FCC Test Report

(PART 27)

Report No.:	RF180112C19-2
FCC ID:	XIA-NTC100
Test Model:	NTC-100, NTC-100G
Received Date:	Jan. 12, 2018
Test Date:	Jun. 20, 2018 ~ Jul. 31, 2018
Issued Date:	Sep. 20, 2018
Applicant:	NetComm Wireless Limited
Address:	18-20 Orion Road, Lane Cove, NSW 2066, Sydney Australia
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 Vil, Kwei Shan Dist., Taoyuan City 33383, Taiwan (R.O.C)
FCC Registration / Designation Number:	788550 / TW0003

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification. The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies

Table of Contents

Release Control Record **4**

1 Certificate of Conformity **5**

2 Summary of Test Results **6**

2.1 Measurement Uncertainty 7
2.2 Test Site and Instruments 8

3 General Information **9**

3.1 General Description of EUT 9
3.2 Configuration of System under Test 11
3.2.1 Description of Support Units 11
3.3 Test Mode Applicability and Tested Channel Detail 12
3.4 EUT Operating Conditions 18
3.5 General Description of Applied Standards 18

4 Test Types and Results **19**

4.1 Output Power Measurement 19
4.1.1 Limits of Output Power Measurement 19
4.1.2 Test Procedures 19
4.1.3 Test Setup 20
4.1.4 Test Results 21
4.2 Modulation Characteristics Measurement 58
4.2.1 Limits of Modulation Characteristics 58
4.2.2 Test Setup 58
4.2.3 Test Procedure 58
4.2.4 Test Results 59
4.3 Frequency Stability Measurement 61
4.3.1 Limits of Frequency Stability Measurement 61
4.3.2 Test Procedure 61
4.3.3 Test Setup 61
4.3.4 Test Results 62
4.4 Occupied Bandwidth Measurement 77
4.4.1 Limits of Occupied Bandwidth Measurement 77
4.4.2 Test Procedure 77
4.4.3 Test Setup 77
4.4.4 Test Result 78
4.5 Band Edge Measurement 87
4.5.1 Limits of Band Edge Measurement 87
4.5.2 Test Setup 87
4.5.3 Test Procedures 87
4.5.4 Test Results 88
4.6 Peak to Average Ratio 106
4.6.1 Limits of Peak to Average Ratio Measurement 106
4.6.2 Test Setup 106
4.6.3 Test Procedures 106
4.6.4 Test Results 107
4.7 Conducted Spurious Emissions 116
4.7.1 Limits of Conducted Spurious Emissions Measurement 116
4.7.2 Test Setup 116
4.7.3 Test Procedure 116
4.7.4 Test Results 117
4.8 Radiated Emission Measurement 146
4.8.1 Limits of Radiated Emission Measurement 146
4.8.2 Test Procedure 146
4.8.3 Deviation from Test Standard 146
4.8.4 Test Setup 147

4.8.5 Test Results 148
5 Pictures of Test Arrangements 234
Appendix – Information on the Testing Laboratories 235

Release Control Record

Issue No.	Description	Date Issued
RF180112C19-2	Original Release	Sep. 20, 2018

1 Certificate of Conformity

Product: 4G LTE Cat M1 / NB1 Industrial IoT Serial Modem

Brand: NetCommWireless

Test Model: NTC-100, NTC-100G

Applicant: NetComm Wireless Limited

Test Date: Jun. 20, 2018 ~ Jul. 31, 2018

Standards: FCC Part 27, Subpart C, H, F, 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 RF characteristics under the conditions specified in this report.

Prepared by : Evonne Liu , **Date:** Sep. 20, 2018

Evonne Liu / Specialist

Approved by : Dylan Chiou , **Date:** Sep. 20, 2018

Dylan Chiou / Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 27 & Part 2 (LTE 4)			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 27.50(d)(4)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement.
2.1055 27.54	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	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 -19.46 dB at 3508.6 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.
2.1047	Modulation Characteristics	Pass	Meet the requirement.
2.1055 27.54	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	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 -25.97 dB at 1399.40 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.
2.1047	Modulation Characteristics	Pass	Meet the requirement.
2.1055 27.54	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	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 -27.91 dB at 2346 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) (±)
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 & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY51210129	Feb. 06, 2018	Feb. 05, 2019
Spectrum Analyzer Agilent	N9010A	MY52220314	Nov. 24, 2017	Nov. 23, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	100115	Nov. 23, 2017	Nov. 22, 2018
Horn Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Dec. 12, 2017	Dec. 11, 2018
BILOG Antenna SCHWARZBECK	VULB 9168	9168-472	Dec. 06, 2017	Dec. 05, 2018
MXG Vector signal generator Agilent	N5182B	MY53050430	Oct. 24, 2017	Oct. 23, 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
RF Coaxial Cable HUBER+SUHNNER	EMC104-SM-SM-800 0&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
Radio Communication Analyzer	MT8821C	6261786083	Dec. 21, 2017	Dec. 20, 2018
Temperature & Humidity Chamber	GTH-120-40-CP-AR	MAA1306-019	Sep. 08, 2017	Sep. 07, 2018
DC Power Supply Topward	33010D	807748	Oct. 25, 2016	Oct. 24, 2018
Digital Multimeter Fluke	87-III	70360742	Jun. 29, 2018	Jun. 28, 2019

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	4G LTE Cat M1 / NB1 Industrial IoT Serial Modem		
Brand	NetCommWireless		
Test Model	NTC-100, NTC-100G		
EUT Rating	Rated Voltage :4.5~36VDC Rated Current :0.23~0.03A		
Modulation Type	**Cat-M1**	QPSK, 16QAM	
	NB-IOT	BPSK, QPSK	
Frequency Range	**Cat-M1**	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
	NB-IOT	LTE Band 4	1710.1 ~ 1754.9 MHz
		LTE Band 12	699.1 ~ 715.9 MHz
		LTE Band 13	777.1 ~ 786.9 MHz
Emission Designator	**Cat-M1**	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	1M09G7D
		LTE Band 4 (Channel Bandwidth: 3 MHz)	1M09G7D
		LTE Band 4 (Channel Bandwidth: 5 MHz)	1M09G7D
		LTE Band 4 (Channel Bandwidth: 10 MHz)	1M09G7D
		LTE Band 4 (Channel Bandwidth: 15 MHz)	1M10G7D
		LTE Band 4 (Channel Bandwidth: 20 MHz)	1M09G7D
		LTE Band 12 (Channel Bandwidth: 1.4 MHz)	1M09G7D
		LTE Band 12 (Channel Bandwidth: 3 MHz)	1M09G7D
		LTE Band 12 (Channel Bandwidth: 5 MHz)	1M09G7D
		LTE Band 12 (Channel Bandwidth: 10 MHz)	1M09G7D
		LTE Band 13 (Channel Bandwidth: 5 MHz)	1M08G7D
		LTE Band 13 (Channel Bandwidth: 10 MHz)	1M09G7D
	NB-IOT	LTE Band 4	1K96G7D
		LTE Band 12	1K90G7D
		LTE Band 13	1K86G7D

Max. ERP Power	**Cat-M1**	LTE Band 12 (Channel Bandwidth: 1.4 MHz)	389.94 mW
		LTE Band 12 (Channel Bandwidth: 3 MHz)	368.13 mW
		LTE Band 12 (Channel Bandwidth: 5 MHz)	350.75 mW
		LTE Band 12 (Channel Bandwidth: 10 MHz)	334.20 mW
		LTE Band 13 (Channel Bandwidth: 5 MHz)	356.45 mW
		LTE Band 13 (Channel Bandwidth: 10 MHz)	299.23 mW
	NB-IOT	LTE Band 12	659.17 mW
		LTE Band 13	415.91 mW
Max. EIRP Power	**Cat-M1**	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	341.19 mW
		LTE Band 4 (Channel Bandwidth: 3 MHz)	324.34 mW
		LTE Band 4 (Channel Bandwidth: 5 MHz)	304.79 mW
		LTE Band 4 (Channel Bandwidth: 10 MHz)	287.08 mW
		LTE Band 4 (Channel Bandwidth: 15 MHz)	272.90 mW
		LTE Band 4 (Channel Bandwidth: 20 MHz)	258.82 mW
	NB-IOT	394.46 mW	
Antenna Type	Dipole Antenna		
Antenna Gain	LTE B4 with 3.28 dBi gain LTE B12,B13 with 4.71 dBi gain		

Note:

1. The models as below are identical to each other except for the following.

Brand	Model	Difference(s)
NetCommWireless	NTC-100	Without GPS
	NTC-100G	With GPS

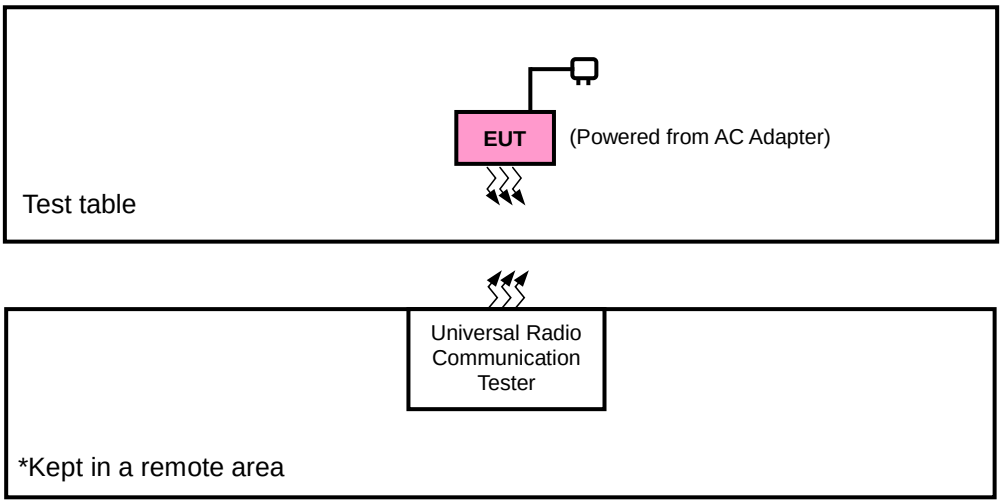
2. The EUT contains following accessory devices.

Accessory	Within the box: 1.Y-cable(Nano-fit to DE-9 and DC power input) :0.15M ,w/o core 2.DIN rail mounting bracket Optional Accessory 1.GPS Active Patch Antenna : 3M , w/o core 2.LTE Tube Antenna : Type:Dipole 3.adaptor: Brand: Ten Pao International Inc. Model: S018KM1200150(1.5M/0core) Input: 100-240V~50/60Hz 500mA Output: 12.0V / 1500mA

3. The above EUT information is declared by manufacturer and for more detailed features description, please refers 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
LTE Band 4	X-plane	Z-axis
LTE Band 12	X-plane	X-axis
LTE Band 13	X-plane	X-axis

Cat-M1

LTE Band 4

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	EIRP	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK, 16QAM	1 RB / 5 RB Offset
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK, 16QAM	1 RB / 5 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM	1 RB / 5 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK, 16QAM	1 RB / 5 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK, 16QAM	1 RB / 5 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM	1 RB / 5 RB Offset
-	Modulation Characteristics	19975 to 20375	20175	5 MHz	QPSK, 16QAM	6 RB / 0 RB Offset, 5 RB / 0 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 / 5 RB Offset
		19975 to 20375	19975, 20375	5 MHz	QPSK	1 RB / 5 RB Offset
		20000 to 20350	20000, 20350	10 MHz	QPSK	1 RB / 5 RB Offset
		20025 to 20325	20025, 20325	15 MHz	QPSK	1 RB / 5 RB Offset
		20050 to 20300	20050, 20300	20 MHz	QPSK	1 RB / 5 RB Offset
-	Occupied Bandwidth	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
-	Peak to Average Ratio	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM	6 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
						6 RB / 0 RB Offset
			20385	3 MHz	QPSK	1 RB / 5 RB Offset
						6 RB / 0 RB Offset
		19975 to 20375	19975	5 MHz	QPSK	1 RB / 0 RB Offset
						6 RB / 0 RB Offset
			20375	5 MHz	QPSK	1 RB / 5 RB Offset
						6 RB / 0 RB Offset
		20000 to 20350	20000	10 MHz	QPSK	1 RB / 0 RB Offset
						6 RB / 0 RB Offset
			20350	10 MHz	QPSK	1 RB / 5 RB Offset
						6 RB / 0 RB Offset
		20025 to 20325	20025	15 MHz	QPSK	1 RB / 0 RB Offset
						6 RB / 0 RB Offset
			20325	15 MHz	QPSK	1 RB / 5 RB Offset
						6 RB / 0 RB Offset
		20050 to 20300	20050	20 MHz	QPSK	1 RB / 0 RB Offset
						6 RB / 0 RB Offset
			20300	20 MHz	QPSK	1 RB / 5 RB Offset
						6 RB / 0 RB Offset
-	Conducted Emission	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK	1 RB / 0 RB Offset
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK	1 RB / 0 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK	1 RB / 0 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK	6 RB / 0 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK	1 RB / 0 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK	6 RB / 0 RB Offset
-	Radiated Emission Above 1 GHz	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK	1 RB / 0 RB Offset
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK	1 RB / 0 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK	1 RB / 0 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK	6 RB / 0 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK	1 RB / 0 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK	6 RB / 0 RB Offset
-	Radiated Emission Below 1 GHz	19957 to 20393	20393	1.4 MHz	QPSK	1 RB / 0 RB Offset

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

LTE Band 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	1 RB / 0 RB Offset
		23025 to 23165	23025, 23095, 23165	3 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		23035 to 23155	23035, 23095, 23155	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		23060 to 23130	23060, 23095, 23130	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Modulation Characteristics	23035 to 23155	23095	5 MHz	QPSK, 16QAM	6 RB / 0 RB Offset, 5 RB / 0 RB Offset
,-	Frequency Stability	23017 to 23173	23017, 23173	1.4 MHz	QPSK	1 RB / 0 RB Offset
		23025 to 23165	23025, 23165	3 MHz	QPSK	1 RB / 0 RB Offset
		23035 to 23155	23035, 23155	5 MHz	QPSK	1 RB / 0 RB Offset
		23060 to 23130	23060, 23130	10 MHz	QPSK	1 RB / 0 RB Offset
-	Occupied Bandwidth	23017 to 23173	23017, 23095, 23173	1.4 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		23025 to 23165	23025, 23095, 23165	3 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		23035 to 23155	23035, 23095, 23155	5 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		23060 to 23130	23060, 23095, 23130	10 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
-	Peak to Average Ratio	23017 to 23173	23017, 23095, 23173	1.4 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		23025 to 23165	23025, 23095, 23165	3 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		23035 to 23155	23035, 23095, 23155	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		23060 to 23130	23060, 23095, 23130	10 MHz	QPSK, 16QAM	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
						6 RB / 0 RB Offset
			23165	3 MHz	QPSK	1 RB / 5 RB Offset
						6 RB / 0 RB Offset
		23035 to 23155	23035	5 MHz	QPSK	1 RB / 0 RB Offset
						6 RB / 0 RB Offset
			23155	5 MHz	QPSK	1 RB / 5 RB Offset
						6 RB / 0 RB Offset
		23060 to 23130	23060	10 MHz	QPSK	1 RB / 0 RB Offset
						6 RB / 0 RB Offset
			23130	10 MHz	QPSK	1 RB / 5 RB Offset
						6 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 Above 1 GHz	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 Below 1 GHz	23017 to 23173	23017	1.4 MHz	QPSK	1 RB / 0 RB Offset

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

LTE Band 13

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	ERP	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK, 16QAM	1 RB / 5 RB Offset
-	Modulation Characteristics	23230	23230	5 MHz	QPSK, 16QAM	6 RB / 0 RB Offset, 5 RB / 0 RB Offset
-	Frequency Stability	23205 to 23255	23205, 23255	5 MHz	QPSK	1 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK	1 RB / 5 RB Offset
-	Occupied Bandwidth	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
-	Peak to Average Ratio	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Band Edge	23205 to 23255	23205	5 MHz	QPSK	1 RB / 0 RB Offset
						6 RB / 0 RB Offset
			23255	5 MHz	QPSK	1 RB / 5 RB Offset
						6 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK	1 RB / 0 RB Offset
						6 RB / 0 RB Offset
			23230	10 MHz	QPSK	1 RB / 5 RB Offset
						6 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 Above 1 GHz	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 Below 1 GHz	23205 to 23255	23230	5 MHz	QPSK	1 RB / 0 RB Offset

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

NB-IOT

LTE Band 4

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Sub-carrier spacing	Modulation	Mode
-	ERP	19951 to 20399	19951, 20175, 20399	3.75 kHz	BPSK	1 RB / 0 RB Offset
		19951 to 20399	19951, 20175, 20399	15 kHz	QPSK	3 RB / 3 RB Offset
-	Frequency Stability	19951 to 20399	19951, 20175, 20399	3.75 kHz	BPSK	1 RB / 0 RB Offset
		19951 to 20399	19951, 20175, 20399	15 kHz	QPSK	3 RB / 3 RB Offset
-	Occupied Bandwidth	19951 to 20399	19951, 20175, 20399	3.75 kHz	BPSK	1 RB / 0 RB Offset
		19951 to 20399	19951, 20175, 20399	15 kHz	QPSK	1 RB / 0 RB Offset
						3 RB / 3 RB Offset
						12 RB / 0 RB Offset
-	Band Edge	19951 to 20399	19951, 20399	3.75 kHz	BPSK	1 RB / 0 RB Offset
			19951, 20399	15 kHz	QPSK	1 RB / 0 RB Offset
						3 RB / 3 RB Offset
-	Peak to Average Ratio	19951 to 20399	20175	3.75 kHz	BPSK	1 RB / 0 RB Offset
			20175	15 kHz	QPSK	1 RB / 0 RB Offset
						3 RB / 3 RB Offset
-	Conducted Emission	19951 to 20399	19951, 20175, 20399	15 kHz	QPSK	3 RB / 3 RB Offset
-	Radiated Emission	19951 to 20399	19951, 20175, 20399	15 kHz	QPSK	3 RB / 3 RB Offset

NOTE:

Selection is tested with Stand-alone, In-band and Guard-band, The worst case was found in Stand-alone.

LTE Band 12

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Sub-carrier spacing	Modulation	Mode
-	ERP	23011 to 23179	23011, 23095, 23179	3.75 kHz	BPSK	1 RB / 0 RB Offset
		23011 to 23179	23011, 23095, 23179	15 kHz	QPSK	3 RB / 3 RB Offset
-	Frequency Stability	23011 to 23179	23011, 23095, 23179	3.75 kHz	BPSK	1 RB / 0 RB Offset
		23011 to 23179	23011, 23095, 23179	15 kHz	QPSK	3 RB / 3 RB Offset
-	Occupied Bandwidth	23011 to 23179	23011, 23095, 23179	3.75 kHz	BPSK	1 RB / 0 RB Offset
		23011 to 23179	23011, 23095, 23179	15 kHz	QPSK	1 RB / 0 RB Offset
						3 RB / 3 RB Offset
						12 RB / 0 RB Offset
-	Band Edge	23011 to 23179	23011, 23179	3.75 kHz	BPSK	1 RB / 0 RB Offset
			23011, 23179	15 kHz	QPSK	1 RB / 0 RB Offset
						3 RB / 3 RB Offset
-	Peak to Average Ratio	23011 to 23179	23095	3.75 kHz	BPSK	1 RB / 0 RB Offset
			23095	15 kHz	QPSK	1 RB / 0 RB Offset
						3 RB / 3 RB Offset
-	Conducted Emission	23011 to 23179	23011, 23095, 23179	15 kHz	QPSK	3 RB / 3 RB Offset
-	Radiated Emission	23011 to 23179	23011, 23095, 23179	15 kHz	QPSK	3 RB / 3 RB Offset

NOTE:

Selection is tested with Stand-alone, In-band and Guard-band, The worst case was found in Stand-alone.

LTE Band 13

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Sub-carrier spacing	Modulation	Mode
-	ERP	23181 to 23279	23181, 23230, 23279	3.75 kHz	BPSK	1 RB / 0 RB Offset
		23181 to 23279	23181, 23230, 23279	15 kHz	QPSK	3 RB / 3 RB Offset
-	Frequency Stability	23181 to 23279	23181, 23230, 23279	3.75 kHz	BPSK	1 RB / 0 RB Offset
		23181 to 23279	23181, 23230, 23279	15 kHz	QPSK	3 RB / 3 RB Offset
-	Occupied Bandwidth	23181 to 23279	23181, 23230, 23279	3.75 kHz	BPSK	1 RB / 0 RB Offset
		23181 to 23279	23181, 23230, 23279	15 kHz	QPSK	1 RB / 0 RB Offset
						3 RB / 3 RB Offset
						12 RB / 0 RB Offset
-	Band Edge	23181 to 23279	23181, 23279	3.75 kHz	BPSK	1 RB / 0 RB Offset
			23181, 23279	15 kHz	QPSK	1 RB / 0 RB Offset
						3 RB / 3 RB Offset
-	Peak to Average Ratio	23181 to 23279	23230	3.75 kHz	BPSK	1 RB / 0 RB Offset
			23230	15 kHz	QPSK	1 RB / 0 RB Offset
						3 RB / 3 RB Offset
-	Conducted Emission	23181 to 23279	23181, 23230, 23279	15 kHz	QPSK	3 RB / 3 RB Offset
-	Radiated Emission	23181 to 23279	23181, 23230, 23279	15 kHz	QPSK	3 RB / 3 RB Offset

NOTE:
Selection is tested with Stand-alone, In-band and Guard-band, The worst case was found in Stand-alone.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
ERP / EIRP	25 deg. C, 65 % RH	120 Vac, 60 Hz	Jisyong Wang
Modulation Characteristics	25 deg. C, 65 % RH	120 Vac, 60 Hz	Getaz Yang
Frequency Stability	25 deg. C, 65 % RH	120 Vac, 60 Hz	Getaz Yang
Occupied Bandwidth	25 deg. C, 65 % RH	120 Vac, 60 Hz	Getaz Yang
Band Edge	25 deg. C, 65 % RH	120 Vac, 60 Hz	Getaz Yang
Peak to Average Ratio	25 deg. C, 65 % RH	120 Vac, 60 Hz	Getaz Yang
Conducted Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Getaz Yang
Radiated Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	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 v03r01
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.

Control and mobile stations in the 698-746 MHz band are limited to 30 watts ERP.
Portable stations (hand-held devices) operating in the 698-746 MHz band, and fixed and mobile stations are limited to 3 watts ERP

Control stations and mobile stations transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands and fixed stations transmitting in the 787-788 MHz and 805-806 MHz bands are limited to 30 watts ERP.
Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.

4.1.2 Test Procedures

EIRP / ERP Measurement:

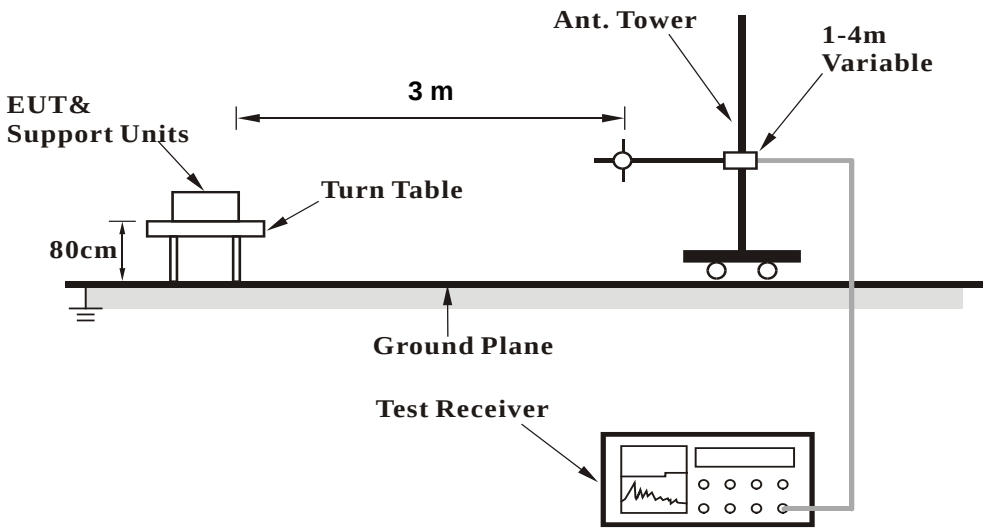
a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 10 MHz for LTE mode.
b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, 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.R.P power - 2.15 dB.

