



# FCC RADIO TEST REPORT

FCC ID : J9CQGM8180X

Equipment : Module

Model Name : QGM8180X

Applicant : Qualcomm Inc

5775 Morehouse Dr.San Diego, CA 92121-1714 (USA)

Manufacturer : Universal Scientific Industrial (Shanghai) Co., Ltd.

No. 1558, Zhang Dong Road, Zhangjiang Hi-Tech Park,

Shanghai, P.R. China 201203

Standard : FCC 47 CFR Part 2, Part 27(D)

The product was received on Feb. 01, 2019 and testing was started from Feb. 27, 2019 and completed on Mar. 08, 2019. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA-603-E and has been in compliance with the applicable technical standards.

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

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

Approved by: Jones Tsai

Innoe Tsai

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)

TEL: 886-3-327-3456 Page Number : 1 of 23 FAX: 886-3-328-4978 Issued Date : Jul. 15, 2019

# **Table of Contents**

	•	of this test report	
Su		y of Test Result	
1	Gene	eral Description	
	1.1	Product Feature of Equipment Under Test	5
	1.2	Modification of EUT	5
	1.3	Testing Site	5
	1.4	Applied Standards	
2	Test	Configuration of Equipment Under Test	7
	2.1	Test Mode	7
	2.2	Connection Diagram of Test System	8
	2.3	Support Unit used in test configuration and system	8
	2.4	Measurement Results Explanation Example	8
	2.5	Frequency List of Low/Middle/High Channels	9
3	Cond	lucted Test Items	10
	3.1	Measuring Instruments	10
	3.2	Conducted Output Power Measurement and EIRP Measurement	11
	3.3	Peak-to-Average Ratio	12
	3.4	EIRP Power Density	13
	3.5	Occupied Bandwidth	14
	3.6	Conducted Band Edge	15
	3.7	Conducted Spurious Emission	16
	3.8	Frequency Stability	17
4	Radia	ated Test Items	18
	4.1	Measuring Instruments	18
	4.2	Radiated Spurious Emission Measurement	
5	List o	of Measuring Equipment	21
6		ertainty of Evaluation	23
		x A. Test Results of Conducted Test	
		x B. Test Results of Radiated Test	
Ap	pendi	x C. Test Setup Photographs	

TEL: 886-3-327-3456 FAX: 886-3-328-4978

Report Template No.: BU5-FGLTE27D Version 2.4

Page Number Issued Date

: 2 of 23 : Jul. 15, 2019

Report Version

: 02

Report No.: FG920117C

# History of this test report

Report No.: FG920117C

Report No.	Version	Description	Issued Date
FG920117C	01	Initial issue of report	Jun. 11, 2019
FG920117C	02	<ol> <li>Revise the test completed date on the cover page.</li> <li>Revise the calibration date and due date of the instrument Programmable Power Supply on page 21.</li> </ol>	Jul. 15, 2019

TEL: 886-3-327-3456 Page Number : 3 of 23 FAX: 886-3-328-4978 Issued Date : Jul. 15, 2019

# **Summary of Test Result**

Report No.: FG920117C

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.2	§2.1046	Conducted Output Power and Effective Isotropic Radiated Power	Reporting only	-
3.3	-	Peak-to-Average Ratio	Reporting only	-
3.4	§27.50 (a)(3)	EIRP Power Density	Pass	-
3.5	§2.1049	Occupied Bandwidth	Reporting only	-
3.6	§2.1051 §27.53 (a)(4)	Conducted Band Edge Measurement	Pass	-
3.7	§2.1051 §27.53 (a)(4)	Conducted Spurious Emission	Pass	-
3.8	§2.1055 §27.54	Frequency Stability Temperature & Voltage	Pass	-
4.2	§2.1053 §27.53 (a)(4)	Radiated Spurious Emission	Pass	Under limit 17.56 dB at 4614.000 MHz

#### **Declaration of Conformity:**

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

#### **Comments and Explanations:**

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Wii Chang

**Report Producer: Maggie Chiang** 

TEL: 886-3-327-3456 Page Number : 4 of 23 FAX: 886-3-328-4978 Issued Date : Jul. 15, 2019

# 1 General Description

# 1.1 Product Feature of Equipment Under Test

WCDMA/LTE and GNSS

Product Specification subjective to this standard					
Antenna Type	WWAN: Dipole Antenna				
ranoma Typo	GPS/Glonass/BDS/Galileo/SBAS: Dipole Antenna				

Report No.: FG920117C

#### 1.2 Modification of EUT

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

# 1.3 Testing Site

Test Site	SPORTON INTERNATIONAL INC.					
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978					
Test Site No.	Sporton Site No.					
rest site No.	TH05-HY					
Test Engineer	Chester Chen					
Temperature	22~24℃					
Relative Humidity	54~59%					

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

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	Sporton Site No.
Test Site No.	03CH12-HY
Test Engineer	Jack Cheng, Lance Chiang, and Chuan Chul
Temperature	<b>23~24</b> ℃
Relative Humidity	63~66%

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

FCC Designation No. TW1190 and TW0007

TEL: 886-3-327-3456 Page Number : 5 of 23
FAX: 886-3-328-4978 Issued Date : Jul. 15, 2019

# 1.4 Applied Standards

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

Report No.: FG920117C

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

#### Remark:

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

TEL: 886-3-327-3456 Page Number : 6 of 23 FAX: 886-3-328-4978 Issued Date : Jul. 15, 2019

# 2 Test Configuration of Equipment Under Test

## 2.1 Test Mode

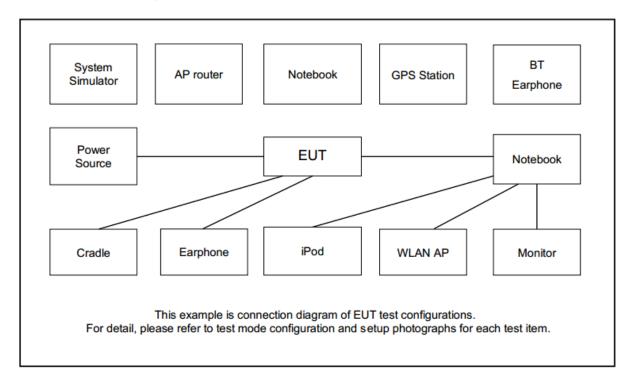
Antenna port conducted and radiated test items listed below are performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power.

Report No.: FG920117C

To at House	D d	Bandwidth (MHz)				Modulation			RB#			Test Channel				
Test Items	Band	1.4	3	5	10	15	20	QPSK	16QAM	64QAM	1	Half	Full	L	М	Н
Max. Output Power	30	•	•	٧	v	•	-	٧	v	v	٧	v	v	v	v	v
Peak-to-Avera ge Ratio	30	•	•		v	•	-	٧	v	v	v		v	v	v	v
E.I.R.P PSD	30	,	,	v	٧	-	-	v	v	v	v			v	v	v
26dB and 99% Bandwidth	30	•	-	v	v	•	-	V	V	v			v	v	v	v
Conducted Band Edge	30	•	•	٧	v	•	-	٧	v	v	٧		v	v		v
Conducted Spurious Emission	30	•	•	>	v	•	-	٧	v	v	>			v	v	v
Frequency Stability	30	•	•		v	•	-	٧	v	v			v		v	
Radiated Spurious Emission	30		Worst Case						v	v	v					
Remark	<ol> <li>The mark "v" means that this configuration is chosen for testing</li> <li>The mark "-" means that this bandwidth is not supported.</li> </ol>						nder									

TEL: 886-3-327-3456 Page Number : 7 of 23
FAX: 886-3-328-4978 Issued Date : Jul. 15, 2019

# 2.2 Connection Diagram of Test System



Report No.: FG920117C

## 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:

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

$$= 4.2 + 10 = 14.2 (dB)$$

TEL: 886-3-327-3456 Page Number : 8 of 23
FAX: 886-3-328-4978 Issued Date : Jul. 15, 2019

# 2.5 Frequency List of Low/Middle/High Channels

LTE Band 30 Channel and Frequency List									
BW [MHz]	BW [MHz] Channel/Frequency(MHz) Lowest Middle Highest								
40	Channel	-	27710	-					
10	Frequency	-	2310	-					
_	Channel	27685	27710	27735					
5	Frequency	2307.5	2310	2312.5					

Report No.: FG920117C

TEL: 886-3-327-3456 Page Number : 9 of 23 FAX: 886-3-328-4978 Issued Date : Jul. 15, 2019

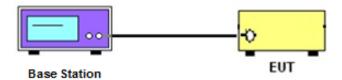
## 3 Conducted Test Items

# 3.1 Measuring Instruments

See list of measuring instruments of this test report.

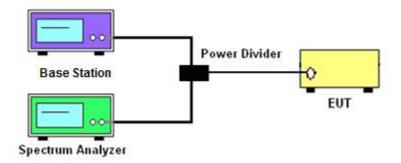
#### 3.1.1 Test Setup

#### 3.1.2 Conducted Output Power

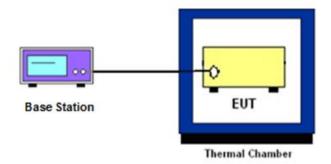


Report No.: FG920117C

# 3.1.3 Peak-to-Average Ratio, Occupied Bandwidth, 26dB Bandwidth ,Band-Edge and Conducted Spurious Emission



#### 3.1.4 Frequency Stability



### 3.1.5 Test Result of Conducted Test

Please refer to Appendix A.

TEL: 886-3-327-3456 Page Number : 10 of 23
FAX: 886-3-328-4978 Issued Date : Jul. 15, 2019

## 3.2 Conducted Output Power Measurement and EIRP Measurement

# 3.2.1 Description of the Conducted Output Power Measurement and EIRP 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.

Report No.: FG920117C

The EIRP of mobile transmitters must not exceed 0.25 Watts for LTE Band 30.

