FCC Test Report

(PART 27)

Report No.:	RF150901C09A-5
FCC ID:	HFS-FT75
Test Model:	FT7
Received Date:	Sep. 01, 2015
Test Date:	Sep. 07, 2015 ~ Sep. 16, 2015
Issued Date:	Dec. 09, 2015
Applicant:	Quanta Computer Inc.
Address:	No. 188, Wen Hwa 2nd Rd., Guishan Dist., Tao Yuan City 333, 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.

Table of Contents

Release Control Record

Issue No.	Description	Date Issued
RF150901C09A-5	Original Release	Dec. 09, 2015

1 Certificate of Conformity

Product:	Tablet
Brand:	C-Spire
Test Model:	FT7
Sample Status:	Identical Prototype
Applicant:	Quanta Computer Inc.
Test Date:	Sep. 07, 2015 ~ Sep. 16, 2015
Standards:	FCC Part 27, Subpart C

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

Prepared by : Vera Huang , **Date:** Dec. 09, 2015

Vera Huang / Specialist

Approved by : Stanley Wu , **Date:** Dec. 09, 2015

Stanley Wu / Assistant Manager

2 Summary of Test Results

Applied Standard: FCC Part 27 & Part 2 (LTE 12)			
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 -30.12dB at 1415.00MHz.

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	150kHz ~ 30MHz	2.44 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	2.93 dB
	200MHz ~1000MHz	2.95 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	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, 2015	Jan. 21, 2016
Spectrum Analyzer Agilent	N9010A	MY52220314	Sep. 03, 2015	Sep. 02, 2016
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Dec. 10, 2014	Dec. 09, 2015
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Feb. 04, 2015	Feb. 04, 2016
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-969	Feb. 09, 2015	Feb. 09, 2016
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Feb. 04, 2015	Feb. 04, 2016
Preamplifier EMCI	EMC 012645	980115	Dec. 12, 2014	Dec. 11, 2015
Preamplifier EMCI	EMC 184045	980116	Jan. 09, 2015	Jan. 08, 2016
Preamplifier EMCI	EMC 330H	980112	Dec. 27, 2014	Dec. 26, 2015
Power Meter Anritsu	ML2495A	1448002	Jan. 05, 2015	Jan. 04, 2016
Power Sensor Anritsu	MA2411B	1339230	Jan. 05, 2015	Jan. 04, 2016
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	309219/4 2950114	Oct. 18, 2014	Oct. 17, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	250130/4	Oct. 18, 2014	Oct. 17, 2015
RF Coaxial Cable Worken	8D-FB	Cable-Ch10-01	Nov. 07, 2014	Nov. 06, 2015
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

Note: 1. The calibration interval of the above test instruments is 12 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 1GHz 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	Tablet	
Brand	C-Spire	
Test Model	FT7	
Power Supply Rating	5.0Vdc (adapter or host equipment) 3.8Vdc (Li-ion battery)	
Modulation Type	LTE	QPSK, 16QAM
Frequency Range	LTE Band 12 (Channel Bandwidth: 1.4MHz)	699.7 ~ 715.3MHz
	LTE Band 12 (Channel Bandwidth: 3MHz)	700.5 ~ 714.5MHz
	LTE Band 12 (Channel Bandwidth: 5MHz)	701.5 ~ 713.5MHz
	LTE Band 12 (Channel Bandwidth: 10MHz)	704.0 ~ 711.0MHz
Emission Designator	LTE Band 12 (Channel Bandwidth: 1.4MHz)	1M09G7D
	LTE Band 12 (Channel Bandwidth: 3MHz)	2M70G7D
	LTE Band 12 (Channel Bandwidth: 5MHz)	4M50G7D
	LTE Band 12 (Channel Bandwidth: 10MHz)	9M00W7D
Max. ERP Power	LTE Band 12 (Channel Bandwidth: 1.4MHz)	49.55mW
	LTE Band 12 (Channel Bandwidth: 3MHz)	49.09mW
	LTE Band 12 (Channel Bandwidth: 5MHz)	52.00mW
	LTE Band 12 (Channel Bandwidth: 10MHz)	58.48mW
Antenna Type	Fixed Internal Antenna	
Accessory Device	Refer to Note as below	
Data Cable Supplied	Refer to Note as below	

Note:

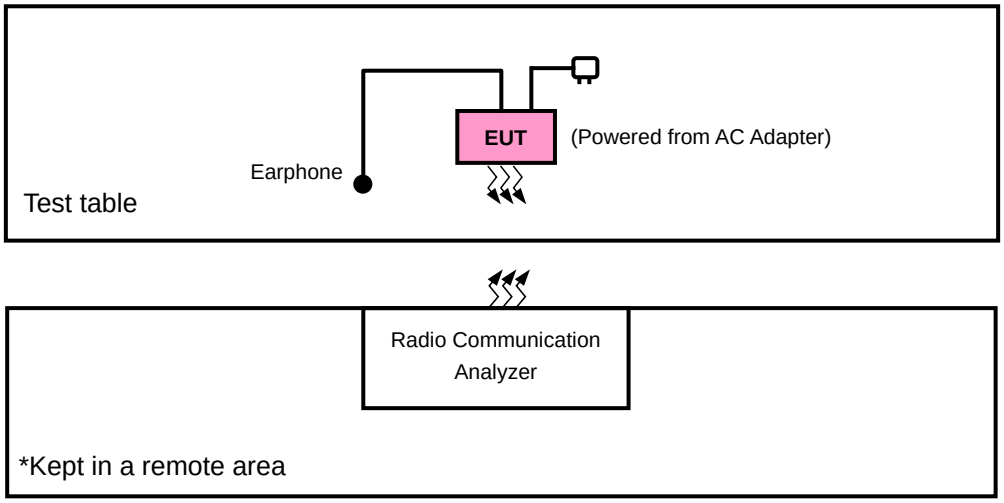
1. The EUT contains following accessory devices.

Product	Brand	Model	Description
Adapter	Tamura	NSS050200B	I/P: 100-240Vac, 0.3A O/P: 5Vdc, 2A
Battery	Veken	141016	3.8Vdc, 3780mAh
USB Cable	Elinke	18-94U1DG1-004G	1.03m cable
LCD Panel	Shenzhen Laibao Hi-Technology Co.,Ltd	ST070SI000BKF	6.98"
Photo Camera	Kingcome	HM7P2-ALRFHQ	2M
Video Camera	Globaloptics	GEGR150012-2R	8M
CPU	Qualcomm	MSM8916	--
eMMC (ROM)	Kingston	EMMC16G-S100-R09	16GB
RAM	Samsung	K4E8E304EE-EGCE	8GB
BT/WLAN Module	Qualcomm	WCN3620	--
WWAN Module	Qualcomm	WCN3620	--

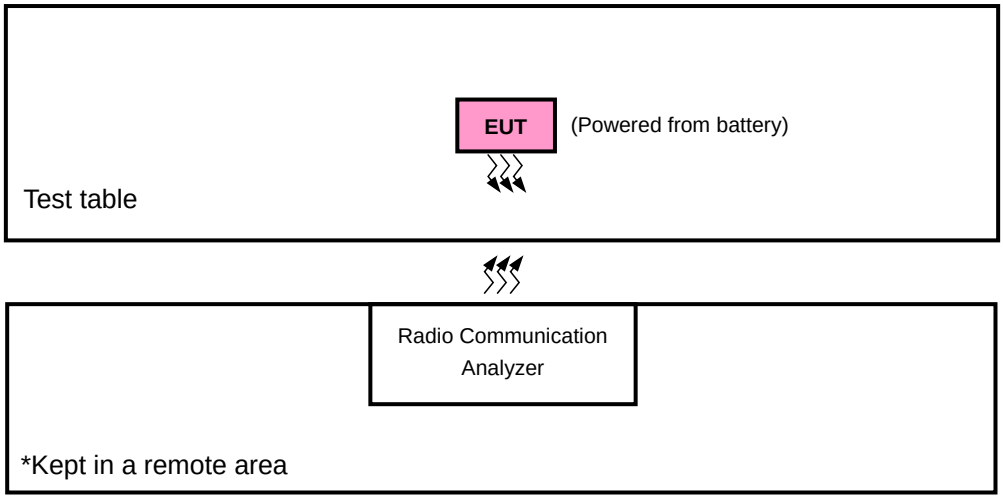
2. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Configuration of System Under Test

<Radiated Emission Test>



<E.R.P. 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.	Radio Communication Analyzer	Anritsu	MT8820C	6201300640	N/A
2.	Earphone	N/A	N/A	N/A	N/A

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

Note:
1. All power cords of the above support units are non-shielded (1.8m).
2. Item 1 acted as communication partner to transfer data.

