FCC Test Report

(PART 27)

Report No.:	RF180301C45
FCC ID:	2AAGMVZM2OQ
Test Model:	VZM20Q
Received Date:	Mar. 01, 2018
Test Date:	Mar. 18, 2018 ~ Mar. 20, 2018
Issued Date:	Mar. 28, 2018
Applicant:	SEQUANS Communications SA
Address:	Batiment CitiCenter 19, le Parvis de la Defense 92073 Paris la Defense Cedex France
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C)
Test Location:	No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.
FCC Registration / Designation Number:	788550 / TW0003

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RF180301C45	Original Release	Mar. 28, 2018

1 Certificate of Conformity

Product: VZM20Q EZlinkLTE modules

Brand: SEQUANS

Test Model: VZM20Q

Sample Status: MP

Applicant: SEQUANS Communications SA

Test Date: Mar. 18, 2018 ~ Mar. 20, 2018

Standards: FCC Part 27, Subpart C, L

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

Prepared by : Rona Chen , **Date:** Mar. 28, 2018

Rona Chen / Specialist

Approved by : , **Date:** Mar. 28, 2018

Dylan Chiou / Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 27 & Part 2 (LTE 4)			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 27.50(d)(4)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
2.1055 27.54	Frequency Stability	Pass	Meet the requirement of limit.
2.1049 27.53(h)	Occupied Bandwidth	Pass	Meet the requirement of limit.
27.50(d)(5)	Peak to Average Ratio	Pass	Meet the requirement of limit.
27.53(h)	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 27.53(h)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 27.53(h)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -33.22 dB at 39.70 MHz.

Applied Standard: FCC Part 27 & Part 2 (LTE 13)			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 27.50(b)(10)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
2.1055 27.54	Frequency Stability	Pass	Meet the requirement of limit.
2.1049 27.53(g)	Occupied Bandwidth	Pass	Meet the requirement of limit.
27.50(d)(5)	Peak to Average Ratio	Pass	Meet the requirement of limit.
27.53(g)	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 27.53(g)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 27.53(g)(f)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -2.52 dB at 1564.00 MHz.

2.1 Measurement Uncertainty

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

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

2.2 Test Site and Instruments

Description & Manaufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY52260177	Jul. 05, 2017	Jul. 04, 2018
Spectrum Analyzer Agilent	N9010A	MY52220314	Nov. 24, 2017	Nov. 23, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	100115	Nov. 23, 2017	Nov. 22, 2018
BILOG Antenna SCHWARZBECK	VULB 9168	9168-153	Dec. 06, 2017	Dec. 05, 2018
Double Ridge Guide Horn Antenna EMCO	3115	5619	Nov. 30, 2017	Nov. 29, 2018
BILOG Antenna SCHWARZBECK	VULB 9168	9168-153	Dec. 06, 2017	Dec. 05, 2018
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-400)	Jun. 23, 2017	Jun. 22, 2018
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 17, 2017	Apr. 16, 2018
MXG Vector signal generator Agilent	N5182B	MY53050430	Oct. 24, 2017	Oct. 23, 2018
Preamplifier EMCI	EMC 012645	980115	Oct. 20, 2017	Oct. 19, 2018
Preamplifier EMCI	EMC 184045	980116	Oct. 20, 2017	Oct. 19, 2018
Preamplifier EMCI	EMC 330H	980112	Oct. 13, 2017	Oct. 12, 2018
Power Meter Anritsu	ML2495A	1012010	Aug. 15, 2017	Aug. 14, 2018
Power Sensor Anritsu	MA2411B	1315050	Aug. 15, 2017	Aug. 14, 2018
RF Coaxial Cable HUBER+SUHNNER	EMC104-SM-SM-8000&3000	140811+170717	Oct. 20, 2017	Oct. 19, 2018
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM-1000(140807)	Oct. 20, 2017	Oct. 19, 2018
RF Coaxial Cable Worken	8D-FB	Cable-Ch10-01	Oct. 20, 2017	Oct. 19, 2018
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
Radio Communication Analyzer	MT8820C	6201300640	Aug. 16, 2017	Aug. 15, 2019
Temperature & Humidity Chamber	GTH-120-40-CP-AR	MAA1306-019	Sep. 08, 2017	Sep. 07, 2018
DC Power Supply Topward	33010D	807748	Oct. 25, 2016	Oct. 24, 2018
Digital Multimeter Fluke	87-III	70360742	Jun. 30, 2017	Jun. 29, 2018

Note:
1. The calibration interval of the above test instruments is 12 / 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 10.
3. The horn antenna and preamplifier (model: EMC 184045) are used only for the measurement of emission frequency above 1 GHz if tested.
4. The IC Site Registration No. is IC7450F-10.

3 General Information

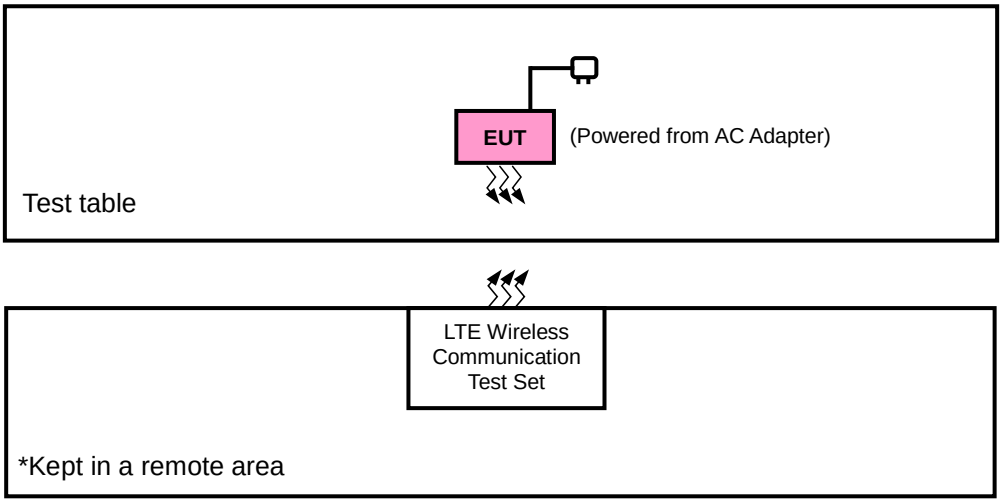
3.1 General Description of EUT

Product	VZM20Q EZlinkLTE modules	
Brand	SEQUANS	
Test Model	VZM20Q	
Status of EUT	MP	
Power Supply Rating	5.0 Vdc (Adapter)	
Modulation Type	LTE	QPSK, 16QAM
Frequency Range	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: 5 MHz)	1M09G7D
	LTE Band 4 (Channel Bandwidth: 10 MHz)	1M09G7D
	LTE Band 4 (Channel Bandwidth: 15 MHz)	1M10G7D
	LTE Band 4 (Channel Bandwidth: 20 MHz)	1M09G7D
	LTE Band 13 (Channel Bandwidth: 5 MHz)	1M09G7D
	LTE Band 13 (Channel Bandwidth: 10 MHz)	1M09G7D
Max. ERP Power	LTE Band 13 (Channel Bandwidth: 5 MHz)	158.85 mW
	LTE Band 13 (Channel Bandwidth: 10 MHz)	151.01 mW
Max. EIRP Power	LTE Band 4 (Channel Bandwidth: 5 MHz)	261.22 mW
	LTE Band 4 (Channel Bandwidth: 10 MHz)	316.96 mW
	LTE Band 4 (Channel Bandwidth: 15 MHz)	337.29 mW
	LTE Band 4 (Channel Bandwidth: 20 MHz)	341.98 mW
Antenna Type	Fixed Internal Antenna	
Accessory Device	Refer to Note as below	
Data Cable Supplied	Refer to Note as below	

Note:

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

3.2 Configuration of System under Test



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.	LTE Wireless Communication Test Set	Keysight	E7515A	MY56030229	N/A

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

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.

3.3 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	Z-plane	Z-axis
LTE Band 13	Z-plane	Z-axis

LTE Band 4

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	EIRP	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
-	Frequency Stability	19975 to 20375	19975, 20375	5 MHz	QPSK	1 RB / 24 RB Offset
		20000 to 20350	20000, 20350	10 MHz	QPSK	1 RB / 49 RB Offset
		20025 to 20325	20025, 20325	15 MHz	QPSK	1 RB / 74 RB Offset
		20050 to 20300	20050, 20300	20 MHz	QPSK	1 RB / 99 RB Offset
-	Occupied Bandwidth	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	19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM	12 RB / 0 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK, 16QAM	1 RB / 24 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK, 16QAM	36 RB / 0 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM	50 RB / 0 RB Offset
-	Band Edge	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	19975 to 20375	19975, 20175, 20375	5 MHz	QPSK	12 RB / 0 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK	50 RB / 0 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK	36 RB / 0 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK	50 RB / 0 RB Offset
-	Radiated Emission	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: This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.

LTE Band 13

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	ERP	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
					QPSK	6 RB / 0 RB Offset
					16QAM	5 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
					QPSK	6 RB / 0 RB Offset
					16QAM	5 RB / 0 RB Offset
-	Frequency Stability	23205 to 23255	23205, 23255	5 MHz	QPSK	1 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK	1 RB / 24 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
						6 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK	1 RB / 0 RB Offset
						6 RB / 0 RB Offset

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

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
ERP / EIRP	25 deg. C, 65 % RH	3.8 Vdc	Carlos Chen
Frequency Stability	25 deg. C, 65 % RH	3.8 Vdc	Carlos Chen
Occupied Bandwidth	25 deg. C, 65 % RH	3.8 Vdc	Carlos Chen
Band Edge	25 deg. C, 65 % RH	3.8 Vdc	Carlos Chen
Peak to Average Ratio	25 deg. C, 65 % RH	3.8 Vdc	Carlos Chen
Conducted Emission	25 deg. C, 65 % RH	3.8 Vdc	Carlos Chen
Radiated Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Jisyong Wang

3.4 EUT Operating Conditions

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

3.5 General Description of Applied Standards

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

FCC 47 CFR Part 2
FCC 47 CFR Part 27
KDB 971168 D01 Power Meas License Digital Systems v02r02
ANSI/TIA/EIA-603-E 2016
ANSI 63.26-2015

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

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

Fixed, mobile, and portable (hand-held) stations operating in the 1710–1755 MHz band are limited to 1 watt EIRP.

Portable stations (hand-held devices) operating in the 776-787 MHz band are limited to 3 watts ERP

4.1.2 Test Procedures

EIRP / ERP Measurement:

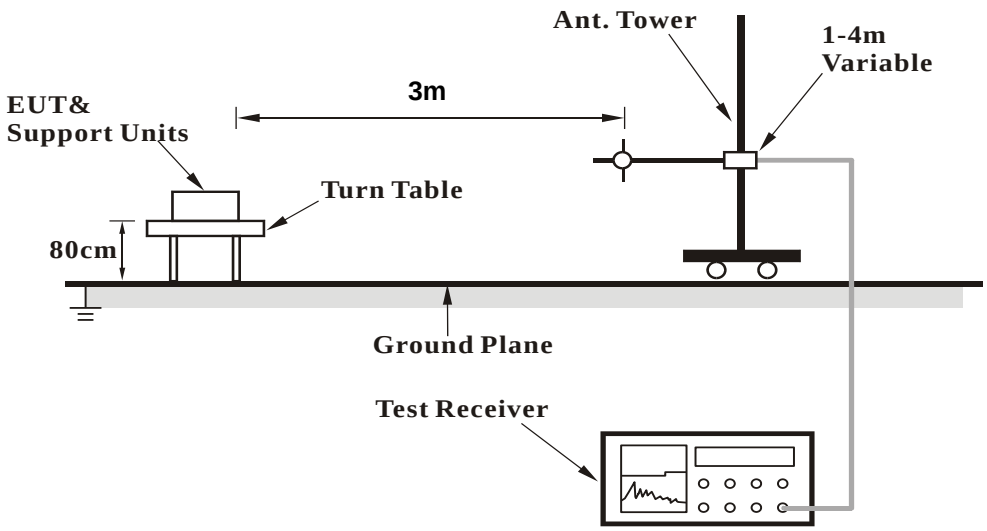
a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 5 MHz for WCDMA and 10 MHz for LTE mode.
b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height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

Conducted Power Measurement:

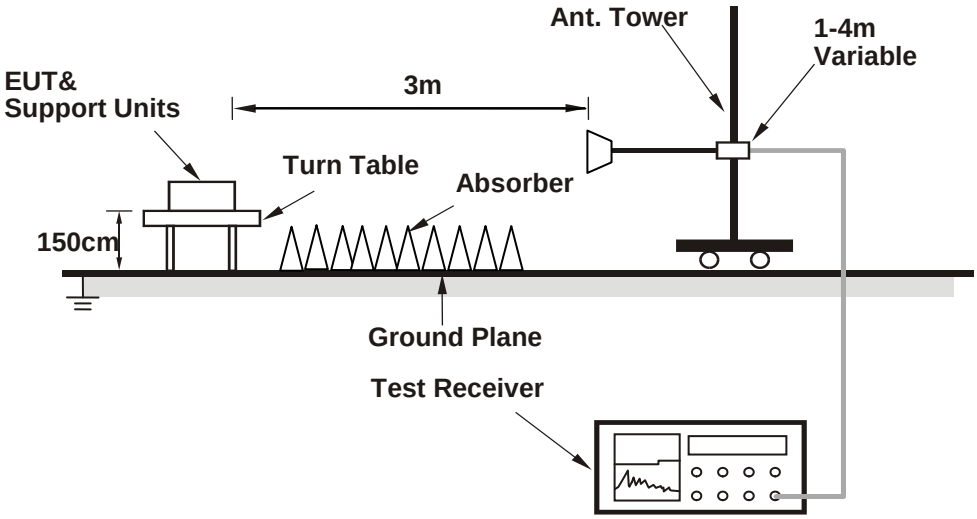
a. The EUT was set up for the maximum power with LTE link data modulation and link up with simulator.
b. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

4.1.3 Test Setup

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



<Radiated Emission above 1 GHz>



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

Conducted Power Measurement:

4.1.4 Test Results

Conducted Output Power (dBm)

LTE Band 4

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	23.67
					QPSK	1	5	0	-85	23.55
					QPSK	1	0	1	-85	23.62
					QPSK	1	5	1	-85	23.51
					QPSK	1	0	3	-85	23.65
					QPSK	1	5	3	-85	23.49
					QPSK	3	0	0	-85	22.75
					QPSK	3	3	3	-85	22.68
					QPSK	6	0	0	-85	22.77
					QPSK	6	0	1	-85	22.71
					QPSK	6	0	3	-85	22.65
					16QAM	1	0	0	-85	23.65
					16QAM	1	5	0	-85	23.61
					16QAM	1	0	1	-85	23.53
					16QAM	1	5	1	-85	23.54
					16QAM	1	0	3	-85	23.62
					16QAM	1	5	3	-85	23.49
					16QAM	3	0	0	-85	22.66
					16QAM	3	3	3	-85	22.61
					16QAM	5	0	0	-85	21.78
					16QAM	5	0	1	-85	21.65
					16QAM	5	0	3	-85	21.73
Mid Range	20175	1732.5	2175	2132.5	QPSK	1	0	0	-85	23.67
					QPSK	1	5	0	-85	23.63
					QPSK	1	0	1	-85	23.63
					QPSK	1	5	1	-85	23.58
					QPSK	1	0	3	-85	23.59
					QPSK	1	5	3	-85	23.60
					QPSK	3	0	0	-85	22.75
					QPSK	3	3	3	-85	22.65
					QPSK	6	0	0	-85	22.72
					QPSK	6	0	1	-85	22.65
					QPSK	6	0	3	-85	22.64
					16QAM	1	0	0	-85	23.52
					16QAM	1	5	0	-85	23.59
					16QAM	1	0	1	-85	23.45
					16QAM	1	5	1	-85	23.48
					16QAM	1	0	3	-85	23.39
					16QAM	1	5	3	-85	23.46
					16QAM	3	0	0	-85	22.66
					16QAM	3	3	3	-85	22.60
					16QAM	5	0	0	-85	21.67
					16QAM	5	0	1	-85	21.64
					16QAM	5	0	3	-85	21.61

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)
High Range	20375	1752.5	2375	2152.5	QPSK	1	0	0	-85	23.65
					QPSK	1	5	0	-85	23.61
					QPSK	1	0	1	-85	23.58
					QPSK	1	5	1	-85	23.54
					QPSK	1	0	3	-85	23.58
					QPSK	1	5	3	-85	23.47
					QPSK	3	0	0	-85	22.70
					QPSK	3	3	3	-85	22.66
					QPSK	6	0	0	-85	22.67
					QPSK	6	0	1	-85	22.63
					QPSK	6	0	3	-85	22.64
					16QAM	1	0	0	-85	23.61
					16QAM	1	5	0	-85	23.55
					16QAM	1	0	1	-85	23.49
					16QAM	1	5	1	-85	23.52
					16QAM	1	0	3	-85	23.49
					16QAM	1	5	3	-85	23.43
					16QAM	3	0	0	-85	22.68
					16QAM	3	3	3	-85	22.58
					16QAM	5	0	0	-85	21.79
					16QAM	5	0	1	-85	21.77
					16QAM	5	0	3	-85	21.73

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)
Low Range	20000	1715	2000	2115	QPSK	1	0	0	-85	23.60
					QPSK	1	5	0	-85	23.64
					QPSK	1	0	3	-85	23.53
					QPSK	1	5	3	-85	23.53
					QPSK	1	0	7	-85	23.49
					QPSK	1	5	7	-85	23.56
					QPSK	4	0	0	-85	23.52
					QPSK	4	2	7	-85	23.48
					QPSK	6	0	0	-85	22.65
					QPSK	6	0	7	-85	22.51
					16QAM	1	0	0	-85	23.42
					16QAM	1	5	0	-85	23.43
					16QAM	1	0	3	-85	23.31
					16QAM	1	5	3	-85	23.38
					16QAM	1	0	7	-85	23.34
					16QAM	1	5	7	-85	23.33
					16QAM	4	2	0	-85	22.54
					16QAM	4	2	7	-85	22.43
					16QAM	5	0	0	-85	22.58
					16QAM	5	0	7	-85	22.51
Mid Range	20175	1732.5	2175	2132.5	QPSK	1	0	0	-85	23.65
					QPSK	1	5	0	-85	23.66
					QPSK	1	0	3	-85	23.61
					QPSK	1	5	3	-85	23.59
					QPSK	1	0	7	-85	23.55
					QPSK	1	5	7	-85	23.59
					QPSK	4	0	0	-85	23.59
					QPSK	4	2	7	-85	23.47
					QPSK	6	0	0	-85	22.68
					QPSK	6	0	7	-85	22.62
					16QAM	1	0	0	-85	23.49
					16QAM	1	5	0	-85	23.42
					16QAM	1	0	3	-85	23.40
					16QAM	1	5	3	-85	23.37
					16QAM	1	0	7	-85	23.46
					16QAM	1	5	7	-85	23.37
					16QAM	4	2	0	-85	22.57
					16QAM	4	2	7	-85	22.55
					16QAM	5	0	0	-85	22.68
					16QAM	5	0	7	-85	22.66
High Range	20350	1750	2350	2150	QPSK	1	0	0	-85	23.65
					QPSK	1	5	0	-85	23.64
					QPSK	1	5	7	-85	23.62
					QPSK	1	0	3	-85	23.60
					QPSK	1	5	3	-85	23.59
					QPSK	1	0	7	-85	23.62
					QPSK	4	0	0	-85	23.54
					QPSK	4	2	7	-85	23.41
					QPSK	6	0	0	-85	22.65
					QPSK	6	0	7	-85	22.61
					16QAM	1	0	0	-85	23.36
					16QAM	1	5	0	-85	23.23
					16QAM	1	0	3	-85	23.29
					16QAM	1	5	3	-85	23.09
					16QAM	1	0	7	-85	23.26
					16QAM	1	5	7	-85	23.12
					16QAM	4	2	0	-85	22.56
					16QAM	4	2	7	-85	22.49
					16QAM	5	0	0	-85	22.52
					16QAM	5	0	7	-85	22.44

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	23.61
					QPSK	1	5	0	-85	23.67
					QPSK	1	0	5	-85	23.58
					QPSK	1	5	5	-85	23.53
					QPSK	1	0	11	-85	23.56
					QPSK	1	5	11	-85	23.60
					QPSK	3	0	0	-85	23.56
					QPSK	3	3	11	-85	23.50
					QPSK	6	0	0	-85	23.58
					QPSK	6	0	11	-85	23.56
					16QAM	1	0	0	-85	23.48
					16QAM	1	5	0	-85	23.64
					16QAM	1	0	5	-85	23.41
					16QAM	1	5	5	-85	23.54
					16QAM	1	0	11	-85	23.34
					16QAM	1	5	11	-85	23.58
					16QAM	3	0	0	-85	23.39
					16QAM	3	3	11	-85	23.34
					16QAM	5	0	0	-85	23.28
					16QAM	5	0	11	-85	23.22
Mid Range	20175	1732.5	2175	2132.5	QPSK	1	0	0	-85	23.61
					QPSK	1	5	0	-85	23.62
					QPSK	1	0	5	-85	23.49
					QPSK	1	5	5	-85	23.56
					QPSK	1	0	11	-85	23.55
					QPSK	1	5	11	-85	23.58
					QPSK	3	0	0	-85	23.51
					QPSK	3	3	11	-85	23.41
					QPSK	6	0	0	-85	23.54
					QPSK	6	0	11	-85	23.46
					16QAM	1	0	0	-85	23.58
					16QAM	1	5	0	-85	23.61
					16QAM	1	0	5	-85	23.48
					16QAM	1	5	5	-85	23.51
					16QAM	1	0	11	-85	23.46
					16QAM	1	5	11	-85	23.58
					16QAM	3	0	0	-85	23.39
					16QAM	3	3	11	-85	23.31
					16QAM	5	0	0	-85	23.28
					16QAM	5	0	11	-85	23.24
High Range	20325	1747.5	2325	2147.5	QPSK	1	0	0	-85	23.61
					QPSK	1	5	11	-85	23.61
					QPSK	1	0	5	-85	23.53
					QPSK	1	5	5	-85	23.58
					QPSK	1	0	11	-85	23.51
					QPSK	1	5	11	-85	23.48
					QPSK	3	0	0	-85	23.57
					QPSK	3	3	11	-85	23.52
					QPSK	6	0	0	-85	23.55
					QPSK	6	0	11	-85	23.50
					16QAM	1	0	0	-85	23.55
					16QAM	1	5	0	-85	23.53
					16QAM	1	0	5	-85	23.46
					16QAM	1	5	5	-85	23.39
					16QAM	1	0	11	-85	23.42
					16QAM	1	5	11	-85	23.51
					16QAM	3	0	0	-85	23.47
					16QAM	3	3	11	-85	23.41
					16QAM	5	0	0	-85	23.44
					16QAM	5	0	11	-85	23.33

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	23.69
					QPSK	1	5	0	-85	23.71
					QPSK	1	0	7	-85	23.57
					QPSK	1	5	7	-85	23.66
					QPSK	1	0	15	-85	23.62
					QPSK	1	5	15	-85	23.63
					QPSK	3	0	0	-85	23.57
					QPSK	3	3	15	-85	23.55
					QPSK	6	0	0	-85	23.59
					QPSK	6	0	15	-85	23.54
					16QAM	1	0	0	-85	23.60
					16QAM	1	5	0	-85	23.29
					16QAM	1	0	7	-85	23.48
					16QAM	1	5	7	-85	23.23
					16QAM	1	0	15	-85	23.53
					16QAM	1	5	15	-85	23.20
					16QAM	3	0	0	-85	23.44
					16QAM	3	3	15	-85	23.37
					16QAM	5	0	0	-85	23.46
					16QAM	5	0	15	-85	23.39
Mid Range	20175	1732.5	2175	2132.5	QPSK	1	0	0	-85	23.57
					QPSK	1	5	0	-85	23.53
					QPSK	1	0	7	-85	23.44
					QPSK	1	5	7	-85	23.51
					QPSK	1	0	15	-85	23.50
					QPSK	1	5	15	-85	23.45
					QPSK	3	0	0	-85	23.51
					QPSK	3	3	15	-85	23.46
					QPSK	6	0	0	-85	23.49
					QPSK	6	0	15	-85	23.47
					16QAM	1	0	0	-85	23.54
					16QAM	1	5	0	-85	23.48
					16QAM	1	0	7	-85	23.46
					16QAM	1	5	7	-85	23.42
					16QAM	1	0	15	-85	23.47
					16QAM	1	5	15	-85	23.40
					16QAM	3	0	0	-85	23.46
					16QAM	3	3	15	-85	23.36
					16QAM	5	0	0	-85	23.37
					16QAM	5	0	15	-85	23.34
High Range	20300	1745	2300	2145	QPSK	1	0	0	-85	23.56
					QPSK	1	5	0	-85	23.55
					QPSK	1	0	7	-85	23.53
					QPSK	1	5	7	-85	23.52
					QPSK	1	0	15	-85	23.44
					QPSK	1	5	15	-85	23.41
					QPSK	3	0	0	-85	23.54
					QPSK	3	3	15	-85	23.42
					QPSK	6	0	0	-85	23.50
					QPSK	6	0	15	-85	23.43
					16QAM	1	0	0	-85	23.42
					16QAM	1	5	0	-85	23.33
					16QAM	1	0	7	-85	23.30
					16QAM	1	5	7	-85	23.24
					16QAM	1	0	15	-85	23.34
					16QAM	1	5	15	-85	23.25
					16QAM	3	0	0	-85	23.31
					16QAM	3	3	15	-85	23.22
					16QAM	5	0	0	-85	23.28
					16QAM	5	0	15	-85	23.14

