# TEST REPORT

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1. Report No : DRTFCC2001-0002
2. Customer
   - Name : LG Electronics USA, Inc.
   - Address : 1000 Sylvan Ave. Englewood Cliffs, New Jersey, United States 07632
3. Use of Report : FCC Original Grant
4. Product Name / Model Name : Mobile Phone / OA2001
   FCC ID : ZNFOA2001
5. Test Method Used : KDB971168 D01v03, ANSI/TIA-603-E-2016, ANSI C63.26-2015
   Test Specification : §2, §22, §24(E), §27
6. Date of Test : 2019.11.21 ~ 2020.01.10
7. Testing Environment : Refer to appended test report.
8. Test Result : Refer to the attached test result.

| | | |
|---|---|---|
| Affirmation | Tested by<br>Name : JaeHyeok Bang (Signature) | Reviewed by<br>Name : Guenki Son (Signature) |

The test results presented in this test report are limited only to the sample supplied by applicant and the use of this test report is inhibited other than its purpose. This test report shall not be reproduced except in full, without the written approval of DT&C Co., Ltd.

**2020 . 01 . 17 .**

**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 | Tested by | Reviewed by |
|---|---|---|---|---|
| DRTFCC2001-0002 | Jan. 17, 2020 | Initial issue | JaeHyeok Bang | Guenki Son |
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# 1. GENERAL INFORMATION

**Applicant Name** : LG Electronics USA, Inc.

**Address** : 1000 Sylvan Ave. Englewood Cliffs, New Jersey, United States 07632

**FCC ID** : ZNFOA2001

**FCC Classification** : PCS Licensed Transmitter held to ear (PCE)

**EUT Type** : Mobile Phone

**Model Name** : OA2001

**Add Model Name** : KA2004

**Supplying power** : DC 3.87 V

**Antenna Information** : PIFA Antenna

| Mode | TX Frequency (MHz) | Emission Designator | Modulation | ERP | |
|---|---|---|---|---|---|
| | | | | Max power (dBm) | Max power (W) |
| LTE Band 12, 17 | 704 ~ 711 | 8M94G7D | QPSK | 18.98 | 0.079 |
| LTE Band 12, 17 | 704 ~ 711 | 8M92W7D | 16QAM | 18.02 | 0.063 |
| LTE Band 12, 17 | 704 ~ 711 | 8M94W7D | 64QAM | 17.42 | 0.055 |
| LTE Band 12, 17 | 701.5 ~ 713.5 | 4M49G7D | QPSK | 19.06 | 0.081 |
| LTE Band 12, 17 | 701.5 ~ 713.5 | 4M49W7D | 16QAM | 18.31 | 0.068 |
| LTE Band 12, 17 | 701.5 ~ 713.5 | 4M49W7D | 64QAM | 17.37 | 0.055 |
| LTE Band 12 | 700.5 ~ 714.5 | 2M68G7D | QPSK | 18.76 | 0.075 |
| LTE Band 12 | 700.5 ~ 714.5 | 2M69W7D | 16QAM | 17.90 | 0.062 |
| LTE Band 12 | 700.5 ~ 714.5 | 2M70W7D | 64QAM | 16.93 | 0.049 |
| LTE Band 12 | 699.7 ~ 715.3 | 1M09G7D | QPSK | 19.05 | 0.080 |
| LTE Band 12 | 699.7 ~ 715.3 | 1M09W7D | 16QAM | 18.26 | 0.067 |
| LTE Band 12 | 699.7 ~ 715.3 | 1M09W7D | 64QAM | 17.17 | 0.052 |
| LTE Band 13 | 782 ~ 782 | 8M93G7D | QPSK | 17.15 | 0.052 |
| LTE Band 13 | 782 ~ 782 | 8M90W7D | 16QAM | 15.40 | 0.035 |
| LTE Band 13 | 782 ~ 782 | 8M94W7D | 64QAM | 14.38 | 0.027 |
| LTE Band 13 | 779.5 ~ 784.5 | 4M49G7D | QPSK | 17.15 | 0.052 |
| LTE Band 13 | 779.5 ~ 784.5 | 4M48W7D | 16QAM | 17.06 | 0.051 |
| LTE Band 13 | 779.5 ~ 784.5 | 4M51W7D | 64QAM | 16.46 | 0.044 |

| Mode | TX Frequency (MHz) | Emission Designator | Modulation | ERP | |
|---|---|---|---|---|---|
| | | | | Max power (dBm) | Max power (W) |
| LTE Band 5 | 829 ~ 844 | 8M95G7D | QPSK | 16.31 | 0.043 |
| LTE Band 5 | 829 ~ 844 | 8M95W7D | 16QAM | 15.87 | 0.039 |
| LTE Band 5 | 829 ~ 844 | 8M94W7D | 64QAM | 14.75 | 0.030 |
| LTE Band 5 | 826.5 ~ 846.5 | 4M48G7D | QPSK | 16.61 | 0.046 |
| LTE Band 5 | 826.5 ~ 846.5 | 4M47W7D | 16QAM | 15.83 | 0.038 |
| LTE Band 5 | 826.5 ~ 846.5 | 4M50W7D | 64QAM | 14.63 | 0.029 |
| LTE Band 5 | 825.5 ~ 847.5 | 2M69G7D | QPSK | 16.56 | 0.045 |
| LTE Band 5 | 825.5 ~ 847.5 | 2M70W7D | 16QAM | 15.91 | 0.039 |
| LTE Band 5 | 825.5 ~ 847.5 | 2M69W7D | 64QAM | 14.71 | 0.030 |
| LTE Band 5 | 824.7 ~ 848.3 | 1M09G7D | QPSK | 16.38 | 0.043 |
| LTE Band 5 | 824.7 ~ 848.3 | 1M09W7D | 16QAM | 15.78 | 0.038 |
| LTE Band 5 | 824.7 ~ 848.3 | 1M09W7D | 64QAM | 14.81 | 0.030 |

| Mode | TX Frequency (MHz) | Emission Designator | Modulation | EIRP | |
|---|---|---|---|---|---|
| | | | | Max power (dBm) | Max power (W) |
| LTE Band 4 | 1720 ~ 1745 | 17M9G7D | QPSK | 21.47 | 0.140 |
| LTE Band 4 | 1720 ~ 1745 | 17M9W7D | 16QAM | 20.61 | 0.115 |
| LTE Band 4 | 1720 ~ 1745 | 17M9W7D | 64QAM | 20.62 | 0.115 |
| LTE Band 4 | 1717.5 ~ 1747.5 | 13M5G7D | QPSK | 20.56 | 0.114 |
| LTE Band 4 | 1717.5 ~ 1747.5 | 13M4W7D | 16QAM | 19.90 | 0.098 |
| LTE Band 4 | 1717.5 ~ 1747.5 | 13M4W7D | 64QAM | 18.54 | 0.071 |
| LTE Band 4 | 1715 ~ 1750 | 8M93G7D | QPSK | 20.94 | 0.124 |
| LTE Band 4 | 1715 ~ 1750 | 8M95W7D | 16QAM | 20.12 | 0.103 |
| LTE Band 4 | 1715 ~ 1750 | 8M96W7D | 64QAM | 18.96 | 0.079 |
| LTE Band 4 | 1712.5 ~ 1752.5 | 4M49G7D | QPSK | 20.44 | 0.111 |
| LTE Band 4 | 1712.5 ~ 1752.5 | 4M50W7D | 16QAM | 19.68 | 0.093 |
| LTE Band 4 | 1712.5 ~ 1752.5 | 4M50W7D | 64QAM | 18.92 | 0.078 |
| LTE Band 4 | 1711.5 ~ 1753.5 | 2M69G7D | QPSK | 20.59 | 0.115 |
| LTE Band 4 | 1711.5 ~ 1753.5 | 2M69W7D | 16QAM | 19.73 | 0.094 |
| LTE Band 4 | 1711.5 ~ 1753.5 | 2M69W7D | 64QAM | 19.01 | 0.080 |
| LTE Band 4 | 1710.7 ~ 1754.3 | 1M09G7D | QPSK | 21.85 | 0.153 |
| LTE Band 4 | 1710.7 ~ 1754.3 | 1M09W7D | 16QAM | 20.14 | 0.103 |
| LTE Band 4 | 1710.7 ~ 1754.3 | 1M09W7D | 64QAM | 18.95 | 0.079 |
| LTE Band 2 | 1860 ~ 1900 | 17M9G7D | QPSK | 22.99 | 0.199 |
| LTE Band 2 | 1860 ~ 1900 | 17M9W7D | 16QAM | 22.56 | 0.180 |
| LTE Band 2 | 1860 ~ 1900 | 17M9W7D | 64QAM | 21.43 | 0.139 |
| LTE Band 2 | 1857.5 ~ 1902.5 | 13M5G7D | QPSK | 22.86 | 0.193 |
| LTE Band 2 | 1857.5 ~ 1902.5 | 13M4W7D | 16QAM | 21.62 | 0.145 |
| LTE Band 2 | 1857.5 ~ 1902.5 | 13M4W7D | 64QAM | 20.64 | 0.116 |
| LTE Band 2 | 1855 ~ 1905 | 8M97G7D | QPSK | 21.38 | 0.137 |
| LTE Band 2 | 1855 ~ 1905 | 8M93W7D | 16QAM | 20.98 | 0.125 |
| LTE Band 2 | 1855 ~ 1905 | 8M95W7D | 64QAM | 20.16 | 0.104 |
| LTE Band 2 | 1852.5 ~ 1907.5 | 4M50G7D | QPSK | 21.86 | 0.153 |
| LTE Band 2 | 1852.5 ~ 1907.5 | 4M48W7D | 16QAM | 20.99 | 0.126 |
| LTE Band 2 | 1852.5 ~ 1907.5 | 4M50W7D | 64QAM | 20.17 | 0.104 |
| LTE Band 2 | 1851.5 ~ 1908.5 | 2M70G7D | QPSK | 22.22 | 0.167 |
| LTE Band 2 | 1851.5 ~ 1908.5 | 2M69W7D | 16QAM | 21.49 | 0.141 |
| LTE Band 2 | 1851.5 ~ 1908.5 | 2M69W7D | 64QAM | 20.45 | 0.111 |
| LTE Band 2 | 1850.7 ~ 1909.3 | 1M09G7D | QPSK | 21.94 | 0.156 |
| LTE Band 2 | 1850.7 ~ 1909.3 | 1M09W7D | 16QAM | 21.32 | 0.136 |
| LTE Band 2 | 1850.7 ~ 1909.3 | 1M09W7D | 64QAM | 20.27 | 0.106 |

# 2. INTRODUCTION

## 2.1 EUT DESCRIPTION

The Equipment Under Test (EUT) supports GSM/WCDMA/LTE Phone with Bluetooth, WLAN, NFC, WPC.

## 2.2. EUT CAPABILITIES

This EUT contains the following capabilities:
850/1900 GSM, 1700/1900 WCDMA/HSUPA, Multi-band LTE, 802.11b/g/n/ac WLAN(2.4GHz)
802.11a/n/ac WLAN(5GHz), Bluetooth(BDR, EDR, LE), NFC, WPC, Dual Display.

## 2.3. TESTING ENVIRONMENT

| **Ambient Condition** | |
|---|---|
| ▪ Temperature | +22 ℃ ~ +25 ℃ |
| ▪ Relative Humidity | 41 % ~ 45 % |

## 2.4 MEASURING INSTRUMENT CALIBRATION

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

## 2.5. MEASUREMENT UNCERTAINTY

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

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

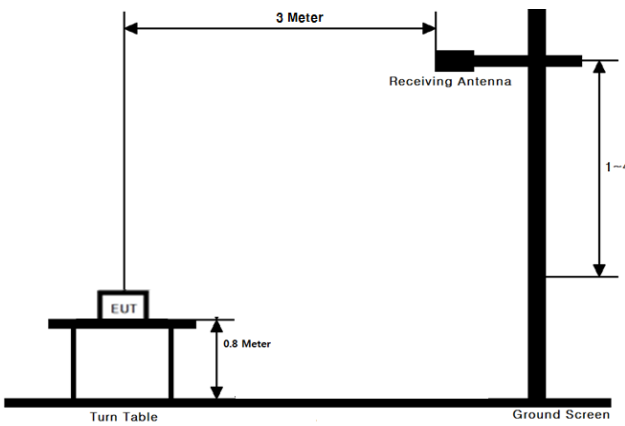
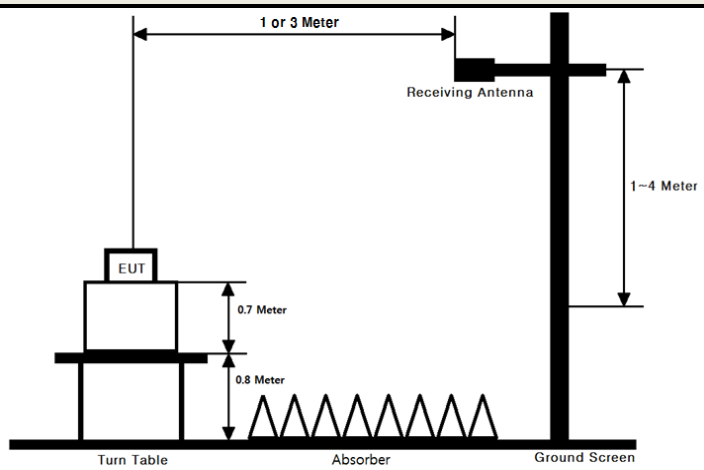
## 2.6. TEST FACILITY

| **DT&C Co., Ltd.** | | |
|---|---|---|
| The 3 m test site and conducted measurement facility used to collect the radiated data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042.<br>The test site comply with the requirements of § 2.948 according to ANSI 63.4-2014.<br><br>**- FCC MRA Accredited Test Firm No. : KR0034** | | |
| 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 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*

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

<u>Test setting</u>

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

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

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

A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminal of the substitute antenna is measured.

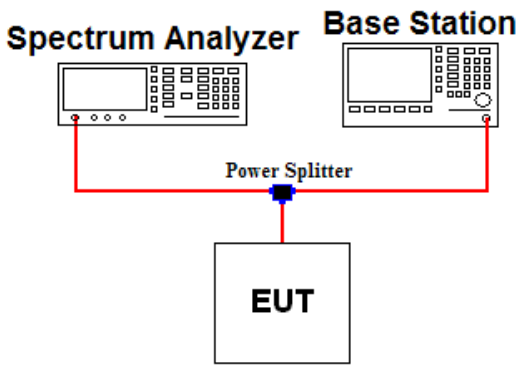
The ERP/EIRP is calculated using the following formula:

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

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

## 3.2 PEAK TO AVERAGE RATIO

### *Test set-up*




### *Test Procedure*

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

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

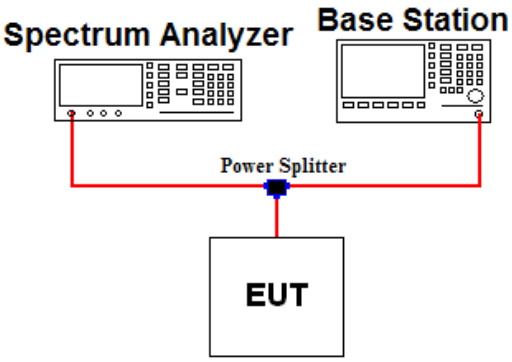
Test setting

The spectrum Analyzer`s CCDF measurement function is enabled.

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

## 3.3 OCCUPIED BANDWIDTH.

### *Test set-up*




### *Test Procedure*

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

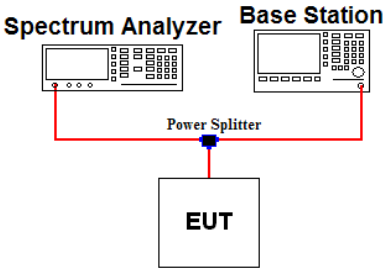
The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power of a given emission.

Test setting

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

## 3.4 BAND EDGE EMISSIONS AT ANTENNA TERMINAL

### *Test set-up*




### *Test Procedure*

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

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

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

Test setting

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

Note 1: Per Part 22.917(b)(1) / 24.238(b) / 27.53(h) in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

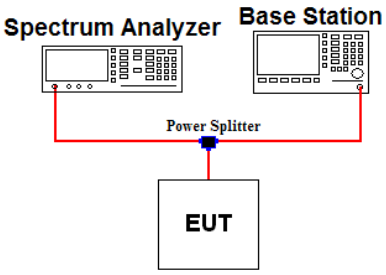
Note 2: Per Part 27(g) for operations in the 600 MHz band and the 698-746 MHz band, compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a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

Note 3: For part 27.53(m)(4) the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz.

Note 4: Per part 27.53(m)(6) in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the 1 MHz band is 2495-2496 MHz, in which case a resolution bandwidth of at least one percent may be employed.

## 3.5 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL

### *Test set-up*




### *Test Procedure*

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

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

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

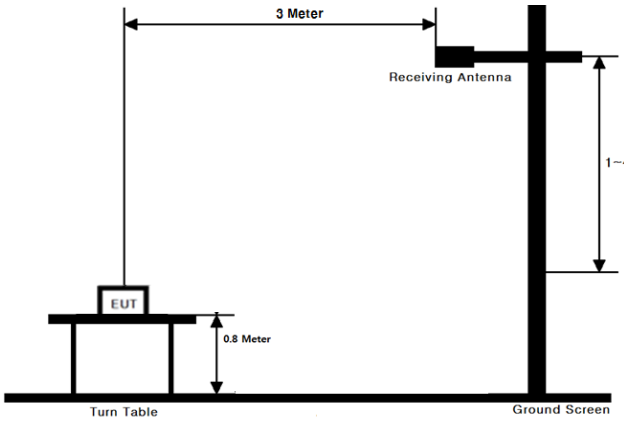
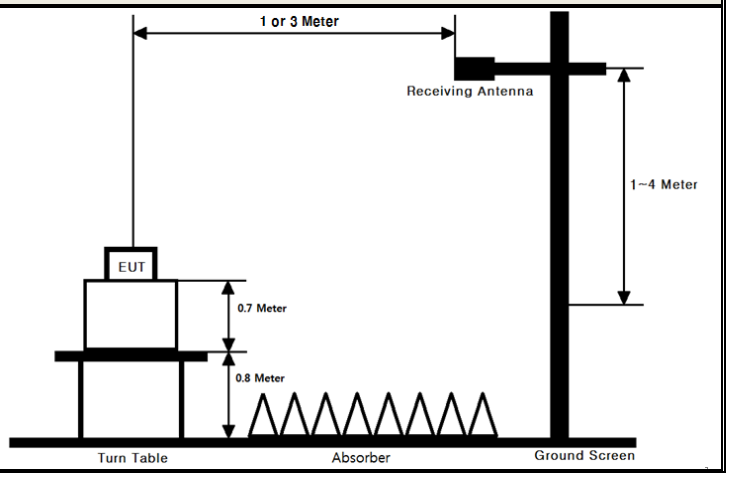
Test setting

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

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

## 3.6 UNDESIRABLE EMISSIONS

### *Test Set-up*

| Below 1GHz | Above 1GHz |
|---|---|
|   |   |

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

### *Test Procedure*

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

Test setting

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

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

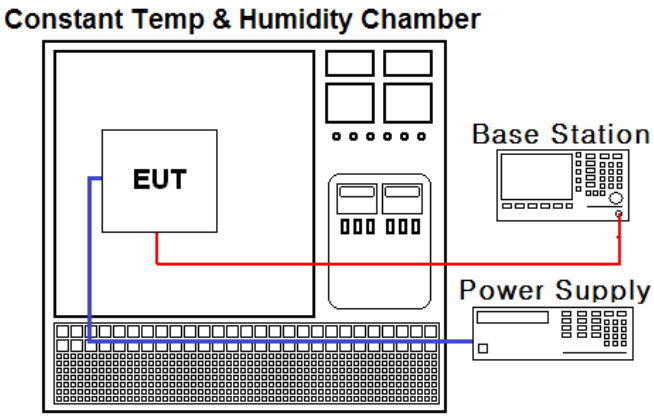
For radiated power measurements below 1 GHz, a half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same spectrum analyzer reading.

For radiated power measurements above 1 GHz, a Horn antenna was substituted in place of the EUT. This Horn antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same spectrum analyzer reading. The difference between the gain of the horn and an isotropic antenna are taken into consideration.

This measurement was performed with the EUT oriented in 3 orthogonal axis.

## 3.7 FREQUENCY STABILITY

### *Test Set-up*




### *Test Procedure*

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

The frequency stability of the transmitter is measured by:

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

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

**Specification:**

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

**Time Period and Procedure:**

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

2. The equipment is turned on in a “standby” condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.

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

# 4. LIST OF TEST EQUIPMENT

| Type | Manufacturer | Model | Cal.Date (yy/mm/dd) | Next.Cal. Date (yy/mm/dd) | S/N |
|---|---|---|---|---|---|
| Spectrum Analyzer | Agilent Technologies | N9020A | 19/06/26 | 20/06/26 | MY46471251 |
| Spectrum Analyzer | Agilent Technologies | N9020A | 19/06/26 | 20/06/26 | MY50410163 |
| DC power supply | Agilent Technologies | 66332A | 19/06/25 | 20/06/25 | MY43001172 |
| Multimeter | FLUKE | 17B+ | 18/12/18<br>19/12/17 | 19/12/18<br>20/12/17 | 36390701WS |
| Power Splitter | Anritus | K241B | 18/12/19<br>19/12/18 | 19/12/19<br>20/12/18 | 016681 |
| Temp & Humi | SJ Science | SJ-TH-S50 | 19/06/25 | 20/06/25 | U5542113 |
| Radio Communication Analyzer | Anritus | MT8820C | 19/06/26 | 20/06/26 | 6201127429 |
| Thermohygrometer | BODYCOM | BJ5478 | 18/12/27<br>19/12/16 | 19/12/27<br>20/12/16 | 120612-2 |
| Thermohygrometer | BODYCOM | BJ5478 | 18/12/27<br>19/12/16 | 19/12/27<br>20/12/16 | 120612-1 |
| Signal Generator | Rohde Schwarz | SMBV100A | 18/12/19<br>19/12/16 | 19/12/19<br>20/12/16 | 255571 |
| Signal Generator | ANRITSU | MG3695C | 18/12/20<br>19/12/16 | 19/12/20<br>20/12/16 | 173501 |
| Loop Antenna | ETS-Lindgren | 6502 | 19/09/18 | 21/09/18 | 00226186 |
| Bilog Antenna | Schwarzbeck | VULB 9160 | 19/04/23 | 21/04/23 | 9160-3362 |
| Dipole Antenna | Schwarzbeck | VHA9103 | 19/02/28 | 21/02/28 | 2116 |
| Dipole Antenna | Schwarzbeck | VHA9103 | 18/04/13 | 20/04/13 | 2117 |
| Dipole Antenna | Schwarzbeck | UHA9105 | 19/02/28 | 21/02/28 | 2261 |
| Dipole Antenna | Schwarzbeck | UHA9105 | 18/04/13 | 20/04/13 | 2262 |
| HORN ANT | ETS | 3117 | 18/05/10 | 20/05/10 | 00140394 |
| HORN ANT | ETS | 3117 | 18/03/26 | 20/03/26 | 00152145 |
| HORN ANT | A.H.Systems | SAS-574 | 19/04/23 | 21/04/23 | 154 |
| HORN ANT | A.H.Systems | SAS-574 | 19/07/03 | 21/07/03 | 155 |
| Amplifier | EMPOWER | BBS3Q7ELU | 19/06/24 | 20/06/24 | 1020 |
| PreAmplifier | H.P | 8447D | 18/12/18<br>19/12/16 | 19/12/18<br>20/12/16 | 2944A07774 |
| PreAmplifier | Agilent | 8449B | 19/06/27 | 20/06/27 | 3008A02108 |
| High-pass filter | Wainwright | WHKX12-935-1000-15000-40SS | 19/06/24 | 20/06/24 | 7 |
| High-pass filter | Wainwright | WHKX12-2580-3000-18000-80SS | 19/06/24 | 20/06/24 | 3 |
| High-pass filter | Wainwright | WHNX8.5/26.5G-6SS | 19/06/24 | 20/06/24 | 1 |
| Cable | DTNC | Cable | 19/01/16 | 20/01/16 | M-01 |
| Cable | DTNC | Cable | 19/01/16 | 20/01/16 | M-02 |
| Cable | Junkosha | MWX315 | 19/01/16 | 20/01/16 | M-05 |
| Cable | Junkosha | MWX221 | 19/01/16 | 20/01/16 | M-06 |
| Cable | DTNC | Cable | 19/01/16 | 20/01/16 | RF-84 |

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 Note2 |
| 2.1049 | Occupied Bandwidth | N/A | | C |
| 24.232(d)<br>27.50(d.5) | Peak to Average Ratio | < 13 dB | | C |
| 2.1051<br>22.917(a)<br>24.238(a)<br>27.53(c)<br>27.53(g)<br>27.53(h) | Band Edge / Conducted Spurious Emissions | > 43 + $10\log_{10}$(P) dB at Band edge and for all out-of-band emissions | | C |
| 2.1055<br>22.355<br>24.235<br>27.54 | Frequency Stability | < 2.5 ppm (Part 22)<br>Fundamental emissions must stay within Authorized frequency block<br>(Part 24, 27) | | C |
| 27.50(b.10)<br>27.50(c.10) | Radiated Output Power (B12,13,17) | < 3 Watts max. ERP | Radiated | C |
| 22.913(a.5) | Radiated Output Power (B5) | < 7 Watts max. ERP | | C |
| 27.50(d.4) | Radiated Output Power (B4) | < 1 Watts max. EIRP | | C |
| 24.232(c) | Radiated Output Power(B2) | < 2 Watts max. EIRP | | C |
| 2.1053<br>22.917(a)<br>24.238(a)<br>27.53(c.2)<br>27.53(g)<br>27.53(h) | Undesirable Emissions | > 43 + $10\log_{10}$(P) dB for all out-of-band emissions | | C |
| 27.53(f) | Undesirable Emissions in 1559 ~ 1610MHz | < -70 dBW/MHz<br>(for wideband signals)<br>< -80 dBW<br>(for discrete emissions of less than 700 Hz bandwidth) | | C |

Note 1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable
Note 2: Refer to RF Exposure Report (Test Report SAR)
Note 3: This device supports wireless charging & Can use Dual Screen.
So per KDB648474 D03v01r04, the radiated test items were performed all not charging, charging and Dual Screen conditions. For wireless charging condition, the handset is placed on the representative charging pad under normal conditions and in a simulated call configuration.
And the worst case data was reported.

# 6. SAMPLE CALCULATION

## A. Emission Designator

**LTE Band 12, 17(QPSK)**

Emission Designator = **8M94G7D**
LTE OBW = 8.938 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data Transmission

**LTE Band 12, 17(16QAM)**

Emission Designator = **8M92W7D**
LTE OBW = 8.921 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data Transmission

**LTE Band 12, 17(64QAM)**

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

**LTE Band 13(QPSK)**

Emission Designator = **8M93G7D**
LTE OBW = 8.931 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data Transmission

**LTE Band 13(16QAM)**

Emission Designator **= 8M90W7D**
LTE OBW = 8.899 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data Transmission

**LTE Band 13(64QAM)**

Emission Designator **= 8M94W7D**
LTE OBW = 8.940 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data Transmission

**LTE Band 5(QPSK)**

Emission Designator = **8M95G7D**
LTE OBW = 8.945 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data Transmission

**LTE Band 5(16QAM)**

Emission Designator = **8M95W7D**
LTE OBW = 8.951 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data Transmission

**LTE Band 5(64QAM)**

Emission Designator = **8M94W7D**
LTE OBW = 8.939 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data Transmission

**LTE Band 4(QPSK)**

Emission Designator = **17M9G7D**
LTE OBW = 17.878 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data Transmission

**LTE Band 4(16QAM)**

Emission Designator = **17M9W7D**
LTE OBW = 17.872 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data Transmission

**LTE Band 4(64QAM)**

Emission Designator = **17M9W7D**
LTE OBW = 17.901 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data Transmission

**LTE Band 2(QPSK)**

Emission Designator =**17M9G7D**
LTE OBW = 17.857 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data Transmission

**LTE Band 2(16QAM)**

Emission Designator = **17M9W7D**
LTE OBW = 17.885 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data Transmission

**LTE Band 2(64QAM)**

Emission Designator = **17M9W7D**
LTE OBW = 17.858 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data Transmission

# B. For substitution method

### EIRP for Band 2

| Channel Bandwidth (MHz) | Test Frequency (MHz) | Test Mode | RB Size/ Offset | Spectrum Reading Value(dBm) | Ant Pol (H/V) | Generator Output (dBm) | T.F (dB)Note1 | Level(dBm) @ Ant Terminal | TX Ant Gain (dBi) | EIRP (dBm) | EIRP (W) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 1900 | QPSK | 1/0 | -27.04 | V | -27.68 | 45.98 | 18.30 | 4.69 | 22.99 | 0.199 |

Level (dBm) @ ant Terminal = Generator output(dBm) + Gain or Loss of equipments

**ERP or EIRP = Level @ Ant Terminal Level(dBm) + Tx Ant. Gain**

1) The EUT mounted on a non-conductive turntable is 0.8 meter above test site ground level.
2) During the test, the turn table is rotated until the maximum signal is found.
3) Record the field strength meter's level.
4) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.
5) Increase the signal generator output till the field strength meter's level is equal to the item (3).
6) The signal generator output level with substituted antenna gain is the rating of ERP, EIRP or Radiated spurious emission.

