FCC Test Report

(PART 27)

Report No.:	RF171122C17-3
FCC ID:	HD5-CT60L1N
Test Model:	CT60L1N
Received Date:	Nov. 22, 2017
Test Date:	Dec. 06, 2017 ~ Dec. 24, 2017
Issued Date:	Jan. 08, 2017
Applicant:	Honeywell International Inc.
Address:	9680 Old Bailes Road, Fort Mill, SC 29707 USA
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C)
Test Location:	No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.
FCC Registration / Designation Number:	788550 / TW0003

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Release Control Record

Issue No.	Description	Date Issued
RF171122C17-3	Original Release	Jan. 08, 2017

1 Certificate of Conformity

Product: Dolphin CT60

Brand: Honeywell

Test Model: CT60L1N

Sample Status: Engineering sample

Applicant: Honeywell International Inc.

Test Date: Dec. 06, 2017 ~ Dec. 24, 2017

Standards: FCC Part 27, Subpart C, L

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

Prepared by : Evonne Liu , **Date:** Jan. 08, 2017

Evonne Liu / Specialist

Approved by : Dylan Chiou , **Date:** Jan. 08, 2017

Dylan Chiou / Project Engineer

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 -33.54 dB at 41.64 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 -34.87 dB at 43.58 MHz.

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 -32.52 dB at 42.61 MHz.

Applied Standard: FCC Part 27 & Part 2 (LTE 13)			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 27.50(b)(10)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
2.1055 27.54	Frequency Stability	Pass	Meet the requirement of limit.
2.1049 27.53(g)	Occupied Bandwidth	Pass	Meet the requirement of limit.
27.50(d)(5)	Peak to Average Ratio	Pass	Meet the requirement of limit.
27.53(g)	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 27.53(g)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 27.53(g)(f)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -22.54 dB at 1564 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 -33.67 dB at 41.64 MHz.

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expended Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.44 dB
Radiated Emissions up to 1 GHz	30 MHz ~ 200 MHz	2.93 dB
	200 MHz ~ 1000 MHz	2.95 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB

2.2 Test Site and Instruments

Description & Manaufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY51210203	Feb. 17, 2017	Feb. 16, 2018
Spectrum Analyzer Agilent	N9010A	MY52220314	Dec. 16, 2016	Dec. 15, 2017
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	100115	Nov. 23, 2017	Nov. 22, 2018
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Dec. 13, 2016	Dec. 12, 2017
			Dec. 06, 2017	Dec. 05, 2018
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-969	Dec. 27, 2016	Dec. 26, 2017
Double Ridge Guide Horn Antenna EMCO	3115	5619	Dec. 15, 2016	Dec. 14, 2017
BILOG Antenna SCHWARZBECK	VULB 9168	9168-153	Dec. 13, 2016	Dec. 12, 2017
			Dec. 06, 2017	Dec. 05, 2018
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Dec. 14, 2016	Dec. 13, 2017
			Dec. 01, 2017	Nov. 30, 2018
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-400)	Jun. 23, 2017	Jun. 22, 2018
MXG Vector signal generator Agilent	N5182B	MY53050430	Oct. 24, 2017	Oct. 23, 2018
Loop Antenna	EM-6879	269	Aug. 11, 2017	Aug. 10, 2018
Preamplifier EMCI	EMC001340	980201	Nov. 01, 2017	Oct. 30, 2018
Bluetooth Tester	CBT	100946	Jul. 29, 2016	Jul. 28, 2018
Preamplifier EMCI	EMC 012645	980115	Oct. 20, 2017	Oct. 19, 2018
Preamplifier EMCI	EMC 184045	980116	Oct. 20, 2017	Oct. 19, 2018
Preamplifier EMCI	EMC 330H	980112	Oct. 13, 2017	Oct. 12, 2018
Power Meter Anritsu	ML2495A	1012010	Aug. 15, 2017	Aug. 14, 2018
Power Sensor Anritsu	MA2411B	1315050	Aug. 15, 2017	Aug. 14, 2018

Description & Manaufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
RF Coaxial Cable HUBER+SUHNNER	EMC104-SM-SM-8000&3000	140811+170717	Oct. 20, 2017	Oct. 19, 2018
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM-1000(140807)	Oct. 20, 2017	Oct. 19, 2018
RF Coaxial Cable Worken	8D-FB	Cable-Ch10-01	Oct. 20, 2017	Oct. 19, 2018
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 / 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 10.
3. The horn antenna and preamplifier (model: EMC 184045) are used only for the measurement of emission frequency above 1 GHz if tested.
4. The IC Site Registration No. is IC7450F-10.

3 General Information

3.1 General Description of EUT

Product	Dolphin CT60	
Brand	Honeywell	
Test Model	CT60L1N	
Status of EUT	Engineering sample	
HW Version	V1.0	
HW P/N	DVT3	
SW Version	OS.01.001-HON.01.003	
SW P/N	329D	
Power Supply Rating	3.6 Vdc (Li-ion battery)	
Modulation Type	WCDMA	QPSK
	LTE	QPSK, 16QAM, 64QAM
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 12 (Channel Bandwidth: 1.4 MHz)	699.7 ~ 715.3 MHz
	LTE Band 12 (Channel Bandwidth: 3 MHz)	700.5 ~ 714.5 MHz
	LTE Band 12 (Channel Bandwidth: 5 MHz)	701.5 ~ 713.5 MHz
	LTE Band 12 (Channel Bandwidth: 10 MHz)	704.0 ~ 711.0 MHz
	LTE Band 13 (Channel Bandwidth: 5 MHz)	779.5 ~ 784.5 MHz
	LTE Band 13 (Channel Bandwidth: 10 MHz)	782.0 MHz
	LTE Band 17 (Channel Bandwidth: 5 MHz)	706.5 ~ 713.5 MHz
	LTE Band 17 (Channel Bandwidth: 10 MHz)	709.0 ~ 711.0 MHz
Emission Designator	WCDMA	4M15F9W
	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	1M09W7D
	LTE Band 4 (Channel Bandwidth: 3 MHz)	2M70G7D
	LTE Band 4 (Channel Bandwidth: 5 MHz)	4M50W7D
	LTE Band 4 (Channel Bandwidth: 10 MHz)	8M99W7D
	LTE Band 4 (Channel Bandwidth: 15 MHz)	13M4G7D
	LTE Band 4 (Channel Bandwidth: 20 MHz)	18M0W7D
	LTE Band 12 (Channel Bandwidth: 1.4 MHz)	1M09W7D
	LTE Band 12 (Channel Bandwidth: 3 MHz)	2M70G7D
	LTE Band 12 (Channel Bandwidth: 5 MHz)	4M50W7D
	LTE Band 12 (Channel Bandwidth: 10 MHz)	8M99W7D
	LTE Band 13 (Channel Bandwidth: 5 MHz)	4M50W7D
	LTE Band 13 (Channel Bandwidth: 10 MHz)	8M95W7D
	LTE Band 17 (Channel Bandwidth: 5 MHz)	4M5W7D
	LTE Band 17 (Channel Bandwidth: 10 MHz)	9M0W7D

Max. ERP Power	LTE Band 12 (Channel Bandwidth: 1.4 MHz)	94.19 mW
	LTE Band 12 (Channel Bandwidth: 3 MHz)	114.55 mW
	LTE Band 12 (Channel Bandwidth: 5 MHz)	117.22 mW
	LTE Band 12 (Channel Bandwidth: 10 MHz)	121.62 mW
	LTE Band 13 (Channel Bandwidth: 5 MHz)	97.05 mW
	LTE Band 13 (Channel Bandwidth: 10 MHz)	96.61 mW
	LTE Band 17 (Channel Bandwidth: 5 MHz)	128.82 mW
	LTE Band 17 (Channel Bandwidth: 10 MHz)	133.66 mW
Max. EIRP Power	WCDMA	117.76 mW
	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	280.54 mW
	LTE Band 4 (Channel Bandwidth: 3 MHz)	281.84 mW
	LTE Band 4 (Channel Bandwidth: 5 MHz)	296.48 mW
	LTE Band 4 (Channel Bandwidth: 10 MHz)	358.10 mW
	LTE Band 4 (Channel Bandwidth: 15 MHz)	374.97 mW
	LTE Band 4 (Channel Bandwidth: 20 MHz)	385.48 mW
Antenna Type	PIFA Antenna	
Accessory Device	Refer to Note as below	
Data Cable Supplied	Refer to Note as below	

Note:

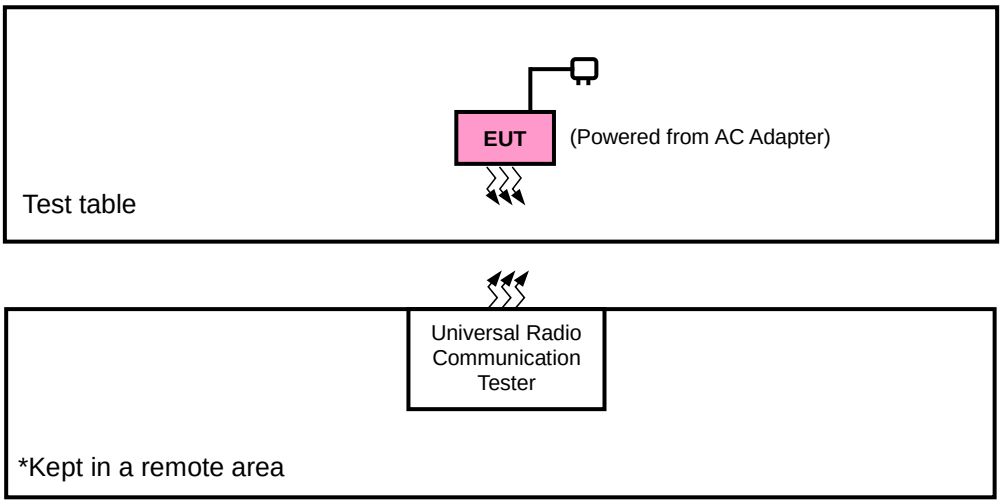
1. The EUT contains following accessory devices.

Product	Brand	Model	Description
Battery	Inventus	CT50-BTSC	3.6 Vdc, 4040 mAh, 14.6Wh

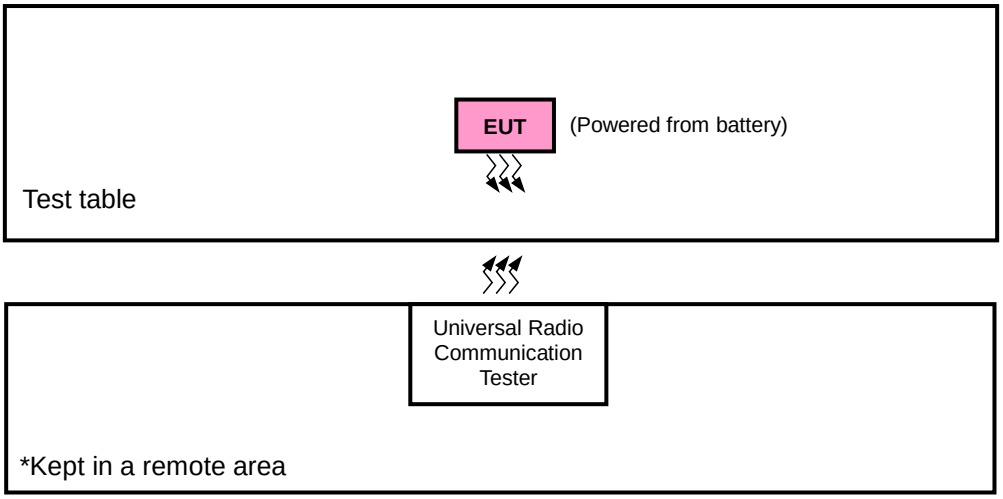
2. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Configuration of System under Test

<Radiated Emission Test>



<E.R.P. / 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:

Band	ERP / EIRP	Radiated Emission
WCDMA	Y-plane	Y-axis
LTE Band 4	Y-plane	Y-axis
LTE Band 12	Y-plane	Y-axis
LTE Band 13	X-plane	Y-axis
LTE Band 17	Y-plane	Y-axis

WCDMA

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

LTE Band 4

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	EIRP	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK, 16QAM, 64QAM	1 RB / 5 RB Offset
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK, 16QAM, 64QAM	1 RB / 14 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM, 64QAM	1 RB / 24 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK, 16QAM, 64QAM	1 RB / 49 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK, 16QAM, 64QAM	1 RB / 74 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM, 64QAM	1 RB / 99 RB Offset
-	Frequency Stability	19957 to 20393	19957, 20393	1.4 MHz	QPSK	1 RB / 5 RB Offset
		19965 to 20385	19965, 20385	3 MHz	QPSK	1 RB / 14 RB Offset
		19975 to 20375	19975, 20375	5 MHz	QPSK	1 RB / 24 RB Offset
		20000 to 20350	20000, 20350	10 MHz	QPSK	1 RB / 49 RB Offset
		20025 to 20325	20025, 20325	15 MHz	QPSK	1 RB / 74 RB Offset
		20050 to 20300	20050, 20300	20 MHz	QPSK	1 RB / 99 RB Offset
-	Occupied Bandwidth	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK, 16QAM, 64QAM	6 RB / 0 RB Offset
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK, 16QAM, 64QAM	15 RB / 0 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM, 64QAM	25 RB / 0 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK, 16QAM, 64QAM	50 RB / 0 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK, 16QAM, 64QAM	75 RB / 0 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM, 64QAM	100 RB / 0 RB Offset
-	Peak to Average Ratio	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK, 16QAM, 64QAM	1 RB / 2 RB Offset
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK, 16QAM, 64QAM	1 RB / 7 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM, 64QAM	12 RB / 0 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK, 16QAM, 64QAM	1 RB / 24 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK, 16QAM, 64QAM	36 RB / 0 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM, 64QAM	50 RB / 0 RB Offset

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

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

LTE Band 12

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	ERP	23017 to 23173	23017, 23095, 23173	1.4 MHz	QPSK, 16QAM, 64QAM	1 RB / 2 RB Offset
		23025 to 23165	23025, 23095, 23165	3 MHz	QPSK, 16QAM, 64QAM	1 RB / 7 RB Offset
		23035 to 23155	23035, 23095, 23155	5 MHz	QPSK, 16QAM, 64QAM	1 RB / 12 RB Offset
		23060 to 23130	23060, 23095, 23130	10 MHz	QPSK, 16QAM, 64QAM	1 RB / 24 RB Offset
-	Frequency Stability	23017 to 23173	23017, 23173	1.4 MHz	QPSK	1 RB / 2 RB Offset
		23025 to 23165	23025, 23165	3 MHz	QPSK	1 RB / 7 RB Offset
		23035 to 23155	23035, 23155	5 MHz	QPSK	1 RB / 12 RB Offset
		23060 to 23130	23060, 23130	10 MHz	QPSK	1 RB / 24 RB Offset
-	Occupied Bandwidth	23017 to 23173	23017, 23095, 23173	1.4 MHz	QPSK, 16QAM, 64QAM	6 RB / 0 RB Offset
		23025 to 23165	23025, 23095, 23165	3 MHz	QPSK, 16QAM, 64QAM	15 RB / 0 RB Offset
		23035 to 23155	23035, 23095, 23155	5 MHz	QPSK, 16QAM, 64QAM	25 RB / 0 RB Offset
		23060 to 23130	23060, 23095, 23130	10 MHz	QPSK, 16QAM, 64QAM	50 RB / 0 RB Offset
-	Peak to Average Ratio	23017 to 23173	23017, 23095, 23173	1.4 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
		23025 to 23165	23025, 23095, 23165	3 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
		23035 to 23155	23035, 23095, 23155	5 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
		23060 to 23130	23060, 23095, 23130	10 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
-	Band Edge	23017 to 23173	23017	1.4 MHz	QPSK	1 RB / 0 RB Offset
						6 RB / 0 RB Offset
			23173	1.4 MHz	QPSK	1 RB / 5 RB Offset
						6 RB / 0 RB Offset
		23025 to 23165	23025	3 MHz	QPSK	1 RB / 0 RB Offset
						15 RB / 0 RB Offset
			23165	3 MHz	QPSK	1 RB / 14 RB Offset
						15 RB / 0 RB Offset
		23035 to 23155	23035	5 MHz	QPSK	1 RB / 0 RB Offset
						25 RB / 0 RB Offset
			23155	5 MHz	QPSK	1 RB / 24 RB Offset
						25 RB / 0 RB Offset
		23060 to 23130	23060	10 MHz	QPSK	1 RB / 0 RB Offset
						50 RB / 0 RB Offset
			23130	10 MHz	QPSK	1 RB / 49 RB Offset
						50 RB / 0 RB Offset
-	Conducted Emission	23017 to 23173	23017, 23095, 23173	1.4 MHz	QPSK	1 RB / 0 RB Offset
		23025 to 23165	23025, 23095, 23165	3 MHz	QPSK	1 RB / 0 RB Offset
		23035 to 23155	23035, 23095, 23155	5 MHz	QPSK	1 RB / 0 RB Offset
		23060 to 23130	23060, 23095, 23130	10 MHz	QPSK	1 RB / 0 RB Offset
-	Radiated Emission	23060 to 23130	23060, 23095, 23130	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.

LTE Band 13

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	ERP	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK, 16QAM, 64QAM	1 RB / 24 RB Offset
-	Frequency Stability	23205 to 23255	23205, 23255	5 MHz	QPSK	1 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK	1 RB / 24 RB Offset
-	Occupied Bandwidth	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK, 16QAM, 64QAM	25 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK, 16QAM, 64QAM	50 RB / 0 RB Offset
-	Peak to Average Ratio	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
-	Band Edge	23205 to 23255	23205	5 MHz	QPSK	1 RB / 0 RB Offset
						25 RB / 0 RB Offset
			23255	5 MHz	QPSK	1 RB / 24 RB Offset
						25 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK	1 RB / 0 RB Offset
						50 RB / 0 RB Offset
			23230	10 MHz	QPSK	1 RB / 49 RB Offset
						50 RB / 0 RB Offset
-	Conducted Emission	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK	1 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK	1 RB / 0 RB Offset
-	Radiated Emission	23230	23230	10 MHz	QPSK	1 RB / 24 RB Offset
						1 RB / 50 RB Offset

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

LTE Band 17

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	ERP	23755 to 23825	23755, 23790, 23825	5 MHz	QPSK, 16QAM, 64QAM	1 RB / 12 RB Offset
		23780 to 23800	23780, 23790, 23800	10 MHz	QPSK, 16QAM, 64QAM	1 RB / 24 RB Offset
-	Frequency Stability	23755 to 23825	23755, 23825	5 MHz	QPSK	1 RB / 12 RB Offset
		23780 to 23800	23780, 23800	10 MHz	QPSK	1 RB / 24 RB Offset
-	Occupied Bandwidth	23755 to 23825	23755, 23790, 23825	5 MHz	QPSK, 16QAM, 64QAM	25 RB / 0 RB Offset
		23780 to 23800	23780, 23790, 23800	10 MHz	QPSK, 16QAM, 64QAM	50 RB / 0 RB Offset
-	Peak to Average Ratio	23755 to 23825	23755, 23790, 23825	5 MHz	QPSK, 16QAM, 64QAM	1 RB / 12 RB Offset
		23780 to 23800	23780, 23790, 23800	10 MHz	QPSK, 16QAM, 64QAM	1 RB / 24 RB Offset
-	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
-	Conducted Emission	23755 to 23825	23755, 23790, 23825	5 MHz	QPSK	1 RB / 12 RB Offset
		23780 to 23800	23780, 23790, 23800	10 MHz	QPSK	1 RB / 24 RB Offset
-	Radiated Emission	23780 to 23800	23780, 23790, 23800	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	3.6 Vdc	Wayne Lin
Frequency Stability	25 deg. C, 65 % RH	3.6 Vdc	Wayne Lin
Occupied Bandwidth	25 deg. C, 65 % RH	3.6 Vdc	Wayne Lin
Band Edge	25 deg. C, 65 % RH	3.6 Vdc	Wayne Lin
Peak to Average Ratio	25 deg. C, 65 % RH	3.6 Vdc	Wayne Lin
Conducted Emission	25 deg. C, 65 % RH	3.6 Vdc	Wayne Lin
Radiated Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Getaz Yang / Jisyong Wang

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-E 2016
ANSI 63.26-2015

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 777~787 MHz band are limited to 3 watts ERP

4.1.2 Test Procedures

EIRP / ERP Measurement:

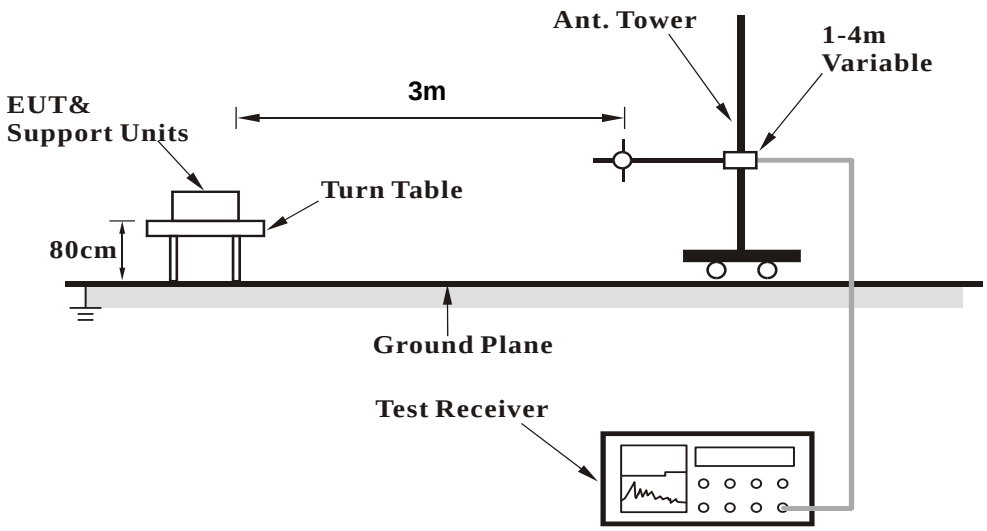
a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 5 MHz for WCDMA and 10 MHz for LTE mode.
b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
c. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value” of step b. Record the power level of S.G.
d. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15 dBi.

