FCC Test Report

(PART 24)

Report No.:	RF200709D02-1
FCC ID:	2AK5B-HB1
Test Model:	HB1LW1NA1
Received Date:	Jul. 09, 2020
Test Date:	Jul. 20 ~ Sep. 09, 2020
Issued Date:	Sep. 11, 2020
Applicant:	Latchable, Inc.
Address:	508 West 26th Street Suite 6G New York, NY 10001
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location :	No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, Taiwan
FCC Registration / Designation Number:	788550 / TW0003

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Release Control Record

Issue No.	Description	Date Issued
RF200709D02-1	Original Release	Sep. 11, 2020

1 Certificate of Conformity

Product:	Hub
Brand:	LATCH
Test Model:	HB1LW1NA1
Sample Status:	Engineering Sample
Applicant:	Latchable, Inc.
Test Date:	Jul. 20 ~ Sep. 09, 2020
Standards:	FCC Part 24, Subpart E

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. 11, 2020

Lena Wang / Specialist

Approved by : , **Date:** Sep. 11, 2020

Dylan Chiou / Senior Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 24 & Part 2			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 24.232	Effective Isotropic Radiated Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement.
24.232(d)	Peak to Average Ratio	Pass	Meet the requirement of limit.
2.1055 24.235	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth	Pass	Meet the requirement of limit.
24.238	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 24.238	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 24.238	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -21.27 dB at 3760.00 MHz.

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

2.1 Measurement Uncertainty

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

Measurement	**Frequency**	**Expanded Uncertainty (k=2) (±)**
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.04 dB
	30 MHz ~ 200 MHz	2.93 dB
	200 MHz ~ 1000 MHz	2.95 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB

2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY51210203	Mar. 18, 2020	Mar. 17, 2021
Spectrum Analyzer Agilent	N9010A	MY52220314	Dec. 12, 2019	Dec. 11, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Apr. 16, 2020	Apr. 15, 2021
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 24, 2019	Nov. 23, 2020
BILOG Antenna SCHWARZBECK	VULB 9168	9168-472	Nov. 08, 2019	Nov. 07, 2020
HORN Antenna SCHWARZBECK	BBHA 9120 D	209	Nov. 24, 2019	Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Nov. 24, 2019	Nov. 23, 2020
Fixed Attenuator WOKEN	MDCS18N-10	MDCS18N-10-01	Apr. 14, 2020	Apr. 13, 2021
Loop Antenna	HLA 6121	45745	Jul. 06, 2020	Jul. 05, 2021
Preamplifier EMCI	EMC 012645	980115	Oct. 08, 2019	Oct. 07, 2020
Preamplifier EMCI	EMC 184045	980116	Oct. 08, 2019	Oct. 07, 2020
Preamplifier EMCI	EMC 330H	980112	Oct. 08, 2019	Oct. 07, 2020
RF Coaxial Cable HUBER+SUHNNER	EMC104-SM-SM-8000&3000	140811+170717	Oct. 08, 2019	Oct. 07, 2020
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM-1000(140807)	Oct. 08, 2019	Oct. 07, 2020
RF Coaxial Cable WOKEN	8D-FB	Cable-Ch10-01	Oct. 08, 2019	Oct. 07, 2020
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 Anritsu	MT8820C	6201300640	Aug. 19, 2019	Aug. 18, 2021
Radio Communication Analyzer Anritsu	MT8821C	6201462755	Feb. 13, 2020	Feb. 12, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSW43	101582	Mar. 31, 2020	Mar. 30, 2021
Temperature & Humidity Chamber GIANT FORCE	GTH-120-40-CP-AR	MAA1306-019	Sep. 10, 2019	Sep. 09, 2020
AC Power Source EEC	6905S	1991553	NA	NA
Digital Multimeter Fluke	87-III	70360742	Jun. 23, 2020	Jun. 22, 2021
MXG Vector signal generator Agilent	N5182B	MY53050430	Nov. 25, 2019	Nov. 24, 2020

Note: 1. The calibration interval of the above test instruments is 12 / 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 10.

3 General Information

3.1 General Description of EUT

Product	Hub	
Brand	LATCH	
Test Model	HB1LW1NA1	
Status of EUT	Engineering Sample	
Power Supply Rating	12.0 Vdc (adapter)	
Modulation Type	WCDMA	BPSK, QPSK
	HSDPA	BPSK
	HSUPA	QPSK
	LTE	QPSK, 16QAM
Frequency Range	WCDMA	1852.4 ~ 1907.6 MHz
	LTE Band 2 (Channel Bandwidth: 1.4 MHz)	1850.7 ~ 1909.3 MHz
	LTE Band 2 (Channel Bandwidth: 3 MHz)	1851.5 ~ 1908.5 MHz
	LTE Band 2 (Channel Bandwidth: 5 MHz)	1852.5 ~ 1907.5 MHz
	LTE Band 2 (Channel Bandwidth: 10 MHz)	1855.0 ~ 1905.0 MHz
	LTE Band 2 (Channel Bandwidth: 15 MHz)	1857.5 ~ 1902.5 MHz
	LTE Band 2 (Channel Bandwidth: 20 MHz)	1860.0 ~ 1900.0 MHz
Max. EIRP Power	WCDMA	271.02 mW
	LTE Band 2 (Channel Bandwidth: 1.4 MHz)	269.15 mW
	LTE Band 2 (Channel Bandwidth: 3 MHz)	283.79 mW
	LTE Band 2 (Channel Bandwidth: 5 MHz)	300.61 mW
	LTE Band 2 (Channel Bandwidth: 10 MHz)	316.96 mW
	LTE Band 2 (Channel Bandwidth: 15 MHz)	334.97 mW
	LTE Band 2 (Channel Bandwidth: 20 MHz)	353.18 mW
Emission Designator	WCDMA	4M09F9W
	LTE Band 2 (Channel Bandwidth: 1.4 MHz)	1M09D7W
	LTE Band 2 (Channel Bandwidth: 3 MHz)	2M70G7D
	LTE Band 2 (Channel Bandwidth: 5 MHz)	4M49G7D
	LTE Band 2 (Channel Bandwidth: 10 MHz)	8M98D7W
	LTE Band 2 (Channel Bandwidth: 15 MHz)	13M5G7D
	LTE Band 2 (Channel Bandwidth: 20 MHz)	18M0D7W
Antenna Type	Refer to Note as below	
Accessory Device	Refer to Note as below	
Data Cable Supplied	N/A	

Note:

1. The EUT contains following accessory devices.

Product	Brand	Model	Description
Adapter	APD	WB-24J12FU	I/P: 100-240 Vac, 50/60 Hz, 0.7 A O/P: 12 Vdc, 2 A

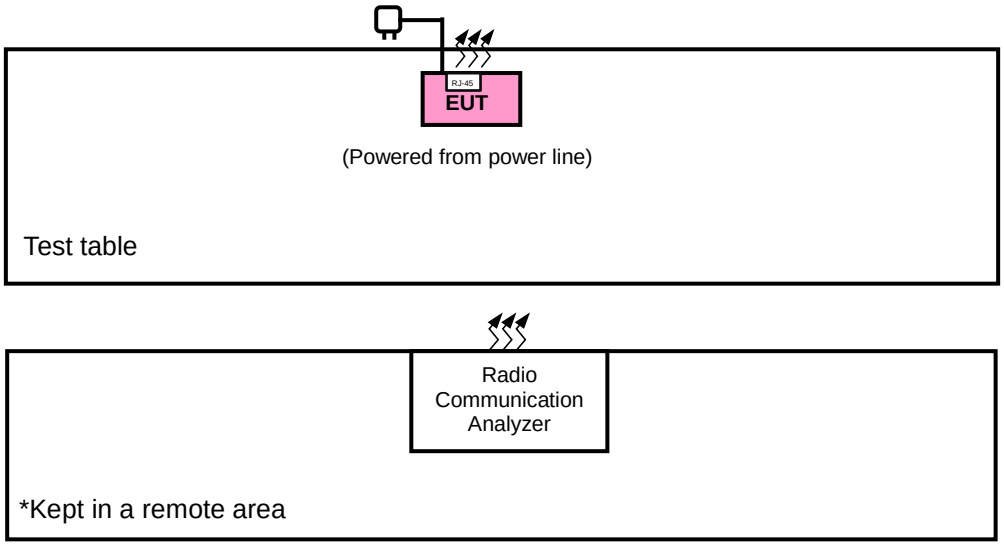
2. The antenna information is listed as below.

Antenna Type		PIFA						
Band		WCDMA		LTE				
		2	5	2	4	5	12	13
Gain	Ant. 1 (Main)	2.3	1.3	2.3	2.8	1.3	1.1	1.1
	Ant. 2 (Div)	2.6	2.5	2.6	2.8	2.5	2.8	2.8

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.

3.2 Configuration of System under Test

<Radiated Emission Test> & <E.I.R.P. Test>



3.2.1 Description of Support Units

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

No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Radio Communication Analyzer	ANRITSU	MT8821C	6201462755	N/A

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	EIRP	Radiated Emission
WCDMA	X-plane	X-plane
LTE Band 2	X-plane	X-plane

WCDMA

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
-	EIRP	9262 to 9538	9262, 9400, 9538	WCDMA
-	Modulation Characteristics	9262 to 9538	9400	WCDMA
-	Frequency Stability	9262 to 9538	9262, 9538	WCDMA
-	Occupied Bandwidth	9262 to 9538	9262, 9400, 9538	WCDMA
-	Band Edge	9262 to 9538	9262, 9538	WCDMA
-	Peak to Average Ratio	9262 to 9538	9262, 9400, 9538	WCDMA
-	Conducted Emission	9262 to 9538	9262, 9400, 9538	WCDMA
-	Radiated Emission	9262 to 9538	9262, 9400, 9538	WCDMA

LTE Band 2

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	EIRP	18607 to 19193	18607, 18900, 19193	1.4 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		18615 to 19185	18615, 18900, 19185	3 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		18625 to 19175	18625, 18900, 19175	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		18650 to 19150	18650, 18900, 19150	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		18675 to 19125	18675, 18900, 19125	15 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		18700 to 19100	18700, 18900, 19100	20 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Modulation Characteristics	18700 to 19100	18900	20 MHz	QPSK, 16QAM	100 RB / 0 RB Offset
-	Frequency Stability	18607 to 19193	18607, 19193	1.4 MHz	QPSK	1 RB / 0 RB Offset
		18615 to 19185	18615, 19185	3 MHz	QPSK	1 RB / 0 RB Offset
		18625 to 19175	18625, 19175	5 MHz	QPSK	1 RB / 0 RB Offset
		18650 to 19150	18650, 19150	10 MHz	QPSK	1 RB / 0 RB Offset
		18675 to 19125	18675, 19125	15 MHz	QPSK	1 RB / 0 RB Offset
		18700 to 19100	18700, 19100	20 MHz	QPSK	1 RB / 0 RB Offset
-	Occupied Bandwidth	18607 to 19193	18607, 18900, 19193	1.4 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		18615 to 19185	18615, 18900, 19185	3 MHz	QPSK, 16QAM	15 RB / 0 RB Offset
		18625 to 19175	18625, 18900, 19175	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		18650 to 19150	18650, 18900, 19150	10 MHz	QPSK, 16QAM	50 RB / 0 RB Offset
		18675 to 19125	18675, 18900, 19125	15 MHz	QPSK, 16QAM	75 RB / 0 RB Offset
		18700 to 19100	18700, 18900, 19100	20 MHz	QPSK, 16QAM	100 RB / 0 RB Offset
-	Peak to Average Ratio	18607 to 19193	18607, 18900, 19193	1.4 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		18615 to 19185	18615, 18900, 19185	3 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		18625 to 19175	18625, 18900, 19175	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		18650 to 19150	18650, 18900, 19150	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		18675 to 19125	18675, 18900, 19125	15 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		18700 to 19100	18700, 18900, 19100	20 MHz	QPSK, 16QAM	1 RB / 0 RB Offset

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	Band Edge	18607 to 19193	18607	1.4 MHz	QPSK	1 RB / 0 RB Offset
						6 RB / 0 RB Offset
			19193	1.4 MHz	QPSK	1 RB / 5 RB Offset
						6 RB / 0 RB Offset
		18615 to 19185	18615	3 MHz	QPSK	1 RB / 0 RB Offset
						15 RB / 0 RB Offset
			19185	3 MHz	QPSK	1 RB / 14 RB Offset
						15 RB / 0 RB Offset
		18625 to 19175	18625	5 MHz	QPSK	1 RB / 0 RB Offset
						25 RB / 0 RB Offset
			19175	5 MHz	QPSK	1 RB / 24 RB Offset
						25 RB / 0 RB Offset
		18650 to 19150	18650	10 MHz	QPSK	1 RB / 0 RB Offset
						50 RB / 0 RB Offset
			19150	10 MHz	QPSK	1 RB / 49 RB Offset
						50 RB / 0 RB Offset
		18675 to 19125	18675	15 MHz	QPSK	1 RB / 0 RB Offset
						75 RB / 0 RB Offset
			19125	15 MHz	QPSK	1 RB / 74 RB Offset
						75 RB / 0 RB Offset
		18700 to 19100	18700	20 MHz	QPSK	1 RB / 0 RB Offset
						100 RB / 0 RB Offset
			19100	20 MHz	QPSK	1 RB / 99 RB Offset
						100 RB / 0 RB Offset
-	Conducted Emission	18607 to 19193	18607, 18900, 19193	1.4 MHz	QPSK	1 RB / 0 RB Offset
		18615 to 19185	18615, 18900, 19185	3 MHz	QPSK	1 RB / 0 RB Offset
		18625 to 19175	18625, 18900, 19175	5 MHz	QPSK	1 RB / 0 RB Offset
		18650 to 19150	18650, 18900, 19150	10 MHz	QPSK	1 RB / 0 RB Offset
		18675 to 19125	18675, 18900, 19125	15 MHz	QPSK	1 RB / 0 RB Offset
		18700 to 19100	18700, 18900, 19100	20 MHz	QPSK	1 RB / 0 RB Offset
-	Radiated Emission	18607 to 19193	18607, 18900, 19193	1.4 MHz	QPSK	1 RB / 0 RB Offset
		18625 to 19175	18625, 18900, 19175	5 MHz	QPSK	1 RB / 0 RB Offset
		18700 to 19100	18700, 18900, 19100	20 MHz	QPSK	1 RB / 0 RB Offset

Note:

1. This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation. Therefore, only EIRP, modulation characteristics, occupied bandwidth and peak to average ratio items had been tested under QPSK, 16QAM 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. For radiated emission (below 1GHz) test items, the worst radiated emission (above 1GHz) mode was selected.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
EIRP	26 deg. C, 58 % RH	120 Vac, 60 Hz	Getaz Yang
Modulation Characteristics	26 deg. C, 58 % RH	120 Vac, 60 Hz	Getaz Yang
Frequency Stability	26 deg. C, 58 % RH	120 Vac, 60 Hz	Getaz Yang
Occupied Bandwidth	26 deg. C, 58 % RH	120 Vac, 60 Hz	Getaz Yang
Band Edge	26 deg. C, 58 % RH	120 Vac, 60 Hz	Getaz Yang
Peak to Average Ratio	26 deg. C, 58 % RH	120 Vac, 60 Hz	Getaz Yang
Conducted Emission	26 deg. C, 58 % RH	120 Vac, 60 Hz	Getaz Yang
Radiated Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Getaz Yang, Cyril Chen

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 24
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 2 watts e.i.r.p.

4.1.2 Test Procedures

EIRP / ERP Measurement:

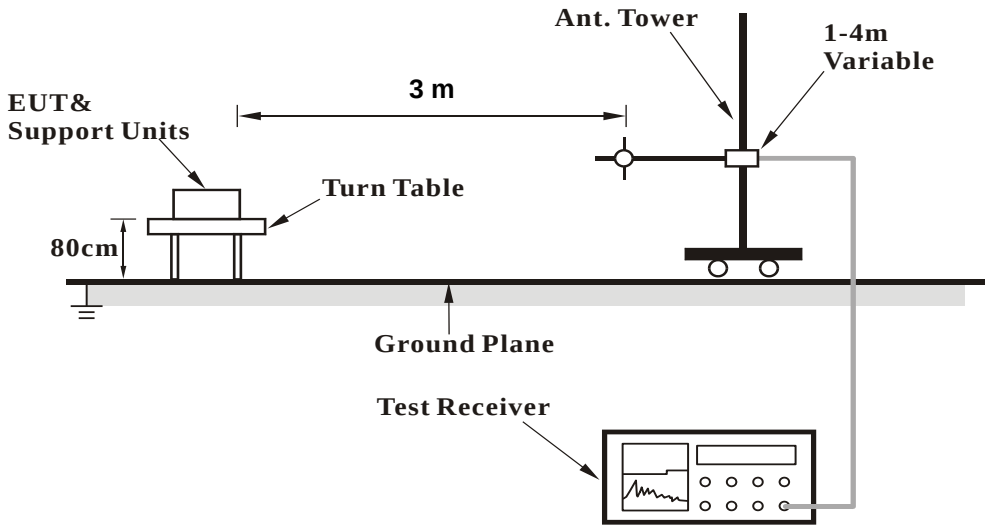
a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 5 MHz for WCDMA and 5MHz, 10 MHz, 15 MHz, 20 MHz for LTE mode, and VBW ≥ 3 x RBW.
b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
c. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value” of step b. Record the power level of S.G.
d. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.R.P power - 2.15 dB.

Conducted Power Measurement:

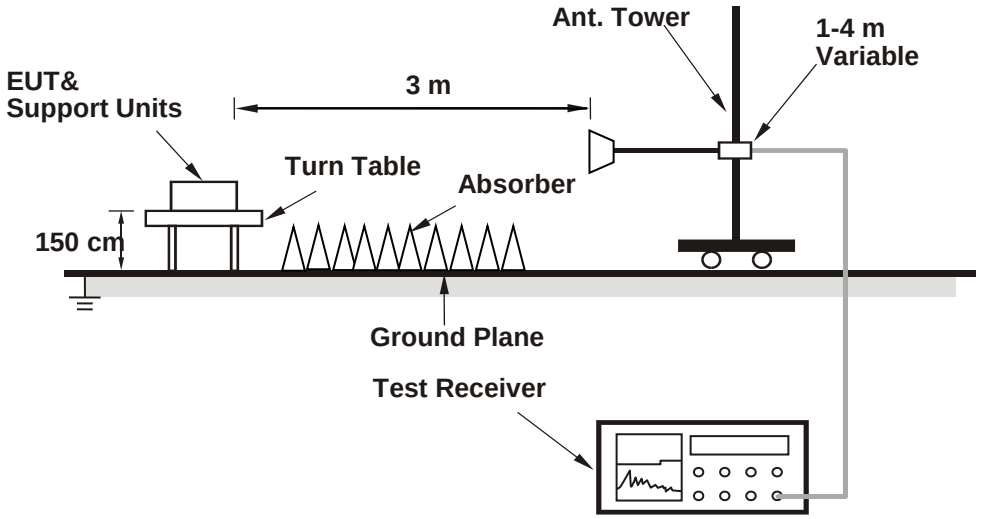
The EUT was set up for the maximum power with WCDMA and LTE link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

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 II		
Channel	9262	9400	9538
Frequency (MHz)	1852.4	1880.0	1907.6
RMC 12.2K	22.91	22.98	22.24
HSDPA Subtest-1	21.95	21.88	21.69
HSDPA Subtest-2	21.86	21.89	21.75
HSDPA Subtest-3	21.58	21.68	21.78
HSDPA Subtest-4	21.98	21.87	21.63
DC-HSDPA Subtest-1	21.82	21.65	21.69
DC-HSDPA Subtest-2	21.58	21.42	21.73
DC-HSDPA Subtest-3	21.66	21.64	21.85
DC-HSDPA Subtest-4	21.75	21.61	21.43

LTE Band 2

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		18700	18900	19100				Channel		18675	18900	19125	
		Frequency (MHz)		1860.0	1880.0	1900.0				Frequency (MHz)		1857.5	1880.0	1902.5	
20M	QPSK	1	0	22.05	21.95	21.91	0	15M	QPSK	1	0	22.02	21.89	21.83	0
		1	50	21.92	21.82	21.82	0			1	37	21.89	21.81	21.72	0
		1	99	21.80	21.69	21.61	0			1	74	21.67	21.65	21.55	0
		50	0	20.89	20.86	20.75	1			36	0	20.85	20.73	20.73	1
		50	25	20.70	20.69	20.56	1			36	19	20.69	20.58	20.58	1
		50	50	20.62	20.61	20.49	1			36	39	20.59	20.43	20.49	1
		100	0	20.89	20.83	20.81	1			75	0	20.92	20.71	20.77	1
	16QAM	1	0	21.03	20.94	20.86	1		16QAM	1	0	20.94	20.83	20.75	1
		1	50	20.90	20.78	20.77	1			1	37	20.88	20.73	20.65	1
		1	99	20.76	20.66	20.59	1			1	74	20.63	20.64	20.50	1
		50	0	19.73	19.74	19.59	2			36	0	19.82	19.57	19.54	2
		50	25	19.64	19.66	19.53	2			36	19	19.60	19.49	19.56	2
		50	50	19.55	19.55	19.44	2			36	39	19.58	19.34	19.40	2
		100	0	19.88	19.79	19.79	2			75	0	19.86	19.68	19.75	2
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		18650	18900	19150				Channel		18625	18900	19175	
		Frequency (MHz)		1855.0	1880.0	1905.0				Frequency (MHz)		1852.5	1880.0	1907.5	
10M	QPSK	1	0	21.99	21.84	21.78	0	5M	QPSK	1	0	21.92	21.79	21.78	0
		1	24	21.85	21.69	21.63	0			1	12	21.75	21.75	21.55	0
		1	49	21.58	21.52	21.57	0			1	24	21.52	21.42	21.51	0
		25	0	20.84	20.68	20.69	1			12	0	20.80	20.73	20.61	1
		25	12	20.65	20.48	20.50	1			12	6	20.55	20.43	20.48	1
		25	25	20.58	20.35	20.33	1			12	13	20.46	20.39	20.41	1
		50	0	20.85	20.62	20.69	1			25	0	20.69	20.53	20.58	1
	16QAM	1	0	20.97	20.80	20.73	1		16QAM	1	0	20.83	20.76	20.72	1
		1	24	20.81	20.62	20.55	1			1	12	20.68	20.69	20.54	1
		1	49	20.50	20.43	20.52	1			1	24	20.49	20.38	20.46	1
		25	0	19.63	19.49	19.52	2			12	0	19.66	19.71	19.46	2
		25	12	19.64	19.46	19.46	2			12	6	19.53	19.42	19.40	2
		25	25	19.53	19.29	19.24	2			12	13	19.43	19.32	19.40	2
		50	0	19.76	19.58	19.65	2			25	0	19.57	19.41	19.53	2
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		18615	18900	19185				Channel		18607	18900	19193	
		Frequency (MHz)		1851.5	1880.0	1908.5				Frequency (MHz)		1850.7	1880.0	1909.3	
3M	QPSK	1	0	21.84	21.78	21.73	0	1.4M	QPSK	1	0	21.80	21.66	21.69	0
		1	7	21.75	21.61	21.50	0			1	2	21.75	21.59	21.63	0
		1	14	21.53	21.40	21.42	0			1	5	21.67	21.56	21.60	0
		8	0	20.74	20.61	20.59	1			3	0	21.62	21.52	21.55	0
		8	3	20.54	20.50	20.36	1			3	1	21.59	21.48	21.50	0
		8	7	20.48	20.36	20.32	1			3	3	21.53	21.41	21.46	0
		15	0	20.68	20.53	20.50	1			6	0	20.58	20.53	20.43	1
	16QAM	1	0	20.76	20.75	20.65	1		16QAM	1	0	20.73	20.58	20.64	1
		1	7	20.72	20.52	20.45	1			1	2	20.72	20.51	20.56	1
		1	14	20.49	20.34	20.40	1			1	5	20.61	20.54	20.56	1
		8	0	19.55	19.51	19.42	2			3	0	20.60	20.50	20.49	1
		8	3	19.53	19.48	19.28	2			3	1	20.57	20.40	20.47	1
		8	7	19.46	19.28	19.30	2			3	3	20.52	20.39	20.39	1
		15	0	19.46	19.49	19.49	2			6	0	19.53	19.50	19.40	2

