



# FCC RF Test Report

**APPLICANT** : Yulong Computer Telecommunication  
Scientific (Shenzhen) Co., Ltd.  
**EQUIPMENT** : Smartphone  
**BRAND NAME** : Coolpad  
**MODEL NAME** : Coolpad 3623A  
**MARKETING NAME** : Coolpad Tattoo  
**FCC ID** : R38YL3623A  
**STANDARD** : 47 CFR Part 2, 27(F)  
**CLASSIFICATION** : PCS Licensed Transmitter Held to Ear (PCE)

The product was received on Dec. 26, 2015 and completely tested on Mar. 05, 2016. We, SPORTON INTERNATIONAL (SHENZHEN) INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA / EIA-603-D-2010 and the testing has shown the tested sample to be in 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.

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Prepared by: Andy Yeh / Manager

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Approved by: Jones Tsai / Manager



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## REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG5D2601B	Rev. 01	Initial issue of report	Mar. 22, 2016

**SUMMARY OF TEST RESULT**

Report Section	FCC Rule	Description	Limit	Result	Remark
3.4	§2.1046	Conducted Output Power	Reporting Only	PASS	-
3.5	N/A	Peak-to-Average Ratio	<13 dB	PASS	-
3.6	§2.1049	Occupied Bandwidth	Reporting Only	PASS	-
3.7	§2.1051 §27.53(c)(2)(4)	Conducted Band Edge Measurement (Band 13)	$< 43 + 10 \log_{10}(P[\text{Watts}])$	PASS	-
3.8	§2.1051 §27.53(c)(2)	Conducted Spurious Emission (Band 13)	$< 43 + 10 \log_{10}(P[\text{Watts}])$	PASS	-
3.9	§2.1055 §27.54	Frequency Stability Temperature & Voltage	Within Authorized Band	PASS	-
4.4	§27.50(b)(10)	Effective Radiated Power (Band 13)	ERP < 3 Watt	PASS	-
4.5	§2.1053 §27.53(c)(2) §27.53(f)	Radiated Spurious Emission (Band 13)	$< 43 + 10 \log_{10}(P[\text{Watts}])$	PASS	Under limit 14.37 dB at 1559.500 MHz



# 1 General Description

## 1.1 Applicant

**Yulong Computer Telecommunication Scientific (Shenzhen) Co., Ltd.**

Coolpad Information Harbor, 2nd Mengxi Road, Hi-Tech Industrial Park(North), Nanshan district, Shenzhen, P.R.C.

## 1.2 Manufacturer

**Yulong Computer Telecommunication Scientific (Shenzhen) Co., Ltd.**

Coolpad Information Harbor, 2nd Mengxi Road, Hi-Tech Industrial Park(North), Nanshan district, Shenzhen, P.R.C.

## 1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Smartphone
Brand Name	Coolpad
Model Name	Coolpad 3623A
Marketing Name	Coolpad Tattoo
FCC ID	R38YL3623A
EUT supports Radios application	CDMA/EV-DO/LTE WLAN2.4GHz 802.11b/g/n HT20 Bluetooth v2.1+EDR Bluetooth v4.0 LE
MEID Code	Conducted: 99000773338079 Radiation: 99000773338062 ERP: 99000773338059
HW Version	P1
SW Version	051.00.160215
EUT Stage	Production Unit

## 1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx Frequency	LTE Band 13 : 779.5 MHz ~ 784.5 MHz
Rx Frequency	LTE Band 13 : 748.5 MHz ~ 753.5 MHz
Bandwidth	LTE Band 13 : 5MHz / 10MHz
Maximum Output Power to Antenna	LTE Band 13 : 24.28 dBm
Type of Modulation	QPSK / 16QAM



## 1.5 Modification of EUT

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

## 1.6 Maximum ERP Power, Frequency Tolerance, and Emission Designator

LTE Band 13	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	4M53G7D	-	0.1247	4M52W7D	-	0.1213
10	8M97G7D	0.0281	0.1189	8M97W7D	-	0.1227

## 1.7 Testing Location

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

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

## 1.8 Applicable Standards

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

- ♦ 47 CFR Part 2, 27(F)
- ♦ ANSI / TIA / EIA-603-D-2010
- ♦ FCC KDB 971168 D01 Power Meas. 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

Antenna port conducted and radiated test items listed below are performed according to KDB 971168 D01 Power Meas. License Digital Systems v02r02 with maximum output power.

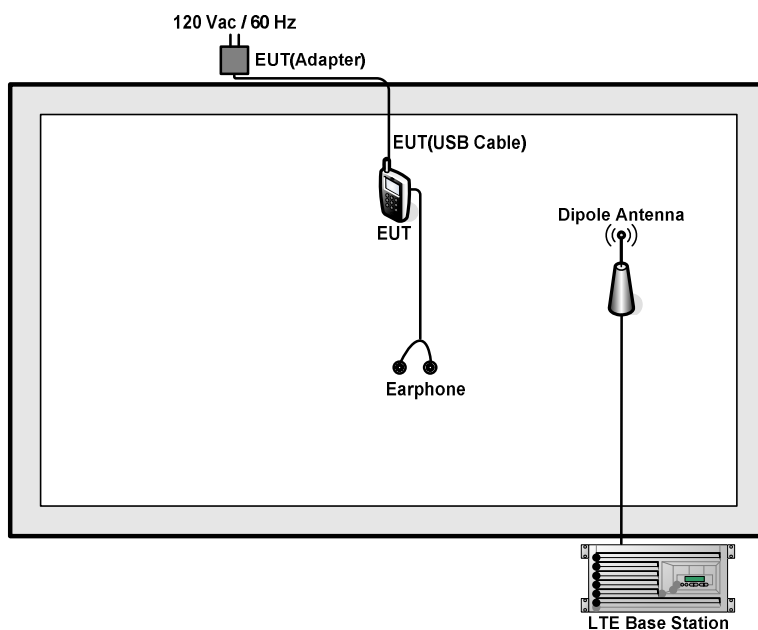
Radiated measurements are performed by rotating the EUT in three different orthogonal test planes to find the maximum emission.

Test Items	Band	Bandwidth (MHz)						Modulation		RB #			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	1	Half	Full	L	M	H
Max. Output	13	-	-	✓		-	-	✓	✓	✓	✓	✓	✓	✓	✓
Power	13	-	-		✓	-	-	✓	✓	✓	✓	✓		✓	
Peak-to-Average Ratio	13	-	-		✓	-	-	✓	✓	✓		✓		✓	
26dB and 99%	13	-	-	✓		-	-	✓	✓			✓	✓	✓	✓
Bandwidth	13	-	-		✓	-	-	✓	✓			✓		✓	
Conducted	13	-	-	✓		-	-	✓	✓	✓		✓	✓		✓
Band Edge	13	-	-		✓	-	-	✓	✓	✓		✓		✓	



Test Items	Band	Bandwidth (MHz)						Modulation		RB #			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	1	Half	Full	L	M	H
Conducted	13	-	-	√		-	-	√	√	√			√	√	√
Spurious Emission	13	-	-		√	-	-	√	√	√			-	√	-
Frequency Stability	13	-	-		√	-	-	√				√		√	
E.R.P.	13	-	-	√		-	-	√	√	√			√	√	√
	13	-	-		√	-	-	√	√	√			-	√	-
Radiated Spurious Emission	13	-	-	√	√	-	-	√		√				√	
Note	1. The mark “√” means that this configuration is chosen for testing 2. The mark “-” means that this bandwidth is not supported. 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.	LTE Base Station	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	DC Power Supply	GW INSTEK	GPS-3030D	N/A	N/A	Unshielded, 1.8 m
3.	Earphone	Apple	N/A	N/A	Unshielded, 1.6 m	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 :

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 4.5 + 10 = 14.5 \text{ (dB)} \end{aligned}$$

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

LTE Band 13 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
10	Channel	-	23230	-
	Frequency	-	782	-
5	Channel	23205	23230	23255
	Frequency	779.5	782	784.5

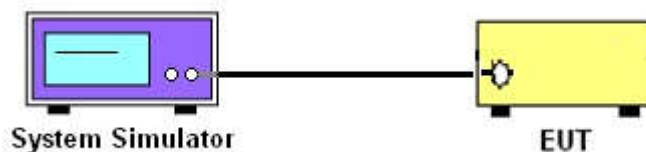
### 3 Conducted Test Items

#### 3.1 Measuring Instruments

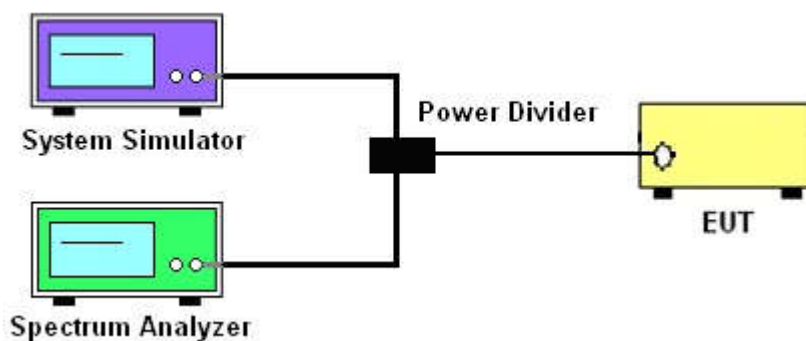
See list of measuring instruments of this test report.