Note 1: For the radiated output power was used power amplifier and cable. (T.F= power amplifier gain[dB] + cable loss[dB])
For the radiated spurious emission was used cable only. (T.F= cable loss[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 ERP & EIRP

### 7.5.1 LTE Band 12, 17

**- Measurement data: Without wireless charging pad**

| 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) | Note |
|---|---|---|---|---|---|---|---|---|---|
| 10 | 704 | QPSK | 1/49 | H | 18.94 | -0.65 | 18.29 | 0.067 | - |
| | | 16QAM | 1/49 | H | 18.00 | -0.65 | 17.35 | 0.054 | - |
| | | 64QAM | 1/49 | H | 16.81 | -0.65 | 16.16 | 0.041 | - |
| | 711 | QPSK | 1/49 | H | 19.33 | -0.63 | 18.70 | 0.074 | - |
| | | 16QAM | 1/49 | H | 18.55 | -0.63 | 17.92 | 0.062 | - |
| | | 64QAM | 1/49 | H | 18.05 | -0.63 | 17.42 | 0.055 | - |
| 5 | 701.5 | QPSK | 1/12 | H | 18.91 | -0.66 | 18.25 | 0.067 | - |
| | | 16QAM | 1/12 | H | 17.86 | -0.66 | 17.20 | 0.052 | - |
| | | 64QAM | 1/12 | H | 17.29 | -0.66 | 16.63 | 0.046 | - |
| | 707.5 | QPSK | 1/12 | H | 18.64 | -0.64 | 18.00 | 0.063 | - |
| | | 16QAM | 1/12 | H | 18.10 | -0.64 | 17.46 | 0.056 | - |
| | | 64QAM | 1/12 | H | 17.03 | -0.64 | 16.39 | 0.044 | - |
| | 713.5 | QPSK | 1/12 | H | 19.40 | -0.62 | 18.78 | 0.076 | - |
| | | 16QAM | 1/12 | H | 18.93 | -0.62 | 18.31 | 0.068 | - |
| | | 64QAM | 1/12 | H | 17.99 | -0.62 | 17.37 | 0.055 | - |
| | | QPSK | 1/12 | H | 19.04 | -0.62 | 18.42 | 0.070 | With Dual Display (180˚) |

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

### 7.5.2 LTE Band 12

**- Measurement data: Without wireless charging pad**

| 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) | Note |
|---|---|---|---|---|---|---|---|---|---|
| 3 | 700.5 | QPSK | 1/7 | H | 18.64 | -0.66 | 17.98 | 0.063 | - |
| | | 16QAM | 1/7 | H | 18.22 | -0.66 | 17.56 | 0.057 | - |
| | | 64QAM | 1/7 | H | 16.98 | -0.66 | 16.32 | 0.043 | - |
| | 707.5 | QPSK | 1/7 | H | 18.87 | -0.64 | 18.23 | 0.067 | - |
| | | 16QAM | 1/7 | H | 17.78 | -0.64 | 17.14 | 0.052 | - |
| | | 64QAM | 1/7 | H | 17.05 | -0.64 | 16.41 | 0.044 | - |
| | 714.5 | QPSK | 1/7 | H | 19.38 | -0.62 | 18.76 | 0.075 | - |
| | | 16QAM | 1/7 | H | 18.52 | -0.62 | 17.90 | 0.062 | - |
| | | 64QAM | 1/7 | H | 17.55 | -0.62 | 16.93 | 0.049 | - |
| 1.4 | 699.7 | QPSK | 1/2 | H | 19.02 | -0.66 | 18.36 | 0.069 | - |
| | | 16QAM | 1/2 | H | 18.28 | -0.66 | 17.62 | 0.058 | - |
| | | 64QAM | 1/2 | H | 17.18 | -0.66 | 16.52 | 0.045 | - |
| | 707.5 | QPSK | 1/2 | H | 18.45 | -0.64 | 17.81 | 0.060 | - |
| | | 16QAM | 1/2 | H | 18.11 | -0.64 | 17.47 | 0.056 | - |
| | | 64QAM | 1/2 | H | 16.82 | -0.64 | 16.18 | 0.041 | - |
| | 715.3 | QPSK | 1/2 | H | 19.37 | -0.62 | 18.75 | 0.075 | - |
| | | 16QAM | 1/2 | H | 18.73 | -0.62 | 18.11 | 0.065 | - |
| | | 64QAM | 1/2 | H | 17.59 | -0.62 | 16.97 | 0.050 | - |

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

**- Measurement data: With wireless charging pad**

| 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) | Note |
|---|---|---|---|---|---|---|---|---|---|
| 10 | 711 | QPSK | 1/49 | H | 19.61 | -0.63 | 18.98 | 0.079 | - |
| | | 16QAM | 1/49 | H | 18.65 | -0.63 | 18.02 | 0.063 | - |
| | | 64QAM | 1/49 | H | 17.87 | -0.63 | 17.24 | 0.053 | - |
| 5 | 713.5 | QPSK | 1/12 | H | 19.35 | -0.62 | 18.73 | 0.075 | - |
| | | 16QAM | 1/12 | H | 18.56 | -0.62 | 17.94 | 0.062 | - |
| | | 64QAM | 1/12 | H | 17.66 | -0.62 | 17.04 | 0.051 | - |
| | | QPSK | 1/12 | H | 19.68 | -0.62 | 19.06 | 0.081 | With Dual Display (180°) |
| 3 | 714.5 | QPSK | 1/7 | H | 18.88 | -0.62 | 18.26 | 0.067 | - |
| | | 16QAM | 1/7 | H | 18.08 | -0.62 | 17.46 | 0.056 | - |
| | | 64QAM | 1/7 | H | 17.13 | -0.62 | 16.51 | 0.045 | - |
| 1.4 | 715.3 | QPSK | 1/2 | H | 19.67 | -0.62 | 19.05 | 0.080 | - |
| | | 16QAM | 1/2 | H | 18.88 | -0.62 | 18.26 | 0.067 | - |
| | | 64QAM | 1/2 | H | 17.79 | -0.62 | 17.17 | 0.052 | - |

Note1: This device was tested under all bandwidths, modulations and RB configurations and the worst case data are reported in the table above.

### 7.5.3 LTE Band 13

**- Measurement data: Without wireless charging pad**

| 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) | Note |
|---|---|---|---|---|---|---|---|---|---|
| 10 | 782 | QPSK | 1/49 | H | 16.24 | -0.45 | 15.79 | 0.038 | - |
| | | 16QAM | 1/49 | H | 15.42 | -0.45 | 14.97 | 0.031 | - |
| | | 64QAM | 1/49 | H | 14.83 | -0.45 | 14.38 | 0.027 | - |
| 5 | 779.5 | QPSK | 1/24 | H | 17.40 | -0.45 | 16.95 | 0.050 | - |
| | | 16QAM | 1/24 | H | 16.92 | -0.45 | 16.47 | 0.044 | - |
| | | 64QAM | 1/24 | H | 15.61 | -0.45 | 15.16 | 0.033 | - |
| | | QPSK | 1/24 | H | 17.60 | -0.45 | 17.15 | 0.052 | With Dual Display (180°) |
| | 784.5 | QPSK | 1/12 | H | 17.00 | -0.44 | 16.56 | 0.045 | - |
| | | 16QAM | 1/12 | H | 16.21 | -0.44 | 15.77 | 0.038 | - |
| | | 64QAM | 1/12 | H | 15.38 | -0.44 | 14.94 | 0.031 | - |

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

**- Measurement data: With wireless charging pad**

| 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) | Note |
|---|---|---|---|---|---|---|---|---|---|
| 10 | 782 | QPSK | 1/49 | H | 16.09 | -0.45 | 15.64 | 0.037 | - |
| | | 16QAM | 1/49 | H | 15.85 | -0.45 | 15.40 | 0.035 | - |
| | | 64QAM | 1/49 | H | 14.69 | -0.45 | 14.24 | 0.027 | - |
| 5 | 779.5 | QPSK | 1/24 | H | 17.60 | -0.45 | 17.15 | 0.052 | - |
| | | 16QAM | 1/24 | H | 17.51 | -0.45 | 17.06 | 0.051 | - |
| | | 64QAM | 1/24 | H | 16.91 | -0.45 | 16.46 | 0.044 | - |
| | | QPSK | 1/24 | H | 16.08 | -0.45 | 15.63 | 0.037 | With Dual Display (180°) |

Note1: This device was tested under all bandwidths, modulations and RB configurations and the worst case data are reported in the table above.

### 7.5.4 LTE Band 5

**- Measurement data: Without wireless charging pad**

| 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) | Note |
|---|---|---|---|---|---|---|---|---|---|
| 10 | 829 | QPSK | 1/25 | H | 15.51 | -0.67 | 14.84 | 0.030 | - |
| | | 16QAM | 1/25 | H | 14.61 | -0.67 | 13.94 | 0.025 | - |
| | | 64QAM | 1/25 | H | 13.57 | -0.67 | 12.90 | 0.019 | - |
| | 836.5 | QPSK | 1/25 | H | 16.24 | -0.74 | 15.50 | 0.035 | - |
| | | 16QAM | 1/25 | H | 15.39 | -0.74 | 14.65 | 0.029 | - |
| | | 64QAM | 1/25 | H | 14.76 | -0.74 | 14.02 | 0.025 | - |
| | 844 | QPSK | 1/25 | H | 17.12 | -0.81 | 16.31 | 0.043 | - |
| | | 16QAM | 1/25 | H | 16.68 | -0.81 | 15.87 | 0.039 | - |
| | | 64QAM | 1/25 | H | 15.56 | -0.81 | 14.75 | 0.030 | - |
| 5 | 826.5 | QPSK | 1/12 | H | 15.40 | -0.65 | 14.75 | 0.030 | - |
| | | 16QAM | 1/12 | H | 15.24 | -0.65 | 14.59 | 0.029 | - |
| | | 64QAM | 1/12 | H | 13.69 | -0.65 | 13.04 | 0.020 | - |
| | 836.5 | QPSK | 1/12 | H | 16.45 | -0.74 | 15.71 | 0.037 | - |
| | | 16QAM | 1/12 | H | 15.86 | -0.74 | 15.12 | 0.033 | - |
| | | 64QAM | 1/12 | H | 14.92 | -0.74 | 14.18 | 0.026 | - |
| | 846.5 | QPSK | 1/12 | H | 17.44 | -0.83 | 16.61 | 0.046 | - |
| | | 16QAM | 1/12 | H | 16.66 | -0.83 | 15.83 | 0.038 | - |
| | | 64QAM | 1/12 | H | 15.46 | -0.83 | 14.63 | 0.029 | - |
| | | QPSK | 1/12 | H | 16.46 | -0.83 | 15.63 | 0.037 | With Dual Display (90˚) |
| 3 | 825.5 | QPSK | 1/7 | H | 15.23 | -0.64 | 14.59 | 0.029 | - |
| | | 16QAM | 1/7 | H | 14.47 | -0.64 | 13.83 | 0.024 | - |
| | | 64QAM | 1/7 | H | 13.59 | -0.64 | 12.95 | 0.020 | - |
| | 836.5 | QPSK | 1/7 | H | 16.82 | -0.74 | 16.08 | 0.041 | - |
| | | 16QAM | 1/7 | H | 16.33 | -0.74 | 15.59 | 0.036 | - |
| | | 64QAM | 1/7 | H | 14.82 | -0.74 | 14.08 | 0.026 | - |
| | 847.5 | QPSK | 1/7 | H | 17.40 | -0.84 | 16.56 | 0.045 | - |
| | | 16QAM | 1/7 | H | 16.75 | -0.84 | 15.91 | 0.039 | - |
| | | 64QAM | 1/7 | H | 15.55 | -0.84 | 14.71 | 0.030 | - |
| 1.4 | 824.7 | QPSK | 1/2 | H | 15.52 | -0.63 | 14.89 | 0.031 | - |
| | | 16QAM | 1/2 | H | 14.92 | -0.63 | 14.29 | 0.027 | - |
| | | 64QAM | 1/2 | H | 13.87 | -0.63 | 13.24 | 0.021 | - |
| | 836.5 | QPSK | 1/2 | H | 16.22 | -0.74 | 15.48 | 0.035 | - |
| | | 16QAM | 1/2 | H | 15.52 | -0.74 | 14.78 | 0.030 | - |
| | | 64QAM | 1/2 | H | 14.45 | -0.74 | 13.71 | 0.023 | - |
| | 848.3 | QPSK | 1/2 | H | 17.23 | -0.85 | 16.38 | 0.043 | - |
| | | 16QAM | 1/2 | H | 16.53 | -0.85 | 15.68 | 0.037 | - |
| | | 64QAM | 1/2 | H | 15.42 | -0.85 | 14.57 | 0.029 | - |

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

**- Measurement data: With wireless charging pad**

| Channel Bandwidth (MHz) | Test Frequency (MHz) | Test Mode | RB Size/ Offset | Ant Pol (H/V) | Level(dBm) @ Ant Terminal | TX Ant Gain (dBc) | ERP (dBm) | ERP (W) | Note |
|---|---|---|---|---|---|---|---|---|---|
| 10 | 844 | QPSK | 1/25 | H | 17.09 | -0.81 | 16.28 | 0.042 | - |
| | | 16QAM | 1/25 | H | 16.45 | -0.81 | 15.64 | 0.037 | - |
| | | 64QAM | 1/25 | H | 15.39 | -0.81 | 14.58 | 0.029 | - |
| 5 | 846.5 | QPSK | 1/12 | H | 17.40 | -0.83 | 16.57 | 0.045 | - |
| | | 16QAM | 1/12 | H | 16.59 | -0.83 | 15.76 | 0.038 | - |
| | | 64QAM | 1/12 | H | 15.24 | -0.83 | 14.41 | 0.028 | - |
| | | QPSK | 1/12 | H | 15.30 | -0.83 | 14.47 | 0.028 | With Dual Display (90˚) |
| 3 | 847.5 | QPSK | 1/7 | H | 17.38 | -0.84 | 16.54 | 0.045 | - |
| | | 16QAM | 1/7 | H | 16.58 | -0.84 | 15.74 | 0.037 | - |
| | | 64QAM | 1/7 | H | 15.55 | -0.84 | 14.71 | 0.030 | - |
| 1.4 | 848.3 | QPSK | 1/2 | H | 17.43 | -0.85 | 16.58 | 0.045 | - |
| | | 16QAM | 1/2 | H | 16.63 | -0.85 | 15.78 | 0.038 | - |
| | | 64QAM | 1/2 | H | 15.66 | -0.85 | 14.81 | 0.030 | - |

Note1: This device was tested under all bandwidths, modulations and RB configurations and the worst case data are reported in the table above.

### 7.5.5 LTE Band 4

**- Measurement data: Without wireless charging pad**

| Channel Bandwidth (MHz) | Test Frequency (MHz) | Test Mode | RB Size/ Offset | Ant Pol (H/V) | Level(dBm) @ Ant Terminal | TX Ant Gain (dBi) | EIRP (dBm) | EIRP (W) | Note |
|---|---|---|---|---|---|---|---|---|---|
| 20 | 1720 | QPSK | 1/50 | V | 13.02 | 5.95 | 18.97 | 0.079 | - |
| | | 16QAM | 1/50 | V | 12.48 | 5.95 | 18.43 | 0.070 | - |
| | | 64QAM | 1/50 | V | 11.18 | 5.95 | 17.13 | 0.052 | - |
| | 1732.5 | QPSK | 1/50 | V | 13.65 | 5.84 | 19.49 | 0.089 | - |
| | | 16QAM | 1/50 | V | 12.70 | 5.84 | 18.54 | 0.071 | - |
| | | 64QAM | 1/50 | V | 11.71 | 5.84 | 17.55 | 0.057 | - |
| | 1745 | QPSK | 1/50 | V | 13.17 | 5.73 | 18.90 | 0.078 | - |
| | | 16QAM | 1/50 | V | 12.44 | 5.73 | 18.17 | 0.066 | - |
| | | 64QAM | 1/50 | V | 11.35 | 5.73 | 17.08 | 0.051 | - |
| 15 | 1717.5 | QPSK | 1/36 | V | 12.25 | 5.97 | 18.22 | 0.066 | - |
| | | 16QAM | 1/36 | V | 11.49 | 5.97 | 17.46 | 0.056 | - |
| | | 64QAM | 1/36 | V | 10.59 | 5.97 | 16.56 | 0.045 | - |
| | 1732.5 | QPSK | 1/36 | V | 14.05 | 5.84 | 19.89 | 0.097 | - |
| | | 16QAM | 1/36 | V | 13.89 | 5.84 | 19.73 | 0.094 | - |
| | | 64QAM | 1/36 | V | 12.41 | 5.84 | 18.25 | 0.067 | - |
| | 1747.5 | QPSK | 1/36 | V | 13.73 | 5.70 | 19.43 | 0.088 | - |
| | | 16QAM | 1/36 | V | 13.14 | 5.70 | 18.84 | 0.077 | - |
| | | 64QAM | 1/36 | V | 11.66 | 5.70 | 17.36 | 0.054 | - |
| 10 | 1715 | QPSK | 1/25 | V | 11.99 | 6.00 | 17.99 | 0.063 | - |
| | | 16QAM | 1/25 | V | 11.41 | 6.00 | 17.41 | 0.055 | - |
| | | 64QAM | 1/25 | V | 10.28 | 6.00 | 16.28 | 0.042 | - |
| | 1732.5 | QPSK | 1/25 | V | 14.42 | 5.84 | 20.26 | 0.106 | - |
| | | 16QAM | 1/25 | V | 13.76 | 5.84 | 19.60 | 0.091 | - |
| | | 64QAM | 1/25 | V | 12.56 | 5.84 | 18.40 | 0.069 | - |
| | 1750 | QPSK | 1/25 | V | 15.26 | 5.68 | 20.94 | 0.124 | - |
| | | 16QAM | 1/25 | V | 14.44 | 5.68 | 20.12 | 0.103 | - |
| | | 64QAM | 1/25 | V | 13.28 | 5.68 | 18.96 | 0.079 | - |

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

| Channel Bandwidth (MHz) | Test Frequency (MHz) | Test Mode | RB Size/ Offset | Ant Pol (H/V) | Level(dBm) @ Ant Terminal | TX Ant Gain (dBi) | EIRP (dBm) | EIRP (W) | Note |
|---|---|---|---|---|---|---|---|---|---|
| 5 | 1712.5 | QPSK | 1/12 | V | 12.16 | 6.02 | 18.18 | 0.066 | - |
| | | 16QAM | 1/12 | V | 11.94 | 6.02 | 17.96 | 0.063 | - |
| | | 64QAM | 1/12 | V | 10.51 | 6.02 | 16.53 | 0.045 | - |
| | 1732.5 | QPSK | 1/12 | V | 14.08 | 5.84 | 19.92 | 0.098 | - |
| | | 16QAM | 1/12 | V | 13.63 | 5.84 | 19.47 | 0.089 | - |
| | | 64QAM | 1/12 | V | 12.30 | 5.84 | 18.14 | 0.065 | - |
| | 1752.5 | QPSK | 1/12 | V | 14.79 | 5.65 | 20.44 | 0.111 | - |
| | | 16QAM | 1/12 | V | 13.89 | 5.65 | 19.54 | 0.090 | - |
| | | 64QAM | 1/12 | V | 13.27 | 5.65 | 18.92 | 0.078 | - |
| 3 | 1711.5 | QPSK | 1/7 | V | 12.35 | 6.03 | 18.38 | 0.069 | - |
| | | 16QAM | 1/7 | V | 11.65 | 6.03 | 17.68 | 0.059 | - |
| | | 64QAM | 1/7 | V | 10.81 | 6.03 | 16.84 | 0.048 | - |
| | 1732.5 | QPSK | 1/7 | V | 14.64 | 5.84 | 20.48 | 0.112 | - |
| | | 16QAM | 1/7 | V | 13.89 | 5.84 | 19.73 | 0.094 | - |
| | | 64QAM | 1/7 | V | 13.06 | 5.84 | 18.90 | 0.078 | - |
| | 1753.5 | QPSK | 1/7 | V | 14.96 | 5.63 | 20.59 | 0.115 | - |
| | | 16QAM | 1/7 | V | 14.03 | 5.63 | 19.66 | 0.092 | - |
| | | 64QAM | 1/7 | V | 13.38 | 5.63 | 19.01 | 0.080 | - |
| 1.4 | 1710.7 | QPSK | 1/2 | V | 12.26 | 6.03 | 18.29 | 0.067 | - |
| | | 16QAM | 1/2 | V | 11.53 | 6.03 | 17.56 | 0.057 | - |
| | | 64QAM | 1/2 | V | 10.41 | 6.03 | 16.44 | 0.044 | - |
| | 1732.5 | QPSK | 1/2 | V | 14.89 | 5.84 | 20.73 | 0.118 | - |
| | | 16QAM | 1/2 | V | 14.21 | 5.84 | 20.05 | 0.101 | - |
| | | 64QAM | 1/2 | V | 13.11 | 5.84 | 18.95 | 0.079 | - |
| | 1754.3 | QPSK | 1/2 | V | 15.43 | 5.62 | 21.05 | 0.127 | - |
| | | 16QAM | 1/2 | V | 14.52 | 5.62 | 20.14 | 0.103 | - |
| | | 64QAM | 1/2 | V | 13.32 | 5.62 | 18.94 | 0.078 | - |
| | | QPSK | 1/2 | V | 16.23 | 5.62 | 21.85 | 0.153 | With Dual Display (90˚) |

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

**Measurement data: With wireless charging pad**

| Channel Bandwidth (MHz) | Test Frequency (MHz) | Test Mode | RB Size/ Offset | Ant Pol (H/V) | Level(dBm) @ Ant Terminal | TX Ant Gain (dBi) | EIRP (dBm) | EIRP (W) | Note |
|---|---|---|---|---|---|---|---|---|---|
| 20 | 1732.5 | QPSK | 1/50 | H | 15.63 | 5.84 | 21.47 | 0.140 | - |
| | | 16QAM | 1/50 | H | 14.77 | 5.84 | 20.61 | 0.115 | - |
| | | 64QAM | 1/50 | H | 14.78 | 5.84 | 20.62 | 0.115 | - |
| 15 | 1732.5 | QPSK | 1/36 | H | 14.72 | 5.84 | 20.56 | 0.114 | - |
| | | 16QAM | 1/36 | H | 14.06 | 5.84 | 19.90 | 0.098 | - |
| | | 64QAM | 1/36 | H | 12.70 | 5.84 | 18.54 | 0.071 | - |
| 10 | 1750 | QPSK | 1/25 | H | 14.62 | 5.68 | 20.30 | 0.107 | - |
| | | 16QAM | 1/25 | H | 13.99 | 5.68 | 19.67 | 0.093 | - |
| | | 64QAM | 1/25 | H | 12.81 | 5.68 | 18.49 | 0.071 | - |
| 5 | 1752.5 | QPSK | 1/12 | H | 14.59 | 5.65 | 20.24 | 0.106 | - |
| | | 16QAM | 1/12 | H | 14.03 | 5.65 | 19.68 | 0.093 | - |
| | | 64QAM | 1/12 | H | 12.80 | 5.65 | 18.45 | 0.070 | - |
| 3 | 1753.5 | QPSK | 1/7 | H | 14.75 | 5.63 | 20.38 | 0.109 | - |
| | | 16QAM | 1/7 | H | 13.97 | 5.63 | 19.60 | 0.091 | - |
| | | 64QAM | 1/7 | H | 12.80 | 5.63 | 18.43 | 0.070 | - |
| 1.4 | 1754.3 | QPSK | 1/2 | H | 14.44 | 5.62 | 20.06 | 0.101 | - |
| | | 16QAM | 1/2 | H | 13.96 | 5.62 | 19.58 | 0.091 | - |
| | | 64QAM | 1/2 | H | 12.64 | 5.62 | 18.26 | 0.067 | - |
| | | QPSK | 1/2 | H | 15.95 | 5.62 | 21.57 | 0.144 | With Dual Display (90˚) |

Note1: This device was tested under all bandwidths, modulations and RB configurations and the worst case data are reported in the table above.

