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 : DRTFCC2509-0062(1)
2. Customer
   - Name (FCC) : LG Electronics Inc.
   - Address (FCC) : 222 LG-ro, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do, South Korea, 17709
3. Use of Report : FCC Original Certification
4. Product Name / Model Name : Telematics / TLVUW3IU-W
   FCC ID : 2BO3LTLVUW3IU-W
5. FCC Regulation(s): Part 22, 27
   Test Method Used : KDB971168 D01v03r01, ANSI C63.26-2015
6. Date of Test : 2025.07.23 ~ 2025.09.02
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 : SeungMin Gil (Signature)	Technical Manager Name : JaeJin Lee (Signature)

2025 . 09 . 11 .

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
DRTFCC2509-0062	Sep. 05, 2025	Initial issue	SeungMin Gil	JaeJin Lee
DRTFCC2509-0062(1)	Sep. 11, 2025	Add the test firm registration number	SeungMin Gil	JaeJin Lee

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1. GENERAL INFORMATION

Equipment Class	PCS Licensed Transmitter(PCB)
Product Name	Telematics
Model Name(s)	TLVUW3IU-W
FVIN(Firmware Version Identification Number)	X662
EUT Serial Number	Conducted(505VIGTG78887), Radiated(505VIKEG78893)
Power Supply	DC 12 V
Modulation Type	QPSK, 16QAM
Channel Bandwidth(MHz)	LTE Band 5: 10, 5, 3, 1.4 LTE Band 7: 20, 15, 10, 5
Antenna Information	Antenna Type: Shark pin Antenna (Model : 5WA.035.507 B 041)

	Antenna gain(dBi)	Cable loss(dB)	Antenna gain including connected cable loss between transmitter and antenna (dBi)
LTE Band 5	1.94	4.35	-2.41
LTE Band 7	1.77	9.04	-7.27

Mode	TX Frequency (MHz)	Emission Designator	Modulation	Conducted output power		ERP	
				Max power (dBm)	Max power (W)	Max power (dBm)	Max power (W)
LTE Band 5	829 ~ 844	8M95G7D	QPSK	21.93	0.156	14.68	0.029
LTE Band 5	829 ~ 844	8M93W7D	16QAM	21.24	0.133	13.92	0.025
LTE Band 5	826.5 ~ 846.5	4M48G7D	QPSK	22.00	0.158	13.67	0.023
LTE Band 5	826.5 ~ 846.5	4M47W7D	16QAM	21.30	0.135	12.99	0.020
LTE Band 5	825.5 ~ 847.5	2M69G7D	QPSK	21.94	0.156	13.85	0.024
LTE Band 5	825.5 ~ 847.5	2M69W7D	16QAM	21.29	0.135	13.05	0.020
LTE Band 5	824.7 ~ 848.3	1M08G7D	QPSK	22.01	0.159	13.43	0.022
LTE Band 5	824.7 ~ 848.3	1M08W7D	16QAM	21.40	0.138	12.83	0.019

Mode	TX Frequency (MHz)	Emission Designator	Modulation	Conducted output power		EIRP	
				Max power (dBm)	Max power (W)	Max power (dBm)	Max power (W)
LTE Band 7	2 510 ~ 2 560	17M9G7D	QPSK	21.98	0.158	12.57	0.018
LTE Band 7	2 510 ~ 2 560	17M9W7D	16QAM	21.26	0.134	12.06	0.016
LTE Band 7	2 507.5 ~ 2 562.5	13M5G7D	QPSK	21.91	0.155	12.76	0.019
LTE Band 7	2 507.5 ~ 2 562.5	13M4W7D	16QAM	21.08	0.128	11.91	0.016
LTE Band 7	2 505 ~ 2 565	8M93G7D	QPSK	22.02	0.159	13.04	0.020
LTE Band 7	2 505 ~ 2 565	8M95W7D	16QAM	21.30	0.135	12.24	0.017
LTE Band 7	2 502.5 ~ 2 567.5	4M47G7D	QPSK	21.88	0.154	13.29	0.021
LTE Band 7	2 502.5 ~ 2 567.5	4M48W7D	16QAM	21.18	0.131	12.78	0.019

2. INTRODUCTION

2.1. EUT DESCRIPTION

The Equipment Under Test (EUT) supports 850 WCDMA and multi band LTE.

2.2. TESTING ENVIRONMENT

Ambient Condition	
▪ Temperature	+24 ℃ ~ +25 ℃
▪ Relative Humidity	45 % ~ 47 %

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 (Below 1 GHz)	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 (Above 18 GHz)	4.9 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.

- FCC & ISED MRA Designation No. : KR0034

- FCC Test Firm Registration No. : 704742

- ISED#: 5740A

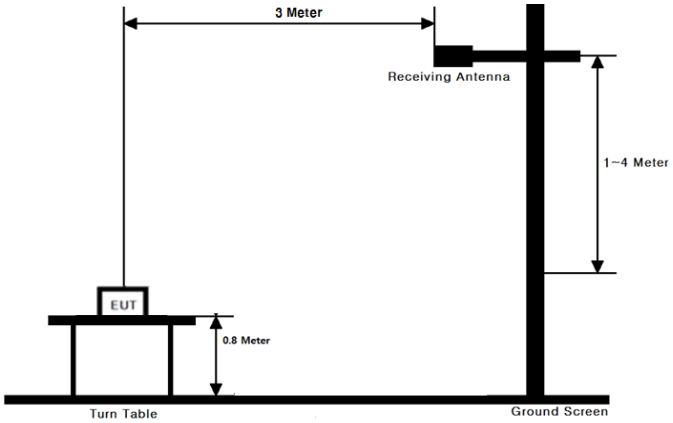
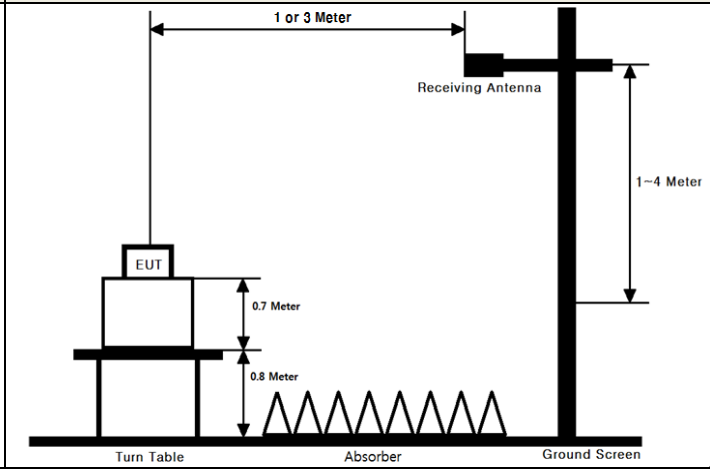
www.dtnc.net

Telephone	:	+ 82-31-321-2664
FAX	:	+ 82-31-321-1664

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 1GHz 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 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.

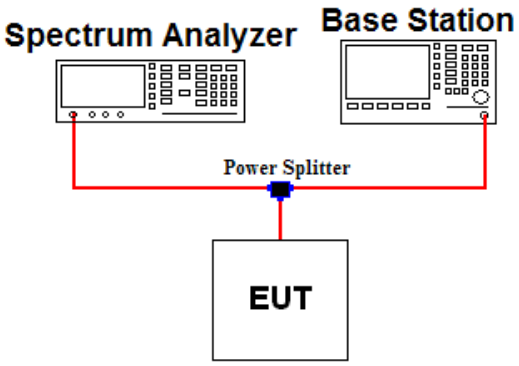
The ERP/EIRP is calculated using the following formula:

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 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.

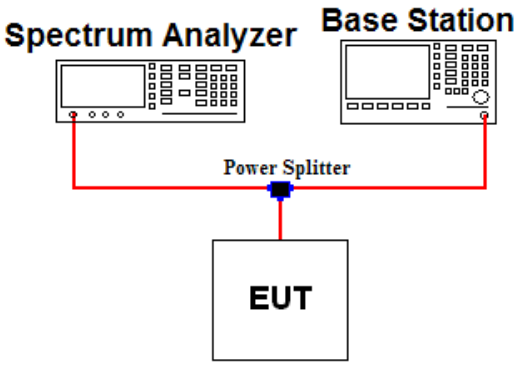
Test setting

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**

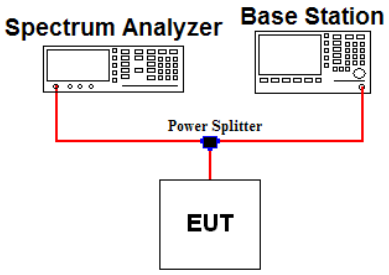
The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power of a given emission.

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
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

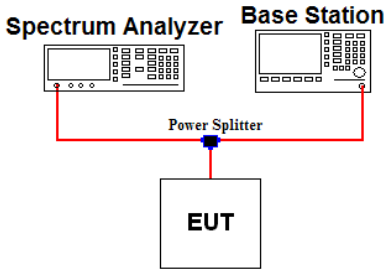
Note 1: Per Part 22.917(b)(1) / 24.238(b) / 27.53(h) in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band 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 90.543(e) for operations in the 758-768 MHz and the 788-798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:
(1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations.
(2) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.
(3) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB.
(4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.
(5) Compliance with the provisions of paragraph (e)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30 kHz may be employed.

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 10^{th} harmonic.

