# FCC RF Test Report

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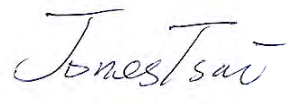
|---|---|
| **APPLICANT** | **: Sonim Technologies, Inc.** |
| **EQUIPMENT** | **: LTE Smartphone** |
| **BRAND NAME** | **: Sonim** |
| **MODEL NAME** | **: XP7700** |
| **MARKETING NAME** | **: XP7** |
| **FCC ID** | **: WYPL22V012AA** |
| **STANDARD** | **: FCC 47 CFR Part 2, 90(R)** |
| **CLASSIFICATION** | **: PCS Licensed Transmitter Held to Ear (PCE)** |

**The product was received on Jul. 13, 2015 and completely tested on Aug. 04, 2015. We, SPORTON INTERNATIONAL (SHENZHEN) INC., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI / TIA / EIA-603-C-2004 and shown compliance with the applicable technical standards.**

**The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL (SHENZHEN) INC., the test report shall not be reproduced except in full.**

**Reviewed by: Joseph Lin / Supervisor**



**Approved by: Jones Tsai / Manager**

***SPORTON INTERNATIONAL (SHENZHEN) INC.***

***1F & 2F, Building A, Morning Business Center, No. 4003 ShiGu Rd., Xili Town, Nanshan District, Shenzhen, Guangdong, P. R. China***

# TABLE OF CONTENTS

# REVISION HISTORY

| REPORT NO. | VERSION | DESCRIPTION | ISSUED DATE |
|---|---|---|---|
| FG571301C | Rev. 01 | Initial issue of report | Sep. 21, 2015 |
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# SUMMARY OF TEST RESULT

| Report Section | FCC Rule | Description | Limit | Result | Remark |
|---|---|---|---|---|---|
| 3.4 | §2.1046 | Conducted Output Power | Reporting only | PASS | - |
| 3.5 | §2.1049 | Occupied Bandwidth | Reporting only | PASS | - |
| 3.6 | §2.1053<br>§90.543 (e)(2)(3) | Conducted Band Edge Measurement | Refer standard | PASS | - |
| 3.7 | §2.1051<br>§90.210(n) | Emission Mask | Mask B | PASS | |
| 3.8 | §2.1053<br>§90.543 (e)(3) | Conducted Spurious Emission | < $43+10\log_{10}$(P[Watts]) | PASS | |
| 3.9 | §2.1055<br>§90.539 (e) | Frequency Stability Temperature & Voltage | < ±1.25 ppm | PASS | |
| 4.4 | §2.1053<br>§90.543 (e)(3)<br>§90.543 (f) | Radiated Spurious Emission | < $43+10\log_{10}$(P[Watts]) | PASS | Under limit 16.11 dB at 1577.180 MHz |
| 4.5 | §90.542 (a)(7) | Effective Radiated Power | ERP < 3Watt | PASS | - |

# 1 General Description

## 1.1 Applicant

**Sonim Technologies, Inc.**
1825 S. Grant St., Suite 200., San Mateo, CA, 94402

## 1.2 Manufacturer

**Sonim Technologies (Shenzhen) Limited**
2nd Floor, No. 2 Building Phase B, Daqian Industrial park, Longchang Road, 67 District, Baoan, Shenzhen, P. R. China

## 1.3 Feature of Equipment Under Test

| Product Feature | |
|---|---|
| **Equipment** | LTE Smartphone |
| **Brand Name** | Sonim |
| **Model Name** | XP7700 |
| **Marketing Name** | XP7 |
| **FCC ID** | WYPL22V012AA |
| **Tx Frequency** | LTE Band 14: 790.5 MHz ~ 795.5 MHz |
| **Rx Frequency** | LTE Band 14: 760.5 MHz ~ 765.5 MHz |
| **Bandwidth** | 5MHz / 10MHz |
| **Maximum Output Power to Antenna** | LTE Band 14: 22.73dBm |
| **Type of Modulation** | QPSK / 16QAM / 64QAM(Downlink only) |
| **MEID Code** | Conducted: 99000516020337<br>Radiation: 99000516020332<br>ERP: NA |
| **Type Number** | L22V012AA |
| **HW Version** | A |
| **SW Version** | 7A.0.0-00-4.4.4-15.01.07 |
| **EUT Stage** | Identical Prototype |

**Remark:**

1.The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

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

## 1.4 Emission Designator

| LTE Band 14 | QPSK | | | 16QAM | | |
|---|---|---|---|---|---|---|
| BW(MHz) | Emission Designator (99%OBW) | Frequency Tolerance (ppm) | Maximum ERP(W) | Emission Designator (99%OBW) | Frequency Tolerance (ppm) | Maximum ERP(W) |
| **5** | 4M52G7D | - | 0.0935 | 4M51W7D | - | 0.0771 |
| **10** | 9M11G7D | 0.0038 | 0.0571 | 9M03W7D | - | 0.0420 |

## 1.5 Testing Site

| | |
|---|---|
| **Test Site** | SPORTON INTERNATIONAL (SHENZHEN) INC. |
| **Test Site Location** | 1F & 2F,Building A, Morning Business Center, No. 4003 ShiGu Rd., Xili Town, Nanshan District, Shenzhen, Guangdong, P. R. China<br>TEL: +86-755-8637-9589<br>FAX: +86-755-8637-9595 |
| **Test Site No.** | **Sporton Site No.** |
| | TH01-SZ |

| | | |
|---|---|---|
| **Test Site** | SPORTON INTERNATIONAL (SHENZHEN) INC. | |
| **Test Site Location** | No. 3 Building, the third floor of south, Shahe River west, Fengzeyuan warehouse, Nanshan District, Shenzhen, Guangdong, P. R. China<br>TEL: +86-755- 3320-2398 | |
| **Test Site No.** | **Sporton Site No.** | **FCC Registration No.** |
| | 03CH01-SZ | 831040 |

**Note:** The test site complies with ANSI C63.4 2009 requirement.

## 1.6 Applied Standards

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

- 47 CFR Part 2, Part 90(R)
- ANSI / TIA / EIA-603-C-2004
- FCC KDB 971168 Measurement Guidance of License Digital Systems v02r02

**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

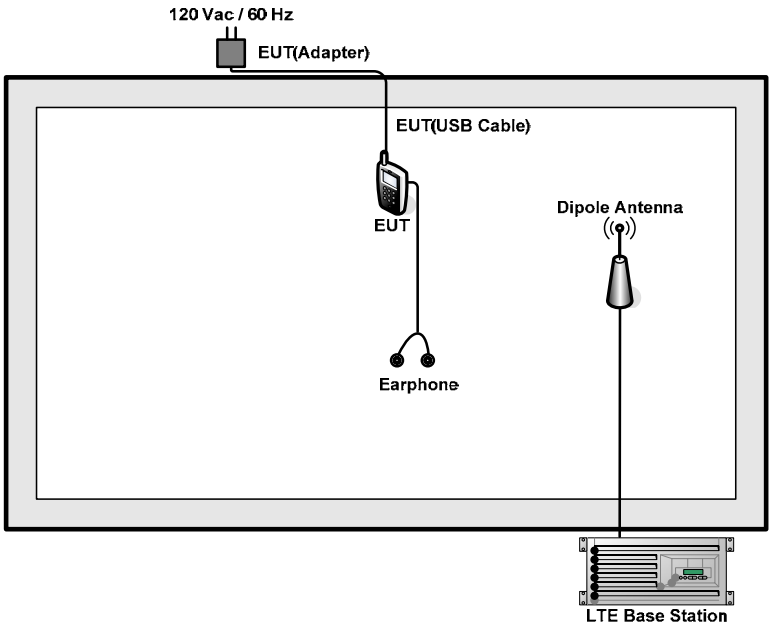
## 2.1 Test Mode

During all testing, EUT is in link mode with base station emulator at maximum power level. The spurious emission measurements were carried out in semi-anechoic chamber with 3-meter test range.

Frequency range investigated for radiated emission: 30MHz to 10th harmonic.

| Conducted Test Cases | Band | Bandwidth (MHz) | | | | | | Modulation | | RB # | | | Test Channel | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1.4 | 3 | 5 | 10 | 15 | 20 | QPSK | 16QAM | 1 | Half | Full | L | M | H |
| Max. Output Power | 14 | - | - | V | - | - | - | V | V | V | V | V | V | V | V |
| | 14 | - | - | | V | - | - | V | V | V | V | V | | V | |
| 26dB and 99% Bandwidth | 14 | - | - | V | | - | - | V | V | | | V | V | V | V |
| | 14 | - | - | | V | - | - | V | V | | | V | | V | |
| Conducted Band Edge | 14 | - | - | V | | - | - | V | V | V | | V | V | | V |
| | 14 | - | - | | V | - | - | V | V | V | | V | | V | |
| Emission Mask | 14 | - | - | V | | - | - | V | V | V | | V | V | V | V |
| | 14 | - | - | | V | - | - | V | V | V | | V | | V | |
| Conducted Spurious Emission | 14 | - | - | V | | - | - | V | V | V | | | V | V | V |
| | 14 | - | - | | V | - | - | V | V | V | | | | V | |
| Frequency Stability | 14 | - | - | | V | - | - | V | V | | | V | | V | |
| E.R.P | 14 | - | - | V | | - | - | V | V | V | | | V | V | V |
| | 14 | - | - | | V | - | - | V | V | V | | | | V | |
| Radiated Spurious Emission | 14 | - | - | V | V | - | - | | | V | | | | V | |
| Note | 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. | | | | | | | | | | | | | | |

## 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. | Power Supply | GW INSTEK | GPD-2303S | N/A | N/A | Unshielded, 1.8 m |
| 2. | LTE Base Station | Anritsu | MT8820C | N/A | N/A | Unshielded, 1.8 m |
| 3. | Earphone | Lenovo | SH100 | N/A | N/A | N/A |

## 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 4.5 dB and 10dB attenuator.

Example :

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

= 4.5 + 10 = 14.5 (dB)

# 3 Conducted Test Items

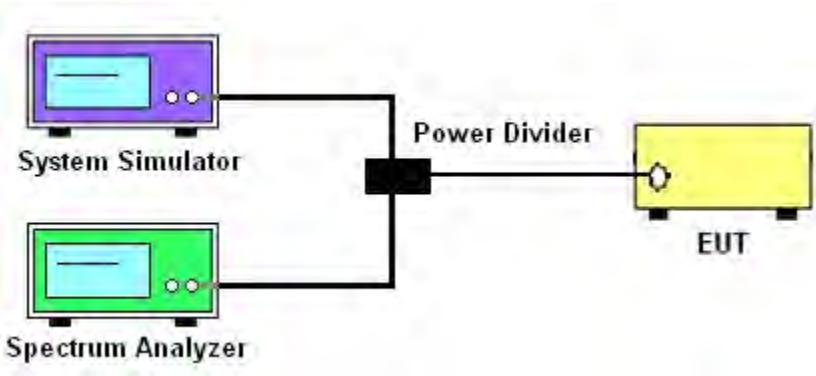
## 3.1 Measuring Instruments

See list of measuring instruments of this test report.

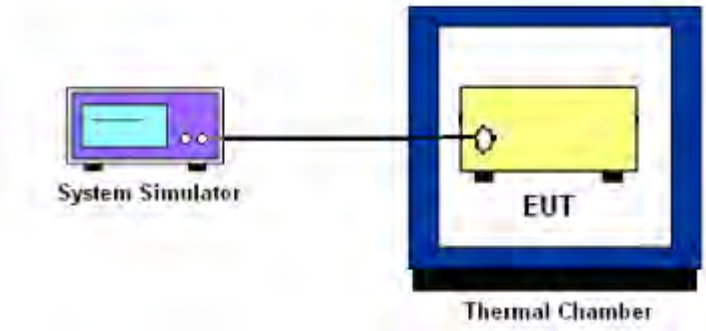
## 3.2 Test Setup

### 3.2.1 Conducted Output Power


### 3.2.2 Occupied / 26dB Bandwidth ,Band-Edge and Conducted Spurious Emission




### 3.2.3 Frequency Stability




## 3.3 Test Result of Conducted Test

Please refer to Appendix A.

## 3.4 Conducted Output Power Measurement

### 3.4.1 Description of the Conducted Output Power Measurement

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

### 3.4.2 Test Procedures

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

# 3.5 Occupied Bandwidth

## 3.5.1 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.

## 3.5.2 Test Procedures

1. The testing follows FCC KDB 971168 v02r02 Section 4.2.
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.

# 3.6 Conducted Band Edge Measurement

## 3.6.1 Description of Conducted Band Edge Measurement

For operations in the 758-768 MHz and the 788-798 MHz bands

(1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations.

(2) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.

(3) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB.