According to KDB 412172 D01 Power Approach,

 $EIRP = P_T + G_T - L_C$ , where

 $P_T$  = transmitter output power in dBm

 $G_T$  = gain of the transmitting antenna in dBi

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

#### 3.2.2 Test Procedures

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

TEL: 886-3-327-3456 Page Number : 11 of 23 FAX: 886-3-328-4978 Issued Date : Jul. 15, 2019

## 3.3 Peak-to-Average Ratio

#### 3.3.1 Description of the PAR Measurement

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

Report No.: FG920117C

#### 3.3.2 Test Procedures

The testing follows ANSI C63.26-2015 Section 5.2.6

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

TEL: 886-3-327-3456 Page Number : 12 of 23
FAX: 886-3-328-4978 Issued Date : Jul. 15, 2019

## 3.4 EIRP Power Density

#### 3.4.1 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.

Report No.: FG920117C

#### 3.4.2 Test Procedures

The testing follows ANSI C63.26-2015 Section 5.2.4.5

- 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 (5MHz).
- 4. Set VBW ≥ 3 × RBW.
- 5. Detector = RMS (power averaging).
- 6. Ensure that the number of measurement points in the sweep  $\geq 2 \times \text{span/RBW}$ .
- 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).
- 10. Determine the EIRP by adding the effective antenna gain to the adjusted power level.

TEL: 886-3-327-3456 Page Number : 13 of 23
FAX: 886-3-328-4978 Issued Date : Jul. 15, 2019

## 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.

Report No.: FG920117C

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

The testing follows ANSI C63.26-2015 Section 5.4.3 (26dB) and Section 5.4.4 (99OB)

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

TEL: 886-3-327-3456 Page Number : 14 of 23
FAX: 886-3-328-4978 Issued Date : Jul. 15, 2019

## 3.6 Conducted Band Edge

#### 3.6.1 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.

Report No.: FG920117C

(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.

#### 3.6.2 Test Procedures

The testing follows ANSI C63.26-2015 Section 5.7.

- 1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
- 2. The band edges of low and high channels for the highest RF powers were measured.
- 3. Set RBW >= 1% EBW in the 1MHz band immediately outside and adjacent to the band edge.
- 4. Beyond the 1 MHz band from the band edge, RBW=1MHz was used.
- 5. Set spectrum analyzer with RMS detector.
- The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
- 7. Checked that all the results comply with the emission limit line.

The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)

TEL: 886-3-327-3456 Page Number : 15 of 23
FAX: 886-3-328-4978 Issued Date : Jul. 15, 2019

## 3.7 Conducted Spurious Emission

#### 3.7.1 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.

Report No.: FG920117C

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.

#### 3.7.2 Test Procedures

The testing follows ANSI C63.26-2015 Section 5.7.

- 1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
- The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.
   The path loss was compensated to the results for each measurement.
- 3. The middle channel for the highest RF power within the transmitting frequency was measured.
- 4. The conducted spurious emission for the whole frequency range was taken.
- 5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz.
- 6. Set spectrum analyzer with RMS detector.
- 7. Taking the record of maximum spurious emission.
- 8. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
- 9. The limit line is derived from 70 + 10log(P)dB below the transmitter power P(Watts)

TEL: 886-3-327-3456 Page Number : 16 of 23
FAX: 886-3-328-4978 Issued Date : Jul. 15, 2019

## 3.8 Frequency Stability

#### 3.8.1 Description of Frequency Stability Measurement

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

Report No.: FG920117C

#### 3.8.2 Test Procedures for Temperature Variation

The testing follows FCC KDB 971168 D01 v03r01 Section 9.0.

- 1. The EUT was set up in the thermal chamber and connected with the system simulator.
- 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.

#### 3.8.3 Test Procedures for Voltage Variation

The testing follows FCC KDB 971168 D01 v03r01 Section 9.0.

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

TEL: 886-3-327-3456 Page Number : 17 of 23
FAX: 886-3-328-4978 Issued Date : Jul. 15, 2019

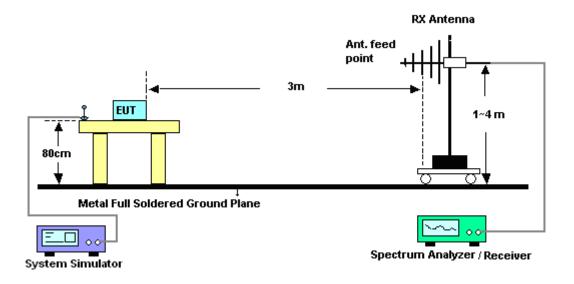
## 4 Radiated Test Items

# 4.1 Measuring Instruments

See list of measuring instruments of this test report.

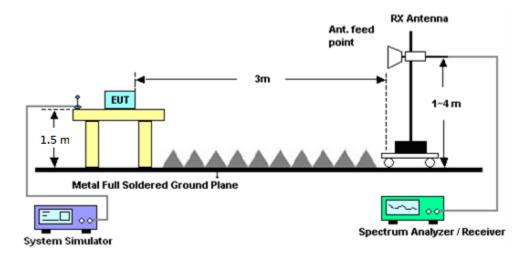
## 4.1.1 Test Setup

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



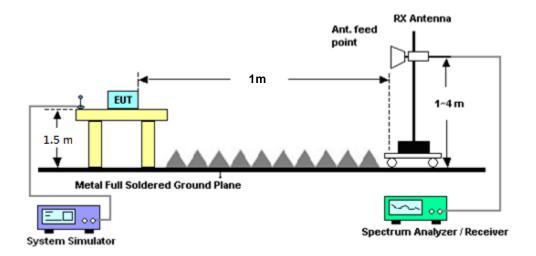
Report No.: FG920117C

#### For radiated test from 1GHz to 18GHz



TEL: 886-3-327-3456 Page Number : 18 of 23
FAX: 886-3-328-4978 Issued Date : Jul. 15, 2019

#### For radiated test above 18GHz



Report No.: FG920117C

#### 4.1.2 Test Result of Radiated Test

Please refer to Appendix B.

TEL: 886-3-327-3456 Page Number : 19 of 23
FAX: 886-3-328-4978 Issued Date : Jul. 15, 2019

## 4.2 Radiated Spurious Emission Measurement

#### 4.2.1 Description of Radiated Spurious Emission Measurement

The radiated spurious emission was measured by substitution method according to ANSI / TIA-603-E The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least 70 + 10 log (P) dB.

Report No.: FG920117C

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

#### 4.2.2 Test Procedures

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

- 1. The EUT was placed on a turntable with 0.8 meter height for frequency below 1GHz and 1.5 meter height for frequency above 1GHz respectively above ground.
- 2. The EUT was set 3 meters from the receiving antenna 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 1m to 4m to search the maximum spurious emission for both horizontal and vertical polarizations.
- 5. During the measurement, the system simulator parameters were set to force the EUT transmitting at maximum output power.
- 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.

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

4. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

The limit line is derived from 70 + 10log(P)dB below the transmitter power P(Watts)

- = P(W) [70 + 10log(P)] (dB)
- = [30 + 10log(P)] (dBm) [70 + 10log(P)] (dB)
- = -40 dBm.

TEL: 886-3-327-3456 Page Number : 20 of 23
FAX: 886-3-328-4978 Issued Date : Jul. 15, 2019

# 5 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
LTE Base Station	Anritsu	MT8820C	6201341951	GSM/GPRS /WCDMA/LTE	Mar. 21, 2018	Feb. 27, 2019	Mar. 20, 2020	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSV40	101397	10Hz~40GHz	Nov. 13, 2018	Feb. 27, 2019	Nov. 12, 2019	Conducted (TH05-HY)
Temperature Chamber	ESPEC	SH-641	92013720	-30°C ~70°C	Aug. 29, 2018	Feb. 27, 2019	Aug. 28, 2019	Conducted (TH05-HY)
Programmable Power Supply	GW Instek	PSS-2005	EL890001	1V~20V 0.5A~5A	Oct. 08, 2018	Feb. 27, 2019	Oct. 07, 2019	Conducted (TH05-HY)
Coupler	Warison	1-18GHz 20dB 25WSMA Directional Coupler	#B	1G~18GHz	Jan. 14, 2019	Feb. 27, 2019	Jan. 13, 2020	Conducted (TH05-HY)
Loop Antenna	TESEQ	HLA 6120	31244	9 kHz~30 MHz	Mar. 29, 2018	Mar. 01, 2019~ Mar. 08, 2019	Mar. 28, 2019	Radiation (03CH12-HY)
Bilog Antenna	TESEQ	CBL 6111D&00800 N1D01N-06	37059&01	30MHz~1GHz	Oct. 13, 2018	Mar. 01, 2019~ Mar. 08, 2019	Oct. 12, 2019	Radiation (03CH12-HY)
Horn Antenna	SCHWARZBE CK	BBHA 9120D	9120D-1328	1GHz ~ 18GHz	Oct. 19, 2018	Mar. 01, 2019~ Mar. 08, 2019	Oct. 18, 2019	Radiation (03CH12-HY)
SHF-EHF Horn Antenna	SCHWARZBE CK	BBHA 9170	BBHA9170576	18GHz ~ 40GHz	May 08, 2018	Mar. 01, 2019~ Mar. 08, 2019	May 07, 2019	Radiation (03CH12-HY)
Preamplifier	COM-POWER	PA-103	161075	10MHz~1GHz	Mar. 26, 2018	Mar. 01, 2019~ Mar. 08, 2019	Mar. 25, 2019	Radiation (03CH12-HY)
Preamplifier	Jet-Power	JPA0118-55-3 03K	171000180005 4002	1GHz~18GHz	Apr. 17, 2018	Mar. 01, 2019~ Mar. 08, 2019	Apr. 16, 2019	Radiation (03CH12-HY)
Preamplifier	EMEC	EM18G40G	060715	18GHz ~ 40GHz	Dec. 06, 2018	Mar. 01, 2019~ Mar. 08, 2019	Dec. 05, 2019	Radiation (03CH12-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100390	20Hz~26.5GHz	Dec. 26, 2018	Mar. 01, 2019~ Mar. 08, 2019	Dec. 25, 2019	Radiation (03CH12-HY)
Signal Generator	Rohde & Schwarz	SMF100A	101107	100kHz~40GHz	May 21, 2018	Mar. 01, 2019~ Mar. 08, 2019	May 20, 2019	Radiation (03CH12-HY)
Filter	Wainwright	WLJ4-1000-15 30-6000-40ST	SN3	1.53 GHz Lowpass	Mar. 21, 2018	Mar. 01, 2019~ Mar. 08, 2019	Mar. 20, 2019	Radiation (03CH12-HY)
Filter	Wainwright	WHKX12-1080 -1200-1500-60 SS	SN2	1.2G High Pass	Sep. 16, 2018	Mar. 01, 2019~ Mar. 08, 2019	Sep. 15, 2019	Radiation (03CH12-HY)
Filter	Wainwright	WHKX12-2700 -3000-18000-6 0ST	SN2	3GHz High Pass	Mar. 21, 2018	Mar. 01, 2019~ Mar. 08, 2019	Mar. 20, 2019	Radiation (03CH12-HY)
Filter	Woken	WHKX8-5272. 5-6750-18000- 40ST	SN2	6.75G Highpass	Mar. 21, 2018	Mar. 01, 2019~ Mar. 08, 2019	Mar. 20, 2019	Radiation (03CH12-HY)

