

FCC Test Report

(PART 24)

Report No.: RF190723C05-6

FCC ID: ZL5S52E

Test Model: S52

Received Date: Jul. 23, 2019

Test Date: Aug. 12 ~ Sep. 06, 2019

Issued Date: Oct. 08, 2019

Applicant: Bullitt Group

Address: One Valpy, Valpy Street, Reading, RG1 1AR, Berkshire, UK

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
RF190723C05-6	Original Release	Oct. 08, 2019

1 Certificate of Conformity

Product: Rugged Smart Phone

Brand: CAT

Test Model: S52

Sample Status: Identical Prototype

Applicant: Bullitt Group

Test Date: Aug. 12 ~ Sep. 06, 2019

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 : Gina Liu, **Date:** Oct. 08, 2019
Gina Liu / Specialist

Approved by : Dylan Chiou, **Date:** Oct. 08, 2019
Dylan Chiou / 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.
2.1046 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 -29.18 dB at 77.53 MHz.

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

2.1 Measurement Uncertainty

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

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

2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY51210203	Mar. 18, 2019	Mar. 17, 2020
Spectrum Analyzer Agilent	N9010A	MY52220314	Dec. 13, 2018	Dec. 12, 2019
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Apr. 15, 2019	Apr. 14, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSW26	102023	Oct. 11, 2018	Oct. 10, 2019
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 25, 2018	Nov. 24, 2019
BILOG Antenna SCHWARZBECK	VULB 9168	9168-472	Nov. 23, 2018	Nov. 22, 2019
HORN Antenna SCHWARZBECK	BBHA 9170	148	Nov. 25, 2018	Nov. 24, 2019
Double Ridge Guide Horn Antenna EMCO	3115	5619	Nov. 25, 2018	Nov. 24, 2019
Fixed Attenuator WOKEN	MDCS18N-10	MDCS18N-10-01	Apr. 15, 2019	Apr. 14, 2020
MXG Vector signal generator Agilent	N5182B	MY53050430	Nov. 19, 2018	Nov. 18, 2019
Preamplifier EMCI	EMC 012645	980115	Oct. 12, 2018	Oct. 11, 2019
Preamplifier EMCI	EMC 330H	980112	Oct. 12, 2018	Oct. 11, 2019
RF Coaxial Cable HUBER+SUHNNER	EMC104-SM-SM-800 0&3000	140811+170717	Oct. 12, 2018	Oct. 11, 2019
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM-1 000(140807)	Oct. 12, 2018	Oct. 11, 2019
RF Coaxial Cable WOKEN	8D-FB	Cable-Ch10-01	Oct. 12, 2018	Oct. 11, 2019
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	NA	NA	NA
Radio Communication Analyzer Anritsu	MT8821C	6201462755	Jan. 16, 2019	Jan. 15, 2020
Radio Communication Analyzer Anritsu	MT8820C	6201300640	Aug. 16, 2017	Aug. 15, 2019
			Aug. 19, 2019	Aug. 18, 2020
Temperature & Humidity Chamber	GTH-120-40-CP-AR	MAA1306-019	Sep. 05, 2018	Sep. 04, 2019
			Sep. 06, 2019	Sep. 05, 2020
DC Power Supply Keysight	U8002A	MY56330015	NA	NA

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

3 General Information

3.1 General Description of EUT

Product	Rugged Smart Phone	
Brand	CAT	
Test Model	S52	
Status of EUT	Identical Prototype	
Power Supply Rating	5-8 Vdc / 8.5-10 Vdc / 10-12 Vdc (adapter 1) 5.0 Vdc / 9.0 Vdc / 12.0 Vdc (adapter 2) 3.8 Vdc (Li-ion battery)	
Modulation Type	GSM/GPRS	GMSK
	EDGE	GMSK, 8PSK
	WCDMA	QPSK
	LTE	QPSK, 16QAM, 64QAM
Frequency Range	GSM/GPRS/EDGE	1850.2 ~ 1909.8 MHz
	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	GSM/GPRS	266.69 mW
	EDGE	112.72 mW
	WCDMA	62.37 mW
	LTE Band 2 (Channel Bandwidth: 1.4 MHz)	49.55 mW
	LTE Band 2 (Channel Bandwidth: 3 MHz)	52.60 mW
	LTE Band 2 (Channel Bandwidth: 5 MHz)	55.98 mW
	LTE Band 2 (Channel Bandwidth: 10 MHz)	59.16 mW
	LTE Band 2 (Channel Bandwidth: 15 MHz)	63.53 mW
Emission Designator	LTE Band 2 (Channel Bandwidth: 20 MHz)	68.71 mW
	GSM/GPRS	249KGXW
	EDGE	248KG7W
	WCDMA	4M20F9W
	LTE Band 2 (Channel Bandwidth: 1.4 MHz)	1M09D7W
	LTE Band 2 (Channel Bandwidth: 3 MHz)	2M70G7D
	LTE Band 2 (Channel Bandwidth: 5 MHz)	4M51D7W
	LTE Band 2 (Channel Bandwidth: 10 MHz)	8M99D7W
	LTE Band 2 (Channel Bandwidth: 15 MHz)	13M5G7D
	LTE Band 2 (Channel Bandwidth: 20 MHz)	18M0D7W
Antenna Type	Loop Antenna with -4.8 dBi gain PIFA Antenna with -9 dBi gain	
Accessory Device	Refer to Note as below	
Data Cable Supplied	Refer to Note as below	

Note:

1. The EUT details of the sample are as follows.

Sample	Description
DS	Dual SIM
SS	Single SIM
* The samples have the same layout, circuit, and components, but different SIM tray.	

After pre-tested with the EUT, only the worst sample (Dual SIM) was chosen for the final test.

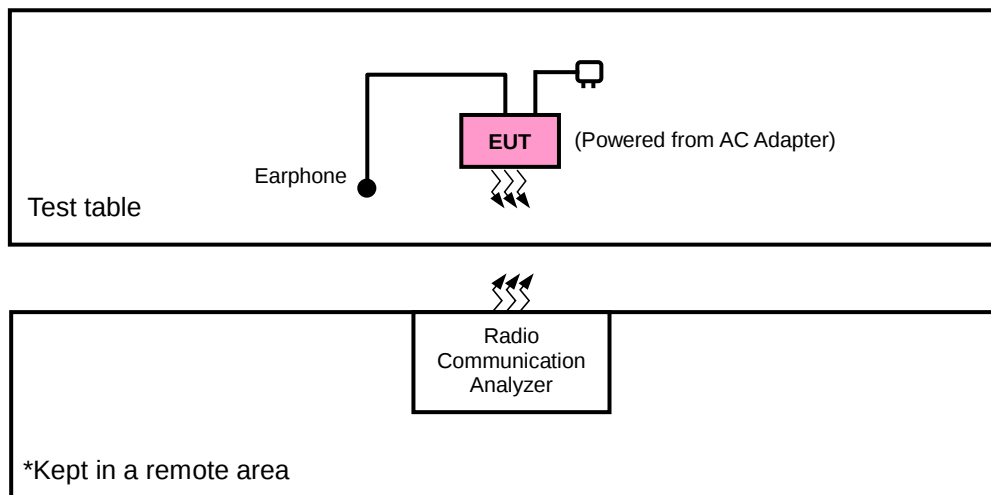
2. The EUT contains following accessory devices.

Product	Manufacture	Model	Description
Adapter 1	Lucent Trans Electronics Co., LTD.	1M52	I/P: 100-240 Vac, 50-60 Hz, 500 mA O/P: 5Vdc-8Vdc, 2.0A / 8.5Vdc-10Vdc, 1.7A / 10Vdc-12Vdc, 1.5A
Adapter 2	Jiangsu Chenyang Electron Co., LTD.	CK18W02U	I/P: 100-240 Vac, 50-60 Hz, 500 mA O/P: 5 Vdc, 3.0A / 9Vdc, 2.0A / 12Vdc, 1.5A
Battery	Apack Technology Co., LTD.	APP00307	3.8 Vdc, 3000 mAh
Earphone	Ganet Global LTD.	HF-AC04D-03 HF	1.2m non-shielded cable with core
USB Cable	Saibao (Jiangxi) Communication Industrial Co., LTD.	SRB-A001A	1.2m shielded cable with core

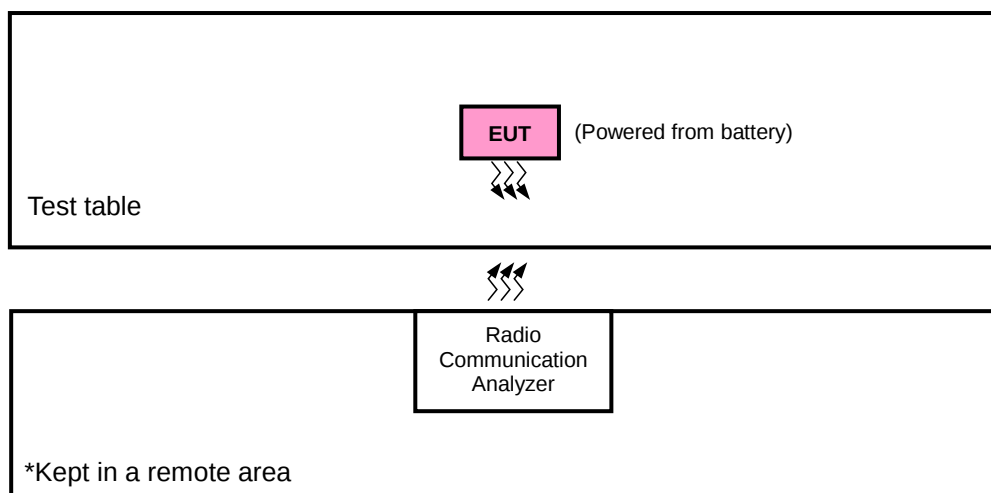
3. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

3.2 Configuration of System under Test

<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.

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
GSM	X-plane	X-plane
EDGE	X-plane	X-plane
WCDMA	X-plane	X-plane
LTE Band 2	X-plane	X-plane

GSM

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
-	EIRP	512 to 810	512, 661, 810	GSM, EDGE
-	Modulation Characteristics	512 to 810	661	GSM, EDGE
-	Frequency Stability	512 to 810	512, 810	GSM, EDGE
-	Occupied Bandwidth	512 to 810	512, 661, 810	GSM, EDGE
-	Band Edge	512 to 810	512, 810	GSM, EDGE
-	Peak to Average Ratio	512 to 810	512, 661, 810	GSM, EDGE
-	Conducted Emission	512 to 810	512, 661, 810	GSM, EDGE
-	Radiated Emission	512 to 810	512, 661, 810	GSM, EDGE

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, 64QAM	1 RB / 0 RB Offset
		18615 to 19185	18615, 18900, 19185	3 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
		18625 to 19175	18625, 18900, 19175	5 MHz	QPSK, 16QAM, 64QAM	1 RB / 12 RB Offset
		18650 to 19150	18650, 18900, 19150	10 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
		18675 to 19125	18675, 18900, 19125	15 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
		18700 to 19100	18700, 18900, 19100	20 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
-	Modulation Characteristics	18700 to 19100	18900	20 MHz	QPSK, 16QAM, 64QAM	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, 64QAM	6 RB / 0 RB Offset
		18615 to 19185	18615, 18900, 19185	3 MHz	QPSK, 16QAM, 64QAM	15 RB / 0 RB Offset
		18625 to 19175	18625, 18900, 19175	5 MHz	QPSK, 16QAM, 64QAM	25 RB / 0 RB Offset
		18650 to 19150	18650, 18900, 19150	10 MHz	QPSK, 16QAM, 64QAM	50 RB / 0 RB Offset
		18675 to 19125	18675, 18900, 19125	15 MHz	QPSK, 16QAM, 64QAM	75 RB / 0 RB Offset
		18700 to 19100	18700, 18900, 19100	20 MHz	QPSK, 16QAM, 64QAM	100 RB / 0 RB Offset
-	Peak to Average Ratio	18607 to 19193	18607, 18900, 19193	1.4 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
		18615 to 19185	18615, 18900, 19185	3 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
		18625 to 19175	18625, 18900, 19175	5 MHz	QPSK, 16QAM, 64QAM	1 RB / 12 RB Offset
		18650 to 19150	18650, 18900, 19150	10 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
		18675 to 19125	18675, 18900, 19125	15 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
		18700 to 19100	18700, 18900, 19100	20 MHz	QPSK, 16QAM, 64QAM	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
			19193	1.4 MHz	QPSK	6 RB / 0 RB Offset
		18615 to 19185	18615	3 MHz	QPSK	1 RB / 5 RB Offset
			19185	3 MHz	QPSK	6 RB / 0 RB Offset
		18625 to 19175	18625	5 MHz	QPSK	1 RB / 0 RB Offset
			19175	5 MHz	QPSK	15 RB / 0 RB Offset
		18650 to 19150	18650	10 MHz	QPSK	1 RB / 14 RB Offset
			19150	10 MHz	QPSK	15 RB / 0 RB Offset
		18675 to 19125	18675	15 MHz	QPSK	1 RB / 0 RB Offset
			19125	15 MHz	QPSK	75 RB / 0 RB Offset
		18700 to 19100	18700	20 MHz	QPSK	1 RB / 74 RB Offset
			19100	20 MHz	QPSK	75 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 / 12 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 / 12 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.
2. For radiated emission above 1 GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the lowest, 5 MHz & highest channel bandwidth for final test.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
EIRP	26 deg. C, 58 % RH	3.8 Vdc	Thomas Wei
Modulation Characteristics	26 deg. C, 58 % RH	3.8 Vdc	Wayne Lin
Frequency Stability	26 deg. C, 58 % RH	3.8 Vdc	Wayne Lin
Occupied Bandwidth	26 deg. C, 58 % RH	3.8 Vdc	Wayne Lin
Band Edge	26 deg. C, 58 % RH	3.8 Vdc	Wayne Lin
Peak to Average Ratio	26 deg. C, 58 % RH	3.8 Vdc	Wayne Lin
Conducted Emission	26 deg. C, 58 % RH	3.8 Vdc	Wayne Lin
Radiated Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Thomas Wei

3.4 EUT Operating Conditions

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

3.5 General Description of Applied Standards

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

FCC 47 CFR Part 2

FCC 47 CFR Part 24

KDB 971168 D01 Power Meas License Digital Systems v03r01

ANSI/TIA/EIA-603-E 2016

ANSI 63.26-2015

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

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

Mobile / Portable station are limited to 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 1 MHz for GSM, GPRS & EDGE, 5 MHz for WCDMA, and 10 MHz for LTE mode.
- b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- c. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step b. Record the power level of S.G.
- d. $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}$. E.R.P power can be calculated from E.I.R.P power by subtracting the gain of dipole, $E.R.P \text{ power} = E.I.R.P \text{ power} - 2.15 \text{ dB}$.

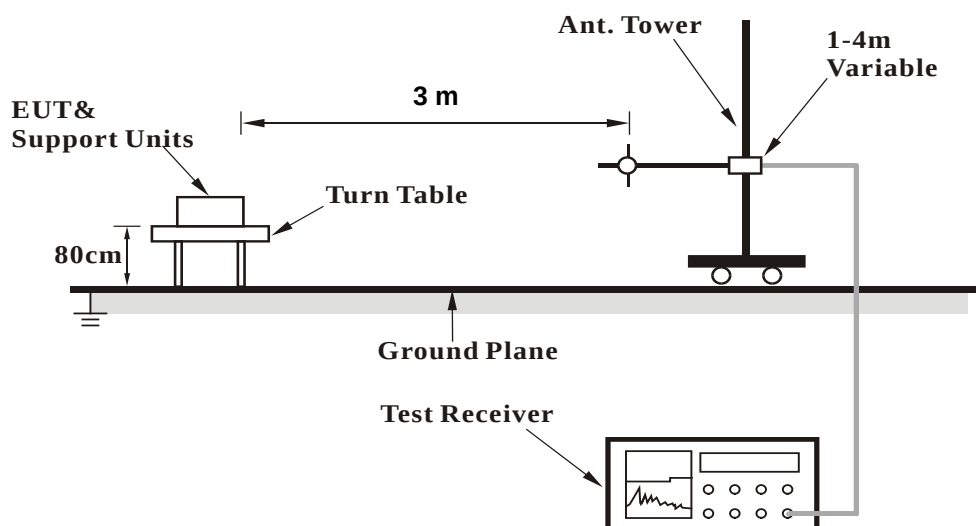
Conducted Power Measurement:

The EUT was set up for the maximum power with GSM, GPRS, EDGE, 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.

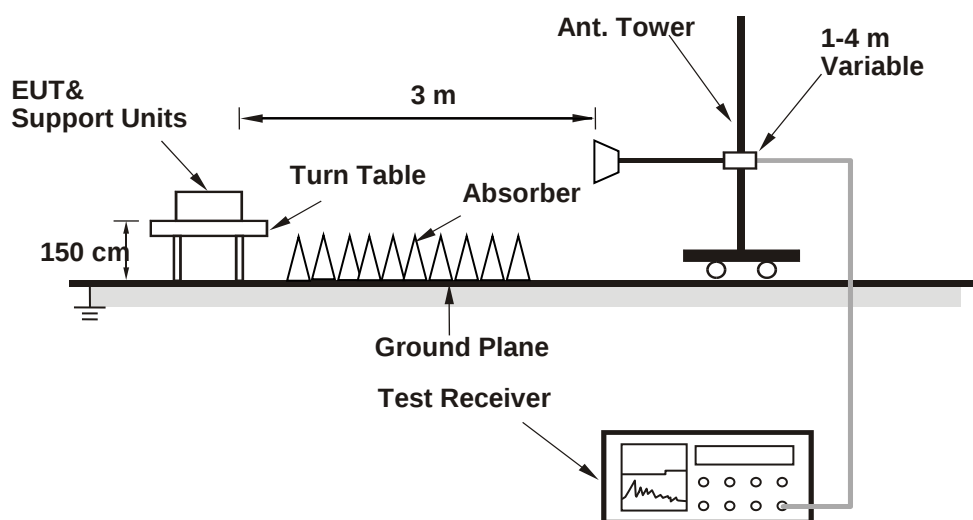
4.1.3 Test Setup

EIRP / ERP Measurement:

<Radiated Emission below or equal 1 GHz>

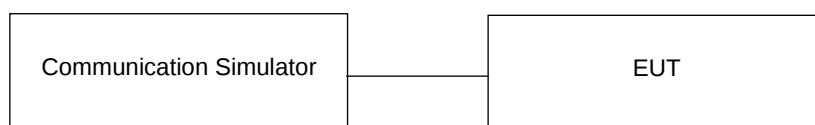


<Radiated Emission above 1 GHz>



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	GSM1900		
Channel	512	661	810
Frequency (MHz)	1850.2	1880.0	1909.8
GSM (GMSK, 1Tx-slot)	29.31	29.54	29.65
GPRS (GMSK, 1Tx-slot)	29.37	29.61	29.72
GPRS (GMSK, 2Tx-slot)	26.33	26.64	26.83
GPRS (GMSK, 3Tx-slot)	24.36	24.65	24.88
GPRS (GMSK, 4Tx-slot)	23.31	23.61	23.85
EDGE (8PSK, 1Tx-slot)	25.71	25.69	25.80
EDGE (8PSK, 2Tx-slot)	24.55	24.61	24.71
EDGE (8PSK, 3Tx-slot)	25.05	25.02	25.07
EDGE (8PSK, 4Tx-slot)	24.50	24.54	24.63

Band	WCDMA II		
Channel	9262	9400	9538
Frequency (MHz)	1852.4	1880.0	1907.6
RMC 12.2K	23.21	23.24	23.41
HSDPA Subtest-1	22.09	22.12	22.29
HSDPA Subtest-2	22.13	22.14	22.31
HSDPA Subtest-3	21.68	21.68	21.87
HSDPA Subtest-4	21.66	21.69	21.86
DC-HSDPA Subtest-1	22.06	22.06	22.23
DC-HSDPA Subtest-2	22.07	22.09	22.26
DC-HSDPA Subtest-3	21.62	21.62	21.79
DC-HSDPA Subtest-4	21.60	21.58	21.76
HSUPA Subtest-1	21.69	21.72	21.89
HSUPA Subtest-2	20.13	20.15	20.33
HSUPA Subtest-3	21.14	21.17	21.34
HSUPA Subtest-4	19.69	19.71	19.88
HSUPA Subtest-5	21.19	21.22	21.39

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	23.38	23.43	23.36	0	15M	QPSK	1	0	23.35	23.37	23.36	0
		1	50	23.34	23.39	23.32	0			1	37	23.33	23.32	23.31	0
		1	99	23.31	23.36	23.29	0			1	74	23.26	23.36	23.21	0
		50	0	22.73	22.78	22.71	1			36	0	22.64	22.71	22.70	1
		50	25	22.65	22.70	22.63	1			36	19	22.65	22.64	22.62	1
		50	50	22.63	22.68	22.61	1			36	39	22.60	22.60	22.53	1
		100	0	22.66	22.71	22.64	1			75	0	22.64	22.66	22.63	1
		1	0	22.71	22.76	22.69	1		16QAM	1	0	22.61	22.69	22.64	1
	16QAM	1	50	22.67	22.72	22.65	1			1	37	22.57	22.67	22.55	1
		1	99	22.65	22.70	22.63	1			1	74	22.63	22.64	22.60	1
		50	0	21.74	21.79	21.72	2			36	0	21.64	21.72	21.66	2
		50	25	21.65	21.70	21.63	2			36	19	21.64	21.65	21.54	2
		50	50	21.62	21.67	21.60	2			36	39	21.52	21.60	21.58	2
		100	0	21.71	21.76	21.69	2			75	0	21.65	21.67	21.65	2
		1	0	21.73	21.78	21.71	2		64QAM	1	0	21.66	21.75	21.68	2
	64QAM	1	50	21.69	21.74	21.67	2			1	37	21.62	21.66	21.60	2
		1	99	21.62	21.67	21.60	2			1	74	21.59	21.66	21.50	2
		50	0	20.68	20.73	20.66	3			36	0	20.58	20.72	20.57	3
		50	25	20.63	20.68	20.61	3			36	19	20.56	20.67	20.53	3
		50	50	20.57	20.62	20.55	3			36	39	20.55	20.61	20.53	3
		100	0	20.59	20.64	20.57	3			75	0	20.56	20.56	20.50	3
		1	0	20.59	20.64	20.57	3			1	0	20.56	20.56	20.50	3
10M	QPSK	1	0	23.31	23.30	23.26	0	5M	QPSK	1	0	23.24	23.25	23.15	0
		1	24	23.30	23.24	23.28	0			1	12	23.26	23.19	23.04	0
		1	49	23.12	23.28	23.25	0			1	24	23.08	23.17	23.10	0
		25	0	22.63	22.68	22.67	1			12	0	22.51	22.71	22.52	1
		25	12	22.45	22.58	22.49	1			12	6	22.47	22.60	22.47	1
		25	25	22.57	22.59	22.44	1			12	13	22.54	22.52	22.40	1
		50	0	22.47	22.61	22.50	1			25	0	22.51	22.66	22.46	1
		1	0	22.52	22.58	22.59	1		16QAM	1	0	22.58	22.61	22.63	1
	16QAM	1	24	22.56	22.55	22.65	1			1	12	22.48	22.62	22.44	1
		1	49	22.48	22.52	22.43	1			1	24	22.46	22.54	22.49	1
		25	0	21.66	21.68	21.67	2			12	0	21.61	21.67	21.56	2
		25	12	21.53	21.62	21.51	2			12	6	21.50	21.62	21.44	2
		25	25	21.42	21.58	21.46	2			12	13	21.43	21.62	21.36	2
		50	0	21.49	21.68	21.51	2			25	0	21.63	21.65	21.62	2
		1	0	21.60	21.63	21.54	2		64QAM	1	0	21.64	21.69	21.49	2
	64QAM	1	24	21.53	21.63	21.56	2			1	12	21.59	21.60	21.50	2
		1	49	21.52	21.51	21.42	2			1	24	21.48	21.63	21.44	2
		25	0	20.55	20.52	20.60	3			12	0	20.64	20.56	20.58	3
		25	12	20.42	20.48	20.57	3			12	6	20.62	20.58	20.49	3
		25	25	20.45	20.58	20.47	3			12	13	20.46	20.48	20.44	3
		50	0	20.49	20.51	20.48	3			25	0	20.42	20.47	20.39	3
		1	0	20.49	20.51	20.48	3			1	0	20.42	20.47	20.39	3
3M	QPSK	1	0	23.19	23.24	23.23	0	1.4M	QPSK	1	0	23.30	23.40	23.17	0
		1	7	23.16	23.19	23.13	0			1	2	23.23	23.38	23.29	0
		1	14	23.09	23.21	23.21	0			1	5	23.15	23.16	23.15	0
		8	0	22.61	22.76	22.54	1			3	0	23.25	23.26	23.24	0
		8	3	22.44	22.61	22.51	1			3	1	23.27	23.22	23.25	0
		8	7	22.58	22.54	22.54	1			3	3	23.31	23.33	23.28	0
		15	0	22.59	22.64	22.60	1			6	0	22.56	22.57	22.50	1
		1	0	22.62	22.57	22.56	1		16QAM	1	0	22.65	22.60	22.63	1
	16QAM	1	7	22.51	22.58	22.52	1			1	2	22.51	22.55	22.52	1
		1	14	22.59	22.54	22.48	1			1	5	22.43	22.57	22.52	1
		8	0	21.53	21.65	21.62	2			3	0	22.67	22.60	22.60	1
		8	3	21.60	21.60	21.54	2			3	1	22.51	22.66	22.43	1
		8	7	21.49	21.67	21.43	2			3	3	22.50	22.55	22.38	1
		15	0	21.60	21.67	21.52	2			6	0	21.57	21.61	21.53	2
		1	0	21.56	21.68	21.55	2		64QAM	1	0	21.57	21.70	21.66	2
	64QAM	1	7	21.63	21.63	21.61	2			1	2	21.53	21.56	21.53	2
		1	14	21.50	21.52	21.40	2			1	5	21.52	21.54	21.45	2
		8	0	20.60	20.70	20.53	3			3	0	21.66	21.53	21.54	2
		8	3	20.60	20.60	20.49	3			3	1	21.57	21.57	21.54	2
		8	7	20.50	20.62	20.46	3			3	3	21.40	21.56	21.41	2
		15	0	20.42	20.45	20.39	3			6	0	20.37	20.56	20.42	3
		1	0	20.42	20.45	20.39	3			1	0	20.37	20.56	20.42	3

EIRP Power (dBm)

GSM							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	512	1850.2	-12.46	36.57	24.11	257.63	H
	661	1880.0	-12.96	37.22	24.26	266.69	
	810	1909.8	-12.99	37.18	24.19	262.42	
	512	1850.2	-19.77	37.65	17.88	61.38	V
	661	1880.0	-19.53	37.58	18.05	63.83	
	810	1909.8	-19.51	37.48	17.97	62.66	

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

EDGE							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	512	1850.2	-16.13	36.57	20.44	110.66	H
	661	1880.0	-16.70	37.22	20.52	112.72	
	810	1909.8	-16.81	37.18	20.37	108.89	
	512	1850.2	-23.50	37.65	14.15	26.00	V
	661	1880.0	-23.36	37.58	14.22	26.42	
	810	1909.8	-23.39	37.48	14.09	25.64	

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

WCDMA							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	9262	1852.4	-18.69	36.57	17.88	61.38	H
	9400	1880.0	-19.27	37.22	17.95	62.37	
	9538	1907.6	-19.37	37.18	17.81	60.39	
	9262	1852.4	-25.92	37.65	11.73	14.89	V
	9400	1880.0	-25.79	37.58	11.79	15.10	
	9538	1907.6	-25.82	37.48	11.66	14.66	