## 3.6.2 Test Procedures

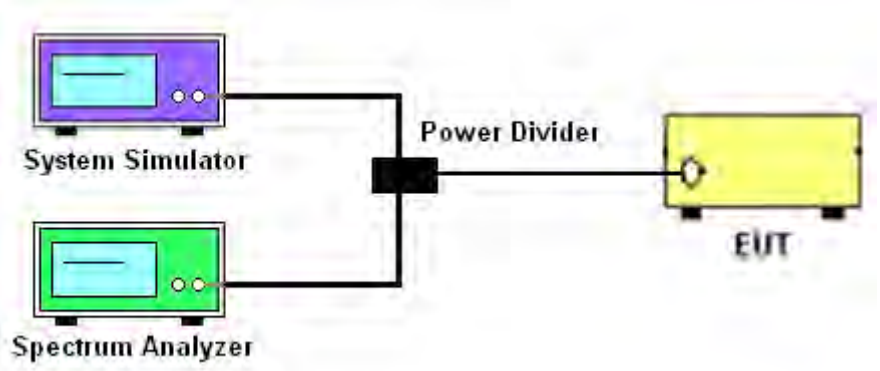
1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. Set spectrum analyzer with RMS detector.
3. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
4. The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
   = P(W)- [43 + 10log(P)] (dB)
   = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)
   = -13dBm.

## 3.7 Emission Mask

### 3.7.1 Test Procedures

1. The testing follows FCC KDB 971168 v02r02 Section 6.0.
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The power of the modulated signal was measured on a spectrum analyzer using an RMS and 10 second sweep time in order to maximize the level.
4. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

### 3.7.2 Test Setup



# 3.8 Conducted Spurious Emission Measurement

## 3.8.1 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.

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

## 3.8.2 Test Procedures

1. The EUT was connected to spectrum analyzer and base station via 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, for under 1GHz RBW = 100kHz, VBW = 300kHz and for above 1GHz RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
6. Set spectrum analyzer with RMS detector.
7. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
8. The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
   = P(W)- [43 + 10log(P)] (dB)
   = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)
   = -13dBm.

## 3.9 Frequency Stability Measurement

### 3.9.1 Description of Frequency Stability Measurement

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 ±1.25 ppm of the center frequency.

### 3.9.2 Test Procedures for Temperature Variation

1. The EUT was set up in the thermal chamber and connected with the base station.
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.

### 3.9.3 Test Procedures for Voltage Variation

1. The EUT was placed in a temperature chamber at 25±5° C and connected with the base station.
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.

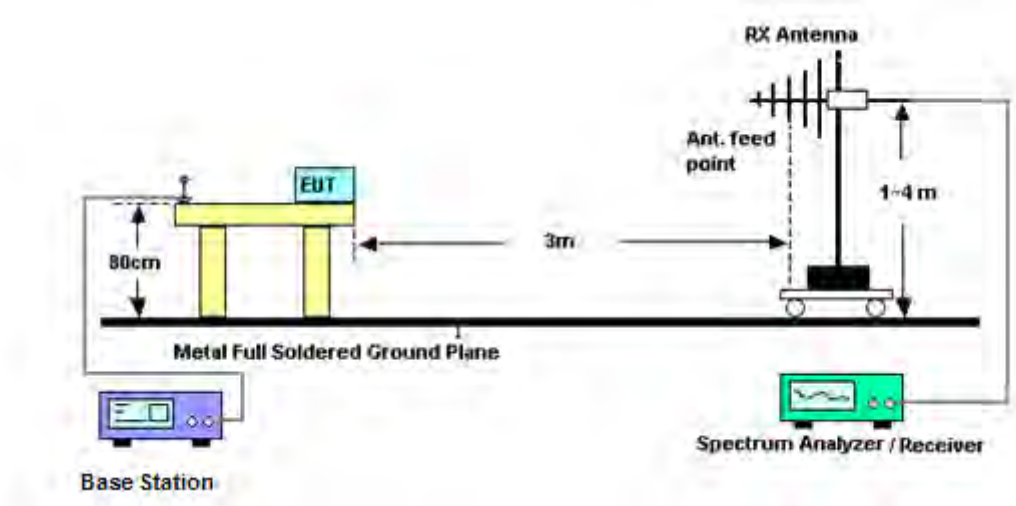
# 4 Radiated Test Items

## 4.1 Measuring Instruments

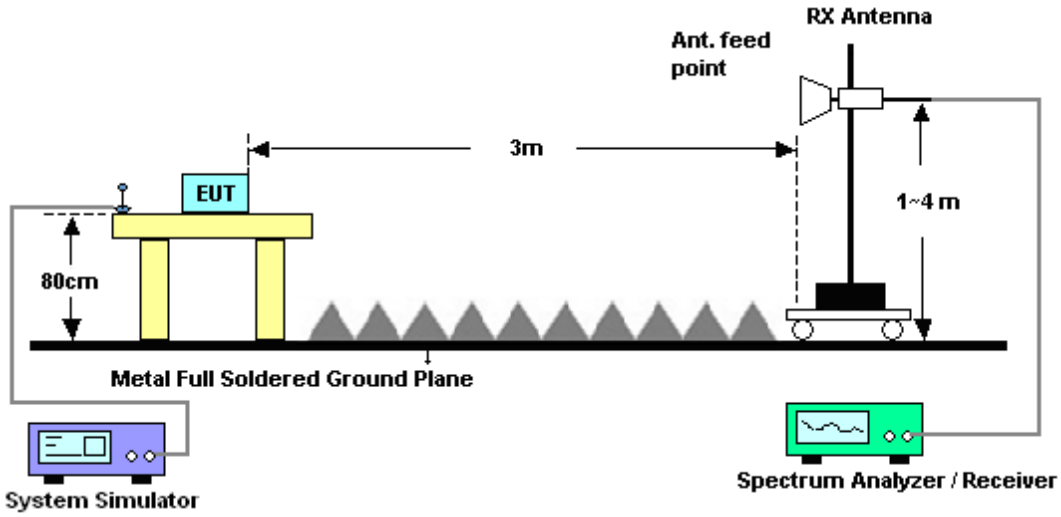
See list of measuring instruments of this test report.

## 4.2 Test Setup

### 4.2.1 For radiated test from 30MHz to 1GHz




### 4.2.2 For radiated test above 1GHz




## 4.3 Test Result of Radiated Test

Please refer to Appendix B.

## 4.4 Radiated Spurious Emission Measurement

### 4.4.1 Description of Radiated Spurious Emission

The radiated spurious emission was measured by substitution method according to ANSI / TIA / EIA-603-C-2004.

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 operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559–1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

### 4.4.2 Test Procedures

1. The EUT was placed on a rotatable wooden table with 0.8 meter 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, Sweep = 500ms, 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)
    = P(W)- [43 + 10log(P)] (dB)
    = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)
    = -13dBm.
11. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
    ERP (dBm) = EIRP – 2.15

# 4.5 Effective Radiated Power

## 4.5.1 Description of the ERP Measurement

Effective radiated power output measurements by substitution method according to ANSI / TIA / EIA-603-C-2004, and the spectrum analyzer configuration follows KDB 971168 D01 Power Meas. License Digital Systems v02r02. The ERP of mobile transmitters must not exceed 3 Watts for Part90R.

## 4.5.2 Test Procedures

12. The EUT was placed on a non-conductive rotating platform 0.8 meters high in a semi-anechoic chamber. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and a spectrum analyzer with RMS detector per section 5. of KDB 971168 D01.
13. During the measurement, the system simulator parameters were set to force the EUT transmitting at maximum output power. The maximum emission was recorded from analyzer power level (LVL) from the 360 degrees rotation of the turntable and the test antenna raised and lowered over a range from 1 to 4 meters in both horizontally and vertically polarized orientations.
14. Effective Isotropic Radiated Power (EIRP) was measured by substitution method according to TIA/EIA-603-C. The EUT was replaced by the substitution antenna at same location, and then a known power from S.G. was applied into the dipole antenna through a Tx cable, and then recorded the maximum Analyzer reading through raised and lowered the test antenna. The correction factor (in dB) = S.G. - Tx Cable loss + Substitution antenna gain - Analyzer reading. Then the EUT's EIRP was calculated with the correction factor, EIRP = LVL + Correction factor and ERP = EIRP - 2.15. Take the record of the output power at substitution antenna.

| | LTE Average | | | | | |
|---|---|---|---|---|---|---|
| LTE BW | 1.4M | 3M | 5M | 10M | 15M | 20M |
| Span | 3MHz | 6MHz | 10MHz | 20MHz | 30MHz | 40MHz |
| RBW | 30kHz | 100kHz | 100kHz | 300kHz | 300kHz | 300kHz |
| VBW | 100kHz | 300kHz | 300kHz | 1MHz | 1MHz | 1MHz |
| Detector | RMS | RMS | RMS | RMS | RMS | RMS |
| Trace | Average | Average | Average | Average | Average | Average |
| Average Type | Power | Power | Power | Power | Power | Power |
| Sweep Count | 100 | 100 | 100 | 100 | 100 | 100 |

# 5 List of Measuring Equipment

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Test Date | Due Date | Remark |
|---|---|---|---|---|---|---|---|---|
| Spectrum Analyzer | R&S | FSV40 | 101078 | 9kHz~40GHz | May 05, 2015 | Aug. 03, 2015~ Aug. 04, 2015 | May 04, 2016 | Conducted (TH01-SZ) |
| Thermal Chamber | Ten Billion Hongzhangroup | LP-150U | H2014081803 | -40~+150°C | Sep. 16, 2014 | Aug. 03, 2015~ Aug. 04, 2015 | Sep. 15, 2015 | Conducted (TH01-SZ) |
| EMI Test Receiver&SA | Agilent Technologies | N9038A | MY52260185 | 20Hz~26.5GHz | May 26, 2015 | Jul. 25, 2015 | May 25, 2016 | Radiation (03CH01-SZ) |
| Spectrum Analyzer | R&S | FSV40 | 101041 | 10kHz~40GHz;Max 30dBm | Sep. 25, 2014 | Jul. 25, 2015 | Sep. 24, 2015 | Radiation (03CH01-SZ) |
| Bilog Antenna | TeseQ | CBL6112D | 23188 | 30MHz~2GHz | Nov. 07, 2014 | Jul. 25, 2015 | Nov. 06, 2015 | Radiation (03CH01-SZ) |
| Double Ridge Horn Antenna | ETS-Lindgren | 3117 | 00119436 | 1GHz~18GHz | Oct. 15, 2014 | Jul. 25, 2015 | Oct. 14, 2015 | Radiation (03CH01-SZ) |
| SHF-EHF Horn | com-power | AH-840 | 101071 | 18GHz~40GHz | Sep. 04, 2014 | Jul. 25, 2015 | Sep. 03, 2015 | Radiation (03CH01-SZ) |
| Amplifier | ADVANTEST | BB525C | E9007003 | 9kHz~3000MHz / 30 dB | Jan. 28, 2015 | Jul. 25, 2015 | Jan. 27, 2016 | Radiation (03CH01-SZ) |
| Amplifier | Yiai | AV3860B | 04030 | 2GHz~26.5GHz | May 05, 2015 | Jul. 25, 2015 | May 04, 2016 | Radiation (03CH01-SZ) |
| Amplifier | Agilent Technologies | 83017A | MY39501302 | 500MHz~26.5GHz | Jan. 28, 2015 | Jul. 25, 2015 | Jan. 27, 2016 | Radiation (03CH01-SZ) |
| AC Power Source | Chroma | 61601 | 616010001985 | N/A | NCR | Jul. 25, 2015 | NCR | Radiation (03CH01-SZ) |
| Turn Table | EM | EM1000 | N/A | 0~360 degree | NCR | Jul. 25, 2015 | NCR | Radiation (03CH01-SZ) |
| Antenna Mast | EM | EM1000 | N/A | 1 m~4 m | NCR | Jul. 25, 2015 | NCR | Radiation (03CH01-SZ) |

# 6 Uncertainty of Evaluation

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

| | |
|---|---|
| **Measuring Uncertainty for a Levxel of Confidence of 95% (U = 2Uc(y))** | **3.9 dB** |

# Appendix A. Test Results of Conducted Test

## Conducted Output Power(Average power)

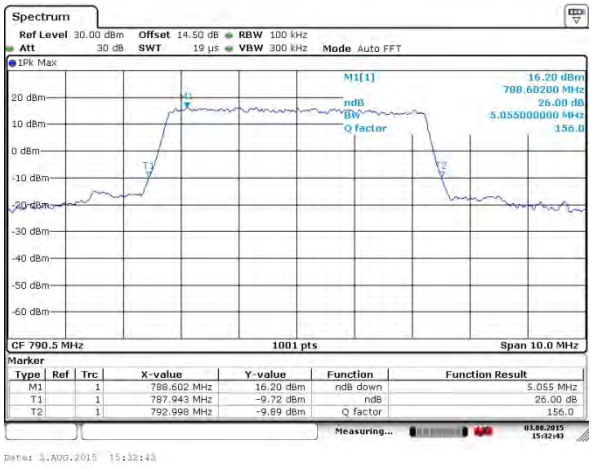
| LTE Band 14 Maximum Average Power [dBm] | | | | | | |
|---|---|---|---|---|---|---|
| BW [MHz] | RB Size | RB Offset | Mod | Lowest | Middle | Highest |
| 5 | 1 | 0 | QPSK | 22.55 | 22.50 | 22.61 |
| 5 | 1 | 12 | | 22.58 | 22.56 | 22.63 |
| 5 | 1 | 24 | | 22.60 | 22.63 | 22.64 |
| 5 | 12 | 0 | | 21.57 | 21.62 | 21.63 |
| 5 | 12 | 6 | | 21.59 | 21.63 | 21.67 |
| 5 | 12 | 11 | | 21.67 | 21.72 | 21.69 |
| 5 | 25 | 0 | | 21.63 | 21.63 | 21.65 |
| 5 | 1 | 0 | 16-QAM | 21.28 | 21.30 | 21.36 |
| 5 | 1 | 12 | | 21.30 | 21.42 | 21.13 |
| 5 | 1 | 24 | | 21.41 | 21.37 | 21.26 |
| 5 | 12 | 0 | | 20.52 | 20.68 | 20.59 |
| 5 | 12 | 6 | | 20.54 | 20.60 | 20.71 |
| 5 | 12 | 11 | | 20.57 | 20.59 | 20.66 |
| 5 | 25 | 0 | | 20.61 | 20.64 | 20.59 |
| 10 | 1 | 0 | QPSK | | 22.65 | |
| 10 | 1 | 24 | | | 22.66 | |
| 10 | 1 | 49 | | | 22.73 | |
| 10 | 25 | 0 | | | 21.64 | |
| 10 | 25 | 12 | | | 21.68 | |
| 10 | 25 | 24 | | | 21.72 | |
| 10 | 50 | 0 | | | 21.71 | |
| 10 | 1 | 0 | 16-QAM | | 21.21 | |
| 10 | 1 | 24 | | | 21.26 | |
| 10 | 1 | 49 | | | 21.35 | |
| 10 | 25 | 0 | | | 20.59 | |
| 10 | 25 | 12 | | | 20.64 | |
| 10 | 25 | 24 | | | 20.59 | |
| 10 | 50 | 0 | | | 20.68 | |