### 7.5.6 LTE Band 2

**- Measurement data: Without wireless charging pad**

| Channel Bandwidth (MHz) | Test Frequency (MHz) | Test Mode | RB Size/ Offset | Ant Pol (H/V) | Level(dBm) @ Ant Terminal | TX Ant Gain (dBi) | EIRP (dBm) | EIRP (W) | Note |
|---|---|---|---|---|---|---|---|---|---|
| 20 | 1860 | QPSK | 1/0 | V | 16.44 | 4.91 | 21.35 | 0.136 | - |
| | | 16QAM | 1/0 | V | 15.41 | 4.91 | 20.32 | 0.108 | - |
| | | 64QAM | 1/0 | V | 14.56 | 4.91 | 19.47 | 0.089 | - |
| | 1880 | QPSK | 1/0 | V | 16.81 | 4.80 | 21.61 | 0.145 | - |
| | | 16QAM | 1/0 | V | 16.05 | 4.80 | 20.85 | 0.122 | - |
| | | 64QAM | 1/0 | V | 14.90 | 4.80 | 19.70 | 0.093 | - |
| | 1900 | QPSK | 1/0 | V | 18.30 | 4.69 | 22.99 | 0.199 | - |
| | | 16QAM | 1/0 | V | 17.87 | 4.69 | 22.56 | 0.180 | - |
| | | 64QAM | 1/0 | V | 16.74 | 4.69 | 21.43 | 0.139 | - |
| | | QPSK | 1/0 | V | 14.61 | 4.69 | 19.30 | 0.085 | With Dual Display (90˚) |
| 15 | 1857.5 | QPSK | 1/36 | V | 15.48 | 4.92 | 20.40 | 0.110 | - |
| | | 16QAM | 1/36 | V | 14.86 | 4.92 | 19.78 | 0.095 | - |
| | | 64QAM | 1/36 | V | 14.02 | 4.92 | 18.94 | 0.078 | - |
| | 1880 | QPSK | 1/0 | V | 16.89 | 4.80 | 21.69 | 0.148 | - |
| | | 16QAM | 1/0 | V | 16.05 | 4.80 | 20.85 | 0.122 | - |
| | | 64QAM | 1/0 | V | 15.08 | 4.80 | 19.88 | 0.097 | - |
| | 1902.5 | QPSK | 1/0 | V | 17.28 | 4.68 | 21.96 | 0.157 | - |
| | | 16QAM | 1/0 | V | 16.54 | 4.68 | 21.22 | 0.132 | - |
| | | 64QAM | 1/0 | V | 15.06 | 4.68 | 19.74 | 0.094 | - |
| 10 | 1855 | QPSK | 1/25 | V | 15.67 | 4.94 | 20.61 | 0.115 | - |
| | | 16QAM | 1/25 | V | 15.25 | 4.94 | 20.19 | 0.104 | - |
| | | 64QAM | 1/25 | V | 13.89 | 4.94 | 18.83 | 0.076 | - |
| | 1880 | QPSK | 1/25 | V | 16.58 | 4.80 | 21.38 | 0.137 | - |
| | | 16QAM | 1/25 | V | 16.18 | 4.80 | 20.98 | 0.125 | - |
| | | 64QAM | 1/25 | V | 15.36 | 4.80 | 20.16 | 0.104 | - |
| | 1905 | QPSK | 1/0 | V | 16.04 | 4.67 | 20.71 | 0.118 | - |
| | | 16QAM | 1/0 | V | 15.54 | 4.67 | 20.21 | 0.105 | - |
| | | 64QAM | 1/0 | V | 14.23 | 4.67 | 18.90 | 0.078 | - |

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

| Channel Bandwidth (MHz) | Test Frequency (MHz) | Test Mode | RB Size/ Offset | Ant Pol (H/V) | Level(dBm) @ Ant Terminal | TX Ant Gain (dBi) | EIRP (dBm) | EIRP (W) | Note |
|---|---|---|---|---|---|---|---|---|---|
| 5 | 1852.5 | QPSK | 1/12 | V | 15.63 | 4.95 | 20.58 | 0.114 | - |
| | | 16QAM | 1/12 | V | 15.38 | 4.95 | 20.33 | 0.108 | - |
| | | 64QAM | 1/12 | V | 14.27 | 4.95 | 19.22 | 0.084 | - |
| | 1880 | QPSK | 1/12 | V | 16.65 | 4.80 | 21.45 | 0.140 | - |
| | | 16QAM | 1/12 | V | 15.86 | 4.80 | 20.66 | 0.116 | - |
| | | 64QAM | 1/12 | V | 15.01 | 4.80 | 19.81 | 0.096 | - |
| | 1907.5 | QPSK | 1/12 | V | 16.80 | 4.65 | 21.45 | 0.140 | - |
| | | 16QAM | 1/12 | V | 16.34 | 4.65 | 20.99 | 0.126 | - |
| | | 64QAM | 1/12 | V | 15.17 | 4.65 | 19.82 | 0.096 | - |
| 3 | 1851.5 | QPSK | 1/0 | V | 16.32 | 4.95 | 21.27 | 0.134 | - |
| | | 16QAM | 1/0 | V | 15.40 | 4.95 | 20.35 | 0.108 | - |
| | | 64QAM | 1/0 | V | 14.43 | 4.95 | 19.38 | 0.087 | - |
| | 1880 | QPSK | 1/7 | V | 17.00 | 4.80 | 21.80 | 0.151 | - |
| | | 16QAM | 1/7 | V | 16.10 | 4.80 | 20.90 | 0.123 | - |
| | | 64QAM | 1/7 | V | 15.30 | 4.80 | 20.10 | 0.102 | - |
| | 1908.5 | QPSK | 1/7 | V | 17.21 | 4.65 | 21.86 | 0.153 | - |
| | | 16QAM | 1/7 | V | 16.53 | 4.65 | 21.18 | 0.131 | - |
| | | 64QAM | 1/7 | V | 15.36 | 4.65 | 20.01 | 0.100 | - |
| 1.4 | 1850.7 | QPSK | 1/2 | V | 15.93 | 4.96 | 20.89 | 0.123 | - |
| | | 16QAM | 1/2 | V | 15.28 | 4.96 | 20.24 | 0.106 | - |
| | | 64QAM | 1/2 | V | 14.22 | 4.96 | 19.18 | 0.083 | - |
| | 1880 | QPSK | 1/2 | V | 16.90 | 4.80 | 21.70 | 0.148 | - |
| | | 16QAM | 1/2 | V | 16.32 | 4.80 | 21.12 | 0.129 | - |
| | | 64QAM | 1/2 | V | 15.13 | 4.80 | 19.93 | 0.098 | - |
| | 1909.3 | QPSK | 1/2 | V | 17.30 | 4.64 | 21.94 | 0.156 | - |
| | | 16QAM | 1/2 | V | 16.68 | 4.64 | 21.32 | 0.136 | - |
| | | 64QAM | 1/2 | V | 15.63 | 4.64 | 20.27 | 0.106 | - |

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

**- Measurement data: With wireless charging pad**

| Channel Bandwidth (MHz) | Test Frequency (MHz) | Test Mode | RB Size/ Offset | Ant Pol (H/V) | Level(dBm) @ Ant Terminal | TX Ant Gain (dBi) | EIRP (dBm) | EIRP (W) | Note |
|---|---|---|---|---|---|---|---|---|---|
| 20 | 1900 | QPSK | 1/0 | H | 18.12 | 4.69 | 22.81 | 0.191 | - |
| | | 16QAM | 1/0 | H | 17.27 | 4.69 | 21.96 | 0.157 | - |
| | | 64QAM | 1/0 | H | 16.32 | 4.69 | 21.01 | 0.126 | - |
| | | QPSK | 1/0 | H | 14.90 | 4.69 | 19.59 | 0.091 | With Dual Display (90˚) |
| 15 | 1902.5 | QPSK | 1/0 | H | 18.18 | 4.68 | 22.86 | 0.193 | - |
| | | 16QAM | 1/0 | H | 16.94 | 4.68 | 21.62 | 0.145 | - |
| | | 64QAM | 1/0 | H | 15.96 | 4.68 | 20.64 | 0.116 | - |
| 10 | 1880 | QPSK | 1/25 | H | 16.29 | 4.80 | 21.09 | 0.129 | - |
| | | 16QAM | 1/25 | H | 15.68 | 4.80 | 20.48 | 0.112 | - |
| | | 64QAM | 1/25 | H | 14.34 | 4.80 | 19.14 | 0.082 | - |
| 5 | 1907.5 | QPSK | 1/12 | H | 17.21 | 4.65 | 21.86 | 0.153 | - |
| | | 16QAM | 1/12 | H | 16.32 | 4.65 | 20.97 | 0.125 | - |
| | | 64QAM | 1/12 | H | 15.52 | 4.65 | 20.17 | 0.104 | - |
| 3 | 1908.5 | QPSK | 1/7 | H | 17.57 | 4.65 | 22.22 | 0.167 | - |
| | | 16QAM | 1/7 | H | 16.84 | 4.65 | 21.49 | 0.141 | - |
| | | 64QAM | 1/7 | H | 15.80 | 4.65 | 20.45 | 0.111 | - |
| 1.4 | 1909.3 | QPSK | 1/2 | H | 16.94 | 4.64 | 21.58 | 0.144 | - |
| | | 16QAM | 1/2 | H | 16.07 | 4.64 | 20.71 | 0.118 | - |
| | | 64QAM | 1/2 | H | 15.30 | 4.64 | 19.94 | 0.099 | - |

Note1: This device was tested under all bandwidths, modulations and RB configurations and the worst case data are reported in the table above.

## 7.6 UNDESIRABLE EMISSIONS (Radiated)

### 7.6.1 LTE Band 12, 17

**- Measurement data: Without wireless charging pad**

| B.W (MHz) | Test Freq. (MHz) | RB Size/ Offset | Test Mode | Freq.(MHz) | Ant Pol (H/V) | Level(dBm) @ Ant Terminal | TX Ant Gain(dBd) | Result | | Limit (dBc) | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | (dBm) | (dBc) | | |
| 10 | 704 | 1/49 | QPSK | 1417.81 | V | -58.74 | 2.87 | -55.87 | 74.16 | 31.29 | - |
| | | | 16QAM | 1421.59 | V | -58.47 | 2.91 | -55.56 | 72.91 | 30.35 | - |
| | | | 64QAM | 1415.98 | V | -58.52 | 2.85 | -55.67 | 71.83 | 29.16 | - |
| | 711 | 1/49 | QPSK | 1436.58 | V | -58.56 | 3.06 | -55.50 | 74.20 | 31.70 | - |
| | | | 16QAM | 1433.53 | V | -58.63 | 3.03 | -55.60 | 73.52 | 30.92 | - |
| | | | 64QAM | 1437.38 | V | -58.79 | 3.07 | -55.72 | 73.14 | 30.42 | - |
| 5 | 713.5 | 1/12 | QPSK | 1429.50 | V | -58.15 | 2.99 | -55.16 | 73.94 | 31.78 | - |
| | | | QPSK | 1427.72 | V | -58.14 | 2.97 | -55.17 | 73.59 | 31.42 | With Dual Display (180˚) |

Note 1: Limit Calculation = 43 + 10log$_{10}$ (P[Watts])
Note 2: This device was tested under all bandwidths, modulations and RB configurations and the worst case data are reported in the table above.
Note 3: The frequency spectrum is examined from 9 kHz to the 10th harmonic of the fundamental frequency of the transmitter. No other spurious and harmonic emissions were reported greater than listed emissions above table.

**- Measurement data: With wireless charging pad**

| B.W (MHz) | Test Freq. (MHz) | RB Size/ Offset | Test Mode | Freq.(MHz) | Ant Pol (H/V) | Level(dBm) @ Ant Terminal | TX Ant Gain(dBd) | Result | | Limit (dBc) | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | (dBm) | (dBc) | | |
| 5 | 713.5 | 1/12 | QPSK | 1426.59 | H | -58.03 | 2.96 | -55.07 | 73.80 | 31.73 | - |
| | | | QPSK | 1427.34 | H | -57.45 | 2.97 | -54.48 | 73.54 | 32.06 | With Dual Display (180˚) |

Note 1: Limit Calculation = 43 + 10log$_{10}$ (P[Watts])
Note 2: This device was tested under all bandwidths, modulations and RB configurations and the worst case data are reported in the table above.
Note 3: The frequency spectrum is examined from 9 kHz to the 10th harmonic of the fundamental frequency of the transmitter. No other spurious and harmonic emissions were reported greater than listed emissions above table.

### 7.6.2 LTE Band 13

**- Measurement data: Without wireless charging pad**

| B.W (MHz) | Test Freq. (MHz) | RB Size/ Offset | Test Mode | Freq.(MHz) | Ant Pol (H/V) | Level(dBm) @ Ant Terminal | TX Ant Gain(dBd) | Result | | Limit (dBc) | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | (dBm) | (dBc) | | |
| 10 | 782 | 1/49 | QPSK | 2358.88 | V | -52.93 | 3.79 | -49.14 | 64.93 | 28.79 | - |
| | | | 16QAM | 2359.11 | V | -53.70 | 3.79 | -49.91 | 64.88 | 27.97 | - |
| | | | 64QAM | 2360.57 | V | -53.04 | 3.79 | -49.25 | 63.63 | 27.38 | - |
| 5 | 779.5 | 1/24 | QPSK | 2344.65 | V | -52.35 | 3.78 | -48.57 | 65.52 | 29.95 | - |
| | | | QPSK | 2346.22 | V | -53.25 | 3.78 | -49.47 | 66.62 | 30.15 | With Dual Display (180˚) |

Note 1: Limit Calculation = 43 + $10\log_{10}$ (P[Watts])
Note 2: This device was tested under all bandwidths, modulations and RB configurations and the worst case data are reported in the table above.
Note 3: The frequency spectrum is examined from 9 kHz to the 10th harmonic of the fundamental frequency of the transmitter. No other spurious and harmonic emissions were reported greater than listed emissions above table.

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

| B.W (MHz) | Test Freq. (MHz) | RB Size/ Offset | Test Mode | Freq.(MHz) | Ant Pol (H/V) | Level(dBm) @ Ant Terminal | TX Ant Gain(dBd) | Result | | Limit (dBm/MHz) | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | (dBm) | (dB) | | |
| 10 | 782 | 1/49 | QPSK | 1569.12 | V | -58.38 | 3.81 | -54.57 | 14.57 | -40.00 | - |
| 5 | 779.5 | 1/24 | QPSK | 1563.28 | V | -58.78 | 3.80 | -54.98 | 14.98 | -40.00 | - |
| | 779.5 | 1/24 | QPSK | 1563.38 | V | -58.80 | 3.80 | -55.00 | 72.15 | -40.00 | With Dual Display (180˚) |

Note 1: Limit Calculation = −70 dBW/MHz (equivalent isotropically radiated power for wideband signals)
Note 2:This device was tested under all bandwidths, modulations and RB configurations and the worst case data are reported in the table above.

**- Measurement data: With wireless charging pad**

| B.W (MHz) | Test Freq. (MHz) | RB Size/ Offset | Test Mode | Freq.(MHz) | Ant Pol (H/V) | Level(dBm) @ Ant Terminal | TX Ant Gain(dBd) | Result | | Limit (dBc) | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | (dBm) | (dBc) | | |
| 10 | 782 | 1/49 | QPSK | 2359.04 | H | -55.54 | 3.79 | -51.75 | 67.39 | 28.64 | - |
| 5 | 779.5 | 1/24 | QPSK | 2344.16 | H | -55.19 | 3.78 | -51.41 | 68.56 | 30.15 | - |
| | | 1/24 | QPSK | 2346.59 | H | -55.19 | 3.78 | -51.41 | 51.41 | 28.63 | With Dual Display (180˚) |

Note 1: Limit Calculation = 43 + $10\log_{10}$ (P[Watts])
Note 2: This device was tested under all bandwidths, modulations and RB configurations and the worst case data are reported in the table above.
Note 3: The frequency spectrum is examined from 9 kHz to the 10th harmonic of the fundamental frequency of the transmitter. No other spurious and harmonic emissions were reported greater than listed emissions above table.

**- UNDESIRABLE EMISSIONS IN 1559~1610MHz (LTE Band 13) : With wireless charging pad**

| B.W (MHz) | Test Freq. (MHz) | RB Size/ Offset | Test Mode | Freq.(MHz) | Ant Pol (H/V) | Level(dBm) @ Ant Terminal | TX Ant Gain(dBd) | Result | | Limit (dBm/MHz) | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | (dBm) | (dB) | | |
| 10 | 782 | 1/49 | QPSK | 1573.24 | H | -58.85 | 3.81 | -55.04 | 15.04 | -40.00 | - |
| 5 | 779.5 | 1/24 | QPSK | 1562.09 | H | -58.61 | 3.81 | -54.80 | 14.80 | -40.00 | - |
| | | | QPSK | 1563.69 | H | -58.36 | 3.80 | -54.56 | 70.19 | -40.00 | With Dual Display (180˚) |

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

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

### 7.6.3 LTE Band 5

**- Measurement data: Without wireless charging pad**

| B.W (MHz) | Test Freq. (MHz) | RB Size/ Offset | Test Mode | Freq.(MHz) | Ant Pol (H/V) | Level(dBm) @ Ant Terminal | TX Ant Gain(dBd) | Result | | Limit (dBc) | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | (dBm) | (dBc) | | |
| 10 | 829 | 1/25 | QPSK | 1660.22 | H | -58.14 | 3.85 | -54.29 | 69.13 | 27.84 | - |
| | | | | 2487.13 | V | -47.67 | 3.81 | -43.86 | 58.70 | | - |
| | | | 16QAM | 1658.00 | H | -58.32 | 3.85 | -54.47 | 68.41 | 26.94 | - |
| | | | | 2487.22 | V | -49.27 | 3.81 | -45.46 | 59.40 | | - |
| | | | 64QAM | 1661.45 | H | -57.87 | 3.86 | -54.01 | 66.91 | 25.90 | - |
| | | | | 2487.19 | V | -48.85 | 3.81 | -45.04 | 57.94 | | - |
| | 836.5 | 1/25 | QPSK | 1674.62 | H | -57.91 | 3.90 | -54.01 | 69.51 | 28.50 | - |
| | | | | 2509.63 | V | -47.23 | 3.80 | -43.43 | 58.93 | | - |
| | | | 16QAM | 1674.92 | H | -57.57 | 3.90 | -53.67 | 68.32 | 27.65 | - |
| | | | | 2509.75 | V | -47.05 | 3.80 | -43.25 | 57.90 | | - |
| | | | 64QAM | 1672.37 | H | -58.46 | 3.89 | -54.57 | 68.59 | 27.02 | - |
| | | | | 2509.74 | V | -47.03 | 3.80 | -43.23 | 57.25 | | - |
| | 844 | 1/25 | QPSK | 1686.63 | H | -58.00 | 3.94 | -54.06 | 70.37 | 29.31 | - |
| | | | | 2532.29 | V | -47.15 | 3.75 | -43.40 | 59.71 | | - |
| | | | 16QAM | 1690.36 | H | -58.22 | 3.95 | -54.27 | 70.14 | 28.87 | - |
| | | | | 2532.39 | V | -46.78 | 3.75 | -43.03 | 58.90 | | - |
| | | | 64QAM | 1688.30 | H | -58.02 | 3.94 | -54.08 | 68.83 | 27.75 | - |
| | | | | 2532.41 | V | -47.79 | 3.75 | -44.04 | 58.79 | | - |
| 5 | 846.5 | 1/12 | QPSK | 1695.48 | H | -57.56 | 3.97 | -53.59 | 70.20 | 29.61 | - |
| | | | | 2539.24 | V | -47.12 | 3.73 | -43.39 | 60.00 | | - |
| | | | 16QAM | 1696.43 | H | -57.74 | 3.97 | -53.77 | 69.60 | 28.83 | - |
| | | | | 2539.40 | V | -46.63 | 3.73 | -42.90 | 58.73 | | - |
| | | | 64QAM | 1696.29 | H | -57.32 | 3.97 | -53.35 | 67.98 | 27.63 | - |
| | | | | 2539.35 | V | -47.75 | 3.73 | -44.02 | 58.65 | | - |
| | | | QPSK | 1692.71 | H | -57.53 | 3.96 | -53.57 | 74.03 | 33.46 | With Dual Display (90°) |
| | | | | 2539.79 | V | -52.22 | 3.73 | -48.49 | 68.95 | | |

Note 1: Limit Calculation = 43 + $10\log_{10}$(P[Watts])

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

Note 3: The frequency spectrum is examined from 9 kHz to the 10th harmonic of the fundamental frequency of the transmitter. No other spurious and harmonic emissions were reported greater than listed emissions above table.

**- Measurement data: With wireless charging pad**

| B.W (MHz) | Test Freq. (MHz) | RB Size/ Offset | Test Mode | Freq.(MHz) | Ant Pol (H/V) | Level(dBm) @ Ant Terminal | TX Ant Gain(dBd) | Result | | Limit (dBc) | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | (dBm) | (dBc) | | |
| 10 | 844 | 1/25 | QPSK | 1685.67 | H | -58.02 | 3.93 | -54.09 | 70.96 | 29.87 | - |
| | | | | 2532.51 | H | -54.91 | 3.75 | -51.16 | 68.03 | | |
| 5 | 846.5 | 1/12 | QPSK | 1693.25 | H | -58.05 | 3.96 | -54.09 | 71.26 | 30.17 | - |
| | | | | 2539.59 | H | -55.31 | 3.73 | -51.58 | 68.75 | | - |
| | | | QPSK | 1693.34 | H | -57.02 | 3.96 | -53.06 | 73.72 | 33.66 | With Dual Display (90°) |
| | | | | 2540.17 | H | -54.93 | 3.73 | -51.20 | 71.86 | | |

Note 1: Limit Calculation = 43 + $10\log_{10}$(P[Watts])

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

Note 3: The frequency spectrum is examined from 9 kHz to the 10th harmonic of the fundamental frequency of the transmitter. No other spurious and harmonic emissions were reported greater than listed emissions above table.

### 7.6.4 LTE Band 4

**- Measurement data: Without wireless charging pad**

| B.W (MHz) | Test Freq. (MHz) | RB Size/ Offset | Test Mode | Freq.(MHz) | Ant Pol (H/V) | Level(dBm) @ Ant Terminal | TX Ant Gain(dBi) | Result | | Limit (dBc) | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | (dBm) | (dBc) | | |
| 20 | 1720 | 1/50 | QPSK | 3437.91 | V | -54.09 | 8.05 | -46.04 | 65.01 | 31.97 | - |
| | | | | 5160.05 | V | -46.13 | 10.28 | -35.85 | 54.82 | | - |
| | | | 16QAM | 3439.88 | V | -54.76 | 8.05 | -46.71 | 65.14 | 31.43 | - |
| | | | | 5160.24 | V | -45.04 | 10.28 | -34.76 | 53.19 | | - |
| | | | 64QAM | 3438.27 | V | -54.61 | 8.05 | -46.56 | 63.69 | 30.13 | - |
| | | | | 5160.36 | V | -44.13 | 10.28 | -33.85 | 50.98 | | - |
| | 1732.5 | 1/50 | QPSK | 3465.41 | V | -54.79 | 8.12 | -46.67 | 66.16 | 32.49 | - |
| | | | | 5197.81 | V | -45.94 | 10.34 | -35.60 | 55.09 | | - |
| | | | 16QAM | 3463.79 | V | -54.23 | 8.11 | -46.12 | 64.66 | 31.54 | - |
| | | | | 5197.72 | V | -44.94 | 10.34 | -34.60 | 53.14 | | - |
| | | | 64QAM | 3463.16 | V | -54.83 | 8.11 | -46.72 | 64.27 | 30.55 | - |
| | | | | 5197.71 | V | -43.91 | 10.34 | -33.57 | 51.12 | | - |
| | 1745 | 1/50 | QPSK | 3490.18 | V | -54.75 | 8.18 | -46.57 | 65.47 | 31.90 | - |
| | | | | 5235.30 | V | -43.97 | 10.33 | -33.64 | 52.54 | | - |
| | | | 16QAM | 3489.43 | V | -55.20 | 8.17 | -47.03 | 65.20 | 31.17 | - |
| | | | | 5234.94 | V | -42.86 | 10.33 | -32.53 | 50.70 | | - |
| | | | 64QAM | 3489.21 | V | -56.46 | 8.17 | -48.29 | 65.37 | 30.08 | - |
| | | | | 5235.27 | V | -42.46 | 10.33 | -32.13 | 49.21 | | - |
| 1.4 | 1754.3 | 1/2 | QPSK | 3510.05 | V | -53.99 | 8.22 | -45.77 | 66.82 | 34.05 | - |
| | | | | 5262.46 | V | -52.28 | 10.32 | -41.96 | 63.01 | | - |
| | | | 16QAM | 3510.45 | V | -53.99 | 8.23 | -45.76 | 65.90 | 33.14 | - |
| | | | | 5262.81 | V | -52.60 | 10.32 | -42.28 | 62.42 | | - |
| | | | 64QAM | 3509.73 | V | -54.61 | 8.22 | -46.39 | 65.33 | 31.94 | - |
| | | | | 5262.63 | V | -53.32 | 10.32 | -43.00 | 61.94 | | - |
| | | | QPSK | 3508.77 | V | -55.75 | 8.22 | -47.53 | 69.38 | 34.85 | With Dual Display (90°) |
| | | | | 5262.46 | V | -54.37 | 10.32 | -44.05 | 65.90 | | |

Note 1: Limit Calculation = 43 + $10\log_{10}$ (P[Watts])

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

Note 3: The frequency spectrum is examined from 9 kHz to the 10th harmonic of the fundamental frequency of the transmitter. No other spurious and harmonic emissions were reported greater than listed emissions above table.

**- Measurement data: With wireless charging pad**

| B.W (MHz) | Test Freq. (MHz) | RB Size/ Offset | Test Mode | Freq.(MHz) | Ant Pol (H/V) | Level(dBm) @ Ant Terminal | TX Ant Gain(dBi) | Result | | Limit (dBc) | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | (dBm) | (dBc) | | |
| 20 | 1732.5 | 1/50 | QPSK | 3464.49 | V | -54.78 | 8.11 | -46.67 | 68.08 | 34.41 | - |
| | | | | 5198.60 | V | -52.35 | 10.34 | -42.01 | 63.42 | | - |
| 1.4 | 1754.3 | 1/2 | QPSK | 3507.80 | V | -54.73 | 8.22 | -46.51 | 66.57 | 33.06 | - |
| | | | | 5262.79 | V | -52.60 | 10.32 | -42.28 | 62.34 | | - |
| | | | QPSK | 3507.80 | V | -54.73 | 8.22 | -46.51 | 68.08 | 34.57 | With Dual Display (90°) |
| | | | | 5262.79 | V | -52.60 | 10.32 | -42.28 | 63.85 | | |

Note 1: Limit Calculation = 43 + $10\log_{10}$(P[Watts])

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

Note 3: The frequency spectrum is examined from 9 kHz to the 10th harmonic of the fundamental frequency of the transmitter. No other spurious and harmonic emissions were reported greater than listed emissions above table.

### 7.6.5 LTE Band 2

**- Measurement data: Without wireless charging pad**

| B.W (MHz) | Test Freq. (MHz) | RB Size/ Offset | Test Mode | Freq.(MHz) | Ant Pol (H/V) | Level(dBm) @ Ant Terminal | TX Ant Gain(dBi) | Result | | Limit (dBc) | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | (dBm) | (dBc) | | |
| 20 | 1860 | 1/0 | QPSK | 3701.09 | H | -54.24 | 8.38 | -45.86 | 67.21 | 34.35 | - |
| | | | | 5553.24 | H | -43.27 | 10.42 | -32.85 | 54.20 | | - |
| | | | | 7404.60 | V | -48.14 | 11.71 | -36.43 | 57.78 | | - |
| | | | 16QAM | 3701.99 | H | -54.65 | 8.38 | -46.27 | 66.59 | 33.32 | - |
| | | | | 5553.39 | H | -41.85 | 10.42 | -31.43 | 51.75 | | - |
| | | | | 7404.52 | V | -47.63 | 11.71 | -35.92 | 56.24 | | - |
| | | | 64QAM | 3701.68 | H | -54.77 | 8.38 | -46.39 | 65.86 | 32.47 | - |
| | | | | 5553.36 | H | -41.82 | 10.42 | -31.40 | 50.87 | | - |
| | | | | 7404.00 | V | -47.64 | 11.70 | -35.94 | 55.41 | | - |
| | 1880 | 1/0 | QPSK | 3741.65 | H | -54.51 | 8.40 | -46.11 | 67.72 | 34.61 | - |
| | | | | 5613.25 | H | -44.78 | 10.60 | -34.18 | 55.79 | | - |
| | | | | 7484.50 | V | -47.81 | 11.87 | -35.94 | 57.55 | | - |
| | | | 16QAM | 3742.40 | H | -56.08 | 8.40 | -47.68 | 68.53 | 33.85 | - |
| | | | | 5613.30 | H | -43.21 | 10.60 | -32.61 | 53.46 | | - |
| | | | | 7484.18 | V | -47.13 | 11.87 | -35.26 | 56.11 | | - |
| | | | 64QAM | 3741.25 | H | -55.63 | 8.40 | -47.23 | 66.93 | 32.70 | - |
| | | | | 5613.24 | H | -42.97 | 10.60 | -32.37 | 52.07 | | - |
| | | | | 7484.15 | V | -47.50 | 11.87 | -35.63 | 55.33 | | - |
| | 1900 | 1/0 | QPSK | 3782.55 | H | -55.35 | 8.28 | -47.07 | 70.06 | 35.99 | - |
| | | | | 5673.33 | H | -45.24 | 10.70 | -34.54 | 57.53 | | - |
| | | | | 7563.91 | V | -48.43 | 12.02 | -36.41 | 59.40 | | - |
| | | | 16QAM | 3783.25 | H | -55.07 | 8.28 | -46.79 | 69.35 | 35.56 | - |
| | | | | 5673.25 | H | -43.27 | 10.70 | -32.57 | 55.13 | | - |
| | | | | 7564.74 | V | -46.84 | 12.03 | -34.81 | 57.37 | | - |
| | | | 64QAM | 3783.45 | H | -55.34 | 8.28 | -47.06 | 68.49 | 34.43 | - |
| | | | | 5673.33 | H | -42.58 | 10.70 | -31.88 | 53.31 | | - |
| | | | | 7564.18 | V | -47.55 | 12.03 | -35.52 | 56.95 | | - |
| | | | QPSK | 3782.48 | H | -55.88 | 8.28 | -47.60 | 66.90 | 32.30 | With Dual Display (90°) |
| | | | | 5673.41 | H | -50.03 | 10.70 | -39.33 | 58.63 | | |
| | | | | 7559.35 | V | -50.95 | 12.01 | -38.94 | 58.24 | | |

Note 1: Limit Calculation = 43 + $10\log_{10}$ (P[Watts])

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

Note 3: The frequency spectrum is examined from 9 kHz to the 10th harmonic of the fundamental frequency of the transmitter. No other spurious and harmonic emissions were reported greater than listed emissions above table.