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	-19.70	36.57	16.87	48.64	H
	18900	1880.0	-20.27	37.22	16.95	49.55	
	19193	1909.3	-20.36	37.18	16.82	48.08	
	18607	1850.7	-30.73	37.65	6.92	4.92	V
	18900	1880.0	-30.34	37.58	7.24	5.30	
	19193	1909.3	-30.60	37.48	6.88	4.88	
Channel Bandwidth: 1.4 MHz / 16QAM							
X	18607	1850.7	-20.76	36.57	15.81	38.11	H
	18900	1880.0	-21.17	37.22	16.05	40.27	
	19193	1909.3	-21.56	37.18	15.62	36.48	
	18607	1850.7	-31.86	37.65	5.79	3.79	V
	18900	1880.0	-31.60	37.58	5.98	3.96	
	19193	1909.3	-31.80	37.48	5.68	3.70	
Channel Bandwidth: 1.4 MHz / 64QAM							
X	18607	1850.7	-21.83	36.57	14.74	29.79	H
	18900	1880.0	-22.22	37.22	15.00	31.62	
	19193	1909.3	-22.60	37.18	14.58	28.71	
	18607	1850.7	-32.86	37.65	4.79	3.01	V
	18900	1880.0	-32.58	37.58	5.00	3.16	
	19193	1909.3	-32.89	37.48	4.59	2.88	

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	-19.40	36.57	17.17	52.12	H
	18900	1880.0	-20.01	37.22	17.21	52.60	
	19185	1908.5	-20.08	37.18	17.10	51.29	
	18615	1851.5	-30.43	37.65	7.22	5.27	V
	18900	1880.0	-30.08	37.58	7.50	5.62	
	19185	1908.5	-30.29	37.48	7.19	5.24	
Channel Bandwidth: 3 MHz / 16QAM							
X	18615	1851.5	-20.47	36.57	16.10	40.74	H
	18900	1880.0	-20.93	37.22	16.29	42.56	
	19185	1908.5	-21.29	37.18	15.89	38.82	
	18615	1851.5	-31.58	37.65	6.07	4.05	V
	18900	1880.0	-31.31	37.58	6.27	4.24	
	19185	1908.5	-31.59	37.48	5.89	3.88	
Channel Bandwidth: 3 MHz / 64QAM							
X	18615	1851.5	-21.52	36.57	15.05	31.99	H
	18900	1880.0	-21.95	37.22	15.27	33.65	
	19185	1908.5	-22.39	37.18	14.79	30.13	
	18615	1851.5	-32.60	37.65	5.05	3.20	V
	18900	1880.0	-32.38	37.58	5.20	3.31	
	19185	1908.5	-32.60	37.48	4.88	3.08	

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	-19.15	36.57	17.42	55.21	H
	18900	1880.0	-19.74	37.22	17.48	55.98	
	19175	1907.5	-19.83	37.18	17.35	54.33	
	18625	1852.5	-30.08	37.65	7.57	5.71	V
	18900	1880.0	-29.86	37.58	7.72	5.92	
	19175	1907.5	-30.02	37.48	7.46	5.57	
Channel Bandwidth: 5 MHz / 16QAM							
X	18625	1852.5	-20.26	36.57	16.31	42.76	H
	18900	1880.0	-20.66	37.22	16.56	45.29	
	19175	1907.5	-21.04	37.18	16.14	41.11	
	18625	1852.5	-31.32	37.65	6.33	4.30	V
	18900	1880.0	-31.07	37.58	6.51	4.48	
	19175	1907.5	-31.29	37.48	6.19	4.16	
Channel Bandwidth: 5 MHz / 64QAM							
X	18625	1852.5	-21.28	36.57	15.29	33.81	H
	18900	1880.0	-21.73	37.22	15.49	35.40	
	19175	1907.5	-22.14	37.18	15.04	31.92	
	18625	1852.5	-32.40	37.65	5.25	3.35	V
	18900	1880.0	-32.12	37.58	5.46	3.52	
	19175	1907.5	-32.38	37.48	5.10	3.24	

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	-18.88	36.57	17.69	58.75	H
	18900	1880.0	-19.50	37.22	17.72	59.16	
	19150	1905.0	-19.53	37.18	17.65	58.21	
	18650	1855.0	-29.82	37.65	7.83	6.07	V
	18900	1880.0	-29.58	37.58	8.00	6.31	
	19150	1905.0	-29.77	37.48	7.71	5.90	
Channel Bandwidth: 10 MHz / 16QAM							
X	18650	1855.0	-19.99	36.57	16.58	45.50	H
	18900	1880.0	-20.42	37.22	16.80	47.86	
	19150	1905.0	-20.82	37.18	16.36	43.25	
	18650	1855.0	-31.02	37.65	6.63	4.60	V
	18900	1880.0	-30.82	37.58	6.76	4.74	
	19150	1905.0	-30.96	37.48	6.52	4.49	
Channel Bandwidth: 10 MHz / 64QAM							
X	18650	1855.0	-20.99	36.57	15.58	36.14	H
	18900	1880.0	-21.48	37.22	15.74	37.50	
	19150	1905.0	-21.84	37.18	15.34	34.20	
	18650	1855.0	-32.09	37.65	5.56	3.60	V
	18900	1880.0	-31.83	37.58	5.75	3.76	
	19150	1905.0	-32.09	37.48	5.39	3.46	

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	-18.62	36.57	17.95	62.37	H
	18900	1880.0	-19.19	37.22	18.03	63.53	
	19125	1902.5	-19.30	37.18	17.88	61.38	
	18675	1857.5	-29.52	37.65	8.13	6.50	V
	18900	1880.0	-29.36	37.58	8.22	6.64	
	19125	1902.5	-29.52	37.48	7.96	6.25	
Channel Bandwidth: 15 MHz / 16QAM							
X	18675	1857.5	-19.71	36.57	16.86	48.53	H
	18900	1880.0	-20.11	37.22	17.11	51.40	
	19125	1902.5	-20.51	37.18	16.67	46.45	
	18675	1857.5	-30.71	37.65	6.94	4.94	V
	18900	1880.0	-30.53	37.58	7.05	5.07	
	19125	1902.5	-30.70	37.48	6.78	4.76	
Channel Bandwidth: 15 MHz / 64QAM							
X	18675	1857.5	-20.75	36.57	15.82	38.19	H
	18900	1880.0	-21.21	37.22	16.01	39.90	
	19125	1902.5	-21.63	37.18	15.55	35.89	
	18675	1857.5	-31.80	37.65	5.85	3.85	V
	18900	1880.0	-31.62	37.58	5.96	3.94	
	19125	1902.5	-31.86	37.48	5.62	3.65	

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	-18.28	36.57	18.29	67.45	H
	18900	1880.0	-18.85	37.22	18.37	68.71	
	19100	1900.0	-18.97	37.18	18.21	66.22	
	18700	1860.0	-29.30	37.65	8.35	6.84	V
	18900	1880.0	-29.15	37.58	8.43	6.97	
	19100	1900.0	-29.21	37.48	8.27	6.71	
Channel Bandwidth: 20 MHz / 16QAM							
X	18700	1860.0	-19.39	36.57	17.18	52.24	H
	18900	1880.0	-19.80	37.22	17.42	55.21	
	19100	1900.0	-20.18	37.18	17.00	50.12	
	18700	1860.0	-30.45	37.65	7.20	5.25	V
	18900	1880.0	-30.27	37.58	7.31	5.38	
	19100	1900.0	-30.39	37.48	7.09	5.12	
Channel Bandwidth: 20 MHz / 64QAM							
X	18700	1860.0	-20.45	36.57	16.12	40.93	H
	18900	1880.0	-20.96	37.22	16.26	42.27	
	19100	1900.0	-21.32	37.18	15.86	38.55	
	18700	1860.0	-31.59	37.65	6.06	4.04	V
	18900	1880.0	-31.40	37.58	6.18	4.15	
	19100	1900.0	-31.55	37.48	5.93	3.92	

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



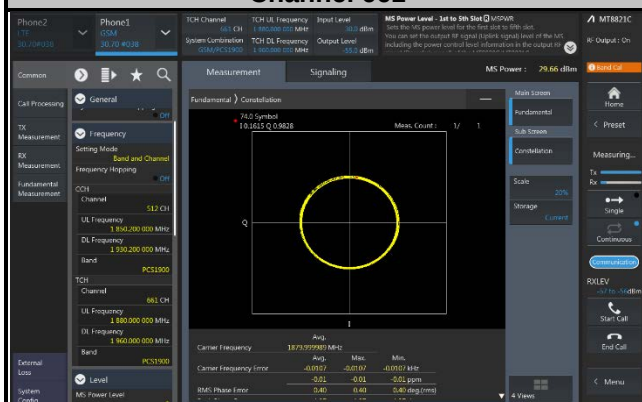
4.2.3 Test Procedure

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.

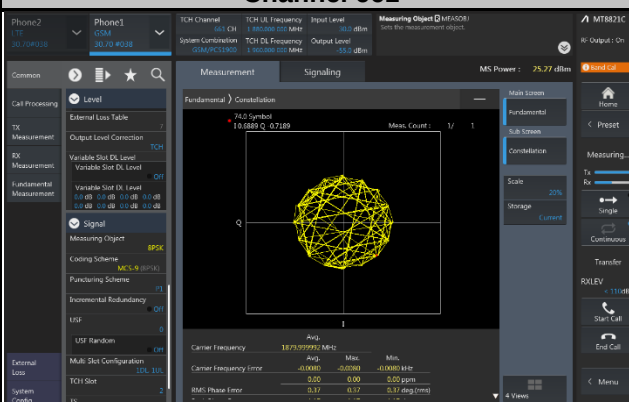
4.2.4 Test Results

Spectrum Plot of Measurement

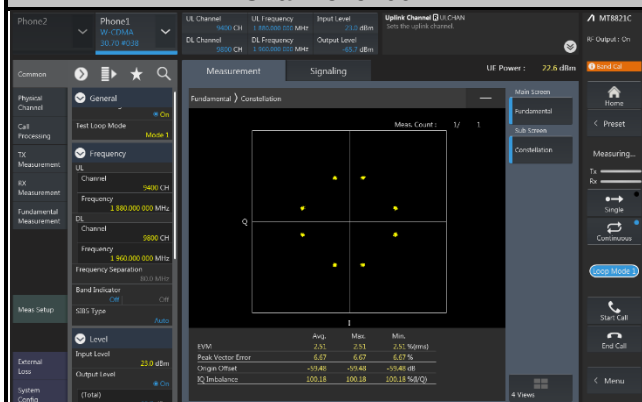
GSM Channel 661



EDGE Channel 661



WCDMA Channel 9400

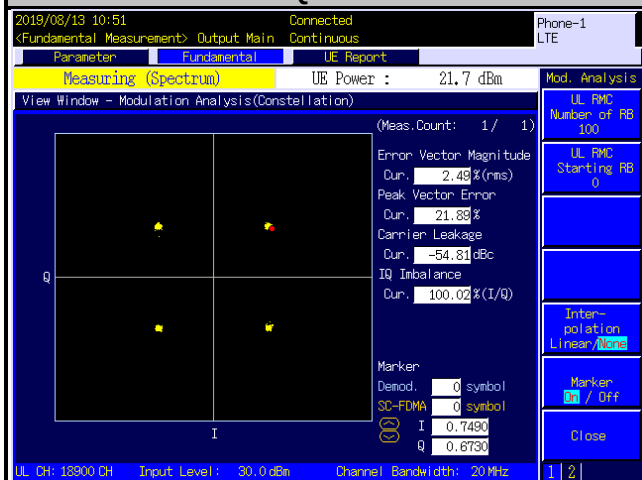


Spectrum Plot of Measurement

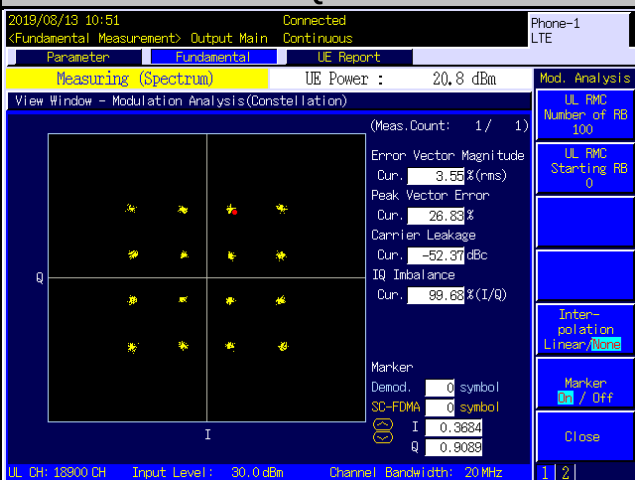
LTE Band 2

Channel 18900

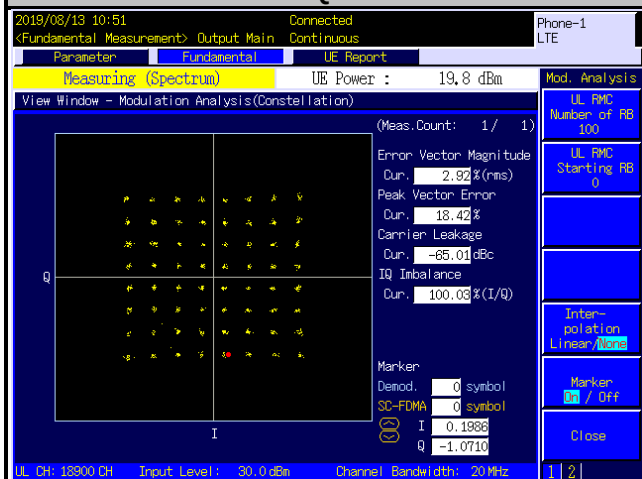
QPSK



16QAM



64QAM



4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

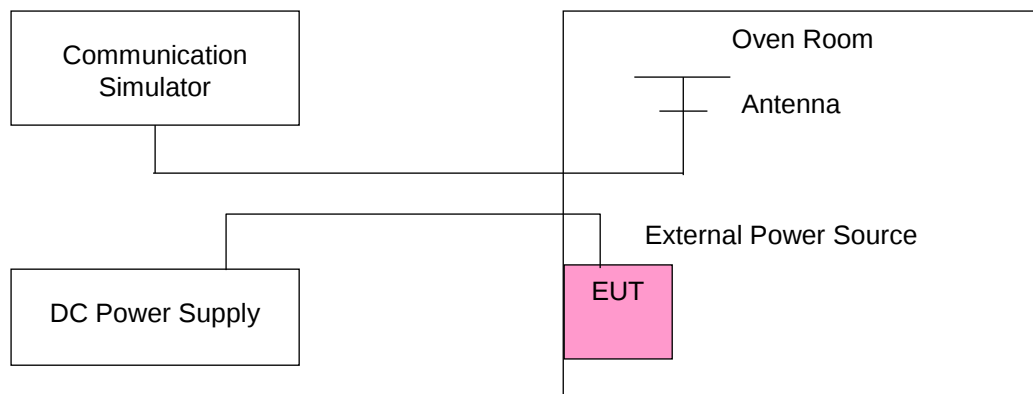
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

4.3.2 Test Procedure

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

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

4.3.3 Test Setup



4.3.4 Test Results

Frequency Error vs. Voltage

Voltage (Volts)	GSM			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.8	1850.200003	0.002	1909.800003	0.001
3.4	1850.200003	0.002	1909.800003	0.002
4.35	1850.200003	0.002	1909.800003	0.002

Note: The applicant defined the normal working voltage of the battery is from 3.4 Vdc to 4.35 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	GSM			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-25	1850.200003	0.001	1909.800001	0.001
-20	1850.200002	0.001	1909.800001	0.001
-10	1850.200003	0.002	1909.800001	0.001
0	1850.200003	0.002	1909.800002	0.001
10	1850.200003	0.001	1909.800001	0.001
20	1850.199997	-0.002	1909.799999	-0.001
30	1850.199999	-0.001	1909.799999	-0.001
40	1850.199999	-0.001	1909.799998	-0.001
50	1850.199998	-0.001	1909.799996	-0.002
55	1850.199998	-0.001	1909.799999	-0.001

Note:

1. The applicant declared that the normal operating temperature of the EUT is from -25°C to 55°C.
2. The EUT would shut down automatically as below -25°C.

Frequency Error vs. Voltage

Voltage (Volts)	EDGE			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.8	1850.200001	0.001	1909.800002	0.001
3.4	1850.200003	0.002	1909.800002	0.001
4.35	1850.200002	0.001	1909.800003	0.001

Note: The applicant defined the normal working voltage of the battery is from 3.4 Vdc to 4.35 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	EDGE			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-25	1850.200001	0.001	1909.800003	0.001
-20	1850.200002	0.001	1909.800004	0.002
-10	1850.200003	0.001	1909.800003	0.002
0	1850.200003	0.002	1909.800002	0.001
10	1850.200002	0.001	1909.800003	0.001
20	1850.199998	-0.001	1909.799998	-0.001
30	1850.199998	-0.001	1909.799999	-0.001
40	1850.199998	-0.001	1909.799999	-0.001
50	1850.199997	-0.002	1909.799999	-0.001
55	1850.199996	-0.002	1909.799998	-0.001

Note:

1. The applicant declared that the normal operating temperature of the EUT is from -25°C to 55°C.
2. The EUT would shut down automatically as below -25°C.

Frequency Error vs. Voltage

Voltage (Volts)	WCDMA			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.8	1852.400003	0.002	1907.600004	0.002
3.4	1852.400001	0.001	1907.600002	0.001
4.35	1852.400003	0.002	1907.600001	0.001

Note: The applicant defined the normal working voltage of the battery is from 3.4 Vdc to 4.35 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	WCDMA			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-25	1852.400001	0.001	1907.600003	0.001
-20	1852.400003	0.002	1907.600001	0.001
-10	1852.400003	0.002	1907.600004	0.002
0	1852.400004	0.002	1907.600003	0.002
10	1852.400003	0.001	1907.600002	0.001
20	1852.399997	-0.001	1907.599997	-0.002
30	1852.399996	-0.002	1907.599998	-0.001
40	1852.399999	-0.001	1907.599997	-0.002
50	1852.399997	-0.002	1907.599999	-0.001
55	1852.399999	-0.001	1907.599998	-0.001

Note:

1. The applicant declared that the normal operating temperature of the EUT is from -25°C to 55°C.
2. The EUT would shut down automatically as below -25°C.

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)
3.8	1850.700002	0.001	1909.300000	0.001
3.4	1850.700002	0.001	1909.300003	0.002
4.35	1850.700004	0.002	1909.300002	0.001

Note: The applicant defined the normal working voltage of the battery is from 3.4 Vdc to 4.35 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 2			
	Channel Bandwidth: 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-25	1850.700003	0.001	1909.300002	0.001
-20	1850.700004	0.002	1909.300002	0.001
-10	1850.700003	0.002	1909.300003	0.001
0	1850.700004	0.002	1909.300004	0.002
10	1850.700002	0.001	1909.300002	0.001
20	1850.699997	-0.002	1909.299999	-0.001
30	1850.699997	-0.002	1909.299998	-0.001
40	1850.699999	-0.001	1909.299999	-0.001
50	1850.699997	-0.002	1909.299997	-0.002
55	1850.699997	-0.002	1909.299998	-0.001

Note:

1. The applicant declared that the normal operating temperature of the EUT is from -25°C to 55°C.
2. The EUT would shut down automatically as below -25°C.

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)
3.8	1851.500003	0.002	1908.500003	0.001
3.4	1851.500004	0.002	1908.500003	0.001
4.35	1851.500002	0.001	1908.500004	0.002

Note: The applicant defined the normal working voltage of the battery is from 3.4 Vdc to 4.35 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 2			
	Channel Bandwidth: 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-25	1851.500002	0.001	1908.500001	0.001
-20	1851.500002	0.001	1908.500004	0.002
-10	1851.500002	0.001	1908.500002	0.001
0	1851.500004	0.002	1908.500003	0.002
10	1851.500002	0.001	1908.500002	0.001
20	1851.499999	-0.001	1908.499997	-0.002
30	1851.499997	-0.002	1908.499999	-0.001
40	1851.499996	-0.002	1908.499999	-0.001
50	1851.499997	-0.001	1908.499997	-0.002
55	1851.499997	-0.001	1908.499999	-0.001

Note:

1. The applicant declared that the normal operating temperature of the EUT is from -25°C to 55°C.
2. The EUT would shut down automatically as below -25°C.

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)
3.8	1852.500002	0.001	1907.500001	0.001
3.4	1852.500003	0.002	1907.500003	0.002
4.35	1852.500002	0.001	1907.500002	0.001

Note: The applicant defined the normal working voltage of the battery is from 3.4 Vdc to 4.35 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 2			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-25	1852.500004	0.002	1907.500002	0.001
-20	1852.500002	0.001	1907.500001	0.001
-10	1852.500002	0.001	1907.500004	0.002
0	1852.500004	0.002	1907.500002	0.001
10	1852.500004	0.002	1907.500004	0.002
20	1852.499999	-0.001	1907.499996	-0.002
30	1852.499998	-0.001	1907.499998	-0.001
40	1852.499998	-0.001	1907.499997	-0.002
50	1852.499998	-0.001	1907.499999	-0.001
55	1852.499999	-0.001	1907.499999	-0.001

Note:

1. The applicant declared that the normal operating temperature of the EUT is from -25°C to 55°C.
2. The EUT would shut down automatically as below -25°C.

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)
3.8	1855.000001	0.001	1905.000002	0.001
3.4	1855.000002	0.001	1905.000002	0.001
4.35	1855.000004	0.002	1905.000003	0.002

Note: The applicant defined the normal working voltage of the battery is from 3.4 Vdc to 4.35 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 2			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-25	1855.000003	0.002	1905.000002	0.001
-20	1855.000004	0.002	1905.000004	0.002
-10	1855.000003	0.001	1905.000003	0.002
0	1855.000003	0.001	1905.000003	0.002
10	1855.000002	0.001	1905.000002	0.001
20	1854.999997	-0.002	1904.999999	-0.001
30	1854.999999	-0.001	1904.999999	-0.001
40	1854.999999	-0.001	1904.999999	-0.001
50	1854.999998	-0.001	1904.999998	-0.001
55	1854.999998	-0.001	1904.999999	-0.001

Note:

1. The applicant declared that the normal operating temperature of the EUT is from -25°C to 55°C.
2. The EUT would shut down automatically as below -25°C.

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)
3.8	1857.500001	0.001	1902.500004	0.002
3.4	1857.500003	0.002	1902.500003	0.002
4.35	1857.500003	0.002	1902.500003	0.002

Note: The applicant defined the normal working voltage of the battery is from 3.4 Vdc to 4.35 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 2			
	Channel Bandwidth: 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-25	1857.500003	0.002	1902.500001	0.001
-20	1857.500004	0.002	1902.500004	0.002
-10	1857.500003	0.002	1902.500003	0.002
0	1857.500004	0.002	1902.500002	0.001
10	1857.500002	0.001	1902.500001	0.001
20	1857.499996	-0.002	1902.499998	-0.001
30	1857.499998	-0.001	1902.499998	-0.001
40	1857.499996	-0.002	1902.499999	-0.001
50	1857.499998	-0.001	1902.499998	-0.001
55	1857.499998	-0.001	1902.499998	-0.001

Note:

1. The applicant declared that the normal operating temperature of the EUT is from -25°C to 55°C.
2. The EUT would shut down automatically as below -25°C.

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)
3.8	1860.000004	0.002	1900.000002	0.001
3.4	1860.000002	0.001	1900.000001	0.001
4.35	1860.000003	0.001	1900.000002	0.001

Note: The applicant defined the normal working voltage of the battery is from 3.4 Vdc to 4.35 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 2			
	Channel Bandwidth: 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-25	1860.000004	0.002	1900.000004	0.002
-20	1860.000003	0.001	1900.000002	0.001
-10	1860.000003	0.002	1900.000002	0.001
0	1860.000002	0.001	1900.000002	0.001
10	1860.000003	0.002	1900.000003	0.002
20	1859.999999	-0.001	1899.999996	-0.002
30	1859.999999	-0.001	1899.999998	-0.001
40	1859.999999	-0.001	1899.999997	-0.002
50	1859.999998	-0.001	1899.999999	-0.001
55	1859.999998	-0.001	1899.999998	-0.001

Note:

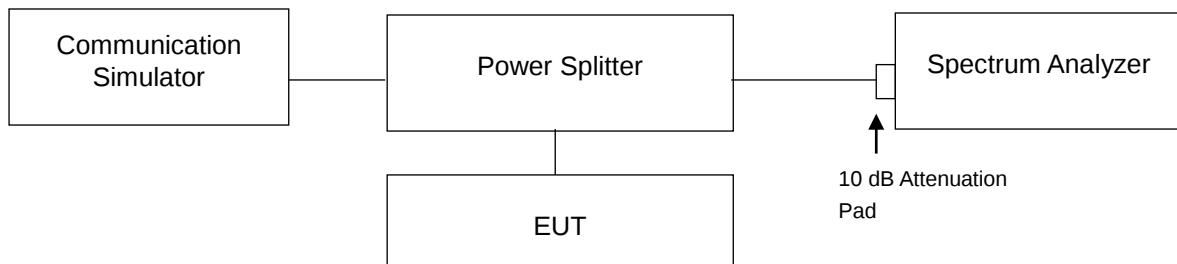
1. The applicant declared that the normal operating temperature of the EUT is from -25°C to 55°C.
2. The EUT would shut down automatically as below -25°C.