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

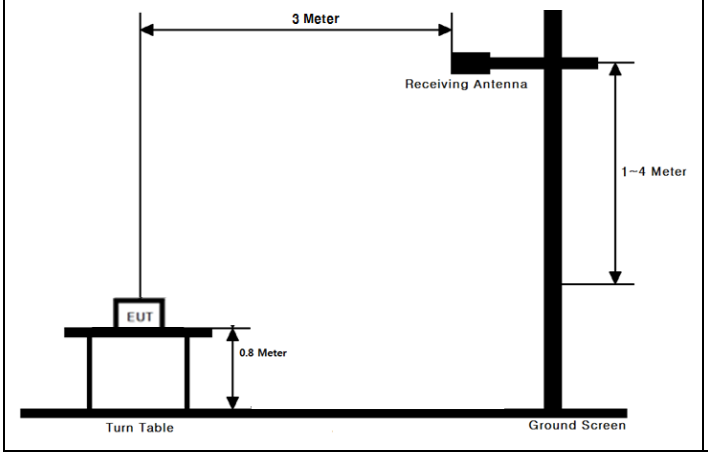
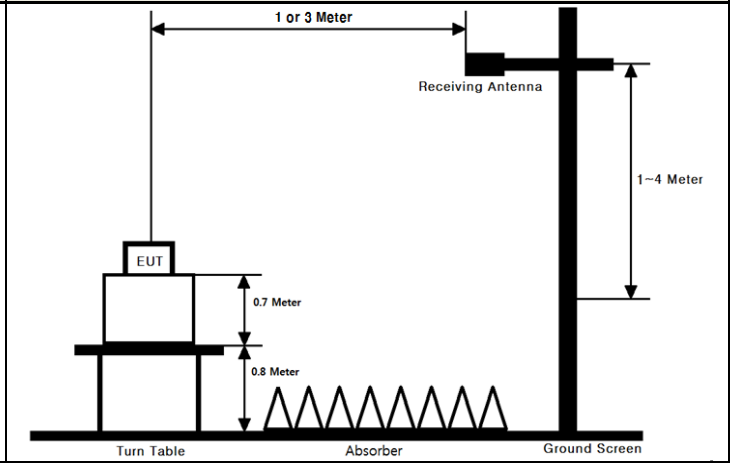
Test setting

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 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

- **ANSI/TIA-603-E-2016 - Section 2.2.12**
- **KDB971168 D01v03r01 - Section 5.8**
- **ANSI C63.26-2015 – Section 5.5**

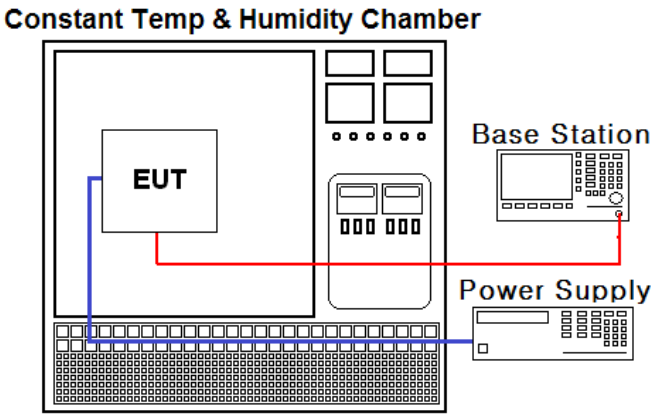
Test setting

1. RBW = 100 kHz for below 1 GHz and 1 MHz for above 1 GHz / VBW ≥ 3 X RBW
2. Detector = RMS & Trace mode = 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 C63.26-2015 – Section 5.6**

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 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	24/12/11	25/12/11	MY53300216
Spectrum Analyzer	Agilent Technologies	N9020A	24/11/26	25/11/26	MY50410399
DC power supply	Agilent Technologies	66332A	25/05/28	26/05/28	US37474230
Digital Multimeter	FLUKE	17B+	24/11/27	25/11/27	36390701WS
Power Divider	Weinschel	1515-1	25/05/30	26/05/30	TA376
Temp Test Chamber	ESPEC	SU-261	25/06/11	26/06/11	92006578
Radio Communication Analyzer	Anritsu	MT8820C	25/05/29	26/05/29	6201127429
Thermohygrometer	BODYCOM	BJ5478	24/12/17	25/12/17	090205-4
Thermohygrometer	BODYCOM	BJ5478	24/12/05	25/12/05	120612-2
Signal Generator	Rohde Schwarz	SMBV100A	24/12/10	25/12/10	255571
Signal Generator	ANRITSU	MG3695C	24/11/29	25/11/29	173501
Loop Antenna	ETS-Lindgren	6502	24/11/08	26/11/08	00060496
Hybrid Antenna	Schwarzbeck	VULB 9160	24/12/13	25/12/13	3362
Dipole Antenna	Schwarzbeck	UHA9105	24/12/13	26/12/13	2262
HORN ANT	ETS	3117	24/12/11	25/12/11	00140394
Horn Antenna	A.H.Systems Inc.	SAS-574	25/06/12	26/06/12	155
PreAmplifier	H.P	8447D	24/12/11	25/12/11	2944A07774
PreAmplifier	Agilent	8449B	24/12/11	25/12/11	3008A02108
PreAmplifier	tsj	MLA-1840-J02-45	25/05/29	26/05/29	16966-10728
High Pass Filter	Wainwright Instruments	WHKX12-935-1000-15000-40SS	24/12/11	25/12/11	7
High Pass Filter	Wainwright Instruments	WHKX10-2838-3300-18000-60SS	24/12/11	25/12/11	2
High Pass Filter	Wainwright Instruments	WHKX6-6320-8000-26500-40CC	24/12/11	25/12/11	2
Cable	HUBER+SUHNER	SUCOFLEX100	25/01/02	26/01/02	M-1
Cable	HUBER+SUHNER	SUCOFLEX100	25/01/02	26/01/02	M-2
Cable	Junkosha	MWX241/B	25/01/02	26/01/02	M-3
Cable	Junkosha	MWX221	25/01/02	26/01/02	M-4
Cable	Junkosha	MWX221	25/01/02	26/01/02	M-5
Cable	Junkosha	J12J101757-00	25/01/02	26/01/02	M-7
Cable	HUBER+SUHNER	SUCOFLEX104	25/01/02	26/01/02	M-8
Cable	HUBER+SUHNER	SUCOFLEX106	25/01/02	26/01/02	M-9
Cable	Junkosha	MWX315	25/01/02	26/01/02	M-10
Cable	Junkosha	MWX241	25/01/02	26/01/02	mmW-1
Cable	Junkosha	MWX241	25/01/02	26/01/02	mmW-4
Test Software (Radiated)	tsj	EMI Measurement	NA	NA	Version 2.00.0185
3m Semi Anechoic Chamber	SYC	3m-SAC	25/06/13(NSA) 25/06/19(VSWR)	26/06/13(NSA) 26/06/19(VSWR)	3m-SAC-1

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	Occupied Bandwidth	N/A		C
-	Peak to Average Ratio	N/A		C
2.1051 22.917(a)	Band Edge / Conducted Spurious Emissions	> 43 + 10log$_{10}$(P) dB at Band edge and for all out-of-band emissions		C
27.53(m)	Band Edge / Conducted Spurious Emissions	> 40 + 10log10 (P) dB at channel edge and 5 MHz from the channel edge > 43 + 10log10 (P) dB at 5 MHz and X MHz from the channel edge > 55 + 10log10 (P) dB at all frequencies more than X MHz from the channel edge		C
2.1055 22.355 27.54	Frequency Stability	Refer to section 3.7 of this report.		C
22.913(a)(5)	Radiated Output Power (B5)	< 7 Watts max. ERP	Radiated	C Note 2
27.50(h)(2)	Radiated Output Power(B7)	< 2 Watts max. EIRP		C Note 2
2.1053 22.917(a)	Undesirable Emissions(B5)	> 43 + 10log$_{10}$(P) dB for all out-of-band emissions		C Note 2
27.53(m)	Undesirable Emissions(B7)	> 55 + 10log$_{10}$(P) dB for all out-of-band emissions		C Note 2

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.

6. SAMPLE CALCULATION

A. Emission Designator

LTE Band 5(QPSK)

Emission Designator =**8M95G7D**
LTE OBW = 8.952 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data Transmission

LTE Band 5(16QAM)

Emission Designator = **8M93W7D**
LTE OBW = 8.927 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data Transmission

B. For substitution method

Unwanted emissions

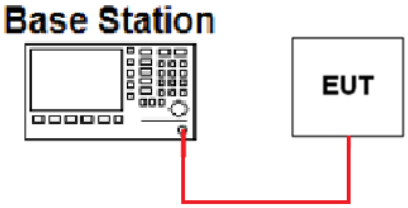
1) The EUT was placed on a turntable with 0.8 meter height for frequency below 1GHz and 1.5 meter height for frequency above 1 GHz respectively above ground.
2) The EUT was set 3 meters from the receiving antenna mounted on the antenna tower.
3) Vary the measurement antenna height through 1 m to 4 m 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. 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.



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

7.1.1. LTE Band 5

Channel Bandwidth (MHz)	Test Frequency (MHz)	Test Mode	Conducted Output power (dBm)	Conducted Output power (W)
10	829	QPSK	21.85	0.153
		16QAM	21.24	0.133
	836.5	QPSK	21.93	0.156
		16QAM	21.23	0.133
	844	QPSK	21.86	0.153
		16QAM	21.20	0.132
5	826.5	QPSK	21.73	0.149
		16QAM	21.01	0.126
	836.5	QPSK	22.00	0.158
		16QAM	21.30	0.135
	846.5	QPSK	21.95	0.157
		16QAM	21.28	0.134
3	825.5	QPSK	21.94	0.156
		16QAM	21.29	0.135
	836.5	QPSK	21.92	0.156
		16QAM	21.26	0.134
	847.5	QPSK	21.93	0.156
		16QAM	21.29	0.135
1.4	824.7	QPSK	21.91	0.155
		16QAM	21.35	0.136
	836.5	QPSK	21.95	0.157
		16QAM	21.32	0.136
	848.3	QPSK	22.01	0.159
		16QAM	21.40	0.138

7.1.2. LTE Band 7

Channel Bandwidth (MHz)	Test Frequency (MHz)	Test Mode	Conducted Output power (dBm)	Conducted Output power (W)
20	2 510.0	QPSK	21.98	0.158
		16QAM	21.26	0.134
	2 535.0	QPSK	21.82	0.152
		16QAM	21.04	0.127
	2 560.0	QPSK	21.84	0.153
		16QAM	21.07	0.128
15	2 507.5	QPSK	21.91	0.155
		16QAM	21.08	0.128
	2 535.0	QPSK	21.79	0.151
		16QAM	21.04	0.127
	2 562.5	QPSK	21.74	0.149
		16QAM	21.00	0.126
10	2 505.0	QPSK	22.02	0.159
		16QAM	21.30	0.135
	2 535.0	QPSK	22.00	0.158
		16QAM	21.28	0.134
	2 565.0	QPSK	22.02	0.159
		16QAM	21.26	0.134
5	2 502.5	QPSK	21.79	0.151
		16QAM	20.88	0.122
	2 535.0	QPSK	21.88	0.154
		16QAM	21.18	0.131
	2 567.5	QPSK	21.74	0.149
		16QAM	21.02	0.126

