

FCC Test Report

(PART 22)

Report No.: RF180723C02

FCC ID: XIA-NTC100

Test Model: NTC-100, NTC-100G

Received Date: Jan. 12, 2018

Test Date: Jun. 15, 2018 ~ Jul. 31, 2018

Issued Date: Sep. 20, 2018

Applicant: NetComm Wireless Limited

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

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(R.O.C)

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33383, Taiwan (R.O.C)

**FCC Registration /
Designation Number:** 788550 / TW0003



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Release Control Record

Issue No.	Description	Date Issued
RF180723C02	Original Release	Sep. 20, 2018

1 Certificate of Conformity

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

Brand:  NetCommWireless

Test Model: NTC-100, NTC-100G

Applicant: NetComm Wireless Limited

Test Date: Jun. 15, 2018 ~ Jul. 31, 2018

Standards: FCC Part 22, Subpart H

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

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

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

2 Summary of Test Results

Applied Standard: FCC Part 22 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 22.913 (a)	Effective Radiated Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement.
---	Peak to Average Ratio	Pass	Meet the requirement of limit.
2.1055 22.355	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth	Pass	Meet the requirement of limit.
22.917	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 22.917	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 22.917	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -32.84 dB at 42.69 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	Expanded Uncertainty (k=2) (±)
Radiated Emissions up to 1 GHz	30 MHz ~ 200 MHz	2.93 dB
	200 MHz ~ 1000 MHz	2.95 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB

2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY51210129	Feb. 06, 2018	Feb. 05, 2019
Spectrum Analyzer Agilent	N9010A	MY52220314	Nov. 24, 2017	Nov. 23, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	100115	Nov. 23, 2017	Nov. 22, 2018
Horn Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Dec. 12, 2017	Dec. 11, 2018
BILOG Antenna SCHWARZBECK	VULB 9168	9168-472	Dec. 06, 2017	Dec. 05, 2018
MXG Vector signal generator Agilent	N5182B	MY53050430	Oct. 24, 2017	Oct. 23, 2018
Preamplifier EMCI	EMC 012645	980115	Oct. 20, 2017	Oct. 19, 2018
Preamplifier EMCI	EMC 184045	980116	Oct. 20, 2017	Oct. 19, 2018
Preamplifier EMCI	EMC 330H	980112	Oct. 13, 2017	Oct. 12, 2018
Power Meter Anritsu	ML2495A	1012010	Aug. 15, 2017	Aug. 14, 2018
Power Sensor Anritsu	MA2411B	1315050	Aug. 15, 2017	Aug. 14, 2018
RF Coaxial Cable HUBER+SUHNNER	EMC104-SM-SM-800 0&3000	140811+170717	Oct. 20, 2017	Oct. 19, 2018
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM- 1000(140807)	Oct. 20, 2017	Oct. 19, 2018
RF Coaxial Cable Worken	8D-FB	Cable-Ch10-01	Oct. 20, 2017	Oct. 19, 2018
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	NA	NA	NA
Radio Communication Analyzer	MT8821C	6261786083	Dec. 21, 2017	Dec. 20, 2018
Temperature & Humidity Chamber	GTH-120-40-CP-AR	MAA1306-019	Sep. 08, 2017	Sep. 07, 2018
DC Power Supply Topward	33010D	807748	Oct. 25, 2016	Oct. 24, 2018
Digital Multimeter Fluke	87-III	70360742	Jun. 29, 2018	Jun. 28, 2019

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

3 General Information

3.1 General Description of EUT

Product	4G LTE Cat M1 / NB1 Industrial IoT Serial Modem		
Brand	 NetCommWireless		
Test Model	NTC-100, NTC-100G		
EUT Rating	Rated Voltage :4.5~36VDC Rated Current :0.23~0.03A		
Modulation Type	Cat-M1	QPSK, 16QAM	
	NB-IOT	BPSK, QPSK	
Frequency Range	Cat-M1	LTE 5 (Channel Bandwidth: 1.4 MHz)	824.7 ~ 848.3 MHz
		LTE 5 (Channel Bandwidth: 3 MHz)	825.5 ~ 847.5 MHz
		LTE 5 (Channel Bandwidth: 5 MHz)	826.5 ~ 846.5 MHz
		LTE 5 (Channel Bandwidth: 10 MHz)	829 ~ 844 MHz
	NB-IOT	LTE 5	824.1 ~ 848.9 MHz
Max. ERP Power	Cat-M1	LTE 5 (Channel Bandwidth: 1.4 MHz)	162.93 mW
		LTE 5 (Channel Bandwidth: 3 MHz)	173.38 mW
		LTE 5 (Channel Bandwidth: 5 MHz)	185.35 mW
		LTE 5 (Channel Bandwidth: 10 MHz)	198.61 mW
	NB-IOT	LTE 5	154.88 mW
Emission Designator	Cat-M1	LTE 5 (Channel Bandwidth: 1.4 MHz)	1M09W7D
		LTE 5 (Channel Bandwidth: 3 MHz)	1M08G7D
		LTE 5 (Channel Bandwidth: 5 MHz)	1M08G7D
		LTE 5 (Channel Bandwidth: 10 MHz)	1M09G7D
	NB-IOT	LTE 5	1K85G7D
Antenna Type	Dipole Antenna with 3.13 dBi gain		

Note:

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

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

* The model "NTC-100" was chosen for final test.

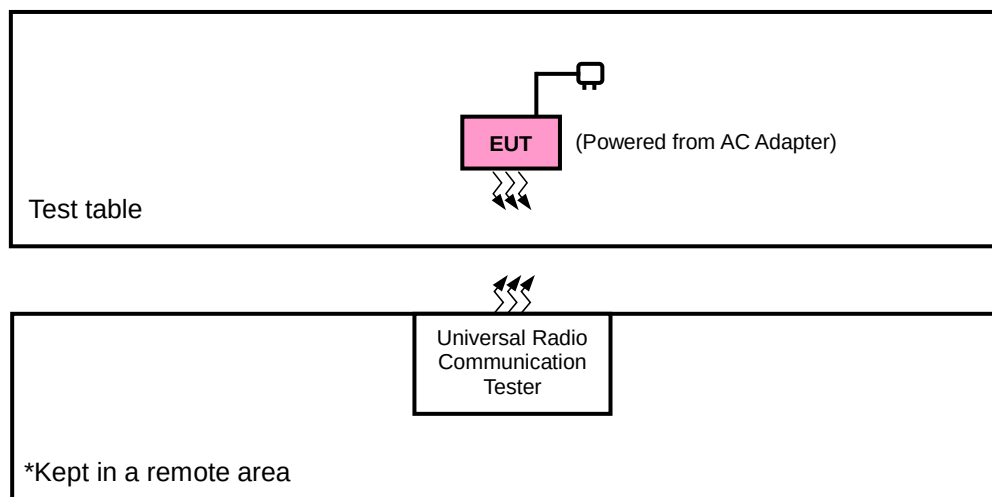
2. The EUT contains following accessory devices.

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

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

3.2 Configuration of System under Test

<Radiated Emission Test / E.R.P. Test >



3.2.1 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units.

3.3 Test Mode Applicability and Tested Channel Detail

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

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

Band	ERP	Radiated Emission
LTE Band 5	Z-plane	Z-axis

Cat-M1

LTE Band 5

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	ERP	20407 to 20643	20407, 20525, 20643	1.4 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20415 to 20635	20415, 20525, 20635	3 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20425 to 20625	20425, 20525, 20625	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20450 to 20600	20450, 20525, 20600	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Modulation Characteristics	20425 to 20625	20525	5 MHz	QPSK, 16QAM	6 RB / 0 RB Offset, 5 RB / 0 RB Offset
-	Frequency Stability	20407 to 20643	20407, 20643	1.4 MHz	QPSK	1 RB / 0 RB Offset
		20415 to 20635	20415, 20635	3 MHz	QPSK	1 RB / 0 RB Offset
		20425 to 20625	20425, 20625	5 MHz	QPSK	1 RB / 0 RB Offset
		20450 to 20600	20450, 20600	10 MHz	QPSK	1 RB / 0 RB Offset
-	Occupied Bandwidth	20407 to 20643	20407, 20525, 20643	1.4 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		20415 to 20635	20415, 20525, 20635	3 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		20425 to 20625	20425, 20525, 20625	5 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		20450 to 20600	20450, 20525, 20600	10 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
-	Band Edge	20407 to 20643	20407	1.4MHz	QPSK	1 RB / 0 RB Offset 6 RB / 0 RB Offset
			20643	1.4MHz	QPSK	1 RB / 5 RB Offset 6 RB / 0 RB Offset
		20415 to 20635	20415	3 MHz	QPSK	1 RB / 0 RB Offset 6 RB / 0 RB Offset
			20635	3 MHz	QPSK	1 RB / 5 RB Offset 6 RB / 0 RB Offset
		20425 to 20625	20425	5 MHz	QPSK	1 RB / 0 RB Offset 6 RB / 0 RB Offset
			20625	5 MHz	QPSK	1 RB / 5 RB Offset 6 RB / 0 RB Offset
		20450 to 20600	20450	10 MHz	QPSK	1 RB / 0 RB Offset 6 RB / 0 RB Offset
			20600	10 MHz	QPSK	1 RB / 5 RB Offset 6 RB / 0 RB Offset

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	Peak to Average Ratio	20407 to 20643	20407, 20525, 20643	1.4 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		20415 to 20635	20415, 20525, 20635	3 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		20425 to 20625	20425, 20525, 20625	5 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		20450 to 20600	20450, 20525, 20600	10 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
-	Conducted Emission	20407 to 20643	20407, 20525, 20643	1.4 MHz	QPSK	1 RB / 0 RB Offset
		20415 to 20635	20415, 20525, 20635	3 MHz	QPSK	1 RB / 0 RB Offset
		20425 to 20625	20425, 20525, 20625	5 MHz	QPSK	1 RB / 0 RB Offset
		20450 to 20600	20450, 20525, 20600	10 MHz	QPSK	1 RB / 0 RB Offset
-	Radiated Emission Above 1 GHz	20407 to 20643	20407, 20525, 20643	1.4 MHz	QPSK	1 RB / 0 RB Offset
		20415 to 20635	20415, 20525, 20635	3 MHz	QPSK	1 RB / 0 RB Offset
		20425 to 20625	20425, 20525, 20625	5 MHz	QPSK	1 RB / 0 RB Offset
		20450 to 20600	20450, 20525, 20600	10 MHz	QPSK	1 RB / 0 RB Offset
-	Radiated Emission Below 1 GHz	20450 to 20600	20600	10 MHz	QPSK	1 RB / 0 RB Offset

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

NB-IOT
LTE Band 5

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Sub-carrier spacing	Modulation	Mode
-	ERP	24041 to 20649	24041, 20525, 20649	3.75 kHz	BPSK	1 RB / 0 RB Offset
		24041 to 20649	24041, 20525, 20649	15 kHz	QPSK	3 RB / 3 RB Offset
-	Frequency Stability	24041 to 20649	24041, 20525, 20649	3.75 kHz	BPSK	1 RB / 0 RB Offset
		24041 to 20649	24041, 20525, 20649	15 kHz	QPSK	3 RB / 3 RB Offset
-	Occupied Bandwidth	24041 to 20649	24041, 20525, 20649	3.75 kHz	BPSK	1 RB / 0 RB Offset
		24041 to 20649	24041, 20525, 20649	15 kHz	QPSK	1 RB / 0 RB Offset
						3 RB / 3 RB Offset
-	Band Edge	24041 to 20649	24041, 20649	3.75 kHz	BPSK	1 RB / 0 RB Offset
			24041, 20649	15 kHz	QPSK	1 RB / 0 RB Offset
						3 RB / 3 RB Offset
-	Peak to Average Ratio	24041 to 20649	20525	3.75 kHz	BPSK	1 RB / 0 RB Offset
				15 kHz	QPSK	1 RB / 0 RB Offset
						3 RB / 3 RB Offset
-	Conducted Emission	24041 to 20649	24041, 20525, 20649	15 kHz	QPSK	3 RB / 3 RB Offset
-	Radiated Emission Above 1 GHz	24041 to 20649	24041, 20525, 20649	15 kHz	QPSK	3 RB / 3 RB Offset
-	Radiated Emission Below 1 GHz	24041 to 20649	20525	15 kHz	QPSK	3 RB / 3 RB Offset

NOTE:

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

Test Condition:

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

3.4 EUT Operating Conditions

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

3.5 General Description of Applied Standards

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

FCC 47 CFR Part 2

FCC 47 CFR Part 22

KDB 971168 D01 Power Meas License Digital Systems v03r01

ANSI/TIA/EIA-603-E 2016

ANSI 63.26-2015

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

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

Mobile / Portable station are limited to 7 watts e.r.p.

4.1.2 Test Procedures

EIRP / ERP Measurement:

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

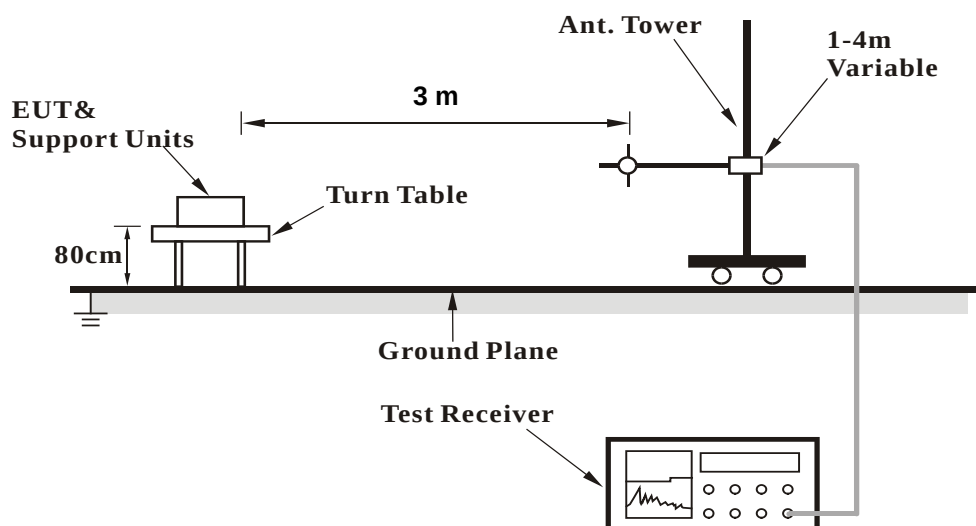
Conducted Power Measurement:

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

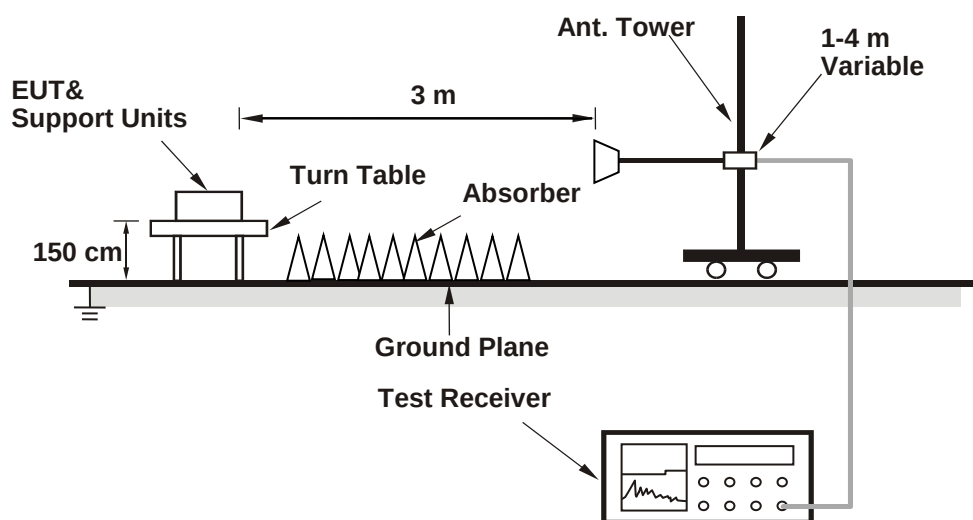
4.1.3 Test Setup

EIRP / ERP Measurement:

<Radiated Emission below or equal 1 GHz>

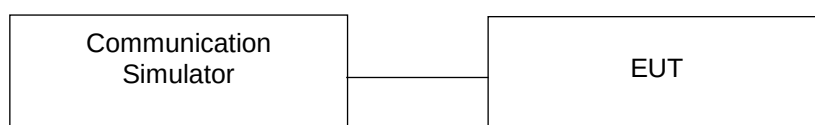


<Radiated Emission above 1 GHz>



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

Conducted Power Measurement:



4.1.4 Test Results

Conducted Output Power (dBm)

Cat-M1

eMTC	Band 5	Region(s):	FCC	Power:	Class 3	23	Tolerance:	2.7
------	--------	------------	-----	--------	---------	----	------------	-----

maximum:	23.34
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BW(MHz):	1.4
----------	-----

Test Frequency ID	N _{UL}	Frequency of Uplink [MHz]	N _{DL}	Frequency of Downlink [MHz]	Test Configuration Initial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	20407	824.7	2407	869.7	QPSK	1	0	0	-85	22.58
					QPSK	1	5	0	-85	22.34
					QPSK	3	3	0	-85	21.67
					QPSK	6	0	0	-85	20.7
					16QAM	1	0	0	-85	21.59
					16QAM	1	5	0	-85	22.31
					16QAM	3	0	0	-85	21.31
					16QAM	5	0	0	-85	21.2
Mid Range	20525	836.5	2525	881.5	QPSK	1	0	0	-85	22.72
					QPSK	1	5	0	-85	22.39
					QPSK	3	3	0	-85	21.76
					QPSK	6	0	0	-85	20.78
					16QAM	1	0	0	-85	21.74
					16QAM	1	5	0	-85	21.81
					16QAM	3	0	0	-85	21.37
					16QAM	5	0	0	-85	21.18
High Range	20643	848.3	2643	893.3					-85	
					QPSK	1	0	0	-85	23.34
					QPSK	1	5	0	-85	22.63
					QPSK	3	3	0	-85	21.98
					QPSK	6	0	0	-85	20.92
					16QAM	1	0	0	-85	22.31
					16QAM	1	5	0	-85	22.28
					16QAM	3	0	0	-85	21.31
					16QAM	5	0	0	-85	21.5

BW(MHz):		3								
Test Frequency ID	N _{UL}	Frequency of Uplink [MHz]	N _{DL}	Frequency of Downlink [MHz]	Test Configuration Initial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	20415	825.5	2415	870.5	QPSK	1	0	0	-85	22.55
					QPSK	1	5	0	-85	22.37
					QPSK	1	0	1	-85	22.45
					QPSK	1	5	1	-85	22.35
					QPSK	3	3	0	-85	21.78
					QPSK	3	3	1	-85	21.84
					QPSK	6	0	0	-85	20.85
					QPSK	6	0	1	-85	20.67
					16QAM	1	0	0	-85	22.01
					16QAM	1	5	0	-85	22.05
					16QAM	1	0	1	-85	22.07
					16QAM	1	5	1	-85	22.02
					16QAM	3	0	0	-85	21.11
					16QAM	3	3	1	-85	20.98
					16QAM	5	0	0	-85	21.47
					16QAM	5	0	1	-85	21.35
Mid Range	20525	836.5	2525	881.5	QPSK	1	0	0	-85	22.43
					QPSK	1	5	0	-85	22.41
					QPSK	1	0	1	-85	22.45
					QPSK	1	5	1	-85	22.52
					QPSK	3	3	0	-85	21.91
					QPSK	3	3	1	-85	21.76
					QPSK	6	0	0	-85	20.89
					QPSK	6	0	1	-85	20.76
					16QAM	1	0	0	-85	22.13
					16QAM	1	5	0	-85	22.27
					16QAM	1	0	1	-85	22.04
					16QAM	1	5	1	-85	21.39
					16QAM	3	0	0	-85	21.17
					16QAM	3	3	1	-85	21.13
					16QAM	5	0	0	-85	21.41
					16QAM	5	0	1	-85	21.29
High Range	20635	847.5	2635	892.5					-85	
					QPSK	1	0	0	-85	22.69
					QPSK	1	5	0	-85	22.67
					QPSK	1	0	1	-85	22.57
					QPSK	1	5	1	-85	22.68

					QPSK	3	3	0	-85	22.1
					QPSK	3	3	1	-85	22.05
					QPSK	6	0	0	-85	21.01
					QPSK	6	0	1	-85	20.92
					16QAM	1	0	0	-85	22.41
					16QAM	1	5	0	-85	22.34
					16QAM	1	0	1	-85	22.69
					16QAM	1	5	1	-85	22.79
					16QAM	3	0	0	-85	21.28
					16QAM	3	3	1	-85	21.99
					16QAM	5	0	0	-85	21.51
					16QAM	5	0	1	-85	22.03

BW(MHz): 5

Test Frequency ID	N _{UL}	Frequency of Uplink [MHz]	N _{DL}	Frequency of Downlink [MHz]	Test Configuration Initial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	20425	826.5	2425	871.5	QPSK	1	0	0	-85	22.57
					QPSK	1	5	0	-85	22.3
					QPSK	1	0	1	-85	22.71
					QPSK	1	5	1	-85	22.66
					QPSK	1	0	3	-85	22.76
					QPSK	1	5	3	-85	22.68
					QPSK	3	0	0	-85	21.87
					QPSK	3	3	3	-85	21.82
					QPSK	6	0	0	-85	21.82
					QPSK	6	0	1	-85	21.77
					QPSK	6	0	3	-85	21.87
					16QAM	1	0	0	-85	23.04
					16QAM	1	5	0	-85	23.16
					16QAM	1	0	1	-85	23.1
					16QAM	1	5	1	-85	23.03
					16QAM	1	0	3	-85	23.11
					16QAM	1	5	3	-85	22.99
					16QAM	3	0	0	-85	22.11
					16QAM	3	3	3	-85	22.14
					16QAM	5	0	0	-85	21.28
					16QAM	5	0	1	-85	21.71
					16QAM	5	0	3	-85	21.95
Mid Range	20525	836.5	2525	881.5	QPSK	1	0	0	-85	22.66
					QPSK	1	5	0	-85	22.65

					QPSK	1	0	1	-85	22.52
					QPSK	1	5	1	-85	22.68
					QPSK	1	0	3	-85	22.52
					QPSK	1	5	3	-85	22.65
					QPSK	3	0	0	-85	21.92
					QPSK	3	3	3	-85	21.81
					QPSK	6	0	0	-85	22.03
					QPSK	6	0	1	-85	21.92
					QPSK	6	0	3	-85	21.99
					16QAM	1	0	0	-85	23.14
					16QAM	1	5	0	-85	23.21
					16QAM	1	0	1	-85	22.86
					16QAM	1	5	1	-85	22.91
					16QAM	1	0	3	-85	22.27
					16QAM	1	5	3	-85	23.01
					16QAM	3	0	0	-85	22.28
					16QAM	3	3	3	-85	22.03
					16QAM	5	0	0	-85	21.3
					16QAM	5	0	1	-85	21.07
					16QAM	5	0	3	-85	21.09
High Range	20625	846.5	2625	891.5					-85	
					QPSK	1	0	0	-85	22.61
					QPSK	1	5	0	-85	22.87
					QPSK	1	0	1	-85	22.72
					QPSK	1	5	1	-85	22.78
					QPSK	1	0	3	-85	22.76
					QPSK	1	5	3	-85	22.72
					QPSK	3	0	0	-85	22.01
					QPSK	3	3	3	-85	21.97
					QPSK	6	0	0	-85	22.02
					QPSK	6	0	1	-85	22.05
					QPSK	6	0	3	-85	22.06
					16QAM	1	0	0	-85	23.21
					16QAM	1	5	0	-85	23.26
					16QAM	1	0	1	-85	23.07
					16QAM	1	5	1	-85	23.17
					16QAM	1	0	3	-85	23.15
					16QAM	1	5	3	-85	23.17
					16QAM	3	0	0	-85	22.4
					16QAM	3	3	3	-85	22.13
					16QAM	5	0	0	-85	21.42