Conducted Power Measurement:

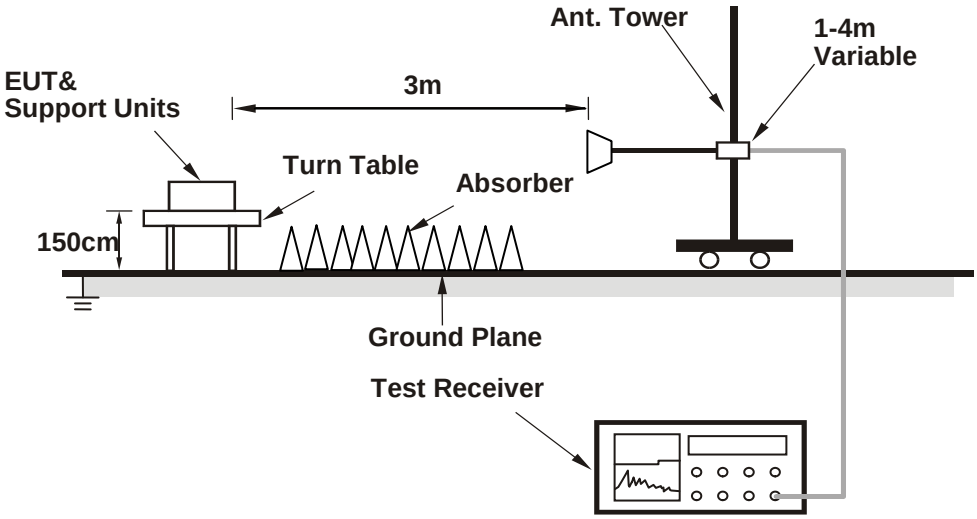
a. The EUT was set up for the maximum power with LTE link data modulation and link up with simulator.
b. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

4.1.3 Test Setup

EIRP / ERP Measurement:
<Radiated Emission below or equal 1 GHz>



<Radiated Emission above 1 GHz>



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	24.69	24.62	24.63
HSDPA Subtest-1	23.64	23.57	23.58
HSDPA Subtest-2	23.70	23.63	23.64
HSDPA Subtest-3	23.21	23.14	23.15
HSDPA Subtest-4	23.18	23.11	23.12
HSUPA Subtest-1	23.69	23.62	23.63
HSUPA Subtest-2	21.69	21.62	21.63
HSUPA Subtest-3	22.70	22.63	22.64
HSUPA Subtest-4	21.72	21.65	21.66
HSUPA Subtest-5	23.77	23.70	23.71

LTE Band 4

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20050	20175	20300	
		Frequency (MHz)		1720.0	1732.5	1745.0	
20M	QPSK	1	0	24.90	24.71	24.73	0
		1	50	24.76	24.69	24.61	0
		1	99	24.89	24.51	24.46	0
		50	0	23.85	23.79	23.77	1
		50	25	23.76	23.65	23.73	1
		50	50	23.72	23.66	23.74	1
		100	0	23.86	23.63	23.73	1
	16QAM	1	0	23.87	23.78	23.81	1
		1	50	23.54	23.86	23.86	1
		1	99	23.83	23.77	23.68	1
		50	0	22.86	22.74	22.88	2
		50	25	22.79	22.70	22.79	2
		50	50	22.67	22.58	22.73	2
		100	0	22.68	22.69	22.76	2
	64QAM	1	0	22.90	22.80	22.83	2
		1	50	22.56	22.88	22.88	2
		1	99	22.85	22.79	22.70	2
		50	0	21.88	21.76	21.90	3
		50	25	21.81	21.72	21.81	3
		50	50	21.69	21.60	21.75	3
		100	0	21.70	21.71	21.78	3

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20025	20175	20325	
		Frequency (MHz)		1717.5	1732.5	1747.5	
15M	QPSK	1	0	24.85	24.64	24.66	0
		1	37	24.69	24.62	24.54	0
		1	74	24.82	24.44	24.39	0
		36	0	23.78	23.72	23.70	1
		36	19	23.69	23.58	23.66	1
		36	39	23.65	23.59	23.67	1
		75	0	23.79	23.56	23.66	1
	16QAM	1	0	23.90	23.71	23.74	1
		1	37	23.47	23.79	23.79	1
		1	74	23.76	23.70	23.61	1
		36	0	22.79	22.67	22.81	2
		36	19	22.72	22.63	22.72	2
		36	39	22.60	22.51	22.66	2
		75	0	22.61	22.62	22.69	2
	64QAM	1	0	22.89	22.73	22.76	2
		1	37	22.49	22.81	22.81	2
		1	74	22.78	22.72	22.63	2
		36	0	21.81	21.69	21.83	3
		36	19	21.74	21.65	21.74	3
		36	39	21.62	21.53	21.68	3
		75	0	21.63	21.64	21.71	3

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20000	20175	20350	
		Frequency (MHz)		1715.0	1732.5	1750.0	
10M	QPSK	1	0	24.76	24.55	24.57	0
		1	24	24.60	24.53	24.45	0
		1	49	24.73	24.35	24.30	0
		25	0	23.69	23.63	23.61	1
		25	12	23.60	23.49	23.57	1
		25	25	23.56	23.50	23.58	1
		50	0	23.70	23.47	23.57	1
	16QAM	1	0	23.81	23.62	23.65	1
		1	24	23.38	23.70	23.70	1
		1	49	23.67	23.61	23.52	1
		25	0	22.70	22.58	22.72	2
		25	12	22.63	22.54	22.63	2
		25	25	22.51	22.42	22.57	2
		50	0	22.52	22.53	22.60	2
	64QAM	1	0	22.83	22.64	22.67	2
		1	24	22.40	22.72	22.72	2
		1	49	22.69	22.63	22.54	2
		25	0	21.72	21.60	21.74	3
		25	12	21.65	21.56	21.65	3
		25	25	21.53	21.44	21.59	3
		50	0	21.54	21.55	21.62	3

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		19975	20175	20375	
		Frequency (MHz)		1712.5	1732.5	1752.5	
5M	QPSK	1	0	24.70	24.49	24.51	0
		1	12	24.54	24.47	24.39	0
		1	24	24.67	24.29	24.24	0
		12	0	23.63	23.57	23.55	1
		12	6	23.54	23.43	23.51	1
		12	13	23.50	23.44	23.52	1
		25	0	23.64	23.41	23.51	1
	16QAM	1	0	23.75	23.56	23.59	1
		1	12	23.32	23.64	23.64	1
		1	24	23.61	23.55	23.46	1
		12	0	22.64	22.52	22.66	2
		12	6	22.57	22.48	22.57	2
		12	13	22.45	22.36	22.51	2
		25	0	22.46	22.47	22.54	2
	64QAM	1	0	22.77	22.58	22.61	2
		1	12	22.34	22.66	22.66	2
		1	24	22.63	22.57	22.48	2
		12	0	21.66	21.54	21.68	3
		12	6	21.59	21.50	21.59	3
		12	13	21.47	21.38	21.53	3
		25	0	21.48	21.49	21.56	3

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		19965	20175	20385	
		Frequency (MHz)		1711.5	1732.5	1753.5	
3M	QPSK	1	0	24.62	24.41	24.43	0
		1	7	24.46	24.39	24.31	0
		1	14	24.59	24.21	24.16	0
		8	0	23.55	23.49	23.47	1
		8	3	23.46	23.35	23.43	1
		8	7	23.42	23.36	23.44	1
		15	0	23.56	23.33	23.43	1
	16QAM	1	0	23.67	23.48	23.51	1
		1	7	23.24	23.56	23.56	1
		1	14	23.53	23.47	23.38	1
		8	0	22.56	22.44	22.58	2
		8	3	22.49	22.40	22.49	2
		8	7	22.37	22.28	22.43	2
		15	0	22.38	22.39	22.46	2
	64QAM	1	0	22.69	22.50	22.53	2
		1	7	22.26	22.58	22.58	2
		1	14	22.55	22.49	22.40	2
		8	0	21.58	21.46	21.60	3
		8	3	21.51	21.42	21.51	3
		8	7	21.39	21.30	21.45	3
		15	0	21.40	21.41	21.48	3

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		19957	20175	20393	
		Frequency (MHz)		1710.7	1732.5	1754.3	
1.4M	QPSK	1	0	24.55	24.34	24.36	0
		1	2	24.39	24.32	24.24	0
		1	5	24.52	24.14	24.09	0
		3	0	23.48	23.42	23.40	0
		3	1	23.39	23.28	23.36	0
		3	3	23.35	23.29	23.37	0
		6	0	23.49	23.26	23.36	1
	16QAM	1	0	23.60	23.41	23.44	1
		1	2	23.17	23.49	23.49	1
		1	5	23.46	23.40	23.31	1
		3	0	22.49	22.37	22.51	1
		3	1	22.42	22.33	22.42	1
		3	3	22.30	22.21	22.36	1
		6	0	22.31	22.32	22.39	2
	64QAM	1	0	22.62	22.43	22.46	2
		1	2	22.19	22.51	22.51	2
		1	5	22.48	22.42	22.33	2
		3	0	21.51	21.39	21.53	2
		3	1	21.44	21.35	21.44	2
		3	3	21.32	21.23	21.38	2
		6	0	21.33	21.34	21.41	3

LTE Band 12

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		23060	23095	23130	
		Frequency (MHz)		704.0	707.5	711.0	
10M	QPSK	1	0	23.81	23.63	23.67	0
		1	24	23.80	23.73	23.62	0
		1	49	23.77	23.71	23.70	0
		25	0	22.88	22.74	22.87	1
		25	12	22.93	22.83	22.75	1
		25	25	22.90	22.79	22.89	1
		50	0	22.91	22.85	22.63	1
	16QAM	1	0	22.69	23.17	22.90	1
		1	24	22.95	22.99	23.23	1
		1	49	22.82	22.98	23.29	1
		25	0	21.75	21.80	21.84	2
		25	12	21.81	21.84	21.79	2
		25	25	21.90	21.80	21.91	2
		50	0	21.86	21.74	21.88	2
	64QAM	1	0	21.95	22.43	22.16	2
		1	24	22.21	22.25	22.49	2
		1	49	22.08	22.24	22.55	2
		25	0	21.01	21.06	21.10	3
		25	12	21.07	21.10	21.05	3
		25	25	21.16	21.06	21.17	3
		50	0	21.12	21.00	21.14	3

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		23035	23095	23155	
		Frequency (MHz)		701.5	707.5	713.5	
5M	QPSK	1	0	23.72	23.54	23.58	0
		1	12	23.71	23.64	23.53	0
		1	24	23.68	23.62	23.61	0
		12	0	22.79	22.65	22.78	1
		12	6	22.84	22.74	22.66	1
		12	13	22.81	22.70	22.80	1
		25	0	22.82	22.76	22.54	1
	16QAM	1	0	22.60	23.08	22.81	1
		1	12	22.86	22.90	23.14	1
		1	24	22.73	22.89	23.20	1
		12	0	21.66	21.71	21.75	2
		12	6	21.72	21.75	21.70	2
		12	13	21.81	21.71	21.82	2
		25	0	21.77	21.65	21.79	2
	64QAM	1	0	21.86	22.34	22.07	2
		1	12	22.12	22.16	22.40	2
		1	24	21.99	22.15	22.46	2
		12	0	20.92	20.97	21.01	3
		12	6	20.98	21.01	20.96	3
		12	13	21.07	20.97	21.08	3
		25	0	21.03	20.91	21.05	3

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		23025	23095	23165	
		Frequency (MHz)		700.5	707.5	714.5	
3M	QPSK	1	0	23.66	23.48	23.52	0
		1	7	23.65	23.58	23.47	0
		1	14	23.62	23.56	23.55	0
		8	0	22.73	22.59	22.72	1
		8	3	22.78	22.68	22.60	1
		8	7	22.75	22.64	22.74	1
		15	0	22.76	22.70	22.48	1
	16QAM	1	0	22.54	23.02	22.75	1
		1	7	22.80	22.84	23.08	1
		1	14	22.67	22.83	23.14	1
		8	0	21.60	21.65	21.69	2
		8	3	21.66	21.69	21.64	2
		8	7	21.75	21.65	21.76	2
		15	0	21.71	21.59	21.73	2
	64QAM	1	0	21.80	22.28	22.01	2
		1	7	22.06	22.10	22.34	2
		1	14	21.93	22.09	22.40	2
		8	0	20.86	20.91	20.95	3
		8	3	20.92	20.95	20.90	3
		8	7	21.01	20.91	21.02	3
		15	0	20.97	20.85	20.99	3

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		23017	23095	23173	
		Frequency (MHz)		699.7	707.5	715.3	
1.4M	QPSK	1	0	23.61	23.43	23.47	0
		1	2	23.60	23.53	23.42	0
		1	5	23.57	23.51	23.50	0
		3	0	23.15	23.01	23.14	0
		3	1	23.20	23.10	23.02	0
		3	3	23.17	23.06	23.16	0
		6	0	22.71	22.65	22.43	1
	16QAM	1	0	22.49	22.97	22.70	1
		1	2	22.75	22.79	23.03	1
		1	5	22.62	22.78	23.09	1
		3	0	22.02	22.07	22.11	1
		3	1	22.08	22.11	22.06	1
		3	3	22.17	22.07	22.18	1
		6	0	21.66	21.54	21.68	2
	64QAM	1	0	21.75	22.23	21.96	2
		1	2	22.01	22.05	22.29	2
		1	5	21.88	22.04	22.35	2
		3	0	21.01	21.06	21.10	2
		3	1	21.07	21.10	21.05	2
		3	3	21.16	21.06	21.17	2
		6	0	20.92	20.80	20.94	3

LTE Band 13

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel			23230					Channel		23205	23230	23225	
		Frequency (MHz)			782.0					Frequency (MHz)		779.5	782.0	784.5	
10M	QPSK	1	0		23.95		0	5M	QPSK	1	0	23.62	23.56	23.64	0
		1	24		23.65		0			1	12	23.68	23.64	23.85	0
		1	49		23.67		0			1	24	23.82	23.60	23.91	0
		25	0		22.62		1			12	0	22.70	22.79	22.66	1
		25	12		22.71		1			12	6	22.76	22.76	22.82	1
		25	25		22.85		1			12	13	22.73	22.62	22.81	1
		50	0		22.69		1			25	0	22.69	22.65	22.79	1
	16QAM	1	0		22.99		1		16QAM	1	0	23.00	22.86	22.87	1
		1	24		22.93		1			1	12	22.94	22.92	22.77	1
		1	49		22.89		1			1	24	22.85	22.69	22.93	1
		25	0		21.64		2			12	0	21.81	21.79	21.70	2
		25	12		21.73		2			12	6	21.75	21.81	21.84	2
		25	25		21.76		2			12	13	21.81	21.70	21.79	2
		50	0		21.76		2			25	0	21.74	21.74	21.64	2
	64QAM	1	0		21.97		2		64QAM	1	0	21.93	21.79	21.80	2
		1	24		21.91		2			1	12	21.87	21.85	21.70	2
		1	49		21.87		2			1	24	21.78	21.62	21.86	2
		25	0		20.62		3			12	0	20.74	20.72	20.63	3
		25	12		20.71		3			12	6	20.68	20.74	20.77	3
		25	25		20.74		3			12	13	20.74	20.63	20.72	3
		50	0		20.74		3			25	0	20.67	20.67	20.57	3

LTE Band 17

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		23780	23790	23800				Channel		23755	23790	23825	
		Frequency (MHz)		709.0	710.0	711.0				Frequency (MHz)		706.5	710.0	713.5	
10M	QPSK	1	0	23.67	23.84	23.70	0	5M	QPSK	1	0	23.59	23.76	23.62	0
		1	24	23.68	23.70	23.56	0			1	12	23.60	23.62	23.48	0
		1	49	23.63	23.80	23.59	0			1	24	23.55	23.72	23.51	0
		25	0	22.76	22.81	22.75	1			12	0	22.68	22.73	22.67	1
		25	12	22.79	22.80	22.72	1			12	6	22.71	22.72	22.64	1
		25	25	22.71	22.80	22.65	1			12	13	22.63	22.72	22.57	1
		50	0	22.76	22.82	22.63	1			25	0	22.68	22.74	22.55	1
	16QAM	1	0	23.03	22.89	23.04	1		16QAM	1	0	22.95	22.81	22.96	1
		1	24	23.21	23.19	23.10	1			1	12	23.13	23.11	23.02	1
		1	49	23.19	23.21	22.88	1			1	24	23.11	23.13	22.80	1
		25	0	21.84	21.76	21.68	2			12	0	21.76	21.68	21.60	2
		25	12	21.66	21.78	21.76	2			12	6	21.58	21.70	21.68	2
		25	25	21.71	21.72	21.71	2			12	13	21.63	21.64	21.63	2
		50	0	21.77	21.82	21.76	2			25	0	21.69	21.74	21.68	2
	64QAM	1	0	22.20	22.06	22.21	2		64QAM	1	0	22.12	21.98	22.13	2
		1	24	22.38	22.36	22.27	2			1	12	22.30	22.28	22.19	2
		1	49	22.36	22.38	22.05	2			1	24	22.28	22.30	21.97	2
		25	0	21.01	20.93	20.85	3			12	0	20.93	20.85	20.77	3
		25	12	20.83	20.95	20.93	3			12	6	20.75	20.87	20.85	3
		25	25	20.88	20.89	20.88	3			12	13	20.80	20.81	20.80	3
		50	0	20.94	20.99	20.93	3			25	0	20.86	20.91	20.85	3

ERP Power (dBm)

LTE Band 12							
Channel Bandwidth: 1.4 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
Y	23017	699.7	-14.45	30.36	13.76	23.77	H
	23095	707.5	-13.99	30.17	14.03	25.29	
	23173	715.3	-13.87	30.17	14.15	26.00	
	23017	699.7	-10.57	32.03	19.31	85.31	V
	23095	707.5	-10.32	31.98	19.51	89.33	
	23173	715.3	-10.17	32.06	19.74	94.19	
Channel Bandwidth: 1.4 MHz / 16QAM							
Y	23017	699.7	-15.53	30.36	12.68	18.54	H
	23095	707.5	-15.07	30.17	12.95	19.72	
	23173	715.3	-14.96	30.17	13.06	20.23	
	23017	699.7	-11.63	32.03	18.25	66.83	V
	23095	707.5	-11.37	31.98	18.46	70.15	
	23173	715.3	-11.18	32.06	18.73	74.64	
Channel Bandwidth: 1.4 MHz / 64QAM							
Y	23017	699.7	-16.55	30.36	11.66	14.66	H
	23095	707.5	-16.12	30.17	11.90	15.49	
	23173	715.3	-16.04	30.17	11.98	15.78	
	23017	699.7	-12.69	32.03	17.19	52.36	V
	23095	707.5	-12.44	31.98	17.39	54.83	
	23173	715.3	-12.21	32.06	17.70	58.88	

LTE Band 12							
Channel Bandwidth: 3 MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
Y	23025	700.5	-13.45	30.17	14.57	28.64	H
	23095	707.5	-13.24	30.17	14.78	30.06	
	23165	714.5	-13.01	30.18	15.02	31.77	
	23025	700.5	-9.61	31.96	20.20	104.71	V
	23095	707.5	-9.46	31.98	20.37	108.89	
	23165	714.5	-9.29	32.03	20.59	114.55	
Channel Bandwidth: 3 MHz / 16QAM							
Y	23025	700.5	-14.47	30.17	13.55	22.65	H
	23095	707.5	-14.33	30.17	13.69	23.39	
	23165	714.5	-14.10	30.18	13.93	24.72	
	23025	700.5	-10.66	31.96	19.15	82.22	V
	23095	707.5	-10.53	31.98	19.30	85.11	
	23165	714.5	-10.35	32.03	19.53	89.74	
Channel Bandwidth: 3 MHz / 64QAM							
Y	23025	700.5	-15.55	30.17	12.47	17.66	H
	23095	707.5	-15.34	30.17	12.68	18.54	
	23165	714.5	-15.15	30.18	12.88	19.41	
	23025	700.5	-11.70	31.96	18.11	64.71	V
	23095	707.5	-11.56	31.98	18.27	67.14	
	23165	714.5	-11.43	32.03	18.45	69.98	

LTE Band 12							
Channel Bandwidth: 5 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
Y	23035	701.5	-13.32	30.17	14.70	29.51	H
	23095	707.5	-13.03	30.17	14.99	31.55	
	23155	713.5	-12.79	30.18	15.24	33.42	
	23035	701.5	-9.87	31.96	19.94	98.63	V
	23095	707.5	-9.31	31.98	20.52	112.72	
	23155	713.5	-9.19	32.03	20.69	117.22	
Channel Bandwidth: 5 MHz / 16QAM							
Y	23035	701.5	-14.39	30.17	13.63	23.07	H
	23095	707.5	-14.07	30.17	13.95	24.83	
	23155	713.5	-13.86	30.18	14.17	26.12	
	23035	701.5	-10.52	31.96	19.29	84.92	V
	23095	707.5	-10.34	31.98	19.49	88.92	
	23155	713.5	-10.22	32.03	19.66	92.47	
Channel Bandwidth: 5 MHz / 64QAM							
Y	23035	701.5	-15.41	30.17	12.61	18.24	H
	23095	707.5	-15.08	30.17	12.94	19.68	
	23155	713.5	-14.92	30.18	13.11	20.46	
	23035	701.5	-11.59	31.96	18.22	66.37	V
	23095	707.5	-11.43	31.98	18.40	69.18	
	23155	713.5	-11.28	32.03	18.60	72.44	

LTE Band 12							
Channel Bandwidth: 10 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
Y	23060	704.0	-13.16	30.17	14.86	30.62	H
	23095	707.5	-12.91	30.17	15.11	32.43	
	23130	711.0	-12.68	30.18	15.35	34.28	
	23060	704.0	-9.37	31.96	20.44	110.66	V
	23095	707.5	-9.22	31.98	20.61	115.08	
	23130	711.0	-9.03	32.03	20.85	121.62	
Channel Bandwidth: 10 MHz / 16QAM							
Y	23060	704.0	-14.24	30.17	13.78	23.88	H
	23095	707.5	-13.94	30.17	14.08	25.59	
	23130	711.0	-13.76	30.18	14.27	26.73	
	23060	704.0	-10.44	31.96	19.37	86.50	V
	23095	707.5	-10.24	31.98	19.59	90.99	
	23130	711.0	-10.07	32.03	19.81	95.72	
Channel Bandwidth: 10 MHz / 64QAM							
Y	23060	704.0	-15.29	30.17	12.73	18.75	H
	23095	707.5	-15.01	30.17	13.01	20.00	
	23130	711.0	-14.84	30.18	13.19	20.84	
	23060	704.0	-11.46	31.96	18.35	68.39	V
	23095	707.5	-11.31	31.98	18.52	71.12	
	23130	711.0	-11.16	32.03	18.72	74.47	

LTE Band 13							
Channel Bandwidth: 5 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
X	23205	779.5	-12.57	32.24	17.52	56.49	H
	23230	782.0	-12.30	32.17	17.72	59.16	
	23255	784.5	-12.06	32.11	17.90	61.66	
	23205	779.5	-10.71	32.43	19.57	90.57	V
	23230	782.0	-10.56	32.42	19.71	93.54	
	23255	784.5	-10.44	32.46	19.87	97.05	
Channel Bandwidth: 5 MHz / 16QAM							
X	23205	779.5	-13.59	32.24	16.50	44.67	H
	23230	782.0	-13.38	32.17	16.64	46.13	
	23255	784.5	-13.15	32.11	16.81	47.97	
	23205	779.5	-11.79	32.43	18.49	70.63	V
	23230	782.0	-11.59	32.42	18.68	73.79	
	23255	784.5	-11.47	32.46	18.84	76.56	
Channel Bandwidth: 5 MHz / 64QAM							
X	23205	779.5	-14.65	32.24	15.44	34.99	H
	23230	782.0	-14.44	32.17	15.58	36.14	
	23255	784.5	-14.19	32.11	15.77	37.76	
	23205	779.5	-12.82	32.43	17.46	55.72	V
	23230	782.0	-12.67	32.42	17.60	57.54	
	23255	784.5	-12.53	32.46	17.78	59.98	

LTE Band 13							
Channel Bandwidth: 10 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
X	23230	782.0	-12.20	32.17	17.82	60.53	H
	23230	782.0	-10.42	32.42	19.85	96.61	V
Channel Bandwidth: 10 MHz / 16QAM							
X	23230	782.0	-13.27	32.17	16.75	47.32	H
	23230	782.0	-11.45	32.42	18.82	76.21	V
Channel Bandwidth: 10 MHz / 64QAM							
X	23230	782.0	-14.34	32.17	15.68	36.98	H
	23230	782.0	-12.46	32.42	17.81	60.39	V

LTE Band 17							
Channel Bandwidth: 5 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
Y	23755	706.5	-10.51	30.36	17.70	58.88	H
	23790	710.0	-10.17	30.17	17.85	60.95	
	23825	713.5	-10.00	30.17	18.02	63.39	
	23755	706.5	-9.22	32.03	20.66	116.41	V
	23790	710.0	-8.89	31.98	20.94	124.17	
	23825	713.5	-8.81	32.06	21.10	128.82	
Channel Bandwidth: 5 MHz / 16QAM							
Y	23755	706.5	-11.53	30.36	16.68	46.56	H
	23790	710.0	-11.24	30.17	16.78	47.64	
	23825	713.5	-11.08	30.17	16.94	49.43	
	23755	706.5	-10.31	32.03	19.57	90.57	V
	23790	710.0	-9.95	31.98	19.88	97.27	
	23825	713.5	-9.87	32.06	20.04	100.93	
Channel Bandwidth: 5 MHz / 64QAM							
Y	23755	706.5	-12.60	30.36	15.61	36.39	H
	23790	710.0	-12.26	30.17	15.76	37.67	
	23825	713.5	-12.10	30.17	15.92	39.08	
	23755	706.5	-11.33	32.03	18.55	71.61	V
	23790	710.0	-11.01	31.98	18.82	76.21	
	23825	713.5	-10.90	32.06	19.01	79.62	