7.2. OCCUPIED BANDWIDTH

- All bandwidths and modulations were investigated and the worst case plots are attached.
- Plots of the EUT's Occupied Bandwidth are shown in Clause 8.1

7.3. PEAK TO AVERAGE RATIO

- All bandwidths and modulations were investigated and the worst case plots are attached.
- Plots of the EUT's Peak- to- Average Ratio are shown in Clause 8.2

7.3.1. LTE Band 5

Channel Bandwidth (MHz)	Frequency (MHz)	Modulation	PAR (dB)
10	829	QPSK	5.38
		16QAM	6.04
	836.5	QPSK	**5.46**
		16QAM	**6.11**
	844	QPSK	5.28
		16QAM	5.97
5	826.5	QPSK	5.35
		16QAM	6.06
	836.5	QPSK	**5.42**
		16QAM	**6.10**
	846.5	QPSK	5.30
		16QAM	5.96
3	825.5	QPSK	5.34
		16QAM	6.19
	836.5	QPSK	**5.41**
		16QAM	**6.20**
	847.5	QPSK	5.30
		16QAM	6.08
1.4	824.7	QPSK	5.42
		16QAM	**6.19**
	836.5	QPSK	**5.45**
		16QAM	6.18
	848.3	QPSK	5.35
		16QAM	6.05

7.3.2. LTE Band 7

Channel Bandwidth (MHz)	Frequency (MHz)	Modulation	PAR (dB)
20	2510	QPSK	5.30
		16QAM	6.06
	2535	QPSK	**5.32**
		16QAM	**6.11**
	2560	QPSK	5.26
		16QAM	6.06
15	2507.5	QPSK	5.35
		16QAM	6.08
	2535	QPSK	**5.35**
		16QAM	**6.13**
	2562.5	QPSK	5.30
		16QAM	6.08
10	2505	QPSK	5.41
		16QAM	6.11
	2535	QPSK	**5.42**
		16QAM	**6.13**
	2565	QPSK	5.38
		16QAM	6.10
5	2502.5	QPSK	5.44
		16QAM	6.10
	2535	QPSK	**5.45**
		16QAM	**6.14**
	2567.5	QPSK	5.41
		16QAM	6.10

7.4. BAND EDGE EMISSIONS (Conducted)

- All bandwidths, RB configurations and modulations were investigated and the worst case plots are attached.
- Plots of the EUT's Band Edge Emissions are shown in Clause 8.3

7.5. SPURIOUS AND HARMONICS EMISSIONS (Conducted)

- All bandwidths, RB configurations and modulations were investigated and the worst case plots are attached.
- Plots of the EUT's Spurious Emissions are shown in Clause 8.4

7.6. ERP & EIRP

- Test Notes

1) This is device was tested under all bandwidths, modulations and RB configurations and the worst case data are reported in the below table.

7.6.1. 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	15.17	-1.26	13.91	0.025
		16QAM	1/0	H	14.52	-1.26	13.26	0.021
	836.5	QPSK	1/0	H	15.91	-1.23	14.68	0.029
		16QAM	1/0	H	15.15	-1.23	13.92	0.025
	844	QPSK	1/0	H	14.28	-1.20	13.08	0.020
		16QAM	1/0	H	13.55	-1.20	12.35	0.017
5	826.5	QPSK	1/24	H	14.94	-1.27	13.67	0.023
		16QAM	1/24	H	13.93	-1.27	12.66	0.018
	836.5	QPSK	1/0	H	14.83	-1.23	13.60	0.023
		16QAM	1/0	H	14.10	-1.23	12.87	0.019
	846.5	QPSK	1/12	H	14.73	-1.19	13.54	0.023
		16QAM	1/12	H	14.18	-1.19	12.99	0.020
3	825.5	QPSK	1/14	H	15.13	-1.28	13.85	0.024
		16QAM	1/14	H	14.33	-1.28	13.05	0.020
	836.5	QPSK	1/0	H	14.86	-1.23	13.63	0.023
		16QAM	1/0	H	13.89	-1.23	12.66	0.018
	847.5	QPSK	1/0	H	14.91	-1.18	13.73	0.024
		16QAM	1/0	H	14.00	-1.18	12.82	0.019
1.4	824.7	QPSK	1/2	H	14.71	-1.28	13.43	0.022
		16QAM	1/2	H	14.11	-1.28	12.83	0.019
	836.5	QPSK	1/2	H	14.57	-1.23	13.34	0.022
		16QAM	1/2	H	13.95	-1.23	12.72	0.019
	848.3	QPSK	1/5	H	14.46	-1.18	13.28	0.021
		16QAM	1/5	H	13.76	-1.18	12.58	0.018

7.6.2. LTE Band 7

Channel Bandwidth (MHz)	Tx Freq. (MHz)	Test Mode	RB Size/ Offset	Ant Pol (H/V)	Level at Antenna Terminal(dBm)	Substitute Antenna Gain(dBi)	EIRP (dBm)	EIRP (W)
20	2 510	QPSK	1/0	V	5.90	5.98	11.88	0.015
		16QAM	1/0	V	5.09	5.98	11.07	0.013
	2 535	QPSK	1/0	V	5.96	5.97	11.93	0.016
		16QAM	1/0	V	5.39	5.97	11.36	0.014
	2 560	QPSK	1/0	V	6.58	5.99	12.57	0.018
		16QAM	1/0	V	6.07	5.99	12.06	0.016
15	2 507.5	QPSK	1/0	V	6.04	5.98	12.02	0.016
		16QAM	1/0	V	5.34	5.98	11.32	0.014
	2 535	QPSK	1/0	V	6.55	5.97	12.52	0.018
		16QAM	1/0	V	5.83	5.97	11.80	0.015
	2 562.5	QPSK	1/0	V	6.76	6.00	12.76	0.019
		16QAM	1/0	V	5.91	6.00	11.91	0.016
10	2 505	QPSK	1/0	V	6.55	5.98	12.53	0.018
		16QAM	1/0	V	5.86	5.98	11.84	0.015
	2 535	QPSK	1/0	V	6.30	5.97	12.27	0.017
		16QAM	1/0	V	5.48	5.97	11.45	0.014
	2 565	QPSK	1/0	V	7.04	6.00	13.04	0.020
		16QAM	1/0	V	6.24	6.00	12.24	0.017
5	2 502.5	QPSK	1/0	V	6.99	5.98	12.97	0.020
		16QAM	1/0	V	6.22	5.98	12.20	0.017
	2 535	QPSK	1/0	V	7.32	5.97	13.29	0.021
		16QAM	1/0	V	6.81	5.97	12.78	0.019
	2 567.5	QPSK	1/0	V	5.30	6.01	11.31	0.014
		16QAM	1/0	V	4.50	6.01	10.51	0.011

7.7. UNDESIRABLE EMISSIONS (Radiated)

- Test Notes

1) This device was tested under all bandwidths, modulations and RB configurations and the worst case data are reported.
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.
3) Limit for Band 5 = -13dBm
   Limit for Band 7 = -25dBm

7.7.1. LTE Band 5

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	829	1/0	QPSK	1 649.10	V	-51.55	4.06	-47.49	-13.00	34.49
				2 473.68	V	-42.27	3.92	-38.35	-13.00	25.35
				3 298.20	V	-56.65	5.74	-50.91	-13.00	37.91
				4 122.77	V	-59.27	7.23	-52.04	-13.00	39.04
	836.5	1/0	QPSK	1 664.09	V	-51.34	4.07	-47.27	-13.00	34.27
				2 496.21	V	-44.13	3.84	-40.29	-13.00	27.29
				3 327.97	V	-56.06	5.82	-50.24	-13.00	37.24
				4 160.45	V	-58.04	7.23	-50.81	-13.00	37.81
	844	1/0	QPSK	1 678.98	V	-50.87	4.08	-46.79	-13.00	33.79
				2 518.77	V	-43.16	3.83	-39.33	-13.00	26.33
				3 358.16	V	-56.90	5.92	-50.98	-13.00	37.98
				4 197.39	V	-59.04	7.28	-51.76	-13.00	38.76

7.7.2. LTE Band 7

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	2 510	1/0	QPSK	5 019.61	H	-58.15	9.96	-48.19	-25.00	23.19
				7 504.46	H	-56.90	12.18	-44.72	-25.00	19.72
				10 004.89	H	-55.19	12.86	-42.33	-25.00	17.33
				12 504.59	H	-52.86	13.53	-39.33	-25.00	14.33
	2 535	1/0	QPSK	5 069.98	H	-57.93	10.07	-47.86	-25.00	22.86
				7 577.28	H	-57.51	12.15	-45.36	-25.00	20.36
				10 103.79	H	-54.33	12.94	-41.39	-25.00	16.39
				12 631.54	H	-52.46	13.49	-38.97	-25.00	13.97
	2 560	1/0	QPSK	5 120.28	H	-58.02	10.16	-47.86	-25.00	22.86
				7 653.87	H	-57.59	12.19	-45.40	-25.00	20.40
				10 205.09	H	-54.41	13.04	-41.37	-25.00	16.37
				12 755.89	H	-53.19	13.51	-39.68	-25.00	14.68

7.8. 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.