4.4 Occupied Bandwidth Measurement

4.4.1 Test Procedure

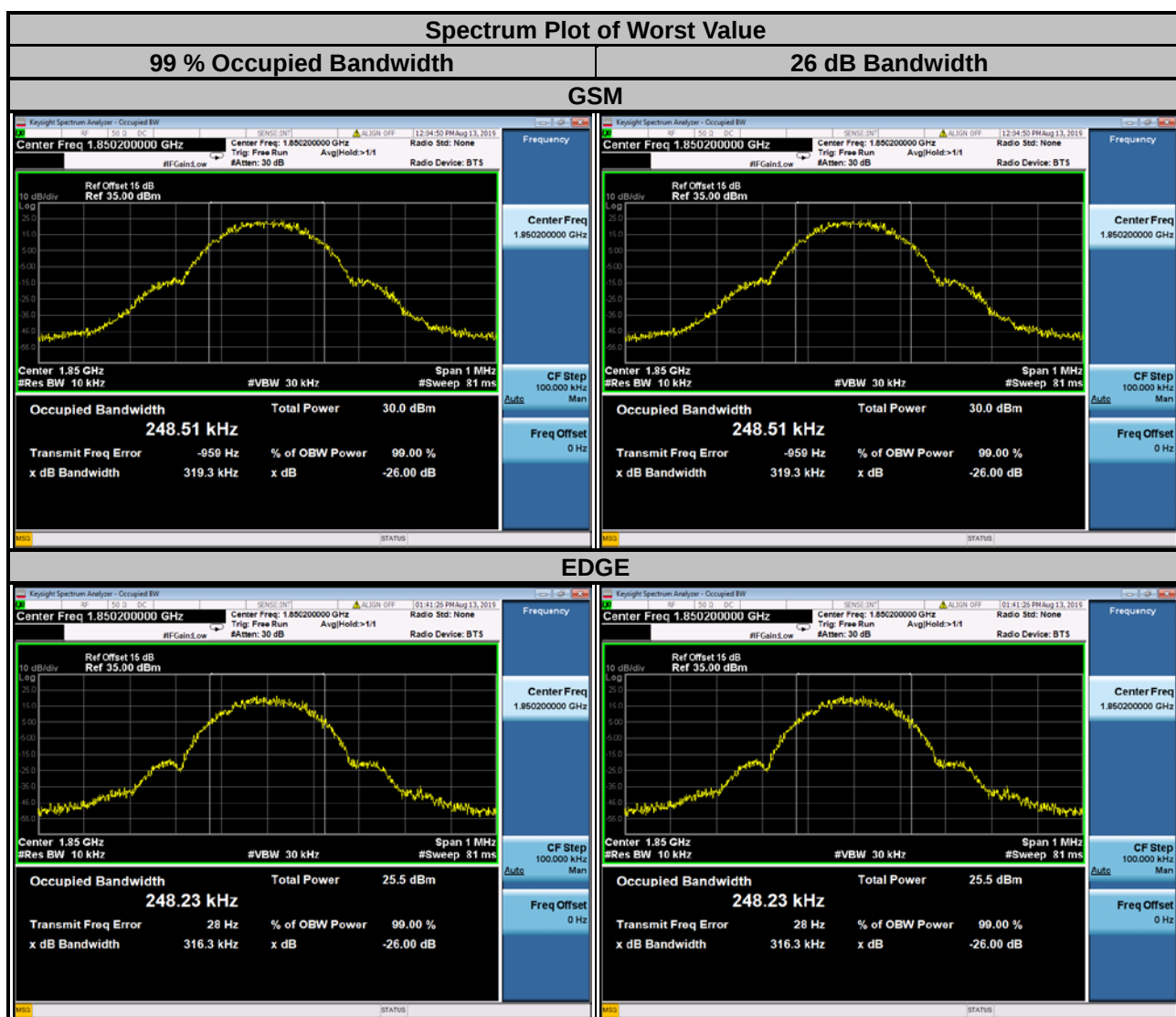
The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function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

4.4.2 Test Setup

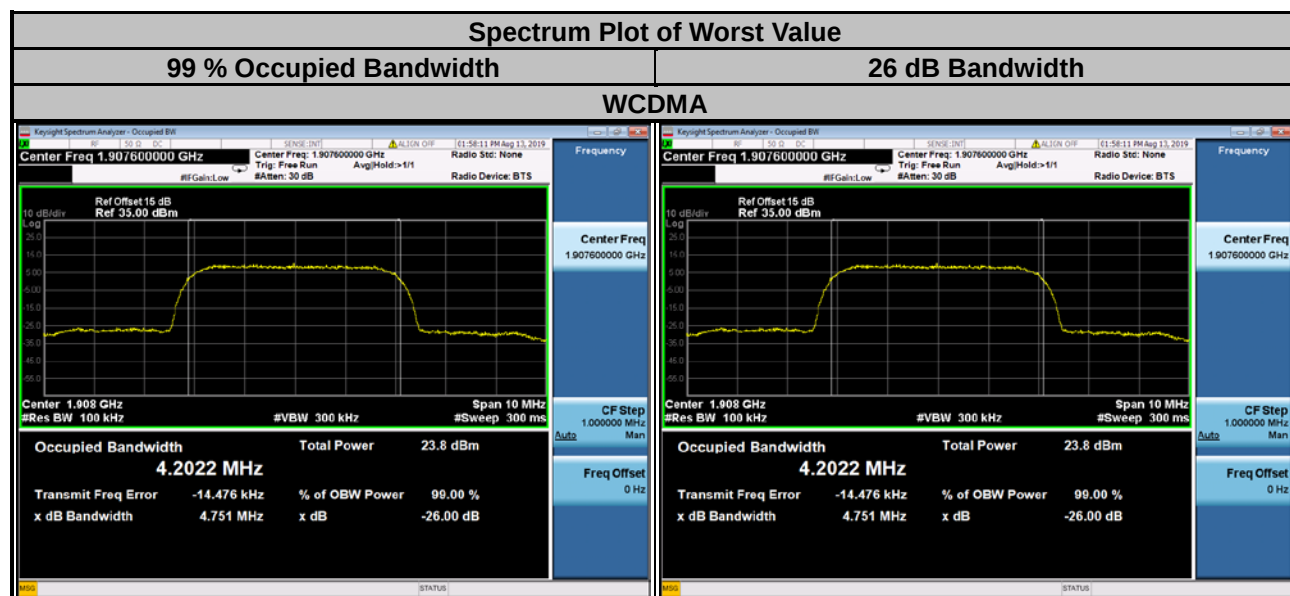


4.4.3 Test Result

GSM				EDGE			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (kHz)	26 dB Bandwidth (kHz)	Channel	Frequency (MHz)	99 % Occupied Bandwidth (kHz)	26 dB Bandwidth (kHz)
512	1850.2	248.51	319.30	512	1850.2	248.23	316.30
661	1880.0	246.22	310.50	661	1880.0	245.37	312.10
810	1909.8	247.20	316.40	810	1909.8	246.63	315.20



WCDMA			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
9262	1852.4	4.1820	4.7310
9400	1880.0	4.1942	4.7410
9538	1907.6	4.2022	4.7510



LTE Band 2

Channel Bandwidth: 1.4 MHz

Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)			26 dB Bandwidth (MHz)		
		QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
18607	1850.7	1.0859	1.0873	1.0892	1.2420	1.2600	1.2530
18900	1880.0	1.0869	1.0895	1.0888	1.2450	1.2540	1.2580
19193	1909.3	1.0872	1.0897	1.0899	1.2450	1.2580	1.2680

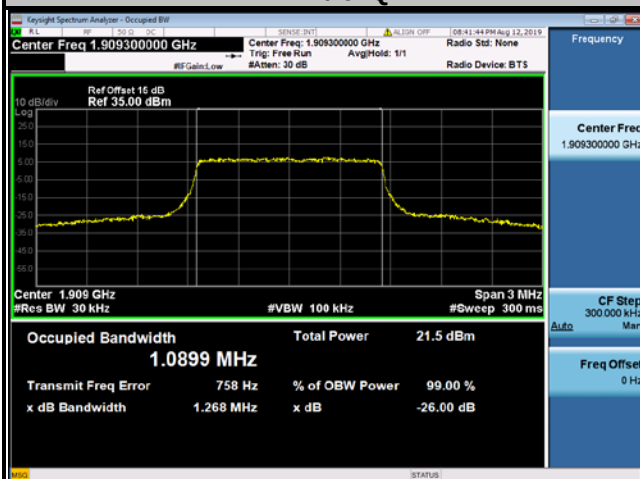
Channel Bandwidth: 3 MHz

Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)			26 dB Bandwidth (MHz)		
		QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
18615	1851.5	2.6968	2.6931	2.6933	2.8730	2.8740	2.8670
18900	1880.0	2.6977	2.6954	2.6941	2.8740	2.8760	2.8640
19185	1908.5	2.6995	2.6949	2.6944	2.8710	2.8810	2.8700

Spectrum Plot of Worst Value

99 % Occupied Bandwidth

1.4 MHz / 64QAM

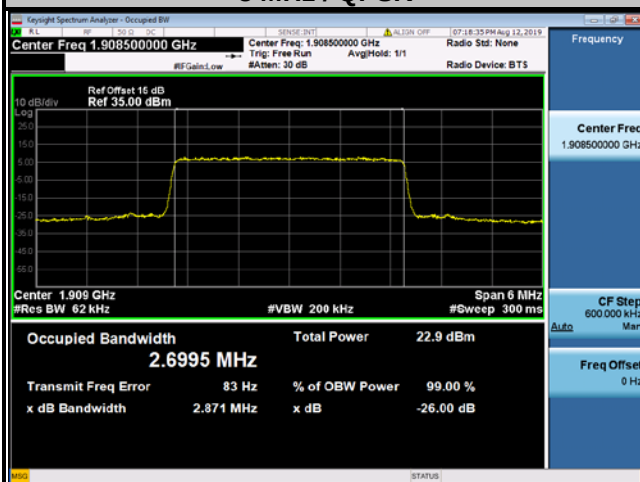


26 dB Bandwidth

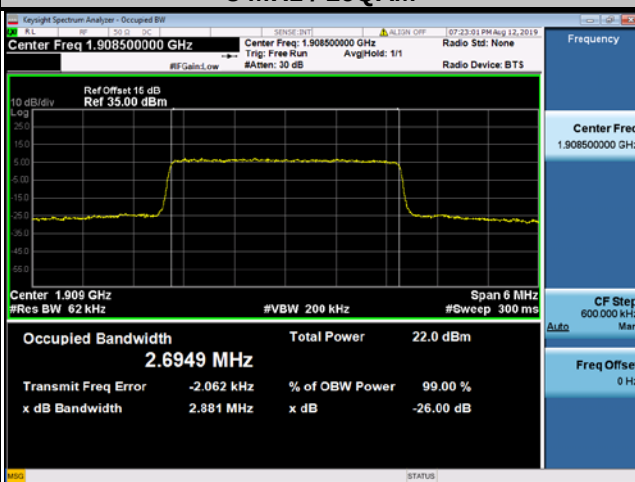
1.4 MHz / QPSK



3 MHz / QPSK



3 MHz / 16QAM



LTE Band 2

Channel Bandwidth: 5 MHz

Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)			26 dB Bandwidth (MHz)		
		QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
18625	1852.5	4.4900	4.4923	4.5026	4.7800	4.7740	4.7820
18900	1880.0	4.4922	4.4935	4.5034	4.7670	4.7830	4.7970
19175	1907.5	4.4942	4.4981	4.5064	4.7670	4.7900	4.7770

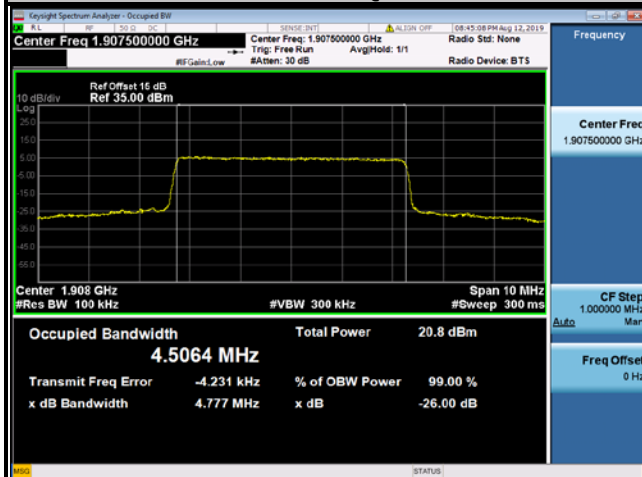
Channel Bandwidth: 10 MHz

Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)			26 dB Bandwidth (MHz)		
		QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
18650	1855.0	8.9798	8.9860	8.9890	9.4870	9.4920	9.5090
18900	1880.0	8.9839	8.9862	8.9882	9.4850	9.5140	9.5370
19150	1905.0	8.9752	8.9777	8.9812	9.4770	9.4980	9.5130

Spectrum Plot of Worst Value

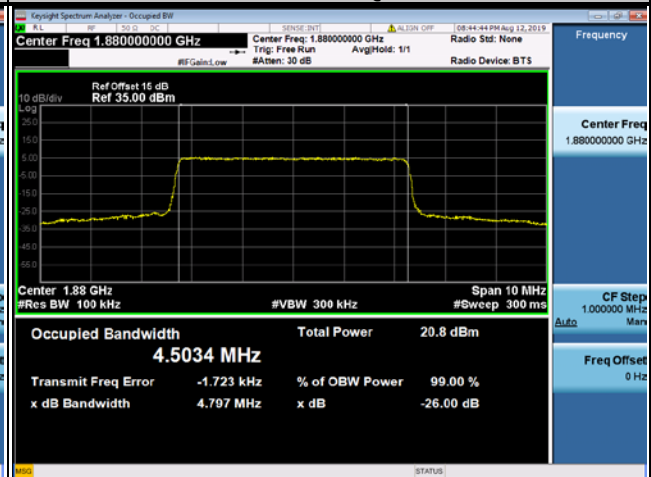
99 % Occupied Bandwidth

5 MHz / 64QAM

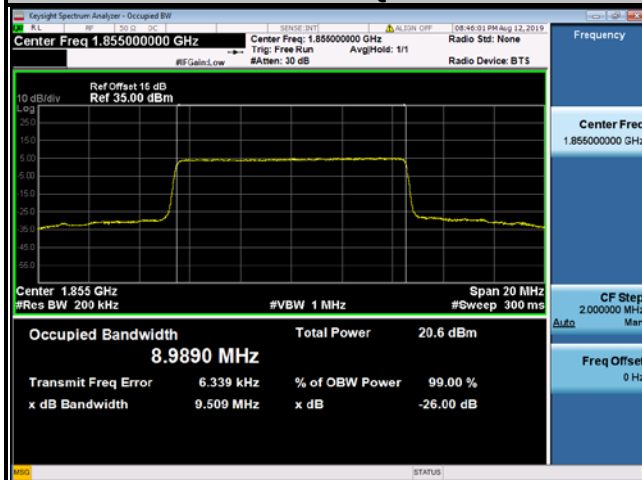


26 dB Bandwidth

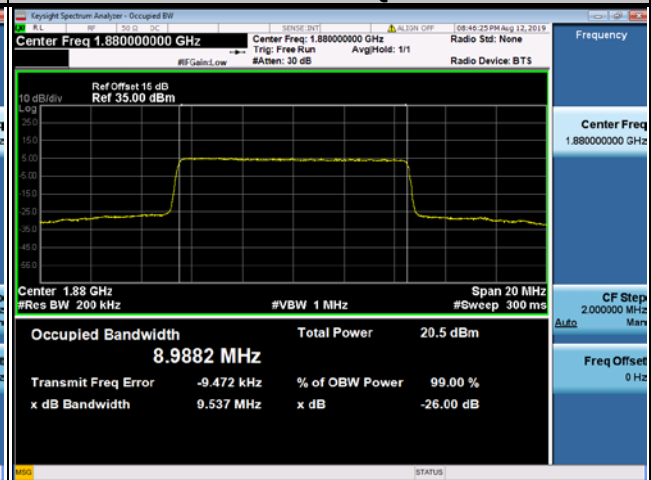
5 MHz / 64QAM



10 MHz / 64QAM



10 MHz / 64QAM



LTE Band 2

Channel Bandwidth: 15 MHz

Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)			26 dB Bandwidth (MHz)		
		QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
18675	1857.5	13.466	13.449	13.450	14.240	14.220	14.220
18900	1880.0	13.495	13.482	13.474	14.250	14.260	14.240
19125	1902.5	13.447	13.438	13.437	14.220	14.230	14.220

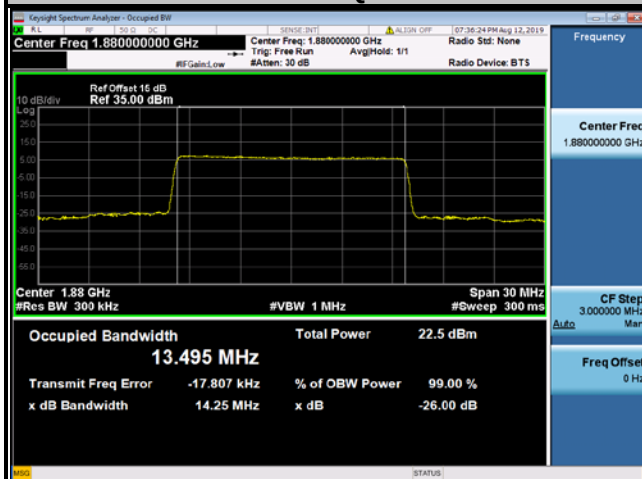
Channel Bandwidth: 20 MHz

Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)			26 dB Bandwidth (MHz)		
		QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
18700	1860.0	17.912	17.925	17.936	19.020	19.010	19.020
18900	1880.0	17.980	18.004	17.991	19.010	19.050	19.040
19100	1900.0	17.884	17.899	17.904	18.990	19.020	19.010

Spectrum Plot of Worst Value

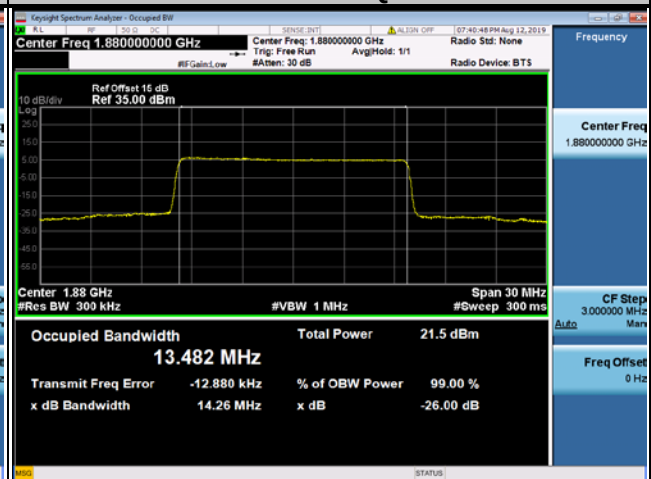
99 % Occupied Bandwidth

15 MHz / QPSK

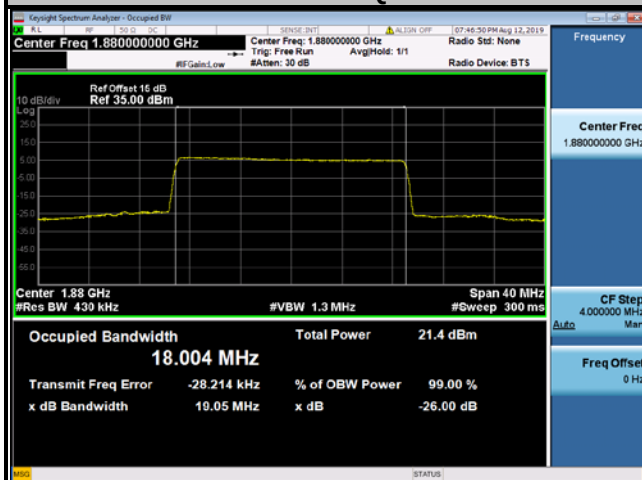


26 dB Bandwidth

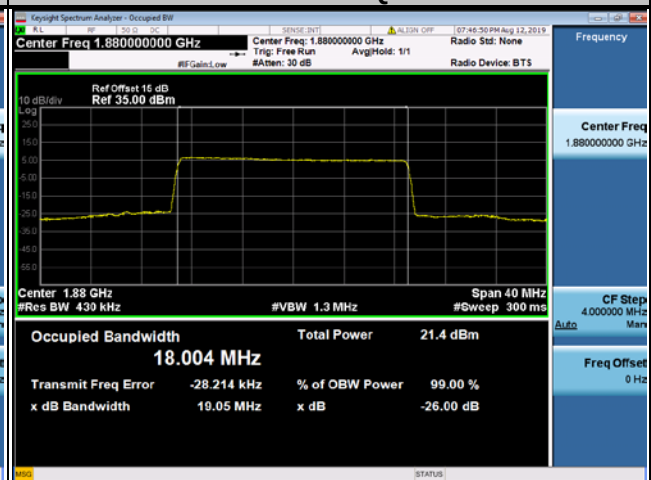
15 MHz / 16QAM



20 MHz / 16QAM



20 MHz / 16QAM

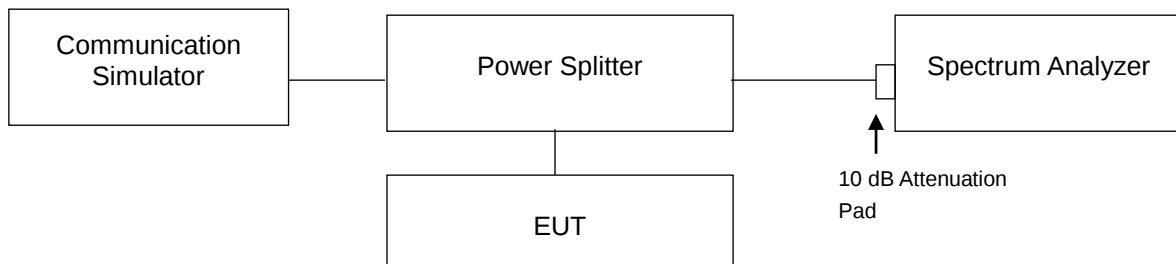


4.5 Band Edge Measurement

4.5.1 Limits of Band Edge Measurement

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

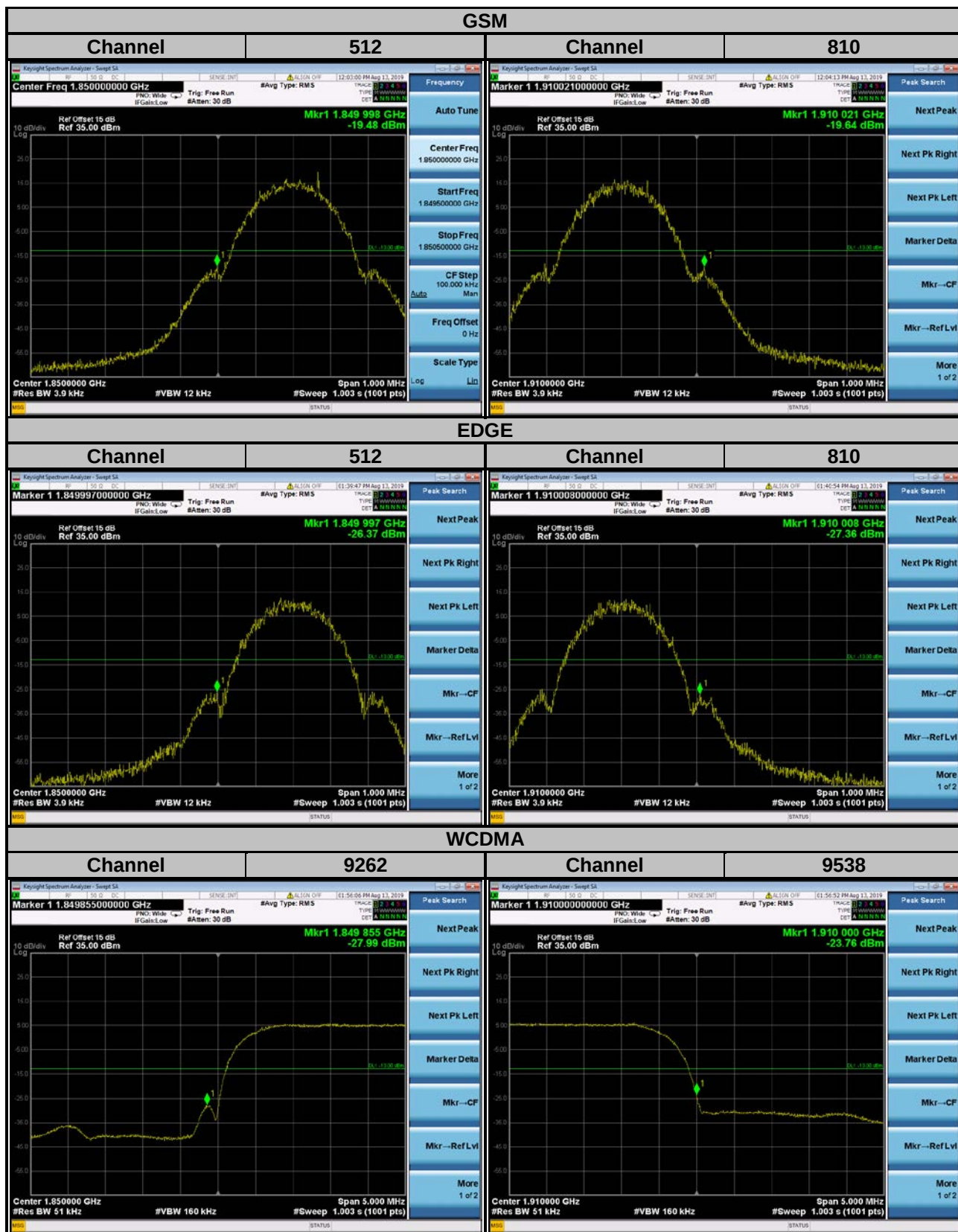
4.5.2 Test Setup



4.5.3 Test Procedures

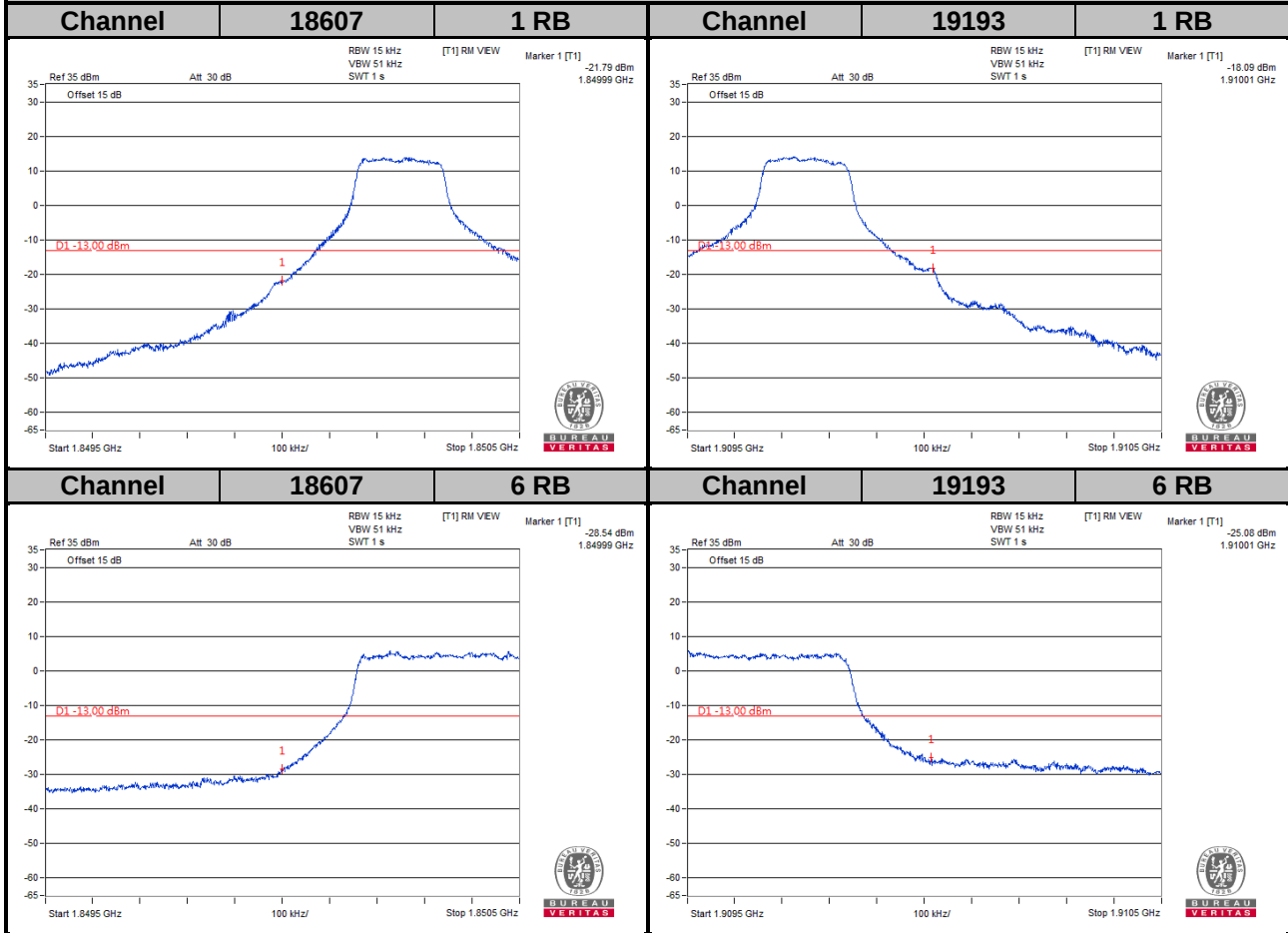
- All measurements were done at low and high operational frequency range.
- The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 3.9 kHz and VB of the spectrum is 12 kHz (GSM/GPRS/EDGE).
- The center frequency of spectrum is the band edge frequency and span is 5 MHz. RB of the spectrum is 51 kHz and VB of the spectrum is 160 kHz (WCDMA).
- 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).
- 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).
- 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).
- 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).
- 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).
- 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).
- Record the max trace plot into the test report.