Conducted Power Measurement:

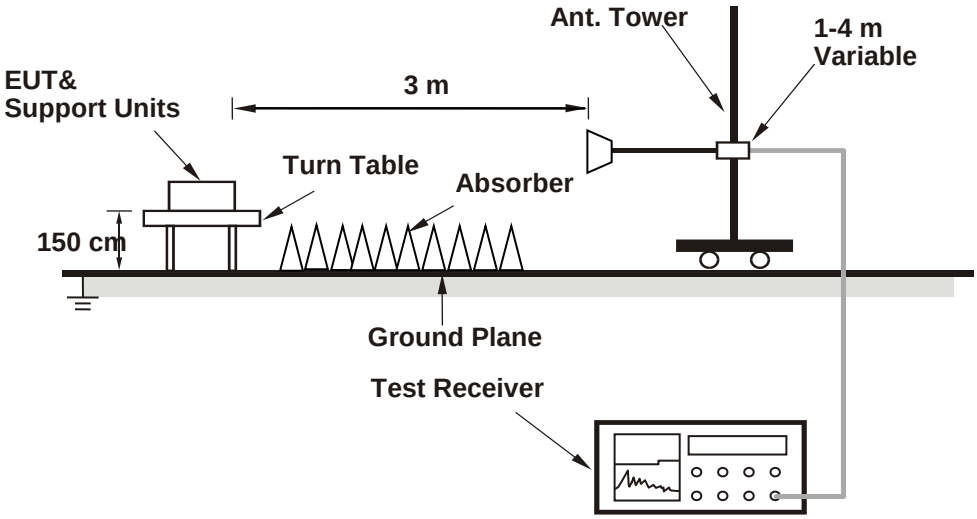
a. The EUT was set up for the maximum power with LTE link data modulation and link up with simulator.
b. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

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)

Cat-M1

eMTC	Band 4	Region(s):	FCC	Power:	Class 3	23	Tolerance:	3.2	maximum:	22.66

BW(MHz):	1.4

Test Frequency ID	N_{UL}	Frequency of Uplink [MHz]	N_{DL}	Frequency of Downlink [MHz]	Test Configuration Initial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	19957	1710.7	1957	2110.7	QPSK	1	0	0	-85	21.91
					QPSK	1	5	0	-85	21.74
					QPSK	3	3	0	-85	20.42
					QPSK	6	0	0	-85	19.88
					16QAM	1	0	0	-85	21.19
					16QAM	1	5	0	-85	20.71
					16QAM	3	0	0	-85	20.02
					16QAM	5	0	0	-85	20.21
Mid Range	20175	1732.5	2175	2132.5	QPSK	1	0	0	-85	21.94
					QPSK	1	5	0	-85	21.8
					QPSK	3	3	0	-85	20.87
					QPSK	6	0	0	-85	19.95
					16QAM	1	0	0	-85	20.81
					16QAM	1	5	0	-85	20.9
					16QAM	3	0	0	-85	20.61
					16QAM	5	0	0	-85	20.32
High Range	20393	1754.3	2393	2154.3						
					QPSK	1	0	0	-85	22.66
					QPSK	1	5	0	-85	22.11
					QPSK	3	3	0	-85	20.86
					QPSK	6	0	0	-85	19.92
					16QAM	1	0	0	-85	20.94
					16QAM	1	5	0	-85	20.97
					16QAM	3	0	0	-85	20.45
					16QAM	5	0	0	-85	20.51

BW(MHz):	3									
Test Frequency ID	N_{UL}	Frequency of Uplink [MHz]	N_{DL}	Frequency of Downlink [MHz]	Test Configuration Initial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	19965	1711.5	1965	2111.5	QPSK	1	0	0	-85	21.51
					QPSK	1	5	0	-85	21.74
					QPSK	1	0	1	-85	21.61
					QPSK	1	5	1	-85	21.53
					QPSK	3	3	0	-85	20.57
					QPSK	3	3	1	-85	20.61
					QPSK	6	0	0	-85	19.95
					QPSK	6	0	1	-85	19.92
					16QAM	1	0	0	-85	20.82
					16QAM	1	5	0	-85	20.86
					16QAM	1	0	1	-85	20.88
					16QAM	1	5	1	-85	20.83
					16QAM	3	0	0	-85	19.96
					16QAM	3	3	1	-85	19.97
					16QAM	5	0	0	-85	20.19
					16QAM	5	0	1	-85	20.14
Mid Range	20175	1732.5	2175	2132.5	QPSK	1	0	0	-85	21.88
					QPSK	1	5	0	-85	21.91
					QPSK	1	0	1	-85	21.87
					QPSK	1	5	1	-85	21.86
					QPSK	3	3	0	-85	20.98
					QPSK	3	3	1	-85	21.97
					QPSK	6	0	0	-85	19.95
					QPSK	6	0	1	-85	19.92
					16QAM	1	0	0	-85	21.23
					16QAM	1	5	0	-85	21.22
					16QAM	1	0	1	-85	21.21
					16QAM	1	5	1	-85	21.23
					16QAM	3	0	0	-85	21.21
					16QAM	3	3	1	-85	20.33
					16QAM	5	0	0	-85	20.31
					16QAM	5	0	1	-85	20.4
High Range	20385	1753.5	2385	2153.5					-85	
					QPSK	1	0	0	-85	22.06
					QPSK	1	5	0	-85	22.14
					QPSK	1	0	1	-85	21.97
					QPSK	1	5	1	-85	22.01

					QPSK	3	3	0	-85	20.97
					QPSK	3	3	1	-85	21.01
					QPSK	6	0	0	-85	19.97
					QPSK	6	0	1	-85	19.99
					16QAM	1	0	0	-85	21.35
					16QAM	1	5	0	-85	21.38
					16QAM	1	0	1	-85	21.34
					16QAM	1	5	1	-85	21.29
					16QAM	3	0	0	-85	20.32
					16QAM	3	3	1	-85	20.34
					16QAM	5	0	0	-85	20.61
					16QAM	5	0	1	-85	20.48

BW(MHz):	5

Test Frequency ID	N_{UL}	Frequency of Uplink [MHz]	N_{DL}	Frequency of Downlink [MHz]	Test Configuration Initial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	19975	1712.5	1975	2112.5	QPSK	1	0	0	-85	21.71
					QPSK	1	5	0	-85	21.76
					QPSK	1	0	1	-85	21.74
					QPSK	1	5	1	-85	21.52
					QPSK	1	0	3	-85	21.85
					QPSK	1	5	3	-85	21.72
					QPSK	3	0	0	-85	20.64
					QPSK	3	3	3	-85	20.72
					QPSK	6	0	0	-85	20.61
					QPSK	6	0	1	-85	20.47
					QPSK	6	0	3	-85	20.68
					16QAM	1	0	0	-85	22.11
					16QAM	1	5	0	-85	22.08
					16QAM	1	0	1	-85	21.72
					16QAM	1	5	1	-85	21.52
					16QAM	1	0	3	-85	22.04
					16QAM	1	5	3	-85	22.01
					16QAM	3	0	0	-85	20.93
					16QAM	3	3	3	-85	20.96
					16QAM	5	0	0	-85	19.92
					16QAM	5	0	1	-85	19.88
					16QAM	5	0	3	-85	19.88
Mid Range	20175	1732.5	2175	2132.5	QPSK	1	0	0	-85	21.88
					QPSK	1	5	0	-85	21.97

					QPSK	1	0	1	-85	21.92
					QPSK	1	5	1	-85	21.89
					QPSK	1	0	3	-85	21.96
					QPSK	1	5	3	-85	21.86
					QPSK	3	0	0	-85	20.95
					QPSK	3	3	3	-85	20.92
					QPSK	6	0	0	-85	20.91
					QPSK	6	0	1	-85	20.99
					QPSK	6	0	3	-85	20.95
					16QAM	1	0	0	-85	21.97
					16QAM	1	5	0	-85	22.07
					16QAM	1	0	1	-85	22.15
					16QAM	1	5	1	-85	22.01
					16QAM	1	0	3	-85	22.03
					16QAM	1	5	3	-85	22.11
					16QAM	3	0	0	-85	21.18
					16QAM	3	3	3	-85	21.34
					16QAM	5	0	0	-85	20.11
					16QAM	5	0	1	-85	20.06
					16QAM	5	0	3	-85	20.17
High Range	20375	1752.5	2375	2152.5					-85	
					QPSK	1	0	0	-85	22.03
					QPSK	1	5	0	-85	22.37
					QPSK	1	0	1	-85	22.13
					QPSK	1	5	1	-85	22.34
					QPSK	1	0	3	-85	22.06
					QPSK	1	5	3	-85	22.13
					QPSK	3	0	0	-85	21.21
					QPSK	3	3	3	-85	21.02
					QPSK	6	0	0	-85	21.22
					QPSK	6	0	1	-85	21.23
					QPSK	6	0	3	-85	21.04
					16QAM	1	0	0	-85	22.26
					16QAM	1	5	0	-85	22.51
					16QAM	1	0	1	-85	22.07
					16QAM	1	5	1	-85	22.19
					16QAM	1	0	3	-85	22.22
					16QAM	1	5	3	-85	22.08
					16QAM	3	0	0	-85	21.51
					16QAM	3	3	3	-85	21.43
					16QAM	5	0	0	-85	20.51

					16QAM	5	0	1	-85	20.36
					16QAM	5	0	3	-85	20.21

BW(MHz):	10

Test Frequency ID	N_{UL}	Frequency of Uplink [MHz]	N_{DL}	Frequency of Downlink [MHz]	Test Configuration Initial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	20000	1715	2000	2115	QPSK	1	0	0	-85	21.67
					QPSK	1	5	0	-85	21.71
					QPSK	1	0	3	-85	21.78
					QPSK	1	5	3	-85	21.67
					QPSK	1	0	7	-85	21.75
					QPSK	1	5	7	-85	21.92
					QPSK	4	0	0	-85	21.72
					QPSK	4	2	7	-85	21.97
					QPSK	6	0	0	-85	20.58
					QPSK	6	0	7	-85	20.92
					16QAM	1	0	0	-85	21.63
					16QAM	1	5	0	-85	21.97
					16QAM	1	0	3	-85	22.01
					16QAM	1	5	3	-85	22.01
					16QAM	1	0	7	-85	22.01
					16QAM	1	5	7	-85	22.02
					16QAM	4	2	0	-85	20.81
					16QAM	4	2	7	-85	20.91
					16QAM	5	0	0	-85	20.88
					16QAM	5	0	7	-85	21.09
Mid Range	20175	1732.5	2175	2132.5	QPSK	1	0	0	-85	21.86
					QPSK	1	5	0	-85	21.97
					QPSK	1	0	3	-85	22.02
					QPSK	1	5	3	-85	22.09
					QPSK	1	0	7	-85	22.04
					QPSK	1	5	7	-85	21.97
					QPSK	4	0	0	-85	21.9
					QPSK	4	2	7	-85	21.92
					QPSK	6	0	0	-85	20.87
					QPSK	6	0	7	-85	20.98
					16QAM	1	0	0	-85	22.32
					16QAM	1	5	0	-85	22.15
					16QAM	1	0	3	-85	22.21

					16QAM	1	5	3	-85	22.11
					16QAM	1	0	7	-85	22.32
					16QAM	1	5	7	-85	22.26
					16QAM	4	2	0	-85	21.1
					16QAM	4	2	7	-85	21.04
					16QAM	5	0	0	-85	21.07
					16QAM	5	0	7	-85	21.24
High Range	20350	1750	2350	2150					-85	
					QPSK	1	0	0	-85	22.17
					QPSK	1	5	0	-85	22.03
					QPSK	1	5	7	-85	22.01
					QPSK	1	0	3	-85	22.17
					QPSK	1	5	3	-85	22.25
					QPSK	1	0	7	-85	22.13
					QPSK	4	0	0	-85	22.16
					QPSK	4	2	7	-85	22.04
					QPSK	6	0	0	-85	21.13
					QPSK	6	0	7	-85	21.03
					16QAM	1	0	0	-85	22.47
					16QAM	1	5	0	-85	22.35
					16QAM	1	0	3	-85	22.04
					16QAM	1	5	3	-85	22.51
					16QAM	1	0	7	-85	22.39
					16QAM	1	5	7	-85	22.45
					16QAM	4	2	0	-85	21.37
					16QAM	4	2	7	-85	21.89
					16QAM	5	0	0	-85	21.38
					16QAM	5	0	7	-85	21.15

BW(MHz):	15

Test Frequency ID	N_{UL}	Frequency of Uplink [MHz]	N_{DL}	Frequency of Downlink [MHz]	Test Configuration Initial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	20025	1717.5	2025	2117.5	QPSK	1	0	0	-85	21.78
					QPSK	1	5	0	-85	21.69
					QPSK	1	0	5	-85	21.77
					QPSK	1	5	5	-85	21.72
					QPSK	1	0	11	-85	21.91
					QPSK	1	5	11	-85	21.72
					QPSK	3	0	0	-85	21.72
					QPSK	3	3	11	-85	21.75
					QPSK	6	0	0	-85	21.71
					QPSK	6	0	11	-85	21.79
					16QAM	1	0	0	-85	22.41
					16QAM	1	5	0	-85	22.09
					16QAM	1	0	5	-85	22.19
					16QAM	1	5	5	-85	22.17
					16QAM	1	0	11	-85	22.13
					16QAM	1	5	11	-85	22.02
					16QAM	3	0	0	-85	22.17
					16QAM	3	3	11	-85	22.28
					16QAM	5	0	0	-85	21.97
					16QAM	5	0	11	-85	21.62
Mid Range	20175	1732.5	2175	2132.5	QPSK	1	0	0	-85	21.96
					QPSK	1	5	0	-85	21.93
					QPSK	1	0	5	-85	21.94
					QPSK	1	5	5	-85	21.91
					QPSK	1	0	11	-85	22.01
					QPSK	1	5	11	-85	22.05
					QPSK	3	0	0	-85	21.93
					QPSK	3	3	11	-85	21.95
					QPSK	6	0	0	-85	21.89
					QPSK	6	0	11	-85	21.97
					16QAM	1	0	0	-85	22.39
					16QAM	1	5	0	-85	22.14
					16QAM	1	0	5	-85	22.25
					16QAM	1	5	5	-85	22.32
					16QAM	1	0	11	-85	22.23
					16QAM	1	5	11	-85	22.41

					16QAM	3	0	0	-85	22.12
					16QAM	3	3	11	-85	22.18
					16QAM	5	0	0	-85	22.09
					16QAM	5	0	11	-85	22.2
High Range	20325	1747.5	2325	2147.5					-85	
					QPSK	1	0	0	-85	22.13
					QPSK	1	5	0	-85	22.03
					QPSK	1	0	5	-85	22.1
					QPSK	1	5	5	-85	22.23
					QPSK	1	0	11	-85	22.13
					QPSK	1	5	11	-85	22.11
					QPSK	3	0	0	-85	22.04
					QPSK	3	3	11	-85	22.12
					QPSK	6	0	0	-85	21.87
					QPSK	6	0	11	-85	22.01
					16QAM	1	0	0	-85	22.03
					16QAM	1	5	0	-85	22.16
					16QAM	1	0	5	-85	22.41
					16QAM	1	5	5	-85	22.47
					16QAM	1	0	11	-85	22.43
					16QAM	1	5	11	-85	22.34
					16QAM	3	0	0	-85	22.13
					16QAM	3	3	11	-85	22.61
					16QAM	5	0	0	-85	22.22
					16QAM	5	0	11	-85	22.3

BW(MHz):	20

Test Frequency ID	N_{UL}	Frequency of Uplink [MHz]	N_{DL}	Frequency of Downlink [MHz]	Test Configuration Initial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	20050	1720	2050	2120	QPSK	1	0	0	-85	21.75
					QPSK	1	5	0	-85	21.67
					QPSK	1	0	7	-85	22.02
					QPSK	1	5	7	-85	21.91
					QPSK	1	0	15	-85	21.96
					QPSK	1	5	15	-85	21.86
					QPSK	3	0	0	-85	21.68
					QPSK	3	3	15	-85	21.82
					QPSK	6	0	0	-85	21.64
					QPSK	6	0	15	-85	21.83
					16QAM	1	0	0	-85	22.15
					16QAM	1	5	0	-85	21.93
					16QAM	1	0	7	-85	21.91
					16QAM	1	5	7	-85	22.02
					16QAM	1	0	15	-85	22.03
					16QAM	1	5	15	-85	22.14
					16QAM	3	0	0	-85	21.97
					16QAM	3	3	15	-85	22.06
					16QAM	5	0	0	-85	22.06
					16QAM	5	0	15	-85	22.07
Mid Range	20175	1732.5	2175	2132.5	QPSK	1	0	0	-85	22.05
					QPSK	1	5	0	-85	21.92
					QPSK	1	0	7	-85	21.95
					QPSK	1	5	7	-85	22.03
					QPSK	1	0	15	-85	22.21
					QPSK	1	5	15	-85	21.96
					QPSK	3	0	0	-85	21.84
					QPSK	3	3	15	-85	21.87
					QPSK	6	0	0	-85	21.99
					QPSK	6	0	15	-85	21.94
					16QAM	1	0	0	-85	22.11
					16QAM	1	5	0	-85	22.26
					16QAM	1	0	7	-85	22.1
					16QAM	1	5	7	-85	22.12
					16QAM	1	0	15	-85	22.18
					16QAM	1	5	15	-85	22.14

					16QAM	3	0	0	-85	22.12
					16QAM	3	3	15	-85	22.23
					16QAM	5	0	0	-85	22.14
					16QAM	5	0	15	-85	22.23
High Range	20300	1745	2300	2145					-85	
					QPSK	1	0	0	-85	22.02
					QPSK	1	5	0	-85	21.95
					QPSK	1	0	7	-85	22.25
					QPSK	1	5	7	-85	22.17
					QPSK	1	0	15	-85	22.05
					QPSK	1	5	15	-85	22.06
					QPSK	3	0	0	-85	21.91
					QPSK	3	3	15	-85	21.99
					QPSK	6	0	0	-85	21.9
					QPSK	6	0	15	-85	22.01
					16QAM	1	0	0	-85	22.39
					16QAM	1	5	0	-85	22.1
					16QAM	1	0	7	-85	22.25
					16QAM	1	5	7	-85	22.26
					16QAM	1	0	15	-85	22.19
					16QAM	1	5	15	-85	22.37
					16QAM	3	0	0	-85	22.27
					16QAM	3	3	15	-85	22.15
					16QAM	5	0	0	-85	22.25
					16QAM	5	0	15	-85	22.35

eMTC	Band 12	Region(s):	FCC	Power:	Class 3	23	Tolerance:	2.7

maximum:	23.24

BW(MHz):	1.4

Test Frequency ID	N_{UL}	Frequency of Uplink [MHz]	N_{DL}	Frequency of Downlink [MHz]	Test Configuration Initial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	23017	699.7	5017	729.7	QPSK	1	0	0	-85	22.69
					QPSK	1	5	0	-85	22.42
					QPSK	3	3	0	-85	21.58
					QPSK	6	0	0	-85	20.56
					16QAM	1	0	0	-85	21.97
					16QAM	1	5	0	-85	21.41
					16QAM	3	0	0	-85	21.16
					16QAM	5	0	0	-85	21.11
Mid Range	23095	707.5	5095	737.5	QPSK	1	0	0	-85	23.24
					QPSK	1	5	0	-85	22.55
					QPSK	3	3	0	-85	21.58
					QPSK	6	0	0	-85	20.67
					16QAM	1	0	0	-85	21.49
					16QAM	1	5	0	-85	21.57
					16QAM	3	0	0	-85	21.19
					16QAM	5	0	0	-85	21.25
High Range	23173	715.3	5173	745.3					-85	
					QPSK	1	0	0	-85	22.85
					QPSK	1	5	0	-85	22.46
					QPSK	3	3	0	-85	21.49
					QPSK	6	0	0	-85	20.46
					16QAM	1	0	0	-85	21.42
					16QAM	1	5	0	-85	21.57
					16QAM	3	0	0	-85	21.01
					16QAM	5	0	0	-85	21.19

BW(MHz):	3									
Test Frequency ID	N_{UL}	Frequency of Uplink [MHz]	N_{DL}	Frequency of Downlink [MHz]	Test Configuration Initial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	23025	700.5	5025	730.5	QPSK	1	0	0	-85	22.56
					QPSK	1	5	0	-85	22.46
					QPSK	1	0	1	-85	22.64
					QPSK	1	5	1	-85	22.69
					QPSK	3	3	0	-85	21.67
					QPSK	3	3	1	-85	21.64
					QPSK	6	0	0	-85	20.63
					QPSK	6	0	1	-85	20.68
					16QAM	1	0	0	-85	21.77
					16QAM	1	5	0	-85	21.91
					16QAM	1	0	1	-85	21.89
					16QAM	1	5	1	-85	21.91
					16QAM	3	0	0	-85	21.01
					16QAM	3	3	1	-85	21.05
					16QAM	5	0	0	-85	21.08
					16QAM	5	0	1	-85	21.22
Mid Range	23095	707.5	5095	737.5	QPSK	1	0	0	-85	22.68
					QPSK	1	5	0	-85	22.61
					QPSK	1	0	1	-85	22.39
					QPSK	1	5	1	-85	22.41
					QPSK	3	3	0	-85	21.54
					QPSK	3	3	1	-85	21.51
					QPSK	6	0	0	-85	20.72
					QPSK	6	0	1	-85	20.71
					16QAM	1	0	0	-85	21.94
					16QAM	1	5	0	-85	21.82
					16QAM	1	0	1	-85	21.92
					16QAM	1	5	1	-85	21.85
					16QAM	3	0	0	-85	20.96
					16QAM	3	3	1	-85	21.12
					16QAM	5	0	0	-85	21.25
					16QAM	5	0	1	-85	20.91
High Range	23165	714.5	5165	744.5					-85	
					QPSK	1	0	0	-85	22.43
					QPSK	1	5	0	-85	22.31
					QPSK	1	0	1	-85	22.56
					QPSK	1	5	1	-85	22.32

					QPSK	3	3	0	-85	21.62
					QPSK	3	3	1	-85	21.56
					QPSK	6	0	0	-85	20.57
					QPSK	6	0	1	-85	20.52
					16QAM	1	0	0	-85	21.84
					16QAM	1	5	0	-85	21.73
					16QAM	1	0	1	-85	22.49
					16QAM	1	5	1	-85	22.47
					16QAM	3	0	0	-85	20.89
					16QAM	3	3	1	-85	21.41
					16QAM	5	0	0	-85	20.88
					16QAM	5	0	1	-85	21.56

BW(MHz):	5

Test Frequency ID	N_{UL}	Frequency of Uplink [MHz]	N_{DL}	Frequency of Downlink [MHz]	Test Configuration Initial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	23035	701.5	5035	731.5	QPSK	1	0	0	-85	22.56
					QPSK	1	5	0	-85	22.58
					QPSK	1	0	1	-85	22.71
					QPSK	1	5	1	-85	22.61
					QPSK	1	0	3	-85	22.85
					QPSK	1	5	3	-85	22.92
					QPSK	3	0	0	-85	21.71
					QPSK	3	3	3	-85	21.71
					QPSK	6	0	0	-85	21.66
					QPSK	6	0	1	-85	21.64
					QPSK	6	0	3	-85	21.64
					16QAM	1	0	0	-85	23.12
					16QAM	1	5	0	-85	23.14
					16QAM	1	0	1	-85	22.97
					16QAM	1	5	1	-85	22.83
					16QAM	1	0	3	-85	22.84
					16QAM	1	5	3	-85	23.01
					16QAM	3	0	0	-85	21.98
					16QAM	3	3	3	-85	21.91
					16QAM	5	0	0	-85	20.84
					16QAM	5	0	1	-85	20.67
					16QAM	5	0	3	-85	20.75
Mid Range	23095	707.5	5095	737.5	QPSK	1	0	0	-85	22.91
					QPSK	1	5	0	-85	22.82

					QPSK	1	0	1	-85	22.74
					QPSK	1	5	1	-85	22.67
					QPSK	1	0	3	-85	22.76
					QPSK	1	5	3	-85	22.77
					QPSK	3	0	0	-85	21.75
					QPSK	3	3	3	-85	21.61
					QPSK	6	0	0	-85	21.77
					QPSK	6	0	1	-85	21.72
					QPSK	6	0	3	-85	21.42
					16QAM	1	0	0	-85	23.19
					16QAM	1	5	0	-85	23.21
					16QAM	1	0	1	-85	22.81
					16QAM	1	5	1	-85	22.77
					16QAM	1	0	3	-85	23.11
					16QAM	1	5	3	-85	22.98
					16QAM	3	0	0	-85	22.03
					16QAM	3	3	3	-85	21.87
					16QAM	5	0	0	-85	21.11
					16QAM	5	0	1	-85	21.62
					16QAM	5	0	3	-85	20.82
High Range	23155	713.5	5155	743.5					-85	
					QPSK	1	0	0	-85	22.6
					QPSK	1	5	0	-85	22.74
					QPSK	1	0	1	-85	22.48
					QPSK	1	5	1	-85	22.51
					QPSK	1	0	3	-85	22.56
					QPSK	1	5	3	-85	22.59
					QPSK	3	0	0	-85	21.55
					QPSK	3	3	3	-85	21.45
					QPSK	6	0	0	-85	21.51
					QPSK	6	0	1	-85	21.65
					QPSK	6	0	3	-85	21.58
					16QAM	1	0	0	-85	22.97
					16QAM	1	5	0	-85	23.17
					16QAM	1	0	1	-85	22.86
					16QAM	1	5	1	-85	22.89
					16QAM	1	0	3	-85	22.98
					16QAM	1	5	3	-85	22.81
					16QAM	3	0	0	-85	21.78
					16QAM	3	3	3	-85	21.97
					16QAM	5	0	0	-85	20.98

					16QAM	5	0	1	-85	20.87
					16QAM	5	0	3	-85	20.73

BW(MHz):	10

Test Frequency ID	N_{UL}	Frequency of Uplink [MHz]	N_{DL}	Frequency of Downlink [MHz]	Test Configuration Initial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	23060	704	5060	734	QPSK	1	0	0	-85	22.23
					QPSK	1	5	0	-85	22.19
					QPSK	1	0	3	-85	22.17
					QPSK	1	5	3	-85	22.09
					QPSK	1	0	7	-85	22.09
					QPSK	1	5	7	-85	22.16
					QPSK	4	0	0	-85	22.51
					QPSK	4	2	7	-85	22.49
					QPSK	6	0	0	-85	21.53
					QPSK	6	0	7	-85	21.45
					16QAM	1	0	0	-85	22.11
					16QAM	1	5	0	-85	22.03
					16QAM	1	0	3	-85	21.99
					16QAM	1	5	3	-85	21.89
					16QAM	1	0	7	-85	21.99
					16QAM	1	5	7	-85	21.92
					16QAM	4	2	0	-85	21.7
					16QAM	4	2	7	-85	21.68
					16QAM	5	0	0	-85	21.48
					16QAM	5	0	7	-85	21.35
Mid Range	23095	707.5	5095	737.5	QPSK	1	0	0	-85	22.55
					QPSK	1	5	0	-85	22.41
					QPSK	1	0	3	-85	22.43
					QPSK	1	5	3	-85	22.32
					QPSK	1	0	7	-85	22.51
					QPSK	1	5	7	-85	22.28
					QPSK	4	0	0	-85	22.42
					QPSK	4	2	7	-85	22.32
					QPSK	6	0	0	-85	21.53
					QPSK	6	0	7	-85	21.43
					16QAM	1	0	0	-85	22.03
					16QAM	1	5	0	-85	22.06
					16QAM	1	0	3	-85	22.01

					16QAM	1	5	3	-85	21.97
					16QAM	1	0	7	-85	21.95
					16QAM	1	5	7	-85	21.98
					16QAM	4	2	0	-85	21.32
					16QAM	4	2	7	-85	21.18
					16QAM	5	0	0	-85	21.66
					16QAM	5	0	7	-85	21.55
High Range	23130	711	5130	741					-85	
					QPSK	1	0	0	-85	22.47
					QPSK	1	5	0	-85	22.43
					QPSK	1	5	7	-85	22.35
					QPSK	1	0	3	-85	22.34
					QPSK	1	5	3	-85	22.35
					QPSK	1	0	7	-85	22.3
					QPSK	4	0	0	-85	22.59
					QPSK	4	2	7	-85	22.5
					QPSK	6	0	0	-85	21.57
					QPSK	6	0	7	-85	21.52
					16QAM	1	0	0	-85	21.89
					16QAM	1	5	0	-85	21.83
					16QAM	1	0	3	-85	21.76
					16QAM	1	5	3	-85	21.71
					16QAM	1	0	7	-85	21.81
					16QAM	1	5	7	-85	21.79
					16QAM	4	2	0	-85	21.59
					16QAM	4	2	7	-85	21.55
					16QAM	5	0	0	-85	21.83
					16QAM	5	0	7	-85	21.77

eMTC	Band 13	Region(s):	FCC	Power:	Class 3	23	Tolerance:	2.7	maximum:	23.01

BW(MHz):	5

Test Frequency ID	N_{UL}	Frequency of Uplink [MHz]	N_{DL}	Frequency of Downlink [MHz]	Test Configuration Initial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	23205	779.5	5205	748.5	QPSK	1	0	0	-85	23.01
					QPSK	1	5	0	-85	22.67
					QPSK	1	0	1	-85	22.6
					QPSK	1	5	1	-85	22.53
					QPSK	1	0	3	-85	22.67
					QPSK	1	5	3	-85	22.53
					QPSK	3	0	0	-85	21.71
					QPSK	3	3	3	-85	21.62
					QPSK	6	0	0	-85	21.68
					QPSK	6	0	1	-85	21.66
					QPSK	6	0	3	-85	21.56
					16QAM	1	0	0	-85	22.66
					16QAM	1	5	0	-85	22.71
					16QAM	1	0	1	-85	22.56
					16QAM	1	5	1	-85	22.68
					16QAM	1	0	3	-85	22.59
					16QAM	1	5	3	-85	22.63
					16QAM	3	0	0	-85	21.99
					16QAM	3	3	3	-85	21.86
					16QAM	6	0	0	-85	21.33
					16QAM	6	0	1	-85	21.28
					16QAM	6	0	3	-85	21.22
Mid Range	23230	782	5230	751	QPSK	1	0	0	-85	22.55
					QPSK	1	5	0	-85	22.59
					QPSK	1	0	1	-85	22.47
					QPSK	1	5	1	-85	22.48
					QPSK	1	0	3	-85	22.5
					QPSK	1	5	3	-85	22.52
					QPSK	3	0	0	-85	21.74
					QPSK	3	3	3	-85	21.66
					QPSK	6	0	0	-85	21.71
					QPSK	6	0	1	-85	21.6
					QPSK	6	0	3	-85	21.57
					16QAM	1	0	0	-85	22.81
					16QAM	1	5	0	-85	22.86