7.8.1 LTE Band 5

OPERATING FREQUENCY : 836.5 MHz
REFERENCE VOLTAGE : 12 V DC
LIMIT(FCC) : ± 0.000 25 % or 2.5 ppm

VOLTAGE (%)	POWER (V DC)	TEMP (℃)	FREQ (Hz)	Deviation	
				(%)	(ppm)
100 %	12.00	+20	836,500,001	0.0000001	0.001
100 %		-30	836,499,996	-0.0000005	-0.005
100 %		-20	836,500,001	0.0000001	0.001
100 %		-10	836,499,998	-0.0000002	-0.002
100 %		0	836,499,997	-0.0000004	-0.004
100 %		+10	836,500,004	0.0000005	0.005
100 %		+20	836,500,001	0.0000001	0.001
100 %		+30	836,500,003	0.0000004	0.004
100 %		+40	836,500,004	0.0000005	0.005
100 %		+50	836,500,001	0.0000001	0.001
115 %	13.80	+20	836,499,998	-0.0000002	-0.002
BATT.ENDPOINT	10.20	+20	836,499,998	-0.0000002	-0.002

7.8.2. LTE Band 7

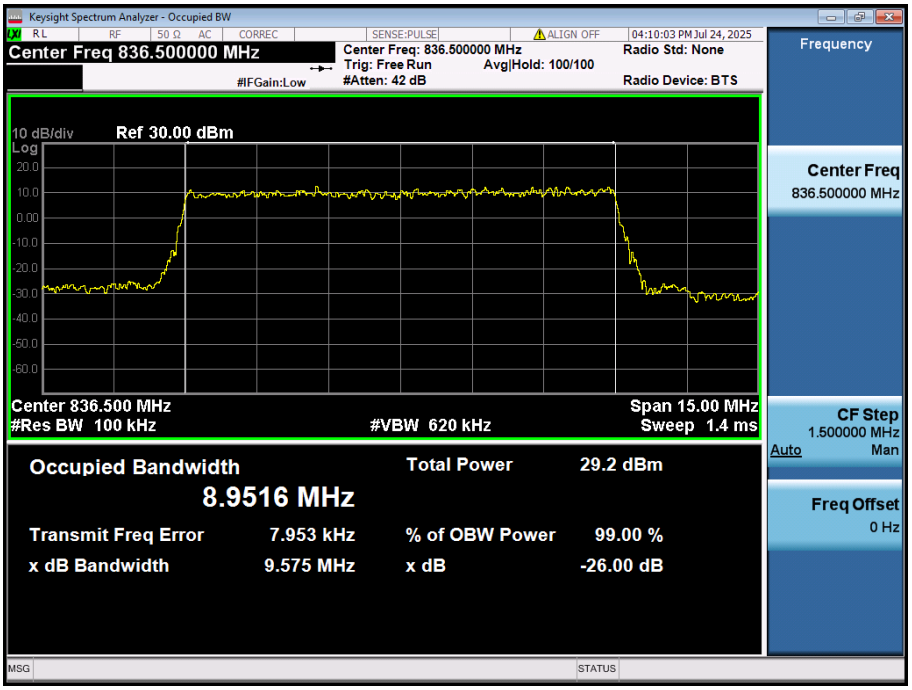
OPERATING FREQUENCY : 2 535.00 MHz
REFERENCE VOLTAGE : 12 V DC
LIMIT : The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

VOLTAGE (%)	POWER (V DC)	TEMP (℃)	FREQ (Hz)	Deviation	
				(%)	(ppm)
100 %	12.00	+20	2,535,000,002	0.0000001	0.001
100 %		-30	2,534,999,997	-0.0000001	-0.001
100 %		-20	2,534,999,990	-0.0000004	-0.004
100 %		-10	2,535,000,005	0.0000002	0.002
100 %		0	2,535,000,002	0.0000001	0.001
100 %		+10	2,534,999,997	-0.0000001	-0.001
100 %		+20	2,535,000,002	0.0000001	0.001
100 %		+30	2,534,999,998	-0.0000001	-0.001
100 %		+40	2,534,999,997	-0.0000001	-0.001
100 %		+50	2,535,000,002	0.0000001	0.001
115 %	13.80	+20	2,535,000,002	0.0000001	0.001
BATT.ENDPOINT	10.20	+20	2,535,000,002	0.0000001	0.001

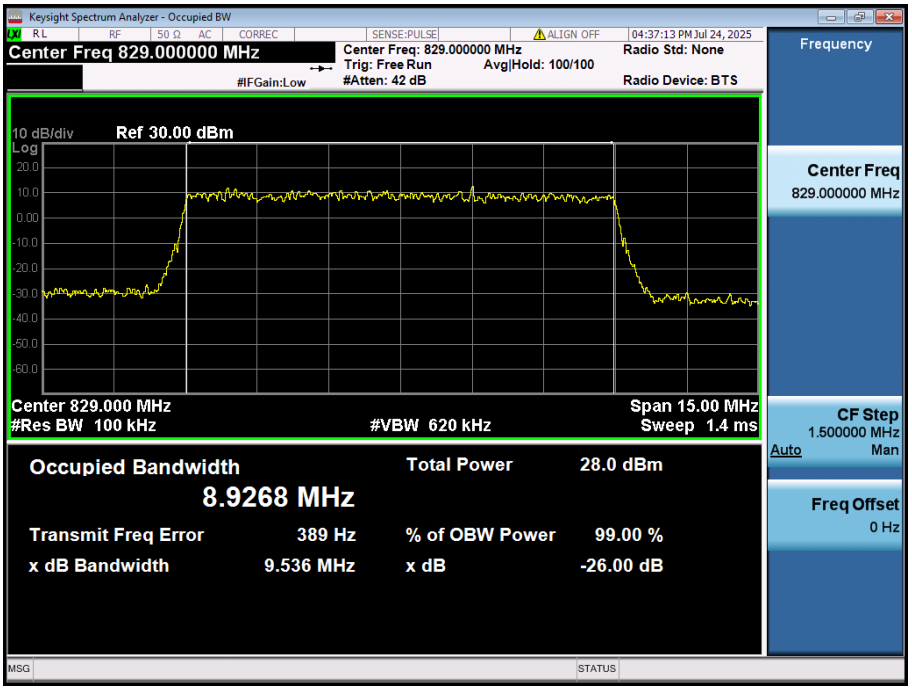
8. TEST PLOTS

8.1. OCCUPIED BANDWIDTH

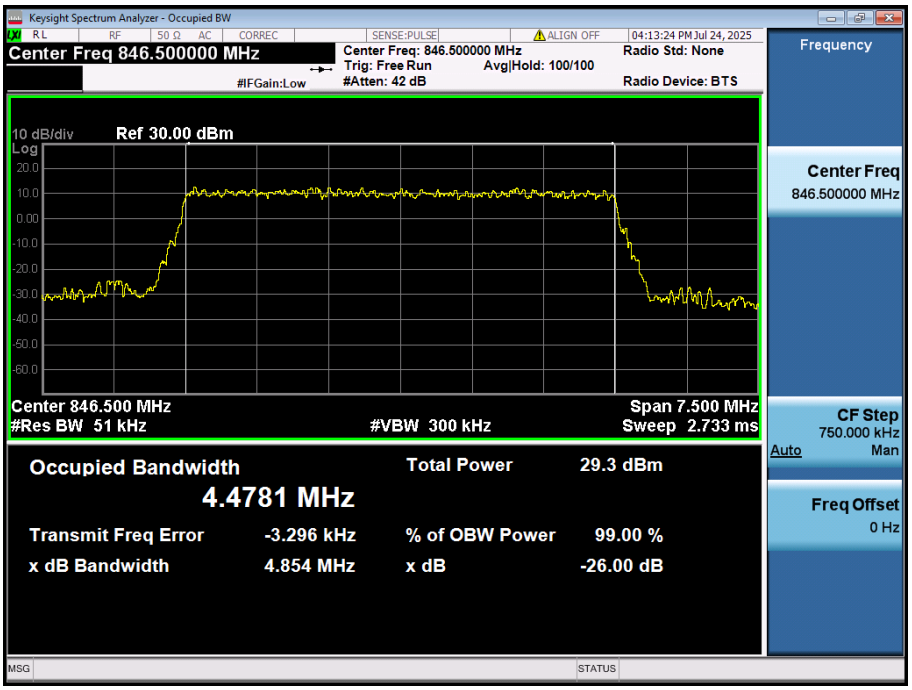
8.1.1. LTE Band 5



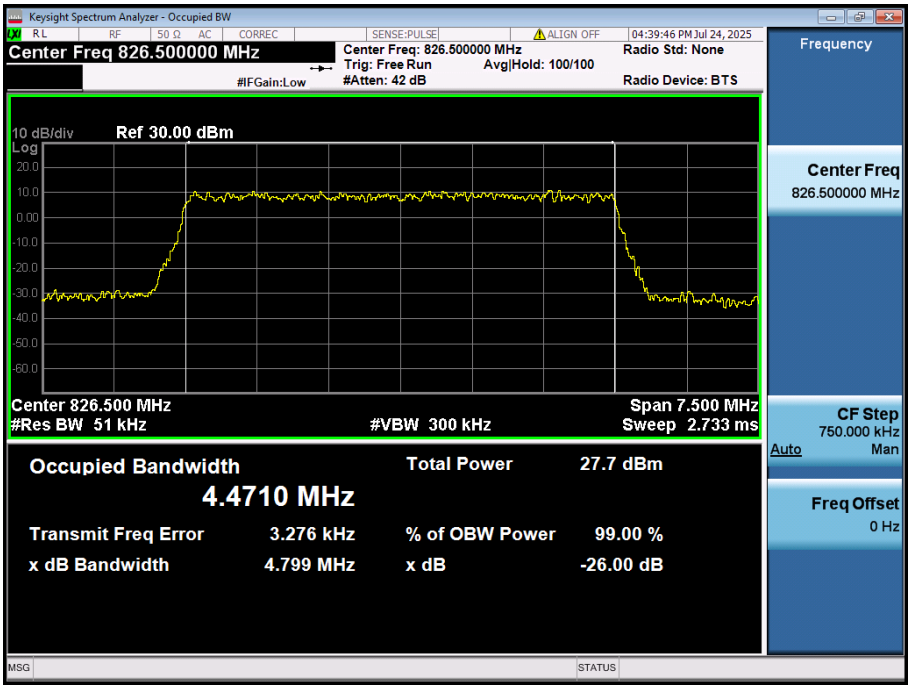
LTE Band 5 / 10MHz / QPSK - RB Size 50/0



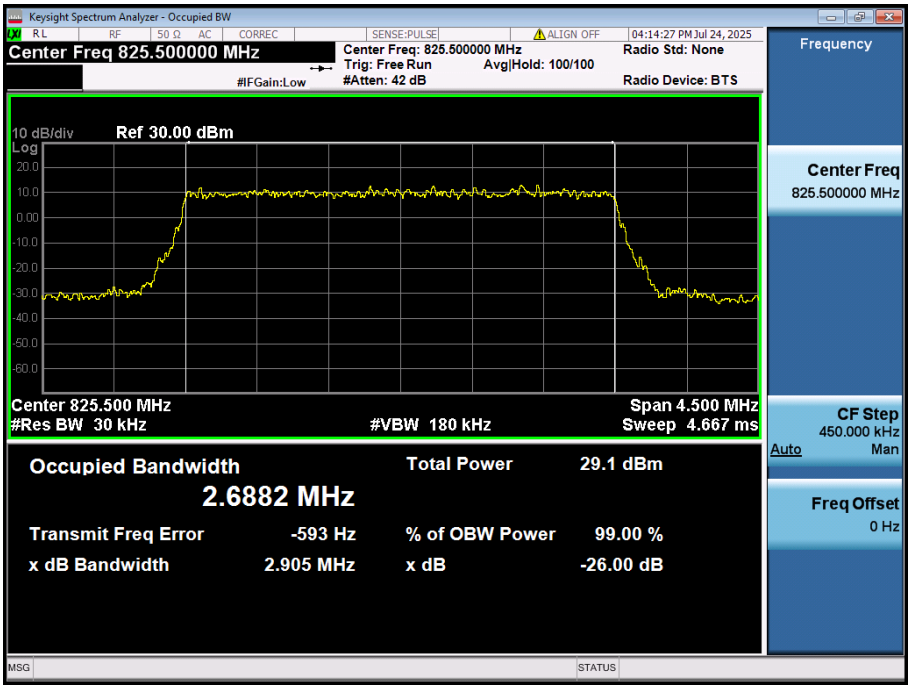
LTE Band 5 / 10MHz / 16QAM - RB Size 50/0