LTE Band 17							
Channel Bandwidth: 10 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
Y	23780	709.0	-10.30	30.17	17.72	59.16	H
	23790	710.0	-10.05	30.17	17.97	62.66	
	23800	711.0	-9.94	30.18	18.09	64.42	
	23780	709.0	-9.01	31.96	20.80	120.23	V
	23790	710.0	-8.81	31.98	21.02	126.47	
	23800	711.0	-8.62	32.03	21.26	133.66	
Channel Bandwidth: 10 MHz / 16QAM							
Y	23780	709.0	-11.34	30.17	16.68	46.56	H
	23790	710.0	-11.06	30.17	16.96	49.66	
	23800	711.0	-11.00	30.18	17.03	50.47	
	23780	709.0	-10.06	31.96	19.75	94.41	V
	23790	710.0	-9.85	31.98	19.98	99.54	
	23800	711.0	-9.96	32.03	19.92	98.17	
Channel Bandwidth: 10 MHz / 64QAM							
Y	23780	709.0	-12.39	30.17	15.63	36.56	H
	23790	710.0	-12.10	30.17	15.92	39.08	
	23800	711.0	-12.04	30.18	15.99	39.72	
	23780	709.0	-11.14	31.96	18.67	73.62	V
	23790	710.0	-10.90	31.98	18.93	78.16	
	23800	711.0	-10.71	32.03	19.17	82.60	

EIRP Power (dBm)

WCDMA							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Y	1312	1712.4	-9.07	36.29	27.22	527.35	H
	1413	1732.6	-9.18	36.69	27.51	563.12	
	1513	1752.6	-9.22	36.98	27.76	597.04	
	1312	1712.4	-16.95	37.11	20.16	103.75	V
	1413	1732.6	-17.20	37.60	20.40	109.65	
	1513	1752.6	-16.94	37.65	20.71	117.76	

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)
Y	19957	1710.7	-16.66	36.45	19.80	95.39	H
	20175	1732.5	-16.94	36.80	19.86	96.81	
	20393	1754.3	-16.98	36.94	19.96	99.11	
	19957	1710.7	-13.03	37.28	24.25	266.07	V
	20175	1732.5	-13.15	37.63	24.48	280.54	
	20393	1754.3	-13.17	37.64	24.47	279.90	
Channel Bandwidth: 1.4 MHz / 16QAM							
Y	19957	1710.7	-17.74	36.45	18.72	74.39	H
	20175	1732.5	-17.98	36.80	18.82	76.19	
	20393	1754.3	-18.00	36.94	18.94	78.36	
	19957	1710.7	-14.04	37.28	23.24	210.86	V
	20175	1732.5	-14.21	37.63	23.42	219.79	
	20393	1754.3	-14.23	37.64	23.41	219.28	
Channel Bandwidth: 1.4 MHz / 64QAM							
Y	19957	1710.7	-18.82	36.45	17.64	58.01	H
	20175	1732.5	-18.99	36.80	17.81	60.38	
	20393	1754.3	-19.08	36.94	17.86	61.11	
	19957	1710.7	-15.08	37.28	22.20	165.96	V
	20175	1732.5	-15.48	37.63	22.15	164.06	
	20393	1754.3	-15.30	37.64	22.34	171.40	

LTE Band 4							
Channel Bandwidth: 3 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
Y	19965	1711.5	-16.58	36.45	19.88	97.16	H
	20175	1732.5	-16.87	36.80	19.93	98.38	
	20385	1753.5	-16.88	36.94	20.06	101.41	
	19965	1711.5	-12.86	37.28	24.42	276.69	V
	20175	1732.5	-13.13	37.63	24.50	281.84	
	20385	1753.5	-13.16	37.64	24.48	280.54	
Channel Bandwidth: 3 MHz / 16QAM							
Y	19965	1711.5	-17.60	36.45	18.86	76.82	H
	20175	1732.5	-17.92	36.80	18.88	77.25	
	20385	1753.5	-17.95	36.94	18.99	79.27	
	19965	1711.5	-13.94	37.28	23.34	215.77	V
	20175	1732.5	-14.22	37.63	23.41	219.28	
	20385	1753.5	-14.22	37.64	23.42	219.79	
Channel Bandwidth: 3 MHz / 64QAM							
Y	19965	1711.5	-18.63	36.45	17.83	60.60	H
	20175	1732.5	-19.01	36.80	17.79	60.10	
	20385	1753.5	-18.98	36.94	17.96	62.53	
	19965	1711.5	-15.07	37.28	22.21	166.34	V
	20175	1732.5	-15.39	37.63	22.24	167.49	
	20385	1753.5	-15.28	37.64	22.36	172.19	

LTE Band 4							
Channel Bandwidth: 5 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
Y	19975	1712.5	-16.38	36.45	20.08	101.74	H
	20175	1732.5	-16.68	36.80	20.12	102.78	
	20375	1752.5	-16.70	36.94	20.24	105.71	
	19975	1712.5	-12.69	37.28	24.59	287.74	V
	20175	1732.5	-12.91	37.63	24.72	296.48	
	20375	1752.5	-12.94	37.64	24.70	295.12	
Channel Bandwidth: 5 MHz / 16QAM							
Y	19975	1712.5	-17.54	36.45	18.92	77.89	H
	20175	1732.5	-17.72	36.80	19.08	80.89	
	20375	1752.5	-17.79	36.94	19.15	82.24	
	19975	1712.5	-13.89	37.28	23.39	218.27	V
	20175	1732.5	-14.10	37.63	23.53	225.42	
	20375	1752.5	-14.04	37.64	23.60	229.09	
Channel Bandwidth: 5 MHz / 64QAM							
Y	19975	1712.5	-18.61	36.45	17.85	60.88	H
	20175	1732.5	-18.73	36.80	18.07	64.11	
	20375	1752.5	-18.93	36.94	18.01	63.26	
	19975	1712.5	-14.63	37.28	22.65	184.08	V
	20175	1732.5	-15.26	37.63	22.37	172.58	
	20375	1752.5	-15.15	37.64	22.49	177.42	

LTE Band 4							
Channel Bandwidth: 10 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
Y	20000	1715.0	-15.69	36.64	20.95	124.45	H
	20175	1732.5	-15.79	36.80	21.01	126.15	
	20350	1750.0	-15.86	36.80	20.94	124.08	
	20000	1715.0	-12.06	37.44	25.38	345.14	V
	20175	1732.5	-12.14	37.63	25.49	353.92	
	20350	1750.0	-12.10	37.64	25.54	358.10	
Channel Bandwidth: 10 MHz / 16QAM							
Y	20000	1715.0	-16.74	36.64	19.90	97.72	H
	20175	1732.5	-16.81	36.80	19.99	99.75	
	20350	1750.0	-16.92	36.80	19.88	97.21	
	20000	1715.0	-13.15	37.44	24.29	268.53	V
	20175	1732.5	-13.17	37.63	24.46	279.19	
	20350	1750.0	-13.13	37.64	24.51	282.49	
Channel Bandwidth: 10 MHz / 64QAM							
Y	20000	1715.0	-17.78	36.64	18.86	76.91	H
	20175	1732.5	-17.83	36.80	18.97	78.87	
	20350	1750.0	-17.93	36.80	18.87	77.04	
	20000	1715.0	-14.18	37.44	23.26	211.84	V
	20175	1732.5	-14.24	37.63	23.39	218.22	
	20350	1750.0	-14.18	37.64	23.46	221.82	

LTE Band 4							
Channel Bandwidth: 15 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
Y	20025	1717.5	-15.42	36.45	21.04	126.91	H
	20175	1732.5	-15.64	36.80	21.16	130.59	
	20325	1747.5	-15.71	36.94	21.23	132.77	
	20025	1717.5	-11.70	37.28	25.58	361.41	V
	20175	1732.5	-11.89	37.63	25.74	374.97	
	20325	1747.5	-11.98	37.64	25.66	368.13	
Channel Bandwidth: 15 MHz / 16QAM							
Y	20025	1717.5	-16.48	36.45	19.98	99.43	H
	20175	1732.5	-16.69	36.80	20.11	102.54	
	20325	1747.5	-16.77	36.94	20.17	104.02	
	20025	1717.5	-12.79	37.28	24.49	281.19	V
	20175	1732.5	-12.91	37.63	24.72	296.48	
	20325	1747.5	-13.02	37.64	24.62	289.73	
Channel Bandwidth: 15 MHz / 64QAM							
Y	20025	1717.5	-17.56	36.45	18.90	77.54	H
	20175	1732.5	-17.77	36.80	19.03	79.97	
	20325	1747.5	-17.82	36.94	19.12	81.68	
	20025	1717.5	-13.88	37.28	23.40	218.78	V
	20175	1732.5	-13.98	37.63	23.65	231.74	
	20325	1747.5	-14.08	37.64	23.56	226.99	

LTE Band 4							
Channel Bandwidth: 20 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
Y	20050	1720.0	-15.28	36.45	21.18	131.07	H
	20175	1732.5	-15.51	36.80	21.29	134.56	
	20300	1745.0	-15.60	36.94	21.34	136.18	
	20050	1720.0	-11.59	37.28	25.69	370.68	V
	20175	1732.5	-11.77	37.63	25.86	385.48	
	20300	1745.0	-11.84	37.64	25.80	380.19	
Channel Bandwidth: 20 MHz / 16QAM							
Y	20050	1720.0	-16.31	36.45	20.15	103.40	H
	20175	1732.5	-16.59	36.80	20.21	104.93	
	20300	1745.0	-16.64	36.94	20.30	107.18	
	20050	1720.0	-12.66	37.28	24.62	289.73	V
	20175	1732.5	-12.83	37.63	24.80	302.00	
	20300	1745.0	-12.92	37.64	24.72	296.48	
Channel Bandwidth: 20 MHz / 64QAM							
Y	20050	1720.0	-17.32	36.45	19.14	81.94	H
	20175	1732.5	-17.67	36.80	19.13	81.83	
	20300	1745.0	-17.71	36.94	19.23	83.77	
	20050	1720.0	-13.72	37.28	23.56	226.99	V
	20175	1732.5	-13.89	37.63	23.74	236.59	
	20300	1745.0	-13.95	37.64	23.69	233.88	

4.2 Frequency Stability Measurement

4.2.1 Limits of Frequency Stabiliity Measurement

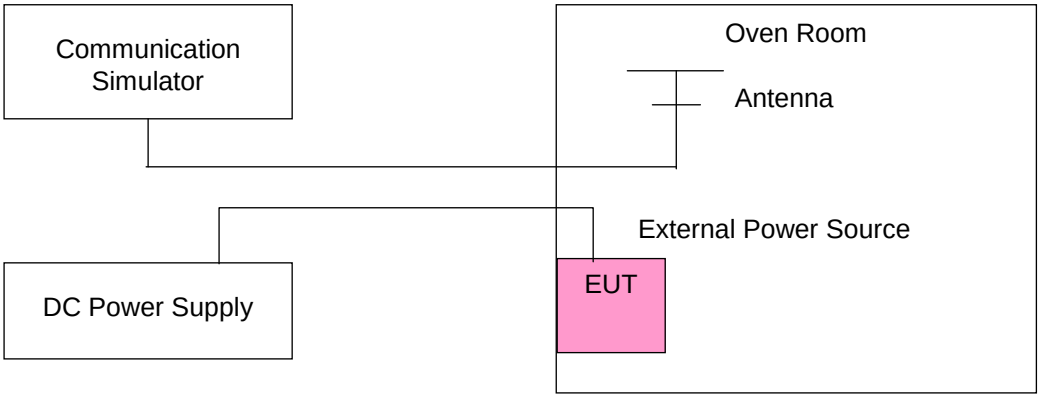
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

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)	WCDMA				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.6	1712.400004	0.002	1752.600002	0.001	2.5
3.3	1712.400002	0.001	1752.600001	0.001	2.5
4.2	1712.400004	0.002	1752.600004	0.002	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.3 Vdc to 4.2 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	WCDMA				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	1712.400003	0.002	1752.600002	0.001	2.5
-20	1712.400003	0.002	1752.600002	0.001	2.5
-10	1712.400003	0.002	1752.600002	0.001	2.5
0	1712.400001	0.001	1752.600004	0.002	2.5
10	1712.400004	0.002	1752.600004	0.002	2.5
20	1712.399999	-0.001	1752.599999	-0.001	2.5
30	1712.399998	-0.001	1752.599998	-0.001	2.5
40	1712.399996	-0.002	1752.599999	-0.001	2.5
50	1712.399996	-0.002	1752.599999	-0.001	2.5
55	1712.399998	-0.001	1752.599999	-0.001	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4				Limit (ppm)
	Channel Bandwidth: 1.4 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.6	1710.700004	0.002	1754.300002	0.001	2.5
3.3	1710.700002	0.001	1754.300001	0.001	2.5
4.2	1710.700003	0.002	1754.300004	0.002	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.3 Vdc to 4.2 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 4				Limit (ppm)
	Channel Bandwidth: 1.4 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	1710.700002	0.001	1754.300001	0.001	2.5
-20	1710.700003	0.001	1754.300004	0.002	2.5
-10	1710.700003	0.002	1754.300004	0.002	2.5
0	1710.700001	0.001	1754.300003	0.002	2.5
10	1710.700003	0.002	1754.300002	0.001	2.5
20	1710.699997	-0.002	1754.299997	-0.002	2.5
30	1710.699997	-0.002	1754.299998	-0.001	2.5
40	1710.699997	-0.002	1754.299998	-0.001	2.5
50	1710.699997	-0.002	1754.299997	-0.002	2.5
55	1710.699999	-0.001	1754.299999	-0.001	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4				Limit (ppm)
	Channel Bandwidth: 3 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.6	1711.500003	0.002	1753.500001	0.001	2.5
3.3	1711.500004	0.002	1753.500002	0.001	2.5
4.2	1711.500002	0.001	1753.500001	0.001	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.3 Vdc to 4.2 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 4				Limit (ppm)
	Channel Bandwidth: 3 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	1711.500002	0.001	1753.500001	0.001	2.5
-20	1711.500001	0.001	1753.500002	0.001	2.5
-10	1711.500003	0.002	1753.500001	0.001	2.5
0	1711.500003	0.002	1753.500001	0.001	2.5
10	1711.500002	0.001	1753.500001	0.001	2.5
20	1711.499999	-0.001	1753.499999	-0.001	2.5
30	1711.499997	-0.002	1753.499997	-0.002	2.5
40	1711.499996	-0.002	1753.499997	-0.002	2.5
50	1711.499998	-0.001	1753.499999	-0.001	2.5
55	1711.499998	-0.001	1753.499997	-0.002	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.6	1712.500002	0.001	1752.500001	0.001	2.5
3.3	1712.500004	0.002	1752.500003	0.001	2.5
4.2	1712.500003	0.002	1752.500004	0.002	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.3 Vdc to 4.2 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 4				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	1712.500003	0.002	1752.500002	0.001	2.5
-20	1712.500002	0.001	1752.500001	0.001	2.5
-10	1712.500002	0.001	1752.500003	0.001	2.5
0	1712.500001	0.001	1752.500003	0.002	2.5
10	1712.500001	0.001	1752.500002	0.001	2.5
20	1712.499998	-0.001	1752.499998	-0.001	2.5
30	1712.499997	-0.002	1752.499998	-0.001	2.5
40	1712.499999	-0.001	1752.499998	-0.001	2.5
50	1712.499998	-0.001	1752.499999	-0.001	2.5
55	1712.499997	-0.002	1752.499997	-0.002	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4				Limit (ppm)
	Channel Bandwidth: 10 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.6	1715.000004	0.002	1750.000001	0.001	2.5
3.3	1715.000002	0.001	1750.000003	0.001	2.5
4.2	1715.000003	0.002	1750.000003	0.002	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.3 Vdc to 4.2 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 4				Limit (ppm)
	Channel Bandwidth: 10 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	1715.000003	0.002	1750.000004	0.002	2.5
-20	1715.000002	0.001	1750.000002	0.001	2.5
-10	1715.000003	0.002	1750.000001	0.001	2.5
0	1715.000001	0.001	1750.000004	0.002	2.5
10	1715.000003	0.002	1750.000004	0.002	2.5
20	1714.999997	-0.002	1749.999999	-0.001	2.5
30	1714.999999	-0.001	1749.999999	-0.001	2.5
40	1714.999999	-0.001	1749.999998	-0.001	2.5
50	1714.999999	-0.001	1749.999998	-0.001	2.5
55	1714.999997	-0.002	1749.999998	-0.001	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4				Limit (ppm)
	Channel Bandwidth: 15 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.6	1717.500003	0.002	1747.500004	0.002	2.5
3.3	1717.500003	0.002	1747.500002	0.001	2.5
4.2	1717.500003	0.002	1747.500004	0.002	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.3 Vdc to 4.2 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 4				Limit (ppm)
	Channel Bandwidth: 15 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	1717.500003	0.002	1747.500002	0.001	2.5
-20	1717.500003	0.002	1747.500002	0.001	2.5
-10	1717.500002	0.001	1747.500003	0.002	2.5
0	1717.500003	0.001	1747.500002	0.001	2.5
10	1717.500003	0.002	1747.500001	0.001	2.5
20	1717.499998	-0.001	1747.499998	-0.001	2.5
30	1717.499997	-0.002	1747.499999	-0.001	2.5
40	1717.499998	-0.001	1747.499997	-0.001	2.5
50	1717.499997	-0.002	1747.499998	-0.001	2.5
55	1717.499997	-0.002	1747.499998	-0.001	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4				Limit (ppm)
	Channel Bandwidth: 20 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.6	1720.000003	0.002	1745.000004	0.002	2.5
3.3	1720.000003	0.002	1745.000004	0.002	2.5
4.2	1720.000002	0.001	1745.000001	0.001	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.3 Vdc to 4.2 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 4				Limit (ppm)
	Channel Bandwidth: 20 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	1720.000003	0.002	1745.000003	0.001	2.5
-20	1720.000002	0.001	1745.000003	0.002	2.5
-10	1720.000001	0.001	1745.000002	0.001	2.5
0	1720.000001	0.001	1745.000003	0.002	2.5
10	1720.000004	0.002	1745.000004	0.002	2.5
20	1719.999998	-0.001	1744.999999	-0.001	2.5
30	1719.999998	-0.001	1744.999997	-0.002	2.5
40	1719.999998	-0.001	1744.999998	-0.001	2.5
50	1719.999997	-0.002	1744.999997	-0.002	2.5
55	1719.999997	-0.002	1744.999996	-0.002	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 12				Limit (ppm)
	Channel Bandwidth: 1.4 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.6	699.700002	0.003	715.300002	0.003	2.5
3.3	699.700004	0.005	715.300003	0.003	2.5
4.2	699.700003	0.005	715.300002	0.003	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.3 Vdc to 4.2 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 12				Limit (ppm)
	Channel Bandwidth: 1.4 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	699.700001	0.002	715.300002	0.003	2.5
-20	699.700001	0.001	715.300003	0.004	2.5
-10	699.700002	0.003	715.300001	0.002	2.5
0	699.700002	0.003	715.300003	0.005	2.5
10	699.700002	0.003	715.300002	0.003	2.5
20	699.699997	-0.005	715.299997	-0.004	2.5
30	699.699998	-0.003	715.299998	-0.003	2.5
40	699.699998	-0.003	715.299997	-0.004	2.5
50	699.699996	-0.005	715.299997	-0.005	2.5
55	699.699997	-0.004	715.299998	-0.003	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 12				Limit (ppm)
	Channel Bandwidth: 3 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.6	700.500001	0.002	714.500004	0.005	2.5
3.3	700.500003	0.005	714.500004	0.006	2.5
4.2	700.500003	0.004	714.500004	0.005	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.3 Vdc to 4.2 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 12				Limit (ppm)
	Channel Bandwidth: 3 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	700.500004	0.005	714.500002	0.003	2.5
-20	700.500001	0.002	714.500004	0.005	2.5
-10	700.500003	0.005	714.500003	0.004	2.5
0	700.500002	0.002	714.500004	0.005	2.5
10	700.500002	0.003	714.500001	0.002	2.5
20	700.499998	-0.003	714.499997	-0.004	2.5
30	700.499997	-0.004	714.499997	-0.004	2.5
40	700.499996	-0.005	714.499999	-0.002	2.5
50	700.499998	-0.003	714.499999	-0.002	2.5
55	700.499996	-0.005	714.499997	-0.004	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 12				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.6	701.500003	0.004	713.500003	0.005	2.5
3.3	701.500002	0.002	713.500003	0.004	2.5
4.2	701.500003	0.004	713.500003	0.004	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.3 Vdc to 4.2 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 12				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	701.500003	0.005	713.500002	0.003	2.5
-20	701.500001	0.002	713.500001	0.002	2.5
-10	701.500002	0.003	713.500002	0.003	2.5
0	701.500004	0.005	713.500003	0.004	2.5
10	701.500003	0.004	713.500003	0.004	2.5
20	701.499996	-0.005	713.499999	-0.002	2.5
30	701.499998	-0.004	713.499999	-0.002	2.5
40	701.499997	-0.005	713.499997	-0.004	2.5
50	701.499996	-0.005	713.499998	-0.003	2.5
55	701.499996	-0.006	713.499996	-0.005	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 12				Limit (ppm)
	Channel Bandwidth: 10 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.6	704.000003	0.004	711.000004	0.005	2.5
3.3	704.000003	0.004	711.000003	0.005	2.5
4.2	704.000003	0.004	711.000002	0.003	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.3 Vdc to 4.2 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 12				Limit (ppm)
	Channel Bandwidth: 10 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	704.000004	0.005	711.000002	0.002	2.5
-20	704.000003	0.004	711.000003	0.004	2.5
-10	704.000001	0.001	711.000002	0.003	2.5
0	704.000002	0.003	711.000002	0.003	2.5
10	704.000002	0.003	711.000002	0.002	2.5
20	703.999997	-0.005	710.999998	-0.003	2.5
30	703.999997	-0.004	710.999999	-0.002	2.5
40	703.999999	-0.002	710.999999	-0.002	2.5
50	703.999997	-0.004	710.999998	-0.002	2.5
55	703.999997	-0.004	710.999996	-0.005	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 13				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.6	779.500002	0.003	784.500004	0.004	2.5
3.3	779.500001	0.001	784.500004	0.005	2.5
4.2	779.500001	0.001	784.500001	0.002	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.3 Vdc to 4.2 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 13				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	779.500003	0.004	784.500004	0.005	2.5
-20	779.500003	0.004	784.500002	0.003	2.5
-10	779.500004	0.005	784.500004	0.004	2.5
0	779.500002	0.002	784.500003	0.003	2.5
10	779.500003	0.003	784.500003	0.003	2.5
20	779.499996	-0.005	784.499999	-0.001	2.5
30	779.499999	-0.002	784.499996	-0.005	2.5
40	779.499997	-0.004	784.499997	-0.004	2.5
50	779.499997	-0.004	784.499999	-0.002	2.5
55	779.499999	-0.002	784.499997	-0.004	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 13		Limit (ppm)
	Channel Bandwidth: 10 MHz		
	Frequency (MHz)	Frequency Error (ppm)	
3.6	782.000001	0.002	2.5
3.3	782.000003	0.004	2.5
4.2	782.000002	0.003	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.3 Vdc to 4.2 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 13		Limit (ppm)
	Channel Bandwidth: 10 MHz		
	Frequency (MHz)	Frequency Error (ppm)	
-30	782.000003	0.004	2.5
-20	782.000002	0.002	2.5
-10	782.000002	0.003	2.5
0	782.000002	0.002	2.5
10	782.000004	0.005	2.5
20	781.999997	-0.003	2.5
30	781.999997	-0.004	2.5
40	781.999998	-0.002	2.5
50	781.999996	-0.005	2.5
55	781.999996	-0.005	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 17				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.6	706.500002	0.003	713.500002	0.003	2.5
3.3	706.500002	0.003	713.500002	0.003	2.5
4.2	706.500002	0.002	713.500002	0.002	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.3 Vdc to 4.2 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 17				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	706.500004	0.005	713.500002	0.003	2.5
-20	706.500004	0.006	713.500003	0.004	2.5
-10	706.500002	0.002	713.500003	0.004	2.5
0	706.500002	0.003	713.500002	0.003	2.5
10	706.500004	0.005	713.500004	0.005	2.5
20	706.499996	-0.005	713.499997	-0.004	2.5
30	706.499998	-0.003	713.499997	-0.004	2.5
40	706.499998	-0.003	713.499998	-0.003	2.5
50	706.499997	-0.004	713.499999	-0.002	2.5
55	706.499999	-0.002	713.499998	-0.004	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 17				Limit (ppm)
	Channel Bandwidth: 10 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.6	709.000003	0.004	711.000004	0.005	2.5
3.3	709.000003	0.004	711.000004	0.005	2.5
4.2	709.000004	0.006	711.000002	0.002	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.3 Vdc to 4.2 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 17				Limit (ppm)
	Channel Bandwidth: 10 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	709.000004	0.005	711.000004	0.005	2.5
-20	709.000004	0.005	711.000004	0.005	2.5
-10	709.000001	0.002	711.000004	0.005	2.5
0	709.000003	0.004	711.000002	0.003	2.5
10	709.000001	0.001	711.000001	0.002	2.5
20	708.999998	-0.003	710.999999	-0.002	2.5
30	708.999997	-0.004	710.999998	-0.002	2.5
40	708.999997	-0.004	710.999997	-0.005	2.5
50	708.999996	-0.005	710.999997	-0.004	2.5
55	708.999998	-0.003	710.999998	-0.003	2.5

4.3 Occupied Bandwidth Measurement

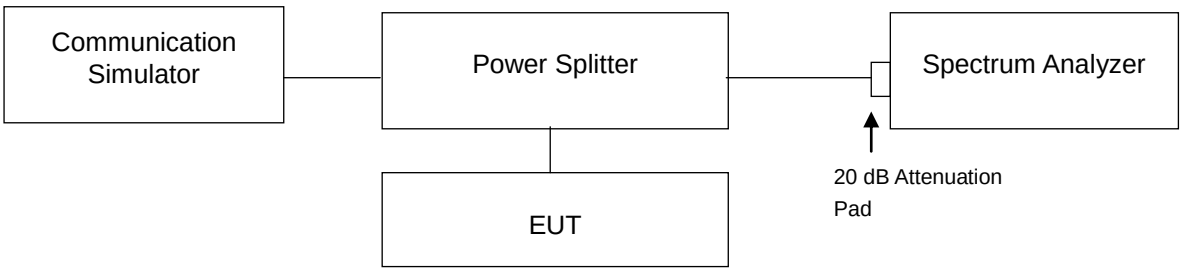
4.3.1 Limits of Occupied Bandwidth Measurement

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.

