# FCC RADIO TEST REPORT

| | | |
|---|---|---|
| **FCC ID** | : | **2AJOTTA-1108** |
| **Equipment** | : | **Smart Phone** |
| **Brand Name** | : | **NOKIA** |
| **Model Name** | : | **TA-1108** |
| **Applicant** | : | **HMD Global Oy**<br>**Bertel Jungin aukio 9, 02600 Espoo, Finland** |
| **Manufacturer** | : | **HMD Global Oy**<br>**Bertel Jungin aukio 9, 02600 Espoo, Finland** |
| **Standard** | : | **47 CFR Part 2, 22(H), 27** |

**The product was received on Apr. 30, 2018 and testing was started from Nov. 02, 2018 and completed on Nov. 05, 2018. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA-603-E and has been in compliance with the applicable technical standards.**

**The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.**

**The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.**

**Approved by: Joseph Lin**

***SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory***
*No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)*

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# History of this test report

| Report No. | Version | Description | Issued Date |
|---|---|---|---|
| FG843024-03B | 01 | Initial issue of report | Nov. 15, 2018 |
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# Summary of Test Result

| Report Clause | Ref Std. Clause | Test Items | Result (PASS/FAIL) | Remark |
|---|---|---|---|---|
| 3.2 | §2.1046 | Conducted Output Power | Reporting only | - |
| | §22.913 (a)(2) | Effective Radiated Power (Band 5) | Pass | |
| | §27.50 (h)(2) | Equivalent Isotropic Radiated Power (Band 7) (Band 38) | | |
| 3.3 | §27.50 (d)(5) | Peak-to-Average Ratio | Reporting only | - |
| 3.4 | §2.1049 | Occupied Bandwidth | Reporting only | - |
| 3.5 | §2.1051 §22.917 (a) | Conducted Band Edge Measurement (Band 5) | Pass | - |
| | §2.1051 §27.53 (m)(4) | Conducted Band Edge Measurement (Band 7) (Band 38) | | |
| 3.6 | §2.1051 §22.917 (a) | Conducted Spurious Emission (Band 5) | Pass | - |
| | §2.1051 §27.53 (m)(4) | Conducted Spurious Emission (Band 7) (Band 38) | | |
| 3.7 | §2.1055 §22.355 §24.235 §27.54 | Frequency Stability Temperature & Voltage | Pass | - |
| 4.2 | §2.1053 §22.917 (a) | Radiated Spurious Emission (Band 5) | Pass | Under limit 11.52 dB at 15483.000 MHz |
| | §2.1053 §27.53 (m)(4) | Radiated Spurious Emission (Band 7) (Band 38) | | |

| **Declaration of Conformity:** |
|---|
| The judgment of conformity in the report is based on the measurement results excluding the measurement uncertainty. |
| **Comments and Explanations:** |
| None |

**Reviewed by: Wii Chang**

**Report Producer: Yimin Ho**

# 1 General Description

## 1.1 Product Feature of Equipment Under Test

GSM/WCDMA/LTE, Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n, Wi-Fi 5GHz 802.11a/n/ac, FM Receiver, and GNSS.

| Product Specification subjective to this standard | |
|---|---|
| **Antenna Type** | WWAN: Monopole Antenna<br>WLAN: Monopole Antenna<br>Bluetooth: Monopole Antenna<br>GPS/Glonass/Galileo/BDS: PIFA Antenna<br>FM: using earphone as antenna |

## 1.2 Modification of EUT

No modifications are made to the EUT during all test items.

## 1.3 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1190 and TW0007 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

| | |
|---|---|
| **Test Site** | SPORTON INTERNATIONAL INC. |
| **Test Site Location** | No.52, Huaya 1st Rd., Guishan Dist.,<br>Taoyuan City, Taiwan (R.O.C.)<br>TEL: +886-3-327-3456<br>FAX: +886-3-328-4978 |
| **Test Site No.** | **Sporton Site No.** |
| | TH05-HY |

**Note:** The test site complies with ANSI C63.4 2014 requirement.

| | |
|---|---|
| **Test Site** | SPORTON INTERNATIONAL INC. |
| **Test Site Location** | No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist.,<br>Taoyuan City, Taiwan (R.O.C.)<br>TEL: +886-3-327-0868<br>FAX: +886-3-327-0855 |
| **Test Site No.** | **Sporton Site No.** |
| | 03CH13-HY |

**Note:** The test site complies with ANSI C63.4 2014 requirement.

## 1.4 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ANSI C63.26-2015
- ANSI / TIA-603-E
- 47 CFR Part 2, 22(H), 27
- FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- FCC KDB 412172 D01 Determining ERP and EIRP v01r01

**Remark:**

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

# 2 Test Configuration of Equipment Under Test

## 2.1 Test Mode

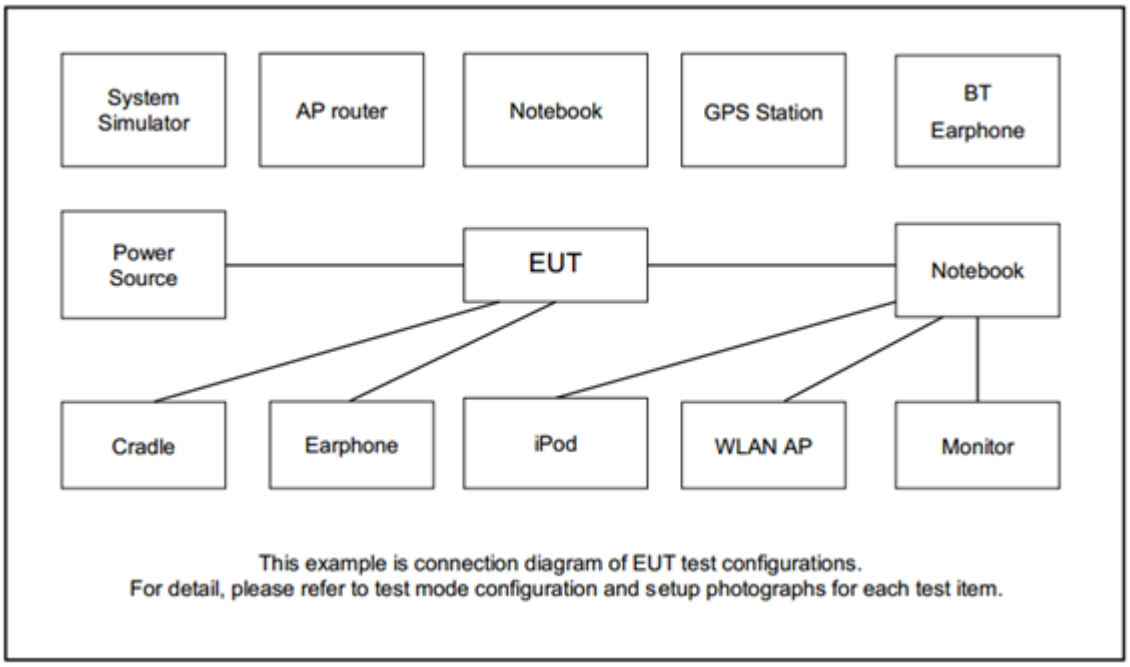
Antenna port conducted and radiated test items listed below are performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power.

For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Z plane with Main Antenna for LTE Band 5 / 7 / 38 and Y plane with Aux. Antenna for LTE Band 5) were recorded in this report.

| Test Items | Band | Bandwidth (MHz) | | | | | | Modulation | | | RB # | | | Test Channel | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1.4 | 3 | 5 | 10 | 15 | 20 | QPSK | 16QAM | 64QAM | 1 | Half | Full | L | M | H |
| Max. Output Power | 5 | v | v | v | v | - | - | v | v | v | v | v | v | v | v | v |
| | 7 | - | - | v | v | v | v | v | v | v | v | v | v | v | v | v |
| | 38 | - | - | v | v | v | v | v | v | v | v | v | v | v | v | v |
| Peak-to-Average Ratio | 5 | | | | v | - | - | v | v | v | v | | v | v | v | v |
| | 7 | - | - | | | | v | v | v | v | v | | v | v | v | v |
| | 38 | - | - | | | | v | v | v | v | v | | v | v | v | v |
| 26dB and 99% Bandwidth | 5 | v | v | v | v | - | - | v | v | v | | | v | v | v | v |
| | 7 | - | - | v | v | v | v | v | v | v | | | v | v | v | v |
| | 38 | - | - | v | v | v | v | v | v | v | | | v | v | v | v |
| Conducted Band Edge | 5 | v | v | v | v | - | - | v | v | v | v | | v | v | | v |
| | 7 | - | - | v | v | v | v | v | v | v | v | | v | v | | v |
| | 38 | - | - | v | v | v | v | v | v | v | v | | v | v | | v |
| Conducted Spurious Emission | 5 | v | v | v | v | - | - | v | v | v | v | | | v | v | v |
| | 7 | - | - | v | v | v | v | v | v | v | v | | | v | v | v |
| | 38 | - | - | v | v | v | v | v | v | v | v | | | v | v | v |
| Frequency Stability | 5 | | | | v | - | - | v | | | | | v | | v | |
| | 7 | - | - | | v | | | v | | | | | v | | v | |
| | 38 | - | - | | v | | | v | | | | | v | | v | |

| Test Items | Band | Bandwidth (MHz) | | | | | | Modulation | | | RB # | | | Test Channel | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1.4 | 3 | 5 | 10 | 15 | 20 | QPSK | 16QAM | 64QAM | 1 | Half | Full | L | M | H |
| E.R.P / E.I.R.P | 5 | v | v | v | v | - | - | v | v | v | v | v | | v | v | v |
| | 7 | - | - | v | v | v | v | v | v | v | v | | | v | v | v |
| | 38 | - | - | v | v | v | v | v | v | v | v | | | v | v | v |
| Radiated Spurious Emission | 5 | Worst Case | | | | | | | | | | | | v | v | v |
| | 7 | Worst Case | | | | | | | | | | | | v | v | v |
| | 38 | Worst Case | | | | | | | | | | | | v | v | v |
| Remark | 1. The mark "**v** " means that this configuration is chosen for testing<br>2. The mark "-" means that this bandwidth is not supported.<br>3. The device is investigated from 30MHz to 10 times of fundamental signal for radiated spurious emission test under different RB size/offset and modulations in exploratory test. Subsequently, only the worst case emissions are reported.<br>4. All the radiated test cases were performed with Adapter 1. | | | | | | | | | | | | | | | |

## 2.2 Connection Diagram of Test System




## 2.3 Support Unit used in test configuration and system

| Item | Equipment | Trade Name | Model No. | FCC ID | Data Cable | Power Cord |
|---|---|---|---|---|---|---|
| 1. | LTE Base Station | Anritsu | MT8820C | N/A | N/A | Unshielded, 1.8 m |

## 2.4 Measurement Results Explanation Example

**For all conducted test items:**

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

*Offset = RF cable loss + attenuator factor.*

Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

Example :

*Offset(dB) = RF cable loss(dB) + attenuator factor(dB).*

= 4.2 + 10 = 14.2 (dB)

## 2.5 Frequency List of Low/Middle/High Channels

| LTE Band 5 Channel and Frequency List | | | | |
|---|---|---|---|---|
| **BW [MHz]** | **Channel/Frequency(MHz)** | **Lowest** | **Middle** | **Highest** |
| 10 | Channel | 20450 | 20525 | 20600 |
| | Frequency | 829 | 836.5 | 844 |
| 5 | Channel | 20425 | 20525 | 20625 |
| | Frequency | 826.5 | 836.5 | 846.5 |
| 3 | Channel | 20415 | 20525 | 20635 |
| | Frequency | 825.5 | 836.5 | 847.5 |
| 1.4 | Channel | 20407 | 20525 | 20643 |
| | Frequency | 824.7 | 836.5 | 848.3 |

| LTE Band 7 Channel and Frequency List | | | | |
|---|---|---|---|---|
| **BW [MHz]** | **Channel/Frequency(MHz)** | **Lowest** | **Middle** | **Highest** |
| 20 | Channel | 20850 | 21100 | 21350 |
| | Frequency | 2510 | 2535 | 2560 |
| 15 | Channel | 20825 | 21100 | 21375 |
| | Frequency | 2507.5 | 2535 | 2562.5 |
| 10 | Channel | 20800 | 21100 | 21400 |
| | Frequency | 2505 | 2535 | 2565 |
| 5 | Channel | 20775 | 21100 | 21425 |
| | Frequency | 2502.5 | 2535 | 2567.5 |

| LTE Band 38 Channel and Frequency List | | | | |
|---|---|---|---|---|
| **BW [MHz]** | **Channel/Frequency(MHz)** | **Lowest** | **Middle** | **Highest** |
| 20 | Channel | 37850 | 38000 | 38150 |
| | Frequency | 2580.0 | 2595.0 | 2610.0 |
| 15 | Channel | 37825 | 38000 | 38175 |
| | Frequency | 2577.5 | 2595.0 | 2612.5 |
| 10 | Channel | 37800 | 38000 | 38200 |
| | Frequency | 2575.0 | 2595.0 | 2615.0 |
| 5 | Channel | 37775 | 38000 | 38225 |
| | Frequency | 2572.5 | 2595.0 | 2617.5 |

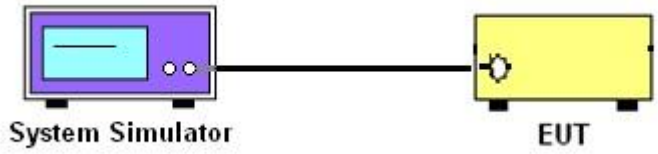
# 3 Conducted Test Items

## 3.1 Measuring Instruments

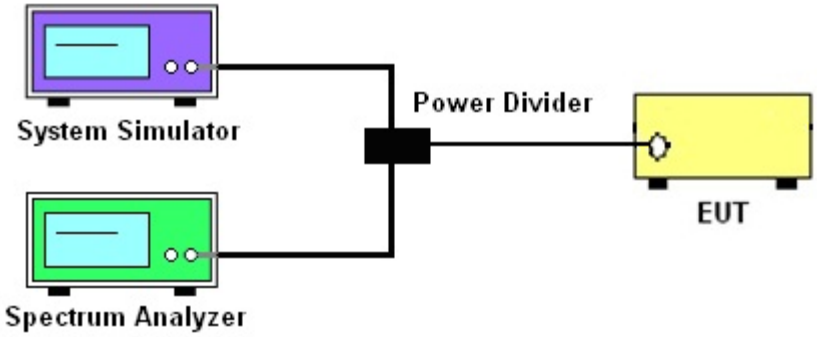
See list of measuring instruments of this test report.

### 3.1.1 Test Setup

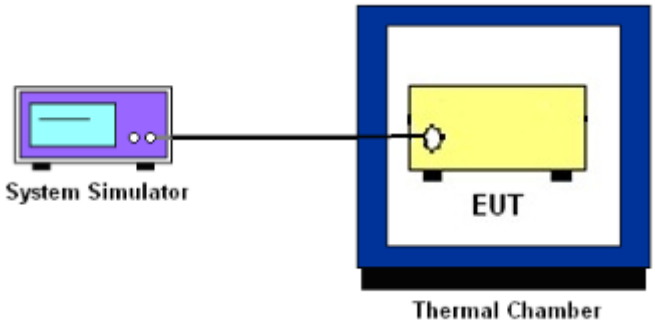
### 3.1.2 Conducted Output Power




### 3.1.3 Peak-to-Average Ratio, Occupied Bandwidth ,Conducted Band-Edge and Conducted Spurious Emission




### 3.1.4 Frequency Stability




### 3.1.5 Test Result of Conducted Test

Please refer to Appendix A.

# 3.2 Conducted Output Power and ERP/EIRP

## 3.2.1 Description of the Conducted Output Power Measurement and ERP/EIRP Measurement

A system simulator was used to establish communication with the EUT. Its parameters were set to force the EUT transmitting at maximum output power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

The ERP of mobile transmitters must not exceed 7 Watts for LTE Band 5.

The EIRP of mobile transmitters must not exceed 2 Watts for LTE Band 7 and Band 38.

According to KDB 412172 D01 Power Approach,

EIRP = $P_T + G_T – L_C$, ERP = EIRP -2.15, where

$P_T$ = transmitter output power in dBm

$G_T$ = gain of the transmitting antenna in dBi

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

## 3.2.2 Test Procedures

1. The transmitter output port was connected to the system simulator.
2. Set EUT at maximum power through the system simulator.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure and record the power level from the system simulator.

# 3.3 Peak-to-Average Ratio

## 3.3.1 Description of the PAR Measurement

Power Complementary Cumulative Distribution Function (CCDF) curves provide a means for characterizing the power peaks of a digitally modulated signal on a statistical basis. A CCDF curve depicts the probability of the peak signal amplitude exceeding the average power level. Most contemporary measurement instrumentation include the capability to produce CCDF curves for an input signal provided that the instrument's resolution bandwidth can be set wide enough to accommodate the entire input signal bandwidth. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

## 3.3.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 5.7.1

1. The EUT was connected to spectrum and system simulator via a power divider.
2. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
3. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.
4. Record the deviation as Peak to Average Ratio.

# 3.4 Occupied Bandwidth

## 3.4.1 Description of Occupied Bandwidth Measurement

The occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean transmitted power.

The 26 dB emission bandwidth is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated 26 dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth equal to approximately 1.0% of the emission bandwidth.

