



# FCC RF Test Report

**APPLICANT** : ASUSTeK COMPUTER INC.  
**EQUIPMENT** : ASUS Phone  
**BRAND NAME** : ASUS  
**MODEL NAME** : ASUS\_Z016D  
**FCC ID** : MSQZ016D  
**STANDARD** : FCC 47 CFR Part 2, 27  
**CLASSIFICATION** : PCS Licensed Transmitter Held to Ear (PCE)

The product was received on Apr. 19, 2016 and completely tested on Aug. 05, 2016. We, SPORTON INTERNATIONAL 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 INC., the test report shall not be reproduced except in full.

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager



**SPORTON INTERNATIONAL INC.**

No. 52, Hwa Ya 1<sup>st</sup> Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.



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APPENDIX A. TEST RESULTS OF CONDUCTED TEST

APPENDIX B. TEST RESULTS OF RADIATED TEST

APPENDIX C. TEST SETUP PHOTOGRAPHS





SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.4	§2.1046	Conducted Output Power	Reporting Only	PASS	-
-	-	Peak-to-Average Ratio	<13dB	N/A	Reporting only
3.5	§27.50 (a)(3)	EIRP Power Density	EIRP < 250mW/5MHz	PASS	-
3.6	§2.1049	Occupied Bandwidth	Reporting Only	PASS	-
3.7	§2.1051 §27.53 (a)(4)	Conducted Band Edge Measurement	Refer standard	PASS	-
3.8	§2.1051 §27.53 (a)(4)	Conducted Spurious Emission	< 70+10log <sub>10</sub> (P[Watts])	PASS	-
3.9	§2.1055 §27.54	Frequency Stability Temperature & Voltage	Within the band	PASS	-
4.4	§2.1053 §27.53 (a)(4)	Radiated Spurious Emission	< 70+10log <sub>10</sub> (P[Watts])	PASS	Under limit 7.02 dB at 9222.000 MHz



# 1 General Description

## 1.1 Applicant

ASUSTeK COMPUTER INC.

4F, No. 150, LI-TE RD., PEITOU, TAIPEI, TAIWAN

## 1.2 Manufacturer

COTEK ELECTRONICS (SUZHOU) CO., LTD.

No. 288, Mayun Road, Suzhou New District, Jiangsu, PRC

## 1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	ASUS Phone
Brand Name	ASUS
Model Name	ASUS_Z016D
FCC ID	MSQZ016D
EUT supports Radios application	CDMA/EV-DO /GSM/EGPRS/WCDMA/HSPA/LTE/NFC WLAN 11a/b/g/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 Bluetooth v4.2 BR/EDR/LE
HW Version	REV2.0
SW Version	4.0.20.270
EUT Stage	Production Unit

## 1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx Frequency	LTE Band 30 : 2305 MHz ~ 2315 MHz
RX Frequency	LTE Band 30 : 2350 MHz ~ 2360 MHz
Bandwidth	LTE Band 30 : 5MHz / 10MHz
Maximum Output Power to Antenna	LTE Band 30 : 17.51 dBm
Antenna Gain	<Bottom Antenna> LTE Band 30 : -4.2 dBi

## 1.5 Modification of EUT

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



### 1.6 Maximum Frequency Tolerance, Maximum conducted power, and Emission Designator

LTE Band 30	QPSK			16QAM		
	Emission Designator (99%OBW)	Maximum conducted power	Frequency Tolerance (ppm)	Emission Designator (99%OBW)	Maximum conducted power	Frequency Tolerance (ppm)
5	4M50G7D	17.37	-	4M52W7D	16.63	-
10	9M01G7D	17.51	0.0091	9M05W7D	16.85	-

## 1.7 Testing Site

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1022 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

<b>Test Site</b>	SPORTON INTERNATIONAL INC.
<b>Test Site Location</b>	No. 52, Hwa Ya 1 <sup>st</sup> Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-327-3456 ; FAX: +886-3-328-4978
<b>Test Site No.</b>	<b>Sporton Site No.</b>
	TH05-HY

<b>Test Site</b>	SPORTON INTERNATIONAL INC.
<b>Test Site Location</b>	No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd. Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-327-0855
<b>Test Site No.</b>	<b>Sporton Site No.</b>
	03CH11-HY

## 1.8 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 27(D)
- ♦ ANSI / TIA / EIA-603
- ♦ FCC KDB 971168 Power Meas License Digital Systems D01 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

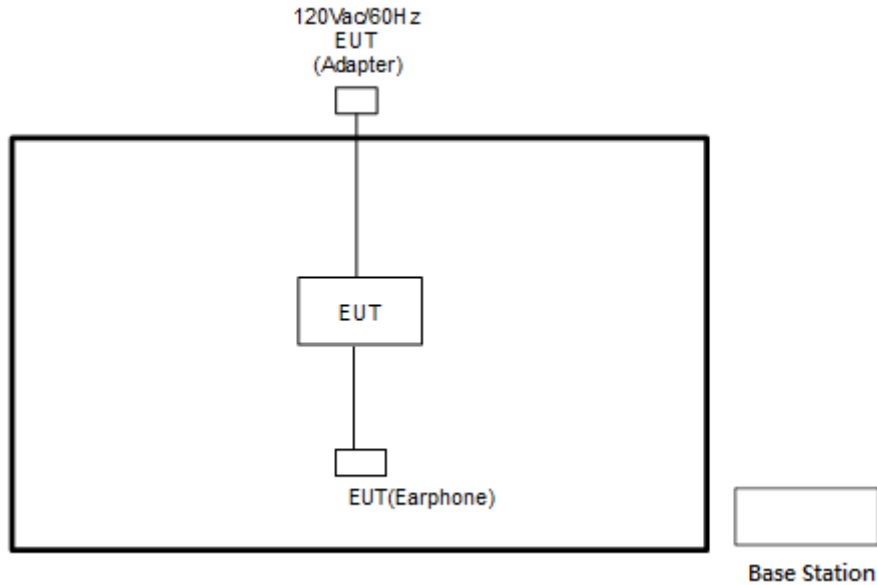
Antenna port conducted and radiated test items listed below are performed according to KDB 971168 D01 Power Meas. License Digital Systems v02r02 with maximum output power.

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

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	30	-	-	v	v	-	-	v	v	v	v	v	v	v	v
Peak-to-Average Ratio	30	-	-		v	-	-	v	v	v		v		v	
E.I.R.P PSD	30	-	-	v	v	-	-	v	v	v			v	v	v
26dB and 99% Bandwidth	30	-	-	v	v	-	-	v	v			v	v	v	v
Conducted Band Edge	30	-	-	v	v	-	-	v	v	v		v	v		v
Conducted Spurious Emission	30	-	-	v	v	-	-	v	v	v			v	v	v
Frequency Stability	30	-	-	v	v	-	-	v				v		v	
Radiated Spurious Emission	30	-	-	v	v	-	-	v		v			v	v	v
Note	<ol style="list-style-type: none"> <li>The mark "v" means that this configuration is chosen for testing</li> <li>The mark "-" means that this bandwidth is not supported.</li> <li>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.</li> </ol>														



## 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.	System Simulator	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 :

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\ &= 4.2 + 10 = 14.2 \text{ (dB)} \end{aligned}$$

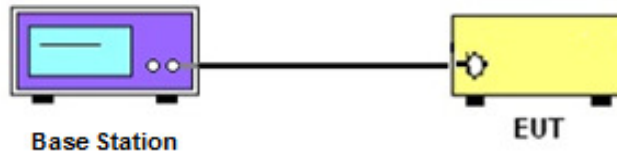
### 3 Conducted Test Items

#### 3.1 Measuring Instruments

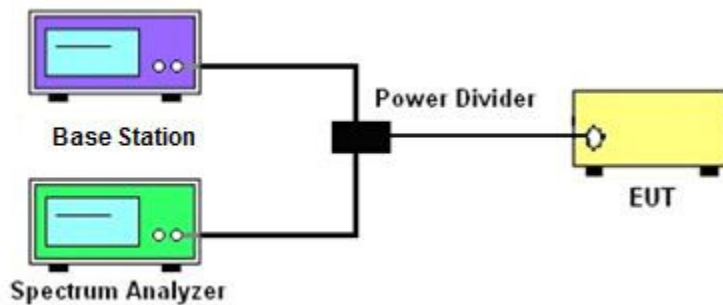
See list of measuring instruments of this test report.

#### 3.2 Test Setup

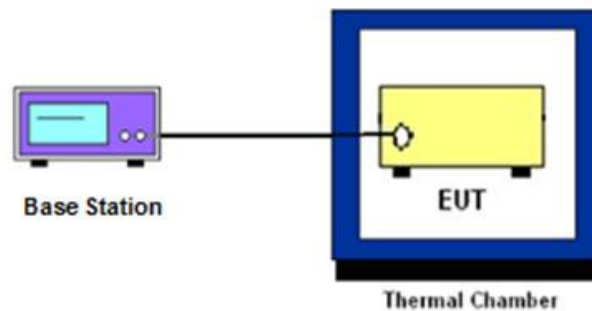
##### 3.2.1 Conducted Output Power



##### 3.2.2 Peak-to-Average Ratio, Occupied / 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.



## **3.5 EIRP Power Density**

### **3.5.1 Description of EIRP Power Density**

For mobile and portable stations transmitting in the 2305-2315 MHz band or the 2350-2360 MHz band, the average EIRP must not exceed 50 milliwatts within any 1 megahertz of authorized bandwidth, *except that* for mobile and portable stations compliant with 3GPP LTE standards or another advanced mobile broadband protocol that avoids concentrating energy at the edge of the operating band the average EIRP must not exceed 250 milliwatts within any 5 megahertz of authorized bandwidth but may exceed 50 milliwatts within any 1 megahertz of authorized bandwidth. For mobile and portable stations using time division duplexing (TDD) technology, the duty cycle must not exceed 38 percent in the 2305-2315 MHz and 2350-2360 MHz bands. Mobile and portable stations using FDD technology are restricted to transmitting in the 2305-2315 MHz band. Power averaging shall not include intervals in which the transmitter is off.