					16QAM	5	0	1	-85	21.19
					16QAM	5	0	3	-85	21.25

BW(MHz):	10
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Test Frequency ID	N _{UL}	Frequency of Uplink [MHz]	N _{DL}	Frequency of Downlink [MHz]	Test Configuration Initial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	20450	829	2450	874	QPSK	1	0	0	-85	22.54
					QPSK	1	5	0	-85	22.53
					QPSK	1	0	3	-85	22.62
					QPSK	1	5	3	-85	22.64
					QPSK	1	0	7	-85	22.41
					QPSK	1	5	7	-85	22.68
					QPSK	4	0	0	-85	22.53
					QPSK	4	2	7	-85	22.61
					QPSK	6	0	0	-85	21.76
					QPSK	6	0	7	-85	21.95
					16QAM	1	0	0	-85	23.07
					16QAM	1	5	0	-85	23.31
					16QAM	1	0	3	-85	23.01
					16QAM	1	5	3	-85	23.08
					16QAM	1	0	7	-85	23.03
					16QAM	1	5	7	-85	22.71
					16QAM	4	2	0	-85	21.91
					16QAM	4	2	7	-85	22.04
					16QAM	5	0	0	-85	22.14
					16QAM	5	0	7	-85	21.87
Mid Range	20525	836.5	2525	881.5	QPSK	1	0	0	-85	22.62
					QPSK	1	5	0	-85	22.47
					QPSK	1	0	3	-85	22.42
					QPSK	1	5	3	-85	22.51
					QPSK	1	0	7	-85	22.64
					QPSK	1	5	7	-85	22.41
					QPSK	4	0	0	-85	22.47
					QPSK	4	2	7	-85	22.55
					QPSK	6	0	0	-85	21.78
					QPSK	6	0	7	-85	21.98
					16QAM	1	0	0	-85	23.12
					16QAM	1	5	0	-85	23.08
					16QAM	1	0	3	-85	23.01

					16QAM	1	5	3	-85	23.01
					16QAM	1	0	7	-85	23.15
					16QAM	1	5	7	-85	23.16
					16QAM	4	2	0	-85	21.95
					16QAM	4	2	7	-85	21.98
					16QAM	5	0	0	-85	22.23
					16QAM	5	0	7	-85	22.02
High Range	20600	844	2600	889					-85	
					QPSK	1	0	0	-85	22.59
					QPSK	1	5	0	-85	22.65
					QPSK	1	5	7	-85	22.91
					QPSK	1	0	3	-85	22.77
					QPSK	1	5	3	-85	22.88
					QPSK	1	0	7	-85	22.63
					QPSK	4	0	0	-85	22.61
					QPSK	4	2	7	-85	22.71
					QPSK	6	0	0	-85	21.95
					QPSK	6	0	7	-85	22.03
					16QAM	1	0	0	-85	23.26
					16QAM	1	5	0	-85	23.18
					16QAM	1	0	3	-85	23.01
					16QAM	1	5	3	-85	23.05
					16QAM	1	0	7	-85	23.06
					16QAM	1	5	7	-85	23.21
					16QAM	4	2	0	-85	22.15
					16QAM	4	2	7	-85	22.41
					16QAM	5	0	0	-85	22.37
					16QAM	5	0	7	-85	22.27

eMTC	Band 4	Region(s):	FCC	Power:	Class 3	23	Tolerance:	2.7
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maximum:	22.67
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BW(MHz):	1.4
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Test Frequency ID	N _{UL}	Frequency of Uplink [MHz]	N _{DL}	Frequency of Downlink [MHz]	Test Configuration Initial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	26797	824.7	8797	876.5	QPSK	1	0	0	-85	22.61
					QPSK	1	5	0	-85	22.67
					QPSK	3	3	0	-85	21.43
					QPSK	6	0	0	-85	20.51
					16QAM	1	0	0	-85	21.95
					16QAM	1	5	0	-85	21.36
					16QAM	3	0	0	-85	20.96
					16QAM	5	0	0	-85	20.74
Mid Range	26915	836.5	8915	888.3	QPSK	1	0	0	-85	22.38
					QPSK	1	5	0	-85	22.37
					QPSK	3	3	0	-85	21.47
					QPSK	6	0	0	-85	20.35
					16QAM	1	0	0	-85	21.34
					16QAM	1	5	0	-85	21.39
					16QAM	3	0	0	-85	21.03
					16QAM	5	0	0	-85	20.99
High Range	27033	848.3	9033	900.1						
					QPSK	1	0	0	-85	22.53
					QPSK	1	5	0	-85	22.18
					QPSK	3	3	0	-85	21.32
					QPSK	6	0	0	-85	20.39
					16QAM	1	0	0	-85	21.27
					16QAM	1	5	0	-85	21.31
					16QAM	3	0	0	-85	20.85
					16QAM	5	0	0	-85	21.11

BW(MHz):		3								
Test Frequency ID	N _{UL}	Frequency of Uplink [MHz]	N _{DL}	Frequency of Downlink [MHz]	Test Configuration Initial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	26805	825.5	8805	876.5	QPSK	1	0	0	-85	22.49
					QPSK	1	5	0	-85	22.46
					QPSK	1	0	1	-85	22.38
					QPSK	1	5	1	-85	22.33
					QPSK	3	3	0	-85	21.49
					QPSK	3	3	1	-85	21.37
					QPSK	6	0	0	-85	20.51
					QPSK	6	0	1	-85	20.46
					16QAM	1	0	0	-85	21.77
					16QAM	1	5	0	-85	21.62
					16QAM	1	0	1	-85	21.67
					16QAM	1	5	1	-85	21.56
					16QAM	3	0	0	-85	20.88
					16QAM	3	3	1	-85	20.75
					16QAM	5	0	0	-85	21.05
					16QAM	5	0	1	-85	21.03
Mid Range	26915	836.5	8915	887.5	QPSK	1	0	0	-85	22.35
					QPSK	1	5	0	-85	22.37
					QPSK	1	0	1	-85	22.26
					QPSK	1	5	1	-85	22.34
					QPSK	3	3	0	-85	21.51
					QPSK	3	3	1	-85	21.44
					QPSK	6	0	0	-85	20.55
					QPSK	6	0	1	-85	20.51
					16QAM	1	0	0	-85	21.84
					16QAM	1	5	0	-85	21.83
					16QAM	1	0	1	-85	21.7
					16QAM	1	5	1	-85	21.69
					16QAM	3	0	0	-85	20.86
					16QAM	3	3	1	-85	20.77
					16QAM	5	0	0	-85	21.09
					16QAM	5	0	1	-85	20.95
High Range	27025	847.5	9025	-4					-85	
					QPSK	1	0	0	-85	22.55
					QPSK	1	5	0	-85	22.34
					QPSK	1	0	1	-85	22.45
					QPSK	1	5	1	-85	22.2

					QPSK	3	3	0	-85	21.53
					QPSK	3	3	1	-85	21.39
					QPSK	6	0	0	-85	20.49
					QPSK	6	0	1	-85	20.44
					16QAM	1	0	0	-85	21.81
					16QAM	1	5	0	-85	21.75
					16QAM	1	0	1	-85	21.77
					16QAM	1	5	1	-85	21.61
					16QAM	3	0	0	-85	20.79
					16QAM	3	3	1	-85	20.72
					16QAM	5	0	0	-85	20.91
					16QAM	5	0	1	-85	20.81

BW(MHz): 5

Test Frequency ID	N _{UL}	Frequency of Uplink [MHz]	N _{DL}	Frequency of Downlink [MHz]	Test Configuration Initial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	26815	826.5	8815	876.5	QPSK	1	0	0	-85	22.27
					QPSK	1	5	0	-85	22.32
					QPSK	1	0	1	-85	22.23
					QPSK	1	5	1	-85	22.25
					QPSK	1	0	3	-85	22.19
					QPSK	1	5	3	-85	22.29
					QPSK	3	0	0	-85	21.49
					QPSK	3	3	3	-85	21.46
					QPSK	6	0	0	-85	21.32
					QPSK	6	0	1	-85	21.29
					QPSK	6	0	3	-85	21.23
					16QAM	1	0	0	-85	22.03
					16QAM	1	5	0	-85	21.97
					16QAM	1	0	1	-85	21.97
					16QAM	1	5	1	-85	21.89
					16QAM	1	0	3	-85	21.94
					16QAM	1	5	3	-85	21.84
					16QAM	3	0	0	-85	21.77
					16QAM	3	3	3	-85	21.66
					16QAM	5	0	0	-85	20.68
					16QAM	5	0	1	-85	20.59
					16QAM	5	0	3	-85	20.59
Mid Range	26915	836.5	8915	886.5	QPSK	1	0	0	-85	22.31
					QPSK	1	5	0	-85	22.44

					QPSK	1	0	1	-85	22.21
					QPSK	1	5	1	-85	22.33
					QPSK	1	0	3	-85	22.29
					QPSK	1	5	3	-85	22.4
					QPSK	3	0	0	-85	21.38
					QPSK	3	3	3	-85	21.32
					QPSK	6	0	0	-85	21.52
					QPSK	6	0	1	-85	21.43
					QPSK	6	0	3	-85	21.4
					16QAM	1	0	0	-85	22.13
					16QAM	1	5	0	-85	22.09
					16QAM	1	0	1	-85	22.02
					16QAM	1	5	1	-85	22.04
					16QAM	1	0	3	-85	22.01
					16QAM	1	5	3	-85	21.98
					16QAM	3	0	0	-85	21.79
					16QAM	3	3	3	-85	21.66
					16QAM	5	0	0	-85	20.91
					16QAM	5	0	1	-85	20.83
					16QAM	5	0	3	-85	20.86
High Range	27015	846.5	9015	896.5					-85	
					QPSK	1	0	0	-85	22.27
					QPSK	1	5	0	-85	22.41
					QPSK	1	0	1	-85	22.16
					QPSK	1	5	1	-85	22.34
					QPSK	1	0	3	-85	22.21
					QPSK	1	5	3	-85	22.31
					QPSK	3	0	0	-85	21.44
					QPSK	3	3	3	-85	21.33
					QPSK	6	0	0	-85	21.52
					QPSK	6	0	1	-85	21.42
					QPSK	6	0	3	-85	21.44
					16QAM	1	0	0	-85	22.13
					16QAM	1	5	0	-85	22.09
					16QAM	1	0	1	-85	22.03
					16QAM	1	5	1	-85	21.98
					16QAM	1	0	3	-85	22
					16QAM	1	5	3	-85	21.97
					16QAM	3	0	0	-85	21.74
					16QAM	3	3	3	-85	21.68
					16QAM	5	0	0	-85	20.65

					16QAM	5	0	1	-85	20.63
					16QAM	5	0	3	-85	20.56

BW(MHz):	10
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Test Frequency ID	N _{UL}	Frequency of Uplink [MHz]	N _{DL}	Frequency of Downlink [MHz]	Test Configuration Initial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	26840	829	8840	879	QPSK	1	0	0	-85	22.25
					QPSK	1	5	0	-85	22.41
					QPSK	1	0	3	-85	22.21
					QPSK	1	5	3	-85	22.29
					QPSK	1	0	7	-85	22.23
					QPSK	1	5	7	-85	22.35
					QPSK	4	0	0	-85	22.45
					QPSK	4	2	7	-85	22.43
					QPSK	6	0	0	-85	21.47
					QPSK	6	0	7	-85	21.38
					16QAM	1	0	0	-85	21.94
					16QAM	1	5	0	-85	21.93
					16QAM	1	0	3	-85	21.84
					16QAM	1	5	3	-85	21.79
					16QAM	1	0	7	-85	21.89
					16QAM	1	5	7	-85	21.85
					16QAM	4	2	0	-85	21.78
					16QAM	4	2	7	-85	21.64
					16QAM	5	0	0	-85	21.63
					16QAM	5	0	7	-85	21.58
Mid Range	26915	836.5	8915	886.5	QPSK	1	0	0	-85	22.64
					QPSK	1	5	0	-85	22.48
					QPSK	1	0	3	-85	22.58
					QPSK	1	5	3	-85	22.44
					QPSK	1	0	7	-85	22.5
					QPSK	1	5	7	-85	22.46
					QPSK	4	0	0	-85	22.37
					QPSK	4	2	7	-85	22.3
					QPSK	6	0	0	-85	21.59
					QPSK	6	0	7	-85	21.46
					16QAM	1	0	0	-85	22.45
					16QAM	1	5	0	-85	22.33
					16QAM	1	0	3	-85	22.38

					16QAM	1	5	3	-85	22.24
					16QAM	1	0	7	-85	22.35
					16QAM	1	5	7	-85	22.24
					16QAM	4	2	0	-85	21.74
					16QAM	4	2	7	-85	21.6
					16QAM	5	0	0	-85	21.72
					16QAM	5	0	7	-85	21.64
High Range	26990	844	8990	894					-85	
					QPSK	1	0	0	-85	22.61
					QPSK	1	5	0	-85	22.53
					QPSK	1	5	7	-85	22.52
					QPSK	1	0	3	-85	22.39
					QPSK	1	5	3	-85	22.5
					QPSK	1	0	7	-85	22.46
					QPSK	4	0	0	-85	22.44
					QPSK	4	2	7	-85	22.37
					QPSK	6	0	0	-85	21.39
					QPSK	6	0	7	-85	21.25
					16QAM	1	0	0	-85	22.45
					16QAM	1	5	0	-85	22.21
					16QAM	1	0	3	-85	22.39
					16QAM	1	5	3	-85	22.12
					16QAM	1	0	7	-85	22.41
					16QAM	1	5	7	-85	22.19
					16QAM	4	2	0	-85	21.69
					16QAM	4	2	7	-85	21.56
					16QAM	5	0	0	-85	21.58
					16QAM	5	0	7	-85	21.47

BW(MHz):		15								
Test Frequency ID	N _{UL}	Frequency of Uplink [MHz]	N _{DL}	Frequency of Downlink [MHz]	Test Configuration Initial of Power				EUT	
					Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	26865	831.5	8865	881.5	QPSK	1	0	0	-85	22.52
					QPSK	1	5	0	-85	22.47
					QPSK	1	0	5	-85	22.42
					QPSK	1	5	5	-85	22.45
					QPSK	1	0	11	-85	22.43
					QPSK	1	5	11	-85	22.43
					QPSK	3	0	0	-85	22.34
					QPSK	3	3	11	-85	22.24
					QPSK	6	0	0	-85	22.56
					QPSK	6	0	11	-85	22.45
					16QAM	1	0	0	-85	22.34
					16QAM	1	5	0	-85	22.06
					16QAM	1	0	5	-85	22.25
					16QAM	1	5	5	-85	21.97
					16QAM	1	0	11	-85	22.31
					16QAM	1	5	11	-85	21.93
					16QAM	3	0	0	-85	22.35
					16QAM	3	3	11	-85	22.3
					16QAM	5	0	0	-85	22.51
					16QAM	5	0	11	-85	22.44
Mid Range	26915	836.5	8915	886.5	QPSK	1	0	0	-85	22.66
					QPSK	1	5	0	-85	22.61
					QPSK	1	0	5	-85	22.56
					QPSK	1	5	5	-85	22.56
					QPSK	1	0	11	-85	22.58
					QPSK	1	5	11	-85	22.52
					QPSK	3	0	0	-85	22.56
					QPSK	3	3	11	-85	22.5
					QPSK	6	0	0	-85	22.52
					QPSK	6	0	11	-85	22.43
					16QAM	1	0	0	-85	22.53
					16QAM	1	5	0	-85	22.44
					16QAM	1	0	5	-85	22.48
					16QAM	1	5	5	-85	22.34
					16QAM	1	0	11	-85	22.39
					16QAM	1	5	11	-85	22.42

					16QAM	3	0	0	-85	22.33
					16QAM	3	3	11	-85	22.22
					16QAM	5	0	0	-85	22.6
					16QAM	5	0	11	-85	22.54
High Range	26965	841.5	8965	891.5					-85	
					QPSK	1	0	0	-85	22.65
					QPSK	1	5	0	-85	22.51
					QPSK	1	0	5	-85	22.51
					QPSK	1	5	5	-85	22.45
					QPSK	1	0	11	-85	22.56
					QPSK	1	5	11	-85	22.46
					QPSK	3	0	0	-85	22.44
					QPSK	3	3	11	-85	22.37
					QPSK	6	0	0	-85	22.41
					QPSK	6	0	11	-85	22.39
					16QAM	1	0	0	-85	22.38
					16QAM	1	5	0	-85	22.36
					16QAM	1	0	5	-85	22.33
					16QAM	1	5	5	-85	22.3
					16QAM	1	0	11	-85	22.25
					16QAM	1	5	11	-85	22.24
					16QAM	3	0	0	-85	22.52
					16QAM	3	3	11	-85	22.43
					16QAM	5	0	0	-85	22.44
					16QAM	5	0	11	-85	22.36

NB-IOT

NB-IoT	Band 5	Region(s):	FCC	Power:	Class 3	23	Tolerance:	2.7
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maximum:	23.67
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Stand-alone											
Test Frequency ID	N _{UL}	M _{UL}	Frequency of Uplink [MHz]	N _{DL}	M _{DL}	Frequency of Downlink [MHz]	Test Configuration Initial of Power			EUT	
							Modulation	Ntones	Sub-carrier spacing (kHz)	Cell power (dBm/15kHz)	power (dBm)
Low Range	20401	0	824.1	2401	-0.5	869.1	BPSK	1@0	3.75	-110	22.71
							QPSK	1@0	15	-110	22.85
							QPSK	3@3	15	-110	23.39
							QPSK	12@0	15	-110	21.25
Mid Range	20525	0	836.5	2525	-0.5	881.5	BPSK	1@0	3.75	-110	22.67
							BPSK	1@47	3.75	-110	22.83
							QPSK	1@0	15	-110	22.74
							QPSK	1@11	15	-110	22.79
							QPSK	3@3	15	-110	23.45
							QPSK	12@0	15	-110	21.14
High Range	20649	0	848.9	2649	-0.5	893.9	BPSK	1@47	3.75	-110	22.74
							QPSK	1@11	15	-110	22.97
							QPSK	3@3	15	-110	23.67
							QPSK	12@0	15	-110	21.33

In-band	BW(MHz):	3												
Test Frequency ID	N _{UL}	M _{UL}	Frequency of Uplink [MHz]	N _{DL}	M _{DL}	Frequency of Downlink [MHz]	LTE Host Cell			Test Configuration Initial of Power			EUT	
							NDL	Frequency of Downlink [MHz]	DL PRB Location	Modulation	Ntones	Sub-carrier spacing (kHz)	Cell power (dBm/15kHz)	power (dBm)
Low Range	20406	0	824.6	2406	-2	869.5925	2415	870.5	-5	BPSK	1@0	3.75	-110	22.78
										QPSK	1@0	15	-110	22.8
										QPSK	3@3	15	-110	23.11
										QPSK	12@0	15	-110	21.24
Mid Range	20516	0	835.6	2516	-2	880.5925	2525	881.5	-5	BPSK	1@0	3.75	-110	22.65
										BPSK	1@47	3.75	-110	22.58
										QPSK	1@0	15	-110	22.63
										QPSK	1@11	15	-110	22.8
										QPSK	3@3	15	-110	23.32
										QPSK	12@0	15	-110	21.34
High Range	20644	0	848.4	2644	1	893.4075	2635	892.5	5	BPSK	1@47	3.75	-110	22.75
										QPSK	1@11	15	-110	22.99
										QPSK	3@3	15	-110	23.56
										QPSK	12@0	15	-110	21.37

In-band	BW(MHz):	10	NB-IoT PRB:	30										
Test Frequency ID	N _{UL}	M _{UL}	Frequency of Uplink [MHz]	N _{DL}	M _{DL}	Frequency of Downlink [MHz]	LTE Host Cell			Test Configuration Initial of Power			EUT	
							NDL	Frequency of Downlink [MHz]	DL PRB Location	Modulation	Ntones	Sub-carrier spacing (kHz)	Cell power (dBm/15kHz)	power (dBm)
Low Range	20460	-2	829.99	2460	-1	874.9975	2450	874	5	BPSK	1@0	3.75	-110	22.59
										QPSK	1@0	15	-110	22.73
										QPSK	3@3	15	-110	23.16
										QPSK	12@0	15	-110	21.23
Mid Range	20535	-2	837.49	2535	-1	882.4975	2525	881.5	5	BPSK	1@0	3.75	-110	22.65
										BPSK	1@47	3.75	-110	22.71
										QPSK	1@0	15	-110	22.77
										QPSK	1@11	15	-110	22.96
										QPSK	3@3	15	-110	23.31
										QPSK	12@0	15	-110	21.34
High Range	20610	-2	844.99	2610	-1	889.9975	2600	889	5	BPSK	1@47	3.75	-110	22.61
										QPSK	1@11	15	-110	22.73
										QPSK	3@3	15	-110	23.23
										QPSK	12@0	15	-110	21.36

In-band	BW(MHz):	10	NB-IoT PRB:	35										
Test Frequency ID	N _{UL}	M _{UL}	Frequency of Uplink [MHz]	N _{DL}	M _{DL}	Frequency of Downlink [MHz]	LTE Host Cell			Test Configuration Initial of Power			EUT	
							NDL	Frequency of Downlink [MHz]	DL PRB Location	Modulation	Ntones	Sub-carrier spacing (kHz)	Cell power (dBm/15kHz)	power (dBm)
Low Range	20469	-2	830.89	2469	-1	875.8975	2450	874	10	BPSK	1@0	3.75	-110	22.23
										QPSK	1@0	15	-110	22.75
										QPSK	3@3	15	-110	23.02
										QPSK	12@0	15	-110	21.15
Mid Range	20544	-2	838.39	2544	-1	883.3975	2525	881.5	10	BPSK	1@0	3.75	-110	22.28
										BPSK	1@47	3.75	-110	22.22
										QPSK	1@0	15	-110	22.81
										QPSK	1@11	15	-110	22.76
										QPSK	3@3	15	-110	23.2
										QPSK	12@0	15	-110	21.1
High Range	20619	-2	845.89	2619	-1	890.8975	2600	889	10	BPSK	1@47	3.75	-110	22.62
										QPSK	1@11	15	-110	22.85
										QPSK	3@3	15	-110	23.41
										QPSK	12@0	15	-110	21.04

Guard-band	BW(MHz):	5												
Test Frequency ID	N _{UL}	M _{UL}	Frequency of Uplink [MHz]	N _{DL}	M _{DL}	Frequency of Downlink [MHz]	LTE Host Cell			Test Configuration Initial of Power			EUT	
							NDL	Frequency of Downlink [MHz]	DL PRB Location	Modulation	Ntones	Sub-carrier spacing (kHz)	Cell power (dBm/15kHz)	power (dBm)
Low Range	20401	0	824.1	2401	1	869.1075	2425	871.5	-24	BPSK	1@0	3.75	-110	22.59
										QPSK	1@0	15	-110	22.76
										QPSK	3@3	15	-110	23.29
										QPSK	12@0	15	-110	21.13
Mid Range	20501	0	834.1	2501	1	879.1075	2525	881.5	-24	BPSK	1@0	3.75	-110	22.72
										BPSK	1@47	3.75	-110	22.55
										QPSK	1@0	15	-110	22.83
										QPSK	1@11	15	-110	22.72
										QPSK	3@3	15	-110	23.31
										QPSK	12@0	15	-110	21.18
High Range	20649	0	848.9	2649	-2	893.8925	2625	891.5	24	BPSK	1@47	3.75	-110	22.76
										QPSK	1@11	15	-110	23.07
										QPSK	3@3	15	-110	23.45
										QPSK	12@0	15	-110	21.08

ERP Power (dBm)

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LTE Band 5							
Channel Bandwidth: 1.4 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
Z	20407	824.7	-13.48	32.62	16.99	50.00	H
	20525	836.5	-13.72	32.52	16.65	46.24	
	20643	848.3	-14.07	32.65	16.43	43.95	
	20407	824.7	-8.49	32.76	22.12	162.93	V
	20525	836.5	-8.38	32.39	21.86	153.46	
	20643	848.3	-8.67	32.54	21.72	148.59	
Channel Bandwidth: 1.4 MHz / 16QAM							
Z	20407	824.7	-14.49	32.62	15.98	39.63	H
	20525	836.5	-14.73	32.52	15.64	36.64	
	20643	848.3	-15.08	32.65	15.42	34.83	
	20407	824.7	-9.50	32.76	21.11	129.12	V
	20525	836.5	-9.39	32.39	20.85	121.62	
	20643	848.3	-9.68	32.54	20.71	117.76	