					16QAM	1	0	1	-85	22.7
					16QAM	1	5	1	-85	22.77
					16QAM	1	0	3	-85	22.79
					16QAM	1	5	3	-85	22.84
					16QAM	3	0	0	-85	21.98
					16QAM	3	3	3	-85	21.95
					16QAM	6	0	0	-85	21.1
					16QAM	6	0	1	-85	21.02
					16QAM	6	0	3	-85	21.04
High Range	23255	784.5	5255	753.5					-85	
					QPSK	1	0	0	-85	22.66
					QPSK	1	5	0	-85	22.62
					QPSK	1	0	1	-85	22.61
					QPSK	1	5	1	-85	22.49
					QPSK	1	0	3	-85	22.57
					QPSK	1	5	3	-85	22.51
					QPSK	3	0	0	-85	21.66
					QPSK	3	3	3	-85	21.56
					QPSK	6	0	0	-85	21.67
					QPSK	6	0	1	-85	21.59
					QPSK	6	0	3	-85	21.6
					16QAM	1	0	0	-85	22.79
					16QAM	1	5	0	-85	22.78
					16QAM	1	0	1	-85	22.77
					16QAM	1	5	1	-85	22.76
					16QAM	1	0	3	-85	22.66
					16QAM	1	5	3	-85	22.74
					16QAM	3	0	0	-85	22.03
					16QAM	3	3	3	-85	22
					16QAM	6	0	0	-85	21.06
					16QAM	6	0	1	-85	21.02
					16QAM	6	0	3	-85	20.92

BW(MHz):	10

Test Frequency ID	N_{UL}	Frequency of Uplink [MHz]	N_{DL}	Frequency of Downlink [MHz]	Test Configuration Initial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Mid Range	23230	782	5230	751	QPSK	1	0	0	-85	22.99
					QPSK	1	5	0	-85	22.87
					QPSK	1	0	3	-85	22.96
					QPSK	1	5	3	-85	22.82
					QPSK	1	0	7	-85	22.86
					QPSK	1	5	7	-85	22.8
					QPSK	4	0	0	-85	22.59
					QPSK	4	2	7	-85	22.55
					QPSK	6	0	0	-85	21.79
					QPSK	6	0	7	-85	21.73
					16QAM	1	0	0	-85	22.94
					16QAM	1	5	0	-85	22.75
					16QAM	1	0	3	-85	22.89
					16QAM	1	5	3	-85	22.68
					16QAM	1	0	7	-85	22.81
					16QAM	1	5	7	-85	22.64
					16QAM	4	2	0	-85	21.66
					16QAM	4	2	7	-85	21.52
					16QAM	6	0	0	-85	22.04
					16QAM	6	0	7	-85	22

NB-IOT

NB-IoT	Band 4	Region(s):	FCC	Power:	Class 3	23	Tolerance:	2.7

maximum:	23.15

Stand-alone

Test Frequency ID	N_{UL}	M_{UL}	Frequency of Uplink [MHz]	N_{DL}	M_{DL}	Frequency of Downlink [MHz]	Test Configuration Initial of Power			EUT	
							Modulation	Ntones	Sub-carrier spacing (kHz)	Cell power (dBm/15kHz)	power (dBm)
Low Range	19951	0	1710.1	1951	-0.5	2110.1	BPSK	1@0	3.75	-110	21.56
							QPSK	1@0	15	-110	21.68
							QPSK	3@3	15	-110	22.75
							QPSK	12@0	15	-110	20.49
Mid Range	20175	0	1732.5	2175	-0.5	2132.5	BPSK	1@0	3.75	-110	21.83
							BPSK	1@47	3.75	-110	21.73
							QPSK	1@0	15	-110	21.94
							QPSK	1@11	15	-110	21.93
							QPSK	3@3	15	-110	23.02
							QPSK	12@0	15	-110	20.87
High Range	20399	0	1754.9	2399	-0.5	2154.9	BPSK	1@47	3.75	-110	21.96
							QPSK	1@11	15	-110	22.06
							QPSK	3@3	15	-110	23.15
							QPSK	12@0	15	-110	21.05

In-band	BW(MHz):	3												
Test Frequency ID	N_{UL}	M_{UL}	Frequency of Uplink [MHz]	N_{DL}	M_{DL}	Frequency of Downlink [MHz]	LTE Host Cell			Test Configuration Initial of Power			EUT	
							NDL	Frequency of Downlink [MHz]	DL PRB Location	Modulation	Ntones	Sub-carrier spacing (kHz)	Cell power (dBm/15kHz)	power (dBm)
Low Range	19956	0	1710.6	1956	-2	2110.593	1965	2111.5	-5	BPSK	1@0	3.75	-110	21.42
										QPSK	1@0	15	-110	21.63
										QPSK	3@3	15	-110	22.42
										QPSK	12@0	15	-110	20.46
Mid Range	20166	0	1731.6	2166	-2	2131.593	2175	2132.5	-5	BPSK	1@0	3.75	-110	21.84
										BPSK	1@47	3.75	-110	21.82
										QPSK	1@0	15	-110	22.01
										QPSK	1@11	15	-110	22.02
										QPSK	3@3	15	-110	23.02
										QPSK	12@0	15	-110	21.16
High Range	20394	0	1754.4	2394	1	2154.408	2385	2153.5	5	BPSK	1@47	3.75	-110	21.86
										QPSK	1@11	15	-110	22.12
										QPSK	3@3	15	-110	23.01
										QPSK	12@0	15	-110	21.03

In-band	BW(MHz):	10	NB-IoT PRB:	30										
Test Frequency ID	N_{UL}	M_{UL}	Frequency of Uplink [MHz]	N_{DL}	M_{DL}	Frequency of Downlink [MHz]	LTE Host Cell			Test Configuration Initial of Power			EUT	
							NDL	Frequency of Downlink [MHz]	DL PRB Location	Modulation	Ntones	Sub-carrier spacing (kHz)	Cell power (dBm/15kHz)	power (dBm)
Low Range	20010	-2	1715.99	2010	-1	2115.998	2000	2115	5	BPSK	1@0	3.75	-110	20.49
										QPSK	1@0	15	-110	21.49
										QPSK	3@3	15	-110	22.91
										QPSK	12@0	15	-110	20.74
Mid Range	20185	-2	1733.49	2185	-1	2133.498	2175	2132.5	5	BPSK	1@0	3.75	-110	20.62
										BPSK	1@47	3.75	-110	22.08
										QPSK	1@0	15	-110	21.77
										QPSK	1@11	15	-110	22.08
										QPSK	3@3	15	-110	23.01
										QPSK	12@0	15	-110	20.89
High Range	20360	-2	1750.99	2360	-1	2150.998	2350	2150	5	BPSK	1@47	3.75	-110	22.06
										QPSK	1@11	15	-110	22.29
										QPSK	3@3	15	-110	23.11
										QPSK	12@0	15	-110	21.37

In-band	BW(MHz):	10	NB-IoT PRB:	35

Test Frequency ID	N_{UL}	M_{UL}	Frequency of Uplink [MHz]	N_{DL}	M_{DL}	Frequency of Downlink [MHz]	LTE Host Cell			Test Configuration Initial of Power			EUT	
							NDL	Frequency of Downlink [MHz]	DL PRB Location	Modulation	Ntones	Sub-carrier spacing (kHz)	Cell power (dBm/15kHz)	power (dBm)
Low Range	20019	-2	1716.89	2019	-1	2116.898	2000	2115	10	BPSK	1@0	3.75	-110	20.31
										QPSK	1@0	15	-110	21.24
										QPSK	3@3	15	-110	22.59
										QPSK	12@0	15	-110	20.63
Mid Range	20194	-2	1734.39	2194	-1	2134.398	2175	2132.5	10	BPSK	1@0	3.75	-110	20.53
										BPSK	1@47	3.75	-110	21.63
										QPSK	1@0	15	-110	21.75
										QPSK	1@11	15	-110	22.06
										QPSK	3@3	15	-110	23.11
										QPSK	12@0	15	-110	21.06
High Range	20369	-2	1751.89	2369	-1	2151.898	2350	2150	10	BPSK	1@47	3.75	-110	22.1
										QPSK	1@11	15	-110	22.32
										QPSK	3@3	15	-110	23.13
										QPSK	12@0	15	-110	21.13

Guard-band	BW(MHz):	5

Test Frequency ID	N_{UL}	M_{UL}	Frequency of Uplink [MHz]	N_{DL}	M_{DL}	Frequency of Downlink [MHz]	LTE Host Cell			Test Configuration Initial of Power			EUT	
							NDL	Frequency of Downlink [MHz]	DL PRB Location	Modulation	Ntones	Sub-carrier spacing (kHz)	Cell power (dBm/15kHz)	power (dBm)
Low Range	19951	0	1710.1	1951	1	2110.108	1975	2112.5	-24	BPSK	1@0	3.75	-110	21.7
										QPSK	1@0	15	-110	21.74
										QPSK	3@3	15	-110	22.61
										QPSK	12@0	15	-110	20.31
Mid Range	20151	0	1730.1	2151	1	2130.108	2175	2132.5	-24	BPSK	1@0	3.75	-110	21.94
										BPSK	1@47	3.75	-110	22.18
										QPSK	1@0	15	-110	21.94
										QPSK	1@11	15	-110	20.3
										QPSK	3@3	15	-110	23.02
										QPSK	12@0	15	-110	20.83
High Range	20399	0	1754.9	2399	-2	2154.893	2375	2152.5	24	BPSK	1@47	3.75	-110	22.04
										QPSK	1@11	15	-110	22.02

										QPSK	3@3	15	-110	23.05
										QPSK	12@0	15	-110	21.38
NB-IoT	Band 12	Region(s):	FCC	Power:	Class 3	23	Tolerance:	2.7					maximum:	24.19

Stand-alone											
Test Frequency ID	N_{UL}	M_{UL}	Frequency of Uplink [MHz]	N_{DL}	M_{DL}	Frequency of Downlink [MHz]	Test Configuration Initial of Power			EUT	
							Modulation	Ntones	Sub-carrier spacing (kHz)	Cell power (dBm/15kHz)	power (dBm)
Low Range	23011	0	699.1	5011	-0.5	729.1	BPSK	1@0	3.75	-110	23.12
							QPSK	1@0	15	-110	23.13
							QPSK	3@3	15	-110	24.19
							QPSK	12@0	15	-110	22.02
Mid Range	23095	0	707.5	5095	-0.5	737.5	BPSK	1@0	3.75	-110	22.91
							BPSK	1@47	3.75	-110	22.94
							QPSK	1@0	15	-110	23.04
							QPSK	1@11	15	-110	23.05
							QPSK	3@3	15	-110	23.88
							QPSK	12@0	15	-110	21.94
High Range	23179	0	715.9	5179	-0.5	745.9	BPSK	1@47	3.75	-110	22.76
							QPSK	1@11	15	-110	22.88
							QPSK	3@3	15	-110	23.78
							QPSK	12@0	15	-110	21.65

In-band	BW(MHz):	3												
Test Frequency ID	N_{UL}	M_{UL}	Frequency of Uplink [MHz]	N_{DL}	M_{DL}	Frequency of Downlink [MHz]	LTE Host Cell			Test Configuration Initial of Power			EUT	
							NDL	Frequency of Downlink [MHz]	DL PRB Location	Modulation	Ntones	Sub-carrier spacing (kHz)	Cell power (dBm/15kHz)	power (dBm)
Low Range	23016	0	699.6	5016	-2	729.5925	5025	730.5	-5	BPSK	1@0	3.75	-110	23.19
										QPSK	1@0	15	-110	23.15
										QPSK	3@3	15	-110	24.14
										QPSK	12@0	15	-110	21.97
Mid Range	23086	0	706.6	5086	-2	736.5925	5095	737.5	-5	BPSK	1@0	3.75	-110	22.99
										BPSK	1@47	3.75	-110	22.83
										QPSK	1@0	15	-110	22.78
										QPSK	1@11	15	-110	23.01
										QPSK	3@3	15	-110	23.96
										QPSK	12@0	15	-110	22.14
High Range	23174	0	715.4	5174	1	745.4075	5165	744.5	5	BPSK	1@47	3.75	-110	22.7
										QPSK	1@11	15	-110	23.02
										QPSK	3@3	15	-110	23.77

										QPSK	12@0	15	-110	21.76

In-band	BW(MHz):	10	NB-IoT PRB:	30

Test Frequency ID	N_{UL}	M_{UL}	Frequency of Uplink [MHz]	N_{DL}	M_{DL}	Frequency of Downlink [MHz]	LTE Host Cell			Test Configuration Initial of Power			EUT	
							NDL	Frequency of Downlink [MHz]	DL PRB Location	Modulation	Ntones	Sub-carrier spacing (kHz)	Cell power (dBm/15kHz)	power (dBm)
Low Range	23070	-2	704.99	5070	-1	734.9975	5060	734	5	BPSK	1@0	3.75	-110	21.51
										QPSK	1@0	15	-110	22.83
										QPSK	3@3	15	-110	24.01
										QPSK	12@0	15	-110	22.05
Mid Range	23105	-2	708.49	5105	-1	738.4975	5095	737.5	5	BPSK	1@0	3.75	-110	21.84
										BPSK	1@47	3.75	-110	23.15
										QPSK	1@0	15	-110	22.74
										QPSK	1@11	15	-110	23.21
										QPSK	3@3	15	-110	24.14
										QPSK	12@0	15	-110	22.03
High Range	23140	-2	711.99	5140	-1	741.9975	5130	741	5	BPSK	1@47	3.75	-110	21.57
										QPSK	1@11	15	-110	23.12
										QPSK	3@3	15	-110	24.18
										QPSK	12@0	15	-110	24.11

In-band	BW(MHz):	10	NB-IoT PRB:	35

Test Frequency ID	N_{UL}	M_{UL}	Frequency of Uplink [MHz]	N_{DL}	M_{DL}	Frequency of Downlink [MHz]	LTE Host Cell			Test Configuration Initial of Power			EUT	
							NDL	Frequency of Downlink [MHz]	DL PRB Location	Modulation	Ntones	Sub-carrier spacing (kHz)	Cell power (dBm/15kHz)	power (dBm)
Low Range	23079	-2	705.89	5079	-1	735.8975	5060	734	10	BPSK	1@0	3.75	-110	21.57
										QPSK	1@0	15	-110	22.68
										QPSK	3@3	15	-110	23.92
										QPSK	12@0	15	-110	20.95
Mid Range	23114	-2	709.39	5114	-1	739.3975	5095	737.5	10	BPSK	1@0	3.75	-110	21.5
										BPSK	1@47	3.75	-110	23.22
										QPSK	1@0	15	-110	22.81
										QPSK	1@11	15	-110	23.13
										QPSK	3@3	15	-110	24.11
										QPSK	12@0	15	-110	22.17
High Range	23149	-2	712.89	5149	-1	742.8975	5130	741	10	BPSK	1@47	3.75	-110	22.9
										QPSK	1@11	15	-110	23.01
										QPSK	3@3	15	-110	23.74
										QPSK	12@0	15	-110	21.96

Guard-band	BW(MHz):	5

Test Frequency ID	N_{UL}	M_{UL}	Frequency of Uplink [MHz]	N_{DL}	M_{DL}	Frequency of Downlink [MHz]	LTE Host Cell			Test Configuration Initial of Power			EUT	
							NDL	Frequency of Downlink [MHz]	DL PRB Location	Modulation	Ntones	Sub-carrier spacing (kHz)	Cell power (dBm/15kHz)	power (dBm)
Low Range	23011	0	699.1	5011	1	729.1075	5035	731.5	-24	BPSK	1@0	3.75	-110	23.13
										QPSK	1@0	15	-110	23.22
										QPSK	3@3	15	-110	24.08
										QPSK	12@0	15	-110	22.19
Mid Range	23071	0	705.1	5071	1	735.1075	5095	737.5	-24	BPSK	1@0	3.75	-110	22.98
										BPSK	1@47	3.75	-110	22.55
										QPSK	1@0	15	-110	23.07
										QPSK	1@11	15	-110	20.95
										QPSK	3@3	15	-110	24.12
										QPSK	12@0	15	-110	22.03
High Range	23179	0	715.9	5179	-2	745.8925	5155	743.5	24	BPSK	1@47	3.75	-110	22.81
										QPSK	1@11	15	-110	22.87
										QPSK	3@3	15	-110	23.91
										QPSK	12@0	15	-110	22.05

NB-IoT	Band 13	Region(s):	FCC	Power:	Class 3	23	Tolerance:	2.7

maximum:	24.1

Stand-alone

Test Frequency ID	N_{UL}	M_{UL}	Frequency of Uplink [MHz]	N_{DL}	M_{DL}	Frequency of Downlink [MHz]	Test Configuration Initial of Power			EUT	
							Modulation	Ntones	Sub-carrier spacing (kHz)	Cell power (dBm/15kHz)	power (dBm)
Low Range	23181	0	777.1	5181	-0.5	746.1	BPSK	1@0	3.75	-110	22.95
							QPSK	1@0	15	-110	22.97
							QPSK	3@3	15	-110	24.1
							QPSK	12@0	15	-110	21.79
Mid Range	23230	0	782	5230	-0.5	751	BPSK	1@0	3.75	-110	23.01
							BPSK	1@47	3.75	-110	22.99
							QPSK	1@0	15	-110	23.15
							QPSK	1@11	15	-110	23.09
							QPSK	3@3	15	-110	24.07
							QPSK	12@0	15	-110	21.91
High Range	23279	0	786.9	5279	-0.5	755.9	BPSK	1@47	3.75	-110	23.09
							QPSK	1@11	15	-110	23.27
							QPSK	3@3	15	-110	24.06
							QPSK	12@0	15	-110	21.93

In-band	BW(MHz):	5												
Test Frequency ID	N_{UL}	M_{UL}	Frequency of Uplink [MHz]	N_{DL}	M_{DL}	Frequency of Downlink [MHz]	LTE Host Cell			Test Configuration Initial of Power			EUT	
							NDL	Frequency of Downlink [MHz]	DL PRB Location	Modulation	Ntones	Sub-carrier spacing (kHz)	Cell power (dBm/15kHz)	power (dBm)
Low Range	23187	0	777.7	5187	-2	746.6925	5205	748.5	-10	BPSK	1@0	3.75	-110	23.07
										QPSK	1@0	15	-110	23.11
										QPSK	3@3	15	-110	24.01
										QPSK	12@0	15	-110	21.94
Mid Range	23221	0	781.1	5221	-2	750.0925	5230	751	-5	BPSK	1@0	3.75	-110	22.88
										BPSK	1@47	3.75	-110	22.74
										QPSK	1@0	15	-110	23.04
										QPSK	1@11	15	-110	22.98
										QPSK	3@3	15	-110	23.94
										QPSK	12@0	15	-110	21.77
High Range	23273	0	786.3	5273	1	755.3075	5255	753.5	10	BPSK	1@47	3.75	-110	23.11
										QPSK	1@11	15	-110	23.19
										QPSK	3@3	15	-110	24.01
										QPSK	12@0	15	-110	21.91

In-band	BW(MHz):	10	NB-IoT PRB:	30										
Test Frequency ID	N_{UL}	M_{UL}	Frequency of Uplink [MHz]	N_{DL}	M_{DL}	Frequency of Downlink [MHz]	LTE Host Cell			Test Configuration Initial of Power			EUT	
							NDL	Frequency of Downlink [MHz]	DL PRB Location	Modulation	Ntones	Sub-carrier spacing (kHz)	Cell power (dBm/15kHz)	power (dBm)
Low Range	23240	-2	782.99	5240	-1	751.9975	5230	751	5	BPSK	1@0	3.75	-110	21.44
										BPSK	1@47	3.75	-110	23.14
										QPSK	1@0	15	-110	22.61
										QPSK	1@11	15	-110	23.05
										QPSK	3@3	15	-110	23.99
										QPSK	12@0	15	-110	21.87

In-band	BW(MHz):	10	NB-IoT PRB:	35										
Test Frequency ID	N_{UL}	M_{UL}	Frequency of Uplink [MHz]	N_{DL}	M_{DL}	Frequency of Downlink [MHz]	LTE Host Cell			Test Configuration Initial of Power			EUT	
							NDL	Frequency of Downlink [MHz]	DL PRB Location	Modulation	Ntones	Sub-carrier spacing (kHz)	Cell power (dBm/15kHz)	power (dBm)
Low Range	23249	-2	783.89	5249	-1	752.8975	5230	751	10	BPSK	1@0	3.75	-110	21.51
										BPSK	1@47	3.75	-110	22.97
										QPSK	1@0	15	-110	22.77
										QPSK	1@11	15	-110	23.05
										QPSK	3@3	15	-110	24.09
										QPSK	12@0	15	-110	21.76

Guard-band	BW(MHz):	5												
Test Frequency ID	N_{UL}	M_{UL}	Frequency of Uplink [MHz]	N_{DL}	M_{DL}	Frequency of Downlink [MHz]	LTE Host Cell			Test Configuration Initial of Power			EUT	
							NDL	Frequency of Downlink [MHz]	DL PRB Location	Modulation	Ntones	Sub-carrier spacing (kHz)	Cell power (dBm/15kHz)	power (dBm)
Low Range	23181	0	777.1	5181	1	746.1075	5205	748.5	-24	BPSK	1@0	3.75	-110	22.88
										QPSK	1@0	15	-110	22.91
										QPSK	3@3	15	-110	23.97
										QPSK	12@0	15	-110	21.77
Mid Range	23206	0	779.6	5206	1	748.6075	5230	751	-24	BPSK	1@0	3.75	-110	23.04
										BPSK	1@47	3.75	-110	21.08
										QPSK	1@0	15	-110	22.97
										QPSK	1@11	15	-110	21.67
										QPSK	3@3	15	-110	23.87
										QPSK	12@0	15	-110	21.92
High Range	23279	0	786.9	5279	-2	755.8925	5255	753.5	24	BPSK	1@47	3.75	-110	23.07
										QPSK	1@11	15	-110	23.26
										QPSK	3@3	15	-110	23.97
										QPSK	12@0	15	-110	21.56

ERP Power (dBm)

Cat-M1

LTE Band 12							
Channel Bandwidth: 1.4 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
X	23017	699.7	-2.80	30.36	25.41	347.54	H
	23095	707.5	-2.11	30.17	25.91	389.94	
	23173	715.3	-2.40	30.17	25.62	364.75	
	23017	699.7	-8.79	32.03	21.09	128.53	V
	23095	707.5	-8.20	31.98	21.63	145.55	
	23173	715.3	-8.56	32.06	21.35	136.46	
Channel Bandwidth: 1.4 MHz / 16QAM							
X	23017	699.7	-3.79	30.36	24.42	276.69	H
	23095	707.5	-3.10	30.17	24.92	310.46	
	23173	715.3	-3.39	30.17	24.63	290.40	
	23017	699.7	-9.78	32.03	20.10	102.33	V
	23095	707.5	-9.19	31.98	20.64	115.88	
	23173	715.3	-9.55	32.06	20.36	108.64	

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

LTE Band 12							
Channel Bandwidth: 3 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
X	23025	700.5	-2.86	30.17	25.16	328.10	H
	23095	707.5	-2.36	30.17	25.66	368.13	
	23165	714.5	-2.66	30.18	25.37	344.35	
	23025	700.5	-8.97	31.96	20.84	121.34	V
	23095	707.5	-8.45	31.98	21.38	137.40	
	23165	714.5	-8.78	32.03	21.10	128.82	
Channel Bandwidth: 3 MHz / 16QAM							
X	23025	700.5	-3.88	30.17	24.14	259.42	H
	23095	707.5	-3.38	30.17	24.64	291.07	
	23165	714.5	-3.68	30.18	24.35	272.27	
	23025	700.5	-9.99	31.96	19.82	95.94	V
	23095	707.5	-9.47	31.98	20.36	108.64	
	23165	714.5	-9.80	32.03	20.08	101.86	

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

LTE Band 12							
Channel Bandwidth: 5 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
X	23035	701.5	-3.07	30.17	24.95	312.61	H
	23095	707.5	-2.57	30.17	25.45	350.75	
	23155	713.5	-2.87	30.18	25.16	328.10	
	23035	701.5	-9.18	31.96	20.63	115.61	V
	23095	707.5	-8.66	31.98	21.17	130.92	
	23155	713.5	-8.99	32.03	20.89	122.74	
Channel Bandwidth: 5 MHz / 16QAM							
X	23035	701.5	-4.09	30.17	23.93	247.17	H
	23095	707.5	-3.59	30.17	24.43	277.33	
	23155	713.5	-3.89	30.18	24.14	259.42	
	23035	701.5	-10.20	31.96	19.61	91.41	V
	23095	707.5	-9.68	31.98	20.15	103.51	
	23155	713.5	-10.01	32.03	19.87	97.05	

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

LTE Band 12							
Channel Bandwidth: 10 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
X	23060	704.0	-3.28	30.17	24.74	297.85	H
	23095	707.5	-2.78	30.17	25.24	334.20	
	23130	711.0	-3.08	30.18	24.95	312.61	
	23060	704.0	-9.39	31.96	20.42	110.15	V
	23095	707.5	-8.87	31.98	20.96	124.74	
	23130	711.0	-9.20	32.03	20.68	116.95	
Channel Bandwidth: 10 MHz / 16QAM							
X	23060	704.0	-4.43	30.17	23.59	228.56	H
	23095	707.5	-3.93	30.17	24.09	256.45	
	23130	711.0	-4.23	30.18	23.80	239.88	
	23060	704.0	-10.54	31.96	19.27	84.53	V
	23095	707.5	-10.02	31.98	19.81	95.72	
	23130	711.0	-10.35	32.03	19.53	89.74	

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

LTE Band 13							
Channel Bandwidth: 5 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
X	23205	779.5	-4.57	32.24	25.52	356.45	H
	23230	782.0	-5.01	32.17	25.01	316.96	
	23255	784.5	-4.57	32.11	25.39	345.94	
	23205	779.5	-10.20	32.43	20.08	101.86	V
	23230	782.0	-10.68	32.42	19.59	90.99	
	23255	784.5	-10.56	32.46	19.75	94.41	
Channel Bandwidth: 5 MHz / 16QAM							
X	23205	779.5	-5.59	32.24	24.50	281.84	H
	23230	782.0	-6.03	32.17	23.99	250.61	
	23255	784.5	-5.59	32.11	24.37	273.53	
	23205	779.5	-11.22	32.43	19.06	80.54	V
	23230	782.0	-11.70	32.42	18.57	71.94	
	23255	784.5	-11.58	32.46	18.73	74.64	

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

LTE Band 13							
Channel Bandwidth: 10 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
X	23230	782.0	-5.26	32.17	24.76	299.23	H
	23230	782.0	-10.93	32.42	19.34	85.90	V
Channel Bandwidth: 10 MHz / 16QAM							
X	23230	782.0	-6.37	32.17	23.65	231.74	H
	23230	782.0	-12.04	32.42	18.23	66.53	V

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

EIRP Power (dBm)

LTE Band 4							
Channel Bandwidth: 1.4 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	19957	1710.7	-11.53	36.45	24.92	310.46	H
	20175	1732.5	-11.81	36.80	24.99	315.50	
	20393	1754.3	-11.61	36.94	25.33	341.19	
	19957	1710.7	-16.66	37.28	20.62	115.35	V
	20175	1732.5	-16.78	37.63	20.85	121.62	
	20393	1754.3	-16.45	37.64	21.19	131.52	
Channel Bandwidth: 1.4 MHz / 16QAM							
X	19957	1710.7	-12.55	36.45	23.90	245.47	H
	20175	1732.5	-12.83	36.80	23.97	249.46	
	20393	1754.3	-12.63	36.94	24.31	269.77	
	19957	1710.7	-17.68	37.28	19.60	91.20	V
	20175	1732.5	-17.80	37.63	19.83	96.16	
	20393	1754.3	-17.47	37.64	20.17	103.99	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