LTE Band 13

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	23.71
					QPSK	1	5	0	-85	23.75
					QPSK	1	0	1	-85	23.66
					QPSK	1	5	1	-85	23.62
					QPSK	1	0	3	-85	23.64
					QPSK	1	5	3	-85	23.71
					QPSK	3	0	0	-85	22.94
					QPSK	3	3	3	-85	22.90
					QPSK	6	0	0	-85	22.98
					QPSK	6	0	1	-85	22.92
					QPSK	6	0	3	-85	22.96
					16QAM	1	0	0	-85	23.48
					16QAM	1	5	0	-85	23.47
					16QAM	1	0	1	-85	23.34
					16QAM	1	5	1	-85	23.40
					16QAM	1	0	3	-85	23.36
					16QAM	1	5	3	-85	23.41
					16QAM	3	0	0	-85	22.91
					16QAM	3	3	3	-85	22.85
					16QAM	5	0	0	-85	22.25
					16QAM	5	0	1	-85	22.16
					16QAM	5	0	3	-85	22.18
Mid Range	23230	782	5230	751	QPSK	1	0	0	-85	23.83
					QPSK	1	5	0	-85	23.82
					QPSK	1	0	1	-85	23.81
					QPSK	1	5	1	-85	23.79
					QPSK	1	0	3	-85	23.83
					QPSK	1	5	3	-85	23.74
					QPSK	3	0	0	-85	23.07
					QPSK	3	3	3	-85	22.98
					QPSK	6	0	0	-85	23.04
					QPSK	6	0	1	-85	22.90
					QPSK	6	0	3	-85	22.91
					16QAM	1	0	0	-85	23.85
					16QAM	1	5	0	-85	23.83
					16QAM	1	0	1	-85	23.74
					16QAM	1	5	1	-85	23.77
					16QAM	1	0	3	-85	23.77
					16QAM	1	5	3	-85	23.75
					16QAM	3	0	0	-85	23.19
					16QAM	3	3	3	-85	23.10
					16QAM	5	0	0	-85	22.12
					16QAM	5	0	1	-85	22.00
					16QAM	5	0	3	-85	22.09

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)
High Range	23255	784.5	5255	753.5	QPSK	1	0	0	-85	23.75
					QPSK	1	5	0	-85	23.76
					QPSK	1	0	1	-85	23.65
					QPSK	1	5	1	-85	23.74
					QPSK	1	0	3	-85	23.69
					QPSK	1	5	3	-85	23.68
					QPSK	3	0	0	-85	23.08
					QPSK	3	3	3	-85	22.97
					QPSK	6	0	0	-85	23.02
					QPSK	6	0	1	-85	22.98
					QPSK	6	0	3	-85	22.93
					16QAM	1	0	0	-85	23.59
					16QAM	1	5	0	-85	23.60
					16QAM	1	0	1	-85	23.48
					16QAM	1	5	1	-85	23.49
					16QAM	1	0	3	-85	23.47
					16QAM	1	5	3	-85	23.58
					16QAM	3	0	0	-85	23.05
					16QAM	3	3	3	-85	23.03
					16QAM	5	0	0	-85	22.26
					16QAM	5	0	1	-85	22.18
					16QAM	5	0	3	-85	22.22

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	23.86
					QPSK	1	5	0	-85	23.77
					QPSK	1	0	3	-85	23.73
					QPSK	1	5	3	-85	23.74
					QPSK	1	0	7	-85	23.82
					QPSK	1	5	7	-85	23.63
					QPSK	4	0	0	-85	23.74
					QPSK	4	2	7	-85	23.71
					QPSK	6	0	0	-85	23.06
					QPSK	6	0	7	-85	22.94
					16QAM	1	0	0	-85	23.57
					16QAM	1	5	0	-85	23.55
					16QAM	1	0	3	-85	23.51
					16QAM	1	5	3	-85	23.48
					16QAM	1	0	7	-85	23.46
					16QAM	1	5	7	-85	23.41
					16QAM	4	2	0	-85	22.91
					16QAM	4	2	7	-85	22.77
					16QAM	5	0	0	-85	22.98
					16QAM	5	0	7	-85	22.92

ERP Power (dBm)

1RB

LTE Band 13									
Channel Bandwidth: 5 MHz / QPSK									
Plane	**Channel**	**Frequency (MHz)**	**RB**	**RB Offset**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
Z	23205	779.5	1	0	-11.16	32.24	18.93	78.16	H
	23230	782.0	1	0	-11.34	32.17	18.68	73.79	
	23255	784.5	1	0	-11.68	32.11	18.28	67.30	
	23205	779.5	1	0	-8.27	32.43	22.01	158.85	V
	23230	782.0	1	0	-8.61	32.42	21.66	146.55	
	23255	784.5	1	0	-8.87	32.46	21.44	139.32	
Channel Bandwidth: 5 MHz / 16QAM									
Z	23205	779.5	1	0	-12.26	32.24	17.83	60.67	H
	23230	782.0	1	0	-12.44	32.17	17.58	57.28	
	23255	784.5	1	0	-12.78	32.11	17.18	52.24	
	23205	779.5	1	0	-9.37	32.43	20.91	123.31	V
	23230	782.0	1	0	-9.71	32.42	20.56	113.76	
	23255	784.5	1	0	-9.97	32.46	20.34	108.14	

LTE Band 13									
Channel Bandwidth: 10 MHz / QPSK									
Plane	**Channel**	**Frequency (MHz)**	**RB**	**RB Offset**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
Z	23230	782.0	1	0	-11.25	32.17	18.77	75.34	H
	23230	782.0	1	0	-8.48	32.42	21.79	151.01	V
Channel Bandwidth: 10 MHz / 16QAM									
Z	23230	782.0	1	0	-12.15	32.17	17.87	61.24	H
	23230	782.0	1	0	-9.38	32.42	20.89	122.74	V

Full RB

LTE Band 13									
Channel Bandwidth: 5 MHz / QPSK									
Plane	**Channel**	**Frequency (MHz)**	**RB**	**RB Offset**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
Z	23205	779.5	6	0	-12.06	32.24	18.03	63.53	H
	23230	782.0	6	0	-12.24	32.17	17.78	59.98	
	23255	784.5	6	0	-12.58	32.11	17.38	54.70	
	23205	779.5	6	0	-9.17	32.43	21.11	129.12	V
	23230	782.0	6	0	-9.51	32.42	20.76	119.12	
	23255	784.5	6	0	-9.77	32.46	20.54	113.24	
Channel Bandwidth: 5 MHz / 16QAM									
Z	23205	779.5	5	0	-13.36	32.24	16.73	47.10	H
	23230	782.0	5	0	-13.54	32.17	16.48	44.46	
	23255	784.5	5	0	-13.88	32.11	16.08	40.55	
	23205	779.5	5	0	-10.47	32.43	19.81	95.72	V
	23230	782.0	5	0	-10.81	32.42	19.46	88.31	
	23255	784.5	5	0	-11.07	32.46	19.24	83.95	

LTE Band 13									
Channel Bandwidth: 10 MHz / QPSK									
Plane	**Channel**	**Frequency (MHz)**	**RB**	**RB Offset**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
Z	23230	782.0	6	0	-12.15	32.17	17.87	61.24	H
	23230	782.0	6	0	-9.38	32.42	20.89	122.74	V
Channel Bandwidth: 10 MHz / 16QAM									
Z	23230	782.0	5	0	-13.25	32.17	16.77	47.53	H
	23230	782.0	5	0	-10.48	32.42	19.79	95.28	V

EIRP Power (dBm)

LTE Band 4									
Channel Bandwidth: 5 MHz / QPSK									
Plane	**Channel**	**Frequency (MHz)**	**RB**	**RB Offset**	**LVL (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
Z	19975	1712.5	1	0	-16.98	36.45	19.48	88.61	H
	20175	1732.5	1	0	-17.00	36.80	19.80	95.48	
	20375	1752.5	1	0	-17.08	36.94	19.86	96.85	
	19975	1712.5	1	0	-13.58	37.28	23.70	234.42	V
	20175	1732.5	1	0	-13.66	37.63	23.97	249.46	
	20375	1752.5	1	0	-13.47	37.64	24.17	261.22	
Channel Bandwidth: 5 MHz / 16QAM									
Z	19975	1712.5	1	0	-17.96	36.45	18.50	70.71	H
	20175	1732.5	1	0	-17.99	36.80	18.81	76.02	
	20375	1752.5	1	0	-18.00	36.94	18.94	78.36	
	19975	1712.5	1	0	-14.57	37.28	22.71	186.64	V
	20175	1732.5	1	0	-14.64	37.63	22.99	199.07	
	20375	1752.5	1	0	-14.39	37.64	23.25	211.35	

LTE Band 4									
Channel Bandwidth: 10 MHz / QPSK									
Plane	**Channel**	**Frequency (MHz)**	**RB**	**RB Offset**	**LVL (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
Z	20000	1715.0	1	0	-16.33	36.64	20.31	107.40	H
	20175	1732.5	1	0	-16.25	36.80	20.55	113.47	
	20350	1750.0	1	0	-16.26	36.80	20.54	113.16	
	20000	1715.0	1	0	-12.91	37.44	24.53	283.79	V
	20175	1732.5	1	0	-12.88	37.63	24.75	298.47	
	20350	1750.0	1	0	-12.63	37.64	25.01	316.96	
Channel Bandwidth: 10 MHz / 16QAM									
Z	20000	1715.0	1	0	-17.32	36.64	19.32	85.51	H
	20175	1732.5	1	0	-17.20	36.80	19.60	91.18	
	20350	1750.0	1	0	-17.18	36.80	19.62	91.56	
	20000	1715.0	1	0	-13.85	37.44	23.59	228.56	V
	20175	1732.5	1	0	-13.82	37.63	23.81	240.38	
	20350	1750.0	1	0	-13.57	37.64	24.07	255.27	

LTE Band 4									
Channel Bandwidth: 15 MHz / QPSK									
Plane	Channel	Frequency (MHz)	RB	RB Offset	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Z	20025	1717.5	1	0	-16.01	36.45	20.45	110.79	H
	20175	1732.5	1	0	-16.06	36.80	20.74	118.55	
	20325	1747.5	1	0	-16.13	36.94	20.81	120.53	
	20025	1717.5	1	0	-12.56	37.28	24.72	296.48	V
	20175	1732.5	1	0	-12.71	37.63	24.92	310.46	
	20325	1747.5	1	0	-12.36	37.64	25.28	337.29	
Channel Bandwidth: 15 MHz / 16QAM									
Z	20025	1717.5	1	0	-16.93	36.45	19.53	89.64	H
	20175	1732.5	1	0	-16.97	36.80	19.83	96.14	
	20325	1747.5	1	0	-17.04	36.94	19.90	97.75	
	20025	1717.5	1	0	-13.51	37.28	23.77	238.23	V
	20175	1732.5	1	0	-13.66	37.63	23.97	249.46	
	20325	1747.5	1	0	-13.33	37.64	24.31	269.77	

LTE Band 4									
Channel Bandwidth: 20 MHz / QPSK									
Plane	Channel	Frequency (MHz)	RB	RB Offset	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Z	20050	1720.0	1	0	-15.91	36.45	20.55	113.37	H
	20175	1732.5	1	0	-15.90	36.80	20.90	123.00	
	20300	1745.0	1	0	-15.99	36.94	20.95	124.48	
	20050	1720.0	1	0	-12.45	37.28	24.83	304.09	V
	20175	1732.5	1	0	-12.54	37.63	25.09	322.85	
	20300	1745.0	1	0	-12.30	37.64	25.34	341.98	
Channel Bandwidth: 20 MHz / 16QAM									
Z	20050	1720.0	1	0	-16.83	36.45	19.63	91.73	H
	20175	1732.5	1	0	-16.82	36.80	19.98	99.52	
	20300	1745.0	1	0	-16.98	36.94	19.96	99.11	
	20050	1720.0	1	0	-13.41	37.28	23.87	243.78	V
	20175	1732.5	1	0	-13.47	37.63	24.16	260.62	
	20300	1745.0	1	0	-13.24	37.64	24.40	275.42	

4.2 Frequency Stability Measurement

4.2.1 Limits of Frequency Stabiliity Measurement

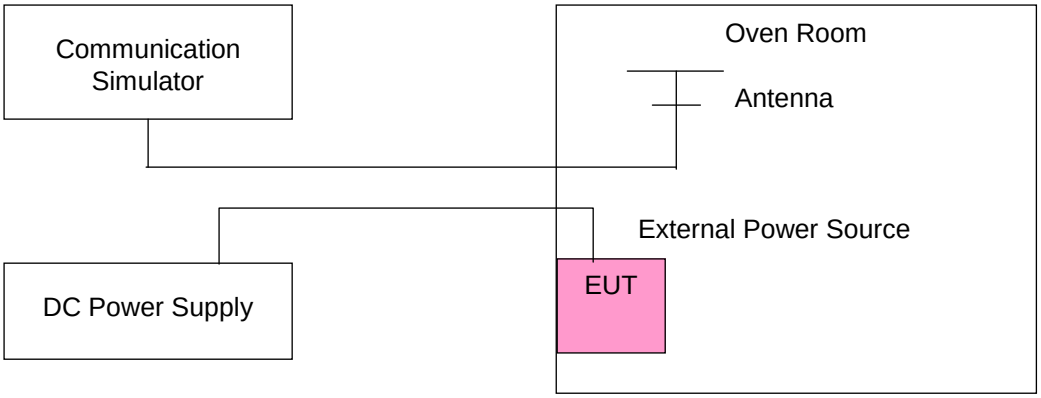
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

4.2.2 Test Procedure

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

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

4.2.3 Test Setup



4.2.4 Test Results

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.8	1712.500003	0.002	1752.500002	0.001	2.5
3.1	1712.500002	0.001	1752.500003	0.002	2.5
4.5	1712.500002	0.001	1752.500002	0.001	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.1 Vdc to 4.5 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 4				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	1712.500002	0.001	1752.500004	0.002	2.5
-20	1712.500002	0.001	1752.500002	0.001	2.5
-10	1712.500004	0.002	1752.500002	0.001	2.5
0	1712.500002	0.001	1752.500003	0.002	2.5
10	1712.500003	0.002	1752.500001	0.001	2.5
20	1712.500001	0.001	1752.500001	0.001	2.5
30	1712.500003	0.002	1752.500001	0.001	2.5
40	1712.499997	-0.002	1752.499998	-0.001	2.5
50	1712.499997	-0.002	1752.499996	-0.002	2.5
60	1712.499998	-0.001	1752.499997	-0.002	2.5
70	1712.499997	-0.002	1752.499998	-0.001	2.5
50	1712.499998	-0.001	1752.499999	-0.001	2.5
85	1712.499997	-0.002	1752.499999	-0.001	2.5

Note:

1. The applicant declared that the normal operating temperature of the EUT is from -20˚C to 85˚C.
2. The EUT would shut down automatically as below -20˚C.

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4				Limit (ppm)
	Channel Bandwidth: 10 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.8	1715.000003	0.002	1750.000003	0.002	2.5
3.1	1715.000003	0.002	1750.000002	0.001	2.5
4.5	1715.000004	0.002	1750.000001	0.001	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.1 Vdc to 4.5 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 4				Limit (ppm)
	Channel Bandwidth: 10 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	1715.000002	0.001	1750.000001	0.001	2.5
-20	1715.000003	0.002	1750.000003	0.002	2.5
-10	1715.000002	0.001	1750.000003	0.001	2.5
0	1715.000002	0.001	1750.000003	0.002	2.5
10	1715.000003	0.002	1750.000002	0.001	2.5
20	1715.000002	0.001	1750.000004	0.002	2.5
30	1715.000002	0.001	1750.000001	0.001	2.5
40	1714.999997	-0.002	1749.999997	-0.002	2.5
50	1714.999998	-0.001	1749.999997	-0.002	2.5
60	1714.999999	-0.001	1749.999997	-0.002	2.5
70	1714.999998	-0.001	1749.999997	-0.002	2.5
50	1714.999997	-0.002	1749.999999	-0.001	2.5
85	1714.999997	-0.002	1749.999997	-0.002	2.5

Note:

1. The applicant declared that the normal operating temperature of the EUT is from -20˚C to 85˚C.
2. The EUT would shut down automatically as below -20˚C.

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4				Limit (ppm)
	Channel Bandwidth: 15 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.8	1717.500003	0.002	1747.500004	0.002	2.5
3.1	1717.500001	0.001	1747.500003	0.002	2.5
4.5	1717.500002	0.001	1747.500001	0.001	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.1 Vdc to 4.5 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 4				Limit (ppm)
	Channel Bandwidth: 15 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	1717.500002	0.001	1747.500001	0.001	2.5
-20	1717.500003	0.002	1747.500003	0.002	2.5
-10	1717.500004	0.002	1747.500003	0.002	2.5
0	1717.500001	0.001	1747.500002	0.001	2.5
10	1717.500004	0.002	1747.500004	0.002	2.5
20	1717.500003	0.002	1747.500003	0.002	2.5
30	1717.500002	0.001	1747.500001	0.001	2.5
40	1717.499997	-0.002	1747.499998	-0.001	2.5
50	1717.499997	-0.002	1747.499997	-0.002	2.5
60	1717.499996	-0.002	1747.499999	-0.001	2.5
70	1717.499998	-0.001	1747.499998	-0.001	2.5
50	1717.499998	-0.001	1747.499998	-0.001	2.5
85	1717.499997	-0.002	1747.499999	-0.001	2.5

Note:

1. The applicant declared that the normal operating temperature of the EUT is from -20˚C to 85˚C.
2. The EUT would shut down automatically as below -20˚C.

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4				Limit (ppm)
	Channel Bandwidth: 20 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.8	1720.000004	0.002	1745.000004	0.002	2.5
3.1	1720.000003	0.002	1745.000001	0.001	2.5
4.5	1720.000001	0.001	1745.000002	0.001	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.1 Vdc to 4.5 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 4				Limit (ppm)
	Channel Bandwidth: 20 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	1720.000001	0.001	1745.000002	0.001	2.5
-20	1720.000001	0.001	1745.000001	0.001	2.5
-10	1720.000003	0.002	1745.000003	0.001	2.5
0	1720.000003	0.002	1745.000003	0.002	2.5
10	1720.000003	0.002	1745.000003	0.002	2.5
20	1720.000003	0.001	1745.000002	0.001	2.5
30	1720.000003	0.002	1745.000002	0.001	2.5
40	1719.999998	-0.001	1744.999998	-0.001	2.5
50	1719.999997	-0.002	1744.999997	-0.002	2.5
60	1719.999998	-0.001	1744.999998	-0.001	2.5
70	1719.999999	-0.001	1744.999997	-0.002	2.5
50	1719.999997	-0.002	1744.999998	-0.001	2.5
85	1719.999998	-0.001	1744.999998	-0.001	2.5

Note:

1. The applicant declared that the normal operating temperature of the EUT is from -20˚C to 85˚C.
2. The EUT would shut down automatically as below -20˚C.

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 13				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.8	779.500004	0.004	784.500002	0.003	2.5
3.1	779.500003	0.004	784.500003	0.004	2.5
4.5	779.500001	0.002	784.500002	0.003	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.1 Vdc to 4.5 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 13				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	779.500001	0.002	784.500002	0.003	2.5
-20	779.500004	0.005	784.500002	0.002	2.5
-10	779.500003	0.003	784.500003	0.004	2.5
0	779.500003	0.004	784.500002	0.002	2.5
10	779.500002	0.003	784.500004	0.005	2.5
20	779.500002	0.003	784.500004	0.004	2.5
30	779.500003	0.004	784.500003	0.004	2.5
40	779.499998	-0.002	784.499998	-0.003	2.5
50	779.499998	-0.003	784.499998	-0.003	2.5
60	779.499997	-0.003	784.499998	-0.003	2.5
70	779.499999	-0.002	784.499998	-0.003	2.5
50	779.499998	-0.003	784.499998	-0.003	2.5
85	779.499997	-0.004	784.499997	-0.004	2.5

Note:

1. The applicant declared that the normal operating temperature of the EUT is from -20˚C to 85˚C.
2. The EUT would shut down automatically as below -20˚C.

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 13		Limit (ppm)
	Channel Bandwidth: 10 MHz		
	Frequency (MHz)	Frequency Error (ppm)	
3.8	782.000004	0.005	2.5
3.1	782.000004	0.005	2.5
4.5	782.000004	0.005	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.1 Vdc to 4.5 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 13		Limit (ppm)
	Channel Bandwidth: 10 MHz		
	Frequency (MHz)	Frequency Error (ppm)	
-30	782.000003	0.004	2.5
-20	782.000003	0.004	2.5
-10	782.000002	0.003	2.5
0	782.000003	0.004	2.5
10	782.000003	0.004	2.5
20	782.000004	0.005	2.5
30	782.000004	0.004	2.5
40	781.999997	-0.004	2.5
50	781.999998	-0.002	2.5
60	781.999997	-0.004	2.5
70	781.999997	-0.004	2.5
50	781.999998	-0.003	2.5
85	781.999996	-0.005	2.5

Note:

1. The applicant declared that the normal operating temperature of the EUT is from -20˚C to 85˚C.
2. The EUT would shut down automatically as below -20˚C.