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

LTE Band 5							
Channel Bandwidth: 3 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
Z	20415	825.5	-13.21	32.62	17.26	53.21	H
	20525	836.5	-13.45	32.52	16.92	49.20	
	20635	847.5	-13.80	32.65	16.70	46.77	
	20415	825.5	-8.22	32.76	22.39	173.38	V
	20525	836.5	-8.11	32.39	22.13	163.31	
	20635	847.5	-8.40	32.54	21.99	158.12	
Channel Bandwidth: 3 MHz / 16QAM							
Z	20415	825.5	-14.18	32.62	16.29	42.56	H
	20525	836.5	-14.42	32.52	15.95	39.36	
	20635	847.5	-14.77	32.65	15.73	37.41	
	20415	825.5	-9.19	32.76	21.42	138.68	V
	20525	836.5	-9.08	32.39	21.16	130.62	
	20635	847.5	-9.37	32.54	21.02	126.47	

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

LTE Band 5							
Channel Bandwidth: 5 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
Z	20425	826.5	-12.92	32.62	17.55	56.89	H
	20525	836.5	-13.16	32.52	17.21	52.60	
	20625	846.5	-13.51	32.65	16.99	50.00	
	20425	826.5	-7.93	32.76	22.68	185.35	V
	20525	836.5	-7.82	32.39	22.42	174.58	
	20625	846.5	-8.11	32.54	22.28	169.04	
Channel Bandwidth: 5 MHz / 16QAM							
Z	20425	826.5	-13.90	32.62	16.57	45.39	H
	20525	836.5	-14.14	32.52	16.23	41.98	
	20625	846.5	-14.49	32.65	16.01	39.90	
	20425	826.5	-8.91	32.76	21.70	147.91	V
	20525	836.5	-8.80	32.39	21.44	139.32	
	20625	846.5	-9.09	32.54	21.30	134.90	

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

LTE Band 5							
Channel Bandwidth: 10 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
Z	20450	829.0	-12.62	32.62	17.85	60.95	H
	20525	836.5	-12.86	32.52	17.51	56.36	
	20600	844.0	-13.21	32.65	17.29	53.58	
	20450	829.0	-7.63	32.76	22.98	198.61	V
	20525	836.5	-7.52	32.39	22.72	187.07	
	20600	844.0	-7.81	32.54	22.58	181.13	
Channel Bandwidth: 10 MHz / 16QAM							
Z	20425	826.5	-13.72	32.62	16.75	47.32	H
	20525	836.5	-13.96	32.52	16.41	43.75	
	20625	846.5	-14.31	32.65	16.19	41.59	
	20425	826.5	-8.73	32.76	21.88	154.17	V
	20525	836.5	-8.62	32.39	21.62	145.21	
	20625	846.5	-8.91	32.54	21.48	140.60	

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

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LTE Band 5							
Channel Bandwidth: QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Z	20401	824.1	-8.57	32.62	21.90	154.88	H
	20525	836.5	-8.63	32.52	21.74	149.28	
	20649	848.9	-8.95	32.65	21.55	142.89	
	20401	824.1	-11.95	32.76	18.66	73.45	V
	20525	836.5	-11.78	32.39	18.46	70.15	
	20649	848.9	-12.08	32.54	18.31	67.76	
Channel Bandwidth: BPSK							
Z	24041	824.1	-9.63	32.62	20.84	121.34	H
	20525	836.5	-9.68	32.52	20.69	117.22	
	20649	848.9	-10.08	32.65	20.42	110.15	
	24041	824.1	-13.02	32.76	17.59	57.41	V
	20525	836.5	-12.79	32.39	17.45	55.59	
	20649	848.9	-13.05	32.54	17.34	54.20	

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

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

N/A

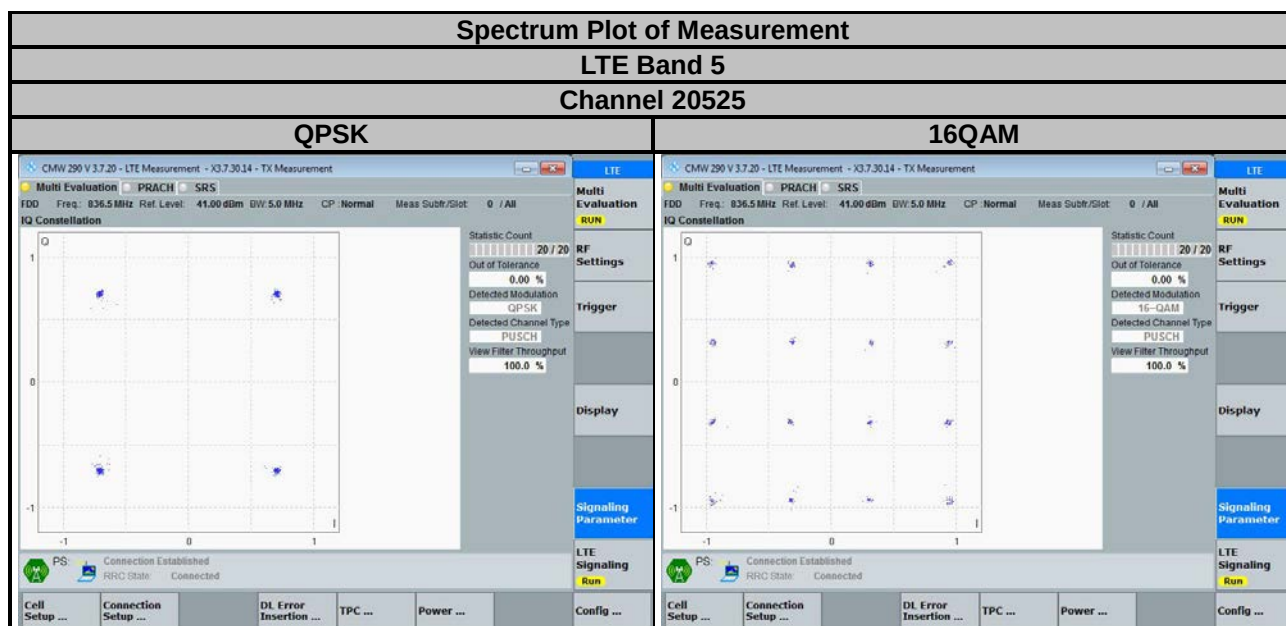
4.2.2 Test Setup



4.2.3 Test Procedure

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

4.2.4 Test Results



4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

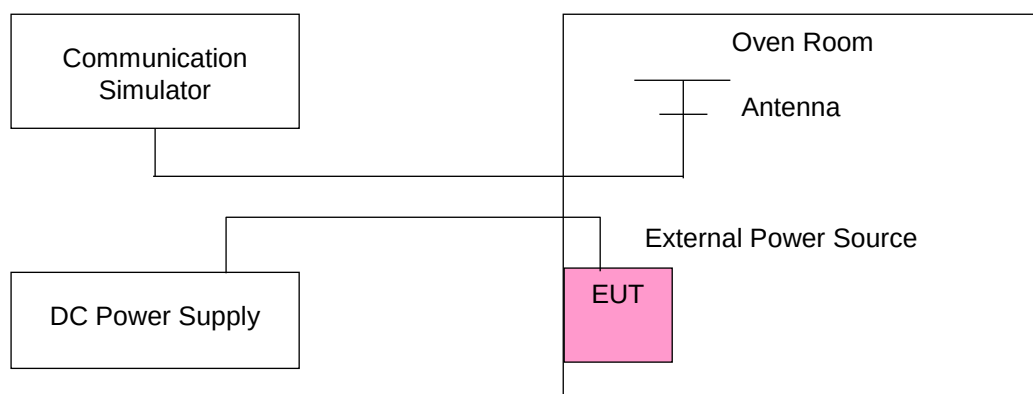
1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

4.3.2 Test Procedure

- 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.
- 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.
- The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the ± 0.5 °C during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

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

4.3.3 Test Setup



4.3.4 Test Results

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Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 1.4 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
10.2	824.700002	0.002	848.300001	0.002	2.5
12	824.700001	0.002	848.300002	0.002	2.5
13.8	824.700002	0.002	848.300001	0.001	2.5

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

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 1.4 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	824.700003	0.003	848.300004	0.004	2.5
-20	824.700002	0.003	848.300003	0.003	2.5
-10	824.700003	0.004	848.300002	0.003	2.5
0	824.700002	0.002	848.300004	0.005	2.5
10	824.700003	0.004	848.300002	0.002	2.5
20	824.699998	-0.002	848.299998	-0.003	2.5
30	824.699997	-0.004	848.299997	-0.004	2.5
40	824.699999	-0.001	848.299997	-0.004	2.5
50	824.699996	-0.004	848.299997	-0.004	2.5
55	824.699997	-0.004	848.299997	-0.003	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 3 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
10.2	825.500003	0.004	847.500003	0.003	2.5
12	825.500003	0.003	847.500003	0.004	2.5
13.8	825.500003	0.004	847.500001	0.001	2.5

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

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 3 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	825.500004	0.005	847.500002	0.002	2.5
-20	825.500003	0.003	847.500001	0.001	2.5
-10	825.500003	0.003	847.500004	0.004	2.5
0	825.500002	0.002	847.500001	0.002	2.5
10	825.500002	0.003	847.500001	0.002	2.5
20	825.499998	-0.003	847.499999	-0.001	2.5
30	825.499996	-0.004	847.499998	-0.002	2.5
40	825.499996	-0.004	847.499996	-0.004	2.5
50	825.499997	-0.004	847.499997	-0.004	2.5
55	825.499996	-0.004	847.499998	-0.002	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
10.2	826.500003	0.003	846.500002	0.003	2.5
12	826.500003	0.003	846.500002	0.002	2.5
13.8	826.500002	0.002	846.500003	0.004	2.5

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

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	826.500004	0.004	846.500002	0.002	2.5
-20	826.500003	0.003	846.500002	0.002	2.5
-10	826.500004	0.004	846.500003	0.003	2.5
0	826.500002	0.003	846.500002	0.002	2.5
10	826.500003	0.004	846.500003	0.004	2.5
20	826.499997	-0.004	846.499999	-0.001	2.5
30	826.499997	-0.004	846.499999	-0.001	2.5
40	826.499997	-0.003	846.499998	-0.003	2.5
50	826.499998	-0.002	846.499996	-0.004	2.5
55	826.499996	-0.004	846.499999	-0.002	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 10 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
10.2	829.000003	0.004	844.000003	0.003	2.5
12	829.000002	0.002	844.000003	0.003	2.5
13.8	829.000003	0.004	844.000003	0.003	2.5

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

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 10 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	829.000003	0.003	844.000004	0.005	2.5
-20	829.000002	0.002	844.000003	0.004	2.5
-10	829.000004	0.005	844.000004	0.004	2.5
0	829.000002	0.003	844.000003	0.003	2.5
10	829.000003	0.004	844.000002	0.002	2.5
20	828.999999	-0.002	843.999997	-0.004	2.5
30	828.999997	-0.003	843.999998	-0.002	2.5
40	828.999997	-0.003	843.999999	-0.001	2.5
50	828.999998	-0.003	843.999998	-0.002	2.5
55	828.999998	-0.003	843.999999	-0.001	2.5

NB-IOT

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 5				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
10.2	836.500004	0.005	836.500003	0.003	2.5
12	836.500002	0.002	836.500003	0.004	2.5
13.8	836.500002	0.003	836.500002	0.002	2.5

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

Frequency Error vs. Temperature

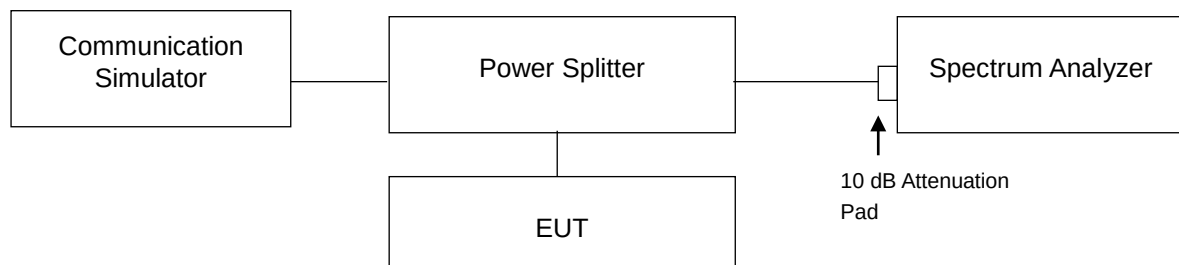
Temp. (°C)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 20 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	836.500001	0.001	836.500003	0.004	2.5
-20	836.500003	0.004	836.500002	0.003	2.5
-10	836.500002	0.002	836.500003	0.004	2.5
0	836.500002	0.002	836.500003	0.003	2.5
10	836.500003	0.004	836.500001	0.001	2.5
20	836.499997	-0.003	836.499997	-0.004	2.5
30	836.499998	-0.003	836.499997	-0.004	2.5
40	836.499997	-0.004	836.499997	-0.003	2.5
50	836.499997	-0.004	836.499999	-0.001	2.5
55	836.499998	-0.002	836.499997	-0.004	2.5

4.4 Occupied Bandwidth Measurement

4.4.1 Test Procedure

The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

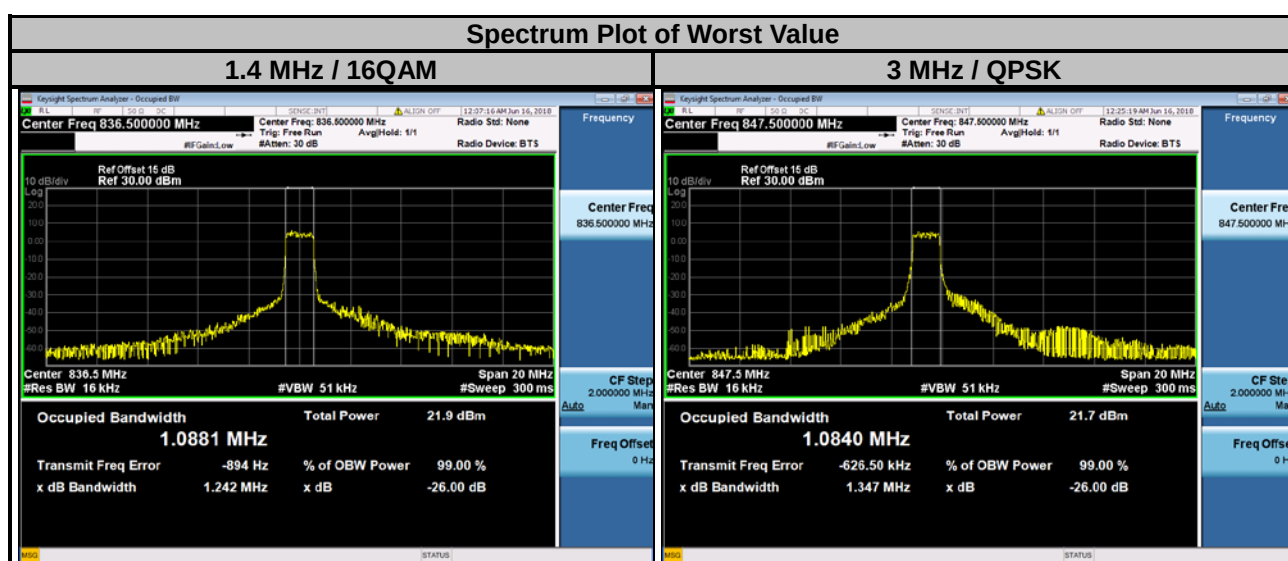
4.4.2 Test Setup



4.4.3 Test Result

Cat-M1

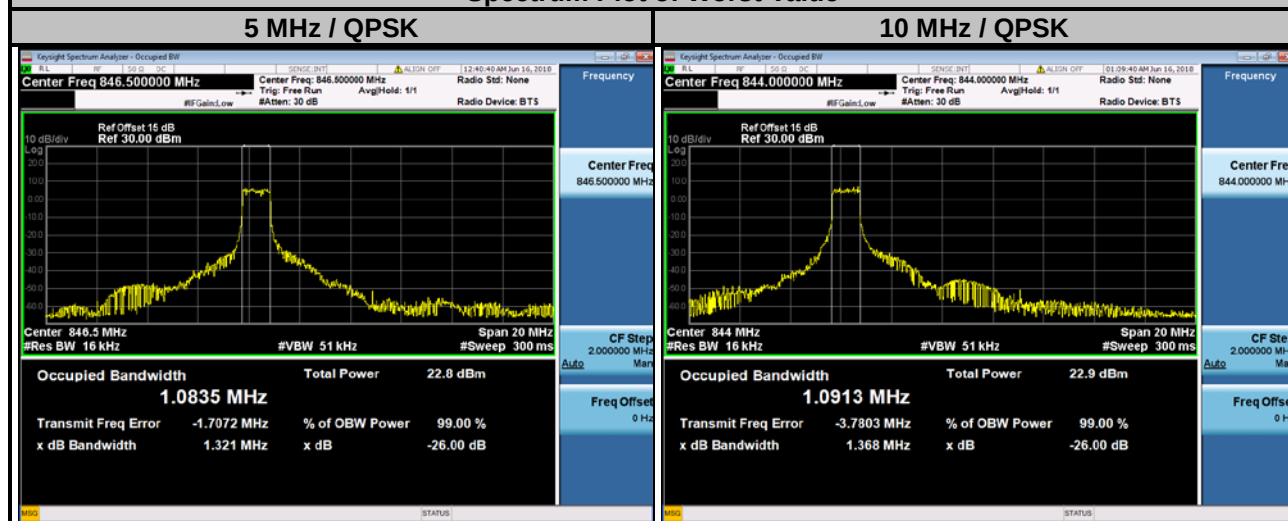
LTE Band 5							
Channel Bandwidth: 1.4 MHz				Channel Bandwidth: 3 MHz			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
20407	824.7	1.0858	0.9094	20415	825.5	1.0793	0.9019
20525	836.5	1.0846	1.0881	20525	836.5	1.0835	0.9088
20643	848.3	1.0871	0.9083	20635	847.5	1.0840	0.9067



LTE Band 5

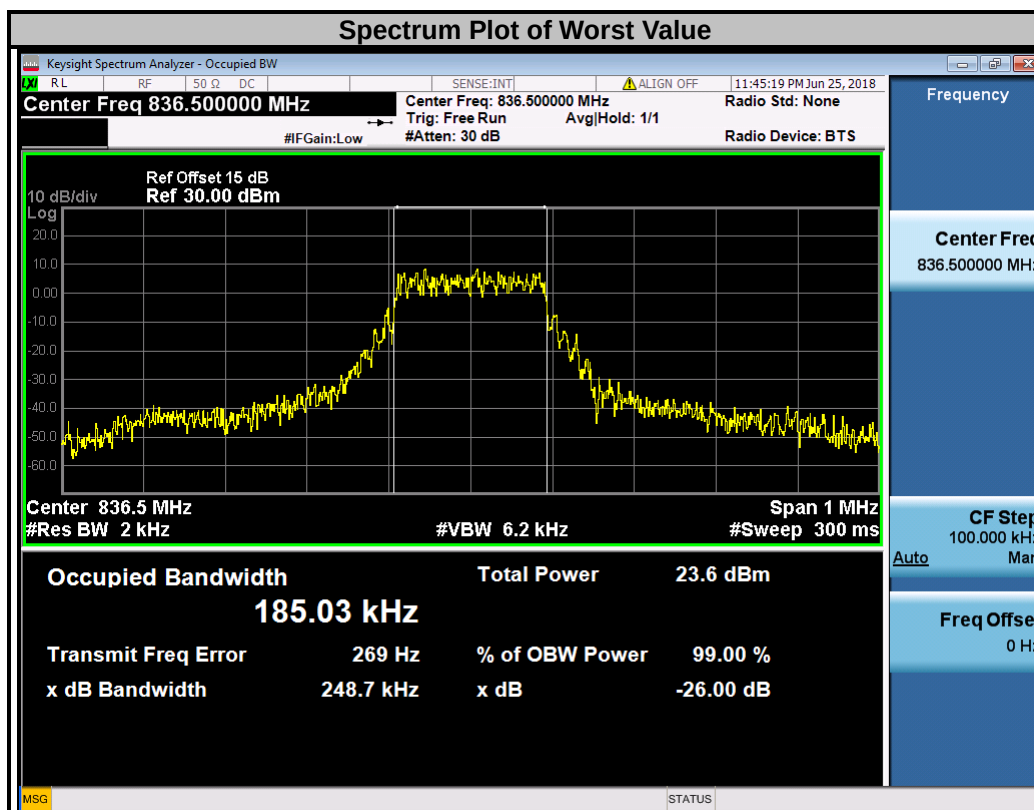
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
20425	826.5	1.0820	0.9068	20450	829.0	1.0896	0.9128
20525	836.5	1.0825	0.9125	20525	836.5	1.0901	0.9119
20625	846.5	1.0835	0.9144	20600	844.0	1.0913	0.9125

Spectrum Plot of Worst Value



NB-IOT

99 % Occupied Bandwidth (kHz)					
LTE Band 5					
Channel	Frequency (MHz)	Modulation	Ntones	Sub-carrier spacing (kHz)	99%
24041	824.1	BPSK	1@0	3.75	48.86
		QPSK	1@0	15	117.28
		QPSK	3@3	15	143.18
		QPSK	12@0	15	184.64
20525	836.5	BPSK	1@0	3.75	49.87
		QPSK	1@0	15	124.01
		QPSK	3@3	15	128.48
		QPSK	12@0	15	185.03
20649	848.9	BPSK	1@47	3.75	48.82
		QPSK	1@11	15	129.24
		QPSK	3@3	15	129.66
		QPSK	12@0	15	184.20