LTE Band 4							
Channel Bandwidth: 3 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	19965	1711.5	-11.75	36.45	24.70	295.12	H
	20175	1732.5	-12.03	36.80	24.77	299.92	
	20385	1753.5	-11.83	36.94	25.11	324.34	
	19965	1711.5	-16.88	37.28	20.40	109.65	V
	20175	1732.5	-17.00	37.63	20.63	115.61	
	20385	1753.5	-16.67	37.64	20.97	125.03	
Channel Bandwidth: 3 MHz / 16QAM							
X	19965	1711.5	-12.86	36.45	23.59	228.56	H
	20175	1732.5	-13.14	36.80	23.66	232.27	
	20385	1753.5	-12.94	36.94	24.00	251.19	
	19965	1711.5	-17.99	37.28	19.29	84.92	V
	20175	1732.5	-18.11	37.63	19.52	89.54	
	20385	1753.5	-17.78	37.64	19.86	96.83	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

LTE Band 4							
Channel Bandwidth: 5 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	19975	1712.5	-12.02	36.45	24.43	277.33	H
	20175	1732.5	-12.30	36.80	24.50	281.84	
	20375	1752.5	-12.10	36.94	24.84	304.79	
	19975	1712.5	-17.15	37.28	20.13	103.04	V
	20175	1732.5	-17.27	37.63	20.36	108.64	
	20375	1752.5	-16.94	37.64	20.70	117.49	
Channel Bandwidth: 5 MHz / 16QAM							
X	19975	1712.5	-13.01	36.45	23.44	220.80	H
	20175	1732.5	-13.29	36.80	23.51	224.39	
	20375	1752.5	-13.09	36.94	23.85	242.66	
	19975	1712.5	-18.14	37.28	19.14	82.04	V
	20175	1732.5	-18.26	37.63	19.37	86.50	
	20375	1752.5	-17.93	37.64	19.71	93.54	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

LTE Band 4							
Channel Bandwidth: 10 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	20000	1715.0	-12.47	36.64	24.17	261.22	H
	20175	1732.5	-12.56	36.80	24.24	265.46	
	20350	1750.0	-12.22	36.80	24.58	287.08	
	20000	1715.0	-17.57	37.44	19.87	97.05	V
	20175	1732.5	-17.53	37.63	20.10	102.33	
	20350	1750.0	-17.20	37.64	20.44	110.66	
Channel Bandwidth: 10 MHz / 16QAM							
X	20000	1715.0	-13.44	36.64	23.20	208.93	H
	20175	1732.5	-13.53	36.80	23.27	212.32	
	20350	1750.0	-13.19	36.80	23.61	229.61	
	20000	1715.0	-18.54	37.44	18.90	77.62	V
	20175	1732.5	-18.50	37.63	19.13	81.85	
	20350	1750.0	-18.17	37.64	19.47	88.51	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

LTE Band 4							
Channel Bandwidth: 15 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	20025	1717.5	-12.50	36.45	23.95	248.31	H
	20175	1732.5	-12.78	36.80	24.02	252.35	
	20325	1747.5	-12.58	36.94	24.36	272.90	
	20025	1717.5	-17.63	37.28	19.65	92.26	V
	20175	1732.5	-17.75	37.63	19.88	97.27	
	20325	1747.5	-17.42	37.64	20.22	105.20	
Channel Bandwidth: 15 MHz / 16QAM							
X	20025	1717.5	-13.52	36.45	22.93	196.34	H
	20175	1732.5	-13.80	36.80	23.00	199.53	
	20325	1747.5	-13.60	36.94	23.34	215.77	
	20025	1717.5	-18.65	37.28	18.63	72.95	V
	20175	1732.5	-18.77	37.63	18.86	76.91	
	20325	1747.5	-18.44	37.64	19.20	83.18	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

LTE Band 4							
Channel Bandwidth: 20 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	20050	1720.0	-12.73	36.45	23.72	235.50	H
	20175	1732.5	-13.01	36.80	23.79	239.33	
	20300	1745.0	-12.81	36.94	24.13	258.82	
	20050	1720.0	-17.86	37.28	19.42	87.50	V
	20175	1732.5	-17.98	37.63	19.65	92.26	
	20300	1745.0	-17.65	37.64	19.99	99.77	
Channel Bandwidth: 20 MHz / 16QAM							
X	20050	1720.0	-13.84	36.45	22.61	182.39	H
	20175	1732.5	-14.12	36.80	22.68	185.35	
	20300	1745.0	-13.92	36.94	23.02	200.45	
	20050	1720.0	-18.97	37.28	18.31	67.76	V
	20175	1732.5	-19.09	37.63	18.54	71.45	
	20300	1745.0	-18.76	37.64	18.88	77.27	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

NB-IOT

LTE Band 4							
Channel Bandwidth: QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
X	19951	1710.1	-10.69	36.45	25.76	376.70	H
	20175	1732.5	-10.96	36.80	25.84	383.71	
	20399	1754.9	-10.98	36.94	25.96	394.46	
	19951	1710.1	-16.95	37.28	20.33	107.89	V
	20175	1732.5	-17.05	37.63	20.58	114.29	
	20399	1754.9	-16.85	37.64	20.79	119.95	
Channel Bandwidth: BPSK							
X	19951	1710.1	-11.98	36.45	24.47	279.90	H
	20175	1732.5	-12.11	36.80	24.69	294.44	
	20399	1754.9	-12.02	36.94	24.92	310.46	
	19951	1710.1	-17.97	37.28	19.31	85.31	V
	20175	1732.5	-18.13	37.63	19.50	89.13	
	20399	1754.9	-17.97	37.64	19.67	92.68	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

LTE Band 12							
Channel Bandwidth: QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
X	23011	699.1	0.11	30.36	28.32	679.20	H
	23095	707.5	-0.08	30.17	27.94	622.30	
	23179	715.9	0.17	30.17	28.19	659.17	
	23011	699.1	-7.47	32.03	22.41	174.18	V
	23095	707.5	-7.75	31.98	22.08	161.44	
	23179	715.9	-7.65	32.06	22.26	168.27	
Channel Bandwidth: BPSK							
X	23011	699.1	-0.90	30.36	27.31	538.27	H
	23095	707.5	-1.26	30.17	26.76	474.24	
	23179	715.9	-0.86	30.17	27.16	520.00	
	23011	699.1	-8.57	32.03	21.31	135.21	V
	23095	707.5	-9.07	31.98	20.76	119.12	
	23179	715.9	-8.99	32.06	20.92	123.59	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

LTE Band 13							
Channel Bandwidth: QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
X	23181	777.1	-3.90	32.24	26.19	415.91	H
	23230	782.0	-4.05	32.17	25.97	395.37	
	23279	786.9	-3.93	32.11	26.03	400.87	
	23181	777.1	-9.40	32.43	20.88	122.46	V
	23230	782.0	-9.75	32.42	20.52	112.72	
	23279	786.9	-9.62	32.46	20.69	117.22	
Channel Bandwidth: BPSK							
X	23181	777.1	-4.88	32.24	25.21	331.89	H
	23230	782.0	-5.33	32.17	24.69	294.44	
	23279	786.9	-5.05	32.11	24.91	309.74	
	23181	777.1	-10.37	32.43	19.91	97.95	V
	23230	782.0	-10.71	32.42	19.56	90.36	
	23279	786.9	-10.63	32.46	19.68	92.90	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

N/A

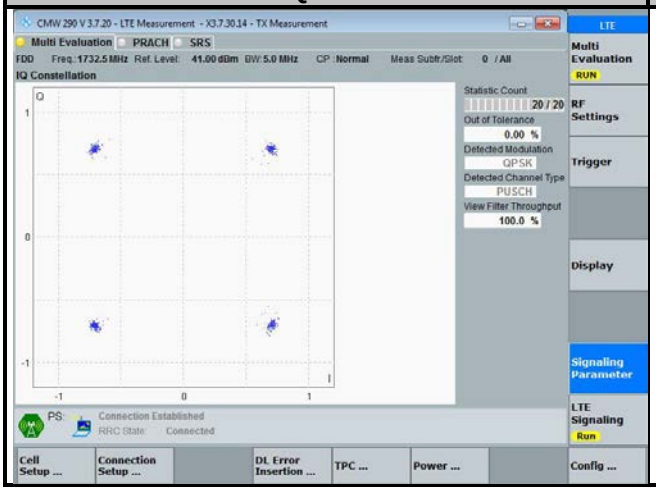
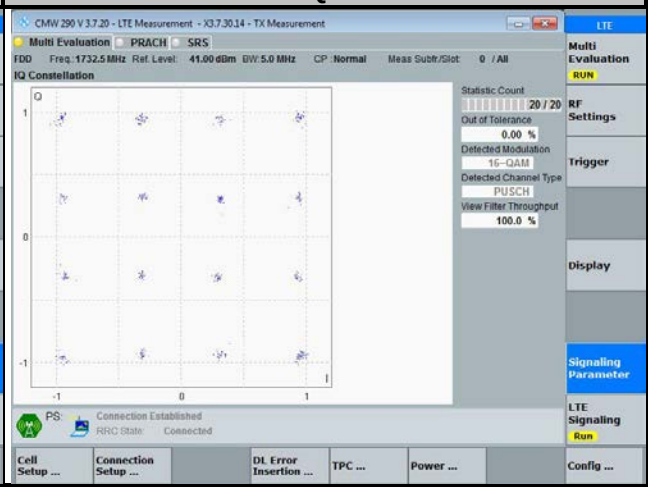
4.2.2 Test Setup

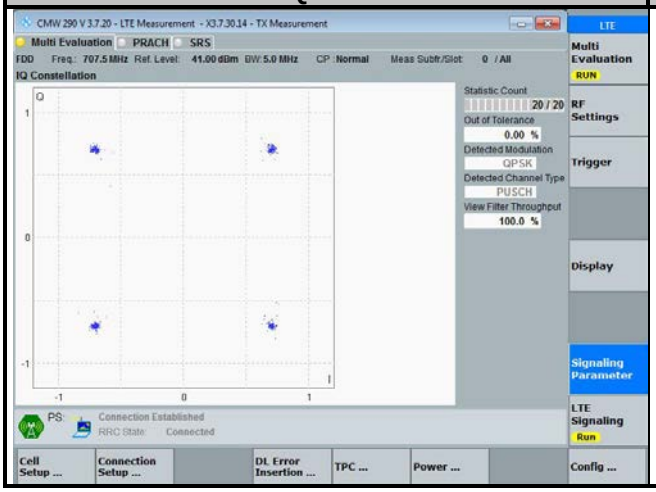
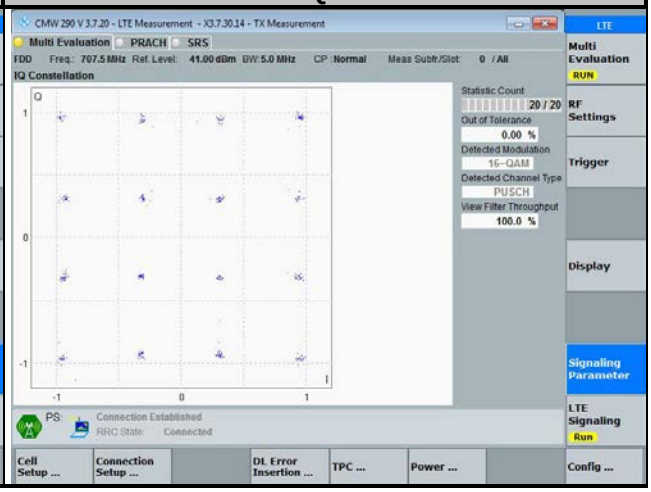
4.2.3 Test Procedure

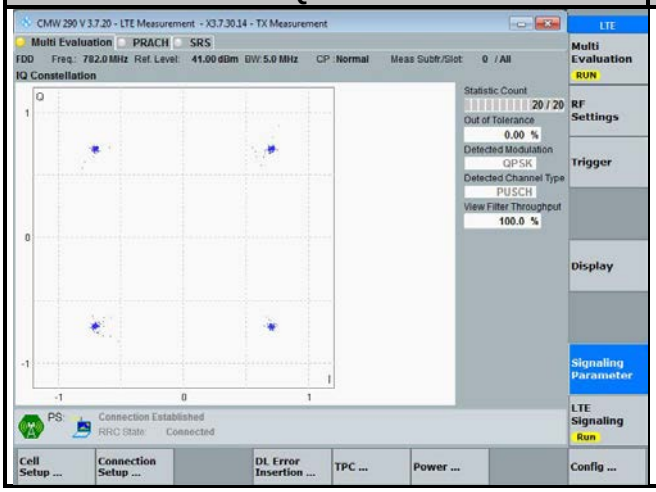
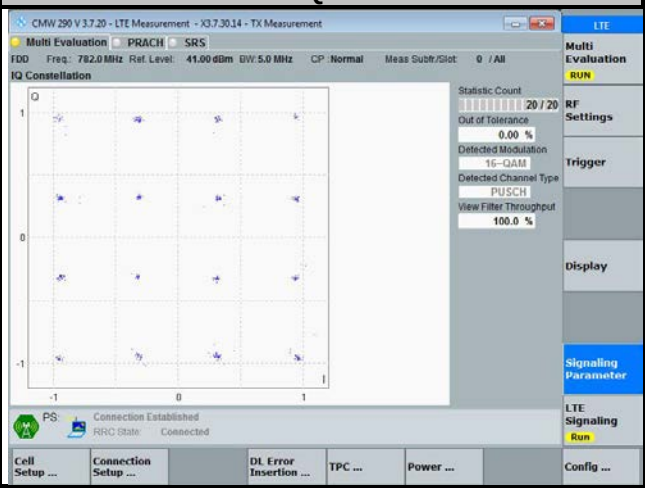
Connect the EUT to Communication Simulator via the antenna connector. The frequency band is set as EUT supported Modulation and Channels, the EUT output is matched with 50 ohm load, the waveform quality and constellation of the EUT was tested.

4.2.4 Test Results

Cat-M1

Spectrum Plot of Measurement	
LTE Band 4	
Channel 20175	
QPSK	16QAM
	

Spectrum Plot of Measurement	
LTE Band 12	
Channel 23095	
QPSK	16QAM
	

Spectrum Plot of Measurement	
LTE Band 13	
Channel 23230	
QPSK	16QAM
	

4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

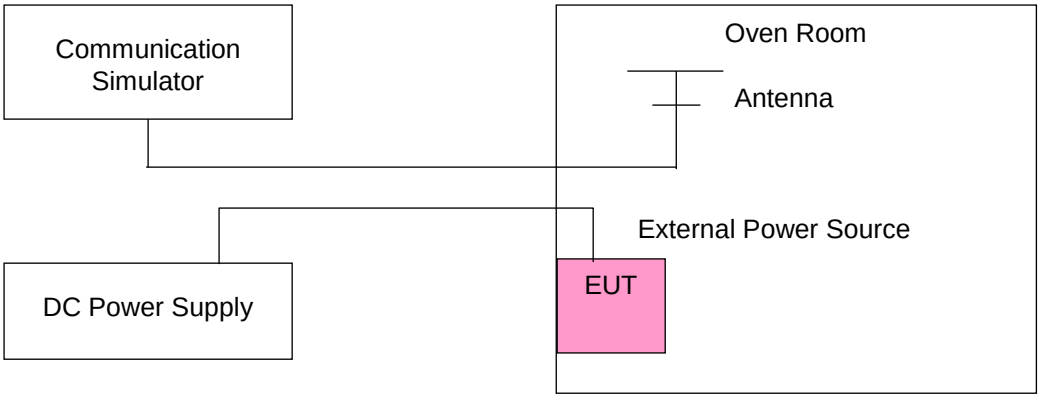
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

4.3.2 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.

4.3.3 Test Setup



4.3.4 Test Results

Cat-M1

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)	
10.2	1710.700002	0.001	1754.300003	0.001	2.5
12	1710.700004	0.002	1754.300002	0.001	2.5
13.8	1710.700002	0.001	1754.300003	0.002	2.5

Note: The applicant defined the normal working voltage of the adapter is from 10.2 Vdc to 13.8 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	1710.700001	0.001	1754.300002	0.001	2.5
-20	1710.700003	0.001	1754.300002	0.001	2.5
-10	1710.700002	0.001	1754.300004	0.002	2.5
0	1710.700002	0.001	1754.300002	0.001	2.5
10	1710.700002	0.001	1754.300004	0.002	2.5
20	1710.699997	-0.002	1754.299997	-0.001	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	1710.699996	-0.002	1754.299997	-0.002	2.5
55	1710.699998	-0.001	1754.299998	-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)	
10.2	1711.500001	0.001	1753.500002	0.001	2.5
12	1711.500003	0.001	1753.500001	0.001	2.5
13.8	1711.500002	0.001	1753.500004	0.002	2.5

Note: The applicant defined the normal working voltage of the adapter is from 10.2 Vdc to 13.8 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	1711.500004	0.002	1753.500004	0.002	2.5
-20	1711.500002	0.001	1753.500003	0.002	2.5
-10	1711.500004	0.002	1753.500003	0.002	2.5
0	1711.500001	0.001	1753.500003	0.002	2.5
10	1711.500001	0.001	1753.500002	0.001	2.5
20	1711.499996	-0.002	1753.499996	-0.002	2.5
30	1711.499997	-0.002	1753.499998	-0.001	2.5
40	1711.499998	-0.001	1753.499999	-0.001	2.5
50	1711.499998	-0.001	1753.499996	-0.002	2.5
55	1711.499999	-0.001	1753.499998	-0.001	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)	
10.2	1712.500003	0.002	1752.500003	0.002	2.5
12	1712.500004	0.002	1752.500001	0.001	2.5
13.8	1712.500004	0.002	1752.500003	0.001	2.5

Note: The applicant defined the normal working voltage of the adapter is from 10.2 Vdc to 13.8 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	1712.500002	0.001	1752.500001	0.001	2.5
-20	1712.500002	0.001	1752.500002	0.001	2.5
-10	1712.500002	0.001	1752.500001	0.001	2.5
0	1712.500004	0.002	1752.500001	0.001	2.5
10	1712.500001	0.001	1752.500003	0.002	2.5
20	1712.499997	-0.002	1752.499999	-0.001	2.5
30	1712.499998	-0.001	1752.499997	-0.002	2.5
40	1712.499998	-0.001	1752.499998	-0.001	2.5
50	1712.499996	-0.002	1752.499998	-0.001	2.5
55	1712.499998	-0.001	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)	
10.2	1715.000002	0.001	1750.000002	0.001	2.5
12	1715.000003	0.002	1750.000004	0.002	2.5
13.8	1715.000001	0.001	1750.000002	0.001	2.5

Note: The applicant defined the normal working voltage of the adapter is from 10.2 Vdc to 13.8 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	1715.000002	0.001	1750.000003	0.001	2.5
-20	1715.000004	0.002	1750.000003	0.002	2.5
-10	1715.000004	0.002	1750.000001	0.001	2.5
0	1715.000003	0.002	1750.000003	0.002	2.5
10	1715.000003	0.002	1750.000002	0.001	2.5
20	1714.999999	-0.001	1749.999996	-0.002	2.5
30	1714.999999	-0.001	1749.999996	-0.002	2.5
40	1714.999998	-0.001	1749.999999	-0.001	2.5
50	1714.999997	-0.002	1749.999999	-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)	
10.2	1717.500004	0.002	1747.500004	0.002	2.5
12	1717.500002	0.001	1747.500003	0.002	2.5
13.8	1717.500001	0.001	1747.500002	0.001	2.5

Note: The applicant defined the normal working voltage of the adapter is from 10.2 Vdc to 13.8 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	1717.500004	0.002	1747.500002	0.001	2.5
-20	1717.500001	0.001	1747.500002	0.001	2.5
-10	1717.500003	0.002	1747.500004	0.002	2.5
0	1717.500003	0.002	1747.500001	0.001	2.5
10	1717.500003	0.002	1747.500004	0.002	2.5
20	1717.499997	-0.002	1747.499998	-0.001	2.5
30	1717.499998	-0.001	1747.499998	-0.001	2.5
40	1717.499996	-0.002	1747.499997	-0.002	2.5
50	1717.499998	-0.001	1747.499996	-0.002	2.5
60	1717.499998	-0.001	1747.499997	-0.002	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)	
10.2	1720.000001	0.001	1745.000001	0.001	2.5
12	1720.000003	0.002	1745.000002	0.001	2.5
13.8	1720.000003	0.002	1745.000003	0.001	2.5

Note: The applicant defined the normal working voltage of the adapter is from 10.2 Vdc to 13.8 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	1720.000002	0.001	1745.000001	0.001	2.5
-20	1720.000003	0.002	1745.000004	0.002	2.5
-10	1720.000002	0.001	1745.000003	0.001	2.5
0	1720.000001	0.001	1745.000004	0.002	2.5
10	1720.000002	0.001	1745.000001	0.001	2.5
20	1719.999999	-0.001	1744.999996	-0.002	2.5
30	1719.999996	-0.002	1744.999996	-0.002	2.5
40	1719.999998	-0.001	1744.999999	-0.001	2.5
50	1719.999999	-0.001	1744.999999	-0.001	2.5
55	1719.999999	-0.001	1744.999997	-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)	
10.2	699.700001	0.002	715.300003	0.004	2.5
12	699.700004	0.005	715.300003	0.004	2.5
13.8	699.700003	0.004	715.300002	0.002	2.5

Note: The applicant defined the normal working voltage of the adapter is from 10.2 Vdc to 13.8 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	699.700002	0.003	715.300002	0.003	2.5
-20	699.700001	0.001	715.300003	0.004	2.5
-10	699.700003	0.005	715.300003	0.004	2.5
0	699.700002	0.003	715.300004	0.005	2.5
10	699.700002	0.003	715.300002	0.003	2.5
20	699.699998	-0.003	715.299998	-0.003	2.5
30	699.699998	-0.004	715.299999	-0.002	2.5
40	699.699997	-0.005	715.299997	-0.004	2.5
50	699.699997	-0.004	715.299998	-0.003	2.5
55	699.699997	-0.005	715.299999	-0.002	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)	
10.2	700.500003	0.004	714.500001	0.002	2.5
12	700.500004	0.006	714.500003	0.004	2.5
13.8	700.500003	0.004	714.500002	0.003	2.5

Note: The applicant defined the normal working voltage of the adapter is from 10.2 Vdc to 13.8 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	700.500002	0.002	714.500003	0.004	2.5
-20	700.500002	0.003	714.500002	0.002	2.5
-10	700.500001	0.002	714.500004	0.005	2.5
0	700.500004	0.006	714.500003	0.004	2.5
10	700.500002	0.002	714.500003	0.004	2.5
20	700.499997	-0.005	714.499997	-0.004	2.5
30	700.499996	-0.005	714.499999	-0.002	2.5
40	700.499999	-0.002	714.499996	-0.005	2.5
50	700.499997	-0.005	714.499998	-0.002	2.5
55	700.499997	-0.005	714.499998	-0.003	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)	
10.2	701.500001	0.002	713.500003	0.004	2.5
12	701.500003	0.004	713.500002	0.003	2.5
13.8	701.500002	0.003	713.500003	0.004	2.5

Note: The applicant defined the normal working voltage of the adapter is from 10.2 Vdc to 13.8 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	701.500001	0.002	713.500002	0.003	2.5
-20	701.500004	0.005	713.500004	0.005	2.5
-10	701.500002	0.003	713.500002	0.003	2.5
0	701.500001	0.002	713.500003	0.003	2.5
10	701.500004	0.006	713.500004	0.005	2.5
20	701.499999	-0.002	713.499998	-0.003	2.5
30	701.499997	-0.004	713.499997	-0.004	2.5
40	701.499998	-0.003	713.499999	-0.002	2.5
50	701.499998	-0.003	713.499997	-0.005	2.5
55	701.499997	-0.004	713.499998	-0.002	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)	
10.2	704.000001	0.001	711.000004	0.005	2.5
12	704.000003	0.004	711.000001	0.002	2.5
13.8	704.000002	0.003	711.000001	0.002	2.5

Note: The applicant defined the normal working voltage of the adapter is from 10.2 Vdc to 13.8 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	704.000001	0.002	711.000002	0.003	2.5
-20	704.000002	0.002	711.000001	0.001	2.5
-10	704.000003	0.004	711.000004	0.005	2.5
0	704.000004	0.005	711.000001	0.002	2.5
10	704.000002	0.003	711.000001	0.002	2.5
20	703.999997	-0.004	710.999997	-0.005	2.5
30	703.999997	-0.004	710.999999	-0.002	2.5
40	703.999997	-0.004	710.999999	-0.002	2.5
50	703.999999	-0.002	710.999996	-0.006	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)	
10.2	779.500004	0.005	784.500002	0.003	2.5
12	779.500004	0.005	784.500003	0.004	2.5
13.8	779.500002	0.002	784.500003	0.003	2.5

Note: The applicant defined the normal working voltage of the adapter is from 10.2 Vdc to 13.8 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	779.500001	0.002	784.500003	0.004	2.5
-20	779.500004	0.005	784.500003	0.003	2.5
-10	779.500001	0.002	784.500004	0.005	2.5
0	779.500001	0.002	784.500004	0.005	2.5
10	779.500003	0.003	784.500003	0.004	2.5
20	779.499996	-0.005	784.499998	-0.003	2.5
30	779.499997	-0.004	784.499997	-0.004	2.5
40	779.499997	-0.004	784.499997	-0.003	2.5
50	779.499996	-0.005	784.499997	-0.004	2.5
55	779.499997	-0.004	784.499996	-0.005	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 13		Limit (ppm)
	Channel Bandwidth: 10 MHz		
	Frequency (MHz)	Frequency Error (ppm)	
10.2	782.000002	0.002	2.5
12	782.000002	0.002	2.5
13.8	782.000004	0.005	2.5

Note: The applicant defined the normal working voltage of the adapter is from 10.2 Vdc to 13.8 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 13		Limit (ppm)
	Channel Bandwidth: 10 MHz		
	Frequency (MHz)	Frequency Error (ppm)	
-30	782.000002	0.002	2.5
-20	782.000002	0.002	2.5
-10	782.000003	0.004	2.5
0	782.000001	0.001	2.5
10	782.000003	0.004	2.5
20	781.999998	-0.002	2.5
30	781.999997	-0.004	2.5
40	781.999997	-0.004	2.5
50	781.999997	-0.004	2.5
55	781.999997	-0.003	2.5

NB-IOT

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
10.2	1732.500002	0.001	1732.500004	0.002	2.5
12	1732.500002	0.001	1732.500002	0.001	2.5
13.8	1732.500003	0.002	1732.500002	0.001	2.5

Note: The applicant defined the normal working voltage of the adapter is from 10.2 Vdc to 13.8 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	1732.500002	0.001	1732.500002	0.001	2.5
-20	1732.500003	0.002	1732.500004	0.002	2.5
-10	1732.500002	0.001	1732.500002	0.001	2.5
0	1732.500001	0.001	1732.500004	0.002	2.5
10	1732.500003	0.002	1732.500004	0.002	2.5
20	1732.499996	-0.002	1732.499999	-0.001	2.5
30	1732.499997	-0.002	1732.499997	-0.002	2.5
40	1732.499996	-0.002	1732.499996	-0.002	2.5
50	1732.499997	-0.002	1732.499999	-0.001	2.5
55	1732.499999	-0.001	1732.499997	-0.002	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 12				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
10.2	707.500004	0.005	707.500003	0.004	2.5
12	707.500002	0.002	707.500002	0.003	2.5
13.8	707.500002	0.002	707.500004	0.006	2.5

Note: The applicant defined the normal working voltage of the adapter is from 10.2 Vdc to 13.8 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 12				Limit (ppm)
	Channel Bandwidth: 20 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	707.500001	0.002	707.500003	0.005	2.5
-20	707.500004	0.006	707.500003	0.004	2.5
-10	707.500004	0.005	707.500001	0.002	2.5
0	707.500004	0.005	707.500002	0.002	2.5
10	707.500003	0.004	707.500002	0.003	2.5
20	707.499999	-0.002	707.499997	-0.004	2.5
30	707.499996	-0.006	707.499997	-0.005	2.5
40	707.499999	-0.002	707.499997	-0.004	2.5
50	707.499997	-0.004	707.499997	-0.005	2.5
55	707.499996	-0.005	707.499998	-0.004	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 13				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
10.2	782.000001	0.002	782.000003	0.004	2.5
12	782.000004	0.005	782.000002	0.002	2.5
13.8	782.000003	0.004	782.000003	0.004	2.5

Note: The applicant defined the normal working voltage of the adapter is from 10.2 Vdc to 13.8 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 13				Limit (ppm)
	Channel Bandwidth: 20 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	782.000001	0.001	782.000004	0.005	2.5
-20	782.000002	0.003	782.000004	0.005	2.5
-10	782.000004	0.005	782.000003	0.004	2.5
0	782.000002	0.003	782.000003	0.004	2.5
10	782.000002	0.002	782.000003	0.004	2.5
20	781.999996	-0.005	781.999999	-0.002	2.5
30	781.999998	-0.003	781.999996	-0.005	2.5
40	781.999997	-0.004	781.999997	-0.004	2.5
50	781.999996	-0.005	781.999998	-0.002	2.5
55	781.999999	-0.001	781.999998	-0.002	2.5

4.4 Occupied Bandwidth Measurement

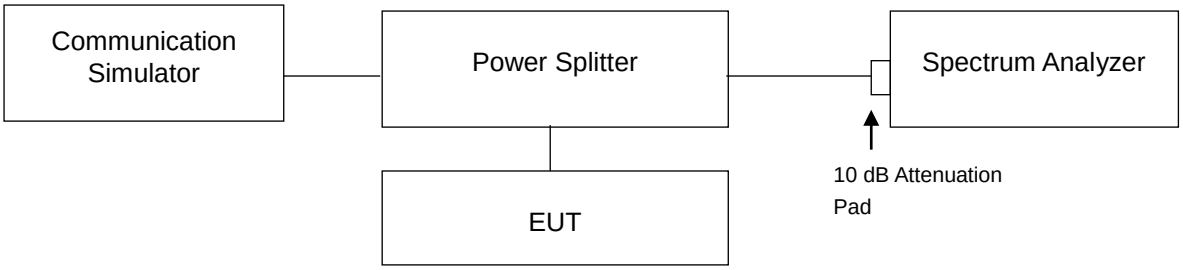
4.4.1 Limits of Occupied Bandwidth Measurement

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.