4.5.4 Test Results



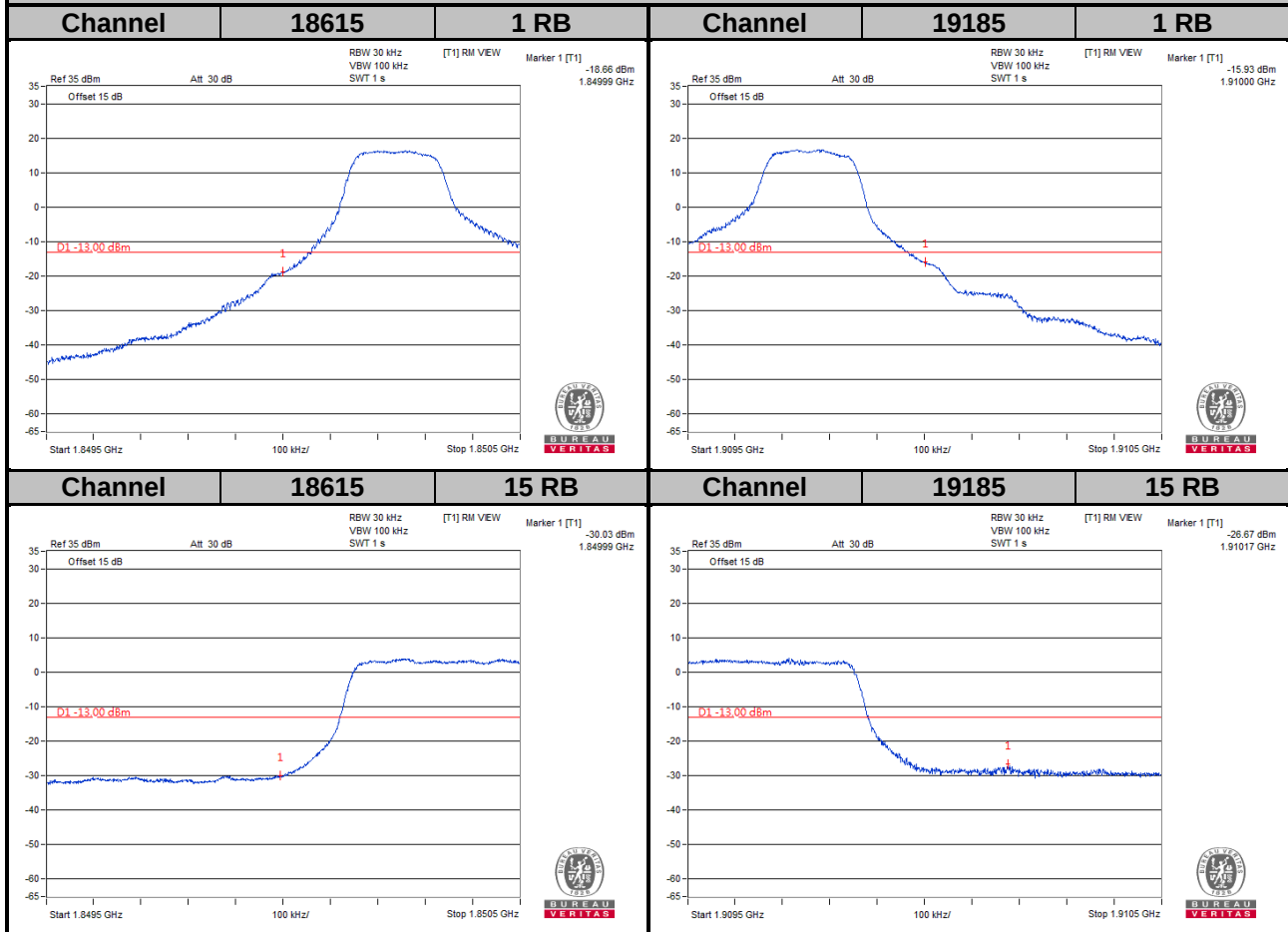
LTE Band 2

Channel Bandwidth: 1.4 MHz



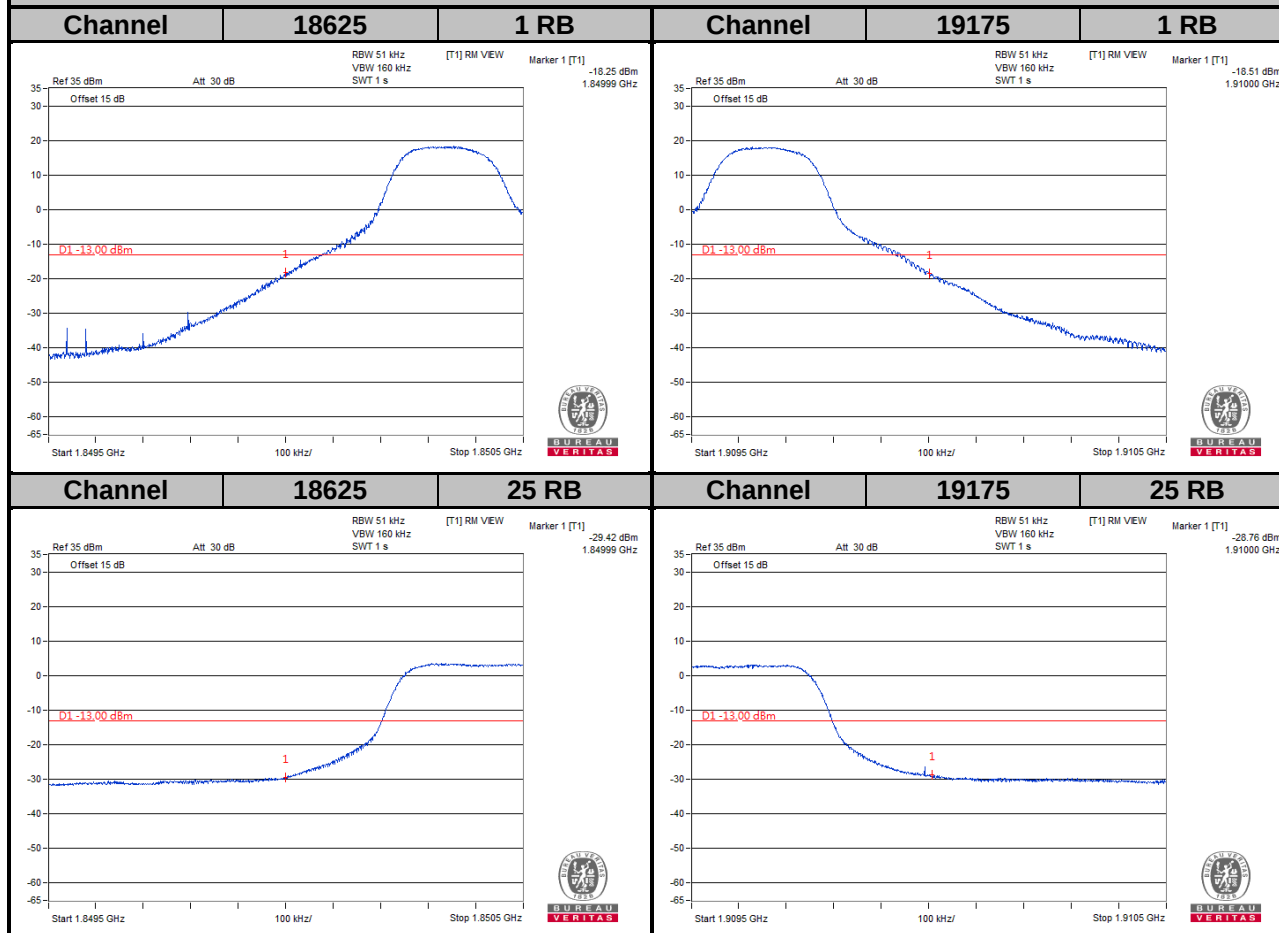
LTE Band 2

Channel Bandwidth: 3 MHz



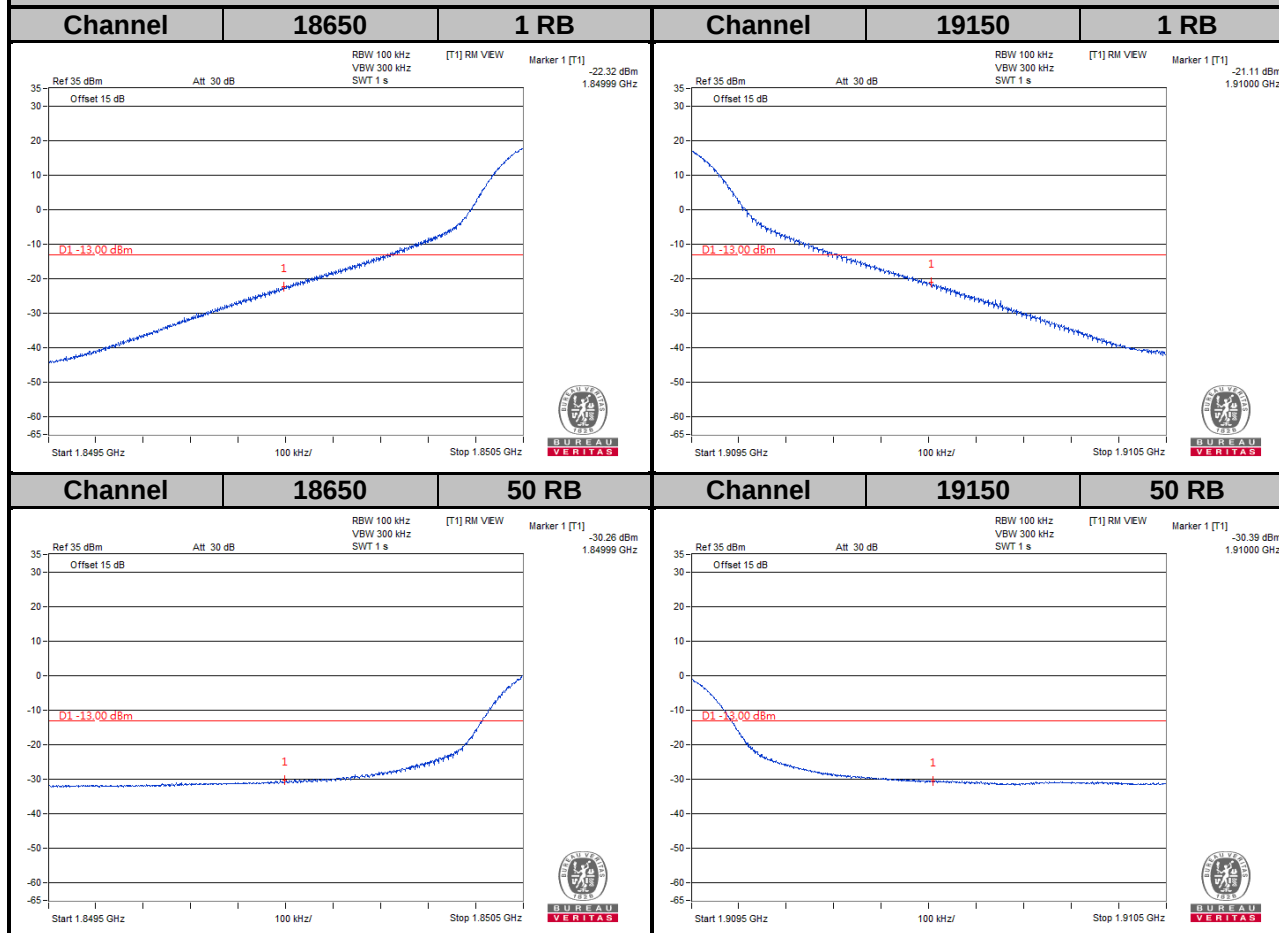
LTE Band 2

Channel Bandwidth: 5 MHz



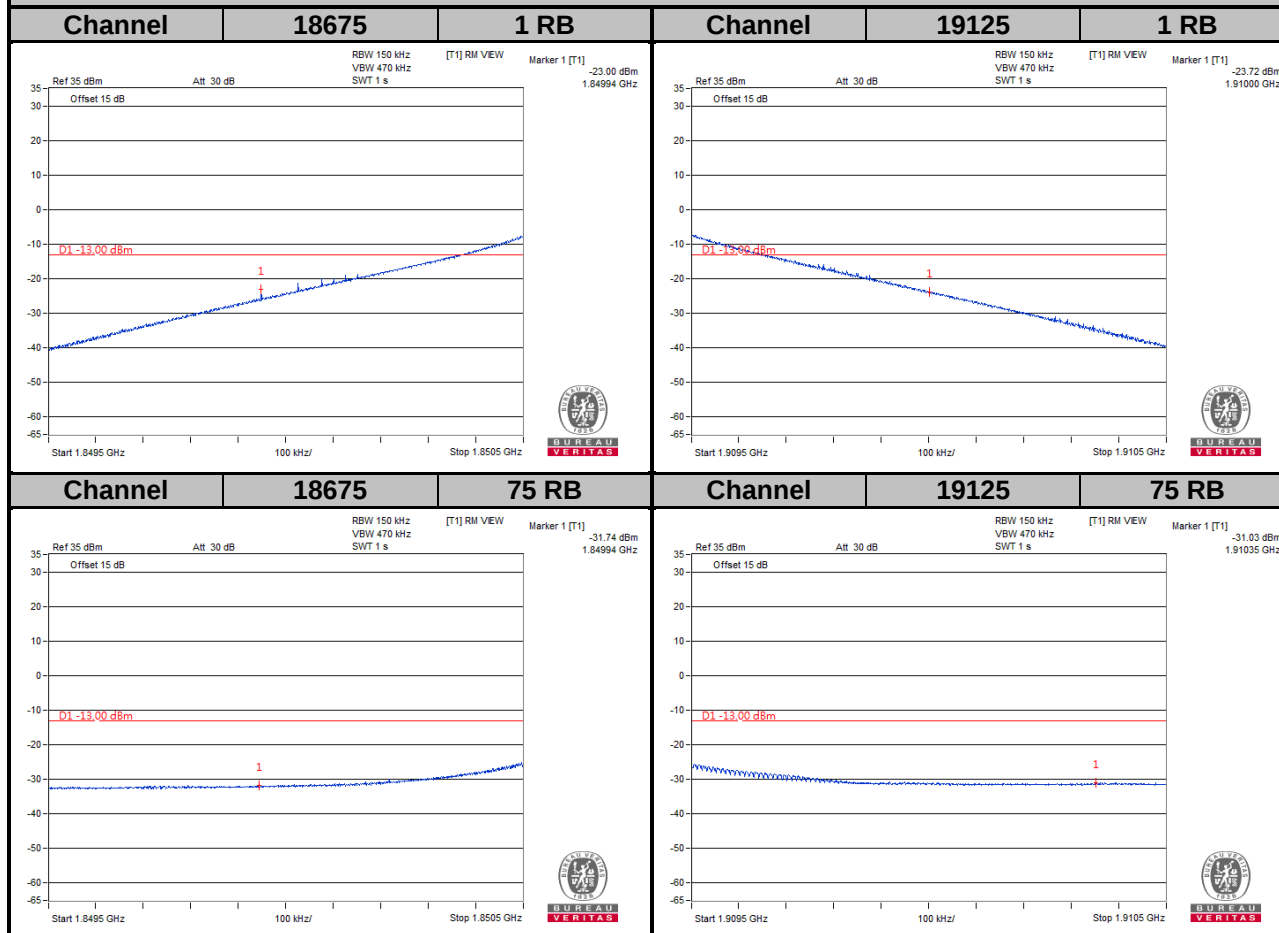
LTE Band 2

Channel Bandwidth: 10 MHz



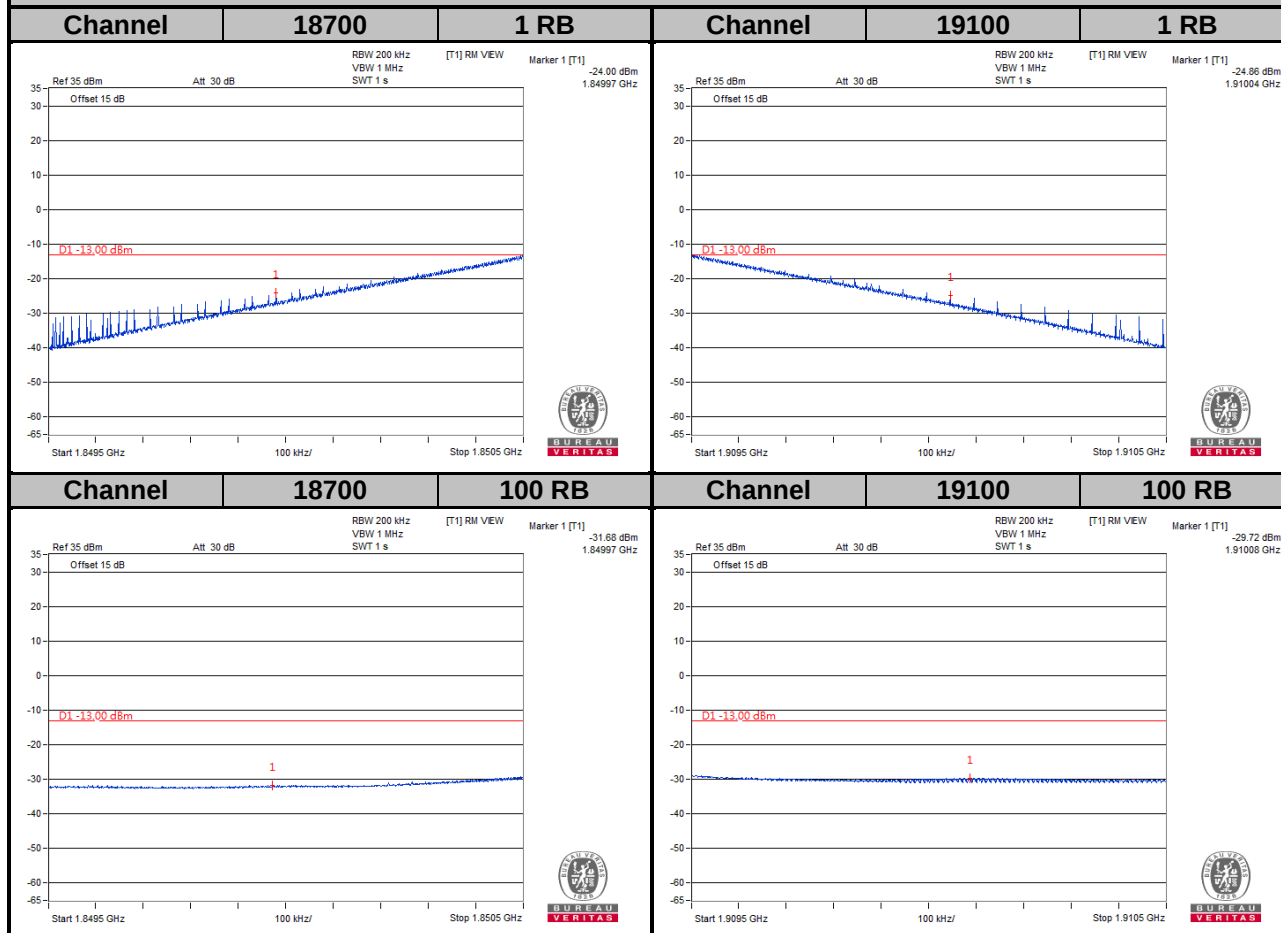
LTE Band 2

Channel Bandwidth: 15 MHz



LTE Band 2

Channel Bandwidth: 20 MHz

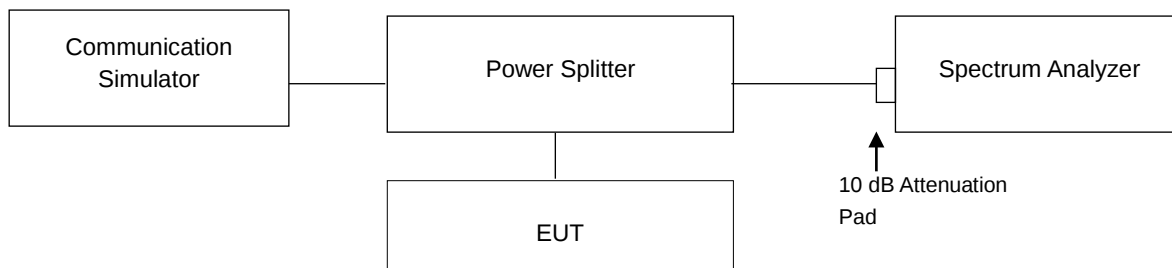


4.6 Peak to Average Ratio

4.6.1 Limits of Peak to Average Ratio Measurement

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

4.6.2 Test Setup

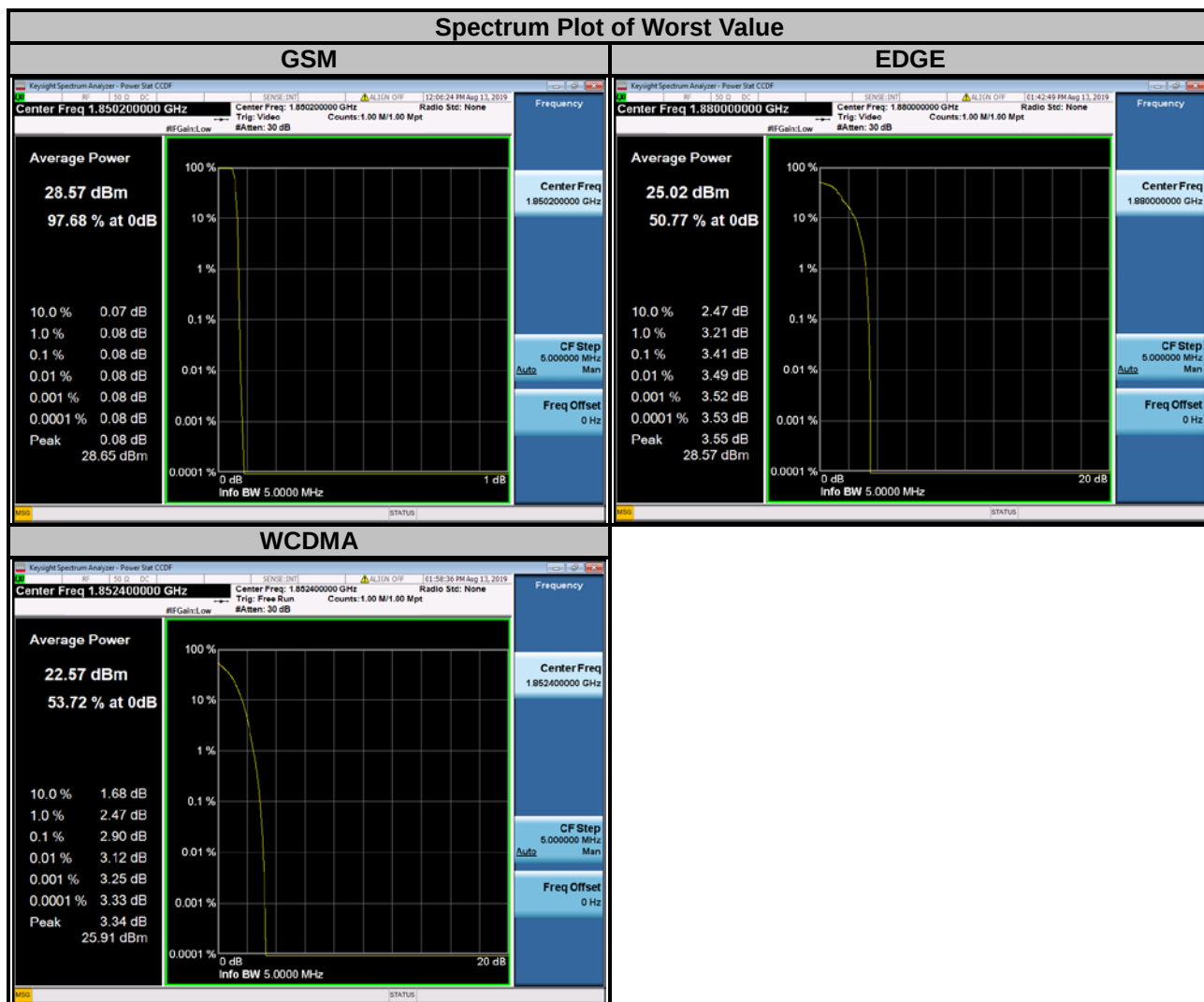


4.6.3 Test Procedures

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

4.6.4 Test Results

Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)
		GSM	EDGE			WCDMA
512	1850.2	0.08	3.39	9262	1852.4	2.90
661	1880.0	0.08	3.41	9400	1880.0	2.74
810	1909.8	0.08	3.39	9538	1907.6	2.53

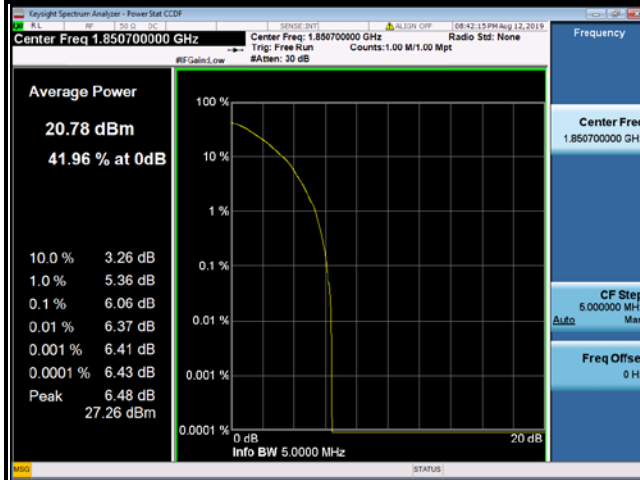


LTE Band 2

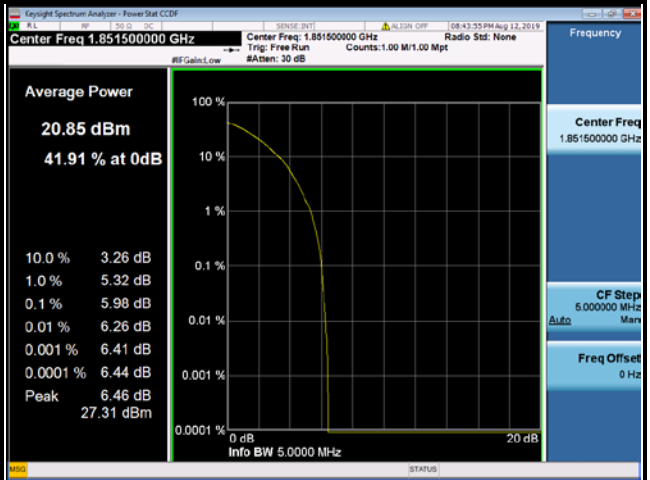
Channel Bandwidth: 1.4 MHz					Channel Bandwidth: 3 MHz				
Channel	Frequency (MHz)	Peak to Average Ratio (dB)			Channel	Frequency (MHz)	Peak to Average Ratio (dB)		
		QPSK	16QAM	64QAM			QPSK	16QAM	64QAM
18607	1850.7	4.67	5.48	6.06	18615	1851.5	4.42	5.23	5.98
18900	1880.0	4.09	4.95	5.61	18900	1880.0	3.86	4.80	5.58
19193	1909.3	3.56	4.35	5.14	19185	1908.5	3.41	4.25	5.19