### **3.5.2 Test Procedures**

1. Set instrument center frequency to OBW center frequency.
2. Set span to at least 1.5 times the OBW.
3. Set the RBW to the specified reference bandwidth (often 1 MHz).
4. Set VBW  $\geq 3 \times$  RBW.
5. Detector = RMS (power averaging).
6. Ensure that the number of measurement points in the sweep  $\geq 2 \times$  span/RBW.
7. Sweep time = auto couple.
8. Employ trace averaging (RMS) mode over a minimum of 100 traces.
9. Use the peak marker function to determine the maximum amplitude level within the reference bandwidth (PSD).



## **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 26dB 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 26 dB.

The 26 dB emission bandwidth(EBW) 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 EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The 26dB and 99% occupied bandwidth (BW) of the middle channel for the highest RF powers with full RB sizes were measured.



### 3.7 Conducted Band Edge Measurement

#### 3.7.1 Description of Conducted Band Edge Measurement

27.53 (a)(4)

For mobile and portable stations operating in the 2305-2315 MHz and 2350-2360 MHz bands:

(i) By a factor of not less than:  $43 + 10 \log (P)$  dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than  $55 + 10 \log (P)$  dB on all frequencies between 2320 and 2324 MHz and on all frequencies between 2341 and 2345 MHz, not less than  $61 + 10 \log (P)$  dB on all frequencies between 2324 and 2328 MHz and on all frequencies between 2337 and 2341 MHz, and not less than  $67 + 10 \log (P)$  dB on all frequencies between 2328 and 2337 MHz;

(ii) By a factor of not less than  $43 + 10 \log (P)$  dB on all frequencies between 2300 and 2305 MHz,  $55 + 10 \log (P)$  dB on all frequencies between 2296 and 2300 MHz,  $61 + 10 \log (P)$  dB on all frequencies between 2292 and 2296 MHz,  $67 + 10 \log (P)$  dB on all frequencies between 2288 and 2292 MHz, and  $70 + 10 \log (P)$  dB below 2288 MHz;

(iii) By a factor of not less than  $43 + 10 \log (P)$  dB on all frequencies between 2360 and 2365 MHz, and not less than  $70 + 10 \log (P)$  dB above 2365 MHz.

#### 3.7.2 Test Procedures

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The band edges of low and high channels were measured with  $RBW \geq 1\%$  EBW set in Spectrum Analyzer, while the EUT was transmitting under maximum power.
3. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
4. The limit line is derived from  $43 + 10\log(P)$ dB below the transmitter power P(Watts)  
 $= P(W) - [43 + 10\log(P)] (dB) = [30 + 10\log(P)] (dBm) - [43 + 10\log(P)] (dB) = -13dBm.$



### 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  $70 + 10 \log (P)$  dB.

It is measured by means of a calibrated spectrum analyzer and scanned from 9 kHz up to a frequency including its 10<sup>th</sup> 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 RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
7. The limit line is derived from  $70 + 10\log(P)$ dB below the transmitter power P(Watts)  
=  $P(W) - [70 + 10\log(P)]$  (dB)  
=  $[30 + 10\log(P)]$  (dBm) -  $[70 + 10\log(P)]$  (dB)  
= -40dBm.



## **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  $\pm 0.00025\%$  ( $\pm 2.5\text{ppm}$ ) 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  $-30^{\circ}\text{C}$  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  $10^{\circ}\text{C}$  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 EUT was placed in a temperature chamber at  $25\pm 5^{\circ}\text{C}$  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.



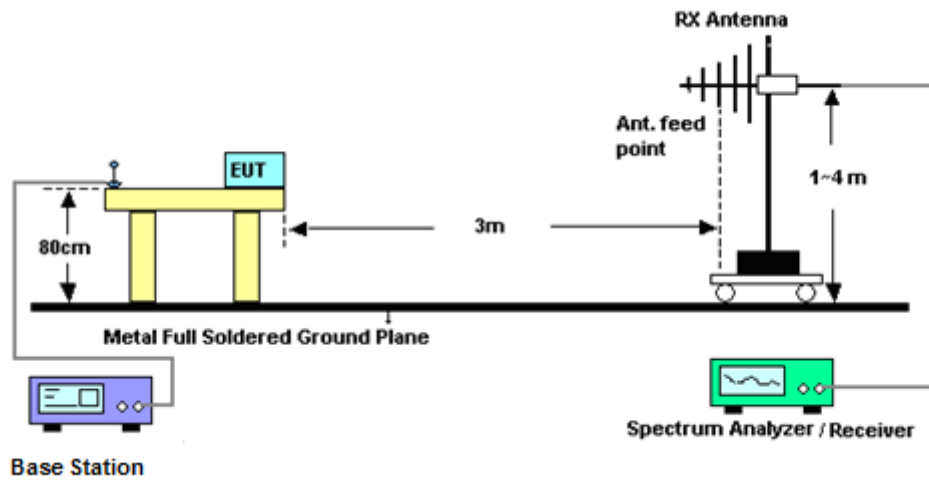
## 4 Radiated Test Items

### 4.1 Measuring Instruments

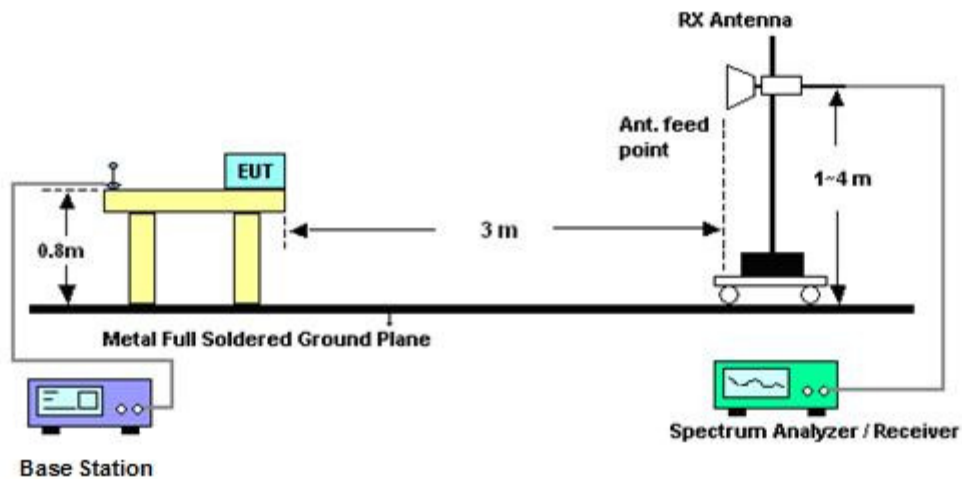
See list of measuring instruments of this test report.

### 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  $70 + 10 \log (P)$  dB.

### 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  $70 + 10\log(P)$ dB below the transmitter power P(Watts)  
= P(W)- [70 + 10log(P)] (dB)  
= [30 + 10log(P)] (dBm) - [70 + 10log(P)] (dB)  
= -40dBm.

11. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain



## 5 List of Measuring Equipment

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. 16, 2015	Apr. 19, 2016 ~ Aug. 05, 2016	Oct. 15, 2016	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSV30	100895	9kHz~30GHz	Apr. 27, 2015	Apr. 19, 2016 ~ Aug. 25, 2016	Apr. 26, 2016	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSV30	100895	9kHz~30GHz	Apr. 26, 2016	Apr. 26, 2016 ~ Aug. 05, 2016	Apr. 25, 2017	Conducted (TH05-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY54130085	20Hz ~ 8.4GHz	Nov. 04, 2015	Apr. 19, 2016 ~ Aug. 05, 2016	Nov. 03, 2016	Conducted (TH05-HY)
Temperature Chamber	ESPEC	SH-641	92013720	-30°C ~70°C	Sep. 08, 2015	Apr. 19, 2016 ~ Aug. 05, 2016	Sep. 07, 2016	Conducted (TH05-HY)
Programmable Power Supply	GW Instek	PSS-2005	EL890089	1V~20V 0.5A~5A	Jan. 18, 2016	Apr. 19, 2016 ~ Aug. 05, 2016	Jan. 17, 2017	Conducted (TH05-HY)
Amplifier	SONOMA	310N	187312	9kHz~1GHz	Nov. 20, 2015	Jul. 13, 2016 ~ Jul. 28, 2016	Nov. 19, 2016	Radiation (03CH11-HY)
Bilog Antenna	TESEQ	CBL 6111D	35414	30MHz~1GHz	Nov. 17, 2015	Jul. 13, 2016 ~ Jul. 28, 2016	Nov. 16, 2016	Radiation (03CH11-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1326	1GHz ~ 18GHz	Oct. 08, 2015	Jul. 13, 2016 ~ Jul. 28, 2016	Oct. 07, 2016	Radiation (03CH11-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200486	10Hz ~ 44GHZ	Sep. 24, 2015	Jul. 13, 2016 ~ Jul. 28, 2016	Sep. 23, 2016	Radiation (03CH11-HY)
Antenna Mast	EMEC	AM-BS-450 0-B	N/A	1~4m	N/A	Jul. 13, 2016 ~ Jul. 28, 2016	N/A	Radiation (03CH11-HY)
Turn Table	EMEC	TT 2000	N/A	0~360 Degree	N/A	Jul. 13, 2016 ~ Jul. 28, 2016	N/A	Radiation (03CH11-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170576	18GHz ~ 40GHz	Apr. 15, 2016	Jul. 13, 2016 ~ Jul. 28, 2016	Apr. 14, 2017	Radiation (03CH11-HY)
Bilog Antenna	TESEQ	CBL 6111D	40103	30MHz to 1GHz	Jan. 13, 2016	Jul. 13, 2016 ~ Jul. 28, 2016	Jan. 12, 2017	Radiation (03CH11-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1522	1G~18GHz	Mar. 31, 2016	Jul. 13, 2016 ~ Jul. 28, 2016	Mar. 30, 2017	Radiation (03CH11-HY)
Preamplifier	MITEQ	TTA0204	1872107	2GHz~40GHz	Feb. 15, 2016	Jul. 13, 2016 ~ Jul. 28, 2016	Feb. 14, 2017	Radiation (03CH11-HY)
Signal Generator	Rohde & Schwarz	SMF100A	101107	100kHz~40GHz	May 19, 2016	Jul. 13, 2016 ~ Jul. 28, 2016	May 18, 2017	Radiation (03CH11-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Sep. 02, 2015	Jul. 13, 2016 ~ Jul. 28, 2016	Sep. 01, 2016	Radiation (03CH11-HY)



