FCC Test Report

(PART 27)

Report No.: RF170502C07-10

FCC ID: NM8G011A

Test Model: G011A

Received Date: May 02, 2017

Test Date: May 26, 2017 ~ Jun. 30, 2017

Issued Date: Jul. 19, 2017

Applicant: HTC Corporation

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Release Control Record

Issue No.	Description	Date Issued
RF170502C07-10	Original Release	Jul. 19, 2017

1 Certificate of Conformity

Product: Smartphone

Test Model: G011A

Sample Status: Production Unit

Applicant: HTC Corporation

Test Date: May 26, 2017 ~ Jun. 30, 2017

Standards: FCC Part 27, Subpart C

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** Jul. 19, 2017

Ivonne Wu / Supervisor

Approved by : _____ , **Date:** Jul. 19, 2017

David Huang / Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 27 & Part 2			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 27.50(a)(3)	Equivalent Isotropic Radiated Power	Pass	Meet the requirement of limit.
2.1055 27.54	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth	Pass	Meet the requirement of limit.
2.1046 27.50(a)(3)	Peak to Average Ratio	Pass	Meet the requirement of limit.
2.1051 27.53(a)(4)	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 27.53(a)(4)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 27.53(a)(4)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -8.18 dB at 4620.00 MHz.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expended Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.44 dB
Radiated Emissions up to 1 GHz	30 MHz ~ 200 MHz	2.0153 dB
	200 MHz ~1000 MHz	2.0224 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	1.0121 dB
	18 GHz ~ 40 GHz	1.1508 dB

2.2 Test Site And Instruments

Description & Manaufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent Technologies	N9010A	MY52220314	Nov. 16, 2016	Nov. 15, 2017
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Dec. 13, 2016	Dec. 12, 2017
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Dec. 16, 2016	Dec. 15, 2017
HORN Antenna ETS-Lindgren	3117	00143293	Dec. 29, 2016	Dec. 28, 2017
Double Ridge Guide Horn Antenna EMCO	3115	5619	Dec. 27, 2016	Dec. 26, 2017
BILOG Antenna SCHWARZBECK	VULB 9168	9168-153	Dec. 13, 2016	Dec. 12, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Dec. 14, 2016	Dec. 13, 2017
Fixed Attenuator Mini-Circuits	BW-N10W5+	NA	Jul. 08, 2016	Jul. 07, 2017
MXG Vector signal generator Agilent	N5182B	MY53050430	Oct. 19, 2016	Oct. 18, 2017
Preamplifier Agilent	310N	187226	Jun. 24, 2016	Jun. 23, 2017
Preamplifier Agilent	310N	187226	Jun. 23, 2017	Jun. 22, 2018
Preamplifier Agilent	83017A	MY39501357	Jun. 24, 2016	Jun. 23, 2017
Preamplifier Agilent	83017A	MY39501357	Jun. 23, 2017	Jun. 22, 2018
Power Meter Anritsu	ML2495A	1232002	Sep. 08, 2016	Sep. 07, 2017
Power Sensor Anritsu	MA2411B	1207325	Sep. 08, 2016	Sep. 07, 2017
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-400)	Jun. 24, 2016	Jun. 23, 2017
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-400)	Jun. 23, 2017	Jun. 22, 2018
RF signal cable ETS-LINDGREN	8D-FB	Cable-CH1-02(RFC-SMS-100-SMS-24)	Jun. 24, 2016	Jun. 23, 2017
RF signal cable ETS-LINDGREN	8D-FB	Cable-CH1-02(RFC-SMS-100-SMS-24)	Jun. 23, 2017	Jun. 22, 2018
Software BV ADT	E3 8.130425b	NA	NA	NA
Antenna Tower MF	NA	NA	NA	NA
Turn Table MF	NA	NA	NA	NA
Antenna Tower &Turn Table Controller MF	MF-7802	NA	NA	NA

Antenna Tower &Turn Table Controller MF	MF-7802	NA	NA	NA
Communications Tester-Wireless Agilent	8960 Series 10	MY53201073	Jun. 28, 2017	Jun. 27, 2019
Radio Communication Analyzer Anritsu	MT8820C	6201300640	Aug. 10, 2015	Aug. 09, 2017
Temperature & Humidity Chamber	GTH-120-40-CP-A R	MAA1306-019	Sep. 02, 2016	Sep. 01, 2017
DC Power Supply Topward	33010D	807748	Oct. 25, 2016	Oct. 24, 2018
Digital Multimeter Fluke	87-III	73680266	Nov. 10, 2016	Nov. 09, 2017

Note:
1. The calibration interval of the above test instruments is 12 / 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HsinTien Chamber 1.
3. The horn antenna and preamplifier (model: 83017A) are used only for the measurement of emission frequency above 1 GHz if tested.
4. The FCC Site Registration No. is 149147.
5. The IC Site Registration No. is IC7450I-1.

3 General Information

3.1 General Description of EUT

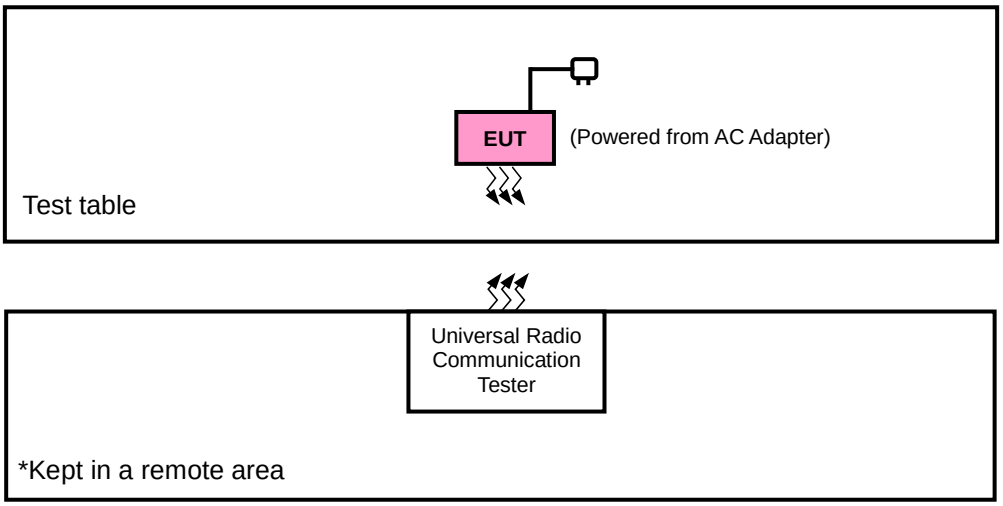
Product	Smartphone	
Test Model	G011A	
Status of EUT	Production Unit	
Power Supply Rating	5.0 Vdc or 9.0 Vdc (adapter) 3.85 Vdc (Li-ion battery)	
Modulation Type	QPSK, 16QAM, 64QAM	
Frequency Range	LTE Band 30 (Channel Bandwidth: 5 MHz)	2307.5 ~ 2312.5 MHz
	LTE Band 30 (Channel Bandwidth: 10 MHz)	2310 MHz
Max. EIRP Power	LTE Band 30 (Channel Bandwidth: 5 MHz)	238.84 mW
	LTE Band 30 (Channel Bandwidth: 10 MHz)	235.50 mW
Emission Designator	LTE Band 30 (Channel Bandwidth: 5 MHz)	4M50W7D
	LTE Band 30 (Channel Bandwidth: 10 MHz)	8M96W7D
Antenna Type	Fixed Internal Antenna	
Accessory Device	Refer to Note as below	
Data Cable Supplied	Refer to Note as below	

Note:

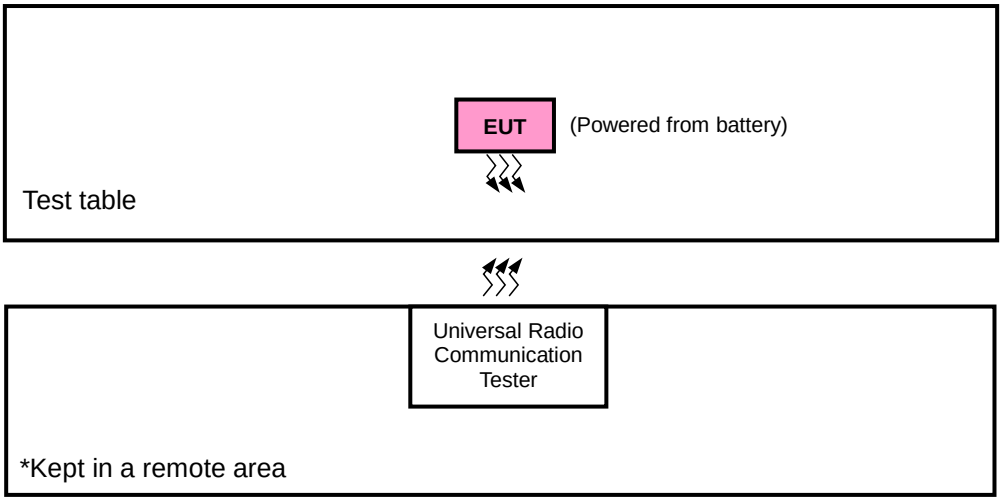
1. There’re 2 configuraitons for the EUT listed as below.
   Main Sample: EUT + Battery 1
   2nd Sample: EUT + Battery 2
   ✧ Only the worst test data was presented in the report.
2. The EUT’s accessories list refers to EMI report.
3. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Configuration of System Under Test

<Radiated Emission Test>



<E.I.R.P. Test>



3.2.1 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units.