4.3 Occupied Bandwidth Measurement

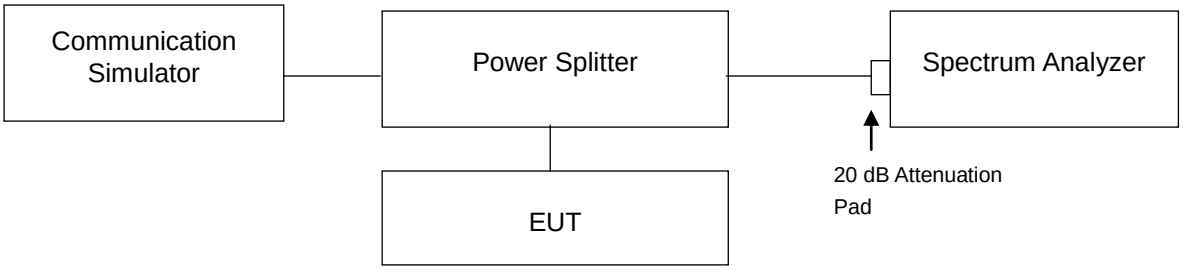
4.3.1 Limits of Occupied Bandwidth Measurement

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

4.3.2 Test Procedure

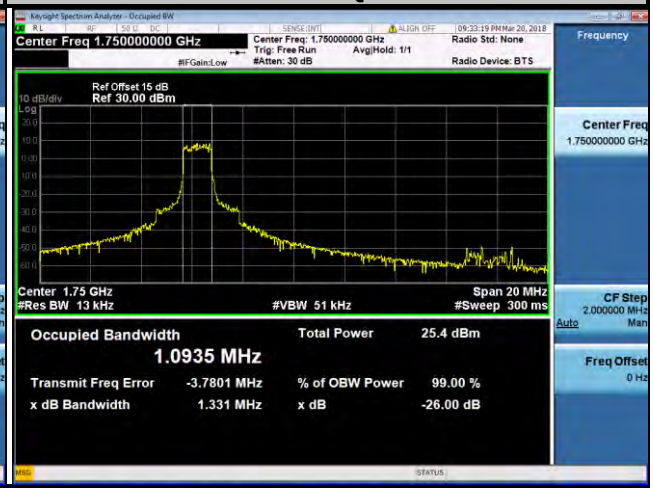
a. The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
b. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

4.3.3 Test Setup

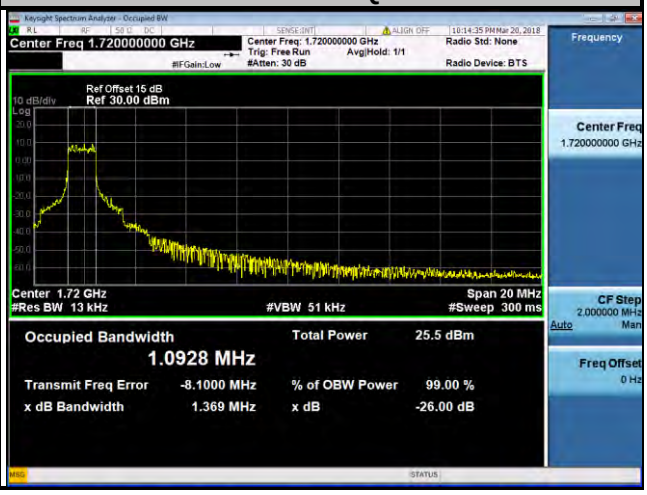


4.3.4 Test Result

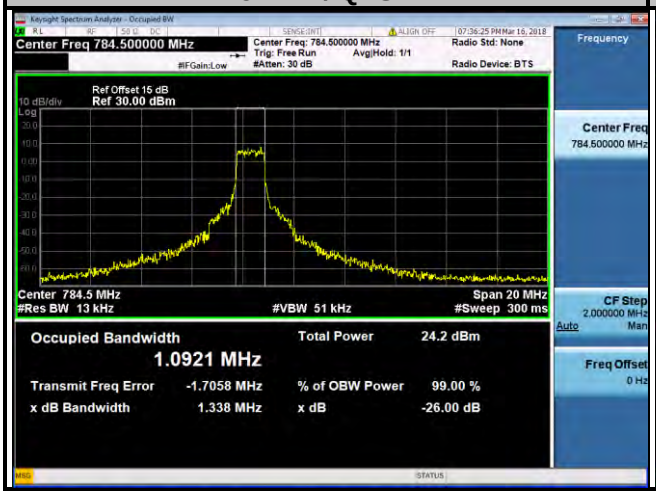
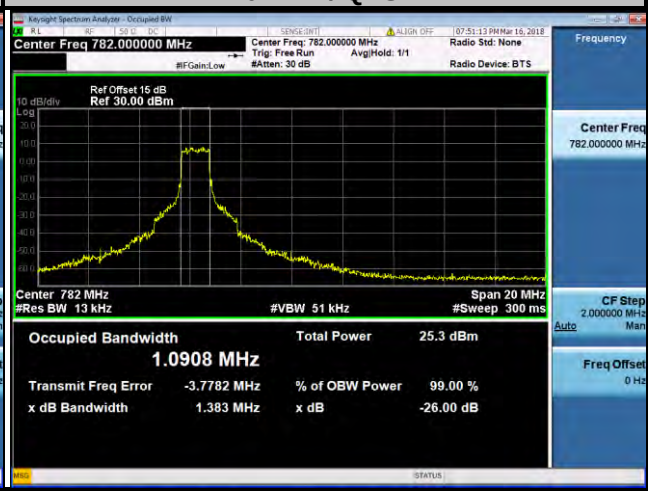
LTE Band 4							
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
19975	1712.5	1.09	0.91	20000	1715.0	1.09	0.91
20175	1732.5	1.09	0.92	20175	1732.5	1.09	0.92
20375	1752.5	1.09	0.92	20350	1750.0	1.09	0.91

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

LTE Band 4							
Channel Bandwidth: 15 MHz				Channel Bandwidth: 20 MHz			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
20025	1717.5	1.08	0.92	20050	1720.0	1.09	0.92
20175	1732.5	1.09	0.93	20175	1732.5	1.09	0.92
20325	1747.5	1.10	0.92	20300	1745.0	1.09	0.92

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

LTE Band 13							
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
23205	779.5	1.09	0.91	23230	782.0	1.09	1.01
23230	782.0	1.08	0.91				
23255	784.5	1.09	0.91				

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

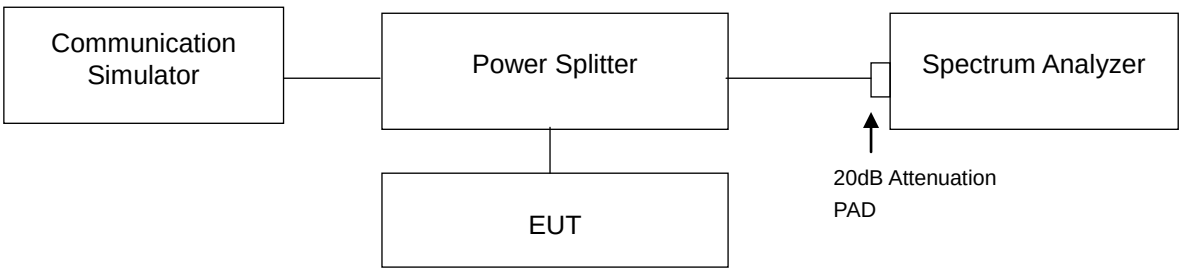
4.4 Band Edge Measurement

4.4.1 Limits of Band Edge Measurement

For operations in the 776-787 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater.
However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

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

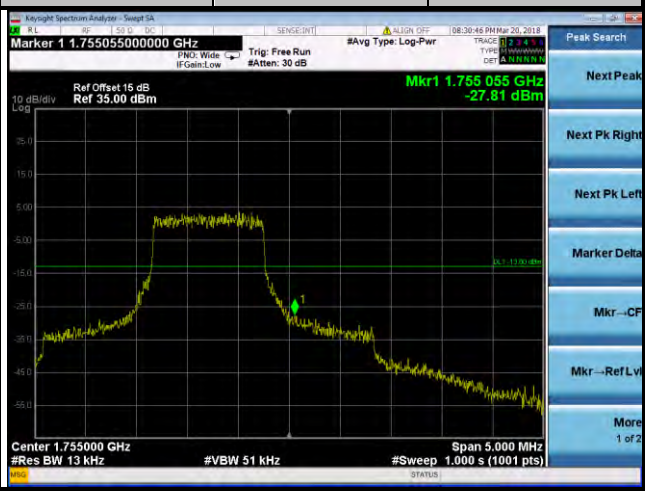
4.4.2 Test Setup

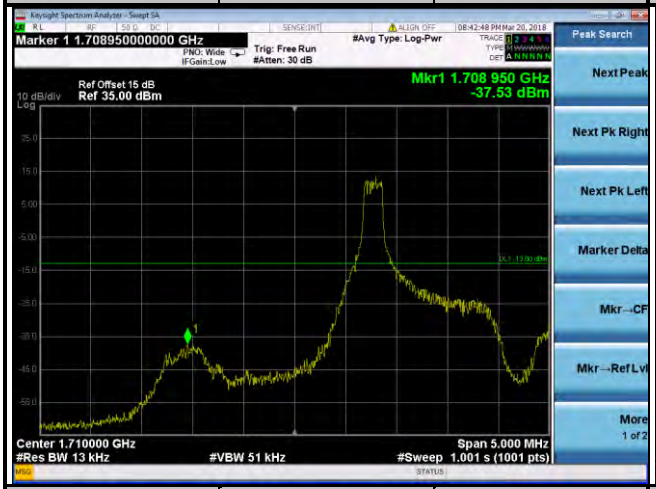


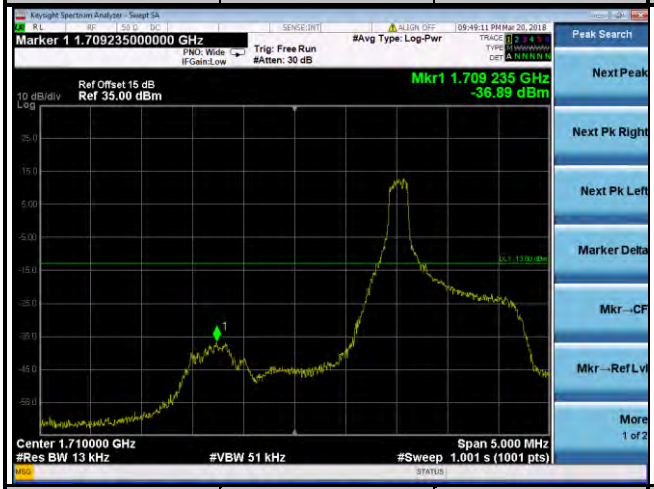
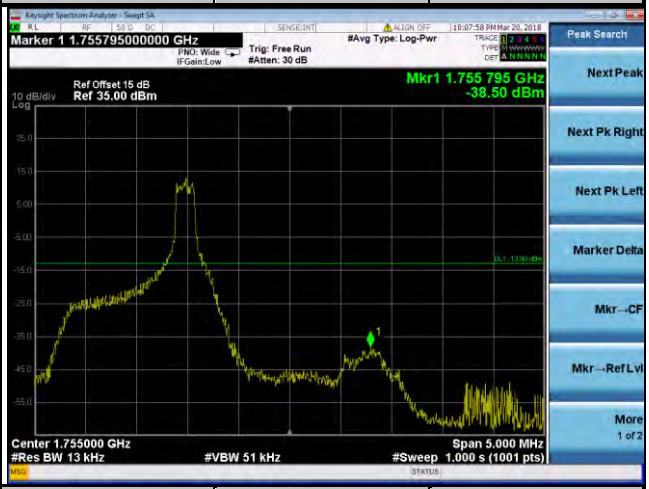
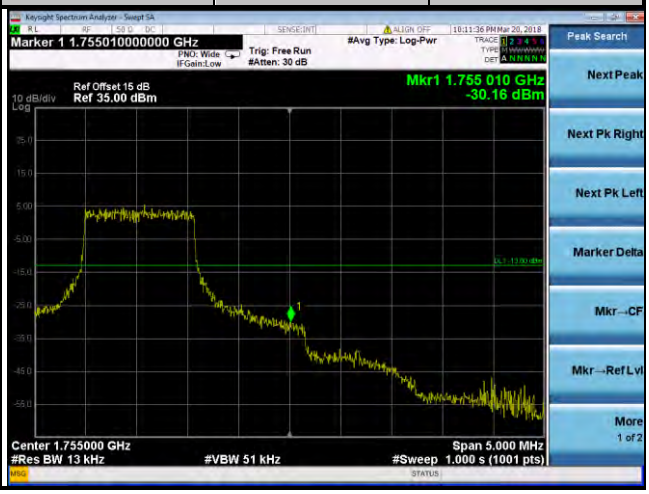
4.4.3 Test Procedures

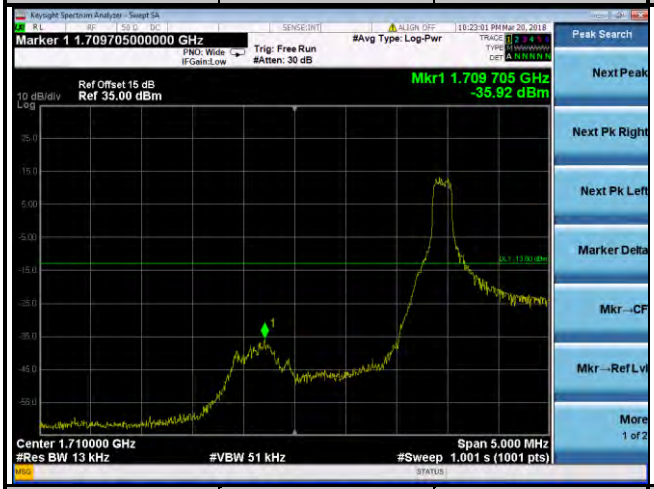
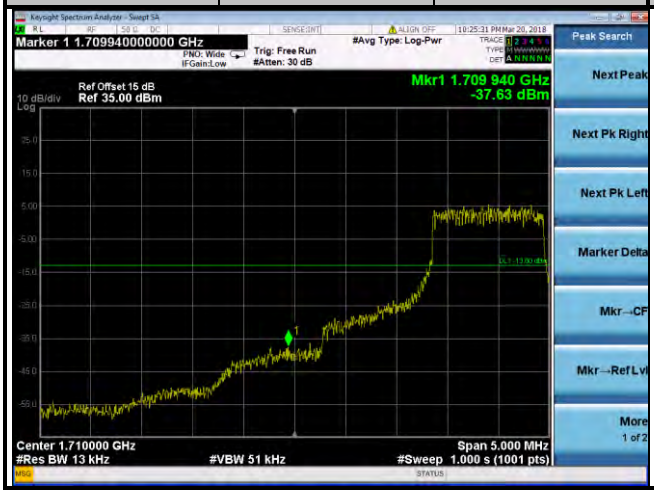
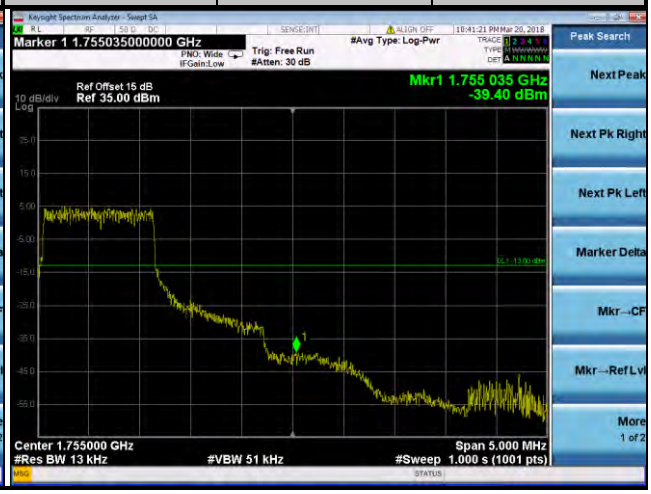
a. All measurements were done at low and high operational frequency range.
b. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 30 kHz and VB of the spectrum is 100 kHz (LTE Bandwidth 3 MHz).
c. The center frequency of spectrum is the band edge frequency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

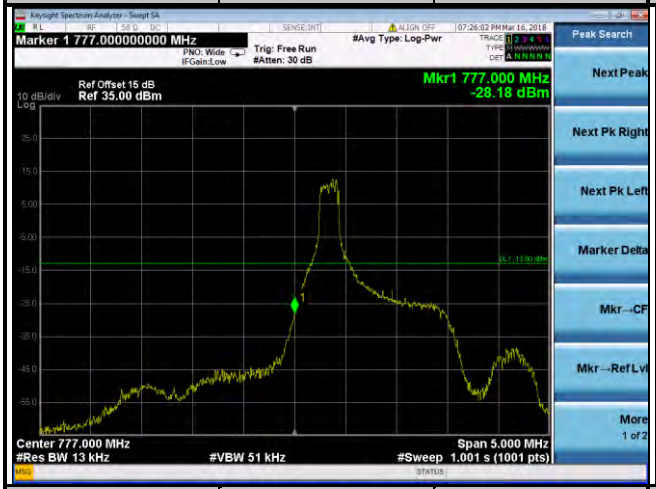
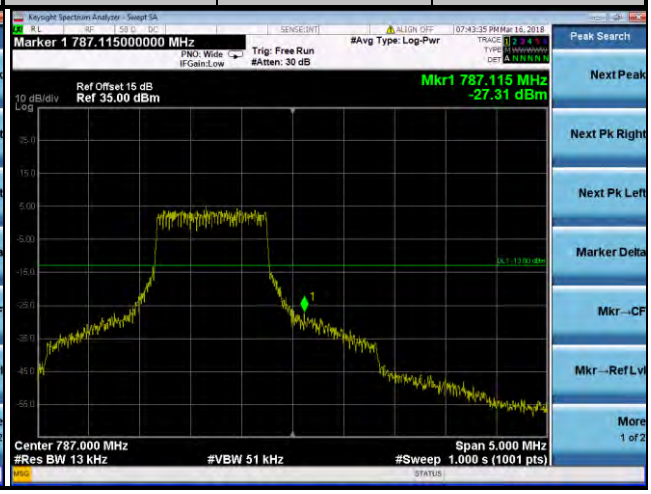
4.4.4 Test Results

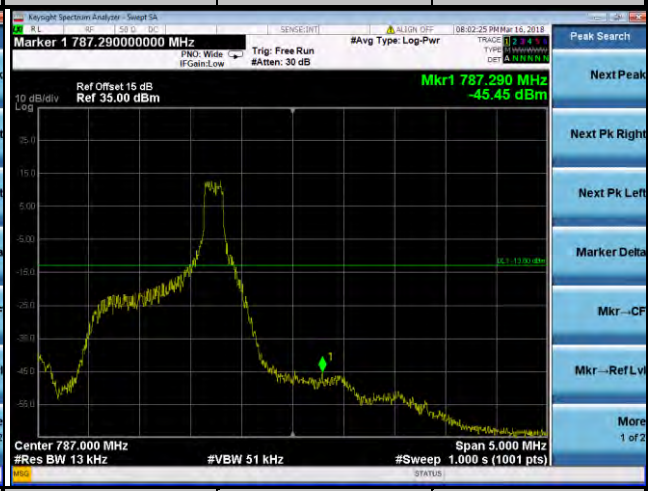
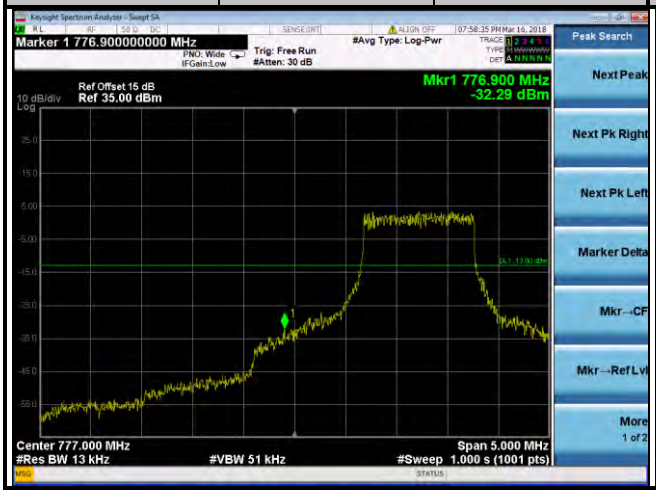
LTE Band 4					
Channel Bandwidth: 5 MHz					
Channel	19975	1 RB	Channel	20375	1 RB
Channel	19975	25 RB	Channel	20375	25 RB
					

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

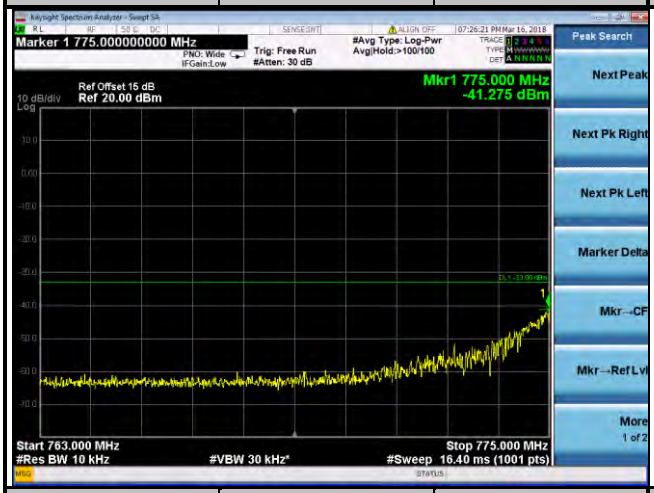
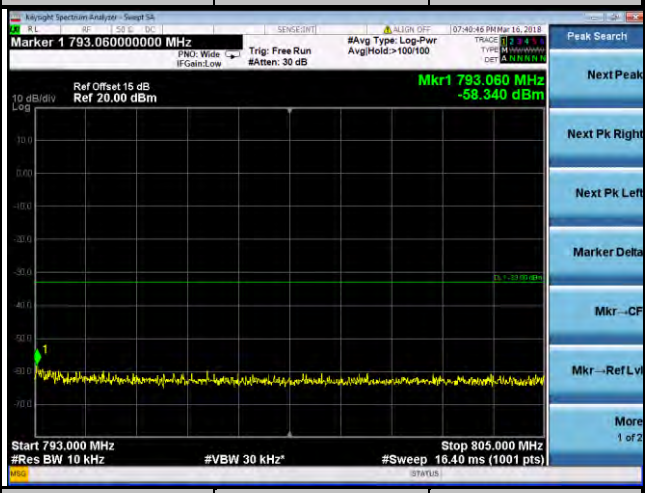
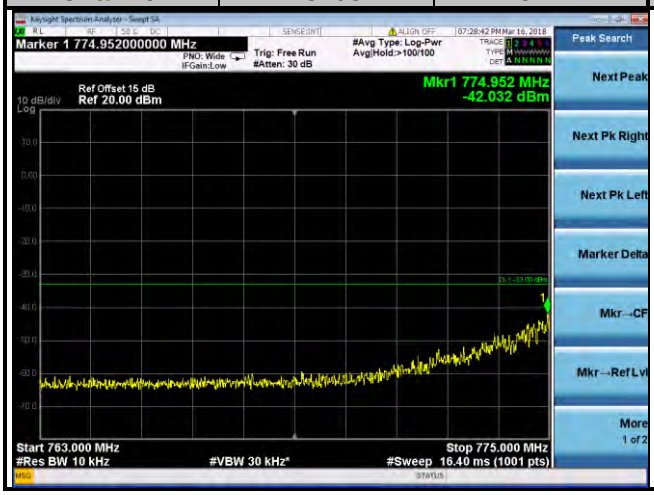
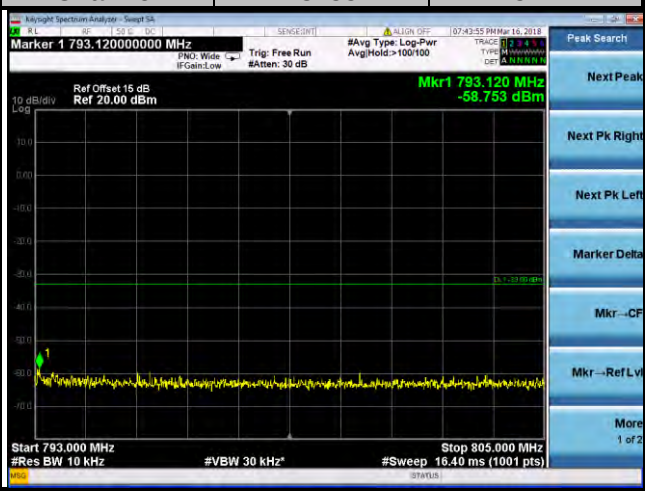
LTE Band 4					
Channel Bandwidth: 15 MHz					
Channel	20025	1 RB	Channel	20325	1 RB
					
Channel	20025	75 RB	Channel	20325	75 RB
					

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
					

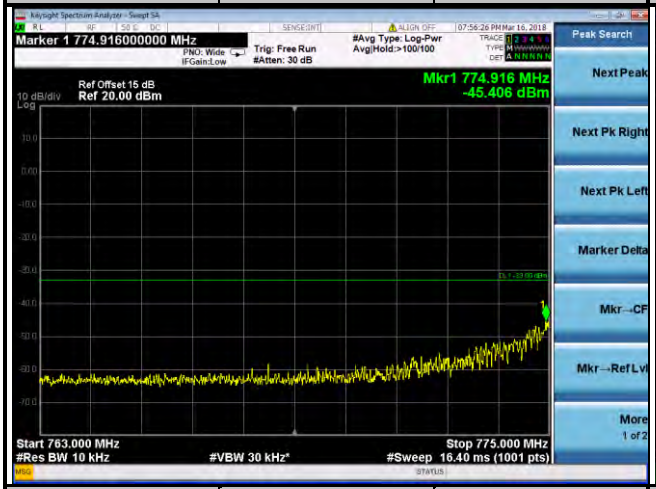
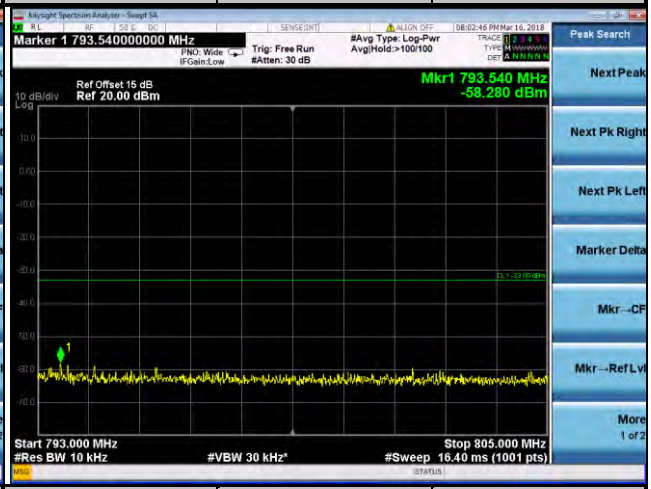
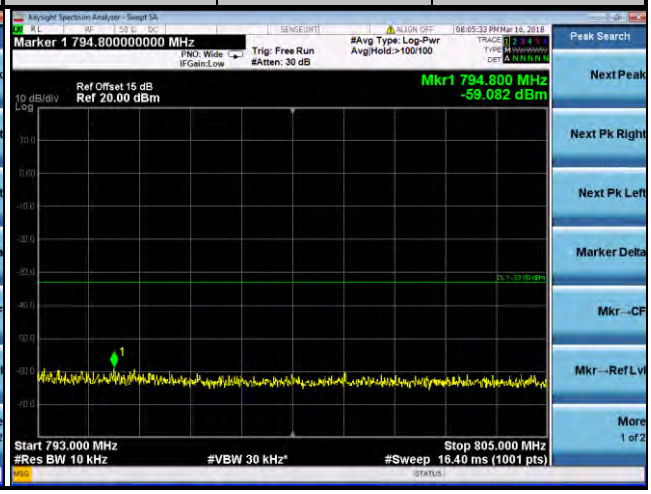
Emission Mask