## 6 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	3.37
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### Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	4.03
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## **Appendix A. Test Results of Conducted Test**

### **Conducted Output Power(Average power)**



LTE Band 30 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
10	1	0	QPSK	-	17.51	-
10	1	25		-	17.32	-
10	1	49		-	17.32	-
10	25	0		-	16.55	-
10	25	12		-	16.43	-
10	25	25		-	16.47	-
10	50	0		-	16.54	-
10	1	0	16-QAM	-	16.85	-
10	1	25		-	16.63	-
10	1	49		-	16.61	-
10	25	0		-	15.56	-
10	25	12		-	15.43	-
10	25	25		-	15.46	-
10	50	0		-	15.61	-
5	1	0	QPSK	17.29	17.37	17.29
5	1	12		17.25	17.20	17.26
5	1	24		17.28	17.29	17.23
5	12	0		16.30	16.32	16.35
5	12	7		16.27	16.29	16.32
5	12	13		16.38	16.29	16.29
5	25	0		16.30	16.28	16.31
5	1	0	16-QAM	16.57	16.63	16.62
5	1	12		16.52	16.56	16.54
5	1	24		16.51	16.56	16.49
5	12	0		15.36	15.39	15.39
5	12	7		15.34	15.32	15.40
5	12	13		15.44	15.33	15.31
5	25	0		15.32	15.30	15.34



## LTE Band 30

### Peak-to-Average Ratio

Mode	LTE Band 30 / 10MHz				
Mod.	QPSK		16QAM		Limit: 13dB
RB Size	1RB	Full RB	1RB	Full RB	Result
Middle CH	4.26	4.75	4.9	5.68	PASS



LTE Band 30 / 10MHz / QPSK

Middle Channel / 1RB



Date: 27\_JUL\_2016 18:58:22

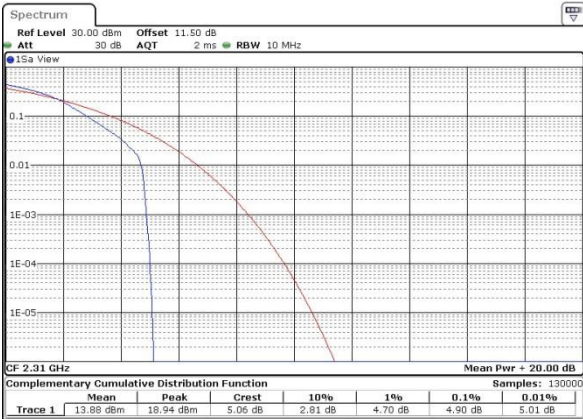
Middle Channel / Full RB



Date: 27\_JUL\_2016 18:58:35

LTE Band 30 / 10MHz / 16QAM

Middle Channel / 1RB



Date: 27\_JUL\_2016 18:58:01

Middle Channel / Full RB



Date: 27\_JUL\_2016 18:58:12





**EIRP Power Density**

Mode	LTE Band 30 : Conducted Power Density (dBm/5MHz)											
	1.4MHz		3MHz		5MHz		10MHz		15MHz		20MHz	
BW	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Lowest CH	-	-	-	-	17.83	17.05	-	-	-	-	-	-
Middle CH	-	-	-	-	17.69	16.86	17.85	17.13	-	-	-	-
Highest CH	-	-	-	-	17.72	16.84	-	-	-	-	-	-

Mode	LTE Band 30 : EIRP Power Density (dBm/5MHz)											
	1.4MHz		3MHz		5MHz		10MHz		15MHz		20MHz	
BW	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Lowest CH	-	-	-	-	16.63	15.85	-	-	-	-	-	-
Middle CH	-	-	-	-	16.49	15.66	16.65	15.93	-	-	-	-
Highest CH	-	-	-	-	16.52	15.64	-	-	-	-	-	-
Antenna Gain	-1.2 dBi											
Limit	250mW / 5MHz = 24dBm / 5MHz											
Result	Pass											



LTE Band 30 / 5MHz

Lowest Channel / 5MHz / 1RB0 / QPSK



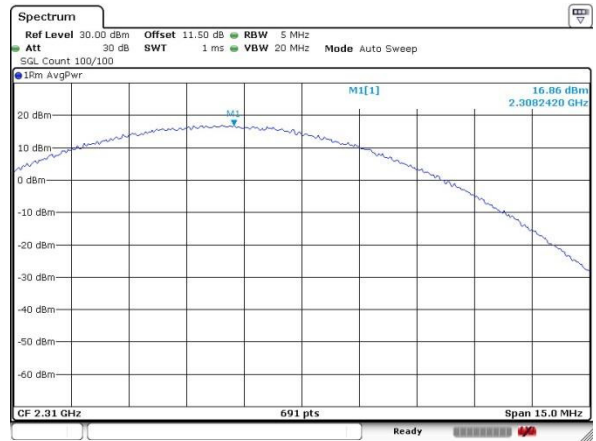
Lowest Channel / 5MHz / 1RB0 / 16QAM



Middle Channel / 5MHz / 1RB0 / QPSK



Middle Channel / 5MHz / 1RBmax / 16QAM



Highest Channel / 5MHz / Full RB / QPSK



Highest Channel / 5MHz / Full RB / 16QAM





LTE Band 30 / 10MHz

Lowest Channel / 10MHz / 1RB0 / QPSK

Lowest Channel / 10MHz / 1RB0 / 16QAM





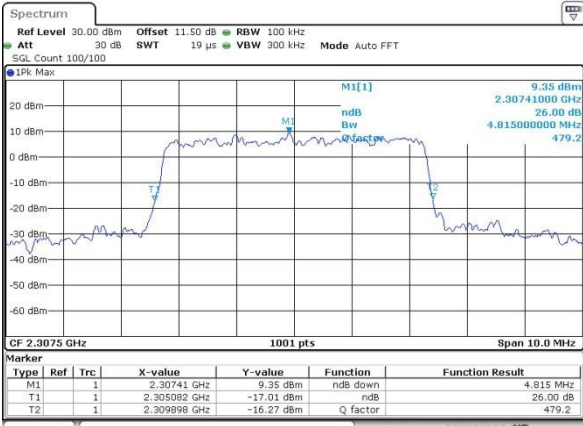
**26dB Bandwidth**

Mode	LTE Band 30 : 26dB BW(MHz)											
	1.4MHz		3MHz		5MHz		10MHz		15MHz		20MHz	
BW												
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Lowest CH	-	-	-	-	4.82	4.89	-	-	-	-	-	-
Middle CH	-	-	-	-	4.93	4.92	9.71	9.67	-	-	-	-
Highest CH	-	-	-	-	4.87	4.82	-	-	-	-	-	-



