FCC Test Report

(PART 27)

Report No.:	RF161012C04-3
FCC ID:	ZOQVT-400
Test Model:	VT-400
Received Date:	Oct. 12, 2016
Test Date:	Oct. 21, 2016 ~ Oct. 25, 2016
Issued Date:	Nov. 03, 2016
Applicant:	Verizon Telematics Inc.
Address:	2002 Summit Blvd, Suite 1800
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C)
Test Location:	No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

Table of Contents

Release Control Record

Issue No.	Description	Date Issued
RF161012C04-3	Original Release	Nov. 03, 2016

1 Certificate of Conformity

Product:	OBD2 LTE/3G/GPS/WIFI/BT tracker
Brand:	Verizon Telematics Inc.
Test Model:	VT-400
Sample Status:	Identical Prototype
Applicant:	Verizon Telematics Inc.
Test Date:	Oct. 21, 2016 ~ Oct. 25, 2016
Standards:	FCC Part 27, Subpart C, L

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 : Evonne Liu , **Date:** Nov. 03, 2016

Evonne Liu / Specialist

Approved by : Stanley Wu , **Date:** Nov. 03, 2016

Stanley Wu / Assistant Manager

2 Summary of Test Results

Applied Standard: FCC Part 27 & Part 2 (LTE 4)			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 27.50(d)(4)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
2.1055 27.54	Frequency Stability	Pass	Meet the requirement of limit.
2.1049 27.53(h)	Occupied Bandwidth	Pass	Meet the requirement of limit.
27.50(d)(5)	Peak to Average Ratio	Pass	Meet the requirement of limit.
27.53(h)	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 27.53(h)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 27.53(h)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -29.73 dB at 5197.50 MHz.

Applied Standard: FCC Part 27 & Part 2 (LTE 13)			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 27.50(b)(10)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
2.1055 27.54	Frequency Stability	Pass	Meet the requirement of limit.
2.1049 27.53(g)	Occupied Bandwidth	Pass	Meet the requirement of limit.
27.50(d)(5)	Peak to Average Ratio	Pass	Meet the requirement of limit.
27.53(g)	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 27.53(g)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 27.53(g)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -16.06 dB at 1564.00 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	2.93 dB
	200 MHz ~1000 MHz	2.95 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB

2.2 Test Site and Instruments

Description & Manaufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY51210203	Jan. 21, 2016	Jan. 20, 2017
Spectrum Analyzer Agilent	N9010A	MY52220314	Sep. 03, 2015	Sep. 02, 2016
MXG Vector signal generator	N5182B	MY53050430	Oct. 19, 2016	Oct. 18, 2017
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Dec. 17, 2015	Dec. 16, 2016
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Jan. 07, 2016	Jan. 06, 2017
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-969	Jan. 04, 2016	Jan. 03, 2017
Double Ridge Guide Horn Antenna EMCO	3115	5619	Jan. 04, 2016	Jan. 03, 2017
BILOG Antenna SCHWARZBECK	VULB 9168	9168-153	Jan. 07, 2016	Jan. 06, 2017
Agilent Communications Tester-Wireless	8960 Series 10	MY53201073	Jul. 03, 2015	Jul. 02, 2017
Preamplifier EMCI	EMC 012645	980115	Dec. 21, 2015	Dec. 20, 2016
Preamplifier EMCI	EMC 184045	980116	Dec. 21, 2015	Dec. 20, 2016
Preamplifier EMCI	EMC 330H	980112	Dec. 28, 2015	Dec. 27, 2016
Power Meter Anritsu	ML2495A	1232002	Sep. 21, 2015	Sep. 20, 2016
Power Sensor Anritsu	MA2411B	1207325	Sep. 21, 2015	Sep. 20, 2016
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	309219/4 2950114	Oct. 12, 2015	Oct. 11, 2016
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	250130/4	Oct. 12, 2015	Oct. 11, 2016
RF Coaxial Cable Worken	8D-FB	Cable-Ch10-01	Oct. 12, 2015	Oct. 11, 2016
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower &Turn Table Controller MF	MF-7802	NA	NA	NA
Radio Communication Analyzer	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. 27, 2014	Oct. 26, 2016
Digital Multimeter Fluke	87-III	70360742	Jul. 01, 2016	Jun. 30, 2017
Fixed Attenuator Mini-Circuits	BW-N10W5+	N/A	Jul. 08, 2016	Jul. 07, 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 HwaYa Chamber 10.
3. The horn antenna and preamplifier (model: EMC 184045) are used only for the measurement of emission frequency above 1 GHz if tested.
4. The FCC Site Registration No. is 690701.
5. The IC Site Registration No. is IC7450F-10.

3 General Information

3.1 General Description of EUT

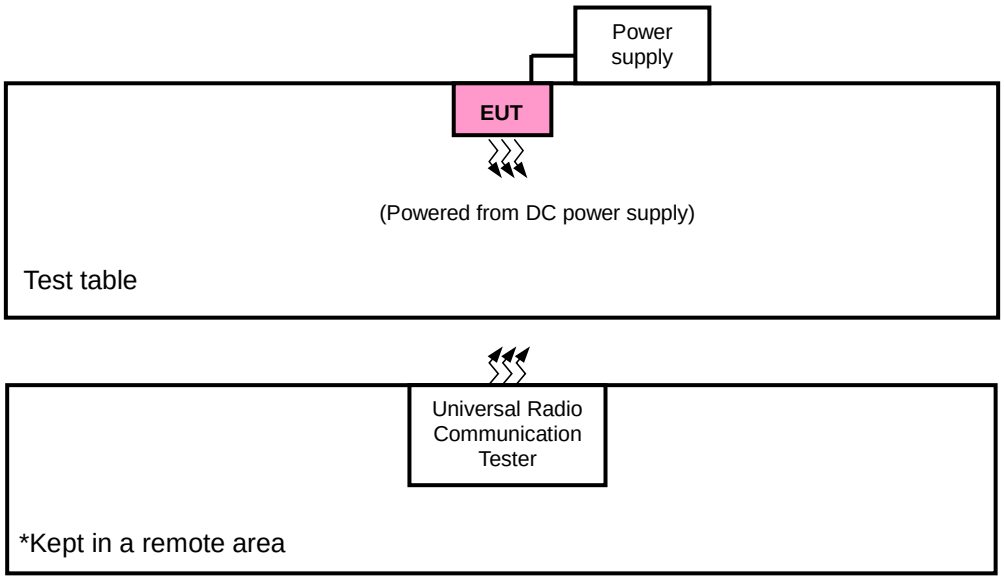
Product	OBD2 LTE/3G/GPS/WIFI/BT tracker	
Brand	Verizon Telematics Inc.	
Test Model	VT-400	
Status of EUT	Identical Prototype	
Power Supply Rating	12Vdc (DC power supply)	
Modulation Type	LTE	QPSK, 16QAM
Frequency Range	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	1710.7 ~ 1754.3 MHz
	LTE Band 4 (Channel Bandwidth: 3 MHz)	1711.5 ~ 1753.5 MHz
	LTE Band 4 (Channel Bandwidth: 5 MHz)	1712.5 ~ 1752.5 MHz
	LTE Band 4 (Channel Bandwidth: 10 MHz)	1715.0 ~ 1750.0 MHz
	LTE Band 4 (Channel Bandwidth: 15 MHz)	1717.5 ~ 1747.5 MHz
	LTE Band 4 (Channel Bandwidth: 20 MHz)	1720.0 ~ 1745.0 MHz
	LTE Band 13 (Channel Bandwidth: 5 MHz)	779.5 ~ 784.5 MHz
	LTE Band 13 (Channel Bandwidth: 10 MHz)	782.0 MHz
Emission Designator	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	1M09G7D
	LTE Band 4 (Channel Bandwidth: 3 MHz)	2M70G7D
	LTE Band 4 (Channel Bandwidth: 5 MHz)	4M49W7D
	LTE Band 4 (Channel Bandwidth: 10 MHz)	8M96W7D
	LTE Band 4 (Channel Bandwidth: 15 MHz)	13M4G7D
	LTE Band 4 (Channel Bandwidth: 20 MHz)	17M9W7D
	LTE Band 13 (Channel Bandwidth: 5 MHz)	4M49W7D
	LTE Band 13 (Channel Bandwidth: 10 MHz)	8M94G7D
Max. ERP Power	LTE Band 13 (Channel Bandwidth: 5 MHz)	111.43mW
	LTE Band 13 (Channel Bandwidth: 10 MHz)	112.46mW
Max. EIRP Power	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	230.67mW
	LTE Band 4 (Channel Bandwidth: 3 MHz)	239.33mW
	LTE Band 4 (Channel Bandwidth: 5 MHz)	241.55mW
	LTE Band 4 (Channel Bandwidth: 10 MHz)	243.16mW
	LTE Band 4 (Channel Bandwidth: 15 MHz)	247.17mW
	LTE Band 4 (Channel Bandwidth: 20 MHz)	250.61mW
Antenna Type	Metal monopole Antenna	
Accessory Device	Refer to Note as below	
Data Cable Supplied	Refer to Note as below	

Note:

1. 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.R.P. / 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. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Power supply	TOP WARD	6603A	725906	N/A

No.	Signal Cable Description Of The Above Support Units
1.	N/A

Note:

1. All power cords of the above support units are non-shielded (1.8m).

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 as the table below. Following channel(s) was (were) selected for the final test as listed below:

Band	ERP / EIRP	Radiated Emission
LTE Band 4	Z-plane	Y-axis
LTE Band 13	Y-plane	X-axis

LTE Band 4

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	EIRP	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK, 16QAM	1 RB / 5 RB Offset
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK, 16QAM	1 RB / 14 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM	1 RB / 24 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK, 16QAM	1 RB / 49 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK, 16QAM	1 RB / 74 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM	1 RB / 99 RB Offset
-	Frequency Stability	19957 to 20393	20175	1.4 MHz	QPSK	1 RB / 5 RB Offset
		19965 to 20385	20175	3 MHz	QPSK	1 RB / 14 RB Offset
		19975 to 20375	20175	5 MHz	QPSK	1 RB / 24 RB Offset
		20000 to 20350	20175	10 MHz	QPSK	1 RB / 49 RB Offset
		20025 to 20325	20175	15 MHz	QPSK	1 RB / 74 RB Offset
		20050 to 20300	20175	20 MHz	QPSK	1 RB / 99 RB Offset
-	Occupied Bandwidth	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK, 16QAM	15 RB / 0 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK, 16QAM	50 RB / 0 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK, 16QAM	75 RB / 0 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM	100 RB / 0 RB Offset
-	Peak to Average Ratio	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK, 16QAM	1 RB / 2 RB Offset
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK, 16QAM	1 RB / 7 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM	12 RB / 0 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK, 16QAM	1 RB / 24 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK, 16QAM	36 RB / 0 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM	50 RB / 0 RB Offset

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	Band Edge	19957 to 20393	19957	1.4 MHz	QPSK	1 RB / 0 RB Offset
						6 RB / 0 RB Offset
			20393	1.4 MHz	QPSK	1 RB / 5 RB Offset
						6 RB / 0 RB Offset
		19965 to 20385	19965	3 MHz	QPSK	1 RB / 0 RB Offset
						15 RB / 0 RB Offset
			20385	3 MHz	QPSK	1 RB / 14 RB Offset
						15 RB / 0 RB Offset
		19975 to 20375	19975	5 MHz	QPSK	1 RB / 0 RB Offset
						25 RB / 0 RB Offset
			20375	5 MHz	QPSK	1 RB / 24 RB Offset
						25 RB / 0 RB Offset
		20000 to 20350	20000	10 MHz	QPSK	1 RB / 0 RB Offset
						50 RB / 0 RB Offset
			20350	10 MHz	QPSK	1 RB / 49 RB Offset
						50 RB / 0 RB Offset
		20025 to 20325	20025	15 MHz	QPSK	1 RB / 0 RB Offset
						75 RB / 0 RB Offset
			20325	15 MHz	QPSK	1 RB / 74 RB Offset
						75 RB / 0 RB Offset
		20050 to 20300	20050	20 MHz	QPSK	1 RB / 0 RB Offset
						100 RB / 0 RB Offset
			20300	20 MHz	QPSK	1 RB / 99 RB Offset
						100 RB / 0 RB Offset
-	Conducted Emission	19957 to 20393	20175	1.4 MHz	QPSK	1 RB / 2 RB Offset
		19965 to 20385	20175	3 MHz	QPSK	1 RB / 7 RB Offset
		19975 to 20375	20175	5 MHz	QPSK	12 RB / 0 RB Offset
		20000 to 20350	20175	10 MHz	QPSK	50 RB / 0 RB Offset
		20025 to 20325	20175	15 MHz	QPSK	36 RB / 0 RB Offset
		20050 to 20300	20175	20 MHz	QPSK	50 RB / 0 RB Offset
-	Radiated Emission	20050 to 20300	20175	20 MHz	QPSK	1 RB / 99 RB Offset

Note: This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.

LTE Band 13

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	ERP	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK, 16QAM	1 RB / 24 RB Offset
-	Frequency Stability	23205 to 23255	23230	5 MHz	QPSK	1 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK	1 RB / 24 RB Offset
-	Occupied Bandwidth	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK, 16QAM	50 RB / 0 RB Offset
-	Peak to Average Ratio	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Band Edge	23205 to 23255	23205	5 MHz	QPSK	1 RB / 0 RB Offset
						25 RB / 0 RB Offset
			23255	5 MHz	QPSK	1 RB / 24 RB Offset
						25 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK	1 RB / 0 RB Offset
						50 RB / 0 RB Offset
			23230	10 MHz	QPSK	1 RB / 49 RB Offset
						50 RB / 0 RB Offset
-	Conducted Emission	23205 to 23255	23230	5 MHz	QPSK	1 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK	1 RB / 0 RB Offset
-	Radiated Emission	23230	23230	10 MHz	QPSK	1 RB / 24 RB Offset
						1 RB / 50 RB Offset

Note: This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
ERP / EIRP	25 deg. C, 65 % RH	120 Vac, 60 Hz	Getaz Yang
Frequency Stability	25 deg. C, 65 % RH	120 Vac, 60 Hz	Carlos Chen
Occupied Bandwidth	25 deg. C, 65 % RH	120 Vac, 60 Hz	Carlos Chen
Band Edge	25 deg. C, 65 % RH	120 Vac, 60 Hz	Carlos Chen
Peak to Average Ratio	25 deg. C, 65 % RH	120 Vac, 60 Hz	Carlos Chen
Condcudeted Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Carlos Chen
Radiated Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Getaz Yang

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

Fixed, mobile, and portable (hand-held) stations operating in the 1710–1755 MHz band are limited to 1 watt EIRP.

Portable stations (hand-held devices) operating in the 776-787 MHz band are limited to 3 watts ERP

4.1.2 Test Procedures

EIRP / ERP Measurement:

a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 5 MHz for WCDMA and 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.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.