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

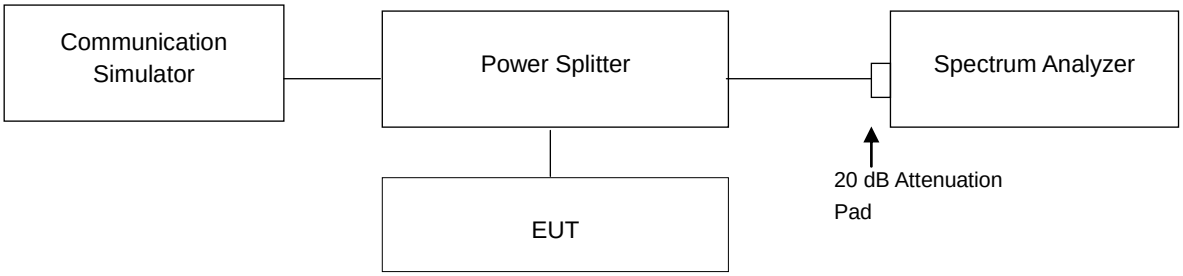
Limit line = -35 dBm + 2.04 dB =-32.96 dBm

4.5 Peak to Average Ratio

4.5.1 Limits of Peak to Average Ratio Measurement

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

4.5.2 Test Setup

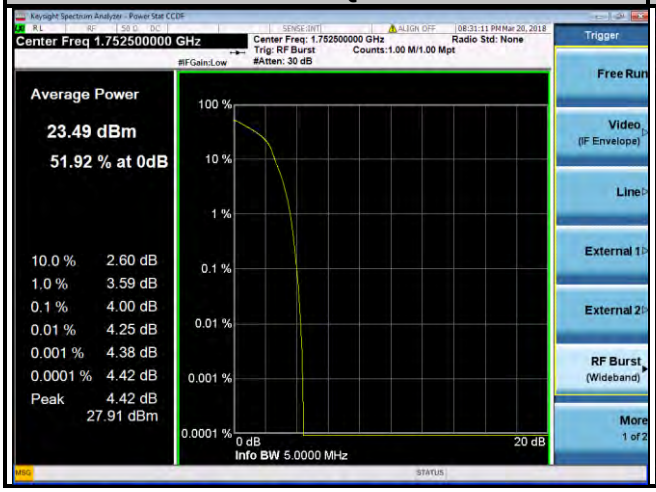
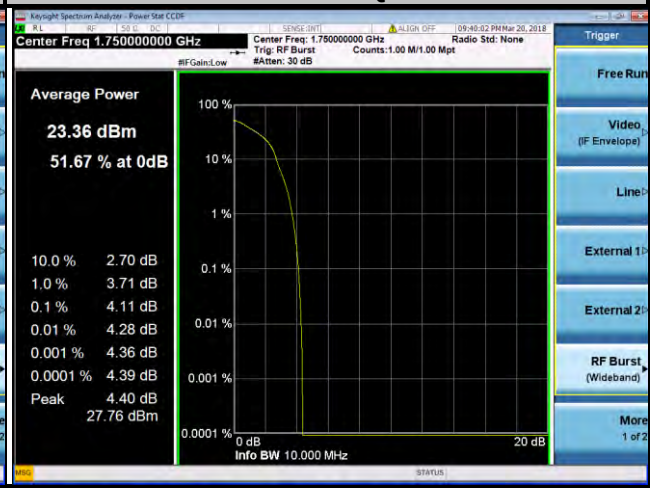


4.5.3 Test Procedures

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

4.5.4 Test Results

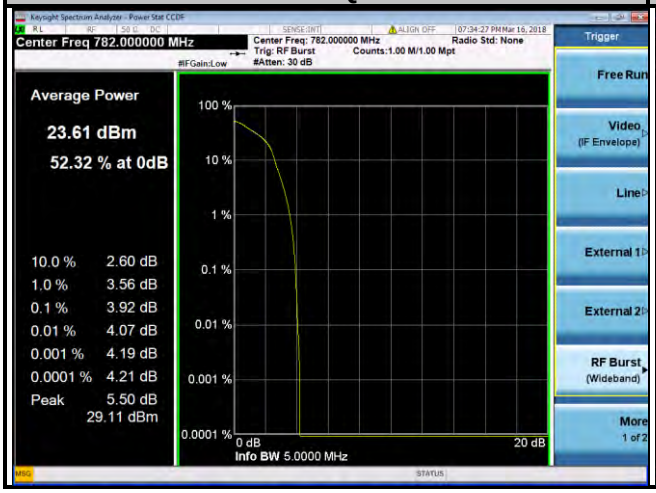
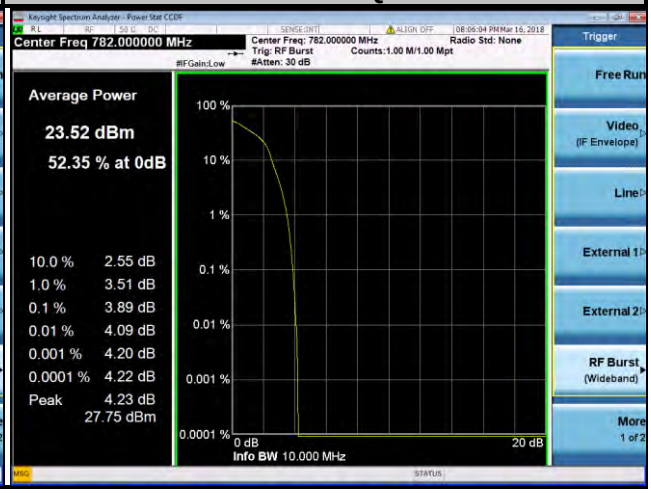
LTE Band 4							
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
19975	1712.5	3.69	3.92	20000	1715.0	3.66	4.01
20175	1732.5	3.67	3.99	20175	1732.5	3.65	4.00
20375	1752.5	3.74	4.00	20350	1750.0	3.73	4.11

Spectrum Plot of Worst Value	
5 MHz / QPSK	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	3.67	4.47	20050	1720.0	3.62	4.32
20175	1732.5	3.75	4.34	20175	1732.5	3.66	4.43
20325	1747.5	3.66	4.48	20300	1745.0	3.66	4.27

Spectrum Plot of Worst Value	
15 MHz / QPSK	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	3.57	3.76	23230	782.0	3.46	3.89
23230	782.0	3.54	3.92				
23255	784.5	3.56	3.86				

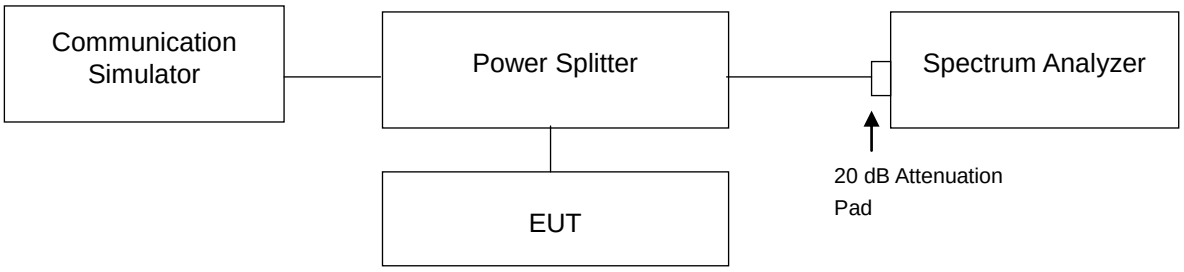
Spectrum Plot of Worst Value	
5 MHz / QPSK	10 MHz / 16QAM
	

4.6 Conducted Spurious Emissions

4.6.1 Limits of Conducted Spurious Emissions Measurement

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 43 +10 log10(P) dB. The limit of emission is equal to -13 dBm.

4.6.2 Test Setup

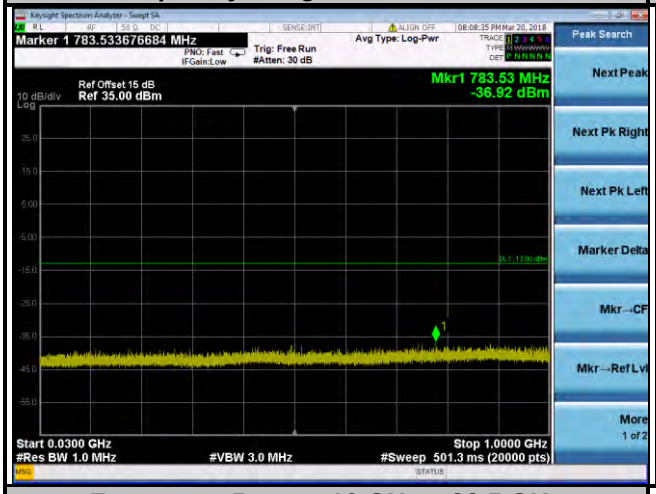
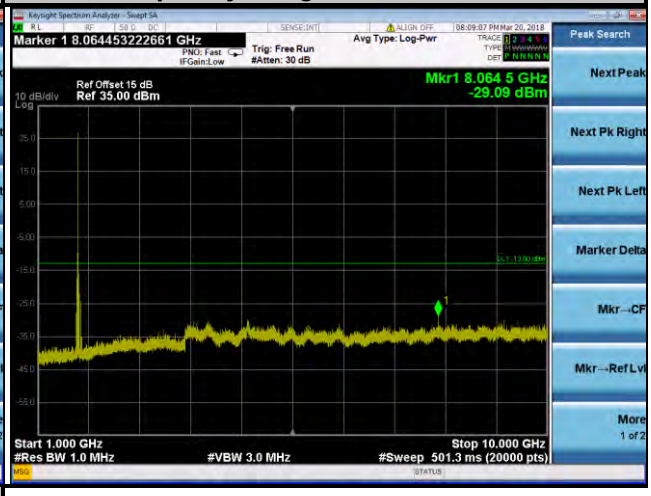
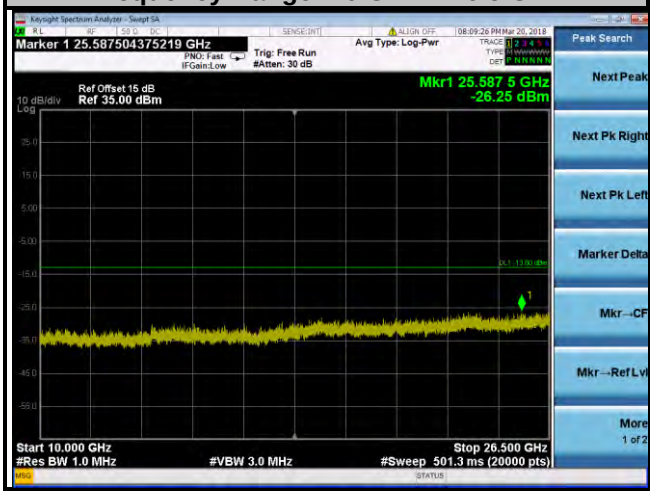


4.6.3 Test Procedure

a. The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.

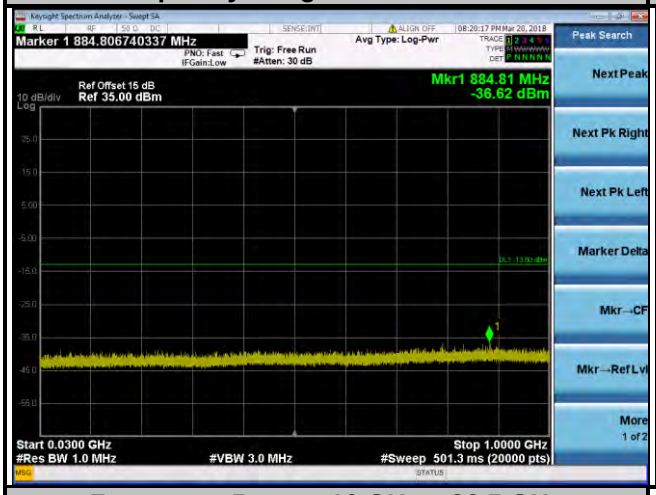
b. Measuring frequency range is from 30 MHz to 26.5 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 1 MHz and VBW = 3 MHz are used for conducted emission measurement.

4.6.4 Test Results

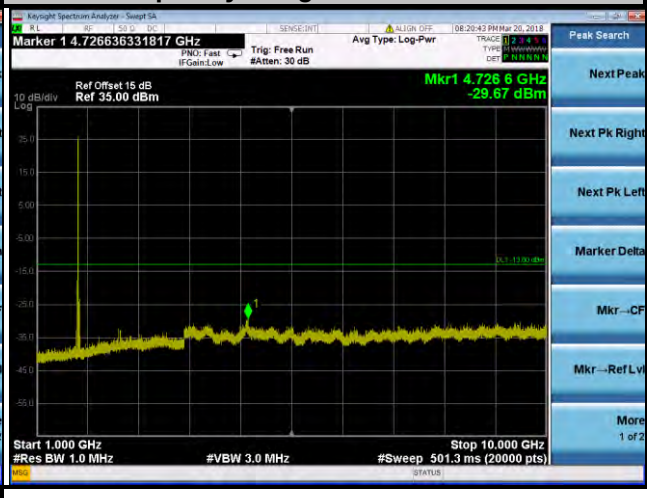
LTE Band 4	
Channel Bandwidth: 5 MHz	
Channel 19975	
Frequency Range: 30 MHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Frequency Range: 10 GHz ~ 26.5 GHz	
	

LTE Band 4
Channel Bandwidth: 5 MHz
Channel 20175

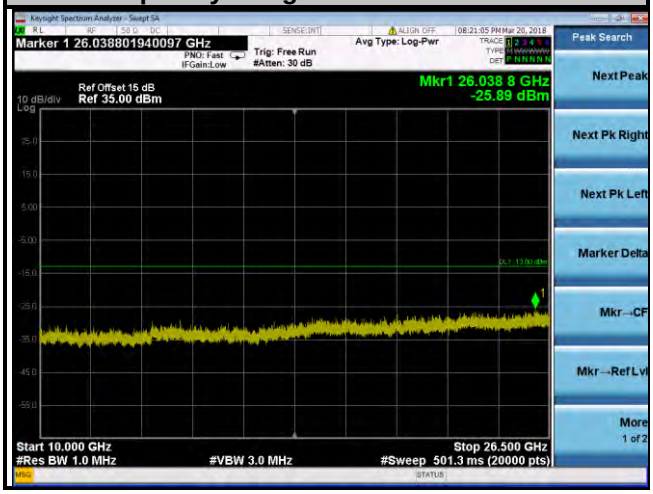
Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz

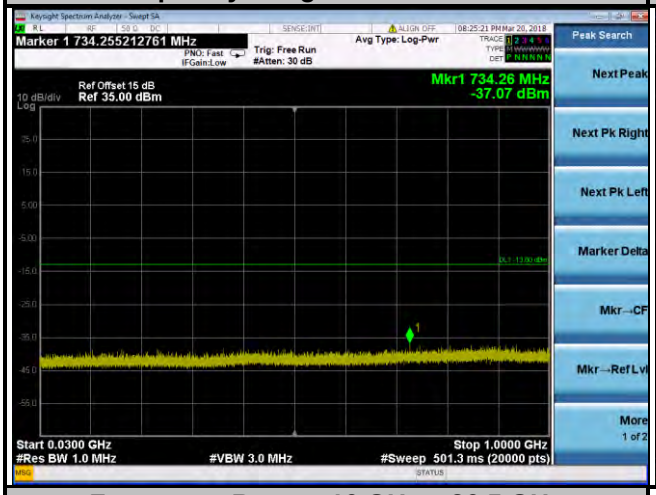


Frequency Range: 10 GHz ~ 26.5 GHz

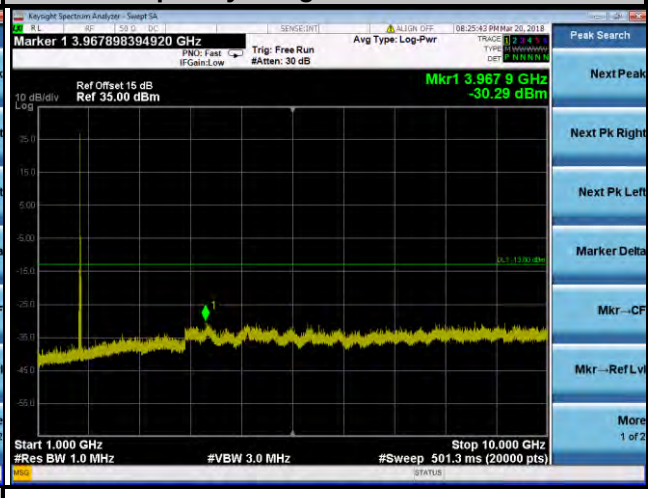


LTE Band 4
Channel Bandwidth: 5 MHz
Channel 20375

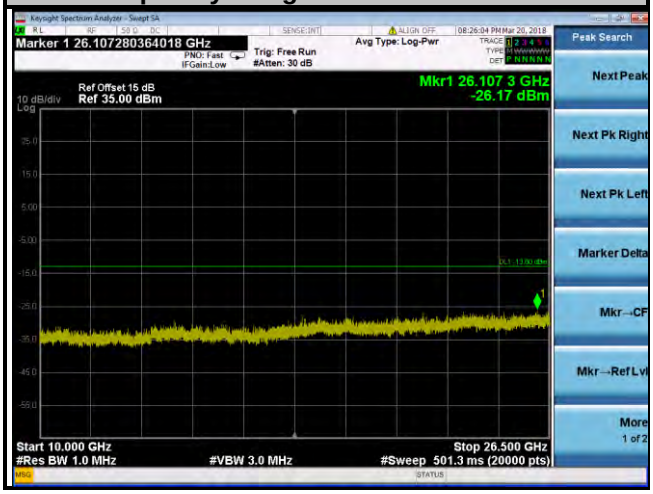
Frequency Range: 30 MHz ~ 1 GHz



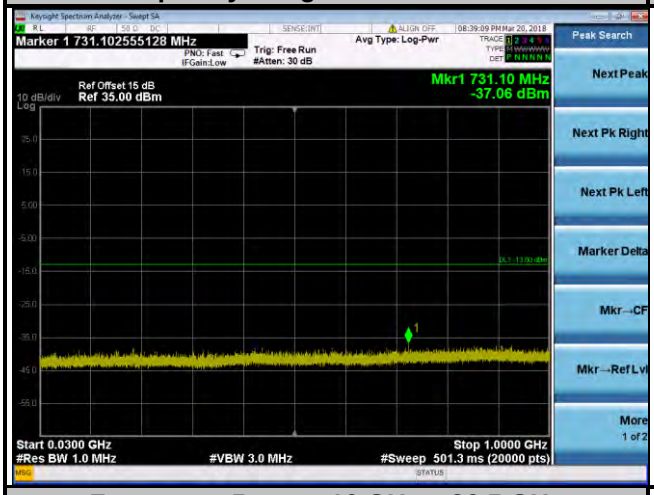
Frequency Range: 1 GHz ~ 10 GHz

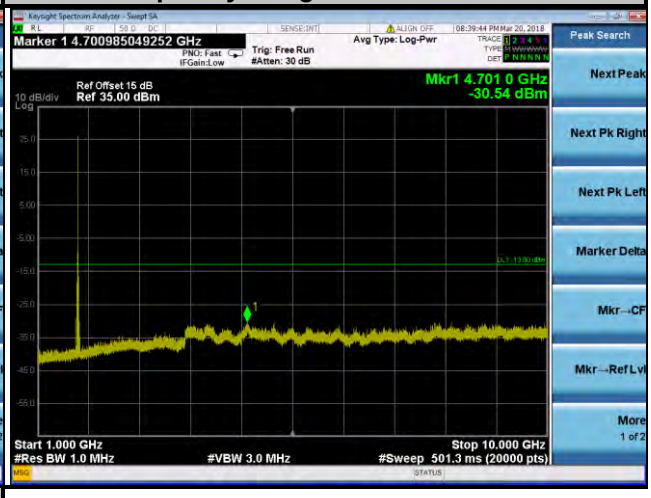


Frequency Range: 10 GHz ~ 26.5 GHz

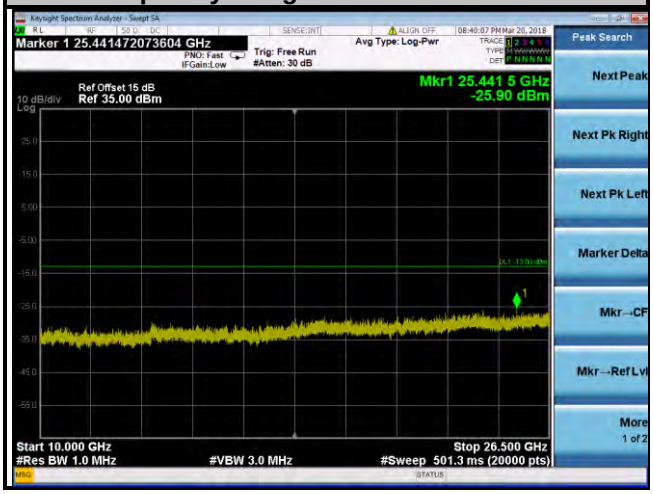


LTE Band 4	
Channel Bandwidth: 10 MHz	
Channel 20000	
Frequency Range: 30 MHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz



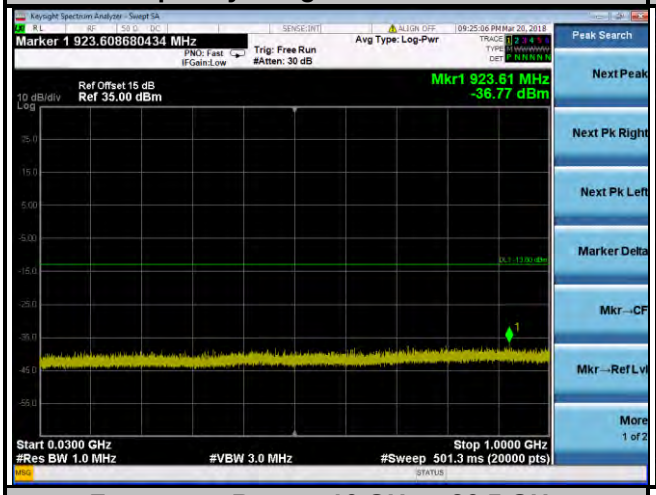


Frequency Range: 10 GHz ~ 26.5 GHz

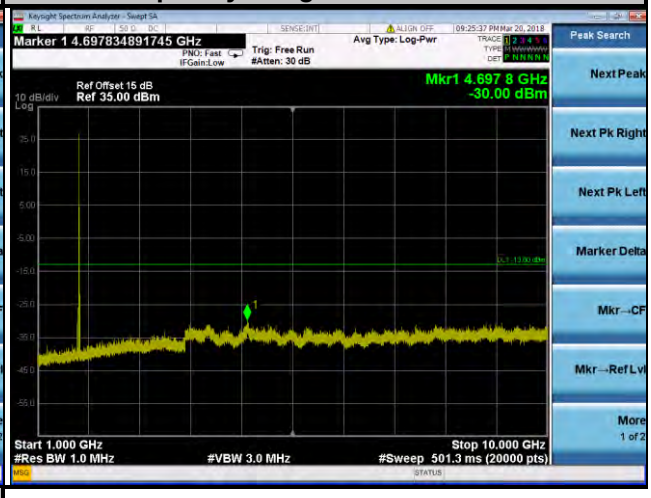


LTE Band 4
Channel Bandwidth: 10 MHz
Channel 20175

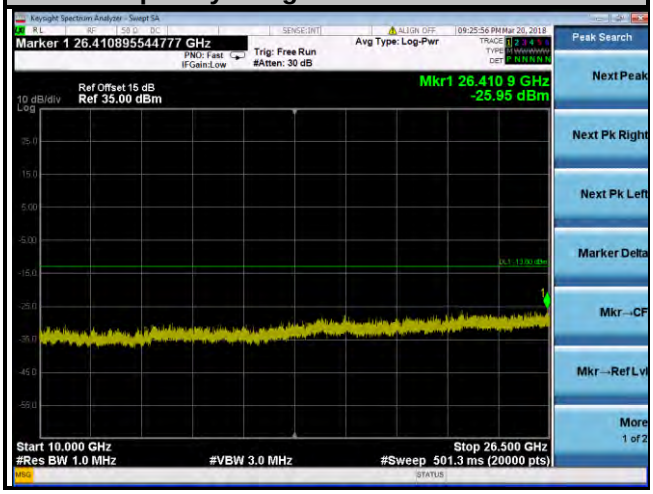
Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz

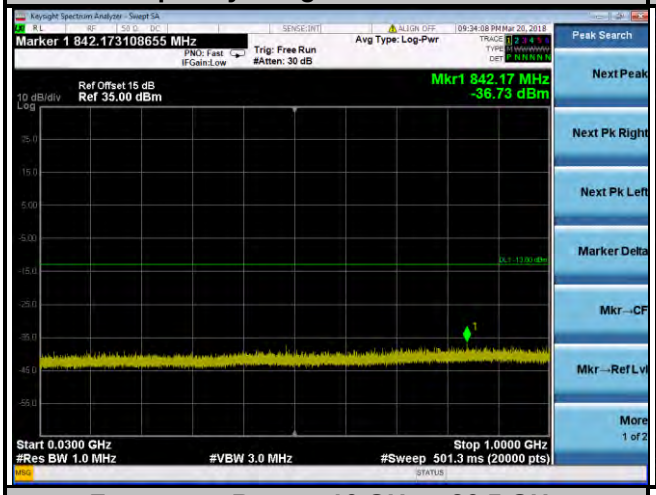


Frequency Range: 10 GHz ~ 26.5 GHz

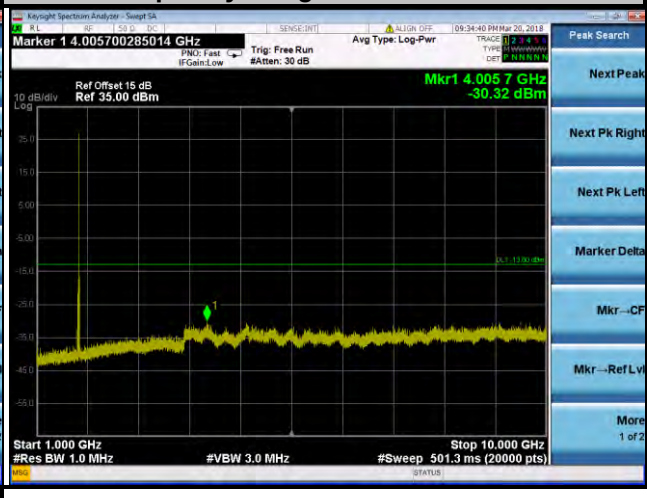


LTE Band 4
Channel Bandwidth: 10 MHz
Channel 20350

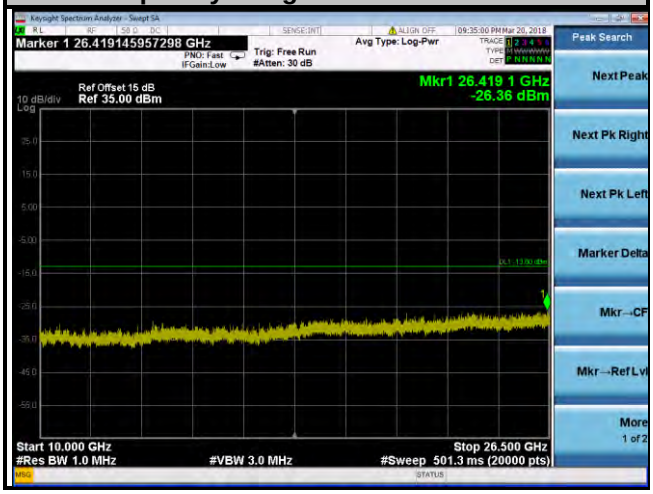
Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz

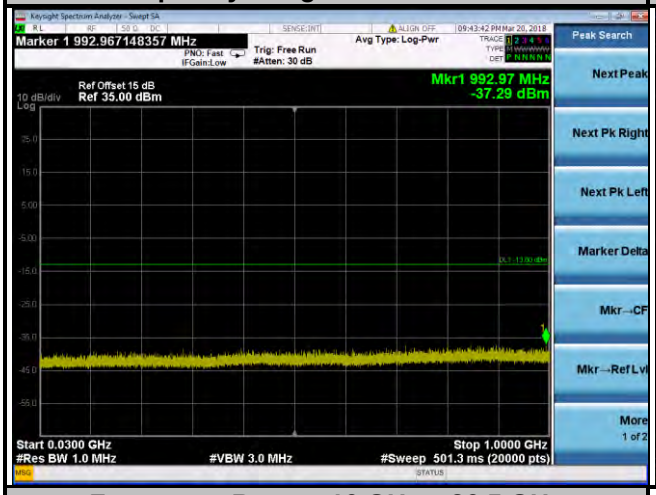


Frequency Range: 10 GHz ~ 26.5 GHz

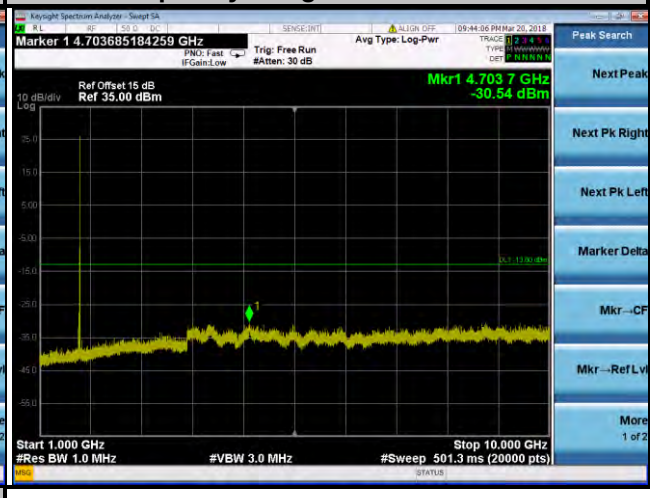


LTE Band 4
Channel Bandwidth: 15 MHz
Channel 20025

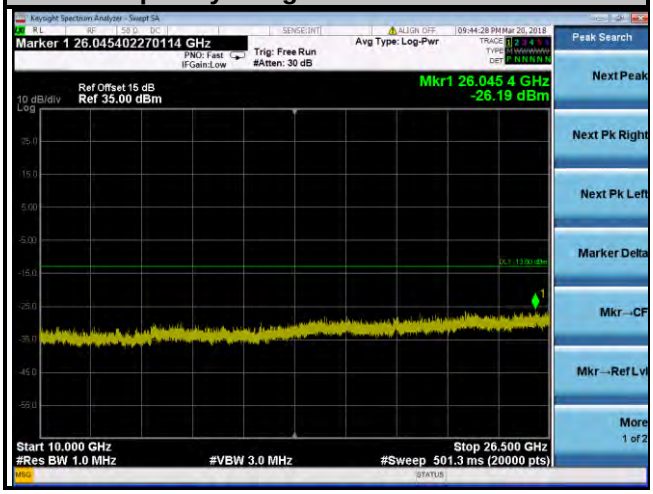
Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz

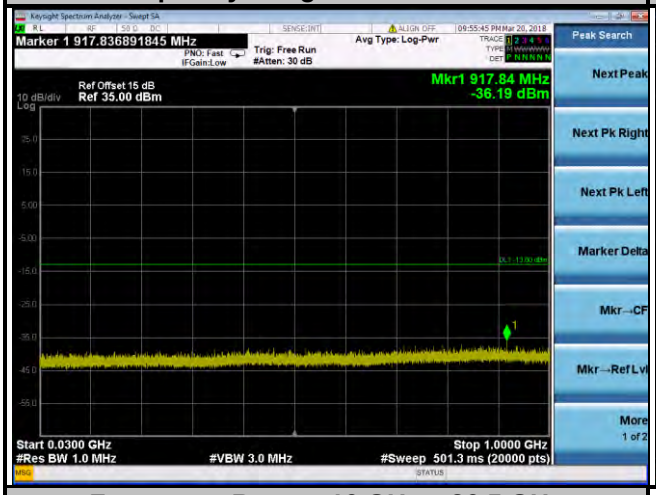


Frequency Range: 10 GHz ~ 26.5 GHz

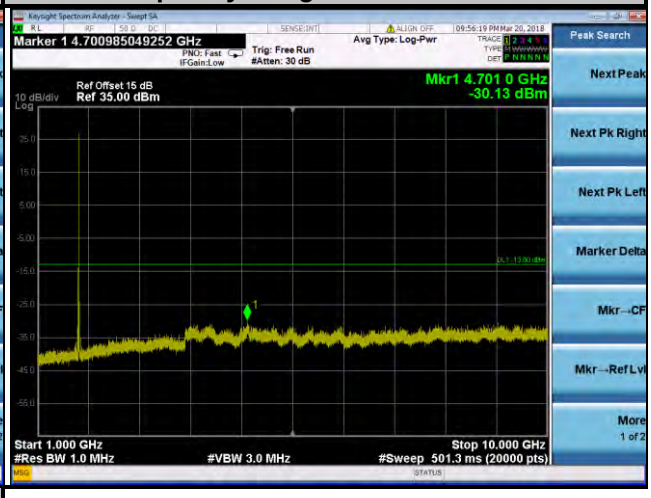


LTE Band 4
Channel Bandwidth: 15 MHz
Channel 20175

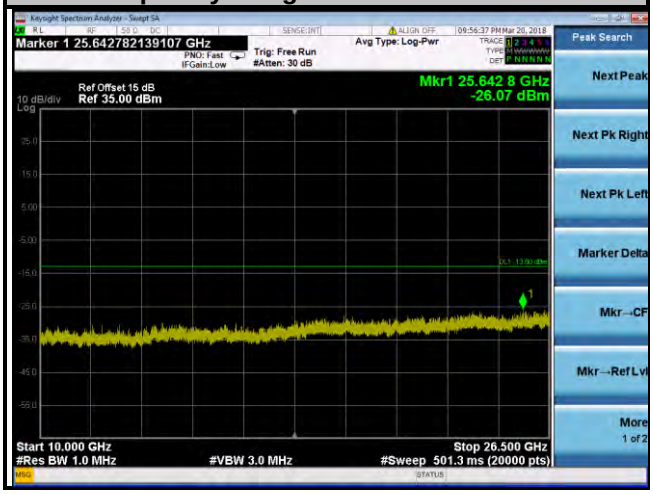
Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz

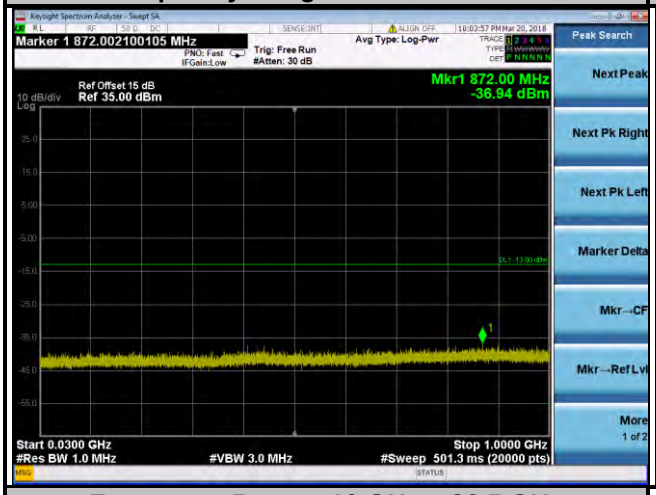


Frequency Range: 10 GHz ~ 26.5 GHz

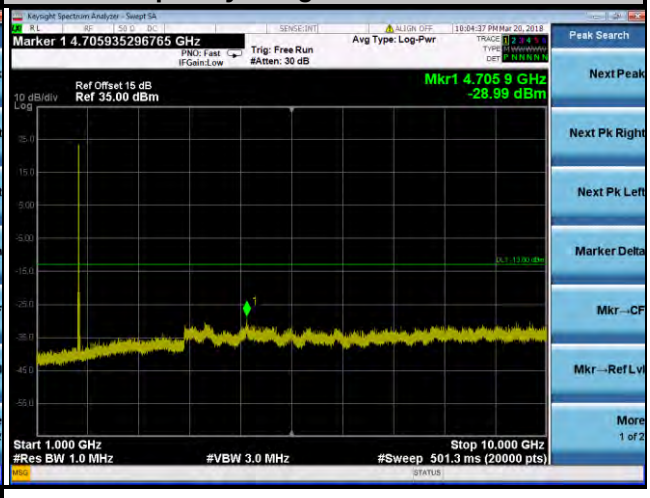


LTE Band 4
Channel Bandwidth: 15 MHz
Channel 20325

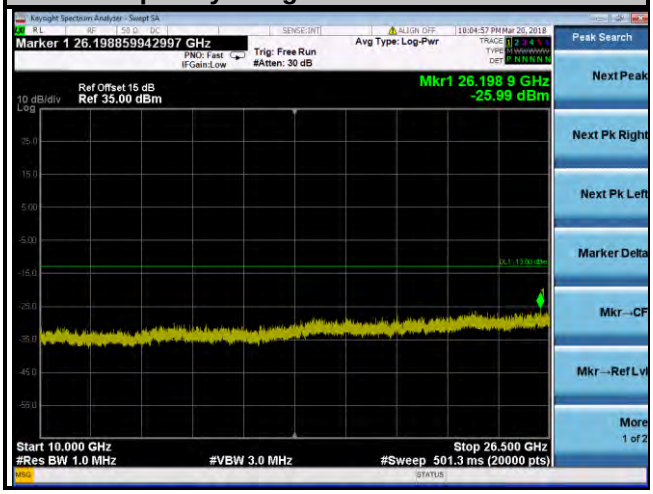
Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz

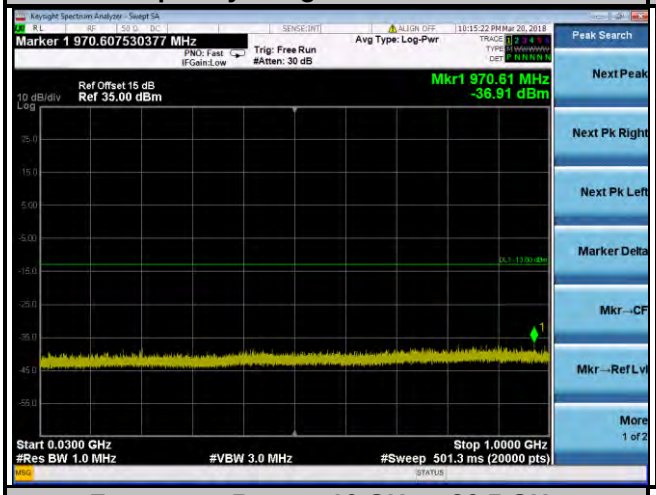


Frequency Range: 10 GHz ~ 26.5 GHz

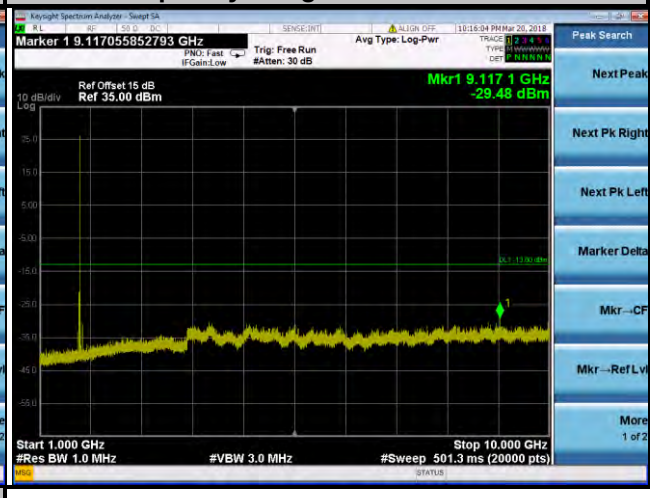


LTE Band 4
Channel Bandwidth: 20 MHz
Channel 20050

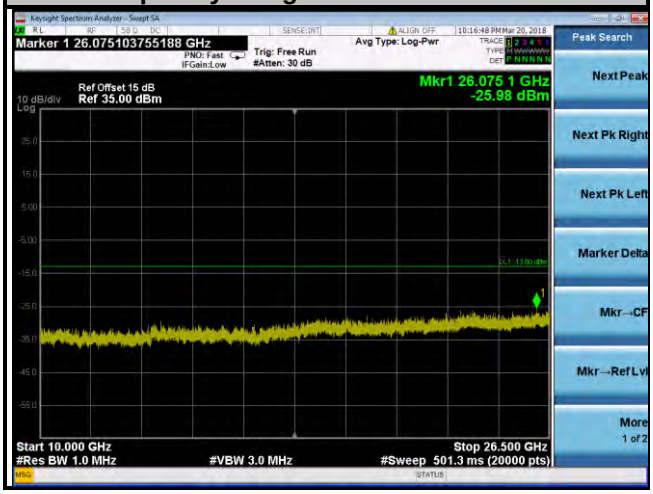
Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz

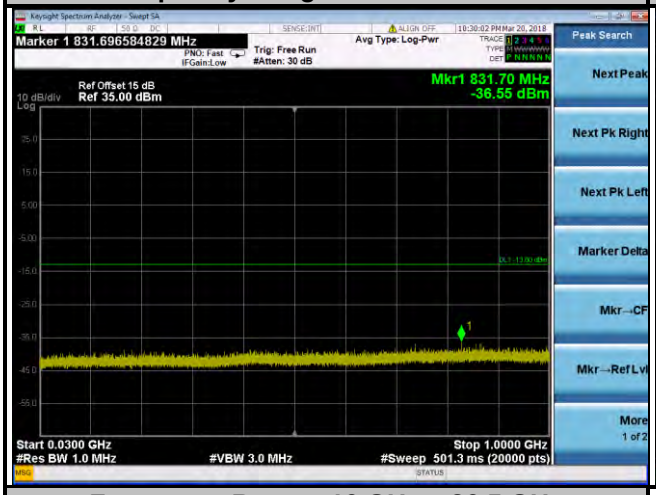


Frequency Range: 10 GHz ~ 26.5 GHz

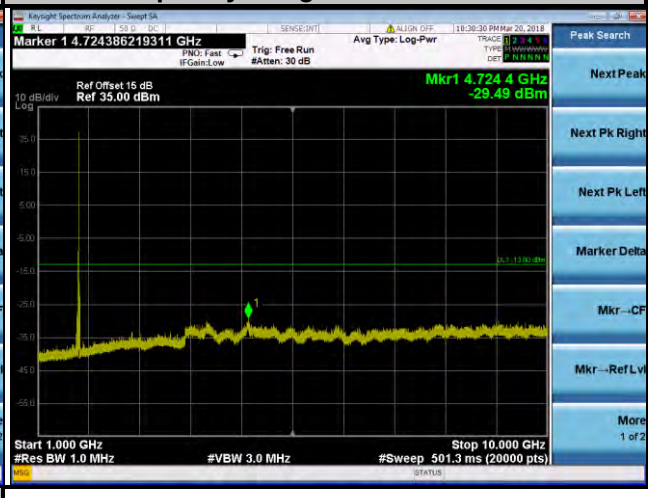


LTE Band 4
Channel Bandwidth: 20 MHz
Channel 20175

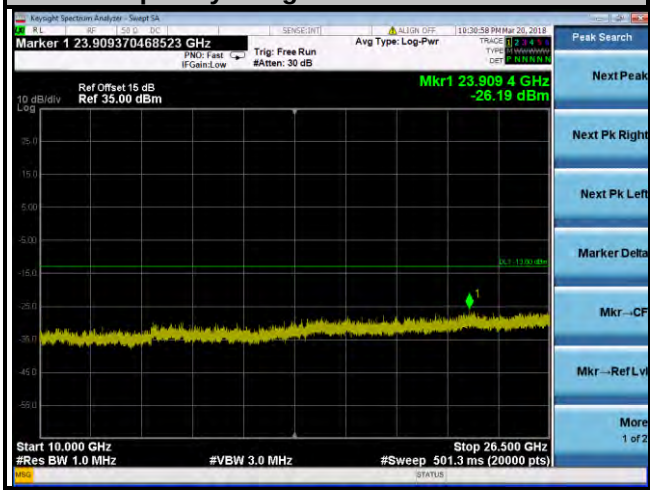
Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz

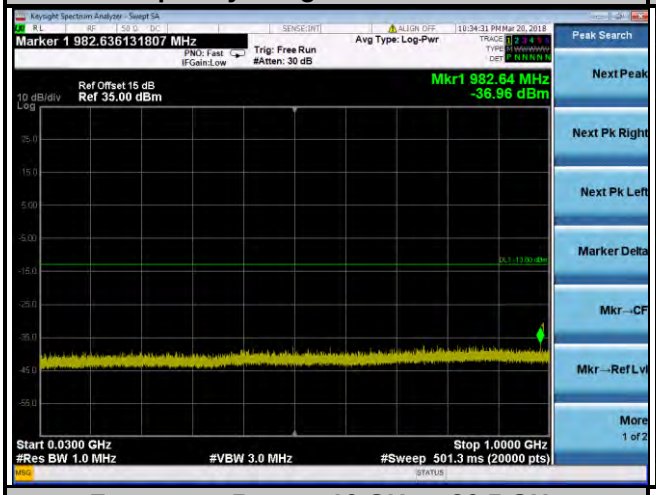


Frequency Range: 10 GHz ~ 26.5 GHz

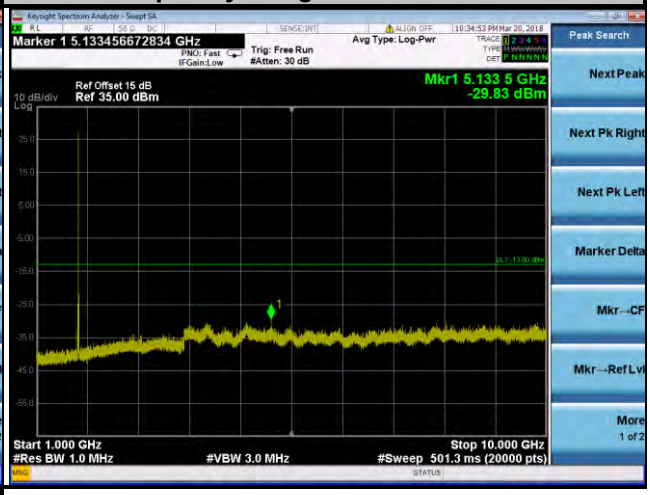


LTE Band 4
Channel Bandwidth: 20 MHz
Channel 20300

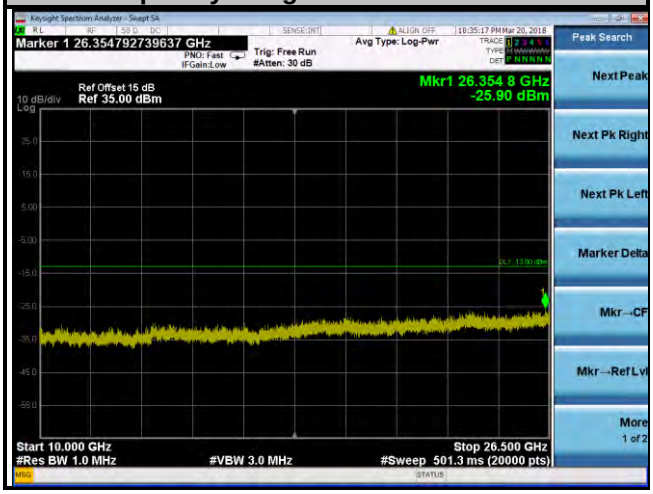
Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz

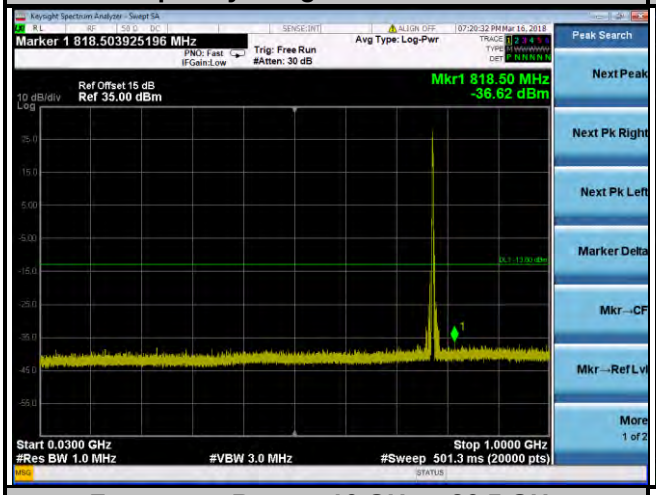


Frequency Range: 10 GHz ~ 26.5 GHz

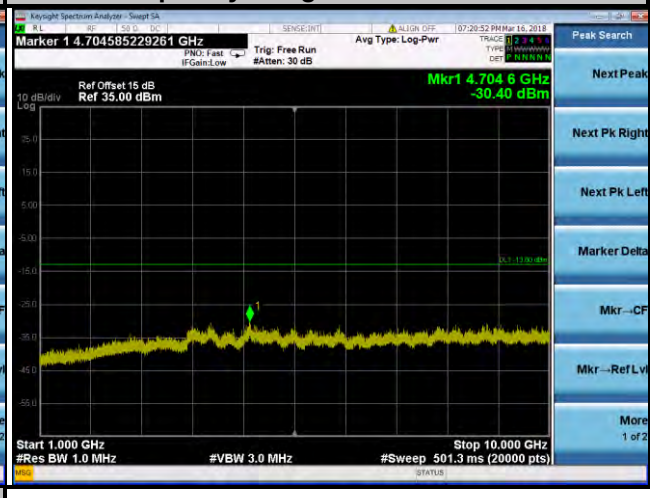


LTE Band 13
Channel Bandwidth: 5 MHz
Channel 23205

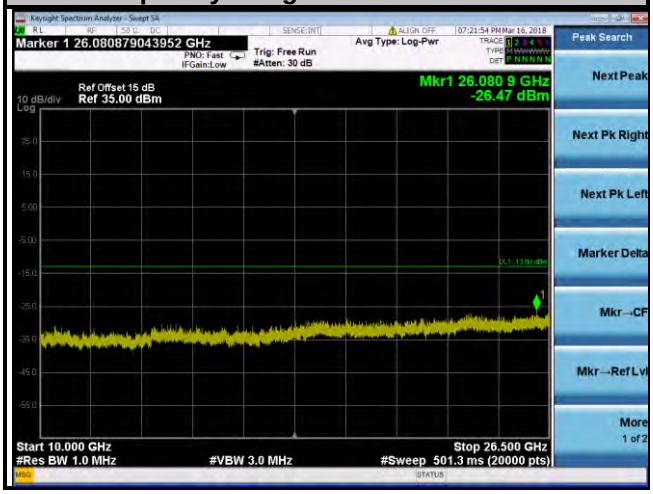
Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz