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	Radiated Emission
LTE Band 12	Y-plane	Y-axis

LTE Band 12

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	ERP	23017 to 23173	23017, 23095, 23173	1.4MHz	QPSK, 16QAM	1 RB / 2 RB Offset
		23025 to 23165	23025, 23095, 23165	3MHz	QPSK, 16QAM	1 RB / 7 RB Offset
		23035 to 23155	23035, 23095, 23155	5MHz	QPSK, 16QAM	1 RB / 12 RB Offset
		23060 to 23130	23060, 23095, 23130	10MHz	QPSK, 16QAM	1 RB / 24 RB Offset
-	Frequency Stability	23017 to 23173	23095	1.4MHz	QPSK	1 RB / 2 RB Offset
		23025 to 23165	23095	3MHz	QPSK	1 RB / 7 RB Offset
		23035 to 23155	23095	5MHz	QPSK	1 RB / 12 RB Offset
		23060 to 23130	23095	10MHz	QPSK	1 RB / 24 RB Offset
-	Occupied Bandwidth	23017 to 23173	23017, 23095, 23173	1.4MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		23025 to 23165	23025, 23095, 23165	3MHz	QPSK, 16QAM	15 RB / 0 RB Offset
		23035 to 23155	23035, 23095, 23155	5MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		23060 to 23130	23060, 23095, 23130	10MHz	QPSK, 16QAM	50 RB / 0 RB Offset
-	Peak to Average Ratio	23017 to 23173	23017, 23095, 23173	1.4MHz	QPSK, 16QAM	1 RB / 2 RB Offset
		23025 to 23165	23025, 23095, 23165	3MHz	QPSK, 16QAM	1 RB / 7 RB Offset
		23035 to 23155	23035, 23095, 23155	5MHz	QPSK, 16QAM	1 RB / 12 RB Offset
		23060 to 23130	23060, 23095, 23130	10MHz	QPSK, 16QAM	1 RB / 24 RB Offset
-	Band Edge	23017 to 23173	23017	1.4MHz	QPSK	1 RB / 0 RB Offset
						6 RB / 0 RB Offset
			23173	1.4MHz	QPSK	1 RB / 5 RB Offset
						6 RB / 0 RB Offset
		23025 to 23165	23025	3MHz	QPSK	1 RB / 0 RB Offset
						15 RB / 0 RB Offset
			23165	3MHz	QPSK	1 RB / 14 RB Offset
						15 RB / 0 RB Offset
		23035 to 23155	23035	5MHz	QPSK	1 RB / 0 RB Offset
						25 RB / 0 RB Offset
			23155	5MHz	QPSK	1 RB / 24 RB Offset
						25 RB / 0 RB Offset
		23060 to 23130	23060	10MHz	QPSK	1 RB / 0 RB Offset
						50 RB / 0 RB Offset
			23130	10MHz	QPSK	1 RB / 49 RB Offset
						50 RB / 0 RB Offset
-	Conducted Emission	23017 to 23173	23095	1.4MHz	QPSK	1 RB / 2 RB Offset
		23025 to 23165	23095	3MHz	QPSK	1 RB / 7 RB Offset
		23035 to 23155	23095	5MHz	QPSK	1 RB / 12 RB Offset
		23060 to 23130	23095	10MHz	QPSK	1 RB / 24 RB Offset
-	Radiated Emission	23060 to 23130	23095	10MHz	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	25deg. C, 65%RH	3.8Vdc	Anson Lin
Frequency Stability	25deg. C, 65%RH	3.8Vdc	Howard Kao
Occupied Bandwidth	25deg. C, 65%RH	3.8Vdc	Howard Kao
Band Edge	25deg. C, 65%RH	3.8Vdc	Howard Kao
Peak to Average Ratio	25deg. C, 65%RH	3.8Vdc	Howard Kao
Condcudeted Emission	25deg. C, 65%RH	3.8Vdc	Howard Kao
Radiated Emission	25deg. C, 65%RH	120Vac, 60Hz	Gavin Wu

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
ANSI/TIA/EIA-603-C 2004

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

Portable stations (hand-held devices) operating in the 699-716 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 5MHz for WCDMA and 10MHz for LTE mode.

b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m 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 1m to 4m 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 - 2.15dBi.

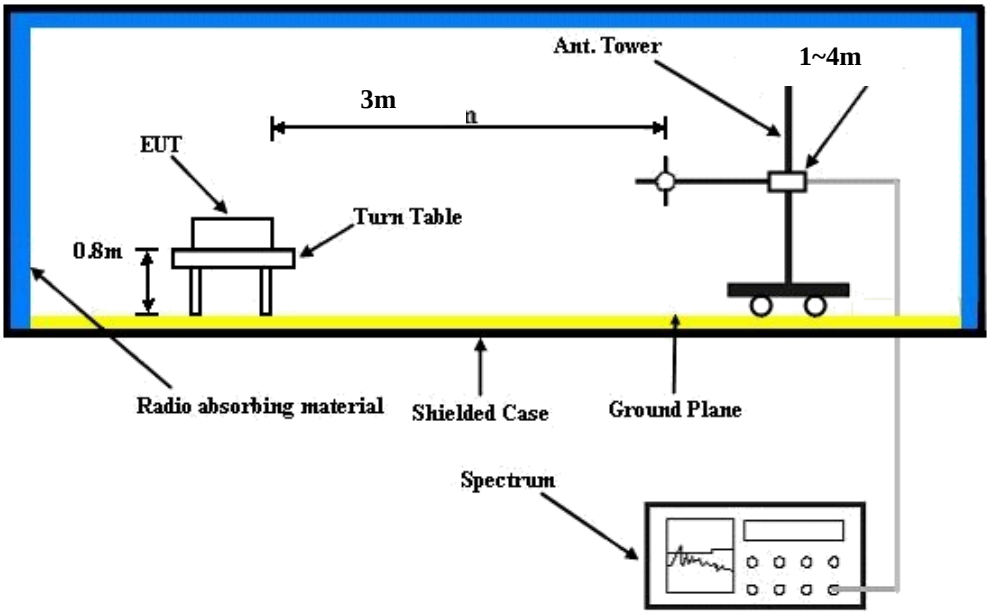
Conducted Power Measurement:

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 23017	Mid Ch 23095	High Ch 23173		Low Ch 23017	Mid Ch 23095	High Ch 23173	
			699.7 MHz	707.5 MHz	715.3 MHz		699.7 MHz	707.5 MHz	715.3 MHz	
12 / 1.4M	1	0	22.18	22.12	22.15	0	21.16	21.10	21.13	1
	1	2	22.21	22.27	22.30	0	21.19	21.25	21.28	1
	1	5	22.14	22.20	22.23	0	21.12	21.18	21.21	1
	3	0	22.08	22.14	22.17	0	21.06	21.12	21.15	1
	3	1	22.19	22.25	22.28	0	21.17	21.23	21.26	1
	3	3	22.12	22.18	22.21	0	21.10	21.16	21.19	1
	6	0	21.24	21.30	21.33	1	20.22	20.28	20.31	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 23025	Mid Ch 23095	High Ch 23165		Low Ch 23025	Mid Ch 23095	High Ch 23165	
			700.5 MHz	707.5 MHz	714.5 MHz		700.5 MHz	707.5 MHz	714.5 MHz	
12 / 3M	1	0	22.30	22.24	22.27	0	21.27	21.21	21.24	1
	1	7	22.33	22.39	22.42	0	21.30	21.36	21.39	1
	1	14	22.26	22.32	22.35	0	21.23	21.29	21.32	1
	8	0	21.30	21.36	21.39	1	20.27	20.33	20.36	2
	8	3	21.41	21.47	21.50	1	20.38	20.44	20.47	2
	8	7	21.34	21.40	21.43	1	20.31	20.37	20.40	2
	15	0	21.36	21.42	21.45	1	20.33	20.39	20.42	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 23035	Mid Ch 23095	High Ch 23155		Low Ch 23035	Mid Ch 23095	High Ch 23155	
			701.5 MHz	707.5 MHz	713.5 MHz		701.5 MHz	707.5 MHz	713.5 MHz	
12 / 5M	1	0	22.43	22.37	22.40	0	21.41	21.35	21.38	1
	1	12	22.46	22.52	22.55	0	21.44	21.50	21.53	1
	1	24	22.39	22.45	22.48	0	21.37	21.43	21.46	1
	12	0	21.43	21.49	21.52	1	20.41	20.47	20.50	2
	12	6	21.54	21.60	21.63	1	20.52	20.58	20.61	2
	12	13	21.47	21.53	21.56	1	20.45	20.51	20.54	2
	25	0	21.49	21.55	21.58	1	20.47	20.53	20.56	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 23060	Mid Ch 23095	High Ch 23130		Low Ch 23060	Mid Ch 23095	High Ch 23130	
			704.0 MHz	707.5 MHz	711.0 MHz		704.0 MHz	707.5 MHz	711.0 MHz	
12 / 10M	1	0	22.57	22.51	22.54	0	21.54	21.48	21.51	1
	1	24	22.60	22.66	22.69	0	21.57	21.63	21.66	1
	1	49	22.53	22.59	22.62	0	21.50	21.56	21.59	1
	25	0	21.57	21.63	21.66	1	20.54	20.60	20.63	2
	25	12	21.68	21.74	21.77	1	20.65	20.71	20.74	2
	25	25	21.61	21.67	21.70	1	20.58	20.64	20.67	2
	50	0	21.63	21.69	21.72	1	20.60	20.66	20.69	2

ERP Power (dBm)

LTE Band 12							
Channel Bandwidth: 1.4MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)
Y	23017	699.7	-11.26	30.36	16.95	49.55	H
	23095	707.5	-11.27	30.17	16.75	47.32	
	23173	715.3	-11.55	30.17	16.47	44.36	
	23017	699.7	-20.45	32.03	9.43	8.77	V
	23095	707.5	-20.62	31.98	9.21	8.34	
	23173	715.3	-20.54	32.06	9.37	8.65	

LTE Band 12							
Channel Bandwidth: 1.4MHz / 16QAM							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)
Y	23017	699.7	-12.29	30.36	15.92	39.08	H
	23095	707.5	-12.42	30.17	15.60	36.31	
	23173	715.3	-12.34	30.17	15.68	36.98	
	23017	699.7	-21.49	32.03	8.39	6.90	V
	23095	707.5	-21.69	31.98	8.14	6.52	
	23173	715.3	-21.75	32.06	8.16	6.55	

LTE Band 12							
Channel Bandwidth: 3MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)
Y	23025	700.5	-11.11	30.17	16.91	49.09	H
	23095	707.5	-11.48	30.17	16.54	45.08	
	23165	714.5	-11.32	30.18	16.71	46.88	
	23025	700.5	-20.36	31.96	9.45	8.81	V
	23095	707.5	-20.69	31.98	9.14	8.20	
	23165	714.5	-20.44	32.03	9.44	8.79	

LTE Band 12							
Channel Bandwidth: 3MHz / 16QAM							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)
Y	23025	700.5	-12.25	30.17	15.77	37.76	H
	23095	707.5	-12.35	30.17	15.67	36.90	
	23165	714.5	-12.24	30.18	15.79	37.93	
	23025	700.5	-21.56	31.96	8.25	6.68	V
	23095	707.5	-21.85	31.98	7.98	6.28	
	23165	714.5	-21.99	32.03	7.89	6.15	

