TEST REPORT

DT&C Co., Ltd.
42, Yurim-ro, 154Beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 17042
Tel : 031-321-2664, Fax : 031-321-1664

1. Report No : DRTFCC2003-0086
2. Customer
   - Name : LG Electronics USA
   - Address : 1000 Sylvan Avenue, Englewood Cliffs, New Jersey, United States, 07632
3. Use of Report : FCC Original Grant
4. Product Name / Model Name : LTE Modem / TM13LNNAHK2
   FCC ID : BEJTM13LNNAHK2
5. Test Method Used : KDB971168 D01v03r01, ANSI/TIA-603-E-2016, ANSI C63.26-2015
   Test Specification : §2, §22, §24, §27
6. Date of Test : 2020.02.03 ~ 2020.02.28
7. Testing Environment : Refer to appended test report.
8. Test Result : Refer to the attached test result.

Affirmation	Tested by Name : Inhee Bae (Signature)	Reviewed by Name : GeunKi Son (Signature)

2020 . 03 . 30 .

DT&C Co., Ltd.

If this report is required to confirmation of authenticity, please contact to report@dtnc.net

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Test Report Version

Test Report No.	Date	Description	Revised By	Reviewed by
DRTFCC2003-0086	Mar. 30, 2020	Initial issue	Inhee Bae	GeunKi Son

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1. GENERAL INFORMATION

Applicant Name : LG Electronics USA

Address : 1000 Sylvan Avenue, Englewood Cliffs, New Jersey, United States, 07632

FCC ID : BEJTM13LNNAHK2

FCC Classification : PCS Licensed Transmitter (PCB)

EUT Type : LTE Moedm

Model Name : TM13LNNAHK2

Add Model Name : NA

Supplying power : DC 12 V

Antenna Information : External antenna

Mode	TX Frequency (MHz)	Emission Designator	Modulation	Conducted Power		ERP		EIRP	
				Max power (dBm)	Max power (W)	Max power (dBm)	Max power (W)	Max power (dBm)	Max power (W)
LTE Band 13	782 ~ 782	8M92G7D	QPSK	23.44	0.221	23.03	0.201	-	-
LTE Band 13	782 ~ 782	8M88W7D	16QAM	22.29	0.169	22.17	0.165	-	-
LTE Band 13	779.5 ~ 784.5	4M50G7D	QPSK	23.52	0.225	23.56	0.227	-	-
LTE Band 13	779.5 ~ 784.5	4M49W7D	16QAM	22.21	0.166	22.56	0.180	-	-
LTE Band 5	829 ~ 844	8M96G7D	QPSK	23.33	0.215	25.17	0.329	-	-
LTE Band 5	829 ~ 844	8M94W7D	16QAM	22.14	0.164	24.56	0.286	-	-
LTE Band 5	826.5 ~ 846.5	4M49G7D	QPSK	23.20	0.209	24.70	0.295	-	-
LTE Band 5	826.5 ~ 846.5	4M50W7D	16QAM	22.04	0.160	24.02	0.252	-	-
LTE Band 5	825.5 ~ 847.5	2M70G7D	QPSK	23.22	0.210	24.77	0.300	-	-
LTE Band 5	825.5 ~ 847.5	2M70W7D	16QAM	22.16	0.164	23.63	0.231	-	-
LTE Band 5	824.7 ~ 848.3	1M09G7D	QPSK	23.42	0.220	24.87	0.307	-	-
LTE Band 5	824.7 ~ 848.3	1M09W7D	16QAM	22.55	0.180	24.35	0.272	-	-
LTE Band 4	1720 ~ 1745	17M9G7D	QPSK	24.10	0.257	-	-	21.47	0.140
LTE Band 4	1720 ~ 1745	17M8W7D	16QAM	22.64	0.184	-	-	20.31	0.107
LTE Band 4	1717.5 ~ 1747.5	13M4G7D	QPSK	23.86	0.243	-	-	21.01	0.126
LTE Band 4	1717.5 ~ 1747.5	13M4W7D	16QAM	22.47	0.177	-	-	20.10	0.102
LTE Band 4	1715 ~ 1750	8M96G7D	QPSK	23.98	0.250	-	-	21.09	0.129
LTE Band 4	1715 ~ 1750	8M92W7D	16QAM	22.59	0.182	-	-	20.17	0.104
LTE Band 4	1712.5 ~ 1752.5	4M50G7D	QPSK	23.78	0.239	-	-	21.29	0.135
LTE Band 4	1712.5 ~ 1752.5	4M50W7D	16QAM	22.41	0.174	-	-	20.44	0.111
LTE Band 4	1711.5 ~ 1753.5	2M69G7D	QPSK	23.72	0.236	-	-	21.18	0.131
LTE Band 4	1711.5 ~ 1753.5	2M70W7D	16QAM	22.47	0.177	-	-	20.35	0.108
LTE Band 4	1710.7 ~ 1754.3	1M09G7D	QPSK	23.79	0.239	-	-	21.35	0.136
LTE Band 4	1710.7 ~ 1754.3	1M09W7D	16QAM	22.78	0.190	-	-	20.70	0.117
LTE Band 2	1860 ~ 1900	17M9G7D	QPSK	23.83	0.242	-	-	23.82	0.241
LTE Band 2	1860 ~ 1900	17M9W7D	16QAM	22.85	0.193	-	-	22.50	0.178
LTE Band 2	1857.5 ~ 1902.5	13M4G7D	QPSK	23.81	0.240	-	-	23.70	0.234
LTE Band 2	1857.5 ~ 1902.5	13M4W7D	16QAM	22.68	0.185	-	-	22.50	0.178
LTE Band 2	1855 ~ 1905	8M93G7D	QPSK	23.90	0.245	-	-	23.47	0.222
LTE Band 2	1855 ~ 1905	8M94W7D	16QAM	22.77	0.189	-	-	22.52	0.179
LTE Band 2	1852.5 ~ 1907.5	4M50G7D	QPSK	23.73	0.236	-	-	23.70	0.234
LTE Band 2	1852.5 ~ 1907.5	4M49W7D	16QAM	22.59	0.182	-	-	22.41	0.174
LTE Band 2	1851.5 ~ 1908.5	2M70G7D	QPSK	23.88	0.244	-	-	23.23	0.210
LTE Band 2	1851.5 ~ 1908.5	2M70W7D	16QAM	22.70	0.186	-	-	21.95	0.157
LTE Band 2	1850.7 ~ 1909.3	1M09G7D	QPSK	23.85	0.243	-	-	23.36	0.217
LTE Band 2	1850.7 ~ 1909.3	1M09W7D	16QAM	22.94	0.197	-	-	22.59	0.182

2. INTRODUCTION

2.1 EUT DESCRIPTION

The Equipment Under Test (EUT) supports CDMA/LTE

2.2. EUT CAPABILITIES

This EUT contains the following capabilities:
850/1900 CDMA, Multi-band LTE.

2.3. TESTING ENVIRONMENT

Ambient Condition	
▪ Temperature	+22 ℃ ~ +24 ℃
▪ Relative Humidity	42 % ~ 45 %

2.4 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.

2.5. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with requirements of ANSI C 63.4-2014. All measurement uncertainty values are shown with a coverage factor of *k* = 2 to indicate a 95 % level of confidence.

Parameter	Measurement uncertainty
Radiated Disturbance (Below 1 GHz)	5.1 dB (The confidence level is about 95 %, k = 2)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.4 dB (The confidence level is about 95 %, k = 2)
Radiated Disturbance (Above 18 GHz)	5.3 dB (The confidence level is about 95 %, k = 2)

2.6. TEST FACILITY

DT&C Co., Ltd.

The 3 m test site and conducted measurement facility used to collect the radiated data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042.
The test site comply with the requirements of § 2.948 according to ANSI 63.4-2014.

- FCC & IC MRA Accredited Test Firm No. : KR0034

- ISED #: 5740A

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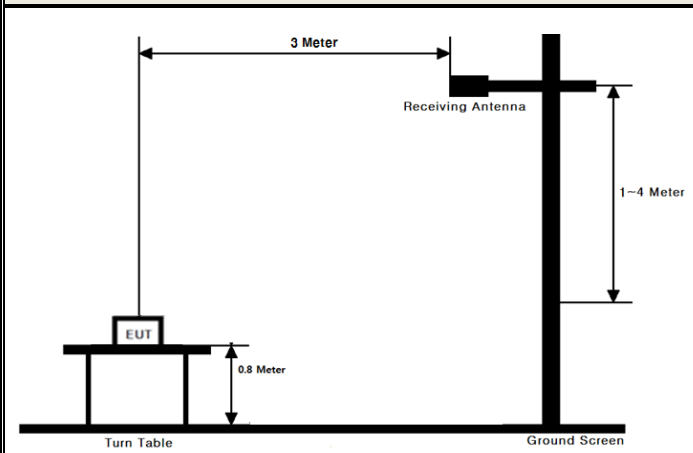
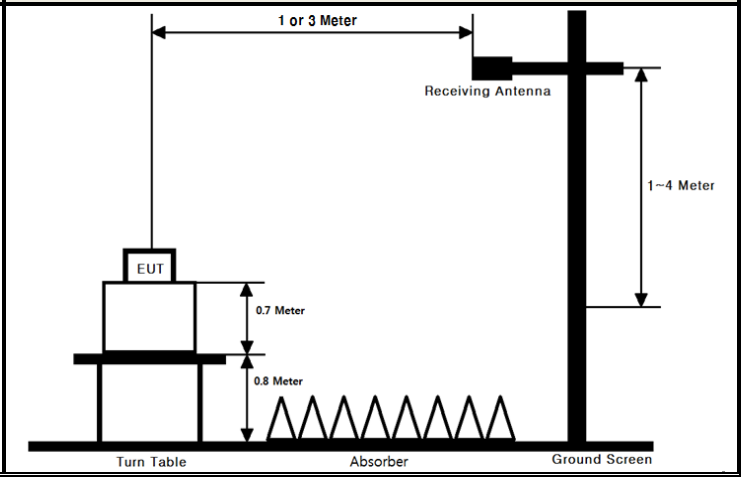
3. DESCRIPTION OF TESTS

3.1 ERP & EIRP (Effective Radiated Power & Equivalent Isotropic Radiated Power)

Test Set-up

Below 1GHz	Above 1GHz
	

These measurements were performed at 3 m test site. The equipment under test is placed on a non-conductive table 0.8 or 1.5 meters above a turntable which is flush with the ground plane and 3 meters from the receive antenna. For measurements above 1 GHz absorbers are placed on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1 GHz, the absorbers are removed.

Test Procedure

- **ANSI/TIA-603-E-2016 - Section 2.2.17**
- **KDB971168 D01v03 - Section 5.2.2**
- **ANSI C63.26-2015 – Section 5.2.4.4.1**

Test setting

1. Set span to 2 x to 3 x the OBW.
2. Set RBW = 1% to 5% of the OBW.
3. Set VBW ≥ 3 x RBW.
4. Set number of points in sweep ≥ 2 × span / RBW.
5. Sweep time:
   1) Set = auto-couple, or
   2) Set ≥ [10 × (number of points in sweep) × (transmission period)] for single sweep (automation-compatible) measurement. Transmission period is the on and off time of the transmitter.
6. Detector = power averaging (rms).
7. If the EUT can be configured to transmit continuously, then set the trigger to free run.
8. If the EUT cannot be configured to transmit continuously, then use a sweep trigger with the level set to enable triggering only on full power bursts and configure the EUT to transmit at full power for the entire duration of each sweep. Verify that the sweep time is less than or equal to the transmission burst duration. Time gating can also be used under similar constraints (i.e., configured such that measurement data is collected only during active full-power transmissions).
9. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. To accurately determine the average power over multiple symbols, it can be necessary to increase the number of traces to be averaged above 100 or, if using a manually configured sweep time, increase the sweep time.

10. Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band or channel power measurement function, with the band/channel limits set equal to the OBW band edges. If the instrument does not have a band or channel power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

The receiver antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer.

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 terminal of the substitute antenna is measured.

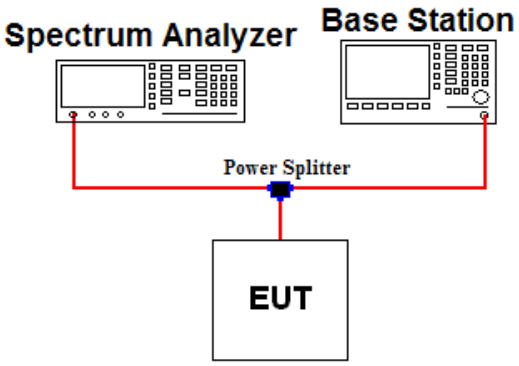
The ERP/EIRP is calculated using the following formula:

ERP/EIRP = The conducted power at the substitute antenna`s terminal [dBm] + Substitute Antenna gain [dBd for ERP , dBi for EIRP]

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

3.2 PEAK TO AVERAGE RATIO

Test set-up



Test Procedure

- **KDB971168 D01v03 - Section 5.7.2**
- **ANSI C63.26-2015 – Section 5.2.3.4**

A peak to average ratio measurement is performed at the conducted port of the EUT.
The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The present of time the signal spends at or above the level defines the probability for that particular power level.

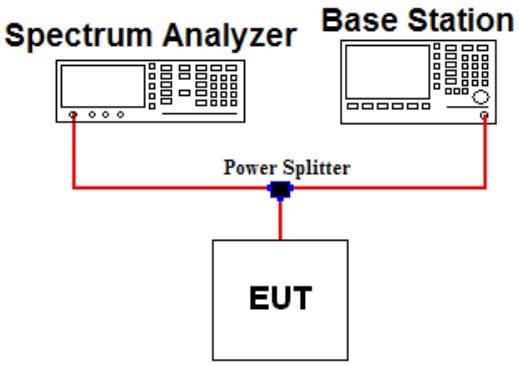
Test setting

The spectrum Analyzer`s CCDF measurement function is enabled.

1. Set resolution/measurement bandwidth ≥ OBW or specified reference bandwidth.
2. Set the number of counts to a value that stabilizes the measured CCDF curve.
3. Set the measurement interval as follows:
   1) For continuous transmissions, set to the greater of [10 × (number of points in sweep) × (transmission symbol period)] or 1 ms.
   2) For burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize. Set the measurement interval to a time that is less than or equal to the burst duration.
   3) If there are several carriers in a single antenna port, the peak power shall be determined for each individual carrier (by disabling the other carriers while measuring the required carrier) and the total peak power calculated from the sum of the individual carrier peak powers.
4. Record the maximum PAPR level associated with a probability of 0.1%.
5. The peak power level is calculated form the sum of the PAPR value from step d) to the measured average power.

3.3 OCCUPIED BANDWIDTH.

Test set-up



Test Procedure

- **KDB971168 D01v03 - Section 4.3**
- **ANSI C63.26-2015 – Section 5.4.4**

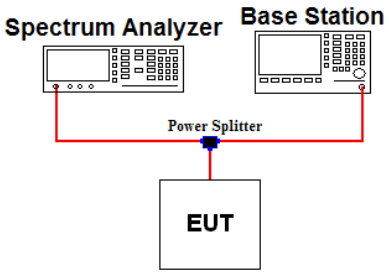
The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power of a given emission.

Test setting

1. The signal analyzer`s automatic bandwidth measurement capability was used to perform the 99 % occupied bandwidth and the 26 dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 ~ 5 % of the expected OBW & VBW ≥ 3 X RBW
3. Detector = Peak
4. Trance mode = Max hold
5. Sweep = Auto couple
6. The trace was allowed to stabilize
7. If necessary, step 2 ~ 6 were repeated after changing the RBW such that it would be within 1 ~ 5 % of the 99 % occupied bandwidth observed in step 6.

3.4 BAND EDGE EMISSIONS AT ANTENNA TERMINAL

Test set-up



Test Procedure

- **KDB971168 D01v03 - Section 6**
- **ANSI C63.26-2015 – Section 5.7**

All out of band emissions are measured by means of a calibrated spectrum analyzer. The EUT was setup to maximum output power at its lowest and highest channel with all bandwidths, modulations and RB configurations.

The power of any spurious emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log(P) dB.

Test setting

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW ≥ 1 % of the emission bandwidth
4. VBW ≥ 3 X RBW
5. Detector = RMS & Trace mode = Max hold
6. Sweep time = Auto couple or 1 s for band edge
7. Number of sweep point ≥ 2 X span / RBW
8. The trace was allowed to stabilize

Note 1: Per Part 22.917(b)(1) / 24.238(b) / 27.53(h) in the 1 MHz 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 to demonstrate compliance with the out-of-band emissions limit.
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.

Note 2: Per Part 27(g) for operations in the 600 MHz band and the 698-746 MHz band, compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

Note 3: Per Part 27.53(c.5) for operations in the 776-788 MHz band, compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

Note 4: Per Part 27.53(c.4) for all frequencies between 763-775 MHz and 793-805 MHz, the FCC limit is 65 + 10log10(P[Watts])= -35dBm in a 6.25kHz bandwidth

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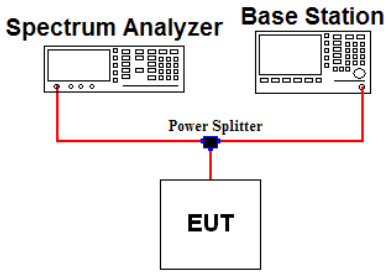
Note 5: Per part 27.53(m)(6) in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the 1 MHz band is 2495-2496 MHz, in which case a resolution bandwidth of at least one percent may be employed.

3.5 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL

Test set-up



Test Procedure

- **KDB971168 D01v03 - Section 6**
- **ANSI C63.26-2015 – Section 5.7**

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The EUT was setup to maximum output power at its low, middle, high channel with all bandwidths, modulations and RB configurations. The spectrum is scanned from 9 kHz up to a frequency including its 10th harmonic.

The power of any spurious emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log(P) dB.

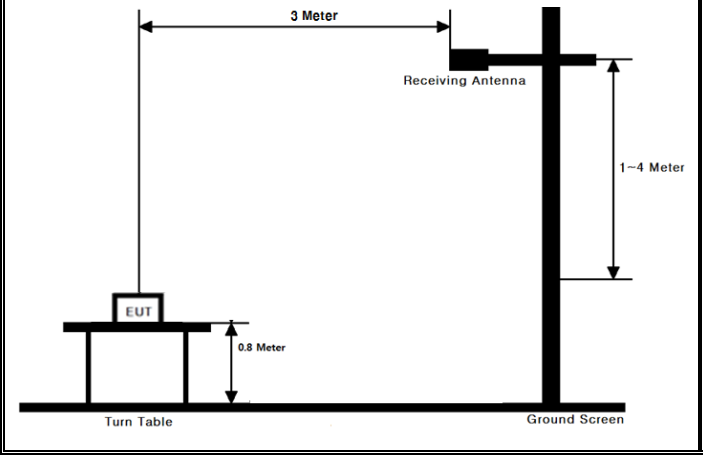
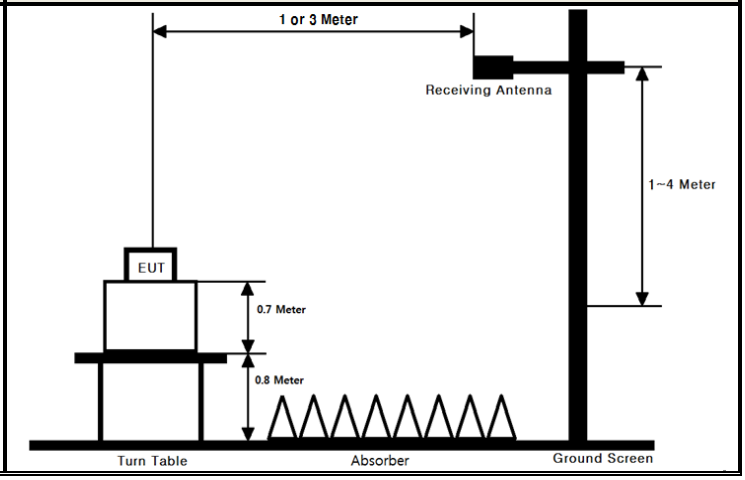
Test setting

1. RBW = 100 kHz(Below 1 GHz) or 1 MHz(Above 1 GHz) & VBW ≥ 3 X RBW (Refer to Note 1)
2. Detector = RMS & Trace mode = Max hold
3. Sweep time = Auto couple
4. Number of sweep point ≥ 2 X span / RBW
5. The trace was allowed to stabilize

Note 1: Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1GHz and 1MHz or greater for frequencies greater than 1GHz.

3.6 UNDESIRABLE EMISSIONS

Test Set-up

Below 1GHz	Above 1GHz
	

These measurements were performed at 3 m test site. The equipment under test is placed on a non-conductive table 0.8 or 1.5 meters above a turntable which is flush with the ground plane and 3 meters from the receive antenna. For measurements above 1 GHz absorbers are placed on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1 GHz, the absorbers are removed.

Test Procedure

- **ANSI/TIA-603-E-2016 - Section 2.2.12**
- **KDB971168 D01v03 - Section 5.8**
- **ANSI C63.26-2015 – Section 5.5**

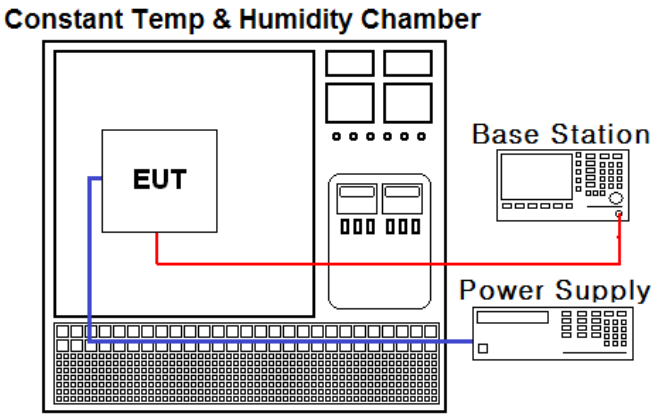
Test setting

1. RBW = 100 kHz for below 1 GHz and 1 MHz for above 1 GHz / VBW ≥ 3 X RBW
2. Detector = RMS & Trace mode = Max hold
3. Sweep time = Auto couple
4. Number of sweep point ≥ 2 X span / RBW
5. The trace was allowed to stabilize

The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer.
For radiated power measurements below 1 GHz, 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 spectrum analyzer reading.
For radiated power measurements above 1 GHz, a Horn antenna was substituted in place of the EUT. This Horn antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same spectrum analyzer reading. The difference between the gain of the horn and an isotropic antenna are taken into consideration.
This measurement was performed with the EUT oriented in 3 orthogonal axis.

3.7 FREQUENCY STABILITY

Test Set-up



Test Procedure

- **ANSI/TIA-603-E-2016**
- **KDB971168 D01v03 - Section 9**

The frequency stability of the transmitter is measured by:

a.) **Temperature:**
The temperature is varied from - 30 °C to + 50 °C using an environmental chamber.

b.) **Primary Supply Voltage:**
The primary supply voltage is varied from 85 % to 115 % of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

Specification:

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block for Part 24, 27. The frequency stability of the transmitter shall be maintained within ± 0.000 25 % (± 2.5 ppm) of the center frequency for Part 22.

Time Period and Procedure:

1. The carrier frequency of the transmitter is measured at room temperature.
(20 °C to provide a reference)

2. 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 is made within one minute after applying power to the transmitter.

