FCC Test Report

(PART 22)

Report No.:	RFBEHG-WTW-P21050666-3
FCC ID:	2AA5WKMP8S1AA
Test Model:	NAR01 (Mobile Router)
Received Date:	May 24, 2021
Test Date:	Jul. 15 ~ Sep. 15, 2021
Issued Date:	Sep. 30, 2021
Applicant:	NEC Platforms, Ltd.
Address:	2-3, tsukasa-machi, kanda, chiyoda-ku, Tokyo 101-8532 Japan
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location (1):	No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, Taiwan
Test Location (2):	B2F., No.215, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan
FCC Registration / Designation Number:	788550 / TW0003 427177 / TW0011

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RFBEHG-WTW-P21050666-3	Original Release	Sep. 30, 2021

1 Certificate of Conformity

Product:	NAR01 Mobile Router
Brand:	NEC
Test Model:	NAR01 (Mobile Router)
Sample Status:	Engineering Sample
Applicant:	NEC Platforms, Ltd.
Test Date:	Jul. 15 ~ Sep. 15, 2021
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 : Lena Wang , **Date:** Sep. 30, 2021

Lena Wang / Specialist

Approved by : , **Date:** Sep. 30, 2021

Dylan Chiou / Senior 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.
22.913 (d)	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 -29.37 dB at 1688.00 MHz.

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

2.1 Measurement Uncertainty

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

Measurement	**Frequency**	**Expanded Uncertainty (k=2) (±)**
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.0400 dB
	30 MHz ~ 200 MHz	2.0153 dB
	200 MHz ~ 1000 MHz	2.0224 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	1.0121 dB
	18 GHz ~ 40 GHz	1.1508 dB

2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent Technologies	N9038A	MY52260177	Aug. 24, 2020	Aug. 23, 2021
			Sep. 01, 2021	Aug. 31, 2022
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Apr. 12, 2021	Apr. 11, 2022
HORN Antenna ETS-Lindgren	3117	00143293	Nov. 22, 2020	Nov. 21, 2021
BILOG Antenna SCHWARZBECK	VULB 9168	9168-616	Nov. 09, 2020	Nov. 08, 2021
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 13, 2021	Apr. 12, 2022
Preamplifier Agilent	310N	187226	Jun. 17, 2021	Jun. 16, 2022
Preamplifier Agilent	83017A	MY39501357	Jun. 17, 2021	Jun. 16, 2022
Preamplifier EMCI	EMC 184045	980116	Oct. 07, 2020	Oct. 06, 2021
Power Meter Anritsu	ML2495A	1012010	Sep. 01, 2020	Aug. 31, 2021
			Sep. 09, 2021	Sep. 08, 2022
Power Sensor Anritsu	MA2411B	1315050	Sep. 01, 2020	Aug. 31, 2021
			Sep. 09, 2021	Sep. 08, 2022
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-400)	Jun. 17, 2021	Jun. 16, 2022
RF signal cable ETS-LINDGREN	8D-FB	Cable-CH1-02(RFC-SMS-100-SMS-24)	Jun. 17, 2021	Jun. 16, 2022
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Software BV ADT	E3 8.130425b	NA	NA	NA
Antenna Tower MF	NA	NA	NA	NA
Turn Table MF	NA	NA	NA	NA
Antenna Tower &Turn Table Controller MF	MF-7802	NA	NA	NA
MXG Vector signal generator Agilent	N5182B	MY53050430	Nov. 25, 2020	Nov. 24, 2021

Radio Communication Analyzer Anritsu	MT8820C	6201300640	Aug. 19, 2019	Aug. 18, 2021
			Aug. 26, 2021	Aug. 25, 2022

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 HsinTien Chamber 1.

3 General Information

3.1 General Description of EUT

Product	NAR01 Mobile Router	
Brand	NEC	
Test Model	NAR01 (Mobile Router)	
Status of EUT	Engineering Sample	
Power Supply Rating	5.0 Vdc (adapter) 3.8 Vdc (Battery)	
Modulation Type	WCDMA	QPSK
	LTE	QPSK, 16QAM, 64QAM
Frequency Range	WCDMA	826.4 ~ 846.6 MHz
	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
Max. ERP Power	WCDMA	126.42 mW
	LTE 5 (Channel Bandwidth: 1.4 MHz)	117.71 mW
	LTE 5 (Channel Bandwidth: 3 MHz)	118.80 mW
	LTE 5 (Channel Bandwidth: 5 MHz)	119.89 mW
	LTE 5 (Channel Bandwidth: 10 MHz)	120.73 mW
Emission Designator	WCDMA	4M16F9W
	LTE 5 (Channel Bandwidth: 1.4 MHz)	1M09D7W
	LTE 5 (Channel Bandwidth: 3 MHz)	2M70G7D
	LTE 5 (Channel Bandwidth: 5 MHz)	4M50D7W
	LTE 5 (Channel Bandwidth: 10 MHz)	8M98D7W
Antenna Type	Refer to Note as below	
Accessory Device	N/A	
Data Cable Supplied	N/A	

Note:

1. The EUT contains following accessory devices.

Product	Brand	Model	Description
Battery	NEC	GXE-005945	3.8 Vdc, Rated 4000mAh, 16Wh

2. The EUT uses following antennas.

Antenna Type		Inverted L (Omni-directional)			
Band		WCDMA		LTE	
		II	V	5	17
Gain	Ant. 1 (TX/RX)	1.7	-	-	-
	Ant. 2 (TX/RX)	-	-0.8	-0.8	-4.8

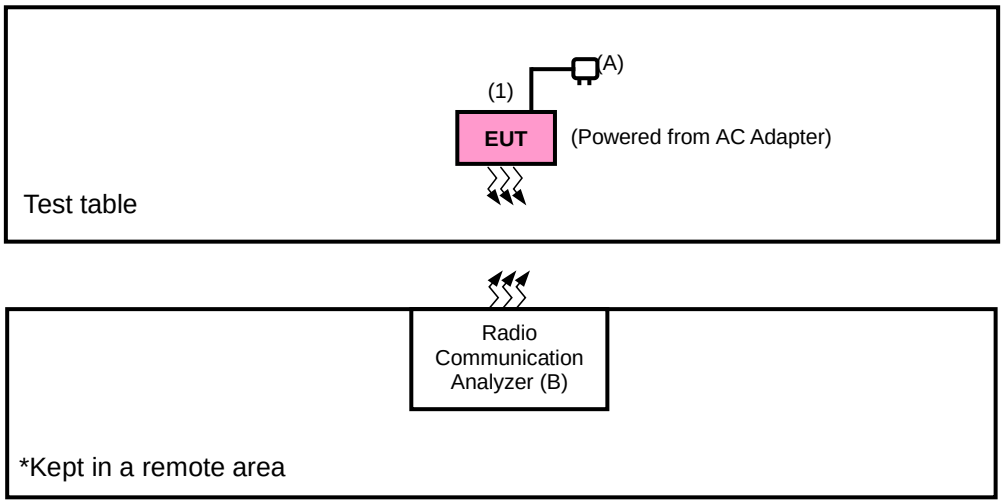
*Ant. 1 & Ant. 2 is diversity.

3. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.
4. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.
5. WLAN 2.4G & WWAN technology can transmit at same time.

6. Spurious emission of the simultaneous operation (WLAN2.4G & WWAN) has been evaluated and no non-compliance was found.

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. 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
A	Adapter	N/A	TC U250	N/A	N/A
B	Radio Communication Analyzer	Anritsu	MT8820C	6201300640	N/A

No.	Signal Cable Description Of The Above Support Units
1.	Type C Cable: 1M, Provided by client

Note:

1. All power cords of the above support units are non-shielded (1.8m).

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
WCDMA	X-plane	X-axis
LTE Band 5	X-plane	X-axis

WCDMA

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
-	ERP	4132 to 4233	4132, 4182, 4233	WCDMA
-	Modulation Characteristics	4132 to 4233	4182	WCDMA
-	Frequency Stability	4132 to 4233	4132, 4233	WCDMA
-	Occupied Bandwidth	4132 to 4233	4132, 4182, 4233	WCDMA
-	Band Edge	4132 to 4233	4132, 4233	WCDMA
-	Peak to Average Ratio	4132 to 4233	4132, 4182, 4233	WCDMA
-	Conducted Emission	4132 to 4233	4132, 4182, 4233	WCDMA
-	Radiated Emission	4132 to 4233	4132, 4182, 4233	WCDMA

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, 64QAM	1 RB / 0 RB Offset
		20415 to 20635	20415, 20525, 20635	3 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
		20425 to 20625	20425, 20525, 20625	5 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
		20450 to 20600	20450, 20525, 20600	10 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
-	Modulation Characteristics	20450 to 20600	20525	10 MHz	QPSK, 16QAM, 64QAM	1 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, 64QAM	6 RB / 0 RB Offset
		20415 to 20635	20415, 20525, 20635	3 MHz	QPSK, 16QAM, 64QAM	15 RB / 0 RB Offset
		20425 to 20625	20425, 20525, 20625	5 MHz	QPSK, 16QAM, 64QAM	25 RB / 0 RB Offset
		20450 to 20600	20450, 20525, 20600	10 MHz	QPSK, 16QAM, 64QAM	50 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
						15 RB / 0 RB Offset
			20635	3 MHz	QPSK	1 RB / 14 RB Offset
						15 RB / 0 RB Offset
		20425 to 20625	20425	5 MHz	QPSK	1 RB / 0 RB Offset
						25 RB / 0 RB Offset
			20625	5 MHz	QPSK	1 RB / 24 RB Offset
						25 RB / 0 RB Offset
		20450 to 20600	20450	10 MHz	QPSK	1 RB / 0 RB Offset
						50 RB / 0 RB Offset
			20600	10 MHz	QPSK	1 RB / 49 RB Offset
						50 RB / 0 RB Offset
-	Peak to Average Ratio	20407 to 20643	20407, 20525, 20643	1.4 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
		20415 to 20635	20415, 20525, 20635	3 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
		20425 to 20625	20425, 20525, 20625	5 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
		20450 to 20600	20450, 20525, 20600	10 MHz	QPSK, 16QAM, 64QAM	1 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	20407 to 20643	20407, 20525, 20643	1.4 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

Note:

1. This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation. Therefore, only ERP, modulation characteristics, occupied bandwidth and peak to average ratio items had been tested under QPSK, 16QAM, 64QAM mode, the other items were performed under QPSK mode only.
2. For radiated emission above 1 GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the lowest, 5 MHz & highest channel bandwidth for final test.
3. For radiated emissions below 1 GHz, select the worst radiated emission channel for final testing.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
ERP	25 deg. C, 65 % RH	120 Vac, 60 Hz	Wayne Lin
Modulation Characteristics	25 deg. C, 65 % RH	120 Vac, 60 Hz	Wayne Lin
Frequency Stability	25 deg. C, 65 % RH	3.8 Vdc	Wayne Lin
Occupied Bandwidth	25 deg. C, 65 % RH	120 Vac, 60 Hz	Wayne Lin
Band Edge	25 deg. C, 65 % RH	120 Vac, 60 Hz	Wayne Lin
Peak to Average Ratio	25 deg. C, 65 % RH	120 Vac, 60 Hz	Wayne Lin
Conducted Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Wayne Lin
Radiated Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Karl Lee

3.4 EUT Operating Conditions

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

3.5 General Description of Applied Standards and references

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

Test Standard:
FCC 47 CFR Part 2
FCC 47 CFR Part 22
ANSI 63.26-2015

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

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

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

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

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

4.1.2 Test Procedures

EIRP / ERP Measurement:

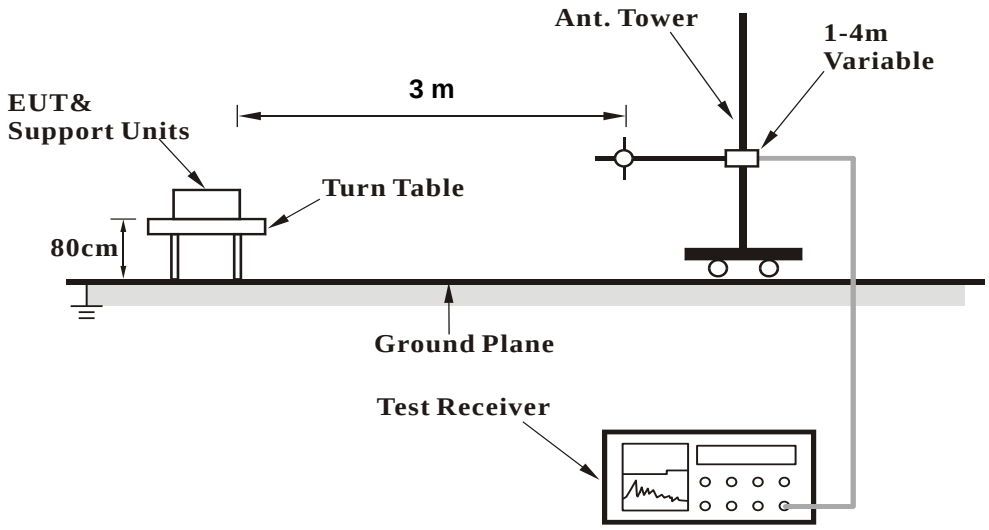
a. All measurements were done at low, middle and high operational frequency range. RBW is 5 MHz for WCDMA and and 1.4 MHz、3 MHz、5 MHz、10 MHz for LTE mode, and VBW ≥ 3 x RBW.
b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
c. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.R.P power - 2.15 dB.

Conducted Power Measurement:

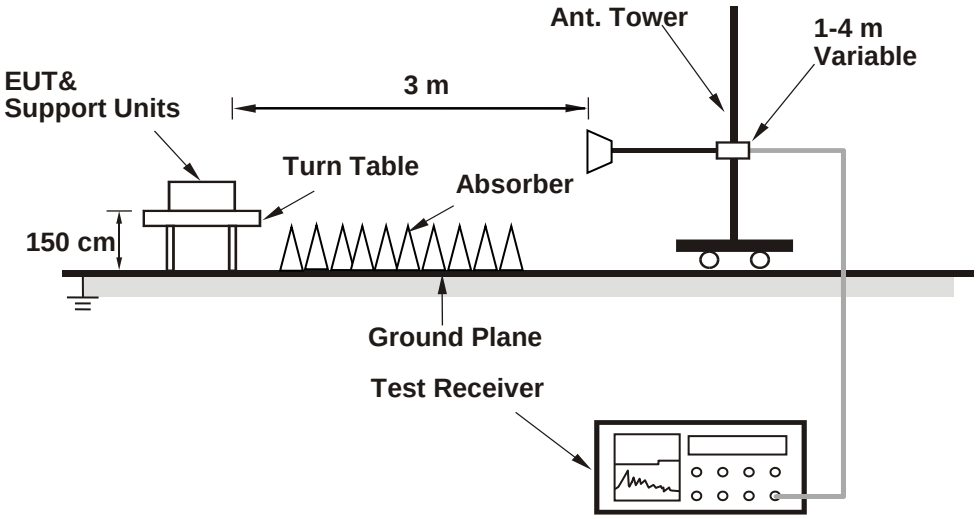
The EUT was set up for the maximum power with WCDMA, and LTE link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

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)

Band	WCDMA V		
Channel	4132	4182	4233
Frequency (MHz)	826.4	836.4	846.6
HSDPA Subtest-1	20.56	20.53	20.49
HSDPA Subtest-2	20.53	20.51	20.48
HSDPA Subtest-3	20.51	20.48	20.47
HSDPA Subtest-4	20.49	20.46	20.44
HSUPA Subtest-1	19.93	19.89	19.87
HSUPA Subtest-2	19.45	19.41	19.38
HSUPA Subtest-3	20.45	20.44	20.5
HSUPA Subtest-4	19.49	19.46	19.43
HSUPA Subtest-5	21.46	21.43	21.28

LTE Band 5																
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20450	20525	20600				Channel		20425	20525	20625	
		Frequency (MHz)		829.0	836.5	844.0				Frequency (MHz)		826.5	836.5	846.5	
10M	QPSK	1	0	23.23	23.27	23.21	0	5M	QPSK	1	0	23.15	23.18	23.19	0
		1	24	23.14	23.24	23.08	0			1	12	23.09	23.21	23.07	0
		1	49	23.03	23.04	22.95	0			1	24	22.97	22.96	22.85	0
		25	0	22.16	22.23	22.11	1			12	0	22.08	22.16	22.01	1
		25	12	22.15	22.17	22.07	1			12	6	22.1	22.14	21.97	1
		25	25	22.1	22.16	22.03	1			12	13	22.07	22.06	21.94	1
		50	0	22.15	22.21	22.1	1			25	0	22.08	22.14	22.02	1
	16QAM	1	0	22.6	22.61	22.58	1		16QAM	1	0	22.58	22.61	22.54	1
		1	24	22.39	22.46	22.29	1			1	12	22.32	22.39	22.22	1
		1	49	22.22	22.25	22.14	1			1	24	22.13	22.24	22.08	1
		25	0	21.16	21.24	21.15	2			12	0	21.15	21.2	21.1	2
		25	12	21.14	21.16	21.09	2			12	6	21.09	21.16	21.06	2
		25	25	21.08	21.17	21.01	2			12	13	21.04	21.1	20.98	2
		50	0	21.2	21.22	21.14	2			25	0	21.13	21.17	21.07	2
	64QAM	1	0	21.4	21.45	21.33	2		64QAM	1	0	21.32	21.45	21.26	2
		1	24	21.26	21.34	21.18	2			1	12	21.19	21.24	21.09	2
		1	49	21.15	21.22	21.07	2			1	24	21.09	21.2	21.07	2
		25	0	20.14	20.18	20.1	3			12	0	20.09	20.12	20.08	3
		25	12	20.05	20.11	19.95	3			12	6	20	20.03	19.9	3
		25	25	20.13	20.14	20.1	3			12	13	20.09	20.14	20.03	3
		50	0	20.14	20.21	20.05	3			25	0	20.1	20.21	20.05	3
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20415	20525	20635				Channel		20407	20525	20643	
		Frequency (MHz)		825.5	836.5	847.5				Frequency (MHz)		824.7	836.5	848.3	
3M	QPSK	1	0	23.08	23.2	23.02	0	1.4M	QPSK	1	0	23.1	23.05	23.11	0
		1	7	23.03	23.09	22.98	0			1	2	23.02	23.12	22.91	0
		1	14	22.81	22.93	22.8	0			1	5	22.88	22.93	22.74	0
		8	0	22.01	22.05	21.98	1			3	0	23.08	23.14	22.87	0
		8	3	21.98	22.07	21.98	1			3	1	23.03	23.17	22.98	0
		8	7	21.93	22.06	21.82	1			3	3	23	23.03	22.95	0
		15	0	22	22.07	21.99	1			6	0	22.06	22.06	21.93	1
	16QAM	1	0	22.4	22.54	22.52	1		16QAM	1	0	22.47	22.37	22.38	1
		1	7	22.24	22.26	22.24	1			1	2	22.15	22.33	22.21	1
		1	14	22.15	22.05	22.02	1			1	5	22.03	22.05	22.01	1
		8	0	21.04	21.16	21.04	2			3	0	22.07	22.11	22	1
		8	3	21.04	21.02	21.05	2			3	1	22.12	22.04	21.99	1
		8	7	20.9	21.03	20.96	2			3	3	21.92	22.03	21.99	1
		15	0	21.05	21.12	21	2			6	0	21.16	21.18	21.06	2
	64QAM	1	0	21.32	21.24	21.21	2		64QAM	1	0	21.29	21.26	21.17	2
		1	7	21.07	21.23	21.02	2			1	2	21.19	21.12	21.15	2
		1	14	20.99	21.04	20.97	2			1	5	21.13	20.97	20.99	2
		8	0	20.09	20	20	3			3	0	21.12	21.13	20.93	2
		8	3	19.91	20.02	19.76	3			3	1	20.91	21.06	20.87	2
		8	7	20.03	19.97	19.96	3			3	3	21	21.04	20.94	2
		15	0	20.07	19.98	19.82	3			6	0	19.95	20.04	19.98	3