EIRP Power (dBm)

WCDMA							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
X	9262	1852.4	-20.49	36.57	16.08	40.55	H
	9400	1880.0	-21.11	37.22	16.11	40.83	
	9538	1907.6	-21.05	37.18	16.13	41.02	
	9262	1852.4	-13.37	37.65	24.28	267.92	V
	9400	1880.0	-13.29	37.58	24.29	268.53	
	9538	1907.6	-13.15	37.48	24.33	271.02	

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

LTE Band 2							
Channel Bandwidth: 1.4 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
X	18607	1850.7	-12.52	36.57	24.05	254.10	H
	18900	1880.0	-12.92	37.22	24.30	269.15	
	19193	1909.3	-13.24	37.18	23.94	247.74	
	18607	1850.7	-20.62	37.65	17.03	50.47	V
	18900	1880.0	-20.34	37.58	17.24	52.97	
	19193	1909.3	-20.63	37.48	16.85	48.42	
Channel Bandwidth: 1.4 MHz / 16QAM							
X	18607	1850.7	-13.52	36.57	23.05	201.84	H
	18900	1880.0	-13.92	37.22	23.30	213.80	
	19193	1909.3	-14.24	37.18	22.94	196.79	
	18607	1850.7	-21.62	37.65	16.03	40.09	V
	18900	1880.0	-21.34	37.58	16.24	42.07	
	19193	1909.3	-21.63	37.48	15.85	38.46	

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

LTE Band 2							
Channel Bandwidth: 3 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	18615	1851.5	-12.29	36.57	24.28	267.92	H
	18900	1880.0	-12.69	37.22	24.53	283.79	
	19185	1908.5	-13.01	37.18	24.17	261.22	
	18615	1851.5	-20.39	37.65	17.26	53.21	V
	18900	1880.0	-20.11	37.58	17.47	55.85	
	19185	1908.5	-20.40	37.48	17.08	51.05	
Channel Bandwidth: 3 MHz / 16QAM							
X	18615	1851.5	-13.27	36.57	23.30	213.80	H
	18900	1880.0	-13.67	37.22	23.55	226.46	
	19185	1908.5	-13.99	37.18	23.19	208.45	
	18615	1851.5	-21.37	37.65	16.28	42.46	V
	18900	1880.0	-21.09	37.58	16.49	44.57	
	19185	1908.5	-21.38	37.48	16.10	40.74	

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

LTE Band 2							
Channel Bandwidth: 5 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	18625	1852.5	-12.04	36.57	24.53	283.79	H
	18900	1880.0	-12.44	37.22	24.78	300.61	
	19175	1907.5	-12.76	37.18	24.42	276.69	
	18625	1852.5	-20.14	37.65	17.51	56.36	V
	18900	1880.0	-19.86	37.58	17.72	59.16	
	19175	1907.5	-20.15	37.48	17.33	54.08	
Channel Bandwidth: 5 MHz / 16QAM							
X	18625	1852.5	-13.03	36.57	23.54	225.94	H
	18900	1880.0	-13.43	37.22	23.79	239.33	
	19175	1907.5	-13.75	37.18	23.43	220.29	
	18625	1852.5	-21.13	37.65	16.52	44.87	V
	18900	1880.0	-20.85	37.58	16.73	47.10	
	19175	1907.5	-21.14	37.48	16.34	43.05	

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

LTE Band 2							
Channel Bandwidth: 10 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	18650	1855.0	-11.81	36.57	24.76	299.23	H
	18900	1880.0	-12.21	37.22	25.01	316.96	
	19150	1905.0	-12.53	37.18	24.65	291.74	
	18650	1855.0	-19.91	37.65	17.74	59.43	V
	18900	1880.0	-19.63	37.58	17.95	62.37	
	19150	1905.0	-19.92	37.48	17.56	57.02	
Channel Bandwidth: 10 MHz / 16QAM							
X	18650	1855.0	-12.78	36.57	23.79	239.33	H
	18900	1880.0	-13.18	37.22	24.04	253.51	
	19150	1905.0	-13.50	37.18	23.68	233.35	
	18650	1855.0	-20.88	37.65	16.77	47.53	V
	18900	1880.0	-20.60	37.58	16.98	49.89	
	19150	1905.0	-20.89	37.48	16.59	45.60	

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

LTE Band 2							
Channel Bandwidth: 15 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	18675	1857.5	-11.57	36.57	25.00	316.23	H
	18900	1880.0	-11.97	37.22	25.25	334.97	
	19125	1902.5	-12.29	37.18	24.89	308.32	
	18675	1857.5	-19.67	37.65	17.98	62.81	V
	18900	1880.0	-19.39	37.58	18.19	65.92	
	19125	1902.5	-19.68	37.48	17.80	60.26	
Channel Bandwidth: 15 MHz / 16QAM							
X	18675	1857.5	-12.54	36.57	24.03	252.93	H
	18900	1880.0	-12.94	37.22	24.28	267.92	
	19125	1902.5	-13.26	37.18	23.92	246.60	
	18675	1857.5	-20.64	37.65	17.01	50.23	V
	18900	1880.0	-20.36	37.58	17.22	52.72	
	19125	1902.5	-20.65	37.48	16.83	48.19	

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

LTE Band 2							
Channel Bandwidth: 20 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
X	18700	1860.0	-11.34	36.57	25.23	333.43	H
	18900	1880.0	-11.74	37.22	25.48	353.18	
	19100	1900.0	-12.06	37.18	25.12	325.09	
	18700	1860.0	-19.44	37.65	18.21	66.22	V
	18900	1880.0	-19.16	37.58	18.42	69.50	
	19100	1900.0	-19.45	37.48	18.03	63.53	
Channel Bandwidth: 20 MHz / 16QAM							
X	18700	1860.0	-12.31	36.57	24.26	266.69	H
	18900	1880.0	-12.71	37.22	24.51	282.49	
	19100	1900.0	-13.03	37.18	24.15	260.02	
	18700	1860.0	-20.41	37.65	17.24	52.97	V
	18900	1880.0	-20.13	37.58	17.45	55.59	
	19100	1900.0	-20.42	37.48	17.06	50.82	

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

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

N/A

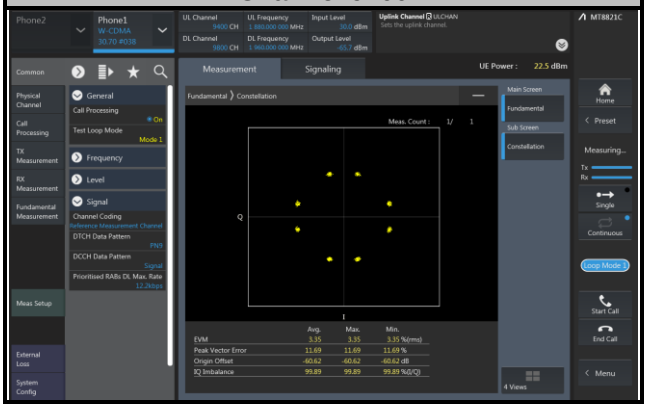
4.2.2 Test Setup

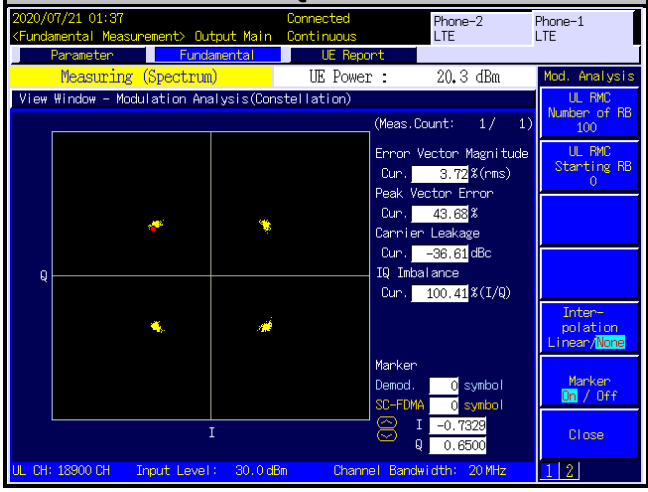
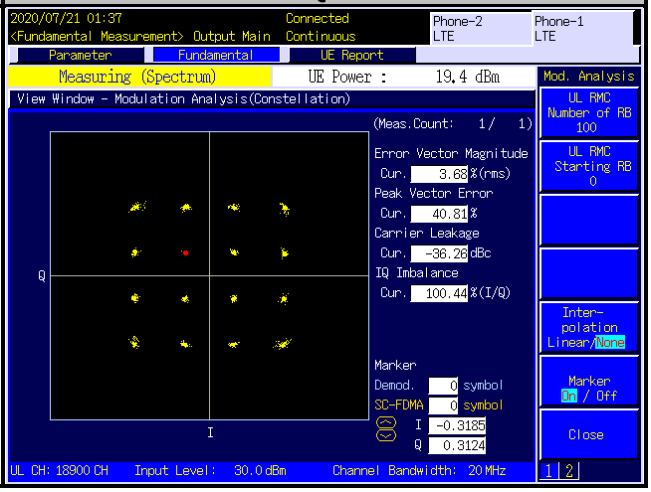
4.2.3 Test Procedure

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

4.2.4 Test Results

Spectrum Plot of Measurement
WCDMA
Channel 9400



Spectrum Plot of Measurement	
LTE Band 2	
Channel 18900	
QPSK	16QAM
	

4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

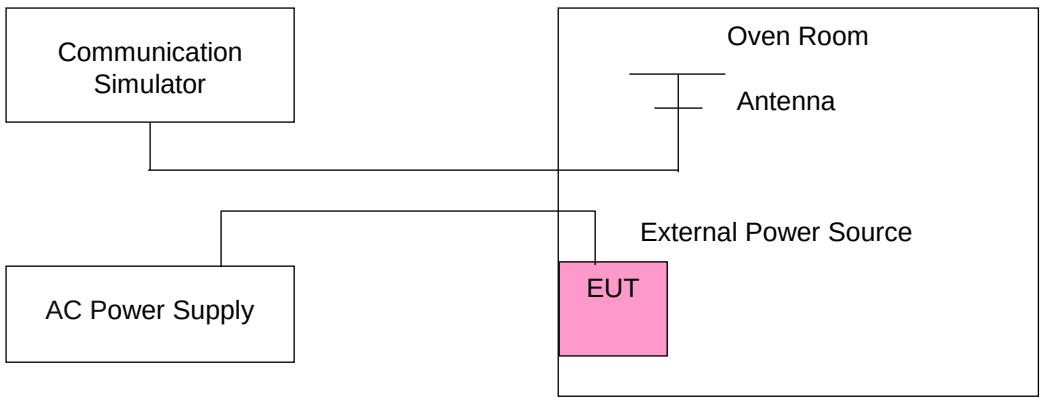
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

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 AC 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			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
120	1852.400001	0.001	1907.600004	0.002
102	1852.400001	0.001	1907.600001	0.001
138	1852.400003	0.001	1907.600003	0.001

Note: The applicant defined the normal working voltage of the battery is from 102 Vac to 138 Vac.

Frequency Error vs. Temperature

Temp. (℃)	WCDMA			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1852.400003	0.002	1907.600003	0.001
-20	1852.400003	0.002	1907.600003	0.001
-10	1852.400003	0.001	1907.600001	0.001
0	1852.400003	0.002	1907.600003	0.002
10	1852.399999	-0.001	1907.599996	-0.002
20	1852.399997	-0.001	1907.599996	-0.002
30	1852.399997	-0.002	1907.599999	-0.001
40	1852.399997	-0.002	1907.599999	-0.001
50	1852.399997	-0.001	1907.599998	-0.001

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 2			
	Channel Bandwidth: 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
120	1850.700002	0.001	1909.300000	0.002
102	1850.700003	0.002	1909.300004	0.002
138	1850.700002	0.001	1909.300002	0.001

Note: The applicant defined the normal working voltage of the battery is from 102 Vac to 138 Vac.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 2			
	Channel Bandwidth: 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1850.700003	0.001	1909.300003	0.002
-20	1850.700003	0.002	1909.300003	0.002
-10	1850.700002	0.001	1909.300003	0.002
0	1850.700003	0.001	1909.300003	0.002
10	1850.700001	0.001	1909.300004	0.002
20	1850.699999	-0.001	1909.299998	-0.001
30	1850.699996	-0.002	1909.299996	-0.002
40	1850.699996	-0.002	1909.299999	-0.001
50	1850.699997	-0.002	1909.299999	-0.001

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 2			
	Channel Bandwidth: 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
120	1851.500003	0.002	1908.500002	0.001
102	1851.500002	0.001	1908.500002	0.001
138	1851.500001	0.001	1908.500003	0.001

Note: The applicant defined the normal working voltage of the battery is from 102 Vac to 138 Vac.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 2			
	Channel Bandwidth: 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1851.500003	0.002	1908.500001	0.001
-20	1851.500002	0.001	1908.500002	0.001
-10	1851.500003	0.002	1908.500001	0.001
0	1851.500002	0.001	1908.500001	0.001
10	1851.500003	0.001	1908.500001	0.001
20	1851.499998	-0.001	1908.499996	-0.002
30	1851.499999	-0.001	1908.499998	-0.001
40	1851.499999	-0.001	1908.499997	-0.002
50	1851.499998	-0.001	1908.499999	-0.001

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 2			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
120	1852.500003	0.001	1907.500003	0.002
102	1852.500002	0.001	1907.500003	0.002
138	1852.500004	0.002	1907.500003	0.001

Note: The applicant defined the normal working voltage of the battery is from 102 Vac to 138 Vac.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 2			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1852.500003	0.002	1907.500001	0.001
-20	1852.500002	0.001	1907.500002	0.001
-10	1852.500003	0.002	1907.500002	0.001
0	1852.500003	0.002	1907.500001	0.001
10	1852.500003	0.002	1907.500001	0.001
20	1852.499998	-0.001	1907.499999	-0.001
30	1852.499998	-0.001	1907.499999	-0.001
40	1852.499999	-0.001	1907.499997	-0.001
50	1852.499997	-0.002	1907.499996	-0.002

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 2			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
120	1855.000002	0.001	1905.000003	0.002
102	1855.000002	0.001	1905.000002	0.001
138	1855.000003	0.002	1905.000002	0.001

Note: The applicant defined the normal working voltage of the battery is from 102 Vac to 138 Vac.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 2			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1855.000003	0.002	1905.000001	0.001
-20	1855.000002	0.001	1905.000001	0.001
-10	1855.000002	0.001	1905.000003	0.001
0	1855.000004	0.002	1905.000004	0.002
10	1855.000002	0.001	1905.000003	0.002
20	1854.999999	-0.001	1904.999996	-0.002
30	1854.999998	-0.001	1904.999997	-0.001
40	1854.999997	-0.002	1904.999996	-0.002
50	1854.999998	-0.001	1904.999998	-0.001

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 2			
	Channel Bandwidth: 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
120	1857.500001	0.001	1902.500004	0.002
102	1857.500002	0.001	1902.500003	0.002
138	1857.500001	0.001	1902.500002	0.001

Note: The applicant defined the normal working voltage of the battery is from 102 Vac to 138 Vac.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 2			
	Channel Bandwidth: 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1857.500003	0.002	1902.500003	0.001
-20	1857.500002	0.001	1902.500002	0.001
-10	1857.500002	0.001	1902.500002	0.001
0	1857.500003	0.002	1902.500004	0.002
10	1857.500003	0.002	1902.500003	0.001
20	1857.499998	-0.001	1902.499997	-0.001
30	1857.499999	-0.001	1902.499997	-0.001
40	1857.499997	-0.002	1902.499999	-0.001
50	1857.499998	-0.001	1902.499999	-0.001

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 2			
	Channel Bandwidth: 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
120	1860.000001	0.001	1900.000002	0.001
102	1860.000003	0.001	1900.000002	0.001
138	1860.000002	0.001	1900.000003	0.002

Note: The applicant defined the normal working voltage of the battery is from 102 Vac to 138 Vac.

Frequency Error vs. Temperature

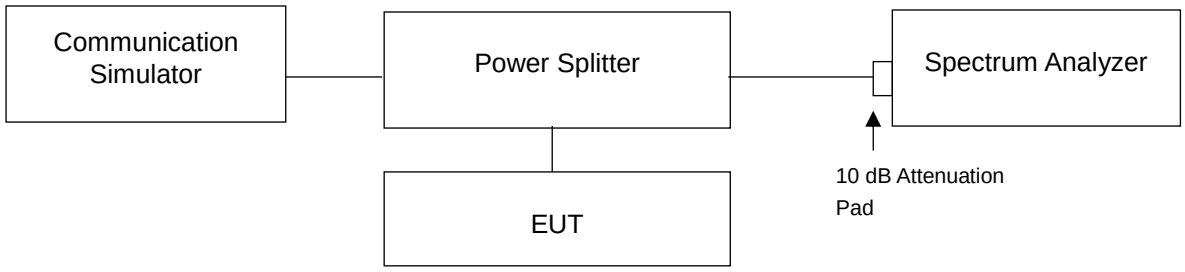
Temp. (℃)	LTE Band 2			
	Channel Bandwidth: 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1860.000001	0.001	1900.000001	0.001
-20	1860.000002	0.001	1900.000003	0.002
-10	1860.000002	0.001	1900.000003	0.001
0	1860.000001	0.001	1900.000003	0.002
10	1860.000003	0.002	1900.000003	0.002
20	1859.999999	-0.001	1899.999999	-0.001
30	1859.999997	-0.002	1899.999998	-0.001
40	1859.999996	-0.002	1899.999997	-0.002
50	1859.999998	-0.001	1899.999997	-0.001

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.

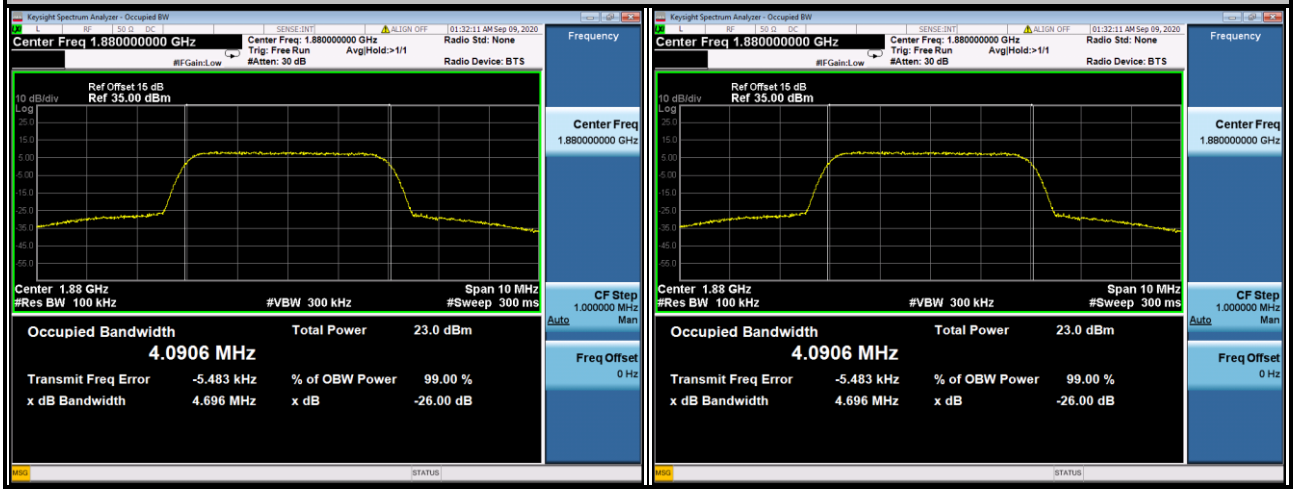
4.4.2 Test Setup



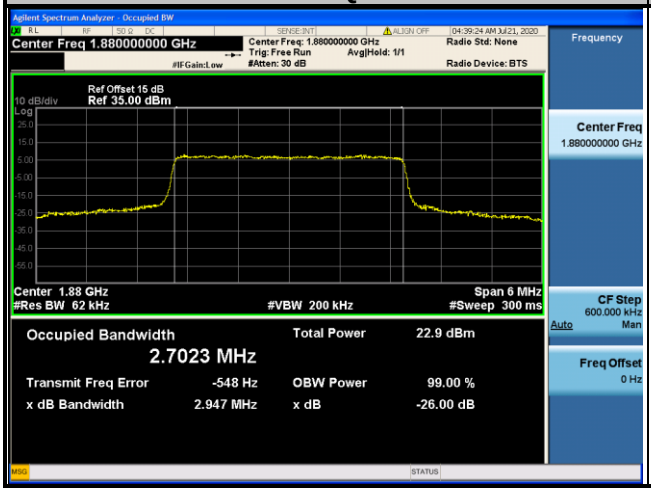
4.4.3 Test Result

WCDMA			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
9262	1852.4	4.0797	4.656
9400	1880.0	4.0906	4.696
9538	1907.6	4.0662	4.646