LTE Band 12							
Channel Bandwidth: 5MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)
Y	23035	701.5	-10.86	30.17	17.16	52.00	H
	23095	707.5	-10.96	30.17	17.06	50.82	
	23155	713.5	-10.92	30.18	17.11	51.40	
	23035	701.5	-20.11	31.96	9.70	9.33	V
	23095	707.5	-20.26	31.98	9.57	9.06	
	23155	713.5	-20.33	32.03	9.55	9.02	

LTE Band 12							
Channel Bandwidth: 5MHz / 16QAM							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)
Y	23035	701.5	-11.32	30.17	16.70	46.77	H
	23095	707.5	-11.55	30.17	16.47	44.36	
	23155	713.5	-11.78	30.18	16.25	42.17	
	23035	701.5	-21.69	31.96	8.12	6.49	V
	23095	707.5	-21.81	31.98	8.02	6.34	
	23155	713.5	-21.88	32.03	8.00	6.31	

LTE Band 12							
Channel Bandwidth: 10MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)
Y	23060	704.0	-10.35	30.17	17.67	58.48	H
	23095	707.5	-10.47	30.17	17.55	56.89	
	23130	711.0	-10.69	30.18	17.34	54.20	
	23060	704.0	-19.96	31.96	9.85	9.66	V
	23095	707.5	-20.06	31.98	9.77	9.48	
	23130	711.0	-20.26	32.03	9.62	9.16	

LTE Band 12							
Channel Bandwidth: 10MHz / 16QAM							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)
Y	23060	704.0	-11.35	30.17	16.67	46.45	H
	23095	707.5	-11.96	30.17	16.06	40.36	
	23130	711.0	-11.58	30.18	16.45	44.16	
	23060	704.0	-21.03	31.96	8.78	7.55	V
	23095	707.5	-21.66	31.98	8.17	6.56	
	23130	711.0	-21.35	32.03	8.53	7.13	

4.2 Frequency Stability Measurement

4.2.1 Limits of Frequency Stabiliity Measurement

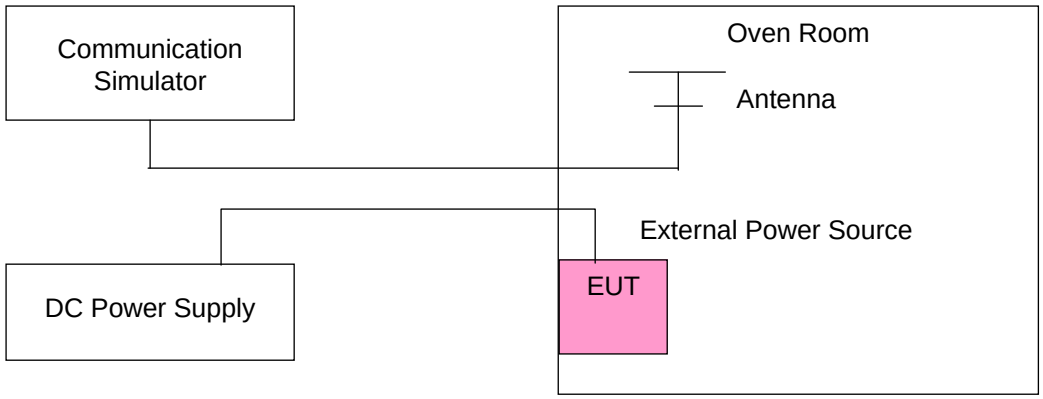
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

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 12				
	1.4MHz	3MHz	5MHz	10MHz	
3.8	0.000734982	0.002035336	0.001964664	0.003250883	2.5
3.4	0.002911661	0.003363958	0.001130742	0.002120141	2.5
4.2	0.001978799	0.005583039	0.004452297	0.002855124	2.5

NOTE: The applicant defined the normal working voltage of the battery is from 3.4Vdc to 4.2Vdc.

Frequency Error vs. Temperature

Temp. (℃)	Frequency Error (ppm)				Limit (ppm)
	LTE Band 12				
	1.4MHz	3MHz	5MHz	10MHz	
-30	0.00135689	0.005371025	0.005583039	0.001045936	2.5
-20	0.001173145	0.004890459	0.002360424	0.000226148	2.5
-10	0.001257951	0.000621908	0.002360424	0.000720848	2.5
0	0.005074205	0.005413428	0.001187279	0.002077739	2.5
10	0.001766784	0.00059364	0.002572438	0.005201413	2.5
20	-0.00555477	-0.001583039	-0.001229682	-0.001257951	2.5
30	-0.001159011	-0.003646643	-0.004028269	-0.003731449	2.5
40	-0.003646643	-0.005625442	-0.004706714	-0.003067138	2.5
50	-0.002261484	-0.000522968	-0.000819788	-0.004466431	2.5

4.3 Occupied Bandwidth Measurement

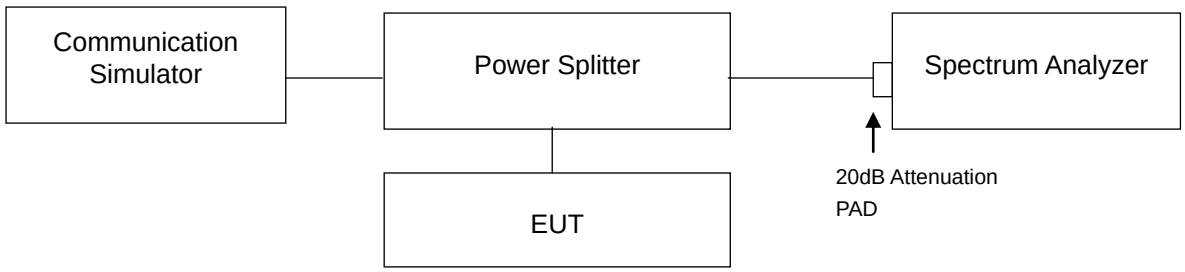
4.3.1 Limits Of Occupied Bandwidth Measurement

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

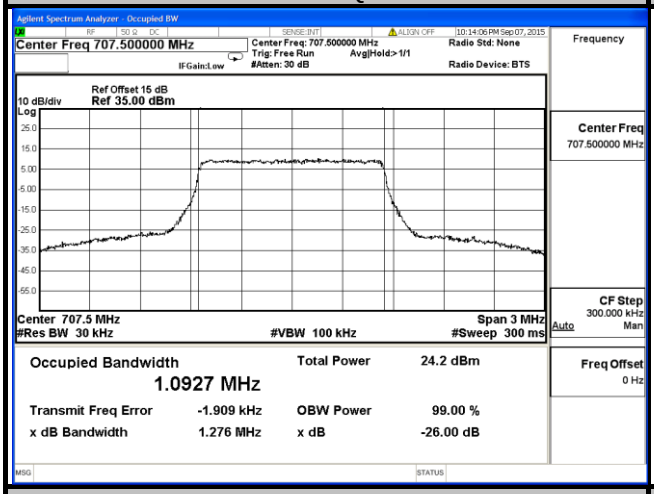


4.3.4 Test Result

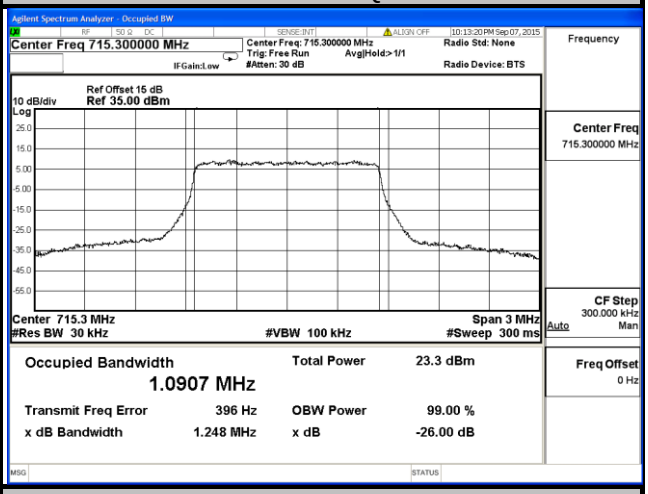
LTE Band 12							
Channel Bandwidth: 1.4MHz				Channel Bandwidth: 3MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)		Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
23017	699.7	1.0924	1.0906	23025	700.5	2.6963	2.6971
23095	707.5	1.0927	1.0900	23095	707.5	2.6975	2.6999
23173	715.3	1.0907	1.0907	23165	714.5	2.7011	2.6994