Report No.: FG920117C

TEL: 886-3-327-3456 Page Number : 21 of 23 FAX: 886-3-328-4978 Issued Date : Jul. 15, 2019

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
RF Cable	HUBER + SUHNER	SUCOFLEX 126E	0058/126E	30M-18G	Mar. 14, 2018	Mar. 01, 2019~ Mar. 08, 2019	Mar. 13, 2019	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	505134/2	30M~40GHz	Oct. 16, 2018	Mar. 01, 2019~ Mar. 08, 2019	Oct. 15, 2019	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	800740/2	30M~40GHz	Oct. 16, 2018	Mar. 01, 2019~ Mar. 08, 2019	Oct. 15, 2019	Radiation (03CH12-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Mar. 01, 2019~ Mar. 08, 2019	N/A	Radiation (03CH12-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Mar. 01, 2019~ Mar. 08, 2019	N/A	Radiation (03CH12-HY)
Software	Audix	E3 6.2009-8-24	RK-000989	N/A	N/A	Mar. 01, 2019~ Mar. 08, 2019	N/A	Radiation (03CH12-HY)

TEL: 886-3-327-3456 Page Number : 22 of 23 FAX: 886-3-328-4978 Issued Date : Jul. 15, 2019

# 6 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of	3.36
Confidence of 95% (U = 2Uc(y))	3.30

Report No.: FG920117C

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

Measuring Uncertainty for a Level of	3.70
Confidence of 95% (U = 2Uc(y))	3.70

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

Measuring Uncertainty for a Level of	3.98
Confidence of 95% (U = 2Uc(y))	3.90

TEL: 886-3-327-3456 Page Number : 23 of 23 FAX: 886-3-328-4978 Issued Date : Jul. 15, 2019



# **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			23.04					
10	1	25			23.12					
10	1	49			23.17					
10	25	0	QPSK		22.20					
10	25	12			22.22					
10	25	25			22.21					
10	50	0			22.23					
10	1	0			22.24					
10	1	25			22.33					
10	1	49			22.43	-				
10	25	0	16-QAM	-	21.18	-				
10	25	12			21.23					
10	25	25			21.20					
10	50	0			21.22	-				
10	1	0			21.31					
10	1	25			21.38	-				
10	1	49			21.44	-				
10	25	0	64-QAM		20.21	1				
10	25	12			20.24	1				
10	25	25			20.22	1				
10	50	0			20.24	1				
5	1	0		23.02	23.05	23.03				
5	1	12		23.09	23.15	23.09				
5	1	24		23.16	23.14	23.12				
5	12	0	QPSK	22.12	22.17	22.19				
5	12	7		22.19	22.22	22.25				
5	12	13		22.19	22.22	22.24				
5	25	0		22.18	22.18	22.25				
5	1	0		22.31	22.35	22.36				
5	1	12		22.37	22.41	22.39				
5	1	24		22.42	22.46	22.37				
5	12	0	16-QAM	21.13	21.18	21.20				
5	12	7		21.24	21.23	21.27				
5	12	13		21.21	21.24	21.25				
5	25	0		21.18	21.17	21.27				
5	1	0		21.24	21.36	21.33				
5	1	12		21.38	21.46	21.42				
5	1	24		21.45	21.43	21.38				
5	12	0	64-QAM	20.18	20.23	20.26				
5	12	7		20.26	20.31	20.31				
5	12	13		20.24	20.29	20.29				
5	25	0		20.21	20.20	20.30				

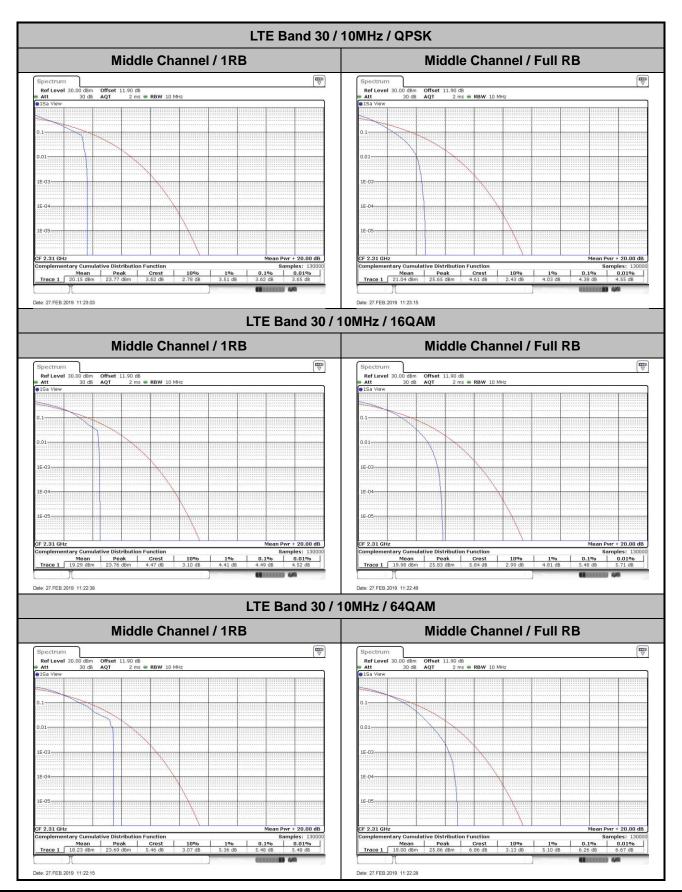
# LTE Band 30

# Peak-to-Average Ratio

Mode					
Mod.	QP	SK	160	Limit: 13dB	
RB Size	1RB Full RB		1RB	Full RB	Result
Lowest CH	-	-	-	-	
Middle CH	3.62	4.38	4.49	5.48	PASS
Highest CH	-	-	-	-	]
Mode		LTE Band	30 / 10MHz		
Mod.	64C	AM		Limit: 13dB	
RB Size	1RB	Full RB			Result
Lowest CH	-	-	-	-	
Middle CH	5.48	6.26	-	-	PASS
Highest CH	-	-	-	-	

Report No. : FG920117C

TEL: 886-3-327-3456 Page Number: A2-1 of 25



TEL: 886-3-327-3456 Page Number : A2-2 of 25 FAX: 886-3-328-4978

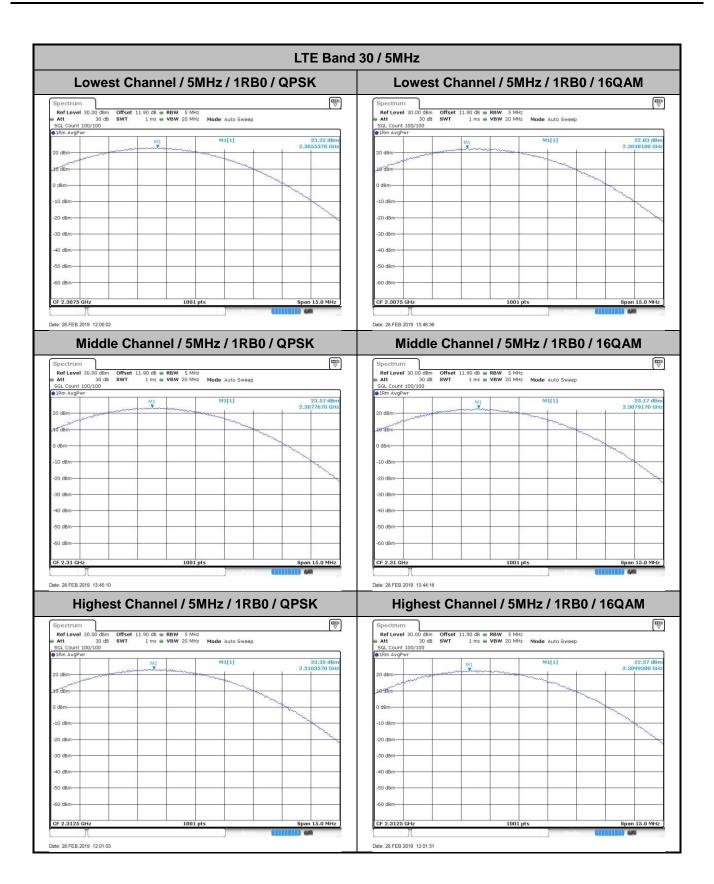
# **EIRP Power Density**

Mode		LTE Band 30 : Conducted Power Density (dBm/5MHz)											
BW	1.4MHz 3MHz			lHz	5N	lHz	10MHz		15MHz		20MHz		
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	
Lowest CH	-	-	-	-	23.32	22.83	-	-	-	-	-	-	
Middle CH	-	-	-	-	23.57	23.17	23.01	22.45	-	-	-	-	
Highest CH	-	-	-	-	23.35	22.57	-	-	-	-	-	-	
Mode			LT	E Band	30 : Con	ducted I	Power D	ensity (d	IBm/5Ml	Hz)			
BW	1.4	ИНz	3M	lHz	5N	lHz	10MHz		15MHz		20MHz		
Mod.	64QAM		64QAM		64QAM		64QAM		64QAM		64QAM		
Lowest CH	-	-	-	-	22.27	-	-	-	-	-	-	-	
Middle CH	-	-	-	-	22.40	-	21.32	-	-	-	-	-	
Highest CH	-	-	-	-	21.85	-	-	-	-	-	1	-	