ERP Power (dBm)

WCDMA							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
X	4132	826.4	-8.04	29.06	21.02	126.42	H
	4182	836.4	-8.26	29.15	20.89	122.74	
	4233	846.6	-8.40	29.07	20.67	116.73	
	4132	826.4	-13.36	29.35	15.99	39.76	V
	4182	836.4	-13.10	28.97	15.87	38.61	
	4233	846.6	-14.09	29.77	15.68	37.00	

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

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)**
X	20407	824.7	-8.35	29.06	20.71	117.71	H
	20525	836.5	-8.49	29.15	20.66	116.41	
	20643	848.3	-8.53	29.07	20.54	113.29	
	20407	824.7	-13.13	29.35	16.22	41.92	V
	20525	836.5	-12.83	28.97	16.14	41.09	
	20643	848.3	-13.75	29.77	16.02	40.01	
Channel Bandwidth: 1.4 MHz / 16QAM							
X	20407	824.7	-9.35	29.06	19.71	93.50	H
	20525	836.5	-9.49	29.15	19.66	92.47	
	20643	848.3	-9.54	29.07	19.53	89.78	
	20407	824.7	-14.13	29.35	15.22	33.30	V
	20525	836.5	-13.83	28.97	15.14	32.64	
	20643	848.3	-14.74	29.77	15.03	31.86	
Channel Bandwidth: 1.4 MHz / 64QAM							
X	20407	824.7	-10.25	29.06	18.81	76.00	H
	20525	836.5	-10.37	29.15	18.78	75.51	
	20643	848.3	-10.31	29.07	18.76	75.20	
	20407	824.7	-15.32	29.35	14.03	25.32	V
	20525	836.5	-14.85	28.97	14.12	25.80	
	20643	848.3	-15.24	29.77	14.53	28.39	

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

LTE Band 5							
Channel Bandwidth: 3 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
X	20415	825.5	-8.31	29.06	20.75	118.80	H
	20525	836.5	-8.45	29.15	20.70	117.49	
	20635	847.5	-8.50	29.07	20.57	114.08	
	20415	825.5	-13.09	29.35	16.26	42.31	V
	20525	836.5	-12.79	28.97	16.18	41.47	
	20635	847.5	-13.71	29.77	16.06	40.38	
Channel Bandwidth: 3 MHz / 16QAM							
X	20415	825.5	-9.32	29.06	19.74	94.15	H
	20525	836.5	-9.45	29.15	19.70	93.33	
	20635	847.5	-9.51	29.07	19.56	90.41	
	20415	825.5	-14.09	29.35	15.26	33.60	V
	20525	836.5	-13.80	28.97	15.17	32.86	
	20635	847.5	-14.72	29.77	15.05	32.00	
Channel Bandwidth: 3 MHz / 64QAM							
X	20415	825.5	-10.42	29.06	18.64	73.08	H
	20525	836.5	-10.30	29.15	18.85	76.74	
	20635	847.5	-10.25	29.07	18.82	76.24	
	20415	825.5	-15.23	29.35	14.12	25.85	V
	20525	836.5	-14.95	28.97	14.02	25.22	
	20635	847.5	-15.37	29.77	14.40	27.55	

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

LTE Band 5							
Channel Bandwidth: 5 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
X	20425	826.5	-8.27	29.06	20.79	119.89	H
	20525	836.5	-8.41	29.15	20.74	118.58	
	20625	846.5	-8.46	29.07	20.61	115.13	
	20425	826.5	-13.05	29.35	16.30	42.70	V
	20525	836.5	-12.75	28.97	16.22	41.85	
	20625	846.5	-13.66	29.77	16.11	40.85	
Channel Bandwidth: 5 MHz / 16QAM							
X	20425	826.5	-9.27	29.06	19.79	95.24	H
	20525	836.5	-9.42	29.15	19.73	93.97	
	20625	846.5	-9.46	29.07	19.61	91.45	
	20425	826.5	-14.05	29.35	15.30	33.92	V
	20525	836.5	-13.75	28.97	15.22	33.24	
	20625	846.5	-14.66	29.77	15.11	32.45	
Channel Bandwidth: 5 MHz / 64QAM							
X	20425	826.5	-10.35	29.06	18.71	74.27	H
	20525	836.5	-10.37	29.15	18.78	75.51	
	20625	846.5	-10.96	29.07	18.11	64.74	
	20425	826.5	-15.32	29.35	14.03	25.32	V
	20525	836.5	-14.62	28.97	14.35	27.21	
	20625	846.5	-15.47	29.77	14.30	26.93	

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

LTE Band 5							
Channel Bandwidth: 10 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
X	20450	829.0	-8.24	29.06	20.82	120.73	H
	20525	836.5	-8.37	29.15	20.78	119.67	
	20600	844.0	-8.42	29.07	20.65	116.20	
	20450	829.0	-13.01	29.35	16.34	43.09	V
	20525	836.5	-12.71	28.97	16.26	42.24	
	20600	844.0	-13.62	29.77	16.15	41.23	
Channel Bandwidth: 10 MHz / 16QAM							
X	20450	829.0	-9.24	29.06	19.82	95.90	H
	20525	836.5	-9.36	29.15	19.79	95.28	
	20600	844.0	-9.43	29.07	19.64	92.09	
	20450	829.0	-14.01	29.35	15.34	34.23	V
	20525	836.5	-13.71	28.97	15.26	33.55	
	20600	844.0	-14.62	29.77	15.15	32.75	
Channel Bandwidth: 10 MHz / 64QAM							
X	20450	829.0	-10.07	29.06	18.99	79.21	H
	20525	836.5	-10.24	29.15	18.91	77.80	
	20600	844.0	-10.63	29.07	18.45	69.94	
	20450	829.0	-15.14	29.35	14.21	26.39	V
	20525	836.5	-15.01	28.97	13.96	24.87	
	20600	844.0	-15.65	29.77	14.12	25.83	

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

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

N/A

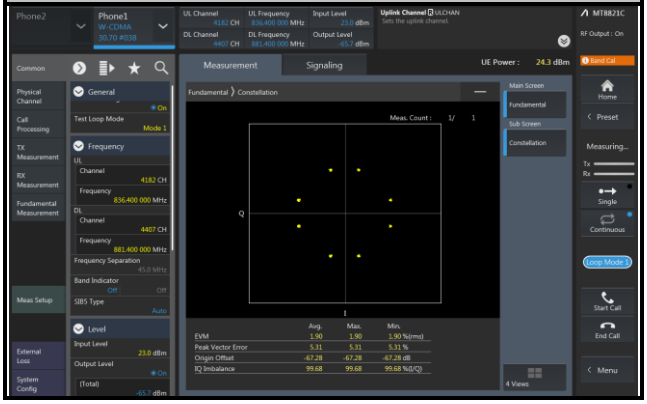
4.2.2 Test Setup

4.2.3 Test Procedure

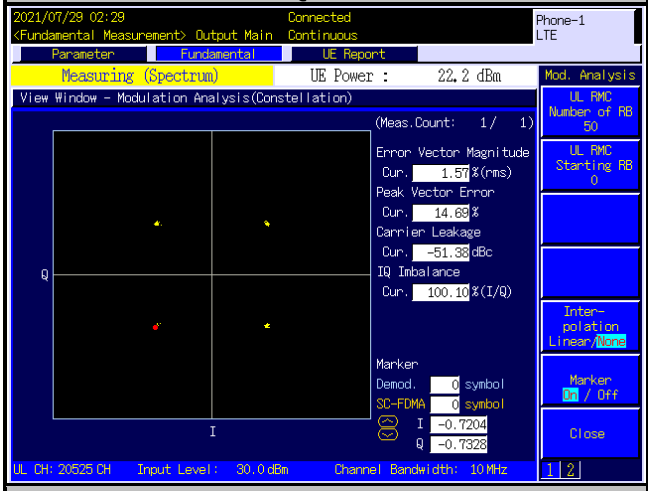
Connect the EUT to Communication Simulator via the antenna connector. The frequency band is set as EUT supported Modulation and Channels, the EUT output is matched with 50 ohm load, the waveform quality and constellation of the EUT was tested.

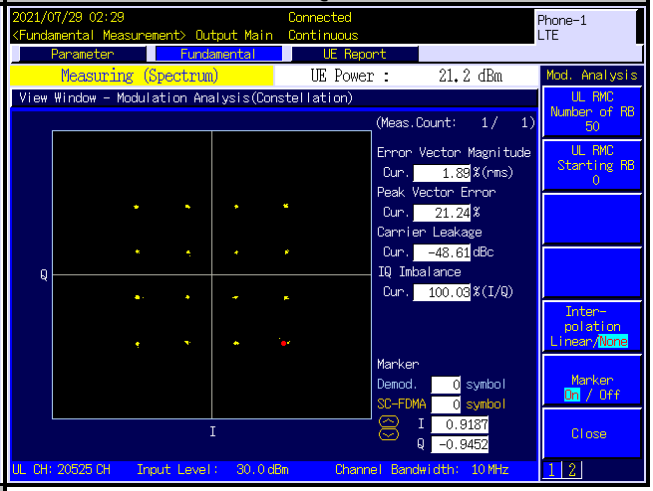
4.2.4 Test Results

Spectrum Plot of Measurement
WCDMA
Channel 4182

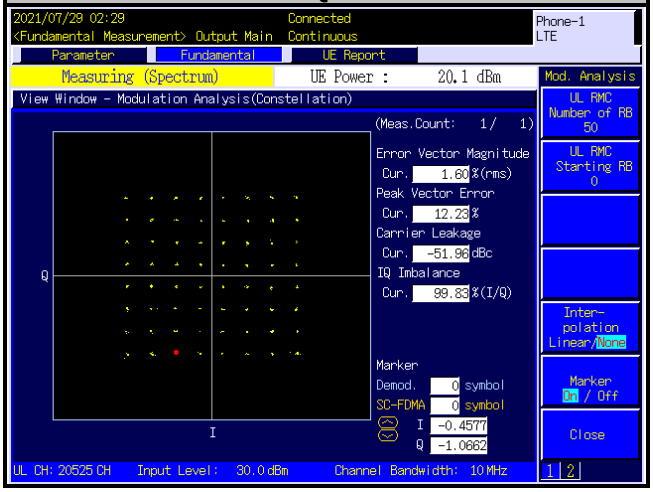


Spectrum Plot of Measurement	
LTE Band 5	
Channel 20525	
QPSK	16QAM





64QAM



4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

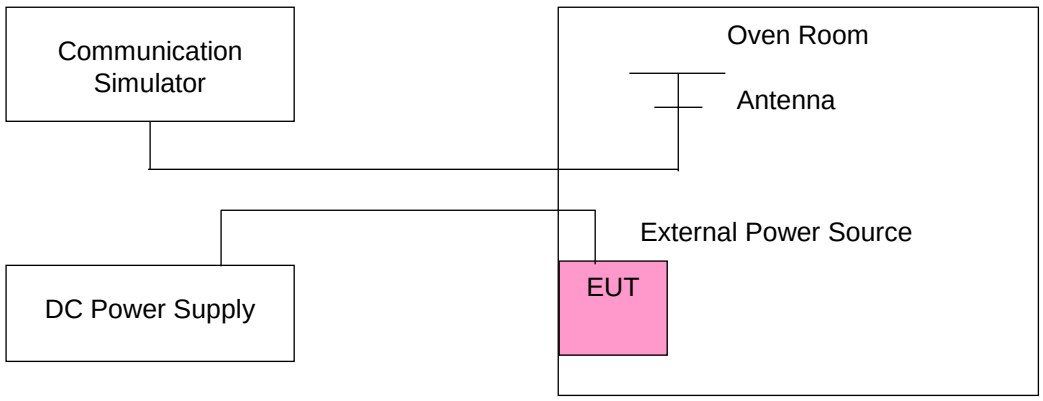
1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

4.3.2 Test Procedure

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

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

4.3.3 Test Setup



4.3.4 Test Results

Frequency Error vs. Voltage

Voltage (Volts)	WCDMA				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.8	826.399991	-0.010891	846.599995	-0.005906	2.5
3.4	826.399990	-0.012101	846.600002	0.002362	2.5
4.37	826.399994	-0.007260	846.599998	-0.002362	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.4 Vdc to 4.37 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	WCDMA				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	826.400008	0.009681	846.599998	-0.002362	2.5
-20	826.400005	0.006050	846.599991	-0.010631	2.5
-10	826.400007	0.008470	846.600008	0.009450	2.5
0	826.399991	-0.010891	846.600003	0.003544	2.5
10	826.399995	-0.006050	846.599997	-0.003544	2.5
20	826.400008	0.009681	846.599994	-0.007087	2.5
30	826.399999	-0.001210	846.600006	0.007087	2.5
40	826.400008	0.009681	846.599992	-0.009450	2.5
50	826.399996	-0.004840	846.600005	0.005906	2.5
55	826.400010	0.012101	846.599992	-0.009450	2.5

Note: The applicant declared that the normal operating temperature of the EUT is from -30°C to 55°C.

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)	
3.8	824.700007	0.008488	848.300002	0.002358	2.5
3.4	824.700007	0.008488	848.299997	-0.003536	2.5
4.37	824.700005	0.006063	848.300001	0.001179	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.4 Vdc to 4.37 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	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	824.699997	-0.003638	848.299993	-0.008252	2.5
-20	824.700003	0.003638	848.300001	0.001179	2.5
-10	824.699994	-0.007275	848.299997	-0.003536	2.5
0	824.699999	-0.001213	848.300002	0.002358	2.5
10	824.700001	0.001213	848.299996	-0.004715	2.5
20	824.699992	-0.009700	848.300009	0.010609	2.5
30	824.700000	0.000000	848.299991	-0.010609	2.5
40	824.699992	-0.009700	848.299998	-0.002358	2.5
50	824.699995	-0.006063	848.299995	-0.005894	2.5
55	824.699990	-0.012126	848.300010	0.011788	2.5

Note: The applicant declared that the normal operating temperature of the EUT is from -30°C to 55°C.

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)	
3.8	825.500008	0.009691	847.499998	-0.002360	2.5
3.4	825.500004	0.004846	847.500000	0.000000	2.5
4.37	825.499999	-0.001211	847.500009	0.010619	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.4 Vdc to 4.37 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 3 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	825.499994	-0.007268	847.499992	-0.009440	2.5
-20	825.499997	-0.003634	847.500000	0.000000	2.5
-10	825.499994	-0.007268	847.499993	-0.008260	2.5
0	825.500006	0.007268	847.499992	-0.009440	2.5
10	825.500004	0.004846	847.500006	0.007080	2.5
20	825.500005	0.006057	847.500002	0.002360	2.5
30	825.499998	-0.002423	847.499990	-0.011799	2.5
40	825.499997	-0.003634	847.499991	-0.010619	2.5
50	825.500001	0.001211	847.500003	0.003540	2.5
55	825.499991	-0.010902	847.500004	0.004720	2.5

Note: The applicant declared that the normal operating temperature of the EUT is from -30°C to 55°C.

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)	
3.8	826.499998	-0.002420	846.499994	-0.007088	2.5
3.4	826.499996	-0.004840	846.499992	-0.009451	2.5
4.37	826.500000	0.000000	846.500004	0.004725	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.4 Vdc to 4.37 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	826.500009	0.010889	846.499990	-0.011813	2.5
-20	826.499992	-0.009679	846.500006	0.007088	2.5
-10	826.500004	0.004840	846.499992	-0.009451	2.5
0	826.500010	0.012099	846.500004	0.004725	2.5
10	826.499994	-0.007260	846.500005	0.005907	2.5
20	826.500000	0.000000	846.499990	-0.011813	2.5
30	826.499999	-0.001210	846.500009	0.010632	2.5
40	826.500007	0.008469	846.500005	0.005907	2.5
50	826.500005	0.006050	846.499994	-0.007088	2.5
55	826.499999	-0.001210	846.500002	0.002363	2.5

Note: The applicant declared that the normal operating temperature of the EUT is from -30°C to 55°C.

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)	
3.8	829.000003	0.003619	844.000010	0.011848	2.5
3.4	828.999998	-0.002413	844.000007	0.008294	2.5
4.37	829.000003	0.003619	844.000010	0.011848	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.4 Vdc to 4.37 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	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	0.003619	843.999996	-0.004739	2.5
-20	828.999992	-0.009650	844.000008	0.009479	2.5
-10	829.000009	0.010856	843.999997	-0.003555	2.5
0	828.999996	-0.004825	843.999990	-0.011848	2.5
10	828.999991	-0.010856	844.000005	0.005924	2.5
20	828.999993	-0.008444	844.000001	0.001185	2.5
30	828.999998	-0.002413	844.000009	0.010664	2.5
40	829.000007	0.008444	844.000009	0.010664	2.5
50	828.999992	-0.009650	844.000001	0.001185	2.5
55	828.999990	-0.012063	843.999990	-0.011848	2.5

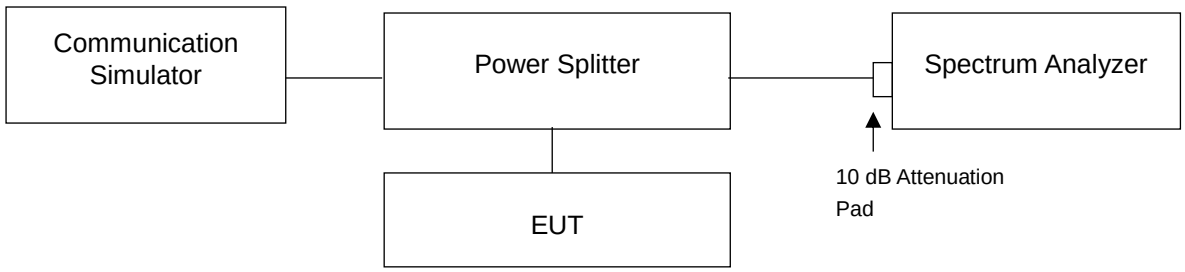
Note: The applicant declared that the normal operating temperature of the EUT is from -30°C to 55°C.

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.

