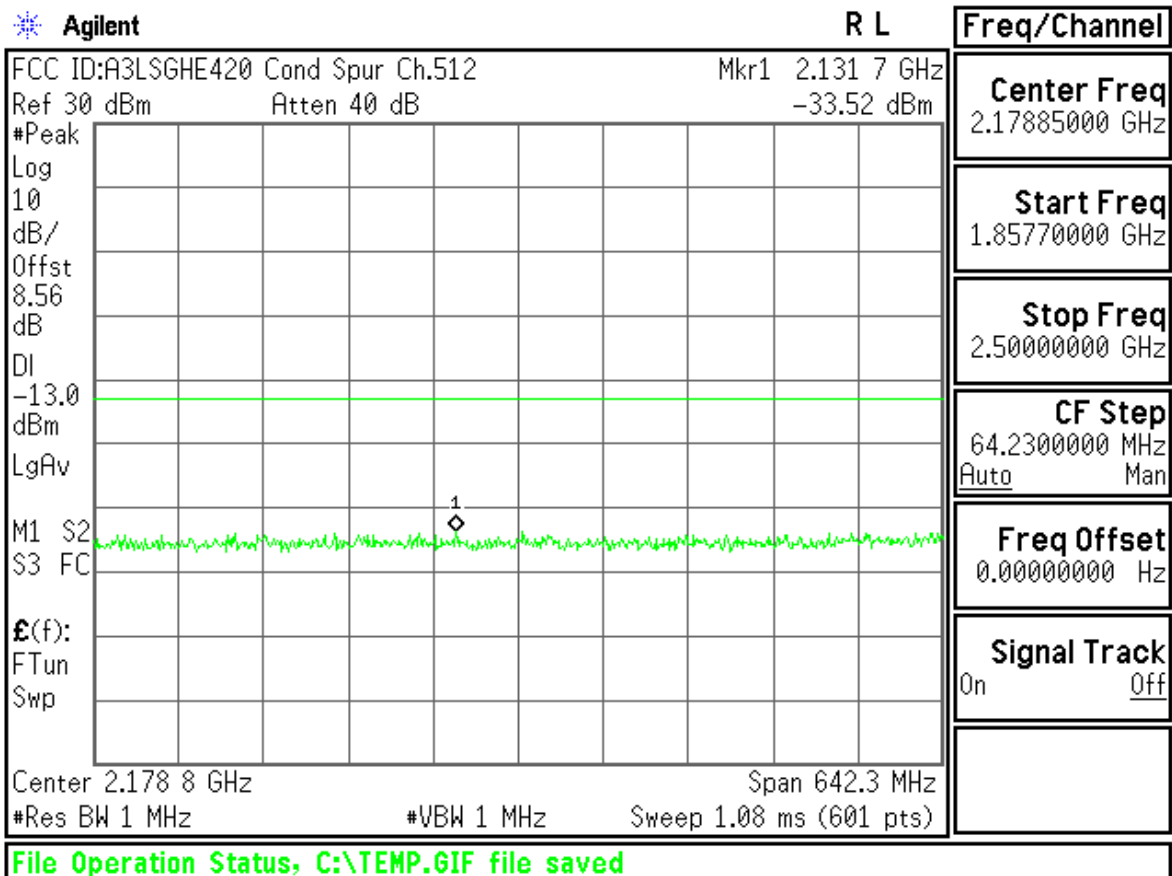


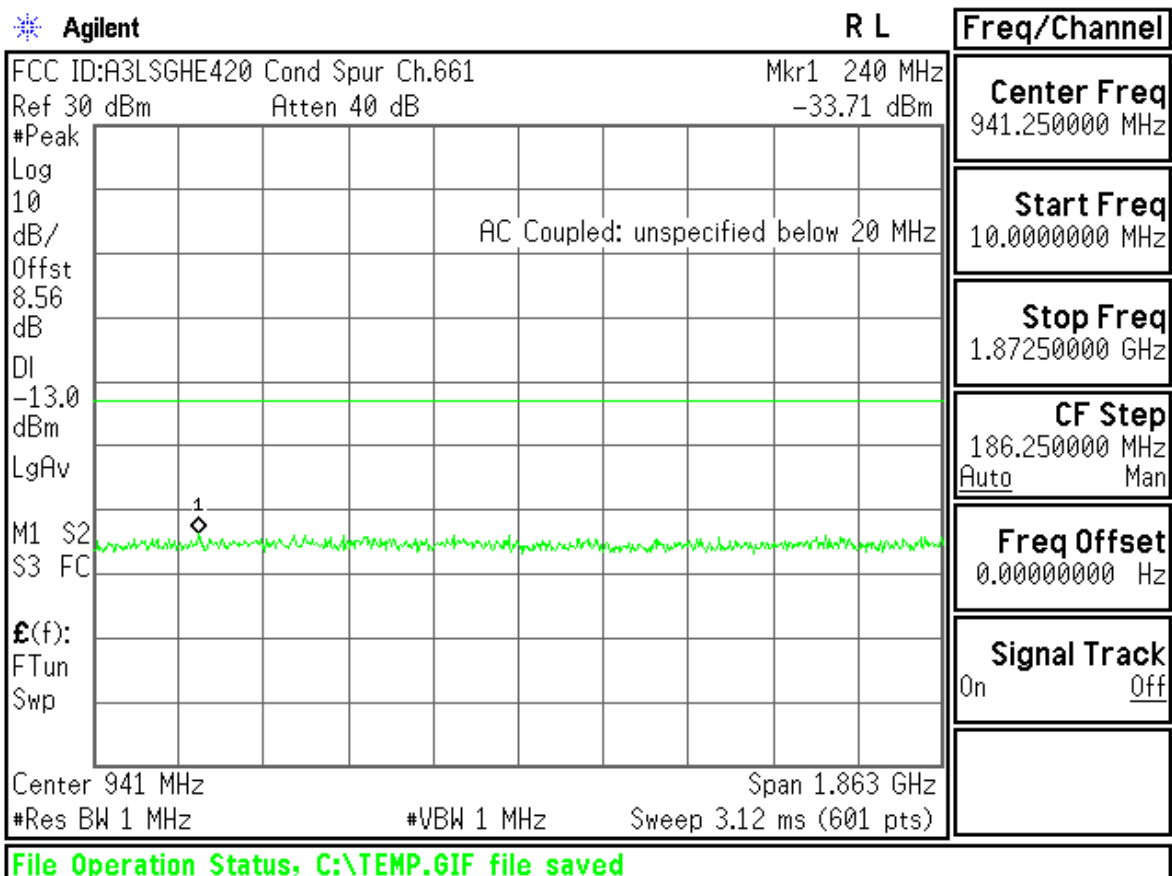