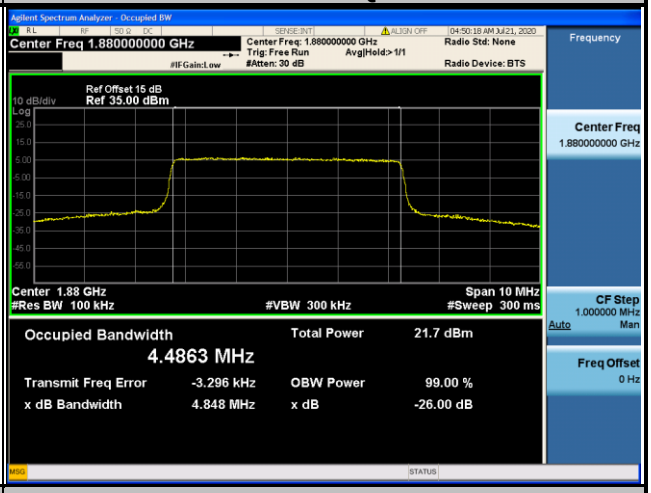
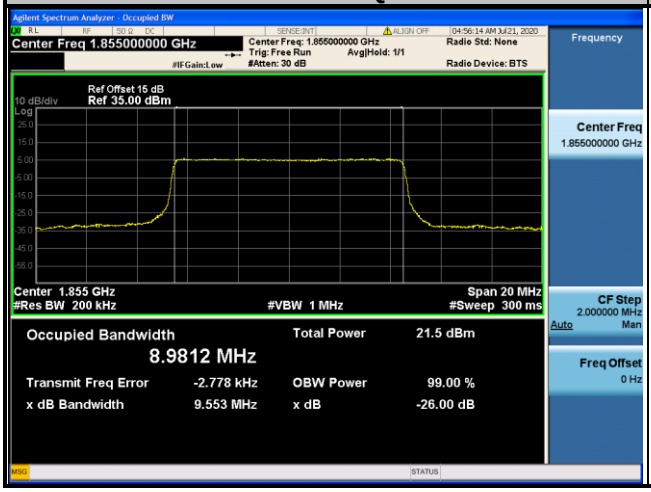
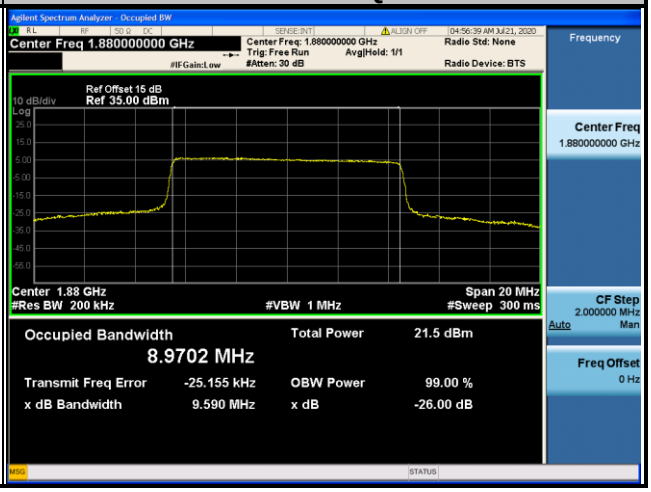
Spectrum Plot of Worst Value	
99 % Occupied Bandwidth	26 dB Bandwidth
WCDMA	



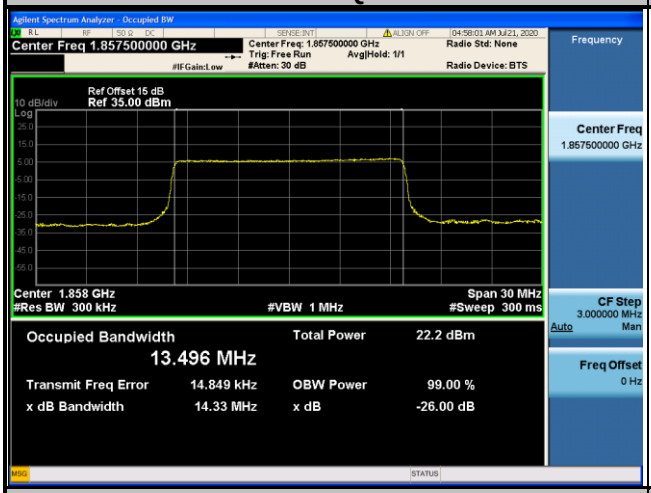
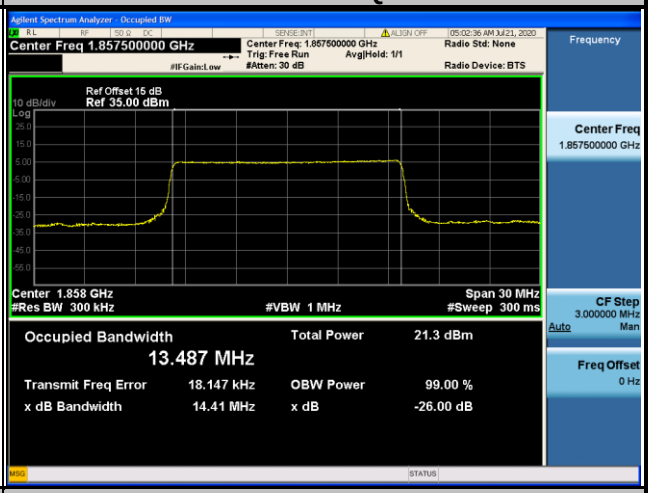
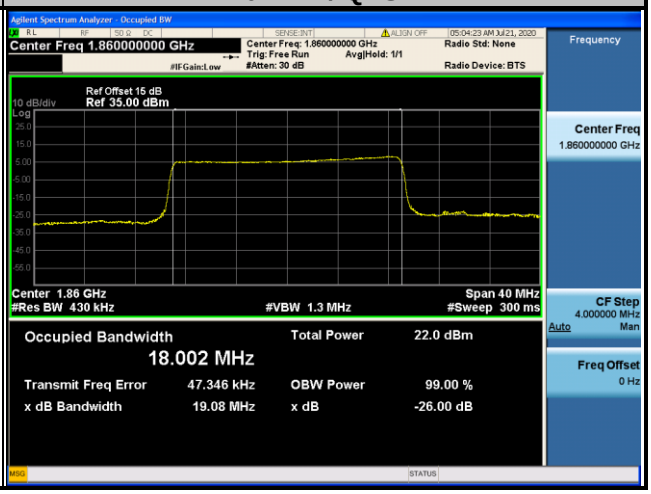
LTE Band 2					
Channel Bandwidth: 1.4 MHz					
Channel	**Frequency (MHz)**	**99 % Occupied Bandwidth (MHz)**		**26 dB Bandwidth (MHz)**	
		QPSK	**16QAM**	**QPSK**	**16QAM**
18607	1850.7	1.0892	1.0901	1.284	1.289
18900	1880.0	1.0897	1.0888	1.305	1.307
19193	1909.3	1.0894	1.0897	1.299	1.277
Channel Bandwidth: 3 MHz					
Channel	**Frequency (MHz)**	**99 % Occupied Bandwidth (MHz)**		**26 dB Bandwidth (MHz)**	
		QPSK	**16QAM**	**QPSK**	**16QAM**
18615	1851.5	2.7011	2.6965	2.944	2.925
18900	1880.0	2.7023	2.6982	2.947	2.947
19185	1908.5	2.7017	2.6942	2.915	2.930

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

LTE Band 2					
Channel Bandwidth: 5 MHz					
Channel	**Frequency (MHz)**	**99 % Occupied Bandwidth (MHz)**		**26 dB Bandwidth (MHz)**	
		QPSK	**16QAM**	**QPSK**	**16QAM**
18625	1852.5	4.4849	4.4863	4.789	4.827
18900	1880.0	4.4866	4.4863	4.830	4.848
19175	1907.5	4.4788	4.4814	4.798	4.808
Channel Bandwidth: 10 MHz					
Channel	**Frequency (MHz)**	**99 % Occupied Bandwidth (MHz)**		**26 dB Bandwidth (MHz)**	
		QPSK	**16QAM**	**QPSK**	**16QAM**
18650	1855.0	8.9777	8.9812	9.556	9.553
18900	1880.0	8.9662	8.9702	9.567	9.590
19150	1905.0	8.9346	8.9258	9.533	9.519

Spectrum Plot of Worst Value	
99 % Occupied Bandwidth	**26 dB Bandwidth**
5 MHz / QPSK	**5 MHz / 16QAM**
	
10 MHz / 16QAM	**10 MHz / 16QAM**
	

LTE Band 2					
Channel Bandwidth: 15 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
18675	1857.5	13.496	13.487	14.33	14.41
18900	1880.0	13.452	13.439	14.32	14.37
19125	1902.5	13.367	13.357	14.22	14.21
Channel Bandwidth: 20 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
18700	1860.0	18.002	18.015	19.08	19.04
18900	1880.0	17.887	17.900	19.04	19.02
19100	1900.0	17.804	17.829	18.96	18.96

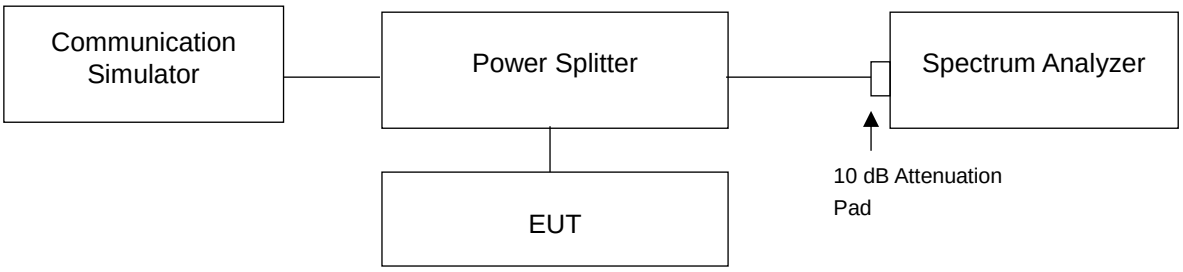
Spectrum Plot of Worst Value	
99 % Occupied Bandwidth	26 dB Bandwidth
15 MHz / QPSK	15 MHz / 16QAM
	
20 MHz / 16QAM	20 MHz / QPSK
	

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.

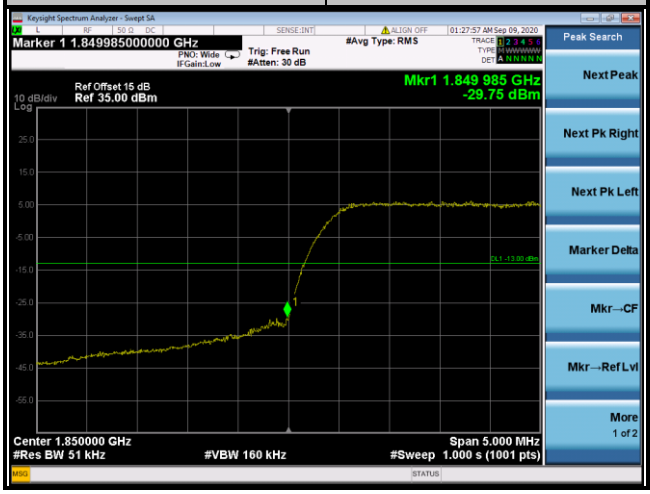
4.5.2 Test Setup

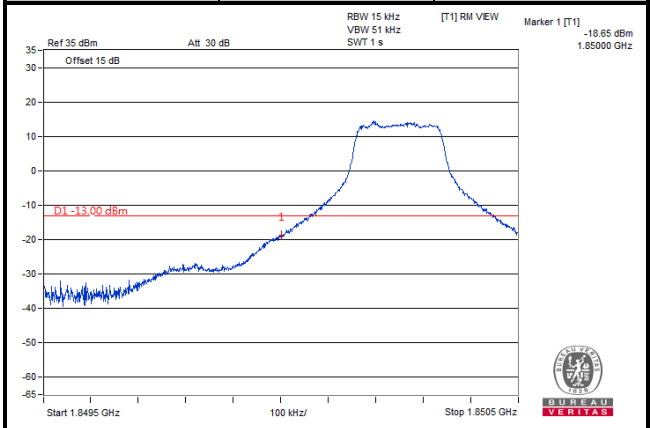
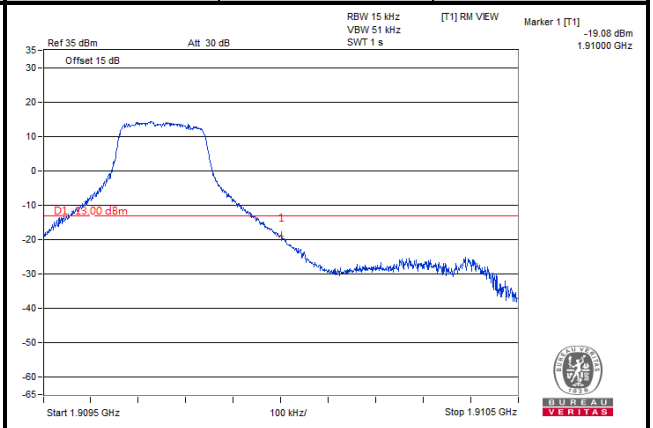
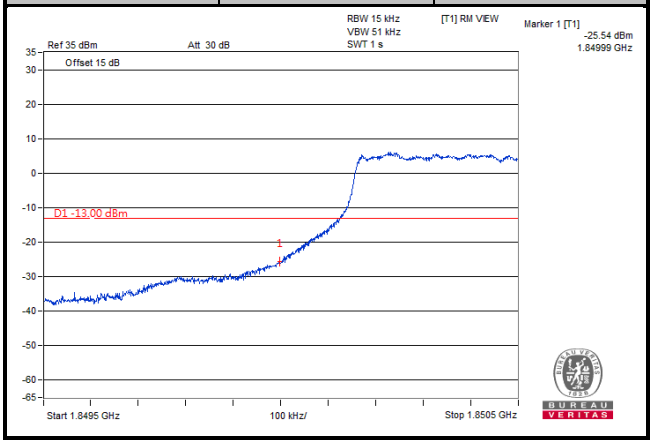
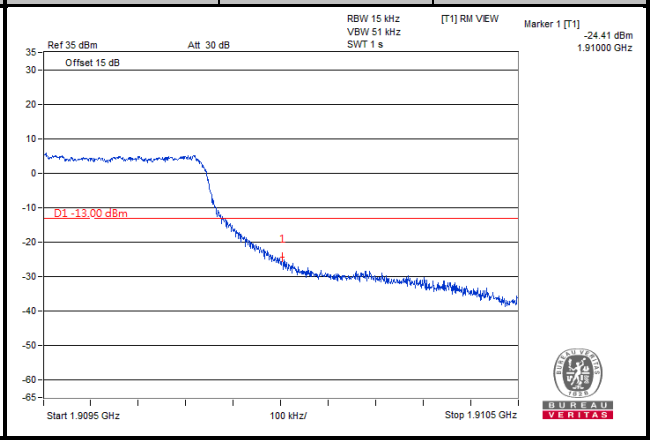


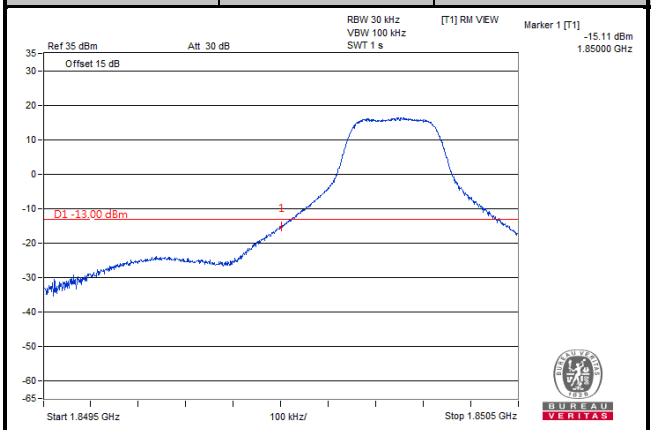
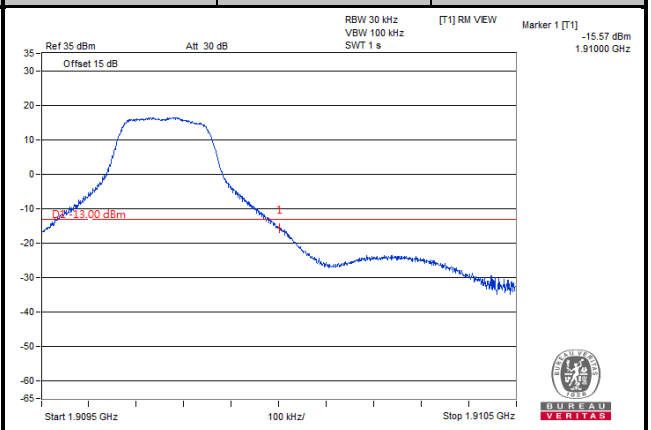
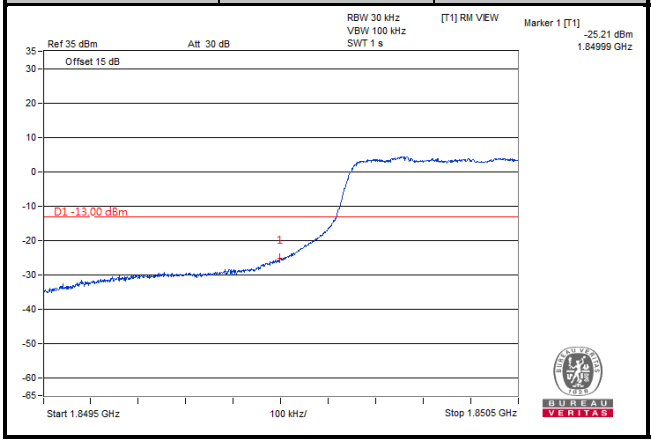
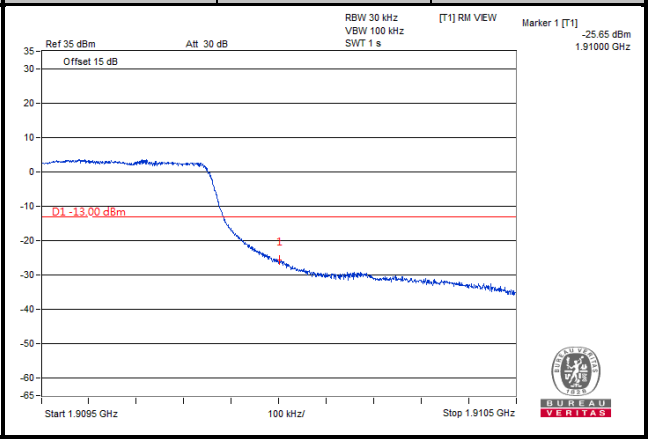
4.5.3 Test Procedures

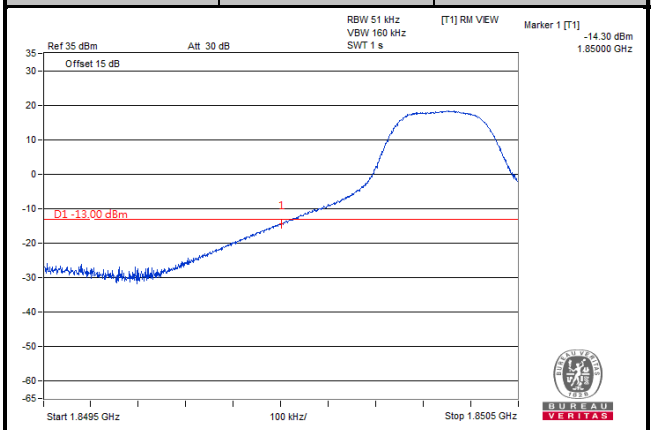
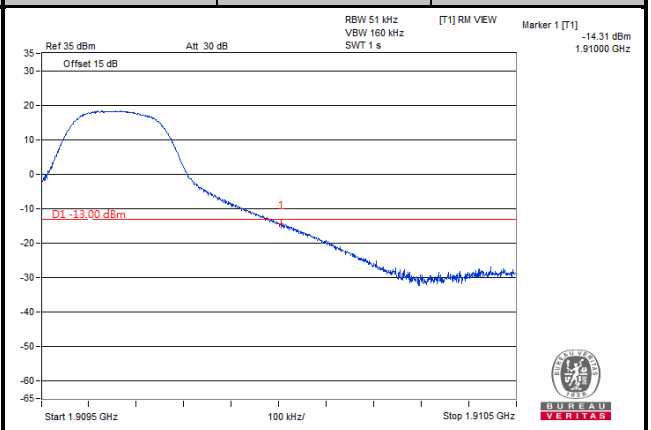
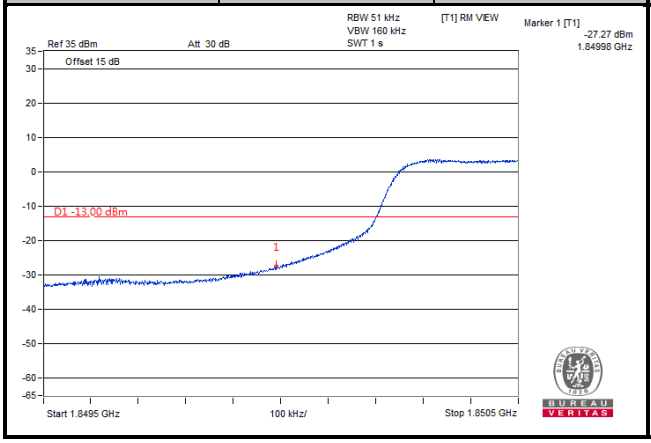
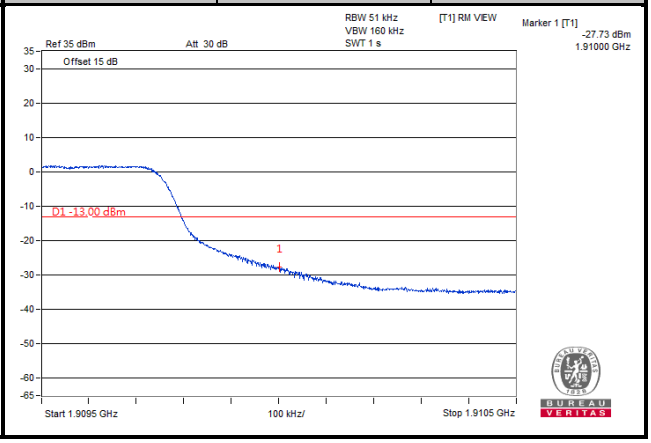
a. All measurements were done at low and high operational frequency range.
b. The center frequency of spectrum is the band edge frequency and span is 5 MHz. RB of the spectrum is 51 kHz and VB of the spectrum is 160 kHz (WCDMA).
c. The center frequency of spectrum is the band edge frequency and span 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. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 150 kHz and VB of the spectrum is 470 kHz (LTE Bandwidth 15 MHz).
h. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 200 kHz and VB of the spectrum is 1 MHz (LTE Bandwidth 20 MHz).
i. Record the max trace plot into the test report.

