FCC Test Report

(PART 27)

Report No.: RF161020C01-5

FCC ID: MSQZ01HD

Test Model: ASUS_Z01HD

Received Date: Oct. 20, 2016

Test Date: Oct. 28, 2016 ~ Nov. 17, 2016

Issued Date: Nov. 24, 2016

Applicant: ASUSTek COMPUTER INC.

Address: 4F, No. 150, LI-TE Rd., PEITOU, TAIPEI 112, TAIWAN

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 (1): No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

Test Location (2): No.215, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan, R.O.C

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Release Control Record

Issue No.	Description	Date Issued
RF161020C01-5	Original Release	Nov. 24, 2016

1 Certificate of Conformity

Product: ASUS Phone

Brand: ASUS

Test Model: ASUS_Z01HD

Sample Status: Identical Prototype

Applicant: ASUSTek COMPUTER INC.

Test Date: Oct. 28, 2016 ~ Nov. 17, 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 : _____ , **Date:** Nov. 24, 2016

Ivonne Wu / Supervisor

Approved by : _____ , **Date:** Nov. 24, 2016

Stanley Wu / Assistant Manager

2 Summary of Test Results

Applied Standard: FCC Part 27 & Part 2 (WCDMA)			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 27.50(d)(4)	Equivalent Isotropic Radiated 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 -24.18 dB at 6930.40 MHz.

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 -17.61 dB at 6930.00 MHz.

Applied Standard: FCC Part 27 & Part 2 (LTE 17)			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 27.50(C)(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 -24.84 dB at 172.83 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	N9038A	MY52260177	Jun. 21, 2016	Jun. 20, 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 ETS-Lindgren	3117	00143293	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
Fixed Attenuator Mini-Circuits	BW-N10W5+	NA	Jul. 08, 2016	Jul. 07, 2017
Bluetooth Tester	CBT	100980	Apr. 27, 2015	Apr. 26, 2017
Loop Antenna	EM-6879	269	Aug. 11, 2016	Aug. 10, 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	83017A	MY39501357	Jun. 24, 2016	Jun. 23, 2017
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	8D-FB	Cable-CH1-02(RFC-SMS-100-SMS-24)	Jun. 24, 2016	Jun. 23, 2017
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
Communications Tester-Wireless Agilent	8960 Series 10	MY53201073	Jul. 03, 2015	Jul. 02, 2017
Radio Communication Analyzer Anritsu	MT8820C	6201300640	Aug. 10, 2015	Aug. 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	ASUS Phone	
Brand	ASUS	
Test Model	ASUS_Z01HD	
Status of EUT	Identical Prototype	
Power Supply Rating	5.0 Vdc (adapter or host equipment) 3.85 Vdc (Li-ion battery)	
Modulation Type	WCDMA	QPSK, BPSK
	LTE	QPSK, 16QAM
Frequency Range	WCDMA	1712.4 ~ 1752.6 MHz
	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 17 (Channel Bandwidth: 5 MHz)	706.5 ~ 713.5 MHz
	LTE Band 17 (Channel Bandwidth: 10 MHz)	709 ~ 711 MHz
Emission Designator	WCDMA	4M13F9W
	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	1M09W7D
	LTE Band 4 (Channel Bandwidth: 3 MHz)	2M70G7D
	LTE Band 4 (Channel Bandwidth: 5 MHz)	4M49G7D
	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 17 (Channel Bandwidth: 5 MHz)	4M49W7D
	LTE Band 17 (Channel Bandwidth: 10 MHz)	8M99W7D
Max. ERP Power	LTE Band 17 (Channel Bandwidth: 5 MHz)	8.13mW
	LTE Band 17 (Channel Bandwidth: 10 MHz)	8.26mW
Max. EIRP Power	WCDMA	122.66mW
	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	127.35mW
	LTE Band 4 (Channel Bandwidth: 3 MHz)	127.06mW
	LTE Band 4 (Channel Bandwidth: 5 MHz)	129.42mW
	LTE Band 4 (Channel Bandwidth: 10 MHz)	129.57mW
	LTE Band 4 (Channel Bandwidth: 15 MHz)	128.53mW
	LTE Band 4 (Channel Bandwidth: 20 MHz)	129.72mW
Antenna Type	Fixed Internal Antenna	
Accessory Device	Refer to Note as below	
Data Cable Supplied	Refer to Note as below	

Note:

1. Ths EUT configurations are listed as below.

Sample	Description
A	EUT + Front Camera 1
B	EUT + Front Camera 2

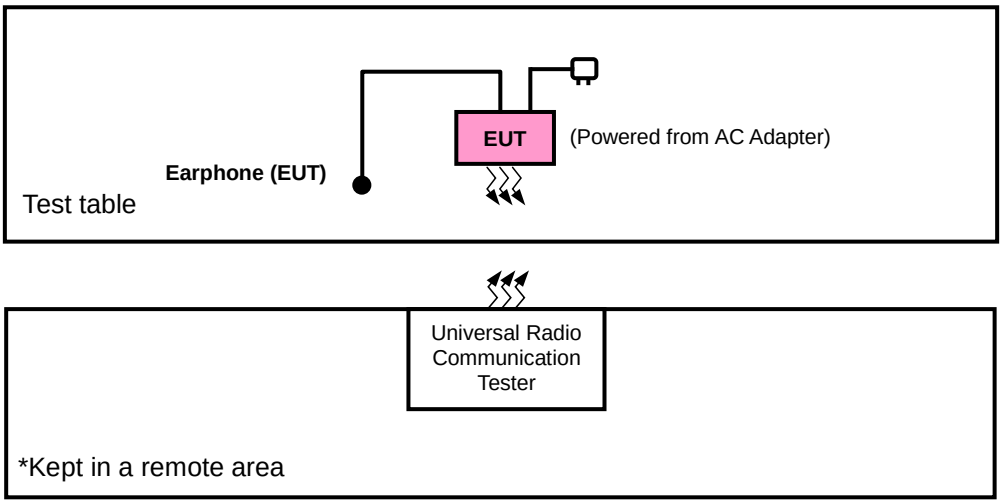
   * Only the worst case data was presented in the report.

   ** After pre-scanned, the EUT was tested together with earphone, USB cable 3, and adapter 2.

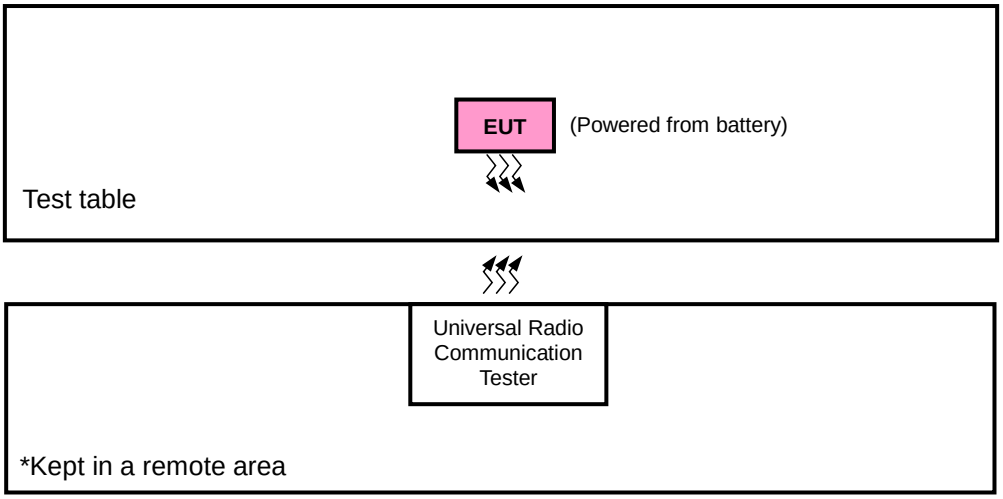
2. After pre-tested EUT with SIM 1 and SIM 2, only the worst case was presented in the report.
3. The EUT's accessories list refers to Ext. Pho.
4. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's 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.

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:

EUT Configure Mode	Description
A	Sample A
B	Sample B

SIM	Band	ERP / EIRP	Radiated Emission
1	**WCDMA**	X-plane	Z-axis
	LTE Band 4	X-plane	Z-axis
	LTE Band 17	X-plane	X-axis

WCDMA

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
A	EIRP	1312 to 1513	1312, 1413, 1513	WCDMA
A	Frequency Stability	1312 to 1513	1413	WCDMA
A	Occupied Bandwidth	1312 to 1513	1312, 1413, 1513	WCDMA
A	Band Edge	1312 to 1513	1312, 1513	WCDMA
A	Peak to Average Ratio	1312 to 1513	1312, 1413, 1513	WCDMA
A	Condcudeted Emission	1312 to 1513	1413	WCDMA
A	Radiated Emission	1312 to 1513	1413	WCDMA

LTE Band 4

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
A	EIRP	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
B	EIRP	20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
A	Frequency Stability	19957 to 20393	20175	1.4 MHz	QPSK	1 RB / 0 RB Offset
		19965 to 20385	20175	3 MHz	QPSK	1 RB / 0 RB Offset
		19975 to 20375	20175	5 MHz	QPSK	1 RB / 0 RB Offset
		20000 to 20350	20175	10 MHz	QPSK	1 RB / 0 RB Offset
		20025 to 20325	20175	15 MHz	QPSK	1 RB / 0 RB Offset
		20050 to 20300	20175	20 MHz	QPSK	1 RB / 0 RB Offset
A	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
A	Peak to Average Ratio	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM	1 RB / 0 RB Offset

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
A	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
A	Conducted Emission	19957 to 20393	20175	1.4 MHz	QPSK	1 RB / 0 RB Offset
		19965 to 20385	20175	3 MHz	QPSK	1 RB / 0 RB Offset
		19975 to 20375	20175	5 MHz	QPSK	1 RB / 0 RB Offset
		20000 to 20350	20175	10 MHz	QPSK	1 RB / 0 RB Offset
		20025 to 20325	20175	15 MHz	QPSK	1 RB / 0 RB Offset
		20050 to 20300	20175	20 MHz	QPSK	1 RB / 0 RB Offset
A, B	Radiated Emission	20050 to 20300	20175	20 MHz	QPSK	1 RB / 0 RB Offset

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

LTE Band 17

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
A	ERP	23755 to 23825	23755, 23790, 23825	5 MHz	QPSK, 16QAM	1 RB / 12 RB Offset
		23780 to 23800	23780, 23790, 23800	10 MHz	QPSK, 16QAM	1 RB / 24 RB Offset
B	ERP	23780 to 23800	23780, 23790, 23800	10 MHz	QPSK, 16QAM	1 RB / 24 RB Offset
A	Frequency Stability	23755 to 23825	23790	5 MHz	QPSK	1 RB / 12 RB Offset
		23780 to 23800	23790	10 MHz	QPSK	1 RB / 24 RB Offset
A	Occupied Bandwidth	23755 to 23825	23755, 23790, 23825	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		23780 to 23800	23780, 23790, 23800	10 MHz	QPSK, 16QAM	50 RB / 0 RB Offset
A	Peak to Average Ratio	23755 to 23825	23755, 23790, 23825	5 MHz	QPSK, 16QAM	1 RB / 12 RB Offset
		23780 to 23800	23780, 23790, 23800	10 MHz	QPSK, 16QAM	1 RB / 24 RB Offset
A	Band Edge	23755 to 23825	23755	5 MHz	QPSK	1 RB / 0 RB Offset
						25 RB / 0 RB Offset
			23825	5 MHz	QPSK	1 RB / 24 RB Offset
						25 RB / 0 RB Offset
		23780 to 23800	23780	10 MHz	QPSK	1 RB / 0 RB Offset
						50 RB / 0 RB Offset
			23800	10 MHz	QPSK	1 RB / 49 RB Offset
						50 RB / 0 RB Offset
A	Conducted Emission	23755 to 23825	23790	5 MHz	QPSK	1 RB / 12 RB Offset
		23780 to 23800	23790	10 MHz	QPSK	1 RB / 24 RB Offset
A, B	Radiated Emission	23780 to 23800	23790	10 MHz	QPSK	1 RB / 24 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	3.85 Vdc	Charles Hsiao
Frequency Stability	25 deg. C, 65 % RH	3.85 Vdc	Carlos Chen
Occupied Bandwidth	25 deg. C, 65 % RH	3.85 Vdc	Carlos Chen
Band Edge	25 deg. C, 65 % RH	3.85 Vdc	Carlos Chen
Peak to Average Ratio	25 deg. C, 65 % RH	3.85 Vdc	Carlos Chen
Condcudeted Emission	25 deg. C, 65 % RH	3.85 Vdc	Carlos Chen
Radiated Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Charles Hsiao & 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

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 704-716 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.

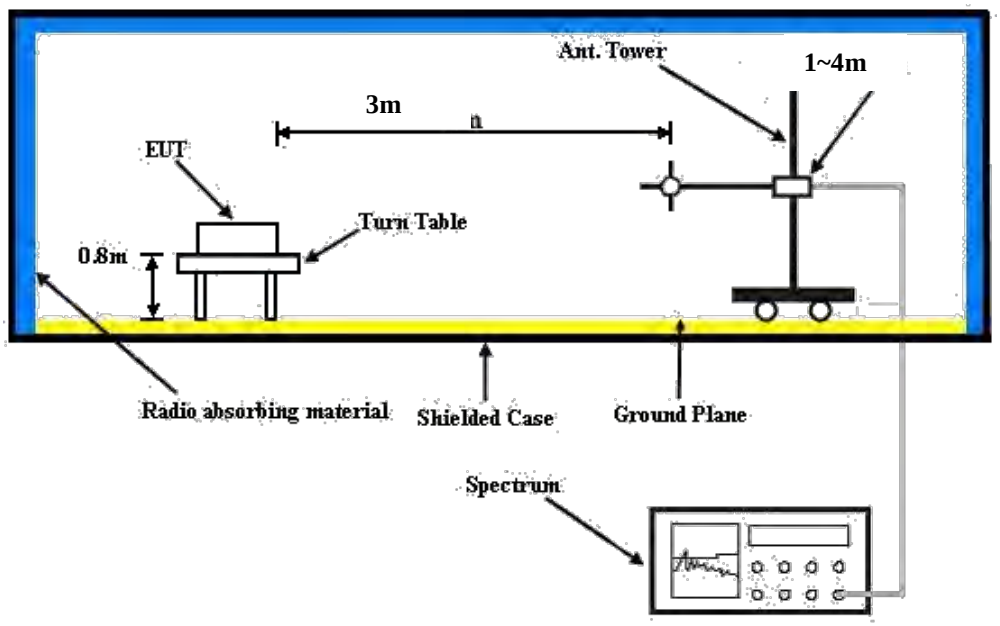
Conducted Power Measurement:

a. The EUT was set up for the maximum power with WCDMA and 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	WCDMA IV		
Channel	1312	1413	1513
Frequency (MHz)	1712.4	1732.6	1752.6
RMC 12.2K	23.30	23.12	23.16
HSDPA Subtest-1	22.44	22.29	22.39
HSDPA Subtest-2	22.42	22.21	22.26
HSDPA Subtest-3	22.04	21.88	21.91
HSDPA Subtest-4	21.96	21.80	21.83
HSUPA Subtest-1	22.52	22.36	22.41
HSUPA Subtest-2	20.56	20.33	20.41
HSUPA Subtest-3	21.51	21.38	21.41
HSUPA Subtest-4	20.63	20.51	20.55
HSUPA Subtest-5	22.65	22.50	22.58

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 19957 1710.7 MHz	Mid Ch 20175 1732.5 MHz	High Ch 20393 1754.3 MHz		Low Ch 19957 1710.7 MHz	Mid Ch 20175 1732.5 MHz	High Ch 20393 1754.3 MHz	
4 / 1.4M	1	0	22.82	23.19	23.29	0	21.80	22.23	22.33	1
	1	2	22.76	23.10	23.25	0	21.75	22.14	22.30	1
	1	5	22.62	23.04	23.19	0	21.66	22.05	22.23	1
	3	0	22.56	22.91	23.04	0	21.47	21.84	22.09	1
	3	1	22.46	22.80	22.95	0	21.42	21.73	21.87	1
	3	3	22.40	22.76	22.86	0	21.36	21.69	21.77	1
	6	0	21.71	21.99	22.10	1	20.53	20.91	21.04	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 19965 1711.5 MHz	Mid Ch 20175 1732.5 MHz	High Ch 20385 1753.5 MHz		Low Ch 19965 1711.5 MHz	Mid Ch 20175 1732.5 MHz	High Ch 20385 1753.5 MHz	
4 / 3M	1	0	22.93	23.23	23.33	0	21.90	22.22	22.37	1
	1	7	22.89	23.21	23.30	0	21.86	22.18	22.31	1
	1	14	22.81	23.15	23.26	0	21.72	22.15	22.27	1
	8	0	21.87	22.14	22.35	1	20.71	21.12	21.26	2
	8	3	21.70	22.02	22.18	1	20.66	21.01	21.15	2
	8	7	21.64	21.98	22.07	1	20.60	20.97	21.03	2
	15	0	21.81	22.11	22.25	1	20.78	21.06	21.21	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	22.98	23.31	23.39	0	21.99	22.33	22.43	1
	1	12	22.94	23.27	23.36	0	21.96	22.28	22.40	1
	1	24	22.89	23.22	23.31	0	21.82	22.23	22.33	1
	12	0	21.98	22.25	22.41	1	20.90	21.22	21.39	2
	12	6	21.86	22.16	22.27	1	20.81	21.07	21.27	2
	12	13	21.80	22.12	22.20	1	20.75	21.05	21.14	2
	25	0	21.90	22.23	22.33	1	20.91	21.18	21.31	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	23.05	23.35	23.44	0	22.05	22.42	22.49	1
	1	24	23.02	23.31	23.40	0	22.02	22.34	22.46	1
	1	49	22.95	23.29	23.38	0	21.89	22.29	22.42	1
	25	0	22.10	22.35	22.46	1	21.06	21.32	21.40	2
	25	12	21.96	22.27	22.37	1	20.93	21.23	21.34	2
	25	25	21.94	22.24	22.33	1	20.89	21.21	21.30	2
	50	0	22.12	22.33	22.40	1	21.02	21.30	21.39	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	23.15	23.42	23.49	0	22.17	22.46	22.54	1
	1	37	23.13	23.39	23.47	0	22.15	22.42	22.51	1
	1	74	23.01	23.37	23.42	0	22.11	22.39	22.46	1
	36	0	22.17	22.48	22.64	1	21.19	21.48	21.61	2
	36	19	22.14	22.41	22.49	1	21.09	21.39	21.52	2
	36	39	22.09	22.38	22.45	1	21.04	21.34	21.41	2
	75	0	22.19	22.46	22.52	1	21.15	21.45	21.53	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	23.22	23.48	23.54	0	22.24	22.52	22.59	1
	1	50	23.20	23.46	23.52	0	22.22	22.50	22.57	1
	1	99	23.15	23.44	23.49	0	22.12	22.46	22.55	1
	50	0	22.34	22.57	22.66	1	21.25	21.56	21.61	2
	50	25	22.28	22.52	22.58	1	21.23	21.49	21.58	2
	50	50	22.24	22.50	22.55	1	21.19	21.46	21.52	2
	100	0	22.30	22.56	22.62	1	21.32	21.54	21.62	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 23755	Mid Ch 23790	High Ch 23825		Low Ch 23755	Mid Ch 23790	High Ch 23825	
			706.5 MHz	710.0 MHz	713.5 MHz		706.5 MHz	710.0 MHz	713.5 MHz	
17 / 5M	1	0	23.79	23.55	23.68	0	22.83	22.58	22.73	1
	1	12	23.96	23.73	23.83	0	22.96	22.78	22.88	1
	1	24	23.90	23.64	23.77	0	22.95	22.67	22.80	1
	12	0	22.84	22.59	22.71	1	21.87	21.55	21.74	2
	12	6	22.87	22.62	22.76	1	21.91	21.61	21.82	2
	12	13	22.81	22.61	22.73	1	21.89	21.57	21.75	2
	25	0	22.73	22.51	22.61	1	21.74	21.48	21.68	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 23780	Mid Ch 23790	High Ch 23800		Low Ch 23780	Mid Ch 23790	High Ch 23800	
			709.0 MHz	710.0 MHz	711.0 MHz		709.0 MHz	710.0 MHz	711.0 MHz	
17 / 10M	1	0	23.85	23.64	23.76	0	22.88	22.66	22.78	1
	1	24	23.99	23.80	23.90	0	22.99	22.83	22.98	1
	1	49	23.97	23.72	23.82	0	22.94	22.74	22.85	1
	25	0	22.93	22.73	22.79	1	21.91	21.68	21.85	2
	25	12	22.97	22.76	22.91	1	21.98	21.73	21.90	2
	25	25	22.93	22.75	22.84	1	21.95	21.71	21.81	2
	50	0	22.85	22.66	22.75	1	21.83	21.61	21.73	2