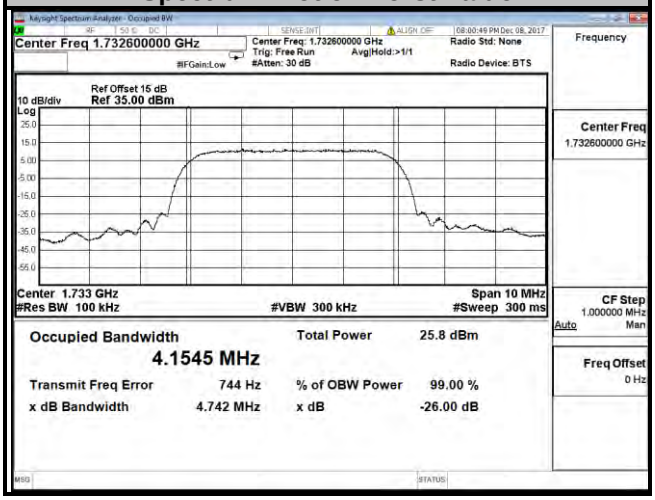
4.3.3 Test Setup



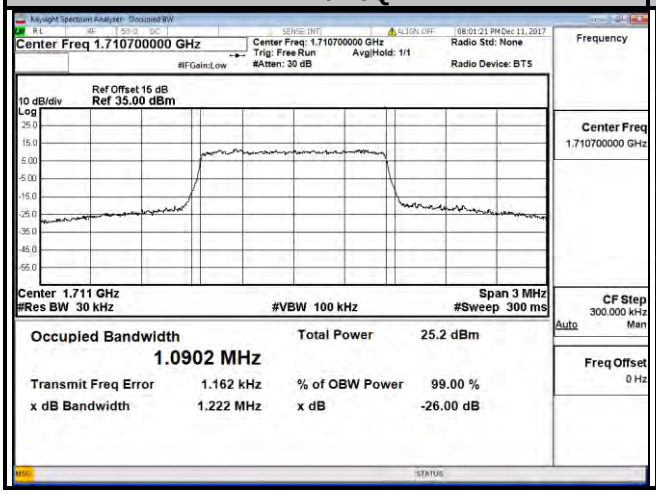
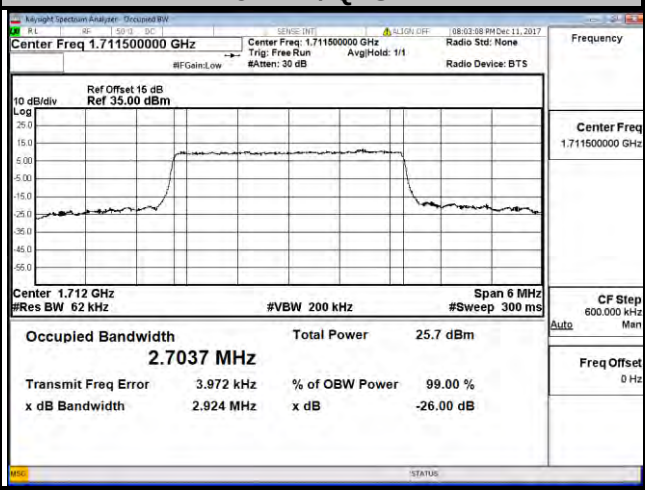
4.3.4 Test Result

WCDMA		
Channel	**Frequency (MHz)**	**99 % Occupied Bandwidth (MHz)**
1312	1712.4	4.1365
1413	1732.6	4.1545
1513	1752.6	4.1460

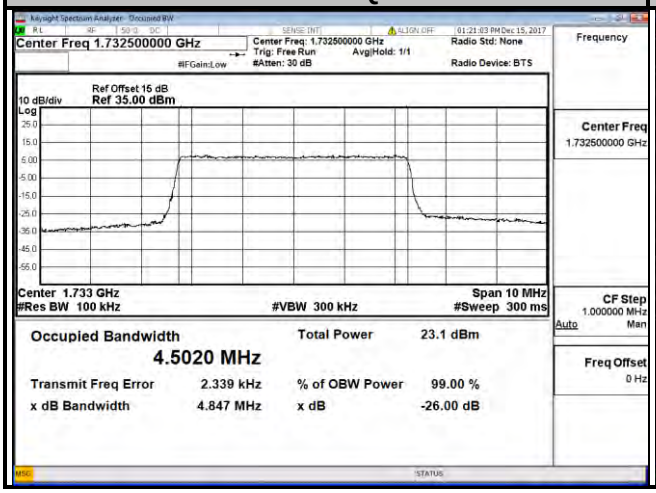
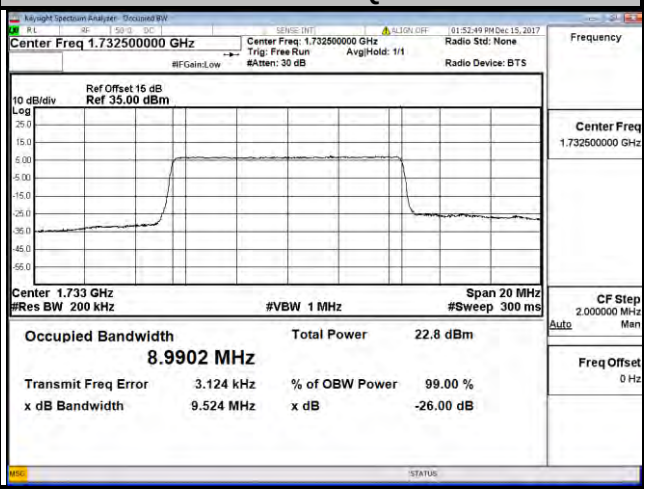
Spectrum Plot of Worst Value



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	64QAM			QPSK	16QAM	64QAM
19957	1710.7	1.0880	1.0902	1.0883	19965	1711.5	2.7037	2.6999	2.6993
20175	1732.5	1.0855	1.0879	1.0869	20175	1732.5	2.7027	2.6992	2.6996
20393	1754.3	1.0869	1.0893	1.0866	20385	1753.5	2.7030	2.6995	2.6997

Spectrum Plot of Worst Value	
1.4 MHz / 16QAM	3 MHz / QPSK
	

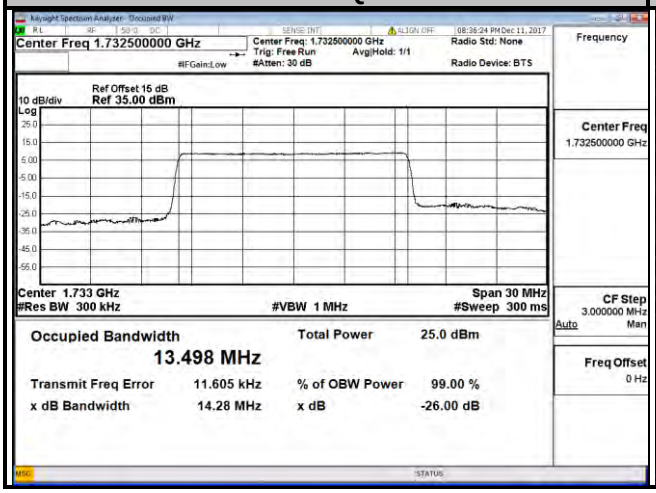
LTE Band 4									
Channel Bandwidth: 5 MHz					Channel Bandwidth: 10 MHz				
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)			Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		
		QPSK	16QAM	64QAM			QPSK	16QAM	64QAM
19975	1712.5	4.4954	4.4939	4.4972	20000	1715.0	8.9584	8.9584	8.9566
20175	1732.5	4.4958	4.4958	4.5020	20175	1732.5	8.9884	8.9861	8.9902
20375	1752.5	4.4954	4.4944	4.4993	20350	1750.0	8.9570	8.9583	8.9613

Spectrum Plot of Worst Value	
5 MHz / 64QAM	10 MHz / 64QAM
	

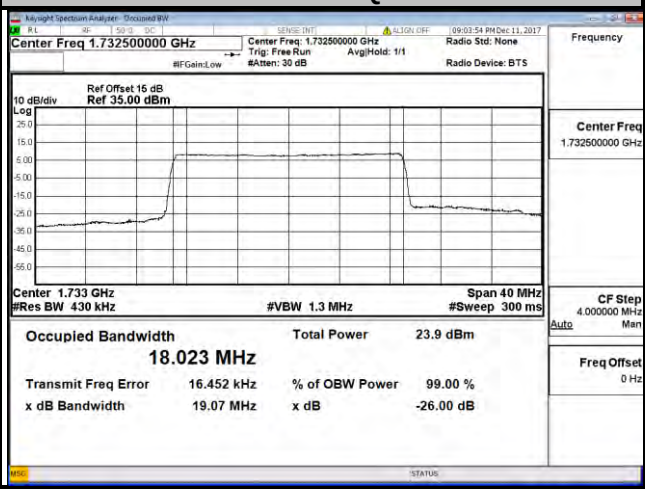
LTE Band 4									
Channel Bandwidth: 15 MHz					Channel Bandwidth: 20 MHz				
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)			Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		
		QPSK	16QAM	64QAM			QPSK	16QAM	64QAM
20025	1717.5	13.413	13.402	13.389	20050	1720.0	17.857	17.875	17.869
20175	1732.5	13.498	13.487	13.480	20175	1732.5	18.008	18.023	18.019
20325	1747.5	13.400	13.394	13.379	20300	1745.0	17.824	17.845	17.827

Spectrum Plot of Worst Value

15 MHz / QPSK

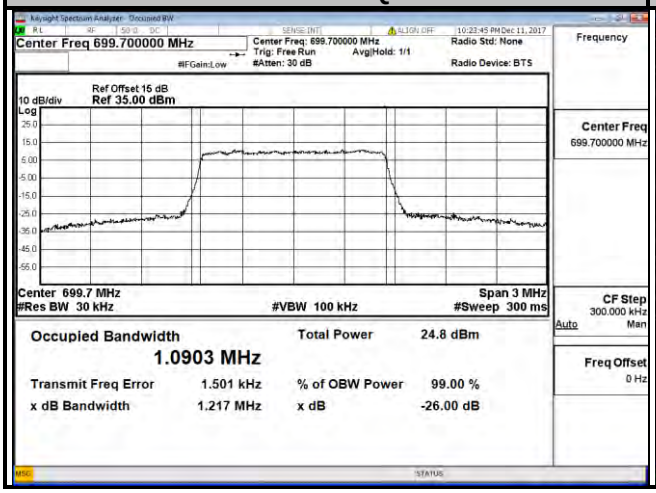


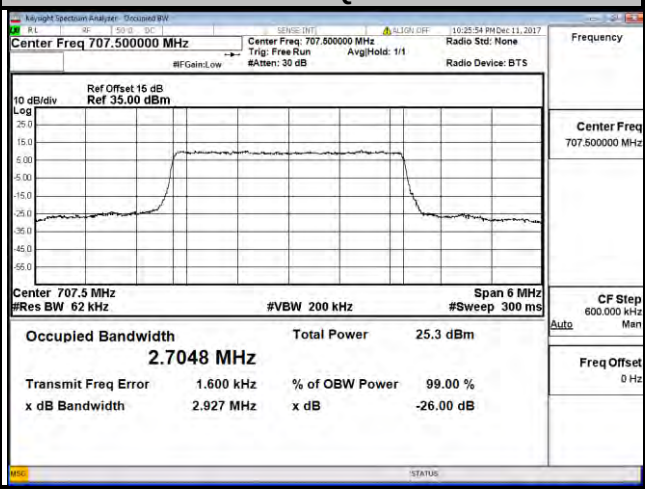
20 MHz / 16QAM



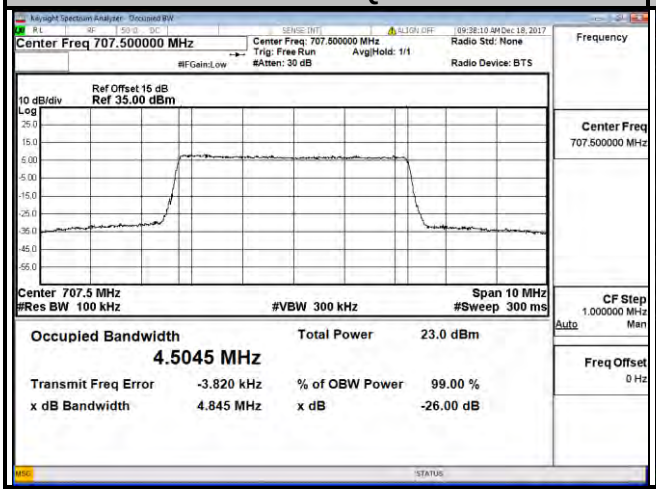
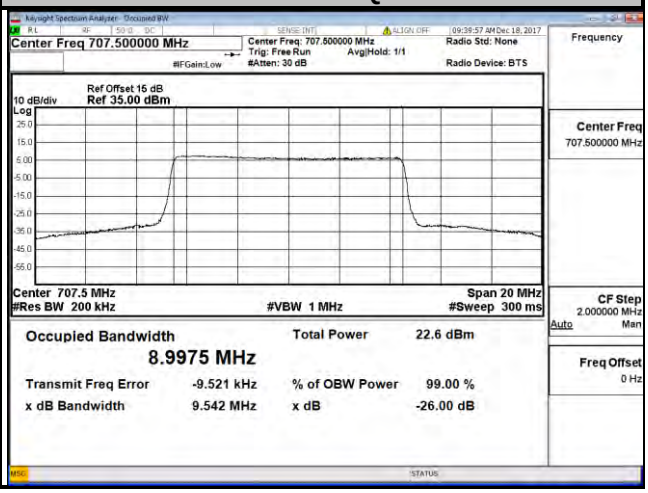
LTE Band 12									
Channel Bandwidth: 1.4 MHz					Channel Bandwidth: 3 MHz				
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)			Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		
		QPSK	16QAM	64QAM			QPSK	16QAM	64QAM
23017	699.7	1.0868	1.0903	1.0874	23025	700.5	2.6999	2.6973	2.6979
23095	707.5	1.0883	1.0894	1.0879	23095	707.5	2.7048	2.7008	2.6981
23173	715.3	1.0860	1.0877	1.0873	23165	714.5	2.6978	2.6939	2.6933

Spectrum Plot of Worst Value	
1.4 MHz / 16QAM	3 MHz / QPSK



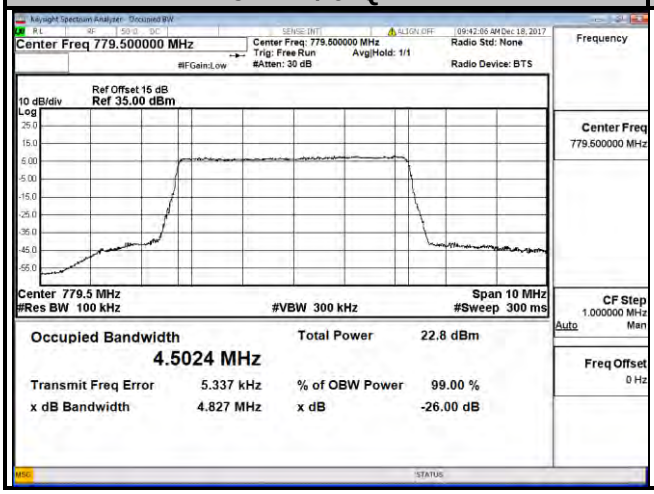


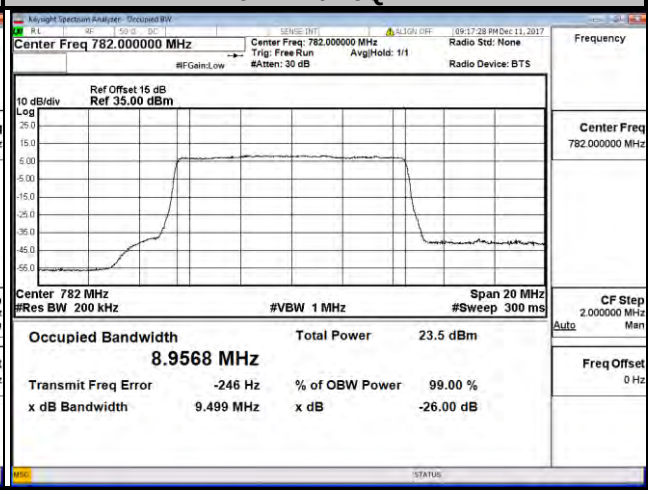
LTE Band 12									
Channel Bandwidth: 5 MHz					Channel Bandwidth: 10 MHz				
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)			Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		
		QPSK	16QAM	64QAM			QPSK	16QAM	64QAM
23035	701.5	4.4829	4.4845	4.4944	23060	704.0	8.9290	8.9343	8.9265
23095	707.5	4.4995	4.5008	4.5045	23095	707.5	8.9923	8.9936	8.9975
23155	713.5	4.4853	4.4868	4.4931	23130	711.0	8.9780	8.9826	8.9852

Spectrum Plot of Worst Value	
5 MHz / 64QAM	10 MHz / 64QAM
	

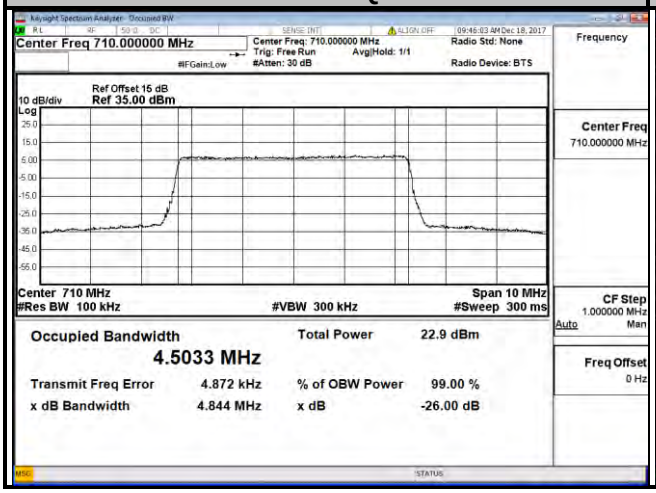
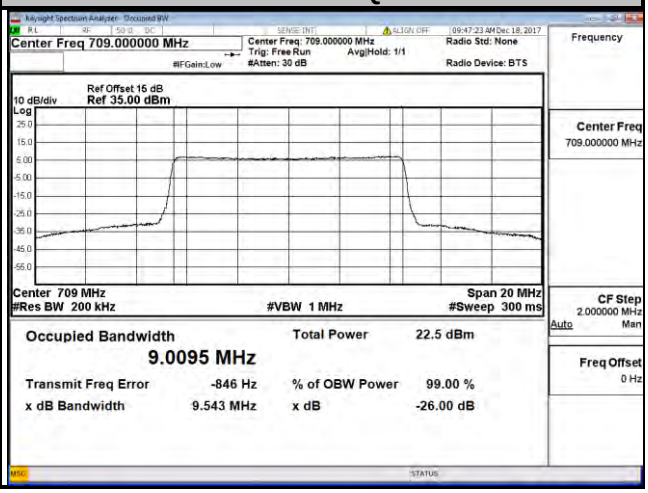
LTE Band 13									
Channel Bandwidth: 5 MHz					Channel Bandwidth: 10 MHz				
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)			Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		
		QPSK	16QAM	64QAM			QPSK	16QAM	64QAM
23205	779.5	4.4929	4.4952	4.5024	23230	782.0	8.9545	8.9568	8.9557
23230	782.0	4.4823	4.4816	4.4913					
23255	784.5	4.4935	4.4975	4.5024					

Spectrum Plot of Worst Value	
5 MHz / 64QAM	10 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	64QAM			QPSK	16QAM	64QAM
23755	706.5	4.4966	4.4967	4.5029	23780	709.0	9.0031	9.0066	9.0095
23790	710.0	4.4952	4.4975	4.5033	23790	710.0	8.9943	8.9987	9.0036
23825	713.5	4.4844	4.4850	4.4938	23800	711.0	8.9783	8.9741	8.9840

Spectrum Plot of Worst Value	
5 MHz / 64QAM	10 MHz / 64QAM
	

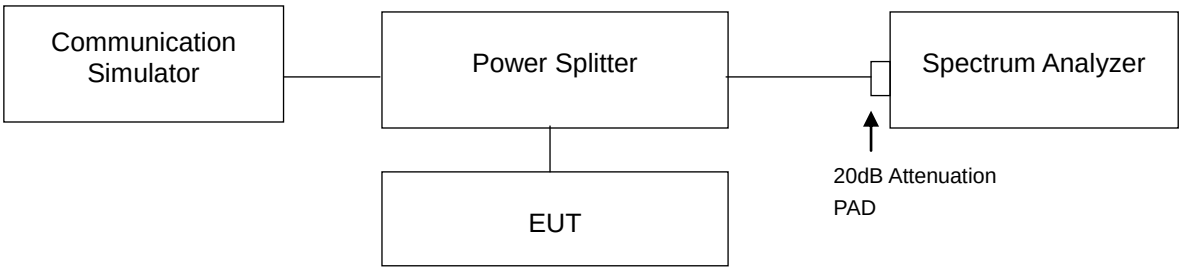
4.4 Band Edge Measurement

4.4.1 Limits of Band Edge Measurement

For operations in the 777~787 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater.
However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

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

4.4.2 Test Setup

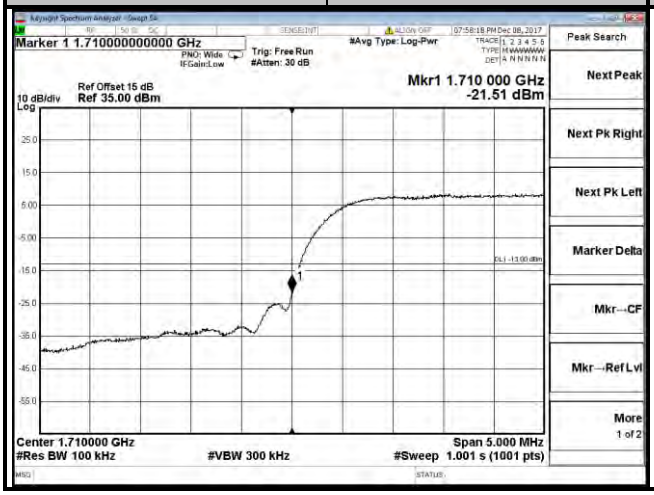


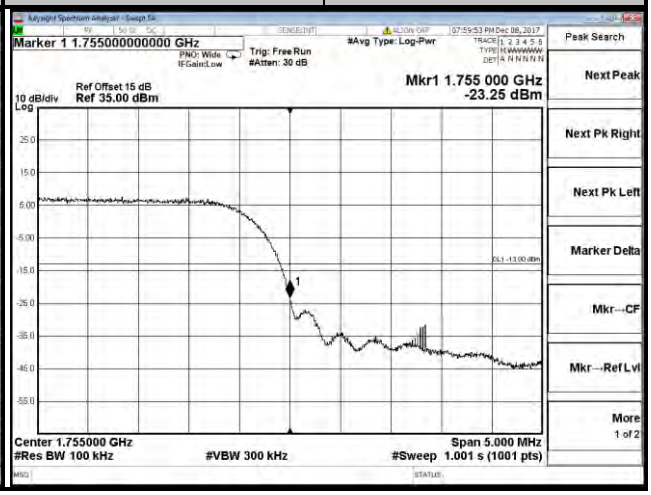
4.4.3 Test Procedures

a. All measurements were done at low and high operational frequency range.
b. The center frequency of spectrum is the band edge frequency and span is 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.