3.3 Test Mode Applicability and Tested Channel Detail

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports

The worst case was found when positioned on X-plane for EIRP and X-axis for radiated emission. Following channel(s) was (were) selected for the final test as listed below:

EUT Configure Mode	Discription
A	Main Sample
B	2nd Sample

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
A	EIRP	27685 to 27735	27685, 27710, 27735	5 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
		27710	27710	10 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
B	EIRP	27710	27710	10 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
A	Frequency Stability	27685 to 27735	27685, 27735	5 MHz	QPSK	1 RB / 0 RB Offset
		27710	27710	10 MHz	QPSK	1 RB / 0 RB Offset
A	Occupied Bandwidth	27685 to 27735	27685, 27710, 27735	5 MHz	QPSK, 16QAM, 64QAM	25 RB / 0 RB Offset
		27710	27710	10 MHz	QPSK, 16QAM, 64QAM	50 RB / 0 RB Offset
A	Peak to Average Ratio	27685 to 27735	27685, 27710, 27735	5 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
		27710	27710	10 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
A	Band Edge	27685 to 27735	27685, 27710, 27735	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		27710	27710	10 MHz	QPSK, 16QAM	50 RB / 0 RB Offset
A	Conducted Emission	27685 to 27735	27685, 27710, 27735	5 MHz	QPSK	1 RB / 0 RB Offset
		27710	27710	10 MHz	QPSK	1 RB / 0 RB Offset
A, B	Radiated Emission	27685 to 27735	27685, 27710, 27735	5 MHz	QPSK	1 RB / 0 RB Offset

Note:

1. This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.
2. For Band edge, this device had verified both 1RB and Full RB. The worst case was found in Full RB.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
EIRP	25 deg. C, 65 % RH	3.85 Vdc	Karl Lee
Frequency Stability	25 deg. C, 65 % RH	3.85 Vdc	Anson Lin
Occupied Bandwidth	25 deg. C, 65 % RH	3.85 Vdc	Anson Lin
Peak to Average Ratio	25 deg. C, 65 % RH	3.85 Vdc	Anson Lin
Band Edge	25 deg. C, 65 % RH	3.85 Vdc	Anson Lin
Condcudeted Emission	25 deg. C, 65 % RH	3.85 Vdc	Anson Lin
Radiated Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Karl Lee

3.4 EUT Operating Conditions

The EUT makes a call to the communication simulator. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency

3.5 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC 47 CFR Part 2
FCC 47 CFR Part 27
KDB 971168 D01 Power Meas License Digital Systems v02r02
ANSI/TIA/EIA-603-D 2010

NOTE: All test items have been performed and recorded as per the above standards.

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

Mobile and portable stations. (i) 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.

4.1.2 Test Procedures

EIRP Measurement:

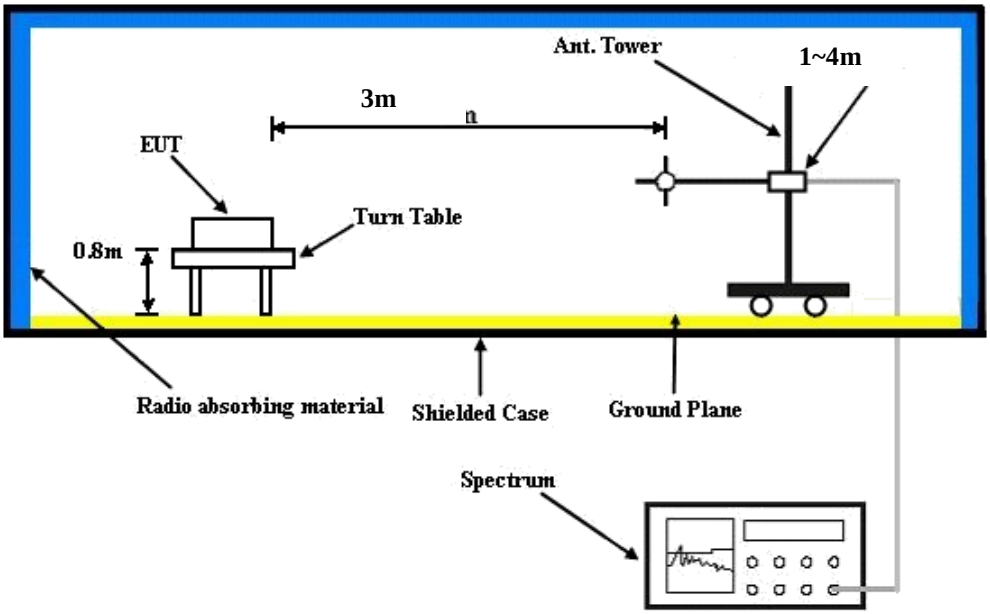
a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 10 MHz for LTE mode.
b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
c. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value” of step b. Record the power level of S.G.
d. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.

Conducted Power Measurement:

a. The EUT was set up for the maximum power with LTE link data modulation and link up with simulator.
b. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

4.1.3 Test Setup

EIRP / ERP Measurement:



For the actual test configuration, please refer to the attached file (Test Setup Photo).

Conducted Power Measurement:

4.1.4 Test Results

Conducted Output Power (dBm)

LTE Band 30														
BW (MHz)	RB Size	RB Offset	QPSK				16QAM				64QAM			
				Mid CH 27710		3GPP MPR (dB)		Mid CH 27710		3GPP MPR (dB)		Mid CH 27710		3GPP MPR (dB)
				2310.0 MHz				2310.0 MHz				2310.0 MHz		
10	1	0		**23.94**		0		22.99		1		22.10		2
	1	24		23.82		0		22.87		1		21.98		2
	1	49		23.75		0		22.78		1		21.89		2
	25	0		22.93		1		21.93		2		21.04		3
	25	12		22.85		1		21.84		2		20.95		3
	25	25		22.79		1		21.77		2		20.88		3
	50	0		22.87		1		21.87		2		20.98		3
BW (MHz)	RB Size	RB Offset	QPSK				16QAM				64QAM			
			Low CH 27685	Mid CH 27710	High CH 27735	3GPP MPR (dB)	Low CH 27685	Mid CH 27710	High CH 27735	3GPP MPR (dB)	Low CH 27685	Mid CH 27710	High CH 27735	3GPP MPR (dB)
			2307.5 MHz	2310.0 MHz	2312.5 MHz		2307.5 MHz	2310.0 MHz	2312.5 MHz		2307.5 MHz	2310.0 MHz	2312.5 MHz	
5	1	0	23.87	23.83	23.80	0	22.92	22.87	22.83	1	21.97	21.92	21.88	2
	1	12	23.83	23.78	23.74	0	22.85	22.80	22.76	1	21.90	21.85	21.81	2
	1	24	23.78	23.70	23.66	0	22.79	22.71	22.66	1	21.84	21.76	21.71	2
	12	0	22.86	22.80	22.78	1	21.92	21.78	21.74	2	20.97	20.83	20.79	3
	12	6	22.81	22.78	22.75	1	21.81	21.75	21.71	2	20.86	20.80	20.76	3
	12	13	22.78	22.75	22.72	1	21.74	21.70	21.67	2	20.79	20.75	20.72	3
	25	0	22.89	22.85	22.80	1	21.88	21.84	21.79	2	20.93	20.89	20.84	3

EIRP Power (dBm)

Mode A

LTE Band 30							
Channel Bandwidth: 5 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
X	27685	2307.5	-21.23	44.24	23.01	199.89	H
	27710	2310.0	-21.02	44.20	23.18	207.83	
	27735	2312.5	-21.02	44.80	23.78	238.84	
	27685	2307.5	-28.29	44.19	15.90	38.91	V
	27710	2310.0	-28.14	44.09	15.95	39.34	
	27735	2312.5	-28.59	44.50	15.91	38.99	
Channel Bandwidth: 5 MHz / 16QAM							
X	27685	2307.5	-21.42	44.24	22.32	170.61	H
	27710	2310.0	-21.27	44.20	22.38	172.98	
	27735	2312.5	-21.86	44.80	22.44	175.39	
	27685	2307.5	-29.31	44.19	14.88	30.77	V
	27710	2310.0	-29.24	44.09	14.85	30.54	
	27735	2312.5	-29.61	44.50	14.89	30.82	
Channel Bandwidth: 5 MHz / 64QAM							
X	27685	2307.5	-22.46	44.24	21.78	150.59	H
	27710	2310.0	-22.30	44.20	21.90	154.77	
	27735	2312.5	-22.82	44.80	21.98	157.80	
	27685	2307.5	-30.34	44.19	13.85	24.27	V
	27710	2310.0	-30.24	44.09	13.85	24.25	
	27735	2312.5	-30.59	44.50	13.91	24.60	

LTE Band 30							
Channel Bandwidth: 10 MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	27710	2310.0	-20.30	44.20	23.72	235.50	H
	27710	2310.0	-28.23	44.09	15.86	38.53	V
Channel Bandwidth: 10 MHz / 16QAM							
X	27710	2310.0	-21.21	44.20	22.85	192.75	H
	27710	2310.0	-29.18	44.09	14.91	30.96	V
Channel Bandwidth: 10 MHz / 64QAM							
X	27710	2310.0	-22.21	44.20	21.99	158.02	H
	27710	2310.0	-30.24	44.09	13.85	24.25	V

Mode B

LTE Band 30							
Channel Bandwidth: 10 MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	27710	2310.0	-22.14	44.20	22.06	160.58	H
	27710	2310.0	-29.75	44.09	14.34	27.15	V
Channel Bandwidth: 10 MHz / 16QAM							
X	27710	2310.0	-22.99	44.20	21.21	132.04	H
	27710	2310.0	-30.88	44.09	13.21	20.93	V
Channel Bandwidth: 10 MHz / 64QAM							
X	27710	2310.0	-23.97	44.20	20.23	105.37	H
	27710	2310.0	-31.83	44.09	12.26	16.82	V

4.2 Frequency Stability Measurement

4.2.1 Limits of Frequency Stabiliity Measurement

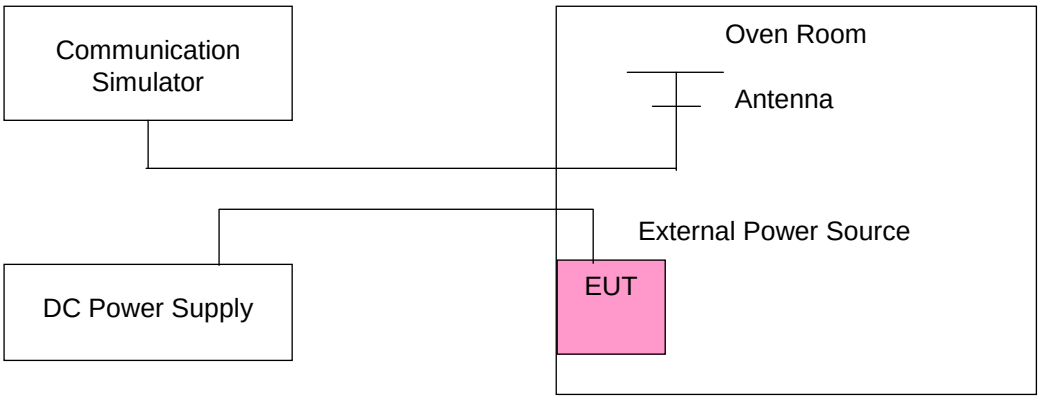
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

4.2.2 Test Procedure

a. Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
b. EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
c. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the ±0.5 ℃ during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

Note: The frequency error was recorded frequency error from the communication simulator.