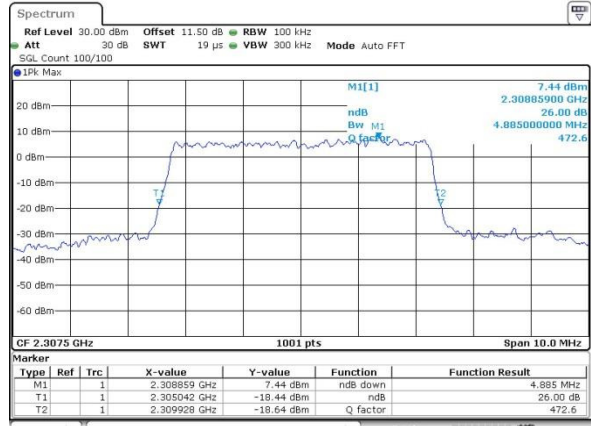
LTE Band 30

Lowest Channel / 5MHz / QPSK



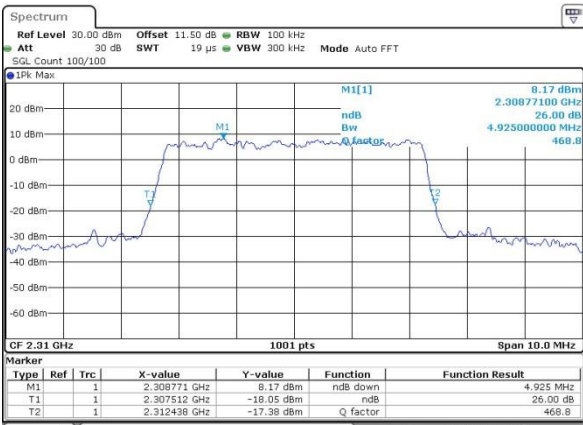
Date: 27.JUL.2016 18:38:59

Lowest Channel / 5MHz / 16QAM



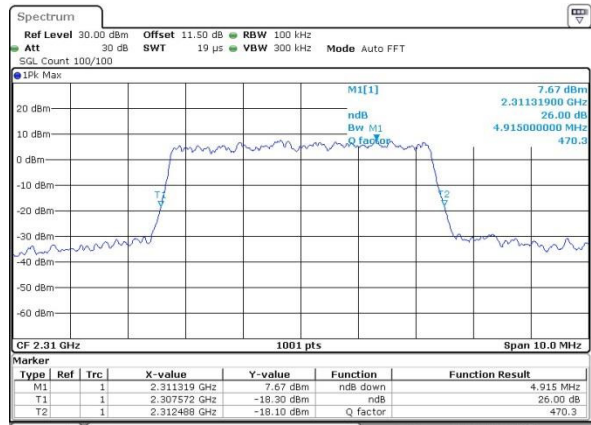
Date: 27.JUL.2016 18:39:10

Middle Channel / 5MHz / QPSK



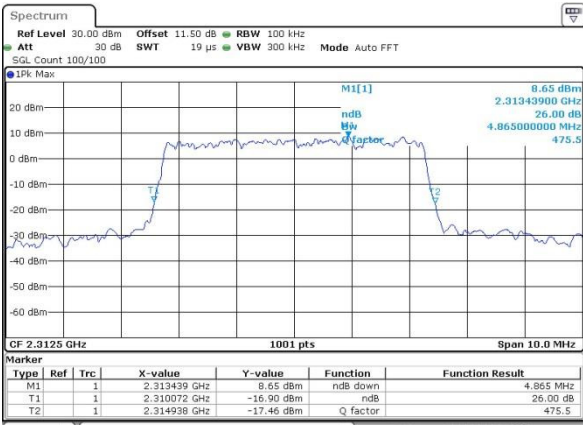
Date: 27.JUL.2016 18:42:58

Middle Channel / 5MHz / 16QAM



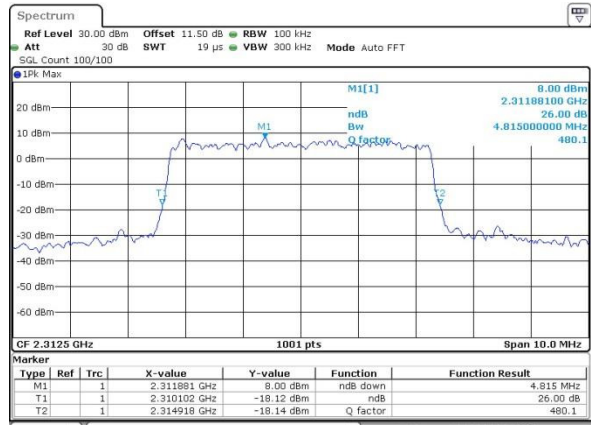
Date: 27.JUL.2016 18:43:09

Highest Channel / 5MHz / QPSK



Date: 27.JUL.2016 18:45:36

Highest Channel / 5MHz / 16QAM

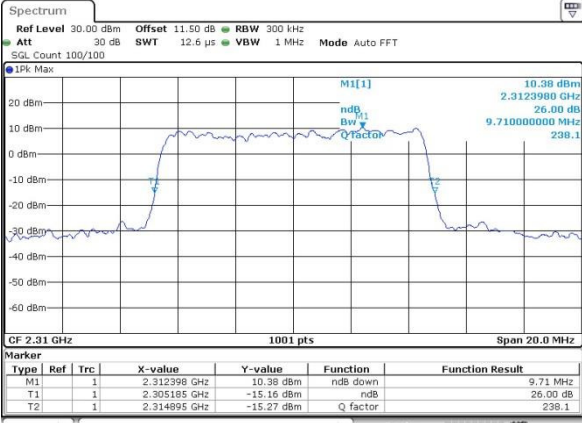


Date: 27.JUL.2016 18:45:48



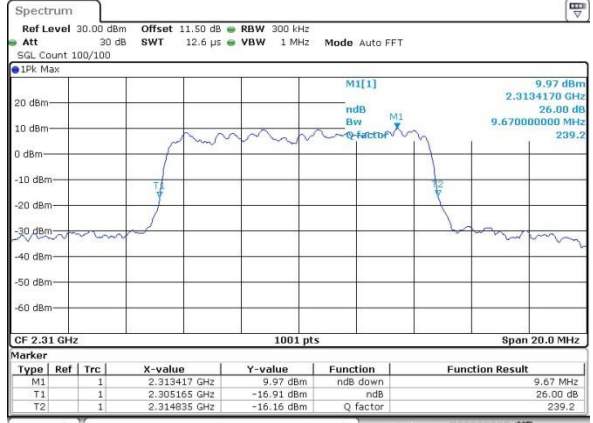
LTE Band 30

Middle Channel / 10MHz / QPSK



Date: 27\_JUL\_2016 18:54:43

Middle Channel / 10MHz / 16QAM



Date: 27\_JUL\_2016 18:54:55



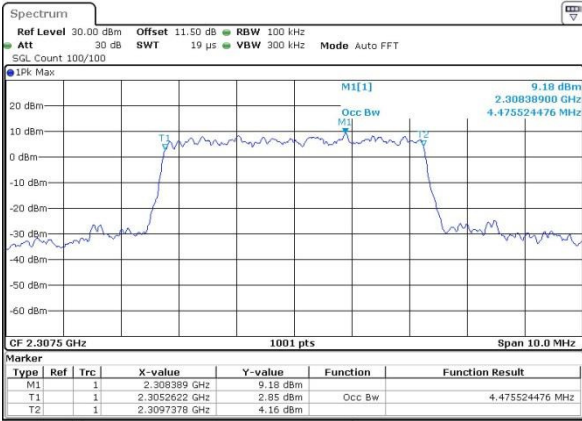
### Occupied Bandwidth

Mode	LTE Band 30 : 99%OBW(MHz)											
	1.4MHz		3MHz		5MHz		10MHz		15MHz		20MHz	
BW												
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Lowest CH	-	-	-	-	4.48	4.52	-	-	-	-	-	-
Middle CH	-	-	-	-	4.49	4.5	9.01	9.05	-	-	-	-
Highest CH	-	-	-	-	4.5	4.49	-	-	-	-	-	-



