TEST REPORT

Dt&C Co., Ltd.
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Tel : 031-321-2664, Fax : 031-321-1664

1. Report No : DRTFCC2501-0005

2. Customer

- Name (FCC) : ST SUNLAB Ltd.
- Address (FCC) : A-1705, 1706, 32, Digital-ro 9-gil Geumcheon-Gu, Seoul, South Korea

3. Use of Report : FCC Original Grant

4. Product Name / Model Name : AI TELEMATICS / ST9730
   FCC ID : WA2-ST9730

5. FCC Regulation(s): Part 22, 24, 27
   Test Method Used : KDB971168 D01v03r01, ANSI/TIA-603-E-2016, ANSI C63.26-2015

6. Date of Test : 2024.11.07 ~ 2024.12.11

7. Location of Test : ☒ Permanent Testing Lab ☐ On Site Testing

8. Testing Environment : See appended test report.

9. Test Result : Refer to the attached test result.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
This test report is not related to KOLAS accreditation.

Affirmation	Tested by Name : SeokHo Han (Signature)	Technical Manager Name : JaeJin Lee (Signature)

2025 . 01 . 07 .

Dt&C Co., Ltd.

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

Test Report Version

Test Report No.	Date	Description	Revised by	Reviewed by
DRTFCC2501-0005	Jan. 07, 2025	Initial issue	SeokHo Han	JaeJin Lee

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1. GENERAL INFORMATION

Equipment Class	PCS Licensed Transmitter(PCB)	
Product Name	AI TELEMATICS	
Model Name(s)	ST9730	
FVIN(Firmware Version Identification Number)	Rev0.1	
EUT Serial Number	No Specified	
Supplying power	DC 12, 24 V	
Modulation Type	QPSK, 16QAM	
Channel Bandwidth(MHz)	LTE Band 12: 10, 5, 3, 1.4 LTE Band 17: 10, 5 LTE Band 13: 10, 5 LTE Band 26: 15, 10, 5, 3, 1.4 LTE Band 5: 10, 5, 3, 1.4 LTE Band 4: 20, 15, 10, 5, 3, 1.4 LTE Band 2: 20, 15, 10, 5, 3, 1.4 LTE Band 25: 20, 15, 10, 5, 3, 1.4	
Antenna Type	FPCB Antenna	
Antenna Gain	LTE Band	Gain(dBi)
	12(17)	Ant 0: -0.5
	13	Ant 0: -0.3
	26(5)	Ant 0: -0.2
	4	Ant 0: 3.2
	25(2)	Ant 0: 3.2

Mode	TX Frequency (MHz)	Emission Designator	Modulation	Conducted output power		ERP	
				dBm	W	dBm	W
LTE Band 12(17)	704 ~ 711	8M96G7D	QPSK	23.74	0.237	21.09	0.129
LTE Band 12(17)	704 ~ 711	8M96W7D	16QAM	23.31	0.214	20.66	0.116
LTE Band 12(17)	701.5 ~ 713.5	4M47G7D	QPSK	23.63	0.231	20.98	0.125
LTE Band 12(17)	701.5 ~ 713.5	4M47W7D	16QAM	23.15	0.207	20.50	0.112
LTE Band 12	700.5 ~ 714.5	2M69G7D	QPSK	23.87	0.244	21.22	0.132
LTE Band 12	700.5 ~ 714.5	2M68W7D	16QAM	23.21	0.209	20.56	0.114
LTE Band 12	699.7 ~ 715.3	1M08G7D	QPSK	23.95	0.248	21.30	0.135
LTE Band 12	699.7 ~ 715.3	1M08W7D	16QAM	23.13	0.206	20.48	0.112
LTE Band 13	782 ~ 782	8M90G7D	QPSK	23.57	0.228	21.12	0.129
LTE Band 13	782 ~ 782	8M91W7D	16QAM	23.05	0.202	20.60	0.115
LTE Band 13	779.5 ~ 784.5	4M47G7D	QPSK	23.59	0.229	21.14	0.130
LTE Band 13	779.5 ~ 784.5	4M46W7D	16QAM	23.17	0.207	20.72	0.118
LTE Band 26	831.5 ~ 841.5	13M4G7D	QPSK	23.96	0.249	21.61	0.145
LTE Band 26	831.5 ~ 841.5	13M4W7D	16QAM	23.12	0.205	20.77	0.119
LTE Band 26(5)	829 ~ 844	8M95G7D	QPSK	24.09	0.256	21.74	0.149
LTE Band 26(5)	829 ~ 844	8M94W7D	16QAM	23.50	0.224	21.15	0.130
LTE Band 26(5)	826.5 ~ 846.5	4M47G7D	QPSK	23.99	0.251	21.64	0.146
LTE Band 26(5)	826.5 ~ 846.5	4M45W7D	16QAM	22.90	0.195	20.55	0.114
LTE Band 26(5)	825.5 ~ 847.5	2M69G7D	QPSK	23.97	0.249	21.62	0.145
LTE Band 26(5)	825.5 ~ 847.5	2M68W7D	16QAM	23.48	0.223	21.13	0.130
LTE Band 26(5)	824.7 ~ 848.3	1M08G7D	QPSK	24.15	0.260	21.80	0.151
LTE Band 26(5)	824.7 ~ 848.3	1M08W7D	16QAM	23.35	0.216	21.00	0.126

Mode	TX Frequency (MHz)	Emission Designator	Modulation	Conducted output power		EIRP	
				dBm	W	dBm	W
LTE Band 4	1 720 ~ 1 745	17M8G7D	QPSK	23.22	0.210	26.42	0.439
LTE Band 4	1 720 ~ 1 745	17M9W7D	16QAM	22.36	0.172	25.56	0.360
LTE Band 4	1 717.5 ~ 1 747.5	13M4G7D	QPSK	22.72	0.187	25.92	0.391
LTE Band 4	1 717.5 ~ 1 747.5	13M4W7D	16QAM	22.05	0.160	25.25	0.335
LTE Band 4	1 715 ~ 1 750	8M96G7D	QPSK	22.94	0.197	26.14	0.411
LTE Band 4	1 715 ~ 1 750	8M95W7D	16QAM	22.40	0.174	25.60	0.363
LTE Band 4	1 712.5 ~ 1 752.5	4M46G7D	QPSK	22.90	0.195	26.10	0.407
LTE Band 4	1 712.5 ~ 1 752.5	4M48W7D	16QAM	21.82	0.152	25.02	0.318
LTE Band 4	1 711.5 ~ 1 753.5	2M69G7D	QPSK	22.77	0.189	25.97	0.395
LTE Band 4	1 711.5 ~ 1 753.5	2M68W7D	16QAM	22.18	0.165	25.38	0.345
LTE Band 4	1 710.7 ~ 1 754.3	1M08G7D	QPSK	22.76	0.189	25.96	0.394
LTE Band 4	1 710.7 ~ 1 754.3	1M08W7D	16QAM	22.18	0.165	25.38	0.345
LTE Band 25(2)	1 860 ~ 1 905	17M8G7D	QPSK	22.39	0.173	25.59	0.362
LTE Band 25(2)	1 860 ~ 1 905	17M8W7D	16QAM	21.71	0.148	24.91	0.310
LTE Band 25(2)	1 857.5 ~ 1 907.5	13M4G7D	QPSK	22.19	0.166	25.39	0.346
LTE Band 25(2)	1 857.5 ~ 1 907.5	13M3W7D	16QAM	21.63	0.146	24.83	0.304
LTE Band 25(2)	1 855 ~ 1 910	8M92G7D	QPSK	22.35	0.172	25.55	0.359
LTE Band 25(2)	1 855 ~ 1 910	8M94W7D	16QAM	21.80	0.151	25.00	0.316
LTE Band 25(2)	1 852.5 ~ 1 912.5	4M47G7D	QPSK	22.27	0.169	25.47	0.352
LTE Band 25(2)	1 852.5 ~ 1 912.5	4M46W7D	16QAM	21.44	0.139	24.64	0.291
LTE Band 25(2)	1 851.5 ~ 1 913.5	2M69G7D	QPSK	22.47	0.177	25.67	0.369
LTE Band 25(2)	1 851.5 ~ 1 913.5	2M69W7D	16QAM	21.78	0.151	24.98	0.315
LTE Band 25(2)	1 850.7 ~ 1 914.3	1M08G7D	QPSK	22.28	0.169	25.48	0.353
LTE Band 25(2)	1 850.7 ~ 1 914.3	1M08W7D	16QAM	21.52	0.142	24.72	0.296

2. INTRODUCTION

2.1. EUT DESCRIPTION

The Equipment Under Test (EUT) supports Multi-band LTE, 2.4/5GHz WLAN, Bluetooth(BDR, EDR, BLE).

2.2. TESTING ENVIRONMENT

Ambient Condition	
▪ Temperature	+20 ℃ ~ +23 ℃
▪ Relative Humidity	38 % ~ 42 %

2.3. 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.

2.4. 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
Antenna-port conducted emission	1.0 dB (The confidence level is about 95 %, k = 2)
Radiated emission (1 GHz Below)	5.0 dB (The confidence level is about 95 %, k = 2)
Radiated emission (1 GHz ~ 18 GHz)	4.8 dB (The confidence level is about 95 %, k = 2)
Radiated emission (18 GHz Above)	5.0 dB (The confidence level is about 95 %, k = 2)

2.5. 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 complies with the requirements of Part 2.948 according to ANSI C63.4-2014.

- FCC & IC MRA Designation No. : KR0034

- ISED#: 5740A

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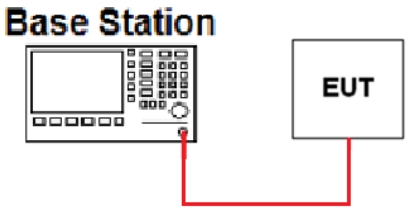
3. DESCRIPTION OF TESTS

3.1. MAXIMUM OUTPUT POWER

Conducted Output Power

Test Set-up



Test Procedure

- **KDB971168 D01v03r01 - Section 5.2.4**
- **ANSI C63.26-2015 – Section 5.2.4.2**

When an average power meter is used to perform RF output power measurements, the fundamental condition that measurements be performed only over durations of active transmissions at maximum output power level applies. Thus, an average power meter can always be used to perform the measurement when the EUT can be configured to transmit continuously.
If the EUT cannot be configured to transmit continuously (i.e., burst duty cycle < 98%), then the following options can be implemented to facilitate measurement of the average power with an average power meter:

a) A gated average power meter can be used to perform the measurement if the gating parameters can be adjusted such that the power is measured only during active transmission bursts at maximum output power levels.

b) A conventional average power meter with no signal gating capability can also be used if the measured burst duty cycle is constant (i.e., duty cycle variations are less than or equal to ±2%) by performing the measurement over the on/off burst cycles and then correcting (increasing) the measured level by a factor equal to [10 log (1/duty cycle)].

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

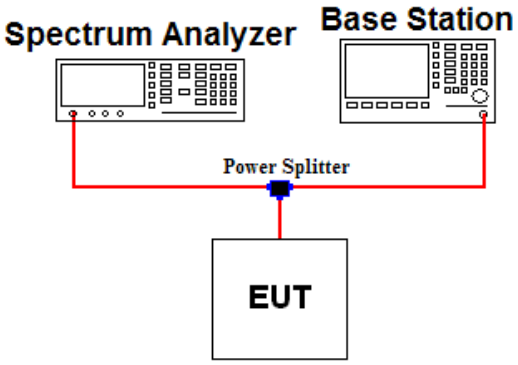
Test Procedure

- **KDB971168 D01v03r01 - Section 5.6**
- **ANSI C63.26-2015 – Section 5.2.5.5**

Determining ERP and EIRP from conducted RF output power measurement results
ERP or EIRP = P_{Meas} + G_T
where:
ERP or EIRP = effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as P_{Meas}, typically dBW or dBm);
P_{Meas} = measured transmitter output power or PSD, in dBm or dBW;
G_T = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);

3.2. PEAK TO AVERAGE RATIO

Test set-up



Test Procedure

- **KDB971168 D01v03r01 - 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.

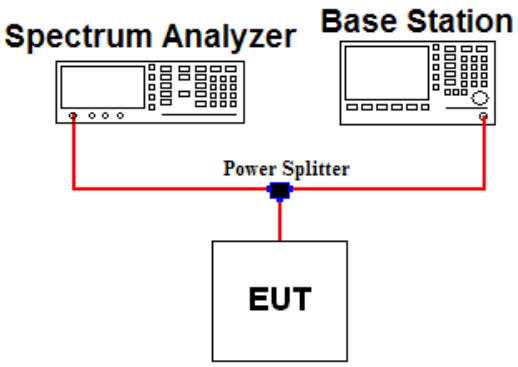
Test setting

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 D01v03r01 - Section 4.3**
- **ANSI C63.26-2015 – Section 5.4.4**

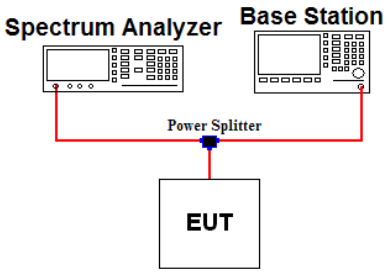
The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power of a given emission.

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 D01v03r01 - 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.

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 or Specified bandwidth
4. VBW ≥ 3 X RBW
5. Detector = RMS & Trace mode = Max hold or Average
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

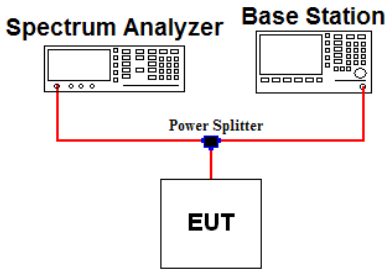
Note 1: Per Part 22.917(b)(1) / 24.238(b) / 27.53(h) in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit.

Note 2: Per Part 27.53(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.4) for all frequencies between 763 MHz - 775 MHz and 793 MHz - 805 MHz, the FCC limit is 65 + 10 log10(P[Watts]) = -35 dBm in a 6.25 kHz bandwidth.

3.5. SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL

Test set-up



Test Procedure

- **KDB971168 D01v03r01 - 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.

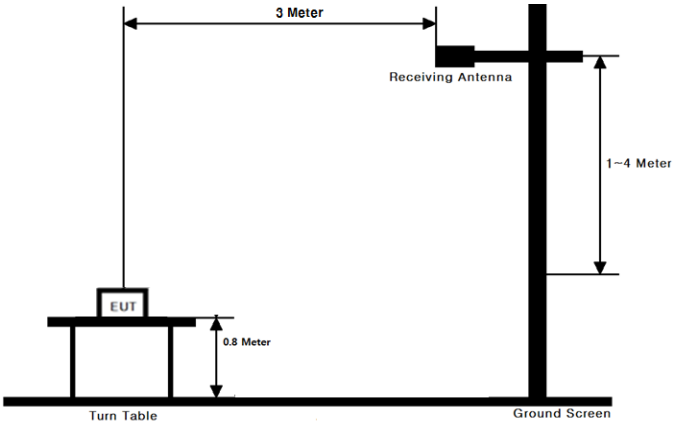
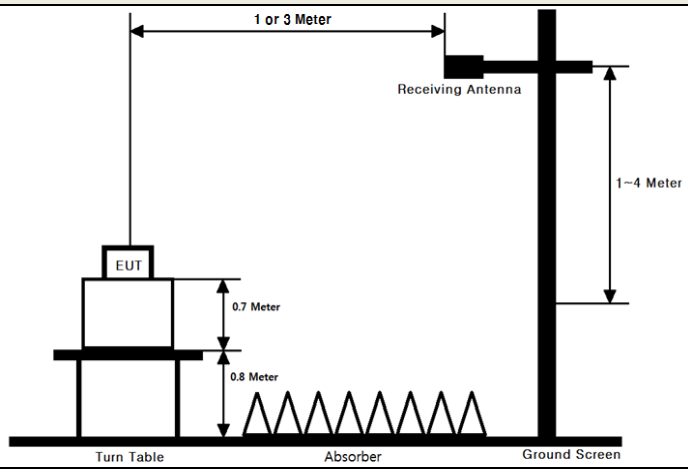
Test setting

1. RBW = 100 kHz(Below 1 GHz) or 1 MHz(Above 1 GHz) & VBW ≥ 3 X RBW (Refer to Note 2)
2. Detector = RMS & Trace mode = Max hold or Average
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 1 GHz and 1 MHz or greater for frequencies greater than 1GHz.

3.6. UNDESIRABLE EMISSIONS

Test Set-up

Below 1GHz	Above 1GHz
	

These measurements were performed at 3 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

- **KDB971168 D01v03r01 - Section 6**
- **ANSI C63.26-2015 – Section 5.5**
- **ANSI/TIA-603-E-2016 - Section 2.2.12**

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 = power averaging (rms)
3. Sweep time = Auto couple
4. Number of sweep point ≥ 2 X span / RBW
5. The trace was allowed to stabilize

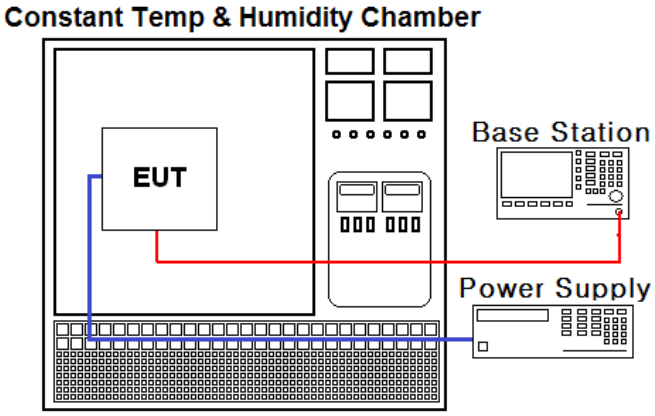
The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer.

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

- **KDB971168 D01v03r01 - Section 9**
- **ANSI/TIA-603-E-2016**

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:

Part 24.235, Part 27.54: The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.
Part 22.355: The frequency stability of the transmitter shall be maintained within ±0.000 25 % (±2.5 ppm) of the center frequency.

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	23/12/15	24/12/15	MY50110097
Spectrum Analyzer	Agilent Technologies	N9020A	23/12/15	24/12/15	MY50410163
Spectrum Analyzer	KEYSIGHT	N9030B	23/12/15	24/12/15	MY55480168
DC power supply	H.P	66332A	23/12/15	24/12/15	US37471368
Multimeter	FLUKE	17B+	23/12/15	24/12/15	36390701WS
Power Splitter	Anritsu	K241B	24/06/04	25/06/04	020611
Temp & Humi	SJ Science	SJ-TH-S50	24/06/11	25/06/11	SJ-TH-S50-130930
WIDEBAND Radio Communication Tester	ROHDE＆SCHWARZ	CMW500	24/11/13	25/11/13	169838
Thermohygrometer	BODYCOM	BJ5478	23/12/15	24/12/15	120612-1
Thermohygrometer	BODYCOM	BJ5478	23/12/15	24/12/15	120612-2
Signal Generator	ROHDE＆SCHWARZ	SMBV100A	23/12/15	24/12/15	255571
Signal Generator	ANRITSU	MG3695C	23/12/15	24/12/15	173501
Loop Antenna	ETS-Lindgren	6502	24/11/08	26/11/08	00060496
BILOG ANTENNA	Schwarzbeck	VULB9160	23/12/15	24/12/15	3362
Dipole Antenna	Schwarzbeck	UHA9105	22/12/16	24/12/16	2262
HORN ANT	ETS	3117	23/12/15	24/12/15	00140394
HORN ANT	A.H.Systems	SAS-574	24/06/11	25/06/11	155
PreAmplifier	H.P	8447D	23/12/15	24/12/15	2944A07774
PreAmplifier	Agilent	8449B	23/12/15	24/12/15	3008A02108
PreAmplifier	tsj	MLA-1840-J02-45	24/06/03	25/06/03	16966-10728
High Pass Filter	Wainwright Instruments	WHKX12-935-1000-15000-40SS	23/12/15	24/12/15	7
High Pass Filter	Wainwright Instruments	WHKX10-2838-3300-18000-60SS	23/12/15	24/12/15	2
High Pass Filter	Wainwright Instruments	WHKX6-6320-8000-26500-40CC	23/12/15	24/12/15	2
Cable	HUBER+SUHNER	SUCOFLEX100	24/01/03	25/01/03	M-1
Cable	HUBER+SUHNER	SUCOFLEX100	24/01/03	25/01/03	M-2
Cable	Junkosha	MWX241/B	24/01/03	25/01/03	M-3
Cable	Junkosha	MWX221	24/01/03	25/01/03	M-4
Cable	Junkosha	MWX221	24/01/03	25/01/03	M-5
Cable	JUNFLON	J12J101757-00	24/01/03	25/01/03	M-7
Cable	HUBER+SUHNER	SUCOFLEX104	24/01/03	25/01/03	M-8
Cable	HUBER+SUHNER	SUCOFLEX106	24/01/03	25/01/03	M-9
Cable	Junkosha	MWX315	24/01/03	25/01/03	M-10
Cable	DTNC	Cable	24/01/03	25/01/03	RFC-69
Cable	Junkosha	MWX241	24/01/03	25/01/03	mmW-1
Cable	Junkosha	MWX241	24/01/03	25/01/03	mmW-4
Test Software	tsj	Radiated Emission Measurement	NA	NA	Version 2.00.0185
Test Software	tsj	Noise Terminal Measurement	NA	NA	Version 2.00.0190

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	Status Note 1
2.1046	Conducted Output Power	N/A	C
2.1049	Occupied Bandwidth	N/A	C
22.913(d) 24.232(d) 27.50(d.5)	Peak to Average Ratio	< 13 dB	C
2.1051 22.917(a) 24.238(a) 27.53(g) 27.53(h) 27.53(c)	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)	Undesirable emissions in 763 ~ 775MHz & 793 ~ 806MHz	>65 + 10 log (P) dB in a 6.25 kHz band segment frequencies between 763-775 MHz and 793-805 MHz	C
2.1055 22.355 24.235 27.54	Frequency Stability	Refer to section 3.7 of this report.	C
27.50(b.10) 27.50(c.10)	Radiated Output Power (B12, 17, 13)	< 3 Watts max. ERP	C
22.913(a.5)	Radiated Output Power (B26, 5)	For mobile equipment: < 7 Watts max. ERP	C
27.50(d)(4)	Radiated Output Power (B4)	For mobile equipment: < 1 Watts max. EIRP	C
24.232(c)	Radiated Output Power (B25, 2)	For mobile equipment: < 2 Watts max. EIRP	C
2.1053 22.917(a) 24.238(a) 27.53(g) 27.53(h)	Undesirable Emissions (B26, 5, 25, 2, 4, 12, 17, 13)	> 43 + 10log$_{10}$ (P) dB for all out-of-band emissions	C Note2
27.53(f)	Undesirable Emissions in 1559 ~ 1610 MHz (B13)	< -70 dBW/MHz (for wideband signals) < -80 dBW (for discrete emissions of less than 700 Hz bandwidth)	C Note2

Note 1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable
Note 2: This test item was performed in three orthogonal EUT positions and the worst case data was reported.
Note 3: LTE Band 26 (814 ~ 849 MHz) overlaps the entire frequency range of LTE Band 5 (824 ~ 849 MHz).
Therefore, test data provided in this test report covers Band 5 as well as Band 26.
LTE Band 12 (699 ~ 716 MHz) overlaps the entire frequency range of LTE Band 17 (704 ~ 716 MHz).
Therefore, test data provided in this test report covers Band 17 as well as Band 12.
LTE Band 25 (1850 ~ 1915 MHz) overlaps the entire frequency range of LTE Band 2 (1850 ~ 1910 MHz).
Therefore, test data provided in this test report covers Band 2 as well as Band 25.

6. SAMPLE CALCULATION

A. Emission Designator

LTE Band 26(QPSK)

Emission Designator = **13M4G7D**
LTE OBW = 13.362 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data Transmission

LTE Band 26(16QAM)

Emission Designator = **13M4W7D**
LTE OBW = 13.401 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data Transmission

B. For substitution method

Unwanted emissions

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) Vary the measurement antenna height through 1 m to 4 m and the rotate EUT through 360° in order to determine the maximum emission level.
4) Record the measured emission level and frequency using the available test method.
If required by the test method, add 10 log(1/duty cycle) to measured emission level.
5) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.
6) Vary the measurement antenna height between 1 m to 4 m to maximize the received (measured) signal amplitude. And adjust the signal generator output power level until the amplitude detected by the measurement instrument equals the previously measured emission level.
7) The conducted power at the terminal of the substitute antenna is measured.
8) Record the level at substituted antenna terminal.
9) The result is calculated as below;

Result: EIRP(dBm) = Level at Substitute antenna terminal + Substitute Antenna Gain (dBi)
Result: ERP(dBm) = Level at Substitute antenna terminal + Substitute Antenna Gain (dBd)
Where, TX Antenna Gain (dBd) = TX Antenna Gain (dBi) - 2.15 dB

7. TEST DATA

7.1. OCCUPIED BANDWIDTH

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

7.2. PEAK TO AVERAGE RATIO

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

7.3. BAND EDEG EMISSIONS (Conducted)

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

7.4. SPURIOUS AND HARMONICS EMISSIONS (Conducted)

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

7.5. MAXIMUM OUTPUT POWER

- Test Notes

1) The EUT was tested under all bandwidths, modulations and RB configurations and the worst case data are reported in the below table.
2) EIRP = Conducted Output Power(dBm) + Antenna gain(dBi), ERP = EIRP – 2.15(dB)

7.5.1. LTE Band 12(17)

Channel Bandwidth (MHz)	Frequency (MHz)	Modulation	RB Size/ Offset	Conducted Output Power (dBm)	Antenna Gain(dBi)	EIRP (dBm)	ERP (dBm)
10	704	QPSK	1/49	23.74	-0.50	23.24	21.09
		16QAM	1/25	23.16	-0.50	22.66	20.51
	711	QPSK	1/25	23.71	-0.50	23.21	21.06
		16QAM	1/25	23.31	-0.50	22.81	20.66
5	701.5	QPSK	1/0	23.49	-0.50	22.99	20.84
		16QAM	1/24	23.15	-0.50	22.65	20.50
	707.5	QPSK	1/0	23.63	-0.50	23.13	20.98
		16QAM	1/12	22.47	-0.50	21.97	19.82
	713.5	QPSK	1/24	23.61	-0.50	23.11	20.96
		16QAM	1/0	22.04	-0.50	21.54	19.39
3	700.5	QPSK	1/0	23.86	-0.50	23.36	21.21
		16QAM	1/0	23.21	-0.50	22.71	20.56
	707.5	QPSK	1/0	23.55	-0.50	23.05	20.90
		16QAM	1/7	22.89	-0.50	22.39	20.24
	714.5	QPSK	1/7	23.87	-0.50	23.37	21.22
		16QAM	1/14	22.92	-0.50	22.42	20.27
1.4	699.7	QPSK	1/2	23.60	-0.50	23.10	20.95
		16QAM	1/2	22.93	-0.50	22.43	20.28
	707.5	QPSK	1/5	23.95	-0.50	23.45	21.30
		16QAM	1/5	23.01	-0.50	22.51	20.36
	715.3	QPSK	1/5	23.95	-0.50	23.45	21.30
		16QAM	1/2	23.13	-0.50	22.63	20.48

7.5.2. LTE Band 13

Channel Bandwidth (MHz)	Frequency (MHz)	Modulation	RB Size/ Offset	Conducted Output Power (dBm)	Antenna Gain(dBi)	EIRP (dBm)	ERP (dBm)
10	782	QPSK	1/25	23.57	-0.30	23.27	21.12
		16QAM	1/25	23.05	-0.30	22.75	20.60
5	779.5	QPSK	1/12	23.59	-0.30	23.29	21.14
		16QAM	1/24	23.17	-0.30	22.87	20.72
	784.5	QPSK	1/0	23.55	-0.30	23.25	21.10
		16QAM	1/24	22.64	-0.30	22.34	20.19

7.5.3. LTE Band 26(5)

Channel Bandwidth (MHz)	Frequency (MHz)	Modulation	RB Size/ Offset	Conducted Output Power (dBm)	Antenna Gain(dBi)	EIRP (dBm)	ERP (dBm)
15	831.5	QPSK	1/74	23.95	-0.20	23.75	21.60
		16QAM	1/74	22.93	-0.20	22.73	20.58
	841.5	QPSK	1/74	23.96	-0.20	23.76	21.61
		16QAM	1/74	23.12	-0.20	22.92	20.77
10	829	QPSK	1/25	24.06	-0.20	23.86	21.71
		16QAM	1/0	23.33	-0.20	23.13	20.98
	836.5	QPSK	1/25	24.04	-0.20	23.84	21.69
		16QAM	1/49	23.02	-0.20	22.82	20.67
	844	QPSK	1/49	24.09	-0.20	23.89	21.74
		16QAM	1/0	23.50	-0.20	23.30	21.15
5	826.5	QPSK	1/12	23.92	-0.20	23.72	21.57
		16QAM	1/24	22.90	-0.20	22.70	20.55
	836.5	QPSK	1/24	23.84	-0.20	23.64	21.49
		16QAM	1/24	22.39	-0.20	22.19	20.04
	846.5	QPSK	1/12	23.99	-0.20	23.79	21.64
		16QAM	1/0	22.42	-0.20	22.22	20.07
3	825.5	QPSK	1/7	23.93	-0.20	23.73	21.58
		16QAM	1/0	23.48	-0.20	23.28	21.13
	836.5	QPSK	1/7	23.94	-0.20	23.74	21.59
		16QAM	1/0	22.68	-0.20	22.48	20.33
	847.5	QPSK	1/14	23.97	-0.20	23.77	21.62
		16QAM	1/0	22.72	-0.20	22.52	20.37
1.4	824.7	QPSK	1/2	23.80	-0.20	23.60	21.45
		16QAM	1/2	23.32	-0.20	23.12	20.97
	836.5	QPSK	1/2	23.91	-0.20	23.71	21.56
		16QAM	1/2	22.80	-0.20	22.60	20.45
	848.3	QPSK	1/2	24.15	-0.20	23.95	21.80
		16QAM	1/2	23.35	-0.20	23.15	21.00

