FCC Test Report

(PART 27)

Report No.:	RF190415C07-2
FCC ID:	O9YJKS3
Test Model:	JKS3A
Series Model:	ATS100M-YZ-V, ATS100M-YZ-S, JKS3B, ATS100M-Y-V, ATS100M-Y-S, JKS3C, ATS100M-Z-V, ATS100M-Z-S, JKS3D, ATS100M-V, ATS100M-S (Refer to section 3.1 for detail)
Received Date:	Apr. 15, 2019
Test Date:	May 03 ~ May 31, 2019
Issued Date:	Jun. 11, 2019
Applicant:	Spireon Inc
Address:	9724 Kingstone Pike, suite 800, Knoxville, Tennessee, USA, 37922
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C)
Test Location:	No. 19, Hwa Ya 2nd Rd, Wen Hwa Vil, Kwei Shan Dist., Taoyuan City 33383, Taiwan (R.O.C)
FCC Registration / Designation Number:	788550 / TW0003

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RF190415C07-2	Original Release	Jun. 11, 2019

1 Certificate of Conformity

Product: GPS Tracker

Brand: Spireon

Test Model: JKS3A

Series Model: ATS100M-YZ-V, ATS100M-YZ-S, JKS3B, ATS100M-Y-V, ATS100M-Y-S, JKS3C, ATS100M-Z-V, ATS100M-Z-S, JKS3D, ATS100M-V, ATS100M-S (Refer to section 3.1 for detail)

Sample Status: Engineering Sample

Applicant: Spireon Inc

Test Date: May 03 ~ May 31, 2019

Standards: FCC Part 27, Subpart F, L

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

Prepared by : Lena Wang , **Date:** Jun. 11, 2019

Lena Wang / Specialist

Approved by : , **Date:** Jun. 11, 2019

Dylan Chiou / Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 27 & Part 2 (LTE 4)			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 27.50(d)(4)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement.
2.1055 27.54	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth	Pass	Meet the requirement of limit.
27.50(d)(5)	Peak to Average Ratio	Pass	Meet the requirement of limit.
27.53(h)	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 27.53(h)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 27.53(h)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -19.02 dB at 6980.00 MHz.

Applied Standard: FCC Part 27 & Part 2 (LTE 13)			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 27.50(b)(10)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement.
2.1055 27.54	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth	Pass	Meet the requirement of limit.
---	Peak to Average Ratio	Pass	Meet the requirement of limit.
27.53(c)(2)(4)	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 27.53(c)(2)&(f)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 27.53(c)(2)&(f)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -5.61 dB at 1564.00 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 Agilent	N9038A	MY51210203	Mar. 18, 2019	Mar. 17, 2020
Spectrum Analyzer Agilent	N9010A	MY52220314	Dec. 13, 2018	Dec. 12, 2019
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Apr. 15, 2019	Apr. 14, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSW26	102023	Oct. 11, 2018	Oct. 10, 2019
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 25, 2018	Nov. 24, 2019
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Nov. 23, 2018	Nov. 22, 2019
Horn Antenna SCHWARZBECK	BBHA 9170	148	Nov. 25, 2018	Nov. 24, 2019
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 15, 2019	Apr. 14, 2020
MXG Vector signal generator Agilent	N5182B	MY53050430	Nov. 19, 2018	Nov. 18, 2019
Preamplifier EMCI	EMC 012645	980115	Oct. 12, 2018	Oct. 11, 2019
Preamplifier EMCI	EMC 184045	980116	Oct. 12, 2018	Oct. 11, 2019
Preamplifier EMCI	EMC 330H	980112	Oct. 12, 2018	Oct. 11, 2019
RF Coaxial Cable HUBER+SUHNNER	EMC104-SM-SM-8000&3000	140811+170717	Oct. 12, 2018	Oct. 11, 2019
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM-1000(140807)	Oct. 12, 2018	Oct. 11, 2019
RF Coaxial Cable Worken	8D-FB	Cable-Ch10-01	Oct. 12, 2018	Oct. 11, 2019
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower &Turn Table Controller MF	MF-7802	NA	NA	NA
LTE Wireless Communication Test Set Keysight	E7515A	MY57270629	Feb. 22, 2019	Feb. 22, 2020
Radio Communication Analyzer Anritsu	MT8820C	6201300640	Aug. 16, 2017	Aug. 15, 2019
Temperature & Humidity Chamber	GTH-120-40-CP-AR	MAA1306-019	Sep. 05, 2018	Sep. 04, 2019
DC Power Supply Topward	33010D	807748	NA	NA

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

2. The test was performed in HwaYa Chamber 10.

3 General Information

3.1 General Description of EUT

Product	GPS Tracker	
Brand	Spireon	
Test Model	JKS3A	
Series Model	ATS100M-YZ-V, ATS100M-YZ-S, JKS3B, ATS100M-Y-V, ATS100M-Y-S, JKS3C, ATS100M-Z-V, ATS100M-Z-S, JKS3D, ATS100M-V, ATS100M-S	
Status of EUT	Engineering Sample	
Power Supply Rating	12 Vdc (adapter) 3.7 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 13 (Channel Bandwidth: 5 MHz)	779.5 ~ 784.5 MHz
	LTE Band 13 (Channel Bandwidth: 10 MHz)	782.0 MHz
Emission Designator	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	1M09G7D
	LTE Band 4 (Channel Bandwidth: 3 MHz)	1M09G7D
	LTE Band 4 (Channel Bandwidth: 5 MHz)	1M10G7D
	LTE Band 4 (Channel Bandwidth: 10 MHz)	1M09G7D
	LTE Band 4 (Channel Bandwidth: 15 MHz)	1M11G7D
	LTE Band 4 (Channel Bandwidth: 20 MHz)	1M10G7D
	LTE Band 13 (Channel Bandwidth: 5 MHz)	1M10G7D
	LTE Band 13 (Channel Bandwidth: 10 MHz)	1M09G7D
Max. ERP Power	LTE Band 13 (Channel Bandwidth: 5 MHz)	190.55 mW
	LTE Band 13 (Channel Bandwidth: 10 MHz)	201.84 mW
Max. EIRP Power	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	319.89 mW
	LTE Band 4 (Channel Bandwidth: 3 MHz)	323.59 mW
	LTE Band 4 (Channel Bandwidth: 5 MHz)	328.85 mW
	LTE Band 4 (Channel Bandwidth: 10 MHz)	331.89 mW
	LTE Band 4 (Channel Bandwidth: 15 MHz)	335.74 mW
	LTE Band 4 (Channel Bandwidth: 20 MHz)	341.19 mW
Antenna Type	PIFA Antenna	
Antenna Gain	LTE Band 4	2.8 dBi
	LTE Band 13	1.8 dBi
Accessory Device	Refer to Note as below	
Data Cable Supplied	Refer to Note as below	

Note:

1. All models are listed as below. Model JKS3A is the representative for final test.

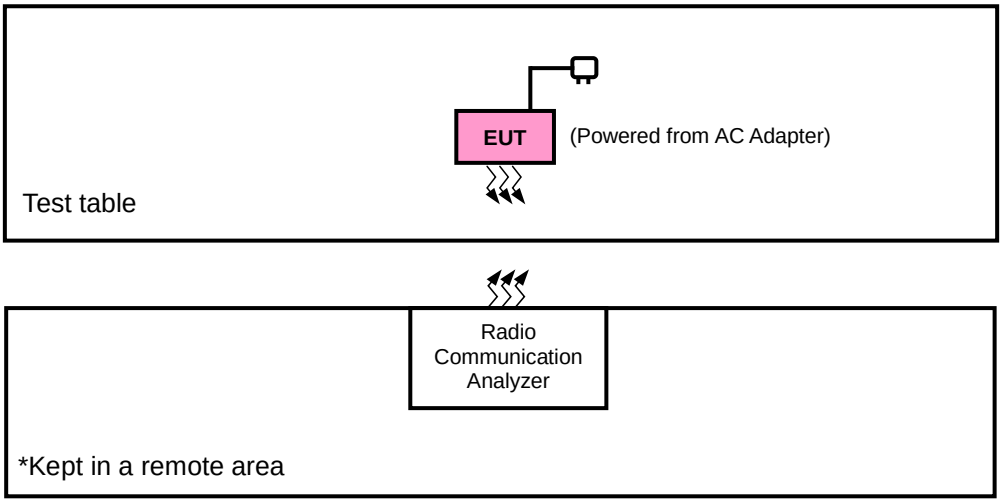
Brand	Model	Difference
Spireon	JKS3A	With Battery; With Buzzer
	ATS100M-YZ-V	
	ATS100M-YZ-S	
	JKS3B	With Battery; Without Buzzer
	ATS100M-Y-V	
	ATS100M-Y-S	
	JKS3C	Without Battery; With Buzzer
	ATS100M-Z-V	
	ATS100M-Z-S	
	JKS3D	Without Battery; Without Buzzer
	ATS100M-V	
	ATS100M-S	

2. The EUT uses following adapter. (For support unit only)

Brand	Chanel Well Technology
Model	CAP012121
Input Power	100-240 Vac,47~63 Hz, 0.35 A
Output Power	12 Vdc, 1.0 A
Power Line	2.25m non-shuelded DC power cable without core

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

3.2 Configuration of System under Test



3.2.1 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Radio Communication Analyzer	ANRITSU	MT8821C	6201502978	N/A
2.	Adapter	Chanel Well Technology	CAP012121	N/A	N/A

No.	Signal Cable Description Of The Above Support Units
1.	N/A
2.	2.25m

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Items 1 acted as communication partners to transfer data.
3. Items 2 was provided by client.

3.3 Test Mode Applicability and Tested Channel Detail

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis, and antenna ports

The worst case was found when positioned as the table below. Following channel(s) was (were) selected for the final test as listed below:

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

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 / 0 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Modulation Characteristics	20050 to 20300	20175	20 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
-	Frequency Stability	19957 to 20393	19957, 20393	1.4 MHz	QPSK	1 RB / 0 RB Offset
		19965 to 20385	19965, 20385	3 MHz	QPSK	1 RB / 0 RB Offset
		19975 to 20375	19975, 20375	5 MHz	QPSK	1 RB / 0 RB Offset
		20000 to 20350	20000, 20350	10 MHz	QPSK	1 RB / 0 RB Offset
		20025 to 20325	20025, 20325	15 MHz	QPSK	1 RB / 0 RB Offset
		20050 to 20300	20050, 20300	20 MHz	QPSK	1 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 / 0 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM	1 RB / 0 RB Offset

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	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 / 0 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK	1 RB / 0 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK	1 RB / 0 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK	1 RB / 0 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK	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 13

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	ERP	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Modulation Characteristics	23230	23230	10 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
-	Frequency Stability	23205 to 23255	23205, 23255	5 MHz	QPSK	1 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK	1 RB / 0 RB Offset
-	Occupied Bandwidth	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK, 16QAM	50 RB / 0 RB Offset
-	Peak to Average Ratio	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Band Edge	23205 to 23255	23205	5 MHz	QPSK	1 RB / 0 RB Offset
						25 RB / 0 RB Offset
			23255	5 MHz	QPSK	1 RB / 24 RB Offset
						25 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK	1 RB / 0 RB Offset
						50 RB / 0 RB Offset
			23230	10 MHz	QPSK	1 RB / 49 RB Offset
						50 RB / 0 RB Offset
-	Conducted Emission	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK	1 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK	1 RB / 0 RB Offset
-	Radiated Emission	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK	1 RB / 0 RB Offset
		23230	23230	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	3.7 Vdc	Thomas Wei
Modulation Characteristics	25 deg. C, 65 % RH	3.7 Vdc	Getaz Yang
Frequency Stability	25 deg. C, 65 % RH	3.7 Vdc	Getaz Yang
Occupied Bandwidth	25 deg. C, 65 % RH	3.7 Vdc	Getaz Yang
Band Edge	25 deg. C, 65 % RH	3.7 Vdc	Getaz Yang
Peak to Average Ratio	25 deg. C, 65 % RH	3.7 Vdc	Getaz Yang
Conducted Emission	25 deg. C, 65 % RH	3.7 Vdc	Getaz Yang
Radiated Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Tim-Chen, Getaz Yang

3.4 EUT Operating Conditions

The EUT makes a call to the communication simulator. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency

3.5 General Description of Applied Standards

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

FCC 47 CFR Part 2
FCC 47 CFR Part 27
KDB 971168 D01 Power Meas License Digital Systems v03r01
ANSI/TIA/EIA-603-E 2016
ANSI 63.26-2015

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

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

Fixed, mobile, and portable (hand-held) stations operating in the 1710–1755 MHz band 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 devices) operating in the 746-757 MHz, 776-788 MHz and 805-806 MHz band are limited to 3 watts ERP

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:

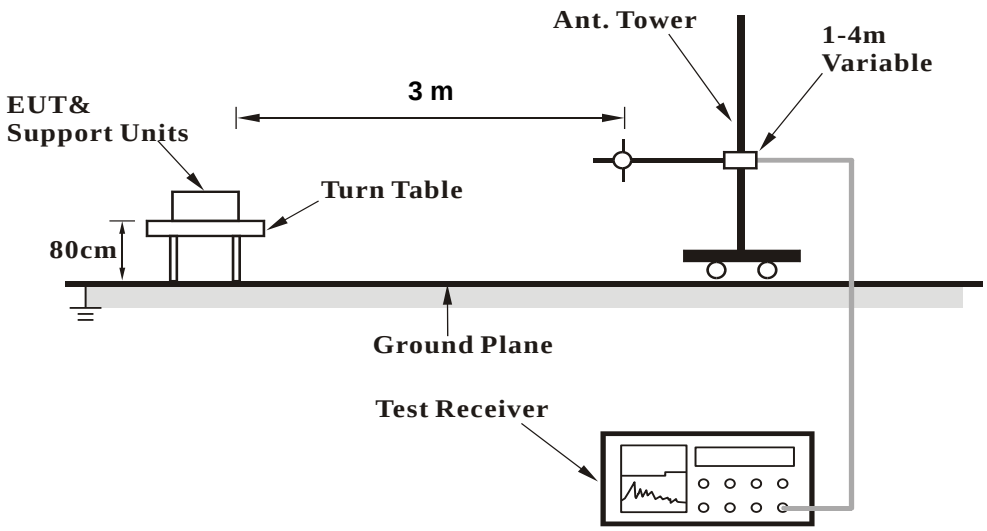
a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 10 MHz for LTE mode.
b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table,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

Conducted Power Measurement:

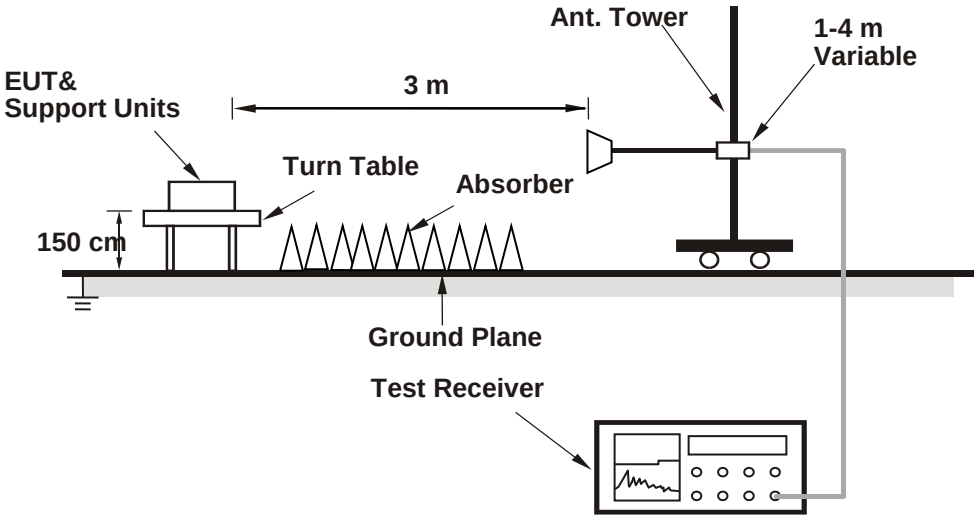
a. The EUT was set up for the maximum power with LTE link data modulation and link up with simulator.
b. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

4.1.3 Test Setup

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



<Radiated Emission above 1 GHz>



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

Conducted Power Measurement:

4.1.4 Test Results

Conducted Output Power (dBm)

eMTC	Band 4	Region(s):	FCC	Power:	Class 3	23	Tolerance:	2.7	maximum:	24.22

BW(MHz):	1.4									
Test Frequency ID	N_{UL}	Frequency of Uplink [MHz]	N_{DL}	Frequency of Downlink [MHz]	Test ConfigurationInitial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	19957	1710.7	1957	2110.7	QPSK	1	0	0	-85	23.02
					QPSK	1	5	0	-85	23.11
					QPSK	3	3	0	-85	23.05
					QPSK	6	0	0	-85	23.06
					16QAM	1	0	0	-85	23.09
					16QAM	1	5	0	-85	23.27
					16QAM	3	0	0	-85	23.12
					16QAM	5	0	0	-85	23.28
Mid Range	20175	1732.5	2175	2132.5	QPSK	1	0	0	-85	23.51
					QPSK	1	5	0	-85	23.31
					QPSK	3	3	0	-85	23.28
					QPSK	6	0	0	-85	23.25
					16QAM	1	0	0	-85	23.21
					16QAM	1	5	0	-85	23.15
					16QAM	3	0	0	-85	23.47
					16QAM	5	0	0	-85	23.53
High Range	20393	1754.3	2393	2154.3	QPSK	1	0	0	-85	23.11
					QPSK	1	5	0	-85	23.36
					QPSK	3	3	0	-85	23.29
					QPSK	6	0	0	-85	23.25
					16QAM	1	0	0	-85	23.34
					16QAM	1	5	0	-85	23.12
					16QAM	3	0	0	-85	23.11
					16QAM	5	0	0	-85	23.12

BW(MHz):	3									
Test Frequency ID	N_{UL}	Frequency of Uplink [MHz]	N_{DL}	Frequency of Downlink [MHz]	Test ConfigurationInitial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	19965	1711.5	1965	2111.5	QPSK	1	0	0	-85	23.1
					QPSK	1	5	0	-85	23.24
					QPSK	1	0	1	-85	23.24

					QPSK	1	5	1	-85	23.15
					QPSK	3	3	0	-85	23.27
					QPSK	3	3	1	-85	23.35
					QPSK	6	0	0	-85	23.15
					QPSK	6	0	1	-85	23.39
					16QAM	1	0	0	-85	23.14
					16QAM	1	5	0	-85	23.39
					16QAM	1	0	1	-85	23.31
					16QAM	1	5	1	-85	23.33
					16QAM	3	0	0	-85	23.37
					16QAM	3	3	1	-85	23.22
					16QAM	5	0	0	-85	23.64
					16QAM	5	0	1	-85	23.56
Mid Range	20175	1732.5	2175	2132.5	QPSK	1	0	0	-85	23.72
					QPSK	1	5	0	-85	23.29
					QPSK	1	0	1	-85	23.6
					QPSK	1	5	1	-85	23.43
					QPSK	3	3	0	-85	23.37
					QPSK	3	3	1	-85	23.47
					QPSK	6	0	0	-85	23.18
					QPSK	6	0	1	-85	23.21
					16QAM	1	0	0	-85	23.19
					16QAM	1	5	0	-85	23.27
					16QAM	1	0	1	-85	23.53
					16QAM	1	5	1	-85	23.1
					16QAM	3	0	0	-85	23.54
					16QAM	3	3	1	-85	23.37
					16QAM	5	0	0	-85	23.73
					16QAM	5	0	1	-85	23.63
High Range	20385	1753.5	2385	1915	QPSK	1	0	0	-85	23.4
					QPSK	1	5	0	-85	23.37
					QPSK	1	0	1	-85	23.25
					QPSK	1	5	1	-85	23.43
					QPSK	3	3	0	-85	23.23
					QPSK	3	3	1	-85	23.55
					QPSK	6	0	0	-85	23.53
					QPSK	6	0	1	-85	23.54
					16QAM	1	0	0	-85	23.04
					16QAM	1	5	0	-85	23.26
					16QAM	1	0	1	-85	22.92
					16QAM	1	5	1	-85	22.92

					16QAM	3	0	0	-85	23
					16QAM	3	3	1	-85	23.28
					16QAM	5	0	0	-85	23.37
					16QAM	5	0	1	-85	23.45

BW(MHz):	5

Test Frequency ID	N_{UL}	Frequency of Uplink [MHz]	N_{DL}	Frequency of Downlink [MHz]	Test ConfigurationInitial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	19975	1712.5	1975	2112.5	QPSK	1	0	0	-85	23.33
					QPSK	1	5	0	-85	23.31
					QPSK	1	0	1	-85	23.36
					QPSK	1	5	1	-85	23.26
					QPSK	1	0	3	-85	23.45
					QPSK	1	5	3	-85	23.52
					QPSK	3	0	0	-85	23.39
					QPSK	3	3	3	-85	23.48
					QPSK	6	0	0	-85	23.36
					QPSK	6	0	1	-85	23.42
					QPSK	6	0	3	-85	23.52
					16QAM	1	0	0	-85	23.34
					16QAM	1	5	0	-85	23.4
					16QAM	1	0	1	-85	23.45
					16QAM	1	5	1	-85	23.7
					16QAM	1	0	3	-85	23.76
					16QAM	1	5	3	-85	23.45
					16QAM	3	0	0	-85	23.41
					16QAM	3	3	3	-85	23.57
					16QAM	5	0	0	-85	23.51
					16QAM	5	0	1	-85	23.43
					16QAM	5	0	3	-85	23.48
Mid Range	20175	1732.5	2175	2132.5	QPSK	1	0	0	-85	23.91
					QPSK	1	5	0	-85	23.36
					QPSK	1	0	1	-85	23.41
					QPSK	1	5	1	-85	23.34
					QPSK	1	0	3	-85	23.64
					QPSK	1	5	3	-85	23.24
					QPSK	3	0	0	-85	23.58
					QPSK	3	3	3	-85	23.51
					QPSK	6	0	0	-85	23.81

					QPSK	6	0	1	-85	23.66
					QPSK	6	0	3	-85	23.5
					16QAM	1	0	0	-85	23.43
					16QAM	1	5	0	-85	23.52
					16QAM	1	0	1	-85	23.36
					16QAM	1	5	1	-85	23.71
					16QAM	1	0	3	-85	23.3
					16QAM	1	5	3	-85	23.77
					16QAM	3	0	0	-85	23.72
					16QAM	3	3	3	-85	23.37
					16QAM	5	0	0	-85	23.25
					16QAM	5	0	1	-85	23.37
					16QAM	5	0	3	-85	23.19
					QPSK	1	0	0	-85	23.21
					QPSK	1	5	0	-85	23.31
					QPSK	1	0	1	-85	23.4
					QPSK	1	5	1	-85	23.52
					QPSK	1	0	3	-85	23.41
					QPSK	1	5	3	-85	23.34
					QPSK	3	0	0	-85	23.3
					QPSK	3	3	3	-85	23.41
					QPSK	6	0	0	-85	23.32
					QPSK	6	0	1	-85	23.29
High Range	20375	1752.5	2375	2152.5	QPSK	6	0	3	-85	23.36
					16QAM	1	0	0	-85	23.5
					16QAM	1	5	0	-85	23.29
					16QAM	1	0	1	-85	23.62
					16QAM	1	5	1	-85	23.32
					16QAM	1	0	3	-85	23.29
					16QAM	1	5	3	-85	23.12
					16QAM	3	0	0	-85	23.21
					16QAM	3	3	3	-85	23.14
					16QAM	5	0	0	-85	23.22
					16QAM	5	0	1	-85	23.37
					16QAM	5	0	3	-85	23.47

BW(MHz):	10					
	N_{UL}		N_{DL}		Test ConfigurationInitial of Power	EUT

Test Frequency ID		Frequency of Uplink [MHz]		Frequency of Downlink [MHz]	Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	20000	1715	2000	2115	QPSK	1	0	0	-85	23.38
					QPSK	1	5	0	-85	23.45
					QPSK	1	0	3	-85	23.52
					QPSK	1	5	3	-85	23.39
					QPSK	1	0	7	-85	23.54
					QPSK	1	5	7	-85	23.66
					QPSK	4	0	0	-85	23.38
					QPSK	4	2	7	-85	23.62
					QPSK	6	0	0	-85	23.5
					QPSK	6	0	7	-85	23.6
					16QAM	1	0	0	-85	23.61
					16QAM	1	5	0	-85	23.57
					16QAM	1	0	3	-85	23.59
					16QAM	1	5	3	-85	23.53
					16QAM	1	0	7	-85	23.9
					16QAM	1	5	7	-85	23.86
					16QAM	4	2	0	-85	23.6
					16QAM	4	2	7	-85	23.57
					16QAM	5	0	0	-85	23.76
					16QAM	5	0	7	-85	23.67
Mid Range	20175	1732.5	2175	2132.5	QPSK	1	0	0	-85	24.01
					QPSK	1	5	0	-85	23.68
					QPSK	1	0	3	-85	23.49
					QPSK	1	5	3	-85	23.46
					QPSK	1	0	7	-85	23.55
					QPSK	1	5	7	-85	23.48
					QPSK	4	0	0	-85	23.77
					QPSK	4	2	7	-85	23.36
					QPSK	6	0	0	-85	23.67
					QPSK	6	0	7	-85	23.6
					16QAM	1	0	0	-85	23.87
					16QAM	1	5	0	-85	23.86
					16QAM	1	0	3	-85	23.68
					16QAM	1	5	3	-85	23.63
					16QAM	1	0	7	-85	23.64
					16QAM	1	5	7	-85	23.5
					16QAM	4	2	0	-85	23.8
					16QAM	4	2	7	-85	23.48

					16QAM	5	0	0	-85	23.81
					16QAM	5	0	7	-85	23.75
High Range	20350	1750	2350	2150	QPSK	1	0	0	-85	23.41
					QPSK	1	5	0	-85	23.47
					QPSK	1	5	7	-85	23.3
					QPSK	1	0	3	-85	23.18
					QPSK	1	5	3	-85	23.27
					QPSK	1	0	7	-85	23.45
					QPSK	4	0	0	-85	23.55
					QPSK	4	2	7	-85	23.62
					QPSK	6	0	0	-85	23.56
					QPSK	6	0	7	-85	23.55
					16QAM	1	0	0	-85	23.46
					16QAM	1	5	0	-85	23.5
					16QAM	1	0	3	-85	23.49
					16QAM	1	5	3	-85	23.39
					16QAM	1	0	7	-85	23.5
					16QAM	1	5	7	-85	23.66
					16QAM	4	2	0	-85	23.46
					16QAM	4	2	7	-85	23.73
					16QAM	5	0	0	-85	23.44
					16QAM	5	0	7	-85	23.42

BW(MHz):	15

Test Frequency ID	N_{UL}	Frequency of Uplink [MHz]	N_{DL}	Frequency of Downlink [MHz]	Test ConfigurationInitial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	20025	1717.5	2025	2117.5	QPSK	1	0	0	-85	23.48
					QPSK	1	5	0	-85	23.58
					QPSK	1	0	5	-85	23.6
					QPSK	1	5	5	-85	23.55
					QPSK	1	0	11	-85	23.67
					QPSK	1	5	11	-85	23.77
					QPSK	3	0	0	-85	23.53
					QPSK	3	3	11	-85	23.76
					QPSK	6	0	0	-85	23.6
					QPSK	6	0	11	-85	23.68
					16QAM	1	0	0	-85	23.71
					16QAM	1	5	0	-85	23.67

					16QAM	1	0	5	-85	23.69
					16QAM	1	5	5	-85	23.69
					16QAM	1	0	11	-85	23.97
					16QAM	1	5	11	-85	23.96
					16QAM	3	0	0	-85	23.74
					16QAM	3	3	11	-85	23.64
					16QAM	5	0	0	-85	23.87
					16QAM	5	0	11	-85	23.77
Mid Range	20175	1732.5	2175	2132.5	QPSK	1	0	0	-85	24.12
					QPSK	1	5	0	-85	23.79
					QPSK	1	0	5	-85	23.62
					QPSK	1	5	5	-85	23.56
					QPSK	1	0	11	-85	23.61
					QPSK	1	5	11	-85	23.63
					QPSK	3	0	0	-85	23.86
					QPSK	3	3	11	-85	23.48
					QPSK	6	0	0	-85	23.9
					QPSK	6	0	11	-85	23.78
					16QAM	1	0	0	-85	24.08
					16QAM	1	5	0	-85	24.02
					16QAM	1	0	5	-85	23.82
					16QAM	1	5	5	-85	23.79
					16QAM	1	0	11	-85	23.75
					16QAM	1	5	11	-85	23.6
					16QAM	3	0	0	-85	23.9
					16QAM	3	3	11	-85	23.63
					16QAM	5	0	0	-85	24
					16QAM	5	0	11	-85	23.92
High Range	20325	1747.5	2325	2147.5	QPSK	1	0	0	-85	23.46
					QPSK	1	5	11	-85	23.54
					QPSK	1	0	5	-85	23.42
					QPSK	1	5	5	-85	23.34
					QPSK	1	0	11	-85	23.41
					QPSK	1	5	11	-85	23.53
					QPSK	3	0	0	-85	23.68
					QPSK	3	3	11	-85	23.76
					QPSK	6	0	0	-85	23.7
					QPSK	6	0	11	-85	23.58
					16QAM	1	0	0	-85	23.59
					16QAM	1	5	0	-85	23.59
					16QAM	1	0	5	-85	23.62

