FCC Test Report

(PART 27)

Report No.:	RF200715C05-2
FCC ID:	L6AITF100-1
Test Model:	ITF100-1
Received Date:	Jul. 15, 2020
Test Date:	Aug. 11 ~ Aug. 22, 2020
Issued Date:	Nov. 03, 2020
Applicant:	BlackBerry Limited
Address:	2200 University Avenue East, Waterloo, Ontario, Canada N2K 0A7
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location:	No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, Taiwan
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.

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 11
3.4 EUT Operating Conditions 15
3.5 General Description of Applied Standards and references 15

4 Test Types and Results **16**

4.1 Output Power Measurement 16
4.1.1 Limits of Output Power Measurement 16
4.1.2 Test Procedures 16
4.1.3 Test Setup 17
4.1.4 Test Results 18
4.2 Modulation Characteristics Measurement 28
4.2.1 Limits of Modulation Characteristics 28
4.2.2 Test Setup 28
4.2.3 Test Procedure 28
4.2.4 Test Results 29
4.3 Frequency Stability Measurement 30
4.3.1 Limits of Frequency Stability Measurement 30
4.3.2 Test Procedure 30
4.3.3 Test Setup 30
4.3.4 Test Results 31
4.4 Occupied Bandwidth Measurement 41
4.4.1 Limits of Occupied Bandwidth Measurement 41
4.4.2 Test Procedure 41
4.4.3 Test Setup 41
4.4.4 Test Result 42
4.5 Band Edge Measurement 47
4.5.1 Limits of Band Edge Measurement 47
4.5.2 Test Setup 47
4.5.3 Test Procedures 47
4.5.4 Test Results 48
4.6 Peak to Average Ratio 58
4.6.1 Limits of Peak to Average Ratio Measurement 58
4.6.2 Test Setup 58
4.6.3 Test Procedures 58
4.6.4 Test Results 59
4.7 Conducted Spurious Emissions 64
4.7.1 Limits of Conducted Spurious Emissions Measurement 64
4.7.2 Test Setup 64
4.7.3 Test Procedure 64
4.7.4 Test Results 65
4.8 Radiated Emission Measurement 87
4.8.1 Limits of Radiated Emission Measurement 87
4.8.2 Test Procedure 87
4.8.3 Deviation from Test Standard 87
4.8.4 Test Setup 88

4.8.5 Test Results 89
5 Pictures of Test Arrangements 105
Appendix – Information of the Testing Laboratories 106

Release Control Record

Issue No.	Description	Date Issued
RF200715C05-2	Original Release	Nov. 03, 2020

1 Certificate of Conformity

Product: Radar H2

Brand: BlackBerry

Test Model: ITF100-1

Sample Status: Identical Prototype

Applicant: BlackBerry Limited

Test Date: Aug. 11 ~ Aug. 22, 2020

Standards: FCC Part 27, Subpart C, H, 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 : Lena Wang , **Date:** Nov. 03, 2020

Lena Wang / Specialist

Approved by : , **Date:** Nov. 03, 2020

Dylan Chiou / Senior 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 -36.90 dB at 3421.40 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.
---	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 -35.80 dB at 1415.00 MHz and 1422.00 MHz.

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

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	Expanded Uncertainty (k=2) (±)
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.04 dB
	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 KEYSIGHT	N9038A	MY55420137	Apr. 16, 2020	Apr. 15, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jun. 12, 2020	Jun. 11, 2021
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Nov. 07, 2019	Nov. 06, 2020
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Nov. 08, 2019	Nov. 07, 2020
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 24, 2019	Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Nov. 24, 2019	Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 24, 2019	Nov. 23, 2020
Loop Antenna EMCI	EM-6879	269	Sep. 16, 2019	Sep. 15, 2020
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Jun. 08, 2020	Jun. 07, 2021
Preamplifier Agilent (Above 1GHz)	8449B	3008A02367	Feb. 18, 2020	Feb. 17, 2021
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM8000	CABLE-CH9-02 (248780+171006)	Jan. 18, 2020	Jan. 17, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	Jan. 18, 2020	Jan. 17, 2021
RF signal cable Woken	8D-FB	Cable-CH9-01	Jun. 08, 2020	Jun. 07, 2021
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower &Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Standard Temperature And Humidity Chamber TERCHY	MHU-225AU	920842	May 27, 2020	May 26, 2021
JFW 20dB attenuation	50HF-020-SMA	NA	NA	NA
True RMS Clamp Meter Fluke	325	31130711WS	Jun. 06, 2020	Jun. 05, 2021
Radio Communication Analyzer Anritsu	MT8820C	6201300640	Aug. 19, 2019	Aug. 18, 2021
DC power supply Keysight	U8002A	MY56330015	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 / 24 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in HwaYa Chamber 9.

3 General Information

3.1 General Description of EUT

Product	Radar H2		
Brand	BlackBerry		
Test Model	ITF100-1		
Status of EUT	Identical Prototype		
Power Supply Rating	7.2 Vdc (battery)		
Modulation Type	LTE	QPSK, 16QAM	
Frequency Range	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	1710.7 ~ 1754.3 MHz	
	LTE Band 4 (Channel Bandwidth: 3 MHz)	1711.5 ~ 1753.5 MHz	
	LTE Band 4 (Channel Bandwidth: 5 MHz)	1712.5 ~ 1752.5 MHz	
	LTE Band 4 (Channel Bandwidth: 10 MHz)	1715.0 ~ 1750.0 MHz	
	LTE Band 4 (Channel Bandwidth: 15 MHz)	1717.5 ~ 1747.5 MHz	
	LTE Band 4 (Channel Bandwidth: 20 MHz)	1720.0 ~ 1745.0 MHz	
	LTE Band 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	
Emission Designator	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	1M09D7W	
	LTE Band 4 (Channel Bandwidth: 3 MHz)	2M70G7D	
	LTE Band 4 (Channel Bandwidth: 5 MHz)	4M49D7W	
	LTE Band 4 (Channel Bandwidth: 10 MHz)	8M98D7W	
	LTE Band 4 (Channel Bandwidth: 15 MHz)	13M5G7D	
	LTE Band 4 (Channel Bandwidth: 20 MHz)	18M0D7W	
	LTE Band 12 (Channel Bandwidth: 1.4 MHz)	1M09D7W	
	LTE Band 12 (Channel Bandwidth: 3 MHz)	2M70G7D	
	LTE Band 12 (Channel Bandwidth: 5 MHz)	4M49D7W	
	LTE Band 12 (Channel Bandwidth: 10 MHz)	8M99D7W	
Max. ERP Power		QPSK	16QAM
	LTE Band 12 (Channel Bandwidth: 1.4 MHz)	97.724 mW (19.90dBm)	79.433 mW (19.00 dBm)
	LTE Band 12 (Channel Bandwidth: 3 MHz)	97.724 mW (19.90dBm)	83.176 mW (19.20 dBm)
	LTE Band 12 (Channel Bandwidth: 5 MHz)	97.724 mW (19.90dBm)	81.283 mW (19.10 dBm)
	LTE Band 12 (Channel Bandwidth: 10 MHz)	97.724 mW (19.90dBm)	81.283 mW (19.10 dBm)
Max. EIRP Power	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	154.882 mW (21.90 dBm)	123.027 mW (20.90 dBm)
	LTE Band 4 (Channel Bandwidth: 3 MHz)	151.356 mW (21.80 dBm)	120.226 mW (20.80 dBm)
	LTE Band 4 (Channel Bandwidth: 5 MHz)	144.544 mW (21.60 dBm)	114.815 mW (20.60 dBm)
	LTE Band 4 (Channel Bandwidth: 10 MHz)	147.911 mW (21.70 dBm)	117.490 mW (20.70 dBm)
	LTE Band 4 (Channel Bandwidth: 15 MHz)	144.544 mW (21.60 dBm)	114.815 mW (20.60 dBm)

	LTE Band 4 (Channel Bandwidth: 20 MHz)	151.356 mW (21.80 dBm)	120.226 mW (20.80 dBm)
Antenna Type	Refer to Note as below		
Antenna Gain	Refer to Note as below		
Accessory Device	Refer to Note as below		
Data Cable Supplied	N/A		

Note:

1. The EUT contains following accessory devices.

Product	Brand	Model	Description
Battery	BlackBerry	BAT-63320-001	7.2 Vdc, 38 A

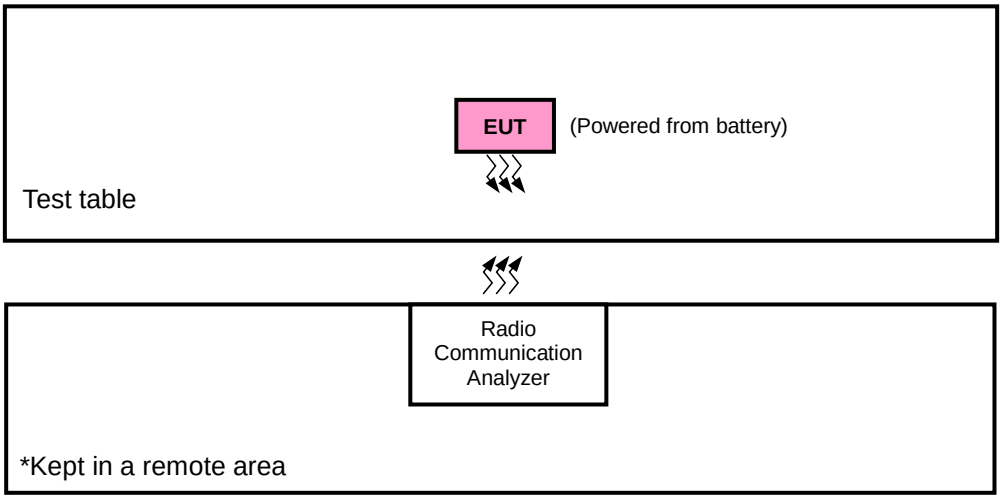
2. The antenna information is listed as below.

Antenna Type	Monopole with gnd resonator	
Band	LTE	
	4	12
Gain (dBi)	2.54	-3.32

3. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.
4. 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.
5. SRD & WWAN technology cannot transmit same time.

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	Y-plane	Y-plane
LTE Band 12	Z-plane	Y-plane

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 / 0 RB Offset
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK, 16QAM	1 RB / 7 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM	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 / 74 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Modulation Characteristics	20050 to 20300	20175	20 MHz	QPSK, 16QAM	100 RB / 0 RB Offset
-	Frequency Stability	19957 to 20393	19957, 20393	1.4 MHz	QPSK	6 RB / 0 RB Offset
		19965 to 20385	19965, 20385	3 MHz	QPSK	15 RB / 0 RB Offset
		19975 to 20375	19975, 20375	5 MHz	QPSK	25 RB / 0 RB Offset
		20000 to 20350	20000, 20350	10 MHz	QPSK	50 RB / 0 RB Offset
		20025 to 20325	20025, 20325	15 MHz	QPSK	75 RB / 0 RB Offset
		20050 to 20300	20050, 20300	20 MHz	QPSK	100 RB / 0 RB Offset
-	Occupied Bandwidth	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK, 16QAM	15 RB / 0 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK, 16QAM	50 RB / 0 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK, 16QAM	75 RB / 0 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM	100 RB / 0 RB Offset
-	Peak to Average Ratio	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK, 16QAM	1 RB / 7 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM	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 / 74 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM	1 RB / 0 RB Offset

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

Note:

1. This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.
2. For radiated emission above 1 GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the lowest, 5 MHz & highest channel bandwidth for final test.

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	23060 to 23130	23095	10 MHz	QPSK, 16QAM	100 RB / 0 RB Offset
-	Frequency Stability	23017 to 23173	23017, 23173	1.4 MHz	QPSK	6 RB / 0 RB Offset
		23025 to 23165	23025, 23165	3 MHz	QPSK	15 RB / 0 RB Offset
		23035 to 23155	23035, 23155	5 MHz	QPSK	25 RB / 0 RB Offset
		23060 to 23130	23060, 23130	10 MHz	QPSK	50 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	15 RB / 0 RB Offset
		23035 to 23155	23035, 23095, 23155	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		23060 to 23130	23060, 23095, 23130	10 MHz	QPSK, 16QAM	50 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
						15 RB / 0 RB Offset
			23165	3 MHz	QPSK	1 RB / 14 RB Offset
						15 RB / 0 RB Offset
		23035 to 23155	23035	5 MHz	QPSK	1 RB / 0 RB Offset
						25 RB / 0 RB Offset
			23155	5 MHz	QPSK	1 RB / 24 RB Offset
						25 RB / 0 RB Offset
		23060 to 23130	23060	10 MHz	QPSK	1 RB / 0 RB Offset
						50 RB / 0 RB Offset
			23130	10 MHz	QPSK	1 RB / 49 RB Offset
						50 RB / 0 RB Offset
-	Conducted Emission	23017 to 23173	23017, 23095, 23173	1.4 MHz	QPSK	1 RB / 0 RB Offset
		23025 to 23165	23025, 23095, 23165	3 MHz	QPSK	1 RB / 0 RB Offset
		23035 to 23155	23035, 23095, 23155	5 MHz	QPSK	1 RB / 0 RB Offset
		23060 to 23130	23060, 23095, 23130	10 MHz	QPSK	1 RB / 0 RB Offset
-	Radiated Emission	23017 to 23173	23017, 23095, 23173	1.4 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

Note:

1. This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.
2. For radiated emission above 1 GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the lowest, 5 MHz & highest channel bandwidth for final test.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
ERP / EIRP	25 deg. C, 65 % RH	7.2 Vdc	Han Wu, Greg Lin
Modulation Characteristics	25 deg. C, 65 % RH	7.2 Vdc	Tank Wu
Frequency Stability	25 deg. C, 65 % RH	7.2 Vdc	James Yang
Occupied Bandwidth	25 deg. C, 65 % RH	7.2 Vdc	Tank Wu
Band Edge	25 deg. C, 65 % RH	7.2 Vdc	Tank Wu
Peak to Average Ratio	25 deg. C, 65 % RH	7.2 Vdc	Tank Wu
Conducted Emission	25 deg. C, 65 % RH	7.2 Vdc	Tank Wu
Radiated Emission	25 deg. C, 65 % RH	7.2 Vdc	Greg Lin

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 and references

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

Test Standard:
FCC 47 CFR Part 2
FCC 47 CFR Part 27
ANSI 63.26-2015

Note: All test items have been performed and recorded as per the above standards.

References Test Guidance:
KDB 971168 D01 Power Meas License Digital Systems v03r01
ANSI/TIA/EIA-603-E 2016

Note: All test items have been performed as a reference to the above KDB test guidance.

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 and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

Portable stations (hand-held device) operating in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

4.1.2 Test Procedures

EIRP / ERP Measurement:

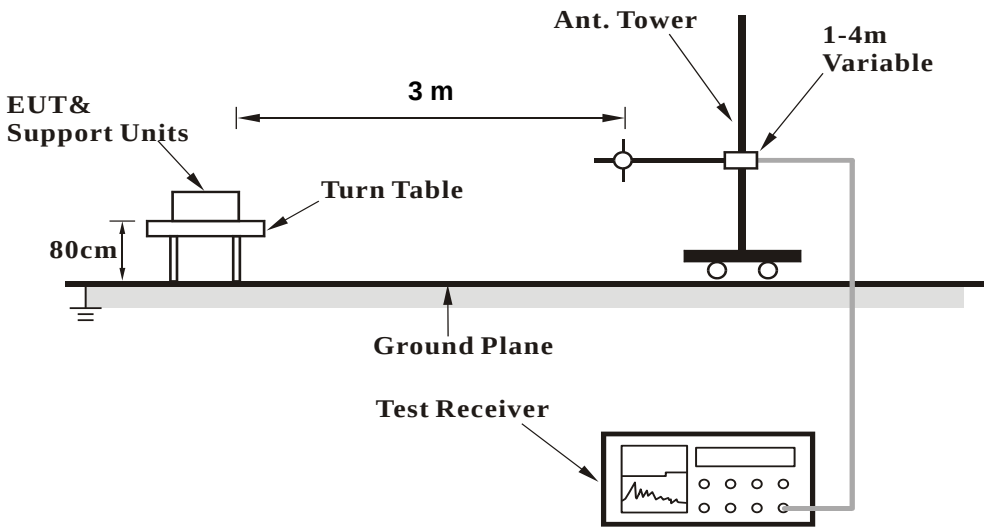
a. All measurements were done at low, middle and high operational frequency range. RBW is 1.4 MHz、3 MHz、5 MHz、10 MHz、20 MHz for LTE mode, and VBW ≥ 3 x RBW.
b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 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:

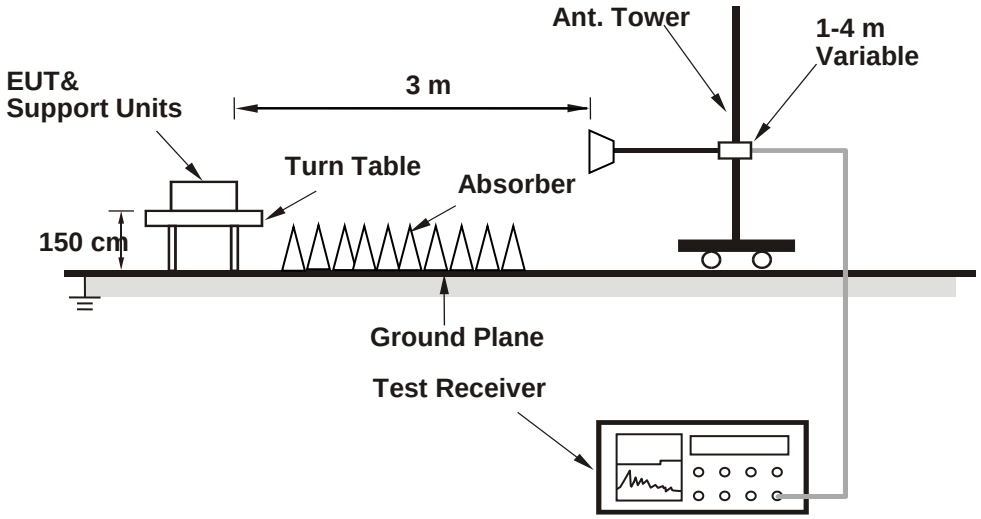
a. The EUT was set up for the maximum power with LTE link data modulation and link up with simulator.
b. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

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)

LTE Band 4															
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20050	20175	20300				Channel		20025	20175	20325	
		Frequency (MHz)		1720.0	1732.5	1745.0				Frequency (MHz)		1717.5	1732.5	1747.5	
20M	QPSK	1	0	21.49	21.41	21.48	0	15M	QPSK	1	0	21.40	21.55	21.35	0
		1	50	21.32	21.35	21.45	0			1	37	21.32	21.33	21.48	0
		1	99	21.39	21.46	21.41	0			1	74	21.50	21.55	21.34	0
		50	0	20.44	20.40	20.48	1			36	0	20.30	20.37	20.57	1
		50	25	20.42	20.44	20.46	1			36	19	20.50	20.35	20.58	1
		50	50	20.56	20.37	20.49	1			36	39	20.35	20.41	20.34	1
		100	0	20.50	20.55	20.47	1			75	0	20.36	20.33	20.44	1
	16QAM	1	0	20.62	20.65	20.66	1		16QAM	1	0	20.57	20.52	20.70	1
		1	50	20.59	20.60	20.55	1			1	37	20.57	20.57	20.58	1
		1	99	20.70	20.52	20.57	1			1	74	20.46	20.60	20.55	1
		50	0	19.42	19.56	19.52	2			36	0	19.52	19.53	19.43	2
		50	25	19.62	19.70	19.58	2			36	19	19.41	19.51	19.63	2
		50	50	19.67	19.51	19.61	2			36	39	19.54	19.65	19.50	2
		100	0	19.42	19.65	19.58	2			75	0	19.66	19.50	19.49	2
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20000	20175	20350				Channel		19975	20175	20375	
		Frequency (MHz)		1715.0	1732.5	1750.0				Frequency (MHz)		1712.5	1732.5	1752.5	
10M	QPSK	1	0	21.61	21.49	21.38	0	5M	QPSK	1	0	21.50	21.60	21.42	0
		1	24	21.55	21.57	21.59	0			1	12	21.40	21.56	21.54	0
		1	49	21.33	21.41	21.31	0			1	24	21.57	21.52	21.43	0
		25	0	20.55	20.43	20.47	1			12	0	20.46	20.39	20.35	1
		25	12	20.43	20.39	20.35	1			12	6	20.48	20.58	20.39	1
		25	25	20.45	20.37	20.43	1			12	13	20.37	20.52	20.33	1
		50	0	20.52	20.36	20.57	1			25	0	20.35	20.40	20.58	1
	16QAM	1	0	20.42	20.50	20.70	1		16QAM	1	0	20.62	20.57	20.60	1
		1	24	20.44	20.44	20.45	1			1	12	20.53	20.60	20.52	1
		1	49	20.67	20.55	20.42	1			1	24	20.61	20.47	20.53	1
		25	0	19.50	19.44	19.54	2			12	0	19.46	19.58	19.52	2
		25	12	19.50	19.50	19.63	2			12	6	19.41	19.52	19.45	2
		25	25	19.59	19.60	19.45	2			12	13	19.64	19.59	19.66	2
		50	0	19.63	19.65	19.48	2			25	0	19.54	19.64	19.67	2
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		19965	20175	20385				Channel		19957	20175	20393	
		Frequency (MHz)		1711.5	1732.5	1753.5				Frequency (MHz)		1710.7	1732.5	1754.3	
3M	QPSK	1	0	21.31	21.41	21.38	0	1.4M	QPSK	1	0	21.38	21.49	21.55	0
		1	7	21.52	21.30	21.58	0			1	2	21.39	21.33	21.38	0
		1	14	21.56	21.45	21.50	0			1	5	21.35	21.35	21.42	0
		8	0	20.49	20.43	20.44	1			3	0	20.56	20.39	20.60	0
		8	3	20.59	20.37	20.39	1			3	1	20.42	20.37	20.37	0
		8	7	20.48	20.32	20.49	1			3	3	20.44	20.38	20.43	0
		15	0	20.30	20.49	20.52	1			6	0	20.40	20.36	20.32	1
	16QAM	1	0	20.43	20.51	20.46	1		16QAM	1	0	20.59	20.51	20.64	1
		1	7	20.46	20.66	20.48	1			1	2	20.42	20.62	20.56	1
		1	14	20.58	20.56	20.53	1			1	5	20.58	20.57	20.61	1
		8	0	19.40	19.53	19.65	2			3	0	19.45	19.49	19.54	1
		8	3	19.63	19.51	19.41	2			3	1	19.48	19.59	19.49	1
		8	7	19.67	19.49	19.70	2			3	3	19.69	19.66	19.40	1
		15	0	19.68	19.46	19.60	2			6	0	19.65	19.45	19.64	2

LTE Band 12

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		23060	23095	23130				Channel		23035	23095	23155	
		Frequency (MHz)		704.0	707.5	711.0				Frequency (MHz)		701.5	707.5	713.5	
10M	QPSK	1	0	22.59	22.45	22.51	0	5M	QPSK	1	0	22.49	22.36	22.40	0
		1	24	22.35	22.53	22.51	0			1	12	22.45	22.48	22.36	0
		1	49	22.46	22.40	22.33	0			1	24	22.34	22.37	22.36	0
		25	0	21.44	21.41	21.48	1			12	0	21.40	21.58	21.48	1
		25	12	21.42	21.32	21.47	1			12	6	21.41	21.33	21.31	1
		25	25	21.49	21.45	21.39	1			12	13	21.50	21.57	21.48	1
		50	0	21.35	21.46	21.41	1			25	0	21.34	21.39	21.50	1
	16QAM	1	0	21.64	21.60	21.43	1		16QAM	1	0	21.59	21.63	21.47	1
		1	24	21.45	21.43	21.68	1			1	12	21.70	21.58	21.51	1
		1	49	21.70	21.60	21.46	1			1	24	21.50	21.69	21.58	1
		25	0	20.50	20.58	20.49	2			12	0	20.69	20.64	20.70	2
		25	12	20.70	20.56	20.62	2			12	6	20.43	20.52	20.47	2
		25	25	20.63	20.55	20.61	2			12	13	20.58	20.47	20.65	2
		50	0	20.43	20.65	20.50	2			25	0	20.48	20.42	20.68	2
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		23025	23095	23165				Channel		23017	23095	23173	
		Frequency (MHz)		700.5	707.5	714.5				Frequency (MHz)		699.7	707.5	715.3	
3M	QPSK	1	0	22.30	22.49	22.57	0	1.4M	QPSK	1	0	22.60	22.38	22.52	0
		1	7	22.44	22.54	22.56	0			1	2	22.58	22.31	22.44	0
		1	14	22.48	22.46	22.55	0			1	5	22.38	22.58	22.38	0
		8	0	21.57	21.49	21.49	1			3	0	21.57	21.44	21.47	0
		8	3	21.37	21.32	21.32	1			3	1	21.46	21.31	21.45	0
		8	7	21.45	21.47	21.34	1			3	3	21.31	21.56	21.53	0
		15	0	21.45	21.59	21.56	1			6	0	21.46	21.54	21.59	1
	16QAM	1	0	21.50	21.48	21.58	1		16QAM	1	0	21.65	21.67	21.63	1
		1	7	21.69	21.54	21.67	1			1	2	21.65	21.41	21.61	1
		1	14	21.47	21.49	21.45	1			1	5	21.60	21.43	21.58	1
		8	0	20.41	20.67	20.57	2			3	0	20.63	20.41	20.51	1
		8	3	20.41	20.52	20.65	2			3	1	20.59	20.66	20.46	1
		8	7	20.42	20.56	20.61	2			3	3	20.69	20.54	20.51	1
		15	0	20.42	20.42	20.58	2			6	0	20.54	20.66	20.50	2

EIRP / ERP Power

Modulation Type: QPSK

LTE Band 4, Channel Bandwidth: 1.4MHz

Mode		TX channel 19957, 20175, 20393					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1710.7	-21.70	16.30	0.70	17.00	30.00	-13.00
2	1732.5	-21.60	16.80	0.60	17.40	30.00	-12.60
3	1754.3	-22.50	16.30	0.50	16.80	30.00	-13.20
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1710.7	-17.00	20.80	0.70	21.50	30.00	-8.50
2	1732.5	-17.60	20.70	0.60	21.30	30.00	-8.70
3	1754.3	-17.50	21.40	0.50	**21.90**	30.00	-8.10

Note: EIRP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 4, Channel Bandwidth: 3MHz

Mode		TX channel 19965, 20175, 20385					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1711.5	-22.30	15.70	0.70	16.40	30.00	-13.60
2	1732.5	-22.00	16.40	0.60	17.00	30.00	-13.00
3	1753.5	-22.50	16.30	0.50	16.80	30.00	-13.20
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1711.5	-16.70	21.10	0.70	**21.80**	30.00	-8.20
2	1732.5	-17.50	20.80	0.60	21.40	30.00	-8.60
3	1753.5	-18.20	20.70	0.50	21.20	30.00	-8.80

Note: EIRP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 4, Channel Bandwidth: 5MHz

Mode		TX channel 19975, 20175, 20375					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1712.5	-22.10	16.00	0.70	16.70	30.00	-13.30
2	1732.5	-21.70	16.70	0.60	17.30	30.00	-12.70
3	1752.5	-21.70	17.10	0.50	17.60	30.00	-12.40
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1712.5	-17.20	20.70	0.70	21.40	30.00	-8.60
2	1732.5	-17.30	21.00	0.60	**21.60**	30.00	-8.40
3	1752.5	-17.80	21.00	0.50	21.50	30.00	-8.50

Note: EIRP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 4, Channel Bandwidth: 10MHz

Mode		TX channel 20000, 20175, 20350					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1715.0	-22.10	16.00	0.70	16.70	30.00	-13.30
2	1732.5	-21.10	17.30	0.60	17.90	30.00	-12.10
3	1750.0	-21.60	17.20	0.50	17.70	30.00	-12.30
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1715.0	-17.30	20.60	0.70	21.30	30.00	-8.70
2	1732.5	-17.40	20.90	0.60	21.50	30.00	-8.50
3	1750.0	-17.60	21.20	0.50	**21.70**	30.00	-8.30