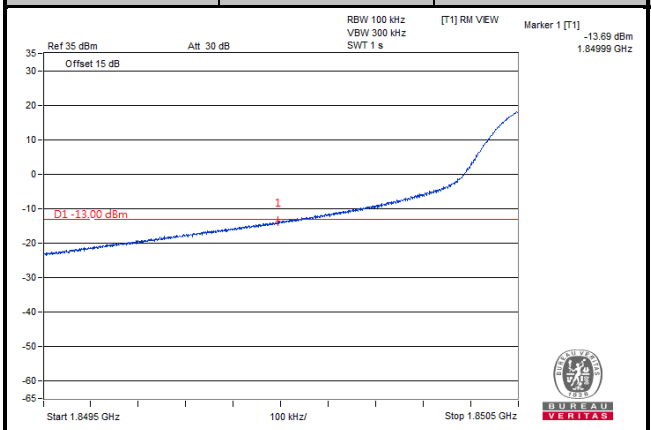
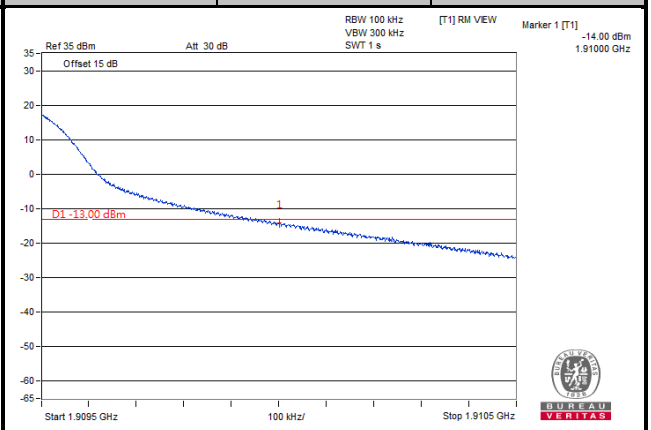
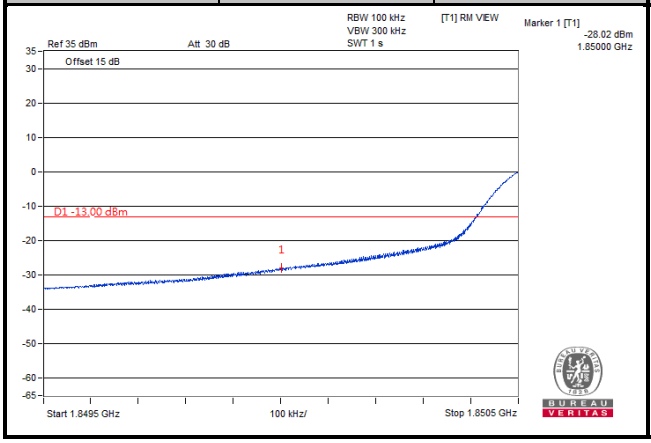
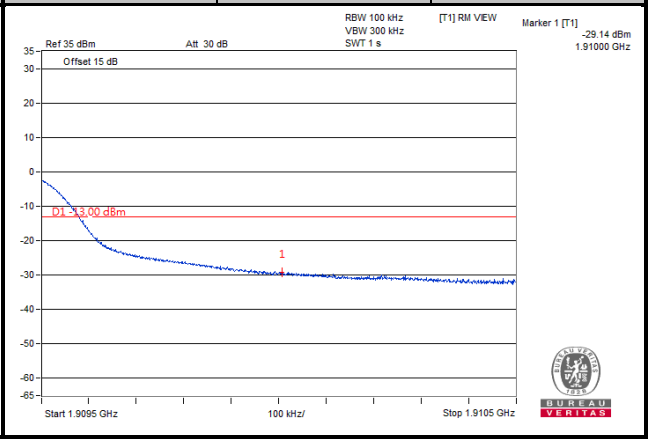
4.5.4 Test Results

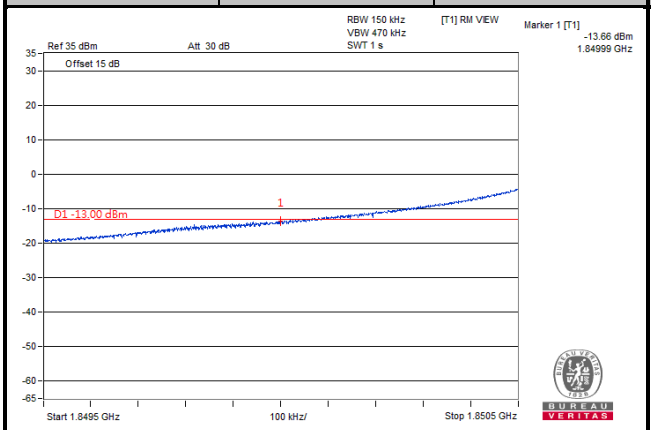
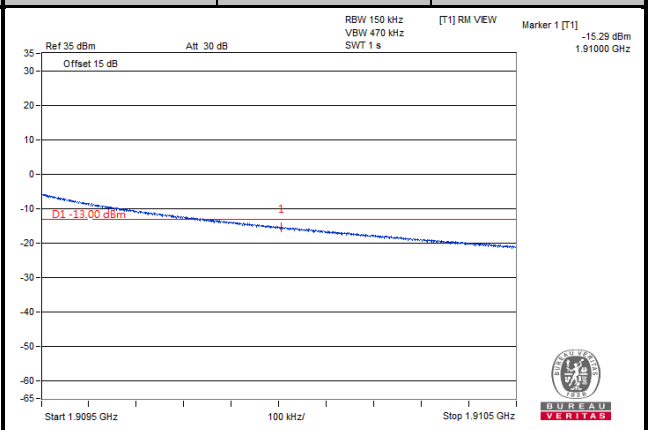
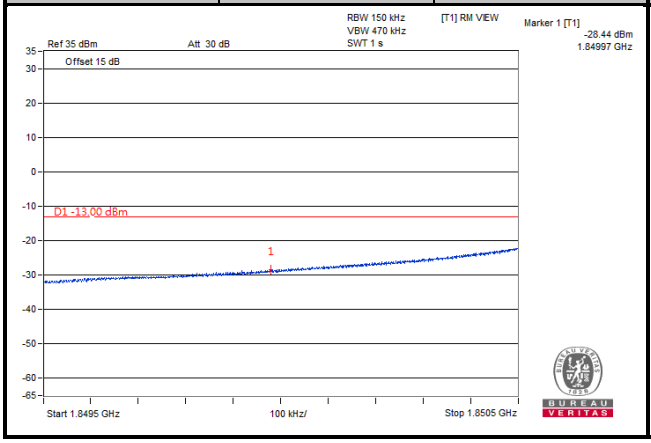
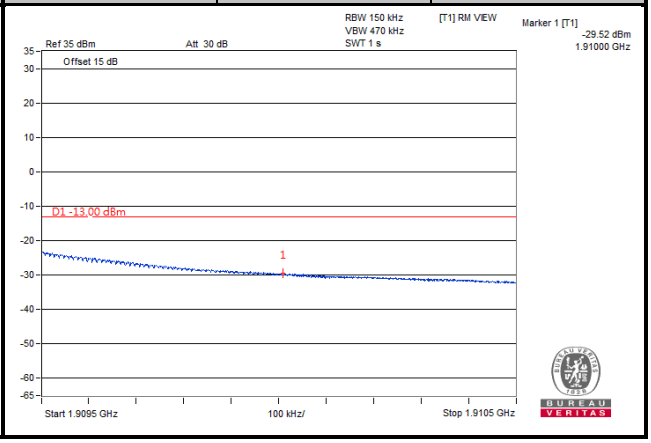
WCDMA			
Channel	9262	Channel	9538
			

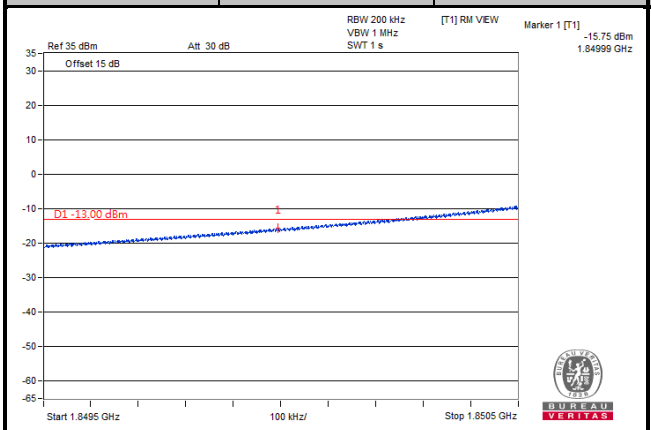
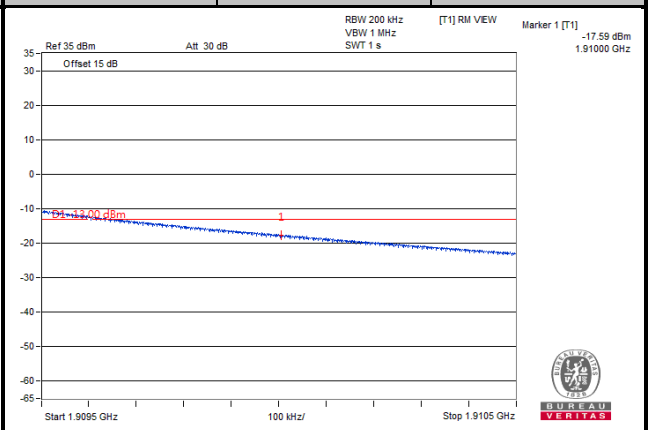
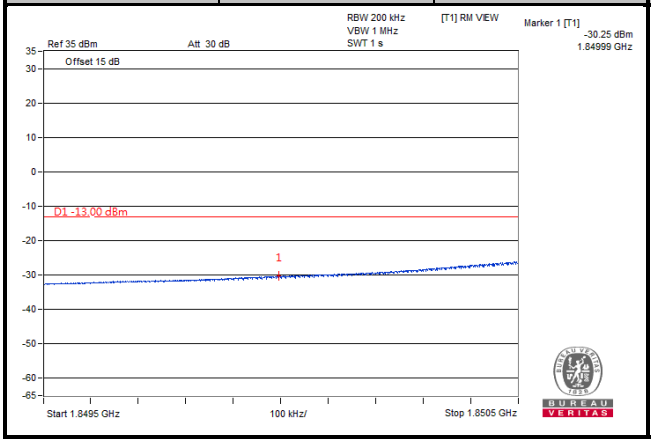
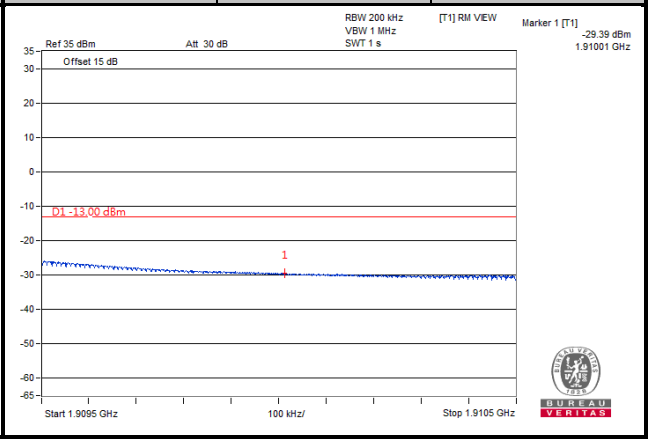
LTE Band 2					
Channel Bandwidth: 1.4 MHz					
Channel	18607	1 RB	Channel	19193	1 RB
					
Channel	18607	6 RB	Channel	19193	6 RB
					

LTE Band 2					
Channel Bandwidth: 3 MHz					
Channel	18615	1 RB	Channel	19185	1 RB
					
Channel	18615	15 RB	Channel	19185	15 RB
					

LTE Band 2					
Channel Bandwidth: 5 MHz					
Channel	18625	1 RB	Channel	19175	1 RB
					
Channel	18625	25 RB	Channel	19175	25 RB
					

LTE Band 2					
Channel Bandwidth: 10 MHz					
Channel	18650	1 RB	Channel	19150	1 RB
					
Channel	18650	50 RB	Channel	19150	50 RB
					

LTE Band 2					
Channel Bandwidth: 15 MHz					
Channel	18675	1 RB	Channel	19125	1 RB
					
Channel	18675	75 RB	Channel	19125	75 RB
					

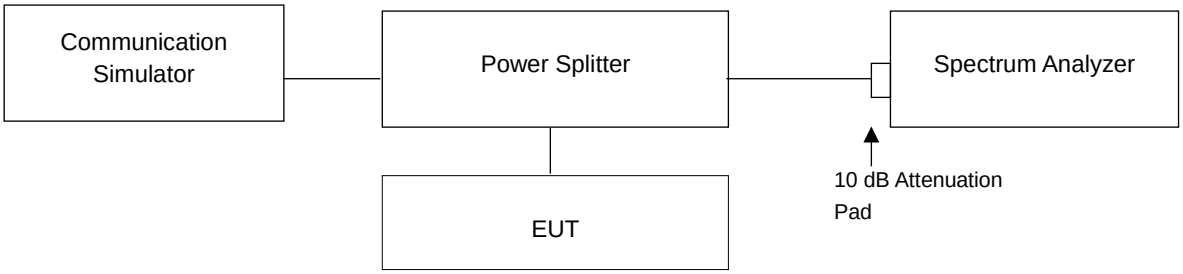
LTE Band 2					
Channel Bandwidth: 20 MHz					
Channel	18700	1 RB	Channel	19100	1 RB
					
Channel	18700	100 RB	Channel	19100	100 RB
					

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



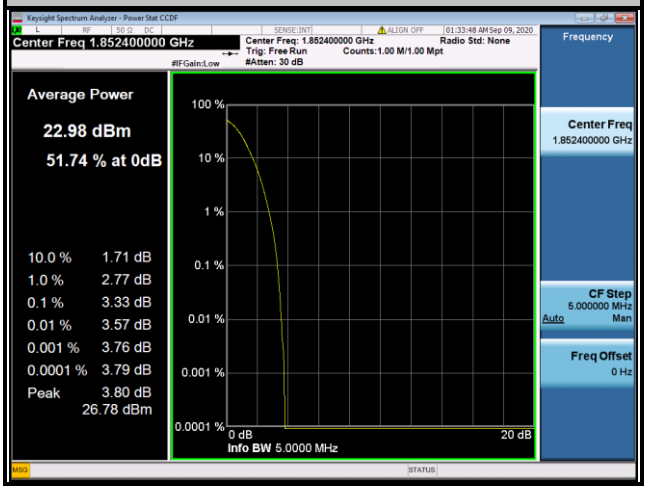
4.6.3 Test Procedures

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
9262	1852.4	3.33
9400	1880.0	3.00
9538	1907.6	3.27

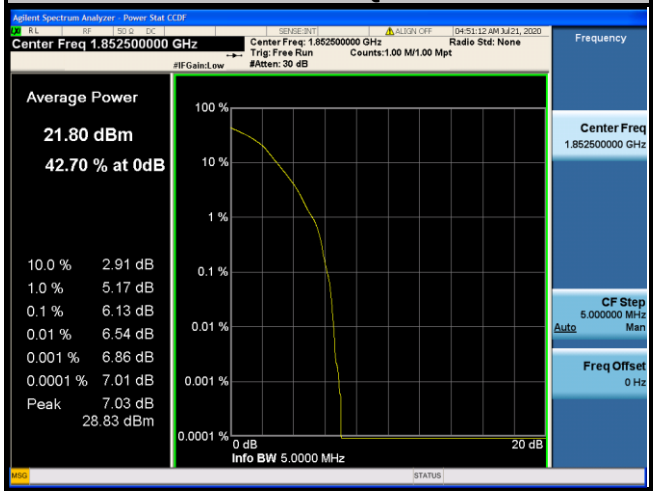
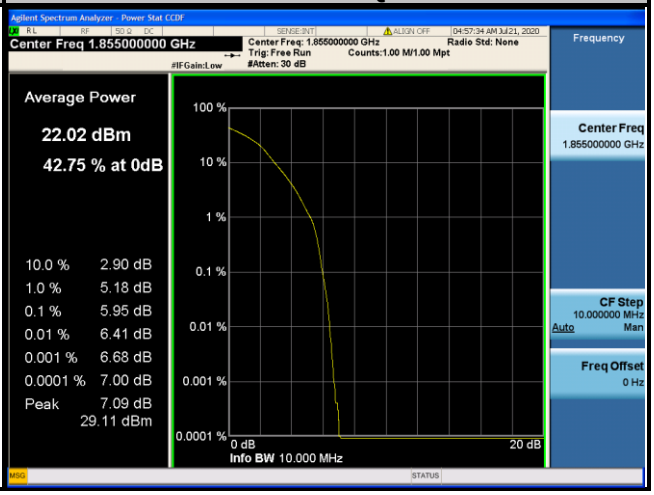
Spectrum Plot of Worst Value
WCDMA



LTE Band 2							
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
18607	1850.7	5.27	6.21	18615	1851.5	5.09	5.95
18900	1880.0	4.25	5.15	18900	1880.0	4.08	4.89
19193	1909.3	5.36	6.24	19185	1908.5	4.97	5.71

Spectrum Plot of Worst Value	
1.4 MHz / 16QAM	3 MHz / 16QAM
	

LTE Band 2							
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
18625	1852.5	5.20	6.13	18650	1855.0	5.13	5.95
18900	1880.0	4.11	4.92	18900	1880.0	4.01	4.75
19175	1907.5	4.54	5.34	19150	1905.0	4.60	5.37

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

LTE Band 2							
Channel Bandwidth: 15 MHz				Channel Bandwidth: 20 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
18675	1857.5	5.08	6.06	18700	1860.0	5.11	5.95
18900	1880.0	3.97	4.88	18900	1880.0	4.31	5.17
19125	1902.5	5.36	6.35	19100	1900.0	5.39	6.43

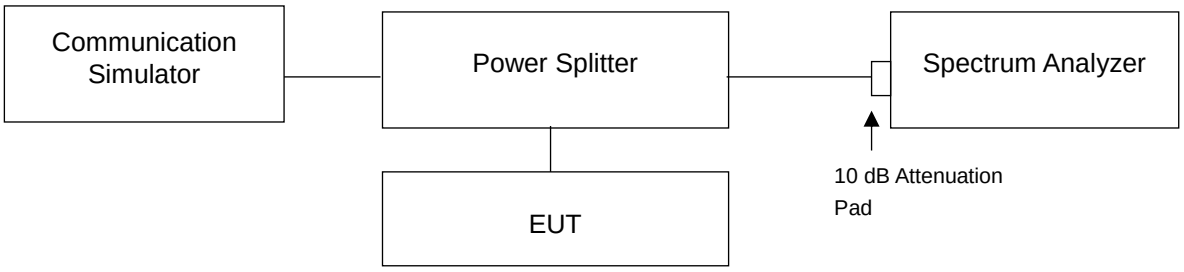
Spectrum Plot of Worst Value	
15 MHz / 16QAM	20 MHz / 16QAM
	

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.

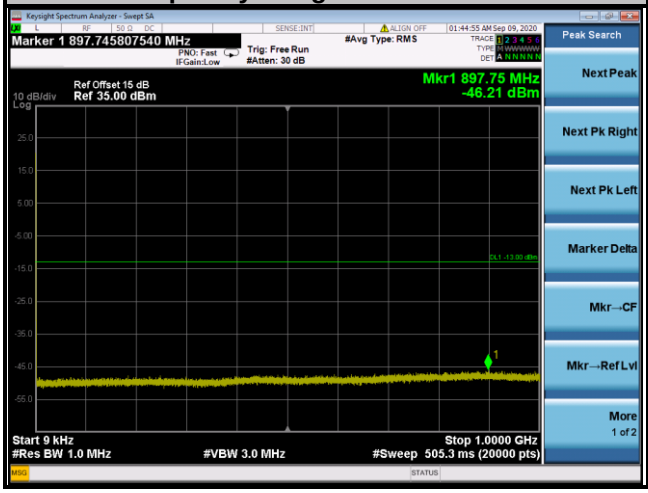
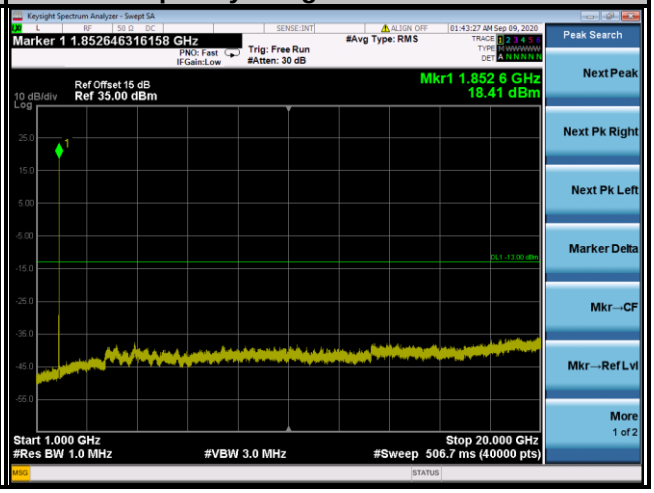
4.7.2 Test Setup



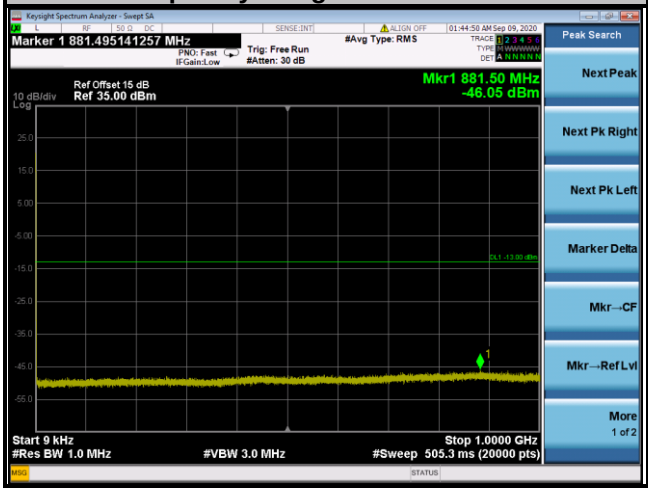
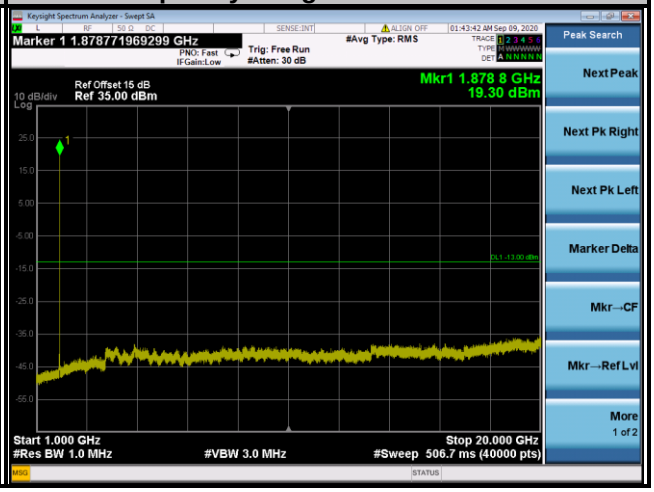
4.7.3 Test Procedure

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 = 1 MHz and VBW = 3 MHz is used for conducted emission measurement.
c. Measuring frequency range is from 1 GHz to 20 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 1 MHz and VBW = 3 MHz is used for conducted emission measurement.