					16QAM	1	5	5	-85	23.58
					16QAM	1	0	11	-85	23.65
					16QAM	1	5	11	-85	23.79
					16QAM	3	0	0	-85	23.57
					16QAM	3	3	11	-85	23.85
					16QAM	5	0	0	-85	23.56
					16QAM	5	0	11	-85	23.58

BW(MHz):	20

Test Frequency ID	N_{UL}	Frequency of Uplink [MHz]	N_{DL}	Frequency of Downlink [MHz]	Test ConfigurationInitial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	20050	1720	2050	2120	QPSK	1	0	0	-85	23.64
					QPSK	1	5	0	-85	23.71
					QPSK	1	0	7	-85	23.73
					QPSK	1	5	7	-85	23.7
					QPSK	1	0	15	-85	23.79
					QPSK	1	5	15	-85	23.91
					QPSK	3	0	0	-85	23.67
					QPSK	3	3	15	-85	23.86
					QPSK	6	0	0	-85	23.7
					QPSK	6	0	15	-85	23.83
					16QAM	1	0	0	-85	23.85
					16QAM	1	5	0	-85	23.8
					16QAM	1	0	7	-85	23.84
					16QAM	1	5	7	-85	23.81
					16QAM	1	0	15	-85	24.09
					16QAM	1	5	15	-85	24.11
					16QAM	3	0	0	-85	23.84
					16QAM	3	3	15	-85	23.79
					16QAM	5	0	0	-85	24.03
					16QAM	5	0	15	-85	23.9
Mid Range	20175	1732.5	2175	2132.5	QPSK	1	0	0	-85	24.22
					QPSK	1	5	0	-85	23.91
					QPSK	1	0	7	-85	23.73
					QPSK	1	5	7	-85	23.7
					QPSK	1	0	15	-85	23.77
					QPSK	1	5	15	-85	23.74
					QPSK	3	0	0	-85	24.01

					QPSK	3	3	15	-85	23.62
					QPSK	6	0	0	-85	23.99
					QPSK	6	0	15	-85	23.88
					16QAM	1	0	0	-85	24.17
					16QAM	1	5	0	-85	24.11
					16QAM	1	0	7	-85	23.92
					16QAM	1	5	7	-85	23.89
					16QAM	1	0	15	-85	23.87
					16QAM	1	5	15	-85	23.76
					16QAM	3	0	0	-85	24.05
					16QAM	3	3	15	-85	23.72
					16QAM	5	0	0	-85	24.11
					16QAM	5	0	15	-85	24.05
High Range	20300	1745	2300	2145	QPSK	1	0	0	-85	23.62
					QPSK	1	5	0	-85	23.7
					QPSK	1	0	7	-85	23.53
					QPSK	1	5	7	-85	23.43
					QPSK	1	0	15	-85	23.56
					QPSK	1	5	15	-85	23.68
					QPSK	3	0	0	-85	23.82
					QPSK	3	3	15	-85	23.89
					QPSK	6	0	0	-85	23.8
					QPSK	6	0	15	-85	23.74
					16QAM	1	0	0	-85	23.74
					16QAM	1	5	0	-85	23.73
					16QAM	1	0	7	-85	23.71
					16QAM	1	5	7	-85	23.68
					16QAM	1	0	15	-85	23.78
					16QAM	1	5	15	-85	23.89
					16QAM	3	0	0	-85	23.7
					16QAM	3	3	15	-85	24.01
					16QAM	5	0	0	-85	23.71
					16QAM	5	0	15	-85	23.73

eMTC	Band 13	Region(s):	FCC	Power:	Class 3	23	Tolerance:	2.7	maximum:	23.53

BW(MHz):	5

Test Frequency ID	N_{UL}	Frequency of Uplink [MHz]	N_{DL}	Frequency of Downlink [MHz]	Test ConfigurationInitial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	23205	779.5	5205	748.5	QPSK	1	0	0	-85	23.32
					QPSK	1	5	0	-85	23.12
					QPSK	1	0	1	-85	23.15
					QPSK	1	5	1	-85	23.11
					QPSK	1	0	3	-85	23.31
					QPSK	1	5	3	-85	23.22
					QPSK	3	0	0	-85	22.16
					QPSK	3	3	3	-85	22.11
					QPSK	6	0	0	-85	22.24
					QPSK	6	0	1	-85	22.45
					QPSK	6	0	3	-85	22.32
					16QAM	1	0	0	-85	23.41
					16QAM	1	5	0	-85	23.23
					16QAM	1	0	1	-85	23.28
					16QAM	1	5	1	-85	23.27
					16QAM	1	0	3	-85	23.21
					16QAM	1	5	3	-85	23.15
					16QAM	3	0	0	-85	22.45
					16QAM	3	3	3	-85	22.24
					16QAM	5	0	0	-85	21.67
					16QAM	5	0	1	-85	21.73
					16QAM	5	0	3	-85	21.72
Mid Range	23230	782	5230	751	QPSK	1	0	0	-85	23.42
					QPSK	1	5	0	-85	23.31
					QPSK	1	0	1	-85	23.45
					QPSK	1	5	1	-85	23.44
					QPSK	1	0	3	-85	23.42
					QPSK	1	5	3	-85	23.46
					QPSK	3	0	0	-85	22.51
					QPSK	3	3	3	-85	22.33
					QPSK	6	0	0	-85	22.52
					QPSK	6	0	1	-85	21.42
					QPSK	6	0	3	-85	22.52
					16QAM	1	0	0	-85	23.32

					16QAM	1	5	0	-85	23.39
					16QAM	1	0	1	-85	23.25
					16QAM	1	5	1	-85	23.41
					16QAM	1	0	3	-85	23.38
					16QAM	1	5	3	-85	23.29
					16QAM	3	0	0	-85	22.41
					16QAM	3	3	3	-85	22.45
					16QAM	5	0	0	-85	21.72
					16QAM	5	0	1	-85	21.62
					16QAM	5	0	3	-85	21.66
					QPSK	1	0	0	-85	22.93
					QPSK	1	5	0	-85	22.91
					QPSK	1	0	1	-85	22.92
					QPSK	1	5	1	-85	22.9
					QPSK	1	0	3	-85	23.05
					QPSK	1	5	3	-85	23.06
					QPSK	3	0	0	-85	21.98
					QPSK	3	3	3	-85	21.81
					QPSK	6	0	0	-85	21.84
					QPSK	6	0	1	-85	22.15
					QPSK	6	0	3	-85	22.07
High Range	23255	784.5	5255	753.5	16QAM	1	0	0	-85	23.21
					16QAM	1	5	0	-85	22.98
					16QAM	1	0	1	-85	23.04
					16QAM	1	5	1	-85	21.99
					16QAM	1	0	3	-85	23.21
					16QAM	1	5	3	-85	22.71
					16QAM	3	0	0	-85	22.12
					16QAM	3	3	3	-85	22.15
					16QAM	5	0	0	-85	21.42
					16QAM	5	0	1	-85	21.23
					16QAM	5	0	3	-85	21.52

BW(MHz):	10									
Test Frequency ID	N_{UL}	Frequency of Uplink [MHz]	N_{DL}	Frequency of Downlink [MHz]	Test ConfigurationInitial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Mid Range	23230	782	5230	751	QPSK	1	0	0	-85	23.53
					QPSK	1	5	0	-85	23.45

					QPSK	1	0	3	-85	23.51
					QPSK	1	5	3	-85	23.48
					QPSK	1	0	7	-85	23.32
					QPSK	1	5	7	-85	23.23
					QPSK	4	0	0	-85	23.25
					QPSK	4	2	7	-85	23.39
					QPSK	6	0	0	-85	22.29
					QPSK	6	0	7	-85	22.34
					16QAM	1	0	0	-85	23.05
					16QAM	1	5	0	-85	22.85
					16QAM	1	0	3	-85	23.11
					16QAM	1	5	3	-85	23.14
					16QAM	1	0	7	-85	23.16
					16QAM	1	5	7	-85	23.15
					16QAM	4	2	0	-85	22.35
					16QAM	4	2	7	-85	22.56
					16QAM	5	0	0	-85	22.48
					16QAM	5	0	7	-85	22.81

ERP Power (dBm)

LTE Band 13							
Channel Bandwidth: 5 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
X	23205	779.5	-7.97	32.24	22.12	162.93	H
	23230	782.0	-7.22	32.17	22.80	190.55	
	23255	784.5	-7.94	32.11	22.02	159.22	
	23205	779.5	-13.43	32.43	16.85	48.42	V
	23230	782.0	-13.34	32.42	16.93	49.32	
	23255	784.5	-13.67	32.46	16.64	46.13	
Channel Bandwidth: 5 MHz / 16QAM							
X	23205	779.5	-8.77	32.24	21.32	135.52	H
	23230	782.0	-8.12	32.17	21.90	154.88	
	23255	784.5	-8.64	32.11	21.32	135.52	
	23205	779.5	-14.23	32.43	16.05	40.27	V
	23230	782.0	-14.24	32.42	16.03	40.09	
	23255	784.5	-14.37	32.46	15.94	39.26	

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

LTE Band 13							
Channel Bandwidth: 10 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
X	23230	782.0	-6.97	32.17	23.05	201.84	H
	23230	782.0	-13.09	32.42	17.18	52.24	V
Channel Bandwidth: 10 MHz / 16QAM							
X	23230	782.0	-7.87	32.17	22.15	164.06	H
	23230	782.0	-13.89	32.42	16.38	43.45	V

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

EIRP Power (dBm)

LTE Band 4							
Channel Bandwidth: 1.4 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
X	19957	1710.7	-11.59	36.45	24.86	306.20	H
	20175	1732.5	-11.75	36.80	25.05	319.89	
	20393	1754.3	-12.13	36.94	24.81	302.69	
	19957	1710.7	-17.09	37.28	20.19	104.47	V
	20175	1732.5	-17.25	37.63	20.38	109.14	
	20393	1754.3	-17.52	37.64	20.12	102.80	
Channel Bandwidth: 1.4 MHz / 16QAM							
X	19957	1710.7	-14.02	36.45	22.43	174.98	H
	20175	1732.5	-14.04	36.80	22.76	188.80	
	20393	1754.3	-14.41	36.94	22.53	179.06	
	19957	1710.7	-19.40	37.28	17.88	61.38	V
	20175	1732.5	-19.51	37.63	18.12	64.86	
	20393	1754.3	-19.85	37.64	17.79	60.12	

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

LTE Band 4							
Channel Bandwidth: 3 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
X	19965	1711.5	-11.55	36.45	24.90	309.03	H
	20175	1732.5	-11.70	36.80	25.10	323.59	
	20385	1753.5	-12.10	36.94	24.84	304.79	
	19965	1711.5	-17.06	37.28	20.22	105.20	V
	20175	1732.5	-17.17	37.63	20.46	111.17	
	20385	1753.5	-17.56	37.64	20.08	101.86	
Channel Bandwidth: 3 MHz / 16QAM							
X	19965	1711.5	-12.89	36.45	23.56	226.99	H
	20175	1732.5	-13.06	36.80	23.74	236.59	
	20385	1753.5	-13.45	36.94	23.49	223.36	
	19965	1711.5	-18.43	37.28	18.85	76.74	V
	20175	1732.5	-18.58	37.63	19.05	80.35	
	20385	1753.5	-18.86	37.64	18.78	75.51	

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

LTE Band 4							
Channel Bandwidth: 5 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	19975	1712.5	-11.54	36.45	24.91	309.74	H
	20175	1732.5	-11.63	36.80	25.17	328.85	
	20375	1752.5	-12.02	36.94	24.92	310.46	
	19975	1712.5	-17.03	37.28	20.25	105.93	V
	20175	1732.5	-17.12	37.63	20.51	112.46	
	20375	1752.5	-17.47	37.64	20.17	103.99	
Channel Bandwidth: 5 MHz / 16QAM							
X	19975	1712.5	-12.79	36.45	23.66	232.27	H
	20175	1732.5	-12.94	36.80	23.86	243.22	
	20375	1752.5	-13.31	36.94	23.63	230.67	
	19975	1712.5	-18.20	37.28	19.08	80.91	V
	20175	1732.5	-18.37	37.63	19.26	84.33	
	20375	1752.5	-18.73	37.64	18.91	77.80	

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

LTE Band 4							
Channel Bandwidth: 10 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	20000	1715.0	-11.65	36.64	24.99	315.50	H
	20175	1732.5	-11.59	36.80	25.21	331.89	
	20350	1750.0	-11.85	36.80	24.95	312.61	
	20000	1715.0	-17.13	37.44	20.31	107.40	V
	20175	1732.5	-17.09	37.63	20.54	113.24	
	20350	1750.0	-17.44	37.64	20.20	104.71	
Channel Bandwidth: 10 MHz / 16QAM							
X	20000	1715.0	-12.96	36.64	23.68	233.35	H
	20175	1732.5	-12.82	36.80	23.98	250.03	
	20350	1750.0	-13.12	36.80	23.68	233.35	
	20000	1715.0	-18.25	37.44	19.19	82.99	V
	20175	1732.5	-18.25	37.63	19.38	86.70	
	20350	1750.0	-18.67	37.64	18.97	78.89	

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

LTE Band 4							
Channel Bandwidth: 15 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	20025	1717.5	-11.42	36.45	25.03	318.42	H
	20175	1732.5	-11.54	36.80	25.26	335.74	
	20325	1747.5	-11.90	36.94	25.04	319.15	
	20025	1717.5	-16.91	37.28	20.37	108.89	V
	20175	1732.5	-17.03	37.63	20.60	114.82	
	20325	1747.5	-17.36	37.64	20.28	106.66	
Channel Bandwidth: 15 MHz / 16QAM							
X	20025	1717.5	-12.50	36.45	23.95	248.31	H
	20175	1732.5	-12.69	36.80	24.11	257.63	
	20325	1747.5	-12.96	36.94	23.98	250.03	
	20025	1717.5	-18.00	37.28	19.28	84.72	V
	20175	1732.5	-18.12	37.63	19.51	89.33	
	20325	1747.5	-18.48	37.64	19.16	82.41	

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

LTE Band 4							
Channel Bandwidth: 20 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	20050	1720.0	-11.34	36.45	25.11	324.34	H
	20175	1732.5	-11.47	36.80	25.33	341.19	
	20300	1745.0	-11.86	36.94	25.08	322.11	
	20050	1720.0	-16.83	37.28	20.45	110.92	V
	20175	1732.5	-16.96	37.63	20.67	116.68	
	20300	1745.0	-17.31	37.64	20.33	107.89	
Channel Bandwidth: 20 MHz / 16QAM							
X	20050	1720.0	-12.39	36.45	24.06	254.68	H
	20175	1732.5	-12.55	36.80	24.25	266.07	
	20300	1745.0	-12.92	36.94	24.02	252.35	
	20050	1720.0	-17.91	37.28	19.37	86.50	V
	20175	1732.5	-18.00	37.63	19.63	91.83	
	20300	1745.0	-18.37	37.64	19.27	84.53	

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

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

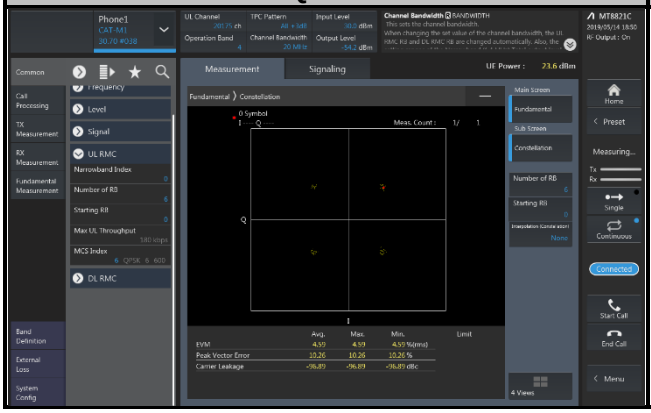
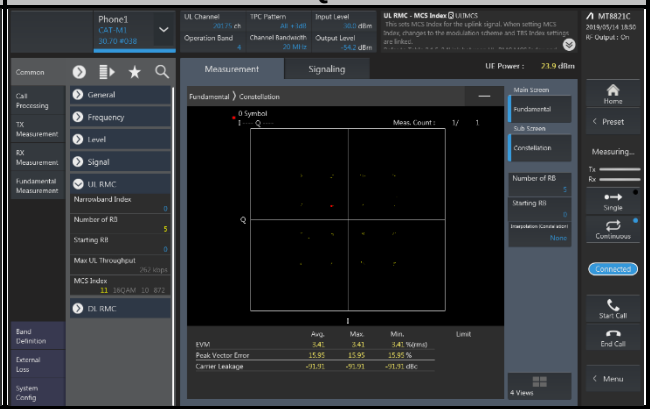
N/A

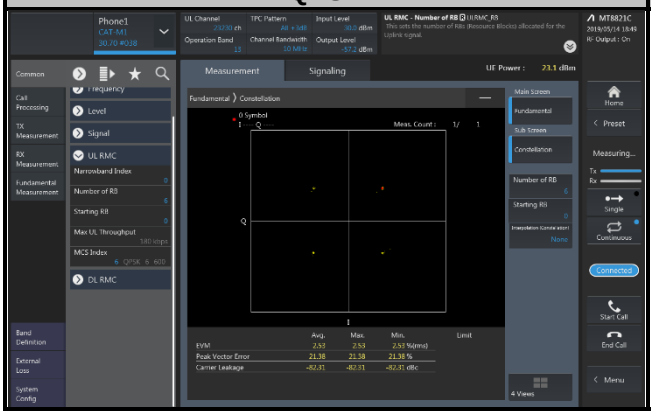
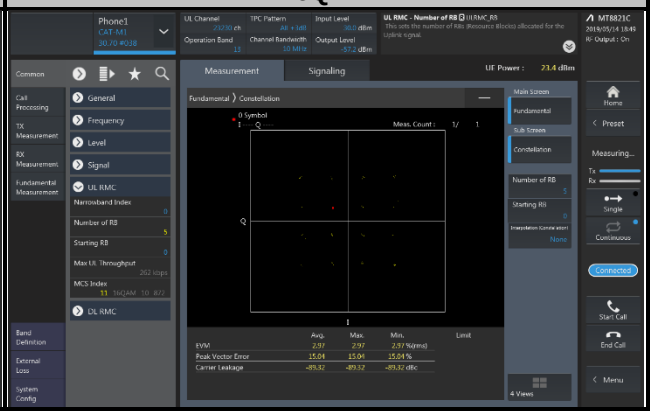
4.2.2 Test Setup

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 13	
Channel 23230	
QPSK	16QAM
	

4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

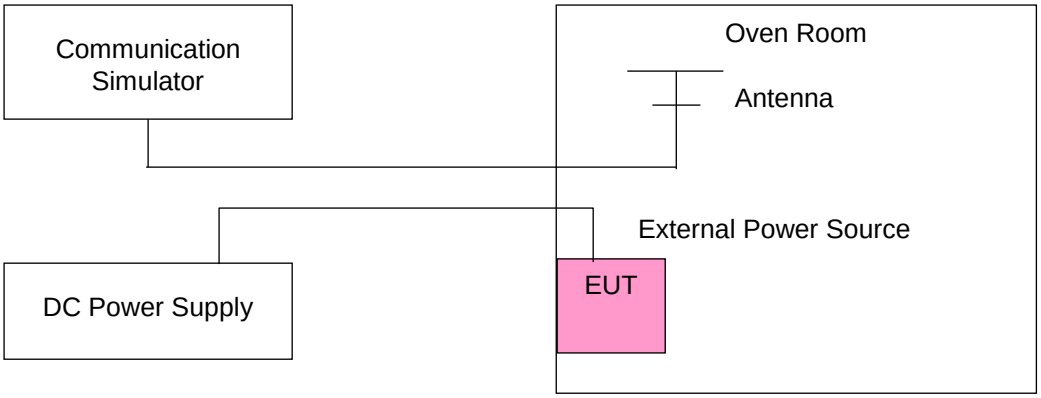
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

4.3.2 Test Procedure

a. Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
b. EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
c. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the ±0.5℃ during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

Note: The frequency error was recorded frequency error from the communication simulator.

4.3.3 Test Setup



4.3.4 Test Results

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)
3.145	1710.700003	0.002	1754.300003	0.002
3.7	1710.700002	0.001	1754.300003	0.002
4.225	1710.700003	0.002	1754.300004	0.002

Note: The applicant defined the normal working voltage of the battery is from 3.7 Vdc to 4.225 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)
-40	1710.700003	0.002	1754.300001	0.001
-30	1710.700004	0.002	1754.300003	0.002
-20	1710.700003	0.001	1754.300003	0.002
-10	1710.700003	0.002	1754.300001	0.001
0	1710.700002	0.001	1754.300003	0.002
10	1710.699997	-0.002	1754.299999	-0.001
20	1710.699997	-0.002	1754.299999	-0.001
30	1710.699999	-0.001	1754.299999	-0.001
40	1710.699996	-0.002	1754.299998	-0.001
50	1710.699996	-0.002	1754.299998	-0.001
60	1710.699996	-0.002	1754.299998	-0.001
70	1710.699996	-0.002	1754.299997	-0.002
75	1710.699997	-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)
3.145	1710.700004	0.002	1754.300003	0.002
3.7	1710.700003	0.002	1754.300002	0.001
4.225	1710.700002	0.001	1754.300004	0.002

Note: The applicant defined the normal working voltage of the battery is from 3.7 Vdc to 4.225 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)
-40	1710.700004	0.002	1754.300003	0.002
-30	1710.700003	0.002	1754.300003	0.002
-20	1710.700002	0.001	1754.300003	0.002
-10	1710.700001	0.001	1754.300001	0.001
0	1710.700004	0.002	1754.300002	0.001
10	1710.699997	-0.002	1754.299998	-0.001
20	1710.699998	-0.001	1754.299999	-0.001
30	1710.699998	-0.001	1754.299998	-0.001
40	1710.699998	-0.001	1754.299999	-0.001
50	1710.699996	-0.002	1754.299997	-0.002
60	1710.699997	-0.002	1754.299998	-0.001
70	1710.699998	-0.001	1754.299997	-0.002
75	1710.699998	-0.001	1754.299997	-0.002

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)
3.145	1710.700003	0.002	1754.300002	0.001
3.7	1710.700003	0.002	1754.300003	0.001
4.225	1710.700003	0.002	1754.300003	0.002

Note: The applicant defined the normal working voltage of the battery is from 3.7 Vdc to 4.225 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)
-40	1710.700001	0.001	1754.300001	0.001
-30	1710.700001	0.001	1754.300003	0.002
-20	1710.700001	0.001	1754.300004	0.002
-10	1710.700003	0.002	1754.300004	0.002
0	1710.700003	0.002	1754.300004	0.002
10	1710.699997	-0.002	1754.299996	-0.002
20	1710.699997	-0.002	1754.299999	-0.001
30	1710.699996	-0.002	1754.299996	-0.002
40	1710.699997	-0.002	1754.299997	-0.001
50	1710.699997	-0.002	1754.299996	-0.002
60	1710.699999	-0.001	1754.299998	-0.001
70	1710.699997	-0.002	1754.299999	-0.001
75	1710.699998	-0.001	1754.299996	-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)
3.145	1710.700003	0.002	1754.300004	0.002
3.7	1710.700001	0.001	1754.300003	0.002
4.225	1710.700001	0.001	1754.300001	0.001

Note: The applicant defined the normal working voltage of the battery is from 3.7 Vdc to 4.225 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)
-40	1710.700001	0.001	1754.300001	0.001
-30	1710.700004	0.002	1754.300003	0.002
-20	1710.700002	0.001	1754.300002	0.001
-10	1710.700002	0.001	1754.300004	0.002
0	1710.700003	0.002	1754.300003	0.002
10	1710.699997	-0.002	1754.299997	-0.002
20	1710.699999	-0.001	1754.299996	-0.002
30	1710.699997	-0.002	1754.299996	-0.002
40	1710.699996	-0.002	1754.299999	-0.001
50	1710.699998	-0.001	1754.299998	-0.001
60	1710.699998	-0.001	1754.299998	-0.001
70	1710.699997	-0.002	1754.299997	-0.002
75	1710.699999	-0.001	1754.299998	-0.001

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)
3.145	1710.700003	0.002	1754.300002	0.001
3.7	1710.700002	0.001	1754.300003	0.002
4.225	1710.700003	0.002	1754.300004	0.002

Note: The applicant defined the normal working voltage of the battery is from 3.7 Vdc to 4.225 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)
-40	1710.700001	0.001	1754.300004	0.002
-30	1710.700003	0.002	1754.300003	0.002
-20	1710.700004	0.002	1754.300004	0.002
-10	1710.700003	0.002	1754.300002	0.001
0	1710.700002	0.001	1754.300001	0.001
10	1710.699998	-0.001	1754.299998	-0.001
20	1710.699998	-0.001	1754.299996	-0.002
30	1710.699999	-0.001	1754.299999	-0.001
40	1710.699998	-0.001	1754.299996	-0.002
50	1710.699998	-0.001	1754.299996	-0.002
60	1710.699998	-0.001	1754.299999	-0.001
70	1710.699997	-0.002	1754.299999	-0.001
75	1710.699997	-0.002	1754.299997	-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)
3.145	1710.700002	0.001	1754.300002	0.001
3.7	1710.700002	0.001	1754.300002	0.001
4.225	1710.700003	0.002	1754.300003	0.002

Note: The applicant defined the normal working voltage of the battery is from 3.7 Vdc to 4.225 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)
-40	1710.700004	0.002	1754.300003	0.002
-30	1710.700004	0.002	1754.300003	0.002
-20	1710.700002	0.001	1754.300001	0.001
-10	1710.700002	0.001	1754.300002	0.001
0	1710.700003	0.002	1754.300004	0.002
10	1710.699998	-0.001	1754.299999	-0.001
20	1710.699999	-0.001	1754.299998	-0.001
30	1710.699999	-0.001	1754.299998	-0.001
40	1710.699998	-0.001	1754.299997	-0.002
50	1710.699996	-0.002	1754.299997	-0.001
60	1710.699998	-0.001	1754.299997	-0.002
70	1710.699996	-0.002	1754.299999	-0.001
75	1710.699999	-0.001	1754.299997	-0.002

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 13			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.145	779.500004	0.005	784.500003	0.003
3.7	779.500002	0.003	784.500003	0.004
4.225	779.500003	0.004	784.500003	0.004

Note: The applicant defined the normal working voltage of the battery is from 3.7 Vdc to 4.225 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 13			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	779.500002	0.003	784.500003	0.004
-30	779.500002	0.002	784.500002	0.002
-20	779.500004	0.005	784.500002	0.003
-10	779.500003	0.003	784.500003	0.004
0	779.500002	0.003	784.500002	0.003
10	779.499996	-0.005	784.499997	-0.004
20	779.499999	-0.002	784.499996	-0.005
30	779.499997	-0.004	784.499996	-0.005
40	779.499999	-0.002	784.499998	-0.002
50	779.499998	-0.003	784.499998	-0.002
60	779.499997	-0.004	784.499998	-0.002
70	779.499999	-0.002	784.499998	-0.003
75	779.499997	-0.004	784.499996	-0.005

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 13	
	Channel Bandwidth: 10 MHz	
	Frequency (MHz)	Frequency Error (ppm)
3.145	779.500002	0.002
3.7	779.500003	0.003
4.225	779.500003	0.004

Note: The applicant defined the normal working voltage of the battery is from 3.7 Vdc to 4.225 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 13	
	Channel Bandwidth: 10 MHz	
	Frequency (MHz)	Frequency Error (ppm)
-40	779.500002	0.002
-30	779.500003	0.004
-20	779.500004	0.005
-10	779.500003	0.004
0	779.500003	0.004
10	779.499999	-0.001
20	779.499997	-0.003
30	779.499997	-0.004
40	779.499997	-0.004
50	779.499997	-0.003
60	779.499996	-0.005
70	779.499996	-0.005
75	779.499999	-0.001

4.4 Occupied Bandwidth Measurement

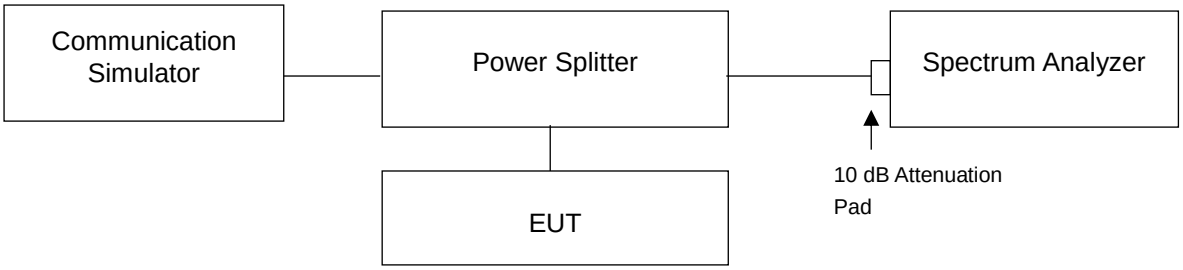
4.4.1 Limits of Occupied Bandwidth Measurement

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

4.4.2 Test Procedure

a. The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
b. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