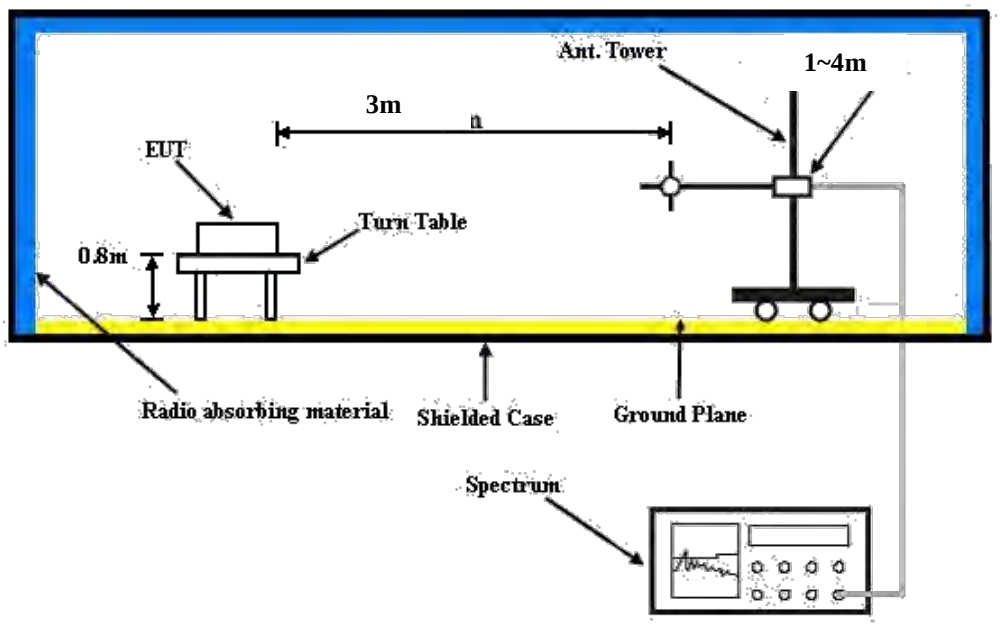
Conducted Power Measurement:

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)

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 19957	Mid Ch 20175	High Ch 20393		Low Ch 19957	Mid Ch 20175	High Ch 20393	
			1710.7 MHz	1732.5 MHz	1754.3 MHz		1710.7 MHz	1732.5 MHz	1754.3 MHz	
4 / 1.4M	1	0	23.77	23.69	23.85	0	22.83	22.56	22.42	1
	1	2	23.64	23.71	23.81	0	22.69	22.60	22.40	1
	1	5	23.55	23.69	23.74	0	22.66	22.47	22.29	1
	3	0	23.61	23.75	23.72	0	22.62	22.58	22.48	1
	3	1	23.50	23.65	23.75	0	22.53	22.75	22.89	1
	3	3	23.42	23.53	23.66	0	22.37	22.58	22.77	1
	6	0	22.75	22.76	22.61	1	21.93	21.67	21.63	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 19965	Mid Ch 20175	High Ch 20385		Low Ch 19965	Mid Ch 20175	High Ch 20385	
			1711.5 MHz	1732.5 MHz	1753.5 MHz		1711.5 MHz	1732.5 MHz	1753.5 MHz	
4 / 3M	1	0	23.89	24.09	23.65	0	23.03	22.41	22.58	1
	1	7	23.82	23.72	23.75	0	22.91	22.42	22.80	1
	1	14	23.67	23.84	23.77	0	22.83	22.31	22.75	1
	8	0	22.78	22.79	22.71	1	21.91	21.80	21.74	2
	8	3	22.67	22.68	22.71	1	21.76	21.57	21.73	2
	8	7	22.50	22.59	22.65	1	21.67	21.74	21.92	2
	15	0	22.54	22.79	22.66	1	21.63	21.80	21.67	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 19975	Mid Ch 20175	High Ch 20375		Low CH 19975	Mid CH 20175	High CH 20375	
			1712.5 MHz	1732.5 MHz	1752.5 MHz		1712.5 MHz	1732.5 MHz	1752.5 MHz	
4 / 5M	1	0	23.68	23.79	23.73	0	22.61	22.57	22.71	1
	1	12	23.56	23.90	23.74	0	22.56	22.55	22.71	1
	1	24	23.39	23.86	23.66	0	22.43	22.46	22.76	1
	12	0	22.54	22.82	22.79	1	21.64	21.81	21.50	2
	12	6	22.40	22.71	22.67	1	21.50	21.84	21.45	2
	12	13	22.37	22.60	22.49	1	21.44	21.71	21.72	2
	25	0	22.57	22.81	22.77	1	21.68	21.68	21.71	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 20000	Mid Ch 20175	High Ch 20350		Low Ch 20000	Mid Ch 20175	High Ch 20350	
			1715.0 MHz	1732.5 MHz	1750.0 MHz		1715.0 MHz	1732.5 MHz	1750.0 MHz	
4 / 10M	1	0	23.83	24.01	23.76	0	22.42	22.58	22.50	1
	1	24	23.73	23.93	24.10	0	22.33	22.82	22.49	1
	1	49	23.67	23.81	23.94	0	22.46	22.30	22.78	1
	25	0	22.64	22.92	22.63	1	21.63	21.60	21.81	2
	25	12	22.56	22.81	22.65	1	21.59	21.87	21.73	2
	25	25	22.36	22.73	22.56	1	21.52	21.56	21.63	2
	50	0	22.53	22.75	22.60	1	21.66	21.68	21.78	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 20025	Mid Ch 20175	High Ch 20325		Low Ch 20025	Mid Ch 20175	High Ch 20325	
			1717.5 MHz	1732.5 MHz	1747.5 MHz		1717.5 MHz	1732.5 MHz	1747.5 MHz	
4 / 15M	1	0	23.83	23.79	23.87	0	22.69	22.66	22.60	1
	1	37	23.69	24.14	23.98	0	22.23	22.75	22.54	1
	1	74	23.59	23.68	23.85	0	22.32	22.21	22.14	1
	36	0	22.52	22.87	22.98	1	21.59	21.62	21.62	2
	36	19	22.42	22.79	22.84	1	21.51	21.76	21.62	2
	36	39	22.51	22.67	22.82	1	21.65	21.56	21.61	2
	75	0	22.53	22.69	22.65	1	21.58	21.65	21.66	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 20050	Mid Ch 20175	High Ch 20300		Low Ch 20050	Mid Ch 20175	High Ch 20300	
			1720.0 MHz	1732.5 MHz	1745.0 MHz		1720.0 MHz	1732.5 MHz	1745.0 MHz	
4 / 20M	1	0	23.79	24.32	23.97	0	22.52	22.65	22.26	1
	1	50	24.10	23.64	23.56	0	22.43	22.66	22.32	1
	1	99	23.84	23.64	24.02	0	22.22	22.31	22.27	1
	50	0	22.45	22.73	22.51	1	21.51	21.70	21.59	2
	50	25	22.59	22.69	22.52	1	21.59	21.57	21.61	2
	50	50	22.71	22.46	22.44	1	21.76	21.49	21.45	2
	100	0	22.53	22.46	22.51	1	21.79	21.53	21.49	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 23205	Mid Ch 23230	High Ch 23255		Low Ch 23205	Mid Ch 23230	High Ch 23255	
			779.5 MHz	782.0 MHz	784.5 MHz		779.5 MHz	782.0 MHz	784.5 MHz	
13 / 5M	1	0	24.34	24.23	24.31	0	23.35	23.11	23.15	1
	1	12	24.23	24.11	24.16	0	23.10	22.98	23.02	1
	1	24	24.15	23.97	24.01	0	23.04	22.88	22.92	1
	12	0	23.26	23.35	23.39	1	22.14	22.24	22.25	2
	12	6	23.18	23.27	23.31	1	22.09	22.16	22.21	2
	12	13	23.04	23.12	23.18	1	21.92	22.00	22.05	2
	25	0	23.27	23.23	23.51	1	22.15	22.13	22.40	2

Band / BW	RB Size	RB Offset	QPSK	3GPP MPR (dB)	16QAM	3GPP MPR (dB)
			Mid Ch 23230		Mid Ch 23230	
			782.0 MHz		782.0 MHz	
13 / 10M	1	0	24.28	0	23.08	1
	1	24	24.16	0	22.93	1
	1	49	24.02	0	22.76	1
	25	0	23.21	1	22.17	2
	25	12	23.12	1	22.04	2
	25	25	22.97	1	21.85	2
	50	0	23.18	1	22.21	2

ERP Power (dBm)

LTE Band 13							
Channel Bandwidth: 5 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
Y	23205	779.5	-9.69	32.24	20.40	109.65	H
	23230	782.0	-9.55	32.17	20.47	111.43	
	23255	784.5	-9.61	32.11	20.35	108.39	
	23205	779.5	-14.51	32.43	15.77	37.76	V
	23230	782.0	-14.44	32.42	15.83	38.28	
	23255	784.5	-14.59	32.46	15.72	37.33	
Channel Bandwidth: 5 MHz / 16QAM							
Y	23205	779.5	-10.62	32.24	19.47	88.51	H
	23230	782.0	-10.44	32.17	19.58	90.78	
	23255	784.5	-10.58	32.11	19.38	86.70	
	23205	779.5	-15.33	32.43	14.95	31.26	V
	23230	782.0	-15.31	32.42	14.96	31.33	
	23255	784.5	-15.44	32.46	14.87	30.69	

LTE Band 13							
Channel Bandwidth: 10 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
Y	23230	782.0	-9.51	32.17	20.51	112.46	H
	23230	782.0	-14.36	32.42	15.91	38.99	V
Channel Bandwidth: 10 MHz / 16QAM							
Y	23230	782.0	-10.38	32.17	19.64	92.04	H
	23230	782.0	-15.29	32.42	14.98	31.48	V

EIRP Power (dBm)

LTE Band 4							
Channel Bandwidth: 1.4 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
Z	19957	1710.7	-19.58	36.45	16.87	48.64	H
	20175	1732.5	-19.89	36.80	16.91	49.08	
	20393	1754.3	-20.09	36.94	16.85	48.45	
	19957	1710.7	-13.77	37.28	23.51	224.23	V
	20175	1732.5	-14.00	37.63	23.63	230.67	
	20393	1754.3	-14.12	37.64	23.52	224.91	
Channel Bandwidth: 1.4 MHz / 16QAM							
Z	19957	1710.7	-19.81	36.45	16.64	46.13	H
	20175	1732.5	-20.14	36.80	16.66	46.33	
	20393	1754.3	-20.32	36.94	16.62	45.95	
	19957	1710.7	-14.55	37.28	22.73	187.37	V
	20175	1732.5	-14.83	37.63	22.80	190.55	
	20393	1754.3	-14.89	37.64	22.75	188.36	

LTE Band 4							
Channel Bandwidth: 3 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
Z	19965	1711.5	-19.51	36.45	16.94	49.43	H
	20175	1732.5	-19.82	36.80	16.98	49.88	
	20385	1753.5	-20.01	36.94	16.93	49.35	
	19965	1711.5	-13.57	37.28	23.71	234.80	V
	20175	1732.5	-13.84	37.63	23.79	239.33	
	20385	1753.5	-14.03	37.64	23.61	229.61	
Channel Bandwidth: 3 MHz / 16QAM							
Z	19965	1711.5	-19.78	36.45	16.67	46.45	H
	20175	1732.5	-20.01	36.80	16.79	47.74	
	20385	1753.5	-20.25	36.94	16.69	46.70	
	19965	1711.5	-14.41	37.28	22.87	193.51	V
	20175	1732.5	-14.70	37.63	22.93	196.34	
	20385	1753.5	-14.82	37.64	22.82	191.43	

LTE Band 4							
Channel Bandwidth: 5 MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Z	19975	1712.5	-19.46	36.45	16.99	50.00	H
	20175	1732.5	-19.75	36.80	17.05	50.69	
	20375	1752.5	-19.94	36.94	17.00	50.15	
	19975	1712.5	-13.49	37.28	23.79	239.17	V
	20175	1732.5	-13.80	37.63	23.83	241.55	
	20375	1752.5	-13.89	37.64	23.75	237.14	
Channel Bandwidth: 5 MHz / 16QAM							
Z	19975	1712.5	-19.70	36.45	16.75	47.32	H
	20175	1732.5	-19.81	36.80	16.99	49.99	
	20375	1752.5	-19.99	36.94	16.95	49.58	
	19975	1712.5	-14.32	37.28	22.96	197.56	V
	20175	1732.5	-14.63	37.63	23.00	199.53	
	20375	1752.5	-14.73	37.64	22.91	195.43	

LTE Band 4							
Channel Bandwidth: 10 MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Z	20000	1715.0	-19.56	36.64	17.08	51.05	H
	20175	1732.5	-19.67	36.80	17.13	51.58	
	20350	1750.0	-19.75	36.80	17.05	50.70	
	20000	1715.0	-13.60	37.44	23.84	242.05	V
	20175	1732.5	-13.77	37.63	23.86	243.16	
	20350	1750.0	-13.79	37.64	23.85	242.38	
Channel Bandwidth: 10 MHz / 16QAM							
Z	20000	1715.0	-19.62	36.64	17.02	50.35	H
	20175	1732.5	-19.77	36.80	17.03	50.41	
	20350	1750.0	-19.80	36.80	17.00	50.12	
	20000	1715.0	-14.40	37.44	23.04	201.33	V
	20175	1732.5	-14.58	37.63	23.05	201.79	
	20350	1750.0	-14.70	37.64	22.94	196.56	

LTE Band 4							
Channel Bandwidth: 15 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
Z	20025	1717.5	-19.31	36.45	17.14	51.76	H
	20175	1732.5	-19.59	36.80	17.21	52.59	
	20325	1747.5	-19.82	36.94	17.12	51.56	
	20025	1717.5	-13.40	37.28	23.88	244.17	V
	20175	1732.5	-13.70	37.63	23.93	247.17	
	20325	1747.5	-13.72	37.64	23.92	246.60	
Channel Bandwidth: 15 MHz / 16QAM							
Z	20025	1717.5	-19.41	36.45	17.04	50.58	H
	20175	1732.5	-19.71	36.80	17.09	51.16	
	20325	1747.5	-19.93	36.94	17.01	50.27	
	20025	1717.5	-14.21	37.28	23.07	202.63	V
	20175	1732.5	-14.51	37.63	23.12	205.12	
	20325	1747.5	-14.58	37.64	23.06	202.30	

LTE Band 4							
Channel Bandwidth: 20 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
Z	20050	1720.0	-19.24	36.45	17.21	52.60	H
	20175	1732.5	-19.50	36.80	17.30	53.69	
	20300	1745.0	-19.71	36.94	17.23	52.88	
	20050	1720.0	-13.31	37.28	23.97	249.29	V
	20175	1732.5	-13.64	37.63	23.99	250.61	
	20300	1745.0	-13.69	37.64	23.95	248.31	
Channel Bandwidth: 20 MHz / 16QAM							
Z	20050	1720.0	-19.38	36.45	17.07	50.93	H
	20175	1732.5	-19.64	36.80	17.16	51.99	
	20300	1745.0	-19.82	36.94	17.12	51.56	
	20050	1720.0	-14.13	37.28	23.15	206.40	V
	20175	1732.5	-14.37	37.63	23.26	211.84	
	20300	1745.0	-14.39	37.64	23.25	211.35	

4.2 Frequency Stability Measurement

4.2.1 Limits of Frequency Stabiliity Measurement

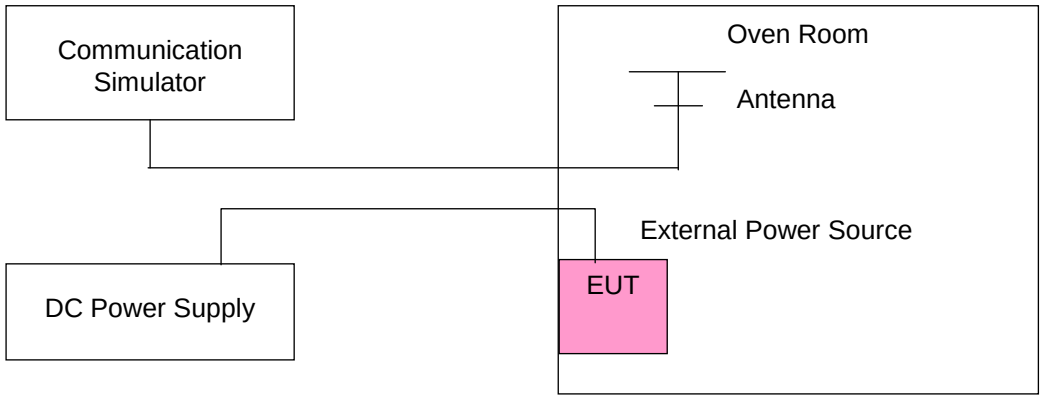
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

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)	Frequency Error (ppm)								Limit (ppm)
	LTE Band 4						LTE Band 13		
	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	5 MHz	10 MHz	
12	0.001	0.002	0.001	0.002	0.002	0.002	0.002	0.004	2.5
6	0.002	0.001	0.002	0.002	0.001	0.001	0.003	0.003	2.5
18	0.002	0.001	0.001	0.002	0.001	0.002	0.002	0.004	2.5

Note: The applicant defined the normal working voltage of the battery is from 6 Vdc to 18 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	Frequency Error (ppm)								Limit (ppm)
	LTE Band 4						LTE Band 13		
	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	5 MHz	10 MHz	
-30	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	2.5
-20	0.002	0.001	0.001	0.002	0.001	0.002	0.004	0.004	2.5
-10	0.001	0.001	0.001	0.001	0.001	0.002	0.004	0.002	2.5
0	0.001	0.002	0.002	0.001	0.001	0.001	0.003	0.003	2.5
10	0.001	0.001	0.001	0.002	0.001	0.002	0.004	0.001	2.5
20	-0.002	-0.001	-0.001	-0.001	-0.002	-0.001	-0.002	-0.004	2.5
30	-0.001	-0.002	-0.002	-0.001	-0.001	-0.002	-0.004	-0.005	2.5
40	-0.002	-0.001	-0.002	-0.002	-0.002	-0.001	-0.005	-0.005	2.5
50	-0.001	-0.001	-0.001	-0.002	-0.001	-0.002	-0.005	-0.002	2.5