7.5.4. LTE Band 4

Channel Bandwidth (MHz)	Frequency (MHz)	Modulation	RB Size/ Offset	Conducted Output Power (dBm)	Antenna Gain(dBi)	EIRP (dBm)
20	1 720	QPSK	1/50	23.22	3.20	26.42
		16QAM	1/50	21.74	3.20	24.94
	1 732.5	QPSK	1/0	22.65	3.20	25.85
		16QAM	1/50	22.36	3.20	25.56
	1 745	QPSK	1/0	22.77	3.20	25.97
		16QAM	1/0	22.18	3.20	25.38
15	1 717.5	QPSK	1/0	22.72	3.20	25.92
		16QAM	1/36	22.05	3.20	25.25
	1 732.5	QPSK	1/0	22.40	3.20	25.60
		16QAM	1/0	21.62	3.20	24.82
	1 747.5	QPSK	1/36	22.70	3.20	25.90
		16QAM	1/0	21.85	3.20	25.05
10	1 715	QPSK	1/0	22.83	3.20	26.03
		16QAM	1/0	21.89	3.20	25.09
	1 732.5	QPSK	1/0	22.52	3.20	25.72
		16QAM	1/49	22.40	3.20	25.60
	1 750	QPSK	1/25	22.94	3.20	26.14
		16QAM	1/0	21.87	3.20	25.07
5	1 712.5	QPSK	1/24	22.90	3.20	26.10
		16QAM	1/12	21.32	3.20	24.52
	1 732.5	QPSK	1/24	22.26	3.20	25.46
		16QAM	1/12	21.82	3.20	25.02
	1 752.5	QPSK	1/12	22.74	3.20	25.94
		16QAM	1/24	21.28	3.20	24.48
3	1 711.5	QPSK	1/7	22.77	3.20	25.97
		16QAM	1/7	22.15	3.20	25.35
	1 732.5	QPSK	1/0	22.38	3.20	25.58
		16QAM	1/0	21.80	3.20	25.00
	1 753.5	QPSK	1/7	22.62	3.20	25.82
		16QAM	1/7	22.18	3.20	25.38
1.4	1 710.7	QPSK	1/2	22.76	3.20	25.96
		16QAM	1/2	22.18	3.20	25.38
	1 732.5	QPSK	1/0	22.67	3.20	25.87
		16QAM	1/0	21.63	3.20	24.83
	1 754.3	QPSK	1/2	22.72	3.20	25.92
		16QAM	1/2	22.11	3.20	25.31

7.5.5. LTE Band 25(2)

Channel Bandwidth (MHz)	Frequency (MHz)	Modulation	RB Size/ Offset	Conducted Output Power (dBm)	Antenna Gain(dBi)	EIRP (dBm)
20	1 860	QPSK	1/50	22.39	3.20	25.59
		16QAM	1/50	21.71	3.20	24.91
	1 882.5	QPSK	1/0	21.99	3.20	25.19
		16QAM	1/99	20.95	3.20	24.15
	1 905	QPSK	1/50	22.05	3.20	25.25
		16QAM	1/50	21.49	3.20	24.69
15	1 857.5	QPSK	1/0	22.19	3.20	25.39
		16QAM	1/0	21.63	3.20	24.83
	1 882.5	QPSK	1/36	21.92	3.20	25.12
		16QAM	1/36	21.01	3.20	24.21
	1 907.5	QPSK	1/0	21.87	3.20	25.07
		16QAM	1/36	20.93	3.20	24.13
10	1 855	QPSK	1/25	22.35	3.20	25.55
		16QAM	1/25	21.54	3.20	24.74
	1 882.5	QPSK	1/25	22.25	3.20	25.45
		16QAM	1/49	21.80	3.20	25.00
	1 910	QPSK	1/0	21.90	3.20	25.10
		16QAM	1/25	21.02	3.20	24.22
5	1 852.5	QPSK	1/12	22.27	3.20	25.47
		16QAM	1/12	21.44	3.20	24.64
	1 882.5	QPSK	1/0	22.10	3.20	25.30
		16QAM	1/12	20.75	3.20	23.95
	1 912.5	QPSK	1/12	21.68	3.20	24.88
		16QAM	1/24	20.94	3.20	24.14
3	1 851.5	QPSK	1/14	22.47	3.20	25.67
		16QAM	1/14	21.78	3.20	24.98
	1 882.5	QPSK	1/14	22.04	3.20	25.24
		16QAM	1/0	20.72	3.20	23.92
	1 913.5	QPSK	1/14	21.87	3.20	25.07
		16QAM	1/14	20.80	3.20	24.00
1.4	1 850.7	QPSK	1/5	22.20	3.20	25.40
		16QAM	1/2	21.52	3.20	24.72
	1 882.5	QPSK	1/5	22.25	3.20	25.45
		16QAM	1/2	21.14	3.20	24.34
	1 914.3	QPSK	1/0	22.28	3.20	25.48
		16QAM	1/0	20.75	3.20	23.95

7.6. UNDESIRABLE EMISSIONS (Radiated)

- Test Notes

1) The frequency spectrum is examined from 9 kHz to the 10 th harmonic of the fundamental frequency of the transmitter. No other spurious and harmonic emissions were reported greater than listed emissions.
2) For Band below 1GHz:
   Result(dBm) = Level at Substitute antenna terminal(dBm) + Substitute Antenna Gain (dBd)
   For Band above 1GHz:
   Result(dBm) = Level at Substitute antenna terminal(dBm) + Substitute Antenna Gain (dBi)
3) Limit
   Band 12(17)/13/26(5)/4/25(2) = -13dBm
   Limit for 1 559 MHz ~ 1 610 MHz in Band 13 = −40dBm/MHz (equivalent isotropically radiated power for wideband signals)

7.6.1. LTE Band 12(17)

- DC 24 V

Channel Bandwidth (MHz)	Test Freq. (MHz)	RB Size/ Offset	Test Mode	Freq.(MHz)	Ant Pol (H/V)	Level at Antenna Terminal(dBm)	Substitute Antenna Gain(dBd)	Result (dBm)	Limit (dBm)	Margin (dB)
10	704	1/49	QPSK	1 416.85	V	-54.68	3.18	-51.50	-13.00	38.50
				2 833.67	V	-57.37	4.65	-52.72	-13.00	39.72
				3 542.09	V	-57.18	6.30	-50.88	-13.00	37.88
				4 250.43	H	-54.82	7.20	-47.62	-13.00	34.62
				4 958.91	H	-64.56	7.71	-56.85	-13.00	43.85
	711	1/25	QPSK	1 422.21	V	-55.93	3.22	-52.71	-13.00	39.71
				2 844.37	V	-60.73	4.69	-56.04	-13.00	43.04
				3 555.47	V	-56.43	6.29	-50.14	-13.00	37.14
				4 266.49	H	-55.06	7.18	-47.88	-13.00	34.88
				4 977.58	H	-62.94	7.77	-55.17	-13.00	42.17

- DC 12 V

Channel Bandwidth (MHz)	Test Freq. (MHz)	RB Size/ Offset	Test Mode	Freq.(MHz)	Ant Pol (H/V)	Level at Antenna Terminal(dBm)	Substitute Antenna Gain(dBd)	Result (dBm)	Limit (dBm)	Margin (dB)
10	704	1/49	QPSK	1 416.80	V	-54.31	3.18	-51.13	-13.00	38.13
				2 833.63	V	-61.83	4.65	-57.18	-13.00	44.18
				3 542.01	V	-57.64	6.30	-51.34	-13.00	38.34
				4 250.46	H	-55.03	7.20	-47.83	-13.00	34.83
				4 958.83	H	-63.63	7.71	-55.92	-13.00	42.92

7.6.2. LTE Band 13

- DC 24 V

Channel Bandwidth (MHz)	Test Freq. (MHz)	RB Size/ Offset	Test Mode	Freq.(MHz)	Ant Pol (H/V)	Level at Antenna Terminal(dBm)	Substitute Antenna Gain(dBd)	Result (dBm)	Limit (dBm)	Margin (dB)
10	782	1/0	QPSK	1 555.22	H	-56.35	3.74	-52.61	-13.00	39.61
				2 332.76	H	-66.28	3.76	-62.52	-13.00	49.52
				3 110.39	H	-59.43	5.21	-54.22	-13.00	41.22
				3 887.94	H	-51.73	6.83	-44.90	-13.00	31.90
				4 665.55	H	-57.92	7.50	-50.42	-13.00	37.42
				6 998.34	V	-66.03	9.41	-56.62	-13.00	43.62

UNDESIRABLE EMISSIONS IN 1 559 MHz ~ 1 610 MHz (LTE Band 13)

Channel Bandwidth (MHz)	Test Freq. (MHz)	RB Size/ Offset	Test Mode	Freq.(MHz)	Ant Pol (H/V)	Level at Antenna Terminal(dBm)	Substitute Antenna Gain(dBi)	Result (dBm)	Limit (dBm)	Margin (dB)
10	782	1/25	QPSK	1 564.17	H	-58.21	5.95	-52.26	-40.00	12.26
		1/49	QPSK	1 572.78	H	-55.79	6.01	-49.78	-40.00	9.78
5	784.5	1/25	QPSK	1 573.29	H	-55.76	6.02	-49.74	-40.00	9.74

- DC 12 V

Channel Bandwidth (MHz)	Test Freq. (MHz)	RB Size/ Offset	Test Mode	Freq.(MHz)	Ant Pol (H/V)	Level at Antenna Terminal(dBm)	Substitute Antenna Gain(dBd)	Result (dBm)	Limit (dBm)	Margin (dB)
10	782	1/0	QPSK	1 555.20	H	-56.42	3.74	-52.68	-13.00	39.68
				2 332.69	H	-65.72	3.76	-61.96	-13.00	48.96
				3 110.33	H	-61.15	5.21	-55.94	-13.00	42.94
				3 887.94	H	-52.00	6.83	-45.17	-13.00	32.17
				4 665.59	H	-58.49	7.50	-50.99	-13.00	37.99
				6 998.45	V	-64.94	9.41	-55.53	-13.00	42.53

UNDESIRABLE EMISSIONS IN 1 559 MHz ~ 1 610 MHz (LTE Band 13)

Channel Bandwidth (MHz)	Test Freq. (MHz)	RB Size/ Offset	Test Mode	Freq.(MHz)	Ant Pol (H/V)	Level at Antenna Terminal(dBm)	Substitute Antenna Gain(dBi)	Result (dBm)	Limit (dBm)	Margin (dB)
5	784.5	1/25	QPSK	1 569.38	H	-56.95	5.99	-50.96	-40.00	10.96

7.6.3. LTE Band 26(5)

- DC 24 V

Channel Bandwidth (MHz)	Test Freq. (MHz)	RB Size/ Offset	Test Mode	Freq.(MHz)	Ant Pol (H/V)	Level at Antenna Terminal(dBm)	Substitute Antenna Gain(dBd)	Result (dBm)	Limit (dBm)	Margin (dB)
15	831.5	1/75	QPSK	1 676.29	V	-55.72	4.00	-51.72	-13.00	38.72
				2 514.52	H	-64.75	3.68	-61.07	-13.00	48.07
				3 352.71	V	-59.00	5.84	-53.16	-13.00	40.16
				4 190.74	V	-55.80	7.20	-48.60	-13.00	35.60
				5 028.99	H	-58.42	7.85	-50.57	-13.00	37.57
				5 867.22	V	-65.92	8.58	-57.34	-13.00	44.34
	841.5	1/75	QPSK	1 696.35	V	-53.18	3.92	-49.26	-13.00	36.26
				2 544.53	H	-58.81	3.92	-54.89	-13.00	41.89
				3 392.69	V	-57.37	5.92	-51.45	-13.00	38.45
				4 240.93	V	-54.50	7.20	-47.30	-13.00	34.30
				5 088.98	H	-57.62	7.91	-49.71	-13.00	36.71
				5 937.17	V	-64.76	8.53	-56.23	-13.00	43.23

DC 12 V

Channel Bandwidth (MHz)	Test Freq. (MHz)	RB Size/ Offset	Test Mode	Freq.(MHz)	Ant Pol (H/V)	Level at Antenna Terminal(dBm)	Substitute Antenna Gain(dBd)	Result (dBm)	Limit (dBm)	Margin (dB)
15	841.5	1/75	QPSK	1 696.34	V	-55.62	3.92	-51.70	-13.00	38.70
				2 544.54	H	-63.64	3.92	-59.72	-13.00	46.72
				3 392.60	V	-57.97	5.92	-52.05	-13.00	39.05
				4 240.84	V	-55.13	7.20	-47.93	-13.00	34.93
				5 088.99	H	-58.62	7.91	-50.71	-13.00	37.71
				5 937.23	V	-65.31	8.53	-56.78	-13.00	43.78

7.6.4. LTE Band 4

- DC 24 V

Channel Bandwidth (MHz)	Test Freq. (MHz)	RB Size/ Offset	Test Mode	Freq.(MHz)	Ant Pol (H/V)	Level at Antenna Terminal(dBm)	Substitute Antenna Gain(dBi)	Result (dBm)	Limit (dBm)	Margin (dB)
20	1720	1/50	QPSK	3 440.14	V	-51.29	8.23	-43.06	-13.00	30.06
				5 160.34	H	-67.76	10.15	-57.61	-13.00	44.61
				8 600.44	V	-63.01	12.93	-50.08	-13.00	37.08
	1732.5	1/0	QPSK	3 447.18	V	-51.04	8.26	-42.78	-13.00	29.78
				5 170.85	H	-65.42	10.16	-55.26	-13.00	42.26
				8 617.93	V	-61.46	12.94	-48.52	-13.00	35.52
	1745	1/0	QPSK	3 472.12	V	-51.99	8.36	-43.63	-13.00	30.63
				5 208.27	H	-66.91	10.21	-56.70	-13.00	43.70
				8 680.41	V	-62.80	12.96	-49.84	-13.00	36.84

- DC 12 V

Channel Bandwidth (MHz)	Test Freq. (MHz)	RB Size/ Offset	Test Mode	Freq.(MHz)	Ant Pol (H/V)	Level at Antenna Terminal(dBm)	Substitute Antenna Gain(dBi)	Result (dBm)	Limit (dBm)	Margin (dB)
20	1732.5	1/0	QPSK	3 447.20	V	-52.19	8.26	-43.93	-13.00	30.93
				5 170.78	H	-67.09	10.16	-56.93	-13.00	43.93
				8 617.92	V	-63.23	12.94	-50.29	-13.00	37.29

7.6.5. LTE Band 25(2)

- DC 24 V

Channel Bandwidth (MHz)	Test Freq. (MHz)	RB Size/ Offset	Test Mode	Freq.(MHz)	Ant Pol (H/V)	Level at Antenna Terminal(dBm)	Substitute Antenna Gain(dBi)	Result (dBm)	Limit (dBm)	Margin (dB)
20	1860	1/0	QPSK	3 702.02	V	-44.47	8.34	-36.13	-13.00	23.13
				5 553.23	H	-62.54	10.31	-52.23	-13.00	39.23
				7 404.34	V	-54.90	12.04	-42.86	-13.00	29.86
				9 255.43	V	-59.43	13.00	-46.43	-13.00	33.43
	1882.5	1/50	QPSK	3 765.18	V	-40.18	8.34	-31.84	-13.00	18.84
				5 647.84	H	-57.89	10.45	-47.44	-13.00	34.44
				7 530.38	V	-58.80	12.18	-46.62	-13.00	33.62
				9 412.99	V	-58.37	13.00	-45.37	-13.00	32.37
	1905	1/50	QPSK	3 810.13	V	-37.81	8.52	-29.29	-13.00	16.29
				5 715.20	H	-52.45	10.55	-41.90	-13.00	28.90
				7 620.38	V	-56.62	12.19	-44.43	-13.00	31.43
				9 525.46	V	-60.26	12.99	-47.27	-13.00	34.27

- DC 12 V

Channel Bandwidth (MHz)	Test Freq. (MHz)	RB Size/ Offset	Test Mode	Freq.(MHz)	Ant Pol (H/V)	Level at Antenna Terminal(dBm)	Substitute Antenna Gain(dBi)	Result (dBm)	Limit (dBm)	Margin (dB)
20	1905	1/50	QPSK	3 810.14	V	-37.41	8.52	-28.89	-13.00	15.89
				5 715.24	H	-51.95	10.55	-41.40	-13.00	28.40
				7 620.29	V	-58.91	12.19	-46.72	-13.00	33.72
				9 525.45	V	-59.10	12.99	-46.11	-13.00	33.11

7.7. FREQUENCY STABILITY

- Test Notes

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.

7.7.1. LTE Band 12(17)

OPERATING FREQUENCY : 707.5 MHz
REFERENCE VOLTAGE : 24 V DC
LIMIT(FCC) : The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

VOLTAGE (%)	POWER (V DC)	TEMP (℃)	FREQ (Hz)	Deviation	
				(%)	(ppm)
100 %	24	+20	707,499,998	-0.0000003	-0.003
100 %		-30	707,499,999	-0.0000001	-0.001
100 %		-20	707,499,999	-0.0000001	-0.001
100 %		-10	707,499,998	-0.0000003	-0.003
100 %		0	707,499,997	-0.0000004	-0.004
100 %		+10	707,499,998	-0.0000003	-0.003
100 %		+20	707,499,998	-0.0000003	-0.003
100 %		+30	707,499,997	-0.0000004	-0.004
100 %		+40	707,499,997	-0.0000004	-0.004
100 %		+50	707,499,999	-0.0000001	-0.001
115 %	27.6	+20	707,499,999	-0.0000001	-0.001
85 %	*10.2	+20	707,499,998	-0.0000003	-0.003

Note: * Test was performed at 15% below the lowest rated supply voltage(12V).

7.7.2. LTE Band 13

OPERATING FREQUENCY : 782 MHz
REFERENCE VOLTAGE : 24 V DC
LIMIT(FCC) : The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

VOLTAGE (%)	POWER (V DC)	TEMP (℃)	FREQ (Hz)	Deviation	
				(%)	(ppm)
100 %	24	+20	782,000,002	0.0000003	0.003
100 %		-30	782,000,001	0.0000001	0.001
100 %		-20	782,000,003	0.0000004	0.004
100 %		-10	782,000,002	0.0000003	0.003
100 %		0	782,000,003	0.0000004	0.004
100 %		+10	782,000,002	0.0000003	0.003
100 %		+20	782,000,002	0.0000003	0.003
100 %		+30	782,000,001	0.0000001	0.001
100 %		+40	782,000,002	0.0000003	0.003
100 %		+50	782,000,002	0.0000003	0.003
115 %	27.6	+20	782,000,003	0.0000004	0.004
85 %	*10.2	+20	782,000,003	0.0000004	0.004

Note: * Test was performed at 15% below the lowest rated supply voltage(12V).

7.7.3. LTE Band 26(5)

OPERATING FREQUENCY : 836.5 MHz
REFERENCE VOLTAGE : 24 V DC
LIMIT(FCC) : ± 0.00025 % or 2.5 ppm

VOLTAGE (%)	POWER (V DC)	TEMP (℃)	FREQ (Hz)	Deviation	
				(%)	(ppm)
100 %	24	+20	836,499,997	-0.0000004	-0.004
100 %		-30	836,499,997	-0.0000004	-0.004
100 %		-20	836,499,999	-0.0000001	-0.001
100 %		-10	836,499,998	-0.0000002	-0.002
100 %		0	836,499,996	-0.0000005	-0.005
100 %		+10	836,499,996	-0.0000005	-0.005
100 %		+20	836,499,997	-0.0000004	-0.004
100 %		+30	836,499,998	-0.0000002	-0.002
100 %		+40	836,499,999	-0.0000001	-0.001
100 %		+50	836,499,998	-0.0000002	-0.002
115 %	27.6	+20	836,499,998	-0.0000002	-0.002
85 %	*10.2	+20	836,499,996	-0.0000005	-0.005

Note: * Test was performed at 15% below the lowest rated supply voltage(12V).

7.7.4. LTE Band 4

OPERATING FREQUENCY : 1 732.5 MHz
REFERENCE VOLTAGE 24 V DC
LIMIT(FCC) : The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.
:

VOLTAGE (%)	POWER (V DC)	TEMP (℃)	FREQ (Hz)	Deviation	
				(%)	(ppm)
100 %	24	+20	1,732,499,996	-0.0000002	-0.002
100 %		-30	1,732,499,997	-0.0000002	-0.002
100 %		-20	1,732,499,998	-0.0000001	-0.001
100 %		-10	1,732,499,999	-0.0000001	-0.001
100 %		0	1,732,499,998	-0.0000001	-0.001
100 %		+10	1,732,499,997	-0.0000002	-0.002
100 %		+20	1,732,499,996	-0.0000002	-0.002
100 %		+30	1,732,499,998	-0.0000001	-0.001
100 %		+40	1,732,499,996	-0.0000002	-0.002
100 %		+50	1,732,499,996	-0.0000002	-0.002
115 %	27.6	+20	1,732,499,998	-0.0000001	-0.001
85 %	*10.2	+20	1,732,499,998	-0.0000001	-0.001

Note: * Test was performed at 15% below the lowest rated supply voltage(12V).

7.7.5. LTE Band 25(2)

OPERATING FREQUENCY : 1 882.5 MHz
REFERENCE VOLTAGE 24 V DC
LIMIT(FCC) : The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

VOLTAGE (%)	POWER (V DC)	TEMP (℃)	FREQ (Hz)	Deviation	
				(%)	(ppm)
100 %	24	+20	1,882,500,003	0.0000002	0.002
100 %		-30	1,882,499,999	-0.0000001	-0.001
100 %		-20	1,882,500,002	0.0000001	0.001
100 %		-10	1,882,499,999	-0.0000001	-0.001
100 %		0	1,882,500,004	0.0000002	0.002
100 %		+10	1,882,500,003	0.0000002	0.002
100 %		+20	1,882,500,003	0.0000002	0.002
100 %		+30	1,882,500,001	0.0000001	0.001
100 %		+40	1,882,499,999	-0.0000001	-0.001
100 %		+50	1,882,499,999	-0.0000001	-0.001
115 %	27.6	+20	1,882,500,003	0.0000002	0.002
85 %	*10.2	+20	1,882,500,002	0.0000001	0.001

Note: * Test was performed at 15% below the lowest rated supply voltage(12V).

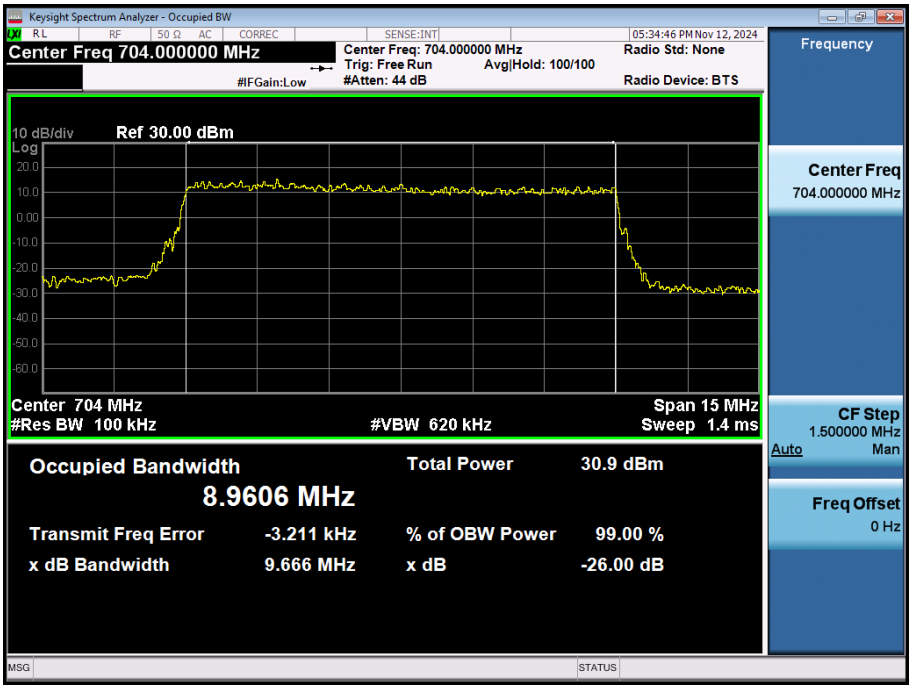
8. TEST PLOTS

- Test Notes:

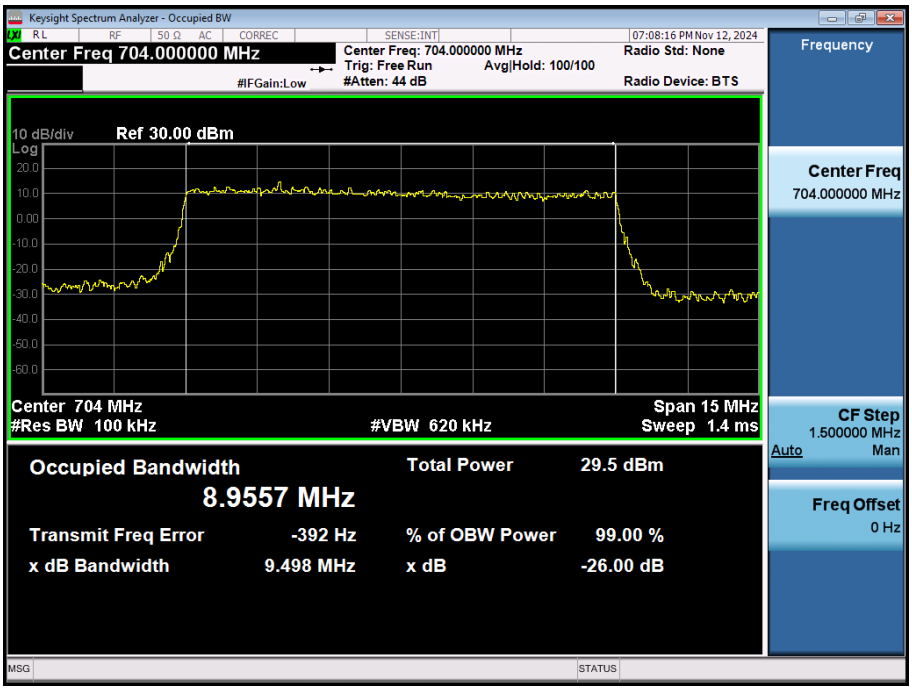
All bandwidths, RB configurations, and modulations were investigated.
The worst case test results are reported.

8.1. OCCUPIED BANDWIDTH

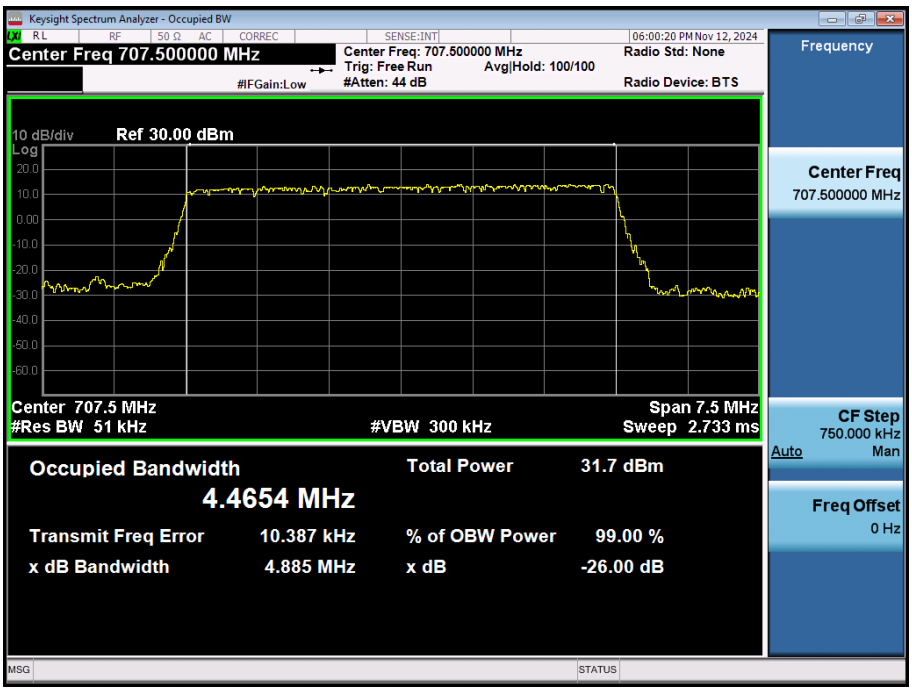
8.1.1. LTE Band 12(17)



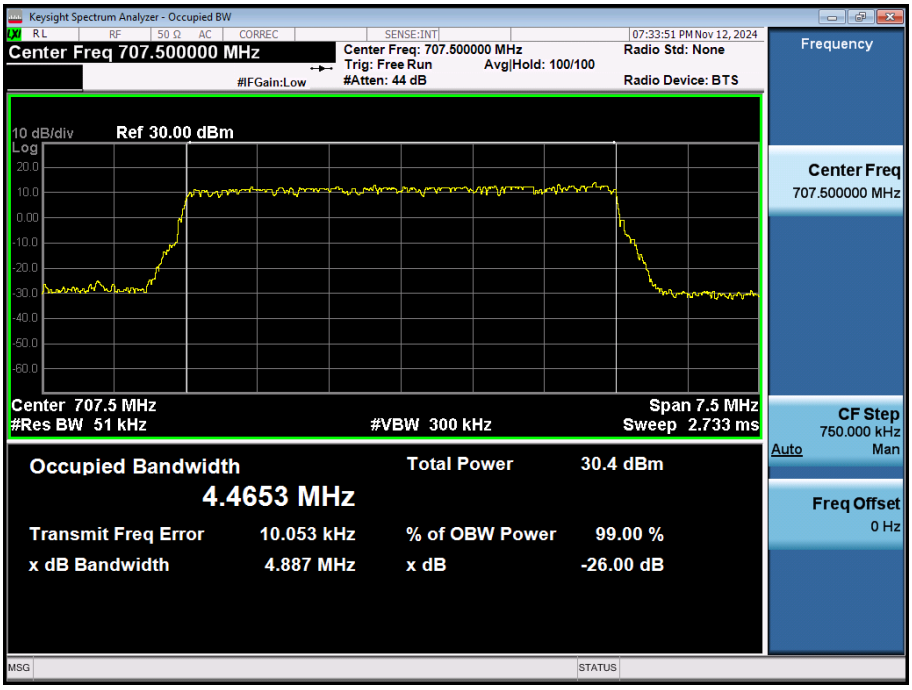
LTE Band 12 / 10 MHz / QPSK / FULL RB Size



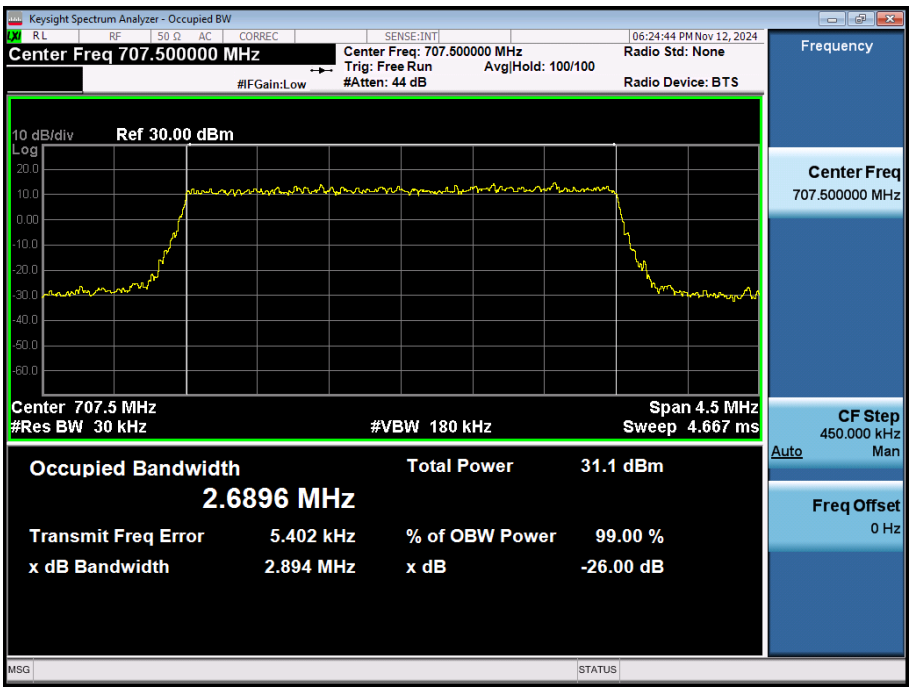
LTE Band 12 / 10 MHz / 16QAM / FULL RB Size