Spectrum Plot of Worst Value

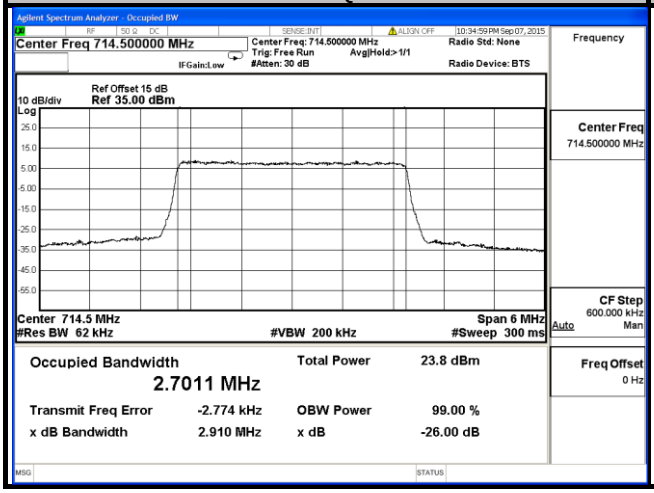
1.4MHz / QPSK



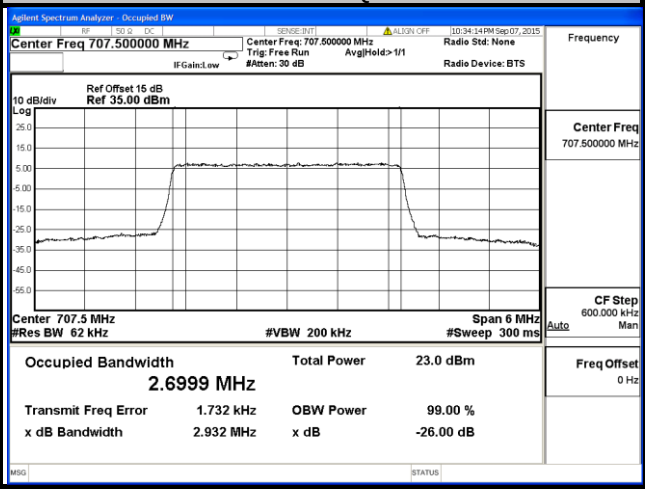
1.4MHz / 16QAM



3MHz / QPSK



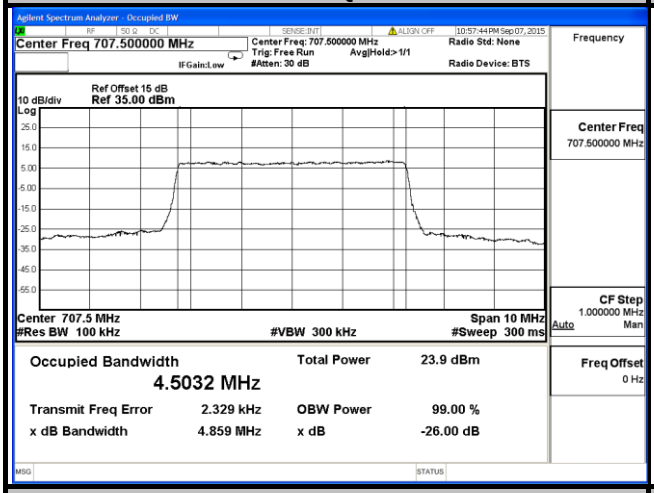
3MHz / 16QAM



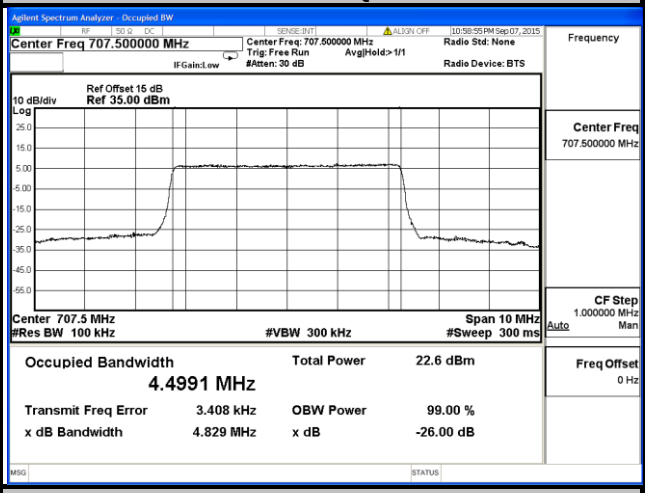
LTE Band 12							
Channel Bandwidth: 5MHz				Channel Bandwidth: 10MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)		Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
23035	701.5	4.4977	4.4930	23060	704.0	8.9857	8.9886
23095	707.5	4.5032	4.4991	23095	707.5	8.9979	8.9981
23155	713.5	4.4981	4.4974	23130	711.0	8.9711	8.9683

Spectrum Plot of Worst Value

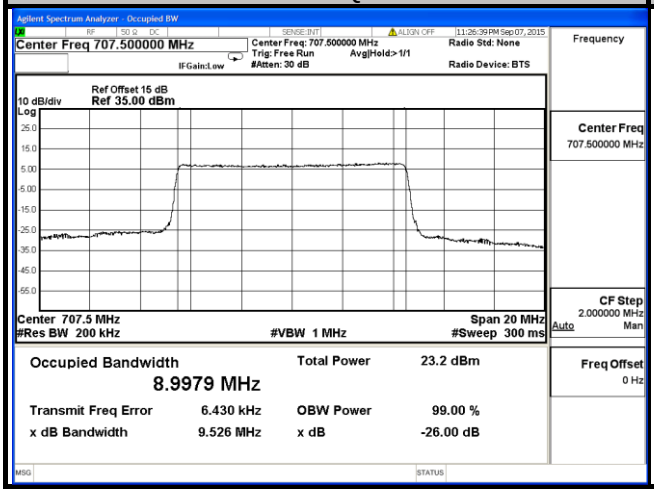
5MHz / QPSK



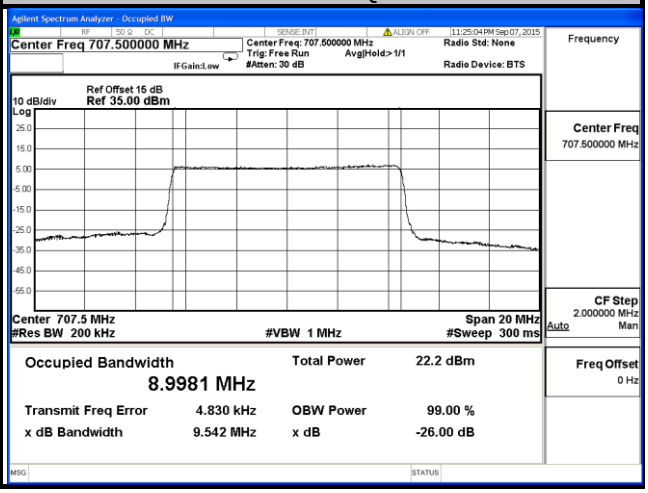
5MHz / 16QAM



10MHz / QPSK



10MHz / 16QAM

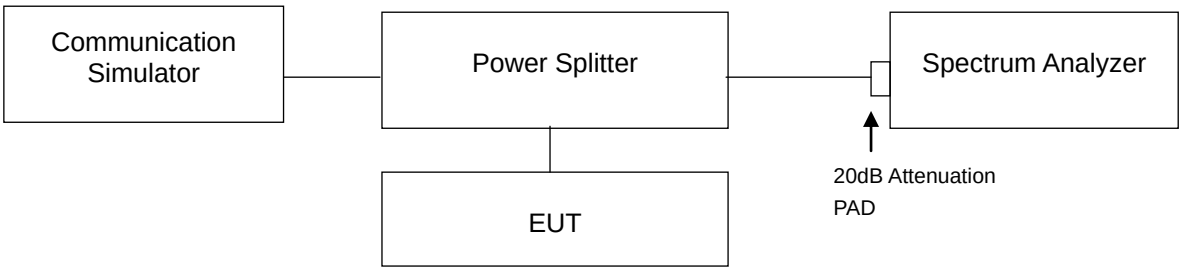


4.4 Band Edge Measurement

4.4.1 Limits of Band Edge Measurement

For operations in the 699-716 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.

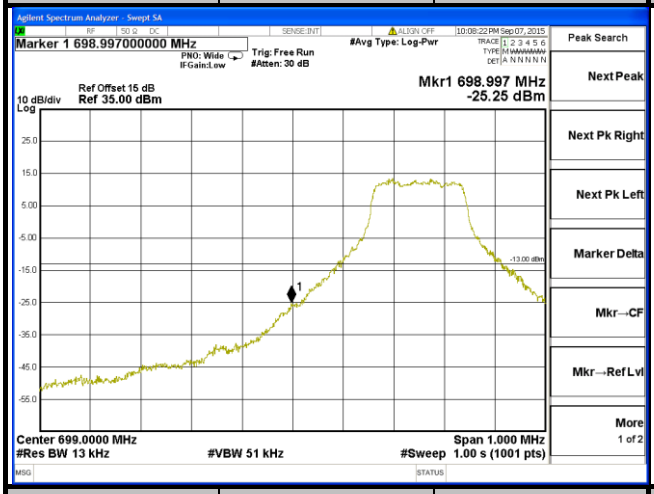
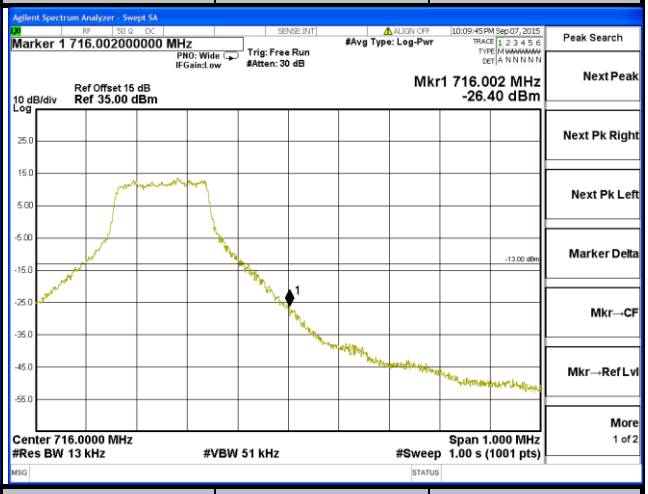
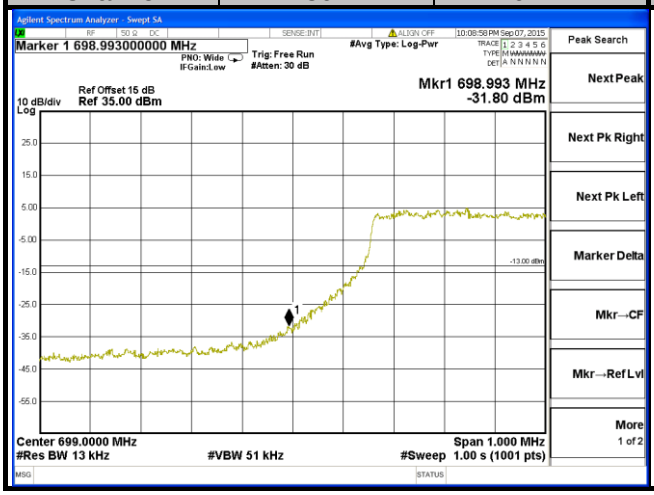
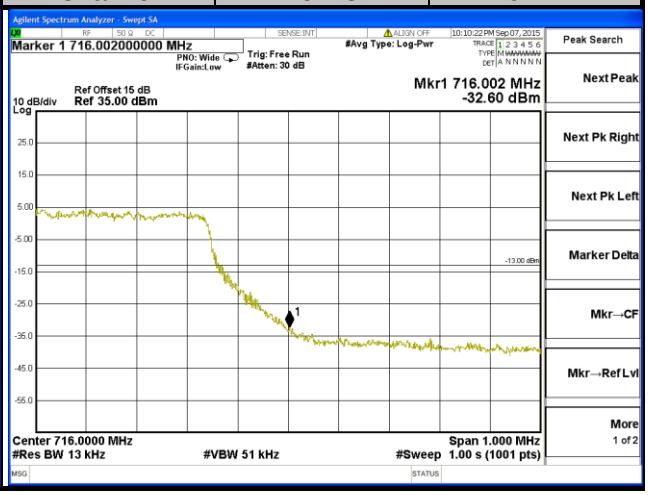
4.4.2 Test Setup