4.4.2 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.

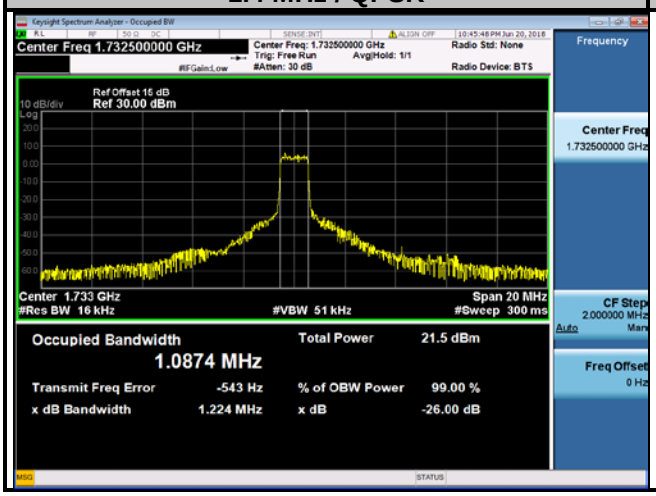
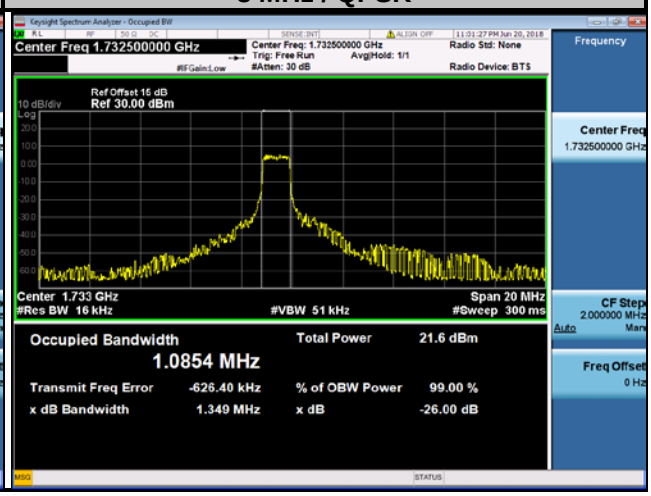
4.4.3 Test Setup



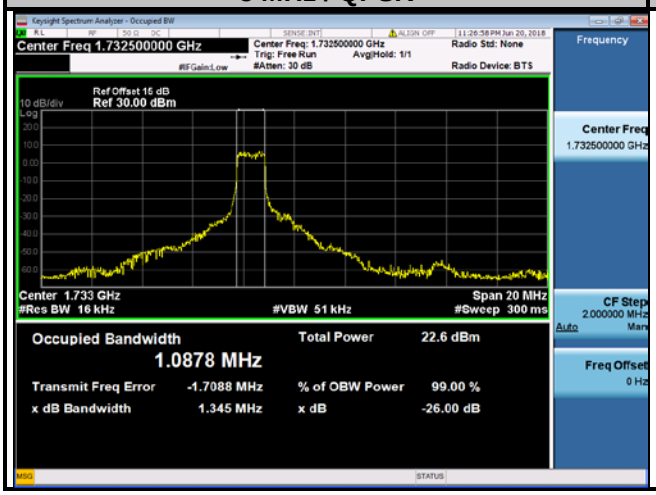
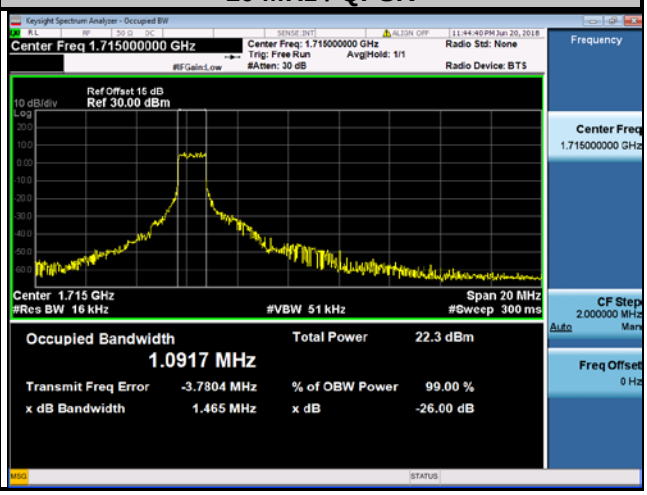
4.4.4 Test Result

Cat-M1

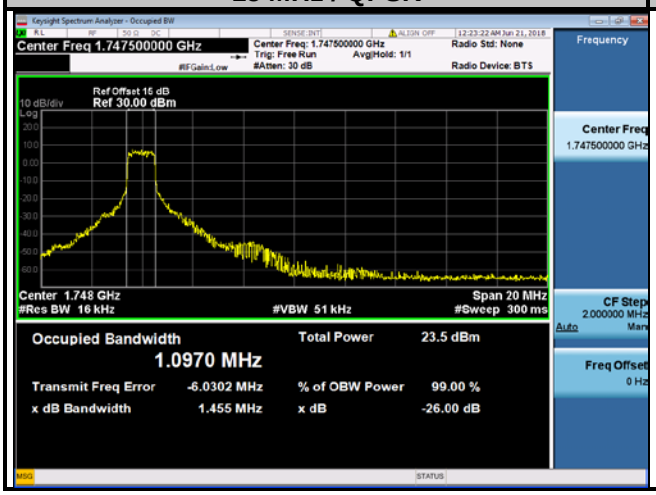
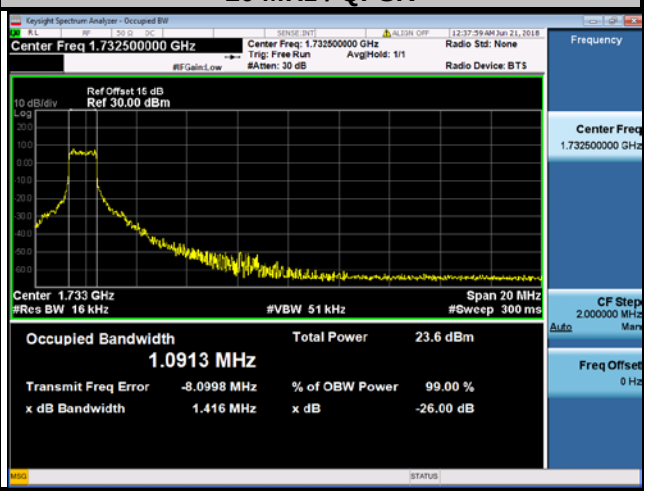
LTE Band 4							
Channel Bandwidth: 1.4 MHz				Channel Bandwidth: 3 MHz			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
19957	1710.7	1.0860	0.9067	19965	1711.5	1.0808	0.9122
20175	1732.5	1.0874	0.9085	20175	1732.5	1.0854	0.9066
20393	1754.3	1.0846	0.9104	20385	1753.5	1.0800	0.9119

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

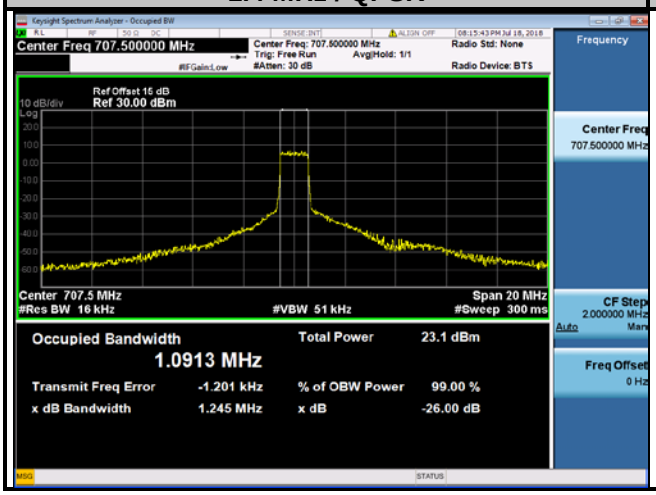
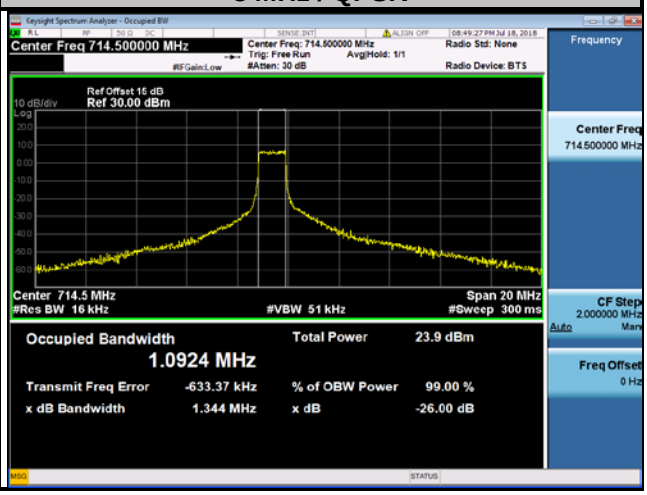
LTE Band 4							
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
19975	1712.5	1.0803	0.9160	20000	1715.0	1.0917	0.9148
20175	1732.5	1.0878	0.9167	20175	1732.5	1.0900	0.9142
20375	1752.5	1.0858	0.9039	20350	1750.0	1.0877	0.9139

Spectrum Plot of Worst Value	
5 MHz / QPSK	10 MHz / QPSK
	

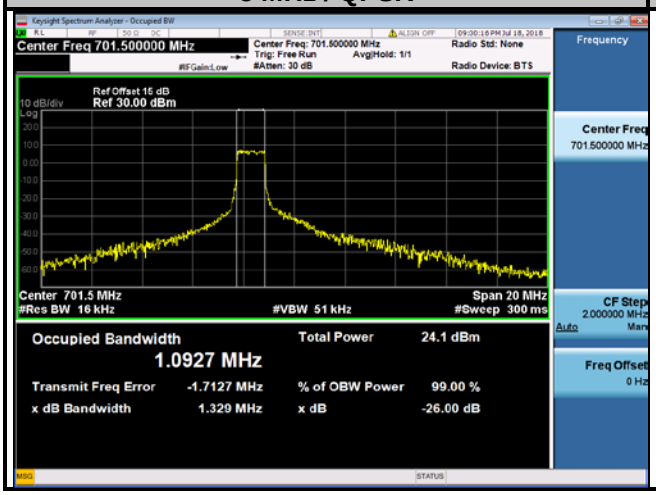
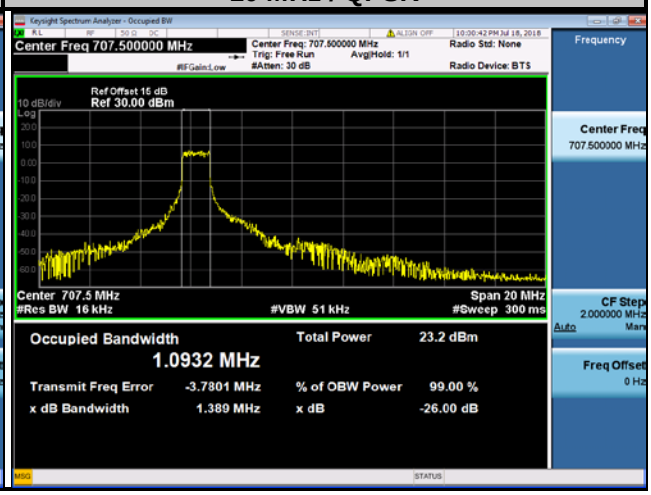
LTE Band 4							
Channel Bandwidth: 15 MHz				Channel Bandwidth: 20 MHz			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
20025	1717.5	1.0964	0.9212	20050	1720.0	1.0911	0.9161
20175	1732.5	1.0948	0.9232	20175	1732.5	1.0913	0.9174
20325	1747.5	1.0970	0.9197	20300	1745.0	1.0909	0.9136

Spectrum Plot of Worst Value	
15 MHz / QPSK	20 MHz / QPSK
	

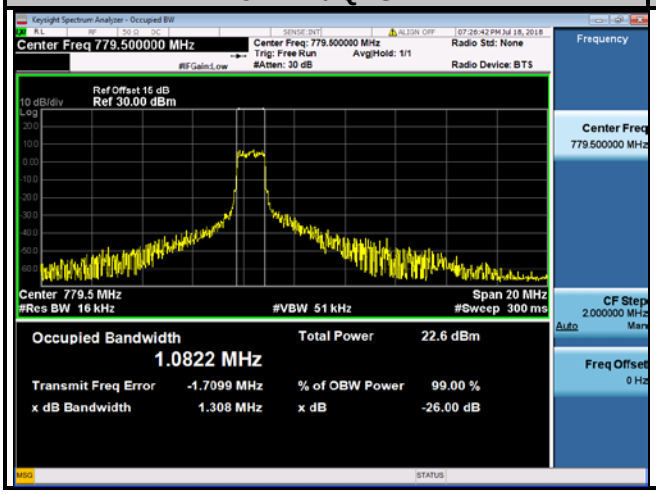
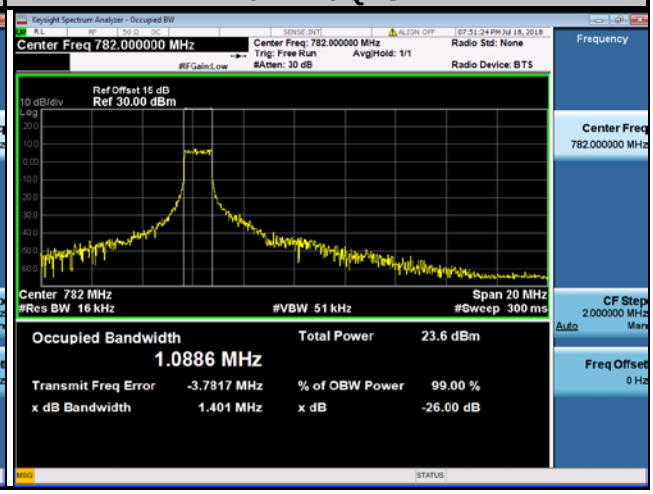
LTE Band 12							
Channel Bandwidth: 1.4 MHz				Channel Bandwidth: 3 MHz			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
23017	699.7	1.0882	0.9114	23025	700.5	1.0836	0.9061
23095	707.5	1.0913	0.9122	23095	707.5	1.0871	0.9216
23173	715.3	1.0880	0.9121	23165	714.5	1.0924	0.9097

Spectrum Plot of Worst Value	
1.4 MHz / QPSK	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			QPSK	16QAM
23035	701.5	1.0927	0.9184	23060	704.0	1.0923	0.9158
23095	707.5	1.0818	0.9140	23095	707.5	1.0932	0.9144
23155	713.5	1.0868	0.9142	23130	711.0	1.0913	0.9152

Spectrum Plot of Worst Value	
5 MHz / QPSK	10 MHz / QPSK
	

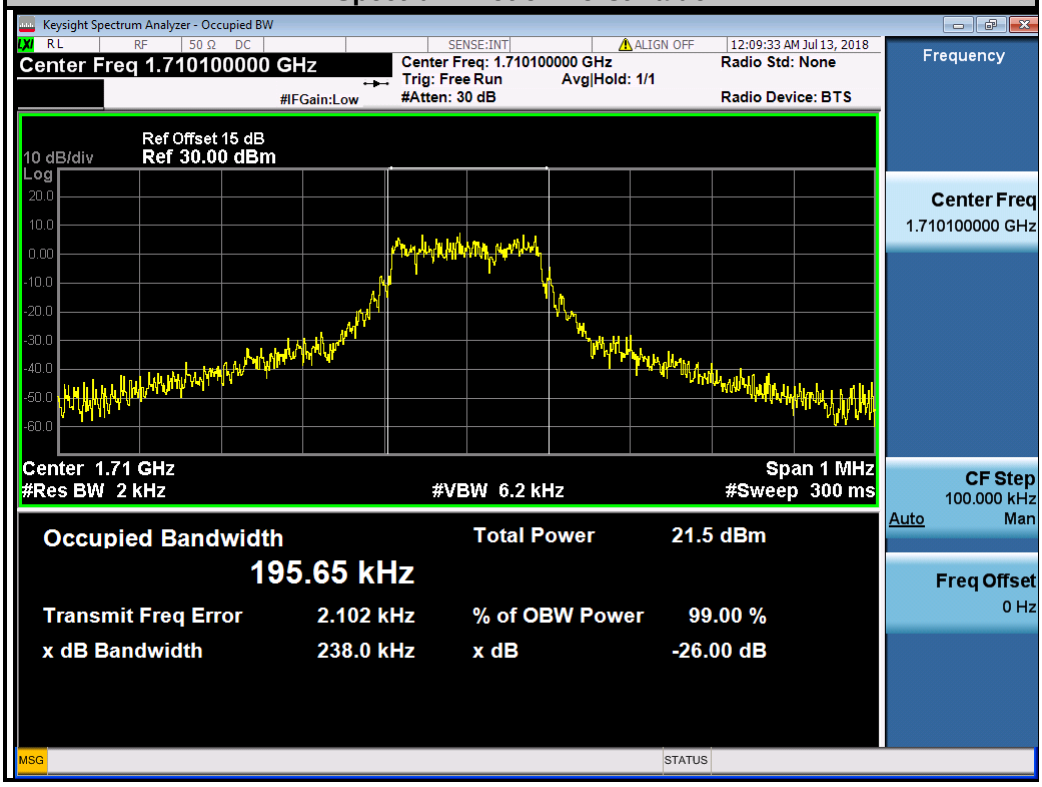
LTE Band 13							
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
23205	779.5	1.0822	0.9018	23230	782.0	1.0886	0.9141
23230	782.0	1.0785	0.9088				
23255	784.5	1.0787	0.9135				

Spectrum Plot of Worst Value	
5 MHz / QPSK	10 MHz / QPSK
	

NB-IOT

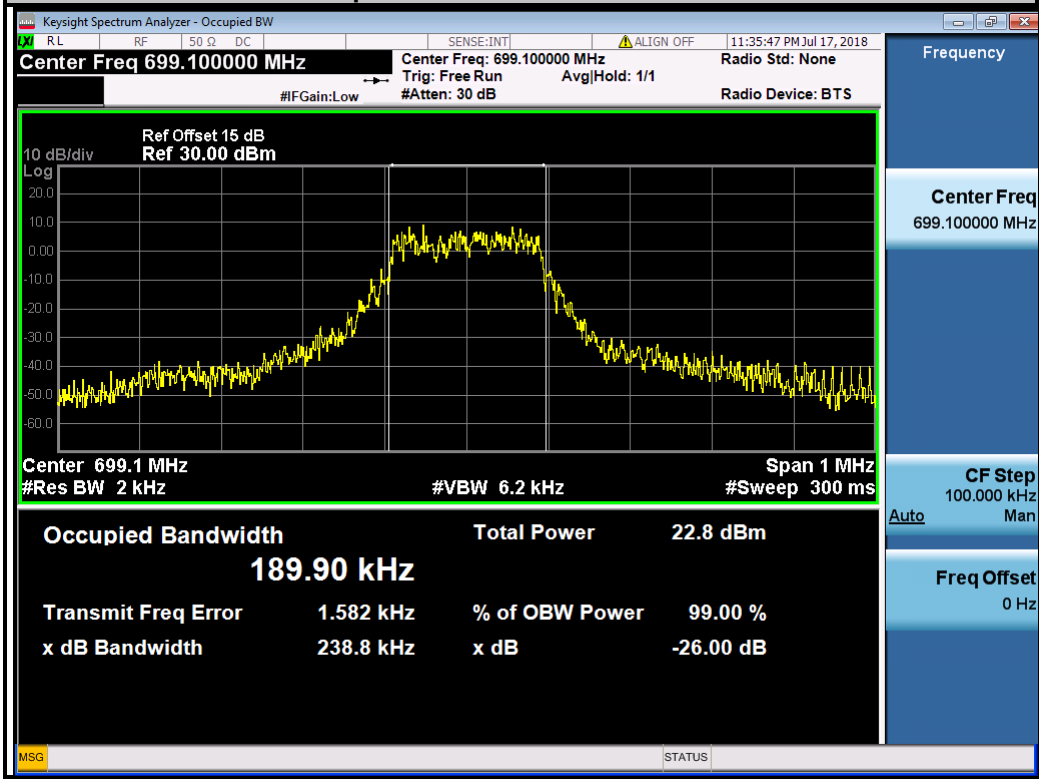
99 % Occupied Bandwidth (kHz)					
LTE Band 4					
Channel	Frequency (MHz)	Modulation	Ntones	Sub-carrier spacing (kHz)	99%
19951	1710.1	BPSK	1@0	3.75	59.66
		QPSK	1@0	15	131.88
		QPSK	3@3	15	128.44
		QPSK	12@0	15	195.65
20175	1732.5	BPSK	1@0	3.75	62.36
		QPSK	1@0	15	131.40
		QPSK	3@3	15	127.17
		QPSK	12@0	15	186.73
20399	1754.9	BPSK	1@47	3.75	53.53
		QPSK	1@11	15	122.54
		QPSK	3@3	15	129.29
		QPSK	12@0	15	184.63

Spectrum Plot of Worst Value



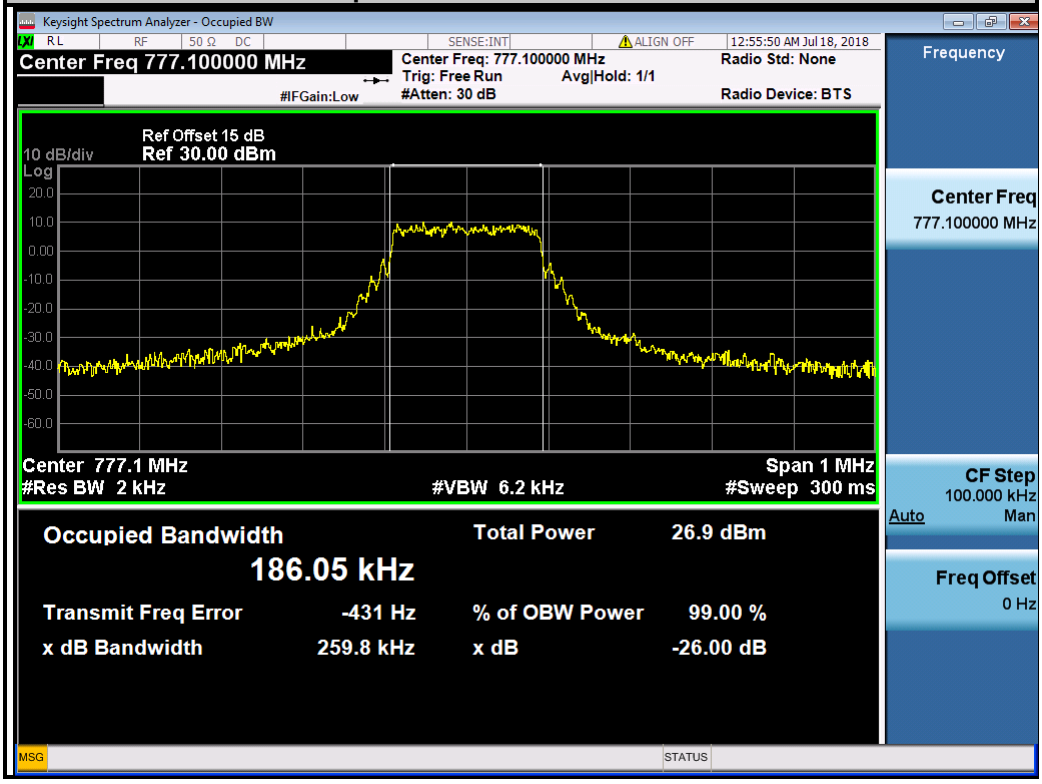
99 % Occupied Bandwidth (kHz)					
LTE Band 12					
Channel	Frequency (MHz)	Modulation	Ntones	Sub-carrier spacing (kHz)	99%
23011	699.1	BPSK	1@0	3.75	46.59
		QPSK	1@0	15	120.60
		QPSK	3@3	15	118.83
		QPSK	12@0	15	189.90
23095	707.5	BPSK	1@0	3.75	48.49
		QPSK	1@0	15	115.28
		QPSK	3@3	15	131.92
		QPSK	12@0	15	185.70
23179	715.9	BPSK	1@47	3.75	49.72
		QPSK	1@11	15	127.43
		QPSK	3@3	15	115.38
		QPSK	12@0	15	186.28

Spectrum Plot of Worst Value



99 % Occupied Bandwidth (kHz)					
LTE Band 13					
Channel	Frequency (MHz)	Modulation	Ntones	Sub-carrier spacing (kHz)	99%
23181	777.1	BPSK	1@0	3.75	48.67
		QPSK	1@0	15	125.82
		QPSK	3@3	15	120.52
		QPSK	12@0	15	186.05
23230	782	BPSK	1@0	3.75	49.26
		QPSK	1@0	15	119.66
		QPSK	3@3	15	138.36
		QPSK	12@0	15	185.99
23279	786.9	BPSK	1@47	3.75	49.84
		QPSK	1@11	15	116.15
		QPSK	3@3	15	120.14
		QPSK	12@0	15	183.60

Spectrum Plot of Worst Value



4.5 Band Edge Measurement

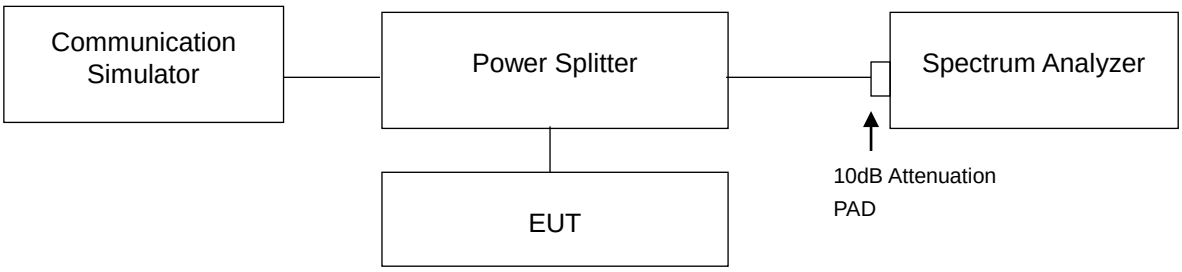
4.5.1 Limits of Band Edge Measurement

For operations in the 698-756 MHz and 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 746-756 MHz and 777-787 MHz bands shall also comply with the following restrictions:
(a) The power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775 MHz and 793-806 MHz shall be attenuated below the transmitter power, P (dBW), by at least:
(i) 76 + 10 log P (watts), dB, for base and fixed equipment, and
(ii) 65 + 10 log P (watts), dB, for mobile and portable equipment.