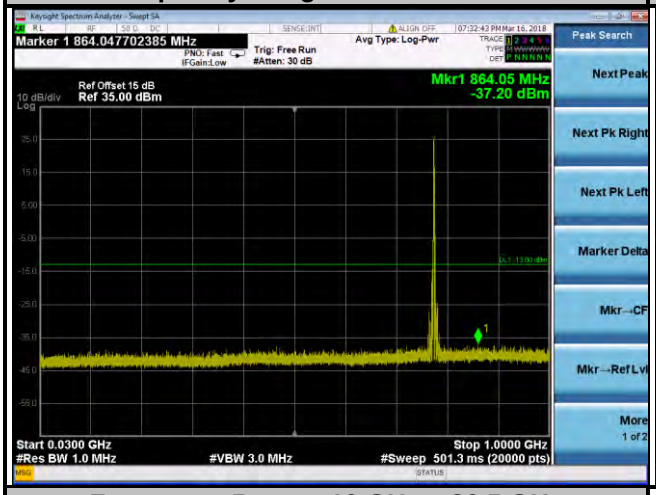


Frequency Range: 10 GHz ~ 26.5 GHz

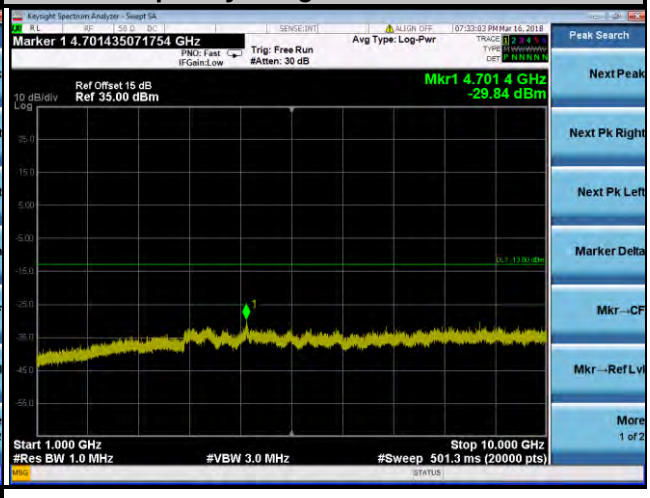


LTE Band 13
Channel Bandwidth: 5 MHz
Channel 23230

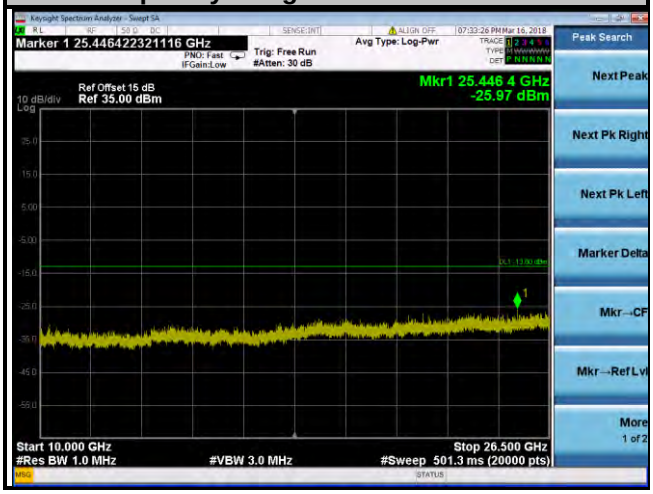
Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz

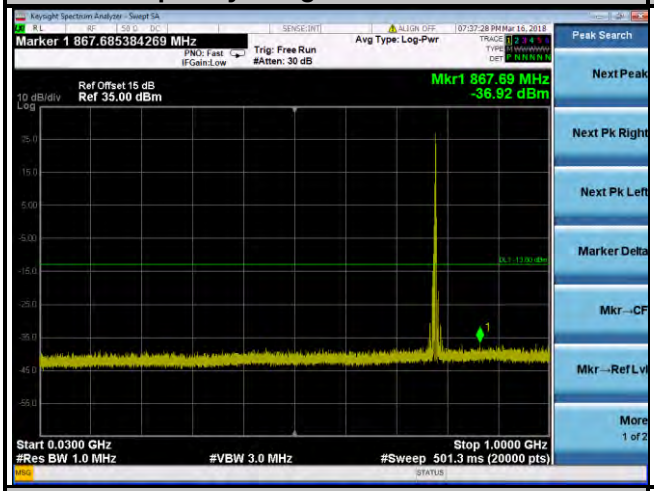


Frequency Range: 10 GHz ~ 26.5 GHz

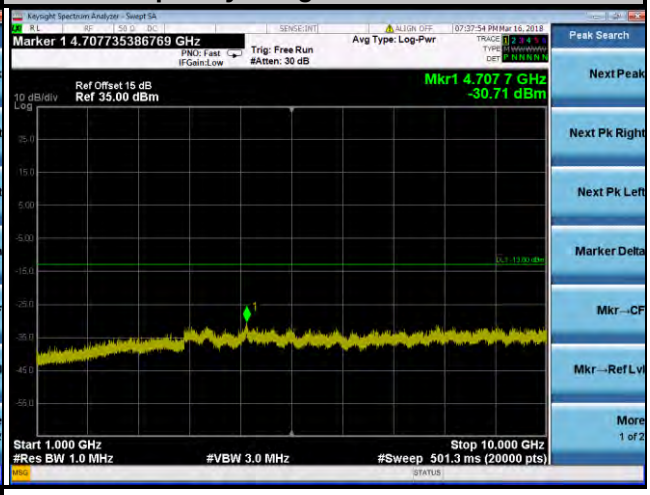


LTE Band 13
Channel Bandwidth: 5 MHz
Channel 23255

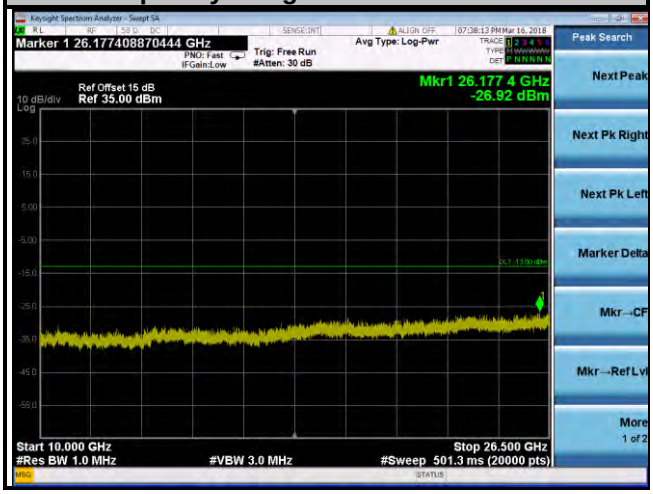
Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz

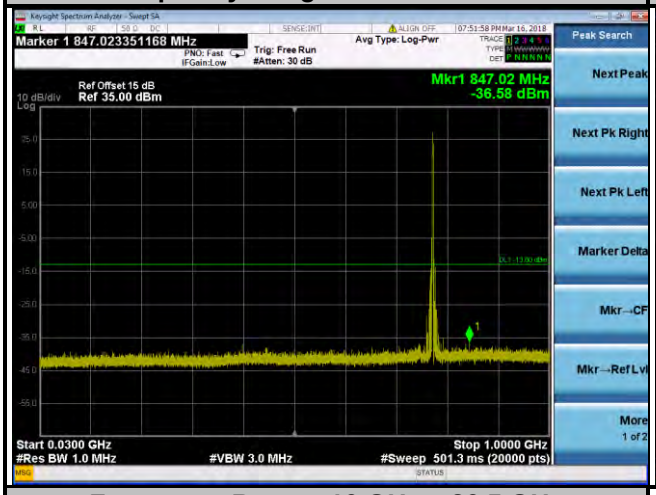


Frequency Range: 10 GHz ~ 26.5 GHz

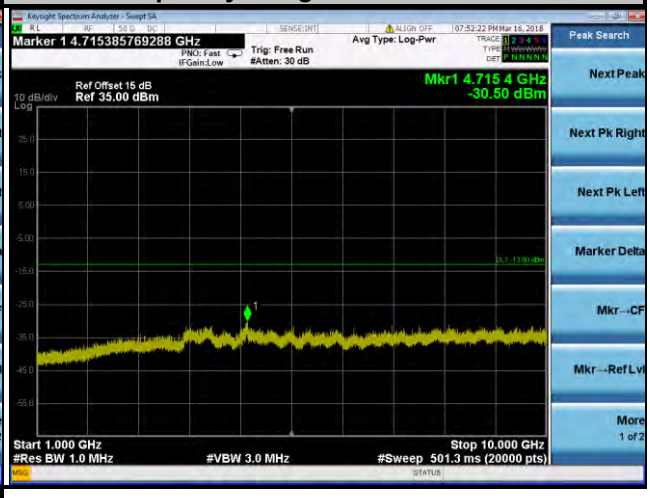


LTE Band 13
Channel Bandwidth: 10 MHz
Channel 23230

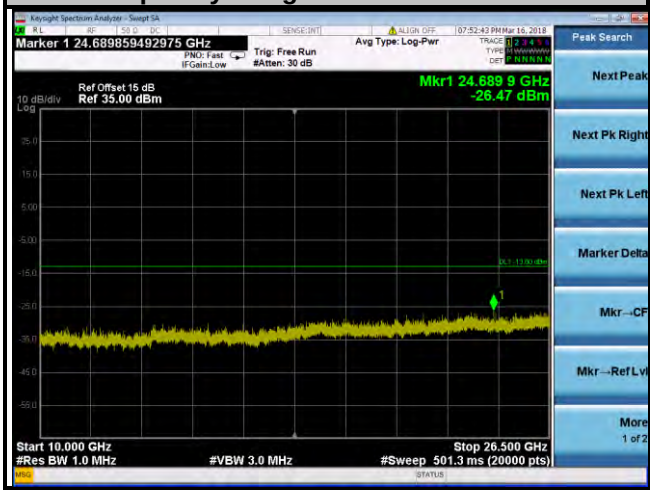
Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 26.5 GHz



4.7 Radiated Emission Measurement

4.7.1 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 log10(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.

4.7.2 Test Procedure

a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 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.P.R power - 2.15 dBi.

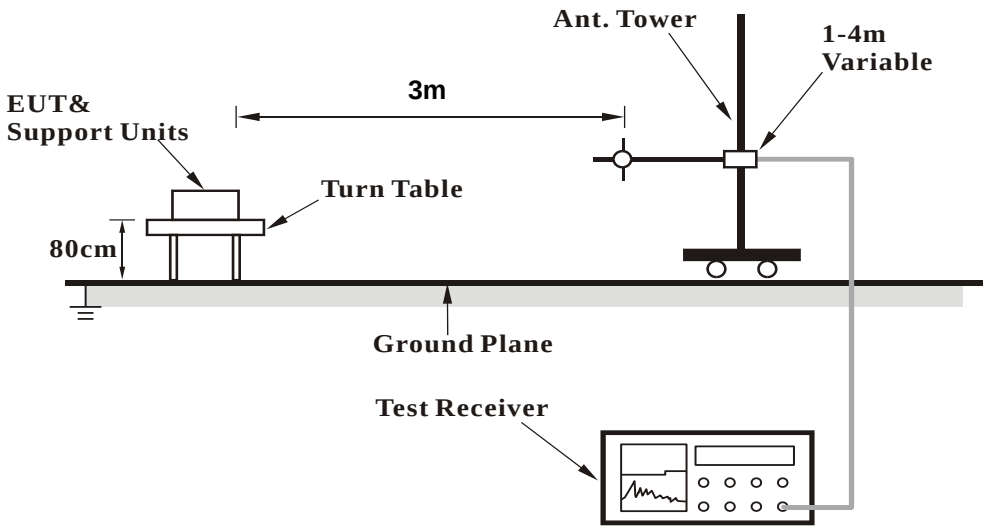
Note: The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

4.7.3 Deviation from Test Standard

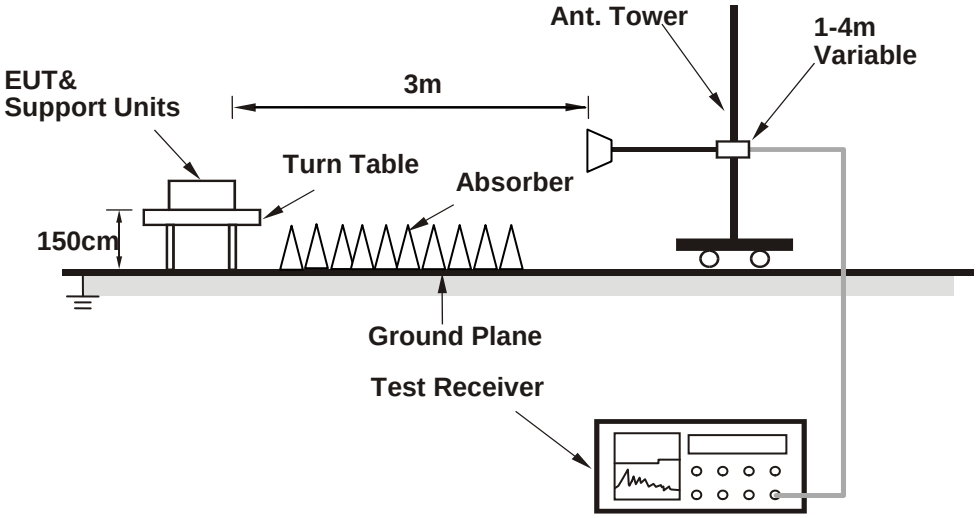
No deviation.

4.7.4 Test Setup

<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).

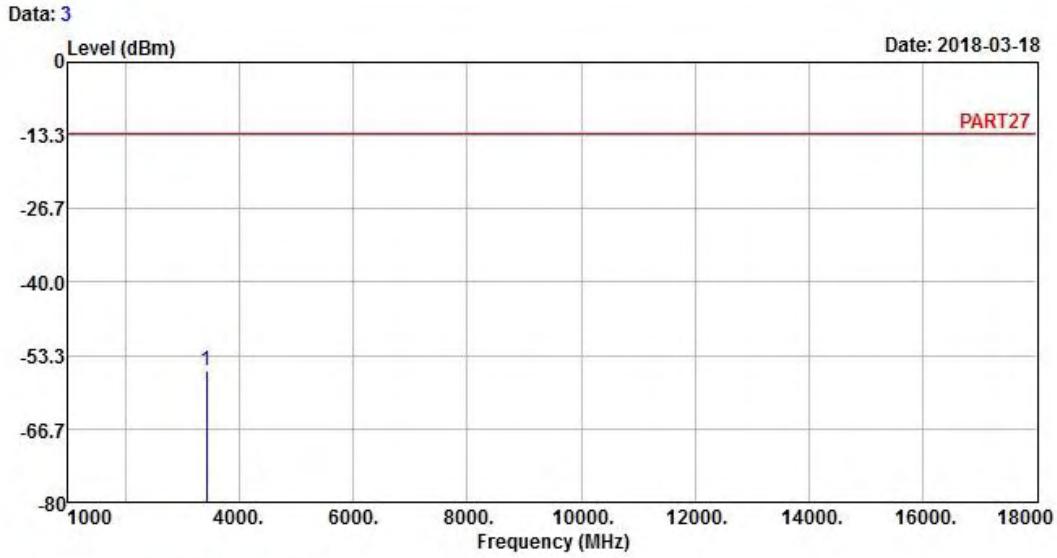
4.7.5 Test Results

LTE Band 4

Channel Bandwidth: 5 MHz / QPSK

Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



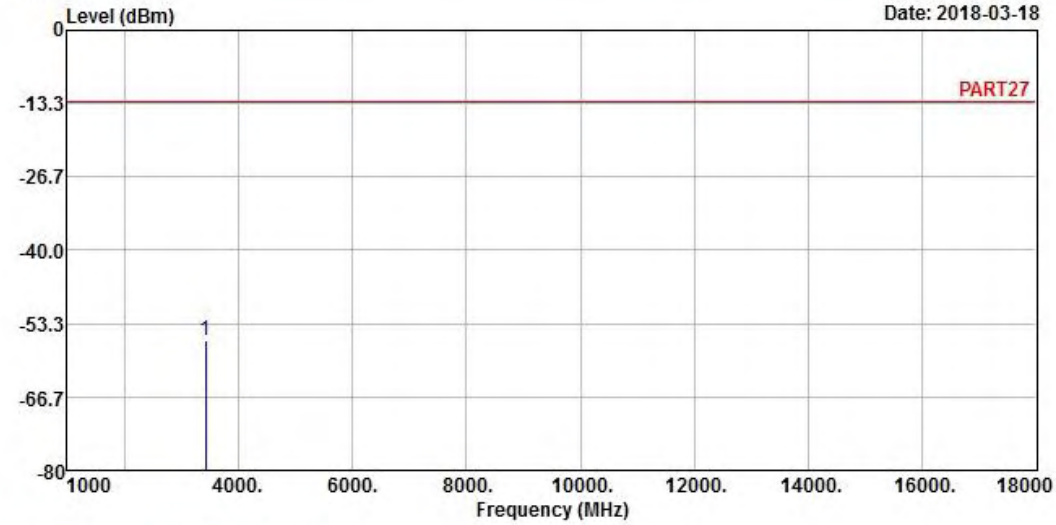
Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remak : CAT_M1 Band 4 QPSK_5M Link_L-CH
Tested by: Jisyong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3425.00	-56.13	-47.04	-13.00	-43.13	-9.09	Peak

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

A D T

Data: 4

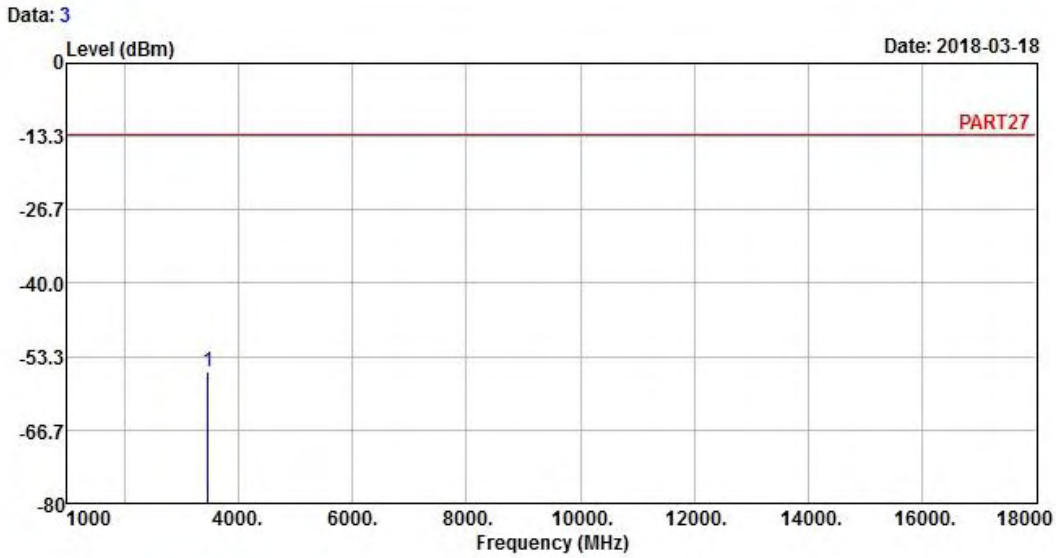


Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : CAT_M1 Band 4 QPSK_5M Link_L-CH
Tested by: Jisyong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3425.00	-56.48	-47.39	-13.00	-43.48	-9.09	Peak

Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : CAT_M1 Band 4 QPSK_5M Link_M-CH
Tested by: Jisyong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3465.00	-56.01	-47.10	-13.00	-43.01	-8.91	Peak

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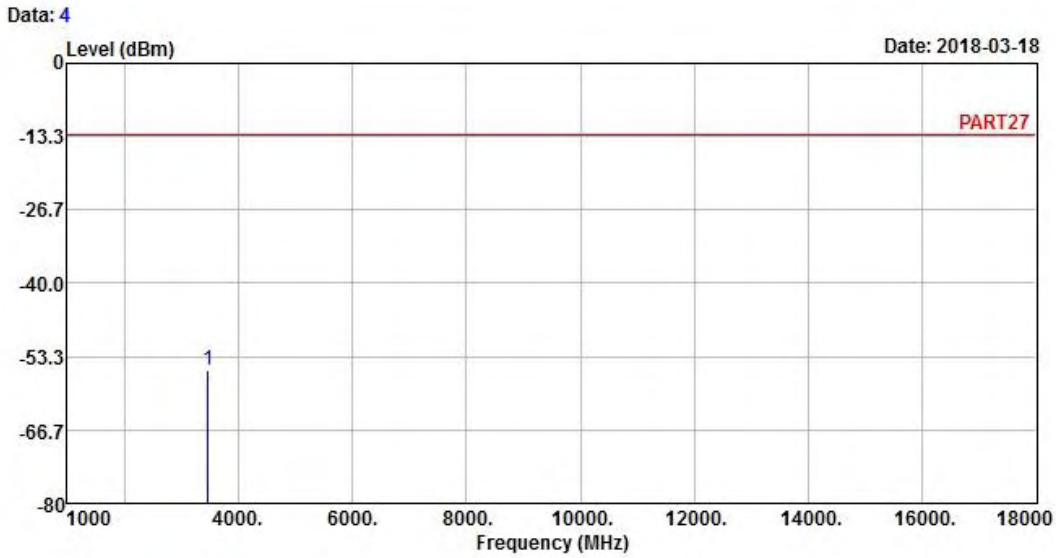
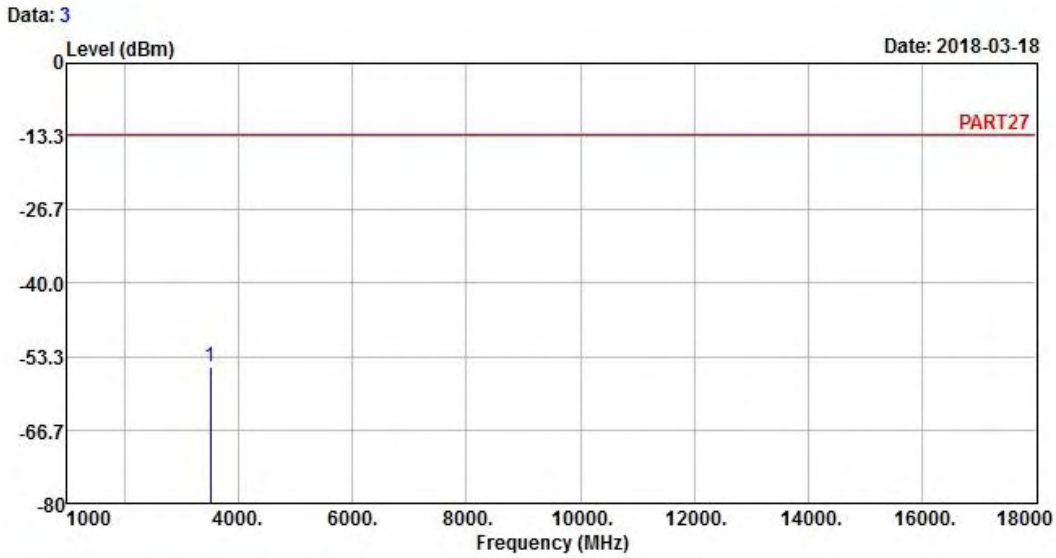


Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : CAT_M1 Band 4 QPSK_5M Link_M-CH
Tested by: Jisyong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3465.00	-55.71	-46.80	-13.00	-42.71	-8.91	Peak