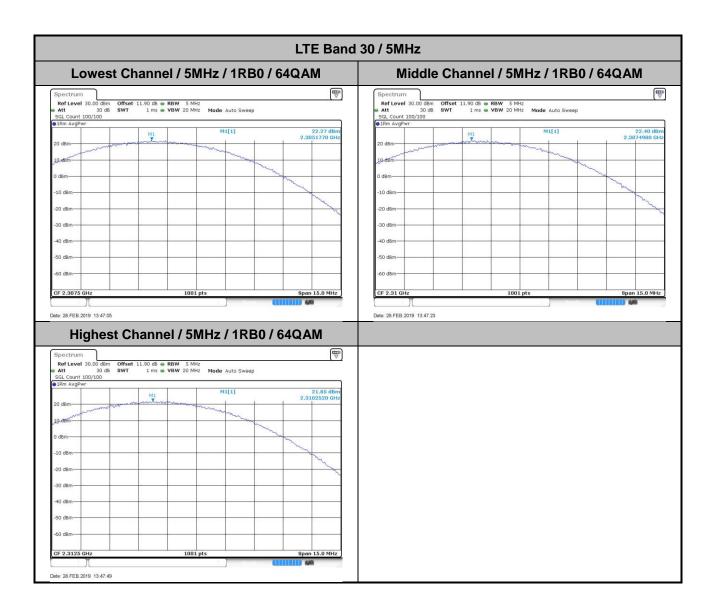
Report No. : FG920117C

Mode				LTE Ba	nd 30 : E	IRP Pov	ver Dens	sity (dBm	n/5MHz)				
BW	1.4MHz			3MHz		5MHz		10MHz		ИHz	20MHz		
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	
Lowest CH	-	-	-	-	23.32	22.83	-	-	-	-	-	-	
Middle CH	-	-	-	-	23.57	23.17	23.01	22.45	-	-	-	-	
Highest CH	-	-	-	-	23.35	22.57	-	-	-	-	-	-	
Mode		LTE Band 30 : EIRP Power Density (dBm/5MHz)											
BW	1.4	ИHz	3MHz		5MHz		10MHz		15MHz		20MHz		
Mod.	64QAM		64QAM		64QAM		64QAM		64QAM		64QAM		
Lowest CH	-	-	-	-	22.27	-	-	-	-	-	-	-	
Middle CH	-	-	-	-	22.40	-	21.32	-	-	-	-	-	
Highest CH	-	-	-	-	21.85	-	-	-	-	-	-	-	
Antenna Gain						0 0	lBi						
Limit					250mW	/ 5MHz :	= 24dBm	ı / 5MHz					
Result						Pa	SS						

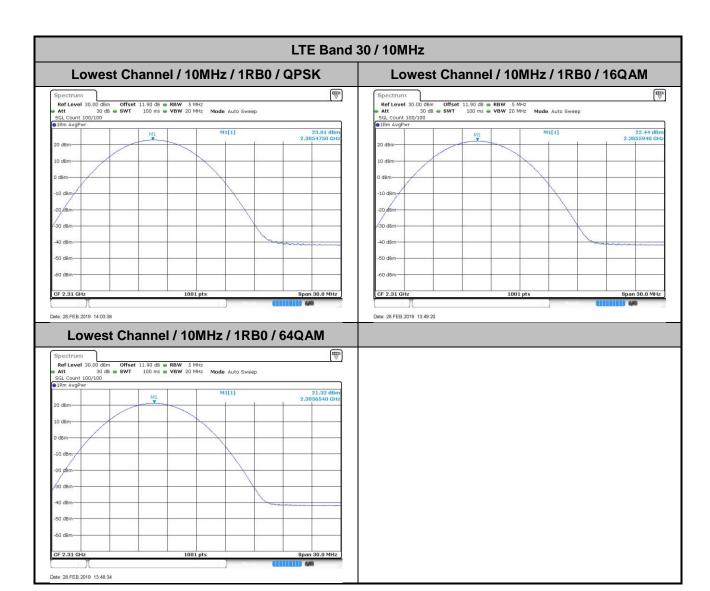
TEL: 886-3-327-3456 Page Number : A2-3 of 25



TEL: 886-3-327-3456 Page Number: A2-4 of 25



TEL: 886-3-327-3456 Page Number: A2-5 of 25



TEL: 886-3-327-3456 Page Number: A2-6 of 25

# 26dB Bandwidth

Mode		LTE Band 30 : 26dB BW(MHz)											
BW	1.4	ИHz	3MHz		5MHz		10MHz		15MHz		20MHz		
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	
Lowest CH	-	-	-	-	4.90	4.92	-	-	-	-	-	-	
Middle CH	-	-	-	-	4.92	4.91	9.85	9.87	-	-	-	-	
Highest CH	-	-	-	-	4.72	4.85	-	-	-	-	-	-	
Mode					LTE Ba	and 30 :	26dB BV	V(MHz)					
BW	1.4	ИHz	3MHz		5MHz		10MHz		15MHz		20MHz		
Mod.	64QAM		64QAM		64QAM		64QAM		64QAM		64QAM		
Lowest CH	-	-	-	-	4.84	-	-	-	-	-	-	-	
Middle CH	-	-	-	-	4.80	-	9.77	-	-	-	-	-	
Highest CH	-	-	-	-	4.83	-	-	-	-	-	-	-	

Report No. : FG920117C

TEL: 886-3-327-3456 Page Number : A2-7 of 25

LTE Band 30 Lowest Channel / 5MHz / QPSK Lowest Channel / 5MHz / 16QAM Ref Level 30.00 dBm
Att 30 dB
SGL Count 100/100 14.35 dBi 2.30581200 GF 26.00 d 4.895000000 MF 2.30709000 GH 26.00 d 4.915000000 MH 471 -10 dBm Span 10.0 MHz CF 2.3075 GHz Span 10.0 MHz Type | Ref | Trc | Type | Ref | Trc | -12.20 dBm -12.30 dBm Middle Channel / 5MHz / QPSK Middle Channel / 5MHz / 16QAM 11.90 dB • RBW 100 kHz 19 µs • VBW 300 kHz Mode Auto FFT Offset 11.90 dB ● RBW 100 kHz SWT 19 µs ● VBW 300 kHz Mode Auto FFT 14.40 dBi 2.31110900 Gi 13.79 dBn 2.31126900 GH 26.00 di 0000 MH 471. 40 dBn 40 dBm 50 d8m 50 d8m Function Result 4.905 MHz 26.00 dB 471.2 Function Result 4.915 MHz 26.00 dB 470.2 Type | Ref | Trc | 
 X-value
 Y-value
 Function

 2.311109 GHz
 14.40 dBm
 ndB down

 2.307552 GHz
 -11.45 dBm
 ndB

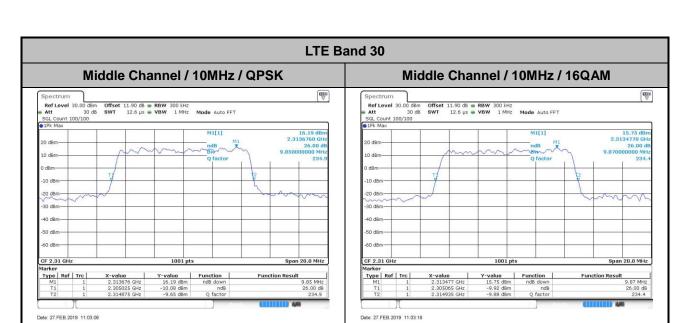
 2.312468 GHz
 -11.73 dBm
 Q factor
 Type Ref Trc Date: 27.FEB.2019 11:01:35 Date: 27.FEB.2019 11:01:46 Highest Channel / 5MHz / QPSK Highest Channel / 5MHz / 16QAM Offset 11.90 dB • RBW 100 kHz SWT 19 µs • VBW 300 kHz Mode Auto FFT Att 30 dB
 SGL Count 100/100
 1Pk Max 15.47 dBr 2.31242000 GF 13.59 dBn 2.31107100 GH CF 2.3125 GHz Function Result
4.715 MHz Function Result 4.845 MHz Type | Ref | Trc | 
 X-value
 Y-value
 Function

 2.31242 GHz
 15.47 dBm
 ndB down

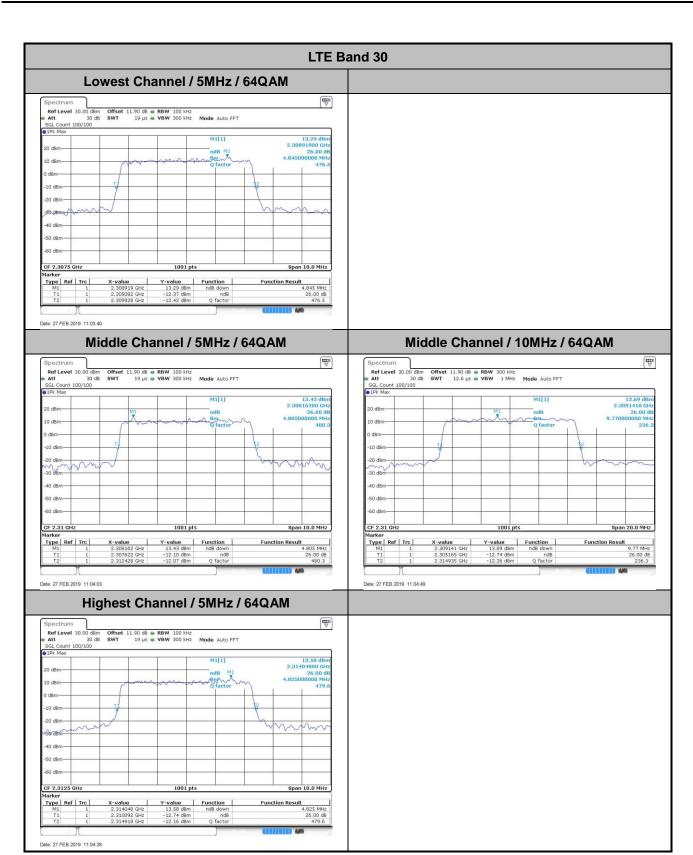
 X-value
 Y-value
 Function

 2.311071 GHz
 13.59 dBm
 ndB down
 Type | Ref | Trc |

Report No.: FG920117C



TEL: 886-3-327-3456 Page Number: A2-9 of 25



TEL: 886-3-327-3456 Page Number : A2-10 of 25

# Occupied Bandwidth

Mode		LTE Band 30 : 99%OBW(MHz)											
BW	1.4MHz 3M			3MHz 5MHz			10MHz		15MHz		20MHz		
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	
Lowest CH	-	-	-	-	4.48	4.49	-	-	-	-	-	-	
Middle CH	-	-	-	-	4.50	4.48	9.07	8.97	-	-	-	-	
Highest CH	-	-	-	-	4.51	4.51	-	-	-	-	-	-	
Mode					LTE Ba	and 26 :	99%OBV	V(MHz)					
BW	1.4	ИHz	3MHz		5MHz		10MHz		15MHz		20MHz		
Mod.	64QAM		64QAM		64QAM		64QAM		64QAM		64QAM		
Lowest CH	-	-	-	-	4.50	-	-	-	-	-	-	-	
Middle CH	-	-	-	-	4.48	-	9.01	-	-	-	-	-	
Highest CH	-	-	-	-	4.48	-	-	-	-	-	-	-	