3. Frequency measurements are made at 10 °C intervals ranging from -30 °C to +50 °C.
A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

4. LIST OF TEST EQUIPMENT

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal. Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent Technologies	N9020A	19/12/16	20/12/16	MY48010133
Spectrum Analyzer	Agilent Technologies	N9020A	19/12/16	20/12/16	MY49060056
DC power supply	Agilent Technologies	66332A	19/06/25	20/06/25	MY43001173
Multimeter	FLUKE	17B+	19/12/16	20/12/16	36390701WS
Power Splitter	Anritsu	K241B	19/12/16	20/12/16	1301182
Temp & Humi	SJ Science	SJ-TH-S50	19/06/25	20/06/25	U5542113
Radio Communication Analyzer	Anritus	MT8820C	19/06/26	20/06/26	6201127429
Thermohygrometer	BODYCOM	BJ5478	19/12/18	20/12/18	120612-2
Thermohygrometer	BODYCOM	BJ5478	19/12/18	20/12/18	120612-1
Signal Generator	Rohde Schwarz	SMBV100A	19/12/16	20/12/16	255571
Signal Generator	ANRITSU	MG3695C	19/12/16	20/12/16	173501
Loop Antenna	ETS-Lindgren	6502	19/09/18	21/09/18	00226186
Bilog Antenna	Schwarzbeck	VULB 9160	19/04/23	21/04/23	9160-3362
Dipole Antenna	Schwarzbeck	VHA9103	18/04/13	20/04/13	2117
Dipole Antenna	Schwarzbeck	UHA9105	18/04/13	20/04/13	2262
HORN ANT	ETS	3117	18/05/10	20/05/10	00140394
HORN ANT	A.H.Systems	SAS-574	19/07/03	21/07/03	155
PreAmplifier	H.P	8447D	19/12/16	20/12/16	2944A07774
PreAmplifier	Agilent	8449B	19/06/27	20/06/27	3008A02108
High-pass filter	Wainwright	WHKX12-935-1000-15000-40SS	19/06/24	20/06/24	7
High-pass filter	Wainwright	WHKX12-2580-3000-18000-80SS	19/06/24	20/06/24	4
Cable	DTNC	Cable	20/01/16	21/01/16	M-01
Cable	DTNC	Cable	20/01/16	21/01/16	M-02
Cable	Junkosha	MWX315	20/01/16	21/01/16	M-05
Cable	Junkosha	MWX221	20/01/16	21/01/16	M-06
Cable	DTNC	Cable	20/01/16	21/01/16	RF-10

Note1: The measurement antennas were calibrated in accordance to the requirements of ANSI C63.5-2017.
Note2: The cable is not a regular calibration item, so it has been calibrated by DT & C itself.

5. SUMMARY OF TEST RESULTS

FCC Part	Section(s)	Test Description	Test Limit	Test Condition	Status Note 1
2.1046	-	Conducted Output Power	N/A	Conducted	C
2.1049	RSS-GEN[6.7]	Occupied Bandwidth	N/A		C
24.232(d) 27.50(d.5)	RSS-130 [4.6] RSS-132 [5.4] RSS-133 [6.4] RSS-139 [6.5]	Peak to Average Ratio	< 13 dB		C
2.1051 22.917(a) 24.238(a) 27.53(c) 27.53(h)	RSS-130 [4.7] RSS-132 [5.5] RSS-133 [6.5] RSS-139 [6.6]	Band Edge / Conducted Spurious Emissions	> 43 + 10log$_{10}$ (P) dB at Band edge and for all out-of-band emissions		C
27.53(c.4)	RSS-130 [4.7.2]	Undesirable Emissions in 763 ~ 775MHz & 793 ~ 805MHz	< 65 + 10 log10(P) dB		C
2.1055 22.355 24.235 27.54	RSS-130 [4.5] RSS-132 [5.3] RSS-133 [6.3] RSS-139 [6.4]	Frequency Stability	< 2.5 ppm (Part 22) Fundamental emissions must stay within Authorized frequency block (Part 24, 27)		C
27.50(b.10)	RSS-130 [4.6]	Radiated Output Power	< 3 Watts max. ERP (B13)	Radiated	C
22.913(a.5)	RSS-132 [5.4]	Radiated Output Power	< 7 Watts max. ERP (B5)		C
27.50(d.4)	RSS-139 [6.5]	Radiated Output Power	< 1 Watts max. EIRP (B4)		C
24.232(c) 27.50(h.2)	RSS-133 [6.4]	Radiated Output Power	< 2 Watts max. EIRP (B2)		C
2.1053 22.917(a) 24.238(a) 27.53(c) 27.53(h)	RSS-130 [4.7] RSS-132 [5.5] RSS-133 [6.5] RSS-139 [6.6]	Undesirable Emissions	> 43 + 10log$_{10}$ (P) dB for all out-of-band emissions		C
27.53(f)	RSS-130 [4.7.2]	Undesirable Emissions in 1559 ~ 1610MHz	< -70 dBW/MHz (for wideband signals) < -80 dBW (for discrete emissions of less than 700 Hz bandwidth)		C

Note 1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable

6. SAMPLE CALCULATION

A. Emission Designator

LTE Band 13(QPSK)

Emission Designator = **8M92G7D**
LTE OBW = 8.922 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data Transmission

LTE Band 13(16QAM)

Emission Designator = **8M88W7D**
LTE OBW = 8.884 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data Transmission

LTE Band 5(QPSK)

Emission Designator = **8M96G7D**
LTE OBW = 8.964 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data Transmission

LTE Band 5(16QAM)

Emission Designator = **8M94W7D**
LTE OBW = 8.936 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data Transmission

LTE Band 4(QPSK)

Emission Designator = **17M9G7D**
LTE OBW = 17.867 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data Transmission

LTE Band 4(16QAM)

Emission Designator = **17M8W7D**
LTE OBW = 17.801 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data Transmission

LTE Band 2(QPSK)

Emission Designator = **17M9G7D**
LTE OBW = 17.855 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data Transmission

LTE Band 2(16QAM)

Emission Designator = **17M9W7D**
LTE OBW = 17.887 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data Transmission

B. For substitution method

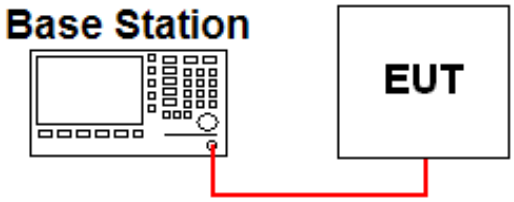
1) The EUT was placed on a turntable with 0.8 meter height for frequency below 1GHz and 1.5 meter height for frequency above 1 GHz respectively above ground.
2) The EUT was set 3 meters from the receiving antenna mounted on the antenna tower.
3) During the test, the turn table is rotated until the maximum signal is found.
4) Record the field strength meter's level. (ex. Spectrum reading level is -8.5 dBm)
5) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.
6) Increase the signal generator output till the field strength meter's level is equal to the item (4). (ex. Signal generator level is -18.04 dBm)
7) The gain of the cable and amplifier between the signal generator and terminals of substituted antenna is 46.92 dB at test frequency.
8) Record the level at substituted antenna terminal. (ex. 28.88dBm)
9) The result is calculated as below;

EIRP(dBm) = LEVLE@ANTENNA TERMINAL + TX Antenna Gain (dBi)
ERP(dBm) = LEVLE@ANTENNA TERMINAL + TX Antenna Gain (dBd)
Where, TX Antenna Gain (dBd) = TX Antenna Gain (dBi) - 2.15 dB

7. TEST DATA

7.1 CONDUCTED OUTPUT POWER

A base station simulator was used to establish communication with the EUT. The base station simulator parameters were set to produce the maximum power from the EUT. This device was tested under all configurations and the highest power is reported. Conducted Output Powers of EUT are reported below.



▪ Band 13

Conducted Power [dBm]									
RB Alloc			1 RB			MID RB			FULL RB
B.W(MHz)	Freq.(MHz)	Modulation	LOW	MID	HIGH	LOW	MID	HIGH	
10	782	QPSK	23.44	23.38	23.35	22.37	22.36	22.23	22.36
		16QAM	22.12	22.29	21.96	21.41	21.32	21.18	21.42
5	779.5	QPSK	23.52	23.39	23.39	22.31	22.38	22.40	22.34
		16QAM	22.21	22.05	22.04	21.48	21.52	21.52	21.28
	784.5	QPSK	23.34	23.39	23.39	22.18	22.30	22.26	22.28
		16QAM	22.02	21.98	21.98	21.13	21.26	21.20	21.22

Note 1: The conducted output power was measured using the Anritsu MT8820C

▪ Band 5

Conducted Power [dBm]									
RB Alloc			1 RB			MID RB			FULL RB
B.W(MHz)	Freq.(MHz)	Modulation	LOW	MID	HIGH	LOW	MID	HIGH	
10	829	QPSK	23.17	23.33	23.26	22.39	22.32	22.28	22.29
		16QAM	21.90	22.06	21.93	21.27	21.28	21.25	21.36
	836.5	QPSK	23.07	23.21	23.19	22.28	22.15	22.23	22.25
		16QAM	21.91	22.14	21.88	21.21	21.13	21.21	21.34
	844	QPSK	23.09	23.23	23.18	22.30	22.19	22.24	22.27
		16QAM	21.99	22.12	21.95	21.29	21.18	21.22	21.36
5	826.5	QPSK	23.08	23.20	23.16	22.20	22.31	22.31	22.27
		16QAM	21.82	22.04	21.89	21.04	21.19	21.19	21.23
	836.5	QPSK	23.13	23.14	23.18	22.26	22.12	22.20	22.29
		16QAM	21.85	22.01	21.88	21.13	21.02	21.18	21.14
	846.5	QPSK	22.97	23.17	23.13	22.12	22.17	22.23	22.24
		16QAM	21.84	21.88	21.90	21.13	21.16	21.20	21.21
3	825.5	QPSK	23.16	23.15	23.14	22.16	22.18	22.32	22.15
		16QAM	21.90	21.92	21.88	21.11	21.26	21.31	21.20
	836.5	QPSK	23.19	23.15	23.20	22.27	22.16	22.19	22.13
		16QAM	22.16	21.97	22.05	21.27	21.36	21.29	21.09
	847.5	QPSK	23.18	23.22	23.13	22.22	22.34	22.33	22.38
		16QAM	21.82	21.98	21.92	21.24	21.52	21.44	21.44
1.4	824.7	QPSK	23.28	23.08	23.06	23.18	23.13	23.26	22.16
		16QAM	21.84	22.50	21.99	22.10	22.25	22.05	21.05
	836.5	QPSK	23.04	22.96	23.24	23.19	23.04	23.16	22.16
		16QAM	21.73	22.34	21.79	22.00	22.09	22.14	21.11
	848.3	QPSK	23.30	23.42	23.30	23.36	23.38	23.31	22.32
		16QAM	22.08	22.55	22.13	22.41	22.23	22.40	20.70

Note 1: The conducted output power was measured using the Anritsu MT8820C

▪ Band 4

Conducted Power [dBm]									
RB Alloc			1 RB			MID RB			FULL RB
B.W(MHz)	Freq.(MHz)	Modulation	LOW	MID	HIGH	LOW	MID	HIGH	
20	1720	QPSK	23.74	23.94	23.61	22.55	22.51	22.42	22.49
		16QAM	22.33	22.41	22.21	21.63	21.49	21.41	21.37
	1732.5	QPSK	23.80	23.83	23.65	22.64	22.61	22.45	22.54
		16QAM	22.44	22.43	22.12	21.62	21.61	21.54	21.52
	1745	QPSK	23.94	24.10	23.74	22.77	22.63	22.46	22.53
		16QAM	22.64	22.47	22.32	21.66	21.61	21.43	21.59
15	1717.5	QPSK	23.73	23.61	23.60	22.52	22.52	22.42	22.55
		16QAM	22.47	22.31	22.36	21.57	21.55	21.55	21.57
	1732.5	QPSK	23.74	23.62	23.63	22.66	22.57	22.43	22.61
		16QAM	22.47	22.26	22.28	21.63	21.62	21.48	21.57
	1747.5	QPSK	23.86	23.61	23.82	22.68	22.63	22.57	22.50
		16QAM	22.46	22.26	22.42	21.59	21.57	21.47	21.60
10	1715	QPSK	23.67	23.78	23.57	22.57	22.57	22.51	22.59
		16QAM	22.46	22.59	22.24	21.59	21.59	21.64	21.61
	1732.5	QPSK	23.70	23.77	23.59	22.65	22.67	22.64	22.64
		16QAM	22.37	22.53	22.30	21.59	21.71	21.58	21.69
	1750	QPSK	23.79	23.98	23.78	22.62	22.65	22.58	22.62
		16QAM	22.29	22.43	22.46	21.72	21.68	21.77	21.72
5	1712.5	QPSK	23.64	23.57	23.50	22.51	22.56	22.51	22.53
		16QAM	22.29	22.29	22.27	21.32	21.46	21.37	21.53
	1732.5	QPSK	23.67	23.63	23.55	22.60	22.65	22.67	22.64
		16QAM	22.30	22.41	22.27	21.74	21.60	21.61	21.58
	1752.5	QPSK	23.67	23.65	23.78	22.69	22.79	22.65	22.66
		16QAM	22.33	22.34	22.38	21.71	21.70	21.48	21.60
3	1711.5	QPSK	23.67	23.53	23.49	22.63	22.62	22.47	22.51
		16QAM	22.47	22.23	22.31	21.60	21.60	21.63	21.55
	1732.5	QPSK	23.72	23.63	23.60	22.73	22.72	22.67	22.62
		16QAM	22.45	22.39	22.38	21.74	21.81	21.86	21.58
	1753.5	QPSK	23.60	23.61	23.54	22.56	22.56	22.59	22.54
		16QAM	22.34	22.39	22.37	21.71	21.80	21.82	21.57
1.4	1710.7	QPSK	23.56	23.65	23.53	23.57	23.63	23.60	22.69
		16QAM	22.29	22.51	22.34	22.52	22.60	22.48	21.39
	1732.5	QPSK	23.67	23.78	23.61	23.48	23.49	23.55	22.59
		16QAM	22.46	22.48	22.39	22.54	22.59	22.61	21.49
	1754.3	QPSK	23.67	23.79	23.65	23.59	23.56	23.64	22.59
		16QAM	22.39	22.61	22.53	22.56	22.72	22.78	21.78

Note 1: The conducted output power was measured using the Anritsu MT8820C

▪ Band 2

Conducted Power [dBm]									
RB Alloc			1 RB			MID RB			FULL RB
B.W(MHz)	Freq.(MHz)	Modulation	LOW	MID	HIGH	LOW	MID	HIGH	
20	1860	QPSK	23.73	23.64	23.47	22.90	22.87	22.69	22.76
		16QAM	22.82	22.85	22.38	21.83	21.78	21.70	21.75
	1880	QPSK	23.72	23.69	23.40	22.85	22.77	22.52	22.73
		16QAM	22.63	22.73	22.38	21.82	21.82	21.65	21.67
	1900	QPSK	23.83	23.76	23.48	22.82	22.76	22.59	22.68
		16QAM	22.62	22.82	22.51	21.72	21.76	21.61	21.58
15	1857.5	QPSK	23.77	23.81	23.53	22.82	22.83	22.78	22.80
		16QAM	22.68	22.55	22.09	21.66	21.68	21.65	21.76
	1880	QPSK	23.75	23.70	23.47	22.85	22.80	22.58	22.71
		16QAM	22.62	22.50	22.35	21.76	21.71	21.68	21.73
	1902.5	QPSK	23.61	23.72	23.75	22.80	22.76	22.54	22.62
		16QAM	22.58	22.51	22.47	21.67	21.76	21.64	21.60
10	1855	QPSK	23.90	23.81	23.81	22.96	22.84	22.68	22.73
		16QAM	22.72	22.76	22.50	21.79	21.87	21.71	21.75
	1880	QPSK	23.83	23.71	23.69	22.76	22.73	22.58	22.71
		16QAM	22.54	22.77	22.33	21.84	21.82	21.64	21.71
	1905	QPSK	23.85	23.75	23.78	22.81	22.70	22.56	22.55
		16QAM	22.59	22.69	22.57	21.79	21.76	21.69	21.72
5	1852.5	QPSK	23.60	23.73	23.62	22.77	22.86	22.81	22.83
		16QAM	22.51	22.59	22.49	21.82	21.81	21.59	21.77
	1880	QPSK	23.52	23.62	23.51	22.70	22.69	22.67	22.70
		16QAM	22.38	22.44	22.24	21.59	21.68	21.55	21.77
	1907.5	QPSK	23.66	23.62	23.58	22.66	22.59	22.54	22.62
		16QAM	22.43	22.37	22.30	21.54	21.37	21.59	21.68
3	1851.5	QPSK	23.81	23.86	23.88	22.84	22.85	22.87	22.81
		16QAM	22.70	22.63	22.65	21.82	21.94	22.03	21.77
	1880	QPSK	23.71	23.70	23.57	22.75	22.76	22.73	22.75
		16QAM	22.54	22.50	22.39	21.42	21.89	21.85	21.65
	1908.5	QPSK	23.70	23.60	23.66	22.68	22.63	22.57	22.63
		16QAM	22.45	22.39	22.38	21.69	21.80	21.89	21.61
1.4	1850.7	QPSK	23.65	23.85	23.71	23.83	23.76	23.85	22.70
		16QAM	22.69	22.88	22.70	22.80	22.93	22.85	21.82
	1880	QPSK	23.55	23.67	23.69	23.72	23.75	23.79	22.66
		16QAM	22.45	22.70	22.61	22.81	22.94	22.91	21.62
	1909.3	QPSK	23.37	23.43	23.34	23.67	23.60	23.64	22.66
		16QAM	22.45	22.64	22.56	22.60	22.94	22.87	21.64

Note 1: The conducted output power was measured using the Anritsu MT8820C

7.2 OCCUPIED BANDWIDTH

- Plots of the EUT's Occupied Bandwidth are shown in Clause 8.1

7.3 PEAK TO AVERAGE RATIO

- Plots of the EUT's Peak- to- Average Ratio are shown in Clause 8.2

7.4 BAND EDEG EMISSIONS (Conducted)

- Plots of the EUT's Band Edge Emissions are shown in Clause 8.3

7.5 SPURIOUS AND HARMONICS EMISSIONS (Conducted)

- Plots of the EUT's Spurious Emissions are shown in Clause 8.4

7.6 ERP & EIRP

7.6.1 LTE Band 13

Channel Bandwidth (MHz)	Test Frequency (MHz)	Test Mode	RB Size/ Offset	Ant Pol (H/V)	Level(dBm) @ Ant Terminal	TX Ant Gain (dBd)	ERP (dBm)	ERP (W)
10	782	QPSK	1/0	H	23.48	-0.45	23.03	0.201
		16QAM	1/0	H	22.62	-0.45	22.17	0.165
5	779.5	QPSK	1/0	H	23.51	-0.45	23.06	0.202
		16QAM	1/0	H	22.14	-0.45	21.69	0.148
	784.5	QPSK	1/0	H	24.00	-0.44	23.56	0.227
		16QAM	1/0	H	23.00	-0.44	22.56	0.180

Note: This device was tested under all bandwidths, modulations and RB configurations and the worst case data are reported in the table above.

7.6.2 LTE Band 5

Channel Bandwidth (MHz)	Test Frequency (MHz)	Test Mode	RB Size/ Offset	Ant Pol (H/V)	Level(dBm) @ Ant Terminal	TX Ant Gain (dBd)	ERP (dBm)	ERP (W)
10	829	QPSK	1/0	H	25.84	-0.67	25.17	0.329
		16QAM	1/0	H	25.23	-0.67	24.56	0.286
	836.5	QPSK	1/0	H	24.16	-0.74	23.42	0.220
		16QAM	1/0	H	22.94	-0.74	22.20	0.166
	844	QPSK	1/0	H	23.53	-0.81	22.72	0.187
		16QAM	1/0	H	22.59	-0.81	21.78	0.151
5	826.5	QPSK	1/0	H	25.35	-0.65	24.70	0.295
		16QAM	1/0	H	24.67	-0.65	24.02	0.252
	836.5	QPSK	1/0	H	24.31	-0.74	23.57	0.228
		16QAM	1/0	H	23.13	-0.74	22.39	0.173
	846.5	QPSK	1/0	H	25.22	-0.83	24.39	0.275
		16QAM	1/0	H	23.70	-0.83	22.87	0.194
3	825.5	QPSK	1/0	H	25.41	-0.64	24.77	0.300
		16QAM	1/0	H	24.27	-0.64	23.63	0.231
	836.5	QPSK	1/0	H	24.83	-0.74	24.09	0.256
		16QAM	1/0	H	23.91	-0.74	23.17	0.207
	847.5	QPSK	1/0	H	25.37	-0.84	24.53	0.284
		16QAM	1/0	H	24.54	-0.84	23.70	0.234
1.4	824.7	QPSK	1/0	H	23.49	-0.63	22.86	0.193
		16QAM	1/0	H	22.25	-0.63	21.62	0.145
	836.5	QPSK	1/0	H	23.71	-0.74	22.97	0.198
		16QAM	1/0	H	22.64	-0.74	21.90	0.155
	848.3	QPSK	1/0	H	25.72	-0.85	24.87	0.307
		16QAM	1/0	H	25.20	-0.85	24.35	0.272

Note: This device was tested under all bandwidths, modulations and RB configurations and the worst case data are reported in the table above.

7.6.3 LTE Band 4

Channel Bandwidth (MHz)	Test Frequency (MHz)	Test Mode	RB Size/ Offset	Ant Pol (H/V)	Level(dBm) @ Ant Terminal	TX Ant Gain (dBi)	EIRP (dBm)	EIRP (W)
20	1720	QPSK	1/0	V	13.61	5.95	19.56	0.090
		16QAM	1/0	V	12.67	5.95	18.62	0.073
	1732.5	QPSK	1/0	V	14.32	5.84	20.16	0.104
		16QAM	1/0	V	13.12	5.84	18.96	0.079
	1745	QPSK	1/0	V	15.74	5.73	21.47	0.140
		16QAM	1/0	V	14.58	5.73	20.31	0.107
15	1717.5	QPSK	1/0	V	12.99	5.97	18.96	0.079
		16QAM	1/0	V	11.44	5.97	17.41	0.055
	1732.5	QPSK	1/0	V	14.70	5.84	20.54	0.113
		16QAM	1/0	V	13.97	5.84	19.81	0.096
	1747.5	QPSK	1/0	V	15.31	5.70	21.01	0.126
		16QAM	1/0	V	14.40	5.70	20.10	0.102
10	1715	QPSK	1/0	V	12.58	6.00	18.58	0.072
		16QAM	1/0	V	11.79	6.00	17.79	0.060
	1732.5	QPSK	1/0	V	15.25	5.84	21.09	0.129
		16QAM	1/0	V	14.33	5.84	20.17	0.104
	1750	QPSK	1/0	V	15.17	5.68	20.85	0.122
		16QAM	1/0	V	14.35	5.68	20.03	0.101
5	1712.5	QPSK	1/0	V	13.33	6.02	19.35	0.086
		16QAM	1/0	V	12.46	6.02	18.48	0.070
	1732.5	QPSK	1/0	V	15.45	5.84	21.29	0.135
		16QAM	1/0	V	14.60	5.84	20.44	0.111
	1752.5	QPSK	1/0	V	15.49	5.65	21.14	0.130
		16QAM	1/0	V	14.59	5.65	20.24	0.106
3	1711.5	QPSK	1/0	V	13.17	6.03	19.20	0.083
		16QAM	1/0	V	12.37	6.03	18.40	0.069
	1732.5	QPSK	1/0	V	14.60	5.84	20.44	0.111
		16QAM	1/0	V	13.41	5.84	19.25	0.084
	1753.5	QPSK	1/0	V	15.55	5.63	21.18	0.131
		16QAM	1/0	V	14.72	5.63	20.35	0.108
1.4	1710.7	QPSK	1/0	V	13.24	6.03	19.27	0.085
		16QAM	1/0	V	12.35	6.03	18.38	0.069
	1732.5	QPSK	1/0	V	14.43	5.84	20.27	0.106
		16QAM	1/0	V	13.52	5.84	19.36	0.086
	1754.3	QPSK	1/0	V	15.73	5.62	21.35	0.136
		16QAM	1/0	V	15.08	5.62	20.70	0.117

Note: This device was tested under all bandwidths, modulations and RB configurations and the worst case data are reported in the table above.