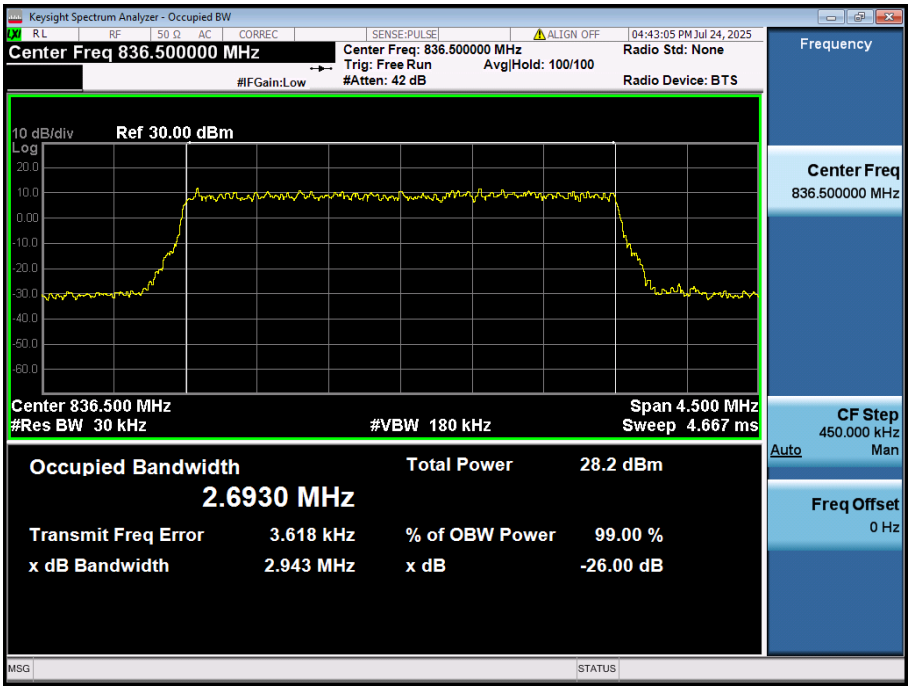
LTE Band 5 / 5MHz / QPSK - RB Size 25/0



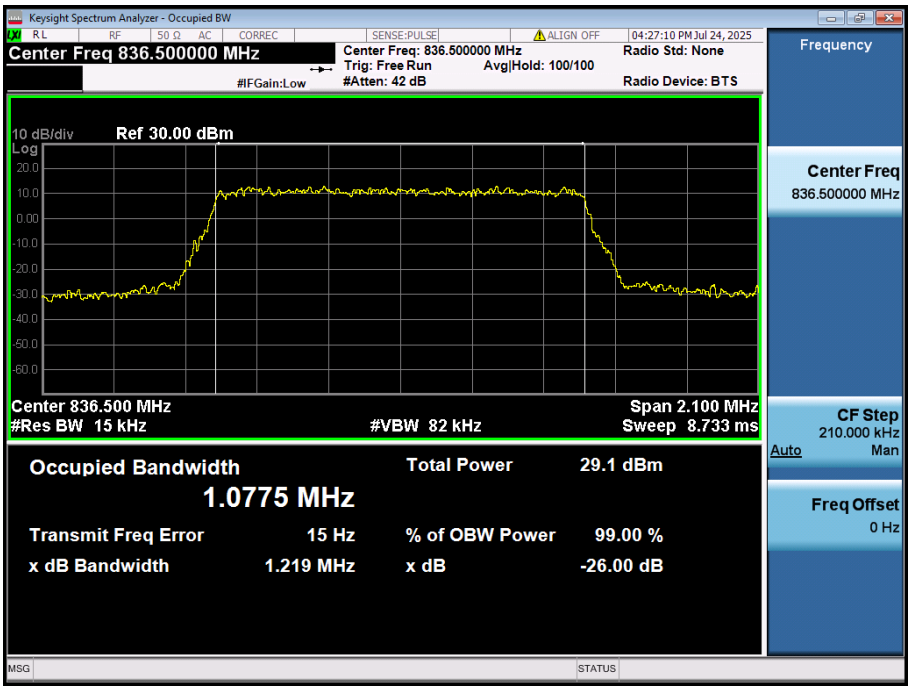
LTE Band 5 / 5MHz / 16QAM - RB Size 25/0