4.2.3 Test Setup



4.2.4 Test Results

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 30				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.85	2307.500004	0.0016	2312.500003	0.0011	2.5
3.6	2307.500002	0.0010	2312.500002	0.0010	2.5
4.40	2307.500004	0.0016	2312.500003	0.0012	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.6 Vdc to 4.4 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 30				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	2307.500001	0.0004	2312.500003	0.0014	2.5
-20	2307.500002	0.0010	2312.500003	0.0011	2.5
-10	2307.500001	0.0006	2312.500003	0.0013	2.5
0	2307.500004	0.0016	2312.500003	0.0013	2.5
10	2307.500004	0.0015	2312.500002	0.0008	2.5
20	2307.499999	-0.0005	2312.499999	-0.0006	2.5
30	2307.499999	-0.0007	2312.499997	-0.0011	2.5
40	2307.499996	-0.0016	2312.499998	-0.0011	2.5
50	2307.499997	-0.0012	2312.499999	-0.0004	2.5
55	2307.499997	-0.0013	2312.499997	-0.0012	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 30		Limit (ppm)
	Channel Bandwidth: 10 MHz		
	High Channel		
	Frequency (MHz)	Frequency Error (ppm)	
3.85	2310.000001	0.0005	2.5
3.6	2310.000004	0.0016	2.5
4.40	2310.000001	0.0004	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.6 Vdc to 4.4 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 30		Limit (ppm)
	Channel Bandwidth: 10 MHz		
	High Channel		
	Frequency (MHz)	Frequency Error (ppm)	
-30	2310.000004	0.0017	2.5
-20	2310.000001	0.0004	2.5
-10	2310.000001	0.0005	2.5
0	2310.000003	0.0012	2.5
10	2310.000002	0.0007	2.5
20	2309.999998	-0.0008	2.5
30	2309.999998	-0.0010	2.5
40	2309.999997	-0.0013	2.5
50	2309.999996	-0.0016	2.5
55	2309.999999	-0.0005	2.5

4.3 Occupied Bandwidth Measurement

4.3.1 Limits of Occupied Bandwidth Measurement

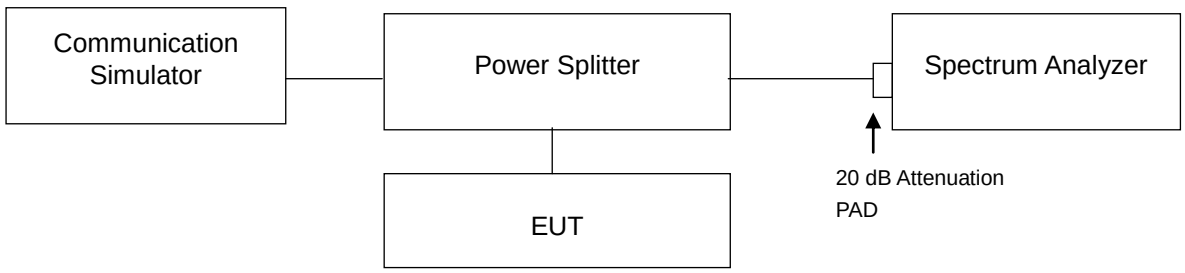
The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

4.3.2 Test Procedure

a. The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

b. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

4.3.3 Test Setup

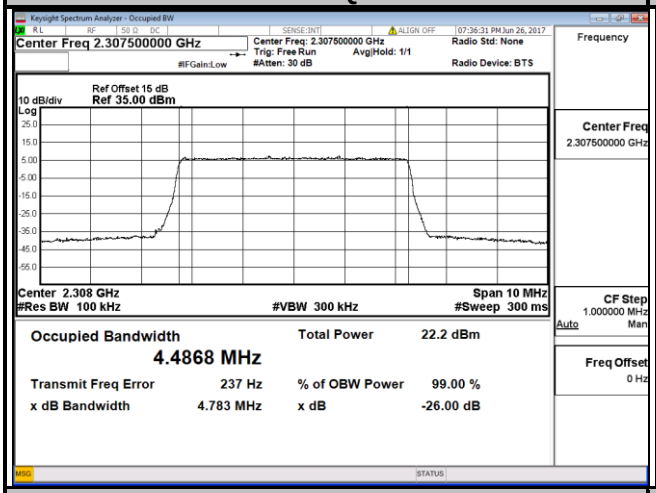


4.3.4 Test Result

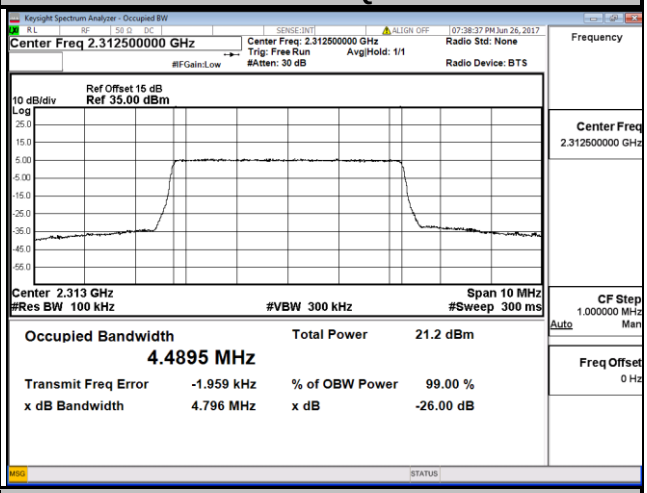
LTE Band 30									
Channel Bandwidth: 5 MHz					Channel Bandwidth: 10 MHz				
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)			Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		
		QPSK	16QAM	64QAM			QPSK	16QAM	64QAM
27685	2307.5	4.4868	4.4861	4.4943	27710	2310.0	8.9625	8.9625	8.9642
27710	2310.0	4.4851	4.4875	4.4959					
27735	2312.5	4.4860	4.4895	4.4962					

Spectrum Plot of Worst Value

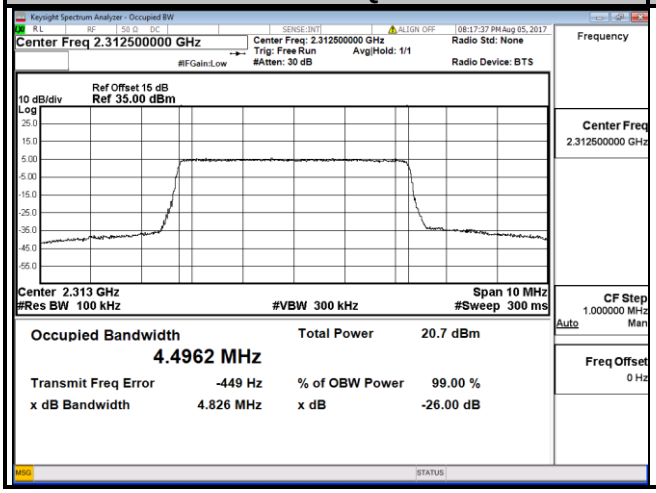
5 MHz / QPSK



5 MHz / 16QAM

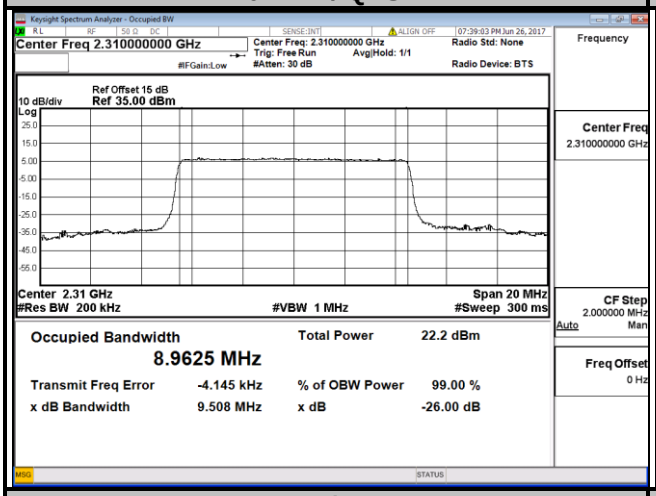


5 MHz / 64QAM

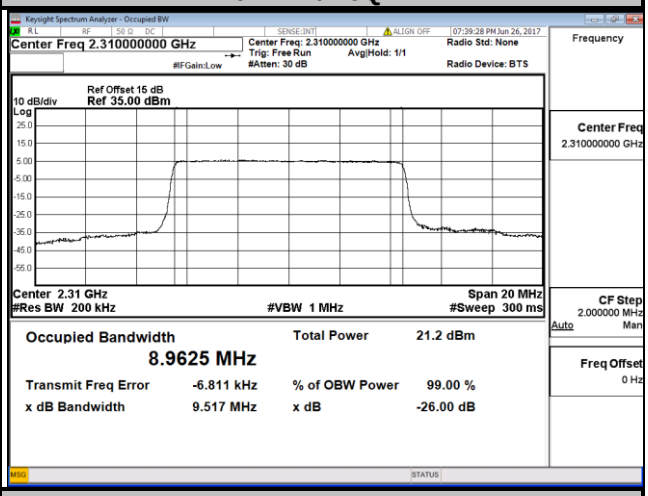


Spectrum Plot of Worst Value

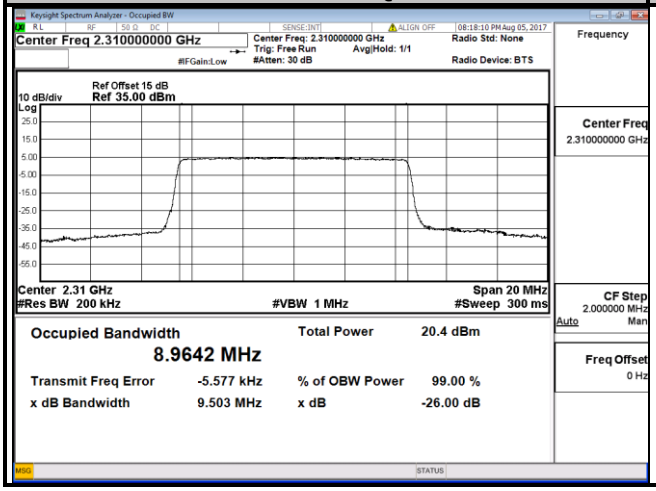
10 MHz / QPSK



10 MHz / 16QAM



10 MHz / 64QAM



4.4 Band Edge Measurement

4.4.1 Limits of Band Edge Measurement

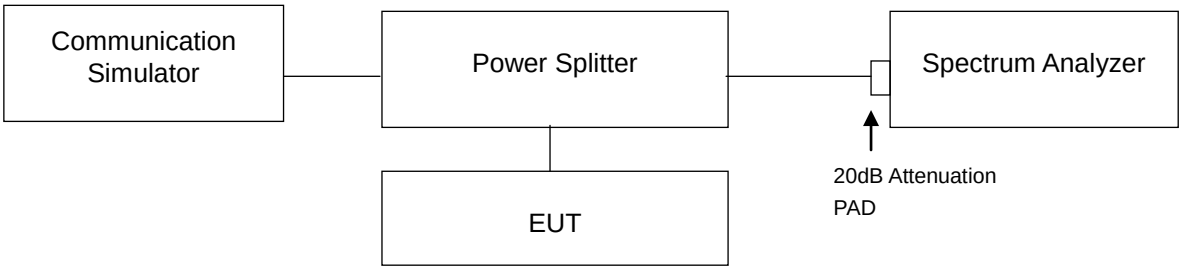
According to FCC 27.53(a) (4) For mobile and portable stations operating in the 2305-2315 MHz and 2350-2360 MHz bands:

(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.