## 3.4.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 4.2

1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be between two and five times the anticipated OBW.
3. The nominal resolution bandwidth (RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.
4. Set the detection mode to peak, and the trace mode to max hold.
5. Determine the reference value: Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace. (this is the reference value)
6. Determine the “-26 dB down amplitude” as equal to (Reference Value – X).
7. Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the “–X dB down amplitude” determined in step 6. If a marker is below this “-X dB down amplitude” value it shall be placed as close as possible to this value. The OBW is the positive frequency difference between the two markers.
8. Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

# 3.5 Conducted Band Edge

## 3.5.1 Description of Conducted Band Edge Measurement

22.917(a)

For operations in the 824 – 849 MHz band, the FCC limit is 43 + $10\log_{10}$(P[Watts]) dB below the transmitter power P(Watts) in a 100kHz bandwidth. However, in the 1MHz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

27.53(m)(4)

For mobile digital stations, 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. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

## 3.5.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 6.0.

1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. The band edges of low and high channels for the highest RF powers were measured.
3. Set RBW >= 1% EBW in the 1MHz band immediately outside and adjacent to the band edge.
4. Beyond the 1 MHz band from the band edge, RBW=1MHz was used.
5. Set spectrum analyzer with RMS detector.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
7. Checked that all the results comply with the emission limit line.
   The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
8. For LTE Band 7, 38, the other 40 dB, and 55 dB have additionally applied same calculation above.

# 3.6 Conducted Spurious Emission

## 3.6.1 Description of Conducted Spurious Emission Measurement

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least 43 + 10 log (P) dB.

For Band 7,38:

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least 55 + 10 log (P) dB.

It is measured by means of a calibrated spectrum analyzer and scanned from 30 MHz up to a frequency including its $10^{th}$ harmonic.

## 3.6.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 6.0.

1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. The middle channel for the highest RF power within the transmitting frequency was measured.
4. The conducted spurious emission for the whole frequency range was taken.
5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz.
6. Set spectrum analyzer with RMS detector.
7. Taking the record of maximum spurious emission.
8. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
9. The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
10. For Band 7, 38
    The limit line is derived from 55 + 10log(P)dB below the transmitter power P(Watts)

# 3.7 Frequency Stability

## 3.7.1 Description of Frequency Stability Measurement

22.355

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5ppm) of the center frequency.

27.54

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

## 3.7.2 Test Procedures for Temperature Variation

The testing follows FCC KDB 971168 D01 v03r01 Section 9.0.

1. The EUT was set up in the thermal chamber and connected with the system simulator.
2. With power OFF, the temperature was decreased to -30°C and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.
3. With power OFF, the temperature was raised in 10°C step up to 50°C. The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.

## 3.7.3 Test Procedures for Voltage Variation

The testing follows FCC KDB 971168 D01 v03r01 Section 9.0.

1. The EUT was placed in a temperature chamber at 20±5° C and connected with the system simulator.
2. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value measured at the input to the EUT.
3. The variation in frequency was measured for the worst case.

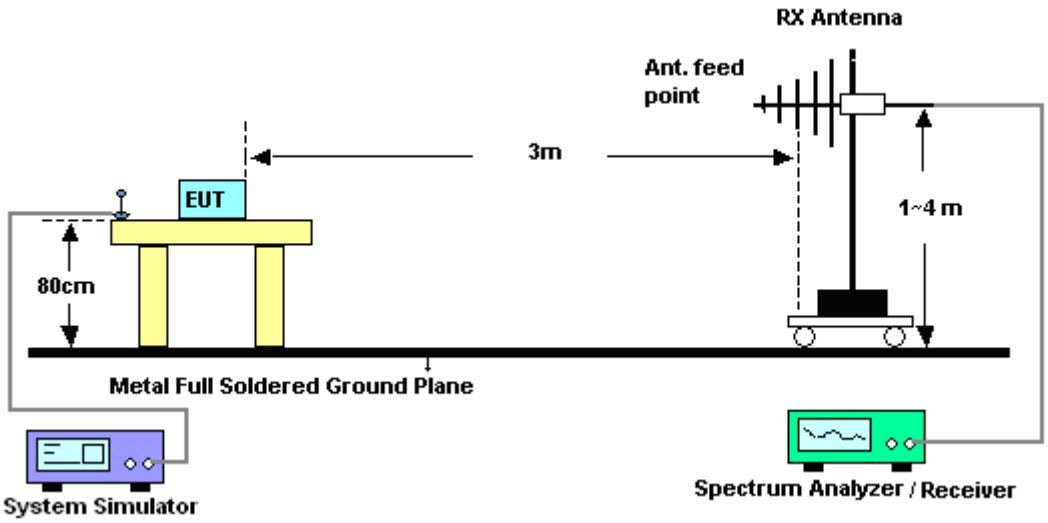
# 4 Radiated Test Items

## 4.1 Measuring Instruments

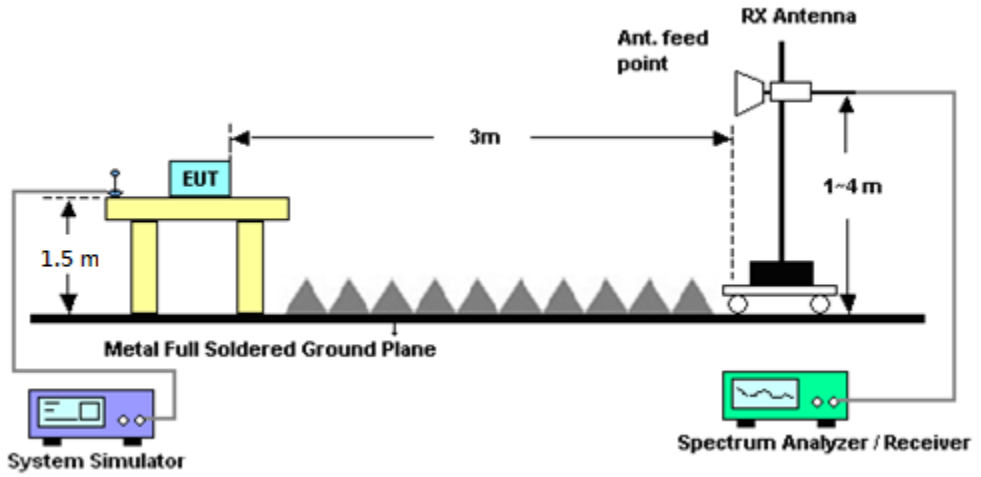
See list of measuring instruments of this test report.

### 4.1.1 Test Setup

**For radiated test from 30MHz to 1GHz**




**For radiated test above 1GHz**




### 4.1.2 Test Result of Radiated Test

Please refer to Appendix B.

# 4.2 Radiated Spurious Emission

## 4.2.1 Description of Radiated Spurious Emission

The radiated spurious emission was measured by substitution method according to ANSI / TIA-603-E. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least 43 + 10 log (P) dB.

For Band 7, 38

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least 55 + 10 log (P) dB.

The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

## 4.2.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 5.8 and ANSI / TIA-603-E Section 2.2.12.

1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving antenna is varied between one meter and four meters to search the maximum spurious emission for both horizontal and vertical polarizations.
5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
6. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
7. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
8. Taking the record of output power at antenna port.
9. Repeat step 7 to step 8 for another polarization.
10. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
    The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
11. For Band 7, 38:
    The limit line is derived from 55 + 10log(P)dB below the transmitter power P(Watts)
    EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
    ERP (dBm) = EIRP - 2.15

# 5 List of Measuring Equipment

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Test Date | Due Date | Remark |
|---|---|---|---|---|---|---|---|---|
| Loop Antenna | Rohde & Schwarz | HFH2-Z2 | 100488 | 9 kHz~30 MHz | Nov. 23, 2017 | Nov. 02, 2018~ Nov. 05, 2018 | Nov. 22, 2018 | Radiation (03CH13-HY) |
| Amplifier | MITEQ | TTA1840-35-HG | 1871923 | 18GHz~40GHz, VSWR : 2.5:1 max | Jul. 16, 2018 | Nov. 02, 2018~ Nov. 05, 2018 | Jul. 15, 2019 | Radiation (03CH13-HY) |
| Amplifier | Sonoma-Instrument | 310 N | 187282 | 9KHz~1GHz | Dec. 21, 2016 | Nov. 02, 2018~ Nov. 05, 2018 | Dec. 20, 2018 | Radiation (03CH13-HY) |
| Bilog Antenna | TESEQ | CBL 6111D&00800N1D01N-06 | 40103&07 | 30MHz to 1GHz | Jan. 10, 2018 | Nov. 02, 2018~ Nov. 05, 2018 | Jan. 09, 2019 | Radiation (03CH13-HY) |
| Horn Antenna | SCHWARZBECK | BBHA 9120 D | 9120D-1241 | 1GHz ~ 18GHz | Jun. 29, 2018 | Nov. 02, 2018~ Nov. 05, 2018 | Jun. 28, 2019 | Radiation (03CH13-HY) |
| Filter | Wainwright | WLK4-1000-1530-8000-40SS | SN1 | 1G Low pass Filter | Sep. 17, 2018 | Nov. 02, 2018~ Nov. 05, 2018 | Sep. 16, 2019 | Radiation (03CH13-HY) |
| Filter | Wainwright | WHKX12-2700-3000-18000-60SS | SN2 | 3G High Pass | Sep. 17, 2018 | Nov. 02, 2018~ Nov. 05, 2018 | Sep. 16, 2019 | Radiation (03CH13-HY) |
| Filter | Wainwright | WHKX12-1080-1200-15000-60ST | SN3 | 1.2 GHz High pass | Jul. 05, 2018 | Nov. 02, 2018~ Nov. 05, 2018 | Jul. 04, 2019 | Radiation (03CH13-HY) |
| SHF-EHF Horn Antenna | SCHWARZBECK | BBHA 9170 | BBHA9170251 | 18GHz- 40GHz | Nov. 10, 2017 | Nov. 02, 2018~ Nov. 05, 2018 | Nov. 09, 2018 | Radiation (03CH13-HY) |
| Preamplifier | Jet-Power | JPA0118-55-303 | 17100018000054001 | 1GHz~18GHz | Apr. 16, 2018 | Nov. 02, 2018~ Nov. 05, 2018 | Apr. 15, 2019 | Radiation (03CH13-HY) |
| Preamplifier | Keysight | 83017A | MY53270147 | 1GHz~26.5GHz | Feb. 02, 2018 | Nov. 02, 2018~ Nov. 05, 2018 | Feb. 01, 2019 | Radiation (03CH13-HY) |
| Spectrum Analyzer | Keysight | N9010A | MY55370526 | 10Hz~44GHz | Mar. 15, 2018 | Nov. 02, 2018~ Nov. 05, 2018 | Mar. 14, 2019 | Radiation (03CH13-HY) |
| Antenna Mast | EMEC | AM-BS-4500-B | N/A | 1m~4m | N/A | Nov. 02, 2018~ Nov. 05, 2018 | N/A | Radiation (03CH13-HY) |
| Turn Table | EMEC | TT2000 | N/A | 0~360 Degree | N/A | Nov. 02, 2018~ Nov. 05, 2018 | N/A | Radiation (03CH13-HY) |
| Signal Generator | Anritsu | MG3694C | 163401 | 0.1Hz~40GHz | Jan. 15, 2018 | Nov. 02, 2018~ Nov. 05, 2018 | Jan. 14, 2019 | Radiation (03CH13-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 126E | 0030/126E | 30M-18G | Jan. 22, 2018 | Nov. 02, 2018~ Nov. 05, 2018 | Jan. 21, 2019 | Radiation (03CH13-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 104 | 335041/4 | 30M-18G | Jan. 22, 2018 | Nov. 02, 2018~ Nov. 05, 2018 | Jan. 21, 2019 | Radiation (03CH13-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 104 | MY24961/4 | 30M~18GHz | Jan. 22, 2018 | Nov. 02, 2018~ Nov. 05, 2018 | Jan. 21, 2019 | Radiation (03CH13-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 102 | MY2859/2 | 30M~40GHz | Mar. 14, 2018 | Nov. 02, 2018~ Nov. 05, 2018 | Mar. 13, 2019 | Radiation (03CH13-HY) |
| Software | AUDIX | E3 6.2009-8-24c | RK-001124 | N/A | N/A | Nov. 02, 2018~ Nov. 05, 2018 | N/A | Radiation (03CH13-HY) |

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Test Date | Due Date | Remark |
|---|---|---|---|---|---|---|---|---|
| LTE Base Station | Anritsu | MT8820C | 6201432821 | GSM/GPRS /WCDMA/LTE | Oct. 14, 2018 | Nov. 02, 2018~ Nov. 03, 2018 | Oct. 13, 2019 | Conducted (TH05-HY) |
| Spectrum Analyzer | Rohde & Schwarz | FSV40 | 101397 | 10Hz~40GHz | Nov. 07, 2017 | Nov. 02, 2018~ Nov. 03, 2018 | Nov. 06, 2018 | Conducted (TH05-HY) |
| Temperature Chamber | ESPEC | SH-641 | 92013720 | -40℃~90℃ | Aug. 29, 2018 | Nov. 02, 2018~ Nov. 03, 2018 | Aug. 28, 2019 | Conducted (TH05-HY) |
| Programmable Power Supply | GW Instek | PSS-2005 | EL890094 | 1V~20V 0.5A~5A | Oct. 02, 2018 | Nov. 02, 2018~ Nov. 03, 2018 | Oct. 01, 2019 | Conducted (TH05-HY) |
| Coupler | Warison | 1-18GHz 20dB 25WSMA Directional Coupler | #B | 1G~18GHz | Dec. 04, 2017 | Nov. 02, 2018~ Nov. 03, 2018 | Dec. 03, 2018 | Conducted (TH05-HY) |

# 6 Uncertainty of Evaluation

**Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)**

| | |
|---|---|
| **Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))** | **3.07** |

**Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)**

| | |
|---|---|
| **Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))** | **3.48** |

**Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)**

| | |
|---|---|
| **Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))** | **3.92** |

# Appendix A. Test Results of Conducted Test

## Conducted Output Power(Average power)

| LTE Band 5 Maximum Average Power [dBm] | | | | | | |
|---|---|---|---|---|---|---|
| BW [MHz] | RB Size | RB Offset | Mod | Lowest | Middle | Highest |
| 10 | 1 | 0 | QPSK | 23.47 | 23.48 | 23.47 |
| 10 | 1 | 25 | | 23.59 | 23.59 | **23.61** |
| 10 | 1 | 49 | | 23.44 | 23.45 | 23.47 |
| 10 | 25 | 0 | | 22.51 | 22.60 | 22.60 |
| 10 | 25 | 12 | | 22.52 | 22.55 | 22.57 |
| 10 | 25 | 25 | | 22.53 | 22.51 | 22.50 |
| 10 | 50 | 0 | | 22.51 | 22.56 | 22.59 |
| 10 | 1 | 0 | 16-QAM | 22.86 | 22.78 | 22.77 |
| 10 | 1 | 25 | | 22.96 | 22.94 | 22.92 |
| 10 | 1 | 49 | | 22.77 | 22.84 | 22.84 |
| 10 | 25 | 0 | | 21.55 | 21.62 | 21.65 |
| 10 | 25 | 12 | | 21.57 | 21.59 | 21.63 |
| 10 | 25 | 25 | | 21.55 | 21.54 | 21.58 |
| 10 | 50 | 0 | | 21.53 | 21.58 | 21.64 |
| 5 | 1 | 0 | QPSK | 23.37 | 23.34 | 23.39 |
| 5 | 1 | 12 | | 23.56 | 23.55 | 23.56 |
| 5 | 1 | 24 | | 23.39 | 23.35 | 23.39 |
| 5 | 12 | 0 | | 22.49 | 22.56 | 22.56 |
| 5 | 12 | 7 | | 22.59 | 22.56 | 22.56 |
| 5 | 12 | 13 | | 22.54 | 22.48 | 22.55 |
| 5 | 25 | 0 | | 22.52 | 22.50 | 22.51 |
| 5 | 1 | 0 | 16-QAM | 22.80 | 22.74 | 22.77 |
| 5 | 1 | 12 | | 22.97 | 22.96 | 22.95 |
| 5 | 1 | 24 | | 22.79 | 22.72 | 22.76 |
| 5 | 12 | 0 | | 21.52 | 21.55 | 21.60 |
| 5 | 12 | 7 | | 21.60 | 21.57 | 21.63 |
| 5 | 12 | 13 | | 21.57 | 21.50 | 21.60 |
| 5 | 25 | 0 | | 21.57 | 21.54 | 21.58 |