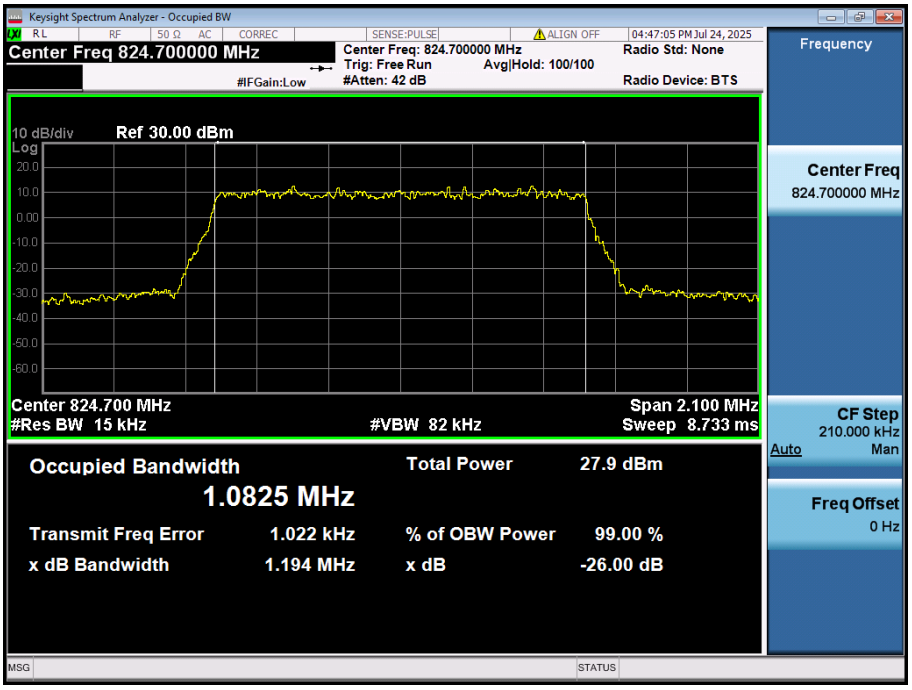
LTE Band 5 / 3MHz / QPSK - RB Size 15/0



LTE Band 5 / 3MHz / 16QAM - RB Size 15/0

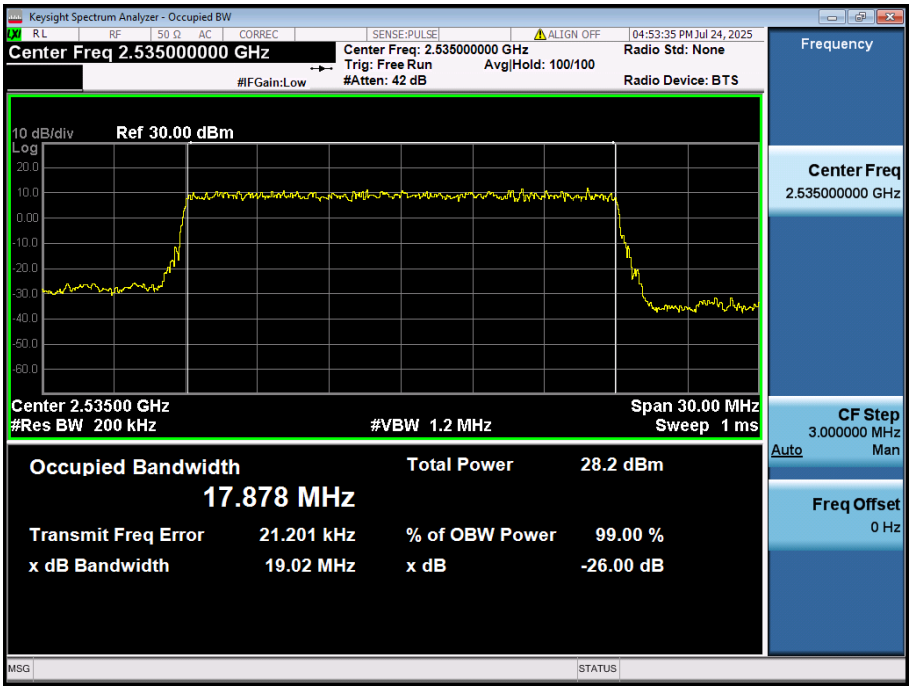


LTE Band 5 / 1.4MHz / QPSK - RB Size 6/0

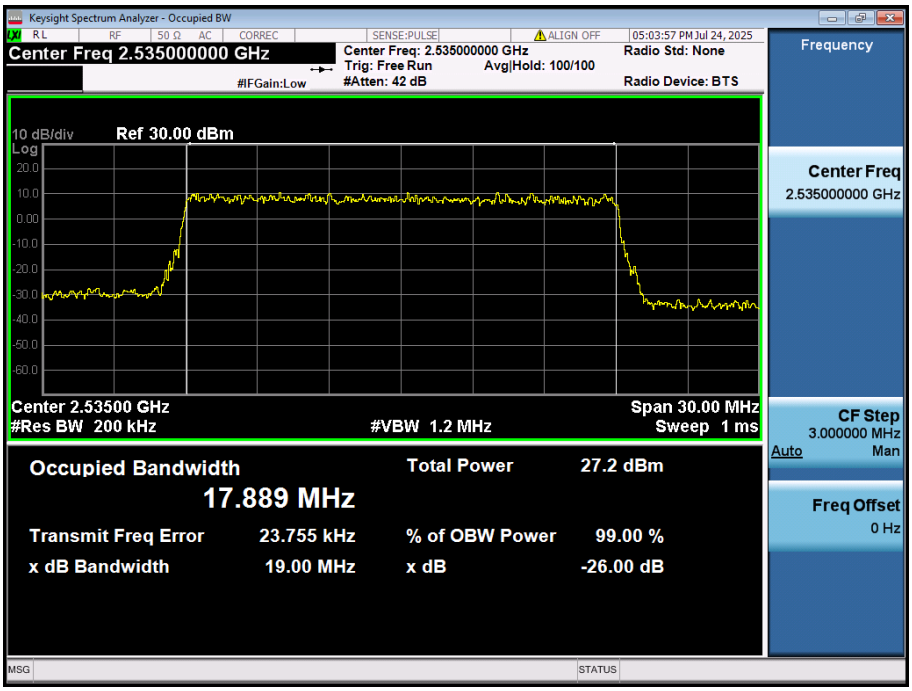


LTE Band 5 / 1.4MHz / 16QAM - RB Size 6/0

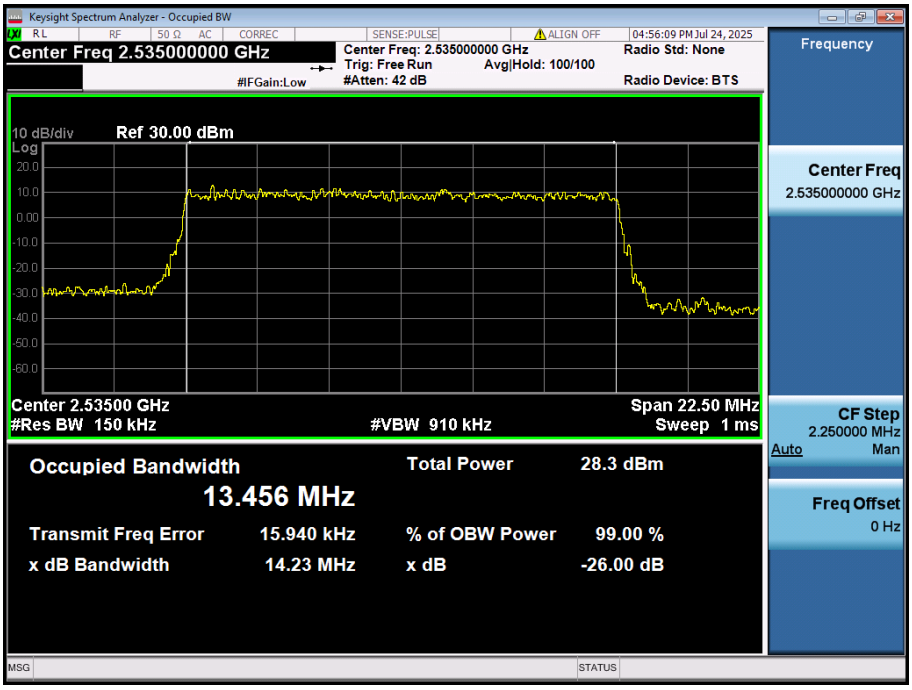
8.1.2. LTE Band 7



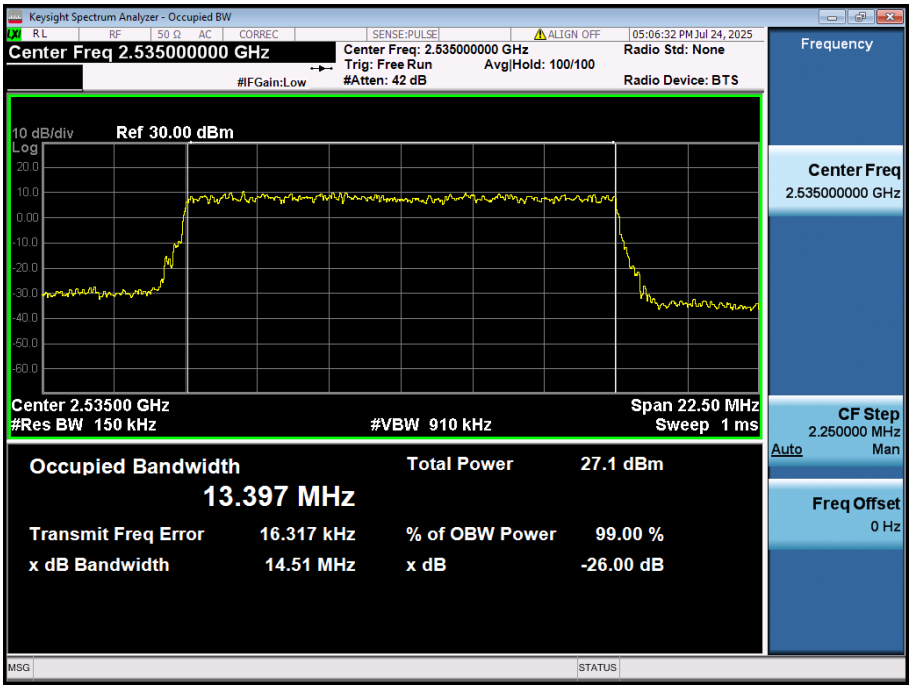
LTE Band 7 / 20MHz / QPSK - RB Size 100/0



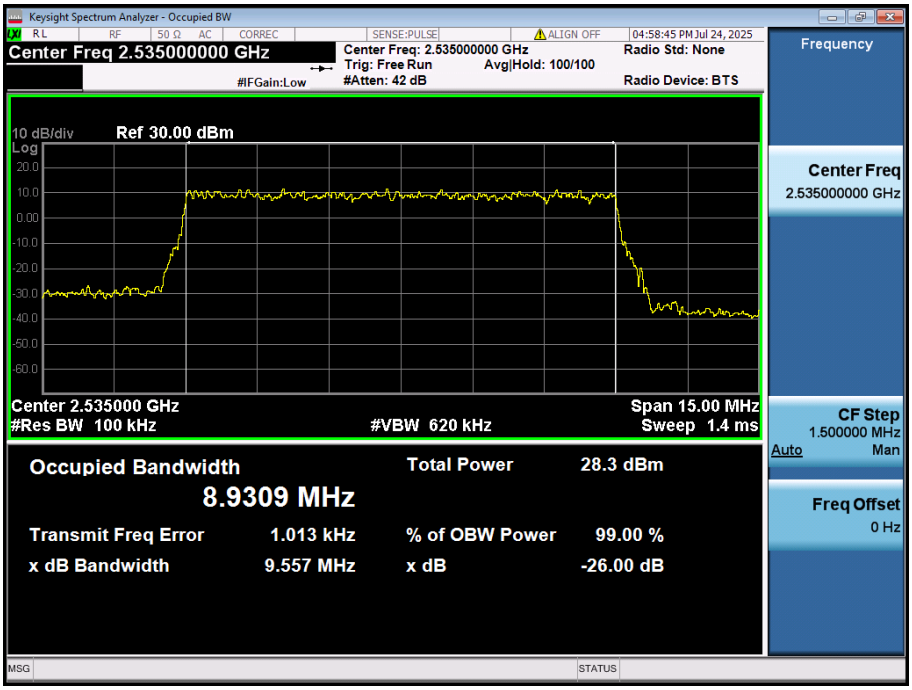
LTE Band 7 / 20MHz / 16QAM - RB Size 100/0



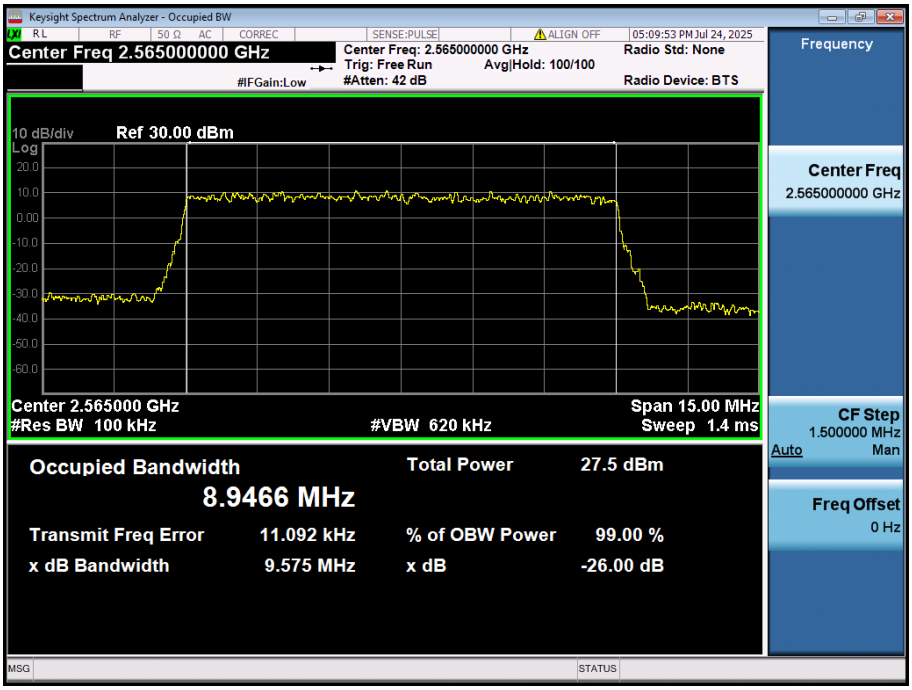
LTE Band 7 / 15MHz / QPSK - RB Size 75/0