Note: EIRP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 4, Channel Bandwidth: 15MHz

Mode		TX channel 20025, 20175, 20325					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1717.5	-21.70	16.40	0.70	17.10	30.00	-12.90
2	1732.5	-21.90	16.50	0.60	17.10	30.00	-12.90
3	1747.5	-22.20	16.50	0.50	17.00	30.00	-13.00
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1717.5	-17.40	20.60	0.70	21.30	30.00	-8.70
2	1732.5	-17.30	21.00	0.60	**21.60**	30.00	-8.40
3	1747.5	-17.60	21.10	0.50	**21.60**	30.00	-8.40

Note: EIRP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 4, Channel Bandwidth: 20MHz

Mode		TX channel 20050, 20175, 20300					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1720.0	-21.80	16.40	0.70	17.10	30.00	-12.90
2	1732.5	-21.60	16.80	0.60	17.40	30.00	-12.60
3	1745.0	-21.60	17.10	0.50	17.60	30.00	-12.40
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1720.0	-17.30	20.70	0.70	21.40	30.00	-8.60
2	1732.5	-17.40	20.90	0.60	21.50	30.00	-8.50
3	1745.0	-17.40	21.30	0.50	**21.80**	30.00	-8.20

Note: EIRP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 12, Channel Bandwidth: 1.4MHz

MODE		TX channel 23017, 23095, 23173					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	699.7	-9.20	15.30	3.50	18.80	34.80	-16.00
2	707.5	-8.90	15.90	3.50	19.40	34.80	-15.40
3	715.3	-9.00	16.00	3.50	19.50	34.80	-15.30
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm))	Limit (dBm)	Margin (dB)
1	699.7	-11.90	15.60	3.50	19.10	34.80	-15.70
2	707.5	-11.90	15.90	3.50	19.40	34.80	-15.40
3	715.3	-11.20	16.40	3.50	**19.90**	34.80	-14.90

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 12, Channel Bandwidth: 3MHz

MODE		TX channel 23025, 23095, 23165					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	700.5	-8.80	15.70	3.50	19.20	34.80	-15.60
2	707.5	-9.10	15.60	3.50	19.10	34.80	-15.70
3	714.5	-8.70	16.30	3.50	19.80	34.80	-15.00
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	700.5	-12.00	15.60	3.50	19.10	34.80	-15.70
2	707.5	-11.40	16.40	3.50	**19.90**	34.80	-14.90
3	714.5	-11.20	16.40	3.50	**19.90**	34.80	-14.90

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 12, Channel Bandwidth: 5MHz

MODE		TX channel 23035, 23095, 23155					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	701.5	-9.00	15.60	3.40	19.00	34.80	-15.80
2	707.5	-9.10	15.60	3.50	19.10	34.80	-15.70
3	713.5	-9.00	16.00	3.50	19.50	34.80	-15.30
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	701.5	-11.80	15.90	3.40	19.30	34.80	-15.50
2	707.5	-11.90	15.90	3.50	19.40	34.80	-15.40
3	713.5	-11.40	16.40	3.50	**19.90**	34.80	-14.90

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 12, Channel Bandwidth: 10MHz

MODE		TX channel 23060, 23095, 23130					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	704.0	-8.60	16.10	3.50	19.60	34.80	-15.20
2	707.5	-8.40	16.40	3.50	19.90	34.80	-14.90
3	711.0	-8.70	16.30	3.50	19.80	34.80	-15.00
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	704.0	-11.30	16.30	3.50	19.80	34.80	-15.00
2	707.5	-11.60	16.20	3.50	19.70	34.80	-15.10
3	711.0	-11.20	16.40	3.50	**19.90**	34.80	-14.90

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

Modulation Type: 16QAM

LTE Band 4, Channel Bandwidth: 1.4MHz

Mode		TX channel 19957, 20175, 20393					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1710.7	-22.80	15.20	0.70	15.90	30.00	-14.10
2	1732.5	-23.20	15.20	0.60	15.80	30.00	-14.20
3	1754.3	-23.00	15.80	0.50	16.30	30.00	-13.70
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1710.7	-18.00	19.80	0.70	20.50	30.00	-9.50
2	1732.5	-18.60	19.70	0.60	20.30	30.00	-9.70
3	1754.3	-18.50	20.40	0.50	**20.90**	30.00	-9.10

Note: EIRP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 4, Channel Bandwidth: 3MHz

Mode		TX channel 19965, 20175, 20385					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1711.5	-23.30	14.70	0.70	15.40	30.00	-14.60
2	1732.5	-23.00	15.40	0.60	16.00	30.00	-14.00
3	1753.5	-23.50	15.30	0.50	15.80	30.00	-14.20
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1711.5	-17.70	20.10	0.70	**20.80**	30.00	-9.20
2	1732.5	-18.50	19.80	0.60	20.40	30.00	-9.60
3	1753.5	-19.20	19.70	0.50	20.20	30.00	-9.80

Note: EIRP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 4, Channel Bandwidth: 5MHz

Mode		TX channel 19975, 20175, 20375					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1712.5	-23.10	15.00	0.70	15.70	30.00	-14.30
2	1732.5	-22.70	15.70	0.60	16.30	30.00	-13.70
3	1752.5	-22.70	16.10	0.50	16.60	30.00	-13.40
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1712.5	-18.20	19.70	0.70	20.40	30.00	-9.60
2	1732.5	-18.30	20.00	0.60	**20.60**	30.00	-9.40
3	1752.5	-18.80	20.00	0.50	20.50	30.00	-9.50

Note: EIRP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 4, Channel Bandwidth: 10MHz

Mode		TX channel 20000, 20175, 20350					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1715.0	-23.10	15.00	0.70	15.70	30.00	-14.30
2	1732.5	-23.10	15.30	0.60	15.90	30.00	-14.10
3	1750.0	-22.60	16.20	0.50	16.70	30.00	-13.30
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1715.0	-18.30	19.60	0.70	20.30	30.00	-9.70
2	1732.5	-18.40	19.90	0.60	20.50	30.00	-9.50
3	1750.0	-18.60	20.20	0.50	**20.70**	30.00	-9.30

Note: EIRP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 4, Channel Bandwidth: 15MHz

Mode		TX channel 20025, 20175, 20325					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1717.5	-22.70	15.40	0.70	16.10	30.00	-13.90
2	1732.5	-22.90	15.50	0.60	16.10	30.00	-13.90
3	1747.5	-23.20	15.50	0.50	16.00	30.00	-14.00
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1717.5	-18.40	19.60	0.70	20.30	30.00	-9.70
2	1732.5	-18.30	20.00	0.60	**20.60**	30.00	-9.40
3	1747.5	-18.60	20.10	0.50	**20.60**	30.00	-9.40

Note: EIRP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 4, Channel Bandwidth: 20MHz

Mode		TX channel 20050, 20175, 20300					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1720.0	-22.80	15.40	0.70	16.10	30.00	-13.90
2	1732.5	-22.60	15.80	0.60	16.40	30.00	-13.60
3	1745.0	-22.60	16.10	0.50	16.60	30.00	-13.40
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1720.0	-18.30	19.70	0.70	20.40	30.00	-9.60
2	1732.5	-18.40	19.90	0.60	20.50	30.00	-9.50
3	1745.0	-18.40	20.30	0.50	**20.80**	30.00	-9.20

Note: EIRP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 12, Channel Bandwidth: 1.4MHz

MODE		TX channel 23017, 23095, 23173					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	699.7	-10.30	14.20	3.50	17.70	34.80	-17.10
2	707.5	-9.90	14.90	3.50	18.40	34.80	-16.40
3	715.3	-9.80	15.20	3.50	18.70	34.80	-16.10
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm))	Limit (dBm)	Margin (dB)
1	699.7	-12.70	14.80	3.50	18.30	34.80	-16.50
2	707.5	-13.10	14.60	3.50	18.10	34.80	-16.70
3	715.3	-12.10	15.50	3.50	**19.00**	34.80	-15.80

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 12, Channel Bandwidth: 3MHz

MODE		TX channel 23025, 23095, 23165					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	700.5	-9.60	14.90	3.50	18.40	34.80	-16.40
2	707.5	-9.90	14.90	3.50	18.40	34.80	-16.40
3	714.5	-9.30	15.70	3.50	**19.20**	34.80	-15.60
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	700.5	-13.00	14.60	3.50	18.10	34.80	-16.70
2	707.5	-12.40	15.40	3.50	18.90	34.80	-15.90
3	714.5	-12.00	15.60	3.50	19.10	34.80	-15.70

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 12, Channel Bandwidth: 5MHz

MODE		TX channel 23035, 23095, 23155					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	701.5	-9.80	14.80	3.40	18.20	34.80	-16.60
2	707.5	-10.10	14.60	3.50	18.10	34.80	-16.70
3	713.5	-9.40	15.60	3.50	**19.10**	34.80	-15.70
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	701.5	-12.60	15.10	3.40	18.50	34.80	-16.30
2	707.5	-12.90	14.90	3.50	18.40	34.80	-16.40
3	713.5	-12.40	15.40	3.50	18.90	34.80	-15.90

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 12, Channel Bandwidth: 10MHz

MODE		TX channel 23060, 23095, 23130					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	704.0	-9.80	14.90	3.50	18.40	34.80	-16.40
2	707.5	-9.10	15.60	3.50	**19.10**	34.80	-15.70
3	711.0	-9.80	15.20	3.50	18.70	34.80	-16.10
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	704.0	-12.30	15.30	3.50	18.80	34.80	-16.00
2	707.5	-12.20	15.50	3.50	19.00	34.80	-15.80
3	711.0	-12.20	15.40	3.50	18.90	34.80	-15.90

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

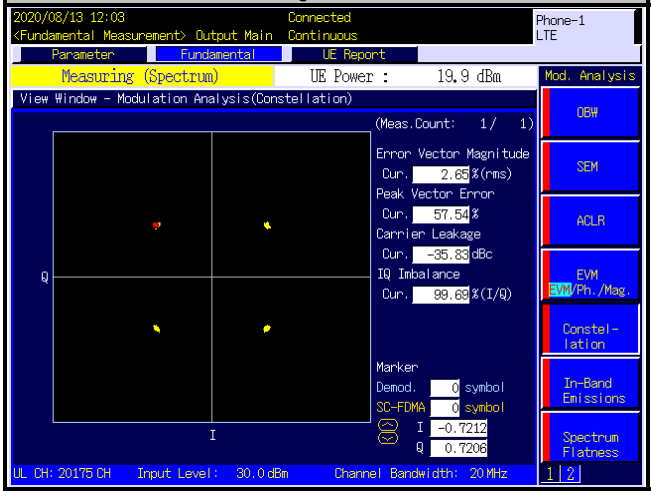
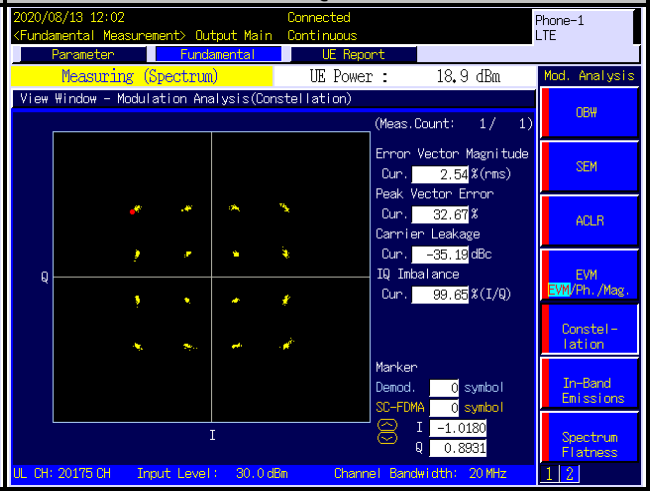
N/A

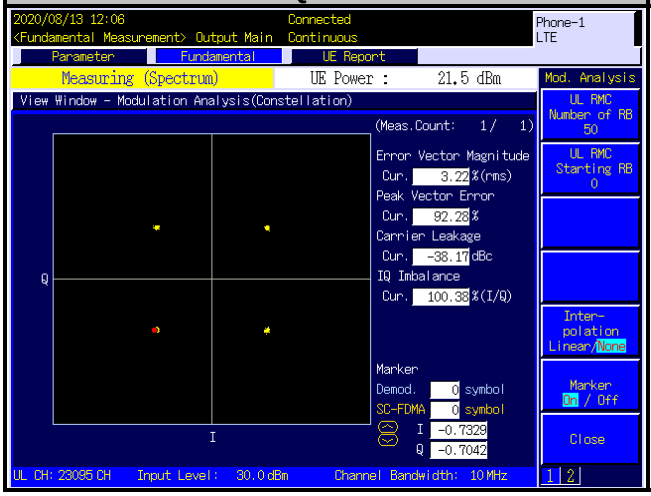
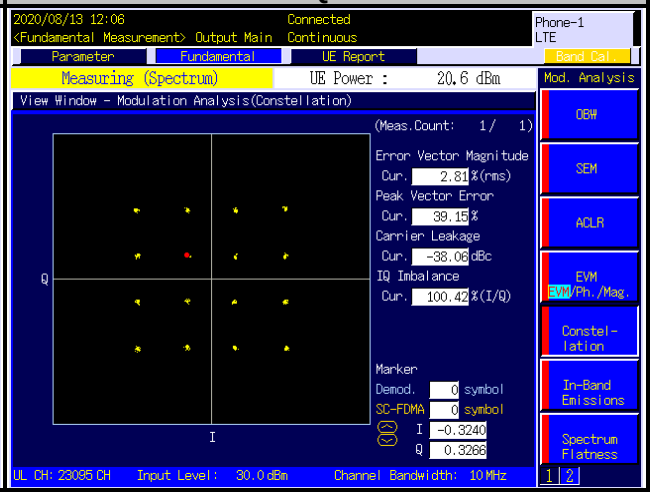
4.2.2 Test Setup

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

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

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

4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

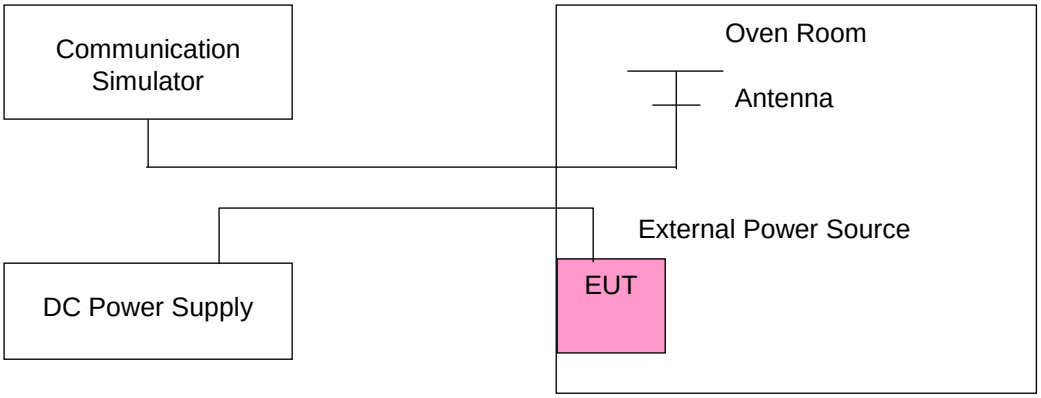
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

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

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4			
	Channel Bandwidth: 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
7.2	1710.700004	0.002	1754.300002	0.001
6.12	1710.700003	0.002	1754.300004	0.002
8.28	1710.700004	0.002	1754.300002	0.001

Note: The applicant defined the normal working voltage of the battery is from 6.12 Vdc to 8.28 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 4			
	Channel Bandwidth: 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1710.700002	0.001	1754.300004	0.002
-20	1710.700004	0.002	1754.300002	0.001
-10	1710.700004	0.002	1754.300001	0.001
0	1710.700002	0.001	1754.300001	0.001
10	1710.700003	0.002	1754.300004	0.002
20	1710.699996	-0.002	1754.299998	-0.001
30	1710.699998	-0.001	1754.299998	-0.001
40	1710.699996	-0.002	1754.299998	-0.001
50	1710.699996	-0.002	1754.299997	-0.002

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4			
	Channel Bandwidth: 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
7.2	1711.500003	0.001	1753.500002	0.001
6.12	1711.500003	0.002	1753.500003	0.002
8.28	1711.500002	0.001	1753.500001	0.001

Note: The applicant defined the normal working voltage of the battery is from 6.12 Vdc to 8.28 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 4			
	Channel Bandwidth: 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1711.500004	0.002	1753.500002	0.001
-20	1711.500002	0.001	1753.500001	0.001
-10	1711.500004	0.002	1753.500002	0.001
0	1711.500001	0.001	1753.500003	0.001
10	1711.500002	0.001	1753.500003	0.002
20	1711.499997	-0.002	1753.499997	-0.002
30	1711.499999	-0.001	1753.499998	-0.001
40	1711.499996	-0.002	1753.499996	-0.002
50	1711.499996	-0.002	1753.499998	-0.001

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
7.2	1712.500001	0.001	1752.500003	0.001
6.12	1712.500002	0.001	1752.500003	0.002
8.28	1712.500002	0.001	1752.500002	0.001

Note: The applicant defined the normal working voltage of the battery is from 6.12 Vdc to 8.28 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 4			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1712.500002	0.001	1752.500004	0.002
-20	1712.500003	0.002	1752.500002	0.001
-10	1712.500002	0.001	1752.500004	0.002
0	1712.500003	0.002	1752.500003	0.002
10	1712.500003	0.002	1752.500001	0.001
20	1712.499996	-0.002	1752.499997	-0.002
30	1712.499997	-0.002	1752.499998	-0.001
40	1712.499997	-0.002	1752.499997	-0.002
50	1712.499999	-0.001	1752.499997	-0.002

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
7.2	1715.000004	0.002	1750.000004	0.002
6.12	1715.000004	0.002	1750.000002	0.001
8.28	1715.000002	0.001	1750.000004	0.002

Note: The applicant defined the normal working voltage of the battery is from 6.12 Vdc to 8.28 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 4			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1715.000004	0.002	1750.000002	0.001
-20	1715.000004	0.002	1750.000003	0.002
-10	1715.000001	0.001	1750.000003	0.002
0	1715.000002	0.001	1750.000002	0.001
10	1715.000003	0.002	1750.000003	0.002
20	1714.999997	-0.002	1749.999998	-0.001
30	1714.999996	-0.002	1749.999998	-0.001
40	1714.999996	-0.002	1749.999997	-0.001
50	1714.999997	-0.002	1749.999997	-0.002

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4			
	Channel Bandwidth: 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
7.2	1717.500003	0.002	1747.500004	0.002
6.12	1717.500004	0.002	1747.500003	0.002
8.28	1717.500003	0.002	1747.500003	0.002

Note: The applicant defined the normal working voltage of the battery is from 6.12 Vdc to 8.28 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 4			
	Channel Bandwidth: 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1717.500002	0.001	1747.500004	0.002
-20	1717.500002	0.001	1747.500004	0.002
-10	1717.500004	0.002	1747.500001	0.001
0	1717.500001	0.001	1747.500003	0.002
10	1717.500003	0.001	1747.500003	0.002
20	1717.499998	-0.001	1747.499997	-0.002
30	1717.499998	-0.001	1747.499998	-0.001
40	1717.499997	-0.002	1747.499998	-0.001
50	1717.499998	-0.001	1747.499997	-0.002

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4			
	Channel Bandwidth: 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
7.2	1720.000001	0.001	1745.000004	0.002
6.12	1720.000003	0.002	1745.000003	0.002
8.28	1720.000002	0.001	1745.000003	0.002

Note: The applicant defined the normal working voltage of the battery is from 6.12 Vdc to 8.28 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 4			
	Channel Bandwidth: 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1720.000002	0.001	1745.000002	0.001
-20	1720.000001	0.001	1745.000002	0.001
-10	1720.000004	0.002	1745.000003	0.002
0	1720.000002	0.001	1745.000003	0.002
10	1720.000002	0.001	1745.000003	0.002
20	1719.999997	-0.002	1744.999997	-0.002
30	1719.999996	-0.002	1744.999998	-0.001
40	1719.999997	-0.002	1744.999998	-0.001
50	1719.999996	-0.002	1744.999998	-0.001

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 12			
	Channel Bandwidth: 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
7.2	699.700002	0.003	715.300003	0.004
6.12	699.700002	0.003	715.300004	0.005
8.28	699.700003	0.004	715.300001	0.001

Note: The applicant defined the normal working voltage of the battery is from 6.12 Vdc to 8.28 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 12			
	Channel Bandwidth: 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	699.700001	0.002	715.300003	0.005
-20	699.700003	0.004	715.300003	0.005
-10	699.700002	0.003	715.300004	0.005
0	699.700003	0.004	715.300004	0.005
10	699.700004	0.006	715.300004	0.005
20	699.699997	-0.005	715.299998	-0.003
30	699.699998	-0.004	715.299999	-0.002
40	699.699998	-0.003	715.299996	-0.005
50	699.699999	-0.002	715.299996	-0.005

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 12			
	Channel Bandwidth: 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
7.2	700.500003	0.004	714.500004	0.005
6.12	700.500002	0.003	714.500001	0.002
8.28	700.500004	0.005	714.500004	0.005

Note: The applicant defined the normal working voltage of the battery is from 6.12 Vdc to 8.28 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 12			
	Channel Bandwidth: 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	700.500001	0.001	714.500004	0.006
-20	700.500004	0.005	714.500001	0.002
-10	700.500004	0.005	714.500003	0.004
0	700.500003	0.004	714.500003	0.004
10	700.500002	0.003	714.500003	0.004
20	700.499996	-0.005	714.499998	-0.003
30	700.499996	-0.005	714.499999	-0.001
40	700.499998	-0.002	714.499997	-0.004
50	700.499997	-0.004	714.499997	-0.004

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 12			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
7.2	701.500002	0.003	713.500004	0.005
6.12	701.500001	0.001	713.500002	0.003
8.28	701.500002	0.003	713.500001	0.002

Note: The applicant defined the normal working voltage of the battery is from 6.12 Vdc to 8.28 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 12			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	701.500002	0.003	713.500003	0.005
-20	701.500003	0.004	713.500001	0.002
-10	701.500002	0.003	713.500003	0.004
0	701.500004	0.005	713.500002	0.002
10	701.500003	0.004	713.500003	0.004
20	701.499996	-0.005	713.499996	-0.005
30	701.499997	-0.004	713.499997	-0.005
40	701.499998	-0.004	713.499996	-0.005
50	701.499999	-0.002	713.499996	-0.006

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 12			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
7.2	704.000002	0.003	711.000003	0.004
6.12	704.000003	0.004	711.000003	0.004
8.28	704.000003	0.004	711.000003	0.005

Note: The applicant defined the normal working voltage of the battery is from 6.12 Vdc to 8.28 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 12			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	704.000002	0.003	711.000003	0.004
-20	704.000001	0.002	711.000003	0.004
-10	704.000002	0.003	711.000001	0.002
0	704.000002	0.003	711.000002	0.003
10	704.000003	0.004	711.000002	0.003
20	703.999997	-0.004	710.999999	-0.002
30	703.999999	-0.002	710.999997	-0.004
40	703.999998	-0.003	710.999998	-0.003
50	703.999997	-0.005	710.999997	-0.004

4.4 Occupied Bandwidth Measurement

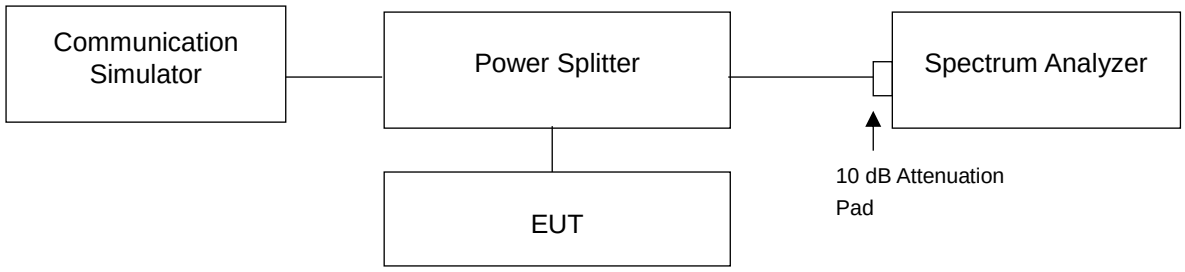
4.4.1 Limits of Occupied Bandwidth Measurement

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. Refer to ANSI C63.26 section 5.4.4. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth. For the 26dBc bandwidth measurement method, please refer to section 5.4.3 of ANSI C63.26.