| LTE Band 5 Maximum Average Power [dBm] | | | | | | |
|---|---|---|---|---|---|---|
| BW [MHz] | RB Size | RB Offset | Mod | Lowest | Middle | Highest |
| 3 | 1 | 0 | QPSK | 23.50 | 23.47 | 23.48 |
| 3 | 1 | 8 | | 23.50 | 23.45 | 23.46 |
| 3 | 1 | 14 | | 23.49 | 23.46 | 23.49 |
| 3 | 8 | 0 | | 22.50 | 22.51 | 22.49 |
| 3 | 8 | 4 | | 22.54 | 22.53 | 22.56 |
| 3 | 8 | 7 | | 22.53 | 22.50 | 22.52 |
| 3 | 15 | 0 | | 22.48 | 22.48 | 22.52 |
| 3 | 1 | 0 | 16-QAM | 22.85 | 22.84 | 22.90 |
| 3 | 1 | 8 | | 22.91 | 22.81 | 22.89 |
| 3 | 1 | 14 | | 22.88 | 22.81 | 22.92 |
| 3 | 8 | 0 | | 21.62 | 21.61 | 21.65 |
| 3 | 8 | 4 | | 21.66 | 21.63 | 21.71 |
| 3 | 8 | 7 | | 21.65 | 21.60 | 21.67 |
| 3 | 15 | 0 | | 21.53 | 21.53 | 21.59 |
| 1.4 | 1 | 0 | QPSK | 23.40 | 23.38 | 23.39 |
| 1.4 | 1 | 3 | | 23.50 | 23.50 | 23.51 |
| 1.4 | 1 | 5 | | 23.41 | 23.40 | 23.41 |
| 1.4 | 3 | 0 | | 23.46 | 23.47 | 23.52 |
| 1.4 | 3 | 1 | | 23.52 | 23.54 | 23.56 |
| 1.4 | 3 | 3 | | 23.50 | 23.49 | 23.51 |
| 1.4 | 6 | 0 | | 22.48 | 22.50 | 22.52 |
| 1.4 | 1 | 0 | 16-QAM | 22.79 | 22.81 | 22.81 |
| 1.4 | 1 | 3 | | 22.84 | 22.89 | 22.92 |
| 1.4 | 1 | 5 | | 22.70 | 22.74 | 22.84 |
| 1.4 | 3 | 0 | | 22.49 | 22.48 | 22.55 |
| 1.4 | 3 | 1 | | 22.54 | 22.58 | 22.63 |
| 1.4 | 3 | 3 | | 22.51 | 22.53 | 22.54 |
| 1.4 | 6 | 0 | | 21.63 | 21.59 | 21.66 |

| LTE Band 7 Maximum Average Power [dBm] | | | | | | |
|---|---|---|---|---|---|---|
| BW [MHz] | RB Size | RB Offset | Mod | Lowest | Middle | Highest |
| 20 | 1 | 0 | QPSK | 23.08 | 23.32 | 23.57 |
| 20 | 1 | 49 | | 23.34 | 23.63 | **23.85** |
| 20 | 1 | 99 | | 23.18 | 23.46 | 23.68 |
| 20 | 50 | 0 | | 22.31 | 22.58 | 22.89 |
| 20 | 50 | 24 | | 22.31 | 22.55 | 22.84 |
| 20 | 50 | 50 | | 22.30 | 22.57 | 22.86 |
| 20 | 100 | 0 | | 22.21 | 22.53 | 22.88 |
| 20 | 1 | 0 | 16-QAM | 22.33 | 22.58 | 22.86 |
| 20 | 1 | 49 | | 22.53 | 22.80 | 23.00 |
| 20 | 1 | 99 | | 22.42 | 22.69 | 22.92 |
| 20 | 50 | 0 | | 21.06 | 21.46 | 21.89 |
| 20 | 50 | 24 | | 21.25 | 21.53 | 21.84 |
| 20 | 50 | 50 | | 21.26 | 21.55 | 21.83 |
| 20 | 100 | 0 | | 21.15 | 21.49 | 21.87 |
| 15 | 1 | 0 | QPSK | 23.09 | 23.40 | 23.67 |
| 15 | 1 | 37 | | 23.34 | 23.67 | 23.80 |
| 15 | 1 | 74 | | 23.19 | 23.48 | 23.75 |
| 15 | 36 | 0 | | 22.14 | 22.53 | 22.84 |
| 15 | 36 | 20 | | 22.27 | 22.60 | 22.88 |
| 15 | 36 | 39 | | 22.28 | 22.57 | 22.90 |
| 15 | 75 | 0 | | 22.22 | 22.56 | 22.87 |
| 15 | 1 | 0 | 16-QAM | 22.38 | 22.65 | 22.94 |
| 15 | 1 | 37 | | 22.57 | 22.90 | 22.99 |
| 15 | 1 | 74 | | 22.44 | 22.72 | 22.95 |
| 15 | 36 | 0 | | 21.06 | 21.46 | 21.83 |
| 15 | 36 | 20 | | 21.21 | 21.52 | 21.87 |
| 15 | 36 | 39 | | 21.23 | 21.51 | 21.88 |
| 15 | 75 | 0 | | 21.18 | 21.52 | 21.86 |

| LTE Band 7 Maximum Average Power [dBm] | | | | | | |
|---|---|---|---|---|---|---|
| BW [MHz] | RB Size | RB Offset | Mod | Lowest | Middle | Highest |
| 10 | 1 | 0 | QPSK | 23.11 | 23.44 | 23.78 |
| 10 | 1 | 25 | | 23.29 | 23.62 | 23.84 |
| 10 | 1 | 49 | | 23.21 | 23.50 | 23.84 |
| 10 | 25 | 0 | | 22.13 | 22.54 | 22.93 |
| 10 | 25 | 12 | | 22.26 | 22.58 | 22.98 |
| 10 | 25 | 25 | | 22.34 | 22.63 | 22.97 |
| 10 | 50 | 0 | | 22.26 | 22.57 | 22.96 |
| 10 | 1 | 0 | 16-QAM | 22.43 | 22.64 | 22.98 |
| 10 | 1 | 25 | | 22.47 | 22.94 | 22.96 |
| 10 | 1 | 49 | | 22.47 | 22.74 | 22.96 |
| 10 | 25 | 0 | | 21.12 | 21.55 | 21.95 |
| 10 | 25 | 12 | | 21.25 | 21.56 | 21.99 |
| 10 | 25 | 25 | | 21.32 | 21.62 | 21.98 |
| 10 | 50 | 0 | | 21.23 | 21.57 | 21.97 |
| 5 | 1 | 0 | QPSK | 23.08 | 23.45 | 23.79 |
| 5 | 1 | 12 | | 23.39 | 23.69 | 23.80 |
| 5 | 1 | 24 | | 23.11 | 23.44 | 23.80 |
| 5 | 12 | 0 | | 22.15 | 22.53 | 22.93 |
| 5 | 12 | 7 | | 22.25 | 22.61 | 22.98 |
| 5 | 12 | 13 | | 22.30 | 22.57 | 22.93 |
| 5 | 25 | 0 | | 22.21 | 22.57 | 22.93 |
| 5 | 1 | 0 | 16-QAM | 22.28 | 22.63 | 22.95 |
| 5 | 1 | 12 | | 22.61 | 22.91 | 22.96 |
| 5 | 1 | 24 | | 22.34 | 22.67 | 22.98 |
| 5 | 12 | 0 | | 21.13 | 21.49 | 21.92 |
| 5 | 12 | 7 | | 21.20 | 21.58 | 21.96 |
| 5 | 12 | 13 | | 21.25 | 21.53 | 21.91 |
| 5 | 25 | 0 | | 21.19 | 21.55 | 21.95 |

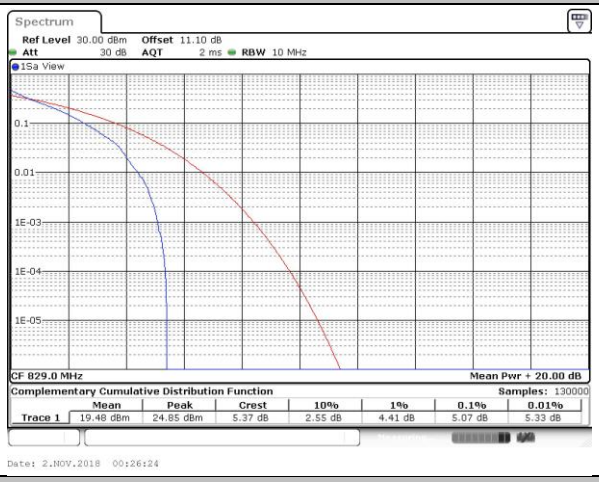
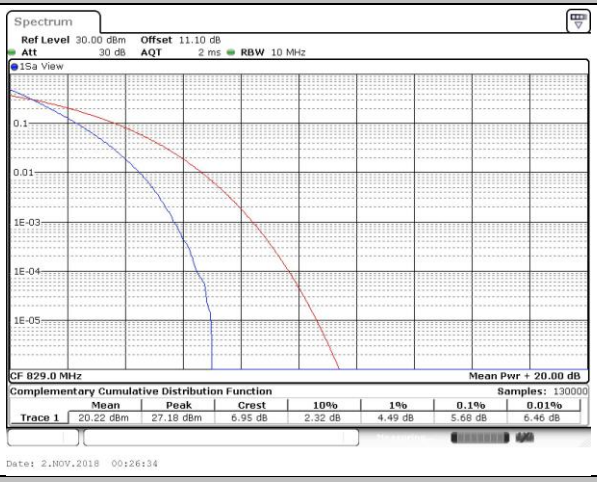
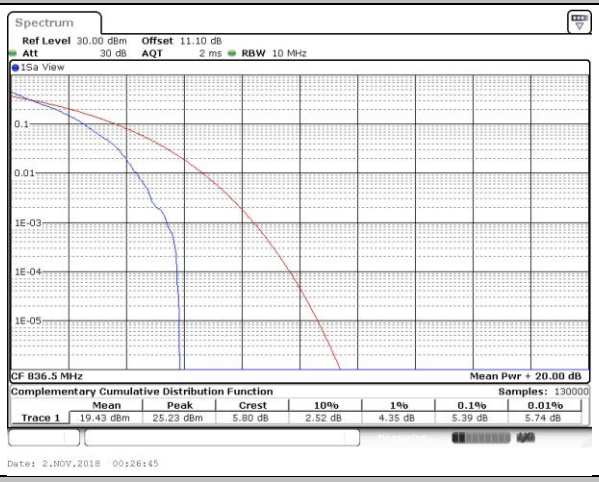
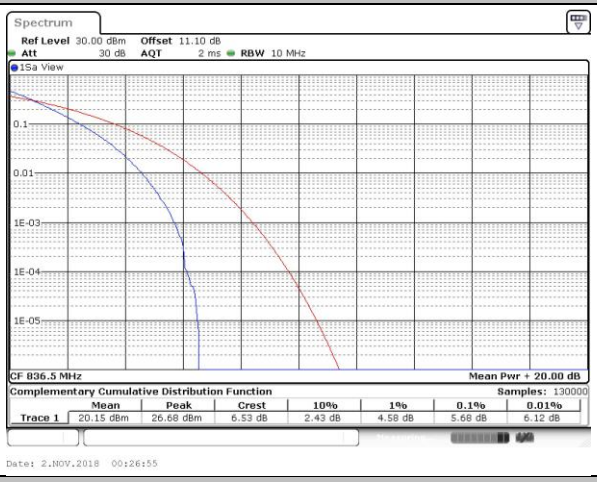
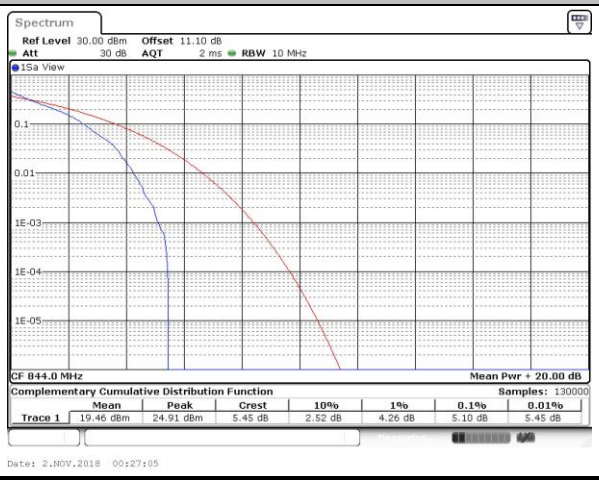
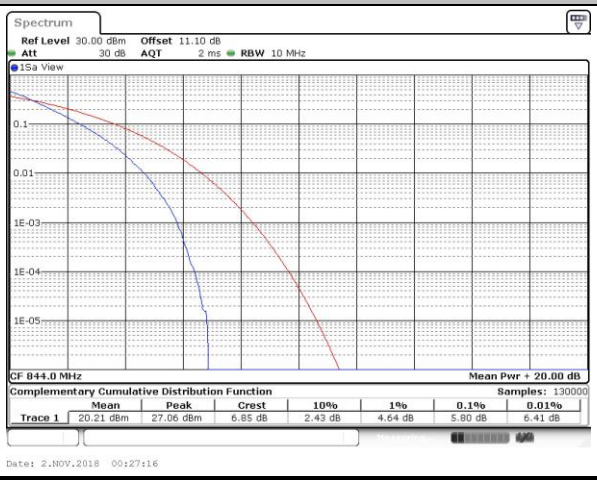
| LTE Band 38 Maximum Average Power [dBm] | | | | | | |
|---|---|---|---|---|---|---|
| BW [MHz] | RB Size | RB Offset | Mod | Lowest | Middle | Highest |
| 20 | 1 | 0 | QPSK | 23.41 | 23.42 | 23.45 |
| 20 | 1 | 49 | | **23.60** | 23.57 | 23.53 |
| 20 | 1 | 99 | | 23.32 | 23.29 | 23.20 |
| 20 | 50 | 0 | | 22.58 | 22.59 | 22.59 |
| 20 | 50 | 24 | | 22.64 | 22.63 | 22.60 |
| 20 | 50 | 50 | | 22.60 | 22.54 | 22.39 |
| 20 | 100 | 0 | | 22.57 | 22.58 | 22.48 |
| 20 | 1 | 0 | 16-QAM | 22.79 | 22.83 | 22.82 |
| 20 | 1 | 49 | | 22.99 | 23.00 | 22.91 |
| 20 | 1 | 99 | | 22.72 | 22.66 | 22.56 |
| 20 | 50 | 0 | | 21.67 | 21.71 | 21.71 |
| 20 | 50 | 24 | | 21.71 | 21.74 | 21.64 |
| 20 | 50 | 50 | | 21.69 | 21.66 | 21.52 |
| 20 | 100 | 0 | | 21.68 | 21.67 | 21.56 |
| 15 | 1 | 0 | QPSK | 23.56 | 23.59 | 23.58 |
| 15 | 1 | 37 | | 23.56 | 23.58 | 23.59 |
| 15 | 1 | 74 | | 23.52 | 23.50 | 23.38 |
| 15 | 36 | 0 | | 22.62 | 22.66 | 22.59 |
| 15 | 36 | 20 | | 22.65 | 22.65 | 22.57 |
| 15 | 36 | 39 | | 22.63 | 22.59 | 22.51 |
| 15 | 75 | 0 | | 22.64 | 22.67 | 22.52 |
| 15 | 1 | 0 | 16-QAM | 22.85 | 22.90 | 22.84 |
| 15 | 1 | 37 | | 22.95 | 22.99 | 22.90 |
| 15 | 1 | 74 | | 22.83 | 22.77 | 22.66 |
| 15 | 36 | 0 | | 21.65 | 21.69 | 21.63 |
| 15 | 36 | 20 | | 21.69 | 21.67 | 21.57 |
| 15 | 36 | 39 | | 21.67 | 21.62 | 21.48 |
| 15 | 75 | 0 | | 21.69 | 21.71 | 21.61 |