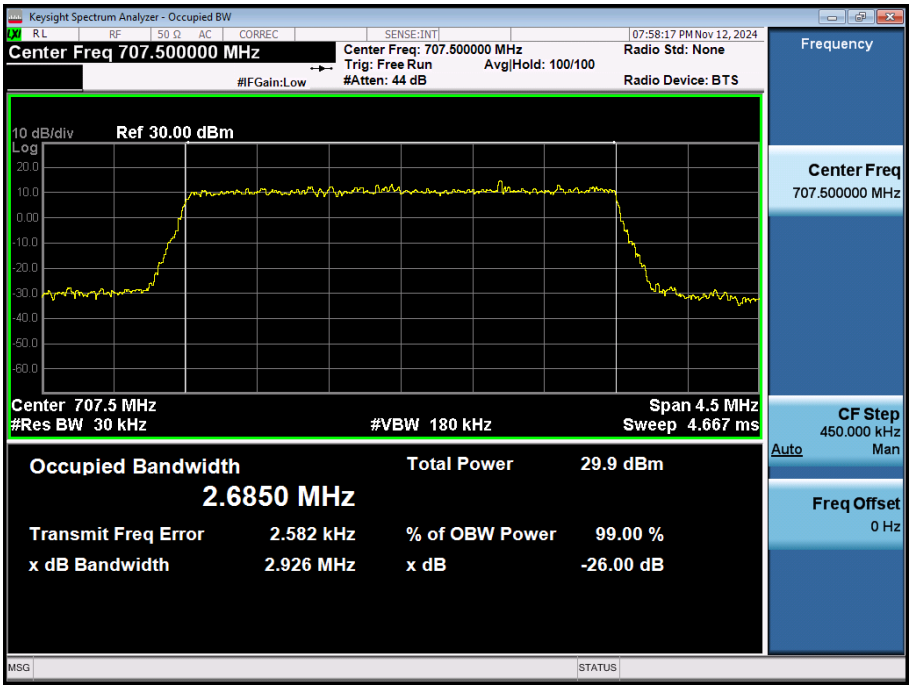
LTE Band 12 / 5 MHz / QPSK / FULL RB Size



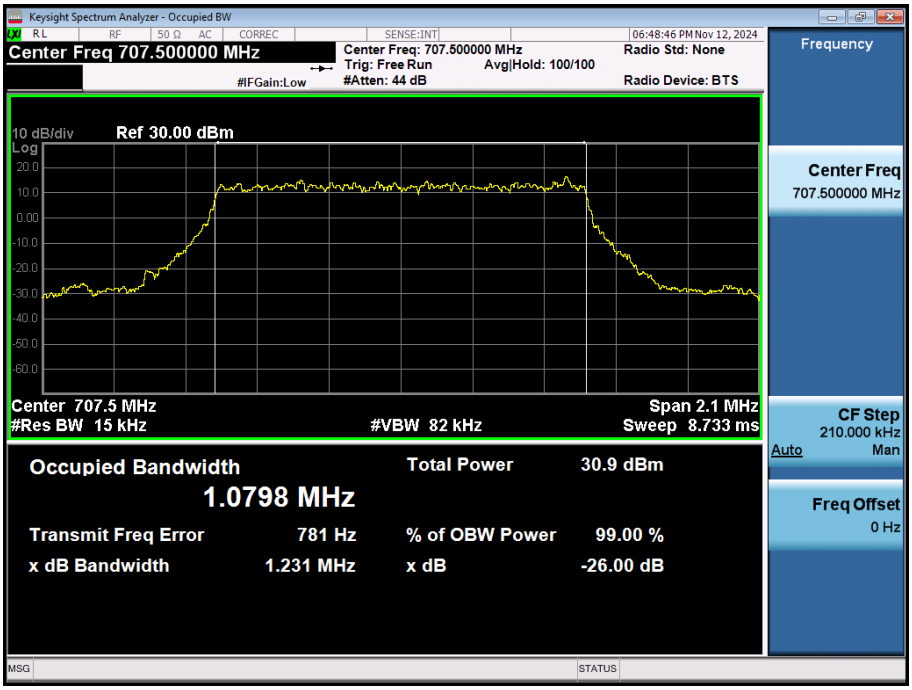
LTE Band 12 / 5 MHz / 16QAM / FULL RB Size



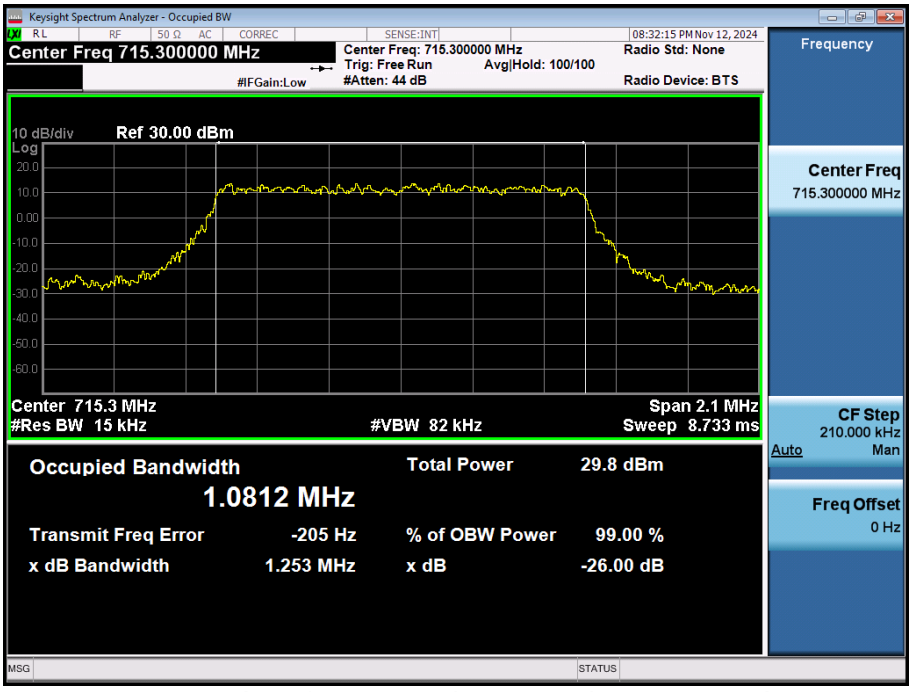
LTE Band 12 / 3 MHz / QPSK / FULL RB Size



LTE Band 12 / 3 MHz / 16QAM / FULL RB Size



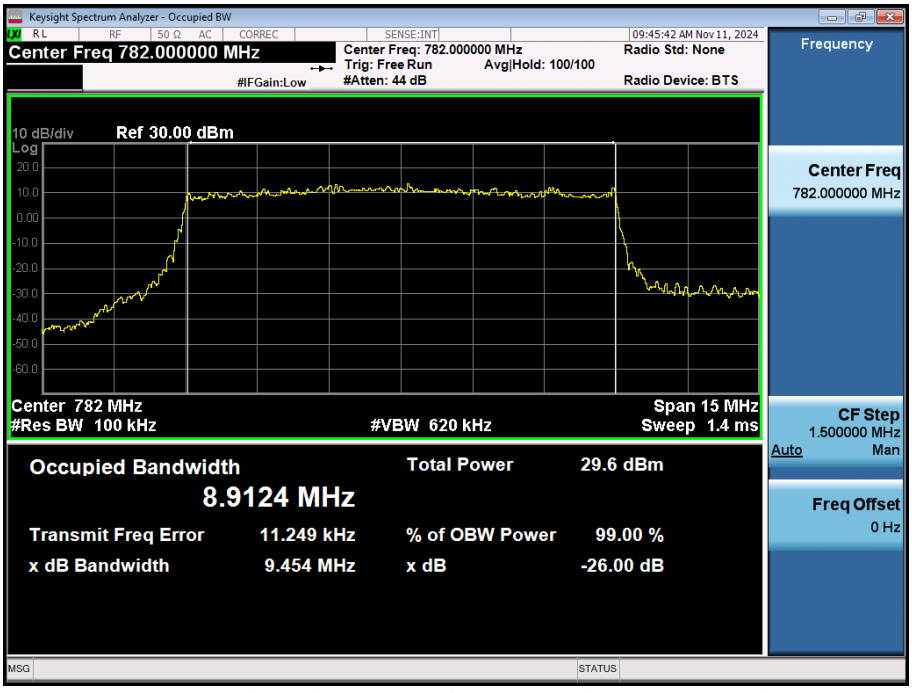
LTE Band 12 / 1.4 MHz / QPSK / FULL RB Size



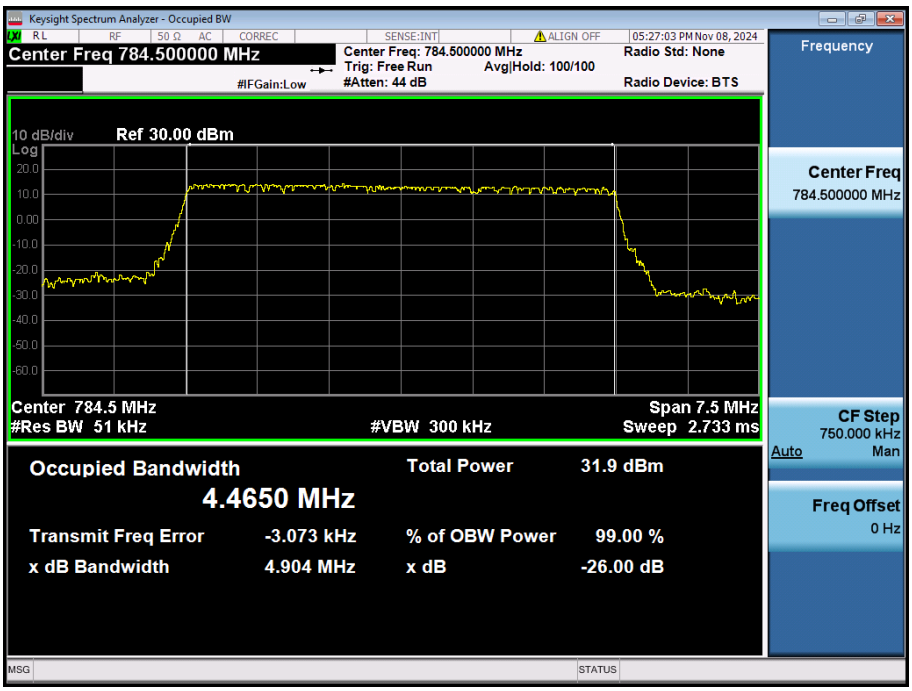
LTE Band 12 / 1.4 MHz / 16QAM / FULL RB Size

8.1.2. LTE Band 13

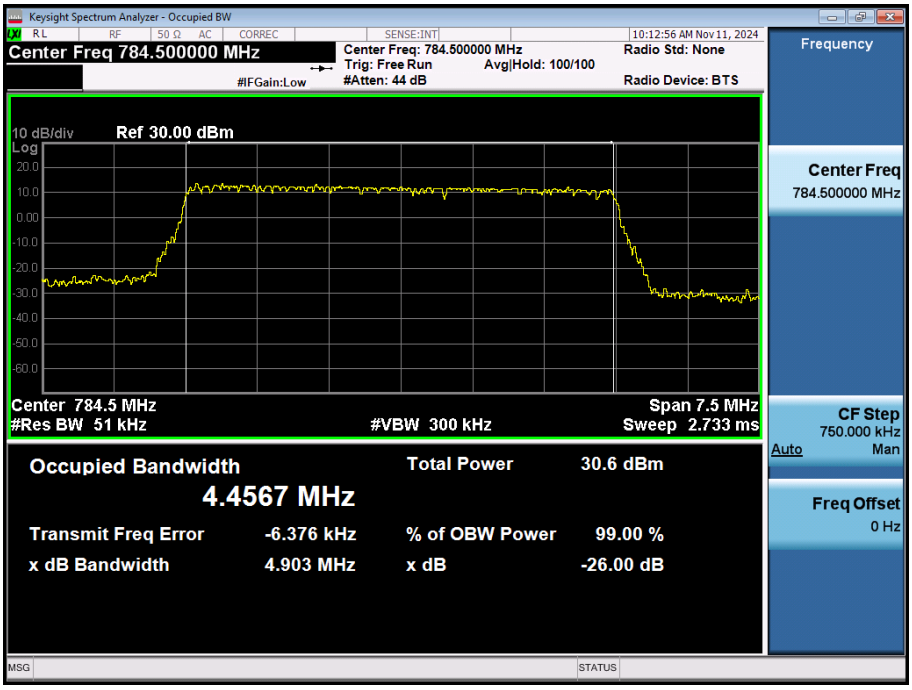
LTE Band 13 / 10 MHz / QPSK / FULL RB Size



LTE Band 13 / 10 MHz / 16QAM / FULL RB Size

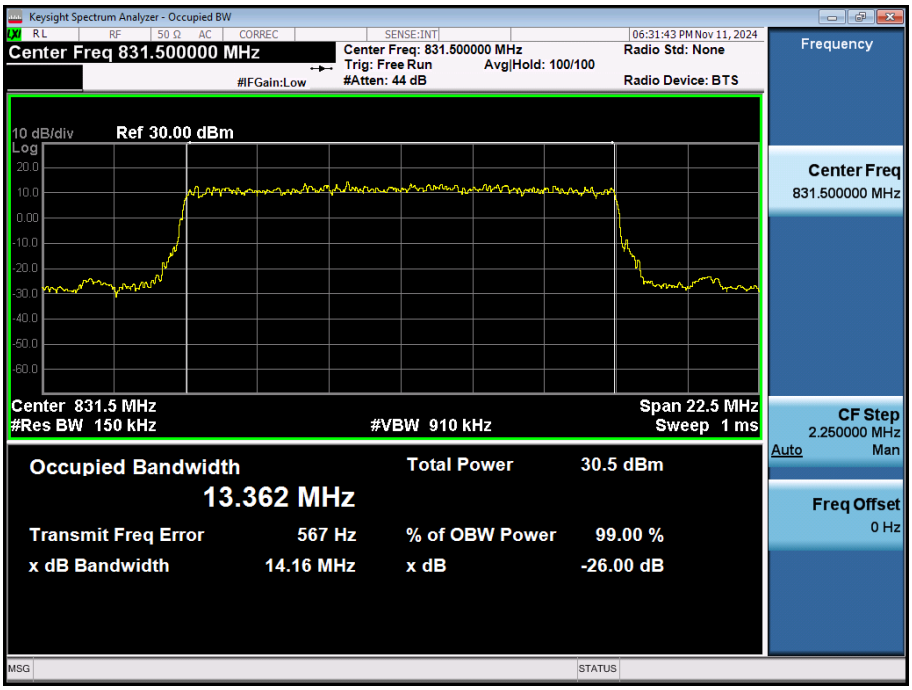


LTE Band 13 / 5 MHz / QPSK / FULL RB Size

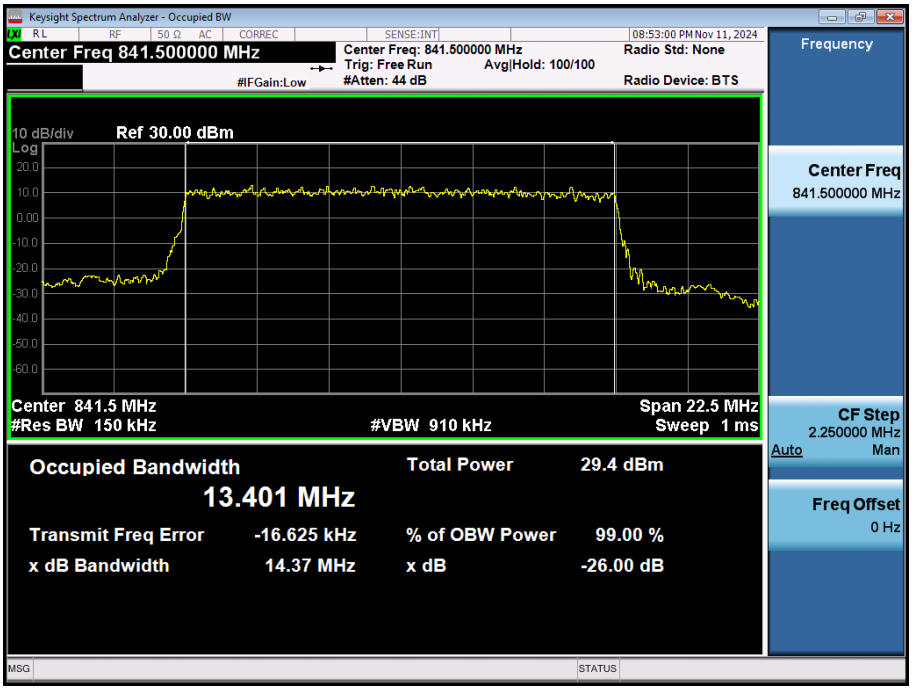


LTE Band 13 / 5 MHz / 16QAM / FULL RB Size

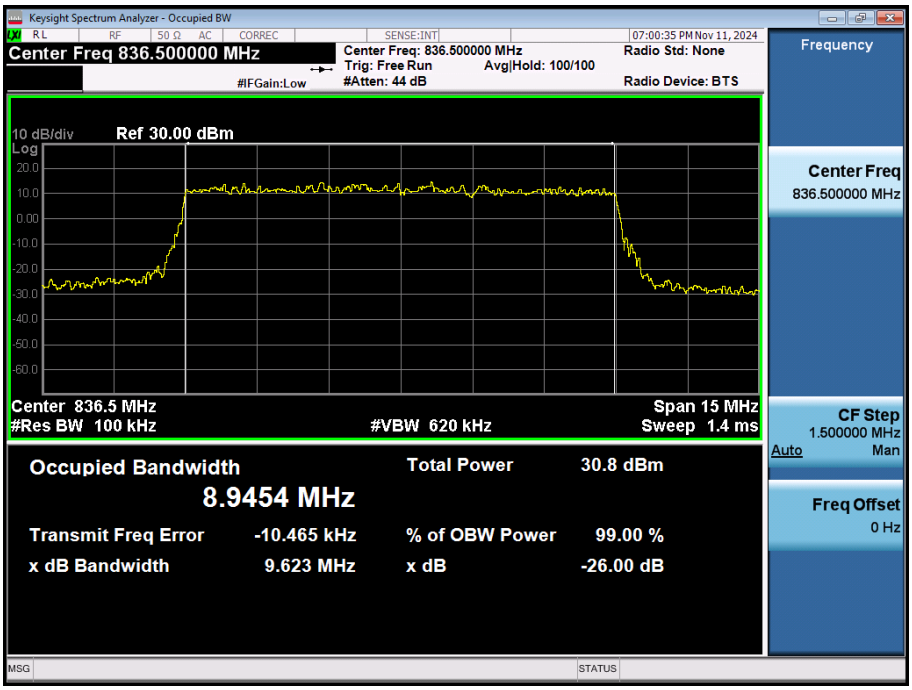
8.1.3. LTE Band 26(5)



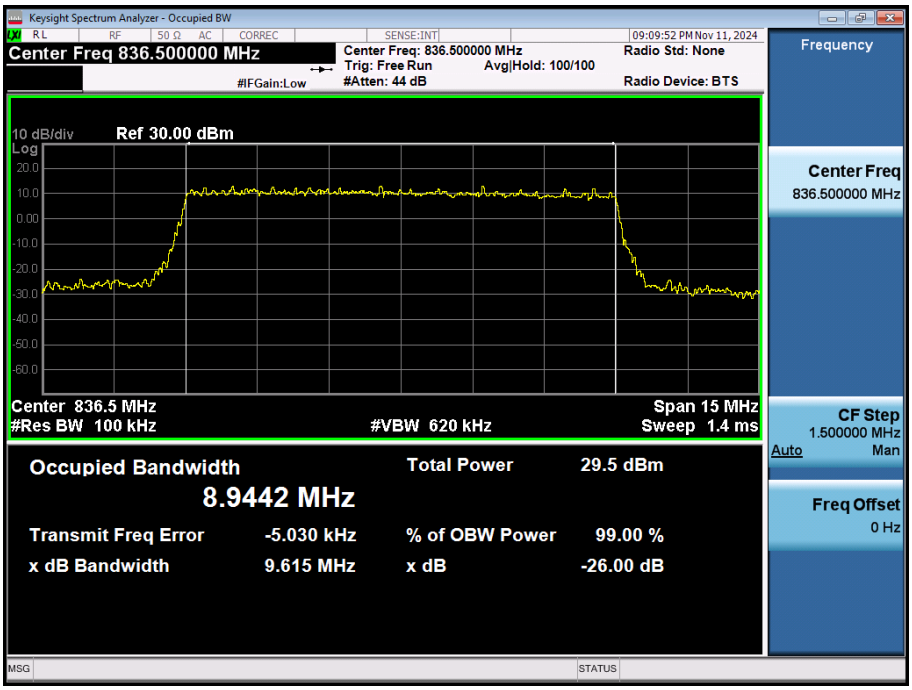
LTE Band 26 / 15 MHz / QPSK / FULL RB Size



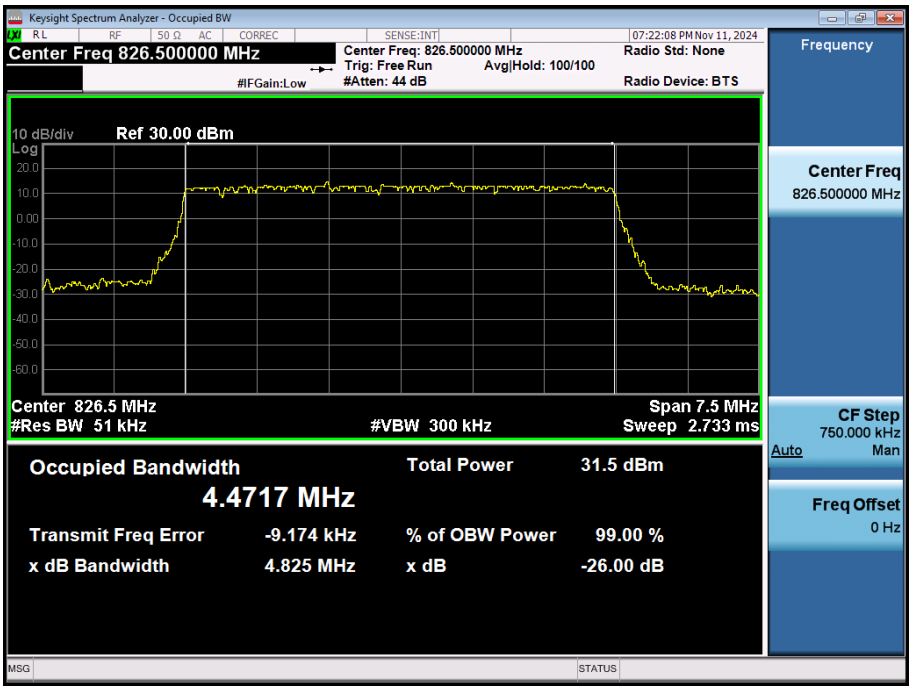
LTE Band 26 / 15 MHz / 16QAM / FULL RB Size



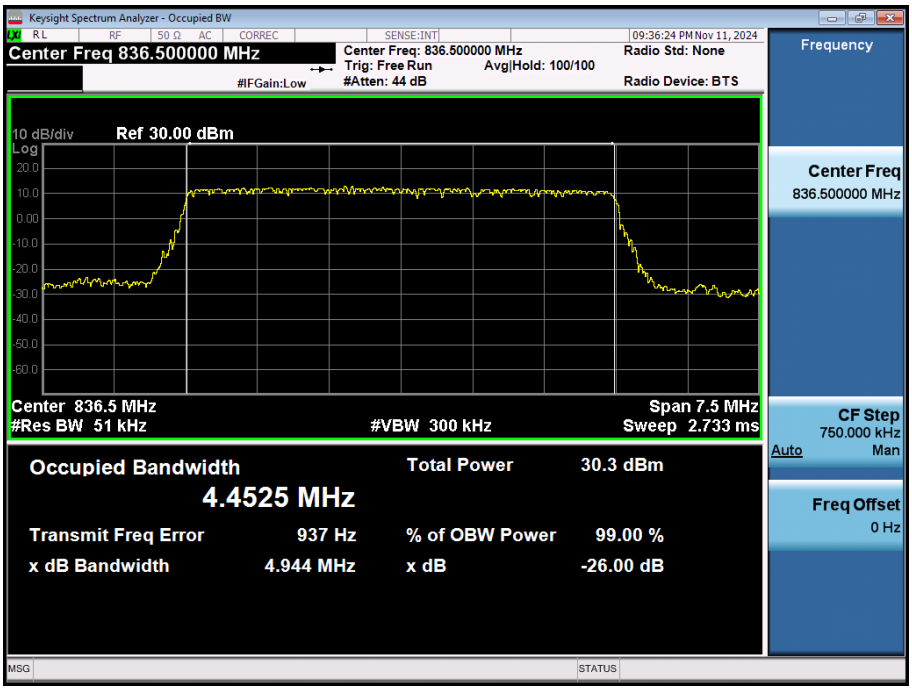
LTE Band 26 / 10 MHz / QPSK / FULL RB Size



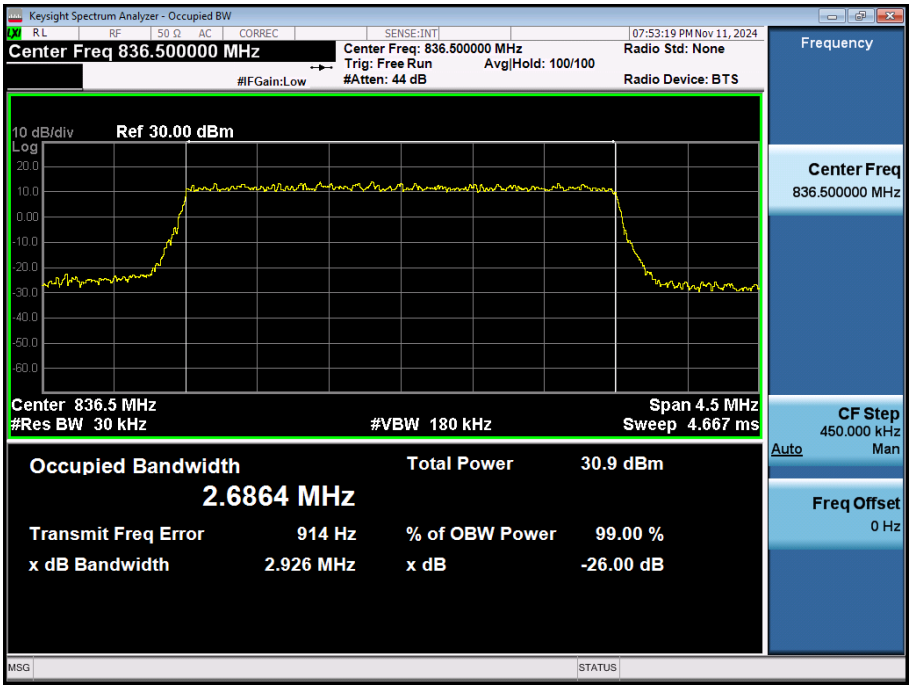
LTE Band 26 / 10 MHz / 16QAM / FULL RB Size



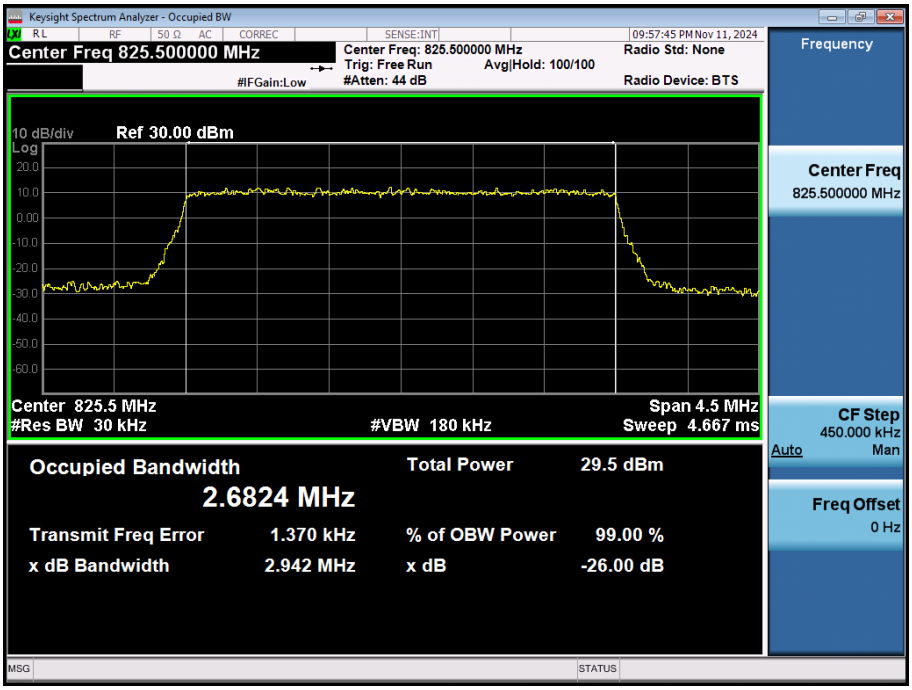
LTE Band 26 / 5 MHz / QPSK / FULL RB Size



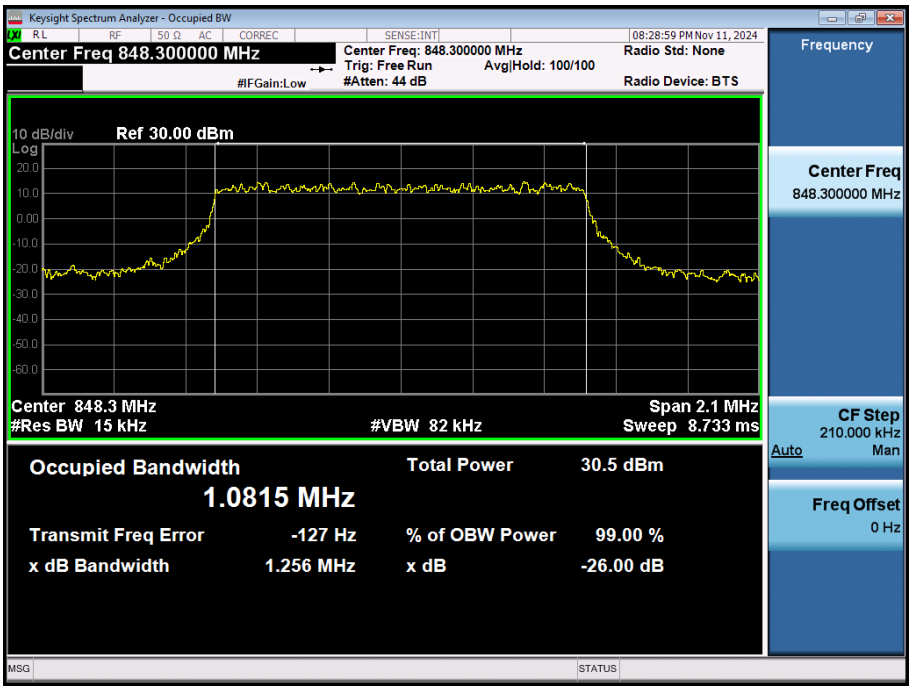
LTE Band 26 / 5 MHz / 16QAM / FULL RB Size