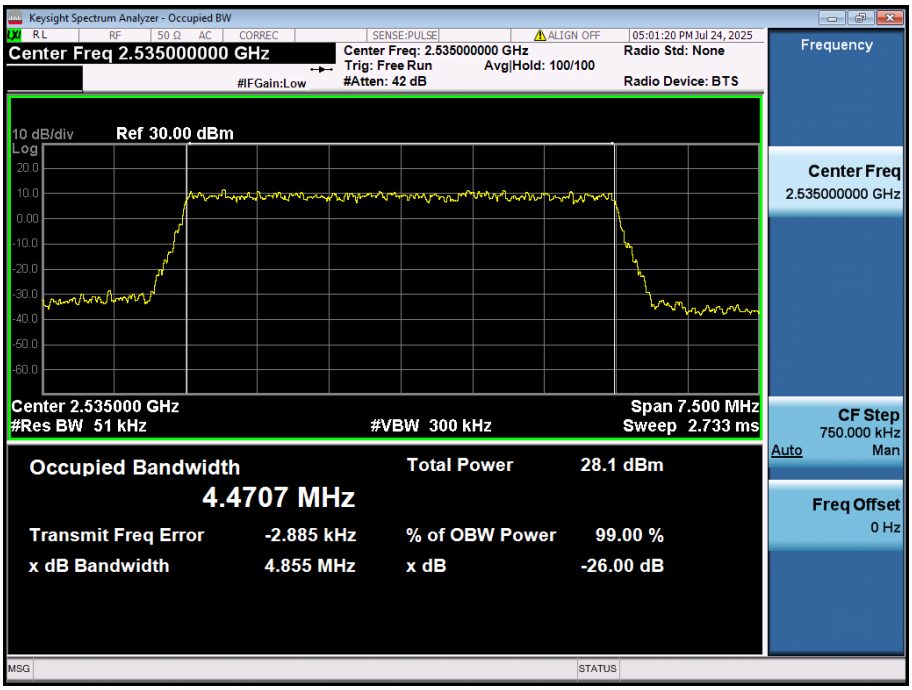
LTE Band 7 / 15MHz / 16QAM - RB Size 75/0



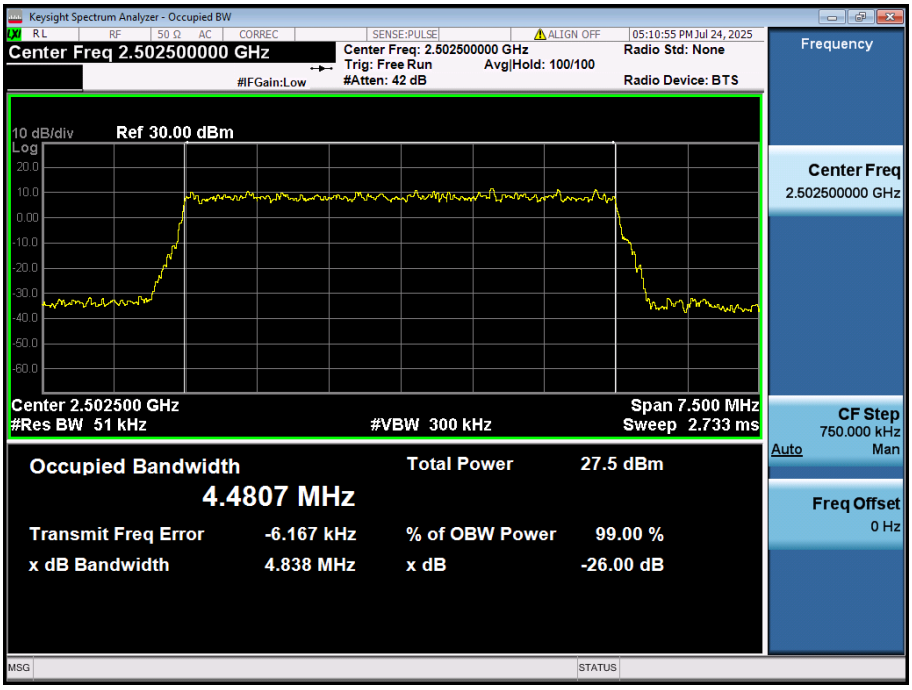
LTE Band 7 / 10MHz / QPSK - RB Size 50/0



LTE Band 7 / 10MHz / 16QAM - RB Size 50/0



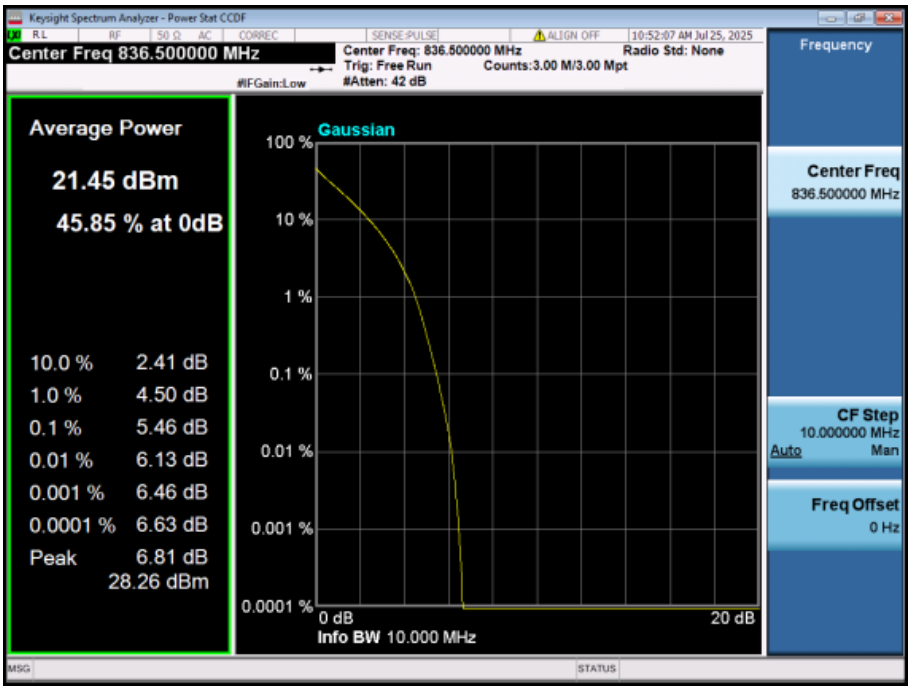
LTE Band 7 / 5MHz / QPSK - RB Size 25/0



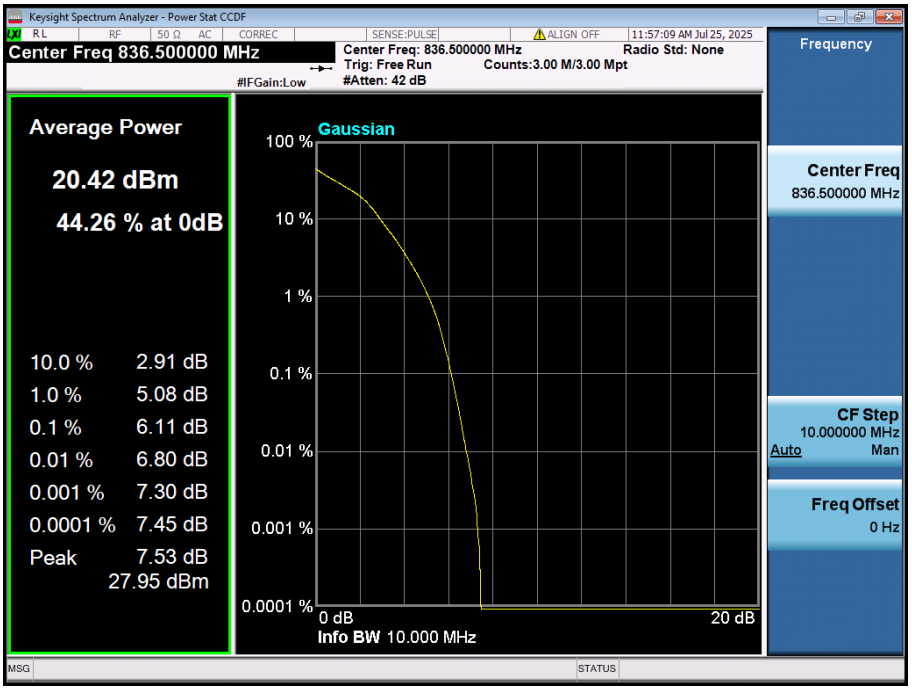
LTE Band 7 / 5MHz / 16QAM - RB Size 25/0