7.6.4 LTE Band 2

Channel Bandwidth (MHz)	Test Frequency (MHz)	Test Mode	RB Size/ Offset	Ant Pol (H/V)	Level(dBm) @ Ant Terminal	TX Ant Gain (dBi)	EIRP (dBm)	EIRP (W)
20	1860	QPSK	1/0	V	17.42	4.91	22.33	0.171
		16QAM	1/0	V	16.82	4.91	21.73	0.149
	1880	QPSK	1/0	V	16.85	4.80	21.65	0.146
		16QAM	1/0	V	15.73	4.80	20.53	0.113
	1900	QPSK	1/0	V	19.13	4.69	23.82	0.241
		16QAM	1/0	V	17.81	4.69	22.50	0.178
15	1857.5	QPSK	1/0	V	16.76	4.92	21.68	0.147
		16QAM	1/0	V	15.43	4.92	20.35	0.108
	1880	QPSK	1/0	V	17.18	4.80	21.98	0.158
		16QAM	1/0	V	16.48	4.80	21.28	0.134
	1902.5	QPSK	1/0	V	19.02	4.68	23.70	0.234
		16QAM	1/0	V	17.82	4.68	22.50	0.178
10	1855	QPSK	1/0	V	16.76	4.94	21.70	0.148
		16QAM	1/0	V	15.85	4.94	20.79	0.120
	1880	QPSK	1/0	V	16.96	4.80	21.76	0.150
		16QAM	1/0	V	16.30	4.80	21.10	0.129
	1905	QPSK	1/0	V	18.80	4.67	23.47	0.222
		16QAM	1/0	V	17.85	4.67	22.52	0.179
5	1852.5	QPSK	1/0	V	15.66	4.95	20.61	0.115
		16QAM	1/0	V	14.75	4.95	19.70	0.093
	1880	QPSK	1/0	V	17.03	4.80	21.83	0.152
		16QAM	1/0	V	16.09	4.80	20.89	0.123
	1907.5	QPSK	1/0	V	19.05	4.65	23.70	0.234
		16QAM	1/0	V	17.76	4.65	22.41	0.174
3	1851.5	QPSK	1/0	V	16.52	4.95	21.47	0.140
		16QAM	1/0	V	15.18	4.95	20.13	0.103
	1880	QPSK	1/0	V	17.03	4.80	21.83	0.152
		16QAM	1/0	V	16.09	4.80	20.89	0.123
	1908.5	QPSK	1/0	V	18.58	4.65	23.23	0.210
		16QAM	1/0	V	17.30	4.65	21.95	0.157
1.4	1850.7	QPSK	1/0	V	17.18	4.96	22.14	0.164
		16QAM	1/0	V	16.23	4.96	21.19	0.132
	1880	QPSK	1/0	V	17.20	4.80	22.00	0.158
		16QAM	1/0	V	16.27	4.80	21.07	0.128
	1909.3	QPSK	1/0	V	18.72	4.64	23.36	0.217
		16QAM	1/0	V	17.95	4.64	22.59	0.182

Note: This device was tested under all bandwidths, modulations and RB configurations and the worst case data are reported in the table above.

7.7 UNDESIRABLE EMISSIONS (Radiated)

7.7.1 LTE Band 13

B.W (MHz)	Test Freq. (MHz)	RB Size/ Offset	Test Mode	Freq.(MHz)	Ant Pol (H/V)	Level(dBm) @ Ant Terminal	TX Ant Gain(dBd)	Result (dBm)	Limit (dBm)	Margin (dB)
10	782	1/0	QPSK	1555.16	V	-33.47	3.79	-29.68	-13.00	16.68
				2332.83	V	-24.03	3.76	-20.27	-13.00	7.27
				3110.32	V	-43.28	5.01	-38.27	-13.00	25.27
				3888.00	V	-47.95	6.09	-41.86	-13.00	28.86
			16QAM	1555.29	V	-33.85	3.79	-30.06	-13.00	17.06
				2332.91	V	-24.22	3.76	-20.46	-13.00	7.46
				3110.26	V	-44.98	5.01	-39.97	-13.00	26.97
				3887.89	V	-48.61	6.09	-42.52	-13.00	29.52
5	784.5	1/0	QPSK	1555.17	V	-33.47	3.79	-29.68	-13.00	16.68
				2332.04	V	-24.94	3.76	-21.18	-13.00	8.18
				3109.54	V	-43.35	5.01	-38.34	-13.00	25.34
				3886.70	V	-47.63	6.09	-41.54	-13.00	28.54
			16QAM	1554.71	V	-35.11	3.79	-31.32	-13.00	18.32
				2332.01	V	-24.97	3.76	-21.21	-13.00	8.21
				3109.22	V	-43.13	5.01	-38.12	-13.00	25.12
				3886.81	V	-47.94	6.09	-41.85	-13.00	28.85
5	784.5	1/0	QPSK	2346.97	V	-23.29	3.78	-19.51	-13.00	6.51
				3129.30	V	-38.54	5.02	-33.52	-13.00	20.52
				3911.79	V	-44.50	6.16	-38.34	-13.00	25.34
			16QAM	2347.16	V	-23.67	3.78	-19.89	-13.00	6.89
				3129.31	V	-38.86	5.02	-33.84	-13.00	20.84
				3911.75	V	-45.86	6.16	-39.70	-13.00	26.70

Note 1: This device was tested under all bandwidths, modulations and RB configurations and the worst case data are reported in the table above.

Note 2: The frequency spectrum is examined from 9 kHz to the 10th harmonic of the fundamental frequency of the transmitter. No other spurious and harmonic emissions were reported greater than listed emissions above table.

- UNDESIRABLE EMISSIONS IN 1559~1610MHz (LTE Band 13)

B.W (MHz)	Test Freq. (MHz)	RB Size/ Offset	Test Mode	Freq.(MHz)	Ant Pol (H/V)	Level(dBm) @ Ant Terminal	TX Ant Gain(dBi)	Result (dBm)	Limit (dBm)	Margin (dB)
5	784.5	1/0	QPSK	1564.77	V	-50.29	5.95	-44.34	-40.00	4.34
	784.5	1/0	16QAM	1564.79	V	-50.37	5.95	-44.42	-40.00	4.42

Note 1: Limit Calculation = −70 dBW/MHz (equivalent isotropically radiated power for wideband signals)

Note 2: This device was tested under all bandwidths, modulations and RB configurations and the worst case data are reported in the table above.

7.7.2 LTE Band 5

B.W (MHz)	Test Freq. (MHz)	RB Size/ Offset	Test Mode	Freq.(MHz)	Ant Pol (H/V)	Level(dBm) @ Ant Terminal	TX Ant Gain(dBd)	Result (dBm)	Limit (dBm)	Margin (dB)
10	829	1/0	QPSK	1658.17	H	-23.25	3.85	-19.40	-13.00	6.40
				2487.24	V	-35.02	3.81	-31.21	-13.00	18.21
				3316.44	V	-34.51	5.58	-28.93	-13.00	15.93
			16QAM	1658.07	H	-23.75	3.85	-19.90	-13.00	6.90
				2487.32	V	-22.14	3.81	-18.33	-13.00	5.33
				3316.44	V	-34.40	5.58	-28.82	-13.00	15.82
	836.5	1/0	QPSK	1673.16	H	-28.47	3.89	-24.58	-13.00	11.58
				2509.74	V	-32.12	3.80	-28.32	-13.00	15.32
				3346.48	V	-34.16	5.66	-28.50	-13.00	15.50
			16QAM	1673.10	H	-28.49	3.89	-24.60	-13.00	11.60
				2509.81	V	-32.42	3.80	-28.62	-13.00	15.62
				3346.39	V	-34.22	5.66	-28.56	-13.00	15.56
	844	1/0	QPSK	1688.14	H	-23.64	3.94	-19.70	-13.00	6.70
				2532.18	V	-28.60	3.75	-24.85	-13.00	11.85
				3376.27	V	-36.27	5.74	-30.53	-13.00	17.53
			16QAM	1688.16	H	-23.85	3.94	-19.91	-13.00	6.91
				2532.19	V	-28.98	3.75	-25.23	-13.00	12.23
				3376.27	V	-36.32	5.74	-30.58	-13.00	17.58

Note 1: This device was tested under all bandwidths, modulations and RB configurations and the worst case data are reported in the table above.

Note 2: The frequency spectrum is examined from 9 kHz to the 10th harmonic of the fundamental frequency of the transmitter. No other spurious and harmonic emissions were reported greater than listed emissions above table.

7.7.3 LTE Band 4

B.W (MHz)	Test Freq. (MHz)	RB Size/ Offset	Test Mode	Freq.(MHz)	Ant Pol (H/V)	Level(dBm) @ Ant Terminal	TX Ant Gain(dBi)	Result (dBm)	Limit (dBm)	Margin (dB)
20	1720	1/0	QPSK	3422.33	V	-33.87	8.01	-25.86	-13.00	12.86
				5133.19	V	-39.96	10.26	-29.70	-13.00	16.70
				6844.44	V	-35.06	11.22	-23.84	-13.00	10.84
				8554.91	V	-49.41	12.87	-36.54	-13.00	23.54
			16QAM	3422.27	V	-33.97	8.01	-25.96	-13.00	12.96
				5133.32	V	-40.17	10.26	-29.91	-13.00	16.91
				6844.54	V	-35.19	11.22	-23.97	-13.00	10.97
				8554.58	V	-49.52	12.87	-36.65	-13.00	23.65
	1732.5	1/0	QPSK	3447.15	V	-28.06	8.07	-19.99	-13.00	6.99
				5170.69	V	-39.47	10.29	-29.18	-13.00	16.18
				6894.37	V	-34.35	11.29	-23.06	-13.00	10.06
				8617.88	V	-43.43	12.99	-30.44	-13.00	17.44
			16QAM	3447.12	V	-28.43	8.07	-20.36	-13.00	7.36
				5170.59	V	-39.65	10.29	-29.36	-13.00	16.36
				6894.18	V	-34.43	11.29	-23.14	-13.00	10.14
				8617.34	V	-43.66	12.99	-30.67	-13.00	17.67
	1745	1/0	QPSK	3472.20	V	-31.37	8.13	-23.24	-13.00	10.24
				5208.29	V	-37.45	10.34	-27.11	-13.00	14.11
				6944.37	V	-29.10	11.44	-17.66	-13.00	4.66
				8680.40	V	-38.71	12.99	-25.72	-13.00	12.72
			16QAM	3472.19	V	-31.46	8.13	-23.33	-13.00	10.33
				5208.32	V	-37.52	10.34	-27.18	-13.00	14.18
				6944.31	V	-29.24	11.44	-17.80	-13.00	4.80
				8680.44	V	-38.73	12.99	-25.74	-13.00	12.74

Note 1: This device was tested under all bandwidths, modulations and RB configurations and the worst case data are reported in the table above.

Note 2: The frequency spectrum is examined from 9 kHz to the 10th harmonic of the fundamental frequency of the transmitter. No other spurious and harmonic emissions were reported greater than listed

7.7.4 LTE Band 2

B.W (MHz)	Test Freq. (MHz)	RB Size/ Offset	Test Mode	Freq.(MHz)	Ant Pol (H/V)	Level(dBm) @ Ant Terminal	TX Ant Gain(dBi)	Result (dBm)	Limit (dBm)	Margin (dB)
20	1860	1/0	QPSK	3702.13	V	-32.28	8.38	-23.90	-13.00	10.90
				5553.34	V	-33.52	10.42	-23.10	-13.00	10.10
				7404.28	V	-35.69	11.71	-23.98	-13.00	10.98
				9255.44	V	-39.21	13.23	-25.98	-13.00	12.98
			16QAM	3702.11	V	-32.36	8.38	-23.98	-13.00	10.98
				5553.12	V	-33.67	10.42	-23.25	-13.00	10.25
				7404.31	V	-35.90	11.71	-24.19	-13.00	11.19
				9255.39	V	-39.22	13.23	-25.99	-13.00	12.99
	1880	1/0	QPSK	3742.21	V	-29.44	8.40	-21.04	-13.00	8.04
				5613.14	V	-36.12	10.60	-25.52	-13.00	12.52
				7484.42	V	-35.14	11.87	-23.27	-13.00	10.27
				9355.41	V	-41.29	13.24	-28.05	-13.00	15.05
			16QAM	3742.17	V	-29.59	8.40	-21.19	-13.00	8.19
				5613.24	V	-36.27	10.60	-25.67	-13.00	12.67
				7484.19	V	-35.06	11.87	-23.19	-13.00	10.19
				9355.25	V	-42.59	13.24	-29.35	-13.00	16.35
	1900	1/0	QPSK	3782.30	V	-36.38	8.28	-28.10	-13.00	15.10
				5673.45	V	-36.50	10.70	-25.80	-13.00	12.80
				7564.15	V	-38.90	12.03	-26.87	-13.00	13.87
				9455.58	V	-43.54	13.21	-30.33	-13.00	17.33
			16QAM	3782.18	V	-36.81	8.28	-28.53	-13.00	15.53
				5673.74	V	-36.65	10.70	-25.95	-13.00	12.95
				7564.40	V	-39.07	12.03	-27.04	-13.00	14.04
				9455.31	V	-44.56	13.21	-31.35	-13.00	18.35

Note 1: This device was tested under all bandwidths, modulations and RB configurations and the worst case data are reported in the table above.

Note 2: The frequency spectrum is examined from 9 kHz to the 10th harmonic of the fundamental frequency of the transmitter. No other spurious and harmonic emissions were reported greater than listed

7.8 FREQUENCY STABILITY

7.8.1 LTE Band 13

OPERATING FREQUENCY : 782 MHz
REFERENCE VOLTAGE : 12 VDC
LIMIT : The frequency stability shall be sufficient to ensure that the fundamental emission stays wthin the authorized frequency block.

VOLTAGE (%)	POWER (V DC)	TEMP (℃)	FREQUENCY (Hz)	FREQ.Dev (Hz)	Deviation	
					(ppm)	(%)
100%	12	+20(Ref)	782,000,008	8	0.0102	0.000001023
100%		-30	781,999,995	-5	-0.0064	-0.000000639
100%		-20	781,999,991	-9	-0.0115	-0.000001151
100%		-10	782,000,001	1	0.0013	0.000000128
100%		0	782,000,007	7	0.0090	0.000000895
100%		+10	782,000,004	4	0.0051	0.000000512
100%		+20	782,000,008	8	0.0102	0.000001023
100%		+30	782,000,006	6	0.0077	0.000000767
100%		+40	781,999,996	-4	-0.0051	-0.000000512
100%		+50	781,999,998	-2	-0.0026	-0.000000256
115%	13.80	+20	782,000,011	11	0.0141	0.000001407
85%	10.20	+20	782,000,007	7	0.0090	0.000000895

Note. Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain inband when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

7.8.2 LTE Band 5

OPERATING FREQUENCY : 836.5 MHz
REFERENCE VOLTAGE : 12 VDC
DEVIATION LIMIT : ± 0.00025 % or 2.5 ppm

VOLTAGE (%)	POWER (V DC)	TEMP (℃)	FREQUENCY (Hz)	FREQ.Dev (Hz)	Deviation	
					(ppm)	(%)
100%	12	+20(Ref)	836,500,013	13	0.0155	0.000001554
100%		-30	836,499,995	-5	-0.0060	-0.000000598
100%		-20	836,500,009	9	0.0108	0.000001076
100%		-10	836,500,002	2	0.0024	0.000000239
100%		0	836,499,996	-4	-0.0048	-0.000000478
100%		+10	836,500,007	7	0.0084	0.000000837
100%		+20	836,500,013	13	0.0155	0.000001554
100%		+30	836,500,006	6	0.0072	0.000000717
100%		+40	836,500,002	2	0.0024	0.000000239
100%		+50	836,500,007	7	0.0084	0.000000837
115%	13.80	+20	836,500,010	10	0.0120	0.000001195
85%	10.20	+20	836,500,009	9	0.0108	0.000001076

7.8.3 LTE Band 4

OPERATING FREQUENCY : 1732.5 MHz
REFERENCE VOLTAGE 12 VDC
LIMIT : The frequency stability shall be sufficient to ensure that the fundamental emission stays wthin the authorized frequency block.

VOLTAGE (%)	POWER (V DC)	TEMP (℃)	FREQUENCY (Hz)	FREQ.Dev (Hz)	Deviation	
					(ppm)	(%)
100%	12	+20(Ref)	1,732,500,005	5	0.0029	0.000000289
100%		-30	1,732,500,007	7	0.0040	0.000000404
100%		-20	1,732,499,993	-7	-0.0040	-0.000000404
100%		-10	1,732,500,005	5	0.0029	0.000000289
100%		0	1,732,500,004	4	0.0023	0.000000231
100%		+10	1,732,500,009	9	0.0052	0.000000519
100%		+20	1,732,500,005	5	0.0029	0.000000289
100%		+30	1,732,500,002	2	0.0012	0.000000115
100%		+40	1,732,499,997	-3	-0.0017	-0.000000173
100%		+50	1,732,499,993	-7	-0.0040	-0.000000404
115%	13.80	+20	1,732,500,014	14	0.0081	0.000000808
85%	10.20	+20	1,732,500,003	3	0.0017	0.000000173

Note. Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain inband when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

7.8.4 LTE Band 2

OPERATING FREQUENCY : 1880 MHz
REFERENCE VOLTAGE 12 VDC
LIMIT : The frequency stability shall be sufficient to ensure that the fundamental emission stays wthin the authorized frequency block.

VOLTAGE (%)	POWER (V DC)	TEMP (℃)	FREQUENCY (Hz)	FREQ.Dev (Hz)	Deviation	
					(ppm)	(%)
100%	12	+20(Ref)	1,880,000,007	7	0.0037	0.000000372
100%		-30	1,880,000,009	9	0.0048	0.000000479
100%		-20	1,879,999,996	-4	-0.0021	-0.000000213
100%		-10	1,879,999,998	-2	-0.0011	-0.000000106
100%		0	1,880,000,005	5	0.0027	0.000000266
100%		+10	1,880,000,008	8	0.0043	0.000000426
100%		+20	1,880,000,007	7	0.0037	0.000000372
100%		+30	1,880,000,013	13	0.0069	0.000000691
100%		+40	1,880,000,010	10	0.0053	0.000000532
100%		+50	1,880,000,005	5	0.0027	0.000000266
115%	13.80	+20	1,879,999,997	-3	-0.0016	-0.000000160
85%	10.20	+20	1,880,000,004	4	0.0021	0.000000213

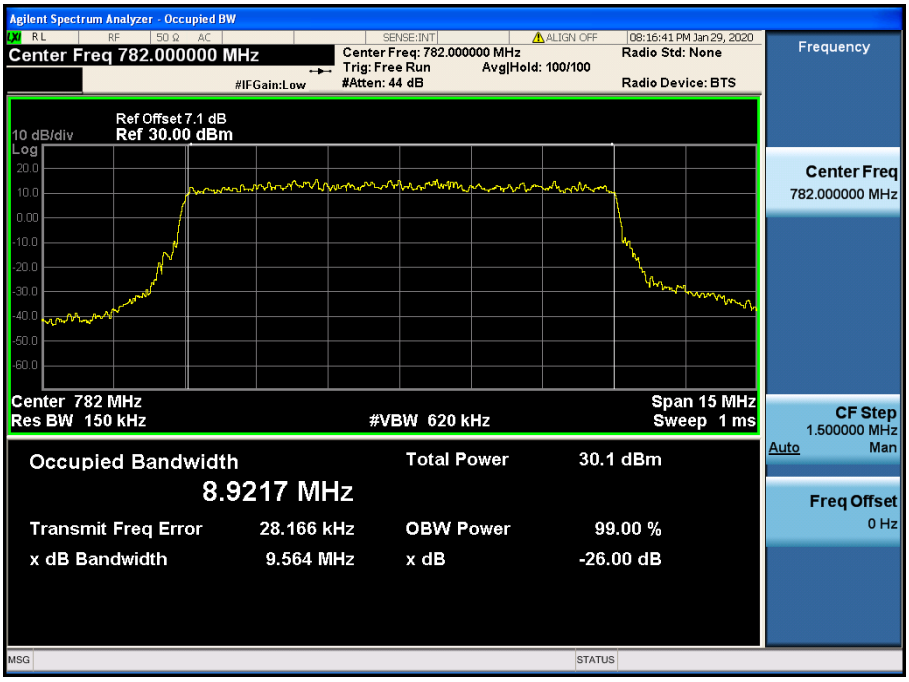
Note. Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

8. TEST PLOTS

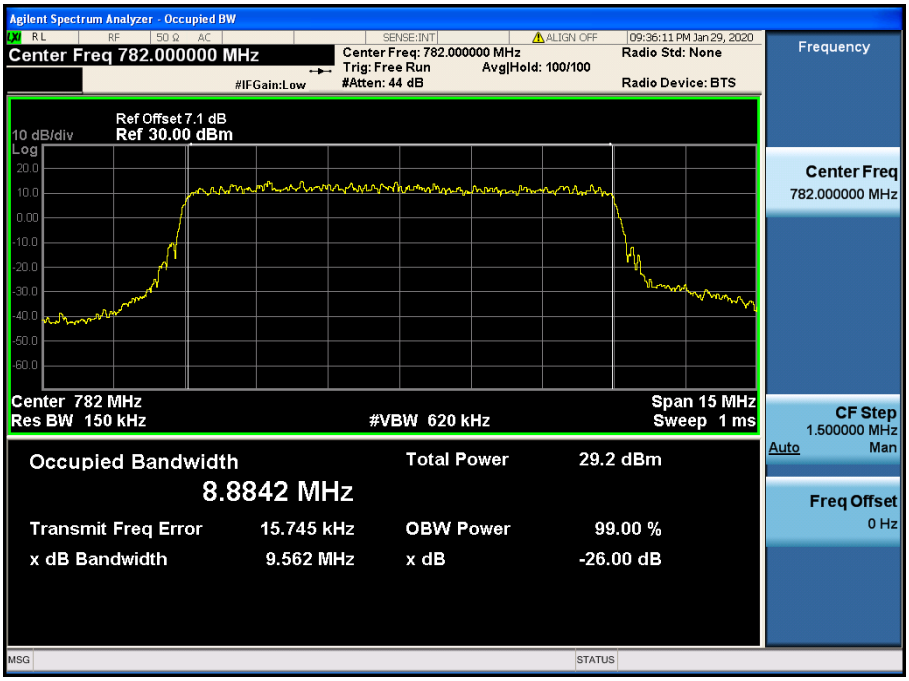
**Note: All bandwidths, RB configurations, and modulations were investigated.
The worst case test results are reported.**

8.1 OCCUPIED BANDWIDTH

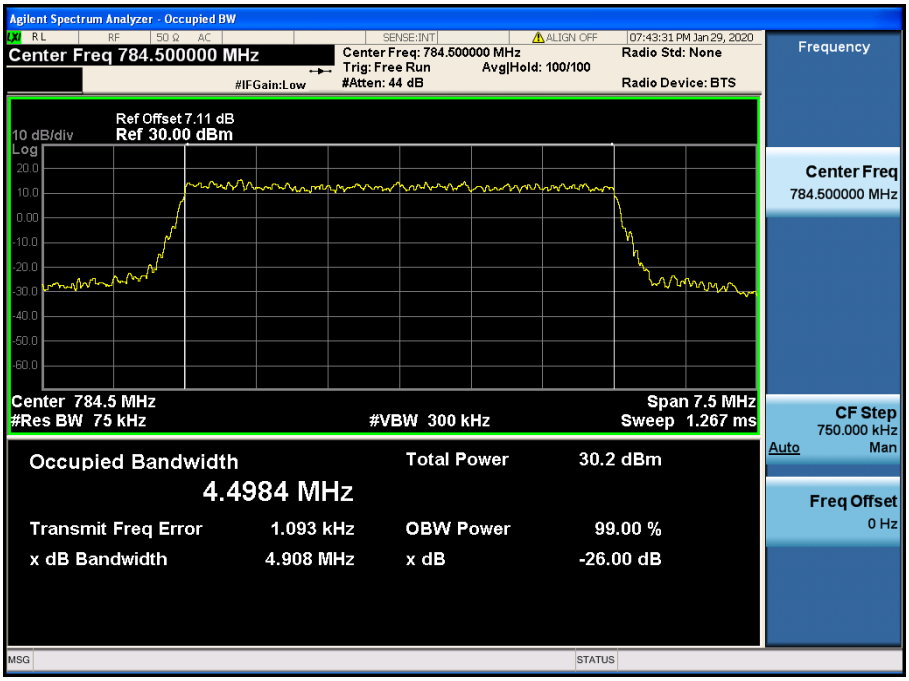
8.1.1 LTE Band 13



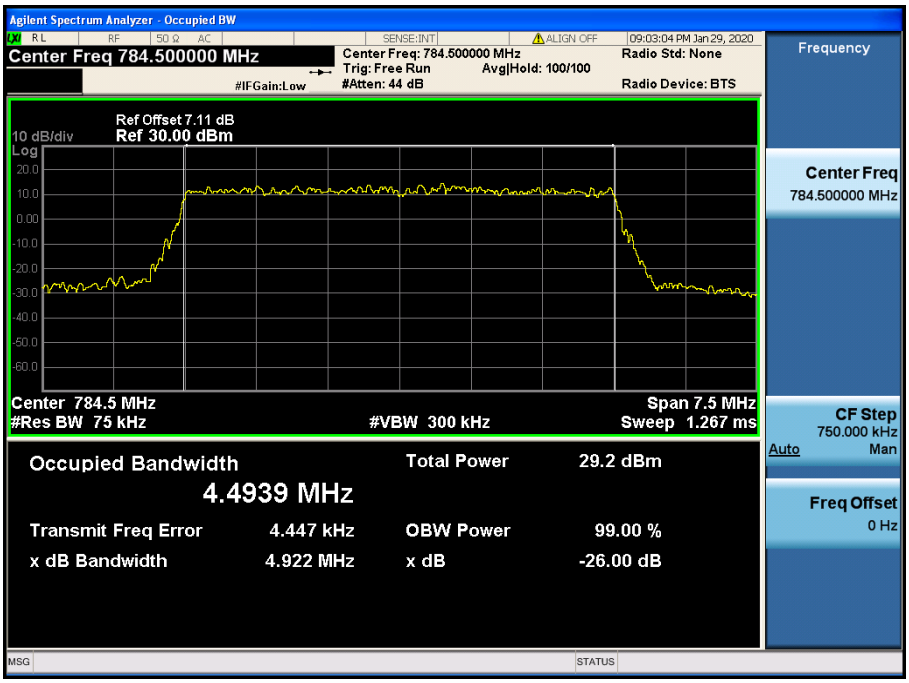
LTE Band 13 / 10 MHz / QPSK - RB Size 50