# 26dB Bandwidth

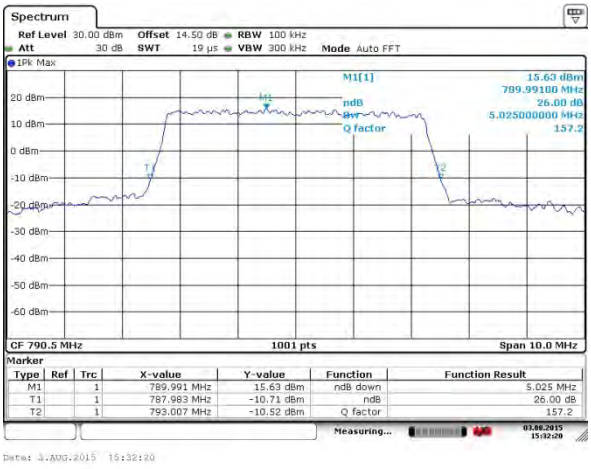
| Mode | LTE Band 14: 26dB BW(MHz) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BW | 1.4MHz | | 3MHz | | 5MHz | | 10MHz | | 15MHz | | 20MHz | |
| Mod. | QPSK | 16QAM | QPSK | 16QAM | QPSK | 16QAM | QPSK | 16QAM | QPSK | 16QAM | QPSK | 16QAM |
| Lowest CH | - | - | - | - | 5.06 | 5.03 | - | - | - | - | - | - |
| Middle CH | - | - | - | - | 5.07 | 5.06 | 10.01 | 9.99 | - | - | - | - |
| Highest CH | - | - | - | - | 5.09 | 5.03 | - | - | - | - | - | - |

## LTE Band 14

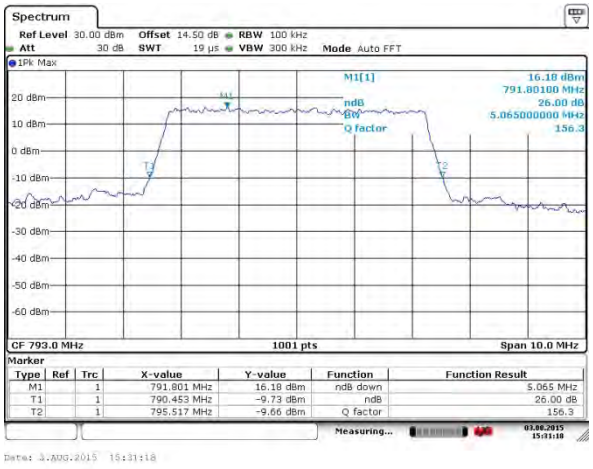
### Lowest Channel / 5MHz / QPSK



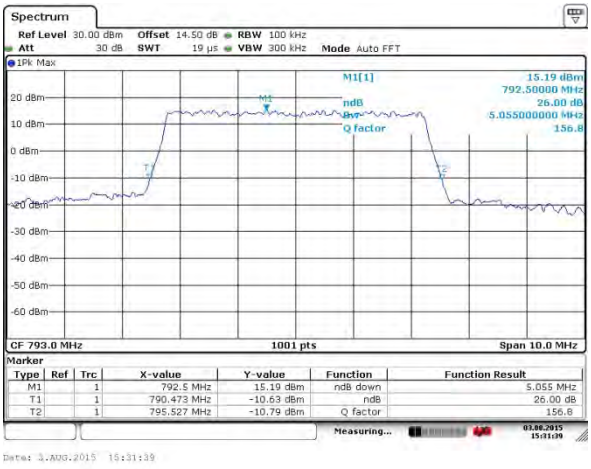

### Lowest Channel / 5MHz / 16QAM



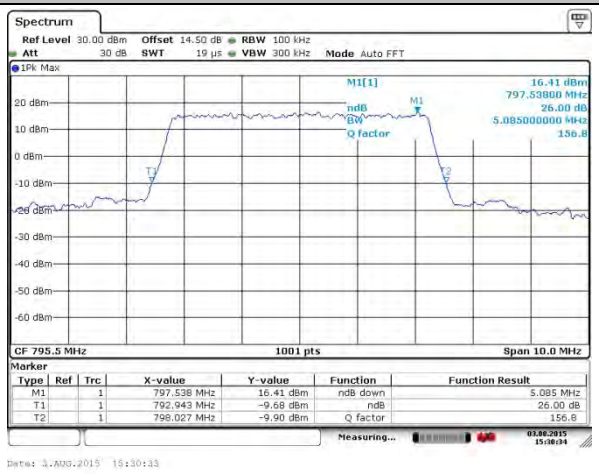

### Middle Channel / 5MHz / QPSK



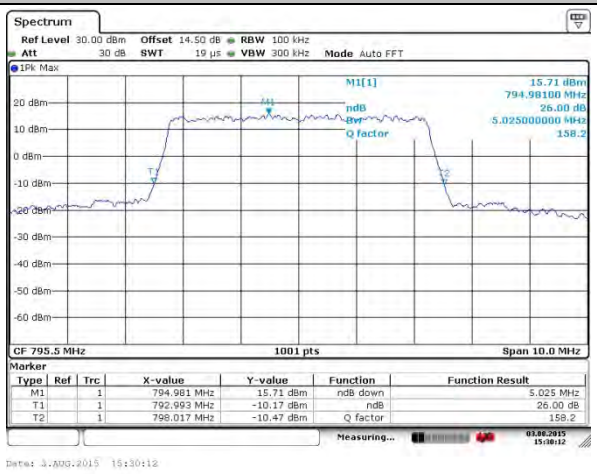

### Middle Channel / 5MHz / 16QAM

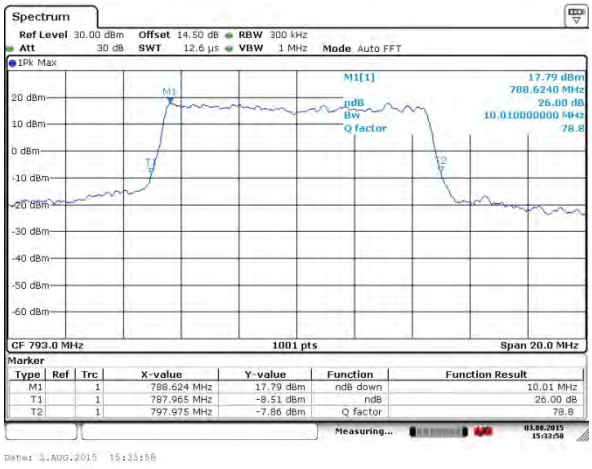
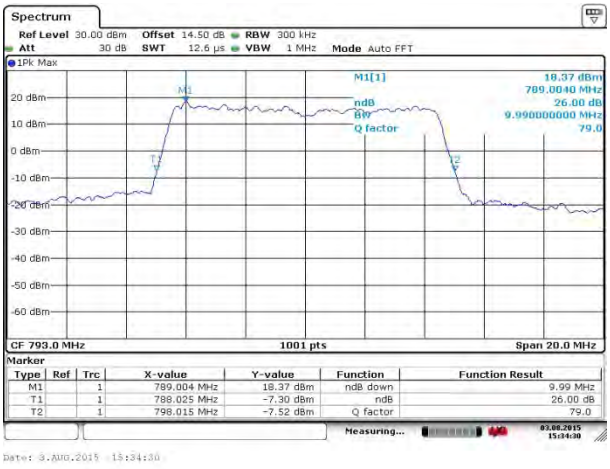



### Highest Channel / 5MHz / QPSK




### Highest Channel / 5MHz / 16QAM



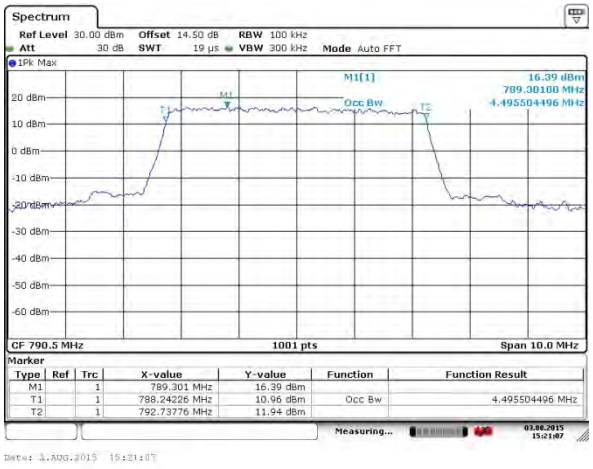
| LTE Band 14 | |
|---|---|
| **Middle Channel / 10MHz / QPSK** | **Middle Channel / 10MHz / 16QAM** |
|  |  |

# Occupied Bandwidth

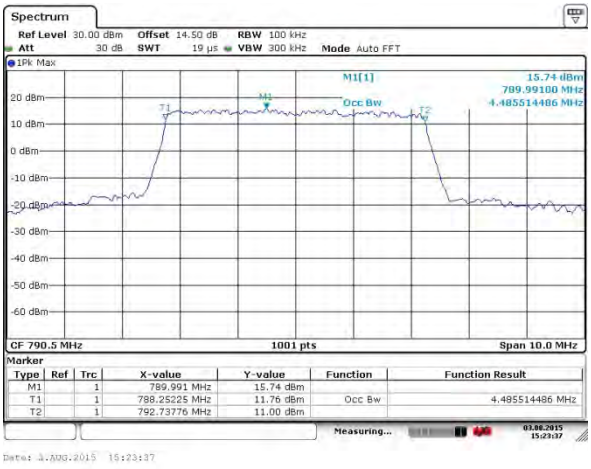
| Mode | LTE Band 14: 99%OBW(MHz) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BW | 1.4MHz | | 3MHz | | 5MHz | | 10MHz | | 15MHz | | 20MHz | |
| Mod. | QPSK | 16QAM | QPSK | 16QAM | QPSK | 16QAM | QPSK | 16QAM | QPSK | 16QAM | QPSK | 16QAM |
| Lowest CH | - | - | - | - | 4.50 | 4.49 | - | - | - | - | - | - |
| Middle CH | - | - | - | - | 4.52 | 4.51 | 9.11 | 9.03 | - | - | - | - |
| Highest CH | - | - | - | - | 4.51 | 4.50 | - | - | - | - | - | - |