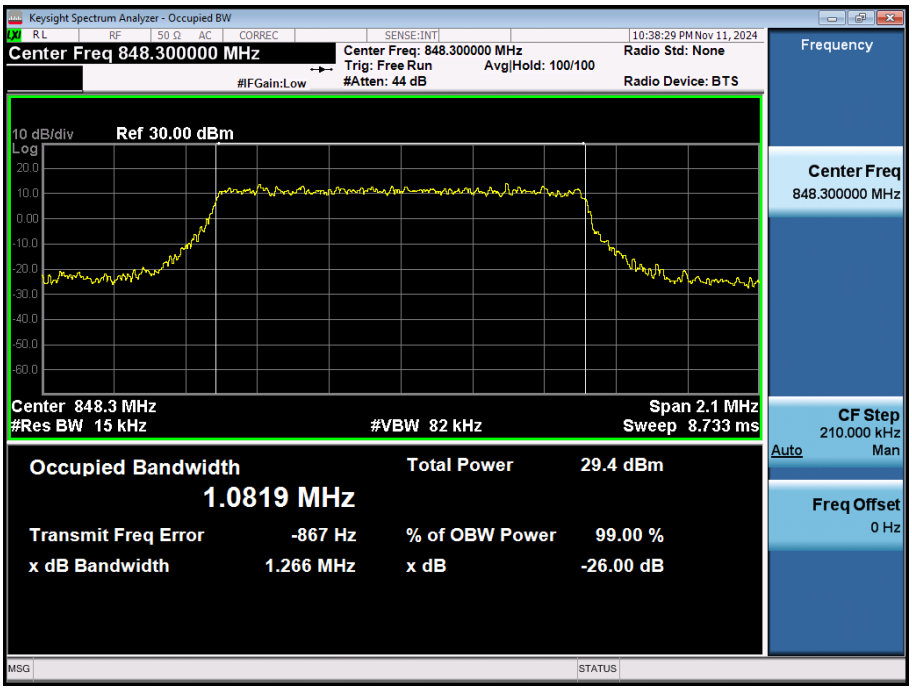
LTE Band 26 / 3 MHz / QPSK / FULL RB Size



LTE Band 26 / 3 MHz / 16QAM / FULL RB Size

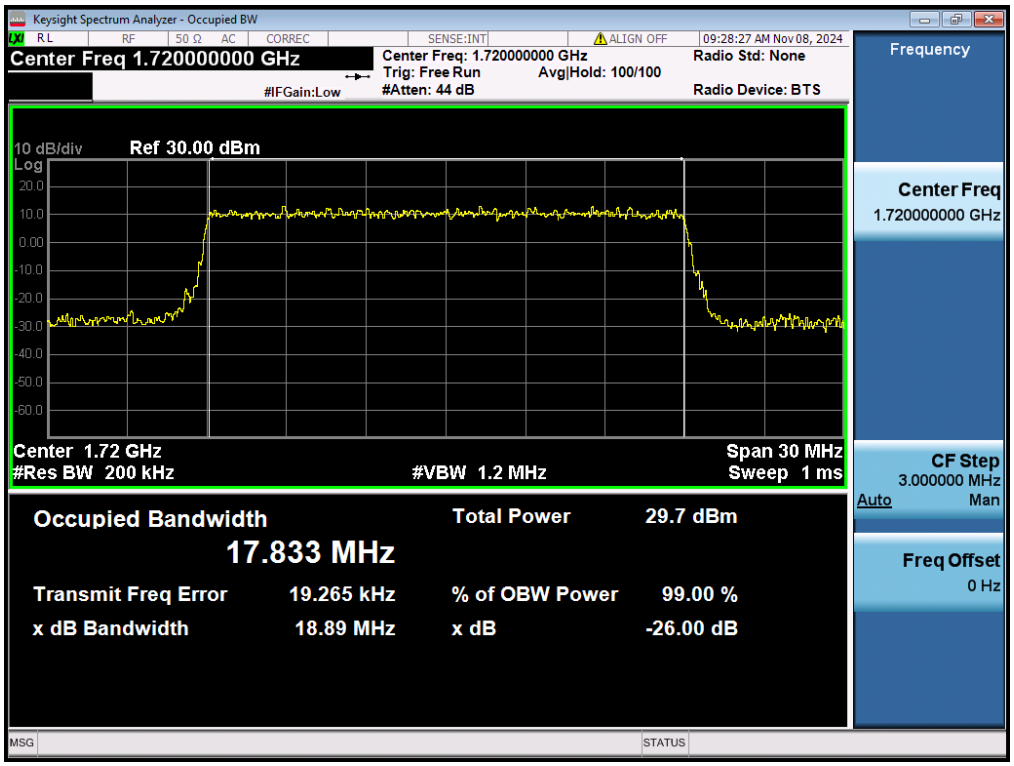


LTE Band 26 / 1.4 MHz / QPSK / FULL RB Size

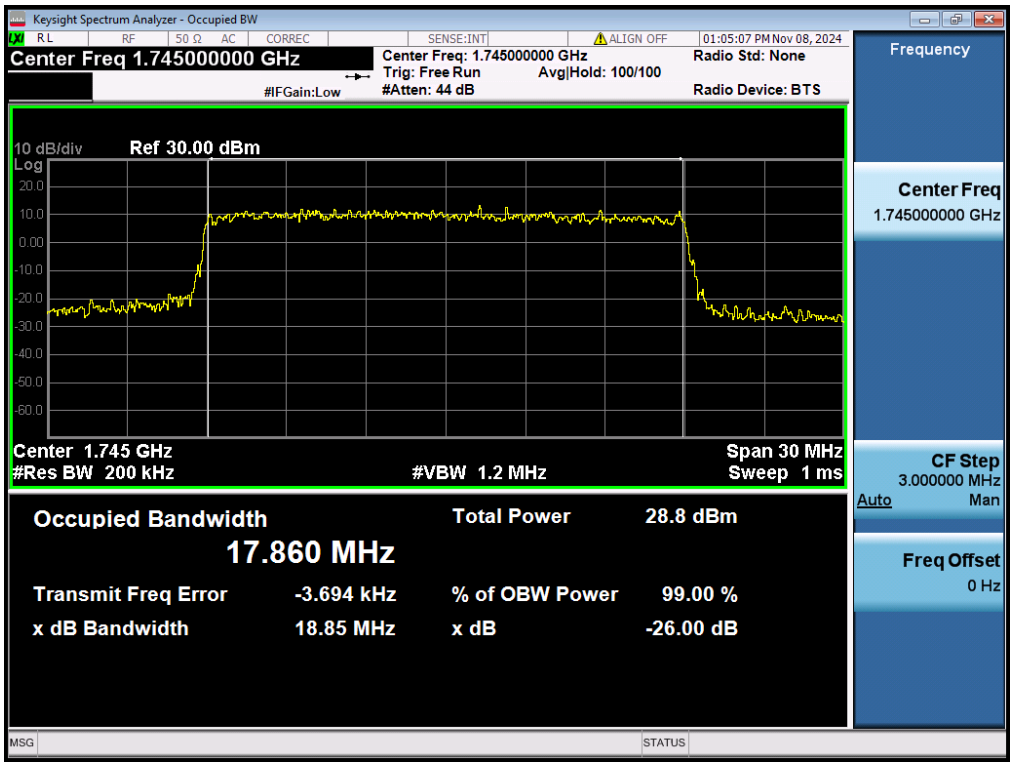


LTE Band 26 / 1.4 MHz / 16QAM / FULL RB Size

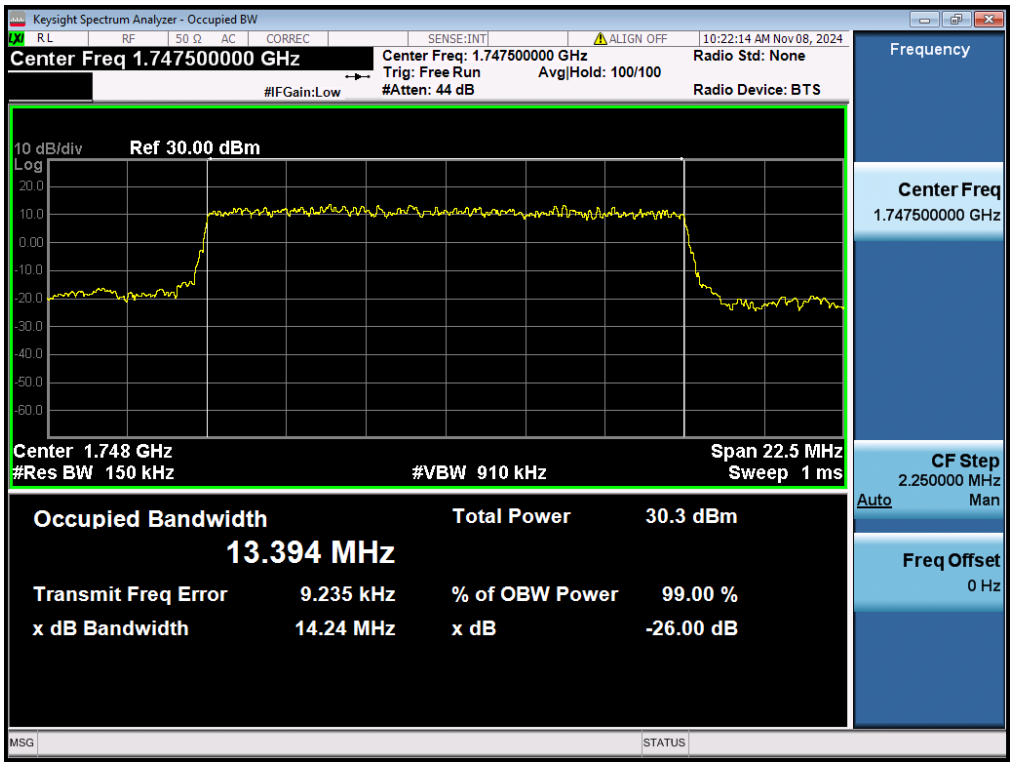
8.1.4. LTE Band 4



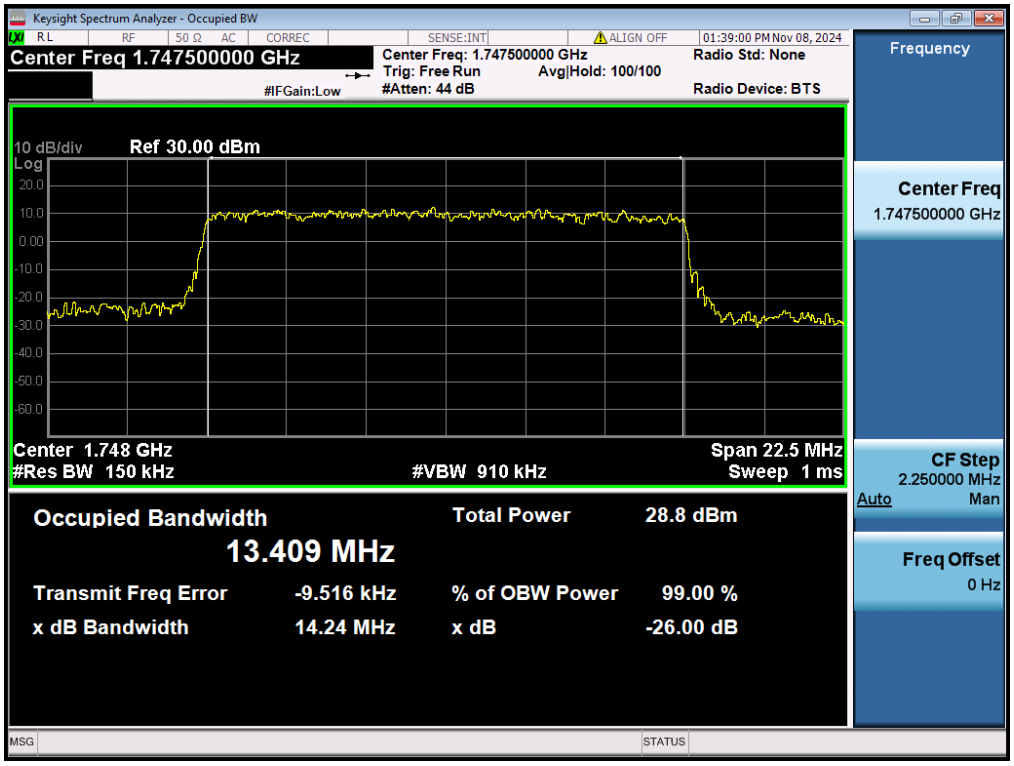
LTE Band 4 / 20 MHz / QPSK / FULL RB Size



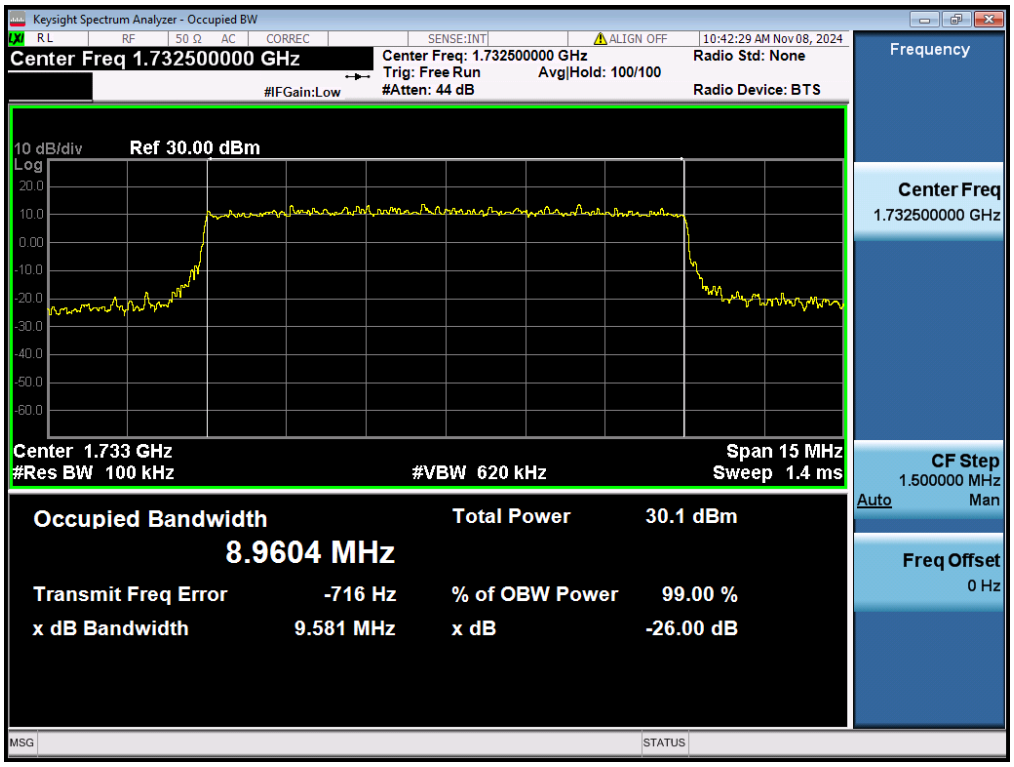
LTE Band 4 / 20 MHz / 16QAM / FULL RB Size



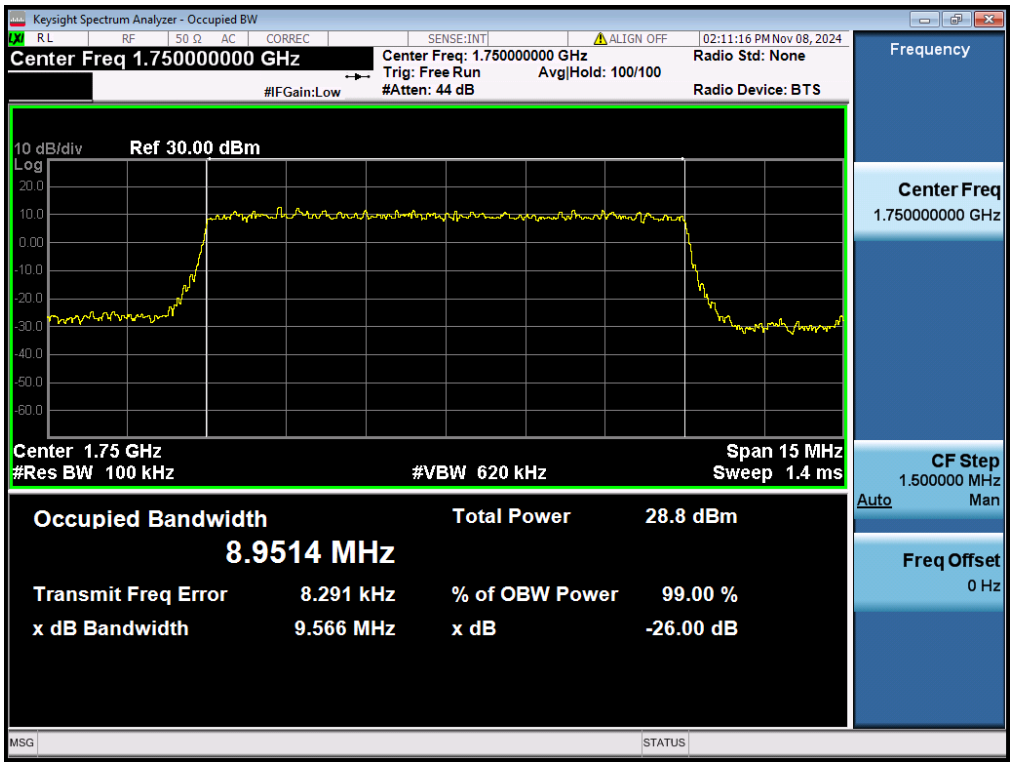
LTE Band 4 / 15 MHz / QPSK / FULL RB Size



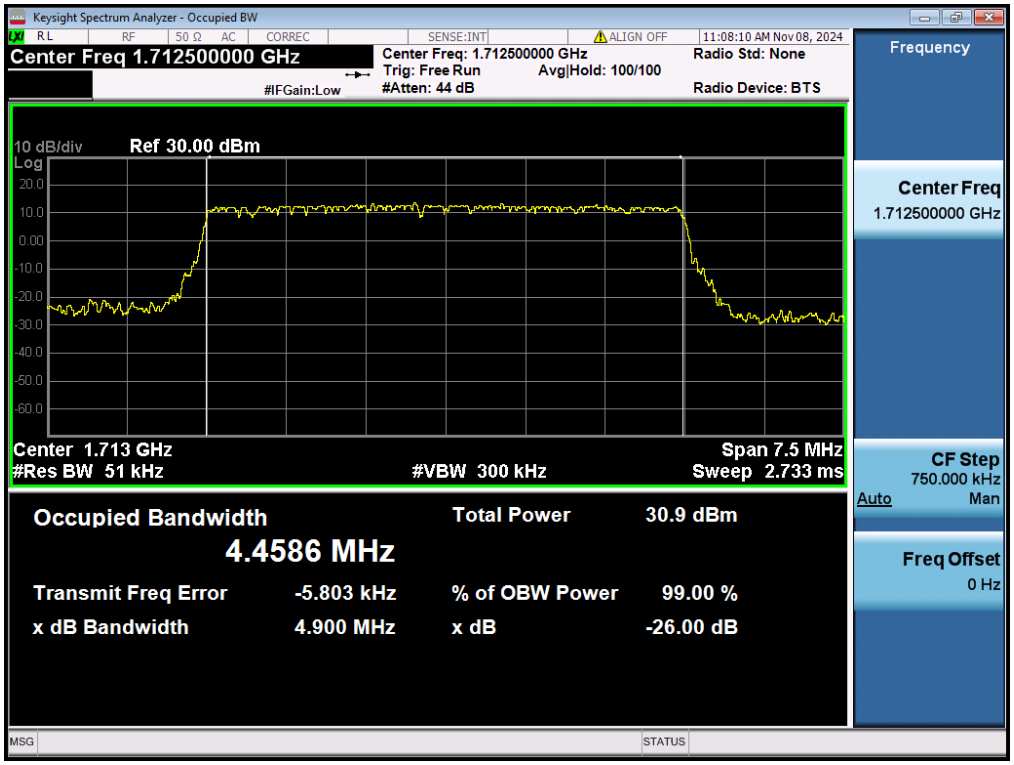
LTE Band 4 / 15 MHz / 16QAM / FULL RB Size



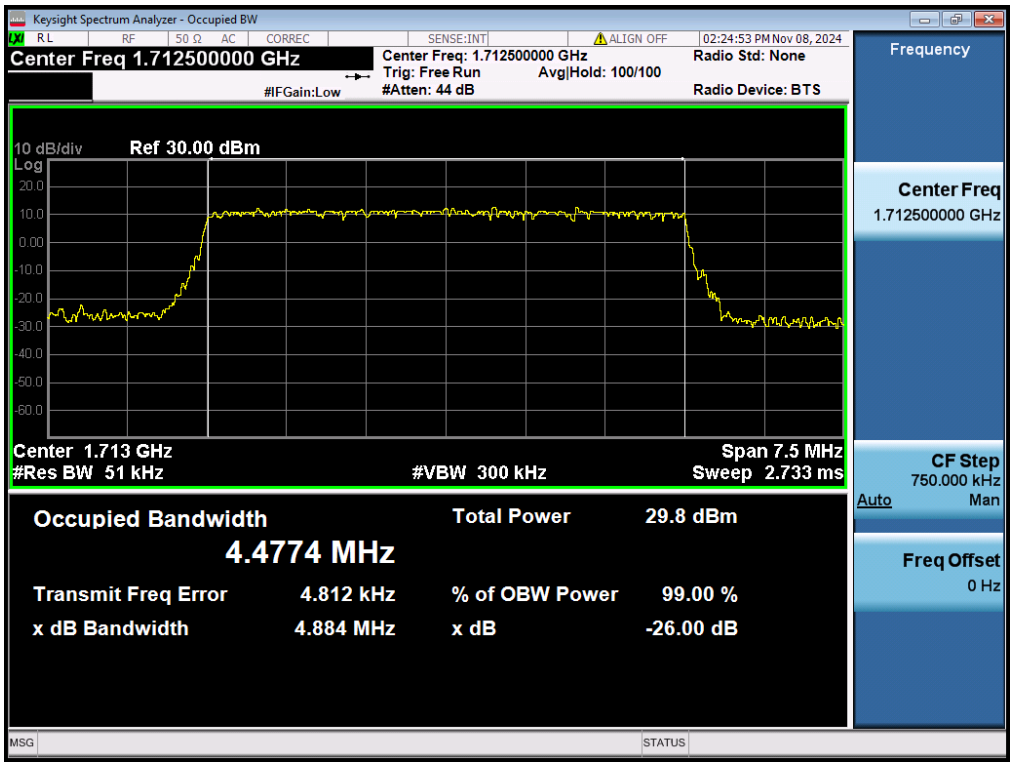
LTE Band 4 / 10 MHz / QPSK / FULL RB Size



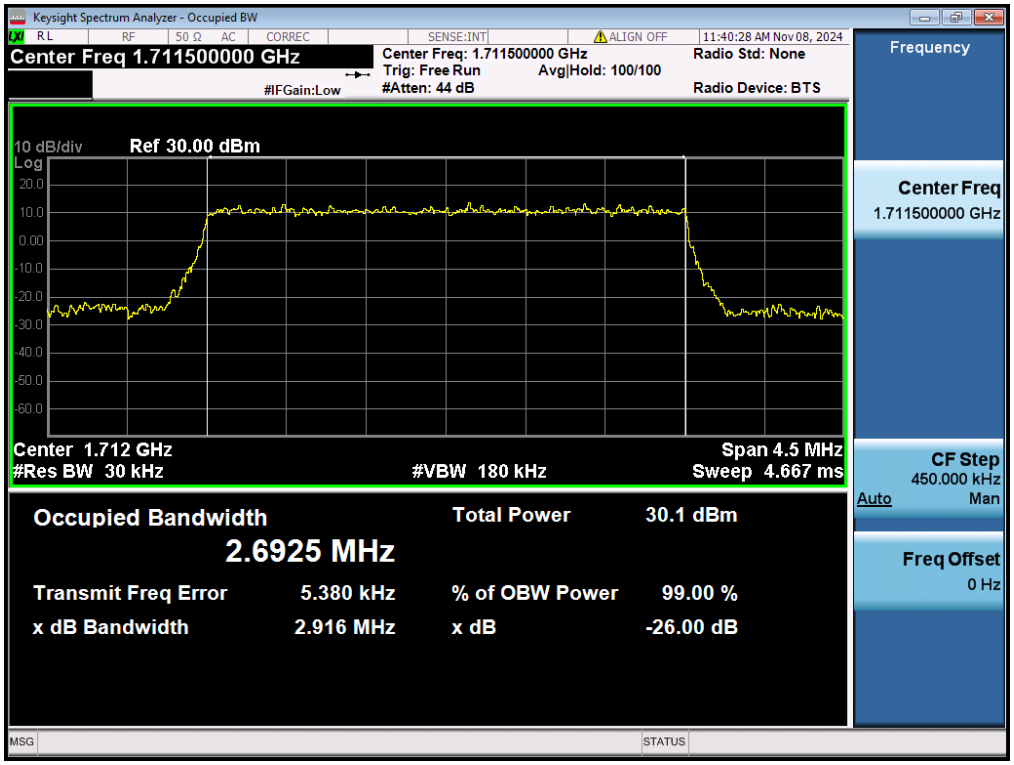
LTE Band 4 / 10 MHz / 16QAM / FULL RB Size



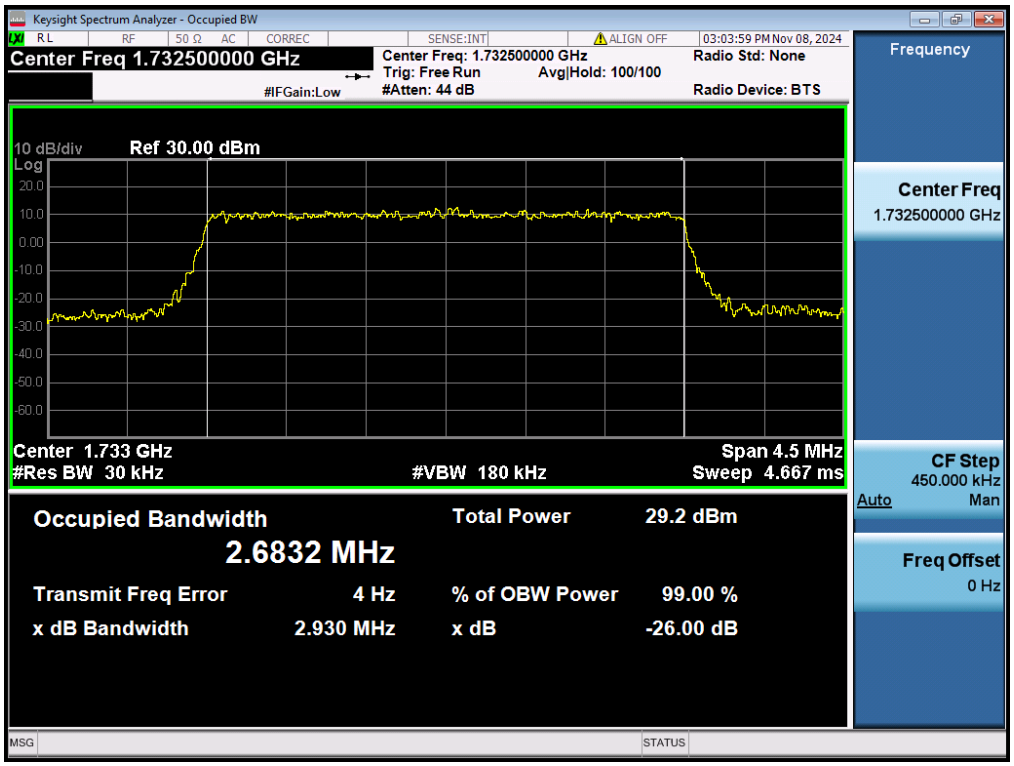
LTE Band 4 / 5 MHz / QPSK / FULL RB Size



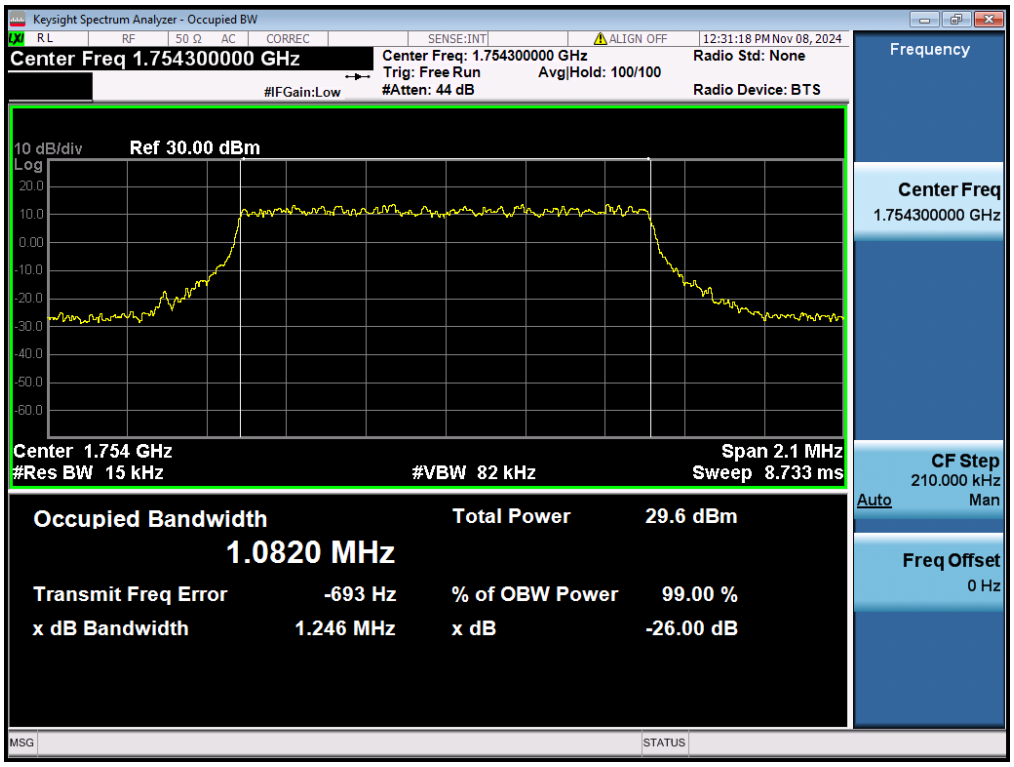
LTE Band 4 / 5 MHz / 16QAM / FULL RB Size