ERP Power (dBm)

Mode A

LTE Band 17							
Channel Bandwidth: 5 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
X	23755	706.5	-21.53	32.719	9.04	8.01	H
	23790	710.0	-21.56	32.736	9.03	7.99	
	23825	713.5	-21.34	32.591	9.10	8.13	
	23755	706.5	-25.49	32.69	5.05	3.20	V
	23790	710.0	-25.62	32.81	5.04	3.19	
	23825	713.5	-25.48	32.74	5.11	3.24	
Channel Bandwidth: 5 MHz / 16QAM							
X	23755	706.5	-22.48	32.719	8.09	6.44	H
	23790	710.0	-22.54	32.736	8.05	6.38	
	23825	713.5	-22.43	32.591	8.01	6.33	
	23755	706.5	-26.51	32.69	4.03	2.53	V
	23790	710.0	-26.56	32.81	4.10	2.57	
	23825	713.5	-26.54	32.74	4.05	2.54	

LTE Band 17							
Channel Bandwidth: 10 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
X	23780	709.0	-21.55	32.727	9.03	7.99	H
	23790	710.0	-21.59	32.739	9.00	7.94	
	23800	711.0	-21.41	32.728	9.17	8.26	
	23780	709.0	-25.55	32.75	5.05	3.20	V
	23790	710.0	-25.60	32.81	5.06	3.21	
	23800	711.0	-25.64	32.84	5.05	3.20	
Channel Bandwidth: 10 MHz / 16QAM							
X	23780	709.0	-22.54	32.727	8.04	6.36	H
	23790	710.0	-22.43	32.739	8.16	6.54	
	23800	711.0	-22.57	32.728	8.01	6.32	
	23780	709.0	-26.42	32.75	4.18	2.62	V
	23790	710.0	-26.54	32.81	4.12	2.58	
	23800	711.0	-26.59	32.84	4.10	2.57	

Mode B

LTE Band 17							
Channel Bandwidth: 10 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
X	23780	709.0	-21.50	32.727	9.08	8.09	H
	23790	710.0	-21.49	32.739	9.10	8.13	
	23800	711.0	-21.46	32.728	9.12	8.16	
	23780	709.0	-25.60	32.75	5.00	3.16	V
	23790	710.0	-25.61	32.81	5.05	3.20	
	23800	711.0	-25.60	32.84	5.09	3.23	
Channel Bandwidth: 10 MHz / 16QAM							
X	23780	709.0	-22.54	32.727	8.04	6.36	H
	23790	710.0	-22.43	32.739	8.16	6.54	
	23800	711.0	-22.57	32.728	8.01	6.32	
	23780	709.0	-26.42	32.75	4.18	2.62	V
	23790	710.0	-26.54	32.81	4.12	2.58	
	23800	711.0	-26.59	32.84	4.10	2.57	

EIRP Power (dBm)

Mode A

WCDMA							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
X	1312	1712.4	-21.71	42.49	20.78	119.54	H
	1413	1732.6	-21.44	42.33	20.89	122.66	
	1513	1752.6	-21.28	42.10	20.82	120.78	
	1312	1712.4	-30.16	42.99	12.83	19.19	V
	1413	1732.6	-29.96	42.74	12.78	18.97	
	1513	1752.6	-29.36	42.21	12.85	19.28	

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)**
X	19957	1710.7	-21.49	42.49	21.00	125.75	H
	20175	1732.5	-21.29	42.33	21.04	126.97	
	20393	1754.3	-21.05	42.10	21.05	127.35	
	19957	1710.7	-29.80	42.99	13.19	20.84	V
	20175	1732.5	-29.63	42.74	13.11	20.46	
	20393	1754.3	-29.16	42.21	13.05	20.18	
Channel Bandwidth: 1.4 MHz / 16QAM							
X	19957	1710.7	-22.43	42.49	20.06	101.27	H
	20175	1732.5	-22.30	42.33	20.03	100.62	
	20393	1754.3	-22.02	42.10	20.08	101.86	
	19957	1710.7	-29.96	42.99	13.03	20.09	V
	20175	1732.5	-29.64	42.74	13.10	20.42	
	20393	1754.3	-29.14	42.21	13.07	20.28	

LTE Band 4							
Channel Bandwidth: 3 MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	19965	1711.5	-21.46	42.49	21.03	126.62	H
	20175	1732.5	-21.30	42.33	21.03	126.68	
	20385	1753.5	-21.06	42.10	21.04	127.06	
	19965	1711.5	-29.80	42.99	13.19	20.84	V
	20175	1732.5	-29.61	42.74	13.13	20.56	
	20385	1753.5	-29.16	42.21	13.05	20.18	
Channel Bandwidth: 3 MHz / 16QAM							
X	19965	1711.5	-22.40	42.49	20.09	101.98	H
	20175	1732.5	-22.21	42.33	20.12	102.73	
	20385	1753.5	-22.09	42.10	20.01	100.23	
	19965	1711.5	-29.90	42.99	13.09	20.37	V
	20175	1732.5	-29.74	42.74	13.00	19.95	
	20385	1753.5	-29.10	42.21	13.11	20.46	

LTE Band 4							
Channel Bandwidth: 5 MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	19975	1712.5	-21.47	42.49	21.02	126.33	H
	20175	1732.5	-21.26	42.33	21.07	127.85	
	20375	1752.5	-20.98	42.10	21.12	129.42	
	19975	1712.5	-29.90	42.99	13.09	20.37	V
	20175	1732.5	-29.59	42.74	13.15	20.65	
	20375	1752.5	-29.11	42.21	13.10	20.42	
Channel Bandwidth: 5 MHz / 16QAM							
X	19975	1712.5	-22.46	42.49	20.03	100.58	H
	20175	1732.5	-22.27	42.33	20.06	101.32	
	20375	1752.5	-22.06	42.10	20.04	100.93	
	19975	1712.5	-29.90	42.99	13.09	20.37	V
	20175	1732.5	-29.51	42.74	13.23	21.04	
	20375	1752.5	-29.13	42.21	13.08	20.32	

LTE Band 4							
Channel Bandwidth: 10 MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	20000	1715.0	-21.36	42.49	21.13	129.57	H
	20175	1732.5	-21.26	42.33	21.07	127.85	
	20350	1750.0	-21.02	42.10	21.08	128.23	
	20000	1715.0	-29.94	42.99	13.05	20.18	V
	20175	1732.5	-29.62	42.74	13.12	20.51	
	20350	1750.0	-29.03	42.21	13.18	20.80	
Channel Bandwidth: 10 MHz / 16QAM							
X	20000	1715.0	-22.42	42.49	20.07	101.51	H
	20175	1732.5	-22.30	42.33	20.03	100.62	
	20350	1750.0	-22.04	42.10	20.06	101.39	
	20000	1715.0	-29.87	42.99	13.12	20.51	V
	20175	1732.5	-29.63	42.74	13.11	20.46	
	20350	1750.0	-29.14	42.21	13.07	20.28	

LTE Band 4							
Channel Bandwidth: 15 MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	20025	1717.5	-21.40	42.49	21.09	128.38	H
	20175	1732.5	-21.31	42.33	21.02	126.39	
	20325	1747.5	-21.01	42.10	21.09	128.53	
	20025	1717.5	-29.91	42.99	13.08	20.32	V
	20175	1732.5	-29.64	42.74	13.10	20.42	
	20325	1747.5	-29.02	42.21	13.19	20.84	
Channel Bandwidth: 15 MHz / 16QAM							
X	20025	1717.5	-22.46	42.49	20.03	100.58	H
	20175	1732.5	-22.30	42.33	20.03	100.62	
	20325	1747.5	-22.03	42.10	20.07	101.62	
	20025	1717.5	-29.89	42.99	13.10	20.42	V
	20175	1732.5	-29.58	42.74	13.16	20.70	
	20325	1747.5	-29.20	42.21	13.01	20.00	

LTE Band 4							
Channel Bandwidth: 20 MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	20050	1720.0	-21.46	42.49	21.03	126.62	H
	20175	1732.5	-21.22	42.33	21.11	129.03	
	20300	1745.0	-20.97	42.10	21.13	129.72	
	20050	1720.0	-29.88	42.99	13.11	20.46	V
	20175	1732.5	-29.71	42.74	13.03	20.09	
	20300	1745.0	-29.20	42.21	13.01	20.00	
Channel Bandwidth: 20 MHz / 16QAM							
X	20050	1720.0	-22.45	42.49	20.04	100.81	H
	20175	1732.5	-22.21	42.33	20.12	102.73	
	20300	1745.0	-22.06	42.10	20.04	100.93	
	20050	1720.0	-29.90	42.99	13.09	20.37	V
	20175	1732.5	-29.71	42.74	13.03	20.09	
	20300	1745.0	-29.16	42.21	13.05	20.18	

Mode B

LTE Band 4							
Channel Bandwidth: 20 MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	20050	1720.0	-21.43	42.49	21.06	127.50	H
	20175	1732.5	-21.26	42.33	21.07	127.85	
	20300	1745.0	-20.98	42.10	21.12	129.42	
	20050	1720.0	-29.90	42.99	13.09	20.37	V
	20175	1732.5	-29.63	42.74	13.11	20.46	
	20300	1745.0	-29.14	42.21	13.07	20.28	
Channel Bandwidth: 20 MHz / 16QAM							
X	20050	1720.0	-22.46	42.49	20.03	100.58	H
	20175	1732.5	-22.23	42.33	20.10	102.26	
	20300	1745.0	-22.03	42.10	20.07	101.62	
	20050	1720.0	-29.88	42.99	13.11	20.46	V
	20175	1732.5	-29.73	42.74	13.01	20.00	
	20300	1745.0	-29.06	42.21	13.15	20.65	

4.2 Frequency Stability Measurement

4.2.1 Limits of Frequency Stabiliity Measurement

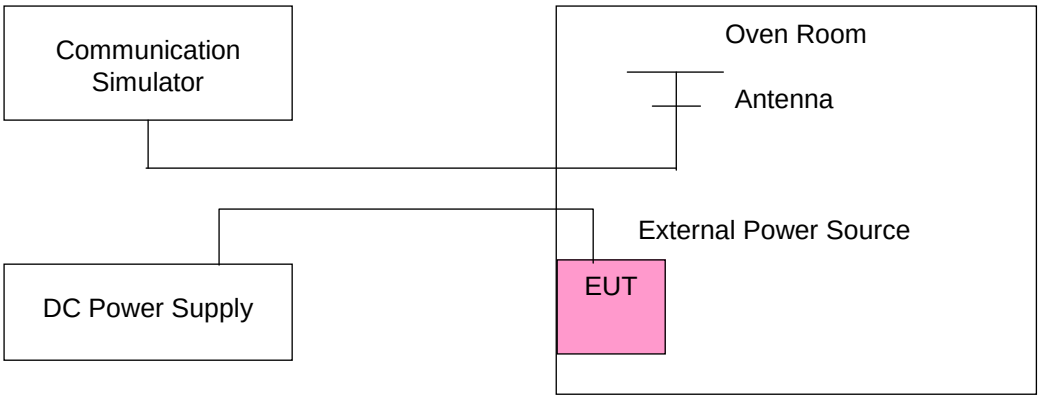
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

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)
	WCDMA	LTE Band 4						LTE Band 17		
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	5 MHz	10 MHz	
3.85	0.0013	0.0014	0.0016	0.0021	0.0021	0.0023	0.0023	0.0038	0.0048	2.5
3.6	0.0010	0.0009	0.0012	0.0018	0.0017	0.0021	0.0009	0.0020	0.0042	2.5
4.2	0.0017	0.0007	0.0008	0.0015	0.0012	0.0013	0.0014	0.0048	0.0041	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.6 Vdc to 4.2 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	Frequency Error (ppm)									Limit (ppm)
	WCDMA	LTE Band 4						LTE Band 17		
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	5 MHz	10 MHz	
-30	0.0013	0.0009	0.0021	0.0019	0.0009	0.0013	0.0017	0.0045	0.0055	2.5
-20	0.0015	0.0023	0.0014	0.0020	0.0015	0.0017	0.0010	0.0014	0.0018	2.5
-10	0.0007	0.0020	0.0023	0.0014	0.0017	0.0012	0.0020	0.0025	0.0023	2.5
0	0.0002	0.0017	0.0021	0.0020	0.0010	0.0006	0.0017	0.0014	0.0023	2.5
10	0.0003	0.0018	0.0020	0.0017	0.0011	0.0019	0.0010	0.0046	0.0014	2.5
20	-0.0020	-0.0009	-0.0010	-0.0016	-0.0020	-0.0023	-0.0013	-0.0045	-0.0042	2.5
30	-0.0019	-0.0008	-0.0018	-0.0009	-0.0010	-0.0009	-0.0016	-0.0027	-0.0051	2.5
40	-0.0014	-0.0007	-0.0019	-0.0013	-0.0009	-0.0009	-0.0019	-0.0028	-0.0044	2.5
50	-0.0013	-0.0020	-0.0013	-0.0006	-0.0016	-0.0023	-0.0022	-0.0018	-0.0039	2.5
55	-0.0023	-0.0013	-0.0006	-0.0017	-0.0006	-0.0008	-0.0023	-0.0055	-0.0025	2.5

4.3 Occupied Bandwidth Measurement

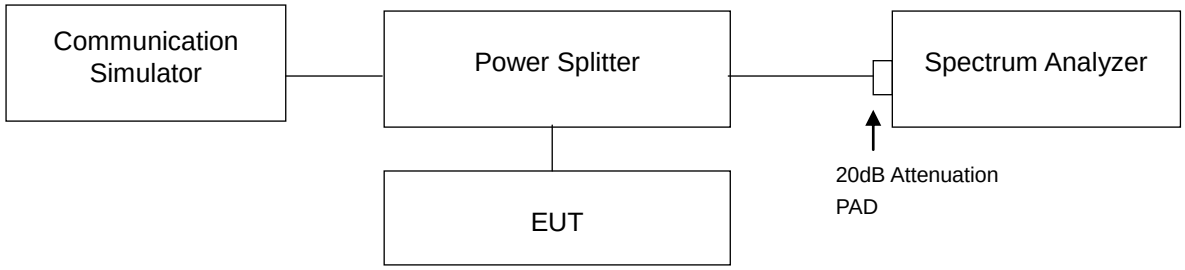
4.3.1 Limits of Occupied Bandwidth Measurement

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.

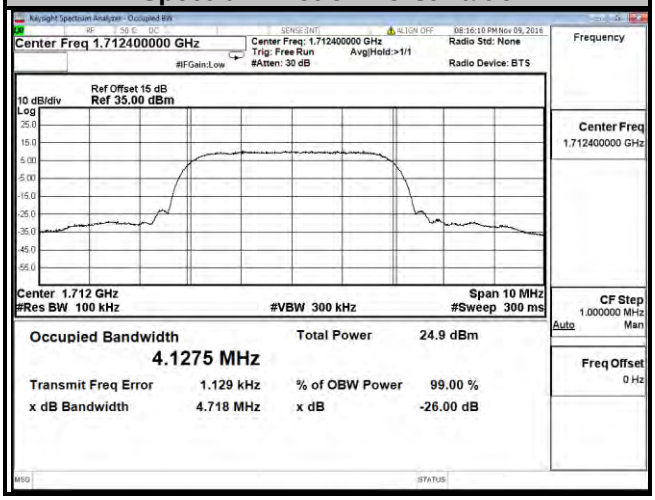
4.3.3 Test Setup



4.3.4 Test Result

WCDMA		
Channel	**Frequency (MHz)**	**99 % Occupied Bandwidth (MHz)**
1312	1712.4	4.1275
1413	1732.6	4.1239
1513	1752.6	4.1242

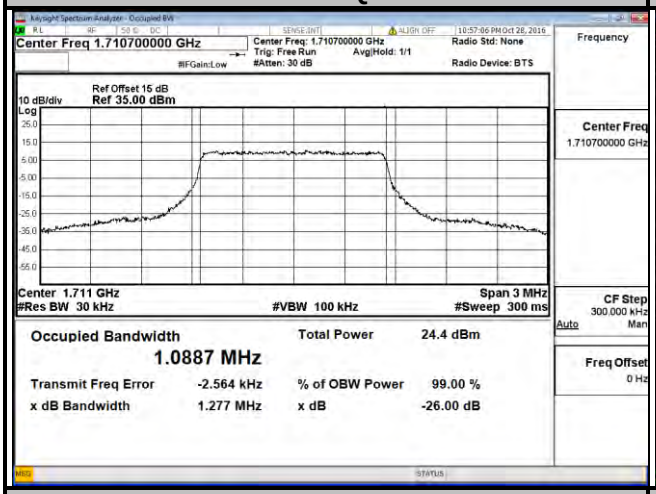
Spectrum Plot of Worst Value



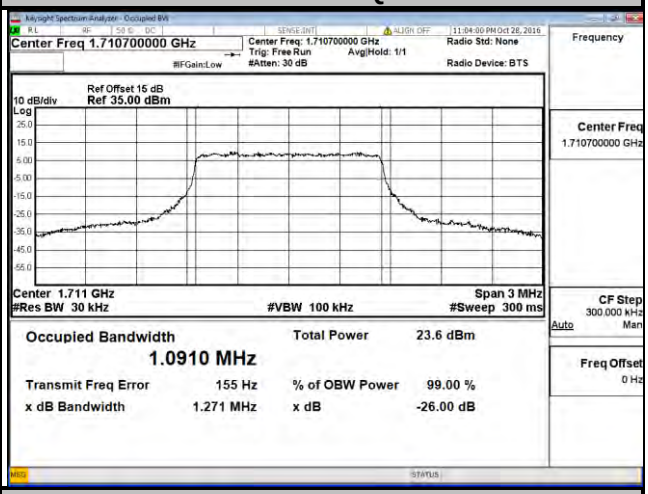
LTE Band 4							
Channel Bandwidth: 1.4 MHz				Channel Bandwidth: 3 MHz			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
19957	1710.7	1.0887	1.0910	19965	1711.5	2.7001	2.6957
20175	1732.5	1.0870	1.0889	20175	1732.5	2.7001	2.6969
20393	1754.3	1.0878	1.0908	20385	1753.5	2.7012	2.6968