## LTE Band 14

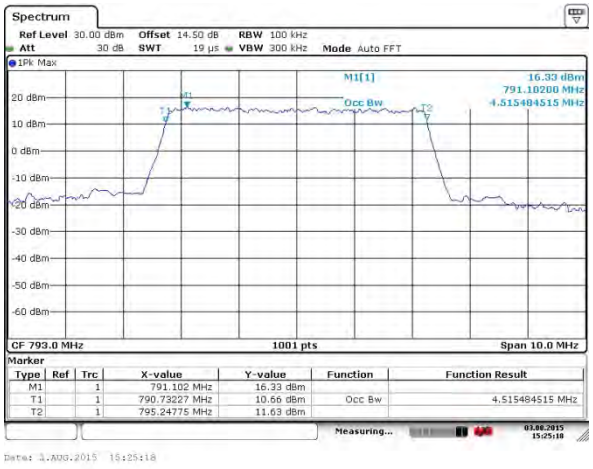
### Lowest Channel / 5MHz / QPSK



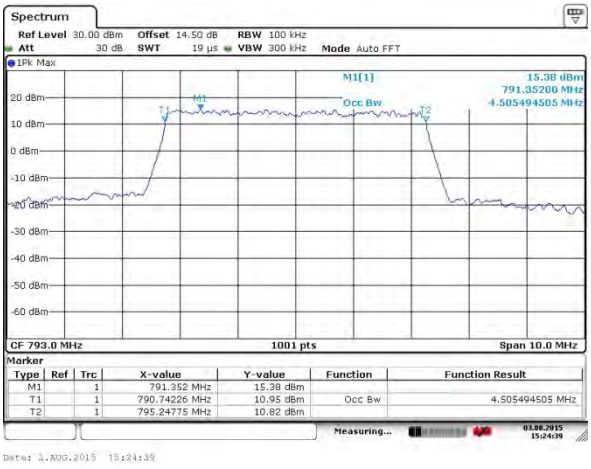

### Lowest Channel / 5MHz / 16QAM



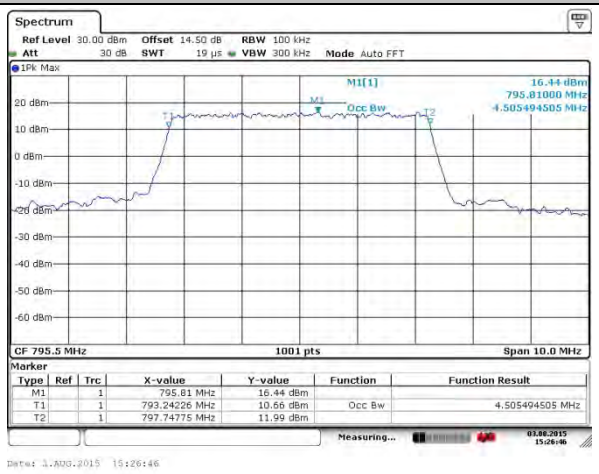

### Middle Channel / 5MHz / QPSK



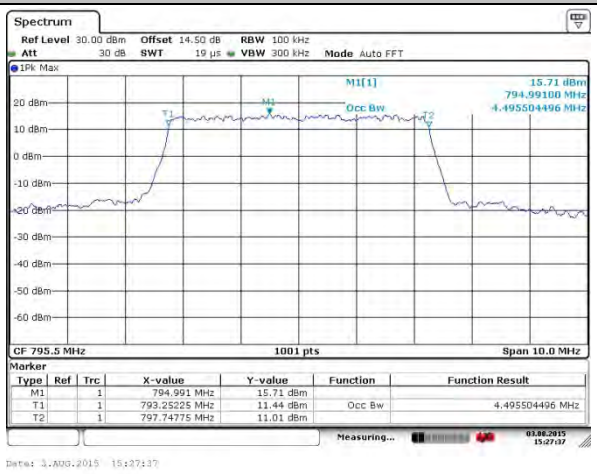

### Middle Channel / 5MHz / 16QAM

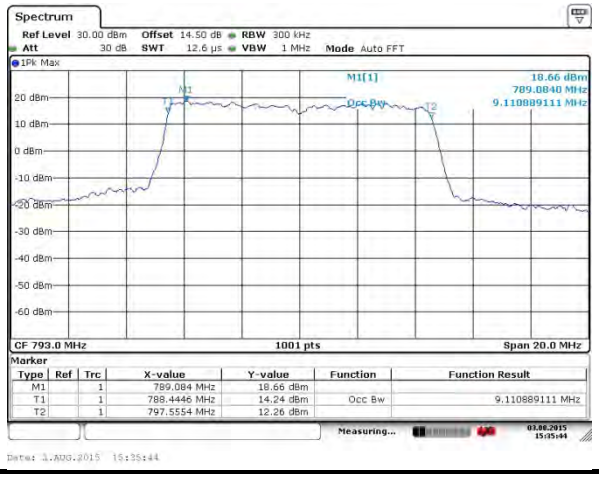
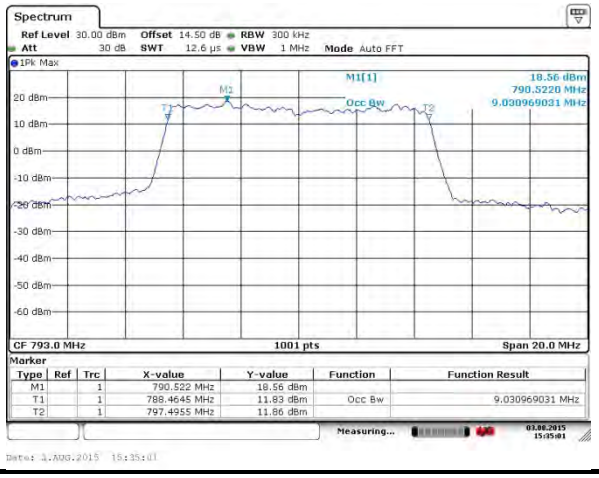



### Highest Channel / 5MHz / QPSK




### Highest Channel / 5MHz / 16QAM

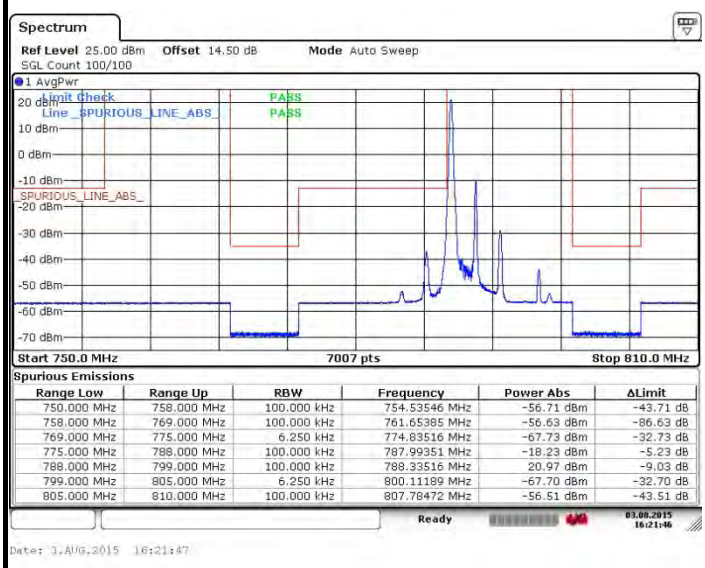


| LTE Band 14 | |
|---|---|
| **Middle Channel / 10MHz / QPSK** | **Middle Channel / 10MHz / 16QAM** |
|  |  |