LTE Band 13 / 10 MHz / 16QAM - RB Size 50

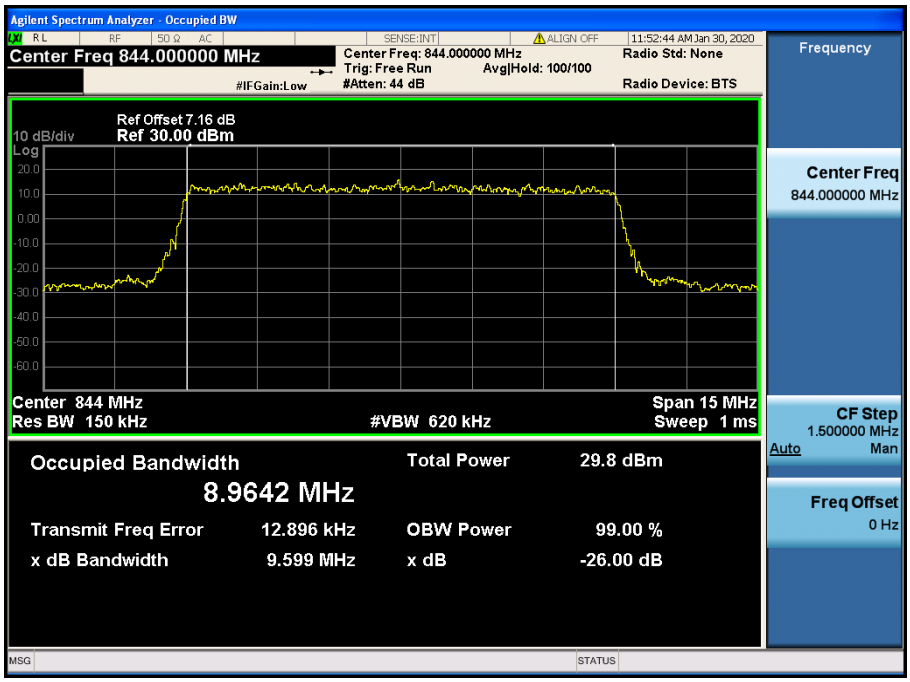


LTE Band 13 / 5 MHz / QPSK - RB Size 25

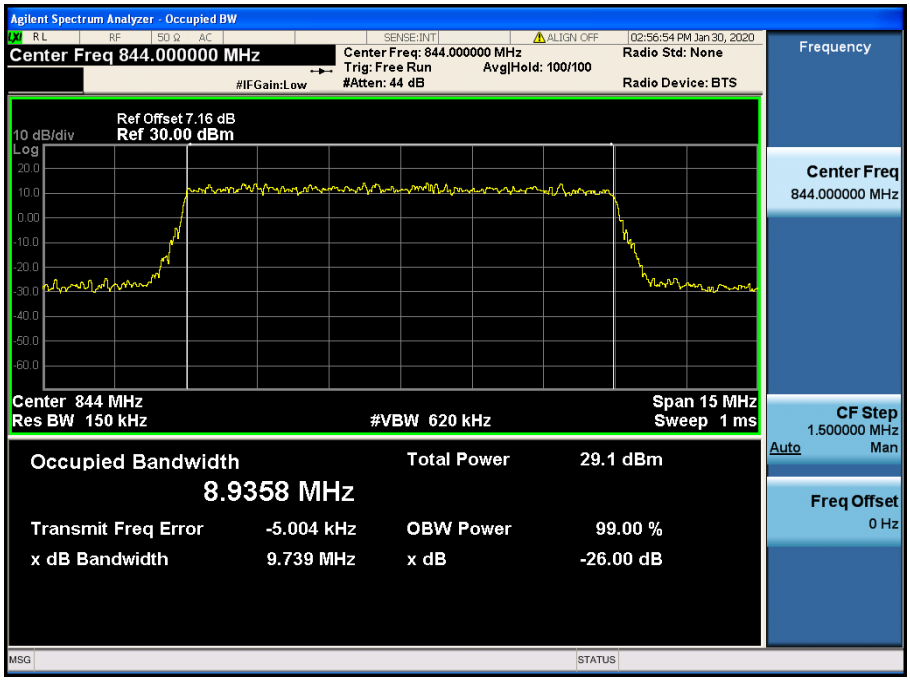


LTE Band 13 / 5 MHz / 16QAM - RB Size 25

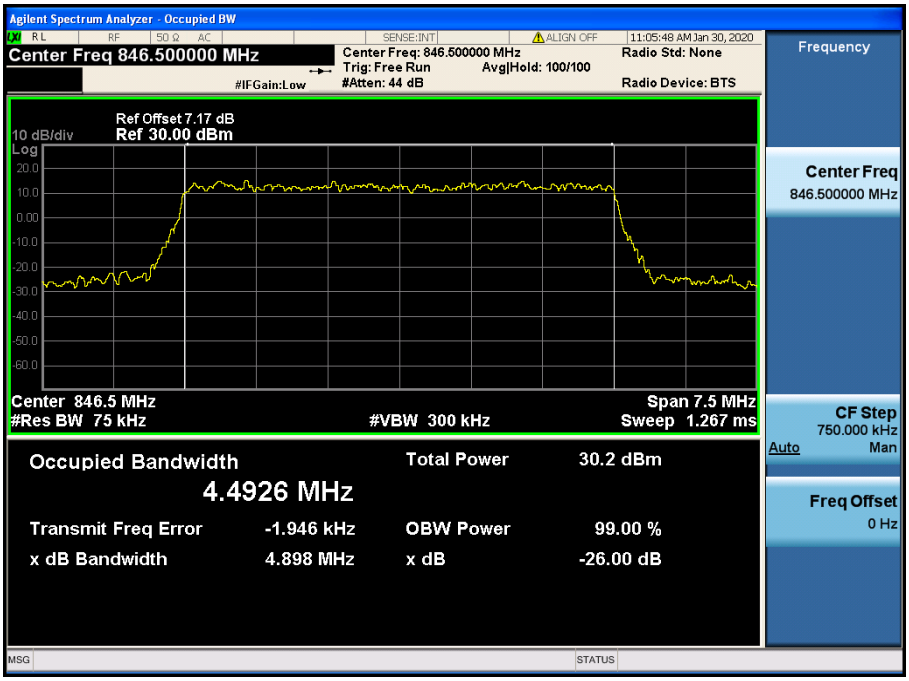
8.1.2 LTE Band 5



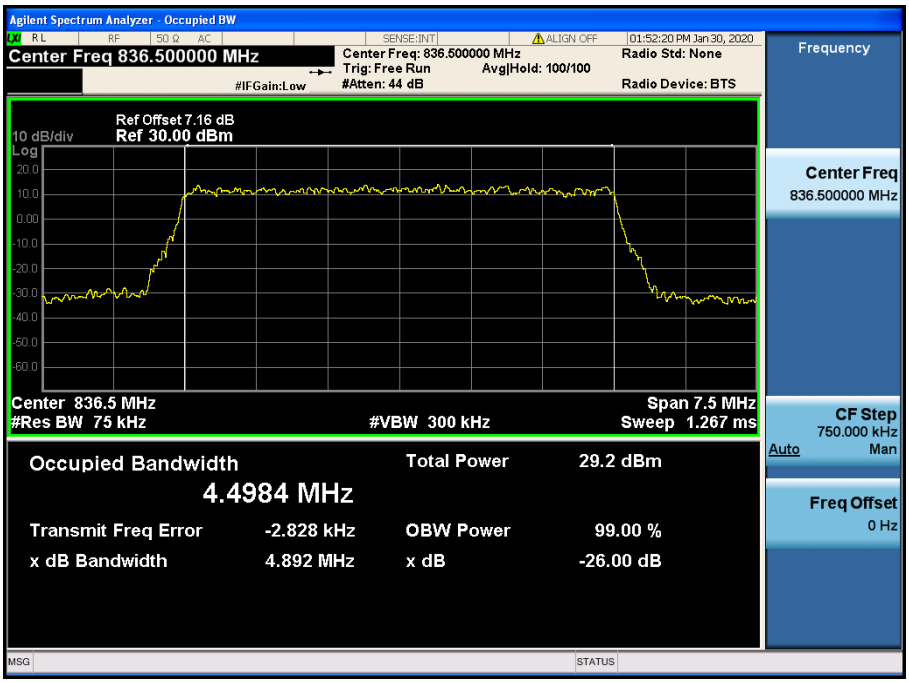
LTE Band 5 / 10 MHz / QPSK - RB Size 50



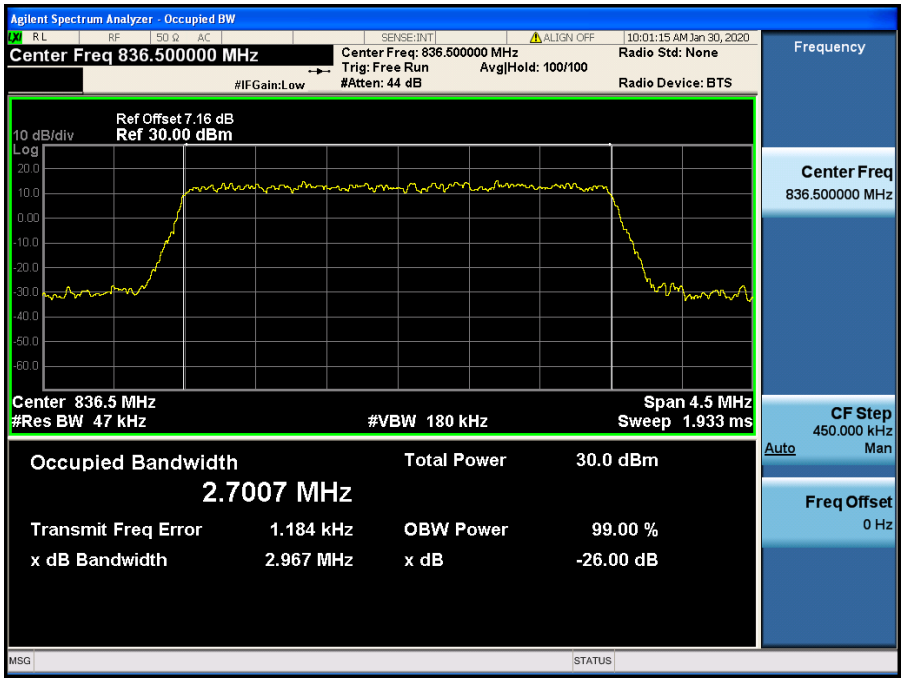
LTE Band 5 / 10 MHz / 16QAM - RB Size 50



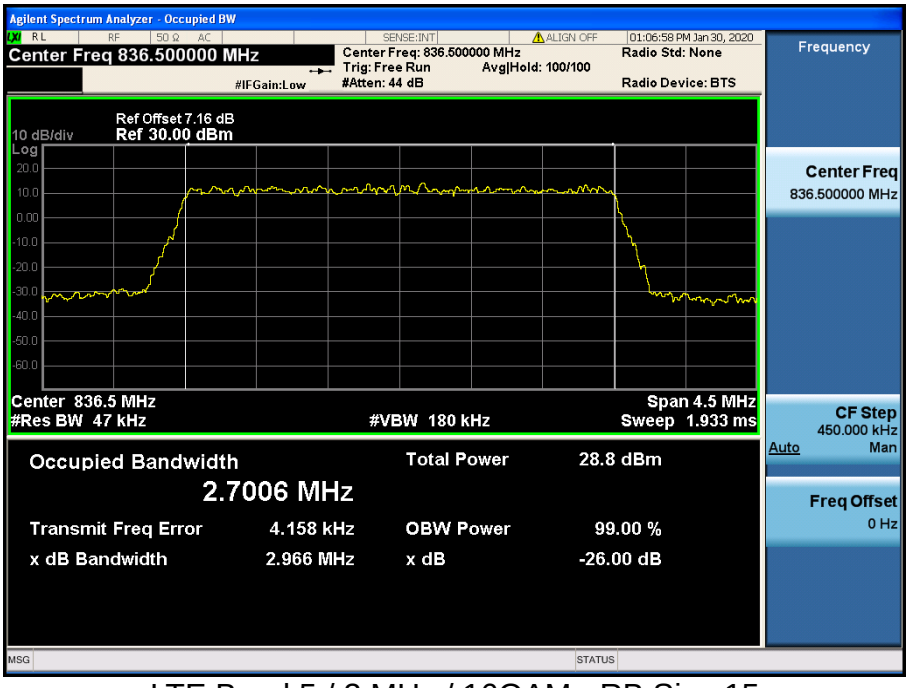
LTE Band 5 / 5 MHz / QPSK - RB Size 25



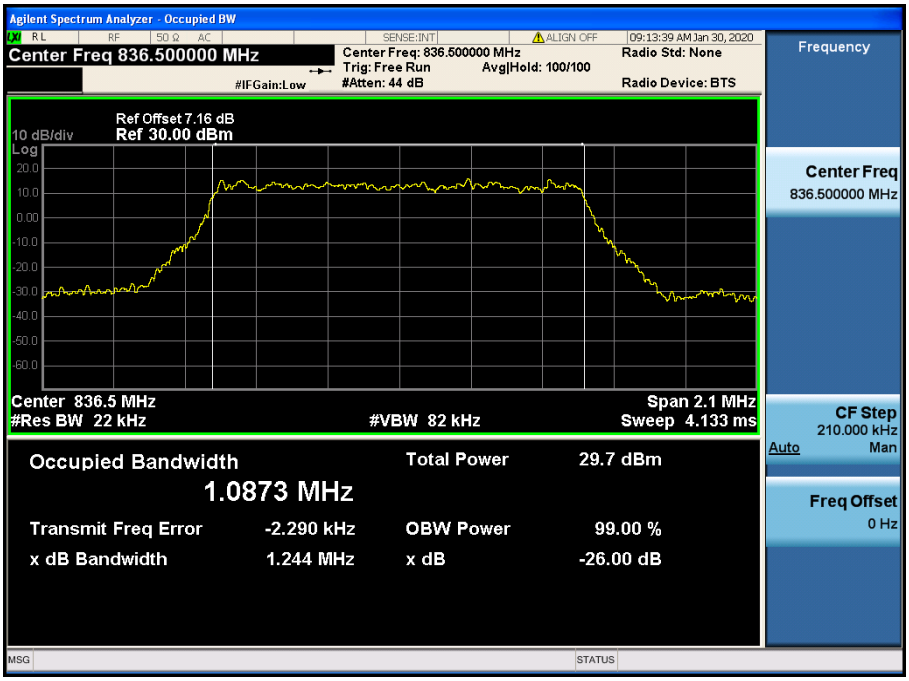
LTE Band 5 / 5 MHz / 16QAM - RB Size 25



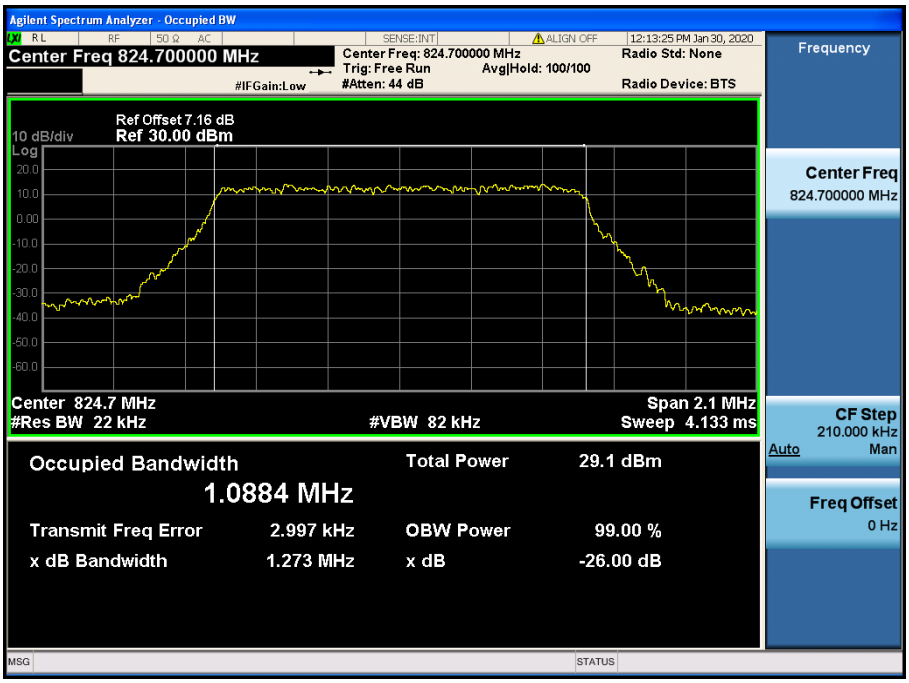
LTE Band 5 / 3 MHz / QPSK - RB Size 15



LTE Band 5 / 3 MHz / 16QAM - RB Size 15

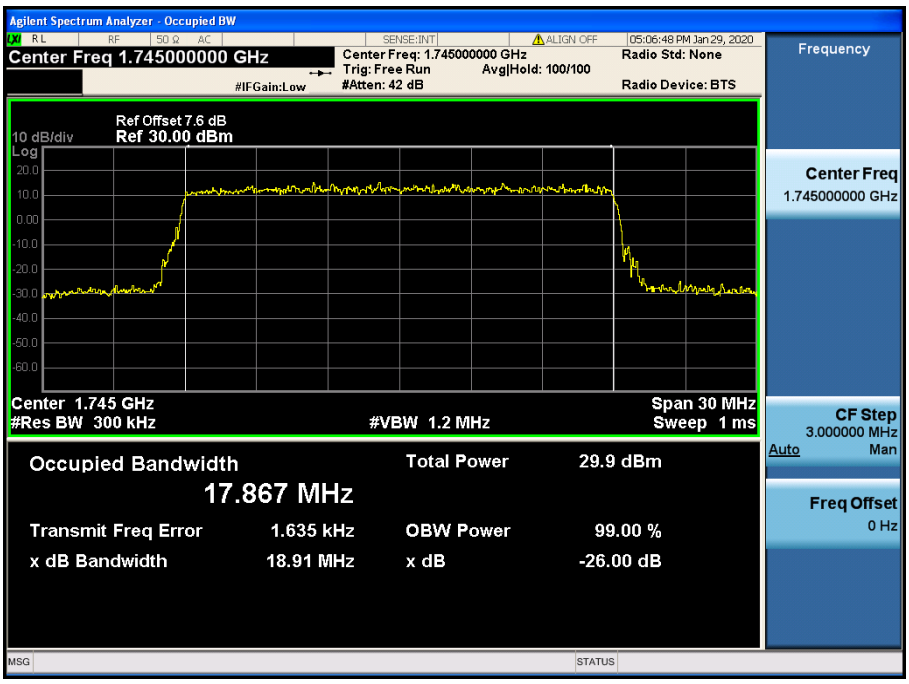


LTE Band 5 / 1.4 MHz / QPSK - RB Size 6

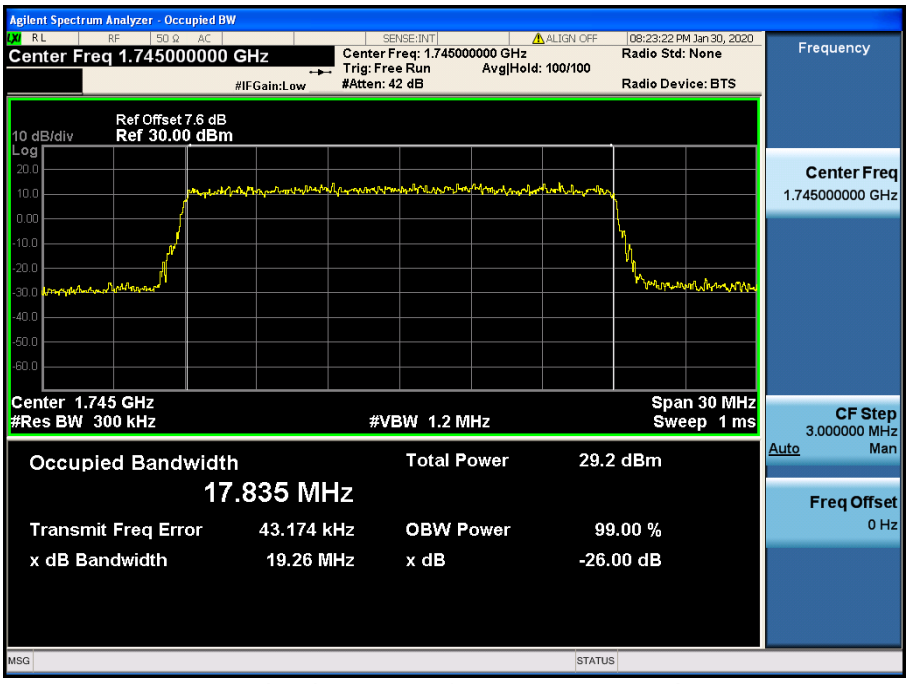


LTE Band 5 / 1.4 MHz / 16QAM - RB Size 6

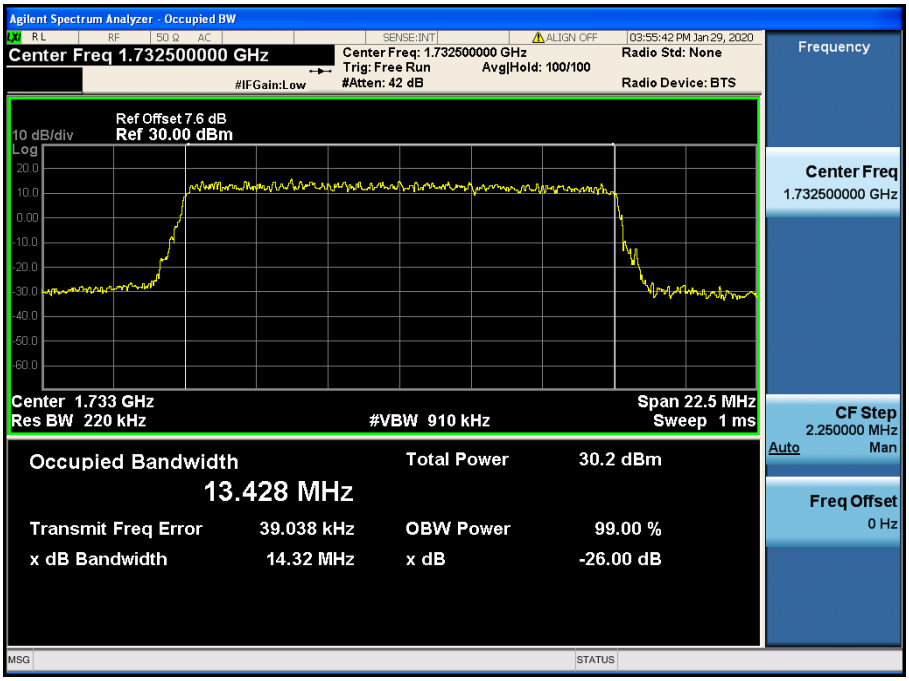
8.1.3 LTE Band 4



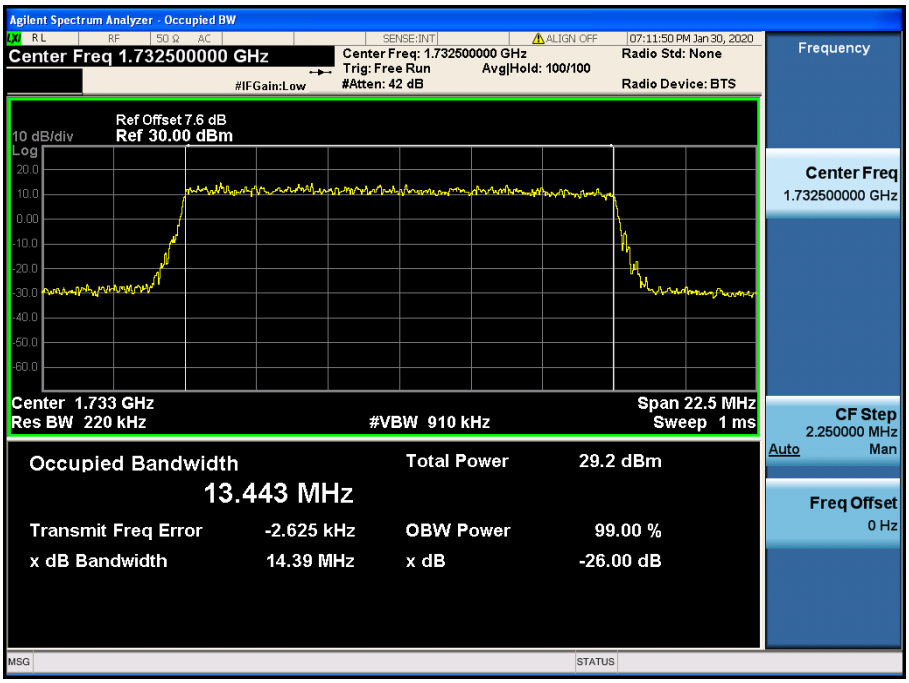
LTE Band 4 / 20 MHz / QPSK - RB Size 100