#### 3.2 Test Setup

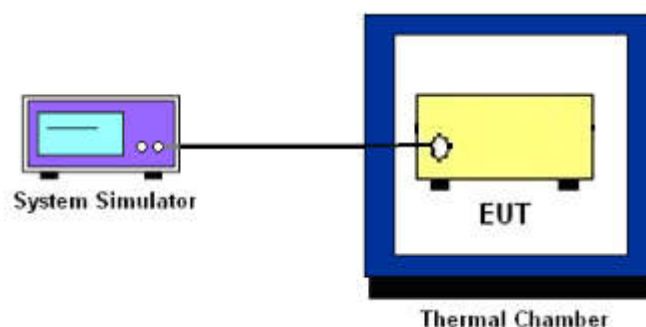
##### 3.2.1 Conducted Output Power



##### 3.2.2 Peak-to-Average Ratio, Occupied Bandwidth ,Conducted 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

#### 3.4.1 Description of the Conducted Output Power 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.

#### 3.4.2 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.

### 3.5 Peak-to-Average Ratio

#### 3.5.1 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.

#### 3.5.2 Test Procedures

1. The testing follows FCC KDB 971168 v02r02 Section 5.7.1.
2. The EUT was connected to spectrum and system simulator via a power divider.
3. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
4. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.
5. Record the deviation as Peak to Average Ratio.

## 3.6 Occupied Bandwidth

### 3.6.1 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.

### 3.6.2 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. 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.
4. 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.
5. Set the detection mode to peak, and the trace mode to max hold.
6. 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)
7. Determine the “-26 dB down amplitude” as equal to (Reference Value – X).
8. 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.
9. Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

### **3.7 Conducted Band Edge**

#### **3.7.1 Description of Conducted Band Edge Measurement**

27.53 (c) for Band 13

For operations in the 776-788 MHz band, the FCC limit is  $43 + 10\log_{10}(P[\text{Watts}])$  dB below the transmitter power  $P(\text{Watts})$  in a 100 kHz bandwidth. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed. In addition, the power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775 MHz and 793-806 MHz shall be attenuated below the transmitter power,  $P$  (dBW), by at least  $65 + 10 \log_{10} p(\text{watts})$ , dB, for mobile and portable equipment.

#### **3.7.2 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 band edges of low and high channels for the highest RF powers were measured.
4. Set RBW  $\geq 1\%$  EBW in the 1MHz band immediately outside and adjacent to the band edge.
5. Beyond the 1 MHz band from the band edge, RBW=1MHz was used
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. Checked that all the results comply with the emission limit line.

Example:

The limit line is derived from  $43 + 10\log(P)\text{dB}$  below the transmitter power  $P(\text{Watts})$   
 $= P(\text{W}) - [43 + 10\log(P)] (\text{dB})$   
 $= [30 + 10\log(P)] (\text{dBm}) - [43 + 10\log(P)] (\text{dB})$   
 $= -13\text{dBm}.$

### 3.8 Conducted Spurious Emission

#### 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 30 MHz up to a frequency including its 10<sup>th</sup> harmonic.

#### 3.8.2 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 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.
4. The middle channel for the highest RF power within the transmitting frequency was measured.
5. The conducted spurious emission for the whole frequency range was taken.
6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz.
7. Set spectrum analyzer with RMS detector.
8. Taking the record of maximum spurious emission.
9. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
10. The limit line is derived from  $43 + 10\log(P)$ dB below the transmitter power P(Watts)  
 $= P(W) - [43 + 10\log(P)]$  (dB)  
 $= [30 + 10\log(P)]$  (dBm) -  $[43 + 10\log(P)]$  (dB)  
 $= -13$ dBm.



### 3.9 Frequency Stability

#### 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  $\pm 0.00025\%$  ( $\pm 2.5\text{ppm}$ ) of the center frequency.

#### 3.9.2 Test Procedures for Temperature Variation

1. The testing follows FCC KDB 971168 v02r02 Section 9.0.
2. The EUT was set up in the thermal chamber and connected with the system simulator.
3. With power OFF, the temperature was decreased to  $-30^{\circ}\text{C}$  and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.
4. With power OFF, the temperature was raised in  $10^{\circ}\text{C}$  step up to  $50^{\circ}\text{C}$ . 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 testing follows FCC KDB 971168 v02r02 Section 9.0.
2. The EUT was placed in a temperature chamber at  $25\pm 5^{\circ}\text{C}$  and connected with the system simulator.
3. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value measured at the input to the EUT.
4. The variation in frequency was measured for the worst case.

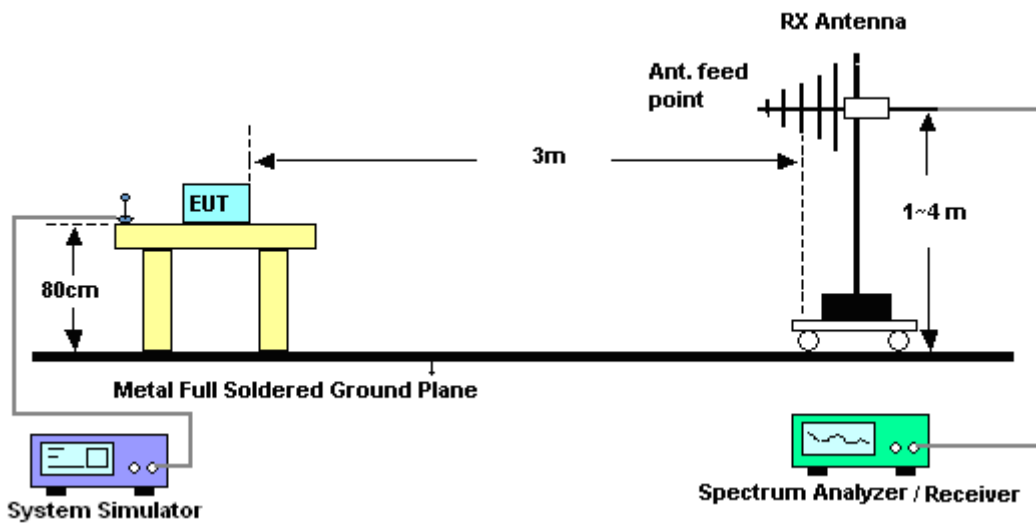
## 4 Radiated Test Items

### 4.1 Measuring Instruments

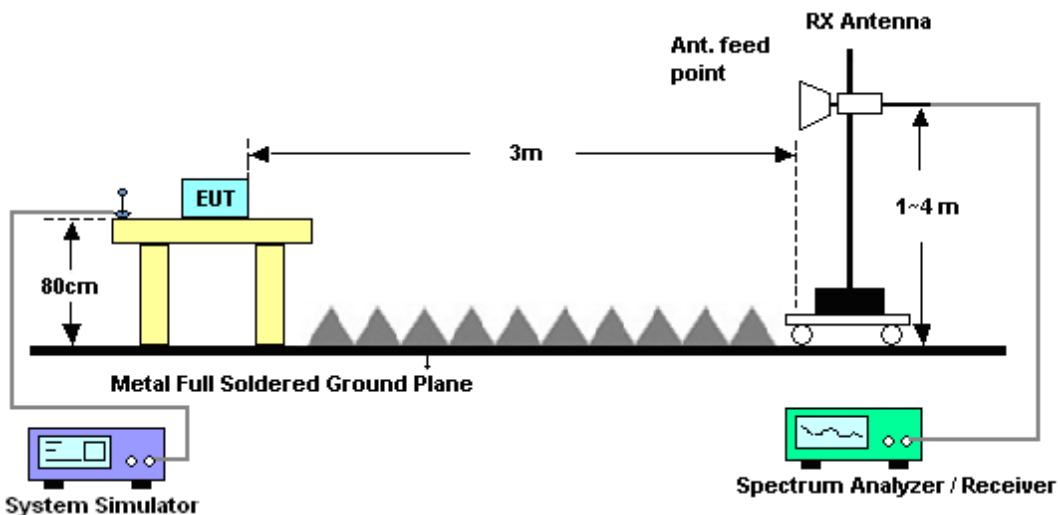
See list of measuring instruments of this test report.