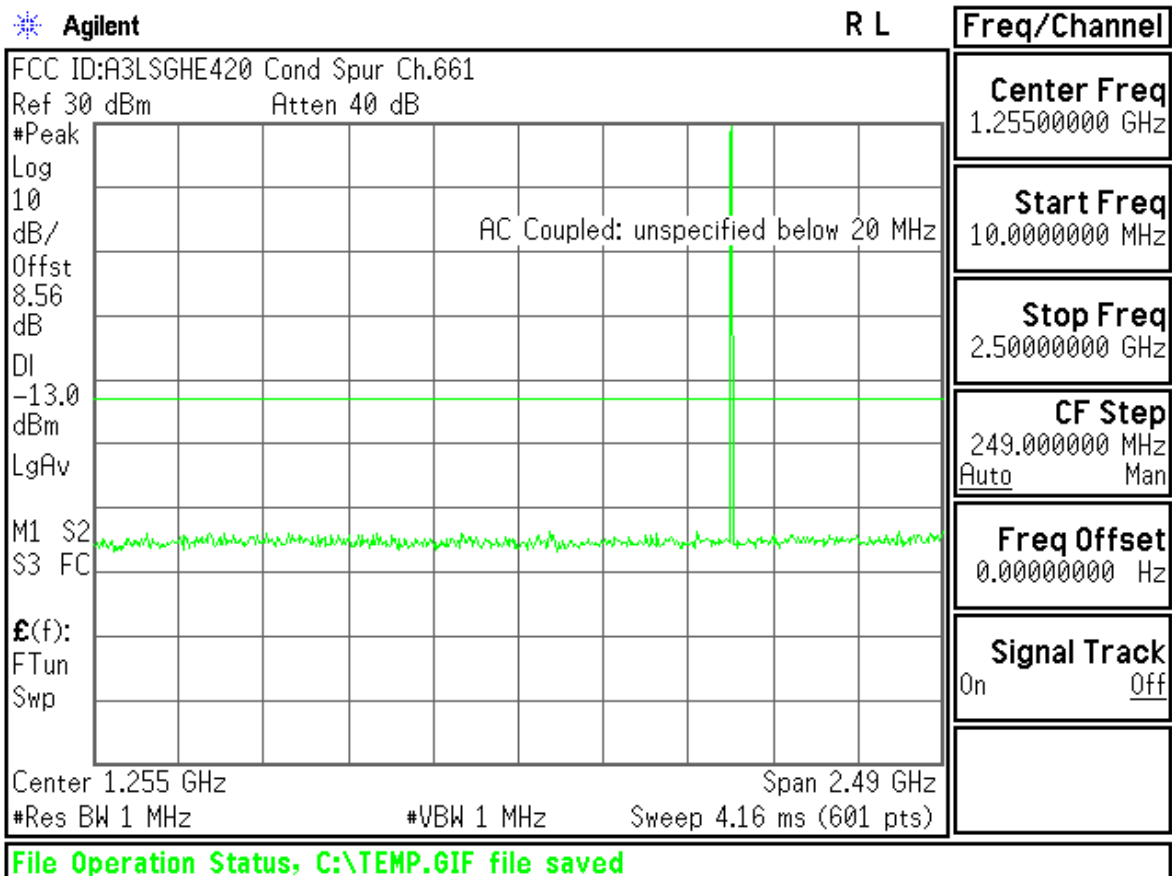