4.4.3 Test Setup

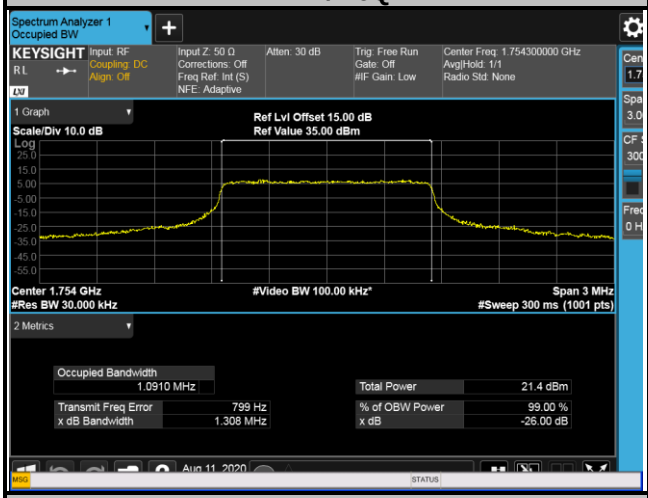


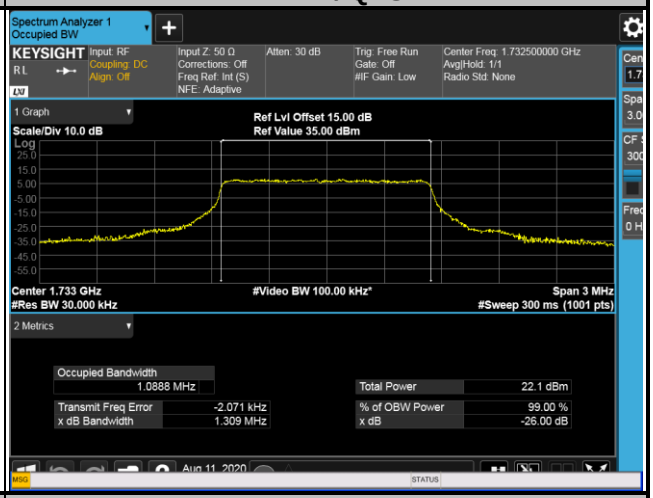
4.4.4 Test Result

LTE Band 4					
Channel Bandwidth: 1.4 MHz					
Channel	**Frequency (MHz)**	**99 % Occupied Bandwidth (MHz)**		**26 dB Bandwidth (MHz)**	
		QPSK	**16QAM**	**QPSK**	**16QAM**
19957	1710.7	1.0886	1.0907	1.285	1.286
20175	1732.5	1.0888	1.0898	1.309	1.280
20393	1754.3	1.0905	1.0910	1.305	1.308
Channel Bandwidth: 3 MHz					
Channel	**Frequency (MHz)**	**99 % Occupied Bandwidth (MHz)**		**26 dB Bandwidth (MHz)**	
		QPSK	**16QAM**	**QPSK**	**16QAM**
19965	1711.5	2.7024	2.6957	2.925	2.929
20175	1732.5	2.7002	2.6960	2.923	2.927
20385	1753.5	2.7020	2.6977	2.935	2.950

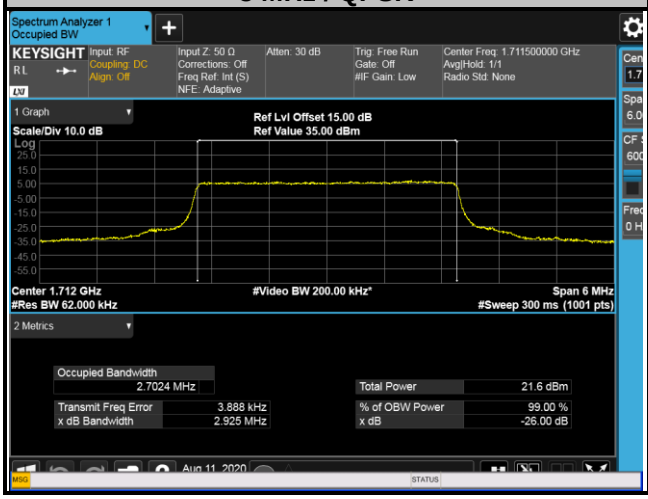
Spectrum Plot of Worst Value

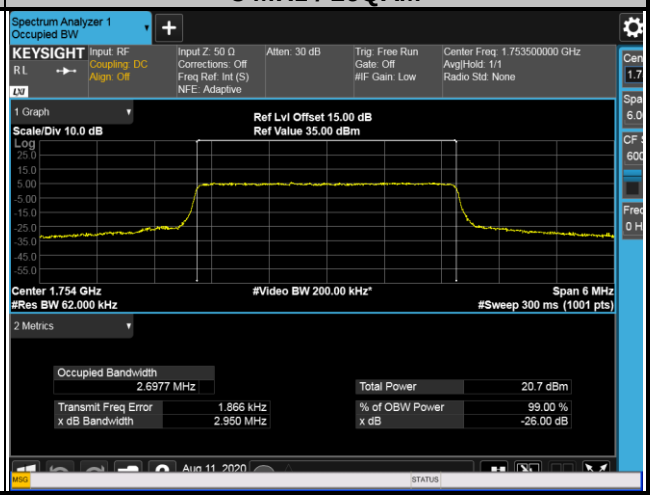
99 % Occupied Bandwidth	26 dB Bandwidth
1.4 MHz / 16QAM	**1.4 MHz / QPSK**





3 MHz / QPSK	3 MHz / 16QAM



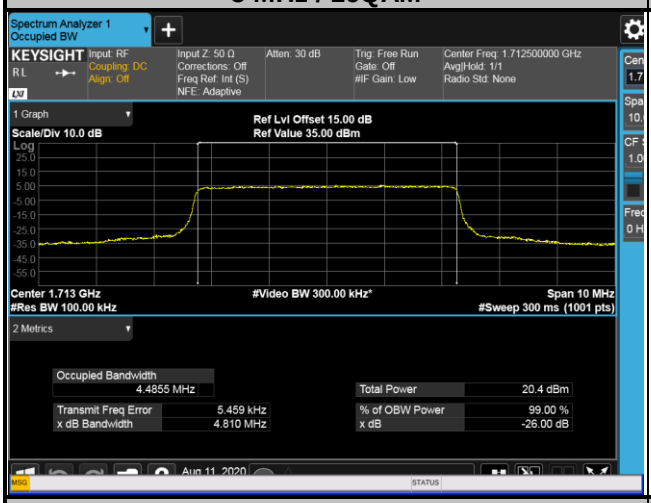


LTE Band 4					
Channel Bandwidth: 5 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
19975	1712.5	4.4845	4.4855	4.820	4.810
20175	1732.5	4.4821	4.4826	4.804	4.818
20375	1752.5	4.4850	4.4204	4.841	4.694
Channel Bandwidth: 10 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
20000	1715.0	8.9666	8.9731	9.519	9.548
20175	1732.5	8.9676	8.9684	9.553	9.551
20350	1750.0	8.9771	8.9786	9.560	9.551

Spectrum Plot of Worst Value

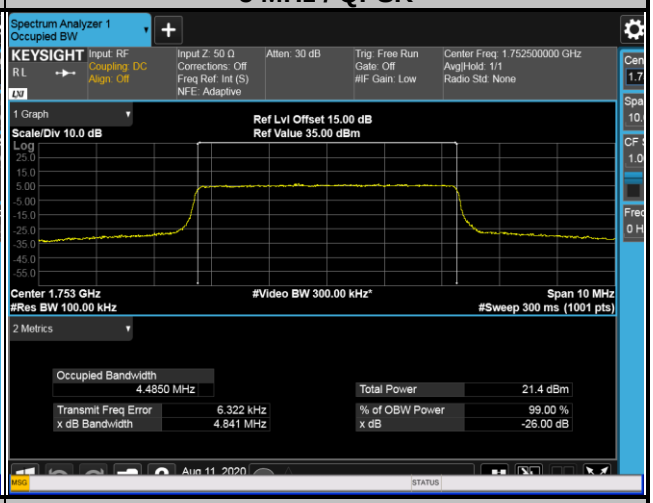
99 % Occupied Bandwidth

5 MHz / 16QAM

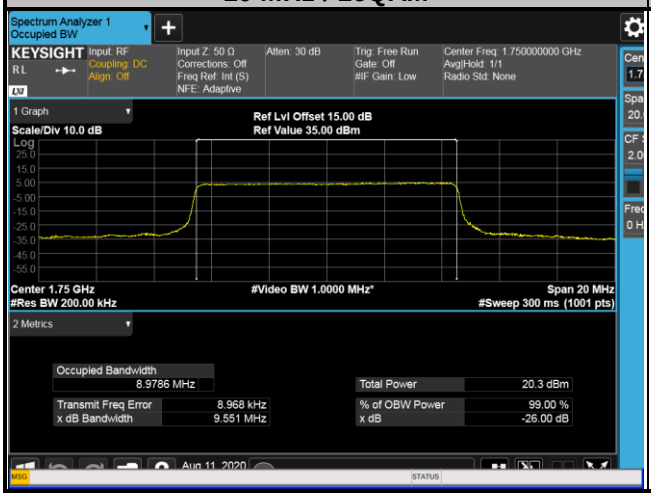


26 dB Bandwidth

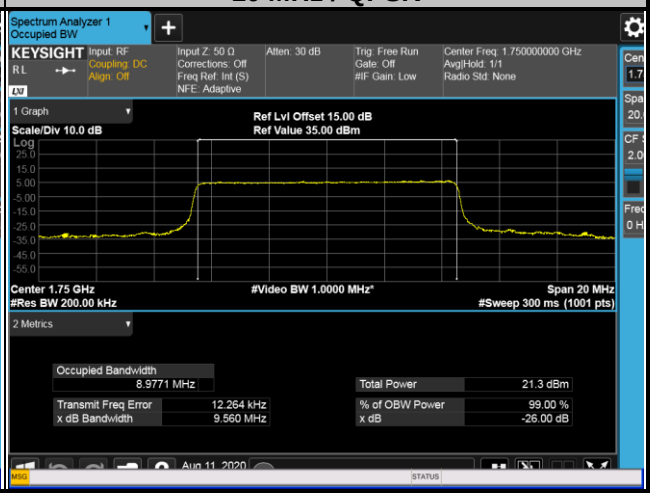
5 MHz / QPSK



10 MHz / 16QAM



10 MHz / QPSK

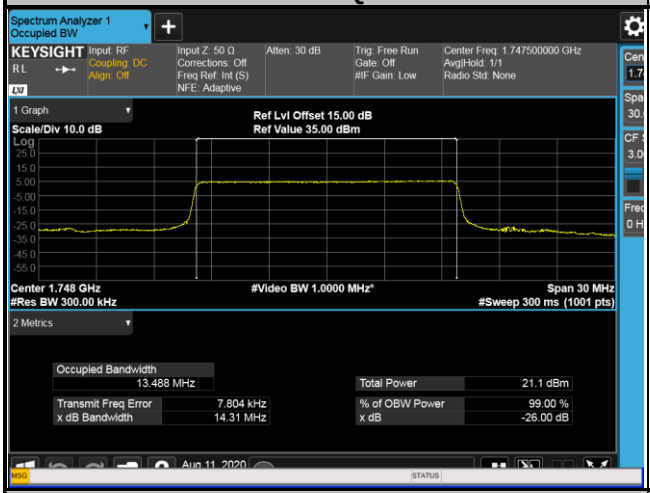


LTE Band 4					
Channel Bandwidth: 15 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
20025	1717.5	13.4494	13.4383	14.260	14.318
20175	1732.5	13.4545	13.4430	14.307	14.328
20325	1747.5	13.4878	13.4805	14.314	14.363
Channel Bandwidth: 20 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
20050	1720.0	17.8917	17.9132	19.021	19.006
20175	1732.5	17.9123	17.9297	19.089	19.070
20300	1745.0	17.9824	18.0116	19.121	19.113

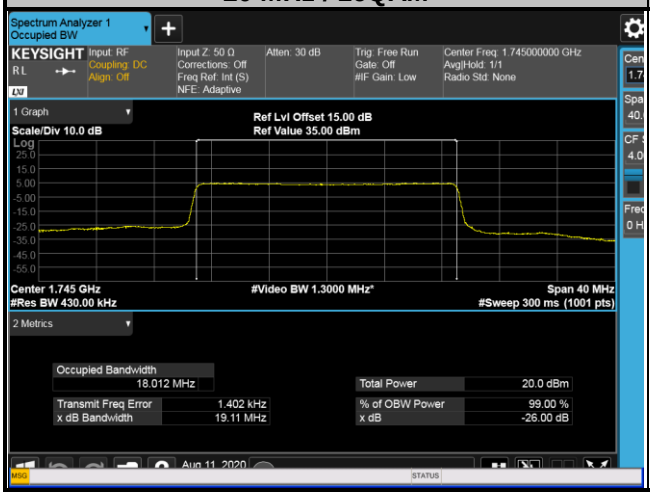
Spectrum Plot of Worst Value

99 % Occupied Bandwidth

15 MHz / QPSK

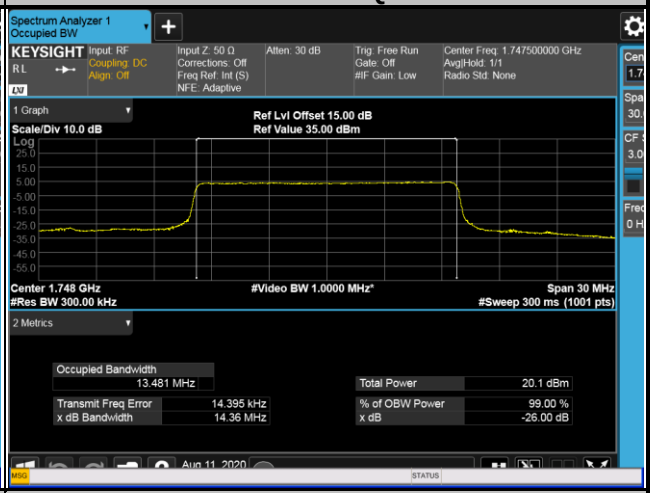


20 MHz / 16QAM

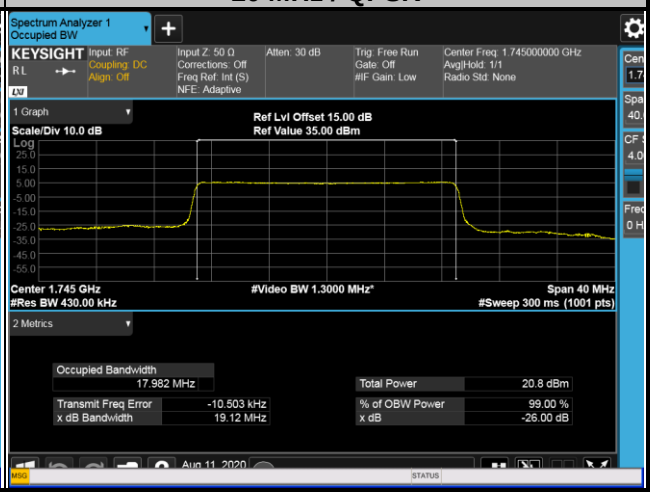


26 dB Bandwidth

15 MHz / 16QAM



20 MHz / QPSK

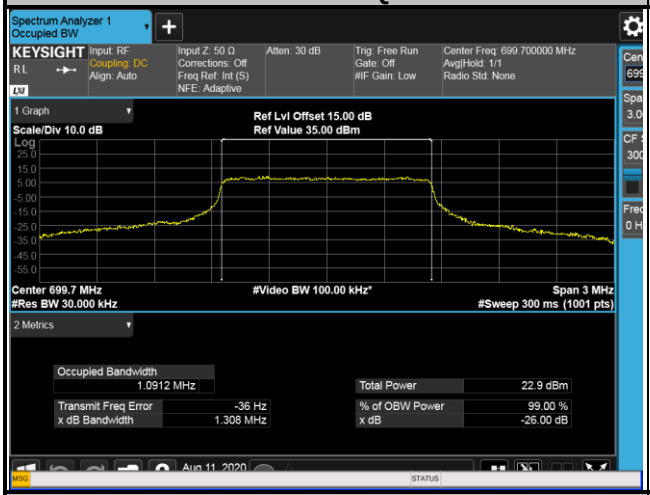


LTE Band 12					
Channel Bandwidth: 1.4 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
23017	699.7	1.0905	1.0912	1.285	1.308
23095	707.5	1.0893	1.0904	1.298	1.284
23173	715.3	1.0886	1.0894	1.303	1.282
Channel Bandwidth: 3 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
23025	700.5	2.7034	2.6997	2.935	2.950
23095	707.5	2.7000	2.6966	2.931	2.934
23165	714.5	2.7008	2.6971	2.907	2.928

Spectrum Plot of Worst Value

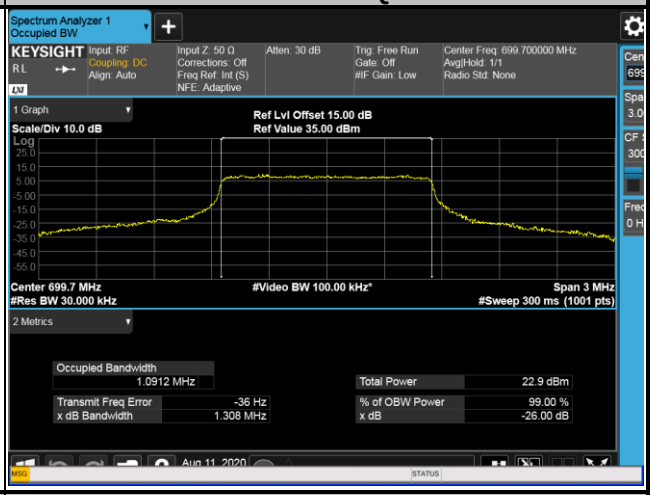
99 % Occupied Bandwidth

1.4 MHz / 16QAM

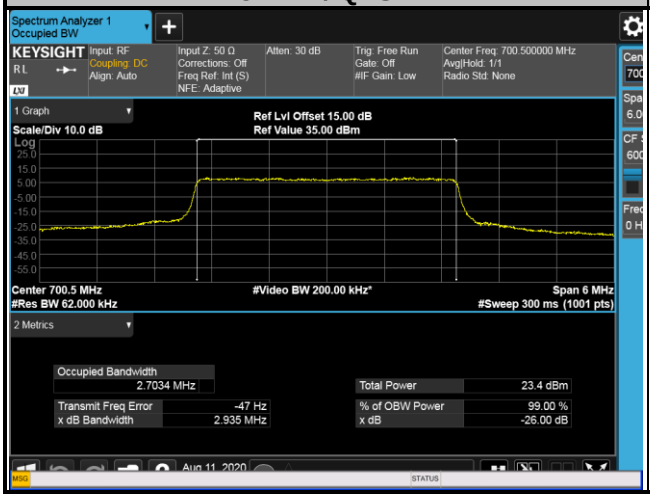


26 dB Bandwidth

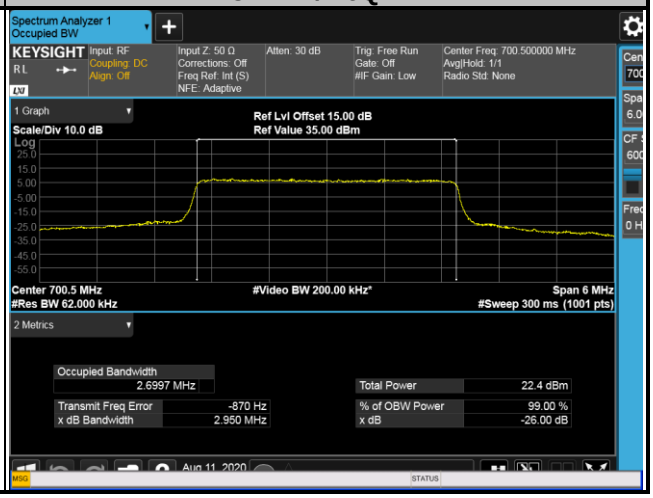
1.4 MHz / 16QAM



3 MHz / QPSK



3 MHz / 16QAM

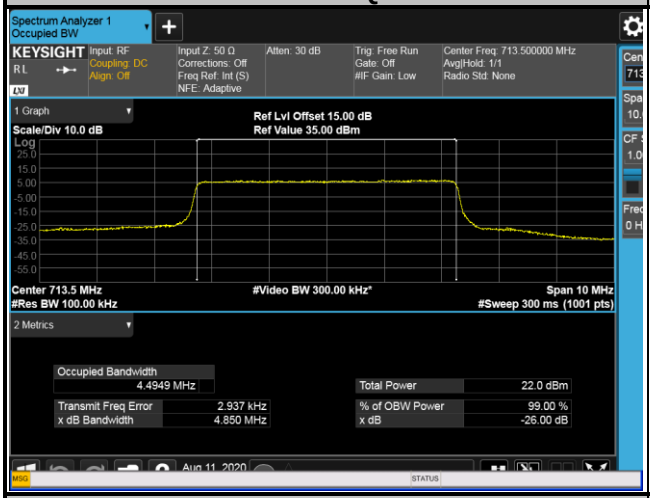


LTE Band 12					
Channel Bandwidth: 5 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
23035	701.5	4.4899	4.4902	4.870	4.862
23095	707.5	4.4777	4.4815	4.818	4.805
23155	713.5	4.4907	4.4949	4.850	4.850
Channel Bandwidth: 10 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
23060	704.0	8.9814	8.9822	9.539	9.577
23095	707.5	8.9394	8.9441	9.517	9.528
23130	711.0	8.9892	8.9939	9.558	9.573

Spectrum Plot of Worst Value

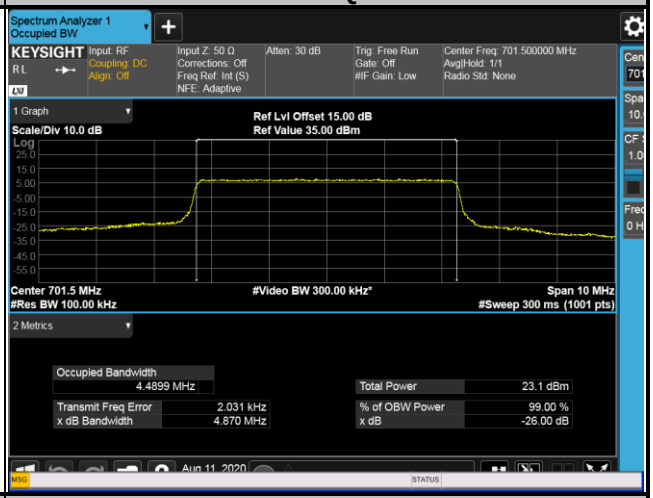
99 % Occupied Bandwidth

5 MHz / 16QAM

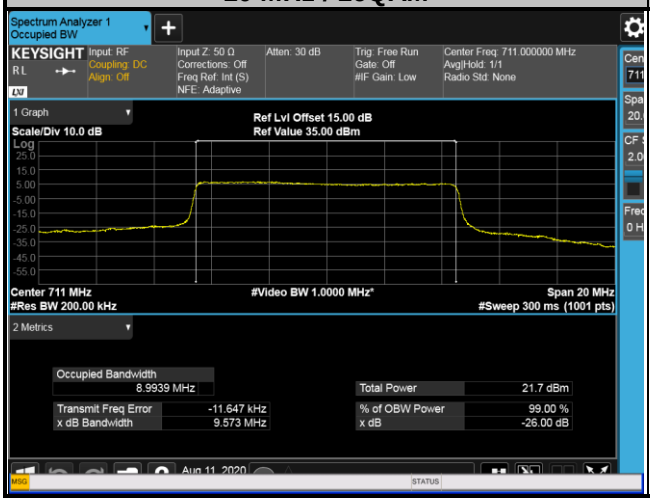


26 dB Bandwidth

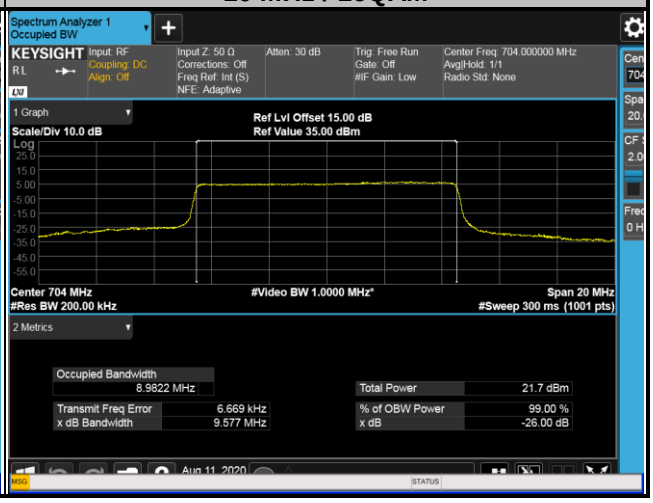
5 MHz / QPSK



10 MHz / 16QAM



10 MHz / 16QAM



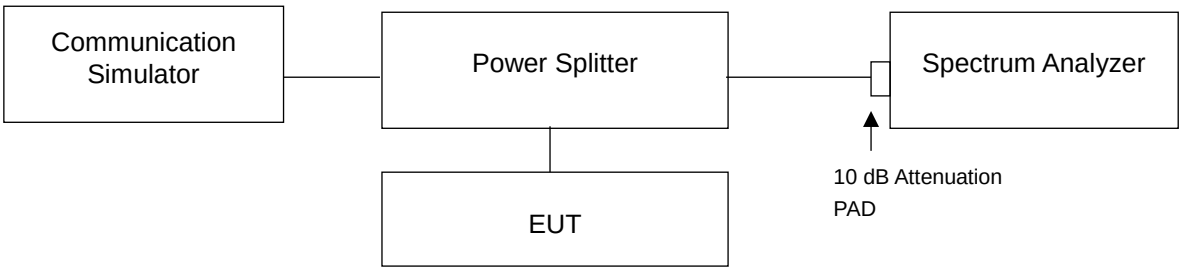
4.5 Band Edge Measurement

4.5.1 Limits of Band Edge Measurement

For operations in the 698-787 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater.
However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

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

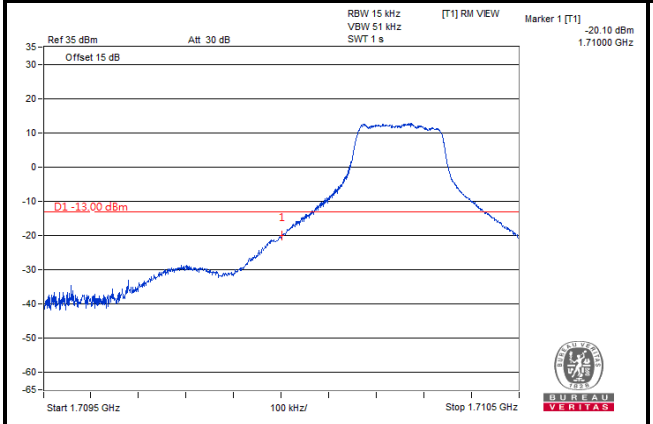
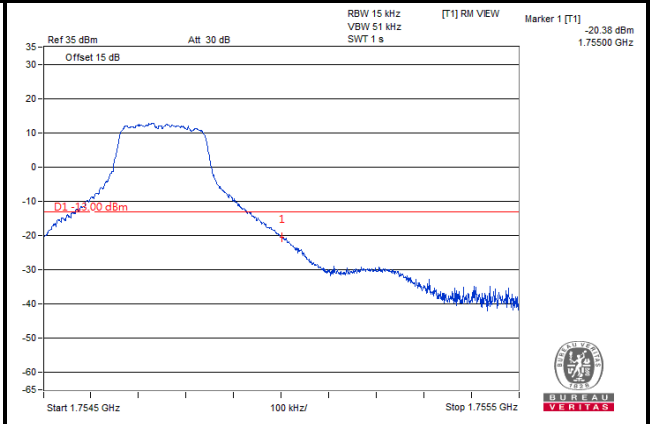
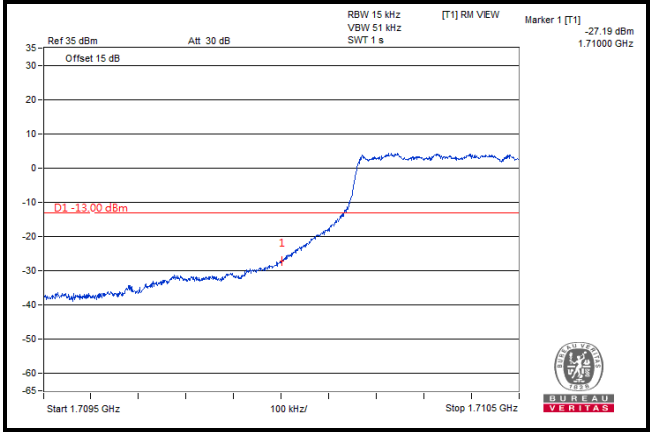
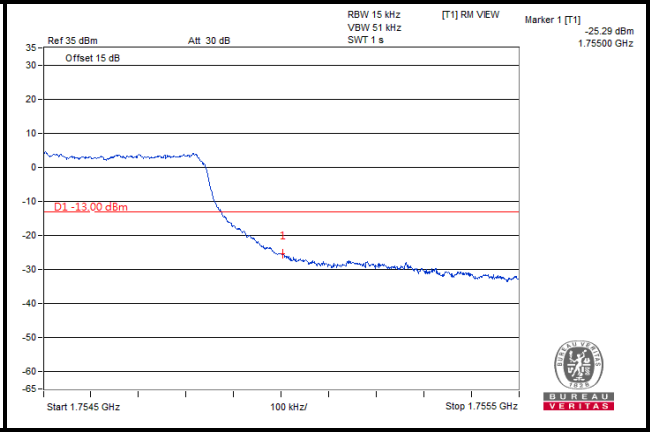
4.5.2 Test Setup

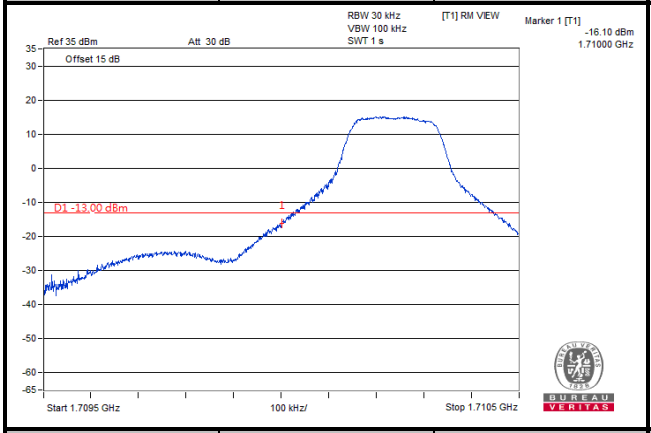
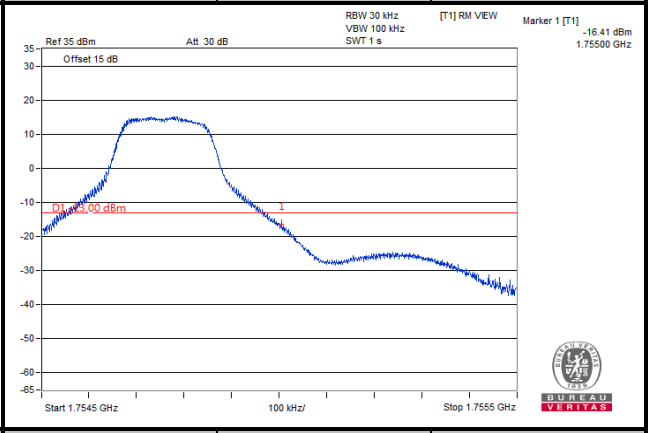
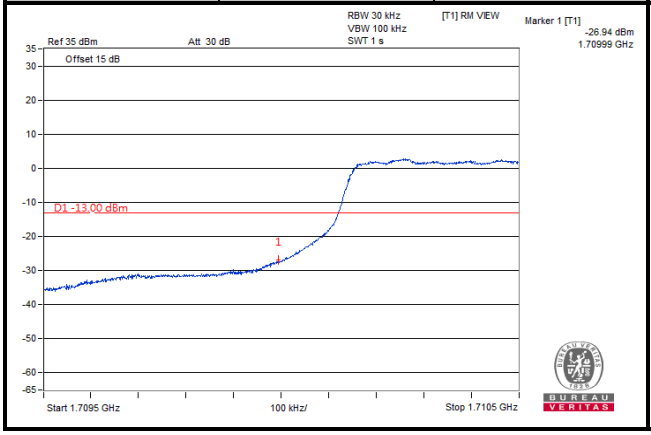
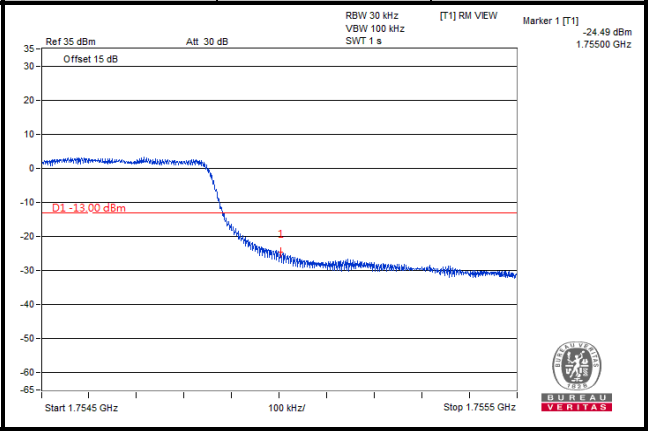