### 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 Effective Radiated Power**

### **4.4.1 Description of the ERP Measurement**

Effective radiated power output measurements by substitution method according to ANSI / TIA / EIA-603-D-2010, and the spectrum analyzer configuration follows KDB 971168 D01 Power Meas. License Digital Systems v02r02. Mobile and portable (hand-held) stations operating are limited to average ERP of 3 watts with LTE band 13.

### **4.4.2 Test Procedures**

1. 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.
2. 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.
3. Effective Isotropic Radiated Power (EIRP) was measured by substitution method according to TIA/EIA-603-D. 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,  $EIRP = LVL + \text{Correction factor}$  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

## **4.5 Radiated Spurious Emission**

### **4.5.1 Description of Radiated Spurious Emission**

The radiated spurious emission was measured by substitution method according to ANSI / TIA / EIA-603-D-2010. 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 LTE Band 13

For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions 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.

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

### **4.5.2 Test Procedures**

1. The testing follows FCC KDB 971168 v02r02 Section 5.8 and ANSI / TIA-603-D-2010 Section 2.2.12.
2. The EUT was placed on a rotatable wooden table with 0.8 meter above ground.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
4. The table was rotated 360 degrees to determine the position of the highest spurious emission.
5. 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.
6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
7. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
8. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
9. Taking the record of output power at antenna port.
10. Repeat step 7 to step 8 for another polarization.
11. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

The limit line is derived from  $43 + 10\log(P)$ dB below the transmitter power P(Watts)  
=  $P(W) - [43 + 10\log(P)]$  (dB)  
=  $[30 + 10\log(P)]$  (dBm) -  $[43 + 10\log(P)]$  (dB)  
=  $-13$ dBm.

12.  $EIRP$  (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
13.  $ERP$  (dBm) =  $EIRP - 2.15$



## 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	Feb. 25, 2016	May 04, 2016	Conducted (TH01-SZ)
Thermal Chamber	Ten Billion Hongzhangroup	LP-150U	H2014081803	-40~+150°C	Aug. 07, 2015	Feb. 25, 2016	Aug. 06, 2016	Conducted (TH01-SZ)
Spectrum Analyzer	KEYSIGHT	N9010A	MY55150213	10Hz~44GHz;Max 30dBm	Jun. 07, 2015	Mar. 05, 2016	Jun. 06, 2016	Radiation (03CH01-SZ)
Bilog Antenna	TeseQ	CBL6112D	23188	30MHz-2GHz	Oct. 17, 2015	Mar. 05, 2016	Oct. 16, 2016	Radiation (03CH01-SZ)
Double Ridge Horn Antenna	ETS Lindgren	3117	00119436	1GHz~18GHz	Oct. 17, 2015	Mar. 05, 2016	Oct. 16, 2016	Radiation (03CH01-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18Ghz-40GHz	Aug. 19, 2015	Mar. 05, 2016	Aug. 18, 2016	Radiation (03CH01-SZ)
Amplifier	HP	8447F	3113A04622	9kHz ~1300MHz / 30 dB	Aug. 07, 2015	Mar. 05, 2016	Aug. 06, 2016	Radiation (03CH01-SZ)
Amplifier	Agilent Technologies	83017A	MY39501302	500MHz~26.5GHz	Jan. 12, 2016	Mar. 05, 2016	Jan. 11, 2017	Radiation (03CH01-SZ)
AC Power Source	Chroma	61601	616010001985	N/A	NCR	Mar. 05, 2016	NCR	Radiation (03CH01-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Mar. 05, 2016	NCR	Radiation (03CH01-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Mar. 05, 2016	NCR	Radiation (03CH01-SZ)

NCR: No Calibration Required



## **6 Uncertainty of Evaluation**

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

<b>Measuring Uncertainty for a Level of Confidence of 95% (<math>U = 2U_c(y)</math>)</b>	<b>4.8 dB</b>
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## Appendix A. Test Results of Conducted Test

### Conducted Output Power(Average power)

LTE Band 13 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
10	1	0	QPSK		24.28	
10	1	25			24.04	
10	1	49			24.07	
10	25	0			23.11	
10	25	12			22.97	
10	25	25			22.93	
10	50	0			22.99	
10	1	0	16-QAM		23.47	
10	1	25			23.25	
10	1	49			23.14	
10	25	0			22.16	
10	25	12			22.08	
10	25	25			22.00	
10	50	0			21.99	
5	1	0	QPSK	23.95	24.03	24.15
5	1	12		24.22	24.23	24.14
5	1	24		24.11	23.59	24.21
5	12	0		22.99	22.97	22.96
5	12	7		22.98	23.03	22.91
5	12	13		23.01	22.86	23.02
5	25	0		23.00	23.02	22.93
5	1	0	16-QAM	23.18	23.21	23.09
5	1	12		23.08	23.13	23.03
5	1	24		23.20	22.88	23.18
5	12	0		22.13	22.08	22.04
5	12	7		22.13	22.01	21.91
5	12	13		22.08	21.90	22.09
5	25	0		22.16	21.95	22.24



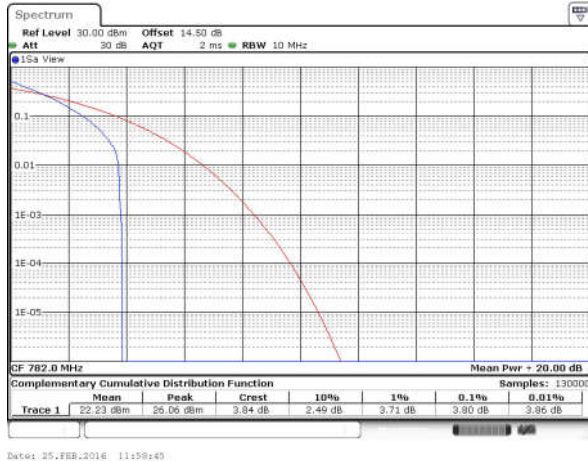
**Peak-to-Average Ratio**

Mode	LTE Band 13 / 10MHz				
Mod.	QPSK		16QAM		Limit: 13dB
RB Size	1RB	Full RB	1RB	Full RB	Result
Lowest CH	-	-	-	-	<b>PASS</b>
Middle CH	3.80	4.81	4.61	5.77	
Highest CH	-	-	-	-	

