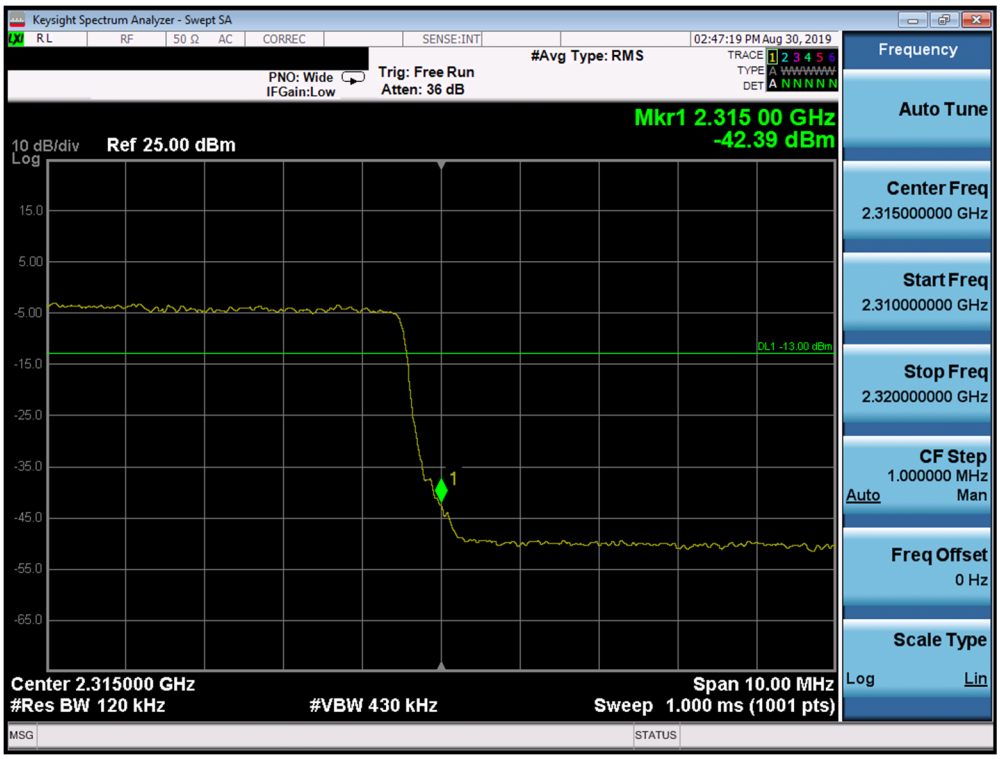
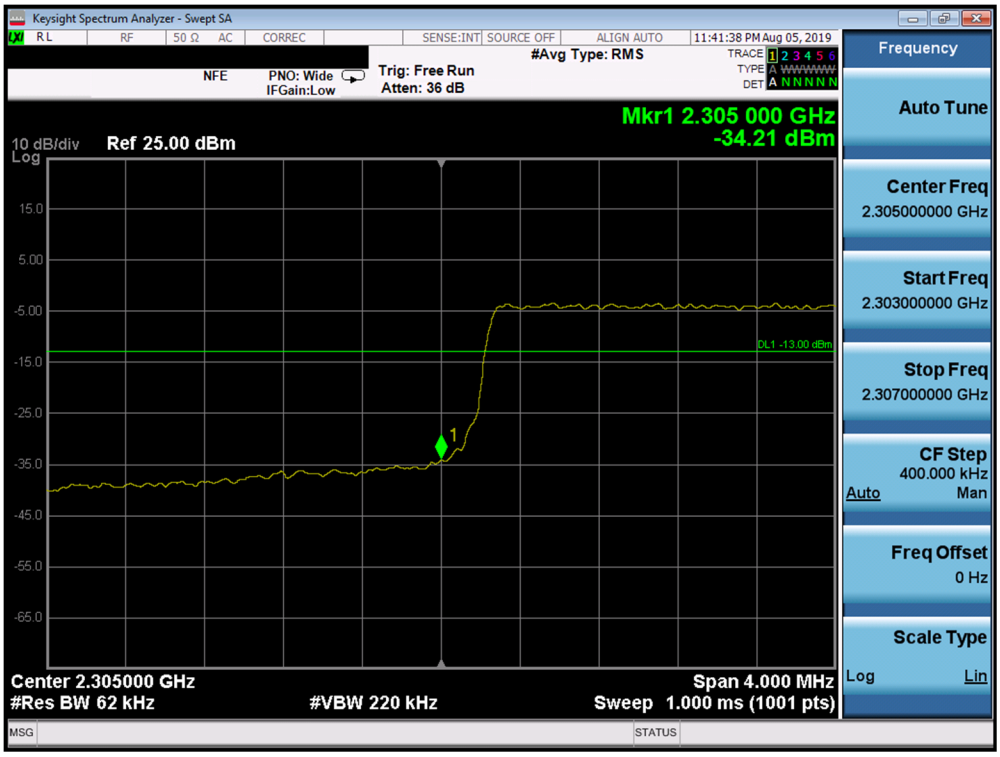