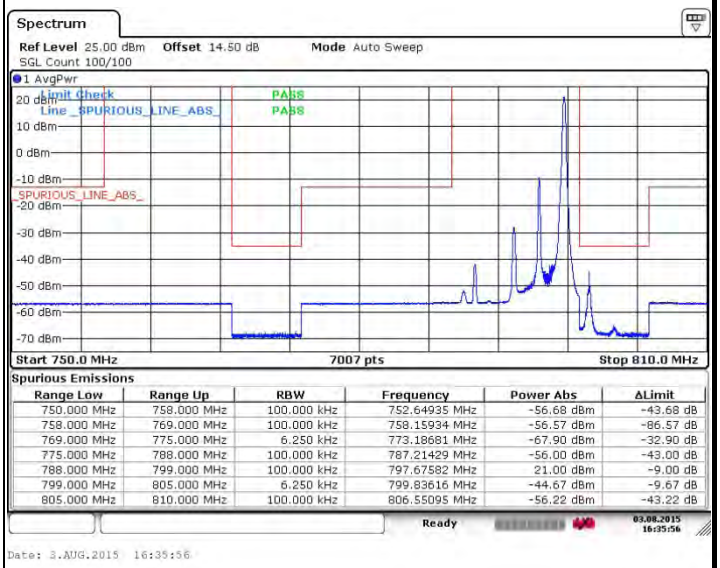
# Conducted Band Edge

## LTE Band 14/ 5MHz / QPSK

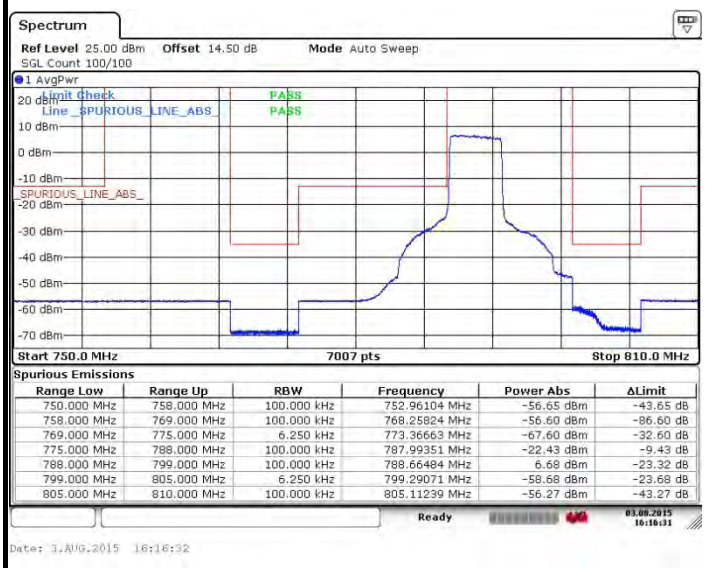
### Lowest Band Edge / 1 RB



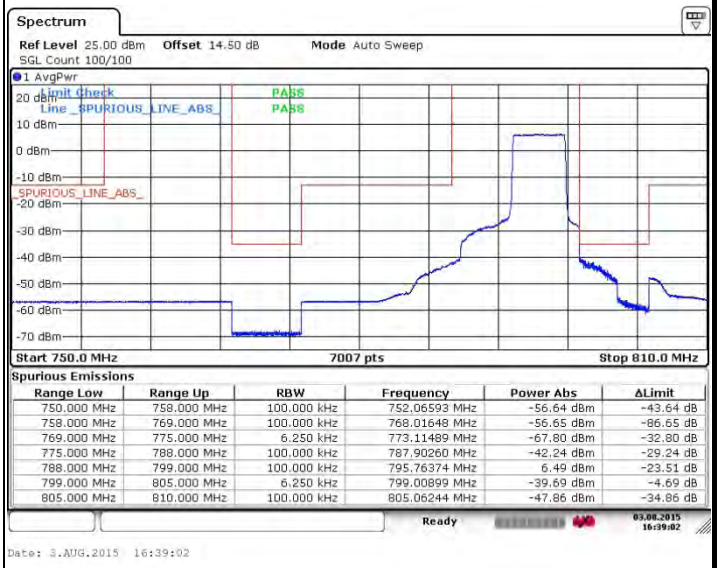

### Highest Band Edge / 1 RB




### Lowest Band Edge / Full RB

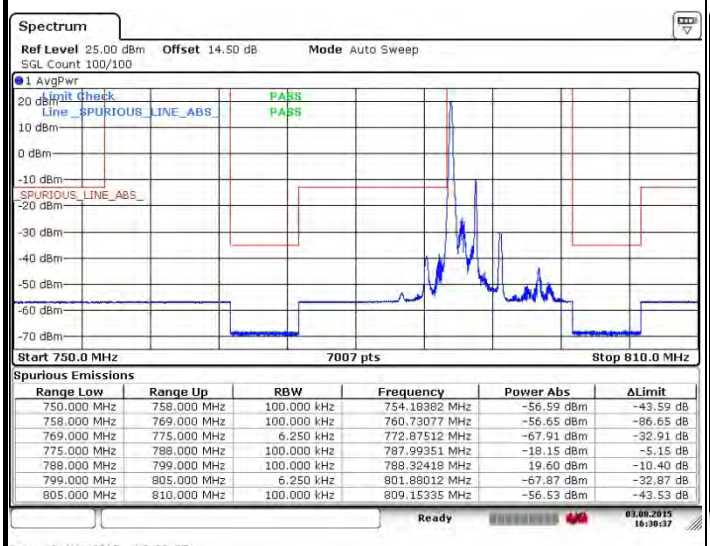



### Highest Band Edge / Full RB

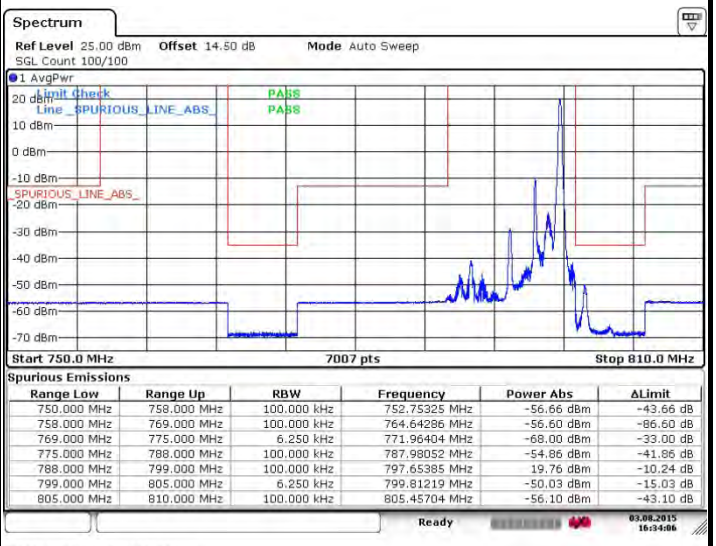


## LTE Band 14/ 5MHz / 16QAM

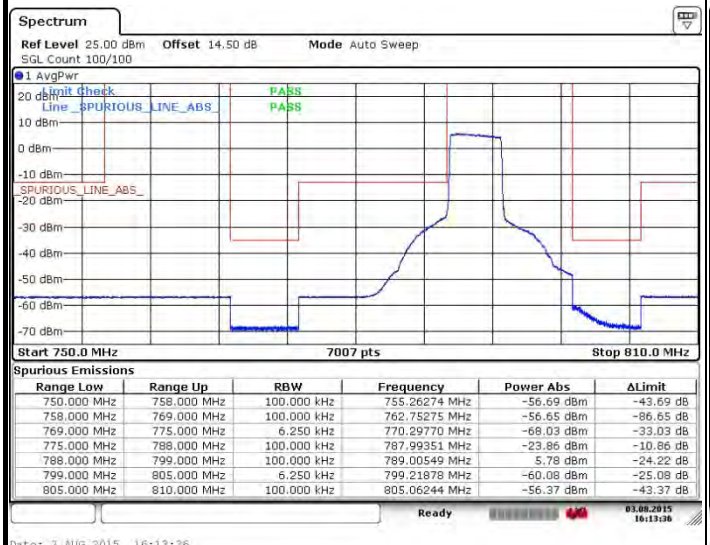
### Lowest Band Edge /1 RB



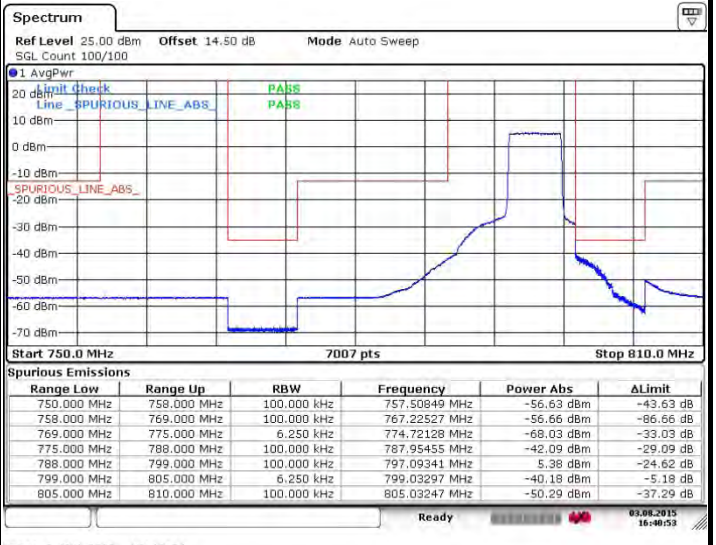

### Highest Band Edge / 1 RB




### Lowest Band Edge / Full RB

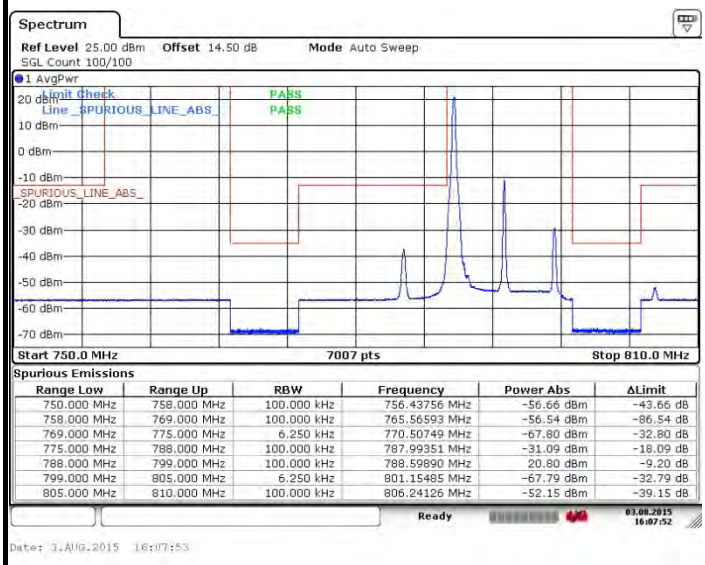



### Highest Band Edge / Full RB

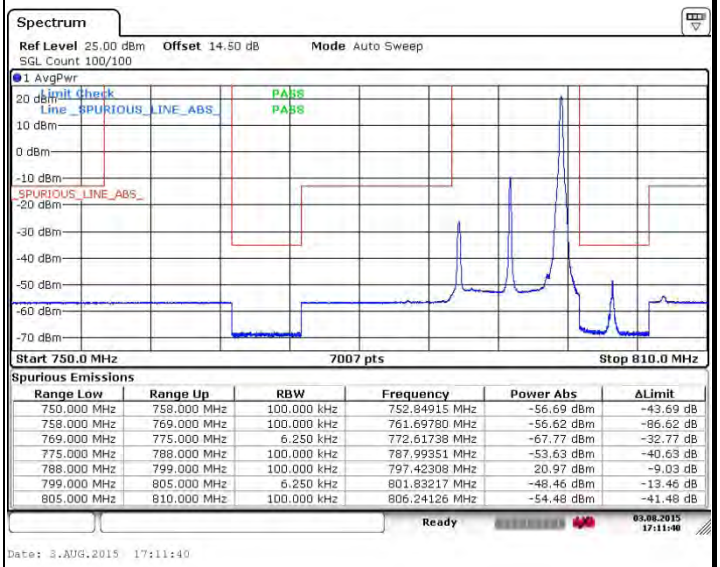


## LTE Band 14/ 10MHz / QPSK

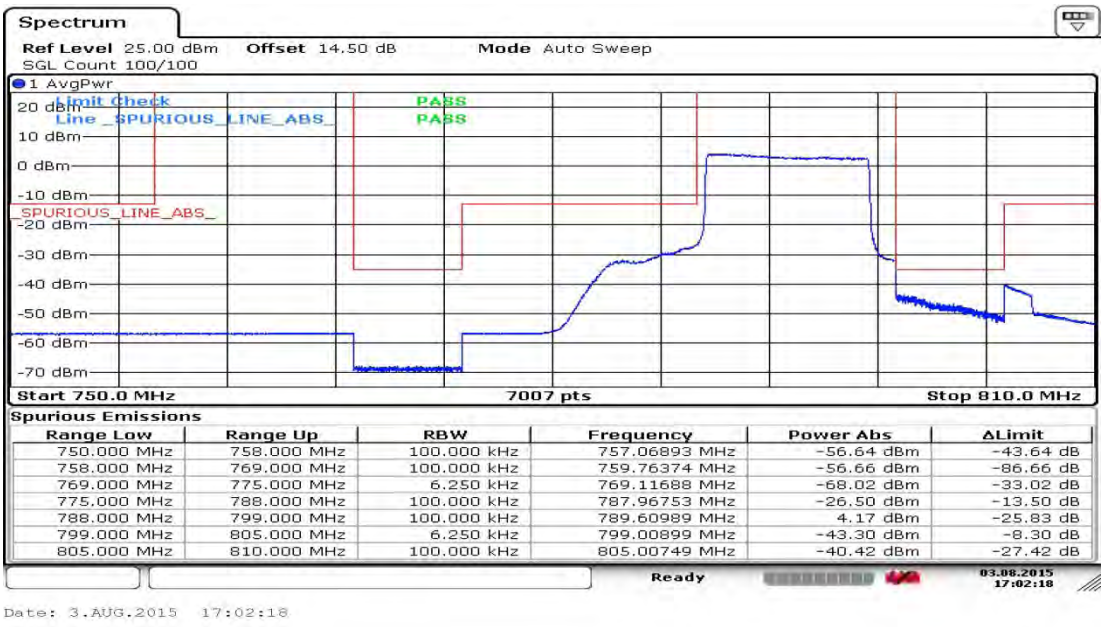
### Lowest Band Edge / 1 RB




### Highest Band Edge / 1 RB

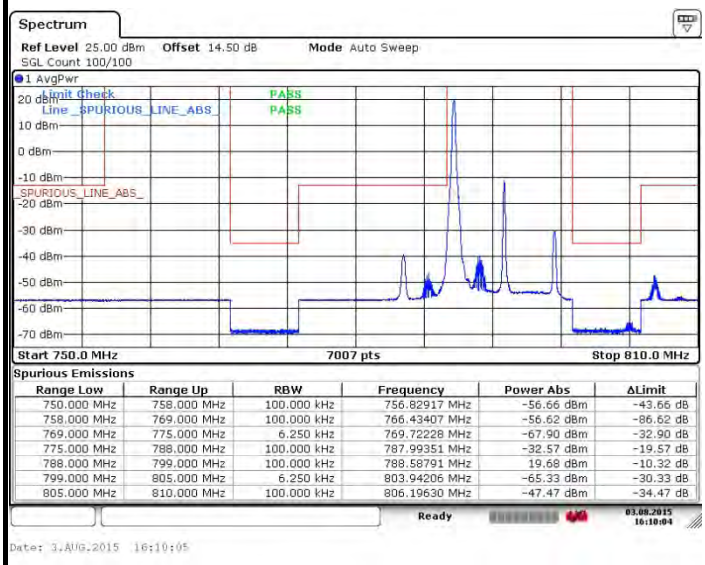