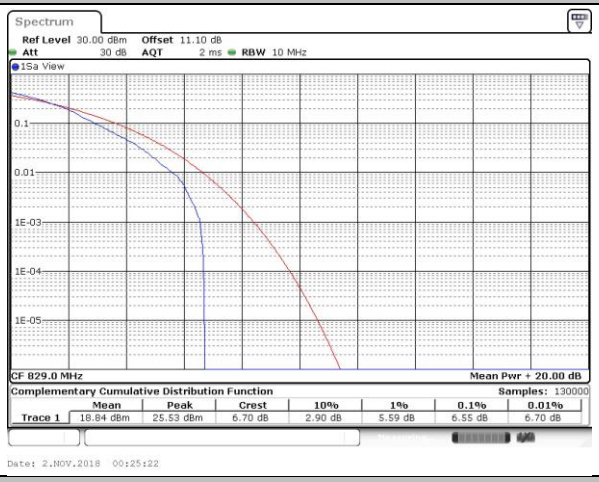
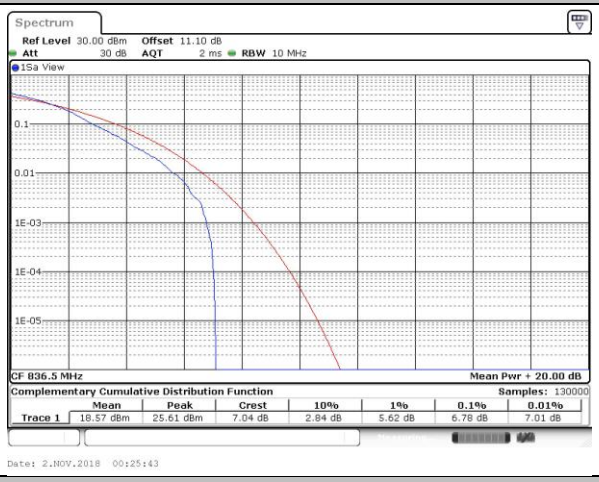
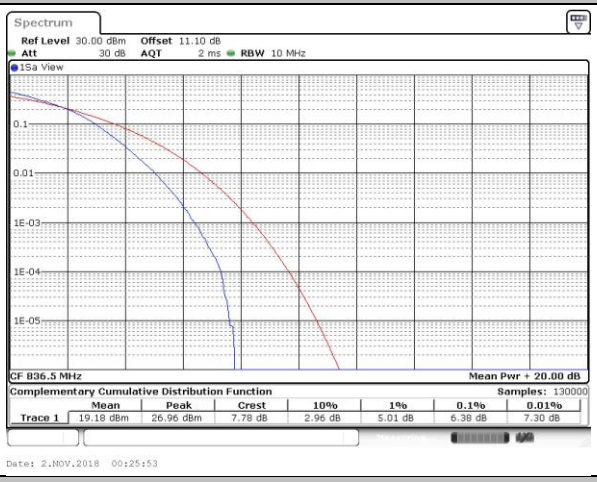
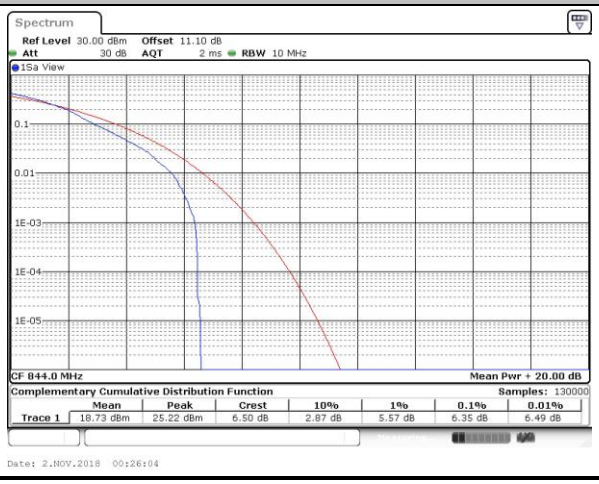
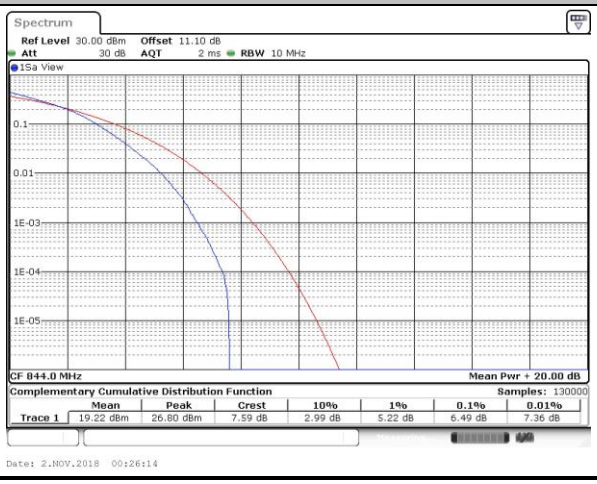
| LTE Band 38 Maximum Average Power [dBm] | | | | | | |
|---|---|---|---|---|---|---|
| BW [MHz] | RB Size | RB Offset | Mod | Lowest | Middle | Highest |
| 10 | 1 | 0 | QPSK | 23.56 | 23.58 | 23.53 |
| 10 | 1 | 25 | | 23.58 | 23.59 | 23.57 |
| 10 | 1 | 49 | | 23.54 | 23.52 | 23.39 |
| 10 | 25 | 0 | | 22.73 | 22.76 | 22.69 |
| 10 | 25 | 12 | | 22.77 | 22.74 | 22.64 |
| 10 | 25 | 25 | | 22.76 | 22.73 | 22.57 |
| 10 | 50 | 0 | | 22.70 | 22.70 | 22.57 |
| 10 | 1 | 0 | 16-QAM | 22.94 | 22.98 | 22.95 |
| 10 | 1 | 25 | | 22.96 | 22.95 | 22.95 |
| 10 | 1 | 49 | | 22.92 | 22.94 | 22.77 |
| 10 | 25 | 0 | | 21.81 | 21.83 | 21.78 |
| 10 | 25 | 12 | | 21.82 | 21.83 | 21.72 |
| 10 | 25 | 25 | | 21.80 | 21.82 | 21.65 |
| 10 | 50 | 0 | | 21.77 | 21.82 | 21.71 |
| 5 | 1 | 0 | QPSK | 23.46 | 23.49 | 23.38 |
| 5 | 1 | 12 | | 23.59 | 23.59 | 23.52 |
| 5 | 1 | 24 | | 23.46 | 23.47 | 23.34 |
| 5 | 12 | 0 | | 22.64 | 22.68 | 22.57 |
| 5 | 12 | 7 | | 22.70 | 22.74 | 22.58 |
| 5 | 12 | 13 | | 22.65 | 22.67 | 22.52 |
| 5 | 25 | 0 | | 22.70 | 22.69 | 22.56 |
| 5 | 1 | 0 | 16-QAM | 22.80 | 22.87 | 22.76 |
| 5 | 1 | 12 | | 22.97 | 23.00 | 22.89 |
| 5 | 1 | 24 | | 22.81 | 22.88 | 22.72 |
| 5 | 12 | 0 | | 21.71 | 21.74 | 21.63 |
| 5 | 12 | 7 | | 21.77 | 21.80 | 21.64 |
| 5 | 12 | 13 | | 21.73 | 21.74 | 21.58 |
| 5 | 25 | 0 | | 21.75 | 21.80 | 21.64 |

# LTE Band 5

## Peak-to-Average Ratio

| Mode | LTE Band 5 / 10MHz | | | | |
|---|---|---|---|---|---|
| Mod. | QPSK | | 16QAM | | Limit: 13dB |
| RB Size | 1RB | Full RB | 1RB | Full RB | Result |
| Lowest CH | 5.07 | 5.68 | 6.55 | 6.46 | PASS |
| Middle CH | 5.39 | 5.68 | 6.78 | 6.38 | |
| Highest CH | 5.10 | 5.80 | 6.35 | 6.49 | |

| LTE Band 5 / 10MHz / QPSK | |
|---|---|
| **Lowest Channel / 1RB** | **Lowest Channel / Full RB** |
|  |  |
| **Middle Channel / 1RB** | **Middle Channel / Full RB** |
|  |  |
| **Highest Channel / 1RB** | **Highest Channel / Full RB** |
|  |  |

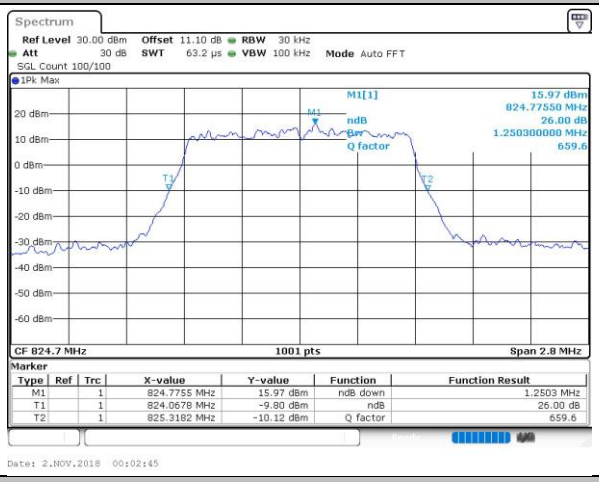
| LTE Band 5 / 10MHz / 16QAM | |
|---|---|
| **Lowest Channel / 1RB** | **Lowest Channel / Full RB** |
|  |  |
| **Middle Channel / 1RB** | **Middle Channel / Full RB** |
|  |  |
| **Highest Channel / 1RB** | **Highest Channel / Full RB** |
|  |  |

# 26dB Bandwidth

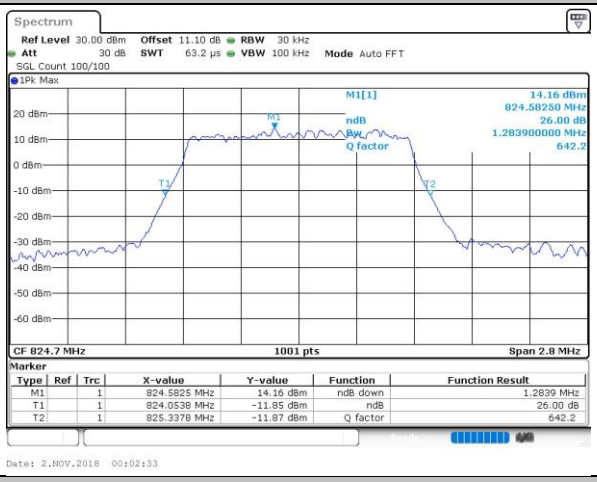
| Mode | LTE Band 5 : 26dB BW(MHz) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BW | 1.4MHz | | 3MHz | | 5MHz | | 10MHz | | 15MHz | | 20MHz | |
| Mod. | QPSK | 16QAM | QPSK | 16QAM | QPSK | 16QAM | QPSK | 16QAM | QPSK | 16QAM | QPSK | 16QAM |
| Lowest CH | 1.25 | 1.28 | 2.95 | 2.94 | 4.85 | 5.13 | 10.21 | 10.13 | - | - | - | - |
| Middle CH | 1.26 | 1.32 | 2.97 | 2.96 | 5.03 | 4.92 | 10.03 | 9.81 | - | - | - | - |
| Highest CH | 1.29 | 1.26 | 2.99 | 2.95 | 5.18 | 5.19 | 9.95 | 9.81 | - | - | - | - |