4.3 Occupied Bandwidth Measurement

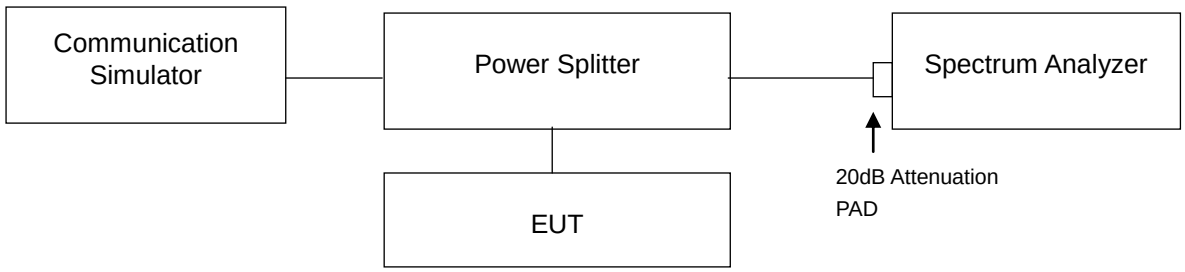
4.3.1 Limits of Occupied Bandwidth Measurement

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

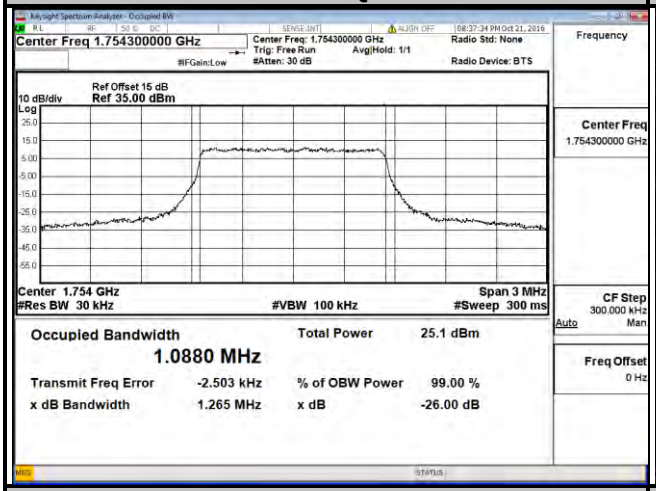


4.3.4 Test Result

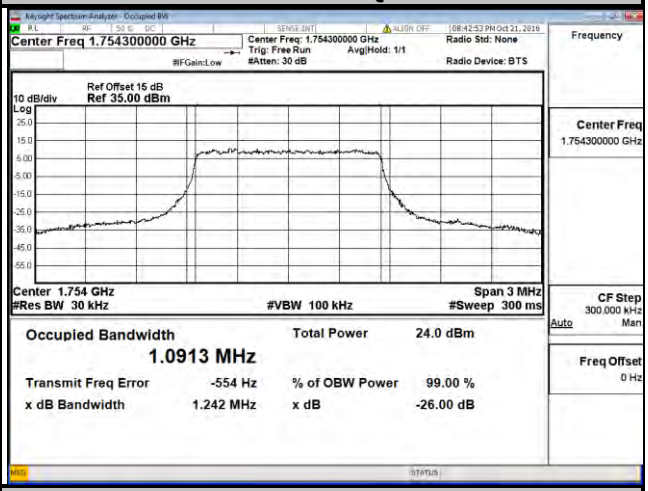
LTE Band 4							
Channel Bandwidth: 1.4 MHz				Channel Bandwidth: 3 MHz			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
19957	1710.7	1.0878	1.0871	19965	1711.5	2.7027	2.6958
20175	1732.5	1.0873	1.0903	20175	1732.5	2.7001	2.6980
20393	1754.3	1.0880	1.0913	20385	1753.5	2.6996	2.6974

Spectrum Plot of Worst Value

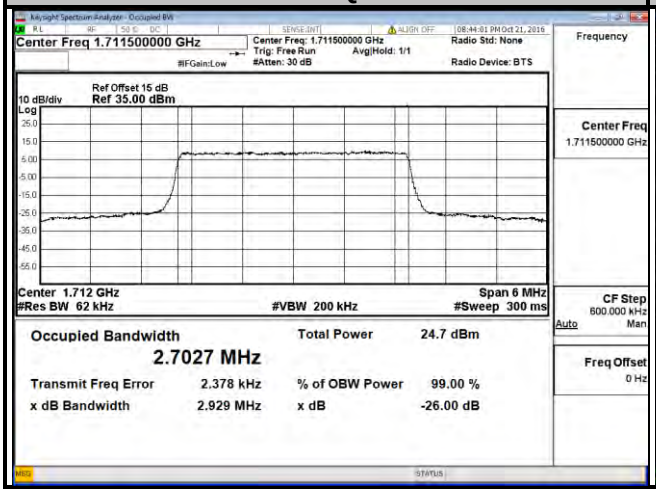
1.4 MHz / QPSK



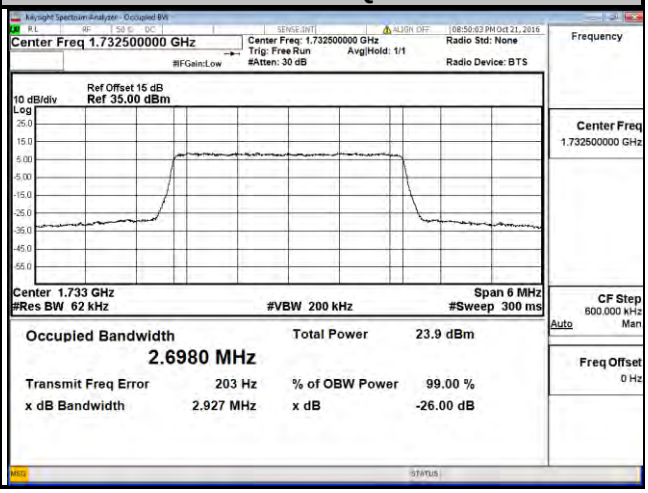
1.4 MHz / 16QAM



3 MHz / QPSK



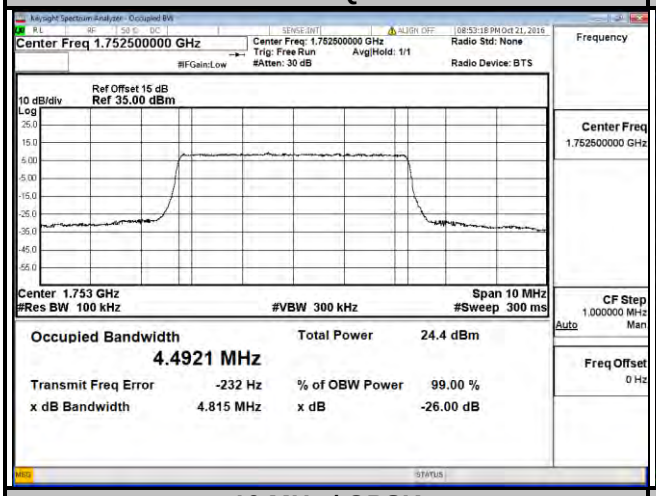
3 MHz / 16QAM



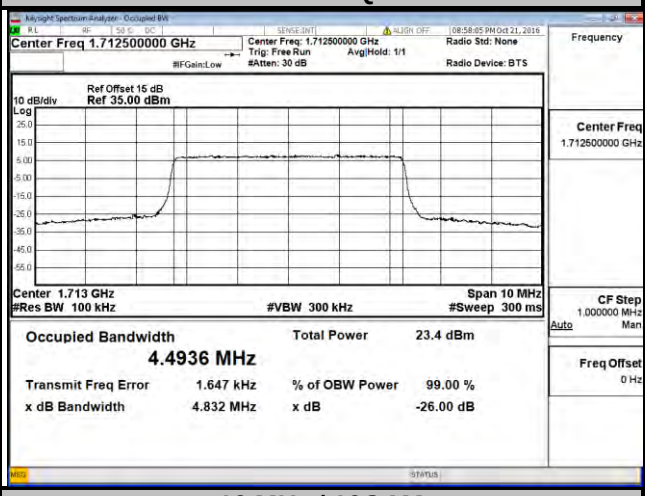
LTE Band 4							
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
19975	1712.5	4.4908	4.4936	20000	1715.0	8.9524	8.9529
20175	1732.5	4.4903	4.4913	20175	1732.5	8.9543	8.9589
20375	1752.5	4.4921	4.4919	20350	1750.0	8.9455	8.9562

Spectrum Plot of Worst Value

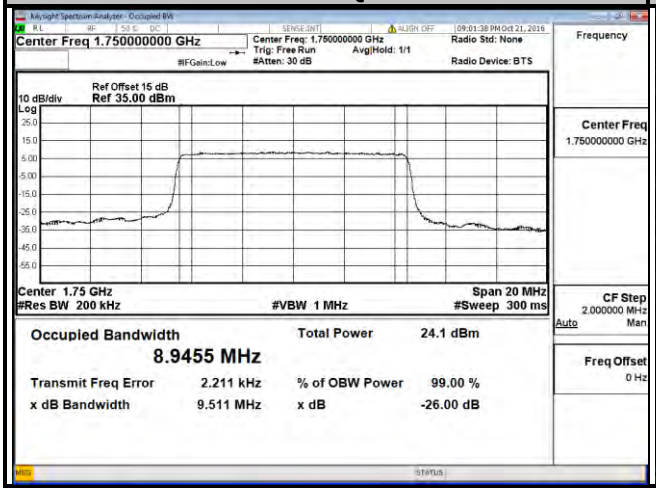
5 MHz / QPSK



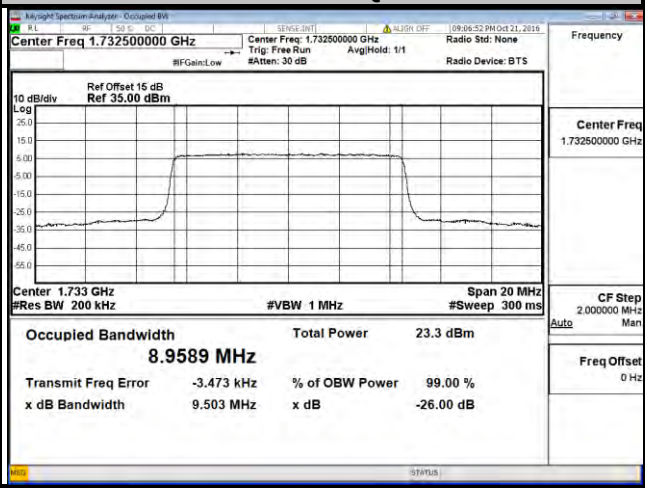
5 MHz / 16QAM



10 MHz / QPSK



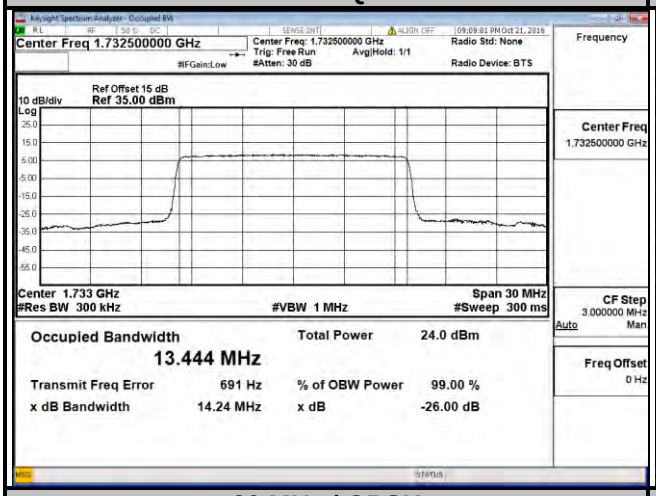
10 MHz / 16QAM



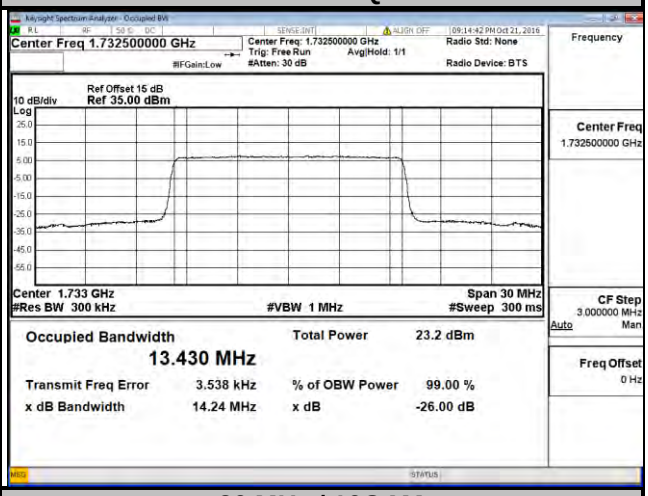
LTE Band 4							
Channel Bandwidth: 15 MHz				Channel Bandwidth: 20 MHz			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
20025	1717.5	13.4300	13.4190	20050	1720.0	17.8890	17.9140
20175	1732.5	13.4440	13.4300	20175	1732.5	17.9070	17.9360
20325	1747.5	13.4270	13.4170	20300	1745.0	17.8810	17.9030

Spectrum Plot of Worst Value

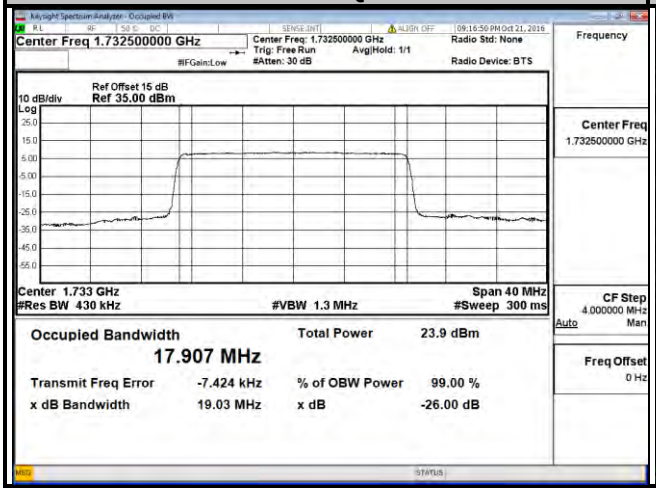
15 MHz / QPSK



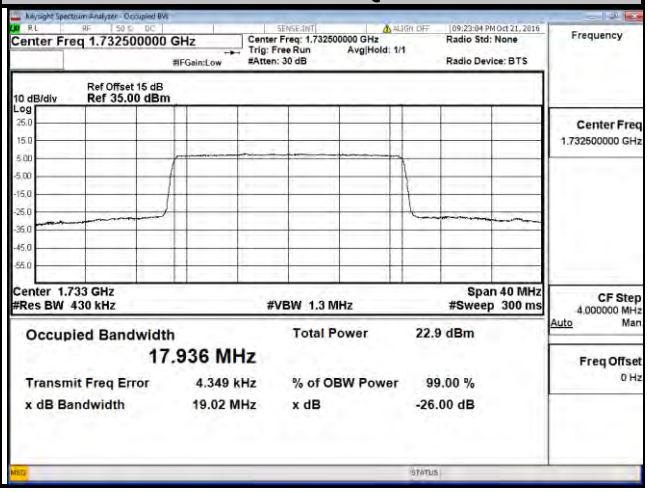
15 MHz / 16QAM



20 MHz / QPSK



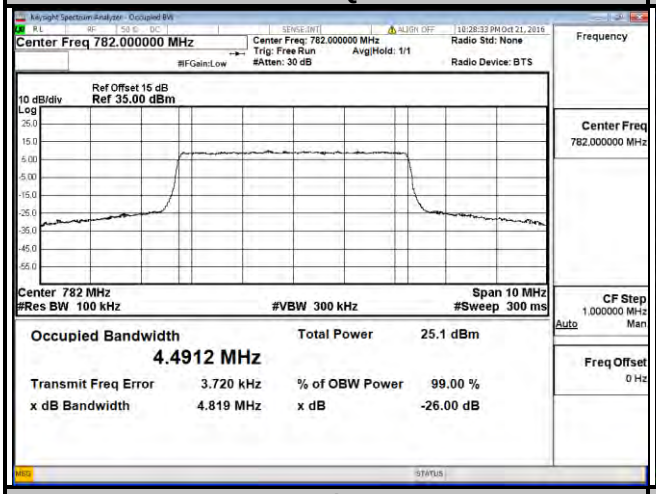
20 MHz / 16QAM



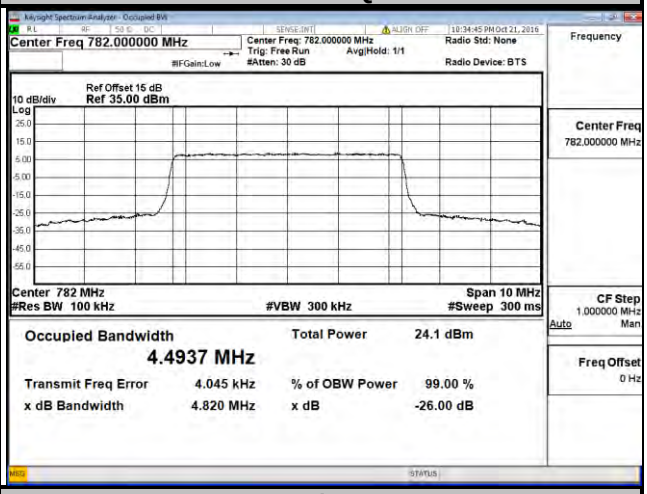
LTE Band 13							
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
23205	779.5	4.4857	4.4893	23230	782.0	8.9435	8.9410
23230	782.0	4.4912	4.4937				
23255	784.5	4.4838	4.4883				