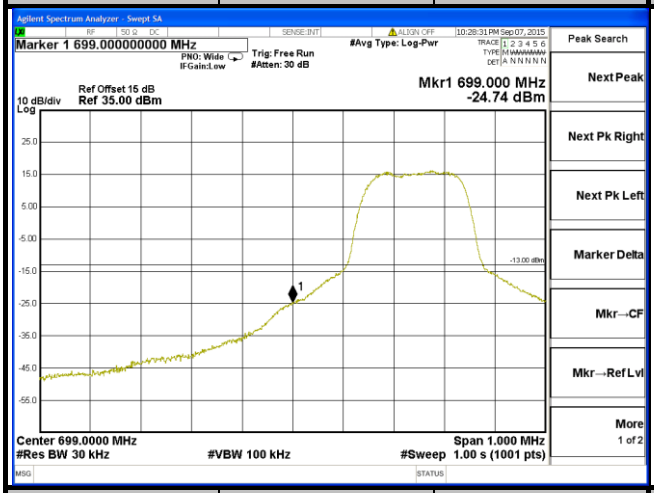
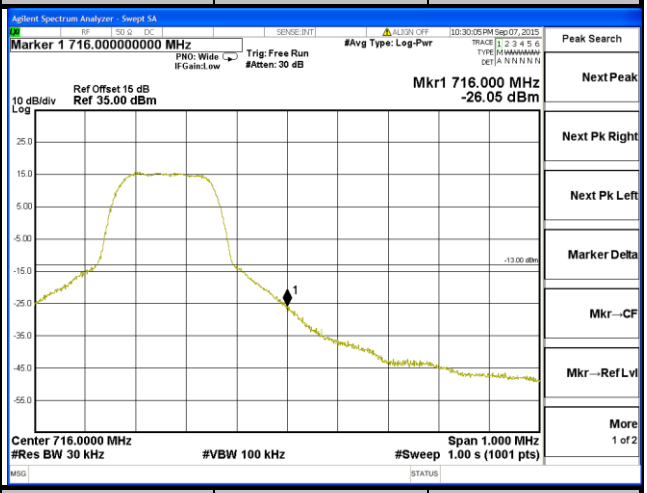
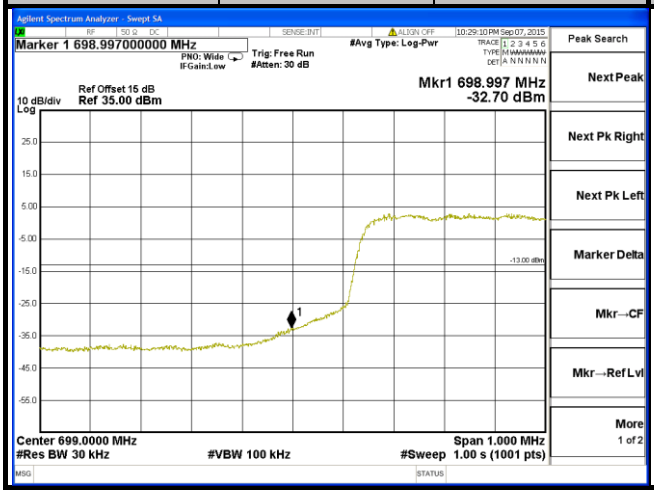
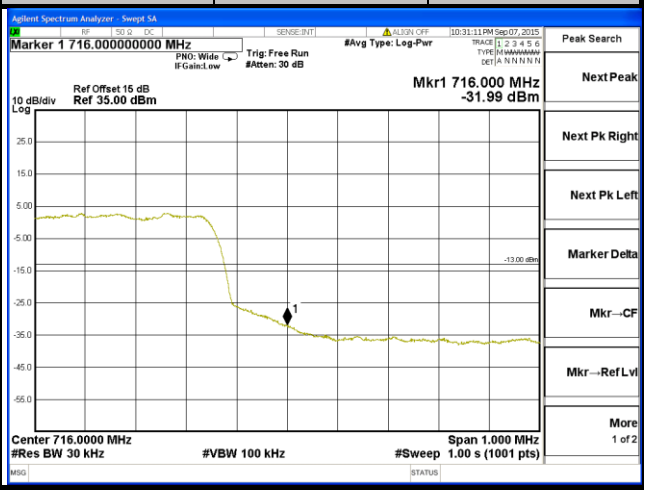


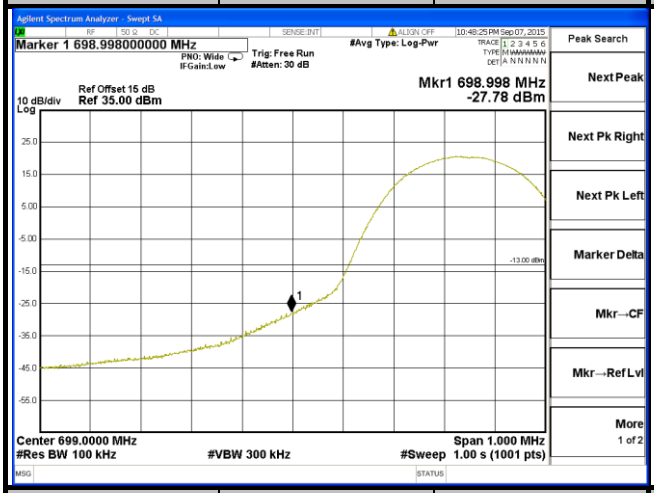
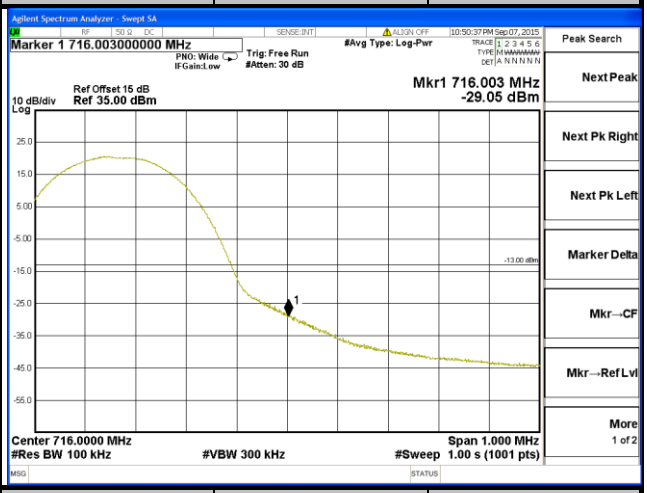
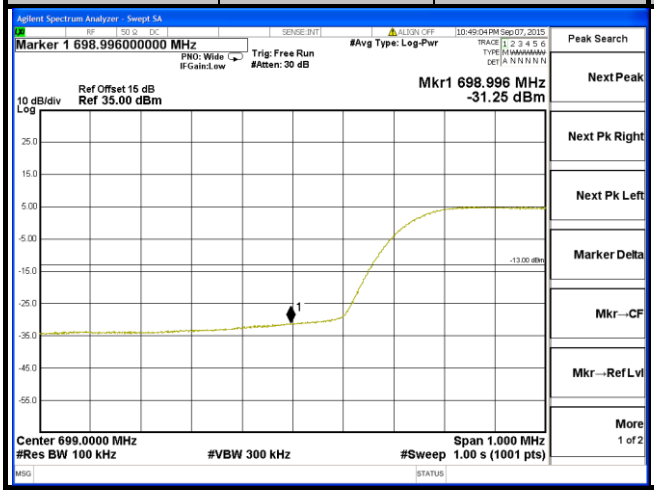
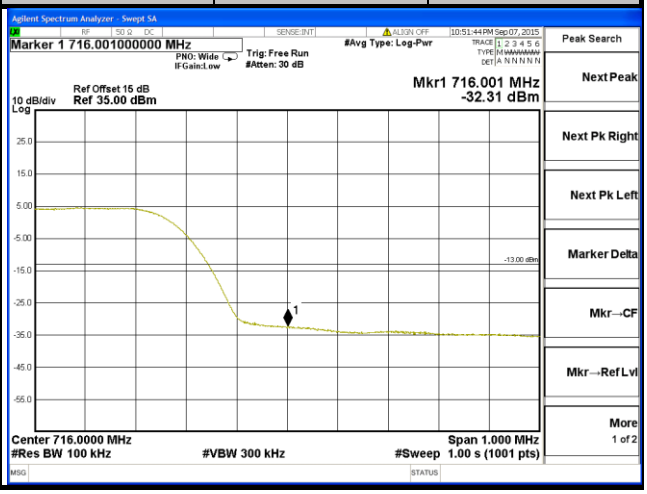
4.4.3 Test Procedures