High Channel

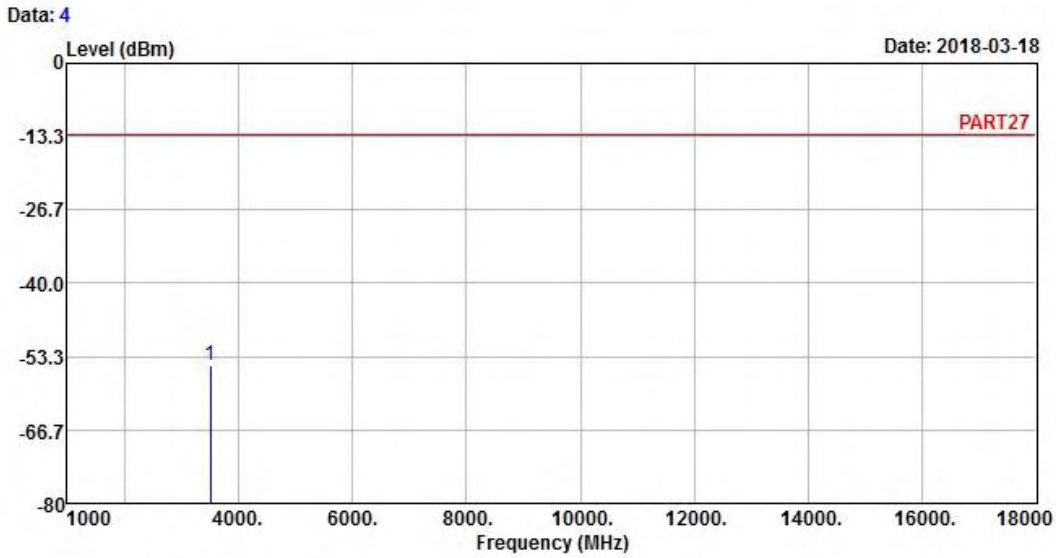
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remak : CAT_M1 Band 4 QPSK_5M Link_H-CH
Tested by: Jisyong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3510.00	-55.35	-47.24	-13.00	-42.35	-8.11	Peak

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : CAT_M1 Band 4 QPSK_5M Link_H-CH
Tested by: Jisyong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3505.00	-55.01	-46.90	-13.00	-42.01	-8.11	Peak

Channel Bandwidth: 20 MHz / QPSK

Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

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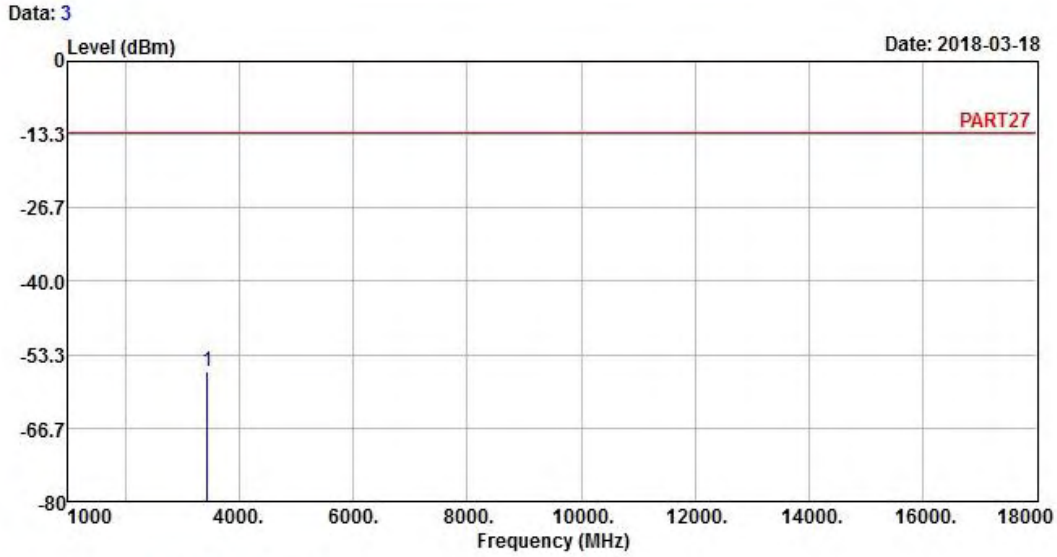
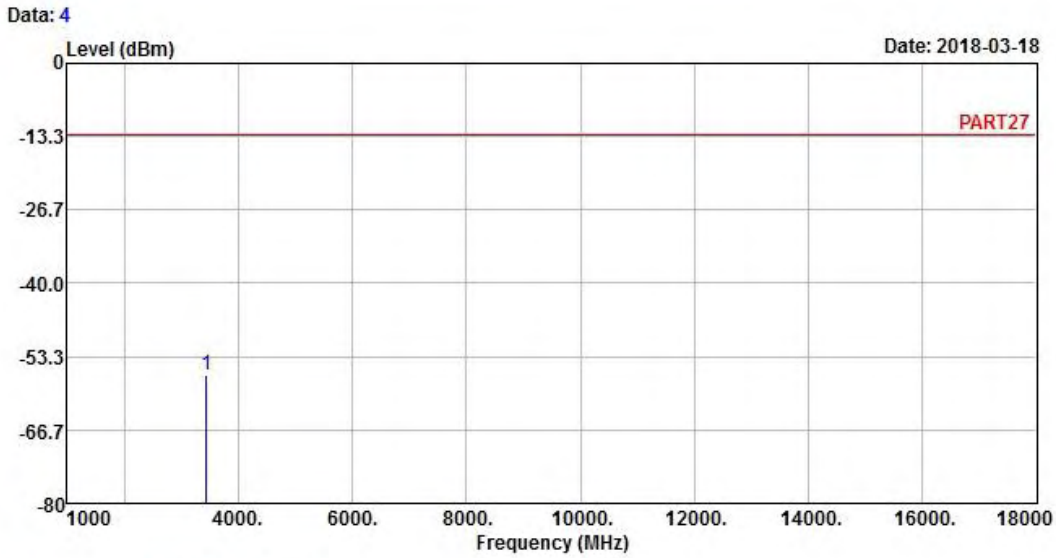


Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remak : CAT_M1 Band 4 QPSK_20M Link_L-CH
Tested by: Jisyong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3440.00	-56.35	-47.35	-13.00	-43.35	-9.00	Peak

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

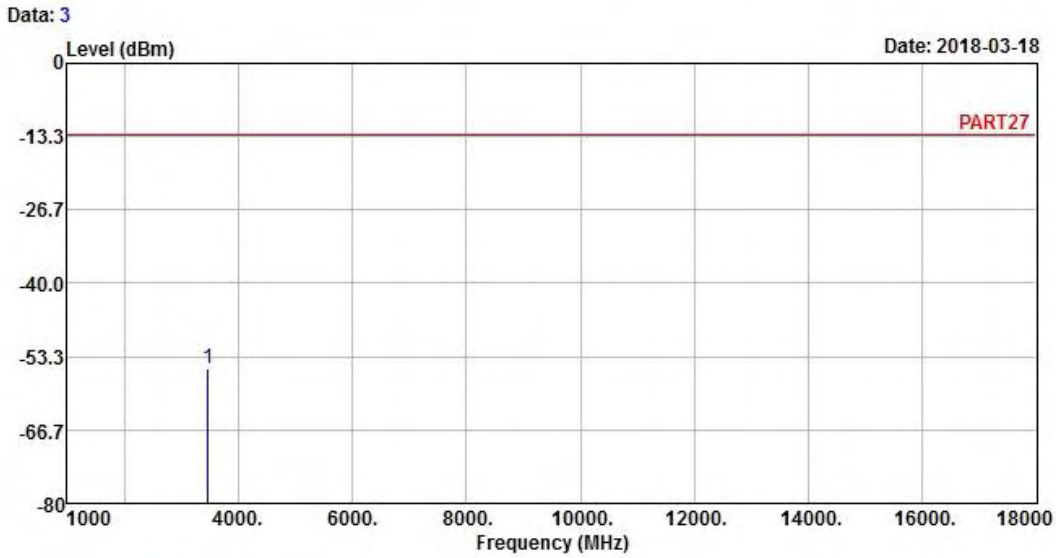


Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : CAT_M1 Band 4 QPSK_20M Link_L-CH
Tested by: Jisyong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3440.00	-56.58	-47.58	-13.00	-43.58	-9.00	Peak

Middle Channel

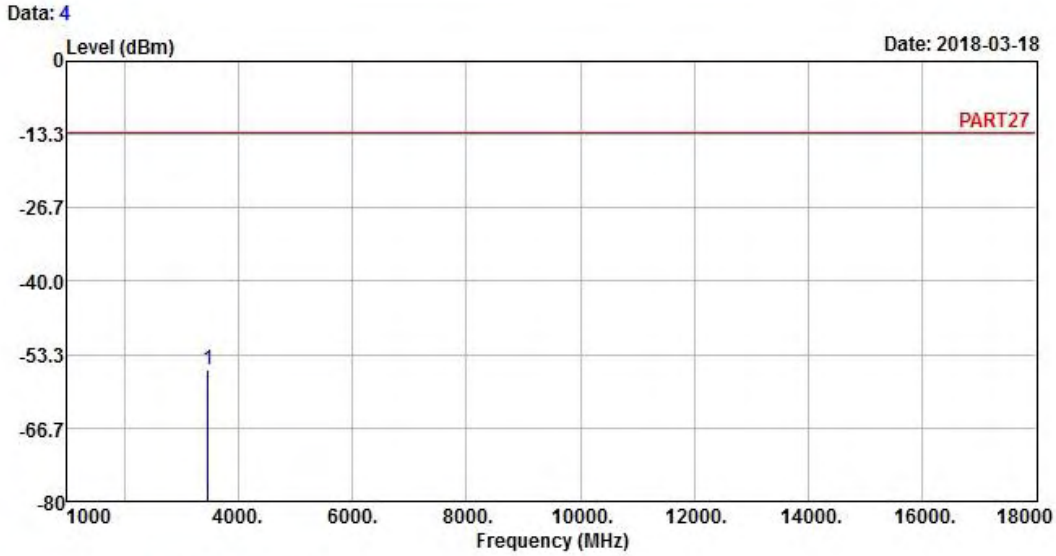
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remak : CAT_M1 Band 4 QPSK_20M Link_M-CH
Tested by: Jisyong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3465.00	-55.52	-46.61	-13.00	-42.52	-8.91	Peak

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



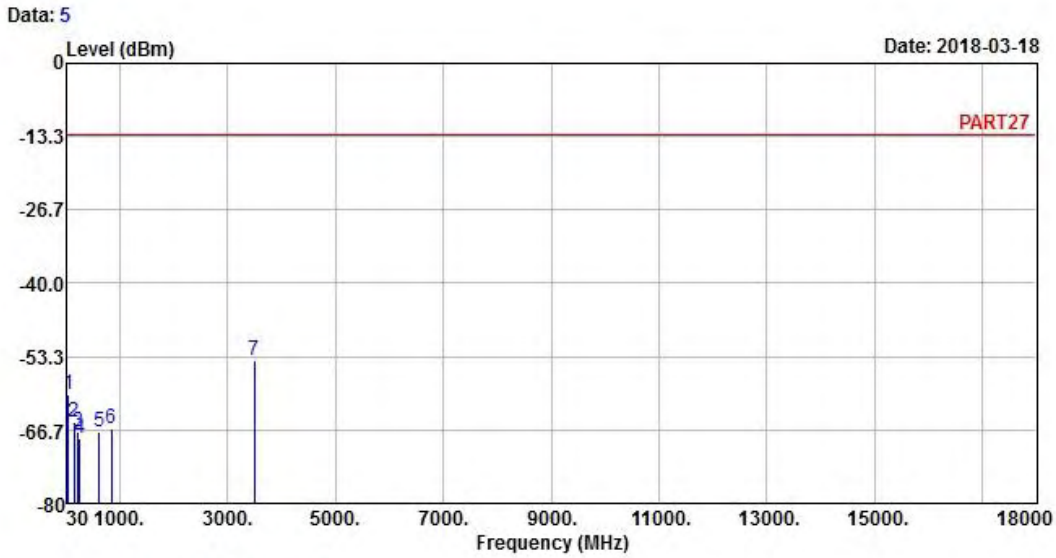
Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : CAT_M1 Band 4 QPSK_20M Link_M-CH
Tested by: Jisyong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3465.00	-56.02	-47.11	-13.00	-43.02	-8.91	Peak

High Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

A D T



Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remak : CAT_M1 Band 4 QPSK_20M Link_H-CH
Tested by: Jisyong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	53.28	-60.23	-54.42	-13.00	-47.23	-5.81	Peak
2	155.13	-65.38	-59.17	-13.00	-52.38	-6.21	Peak
3	234.67	-66.96	-60.34	-13.00	-53.96	-6.62	Peak
4	258.92	-68.31	-62.14	-13.00	-55.31	-6.17	Peak
5	617.82	-66.99	-66.19	-13.00	-53.99	-0.80	Peak
6	841.89	-66.40	-66.76	-13.00	-53.40	0.36	Peak
7 pp	3490.00	-54.01	-45.50	-13.00	-41.01	-8.51	Peak

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

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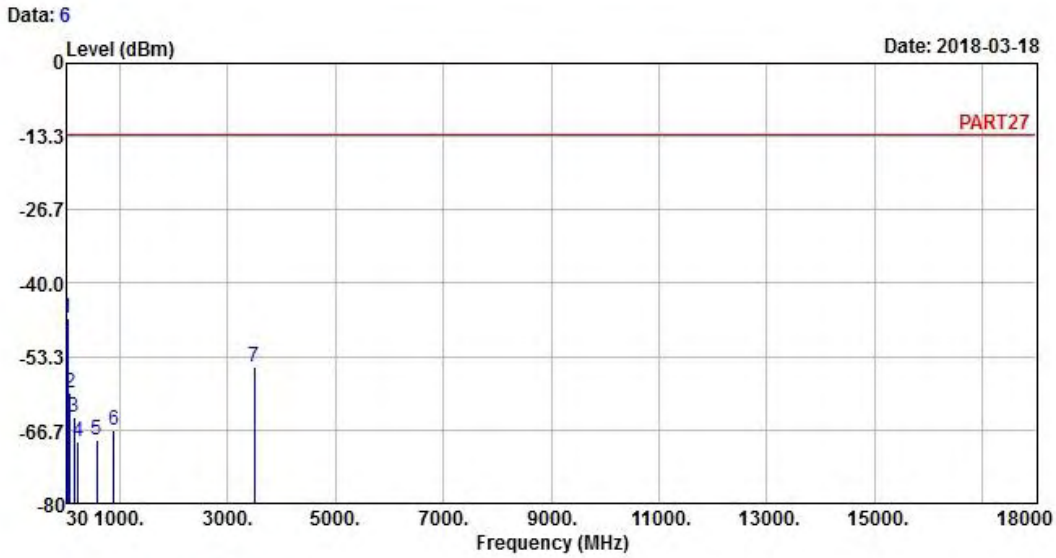


Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : CAT_M1 Band 4 QPSK_20M Link_H-CH
Tested by: Jisyong Wang

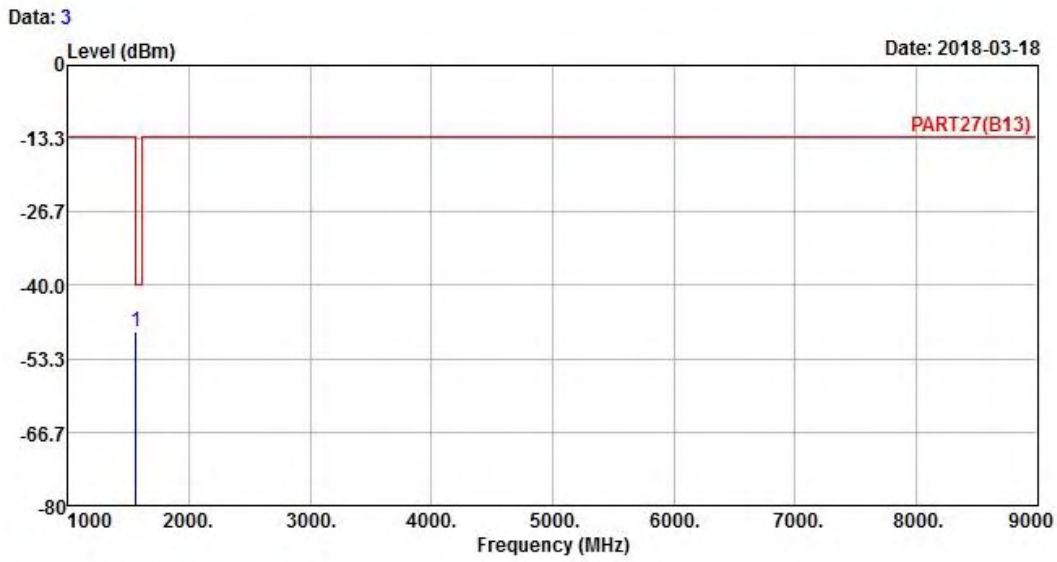
	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	39.70	-46.22	-46.86	-13.00	-33.22	0.64	Peak
2	84.32	-59.98	-49.01	-13.00	-46.98	-10.97	Peak
3	153.19	-64.47	-57.71	-13.00	-51.47	-6.76	Peak
4	237.58	-68.77	-62.27	-13.00	-55.77	-6.50	Peak
5	570.29	-68.44	-66.44	-13.00	-55.44	-2.00	Peak
6	893.30	-66.58	-67.11	-13.00	-53.58	0.53	Peak
7	3490.00	-55.14	-46.63	-13.00	-42.14	-8.51	Peak

LTE Band 13

Channel Bandwidth: 5 MHz / QPSK (1RB / 0RB Offset)

Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

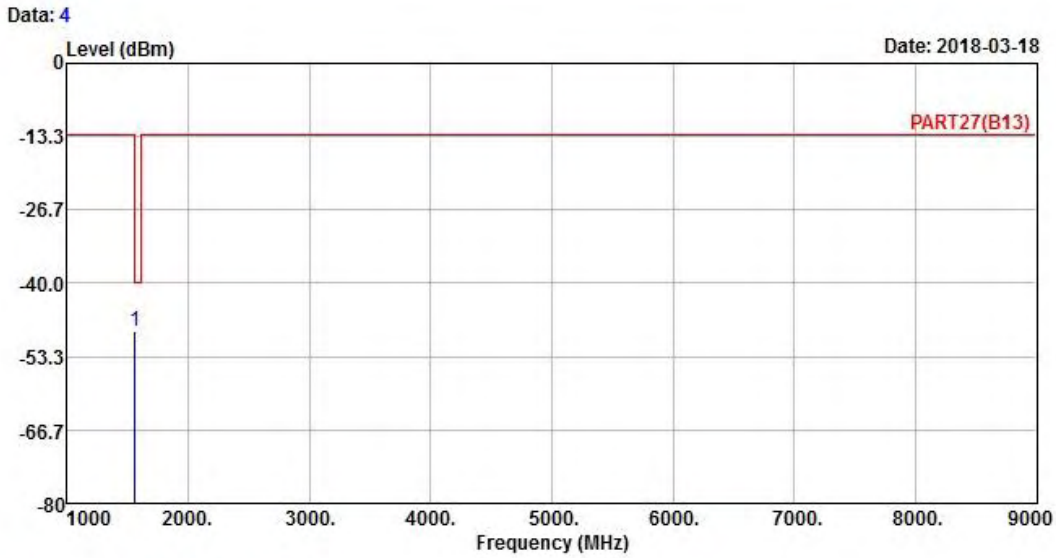


Site : 966 Chamber 5
Condition: PART27(B13) HORIZONTAL
Remak : CAT_M1 Band 13 QPSK_5M Link_L-CH
Tested by: Jistong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1559.00	-48.40	-33.38	-40.00	-8.40	-15.02	Peak

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

A D T

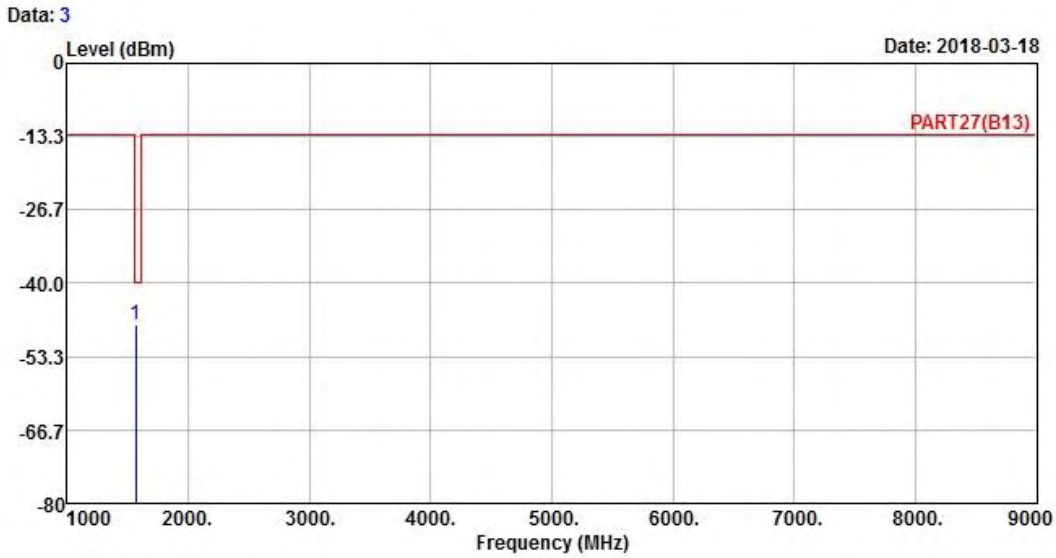


Site : 966 Chamber 5
Condition: PART27(B13) VERTICAL
Remak : CAT_M1 Band 13 QPSK_5M Link_L-CH
Tested by: Jistong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1559.00	-48.81	-33.79	-40.00	-8.81	-15.02	Peak

Middle Channel

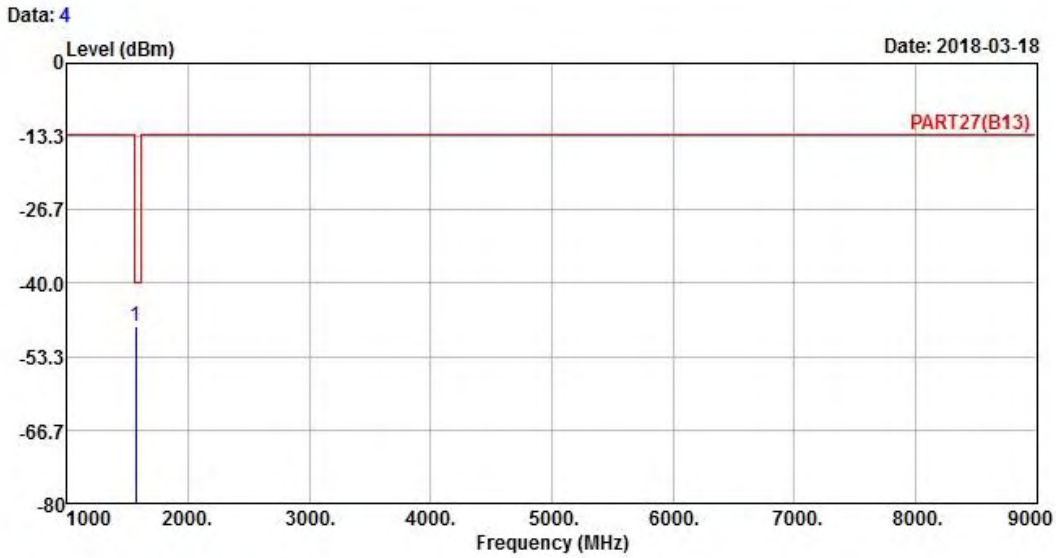
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27(B13) HORIZONTAL
Remak : CAT_M1 Band 13 QPSK_5M Link_M-CH
Tested by: Jistong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1564.00	-47.40	-32.38	-40.00	-7.40	-15.02	Peak

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

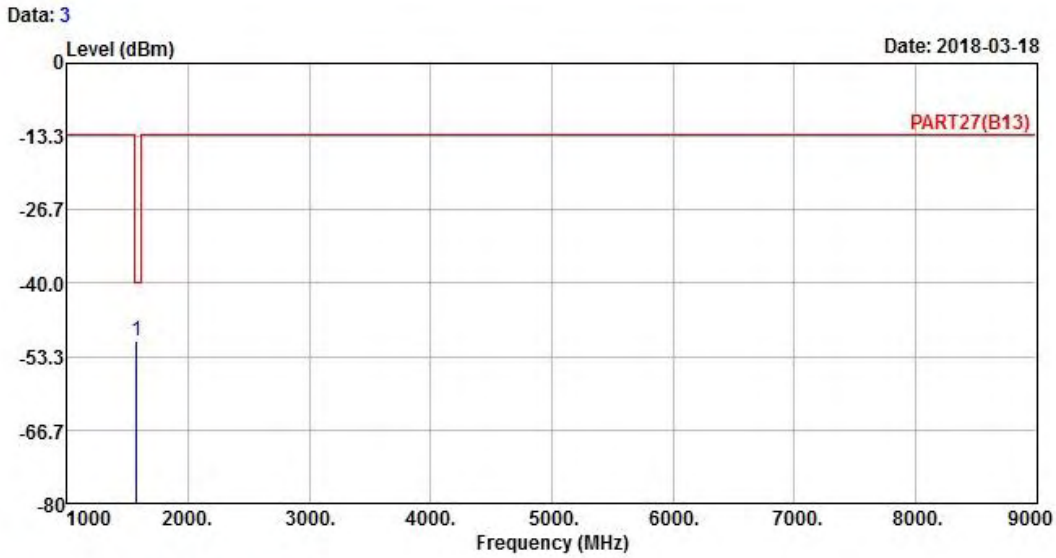


Site : 966 Chamber 5
Condition: PART27(B13) VERTICAL
Remak : CAT_M1 Band 13 QPSK_5M Link_M-CH
Tested by: Jistong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1564.00	-47.81	-32.79	-40.00	-7.81	-15.02	Peak