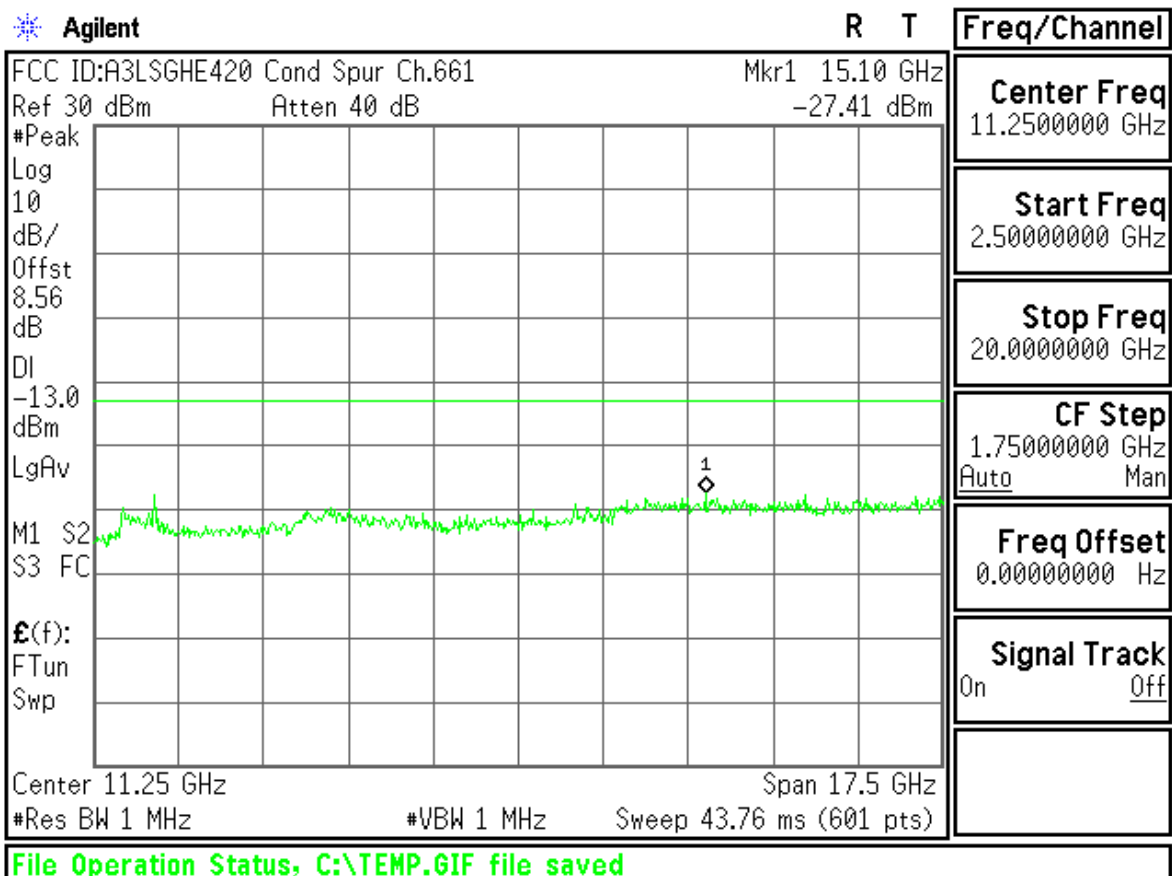