4.4.2 Test Setup



4.4.3 Test Procedures

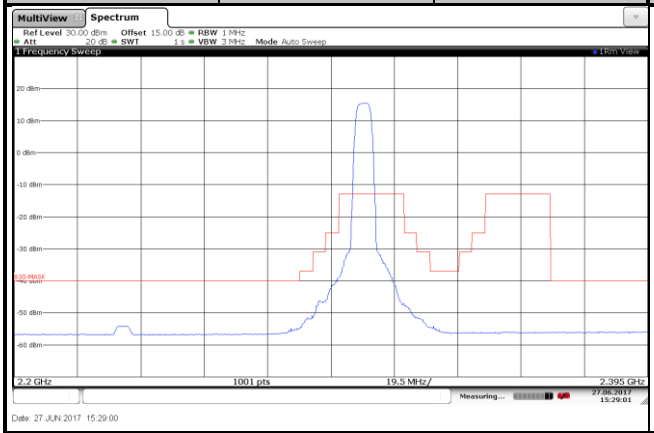
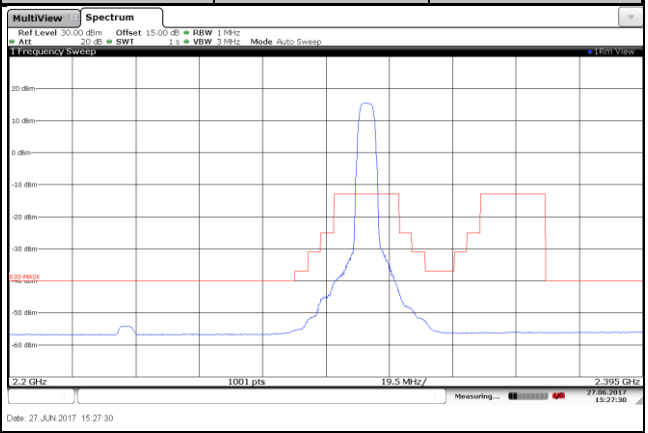
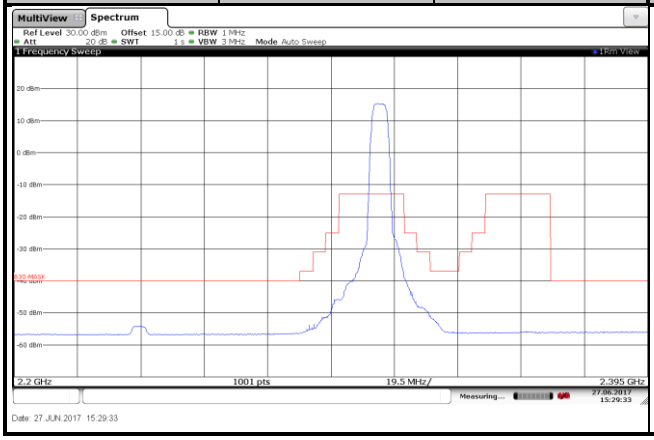
a. The EUT was set up for the maximum peak power with LTE link data modulation. The power was measured with R&S Spectrum Analyzer. All measurements were done at 2 channels (low and high operational frequency range).

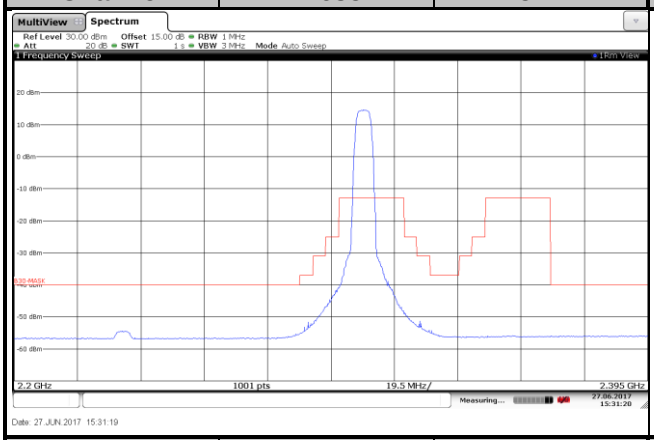
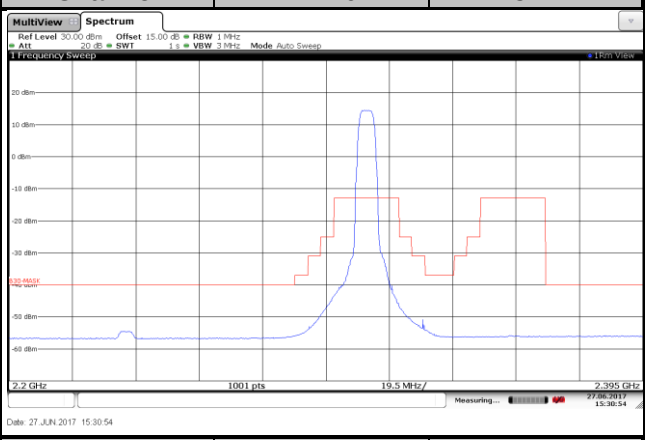
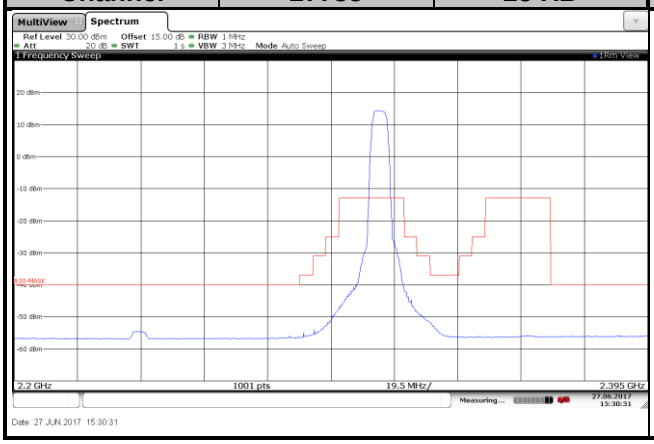
b. The band edge measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

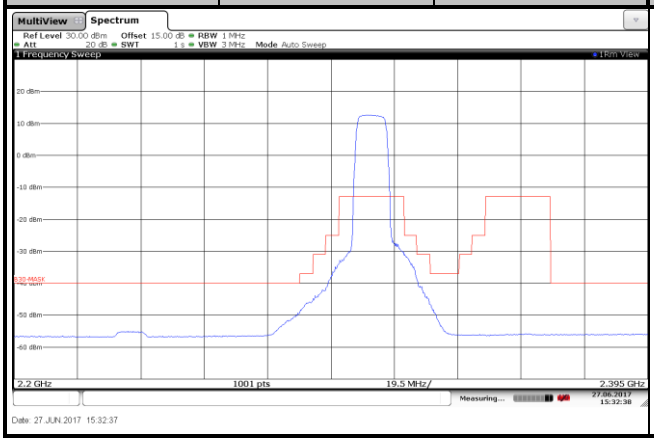
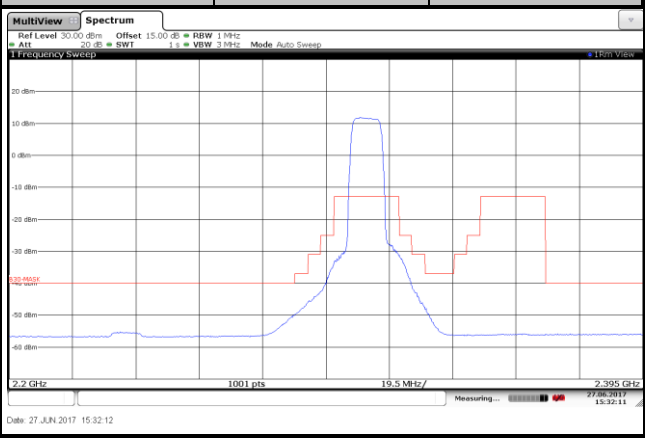
c. Measuring frequency range is from 2200 MHz to 2395 MHz for LTE Band 30. 10 dB attenuation pad is connected with spectrum. RBW=1 MHz and VBW=3 MHz are used for conducted emission measurement.

d. Record the max trace plot into the test report.

4.4.4 Test Results

LTE Band 30					
<Adjacent Channel Band Edge>					
Channel Bandwidth: 5 MHz / QPSK					
Channel	27685	25 RB	Channel	27710	25 RB
					
Channel	27735	25 RB			
					

LTE Band 30					
<Adjacent Channel Band Edge>					
Channel Bandwidth: 5 MHz / 16QAM					
Channel	27685	25 RB	Channel	27710	25 RB
					
Channel	27735	25 RB			
					

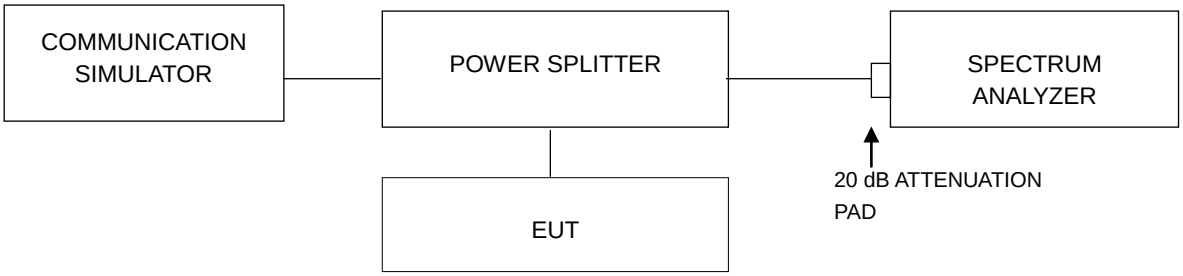
LTE Band 30					
Channel Bandwidth: 10 MHz / QPSK					
Channel Bandwidth: 10MHz / QPSK			Channel Bandwidth: 10MHz / 16QAM		
Channel	27710	50 RB	Channel	27710	50 RB
					

4.5 Peak to Average Ratio

4.5.1 Limits of Peak to Average Ratio Measurement

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.