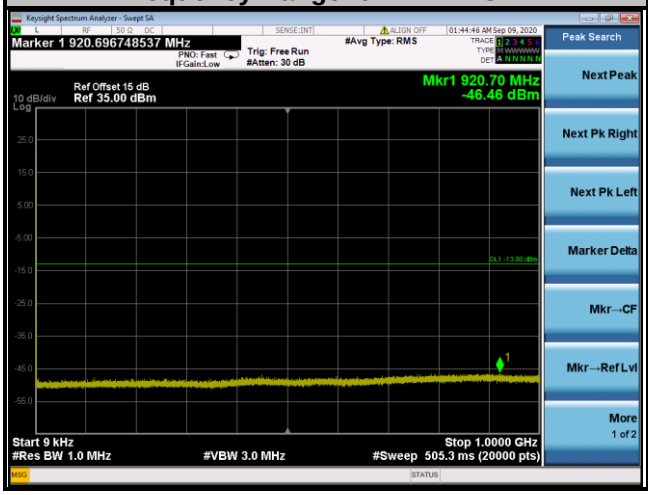
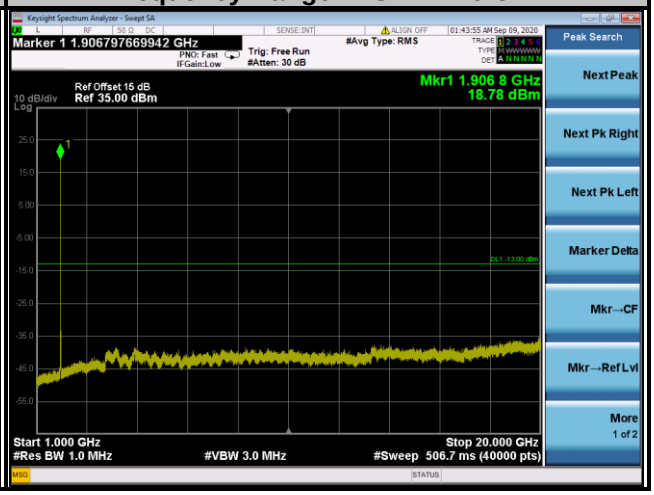
4.7.4 Test Results

WCDMA	
Channel 9262	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

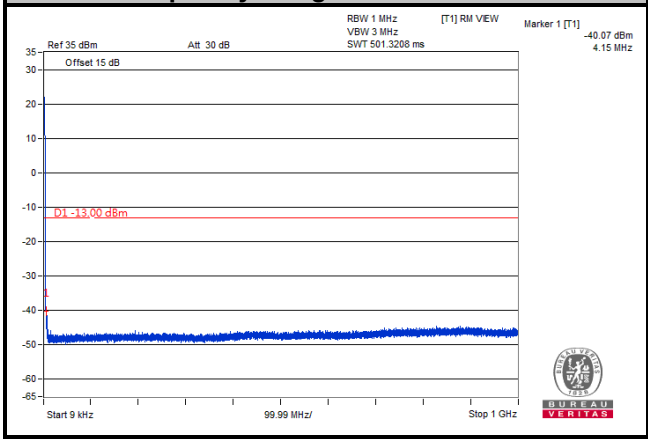
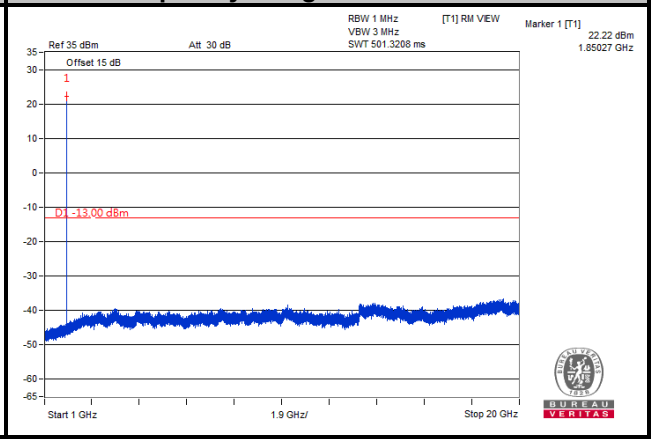
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

WCDMA	
Channel 9400	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

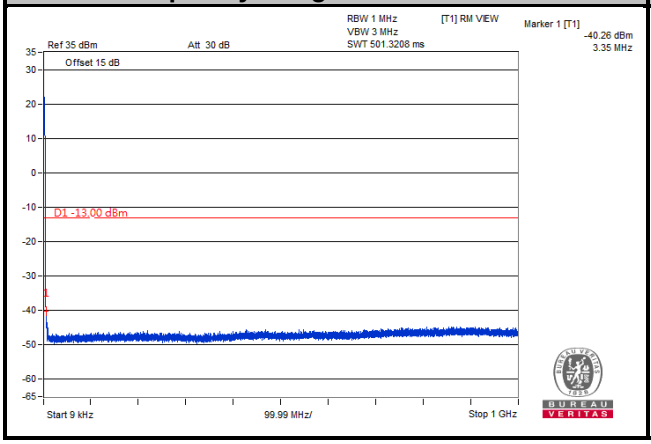
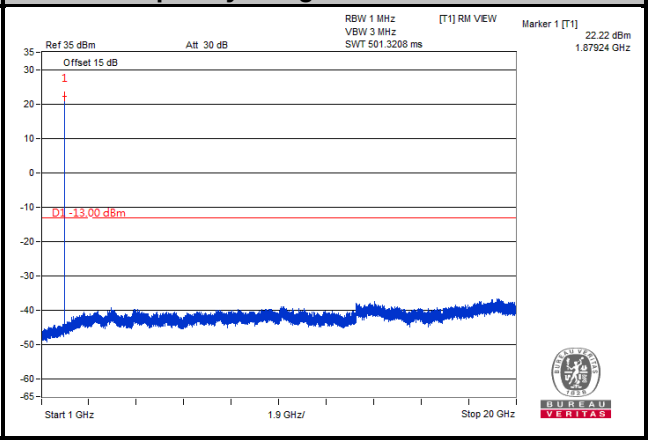
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

WCDMA	
Channel 9538	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

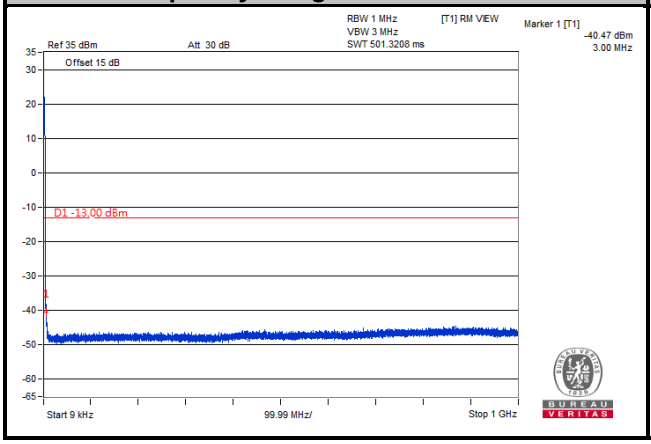
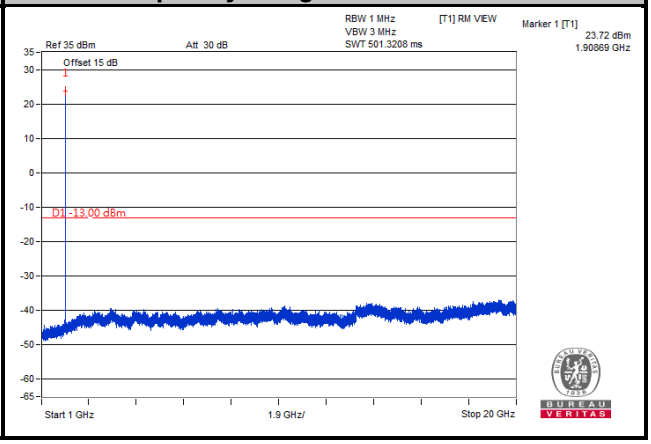
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 1.4 MHz	
Channel 18607	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

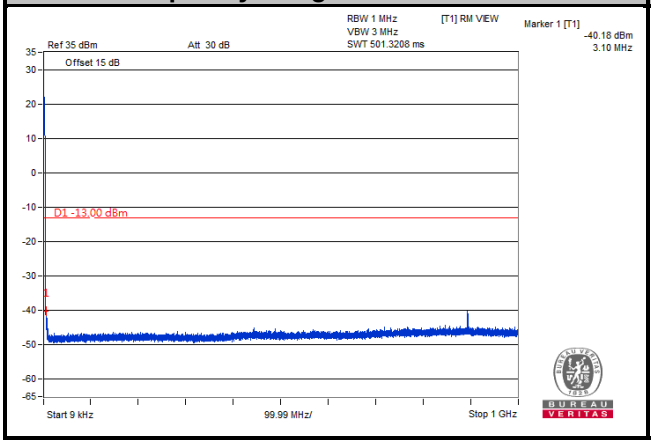
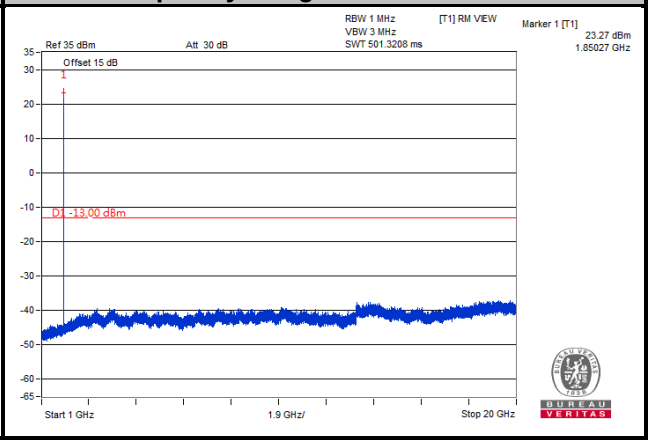
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 1.4 MHz	
Channel 18900	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

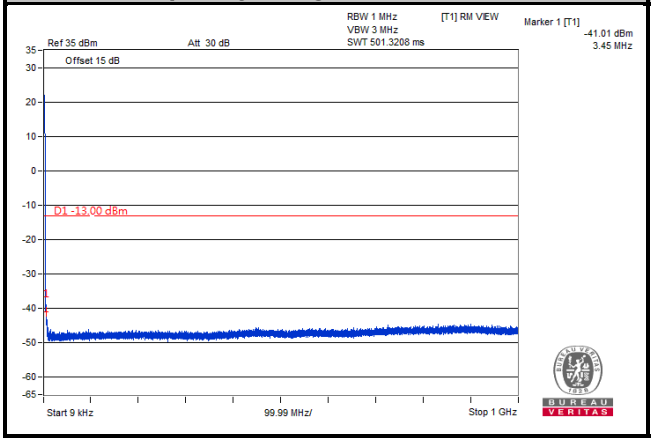
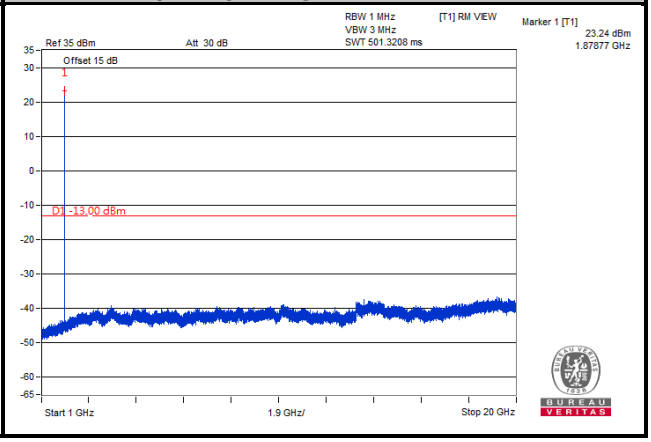
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 1.4 MHz	
Channel 19193	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

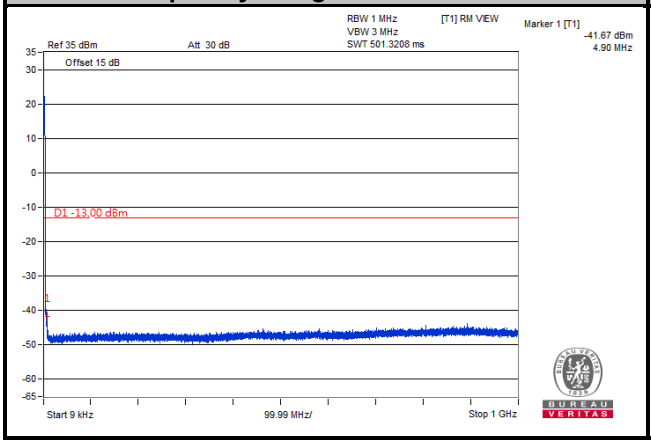
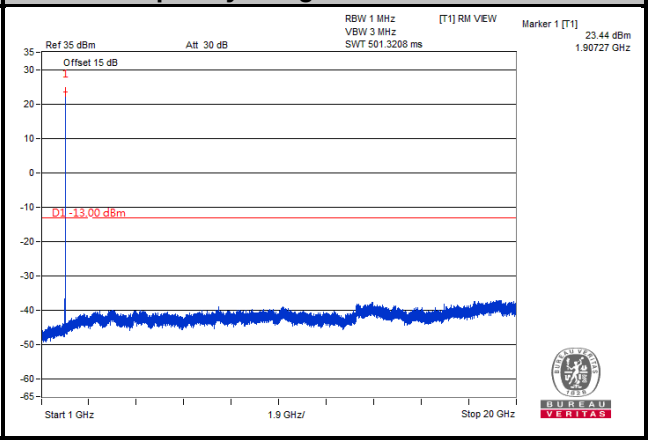
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 3 MHz	
Channel 18615	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

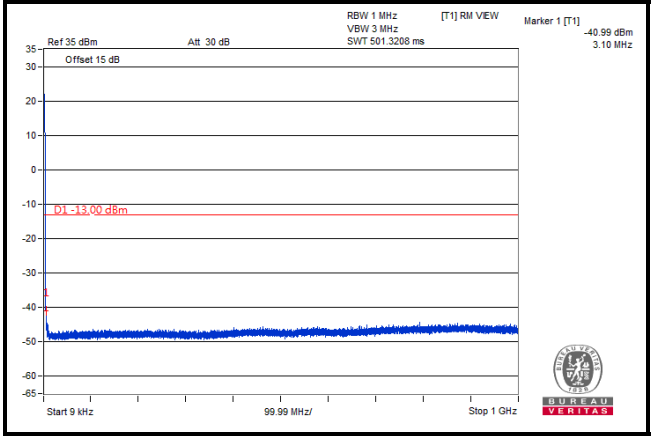
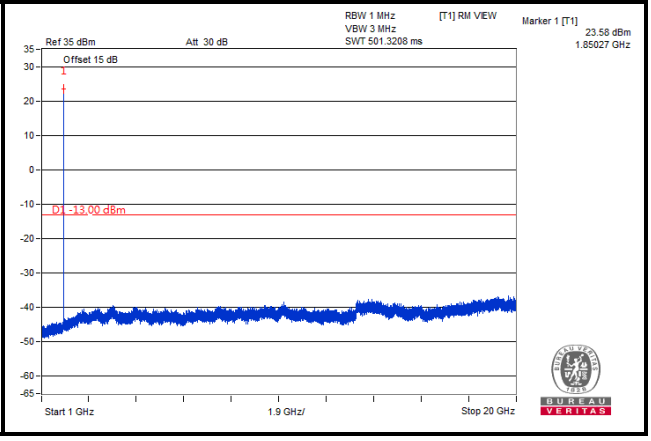
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 3 MHz	
Channel 18900	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

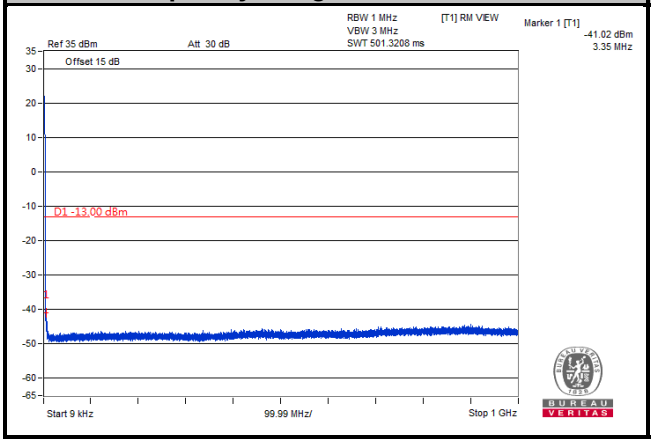
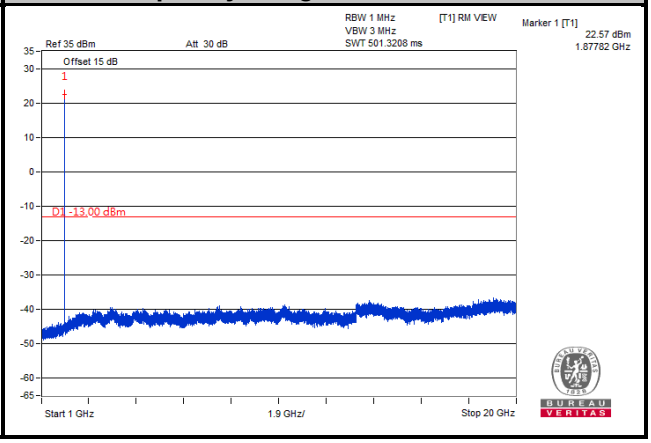
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 3 MHz	
Channel 19185	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

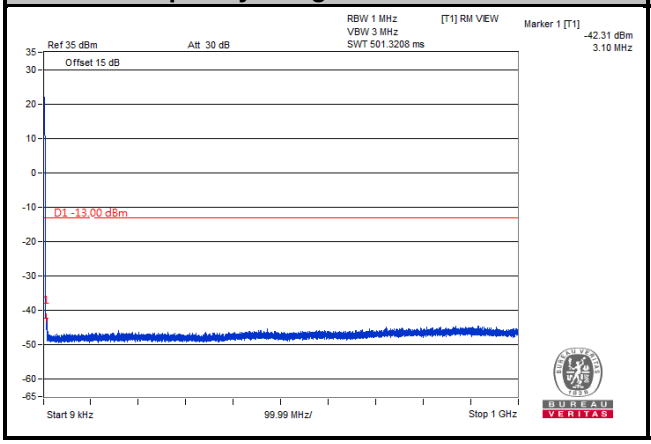
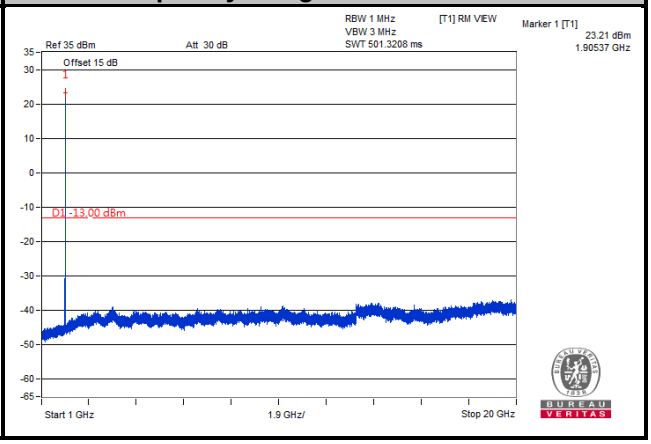
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 5 MHz	
Channel 18625	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

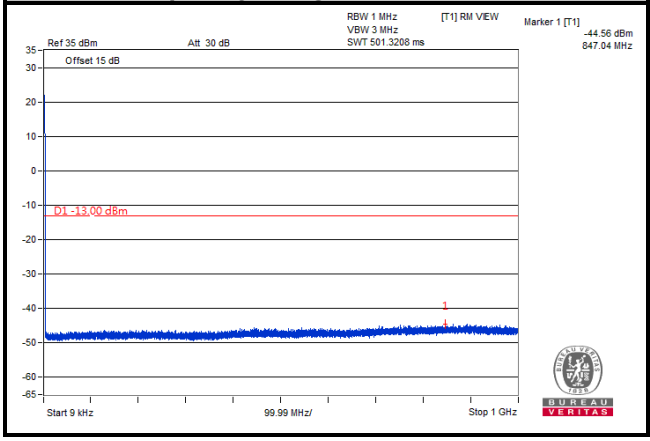
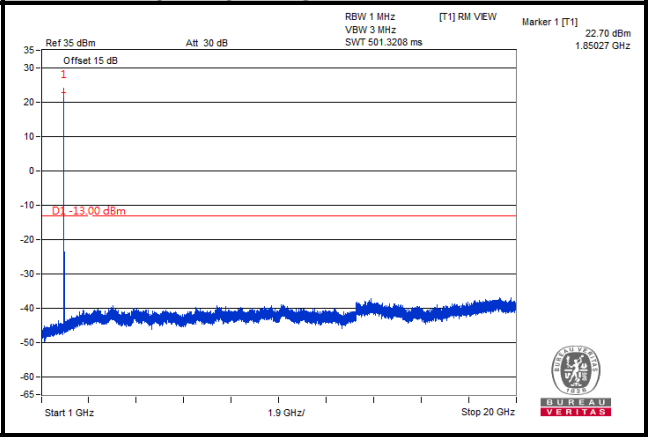
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 5 MHz	
Channel 18900	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

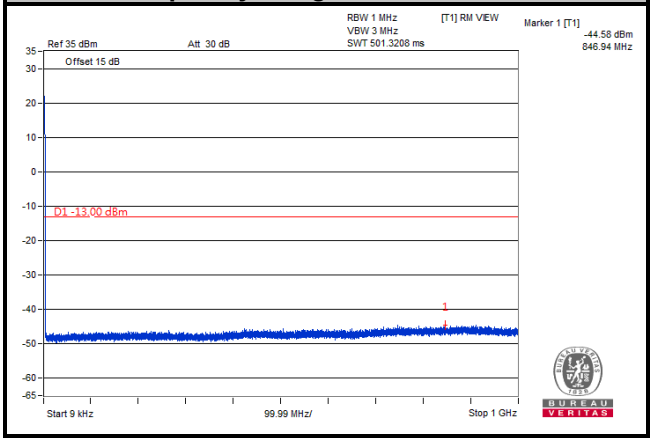
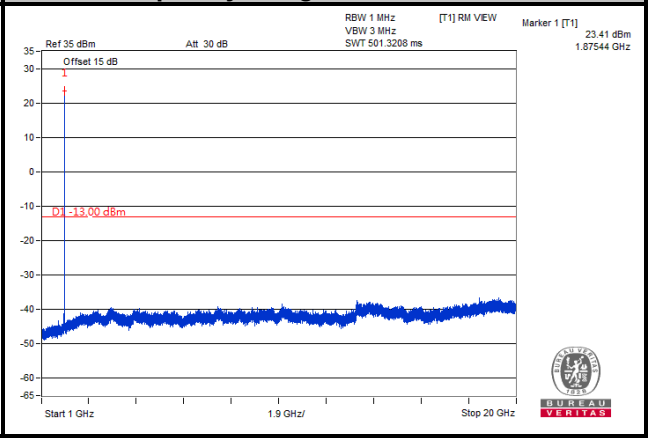
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 5 MHz	
Channel 19175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