### Band Edge / Full RB

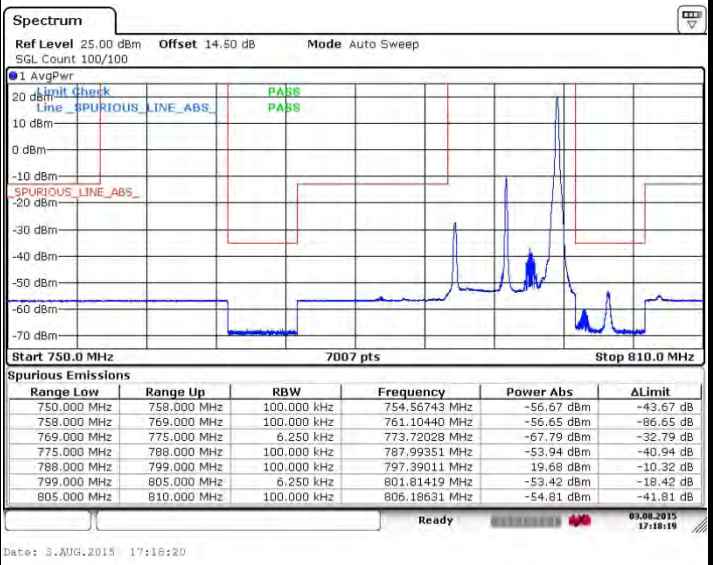


## LTE Band 14/ 10MHz / 16QAM

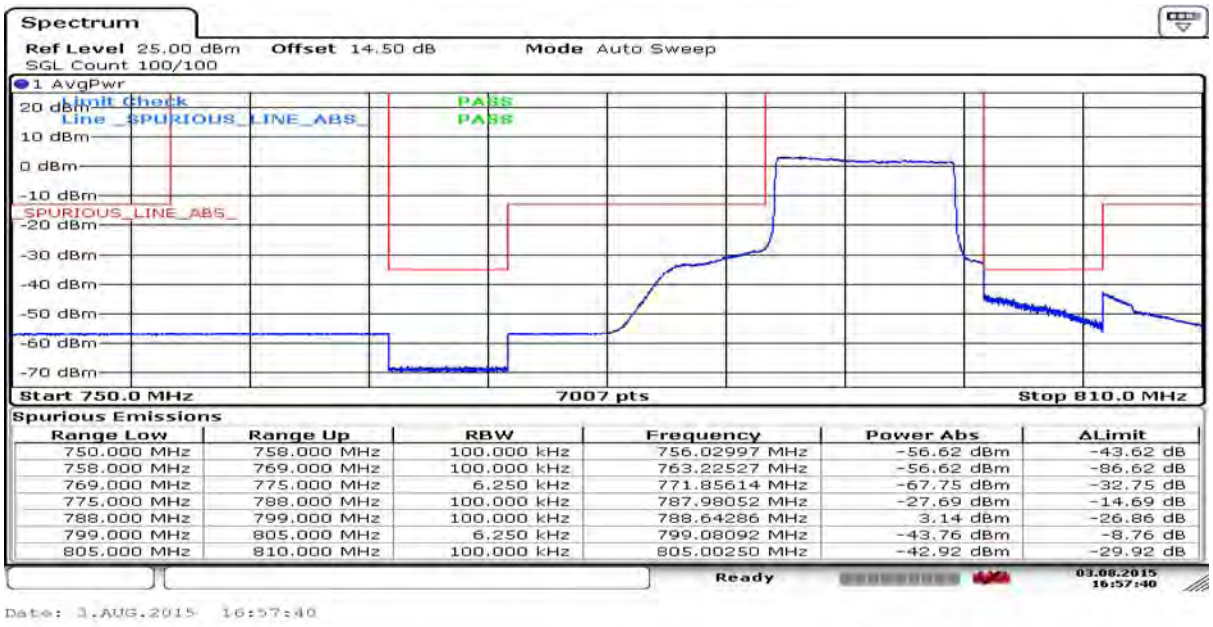
### Lowest Band Edge / 1 RB




### Highest Band Edge / 1 RB



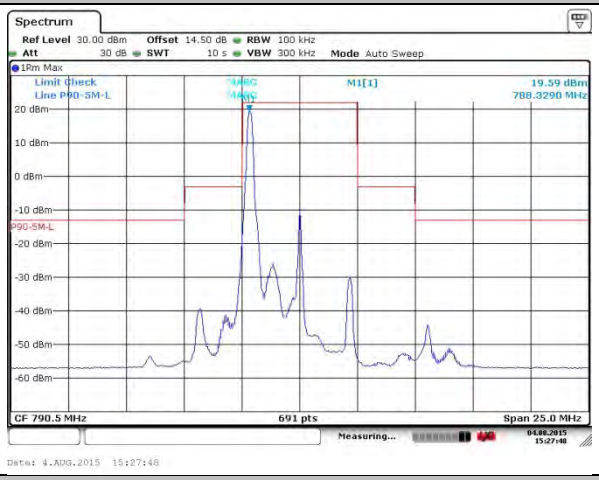

### Band Edge / Full RB



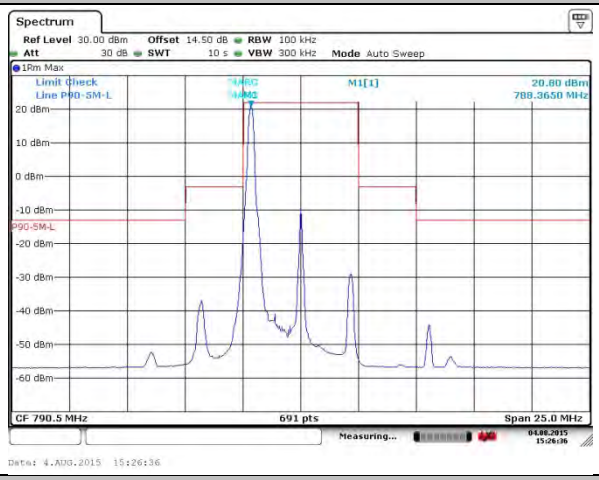
# Emission Mask

## LTE Band 14/ 5MHz / (1RB0)

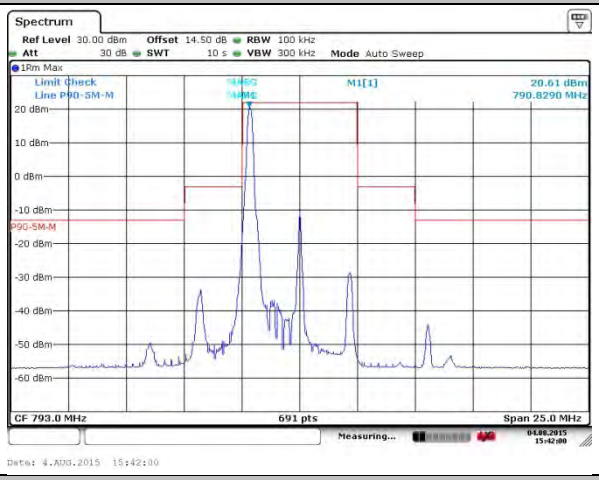
### Lowest Channel / 5MHz / QPSK



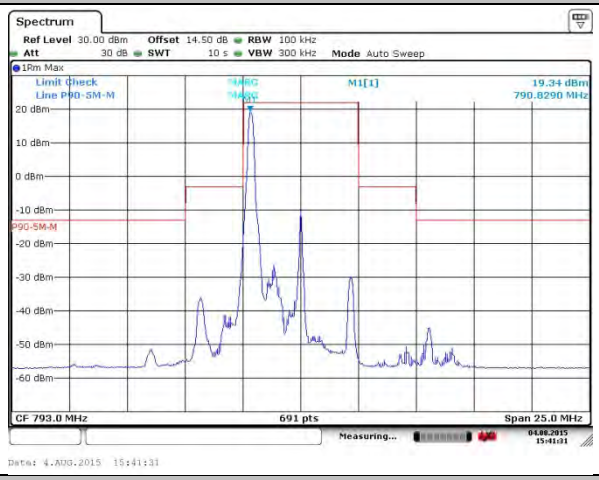

### Lowest Channel / 5MHz / 16QAM



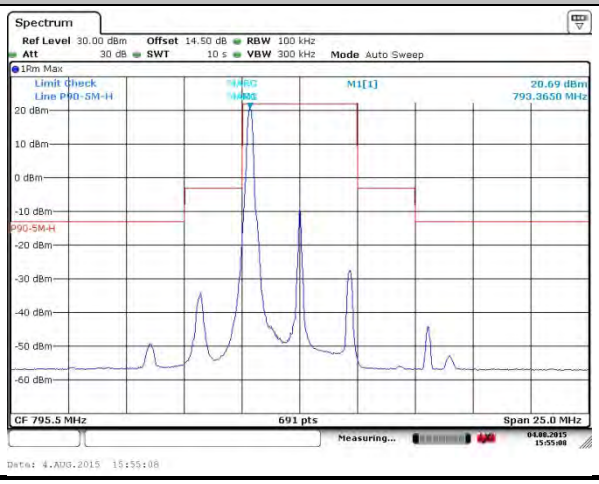

### Middle Channel / 5MHz / QPSK



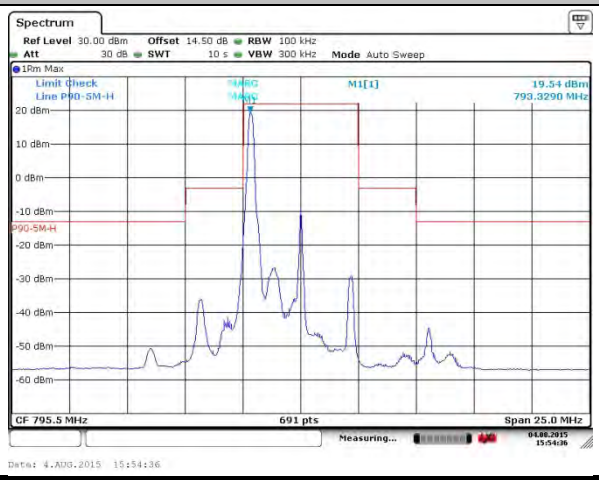

### Middle Channel / 5MHz / 16QAM

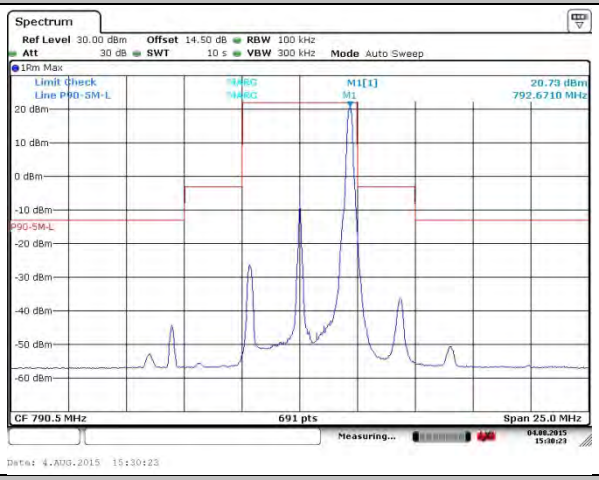
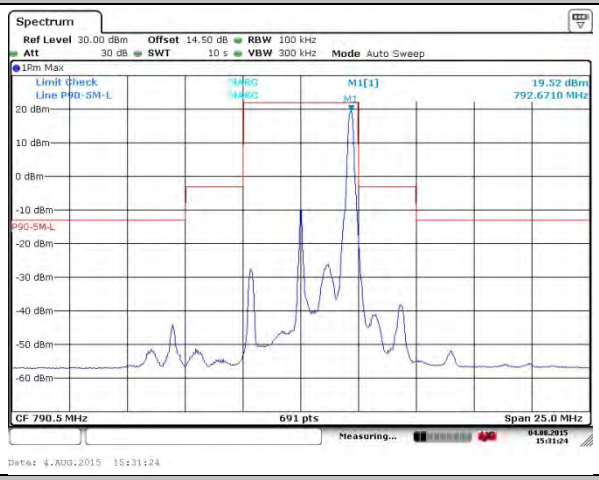
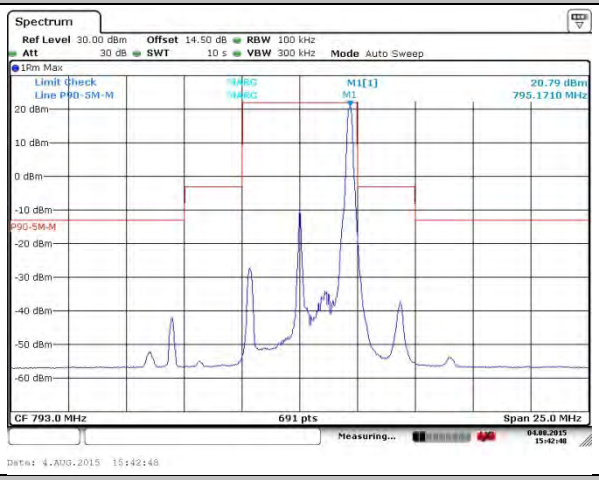
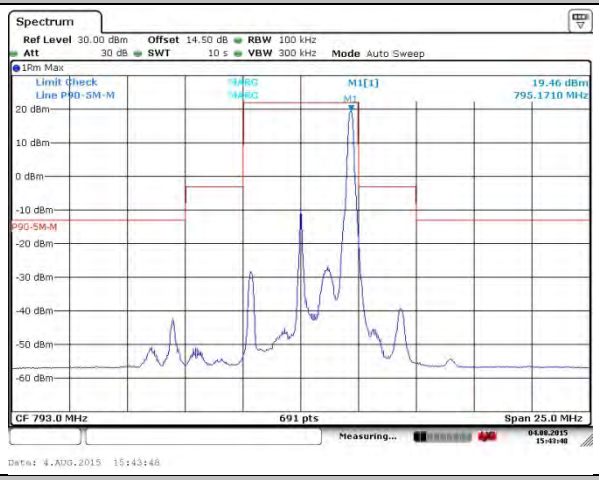
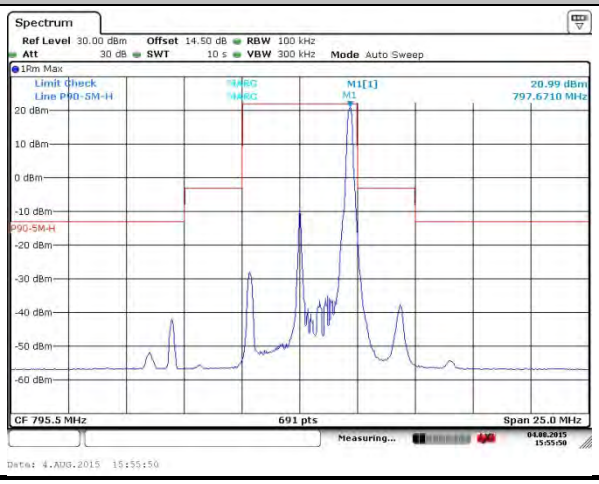
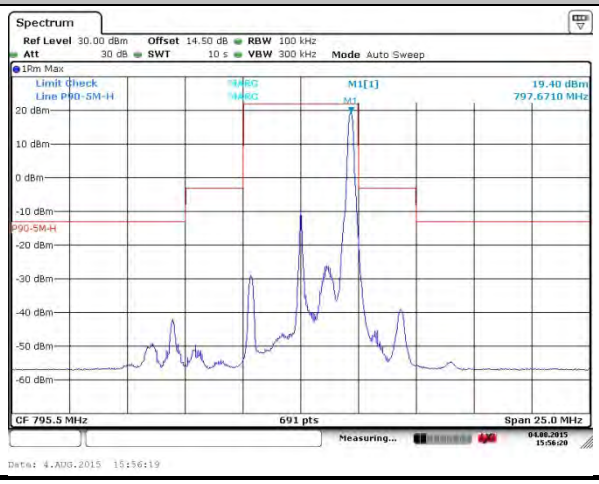