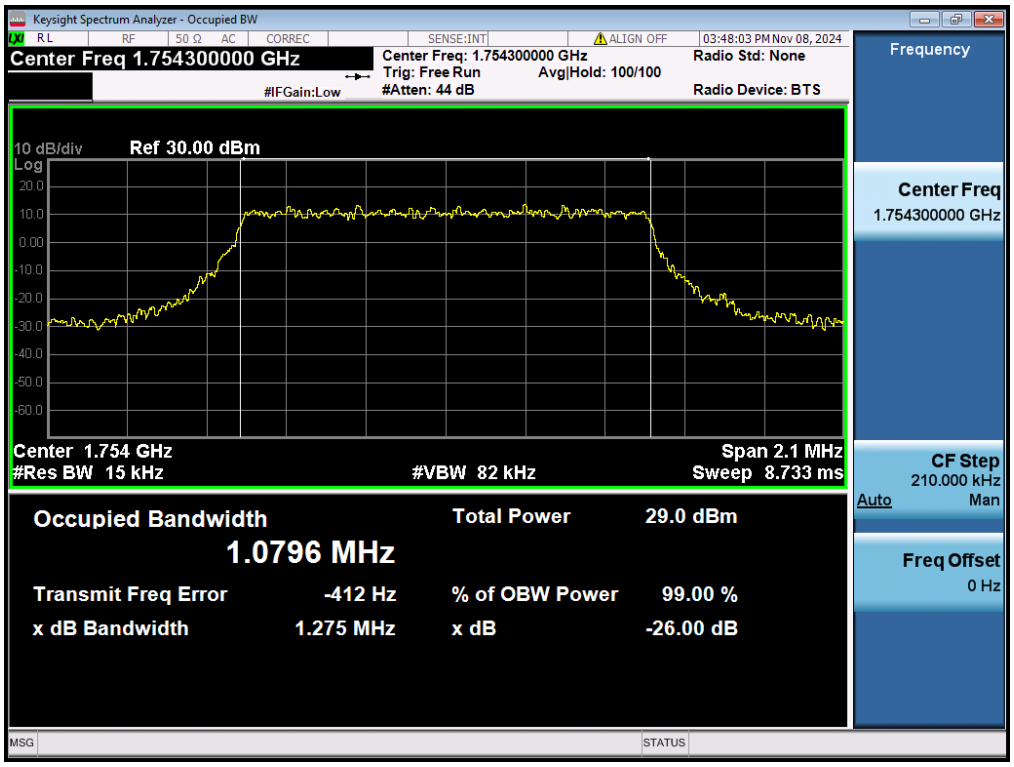
LTE Band 4 / 3 MHz / QPSK / FULL RB Size



LTE Band 4 / 3 MHz / 16QAM / FULL RB Size

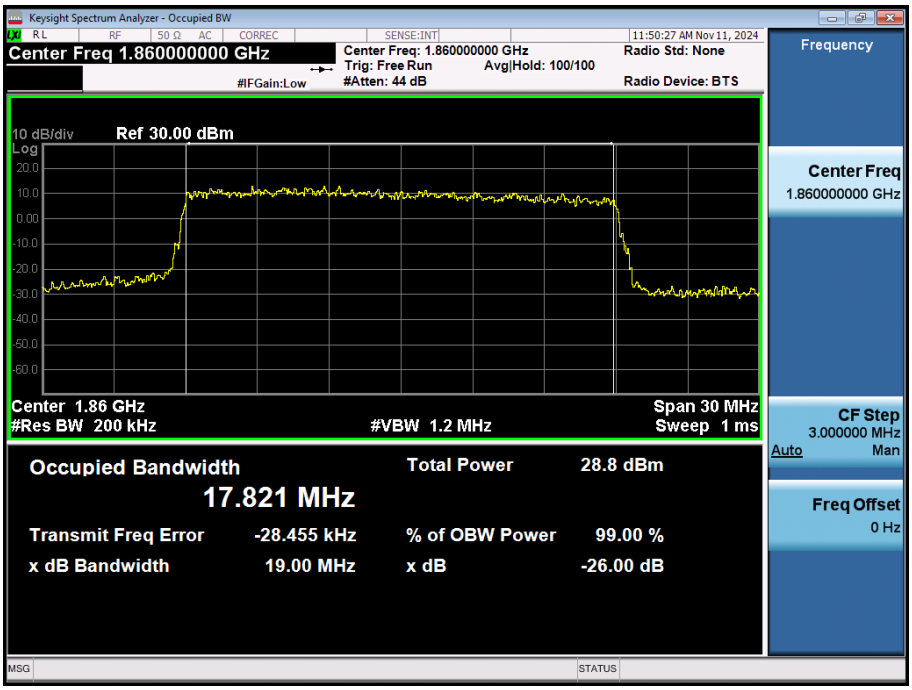


LTE Band 4 / 1.4 MHz / QPSK / FULL RB Size

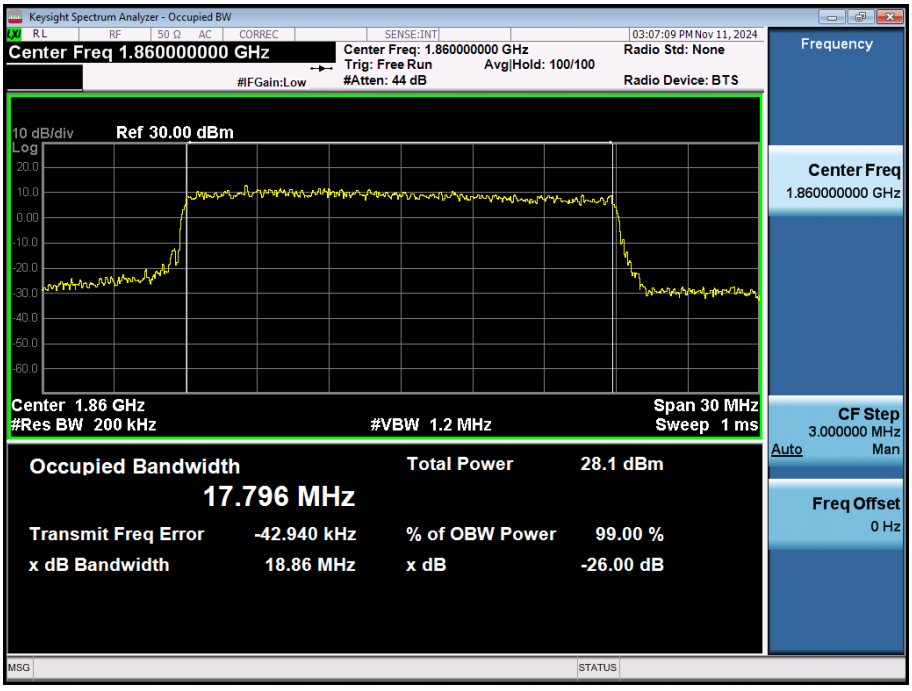


LTE Band 4 / 1.4 MHz / 16QAM / FULL RB Size

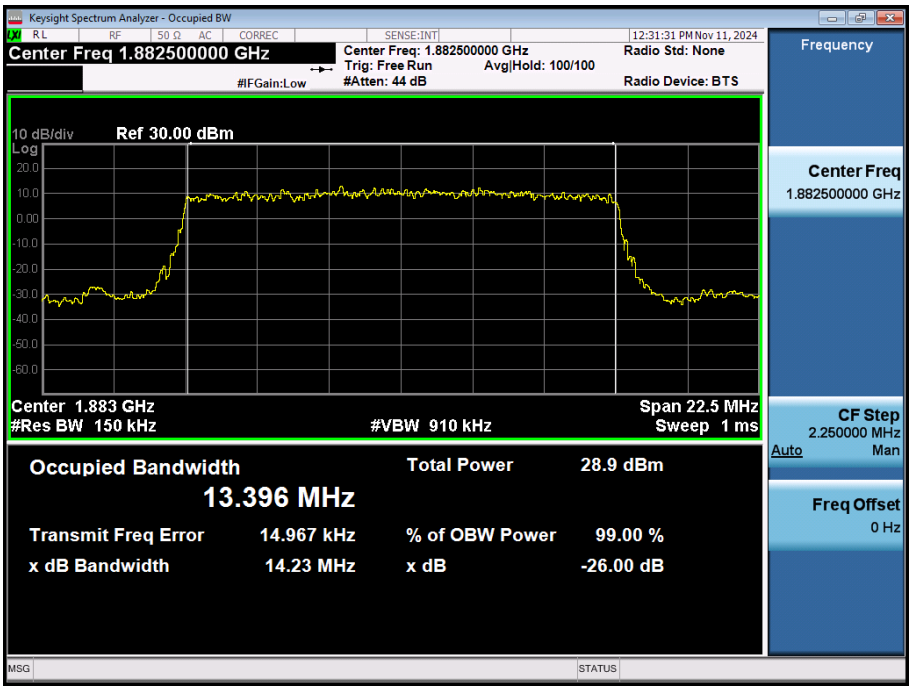
8.1.5. LTE Band 25(2)



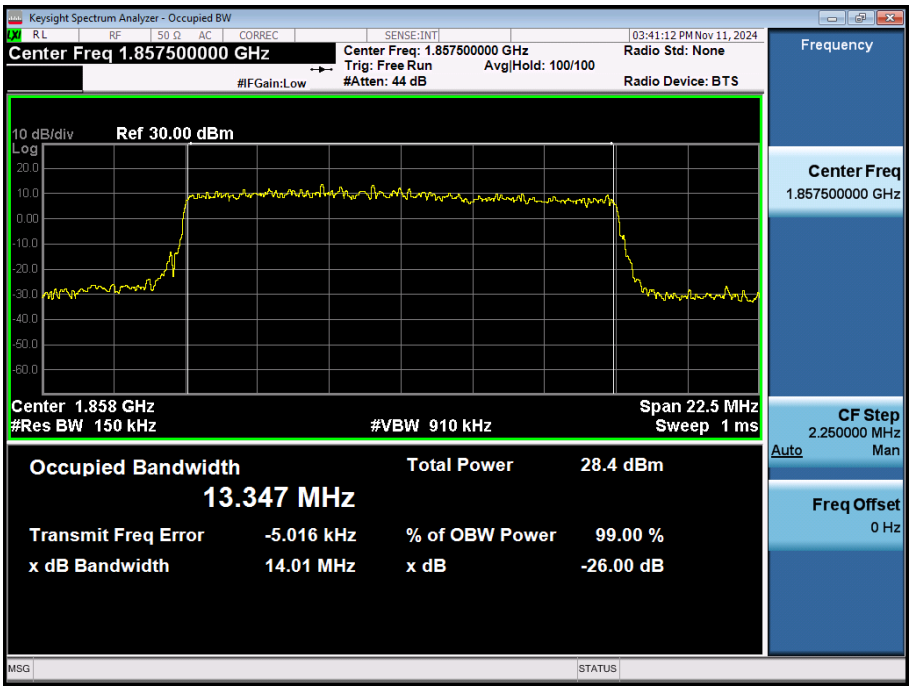
LTE Band 25 / 20 MHz / QPSK / FULL RB Size



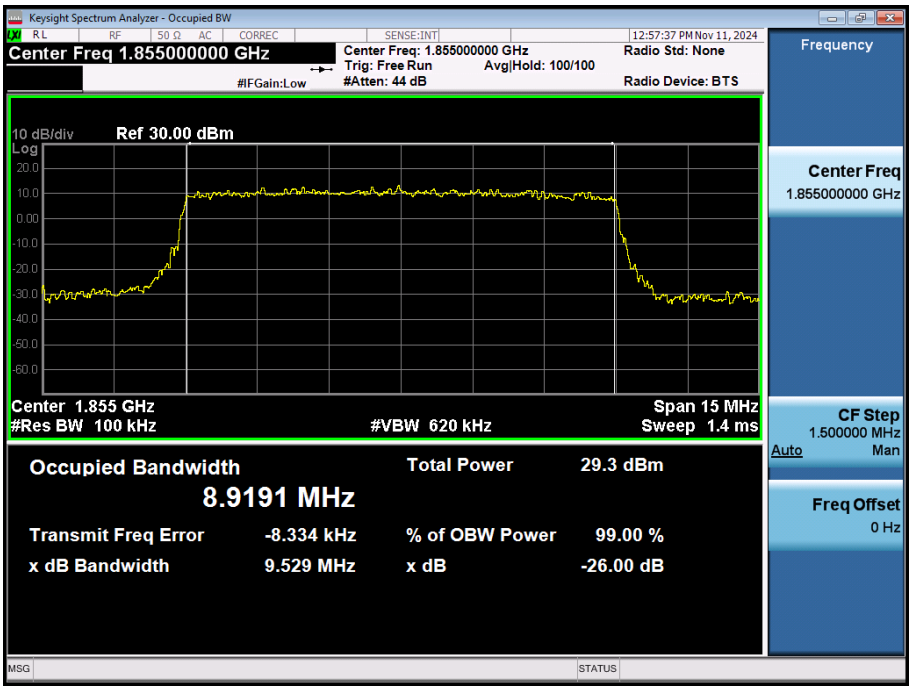
LTE Band 25 / 20 MHz / 16QAM / FULL RB Size



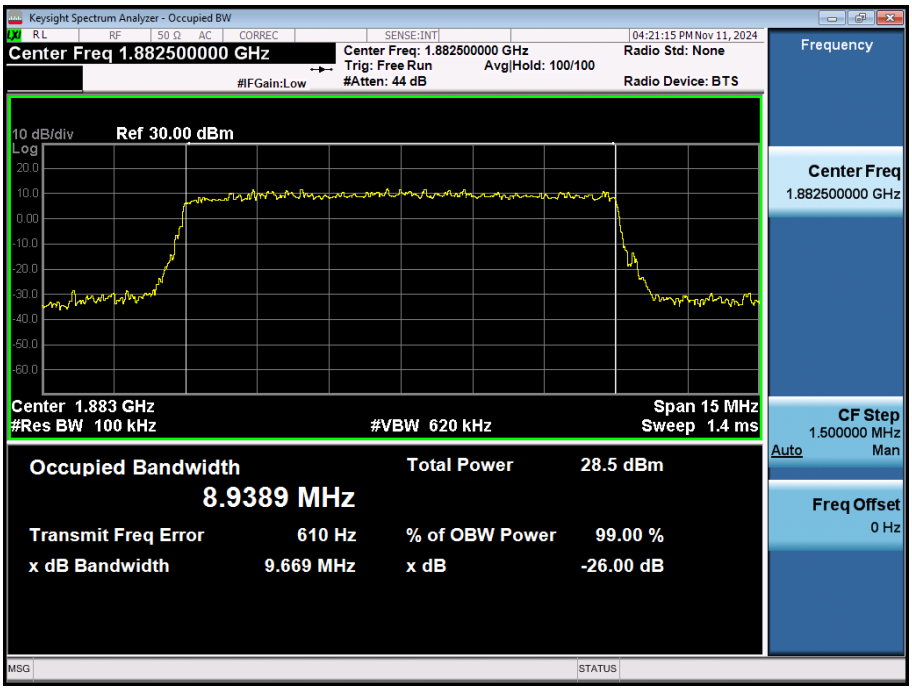
LTE Band 25 / 15 MHz / QPSK / FULL RB Size



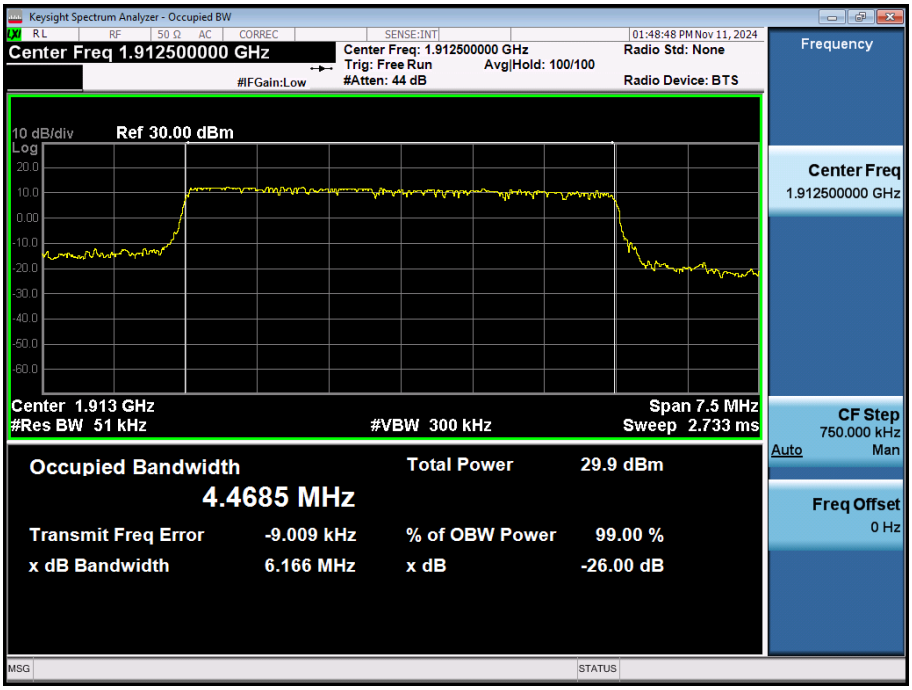
LTE Band 25 / 15 MHz / 16QAM / FULL RB Size



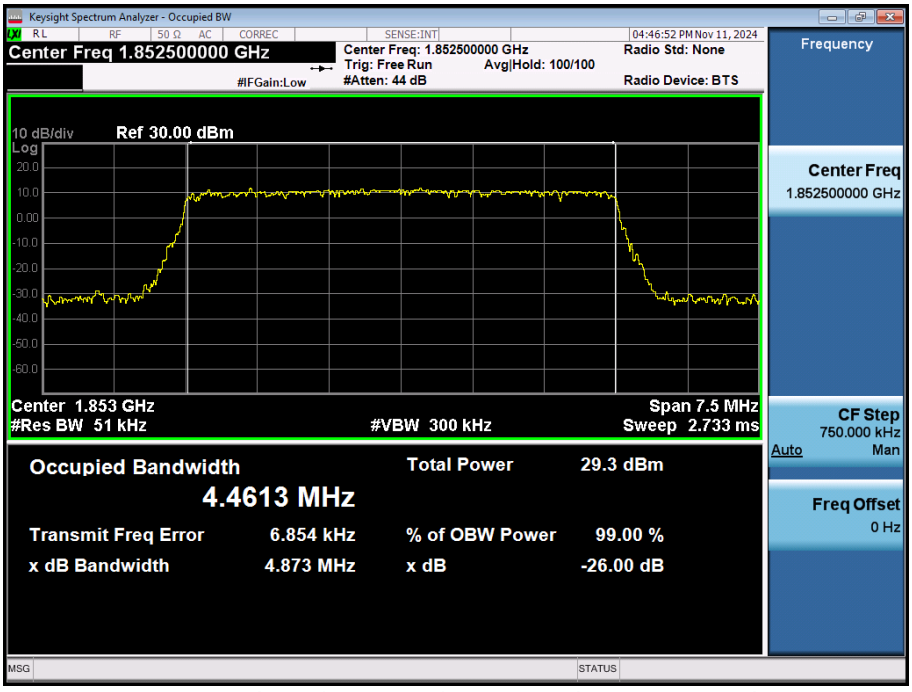
LTE Band 25 / 10 MHz / QPSK / FULL RB Size



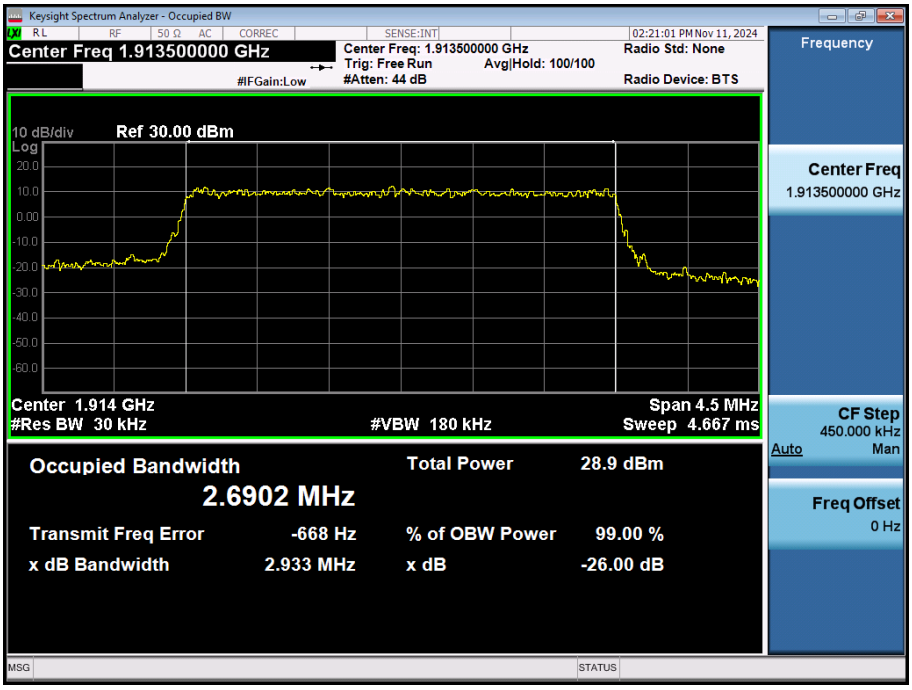
LTE Band 25 / 10 MHz / 16QAM / FULL RB Size



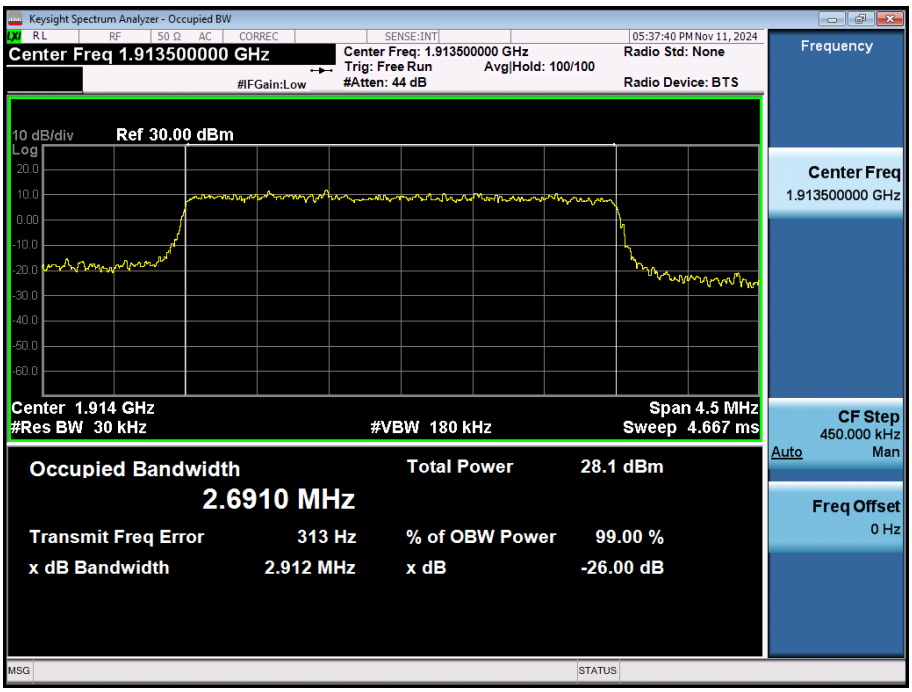
LTE Band 25 / 5 MHz / QPSK / FULL RB Size



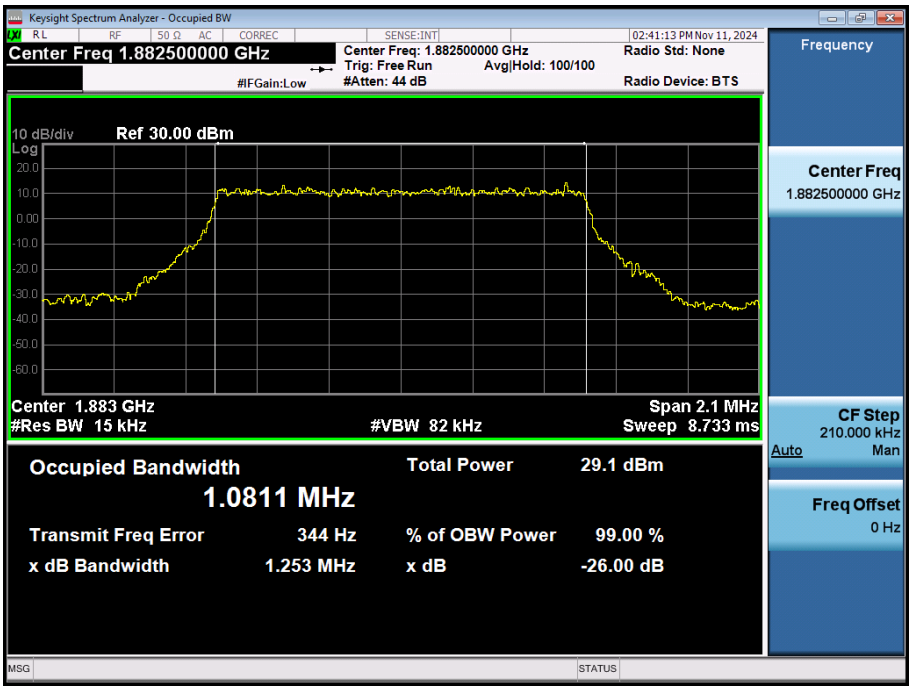
LTE Band 25 / 5 MHz / 16QAM / FULL RB Size



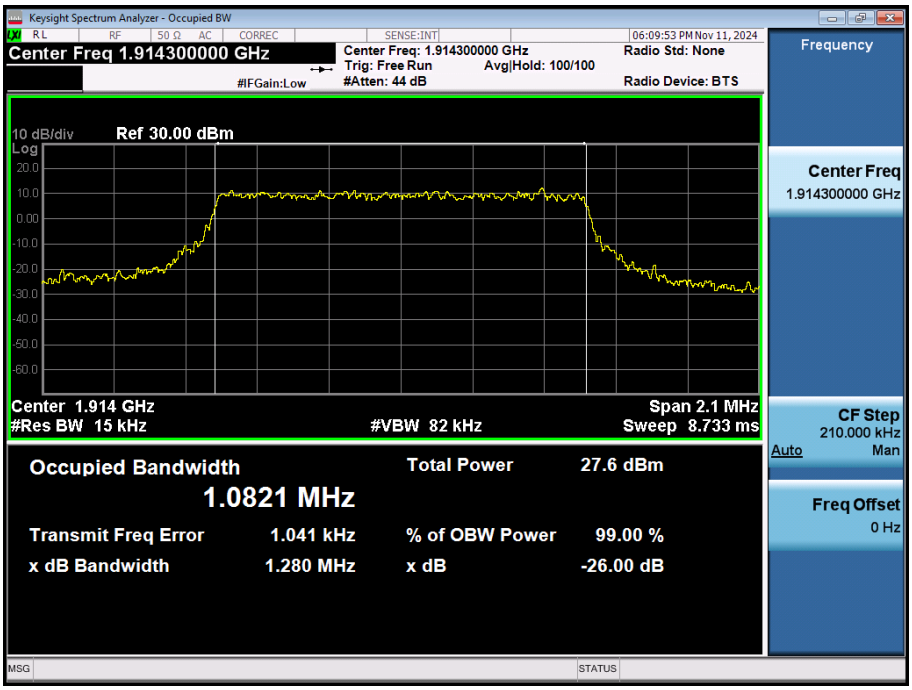
LTE Band 25 / 3 MHz / QPSK / FULL RB Size



LTE Band 25 / 3 MHz / 16QAM / FULL RB Size



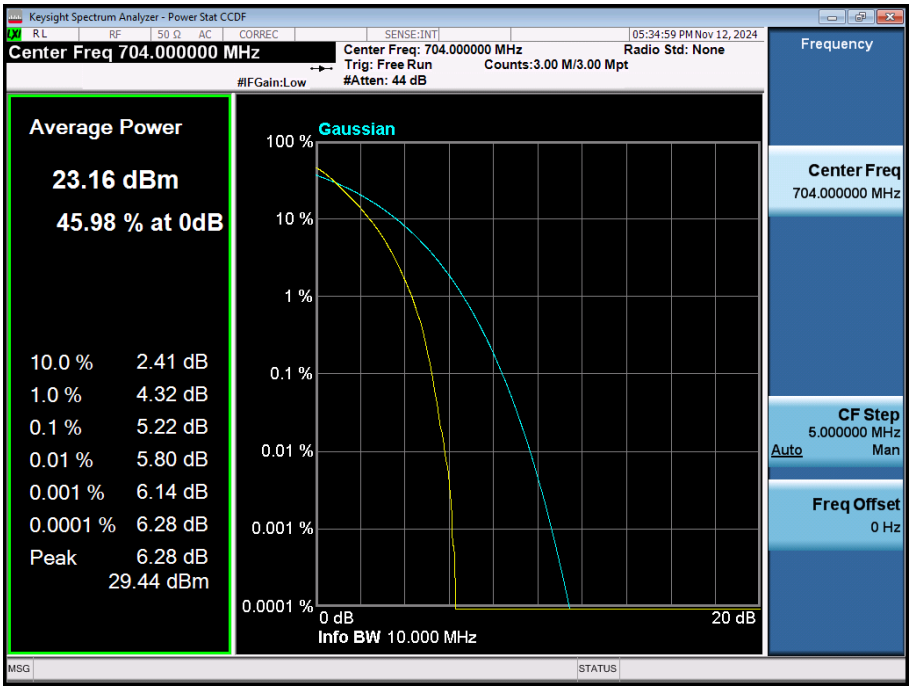
LTE Band 25 / 1.4 MHz / QPSK / FULL RB Size