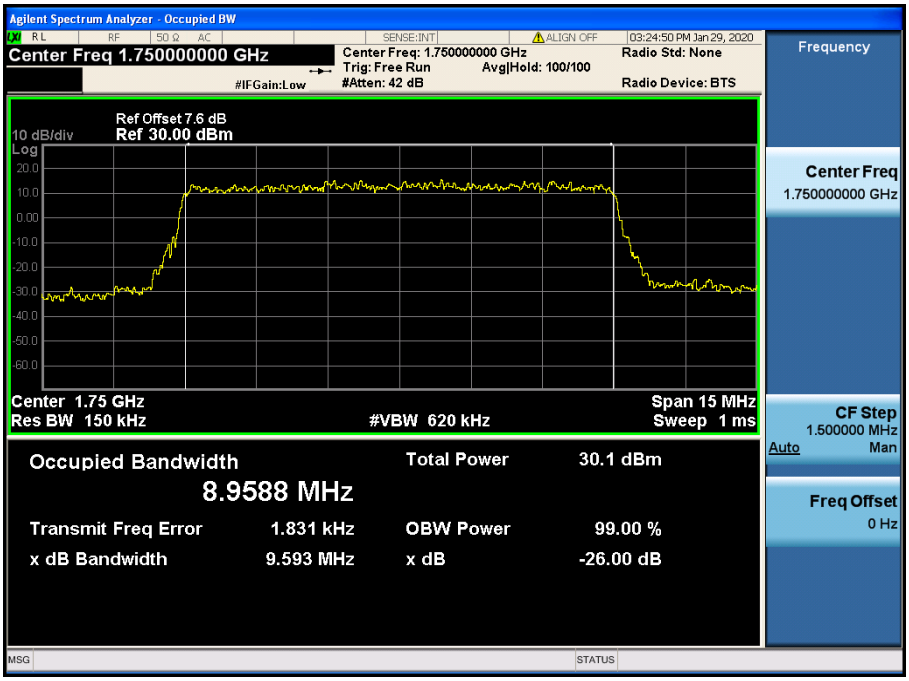
LTE Band 4 / 20 MHz / 16QAM - RB Size 100



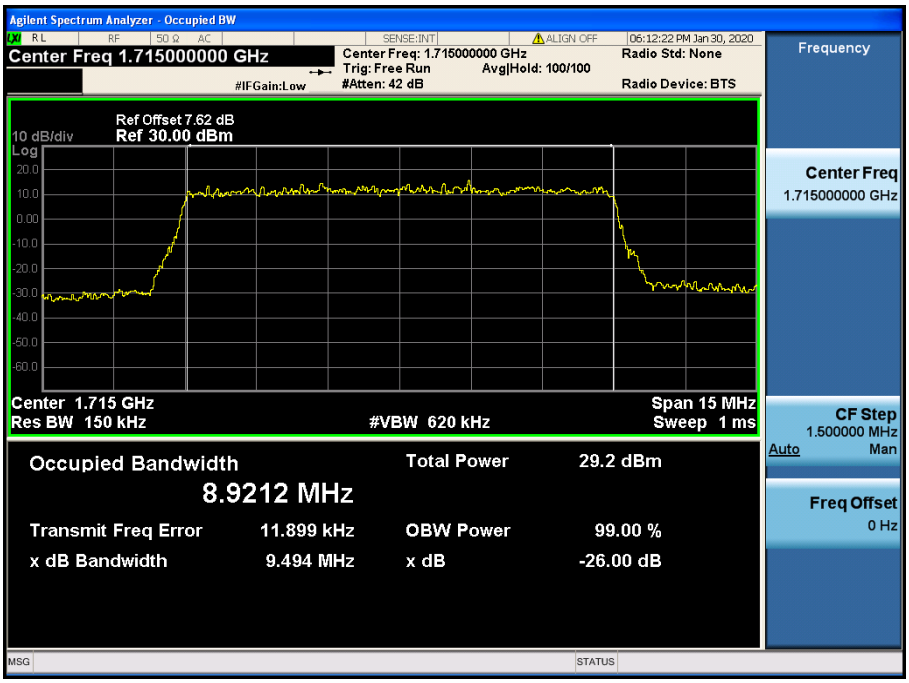
LTE Band 4 / 15 MHz / QPSK - RB Size 75



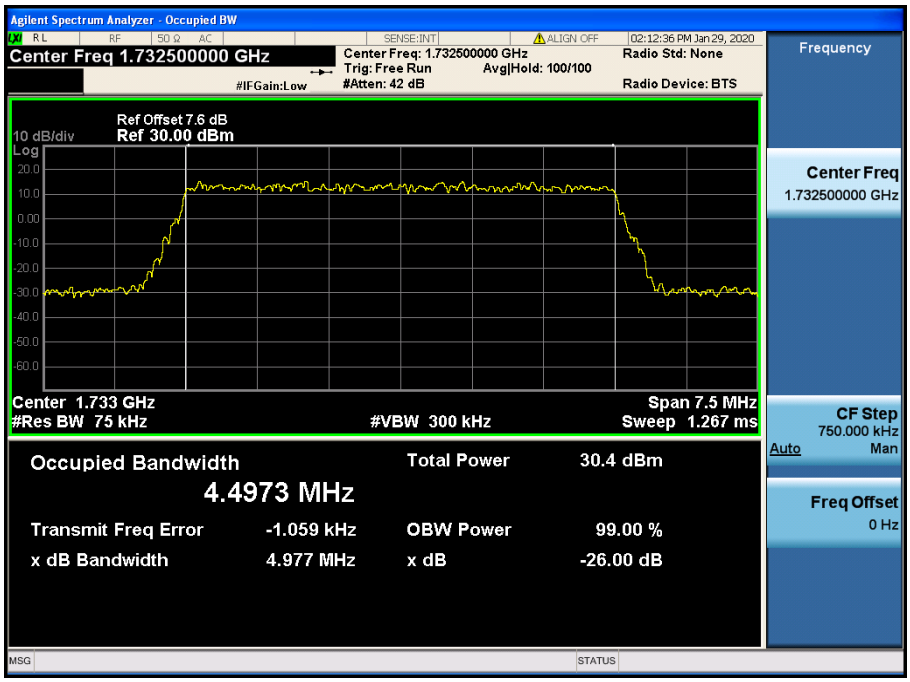
LTE Band 4 / 15 MHz / 16QAM - RB Size 75



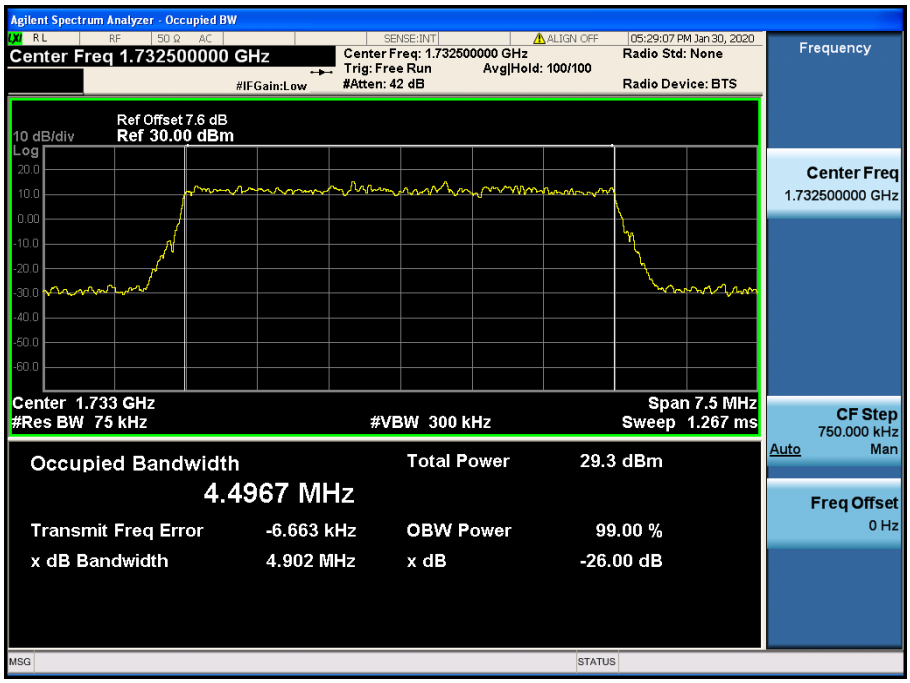
LTE Band 4 / 10 MHz / QPSK - RB Size 50



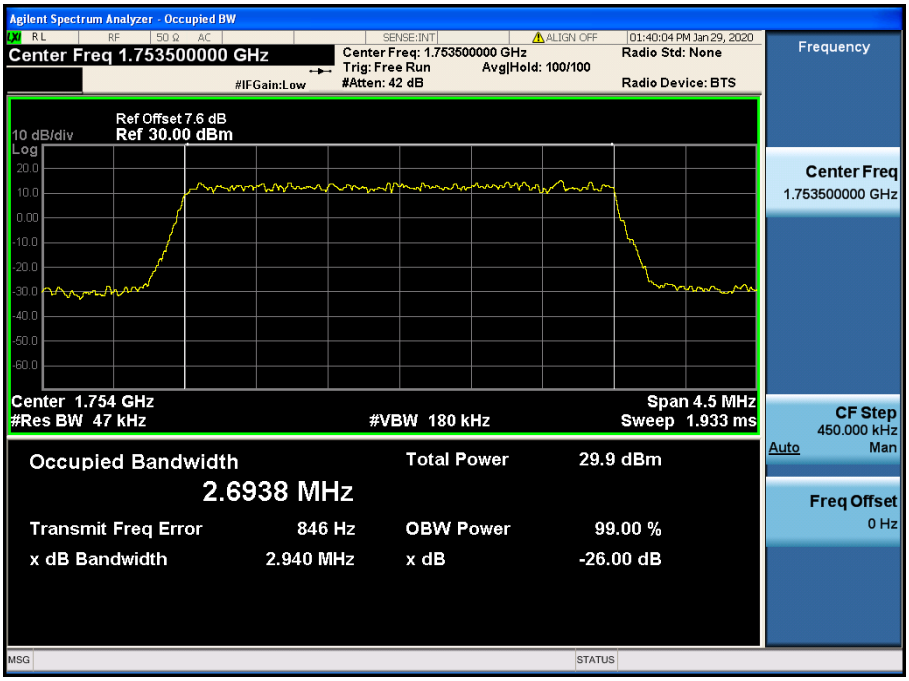
LTE Band 4 / 10 MHz / 16QAM - RB Size 50



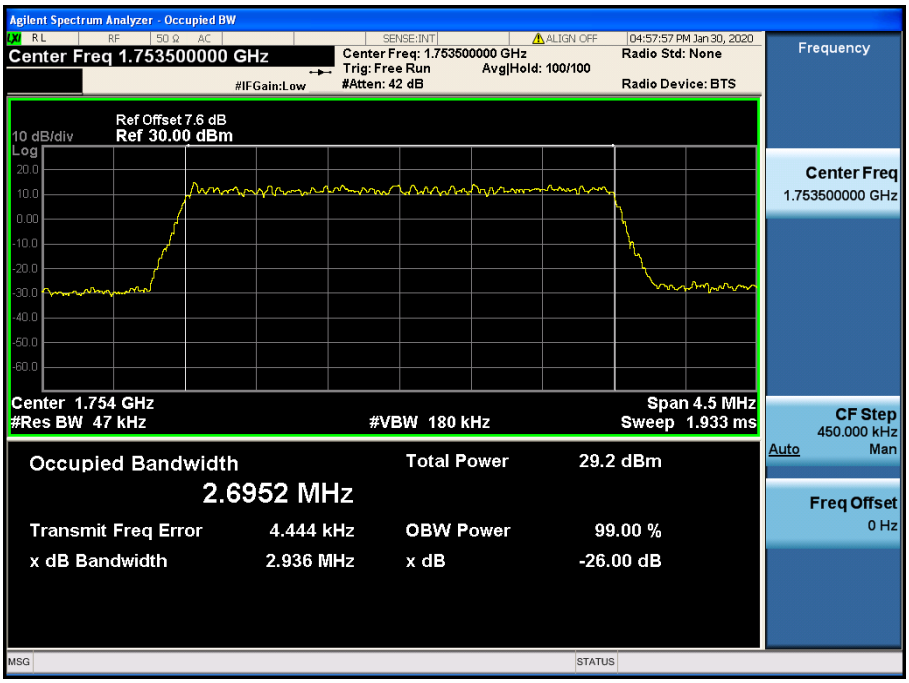
LTE Band 4 / 5 MHz / QPSK - RB Size 25



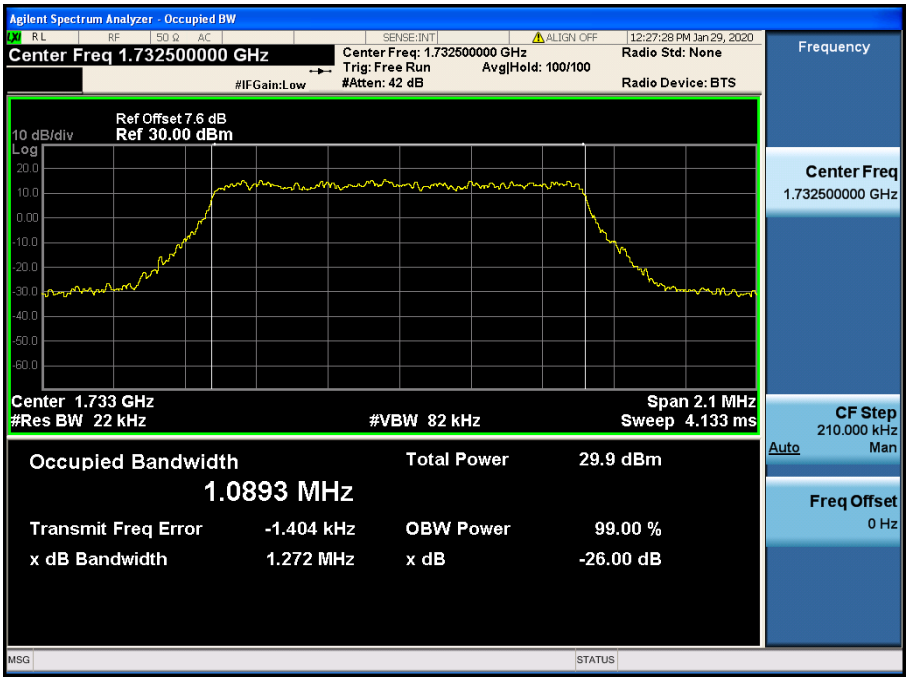
LTE Band 4 / 5 MHz / 16QAM - RB Size 25



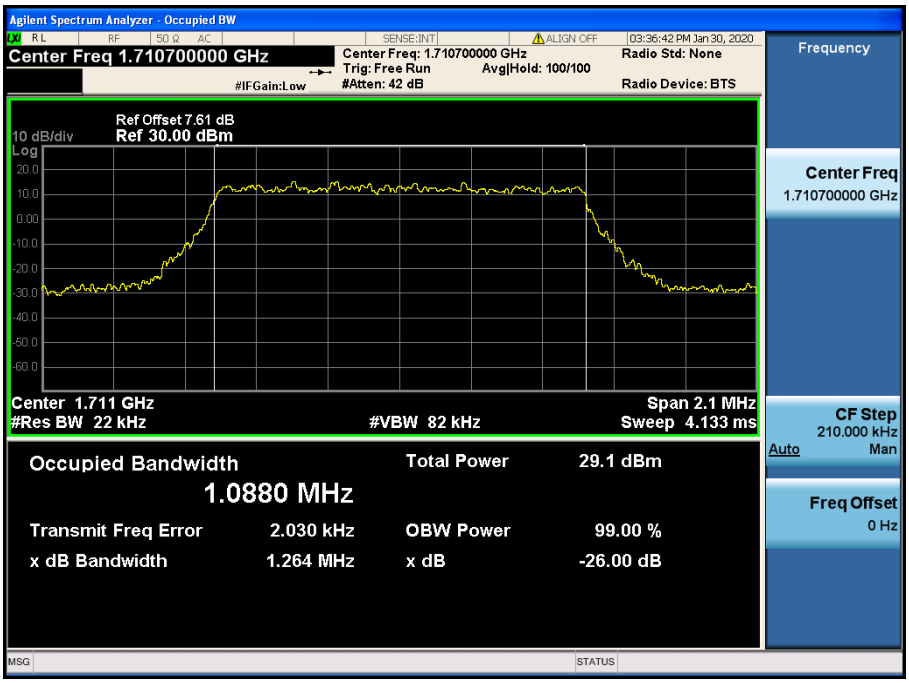
LTE Band 4 / 3 MHz / QPSK - RB Size 15



LTE Band 4 / 3 MHz / 16QAM - RB Size 15

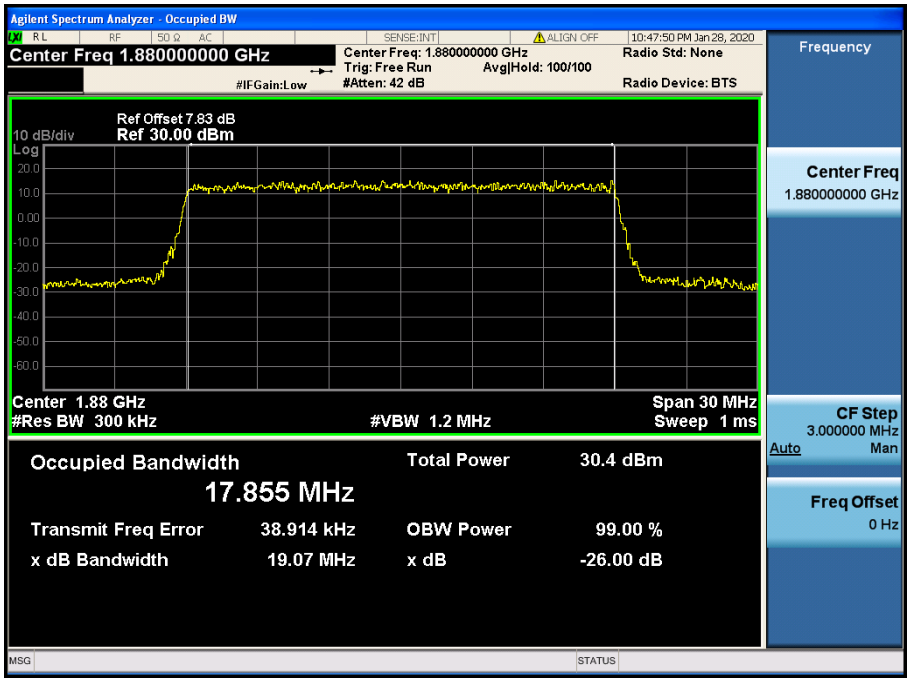


LTE Band 4 / 1.4 MHz / QPSK - RB Size 6

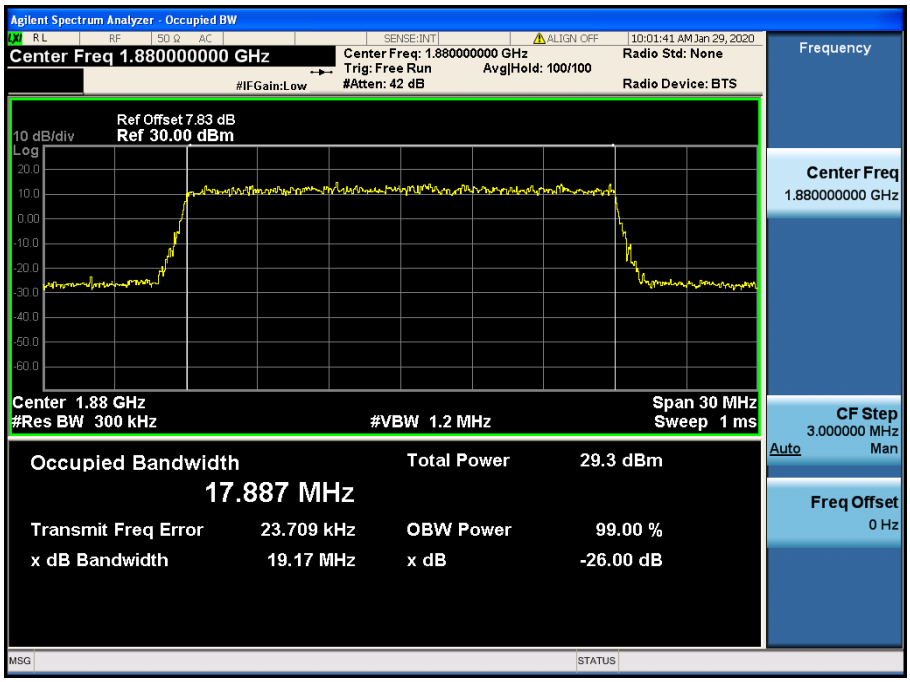


LTE Band 4 / 1.4 MHz / 16QAM - RB Size 6

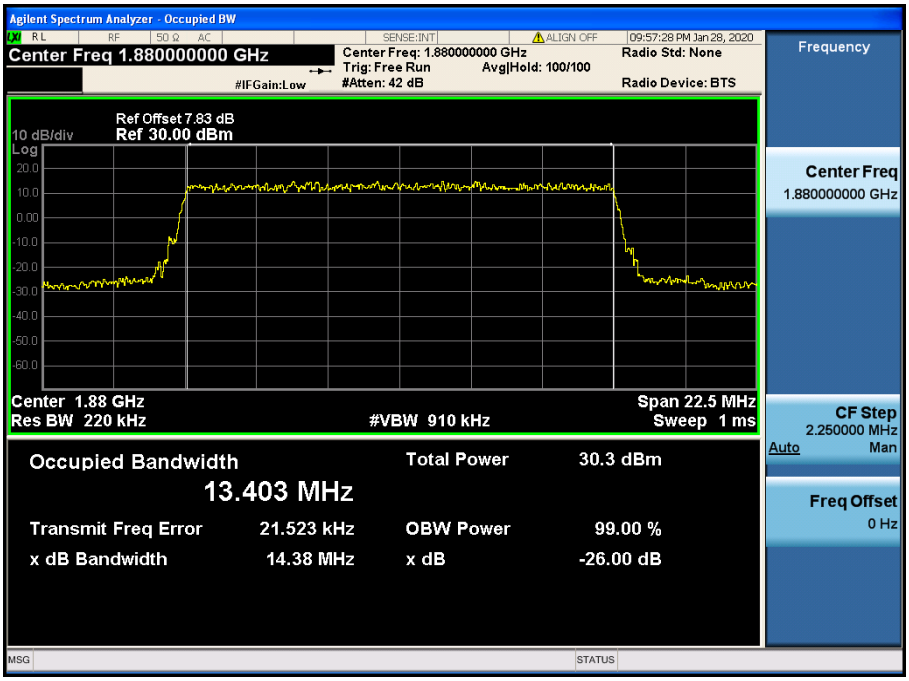
8.1.4 LTE Band 2



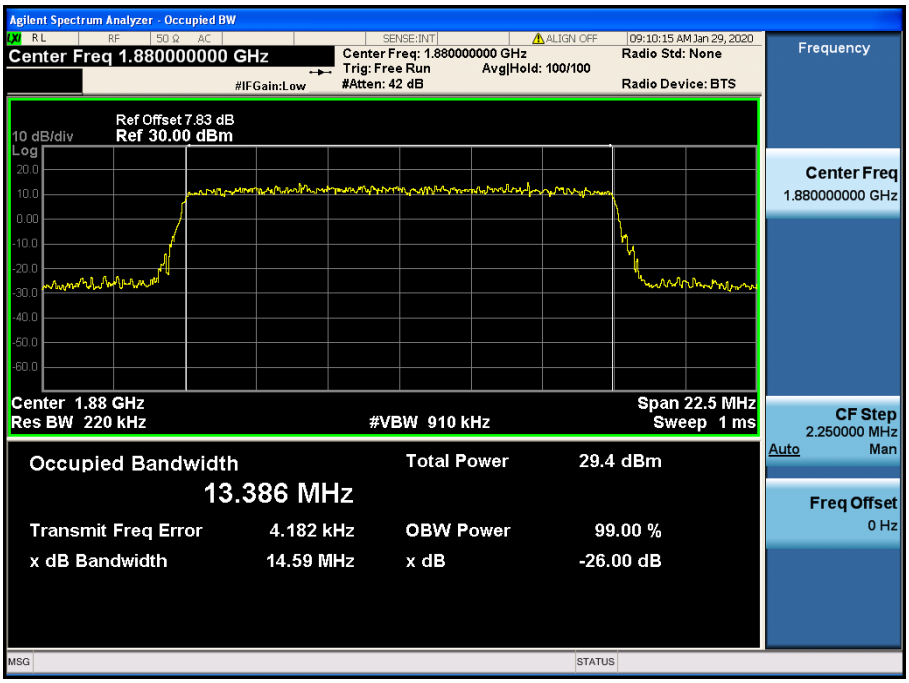
LTE Band 2 / 20 MHz / QPSK - RB Size 100