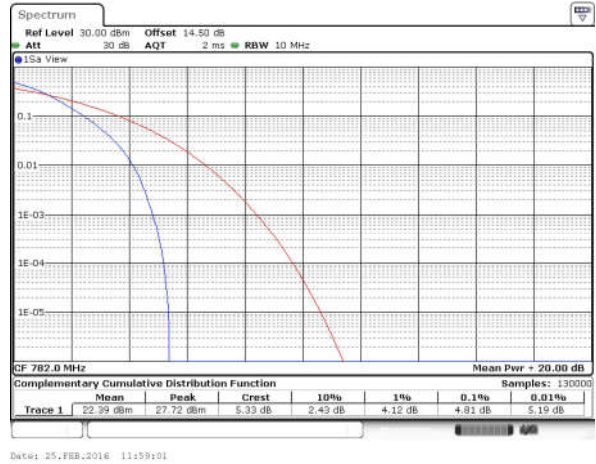


## LTE Band 13 / 10MHz / QPSK

## Middle Channel/ 1RB

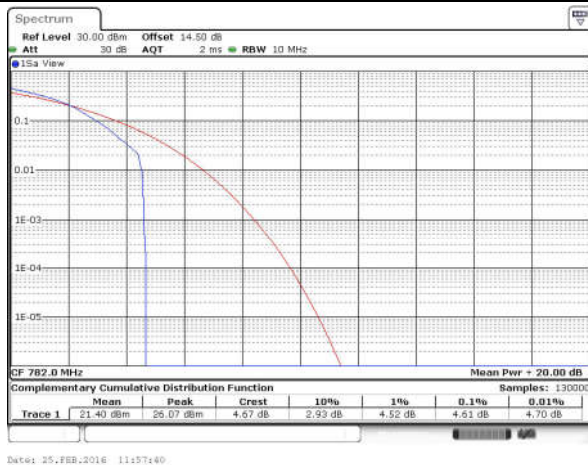


## Middle Channel / Full RB

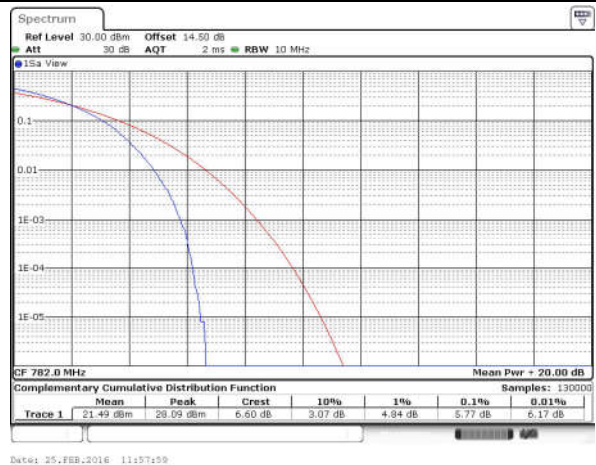


## LTE Band 13 / 10MHz / 16QAM

## Middle Channel/ 1RB



## Middle Channel / Full RB



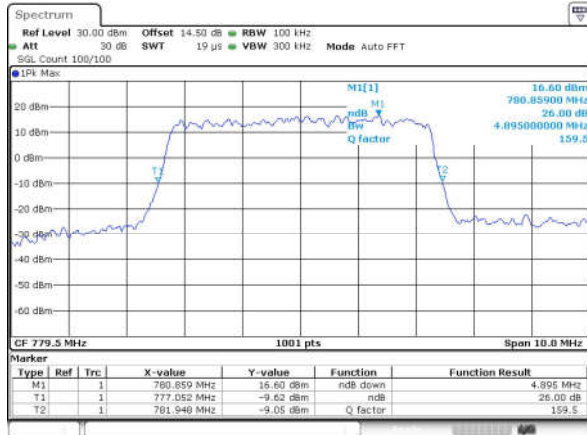
**26dB Bandwidth**

Mode	LTE Band 13 : 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	-	-	-	-	4.90	4.95	-	-	-	-	-	-
Middle CH	-	-	-	-	4.91	4.91	9.67	9.67	-	-	-	-
Highest CH	-	-	-	-	4.93	4.94	-	-	-	-	-	-



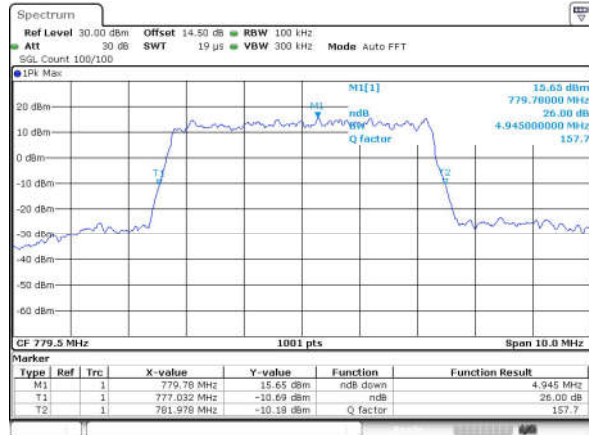
## LTE Band 13

## Lowest Channel / 5MHz / QPSK



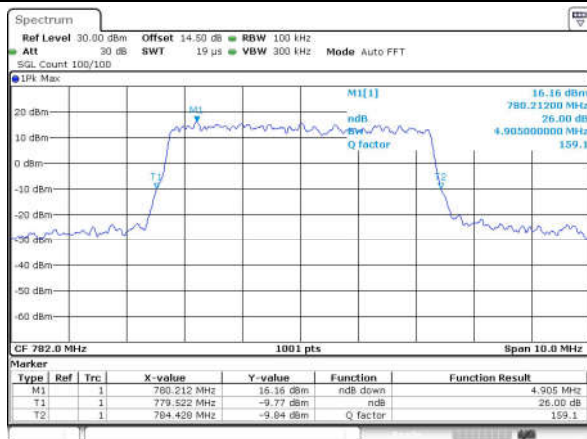
Date: 25.FEB.2016 11:30:44

## Lowest Channel / 5MHz / 16QAM



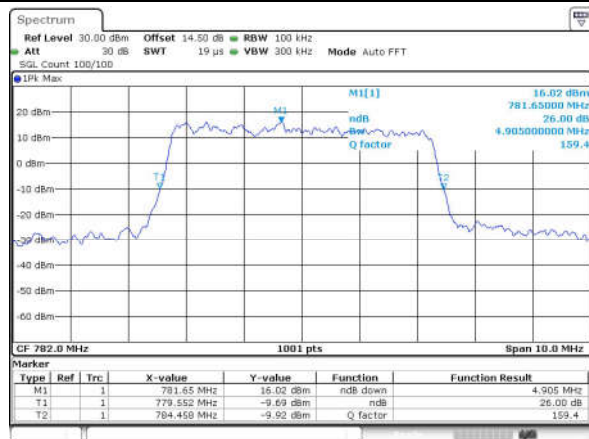
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## Middle Channel / 5MHz / QPSK



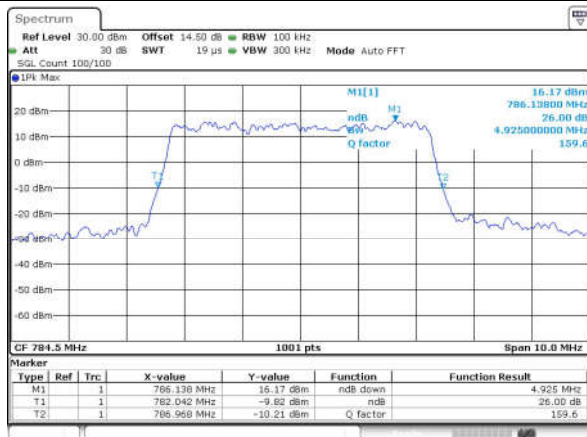
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## Middle Channel / 5MHz / 16QAM



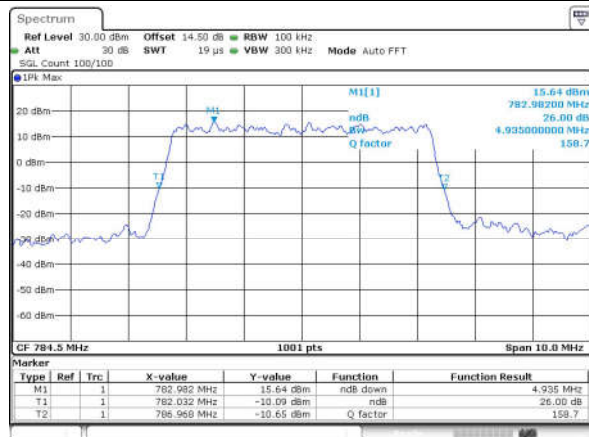
Date: 25.FEB.2016 11:30:21

## Highest Channel / 5MHz / QPSK



Date: 25.FEB.2016 11:40:47

## Highest Channel / 5MHz / 16QAM

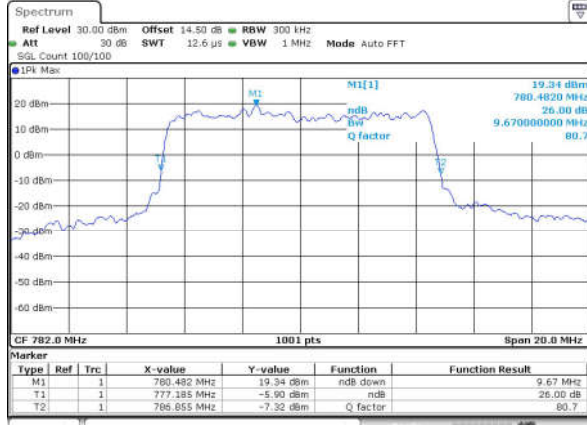


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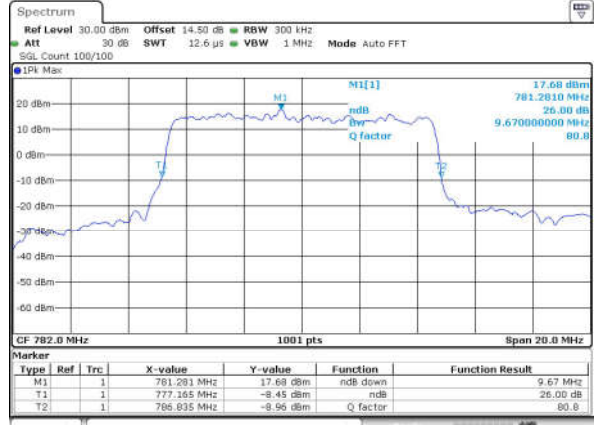
## LTE Band 13