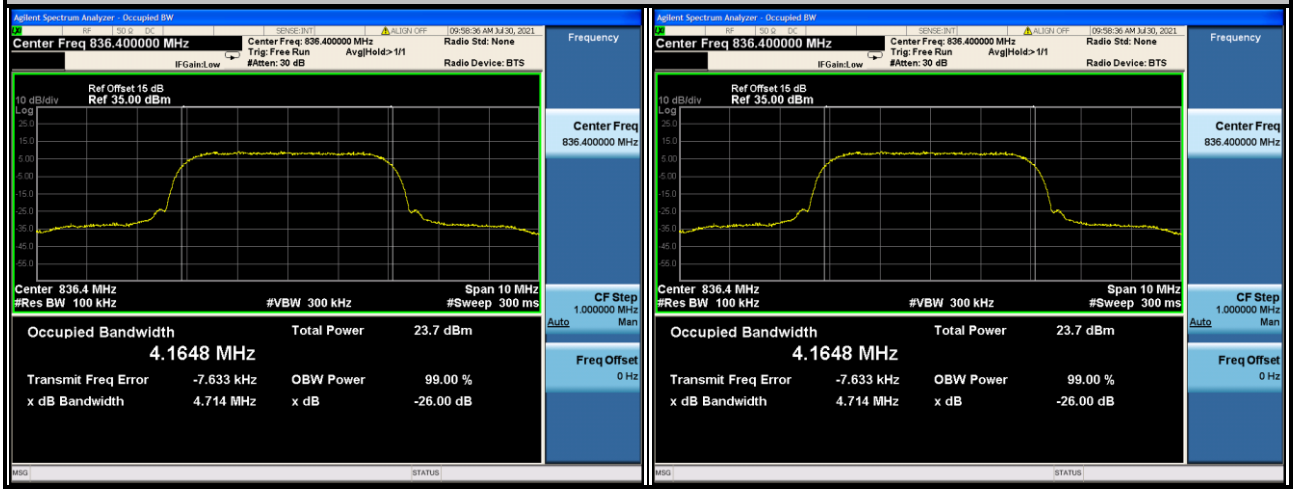
4.4.2 Test Setup



4.4.3 Test Result

WCDMA			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
4132	826.4	4.16	4.71
4182	836.4	4.16	4.71
4233	846.6	4.15	4.70

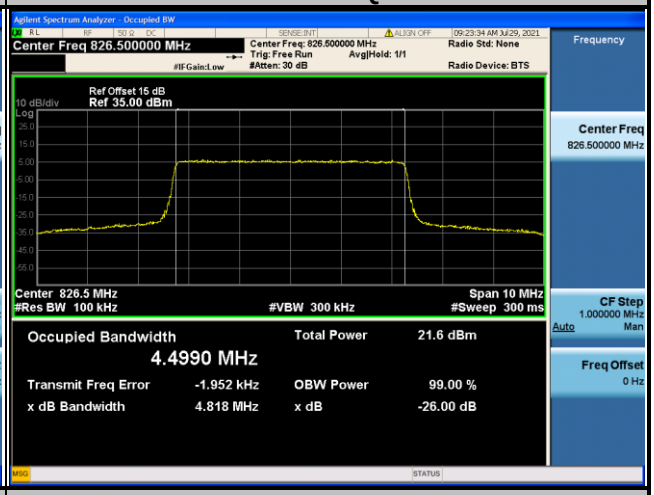
Spectrum Plot of Worst Value	
99 % Occupied Bandwidth	26 dB Bandwidth
WCDMA	



LTE Band 5							
Channel Bandwidth: 1.4 MHz							
Channel	**Frequency (MHz)**	**99 % Occupied Bandwidth (MHz)**			**26 dB Bandwidth (MHz)**		
		QPSK	**16QAM**	**64QAM**	**QPSK**	**16QAM**	**64QAM**
20407	824.7	1.09	1.09	1.09	1.24	1.25	1.26
20525	836.5	1.09	1.09	1.09	1.24	1.25	1.25
20643	848.3	1.09	1.09	1.09	1.23	1.25	1.26
Channel Bandwidth: 3 MHz							
Channel	**Frequency (MHz)**	**99 % Occupied Bandwidth (MHz)**			**26 dB Bandwidth (MHz)**		
		QPSK	**16QAM**	**64QAM**	**QPSK**	**16QAM**	**64QAM**
20415	825.5	2.70	2.70	2.70	2.88	2.89	2.88
20525	836.5	2.70	2.69	2.70	2.88	2.89	2.87
20635	847.5	2.70	2.69	2.69	2.88	2.87	2.86

Spectrum Plot of Worst Value	
99 % Occupied Bandwidth	**26 dB Bandwidth**
1.4 MHz / 16QAM	**1.4 MHz / 64QAM**
	
3 MHz / QPSK	**3 MHz / 16QAM**
	

LTE Band 5							
Channel Bandwidth: 5 MHz							
Channel	**Frequency (MHz)**	**99 % Occupied Bandwidth (MHz)**			**26 dB Bandwidth (MHz)**		
		QPSK	**16QAM**	**64QAM**	**QPSK**	**16QAM**	**64QAM**
20425	826.5	4.49	4.49	4.50	4.77	4.79	4.82
20525	836.5	4.49	4.49	4.50	4.77	4.79	4.79
20625	846.5	4.48	4.49	4.49	4.77	4.77	4.79
Channel Bandwidth: 10 MHz							
Channel	**Frequency (MHz)**	**99 % Occupied Bandwidth (MHz)**			**26 dB Bandwidth (MHz)**		
		QPSK	**16QAM**	**64QAM**	**QPSK**	**16QAM**	**64QAM**
20450	829.0	8.98	8.98	8.98	9.50	9.51	9.52
20525	836.5	8.97	8.97	8.97	9.51	9.50	9.51
20600	844.0	8.95	8.95	8.96	9.48	9.50	9.50

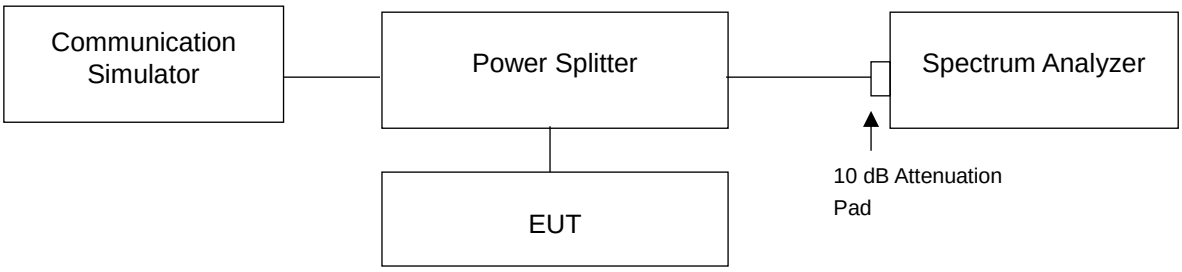
Spectrum Plot of Worst Value	
99 % Occupied Bandwidth	**26 dB Bandwidth**
5 MHz / 64QAM	**5 MHz / 64QAM**
	
10 MHz / 64QAM	**10 MHz / 64QAM**
	

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

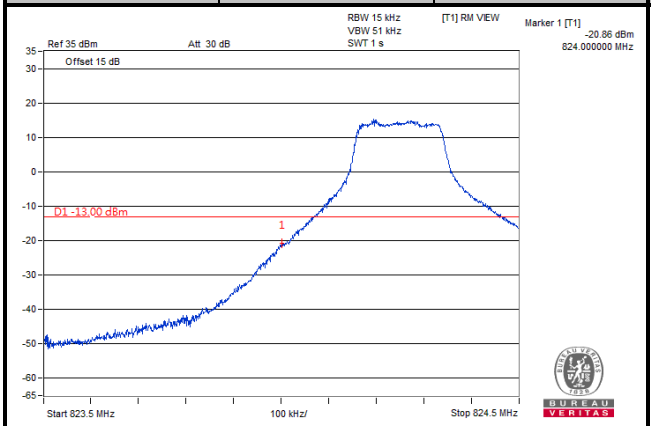
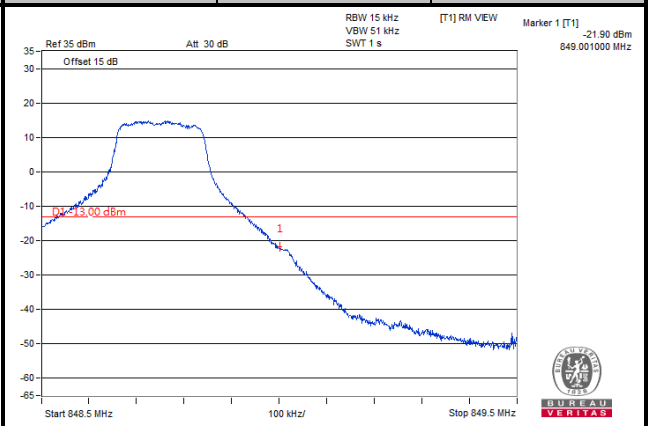
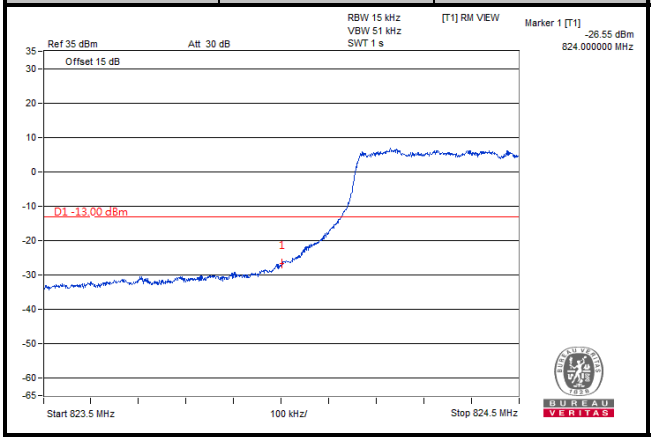
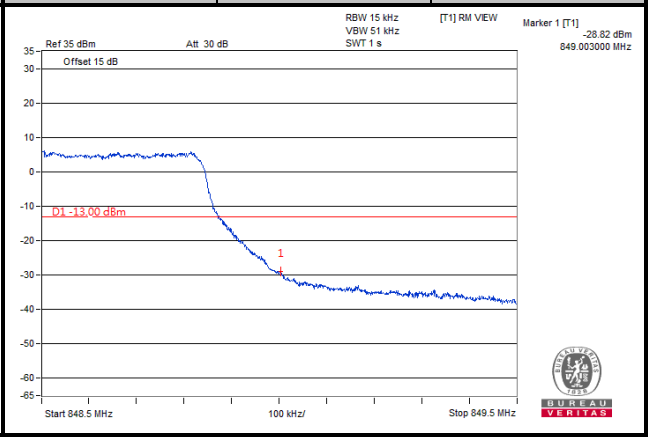


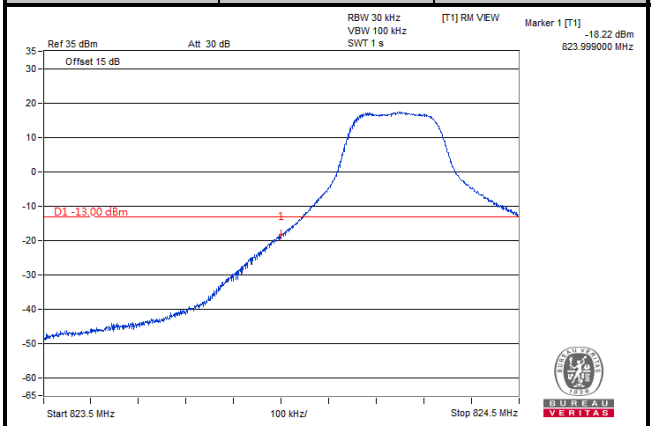
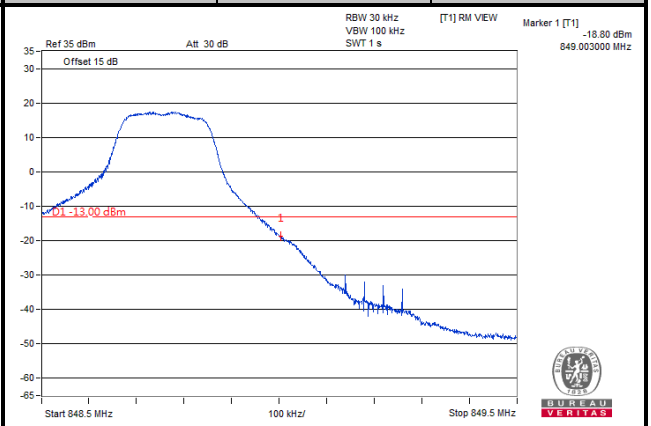
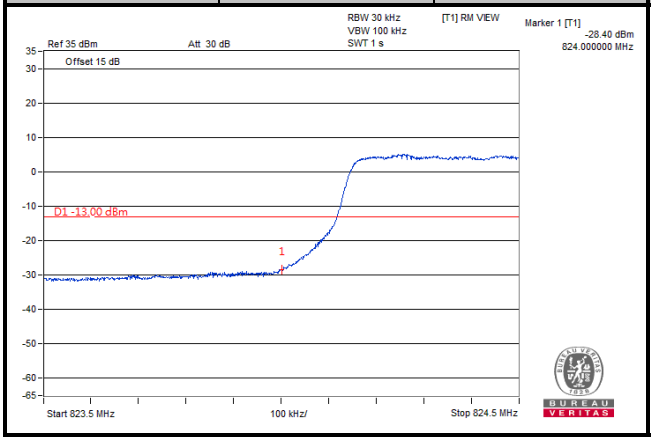
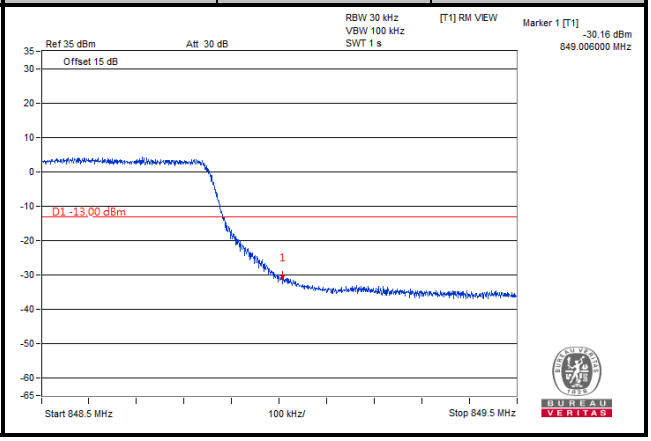
4.5.3 Test Procedures

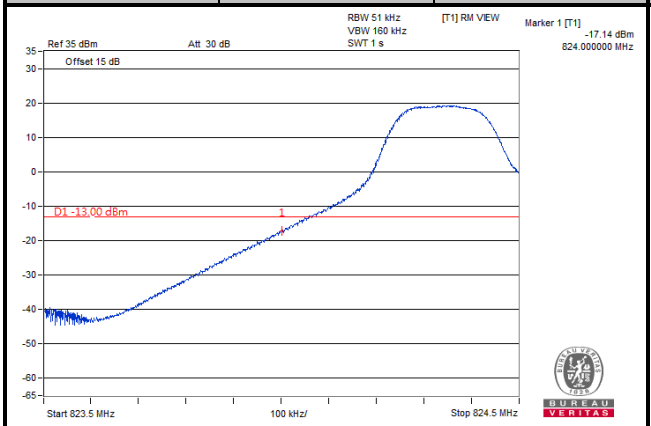
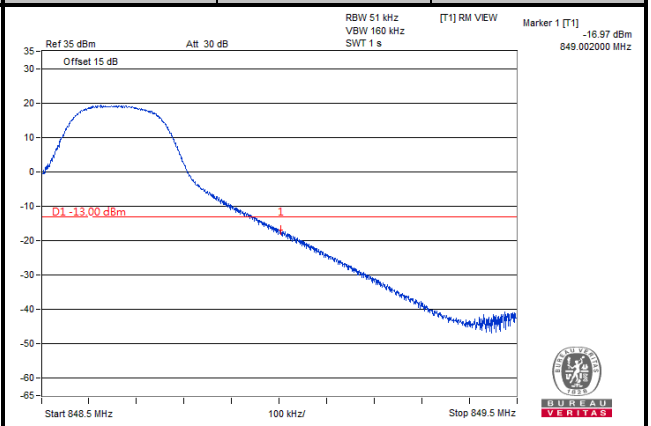
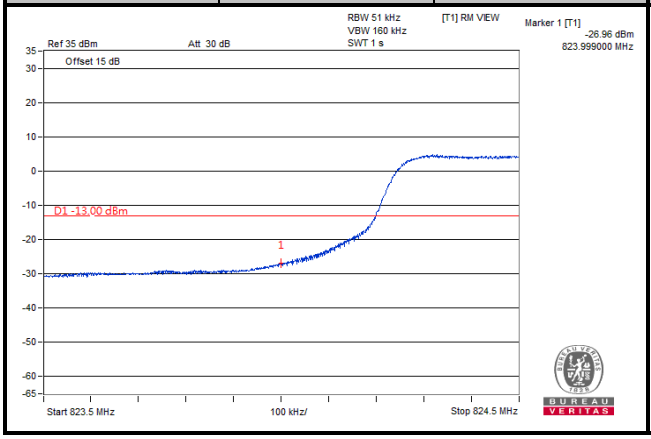
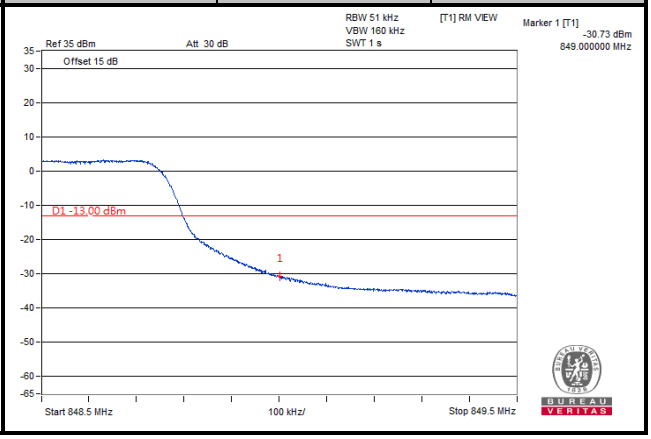
a. All measurements were done at low and high operational frequency range.
b. The center frequency of spectrum is the band edge frequency and span is 5 MHz. RB of the spectrum is 51 kHz and VB of the spectrum is 160 kHz (WCDMA).
c. The center frequency of spectrum is the band edge frequency and span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

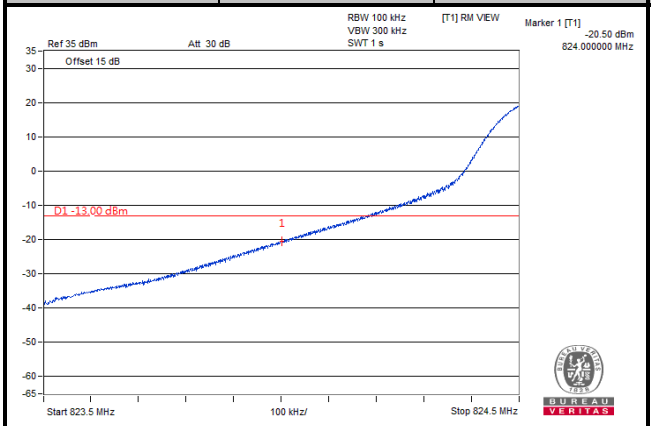
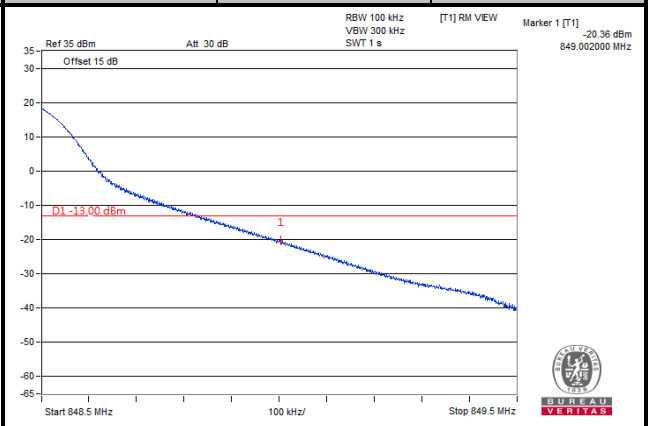
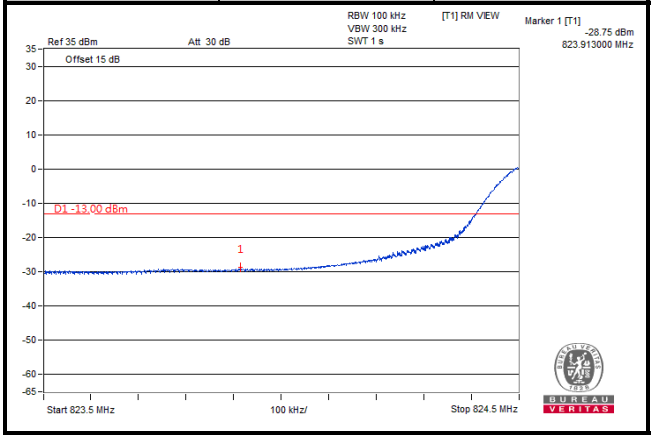
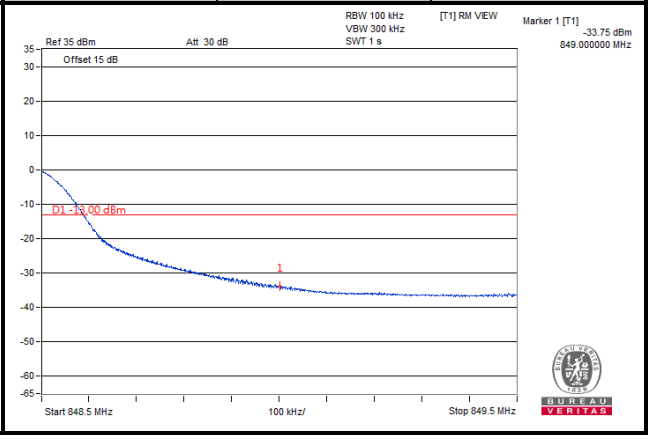
4.5.4 Test Results