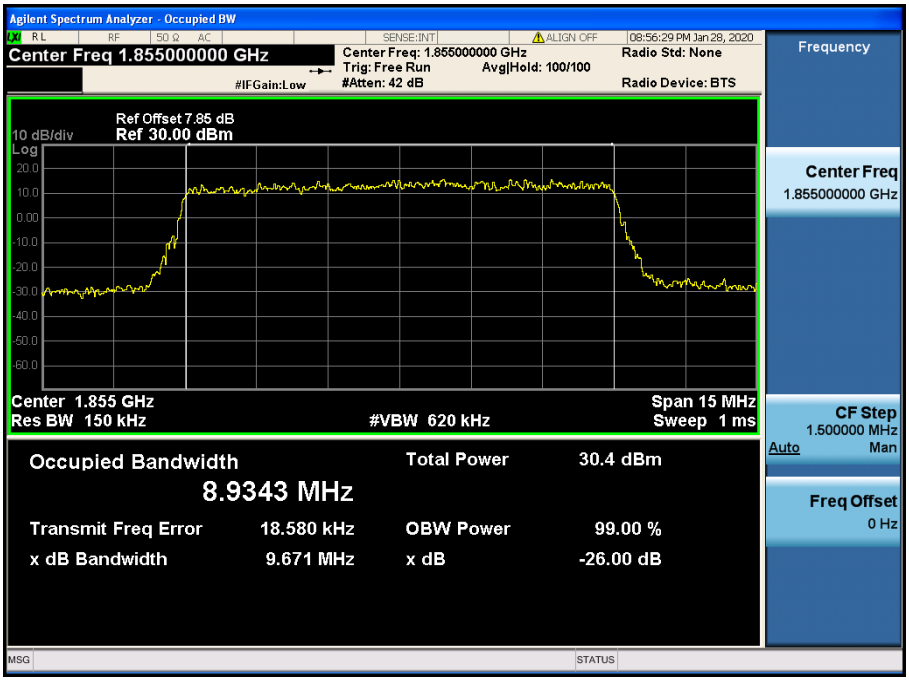
LTE Band 2 / 20 MHz / 16QAM - RB Size 100



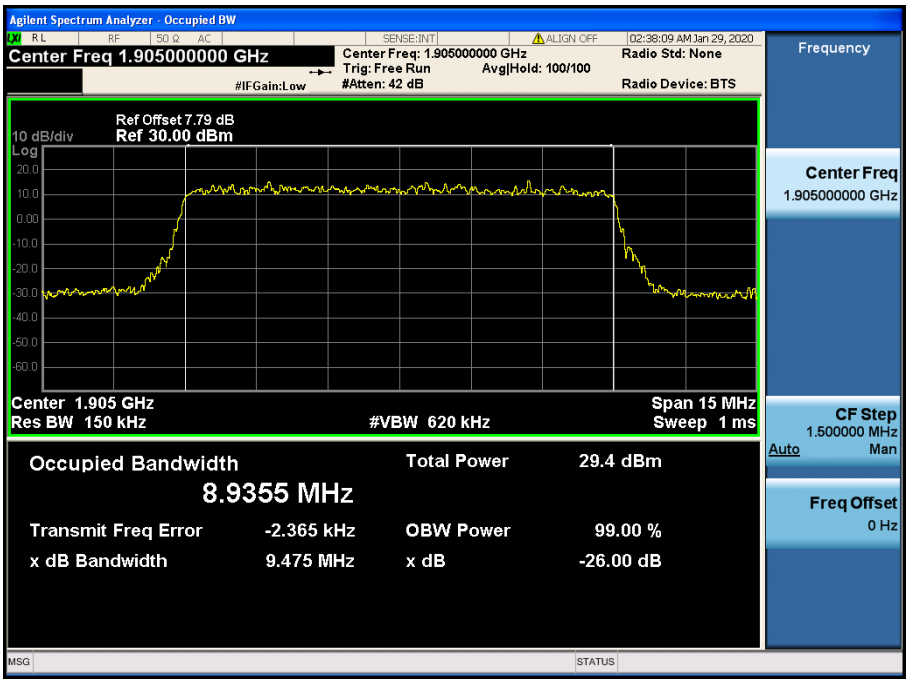
LTE Band 2 / 15 MHz / QPSK - RB Size 75



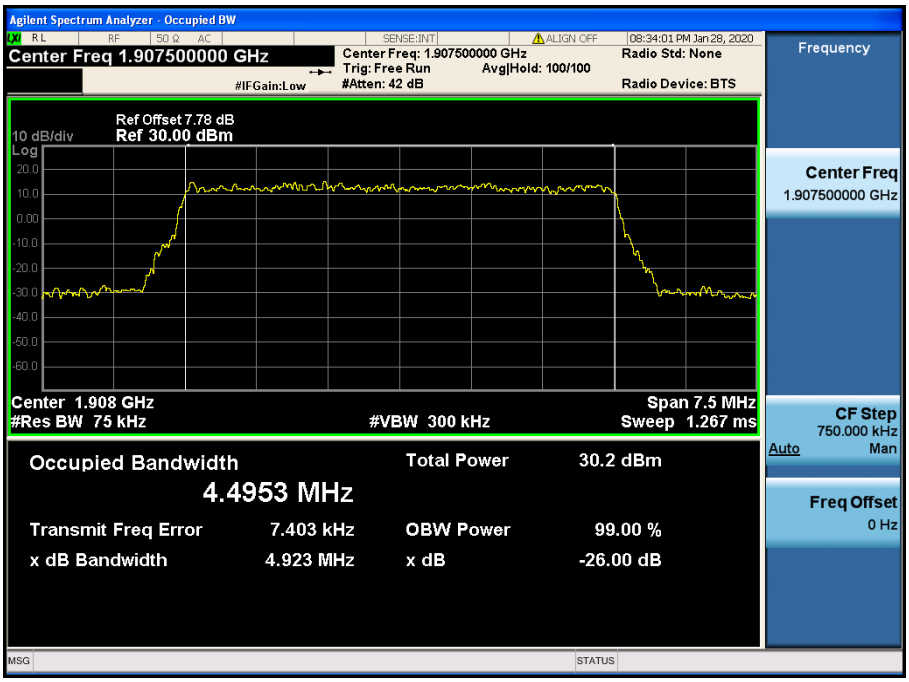
LTE Band 2 / 15 MHz / 16QAM - RB Size 75



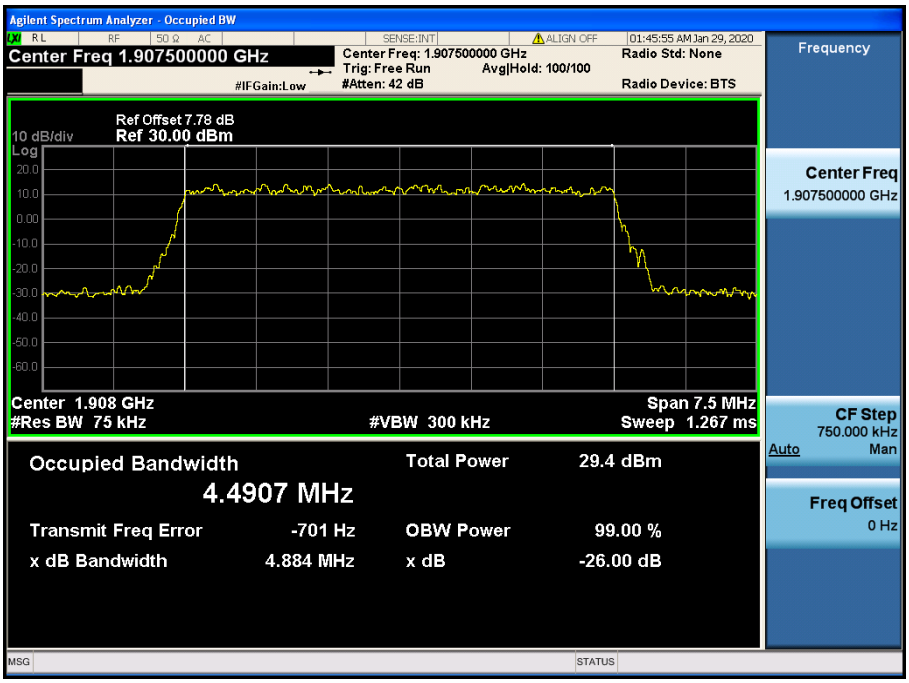
LTE Band 2 / 10 MHz / QPSK - RB Size 50



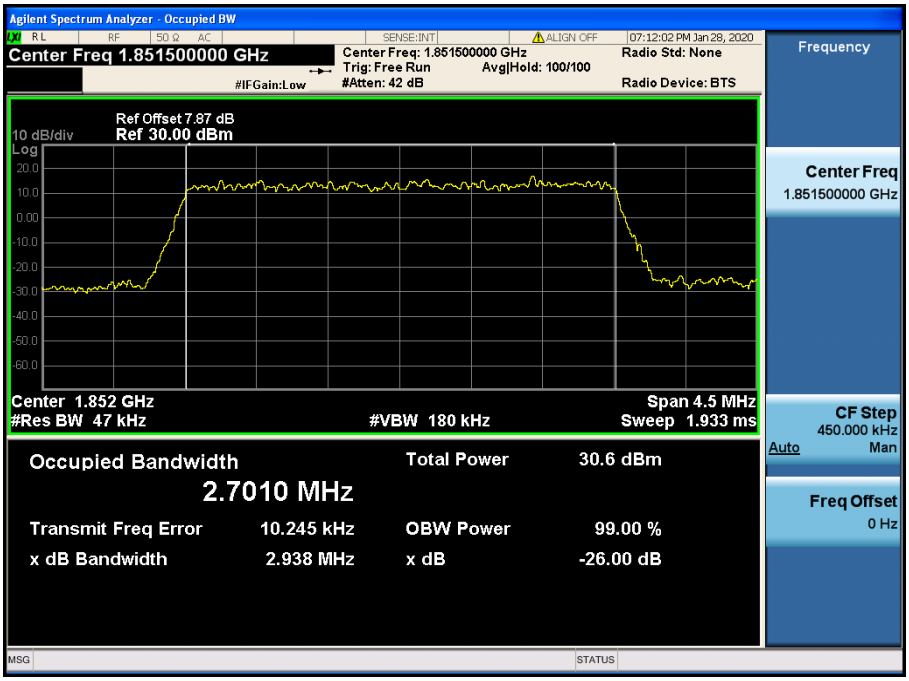
LTE Band 2 / 10 MHz / 16QAM - RB Size 50



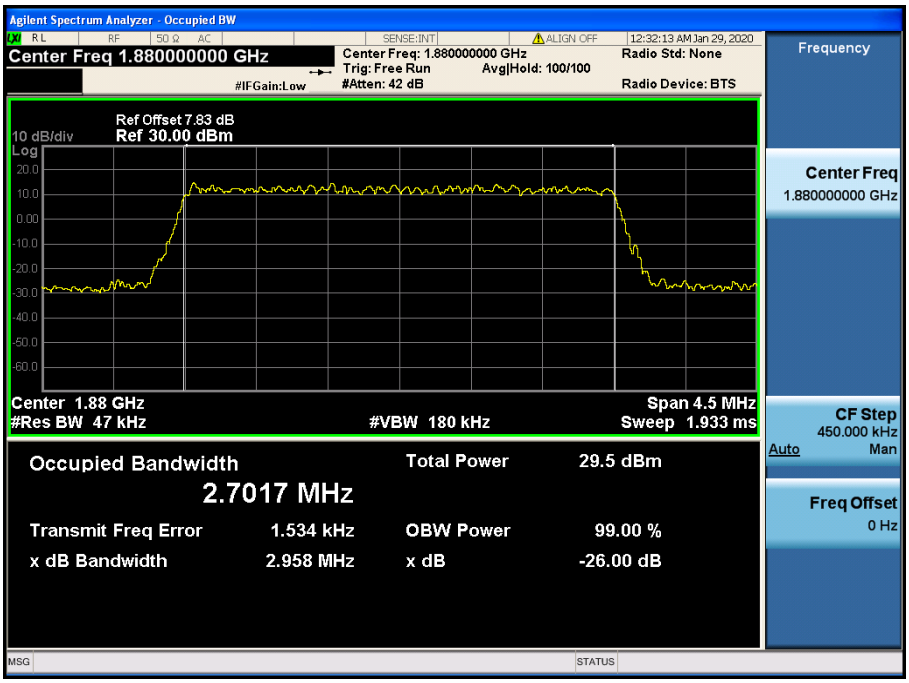
LTE Band 2 / 5 MHz / QPSK - RB Size 25



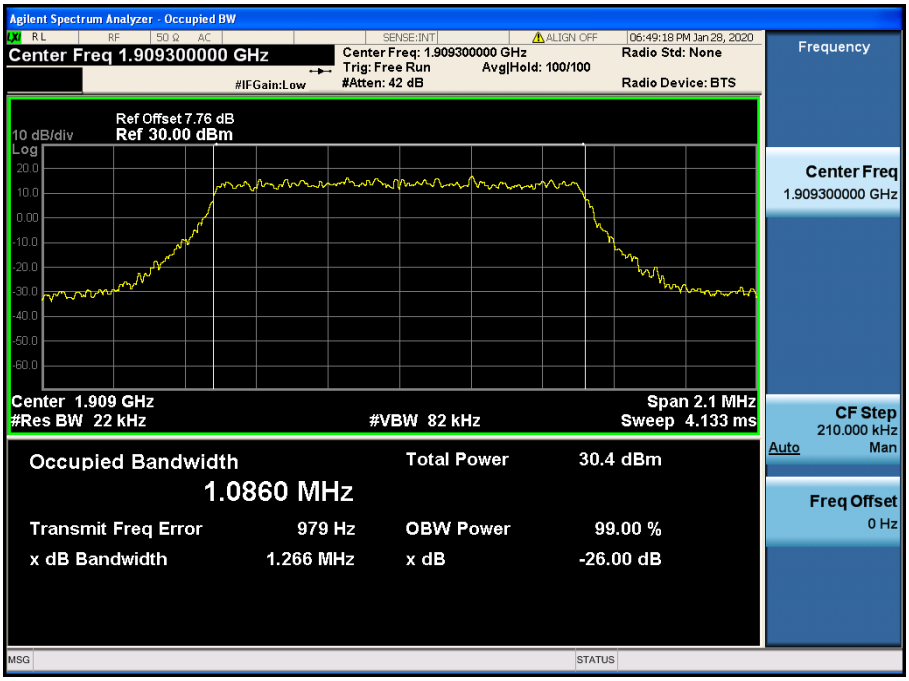
LTE Band 2 / 5 MHz / 16QAM - RB Size 25



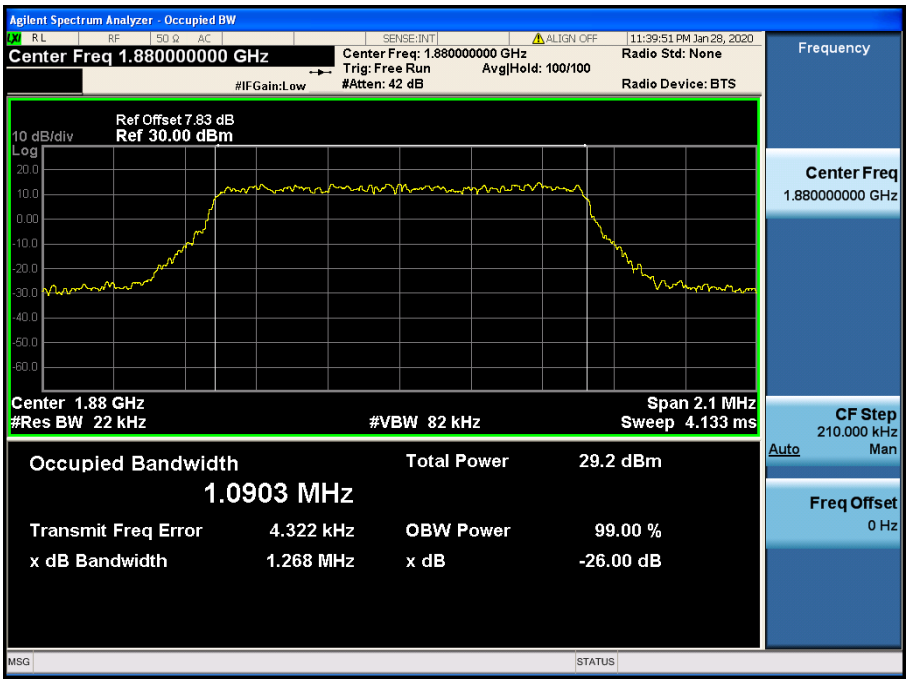
LTE Band 2 / 3 MHz / QPSK - RB Size 15



LTE Band 2 / 3 MHz / 16QAM - RB Size 15



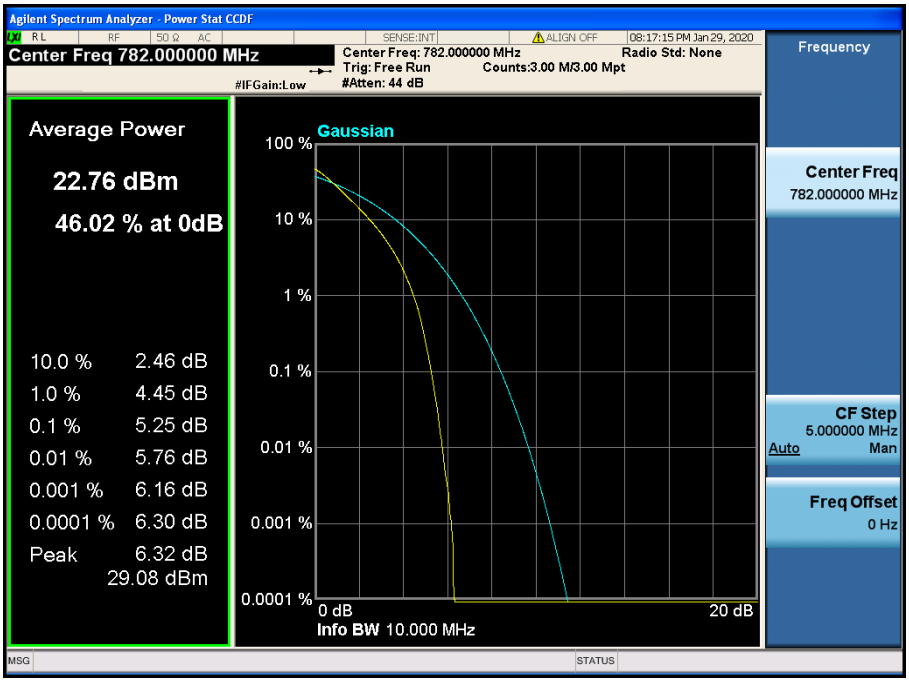
LTE Band 2 / 1.4 MHz / QPSK - RB Size 6



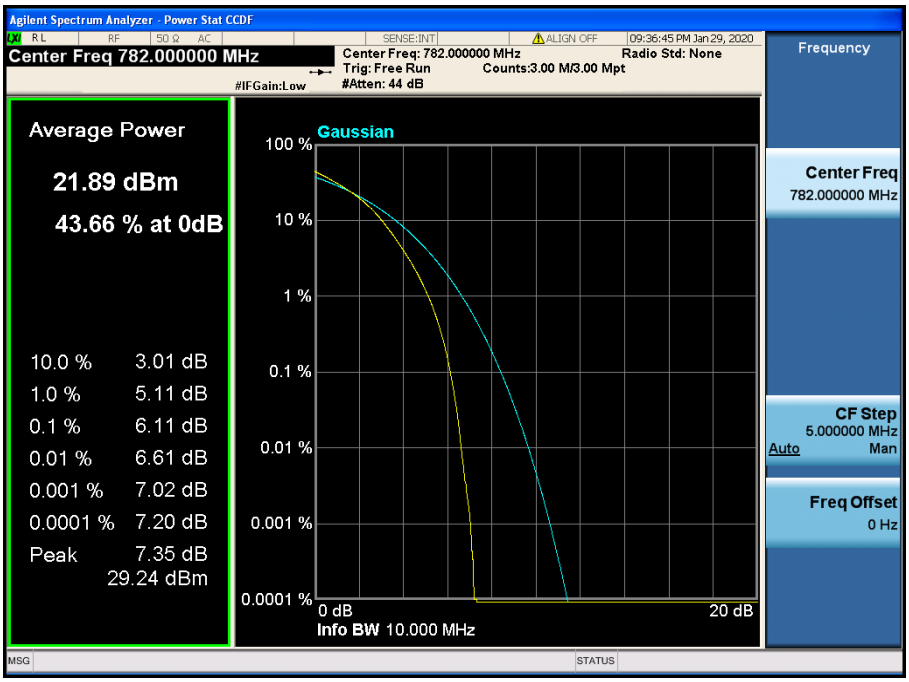
LTE Band 2 / 1.4 MHz / 16QAM - RB Size 6