4.5.2 Test Setup



4.5.3 Test Procedures

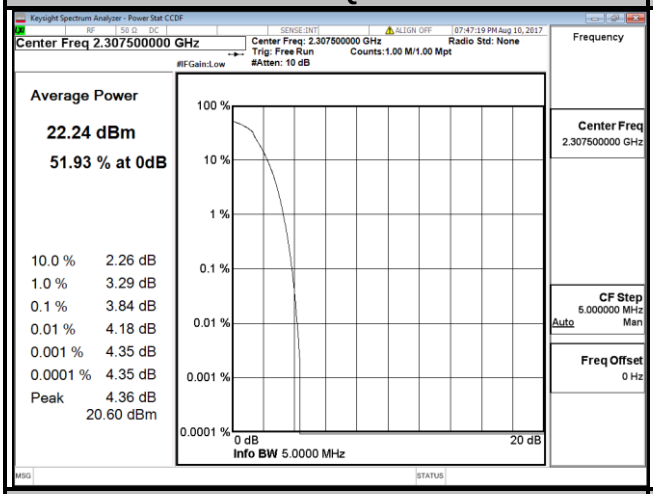
1. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1 %.

4.5.4 Test Results

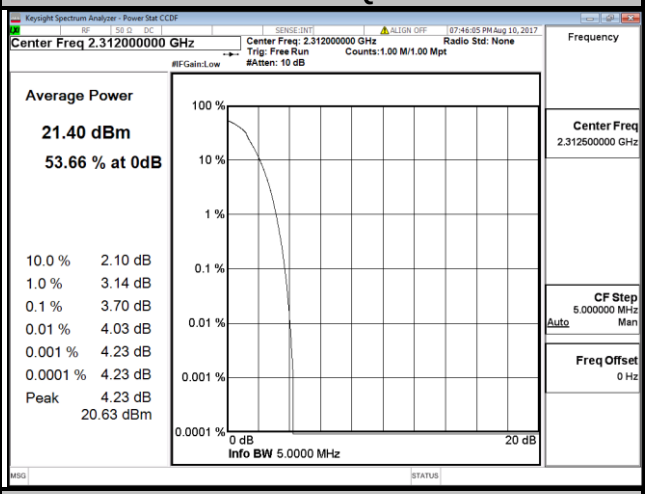
LTE Band 30									
Channel Bandwidth: 5 MHz					Channel Bandwidth: 10 MHz				
Channel	Frequency (MHz)	Peak to Average Ratio (dB)			Channel	Frequency (MHz)	Peak to Average Ratio (dB)		
		QPSK	16QAM	64QAM			QPSK	16QAM	64QAM
27685	2307.5	3.84	3.59	3.82	27710	2310.0	5.89	5.90	5.93
27710	2310.0	3.60	3.60	3.82					
27735	2312.5	3.70	3.70	3.82					

Spectrum Plot of Worst Value

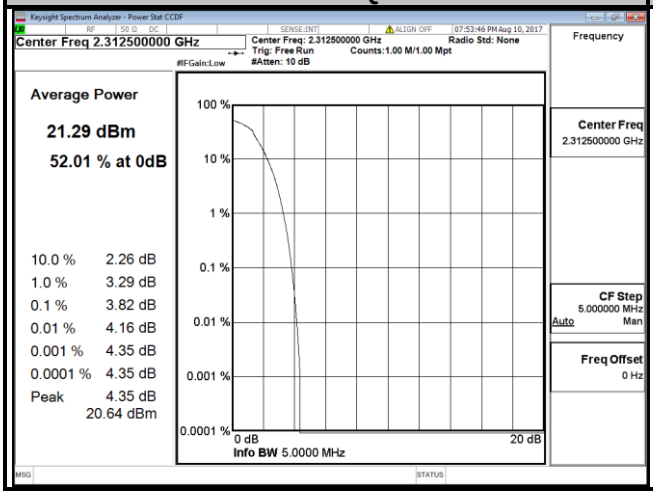
5 MHz / QPSK



5 MHz / 16QAM

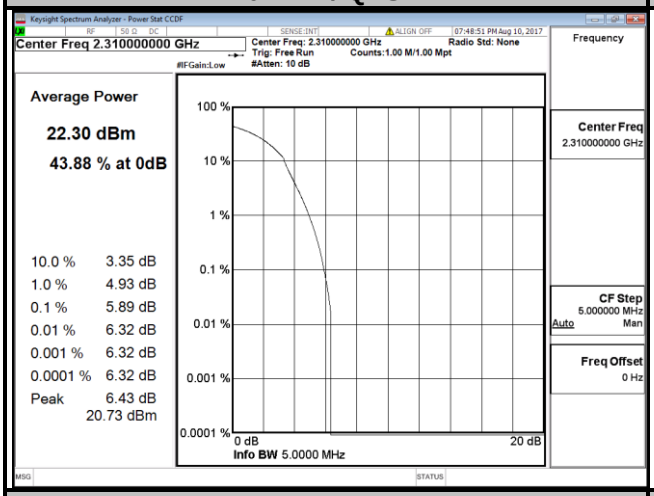


5 MHz / 64QAM

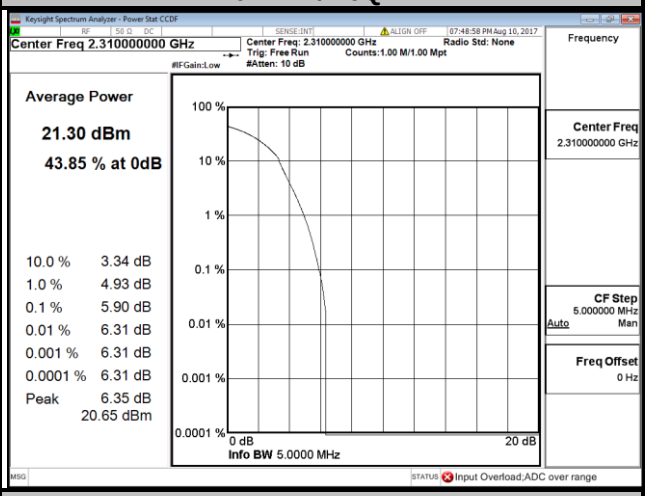


Spectrum Plot of Worst Value

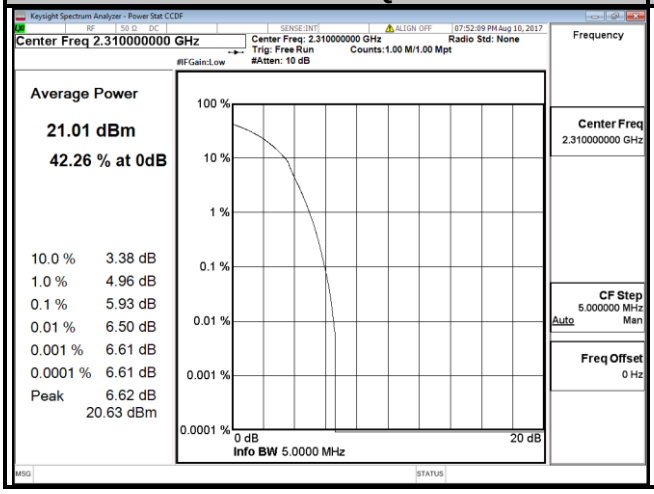
10 MHz / QPSK



10 MHz / 16QAM



10 MHz / 64QAM

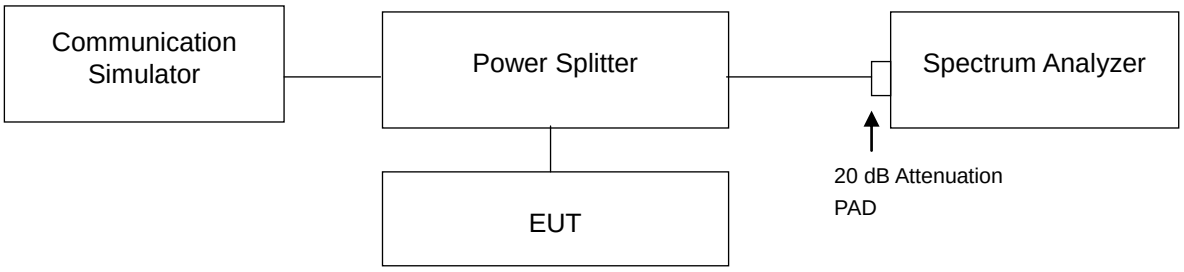


4.6 Conducted Spurious Emissions

4.6.1 Limits of Conducted Spurious Emissions Measurement

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 70 +10 log10(P) dB. The limit of emission is equal to -40 dBm.

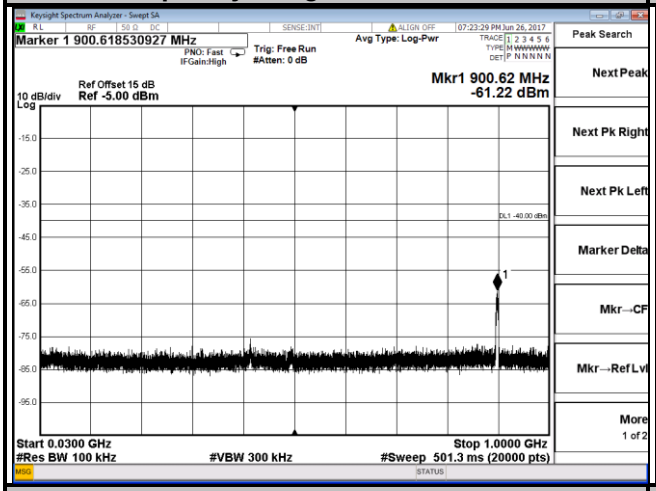
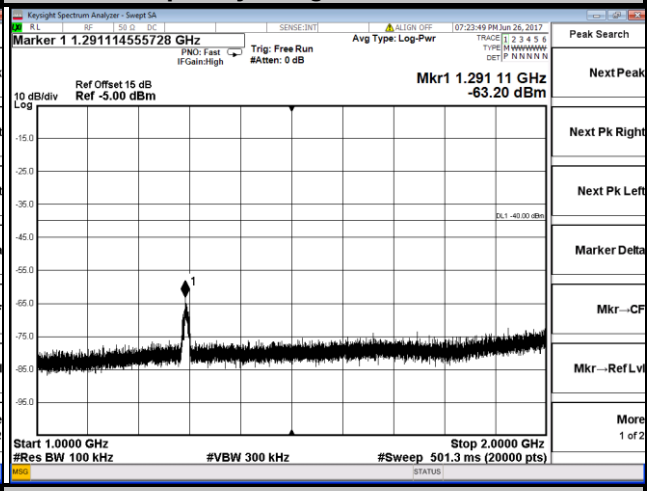
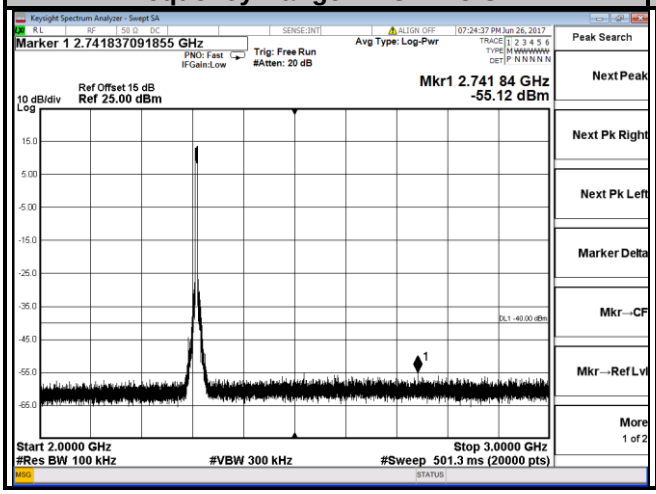
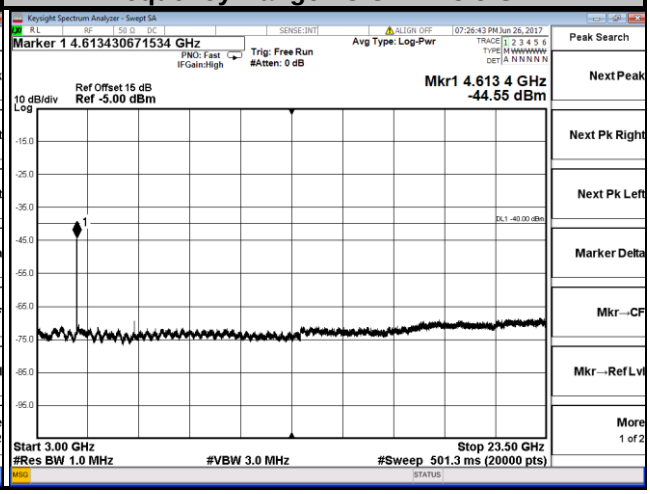
4.6.2 Test Setup