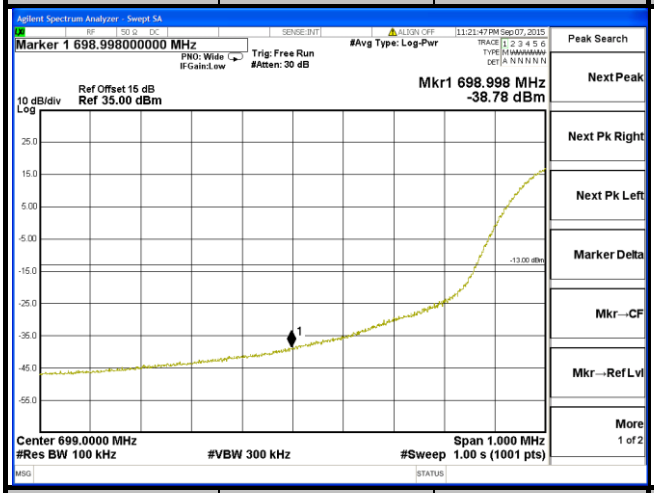
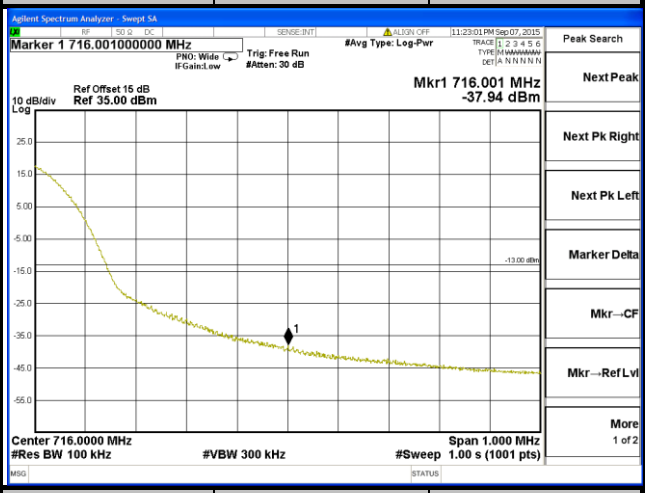
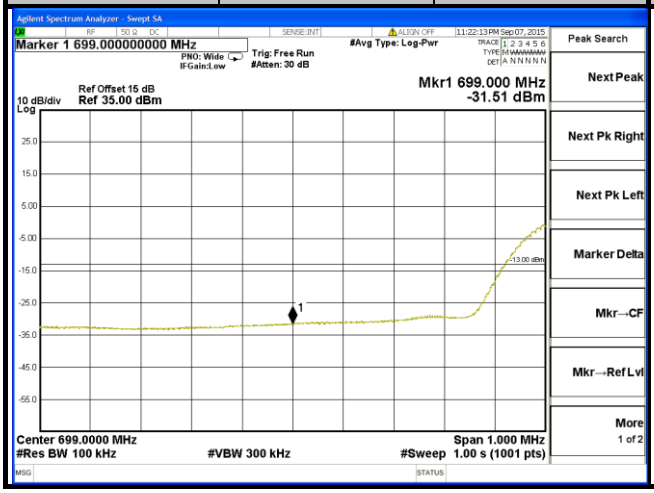
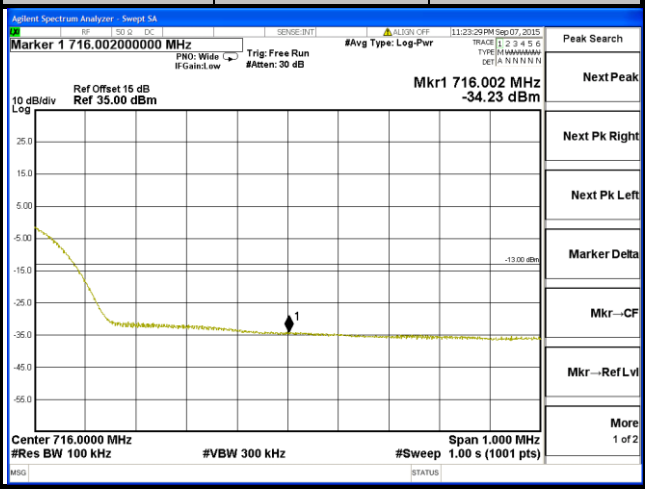
a. All measurements were done at low and high operational frequency range.
b. The center frequency of spectrum is the band edge frequency and span is 5MHz. RB of the spectrum is 100kHz and VB of the spectrum is 300kHz (WCDMA).
c. The center frequency of spectrum is the band edge frequency and span is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

4.4.4 Test Results

LTE Band 12					
CHANNEL BANDWIDTH: 1.4MHz					
Channel	23017	1 RB	Channel	23173	1 RB
					
Channel	23017	6 RB	Channel	23173	6 RB
					

LTE Band 12					
Channel Bandwidth: 3MHz					
Channel	23025	1 RB	Channel	23165	1 RB
					
Channel	23025	15 RB	Channel	23165	15 RB
					

LTE Band 12					
Channel Bandwidth: 5MHz					
Channel	23035	1 RB	Channel	23155	1 RB
					
Channel	23035	25 RB	Channel	23155	25 RB
					

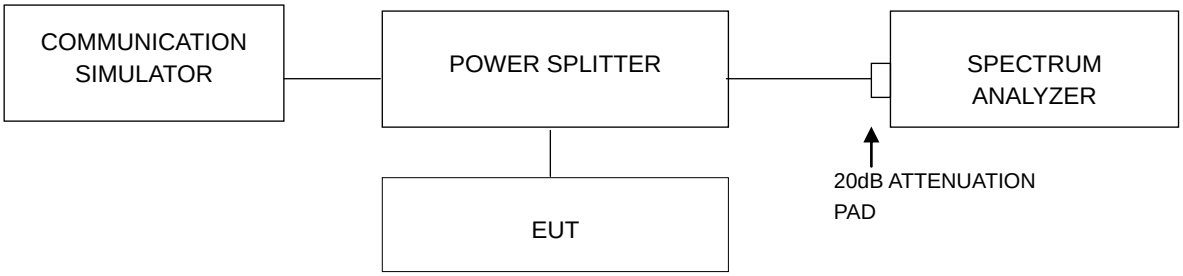
LTE Band 12					
Channel Bandwidth: 10MHz					
Channel	23060	1 RB	Channel	23130	1 RB
					
Channel	23060	50 RB	Channel	23130	50 RB
					

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

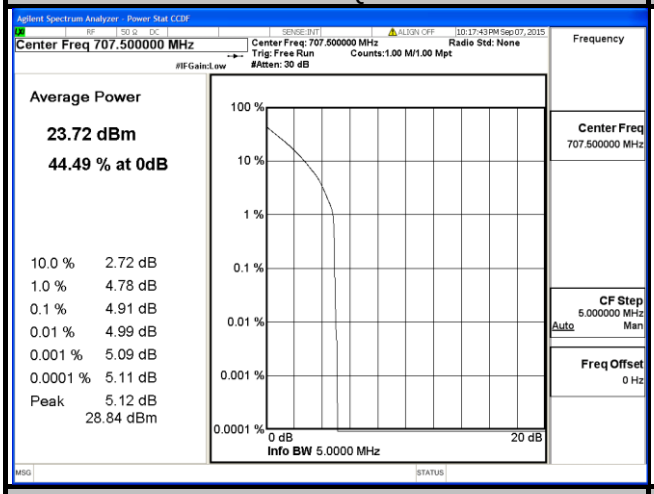
1. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1%.

4.5.4 Test Results

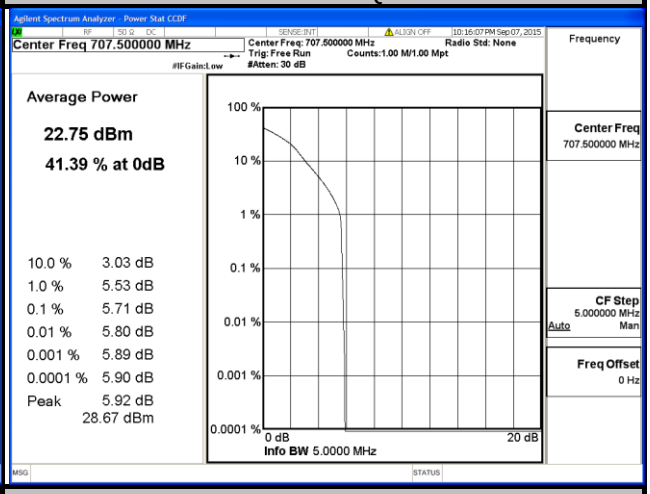
LTE Band 12							
Channel Bandwidth: 1.4MHz				Channel Bandwidth: 3MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
23017	699.7	4.49	5.36	23025	700.5	4.82	5.54
23095	707.5	4.91	5.71	23095	707.5	4.90	5.72
23173	715.3	4.82	5.60	23165	714.5	4.87	5.61