**- Measurement data: Without wireless charging pad**

| B.W (MHz) | Test Freq. (MHz) | RB Size/ Offset | Test Mode | Freq.(MHz) | Ant Pol (H/V) | Level(dBm) @ Ant Terminal | TX Ant Gain(dBi) | Result | | Limit (dBc) | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | (dBm) | (dBc) | | |
| 15 | 1857.5 | 1/36 | QPSK | 3713.71 | H | -54.27 | 8.39 | -45.88 | 66.28 | 33.40 | - |
| | | | | 5572.46 | H | -51.53 | 10.49 | -41.04 | 61.44 | | - |
| | | | | 7428.99 | V | -49.17 | 11.73 | -37.44 | 57.84 | | - |
| | | | 16QAM | 3716.84 | H | -54.56 | 8.39 | -46.17 | 65.95 | 32.78 | - |
| | | | | 5572.46 | H | -52.53 | 10.49 | -42.04 | 61.82 | | - |
| | | | | 7423.17 | V | -49.71 | 11.73 | -37.98 | 57.76 | | - |
| | | | 64QAM | 3716.53 | H | -54.40 | 8.39 | -46.01 | 64.95 | 31.94 | - |
| | | | | 5574.68 | H | -52.67 | 10.49 | -42.18 | 61.12 | | - |
| | | | | 7431.28 | V | -50.35 | 11.74 | -38.61 | 57.55 | | - |
| | 1880 | 1/0 | QPSK | 3743.70 | H | -54.48 | 8.40 | -46.08 | 67.77 | 34.69 | - |
| | | | | 5619.65 | H | -51.22 | 10.61 | -40.61 | 62.30 | | - |
| | | | | 7494.25 | V | -48.74 | 11.90 | -36.84 | 58.53 | | - |
| | | | 16QAM | 3745.20 | H | -55.70 | 8.40 | -47.30 | 68.15 | 33.85 | - |
| | | | | 5620.57 | H | -52.82 | 10.61 | -42.21 | 63.06 | | - |
| | | | | 7497.31 | V | -50.57 | 11.91 | -38.66 | 59.51 | | - |
| | | | 64QAM | 3747.62 | H | -54.38 | 8.40 | -45.98 | 65.86 | 32.88 | - |
| | | | | 5618.58 | H | -53.65 | 10.61 | -43.04 | 62.92 | | - |
| | | | | 7490.73 | V | -51.14 | 11.89 | -39.25 | 59.13 | | - |
| | 1902.5 | 1/0 | QPSK | 3787.93 | H | -55.33 | 8.26 | -47.07 | 69.03 | 34.96 | - |
| | | | | 5681.38 | H | -51.07 | 10.71 | -40.36 | 62.32 | | - |
| | | | | 7582.26 | V | -49.09 | 12.08 | -37.01 | 58.97 | | - |
| | | | 16QAM | 3792.05 | H | -54.77 | 8.25 | -46.52 | 67.74 | 34.22 | - |
| | | | | 5689.83 | H | -52.67 | 10.72 | -41.95 | 63.17 | | - |
| | | | | 7584.32 | V | -50.51 | 12.09 | -38.42 | 59.64 | | - |
| | | | 64QAM | 3790.22 | H | -55.52 | 8.26 | -47.26 | 67.00 | 32.74 | - |
| | | | | 5683.35 | H | -53.12 | 10.71 | -42.41 | 62.15 | | - |
| | | | | 7577.70 | V | -51.25 | 12.07 | -39.18 | 58.92 | | - |

Note 1: Limit Calculation = 43 + 10log$_{10}$ (P[Watts])

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

Note 3: The frequency spectrum is examined from 9 kHz to the 10th harmonic of the fundamental frequency of the transmitter. No other spurious and harmonic emissions were reported greater than listed emissions above table.

**- Measurement data: With wireless charging pad**

| B.W (MHz) | Test Freq. (MHz) | RB Size/ Offset | Test Mode | Freq.(MHz) | Ant Pol (H/V) | Level(dBm) @ Ant Terminal | TX Ant Gain(dBi) | Result | | Limit (dBc) | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | (dBm) | (dBc) | | |
| 20 | 1900 | 1/0 | QPSK | 3780.38 | V | -54.01 | 8.29 | -45.72 | 68.53 | 35.81 | - |
| | | | | 5670.51 | V | -52.57 | 10.69 | -41.88 | 64.69 | | - |
| | | | | 7559.59 | V | -49.75 | 12.01 | -37.74 | 60.55 | | - |
| | | | QPSK | 3779.71 | V | -53.92 | 8.29 | -45.63 | 65.22 | 32.59 | With Dual Display (90°) |
| | | | | 5673.19 | V | -52.36 | 10.70 | -41.66 | 61.25 | | |
| | | | | 7563.86 | V | -50.52 | 12.02 | -38.50 | 58.09 | | |
| 15 | 1902.5 | 1/0 | QPSK | 3789.41 | V | -55.04 | 8.26 | -46.78 | 69.64 | 35.86 | - |
| | | | | 5685.32 | V | -53.16 | 10.72 | -42.44 | 65.30 | | - |
| | | | | 7580.45 | V | -51.08 | 12.08 | -39.00 | 61.86 | | - |

Note 1: Limit Calculation = 43 + $10\log_{10}$ (P[Watts])

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

Note 3: The frequency spectrum is examined from 9 kHz to the 10th harmonic of the fundamental frequency of the transmitter. No other spurious and harmonic emissions were reported greater than listed emissions above table.

## 7.7 FREQUENCY STABILITY

### 7.7.1 LTE Band 12, 17

OPERATING FREQUENCY : 707.5 MHz
REFERENCE VOLTAGE : 3.87 VDC
LIMIT : The frequency stability shall be sufficient to ensure that the fundamental emission stays wthin the authorized frequency block.

| VOLTAGE (%) | POWER (V DC) | TEMP (℃) | FREQUENCY (Hz) | FREQ.Dev (Hz) | Deviation | |
|---|---|---|---|---|---|---|
| | | | | | (ppm) | (%) |
| 100% | 3.87 | +20(Ref) | 707,500,005 | 5 | 0.0071 | 0.000000707 |
| 100% | | -30 | 707,499,997 | -3 | -0.0042 | -0.000000424 |
| 100% | | -20 | 707,499,993 | -7 | -0.0099 | -0.000000989 |
| 100% | | -10 | 707,499,995 | -5 | -0.0071 | -0.000000707 |
| 100% | | 0 | 707,500,001 | 1 | 0.0014 | 0.000000141 |
| 100% | | +10 | 707,499,997 | -3 | -0.0042 | -0.000000424 |
| 100% | | +20 | 707,500,005 | 5 | 0.0071 | 0.000000707 |
| 100% | | +30 | 707,500,003 | 3 | 0.0042 | 0.000000424 |
| 100% | | +40 | 707,499,994 | -6 | -0.0085 | -0.000000848 |
| 100% | | +50 | 707,500,003 | 3 | 0.0042 | 0.000000424 |
| 11450% | 4.45 | +20 | 707,499,999 | -1 | -0.0014 | -0.000000141 |
| BATT.ENDPOINT | 2.30 | +20 | 707,499,995 | -5 | -0.0071 | -0.000000707 |

**Note 1:** Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain inband when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

### 7.8.2 LTE Band 13

OPERATING FREQUENCY : 782 MHz
REFERENCE VOLTAGE : 3.87 VDC
LIMIT : The frequency stability shall be sufficient to ensure that the fundamental emission stays wthin the authorized frequency block.

| VOLTAGE (%) | POWER (V DC) | TEMP (℃) | FREQUENCY (Hz) | FREQ.Dev (Hz) | Deviation | |
|---|---|---|---|---|---|---|
| | | | | | (ppm) | (%) |
| 100% | 3.87 | +20(Ref) | 781,999,997 | -3 | -0.0038 | -0.000000384 |
| 100% | | -30 | 782,000,004 | 4 | 0.0051 | 0.000000512 |
| 100% | | -20 | 781,999,994 | -6 | -0.0077 | -0.000000767 |
| 100% | | -10 | 781,999,999 | -1 | -0.0013 | -0.000000128 |
| 100% | | 0 | 782,000,003 | 3 | 0.0038 | 0.000000384 |
| 100% | | +10 | 781,999,993 | -7 | -0.0090 | -0.000000895 |
| 100% | | +20 | 781,999,997 | -3 | -0.0038 | -0.000000384 |
| 100% | | +30 | 781,999,998 | -2 | -0.0026 | -0.000000256 |
| 100% | | +40 | 782,000,003 | 3 | 0.0038 | 0.000000384 |
| 100% | | +50 | 781,999,992 | -8 | -0.0102 | -0.000001023 |
| 115% | 4.45 | +20 | 782,000,003 | 3 | 0.0038 | 0.000000384 |
| BATT.ENDPOINT | 2.30 | +20 | 782,000,011 | 11 | 0.0141 | 0.000001407 |

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

### 7.8.3 LTE Band 5

OPERATING FREQUENCY : 836.5 MHz
REFERENCE VOLTAGE : 3.87 VDC
DEVIATION LIMIT : ± 0.00025 % or 2.5 ppm

| VOLTAGE (%) | POWER (V DC) | TEMP (℃) | FREQUENCY (Hz) | FREQ.Dev (Hz) | Deviation | |
|---|---|---|---|---|---|---|
| | | | | | (ppm) | (%) |
| 100% | 3.87 | +20(Ref) | 836,500,003 | 3 | 0.0036 | 0.000000359 |
| 100% | | -30 | 836,500,006 | 6 | 0.0072 | 0.000000717 |
| 100% | | -20 | 836,499,997 | -3 | -0.0036 | -0.000000359 |
| 100% | | -10 | 836,500,005 | 5 | 0.0060 | 0.000000598 |
| 100% | | 0 | 836,500,003 | 3 | 0.0036 | 0.000000359 |
| 100% | | +10 | 836,499,992 | -8 | -0.0096 | -0.000000956 |
| 100% | | +20 | 836,500,003 | 3 | 0.0036 | 0.000000359 |
| 100% | | +30 | 836,499,996 | -4 | -0.0048 | -0.000000478 |
| 100% | | +40 | 836,500,001 | 1 | 0.0012 | 0.000000120 |
| 100% | | +50 | 836,500,006 | 6 | 0.0072 | 0.000000717 |
| 115% | 4.45 | +20 | 836,499,998 | -2 | -0.0024 | -0.000000239 |
| BATT.ENDPOINT | 2.30 | +20 | 836,499,992 | -8 | -0.0096 | -0.000000956 |

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

### 7.7.4 LTE Band 4

OPERATING FREQUENCY : 1732.5 MHz
REFERENCE VOLTAGE 3.87 VDC
LIMIT : The frequency stability shall be sufficient to ensure that the fundamental emission stays wthin the authorized frequency block.

| VOLTAGE (%) | POWER (V DC) | TEMP (℃) | FREQUENCY (Hz) | FREQ.Dev (Hz) | Deviation | |
|---|---|---|---|---|---|---|
| | | | | | (ppm) | (%) |
| 100% | 3.87 | +20(Ref) | 1,732,499,993 | -7 | -0.0040 | -0.000000404 |
| 100% | | -30 | 1,732,500,005 | 5 | 0.0029 | 0.000000289 |
| 100% | | -20 | 1,732,499,999 | -1 | -0.0006 | -0.000000058 |
| 100% | | -10 | 1,732,500,010 | 10 | 0.0058 | 0.000000577 |
| 100% | | 0 | 1,732,500,001 | 1 | 0.0006 | 0.000000058 |
| 100% | | +10 | 1,732,499,997 | -3 | -0.0017 | -0.000000173 |
| 100% | | +20 | 1,732,499,993 | -7 | -0.0040 | -0.000000404 |
| 100% | | +30 | 1,732,499,992 | -8 | -0.0046 | -0.000000462 |
| 100% | | +40 | 1,732,500,003 | 3 | 0.0017 | 0.000000173 |
| 100% | | +50 | 1,732,499,994 | -6 | -0.0035 | -0.000000346 |
| 115% | 4.45 | +20 | 1,732,499,998 | -2 | -0.0012 | -0.000000115 |
| BATT.ENDPOINT | 2.30 | +20 | 1,732,499,994 | -6 | -0.0035 | -0.000000346 |

**Note 1:** Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain inband when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

### 7.7.5 LTE Band 2

OPERATING FREQUENCY : 1880 MHz
REFERENCE VOLTAGE 3.87 VDC
LIMIT : The frequency stability shall be sufficient to ensure that the fundamental emission stays wthin the authorized frequency block.

| VOLTAGE (%) | POWER (V DC) | TEMP (℃) | FREQUENCY (Hz) | FREQ.Dev (Hz) | Deviation | |
|---|---|---|---|---|---|---|
| | | | | | (ppm) | (%) |
| 100% | 3.87 | +20(Ref) | 1,880,000,011 | 11 | 0.0059 | 0.000000585 |
| 100% | | -30 | 1,880,000,002 | 2 | 0.0011 | 0.000000106 |
| 100% | | -20 | 1,879,999,995 | -5 | -0.0027 | -0.000000266 |
| 100% | | -10 | 1,879,999,991 | -9 | -0.0048 | -0.000000479 |
| 100% | | 0 | 1,880,000,002 | 2 | 0.0011 | 0.000000106 |
| 100% | | +10 | 1,879,999,996 | -4 | -0.0021 | -0.000000213 |
| 100% | | +20 | 1,880,000,011 | 11 | 0.0059 | 0.000000585 |
| 100% | | +30 | 1,880,000,005 | 5 | 0.0027 | 0.000000266 |
| 100% | | +40 | 1,879,999,999 | -1 | -0.0005 | -0.000000053 |
| 100% | | +50 | 1,880,000,008 | 8 | 0.0043 | 0.000000426 |
| 115% | 4.45 | +20 | 1,880,000,015 | 15 | 0.0080 | 0.000000798 |
| BATT.ENDPOINT | 2.30 | +20 | 1,879,999,999 | -1 | -0.0005 | -0.000000053 |

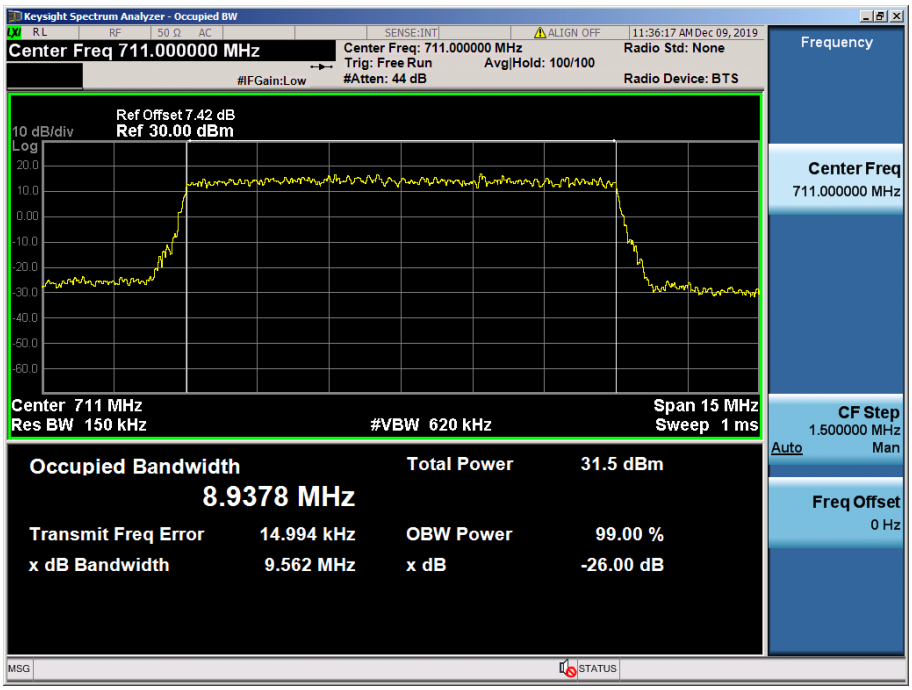
**Note 1:** Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain inband when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

# 8. TEST PLOTS

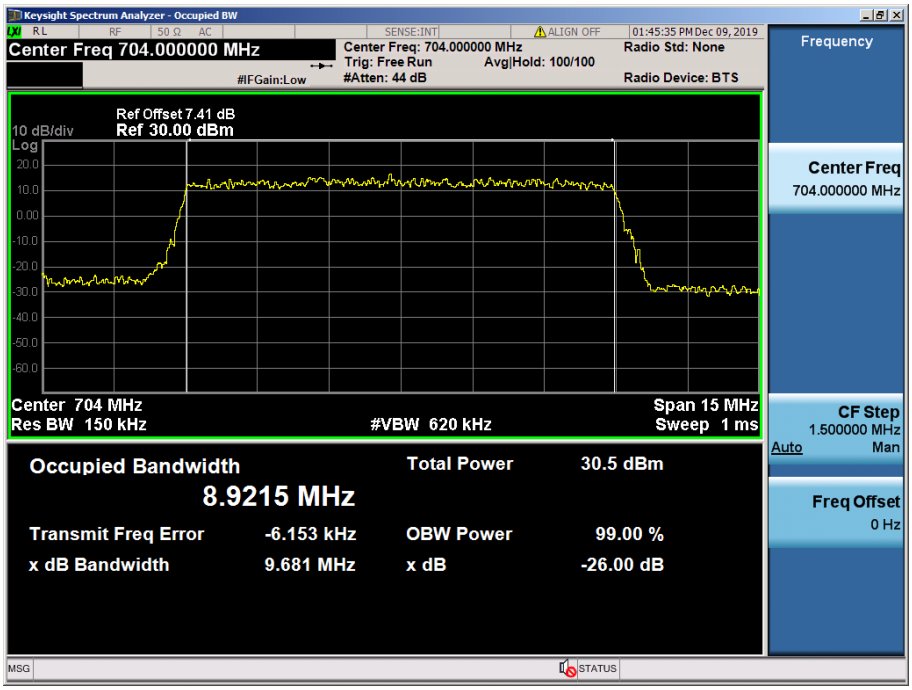
**Note: All bandwidths, RB configurations, and modulations were investigated.**
**The worst case test results are reported.**