Spectrum Plot of Worst Value

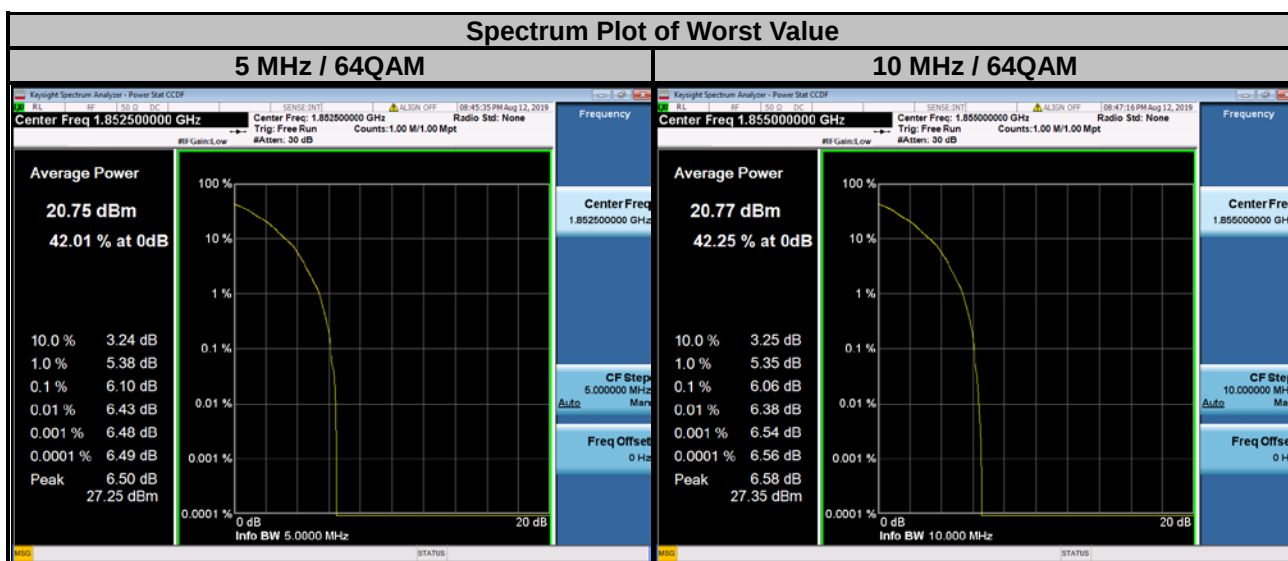
1.4 MHz / 64QAM



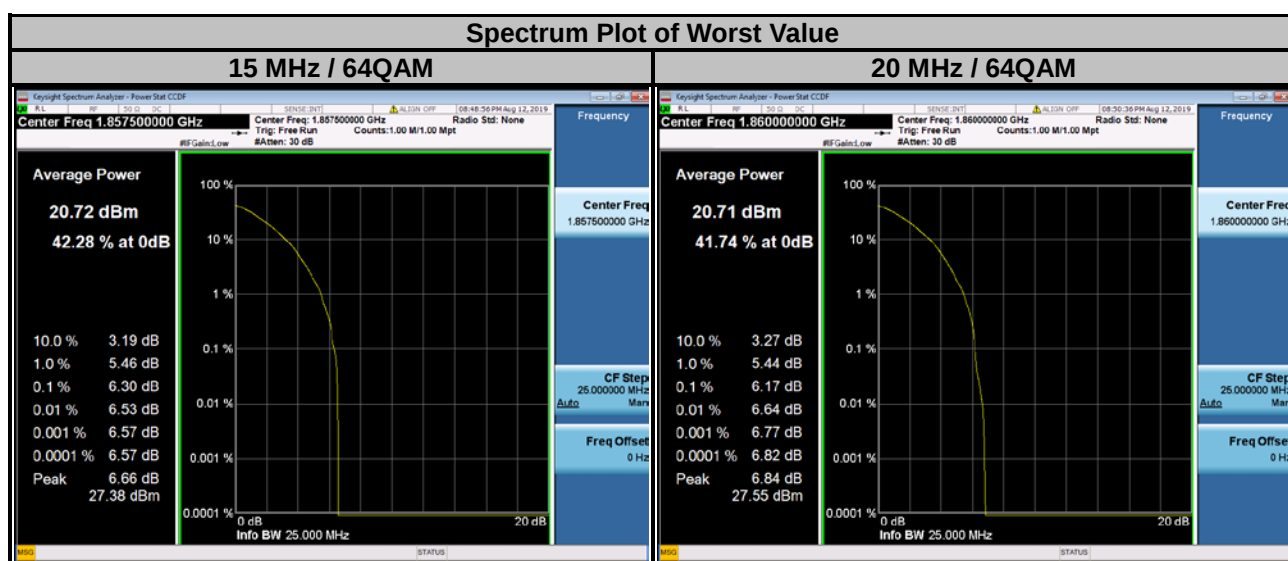
3 MHz / 64QAM



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	64QAM			QPSK	16QAM	64QAM
18625	1852.5	4.38	5.25	6.10	18650	1855.0	4.29	5.20	6.06
18900	1880.0	3.89	4.76	5.70	18900	1880.0	3.89	4.81	5.74
19175	1907.5	3.69	4.59	5.59	19150	1905.0	4.16	5.07	5.95



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	64QAM			QPSK	16QAM	64QAM
18675	1857.5	4.36	5.24	6.30	18700	1860.0	4.45	5.26	6.17
18900	1880.0	4.05	4.88	5.86	18900	1880.0	4.39	5.01	5.89
19125	1902.5	4.42	5.29	6.16	19100	1900.0	4.43	5.14	6.10

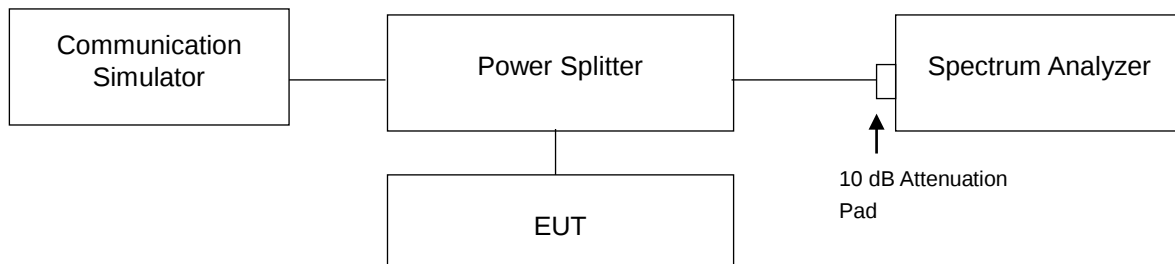


4.7 Conducted Spurious Emissions

4.7.1 Limits of Conducted Spurious Emissions Measurement

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

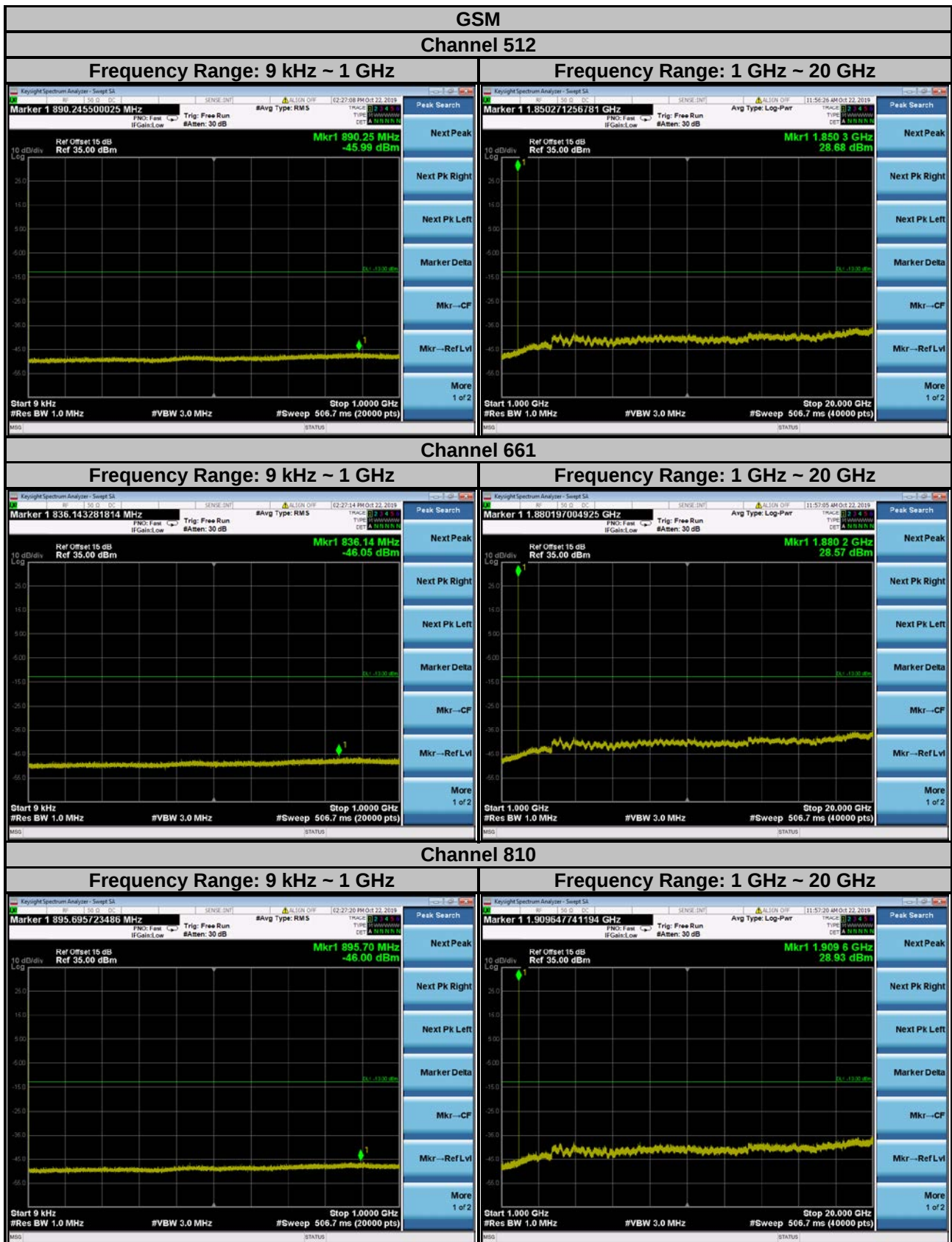
4.7.2 Test Setup



4.7.3 Test Procedure

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

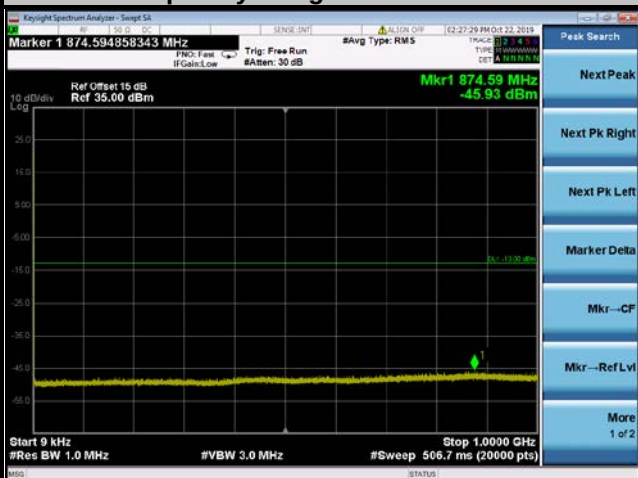


Note: The signal over the limit in 9 kHz is from spectrum analyzer.

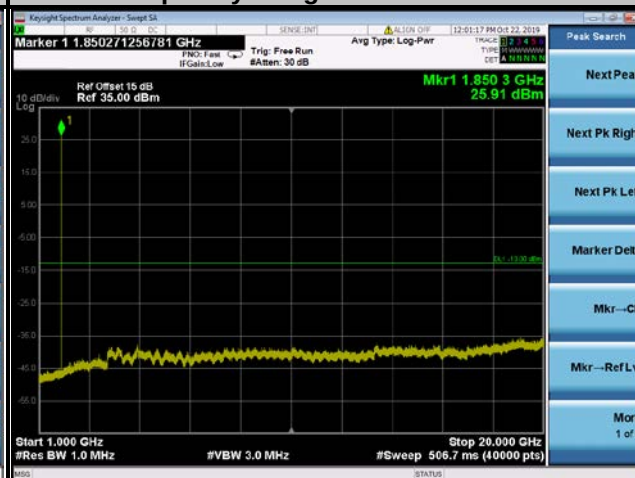
EDGE

Channel 512

Frequency Range: 9 kHz ~ 1 GHz

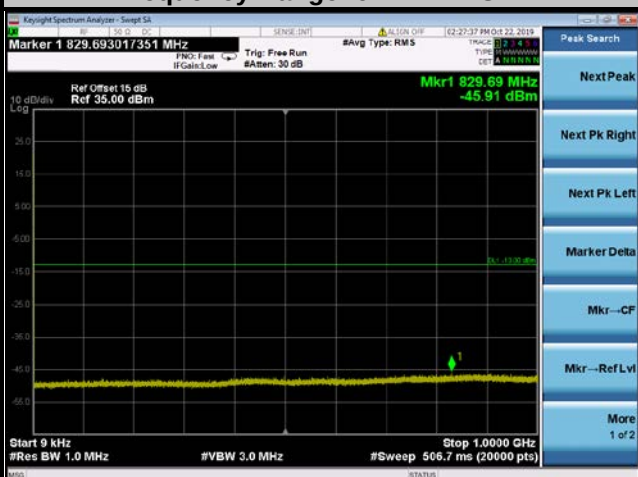


Frequency Range: 1 GHz ~ 20 GHz

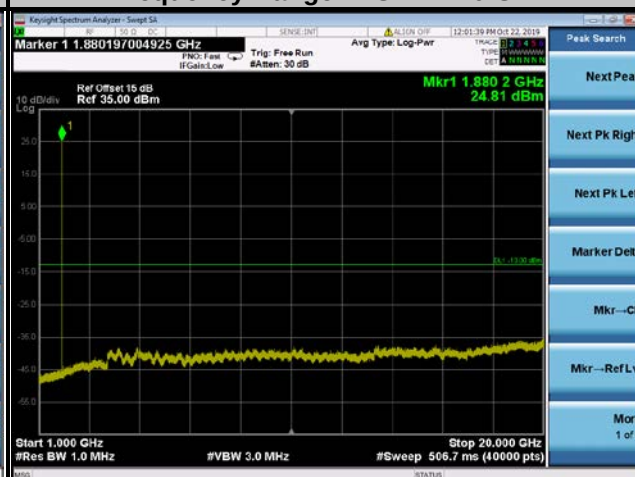


Channel 661

Frequency Range: 9 kHz ~ 1 GHz

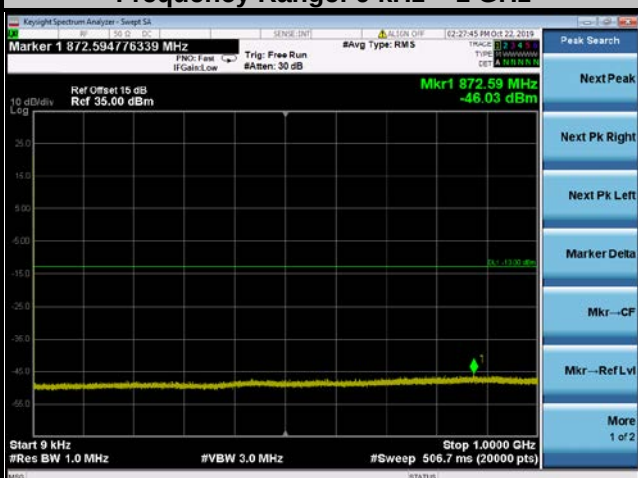


Frequency Range: 1 GHz ~ 20 GHz

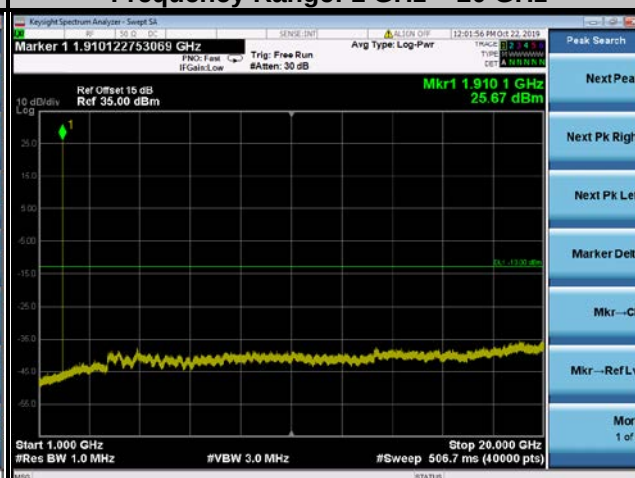


Channel 810

Frequency Range: 9 kHz ~ 1 GHz



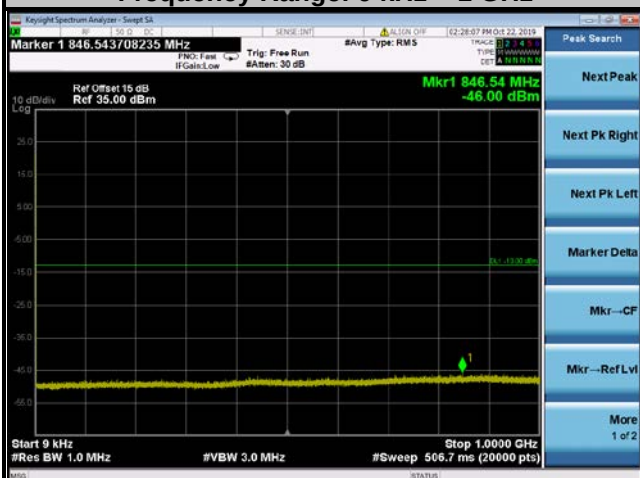
Frequency Range: 1 GHz ~ 20 GHz



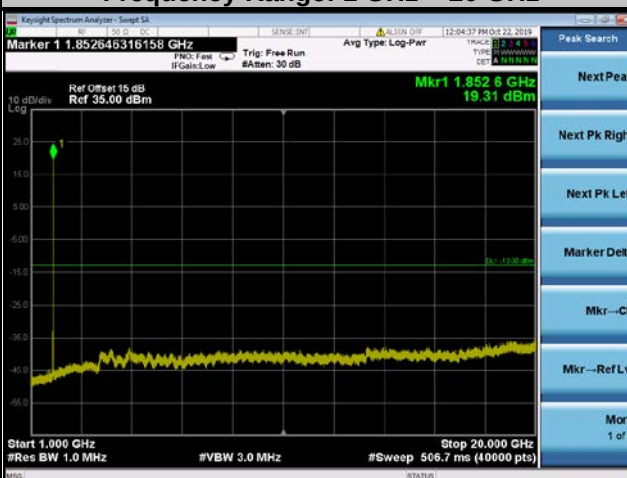
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

WCDMA Channel 9262

Frequency Range: 9 kHz ~ 1 GHz

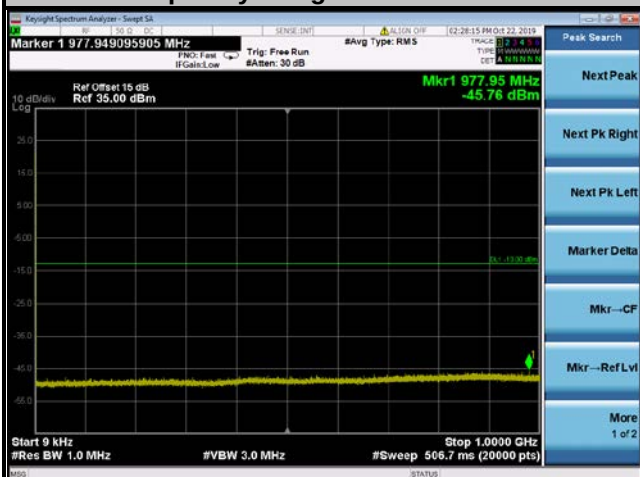


Frequency Range: 1 GHz ~ 20 GHz

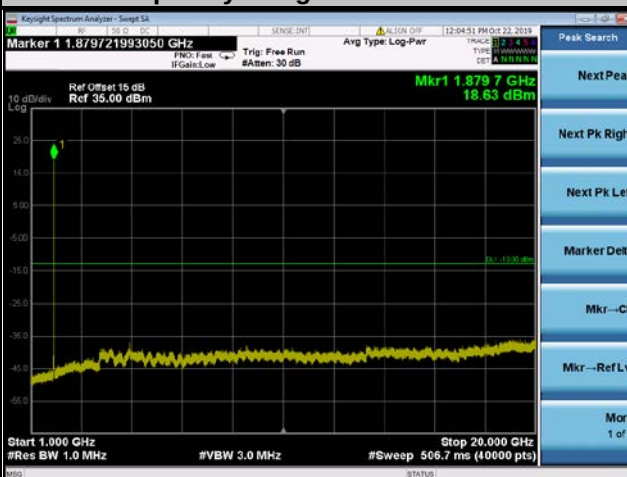


Channel 9400

Frequency Range: 9 kHz ~ 1 GHz

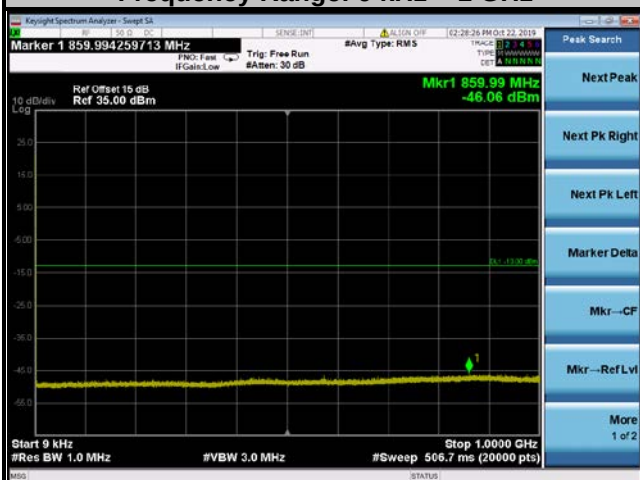


Frequency Range: 1 GHz ~ 20 GHz

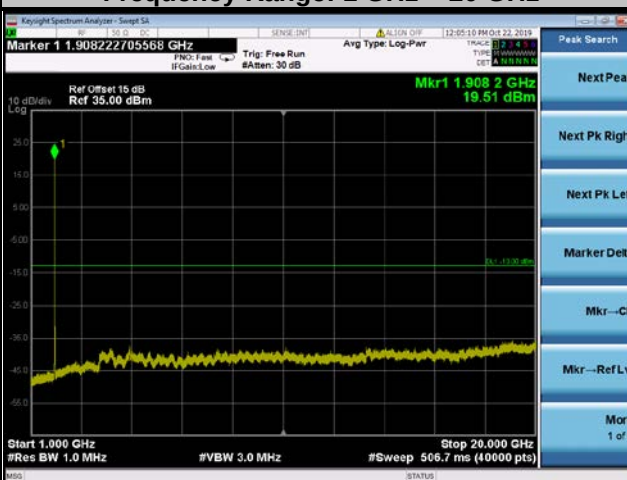


Channel 9538

Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 20 GHz



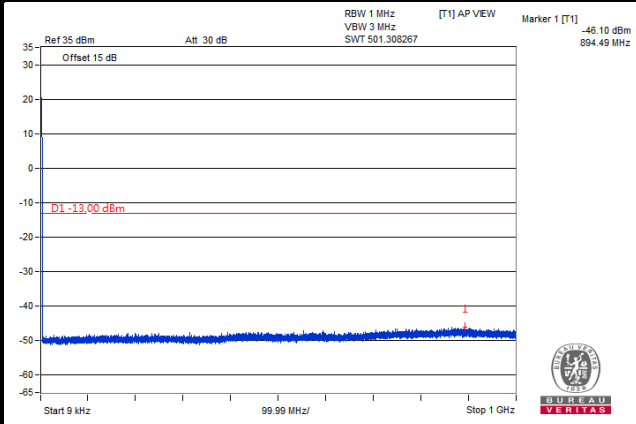
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2