## Middle Channel / 10MHz / QPSK



Date: 25.FEB.2016 11:48:12

## Middle Channel / 10MHz / 16QAM



Date: 25.FEB.2016 11:48:24

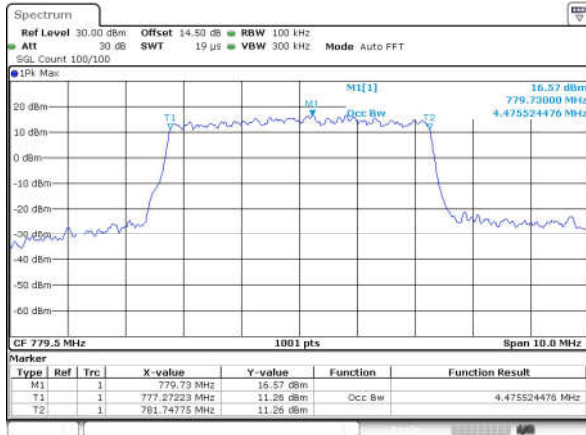
**Occupied Bandwidth**

Mode	LTE Band 13 : 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	-	-	-	-	4.48	4.48	-	-	-	-	-	-
Middle CH	-	-	-	-	4.51	4.52	8.97	8.97	-	-	-	-
Highest CH	-	-	-	-	4.53	4.49	-	-	-	-	-	-