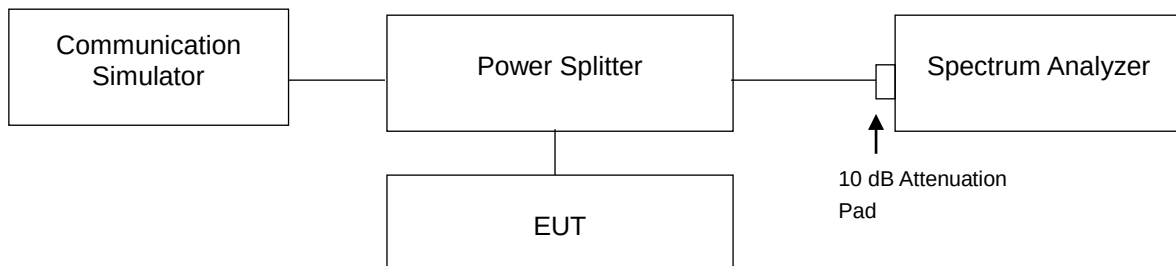


4.5 Band Edge Measurement

4.5.1 Limits of Band Edge Measurement

Power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

4.5.2 Test Setup

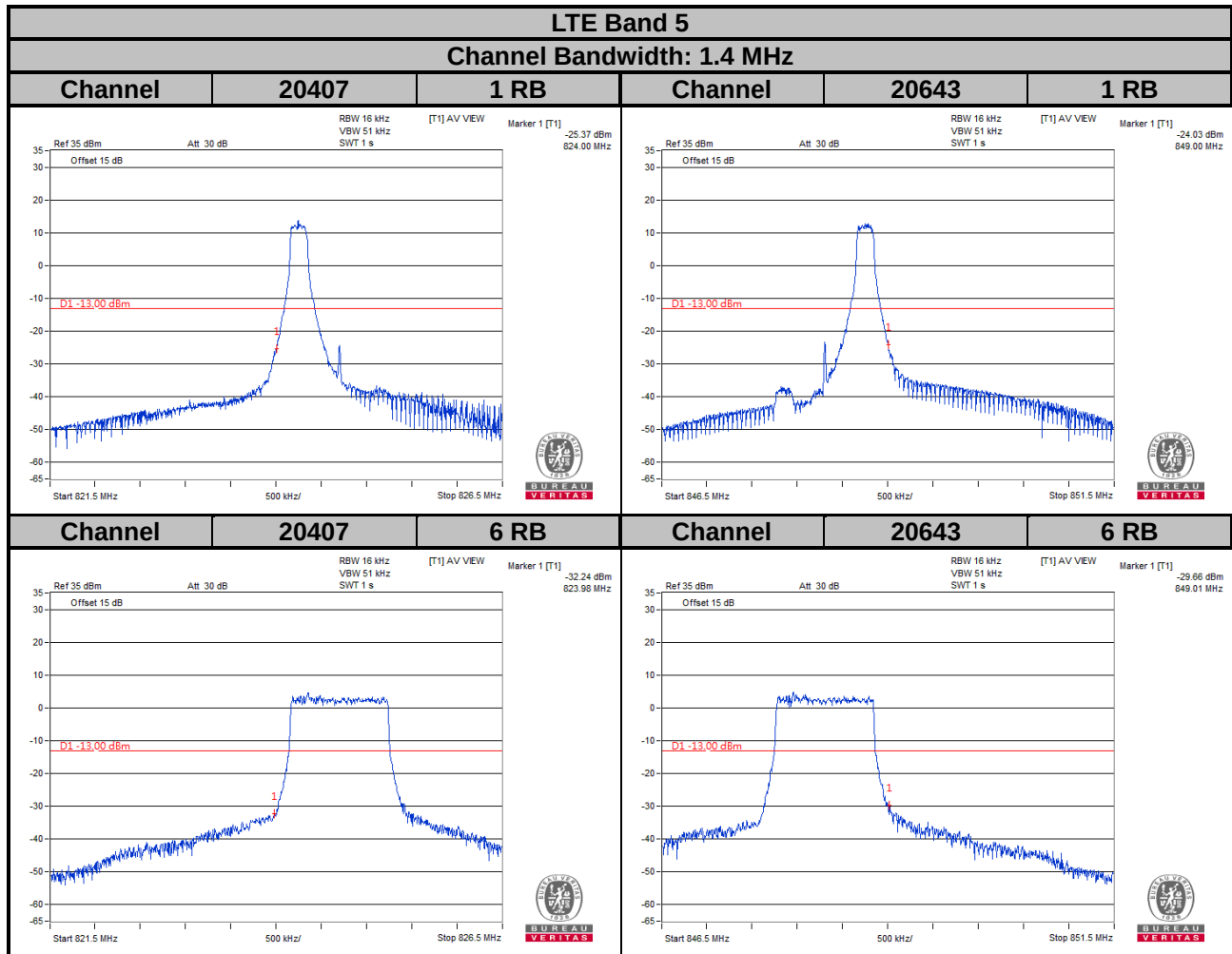


4.5.3 Test Procedures

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

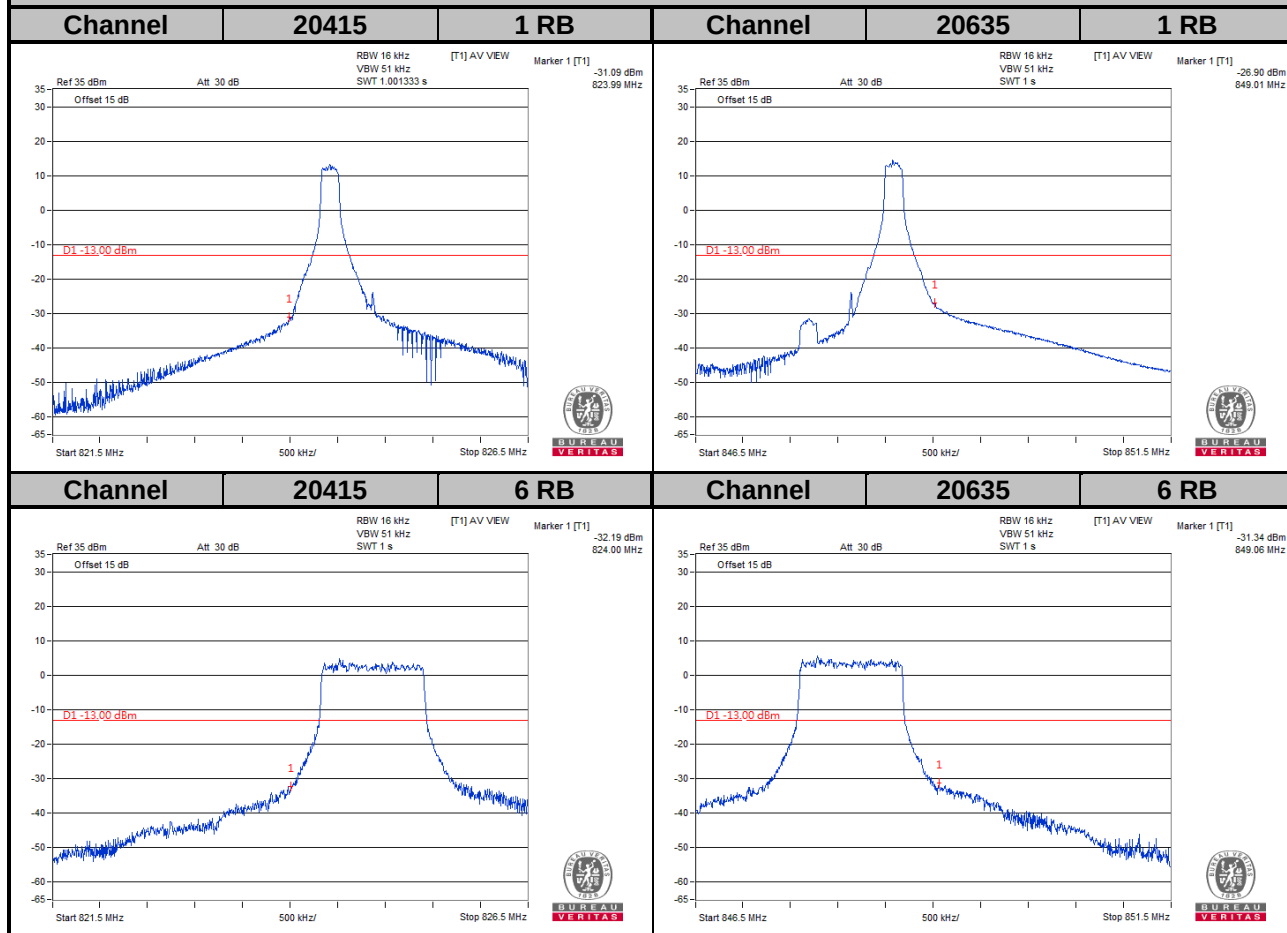
4.5.4 Test Results

Cat-M1



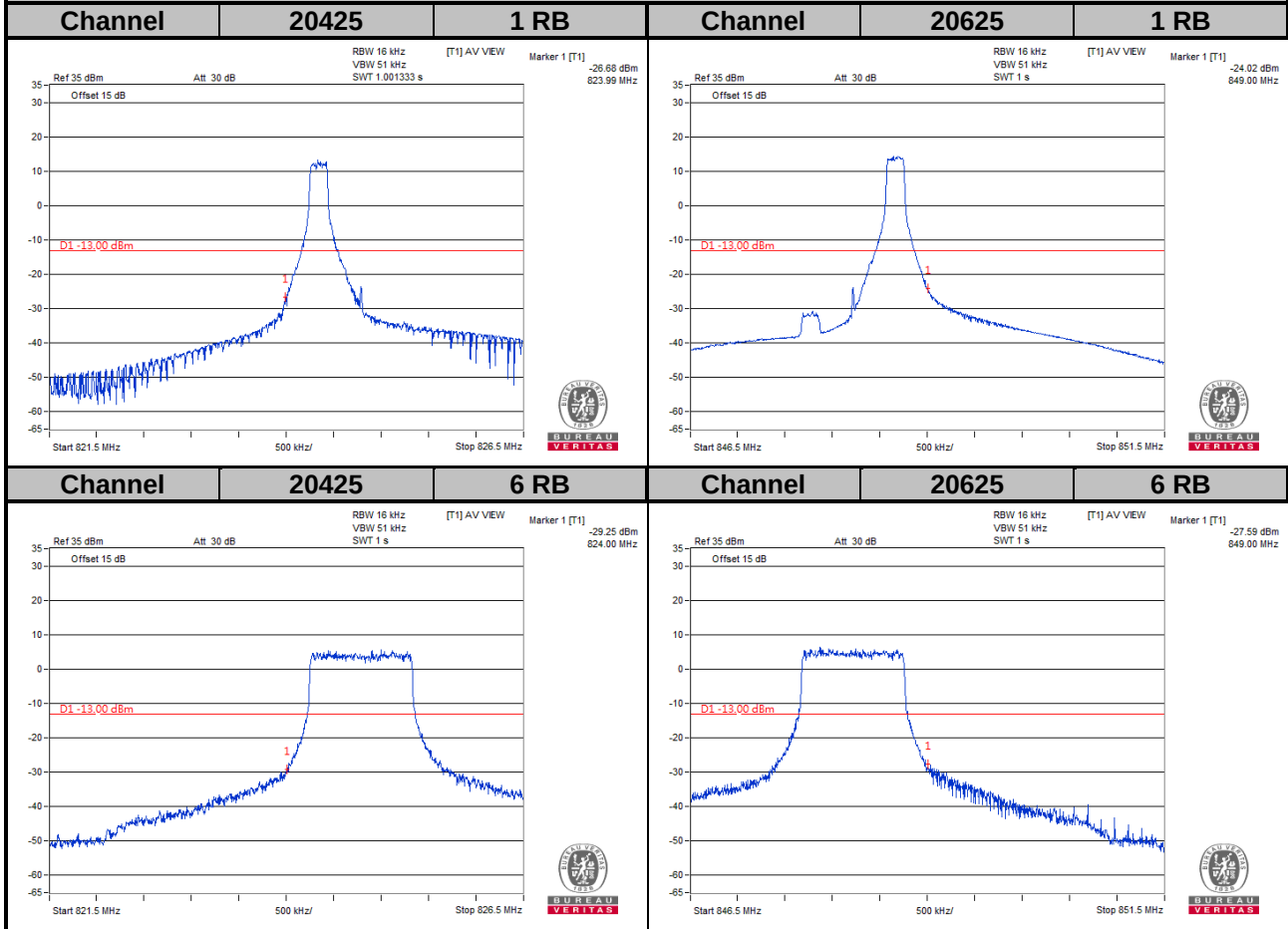
LTE Band 5

Channel Bandwidth: 3 MHz



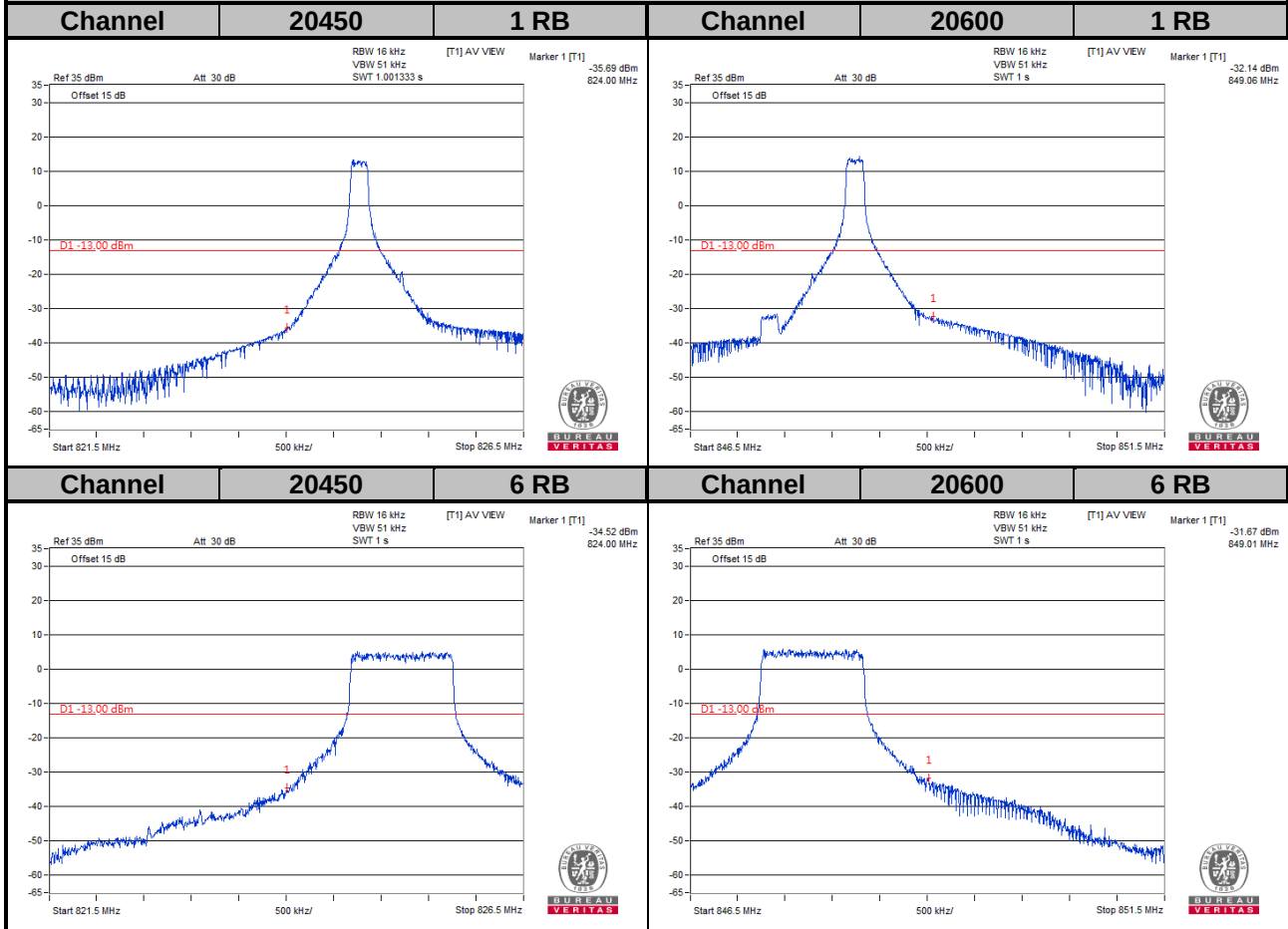
LTE Band 5

Channel Bandwidth: 5 MHz

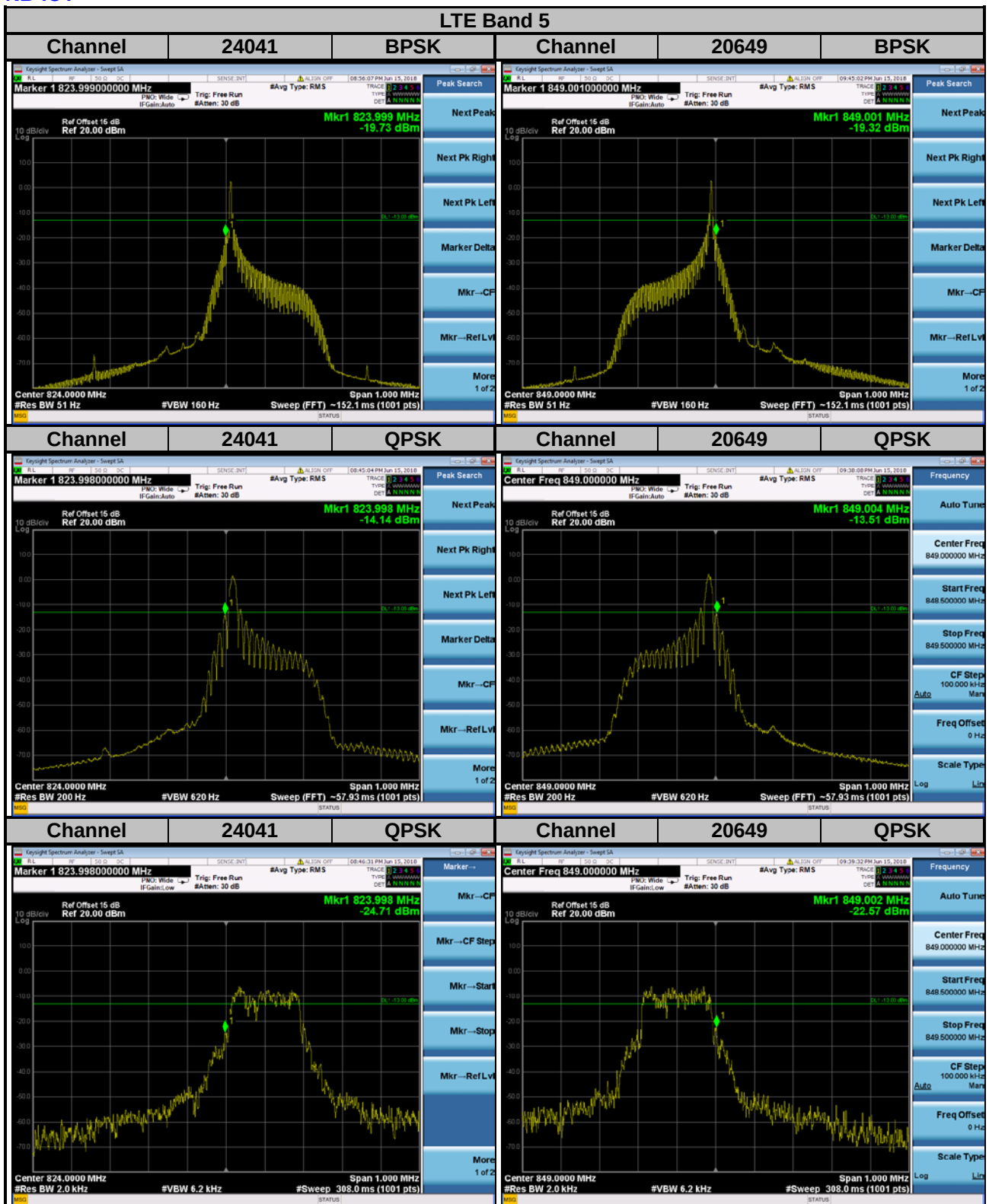


LTE Band 5

Channel Bandwidth: 10 MHz



NB-IOT

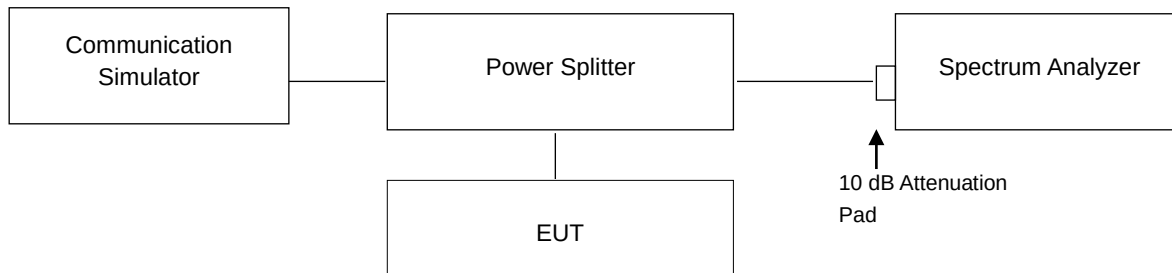


4.6 Peak to Average Ratio

4.6.1 Limits of Peak to Average Ratio Measurement

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

4.6.2 Test Setup



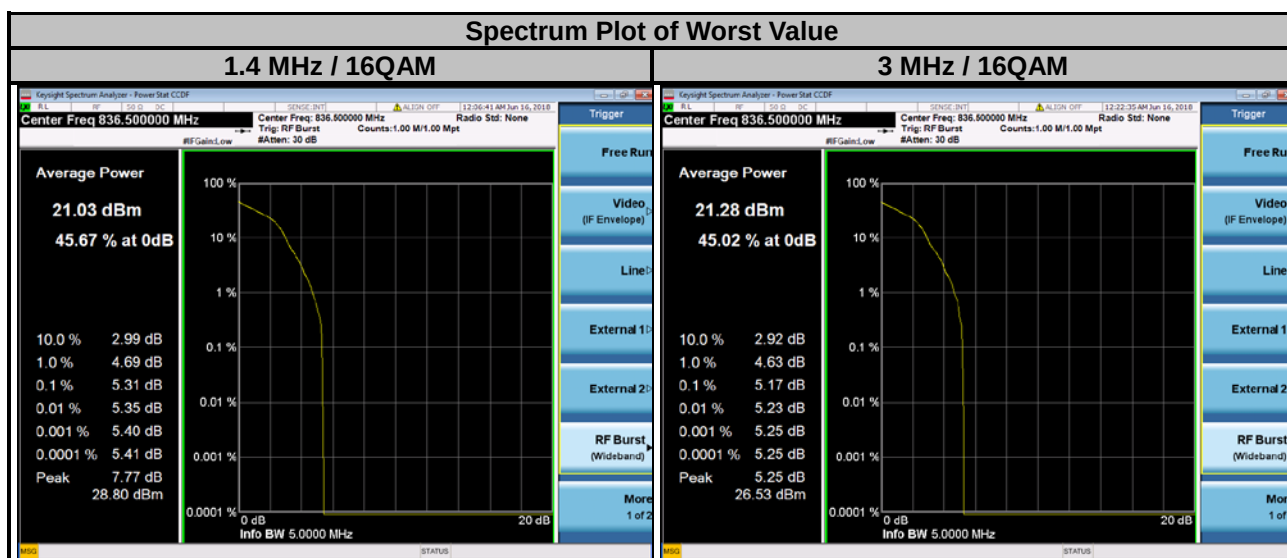
4.6.3 Test Procedures

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

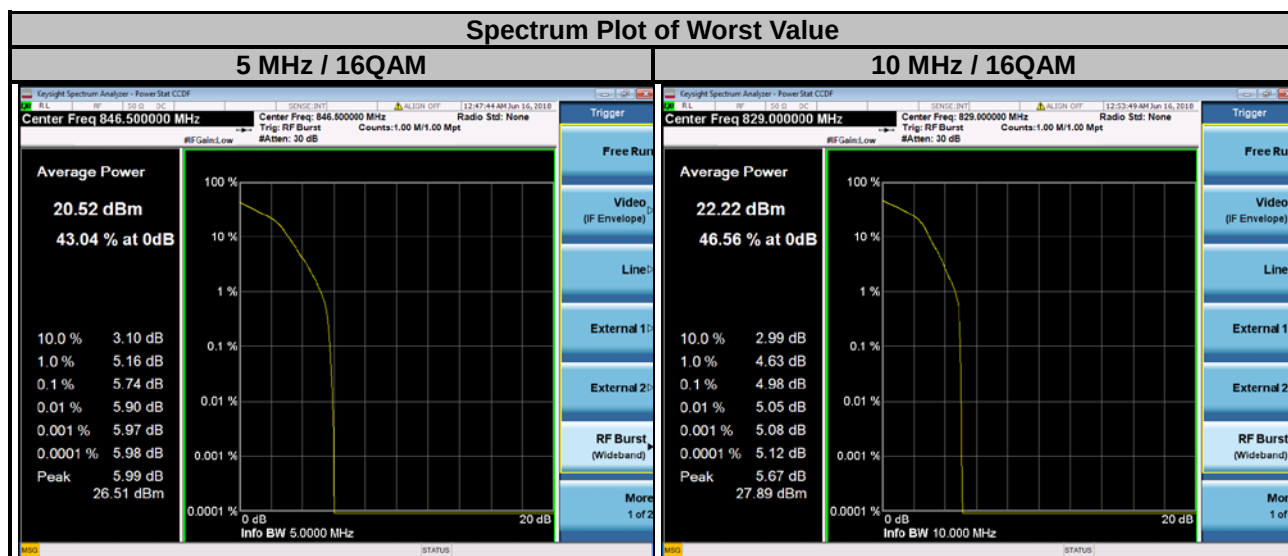
4.6.4 Test Results

Cat-M1

LTE Band 5							
Channel Bandwidth: 1.4 MHz				Channel Bandwidth: 3 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
20407	824.7	4.52	5.25	20415	825.5	4.44	5.14
20525	836.5	4.52	5.31	20525	836.5	4.43	5.17
20643	848.3	4.37	5.13	20635	847.5	4.33	5.04

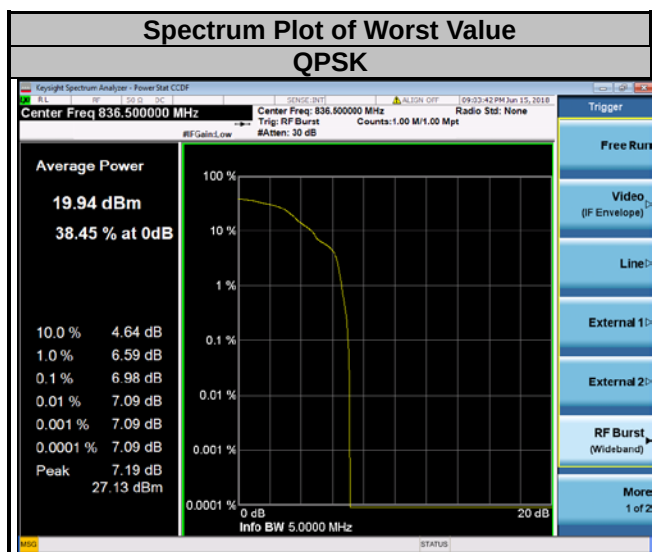


LTE Band 5							
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
20425	826.5	4.51	4.92	20450	829.0	4.36	4.98
20525	836.5	4.48	5.13	20525	836.5	4.42	4.92
20625	846.5	4.45	5.74	20600	844.0	4.38	4.88



NB-IOT

Peak to Average Ratio (dB)					
LTE Band 5					
Channel	Frequency (MHz)	Modulation	Sub-carrier spacing (kHz)	CCDF	Limit
20525	836.5	BPSK	3.75	1.91	13.00
20525	836.5	QPSK	15	3.04	
20525	836.5	QPSK	15	6.98	

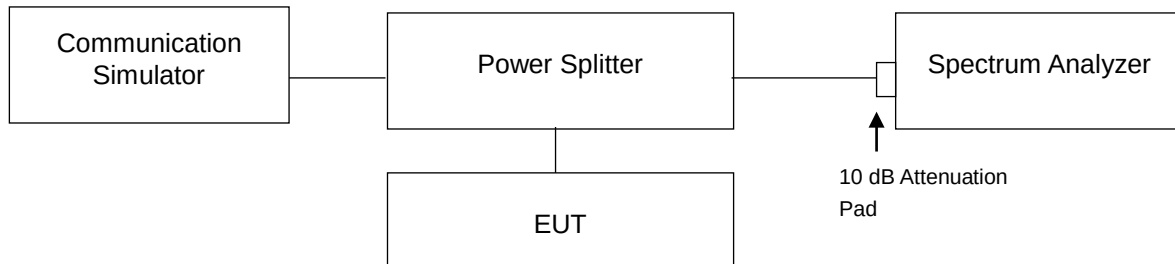


4.7 Conducted Spurious Emissions

4.7.1 Limits of Conducted Spurious Emissions Measurement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. The emission limit equal to -13 dBm.