Spectrum Plot of Worst Value

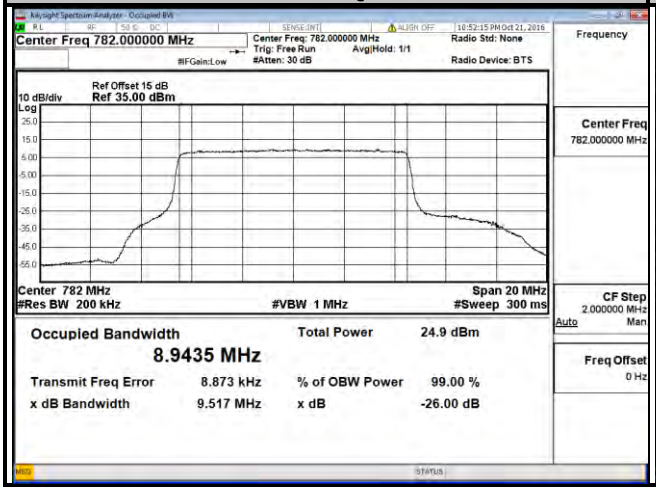
5 MHz / QPSK



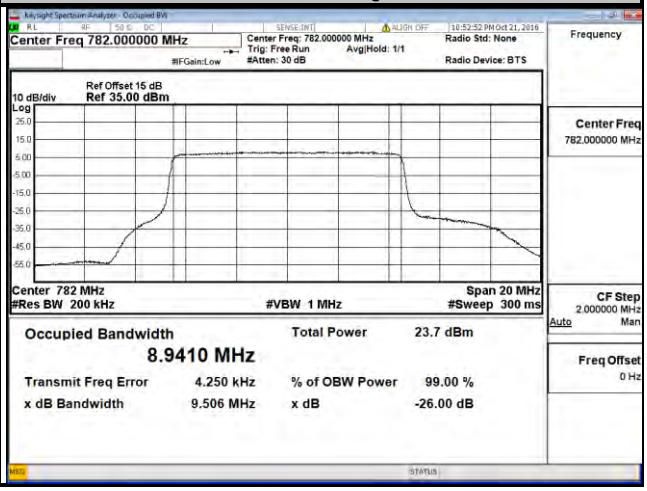
5 MHz / 16QAM



10 MHz / QPSK



10 MHz / 16QAM



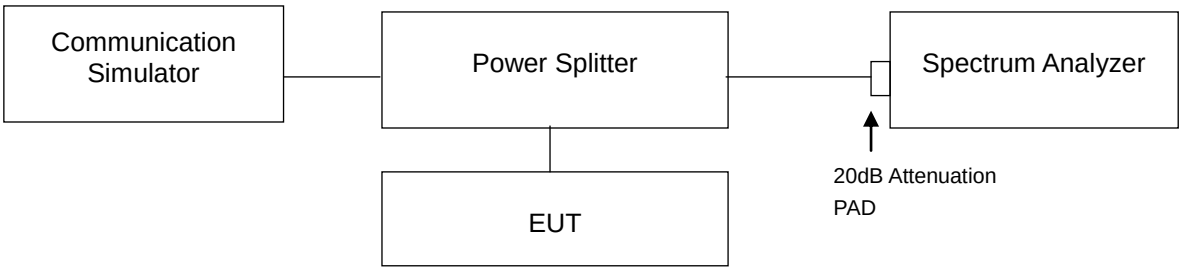
4.4 Band Edge Measurement

4.4.1 Limits of Band Edge Measurement

For operations in the 776-787 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater.
However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

For operations in the 1710–1755 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 43 + 10 log10(P) dB.

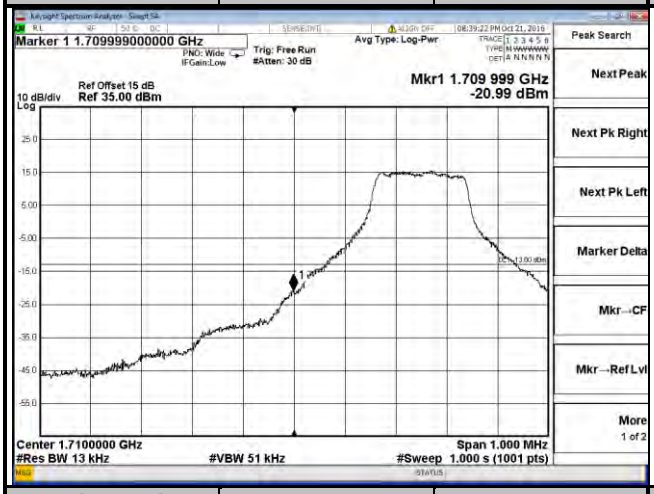
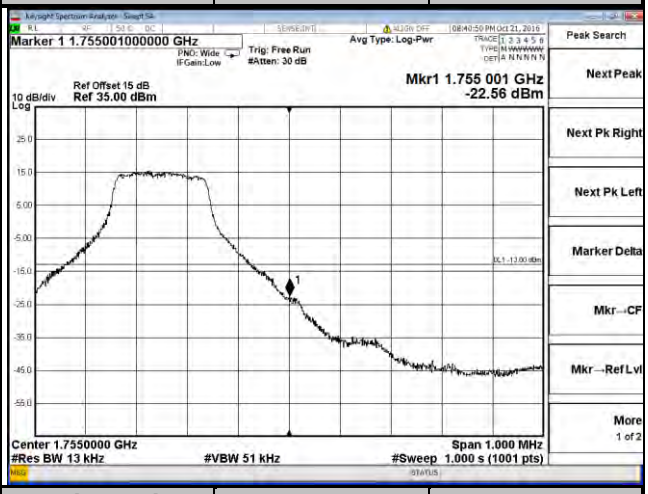
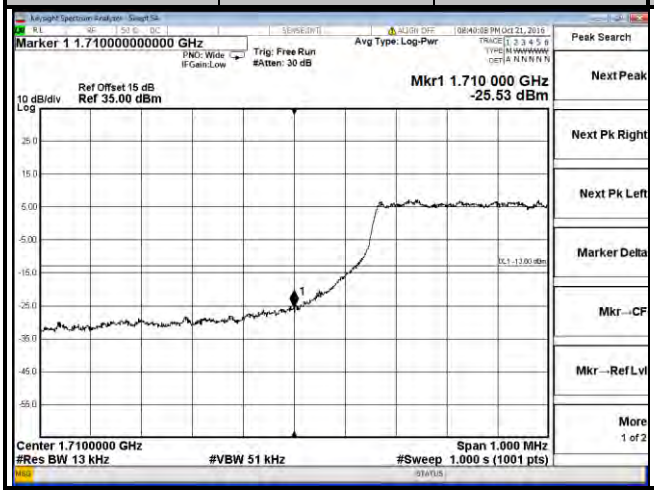
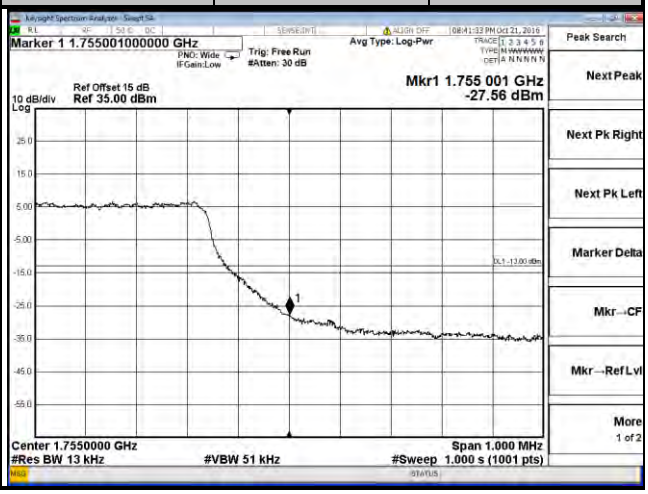
4.4.2 Test Setup

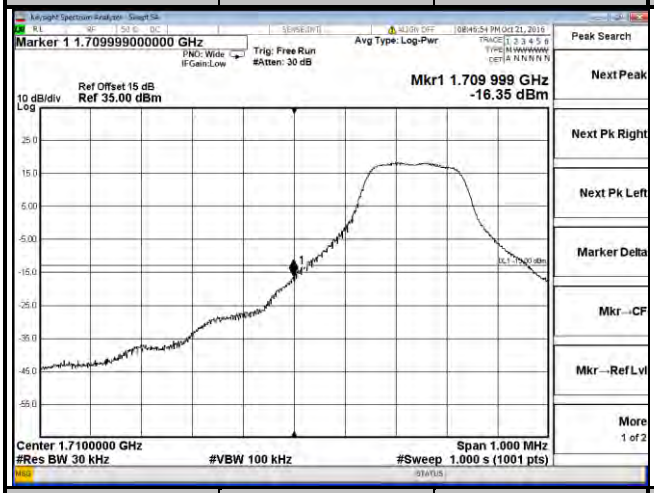
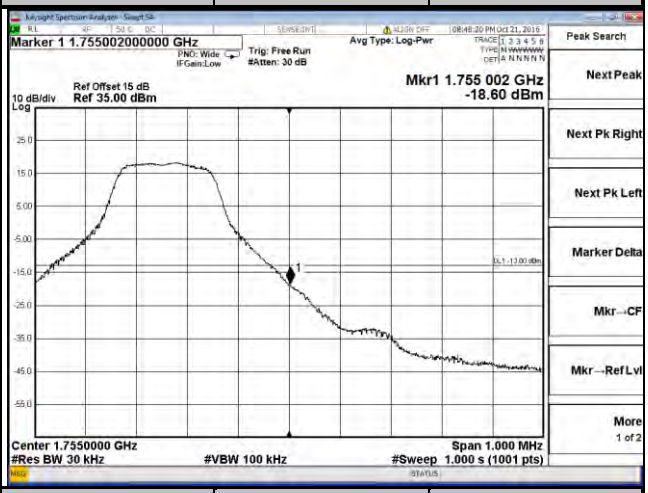
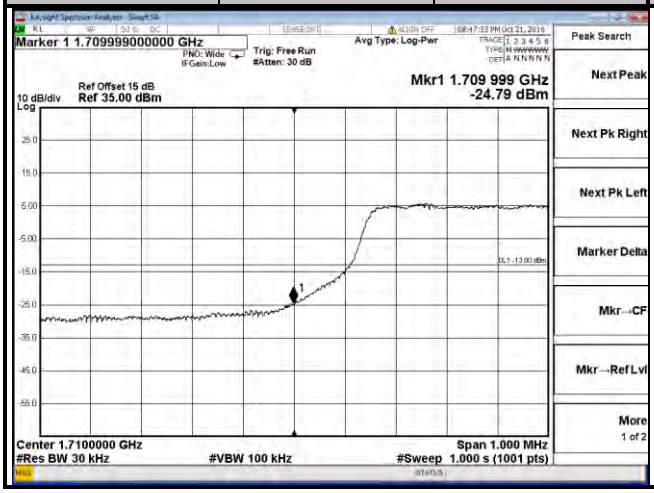
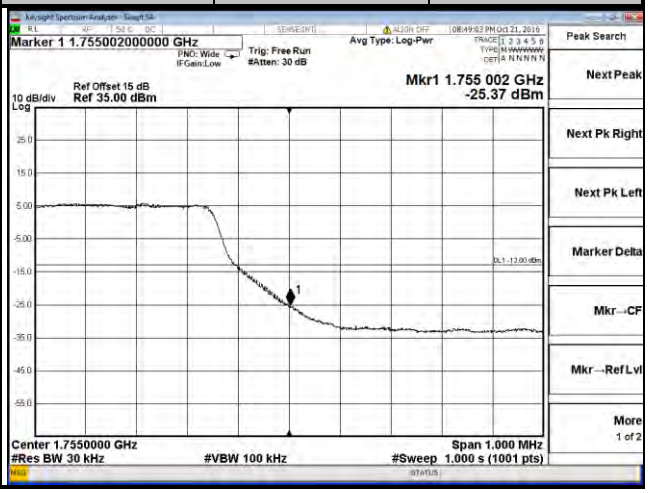


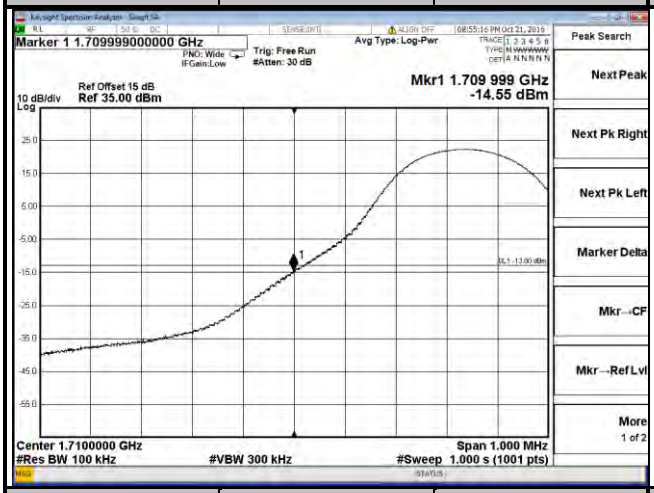
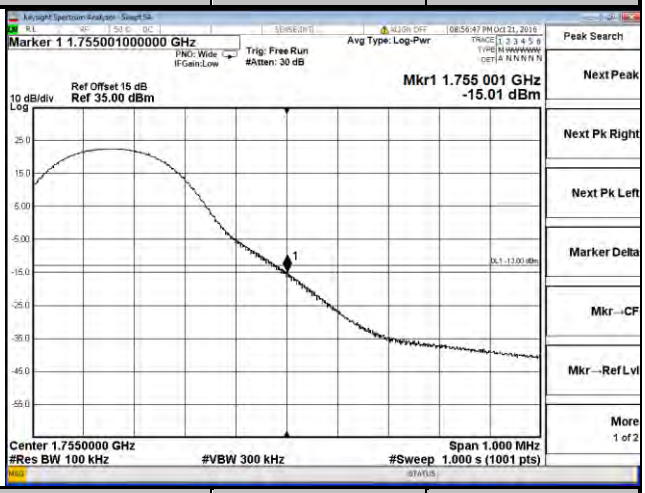
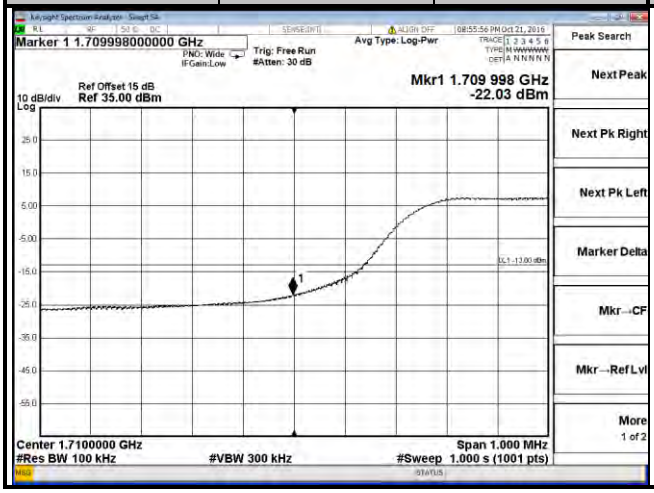
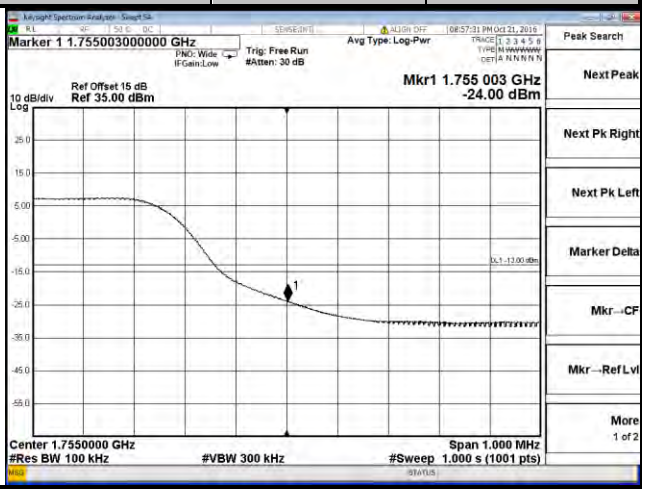
4.4.3 Test Procedures