Report No. : FG920117C

TEL: 886-3-327-3456 Page Number : A2-11 of 25

LTE Band 30 Lowest Channel / 5MHz / QPSK Lowest Channel / 5MHz / 16QAM **□** Ref Level 30.00 dBm

Att 30 dB

SGL Count 100/100

1Pk Max 15.16 dBi 2.30952800 GF 4.475524476 MF 14.28 dBn 2.30796000 GH 4.485514486 MH 10 dBm -10 dBm -10 dBm -20 dBm-40 dBm--60 dBm 1001 pts Span 10.0 MHz CF 2.3075 GHz CF 2.3075 GHz Y-value 14.28 dBm 9.00 dBm 9.14 dBm Type | Ref | Trc | Function Type Ref Trc Date: 27.FEB.2019 11:00:38 Middle Channel / 5MHz / QPSK Middle Channel / 5MHz / 16QAM | Ref Level | 30.00 dBm | Offset | 11.90 dB | RBW | 100 kHz | Att | 30 dB | SWT | 19 µs | VBW | 300 kHz | Mode | Auto FFT | 14.28 dBr 2.31197800 GF 4.495504496 MF 13.67 dBn 2.31122900 GHz 4.475524476 MHz d8man dam 30 db-6 -40 dBm 40 dBm -50 d8m 50 d8m CF 2.31 GHz Type Ref Trc 
 X-value
 Y-value
 Function

 2.311978 GHz
 14.28 dBm
 2.3077622 GHz

 2.3077622 GHz
 10.29 dBm
 Occ Bw

 2.3122577 GHz
 8.70 dBm
 Type Ref Trc 
 X-value
 Y-value
 Function

 2.311229 GHz
 13.67 dBm
 2.307722 GHz
 8.13 dBm
 Occ Bw

 2.307722 GHz
 8.86 dBm
 Occ Bw
 **Function Result Function Result** 4.495504496 MHz 4.475524476 MHz Date: 27.FEB.2019 11:01:12 Date: 27.FEB.2019 11:01:24 Highest Channel / 5MHz / QPSK Highest Channel / 5MHz / 16QAM Ref Level 30.0 dBm Offset 11.90 dB RBW 100 kHz
Att 30 dB SWY 19 µs VBW 300 kHz Mode Auto FFT
SGL count 100/100
GPIs Max 12.97 dBn 2.31403800 GH 4.505494505 MH 15.63 dB 2.31282000 GF 4.505494505 MF 20 dBm 50 dBm -50 dBm-CF 2.3125 GH CF 2.3125 GHz Type | Ref | Trc | 
 X-value
 Y-value
 Function

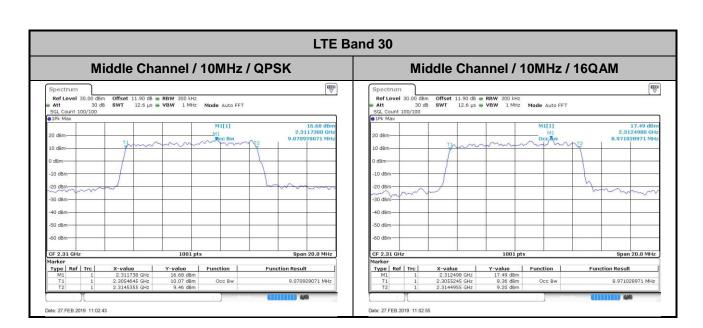
 2.31282 GHz
 15.63 dBm

 Type
 Ref
 Trc
 X-value
 Y-value
 Function

 M1
 1
 2.314038 GHz
 12.97 dBm
 Function Result 8.99 dBm Occ Bw 9.07 dBm 4.505494505 MHz Occ Bw 4.505494505 MHz

Report No.: FG920117C

TEL: 886-3-327-3456 Page Number : A2-12 of 25 FAX: 886-3-328-4978



TEL: 886-3-327-3456 Page Number : A2-13 of 25

LTE Band 30 Lowest Channel / 5MHz / 64QAM M1[1] -10 dBm -40 dBm-Type | Ref | Trc | Middle Channel / 5MHz / 64QAM Middle Channel / 10MHz / 64QAM 
 Spectrum
 Ref Level 30.00 dBm
 Offset 11.90 dB ● RBW 300 kHz

 att
 30 dB
 SWT
 12.6 µS ● VBW
 1 MHz
 Mode Auto FFT
 12.39 dBi 2.31172800 GF 4.475524476 MF 14.21 dBm 2.3074230 GHz 9.010989011 MHz 30 dBm -40 dBm 40 dBm 50 d8m CF 2.31 GH 
 X-value
 Y-value
 Function

 2.311728 GHz
 12.39 dBm
 2.327722 GHz

 2.3077722 GHz
 6.84 dBm
 Occ Bw

 2.3122478 GHz
 6.97 dBm
 Type Ref Trc 
 X-value
 Y-value
 Function

 2.307423 GHz
 14.21 dBm

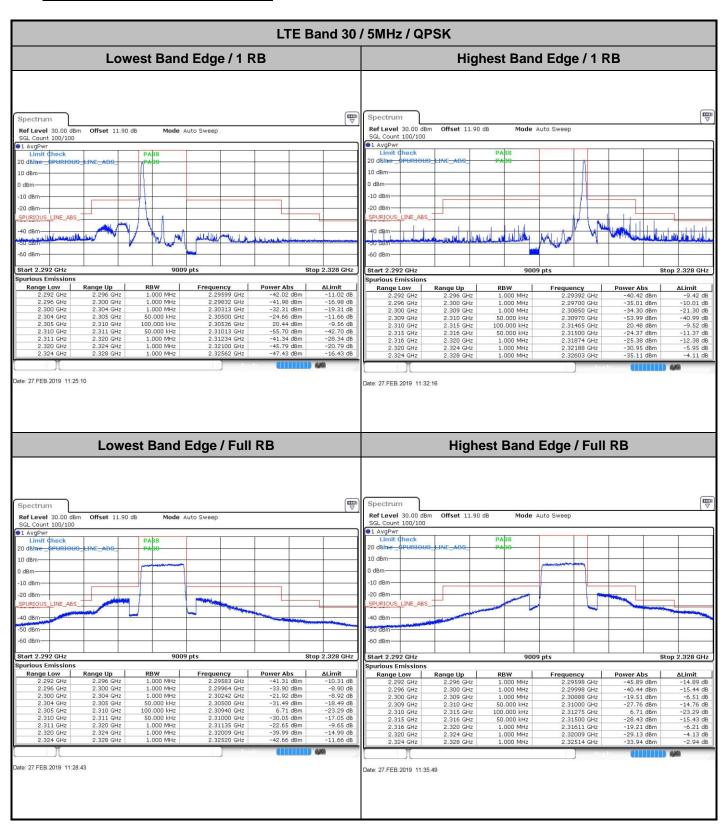
 2.3055245 GHz
 7.86 dBm
 Occ Bw

 2.3145395 GHz
 8.77 dBm
 Type | Ref | Trc | **Function Result Function Result** 4.475524476 MHz 9.010989011 MHz Date: 27.FEB.2019 11:03:52 Date: 27.FEB.2019 11:04:37 Highest Channel / 5MHz / 64QAM 13.57 dBi 2.31361900 GF 4.475524476 MF M1[1] 280 dBm/ CF 2.3125 GHz Type | Ref | Trc | X-value Y-value Function
2.313619 GHz 13.57 dBm 13.57 dBm 7.53 dBm Occ Bw 8.13 dBm 4.475524476 MHz

Report No.: FG920117C

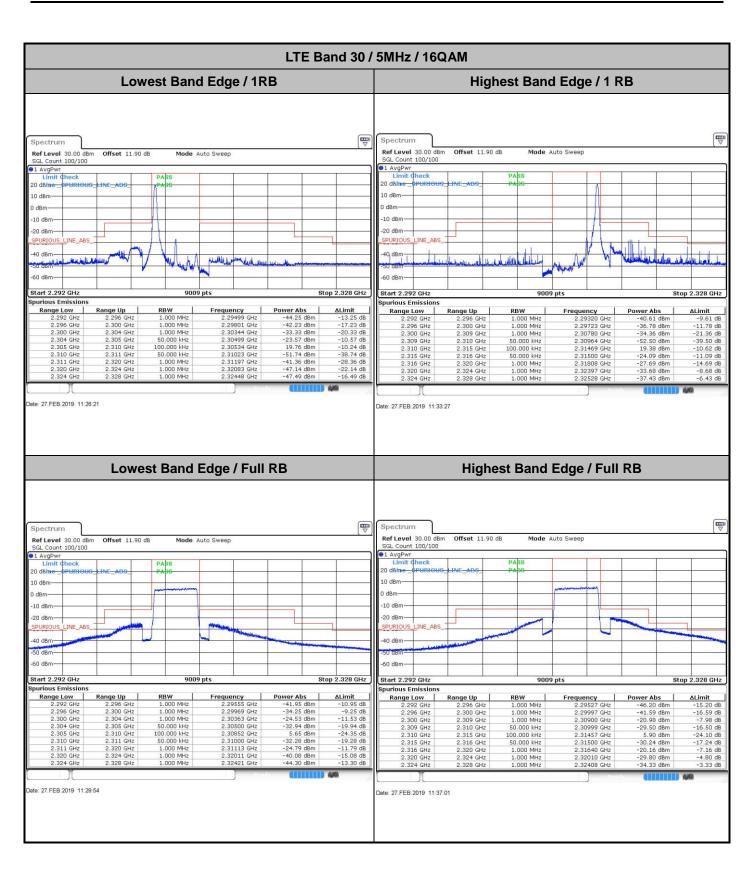
TEL: 886-3-327-3456 Page Number : A2-14 of 25