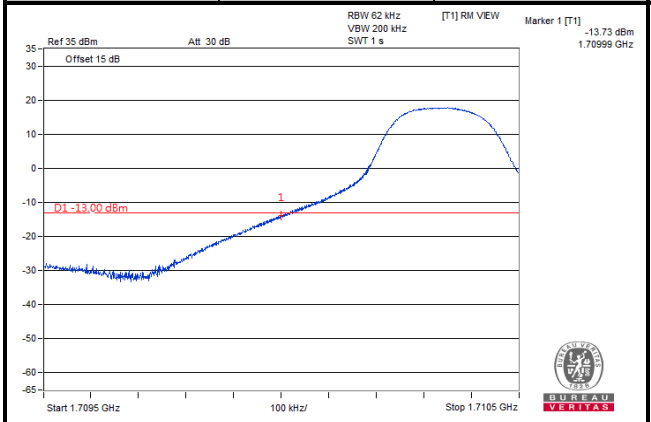
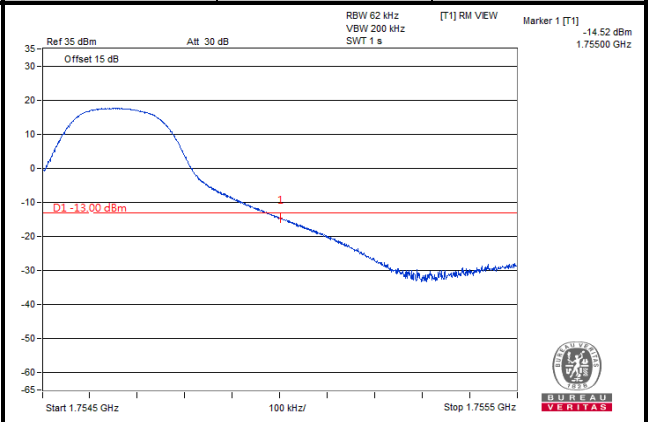
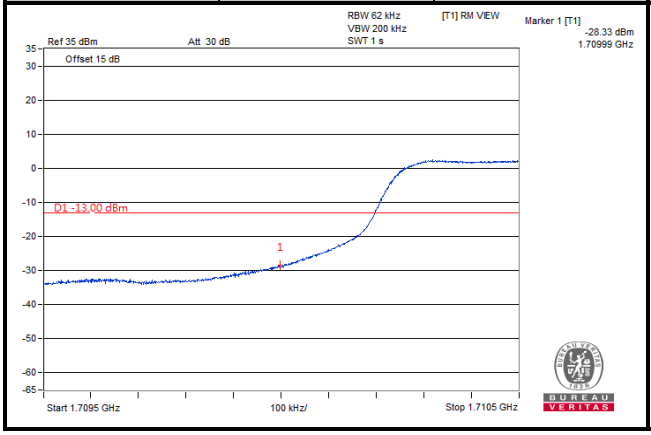
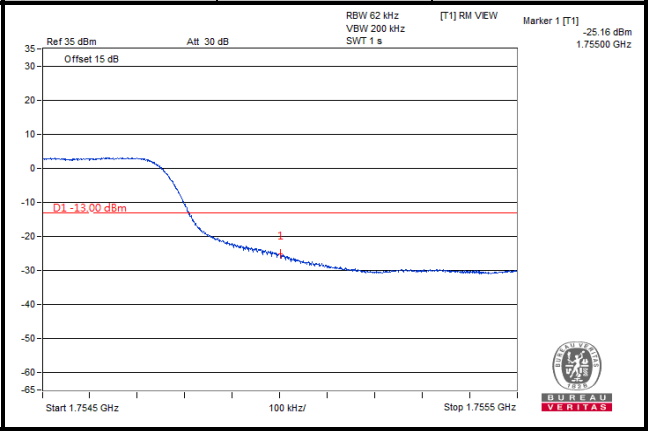
4.5.3 Test Procedures

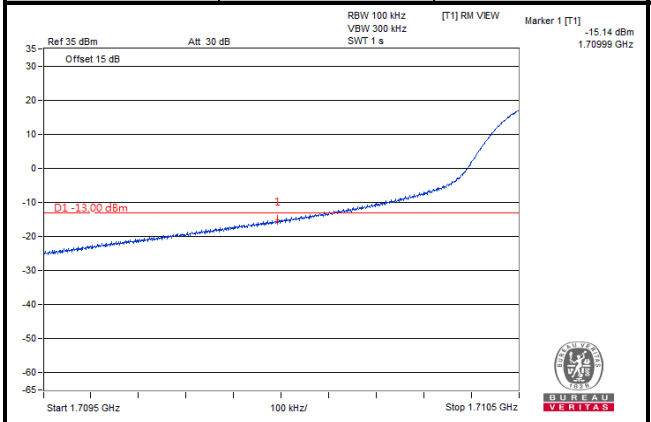
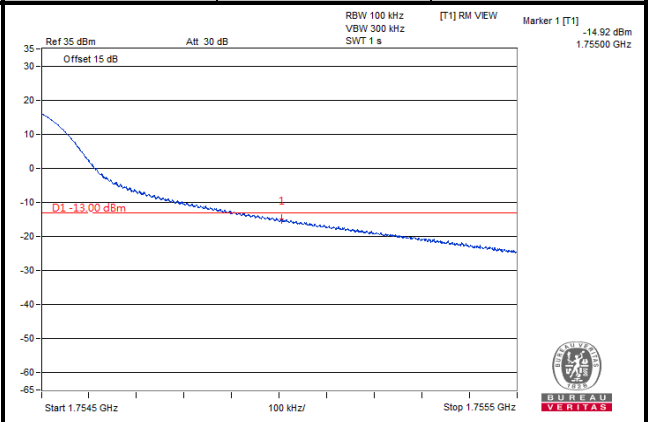
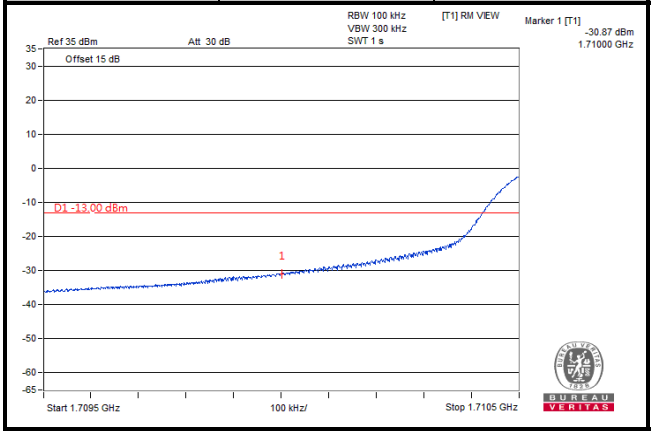
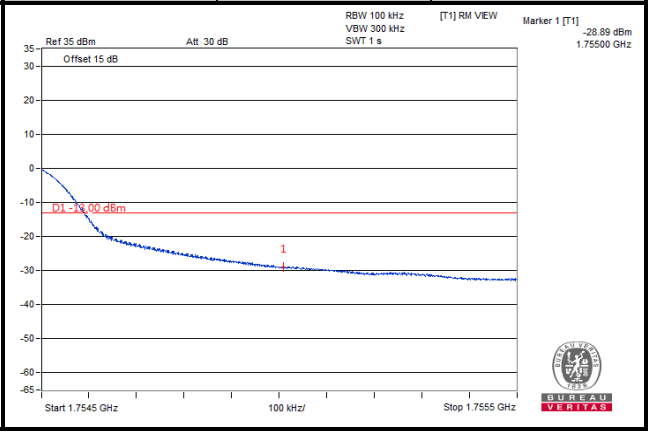
a. All measurements were done at low and high operational frequency range.
b. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 15 kHz or 30 kHz and VB of the spectrum is 51 kHz or 100 kHz (LTE Bandwidth 1.4 MHz).
c. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 30 kHz and VB of the spectrum is 100 kHz (LTE Bandwidth 3 MHz).
d. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 62 kHz or 51 kHz and VB of the spectrum is 200 kHz or 160 kHz (LTE Bandwidth 5 MHz).
e. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 100 kHz and VB of the spectrum is 300 kHz (LTE Bandwidth 10 MHz).
f. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 150 kHz and VB of the spectrum is 470 kHz (LTE Bandwidth 15 MHz).
g. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 200 kHz and VB of the spectrum is 1 MHz (LTE Bandwidth 20 MHz).
h. Record the max. trace plot into the test report.

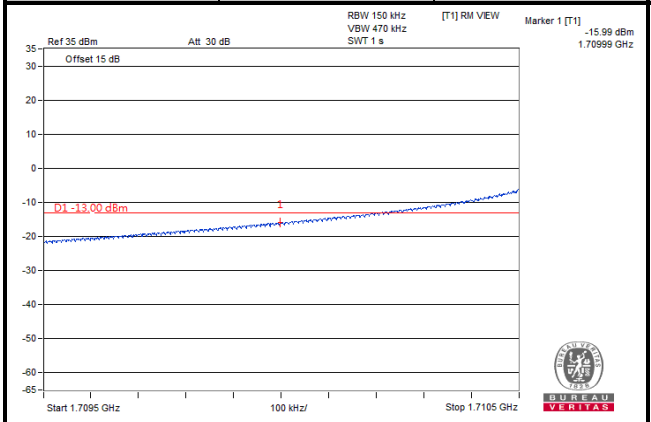
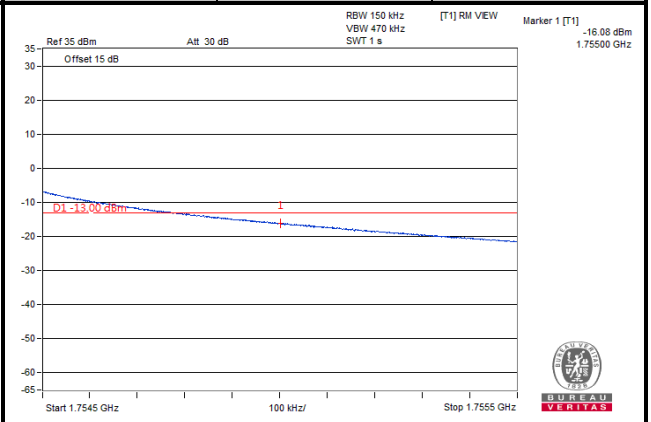
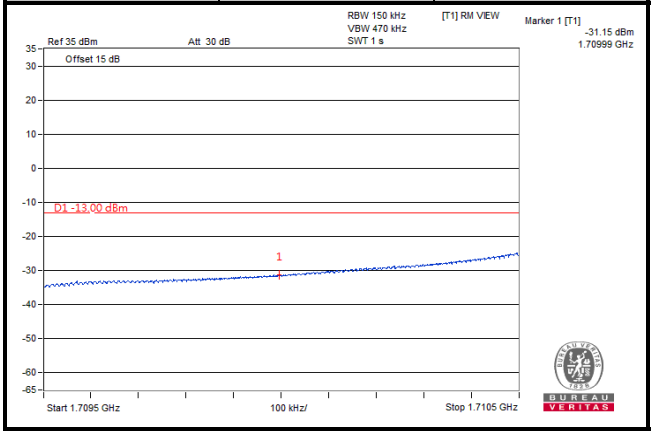
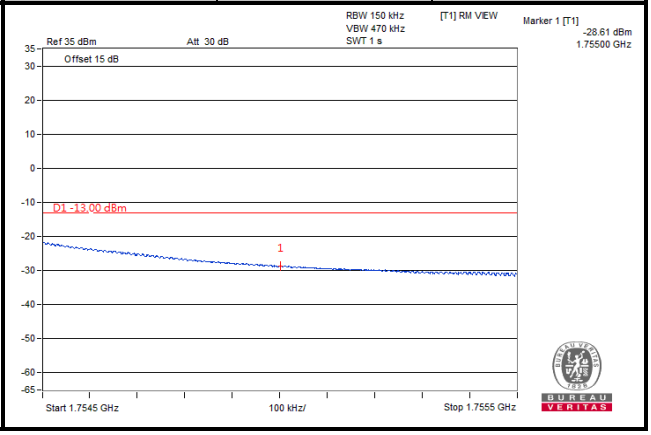
4.5.4 Test Results

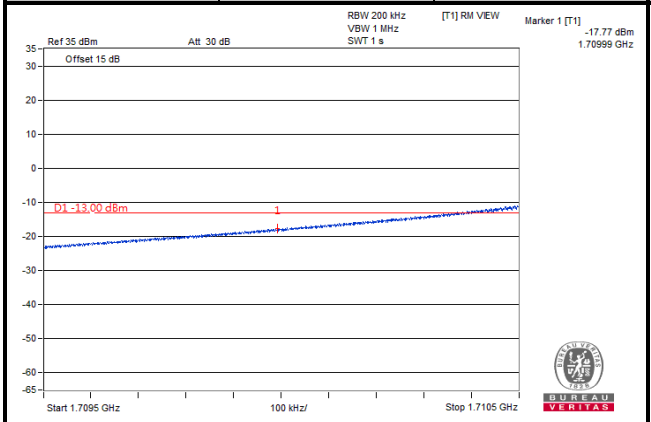
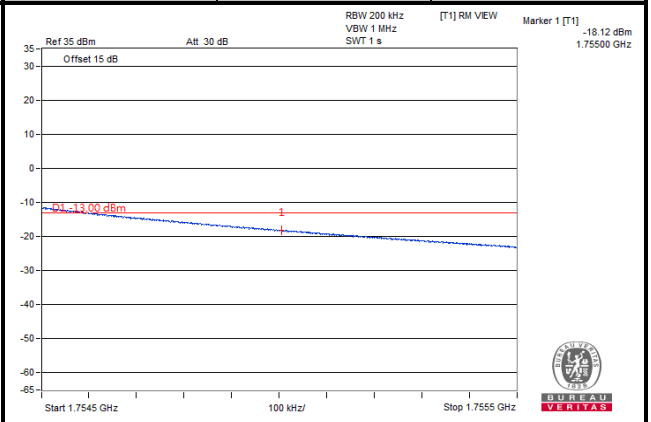
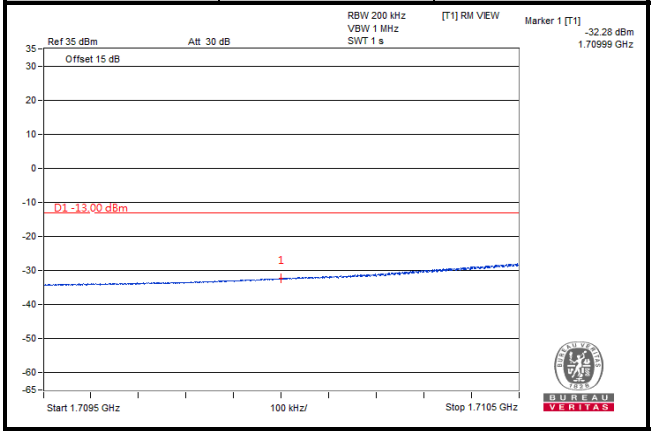
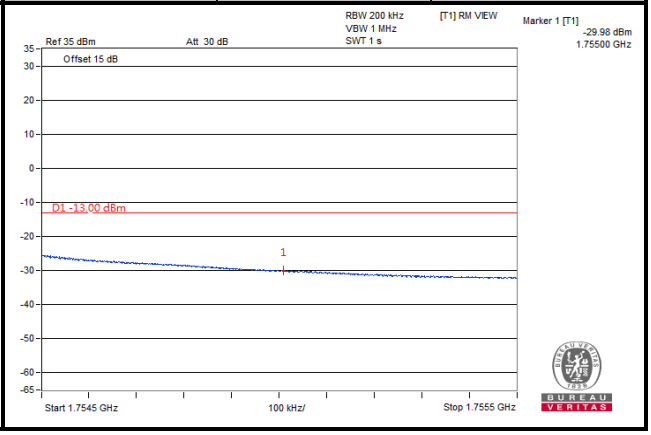
LTE Band 4					
Channel Bandwidth: 1.4 MHz					
Channel	19957	1 RB	Channel	20393	1 RB
					
Channel	19957	6 RB	Channel	20393	6 RB
					

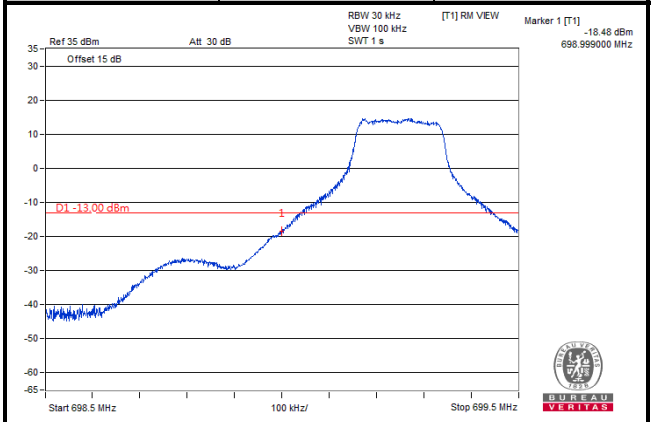
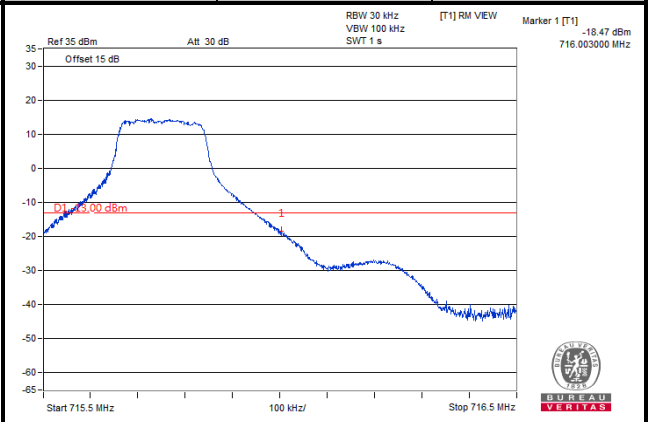
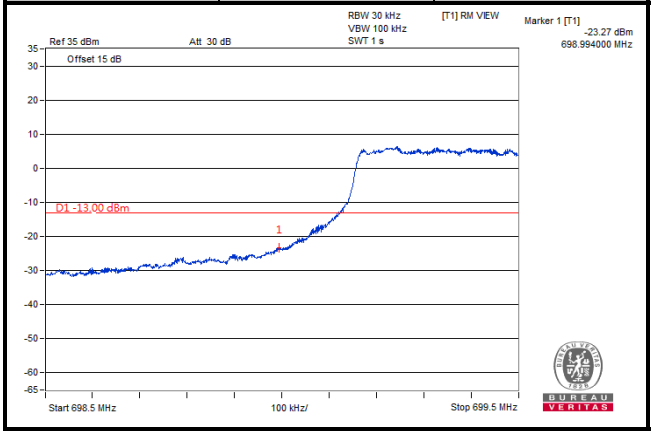
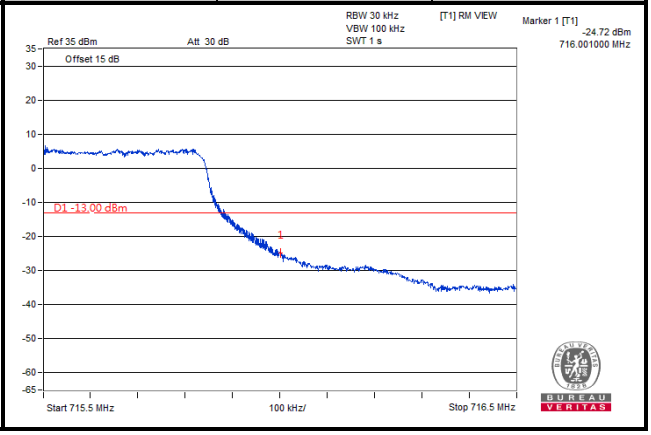
LTE Band 4					
Channel Bandwidth: 3 MHz					
Channel	19965	1 RB	Channel	20385	1 RB
					
Channel	19965	15 RB	Channel	20385	15 RB
					

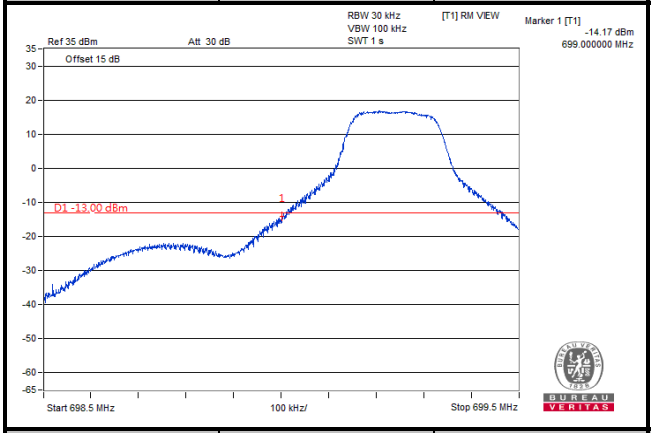
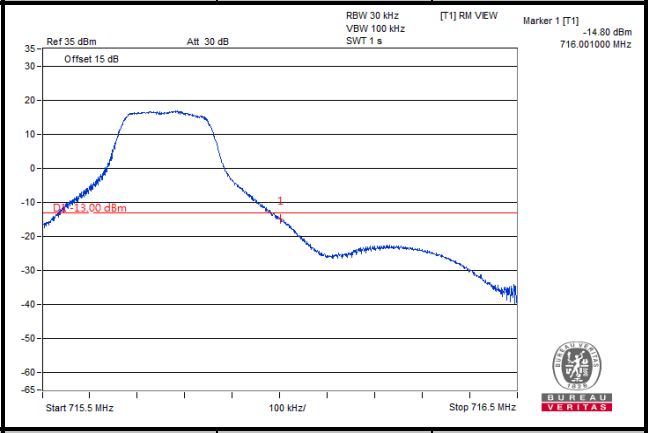
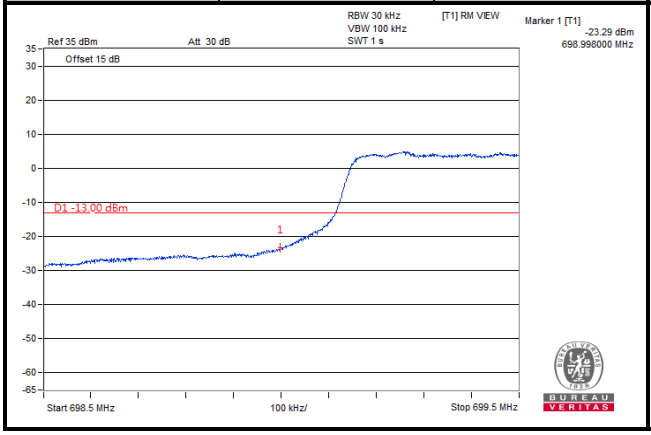
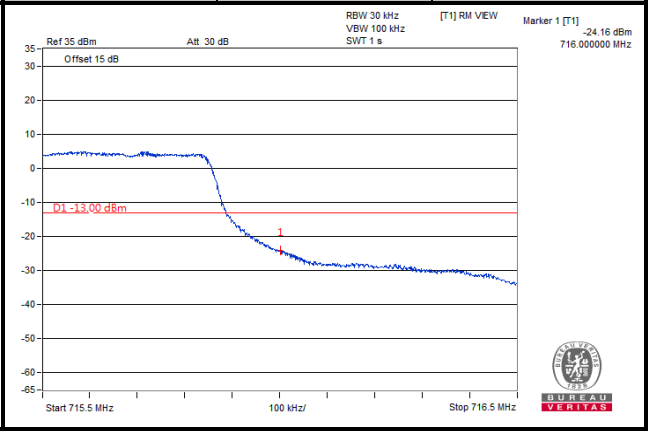
LTE Band 4					
Channel Bandwidth: 5 MHz					
Channel	19975	1 RB	Channel	20375	1 RB
					
Channel	19975	25 RB	Channel	20375	25 RB
					

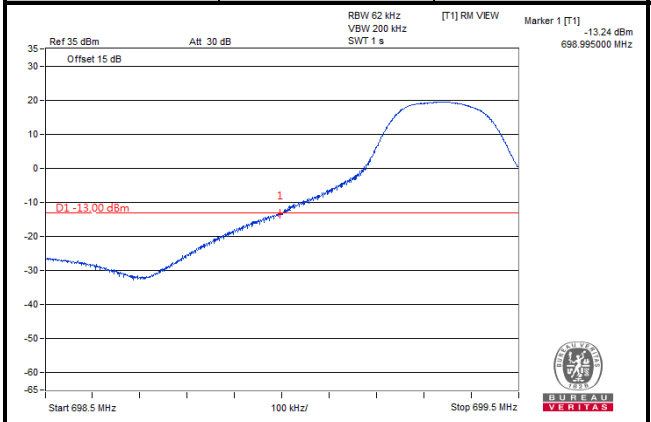
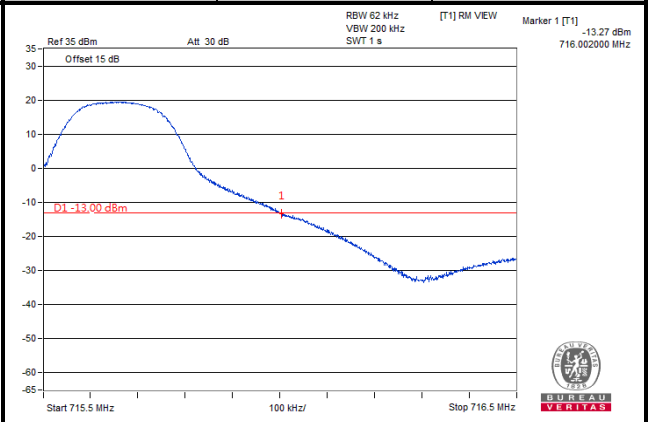
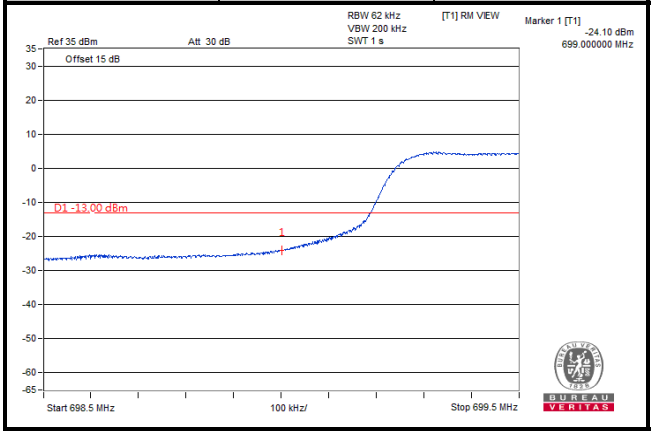
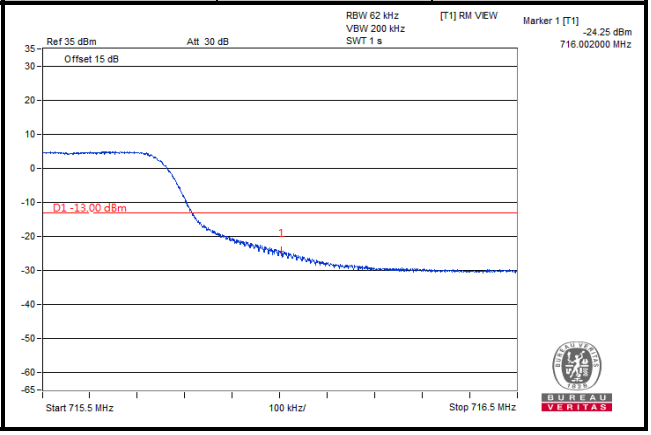
LTE Band 4					
Channel Bandwidth: 10 MHz					
Channel	20000	1 RB	Channel	20350	1 RB
					