Spectrum Plot of Worst Value

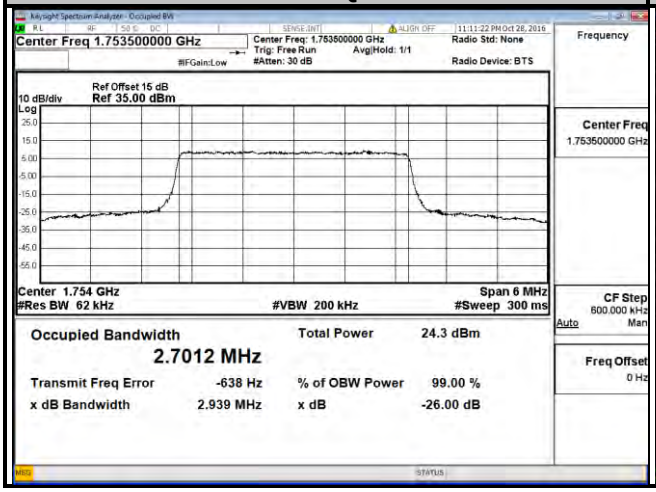
1.4 MHz / QPSK



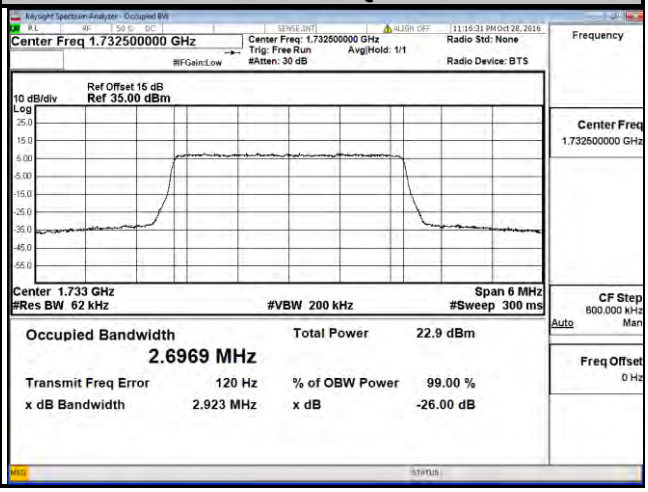
1.4 MHz / 16QAM



3 MHz / QPSK



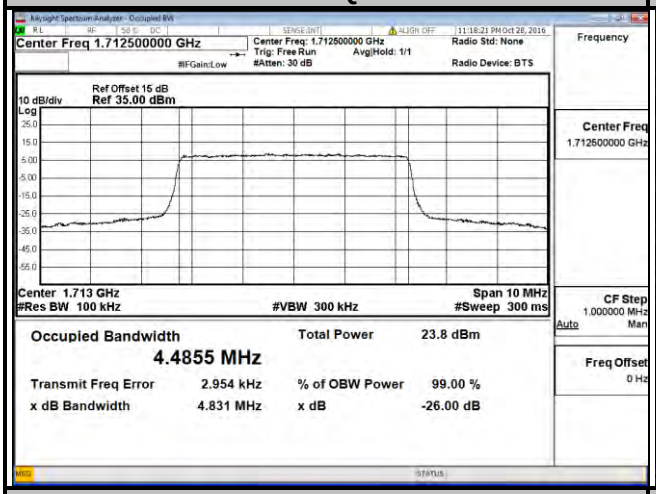
3 MHz / 16QAM



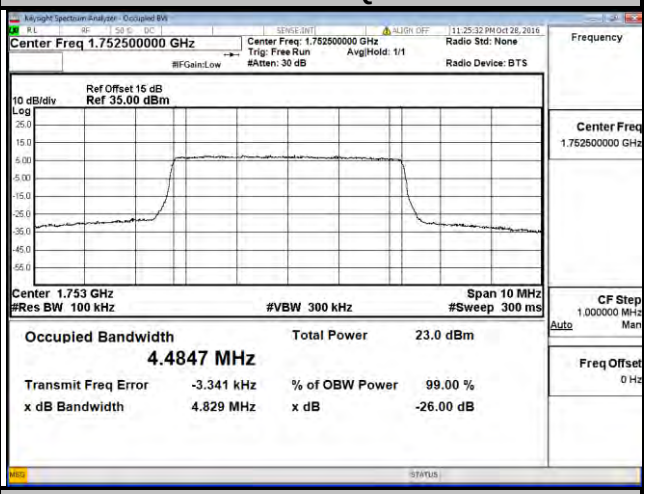
LTE Band 4							
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
19975	1712.5	4.4855	4.4845	20000	1715.0	8.9477	8.9462
20175	1732.5	4.4833	4.4835	20175	1732.5	8.9561	8.9576
20375	1752.5	4.4852	4.4847	20350	1750.0	8.9445	8.9480

Spectrum Plot of Worst Value

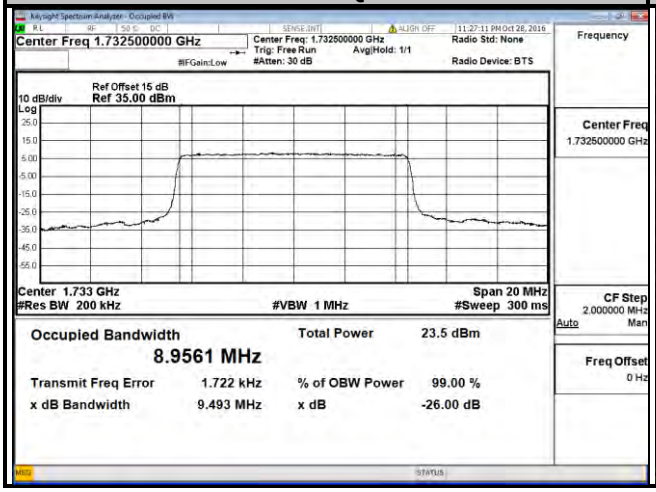
5 MHz / QPSK



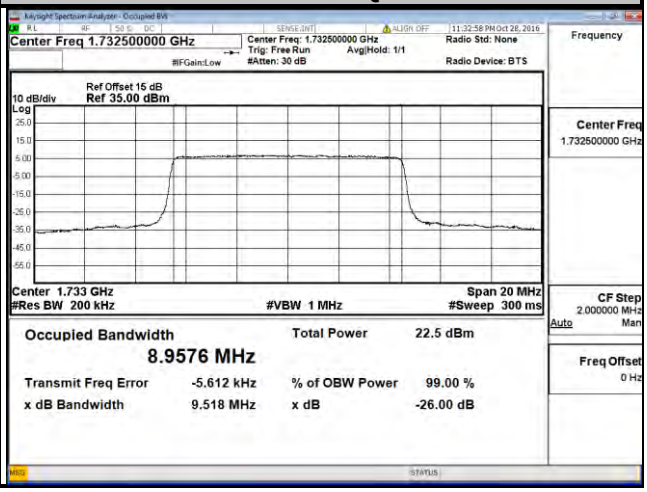
5 MHz / 16QAM



10 MHz / QPSK



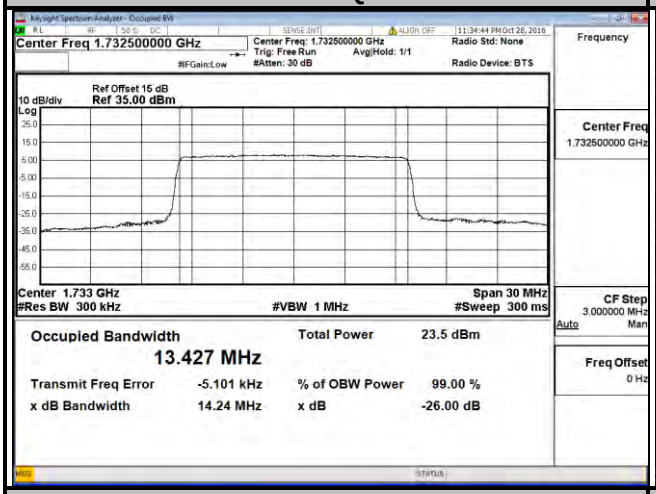
10 MHz / 16QAM



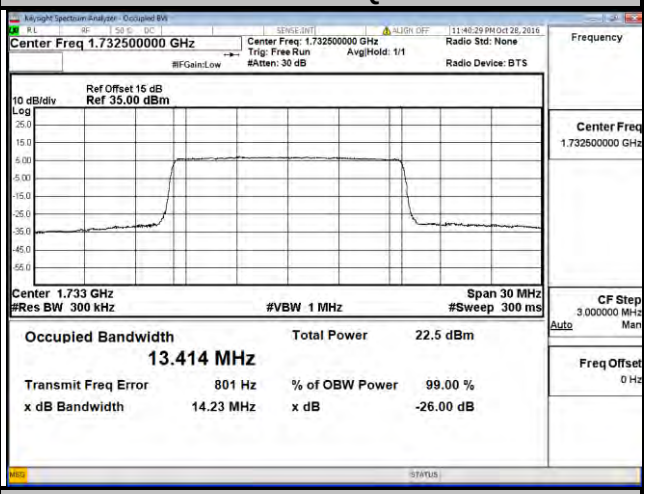
LTE Band 4							
Channel Bandwidth: 15 MHz				Channel Bandwidth: 20 MHz			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
20025	1717.5	13.412	13.396	20050	1720.0	17.873	17.896
20175	1732.5	13.427	13.414	20175	1732.5	17.902	17.924
20325	1747.5	13.400	13.389	20300	1745.0	17.858	17.884

Spectrum Plot of Worst Value

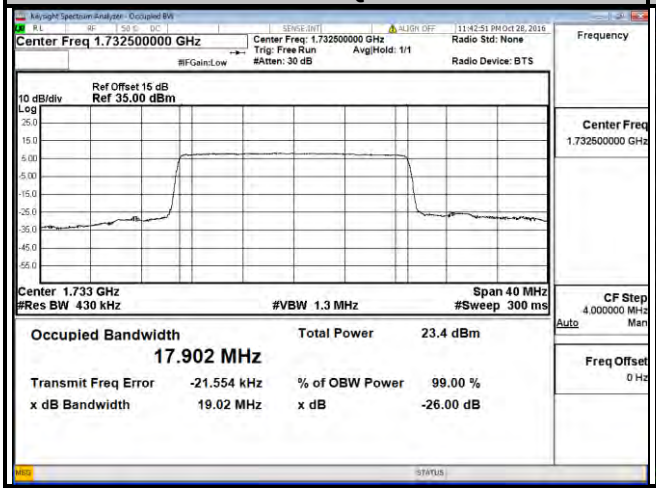
15 MHz / QPSK



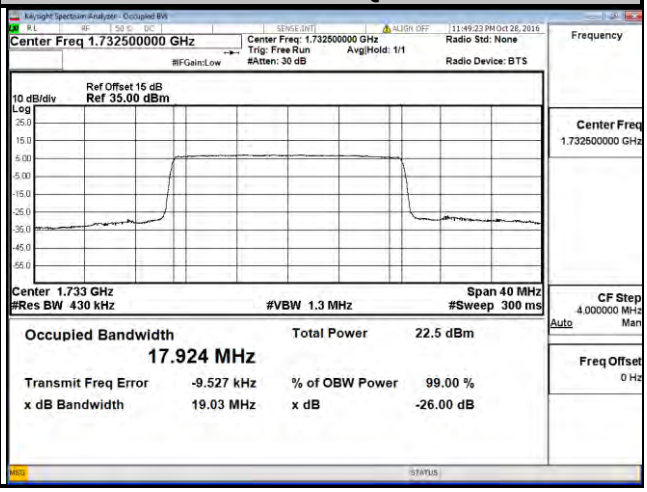
15 MHz / 16QAM



20 MHz / QPSK



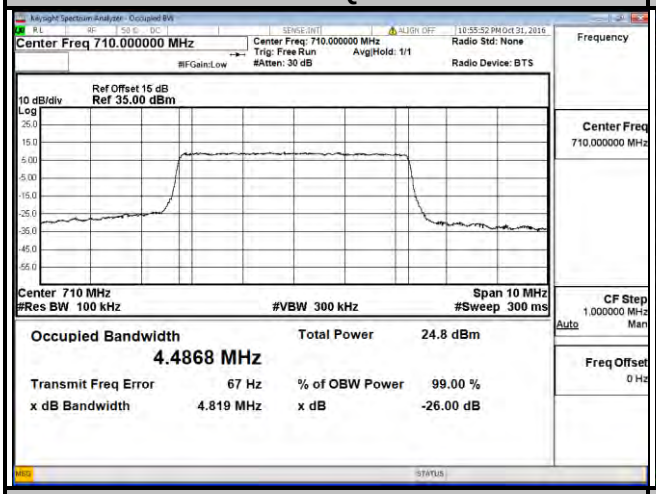
20 MHz / 16QAM



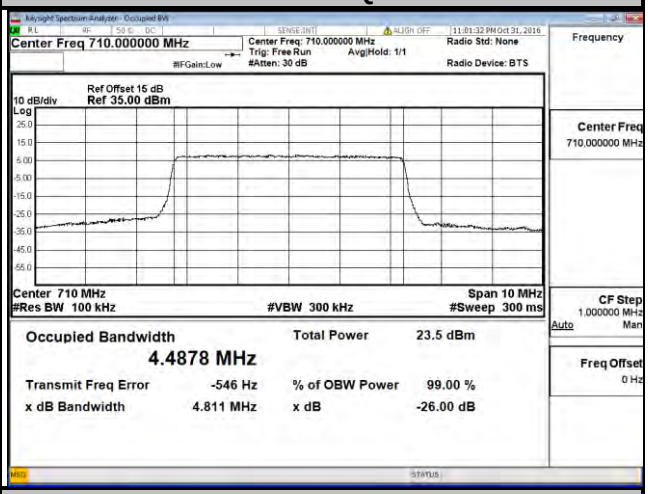
LTE Band 17							
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
23755	706.5	4.4816	4.4797	23780	709.0	8.9672	8.9680
23790	710.0	4.4868	4.4878	23790	710.0	8.9771	8.9781
23825	713.5	4.4845	4.4875	23800	711.0	8.9819	8.9882

Spectrum Plot of Worst Value

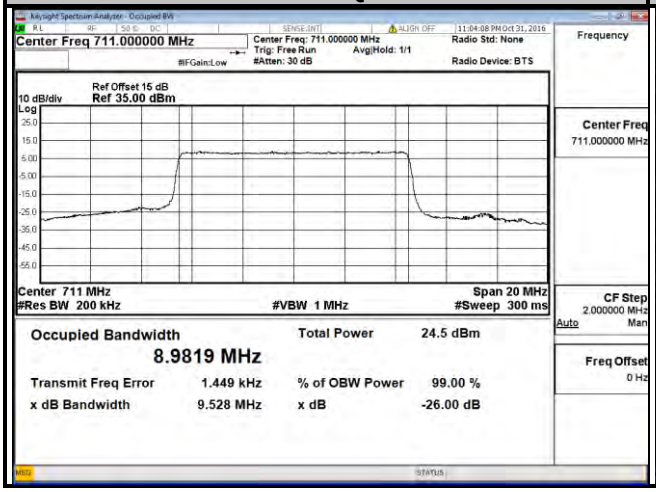
5 MHz / QPSK



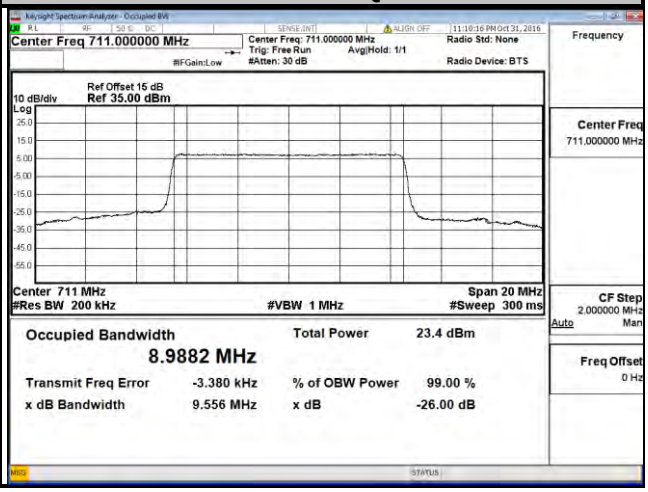
5 MHz / 16QAM



10 MHz / QPSK



10 MHz / 16QAM



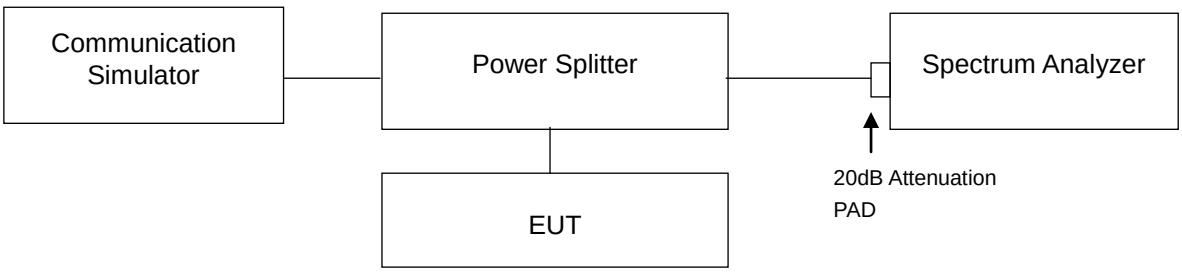
4.4 Band Edge Measurement

4.4.1 Limits of Band Edge Measurement

For operations in the 704-716 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

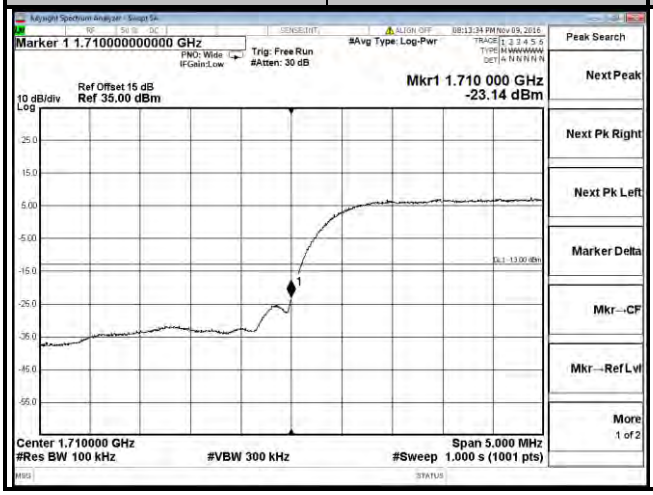


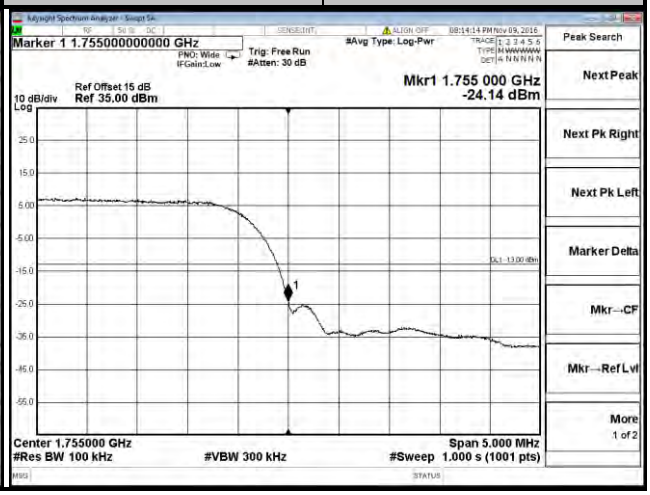
4.4.3 Test Procedures

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 5 MHz. RB of the spectrum is 100 kHz and VB of the spectrum is 300 kHz (WCDMA).
c. 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).
d. 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).
e. 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).
f. 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).
g. 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).
h. Record the max trace plot into the test report.