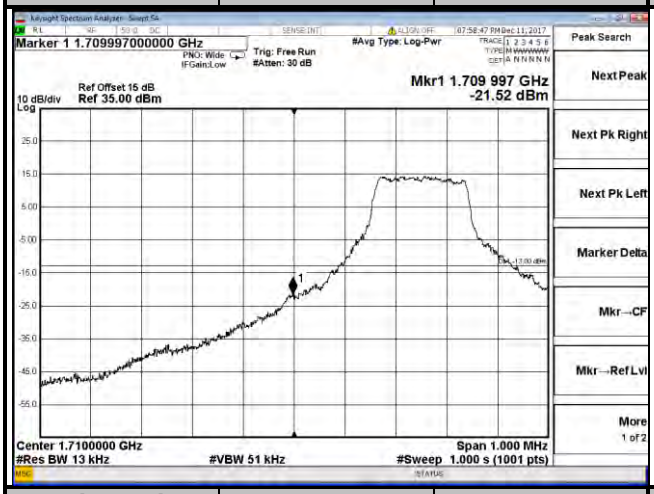
4.4.4 Test Results

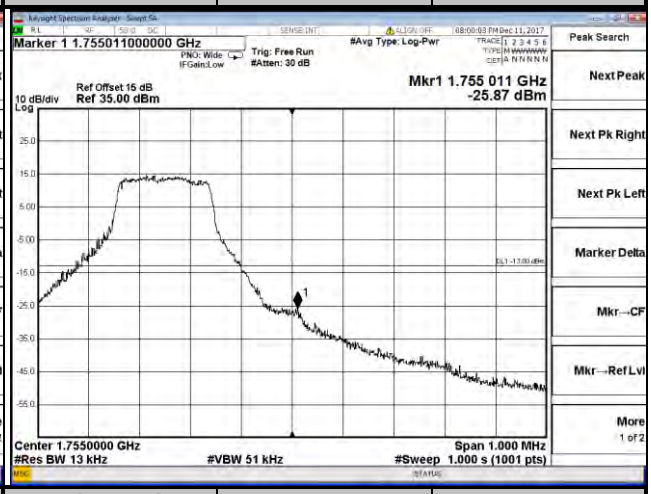
WCDMA			
Channel	1312	Channel	1513



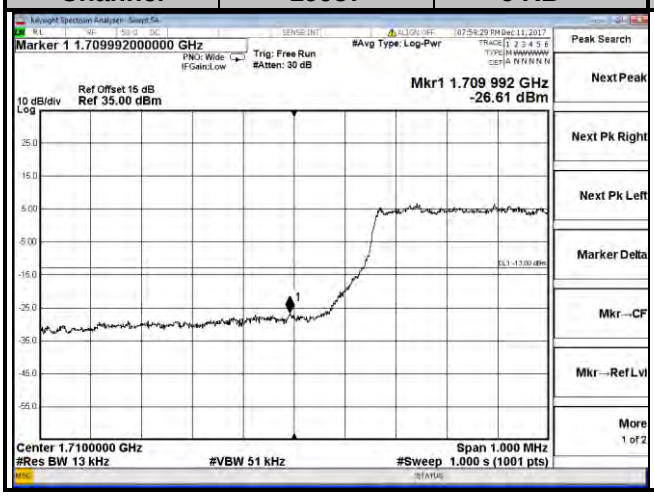


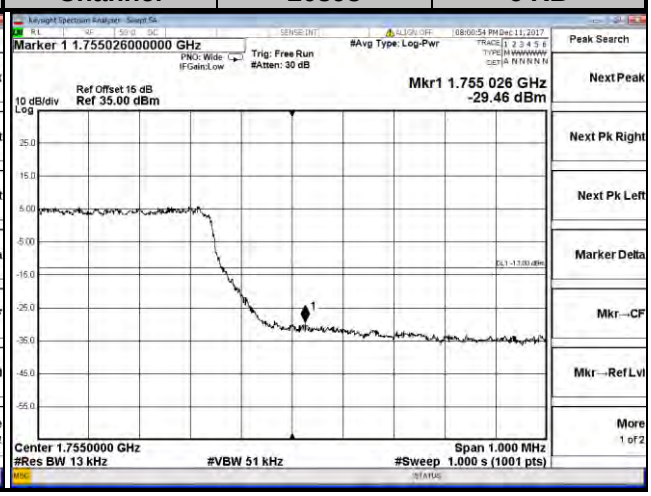
LTE Band 4					
Channel Bandwidth: 1.4 MHz					
Channel	19957	1 RB	Channel	20393	1 RB

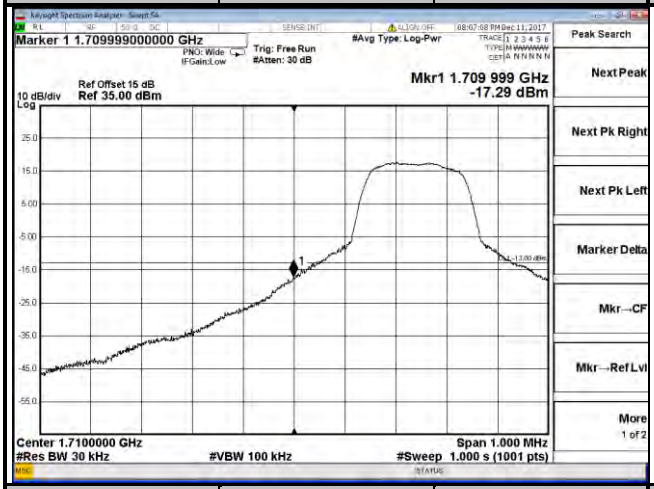
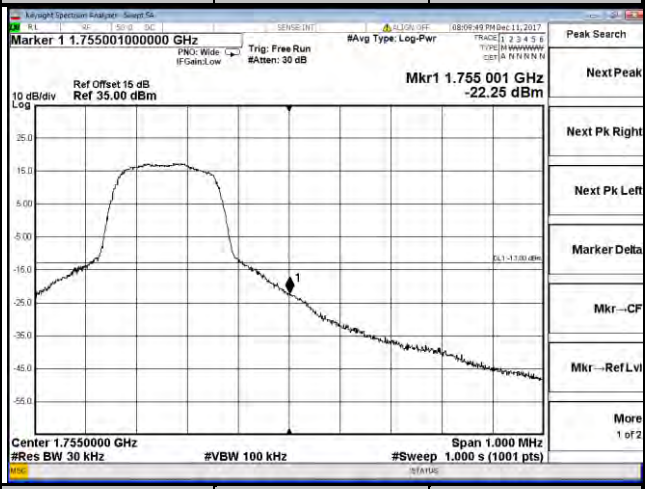
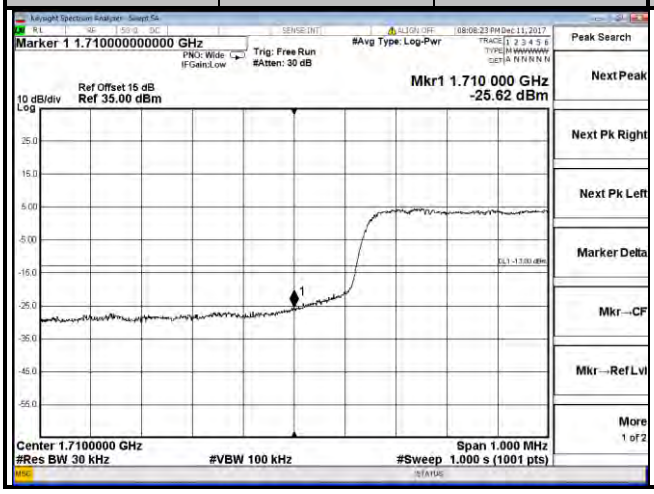
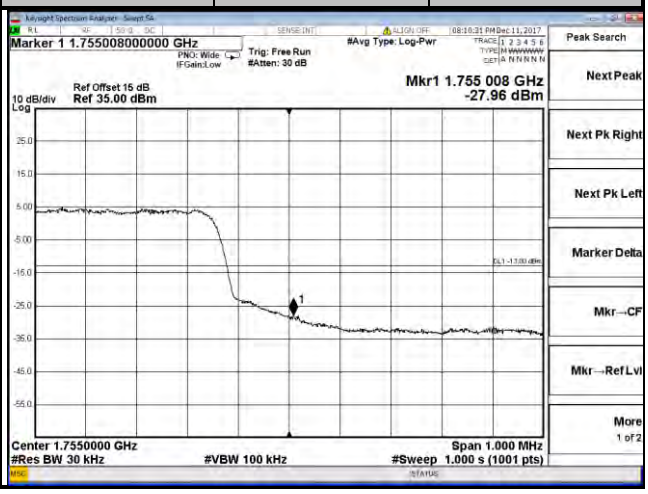


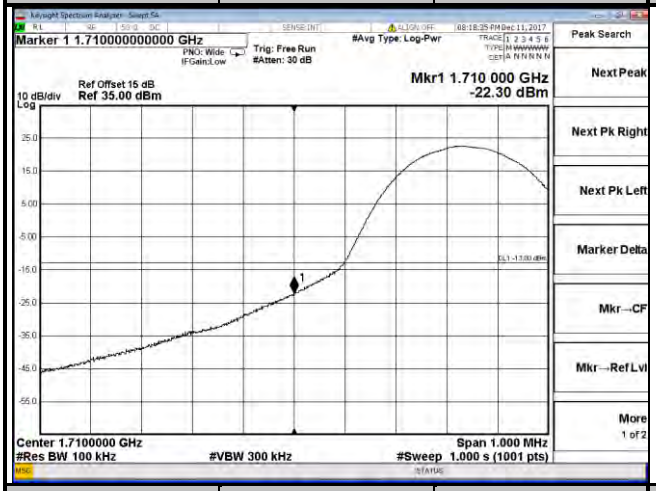
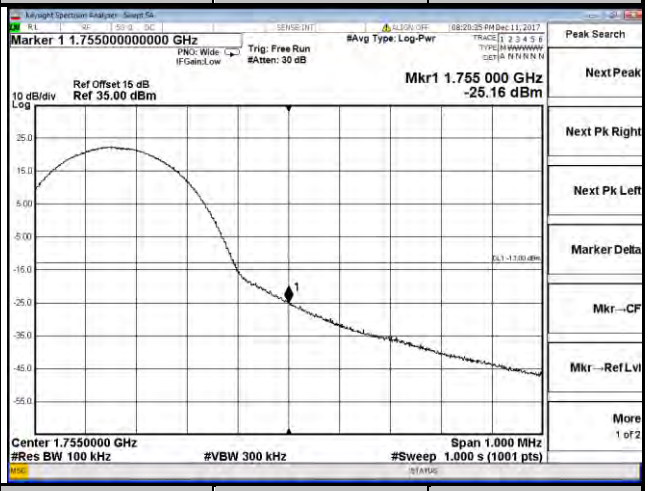
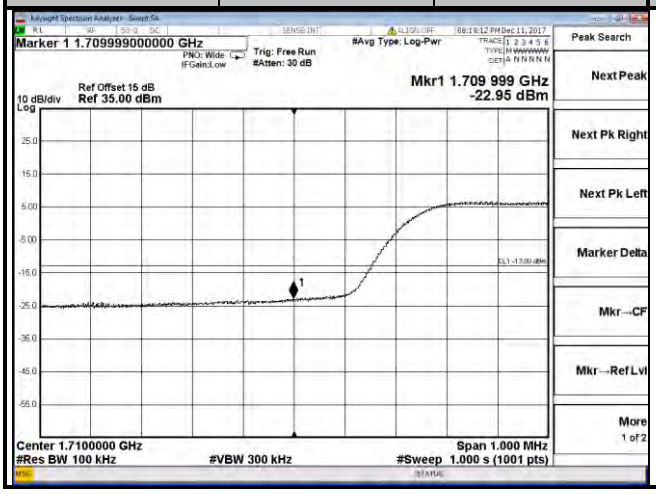
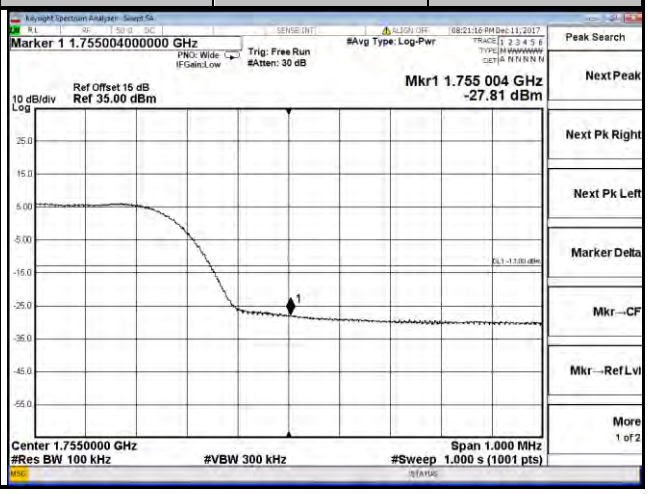


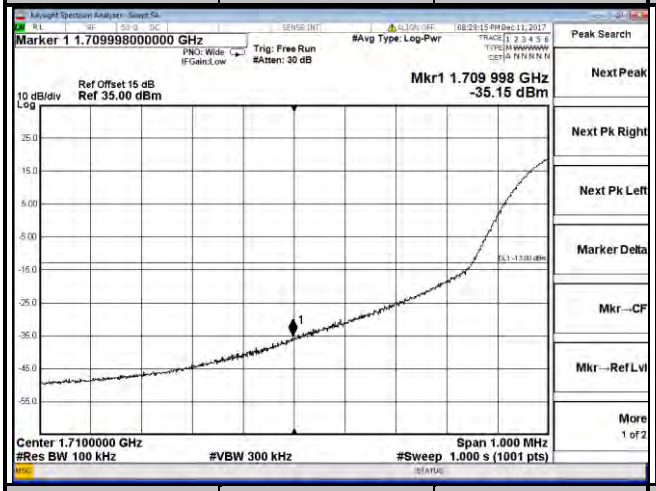
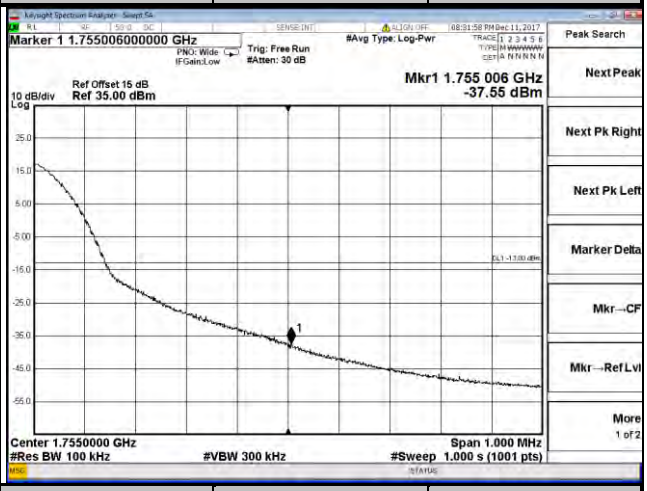
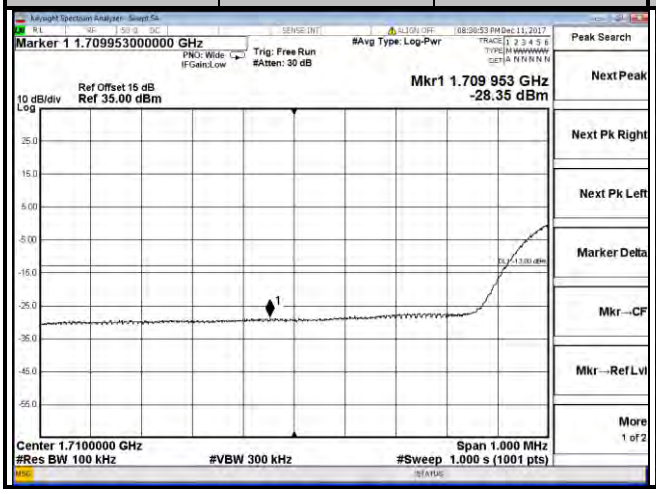
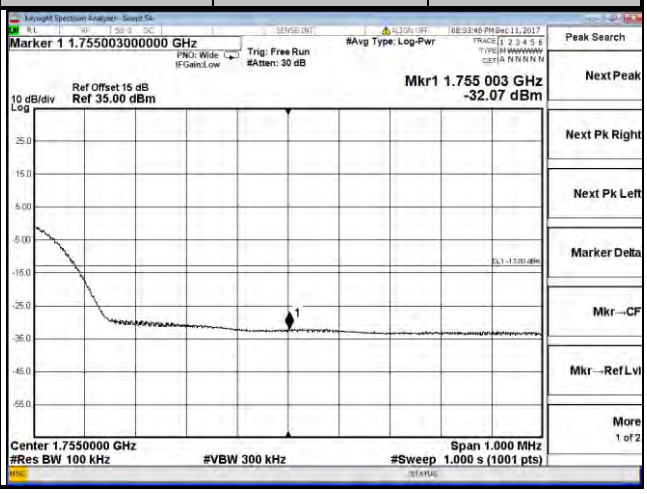
Channel	19957	6 RB	Channel	20393	6 RB

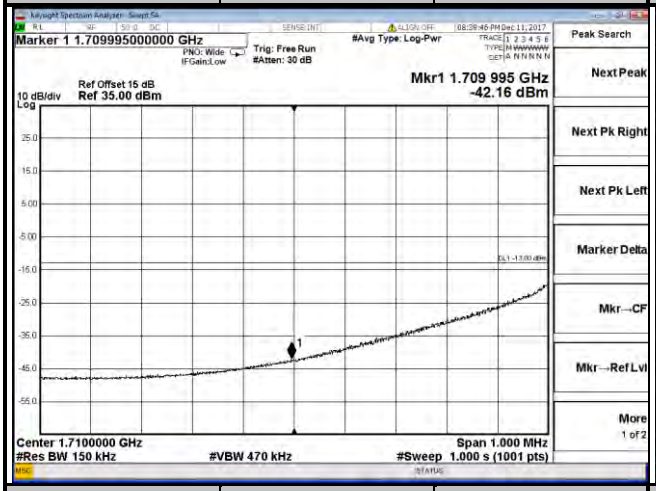
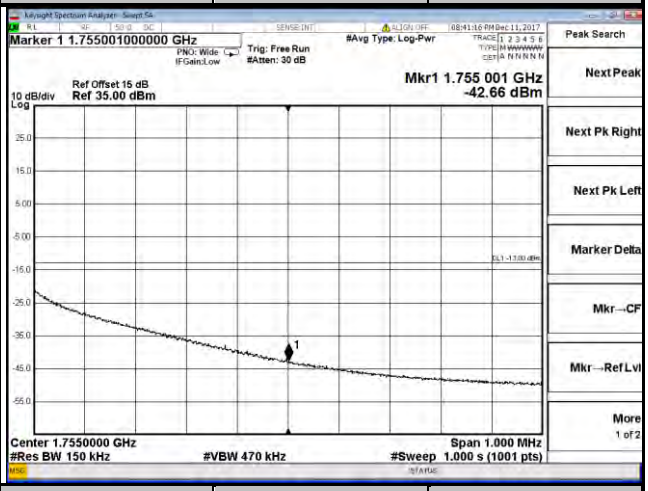
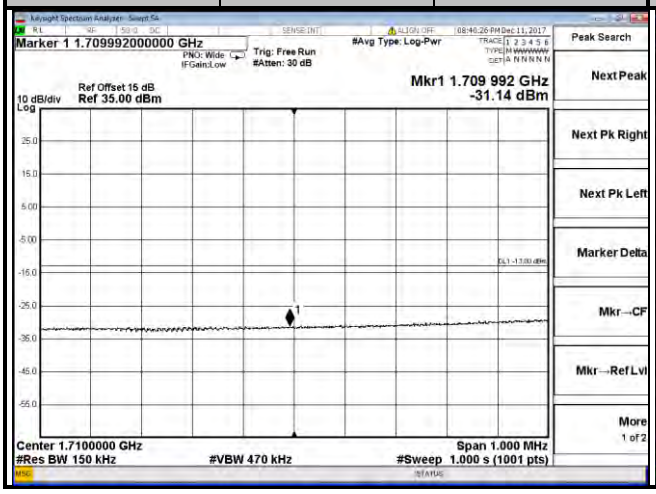
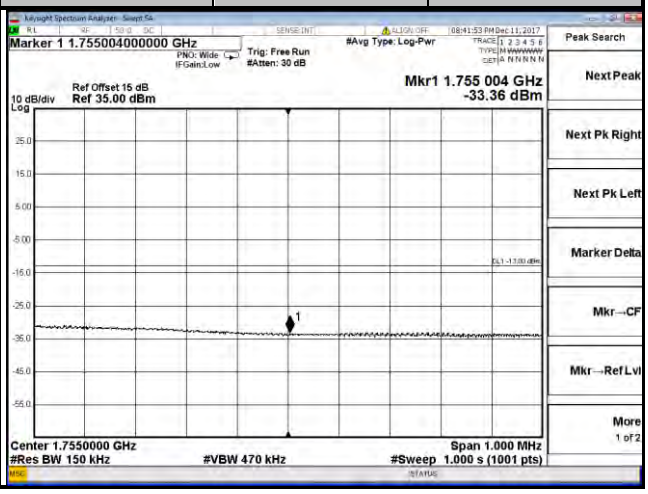