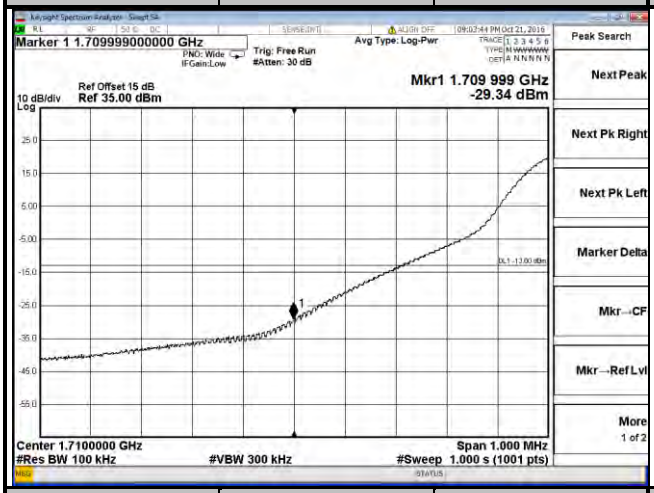
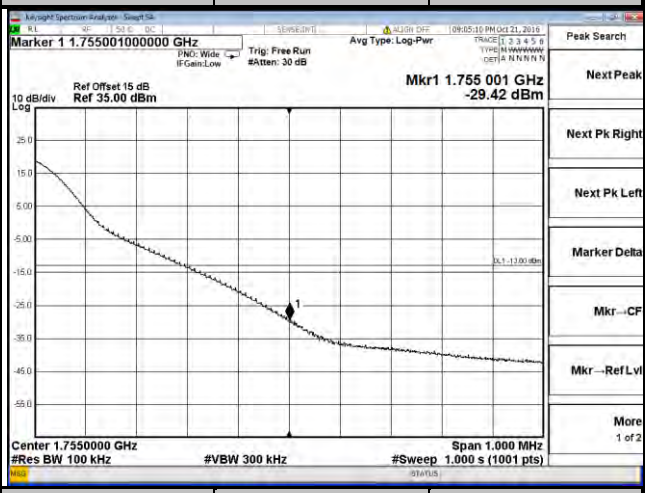
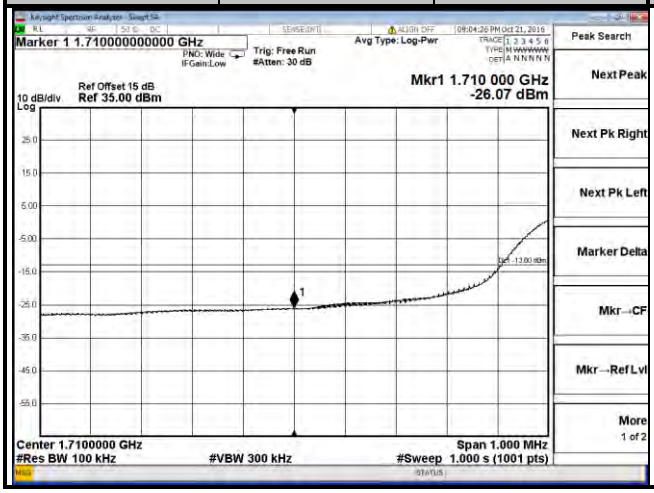
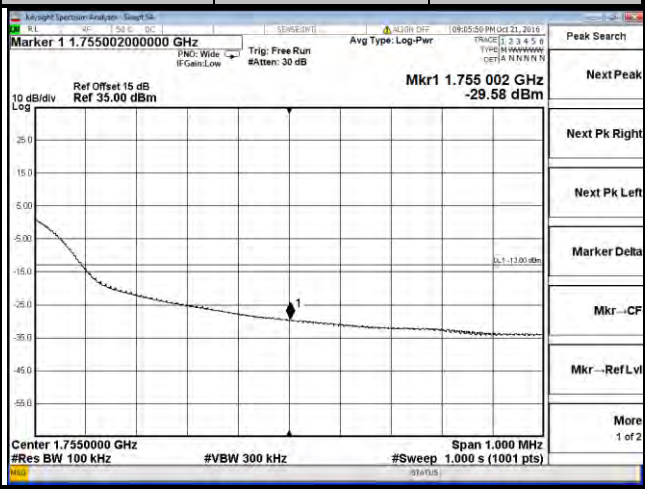
a. All measurements were done at low and high operational frequency range.
b. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 13 kHz and VB of the spectrum is 51 kHz (LTE Bandwidth 1.4 MHz).
c. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 30 kHz and VB of the spectrum is 100 kHz (LTE Bandwidth 3 MHz).
d. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 100 kHz and VB of the spectrum is 300 kHz (LTE Bandwidth 5 MHz/10 MHz).
e. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 150 kHz and VB of the spectrum is 470 kHz (LTE Bandwidth 15 MHz).
f. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 180 kHz and VB of the spectrum is 560 kHz (LTE Bandwidth 20 MHz).
g. Record the max trace plot into the test report.

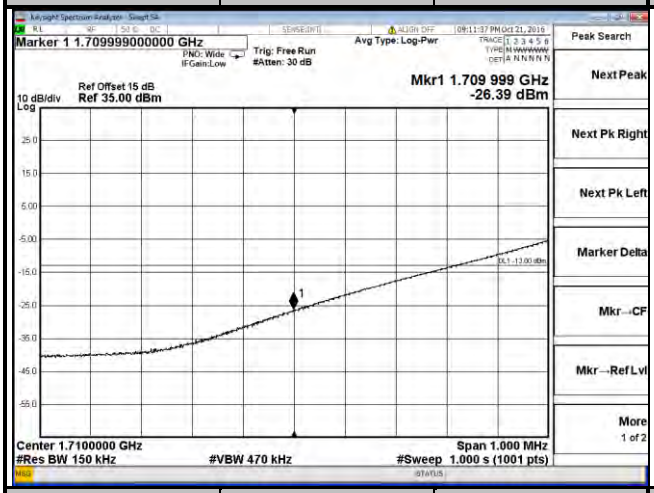
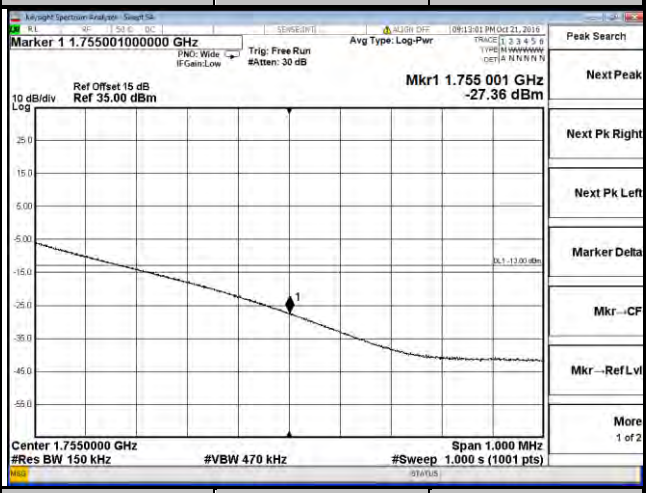
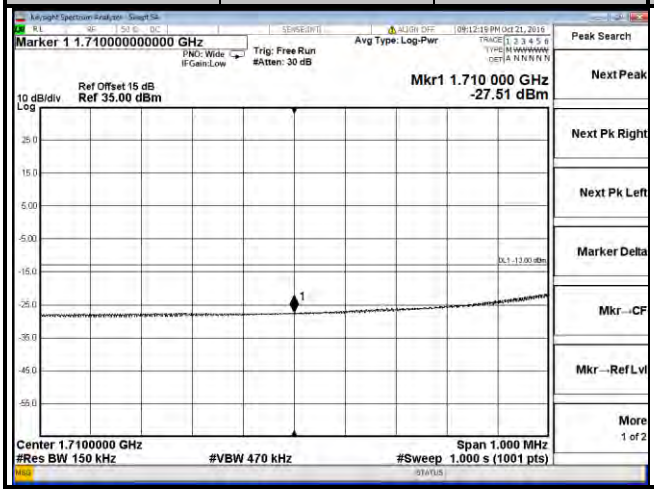
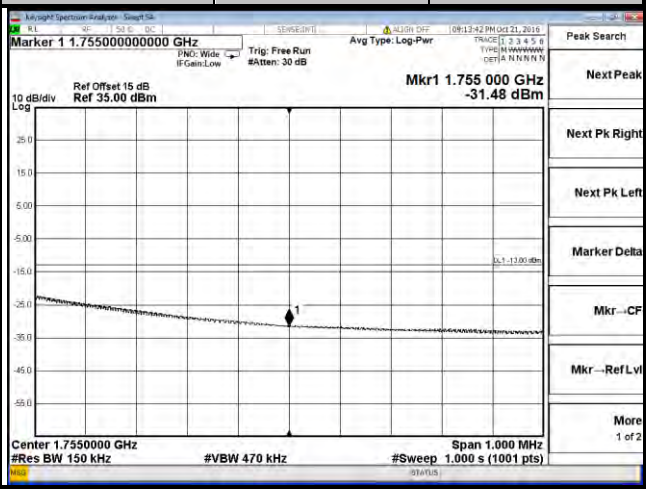
4.4.4 Test Results

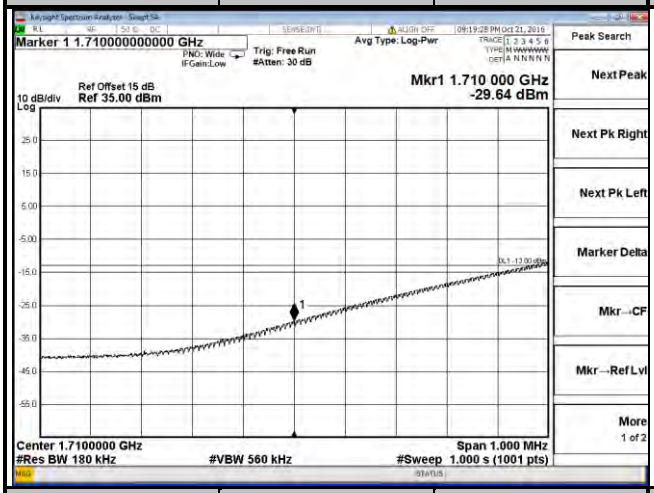
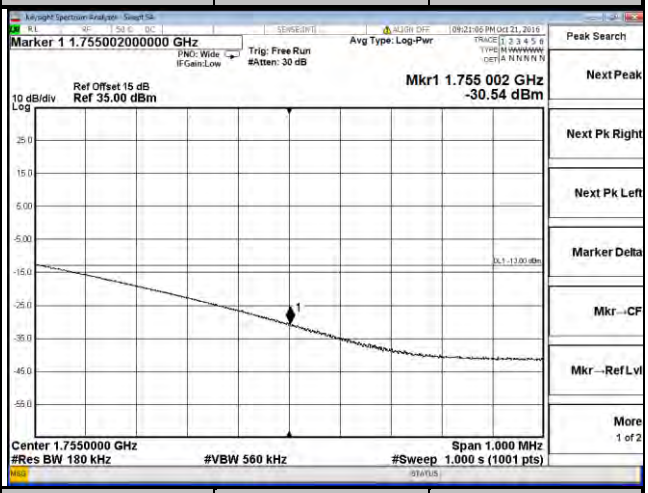
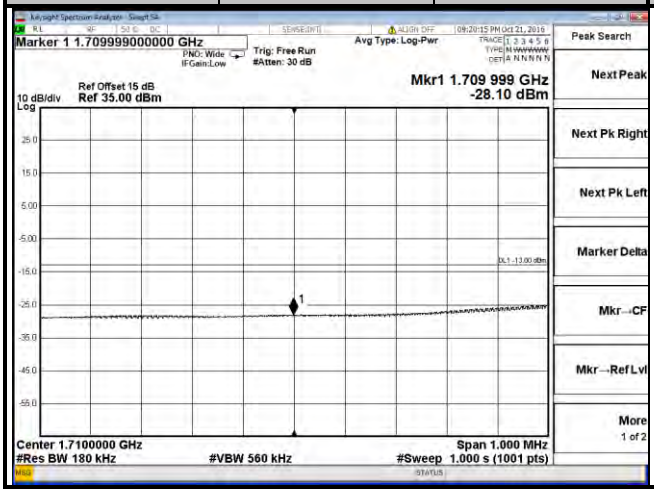
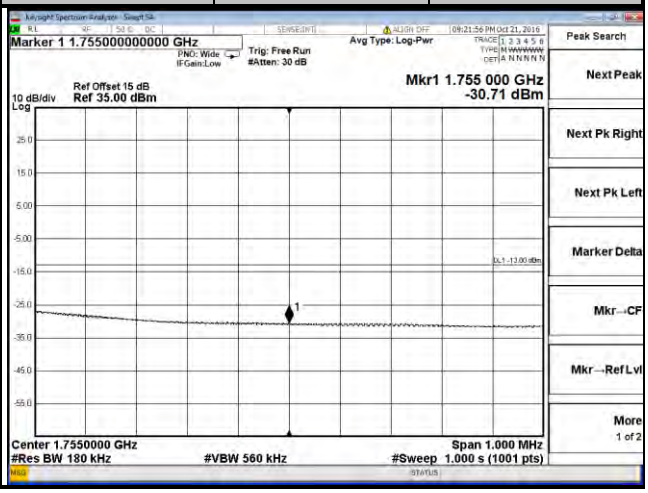
LTE Band 4					
Channel Bandwidth: 1.4 MHz					
Channel	19957	6 RB	Channel	20393	6 RB
					
Channel	19957	25 RB	Channel	20393	25 RB
					

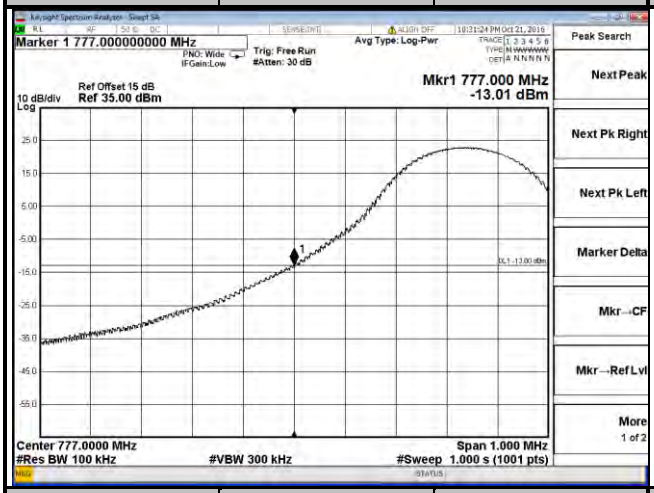
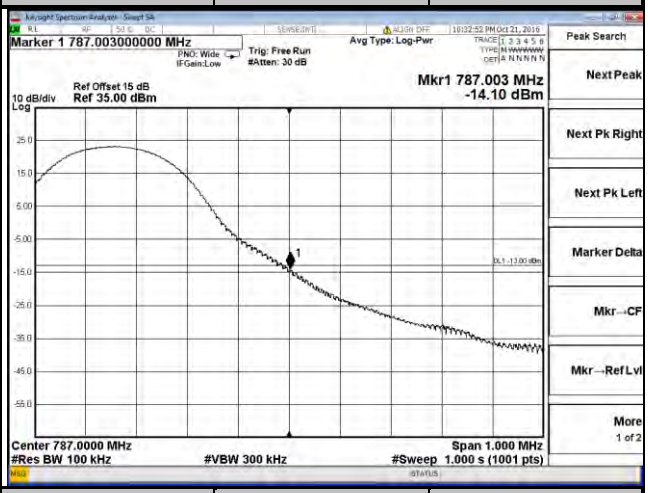
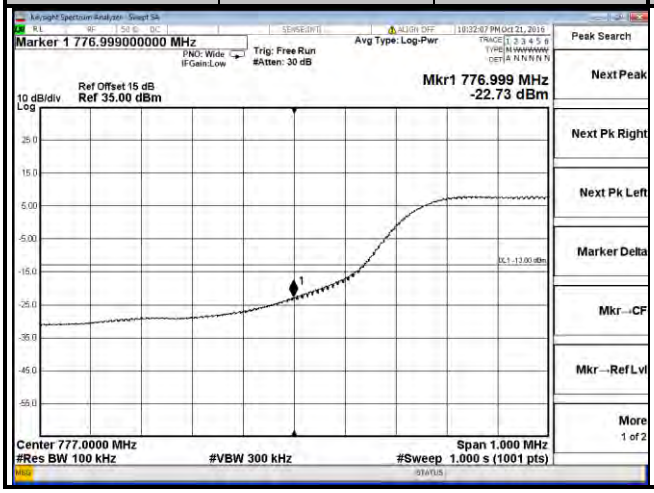
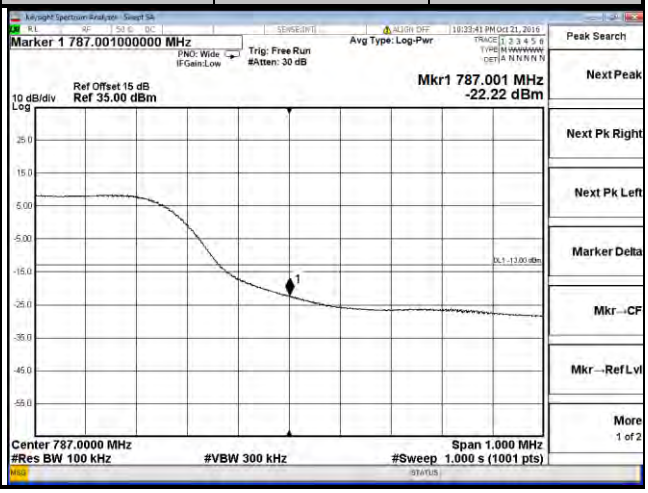
LTE Band 4					
Channel Bandwidth: 3 MHz					
Channel	19965	1 RB	Channel	20385	1 RB
					