WCDMA			
Channel	4132	Channel	4233

LTE Band 5					
Channel Bandwidth: 1.4 MHz					
Channel	20407	1 RB	Channel	20643	1 RB
					
Channel	20407	6 RB	Channel	20643	6 RB
					

LTE Band 5					
Channel Bandwidth: 3 MHz					
Channel	20415	1 RB	Channel	20635	1 RB
					
Channel	20415	15 RB	Channel	20635	15 RB
					

LTE Band 5					
Channel Bandwidth: 5 MHz					
Channel	20425	1 RB	Channel	20625	1 RB
					
Channel	20425	25 RB	Channel	20625	25 RB
					

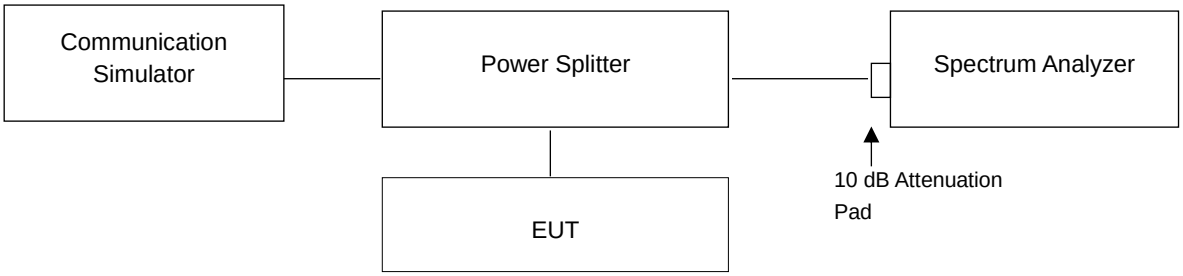
LTE Band 5					
Channel Bandwidth: 10 MHz					
Channel	20450	1 RB	Channel	20600	1 RB
					
Channel	20450	50 RB	Channel	20600	50 RB
					

4.6 Peak to Average Ratio

4.6.1 Limits of Peak to Average Ratio Measurement

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

4.6.2 Test Setup



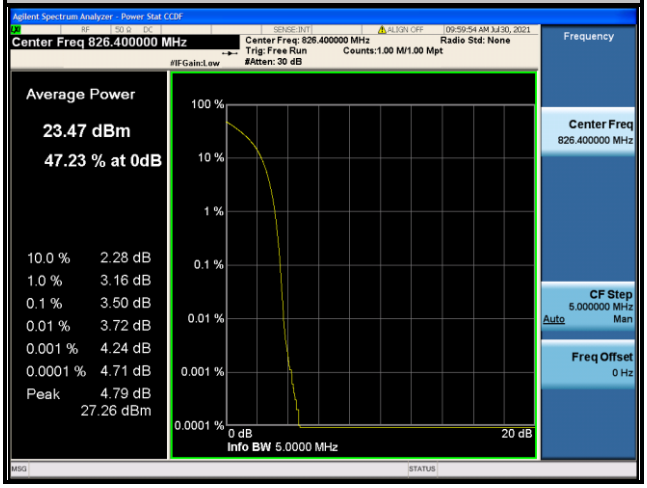
4.6.3 Test Procedures

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

4.6.4 Test Results

Channel	Frequency (MHz)	Peak to Average Ratio (dB)
		WCDMA
4132	826.4	3.50
4182	836.4	3.49
4233	846.6	3.19

Spectrum Plot of Worst Value
WCDMA



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	64QAM			QPSK	16QAM	64QAM
20407	824.7	5.39	6.39	6.59	20415	825.5	5.12	6.26	6.52
20525	836.5	5.43	6.57	6.60	20525	836.5	5.23	6.33	6.62
20643	848.3	4.61	5.50	5.98	20635	847.5	4.59	5.70	6.09

Spectrum Plot of Worst Value

1.4 MHz / 64QAM

3 MHz / 64QAM

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	64QAM			QPSK	16QAM	64QAM
20425	826.5	5.30	6.35	6.63	20450	829.0	5.33	6.31	6.67
20525	836.5	5.35	6.51	6.70	20525	836.5	5.30	6.42	6.76
20625	846.5	5.10	6.07	6.51	20600	844.0	5.21	6.39	6.61

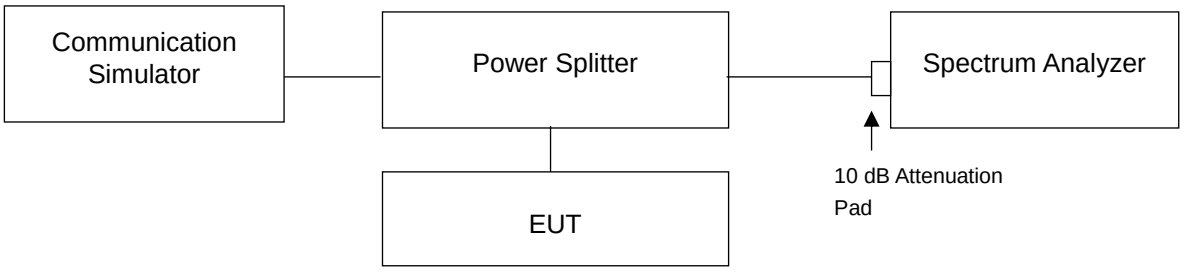
Spectrum Plot of Worst Value	
5 MHz / 64QAM	10 MHz / 64QAM

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.

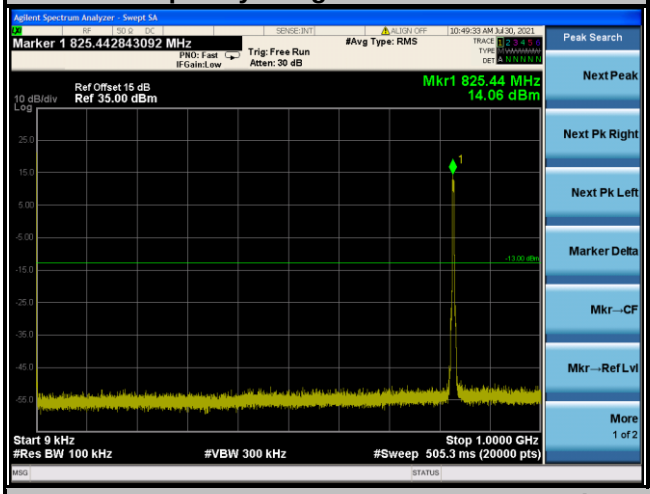
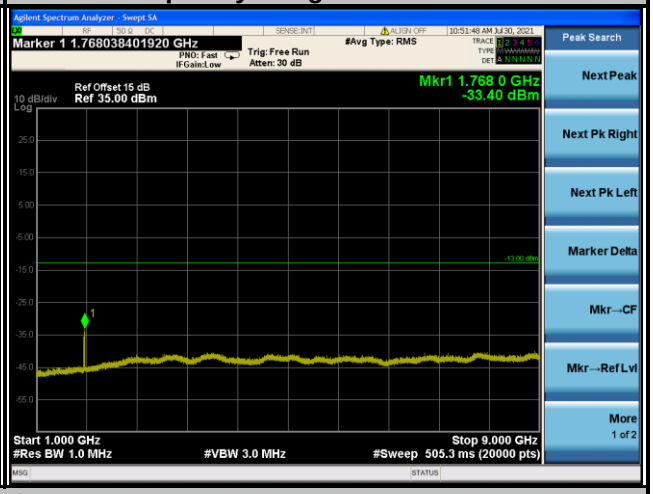
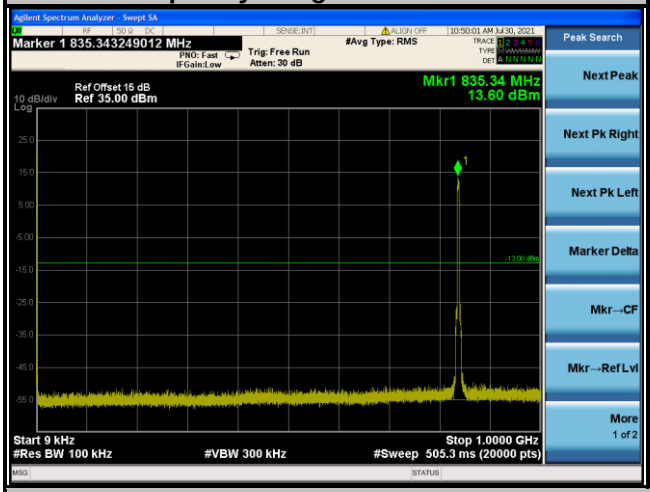
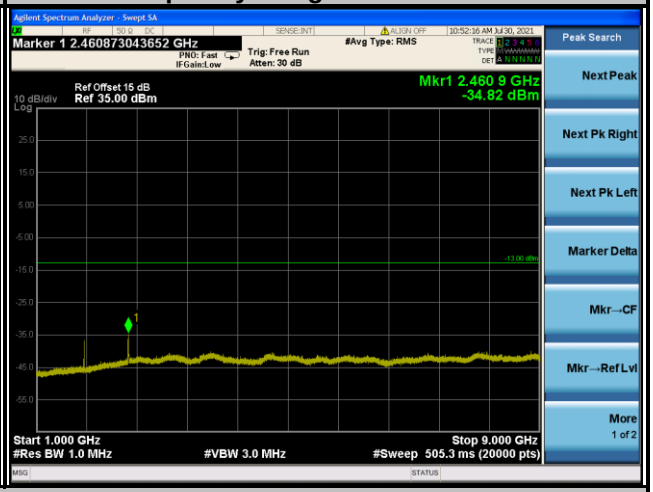
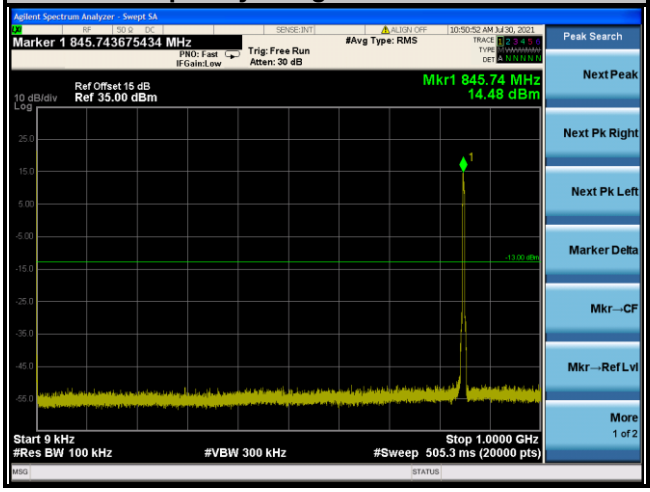
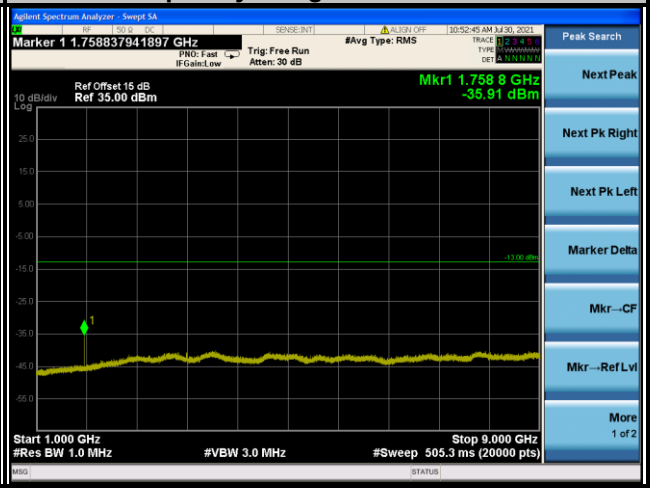
4.7.2 Test Setup



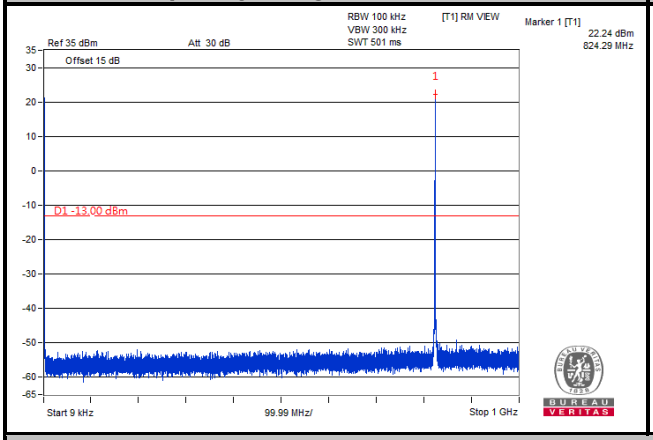
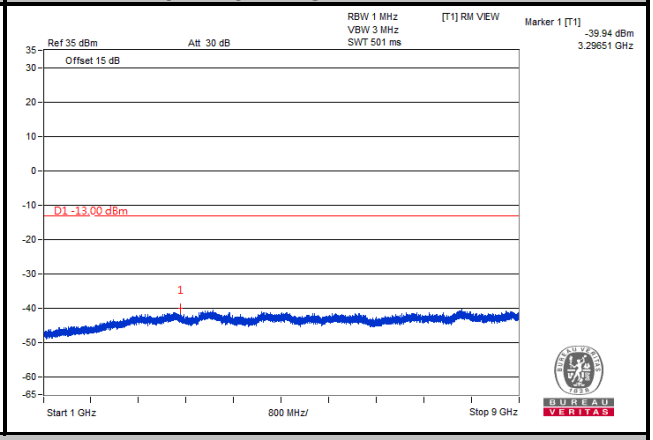
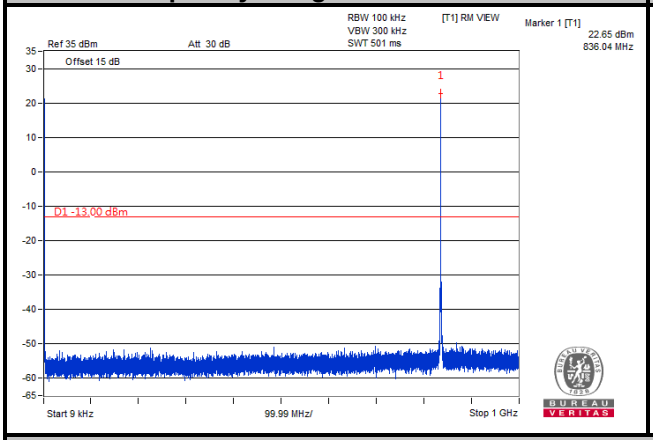
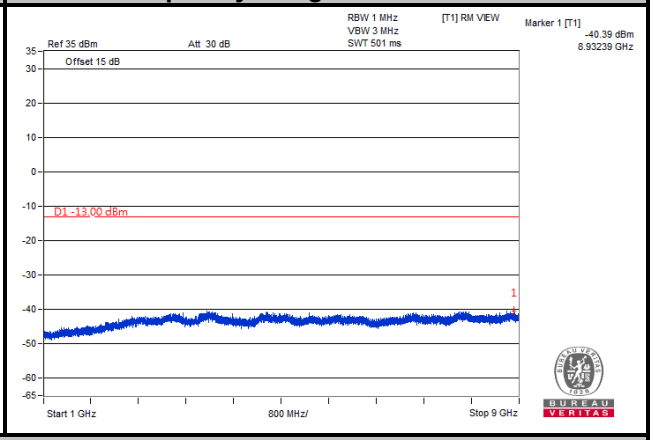
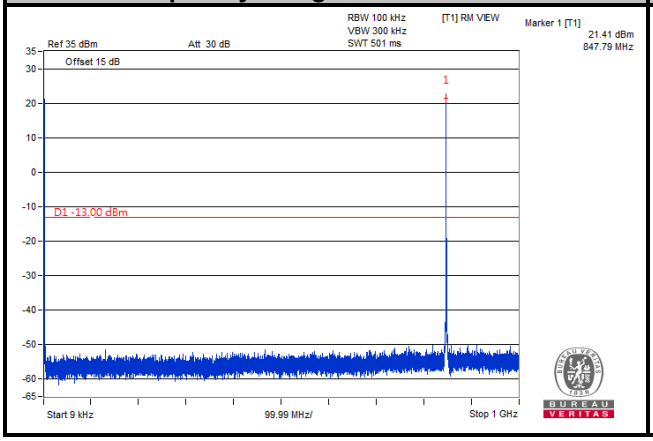
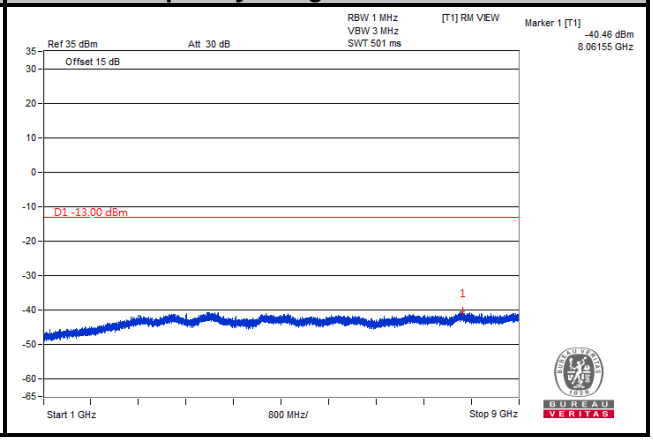
4.7.3 Test Procedure