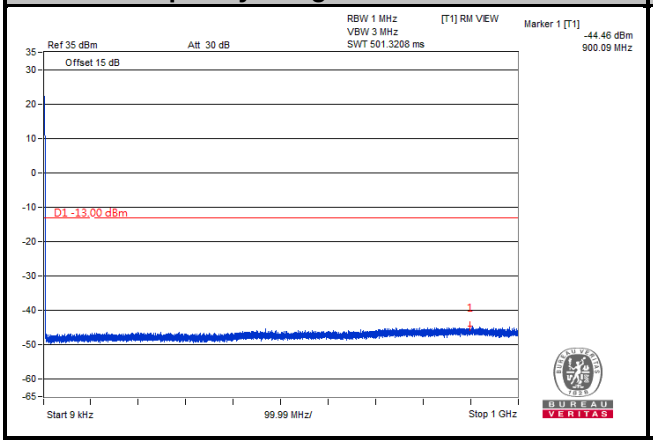
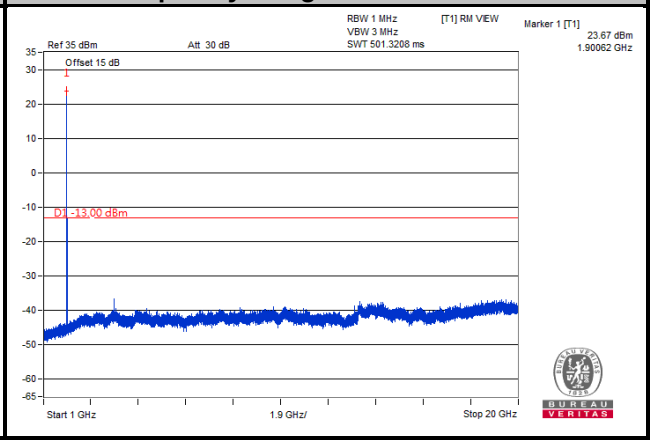
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 10 MHz	
Channel 18650	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

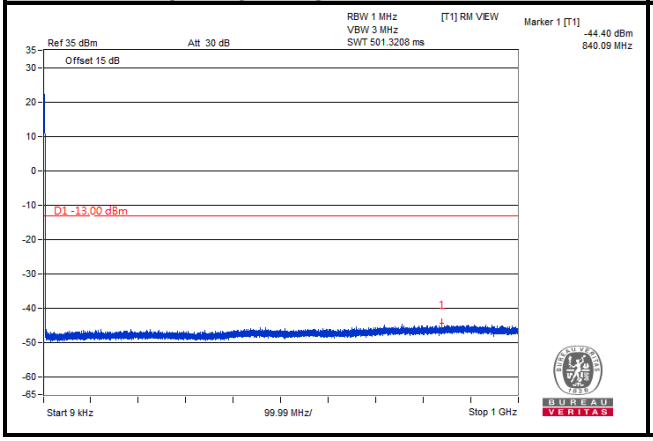
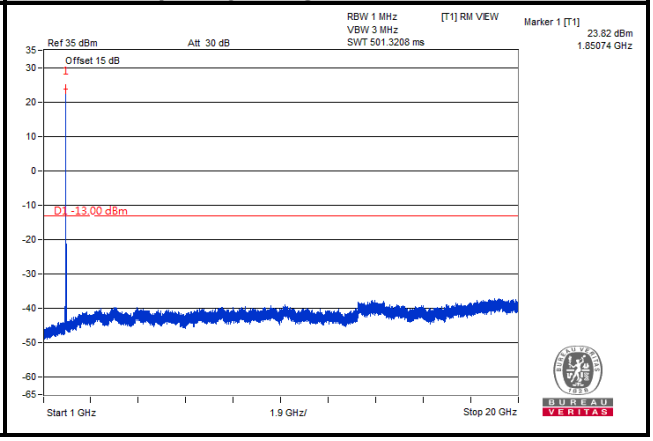
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 10 MHz	
Channel 18900	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

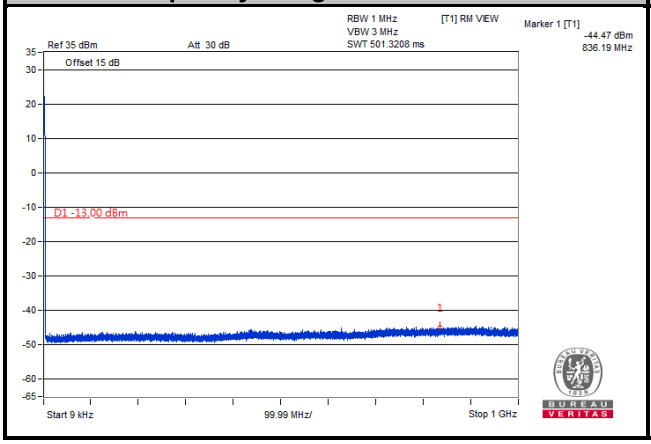
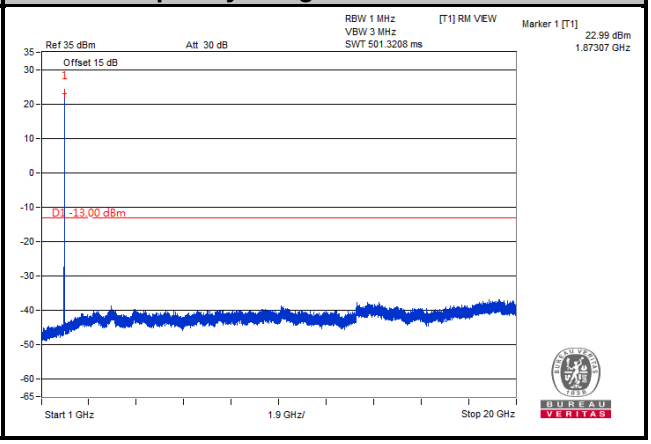
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 10 MHz	
Channel 19150	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

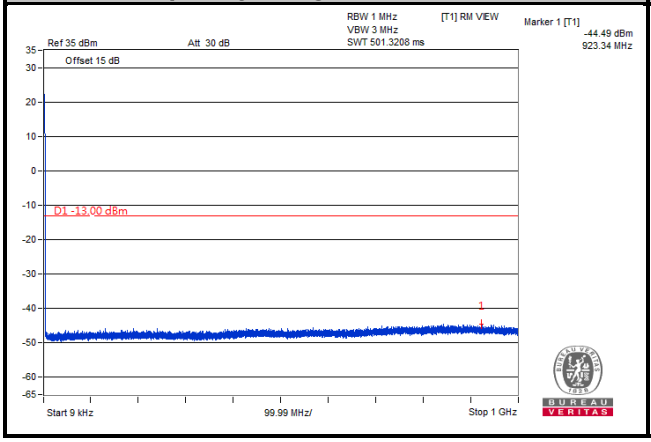
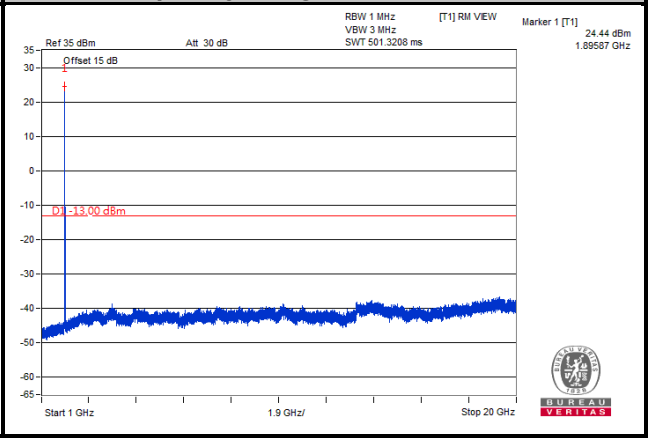
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 15 MHz	
Channel 18675	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

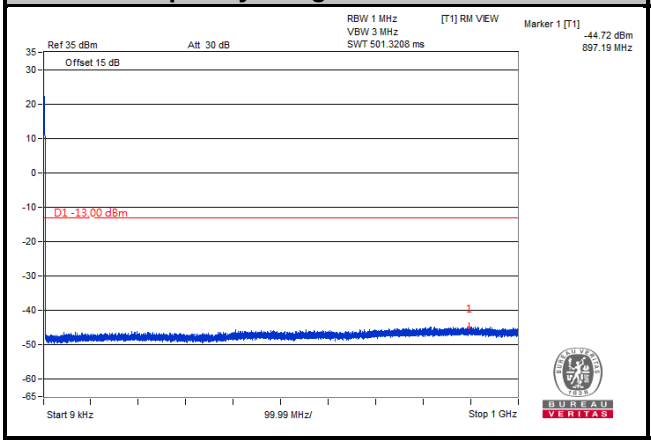
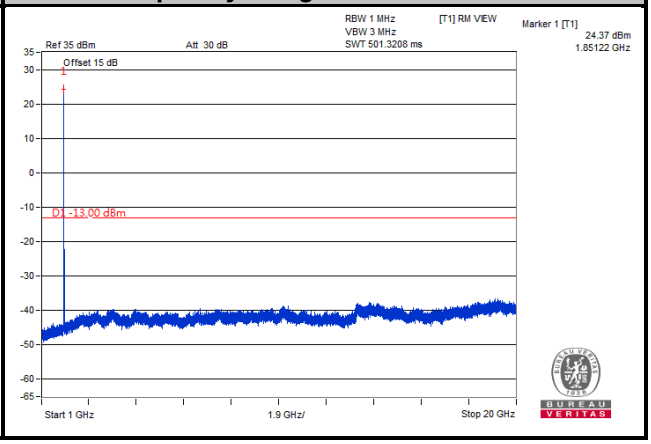
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 15 MHz	
Channel 18900	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

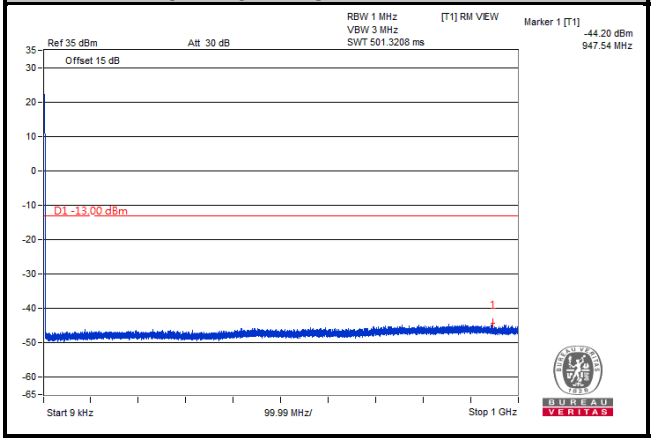
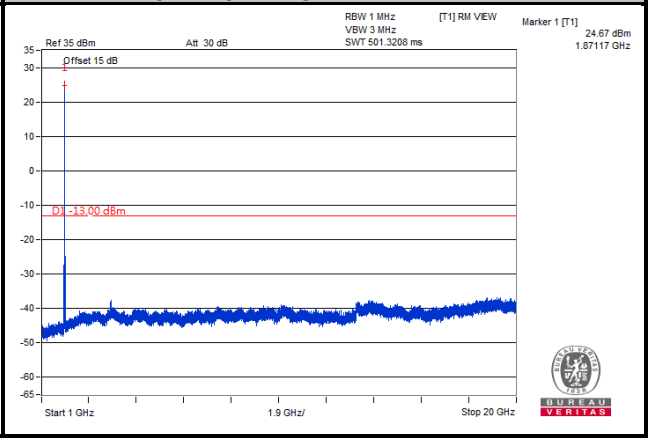
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 15 MHz	
Channel 19125	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

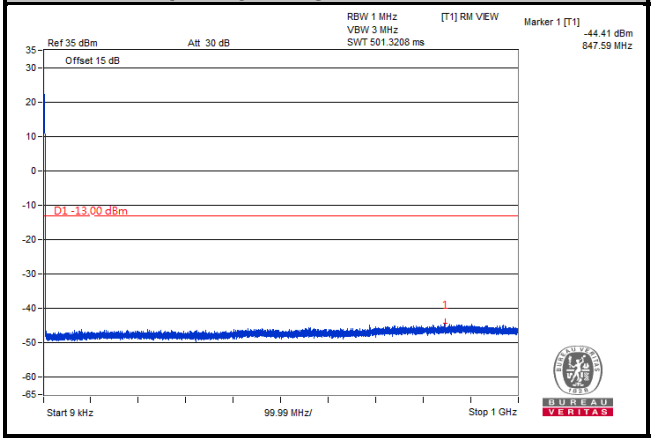
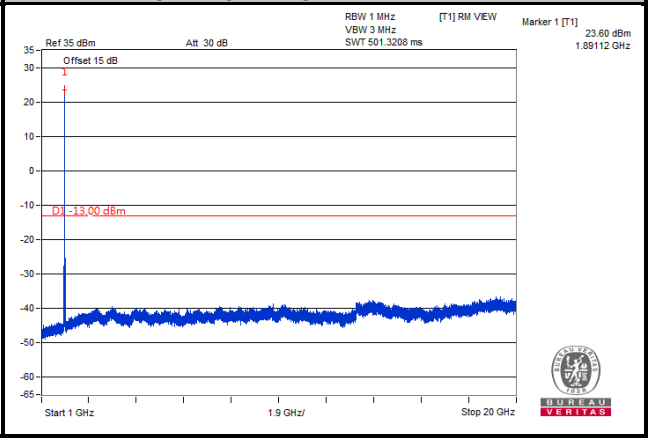
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 20 MHz	
Channel 18700	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

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

LTE Band 2	
Channel Bandwidth: 20 MHz	
Channel 18900	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

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

LTE Band 2	
Channel Bandwidth: 20 MHz	
Channel 19100	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 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. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value” of step a. Record the power level of S.G.
c. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.
d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.R.P power - 2.15 dB.

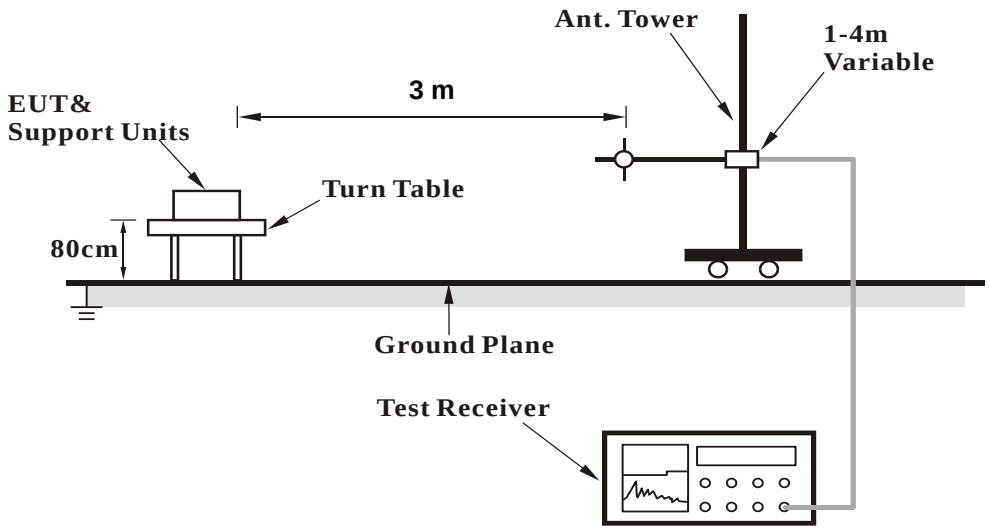
NOTE: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz.
NOTE: The emission levels were against the limit of frequency range 9 kHz ~ 30 MHz:
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

4.8.3 Deviation from Test Standard

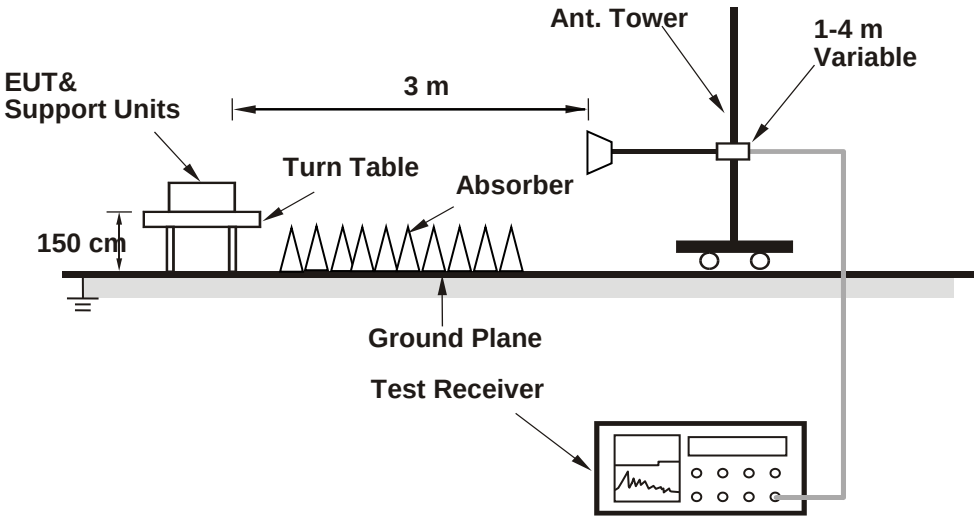
No deviation.

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

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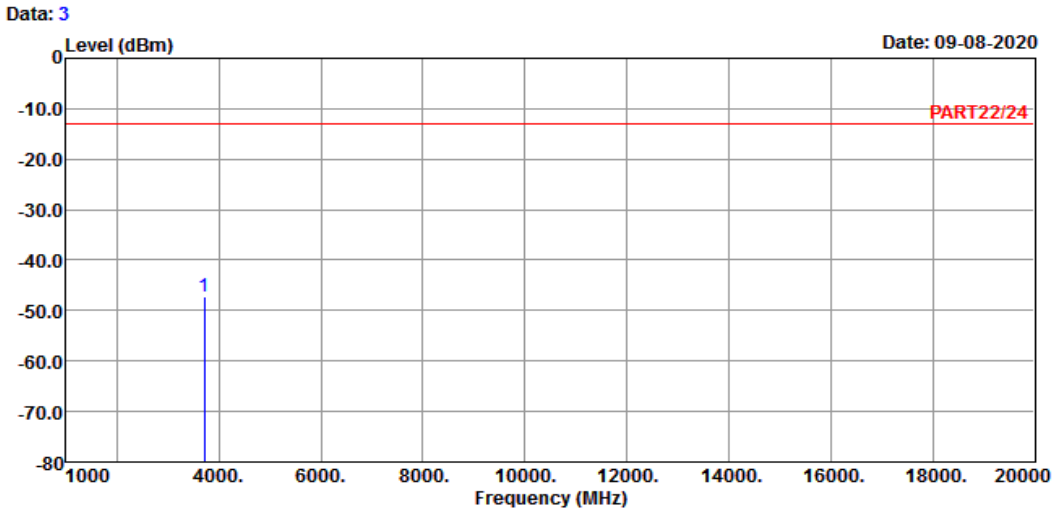
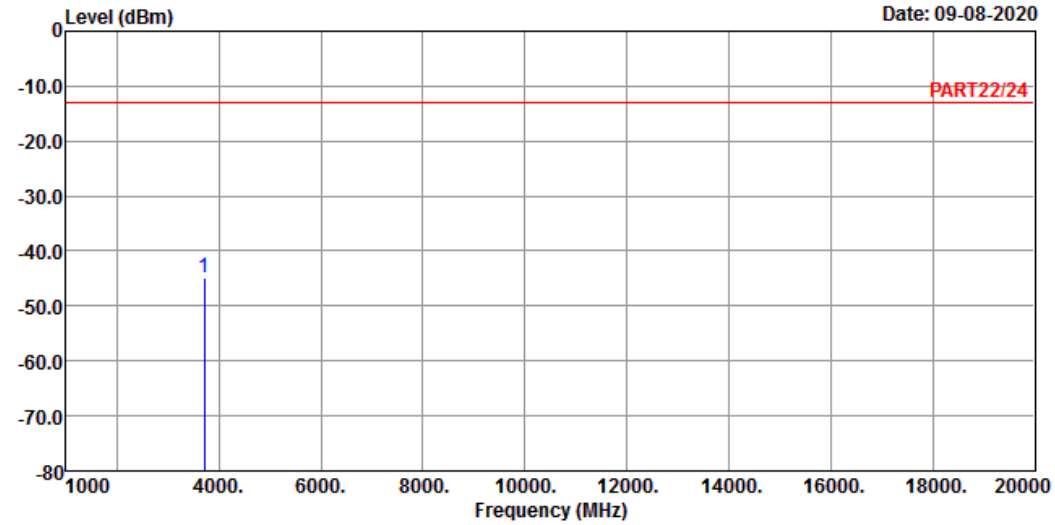


Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : WCDMA B2 Link_L-CH
Tested by: Cyril Chen

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3704.80	-47.24	-40.31	-13.00	-6.93	-34.24	Peak

Data: 4

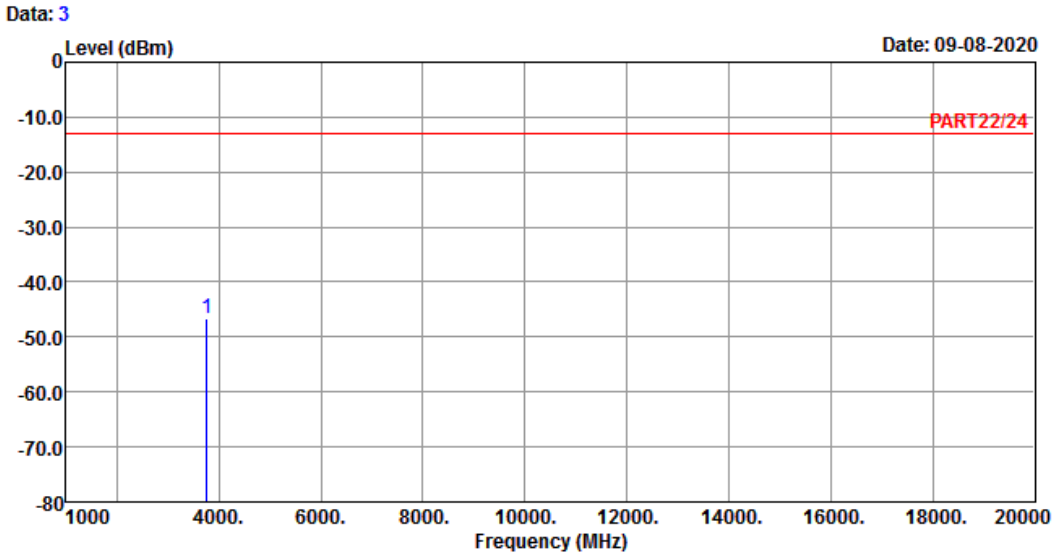


Site : 966 Chamber 5
Condition: PART22/24 VERTICAL
Remak : WCDMA B2 Link_L-CH
Tested by: Cyril Chen

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3704.80	-44.96	-38.03	-13.00	-6.93	-31.96	Peak

Middle Channel

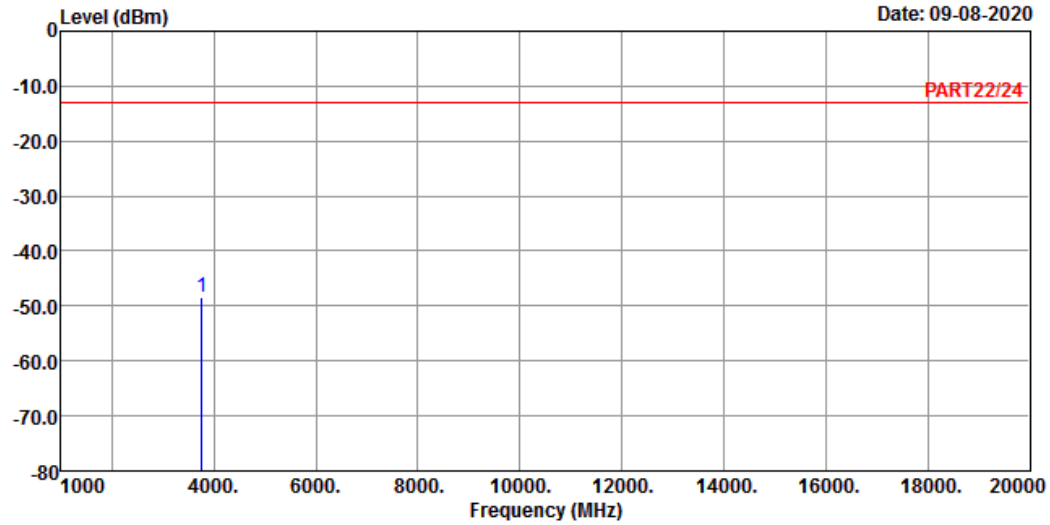
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : WCDMA B2 Link_M-CH
Tested by: Cyril Chen