High Channel

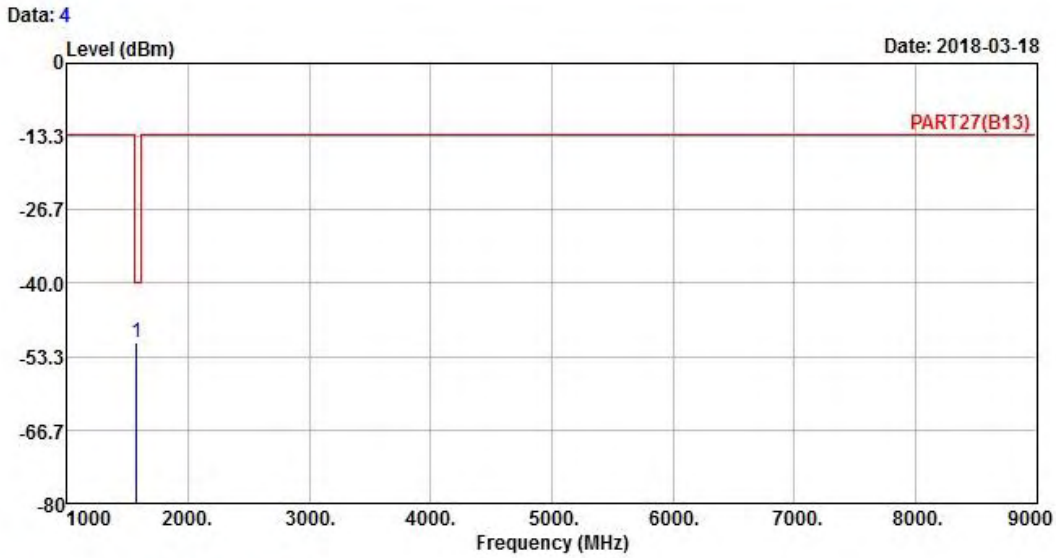
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27(B13) HORIZONTAL
Remak : CAT_M1 Band 13 QPSK_5M Link_H-CH
Tested by: Jistong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1569.00	-50.40	-35.44	-40.00	-10.40	-14.96	Peak

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



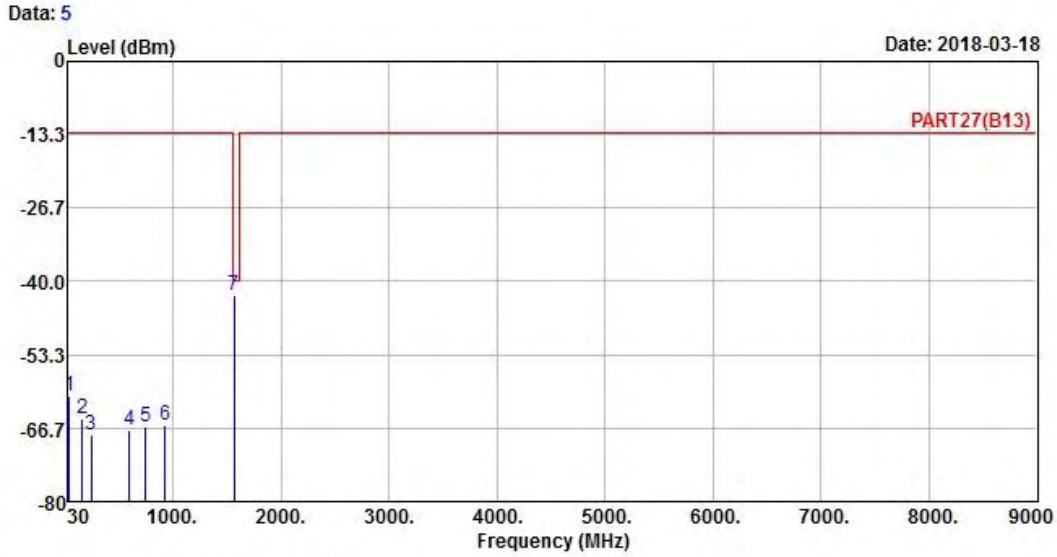
Site : 966 Chamber 5
Condition: PART27(B13) VERTICAL
Remak : CAT_M1 Band 13 QPSK_5M Link_H-CH
Tested by: Jistong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1569.00	-50.81	-35.85	-40.00	-10.81	-14.96	Peak

Channel Bandwidth: 10 MHz / QPSK (1RB / 0RB Offset)
Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

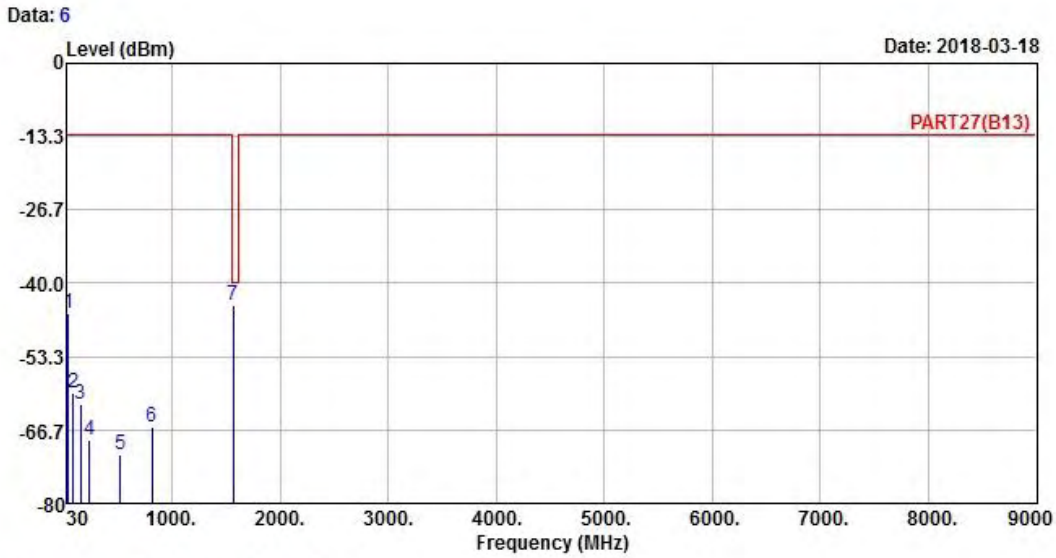
A D T



Site : 966 Chamber 5
Condition: PART27(B13) HORIZONTAL
Remak : CAT_M1 Band 13 QPSK_10M Link_M-CH
Tested by: Jistong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	42.61	-60.75	-59.81	-13.00	-47.75	-0.94	Peak
2	159.01	-64.89	-59.77	-13.00	-51.89	-5.12	Peak
3	240.49	-67.96	-61.58	-13.00	-54.96	-6.38	Peak
4	599.39	-66.97	-66.18	-13.00	-53.97	-0.79	Peak
5	743.92	-66.47	-67.23	-13.00	-53.47	0.76	Peak
6	926.28	-66.24	-67.46	-13.00	-53.24	1.22	Peak
7 pp	1564.00	-42.52	-27.50	-40.00	-2.52	-15.02	Peak

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27(B13) VERTICAL
Remak : CAT_M1 Band 13 QPSK_10M Link_M-CH
Tested by: Jistong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	39.70	-45.49	-46.13	-13.00	-32.49	0.64	Peak
2	84.32	-59.91	-48.94	-13.00	-46.91	-10.97	Peak
3	153.19	-61.98	-55.22	-13.00	-48.98	-6.76	Peak
4	236.61	-68.40	-61.86	-13.00	-55.40	-6.54	Peak
5	518.88	-71.06	-67.11	-13.00	-58.06	-3.95	Peak
6	813.76	-66.11	-66.72	-13.00	-53.11	0.61	Peak
7 pp	1564.00	-44.05	-29.03	-40.00	-4.05	-15.02	Peak

Channel Bandwidth: 5 MHz / QPSK (6RB / 0RB Offset)
Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

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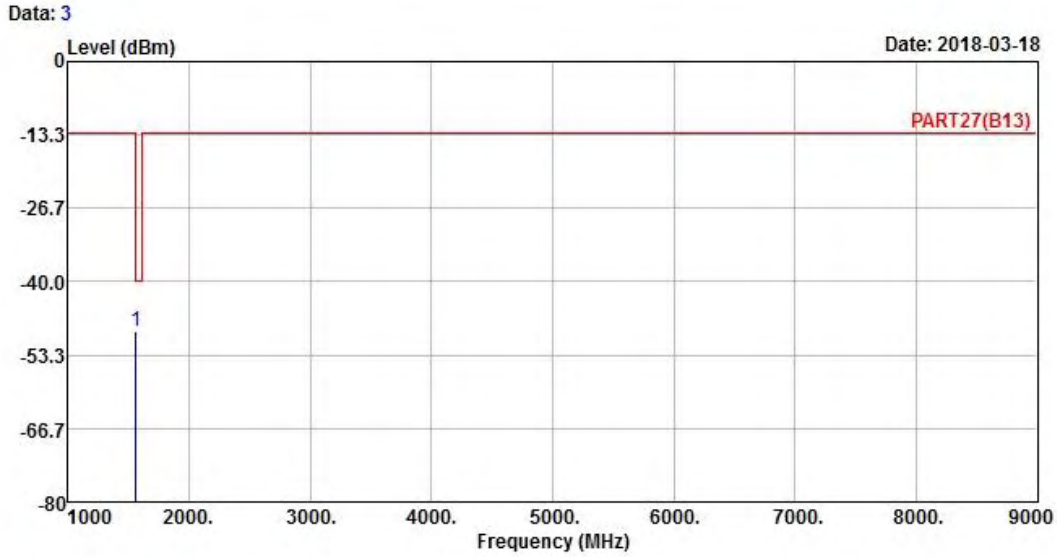
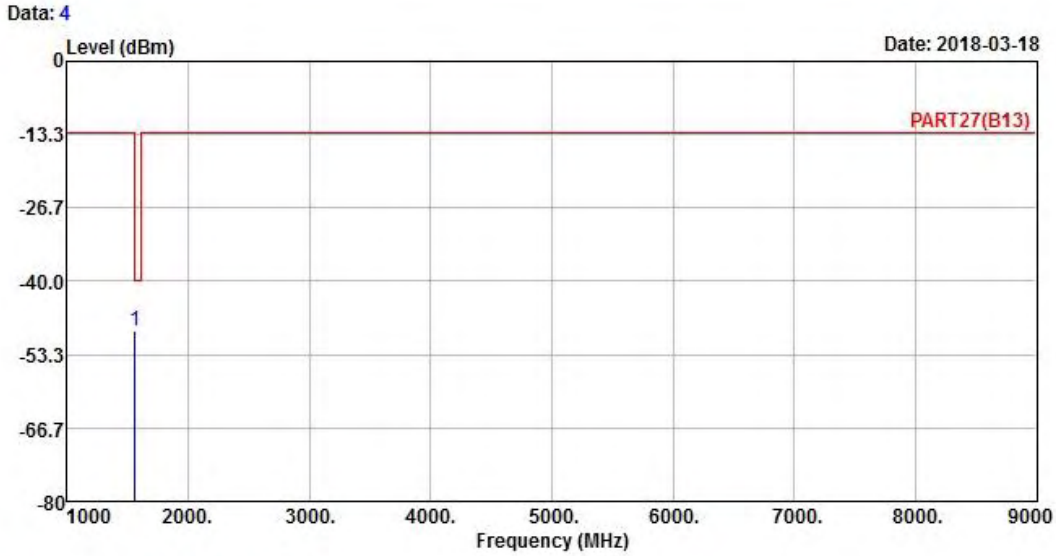


Site : 966 Chamber 5
Condition: PART27(B13) HORIZONTAL
Remak : CAT_M1 Band 13 QPSK_5M Link_L-CH
Tested by: Jistong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1559.00	-48.87	-33.85	-40.00	-8.87	-15.02	Peak

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

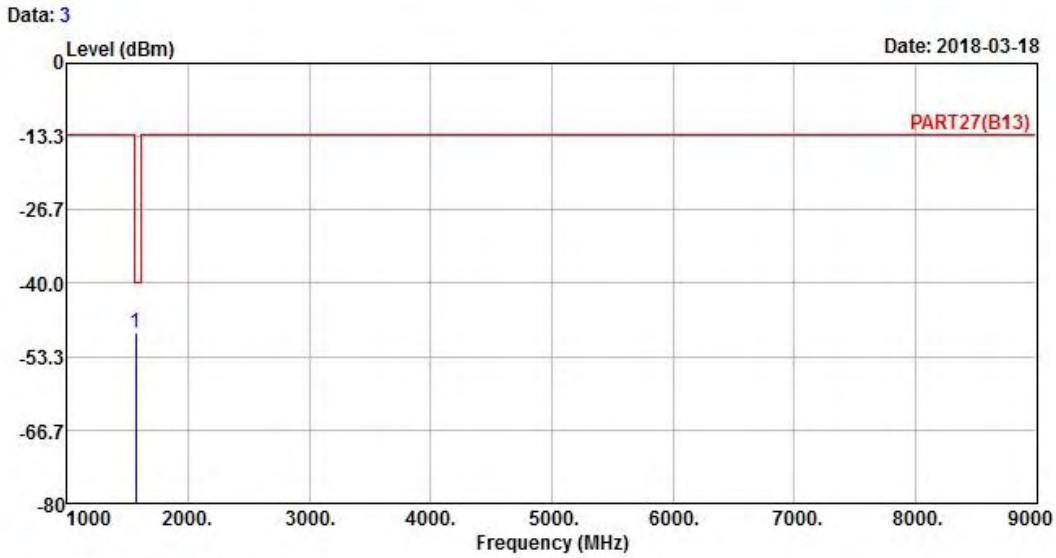


Site : 966 Chamber 5
Condition: PART27(B13) VERTICAL
Remak : CAT_M1 Band 13 QPSK_5M Link_L-CH
Tested by: Jistong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1559.00	-49.03	-34.01	-40.00	-9.03	-15.02	Peak

Middle Channel

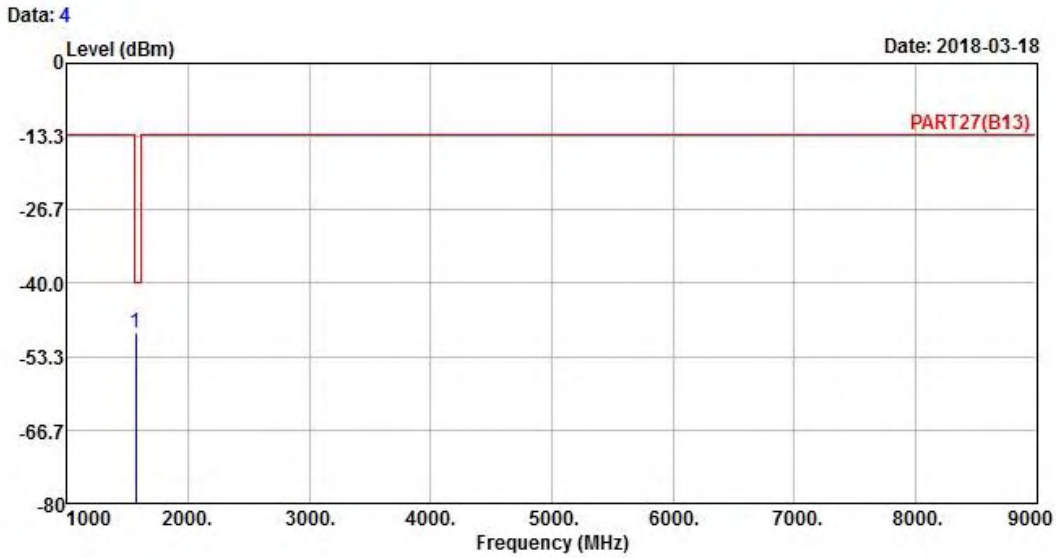
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27(B13) HORIZONTAL
Remak : CAT_M1 Band 13 QPSK_5M Link_M-CH
Tested by: Jistong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1564.00	-49.00	-33.98	-40.00	-9.00	-15.02	Peak

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

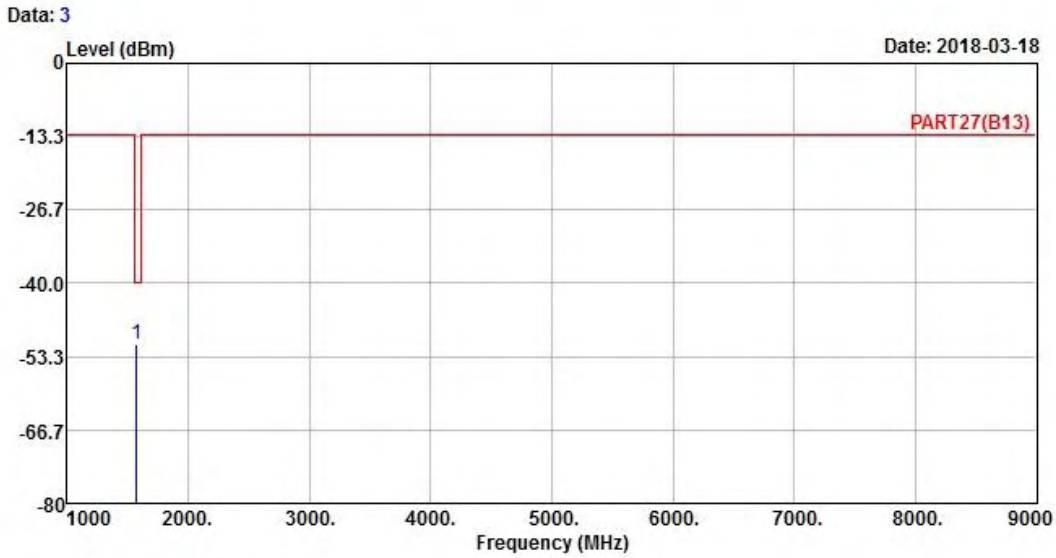


Site : 966 Chamber 5
Condition: PART27(B13) VERTICAL
Remak : CAT_M1 Band 13 QPSK_5M Link_M-CH
Tested by: Jistong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1564.00	-48.93	-33.91	-40.00	-8.93	-15.02	Peak

High Channel

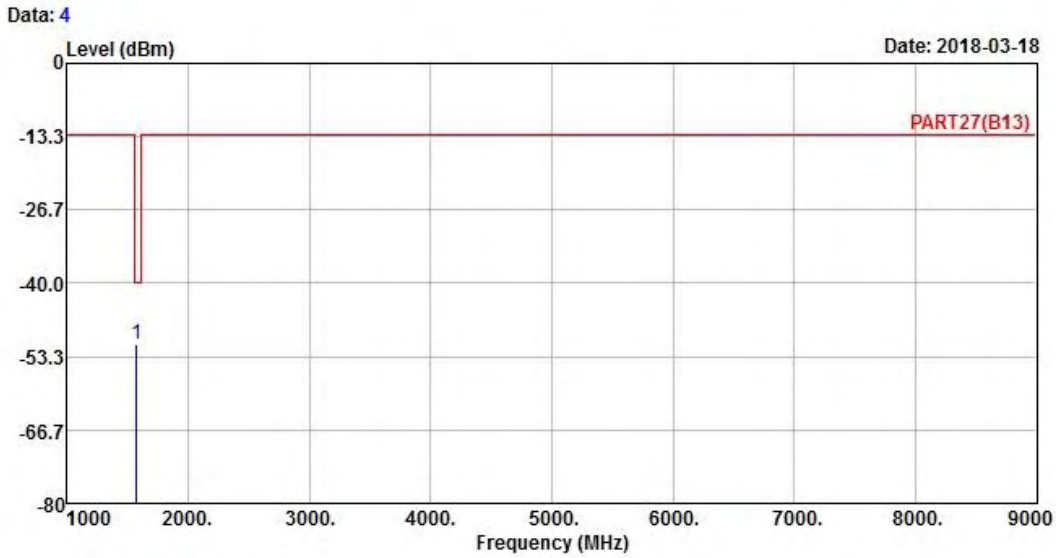
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27(B13) HORIZONTAL
Remak : CAT_M1 Band 13 QPSK_5M Link_H-CH
Tested by: Jistong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1569.00	-50.94	-35.98	-40.00	-10.94	-14.96	Peak

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



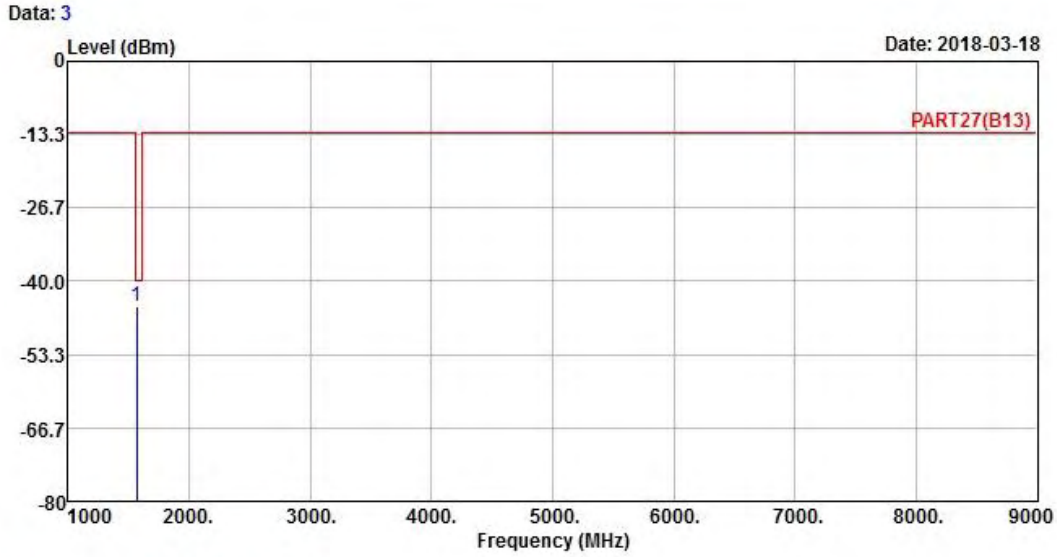
Site : 966 Chamber 5
Condition: PART27(B13) VERTICAL
Remak : CAT_M1 Band 13 QPSK_5M Link_H-CH
Tested by: Jistong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1569.00	-51.21	-36.25	-40.00	-11.21	-14.96	Peak

Channel Bandwidth: 10 MHz / QPSK (6RB / 0RB Offset)
Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

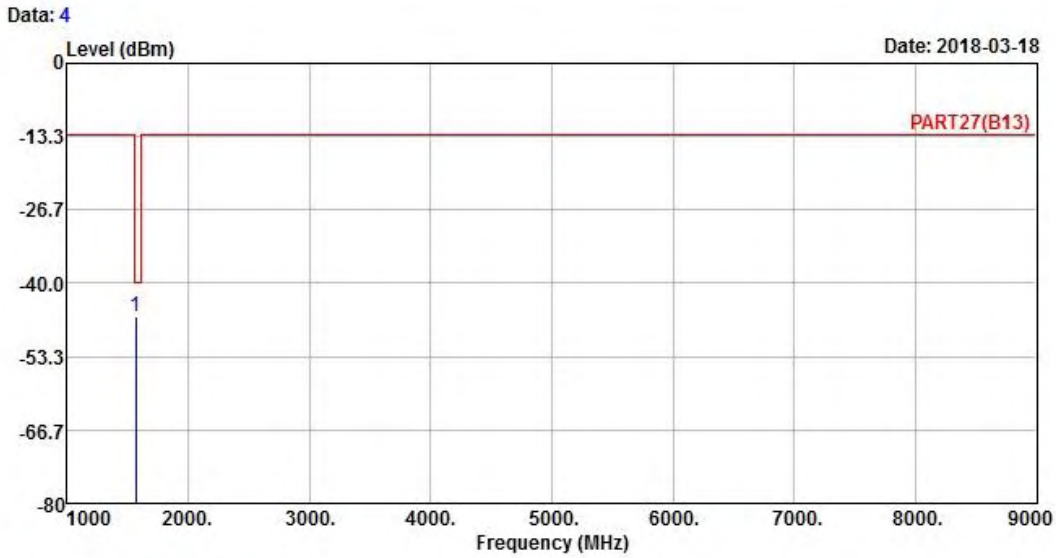
A D T



Site : 966 Chamber 5
Condition: PART27(B13) HORIZONTAL
Remak : CAT_M1 Band 13 QPSK_10M Link_M-CH
Tested by: Jistong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1564.00	-44.52	-29.50	-40.00	-4.52	-15.02	Peak

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27(B13) VERTICAL
Remak : CAT_M1 Band 13 QPSK_10M Link_M-CH
Tested by: Jistong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1564.00	-46.05	-31.03	-40.00	-6.05	-15.02	Peak

5 Pictures of Test Arrangements

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

Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are 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:

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

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

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

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

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

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