## 8.1 OCCUPIED BANDWIDTH

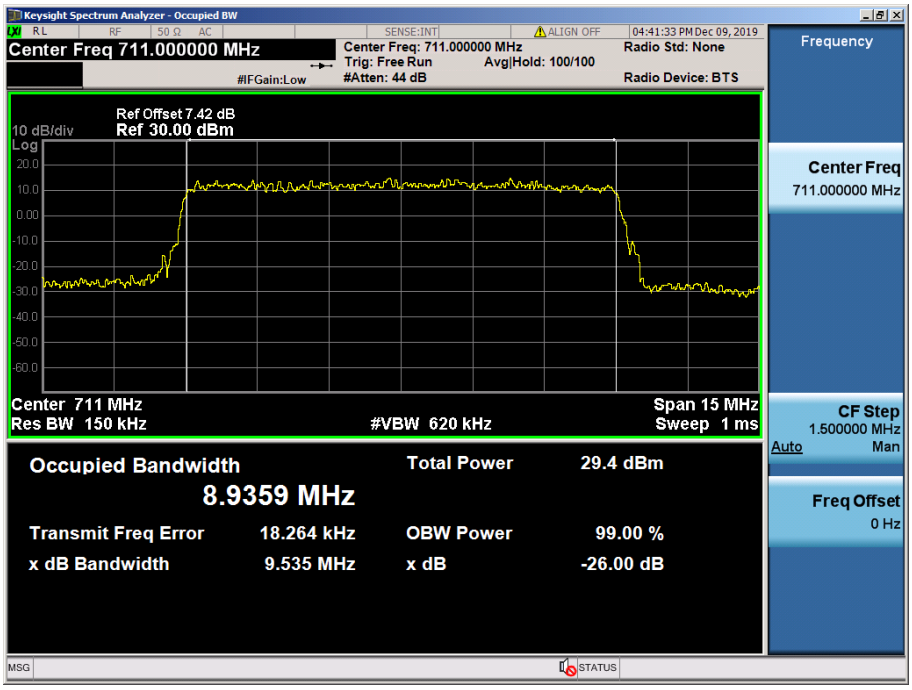
### 8.1.1 LTE Band 12, 17



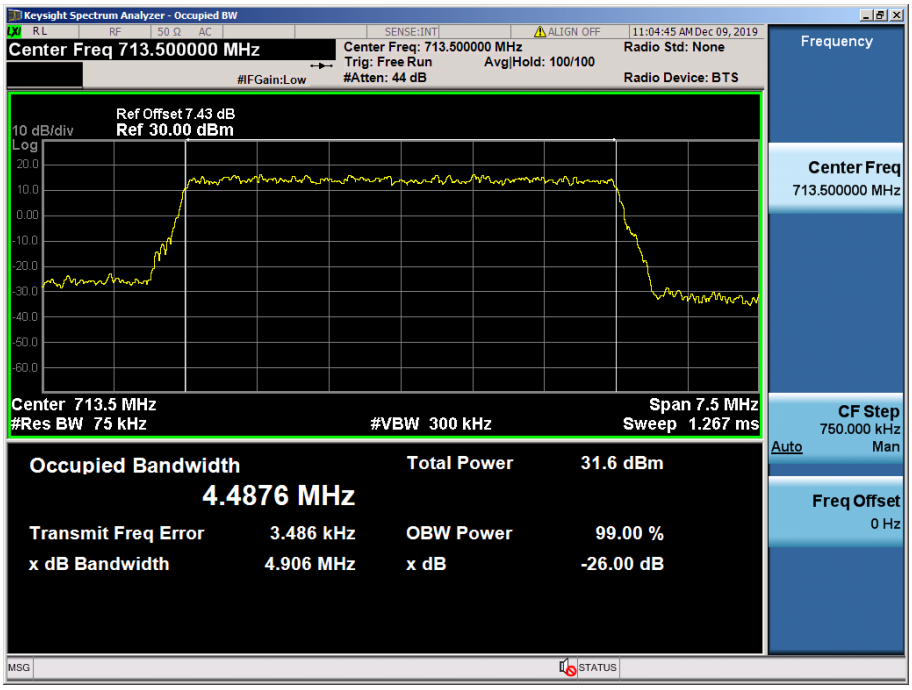

LTE Band 12, 17 / 10 MHz / QPSK - RB Size 50



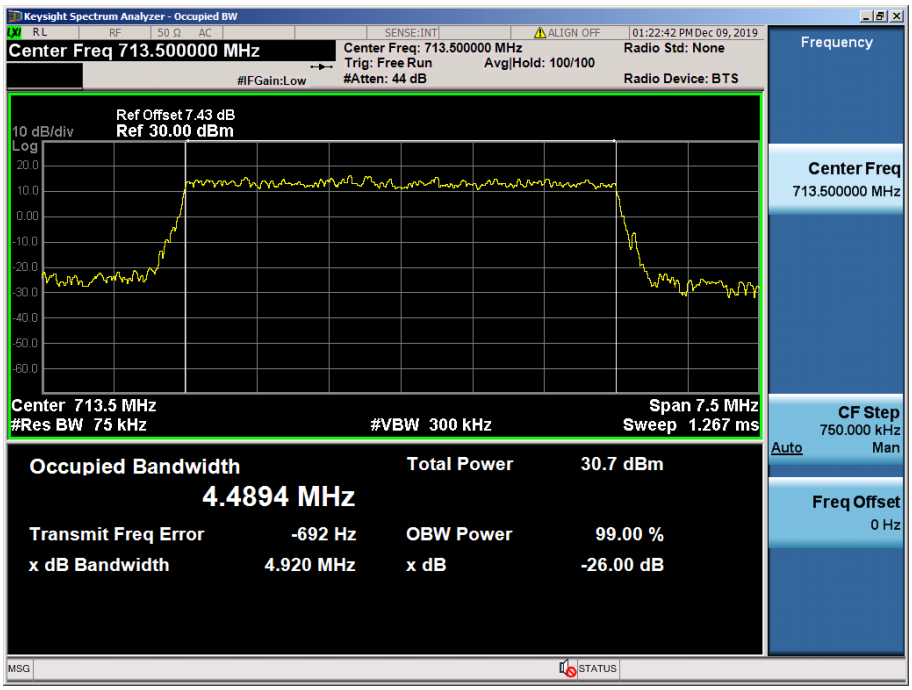

LTE Band 12, 17 / 10 MHz / 16QAM - RB Size 50



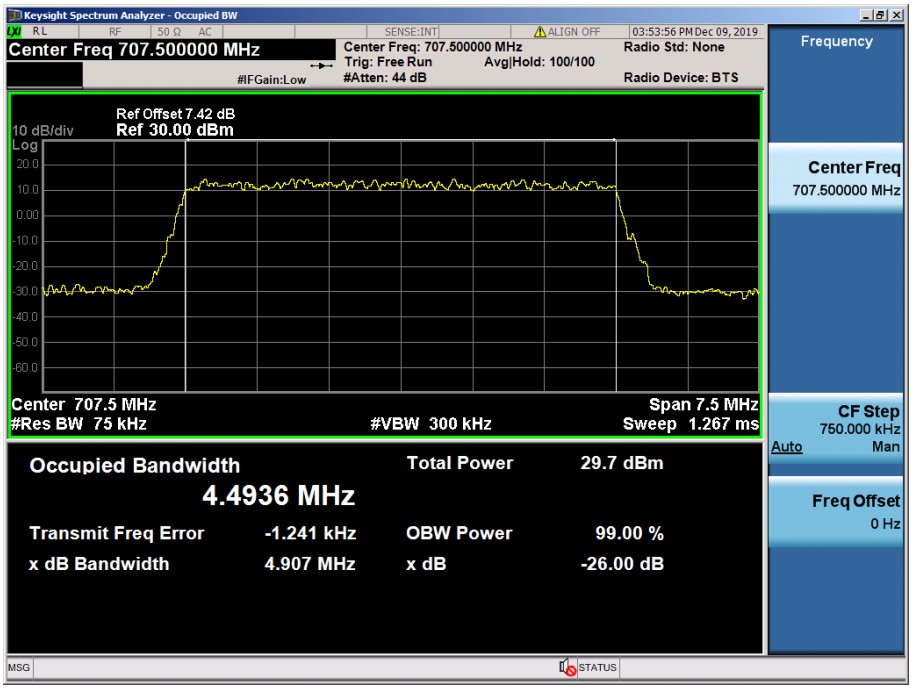

LTE Band 12, 17 / 10 MHz / 64QAM- RB Size 50




LTE Band 12, 17 / 5 MHz / QPSK - RB Size 25

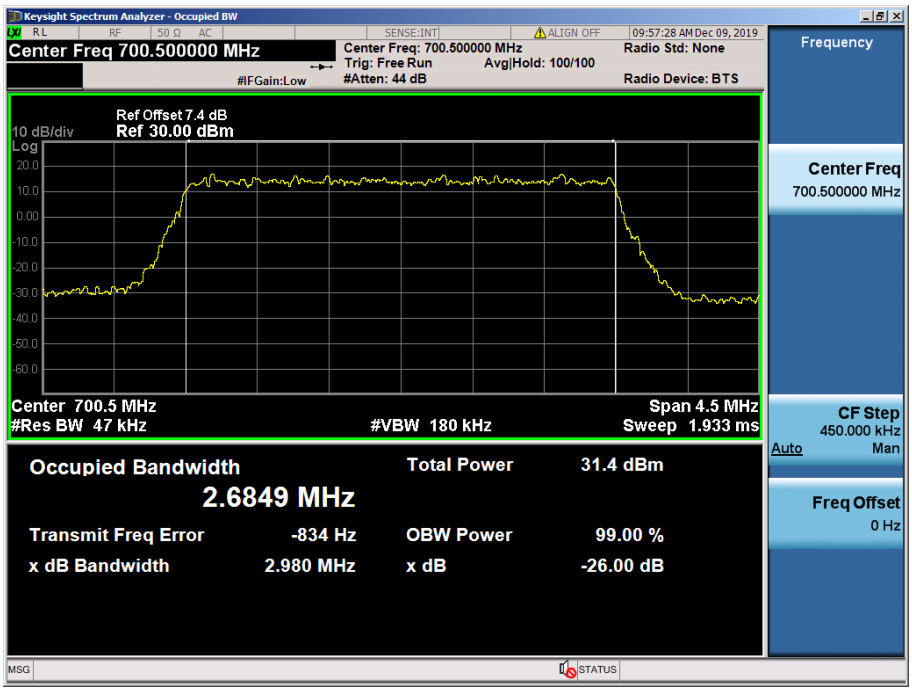



LTE Band 12, 17 / 5 MHz / 16QAM - RB Size 25

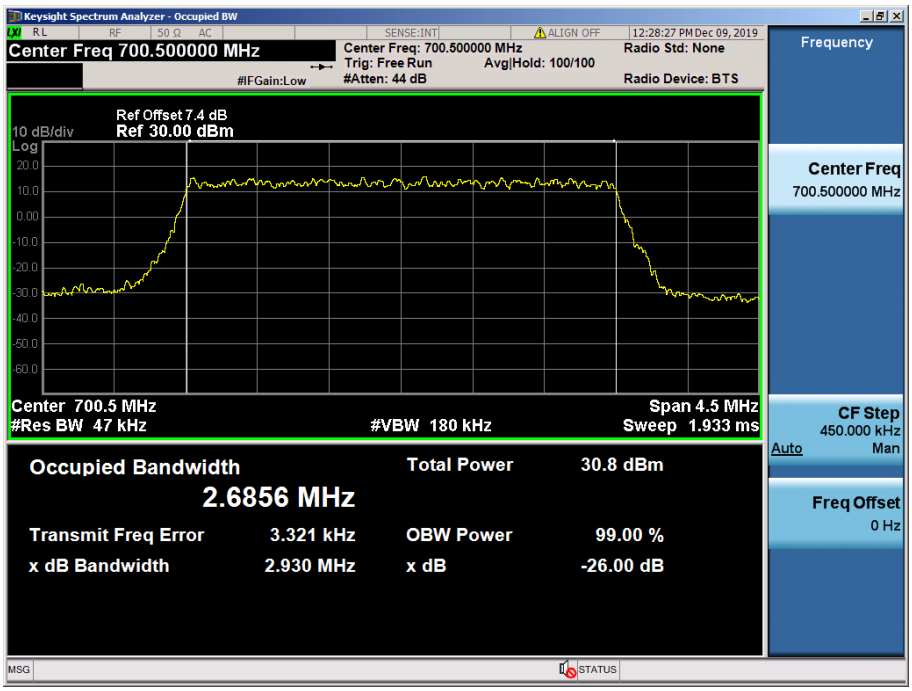



LTE Band 12, 17 / 5 MHz / 64QAM - RB Size 25

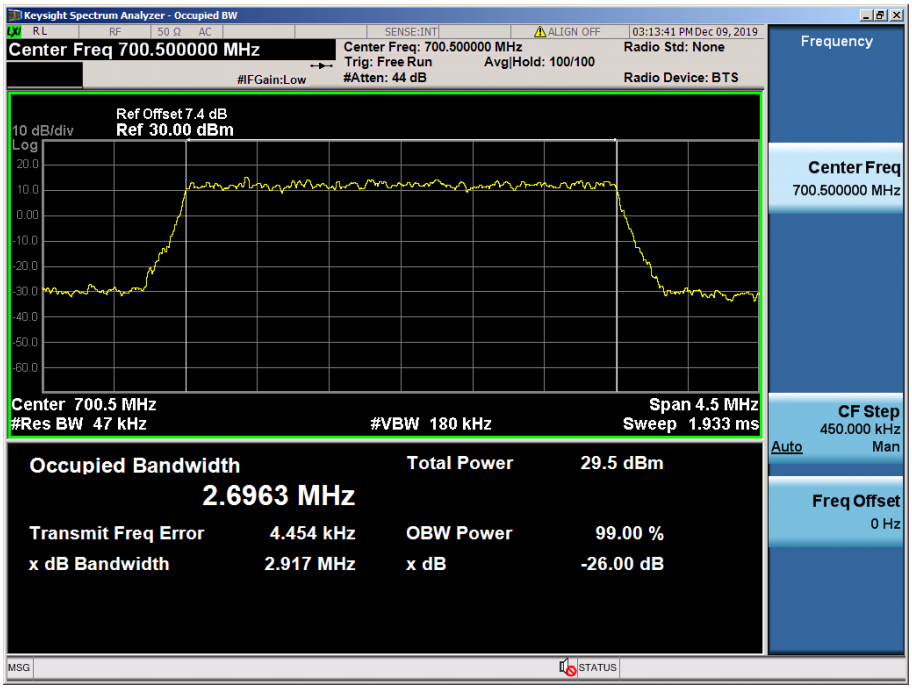
### 8.1.2 LTE Band 12



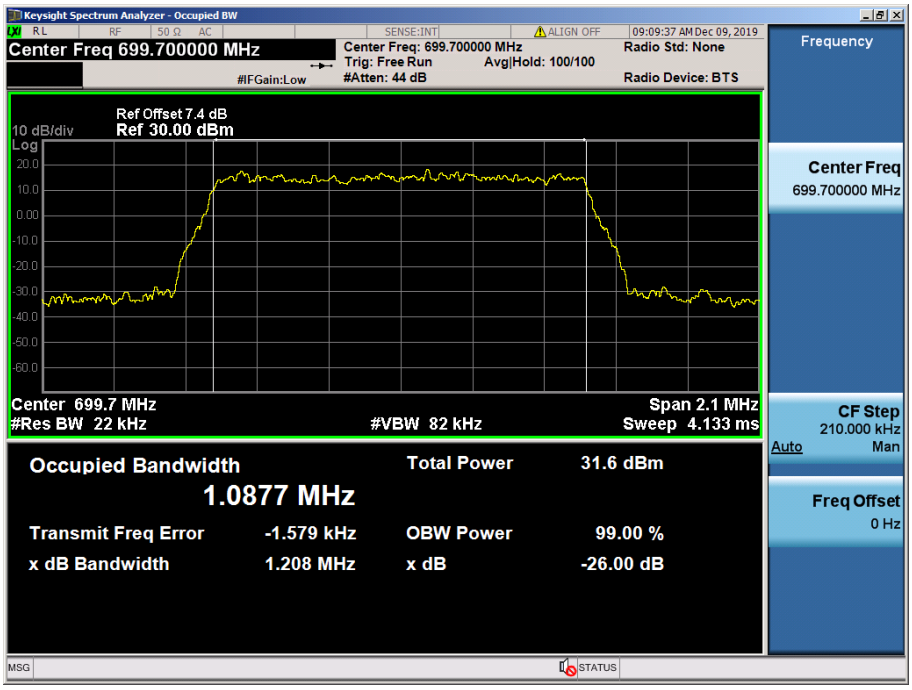

LTE Band 12 / 3 MHz / QPSK - RB Size 15



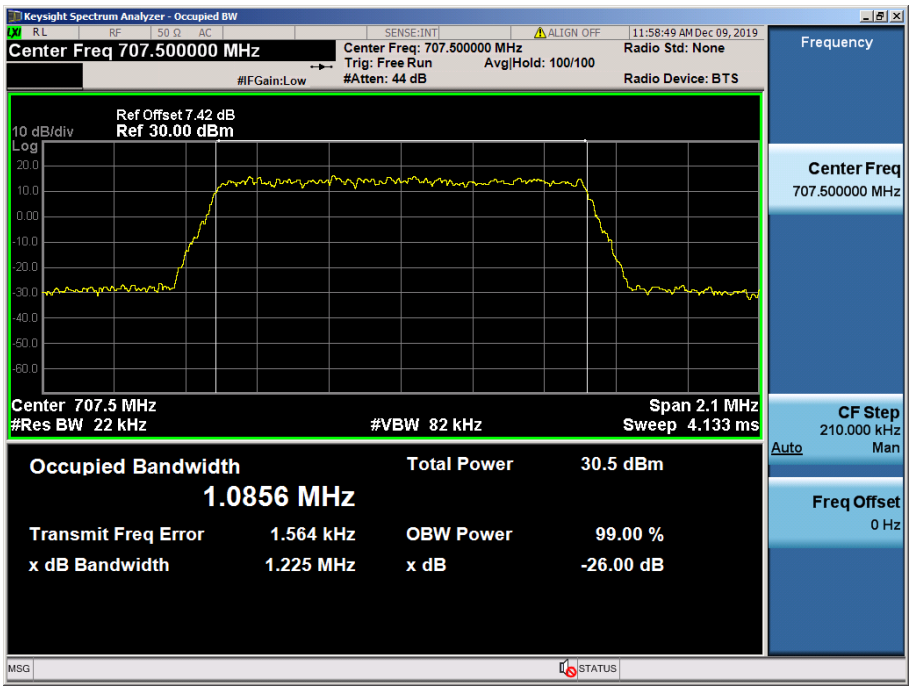

LTE Band 12 / 3 MHz / 16QAM - RB Size 15



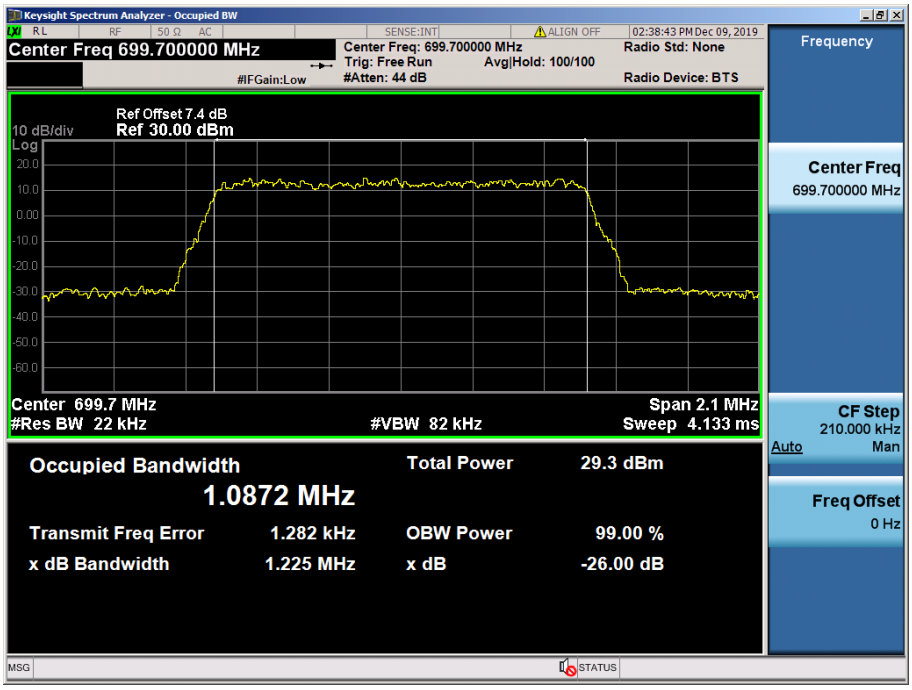

LTE Band 12 / 3 MHz / 64QAM - RB Size 15




LTE Band 12 / 1.4 MHz / QPSK - RB Size 6

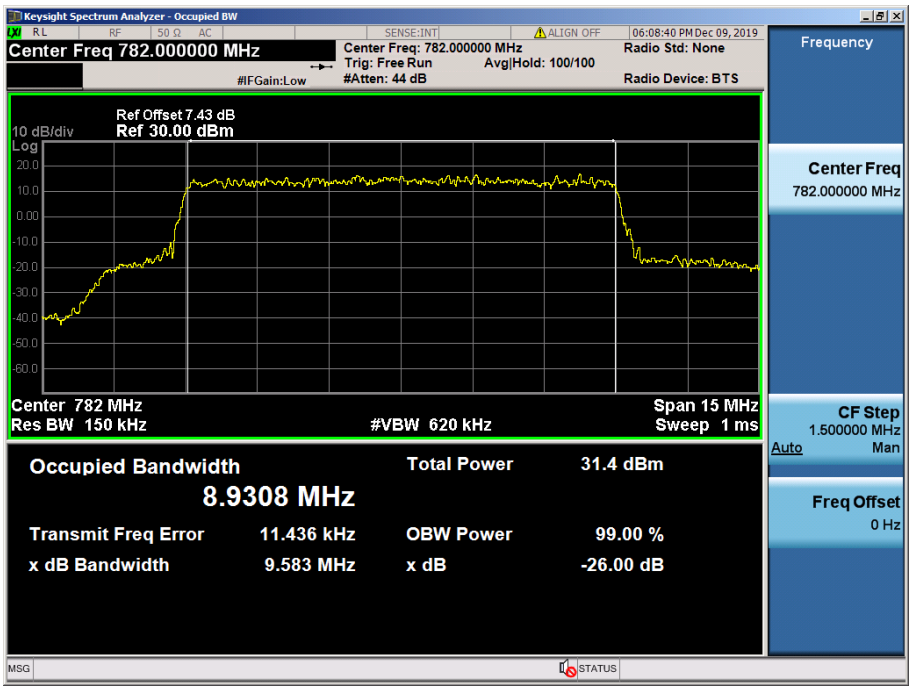



LTE Band 12 / 1.4 MHz / 16QAM - RB Size 6

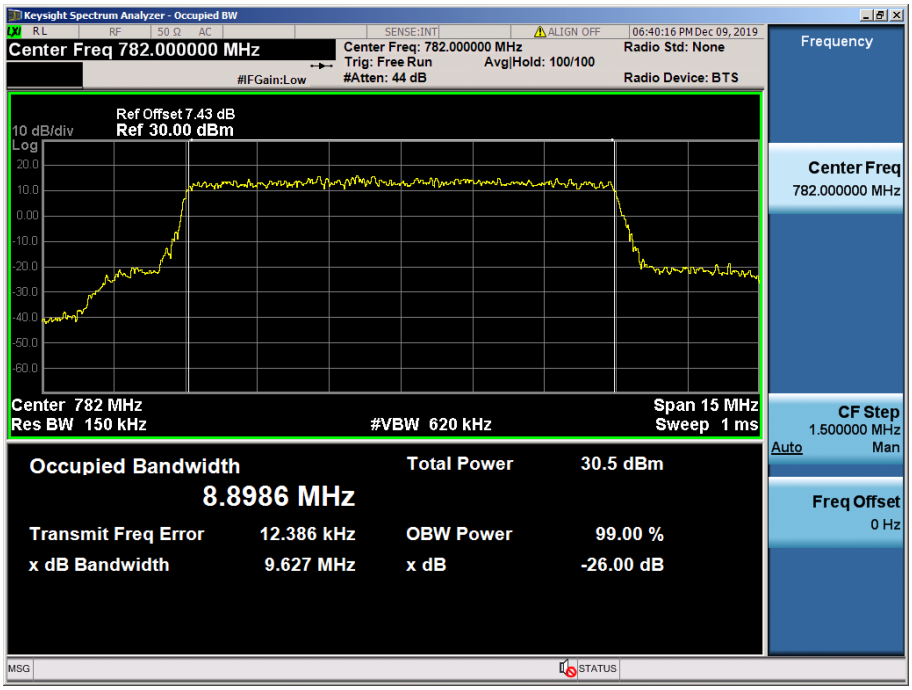



LTE Band 12 / 1.4 MHz / 64QAM - RB Size 6

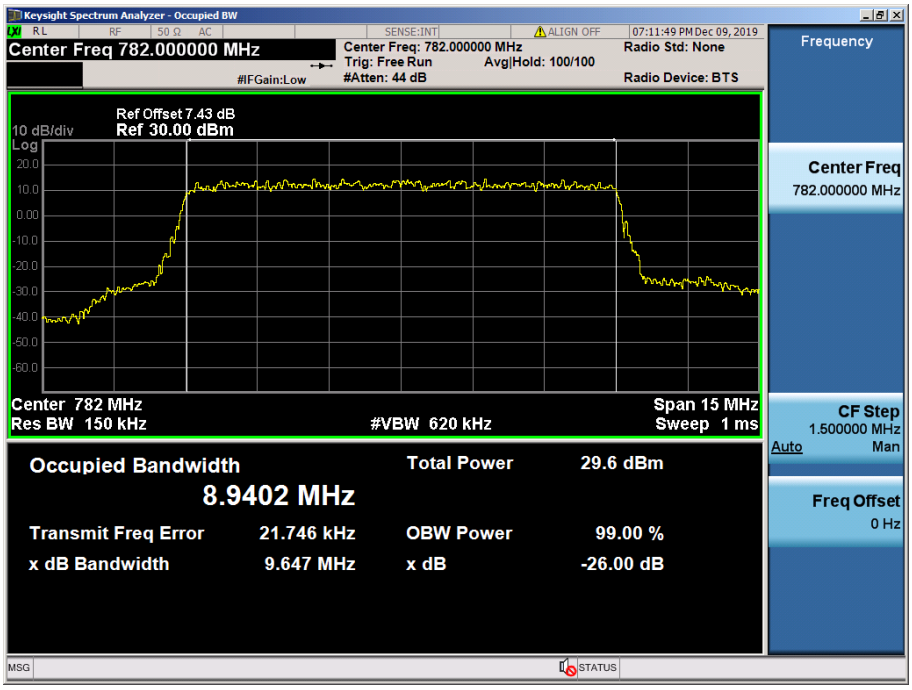
### 8.1.3 LTE Band 13



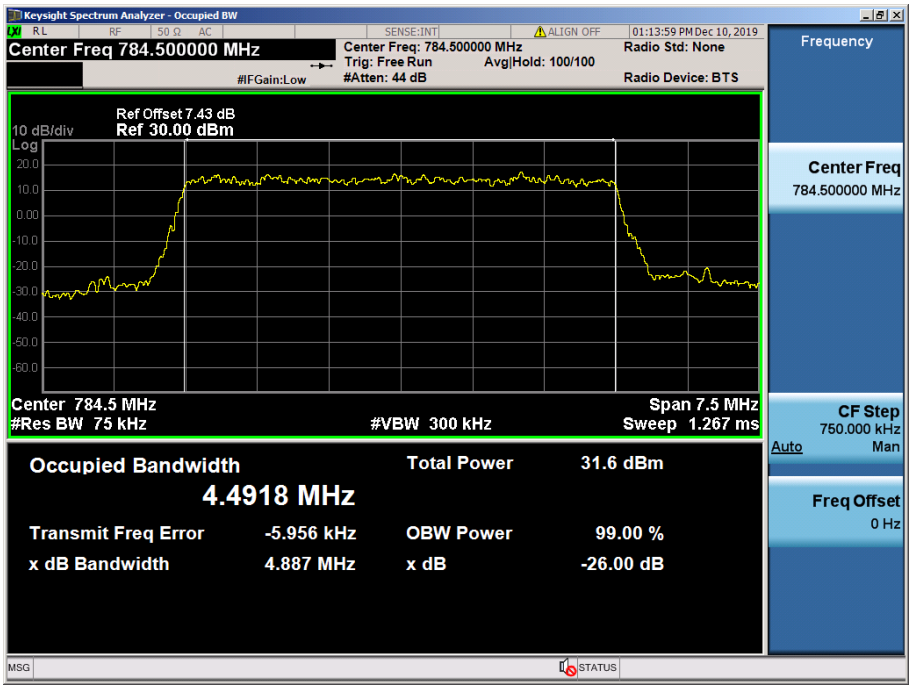

LTE Band 13 / 10 MHz / QPSK - RB Size 50



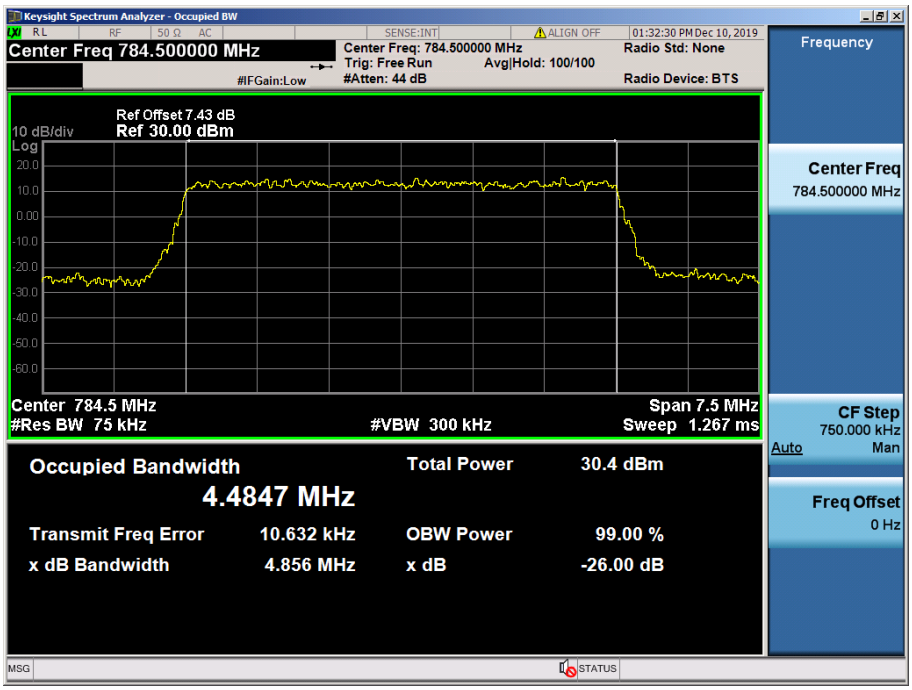

LTE Band 13 / 10 MHz / 16QAM - RB Size 50