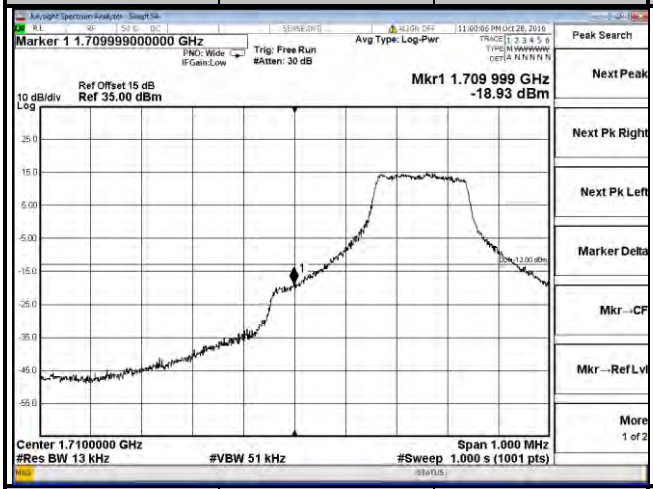
4.4.4 Test Results

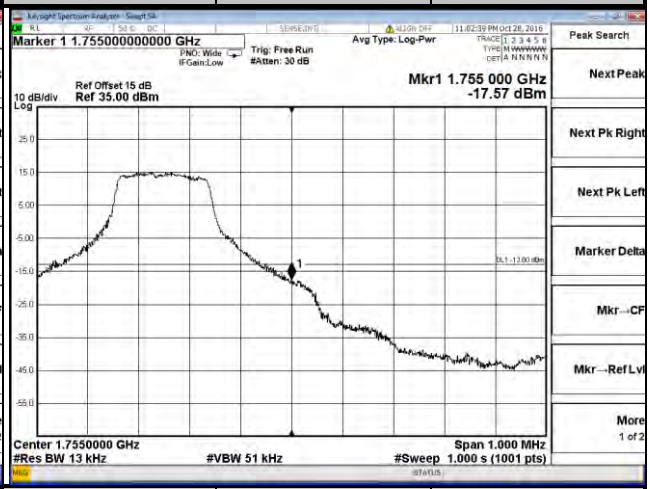
WCDMA			
Channel	1312	Channel	1513



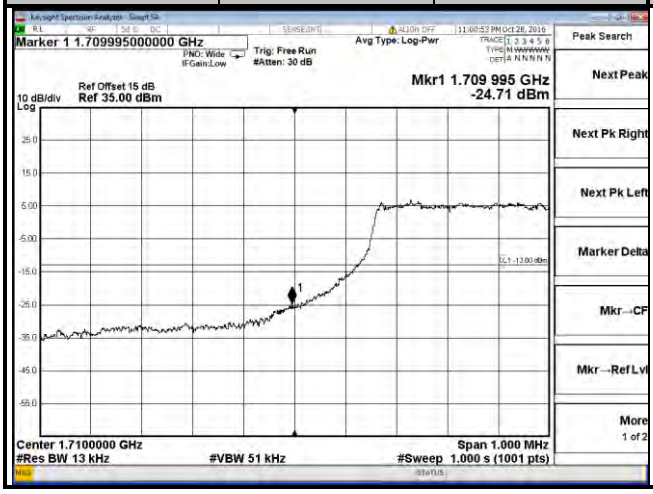


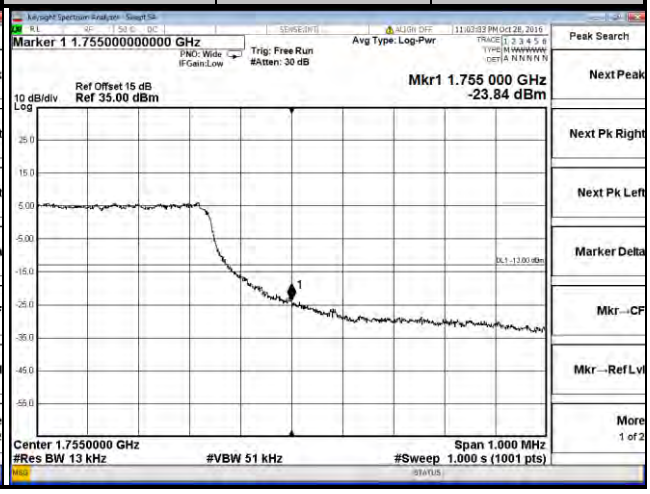
LTE Band 4					
Channel Bandwidth: 1.4 MHz					
Channel	19957	6 RB	Channel	20393	6 RB

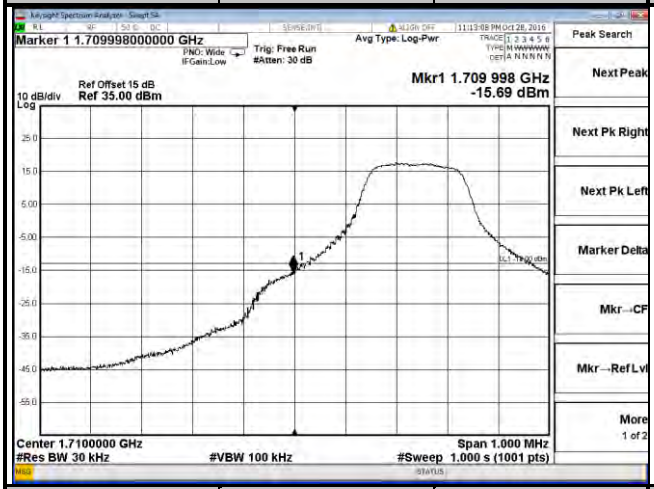
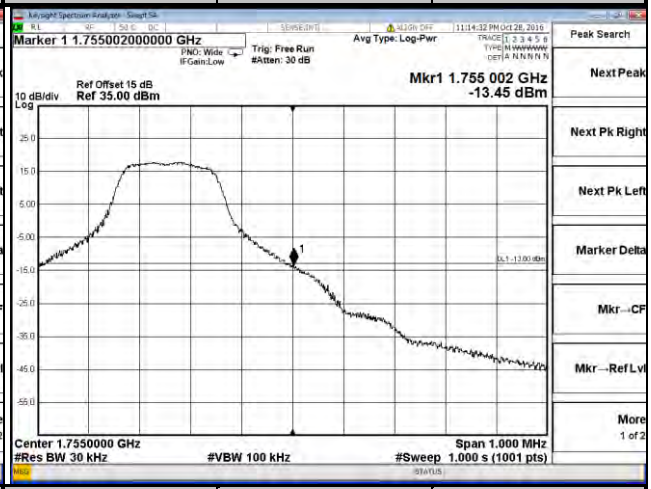
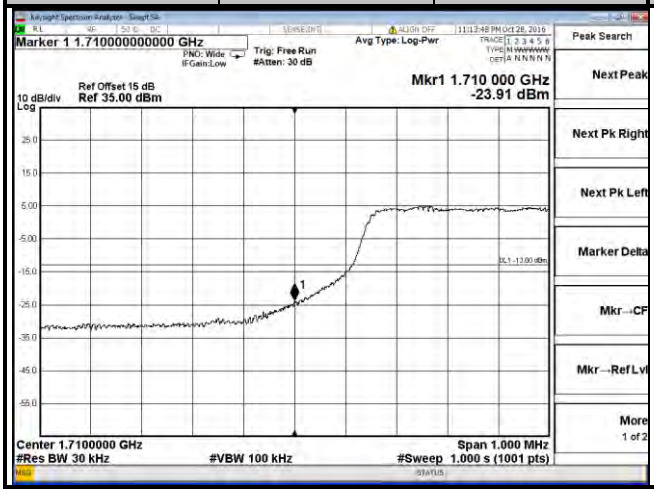
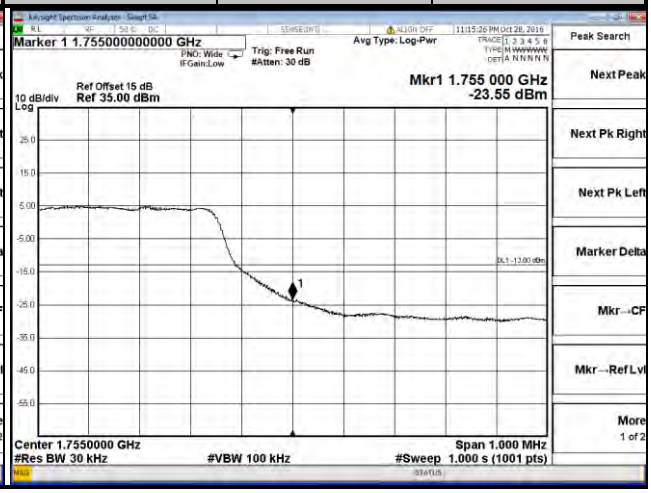


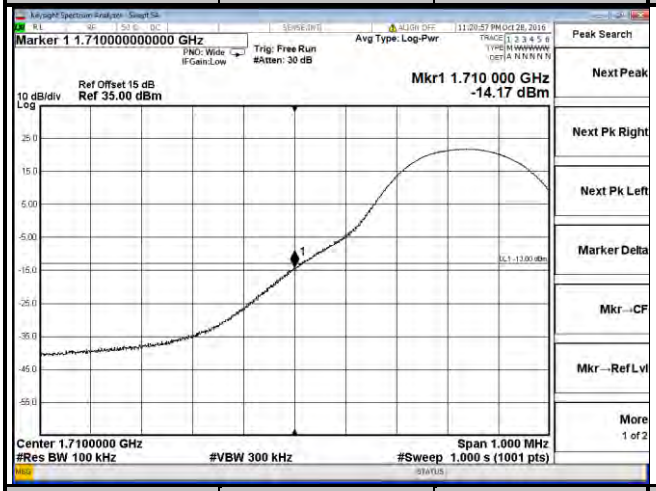
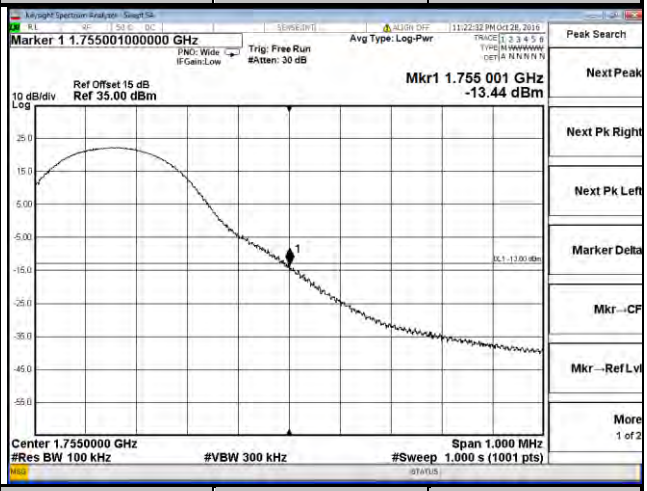
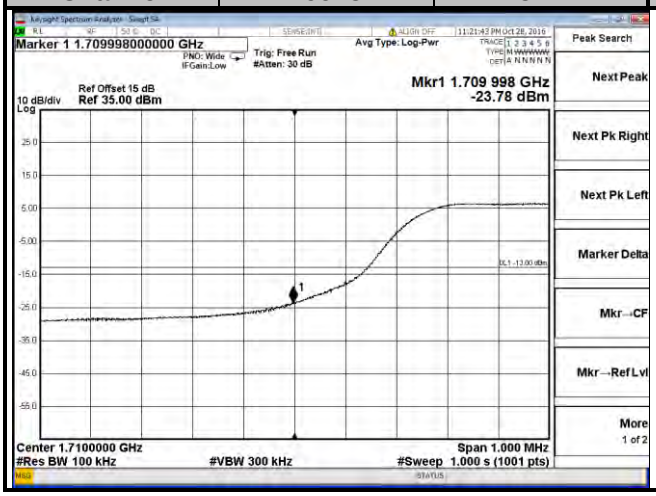
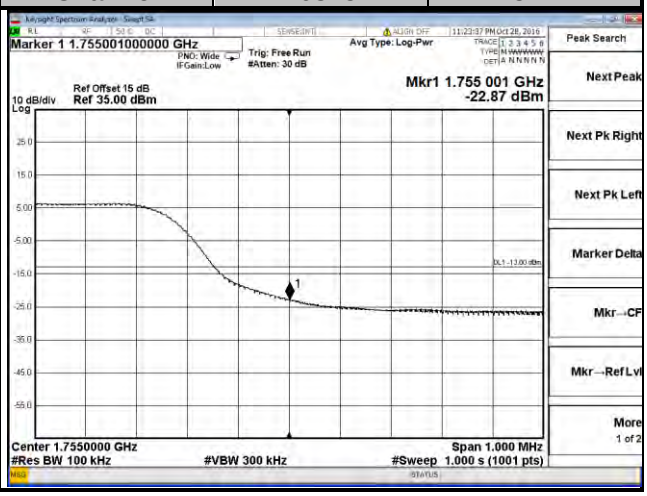


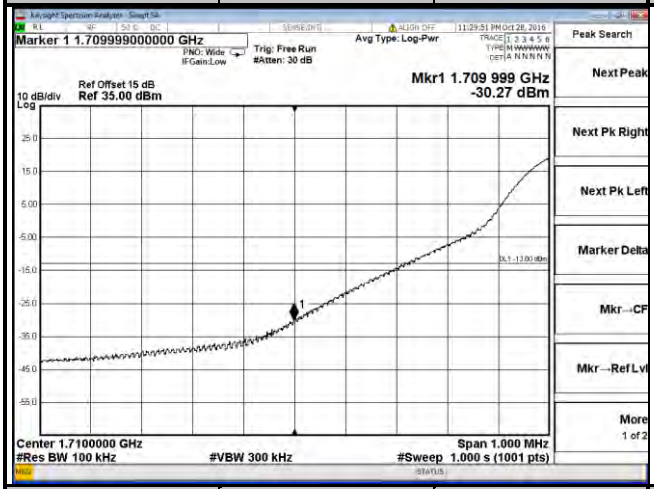
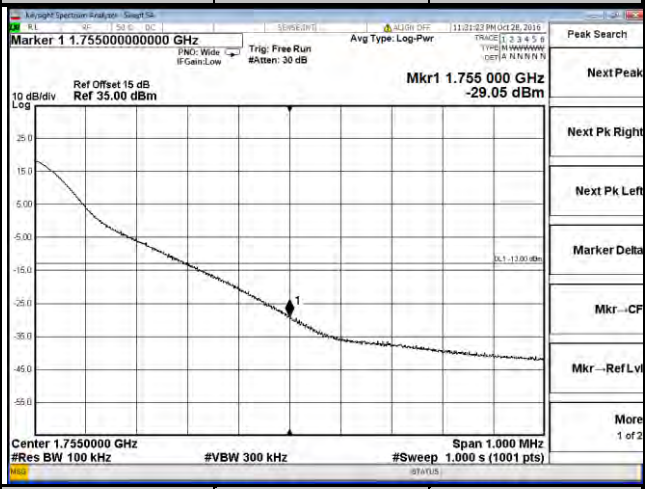
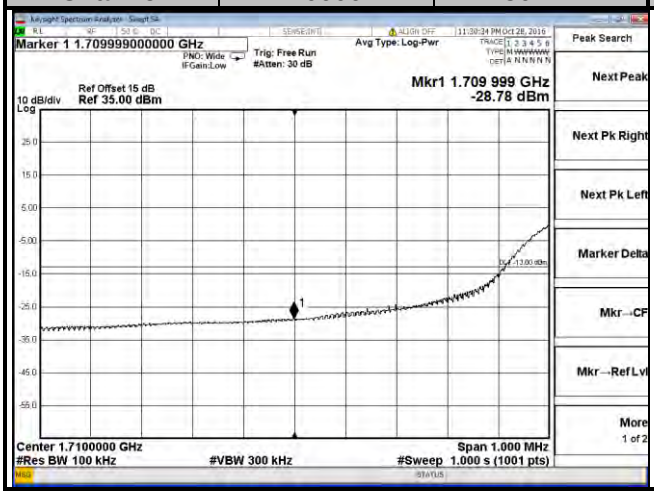
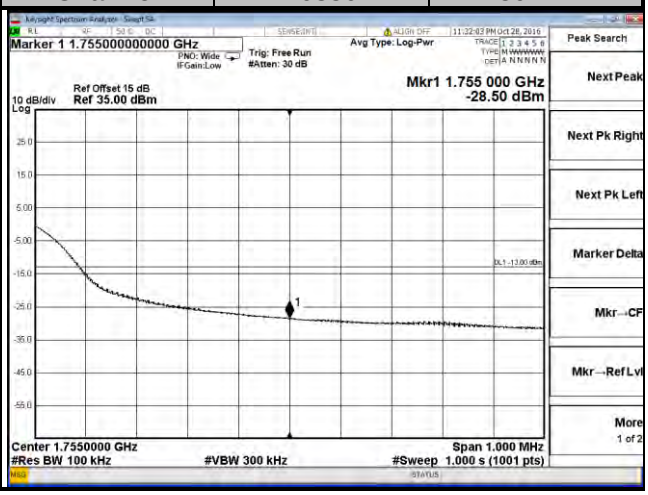
Channel	19957	25 RB	Channel	20393	25 RB

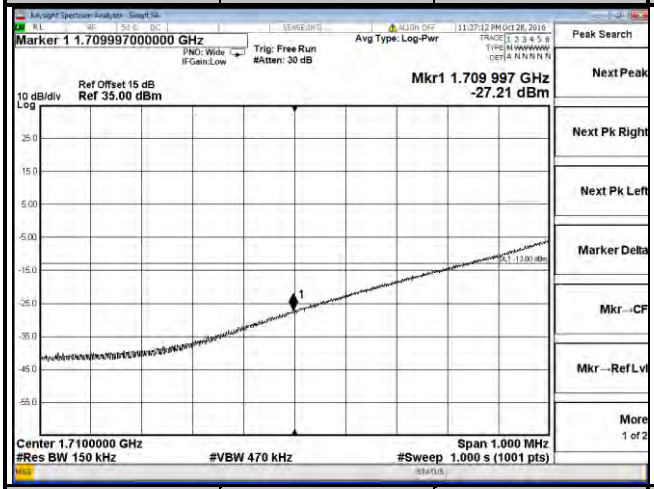
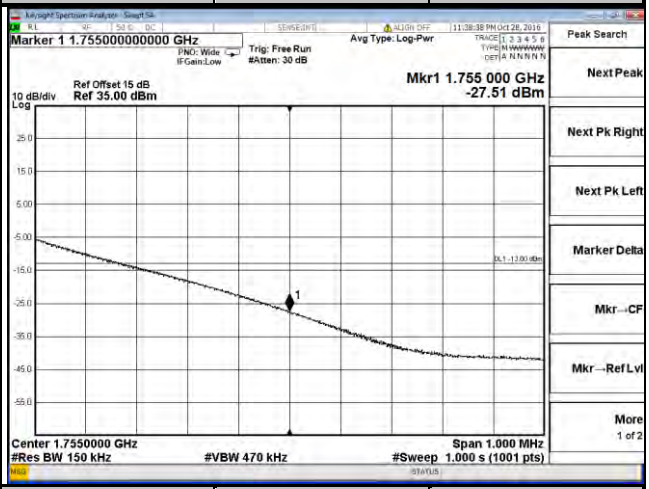
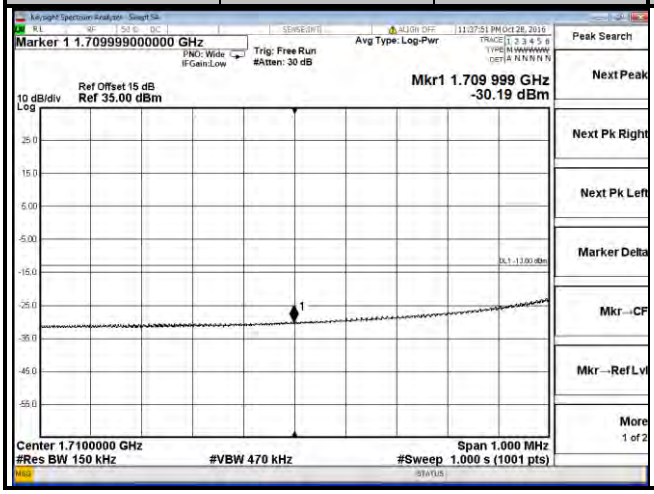
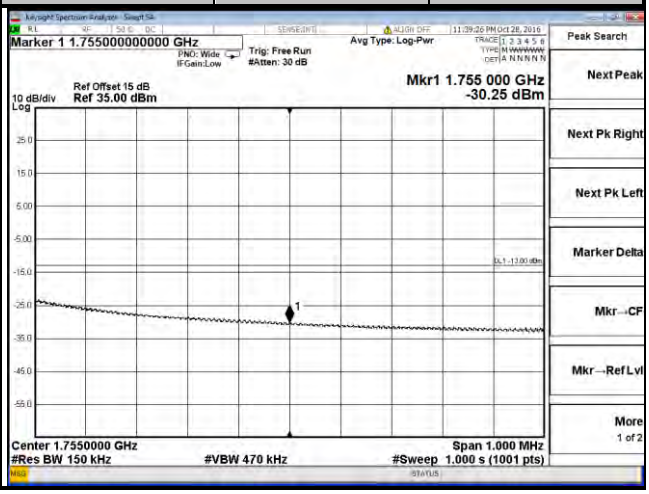