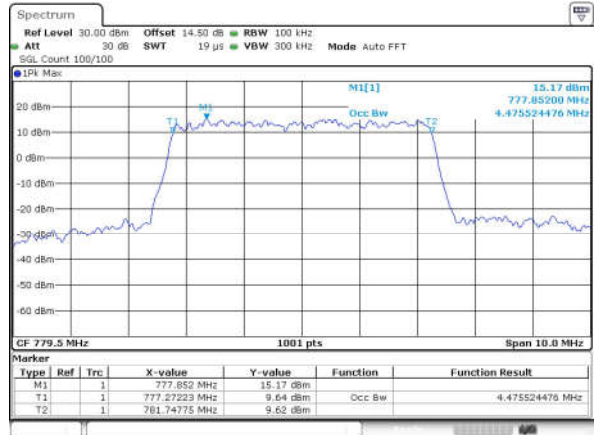


## LTE Band 13

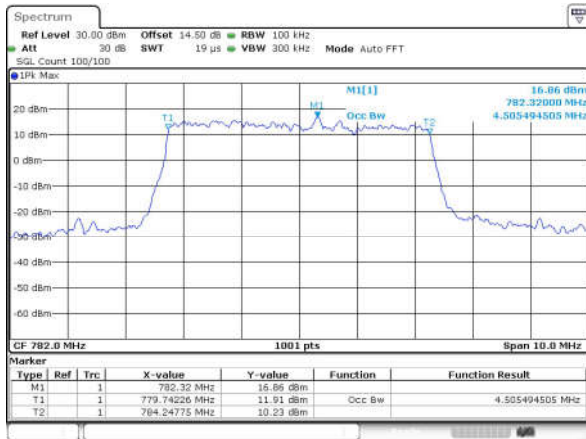
## Lowest Channel / 5MHz / QPSK



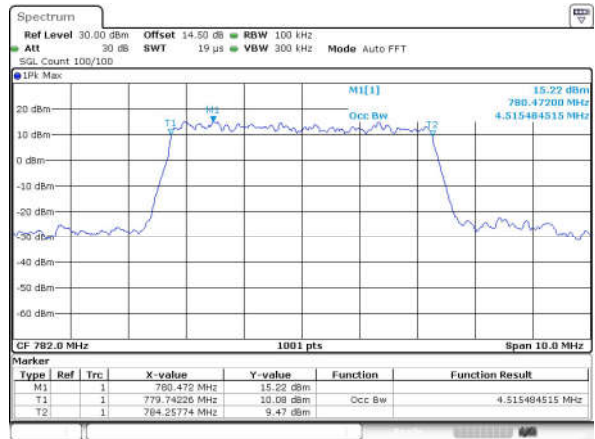
## Lowest Channel / 5MHz / 16QAM



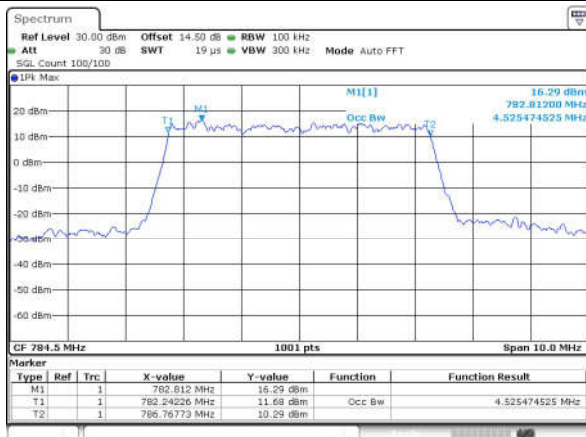
## Middle Channel / 5MHz / QPSK



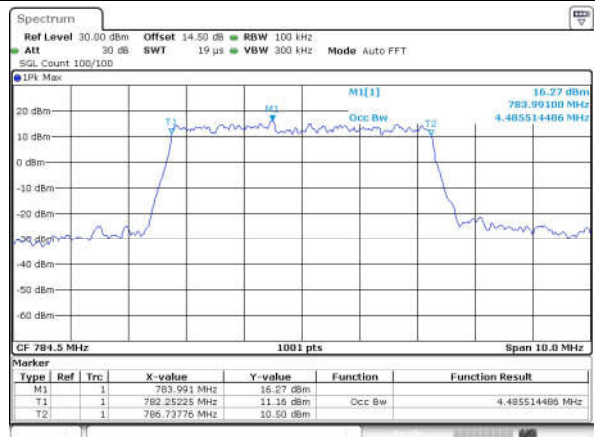
## Middle Channel / 5MHz / 16QAM



## Highest Channel / 5MHz / QPSK



## Highest Channel / 5MHz / 16QAM

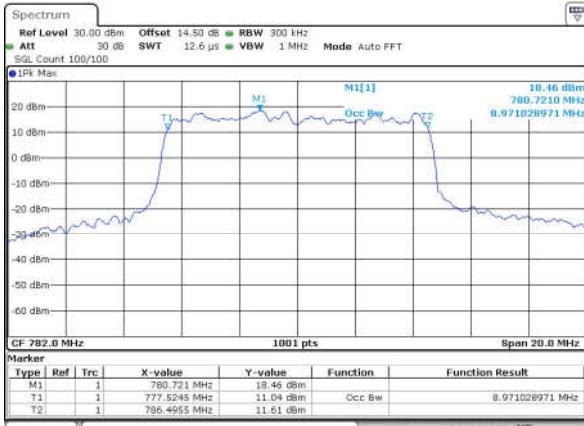






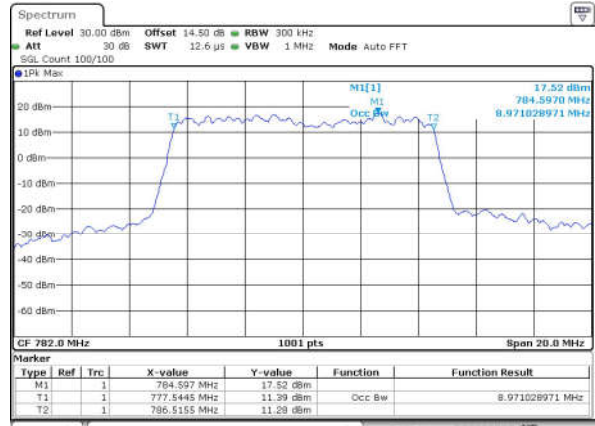
## LTE Band 13

## Middle Channel / 10MHz / QPSK



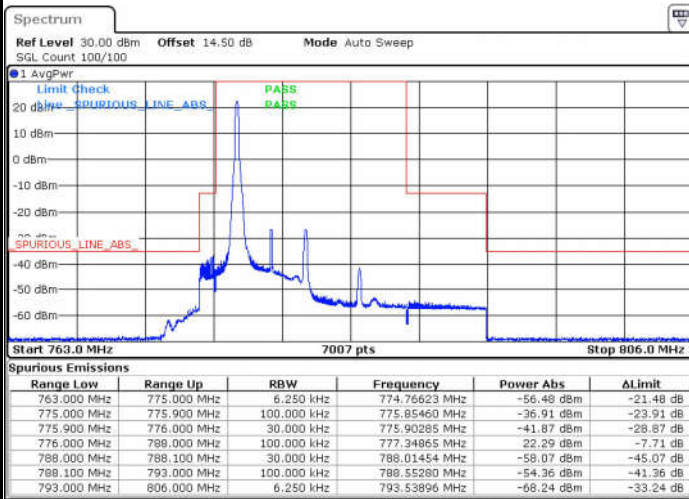
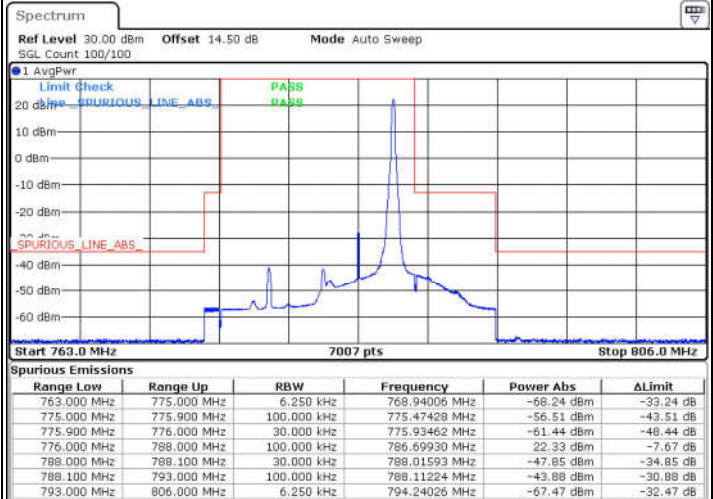
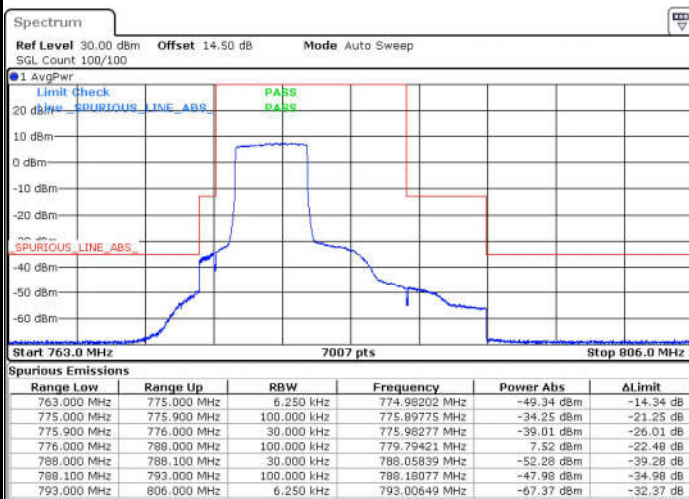
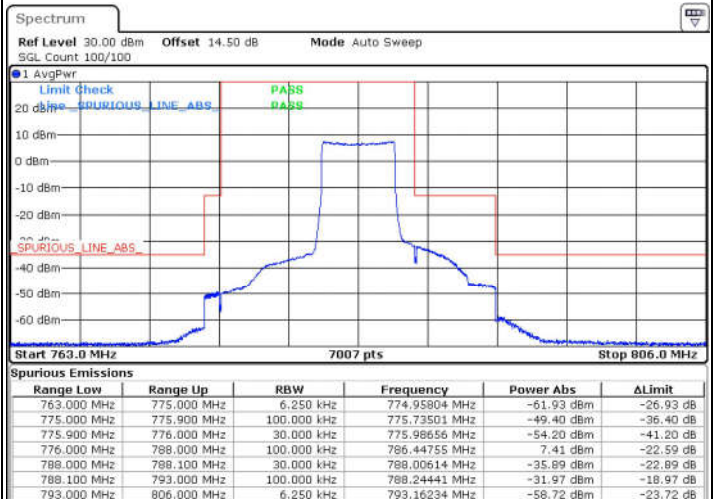
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## Middle Channel / 10MHz / 16QAM



Date: 25.FEB.2016 11:48:00

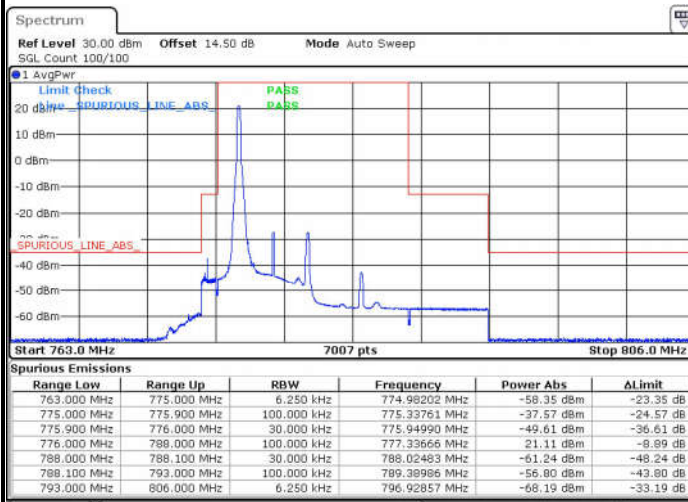


**Conducted Band Edge****LTE Band 13 / 5MHz / QPSK****Lowest Band Edge / 1 RB****Highest Band Edge / 1 RB****Lowest Band Edge / Full RB****Highest Band Edge / Full RB**