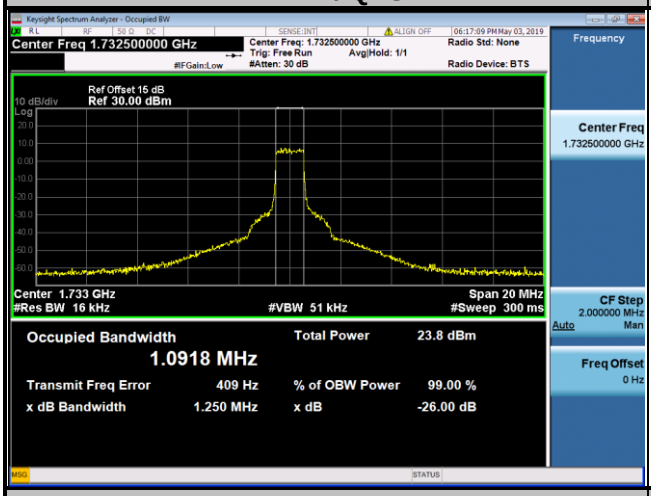
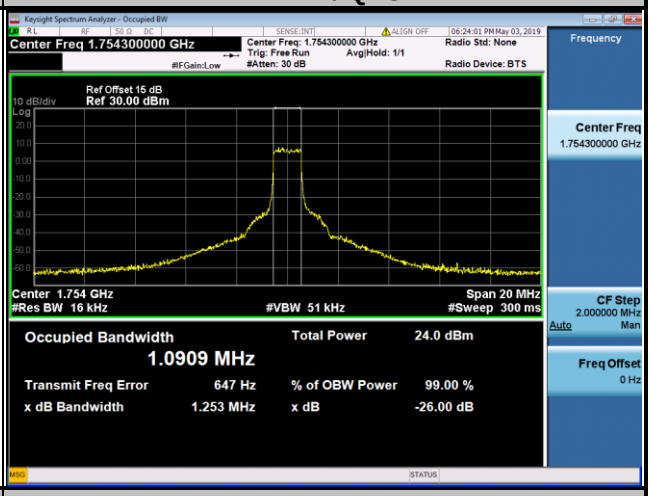
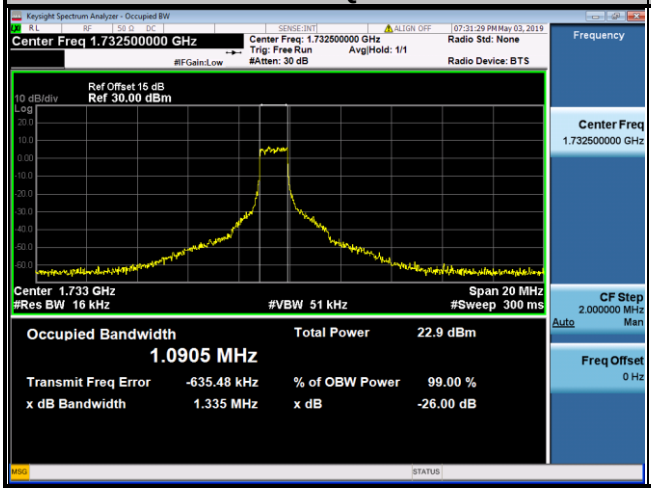
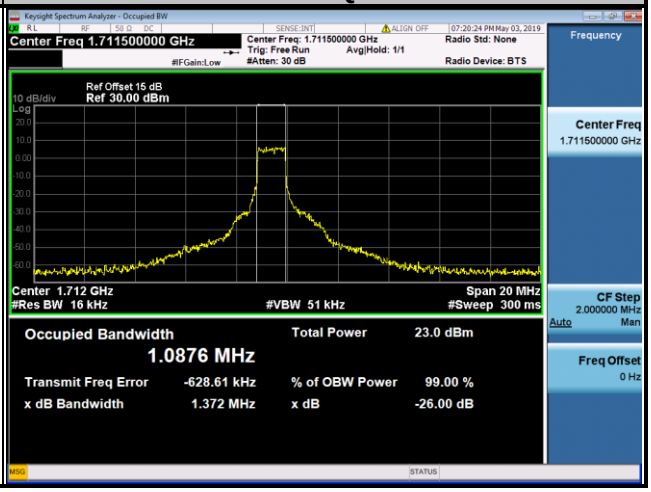
4.4.3 Test Setup



4.4.4 Test Result

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	1.0910	0.9120	1.252	1.106
20175	1732.5	1.0918	0.9129	1.250	1.098
20393	1754.3	1.0909	0.9132	1.253	1.103
Channel Bandwidth: 3 MHz					
Channel	**Frequency (MHz)**	**99 % Occupied Bandwidth (MHz)**		**26 dB Bandwidth (MHz)**	
		QPSK	**16QAM**	**QPSK**	**16QAM**
19965	1711.5	1.0876	0.9219	1.372	1.187
20175	1732.5	1.0905	0.9213	1.335	1.187
20385	1753.5	1.0904	0.9162	1.354	1.147

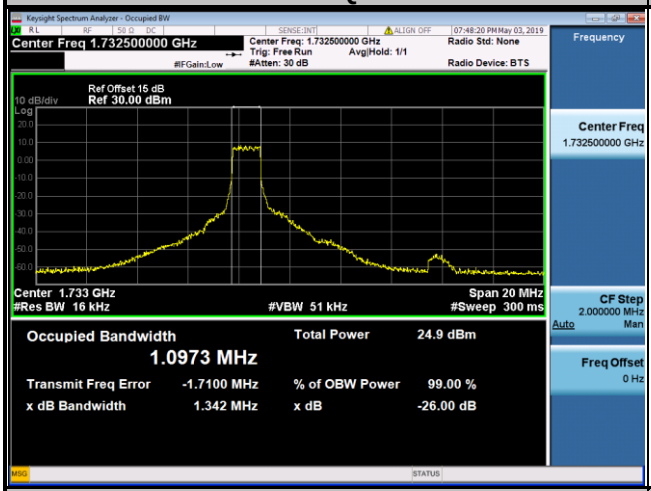
Spectrum Plot of Worst Value

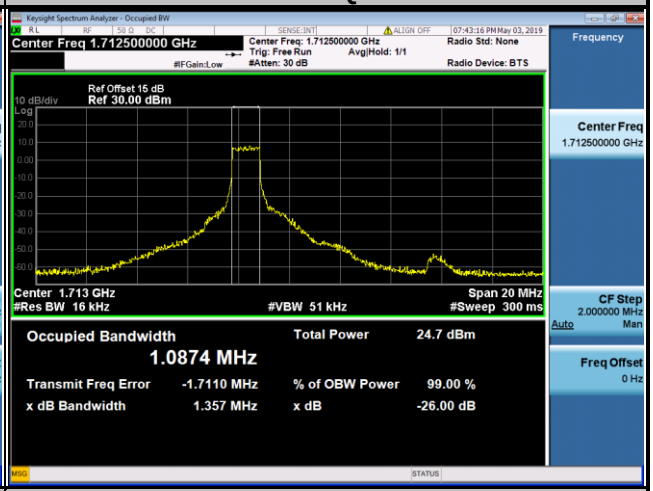
99 % Occupied Bandwidth	26 dB Bandwidth
1.4 MHz / QPSK	**1.4 MHz / QPSK**
	
3 MHz / QPSK	**3 MHz / QPSK**
	

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	1.0874	0.9112	1.357	1.183
20175	1732.5	1.0973	0.9177	1.342	1.166
20375	1752.5	1.0910	0.9149	1.286	1.175
Channel Bandwidth: 10 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
20000	1715.0	1.0939	0.9135	1.468	1.225
20175	1732.5	1.0886	0.9117	1.440	1.274
20350	1750.0	1.0918	0.9146	1.408	1.255

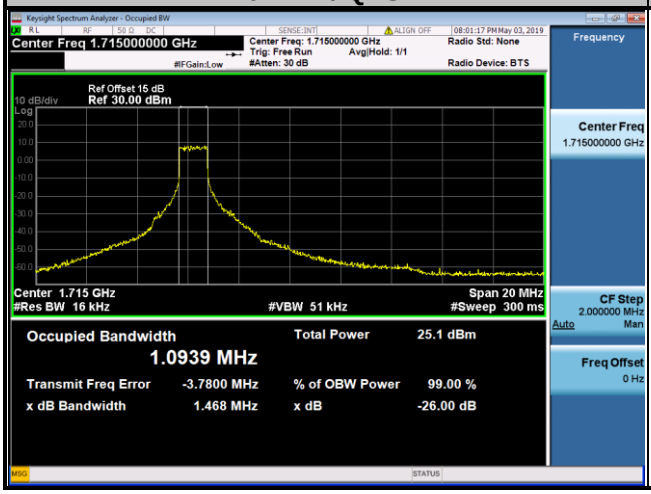
Spectrum Plot of Worst Value

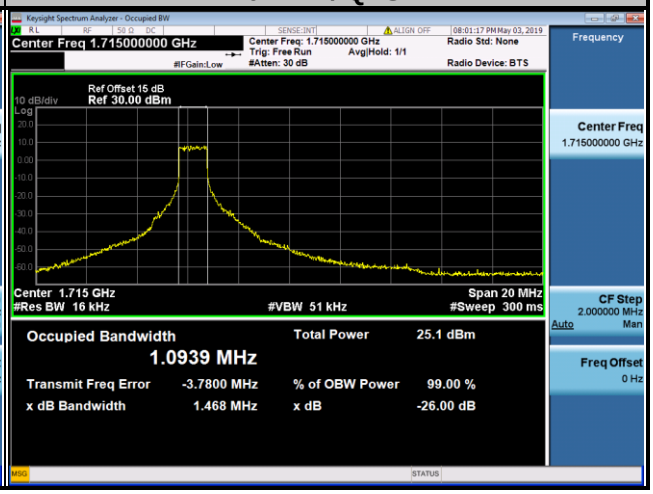
99 % Occupied Bandwidth	26 dB Bandwidth
5 MHz / QPSK	5 MHz / QPSK





10 MHz / QPSK	10 MHz / QPSK

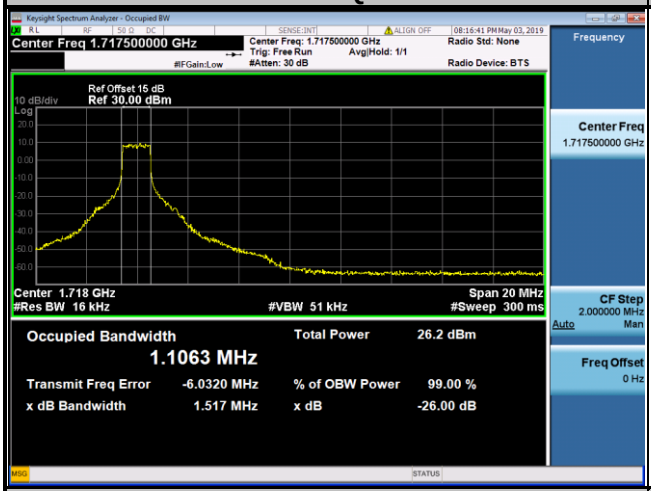


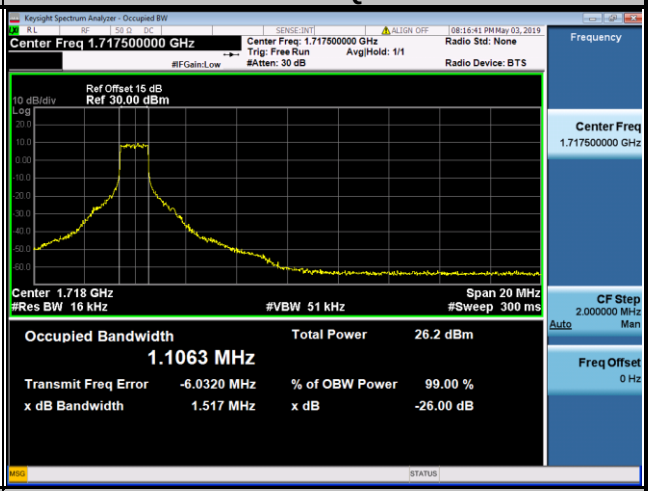


LTE Band 4					
Channel Bandwidth: 15 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
20025	1717.5	1.1063	0.9237	1.517	1.321
20175	1732.5	1.1047	0.9244	1.453	1.343
20325	1747.5	1.1014	0.9275	1.504	1.287
Channel Bandwidth: 20 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
20050	1720.0	1.0951	0.9178	1.455	1.365
20175	1732.5	1.0942	0.9175	1.452	1.374
20300	1745.0	1.0946	0.9174	1.405	1.369

Spectrum Plot of Worst Value

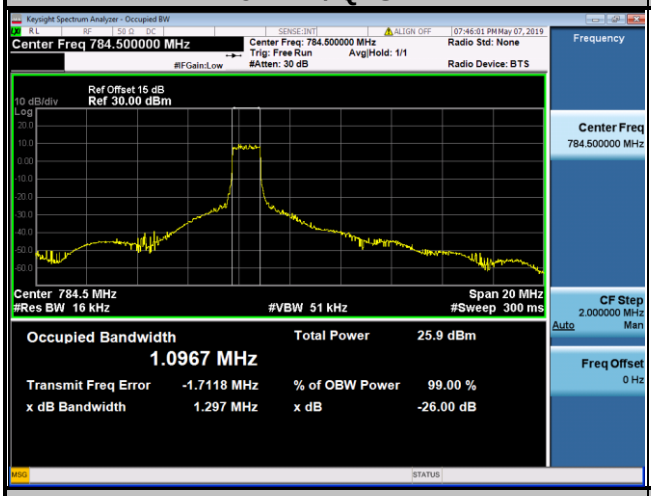
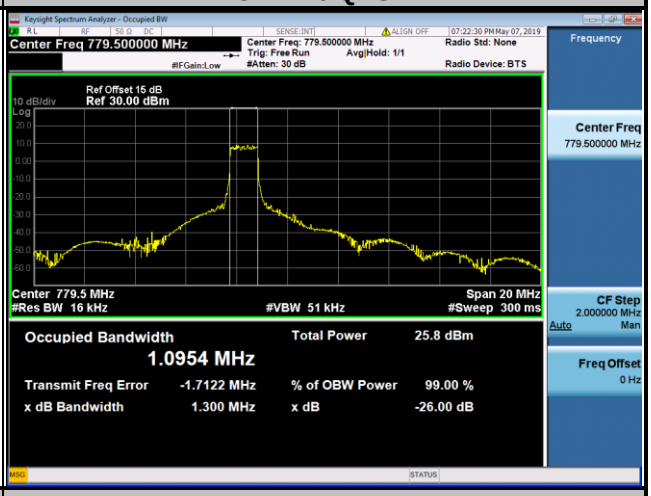
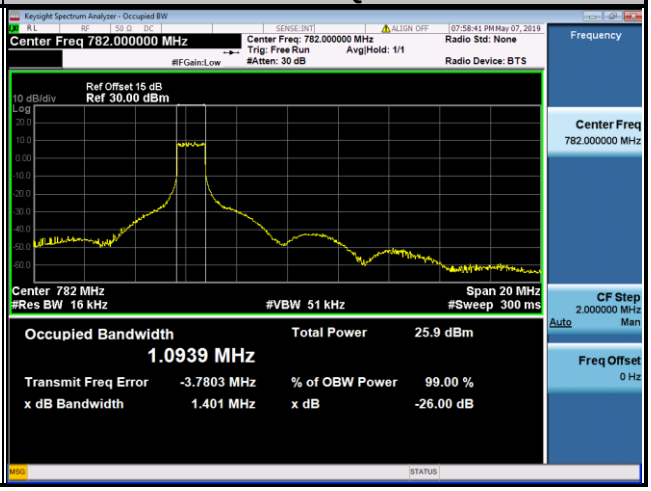
99 % Occupied Bandwidth	26 dB Bandwidth
15 MHz / QPSK	15 MHz / QPSK





20 MHz / QPSK	20 MHz / QPSK

LTE Band 13					
Channel Bandwidth: 5 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
23205	779.5	1.0954	0.9207	1.300	1.153
23230	782.0	1.0962	0.9206	1.297	1.147
23255	784.5	1.0967	0.9205	1.297	1.147
Channel Bandwidth: 10 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
23230	782.0	1.0939	0.9159	1.401	1.232

Spectrum Plot of Worst Value	
99 % Occupied Bandwidth	26 dB Bandwidth
5 MHz / QPSK	5 MHz / QPSK
	
10 MHz / QPSK	10 MHz / QPSK
	

4.5 Band Edge Measurement

4.5.1 Limits of Band Edge Measurement

For ISED

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.

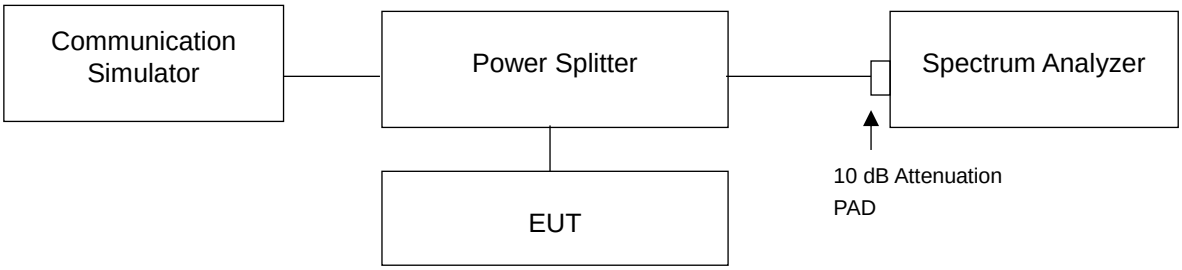
For FCC

For operations in the 746-758 MHz band and the 776-788 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.

On all frequencies between 763-775 MHz and 793-805 MHz, by a factor no less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.

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.

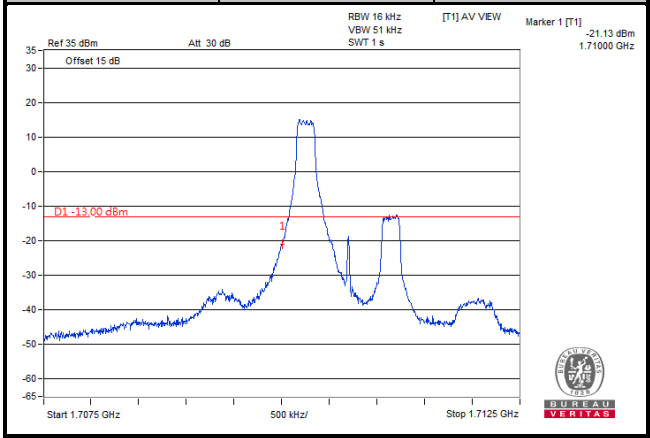
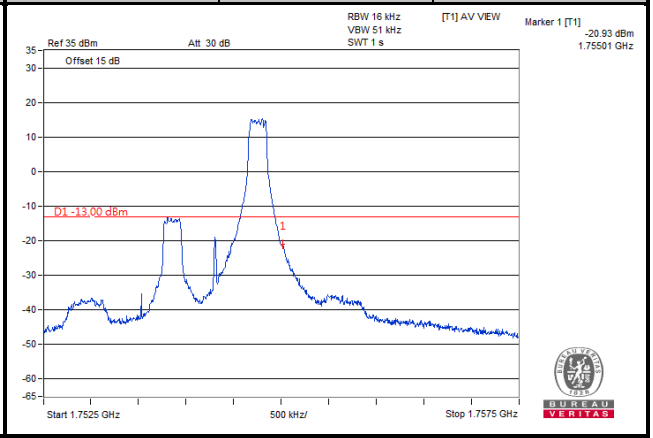
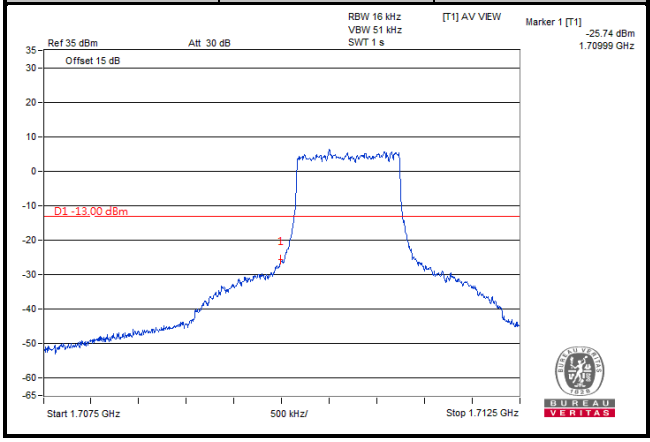
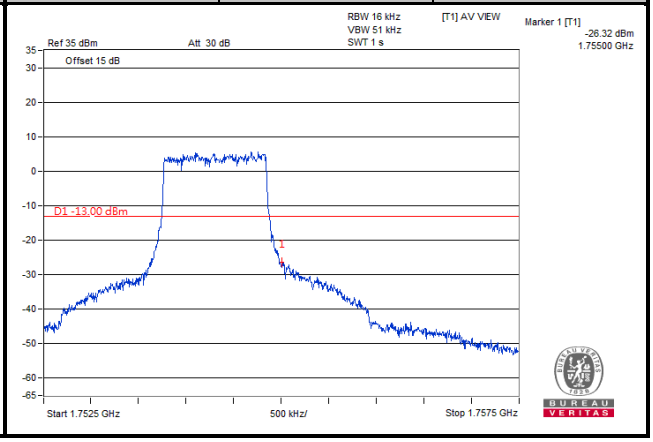
4.5.2 Test Setup

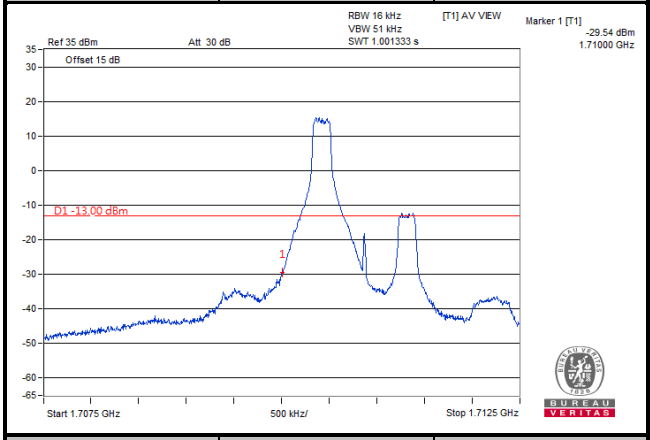
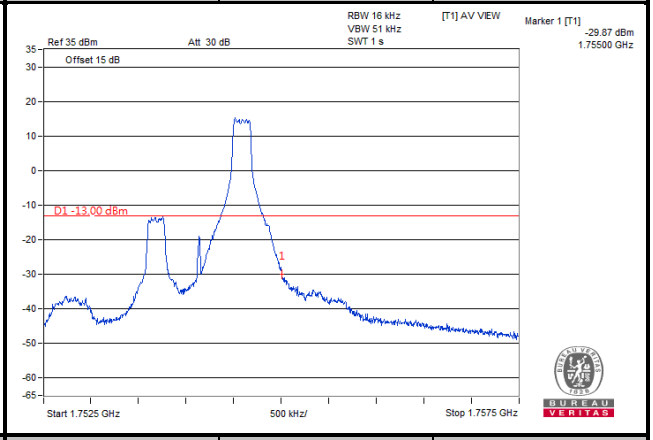
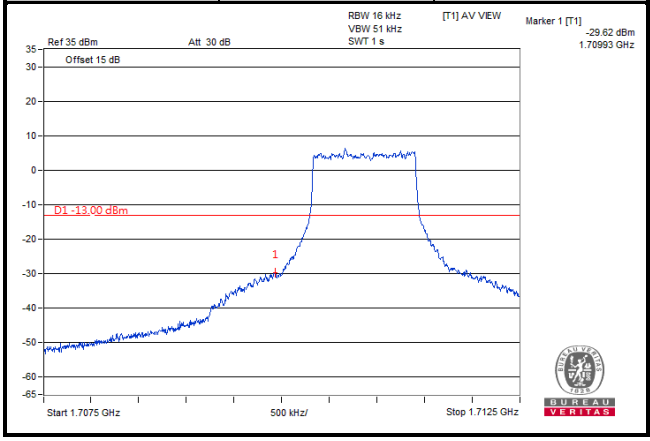
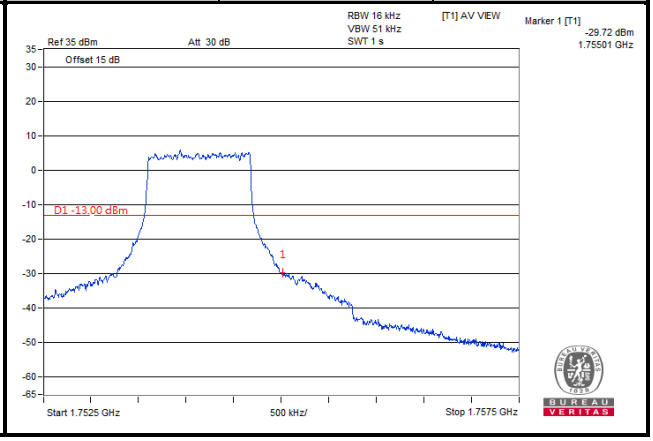


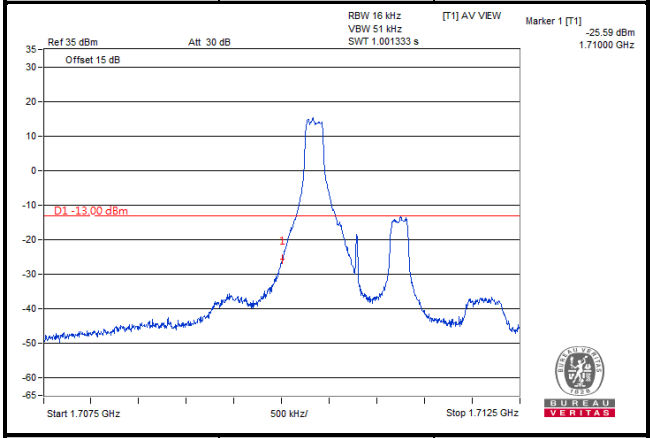
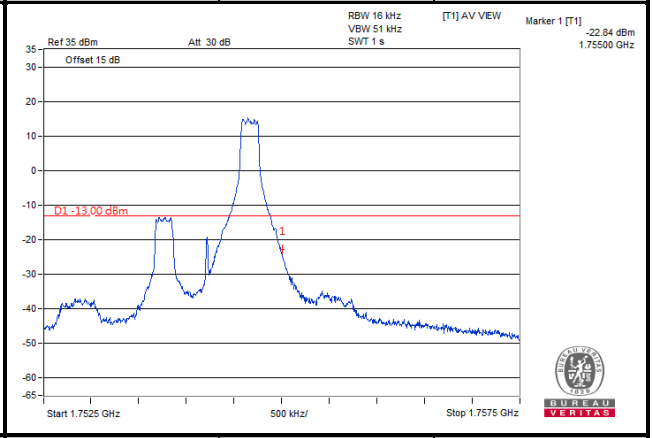
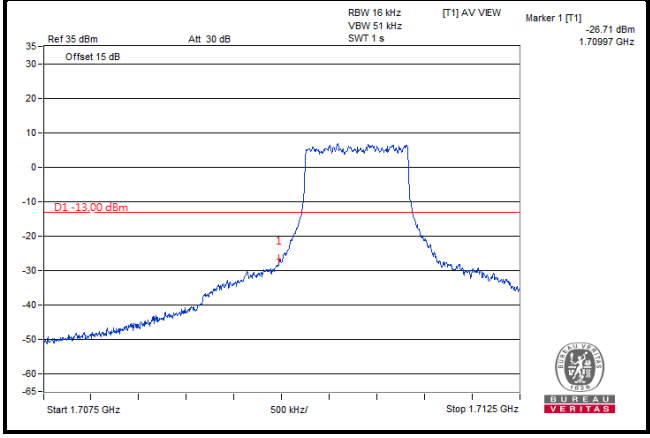
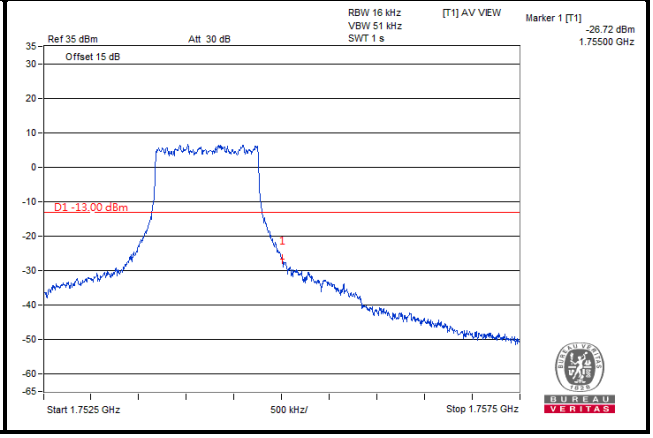
4.5.3 Test Procedures

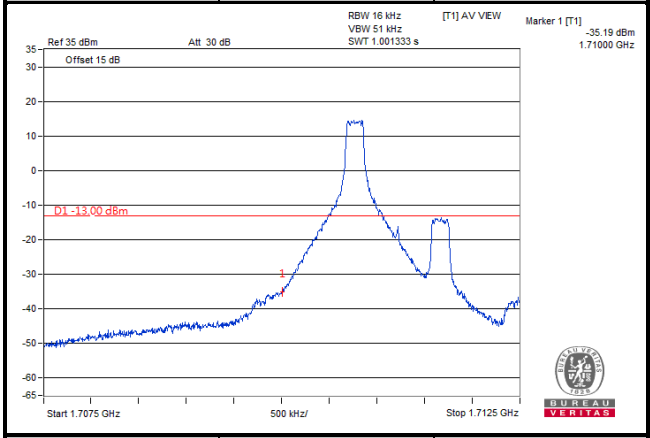
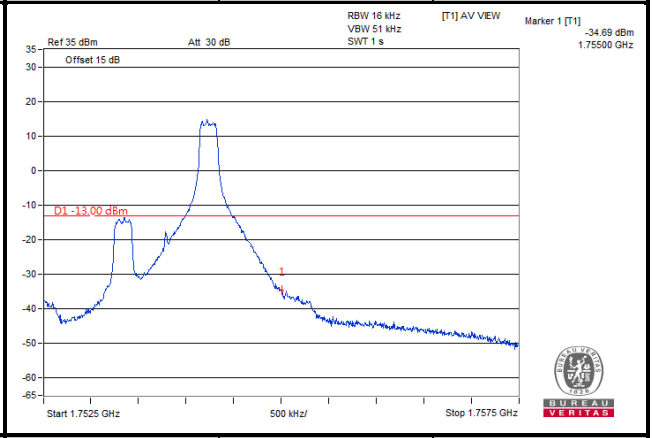
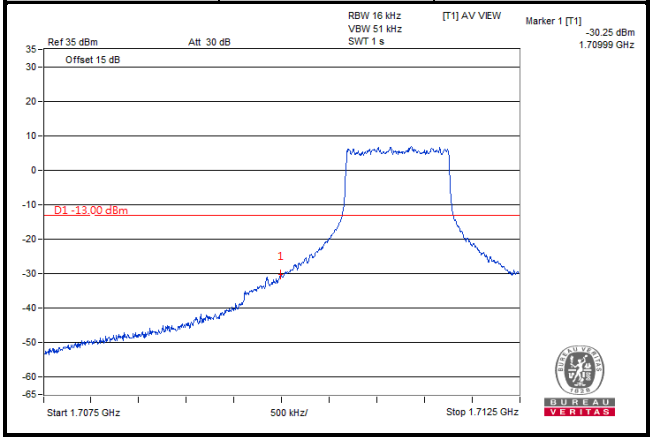
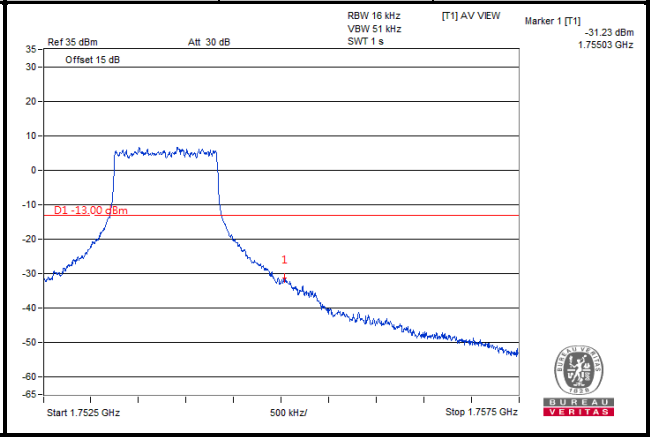
a. All measurements were done at low and high operational frequency range.
b. 16 kHz and VB of the spectrum is 51 kHz (LTE Bandwidth 1.4 MHz).
c. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 16 kHz and VB of the spectrum is 51 kHz (LTE Bandwidth 3 MHz).
d. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 16 kHz and VB of the spectrum is 51 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 16 kHz and VB of the spectrum is 51 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 16 kHz and VB of the spectrum is 51 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 16 kHz and VB of the spectrum is 51 kHz (LTE Bandwidth 20 MHz).
h. Record the max. trace plot into the test report.