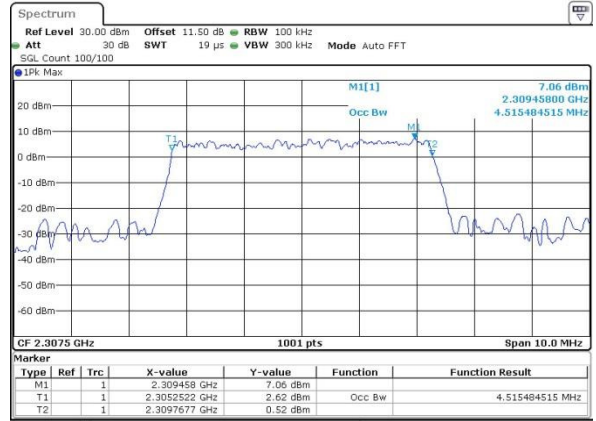
LTE Band 30

Lowest Channel / 5MHz / QPSK



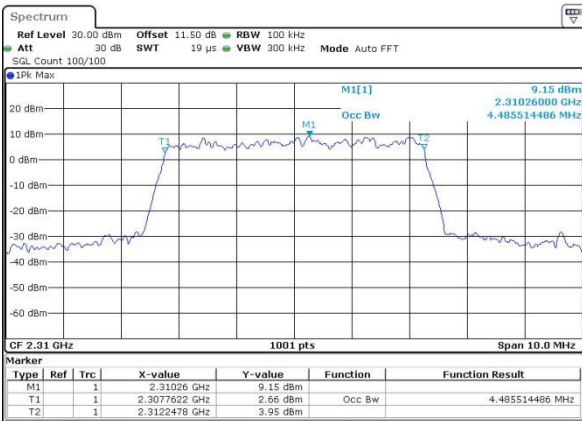
Date: 27.JUL.2016 18:38:33

Lowest Channel / 5MHz / 16QAM



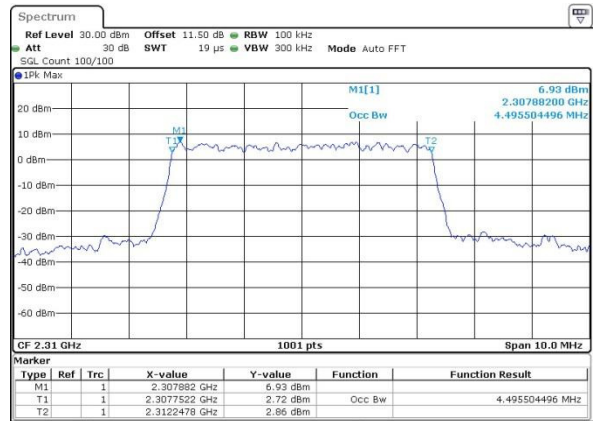
Date: 27.JUL.2016 18:38:45

Middle Channel / 5MHz / QPSK



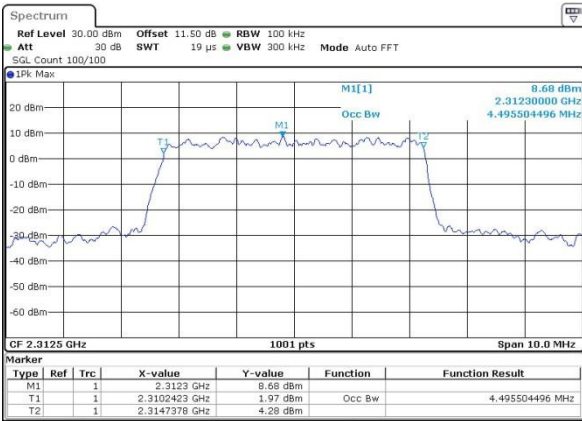
Date: 27.JUL.2016 18:42:34

Middle Channel / 5MHz / 16QAM



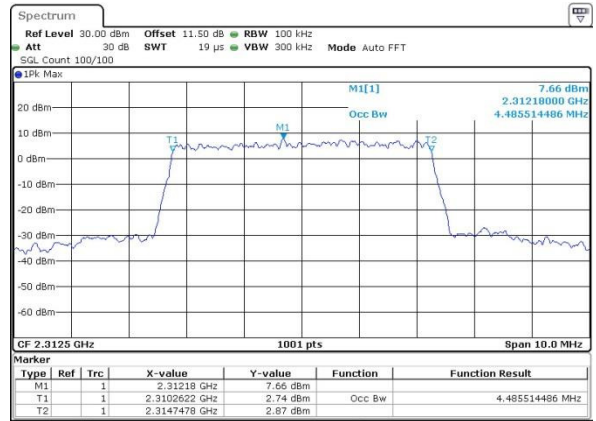
Date: 27.JUL.2016 18:42:46

Highest Channel / 5MHz / QPSK



Date: 27.JUL.2016 18:45:12

Highest Channel / 5MHz / 16QAM



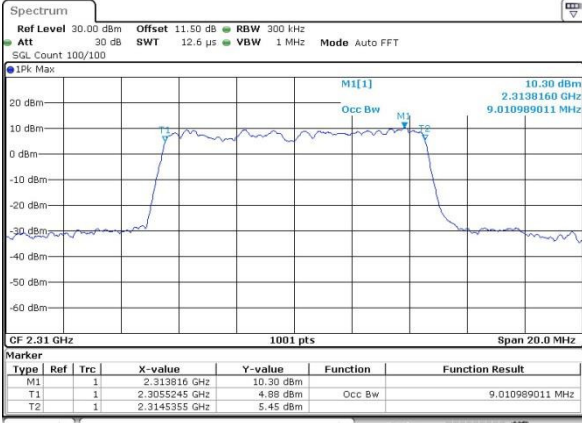
Date: 27.JUL.2016 18:45:24





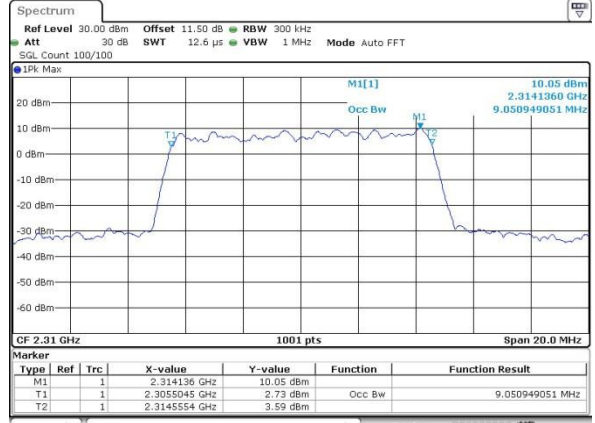
LTE Band 30

Middle Channel / 10MHz / QPSK



Date: 27.JUL.2016 18:54:20

Middle Channel / 10MHz / 16QAM



Date: 27.JUL.2016 18:54:31



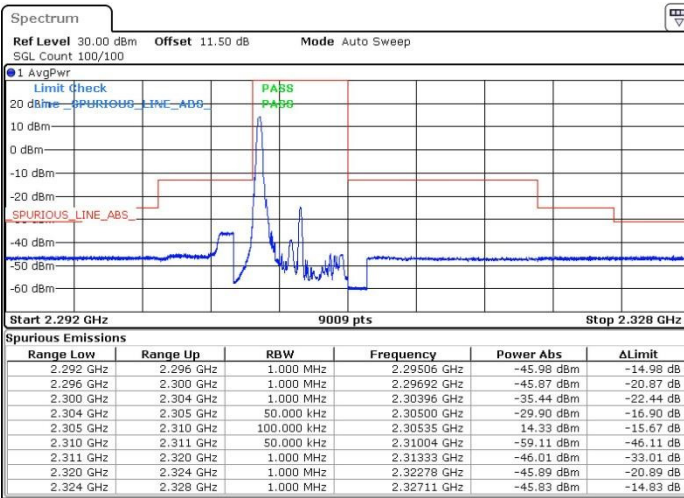
**Conducted Band Edge**



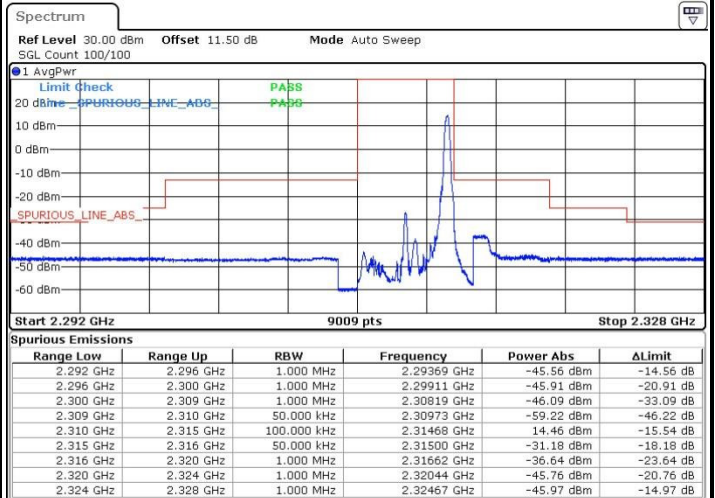
LTE Band 30 / 5MHz / QPSK

Lowest Band Edge / 1 RB

Highest Band Edge / 1 RB



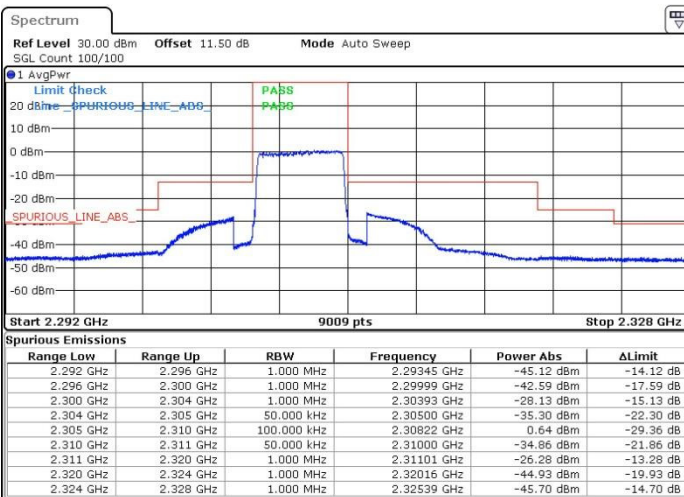
Date: 27.JUL.2016 17:31:14



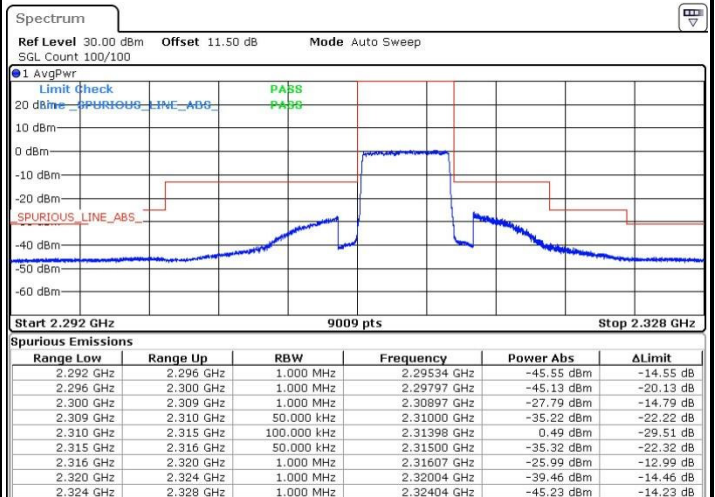
Date: 27.JUL.2016 18:46:59

Lowest Band Edge / Full RB

Highest Band Edge / Full RB



Date: 27.JUL.2016 17:33:36



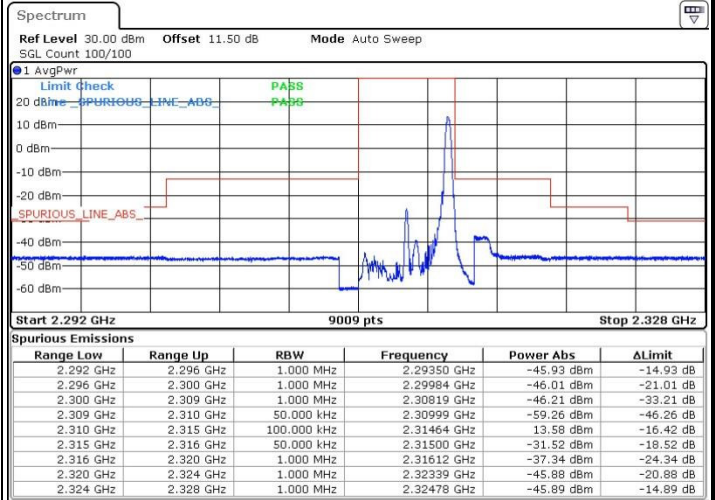
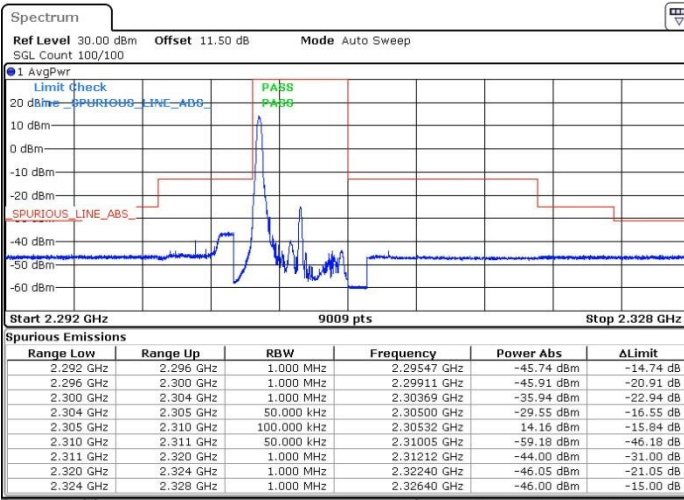
Date: 27.JUL.2016 18:49:22