4.7.2 Test Setup

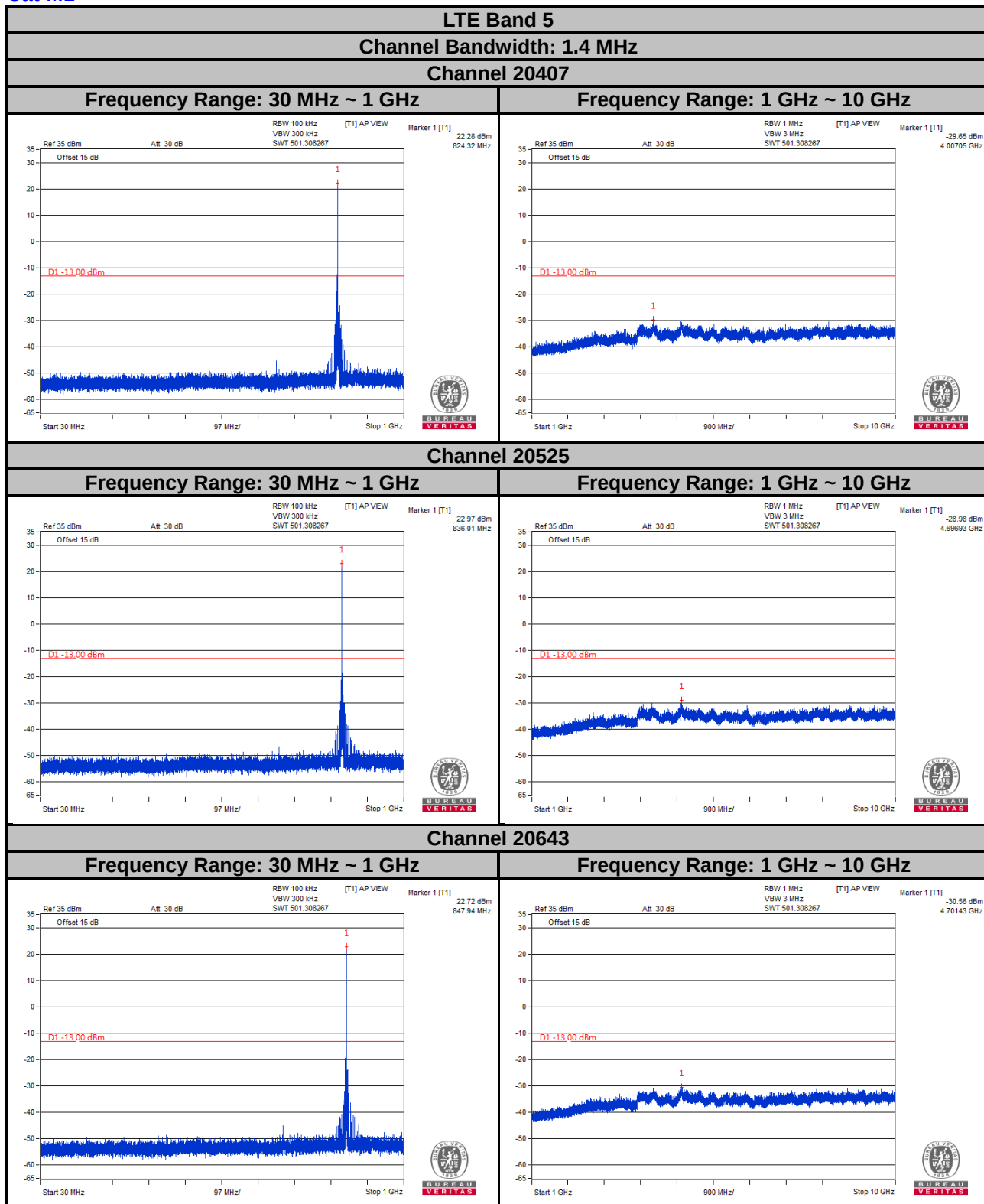


4.7.3 Test Procedure

- The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
- Measuring frequency range is from 30 MHz to 10 GHz. 20 dB attenuation pad is connected with spectrum. RBW = 100 kHz and VBW = 300 kHz is used for conducted emission measurement.

4.7.4 Test Results

Cat-M1

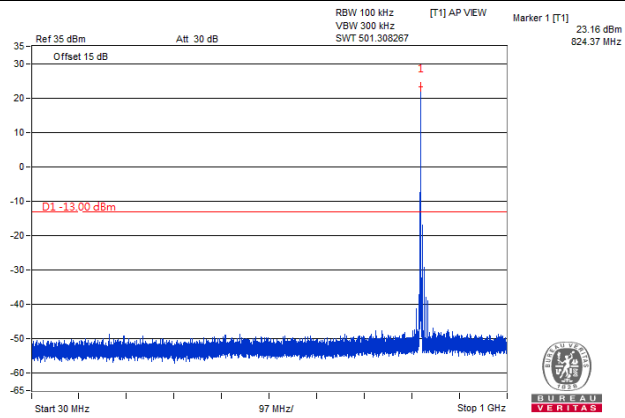


LTE Band 5

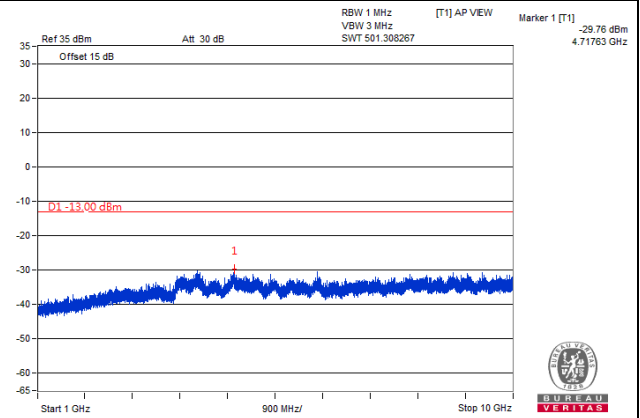
Channel Bandwidth: 3 MHz

Channel 20415

Frequency Range: 30 MHz ~ 1 GHz

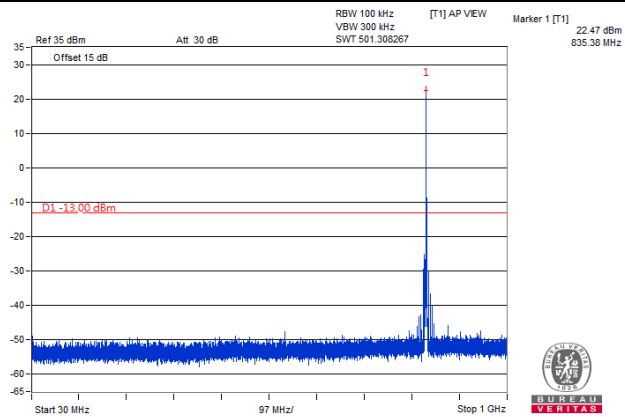


Frequency Range: 1 GHz ~ 10 GHz

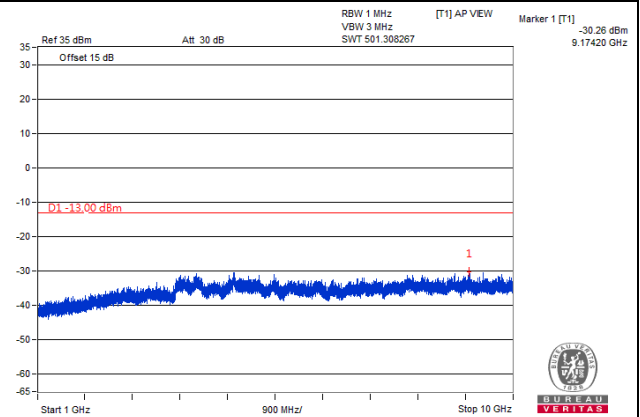


Channel 20525

Frequency Range: 30 MHz ~ 1 GHz

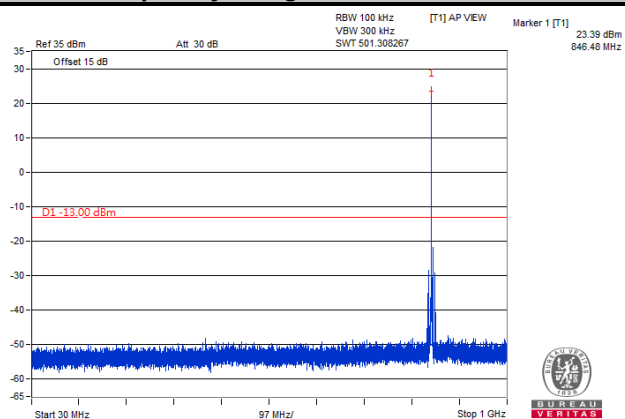


Frequency Range: 1 GHz ~ 10 GHz

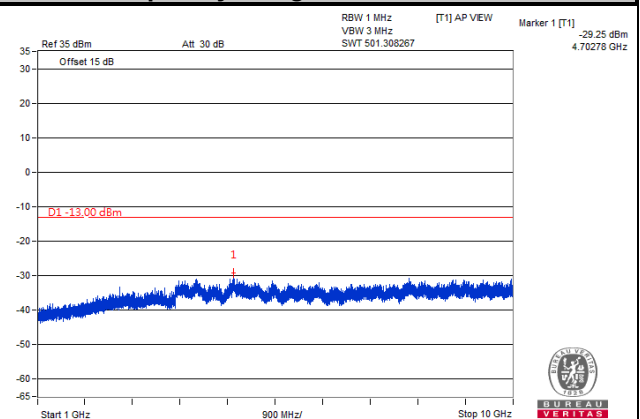


Channel 20635

Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz

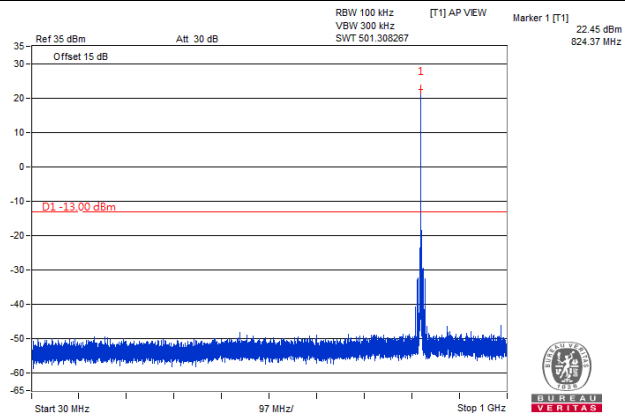


LTE Band 5

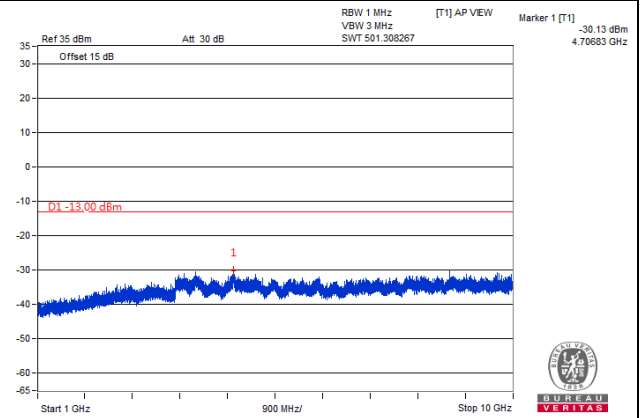
Channel Bandwidth: 5 MHz

Channel 20425

Frequency Range: 30 MHz ~ 1 GHz

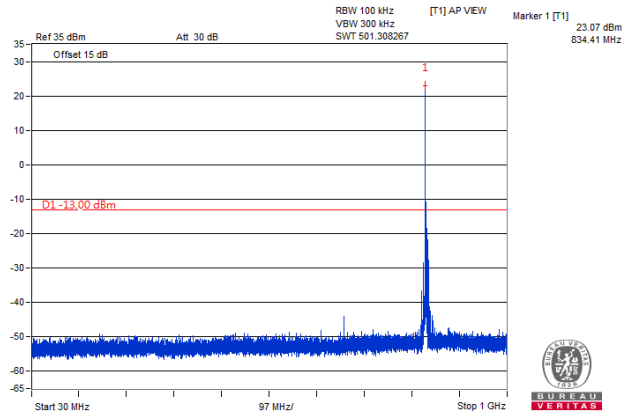


Frequency Range: 1 GHz ~ 10 GHz

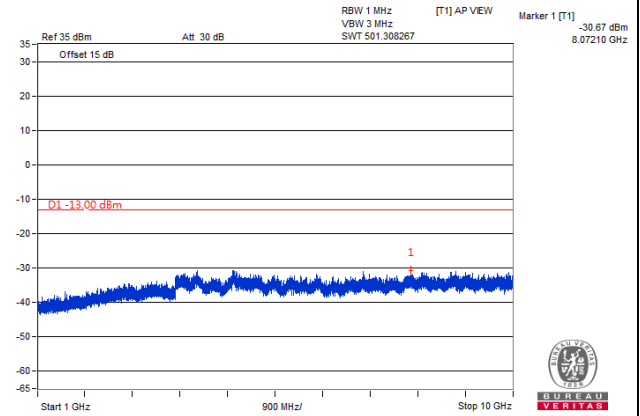


Channel 20525

Frequency Range: 30 MHz ~ 1 GHz

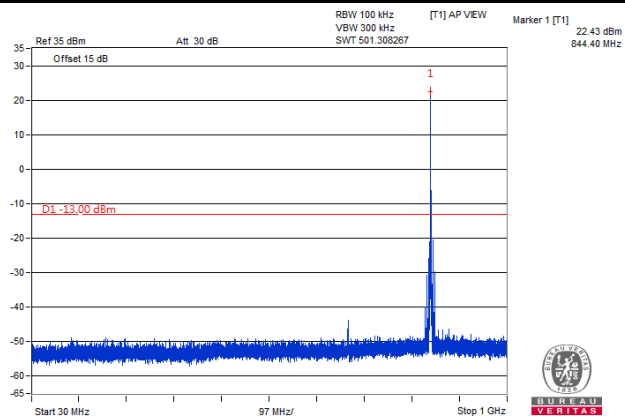


Frequency Range: 1 GHz ~ 10 GHz

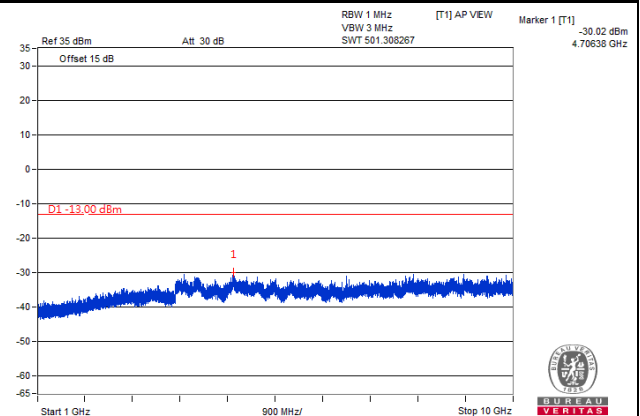


Channel 20625

Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz

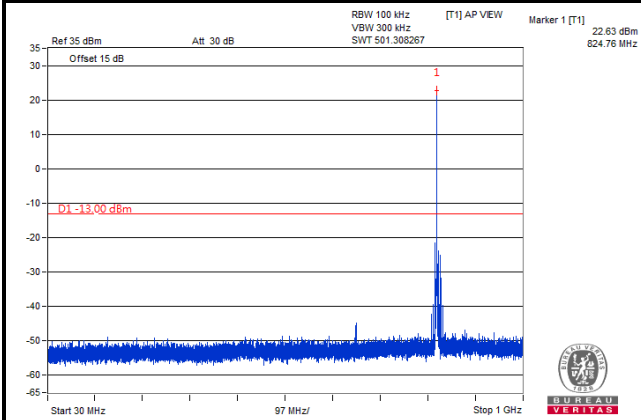


LTE Band 5

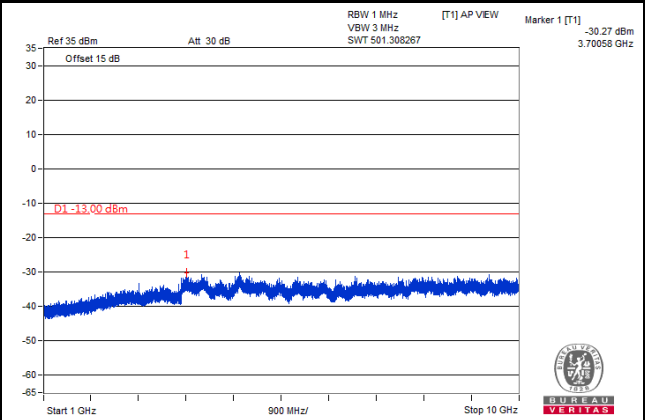
Channel Bandwidth: 10 MHz

Channel 20450

Frequency Range: 30 MHz ~ 1 GHz

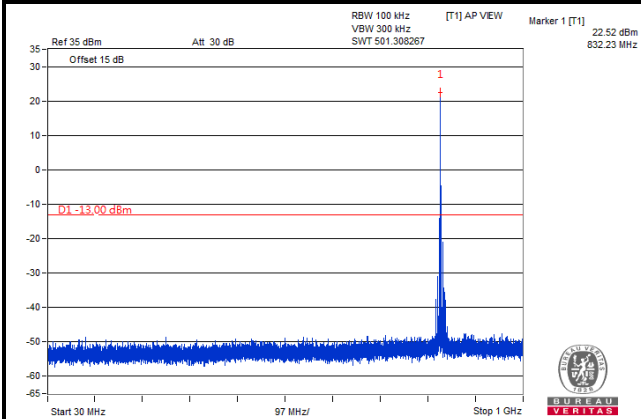


Frequency Range: 1 GHz ~ 10 GHz

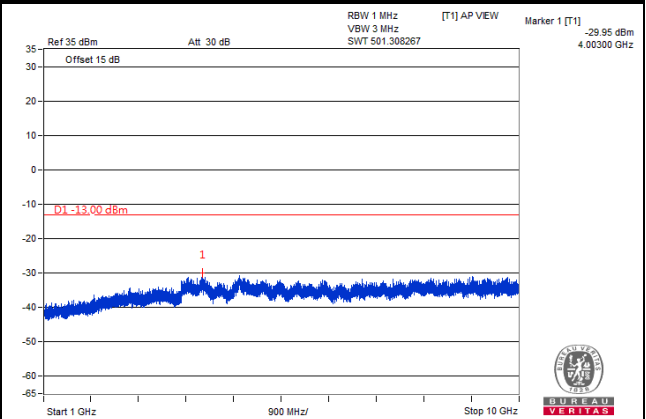


Channel 20525

Frequency Range: 30 MHz ~ 1 GHz

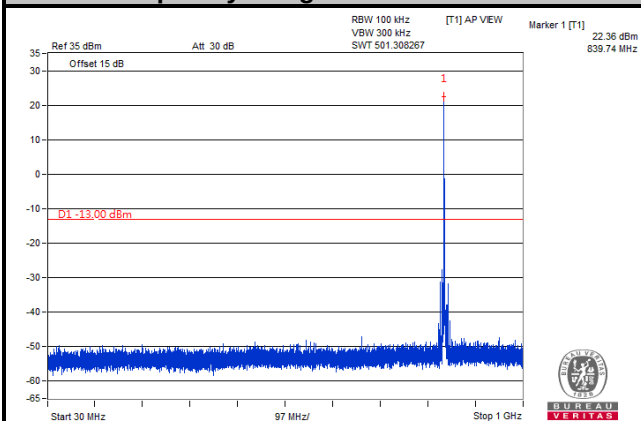


Frequency Range: 1 GHz ~ 10 GHz

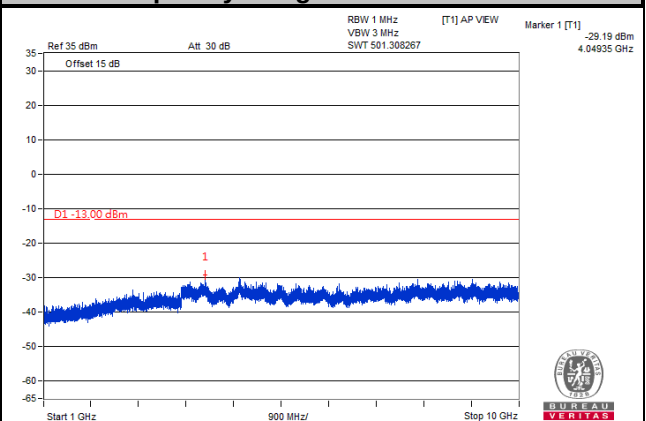


Channel 20600

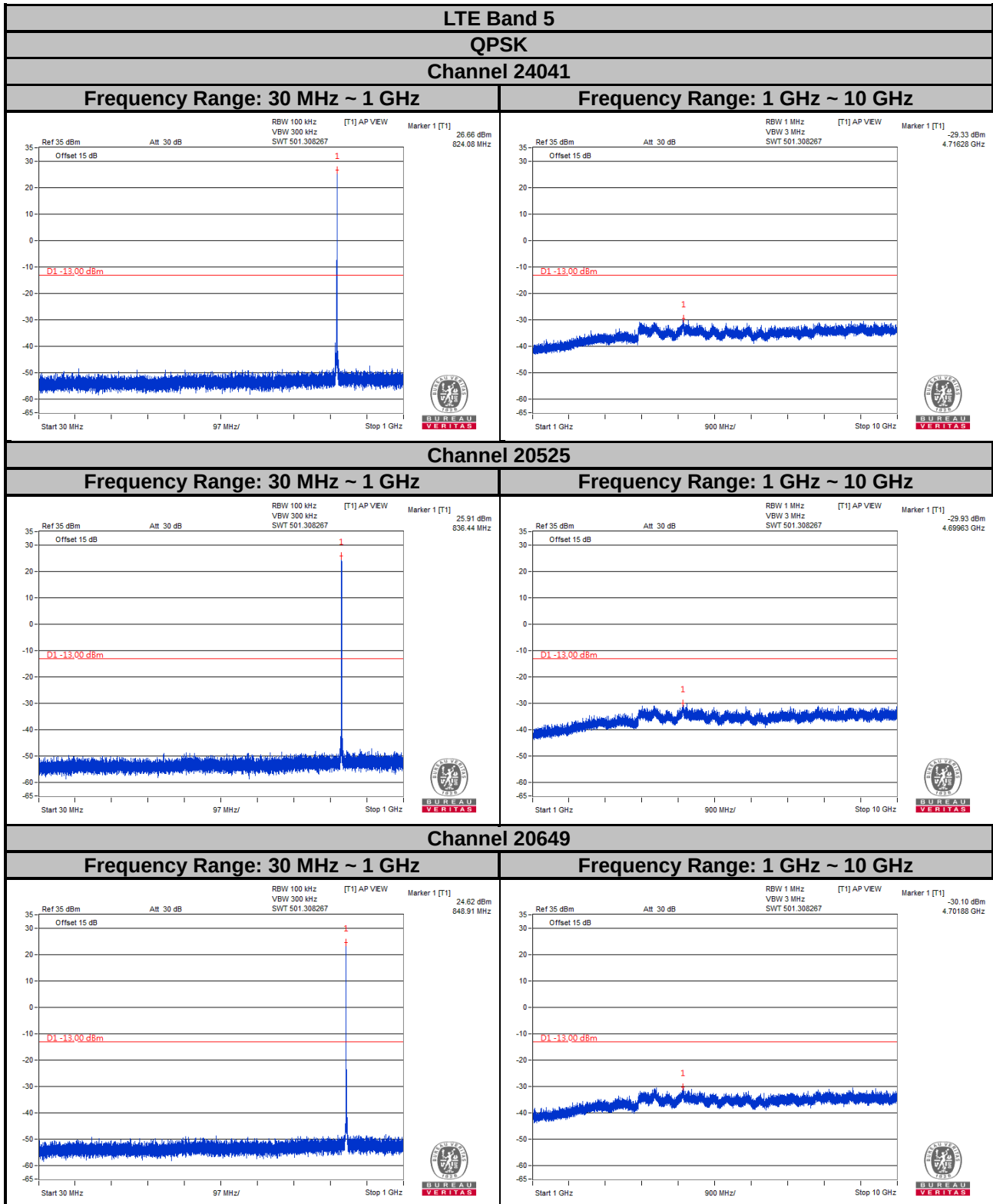
Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