Spectrum Plot of Worst Value

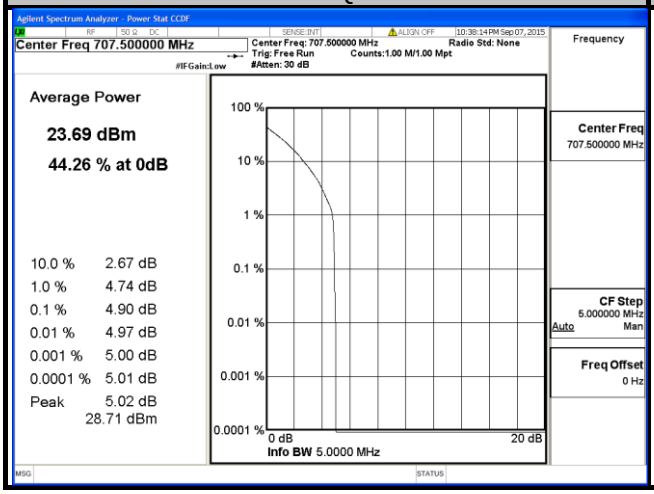
1.4MHz / QPSK



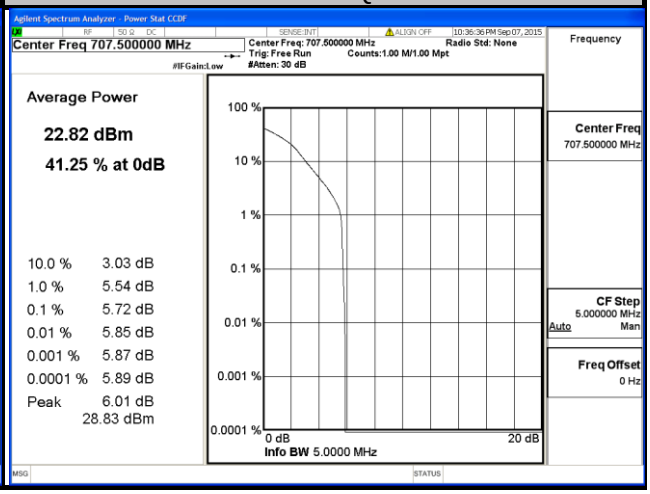
1.4MHz / 16QAM



3MHz / QPSK



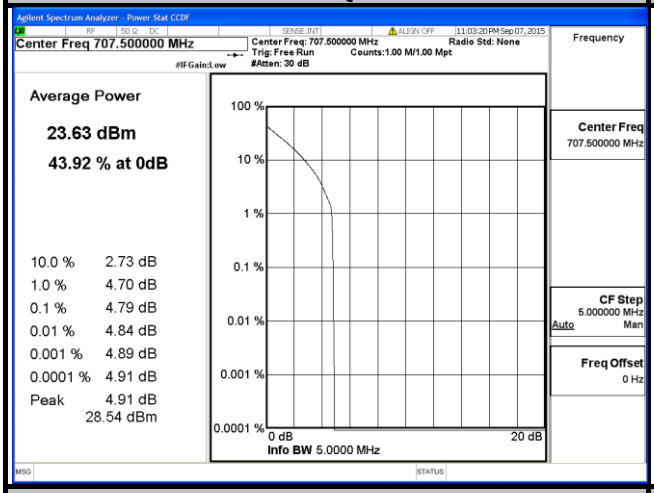
3MHz / 16QAM



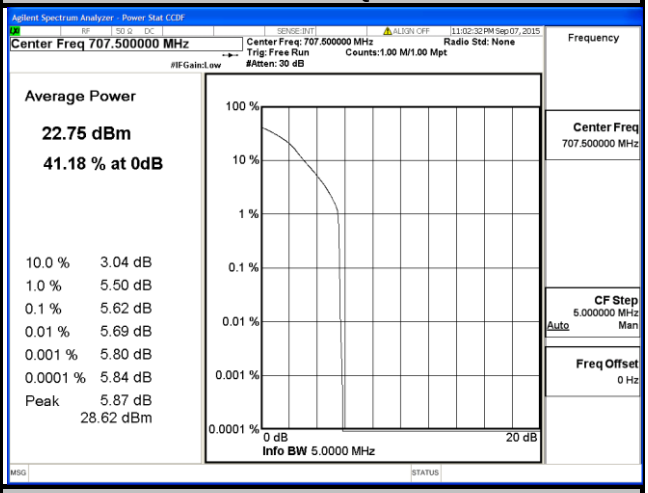
LTE Band 12							
Channel Bandwidth: 5MHz				Channel Bandwidth: 10MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
23035	701.5	4.55	5.53	23060	704.0	4.45	5.48
23095	707.5	4.79	5.62	23095	707.5	4.69	5.48
23155	713.5	4.64	5.41	23130	711.0	4.92	5.78

Spectrum Plot of Worst Value

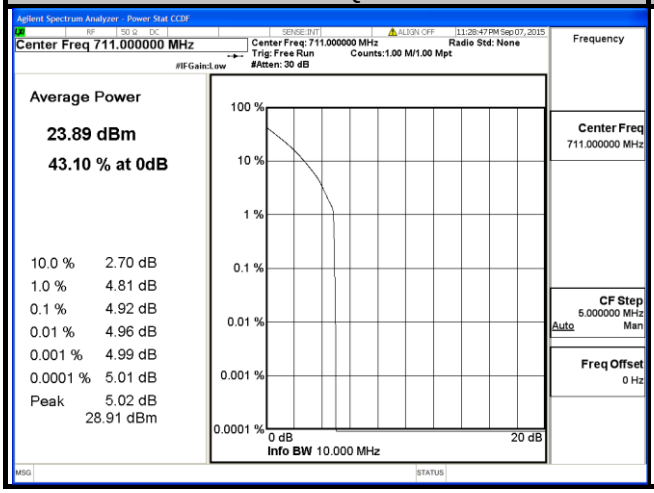
5MHz / QPSK



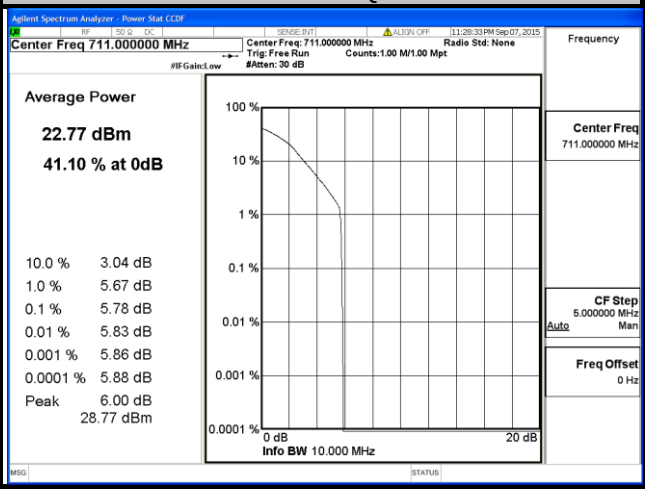
5MHz / 16QAM



10MHz / QPSK



10MHz / 16QAM

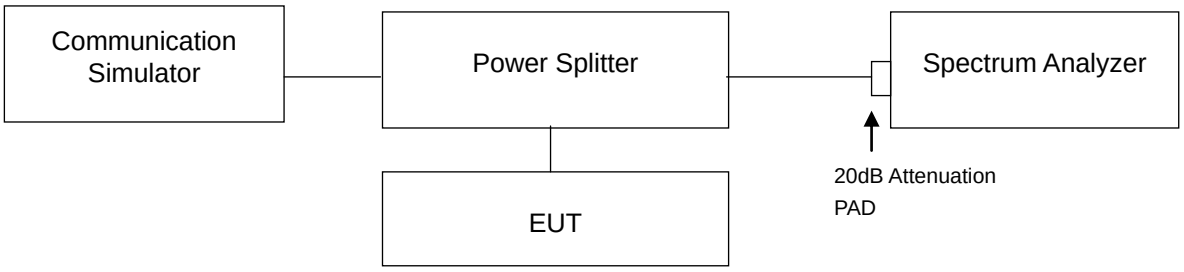


4.6 Conducted Spurious Emissions

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 -13dBm.

4.6.2 Test Setup

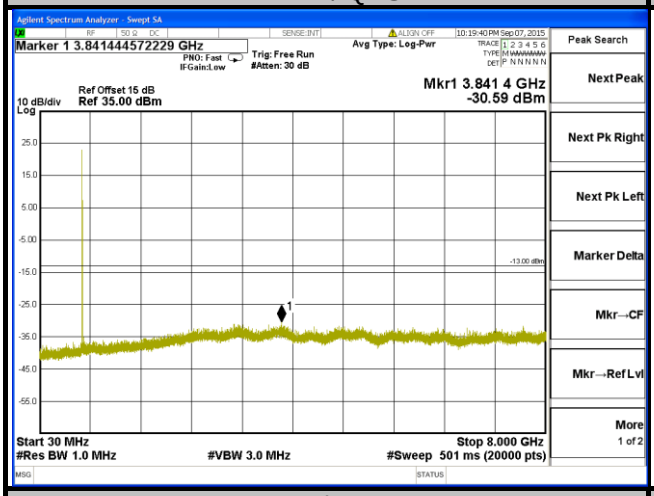
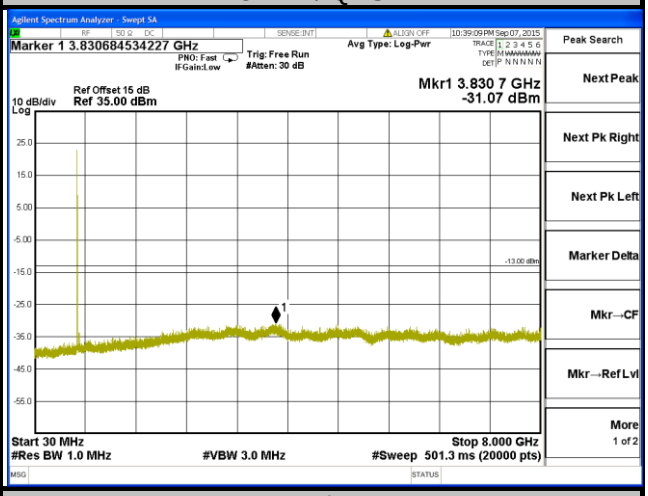
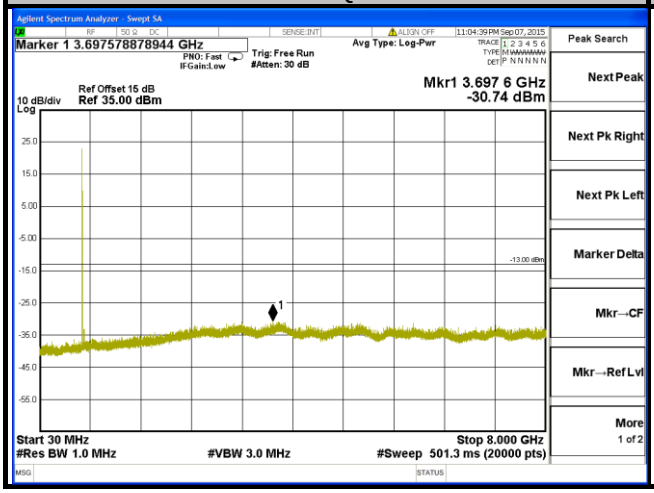
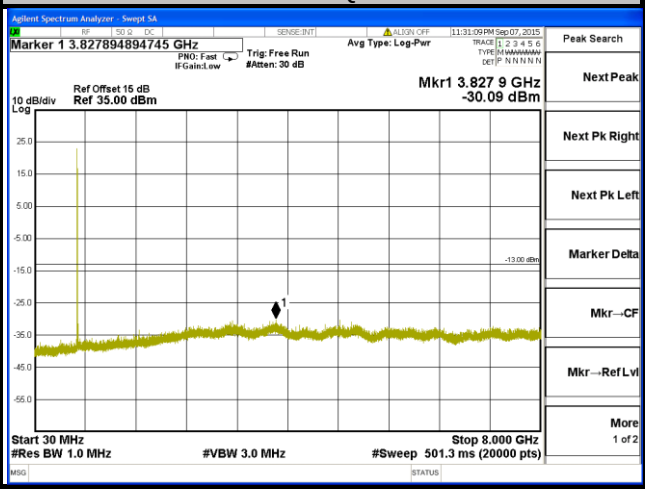


4.6.3 Test Procedure

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 8GHz. 10dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz are used for conducted emission measurement.