Channel	19965	15 RB	Channel	20385	15 RB
					

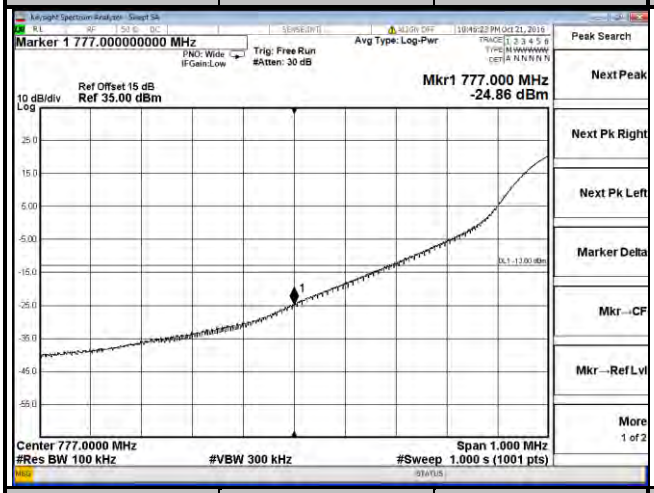
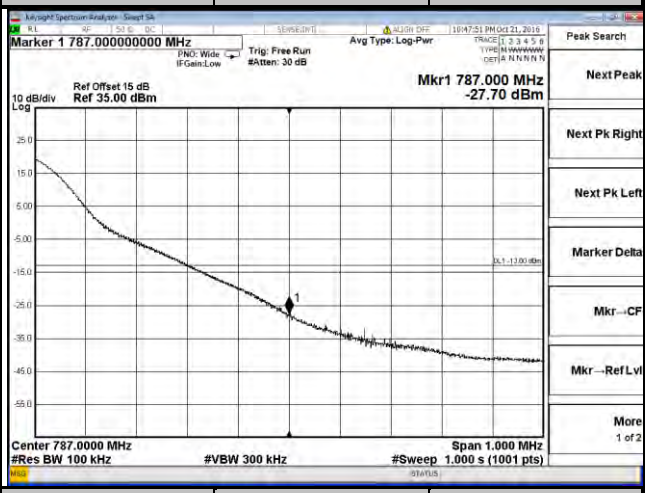
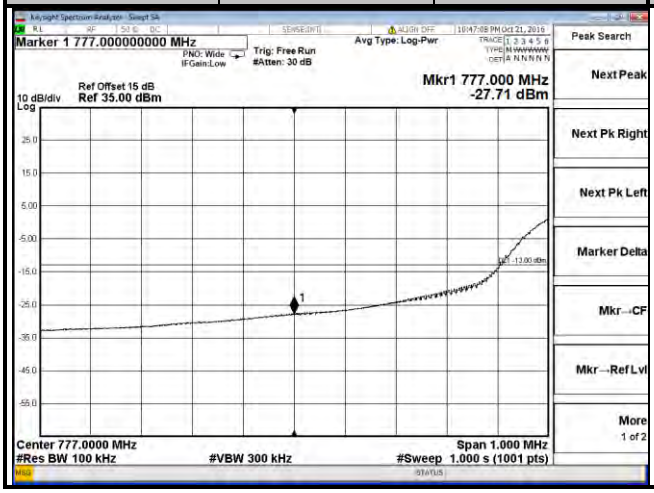
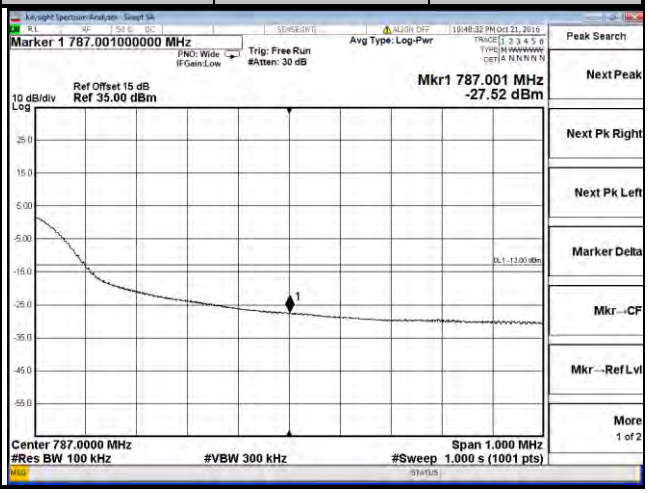
LTE Band 4					
Channel Bandwidth: 5 MHz					
Channel	19975	1 RB	Channel	20375	1 RB
					
Channel	19975	25 RB	Channel	20375	25 RB
					

LTE Band 4					
Channel Bandwidth: 10 MHz					
Channel	20000	1 RB	Channel	20350	1 RB
					
Channel	20000	50 RB	Channel	20350	50 RB
					

LTE Band 4					
Channel Bandwidth: 15 MHz					
Channel	20025	1 RB	Channel	20325	1 RB
					
Channel	20025	75 RB	Channel	20325	75 RB
					

LTE Band 4					
Channel Bandwidth: 20 MHz					
Channel	20050	1 RB	Channel	20300	1 RB
					
Channel	20050	100 RB	Channel	20300	100 RB
					

LTE Band 13					
Channel Bandwidth: 5 MHz					
Channel	23205	1 RB	Channel	23255	1 RB
					
Channel	23205	25 RB	Channel	23255	25 RB
					

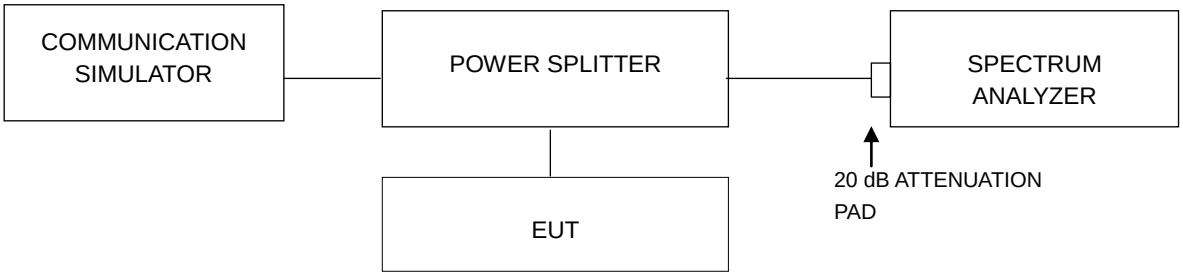
LTE Band 13					
Channel Bandwidth: 10 MHz					
Channel	23230	1 RB	Channel	23230	1 RB
					
Channel	23230	50 RB	Channel	23230	50 RB
					

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

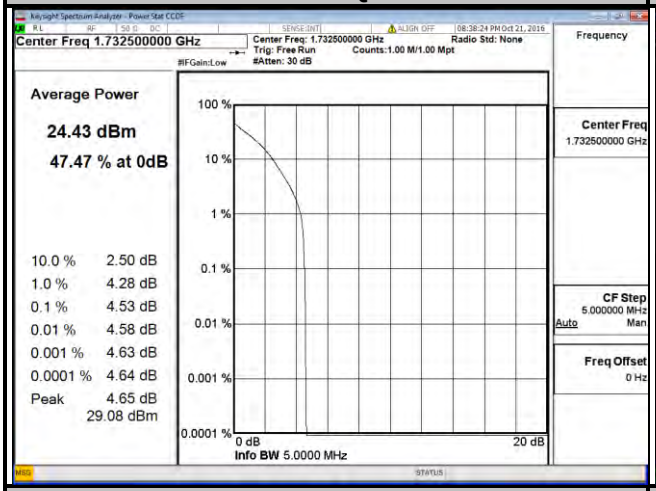
1. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1 %.

4.5.4 Test Results

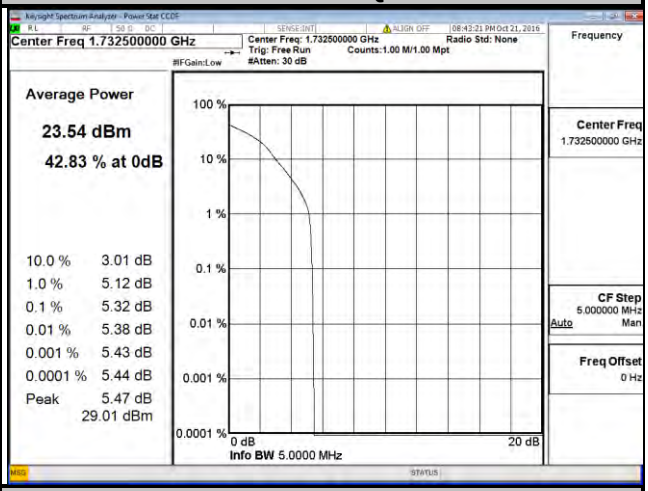
LTE Band 4							
Channel Bandwidth: 1.4 MHz				Channel Bandwidth: 3 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
19957	1710.7	3.88	4.80	19965	1711.5	3.88	4.83
20175	1732.5	4.53	5.32	20175	1732.5	4.57	5.43
20393	1754.3	4.10	5.02	20385	1753.5	4.19	5.11

Spectrum Plot of Worst Value

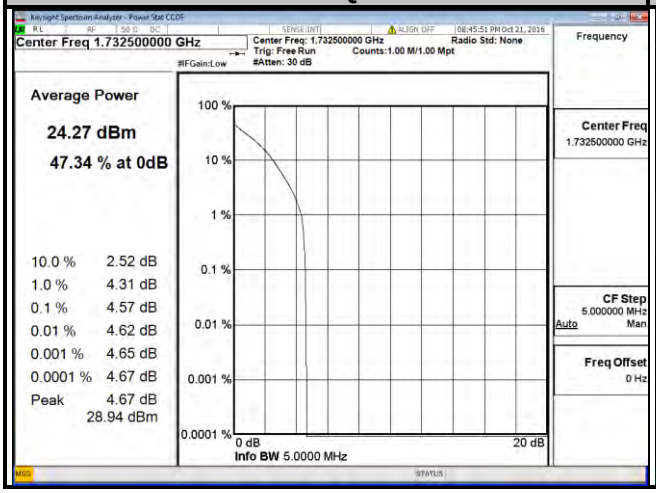
1.4 MHz / QPSK



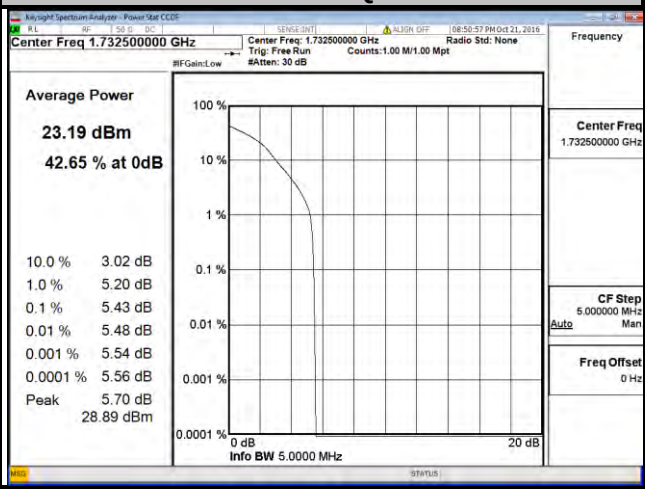
1.4 MHz / 16QAM



3 MHz / QPSK



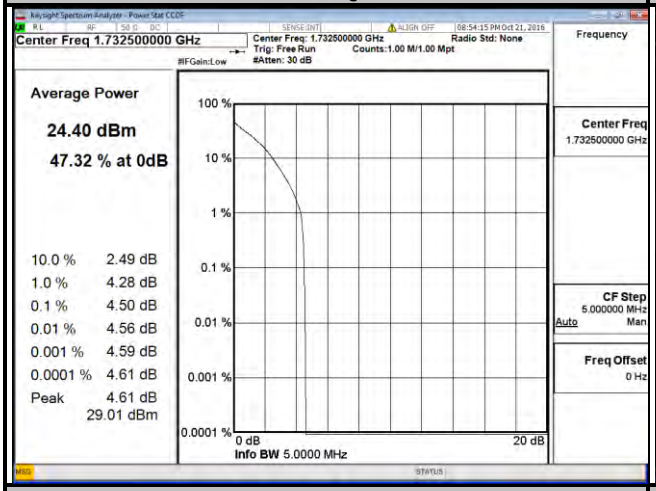
3 MHz / 16QAM



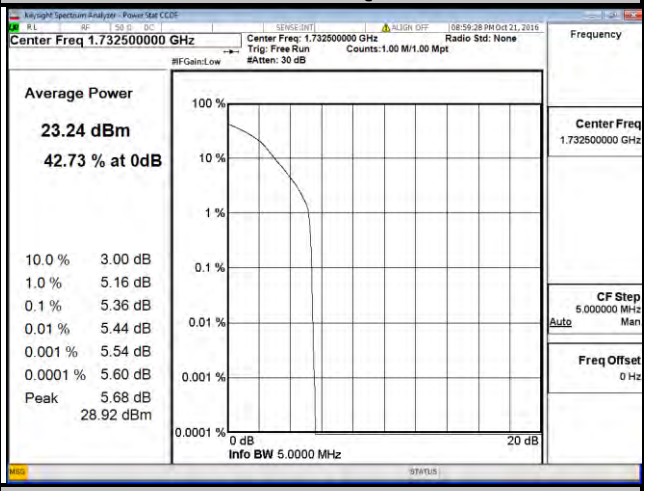
LTE Band 4							
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
19975	1712.5	3.93	4.85	20000	1715.0	3.88	4.83
20175	1732.5	4.50	5.36	20175	1732.5	4.48	5.42
20375	1752.5	4.20	4.95	20350	1750.0	4.40	5.26

Spectrum Plot of Worst Value

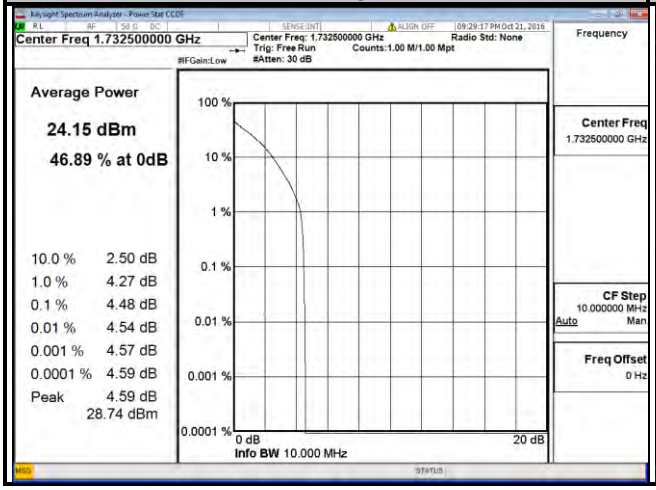
5 MHz / QPSK



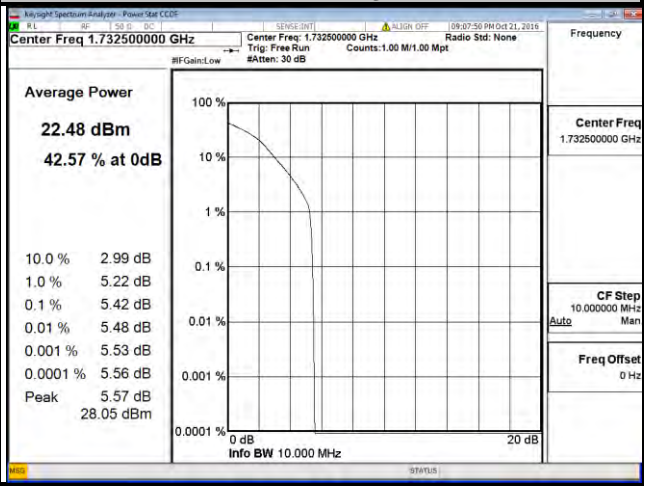
5 MHz / 16QAM



10 MHz / QPSK



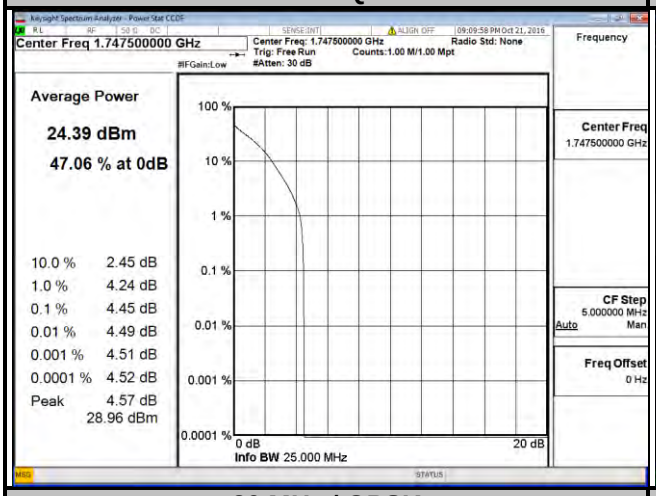
10 MHz / 16QAM



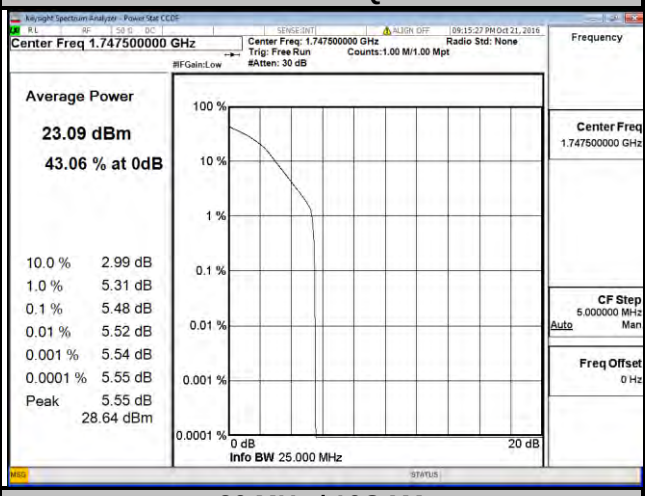
LTE Band 4							
Channel Bandwidth: 15 MHz				Channel Bandwidth: 20 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
20025	1717.5	3.79	4.80	20050	1720.0	3.82	4.74
20175	1732.5	4.28	5.24	20175	1732.5	4.36	5.21
20325	1747.5	4.45	5.48	20300	1745.0	4.55	5.32