NB-IOT



4.8 Radiated Emission Measurement

4.8.1 Limits of Radiated Emission Measurement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. The emission limit is equal to -13 dBm.

4.8.2 Test Procedure

- a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- b. 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. $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}.$
- d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, $E.R.P \text{ power} = E.I.R.P \text{ power} - 2.15 \text{ dB}.$

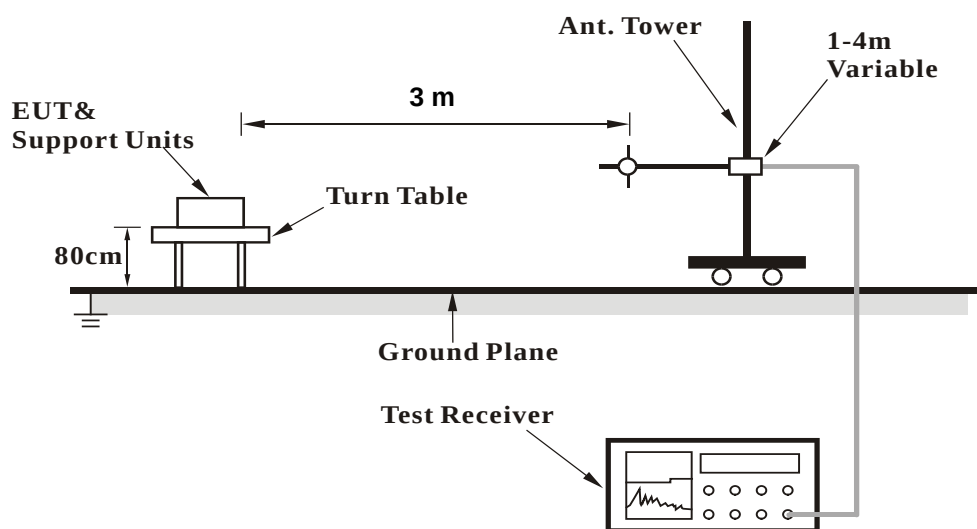
NOTE: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz.

4.8.3 Deviation from Test Standard

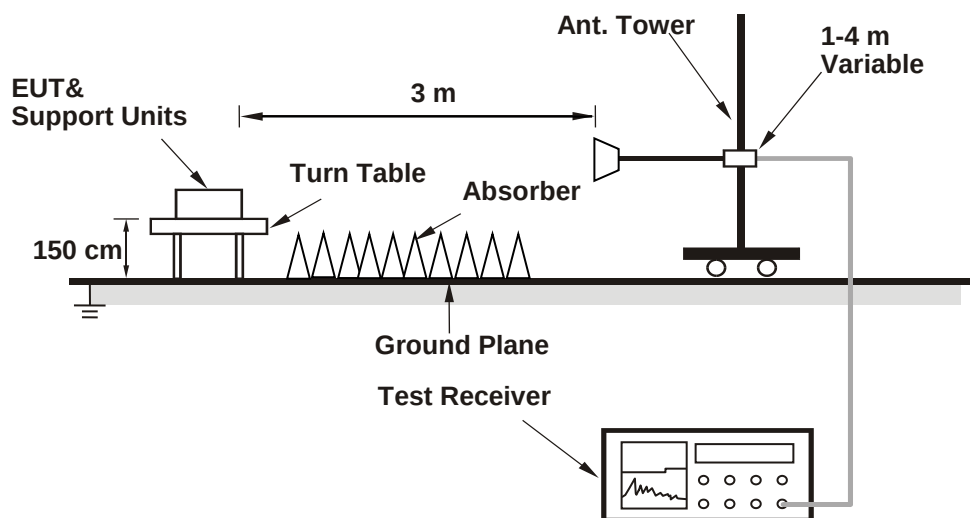
No deviation.

4.8.4 Test Setup

<Radiated Emission below or equal 1 GHz>



<Radiated Emission above 1 GHz>



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

4.8.5 Test Results

Cat-M1

LTE Band 5

Channel Bandwidth: 1.4 MHz / QPSK

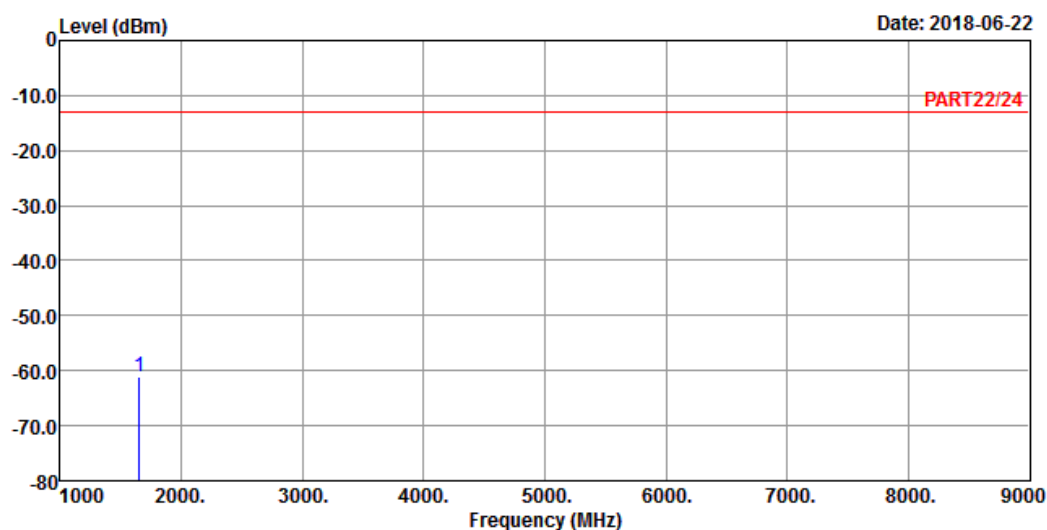
Low Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 Chamber 5

Condition: PART22/24 HORIZONTAL

Remak : Cat-M1 Band 5 QPSK_1.4M Link_L-CH

Tested by: Jisyong Wang

		Read	Limit	Over		
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	

1 pp 1649.40 -61.25 -47.51 -13.00 -48.25 -13.74 Peak

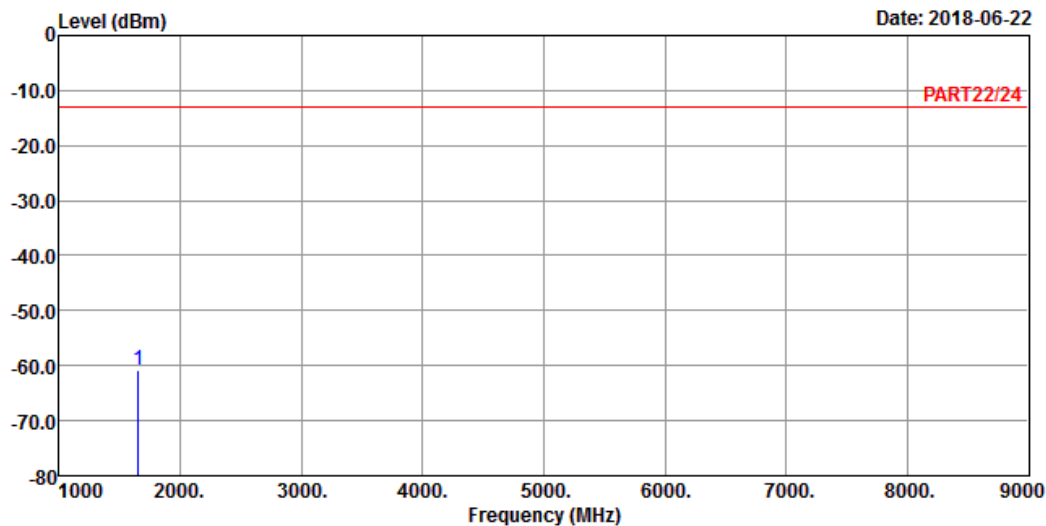


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 2018-06-22



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : Cat-M1 Band 5 QPSK_1.4M Link_L-CH

Tested by: Jisyong Wang

Freq	Level	Read	Limit	Over			Remark
		Level	Line	Limit	Factor		
MHz	dBm	dBm	dBm	dB	dB		

1 pp 1649.40 -60.85 -47.11 -13.00 -47.85 -13.74 Peak

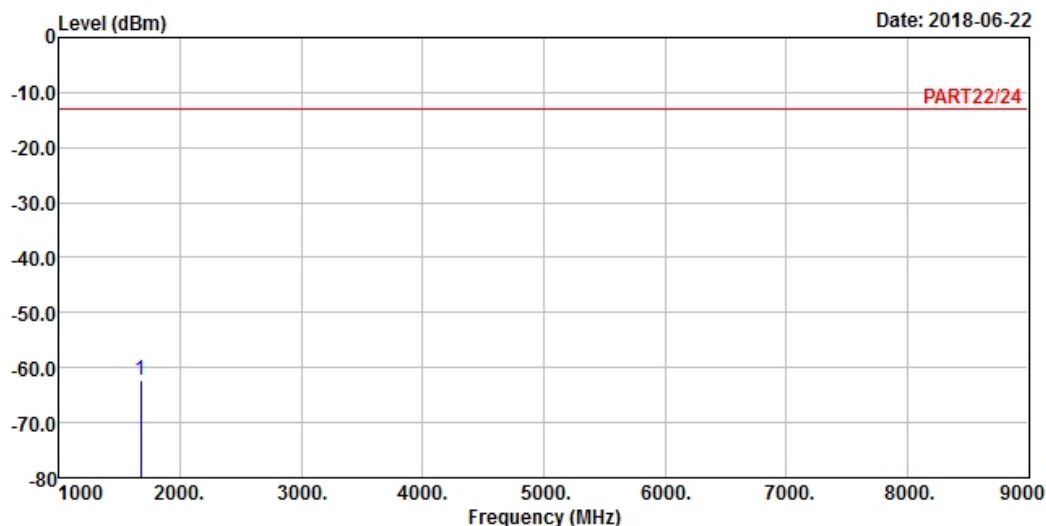
Middle Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : Cat-M1 Band 5 QPSK_1.4M Link_M-CH
Tested by: Jisyong Wang

Freq	Level	Read		Limit		Over	Factor	Remark
		Level	Line	Level	Line			
MHz	dBm	dBm	dBm	dBm	dB	dB		

1 pp 1673.00 -62.23 -48.33 -13.00 -49.23 -13.90 Peak

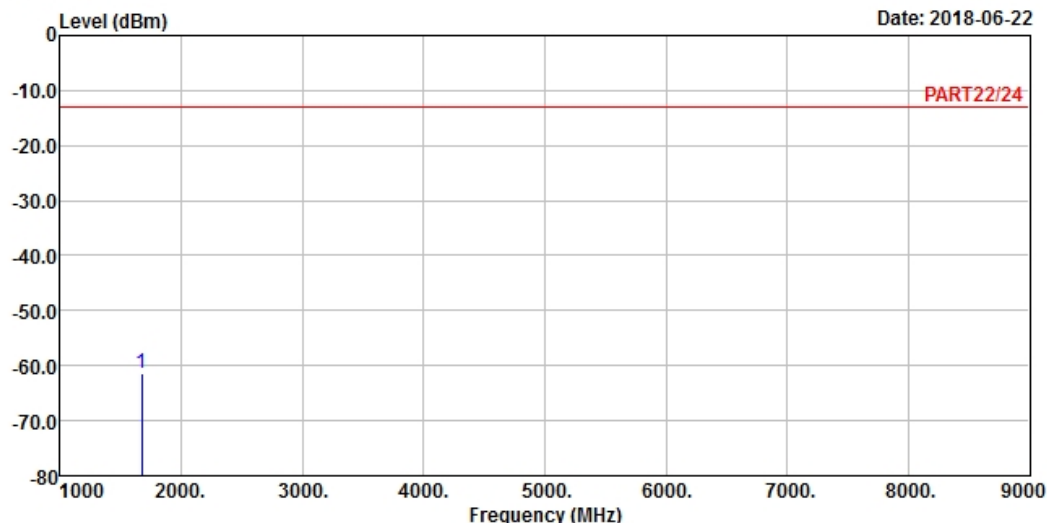


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 2018-06-22



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : Cat-M1 Band 5 QPSK_1.4M Link_M-CH

Tested by: Jisyong Wang

Freq	Level	Read	Limit	Over			Remark
		Level	Line	Limit	Factor		
MHz	dBm	dBm	dBm	dB	dB		

1 pp 1673.00 -61.39 -47.49 -13.00 -48.39 -13.90 Peak

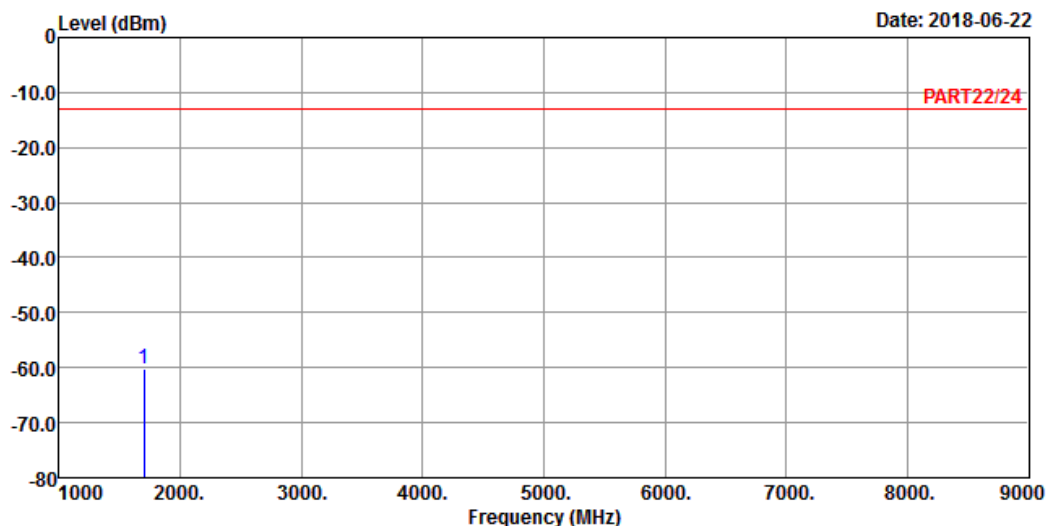
High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : Cat-M1 Band 5 QPSK_1.4M Link_H-CH
Tested by: Jisyong Wang

Freq	Level	Read	Limit	Over		Factor	Remark
		Level	Line	Limit	dB		
MHz	dBm	dBm	dBm	dB	dB		

1 pp 1696.60 -60.12 -46.10 -13.00 -47.12 -14.02 Peak

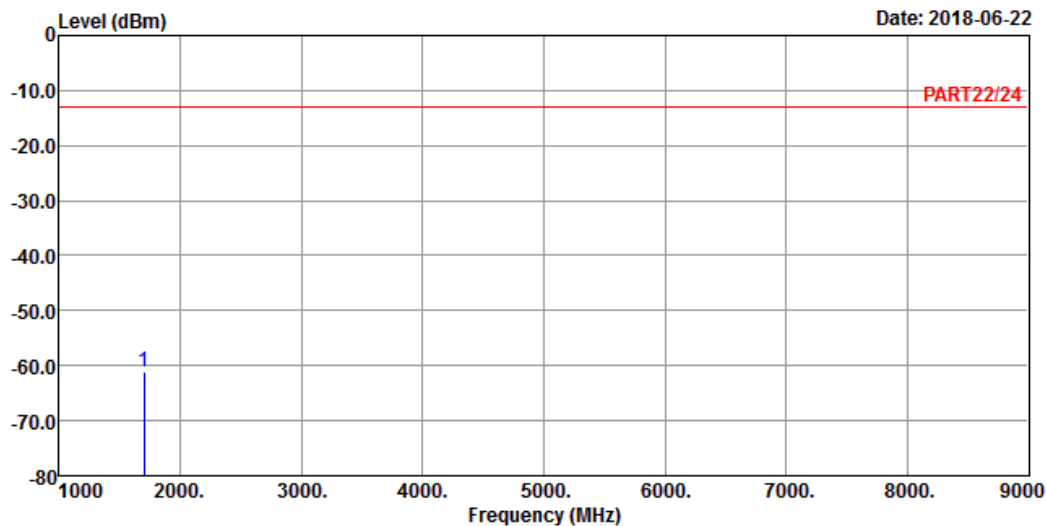


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 2018-06-22



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : Cat-M1 Band 5 QPSK_1.4M Link_H-CH

Tested by: Jisyong Wang

Freq	Level	Read	Limit	Over	Factor	Remark
		Level	Line	Limit		
MHz	dBm	dBm	dBm	dB	dB	

1 pp 1696.60 -61.25 -47.23 -13.00 -48.25 -14.02 Peak

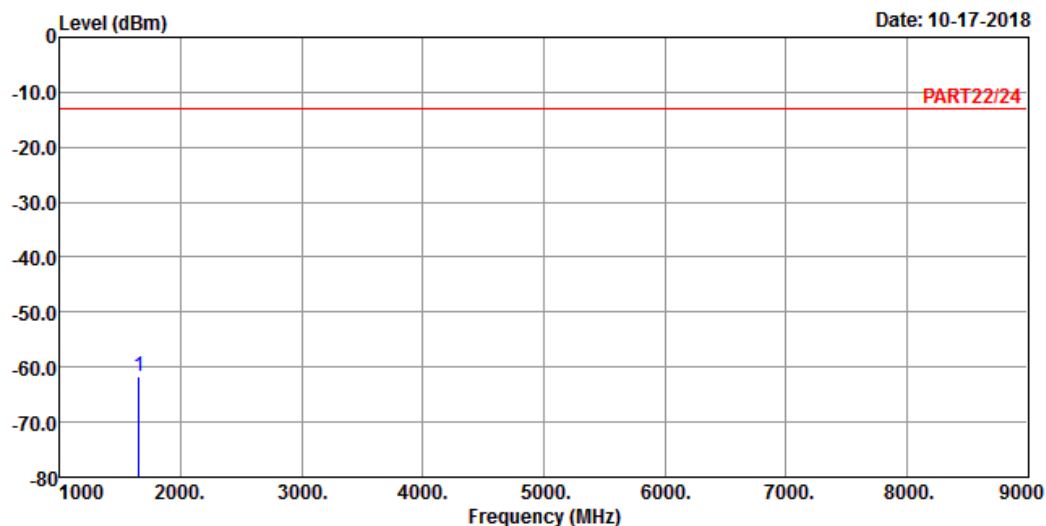
Channel Bandwidth: 3 MHz / QPSK
Low Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : Cat-M1 Band 5 QPSK_3M Link_L-CH
Tested by: Jisyong Wang

		Read	Limit	Over		
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	

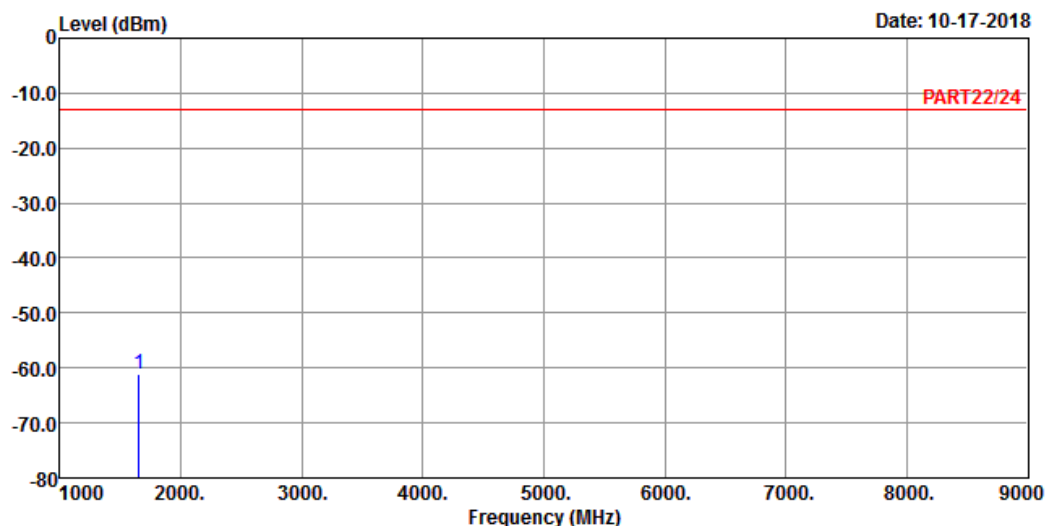
1 pp 1651.00 -61.78 -48.04 -13.00 -48.78 -13.74 Peak



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4



Site : 966 Chamber 5
 Condition: PART22/24 VERTICAL
 Remak : Cat-M1 Band 5 QPSK_3M Link_L-CH
 Tested by: Jisyong Wang