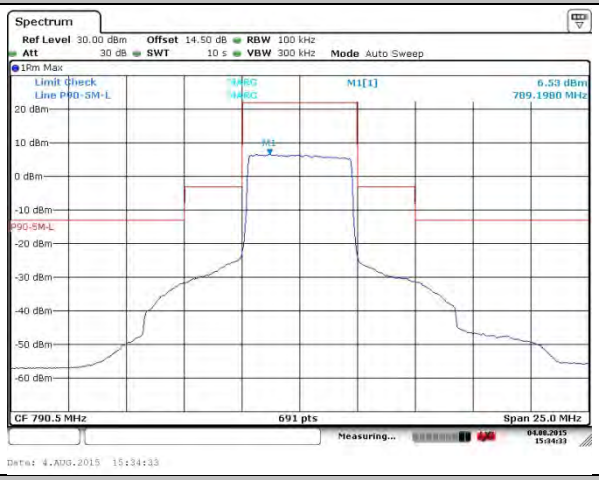
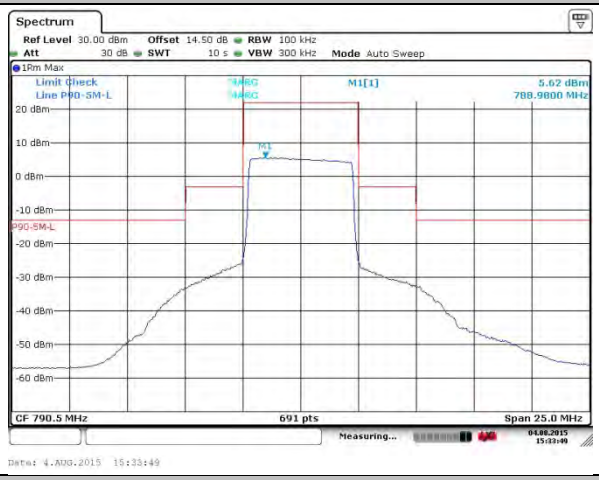
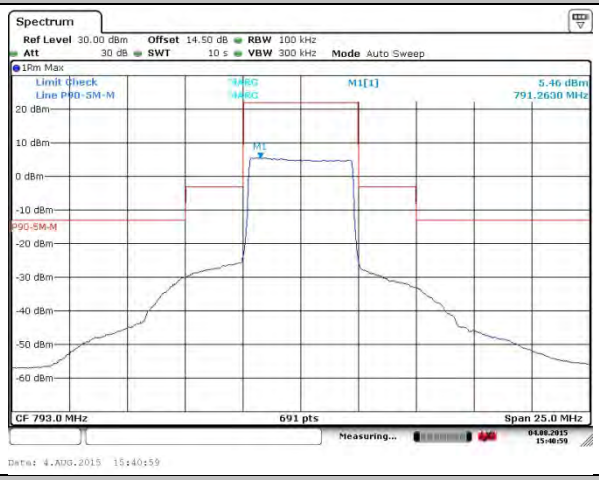
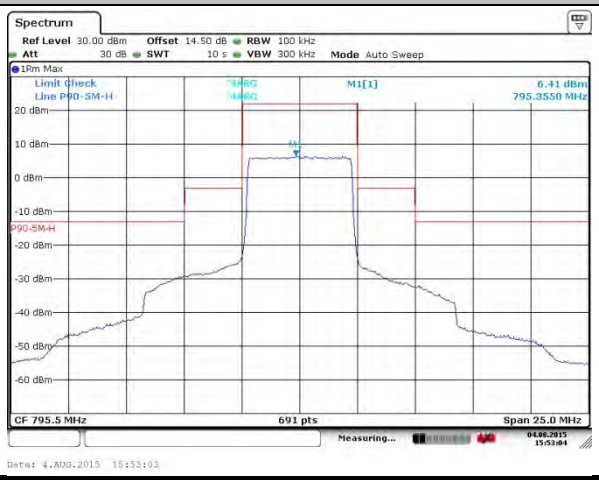
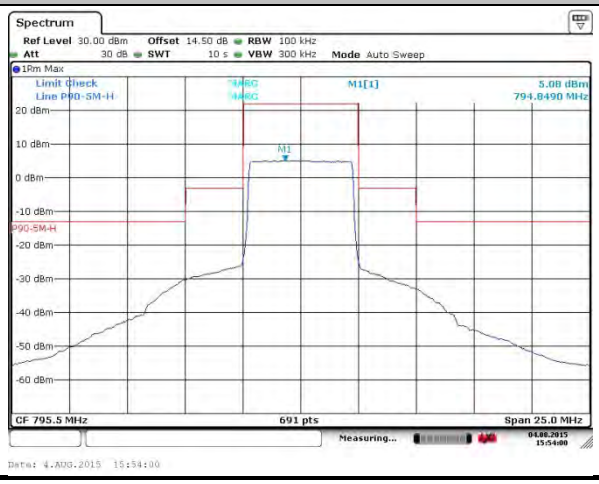

### Highest Channel / 5MHz / QPSK

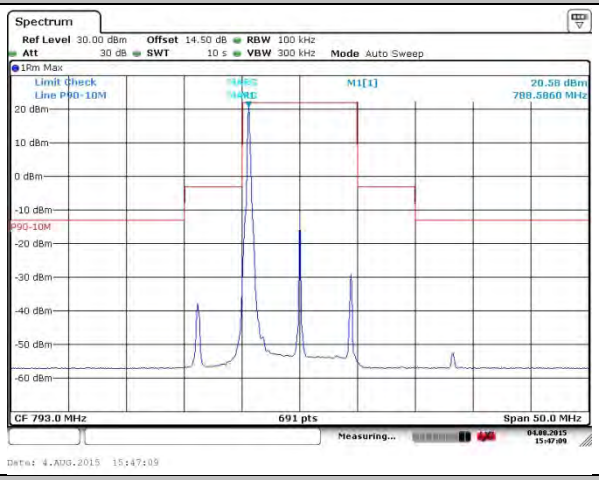
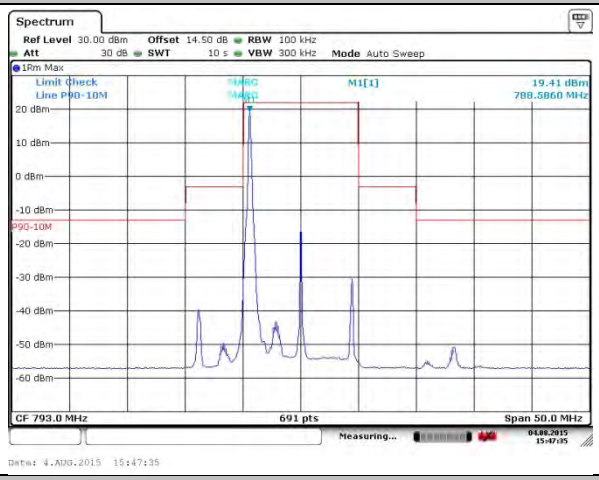
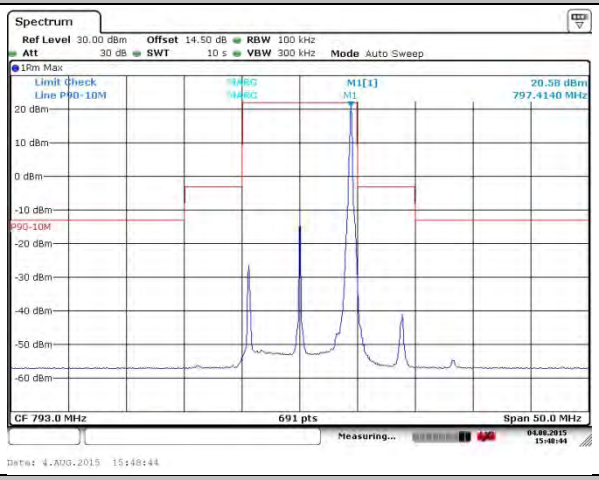
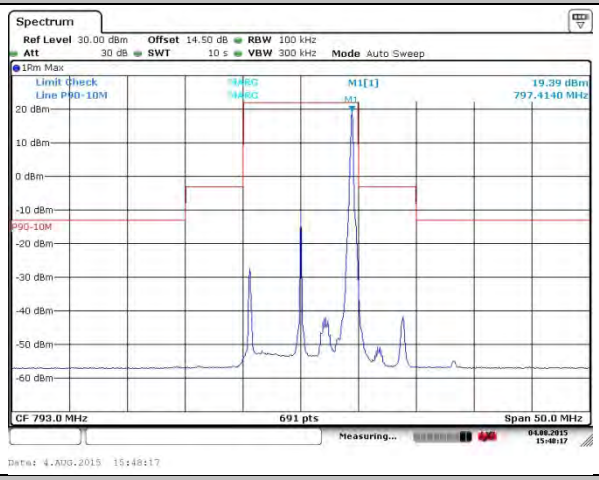
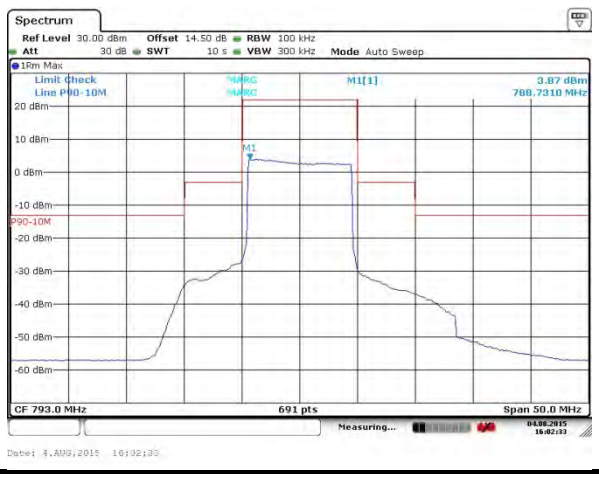
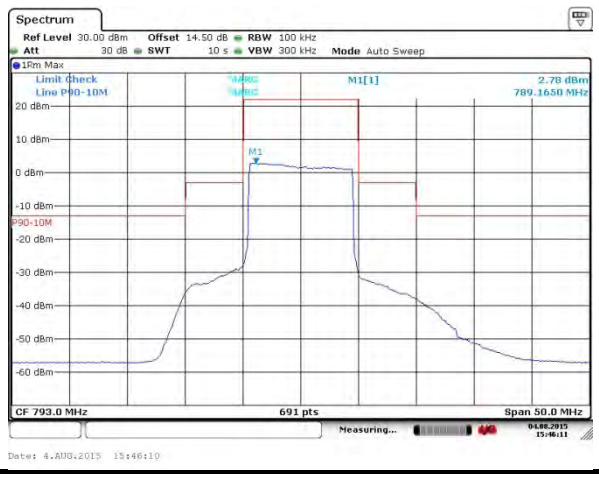



### Highest Channel / 5MHz / 16QAM



| LTE Band 14/ 5MHz / (1RBMax) | |
|---|---|
| **Lowest Channel / 5MHz / QPSK** | **Lowest Channel / 5MHz / 16QAM** |
|  |  |
| **Middle Channel / 5MHz / QPSK** | **Middle Channel / 5MHz / 16QAM** |
|  |  |
| **Highest Channel / 5MHz / QPSK** | **Highest Channel / 5MHz / 16QAM** |
|  |  |

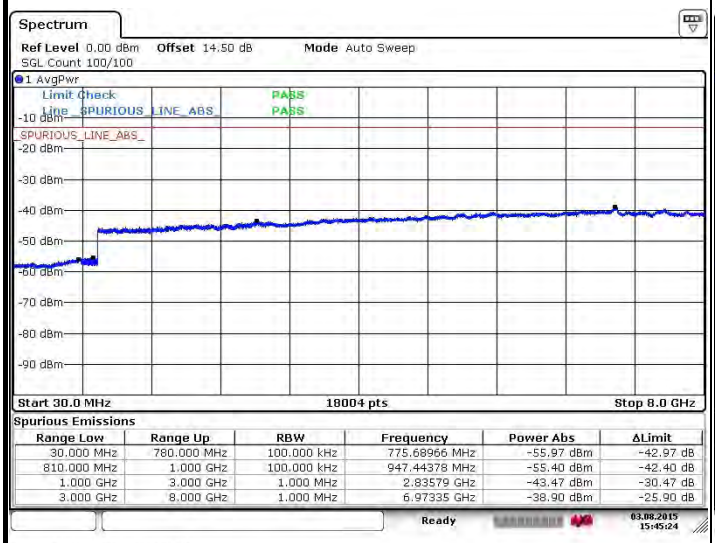
| LTE Band 14/ 5MHz / (Full RB) | |
|---|---|
| **Lowest Channel / 5MHz / QPSK** | **Lowest Channel / 5MHz / 16QAM** |
|  |  |
| **Middle Channel / 5MHz / QPSK** | **Middle Channel / 5MHz / 16QAM** |
|  |  |
| **Highest Channel / 5MHz / QPSK** | **Highest Channel / 5MHz / 16QAM** |
|  |  |

| LTE Band 14/ 10MHz | |
|---|---|
| **Middle Channel / 1RB0 / QPSK** | **Middle Channel / 1RB0 / 16QAM** |
|  |  |
| **Middle Channel / 1RBMax / QPSK** | **Middle Channel / 1RBMax / 16QAM** |
|  |  |
| **Middle Channel / Full RB / QPSK** | **Middle Channel / Full RB / 16QAM** |
|  |  |