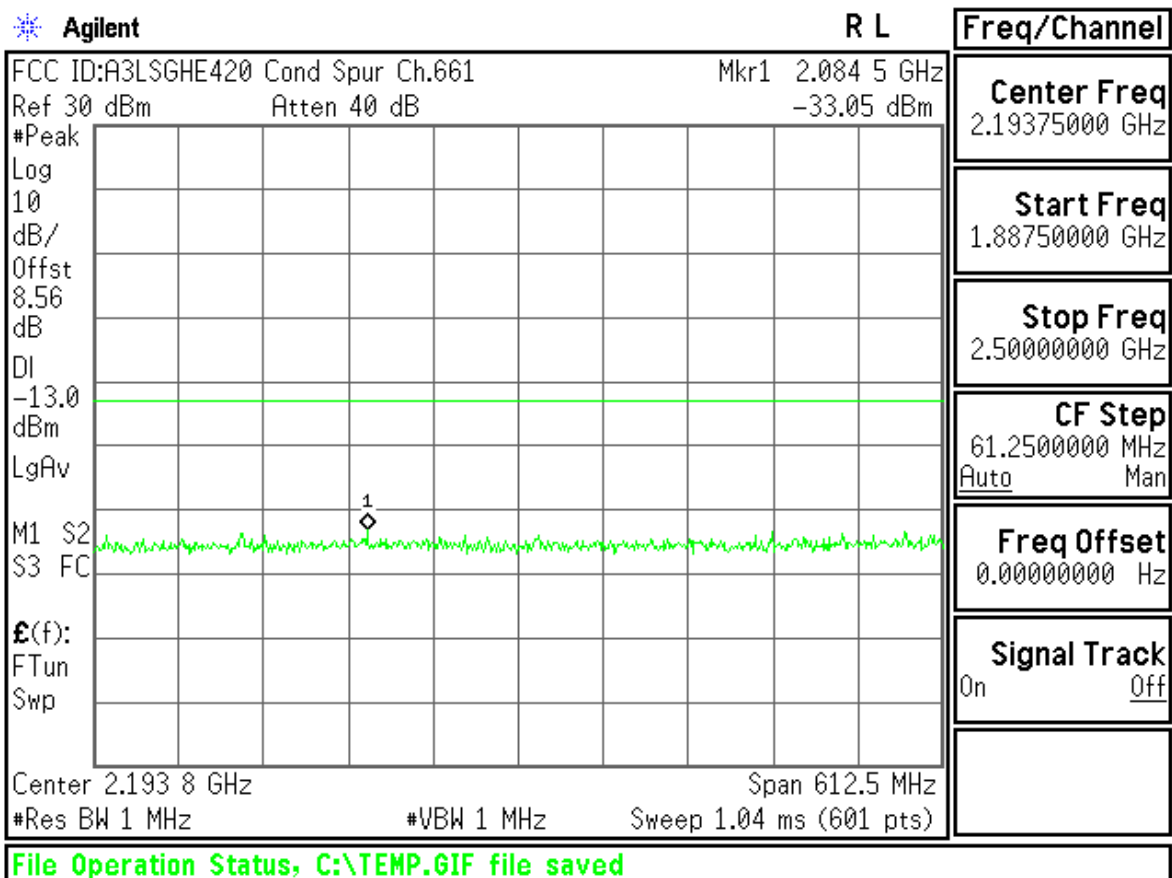