**Plot 7-25. Upper Band Edge Plot (Band 30 - 10.0MHz QPSK - Full RB Configuration)**

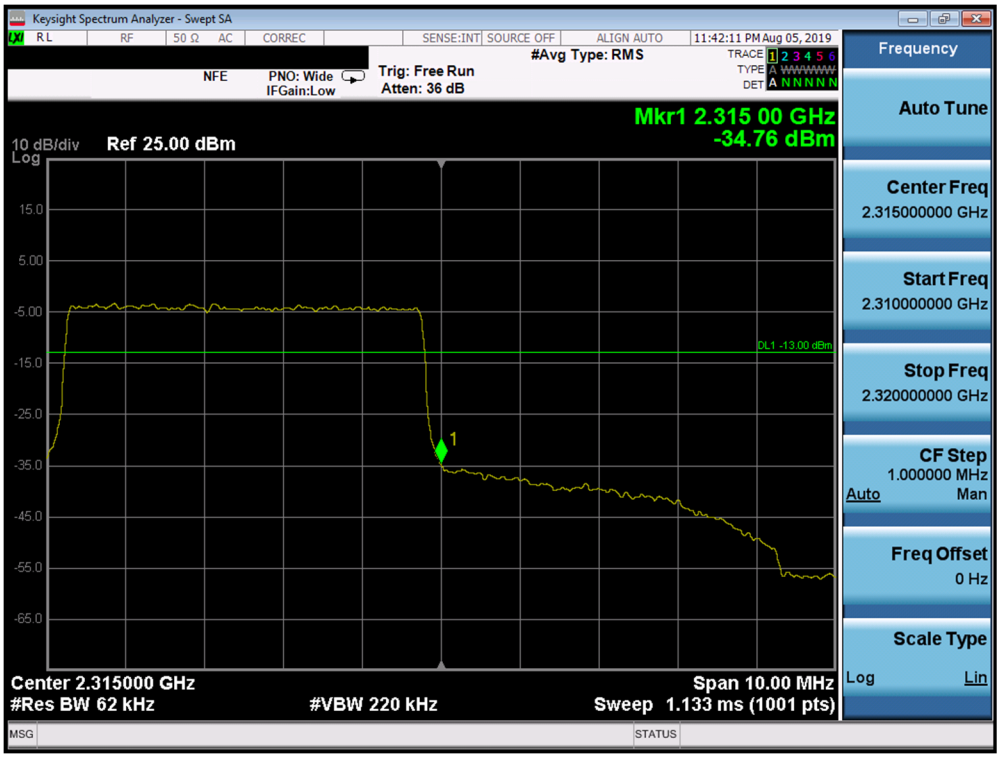

**Plot 7-26. Upper Extended Band Edge Plot (Band 30 - 10.0MHz QPSK - Full RB Configuration)**

## Band 30 – Diversity Antenna



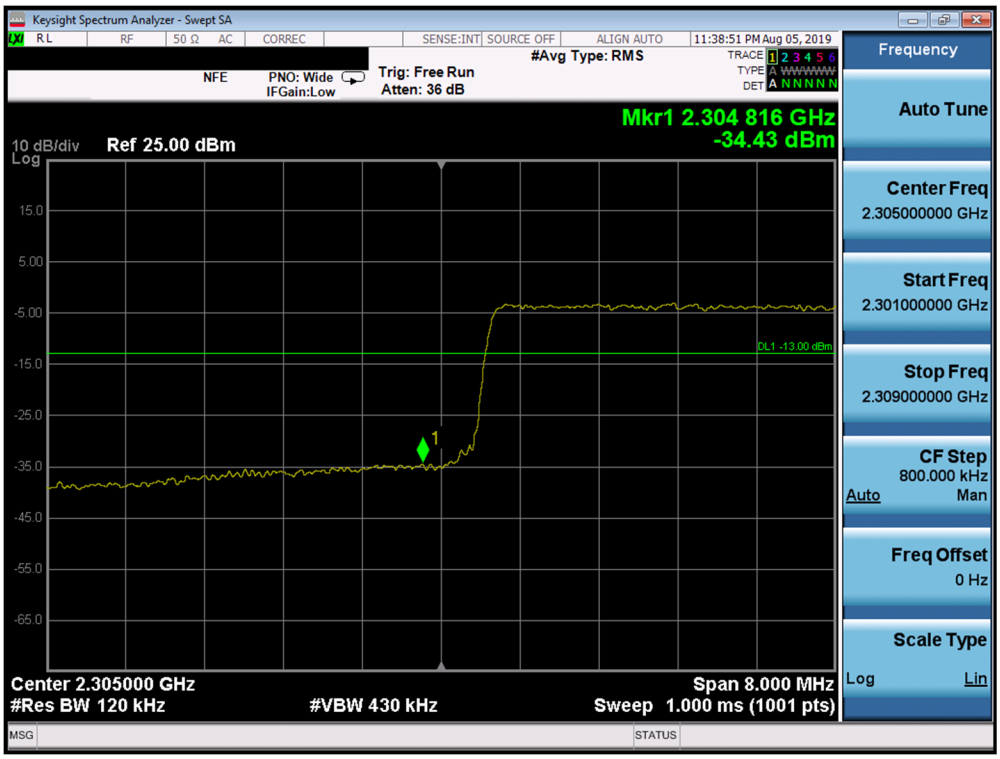

**Plot 7-27. Lower Band Edge Plot (Band 30 - 5.0MHz QPSK - Full RB Configuration)**


**Plot 7-28. Lower Extended Band Edge Plot (Band 30 - 5.0MHz QPSK - Full RB Configuration)**



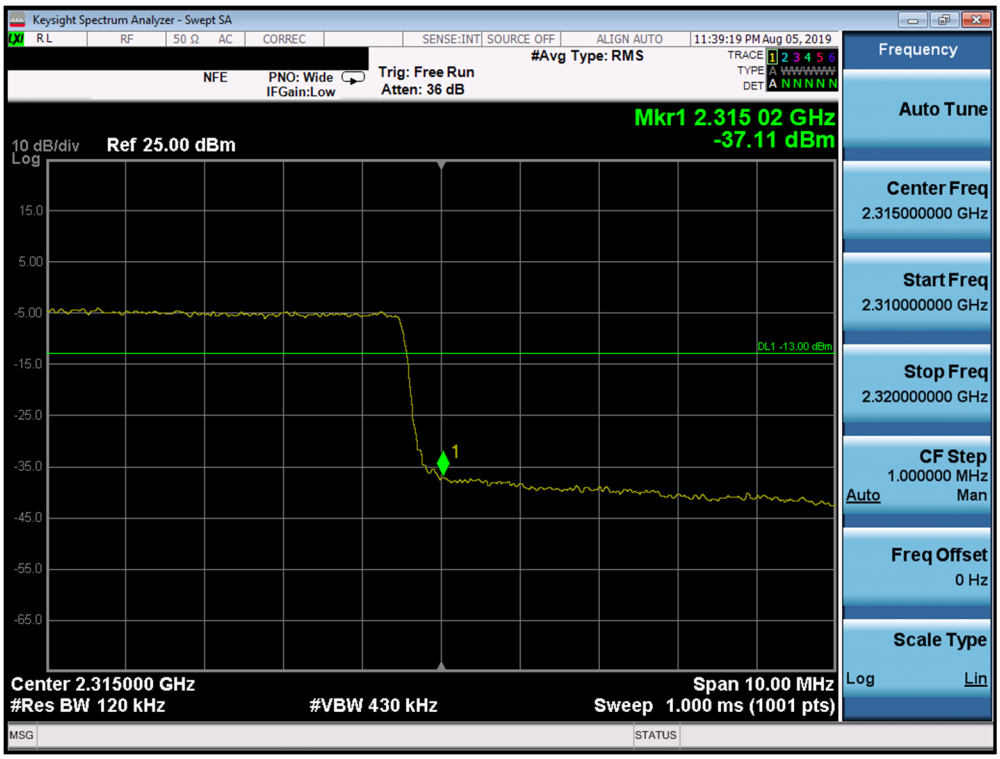

**Plot 7-29. Upper Band Edge Plot (Band 30 - 5.0MHz QPSK - Full RB Configuration)**


**Plot 7-30. Upper Extended Band Edge Plot (Band 30 - 5.0MHz QPSK - Full RB Configuration)**




**Plot 7-31. Lower Band Edge Plot (Band 30 - 10.0MHz QPSK - Full RB Configuration)**


**Plot 7-32. Lower Extended Band Edge Plot (Band 30 - 10.0MHz QPSK - Full RB Configuration)**




**Plot 7-33. Upper Band Edge Plot (Band 30 - 10.0MHz QPSK - Full RB Configuration)**


**Plot 7-34. Upper Extended Band Edge Plot (Band 30 - 10.0MHz QPSK - Full RB Configuration)**

## 7.5 Radiated Power (EIRP)

### Test Overview

Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the method described in ANSI/TIA-603-E-2016. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

### Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.2.1

### Test Settings

The relevant equation for determining the ERP or EIRP from the conducted RF output power measured is:

ERP/EIRP = PMeas – LC + GT

Where:

ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as PMeas, typically dBW or dBm)

PMeas = measured transmitter output power or PSD, in dBW or dBm

LC = signal attenuation in the connecting cable between the transmitter and antenna in dB

GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

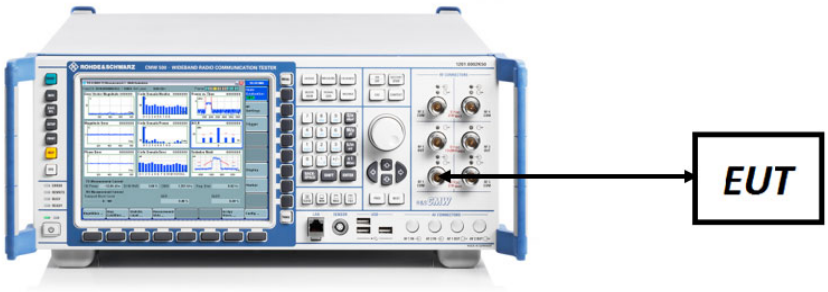



**Figure 7-4. ERP/EIRP Measurement Setup**

## Test Notes

1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.

2) This unit was tested while powered by an Power Over Ethernet (POE) power source.

3) The Level (dBm) readings in the table were taken with a correction table loaded into the base station simulator. The correction table was used to account for the signal attenuation in the connecting cable between the transmitter and antenna.

4) The Ant. Gains (GT) are listed in dBi.

## 7.5.1 Main Antenna Radiated Power (ERP/EIRP)

| Frequency [MHz] | Channel Bandwidth [MHz] | Mod. | RB Size/Offset | Conducted Power [dBm/5MHz] | Ant. Gain [dBi] | EIRP [dBm/5MHz] | EIRP [Watts/5MHz] | EIRP Limit [dBm/5MHz] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 2307.50 | 5 | QPSK | 1/0 | 14.93 | 17.00 | **31.93** | 1.560 | 33.01 | -1.08 |
| 2312.50 | 5 | QPSK | 1/0 | 14.91 | 17.00 | 31.91 | 1.552 | 33.01 | -1.10 |
| 2312.50 | 5 | 16-QAM | 1/0 | 14.91 | 17.00 | 31.91 | 1.552 | 33.01 | -1.10 |
| 2312.50 | 5 | 64-QAM | 1/0 | 14.98 | 17.00 | **31.98** | 1.578 | 33.01 | -1.03 |
| 2310.00 | 10 | QPSK | 1/0 | 15.06 | 17.00 | **32.06** | **1.607** | 33.01 | -0.95 |
| 2310.00 | 10 | 16-QAM | 1/0 | 15.01 | 17.00 | 32.01 | 1.589 | 33.01 | -1.00 |
| 2310.00 | 10 | 64-QAM | 1/0 | 14.98 | 17.00 | 31.98 | 1.578 | 33.01 | -1.03 |

**Table 7-3. EIRP Data (Band 30)**

## 7.5.2 Diversity Antenna Radiated Power (ERP/EIRP)

| Frequency [MHz] | Channel Bandwidth [MHz] | Mod. | RB Size/Offset | Conducted Power [dBm/5MHz] | Ant. Gain [dBi] | EIRP [dBm/5MHz] | EIRP [Watts/5MHz] | EIRP Limit [dBm/5MHz] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 2307.50 | 5 | QPSK | 12 / 6 | 14.83 | 17.00 | 31.83 | 1.524 | 33.01 | -1.18 |
| 2312.50 | 5 | QPSK | 1 / 24 | 15.25 | 17.00 | **32.25** | **1.679** | 33.01 | -0.76 |
| 2312.50 | 5 | 16-QAM | 1 / 24 | 14.37 | 17.00 | **31.37** | 1.371 | 33.01 | -1.64 |
| 2312.50 | 5 | 64-QAM | 1 / 24 | 13.36 | 17.00 | 30.36 | 1.086 | 33.01 | -2.65 |
| 2310.00 | 10 | QPSK | 1 / 49 | 14.98 | 17.00 | **31.98** | 1.578 | 33.01 | -1.03 |
| 2310.00 | 10 | 16-QAM | 1 / 49 | 14.33 | 17.00 | 31.33 | 1.358 | 33.01 | -1.68 |
| 2310.00 | 10 | 64-QAM | 1 / 49 | 13.30 | 17.00 | 30.30 | 1.072 | 33.01 | -2.71 |

**Table 7-4. EIRP Data (Band 30)**

## 7.6 Radiated Spurious Emissions Measurements

**Test Overview**

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas.