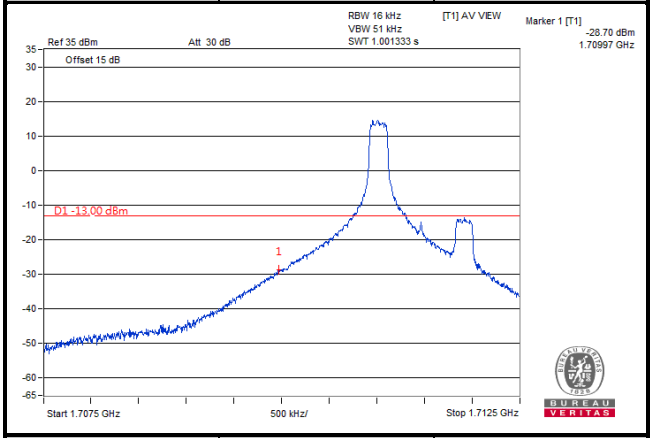
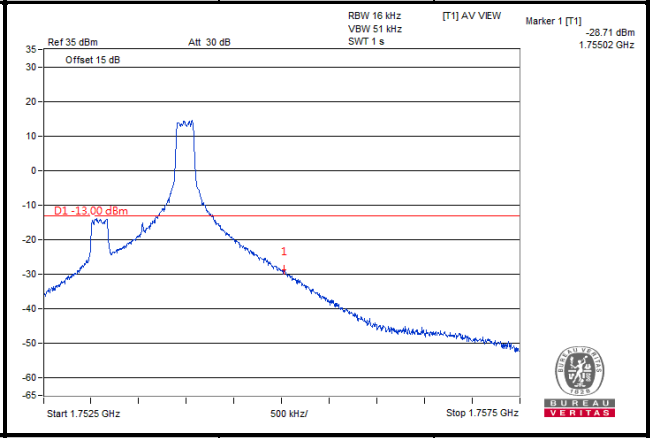
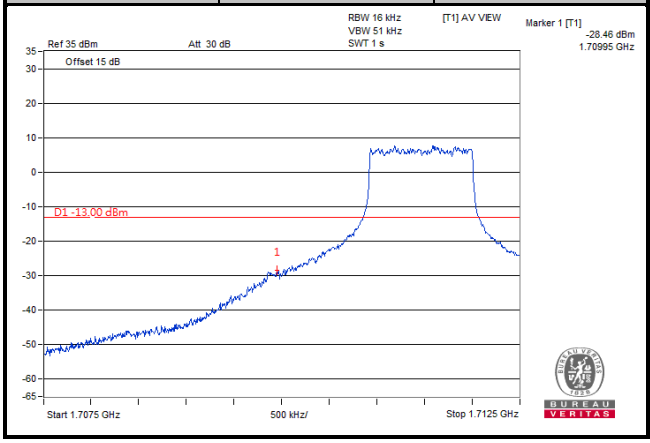
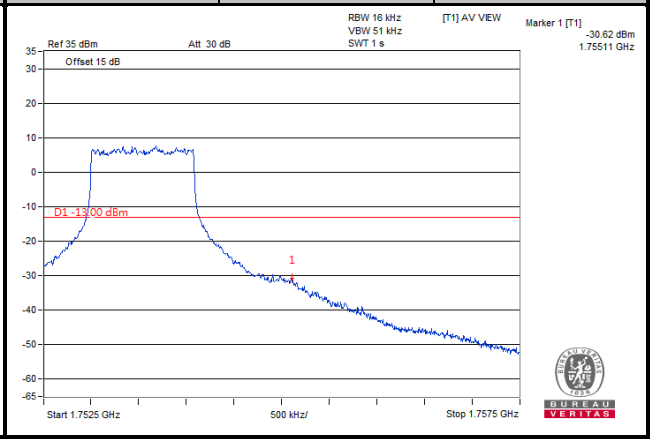
4.5.4 Test Results

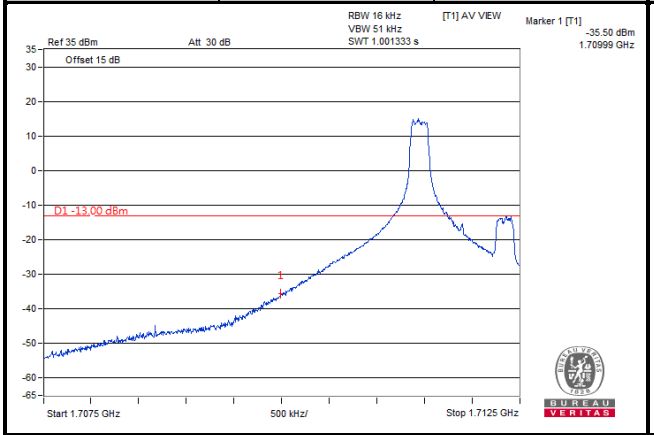
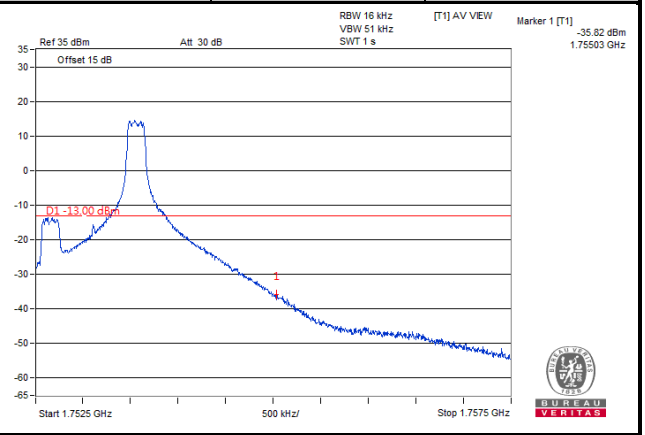
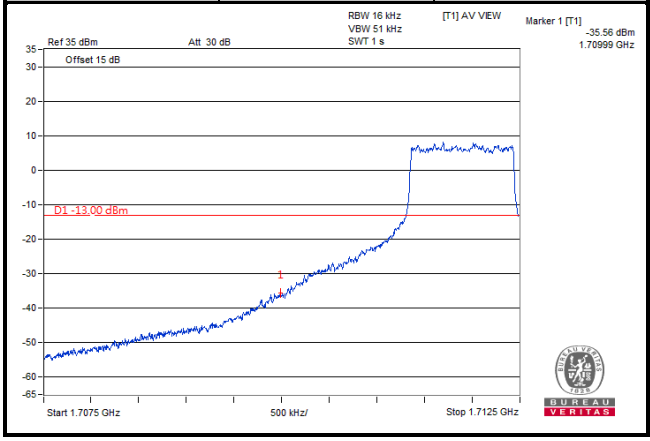
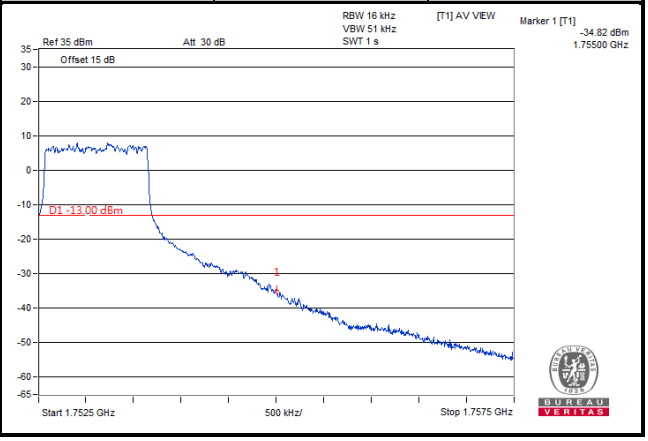
LTE Band 4					
Channel Bandwidth: 1.4 MHz					
Channel	19957	1 RB	Channel	20393	1 RB
					
Channel	19957	6 RB	Channel	20393	6 RB
					

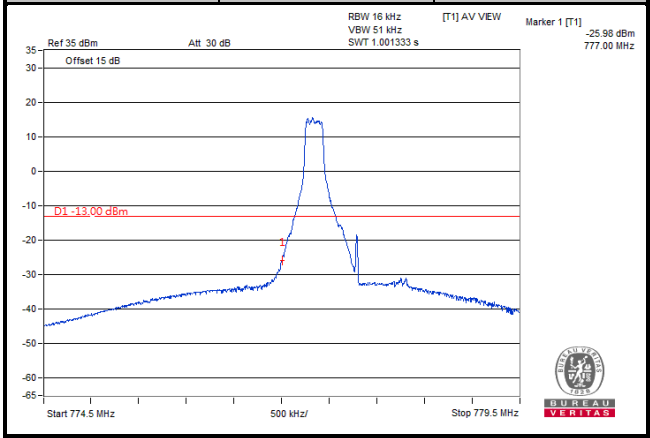
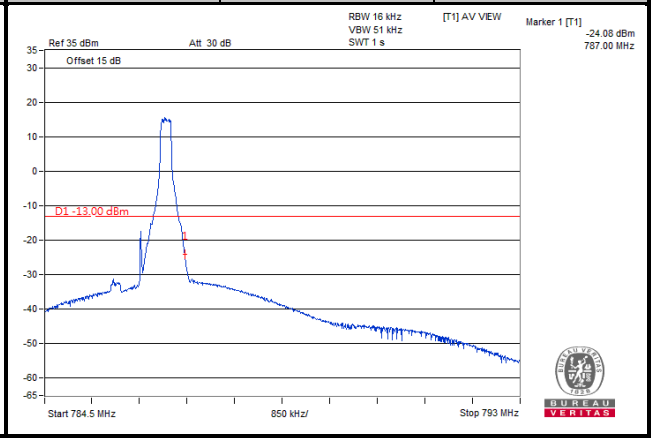
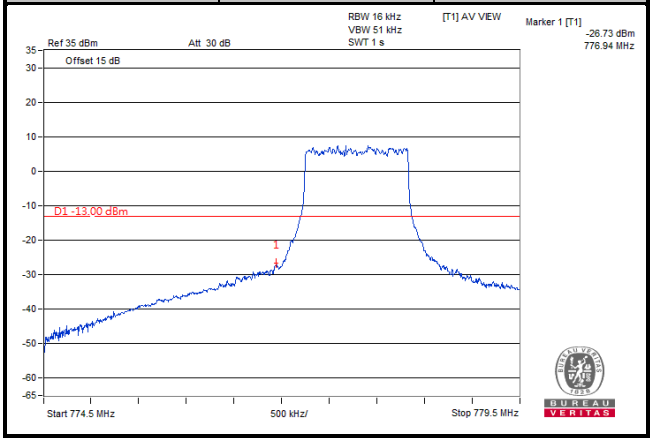
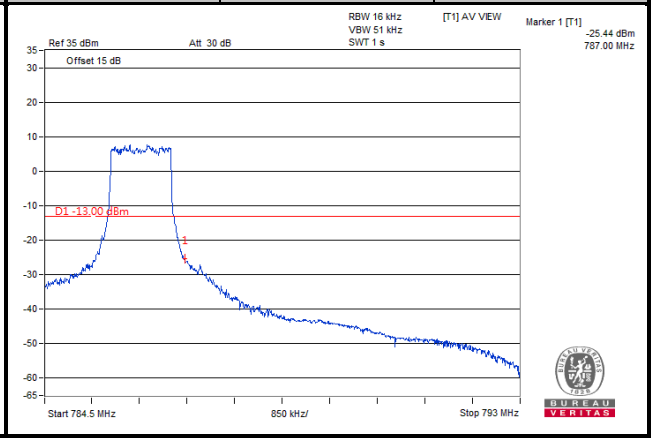
LTE Band 4					
Channel Bandwidth: 3 MHz					
Channel	19965	1 RB	Channel	20385	1 RB
					
Channel	19965	15 RB	Channel	20385	15 RB
					

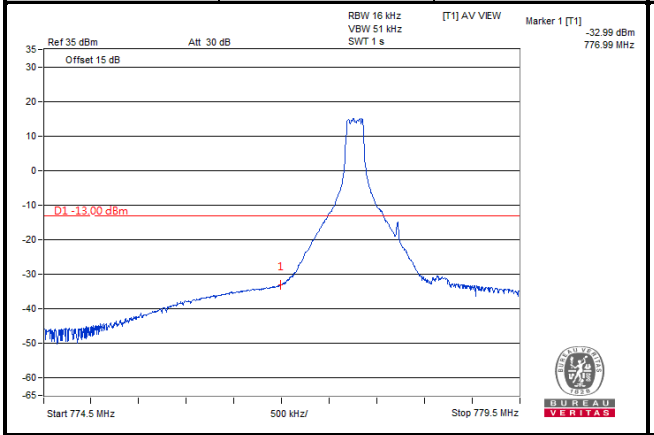
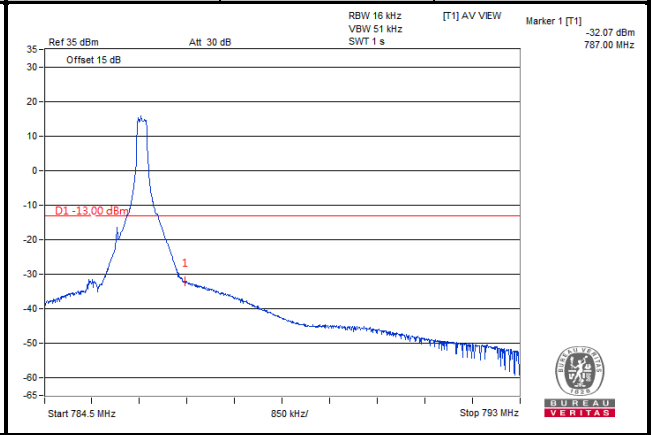
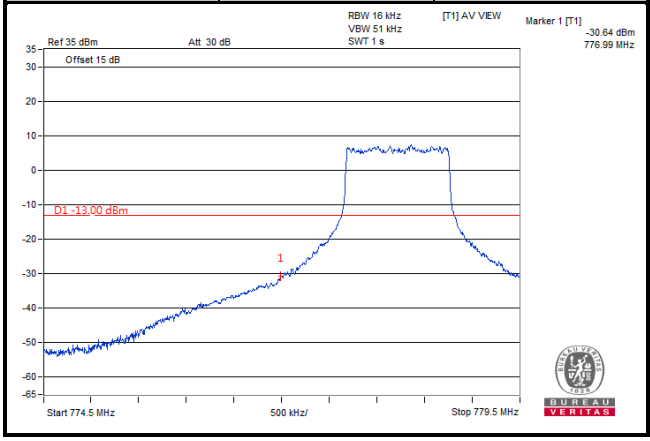
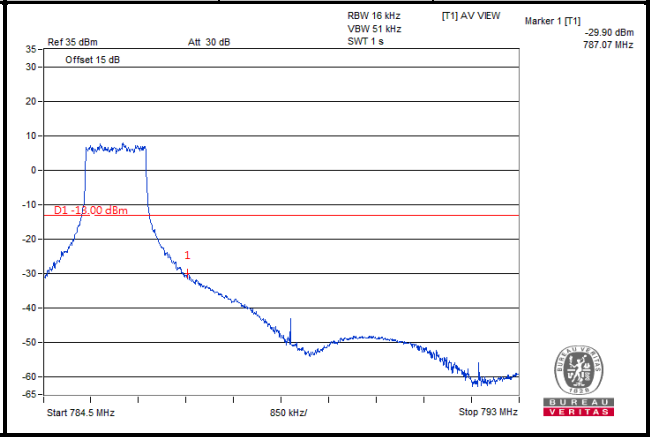
LTE Band 4					
Channel Bandwidth: 5 MHz					
Channel	19975	1 RB	Channel	20375	1 RB
					
Channel	19975	25 RB	Channel	20375	25 RB
					

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

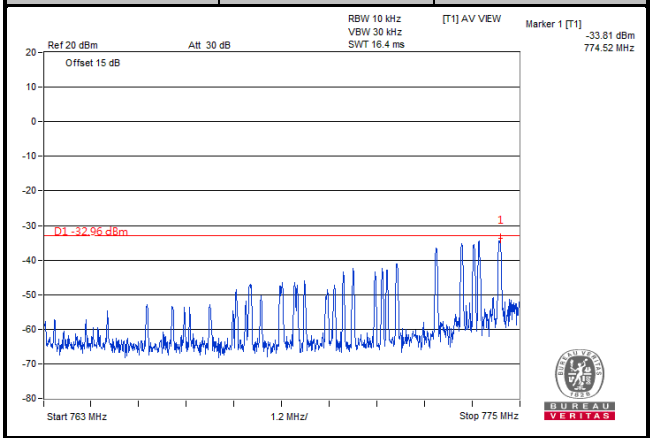
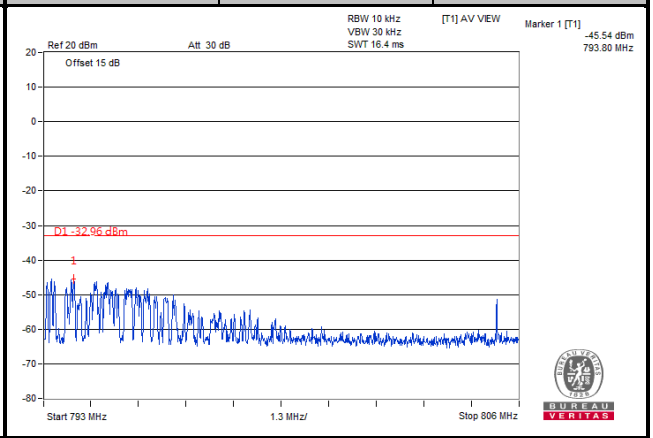
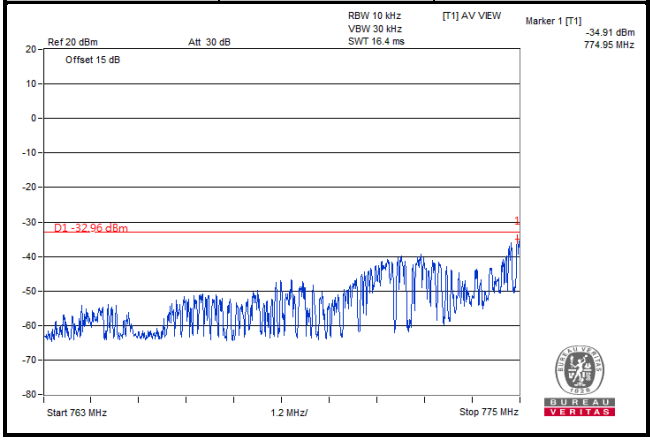
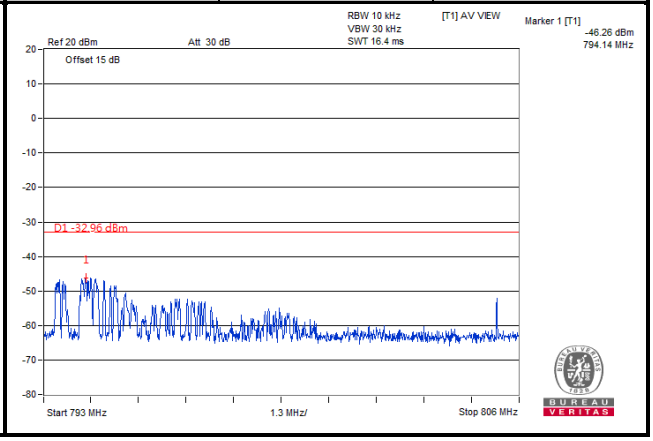
LTE Band 4					
Channel Bandwidth: 15 MHz					
Channel	20025	1 RB	Channel	20325	1 RB
					
Channel	20025	75 RB	Channel	20325	75 RB
					

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

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

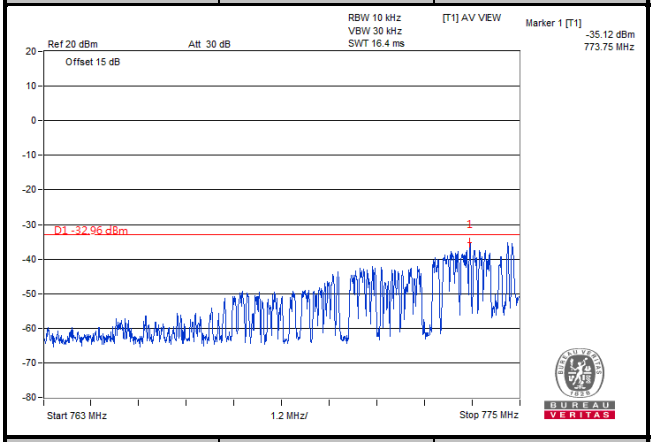
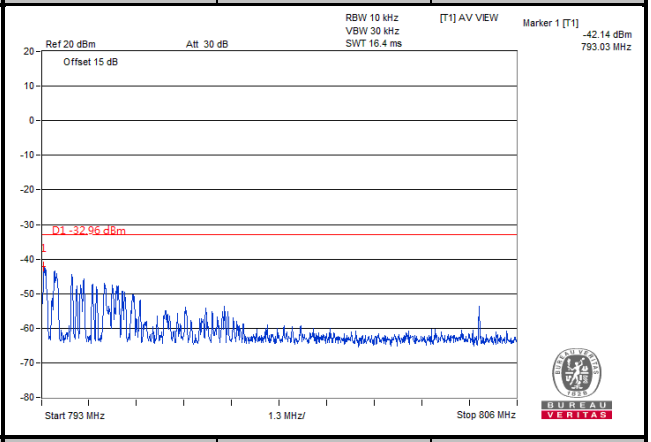
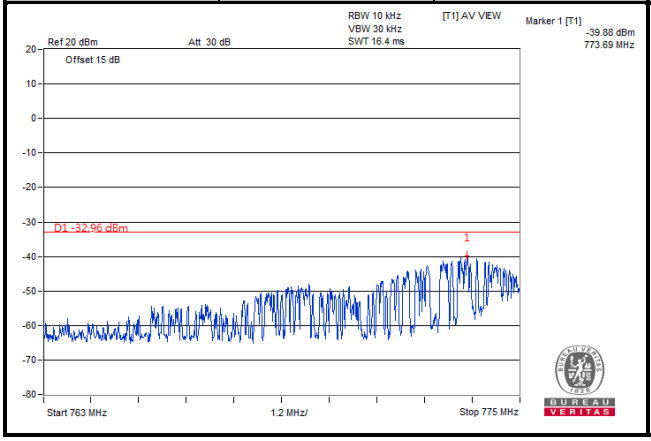
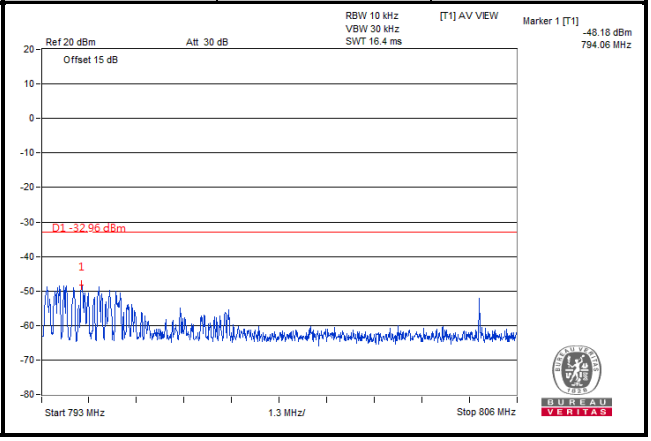
Emission Mask

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

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

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

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

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

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

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

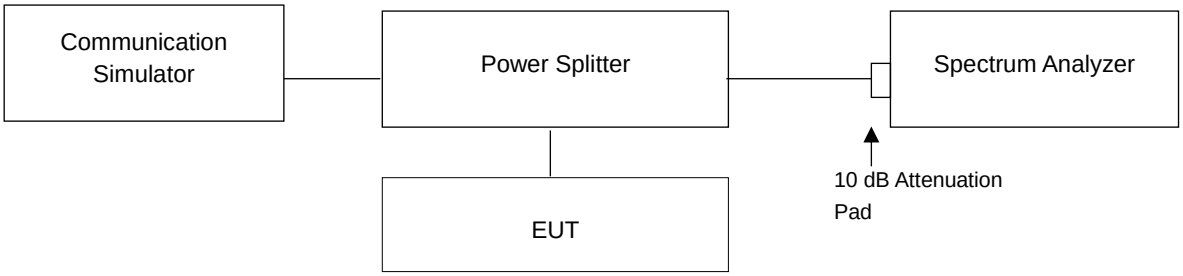
Limit line = -35 dBm + 2.04 dB =-32.96 dBm

4.6 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

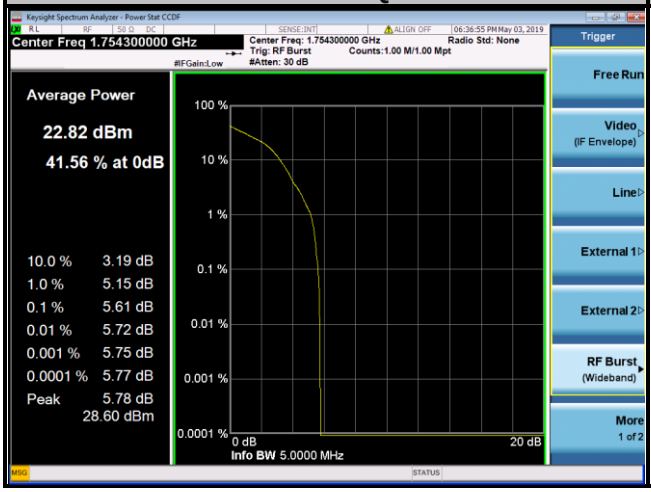
1. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1 %.