Channel	20000	50 RB	Channel	20350	50 RB
					

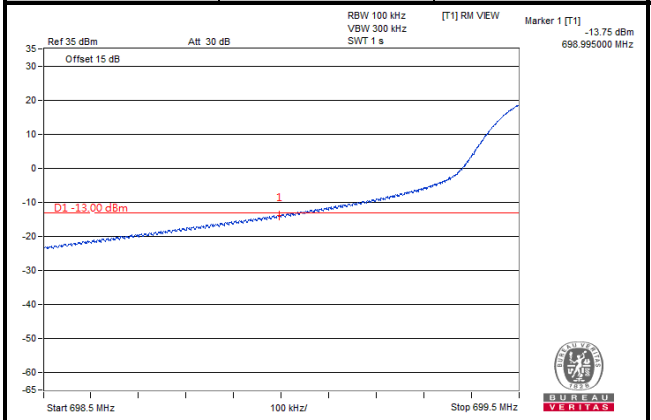
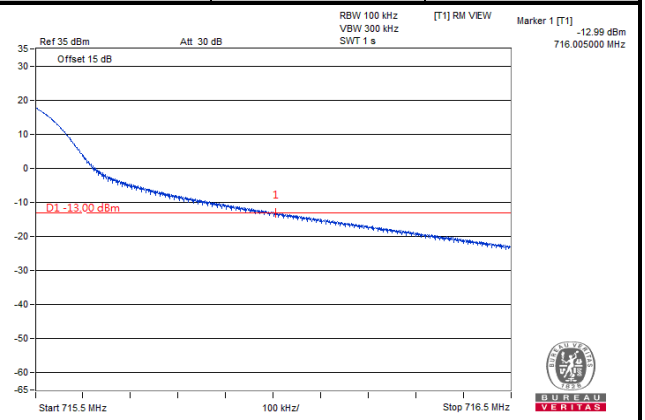
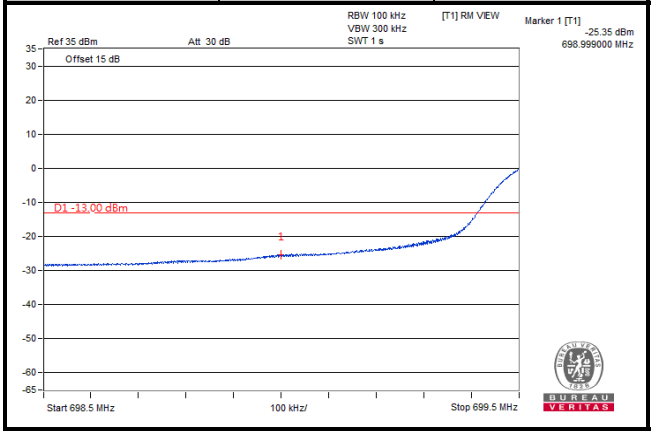
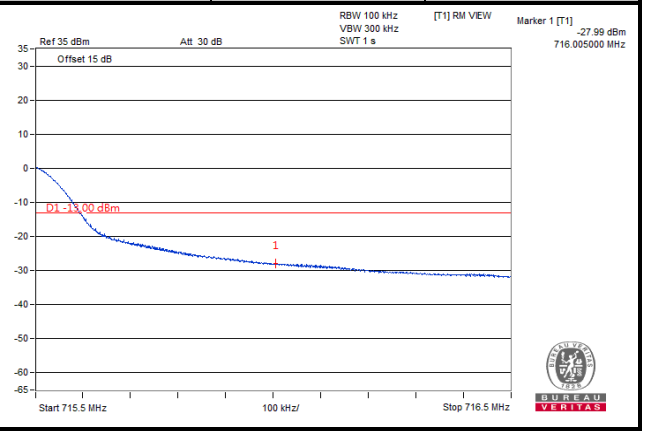
LTE Band 4					
Channel Bandwidth: 15 MHz					
Channel	20025	1 RB	Channel	20325	1 RB
					
Channel	20025	75 RB	Channel	20325	75 RB
					

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

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

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

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

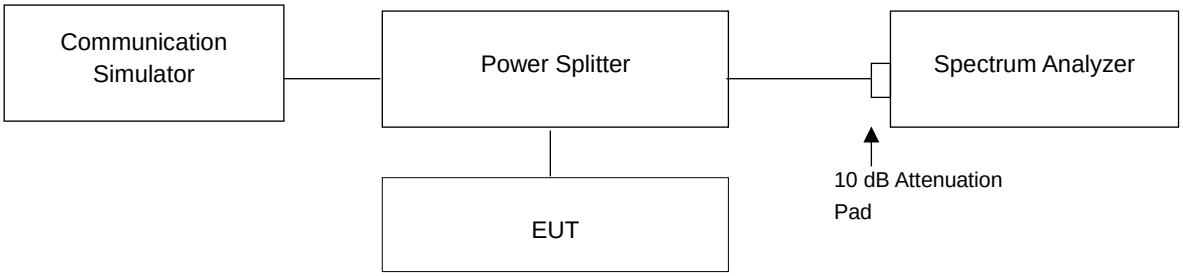
LTE Band 12					
Channel Bandwidth: 10 MHz					
Channel	23060	1 RB	Channel	23130	1 RB
					
Channel	23060	50 RB	Channel	23130	50 RB
					

4.6 Peak to Average Ratio

4.6.1 Limits of Peak to Average Ratio Measurement

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB.

4.6.2 Test Setup



4.6.3 Test Procedures

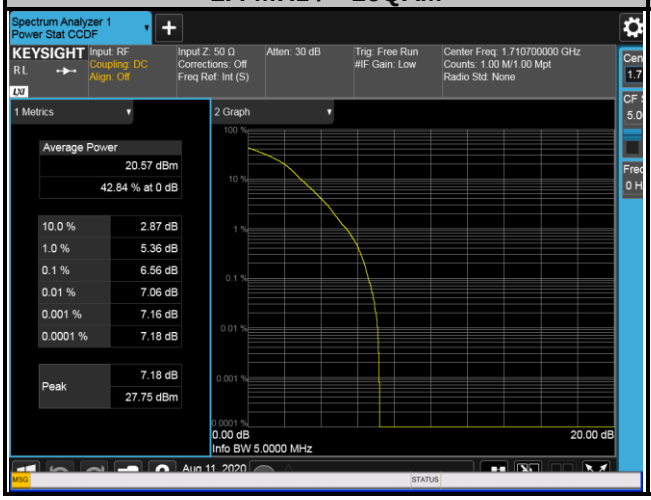
1. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1 %.

4.6.4 Test Results

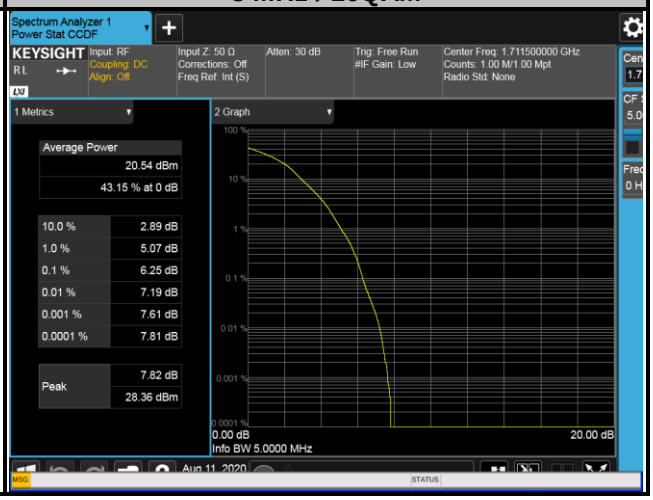
LTE Band 4							
Channel Bandwidth: 1.4 MHz				Channel Bandwidth: 3 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
19957	1710.7	5.59	6.56	19965	1711.5	5.41	6.25
20175	1732.5	5.44	6.43	20175	1732.5	5.23	6.06
20393	1754.3	4.79	5.68	20385	1753.5	4.86	5.73

Spectrum Plot of Worst Value

1.4 MHz / 16QAM



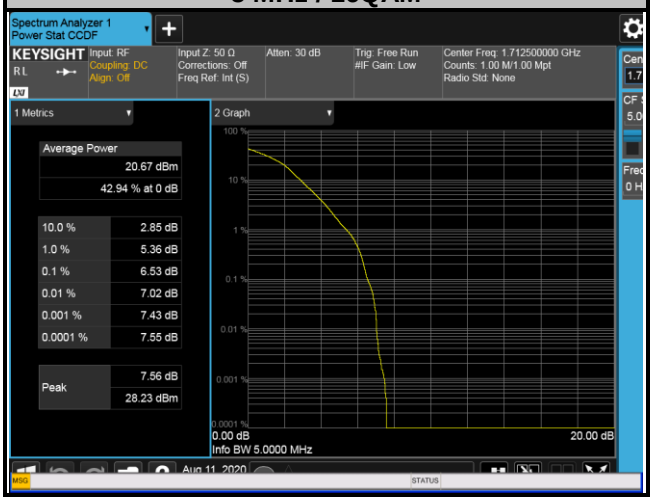
3 MHz / 16QAM



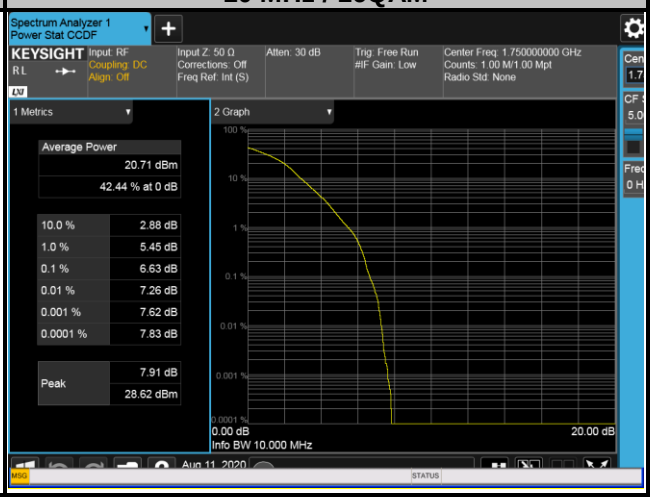
LTE Band 4							
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
19975	1712.5	5.56	6.53	20000	1715.0	5.52	6.35
20175	1732.5	5.29	6.23	20175	1732.5	5.04	5.87
20375	1752.5	5.24	6.17	20350	1750.0	5.62	6.63

Spectrum Plot of Worst Value

5 MHz / 16QAM



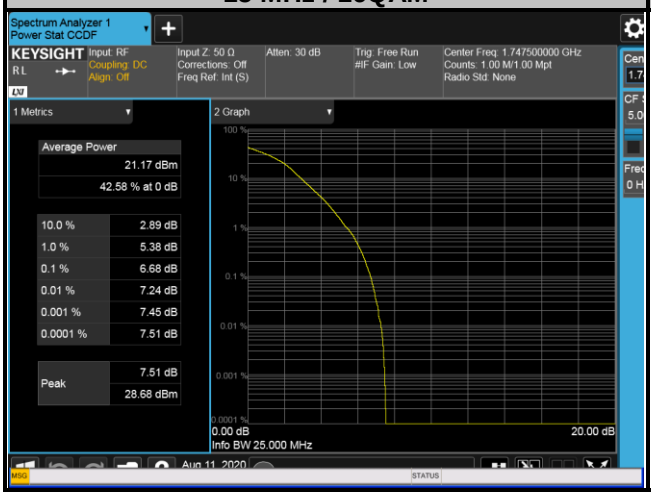
10 MHz / 16QAM



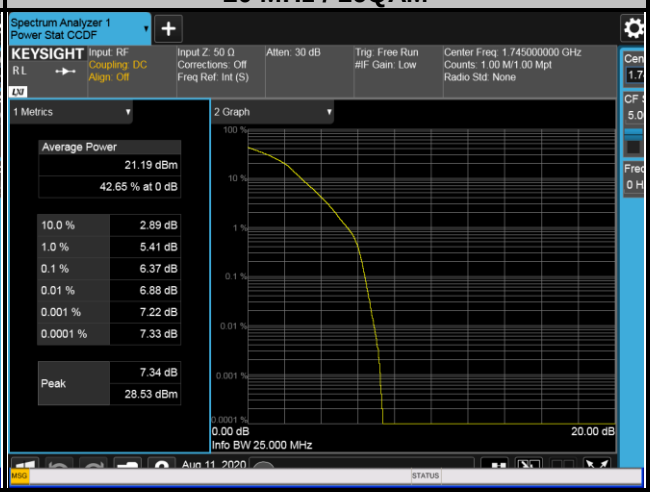
LTE Band 4							
Channel Bandwidth: 15 MHz				Channel Bandwidth: 20 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
20025	1717.5	5.22	6.46	20050	1720.0	5.43	5.62
20175	1732.5	4.72	5.74	20175	1732.5	4.85	5.57
20325	1747.5	5.67	6.68	20300	1745.0	5.61	6.37

Spectrum Plot of Worst Value

15 MHz / 16QAM



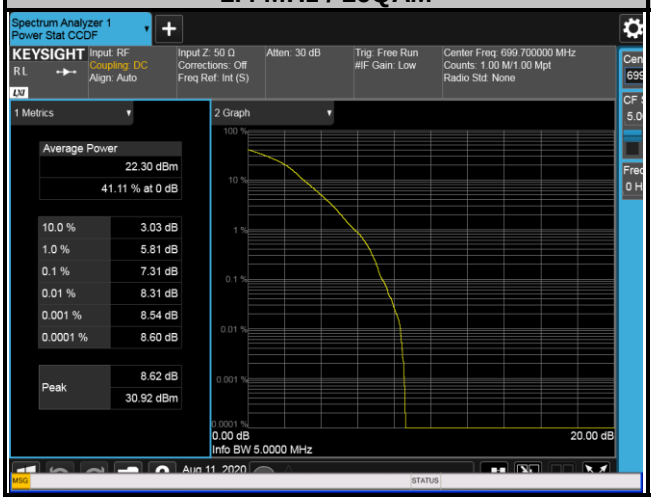
20 MHz / 16QAM



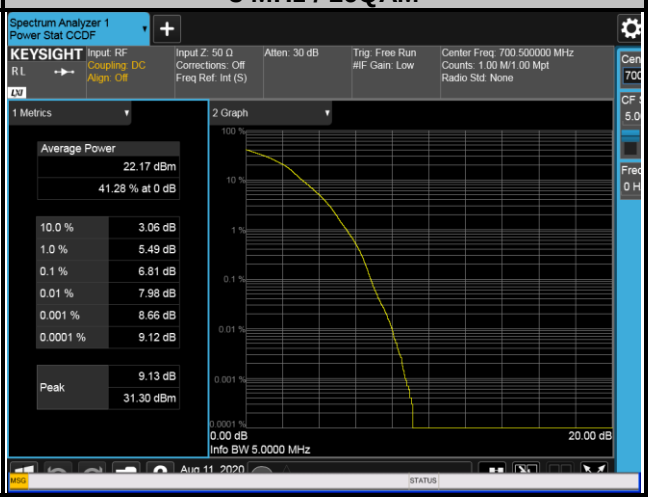
LTE Band 12							
Channel Bandwidth: 1.4 MHz				Channel Bandwidth: 3 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
23017	699.7	6.22	7.31	23025	700.5	5.94	6.81
23095	707.5	5.77	6.81	23095	707.5	5.54	6.41
23173	715.3	5.66	6.67	23165	714.5	5.38	6.27

Spectrum Plot of Worst Value

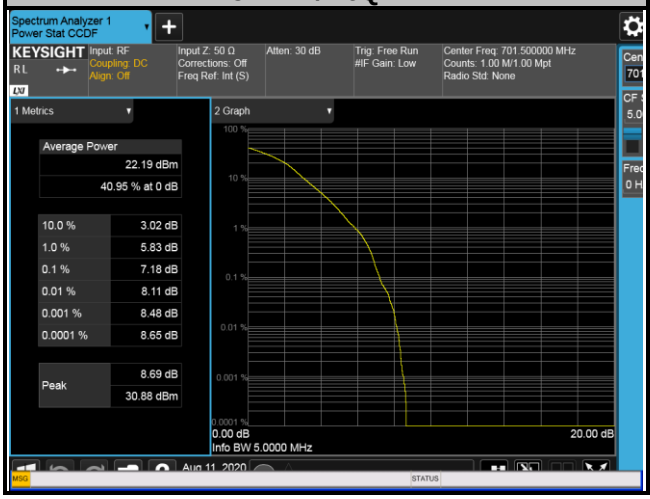
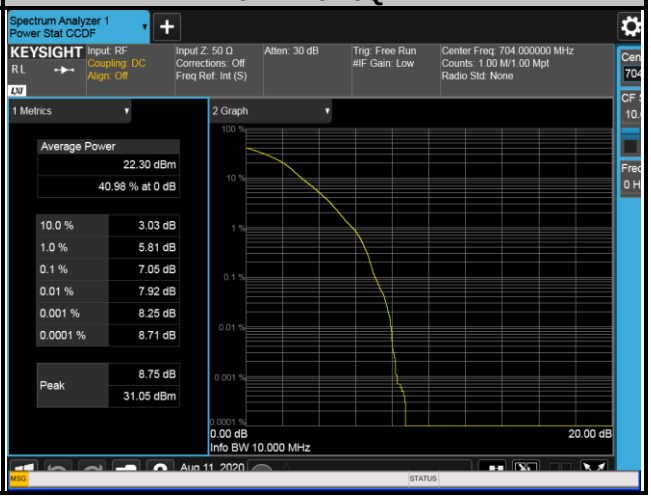
1.4 MHz / 16QAM



3 MHz / 16QAM



LTE Band 12							
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
23035	701.5	6.22	7.18	23060	704.0	6.05	7.05
23095	707.5	5.44	6.30	23095	707.5	5.81	6.70
23155	713.5	5.91	6.85	23130	711.0	5.72	6.59

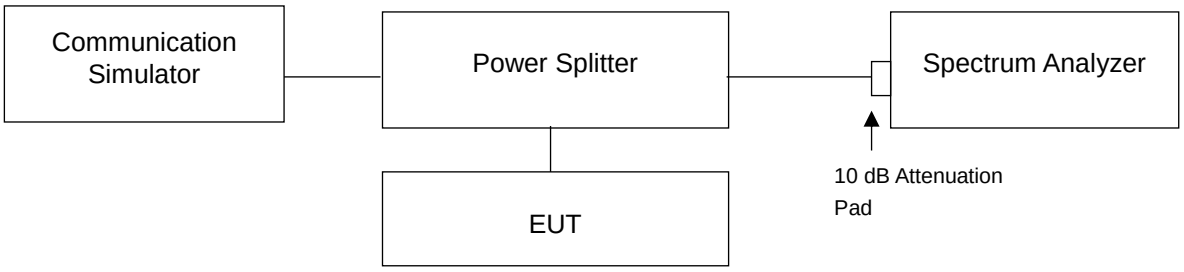
Spectrum Plot of Worst Value	
5 MHz / 16QAM	10 MHz / 16QAM
	

4.7 Conducted Spurious Emissions

4.7.1 Limits of Conducted Spurious Emissions Measurement

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 43 +10 log (P) dB. The limit of emission is equal to -13 dBm.

4.7.2 Test Setup

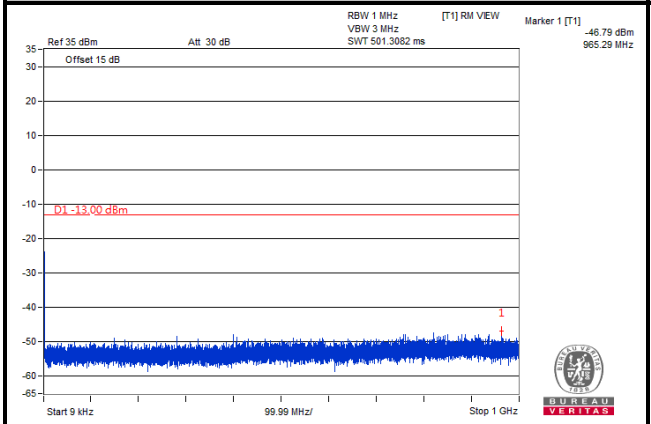


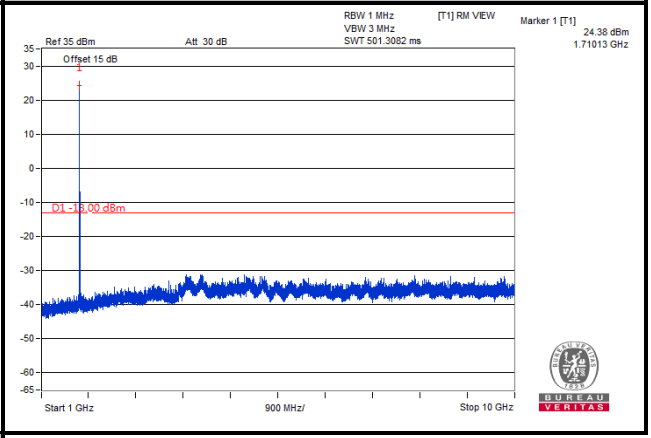
4.7.3 Test Procedure

a. The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
b. Measuring frequency range is from 9 kHz to 1 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 100 kHz and VBW = 300 kHz is used for LTE band 12 conducted emission measurement.
c. Measuring frequency range is from 9 kHz to 1 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 1 MHz and VBW = 3 MHz is used for LTE band 4 conducted emission measurement.
d. Measuring frequency range is from 1 GHz to 10 GHz / 27 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 1 MHz and VBW = 3 MHz is used for conducted emission measurement.

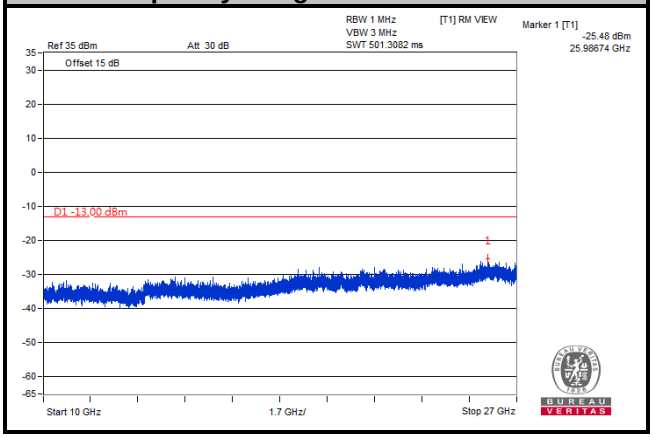
4.7.4 Test Results

LTE Band 4	
Channel Bandwidth: 1.4 MHz	
Channel 19957	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz



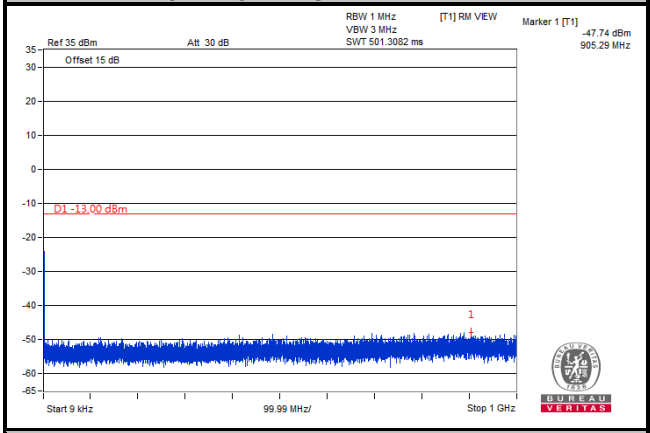


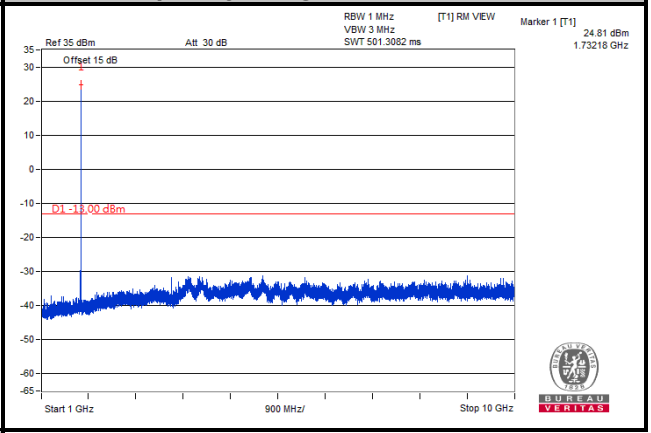
Frequency Range: 10 GHz ~ 27 GHz



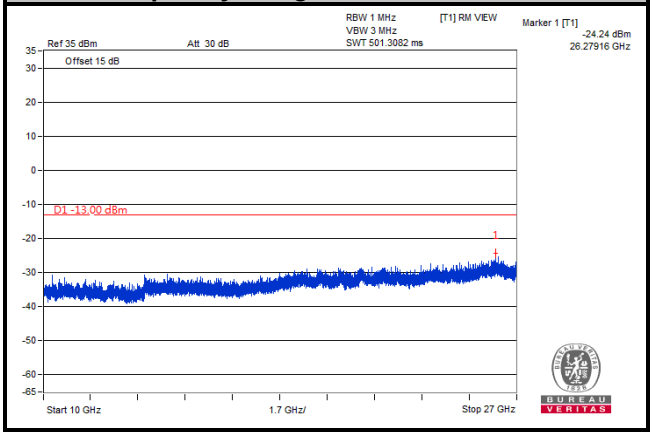
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 1.4 MHz	
Channel 20175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz



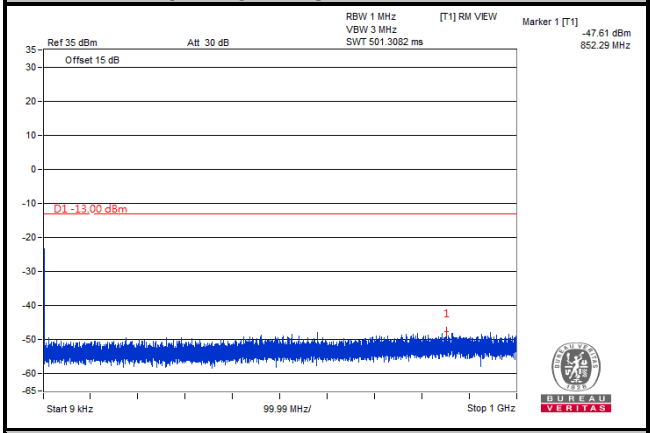


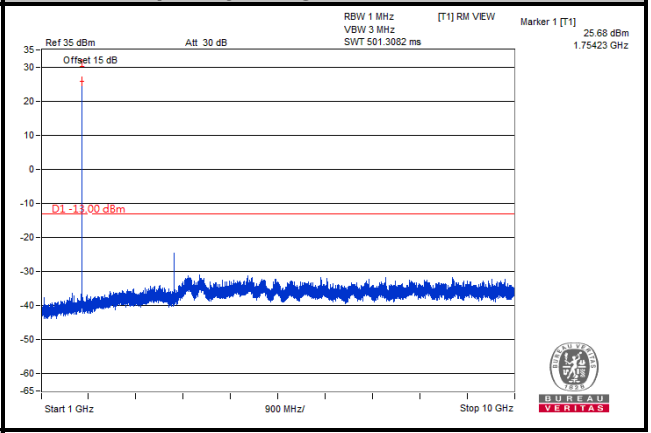
Frequency Range: 10 GHz ~ 27 GHz



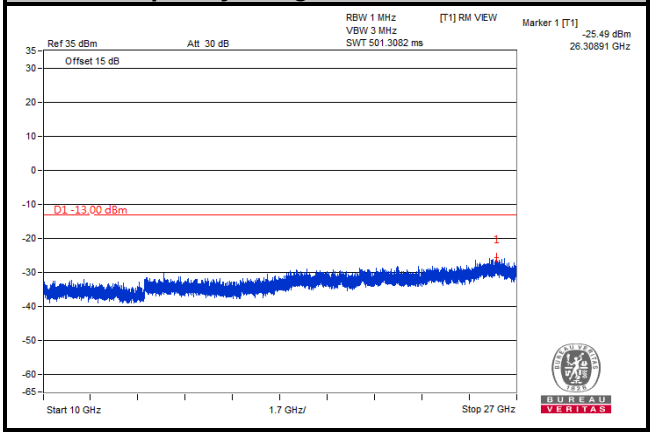
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 1.4 MHz	
Channel 20393	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz

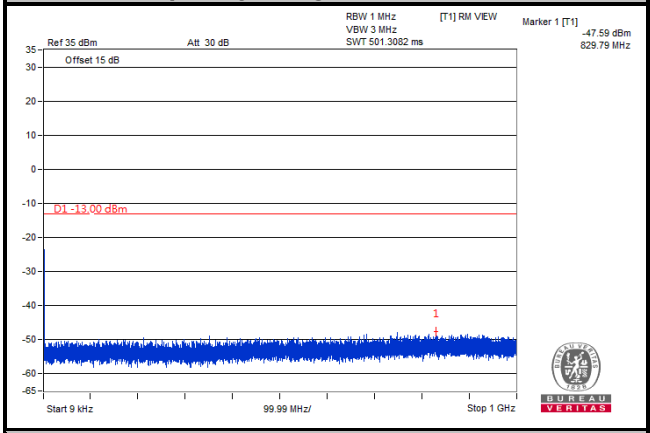
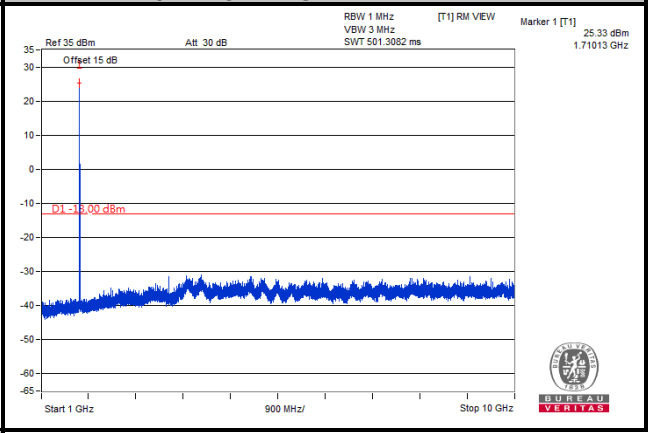
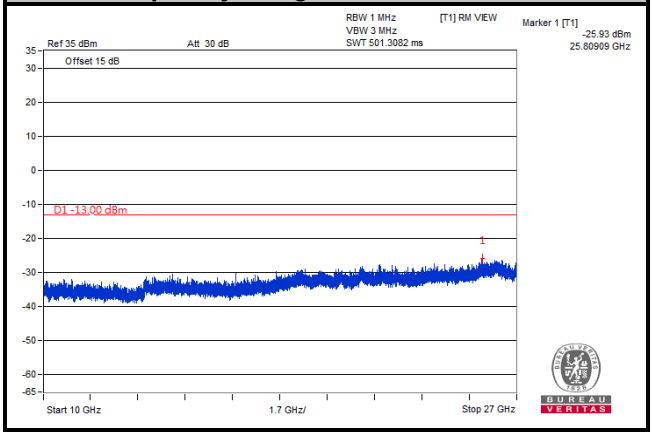




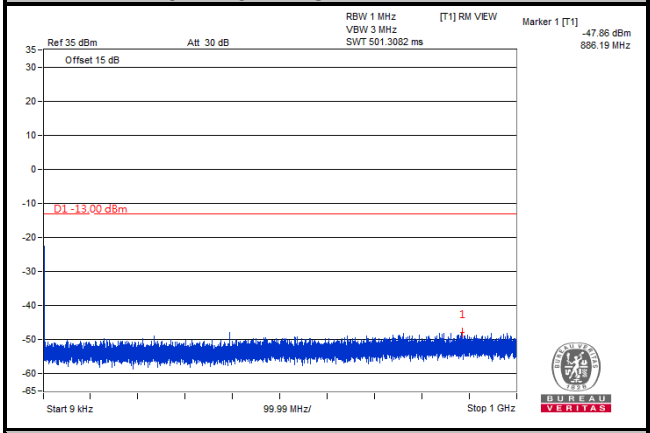
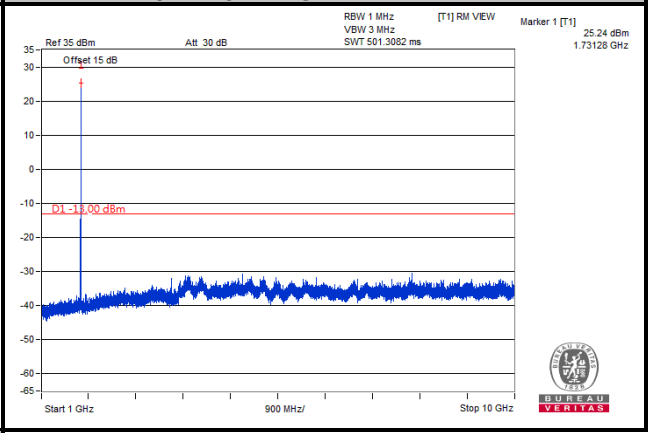
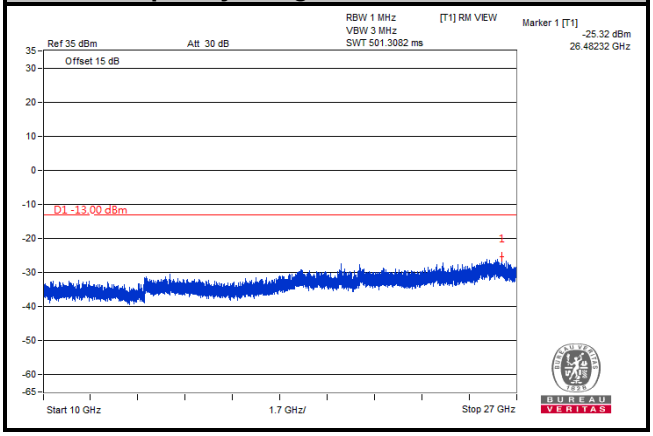
Frequency Range: 10 GHz ~ 27 GHz



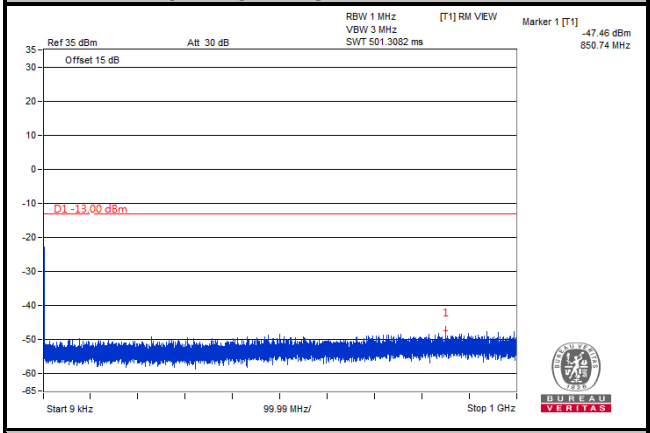
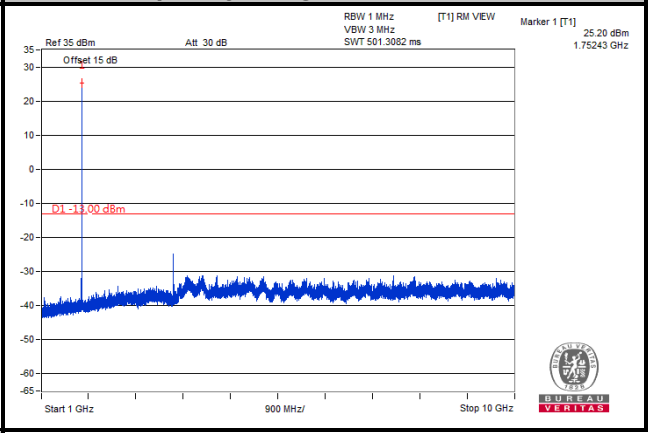
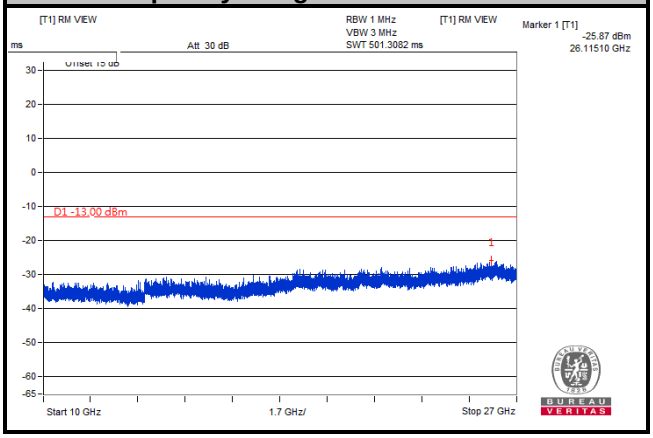
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 3 MHz	
Channel 19965	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Frequency Range: 10 GHz ~ 27 GHz	
	

Note: The signal over the limit in 9 kHz is from spectrum analyzer.

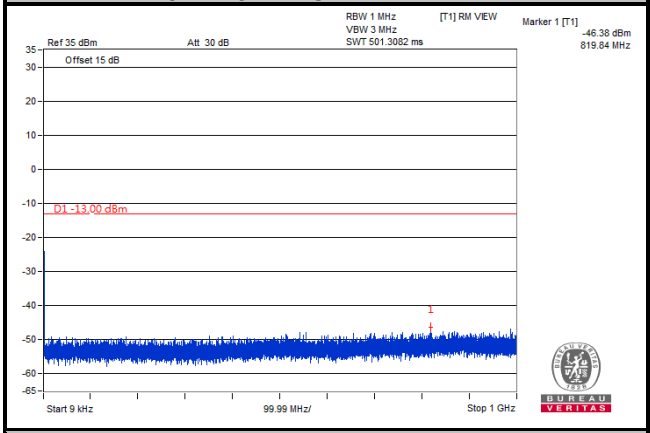
LTE Band 4	
Channel Bandwidth: 3 MHz	
Channel 20175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Frequency Range: 10 GHz ~ 27 GHz	
	

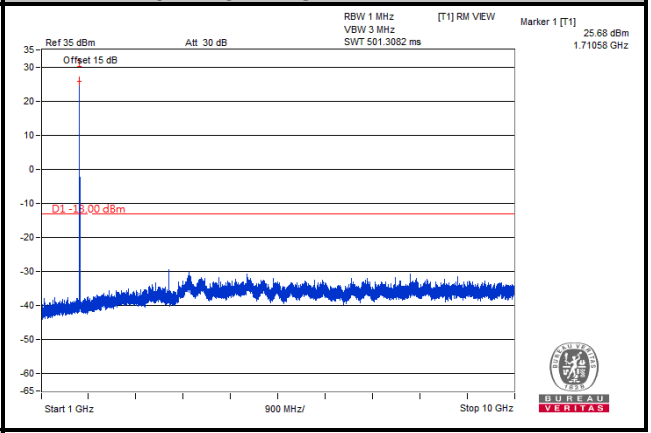
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 3 MHz	
Channel 20385	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Frequency Range: 10 GHz ~ 27 GHz	
	

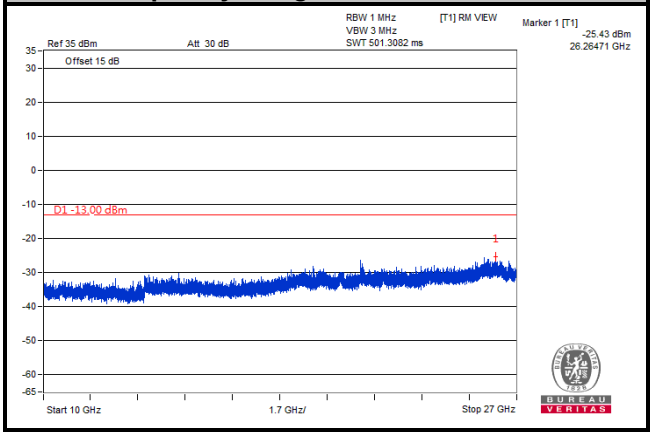
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 5 MHz	
Channel 19975	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz

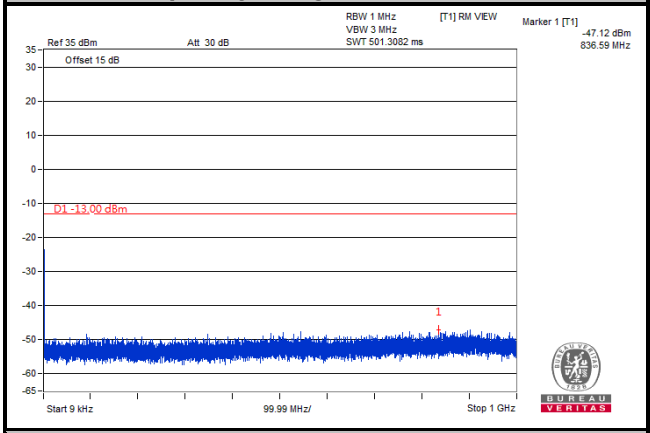
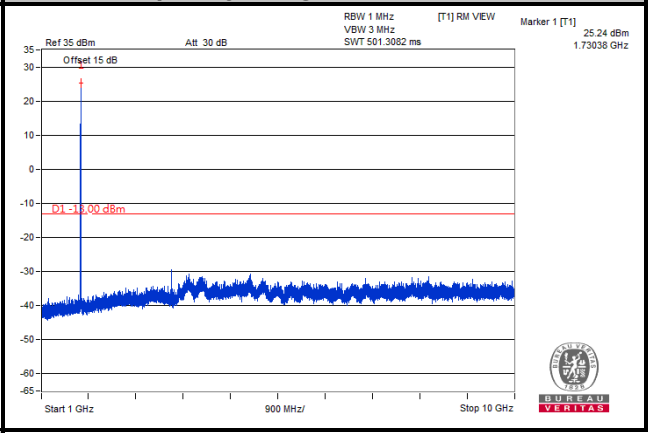
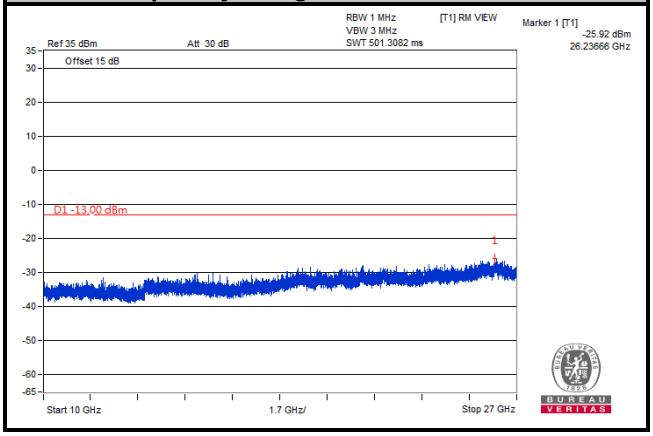




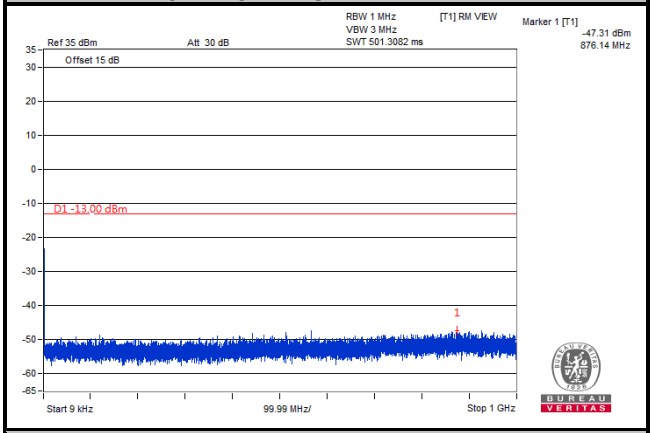
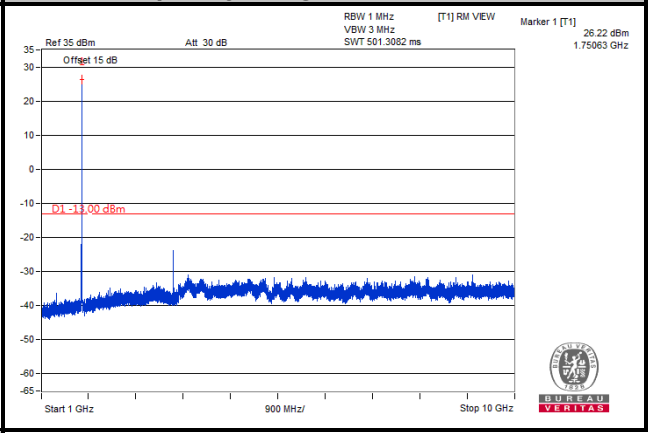
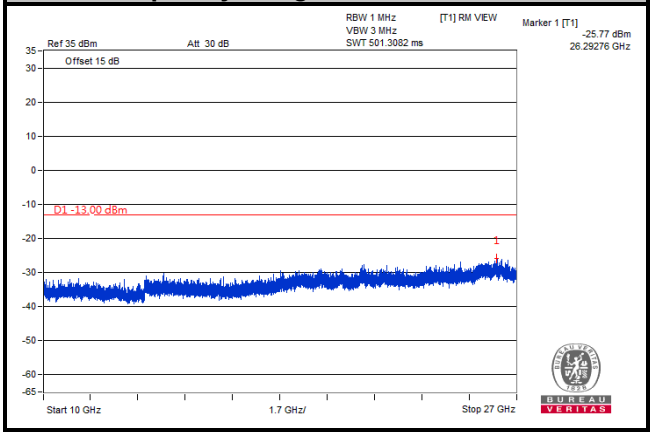
Frequency Range: 10 GHz ~ 27 GHz



Note: The signal over the limit in 9 kHz is from spectrum analyzer.

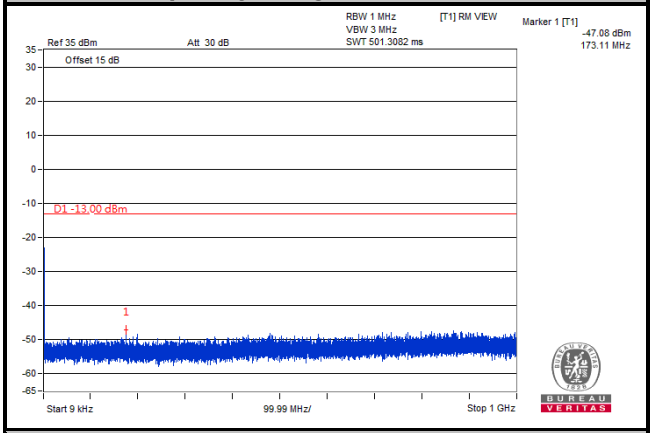
LTE Band 4	
Channel Bandwidth: 5 MHz	
Channel 20175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Frequency Range: 10 GHz ~ 27 GHz	
	

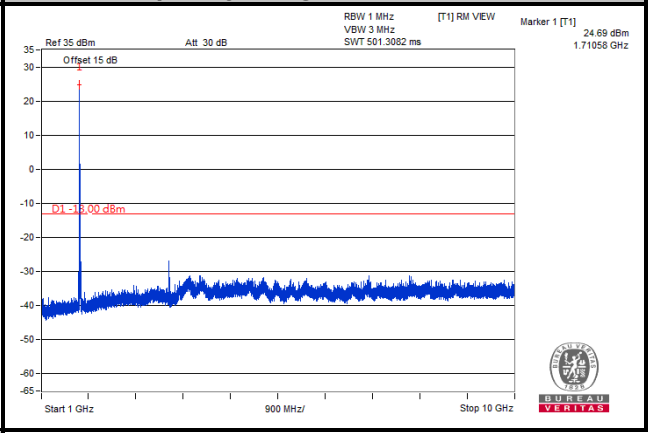
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 5 MHz	
Channel 20375	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Frequency Range: 10 GHz ~ 27 GHz	
	

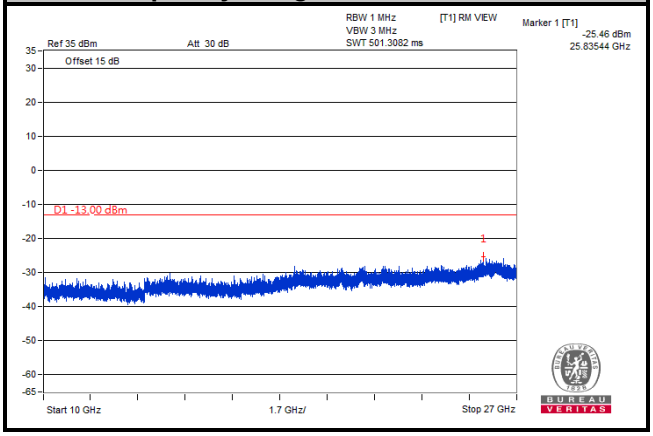
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 10 MHz	
Channel 20000	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz

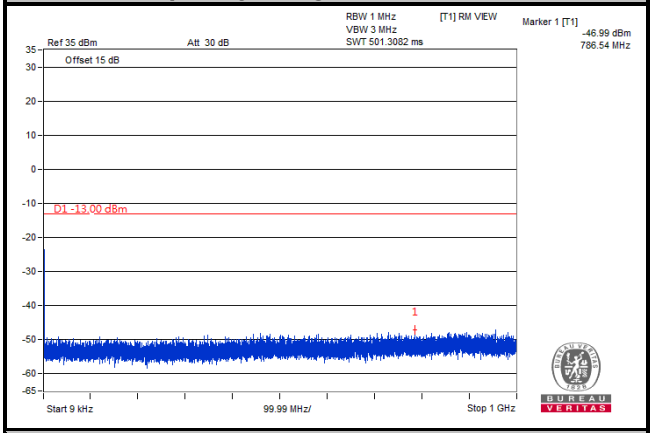
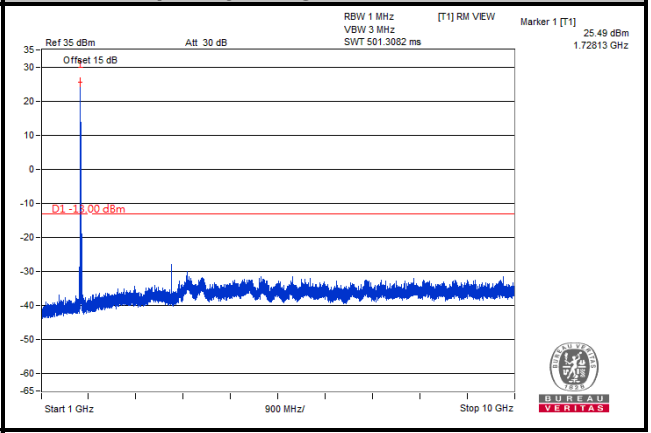
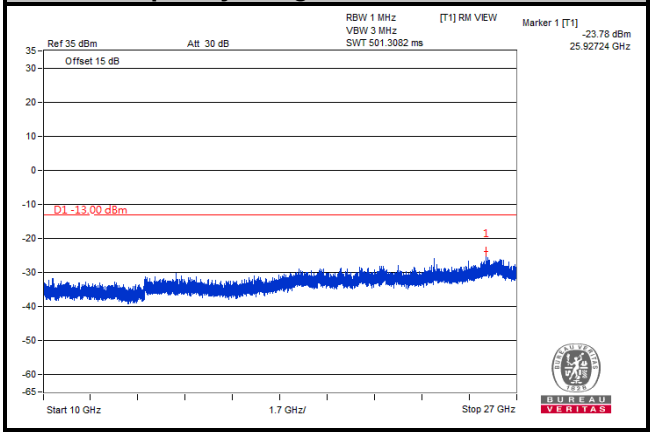




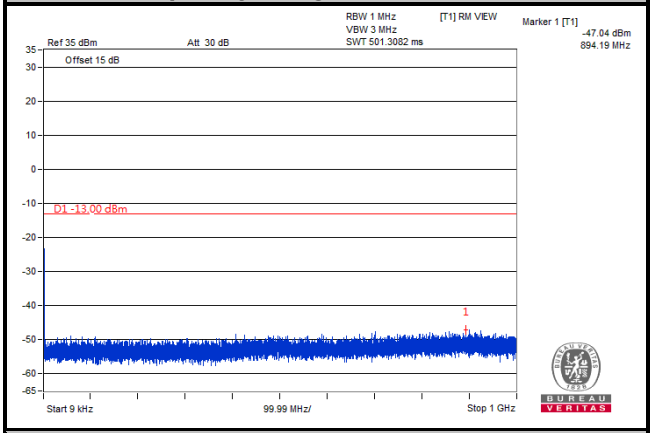
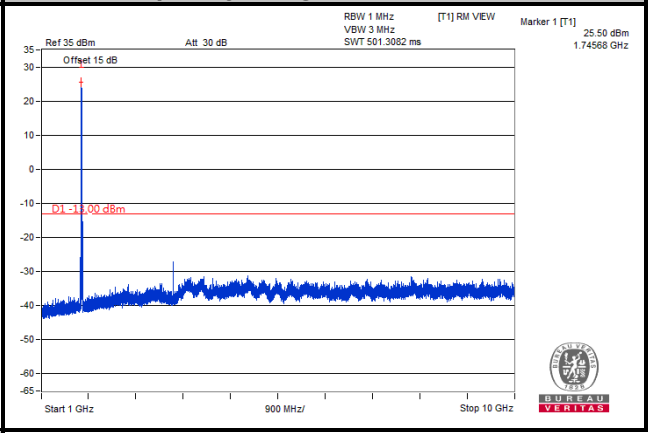
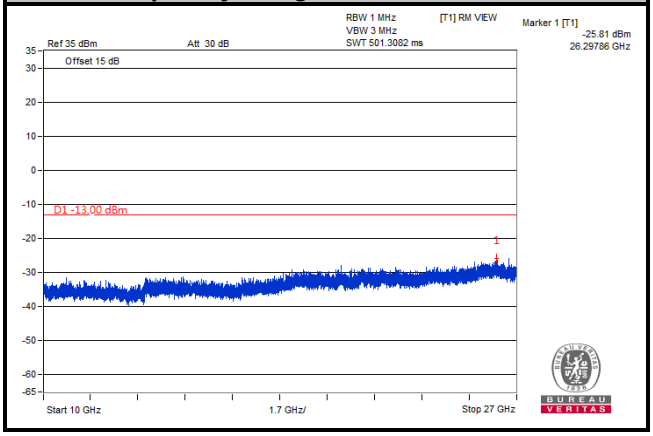
Frequency Range: 10 GHz ~ 27 GHz