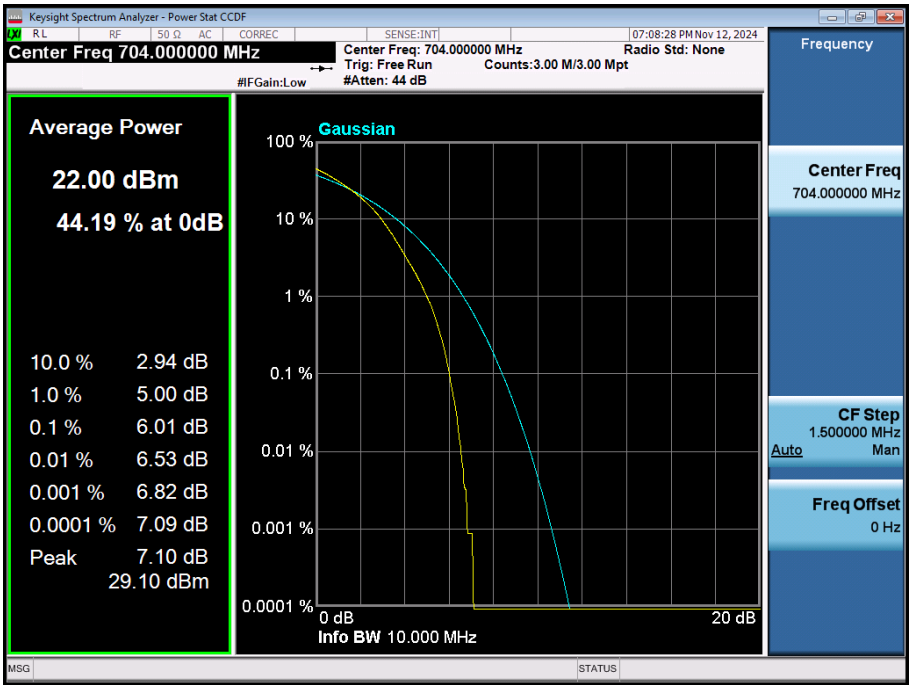
LTE Band 25 / 1.4 MHz / 16QAM / FULL RB Size

8.2. PEAK TO AVERAGE RATIO

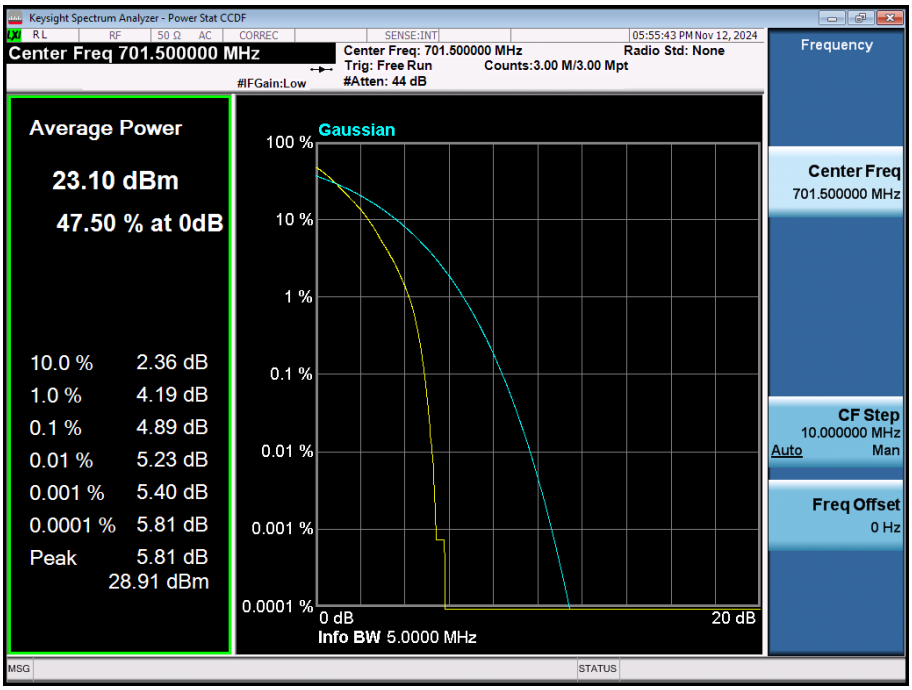
8.2.1. LTE Band 12(17)



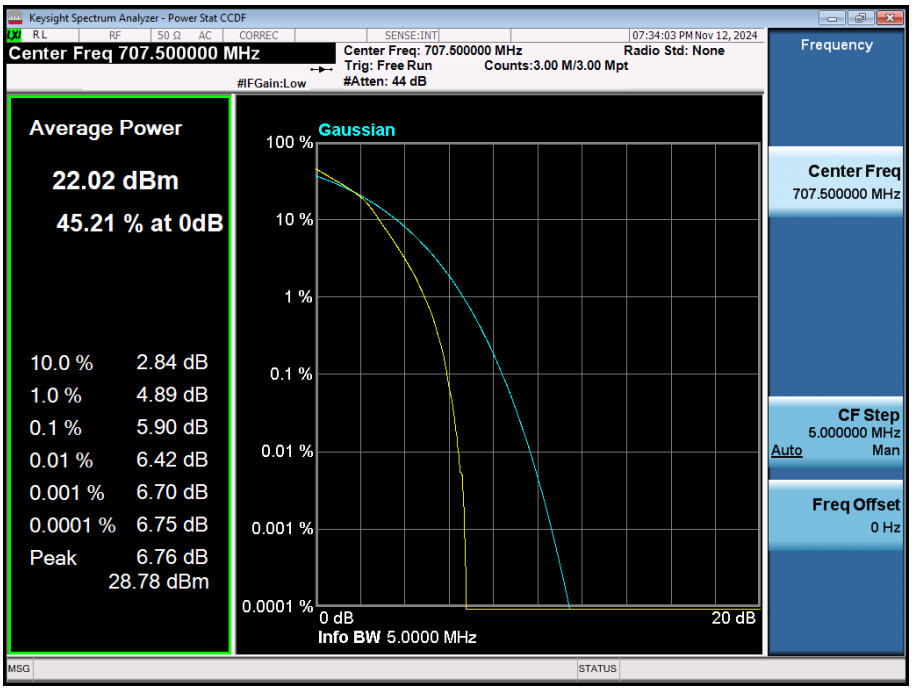
LTE Band 12 / 10 MHz / QPSK / FULL RB Size



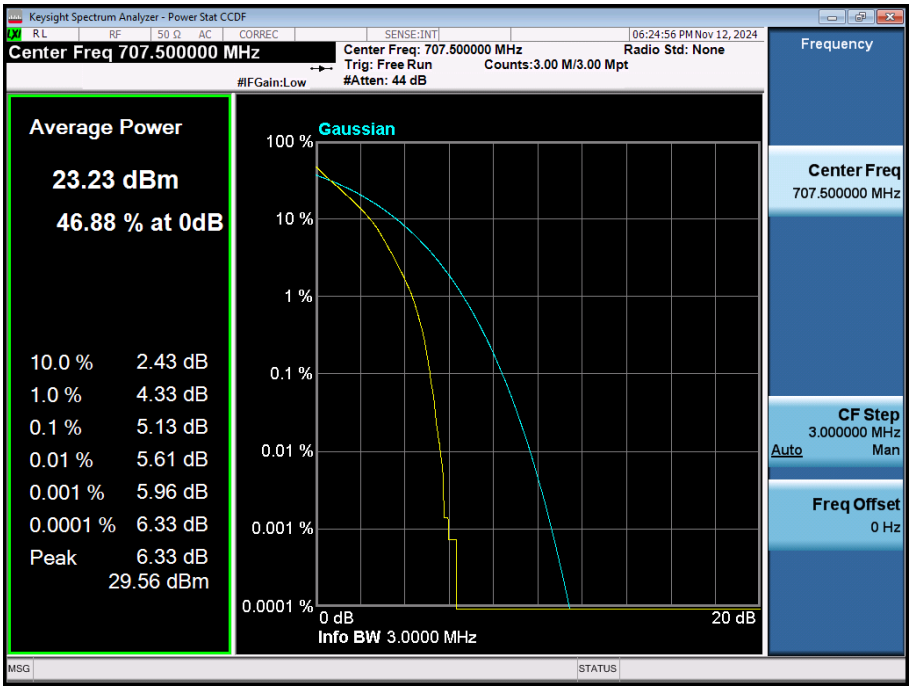
LTE Band 12 / 10 MHz / 16QAM / FULL RB Size



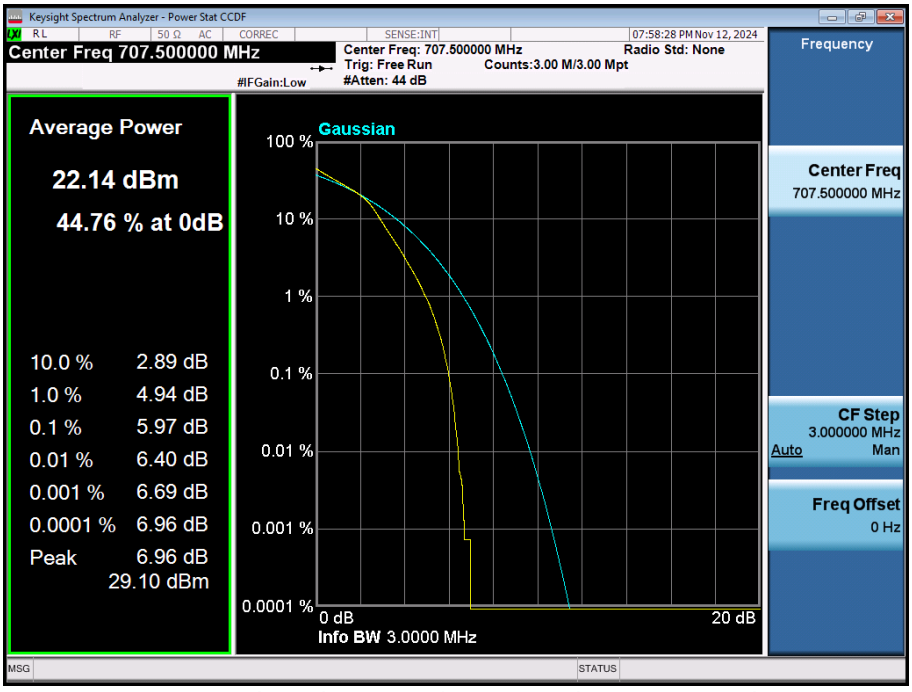
LTE Band 12 / 5 MHz / QPSK / FULL RB Size



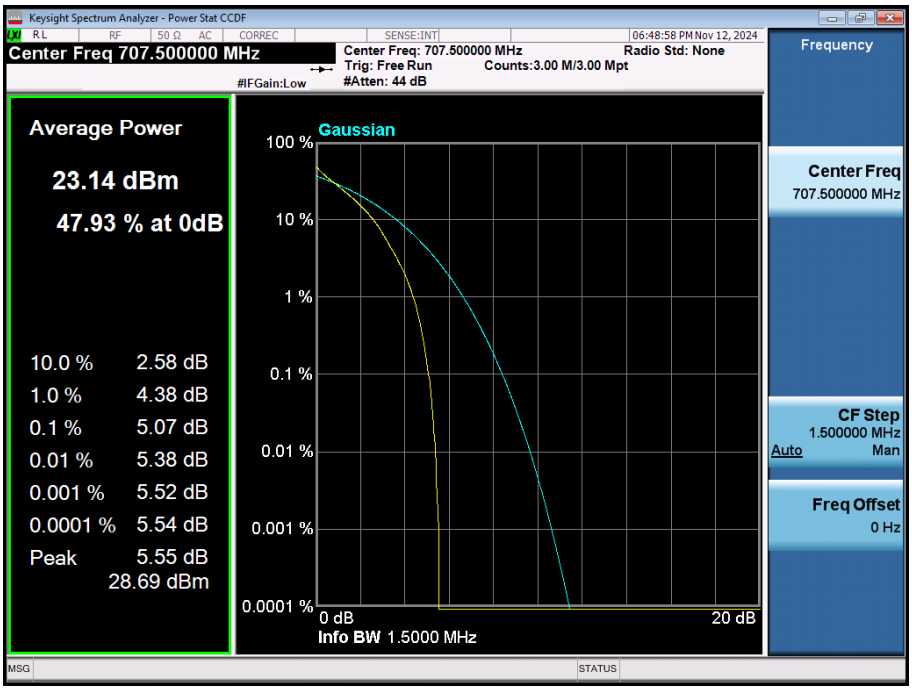
LTE Band 12 / 5 MHz / 16QAM / FULL RB Size



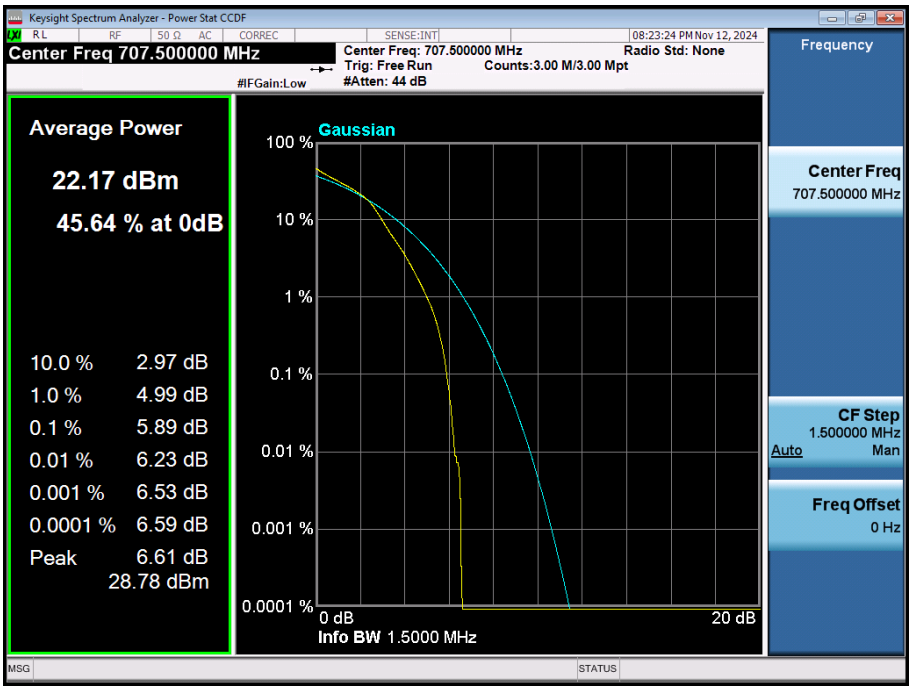
LTE Band 12 / 3 MHz / QPSK / FULL RB Size



LTE Band 12 / 3 MHz / 16QAM / FULL RB Size

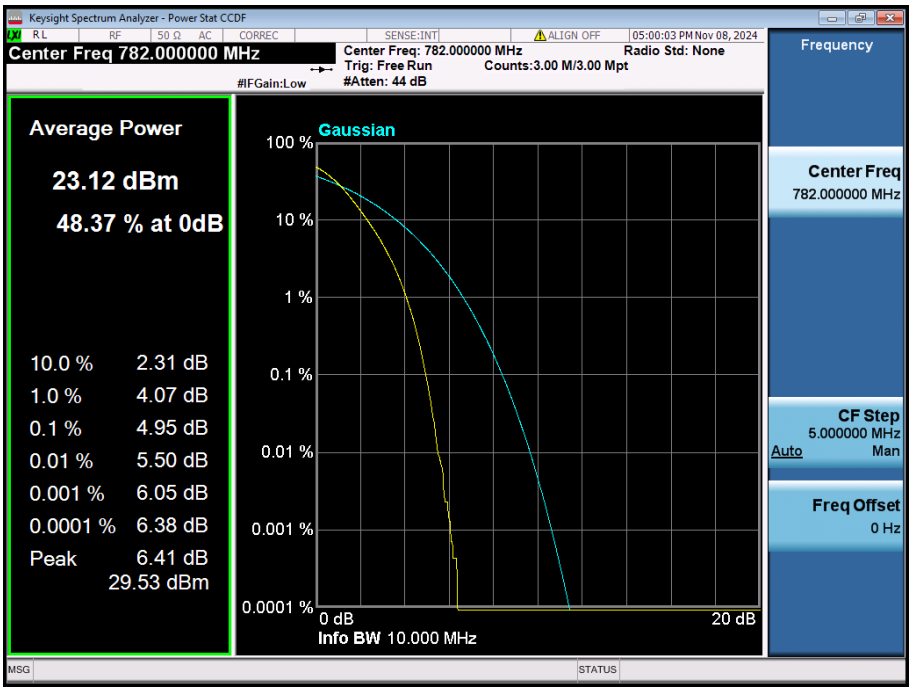


LTE Band 12 / 1.4 MHz / QPSK / FULL RB Size

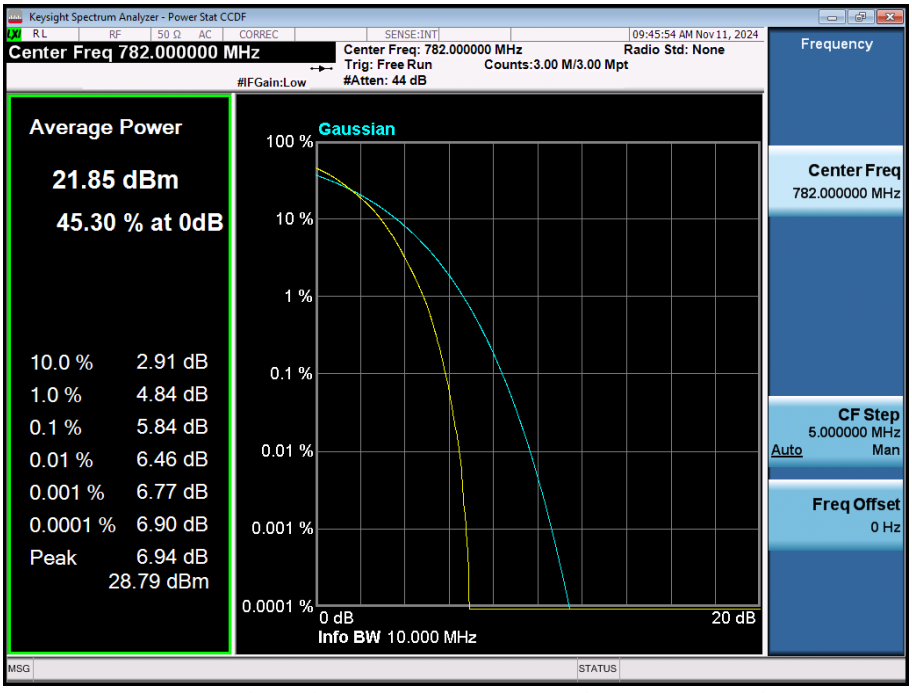


LTE Band 12 / 1.4 MHz / 16QAM / FULL RB Size

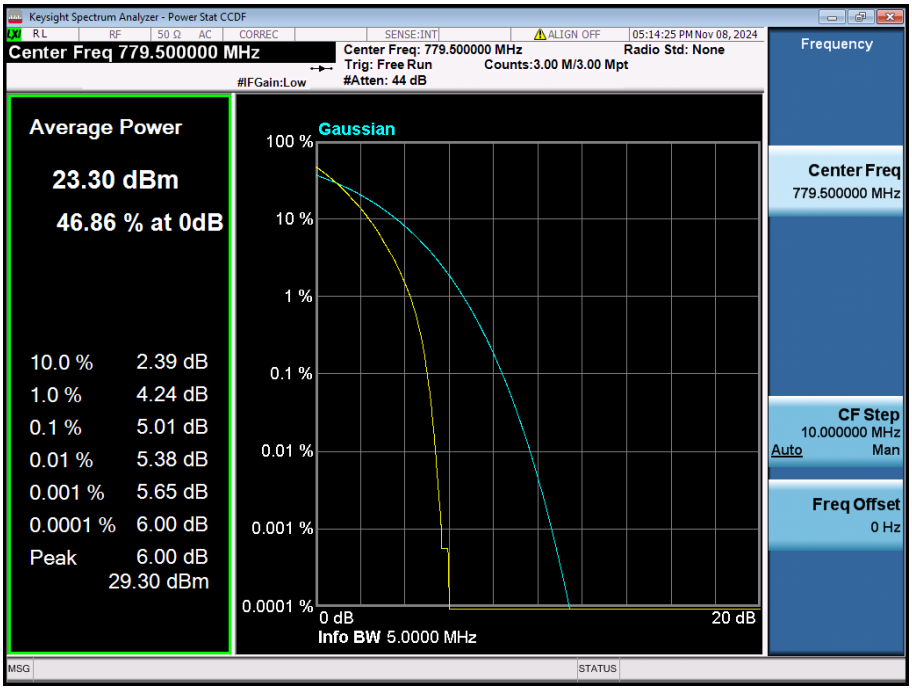
8.2.2. LTE Band 13



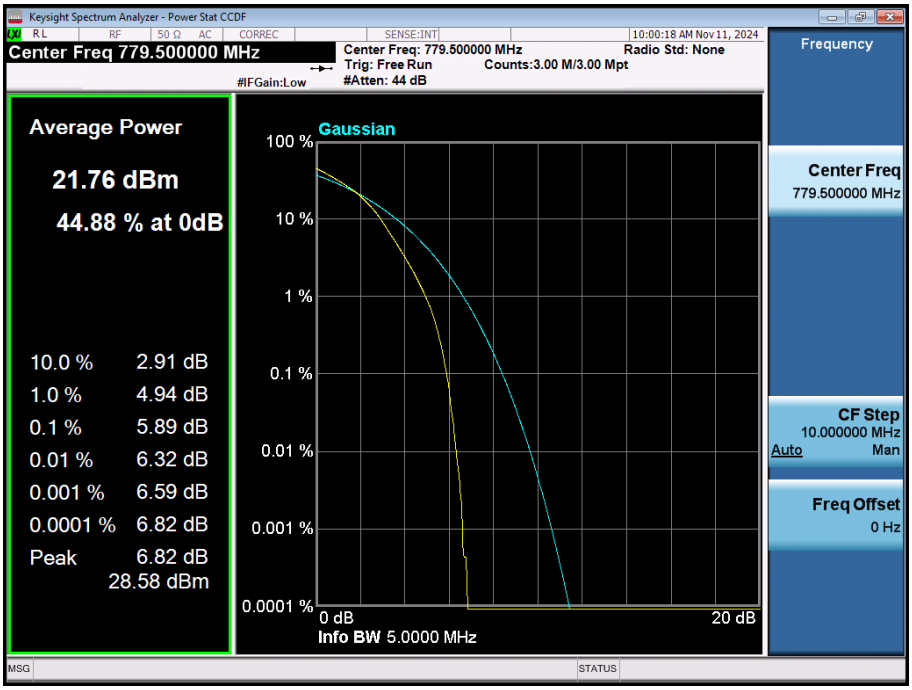
LTE Band 13 / 10 MHz / QPSK / FULL RB Size



LTE Band 13 / 10 MHz / 16QAM / FULL RB Size

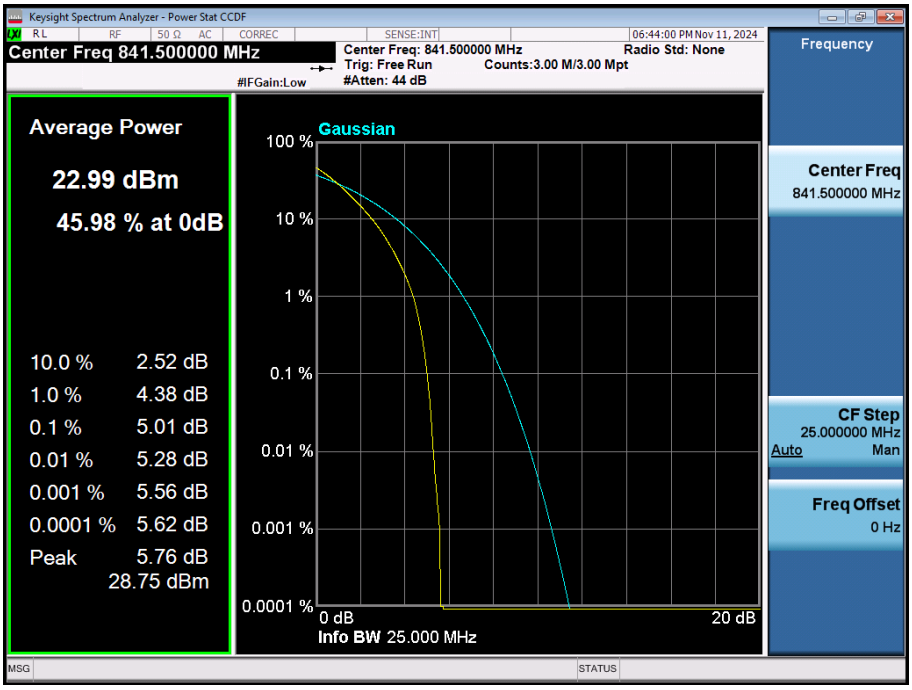


LTE Band 13 / 5 MHz / QPSK / FULL RB Size

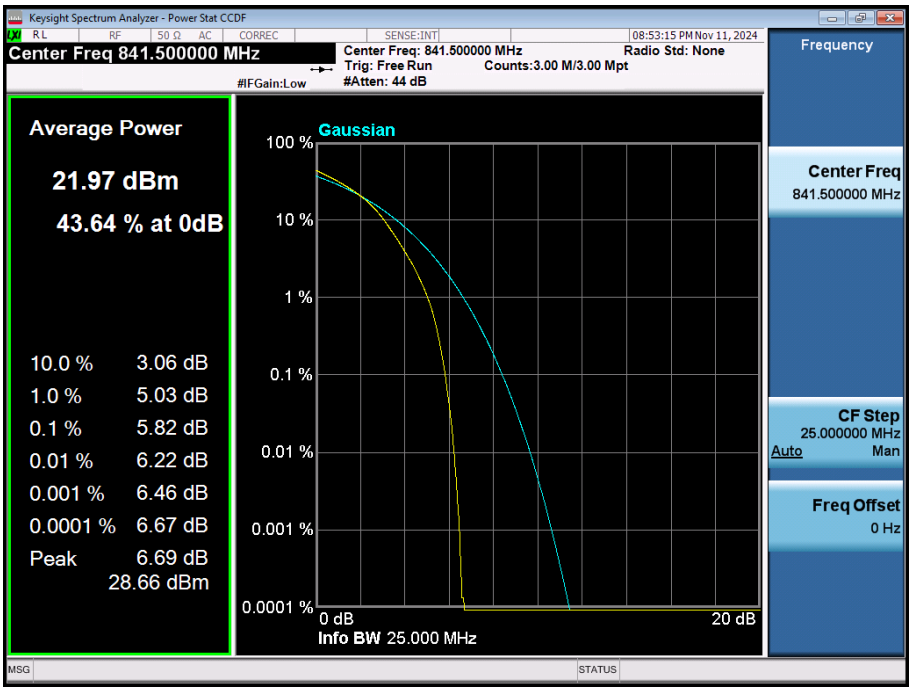


LTE Band 13 / 5 MHz / 16QAM / FULL RB Size

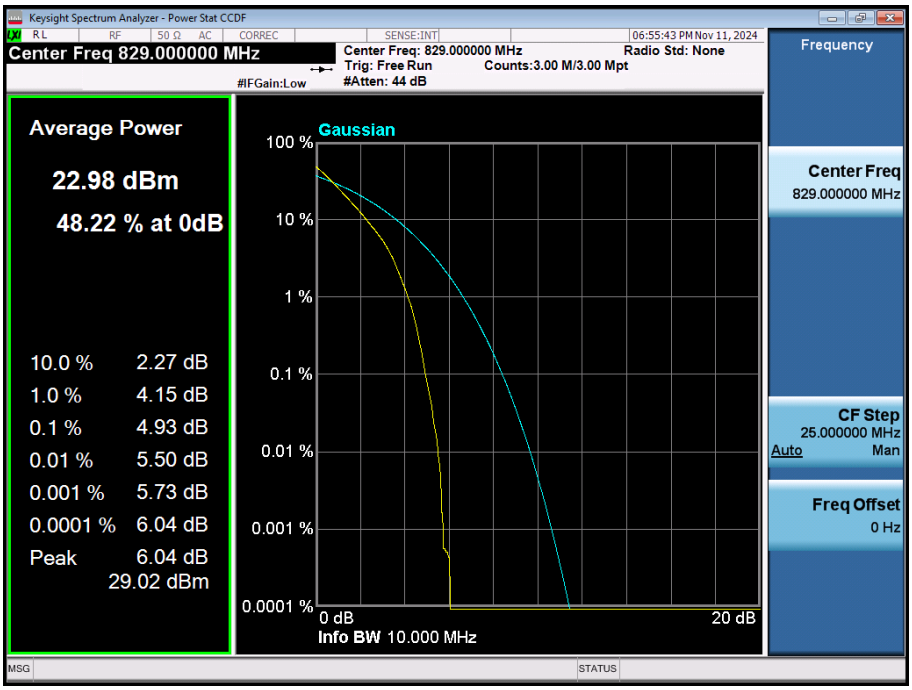
8.2.3. LTE Band 26(5)



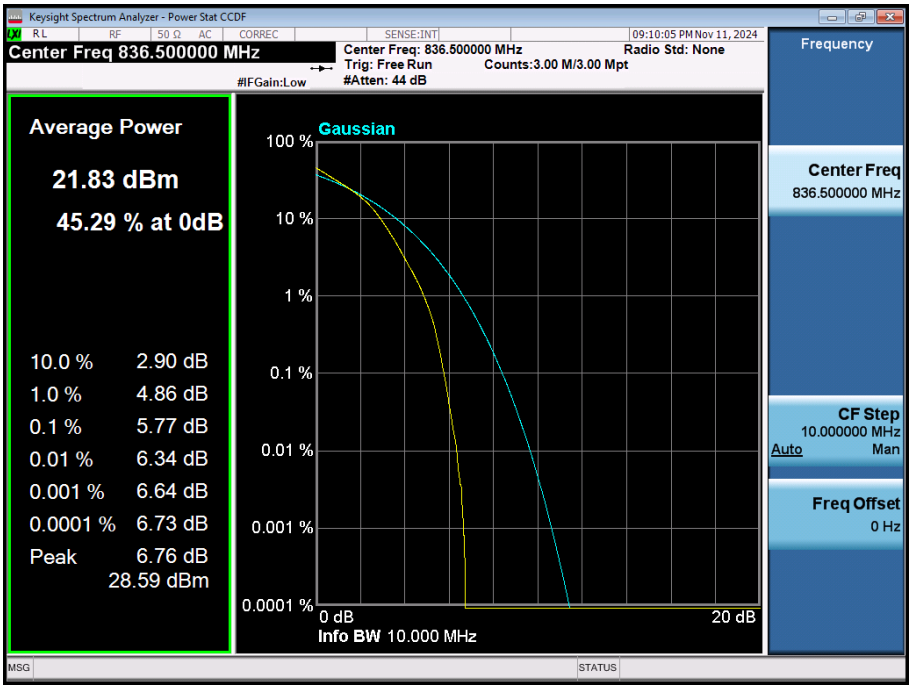
LTE Band 26 / 15 MHz / QPSK / FULL RB Size