4.6.4 Test Results

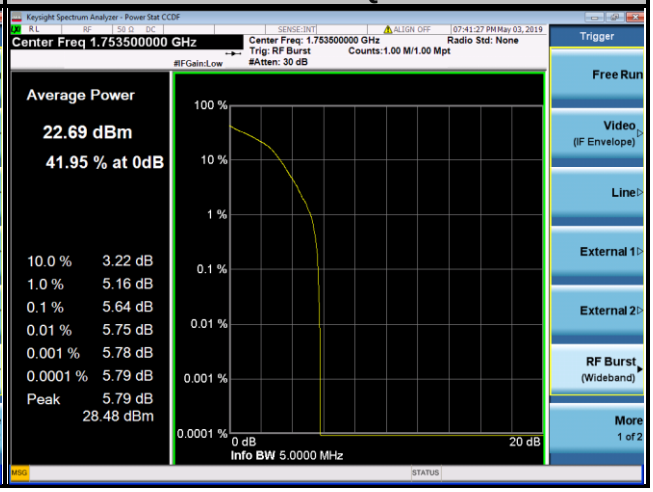
LTE Band 4							
Channel Bandwidth: 1.4 MHz				Channel Bandwidth: 3 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
19957	1710.7	4.36	5.42	19965	1711.5	4.31	5.38
20175	1732.5	4.44	5.54	20175	1732.5	4.38	5.49
20393	1754.3	4.55	5.61	20385	1753.5	4.53	5.64

Spectrum Plot of Worst Value

1.4 MHz / 16QAM



3 MHz / 16QAM



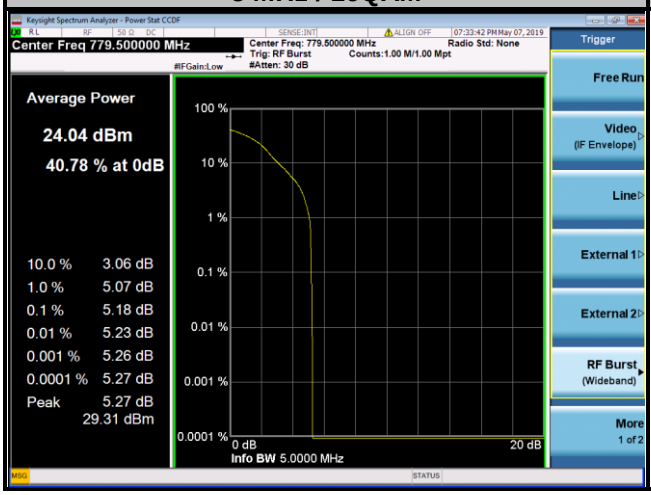
LTE Band 4							
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
19975	1712.5	4.47	5.01	20000	1715.0	4.43	4.89
20175	1732.5	4.57	5.21	20175	1732.5	4.47	4.98
20375	1752.5	4.69	5.36	20350	1750.0	4.59	5.11

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	4.36	4.85	20050	1720.0	4.34	4.86
20175	1732.5	4.42	4.92	20175	1732.5	4.40	4.90
20325	1747.5	4.53	5.01	20300	1745.0	4.48	4.96

Spectrum Plot of Worst Value	
15 MHz / 16QAM	20 MHz / 16QAM

LTE Band 13							
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
23205	779.5	4.74	5.18	23230	782.0	4.71	5.19
23230	782.0	4.74	5.17				
23255	784.5	4.67	5.12				

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

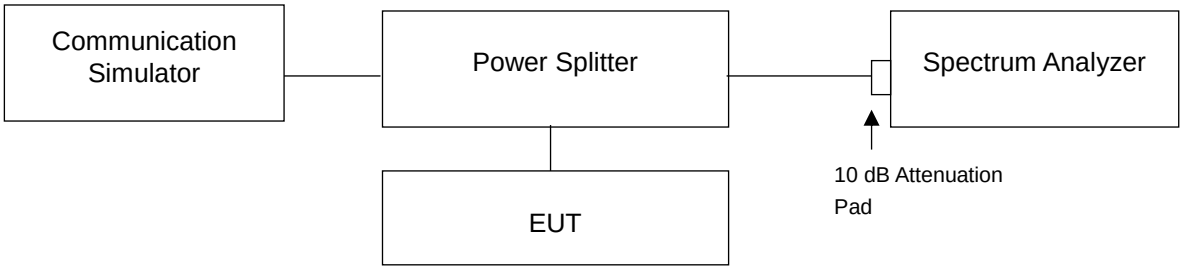
4.7 Conducted Spurious Emissions

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.

For operations in the 775-788 MHz, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz. The limit of emissions is equal to -40 dBm / MHz.

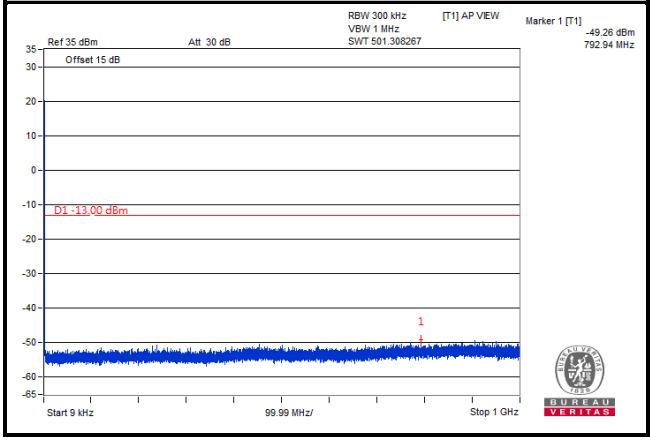
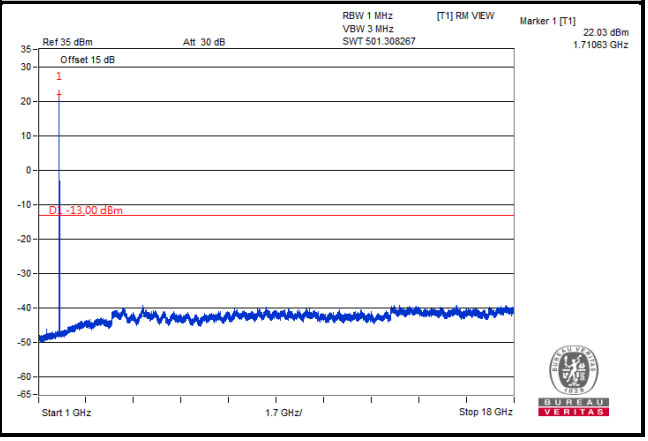
4.7.2 Test Setup



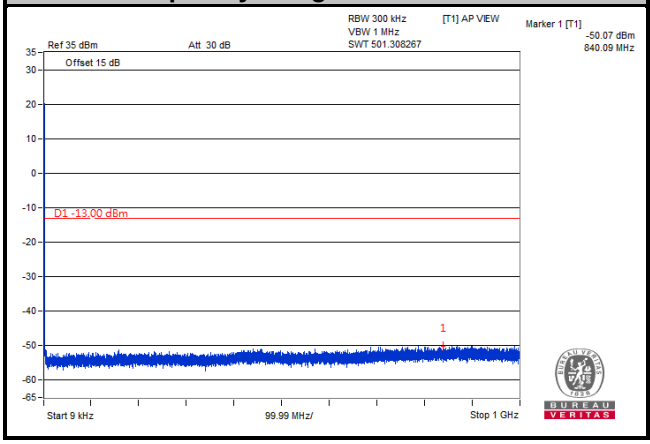
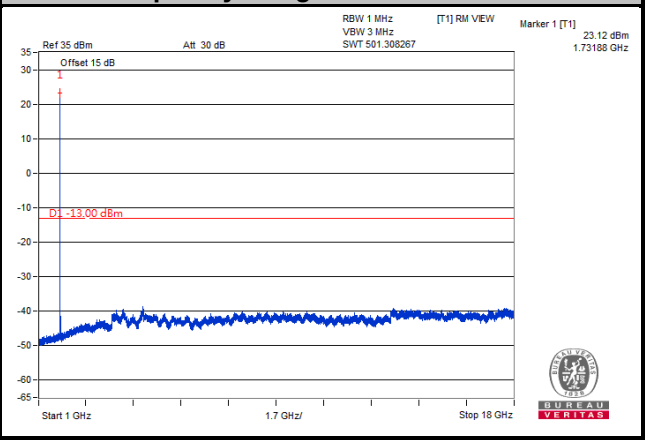
4.7.3 Test Procedure

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 = 300 kHz and VBW = 1 MHz is used for conducted emission measurement.
c. Measuring frequency range is from 1 GHz to 7 GHz / 8 GHz / 18 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 1 MHz and VBW = 3 MHz is used for conducted emission measurement.

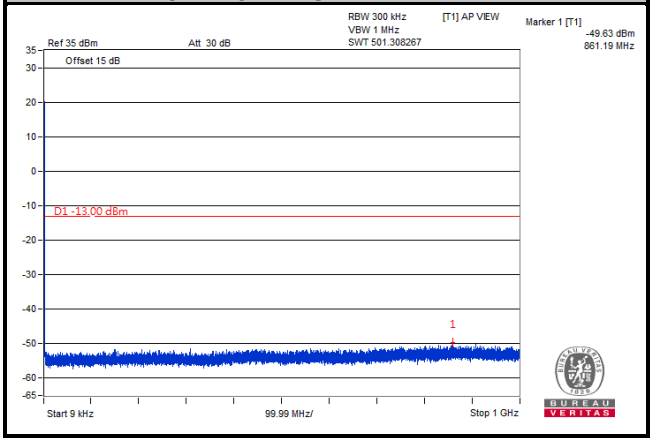
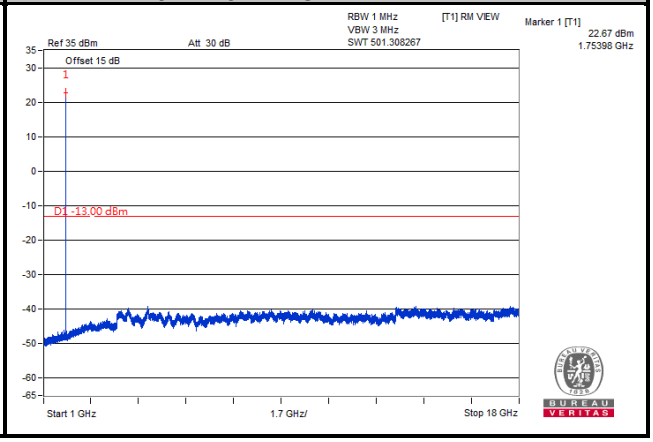
4.7.4 Test Results

LTE Band 4	
Channel Bandwidth: 1.4 MHz	
Channel 19957	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

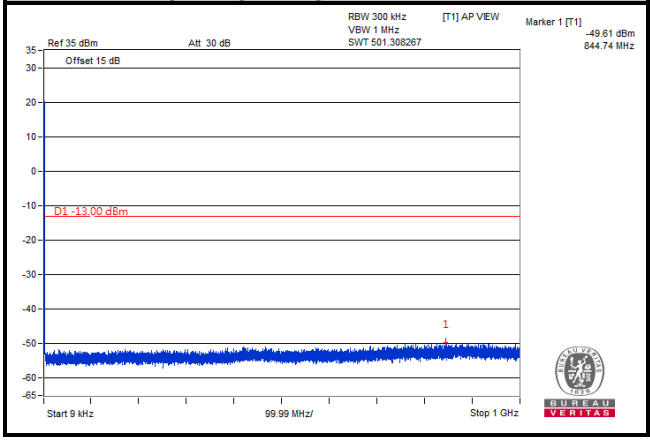
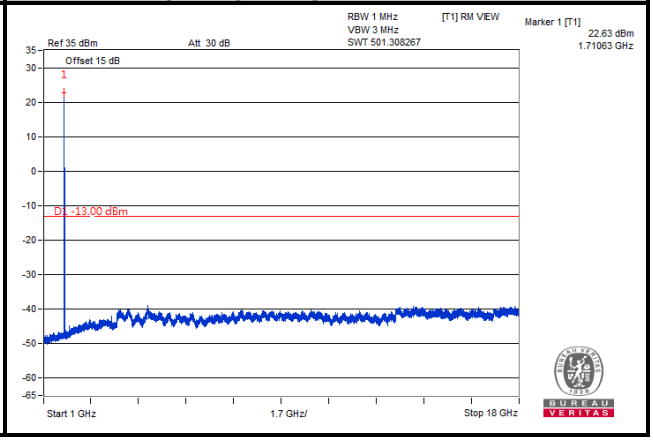
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 1.4 MHz	
Channel 20175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

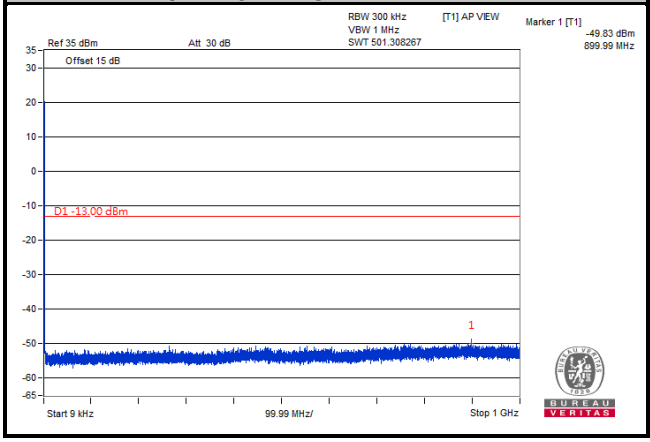
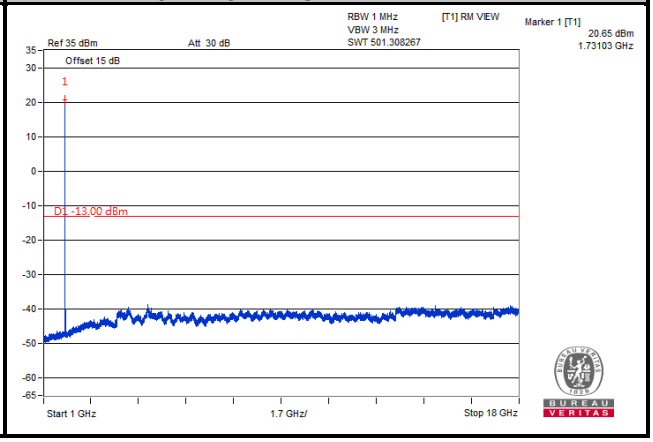
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 1.4 MHz	
Channel 20393	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

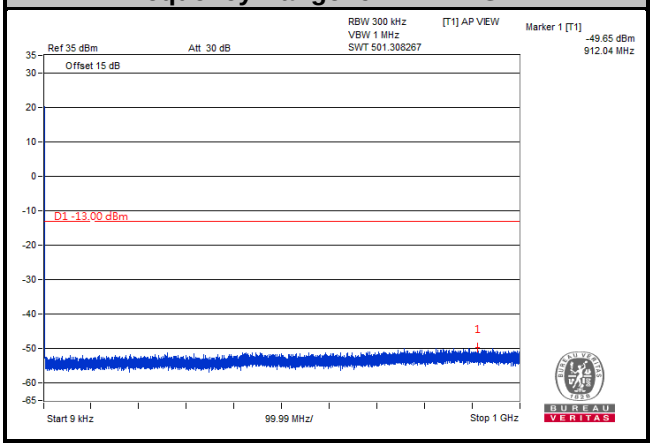
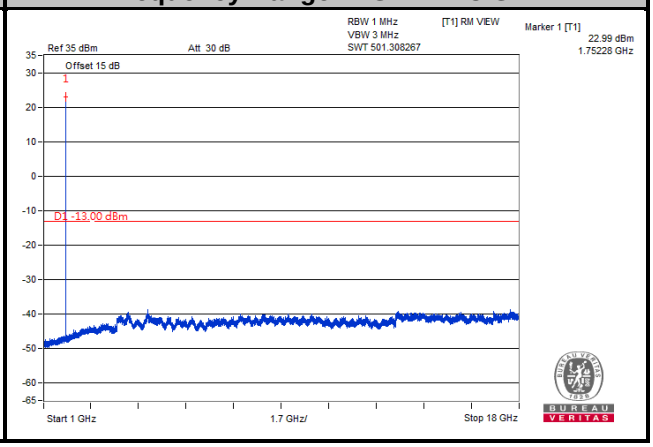
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

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

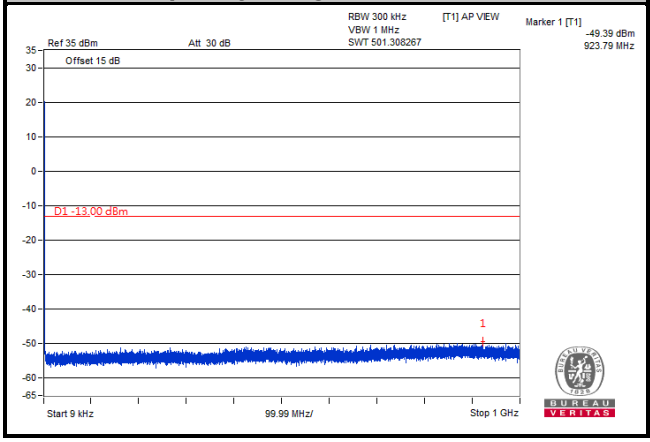
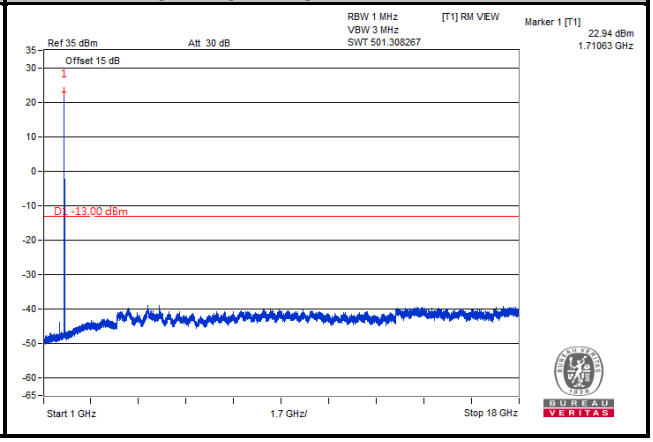
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 3 MHz	
Channel 20175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

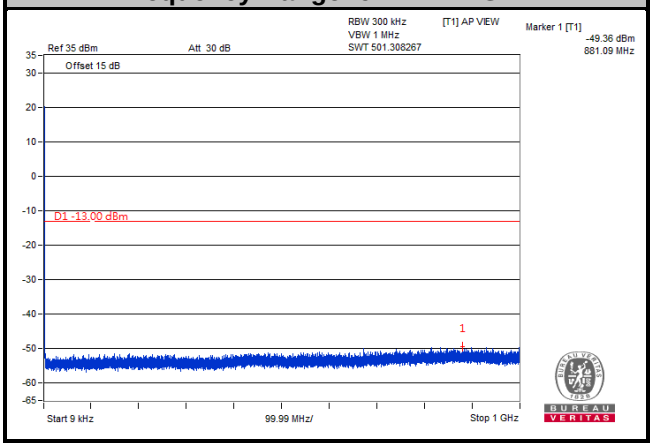
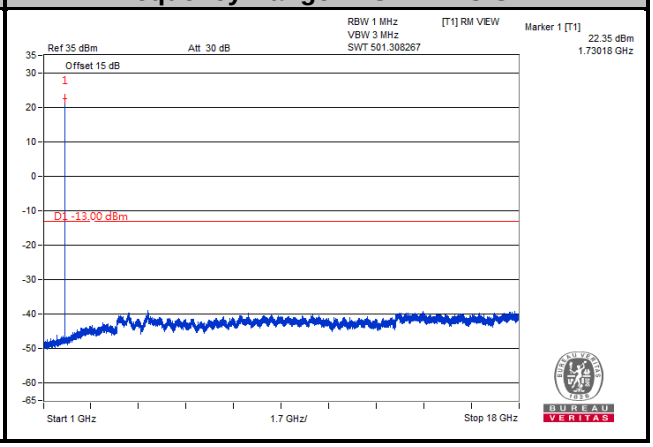
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 3 MHz	
Channel 20385	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

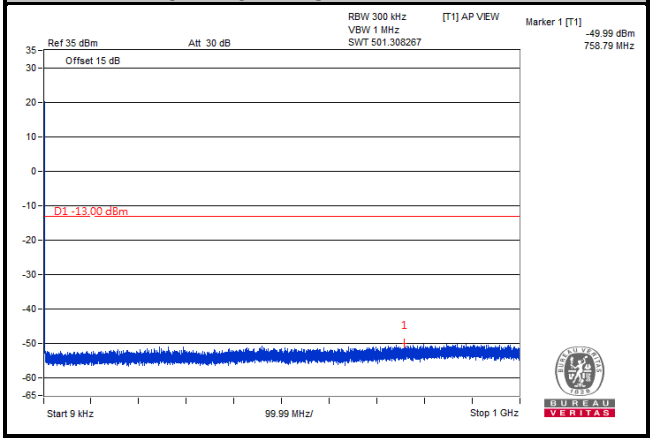
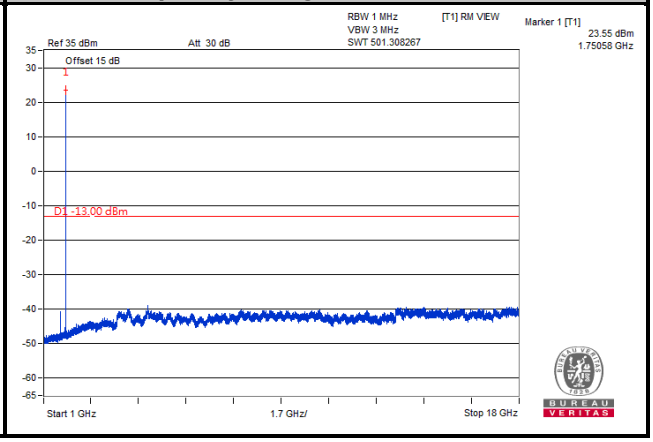
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 5 MHz	
Channel 19975	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

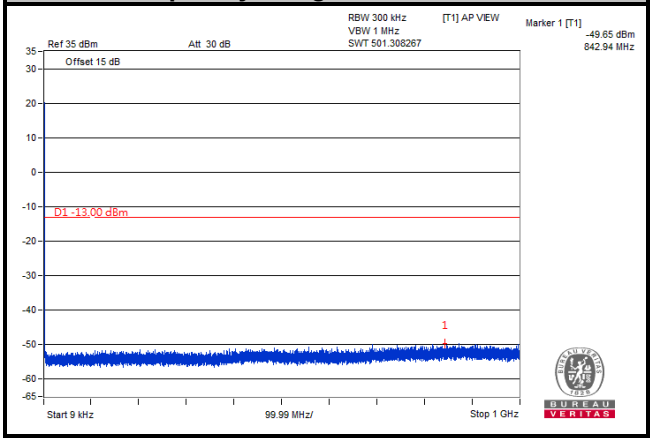
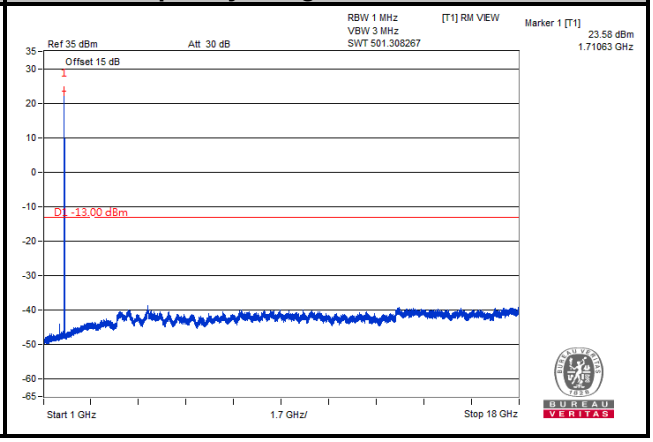
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 5 MHz	
Channel 20175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

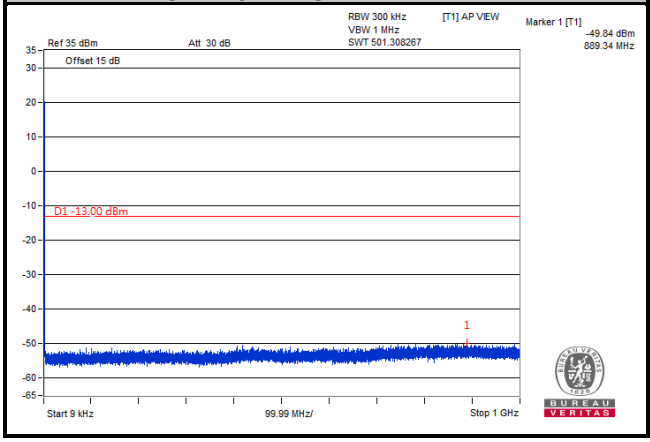
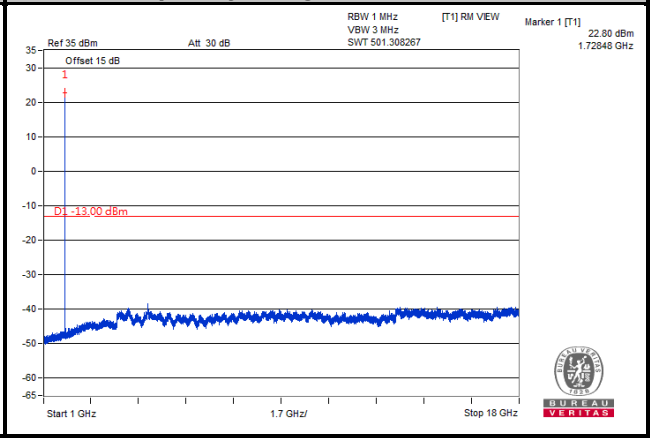
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 5 MHz	
Channel 20375	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

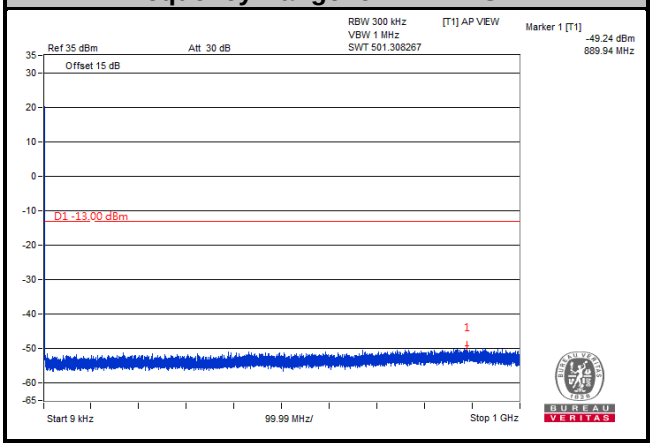
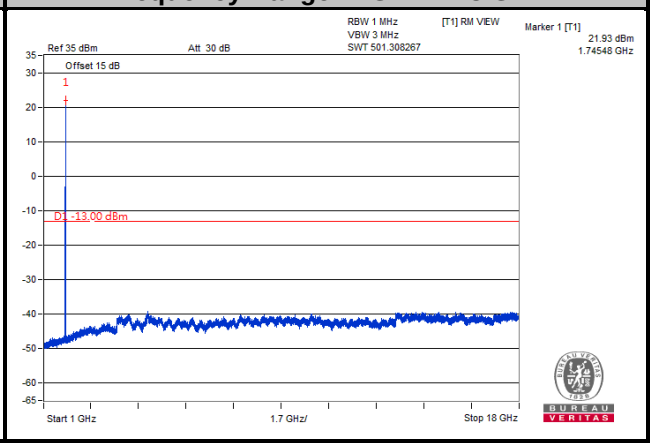
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 10 MHz	
Channel 20000	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

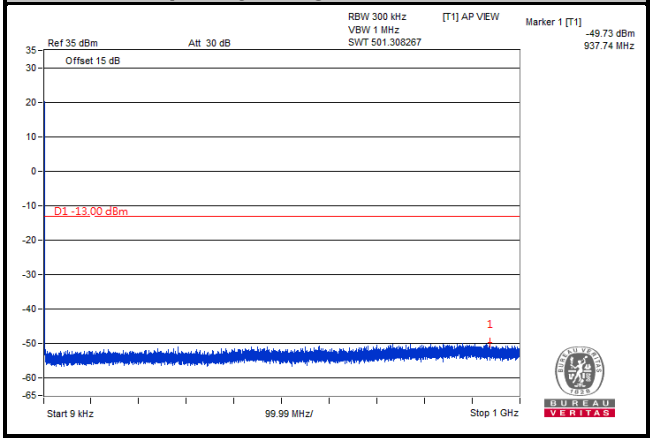
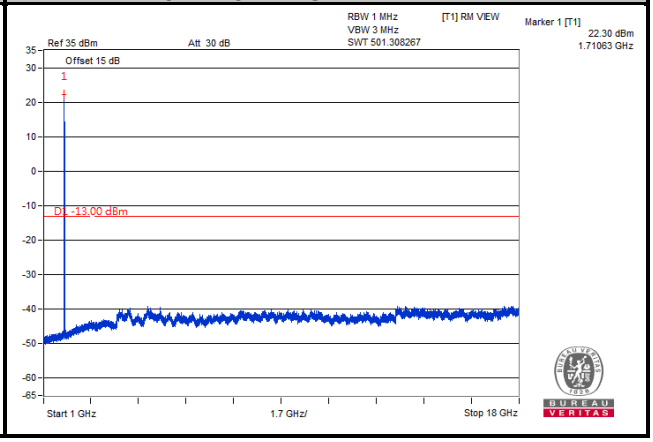
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 10 MHz	
Channel 20175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