## LTE Band 5

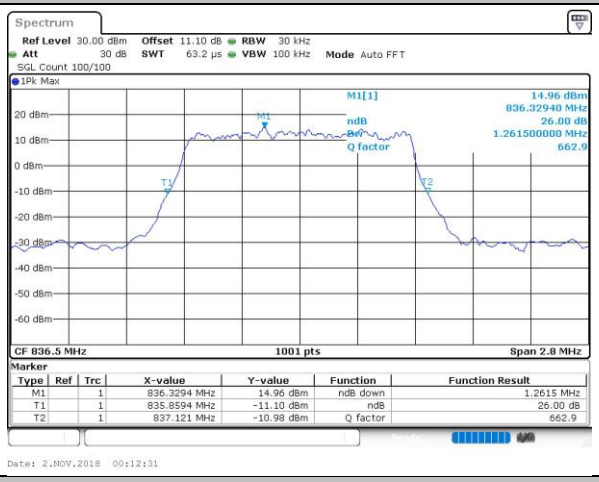
### Lowest Channel / 1.4MHz / QPSK



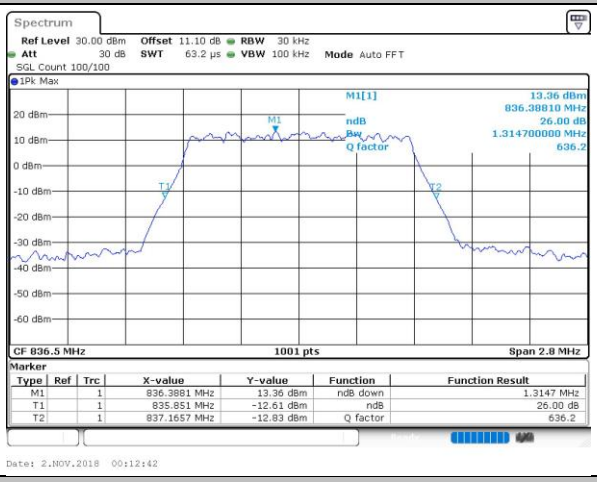

### Lowest Channel / 1.4MHz / 16QAM



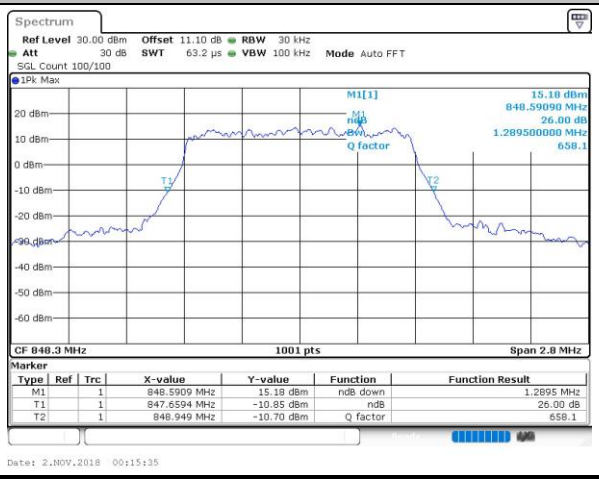

### Middle Channel / 1.4MHz / QPSK



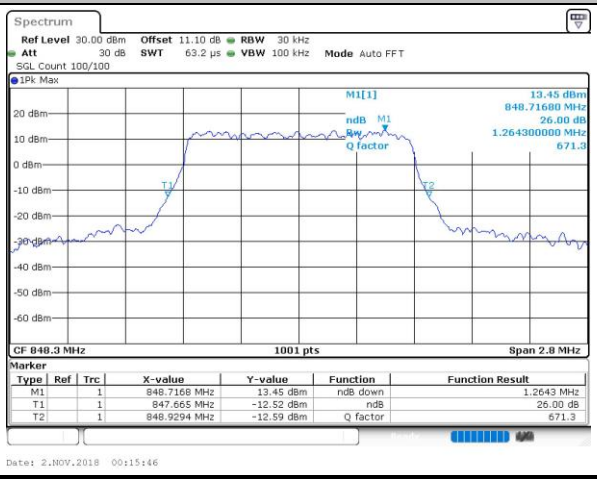

### Middle Channel / 1.4MHz / 16QAM




### Highest Channel / 1.4MHz / QPSK

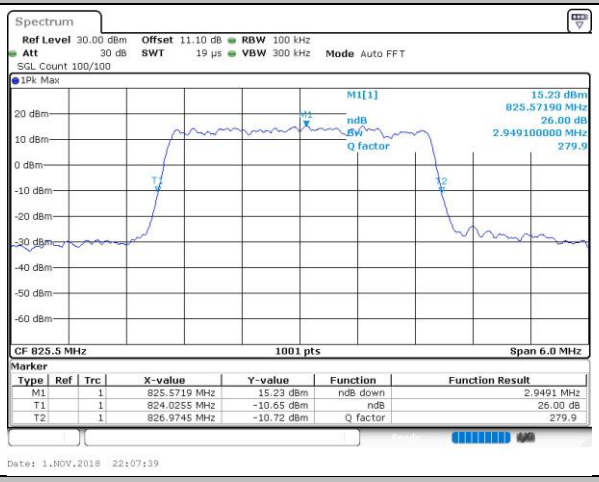



### Highest Channel / 1.4MHz / 16QAM

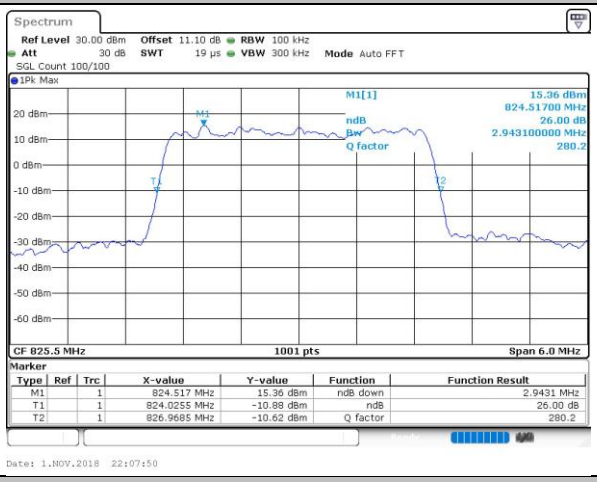


## LTE Band 5

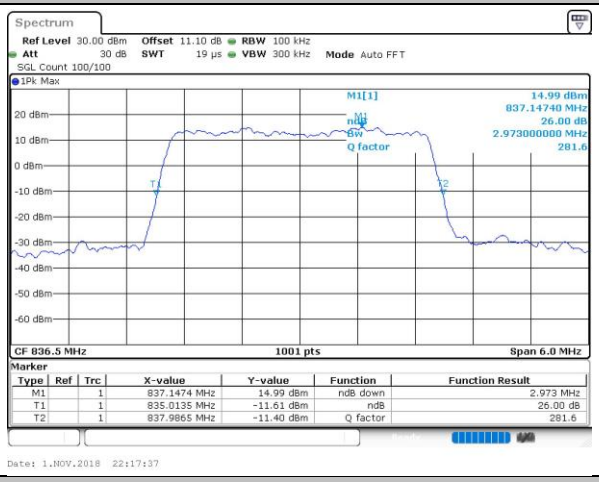
### Lowest Channel / 3MHz / QPSK



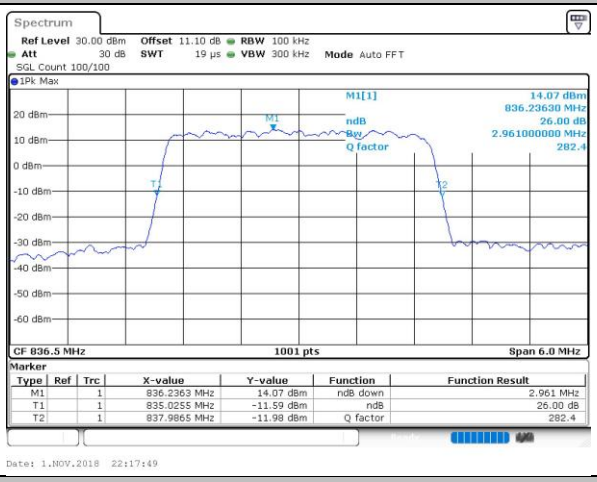

### Lowest Channel / 3MHz / 16QAM



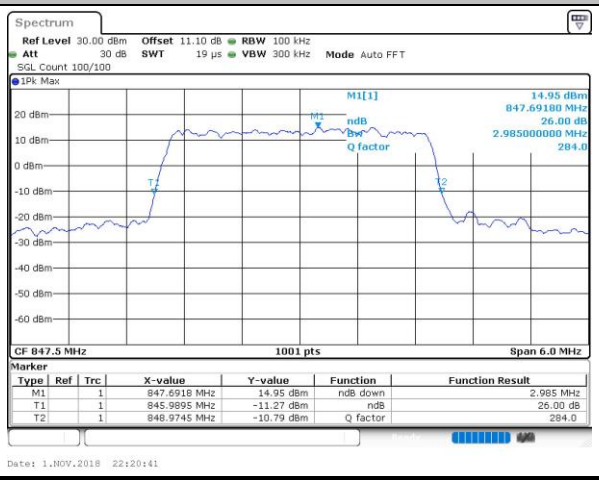

### Middle Channel / 3MHz / QPSK



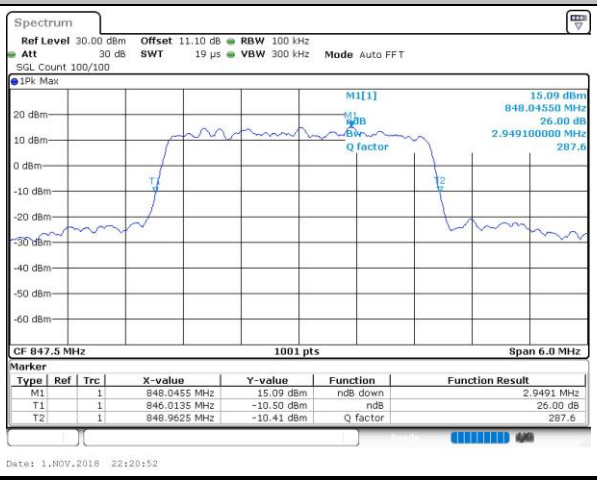

### Middle Channel / 3MHz / 16QAM




### Highest Channel / 3MHz / QPSK

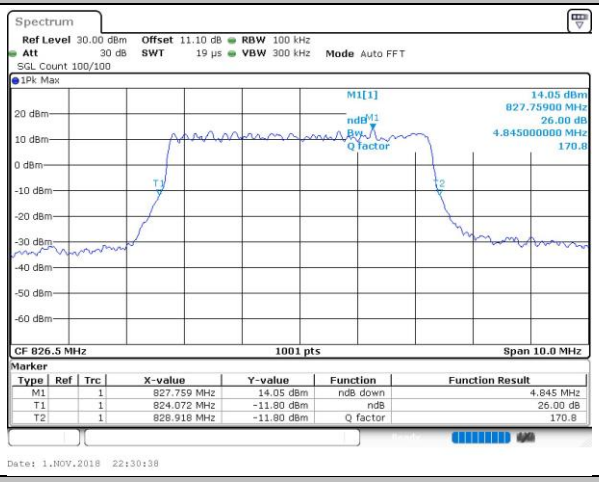



### Highest Channel / 3MHz / 16QAM

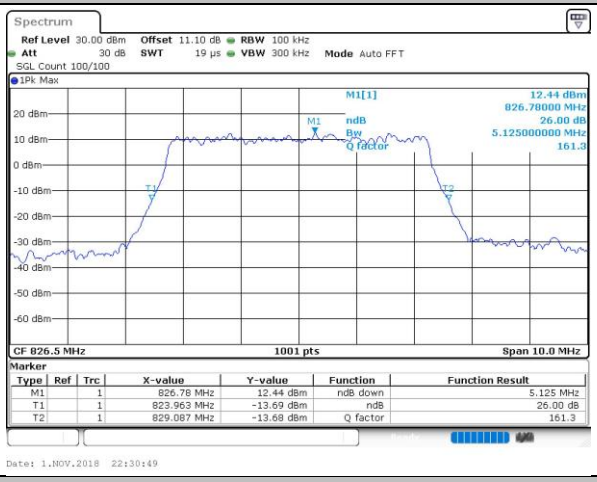


## LTE Band 5

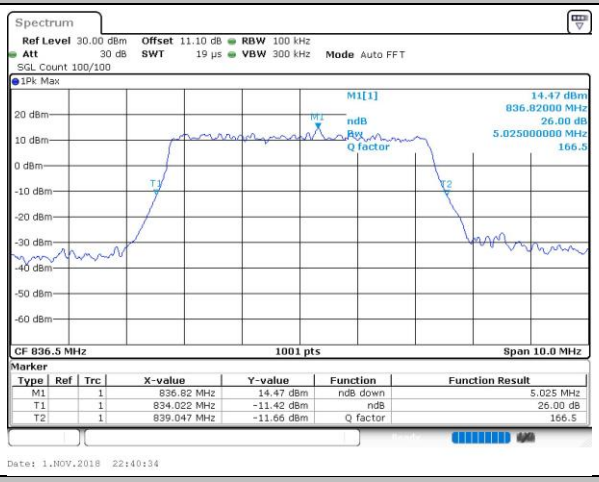
### Lowest Channel / 5MHz / QPSK



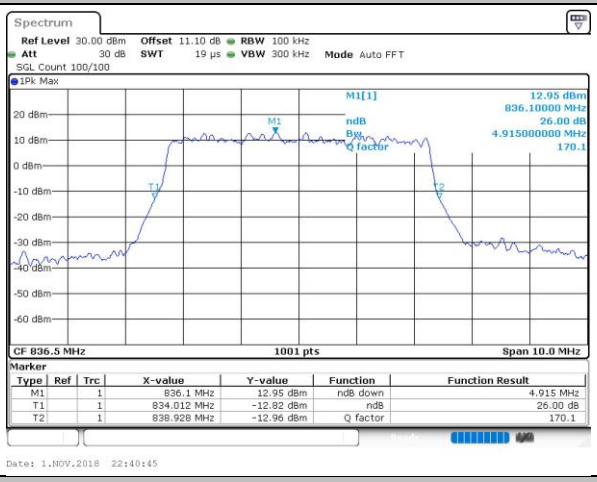

### Lowest Channel / 5MHz / 16QAM



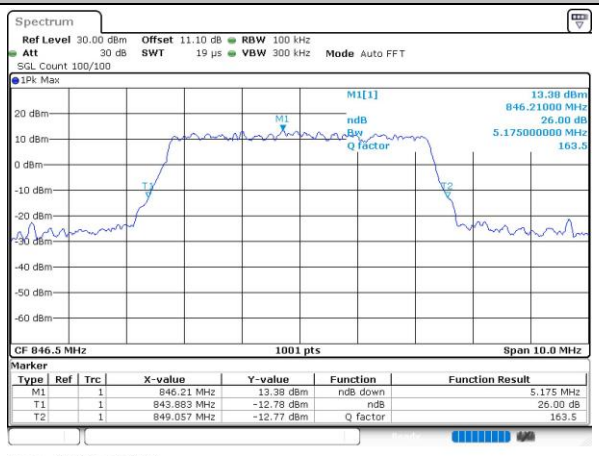

### Middle Channel / 5MHz / QPSK



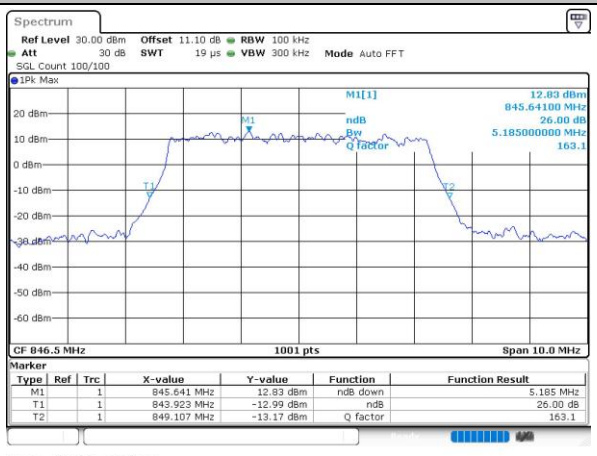

### Middle Channel / 5MHz / 16QAM




### Highest Channel / 5MHz / QPSK

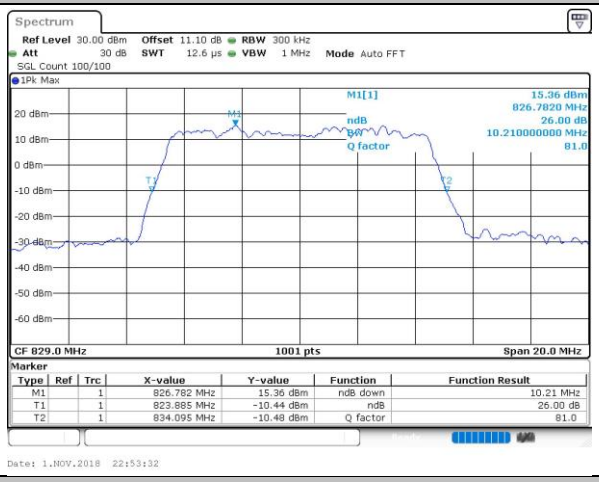



### Highest Channel / 5MHz / 16QAM

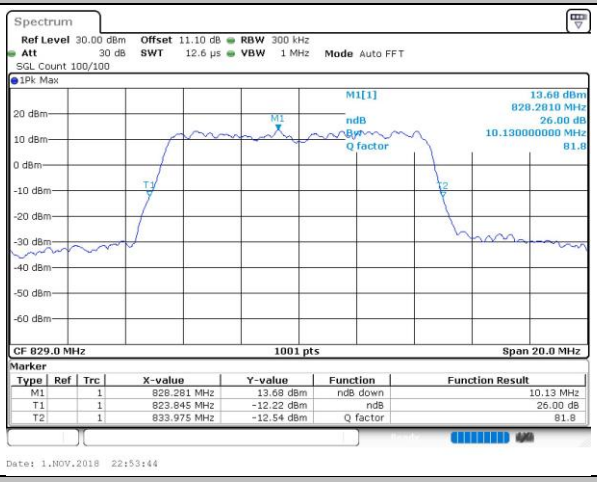


## LTE Band 5

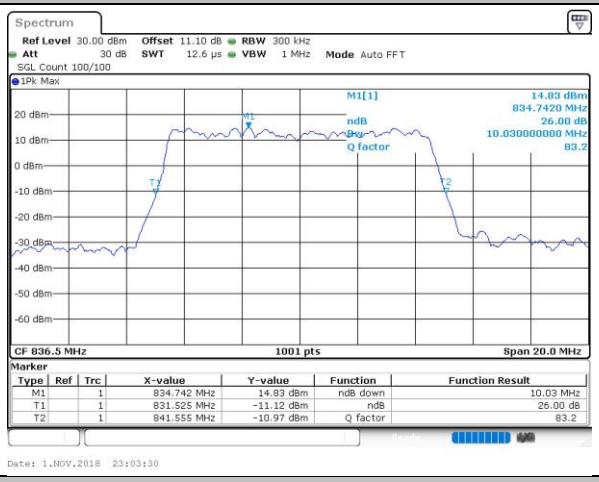
### Lowest Channel / 10MHz / QPSK



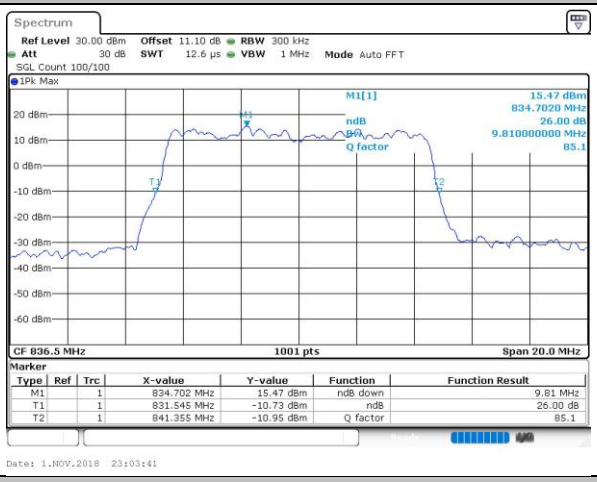

### Lowest Channel / 10MHz / 16QAM



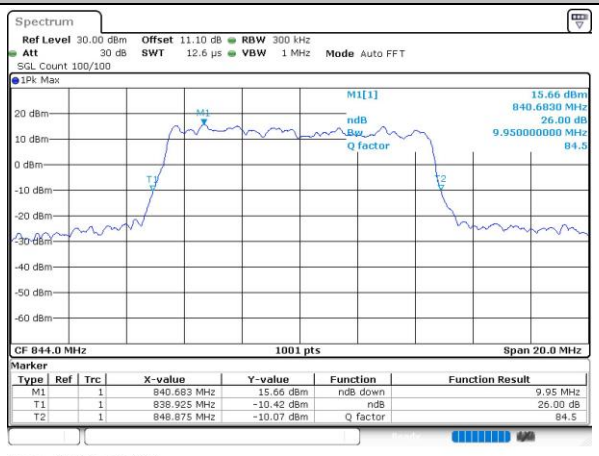

### Middle Channel / 10MHz / QPSK



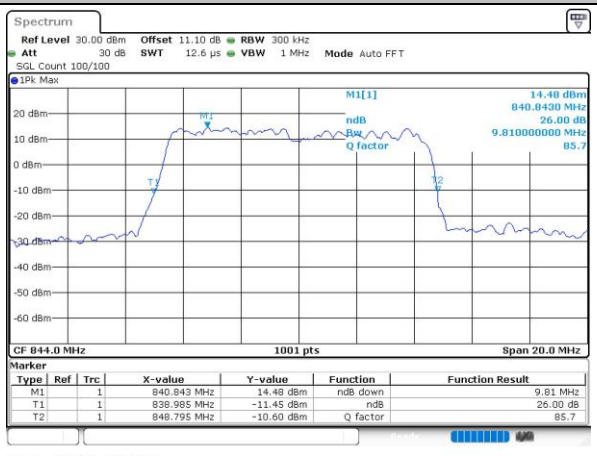

### Middle Channel / 10MHz / 16QAM




### Highest Channel / 10MHz / QPSK




### Highest Channel / 10MHz / 16QAM

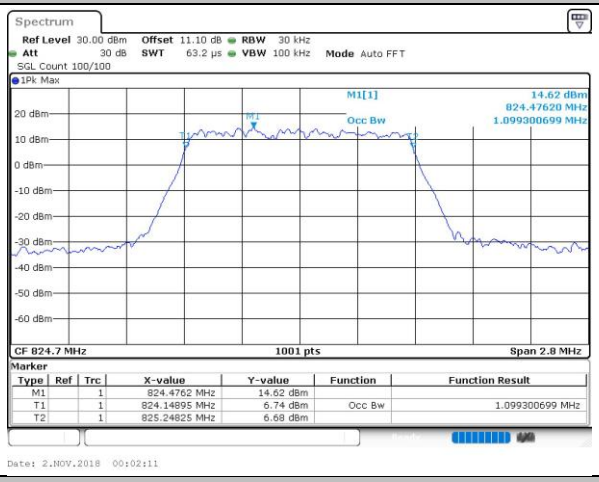


# Occupied Bandwidth

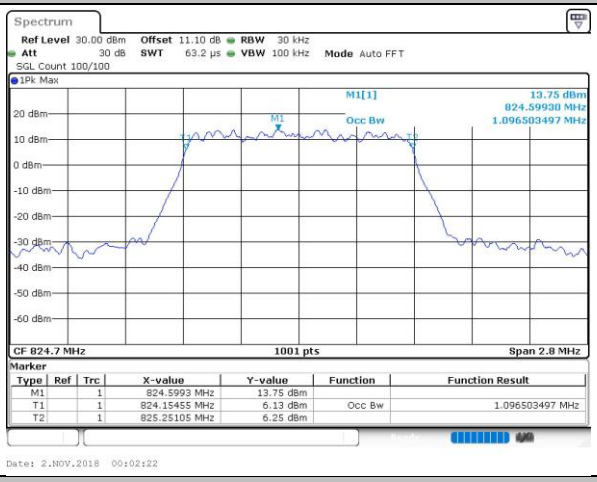
| Mode | LTE Band 5 : 99%OBW(MHz) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BW | 1.4MHz | | 3MHz | | 5MHz | | 10MHz | | 15MHz | | 20MHz | |
| Mod. | QPSK | 16QAM | QPSK | 16QAM | QPSK | 16QAM | QPSK | 16QAM | QPSK | 16QAM | QPSK | 16QAM |
| Lowest CH | 1.10 | 1.10 | 2.71 | 2.72 | 4.48 | 4.53 | 9.05 | 8.97 | - | - | - | - |
| Middle CH | 1.09 | 1.10 | 2.70 | 2.70 | 4.51 | 4.48 | 9.09 | 9.07 | - | - | - | - |
| Highest CH | 1.09 | 1.10 | 2.72 | 2.70 | 4.53 | 4.49 | 9.03 | 9.01 | - | - | - | - |