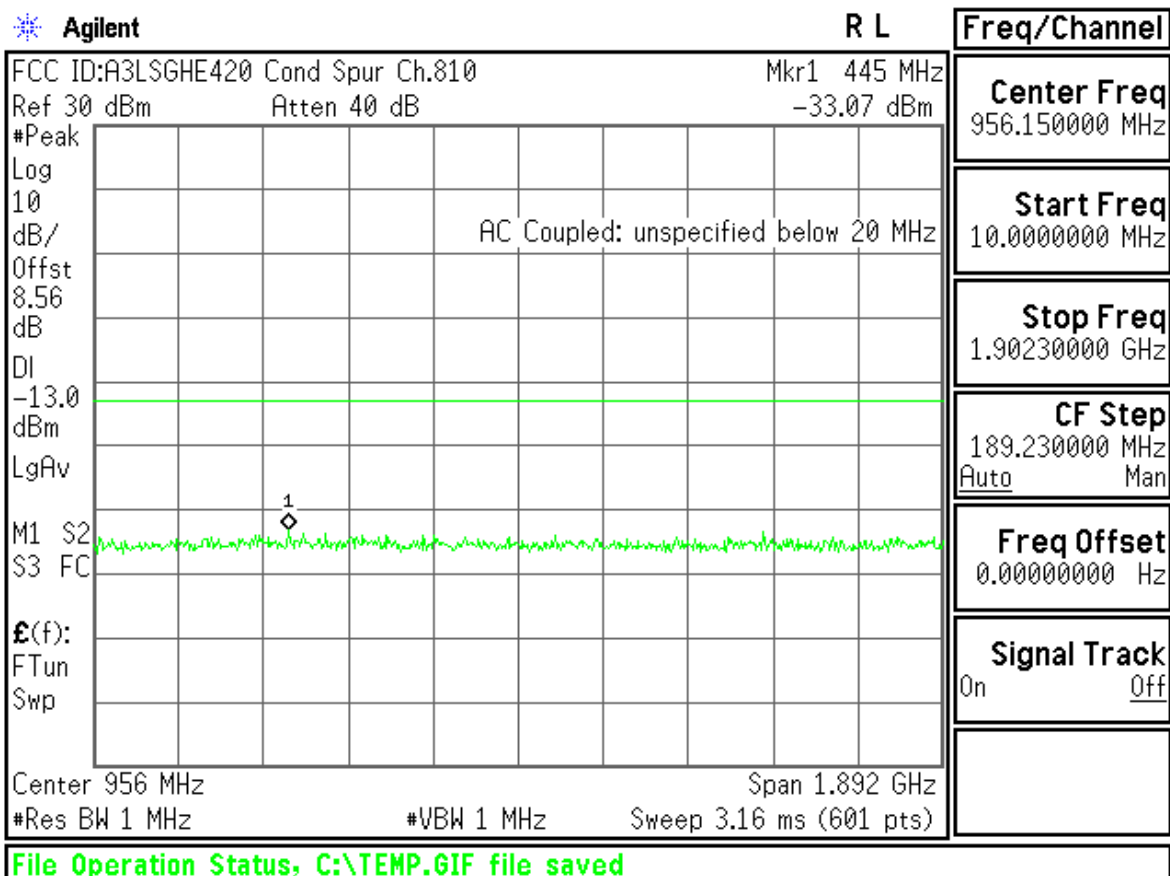
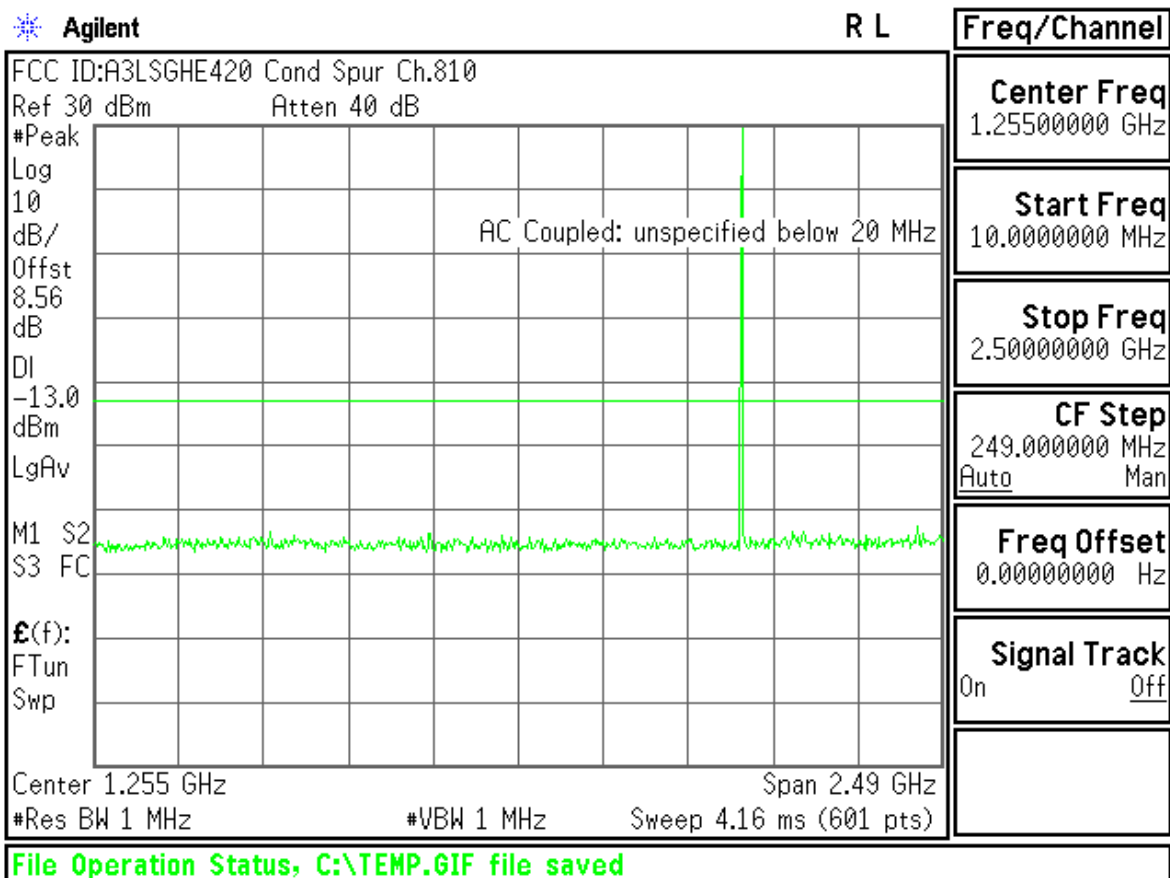