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

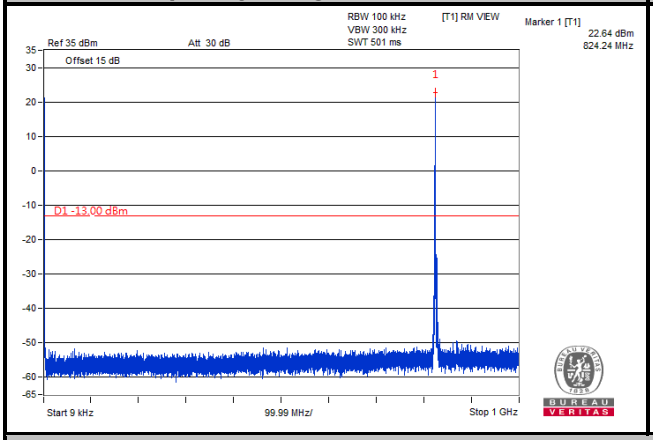
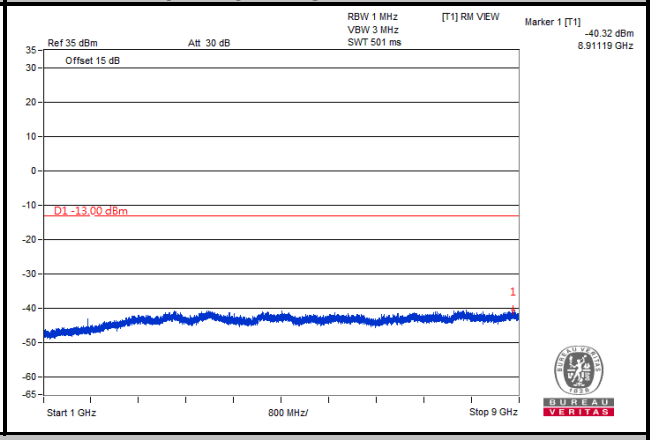
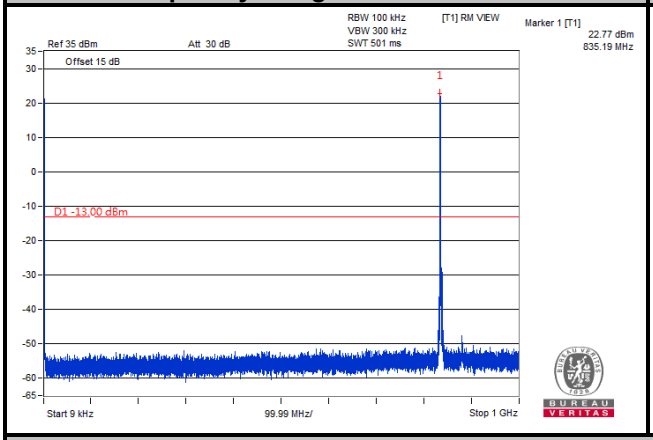
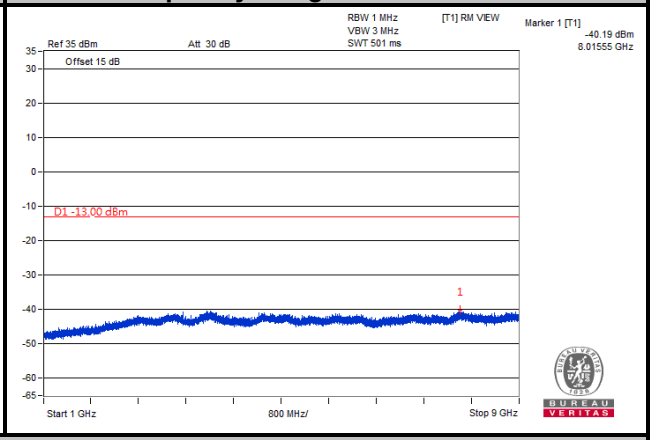
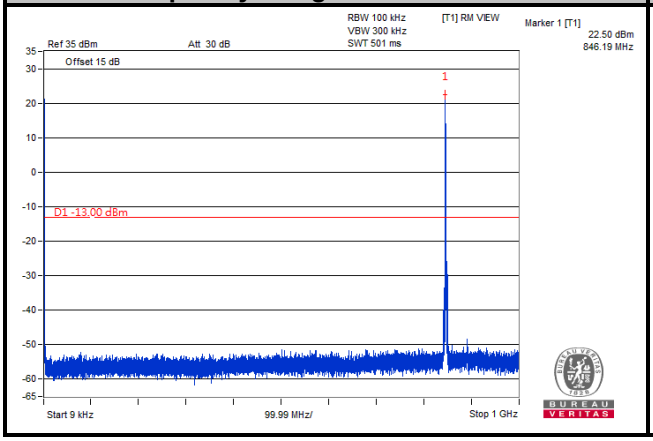
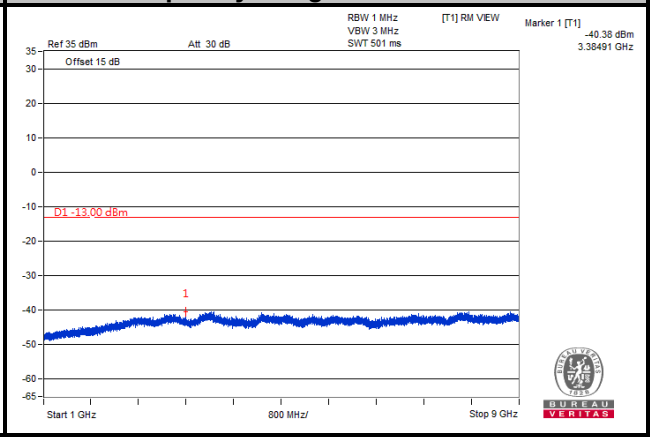
4.7.4 Test Results

WCDMA	
Channel 4132	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 9 GHz
	
Channel 4182	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 9 GHz
	
Channel 4233	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 9 GHz
	

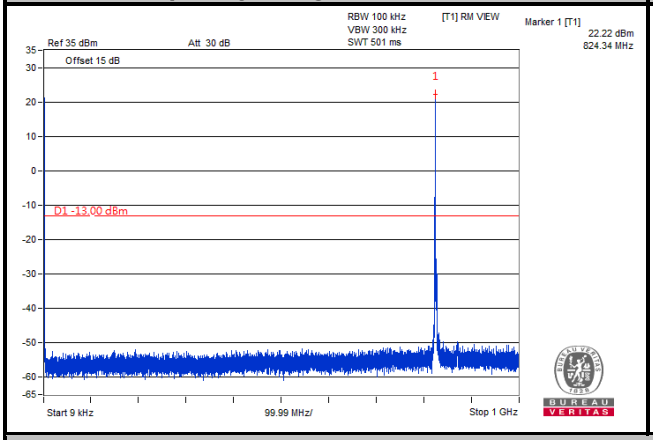
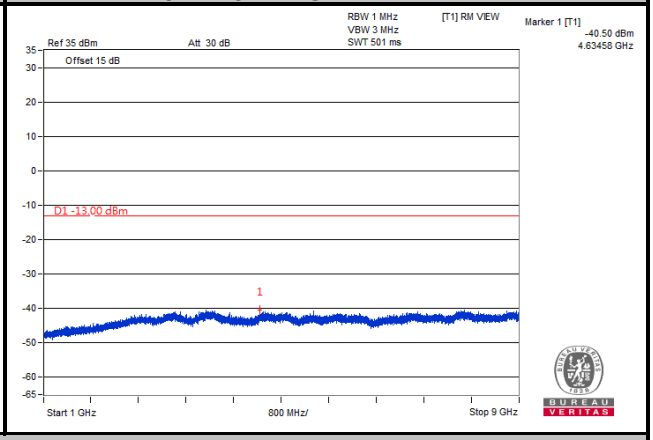
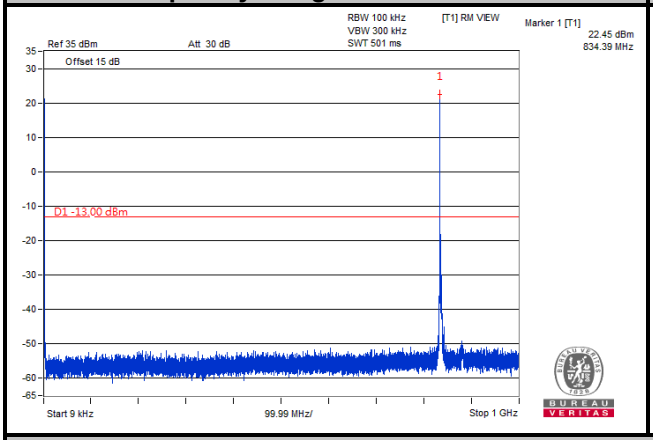
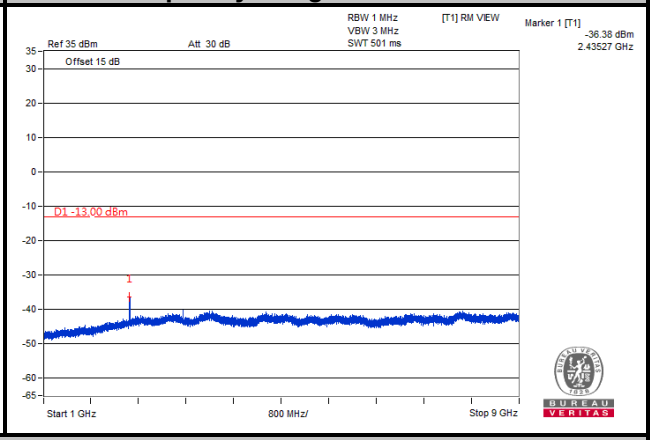
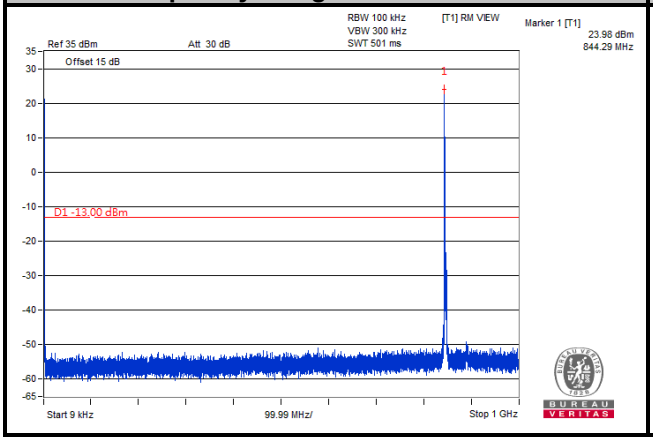
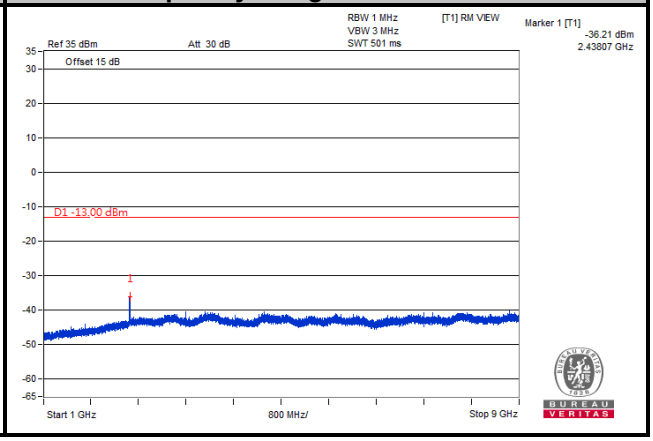
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 5	
Channel Bandwidth: 1.4 MHz	
Channel 20407	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 9 GHz
	
Channel 20525	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 9 GHz
	
Channel 20643	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 9 GHz
	

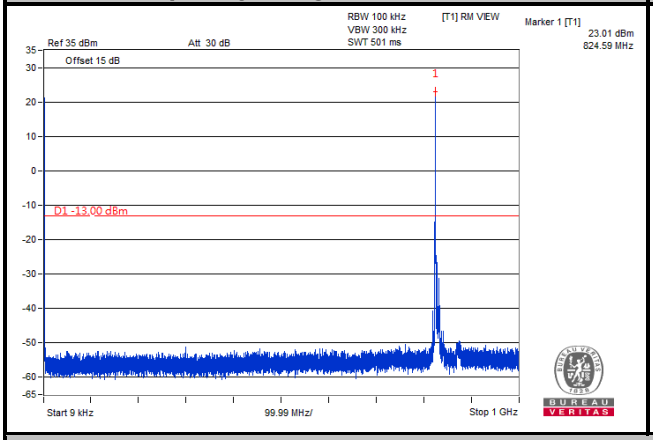
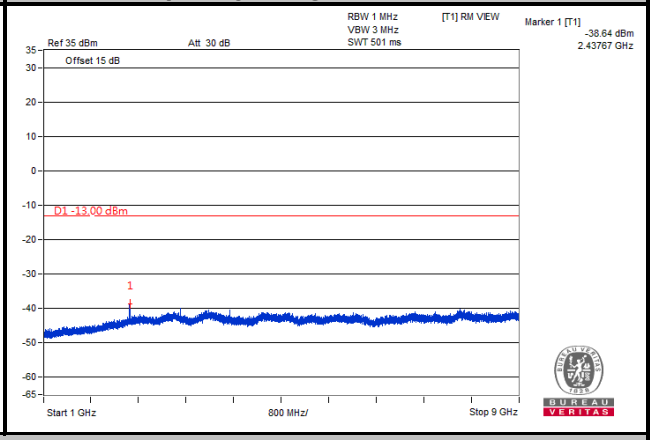
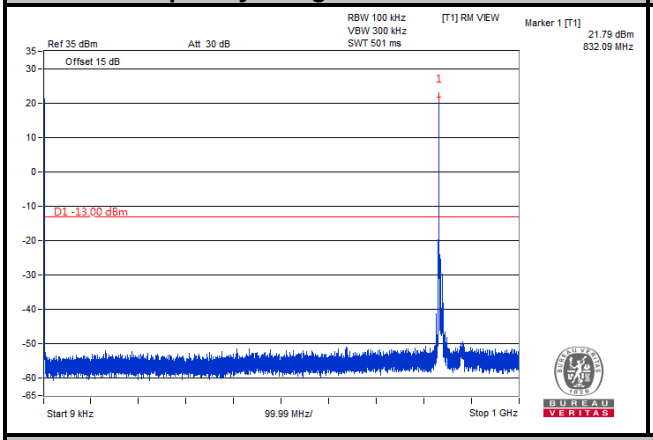
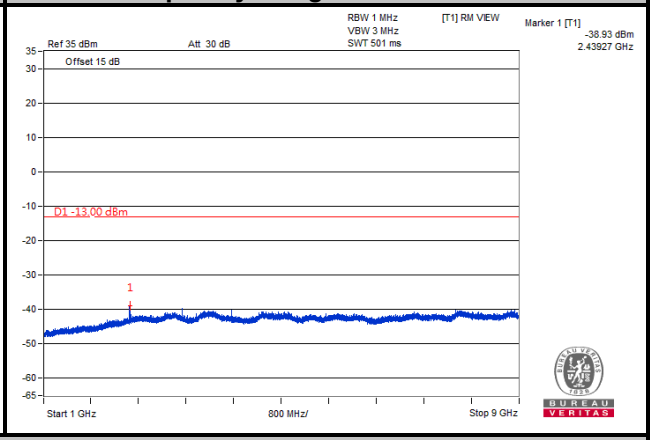
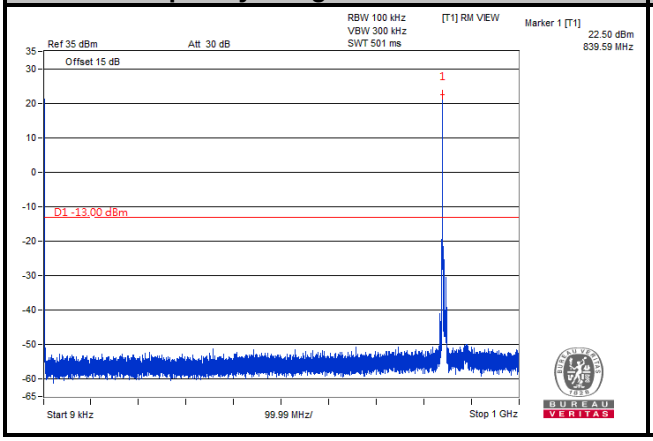
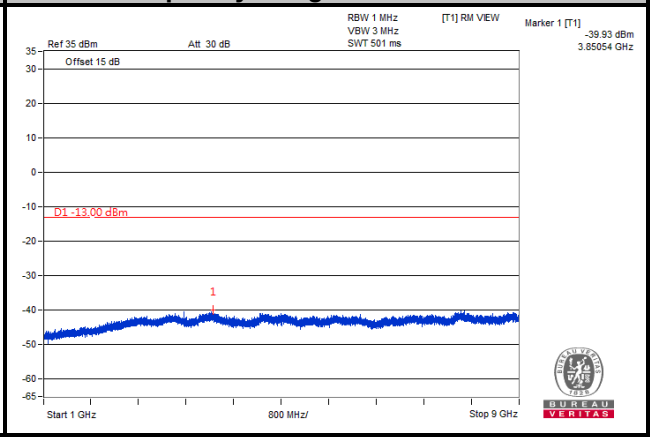
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 5	
Channel Bandwidth: 3 MHz	
Channel 20415	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 9 GHz
	
Channel 20525	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 9 GHz
	
Channel 20635	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 9 GHz
	

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

LTE Band 5	
Channel Bandwidth: 5 MHz	
Channel 20425	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 9 GHz
	
Channel 20525	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 9 GHz
	
Channel 20625	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 9 GHz
	

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

LTE Band 5	
Channel Bandwidth: 10 MHz	
Channel 20450	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 9 GHz
	
Channel 20525	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 9 GHz
	
Channel 20600	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 9 GHz
	

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

4.8 Radiated Emission Measurement

4.8.1 Limits of Radiated Emission Measurement

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. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.
c. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.R.P power - 2.15 dB.

NOTE:

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

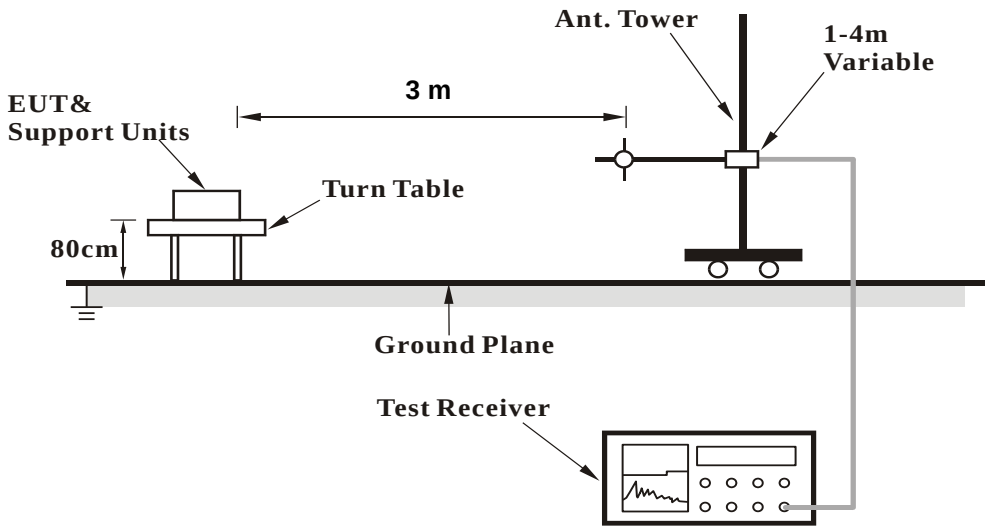
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

4.8.3 Deviation from Test Standard

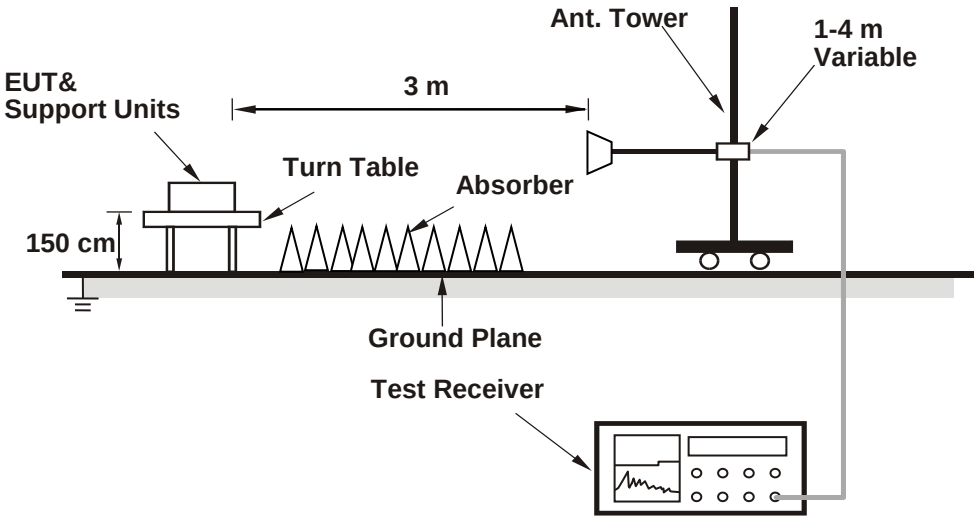
No deviation.