8.2 PEAK TO AVERAGE RATIO

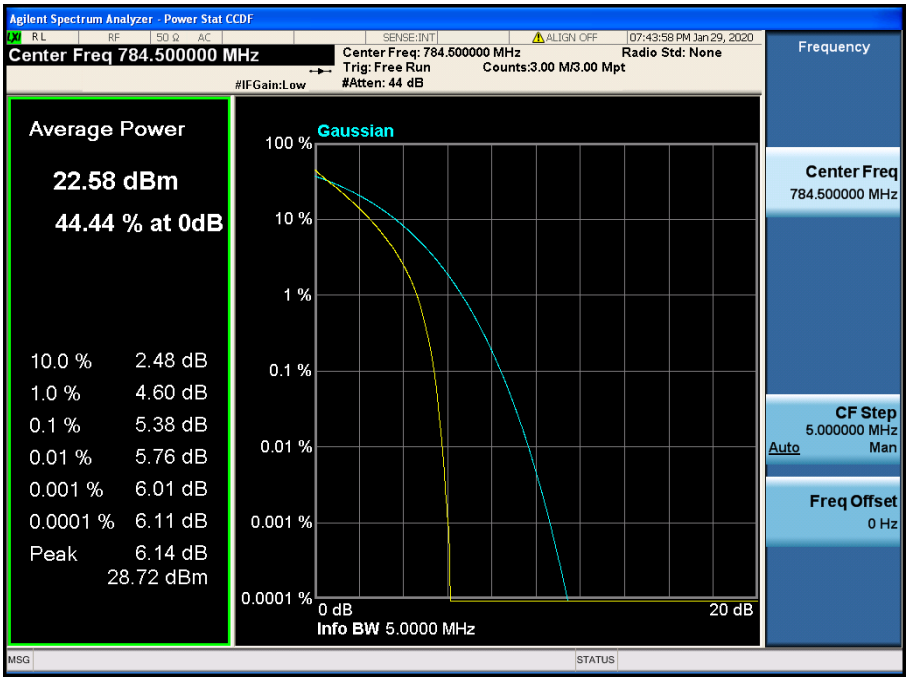
8.2.1 LTE Band 13



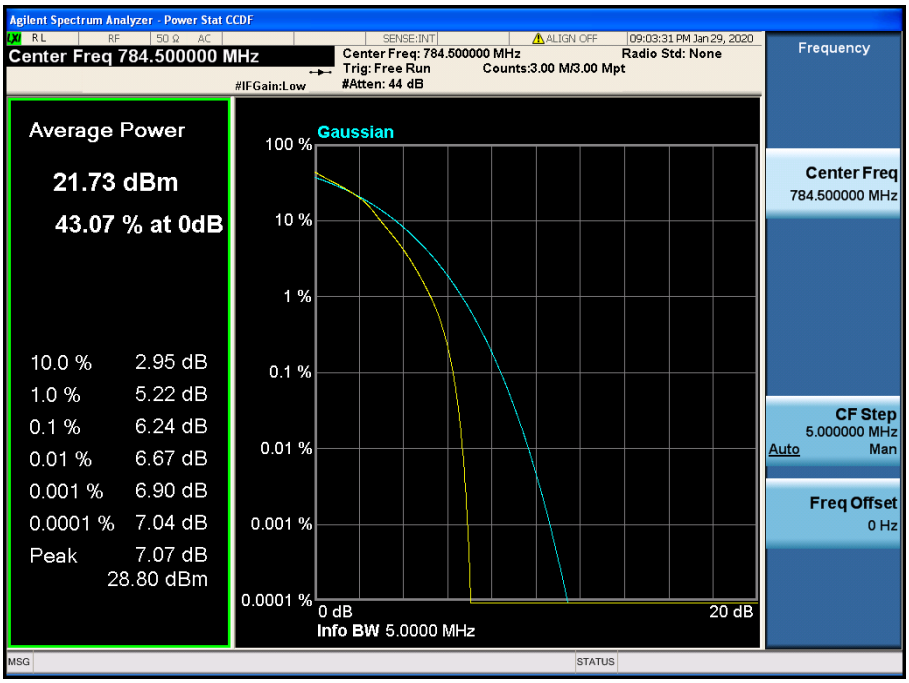
LTE Band 13 / 10 MHz / QPSK - RB Size 50



LTE Band 13 / 10 MHz / 16QAM - RB Size 50

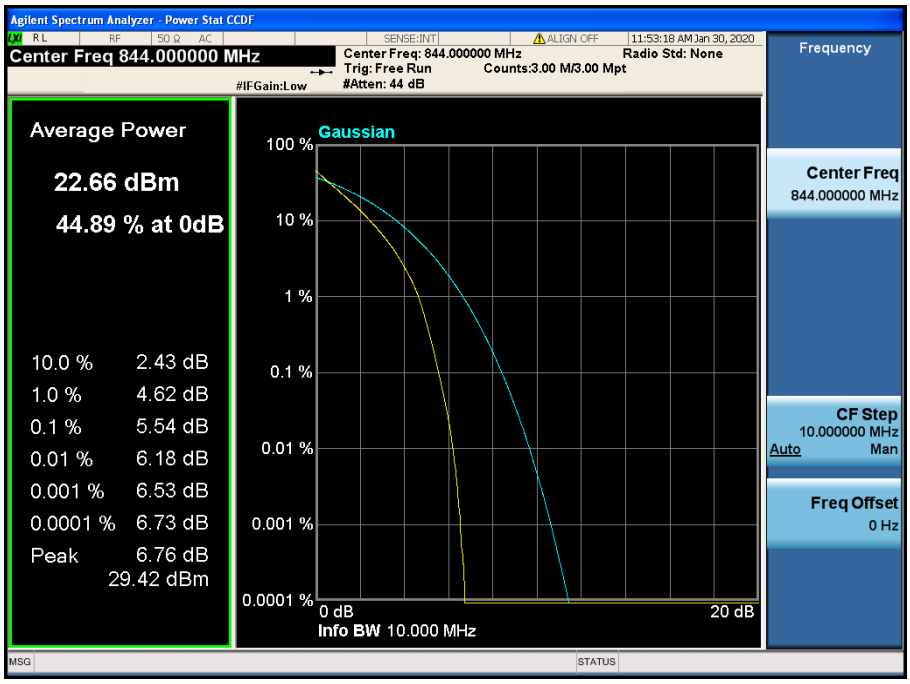


LTE Band 13 / 5 MHz / QPSK - RB Size 25

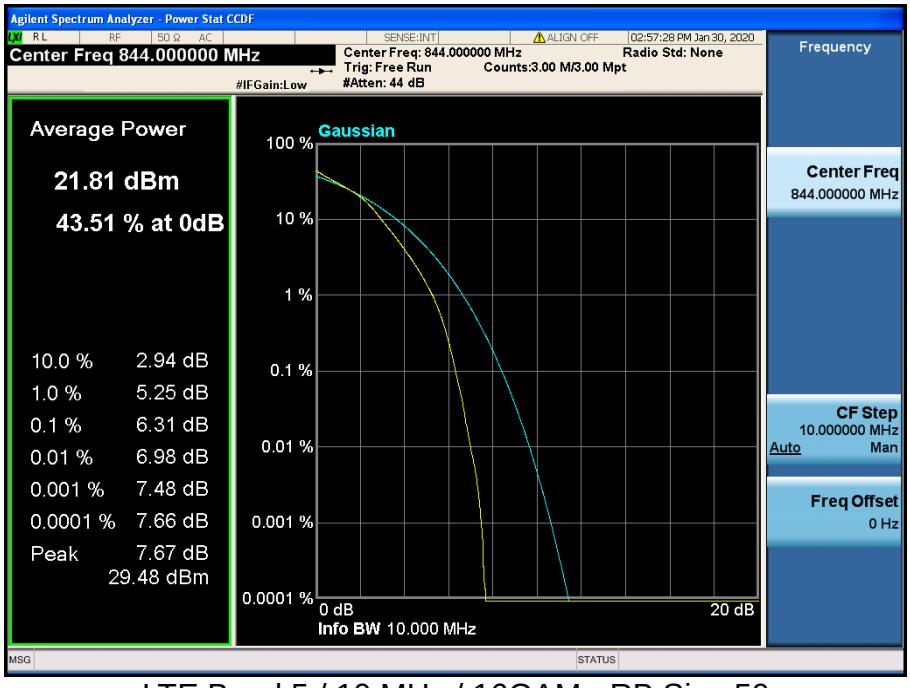


LTE Band 13 / 5 MHz / 16QAM - RB Size 25

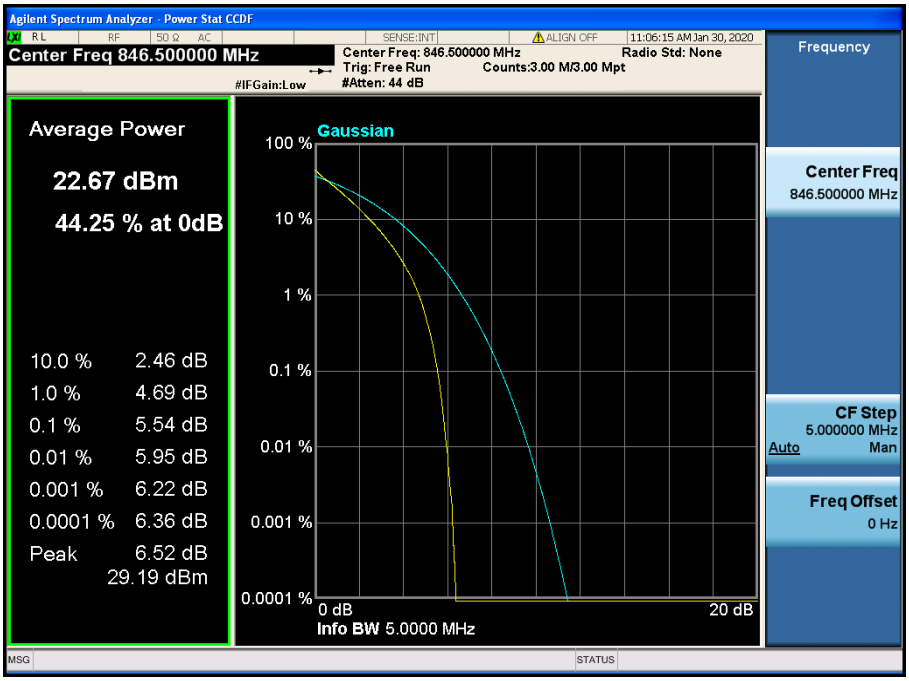
8.2.4 LTE Band 5



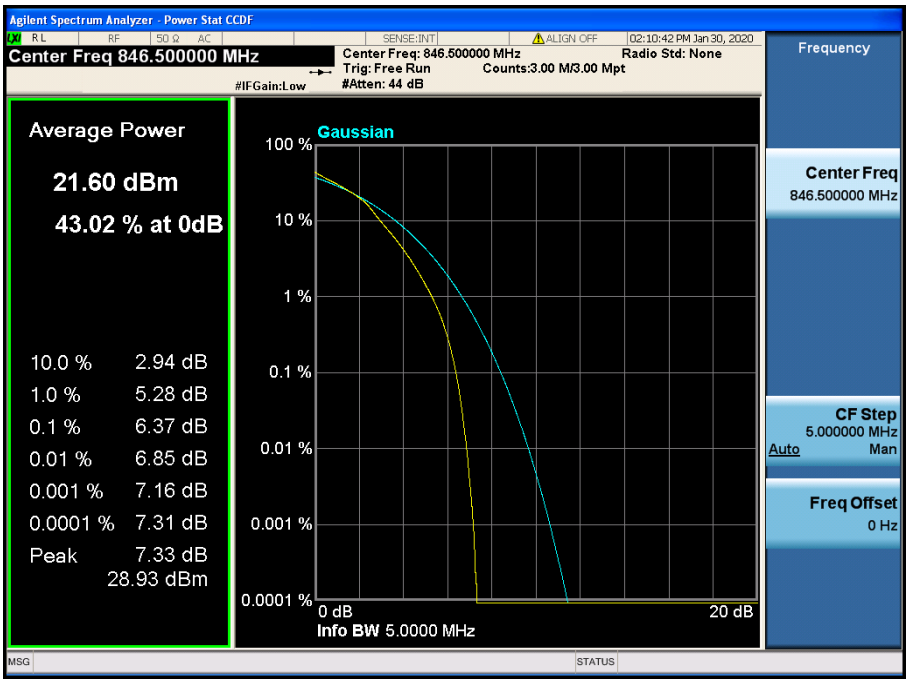
LTE Band 5 / 10 MHz / QPSK - RB Size 50



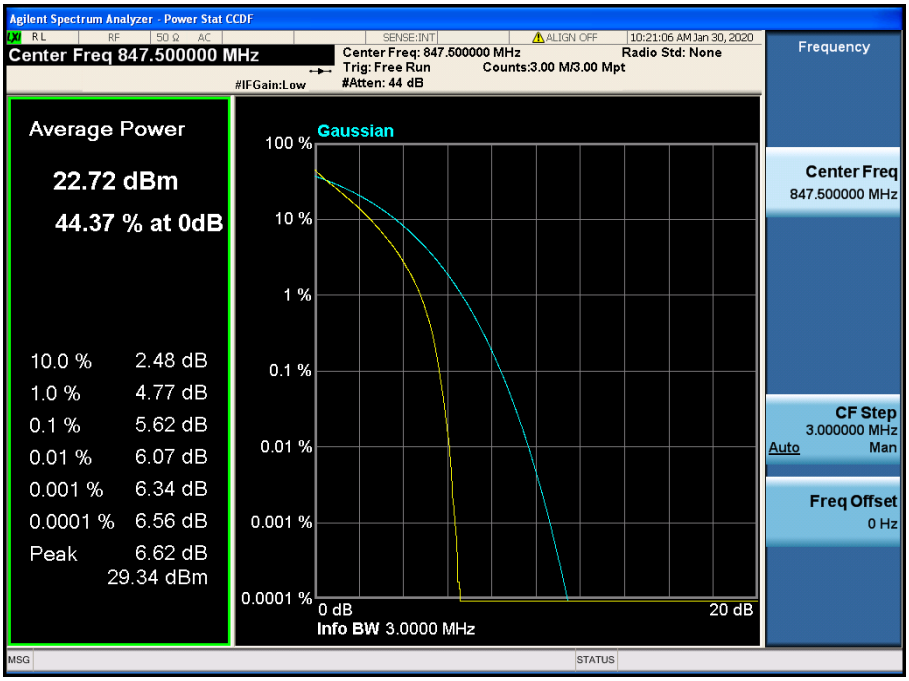
LTE Band 5 / 10 MHz / 16QAM - RB Size 50



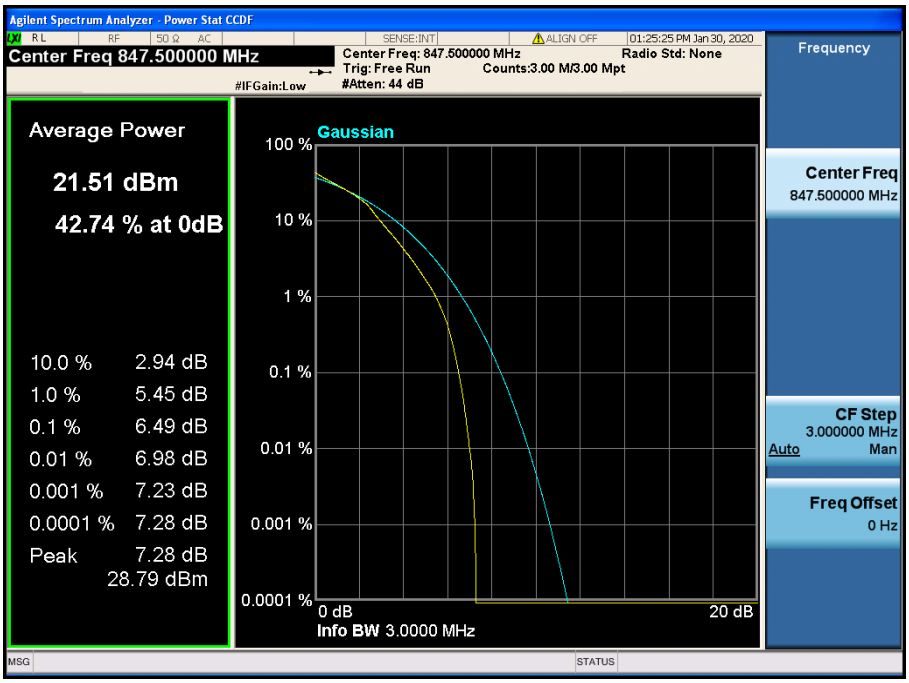
LTE Band 5 / 5 MHz / QPSK - RB Size 25



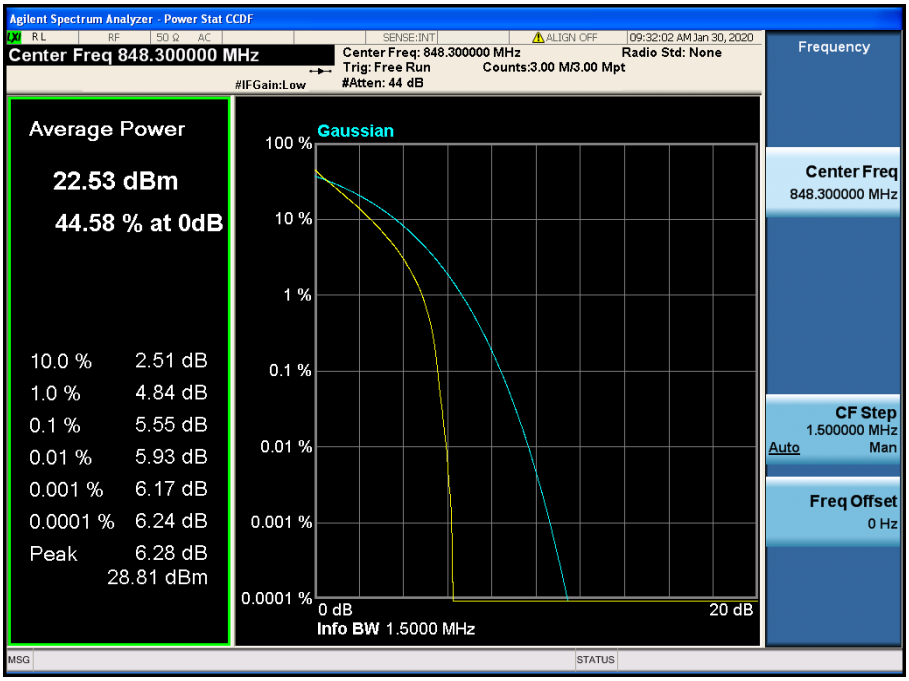
LTE Band 5 / 5 MHz / 16QAM - RB Size 25



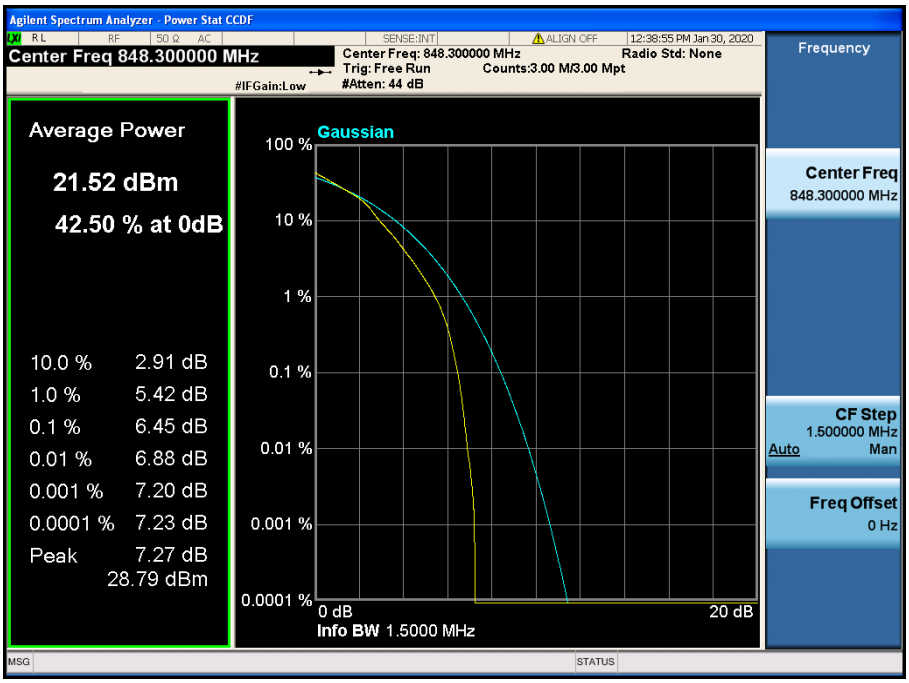
LTE Band 5 / 3 MHz / QPSK - RB Size 15



LTE Band 5 / 3 MHz / 16QAM - RB Size 15

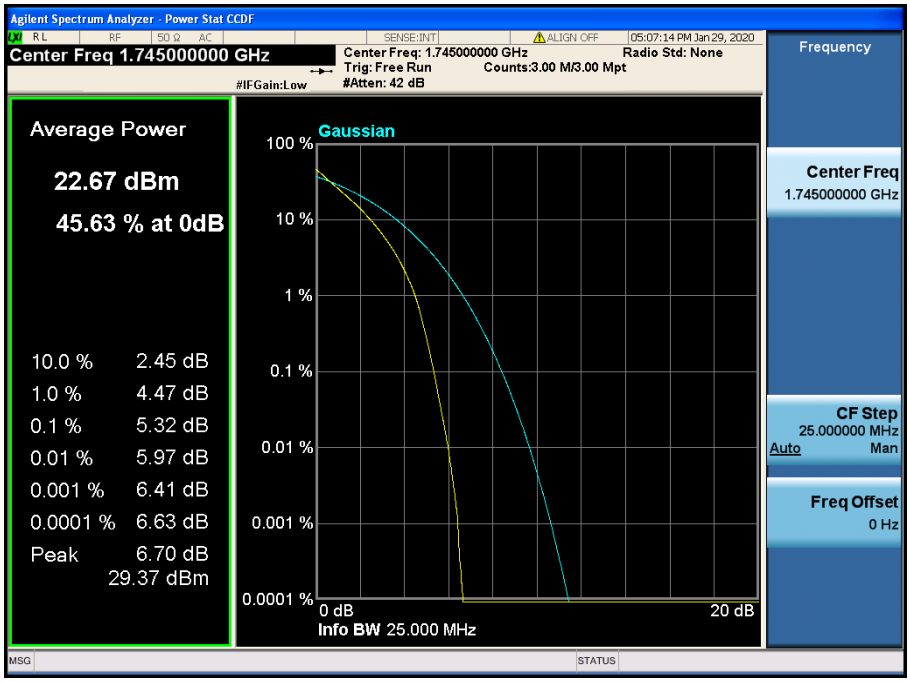


LTE Band 5 / 1.4 MHz / QPSK - RB Size 6

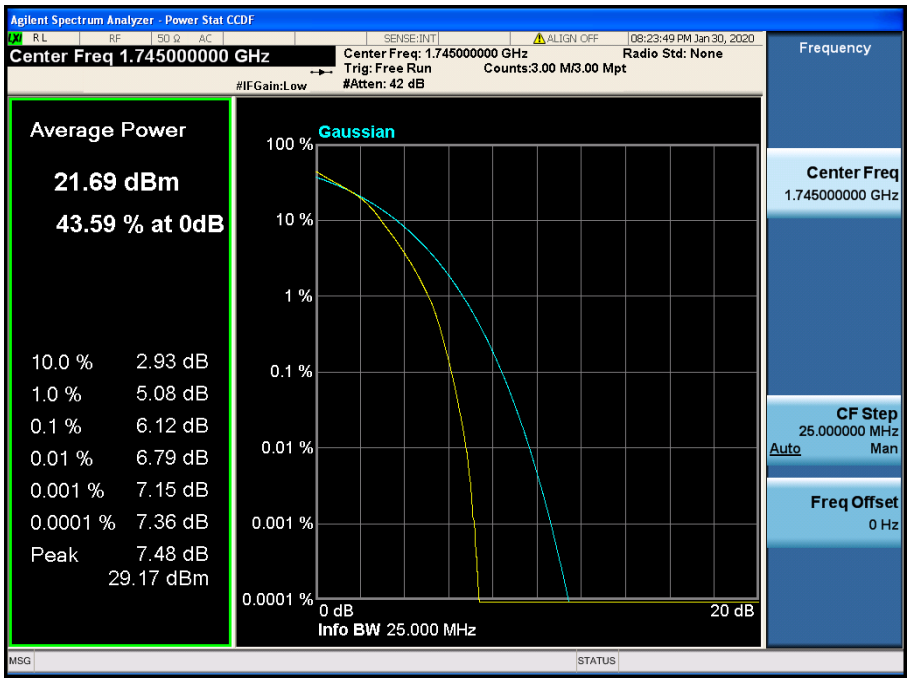


LTE Band 5 / 1.4 MHz / 16QAM - RB Size 6

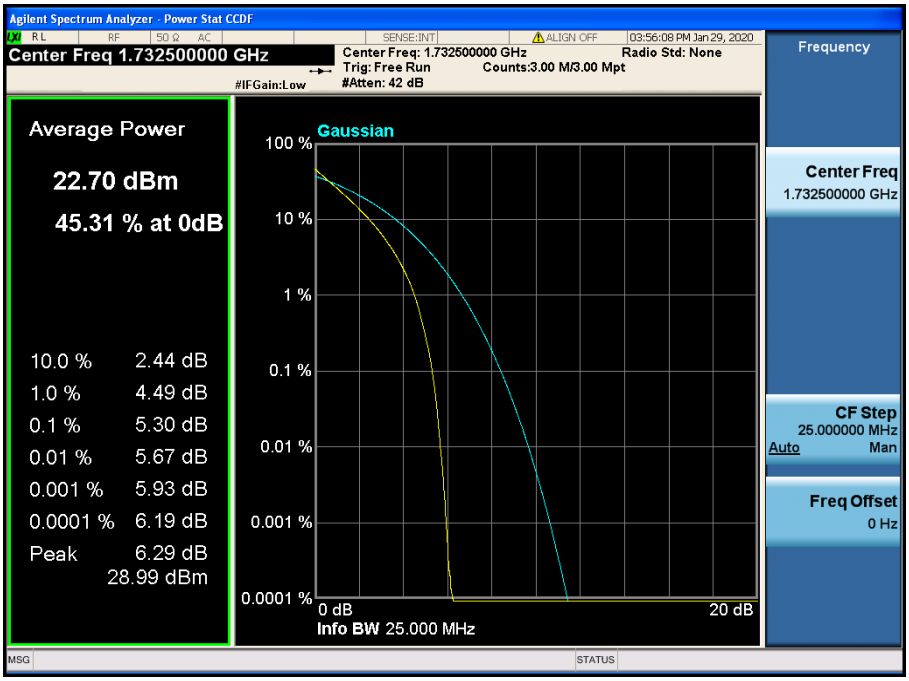
8.2.3 LTE Band 4



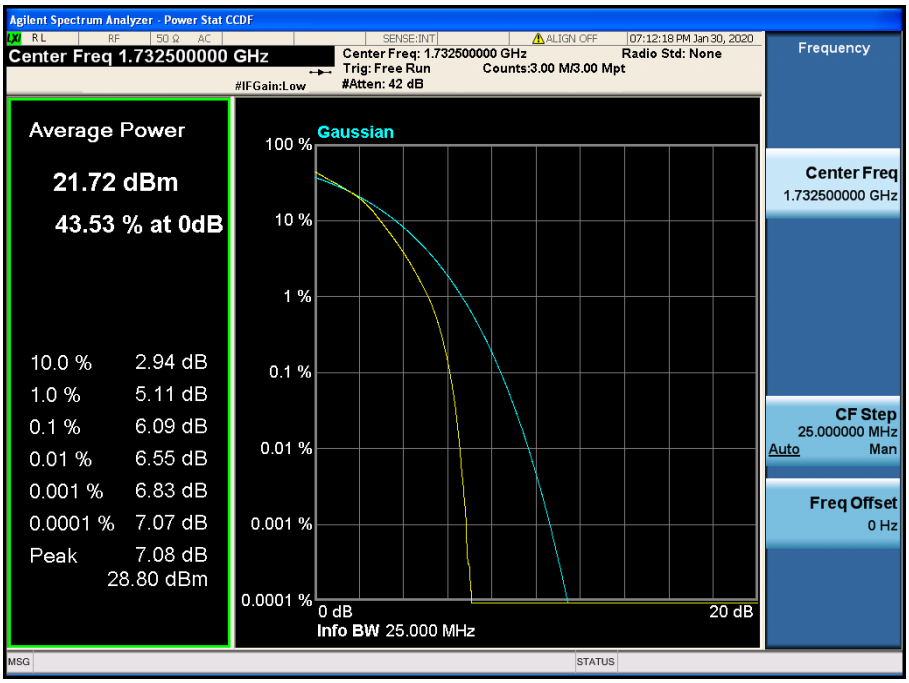
LTE Band 4 / 20 MHz / QPSK - RB Size 100