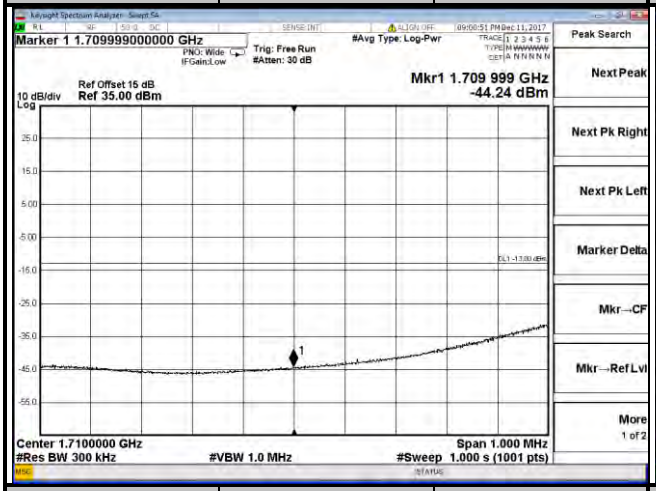
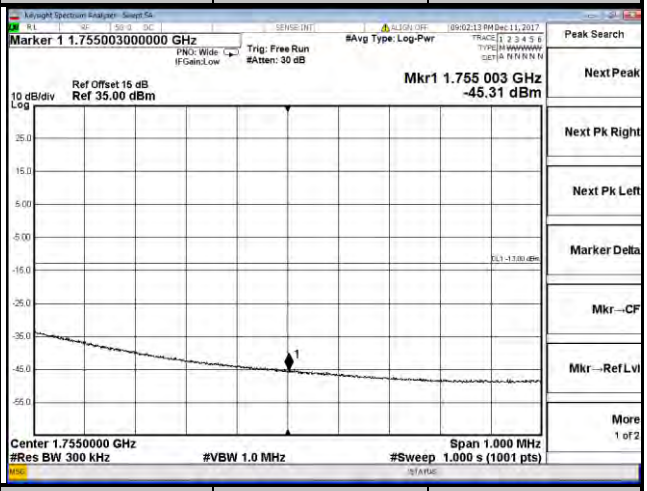
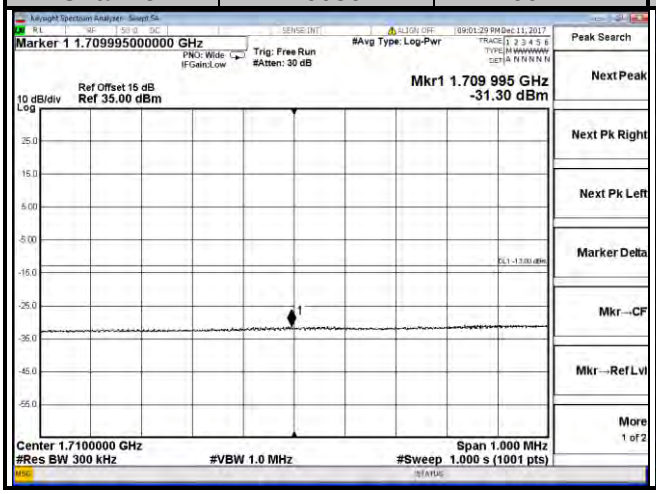
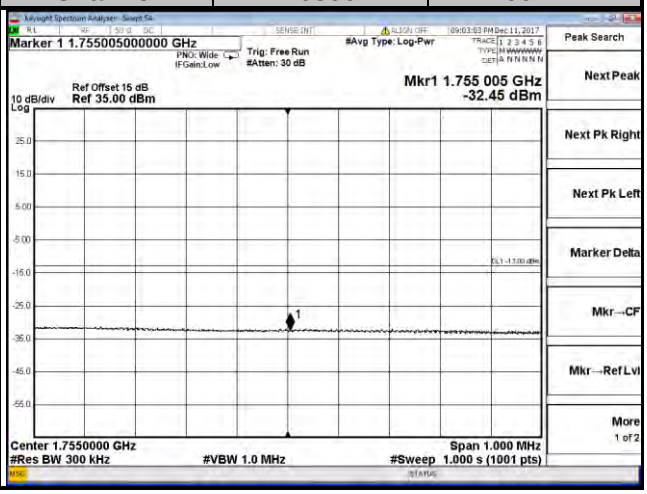


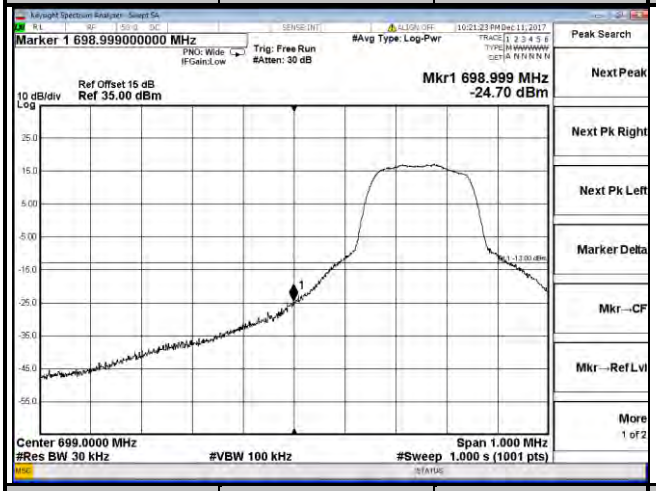
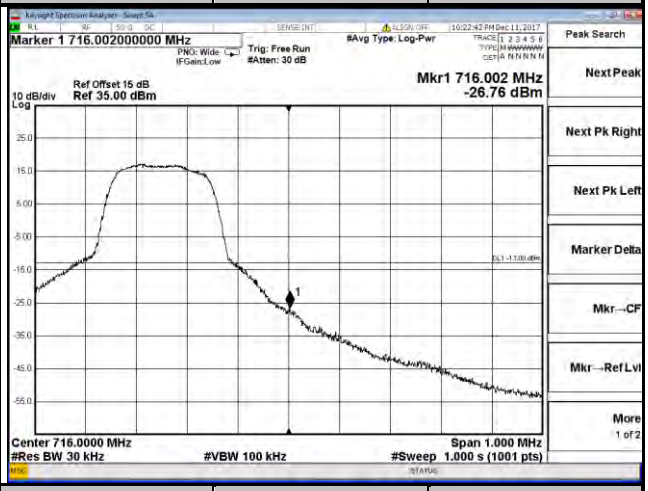
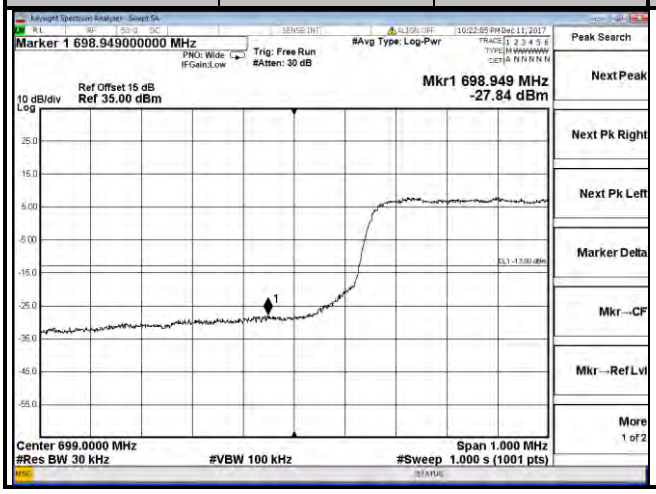
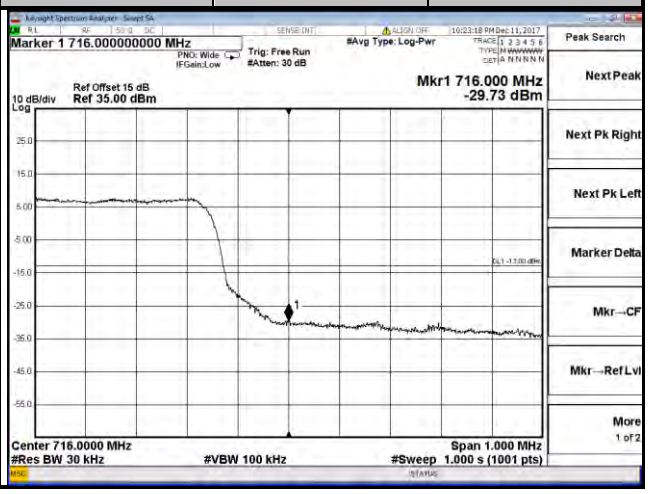
LTE Band 4					
Channel Bandwidth: 3 MHz					
Channel	19965	1 RB	Channel	20385	1 RB
					
Channel	19965	15 RB	Channel	20385	15 RB
					

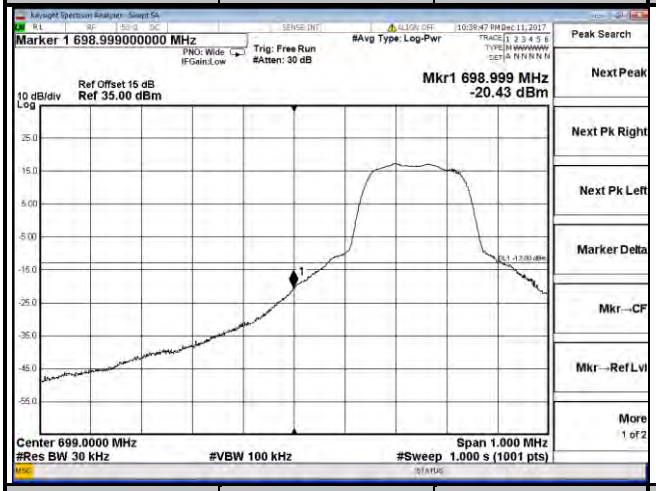
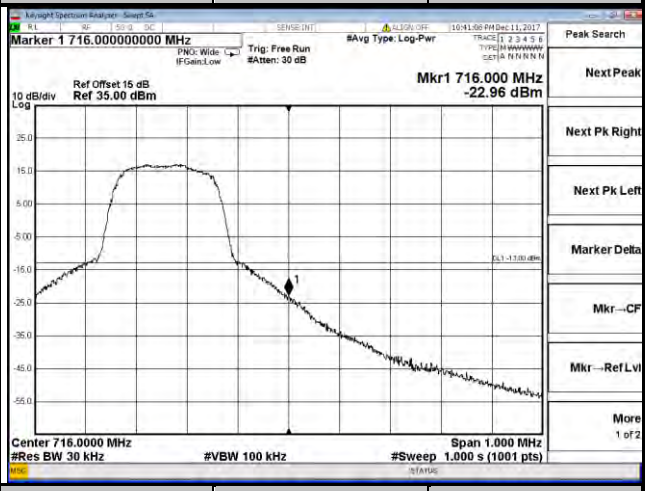
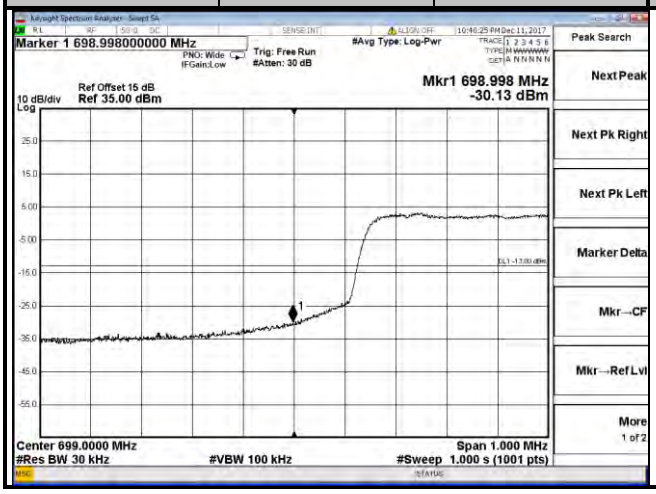
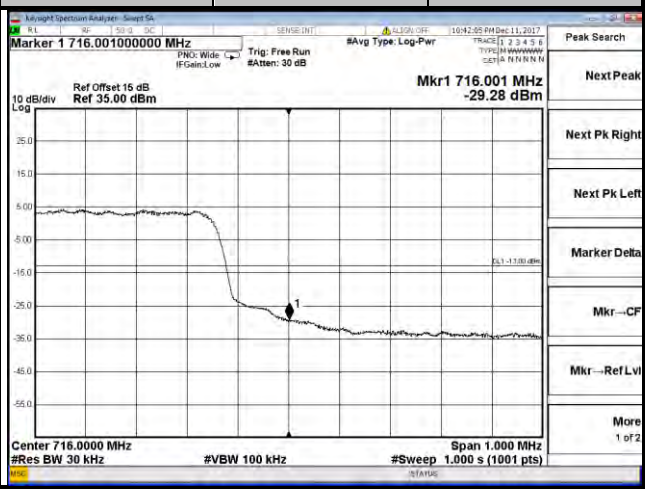
LTE Band 4					
Channel Bandwidth: 5 MHz					
Channel	19975	1 RB	Channel	20375	1 RB
					
Channel	19975	25 RB	Channel	20375	25 RB
					

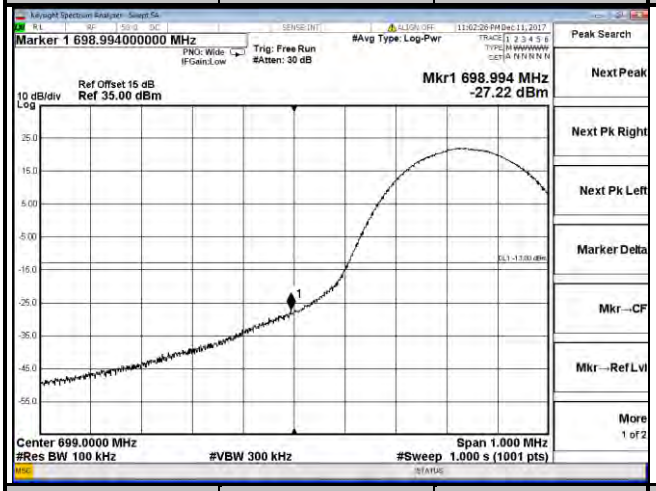
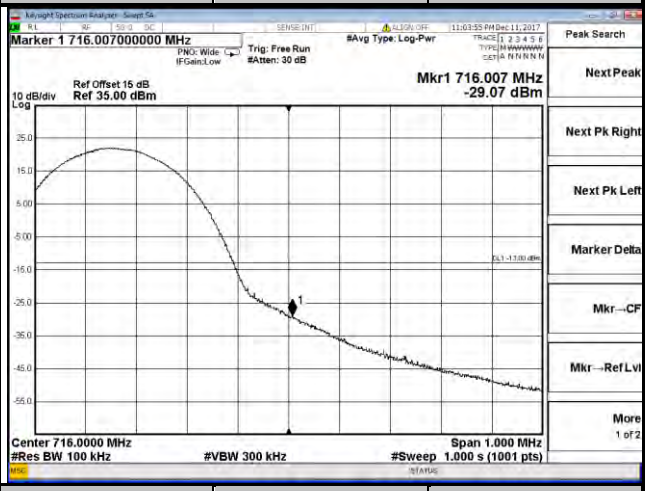
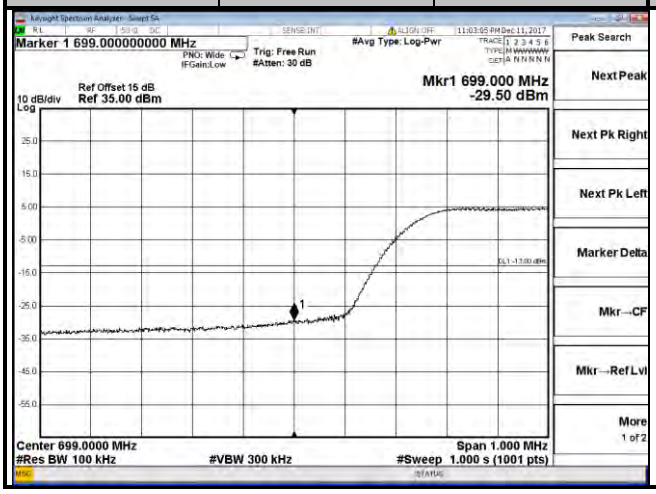
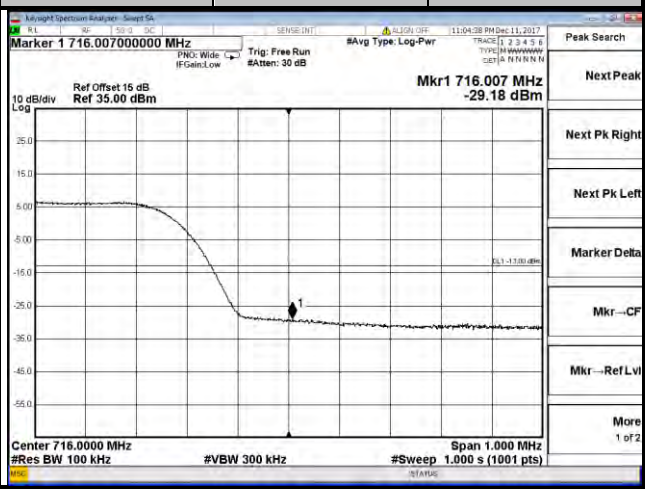
LTE Band 4					
Channel Bandwidth: 10 MHz					
Channel	20000	1 RB	Channel	20350	1 RB
					
Channel	20000	50 RB	Channel	20350	50 RB
					

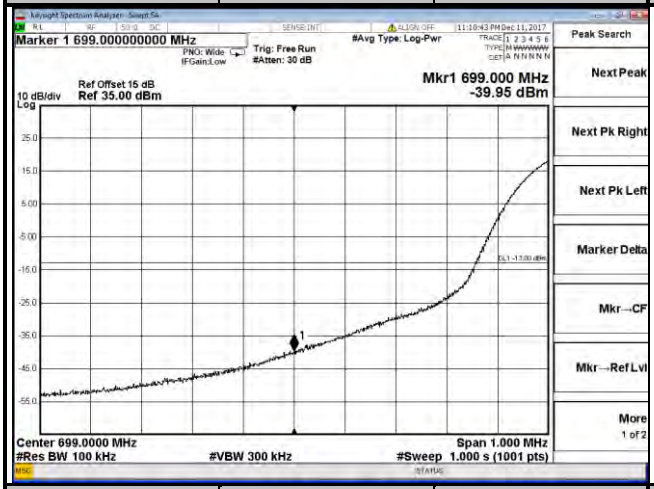
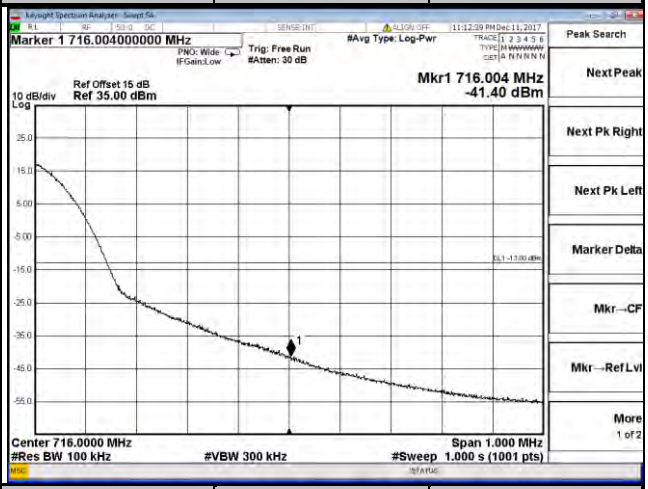
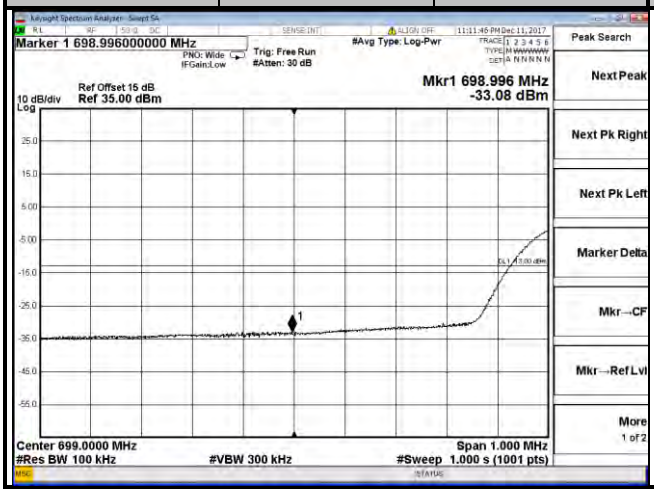
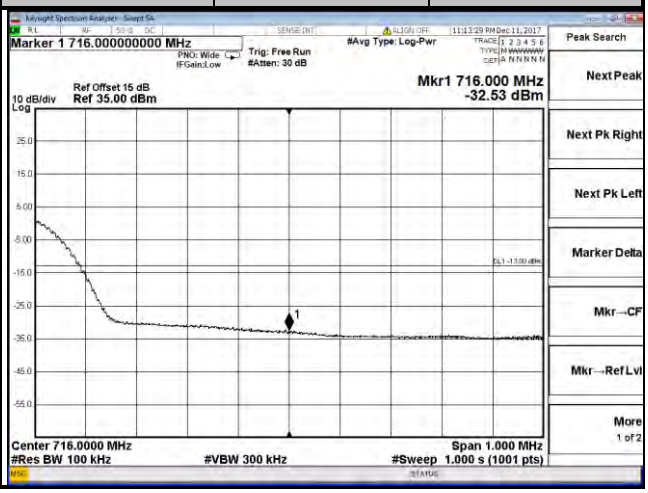
LTE Band 4					
Channel Bandwidth: 15 MHz					
Channel	20025	1 RB	Channel	20325	1 RB
					