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 log (P) dB.

4.5.2 Test Setup

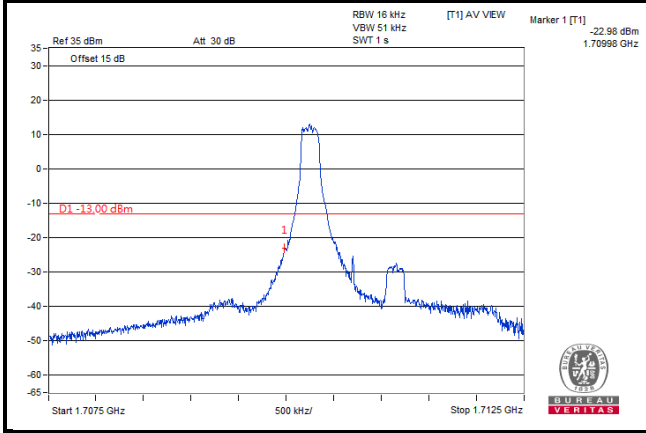
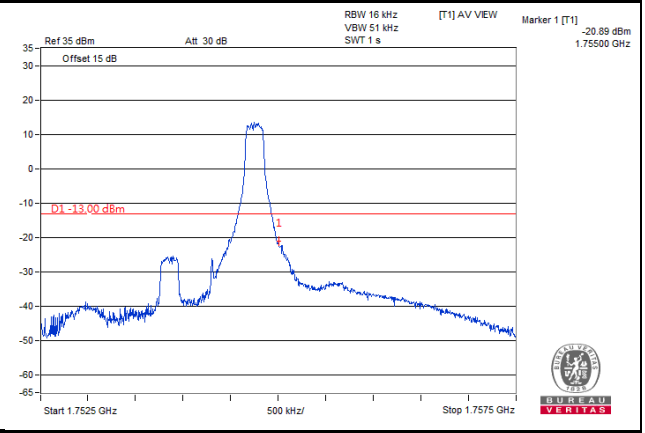
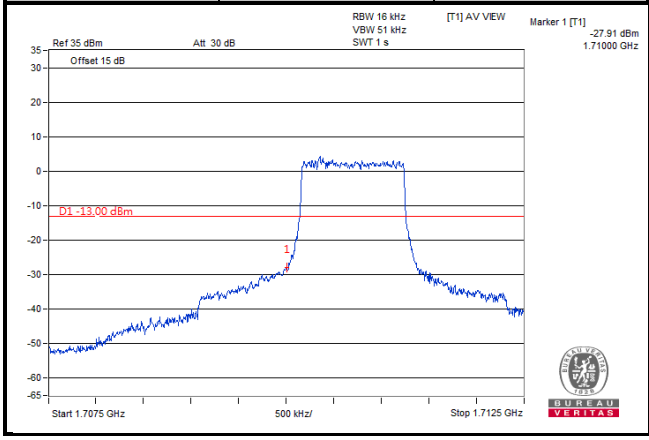
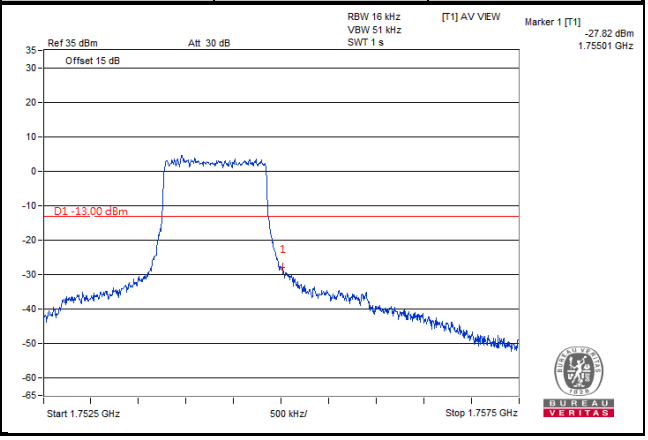


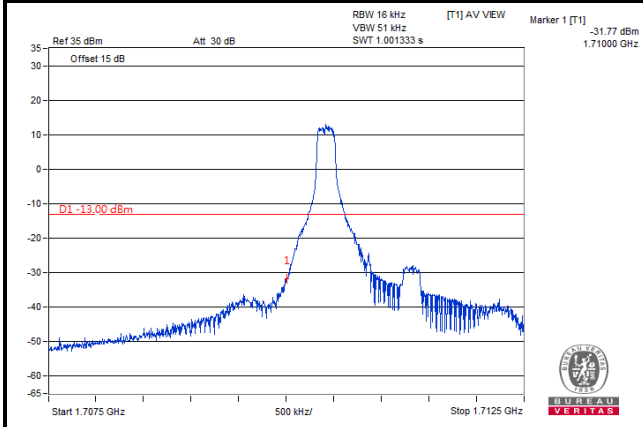
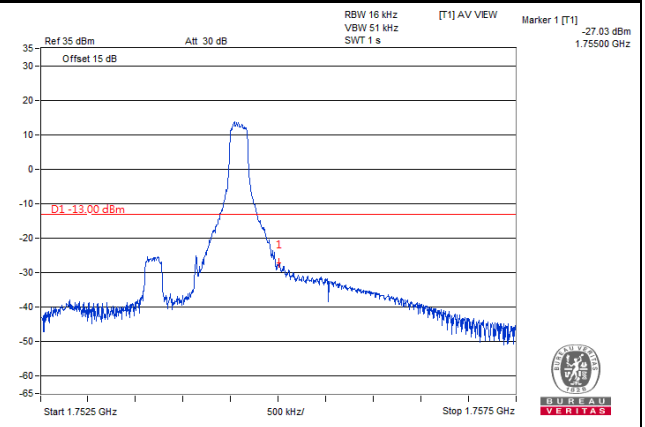
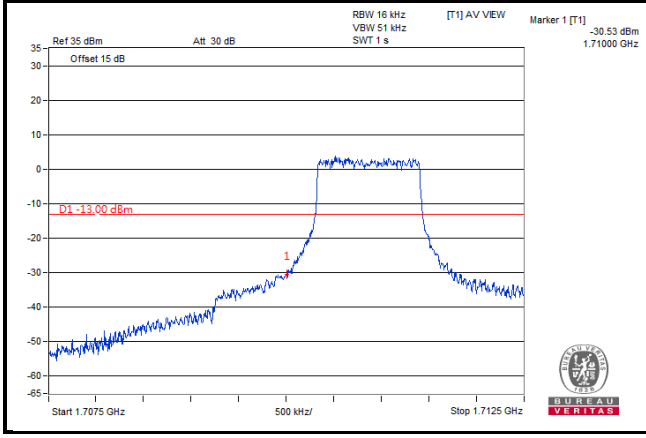
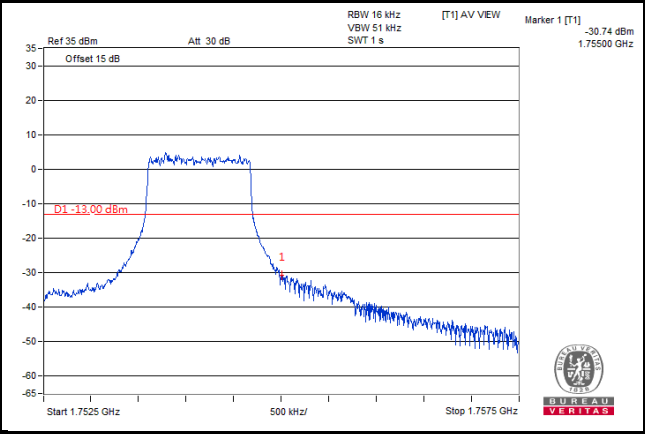
4.5.3 Test Procedures

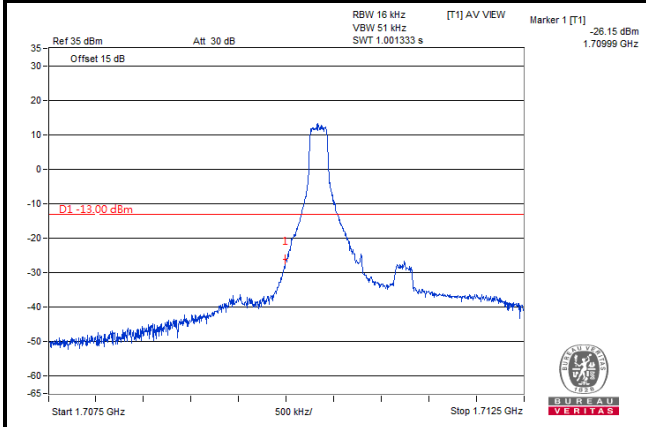
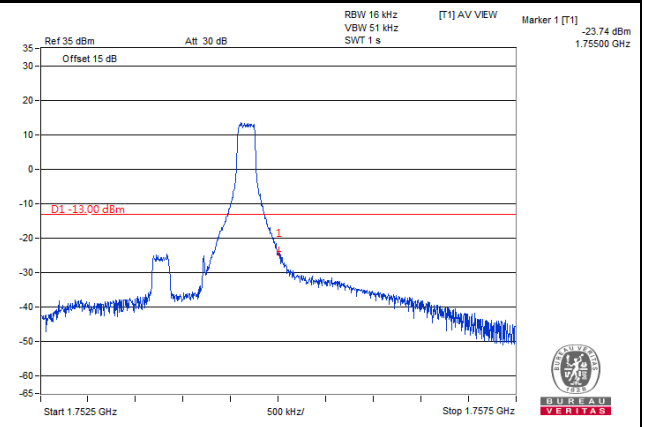
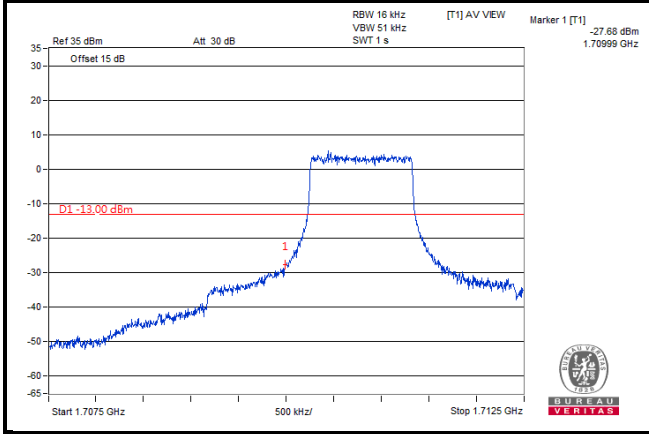
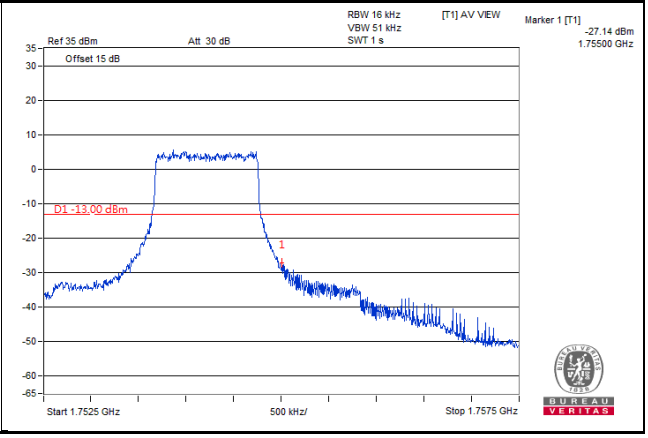
a. All measurements were done at low and high operational frequency range.
b. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 16 kHz and VB of the spectrum is 51 kHz (LTE Bandwidth 1.4 / 3 / 5 / 10 / 15 / 20 MHz) for **Cat-M1**.
c. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 51 Hz and VB of the spectrum is 160 Hz (BPSK) for **NB-IOT**.
d. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 200 Hz and VB of the spectrum is 620 kHz (QPSK) for **NB-IOT**.
e. Record the max. trace plot into the test report.

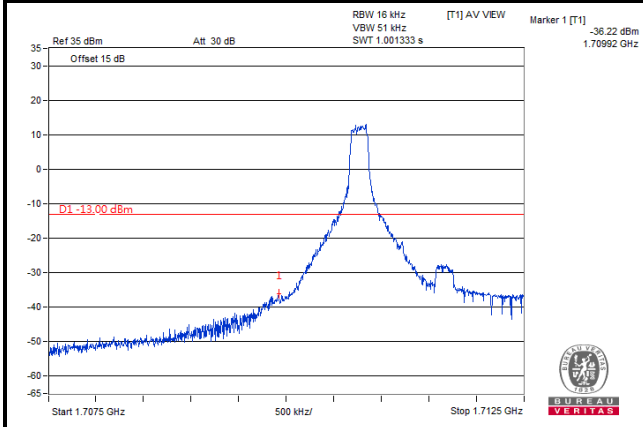
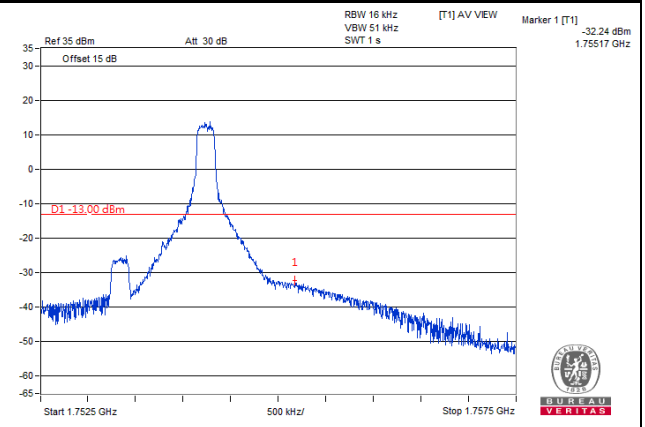
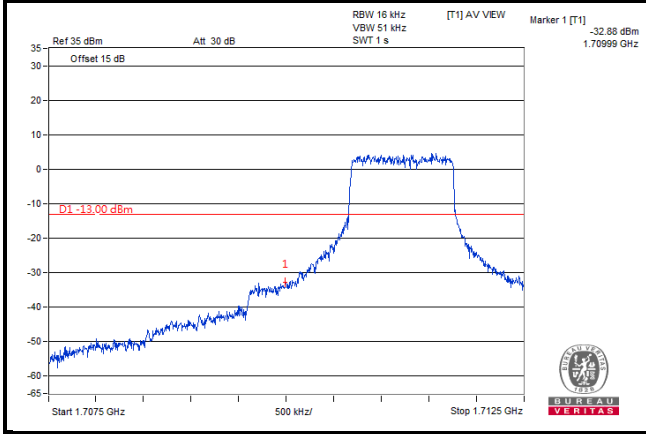
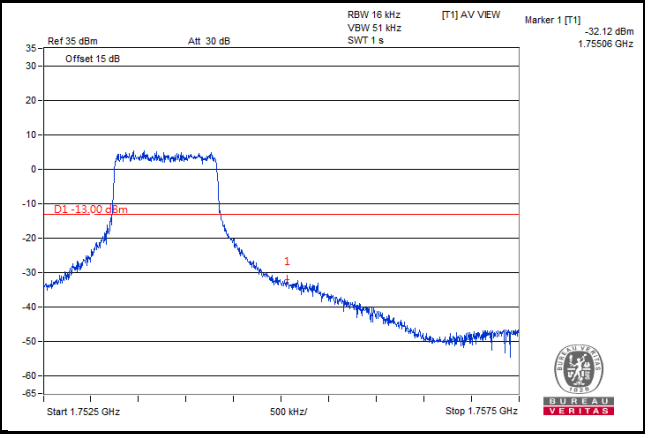
4.5.4 Test Results

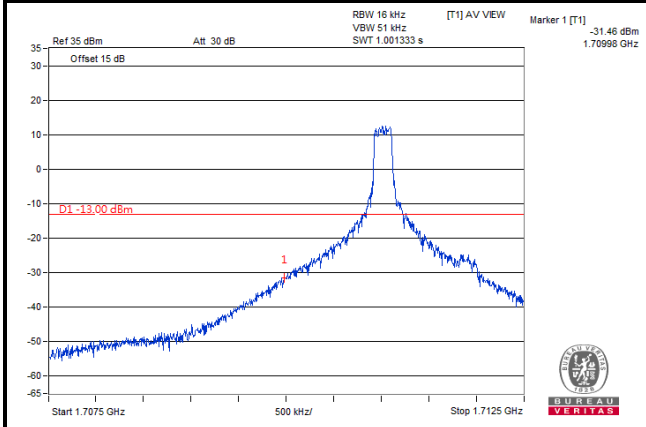
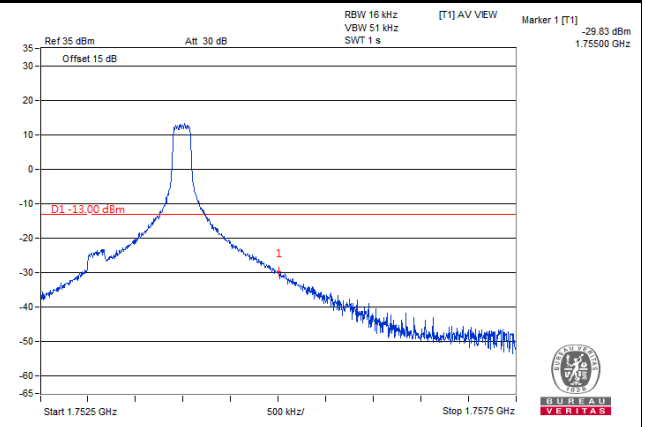
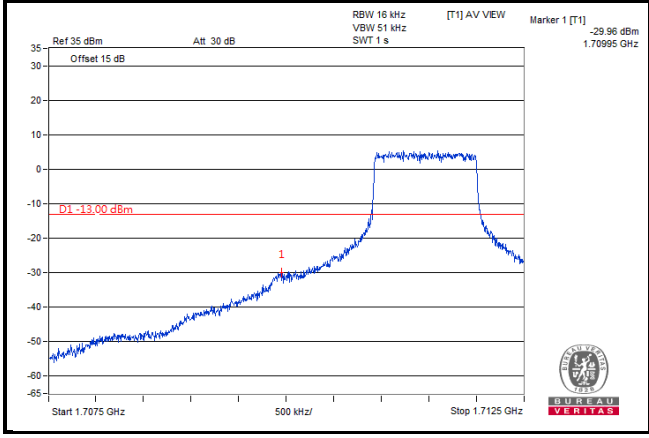
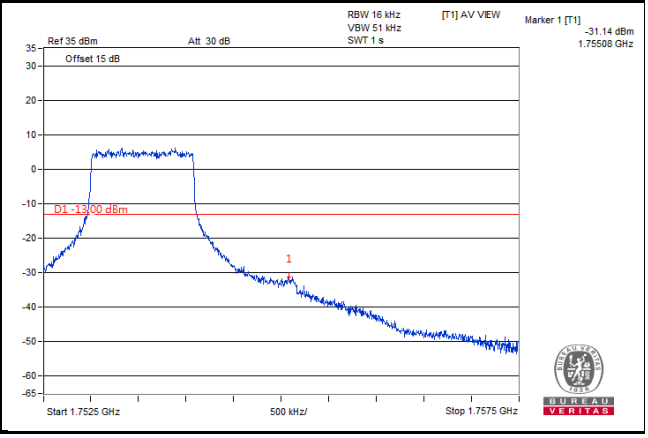
Cat-M1

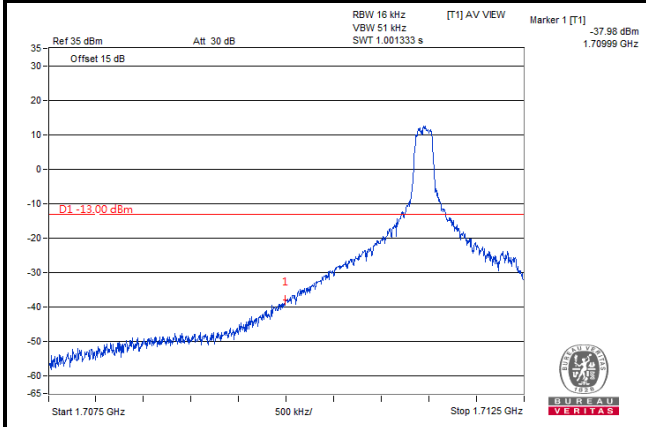
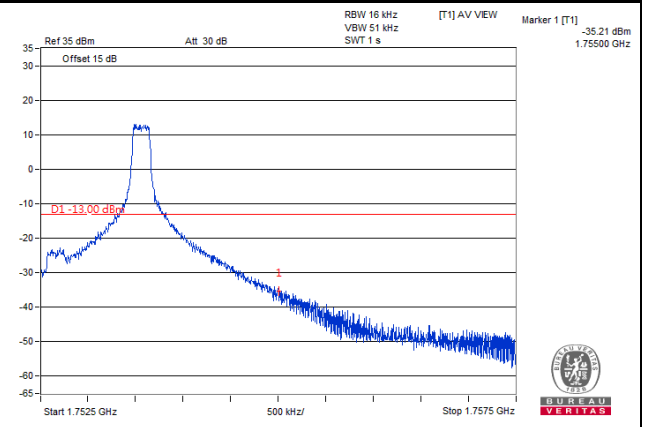
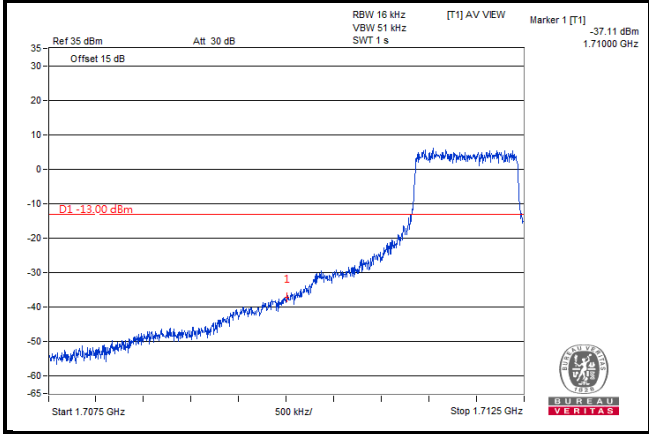
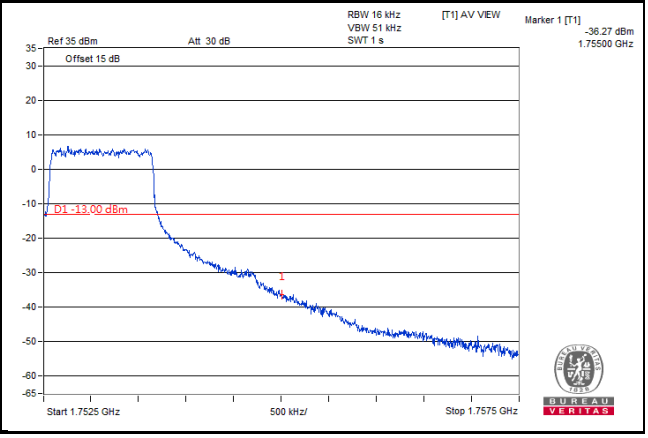
LTE Band 4					
Channel Bandwidth: 1.4 MHz					
Channel	19957	1 RB	Channel	20393	1 RB
					
Channel	19957	6 RB	Channel	20393	6 RB
					

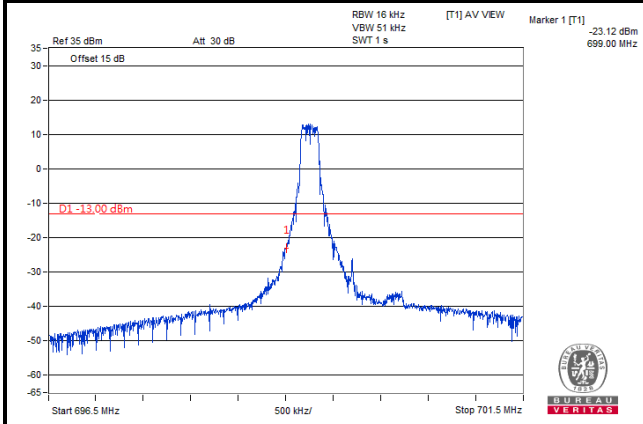
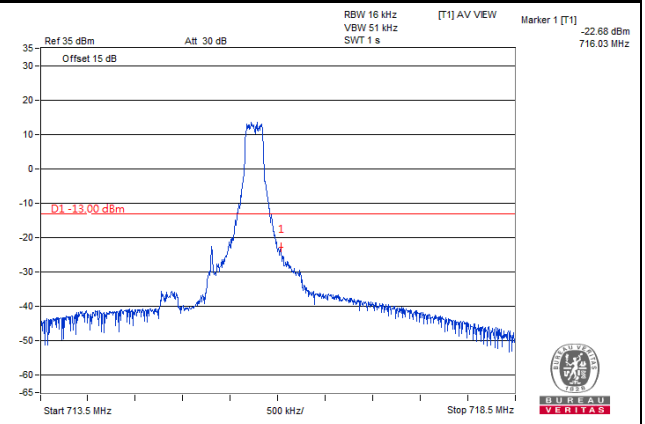
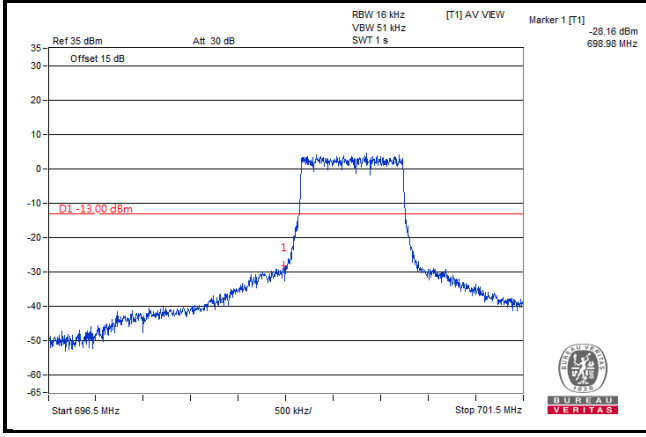
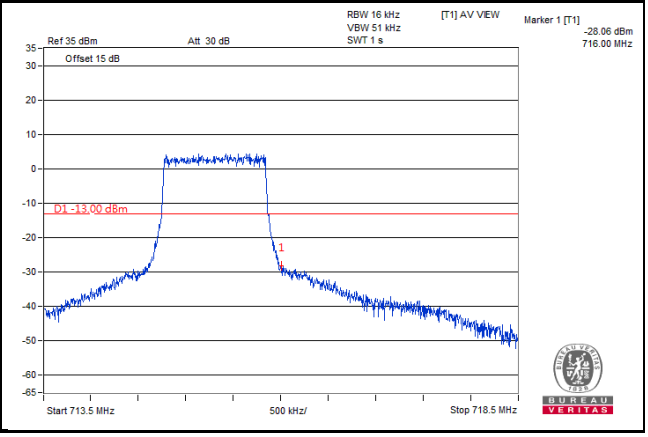
LTE Band 4					
Channel Bandwidth: 3 MHz					
Channel	19965	1 RB	Channel	20385	1 RB
					