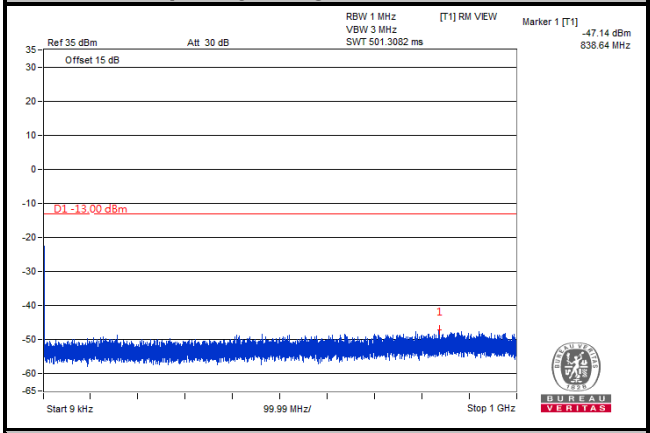
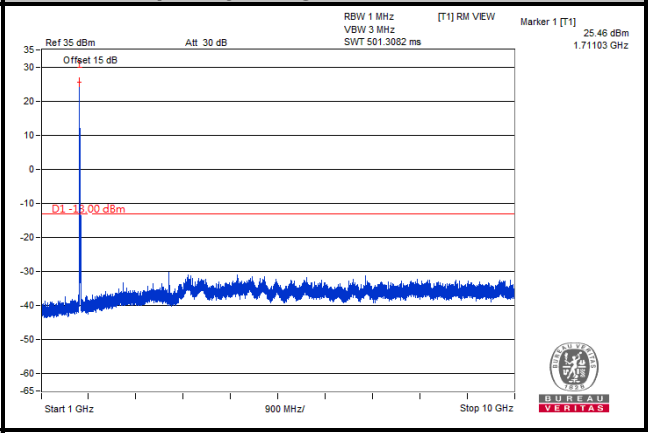
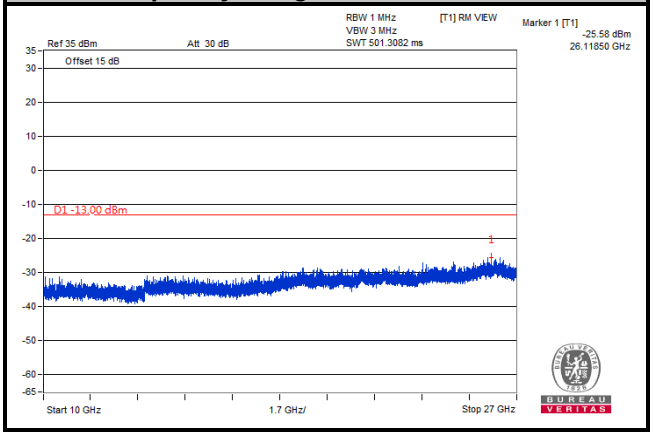
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 10 MHz	
Channel 20175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Frequency Range: 10 GHz ~ 27 GHz	
	

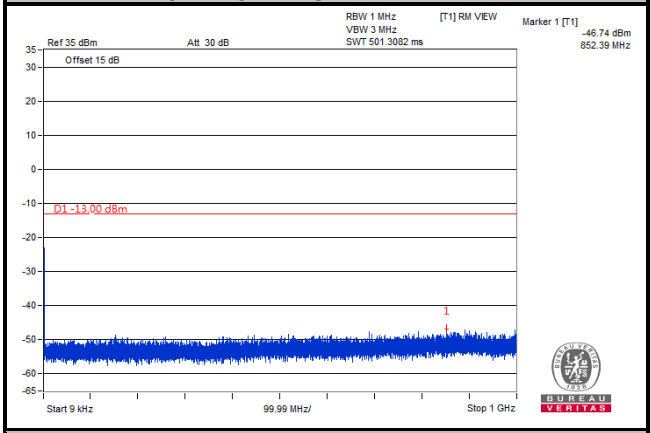
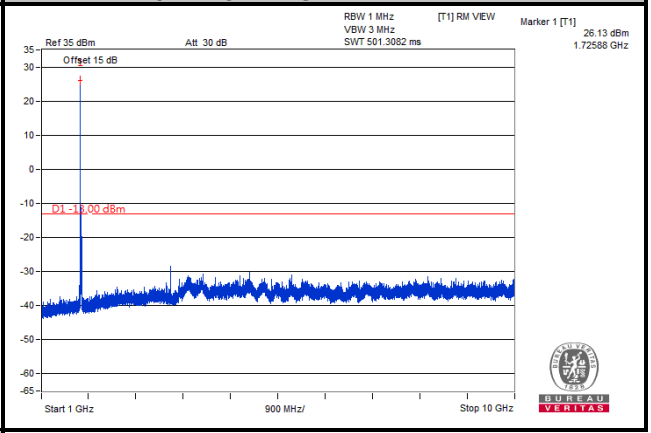
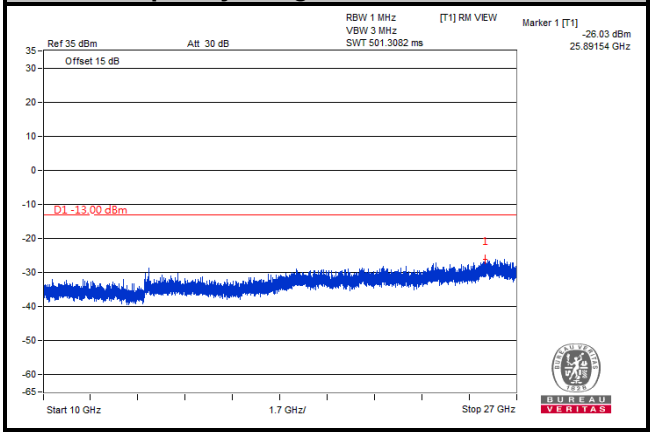
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 10 MHz	
Channel 20350	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Frequency Range: 10 GHz ~ 27 GHz	
	

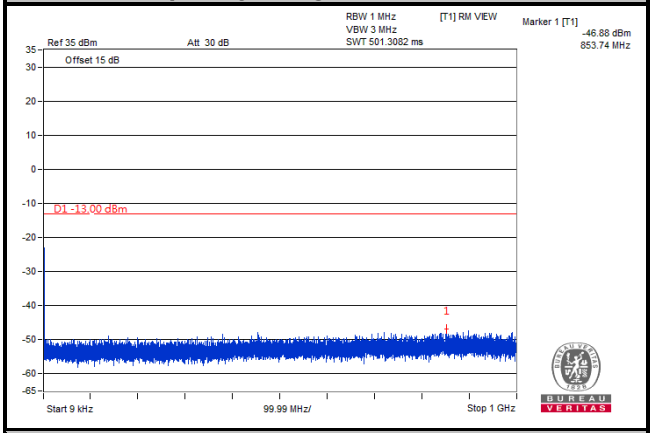
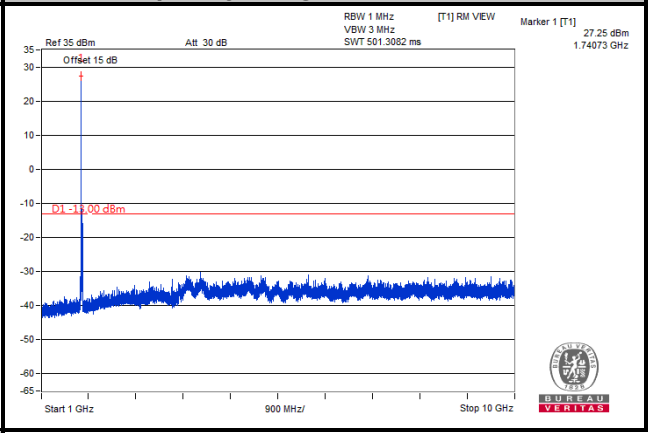
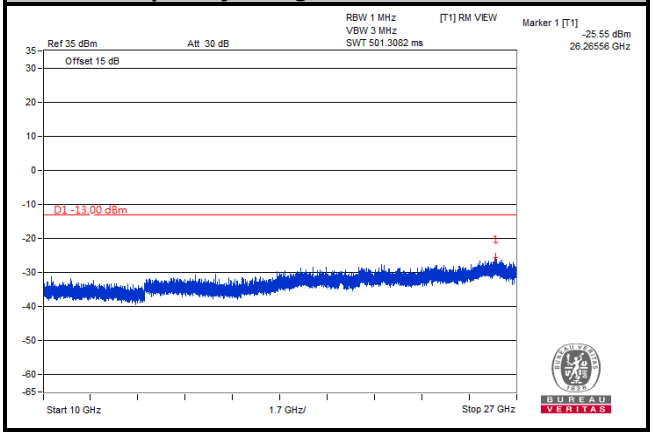
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 15 MHz	
Channel 20025	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Frequency Range: 10 GHz ~ 27 GHz	
	

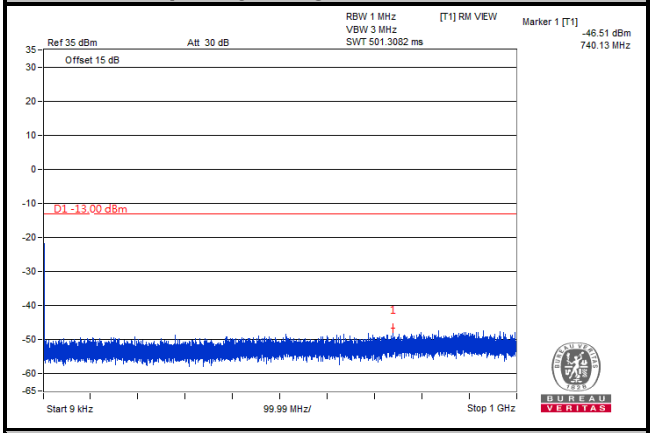
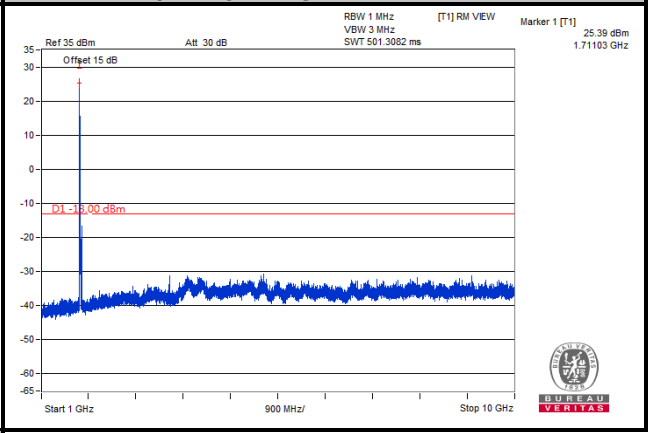
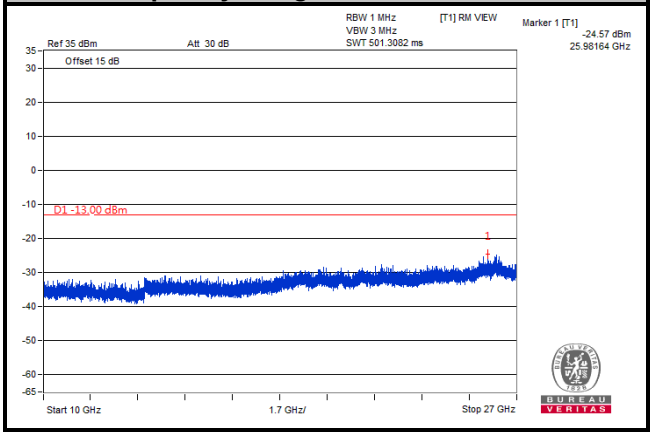
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 15 MHz	
Channel 20175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Frequency Range: 10 GHz ~ 27 GHz	
	

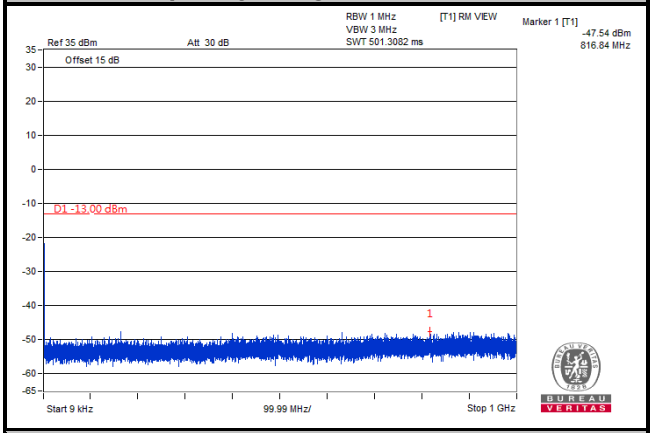
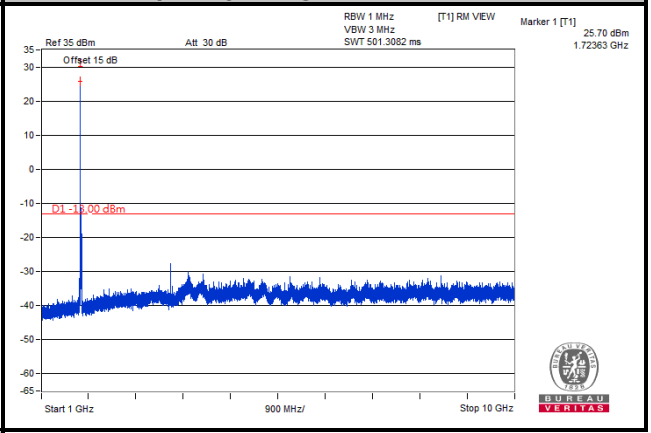
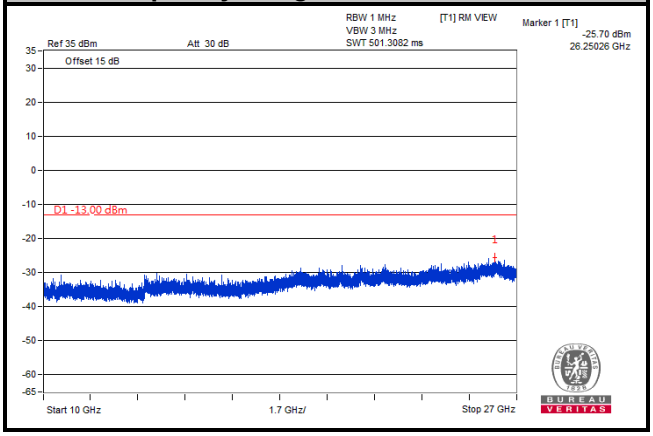
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 15 MHz	
Channel 20325	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Frequency Range: 10 GHz ~ 27 GHz	
	

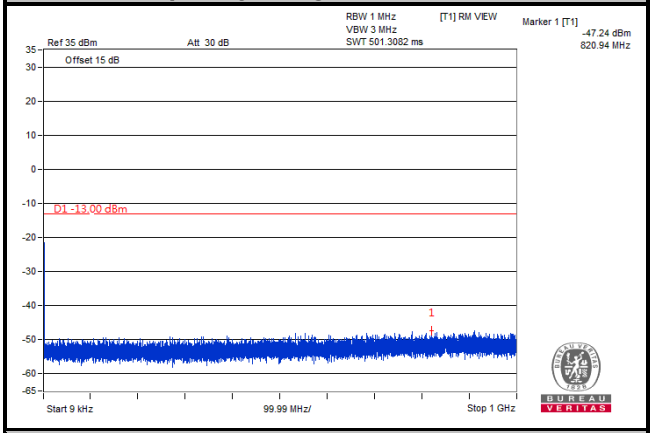
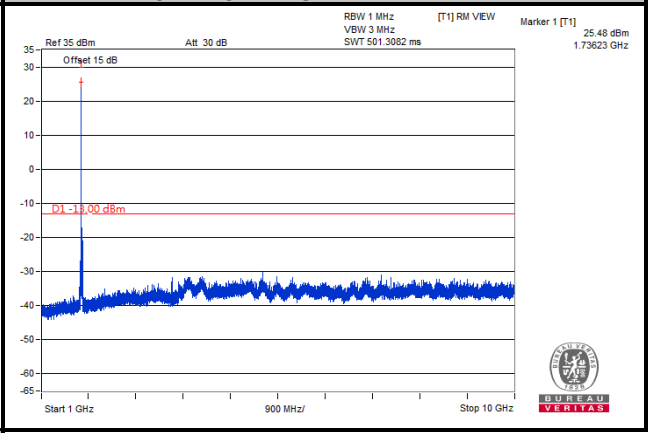
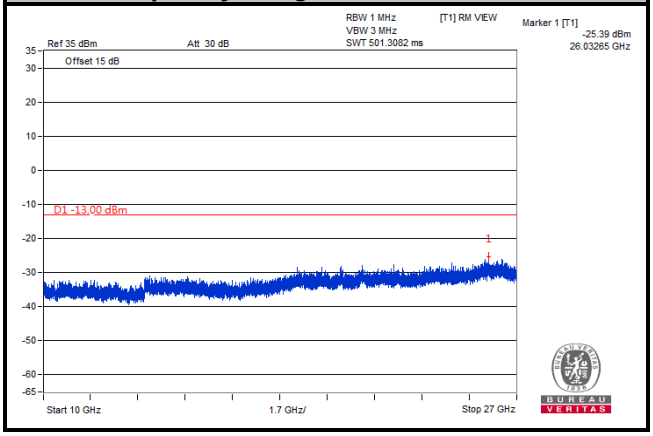
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 20 MHz	
Channel 20050	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Frequency Range: 10 GHz ~ 27 GHz	
	

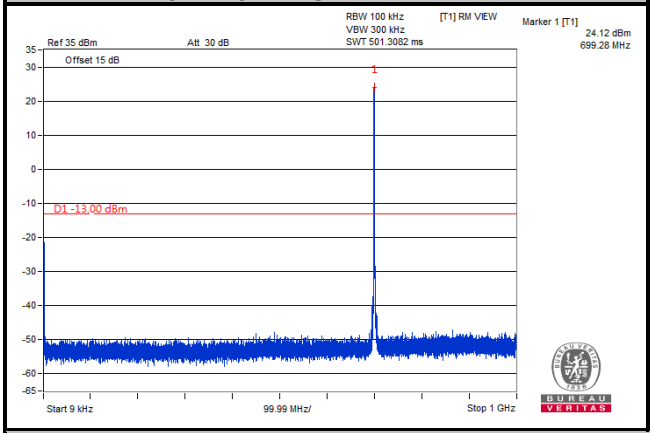
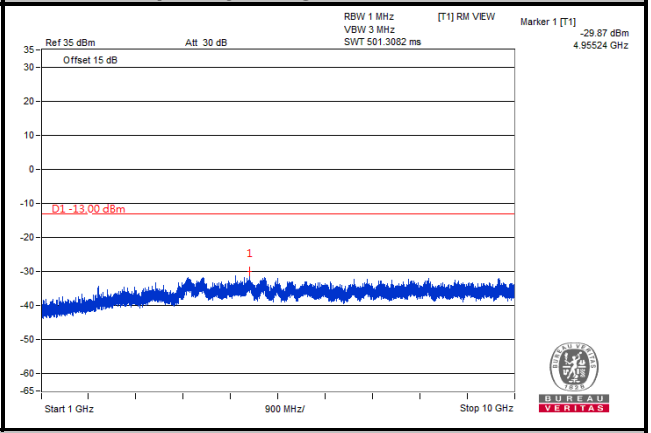
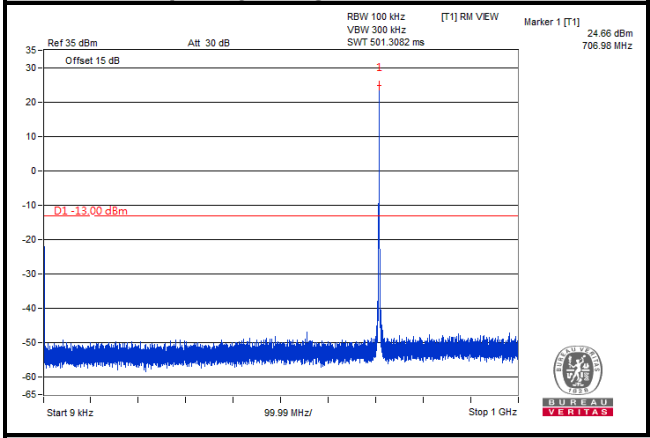
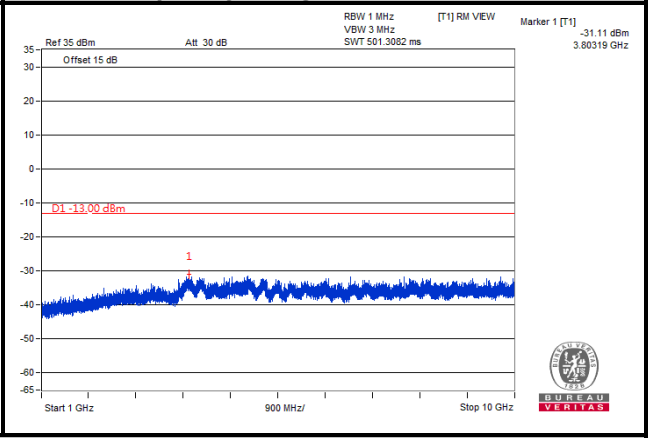
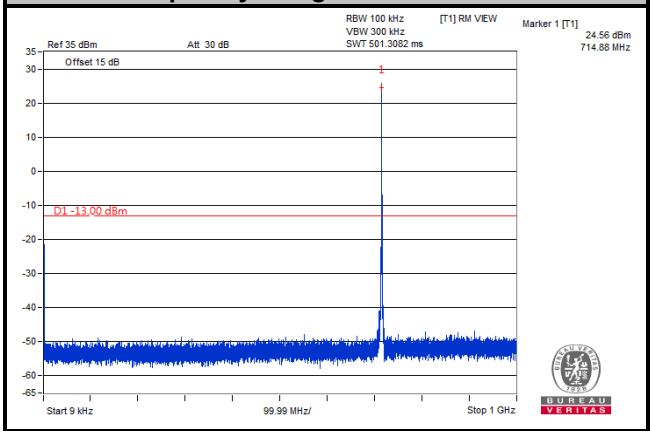
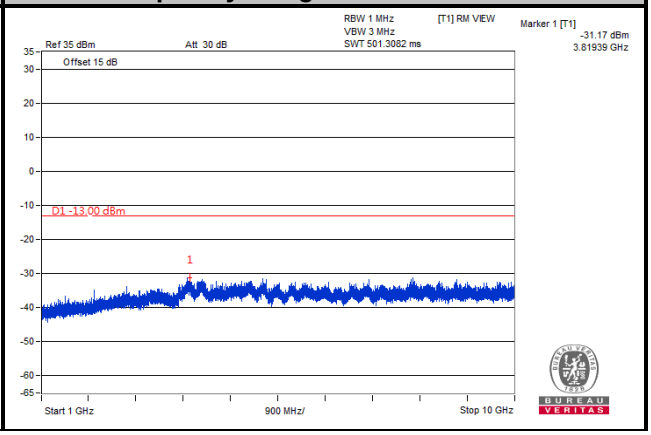
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 20 MHz	
Channel 20175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Frequency Range: 10 GHz ~ 27 GHz	
	

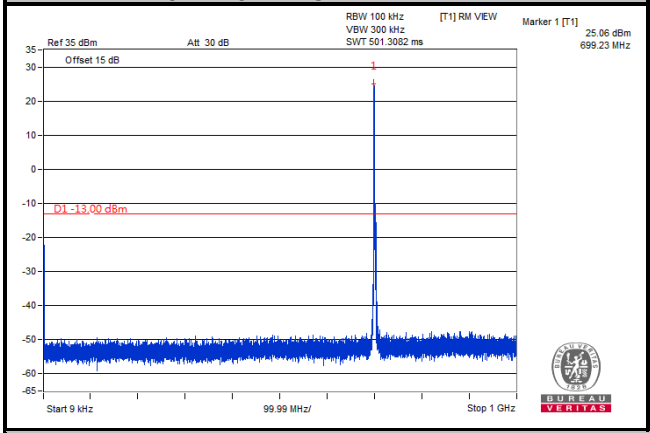
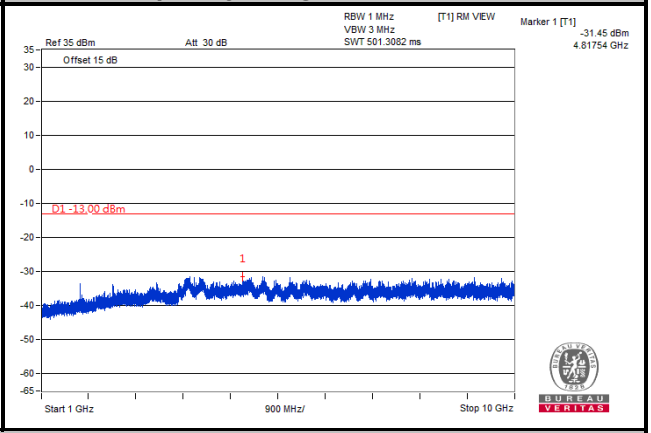
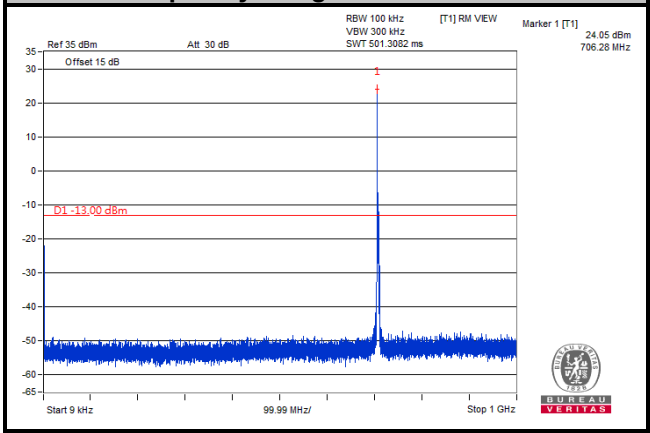
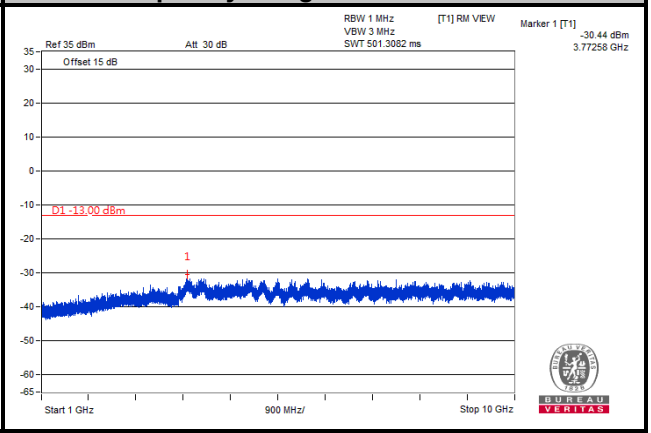
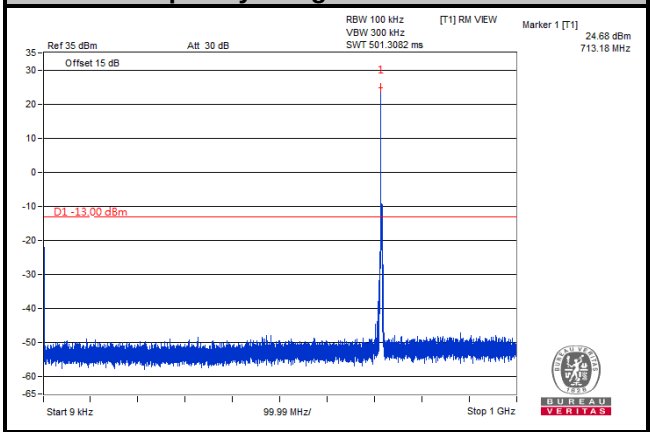
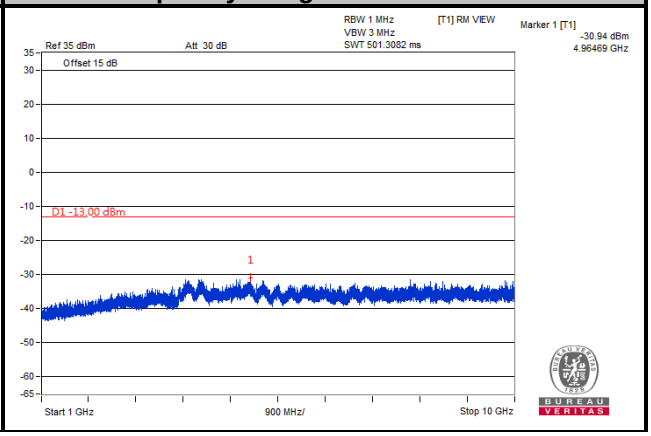
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 20 MHz	
Channel 20300	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Frequency Range: 10 GHz ~ 27 GHz	
	