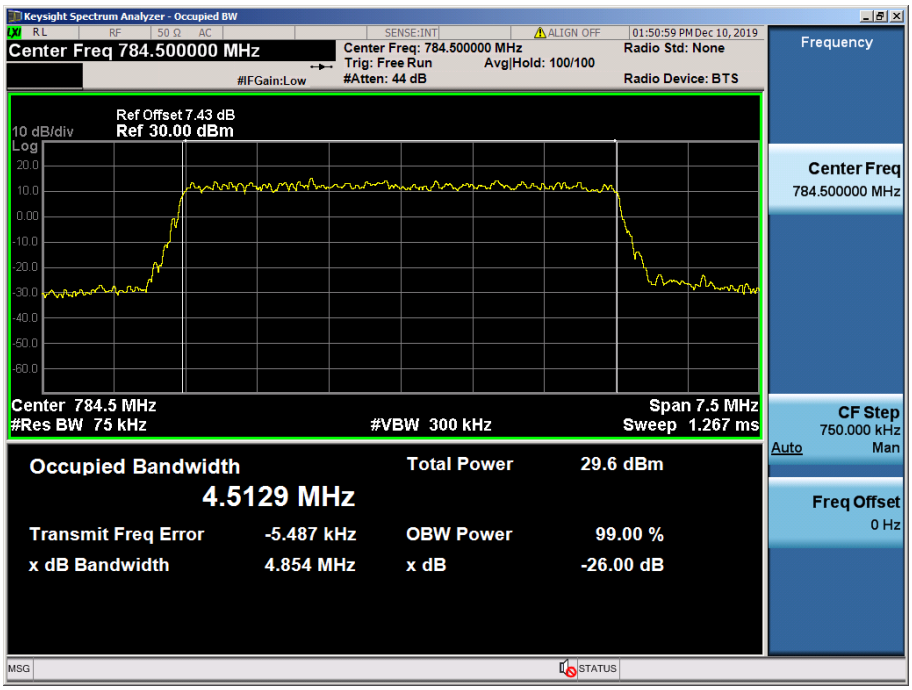

LTE Band 13 / 10 MHz / 64QAM - RB Size 50




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

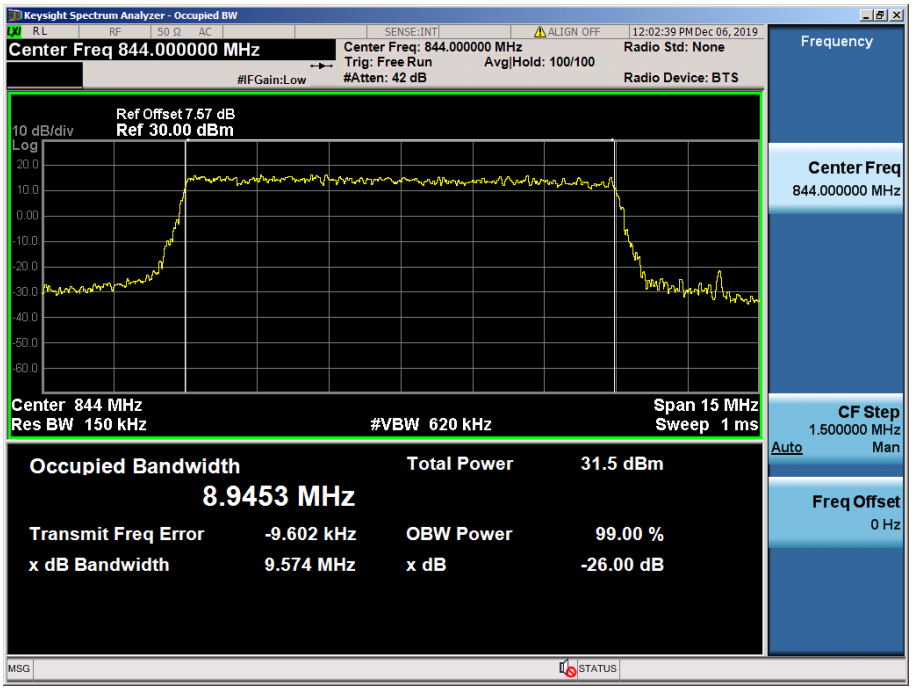



LTE Band 13 / 5 MHz / 16QAM - RB Size 25

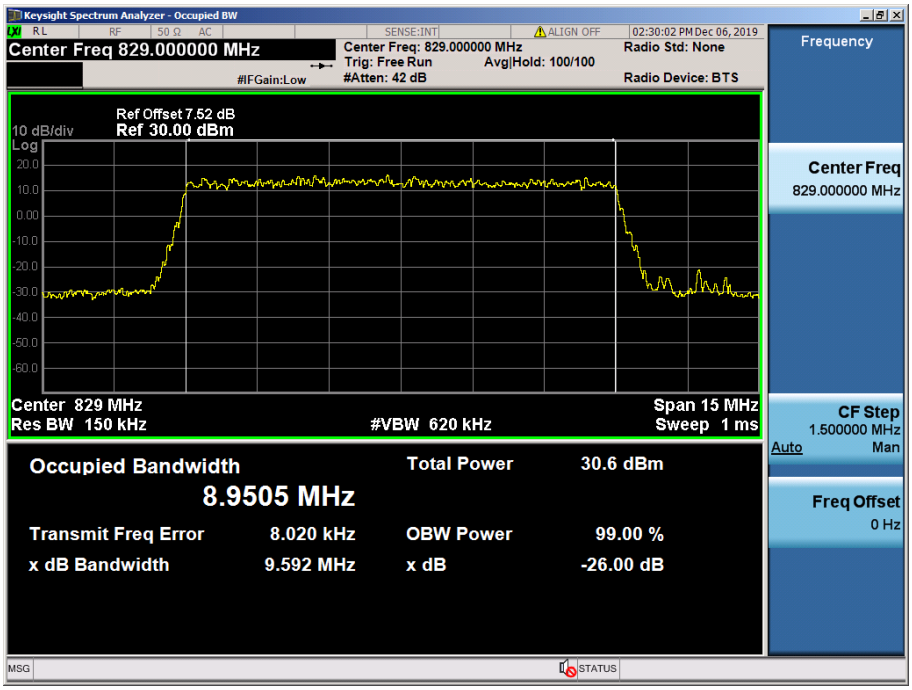



LTE Band 13 / 5 MHz / 64QAM - RB Size 25

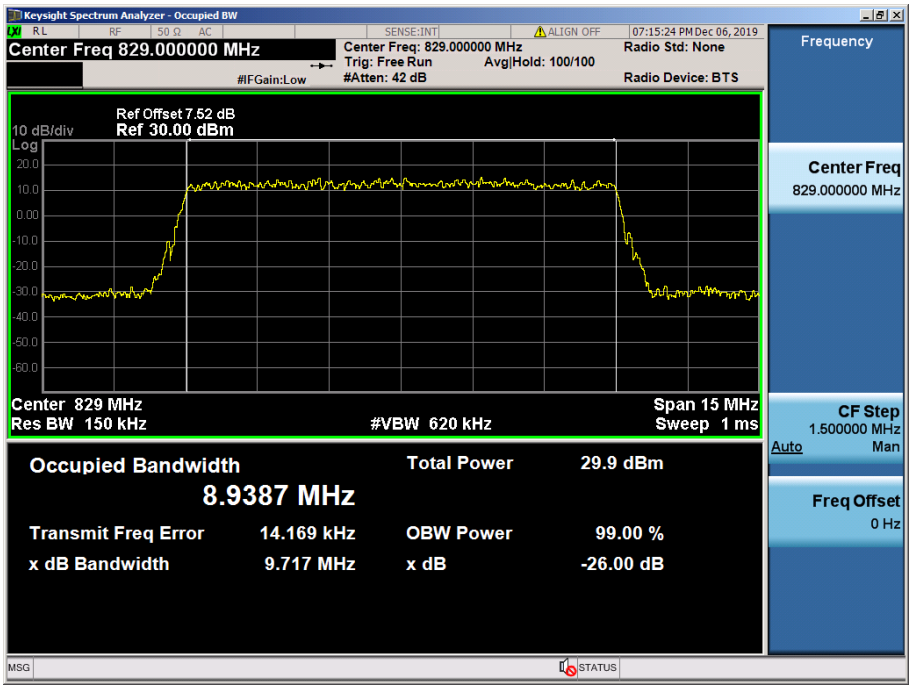
### 8.1.4 LTE Band 5



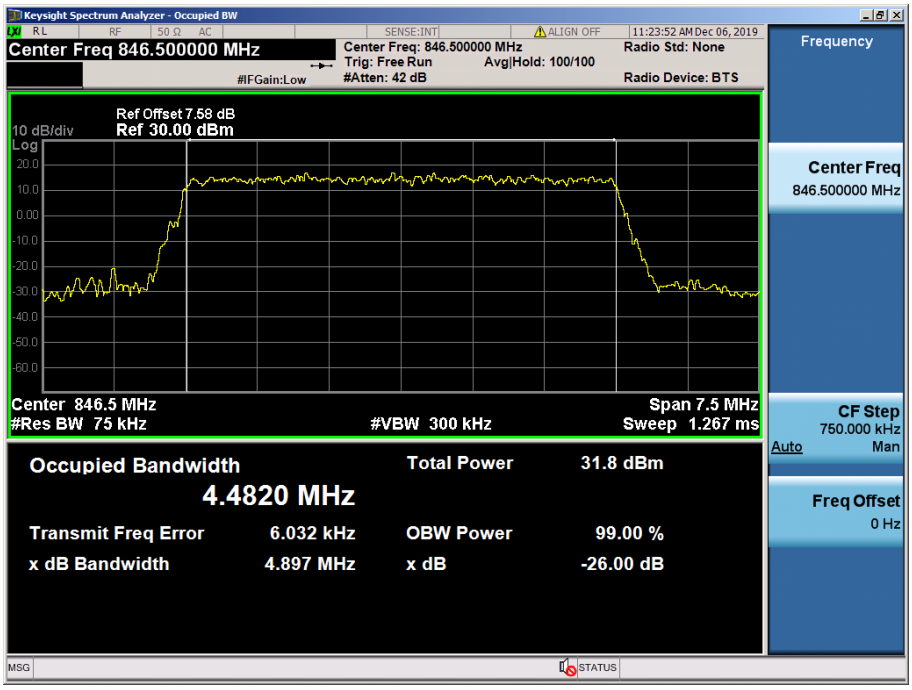

LTE Band 5 / 10 MHz / QPSK - RB Size 50



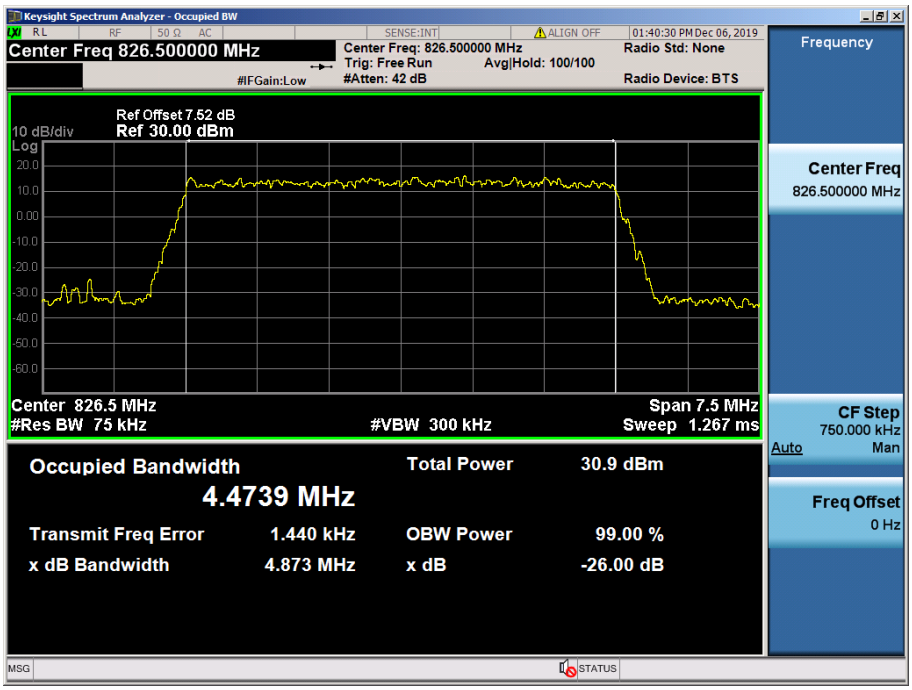

LTE Band 5 / 10 MHz / 16QAM - RB Size 50



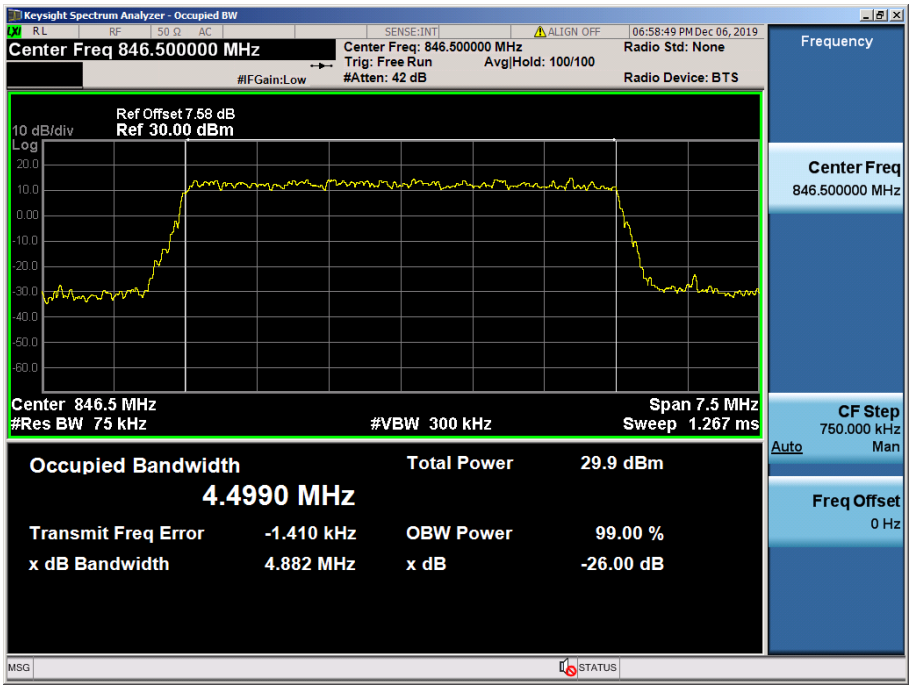

LTE Band 5 / 10 MHz / 64QAM - RB Size 50



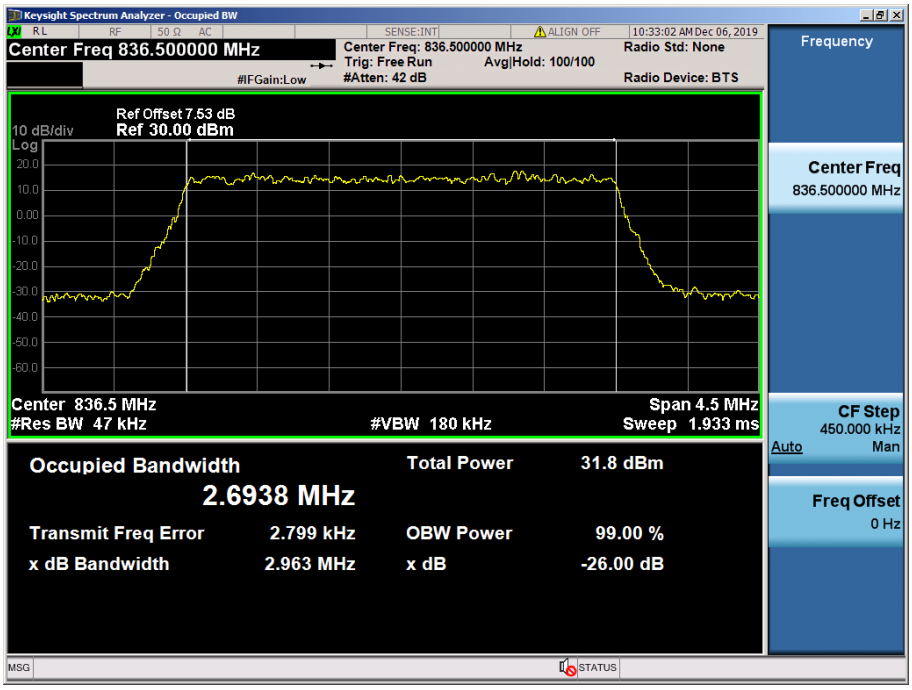

LTE Band 5 / 5 MHz / QPSK - RB Size 25



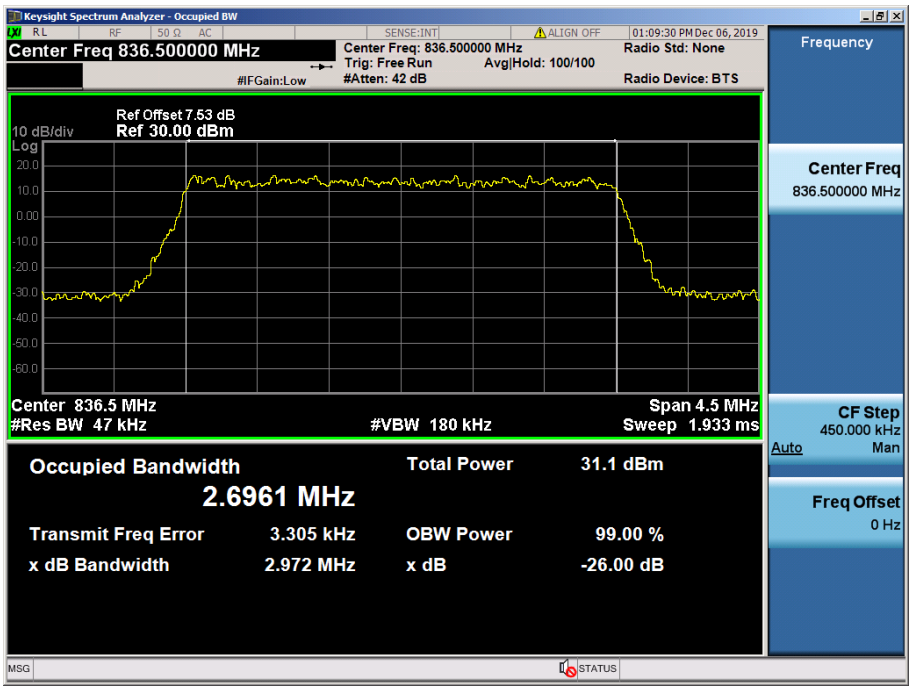

LTE Band 5 / 5 MHz / 16QAM - RB Size 25



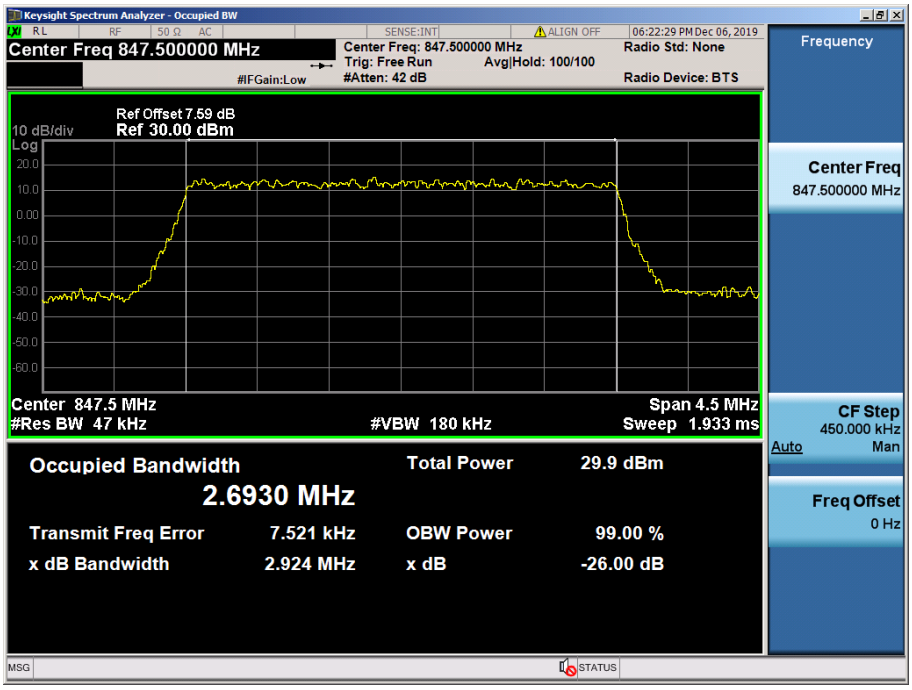

LTE Band 5 / 5 MHz / 16QAM - RB Size 25



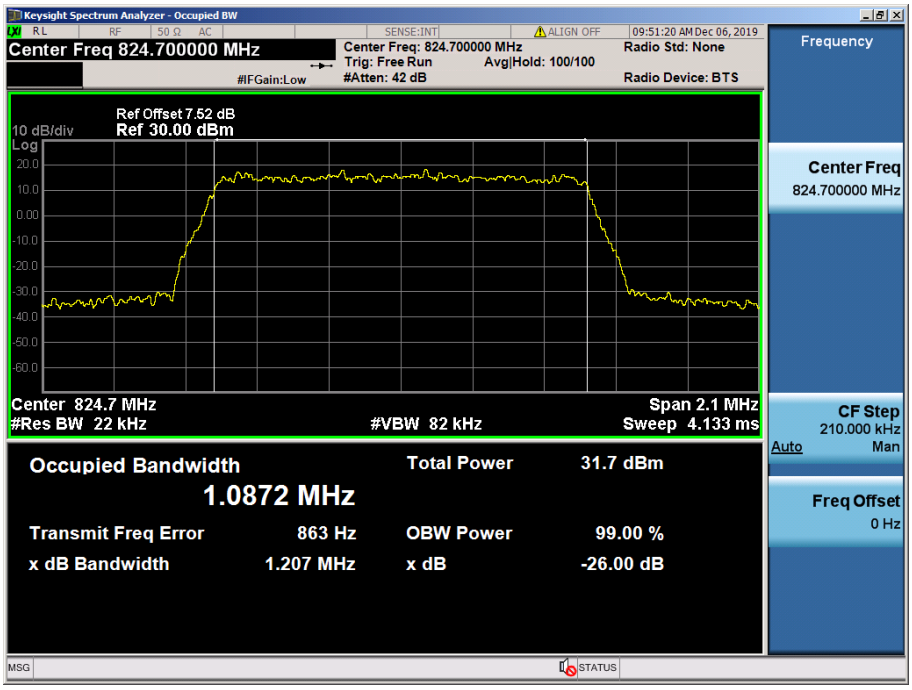

LTE Band 5 / 3 MHz / QPSK - RB Size 15



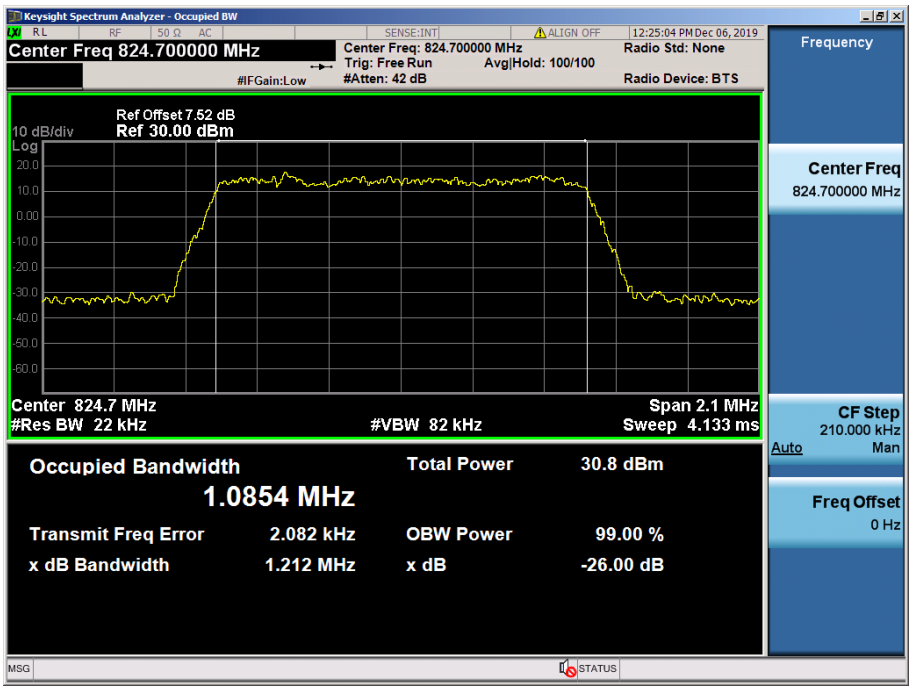

LTE Band 5 / 3 MHz / 16QAM - RB Size 15



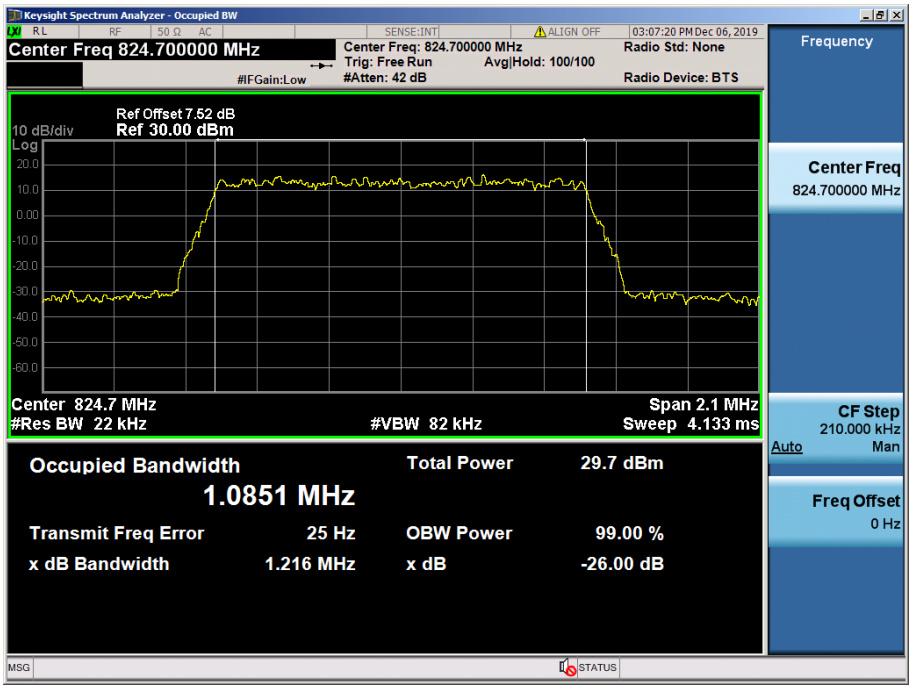

LTE Band 5 / 3 MHz / 64QAM - RB Size 15




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

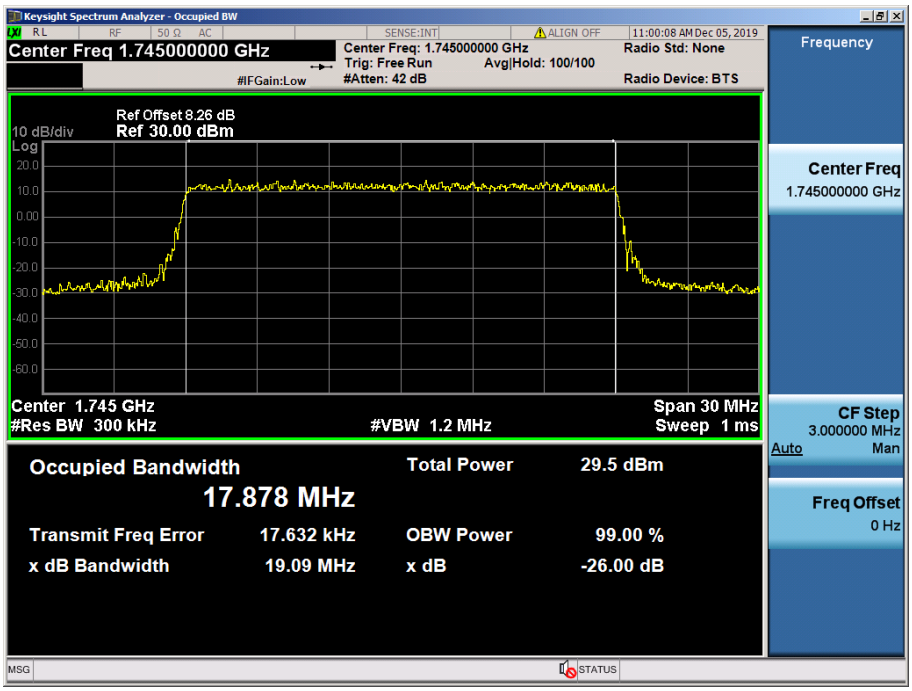



LTE Band 5 / 1.4 MHz / 16QAM - RB Size 6

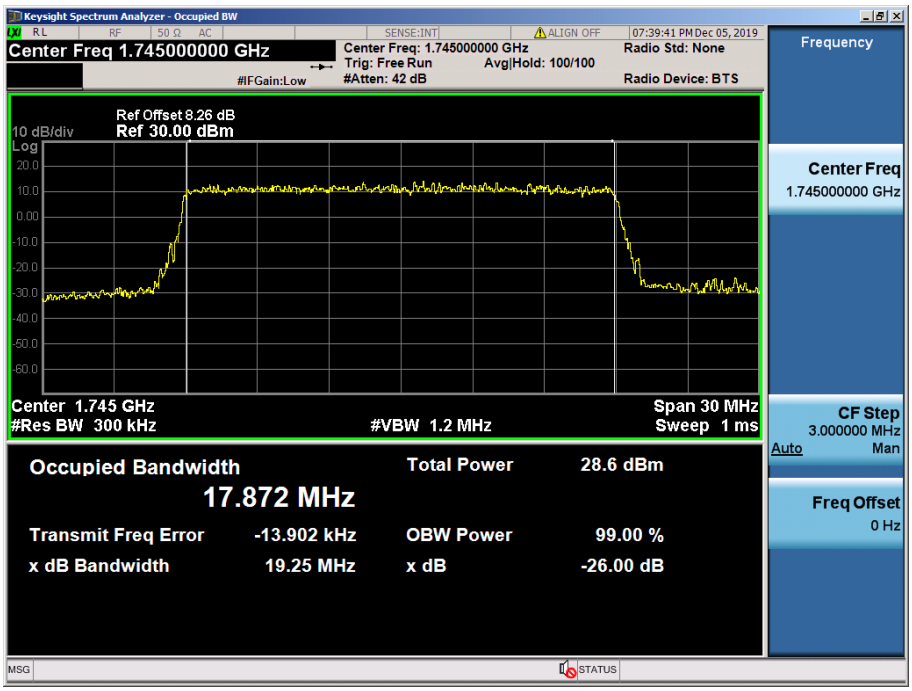



LTE Band 5 / 1.4 MHz / 64QAM - RB Size 6

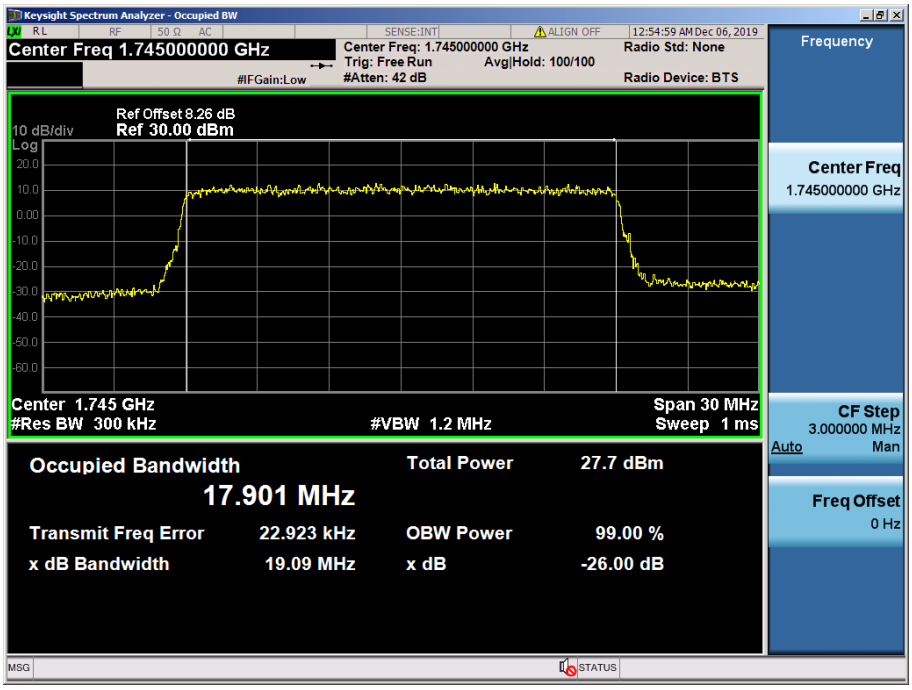