**Test Procedures Used**

KDB 971168 D01 v03r01 – Section 5.8

ANSI/TIA-603-E-2016 – Section 2.2.12

**Test Settings**

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW ≥ 3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points ≥ 2 x span / RBW
5. Detector = RMS
6. Trace mode = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

## Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

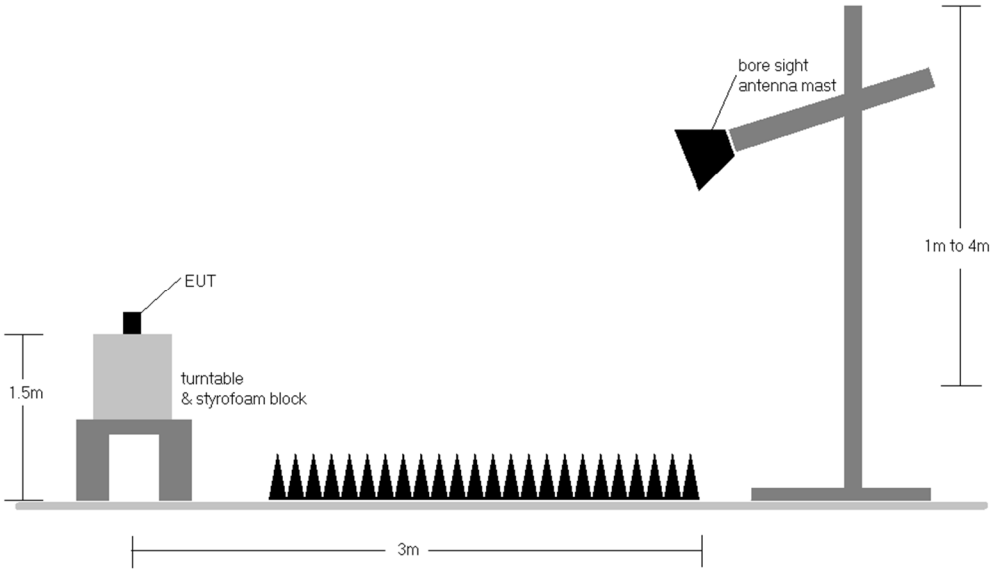



**Figure 7-5. Test Instrument & Measurement Setup**

## Test Notes

1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.

2) This unit was tested while powered by an Power Over Ethernet (POE) power source.

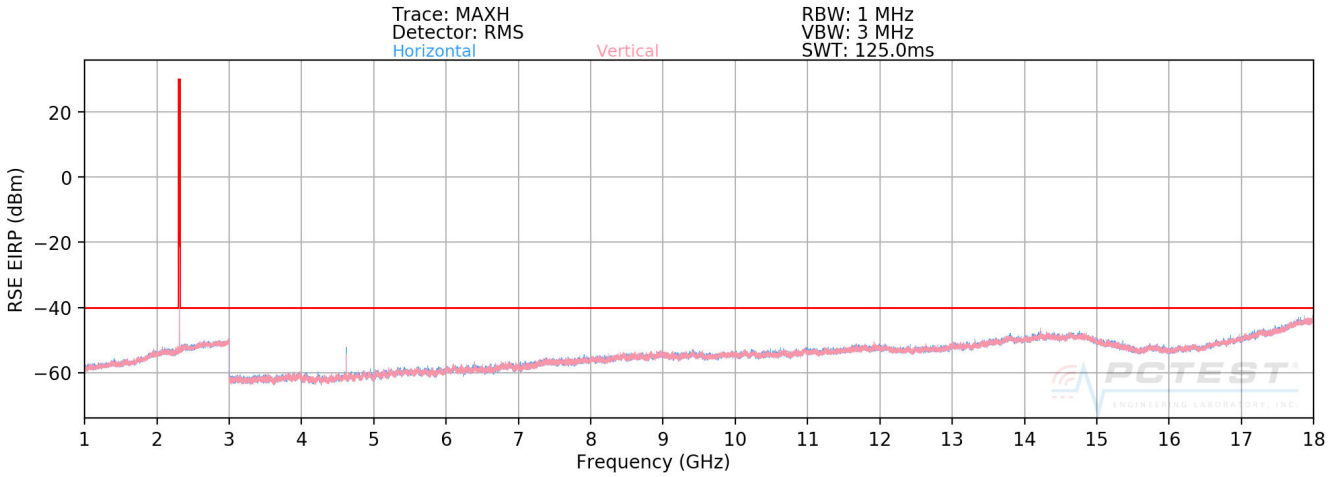
3) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.

4) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.

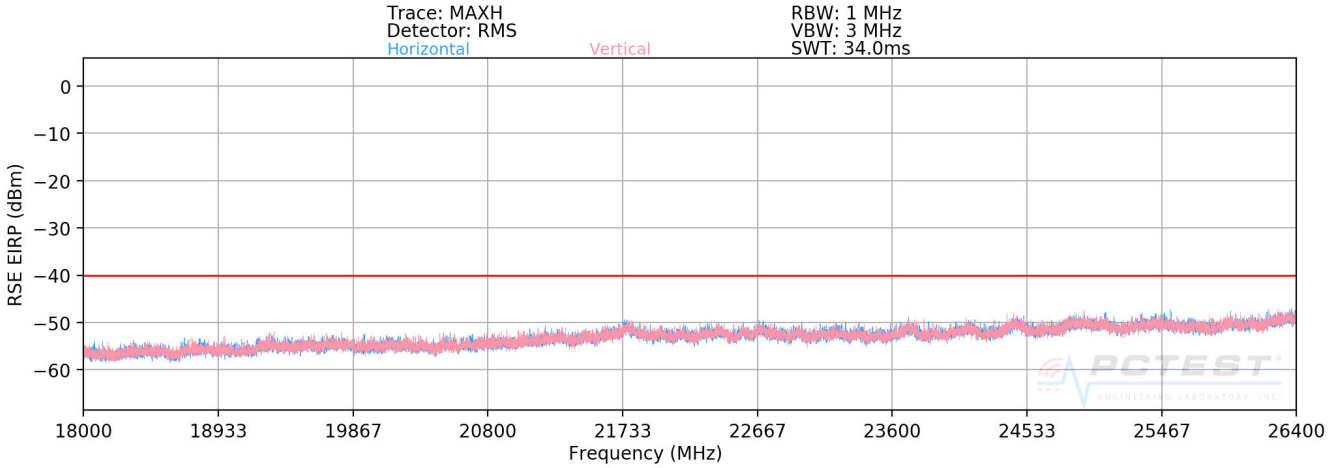
5) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

## 7.6.1 Main Antenna Radiated Spurious Emissions Measurements

### Band 30




**Plot 7-35. Radiated Spurious Plot 1GHz - 18GHz (Band 30)**




**Plot 7-36. Radiated Spurious Plot 18GHz – 26.5GHz (Band 30)**

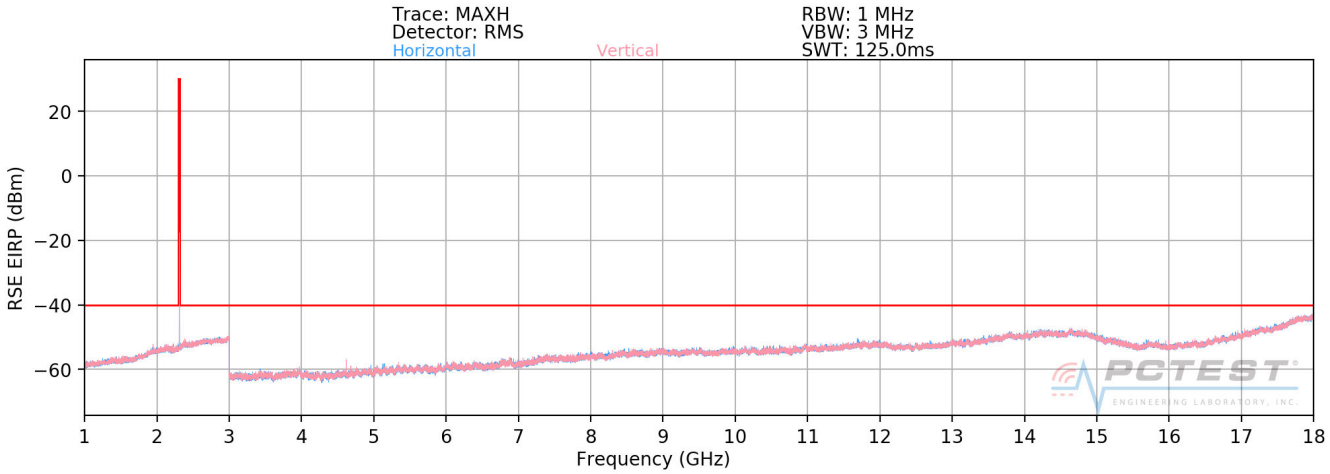
| | | |
|---|---|---|
| OPERATING FREQUENCY: | 2310.00 | MHz |
| MODULATION SIGNAL: | QPSK | |
| BANDWIDTH: | 10.0 | MHz |
| DISTANCE: | 3 | meters |
| LIMIT: | -40 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 4620.00 | V | 125 | 267 | -61.11 | 10.92 | -50.19 | -10.2 |
| 6930.00 | V | - | - | -73.12 | 11.75 | -61.37 | -21.4 |