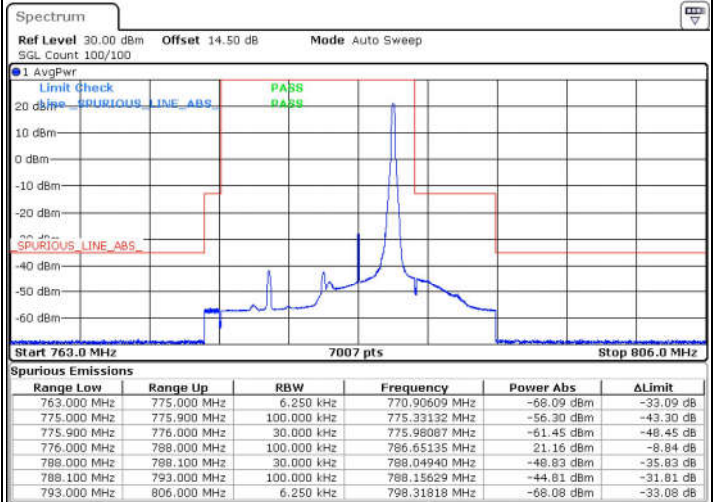


## LTE Band 13 / 5MHz / 16QAM

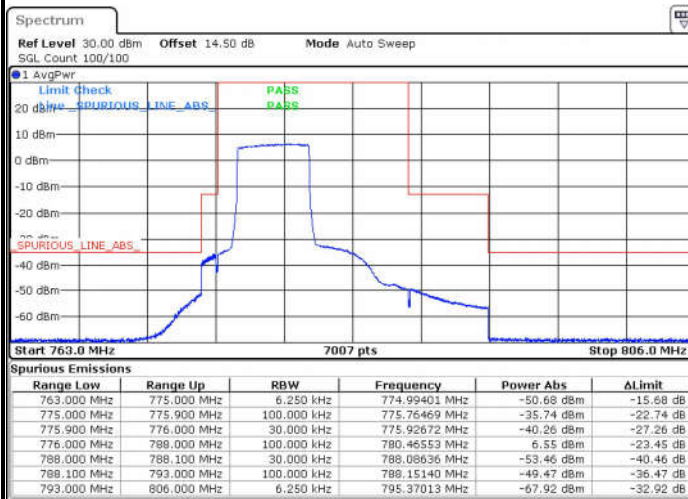
## Lowest Band Edge / 1 RB



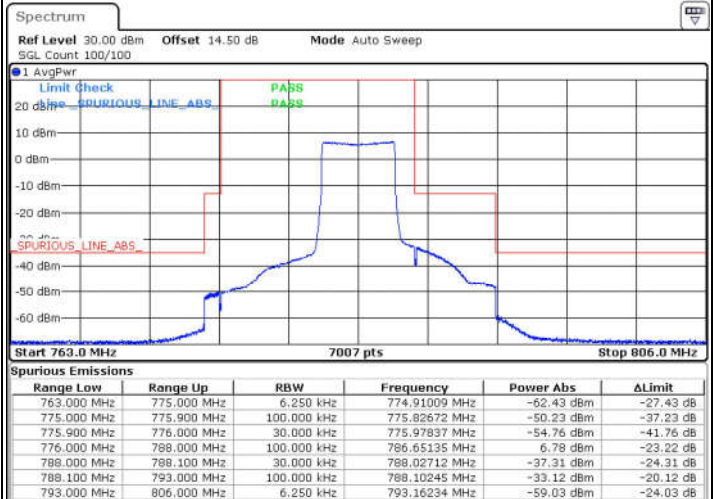
## Highest Band Edge / 1 RB

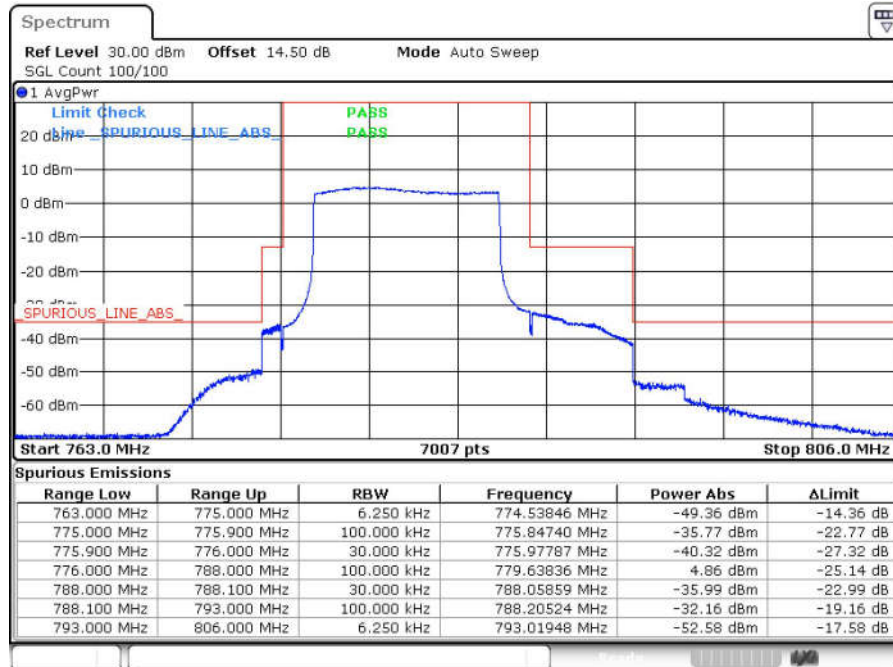


## Lowest Band Edge / Full RB

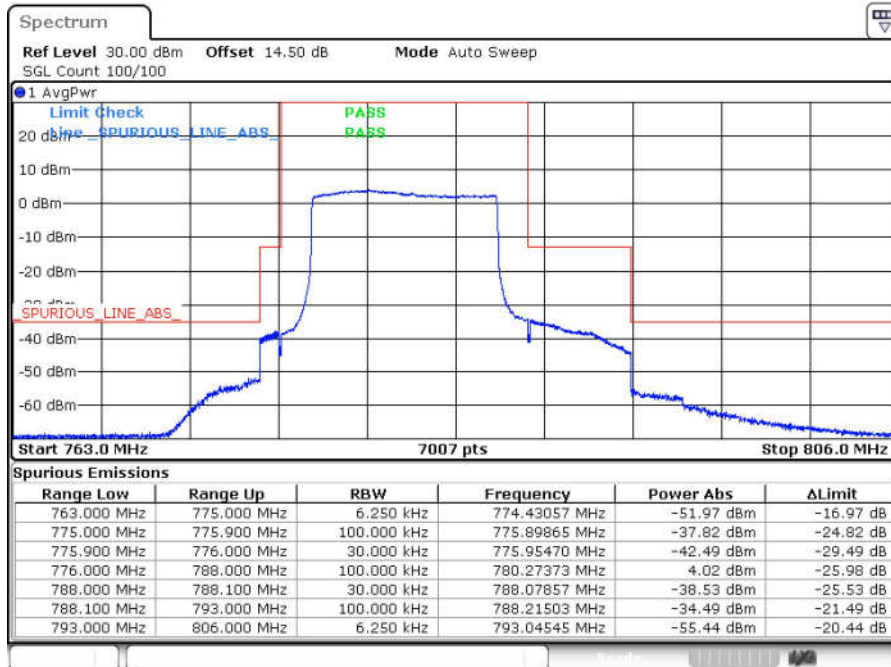


## Highest Band Edge / Full RB



**LTE Band 13 / 10MHz / QPSK****Band Edge / Full RB**

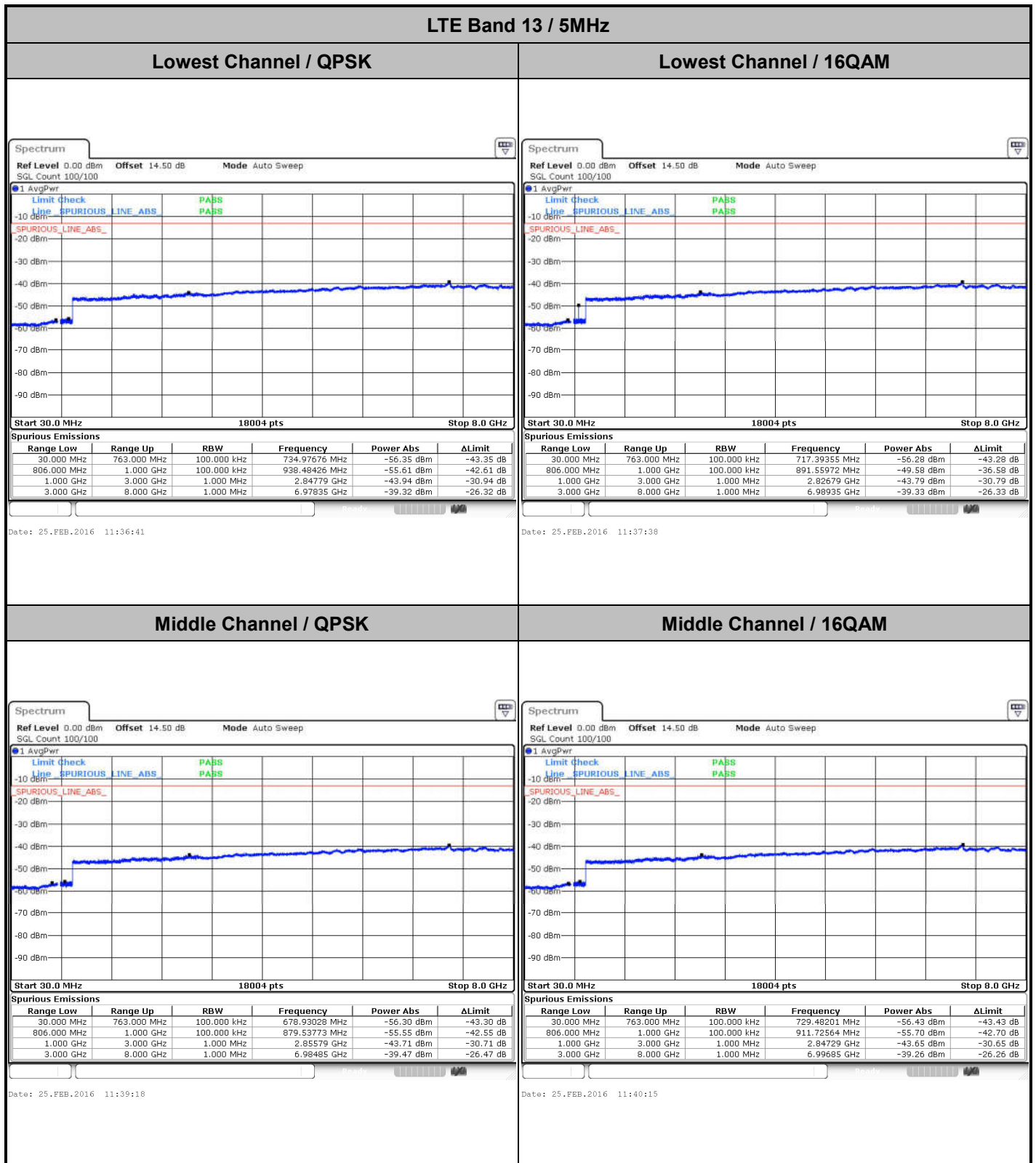
Date: 25.FEB.2016 11:51:56

**LTE Band 13 / 10MHz / 16QAM****Band Edge / Full RB**

Date: 25.FEB.2016 11:53:07



## Conducted Spurious Emission

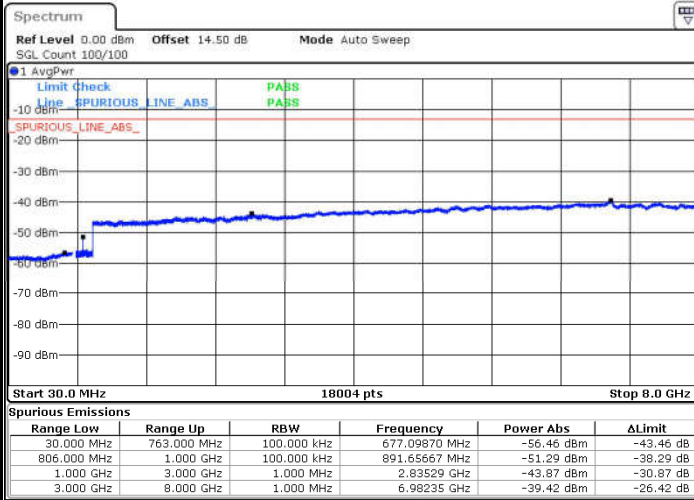






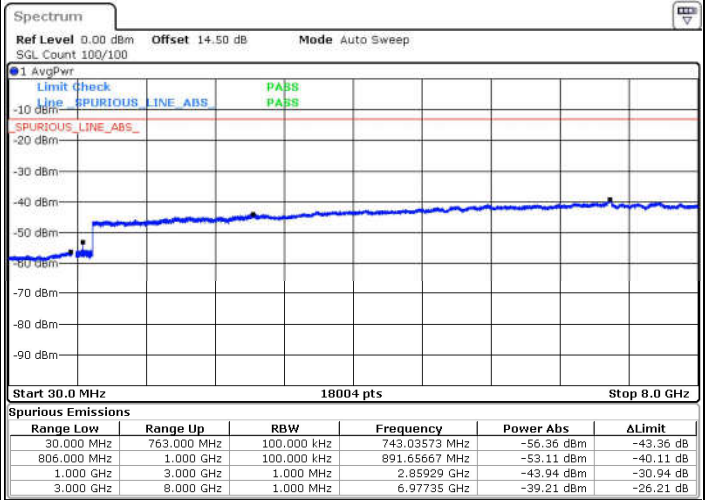
## LTE Band 13 / 5MHz

## Highest Channel / QPSK



Date: 25.FEB.2016 11:46:41

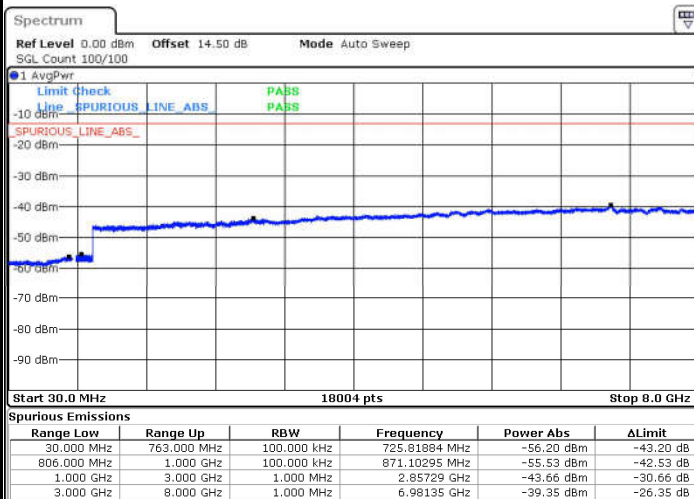
## Highest Channel / 16QAM



Date: 25.FEB.2016 11:47:39

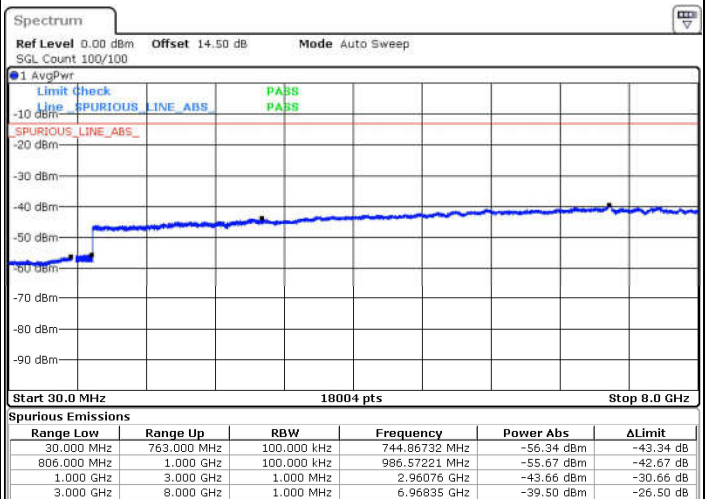
## LTE Band 13 / 10MHz

## Middle Channel / QPSK



Date: 25.FEB.2016 11:56:26

## Middle Channel / 16QAM



Date: 25.FEB.2016 11:57:23

**Frequency Stability**

Test Conditions		LTE Band 13 (QPSK) / Middle Channel	Limit
Temperature (°C)	Voltage (Volt)	BW 10MHz	Note 2.
		Deviation (ppm)	Result
50	Normal Voltage	0.0256	PASS
40	Normal Voltage	0.0217	
30	Normal Voltage	0.0192	
20(Ref.)	Normal Voltage	0.0000	
10	Normal Voltage	0.0230	
0	Normal Voltage	0.0205	
-10	Normal Voltage	0.0038	
-20	Normal Voltage	0.0269	
-30	Normal Voltage	0.0281	
20	Maximum Voltage	0.0217	
20	Normal Voltage	0.0205	
20	Battery End Point	0.0243	

**Note:**

1. Normal Voltage = 3.7 V. ; Battery End Point (BEP) = 3.4 V. ; Maximum Voltage =4.2 V
2. Note: The frequency fundamental emissions stay within the authorized frequency block based on the frequency deviation measured is small.