## LTE Band 5

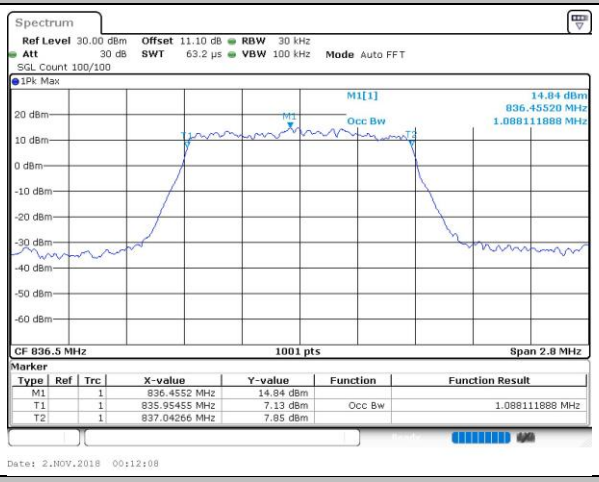
### Lowest Channel / 1.4MHz / QPSK



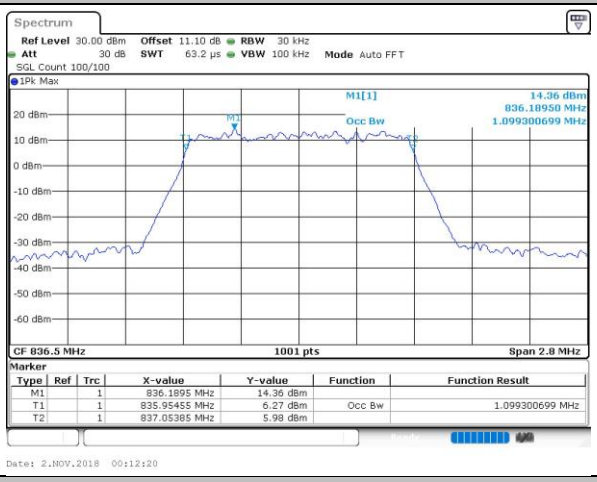

### Lowest Channel / 1.4MHz / 16QAM



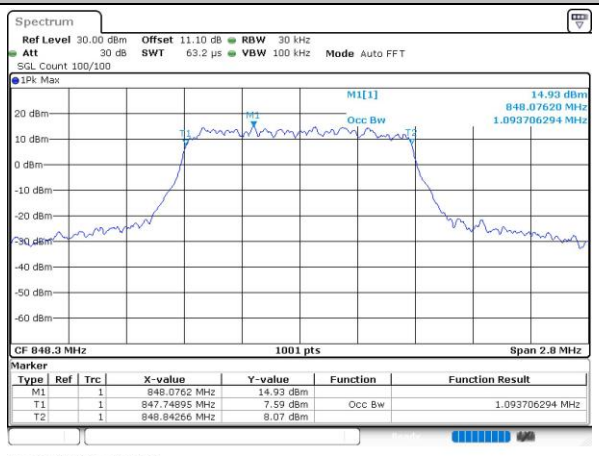

### Middle Channel / 1.4MHz / QPSK



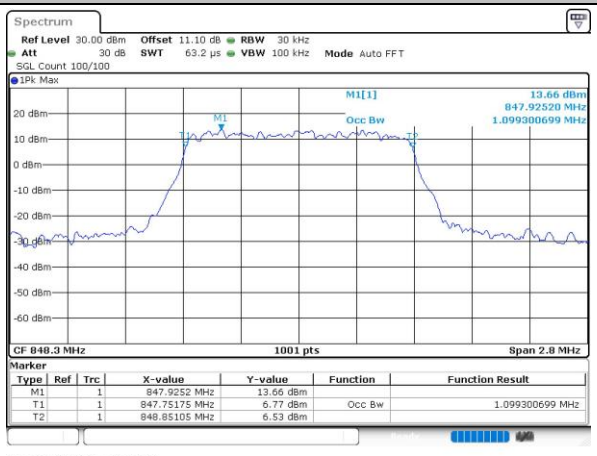

### Middle Channel / 1.4MHz / 16QAM




### Highest Channel / 1.4MHz / QPSK

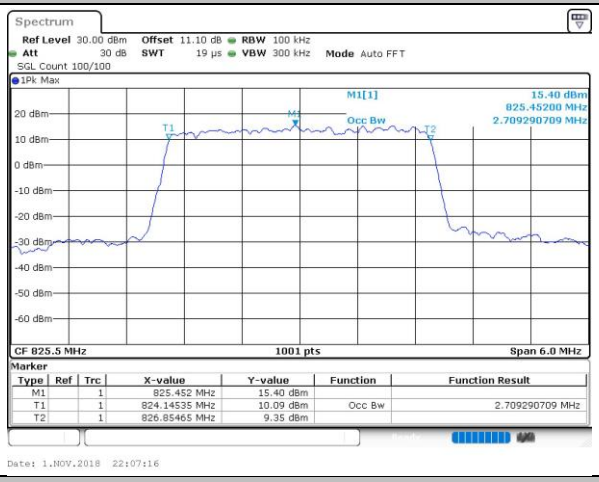



### Highest Channel / 1.4MHz / 16QAM

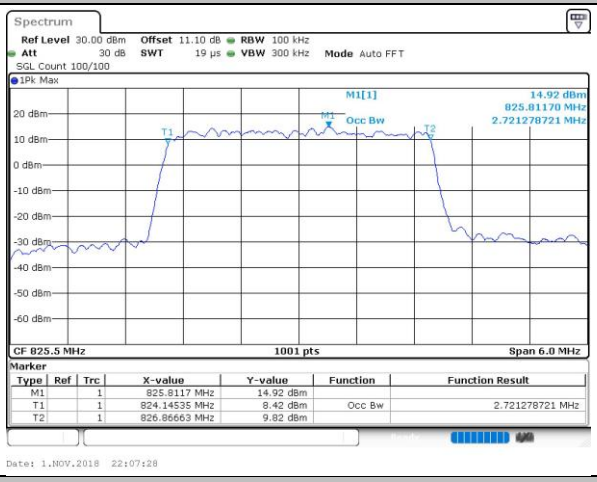


## LTE Band 5

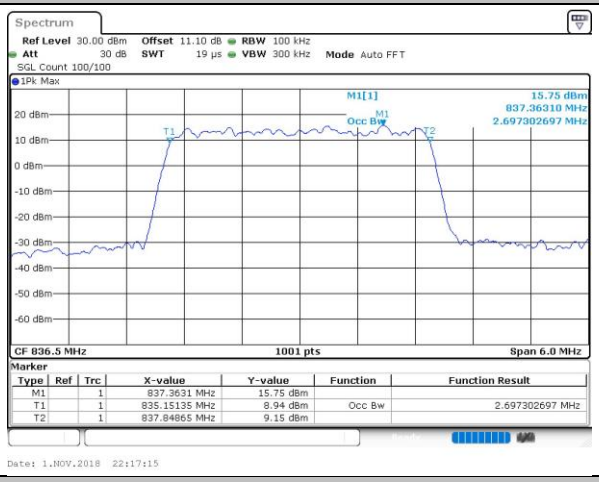
### Lowest Channel / 3MHz / QPSK



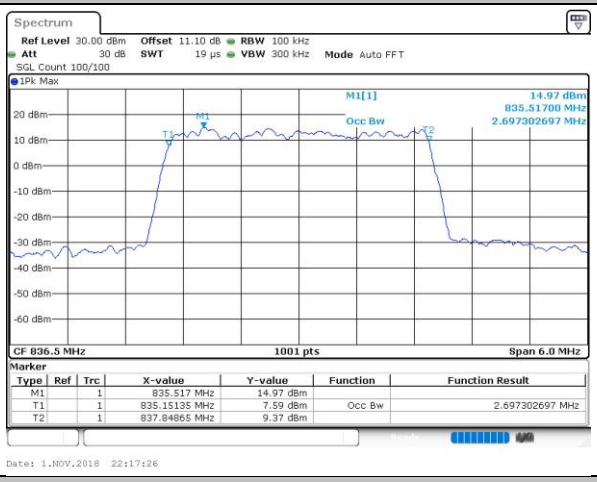

### Lowest Channel / 3MHz / 16QAM



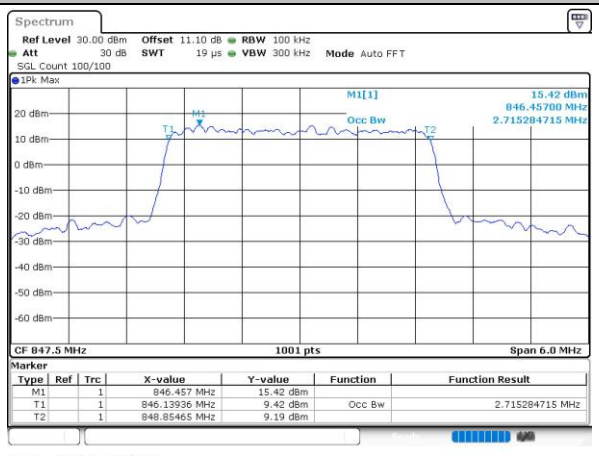

### Middle Channel / 3MHz / QPSK



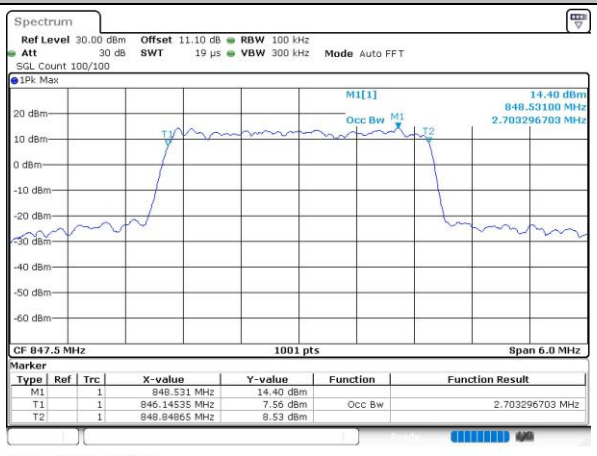

### Middle Channel / 3MHz / 16QAM




### Highest Channel / 3MHz / QPSK

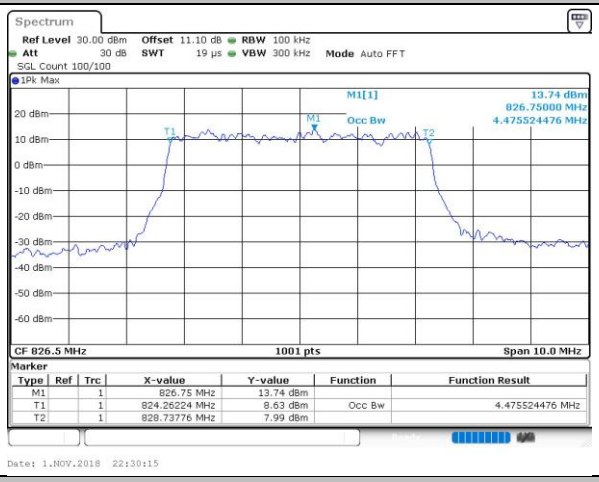



### Highest Channel / 3MHz / 16QAM

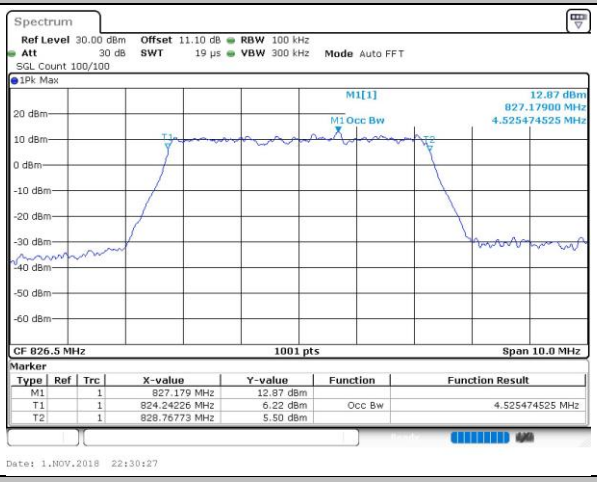


## LTE Band 5

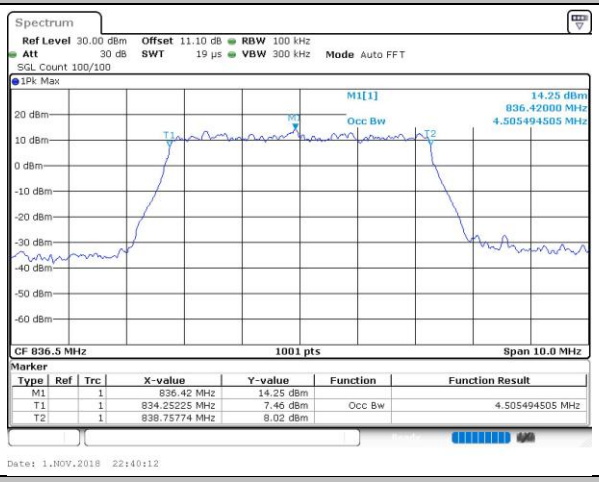
### Lowest Channel / 5MHz / QPSK



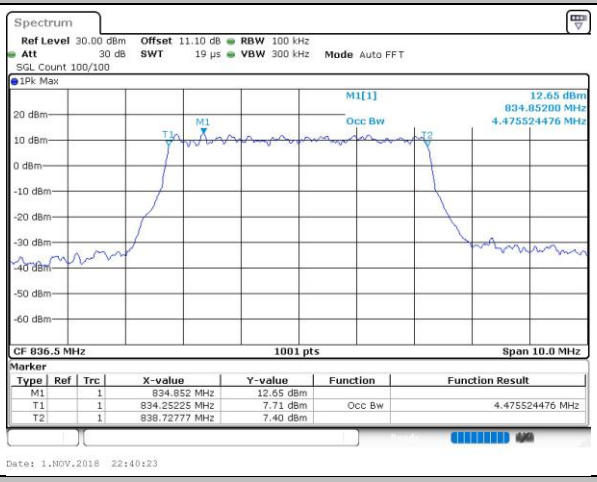

### Lowest Channel / 5MHz / 16QAM



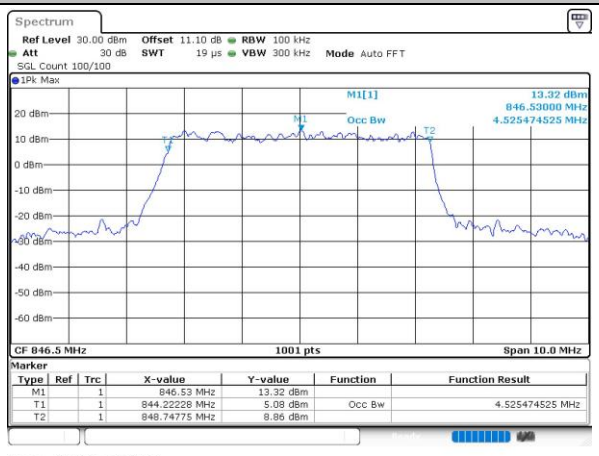

### Middle Channel / 5MHz / QPSK



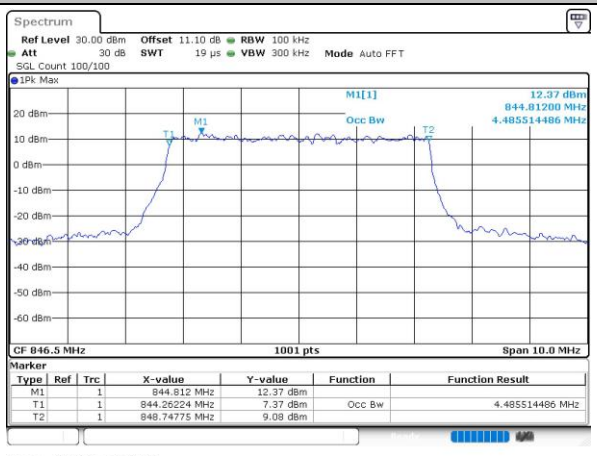

### Middle Channel / 5MHz / 16QAM




### Highest Channel / 5MHz / QPSK

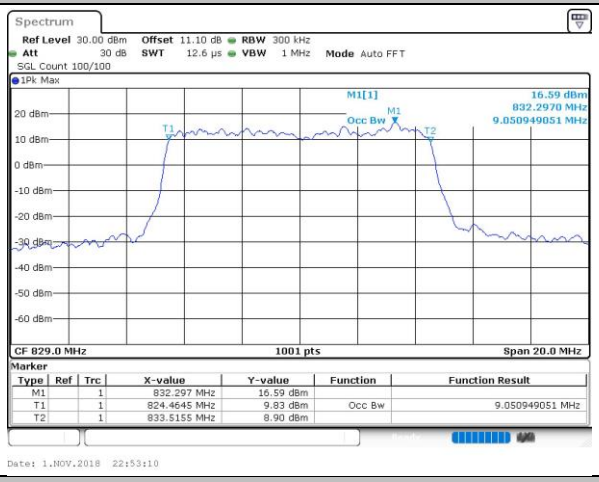



### Highest Channel / 5MHz / 16QAM

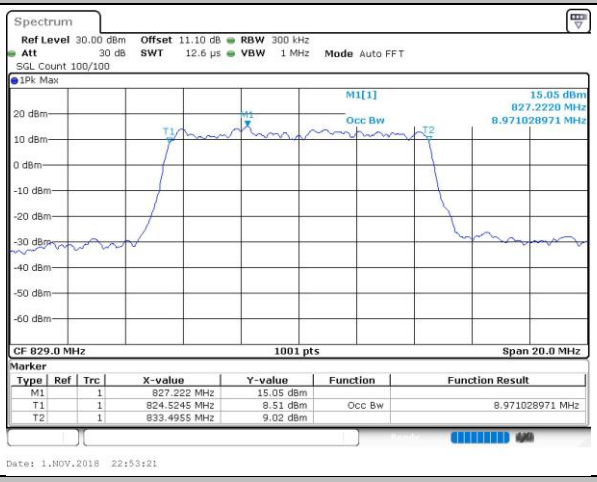


## LTE Band 5

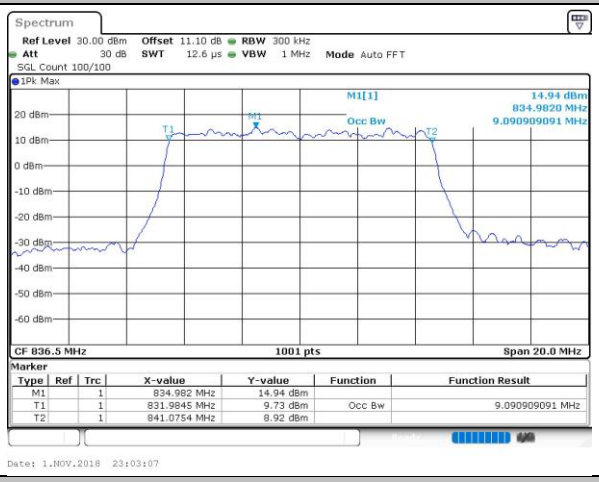