LTE Band 30 / 5MHz / 16QAM

Lowest Band Edge / 1RB

Highest Band Edge / 1 RB

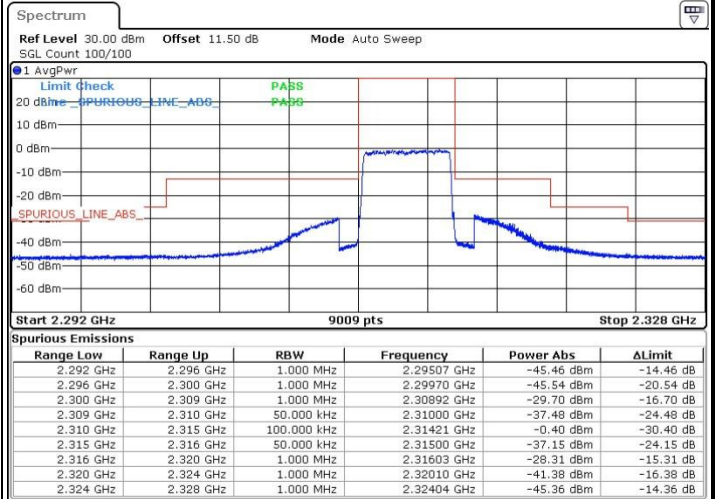
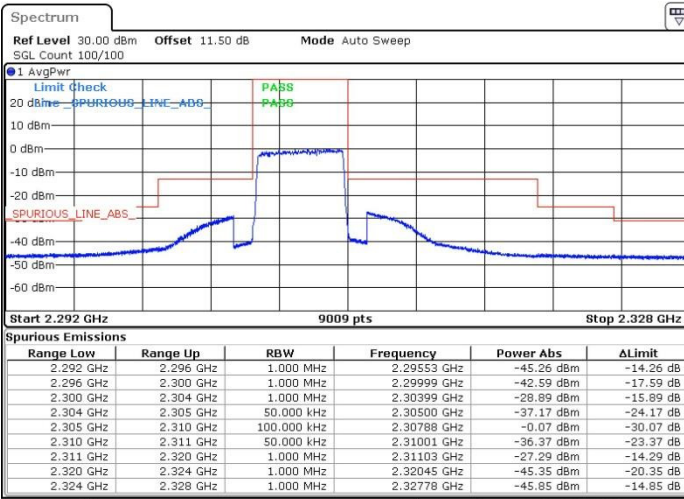


Date: 27.JUL.2016 17:32:25

Date: 27.JUL.2016 18:48:11

Lowest Band Edge / Full RB

Highest Band Edge / Full RB



Date: 27.JUL.2016 17:34:48

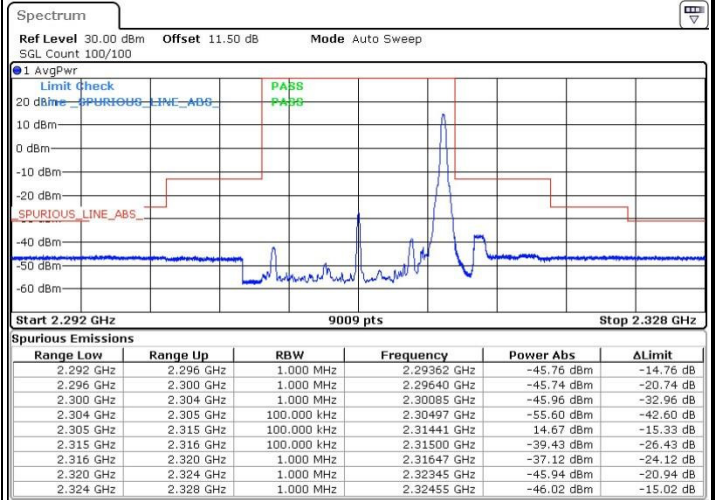
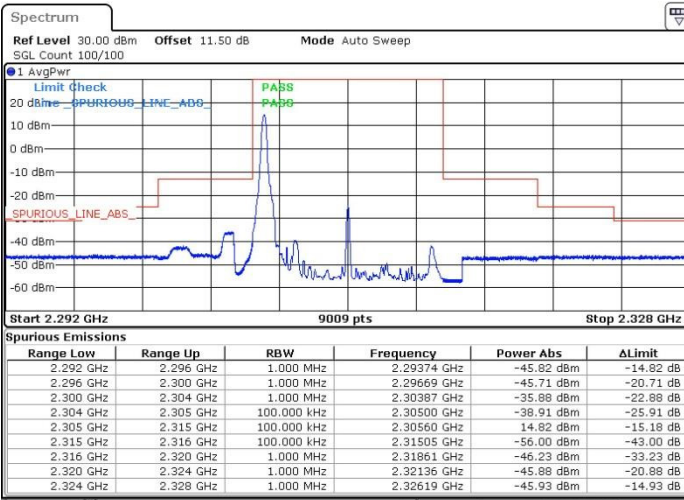
Date: 27.JUL.2016 18:50:33