## **Conducted Band Edge**

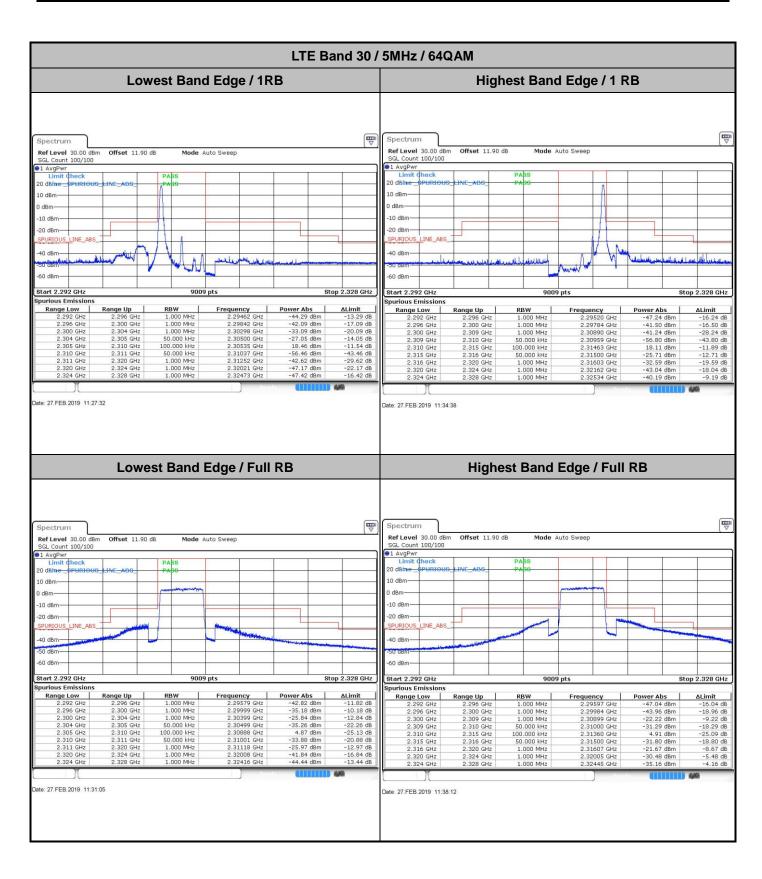


Report No.: FG920117C

TEL: 886-3-327-3456 Page Number: A2-15 of 25



TEL: 886-3-327-3456 Page Number: A2-16 of 25



TEL: 886-3-327-3456 Page Number: A2-17 of 25

LTE Band 30 / 10MHz / QPSK Lowest Band Edge / 1 RB Highest Band Edge / 1 RB Spectrum Offset 11.90 dB Mode Auto Sweep Offset 11.90 dB Mode Auto Sweep Ref Level 30.00 dBm SGL Count 100/100 SGL Count 100/100 1 AvgPwr ●1 AvgPwr Limit Check 20 dBime 10 dBm 10 dBm dBm 10 dBm 20 dBm PURIOUS INE ABS 40 dBn 40 dBm-60 dBm -60 dBm-Start 2.292 GHz Start 2.292 GHz 9009 pts Stop 2.328 GHz Range Up ious Emission urious Emissions Power Abs
-46.62 dBm
-45.66 dBm
-43.82 dBm
-54.22 dBm
20.16 dBm
-31.14 dBm
-32.75 dBm
-38.43 dBm
-42.47 dBm Erequency
2.29541 GHz
2.29960 GHz
2.30384 GHz
2.30499 GHz
2.30558 GHz
2.31599 GHz
2.31598 GHz
2.31628 GHz
2.32040 GHz
2.32040 GHz Power Abs
-42.46 dBm
-34.92 dBm
-28.70 dBm
-32.98 dBm
20.33 dBm
-53.88 dBm
-40.11 dBm
-45.81 dBm
-40.85 dBm 1.000 MHz 1.000 MHz 1.000 MHz 1.000 MHz 2.29494 GHz 2.29972 GHz 2.30062 GHz 2.30400 GHz Range Low 2.292 GH Range Up ΔLimit Range Low 2.292 GHz ΔLimit nge Up 2.296 GHz 2.300 GHz 2.305 GHz 2.305 GHz 2.315 GHz 2.316 GHz 2.320 GHz 2.324 GHz 2.328 GHz 11.46 dB -9.92 dB -15.70 dB -19.87 dB -9.67 dB -40.88 dB -27.11 dB -20.81 dB -9.85 dB ΔLimit
-15.62 dB
-20.66 dB
-30.82 dB
-41.22 dB
-9.84 dB
-18.14 dB
-19.75 dB
-13.43 dB
-11.47 dB 2.296 GHz 2.300 GHz 2.304 GHz 2.305 GHz 2.315 GHz 2.316 GHz 2.320 GHz 2.324 GHz 2.328 GHz 2.292 GHz 2.296 GHz 2.300 GHz 2.304 GHz 2.305 GHz 2.315 GHz 2.316 GHz 2.320 GHz 2.324 GHz 100.000 kHz 100.000 kHz 100.000 kHz 2.30400 GHz 2.31440 GHz 2.31500 GHz 2.31644 GHz 2.32079 GHz 2.32402 GHz ate: 27.FEB.2019 11:39:23 Date: 27.FEB.2019 11:42:56 Band Edge / Full RB Spectrum Offset 11.90 dB Ref Level 30.00 dBm Mode Auto Sweep SGL Count 100/100 Limit Check PASS 20 dBime SPURIOUS\_ 0 dBm -10 dBm -20 dBm-SPURIOUS LINE -50 dBm -60 dBm 9009 pts Stop 2.328 GHz Start 2.292 GHz Spurious Emissions Range Low 2.292 GHz Range Up 2.296 GHz RBW Frequency 2.29554 GHz Power Abs -34.74 dBm -3.74 dB -1.24 dB 1.000 MHz 2.296 GHz 2.300 GHz 1.000 MHz 2.29979 GHz -26.24 dBm 1.000 MHz -25.48 dBm -12.48 dB 2.30400 GHz 304 GHz 2,300 GHz 2.30500 GHz 2.31263 GHz 2.304 GHz 2.305 GHz 100.000 kHz -32.61 dBm -19.61 dB -26.56 dB -17.73 dB 100.000 kHz 2.305 GHz 2.315 GHz 3.44 dBm 2.315 GHz 2.316 GHz 100.000 kHz .31500 GHz -30.73 dBm 2.320 GHz 1.000 MHz -10.61 dB 2.316 GHz 2.31609 GHz -23.61 dBm 2.320 GHz 2.324 GHz 2.328 GHz 1.000 MHz .32023 GHz -25.23 dBm -31.62 dBm -0.23 dB -0.62 dB 2.324 GHz 1,000 MHz 2.32409 GHz Date: 28.FEB.2019 11:58:46

Report No.: FG920117C

TEL: 886-3-327-3456 Page Number : A2-18 of 25

LTE Band 30 / 10MHz / 16QAM Lowest Band Edge / 1 RB Highest Band Edge / 1 RB Spectrum Offset 11.90 dB Mode Auto Sweep Offset 11.90 dB Mode Auto Sweep Ref Level 30.00 dBm SGL Count 100/100 SGL Count 100/100 1 AvgPwr ●1 AvgPwr Limit Check 20 dBime 10 dBm 10 dBm dBm 10 dBm 20 dBm PURIOUS INE ABS 40 dBm 40 dBm-44.141 60 dBm -60 dBm-Start 2.292 GHz Start 2.292 GHz 9009 pts Stop 2.328 GHz Range Up ious Emissions urious Emissions Erequency
2.29517 GHz
2.29679 GHz
2.30395 GHz
2.30500 GHz
2.30558 GHz
2.31595 GHz
2.31595 GHz
2.31590 GHz
2.32691 GHz
2.32693 GHz Power Abs
-42.94 dBm
-39.29 dBm
-32.59 dBm
-30.31 dBm
19.16 dBm
-52.96 dBm
-42.64 dBm
-46.55 dBm
-40.73 dBm Power Abs
-47.44 dBm
-46.71 dBm
-43.73 dBm
-54.69 dBm
-30.17 dBm
-31.68 dBm
-42.57 dBm Range Up
2.296 GHz
2.300 GHz
2.304 GHz
2.305 GHz
2.315 GHz
2.316 GHz
2.320 GHz
2.324 GHz
2.328 GHz ΔLimit
-11.94 dB
-14.29 dB
-19.59 dB
-17.31 dB
-10.84 dB
-39.96 dB
-29.64 dB
-21.55 dB
-9.73 dB 1.000 MHz 1.000 MHz 1.000 MHz 1.000 MHz 2.29597 GHz 2.29597 GHz 2.29927 GHz 2.30375 GHz 2.30499 GHz Range Low 2.292 GH Range Low 2.292 GHz ΔLimit ΔLimit
-16.44 dB
-21.71 dB
-30.73 dB
-41.69 dB
-10.33 dB
-17.17 dB
-18.68 dB
-17.57 dB
-12.16 dB 2.292 GHz 2.296 GHz 2.300 GHz 2.304 GHz 2.305 GHz 2.315 GHz 2.316 GHz 2.320 GHz 2.324 GHz 2.296 GHz 2.300 GHz 2.304 GHz 2.305 GHz 2.315 GHz 2.316 GHz 2.320 GHz 2.324 GHz 2.328 GHz 100.000 kHz 100.000 kHz 100.000 kHz 2.30499 GHz 2.31443 GHz 2.31500 GHz 2.31600 GHz 2.32164 GHz 2.32461 GHz ate: 27.FEB.2019 11:40:34 Date: 27.FEB.2019 11:44:07 Band Edge / Full RB Spectrum Offset 11.90 dB Ref Level 30.00 dBm Mode Auto Sweep SGL Count 100/100 Limit Check PASS 20 dBime SPURIOUS\_ 0 dBm -10 dBm -20 dBm-SPURIOUS LINE -50 dBm -60 dBm 9009 pts Stop 2.328 GHz Start 2.292 GHz Spurious Emissions Range Low 2.292 GHz Range Up 2.296 GHz RBW Frequency 2.29552 GHz Power Abs -33.64 dBm ∆Limit 1.000 MHz -2.64 dB 2.296 GHz 2.300 GHz 1.000 MHz 2.29996 GHz -26.68 dBm -1.68 dB 1.000 MHz 2.30380 GHz -11.42 dB 304 GHz -24.42 dBm 2,300 GHz 2.30499 GHz 2.31405 GHz -19.26 dB -27.21 dB 2.304 GHz 2.305 GHz 100.000 kHz -32.26 dBm 100.000 kHz 2.305 GHz 2.315 GHz 2.79 dBm -18.97 dB -10.37 dB 2.315 GHz 2.316 GHz 100.000 kHz .31501 GHz -31.97 dBm 2.320 GHz 1.000 MHz 2.316 GHz 2.31644 GHz -23.37 dBm 2.320 GHz 2.324 GHz 2.328 GHz 1.000 MHz 2.32018 GHz -26.19 dBm 2.324 GHz 1,000 MHz -32.02 dBm 2.32423 GHz -1.02 dB Date: 27.FEB.2019 11:47:40