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3760.00	-46.63	-39.98	-13.00	-6.65	-33.63	Peak

Data: 4

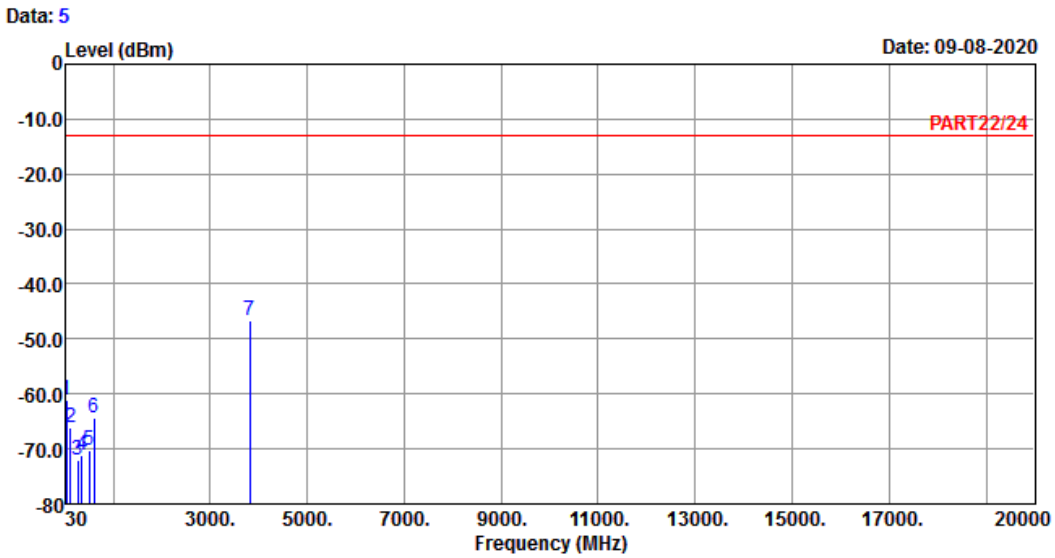


Site : 966 Chamber 5
Condition: PART22/24 VERTICAL
Remak : WCDMA B2 Link_M-CH
Tested by: Cyril Chen

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3760.00	-48.36	-41.71	-13.00	-6.65	-35.36	Peak

High Channel

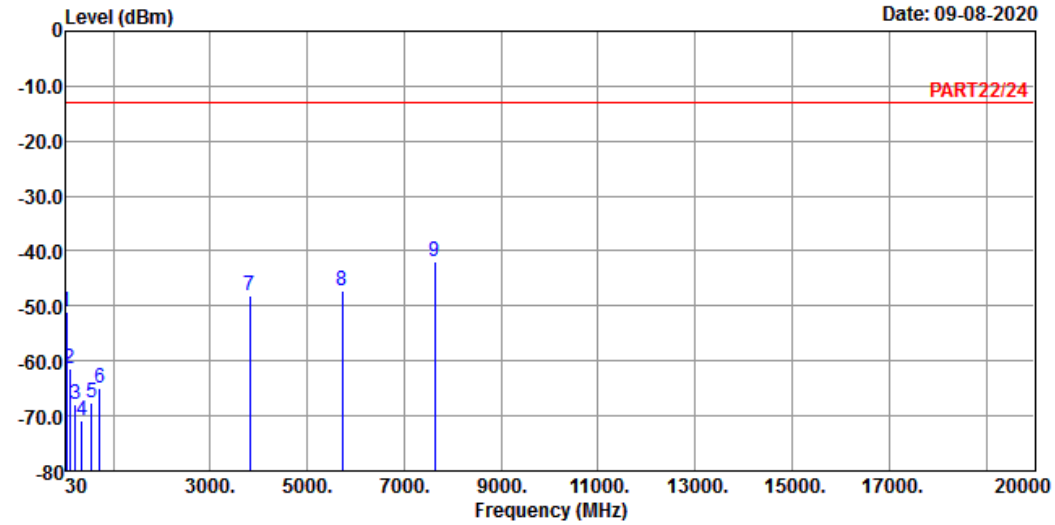
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : WCDMA B2 Link_H-CH
Tested by: Cyril Chen

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	38.73	-61.05	-61.15	-13.00	0.10	-48.05	Peak
2	127.00	-66.07	-57.03	-13.00	-9.04	-53.07	Peak
3	265.71	-72.07	-65.76	-13.00	-6.31	-59.07	Peak
4	349.13	-71.08	-64.83	-13.00	-6.25	-58.08	Peak
5	505.30	-70.30	-65.86	-13.00	-4.44	-57.30	Peak
6	598.42	-64.50	-63.67	-13.00	-0.83	-51.50	Peak
7 pp	3815.20	-46.70	-40.30	-13.00	-6.40	-33.70	Peak

Data: 6

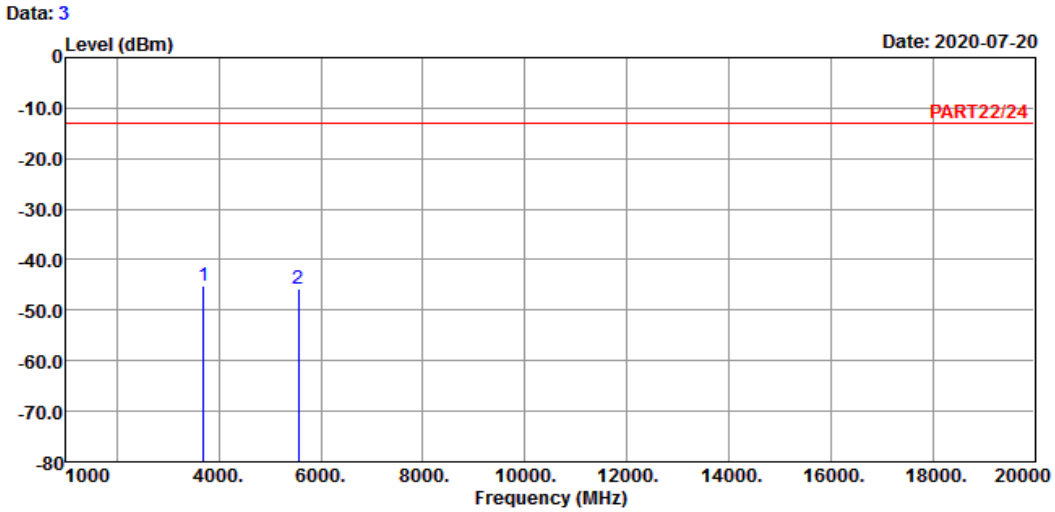


Site : 966 Chamber 5
Condition: PART22/24 VERTICAL
Remak : WCDMA B2 Link_H-CH
Tested by: Cyril Chen

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	31.94	-50.98	-50.38	-13.00	-0.60	-37.98	Peak
2	99.84	-61.34	-50.78	-13.00	-10.56	-48.34	Peak
3	220.12	-67.77	-60.57	-13.00	-7.20	-54.77	Peak
4	356.89	-70.76	-64.56	-13.00	-6.20	-57.76	Peak
5	558.65	-67.72	-65.23	-13.00	-2.49	-54.72	Peak
6	717.73	-65.00	-65.25	-13.00	0.25	-52.00	Peak
7	3815.20	-48.22	-41.82	-13.00	-6.40	-35.22	Peak
8	5722.80	-47.25	-45.56	-13.00	-1.69	-34.25	Peak
9 pp	7630.40	-41.80	-46.31	-13.00	4.51	-28.80	Peak

LTE Band 2
Channel Bandwidth: 1.4 MHz / QPSK
Low Channel

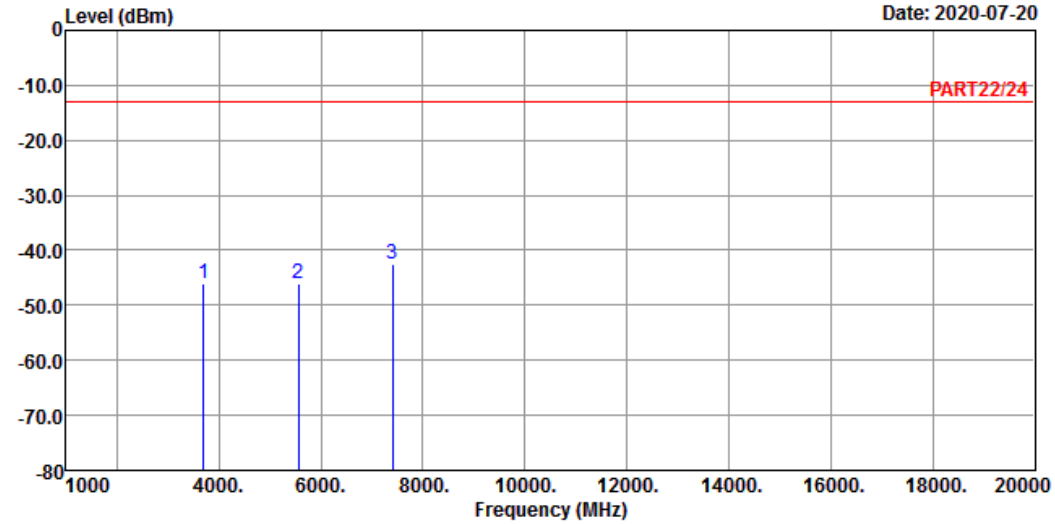
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : LTE Band 2 QPSK_1.4M Link_L-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3701.40	-45.25	-38.32	-13.00	-6.93	-32.25	Peak
2	5552.10	-45.66	-43.76	-13.00	-1.90	-32.66	Peak

Data: 4

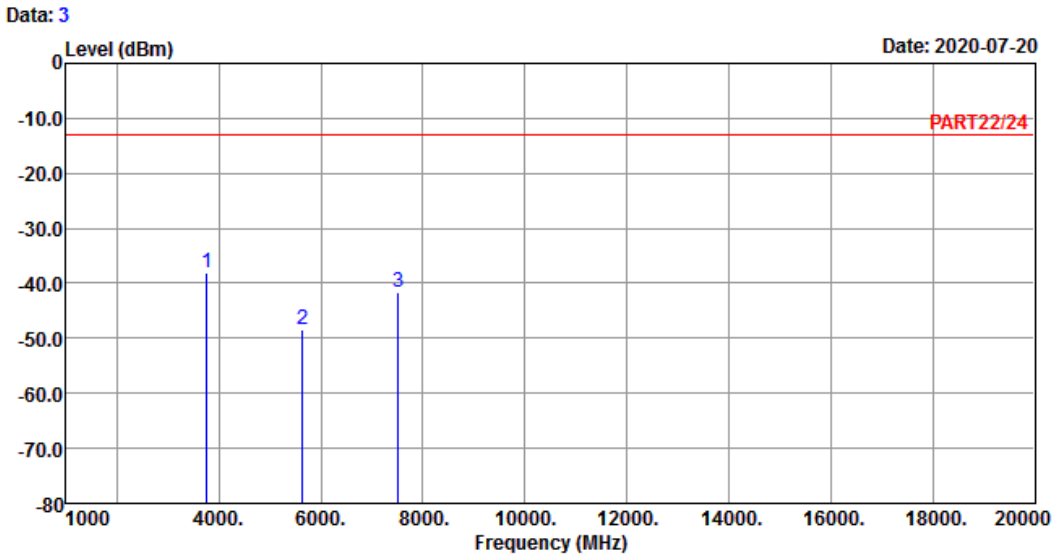


Site : 966 Chamber 5
Condition: PART22/24 VERTICAL
Remak : LTE Band 2 QPSK_1.4M Link_L-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3701.40	-46.08	-39.15	-13.00	-6.93	-33.08	Peak
2	5552.10	-46.20	-44.30	-13.00	-1.90	-33.20	Peak
3 pp	7402.80	-42.60	-46.71	-13.00	4.11	-29.60	Peak

Middle Channel

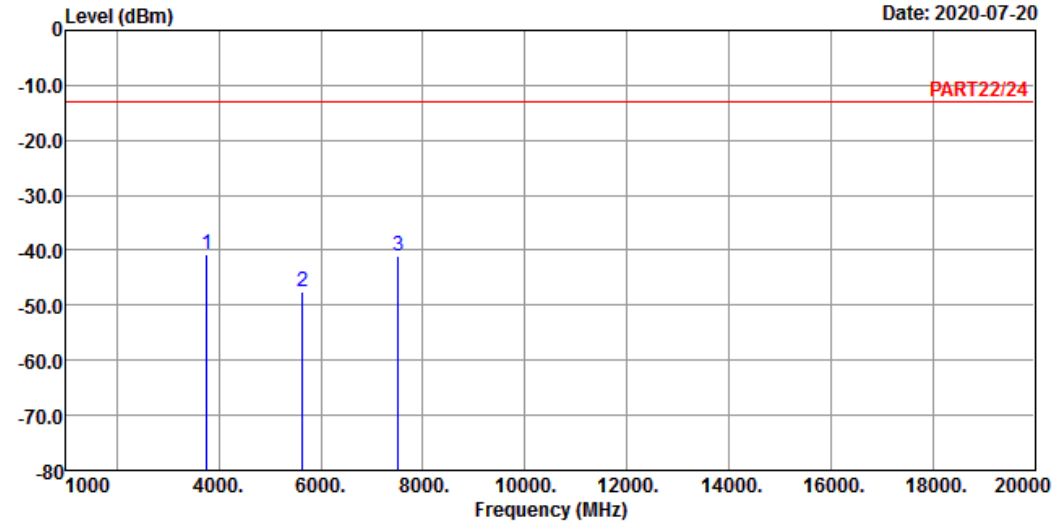
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART22/24 VERTICAL
Remak : LTE Band 2 QPSK_1.4M Link_M-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3760.00	-38.19	-31.54	-13.00	-6.65	-25.19	Peak
2	5640.00	-48.45	-46.59	-13.00	-1.86	-35.45	Peak
3	7520.00	-41.66	-45.87	-13.00	4.21	-28.66	Peak

Data: 4

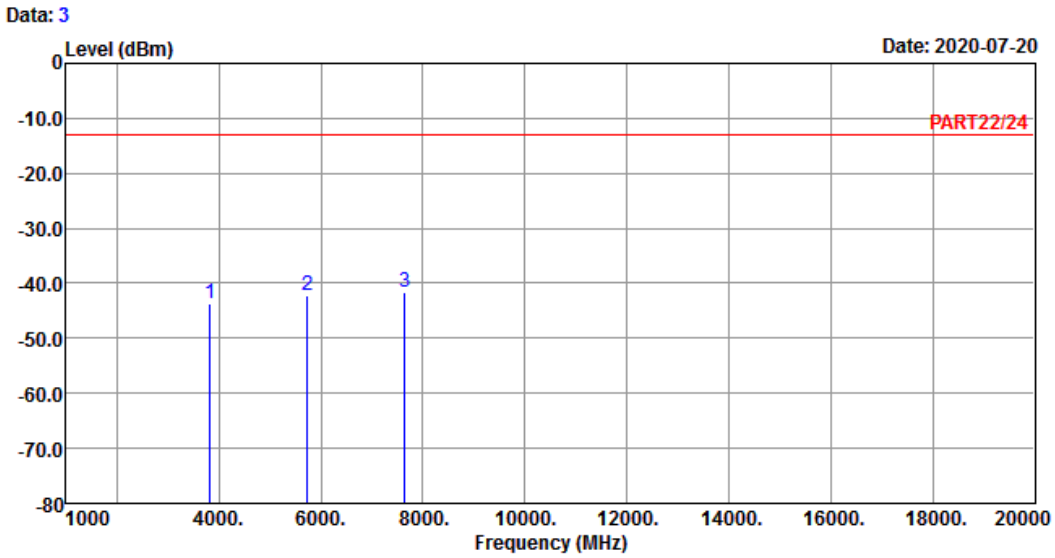


Site : 966 Chamber 5
Condition: PART22/24 VERTICAL
Remak : LTE Band 2 QPSK_1.4M Link_M-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3760.00	-40.75	-34.10	-13.00	-6.65	-27.75	Peak
2	5640.00	-47.46	-45.60	-13.00	-1.86	-34.46	Peak
3	7520.00	-40.98	-45.19	-13.00	4.21	-27.98	Peak

High Channel

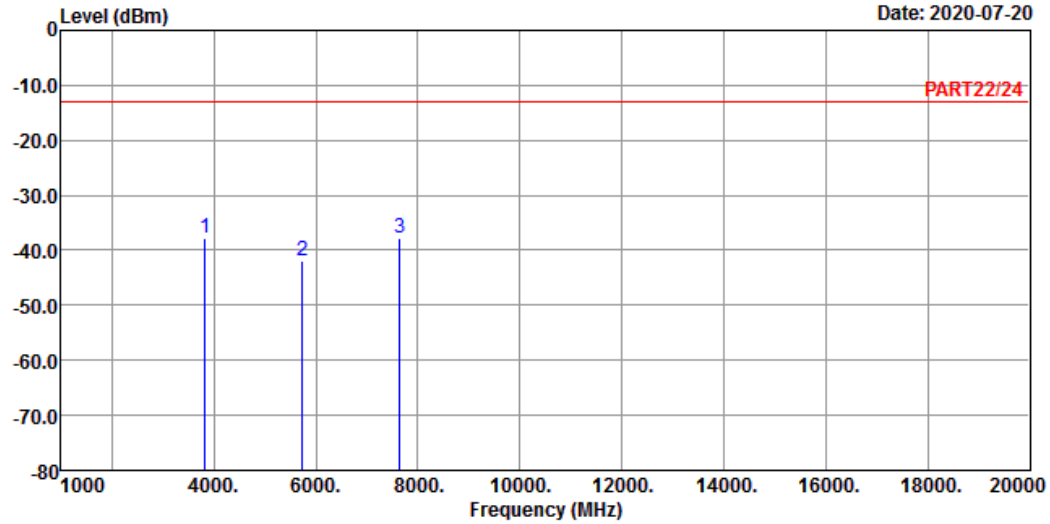
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : LTE Band 2 QPSK_1.4M Link_H-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3818.60	-43.61	-37.21	-13.00	-6.40	-30.61	Peak
2	5727.90	-42.35	-40.70	-13.00	-1.65	-29.35	Peak
3 pp	7637.20	-41.68	-46.23	-13.00	4.55	-28.68	Peak

Data: 4

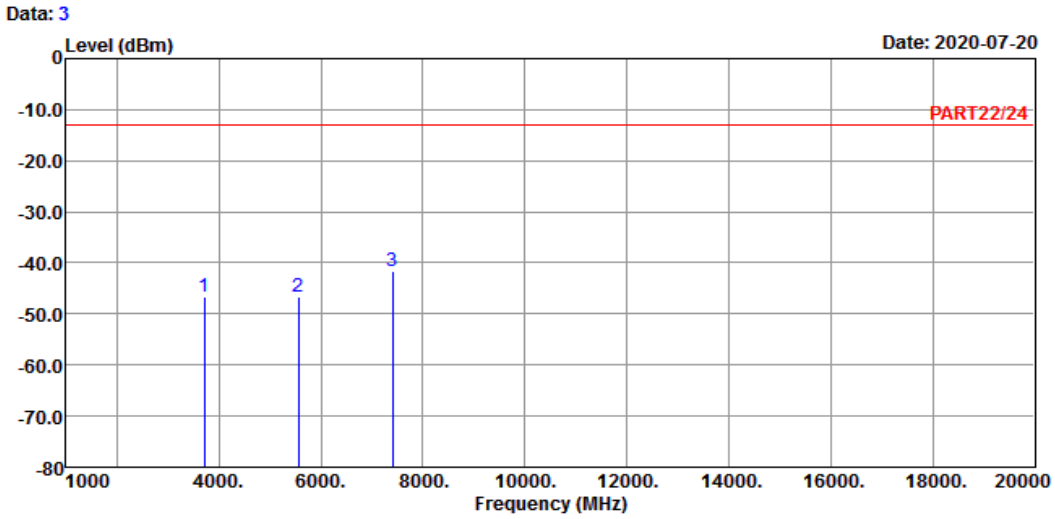


Site : 966 Chamber 5
Condition: PART22/24 VERTICAL
Remak : LTE Band 2 QPSK_1.4M Link_H-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3818.60	-37.75	-31.35	-13.00	-6.40	-24.75	Peak
2	5727.90	-41.93	-40.28	-13.00	-1.65	-28.93	Peak
3	7637.20	-37.75	-42.30	-13.00	4.55	-24.75	Peak

Channel Bandwidth: 5 MHz / QPSK
Low Channel

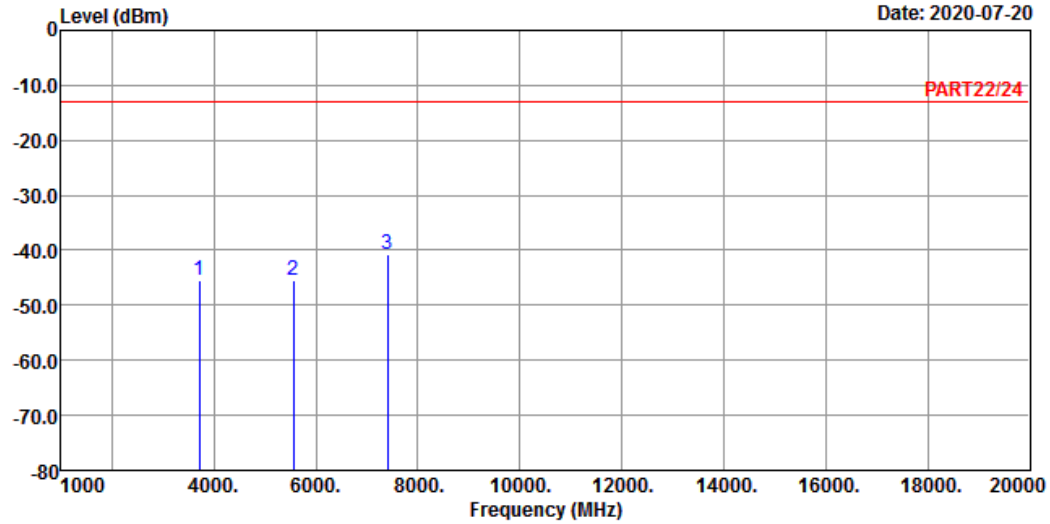
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : LTE Band 2 QPSK_5M Link_L-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3705.00	-46.60	-39.67	-13.00	-6.93	-33.60	Peak
2	5557.50	-46.72	-44.81	-13.00	-1.91	-33.72	Peak
3 pp	7410.00	-41.70	-45.83	-13.00	4.13	-28.70	Peak