		Read	Limit	Over		
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	

1 pp 1651.00 -60.99 -47.25 -13.00 -47.99 -13.74 Peak

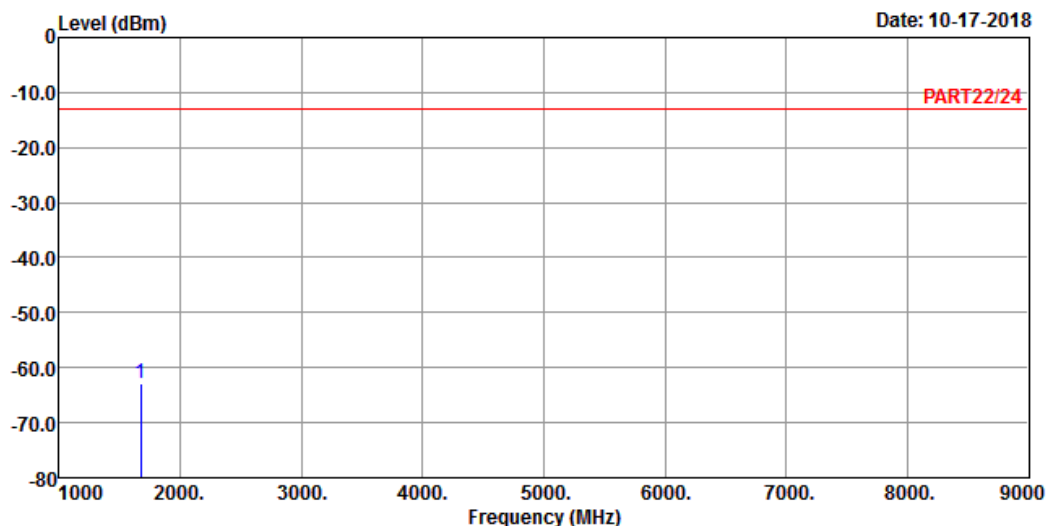
Middle Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 Chamber 5
 Condition: PART22/24 HORIZONTAL
 Remak : Cat-M1 Band 5 QPSK_3M Link_M-CH
 Tested by: Jisyong Wang

		Read	Limit	Over		
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	

1 pp 1673.00 -62.75 -48.85 -13.00 -49.75 -13.90 Peak

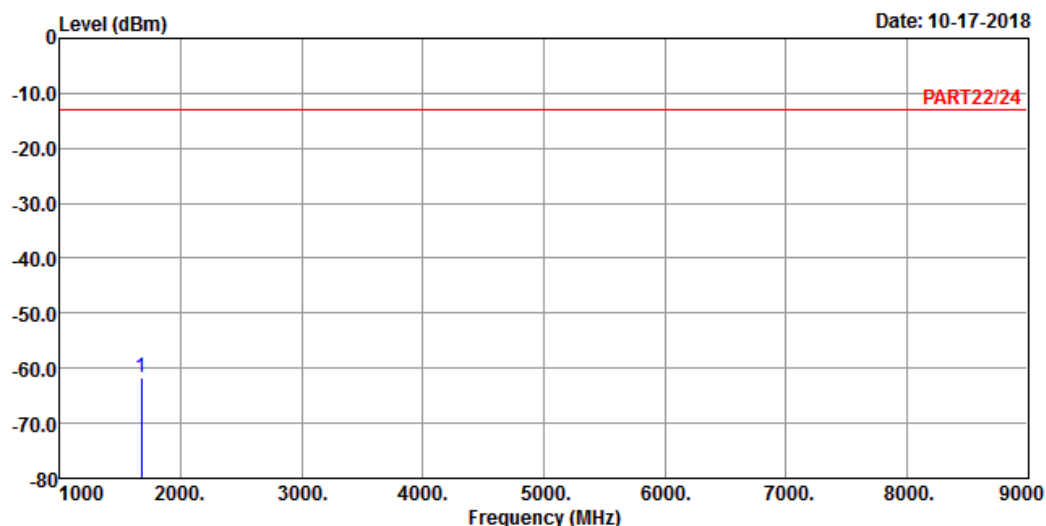


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 10-17-2018



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : Cat-M1 Band 5 QPSK_3M Link_M-CH

Tested by: Jisyong Wang

		Read	Limit	Over		
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	

1 pp 1673.00 -61.69 -47.79 -13.00 -48.69 -13.90 Peak

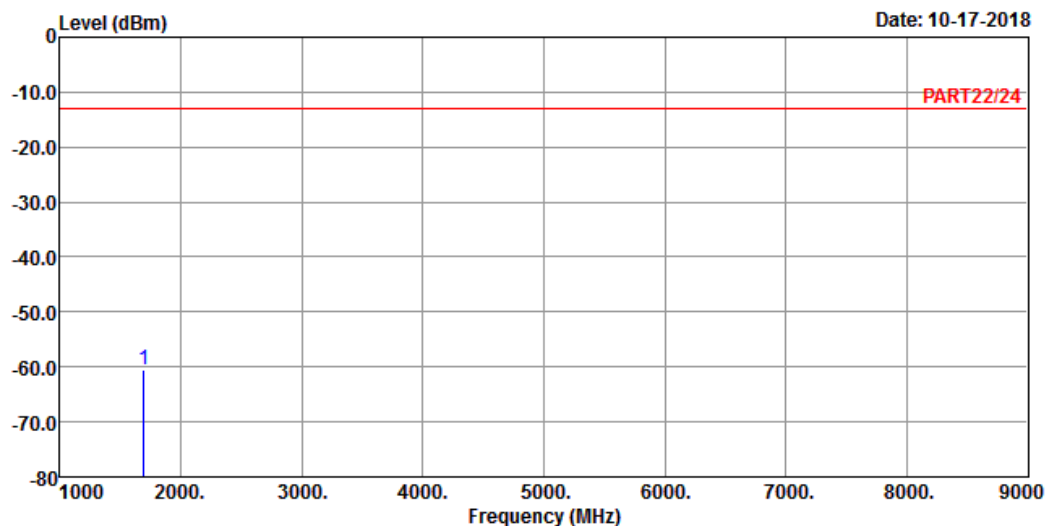
High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : Cat-M1 Band 5 QPSK_3M Link_H-CH
Tested by: Jisyong Wang

		Read	Limit	Over		
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	

1 pp 1695.00 -60.52 -46.50 -13.00 -47.52 -14.02 Peak

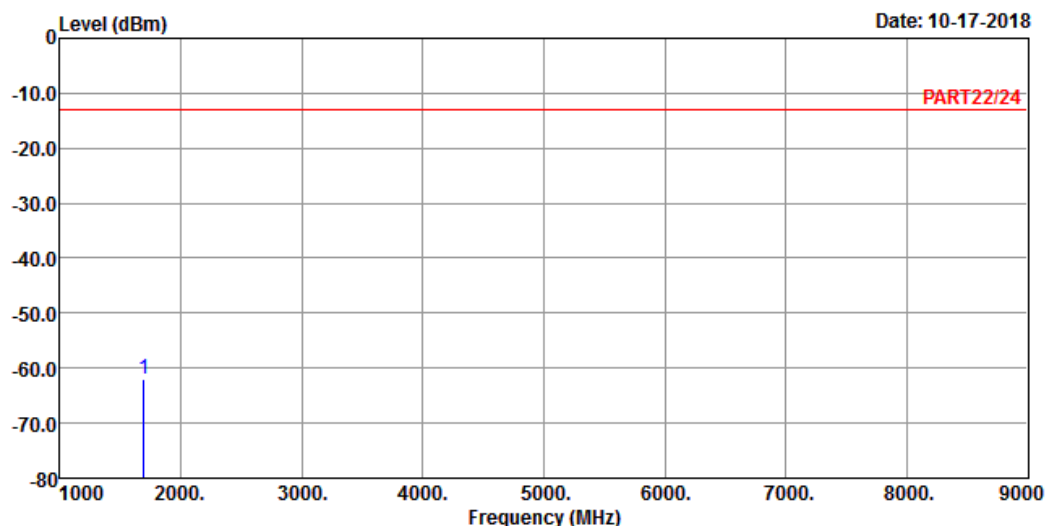


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 10-17-2018



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : Cat-M1 Band 5 QPSK_3M Link_H-CH

Tested by: Jisyong Wang

Freq	Level	Read	Limit	Over	Factor	Remark
		Level	Line	Limit		
MHz	dBm	dBm	dBm	dB	dB	

1 pp 1695.00 -61.85 -47.83 -13.00 -48.85 -14.02 Peak

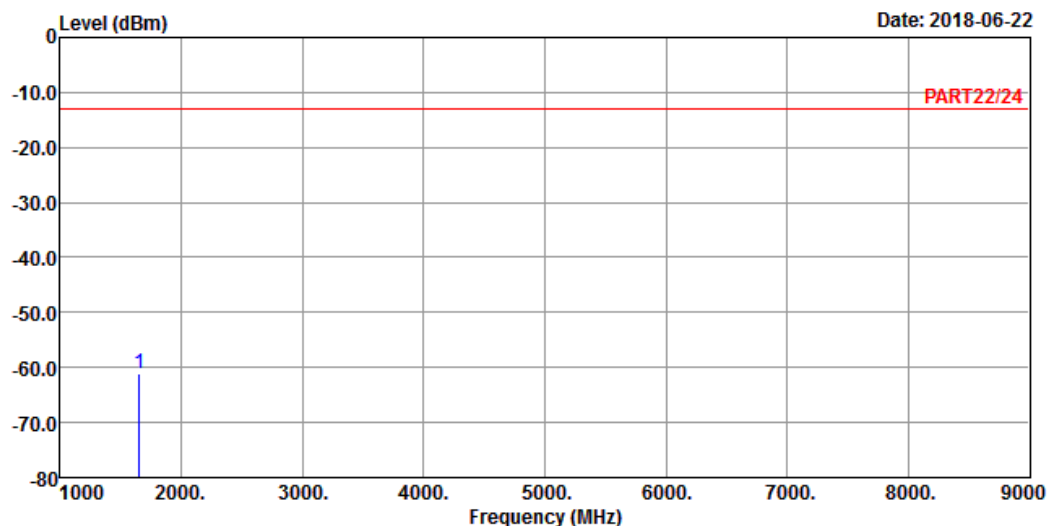
Channel Bandwidth: 5 MHz / QPSK
Low Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : Cat-M1 Band 5 QPSK_5M Link_L-CH
Tested by: Jisyong Wang

		Read	Limit	Over		
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	

1 pp 1653.00 -61.02 -47.25 -13.00 -48.02 -13.77 Peak

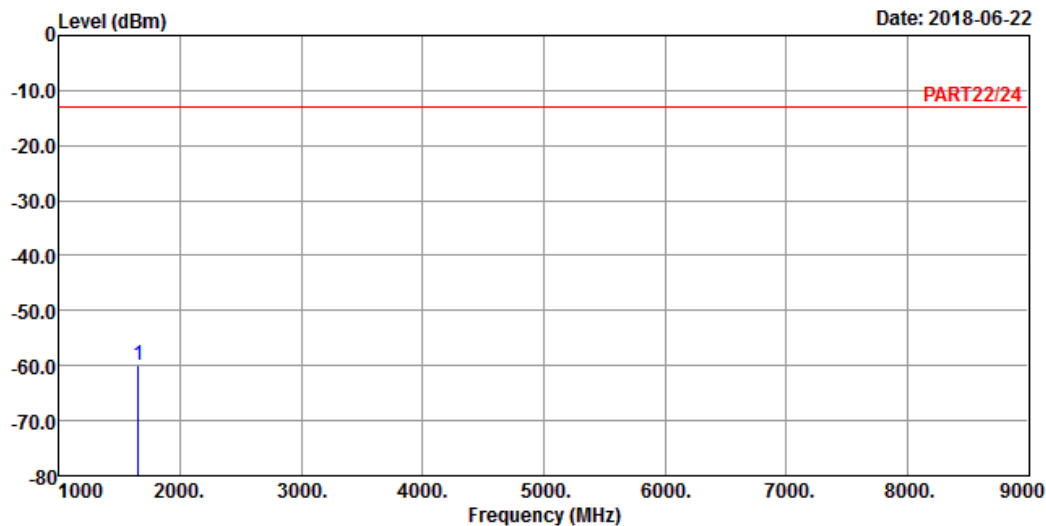


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 2018-06-22



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : Cat-M1 Band 5 QPSK_5M Link_L-CH

Tested by: Jisyong Wang

Freq	Level	Read	Limit	Over	Factor	Remark
		Level	Line	Limit		
MHz	dBm	dBm	dBm	dB	dB	

1 pp 1653.00 -60.03 -46.26 -13.00 -47.03 -13.77 Peak

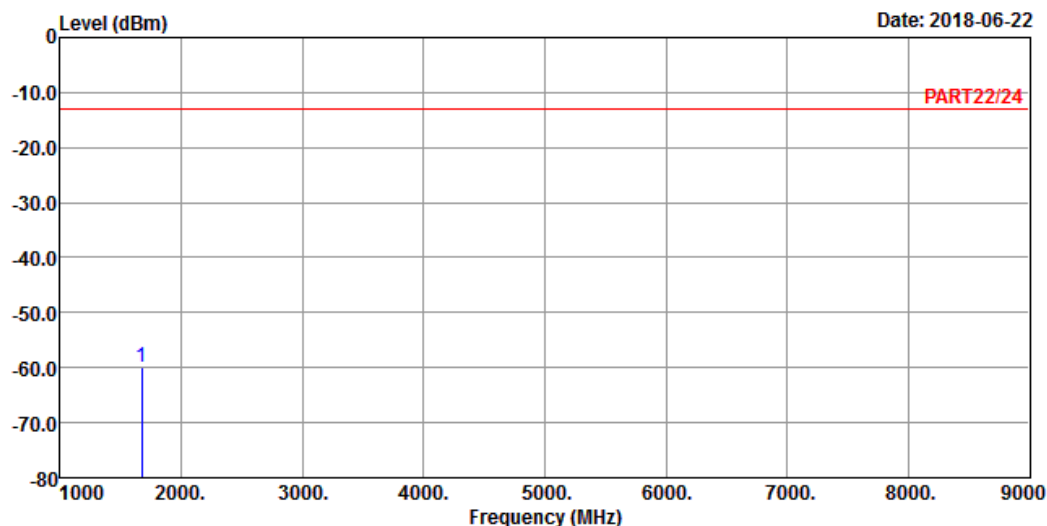
Middle Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : Cat-M1 Band 5 QPSK_5M Link_M-CH
Tested by: Jisyong Wang

		Read	Limit	Over		
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	

1 pp 1673.00 -60.02 -46.12 -13.00 -47.02 -13.90 Peak

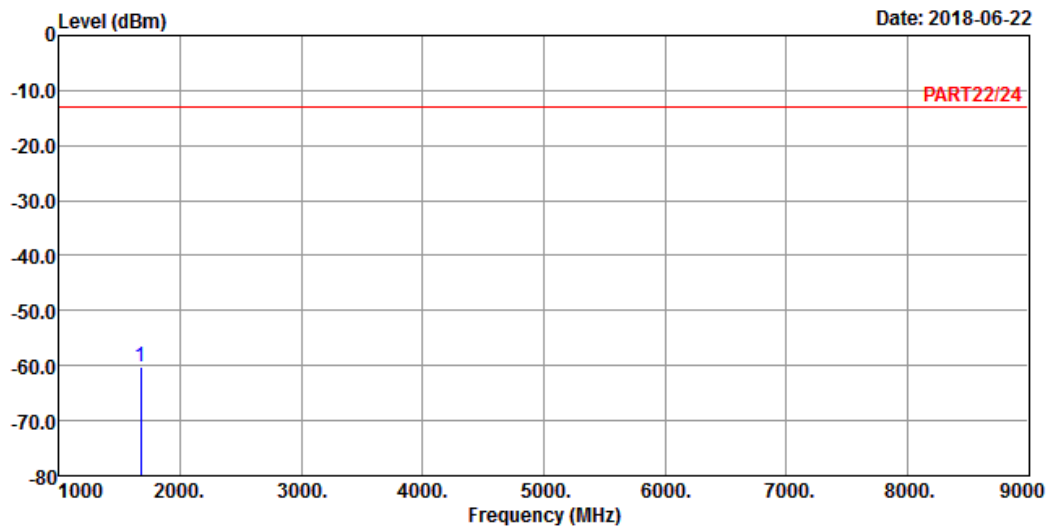


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 2018-06-22



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : Cat-M1 Band 5 QPSK_5M Link_M-CH

Tested by: Jisyong Wang

Freq	Level	Read	Limit	Over	Factor	Remark
		Level	Line	Limit		
MHz	dBm	dBm	dBm	dB	dB	

1 pp 1673.00 -60.15 -46.25 -13.00 -47.15 -13.90 Peak

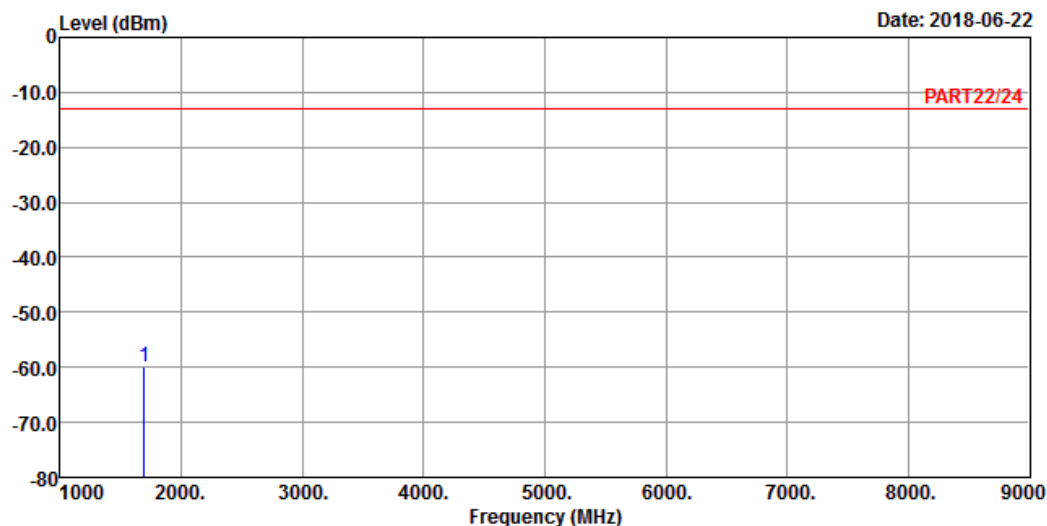
High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 Chamber 5

Condition: PART22/24 HORIZONTAL

Remak : Cat-M1 Band 5 QPSK_5M Link_H-CH

Tested by: Jisyong Wang

		Read	Limit	Over		
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	
1 pp 1693.00	-60.01	-45.99	-13.00	-47.01	-14.02	Peak

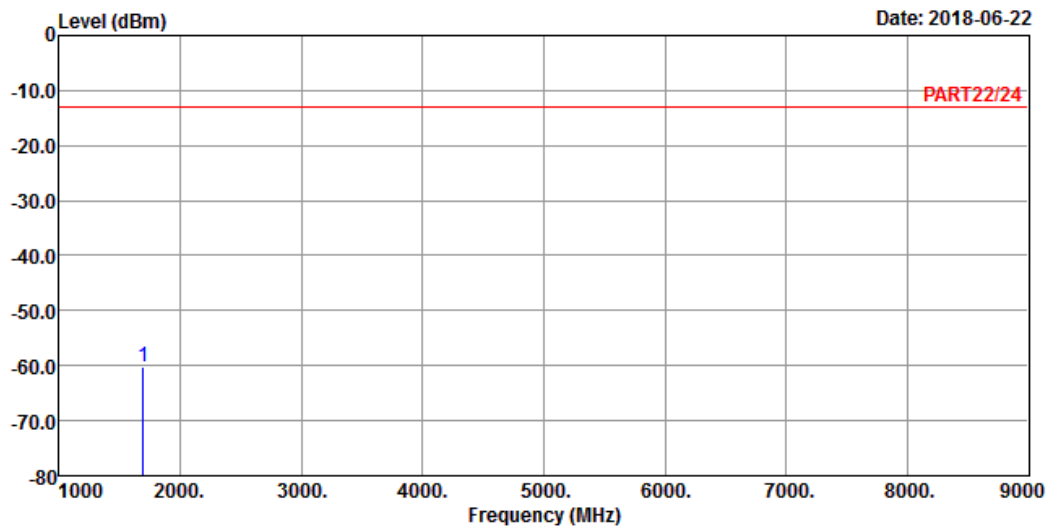


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 2018-06-22



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : Cat-M1 Band 5 QPSK_5M Link_H-CH

Tested by: Jisyong Wang

Freq	Level	Read	Limit	Over	Factor	Remark
		Level	Line	Limit		
MHz	dBm	dBm	dBm	dB	dB	

1 pp 1693.00 -60.13 -46.11 -13.00 -47.13 -14.02 Peak

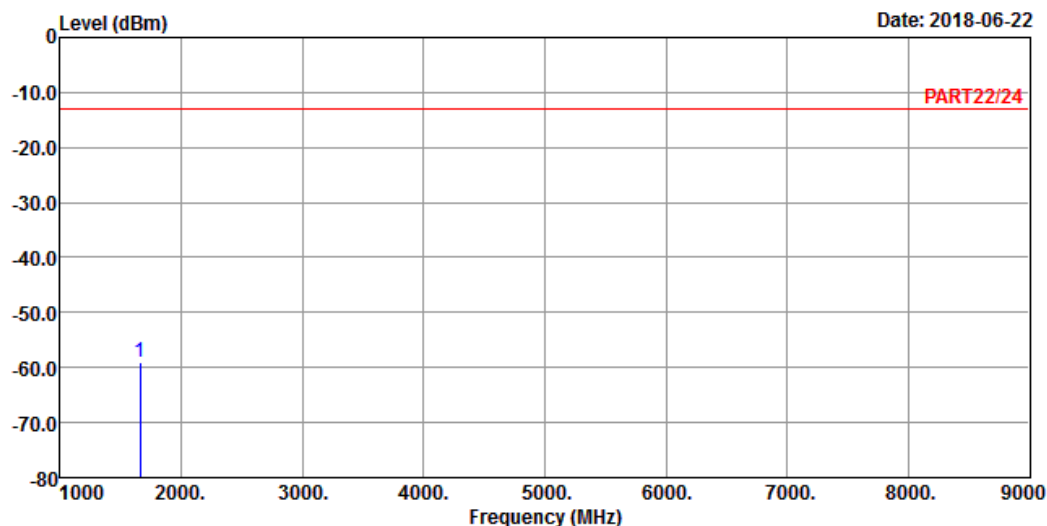
Channel Bandwidth: 10 MHz / QPSK
Low Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : Cat-M1 Band 5 QPSK_10M Link_L-CH
Tested by: Jisyong Wang

		Read	Limit	Over		
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	

1 pp 1658.00 -59.01 -45.21 -13.00 -46.01 -13.80 Peak

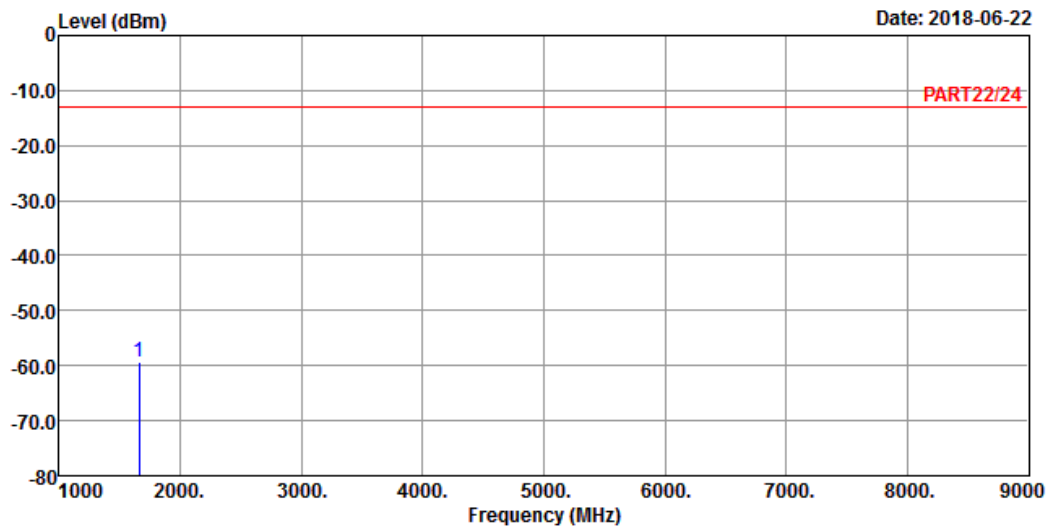


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 2018-06-22



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : Cat-M1 Band 5 QPSK_10M Link_L-CH