4.6.4 Test Results

Frequency Range: 30MHz~8GHz

LTE Band 12	
Channel 23095	
1.4MHz / QPSK	3MHz / QPSK
	
5MHz / QPSK	10MHz / 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 equal to -13dBm.

4.7.2 Test Procedure

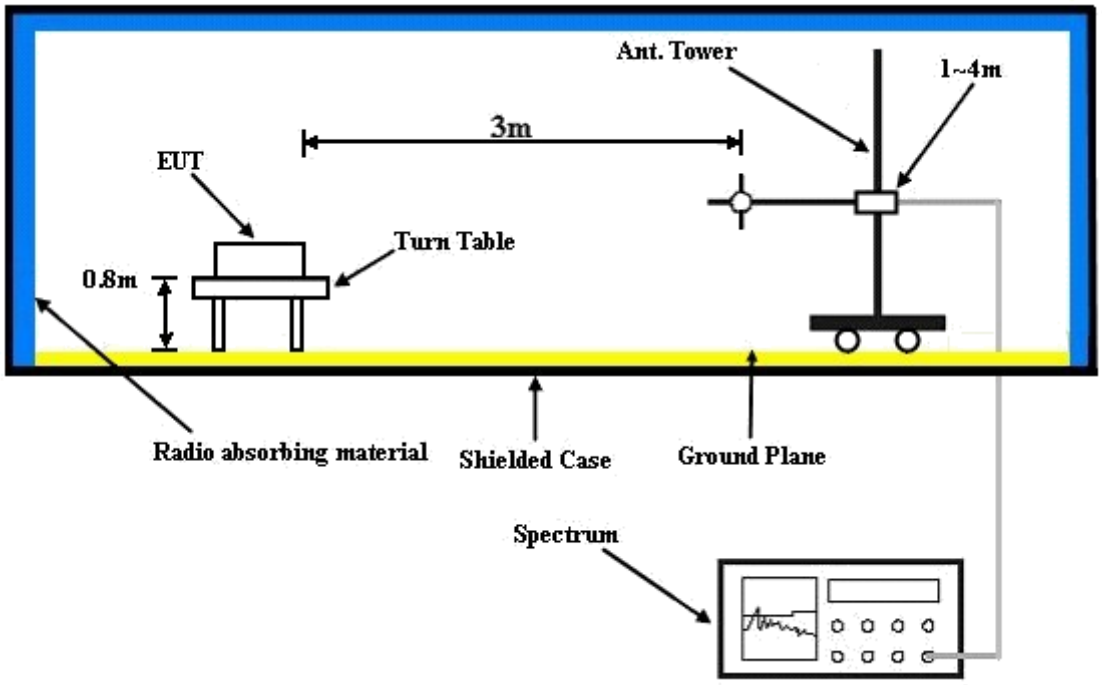
a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m 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 - 2.15dBi.

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



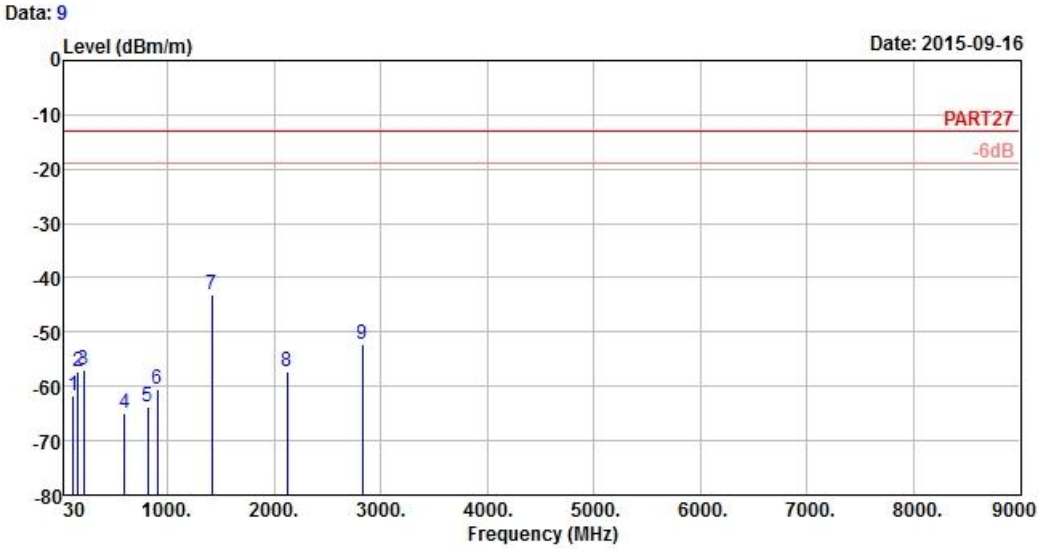
For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.7.5 Test Results

LTE Band 12

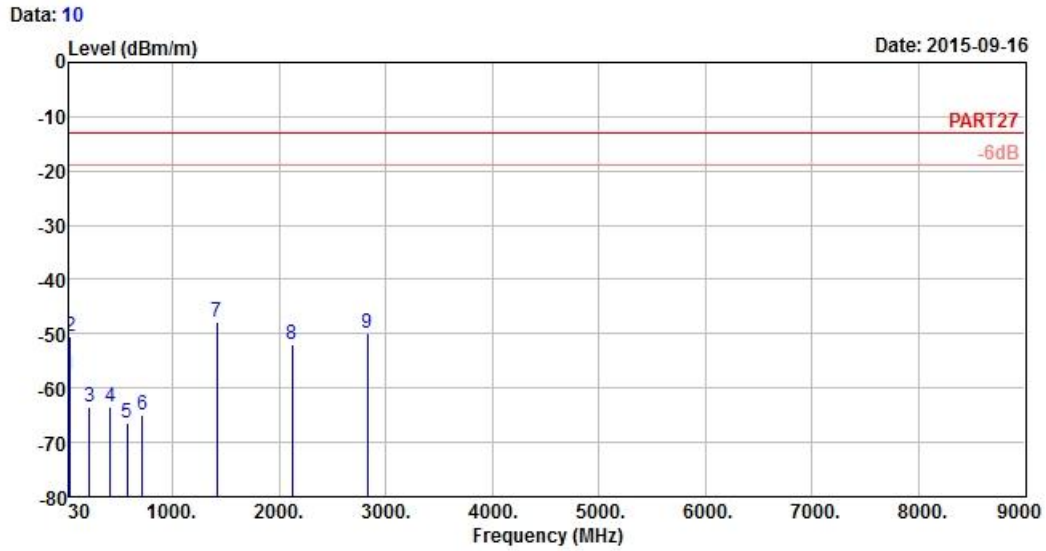
Channel Bandwidth: 10MHz / QPSK

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27 3m HORIZONTAL
Remak : LTE Band 12_QPSK_10M(1.24)
Tested by: Gavin Wu
Plane : Y

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm/m	dBm	dBm/m	dB	dB/m	
1	114.51	-61.81	-51.70	-13.00	-48.81	-10.11	Peak
2	159.60	-57.41	-52.57	-13.00	-44.41	-4.84	Peak
3	213.87	-56.91	-49.47	-13.00	-43.91	-7.44	Peak
4	596.80	-64.83	-63.92	-13.00	-51.83	-0.91	Peak
5	813.80	-63.71	-64.32	-13.00	-50.71	0.61	Peak
6	900.60	-60.51	-61.11	-13.00	-47.51	0.60	Peak
7 pp	1415.00	-43.12	-28.78	-13.00	-30.12	-14.34	Peak
8	2122.50	-57.17	-44.93	-13.00	-44.17	-12.24	Peak
9	2830.00	-52.16	-42.45	-13.00	-39.16	-9.71	Peak



Site : 966 Chamber 5
Condition: PART27 3m VERTICAL
Remak : LTE Band 12_QPSK_10M(1.24)
Tested by: Gavin Wu
Plane : Y

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm/m	dBm	dBm/m	dB	dB/m	
1	30.54	-57.68	-57.57	-13.00	-44.68	-0.11	Peak
2	40.80	-50.53	-50.65	-13.00	-37.53	0.12	Peak
3	221.16	-63.42	-56.26	-13.00	-50.42	-7.16	Peak
4	419.00	-63.37	-57.58	-13.00	-50.37	-5.79	Peak
5	572.30	-66.39	-64.47	-13.00	-53.39	-1.92	Peak
6	716.50	-64.96	-65.19	-13.00	-51.96	0.23	Peak
7 pp	1415.00	-47.86	-33.52	-13.00	-34.86	-14.34	Peak
8	2122.50	-51.99	-39.75	-13.00	-38.99	-12.24	Peak
9	2830.00	-49.95	-40.24	-13.00	-36.95	-9.71	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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Fax: 886-2-26051924

Hsin Chu EMC/RF Lab/Telecom Lab
Tel: 886-3-5935343
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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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