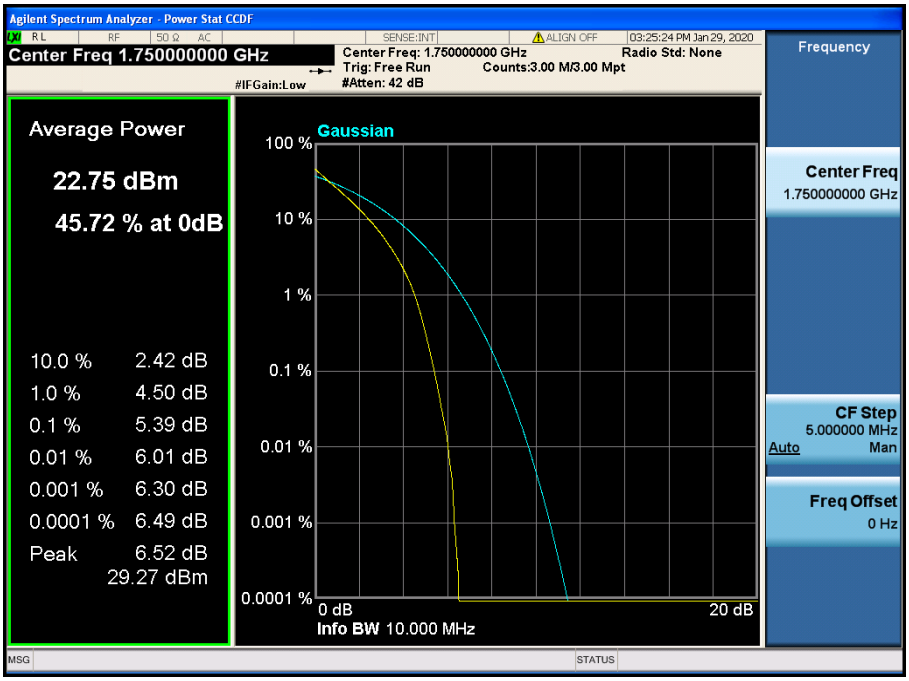
LTE Band 4 / 20 MHz / 16QAM - RB Size 100



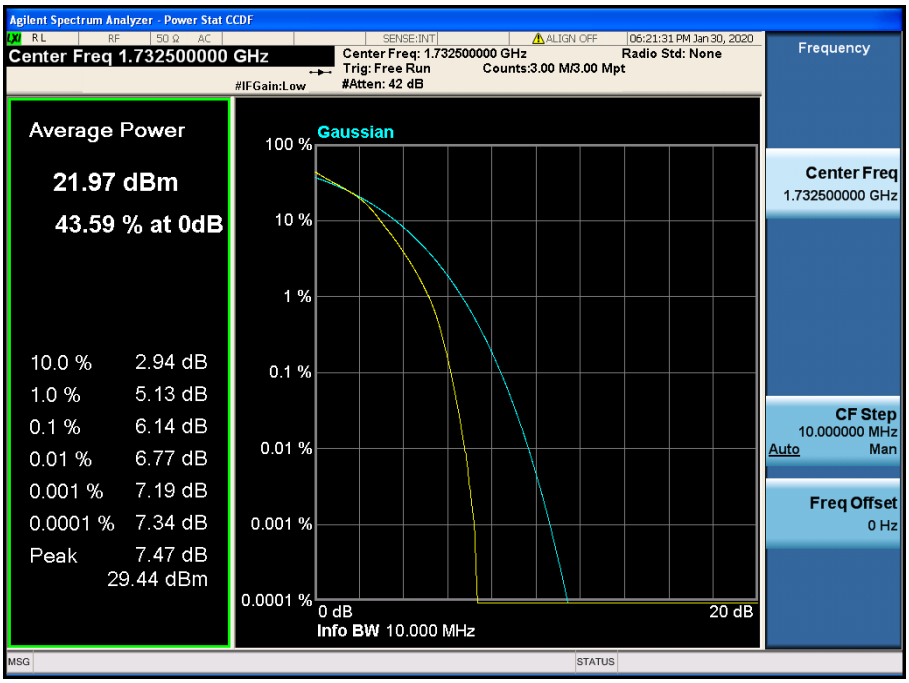
LTE Band 4 / 15 MHz / QPSK - RB Size 75



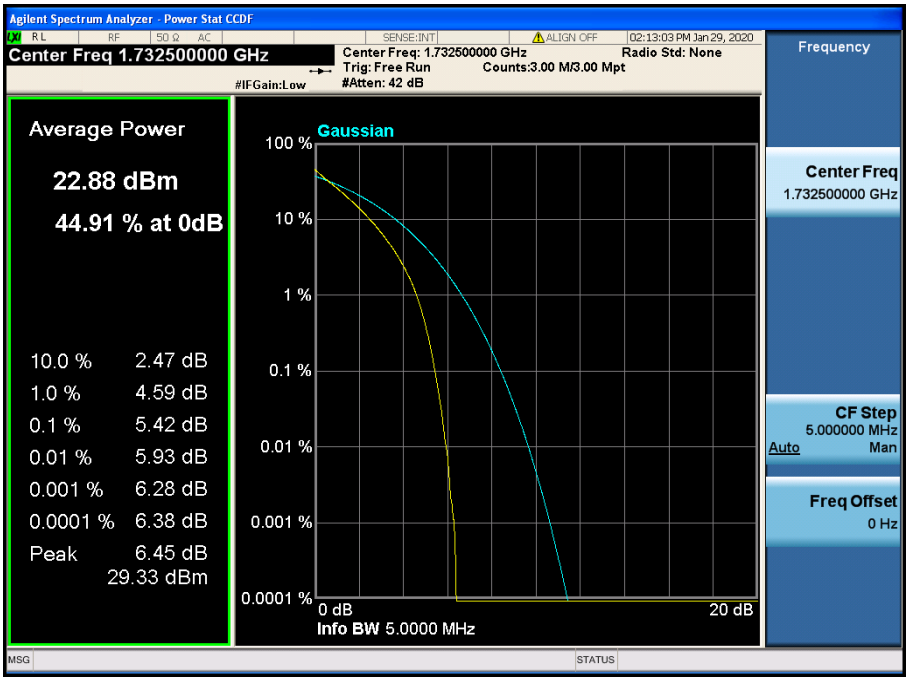
LTE Band 4 / 15 MHz / 16QAM - RB Size 75



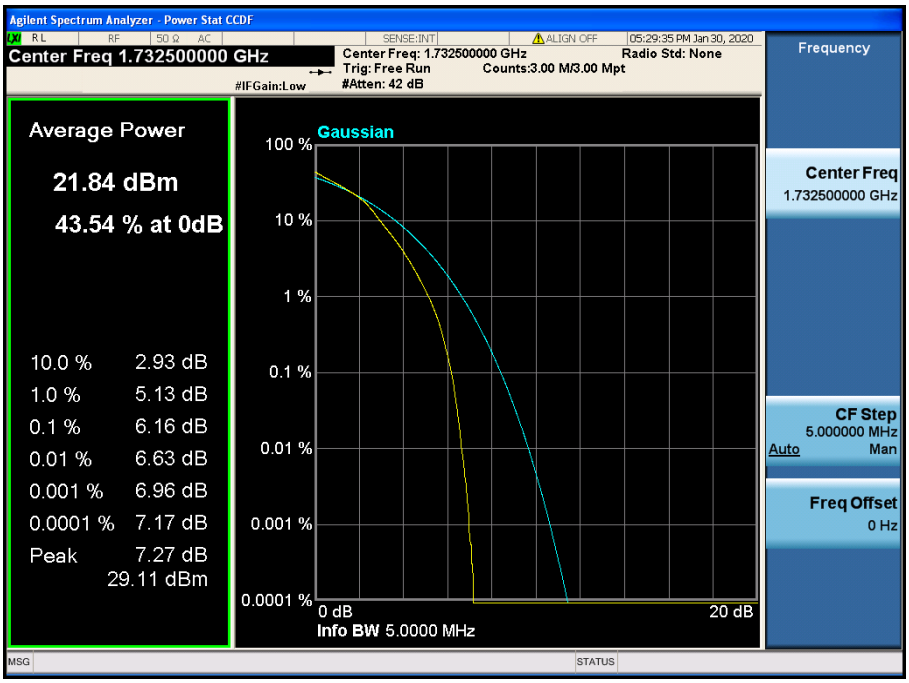
LTE Band 4 / 10 MHz / QPSK - RB Size 50



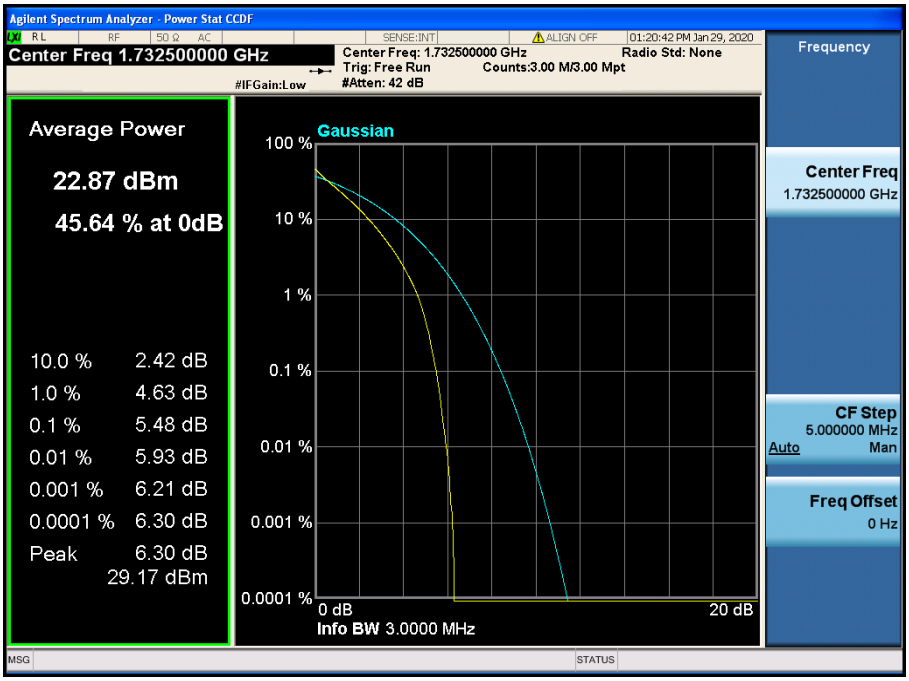
LTE Band 4 / 10 MHz / 16QAM - RB Size 50



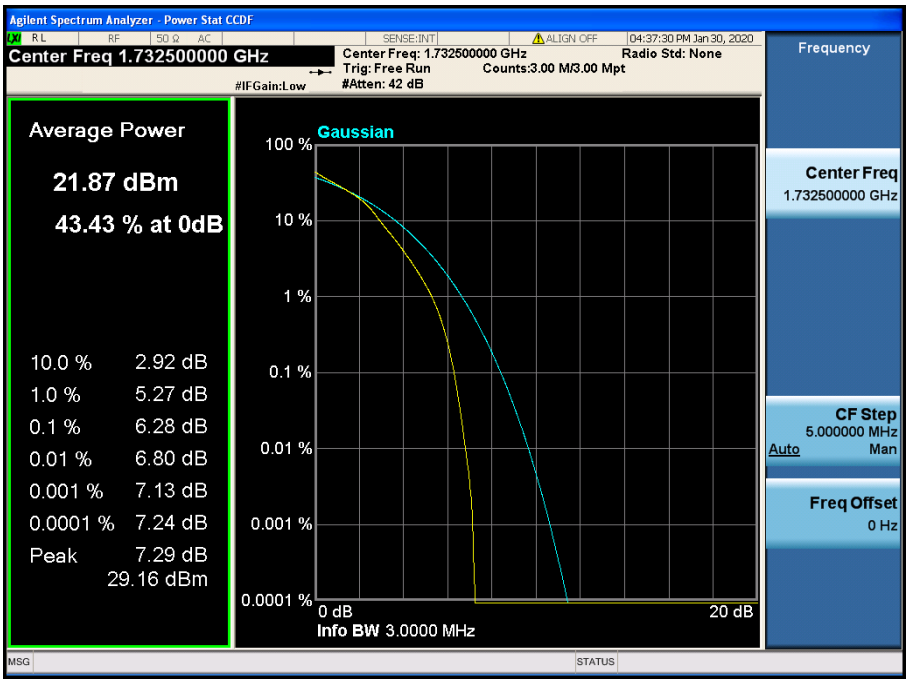
LTE Band 4 / 5 MHz / QPSK - RB Size 25



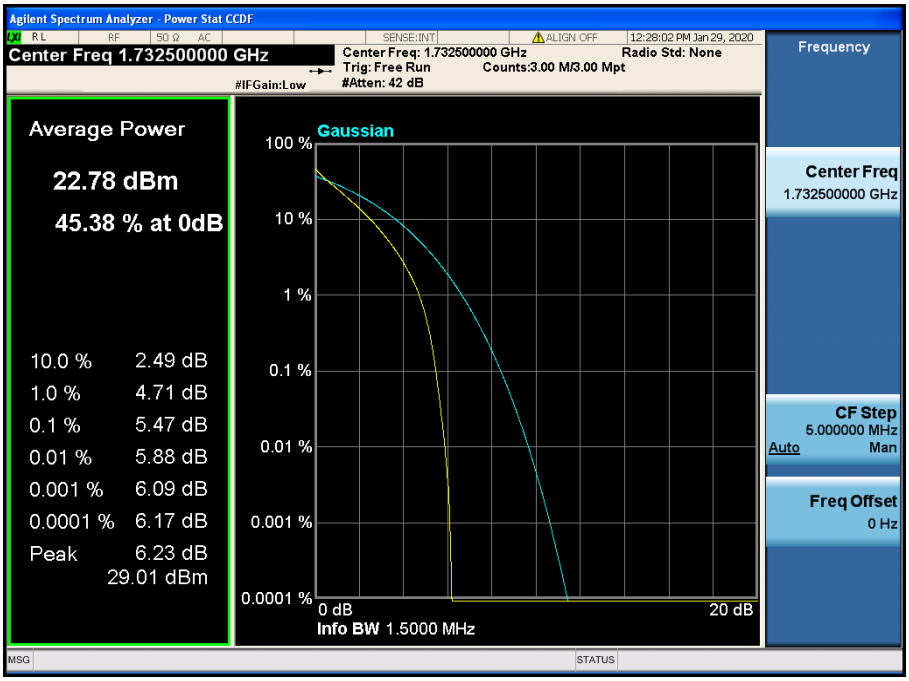
LTE Band 4 / 5 MHz / 16QAM - RB Size 25



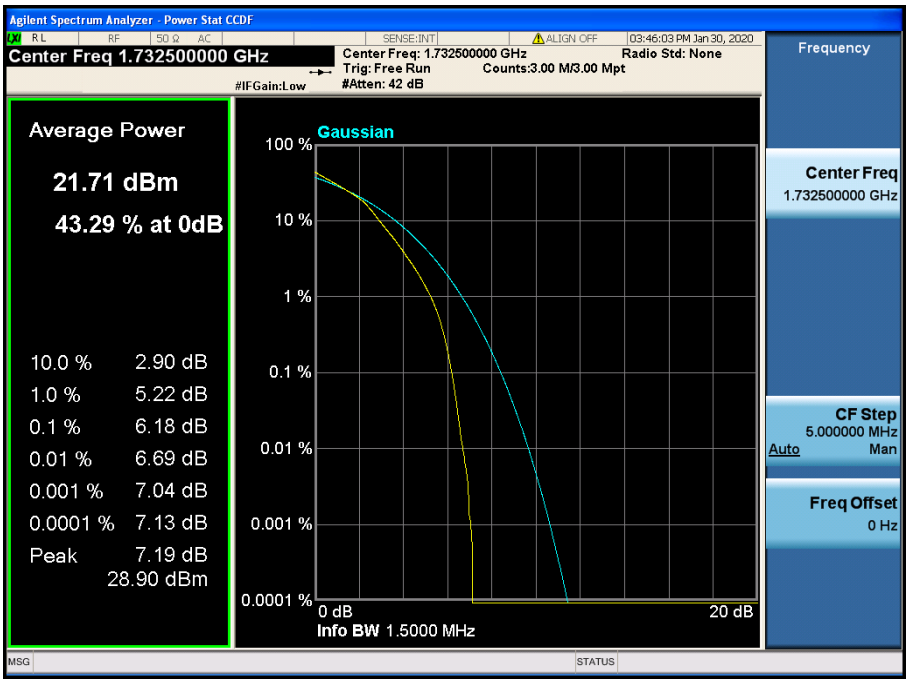
LTE Band 4 / 3 MHz / QPSK - RB Size 15



LTE Band 4 / 3 MHz / 16QAM - RB Size 15

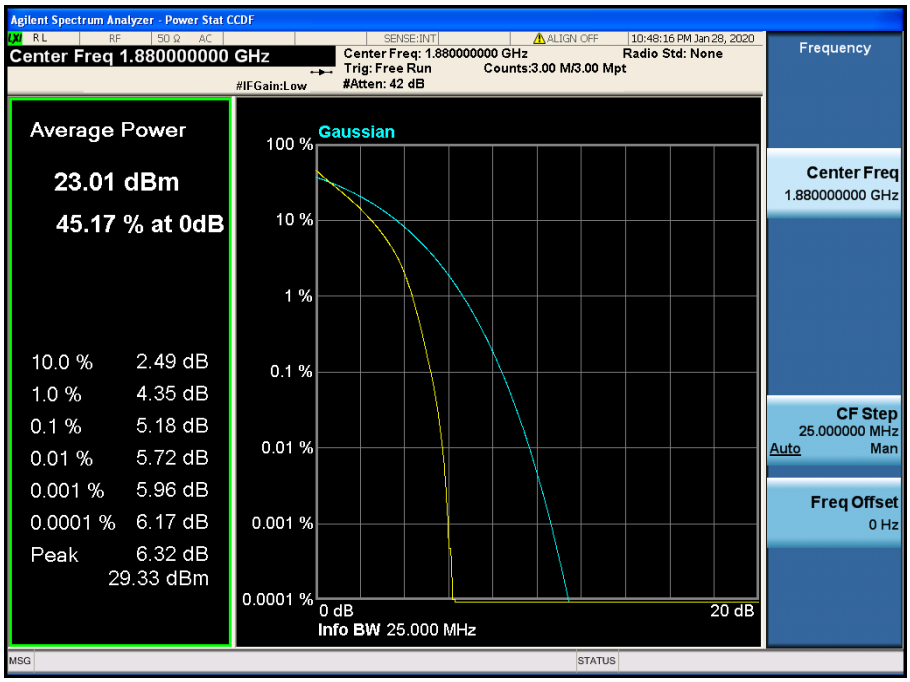


LTE Band 4 / 1.4 MHz / QPSK - RB Size 6

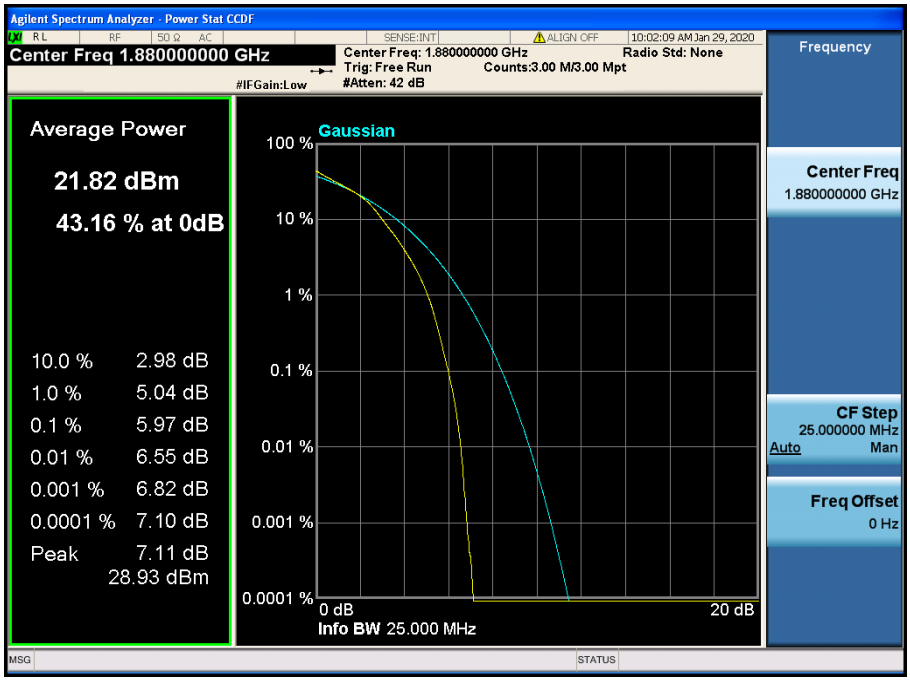


LTE Band 4 / 1.4 MHz / 16QAM - RB Size 6

8.2.4 LTE Band 2



LTE Band 2 / 20 MHz / QPSK - RB Size 100



LTE Band 2 / 20 MHz / 16QAM - RB Size 100