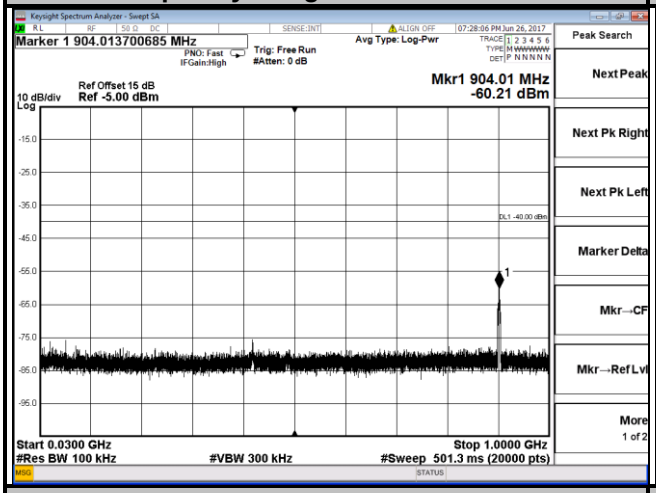
4.6.3 Test Procedure

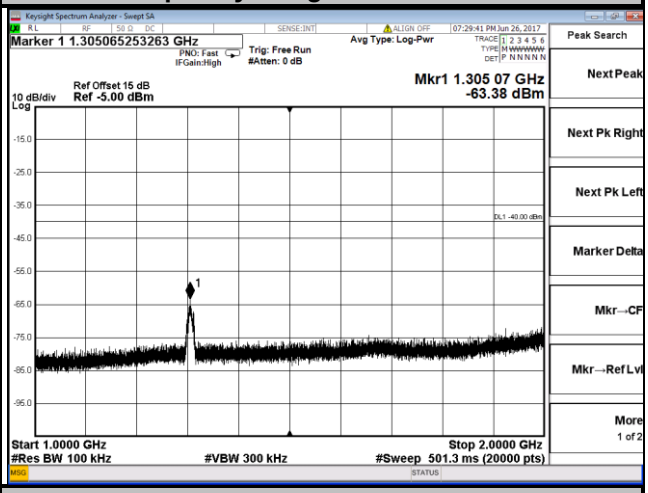
a. The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
b. Measuring frequency range is from 30 MHz to 23.5 GHz for LTE Band 30. 10 dB attenuation pad is connected with spectrum. RBW=1 MHz and VBW=3 MHz are used for conducted emission measurement.

4.6.4 Test Results

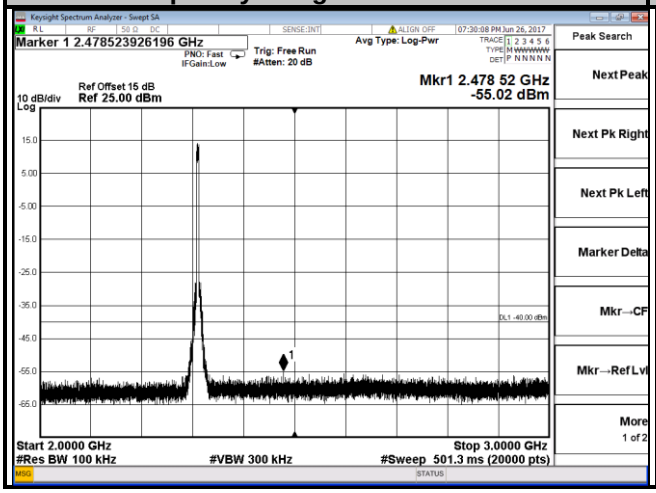
LTE Band 30	
Channel Bandwidth: 5 MHz	
Channel 27685	
Frequency Range : 30 MHz~1 GHz	Frequency Range : 1 GHz~2 GHz
	
Frequency Range : 2 GHz~3 GHz	Frequency Range : 3 GHz~23.5 GHz
	

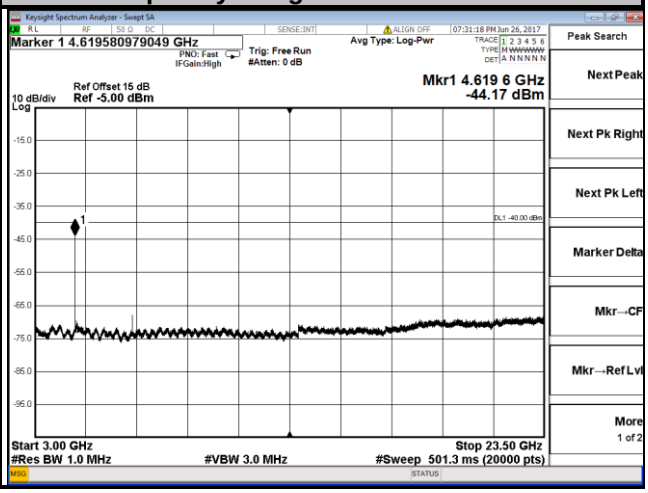
LTE Band 30	
Channel Bandwidth: 5 MHz	
Channel 27710	
Frequency Range : 30 MHz~1 GHz	Frequency Range : 1 GHz~2 GHz



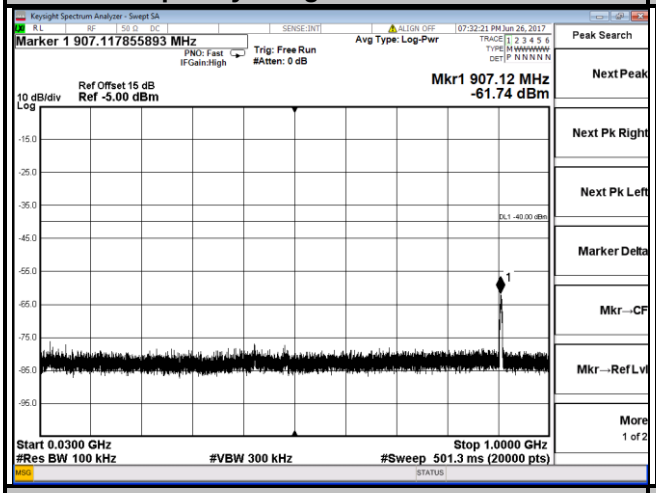


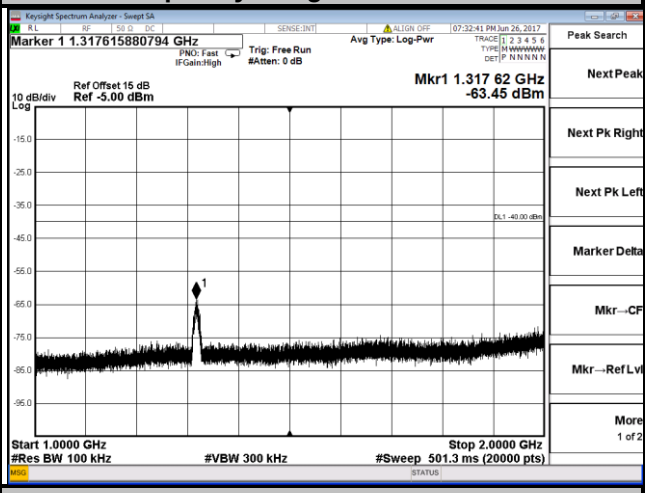
Frequency Range : 2 GHz~3 GHz	Frequency Range : 3 GHz~23.5 GHz



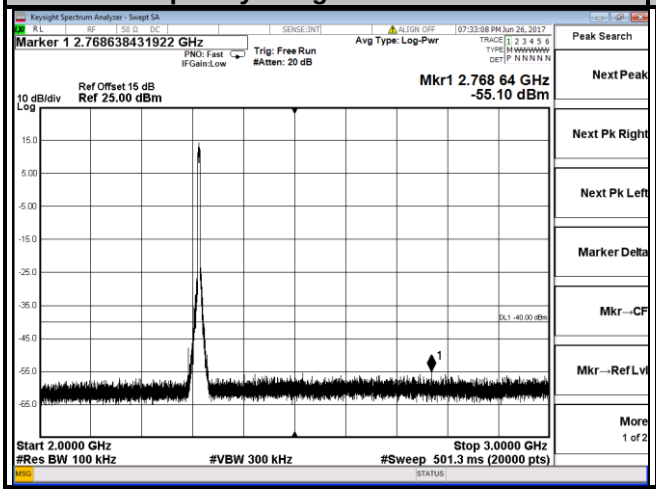


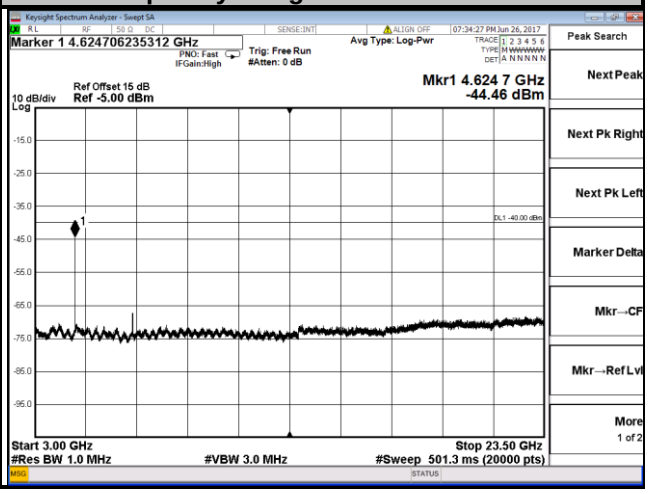
LTE Band 30	
Channel Bandwidth: 5 MHz	
Channel 27735	
Frequency Range : 30 MHz~1 GHz	Frequency Range : 1 GHz~2 GHz