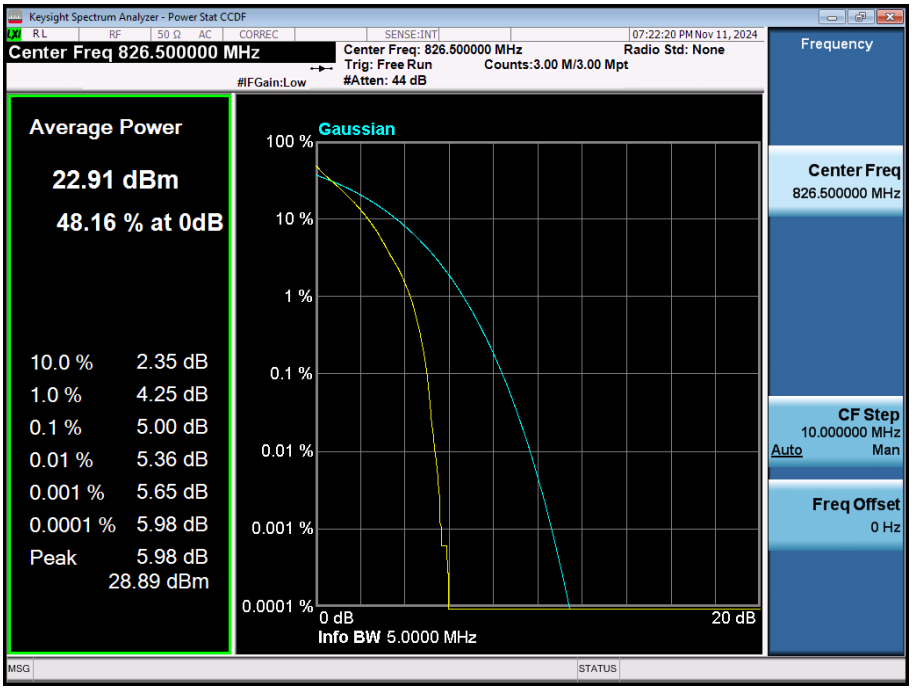
LTE Band 26 / 15 MHz / 16QAM / FULL RB Size



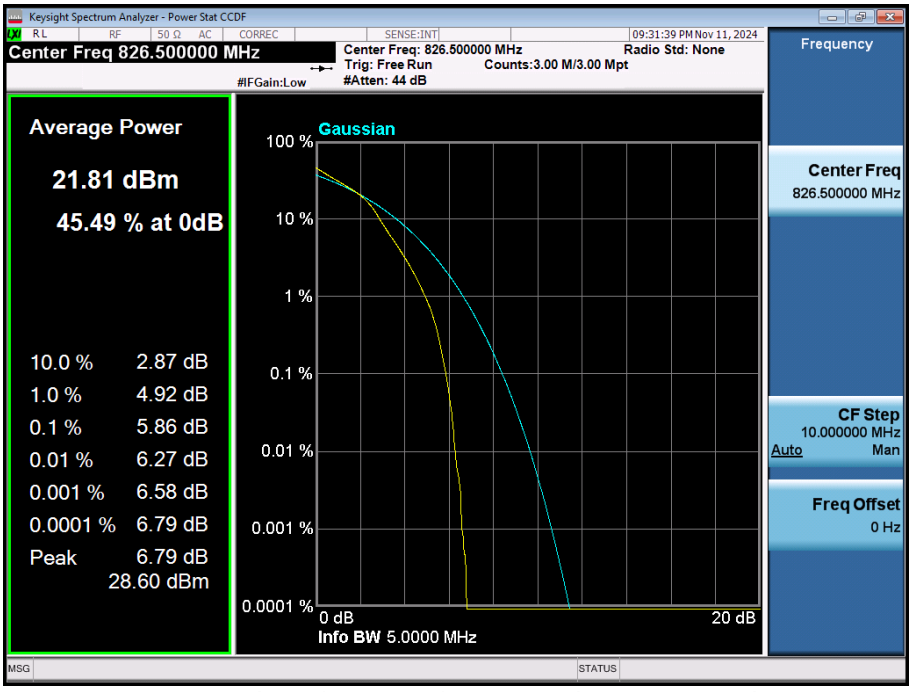
LTE Band 26 / 10 MHz / QPSK / FULL RB Size



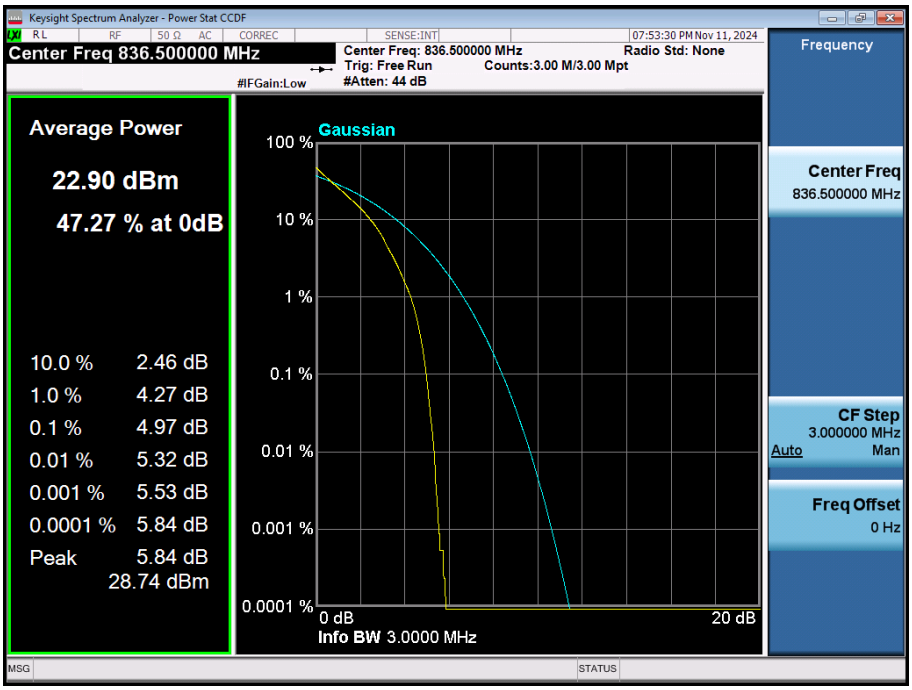
LTE Band 26 / 10 MHz / 16QAM / FULL RB Size



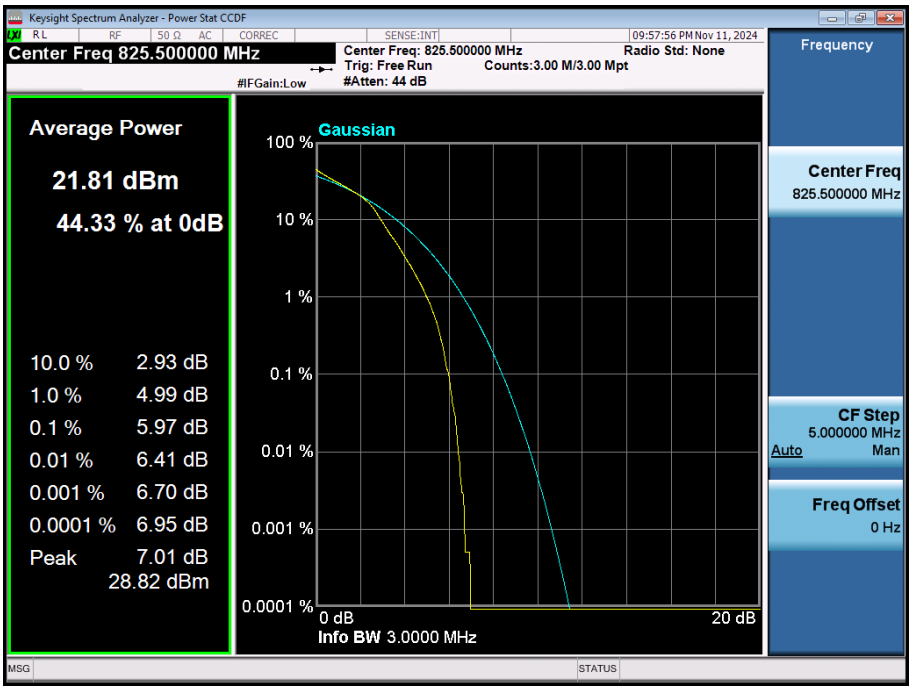
LTE Band 26 / 5 MHz / QPSK / FULL RB Size



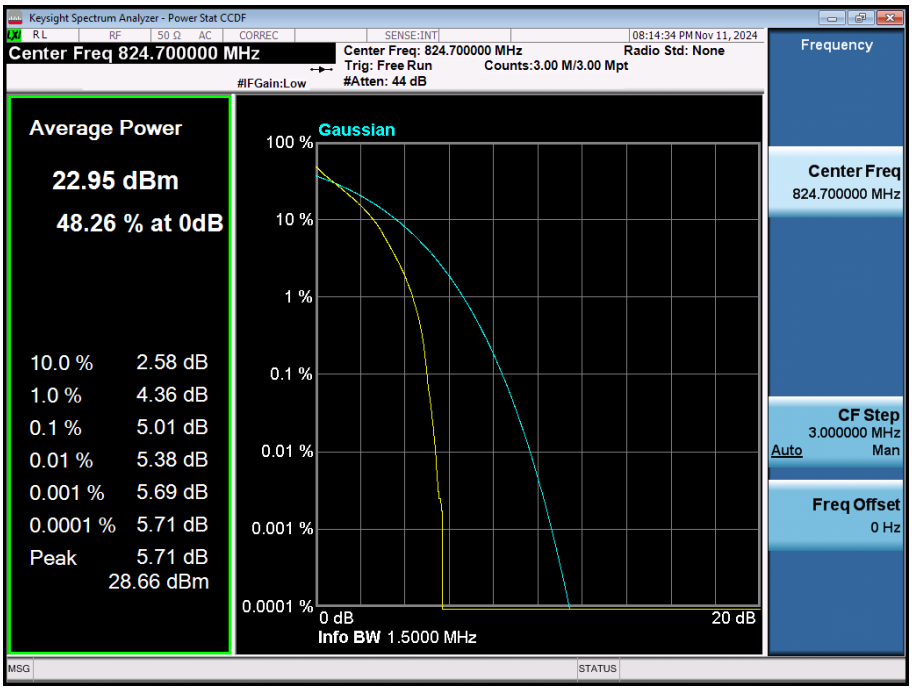
LTE Band 26 / 5 MHz / 16QAM / FULL RB Size



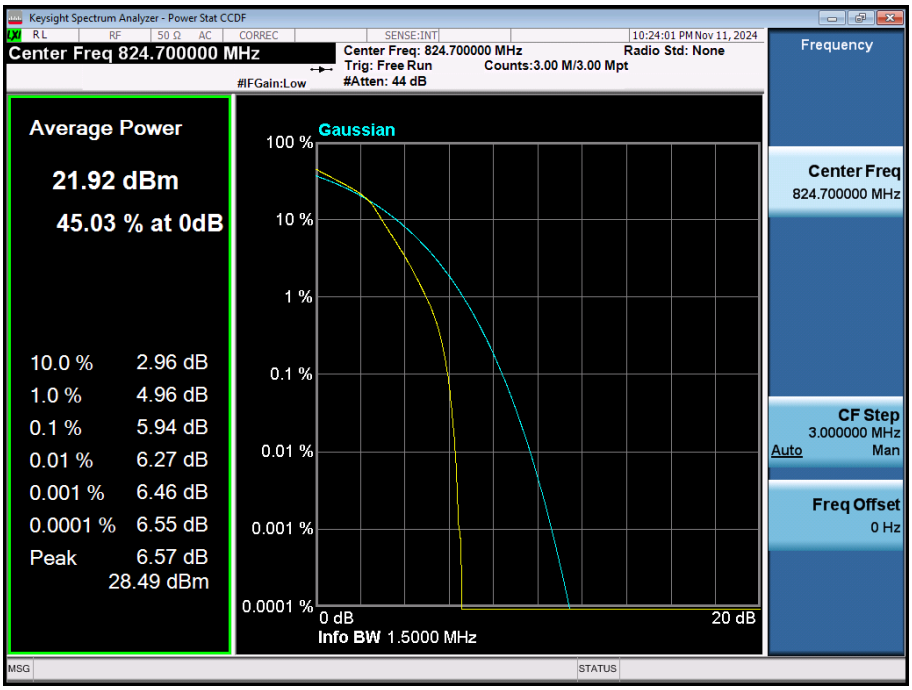
LTE Band 26 / 3 MHz / QPSK / FULL RB Size



LTE Band 26 / 3 MHz / 16QAM / FULL RB Size

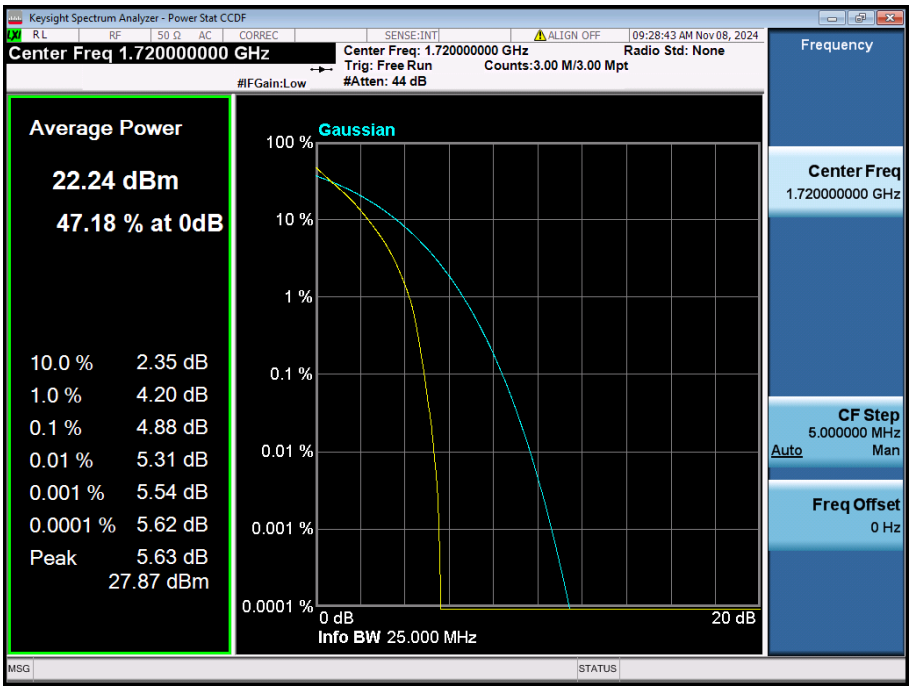


LTE Band 26 / 1.4 MHz / QPSK / FULL RB Size

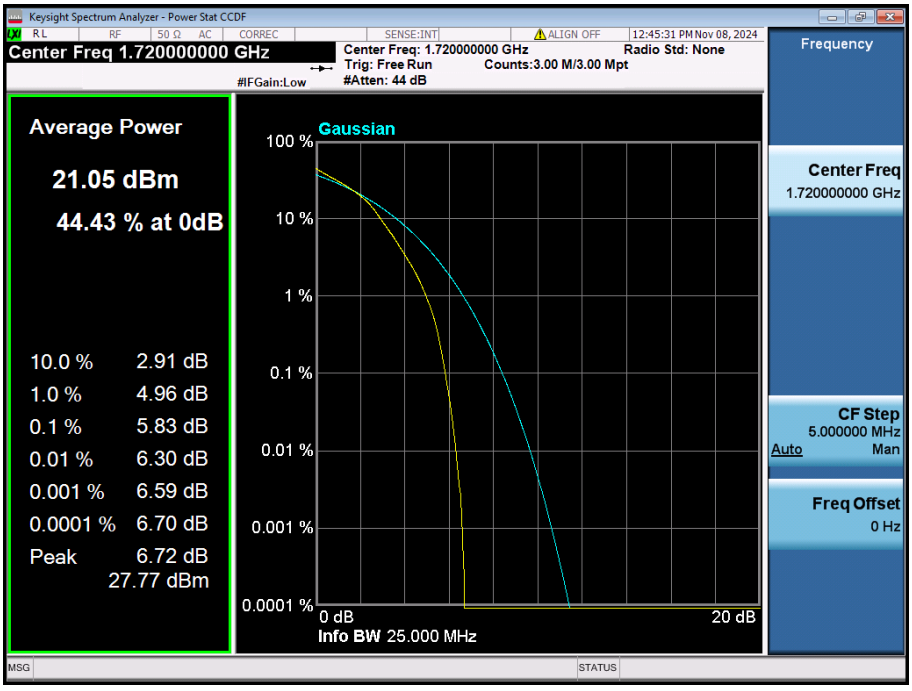


LTE Band 26 / 1.4 MHz / 16QAM / FULL RB Size

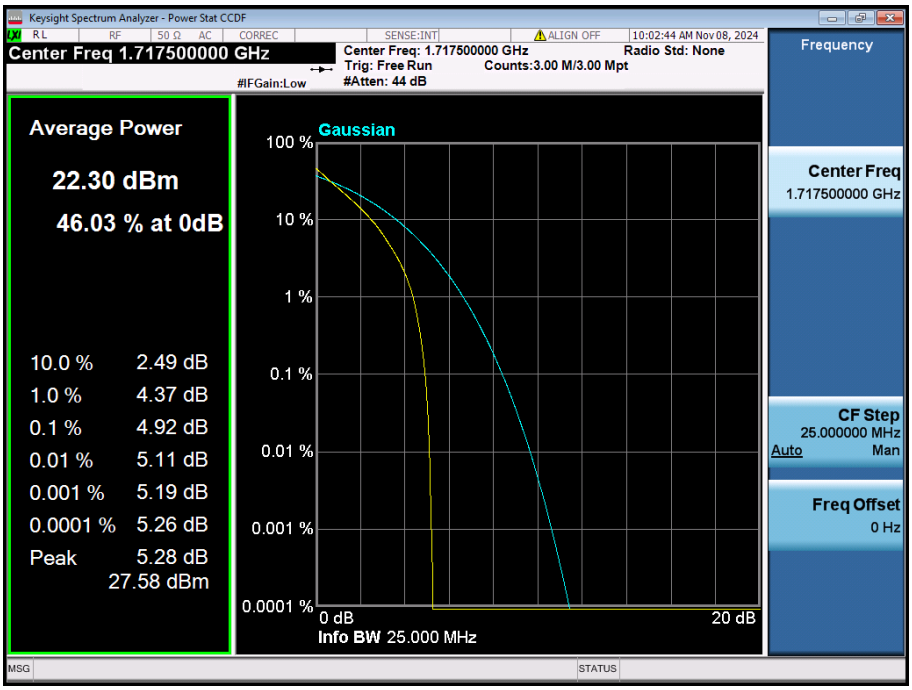
8.2.4. LTE Band 4



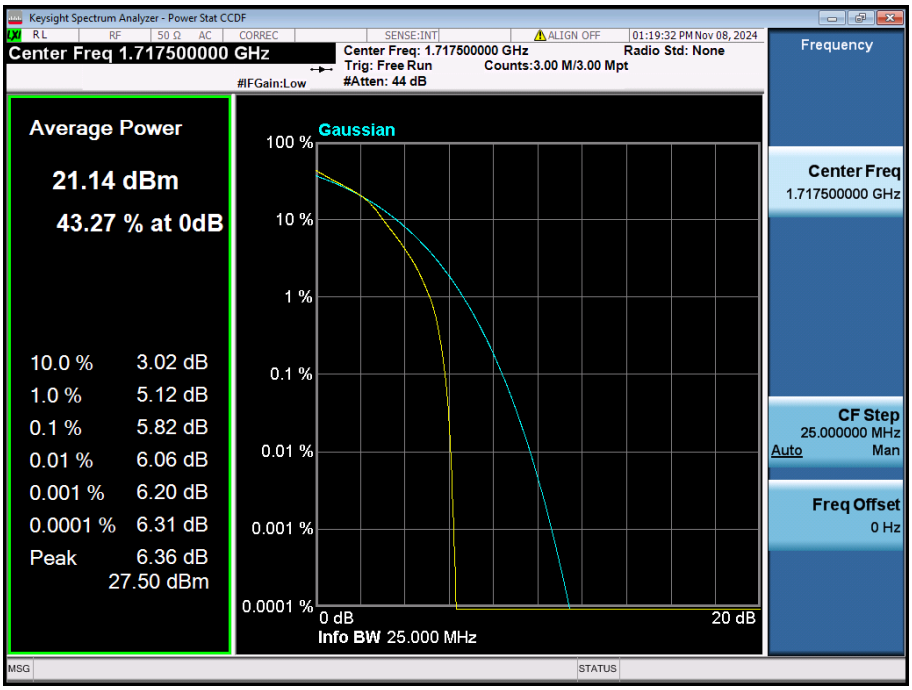
LTE Band 4 / 20 MHz / QPSK / FULL RB Size



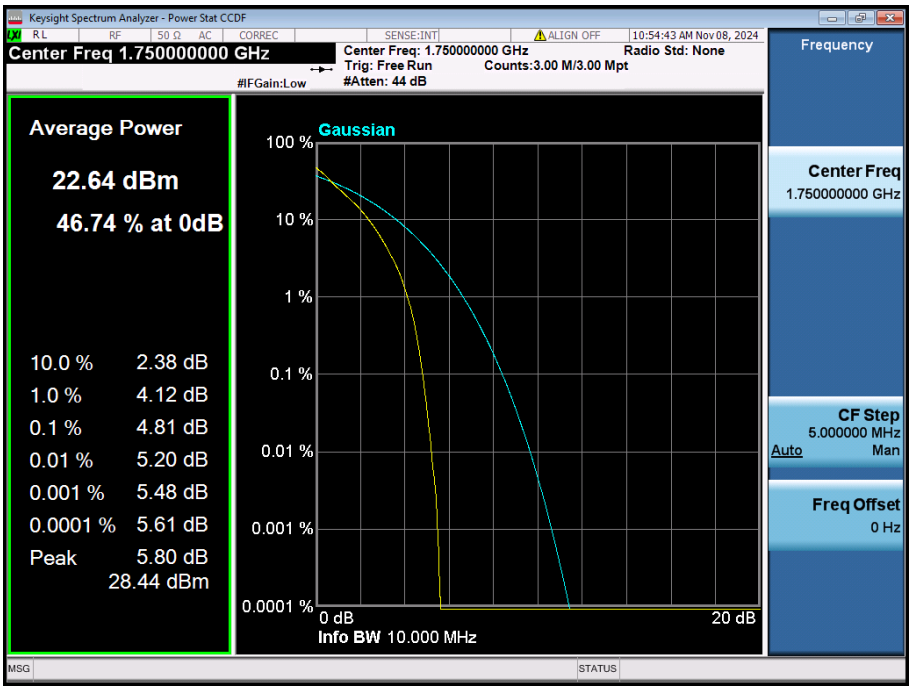
LTE Band 4 / 20 MHz / 16QAM / FULL RB Size



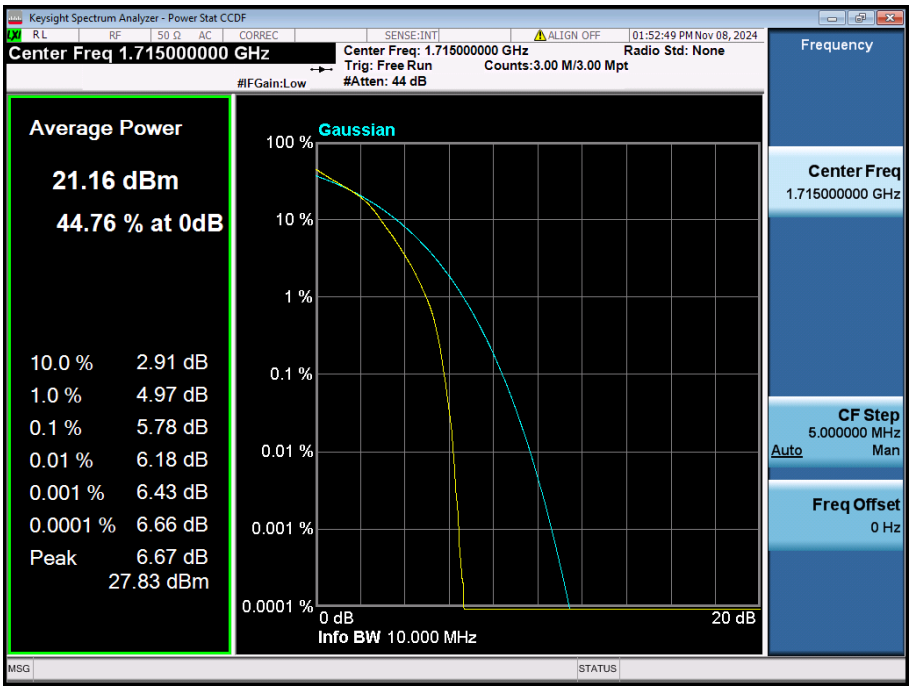
LTE Band 4 / 15 MHz / QPSK / FULL RB Size



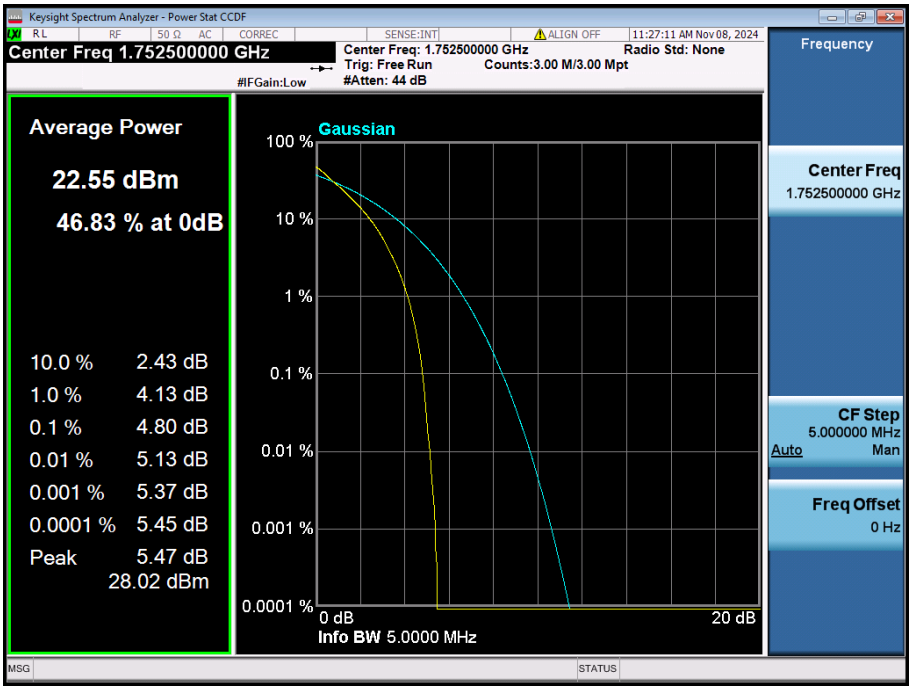
LTE Band 4 / 15 MHz / 16QAM / FULL RB Size



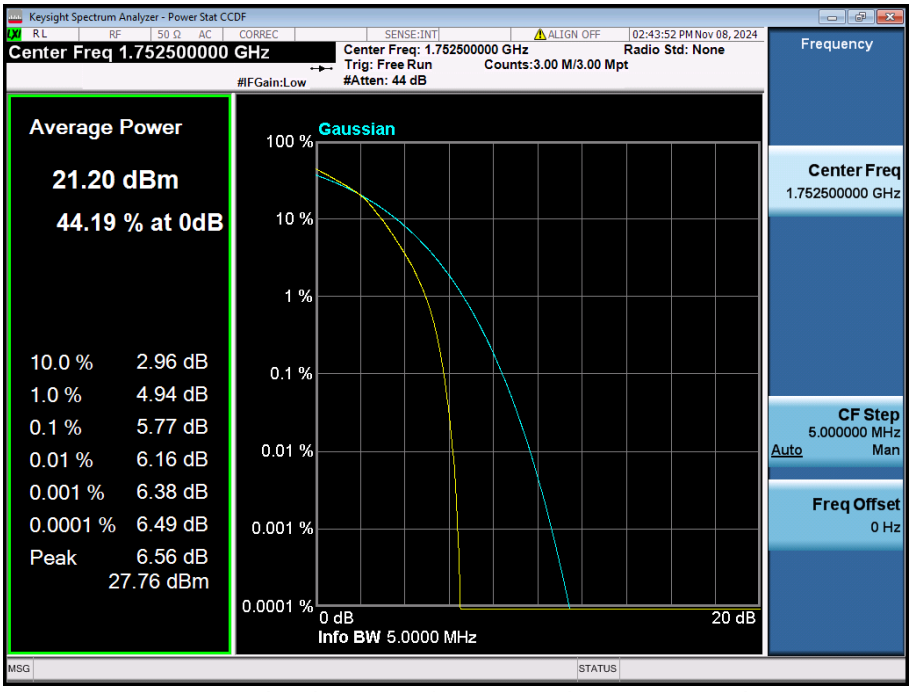
LTE Band 4 / 10 MHz / QPSK / FULL RB Size



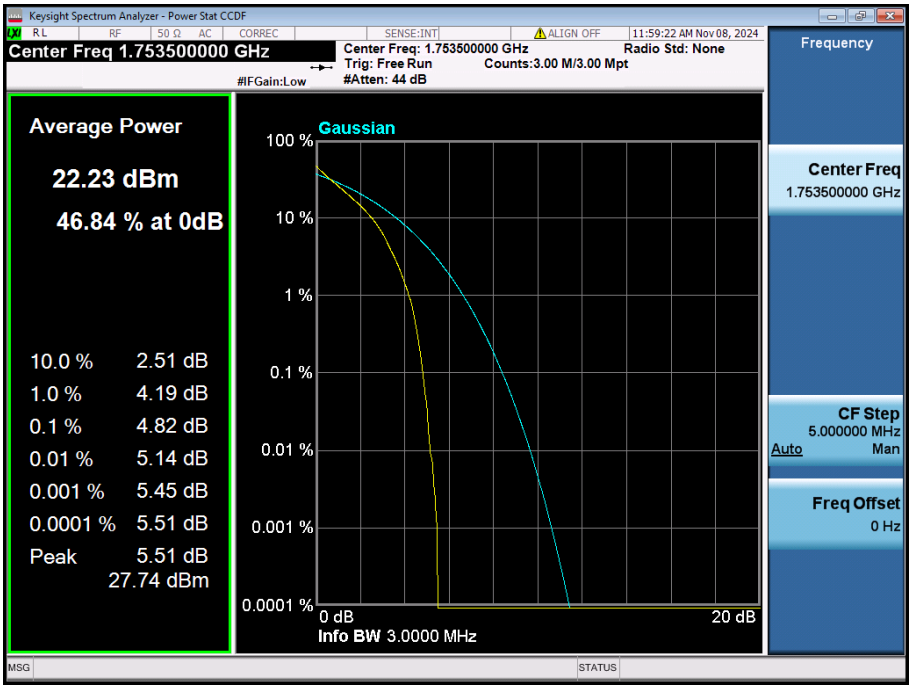
LTE Band 4 / 10 MHz / 16QAM / FULL RB Size