4.8.4 Test Setup

<Radiated Emission below or equal 1 GHz>



<Radiated Emission above 1 GHz>



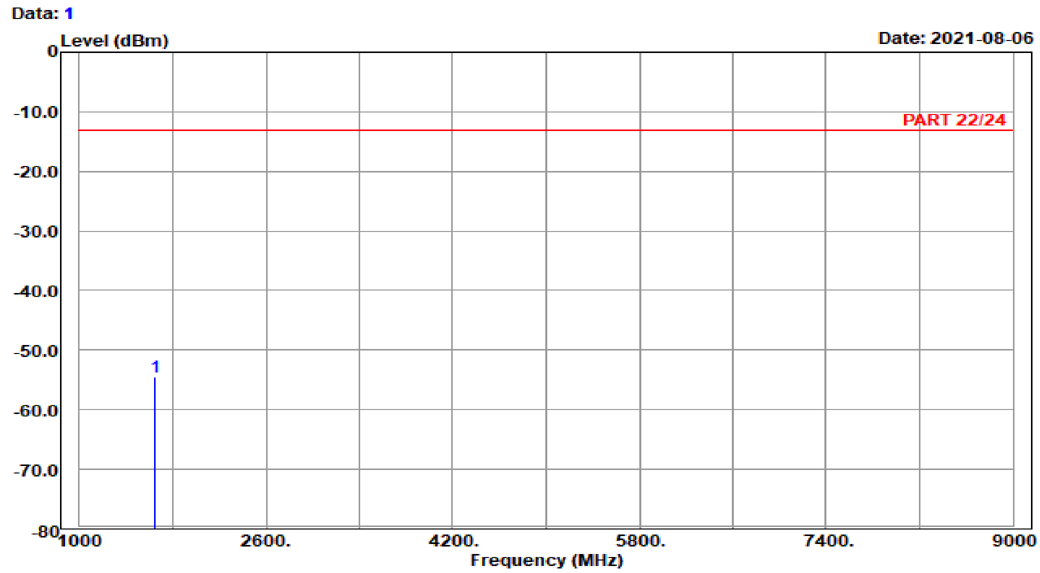
For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.8.5 Test Results

WCDMA:

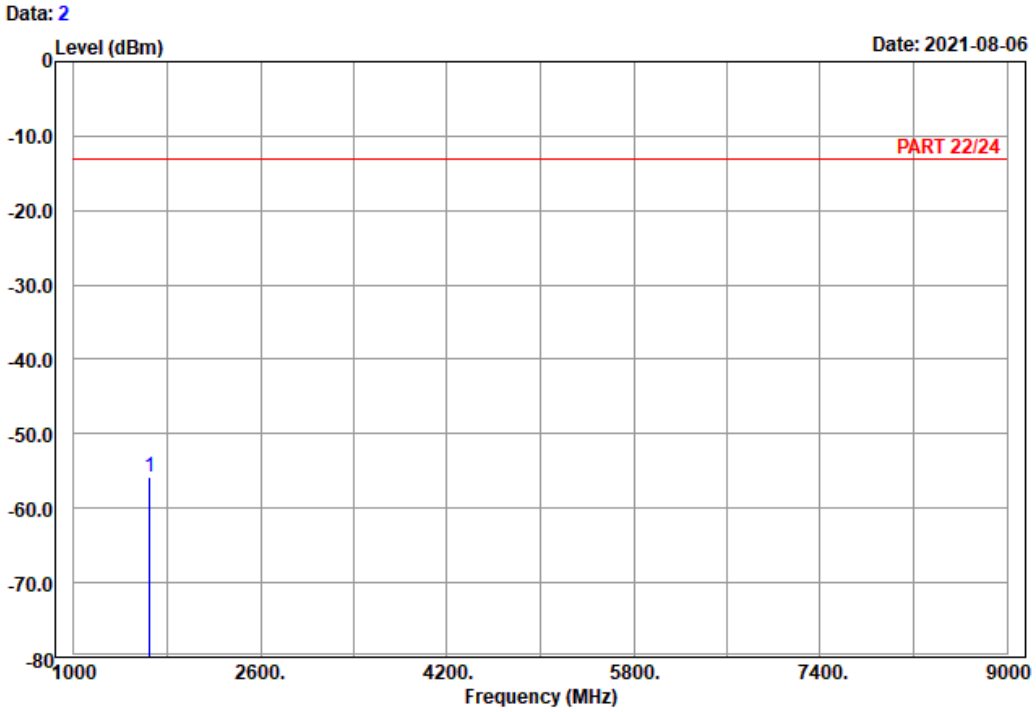
Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : Band V_Link_L-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1652.80	-54.42	-62.15	-13.00	-41.42	7.73	Peak

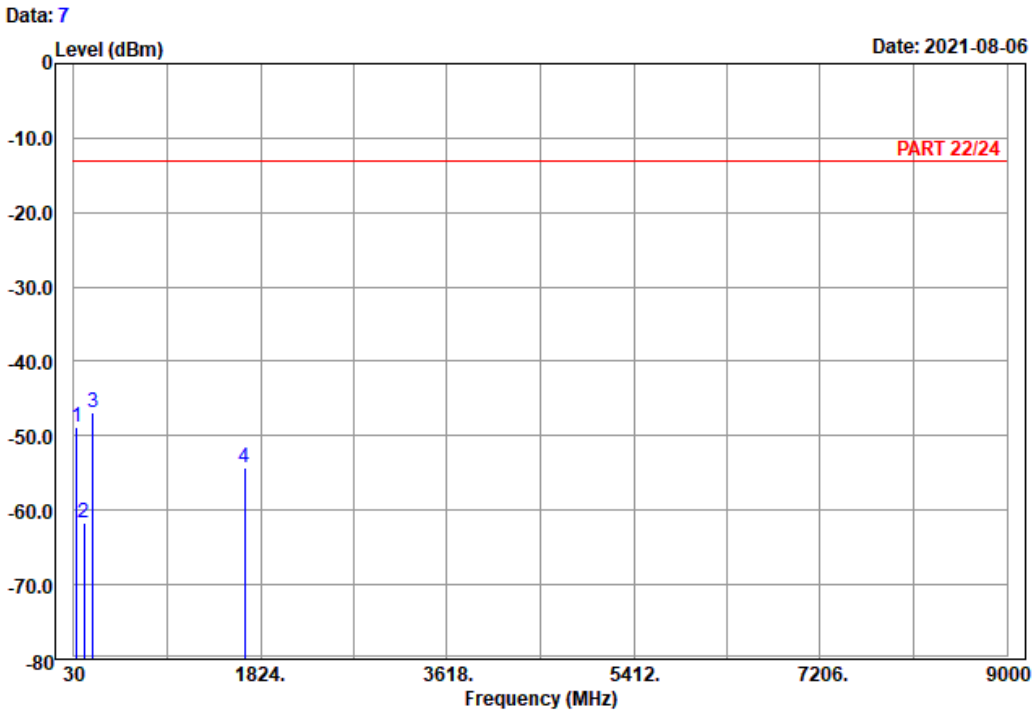


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : Band V_Link_L-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1652.80	-55.80	-63.53	-13.00	-42.80	7.73	Peak

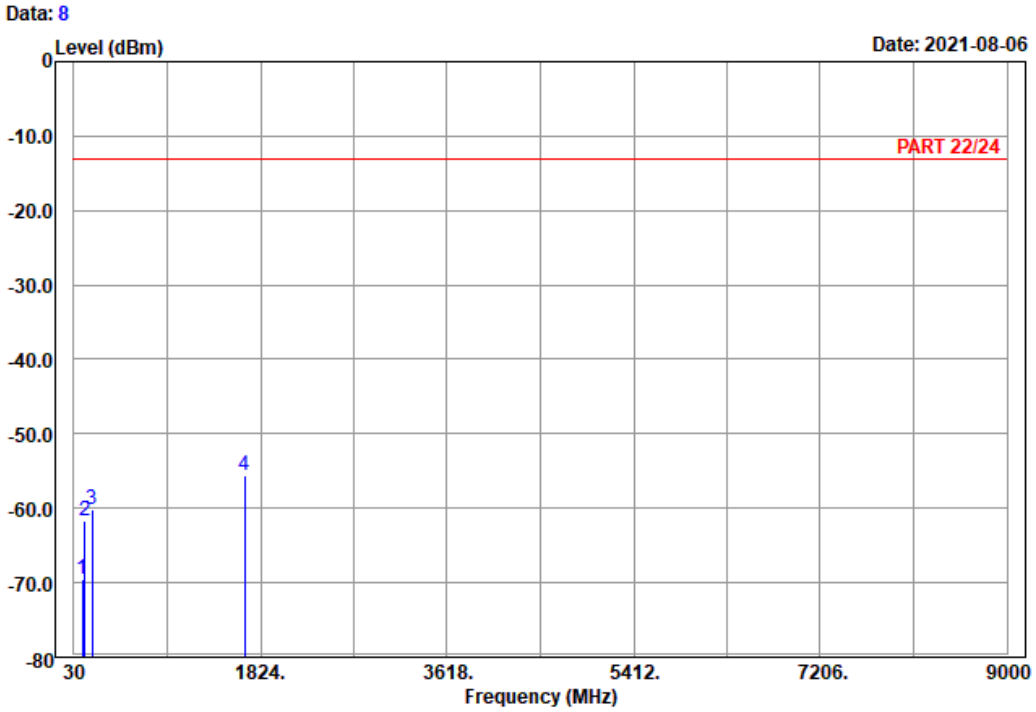
Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : Band V_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	56.73	-48.87	-34.81	-13.00	-35.87	-14.06	Peak
2	129.36	-61.66	-53.95	-13.00	-48.66	-7.71	Peak
3 pp	210.36	-46.81	-40.77	-13.00	-33.81	-6.04	Peak
4	1672.80	-54.37	-62.28	-13.00	-41.37	7.91	Peak

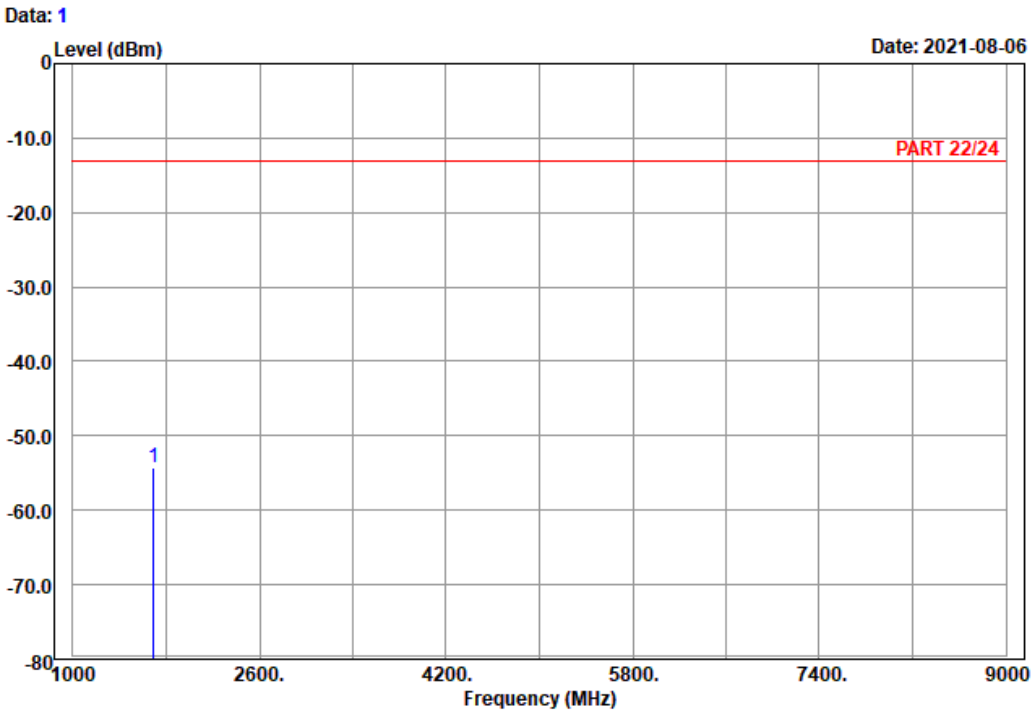


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : Band V_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	108.84	-69.46	-60.39	-13.00	-56.46	-9.07	Peak
2	134.76	-61.65	-53.98	-13.00	-48.65	-7.67	Peak
3	205.50	-60.09	-53.98	-13.00	-47.09	-6.11	Peak
4 pp	1672.80	-55.53	-63.44	-13.00	-42.53	7.91	Peak

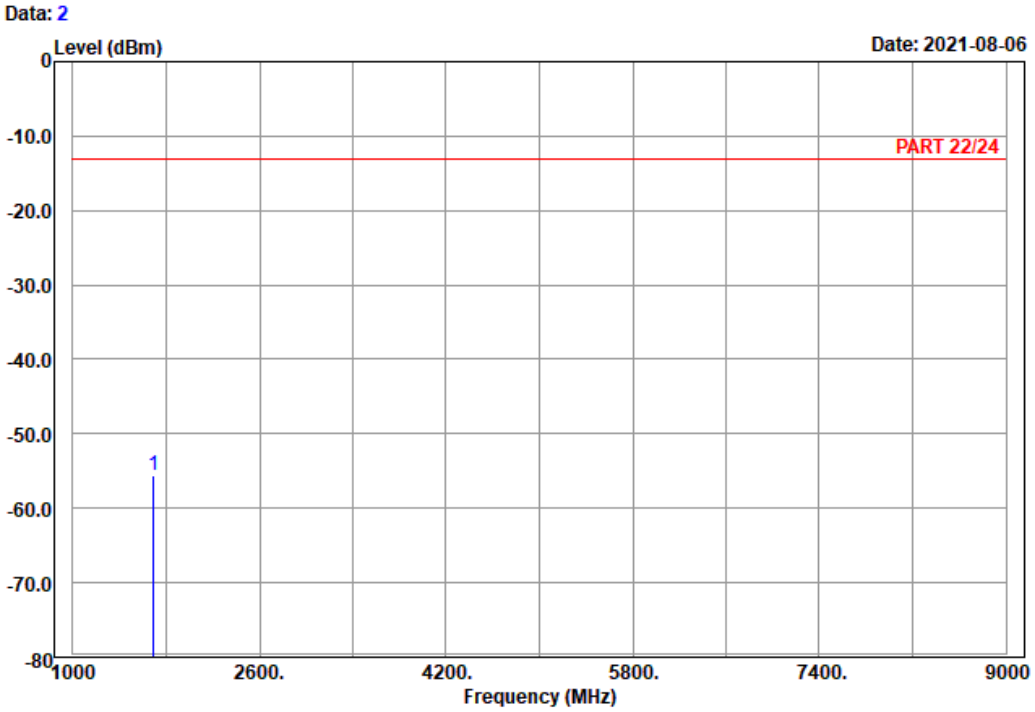
High Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : Band V_Link_H-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1693.20	-54.33	-62.47	-13.00	-41.33	8.14	Peak

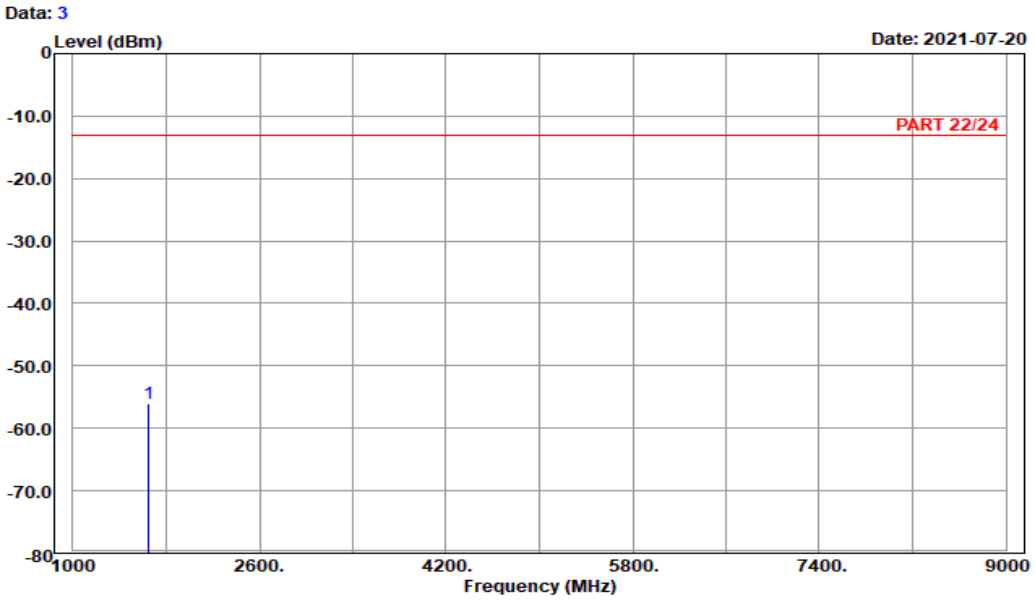


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : Band V_Link_H-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1693.20	-55.62	-63.76	-13.00	-42.62	8.14	Peak

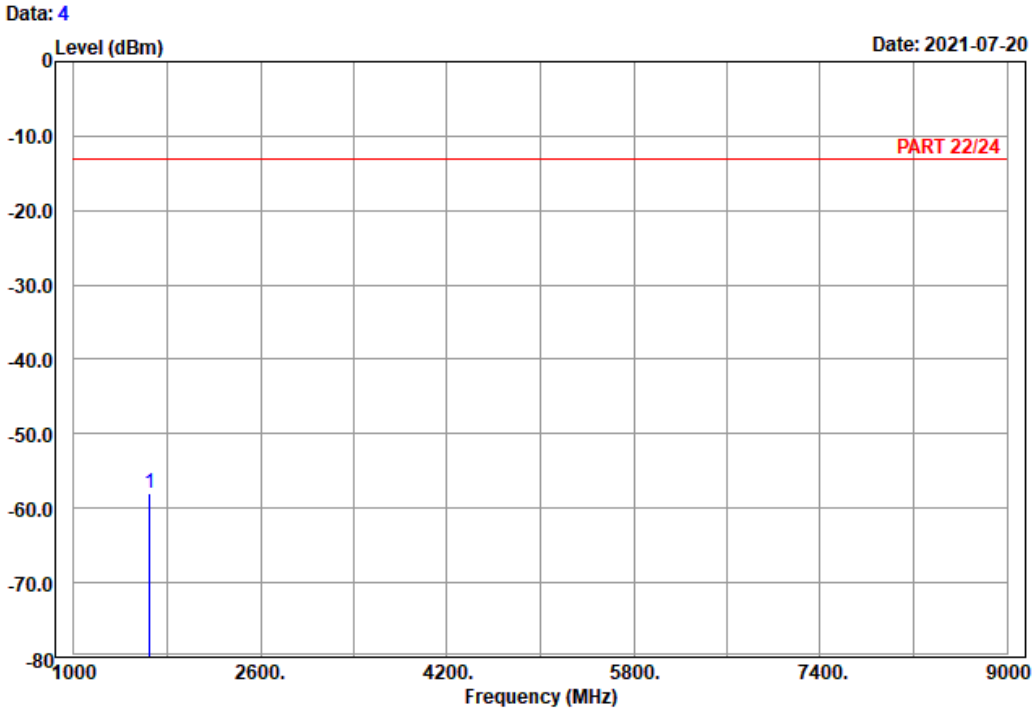
LTE Band 5
Channel Bandwidth: 1.4 MHz / QPSK
Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch




```
Site      : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark    : LTE_Band 5_Link_L-Ch
Tested by: Karl Lee
                        Read          Limit   Over
           Freq  Level  Level Factor   Line  Limit Remark
          _____ _____ _____ _____ _____ _____ _____
            MHz   dBm   dBm    dB    dBm    dB

  1 pp  1649.40 -55.96 -63.69  7.73 -13.00 -42.96 Peak
```