### Lowest Channel / 10MHz / QPSK



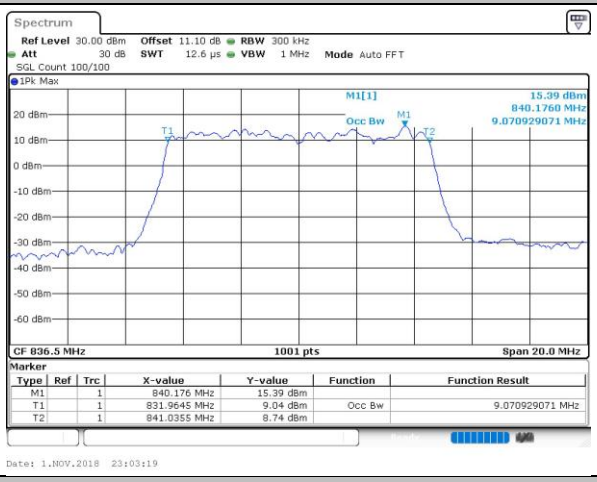

### Lowest Channel / 10MHz / 16QAM



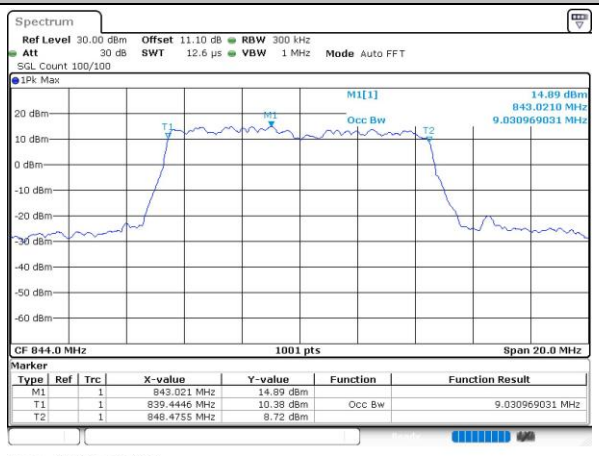

### Middle Channel / 10MHz / QPSK



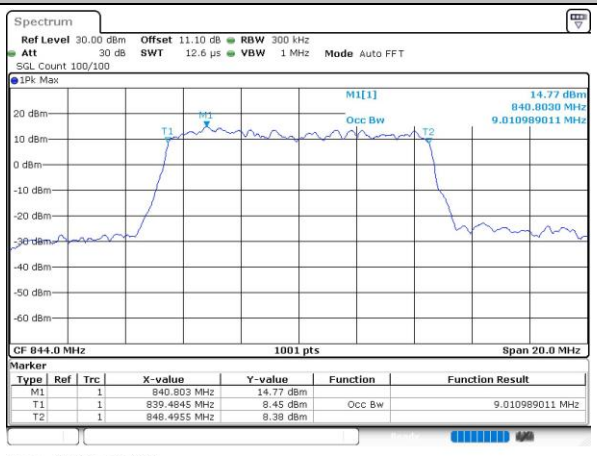

### Middle Channel / 10MHz / 16QAM




### Highest Channel / 10MHz / QPSK



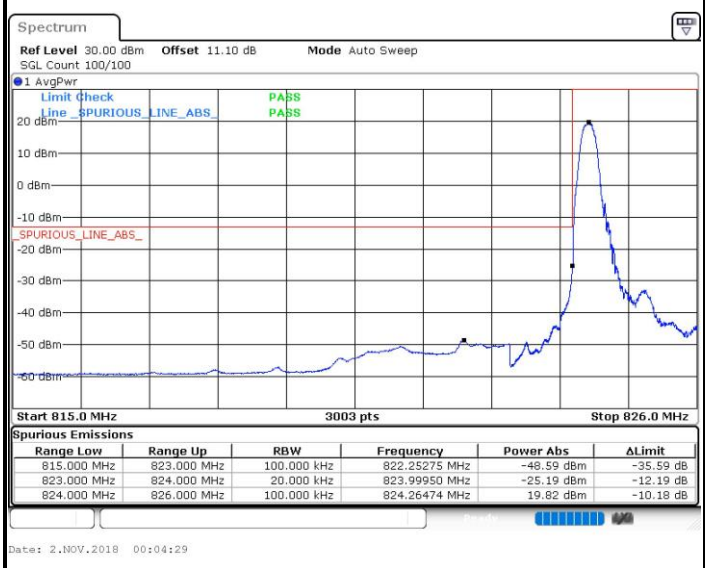

### Highest Channel / 10MHz / 16QAM



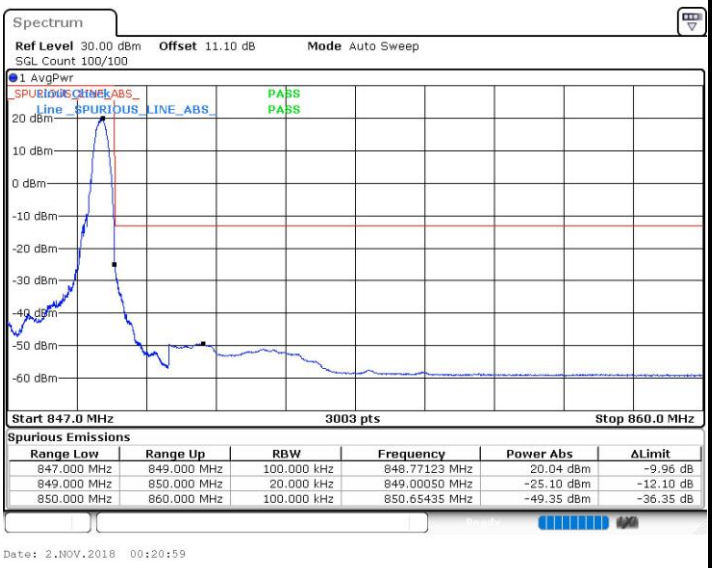
# Conducted Band Edge

## LTE Band 5 / 1.4MHz / QPSK

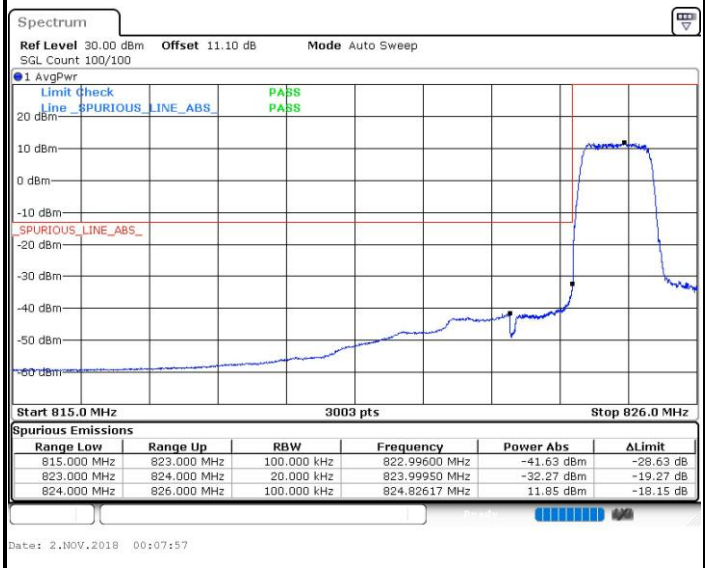
### Lowest Band Edge / 1RB



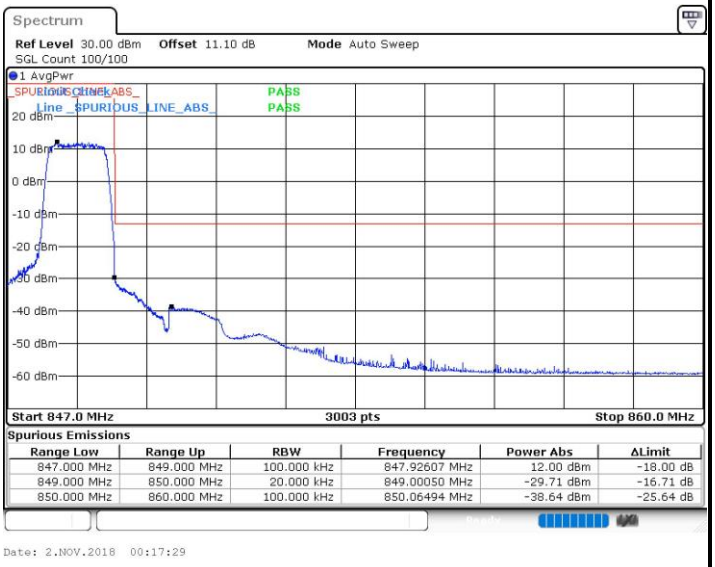

### Highest Band Edge / 1RB




### Lowest Band Edge / Full RB

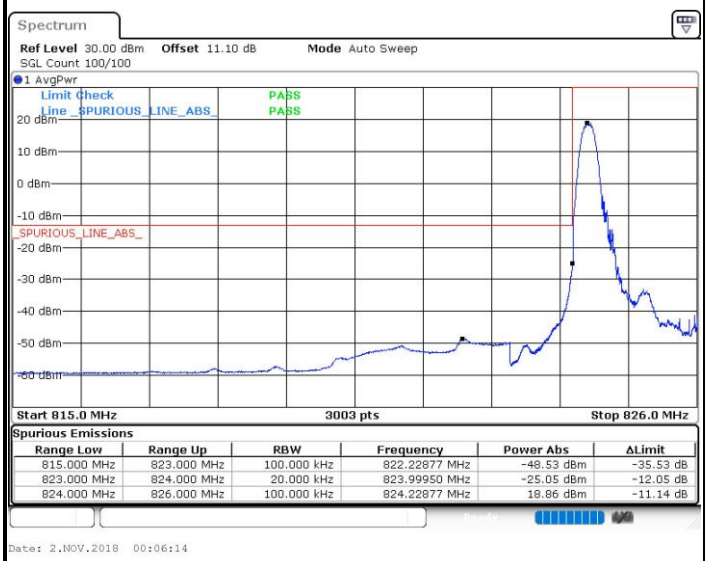



### Highest Band Edge / Full RB

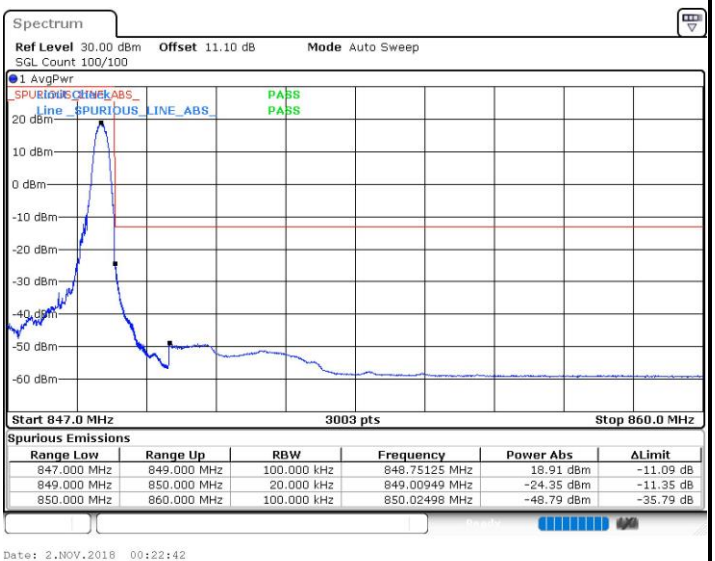


## LTE Band 5 / 1.4MHz / 16QAM

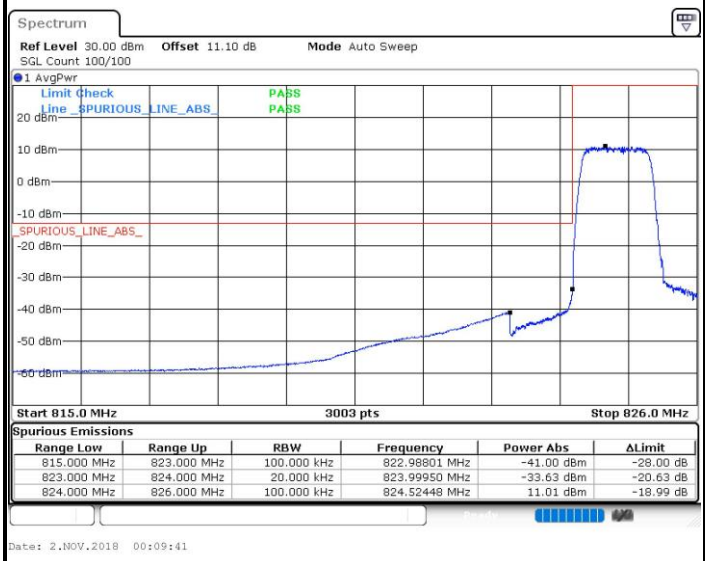
### Lowest Band Edge / 1 RB



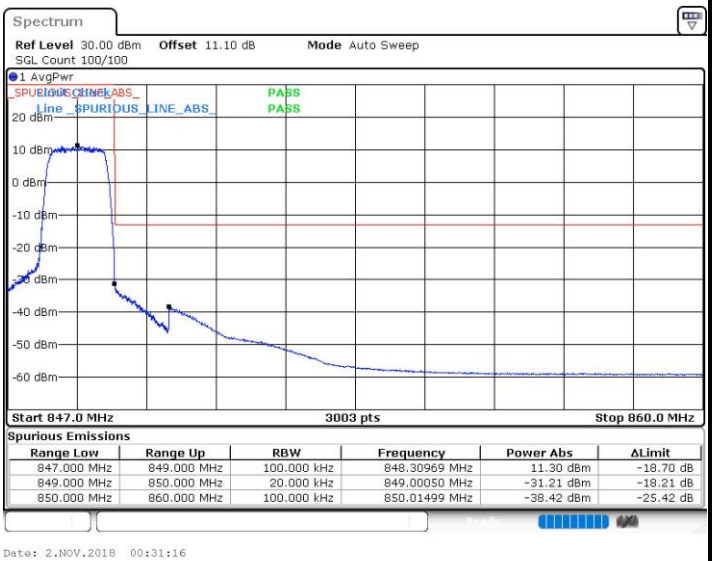

### Highest Band Edge / 1 RB




### Lowest Band Edge / Full RB

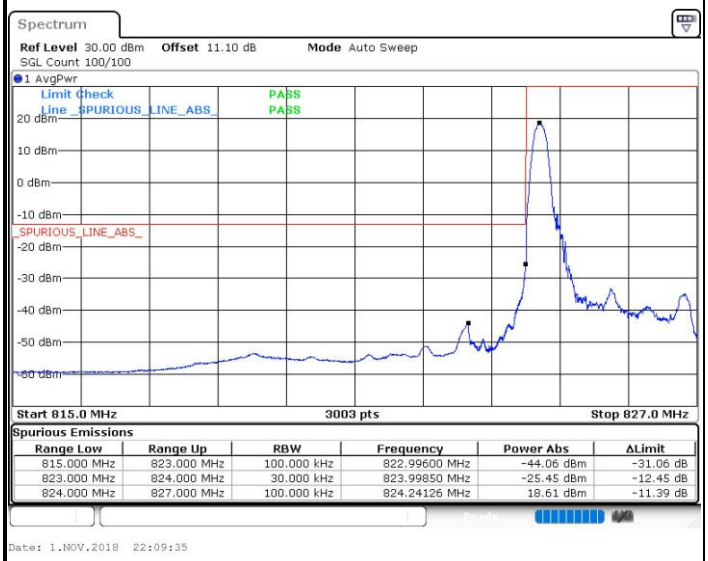



### Highest Band Edge / Full RB



## LTE Band 5 / 3MHz / QPSK

### Lowest Band Edge / 1RB




Spurious Emissions

| Range Low | Range Up | RBW | Frequency | Power Abs | ΔLimit |
|---|---|---|---|---|---|
| 815.000 MHz | 823.000 MHz | 100.000 kHz | 822.99600 MHz | -44.06 dBm | -31.06 dB |
| 823.000 MHz | 824.000 MHz | 30.000 kHz | 823.99850 MHz | -25.45 dBm | -12.45 dB |
| 824.000 MHz | 827.000 MHz | 100.000 kHz | 824.24126 MHz | 18.61 dBm | -11.39 dB |