Report No.: FG920117C

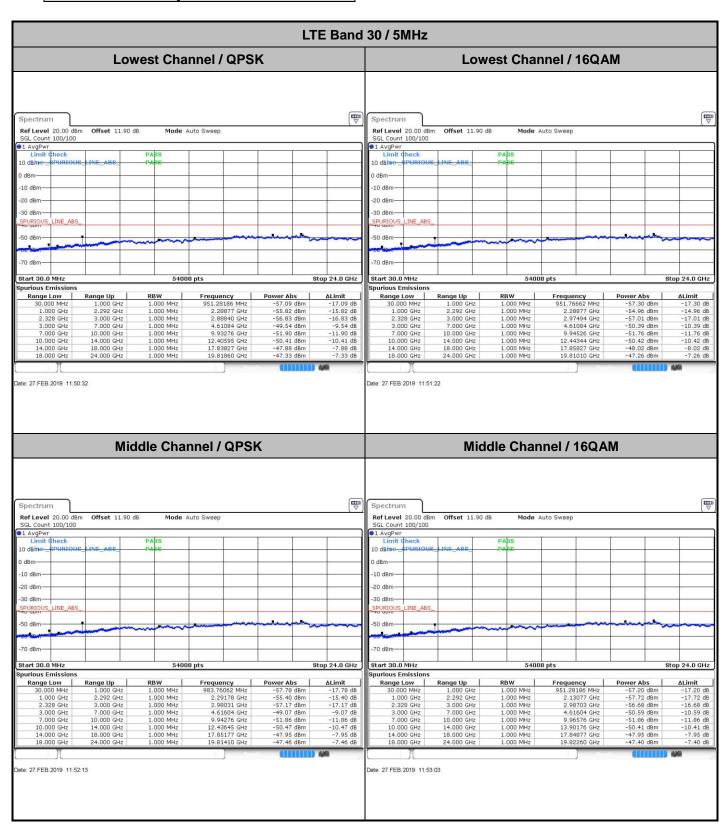
TEL: 886-3-327-3456 Page Number : A2-19 of 25

LTE Band 30 / 10MHz / 64QAM Lowest Band Edge / 1 RB Highest Band Edge / 1 RB Spectrum Offset 11.90 dB Mode Auto Sweep Offset 11.90 dB Mode Auto Sweep Ref Level 30.00 dBm SGL Count 100/100 SGL Count 100/100 1 AvgPwr ●1 AvgPwr Limit Check 20 dBime 10 dBm 10 dBm dBm 10 dBm -20 dBm INE\_ABS PURIOUS INE ABS 40 dBm 40 dBm-60 dBm -60 dBm-Start 2.292 GHz 9009 pts Stop 2.328 GHz Start 2.292 GHz Range Up ious Emissions urious Emissions Power Abs
-40.33 dBm
-39.45 dBm
-32.87 dBm
-35.48 dBm
17.59 dBm
-54.98 dBm
-40.39 dBm
-47.49 dBm
-47.49 dBm Range Up
2.296 GHz
2.300 GHz
2.304 GHz
2.305 GHz
2.315 GHz
2.316 GHz
2.320 GHz
2.324 GHz
2.328 GHz 1.000 MHz 1.000 MHz 1.000 MHz 1.000 MHz 2.29501 GHz 2.29501 GHz 2.29989 GHz 2.30384 GHz 2.30404 GHz Range Low 2.292 GH Frequency 2.29374 GHz ∆Limit Range Low 2.292 GHz Power Abs -47.57 dBn ΔLimit -16.57 -9.33 dB -14.45 dB -19.87 dB -22.48 dB -12.41 dB -41.98 dB -27.39 dB -20.90 dB -16.49 dB 16.57 dB -16.57 dB -21.25 dB -31.08 dB -42.90 dB -11.42 dB -19.85 dB -21.66 dB -16.91 dB -13.15 dB 2.292 GHz 2.296 GHz 2.300 GHz 2.304 GHz 2.305 GHz 2.315 GHz 2.316 GHz 2.320 GHz 2.324 GHz 2.296 GHz 2.300 GHz 2.304 GHz 2.305 GHz 2.315 GHz 2.316 GHz 2.320 GHz 2.324 GHz 2.328 GHz -47.57 d8m -46.25 d8m -44.08 d8m -55.90 d8m 18.58 d8m -32.85 d8m -34.66 d8m -41.91 d8m -44.15 d8m 100.000 kHz 100.000 kHz 100.000 kHz 2.30404 GHz 2.31442 GHz 2.31500 GHz 2.31606 GHz 2.32170 GHz 2.32455 GHz ate: 27.FEB.2019 11:41:45 Date: 27.FEB.2019 11:45:18 Band Edge / Full RB Spectrum Offset 11.90 dB Ref Level 30.00 dBm Mode Auto Sweep SGL Count 100/100 Limit Check PASS 20 dBime PURIOUS\_ 10 dBm 0 dBm -10 dBm -20 dBm-SPURIOUS LINE ABS -50 dBm -60 dBm 9009 pts Stop 2.328 GHz Start 2.292 GHz Spurious Emissions Range Low 2.292 GHz Range Up 2.296 GHz RBW Frequency Power Abs -35.34 dBm ∆Limit 1.000 MHz -4.34 dB 2.296 GHz 2.300 GHz 1.000 MHz 2.29959 GHz -28.76 dBm -3.76 dB 1.000 MHz 2.30389 GHz 304 GHz -26.96 dBm -13.96 dB 2,300 GHz 2.30498 GHz 2.31348 GHz -22.86 dB -27.91 dB 2.304 GHz 2.305 GHz 100.000 kHz -35.86 dBm 100.000 kHz 2.305 GHz 2.315 GHz 2.09 dBm 2.315 GHz 2.316 GHz 100.000 kHz .31596 GHz -33.37 dBm -20.37 dB -11.71 dB -2.19 dB 2.320 GHz 1.000 MHz 2.31602 GHz -24.71 dBm 2.316 GHz 2.320 GHz 2.324 GHz 2.328 GHz 1.000 MHz .32031 GHz -27.19 dBm -32.79 dBm 2.324 GHz 1,000 MHz 2.32432 GHz -1.79 dB Date: 27.FEB.2019 11:48:51

Report No.: FG920117C

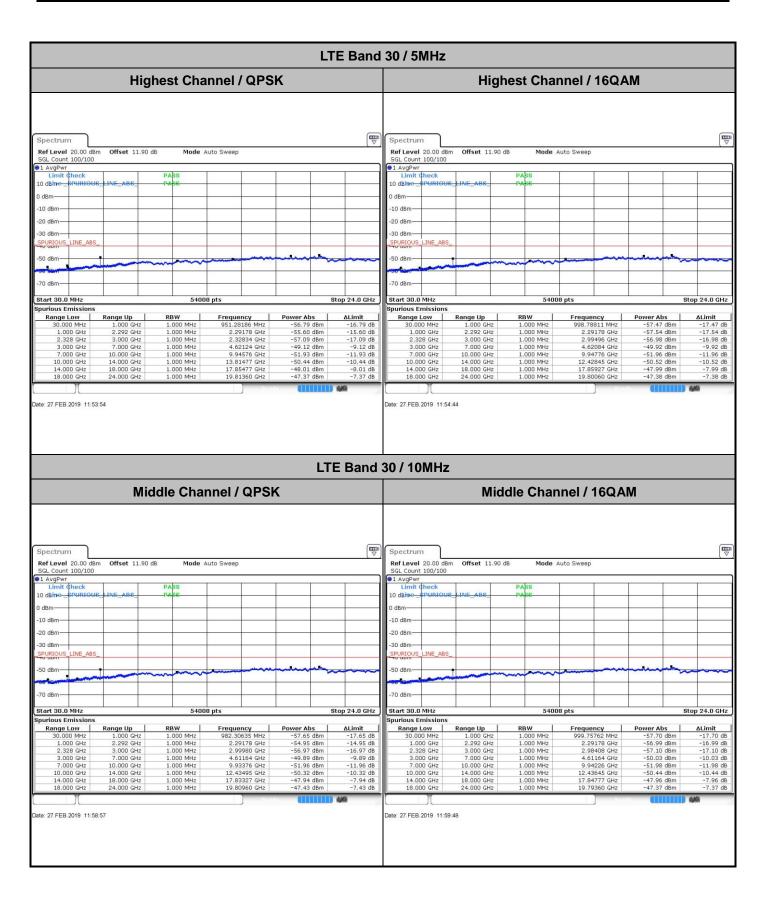
TEL: 886-3-327-3456 Page Number : A2-20 of 25