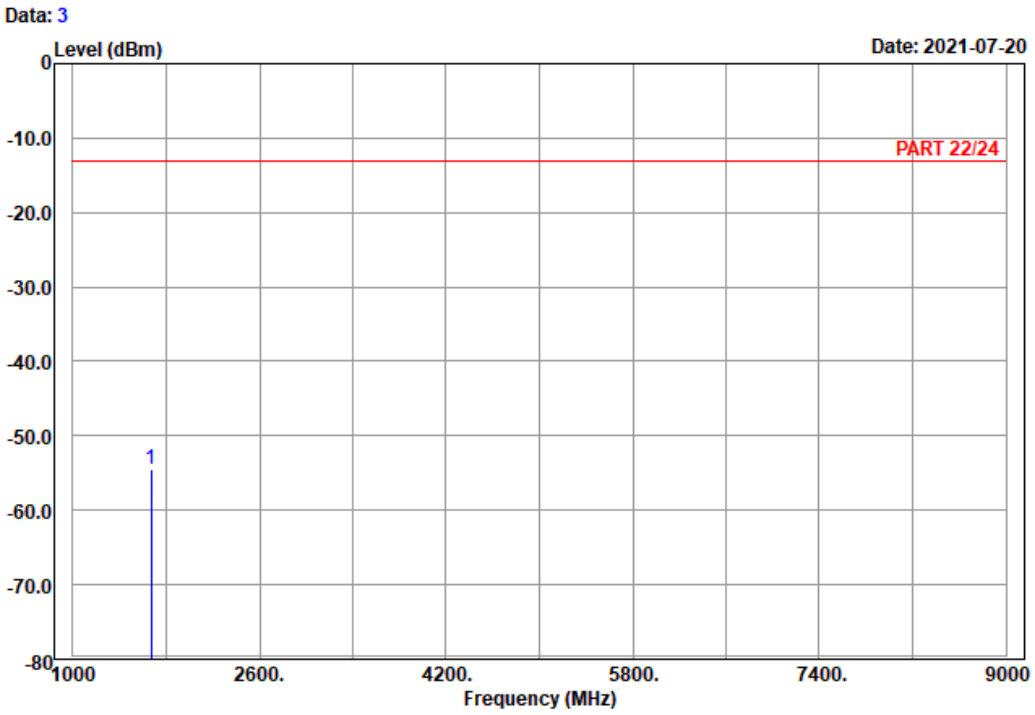


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : LTE_Band 5_Link_L-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	1649.40	-57.96	-65.69	7.73	-13.00	-44.96	Peak

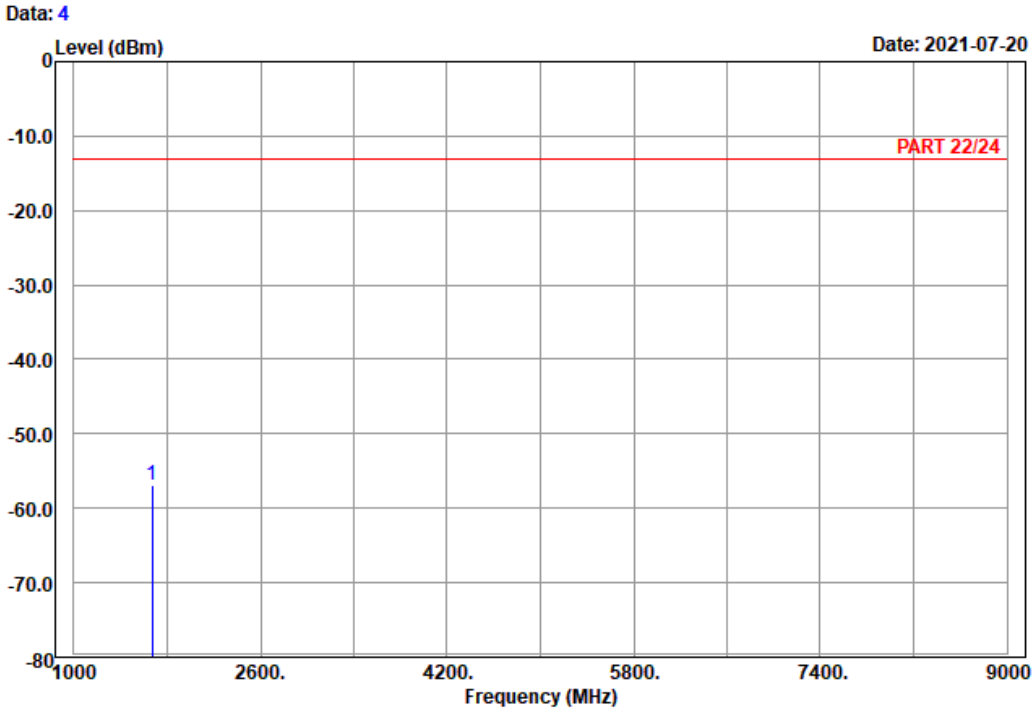
Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : LTE_Band 5_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	1673.00	-54.52	-62.43	7.91	-13.00	-41.52	Peak

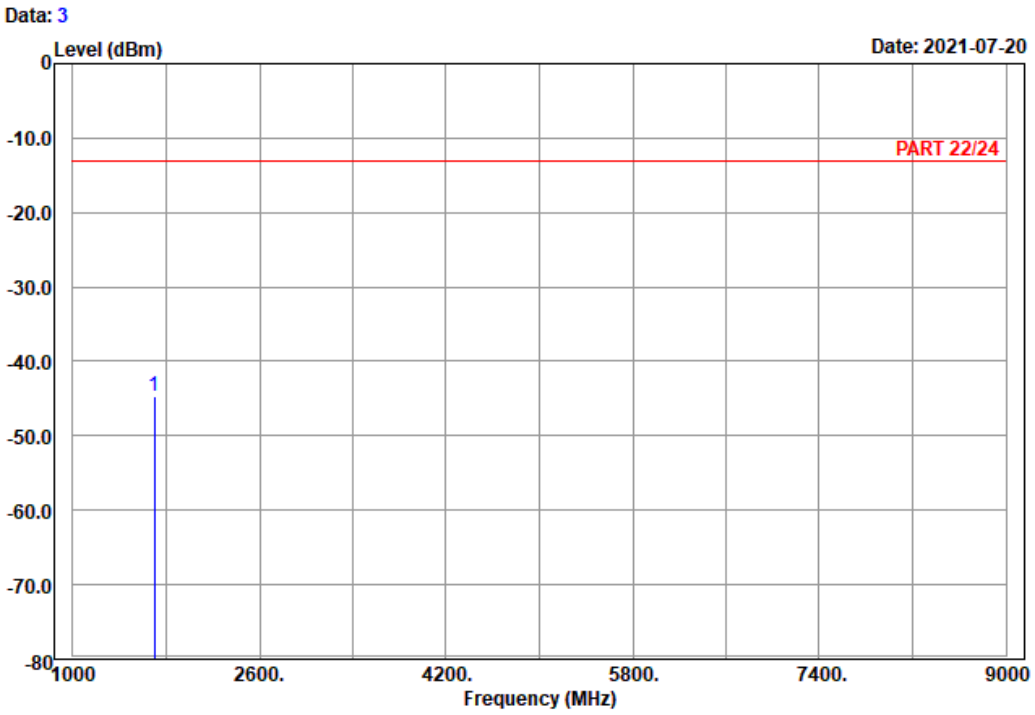


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : LTE_Band 5_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	1673.00	-56.98	-64.89	7.91	-13.00	-43.98	Peak

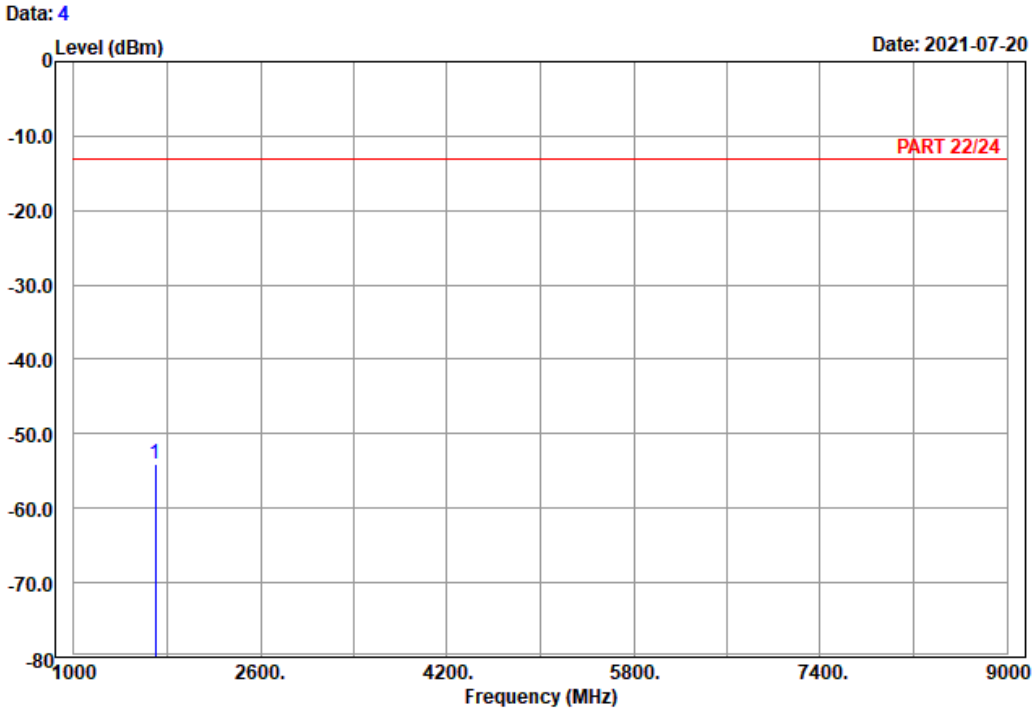
High Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : LTE_Band 5_Link_H-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	1696.60	-44.66	-52.80	8.14	-13.00	-31.66	Peak

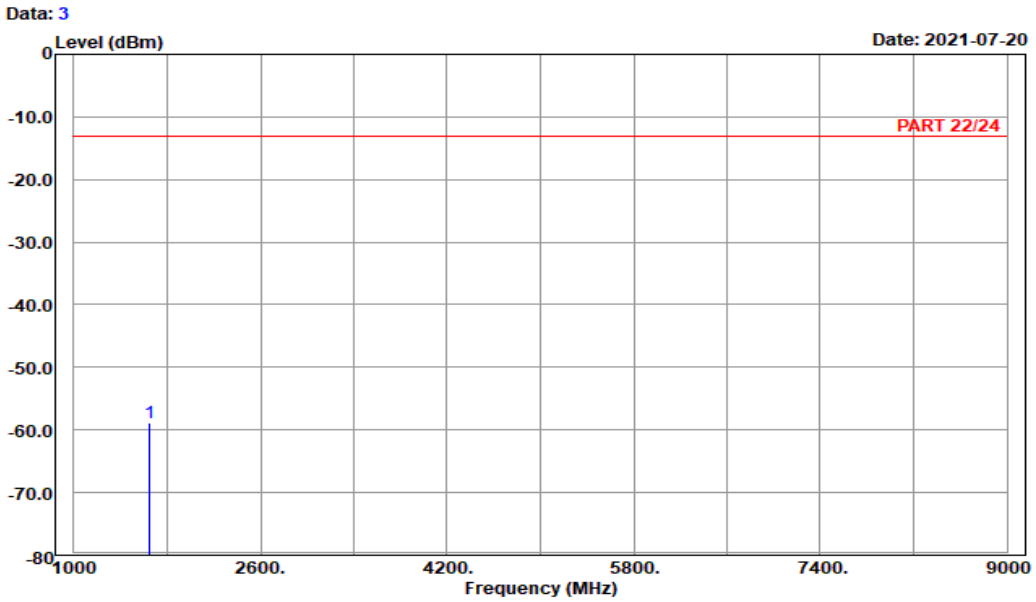


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : LTE_Band 5_Link_H-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	1696.60	-54.10	-62.24	8.14	-13.00	-41.10	Peak

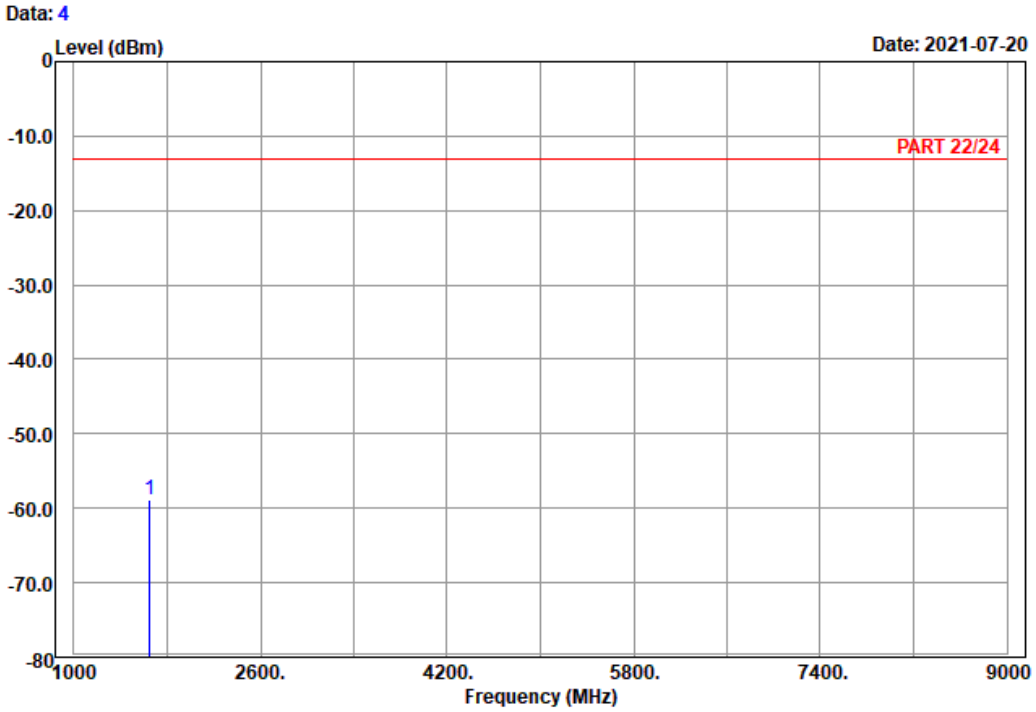
Channel Bandwidth: 5 MHz / QPSK
Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : LTE_Band 5_Link_L-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	1653.00	-58.84	-66.57	7.73	-13.00	-45.84	Peak

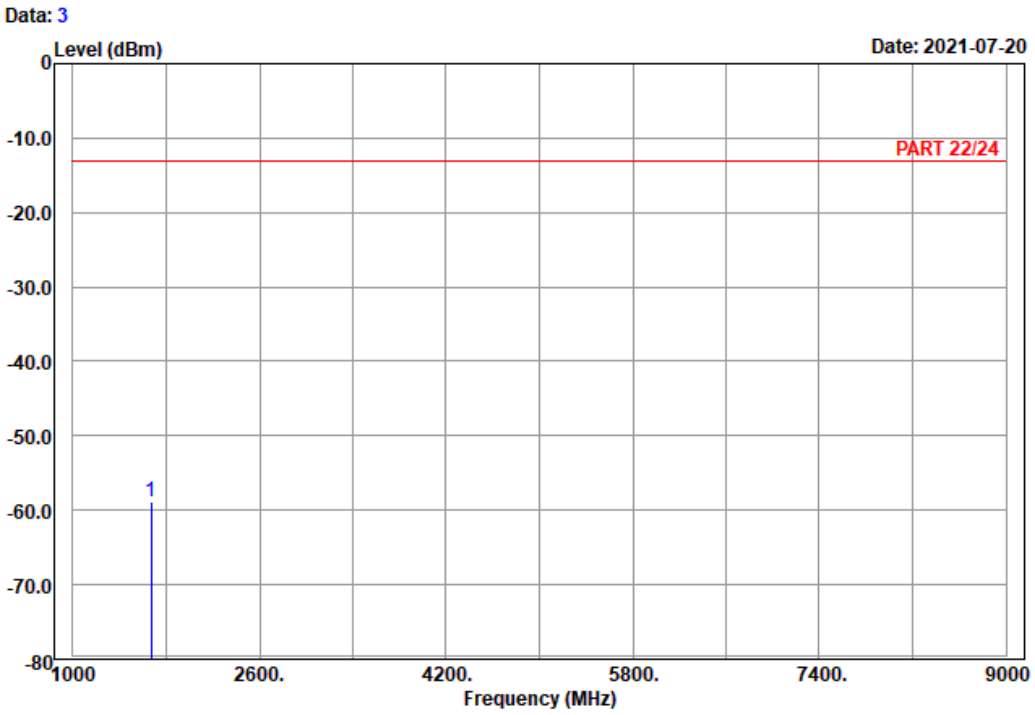


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : LTE_Band 5_Link_L-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	1653.00	-58.93	-66.66	7.73	-13.00	-45.93	Peak

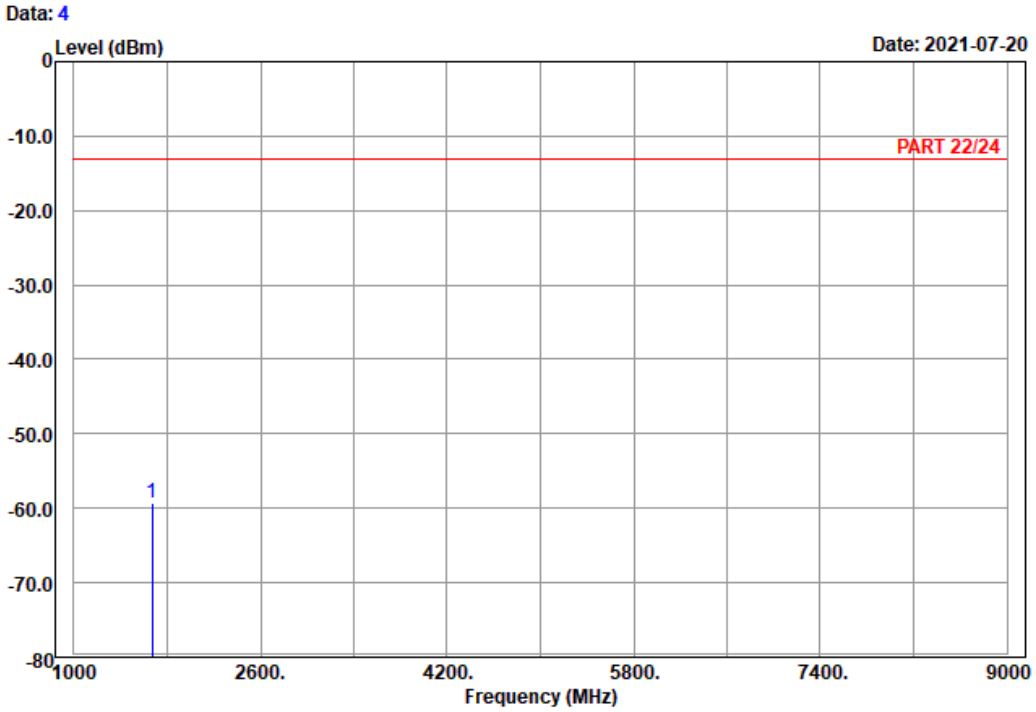
Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : LTE_Band 5_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	1673.00	-58.84	-66.75	7.91	-13.00	-45.84	Peak