### 8.1.5 LTE Band 4



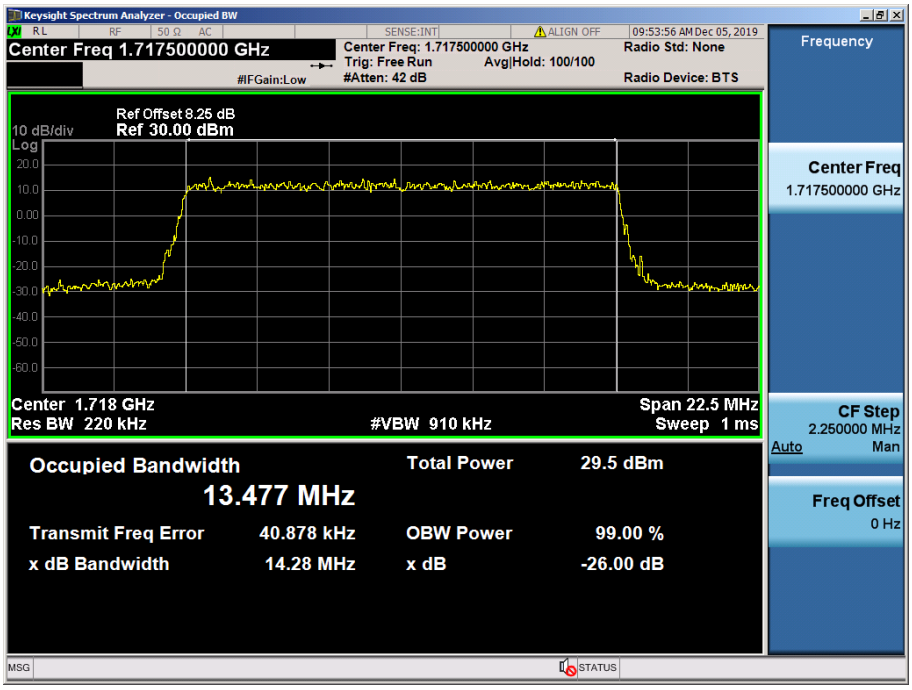

LTE Band 4 / 20 MHz / QPSK - RB Size 100



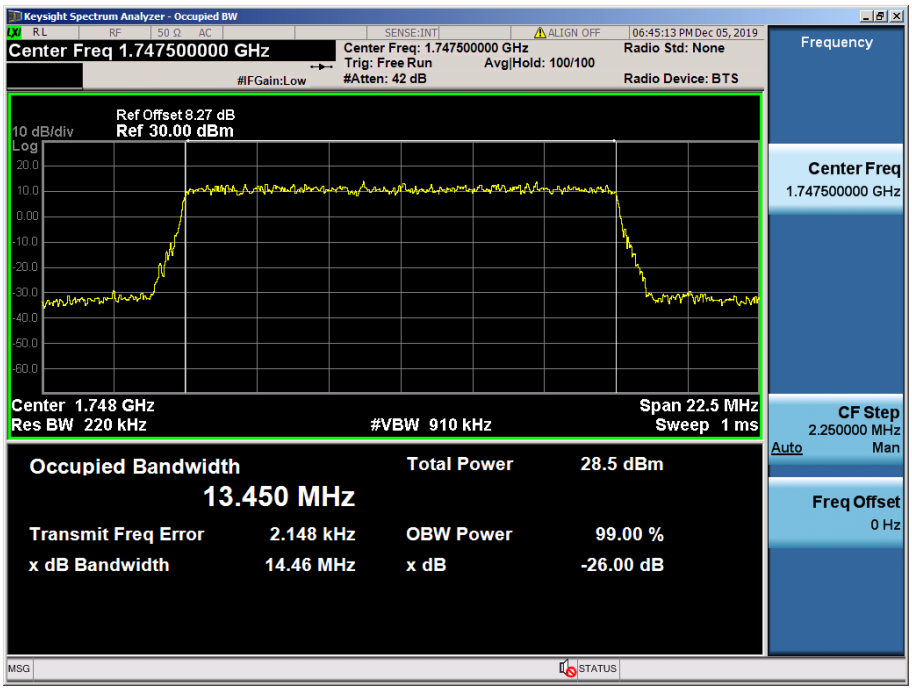

LTE Band 4 / 20 MHz / 16QAM - RB Size 100



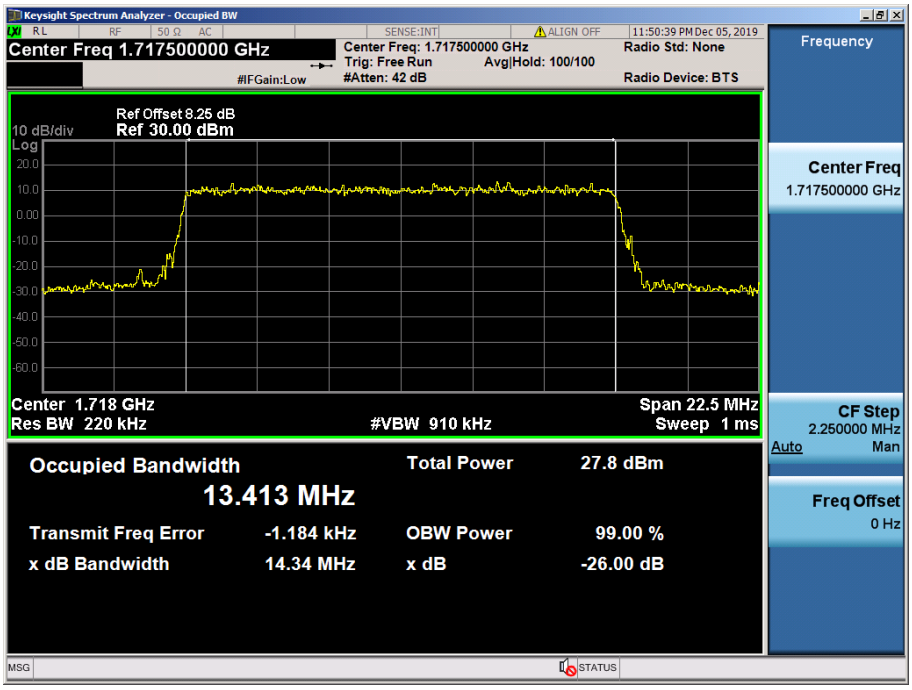

LTE Band 4 / 20 MHz / 64QAM - RB Size 100



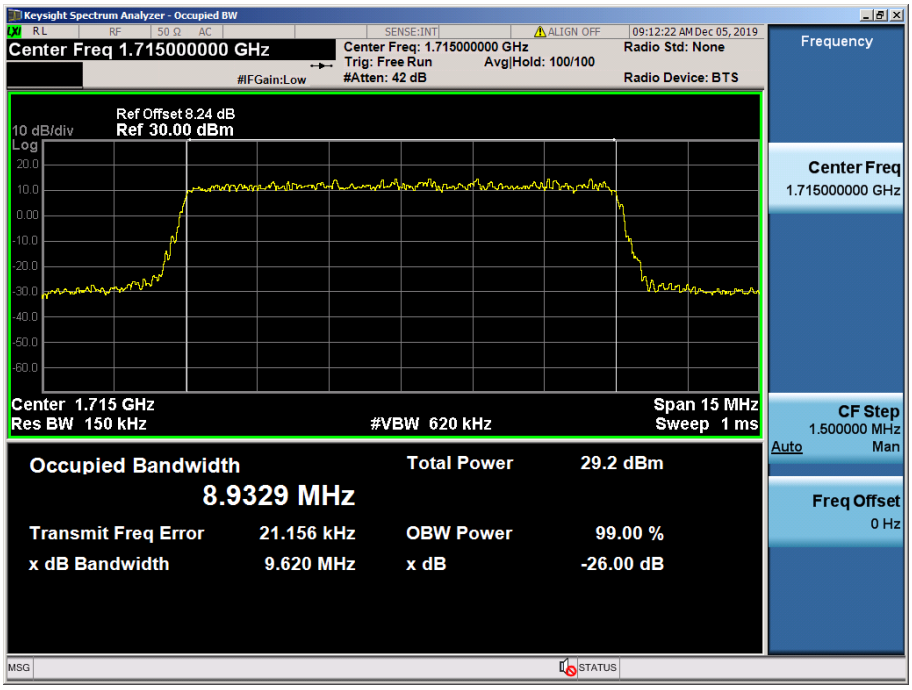

LTE Band 4 / 15 MHz / QPSK - RB Size 75



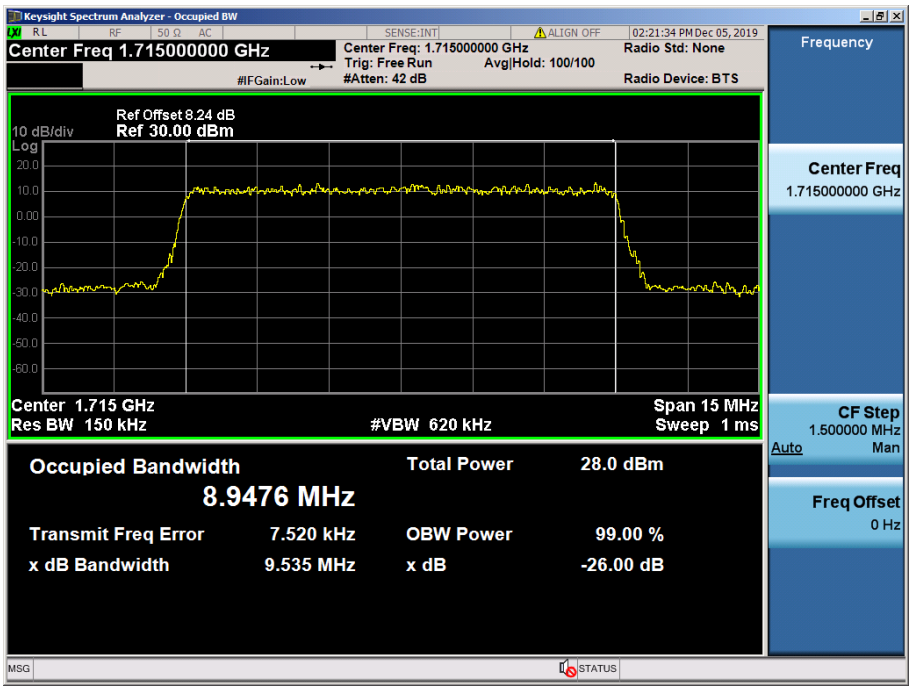

LTE Band 4 / 15 MHz / 16QAM - RB Size 75



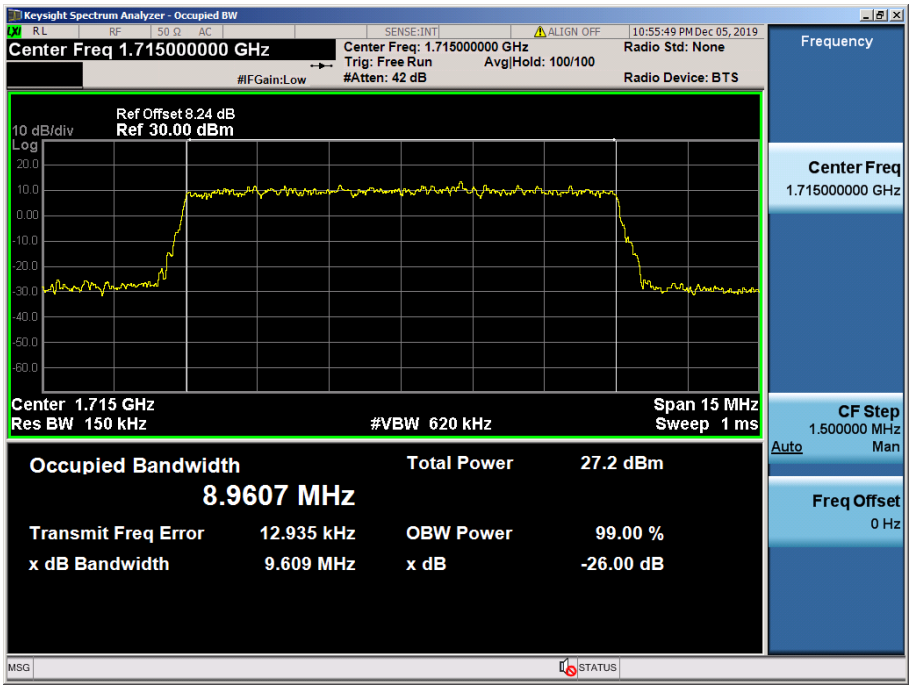

LTE Band 4 / 15 MHz / 64QAM - RB Size 75



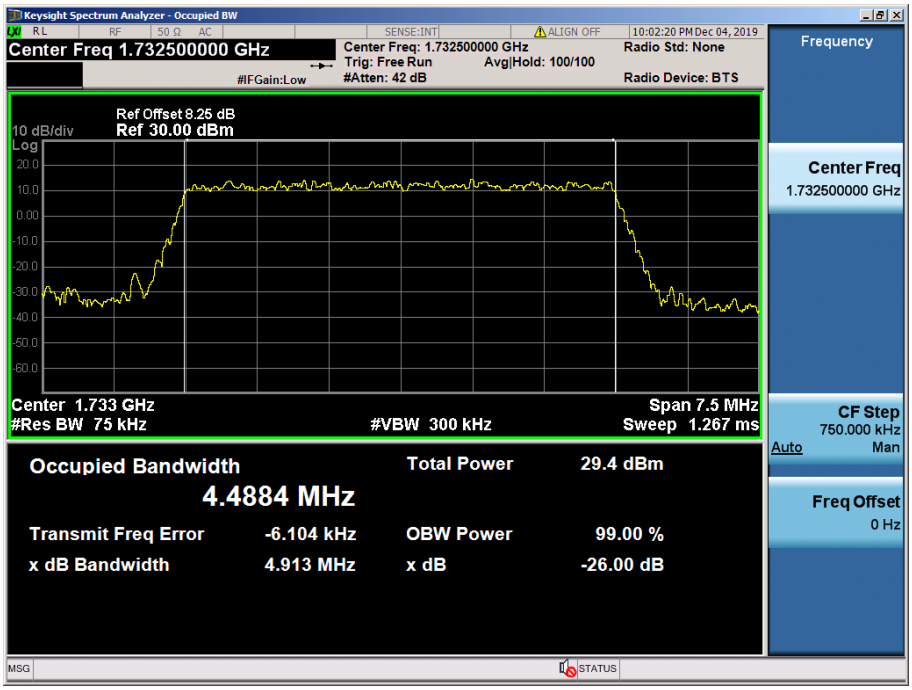

LTE Band 4 / 10 MHz / QPSK - RB Size 50



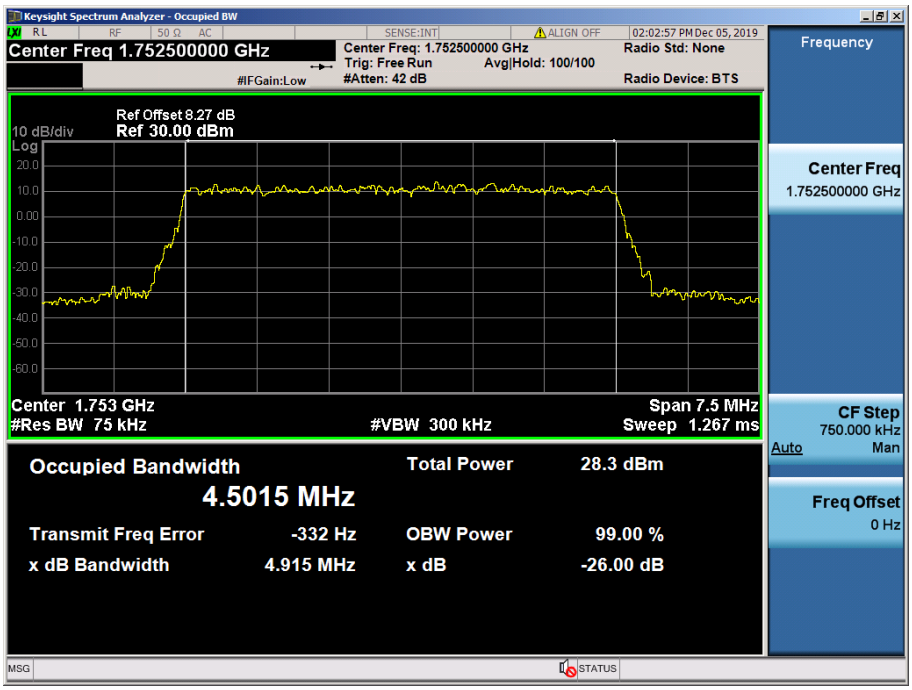

LTE Band 4 / 10 MHz / 16QAM - RB Size 50



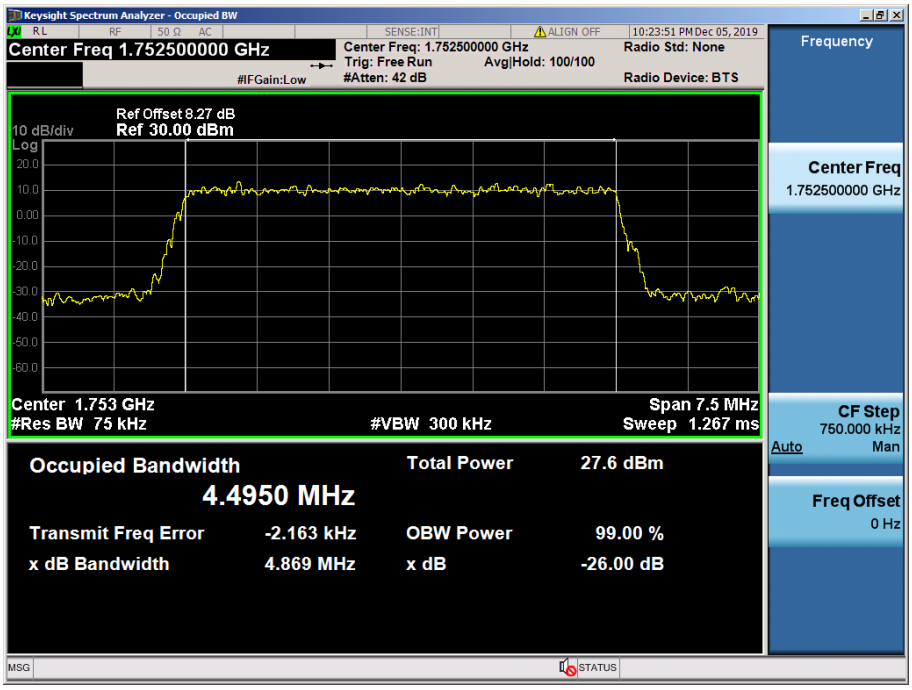

LTE Band 4 / 10 MHz / 64QAM - RB Size 50



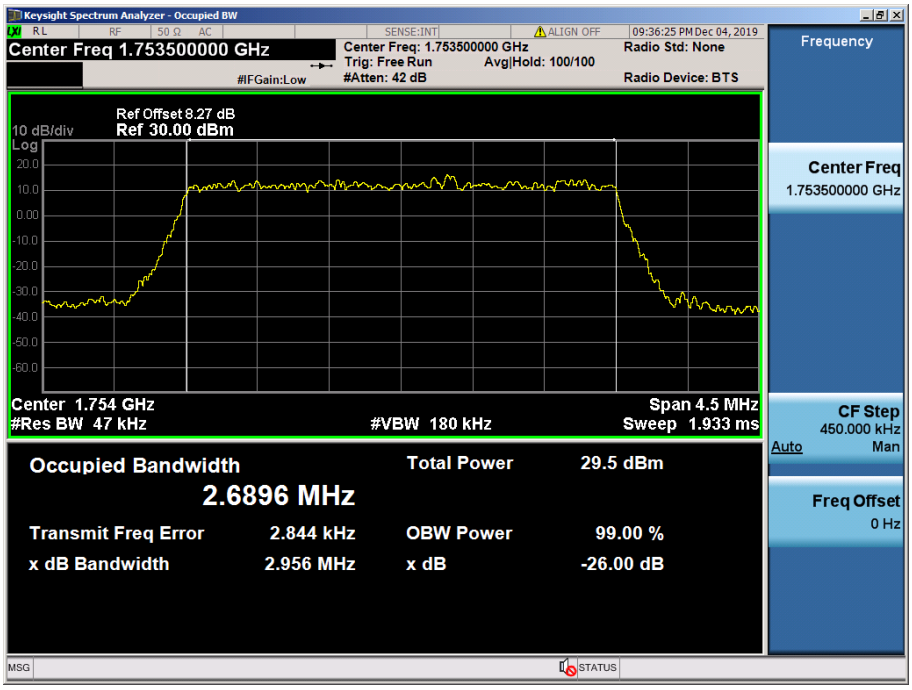

LTE Band 4 / 5 MHz / QPSK - RB Size 25



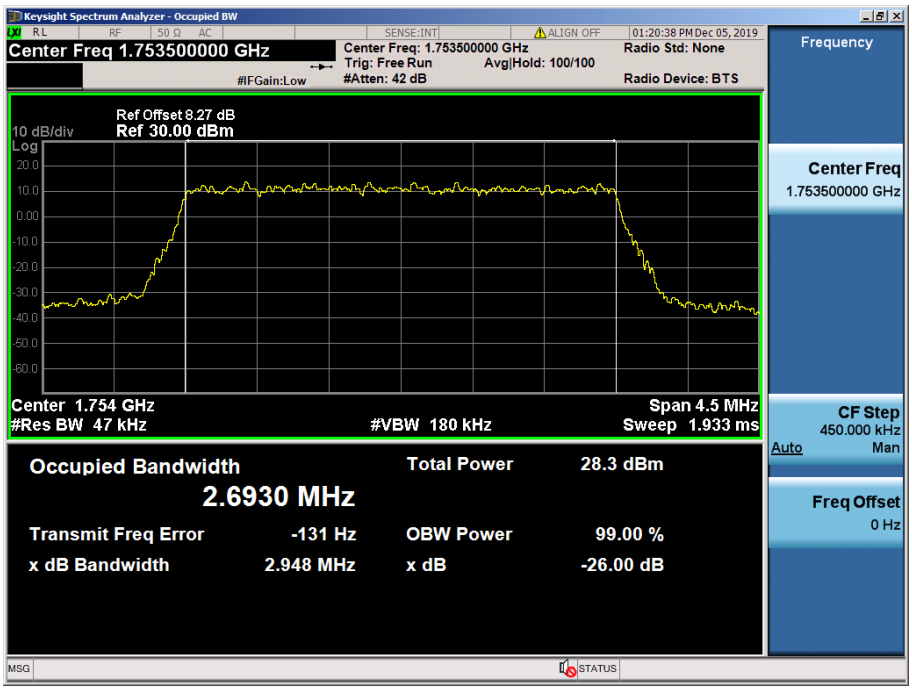

LTE Band 4 / 5 MHz / 16QAM - RB Size 25



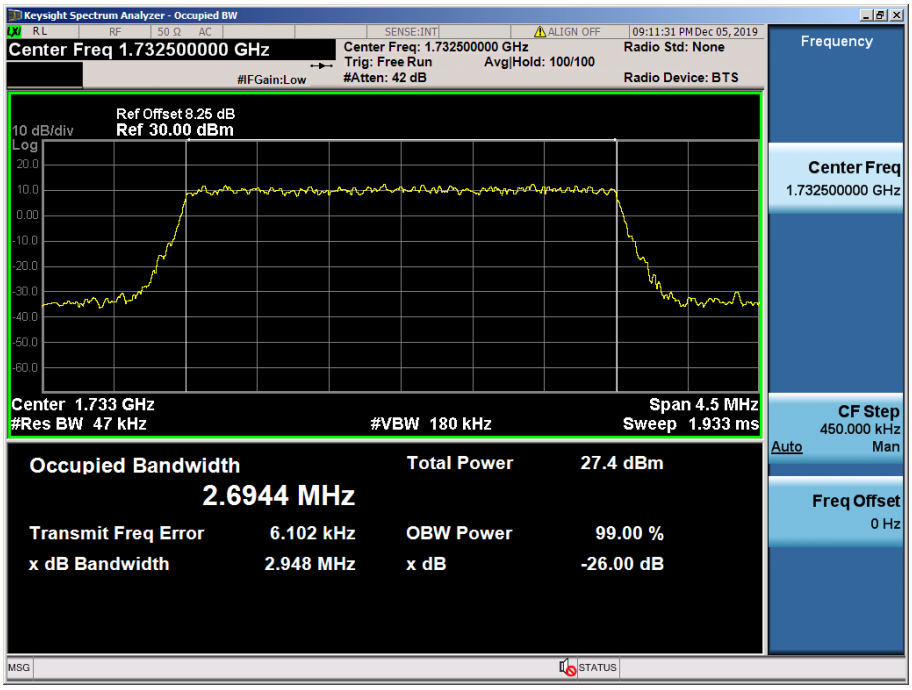

LTE Band 4 / 5 MHz / 64QAM - RB Size 25



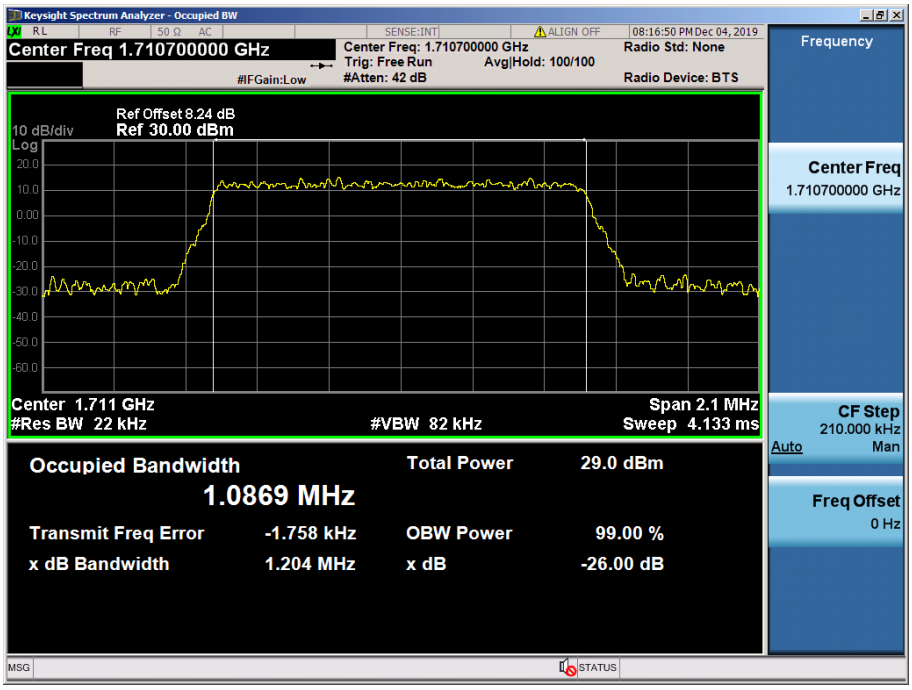

LTE Band 4 / 3 MHz / QPSK - RB Size 15



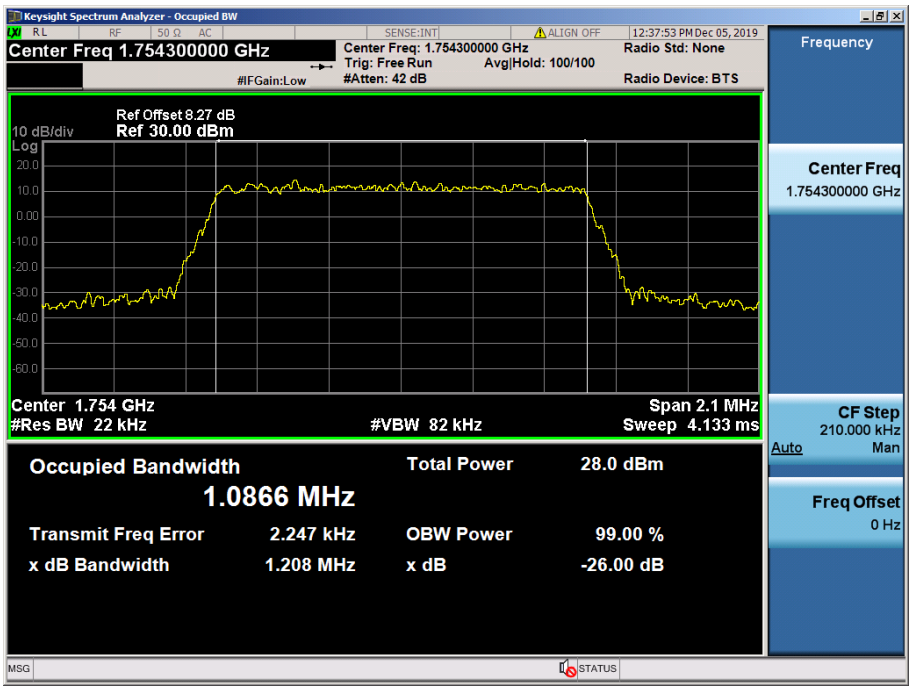

LTE Band 4 / 3 MHz / 16QAM - RB Size 15



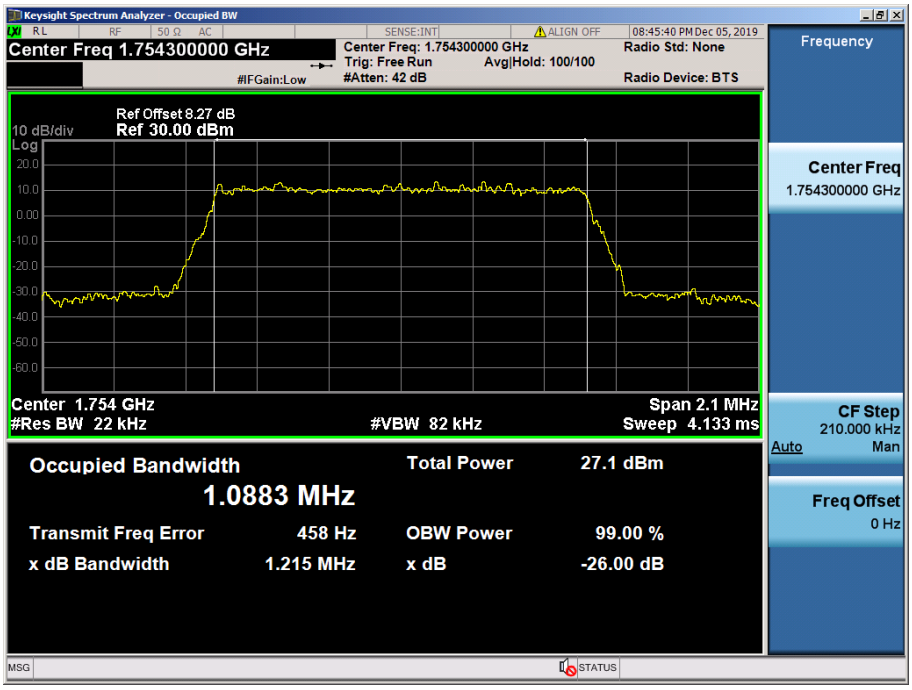

LTE Band 4 / 3 MHz / 64QAM - RB Size 15




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

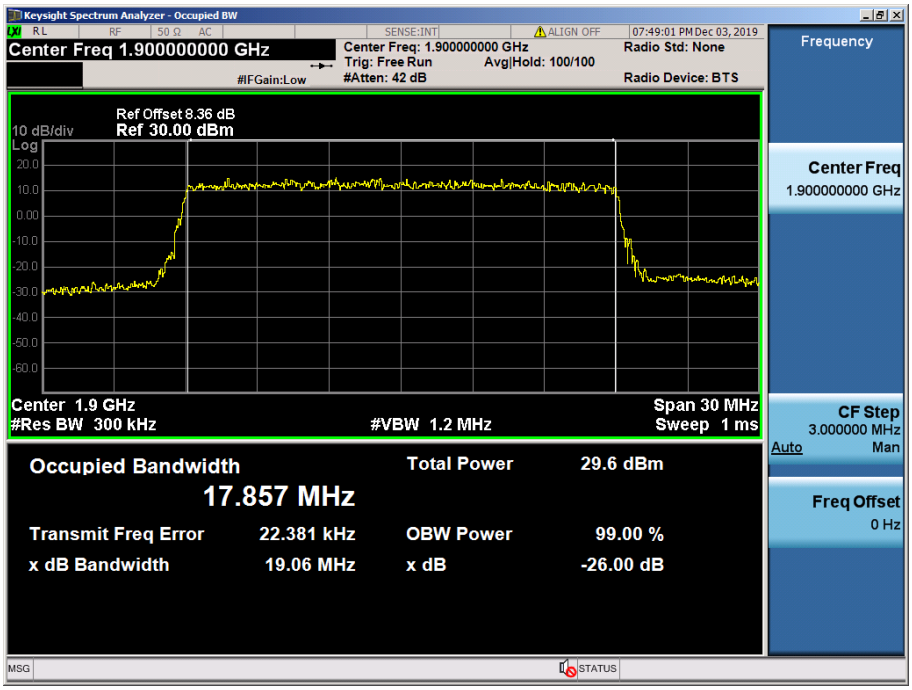