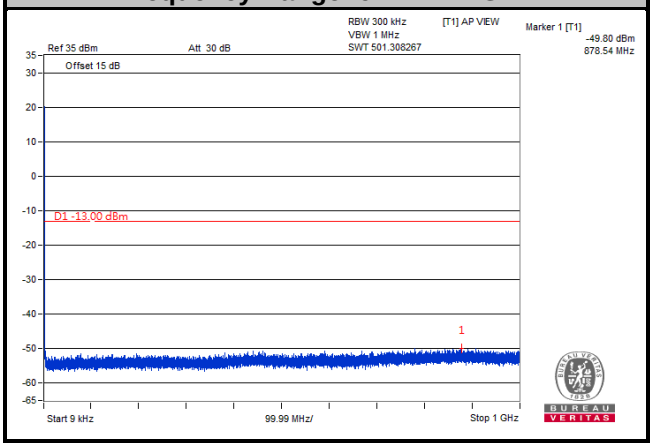
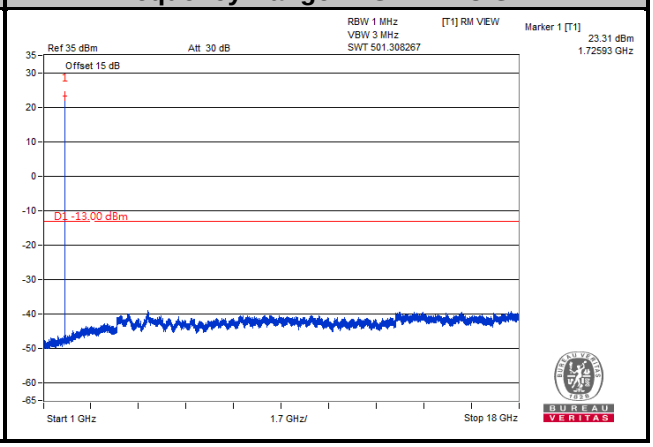
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 10 MHz	
Channel 20350	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

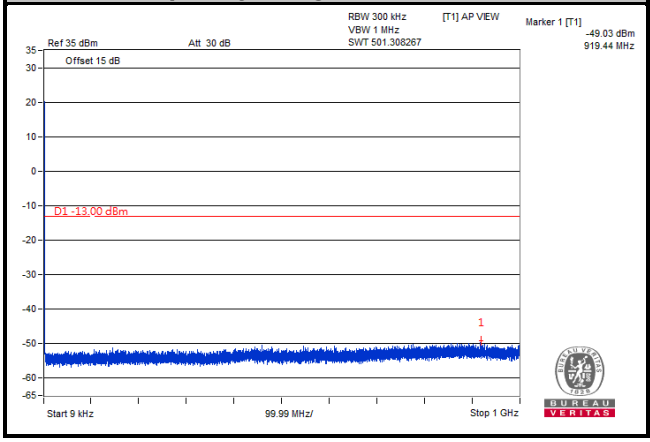
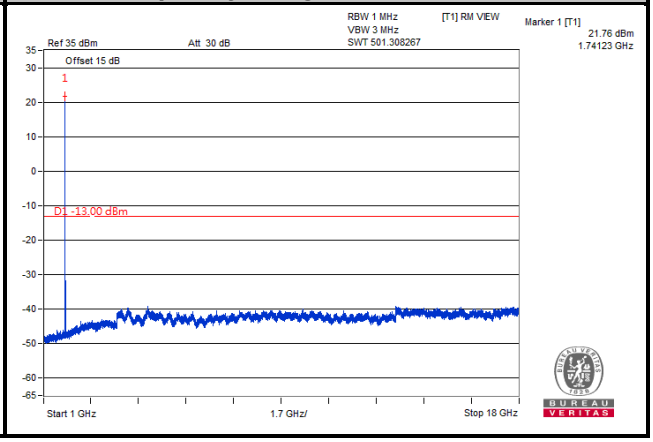
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

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

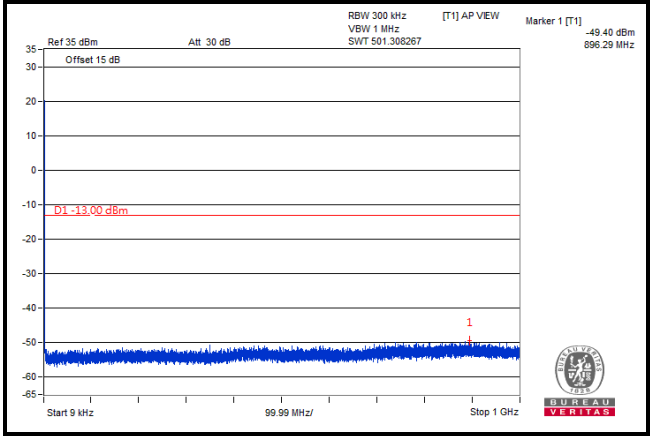
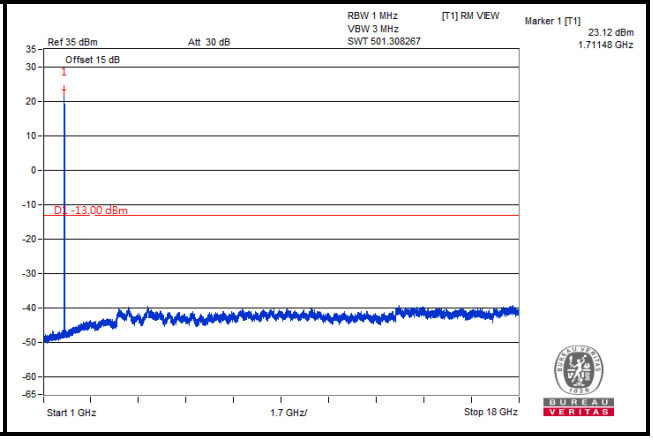
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 15 MHz	
Channel 20175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

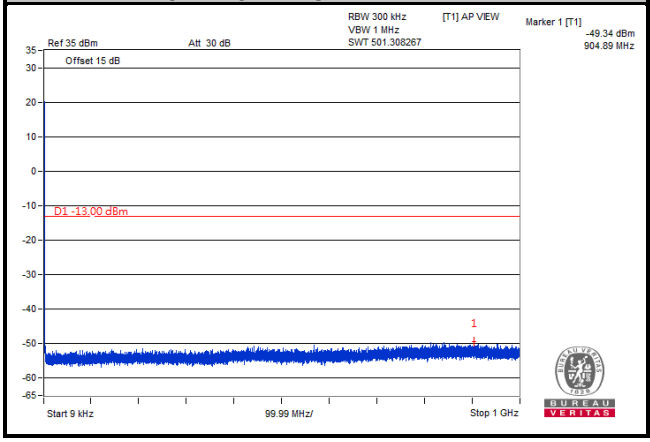
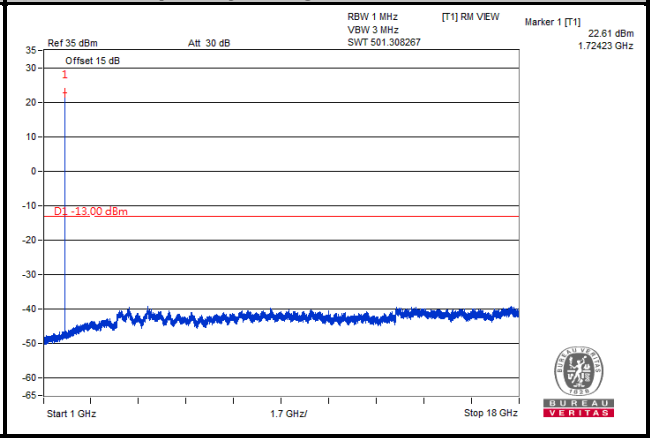
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 15 MHz	
Channel 20325	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

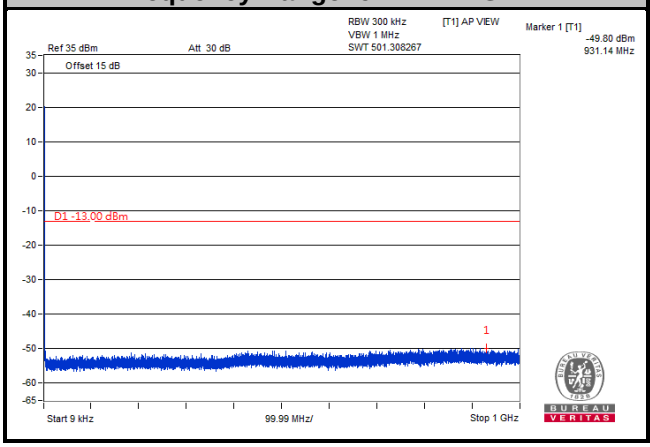
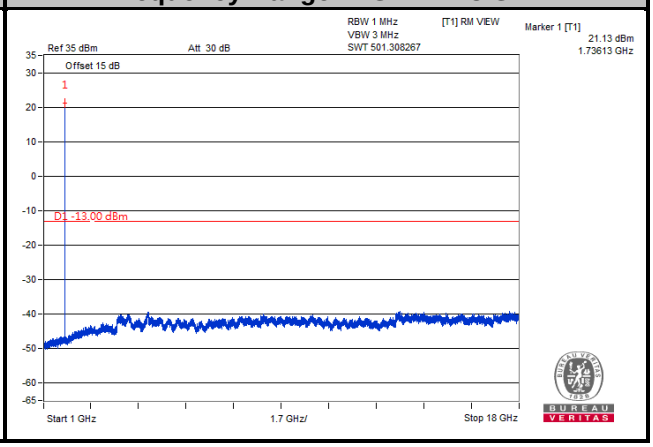
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 20 MHz	
Channel 20050	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

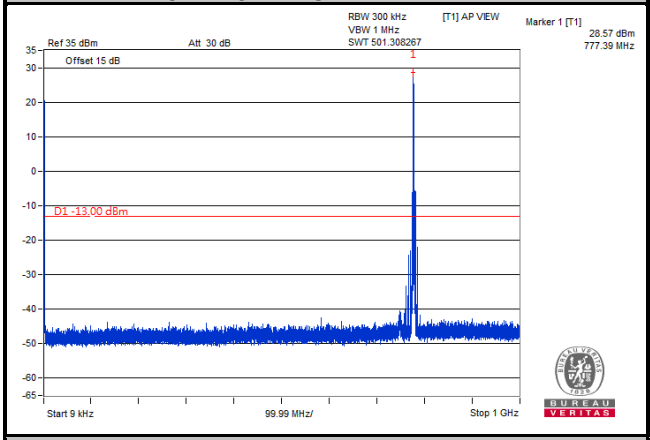
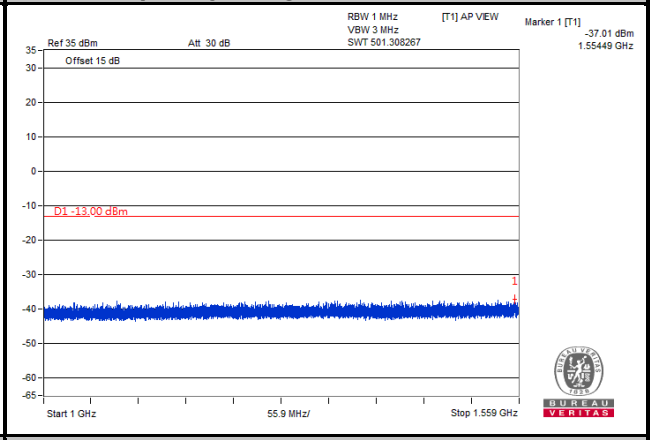
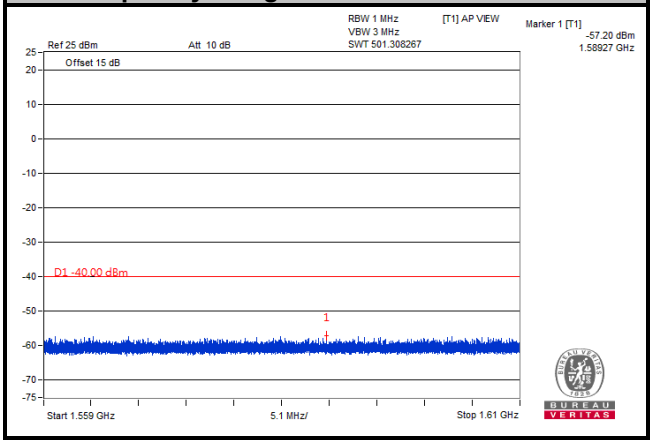
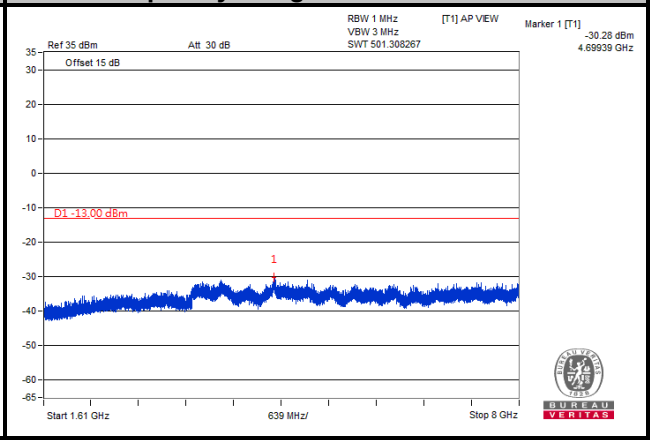
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 20 MHz	
Channel 20175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

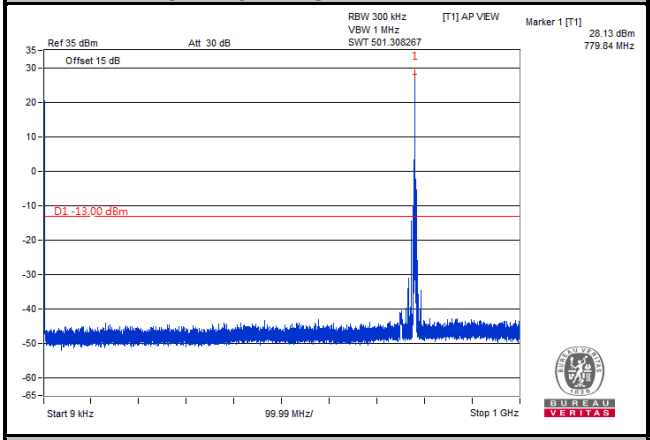
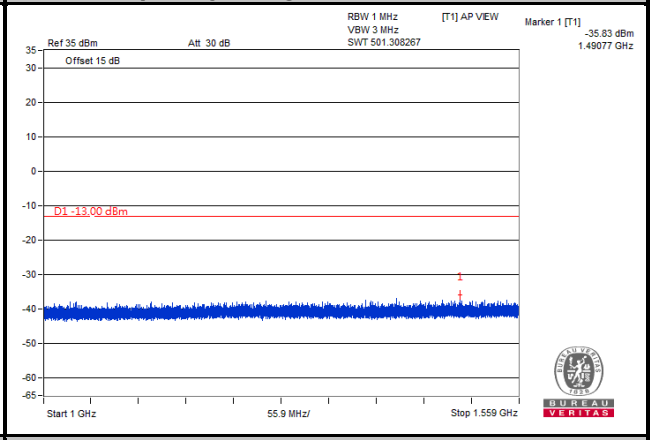
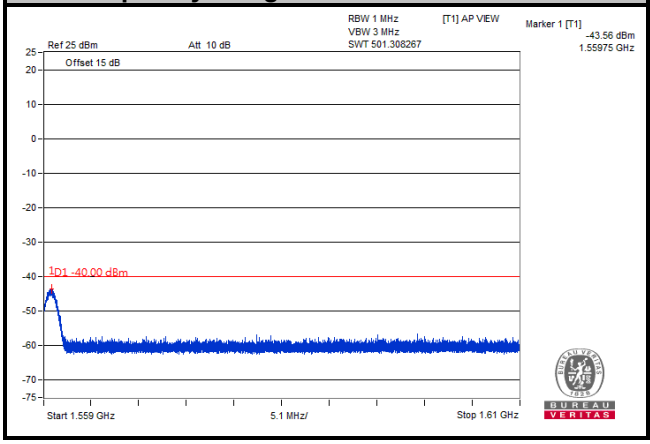
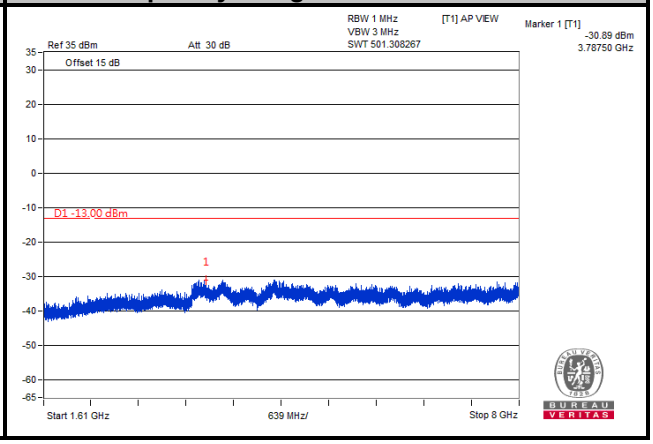
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 20 MHz	
Channel 20300	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

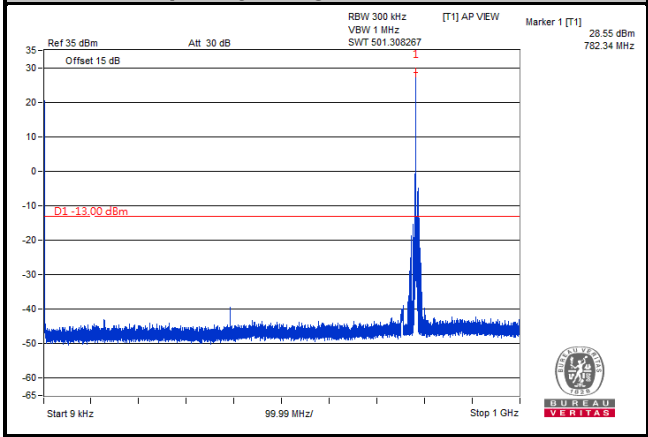
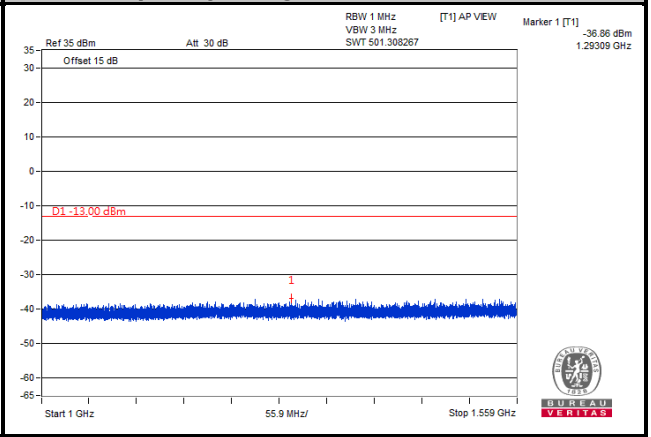
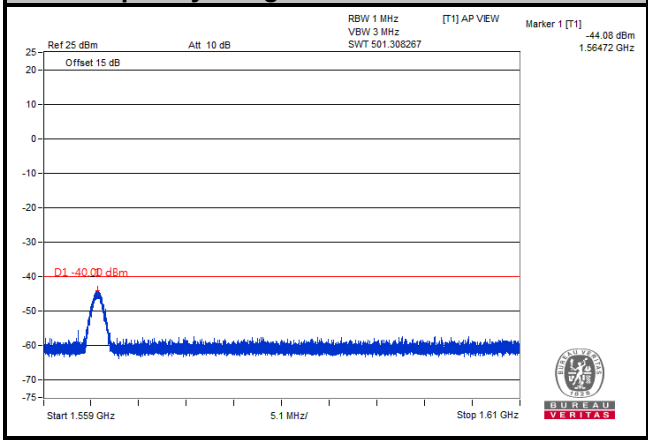
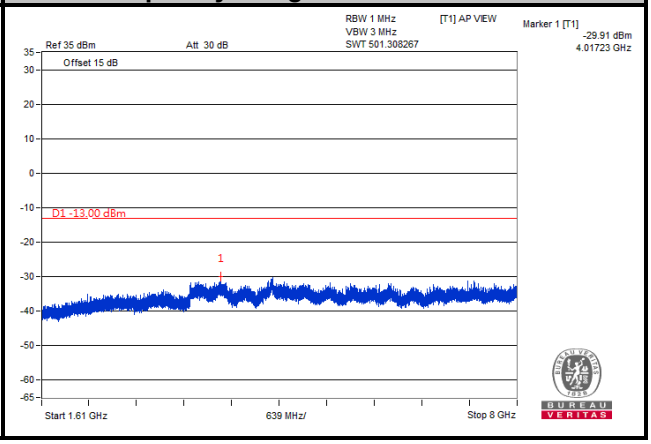
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 13	
Channel Bandwidth: 5 MHz	
Channel 23205	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 1.559 GHz
	
Frequency Range: 1.559 GHz ~ 1.61 GHz	Frequency Range: 1.61 GHz ~ 8 GHz
	

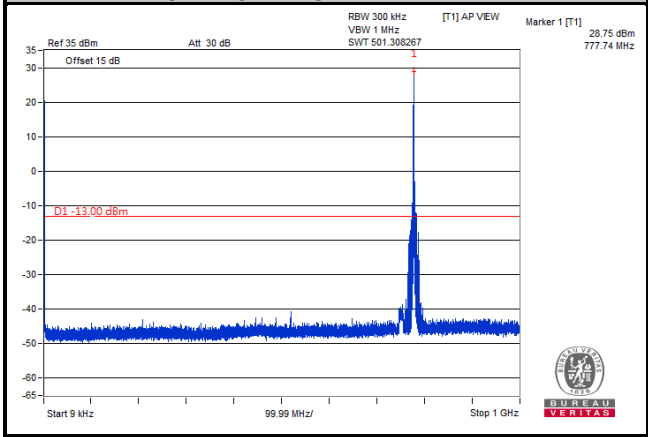
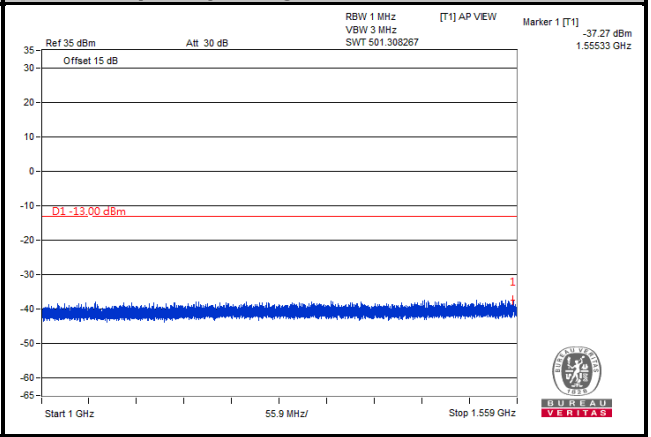
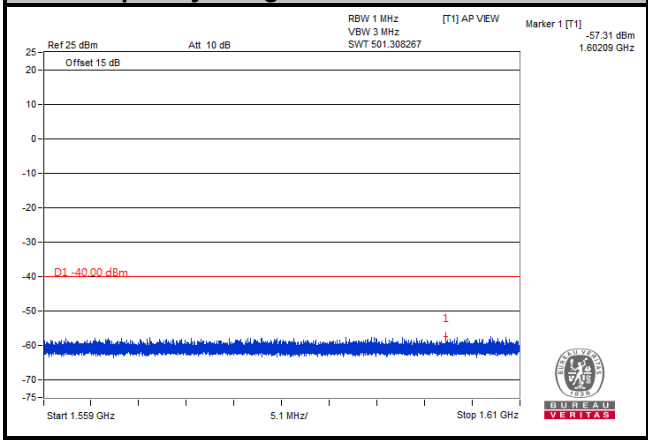
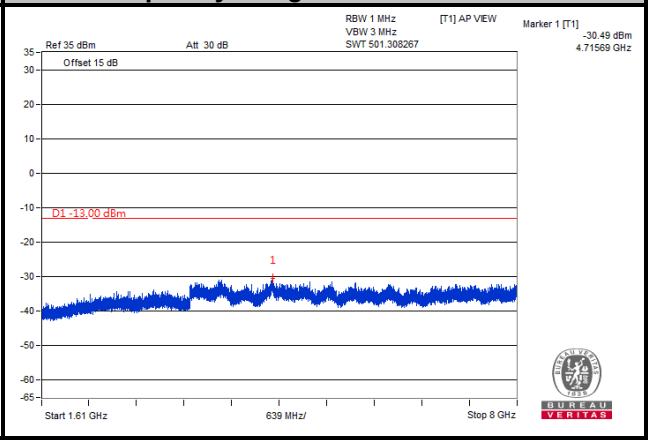
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 13	
Channel Bandwidth: 5 MHz	
Channel 23230	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 1.559 GHz
	
Frequency Range: 1.559 GHz ~ 1.61 GHz	Frequency Range: 1.61 GHz ~ 8 GHz
	

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

LTE Band 13	
Channel Bandwidth: 5 MHz	
Channel 23255	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 1.559 GHz
	
Frequency Range: 1.559 GHz ~ 1.61 GHz	Frequency Range: 1.61 GHz ~ 8 GHz
	

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

LTE Band 13	
Channel Bandwidth: 10 MHz	
Channel 23230	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 1.559 GHz
	
Frequency Range: 1.559 GHz ~ 1.61 GHz	Frequency Range: 1.61 GHz ~ 8 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.
b. For operations in the 775-788 MHz, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz. The limit of emissions is equal to -40 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. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value” of step a. Record the power level of S.G.
c. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.
d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.R.P power - 2.15 dB.

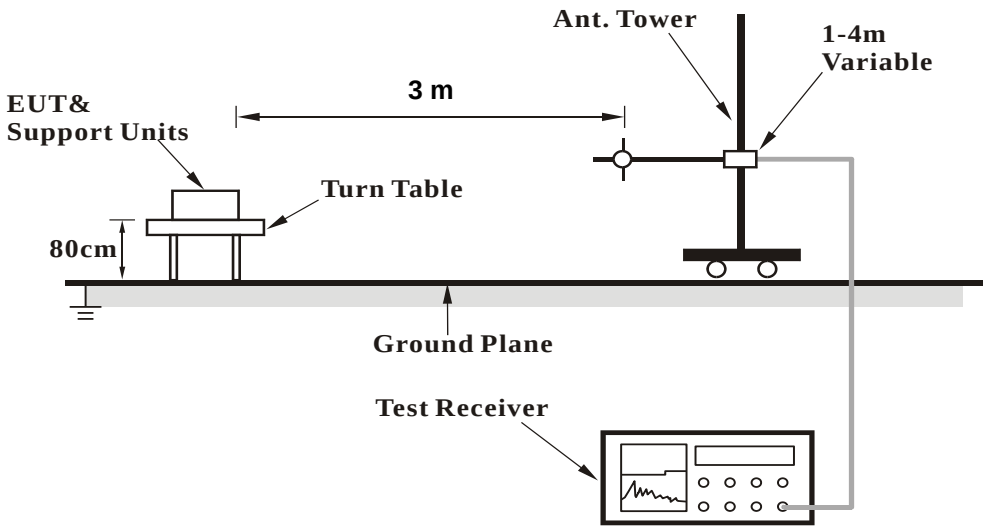
Note: The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

4.8.3 Deviation from Test Standard

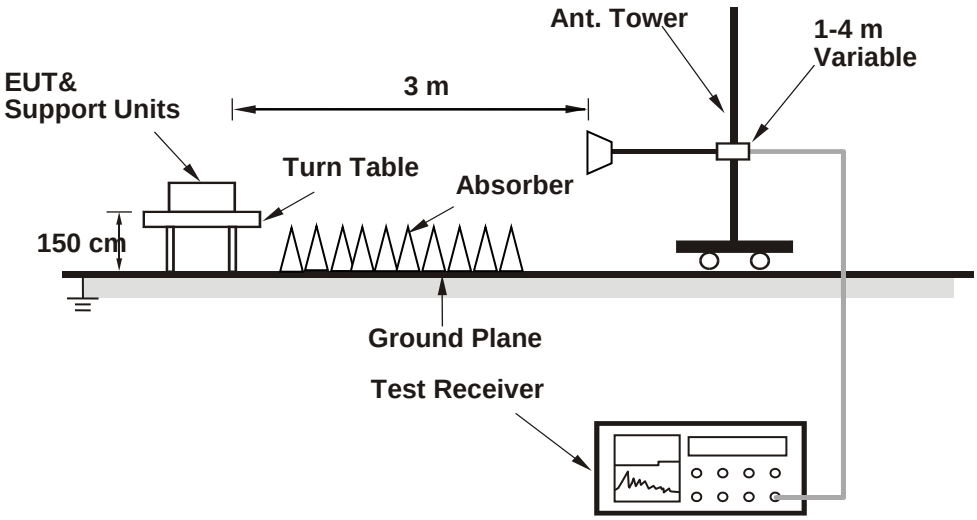
No deviation.