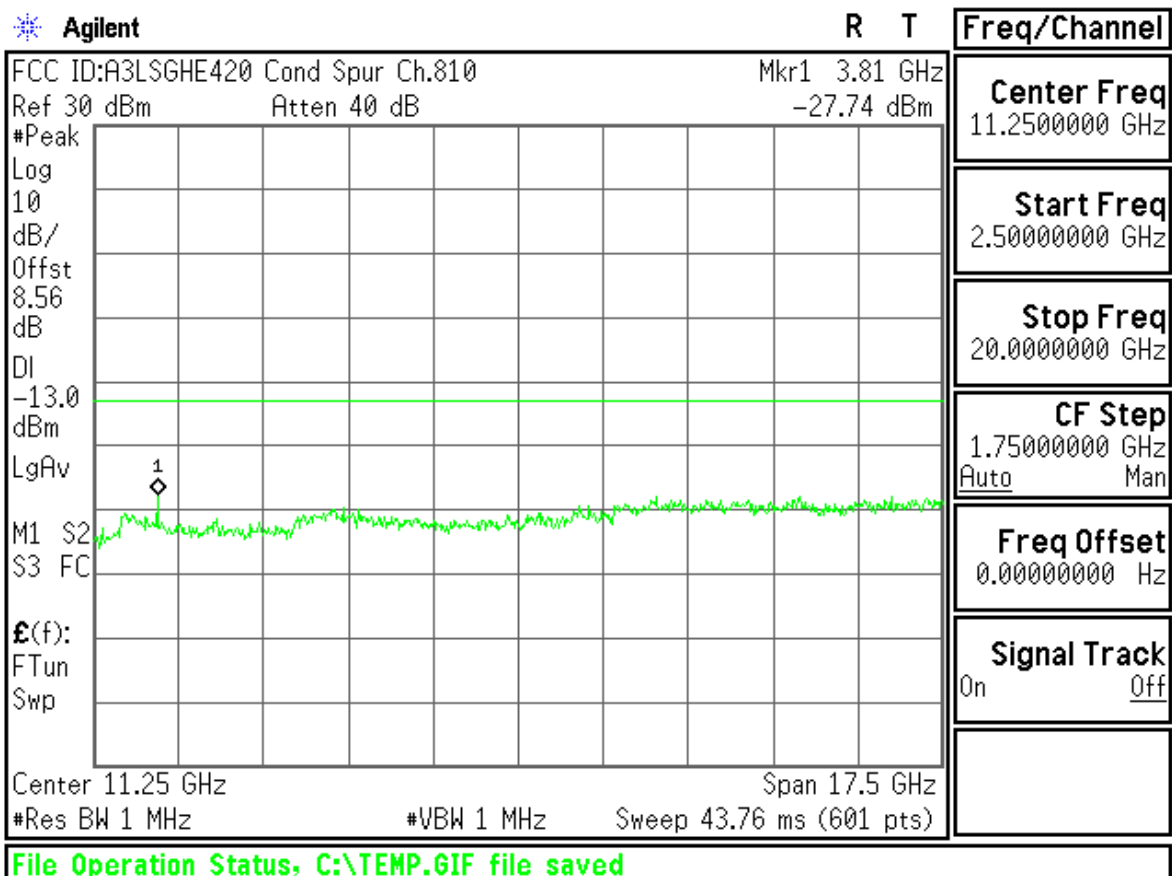
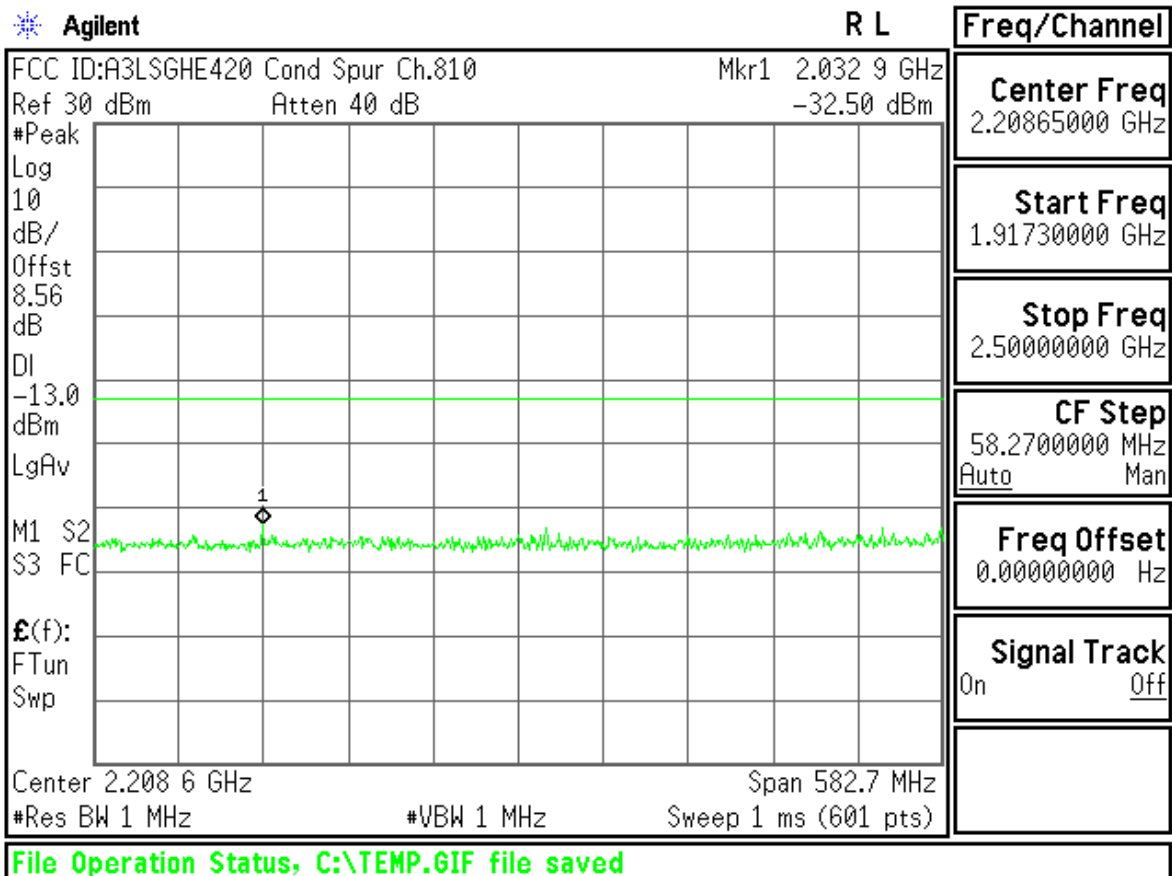