LTE Band 4 / 1.4 MHz / 16QAM - RB Size 6

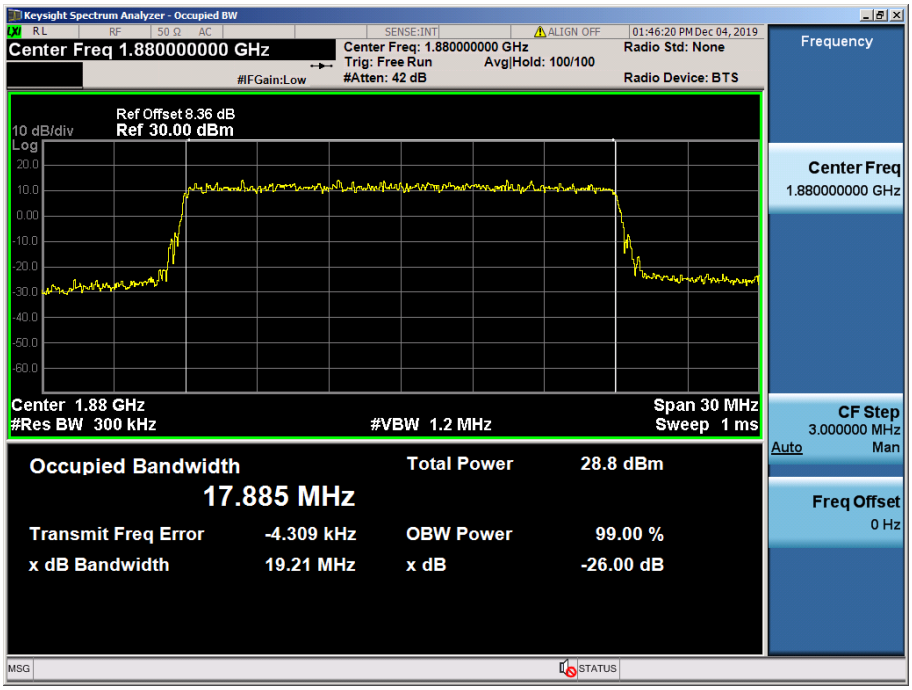



LTE Band 4 / 1.4 MHz / 64QAM - RB Size 6

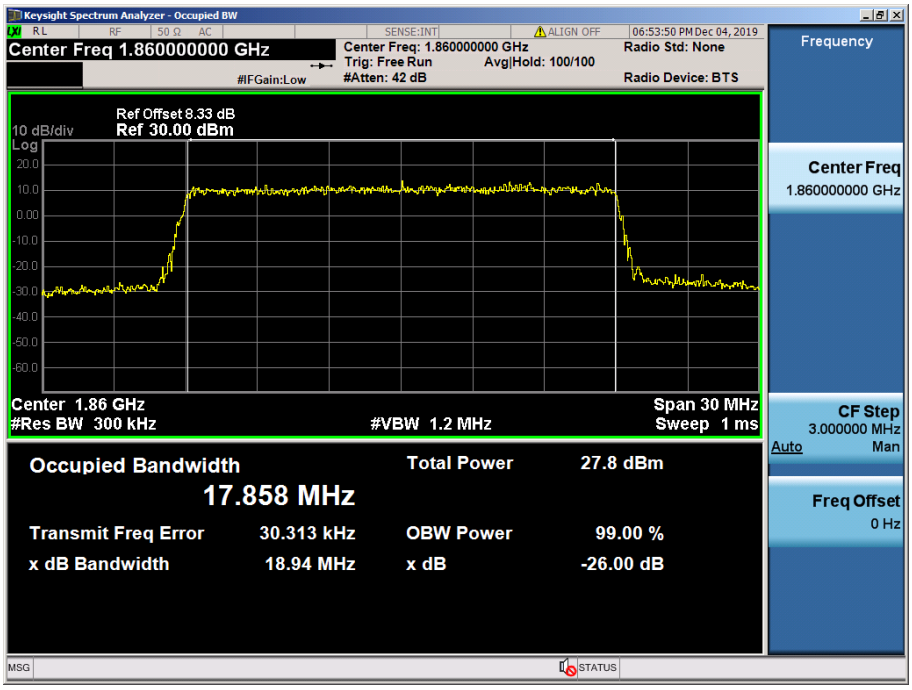
### 8.1.6 LTE Band 2



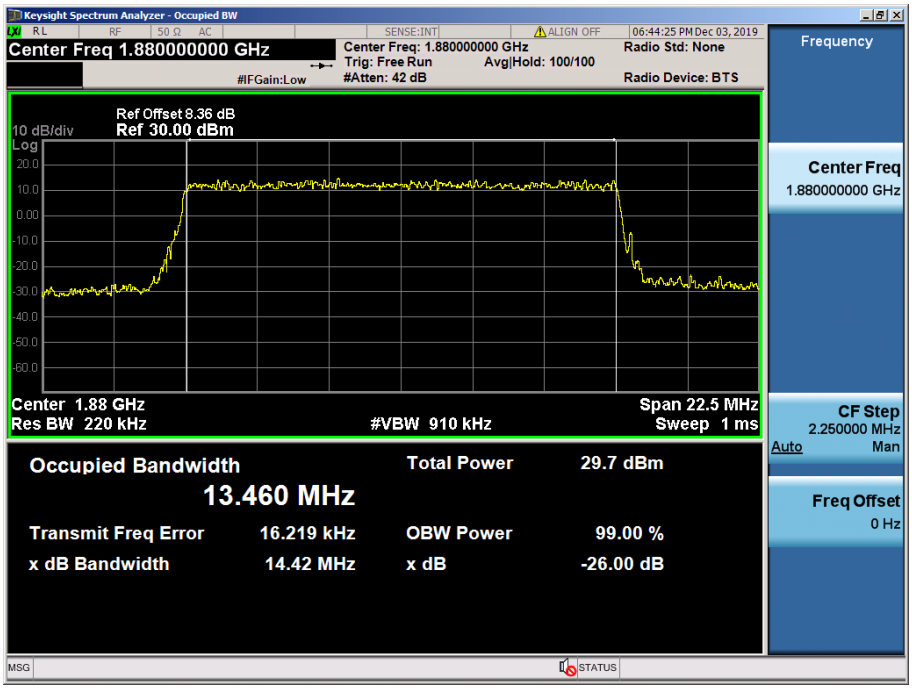

LTE Band 2 / 20 MHz / QPSK - RB Size 100



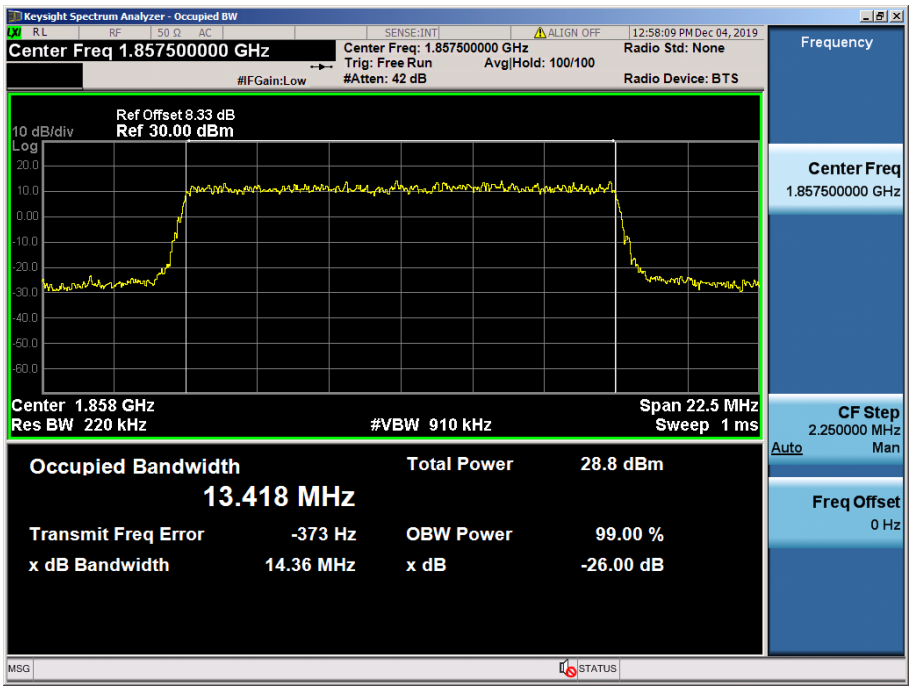

LTE Band 2 / 20 MHz / 16QAM - RB Size 100



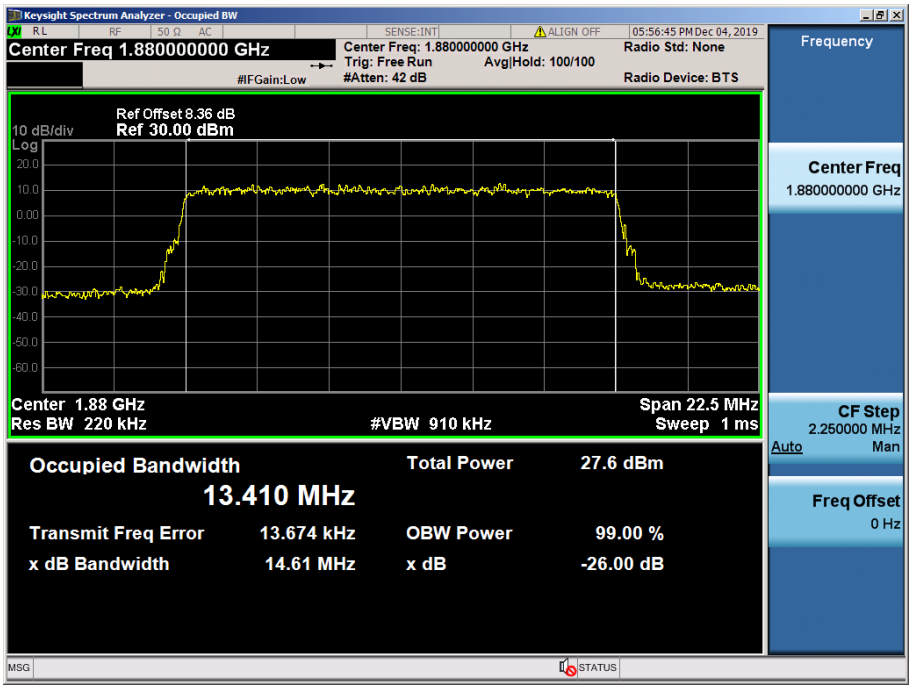

LTE Band 2 / 20 MHz / 64QAM - RB Size 100



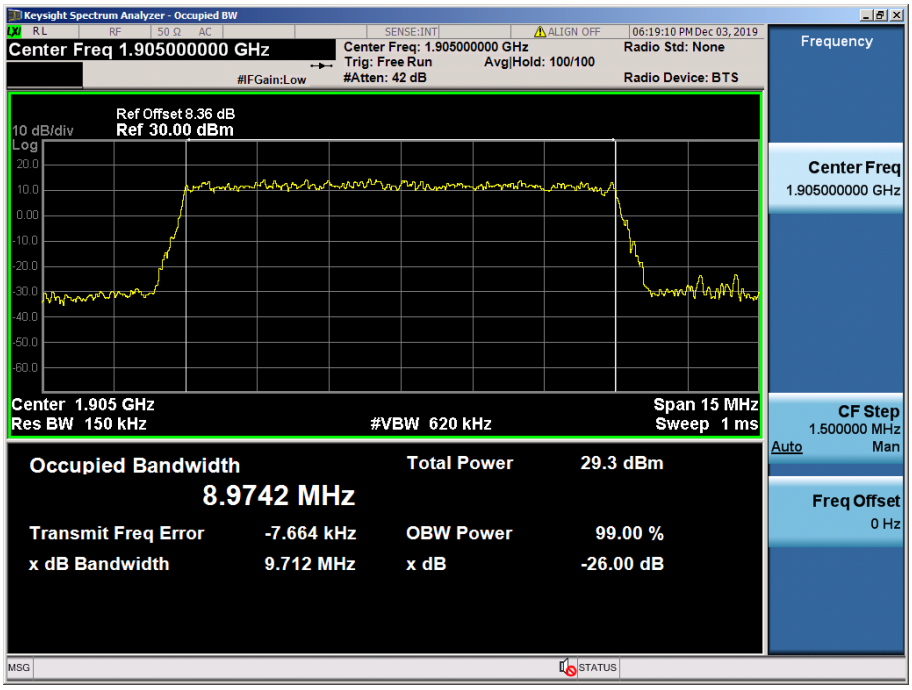

LTE Band 2 / 15 MHz / QPSK - RB Size 75



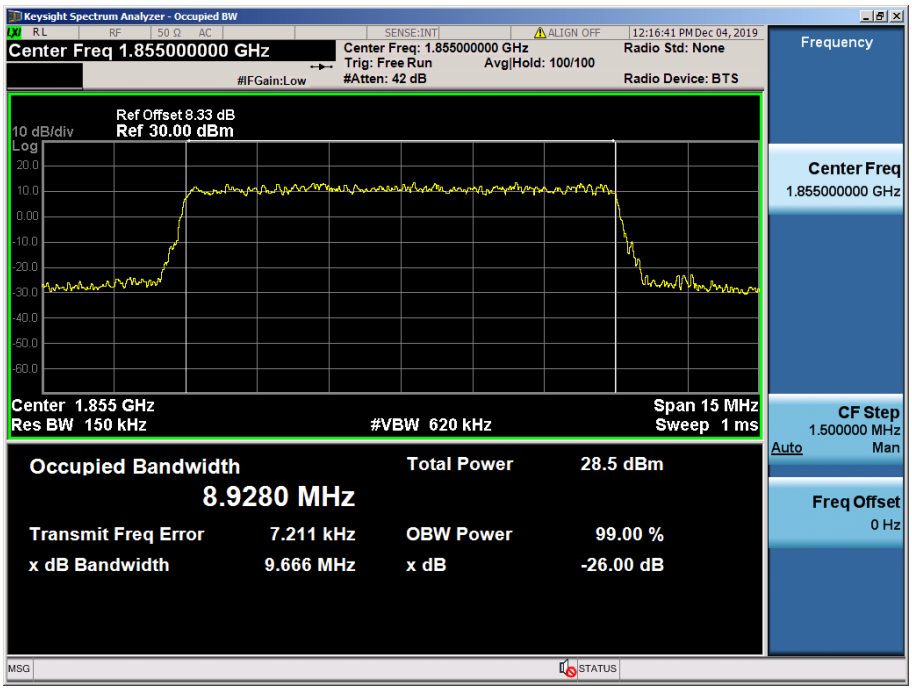

LTE Band 2 / 15 MHz / 16QAM - RB Size 75



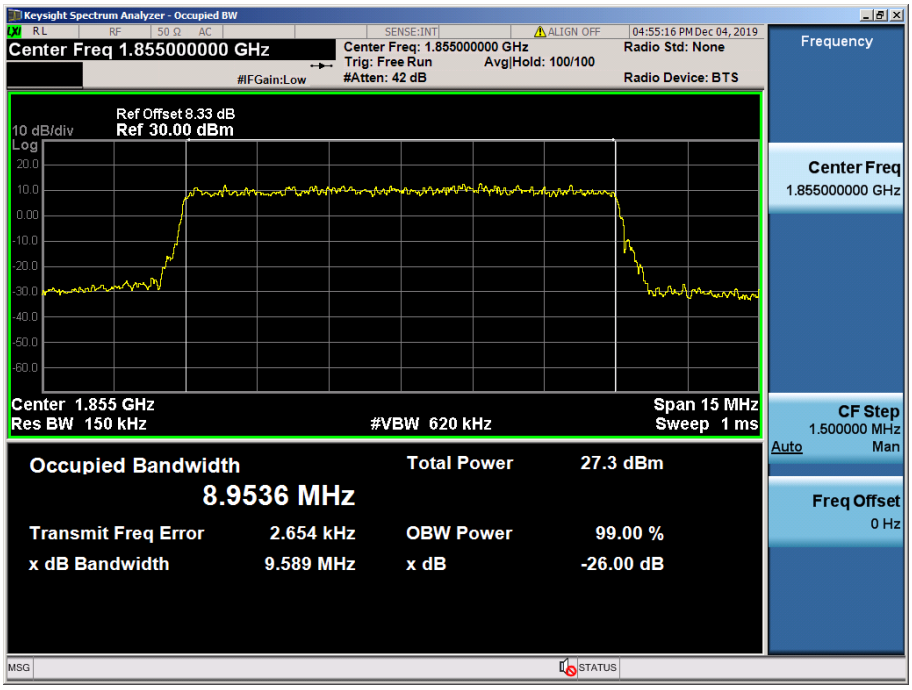

LTE Band 2 / 15 MHz / 64QAM - RB Size 75



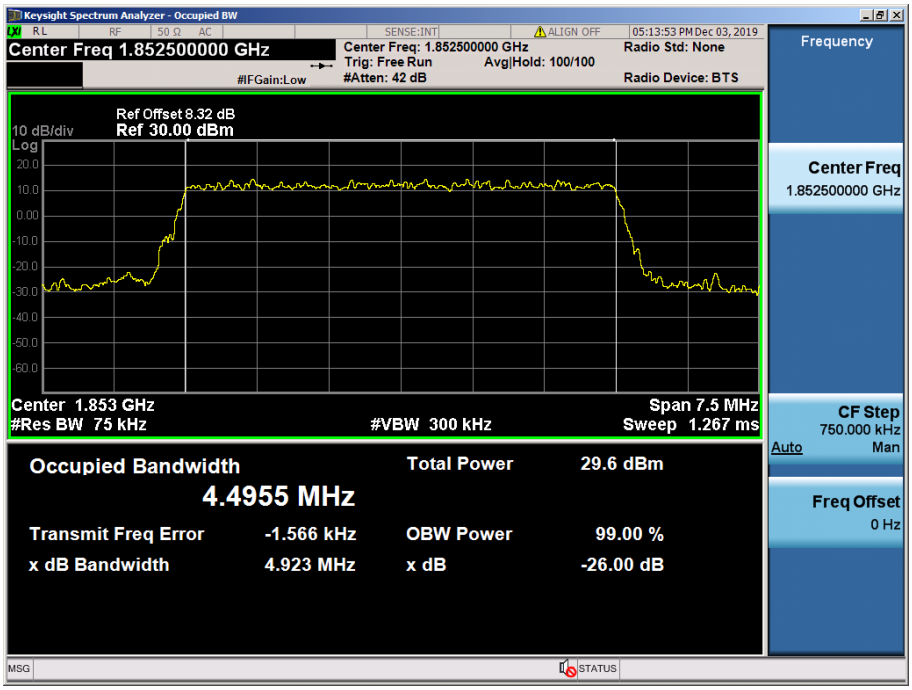

LTE Band 2 / 10 MHz / QPSK - RB Size 50



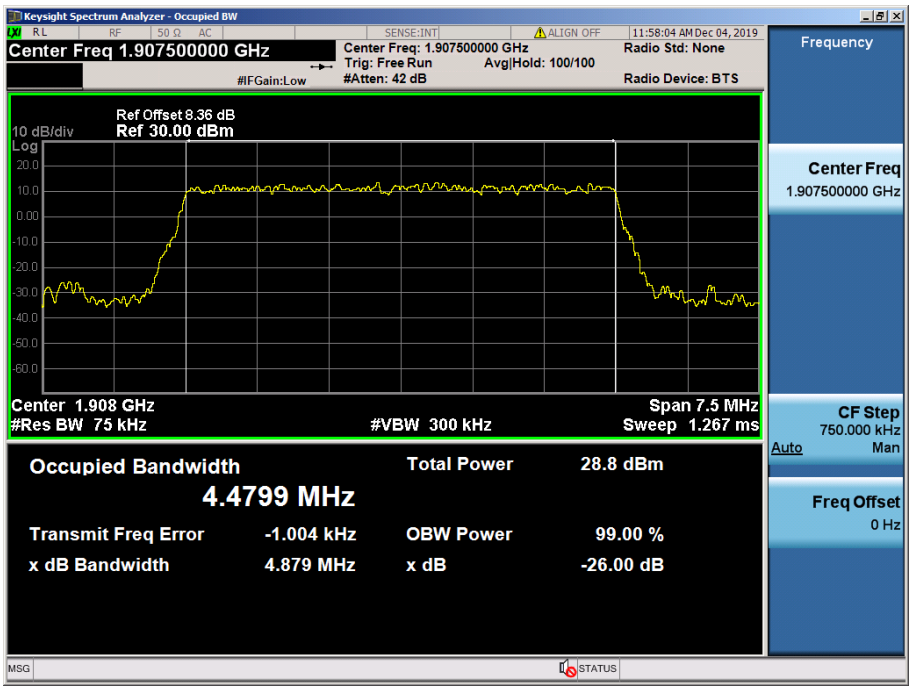

LTE Band 2 / 10 MHz / 16QAM - RB Size 50



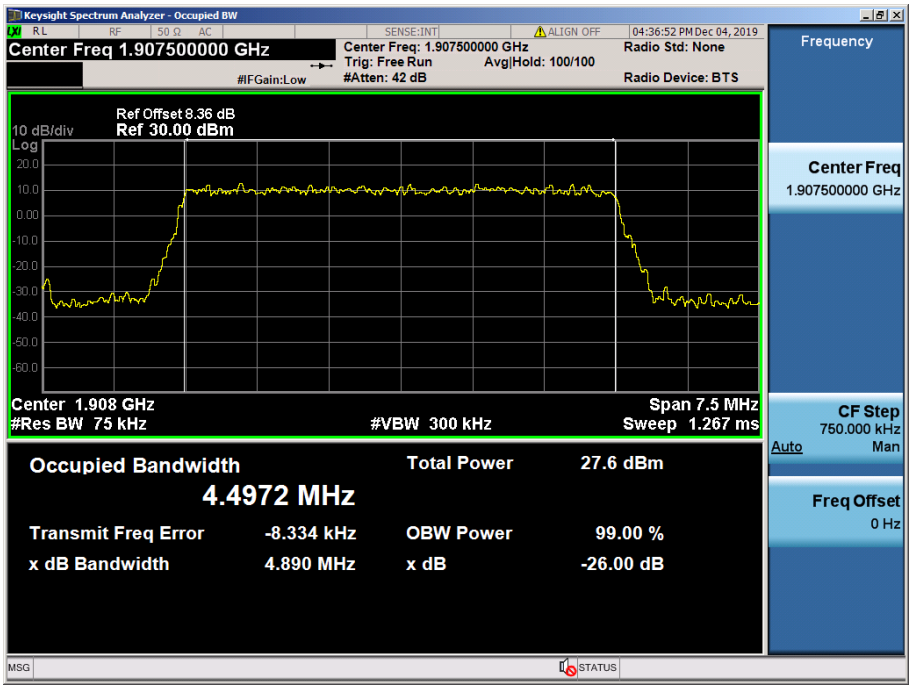

LTE Band 2 / 10 MHz / 64QAM - RB Size 50



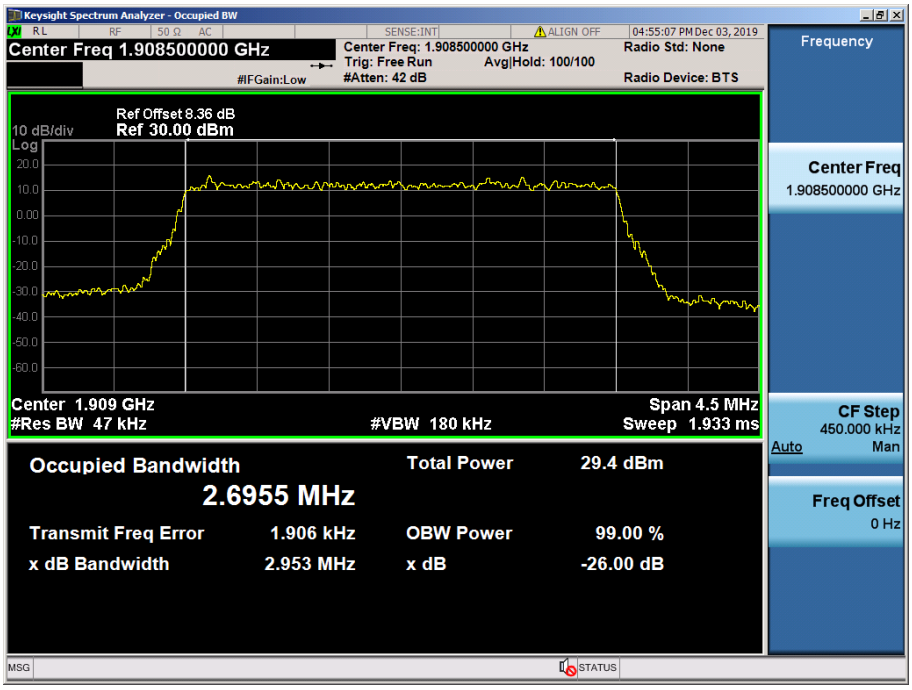

LTE Band 2 / 5 MHz / QPSK - RB Size 25



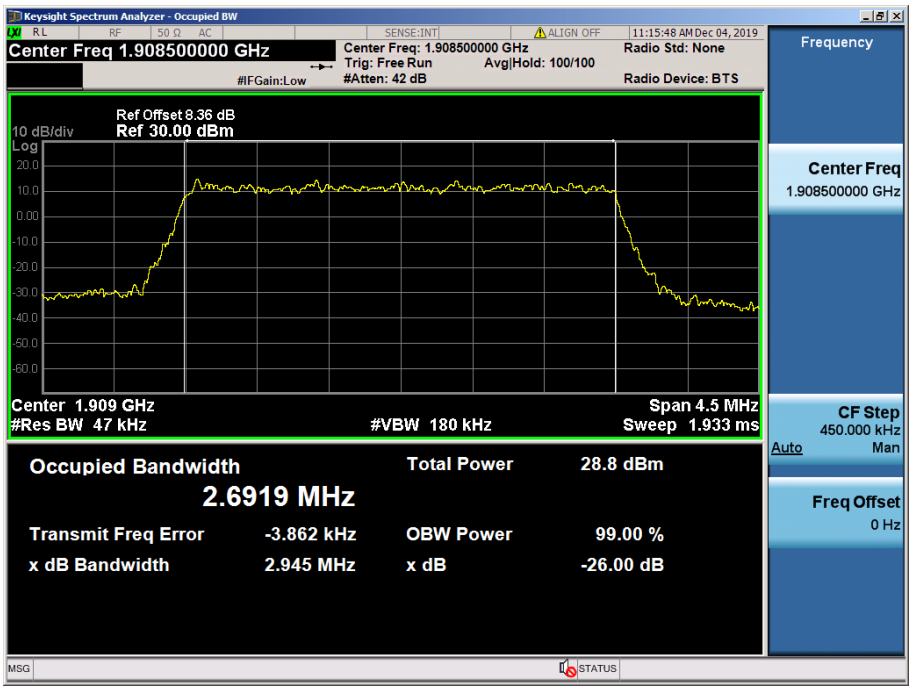

LTE Band 2 / 5 MHz / 16QAM - RB Size 25



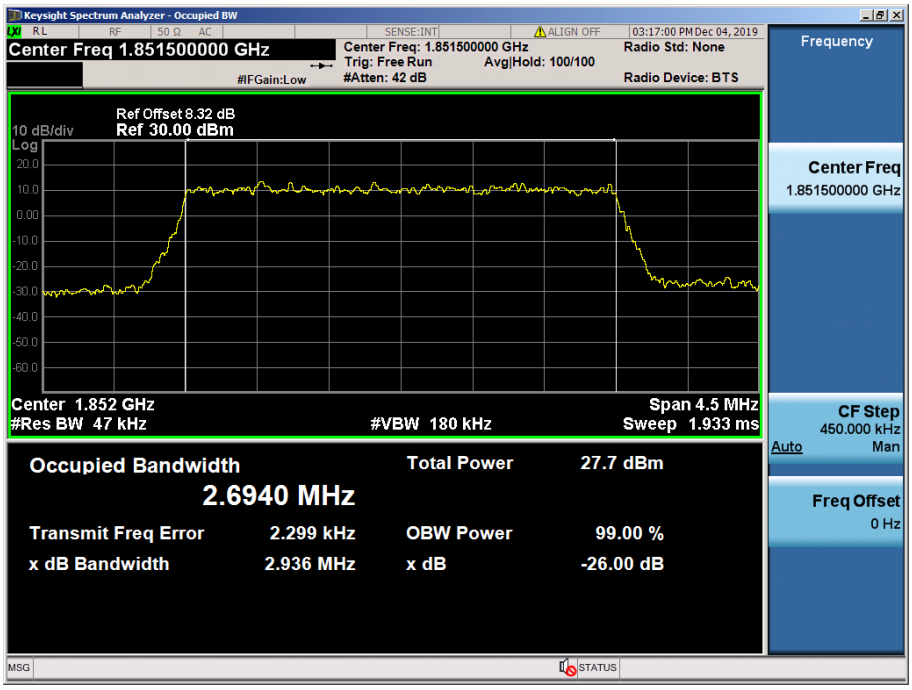

LTE Band 2 / 5 MHz / 64QAM - RB Size 25




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




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




LTE Band 2 / 3 MHz / 64QAM - RB Size 15