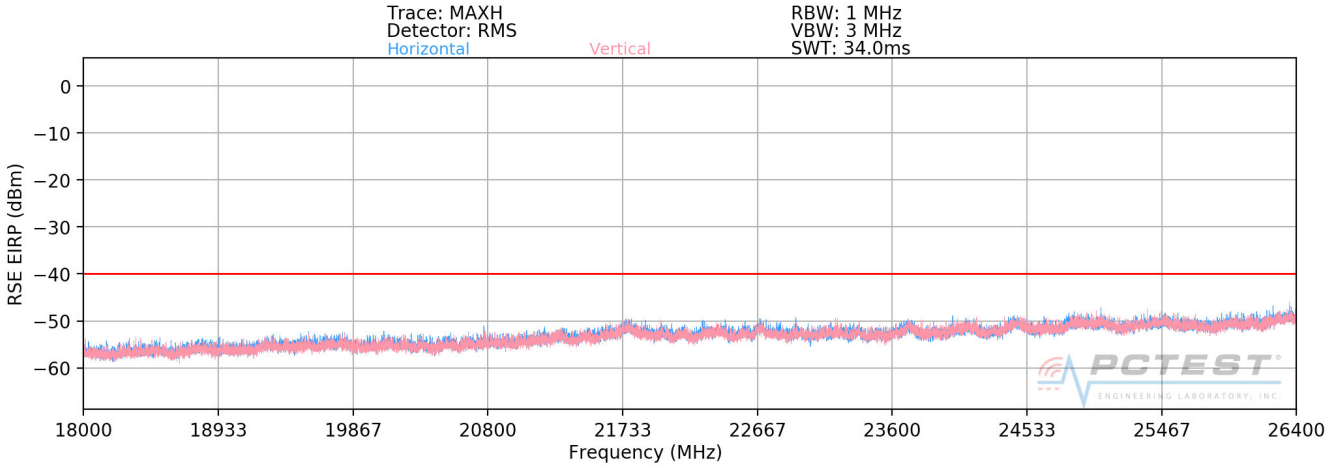
**Table 7-5. Radiated Spurious Data (Band 30 – Mid Channel)**

## 7.6.2 Diversity Antenna Radiated Spurious Emissions Measurements

## Band 30




**Plot 7-37. Radiated Spurious Plot 1GHz - 18GHz (Band 30)**




**Plot 7-38. Radiated Spurious Plot 18GHz – 26.5GHz (Band 30)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 2307.50 | MHz |
| MODULATION SIGNAL: | QPSK | |
| BANDWIDTH: | 5.0 | MHz |
| DISTANCE: | 3 | meters |
| LIMIT: | -40 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 4615.00 | H | 150 | 227 | -64.99 | 10.91 | -54.08 | -14.1 |
| 6925.00 | H | 169 | 27 | -65.13 | 11.73 | -53.40 | -13.4 |

**Table 7-6. Radiated Spurious Data (Band 30 – Low Channel)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 2312.50 | MHz |
| MODULATION SIGNAL: | QPSK | |
| BANDWIDTH: | 5.0 | MHz |
| DISTANCE: | 3 | meters |
| LIMIT: | -40 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 4625.00 | H | 145 | 231 | -62.23 | 10.92 | -51.31 | -11.3 |
| 6935.00 | H | 162 | 30 | -67.03 | 11.75 | -55.28 | -15.3 |

**Table 7-7. Radiated Spurious Data (Band 30 – High Channel)**

## 7.7 Frequency Stability / Temperature Variation

**Test Overview and Limit**

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-E-2016. The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

***For Part 27, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.***

**Test Procedure Used**

ANSI/TIA-603-E-2016

**Test Settings**

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 fifteen minutes 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.

**Test Setup**

The EUT was connected via an RF cable to a spectrum analyzer with the EUT placed inside an environmental chamber.