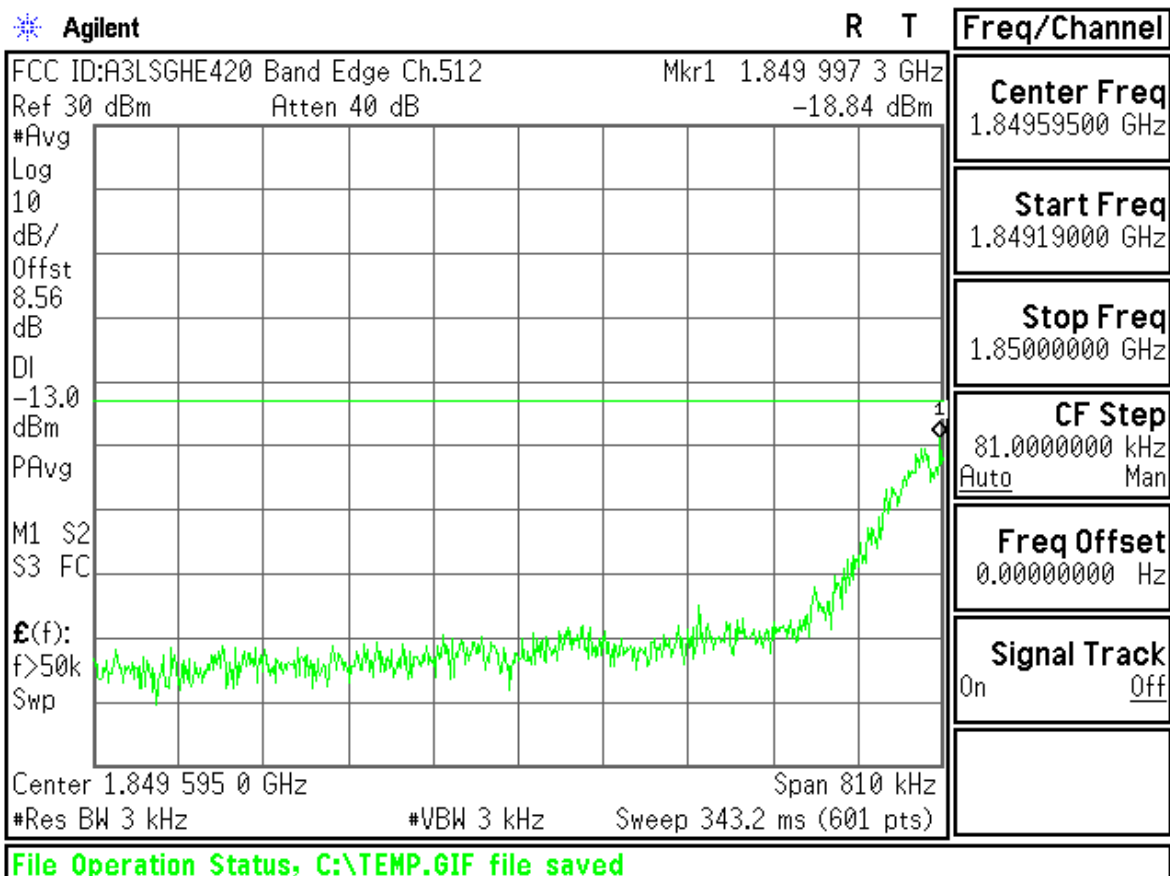
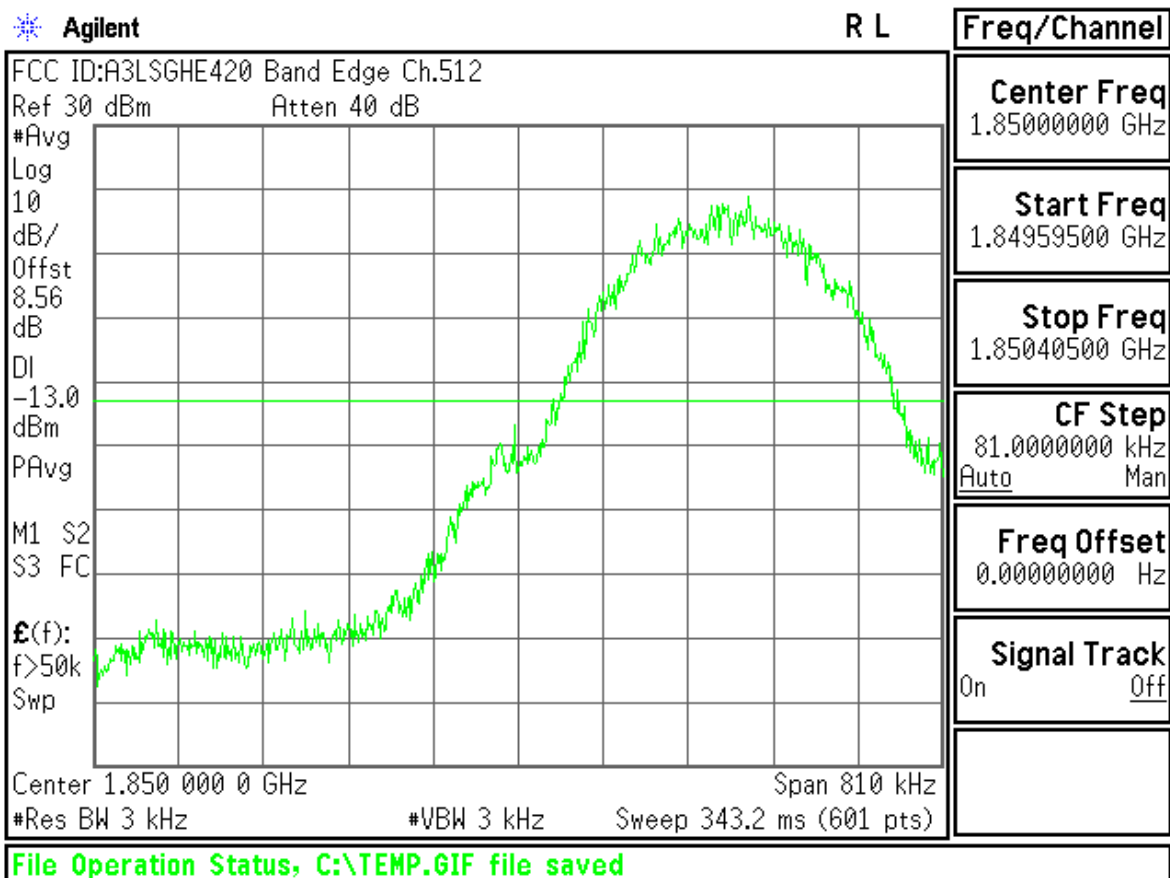