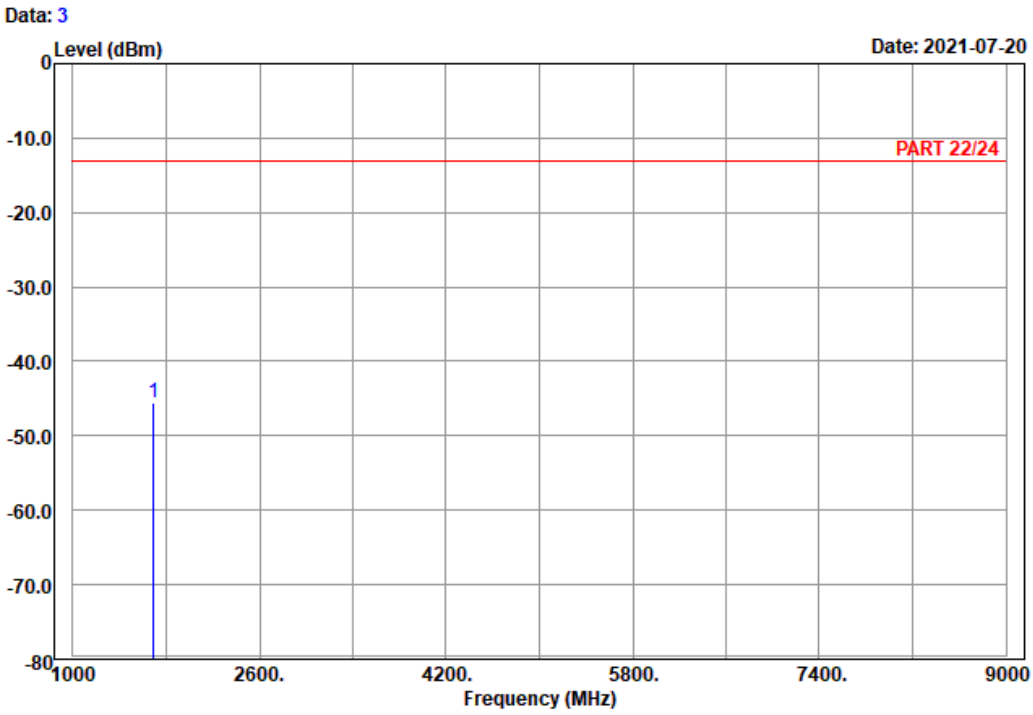


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : LTE_Band 5_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	1673.00	-59.33	-67.24	7.91	-13.00	-46.33	Peak

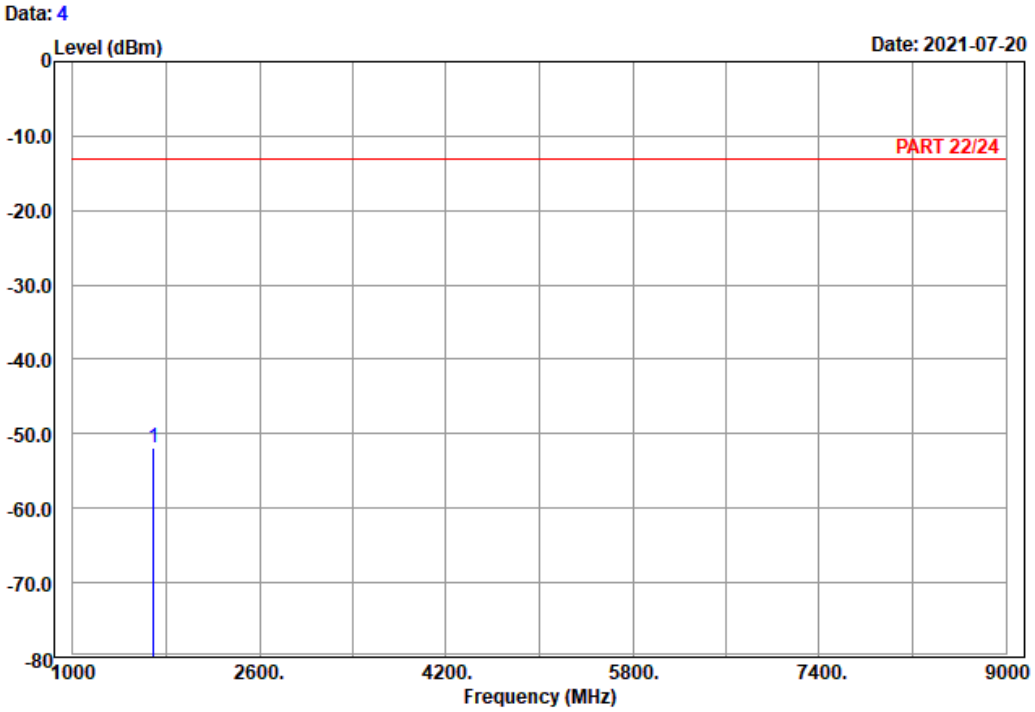
High Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : LTE_Band 5_Link_H-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	1693.00	-45.50	-53.52	8.02	-13.00	-32.50	Peak

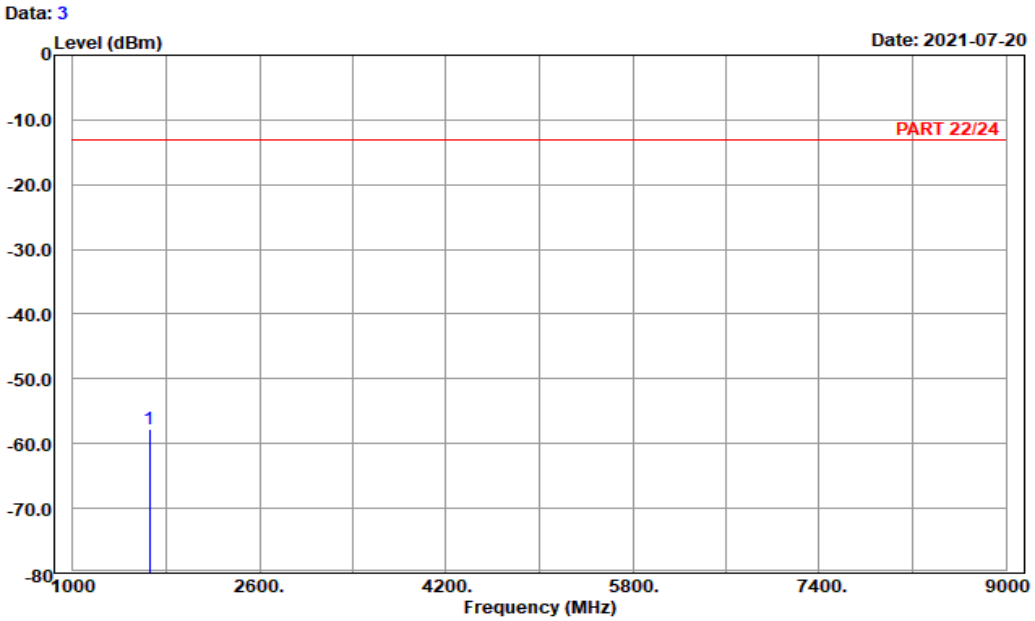


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : LTE_Band 5_Link_H-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	1693.00	-51.84	-59.86	8.02	-13.00	-38.84	Peak

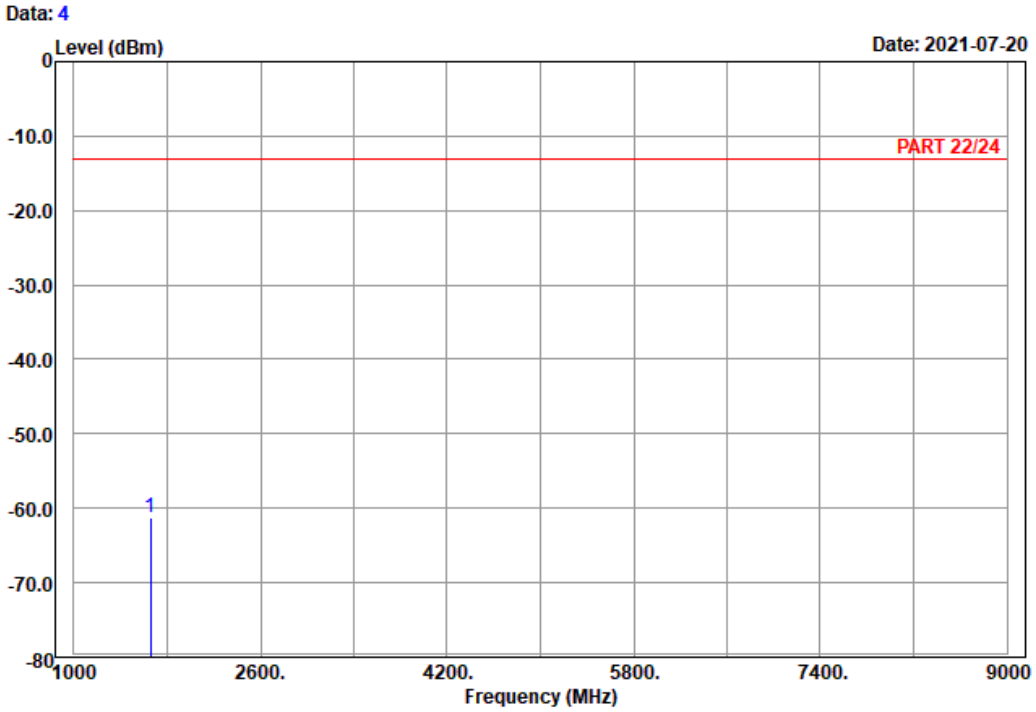
Channel Bandwidth: 10 MHz / QPSK
Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : LTE_Band 5_Link_L-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	1658.00	-57.77	-65.68	7.91	-13.00	-44.77	Peak

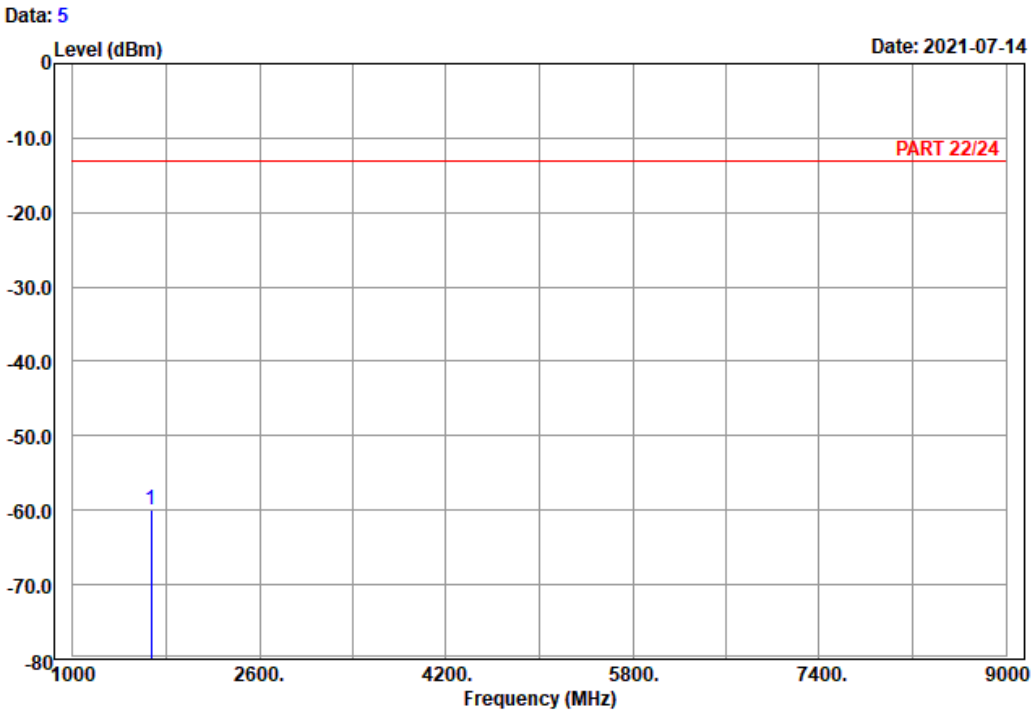


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : LTE_Band 5_Link_L-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	1658.00	-61.30	-69.21	7.91	-13.00	-48.30	Peak

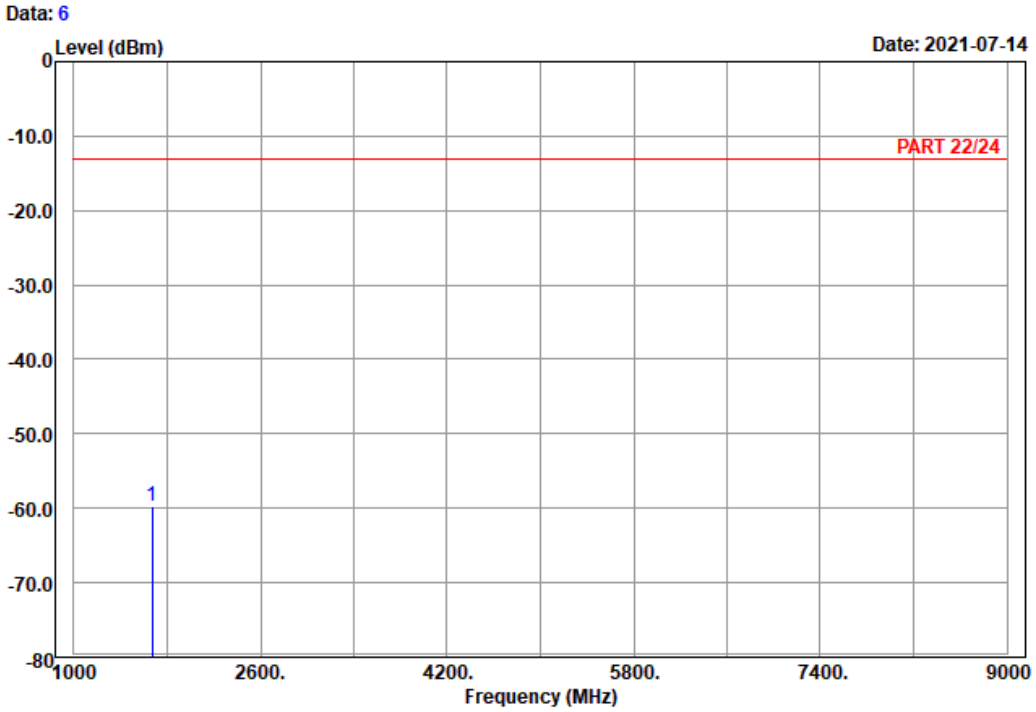
Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : LTE_Band 5_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	1673.00	-60.02	-67.93	7.91	-13.00	-47.02	Peak

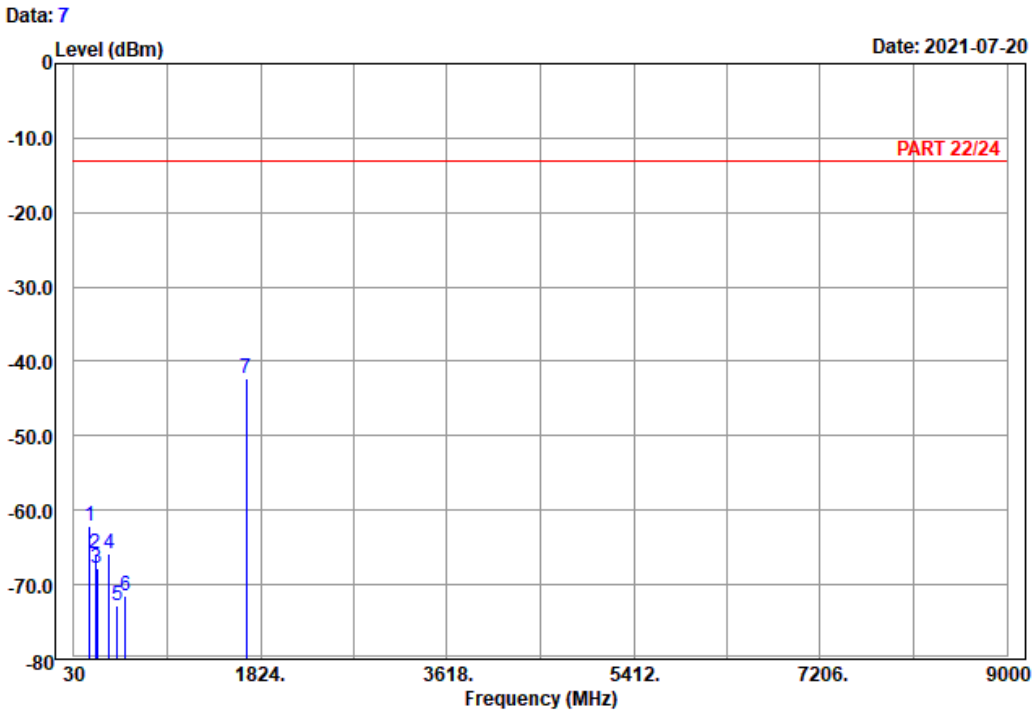


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : LTE_Band 5_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	1673.00	-59.68	-67.59	7.91	-13.00	-46.68	Peak

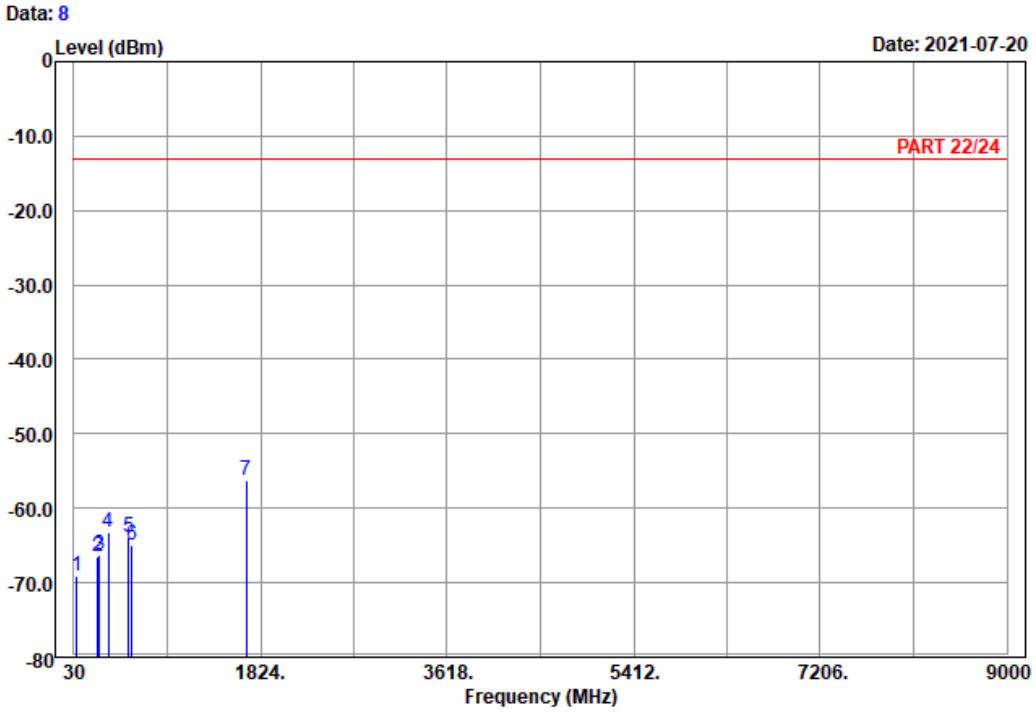
High Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : LTE_Band 5_Link_H-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	181.47	-62.08	-56.49	-5.59	-13.00	-49.08	Peak
2	233.58	-65.87	-60.14	-5.73	-13.00	-52.87	Peak
3	255.72	-67.74	-62.18	-5.56	-13.00	-54.74	Peak
4	367.90	-65.74	-61.29	-4.45	-13.00	-52.74	Peak
5	447.70	-72.84	-69.04	-3.80	-13.00	-59.84	Peak
6	524.00	-71.51	-67.93	-3.58	-13.00	-58.51	Peak
7 pp	1688.00	-42.37	-50.39	8.02	-13.00	-29.37	Peak



Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : LTE_Band 5_Link_H-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	53.76	-69.06	-55.00	-14.06	-13.00	-56.06	Peak
2	262.74	-66.41	-60.79	-5.62	-13.00	-53.41	Peak
3	275.70	-66.23	-60.49	-5.74	-13.00	-53.23	Peak
4	359.50	-63.19	-58.33	-4.86	-13.00	-50.19	Peak
5	555.50	-63.79	-62.37	-1.42	-13.00	-50.79	Peak
6	587.70	-64.99	-64.89	-0.10	-13.00	-51.99	Peak
7 pp	1688.00	-56.32	-64.34	8.02	-13.00	-43.32	Peak

5 Pictures of Test Arrangements

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

Appendix – Information of the Testing Laboratories

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

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

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

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

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

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

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

--- END ---