Channel	20025	75 RB	Channel	20325	75 RB
					

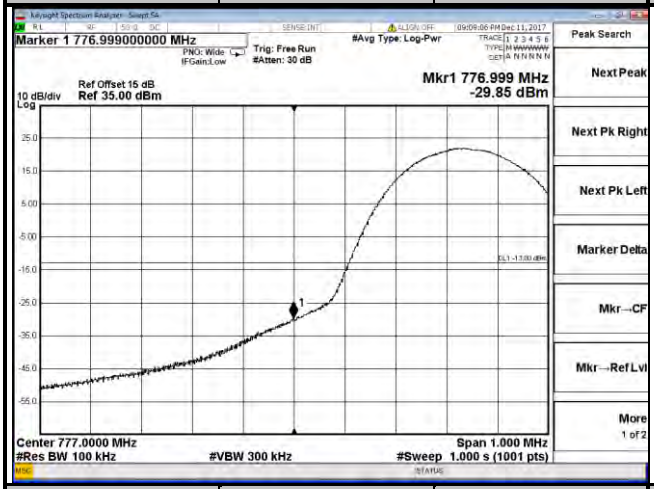
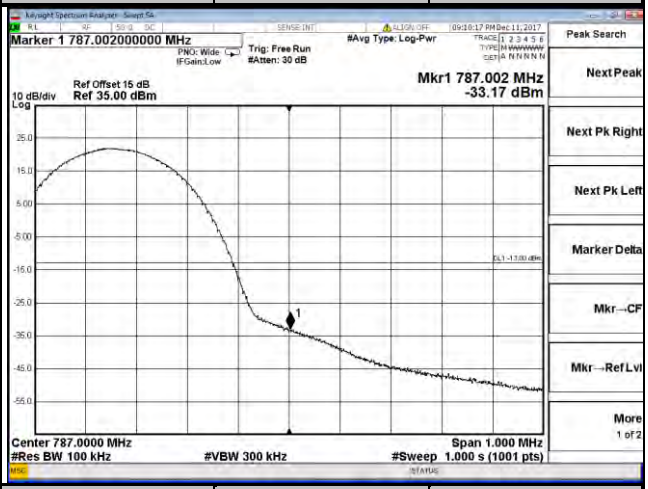
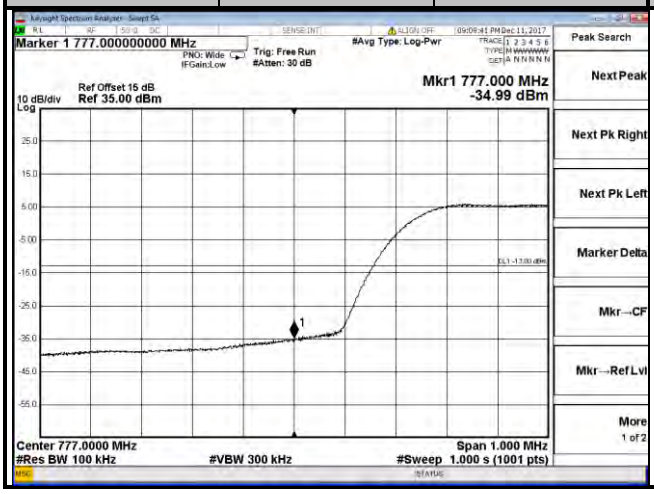
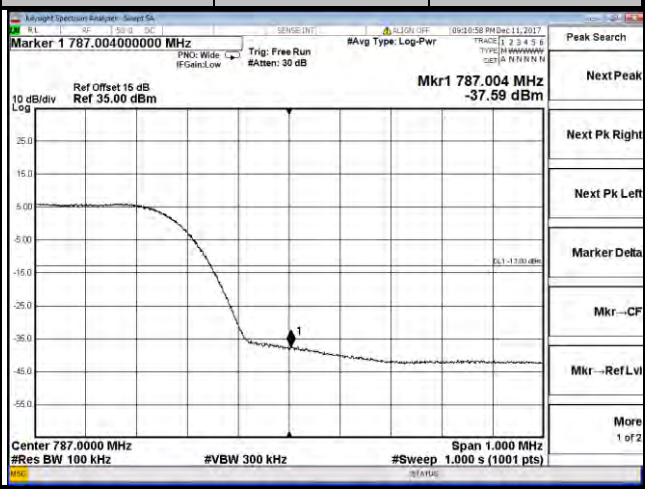
LTE Band 4					
Channel Bandwidth: 20 MHz					
Channel	20050	1 RB	Channel	20300	1 RB
					
Channel	20050	100 RB	Channel	20300	100 RB
					

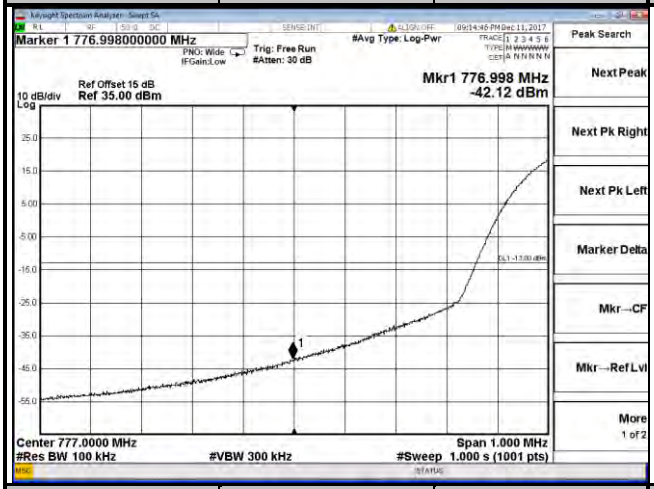
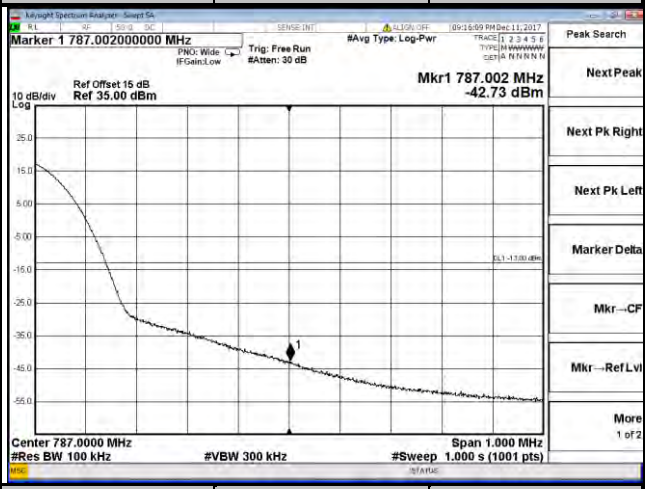
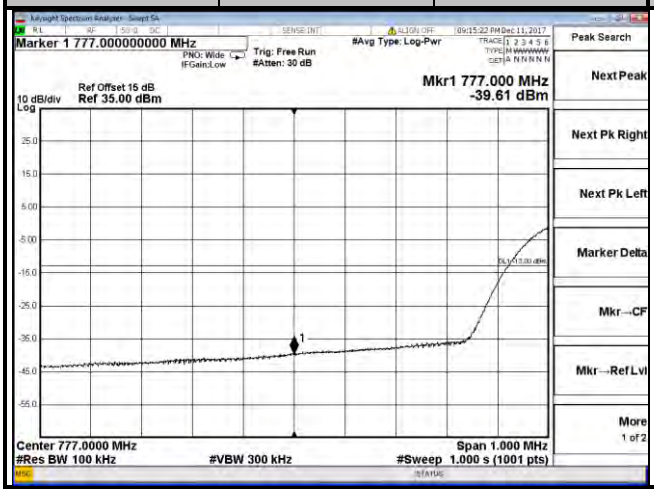
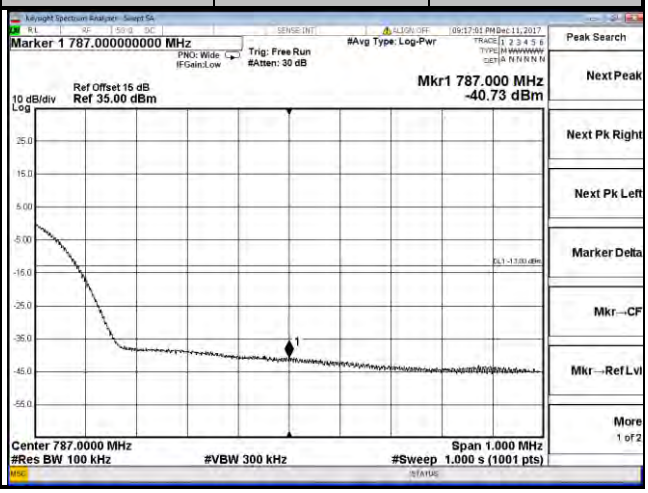
LTE Band 12					
Channel Bandwidth: 1.4 MHz					
Channel	23017	1 RB	Channel	23173	1 RB
					
Channel	23017	6 RB	Channel	23173	6 RB
					

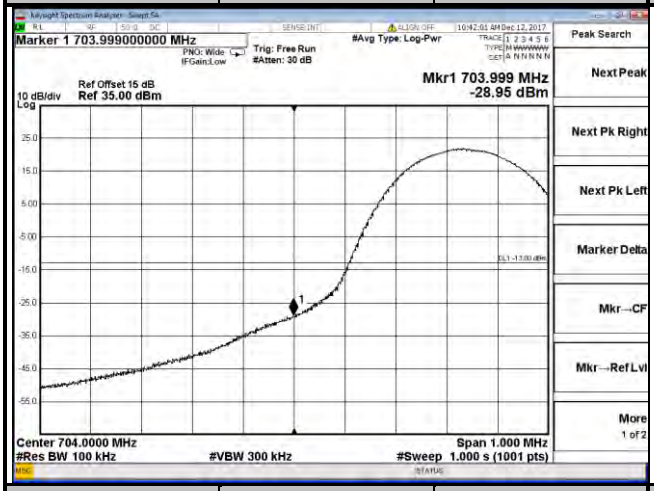
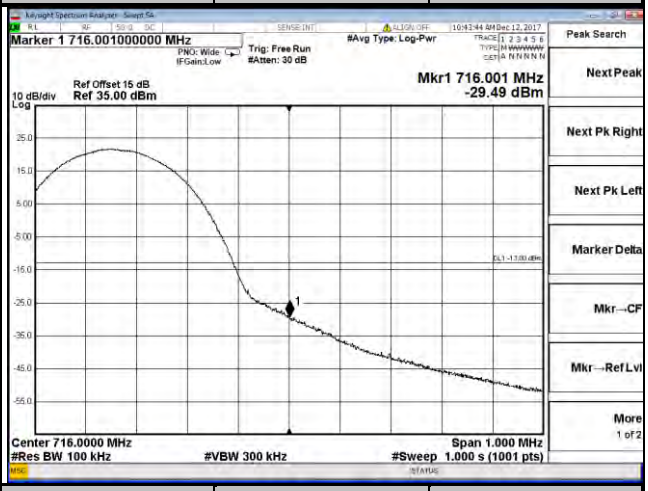
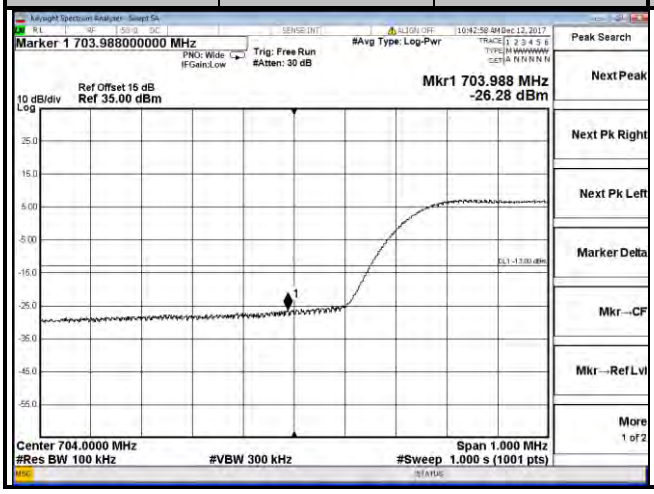
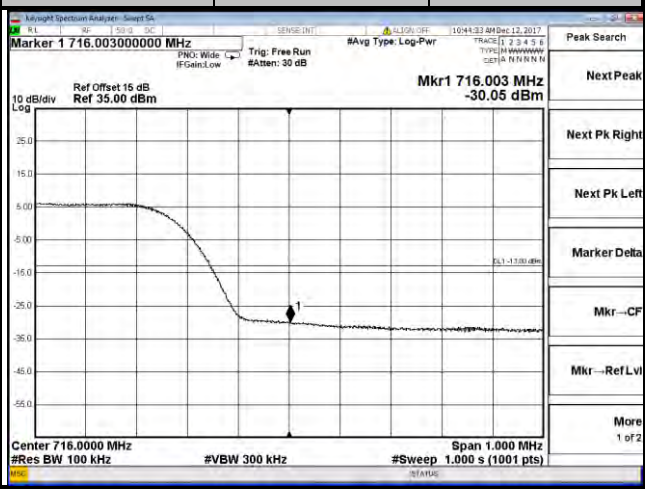
LTE Band 12					
Channel Bandwidth: 3 MHz					
Channel	23025	1 RB	Channel	23165	1 RB
					
Channel	23025	15 RB	Channel	23165	15 RB
					

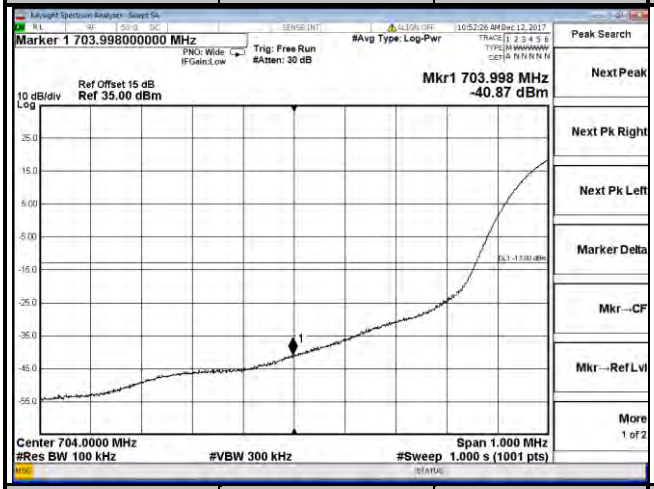
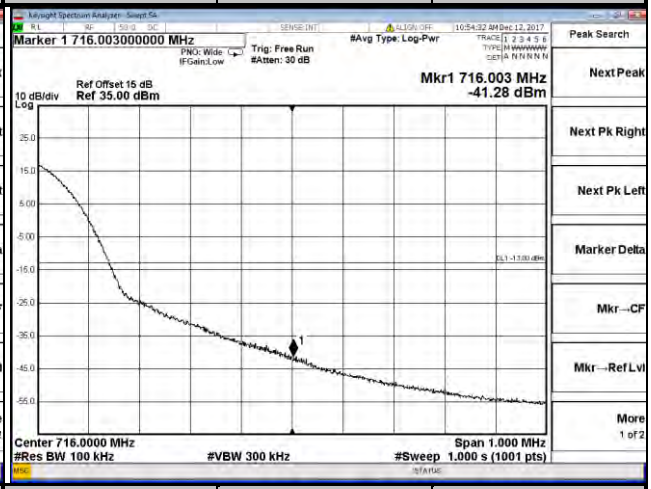
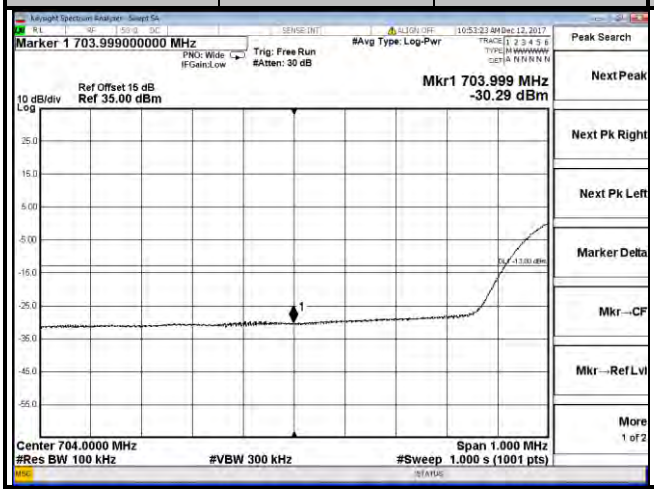
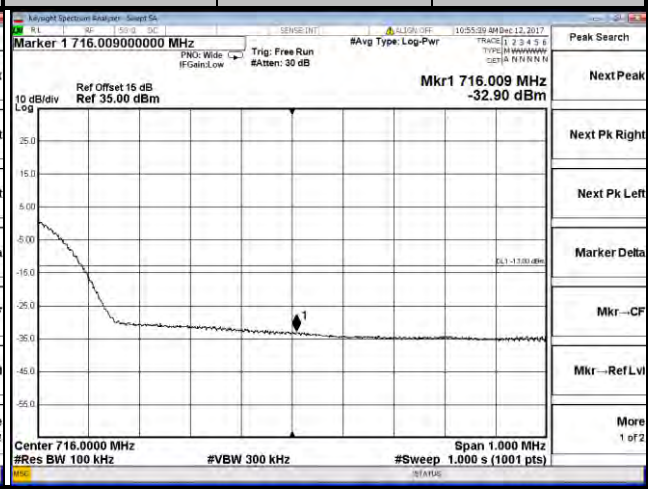
LTE Band 12					
Channel Bandwidth: 5 MHz					
Channel	23035	1 RB	Channel	23155	1 RB
					
Channel	23035	25 RB	Channel	23155	25 RB
					

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

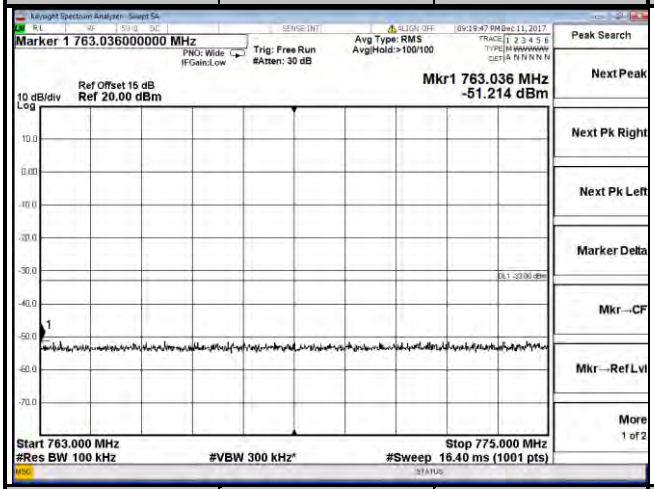
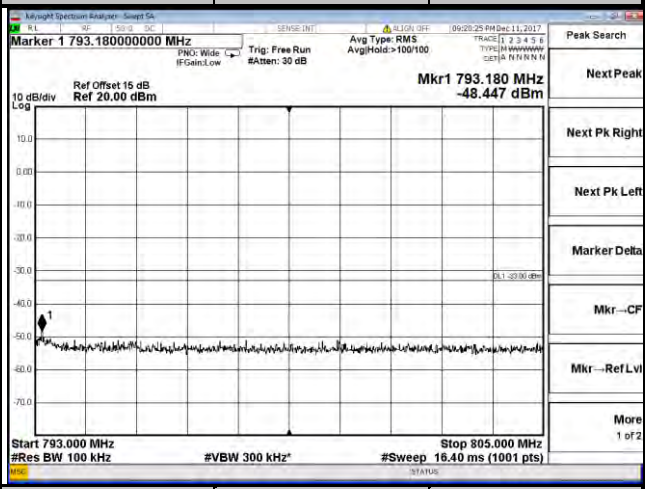
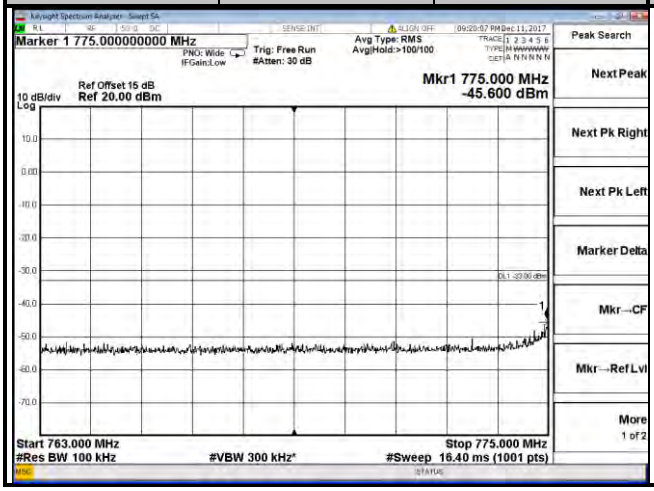
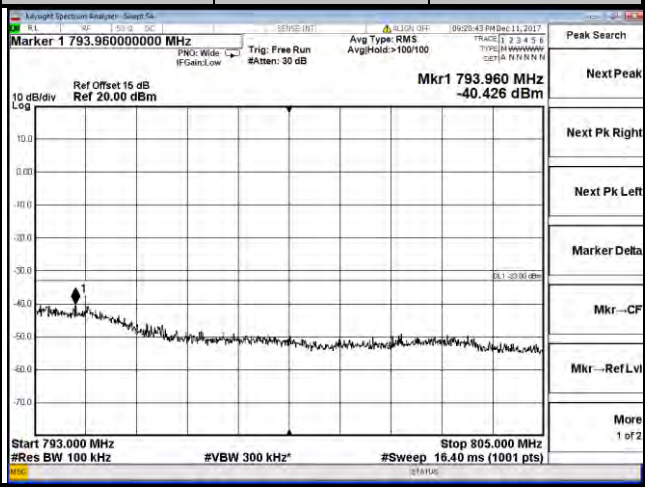
LTE Band 13					
Channel Bandwidth: 5 MHz					
Channel	23205	1 RB	Channel	23255	1 RB
					
Channel	23205	25 RB	Channel	23255	25 RB
					

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

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
					

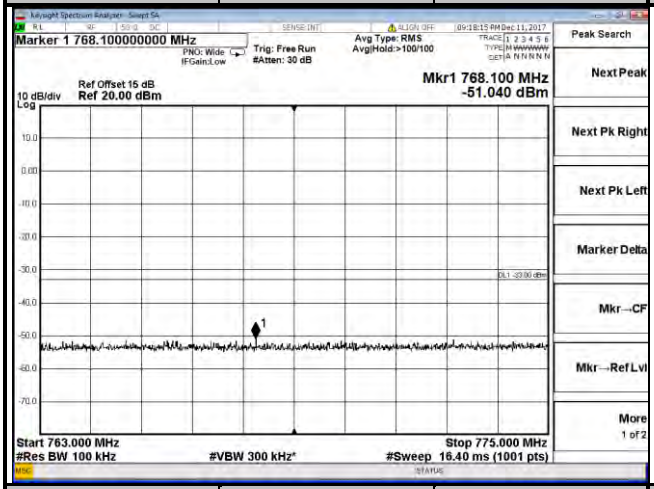
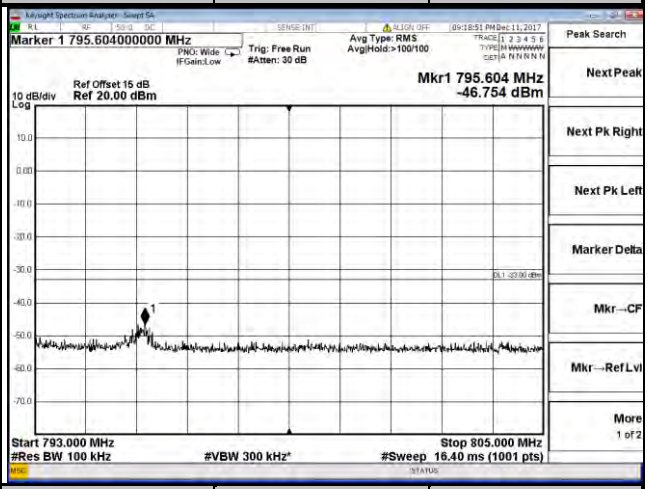
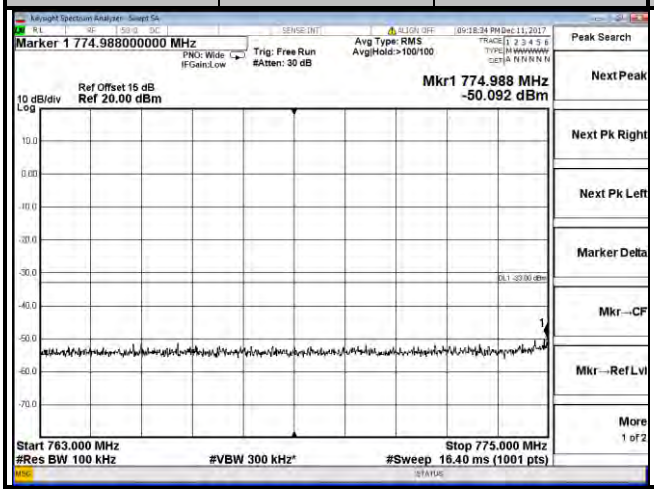
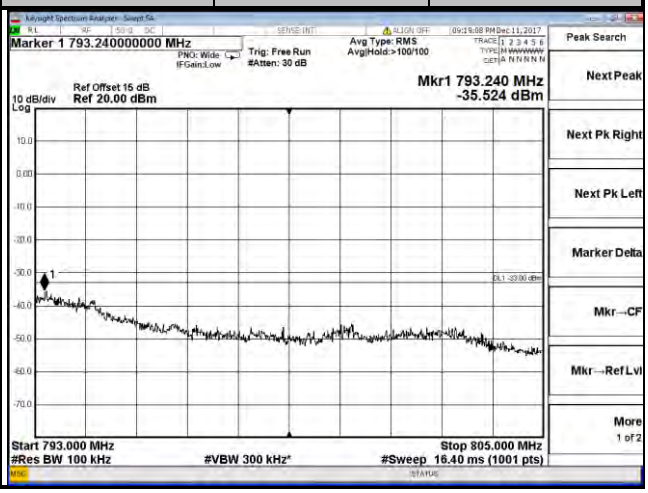
Emission Mask

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

For the 763 - 775 MHz and 793 - 805 MHz band, the FCC limit is 65+10log(P[watt]) in a 6.25 kHz bandwidth. Since it was not possible to set the resolution bandwidth to 6.25 kHz with the available equipment, a bandwidth of 10 kHz was used instead to show compliance. By using a 10 kHz bandwidth on the spectrum analyzer.