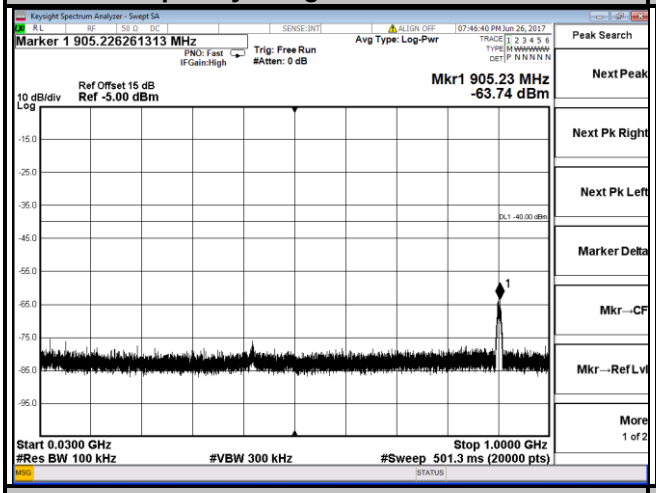


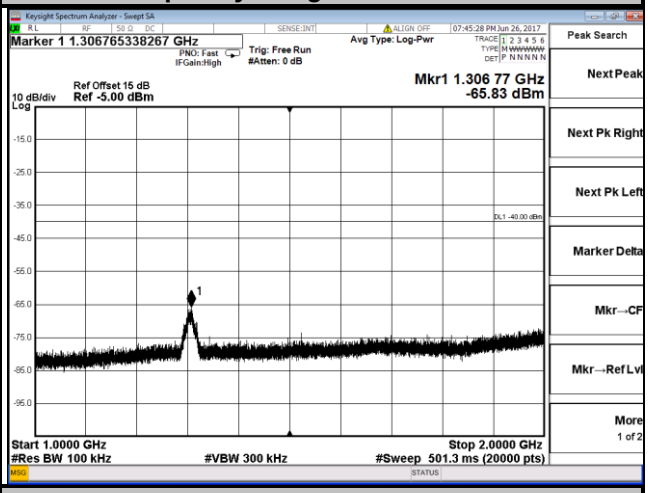
Frequency Range : 2 GHz~3 GHz	Frequency Range : 3 GHz~23.5 GHz



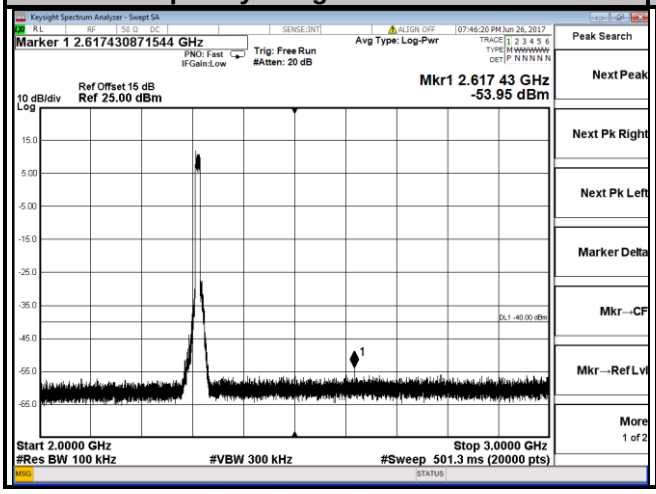


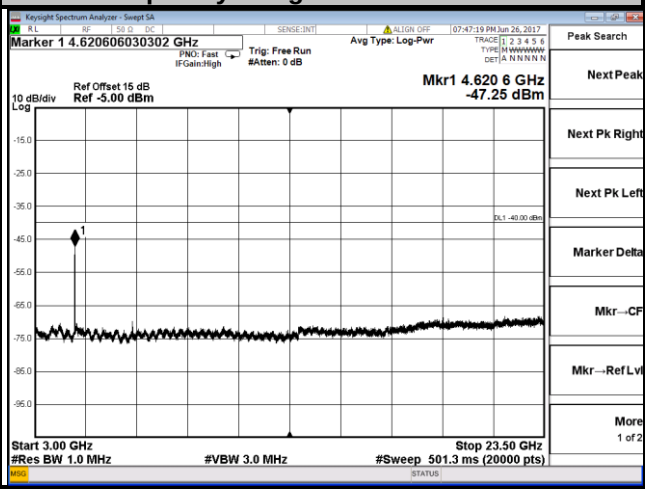
LTE Band 30	
Channel Bandwidth: 10 MHz	
Channel 27710	
Frequency Range : 30 MHz~1 GHz	Frequency Range : 1 GHz~2 GHz





Frequency Range : 2 GHz~3 GHz	Frequency Range : 3 GHz~23.5 GHz





4.7 Radiated Emission Measurement

4.7.1 Limits of Radiated Emission Measurement

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 70 +10 log10(P) dB. The limit of emission is equal to -40 dBm.

4.7.2 Test Procedure

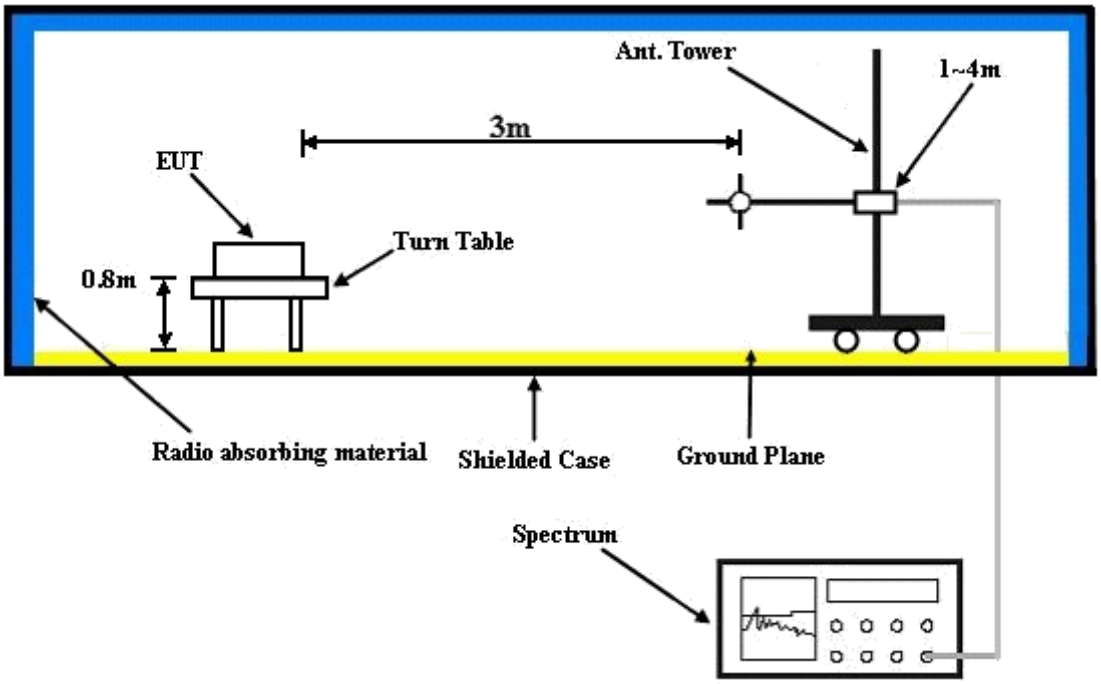
a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
b. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value “ of step a. Record the power level of S.G
c. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.
d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15 dBi.

Note: The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

4.7.3 Deviation from Test Standard

No deviation.

4.7.4 Test Setup



For the actual test configuration, please refer to the attached file (Test Setup Photo).