LTE Band 30 / 10MHz / QPSK

Lowest Band Edge / 1 RB

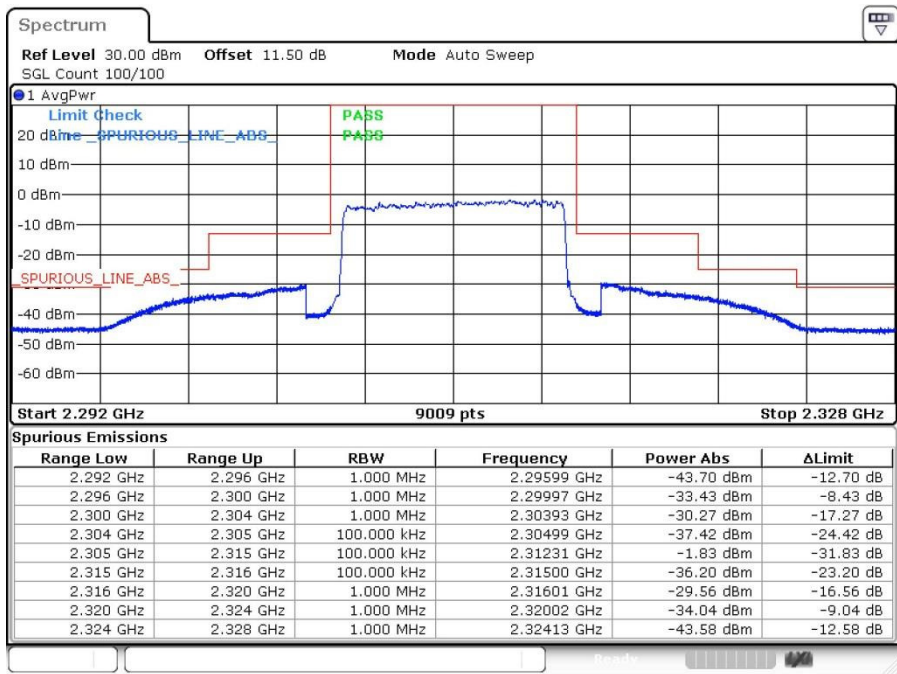
Highest Band Edge / 1 RB



Date: 27.JUL.2016 19:03:12

Date: 27.JUL.2016 19:05:35

Band Edge / Full RB



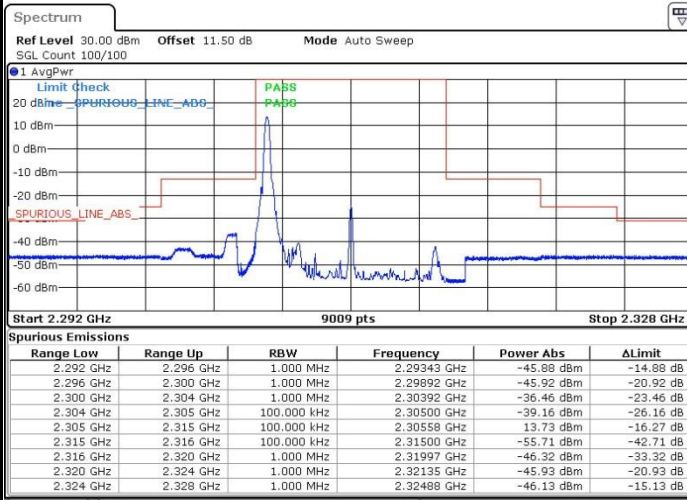
Date: 27.JUL.2016 19:07:57





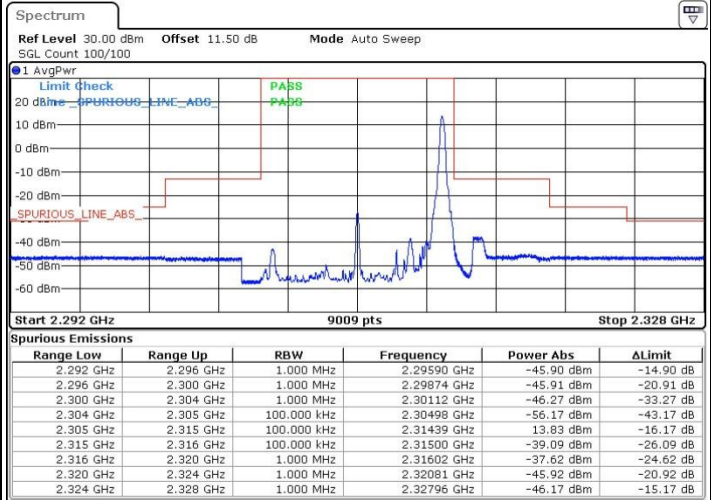
LTE Band 30 / 10MHz / 16QAM

Lowest Band Edge / 1 RB



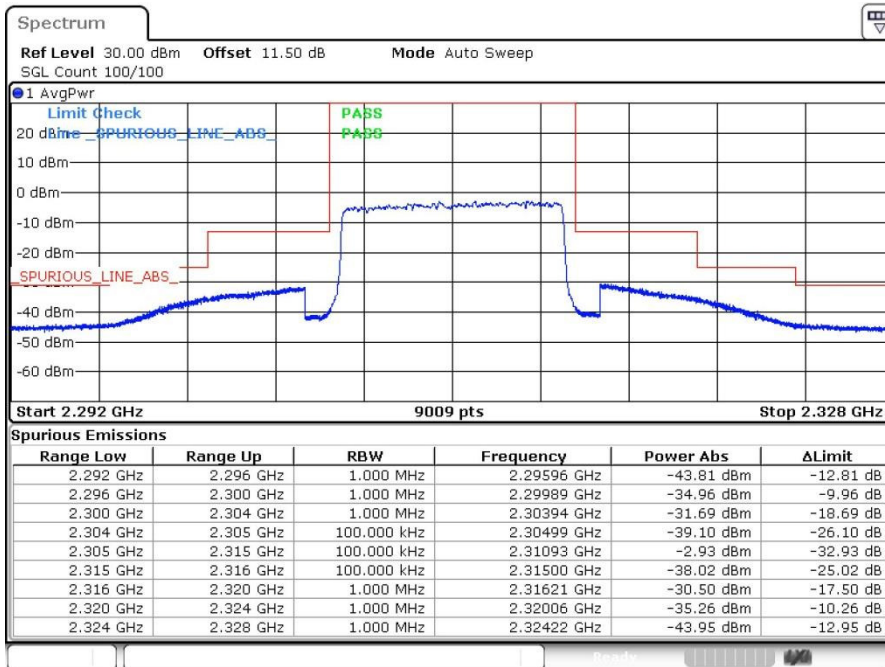
Date: 27.JUL.2016 19:04:23

Highest Band Edge / 1 RB



Date: 27.JUL.2016 19:06:46

Band Edge / Full RB



Date: 27.JUL.2016 19:09:08



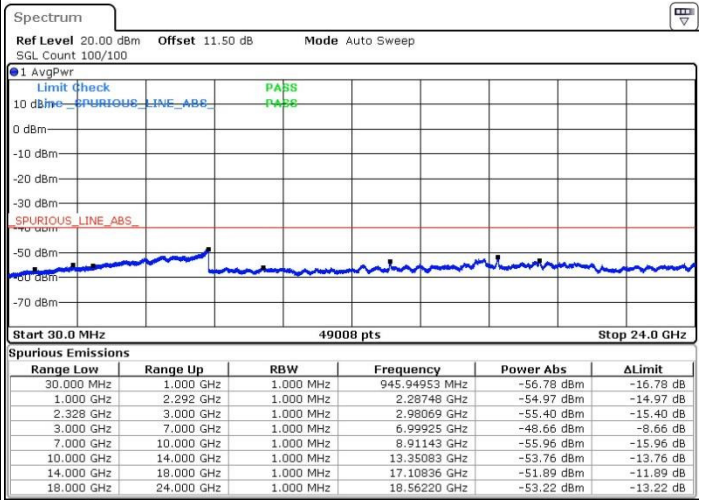
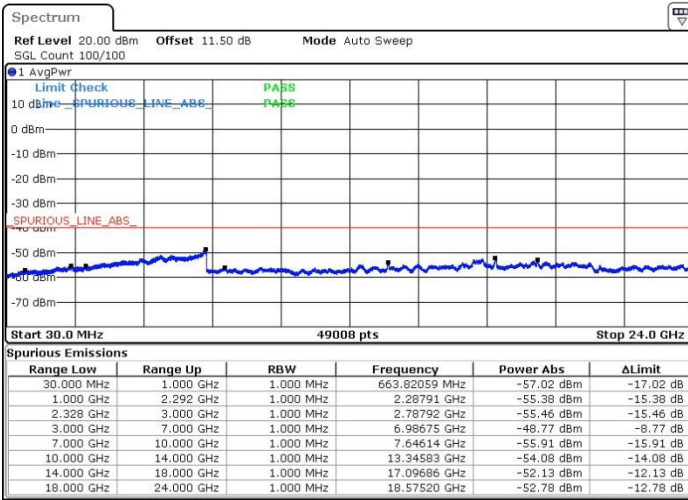
**Conducted Spurious Emission**



LTE Band 30 / 5MHz

Lowest Channel / QPSK

Lowest Channel / 16QAM

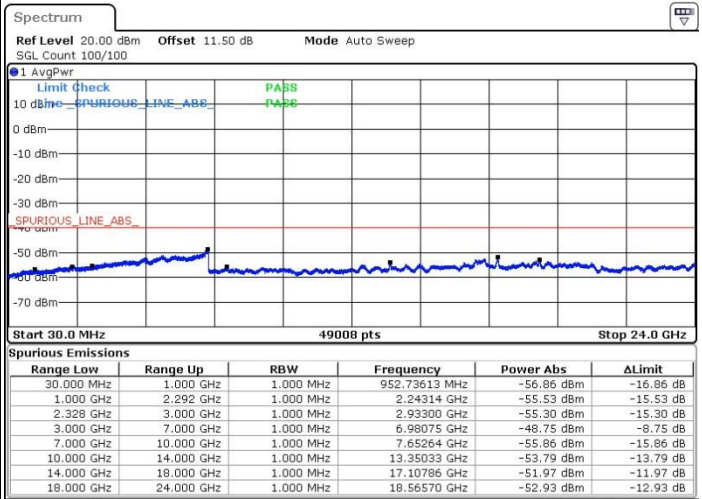
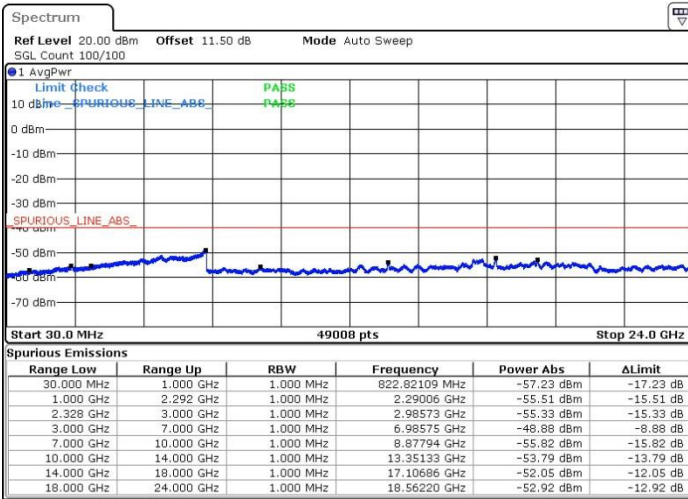