10log(10kHz/6.25kHz) = 2.04 dB

Limit line = -35 dBm + 2.04 dB = -32.96 dBm

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

For the 763 - 775 MHz and 793 - 805 MHz band, the FCC limit is 65+10log(P[watt]) in a 6.25 kHz bandwidth. Since it was not possible to set the resolution bandwidth to 6.25 kHz with the available equipment, a bandwidth of 10 kHz was used instead to show compliance. By using a 10 kHz bandwidth on the spectrum analyzer.

10log(10kHz/6.25kHz) = 2.04 dB

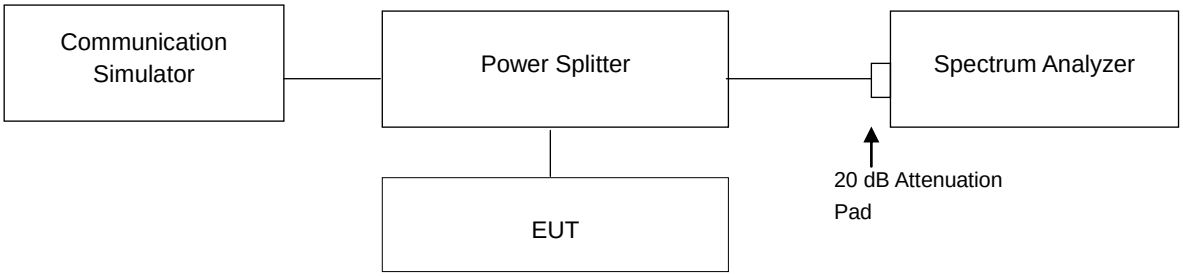
Limit line = -35 dBm + 2.04 dB =-32.96 dBm

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



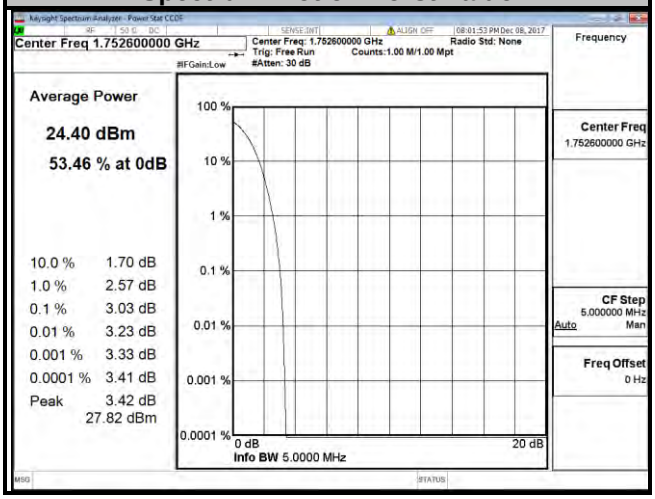
4.5.3 Test Procedures

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 %.

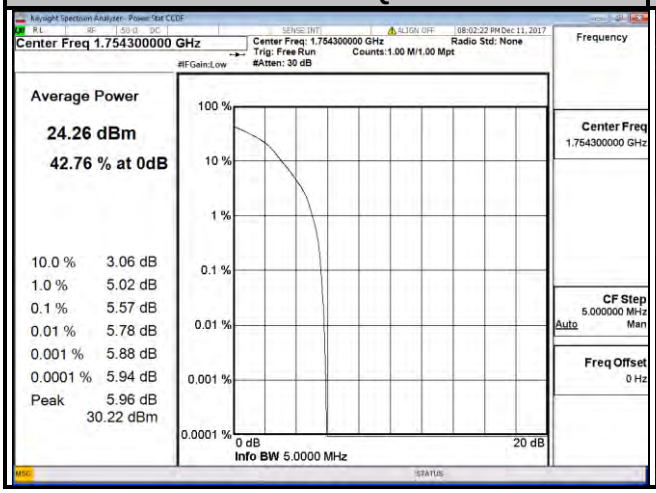
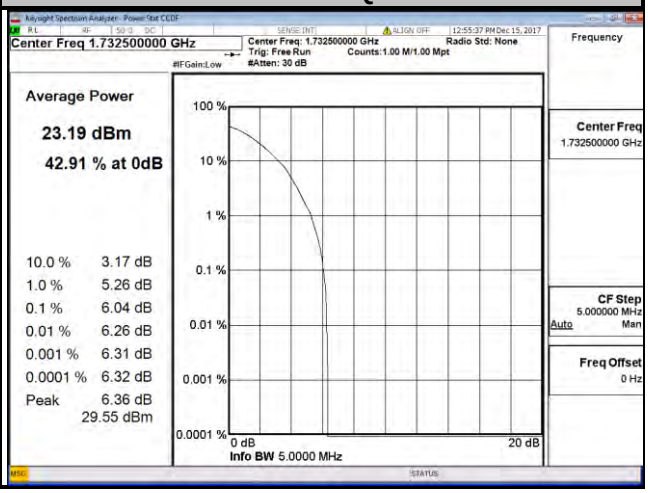
4.5.4 Test Results

WCDMA		
Channel	**Frequency (MHz)**	**Peak to Average Ratio (dB)**
1312	1712.4	3.02
1413	1732.6	2.91
1513	1752.6	3.03

Spectrum Plot of Worst Value

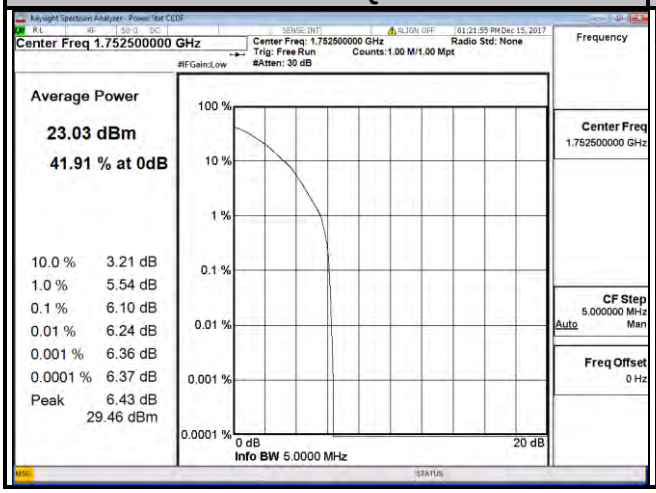


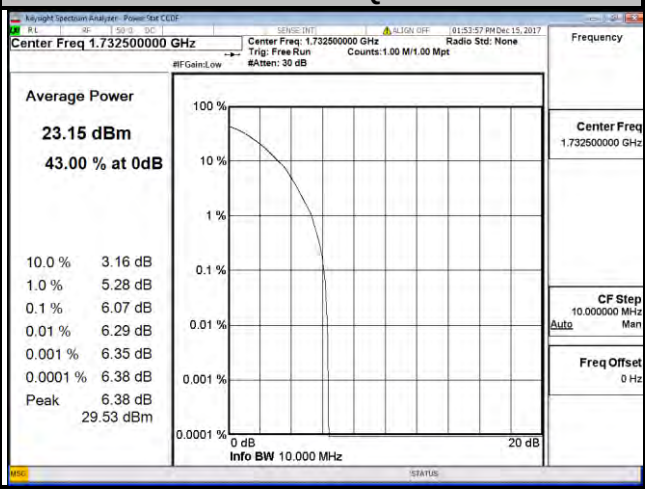
LTE Band 4									
Channel Bandwidth: 1.4 MHz					Channel Bandwidth: 3 MHz				
Channel	Frequency (MHz)	Peak to Average Ratio (dB)			Channel	Frequency (MHz)	Peak to Average Ratio (dB)		
		QPSK	16QAM	64QAM			QPSK	16QAM	64QAM
19957	1710.7	4.14	4.92	4.88	19965	1711.5	3.96	4.75	5.68
20175	1732.5	4.53	5.30	5.31	20175	1732.5	4.45	5.21	6.04
20393	1754.3	4.76	5.57	4.71	20385	1753.5	4.62	5.45	5.38

Spectrum Plot of Worst Value	
1.4 MHz / 16QAM	3 MHz / 64QAM
	

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	64QAM			QPSK	16QAM	64QAM
19975	1712.5	3.95	4.72	5.65	20000	1715.0	3.88	4.73	5.44
20175	1732.5	4.44	5.25	6.04	20175	1732.5	4.49	5.26	6.07
20375	1752.5	4.27	5.00	6.10	20350	1750.0	4.18	4.94	5.99

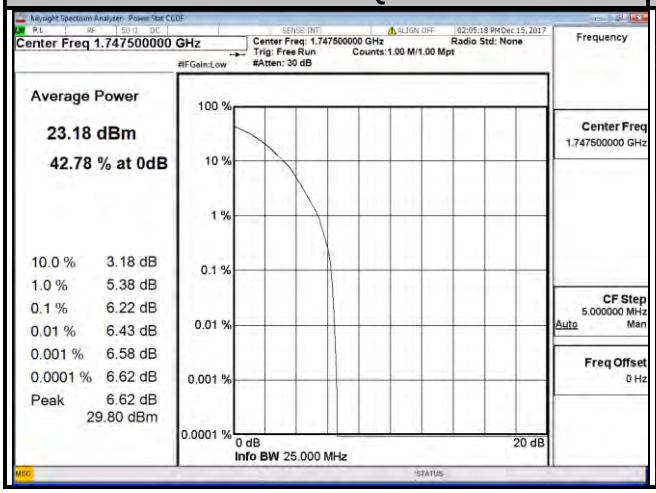
Spectrum Plot of Worst Value	
5 MHz / 64QAM	10 MHz / 64QAM

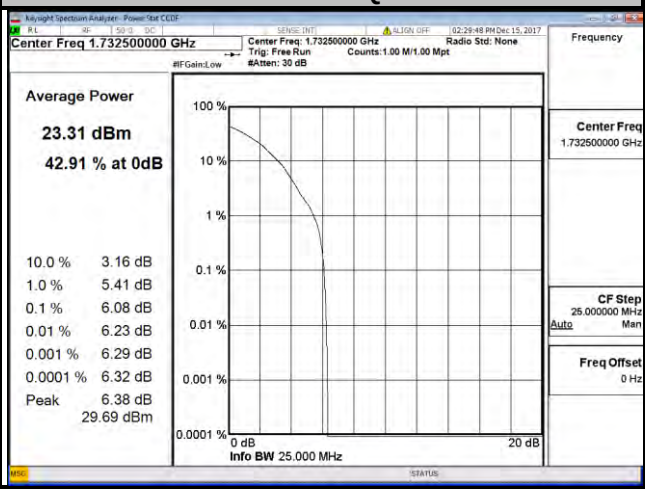




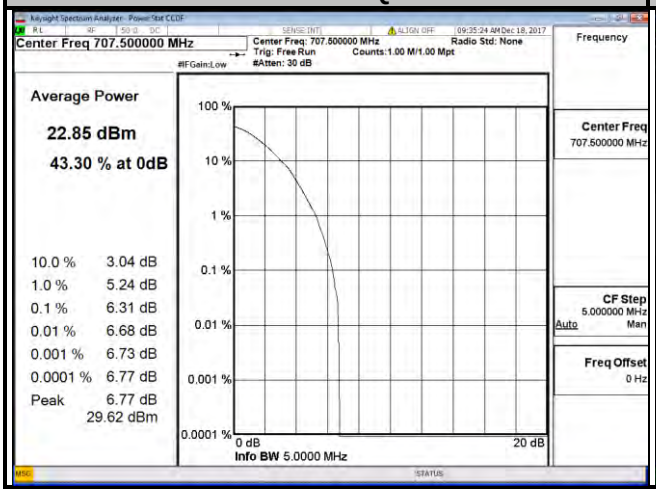
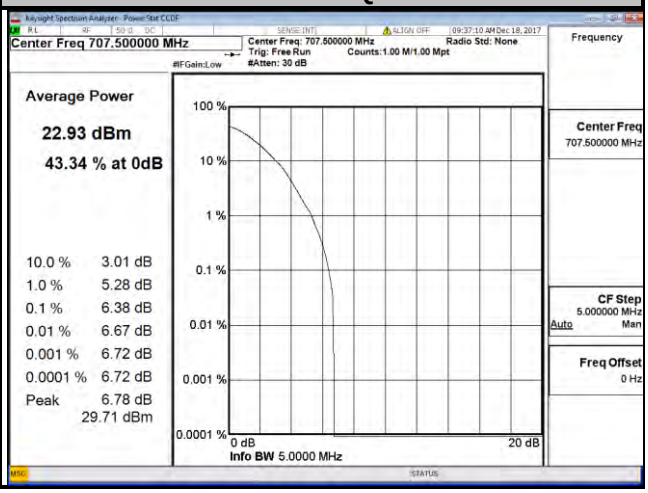
LTE Band 4									
Channel Bandwidth: 15 MHz					Channel Bandwidth: 20 MHz				
Channel	Frequency (MHz)	Peak to Average Ratio (dB)			Channel	Frequency (MHz)	Peak to Average Ratio (dB)		
		QPSK	16QAM	64QAM			QPSK	16QAM	64QAM
20025	1717.5	3.81	4.62	5.33	20050	1720.0	3.78	4.53	5.28
20175	1732.5	4.53	5.31	6.09	20175	1732.5	4.59	5.33	6.08
20325	1747.5	4.72	5.42	6.22	20300	1745.0	4.49	5.23	6.06

Spectrum Plot of Worst Value	
15 MHz / 64QAM	20 MHz / 64QAM



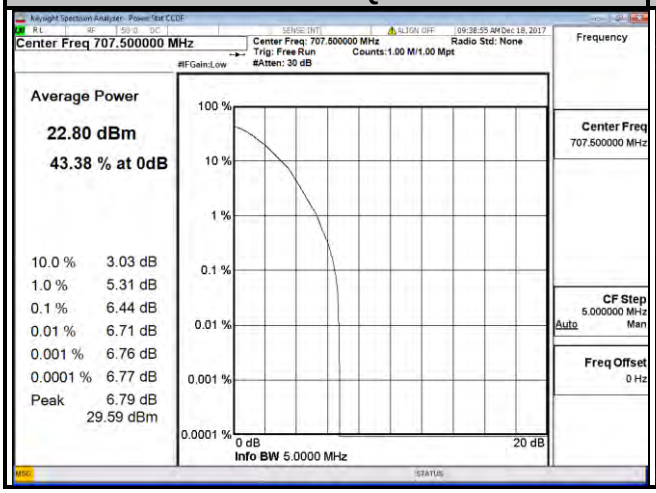


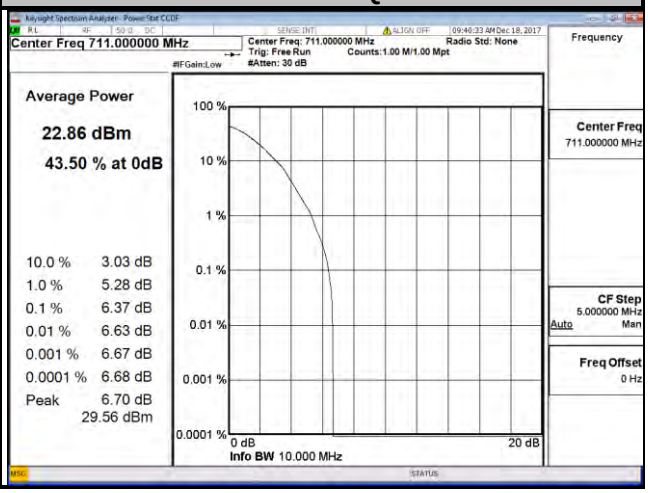
LTE Band 12									
Channel Bandwidth: 1.4 MHz					Channel Bandwidth: 3 MHz				
Channel	Frequency (MHz)	Peak to Average Ratio (dB)			Channel	Frequency (MHz)	Peak to Average Ratio (dB)		
		QPSK	16QAM	64QAM			QPSK	16QAM	64QAM
23017	699.7	3.51	4.48	5.35	23025	700.5	3.58	4.40	5.32
23095	707.5	4.72	5.55	6.31	23095	707.5	4.80	5.60	6.38
23173	715.3	3.76	4.57	5.29	23165	714.5	3.56	4.30	5.12

Spectrum Plot of Worst Value	
1.4 MHz / 64QAM	3 MHz / 64QAM
	

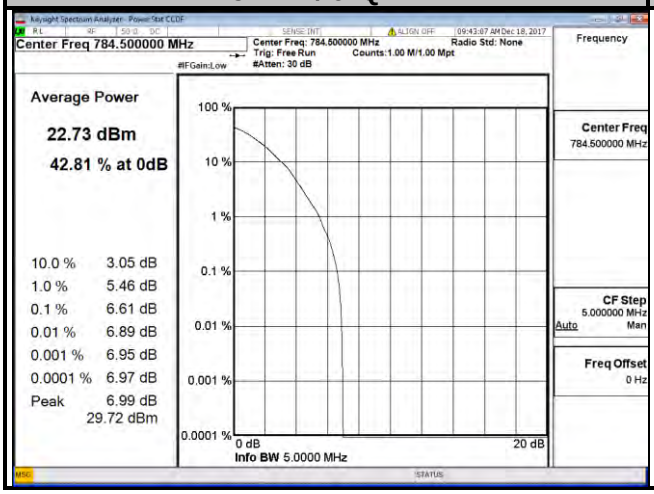
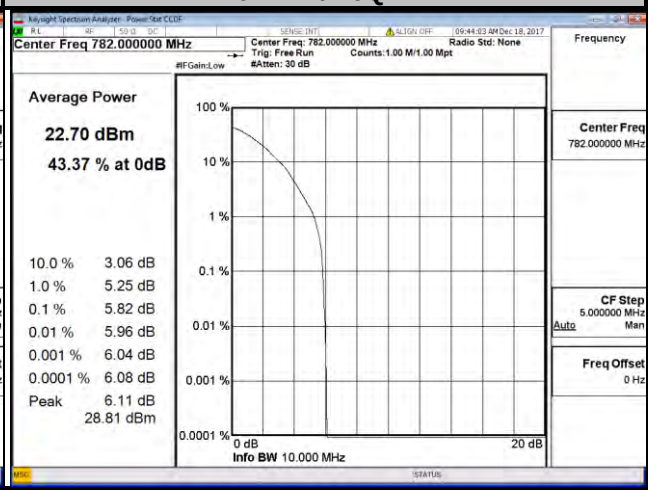
LTE Band 12									
Channel Bandwidth: 5 MHz					Channel Bandwidth: 10 MHz				
Channel	Frequency (MHz)	Peak to Average Ratio (dB)			Channel	Frequency (MHz)	Peak to Average Ratio (dB)		
		QPSK	16QAM	64QAM			QPSK	16QAM	64QAM
23035	701.5	3.69	4.47	5.28	23060	704.0	3.60	4.37	5.20
23095	707.5	4.86	5.64	6.44	23095	707.5	4.02	4.81	5.67
23155	713.5	4.05	4.80	5.59	23130	711.0	4.77	5.53	6.37

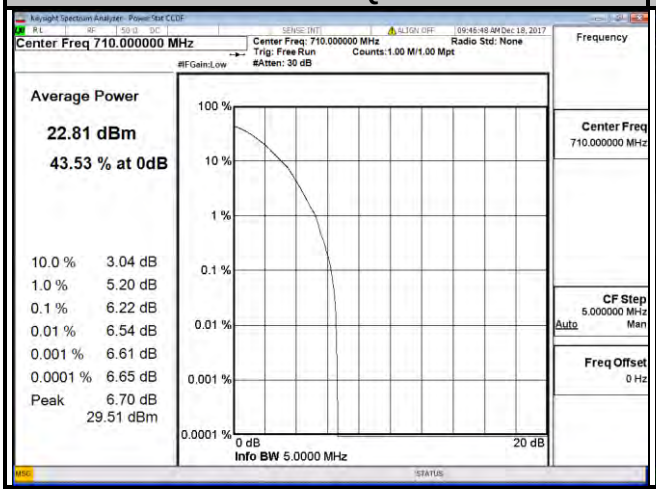
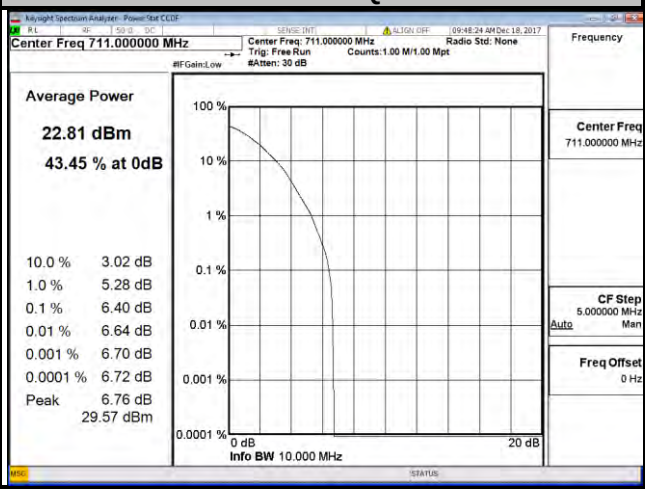
Spectrum Plot of Worst Value	
5 MHz / 64QAM	10 MHz / 16QAM





LTE Band 13									
Channel Bandwidth: 5 MHz					Channel Bandwidth: 10 MHz				
Channel	Frequency (MHz)	Peak to Average Ratio (dB)			Channel	Frequency (MHz)	Peak to Average Ratio (dB)		
		QPSK	16QAM	64QAM			QPSK	16QAM	64QAM
23205	779.5	4.06	4.77	5.52	23230	782.0	4.29	5.04	5.82
23230	782.0	4.88	5.67	6.43					
23255	784.5	5.10	5.87	6.61					

Spectrum Plot of Worst Value	
5 MHz / 64QAM	10 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	64QAM			QPSK	16QAM	64QAM
23755	706.5	4.49	5.26	6.10	23780	709.0	4.57	5.33	6.18
23790	710.0	4.69	5.48	6.22	23790	710.0	4.81	5.57	6.39
23825	713.5	4.07	4.81	5.65	23800	711.0	4.76	5.55	6.40

Spectrum Plot of Worst Value	
5 MHz / 64QAM	10 MHz / 16QAM