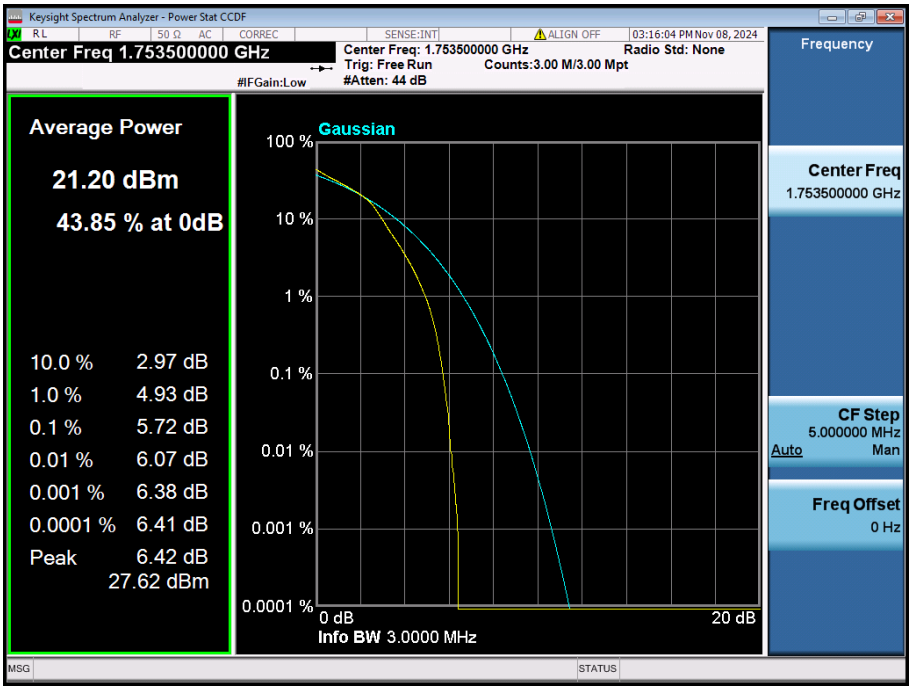
LTE Band 4 / 5 MHz / QPSK / FULL RB Size



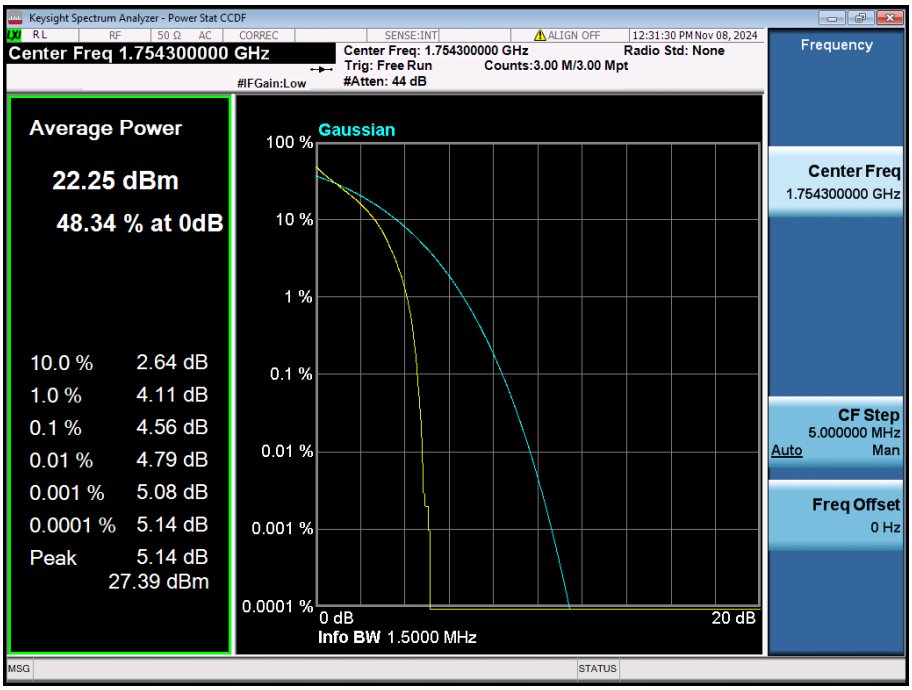
LTE Band 4 / 5 MHz / 16QAM / FULL RB Size



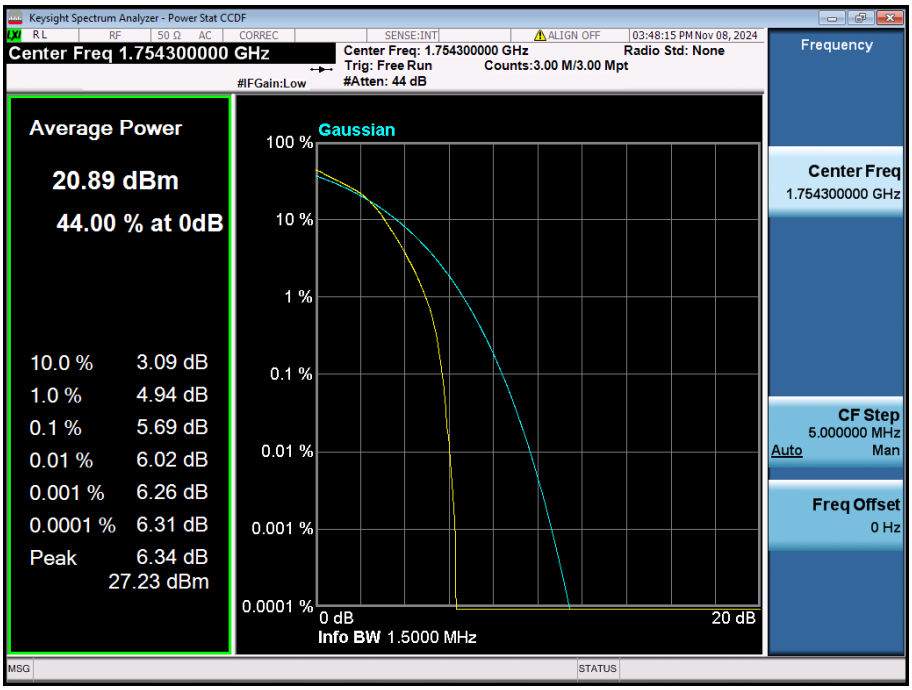
LTE Band 4 / 3 MHz / QPSK / FULL RB Size



LTE Band 4 / 3 MHz / 16QAM / FULL RB Size

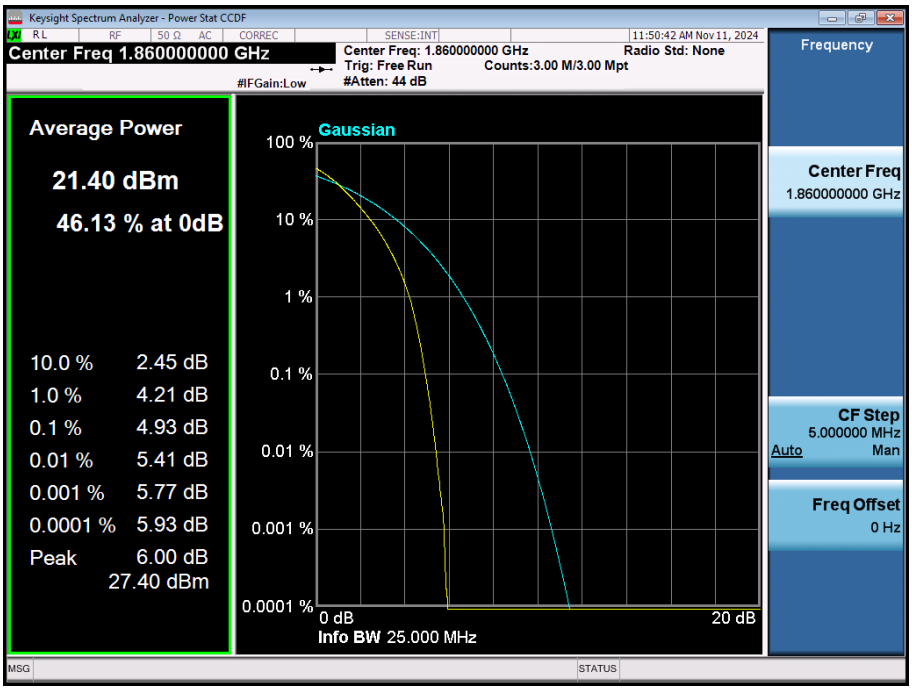


LTE Band 4 / 1.4 MHz / QPSK / FULL RB Size

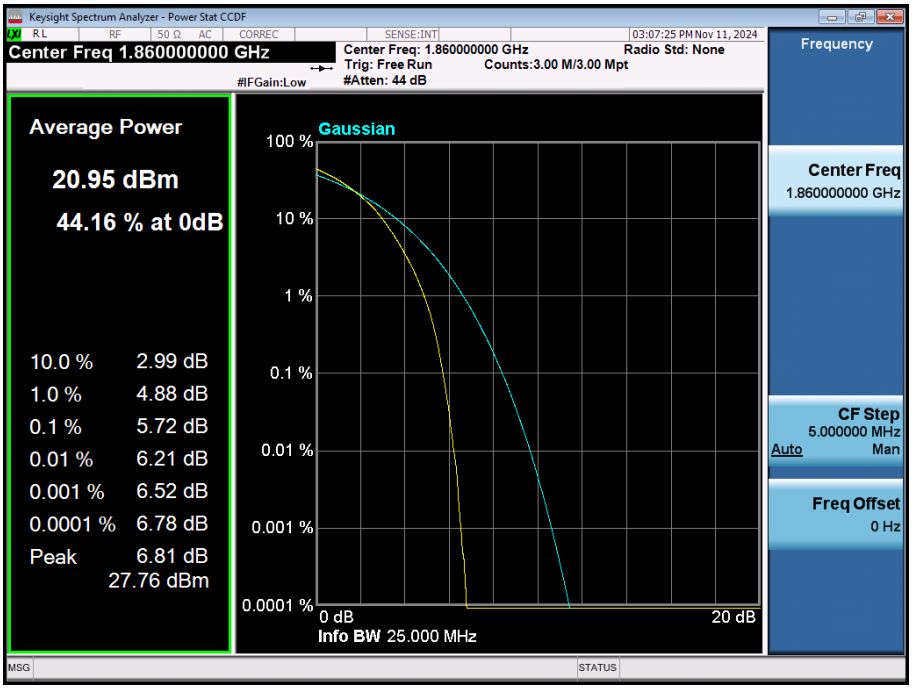


LTE Band 4 / 1.4 MHz / 16QAM / FULL RB Size

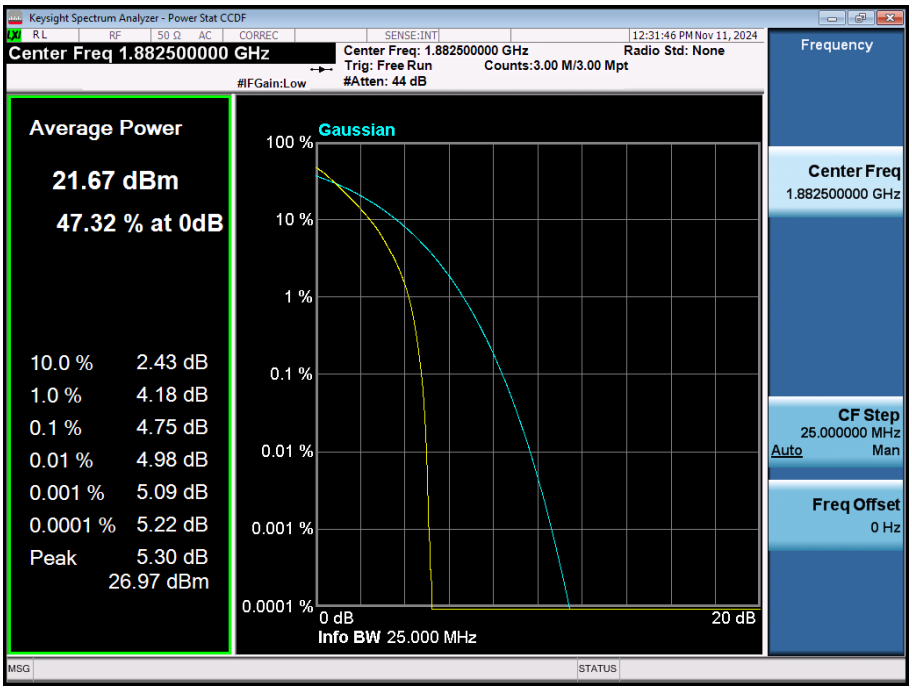
8.2.5. LTE Band 25(2)



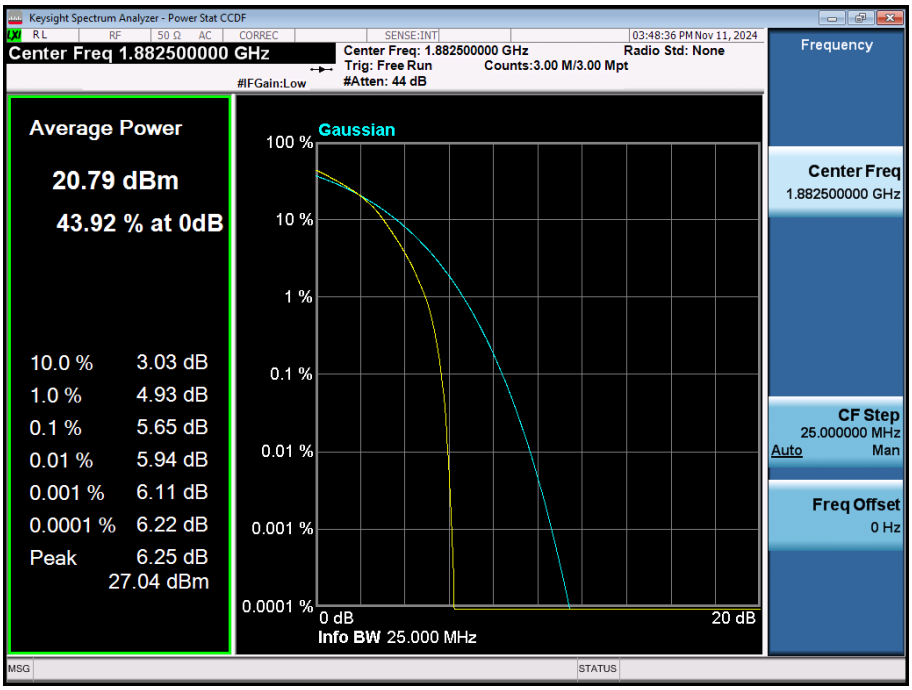
LTE Band 25 / 20 MHz / QPSK / FULL RB Size



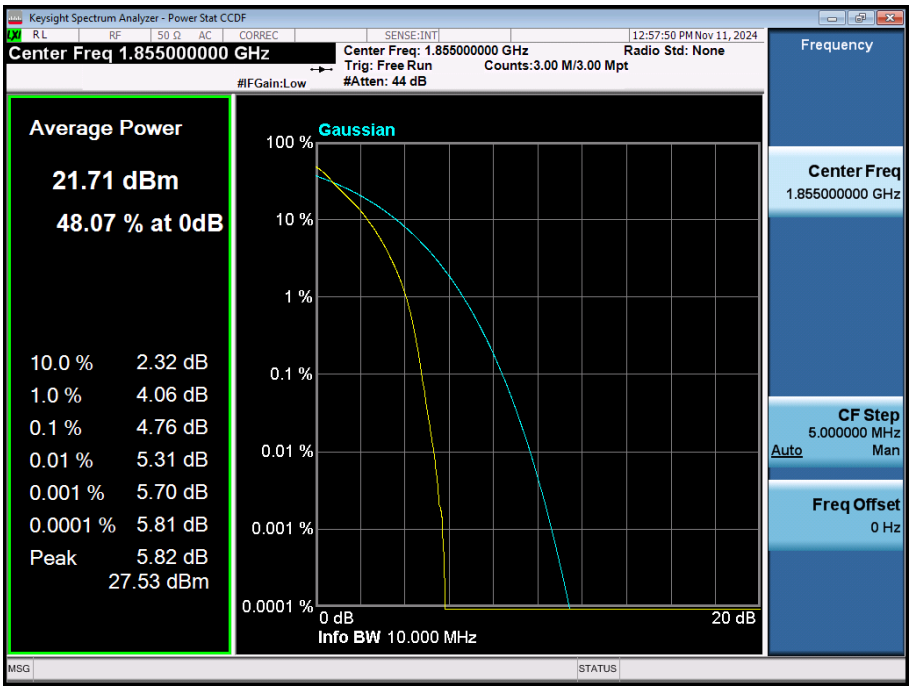
LTE Band 25 / 20 MHz / 16QAM / FULL RB Size



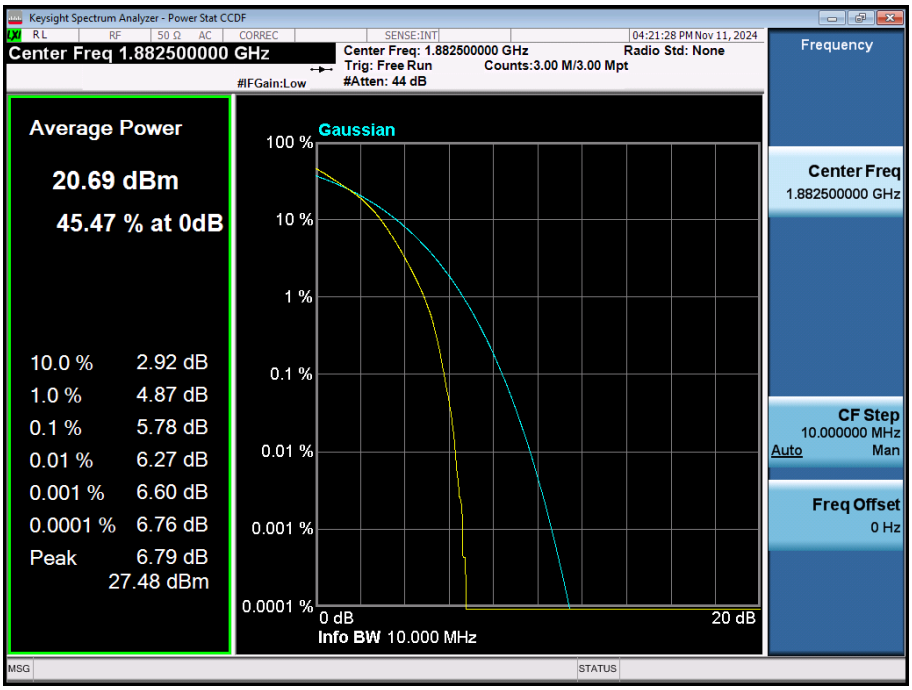
LTE Band 25 / 15 MHz / QPSK / FULL RB Size



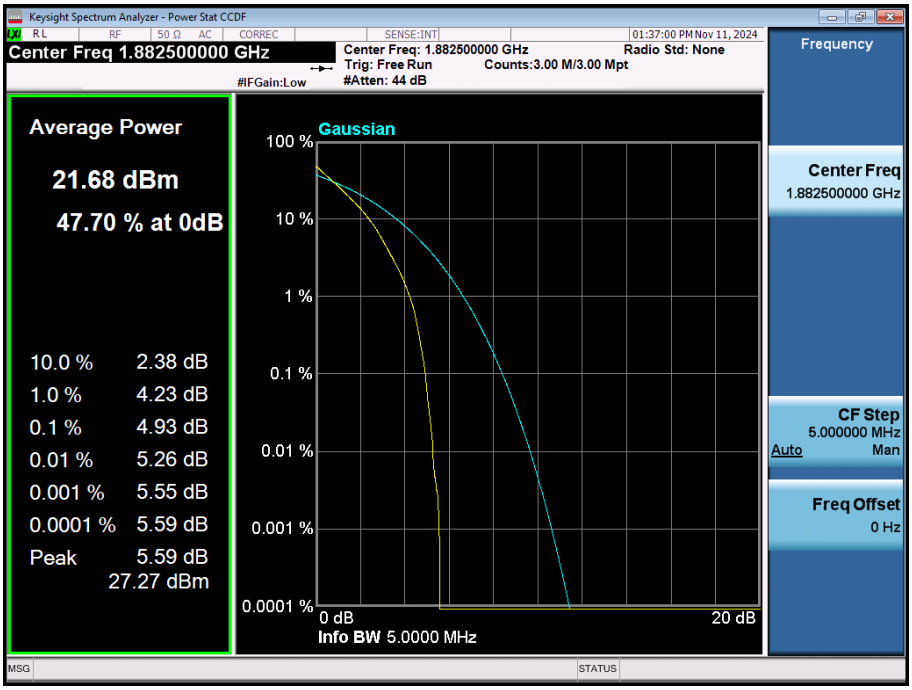
LTE Band 25 / 15 MHz / 16QAM / FULL RB Size



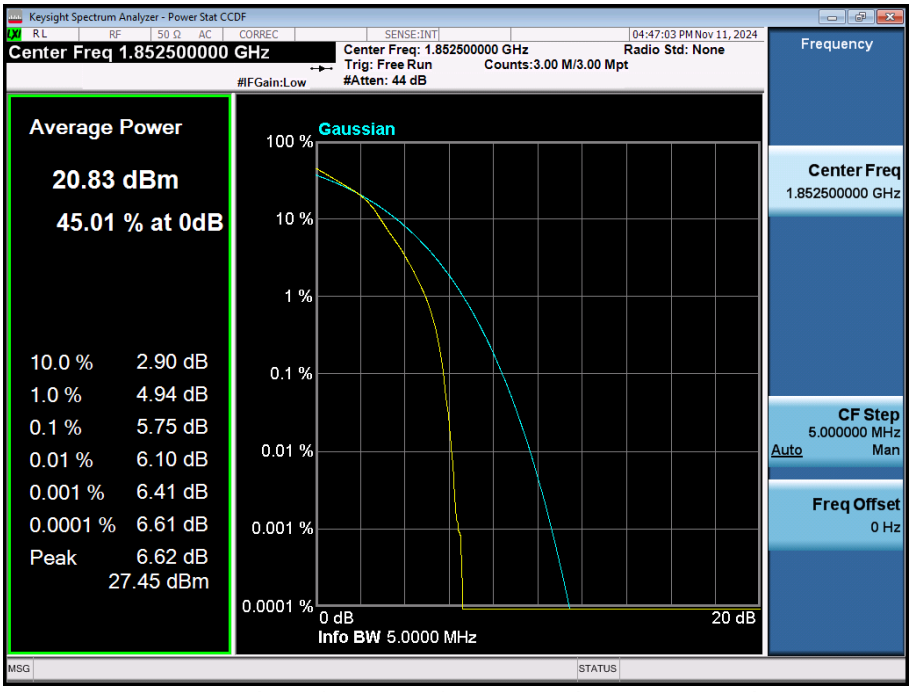
LTE Band 25 / 10 MHz / QPSK / FULL RB Size



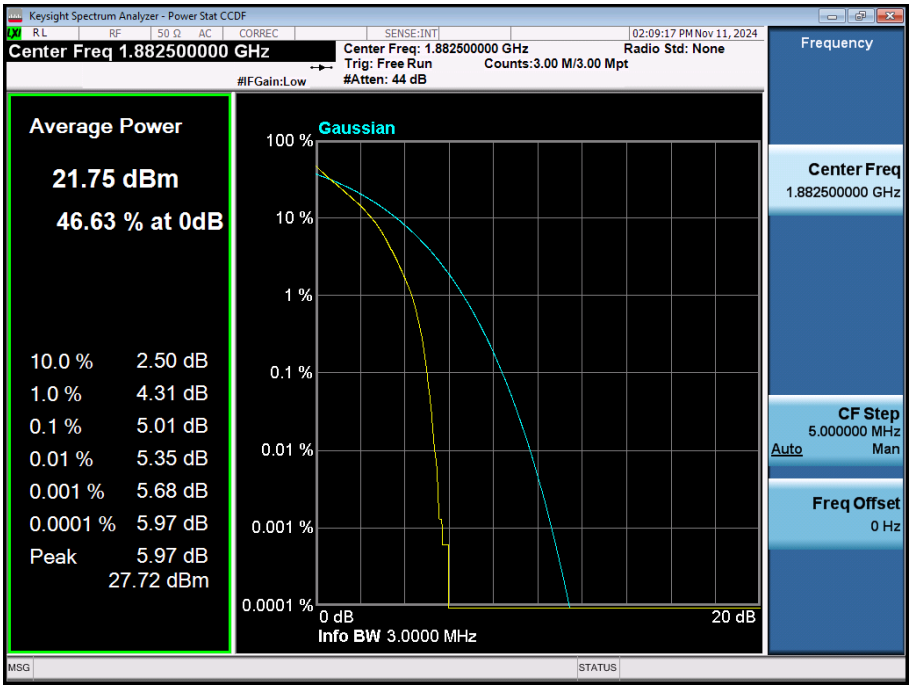
LTE Band 25 / 10 MHz / 16QAM / FULL RB Size



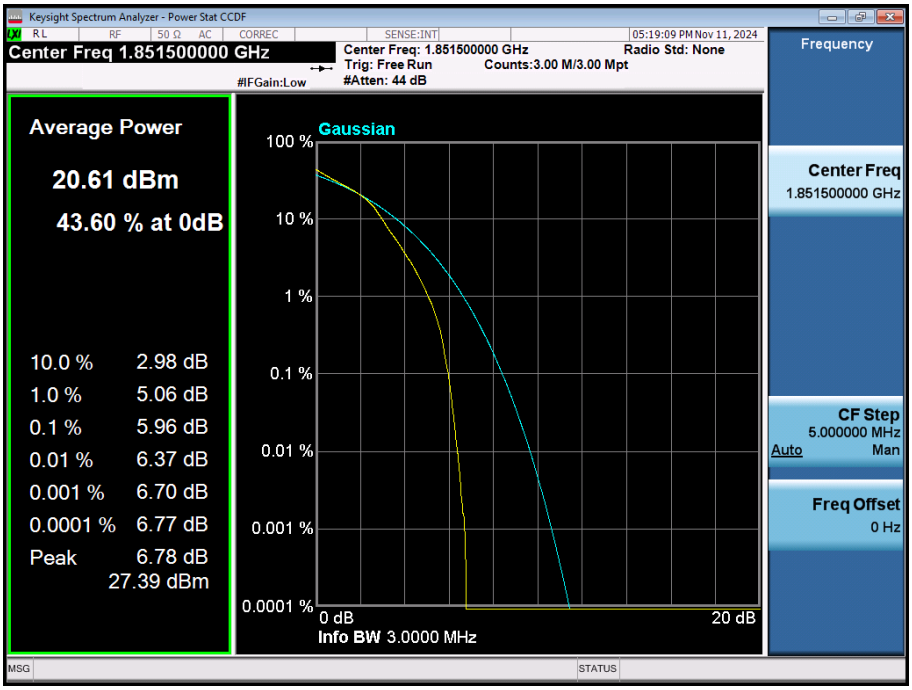
LTE Band 25 / 5 MHz / QPSK / FULL RB Size



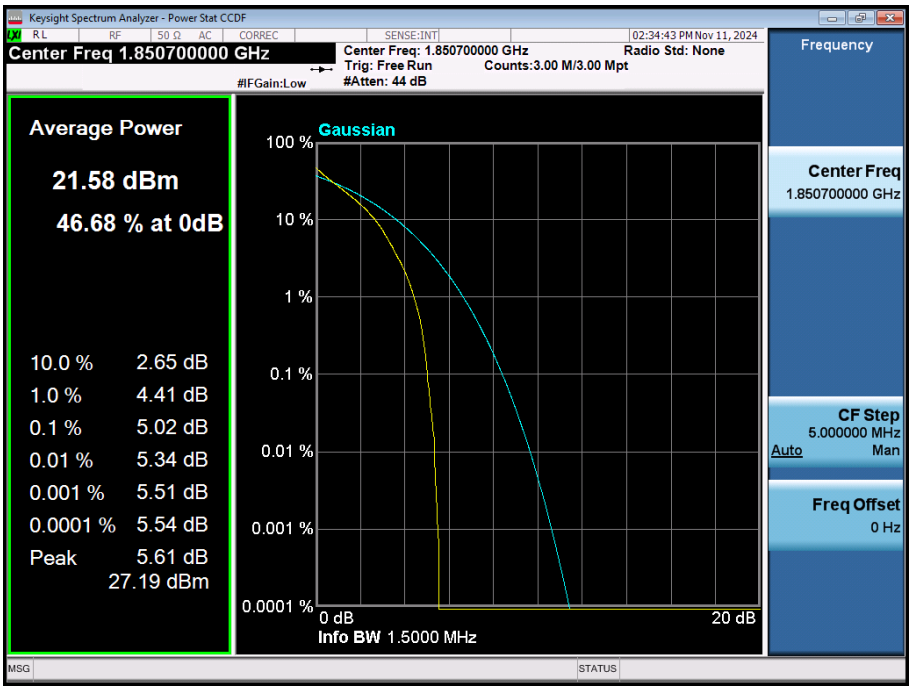
LTE Band 25 / 5 MHz / 16QAM / FULL RB Size



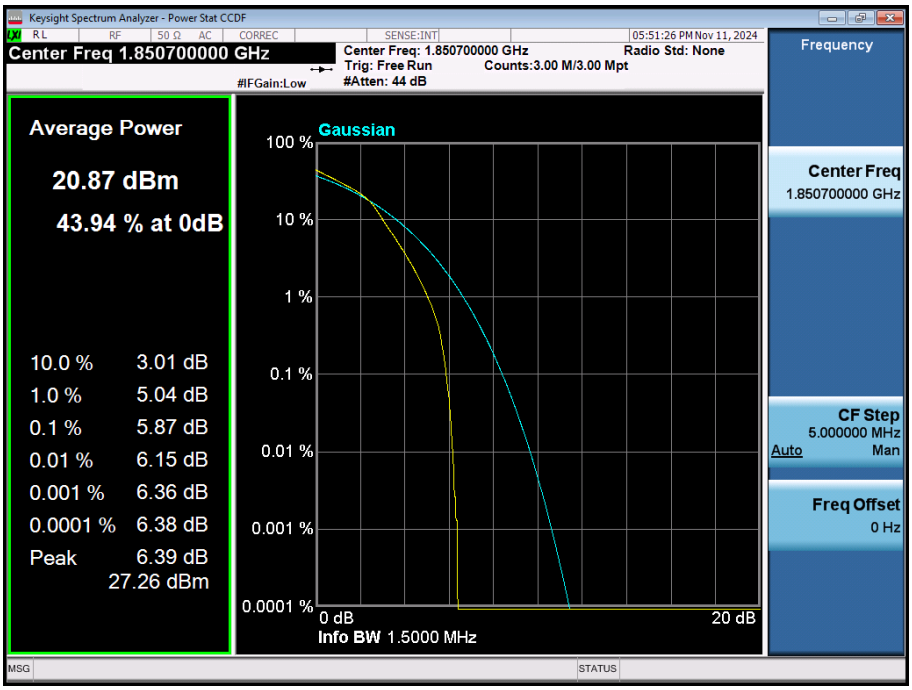
LTE Band 25 / 3 MHz / QPSK / FULL RB Size



LTE Band 25 / 3 MHz / 16QAM / FULL RB Size



LTE Band 25 / 1.4 MHz / QPSK / FULL RB Size



LTE Band 25 / 1.4 MHz / 16QAM / FULL RB Size