Date: 27.JUL.2016 18:41:26

Date: 27.JUL.2016 18:42:22

Middle Channel / QPSK

Middle Channel / 16QAM



Date: 27.JUL.2016 18:44:04

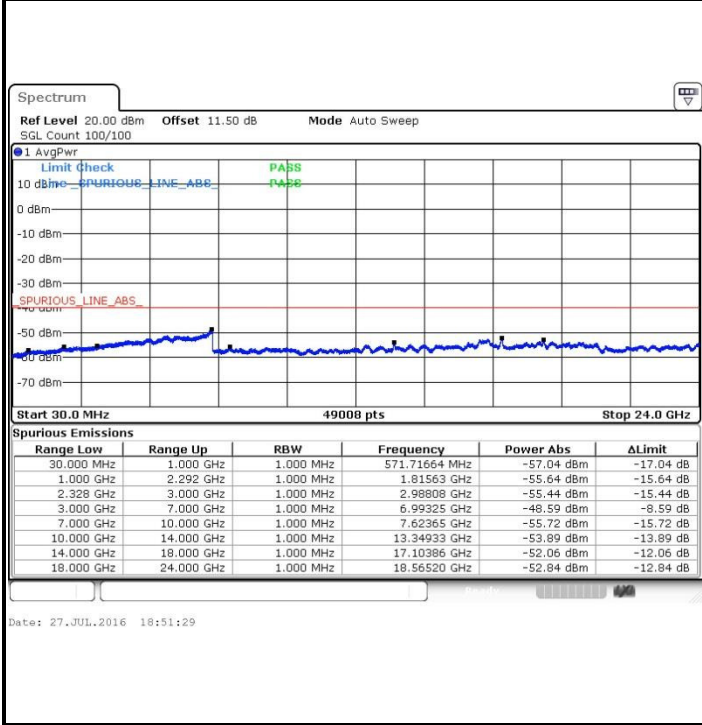
Date: 27.JUL.2016 18:44:59



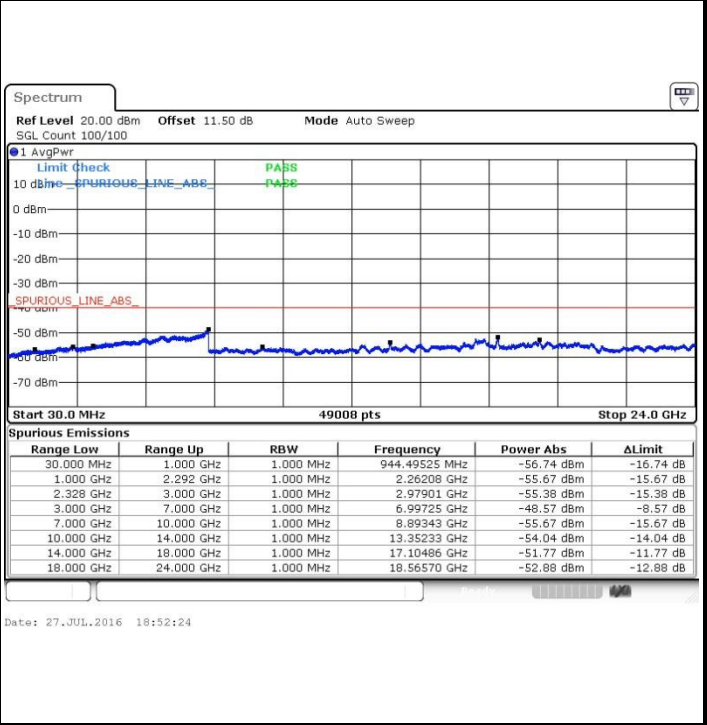


LTE Band 30 / 5MHz

Highest Channel / QPSK

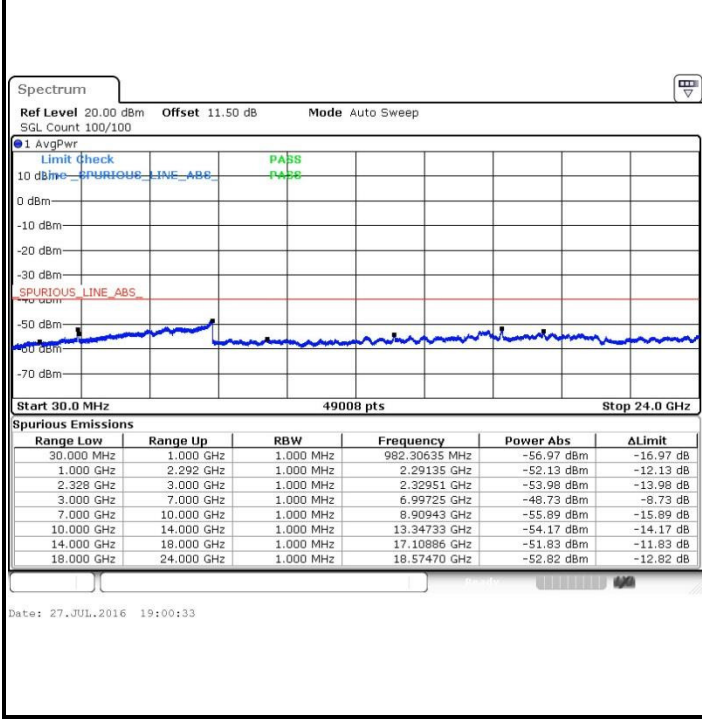


Highest Channel / 16QAM

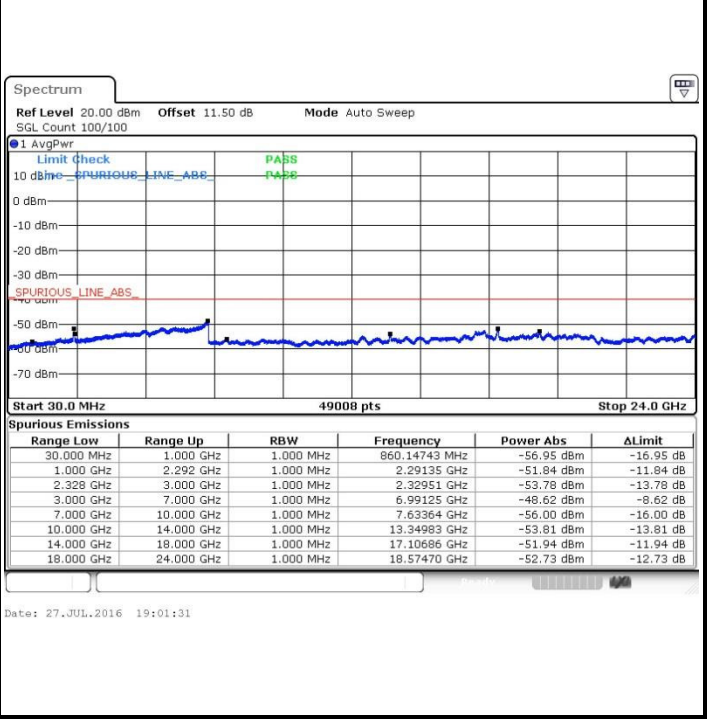


LTE Band 30 / 10MHz

Middle Channel / QPSK



Middle Channel / 16QAM





Frequency Stability

Test Conditions		LTE Band 30 (QPSK) / Middle Channel	Limit
Temperature (°C)	Voltage (Volt)	BW 10MHz	Note 2.
		Deviation (ppm)	Result
50	Normal Voltage	0.0000	PASS
40	Normal Voltage	0.0090	
30	Normal Voltage	0.0090	
20(Ref.)	Normal Voltage	0.0000	
10	Normal Voltage	0.0088	
0	Normal Voltage	0.0086	
-10	Normal Voltage	0.0006	
-20	Normal Voltage	0.0086	
-30	Normal Voltage	0.0001	
20	Maximum Voltage	0.0006	
20	Normal Voltage	0.0000	
20	Battery End Point	0.0091	

Note:

1. Normal Voltage =3.85 V. ; Battery End Point (BEP) =3.6 V. ; Maximum Voltage =4.35 V.
2. Note: The frequency fundamental emissions stay within the authorized frequency block.



## Appendix B. Test Results of Radiated Test

### EIRP

<Bottom Ant.>

LTE Band 30 / 5MHz (Average)							
Channel	Mode	RB		Horizontal		Vertical	
		Size	Offset	EIRP(dBm)	EIRP(W)	EIRP(dBm)	EIRP(W)
Lowest	QPSK	1	0	14.71	0.0296	15.84	0.0384
Middle		1	0	14.76	0.0299	15.75	0.0376
Highest		1	0	14.83	0.0304	15.91	0.0390
Lowest	16QAM	1	0	14.03	0.0253	15.09	0.0323
Middle		1	0	14.18	0.0262	15.24	0.0334
Highest		1	0	13.99	0.0251	15.39	0.0346
Limit	EIRP < 0.25W			Result		PASS	

LTE Band 30 / 10MHz (Average)							
Channel	Mode	RB		Horizontal		Vertical	
		Size	Offset	EIRP(dBm)	EIRP(W)	EIRP(dBm)	EIRP(W)
Lowest	QPSK	-	-	-	-	-	-
Middle		1	0	14.78	0.0301	16.05	0.0403
Highest		-	-	-	-	-	-
Lowest	16QAM	-	-	-	-	-	-
Middle		1	0	14.18	0.0262	15.46	0.0352
Highest		-	-	-	-	-	-
Limit	EIRP < 0.25W			Result		PASS	



<Bottom Antenna with SIM 1>

LTE Band 30 / 5MHz / QPSK / RB Size 1 Offset 0									
Channel	Frequency ( MHz )	EIRP ( dBm )	Limit ( dBm )	Over Limit ( dB )	SPA Reading (dBm)	S.G. Power ( dBm )	TX Cable loss ( dB )	TX Antenna Gain (dBi)	Polarization (H/V)
Lowest	6918	-52.83	-40	-12.83	-76.3	-60.91	2.62	10.70	H
	9222	-47.02	-40	-7.02	-75.8	-57.1	2.53	12.61	H
	11526	-47.07	-40	-7.07	-77.55	-56.69	2.68	12.30	H
	6918	-47.73	-40	-7.73	-70.92	-55.81	2.62	10.70	V
	9222	-48.41	-40	-8.41	-74.73	-58.49	2.53	12.61	V
	11526	-47.99	-40	-7.99	-77.49	-57.61	2.68	12.30	V
Middle	6924	-52.62	-40	-12.62	-76.03	-60.71	2.62	10.71	H
	9234	-47.86	-40	-7.86	-78.44	-57.93	2.53	12.61	H
	11540	-47.90	-40	-7.90	-78.44	-57.52	2.68	12.30	H
	6924	-49.84	-40	-9.84	-73	-57.93	2.62	10.71	V
	9234	-50.24	-40	-10.24	-76.58	-60.31	2.53	12.61	V
	11540	-48.63	-40	-8.63	-78.12	-58.25	2.68	12.30	V
Highest	6930	-53.05	-40	-13.05	-76.54	-61.15	2.61	10.72	H
	9240	-47.75	-40	-7.75	-76.58	-57.82	2.53	12.60	H
	11550	-47.47	-40	-7.47	-78.1	-57.09	2.68	12.30	H
	6930	-49.26	-40	-9.26	-72.51	-57.36	2.61	10.72	V
	9240	-50.14	-40	-10.14	-76.32	-60.21	2.53	12.60	V
	11550	-48.06	-40	-8.06	-77.6	-57.68	2.68	12.30	V

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

LTE Band 30 / 10MHz / QPSK / RB Size 1 Offset 0									
Channel	Frequency ( MHz )	EIRP ( 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	6918	-53.07	-40	-13.07	-76.5	-61.15	2.62	10.70	H
	9222	-47.15	-40	-7.15	-75.96	-57.23	2.53	12.61	H
	11526	-48.24	-40	-8.24	-78.73	-57.86	2.68	12.30	H
	6918	-48.28	-40	-8.28	-71.52	-56.36	2.62	10.70	V
	9222	-49.33	-40	-9.33	-75.67	-59.41	2.53	12.61	V
	11526	-48.50	-40	-8.50	-77.96	-58.12	2.68	12.30	V

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



<Bottom Antenna with SIM 2>

LTE Band 30 / 5MHz / QPSK / RB Size 1 Offset 0									
Channel	Frequency ( MHz )	EIRP ( dBm )	Limit ( dBm )	Over Limit ( dB )	SPA Reading (dBm)	S.G. Power ( dBm )	TX Cable loss ( dB )	TX Antenna Gain (dBi)	Polarization (H/V)
Lowest	4610	-60.29	-40	-20.29	-77.66	-67.1	2.11	8.92	H
	6918	-52.42	-40	-12.42	-75.68	-60.5	2.62	10.70	H
	9222	-47.12	-40	-7.12	-73.51	-57.2	2.53	12.61	H
	4610	-61.29	-40	-21.29	-77.4	-68.1	2.11	8.92	V
	6918	-49.52	-40	-9.52	-72.2	-57.6	2.62	10.70	V
	9222	-50.12	-40	-10.12	-76.3	-60.2	2.53	12.61	V
Middle	4615	-60.69	-40	-20.69	-77.54	-67.5	2.12	8.93	H
	6924	-52.11	-40	-12.11	-75.23	-60.2	2.62	10.71	H
	9234	-47.63	-40	-7.63	-75.4	-57.7	2.53	12.61	H
	4615	-61.69	-40	-21.69	-77.46	-68.5	2.12	8.93	V
	6924	-48.51	-40	-8.51	-71.49	-56.6	2.62	10.71	V
	9234	-50.83	-40	-10.83	-76.98	-60.9	2.53	12.61	V
Highest	4620	-59.38	-40	-19.38	-76.77	-66.2	2.12	8.94	H
	6930	-52.70	-40	-12.70	-75.89	-60.8	2.61	10.72	H
	9240	-47.43	-40	-7.43	-75.27	-57.5	2.53	12.60	H
	4620	-60.88	-40	-20.88	-76.95	-67.7	2.12	8.94	V
	6930	-49.40	-40	-9.40	-72.32	-57.5	2.61	10.72	V
	9240	-50.63	-40	-10.63	-76.73	-60.7	2.53	12.60	V

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