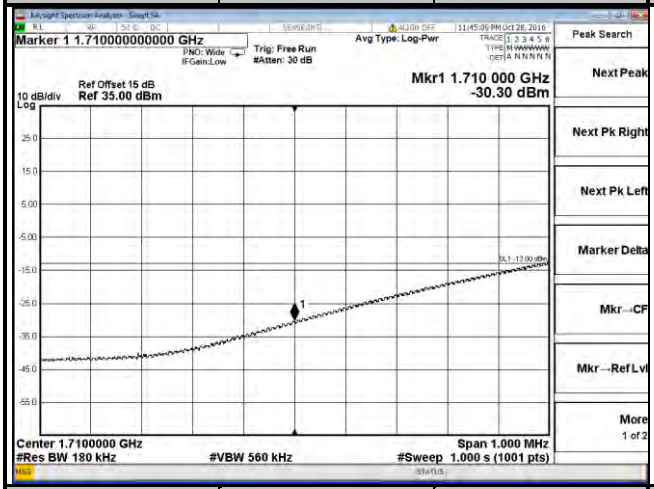
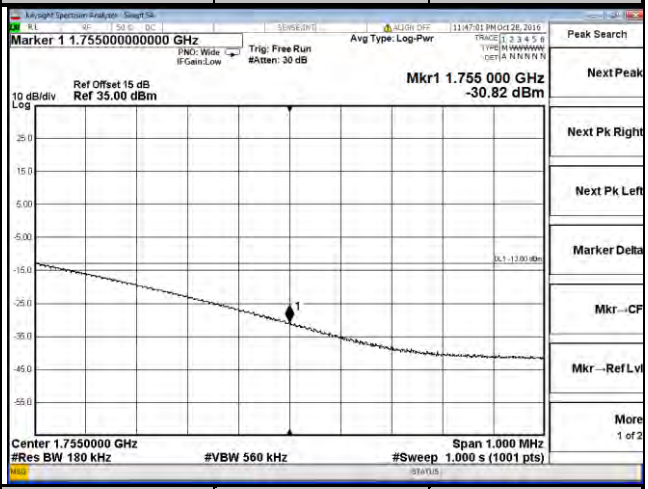
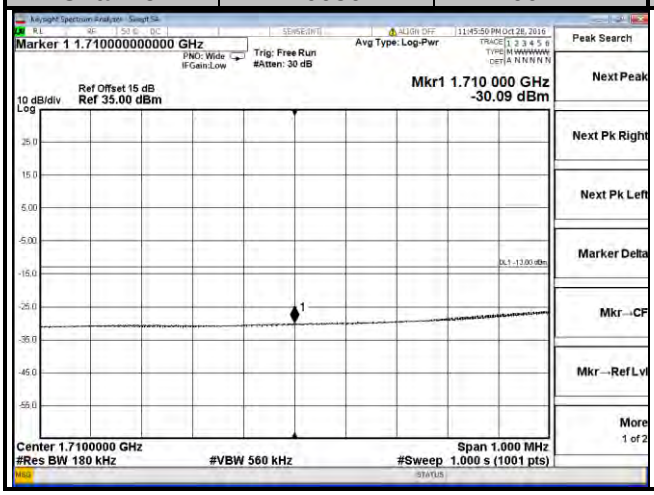
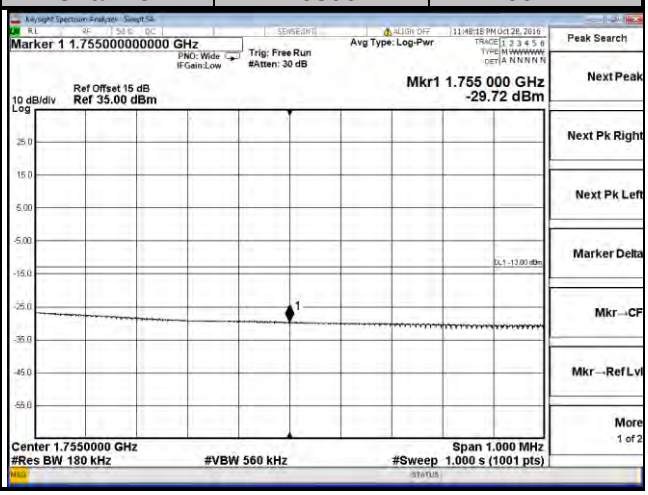


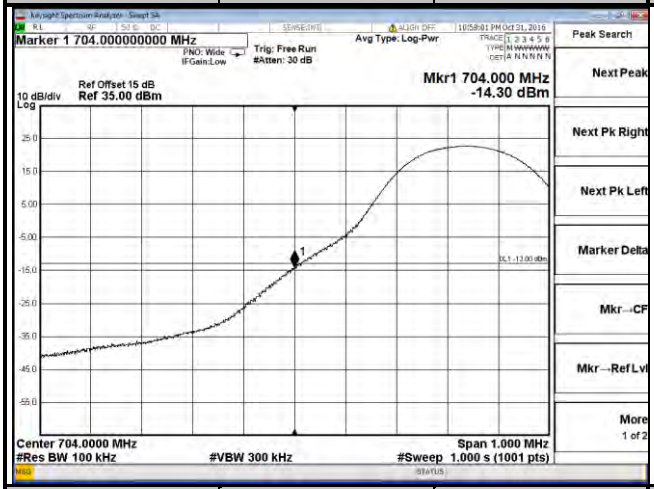
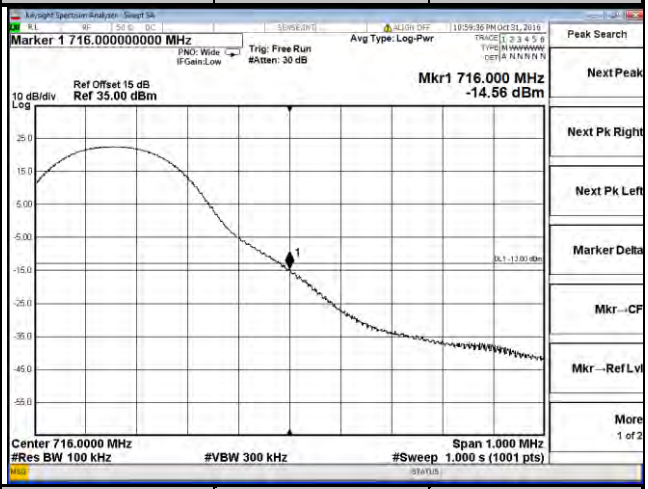
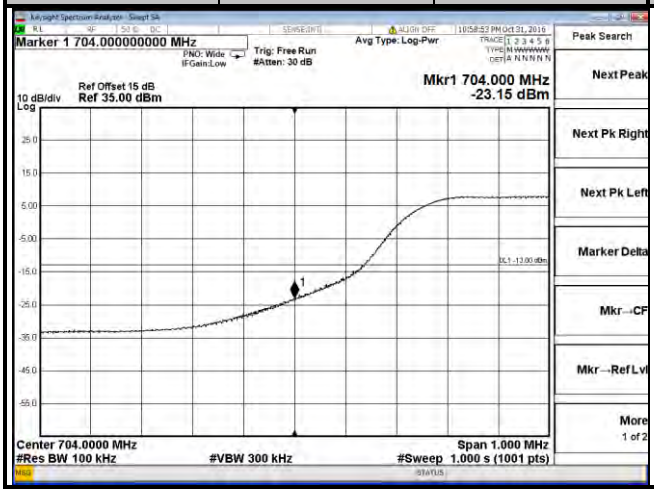
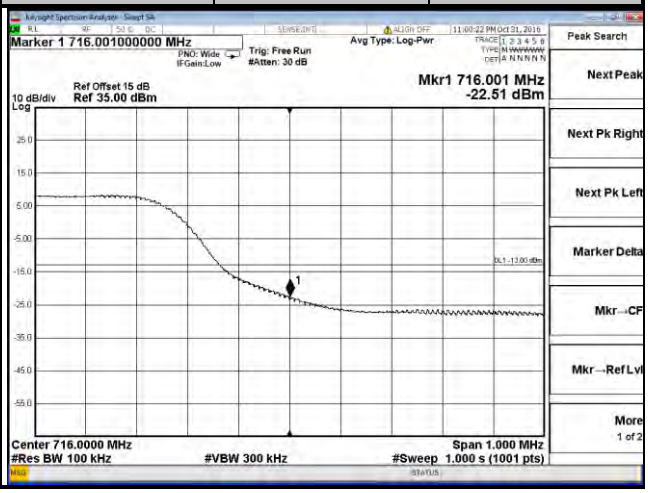
LTE Band 4					
Channel Bandwidth: 3 MHz					
Channel	19965	1 RB	Channel	20385	1 RB
					
Channel	19965	15 RB	Channel	20385	15 RB
					

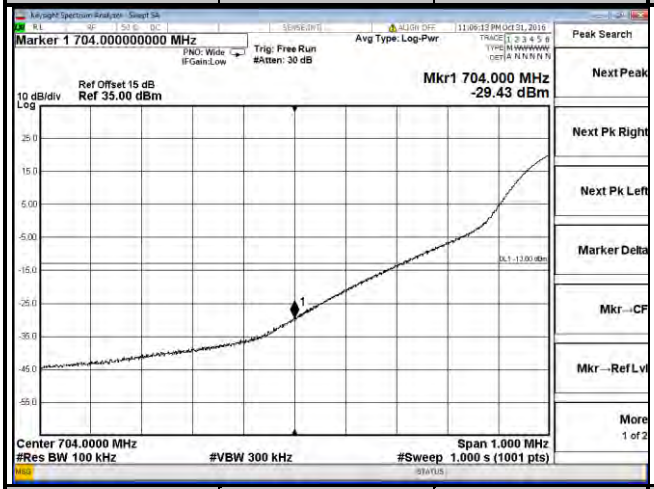
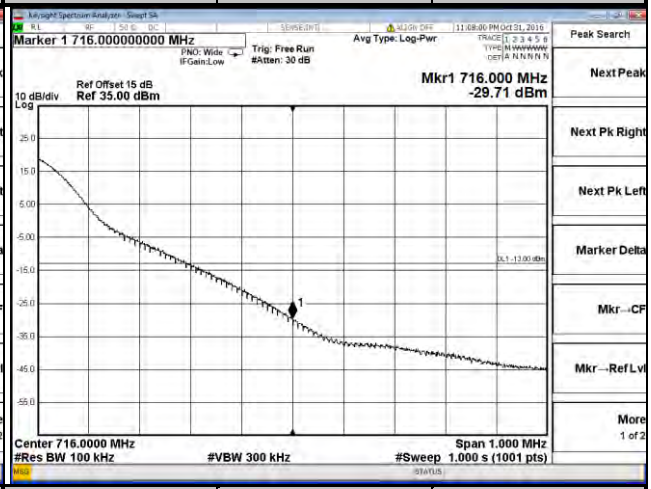
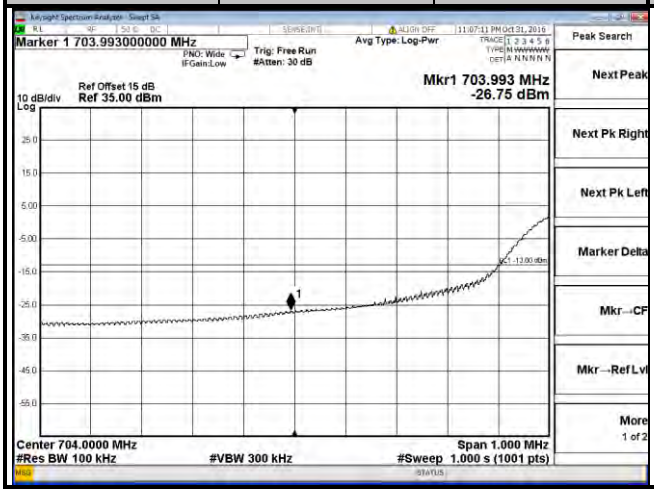
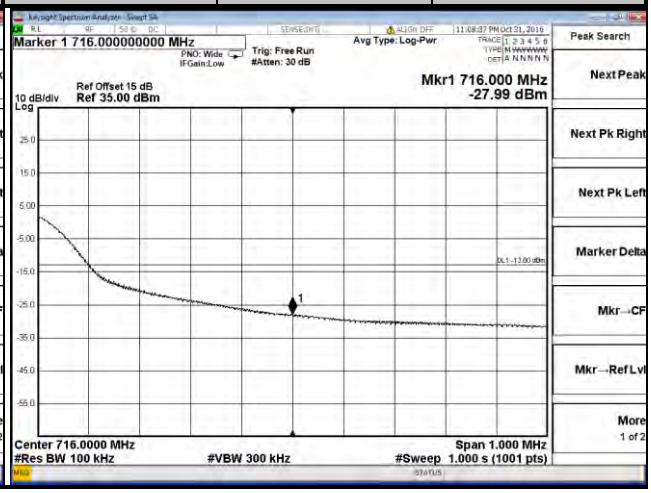
LTE Band 4					
Channel Bandwidth: 5 MHz					
Channel	19975	1 RB	Channel	20375	1 RB
					
Channel	19975	25 RB	Channel	20375	25 RB
					

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 17					
Channel Bandwidth: 5 MHz					
Channel	23755	1 RB	Channel	23825	1 RB
					
Channel	23755	25 RB	Channel	23825	25 RB
					

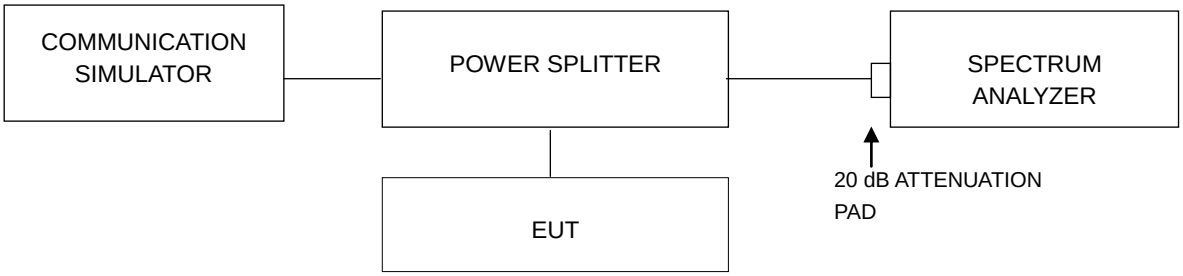
LTE Band 17					
Channel Bandwidth: 10 MHz					
Channel	23780	1 RB	Channel	23800	1 RB
					
Channel	23780	50 RB	Channel	23800	50 RB
					

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



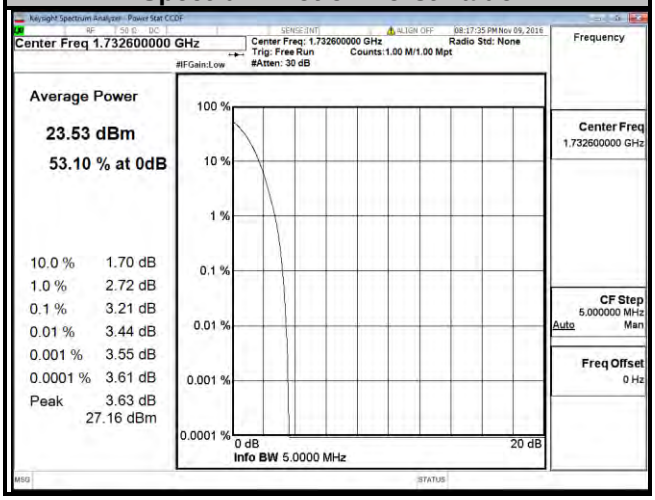
4.5.3 Test Procedures

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

WCDMA		
Channel	**Frequency (MHz)**	**Peak to Average Ratio (dB)**
1312	1712.4	3.11
1413	1732.6	3.21
1513	1752.6	3.16

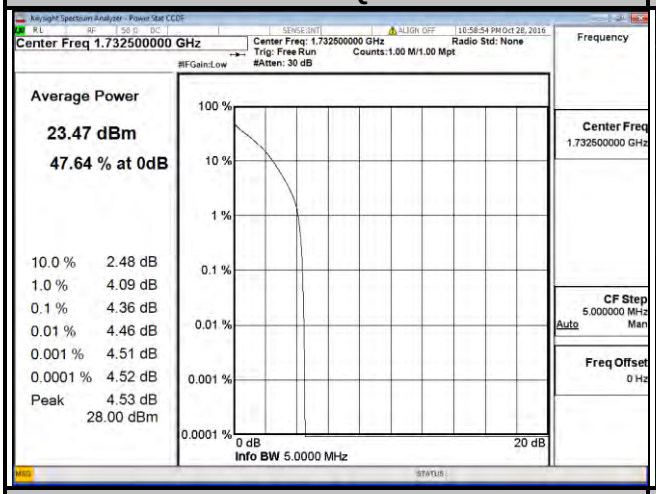
Spectrum Plot of Worst Value



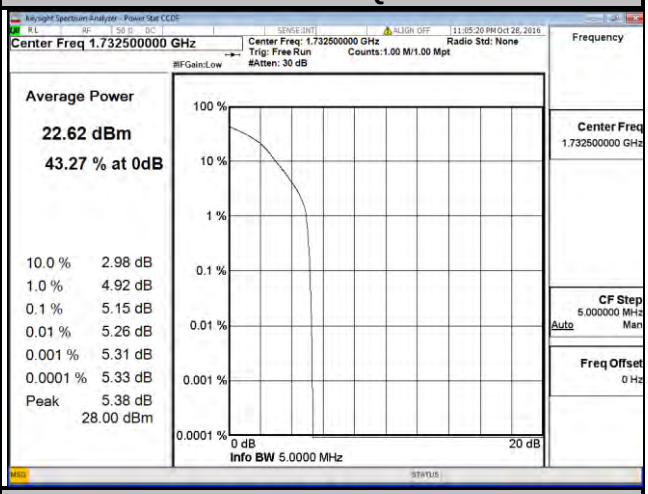
LTE Band 4							
Channel Bandwidth: 1.4 MHz				Channel Bandwidth: 3 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
19957	1710.7	4.07	4.90	19965	1711.5	3.96	4.88
20175	1732.5	4.36	5.15	20175	1732.5	4.25	5.24
20393	1754.3	3.92	4.81	20385	1753.5	3.87	4.98