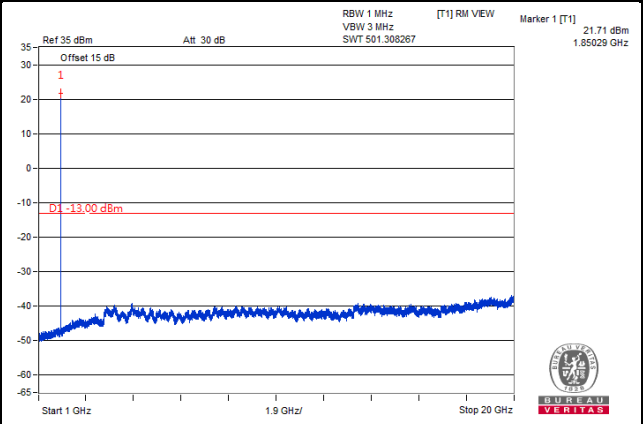
Channel Bandwidth: 1.4 MHz

Channel 18607

Frequency Range: 9 kHz ~ 1 GHz



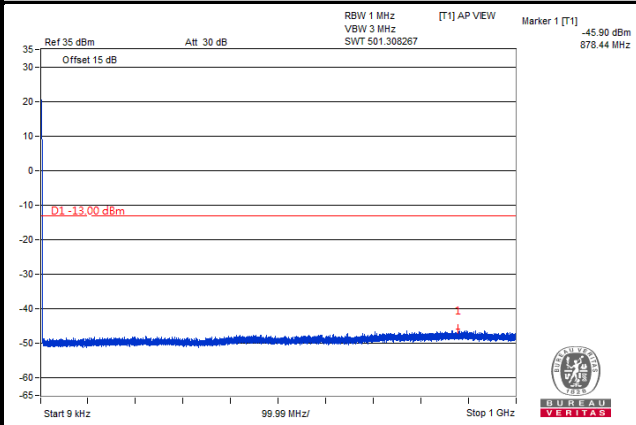
Frequency Range: 1 GHz ~ 20 GHz



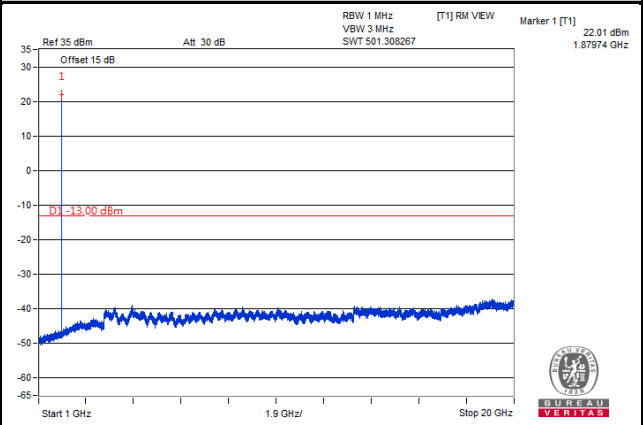
Channel Bandwidth: 1.4 MHz

Channel 18900

Frequency Range: 9 kHz ~ 1 GHz



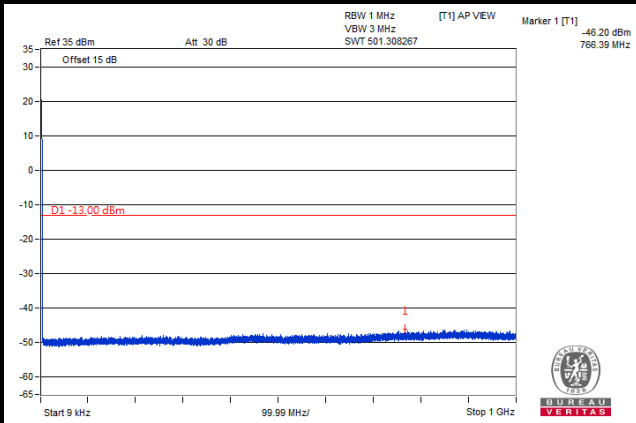
Frequency Range: 1 GHz ~ 20 GHz



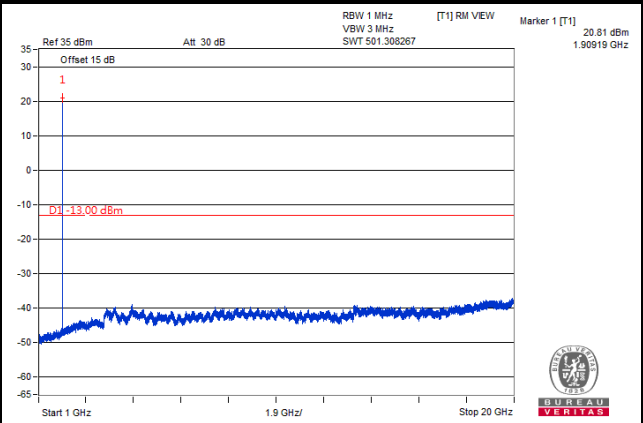
Channel Bandwidth: 1.4 MHz

Channel 19193

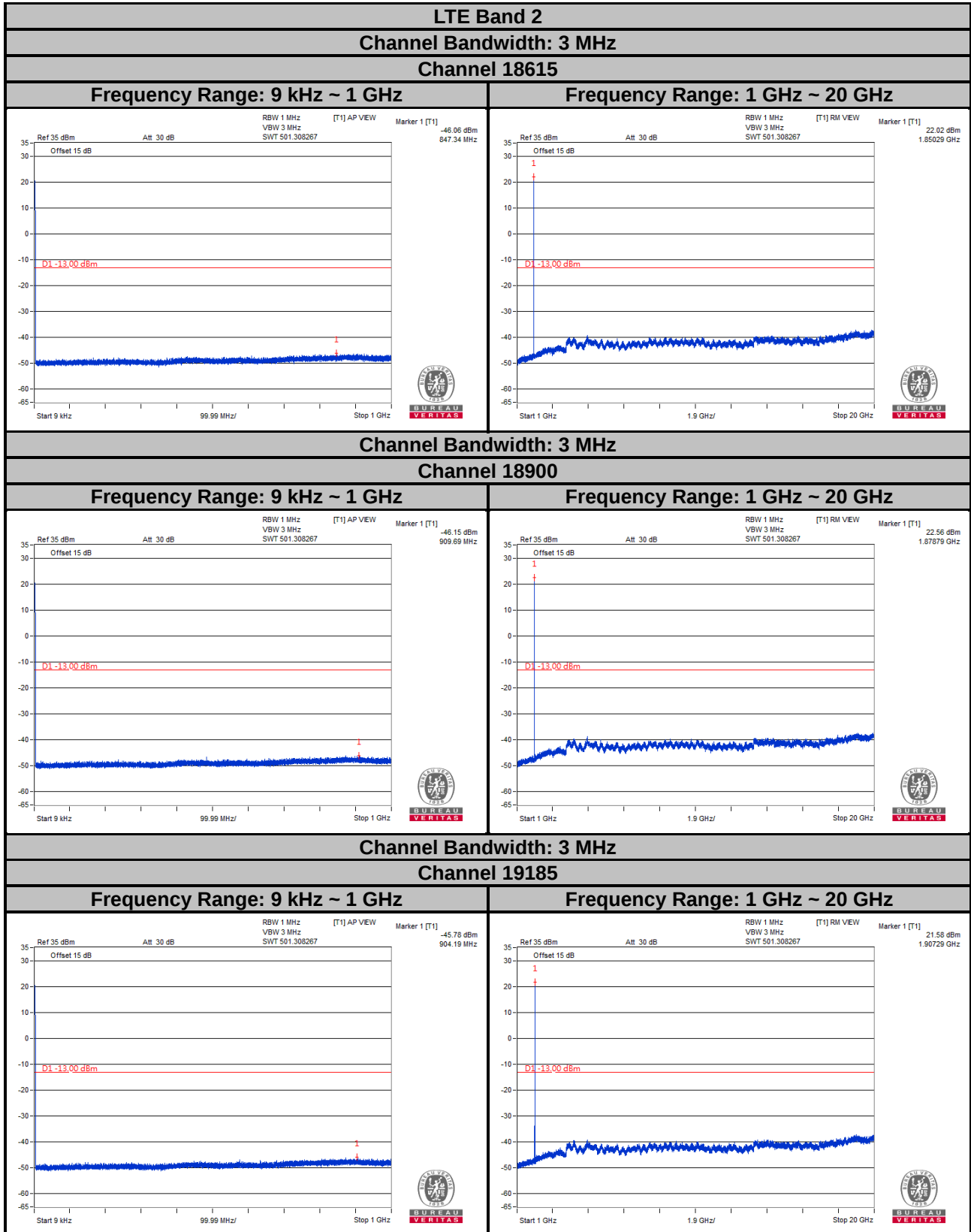
Frequency Range: 9 kHz ~ 1 GHz



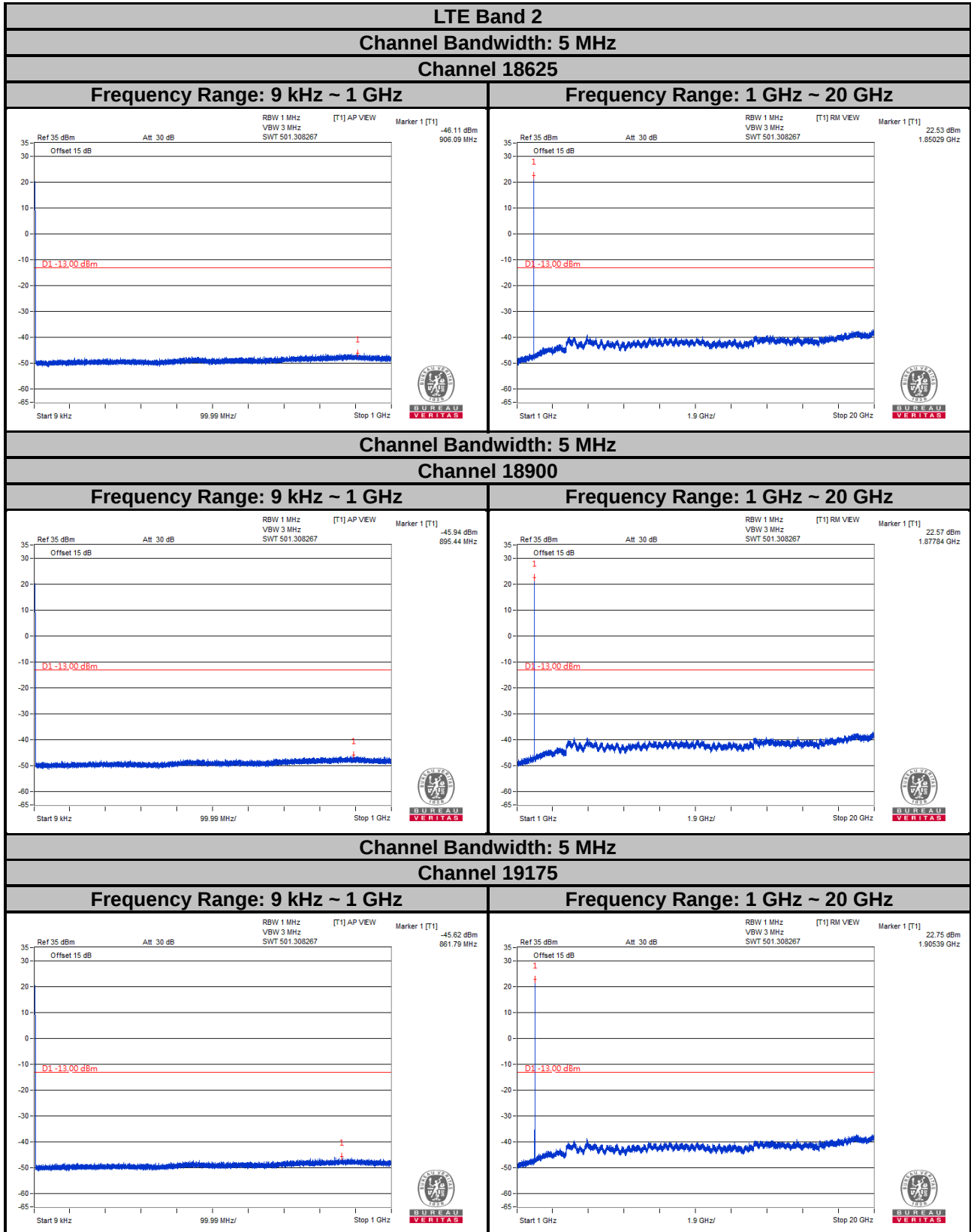
Frequency Range: 1 GHz ~ 20 GHz



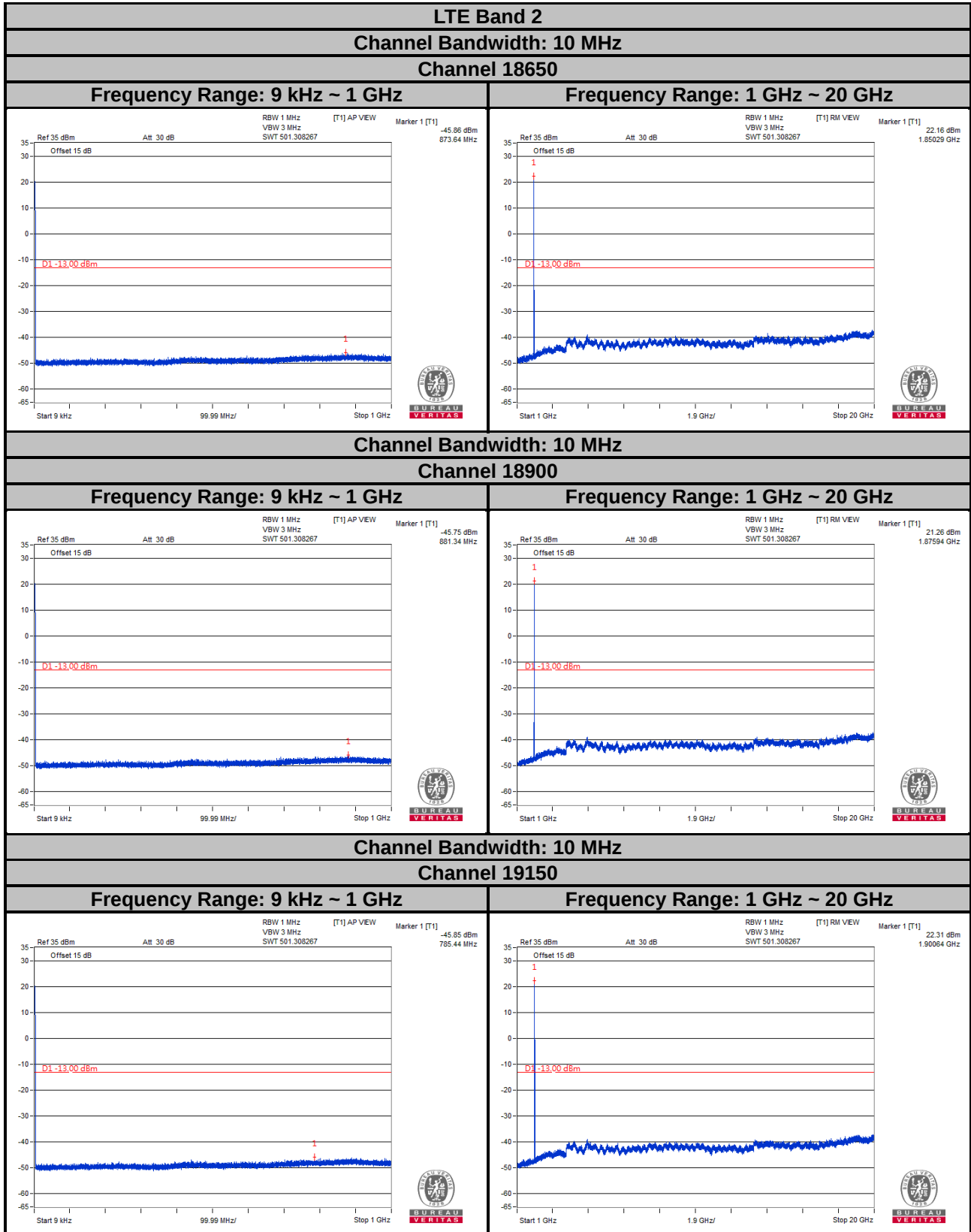
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



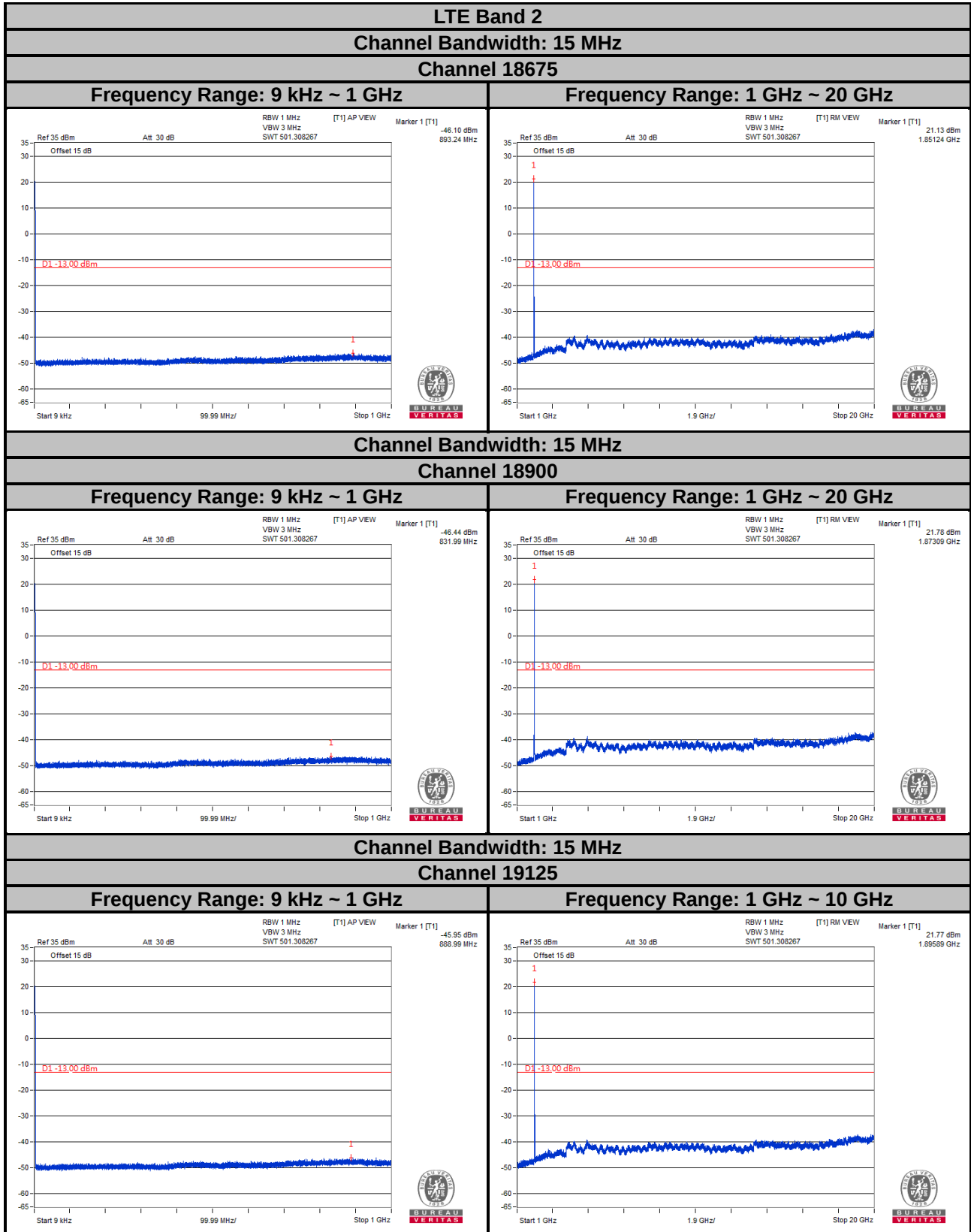
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



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



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



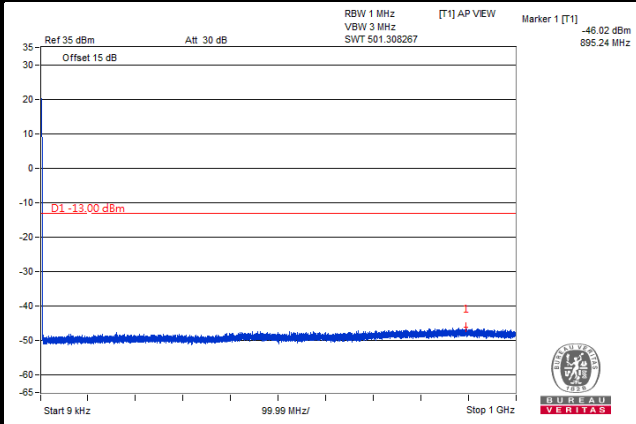
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2

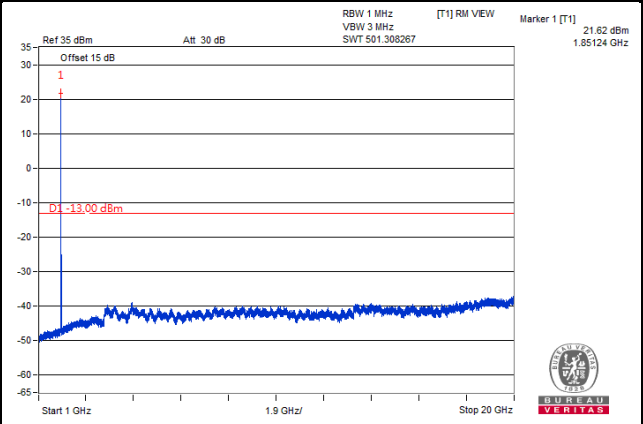
Channel Bandwidth: 20 MHz

Channel 18700

Frequency Range: 9 kHz ~ 1 GHz



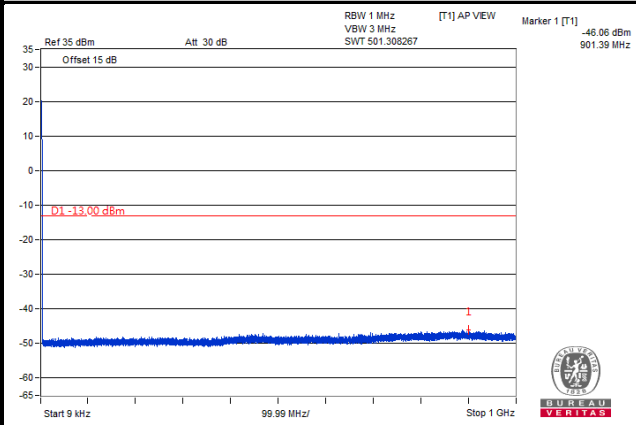
Frequency Range: 1 GHz ~ 20 GHz



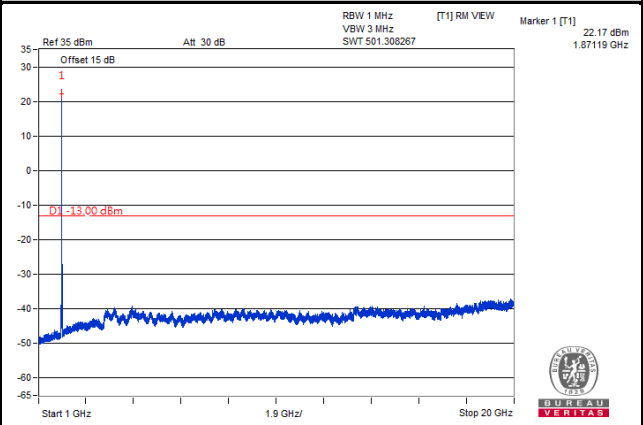
Channel Bandwidth: 20 MHz

Channel 18900

Frequency Range: 9 kHz ~ 1 GHz



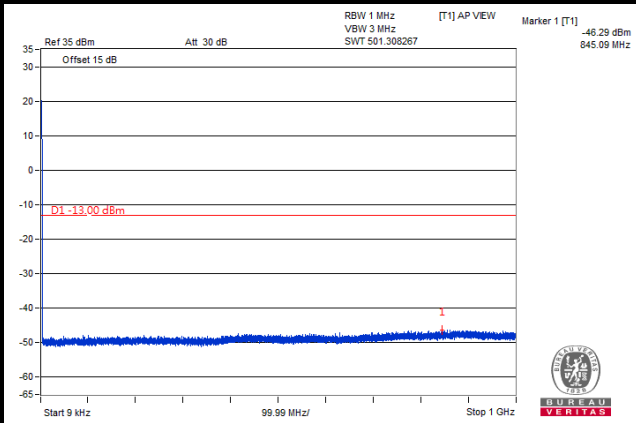
Frequency Range: 1 GHz ~ 10 GHz



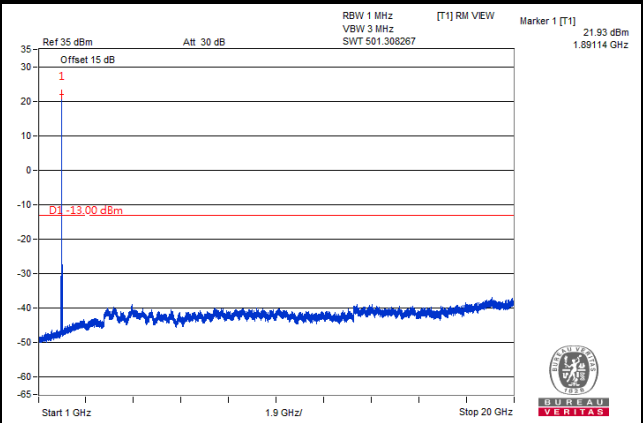
Channel Bandwidth: 20 MHz

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.

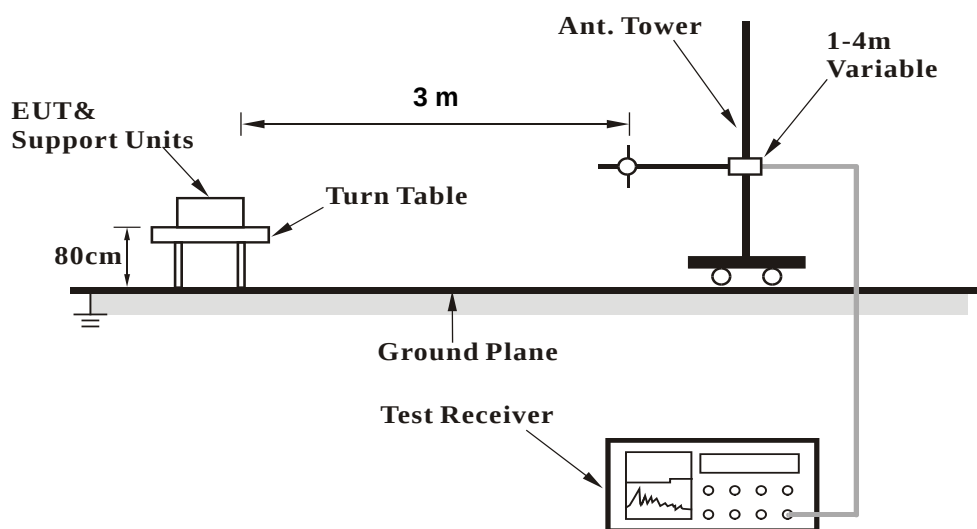
NOTE: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz.

4.8.3 Deviation from Test Standard

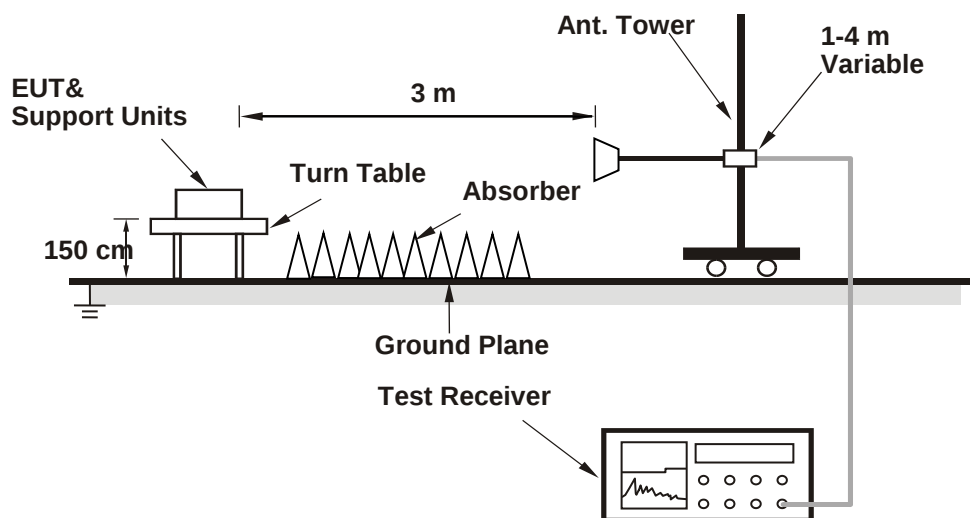
No deviation.