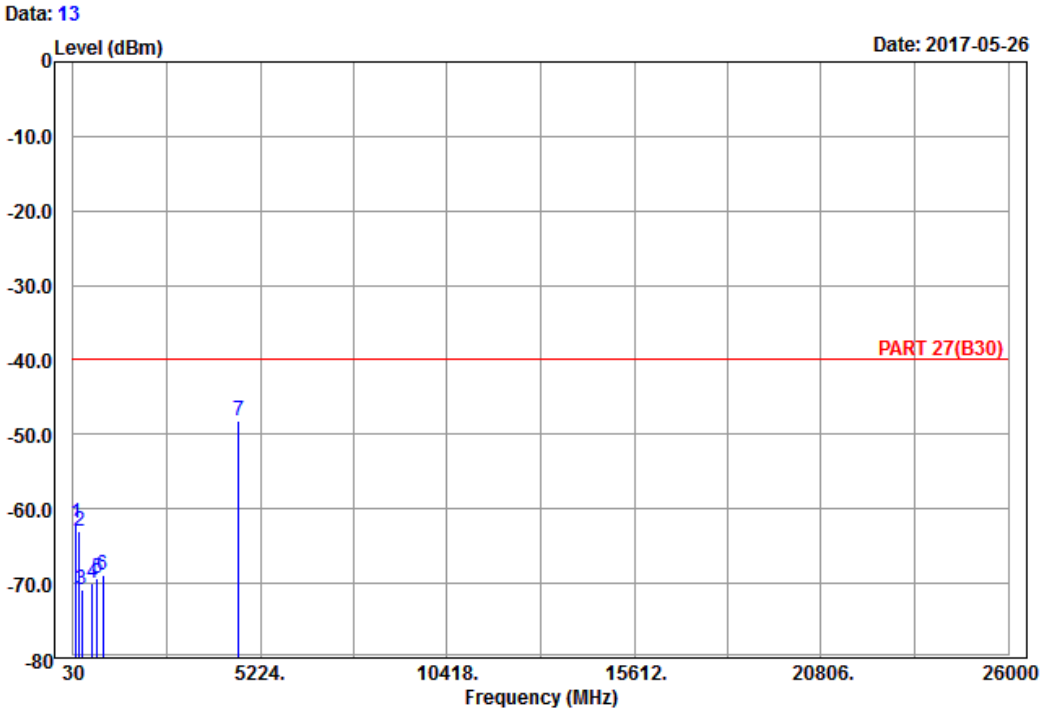
4.7.5 Test Results

Mode A

LTE Band 30

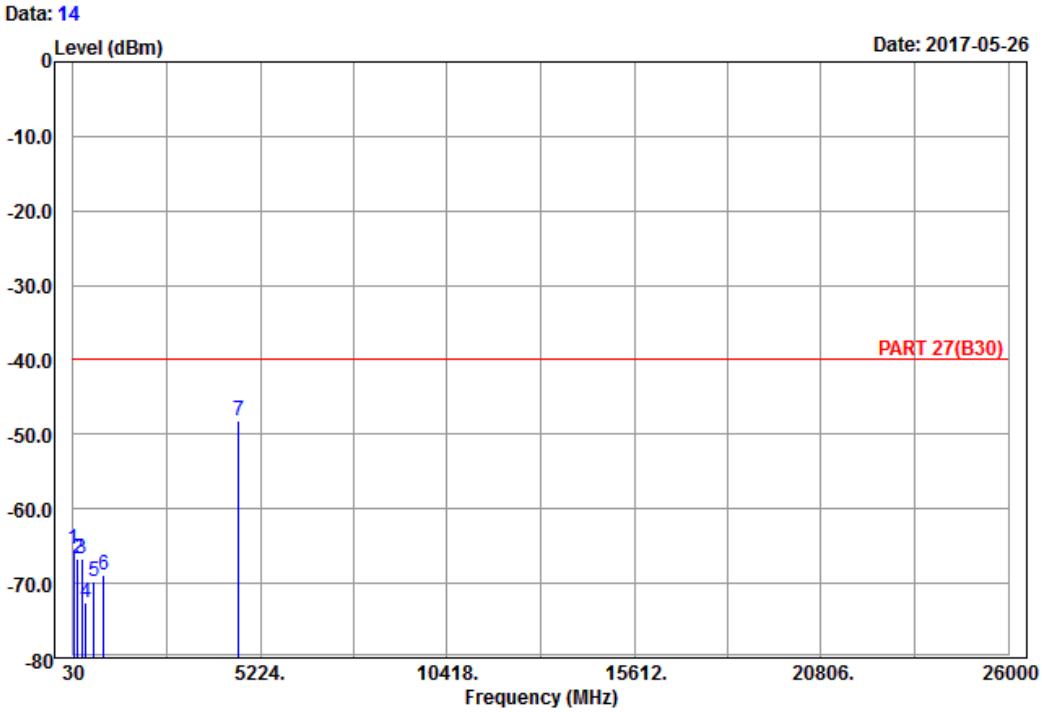
Channel Bandwidth: 10 MHz / QPSK

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 27(B30) Horizontal
Remark : LTE_Band 30_Link_CH27710
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	108.30	-61.82	-52.75	-40.00	-21.82	-9.07	Peak
2	196.32	-62.89	-56.89	-40.00	-22.89	-6.00	Peak
3	267.87	-70.83	-65.16	-40.00	-30.83	-5.67	Peak
4	566.00	-70.04	-69.06	-40.00	-30.04	-0.98	Peak
5	687.10	-69.41	-69.10	-40.00	-29.41	-0.31	Peak
6	853.70	-68.78	-70.34	-40.00	-28.78	1.56	Peak
7 pp	4620.00	-48.18	-66.61	-40.00	-8.18	18.43	Peak



Site : 966 chamber 1
Condition: PART 27(B30) Vertical
Remark : LTE_Band 30_Link_CH27710
Tested by: Karl Lee

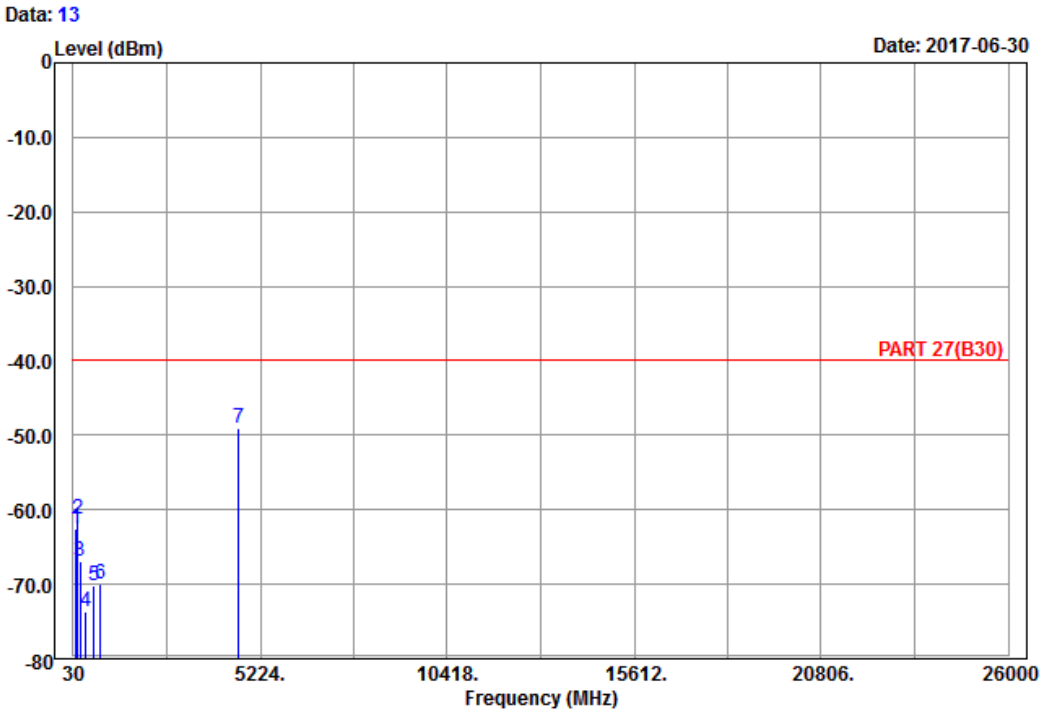
	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	40.80	-65.34	-55.54	-40.00	-25.34	-9.80	Peak
2	160.14	-66.75	-59.08	-40.00	-26.75	-7.67	Peak
3	268.41	-66.60	-60.92	-40.00	-26.60	-5.68	Peak
4	376.30	-72.55	-68.57	-40.00	-32.55	-3.98	Peak
5	613.60	-69.81	-70.08	-40.00	-29.81	0.27	Peak
6	869.80	-68.95	-70.98	-40.00	-28.95	2.03	Peak
7 pp	4620.00	-48.28	-66.71	-40.00	-8.28	18.43	Peak

Mode B

LTE Band 30

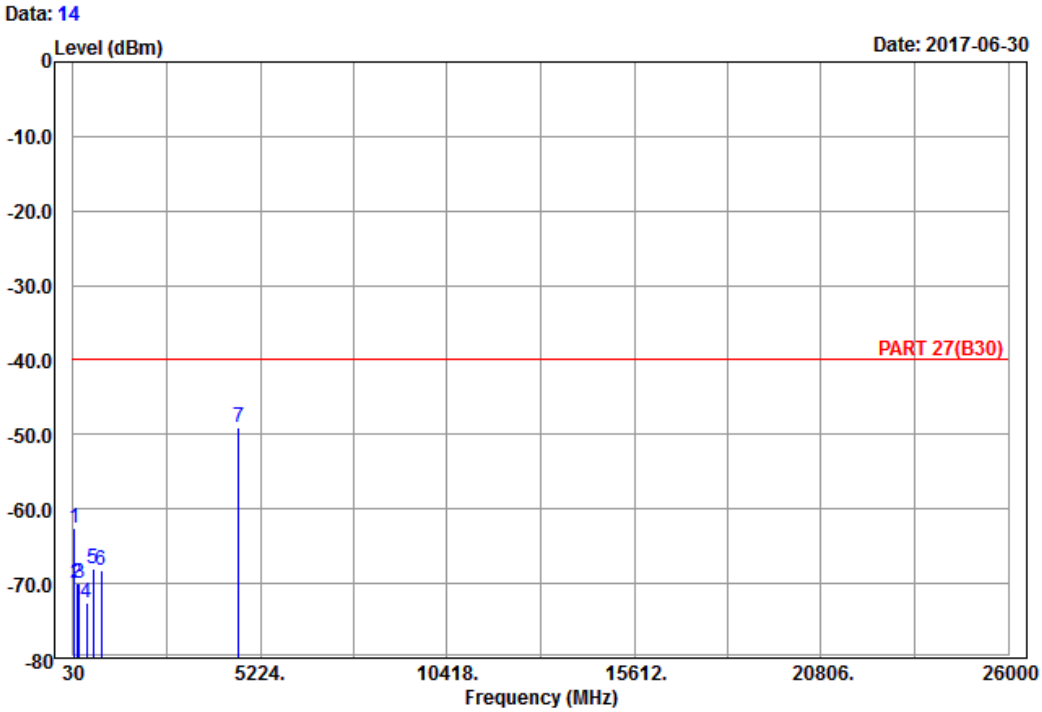
Channel Bandwidth: 10 MHz / QPSK

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 27(B30) Horizontal
Remark : LTE_Band 30_Link_CH27710
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	102.09	-62.46	-52.57	-40.00	-22.46	-9.89	Peak
2	158.25	-61.30	-53.58	-40.00	-21.30	-7.72	Peak
3	211.44	-66.87	-60.84	-40.00	-26.87	-6.03	Peak
4	372.80	-73.65	-69.46	-40.00	-33.65	-4.19	Peak
5	612.20	-70.22	-70.51	-40.00	-30.22	0.29	Peak
6	786.50	-69.93	-71.05	-40.00	-29.93	1.12	Peak
7 pp	4620.00	-48.96	-67.39	-40.00	-8.96	18.43	Peak



Site : 966 chamber 1
Condition: PART 27(B30) Vertical
Remark : LTE_Band 30_Link_CH27710
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	59.97	-62.55	-48.48	-40.00	-22.55	-14.07	Peak
2	130.71	-69.92	-62.27	-40.00	-29.92	-7.65	Peak
3	196.86	-69.91	-63.86	-40.00	-29.91	-6.05	Peak
4	402.20	-72.62	-69.82	-40.00	-32.62	-2.80	Peak
5	579.30	-67.96	-67.50	-40.00	-27.96	-0.46	Peak
6	818.70	-68.29	-70.09	-40.00	-28.29	1.80	Peak
7 pp	4620.00	-48.98	-67.41	-40.00	-8.98	18.43	Peak

5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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The address and road map of all our labs can be found in our web site also.

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