Channel	19965	6 RB	Channel	20385	6 RB
					

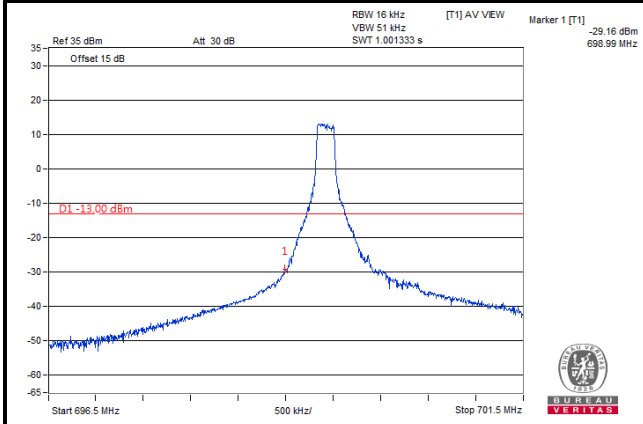
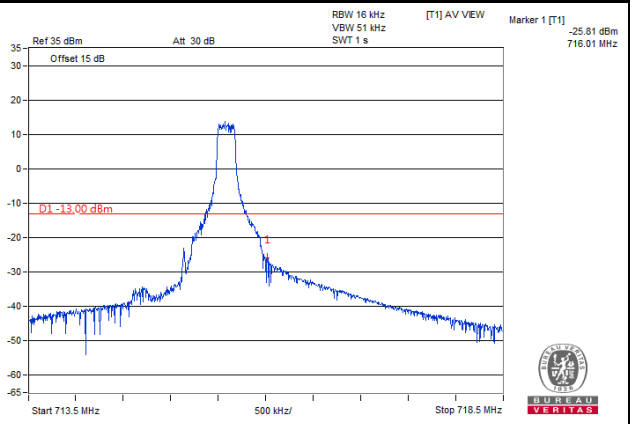
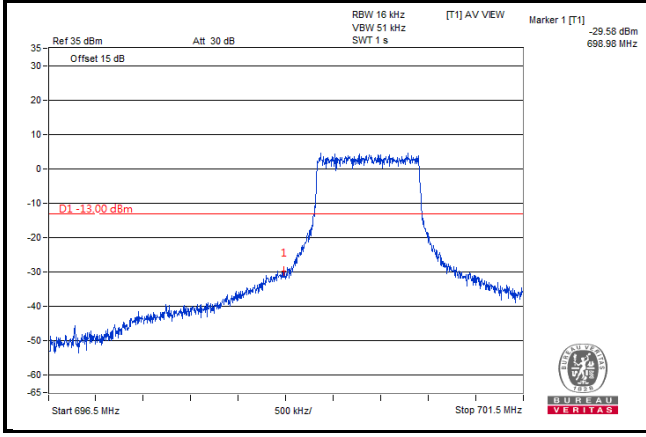
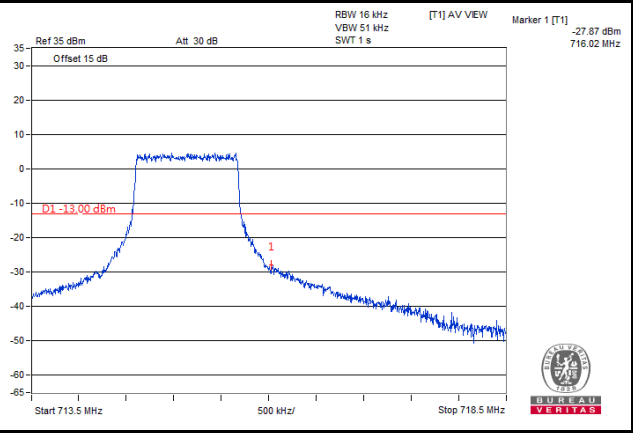
LTE Band 4					
Channel Bandwidth: 5 MHz					
Channel	19975	1 RB	Channel	20375	1 RB
					
Channel	19975	6 RB	Channel	20375	6 RB
					

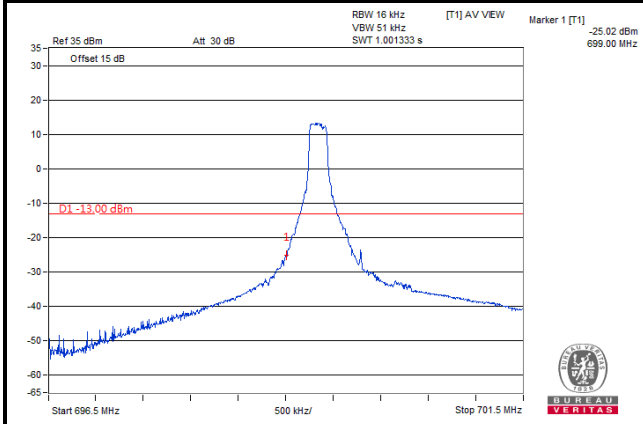
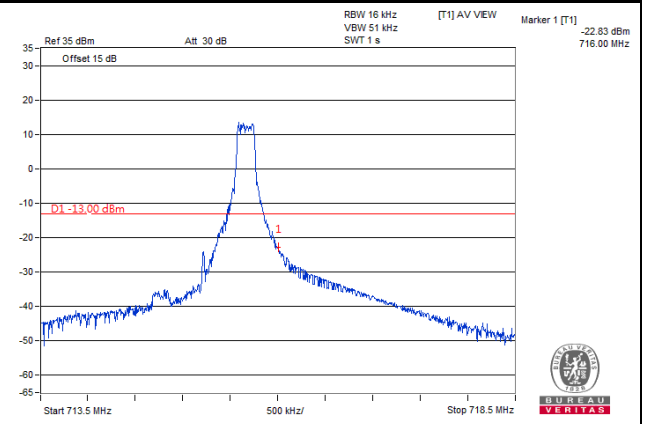
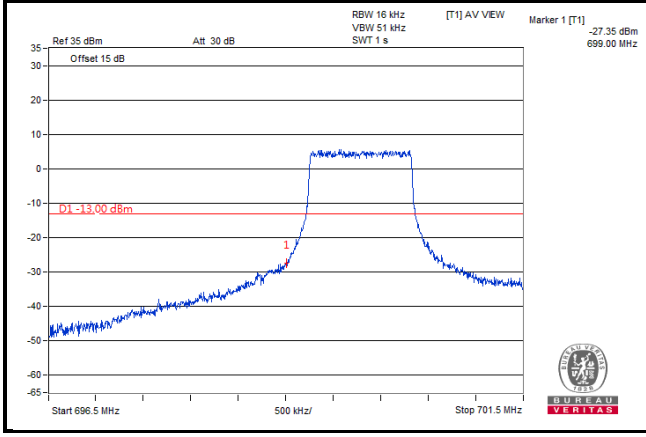
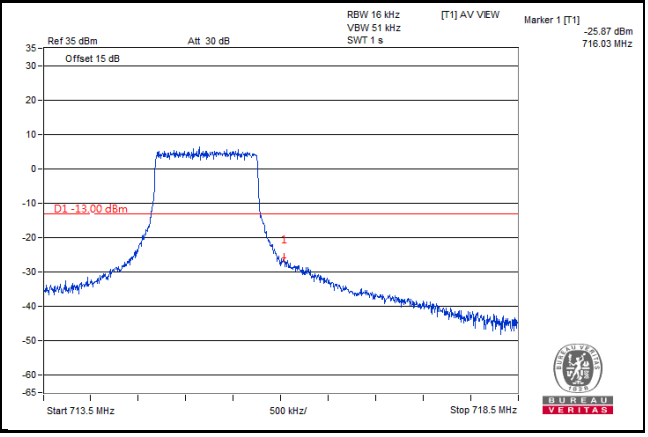
LTE Band 4					
Channel Bandwidth: 10 MHz					
Channel	20000	1 RB	Channel	20350	1 RB
					
Channel	20000	6 RB	Channel	20350	6 RB
					

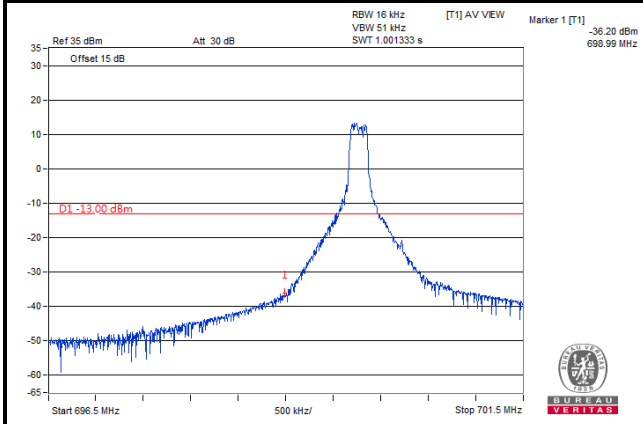
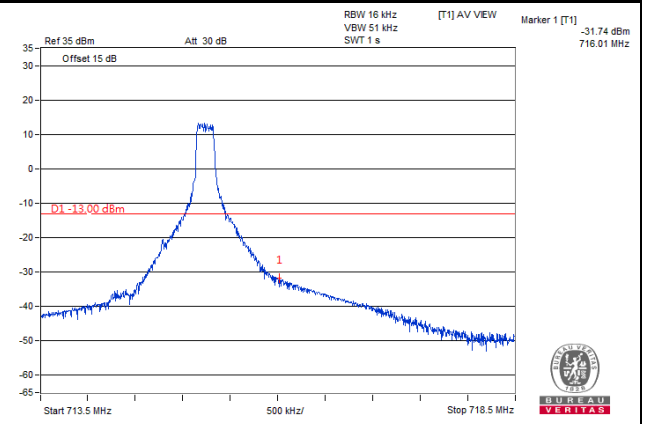
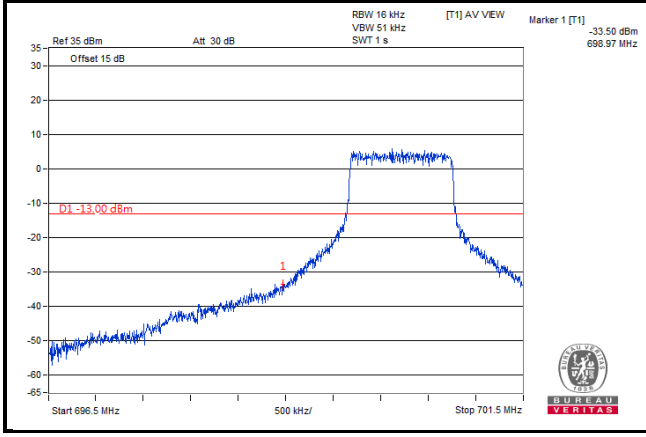
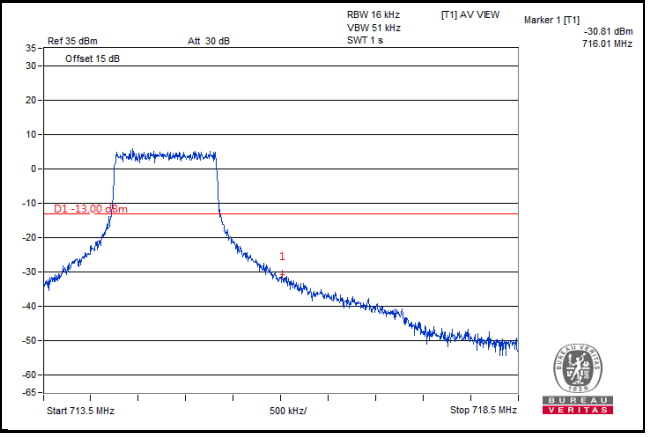
LTE Band 4					
Channel Bandwidth: 15 MHz					
Channel	20025	1 RB	Channel	20325	1 RB
					
Channel	20025	6 RB	Channel	20325	6 RB
					

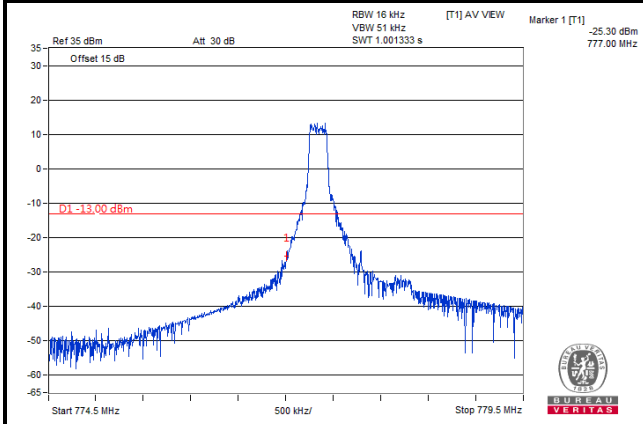
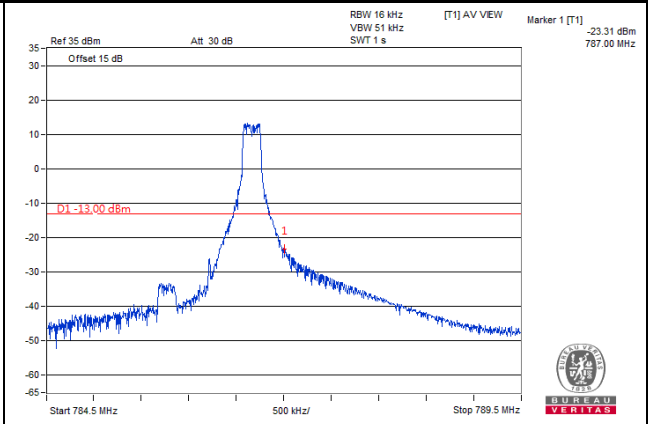
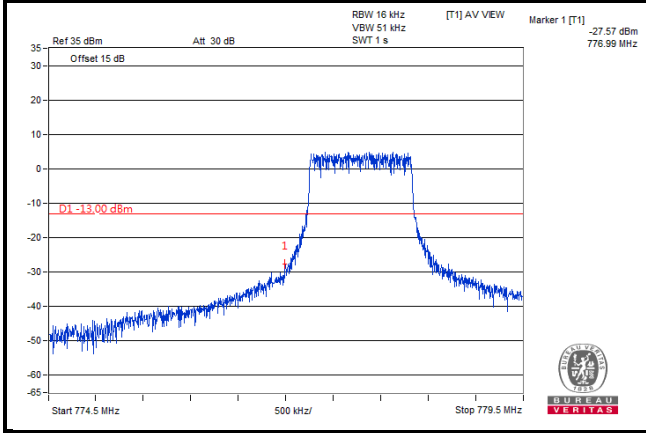
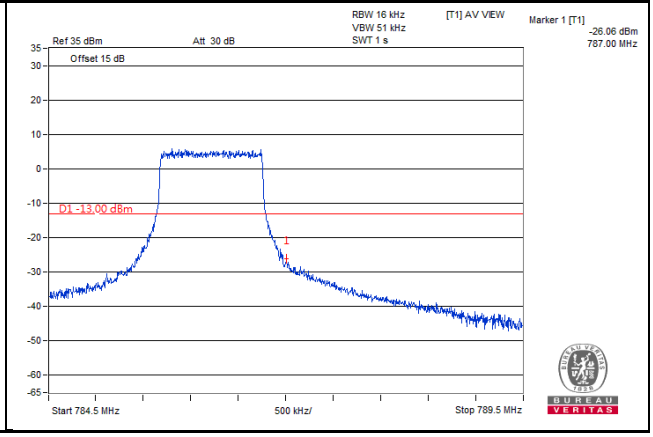
LTE Band 4					
Channel Bandwidth: 20 MHz					
Channel	20050	1 RB	Channel	20300	1 RB
					
Channel	20050	6 RB	Channel	20300	6 RB
					

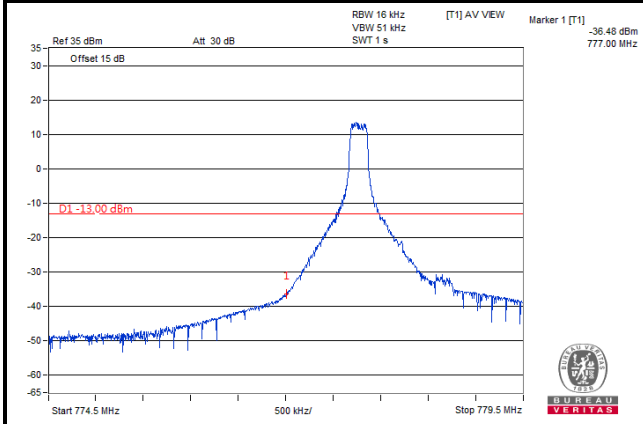
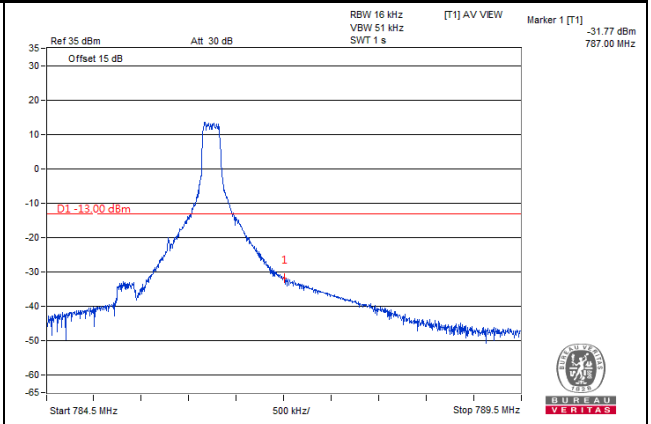
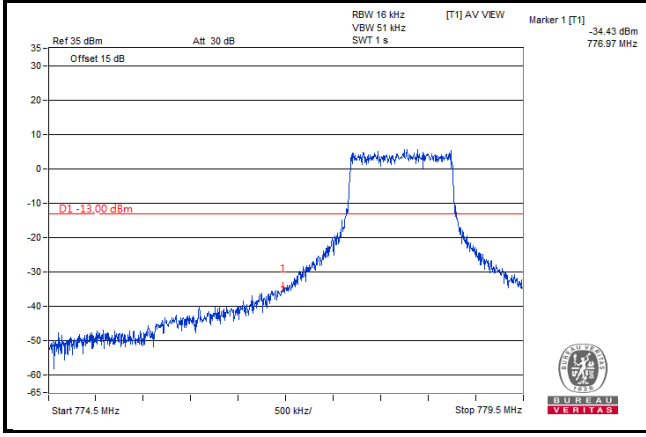
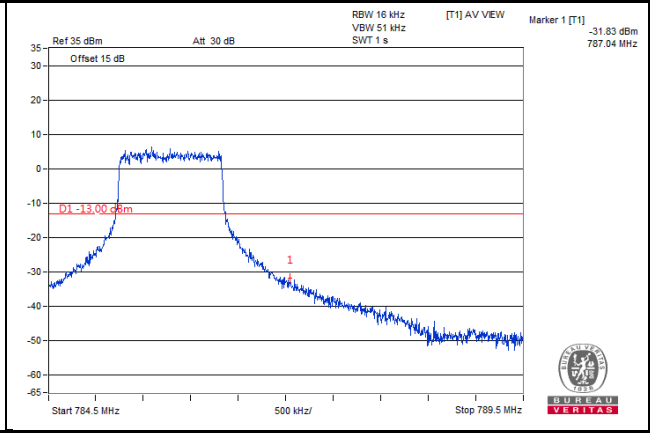
LTE Band 12					
Channel Bandwidth: 1.4 MHz					
Channel	23017	1 RB	Channel	23173	1 RB
					
Channel	23017	6 RB	Channel	23173	6 RB
					

LTE Band 12					
Channel Bandwidth: 3 MHz					
Channel	23025	1 RB	Channel	23165	1 RB
					
Channel	23025	6 RB	Channel	23165	6 RB
					

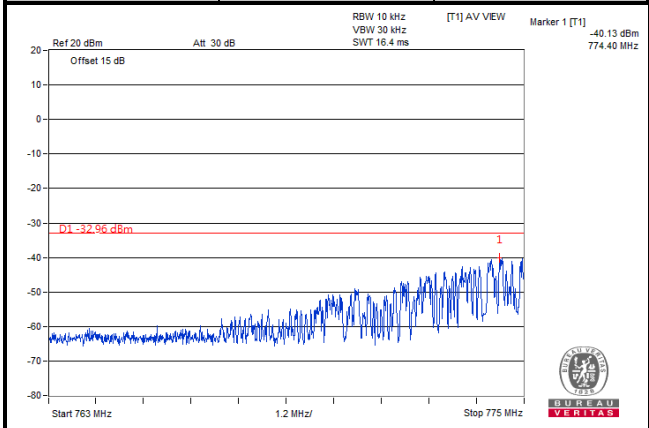
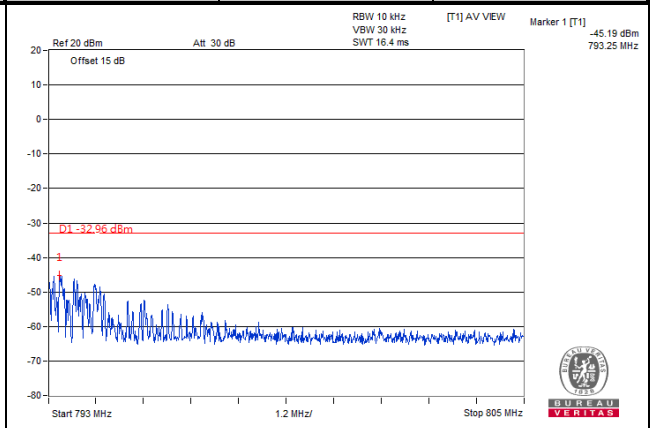
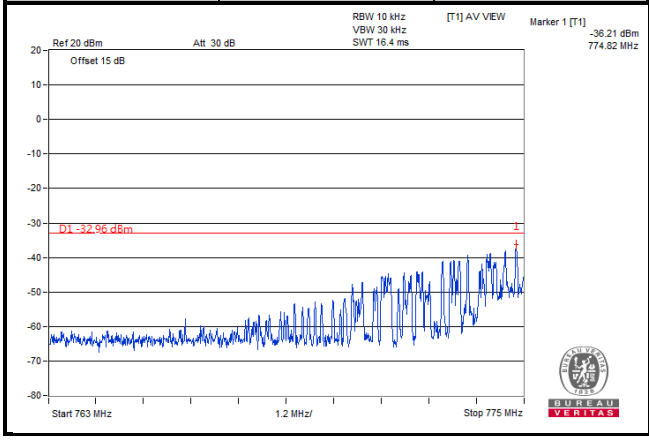
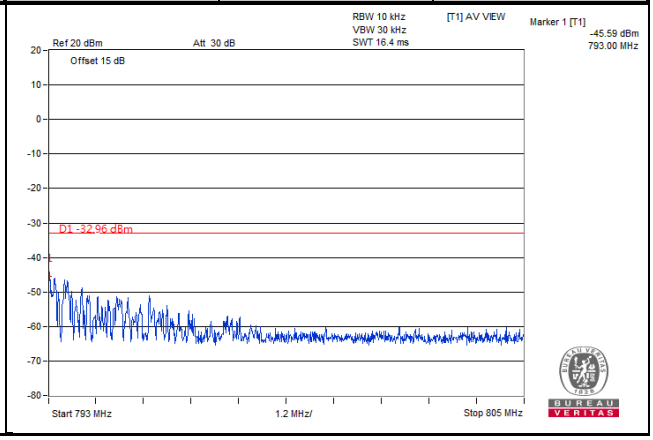
LTE Band 12					
Channel Bandwidth: 5 MHz					
Channel	23035	1 RB	Channel	23155	1 RB
					
Channel	23035	6 RB	Channel	23155	6 RB
					

LTE Band 12					
Channel Bandwidth: 10 MHz					
Channel	23060	1 RB	Channel	23130	1 RB
					
Channel	23060	6 RB	Channel	23130	6 RB
					

LTE Band 13					
Channel Bandwidth: 5 MHz					
Channel	23205	1 RB	Channel	23255	1 RB
					
Channel	23205	6 RB	Channel	23255	6 RB
					

LTE Band 13					
Channel Bandwidth: 10 MHz					
Channel	23230	1 RB	Channel	23230	1 RB
					
Channel	23230	6 RB	Channel	23230	6 RB
					

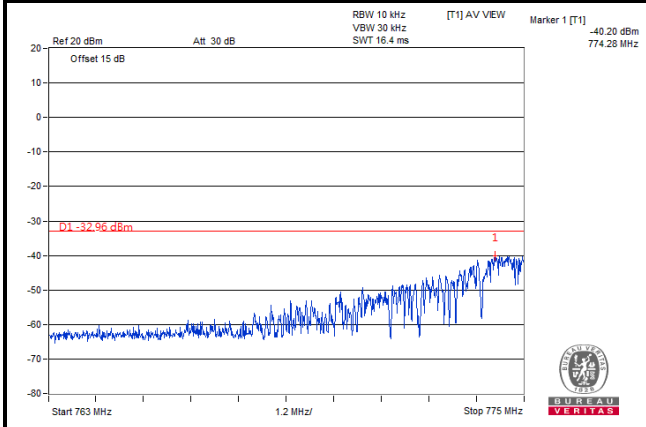
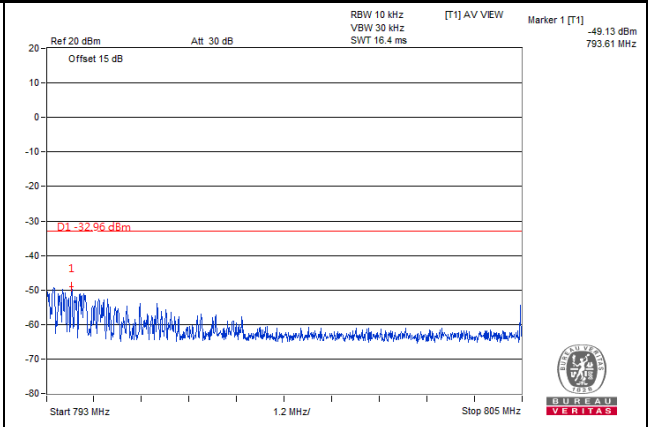
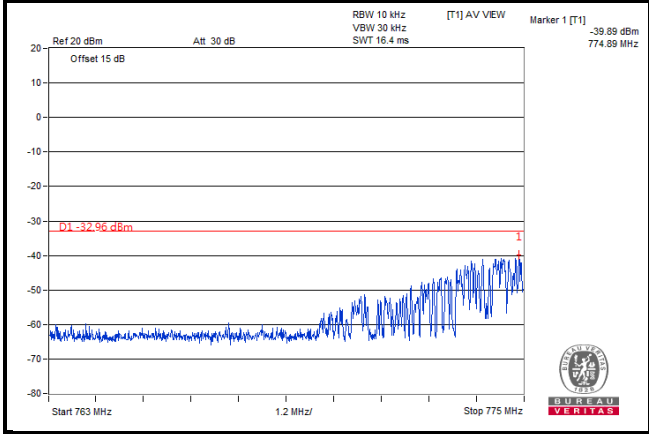
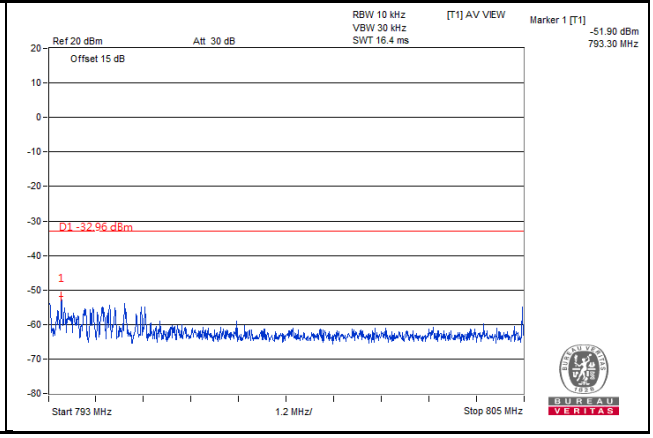
Emission Mask