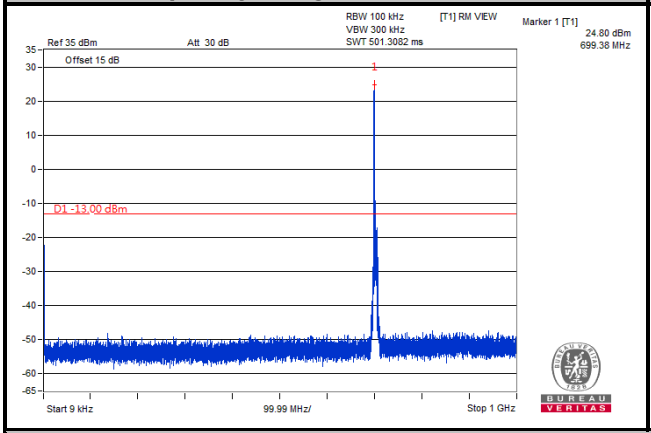
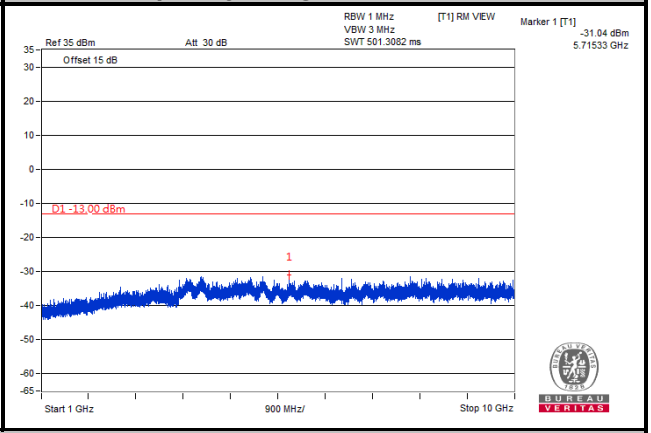
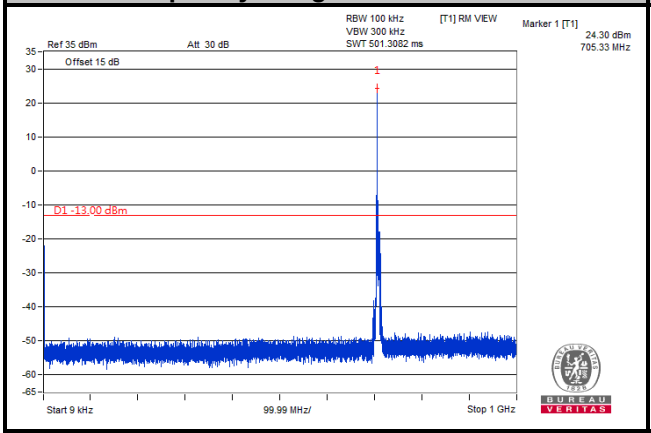
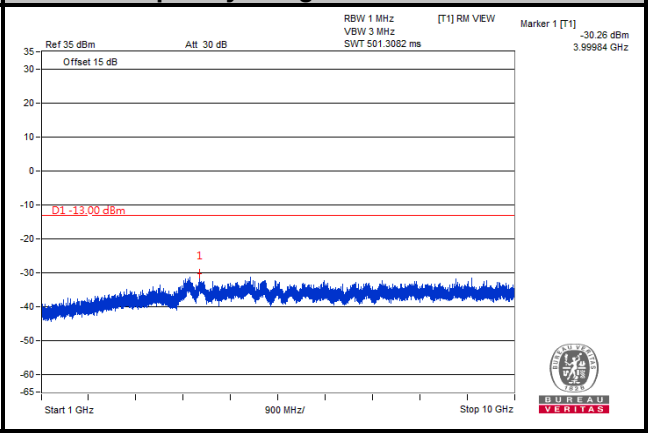
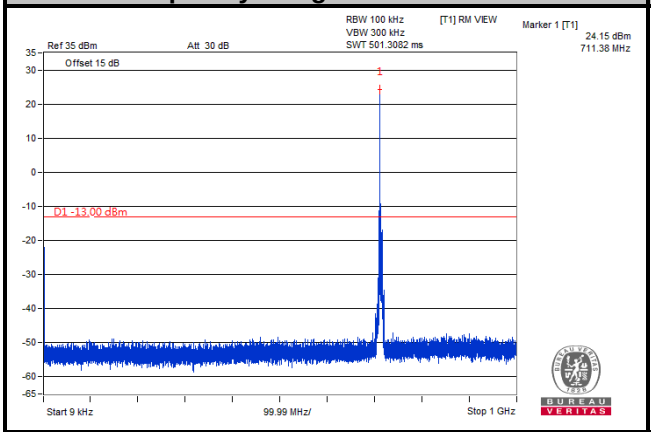
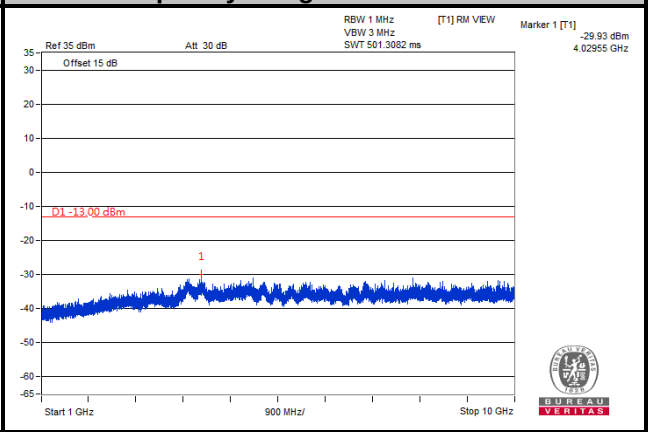
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 12	
Channel Bandwidth: 1.4 MHz	
Channel 23017	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Channel 23095	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Channel 23173	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	

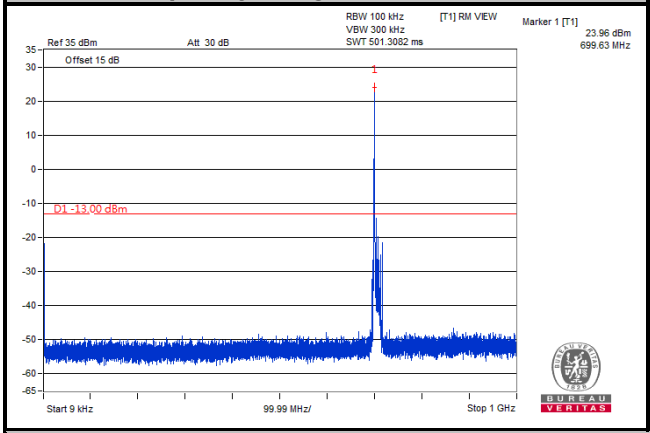
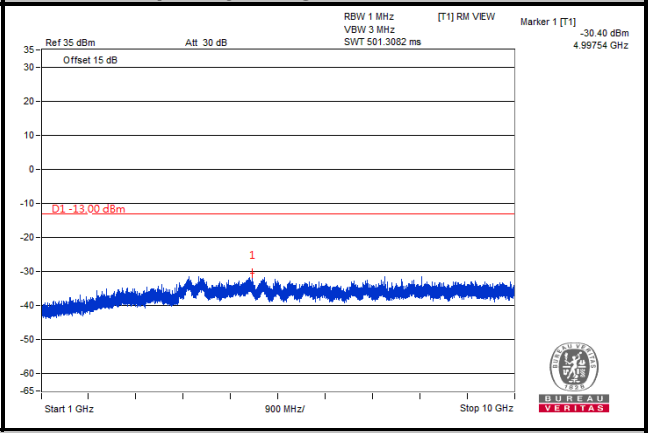
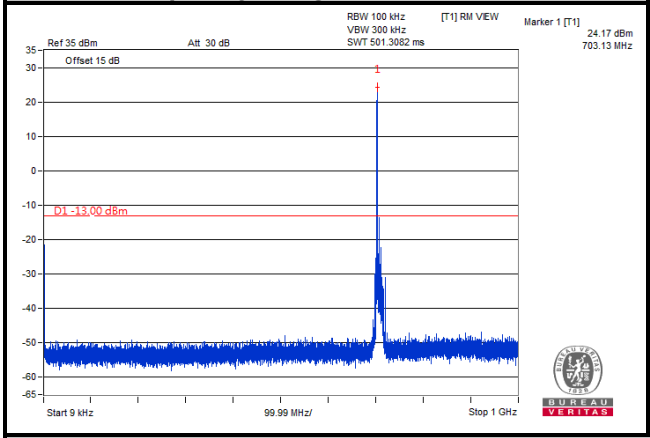
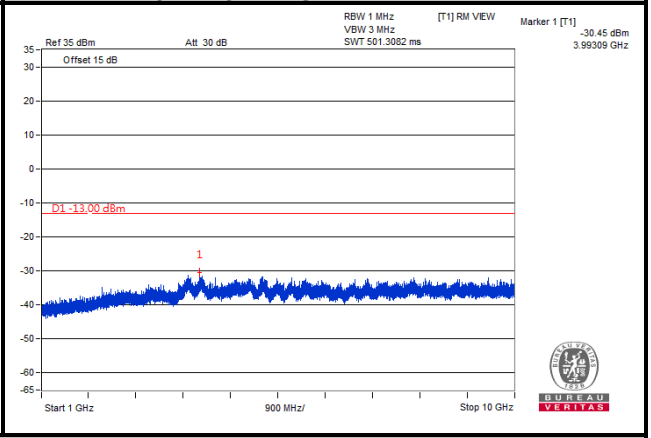
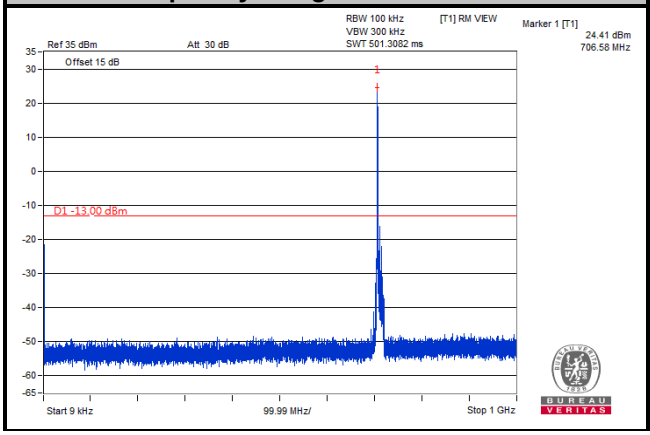
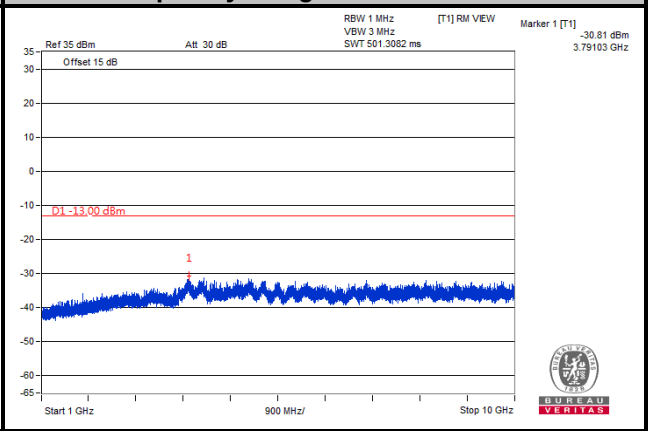
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 12	
Channel Bandwidth: 3 MHz	
Channel 23025	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Channel 23095	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Channel 23165	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	

Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 12	
Channel Bandwidth: 5 MHz	
Channel 23035	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Channel 23095	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Channel 23155	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	

Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 12	
Channel Bandwidth: 10 MHz	
Channel 23060	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Channel 23095	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Channel 23130	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	

Note: The signal over the limit in 9 kHz is from spectrum analyzer.

4.8 Radiated Emission Measurement

4.8.1 Limits of Radiated Emission Measurement

a. 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. The limit of emission is equal to -13 dBm.

4.8.2 Test Procedure

a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (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.
b. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.
c. 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.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz.
2. The emission levels were against the limit of frequency range 9 kHz ~ 30 MHz:

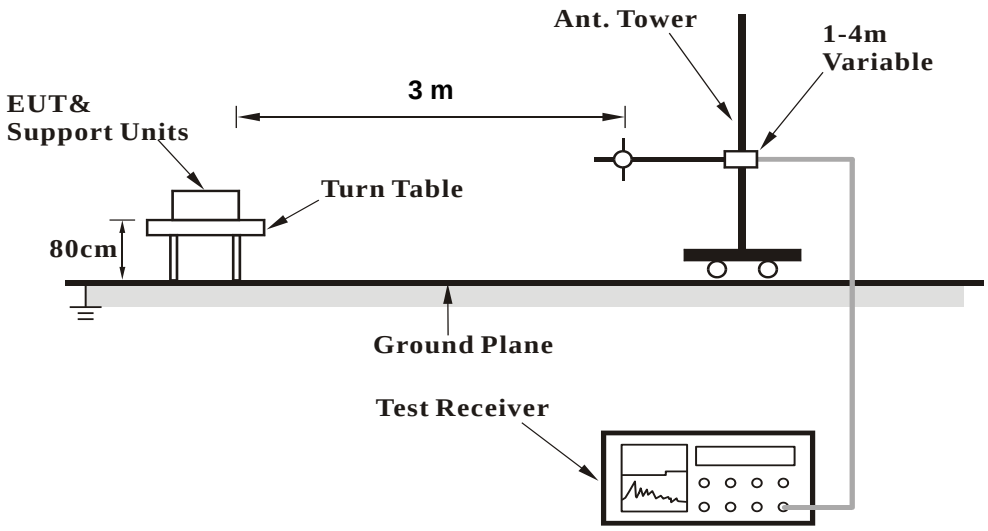
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

4.8.3 Deviation from Test Standard

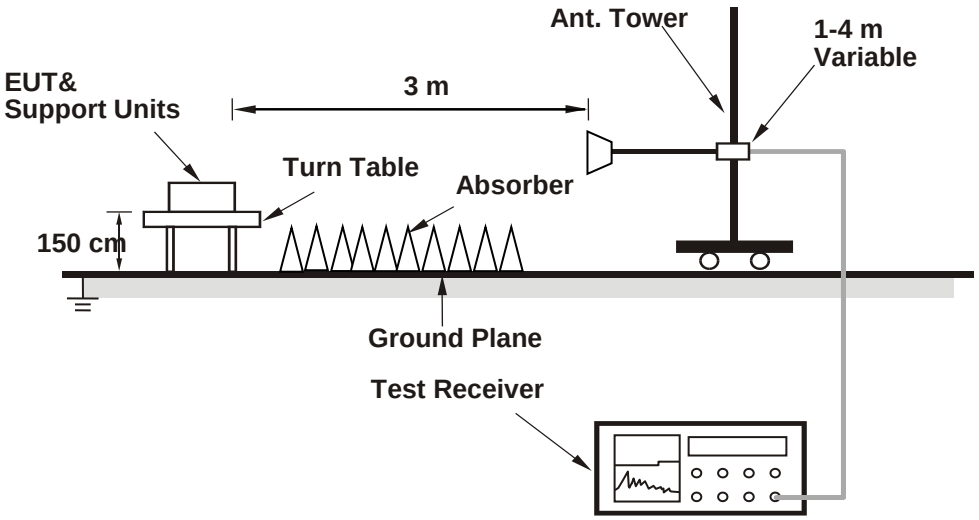
No deviation.

4.8.4 Test Setup

<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).

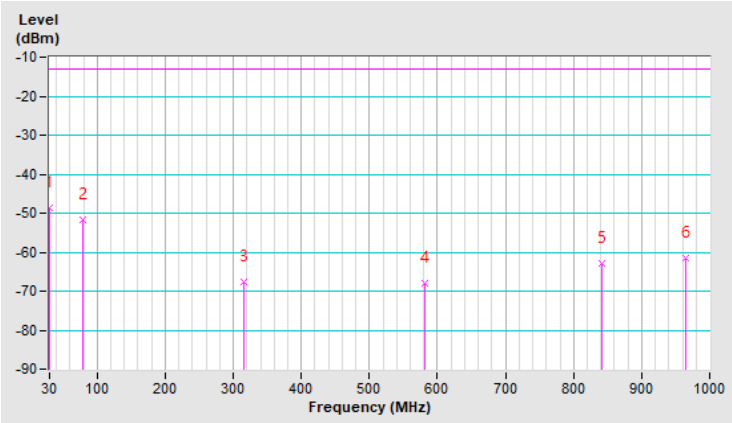
4.8.5 Test Results

Below 1GHz
LTE Band 4, Channel Bandwidth: 1.4MHz

Mode	TX channel 19957 (1710.7MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	30.00	-52.80	-29.40	-19.40	-48.80	-13.00	-35.80
2	79.47	-46.80	-52.30	0.60	-51.70	-13.00	-38.70
3	315.18	-63.70	-71.70	4.00	-67.70	-13.00	-54.70
4	581.93	-69.00	-71.50	3.70	-67.80	-13.00	-54.80
5	841.89	-69.50	-66.40	3.60	-62.80	-13.00	-49.80
6	964.11	-69.80	-65.10	3.70	-61.40	-13.00	-48.40

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).

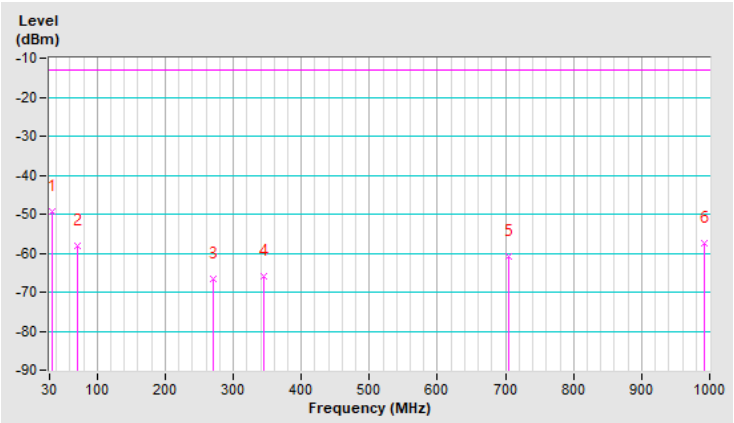


Mode	TX channel 19957 (1710.7MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	33.88	-38.60	-32.10	-17.10	-49.20	-13.00	-36.20
2	70.74	-52.10	-57.90	-0.40	-58.30	-13.00	-45.30
3	270.56	-68.70	-65.30	-1.40	-66.70	-13.00	-53.70
4	344.28	-65.30	-69.90	4.00	-65.90	-13.00	-52.90
5	704.15	-66.60	-64.20	3.50	-60.70	-13.00	-47.70
6	991.27	-67.40	-60.90	3.40	-57.50	-13.00	-44.50

Remarks:

1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).



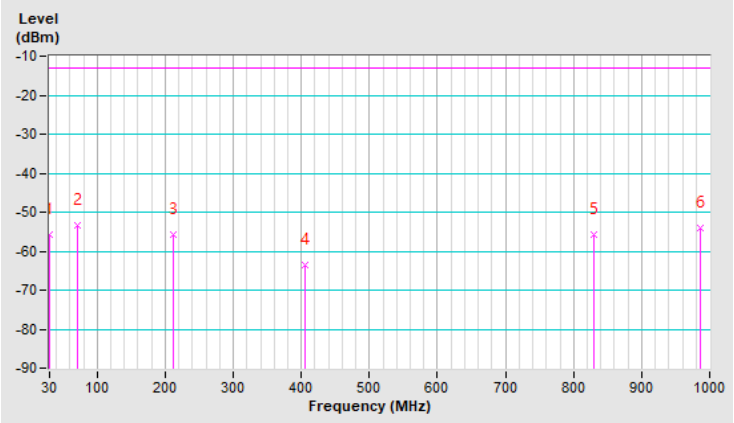
LTE Band 12, Channel Bandwidth: 1.4MHz

Mode	TX channel 23095 (707.5MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	30.00	-57.50	-36.20	-19.40	-55.60	-13.00	-42.60
2	70.74	-45.10	-53.10	-0.40	-53.50	-13.00	-40.50
3	211.39	-45.20	-53.80	-2.10	-55.90	-13.00	-42.90
4	406.36	-61.00	-66.90	3.30	-63.60	-13.00	-50.60
5	830.25	-60.50	-59.50	3.90	-55.60	-13.00	-42.60
6	986.42	-60.80	-57.60	3.50	-54.10	-13.00	-41.10

Remarks:

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

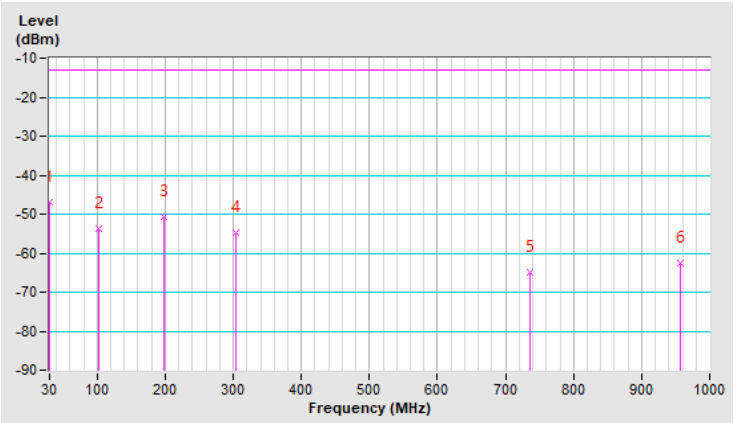


Mode	TX channel 23095 (707.5MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	30.00	-34.80	-27.50	-19.40	-46.90	-13.00	-33.90
2	102.75	-43.10	-52.00	-1.80	-53.80	-13.00	-40.80
3	197.81	-47.80	-48.30	-2.40	-50.70	-13.00	-37.70
4	303.54	-52.60	-58.30	3.70	-54.60	-13.00	-41.60
5	735.19	-69.30	-68.50	3.70	-64.80	-13.00	-51.80
6	957.32	-69.50	-66.20	3.80	-62.40	-13.00	-49.40

Remarks:

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).



Above 1GHz
LTE Band 4, Channel Bandwidth: 1.4MHz

Mode	TX channel 19957 (1710.7MHz)	Frequency Range	1GHz ~ 18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	3421.40	-61.20	-52.60	1.30	-51.30	-13.00	-38.30
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	**3421.40**	**-59.30**	**-51.20**	**1.30**	**-49.90**	**-13.00**	**-36.90**

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).

Mode	TX channel 20175 (1732.5MHz)	Frequency Range	1GHz ~ 18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	3465.00	-61.00	-52.60	1.40	-51.20	-13.00	-38.20
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	3465.00	-61.30	-53.00	1.40	-51.60	-13.00	-38.60

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).

Mode	TX channel 20393 (1754.3MHz)	Frequency Range	1GHz ~ 18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	3508.60	-59.70	-51.90	1.40	-50.50	-13.00	-37.50
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	3508.60	-59.80	-52.10	1.40	-50.70	-13.00	-37.70

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).

LTE Band 4, Channel Bandwidth: 5MHz

Mode	TX channel 19975 (1712.5MHz)	Frequency Range	1GHz ~ 18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	3425.00	-61.50	-52.90	1.30	-51.60	-13.00	-38.60
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	3425.00	-60.10	-52.00	1.30	-50.70	-13.00	-37.70

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).

Mode	TX channel 20175 (1732.5MHz)	Frequency Range	1GHz ~ 18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	3465.00	-61.30	-52.90	1.40	-51.50	-13.00	-38.50
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	3465.00	-61.40	-53.60	1.40	-52.20	-13.00	-39.20

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).

Mode	TX channel 20375 (1752.5MHz)	Frequency Range	1GHz ~ 18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	3505.00	-61.60	-53.40	1.50	-51.90	-13.00	-38.90
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	3505.00	-59.60	-52.00	1.50	-50.50	-13.00	-37.50

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).

LTE Band 4, Channel Bandwidth: 20MHz

Mode	TX channel 20050 (1720.0MHz)	Frequency Range	1GHz ~ 18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	3440.00	-61.10	-52.60	1.30	-51.30	-13.00	-38.30
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	3440.00	-59.60	-51.60	1.30	-50.30	-13.00	-37.30

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).

Mode	TX channel 20175 (1732.5MHz)	Frequency Range	1GHz ~ 18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	3465.00	-61.70	-53.30	1.40	-51.90	-13.00	-38.90
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	3465.00	-59.70	-51.90	1.40	-50.50	-13.00	-37.50

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).

Mode	TX channel 20300 (1745.0MHz)	Frequency Range	1GHz ~ 18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	3490.00	-61.80	-53.60	1.50	-52.10	-13.00	-39.10
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	3490.00	-59.70	-52.10	1.50	-50.60	-13.00	-37.60

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).

LTE Band 12, Channel Bandwidth: 1.4MHz

Mode	TX channel 23017 (699.7MHz)	Frequency Range	1GHz ~ 18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1399.40	-59.40	-53.20	0.90	-52.30	-13.00	-39.30
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1399.40	-55.40	-50.30	0.90	-49.40	-13.00	-36.40

Remarks:
1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

Mode	TX channel 23095 (707.5MHz)	Frequency Range	1GHz ~ 18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1415.00	-59.50	-52.90	0.90	-52.00	-13.00	-39.00
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	**1415.00**	**-55.00**	**-49.70**	**0.90**	**-48.80**	**-13.00**	**-35.80**

Remarks:
1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

Mode	TX channel 23173 (715.3MHz)	Frequency Range	1GHz ~ 18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1430.60	-59.20	-52.50	1.00	-51.50	-13.00	-38.50
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1430.60	-55.90	-50.40	1.00	-49.40	-13.00	-36.40

Remarks:
1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

LTE Band 12, Channel Bandwidth: 5MHz

Mode	TX channel 23035 (701.5MHz)	Frequency Range	1GHz ~ 18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1403.00	-59.80	-53.40	0.90	-52.50	-13.00	-39.50
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1403.00	-55.60	-50.50	0.90	-49.60	-13.00	-36.60

Remarks:
1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

Mode	TX channel 23095 (707.5MHz)	Frequency Range	1GHz ~ 18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1415.00	-59.80	-53.20	0.90	-52.30	-13.00	-39.30
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1415.00	-55.20	-49.90	0.90	-49.00	-13.00	-36.00

Remarks:
1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

Mode	TX channel 23155 (713.5MHz)	Frequency Range	1GHz ~ 18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1427.00	-59.40	-52.70	1.00	-51.70	-13.00	-38.70
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1427.00	-55.90	-50.40	1.00	-49.40	-13.00	-36.40

Remarks:
1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

LTE Band 12, Channel Bandwidth: 10MHz

Mode	TX channel 23060 (704MHz)	Frequency Range	1GHz ~ 18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1408.00	-59.50	-53.00	0.90	-52.10	-13.00	-39.10
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1408.00	-55.20	-50.00	0.90	-49.10	-13.00	-36.10

Remarks:
1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

Mode	TX channel 23095 (707.5MHz)	Frequency Range	1GHz ~ 18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1415.00	-59.70	-53.10	0.90	-52.20	-13.00	-39.20
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1415.00	-55.50	-50.10	0.90	-49.20	-13.00	-36.20

Remarks:
1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

Mode	TX channel 23130 (711MHz)	Frequency Range	1GHz ~ 18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1422.00	-60.00	-53.50	1.00	-52.50	-13.00	-39.50
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	**1422.00**	**-55.20**	**-49.80**	**1.00**	**-48.80**	**-13.00**	**-35.80**

Remarks:
1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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

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

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

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

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

--- END ---