Spectrum Plot of Worst Value

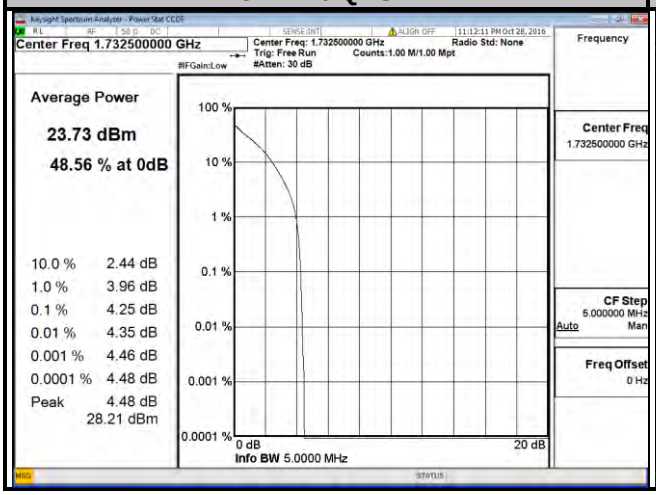
1.4 MHz / QPSK



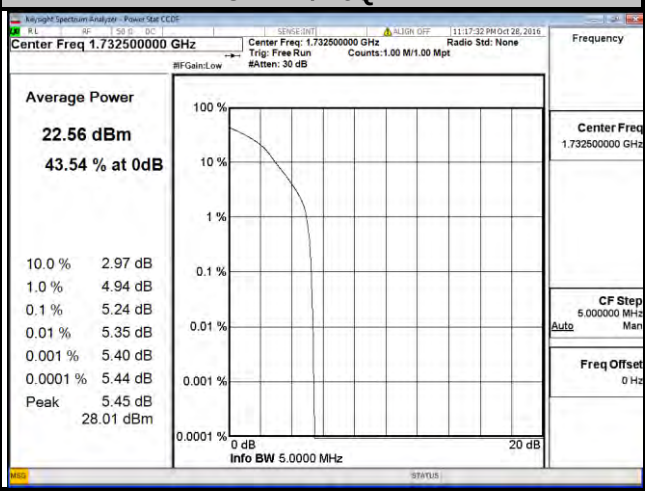
1.4 MHz / 16QAM



3 MHz / QPSK



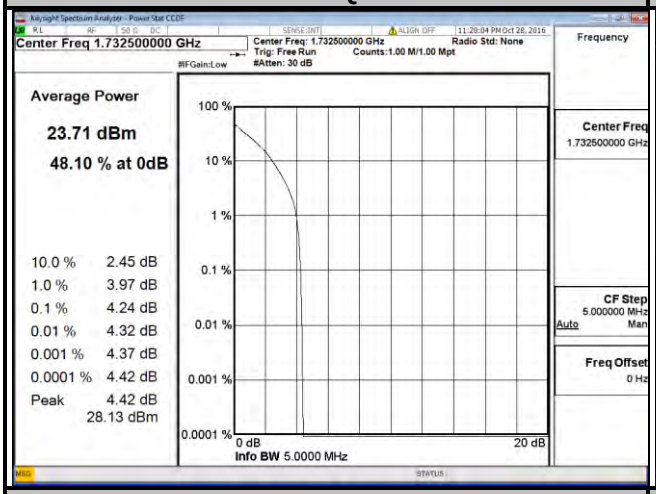
3 MHz / 16QAM



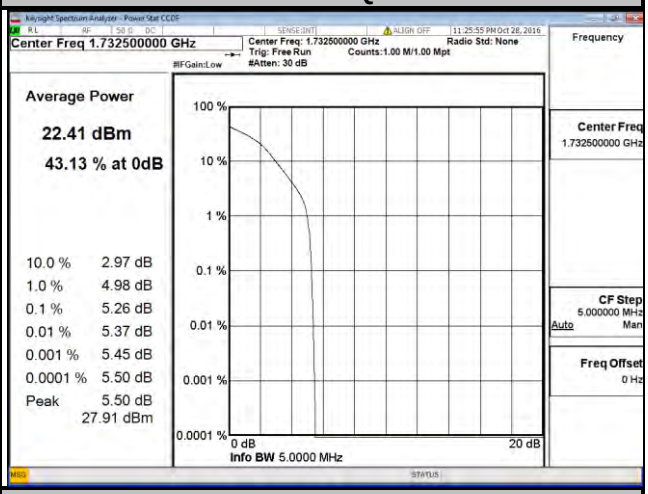
LTE Band 4							
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
19975	1712.5	3.94	5.08	20000	1715.0	3.92	4.95
20175	1732.5	4.24	5.26	20175	1732.5	4.22	5.34
20375	1752.5	3.82	4.88	20350	1750.0	3.78	4.77

Spectrum Plot of Worst Value

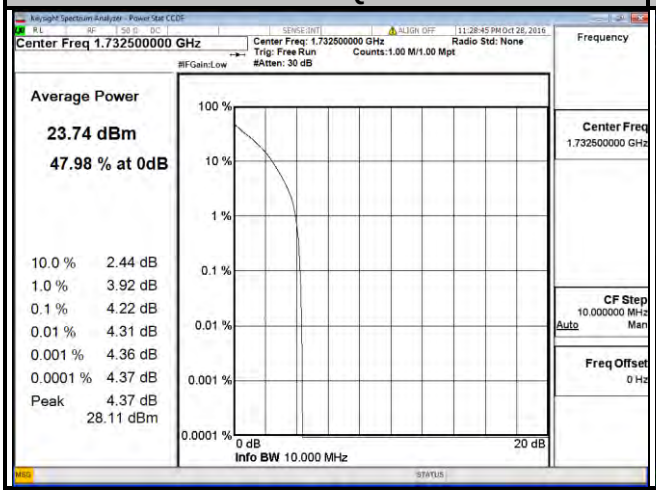
5 MHz / QPSK



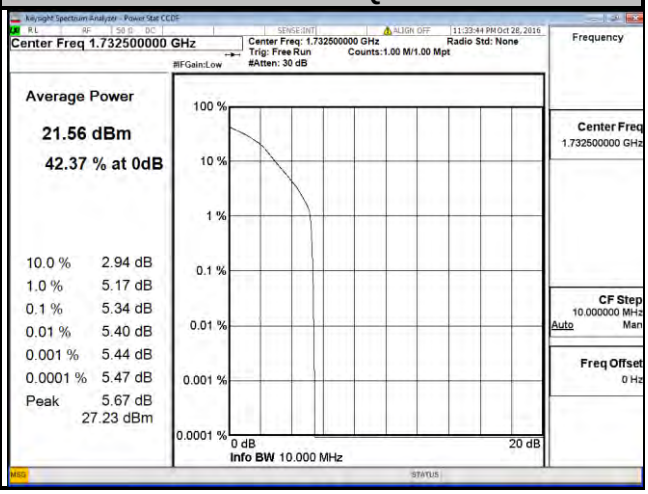
5 MHz / 16QAM



10 MHz / QPSK



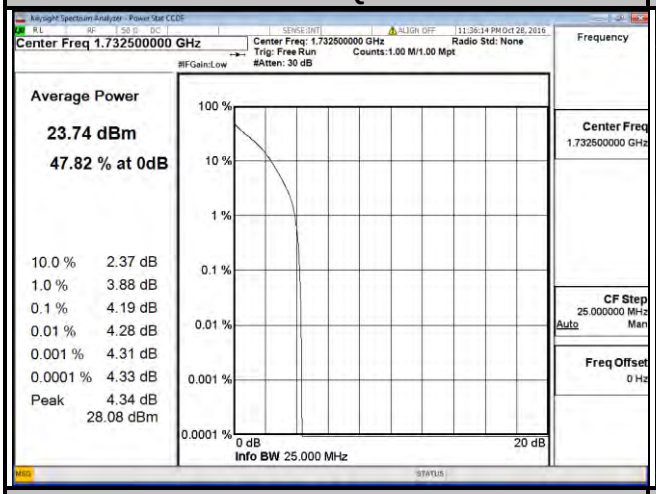
10 MHz / 16QAM



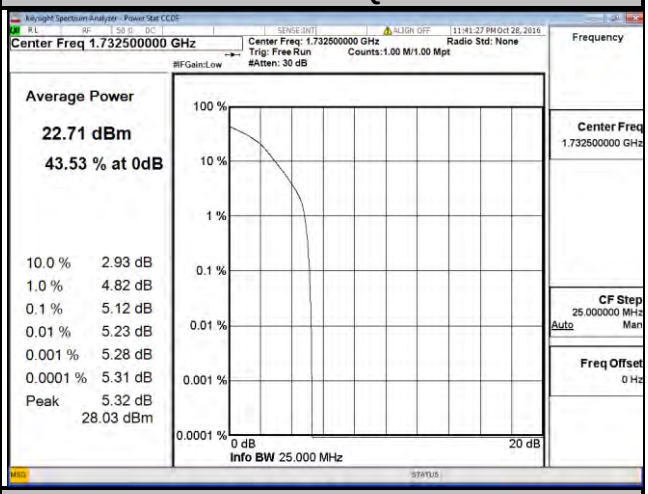
LTE Band 4							
Channel Bandwidth: 15 MHz				Channel Bandwidth: 20 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
20025	1717.5	3.92	4.92	20050	1720.0	3.98	4.91
20175	1732.5	4.19	5.12	20175	1732.5	4.11	5.10
20325	1747.5	3.93	4.96	20300	1745.0	4.10	5.13

Spectrum Plot of Worst Value

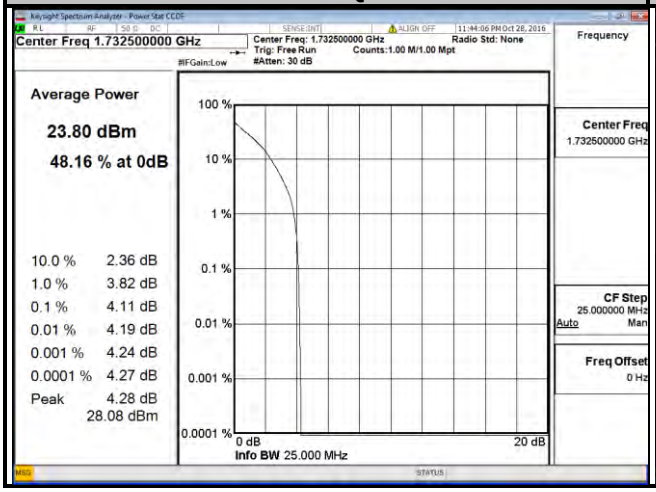
15 MHz / QPSK



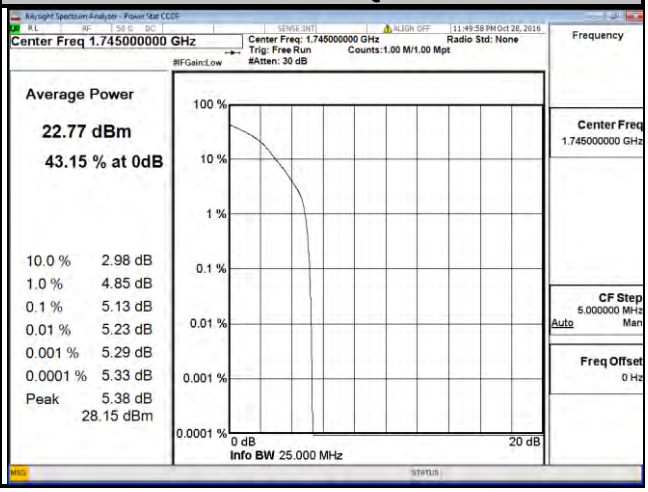
15 MHz / 16QAM



20 MHz / QPSK



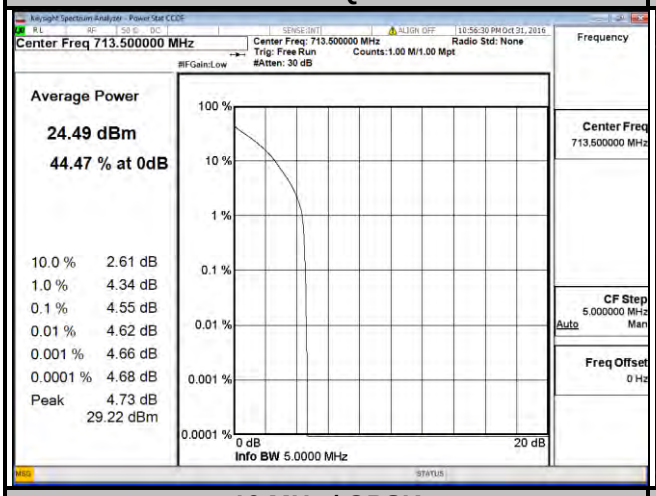
20 MHz / 16QAM



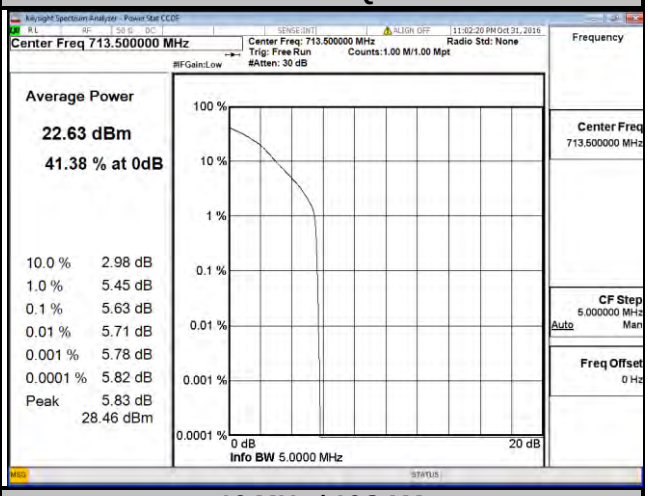
LTE Band 17							
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
23755	706.5	3.96	4.99	23780	709.0	3.94	4.90
23790	710.0	3.76	4.70	23790	710.0	3.82	4.83
23825	713.5	4.55	5.63	23800	711.0	3.68	4.72

Spectrum Plot of Worst Value

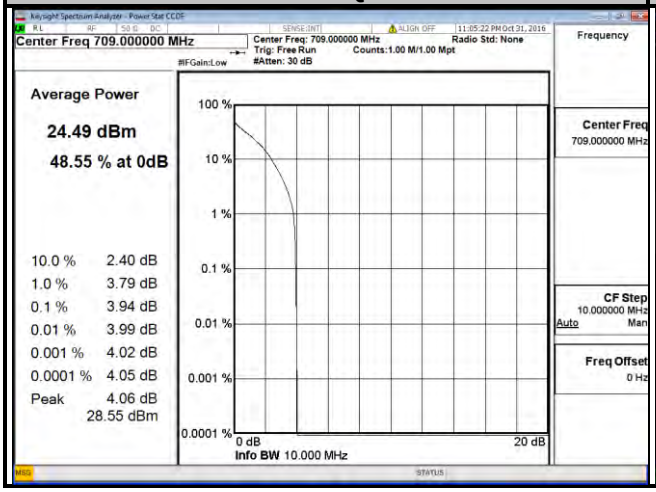
5 MHz / QPSK



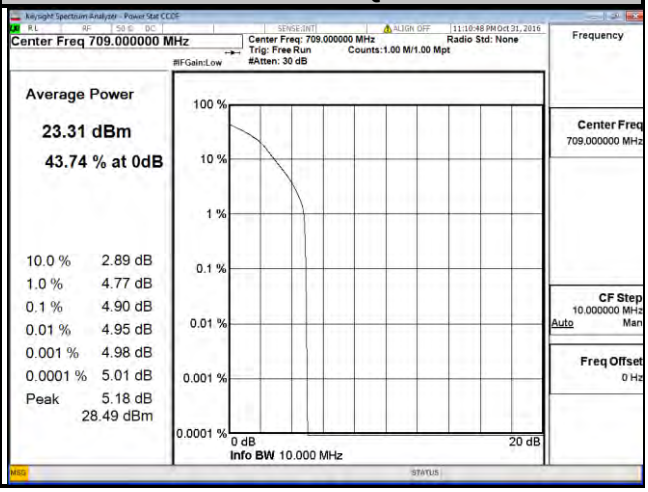
5 MHz / 16QAM



10 MHz / QPSK



10 MHz / 16QAM

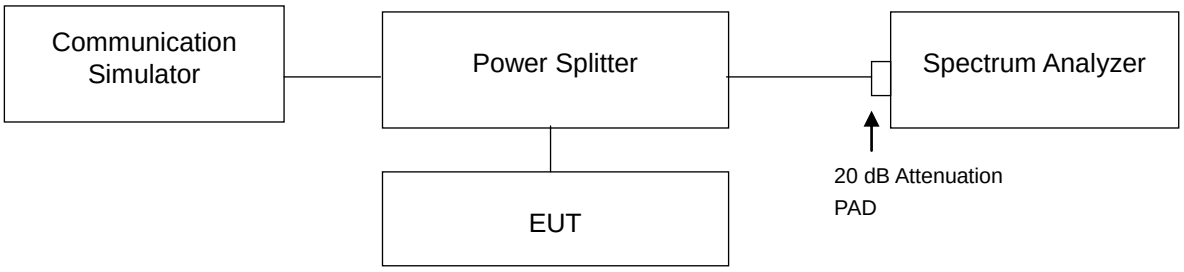


4.6 Conducted Spurious Emissions

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



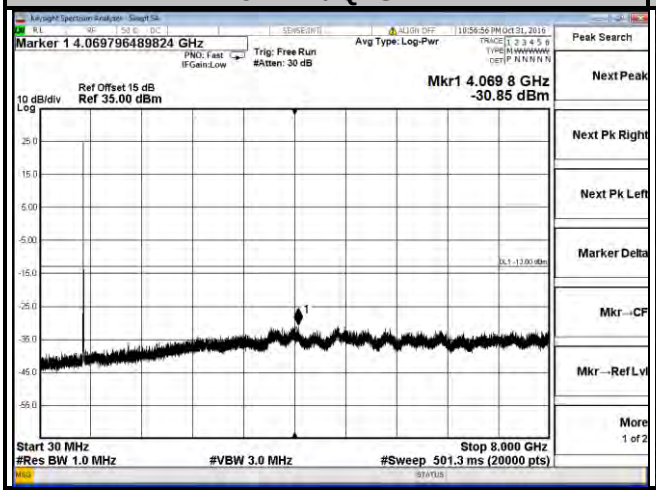
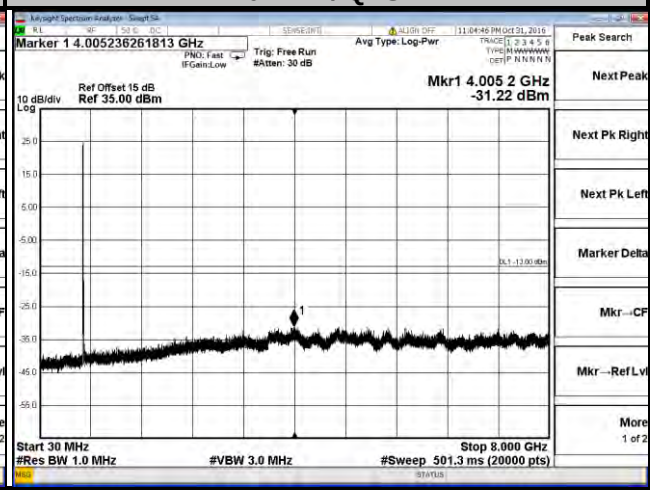
4.6.3 Test Procedure

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

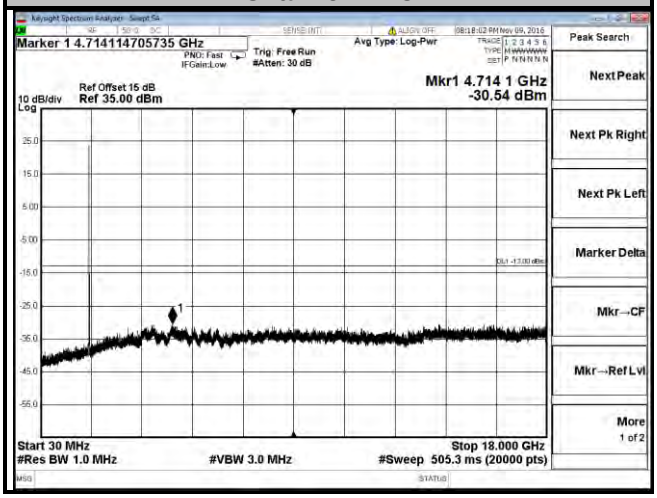
b. Measuring frequency range is from 30 MHz to 8 GHz for LTE Band 17 and from 30 MHz to 18 GHz for WCDMA and LTE Band 4. 10 dB attenuation pad is connected with spectrum. RBW=1 MHz and VBW=3 MHz are used for conducted emission measurement.