8.2. PEAK TO AVERAGE RATIO

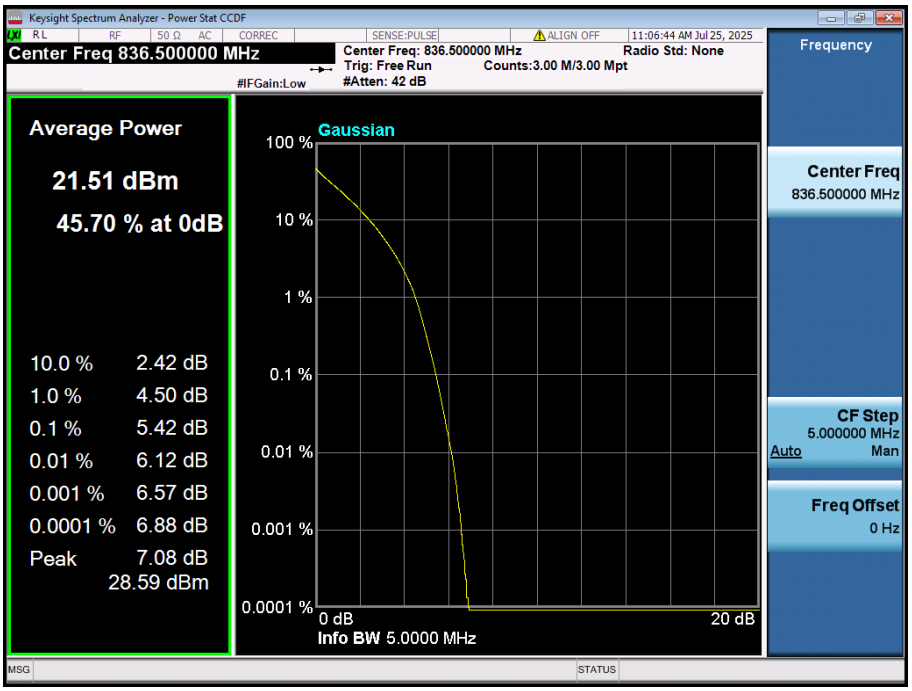
8.2.1. LTE Band 5



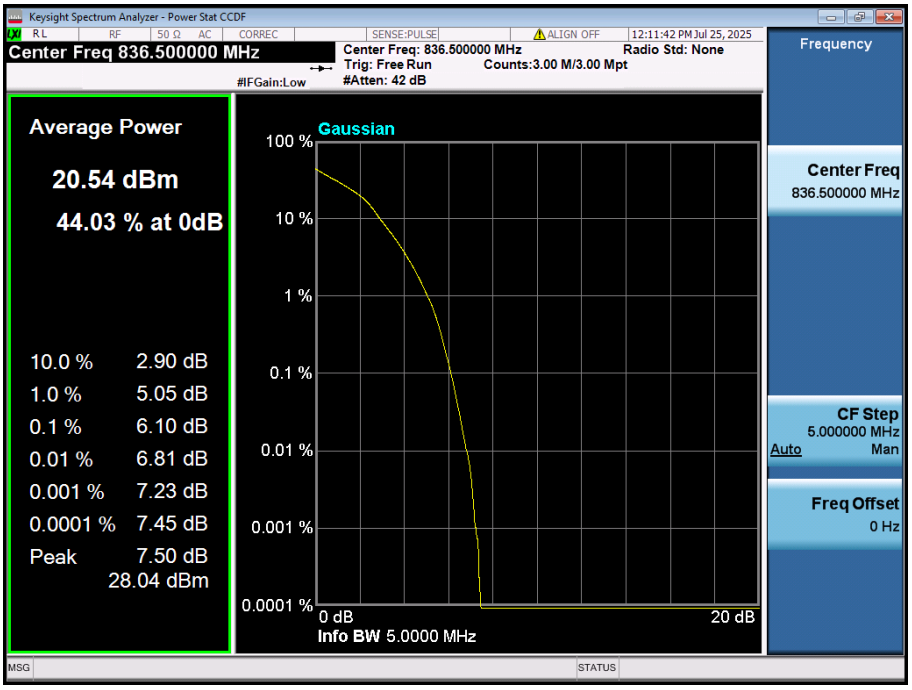
LTE Band 5 / 10MHz / QPSK - RB Size 50/0



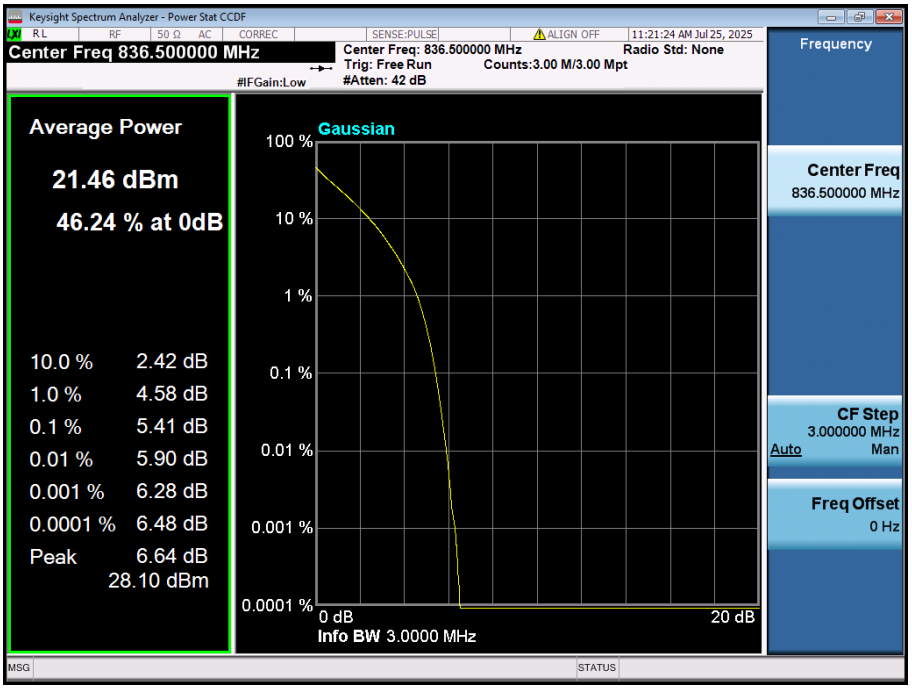
LTE Band 5 / 10MHz / 16QAM - RB Size 50/0



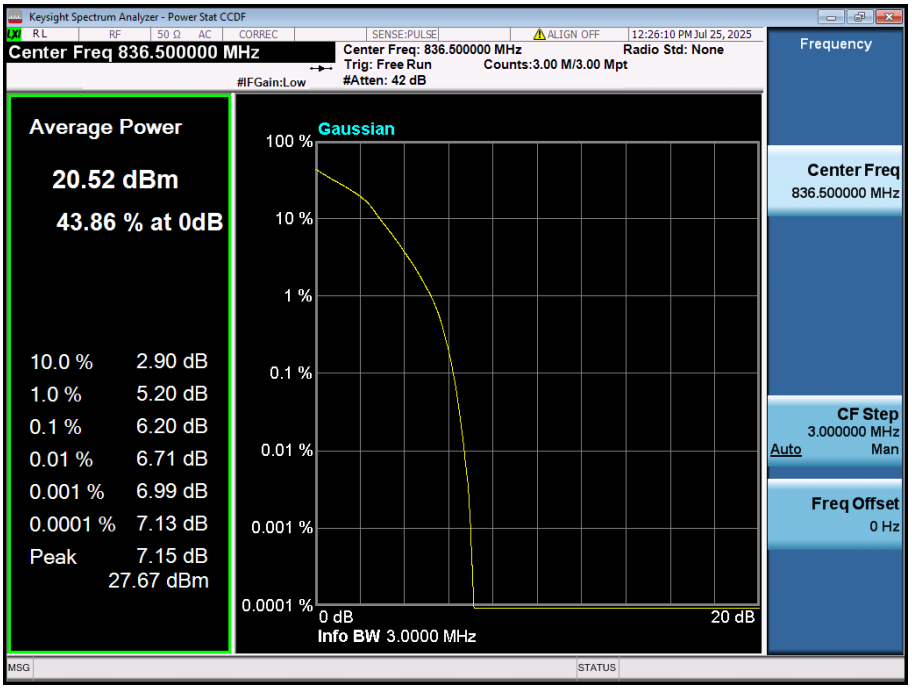
LTE Band 5 / 5MHz / QPSK - RB Size 25/0



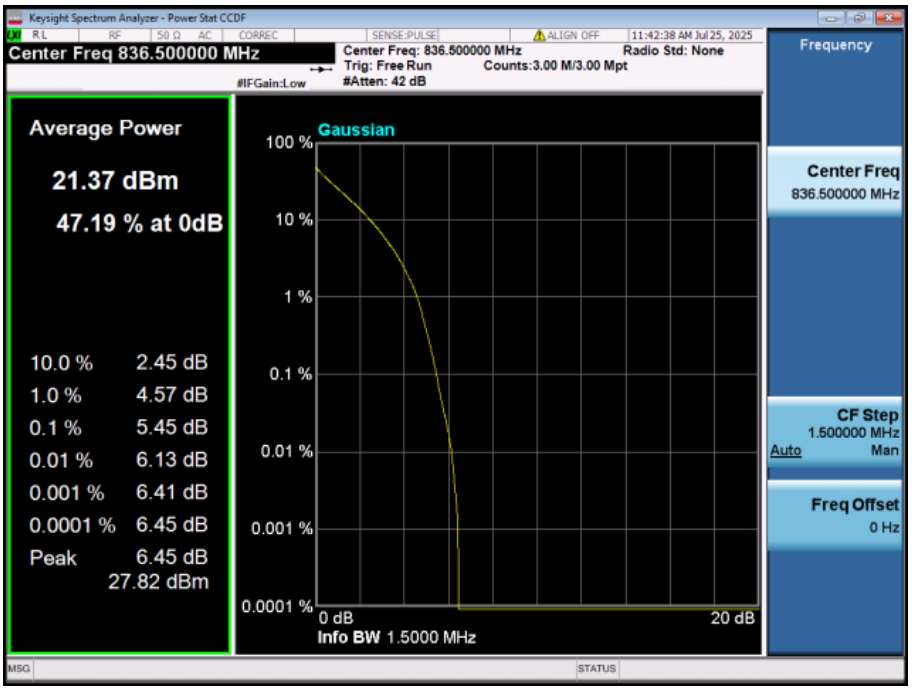
LTE Band 5 / 5MHz / 16QAM - RB Size 25/0



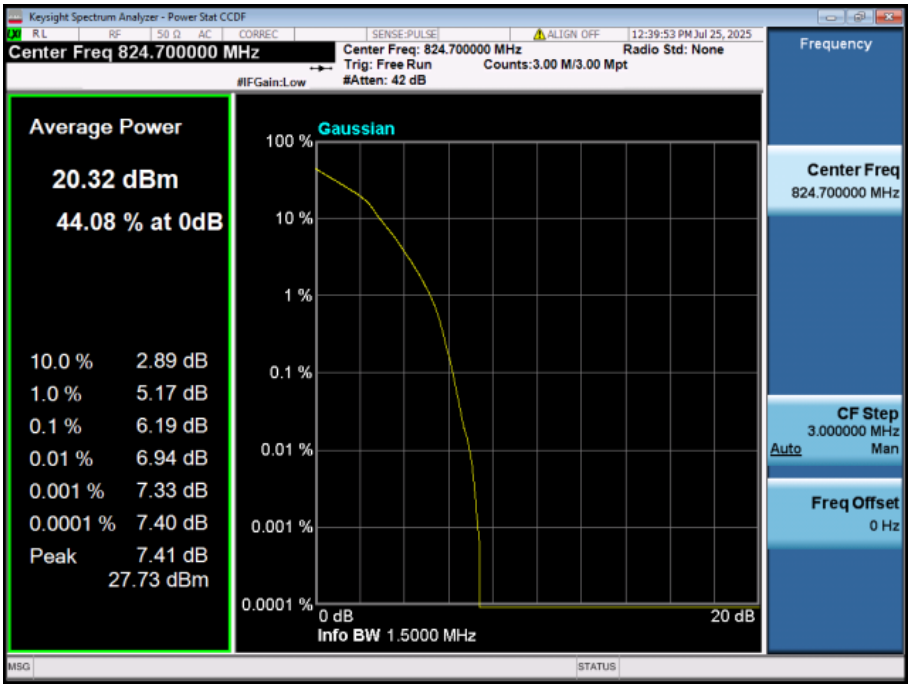
LTE Band 5 / 3MHz / QPSK - RB Size 15/0



LTE Band 5 / 3MHz / 16QAM - RB Size 15/0



LTE Band 5 / 1.4MHz / QPSK - RB Size 6/0



LTE Band 5 / 1.4MHz / 16QAM - RB Size 6/0