Spectrum Plot of Worst Value

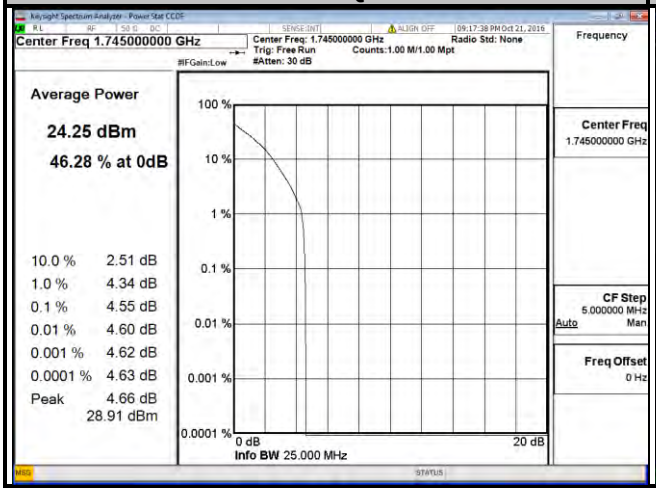
15 MHz / QPSK



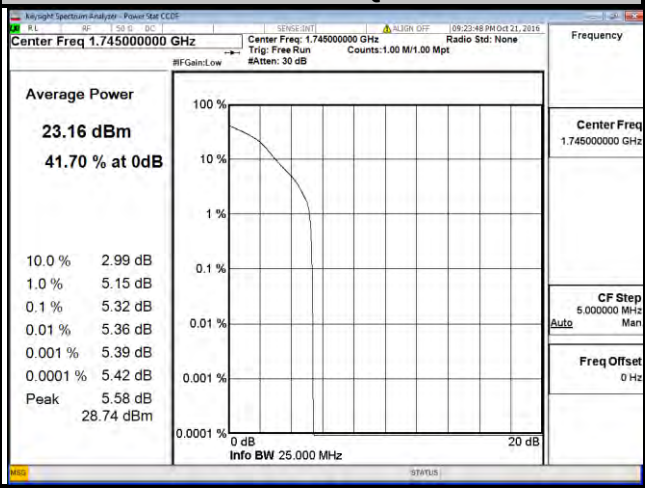
15 MHz / 16QAM



20 MHz / QPSK



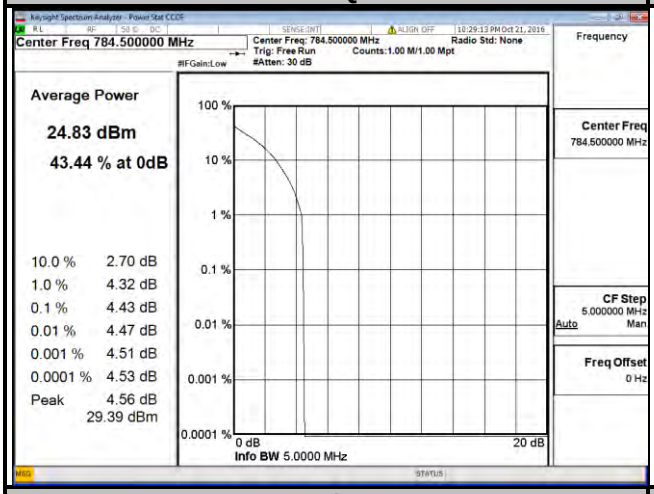
20 MHz / 16QAM



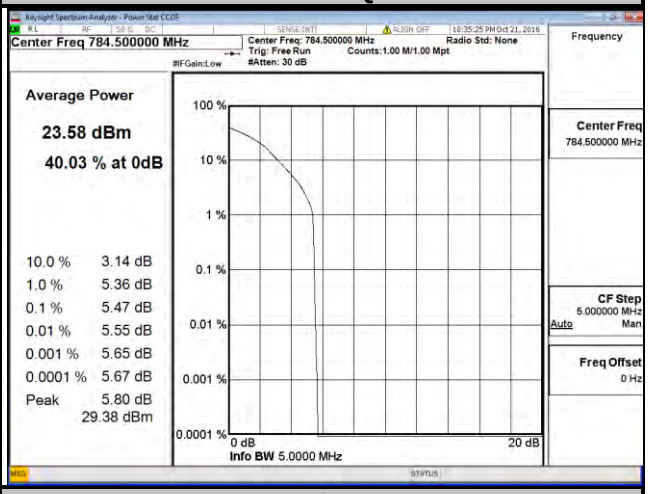
LTE Band 13							
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
23205	779.5	2.03	2.84	23230	782.0	2.19	3.22
23230	782.0	4.14	5.17				
23255	784.5	4.43	5.47				

Spectrum Plot of Worst Value

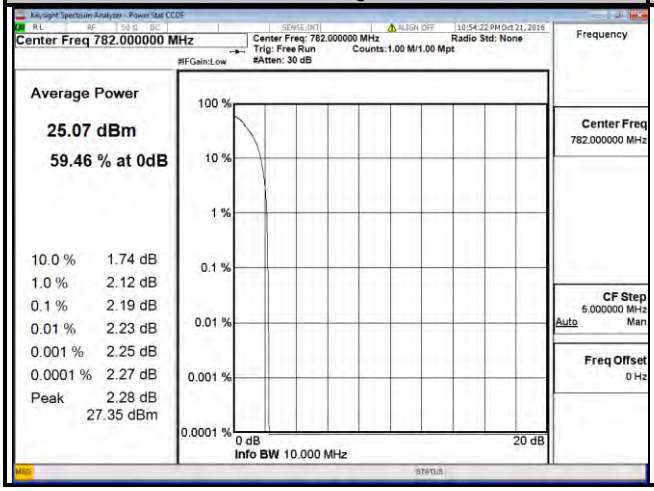
5 MHz / QPSK



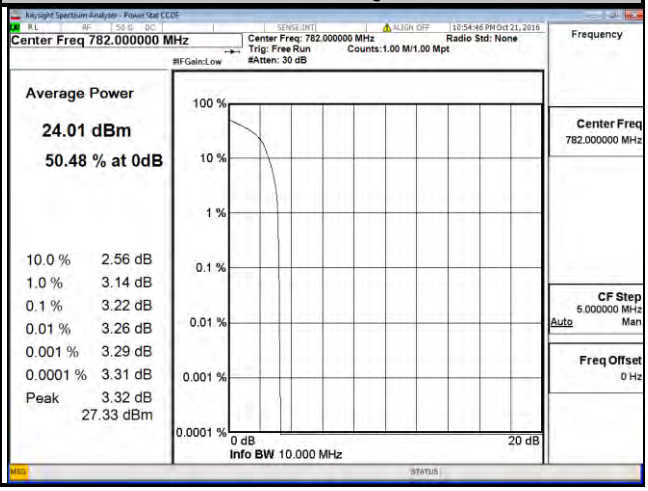
5 MHz / 16QAM



10 MHz / QPSK



10 MHz / 16QAM

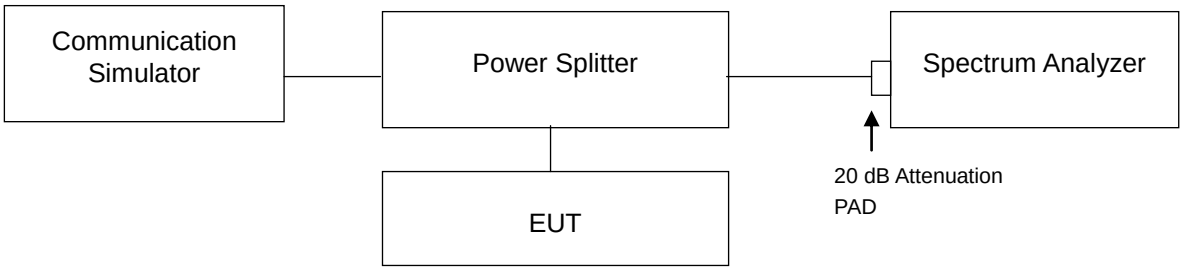


4.6 Conducted Spurious Emissions

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 43 +10 log10(P) dB. The limit of emission is equal to -13 dBm.

4.6.2 Test Setup



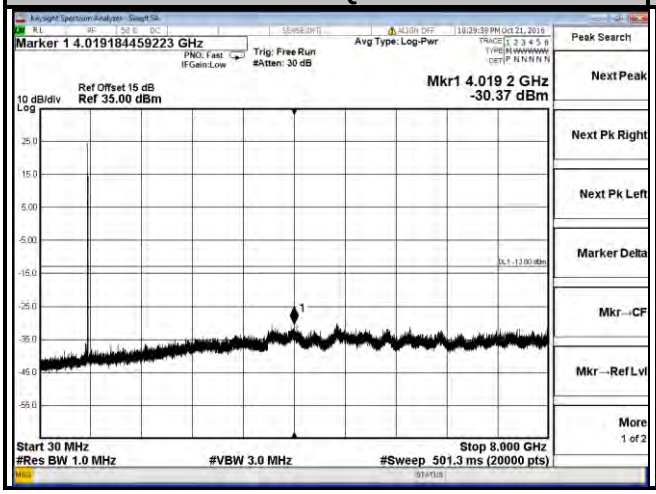
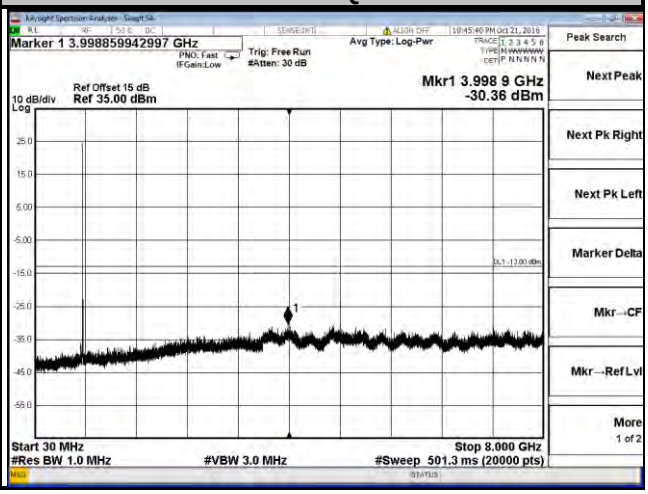
4.6.3 Test Procedure

a. The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.

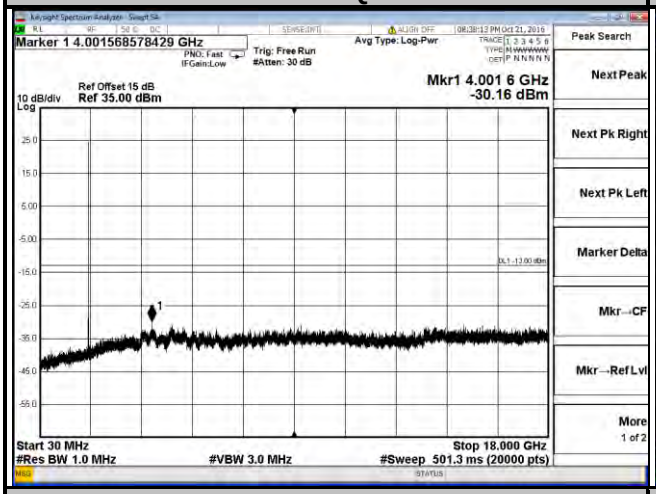
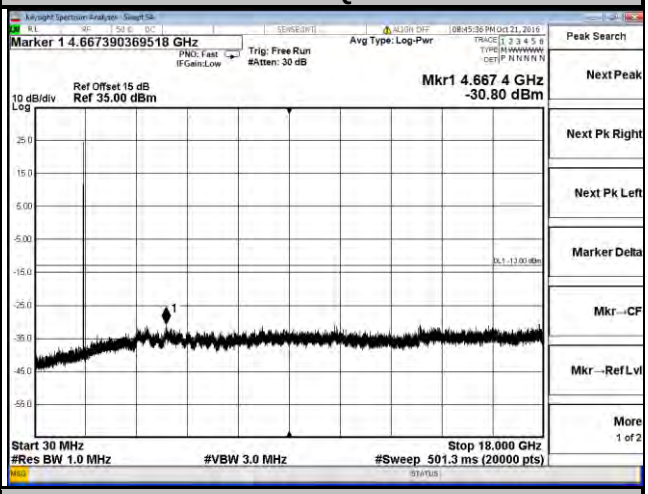
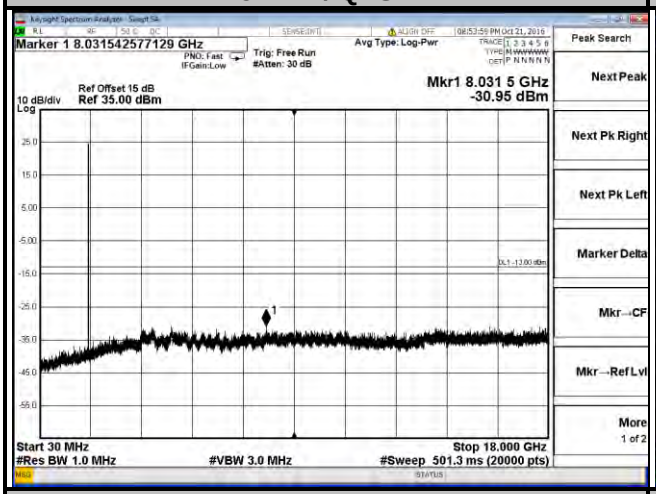
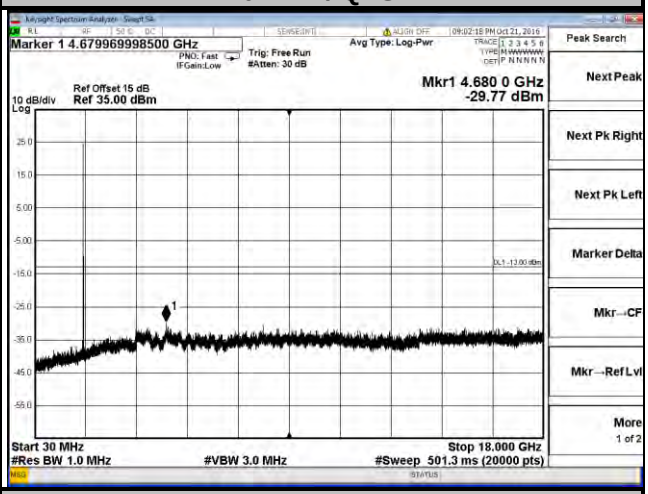
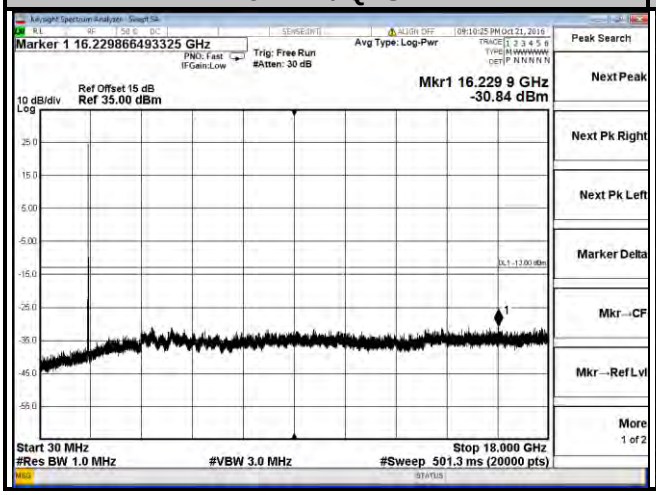
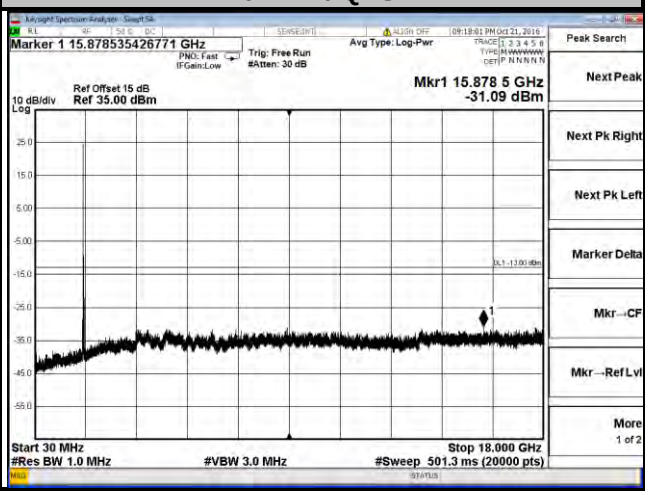
b. Measuring frequency range is from 30 MHz to 18 GHz for LTE Band 4. 10 dB attenuation pad is connected with spectrum. RBW=1 MHz and VBW=3 MHz are used for conducted emission measurement.