Agilent

R L

Freq/Channel

FCC ID:A3LSGHE420 Band Edge Ch.810

Ref 30 dBm

Atten 40 dB

#Avg

Log

10

dB/

Offst

8.56

dB

DI

-13.0

dBm

PAvg

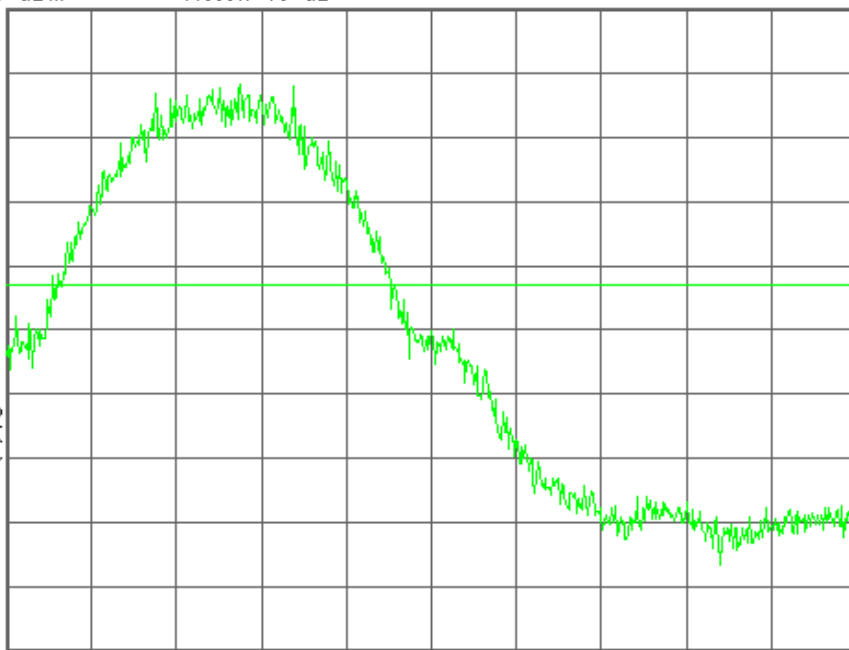
M1 S2

S3 FC

$\mathcal{E}(f)$ :

f>50k

Swp



Center 1.910 000 0 GHz

Span 810 kHz

#Res BW 3 kHz

#VBW 3 kHz

Sweep 343.2 ms (601 pts)

Center Freq  
1.91000000 GHz

Start Freq  
1.90959500 GHz

Stop Freq  
1.91040500 GHz

CF Step  
81.0000000 kHz  
Auto Man

Freq Offset  
0.00000000 Hz

Signal Track  
On Off

File Operation Status, C:\TEMP.GIF file saved

Agilent

R T

Freq/Channel

FCC ID:A3LSGHE420 Band Edge Ch.810

Mkr1 1.910 002 3 GHz

Ref 30 dBm

Atten 40 dB

-18.01 dBm

#Avg

Log

10

dB/

Offst

8.56

dB

DI

-13.0

dBm

PAvg

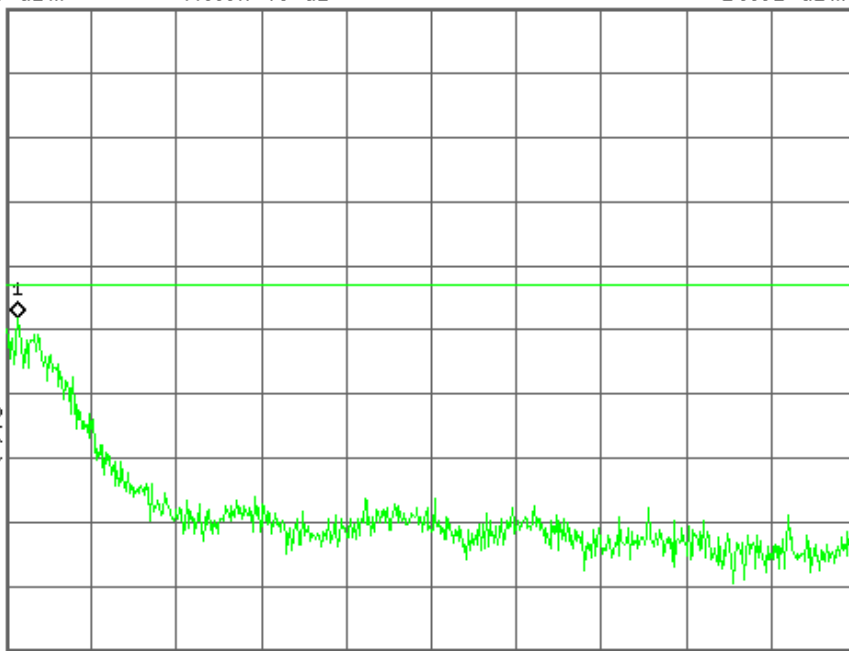
M1 S2

S3 FC

$\mathcal{E}(f)$ :

f>50k

Swp



Center 1.910 405 0 GHz

Span 810 kHz

#Res BW 3 kHz

#VBW 3 kHz

Sweep 343.2 ms (601 pts)

Center Freq  
1.91040500 GHz

Start Freq  
1.91000000 GHz

Stop Freq  
1.91081000 GHz

CF Step  
81.0000000 kHz  
Auto Man

Freq Offset  
0.00000000 Hz

Signal Track  
On Off

File Operation Status, C:\TEMP.GIF file saved