## Appendix B. Test Results of Radiated Test

**ERP**

LTE Band 13 / 5MHz (Average)							
Channel	Modulation	RB		Horizontal		Vertical	
		Size	Offset	ERP(dBm)	ERP(W)	ERP(dBm)	ERP(W)
Lowest	QPSK	1	12	20.66	0.1164	7.82	0.0061
Middle		1	12	20.96	0.1247	8.06	0.0064
Highest		1	24	20.69	0.1172	8.75	0.0075
Lowest	16QAM	1	24	20.52	0.1127	7.95	0.0062
Middle		1	0	20.84	0.1213	8.19	0.0066
Highest		1	24	20.56	0.1138	8.68	0.0074
Limit	ERP < 3W			Result		PASS	

LTE Band 13 / 10MHz (Average)							
Channel	Modulation	RB		Horizontal		Vertical	
		Size	Offset	ERP(dBm)	ERP(W)	ERP(dBm)	ERP(W)
Lowest	QPSK	-	-	-	-	-	-
Middle		1	0	20.75	0.1189	7.99	0.0063
Highest		-	-	-	-	-	-
Lowest	16QAM	-	-	-	-	-	-
Middle		1	0	20.89	0.1227	8.48	0.0070
Highest		-	-	-	-	-	-
Limit	ERP < 3W			Result		PASS	



**Radiated Spurious Emission**

LTE Band 13 / 5MHz / QPSK / RB Size 1 Offset 0									
Channel	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)
Middle	1559.5	-54.37	-40	-14.37	-58.22	-59.49	0.88	6.00	H
	2339.25	-41.10	-13	-28.10	-48.13	-43.71	1.08	5.84	H
	3119	-57.89	-13	-44.89	-65.77	-62.26	1.14	7.66	H
	1559.5	-55.67	-40	-15.67	-59.94	-60.79	0.88	6.00	V
	2339.25	-46.89	-13	-33.89	-53.04	-49.50	1.08	5.84	V
	3119	-58.83	-13	-45.83	-66.73	-63.20	1.14	7.66	V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

LTE Band 13 / 10MHz / QPSK / RB Size 1 Offset 0									
Channel	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)
Middle	1555.18	-55.63	-13	-42.63	-57.33	-58.60	0.88	6.00	H
	2332.77	-36.31	-13	-23.31	-43.87	-38.92	1.08	5.84	H
	3110.36	-57.37	-13	-44.37	-65.25	-61.74	1.14	7.66	H
	1555.18	-55.71	-13	-42.71	-57.83	-58.68	0.88	6.00	V
	2332.77	-49.98	-13	-36.98	-55.33	-52.59	1.08	5.84	V
	3110.36	-57.10	-13	-44.10	-65.00	-61.47	1.14	7.66	V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.