Data: 4



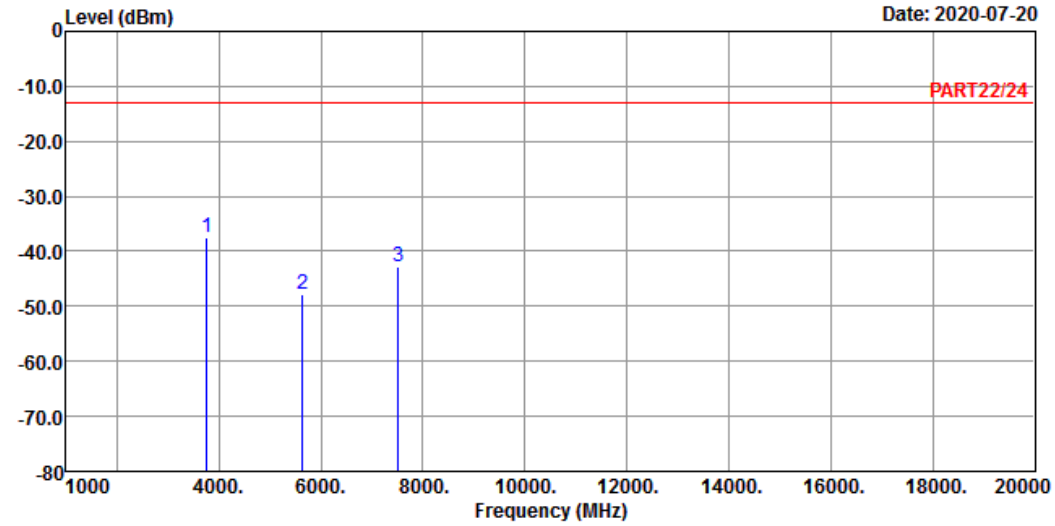
Site : 966 Chamber 5
Condition: PART22/24 VERTICAL
Remak : LTE Band 2 QPSK_5M Link_L-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3705.00	-45.39	-38.46	-13.00	-6.93	-32.39	Peak
2	5557.50	-45.59	-43.68	-13.00	-1.91	-32.59	Peak
3 pp	7410.00	-40.68	-44.81	-13.00	4.13	-27.68	Peak

Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

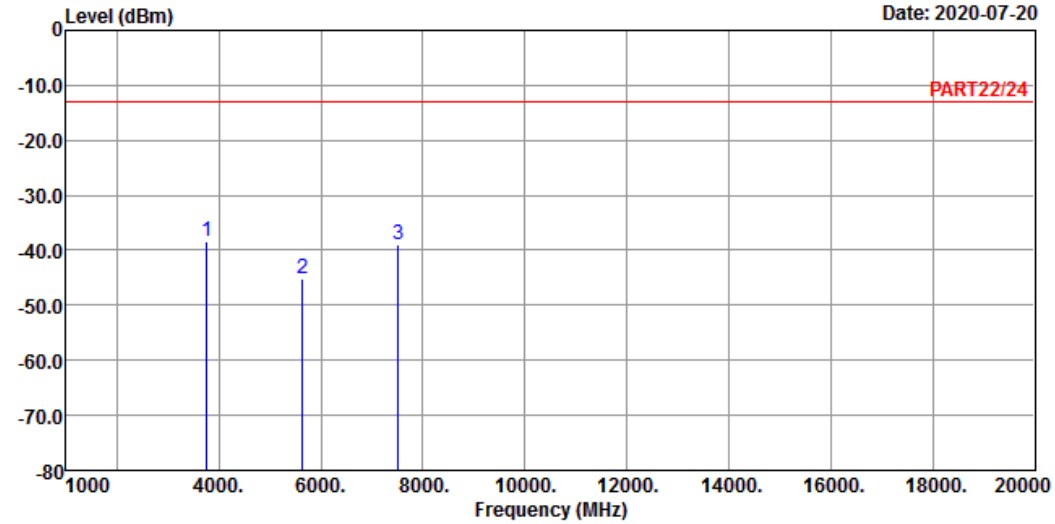
Data: 3



Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : LTE Band 2 QPSK_5M Link_M-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3760.00	-37.48	-30.83	-13.00	-6.65	-24.48	Peak
2	5640.00	-47.94	-46.08	-13.00	-1.86	-34.94	Peak
3	7520.00	-42.92	-47.13	-13.00	4.21	-29.92	Peak

Data: 4

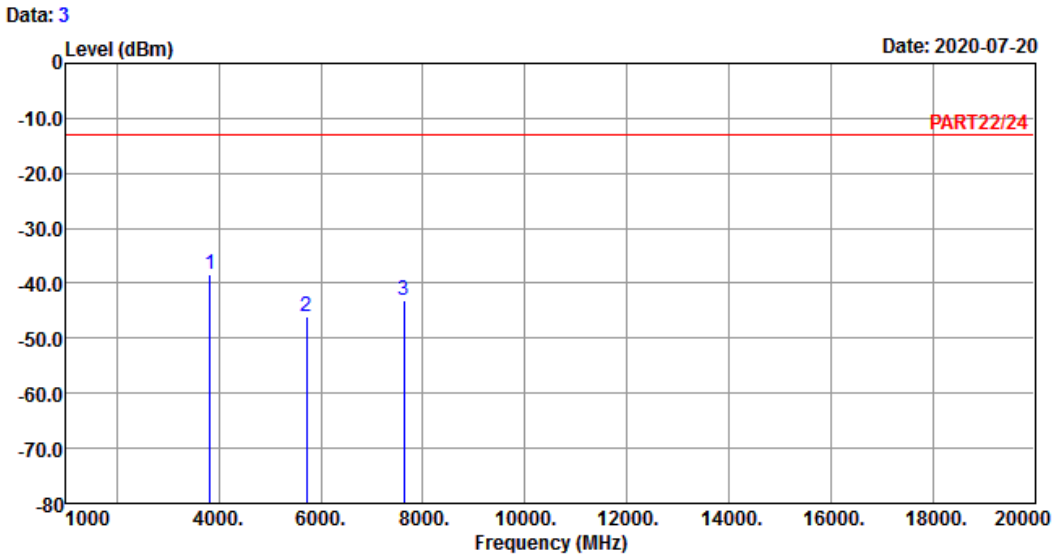


Site : 966 Chamber 5
Condition: PART22/24 VERTICAL
Remak : LTE Band 2 QPSK_5M Link_M-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3760.00	-38.28	-31.63	-13.00	-6.65	-25.28	Peak
2	5640.00	-45.13	-43.27	-13.00	-1.86	-32.13	Peak
3	7520.00	-39.09	-43.30	-13.00	4.21	-26.09	Peak

High Channel

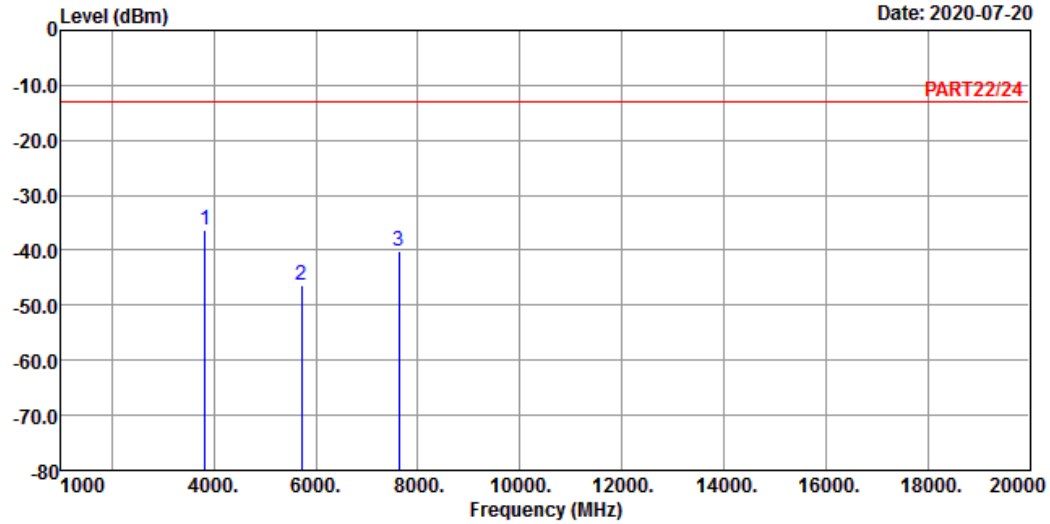
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART22/24 VERTICAL
Remak : LTE Band 2 QPSK_5M Link_H-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3815.00	-38.45	-32.05	-13.00	-6.40	-25.45	Peak
2	5722.50	-45.97	-44.28	-13.00	-1.69	-32.97	Peak
3	7630.00	-42.97	-47.48	-13.00	4.51	-29.97	Peak

Data: 4

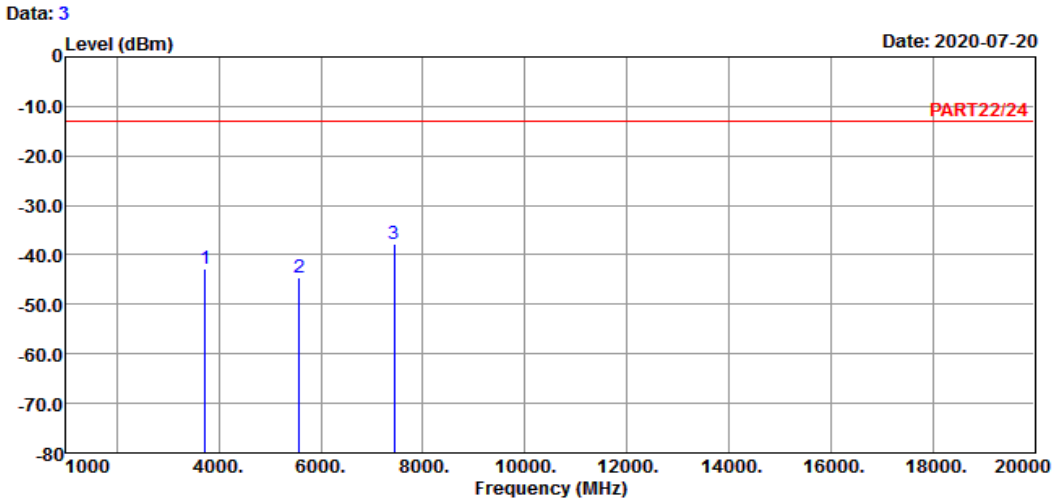


Site : 966 Chamber 5
Condition: PART22/24 VERTICAL
Remak : LTE Band 2 QPSK_5M Link_H-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3815.00	-36.44	-30.04	-13.00	-6.40	-23.44	Peak
2	5722.50	-46.43	-44.74	-13.00	-1.69	-33.43	Peak
3	7630.00	-40.28	-44.79	-13.00	4.51	-27.28	Peak

Channel Bandwidth: 20 MHz / QPSK
Low Channel

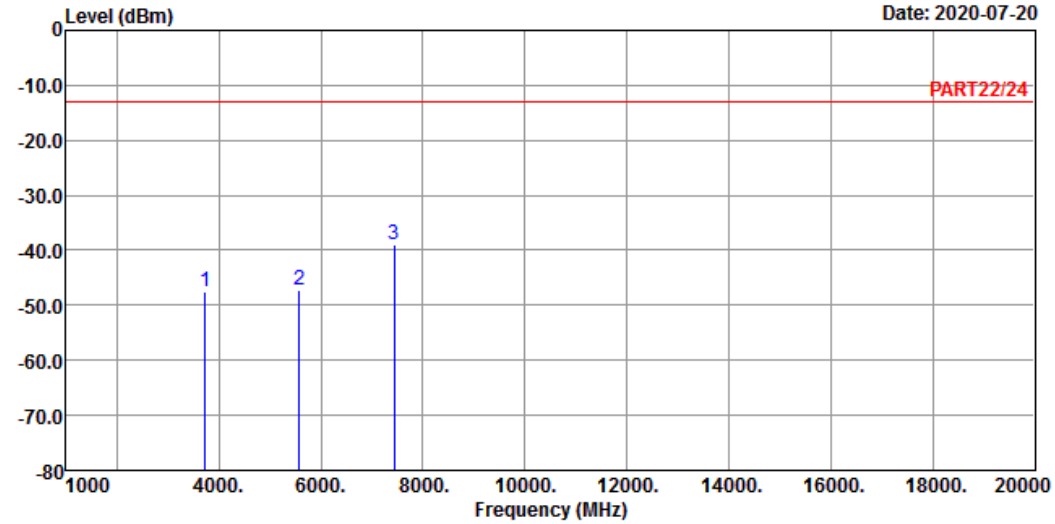
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : LTE Band 2 QPSK_20M Link_L-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3720.00	-42.75	-35.93	-13.00	-6.82	-29.75	Peak
2	5580.00	-44.63	-42.71	-13.00	-1.92	-31.63	Peak
3 pp	7440.00	-37.85	-42.00	-13.00	4.15	-24.85	Peak

Data: 4

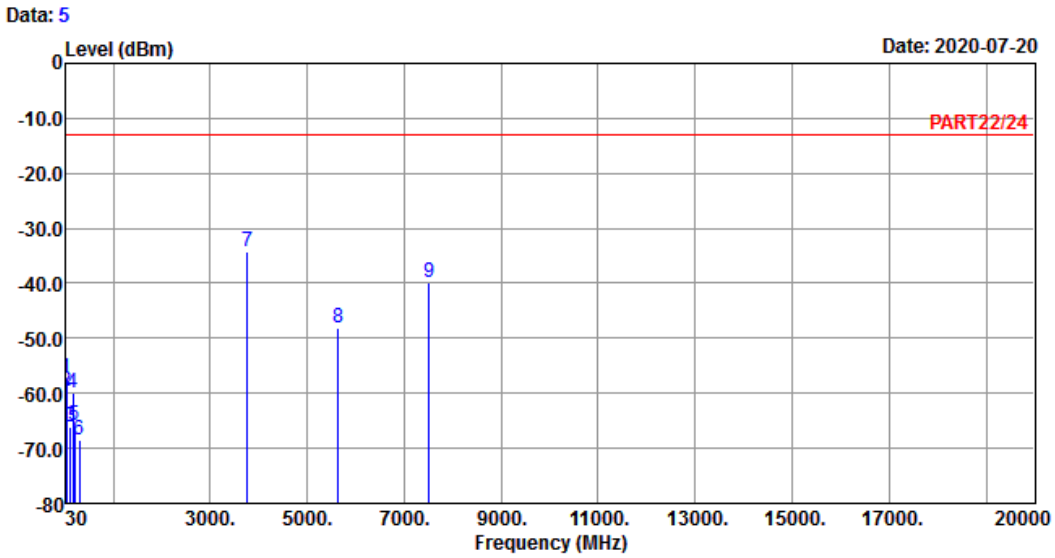


Site : 966 Chamber 5
Condition: PART22/24 VERTICAL
Remak : LTE Band 2 QPSK_20M Link_L-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3720.00	-47.44	-40.62	-13.00	-6.82	-34.44	Peak
2	5580.00	-47.17	-45.25	-13.00	-1.92	-34.17	Peak
3 pp	7440.00	-39.08	-43.23	-13.00	4.15	-26.08	Peak

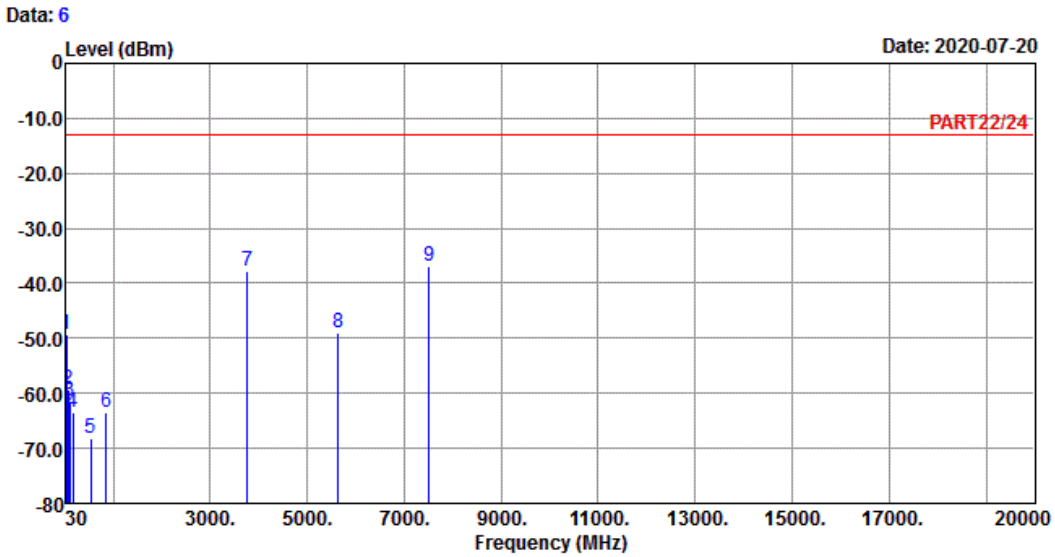
Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : LTE Band 2 QPSK_20M Link_M-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 qp	30.00	-57.20	-57.58	-13.00	0.38	-44.20	QP
2	40.67	-59.56	-59.68	-13.00	0.12	-46.56	QP
3	127.00	-66.07	-57.03	-13.00	-9.04	-53.07	QP
4	171.62	-59.88	-54.01	-13.00	-5.87	-46.88	QP
5	208.48	-65.78	-58.11	-13.00	-7.67	-52.78	QP
6	302.57	-68.36	-61.39	-13.00	-6.97	-55.36	QP
7 pp	3760.00	-34.27	-27.62	-13.00	-6.65	-21.27	Peak
8	5640.00	-48.06	-46.20	-13.00	-1.86	-35.06	Peak
9	7520.00	-39.71	-43.92	-13.00	4.21	-26.71	Peak

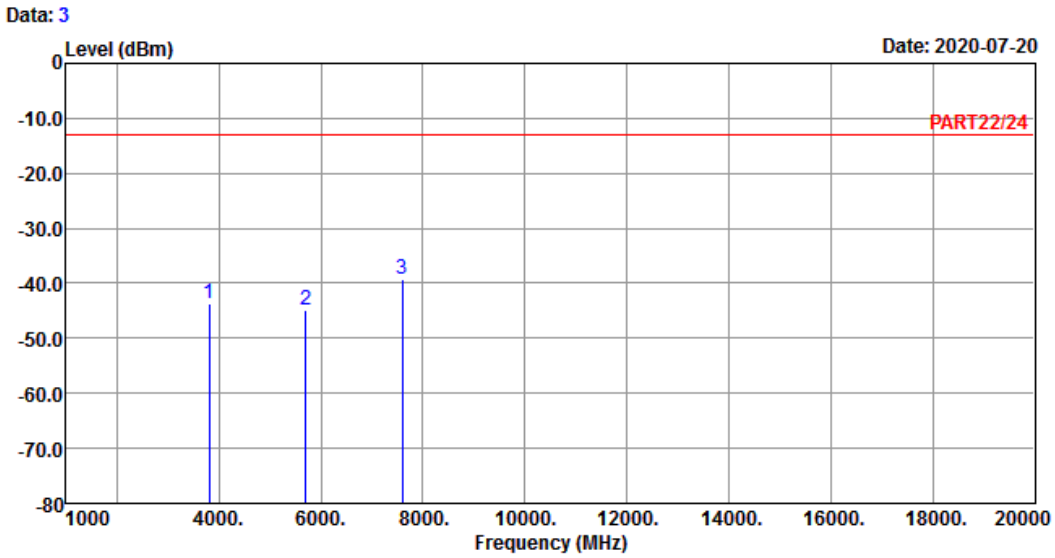


Site : 966 Chamber 5
Condition: PART22/24 VERTICAL
Remak : LTE Band 2 QPSK_20M Link_M-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 qp	38.73	-49.23	-49.33	-13.00	0.10	-36.23	QP
2	76.56	-59.37	-49.39	-13.00	-9.98	-46.37	QP
3	99.84	-61.34	-50.78	-13.00	-10.56	-48.34	QP
4	170.65	-63.35	-57.65	-13.00	-5.70	-50.35	QP
5	535.37	-68.19	-64.82	-13.00	-3.37	-55.19	QP
6	849.65	-63.59	-63.88	-13.00	0.29	-50.59	QP
7	3760.00	-37.87	-31.22	-13.00	-6.65	-24.87	Peak
8	5640.00	-49.12	-47.26	-13.00	-1.86	-36.12	Peak
9 pp	7520.00	-36.89	-41.10	-13.00	4.21	-23.89	Peak

High Channel

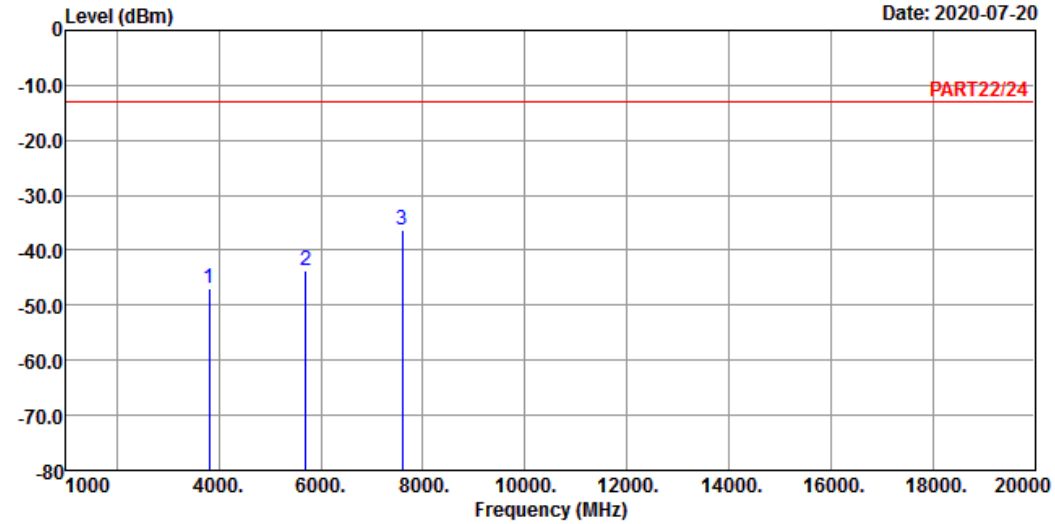
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : LTE Band 2 QPSK_20M Link_H-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3800.00	-43.80	-37.37	-13.00	-6.43	-30.80	Peak
2	5700.00	-45.02	-43.29	-13.00	-1.73	-32.02	Peak
3 pp	7600.00	-39.32	-43.79	-13.00	4.47	-26.32	Peak

Data: 4



Site : 966 Chamber 5
Condition: PART22/24 VERTICAL
Remak : LTE Band 2 QPSK_20M Link_H-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3800.00	-46.86	-40.43	-13.00	-6.43	-33.86	Peak
2	5700.00	-43.66	-41.93	-13.00	-1.73	-30.66	Peak
3 pp	7600.00	-36.35	-40.82	-13.00	4.47	-23.35	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 ---