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

GSM:

Low Channel

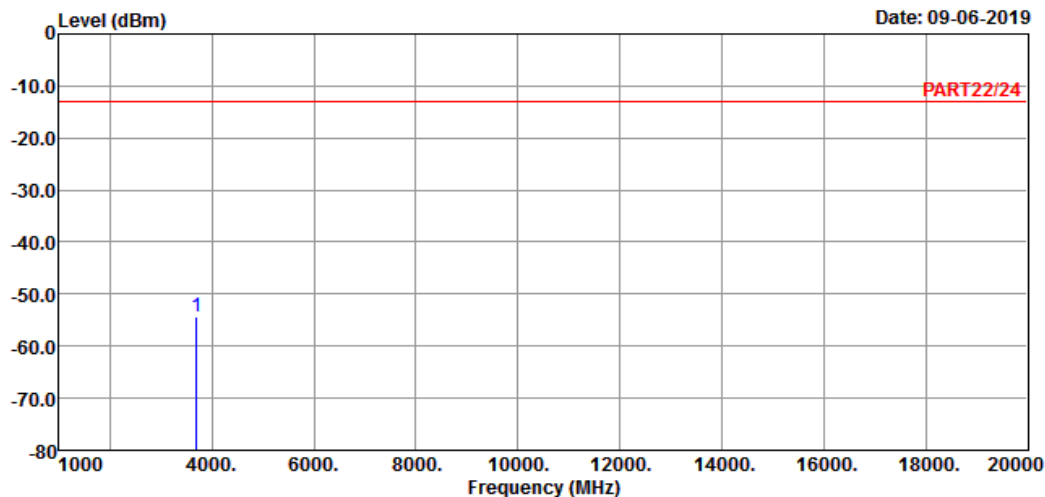


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3

Date: 09-06-2019



Site : 966 Chamber 5

Condition: PART22/24 HORIZONTAL

Remark : PCS 1900 Link_L-CH

Tested by: Thomas Wei

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

1 pp 3700.40 -54.42 -47.49 -13.00 -6.93 -41.42 Peak

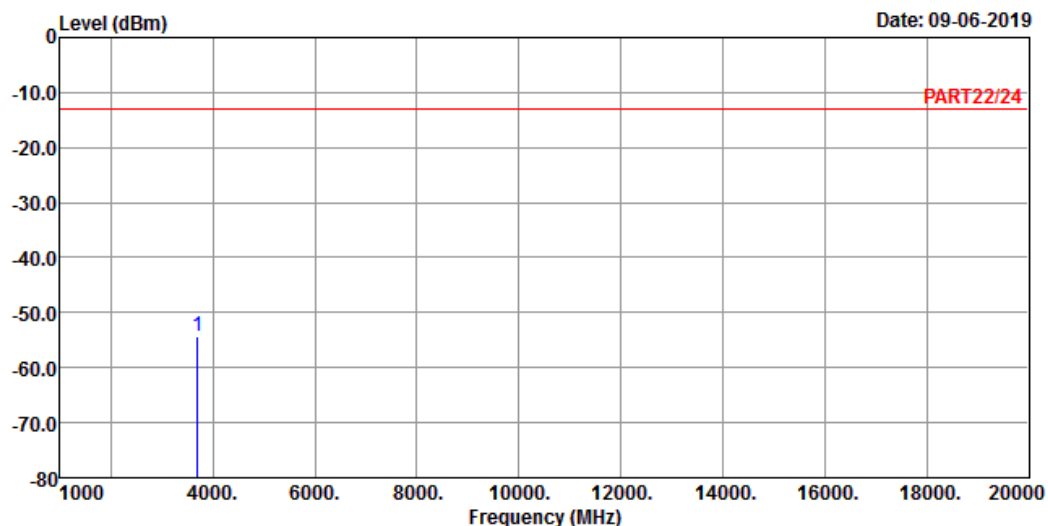


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 09-06-2019



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remark : PCS 1900 Link_L-CH

Tested by: Thomas Wei

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

1 pp 3700.40 -54.33 -47.40 -13.00 -6.93 -41.33 Peak

Middle Channel

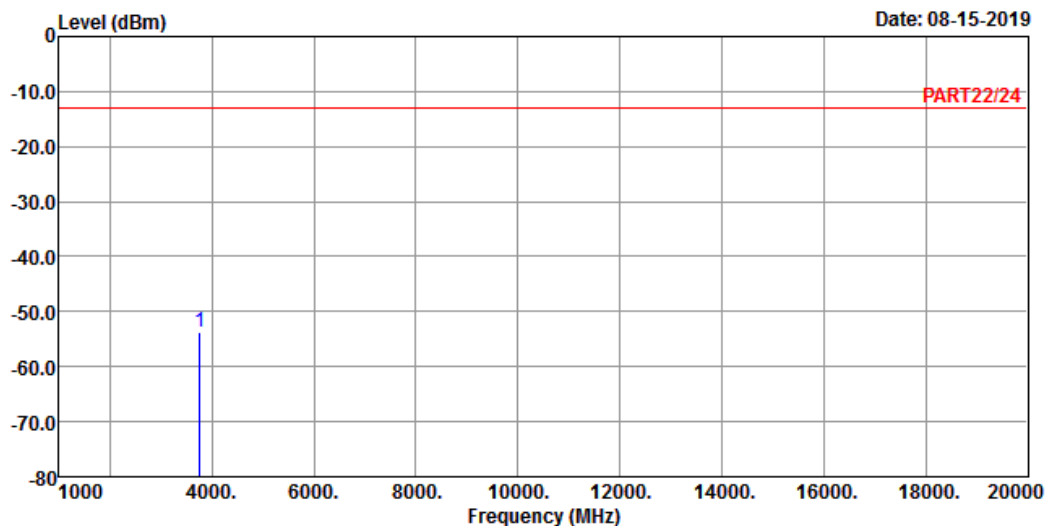


Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

A D T

Data: 3

Date: 08-15-2019



Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remark : PCS 1900 Link_M-CH
Tested by: Thomas Wei

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

1 pp 3760.00 -53.75 -47.10 -13.00 -6.65 -40.75 Peak

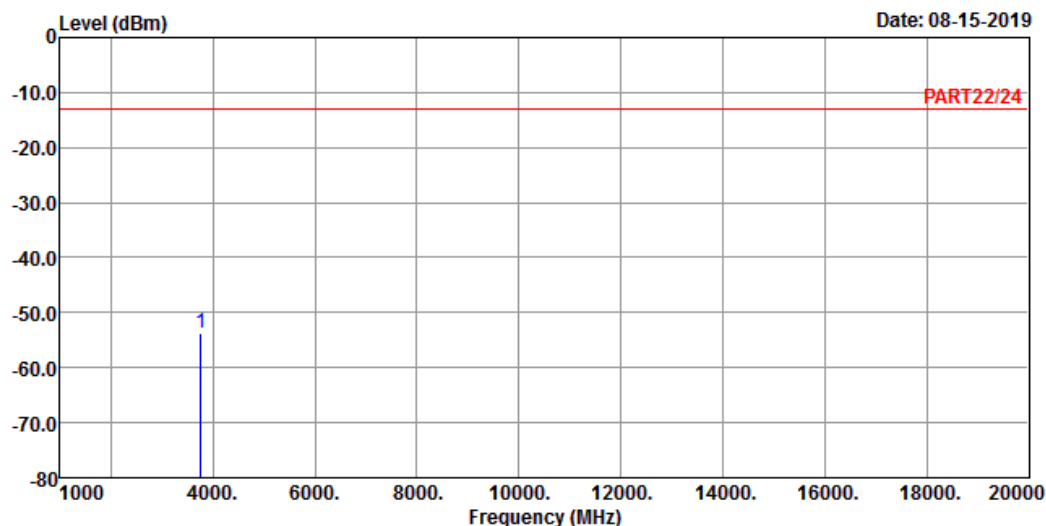


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 08-15-2019



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remark : PCS 1900 Link_M-CH

Tested by: Thomas Wei

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

1 pp 3760.00 -53.76 -47.11 -13.00 -6.65 -40.76 Peak

High Channel

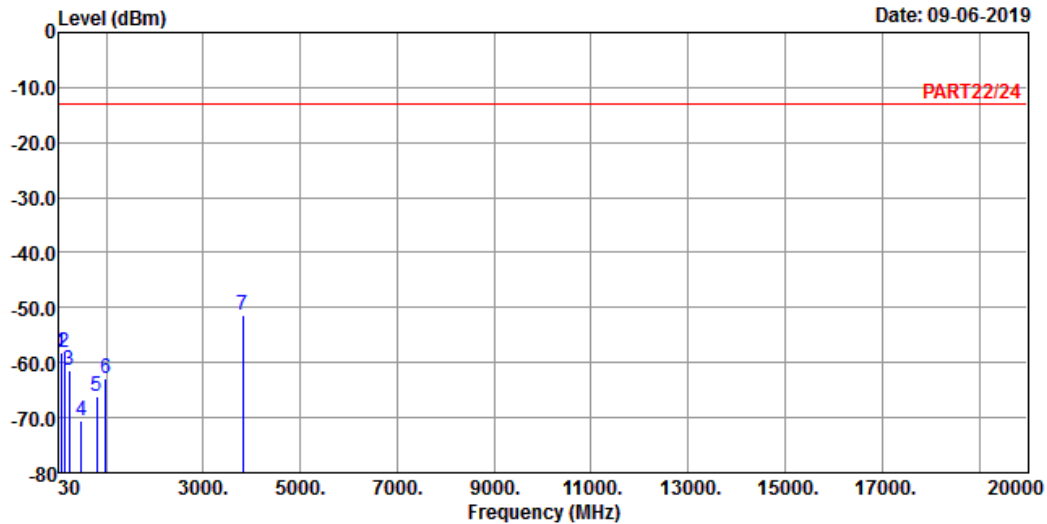


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 09-06-2019



Site : 966 Chamber 5

Condition: PART22/24 HORIZONTAL

Remark : PCS 1900 Link_H-CH

Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	62.98	-58.08	-50.20	-13.00	-7.88	-45.08	Peak
2	133.79	-58.29	-49.61	-13.00	-8.68	-45.29	Peak
3	240.49	-61.39	-55.01	-13.00	-6.38	-48.39	Peak
4	491.72	-70.43	-65.66	-13.00	-4.77	-57.43	Peak
5	810.85	-66.01	-66.65	-13.00	0.64	-53.01	Peak
6	985.45	-62.97	-66.03	-13.00	3.06	-49.97	Peak
7 pp	3819.60	-51.44	-45.04	-13.00	-6.40	-38.44	Peak

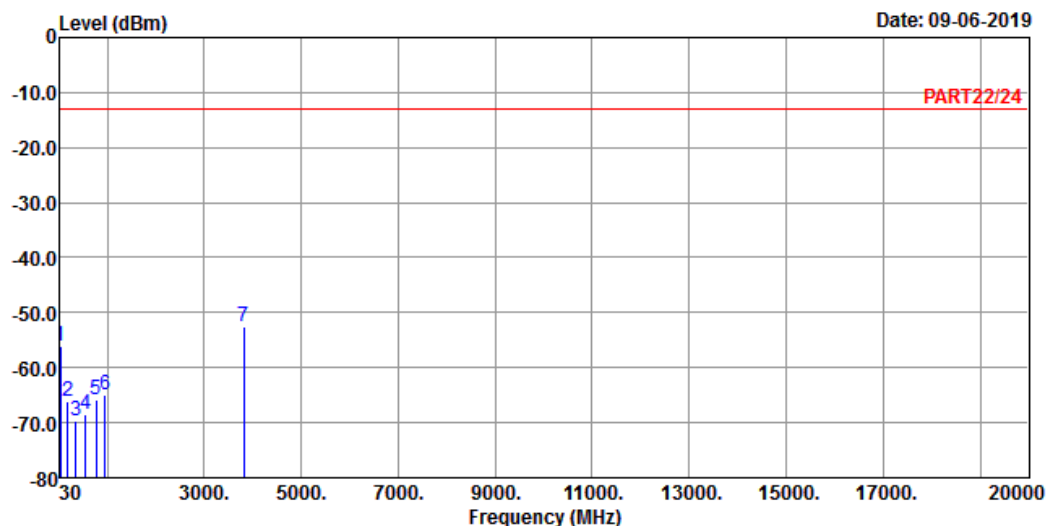


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 09-06-2019



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remark : PCS 1900 Link_H-CH

Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	37.76	-56.13	-55.69	-13.00	-0.44	-43.13	Peak
2	186.17	-66.17	-58.96	-13.00	-7.21	-53.17	Peak
3	353.01	-69.76	-63.54	-13.00	-6.22	-56.76	Peak
4	560.59	-68.55	-66.14	-13.00	-2.41	-55.55	Peak
5	778.84	-65.97	-66.77	-13.00	0.80	-52.97	Peak
6	952.47	-64.95	-66.85	-13.00	1.90	-51.95	Peak
7 pp	3819.60	-52.51	-46.11	-13.00	-6.40	-39.51	Peak

EDGE:
Low Channel

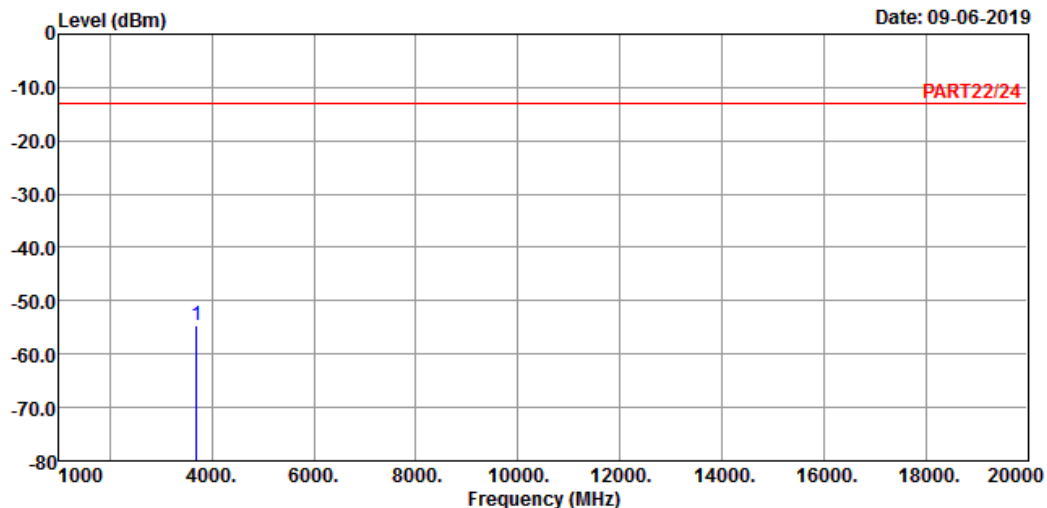


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3

Date: 09-06-2019



Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remark : EDGE 1900 Link_L-CH
Tested by: Thomas Wei

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

1 pp 3700.40 -54.61 -47.68 -13.00 -6.93 -41.61 Peak

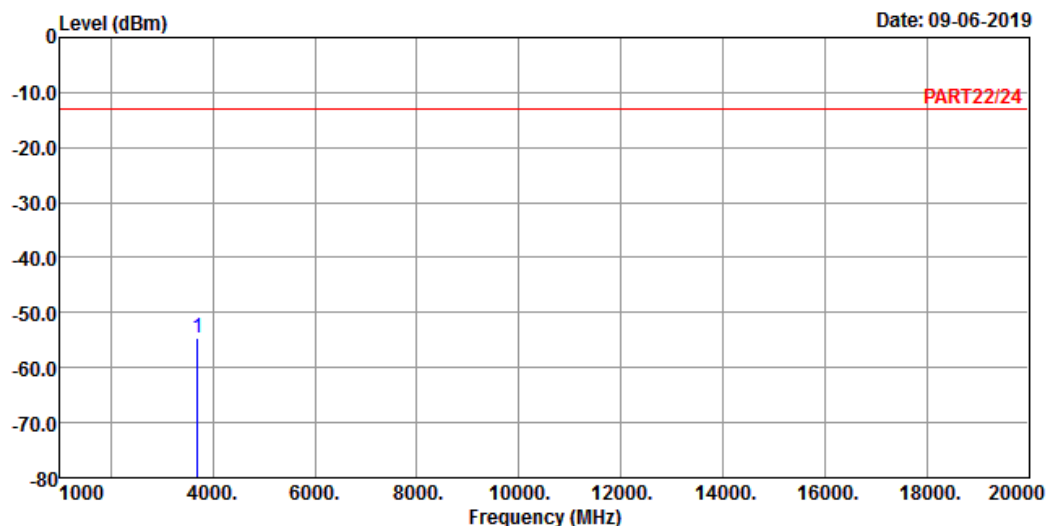


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 09-06-2019



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remark : EDGE 1900 Link_L-CH

Tested by: Thomas Wei

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

1 pp 3700.40 -54.74 -47.81 -13.00 -6.93 -41.74 Peak

Middle Channel

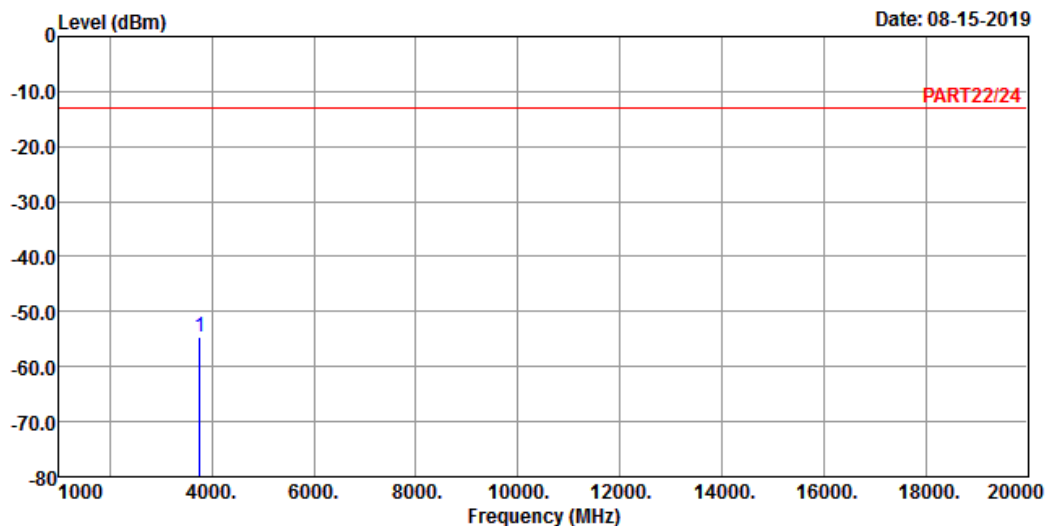


Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

A D T

Data: 3

Date: 08-15-2019



Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remark : EDGE 1900 Link_M-CH
Tested by: Thomas Wei

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

1 pp 3760.00 -54.65 -48.00 -13.00 -6.65 -41.65 Peak

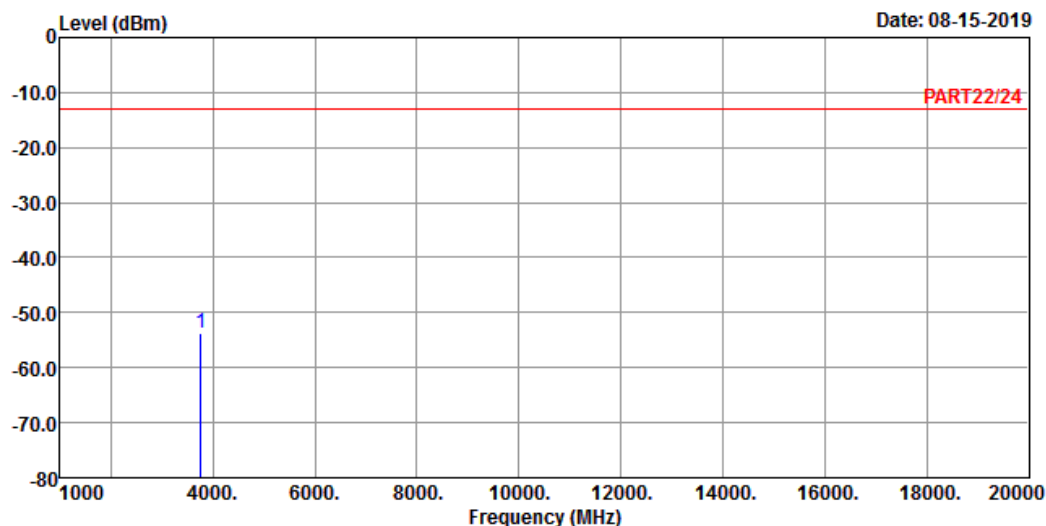


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 08-15-2019



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remark : EDGE 1900 Link_M-CH

Tested by: Thomas Wei

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

1 pp 3760.00 -53.65 -47.00 -13.00 -6.65 -40.65 Peak

High Channel

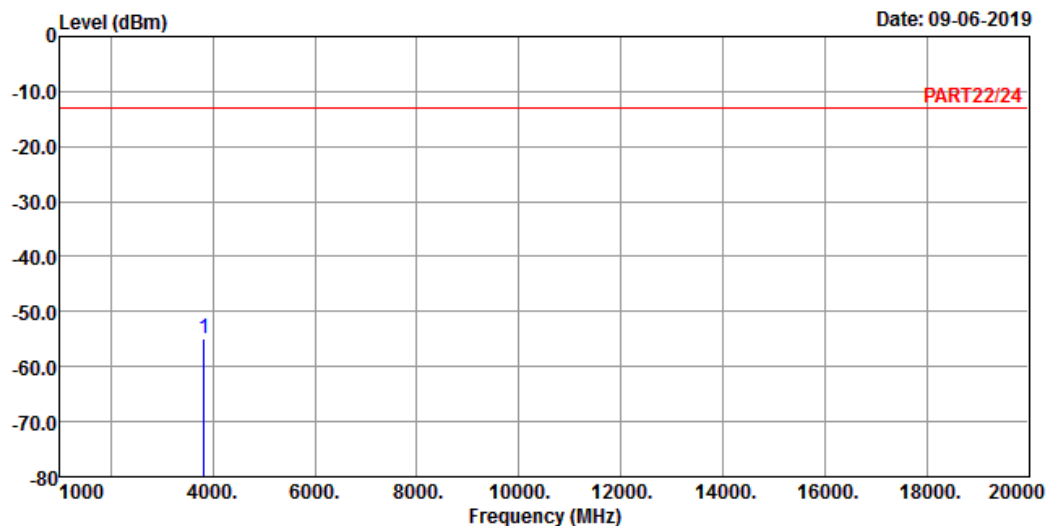


Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

A D T

Data: 3

Date: 09-06-2019



Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remark : EDGE 1900 Link_H-CH
Tested by: Thomas Wei

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

1 pp 3819.60 -54.82 -48.42 -13.00 -6.40 -41.82 Peak

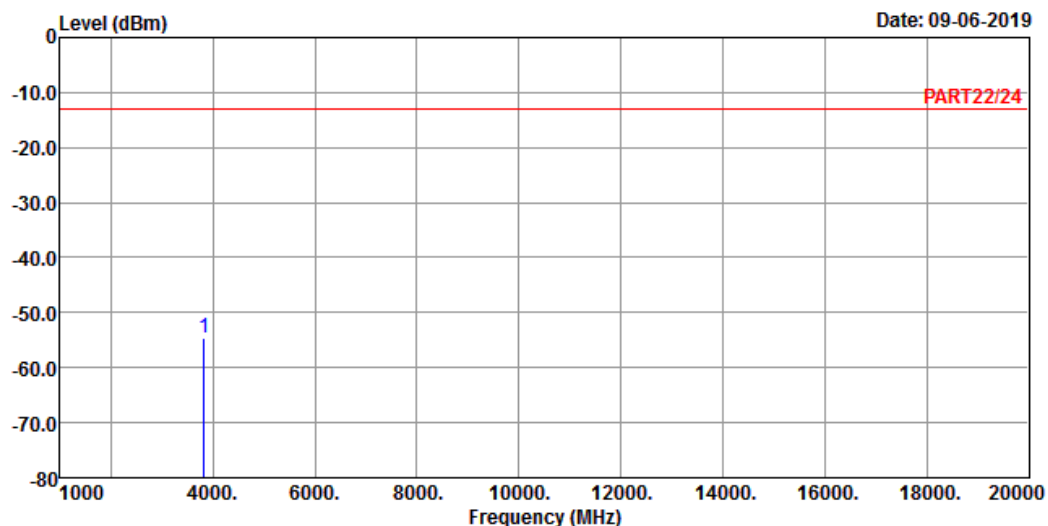


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 09-06-2019



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remark : EDGE 1900 Link_H-CH

Tested by: Thomas Wei

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

1 pp 3819.60 -54.56 -48.16 -13.00 -6.40 -41.56 Peak

WCDMA:
Low Channel

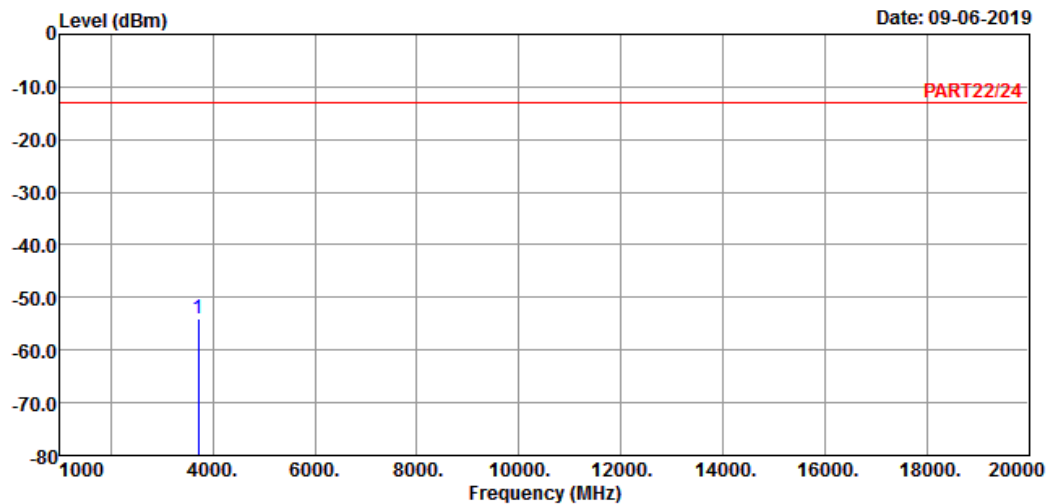


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3

Date: 09-06-2019



Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remark : WCDMA Band 2 Link_L-CH
Tested by: Thomas Wei

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

1 pp 3704.80 -54.12 -47.19 -13.00 -6.93 -41.12 Peak

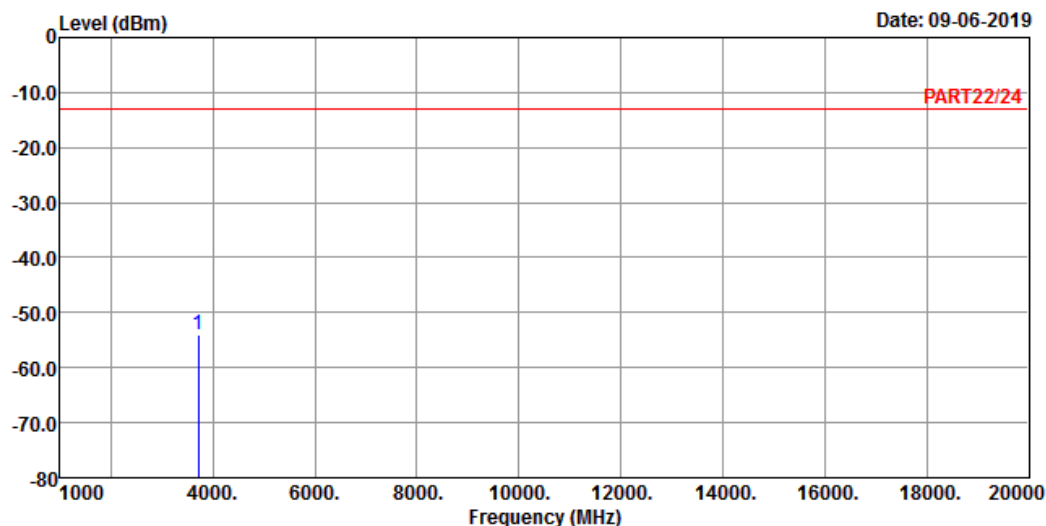


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 09-06-2019



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remark : WCDMA Band 2 Link_L-CH