LTE Band 13					
Channel Bandwidth: 5 MHz					
Channel	23205	1 RB	Channel	23255	1 RB
					
Channel	23205	6 RB	Channel	23255	6 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

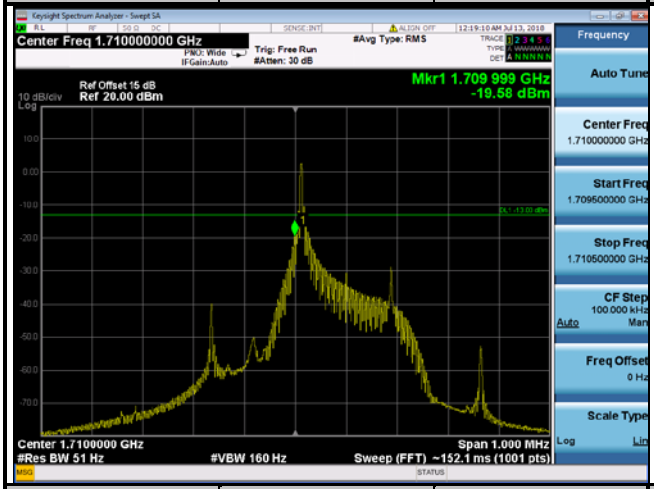
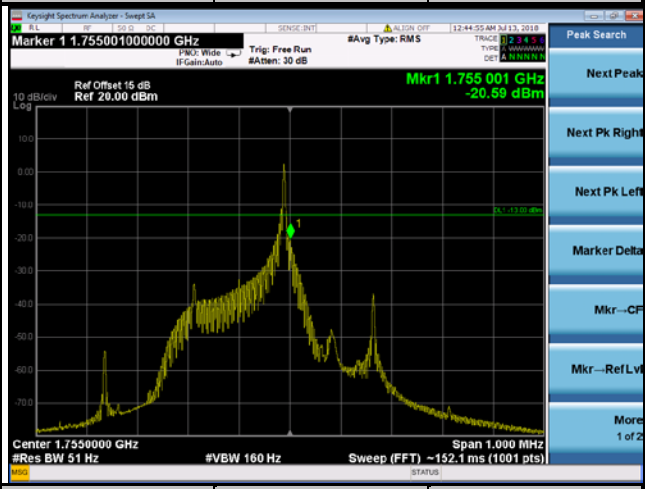
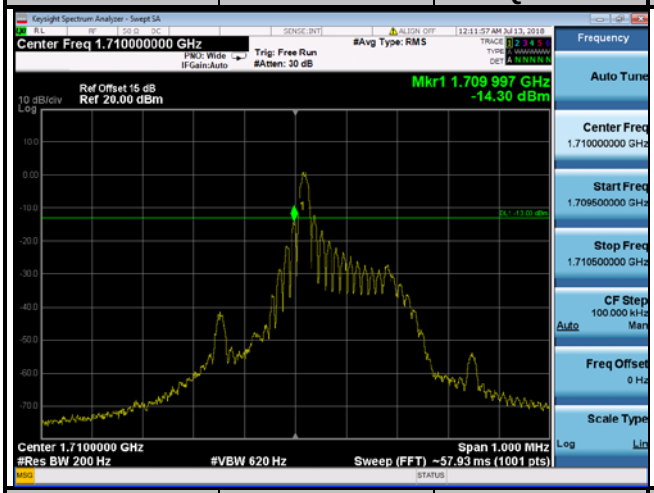
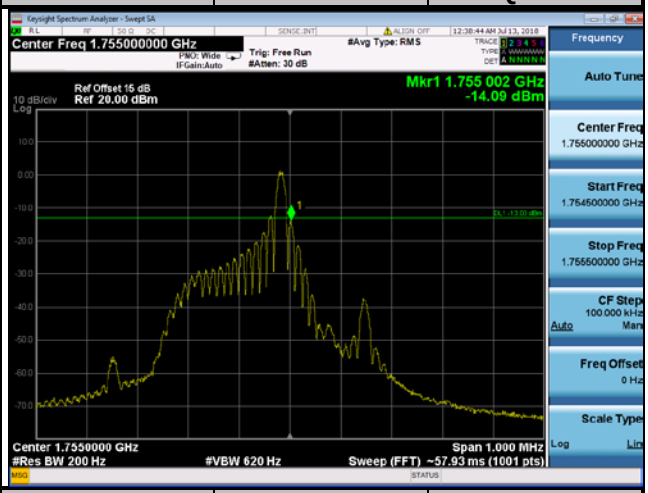
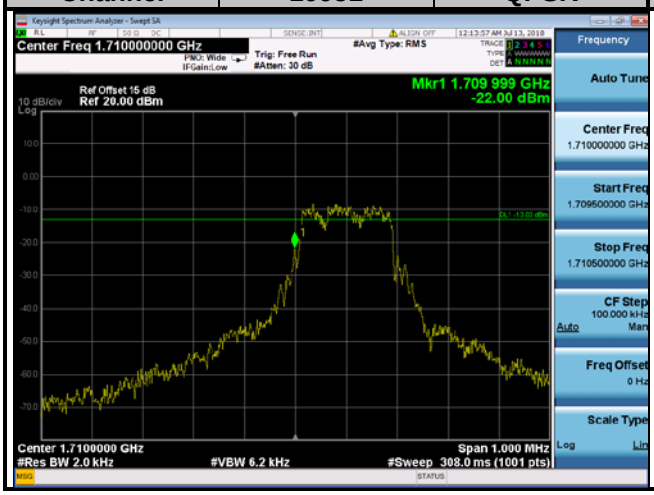
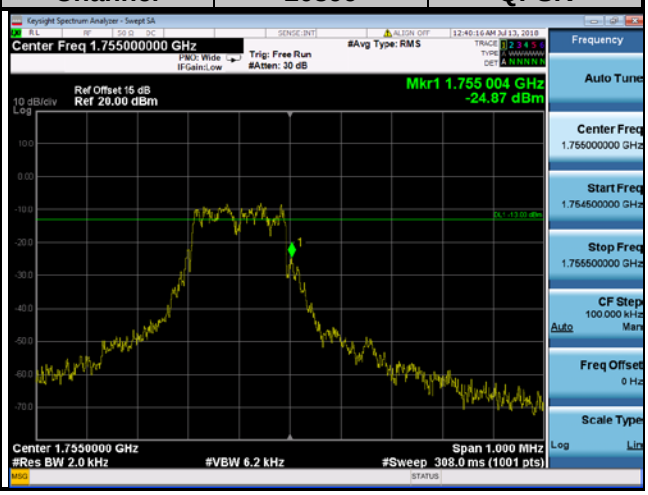
LTE Band 13					
Channel Bandwidth: 10 MHz					
Channel	23230	1 RB	Channel	23230	1 RB
					
Channel	23230	6 RB	Channel	23230	6 RB
					

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

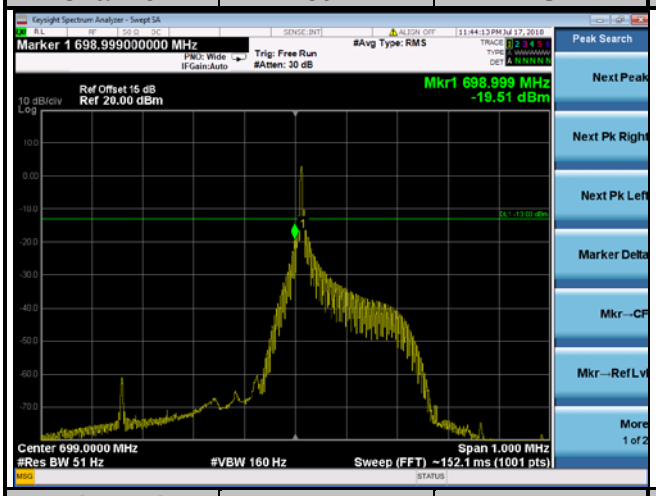
Limit line = -35 dBm + 2.04 dB =-32.96 dBm

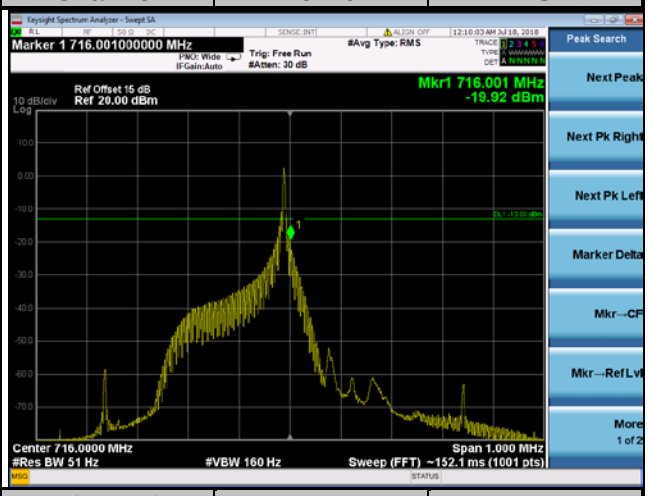
NB-IOT

LTE Band 4					
Channel	19951	BPSK	Channel	20399	BPSK
					
Channel	19951	QPSK	Channel	20399	QPSK
					
Channel	19951	QPSK	Channel	20399	QPSK
					

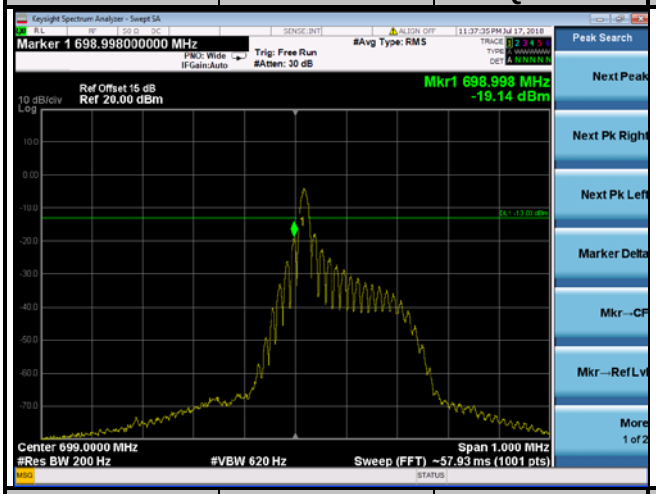
LTE Band 12

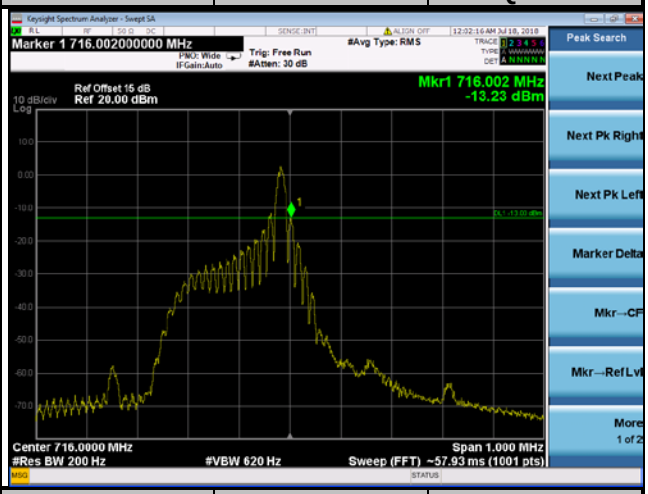
Channel	23011	BPSK	Channel	23179	BPSK



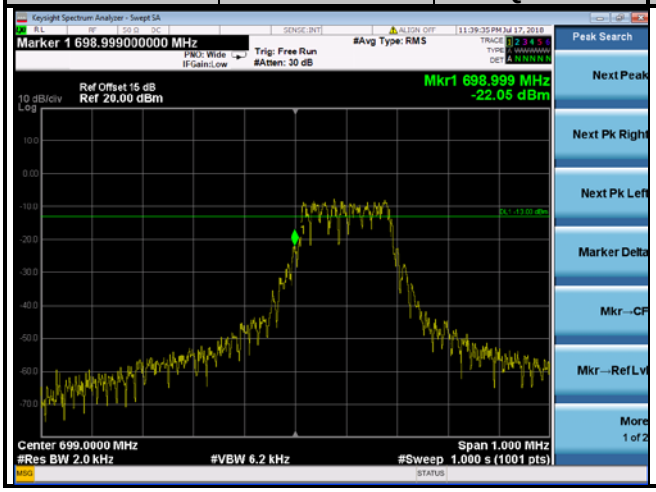


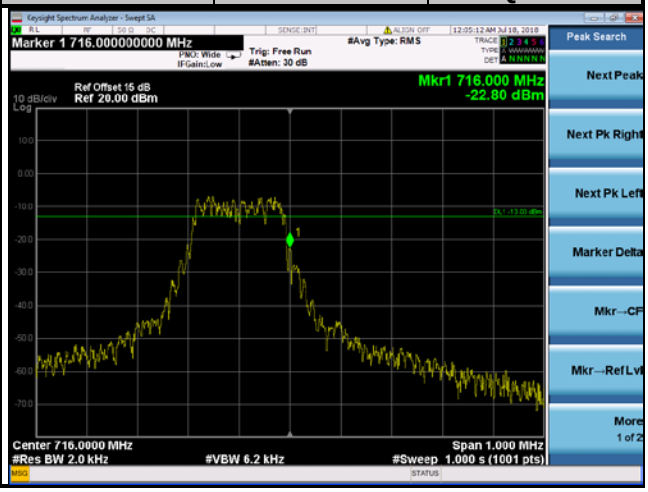
Channel	23011	QPSK	Channel	23179	QPSK





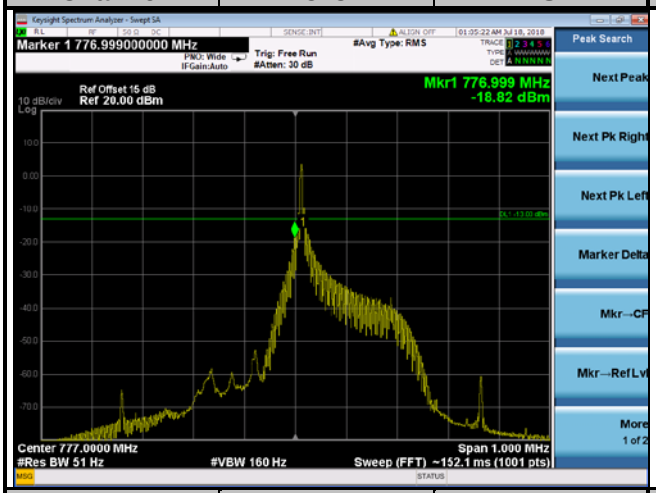
Channel	23011	QPSK	Channel	23179	QPSK



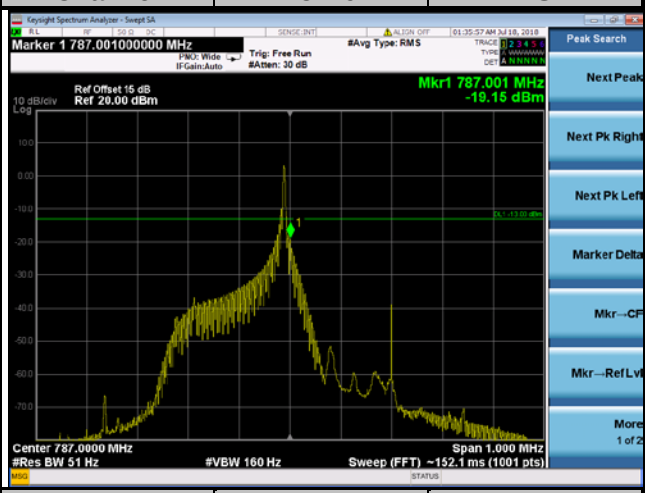


LTE Band 13

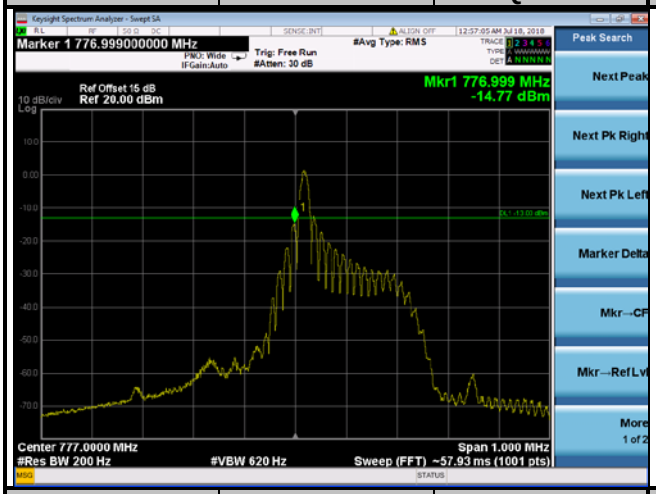
Channel	23181	BPSK



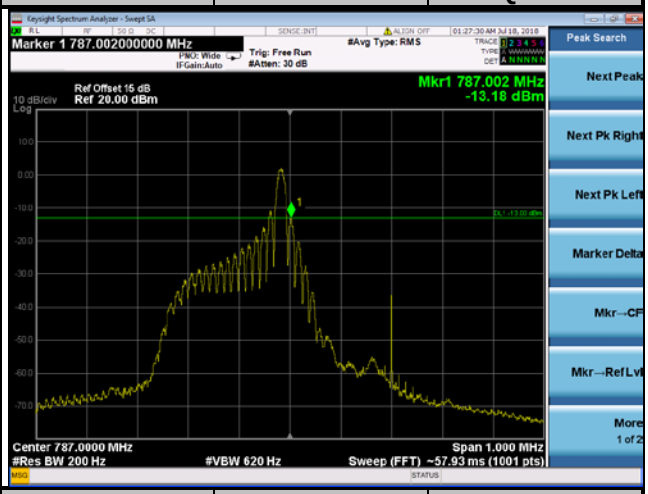
Channel	23279	BPSK



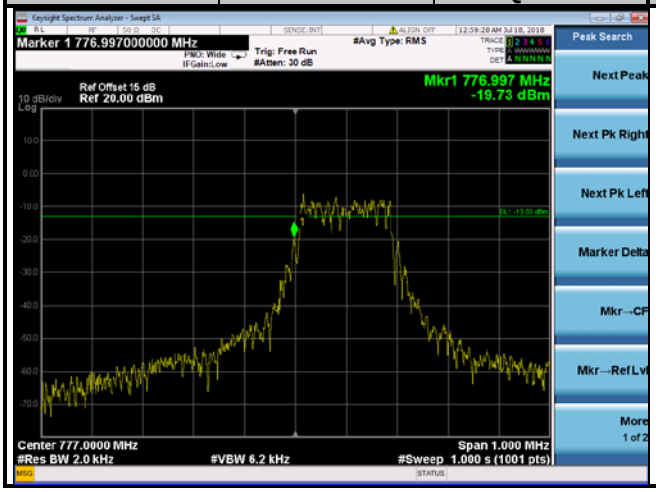
Channel	23181	QPSK



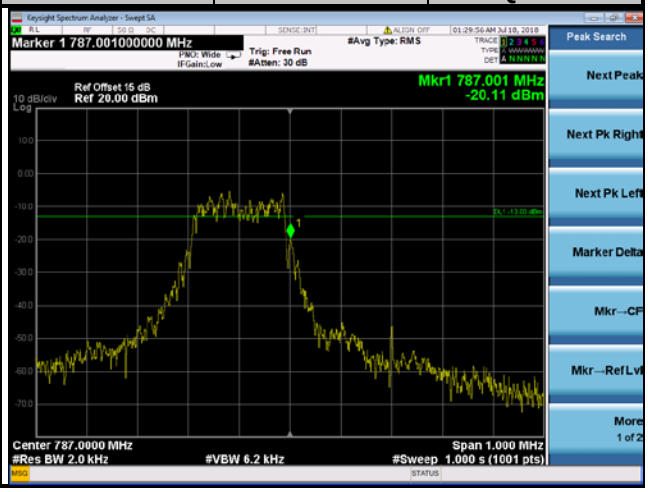
Channel	23279	QPSK



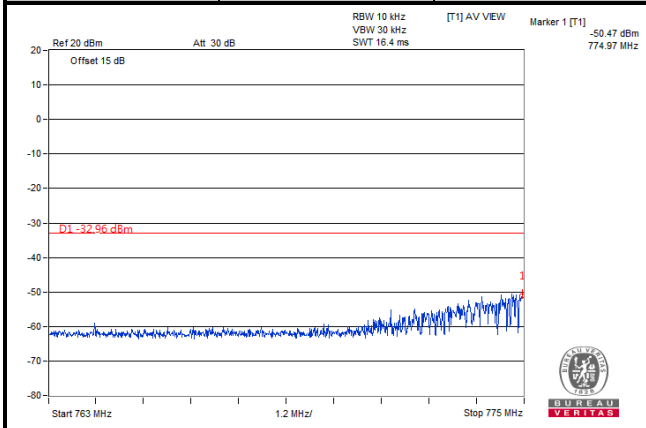
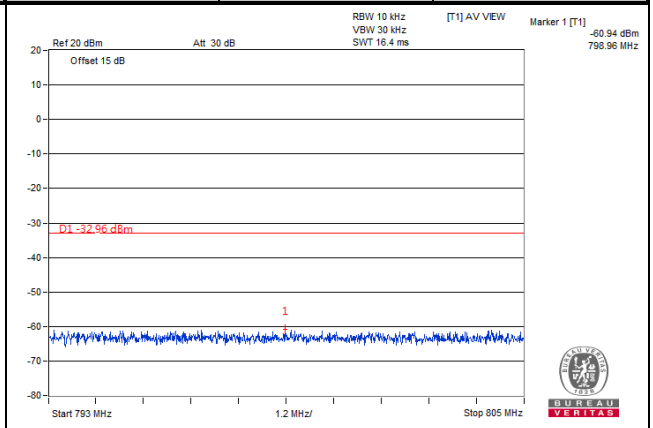
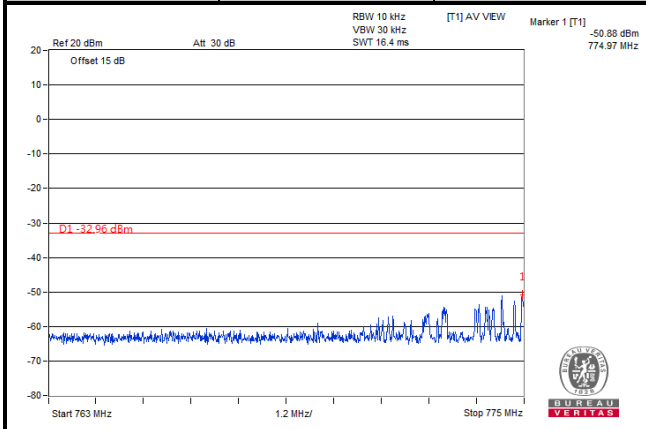
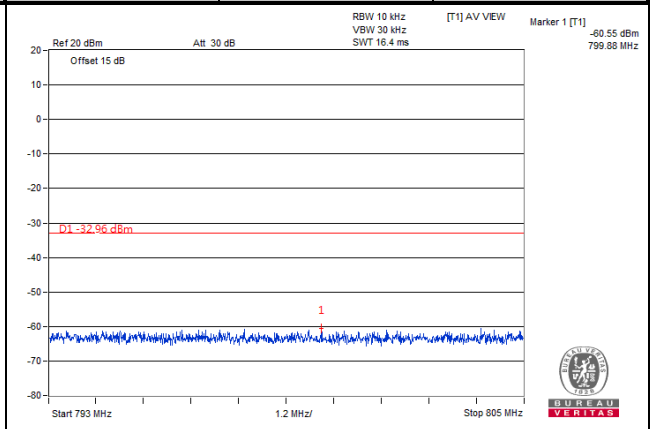
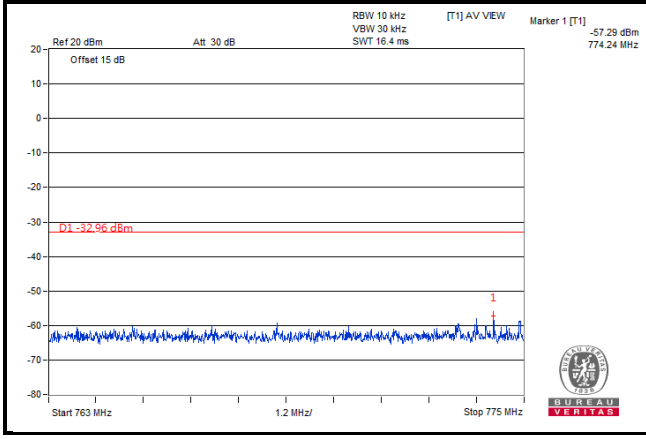
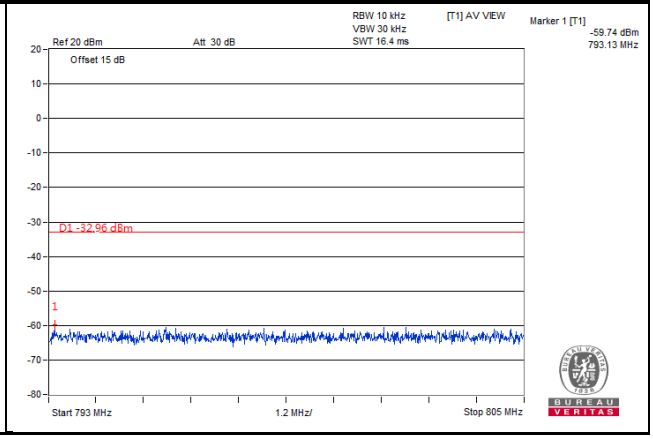
Channel	23181	QPSK



Channel	23279	QPSK



Emission Mask

LTE Band 13					
BPSK					
Channel	23181	1 RB	Channel	23279	1 RB
					
QPSK					
Channel	23181	1 RB	Channel	23279	1 RB
					
QPSK					
Channel	23205	6 RB	Channel	23255	6 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