# **Conducted Spurious Emission**



Report No.: FG920117C

TEL: 886-3-327-3456 Page Number : A2-21 of 25



TEL: 886-3-327-3456 Page Number : A2-22 of 25

LTE Band 30 / 5MHz **Lowest Channel / 64QAM** Middle Channel / 64QAM **W** Spectrum Spectrum Offset 11.90 dB Mode Auto Sweep Offset 11.90 dB Mode Auto Sweep Ref Level 20.00 dBm Ref Level 20.00 dBm SGL Count 100/100 SGL Count 100/100 1 AvgPwr Limit Check ●1 AvgPwr Limit ¢h 10 dBine dBm dBm -10 dBm -10 dBm 20 dBm -20 dBm LINE\_ABS SPURIOUS INE\_ABS 50 dBm -50 dBm 70 dBm-70 dBm-Start 30.0 MHz Stop 24.0 GHz Start 30.0 MHz rious Emissio Spurious Emissions Power Abs
-57.07 dBm
-57.73 dBm
-56.96 dBm
-51.76 dBm
-51.80 dBm
-50.38 dBm
-47.96 dBm
-47.56 dBm 951.76662 MHz 2.29178 GHz 2.97575 GHz 4.61124 GHz ΔLimit
-17.07 dB
-17.73 dB
-16.96 dB
-11.76 dB
-11.80 dB
-10.38 dB
-7.96 dB
-7.56 dB 973.09595 MHz 2.28877 GHz 2.99966 GHz 4.61604 GHz Range Low Range Up RBW Range Low 30.000 MHz Range Up RBW Power Abs ΔLimit 1.000 MHz -17.90 dB -17.83 dB -16.93 dB -10.82 dB -11.89 dB -10.38 dB -8.02 dB -7.40 dB 1.000 MHz 1.000 MHz 1.000 MHz 1.000 MHz 1.000 MHz 1.000 GHz 2.292 GHz -57.90 dBm -57.83 dBm 2.292 GHz 3.000 GHz 1.000 MHz 1.000 GHz 2.328 GHz 3.000 GHz 7.000 GHz 10.000 GHz 14.000 GHz 18.000 GHz -57.83 dBm -56.93 dBm -50.82 dBm -51.89 dBm -50.38 dBm -48.02 dBm -47.40 dBm 2.328 GHz 3.000 GHz 9.97275 GHz 12.45094 GHz 17.83177 GHz 19.81610 GHz 9.94326 GHz 12.42245 GHz 17.84427 GHz 19.81410 GHz 10.000 GHz 14.000 GHz 7.000 GHz 10.000 GHz 10.000 GHz 14.000 GHz .000 MHz 18.000 GHz 24.000 GHz 14.000 GHz 18.000 GHz 18.000 GHz 24.000 GHz 1.000 MHz 1.000 MHz ate: 27.FEB.2019 11:55:35 Date: 27.FEB.2019 11:56:26 **Highest Channel / 64QAM** Spectrum Ref Level 20.00 dBm Offset 11.90 dB Mode Auto Sweep SGL Count 100/100 1 AvgPwr Limit Check 0 dBm -10 dBm -30 dBm-LINE\_ABS 70 dBm-Start 30.0 MHz Stop 24.0 GHz rious Emissions 1.000 MHz Range Low 30.000 MHz 51.76662 MHz 1.80142 GHz 2.99402 GHz 4.62124 GHz 9.95576 GHz 12.43745 GHz 17.85527 GHz 19.79560 GHz 30.000 MHz 1.000 GHz 2.328 GHz 3.000 GHz 7.000 GHz 10.000 GHz 14.000 GHz ite: 27.FEB.2019 11:57:16

Report No.: FG920117C

TEL: 886-3-327-3456 Page Number : A2-23 of 25

LTE Band 30 / 10MHz Middle Channel / 64QAM **₩** Spectrum Ref Level 20.00 dBm Offset 11.90 dB SGL Count 100/100 Mode Auto Sweep ●1 AvgPwr Limit ¢heck 0 dBm -10 dBm -20 dBm LINE\_ABS -50 dBm 70 dBm-Start 30.0 MHz Stop 24.0 GHz Cart 30.0 MHz

Nurious Emissions

Range Low

30.000 MHz

1.000 GHz

2.328 GHz

3.000 GHz

7.000 GHz

10.000 GHz

14.000 GHz

18.000 GHz Range Up 1.000 GHz 2.292 GHz 3.000 GHz 7.000 GHz 10.000 GHz 14.000 GHz 18.000 GHz 24.000 GHz RBW 1.000 MHz Frequency 984.73013 MHz 2.29178 GHz 2.98959 GHz 4.61164 GHz 9.94576 GHz 12.39745 GHz 17.85827 GHz 19.81960 GHz Power Abs
-57.72 dBm
-56.77 dBm
-57.12 dBm
-51.90 dBm
-51.91 dBm
-50.48 dBm
-47.99 dBm
-47.45 dBm ΔLimit
-17.72 dB
-16.77 dB
-17.12 dB
-11.90 dB
-11.91 dB
-10.48 dB
-7.99 dB
-7.45 dB Date: 27.FEB.2019 11:58:07

Report No.: FG920117C

TEL: 886-3-327-3456 Page Number: A2-24 of 25

# Frequency Stability

Test Conditions		LTE Band 30 (QPSK) / Middle Channel				
_ ,		BW 10MHz	Note 2.			
Temperature (°C)	Voltage (Volt)	Deviation (ppm)	Result			
50	Normal Voltage	0.0002				
40	Normal Voltage	0.0055				
30	Normal Voltage  Normal Voltage	0.0004				
20(Ref.)		0.0000				
10	Normal Voltage	0.0005				
0	Normal Voltage	0.0055				
-10	Normal Voltage	0.0002	PASS			
-20	Normal Voltage	0.0064				
-30	Normal Voltage	0.0062				
20	Maximum Voltage	0.0004				
20	Normal Voltage	0.0000				
20	Battery End Point	0.0058				

Report No.: FG920117C

#### Note:

- 1. Normal Voltage =3.8 V.; Battery End Point (BEP) =3.6 V.; Maximum Voltage =4.2 V..
- 2. Note: The frequency fundamental emissions stay within the authorized frequency block.

TEL: 886-3-327-3456 Page Number : A2-25 of 25

### **Appendix B. Test Results of EIRP and Radiated Test**

## EIRP

<Reporting Only>

LTE Band 30 / 5MHz (Average) (GT - LC = 0 dB)										
Channel	Mode	RB		Cond	ucted	EIRP				
Chamilei		Size	Offset	Power (dBm)	Power (Watts)	EIRP(dBm)	EIRP(W)			
Lowest	QPSK	1	24	23.16	0.2070	23.16	0.2070			
Middle		1	24	23.14	0.2061	23.14	0.2061			
Highest		1	24	23.12	0.2051	23.12	0.2051			
Lowest	16QAM	1	24	22.42	0.1746	22.42	0.1746			
Middle		1	24	22.46	0.1762	22.46	0.1762			
Highest		1	24	22.37	0.1726	22.37	0.1726			
Lowest	64QAM	1	12	21.38	0.1374	21.38	0.1374			
Middle		1	12	21.46	0.1400	21.46	0.1400			
Highest		1	12	21.42	0.1387	21.42	0.1387			
Limit	EIRP < 0.25W			Re	sult	PASS				

Report No.: FG920117C

LTE Band 30 / 10MHz (Average) (GT - LC = 0 dB)									
Channel	Mode	RB		Cond	ucted	EIRP			
		Size	Offset	Power (dBm)	Power (Watts)	EIRP(dBm)	EIRP(W)		
Lowest	QPSK	1	-	-	-	-	-		
Middle		1	49	23.17	0.2075	23.17	0.2075		
Highest		1	-	-	-	-	-		
Lowest	16QAM	1	-	-	-	-	-		
Middle		1	49	22.43	0.1750	22.43	0.1750		
Highest		-	-	-	-	-	-		
Lowest	64QAM	-	-	-	-	-	-		
Middle		1	49	21.44	0.1393	21.44	0.1393		
Highest		•	-	-	-	-	-		
Limit	EIRP < 0.25W			Re	sult	PASS			

# **Radiated Spurious Emission**

## LTE Band 30

Report No.: FG920117C

LTE Band 30 / 5MHz / QPSK									
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)
	4614	-59.79	-40	-19.79	-57.21	-71.01	1.46	12.68	Н
	6924	-61.56	-40	-21.56	-64.49	-71.84	1.73	12.01	Н
	9234	-59.79	-40	-19.79	-64.96	-69.40	2.16	11.77	Н
Lowest									Н
Lowest	4614	-57.56	-40	-17.56	-54.21	-68.78	1.46	12.68	V
	6924	-62.20	-40	-22.20	-64.68	-72.48	1.73	12.01	V
	9234	-58.98	-40	-18.98	-65.16	-68.59	2.16	11.77	V
									V
	4620	-60.06	-40	-20.06	-57.48	-71.28	1.46	12.68	Н
	6924	-61.86	-40	-21.86	-64.79	-72.14	1.73	12.01	Н
	9234	-60.49	-40	-20.49	-65.66	-70.10	2.16	11.77	Н
N 4: -l -ll -									Н
Middle	4620	-58.30	-40	-18.30	-54.95	-69.52	1.46	12.68	V
	6924	-62.10	-40	-22.10	-64.58	-72.38	1.73	12.01	V
	9234	-58.80	-40	-18.80	-64.98	-68.41	2.16	11.77	V
									V
	4620	-59.68	-40	-19.68	-57.1	-70.90	1.46	12.68	Н
Highest	6930	-60.92	-40	-20.92	-63.94	-71.19	1.73	12.00	Н
	9243	-60.06	-40	-20.06	-65.21	-69.65	2.16	11.76	Н
									Н
	4620	-58.38	-40	-18.38	-55.03	-69.60	1.46	12.68	V
	6930	-62.05	-40	-22.05	-64.61	-72.32	1.73	12.00	V
	9243	-58.67	-40	-18.67	-64.86	-68.26	2.16	11.76	V
									V

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

TEL: 886-3-327-3456 Page Number : B2-1 of 2

	LTE Band 30 / 10MHz / QPSK									
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)	
	4614	-58.52	-40	-18.52	-55.94	-69.74	1.46	12.68	Н	
	6918	-60.55	-40	-20.55	-63.48	-70.83	1.73	12.01	Н	
	9225	-59.68	-40	-19.68	-64.87	-69.30	2.16	11.78	Н	
									Н	
									Н	
									Н	
Middle									Н	
Middle	4614	-57.96	-40	-17.96	-54.61	-69.18	1.46	12.68	V	
	6918	-61.73	-40	-21.73	-64.21	-72.01	1.73	12.01	V	
	9225	-59.21	-40	-19.21	-65.41	-68.83	2.16	11.78	V	
									V	
									V	
									V	
									V	

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

TEL: 886-3-327-3456 Page Number : B2-2 of 2