4.6.4 Test Results

Frequency Range: 30 MHz ~ 8 GHz

LTE Band 13	
Channel 23230	
5 MHz / QPSK	10 MHz / QPSK
	

Frequency Range: 30 MHz ~ 18 GHz

LTE Band 4	
Channel 20175	
1.4 MHz / QPSK	3 MHz / QPSK
	
5 MHz / QPSK	10 MHz / QPSK
	
15 MHz / QPSK	20 MHz / QPSK
	

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 43 +10 log10(P) dB. The limit of emission is equal to -13 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.

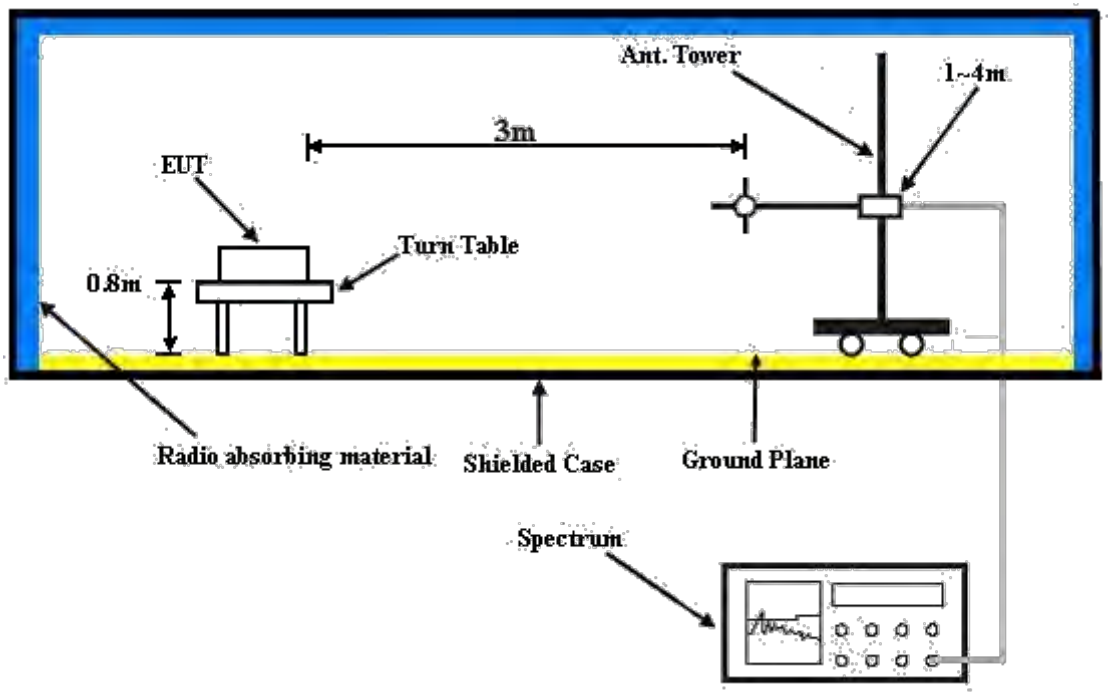
d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15 dBi.

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

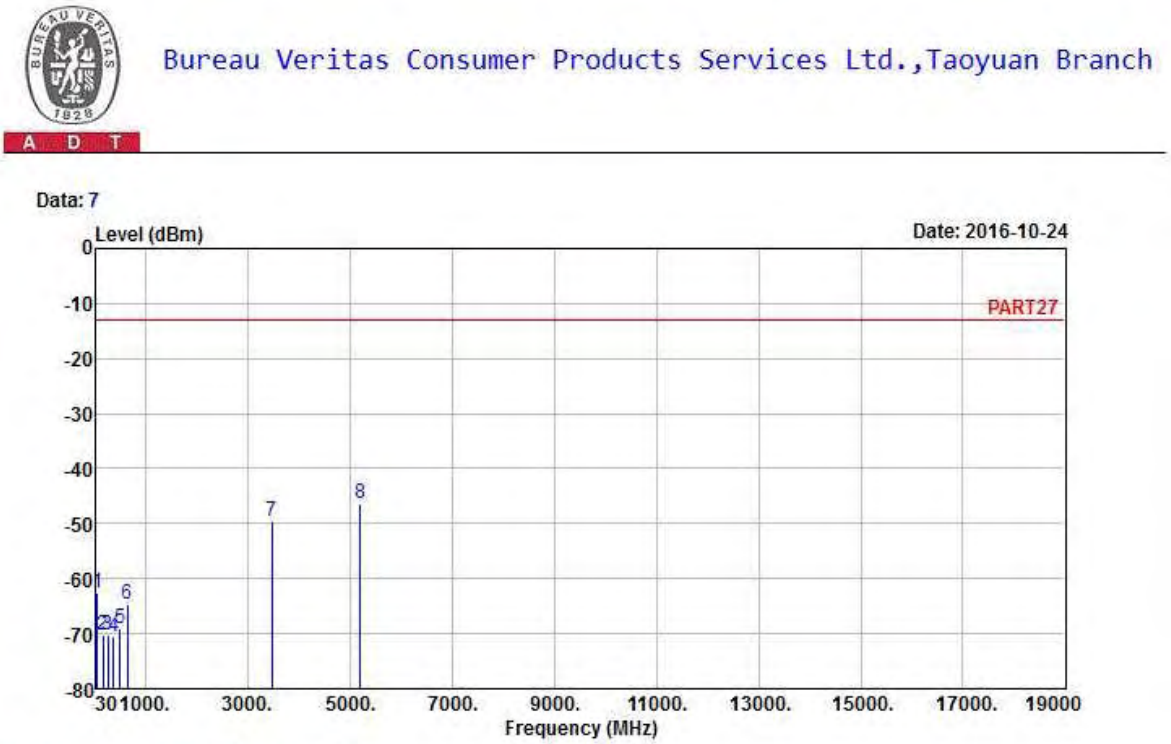


For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.7.5 Test Results

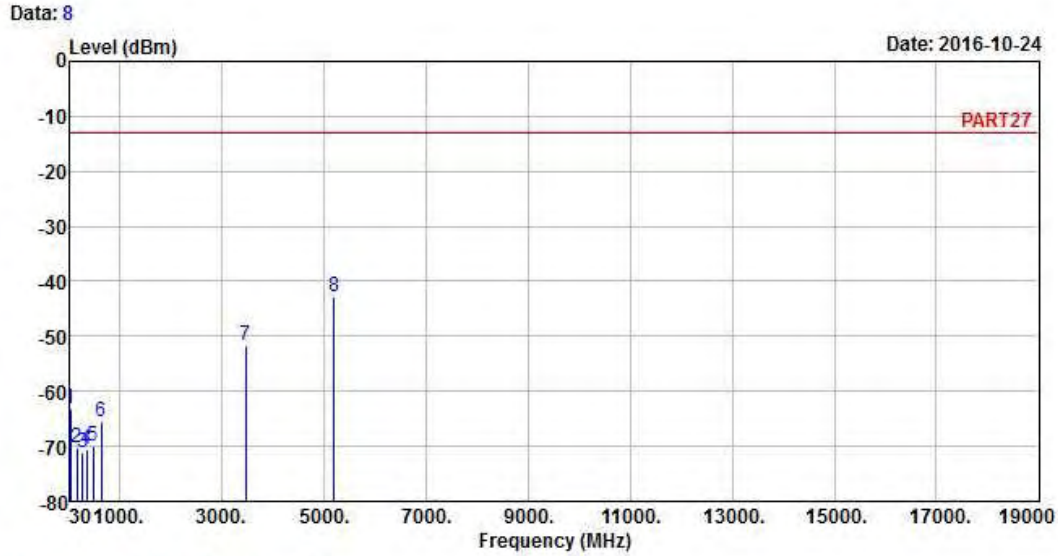
LTE Band 4

Channel Bandwidth: 20 MHz / QPSK



Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remak : LTE Band 4_QPSK_20M Link
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	43.58	-62.69	-61.22	-13.00	-49.69	-1.47	Peak
2	159.01	-70.13	-65.01	-13.00	-57.13	-5.12	Peak
3	256.01	-70.21	-64.10	-13.00	-57.21	-6.11	Peak
4	373.38	-70.52	-64.42	-13.00	-57.52	-6.10	Peak
5	499.48	-69.06	-64.43	-13.00	-56.06	-4.63	Peak
6	633.34	-64.79	-63.95	-13.00	-51.79	-0.84	Peak
7	3465.00	-49.61	-40.70	-13.00	-36.61	-8.91	Peak
8 pp	5197.50	-46.45	-43.59	-13.00	-33.45	-2.86	Peak



Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : LTE Band 4_QPSK_20M Link
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	42.61	-63.19	-62.25	-13.00	-50.19	-0.94	Peak
2	159.01	-70.24	-65.12	-13.00	-57.24	-5.12	Peak
3	266.68	-71.04	-64.71	-13.00	-58.04	-6.33	Peak
4	352.04	-70.63	-64.40	-13.00	-57.63	-6.23	Peak
5	486.87	-69.83	-64.97	-13.00	-56.83	-4.86	Peak
6	633.34	-65.53	-64.69	-13.00	-52.53	-0.84	Peak
7	3465.00	-51.53	-42.62	-13.00	-38.53	-8.91	Peak
8 pp	5197.50	-42.73	-39.87	-13.00	-29.73	-2.86	Peak

LTE Band 13
Channel Bandwidth: 10 MHz / QPSK

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

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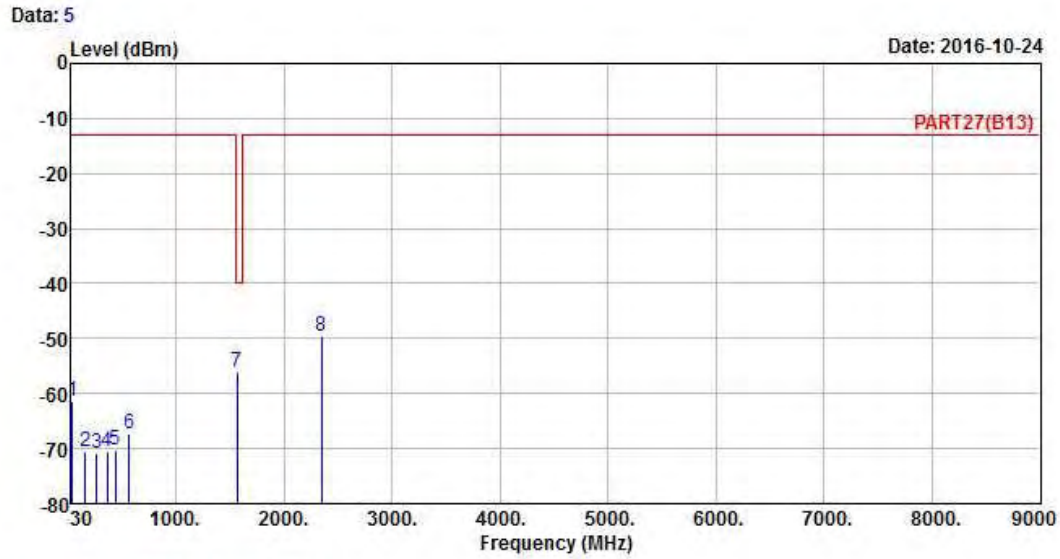
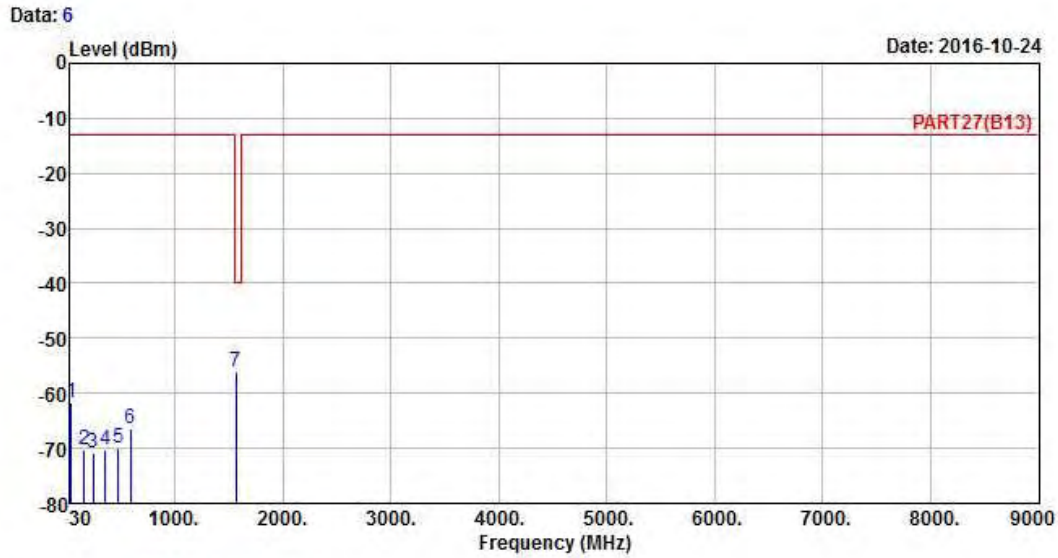


Site : 966 Chamber 5
Condition: PART27(B13) HORIZONTAL
Remak : LTE Band 13_QPSK_10M Link
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	42.61	-61.50	-60.56	-13.00	-48.50	-0.94	Peak
2	161.92	-70.50	-65.52	-13.00	-57.50	-4.98	Peak
3	265.71	-70.94	-64.63	-13.00	-57.94	-6.31	Peak
4	365.62	-70.61	-64.46	-13.00	-57.61	-6.15	Peak
5	439.34	-70.19	-64.56	-13.00	-57.19	-5.63	Peak
6	564.47	-67.32	-65.08	-13.00	-54.32	-2.24	Peak
7 pp	1564.00	-56.06	-41.04	-40.00	-16.06	-15.02	Peak
8	2346.00	-49.71	-39.27	-13.00	-36.71	-10.44	Peak



Site : 966 Chamber 5
Condition: PART27(B13) VERTICAL
Remak : LTE Band 13_QPSK_10M Link
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	42.61	-61.82	-60.88	-13.00	-48.82	-0.94	Peak
2	159.98	-70.13	-65.29	-13.00	-57.13	-4.84	Peak
3	245.34	-70.72	-64.53	-13.00	-57.72	-6.19	Peak
4	353.98	-70.38	-64.16	-13.00	-57.38	-6.22	Peak
5	472.32	-70.10	-64.97	-13.00	-57.10	-5.13	Peak
6	584.84	-66.46	-65.06	-13.00	-53.46	-1.40	Peak
7 pp	1564.00	-56.09	-41.07	-40.00	-16.09	-15.02	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:

Linko EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

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

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