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).

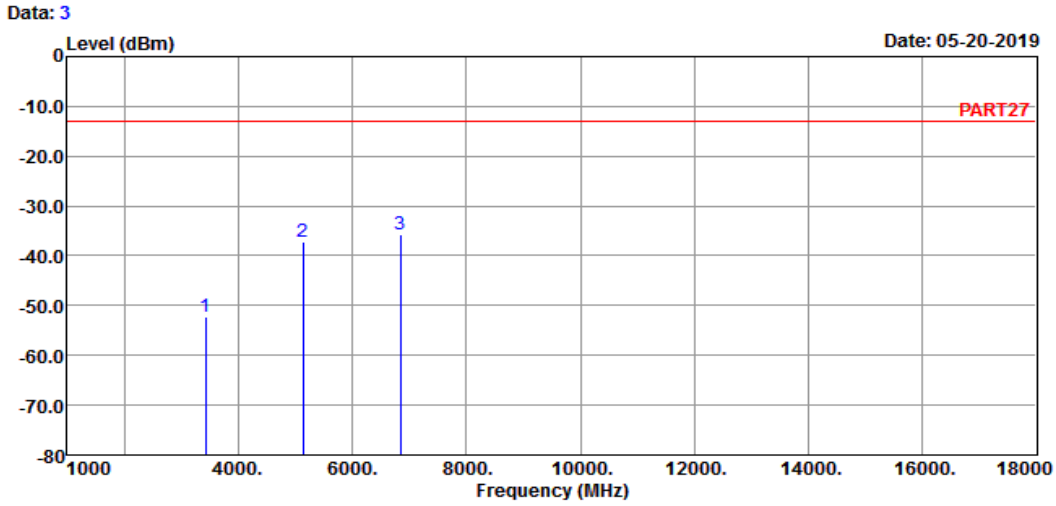
4.8.5 Test Results

LTE Band 4

Channel Bandwidth: 1.4 MHz / QPSK

Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

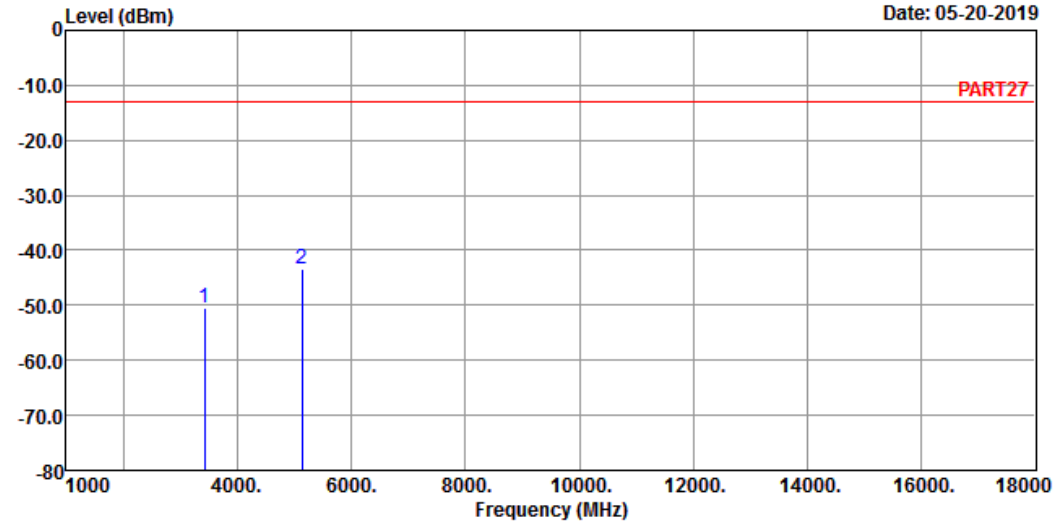


Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remak : Cat-M1 Band 4 QPSK_1.4M Link_L-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3421.40	-52.25	-43.91	-13.00	-8.34	-39.25	Peak
2	5132.10	-37.19	-35.45	-13.00	-1.74	-24.19	Peak
3 pp	6842.80	-35.76	-38.07	-13.00	2.31	-22.76	Peak

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

Data: 4

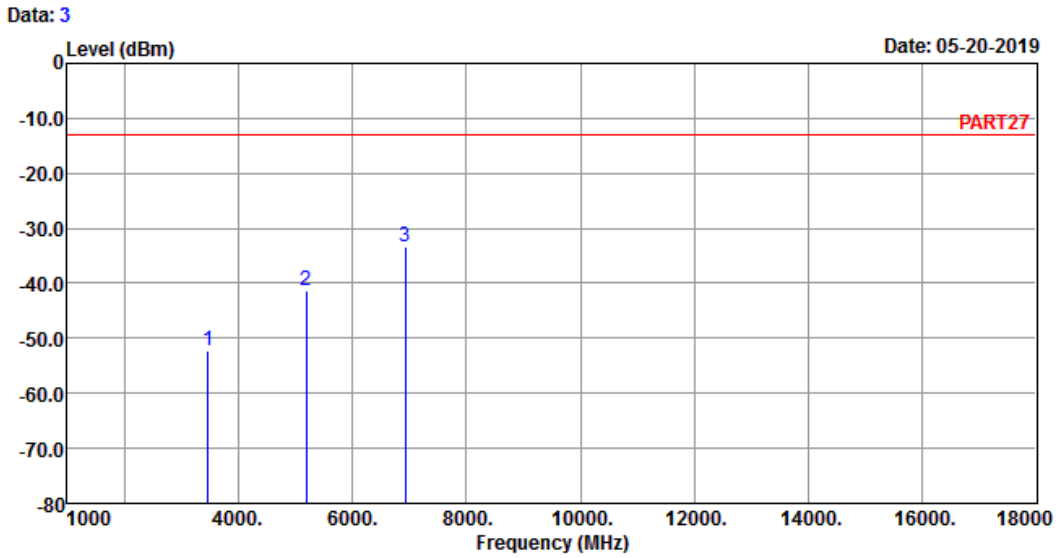


Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : Cat-M1 Band 4 QPSK_1.4M Link_L-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3421.40	-50.35	-42.01	-13.00	-8.34	-37.35	Peak
2 pp	5132.10	-43.27	-41.53	-13.00	-1.74	-30.27	Peak

Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

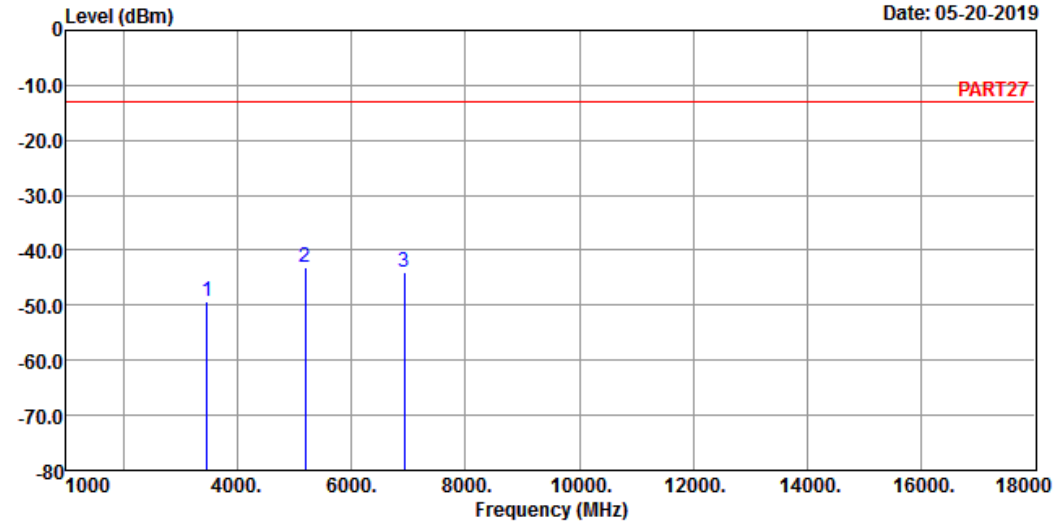


Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remak : Cat-M1 Band 4 QPSK_1.4M Link_M-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3465.00	-52.37	-44.49	-13.00	-7.88	-39.37	Peak
2	5197.50	-41.39	-39.32	-13.00	-2.07	-28.39	Peak
3 pp	6930.00	-33.38	-36.07	-13.00	2.69	-20.38	Peak

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

Data: 4

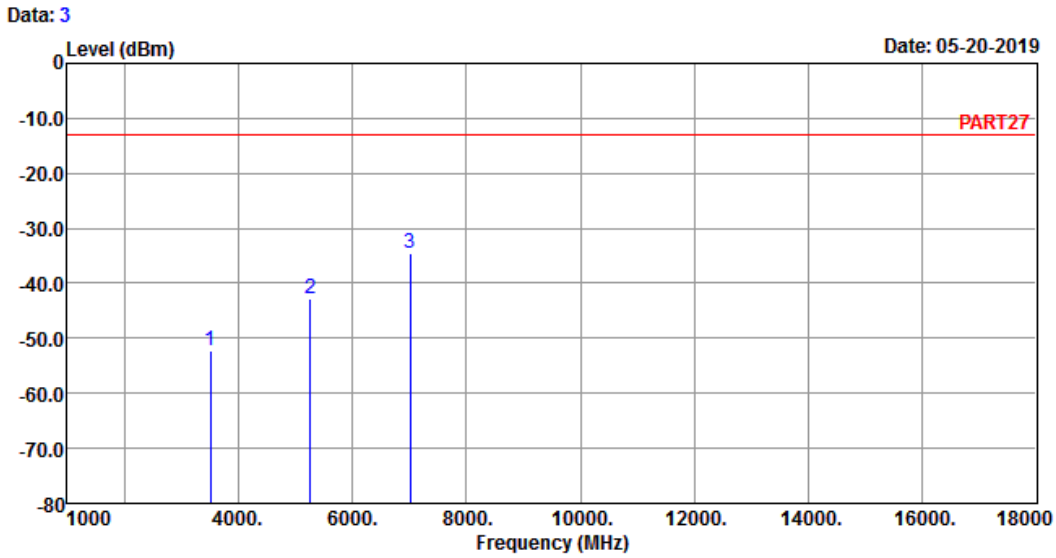


Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : Cat-M1 Band 4 QPSK_1.4M Link_M-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3465.00	-49.35	-41.47	-13.00	-7.88	-36.35	Peak
2 pp	5197.50	-43.07	-41.00	-13.00	-2.07	-30.07	Peak
3	6930.00	-44.10	-46.79	-13.00	2.69	-31.10	Peak

High Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

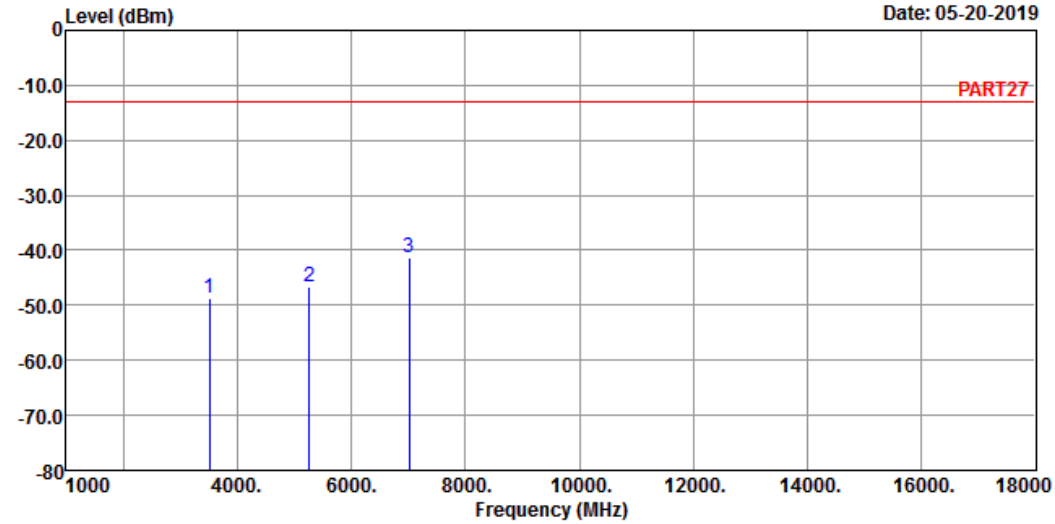


Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remak : Cat-M1 Band 4 QPSK_1.4M Link_H-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3508.60	-52.29	-44.84	-13.00	-7.45	-39.29	Peak
2	5262.90	-42.68	-40.16	-13.00	-2.52	-29.68	Peak
3 pp	7017.20	-34.63	-37.82	-13.00	3.19	-21.63	Peak

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

Data: 4

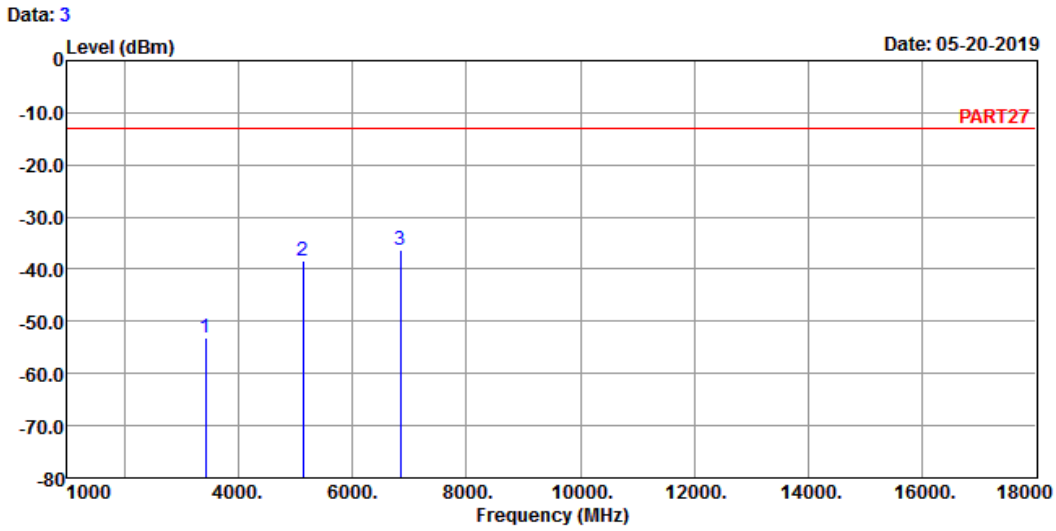


Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : Cat-M1 Band 4 QPSK_1.4M Link_H-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3508.60	-48.67	-41.22	-13.00	-7.45	-35.67	Peak
2	5262.90	-46.51	-43.99	-13.00	-2.52	-33.51	Peak
3 pp	7017.20	-41.21	-44.40	-13.00	3.19	-28.21	Peak

Channel Bandwidth: 5 MHz / QPSK
Low Channel

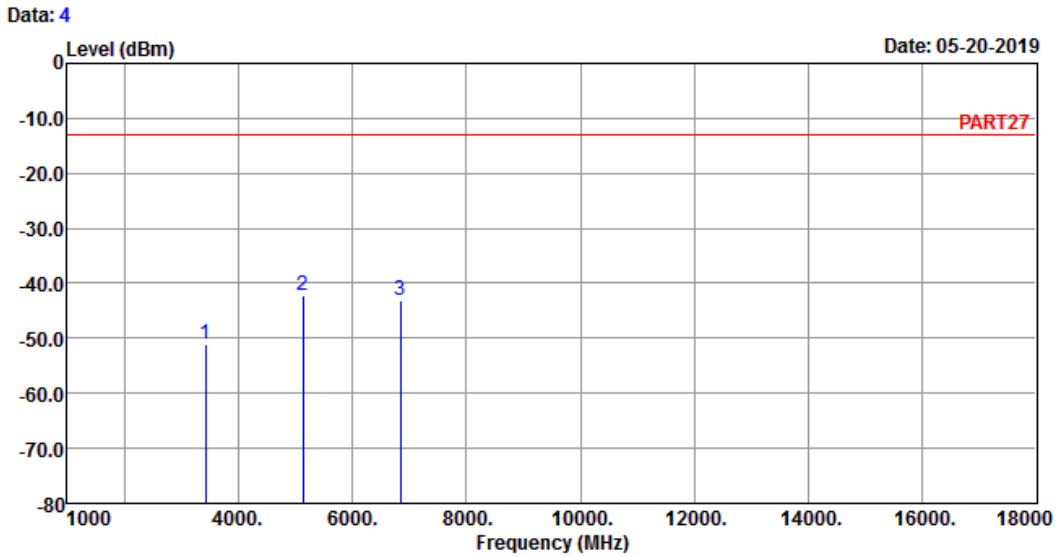
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remak : Cat-M1 Band 4 QPSK_5M Link_L-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3425.00	-53.15	-44.81	-13.00	-8.34	-40.15	Peak
2	5137.50	-38.29	-36.55	-13.00	-1.74	-25.29	Peak
3 pp	6850.00	-36.30	-38.61	-13.00	2.31	-23.30	Peak

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

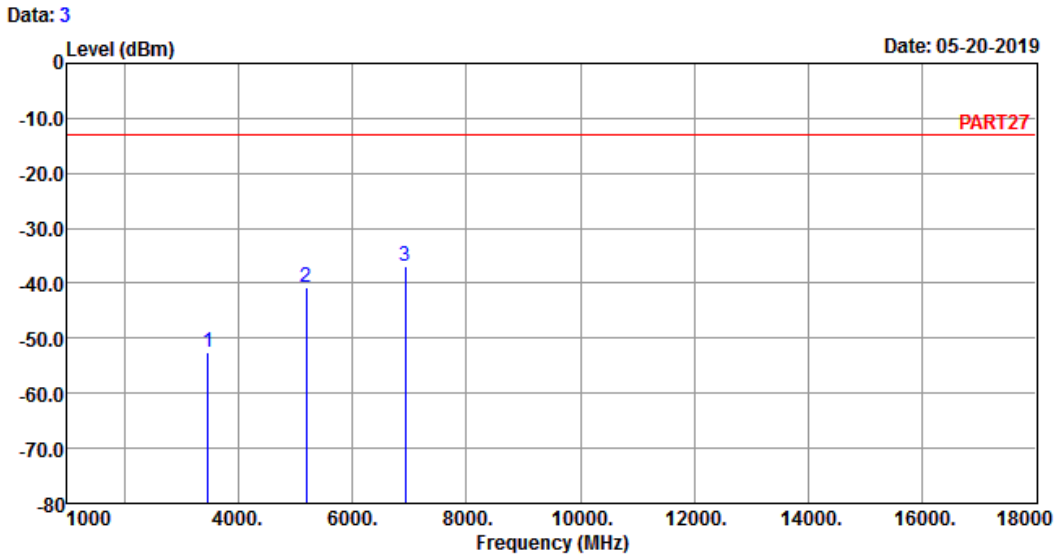


Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : Cat-M1 Band 4 QPSK_5M Link_L-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3425.00	-50.95	-42.61	-13.00	-8.34	-37.95	Peak
2 pp	5137.50	-42.10	-40.36	-13.00	-1.74	-29.10	Peak
3	6850.00	-43.17	-45.48	-13.00	2.31	-30.17	Peak

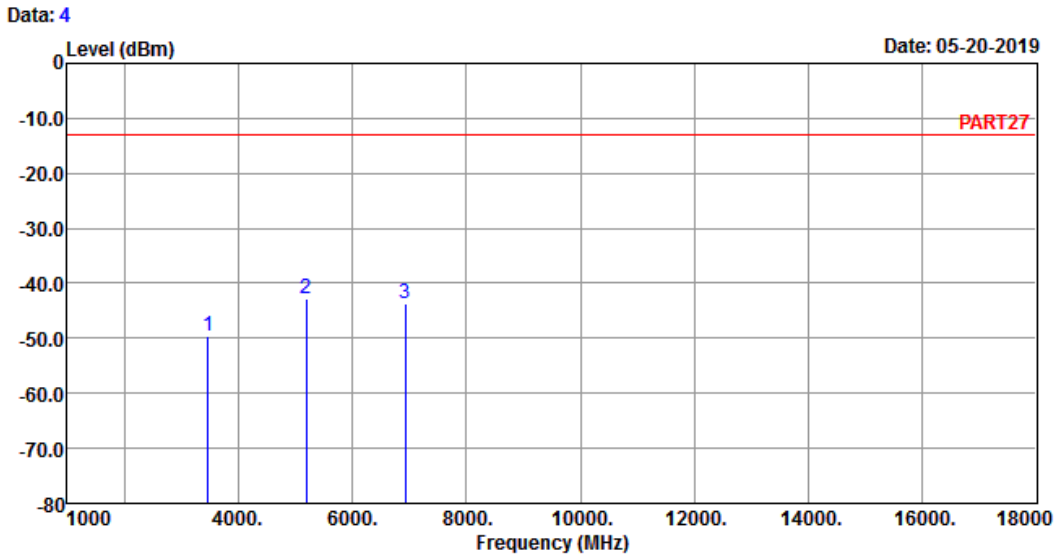
Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remak : Cat-M1 Band 4 QPSK_5M Link_M-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3465.00	-52.69	-44.81	-13.00	-7.88	-39.69	Peak
2	5197.50	-40.80	-38.73	-13.00	-2.07	-27.80	Peak
3 pp	6930.00	-36.85	-39.54	-13.00	2.69	-23.85	Peak

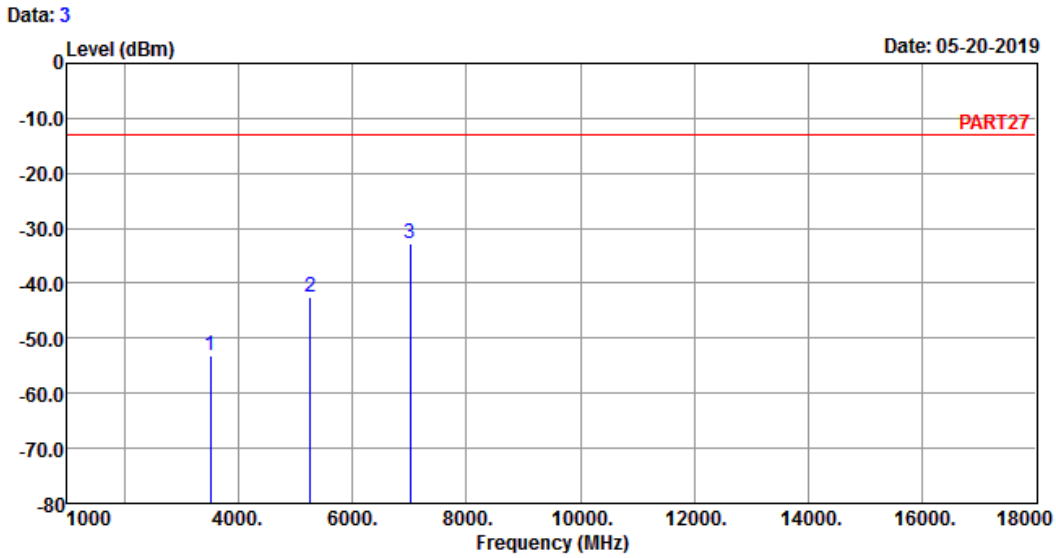


Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : Cat-M1 Band 4 QPSK_5M Link_M-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3465.00	-49.69	-41.81	-13.00	-7.88	-36.69	Peak
2 pp	5197.50	-42.66	-40.59	-13.00	-2.07	-29.66	Peak
3	6930.00	-43.76	-46.45	-13.00	2.69	-30.76	Peak

High Channel

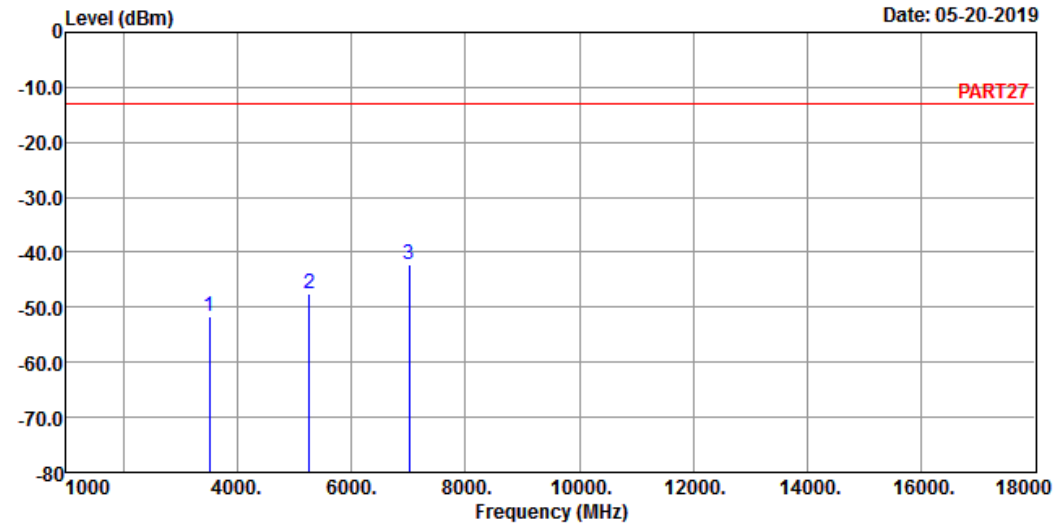
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remak : Cat-M1 Band 4 QPSK_5M Link_H-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3505.00	-53.24	-45.79	-13.00	-7.45	-40.24	Peak
2	5257.50	-42.55	-40.03	-13.00	-2.52	-29.55	Peak
3 pp	7010.00	-32.77	-35.96	-13.00	3.19	-19.77	Peak

Data: 4

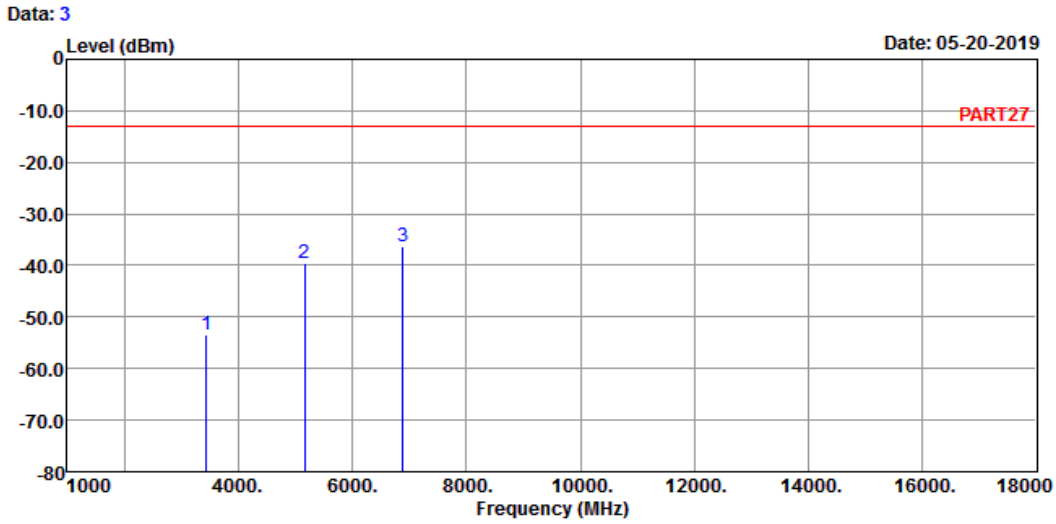


Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : Cat-M1 Band 4 QPSK_5M Link_H-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3505.00	-51.53	-44.08	-13.00	-7.45	-38.53	Peak
2	5257.50	-47.56	-45.04	-13.00	-2.52	-34.56	Peak
3 pp	7010.00	-42.28	-45.47	-13.00	3.19	-29.28	Peak

Channel Bandwidth: 20 MHz / QPSK
Low Channel

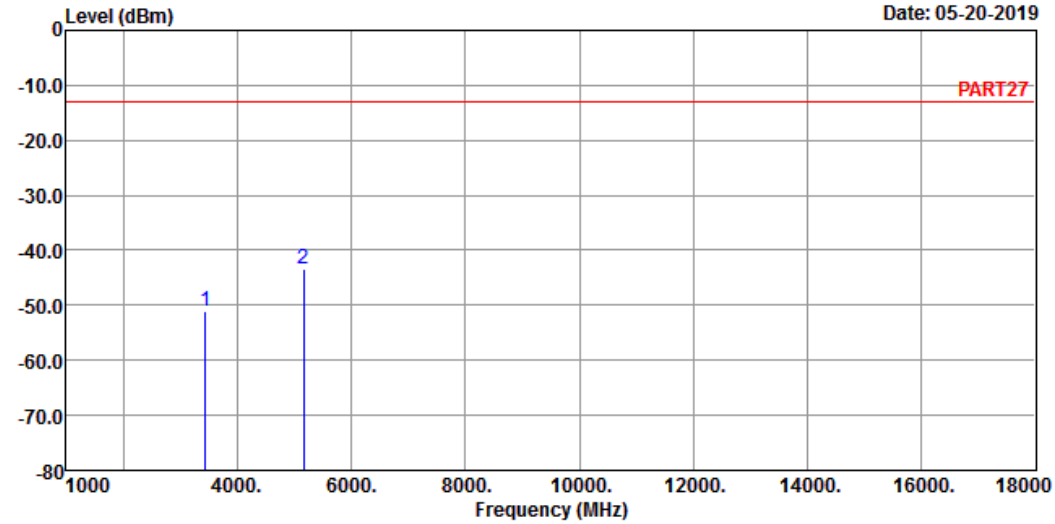
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remak : Cat-M1 Band 4 QPSK_20M Link_L-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3440.00	-53.29	-45.07	-13.00	-8.22	-40.29	Peak
2	5160.00	-39.64	-37.73	-13.00	-1.91	-26.64	Peak
3 pp	6880.00	-36.37	-38.85	-13.00	2.48	-23.37	Peak