4.6.4 Test Results

Frequency Range: 30 MHz ~ 8 GHz

LTE Band 17	
Channel 23790	
5 MHz / QPSK	10 MHz / QPSK
	

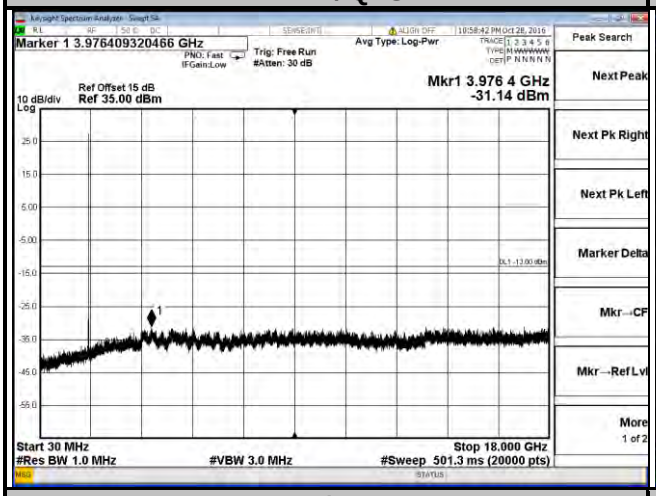
Frequency Range: 30 MHz ~ 18 GHz

WCDMA
Channel 1413


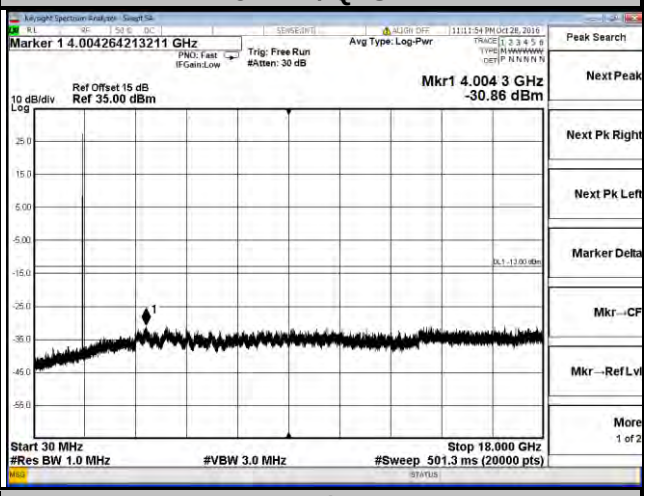
LTE Band 4

Channel 20175

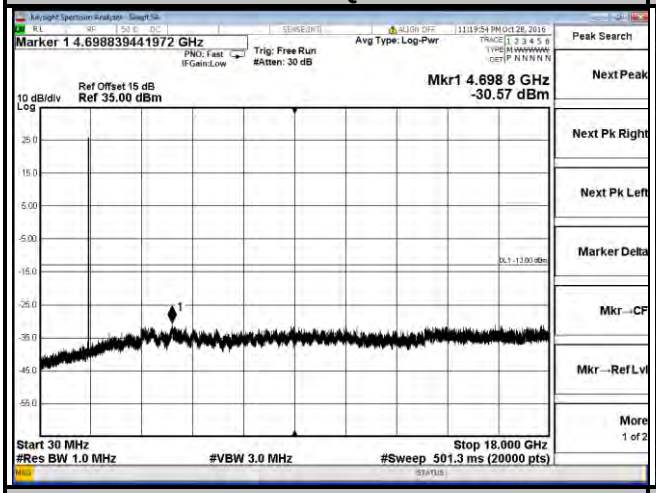
1.4 MHz / QPSK



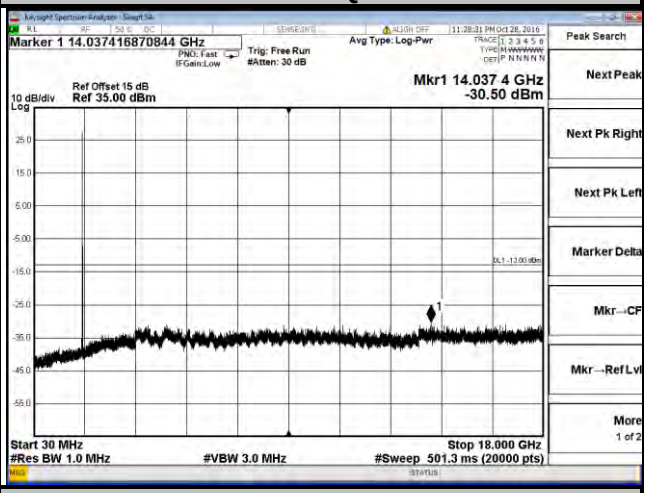
3 MHz / QPSK



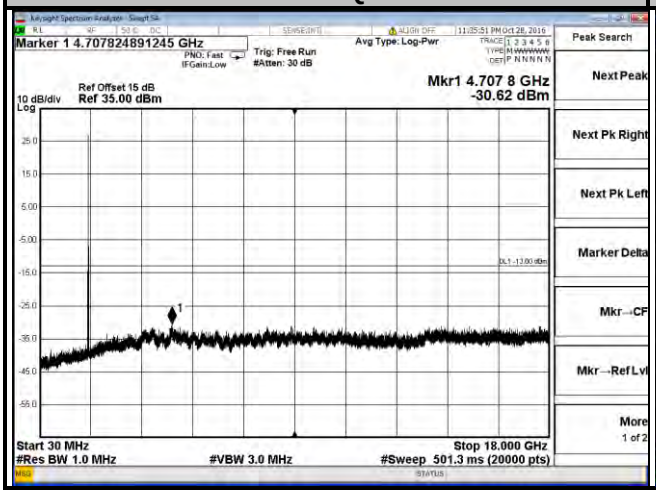
5 MHz / QPSK



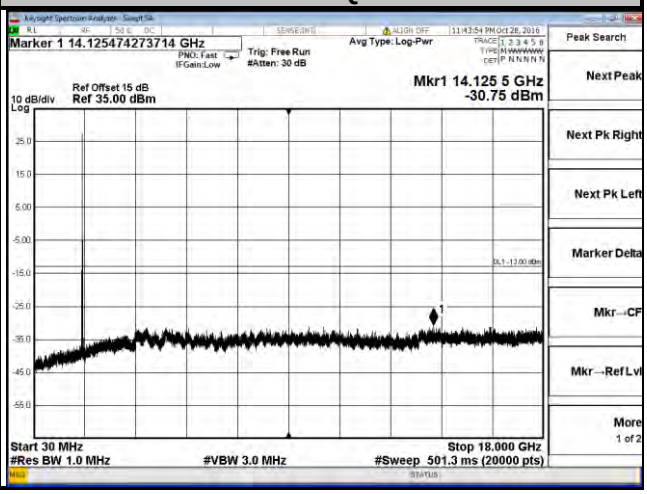
10 MHz / QPSK



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.

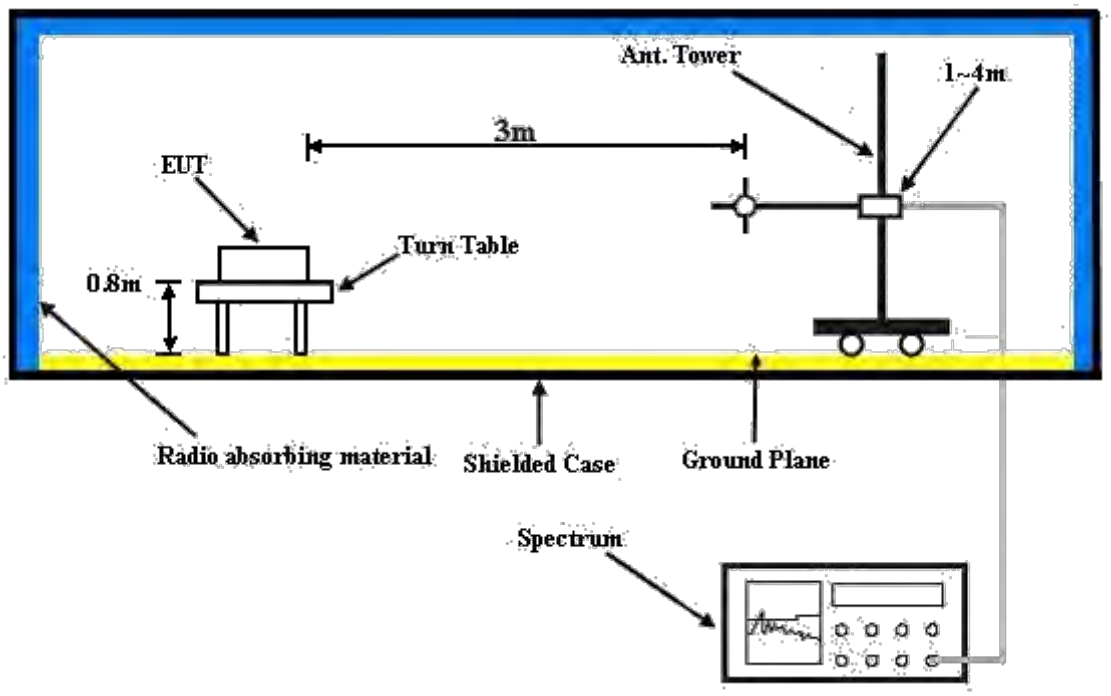
d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15 dBi.

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

Mode A

WCDMA:

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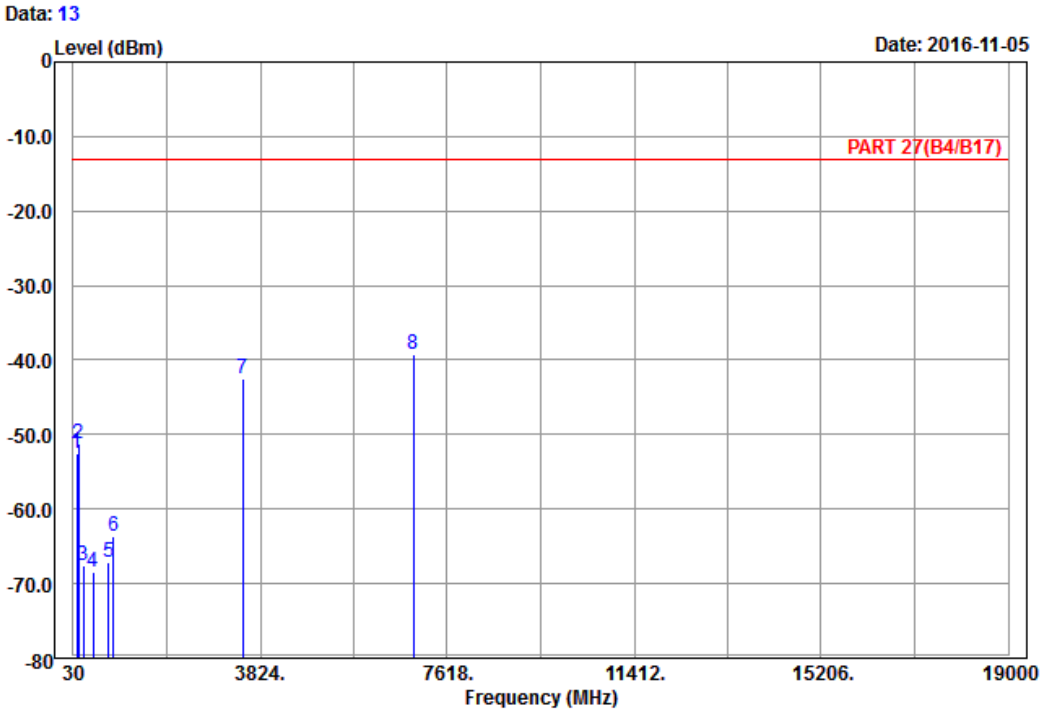
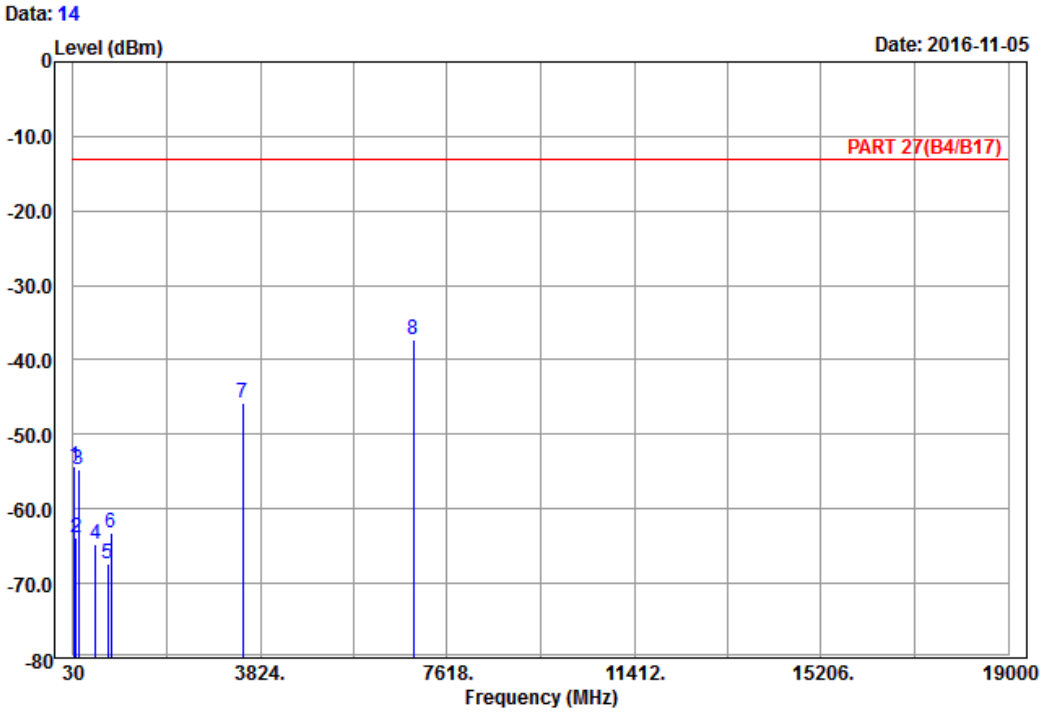


Site : 966 chamber 1
Condition: PART 27(B4/B17) Horizontal
Remark : Band IV_Link_CH1413
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	99.66	-52.63	-42.51	-13.00	-39.63	-10.12	Peak
2	145.29	-51.17	-43.34	-13.00	-38.17	-7.83	Peak
3	240.60	-67.49	-61.85	-13.00	-54.49	-5.64	Peak
4	427.40	-68.41	-65.05	-13.00	-55.41	-3.36	Peak
5	739.60	-67.16	-66.03	-13.00	-54.16	-1.13	Peak
6	843.90	-63.69	-65.20	-13.00	-50.69	1.51	Peak
7	3465.20	-42.58	-56.92	-13.00	-29.58	14.34	Peak
8 pp	6930.40	-39.20	-62.07	-13.00	-26.20	22.87	Peak

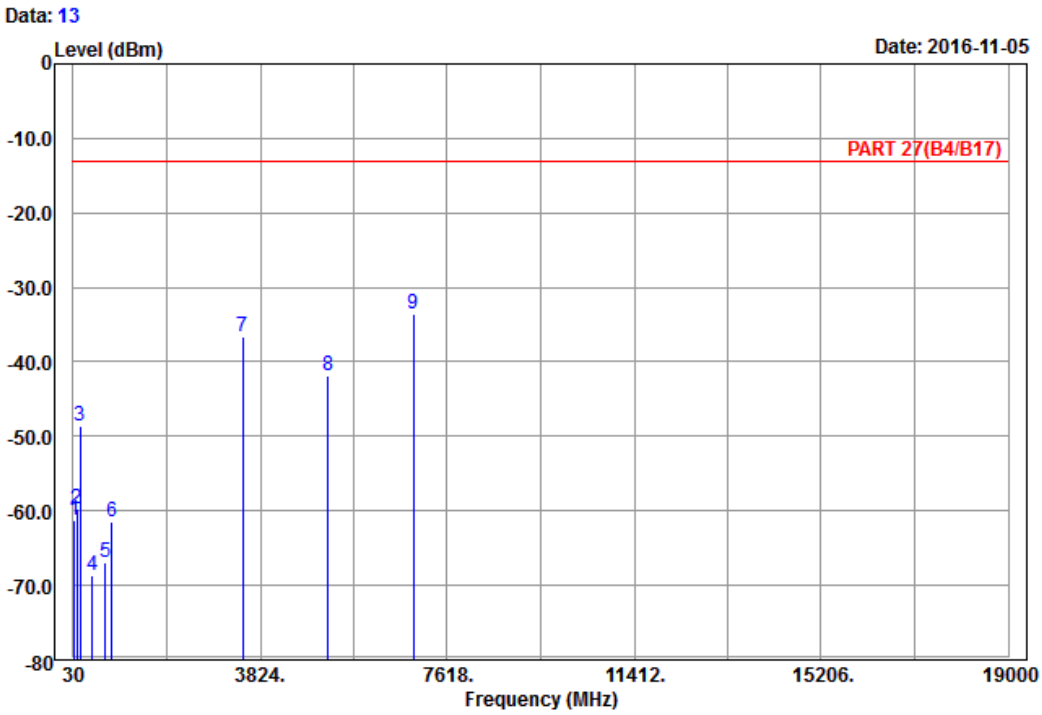


Site : 966 chamber 1
Condition: PART 27(B4/B17) Vertical
Remark : Band IV_Link_CH1413
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	47.28	-54.22	-41.11	-13.00	-41.22	-13.11	Peak
2	92.91	-63.93	-53.42	-13.00	-50.93	-10.51	Peak
3	143.94	-54.68	-46.89	-13.00	-41.68	-7.79	Peak
4	482.00	-64.71	-59.95	-13.00	-51.71	-4.76	Peak
5	734.00	-67.33	-66.31	-13.00	-54.33	-1.02	Peak
6	801.90	-63.19	-65.18	-13.00	-50.19	1.99	Peak
7	3465.20	-45.80	-60.14	-13.00	-32.80	14.34	Peak
8 pp	6930.40	-37.18	-60.05	-13.00	-24.18	22.87	Peak

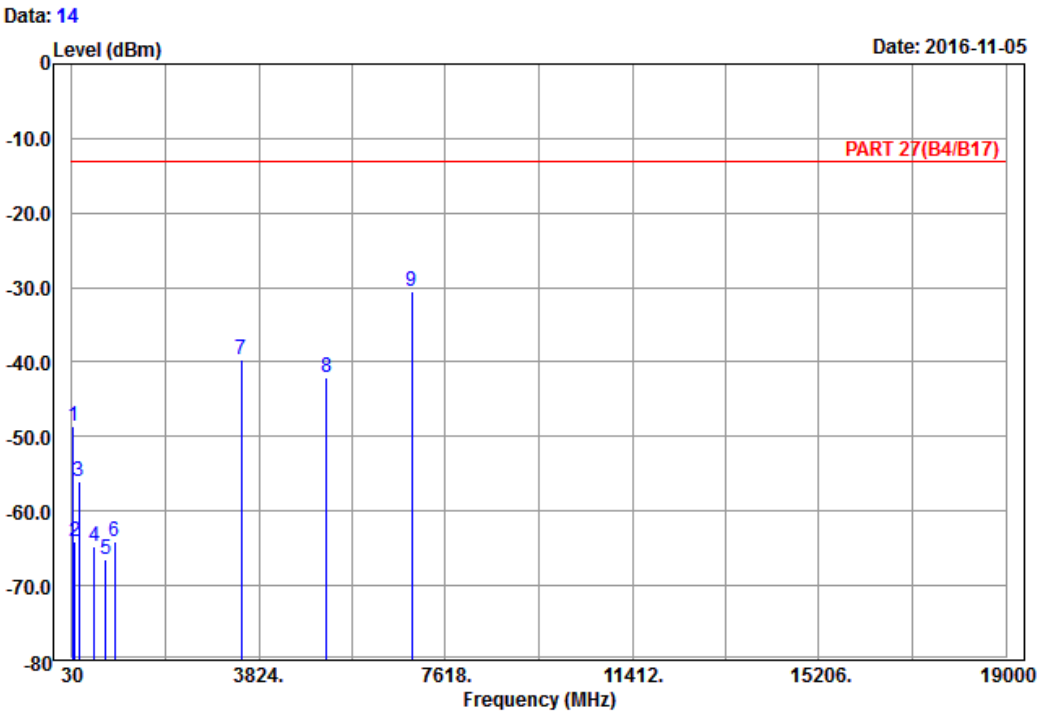
LTE Band 4
Channel Bandwidth: 20 MHz / QPSK

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 27(B4/B17) Horizontal
Remark : LTE_Band 4_Link_CH20175
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	48.90	-61.25	-47.82	-13.00	-48.25	-13.43	Peak
2	96.15	-59.67	-49.33	-13.00	-46.67	-10.34	Peak
3	162.03	-48.70	-41.23	-13.00	-35.70	-7.47	Peak
4	416.20	-68.62	-65.52	-13.00	-55.62	-3.10	Peak
5	685.70	-66.95	-66.64	-13.00	-53.95	-0.31	Peak
6	806.10	-61.51	-63.45	-13.00	-48.51	1.94	Peak
7	3465.00	-36.65	-50.99	-13.00	-23.65	14.34	Peak
8	5197.50	-41.78	-61.90	-13.00	-28.78	20.12	Peak
9 pp	6930.00	-33.47	-56.34	-13.00	-20.47	22.87	Peak