Tested by: Jisyong Wang

Freq	Level	Read	Limit	Over			Remark
		Level	Line	Limit	Factor		
MHz	dBm	dBm	dBm	dB	dB		

1 pp 1658.00 -59.23 -45.43 -13.00 -46.23 -13.80 Peak

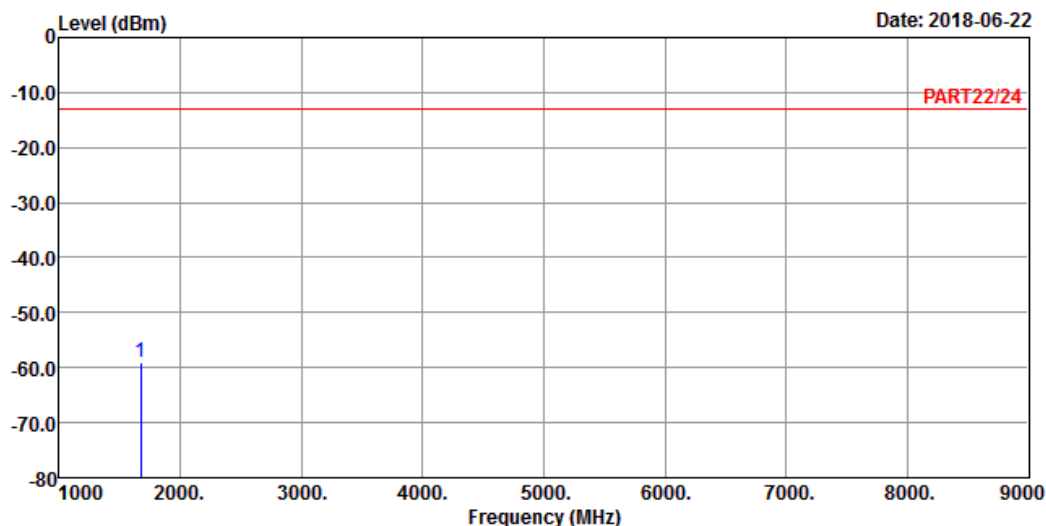
Middle Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : Cat-M1 Band 5 QPSK_10M Link_M-Ch
Tested by: Jisyong Wang

		Read	Limit	Over		
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	

1 pp 1673.00 -59.01 -45.11 -13.00 -46.01 -13.90 Peak

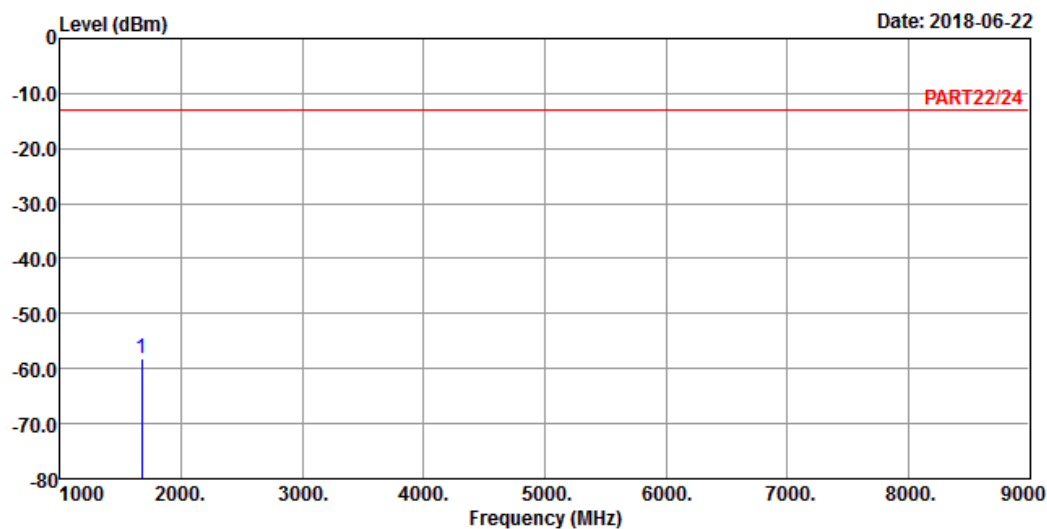


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 2018-06-22



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : Cat-M1 Band 5 QPSK_10M Link_M-Ch

Tested by: Jisyong Wang

Freq	Level	Read	Limit	Over			Remark
		Level	Line	Limit	Factor		
MHz	dBm	dBm	dBm	dB	dB		

1 pp 1673.00 -58.03 -44.13 -13.00 -45.03 -13.90 Peak

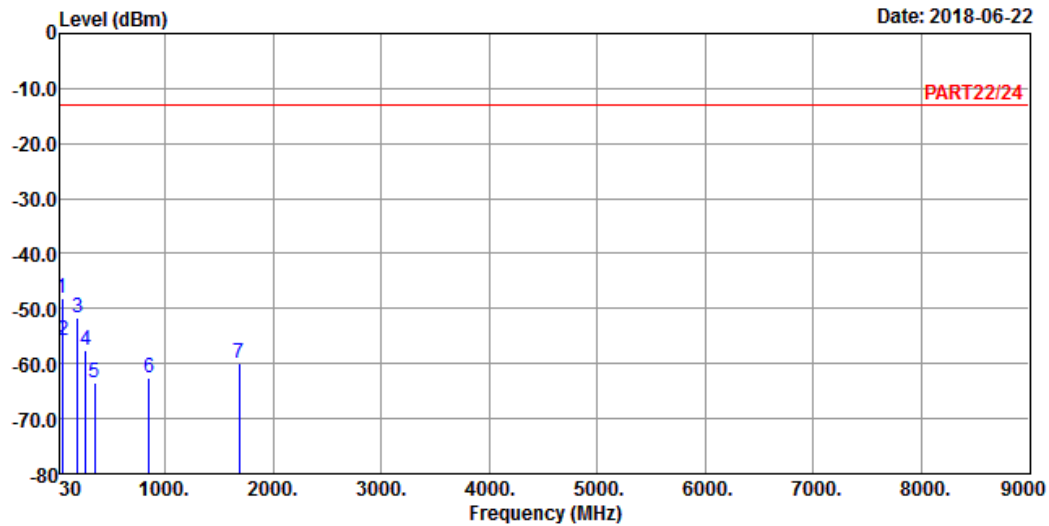
High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 7



Site : 966 Chamber 5
 Condition: PART22/24 HORIZONTAL
 Remak : Cat-M1 Band 5 QPSK_10M Link_H-CH
 Tested by: Jisyong Wang

			Read	Limit	Over		
	Freq	Level	Level	Line	Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	44.31	-48.06	-46.07	-13.00	-35.06	-1.99	Peak
2	52.41	-55.81	-50.27	-13.00	-42.81	-5.54	Peak
3	192.54	-51.70	-44.33	-13.00	-38.70	-7.37	Peak
4	267.33	-57.65	-51.30	-13.00	-44.65	-6.35	Peak
5	346.20	-63.39	-57.09	-13.00	-50.39	-6.30	Peak
6	853.70	-62.59	-62.90	-13.00	-49.59	0.31	Peak
7	1688.00	-60.01	-46.02	-13.00	-47.01	-13.99	Peak

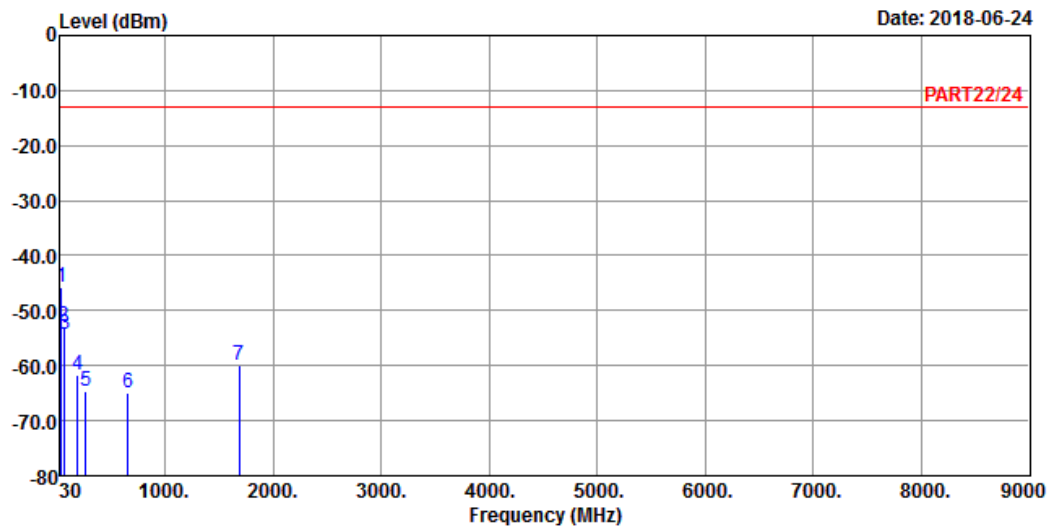


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 8

Date: 2018-06-24



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : Cat-M1 Band 5 QPSK_10M Link_H-CH

Tested by: Jisyong Wang

			Read	Limit	Over		
	Freq	Level	Level	Line	Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	42.69	-45.84	-44.90	-13.00	-32.84	-0.94	Peak
2	58.89	-52.72	-45.32	-13.00	-39.72	-7.40	Peak
3	67.53	-54.22	-45.97	-13.00	-41.22	-8.25	Peak
4	187.95	-61.78	-54.63	-13.00	-48.78	-7.15	Peak
5	262.47	-64.63	-58.38	-13.00	-51.63	-6.25	Peak
6	658.40	-64.80	-64.05	-13.00	-51.80	-0.75	Peak
7	1688.00	-60.01	-46.02	-13.00	-47.01	-13.99	Peak

NB-IOT
LTE Band 5
Low Channel

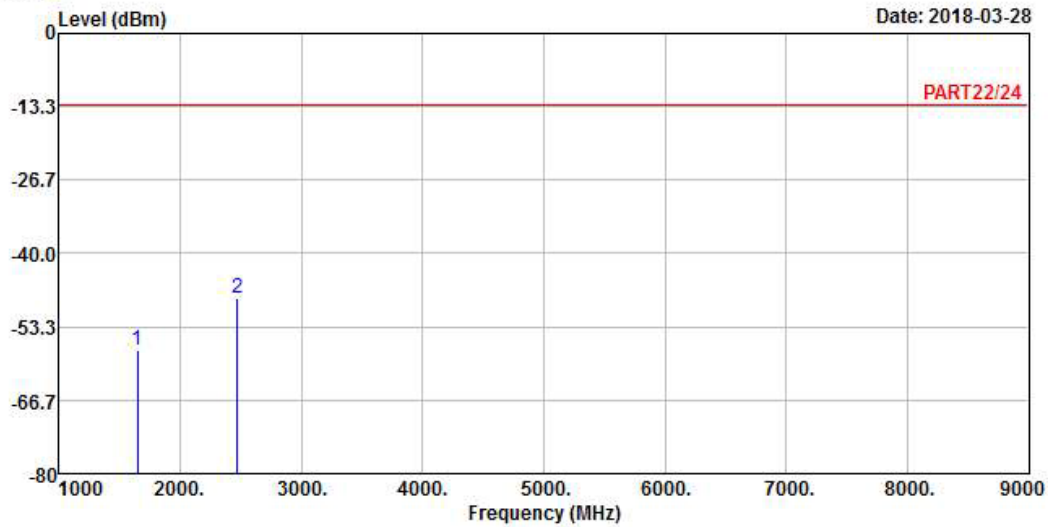


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3

Date: 2018-03-28



Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : NB-IOT Band 5 Stand-alone_Link_L-Ch
Tested by: Getaz Yang

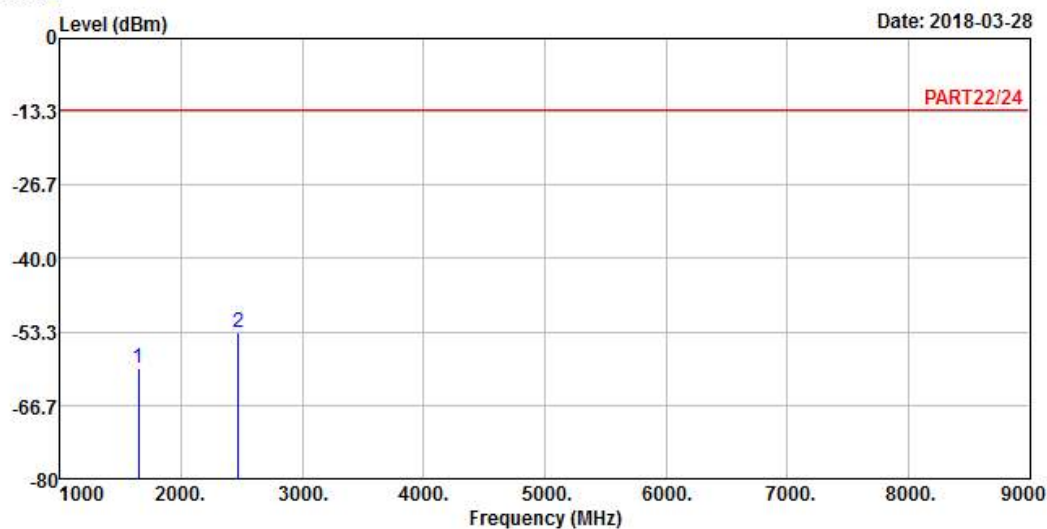
	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	1648.20	-57.44	-43.70	-13.00	-44.44	-13.74	Peak
2 pp	2472.30	-48.03	-38.01	-13.00	-35.03	-10.02	Peak



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : NB-IOT Band 5 Stand-alone_Link_L-Ch

Tested by: Getaz Yang

			Read	Limit	Over		
	Freq	Level	Level	Line	Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	1648.20	-59.80	-46.06	-13.00	-46.80	-13.74	Peak
2 pp	2472.30	-53.42	-43.40	-13.00	-40.42	-10.02	Peak

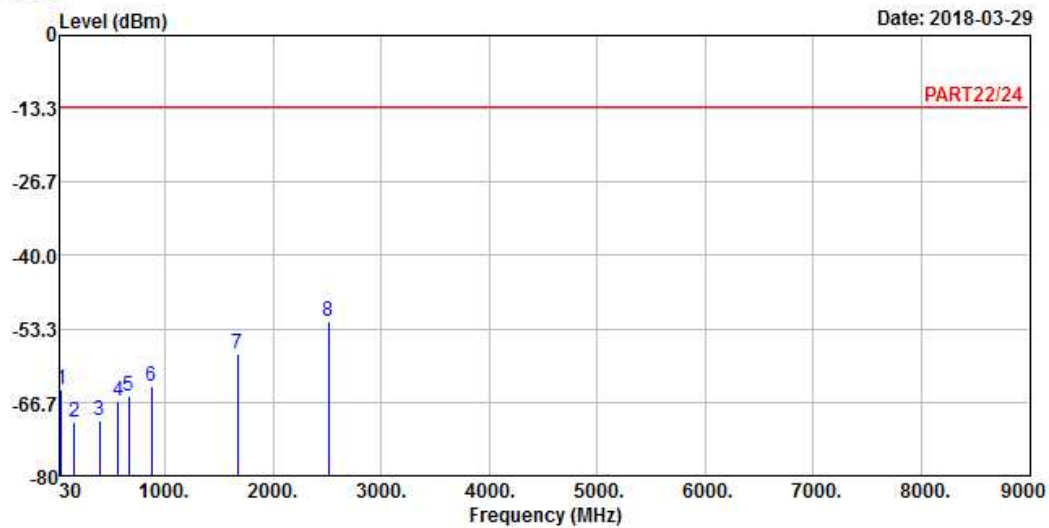
Middle Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5



Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : NB-IOT Band 5 Stand-alone_Link_M-Ch
Tested by: Getaz Yang

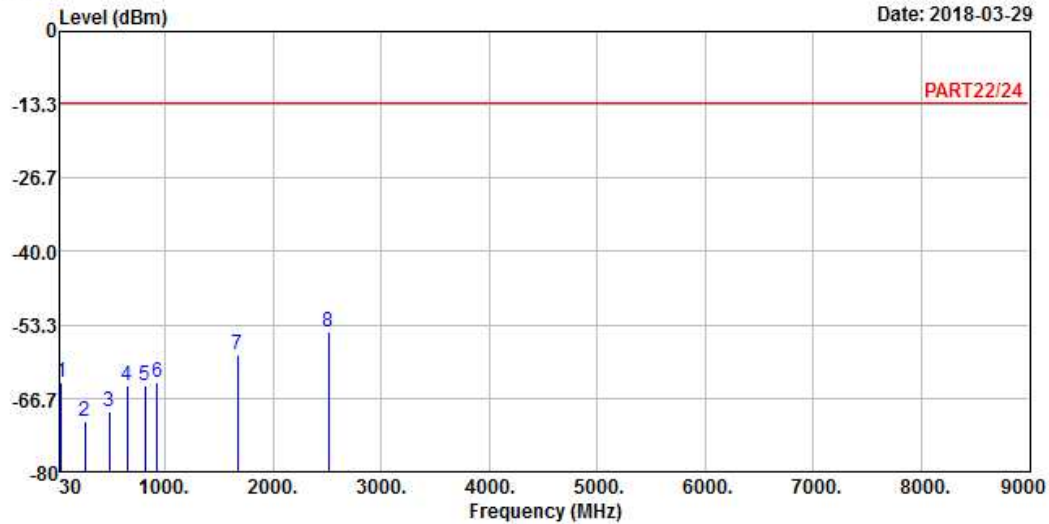
			Read	Limit	Over		
	Freq	Level	Level	Line	Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	40.67	-64.22	-64.34	-13.00	-51.22	0.12	Peak
2	162.89	-70.25	-65.20	-13.00	-57.25	-5.05	Peak
3	389.87	-69.94	-63.94	-13.00	-56.94	-6.00	Peak
4	569.32	-66.53	-64.49	-13.00	-53.53	-2.04	Peak
5	667.29	-65.61	-65.00	-13.00	-52.61	-0.61	Peak
6	876.81	-63.77	-64.21	-13.00	-50.77	0.44	Peak
7	1672.00	-57.76	-43.86	-13.00	-44.76	-13.90	Peak
8 pp	2509.50	-51.96	-41.88	-13.00	-38.96	-10.08	Peak



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : NB-IOT Band 5 Stand-alone_Link_M-Ch

Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	38.73	-63.85	-63.95	-13.00	-50.85	0.10	Peak
2	256.98	-70.73	-64.60	-13.00	-57.73	-6.13	Peak
3	484.93	-69.11	-64.21	-13.00	-56.11	-4.90	Peak
4	648.86	-64.39	-63.51	-13.00	-51.39	-0.88	Peak
5	811.82	-64.43	-65.06	-13.00	-51.43	0.63	Peak
6	923.37	-63.62	-64.77	-13.00	-50.62	1.15	Peak
7	1673.00	-58.71	-44.81	-13.00	-45.71	-13.90	Peak
8 pp	2509.50	-54.61	-44.53	-13.00	-41.61	-10.08	Peak

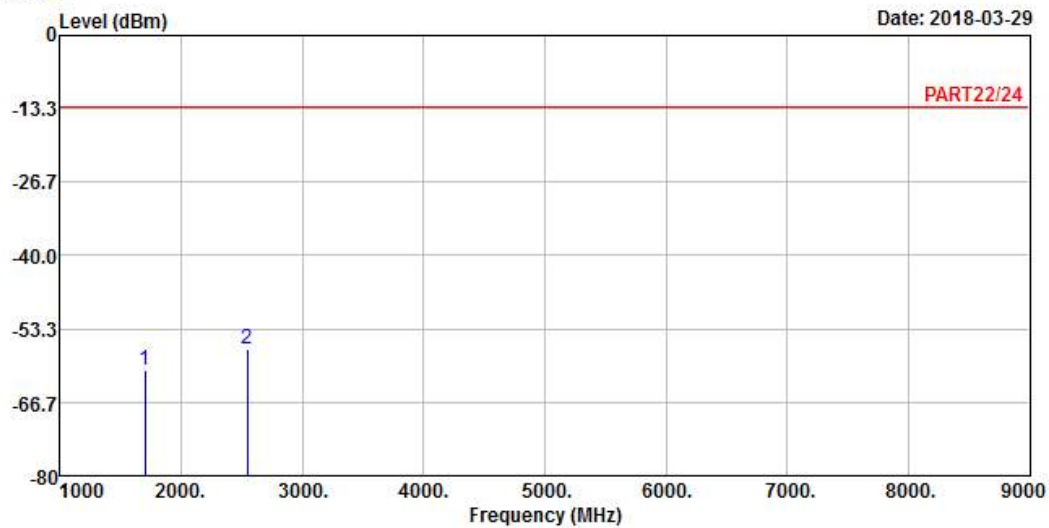
High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 Chamber 5

Condition: PART22/24 HORIZONTAL

Remak : NB-IOT Band 5 Stand-alone_Link_H-Ch

Tested by: Getaz Yang

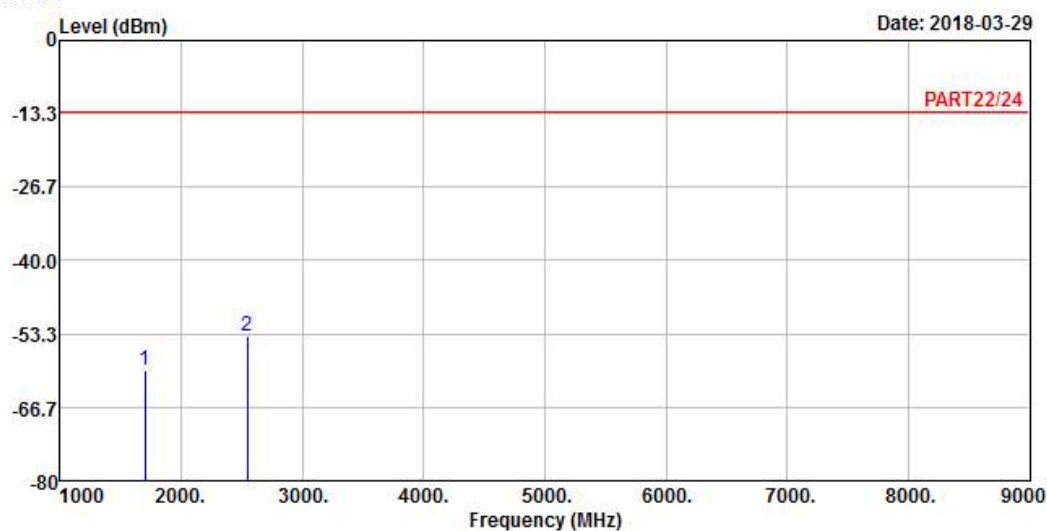
			Read	Limit	Over		
	Freq	Level	Level	Line	Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	1697.80	-60.81	-46.76	-13.00	-47.81	-14.05	Peak
2 pp	2546.70	-56.83	-46.77	-13.00	-43.83	-10.06	Peak



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : NB-IOT Band 5 Stand-alone_Link_H-Ch

Tested by: Getaz Yang

			Read	Limit	Over		
	Freq	Level	Level	Line	Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	1697.80	-60.01	-45.96	-13.00	-47.01	-14.05	Peak
2 pp	2546.70	-53.75	-43.69	-13.00	-40.75	-10.06	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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