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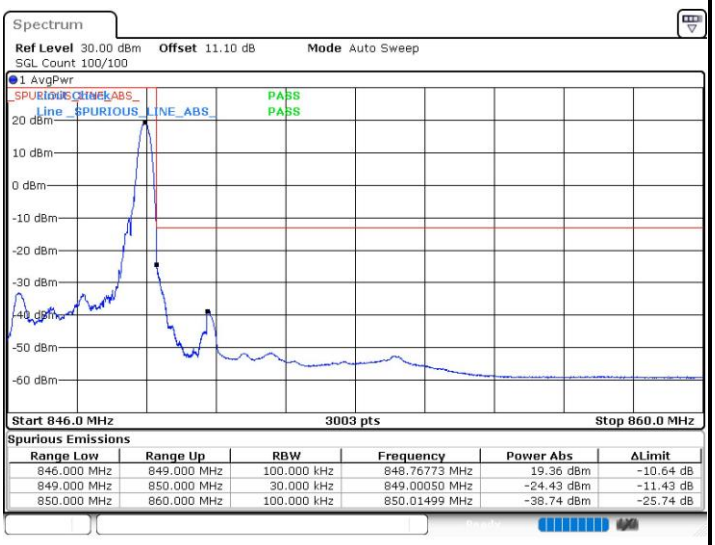
### Highest Band Edge / 1 RB




Spurious Emissions

| Range Low | Range Up | RBW | Frequency | Power Abs | ΔLimit |
|---|---|---|---|---|---|
| 846.000 MHz | 849.000 MHz | 100.000 kHz | 848.76773 MHz | 19.36 dBm | -10.64 dB |
| 849.000 MHz | 850.000 MHz | 30.000 kHz | 849.00050 MHz | -24.43 dBm | -11.43 dB |
| 850.000 MHz | 860.000 MHz | 100.000 kHz | 850.01499 MHz | -38.74 dBm | -25.74 dB |

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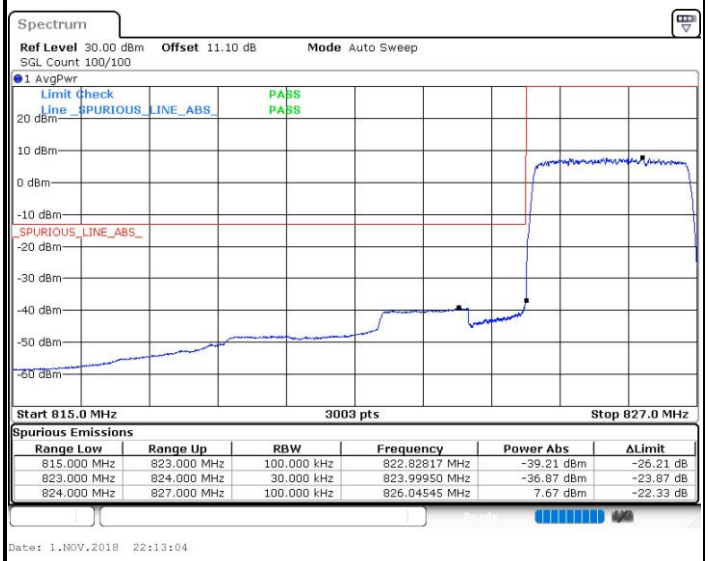
### Lowest Band Edge / Full RB




Spurious Emissions

| Range Low | Range Up | RBW | Frequency | Power Abs | ΔLimit |
|---|---|---|---|---|---|
| 815.000 MHz | 823.000 MHz | 100.000 kHz | 822.82817 MHz | -39.21 dBm | -26.21 dB |
| 823.000 MHz | 824.000 MHz | 30.000 kHz | 823.99950 MHz | -36.87 dBm | -23.87 dB |
| 824.000 MHz | 827.000 MHz | 100.000 kHz | 826.04545 MHz | 7.67 dBm | -22.33 dB |

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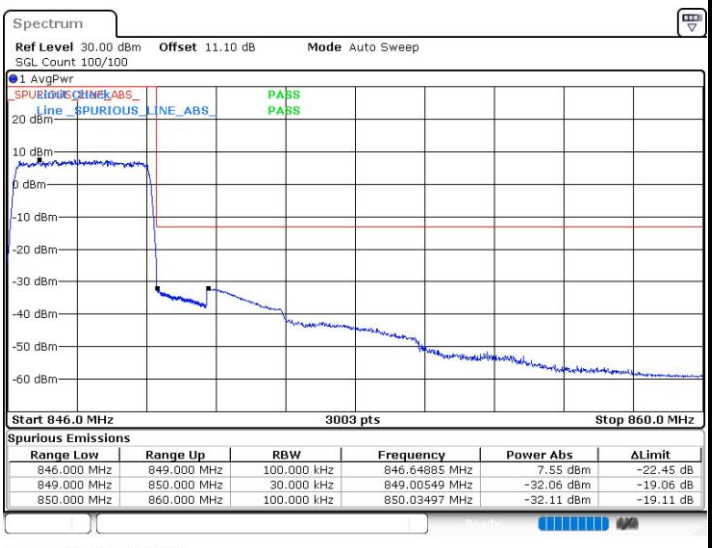
### Highest Band Edge / Full RB




Spurious Emissions

| Range Low | Range Up | RBW | Frequency | Power Abs | ΔLimit |
|---|---|---|---|---|---|
| 846.000 MHz | 849.000 MHz | 100.000 kHz | 846.64885 MHz | 7.55 dBm | -22.45 dB |
| 849.000 MHz | 850.000 MHz | 30.000 kHz | 849.00549 MHz | -32.06 dBm | -19.06 dB |
| 850.000 MHz | 860.000 MHz | 100.000 kHz | 850.03497 MHz | -32.11 dBm | -19.11 dB |

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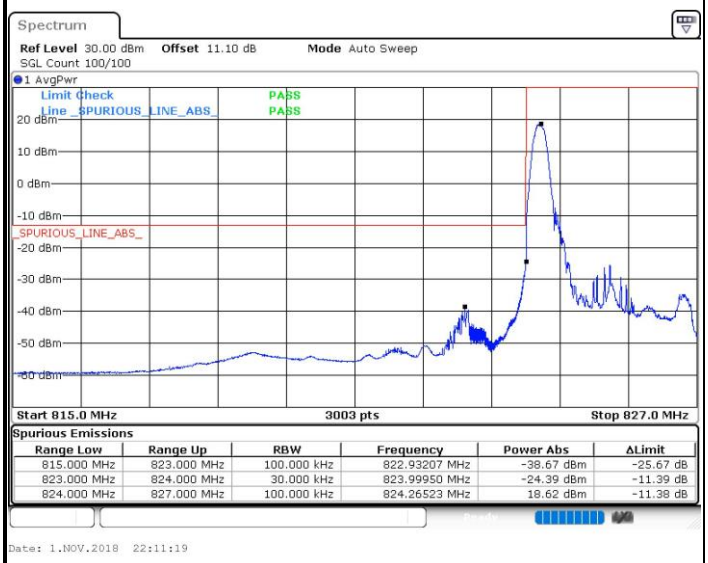
## LTE Band 5 / 3MHz / 16QAM

### Lowest Band Edge / 1 RB

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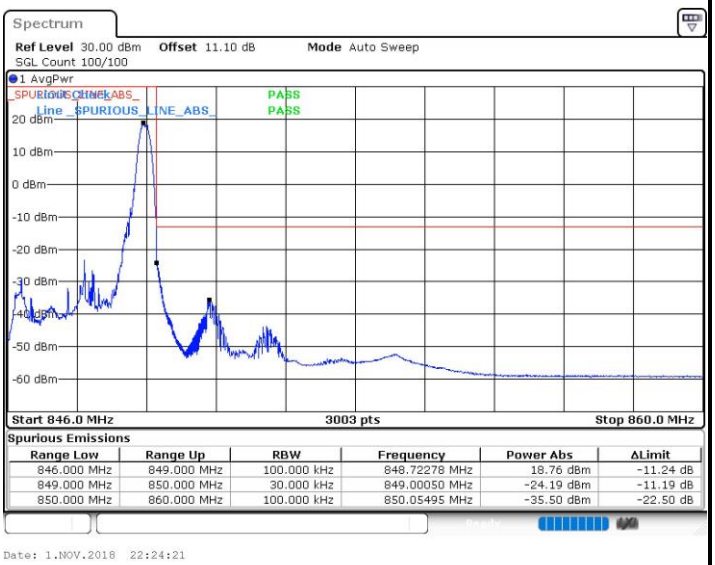
### Highest Band Edge /1 RB

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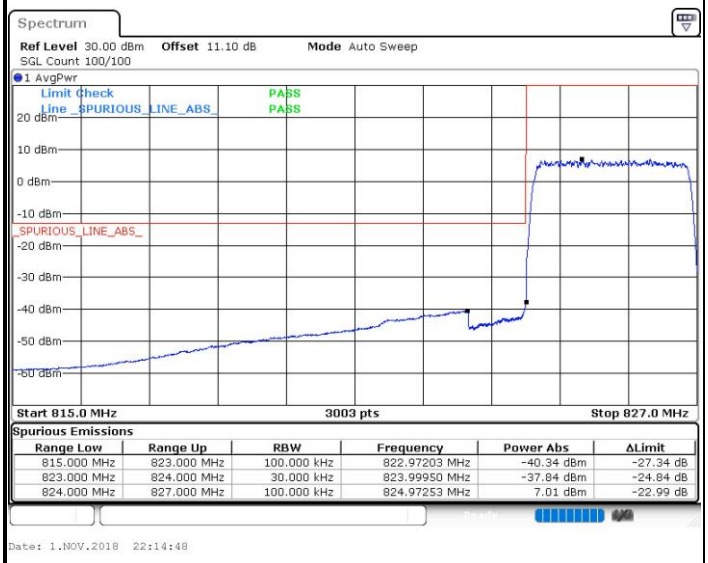
### Lowest Band Edge / Full RB

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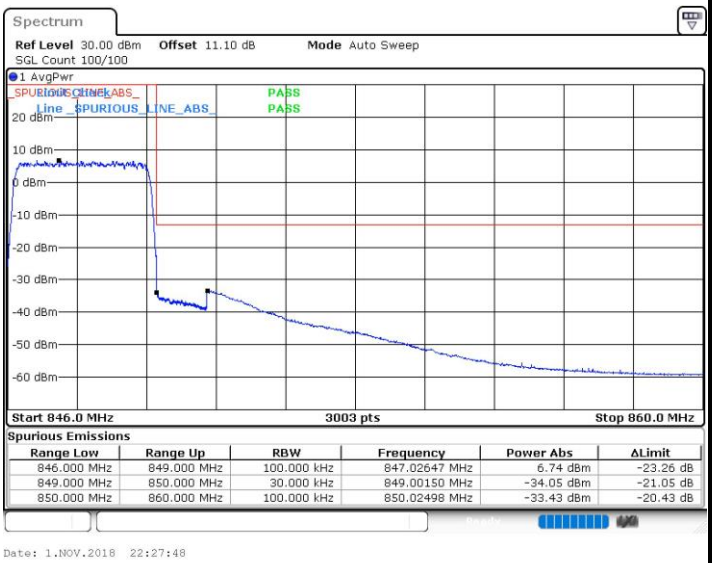
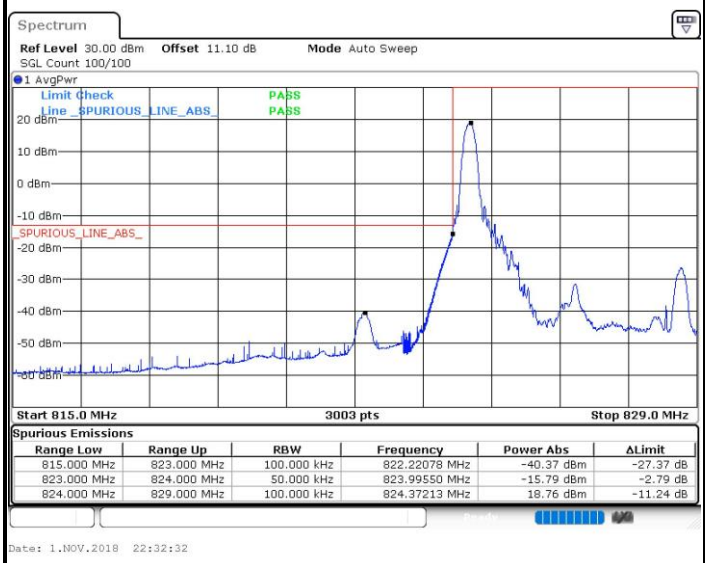
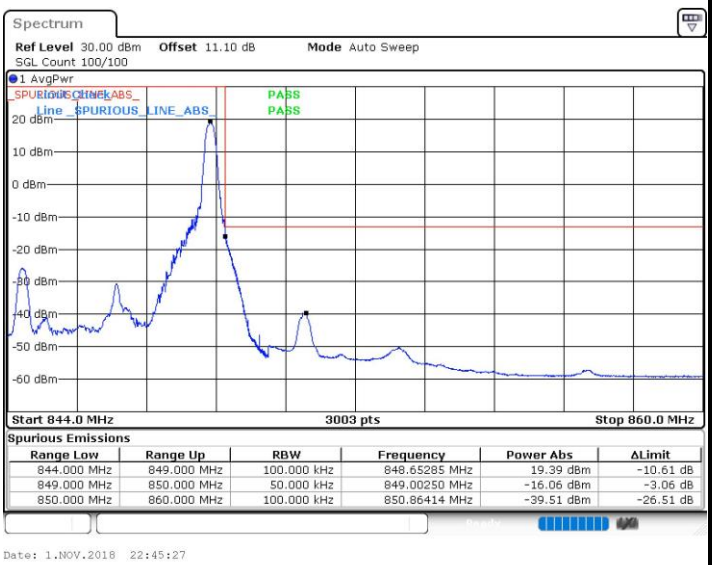
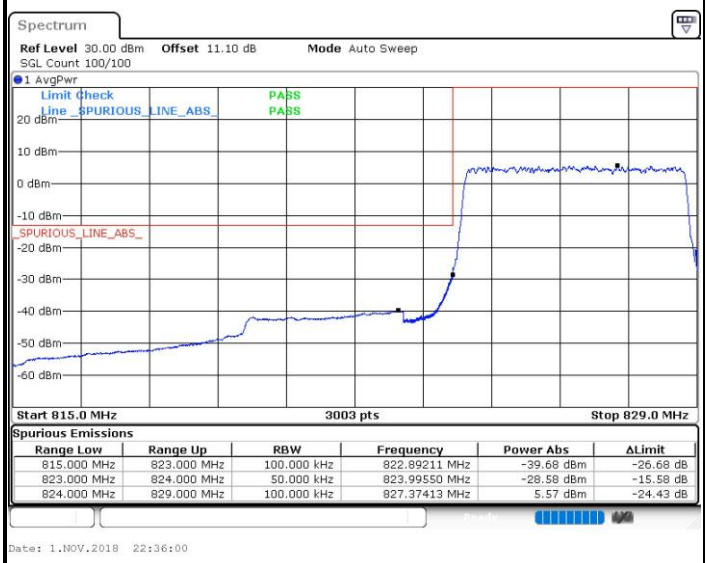
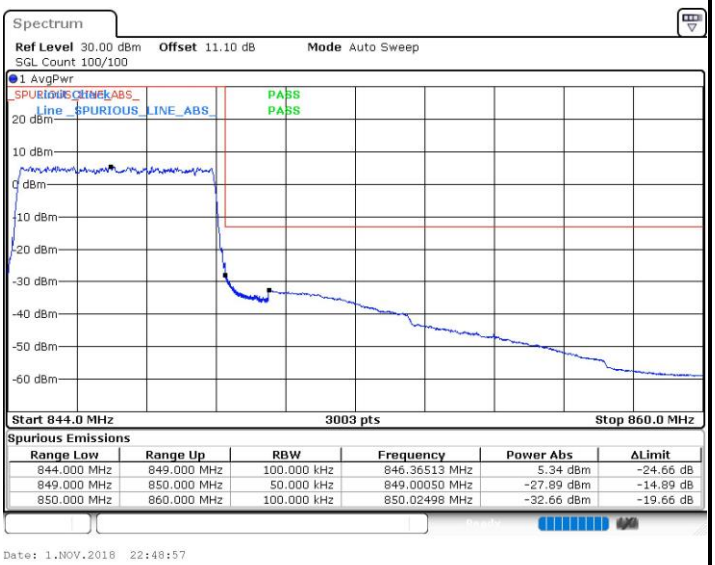
### Highest Band Edge / Full RB




Date: 1.NOV.2018 22:27:48

| LTE Band 5 / 5MHz / QPSK | |
|---|---|
| **Lowest Band Edge / 1 RB** | **Highest Band Edge / 1 RB** |
|  |  |
| **Lowest Band Edge / Full RB** | **Highest Band Edge / Full RB** |
|  |  |