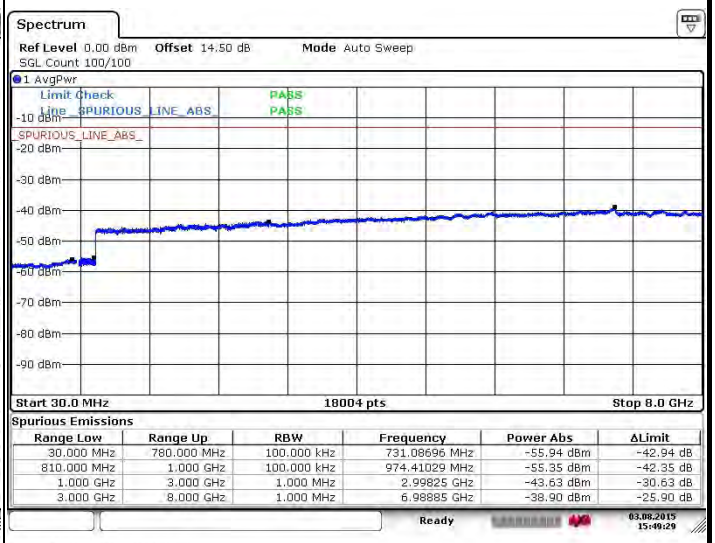
# Conducted Emission

## LTE Band 14/ 5MHz

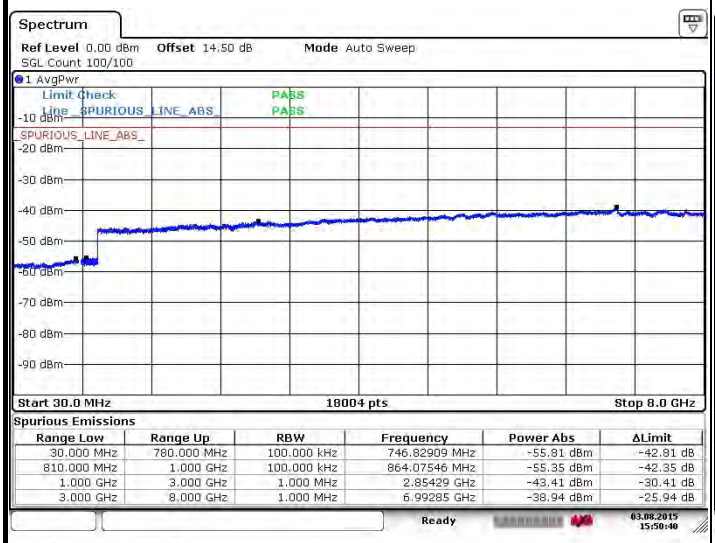
### Lowest Channel / QPSK



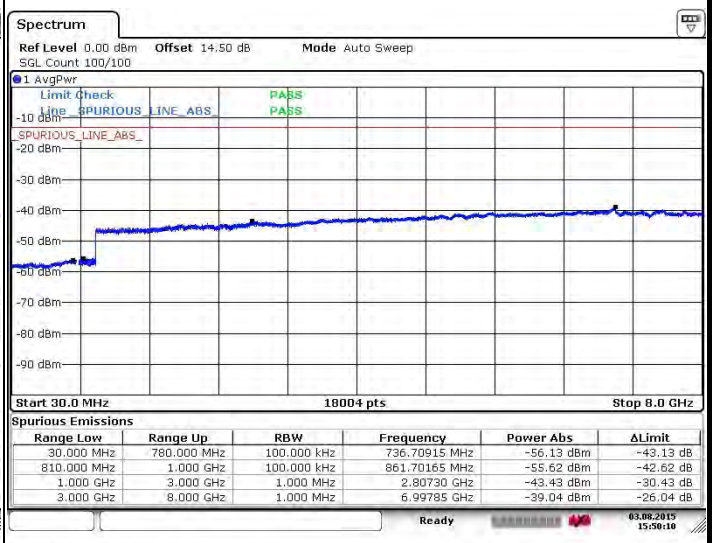

### Lowest Channel / 16QAM




### Middle Channel / QPSK

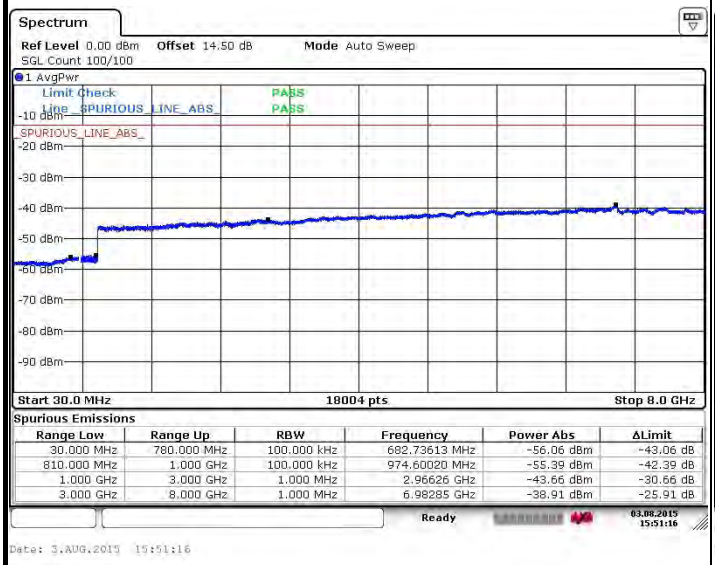



### Middle Channel / 16QAM

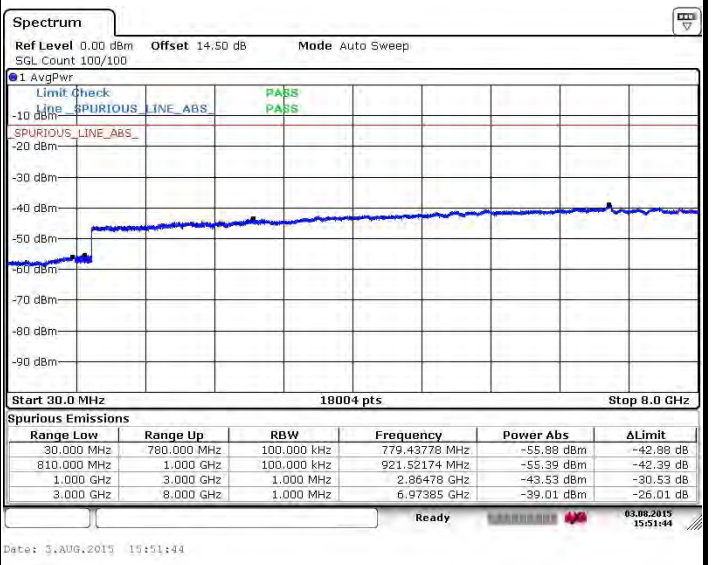


## LTE Band 14/ 5MHz

### Highest Channel / QPSK

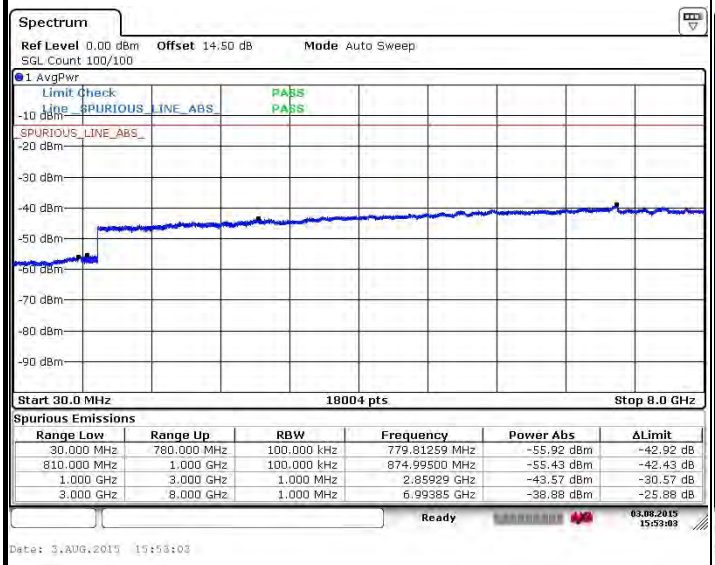



### Highest Channel / 16QAM

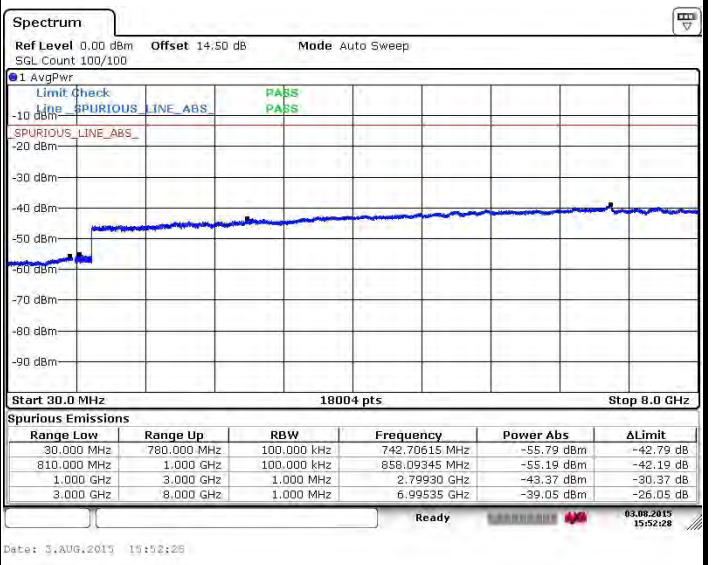



## LTE Band 14/ 10MHz

### Middle Channel / QPSK




### Middle Channel / 16QAM



# Frequency Stability

| Test Conditions | | LTE Band 14(QPSK) / Middle Channel | Limit |
|---|---|---|---|
| Temperature (°C) | Voltage (Volt) | BW 10MHz | 1.25ppm |
| | | Deviation (ppm) | Result |
| 50 | Normal Voltage | 0.0038 | PASS |
| 40 | Normal Voltage | 0.0013 | |
| 30 | Normal Voltage | 0.0013 | |
| 20(Ref.) | Normal Voltage | 0.0000 | |
| 10 | Normal Voltage | 0.0000 | |
| 0 | Normal Voltage | 0.0025 | |
| -10 | Normal Voltage | 0.0013 | |
| -20 | Normal Voltage | 0.0025 | |
| -30 | Normal Voltage | 0.0013 | |
| 20 | Maximum Voltage | 0.0025 | |
| 20 | Normal Voltage | 0.0013 | |
| 20 | Battery End Point | 0.0000 | |

**Note:** Normal Voltage = 3.8 V. ；Battery End Point (BEP) = 3.5 V.；Maximum Voltage =4.35 V

# Appendix B. Test Results of Radiated Test

## ERP

| LTE Band 14 / 5MHz | | | | | | | |
|---|---|---|---|---|---|---|---|
| Channel | Modulation | RB | | Horizontal | | Vertical | |
| | | Size | Offset | ERP(dBm) | ERP(W) | ERP(dBm) | ERP(W) |
| Lowest | QPSK | 1 | 24 | 18.05 | 0.0638 | 9.95 | 0.0099 |
| Middle | | 1 | 24 | 17.77 | 0.0598 | 9.80 | 0.0095 |
| Highest | | 1 | 24 | 19.71 | 0.0935 | 11.94 | 0.0156 |
| Lowest | 16QAM | 1 | 24 | 16.75 | 0.0473 | 9.29 | 0.0085 |
| Middle | | 1 | 12 | 16.70 | 0.0468 | 9.29 | 0.0085 |
| Highest | | 1 | 0 | 18.87 | 0.0771 | 11.49 | 0.0141 |
| Limit | ERP < 3W | | | Result | | PASS | |

| LTE Band 14 / 10MHz | | | | | | | |
|---|---|---|---|---|---|---|---|
| Channel | Modulation | RB | | Horizontal | | Vertical | |
| | | Size | Offset | ERP(dBm) | ERP(W) | ERP(dBm) | ERP(W) |
| Lowest | QPSK | - | - | - | - | - | - |
| Middle | | 1 | 49 | 17.57 | 0.0571 | 9.78 | 0.0095 |
| Highest | | - | - | - | - | - | - |
| Lowest | 16QAM | - | - | - | - | - | - |
| Middle | | 1 | 49 | 16.23 | 0.0420 | 9.07 | 0.0081 |
| Highest | | - | - | - | - | - | - |
| Limit | ERP < 3W | | | Result | | PASS | |

# Field Strength of Spurious Radiated

| LTE Band 14 / QPSK / RB Size 1 Offset 0 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Bandwidth | Frequency ( MHz ) | ERP ( dBm ) | Limit ( dBm ) | Over Limit ( dB ) | SPA Reading (dBm) | S.G. Power ( dBm ) | TX Cable loss ( dB ) | TX Antenna Gain (dBi) | Polarization (H/V) |
| 5MHz | 1581.86 | -56.68 | -40 | -16.68 | -69.60 | -59.65 | 0.88 | 6.00 | H |
| | 2372.79 | -49.69 | -13 | -36.69 | -71.21 | -52.30 | 1.08 | 5.84 | H |
| | 3163.72 | -60.26 | -13 | -47.26 | -70.86 | -64.63 | 1.14 | 7.66 | H |
| | 1581.86 | -56.59 | -40 | -16.59 | -67.22 | -59.56 | 0.88 | 6.00 | V |
| | 2372.79 | -52.52 | -13 | -39.52 | -71.36 | -55.13 | 1.08 | 5.84 | V |
| | 3163.72 | -60.40 | -13 | -47.40 | -72.23 | -64.77 | 1.14 | 7.66 | V |
| 10MHz | 1577.18 | -56.11 | -40 | -16.11 | -69.03 | -59.08 | 0.88 | 6.00 | H |
| | 2365.77 | -49.22 | -13 | -36.22 | -70.68 | -51.83 | 1.08 | 5.84 | H |
| | 3154.36 | -59.66 | -13 | -46.66 | -70.26 | -64.03 | 1.14 | 7.66 | H |
| | 1577.18 | -56.19 | -40 | -16.19 | -66.82 | -59.16 | 0.88 | 6.00 | V |
| | 2365.77 | -49.76 | -13 | -36.76 | -69.75 | -52.37 | 1.08 | 5.84 | V |
| | 3154.36 | -58.92 | -13 | -45.92 | -70.75 | -63.29 | 1.14 | 7.66 | V |
| | Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line. | | | | | | | | |
| Test Result | PASS | | | | | | | | |