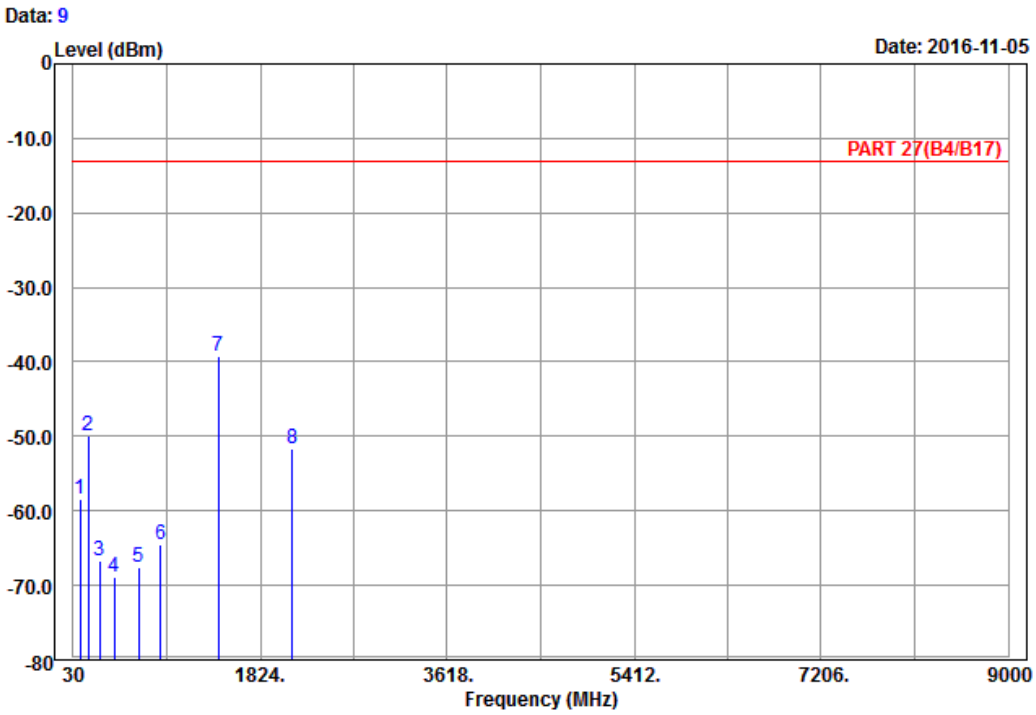


Site : 966 chamber 1
Condition: PART 27(B4/B17) Vertical
Remark : LTE_Band 4_Link_CH20175
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	54.03	-48.60	-34.54	-13.00	-35.60	-14.06	Peak
2	92.10	-64.16	-53.60	-13.00	-51.16	-10.56	Peak
3	178.23	-56.11	-50.33	-13.00	-43.11	-5.78	Peak
4	482.70	-64.82	-60.03	-13.00	-51.82	-4.79	Peak
5	720.00	-66.57	-65.83	-13.00	-53.57	-0.74	Peak
6	888.00	-64.09	-66.64	-13.00	-51.09	2.55	Peak
7	3465.00	-39.60	-53.94	-13.00	-26.60	14.34	Peak
8	5197.50	-42.09	-62.21	-13.00	-29.09	20.12	Peak
9 pp	6930.00	-30.61	-53.48	-13.00	-17.61	22.87	Peak

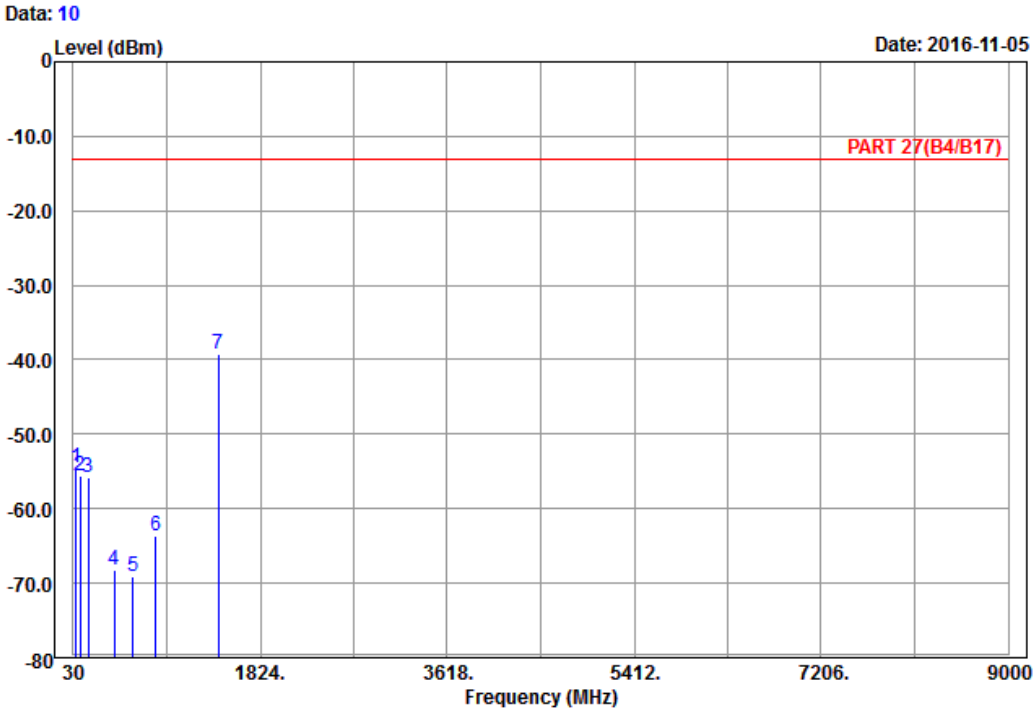
LTE Band 17
Channel Bandwidth: 10 MHz / QPSK

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 27(B4/B17) Horizontal
Remark : LTE_Band 17_Link_CH23790
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	96.69	-58.51	-48.22	-25.00	-33.51	-10.29	Peak
2 pp	172.83	-49.84	-43.44	-25.00	-24.84	-6.40	Peak
3	281.37	-66.70	-60.91	-25.00	-41.70	-5.79	Peak
4	422.50	-68.85	-65.60	-25.00	-43.85	-3.25	Peak
5	655.60	-67.57	-67.41	-25.00	-42.57	-0.16	Peak
6	866.30	-64.58	-66.50	-25.00	-39.58	1.92	Peak
7	1420.00	-39.31	-45.67	-13.00	-26.31	6.36	Peak
8	2130.00	-51.67	-62.95	-13.00	-38.67	11.28	Peak



Site : 966 chamber 1
Condition: PART 27(B4/B17) Vertical
Remark : LTE_Band 17_Link_CH23790
Tested by: Charles Hsiao

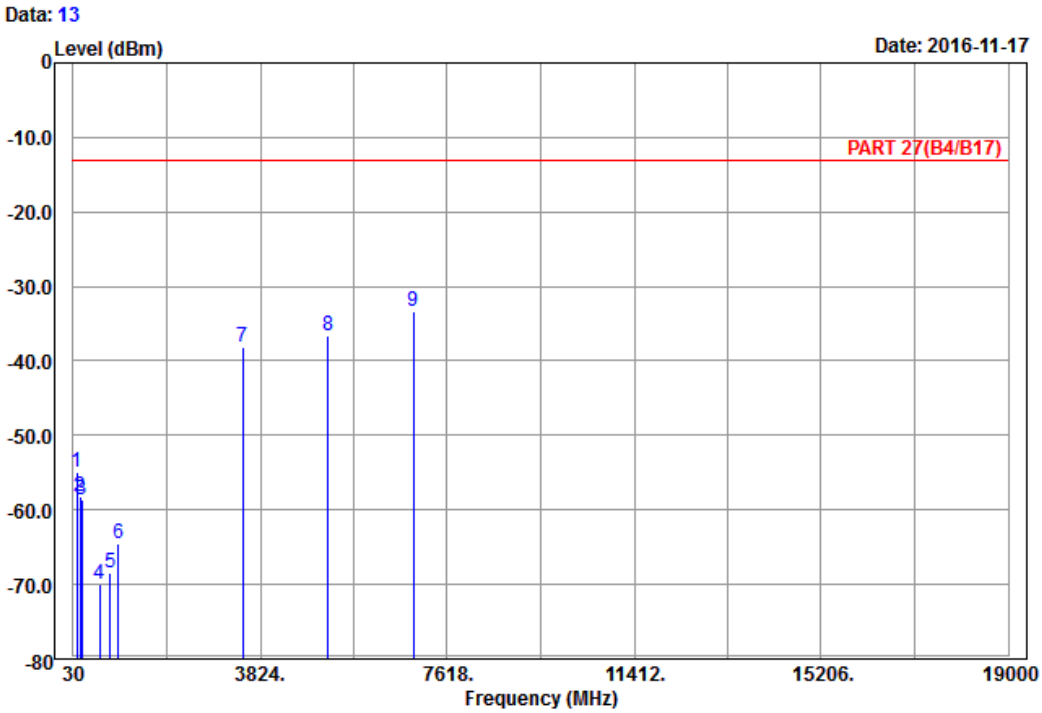
	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	57.81	-54.50	-40.44	-25.00	-29.50	-14.06	Peak
2	95.07	-55.63	-45.23	-25.00	-30.63	-10.40	Peak
3	177.69	-55.70	-49.82	-25.00	-30.70	-5.88	Peak
4	427.40	-68.22	-64.86	-25.00	-43.22	-3.36	Peak
5	603.80	-69.05	-69.43	-25.00	-44.05	0.38	Peak
6	820.80	-63.74	-65.52	-25.00	-38.74	1.78	Peak
7 pp	1420.00	-39.26	-45.62	-13.00	-26.26	6.36	Peak

Mode B

LTE Band 4

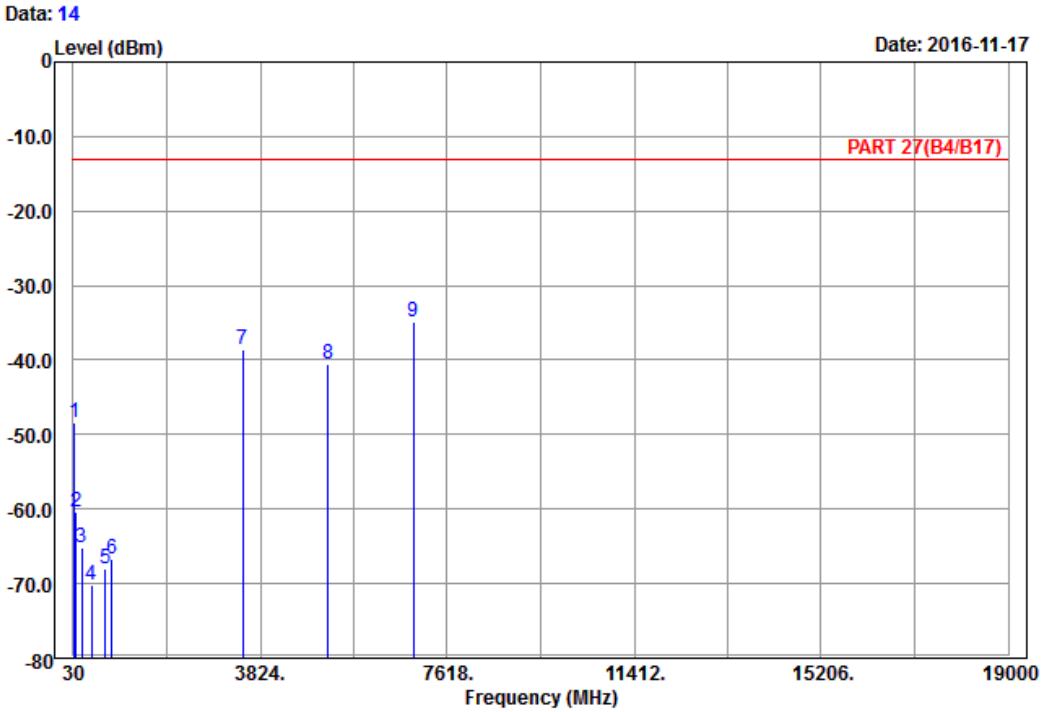
Channel Bandwidth: 20 MHz / QPSK

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 27(B4/B17) Horizontal
Remark : LTE_Band 4_Link_CH20175
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	96.96	-55.02	-44.73	-13.00	-42.02	-10.29	Peak
2	173.10	-58.27	-51.97	-13.00	-45.27	-6.30	Peak
3	206.31	-58.63	-52.54	-13.00	-45.63	-6.09	Peak
4	567.40	-70.00	-69.06	-13.00	-57.00	-0.94	Peak
5	785.10	-68.43	-69.42	-13.00	-55.43	0.99	Peak
6	939.80	-64.54	-69.21	-13.00	-51.54	4.67	Peak
7	3465.00	-38.12	-52.46	-13.00	-25.12	14.34	Peak
8	5197.50	-36.72	-56.84	-13.00	-23.72	20.12	Peak
9 pp	6930.00	-33.27	-56.14	-13.00	-20.27	22.87	Peak

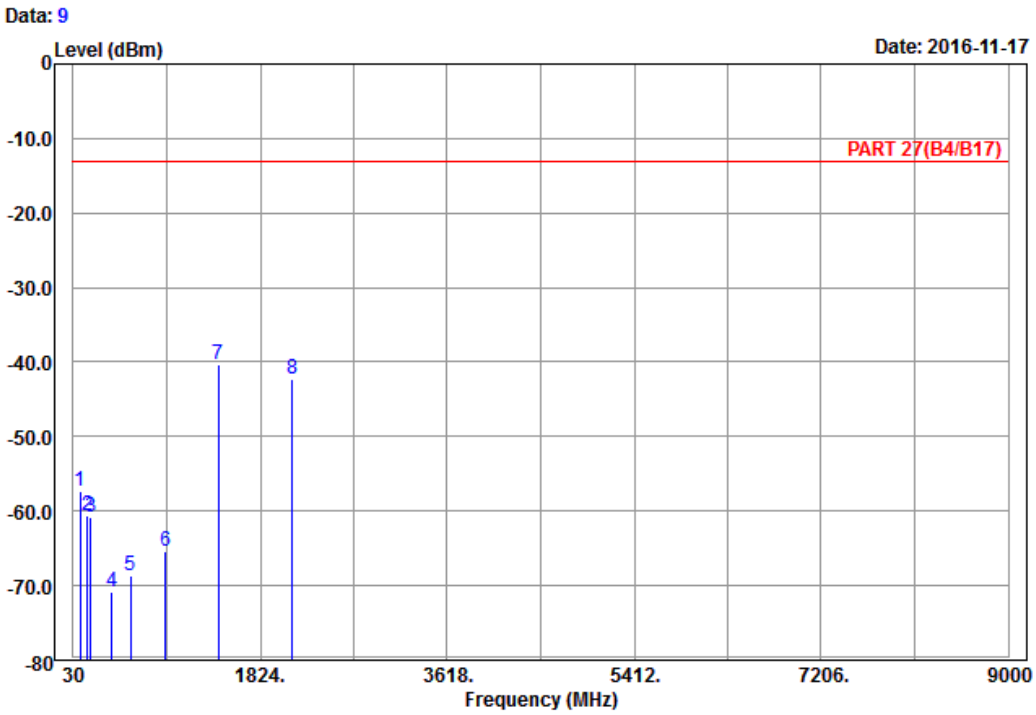


Site : 966 chamber 1
Condition: PART 27(B4/B17) Vertical
Remark : LTE_Band 4_Link_CH20175
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	47.82	-48.32	-35.21	-13.00	-35.32	-13.11	Peak
2	82.65	-60.49	-48.94	-13.00	-47.49	-11.55	Peak
3	209.82	-65.08	-59.03	-13.00	-52.08	-6.05	Peak
4	395.20	-70.27	-67.27	-13.00	-57.27	-3.00	Peak
5	687.80	-67.97	-67.65	-13.00	-54.97	-0.32	Peak
6	806.10	-66.78	-68.72	-13.00	-53.78	1.94	Peak
7	3465.00	-38.52	-52.86	-13.00	-25.52	14.34	Peak
8	5197.50	-40.50	-60.62	-13.00	-27.50	20.12	Peak
9 pp	6930.00	-34.87	-57.74	-13.00	-21.87	22.87	Peak

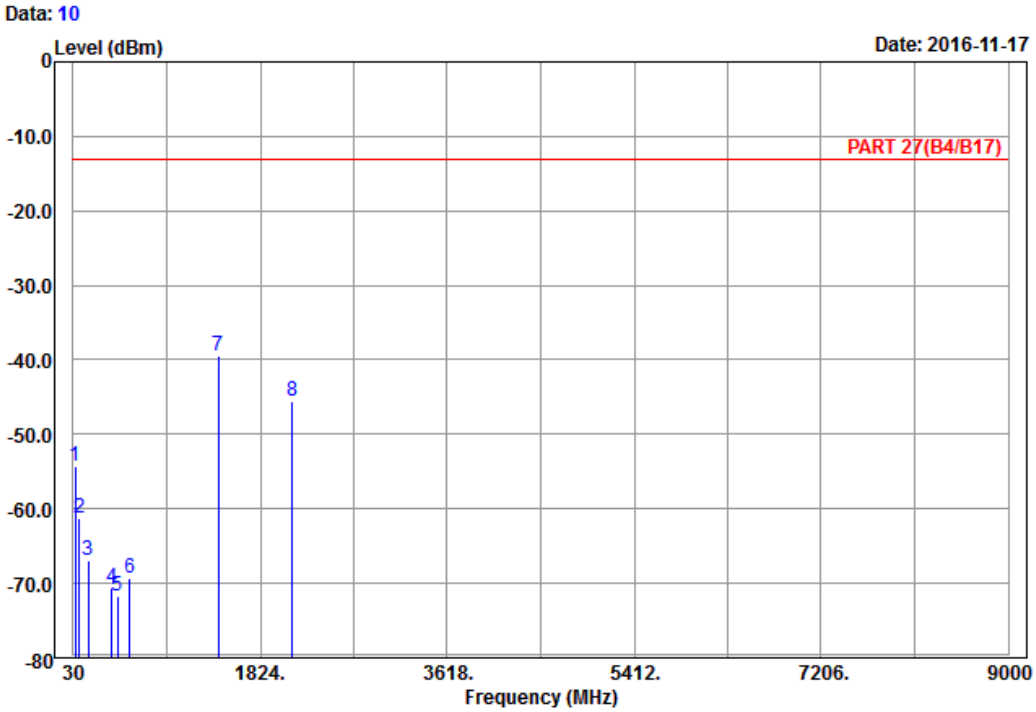
LTE Band 17
Channel Bandwidth: 10 MHz / QPSK

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 27(B4/B17) Horizontal
Remark : LTE_Band 17_Link_CH23790
Tested by: Karl Leee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	97.23	-57.24	-46.95	-13.00	-44.24	-10.29	Peak
2	170.13	-60.56	-53.85	-13.00	-47.56	-6.71	Peak
3	199.83	-60.91	-54.73	-13.00	-47.91	-6.18	Peak
4	403.60	-70.89	-68.06	-13.00	-57.89	-2.83	Peak
5	577.90	-68.63	-68.13	-13.00	-55.63	-0.50	Peak
6	918.80	-65.29	-69.00	-13.00	-52.29	3.71	Peak
7 pp	1420.00	-40.26	-46.62	-13.00	-27.26	6.36	Peak
8	2130.00	-42.38	-53.66	-13.00	-29.38	11.28	Peak



Site : 966 chamber 1
Condition: PART 27(B4/B17) Vertical
Remark : LTE_Band 17_Link_CH23790
Tested by: Karl Leee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	48.09	-54.37	-40.94	-13.00	-41.37	-13.43	Peak
2	90.21	-61.36	-50.69	-13.00	-48.36	-10.67	Peak
3	174.99	-66.96	-60.77	-13.00	-53.96	-6.19	Peak
4	402.90	-70.52	-67.72	-13.00	-57.52	-2.80	Peak
5	456.10	-71.78	-67.77	-13.00	-58.78	-4.01	Peak
6	575.10	-69.42	-68.80	-13.00	-56.42	-0.62	Peak
7 pp	1420.00	-39.51	-45.87	-13.00	-26.51	6.36	Peak
8	2130.00	-45.46	-56.74	-13.00	-32.46	11.28	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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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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