**Test Notes**

None

## Band 30 Frequency Stability Measurements

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 2,310,000,000 | Hz |
| CHANNEL: | 27710 | |
| REFERENCE VOLTAGE: | 37.00 | VDC |

| VOLTAGE (%) | POWER (VDC) | TEMP (°C) | FREQUENCY (Hz) | Freq. Dev. (Hz) | Deviation (%) |
|---|---|---|---|---|---|
| 100 % | 37.00 | - 30 | 2,309,999,776 | -224 | -0.0000097 |
| 100 % | | - 20 | 2,309,999,528 | -472 | -0.0000204 |
| 100 % | | - 10 | 2,309,999,535 | -465 | -0.0000201 |
| 100 % | | 0 | 2,309,999,766 | -234 | -0.0000101 |
| 100 % | | + 10 | 2,309,999,881 | -119 | -0.0000052 |
| 100 % | | + 20 | 2,310,000,536 | 536 | 0.0000232 |
| 100 % | | + 30 | 2,310,000,162 | 162 | 0.0000070 |
| 100 % | | + 40 | 2,310,000,057 | 57 | 0.0000025 |
| 100 % | | + 50 | 2,310,000,449 | 449 | 0.0000194 |

**Table 7-8. Frequency Stability Data (Band 30)**

**Note:**

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

## Band 30 Frequency Stability Measurements

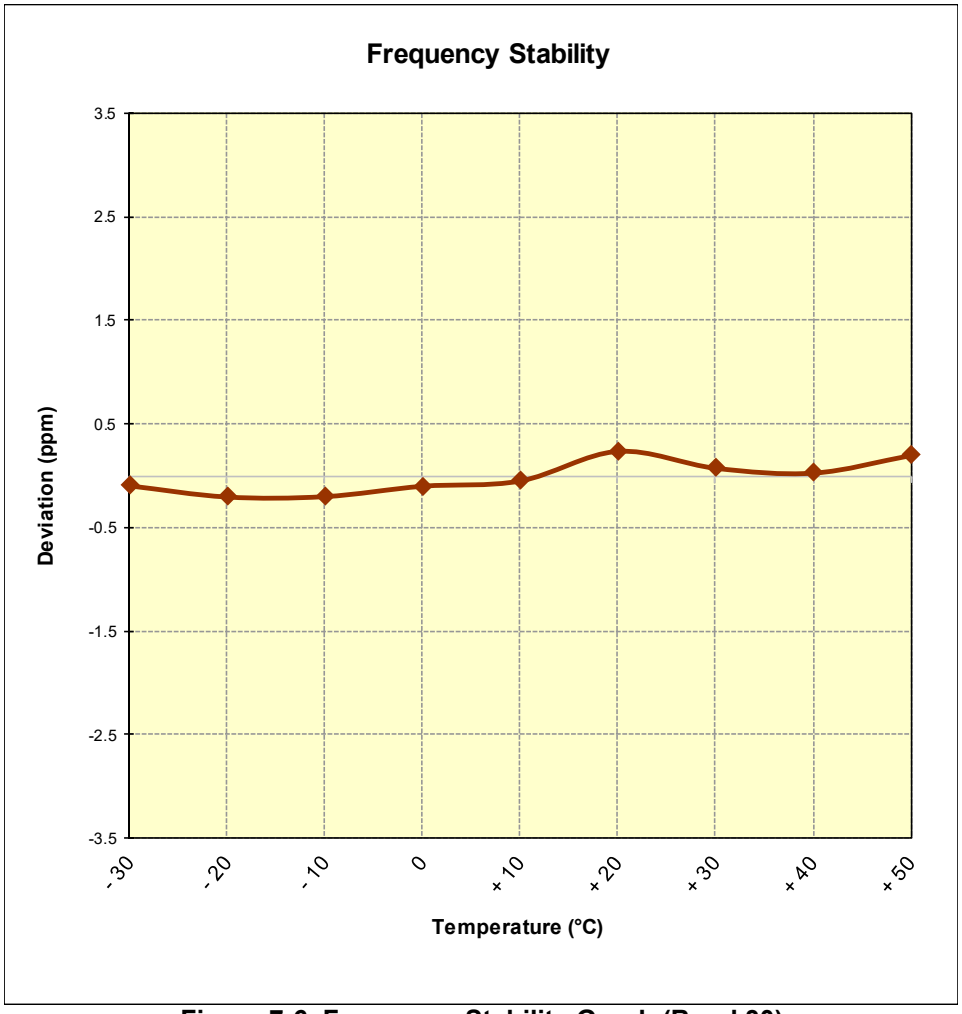



**Figure 7-6. Frequency Stability Graph (Band 30)**

# 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Netcomm Outdoor LTE Router FCC ID: XIA-IFWA661** complies with all the requirements of Part 27 of the FCC Rules for LTE operation only.