Data: 4

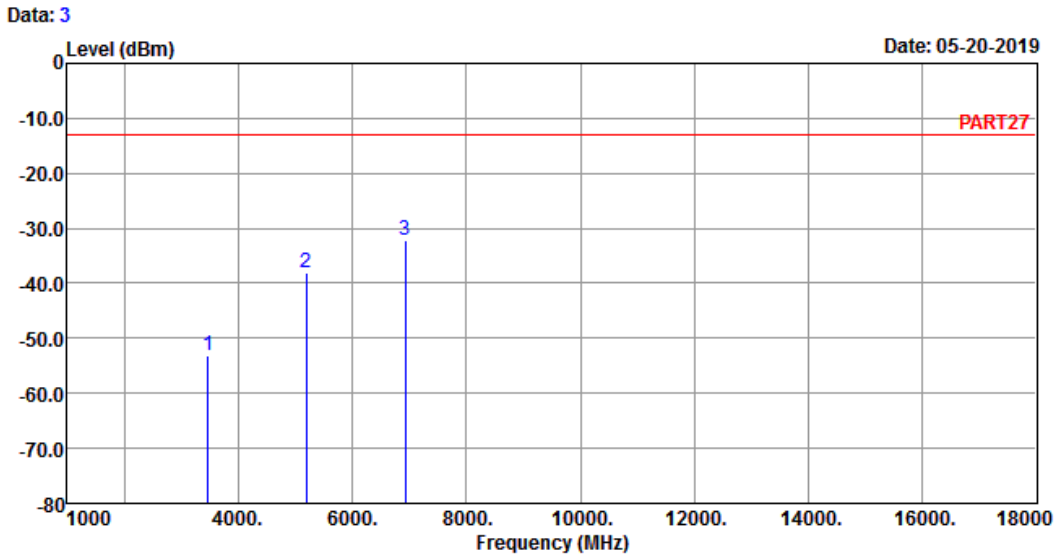


Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : Cat-M1 Band 4 QPSK_20M Link_L-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3440.00	-50.92	-42.70	-13.00	-8.22	-37.92	Peak
2 pp	5160.00	-43.47	-41.56	-13.00	-1.91	-30.47	Peak

Middle Channel

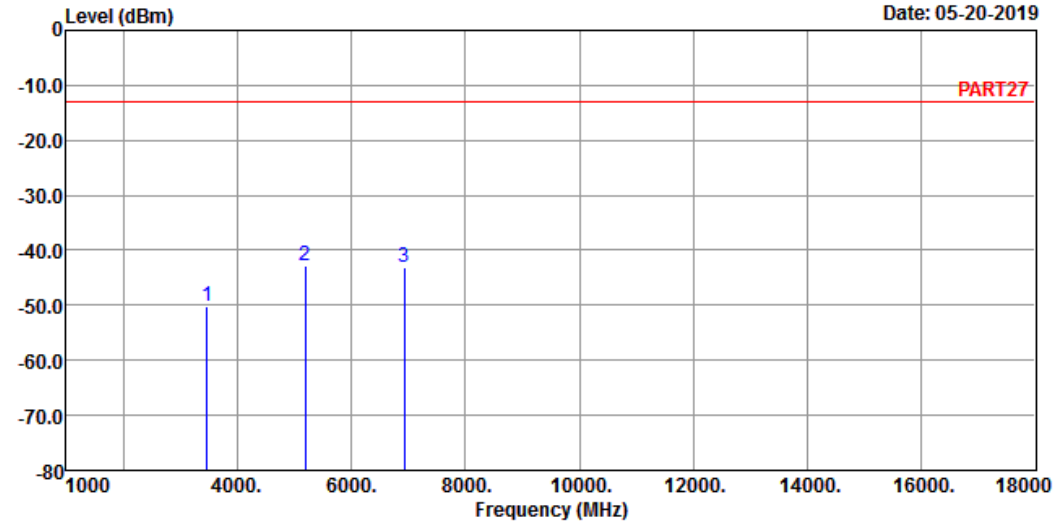
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remak : Cat-M1 Band 4 QPSK_20M Link_M-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3465.00	-53.00	-45.12	-13.00	-7.88	-40.00	Peak
2	5197.50	-38.11	-36.04	-13.00	-2.07	-25.11	Peak
3 pp	6930.00	-32.08	-34.77	-13.00	2.69	-19.08	Peak

Data: 4

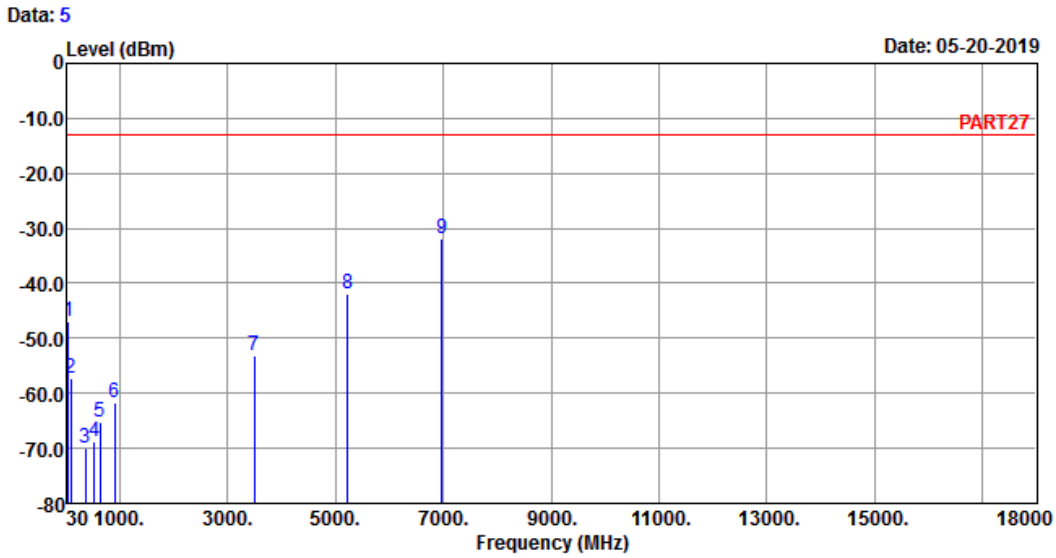


Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : Cat-M1 Band 4 QPSK_20M Link_M-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3465.00	-50.11	-42.23	-13.00	-7.88	-37.11	Peak
2 pp	5197.50	-42.78	-40.71	-13.00	-2.07	-29.78	Peak
3	6930.00	-42.96	-45.65	-13.00	2.69	-29.96	Peak

High Channel

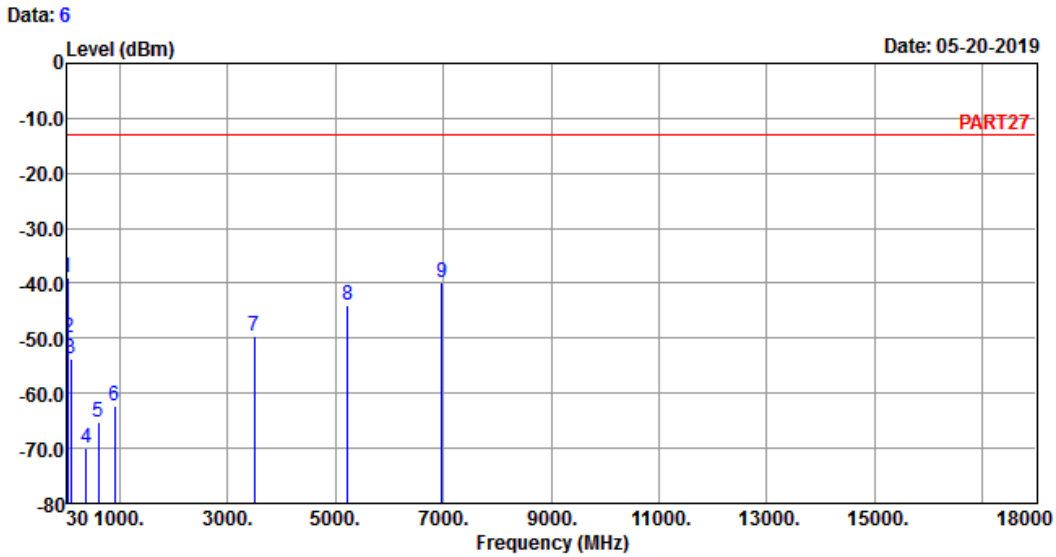
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remak : Cat-M1 Band 4 QPSK_20M Link_H-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	42.61	-46.86	-45.92	-13.00	-0.94	-33.86	Peak
2	95.96	-57.22	-46.44	-13.00	-10.78	-44.22	Peak
3	363.68	-70.09	-63.93	-13.00	-6.16	-57.09	Peak
4	527.61	-68.87	-65.23	-13.00	-3.64	-55.87	Peak
5	635.28	-65.18	-64.33	-13.00	-0.85	-52.18	Peak
6	903.97	-61.55	-62.22	-13.00	0.67	-48.55	Peak
7	3490.00	-53.04	-45.39	-13.00	-7.65	-40.04	Peak
8	5235.00	-42.00	-39.59	-13.00	-2.41	-29.00	Peak
9 pp	6980.00	-32.02	-35.08	-13.00	3.06	-19.02	Peak

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

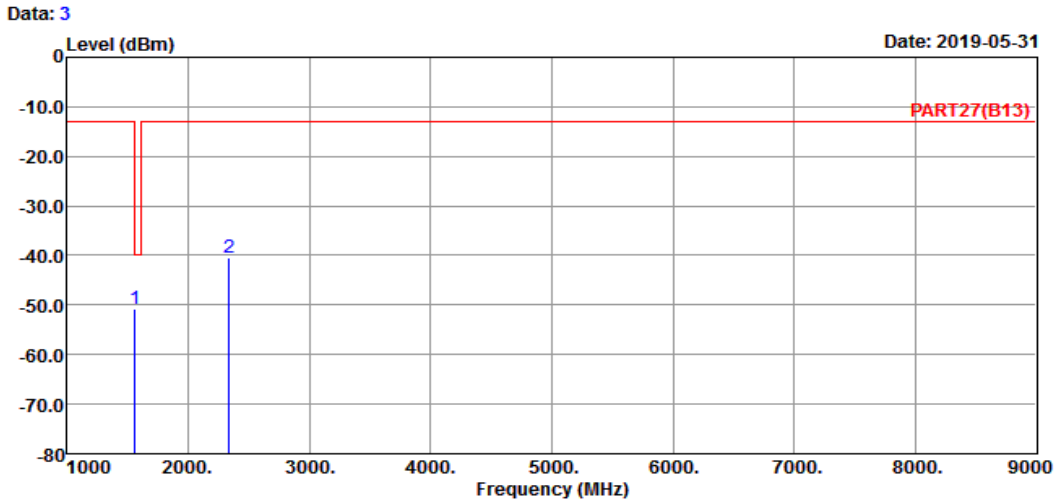


Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : Cat-M1 Band 4 QPSK_20M Link_H-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	31.94	-38.84	-38.24	-13.00	-0.60	-25.84	Peak
2	53.28	-49.77	-43.96	-13.00	-5.81	-36.77	Peak
3	94.99	-53.64	-42.80	-13.00	-10.84	-40.64	Peak
4	373.38	-69.96	-63.86	-13.00	-6.10	-56.96	Peak
5	604.24	-65.24	-64.48	-13.00	-0.76	-52.24	Peak
6	903.97	-62.24	-62.91	-13.00	0.67	-49.24	Peak
7	3490.00	-49.46	-41.81	-13.00	-7.65	-36.46	Peak
8	5235.00	-44.03	-41.62	-13.00	-2.41	-31.03	Peak
9	6980.00	-39.74	-42.80	-13.00	3.06	-26.74	Peak

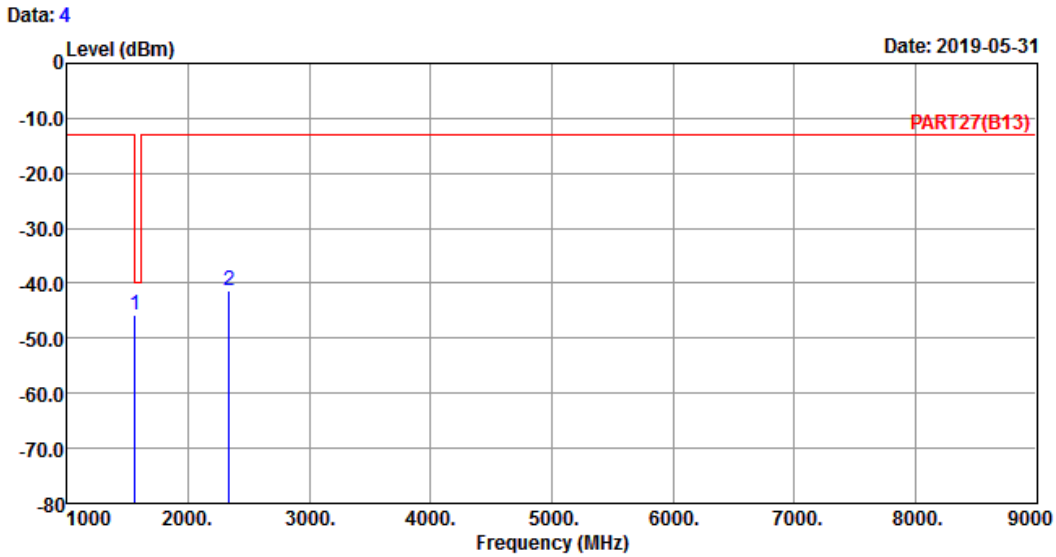
LTE Band 13
Channel Bandwidth: 5 MHz / QPSK
Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27(B13) HORIZONTAL
Remak : Cat-M1 Band 13 QPSK_5M Link_L-CH
Tested by: tim-chen

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1559.00	-50.85	-37.53	-40.00	-13.32	-10.85	Peak
2	2338.50	-40.40	-31.02	-13.00	-9.38	-27.40	Peak

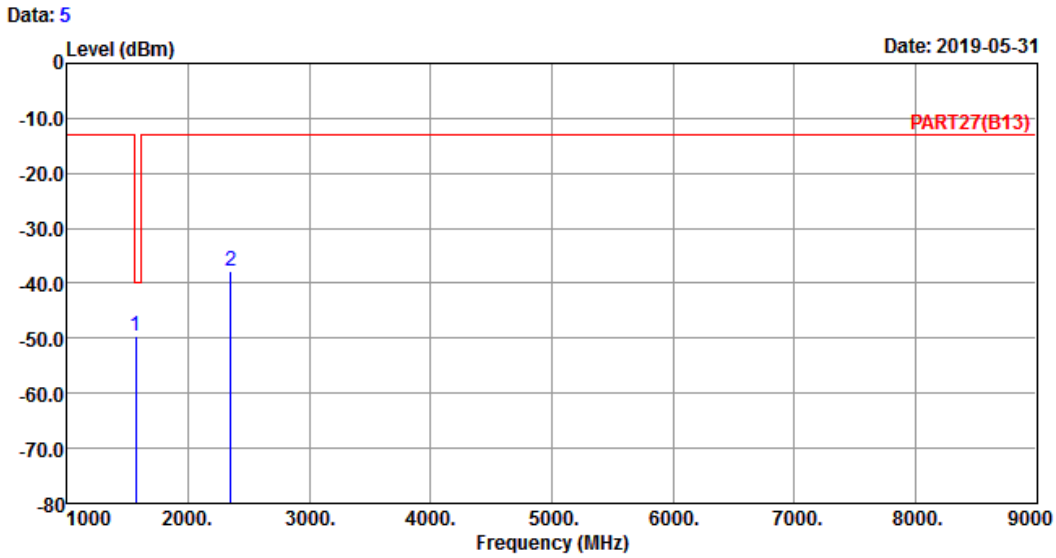


Site : 966 Chamber 5
Condition: PART27(B13) VERTICAL
Remak : Cat-M1 Band 13 QPSK_5M Link_L-CH
Tested by: tim-chen

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1559.00	-45.80	-32.48	-40.00	-13.32	-5.80	Peak
2	2338.50	-41.43	-32.05	-13.00	-9.38	-28.43	Peak

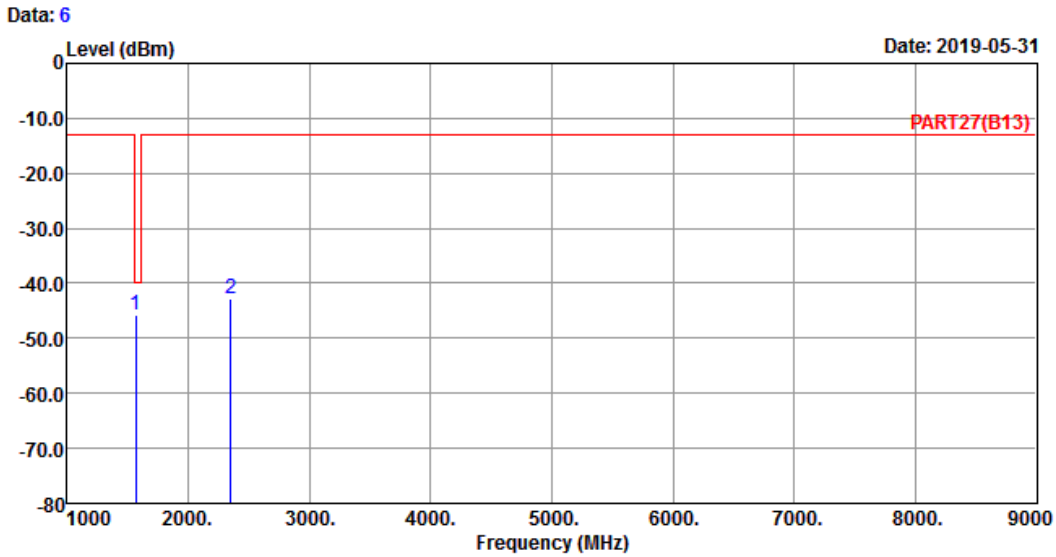
Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27(B13) HORIZONTAL
Remak : Cat-M1 Band 13 QPSK_5M Link_M-CH
Tested by: tim-chen

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1564.00	-49.63	-36.29	-40.00	-13.34	-9.63	Peak
2	2346.00	-37.78	-28.34	-13.00	-9.44	-24.78	Peak

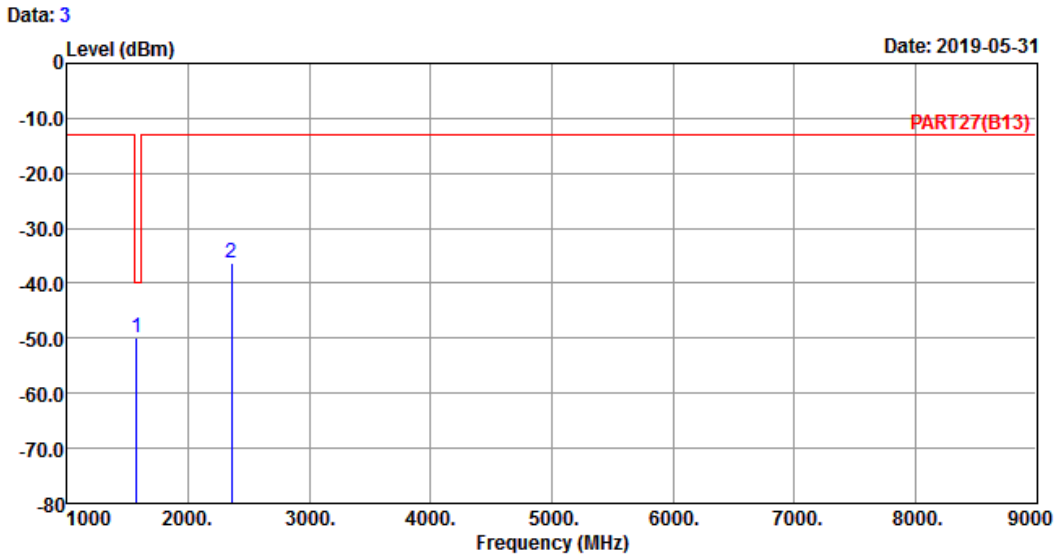


Site : 966 Chamber 5
Condition: PART27(B13) VERTICAL
Remak : Cat-M1 Band 13 QPSK_5M Link_M-CH
Tested by: tim-chen

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1564.00	-45.79	-32.45	-40.00	-13.34	-5.79	Peak
2	2346.00	-42.81	-33.37	-13.00	-9.44	-29.81	Peak

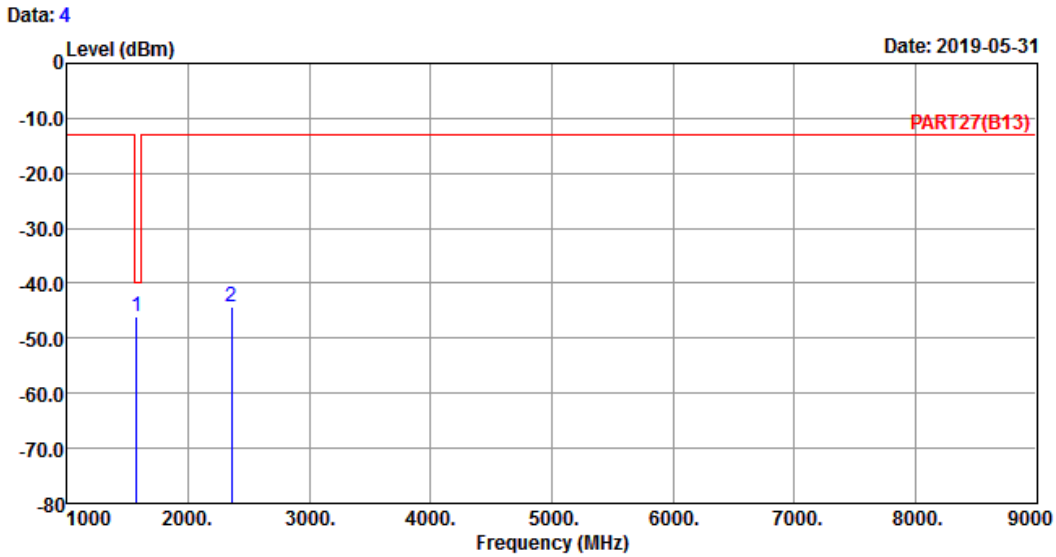
High Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27(B13) HORIZONTAL
Remak : Cat-M1 Band 13 QPSK_5M Link_H-CH
Tested by: tim-chen

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1569.00	-49.81	-36.46	-40.00	-13.35	-9.81	Peak
2	2353.50	-36.34	-26.83	-13.00	-9.51	-23.34	Peak

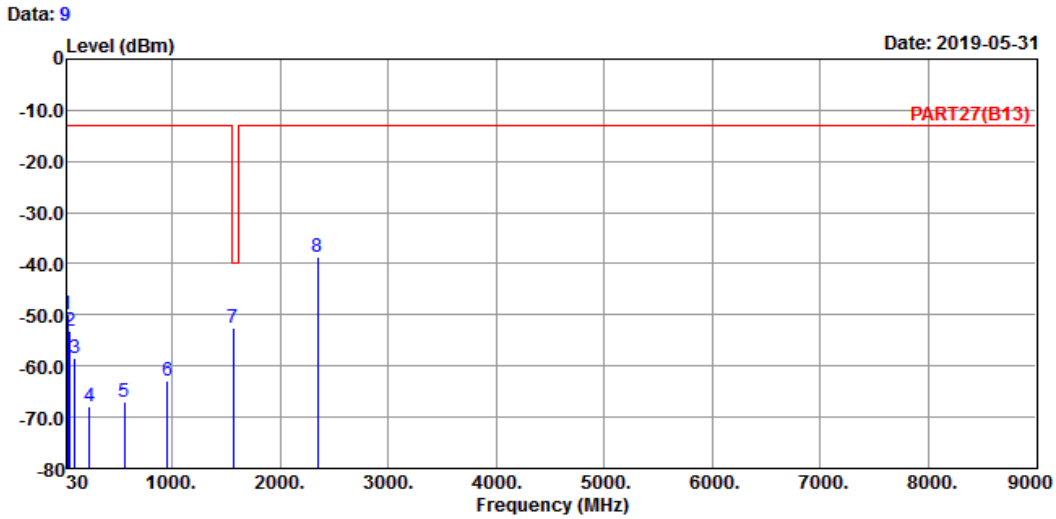


Site : 966 Chamber 5
Condition: PART27(B13) VERTICAL
Remak : Cat-M1 Band 13 QPSK_5M Link_H-CH
Tested by: tim-chen

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1569.00	-45.97	-32.62	-40.00	-13.35	-5.97	Peak
2	2353.50	-44.32	-34.81	-13.00	-9.51	-31.32	Peak

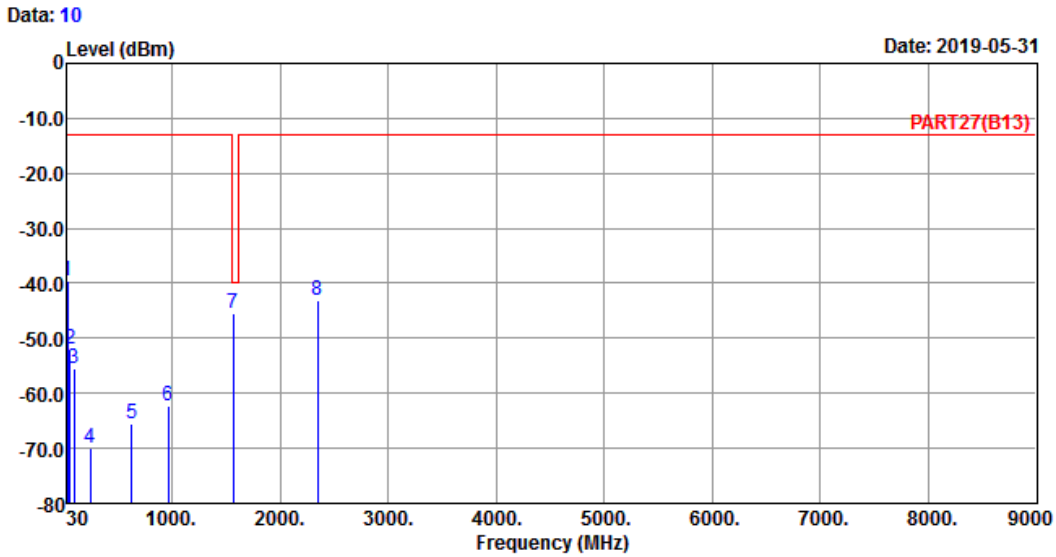
Channel Bandwidth: 10 MHz / QPSK
Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27(B13) HORIZONTAL
Remak : Cat-M1 Band 13 QPSK_10M Link_M-CH
Tested by: tim-chen

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	32.91	-49.79	-48.70	-13.00	-1.09	-36.79	Peak
2	55.22	-53.19	-46.85	-13.00	-6.34	-40.19	Peak
3	98.87	-58.53	-47.91	-13.00	-10.62	-45.53	Peak
4	232.73	-67.92	-61.22	-13.00	-6.70	-54.92	Peak
5	561.56	-66.97	-64.60	-13.00	-2.37	-53.97	Peak
6	958.29	-62.85	-64.96	-13.00	2.11	-49.85	Peak
7 pp	1564.00	-52.60	-39.26	-40.00	-13.34	-12.60	Peak
8	2346.00	-38.62	-29.18	-13.00	-9.44	-25.62	Peak



Site : 966 Chamber 5
Condition: PART27(B13) VERTICAL
Remak : Cat-M1 Band 13 QPSK_10M Link_M-CH
Tested by: tim-chen

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	30.97	-39.54	-39.43	-13.00	-0.11	-26.54	Peak
2	54.25	-51.86	-45.79	-13.00	-6.07	-38.86	Peak
3	93.05	-55.35	-44.40	-13.00	-10.95	-42.35	Peak
4	243.40	-69.85	-63.58	-13.00	-6.27	-56.85	Peak
5	623.64	-65.45	-64.63	-13.00	-0.82	-52.45	Peak
6	964.11	-62.22	-64.53	-13.00	2.31	-49.22	Peak
7 pp	1564.00	-45.61	-32.27	-40.00	-13.34	-5.61	Peak
8	2346.00	-42.99	-33.55	-13.00	-9.44	-29.99	Peak

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:

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Web Site: www.bureauveritas-adt.com

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

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