Tested by: Thomas Wei

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

1 pp 3704.80 -54.00 -47.07 -13.00 -6.93 -41.00 Peak

Middle Channel

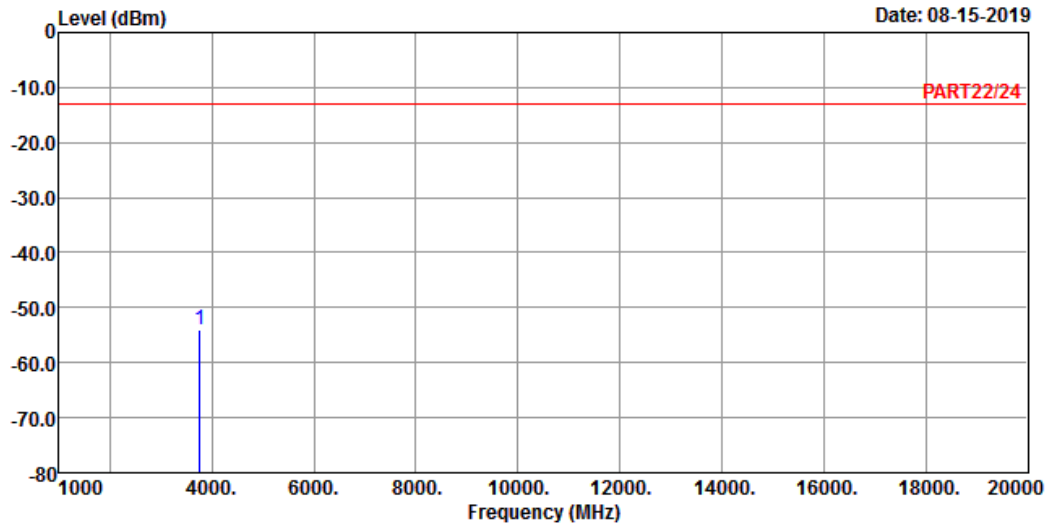


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3

Date: 08-15-2019



Site : 966 Chamber 5

Condition: PART22/24 HORIZONTAL

Remak : WCDMA Band 2 Link_M-CH

Tested by: Thomas Wei

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

1 pp 3760.00 -54.15 -47.50 -13.00 -6.65 -41.15 Peak

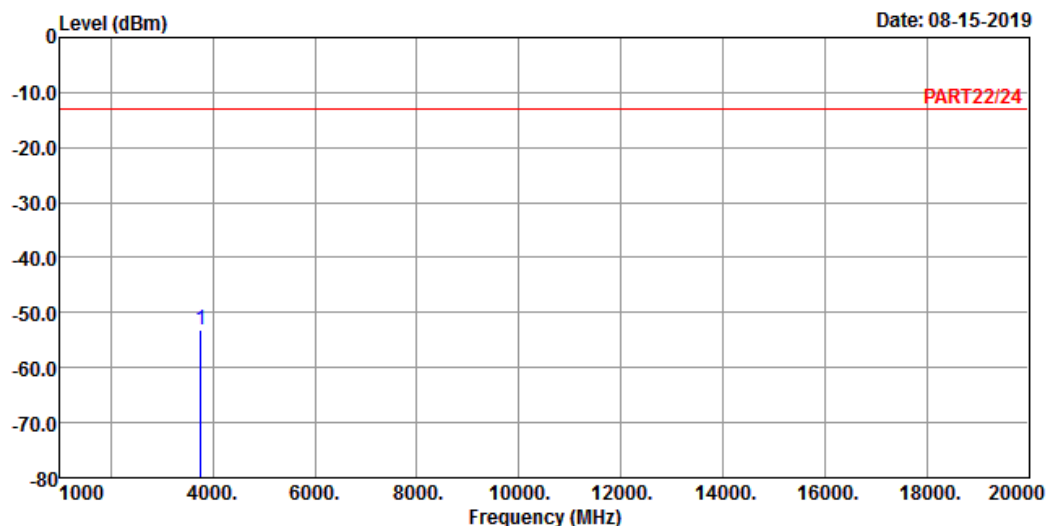


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 08-15-2019



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : WCDMA Band 2 Link_M-CH

Tested by: Thomas Wei

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

1 pp 3760.00 -53.23 -46.58 -13.00 -6.65 -40.23 Peak

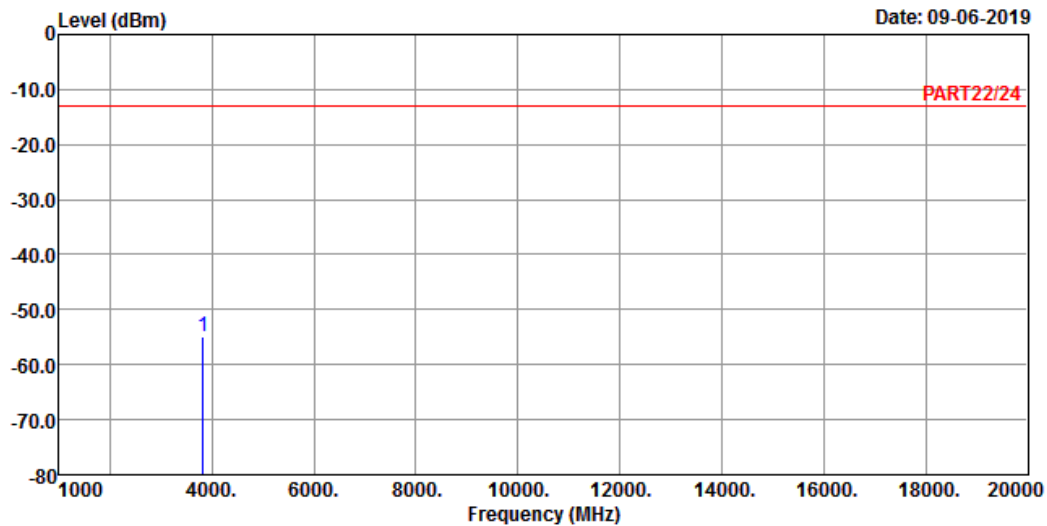
High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 Chamber 5

Condition: PART22/24 HORIZONTAL

Remark : WCDMA Band 2 Link_H-CH

Tested by: Thomas Wei

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

1 pp 3815.20 -54.96 -48.56 -13.00 -6.40 -41.96 Peak

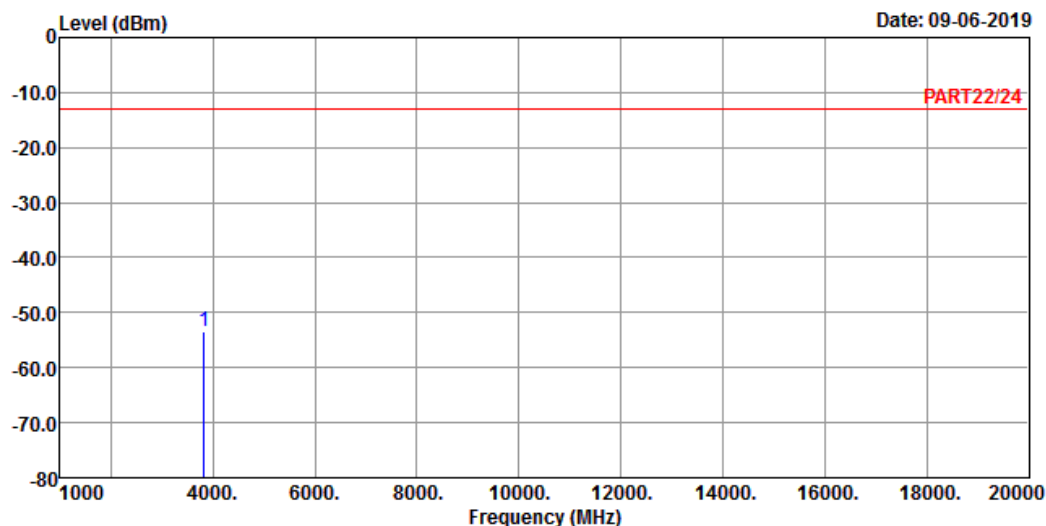


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 09-06-2019



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remark : WCDMA Band 2 Link_H-CH

Tested by: Thomas Wei

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

1 pp 3815.20 -53.42 -47.02 -13.00 -6.40 -40.42 Peak

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

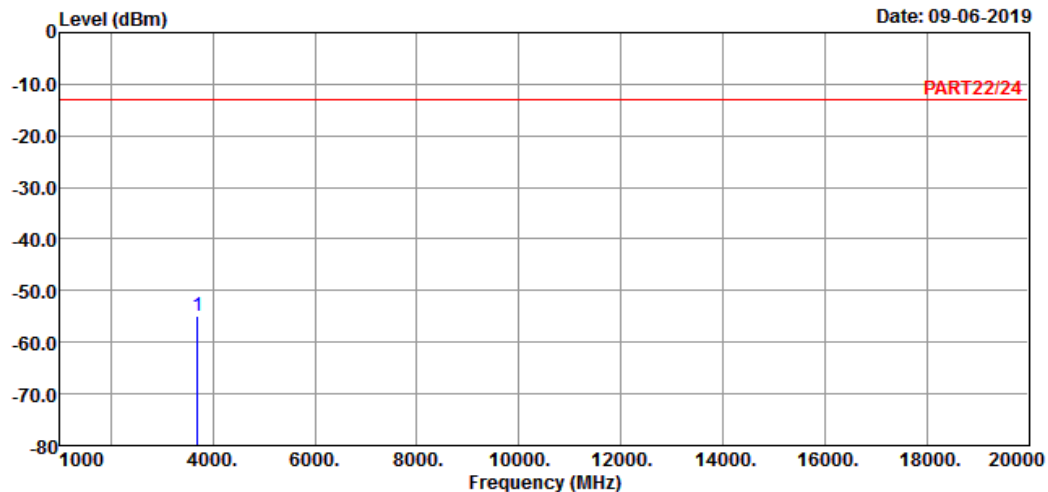


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3

Date: 09-06-2019



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

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

1 pp 3701.40 -54.96 -48.03 -13.00 -6.93 -41.96 Peak

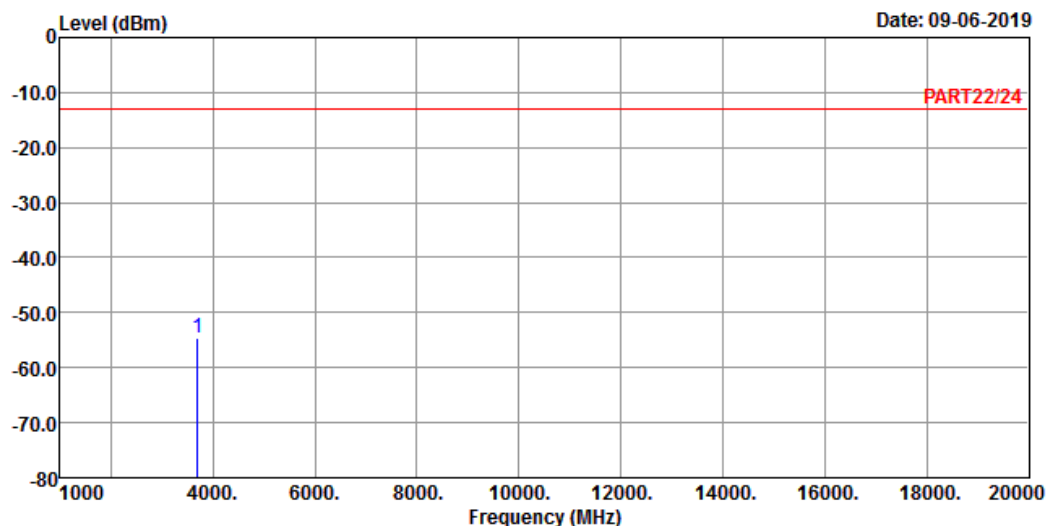


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 09-06-2019



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : LTE Band 2 QPSK_1.4M Link_L-CH

Tested by: Thomas Wei

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

1 pp 3701.40 -54.68 -47.75 -13.00 -6.93 -41.68 Peak

Middle Channel

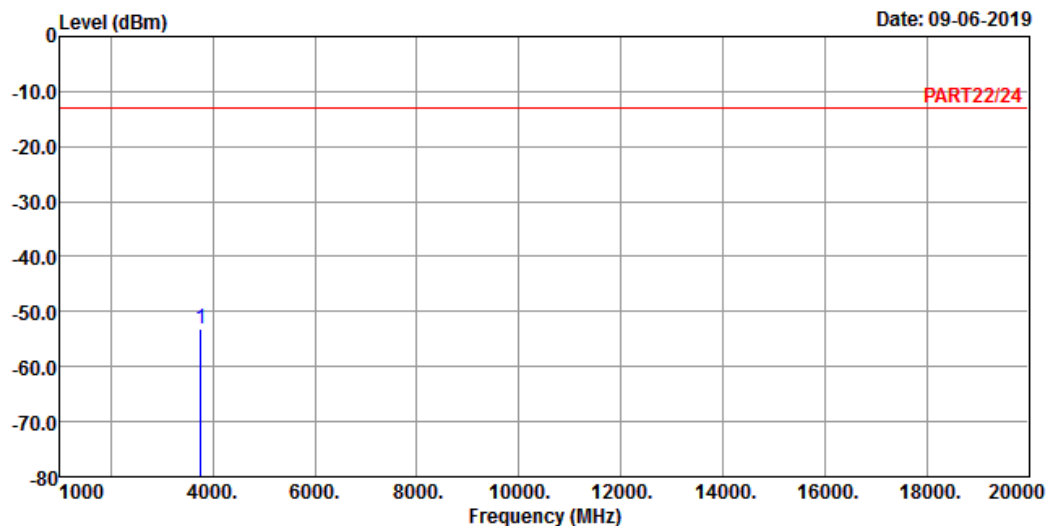


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3

Date: 09-06-2019



Site : 966 Chamber 5

Condition: PART22/24 HORIZONTAL

Remak : LTE Band 2 QPSK_1.4M Link_M-CH

Tested by: Thomas Wei

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

1 pp 3760.00 -53.07 -46.42 -13.00 -6.65 -40.07 Peak

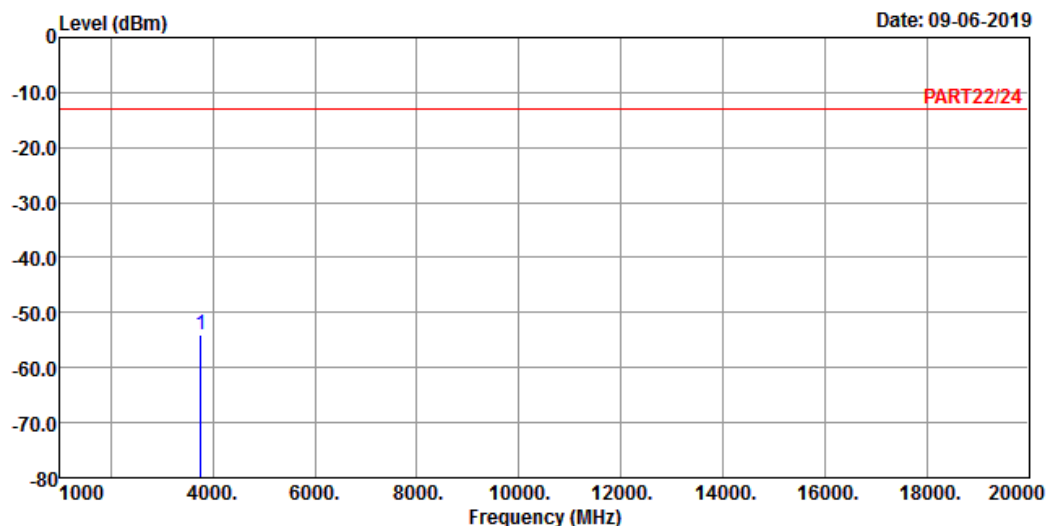


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 09-06-2019



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : LTE Band 2 QPSK_1.4M Link_M-CH

Tested by: Thomas Wei

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

1 pp 3760.00 -54.11 -47.46 -13.00 -6.65 -41.11 Peak

High Channel

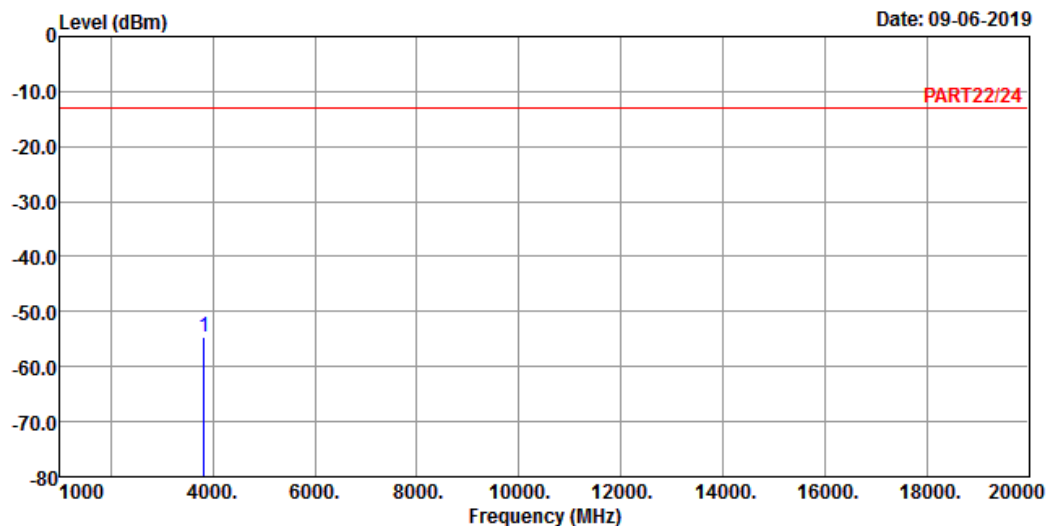


Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

A D T

Data: 3

Date: 09-06-2019



Site : 966 Chamber 5

Condition: PART22/24 HORIZONTAL

Remak : LTE Band 2 QPSK_1.4M Link_H-CH

Tested by: Thomas Wei

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

1 pp 3818.60 -54.58 -48.18 -13.00 -6.40 -41.58 Peak

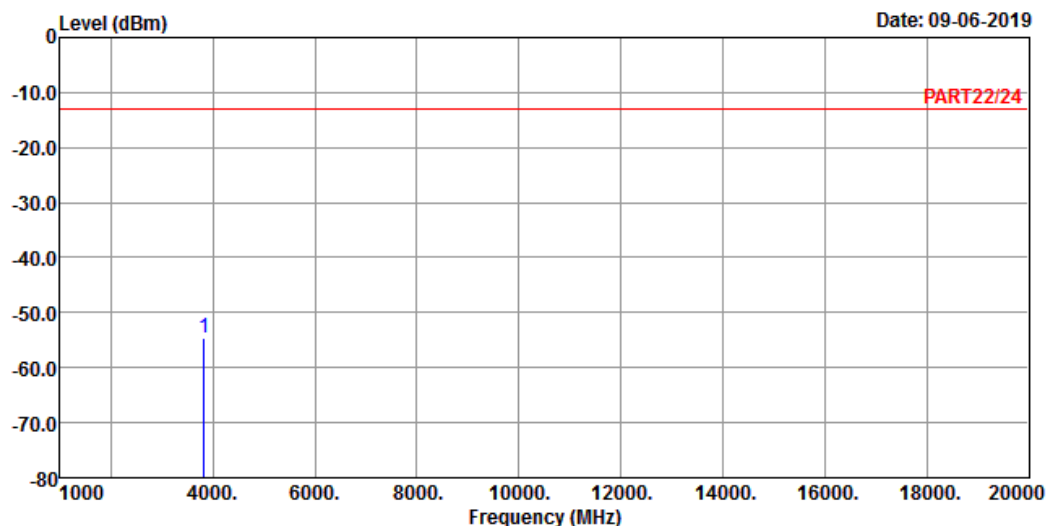


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 09-06-2019



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : LTE Band 2 QPSK_1.4M Link_H-CH

Tested by: Thomas Wei

Freq	Level	Read Level	Limit	Over	
MHz	dBm	dBm	dBm	dB	dB

1 pp 3818.60 -54.73 -48.33 -13.00 -6.40 -41.73 Peak

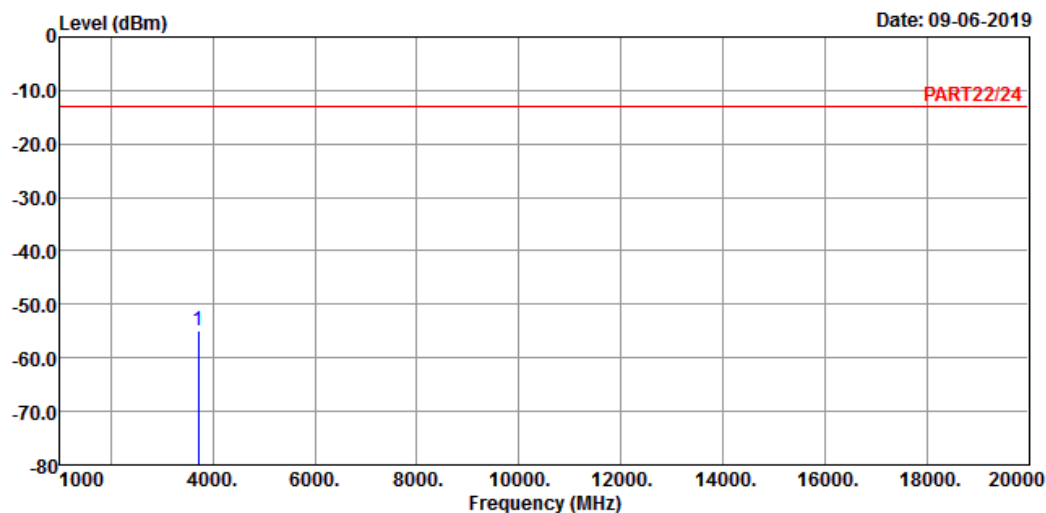
Channel Bandwidth: 5 MHz / QPSK
Low Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



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

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

1 pp 3705.00 -54.82 -47.89 -13.00 -6.93 -41.82 Peak

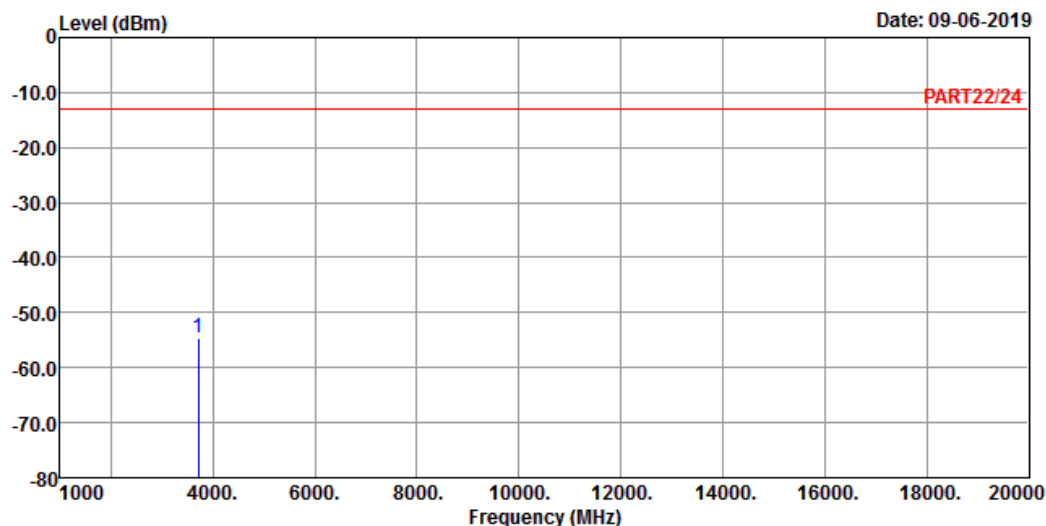


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 09-06-2019



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : LTE Band 2 QPSK_5M Link_L-CH

Tested by: Thomas Wei

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

1 pp 3705.00 -54.55 -47.62 -13.00 -6.93 -41.55 Peak

Middle Channel

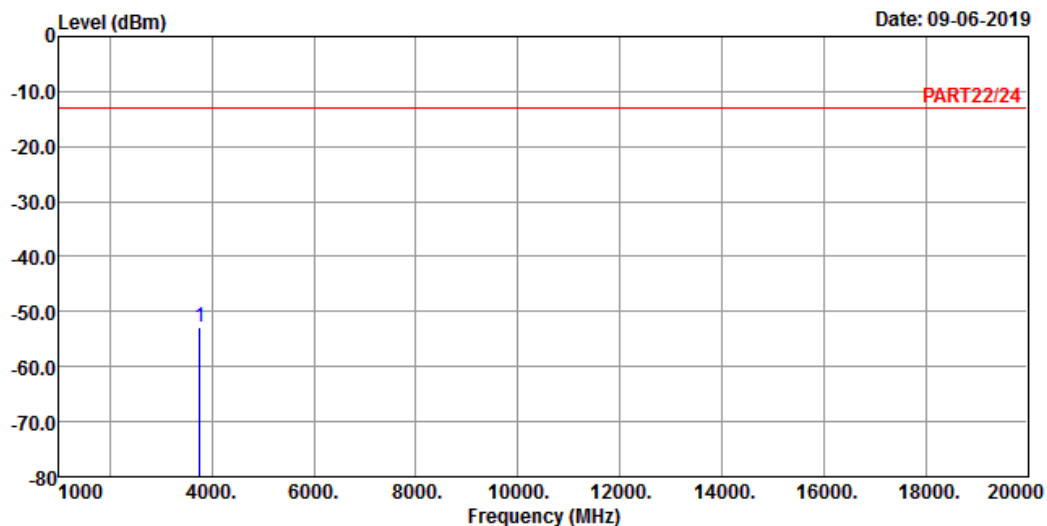


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3

Date: 09-06-2019



Site : 966 Chamber 5

Condition: PART22/24 HORIZONTAL

Remak : LTE Band 2 QPSK_5M Link_M-CH

Tested by: Thomas Wei

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

1 pp 3760.00 -52.91 -46.26 -13.00 -6.65 -39.91 Peak

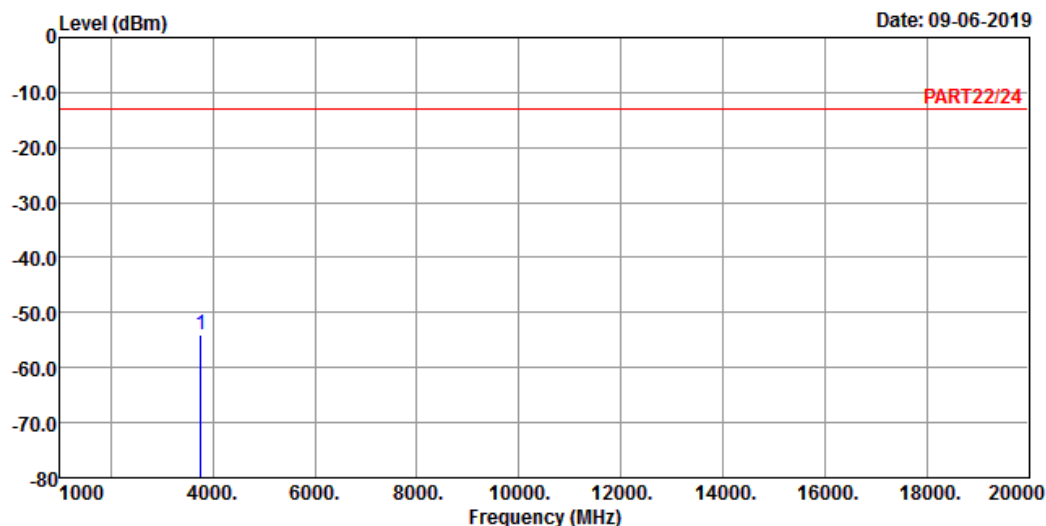


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 09-06-2019



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : LTE Band 2 QPSK_5M Link_M-CH

Tested by: Thomas Wei

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

1 pp 3760.00 -53.99 -47.34 -13.00 -6.65 -40.99 Peak

High Channel

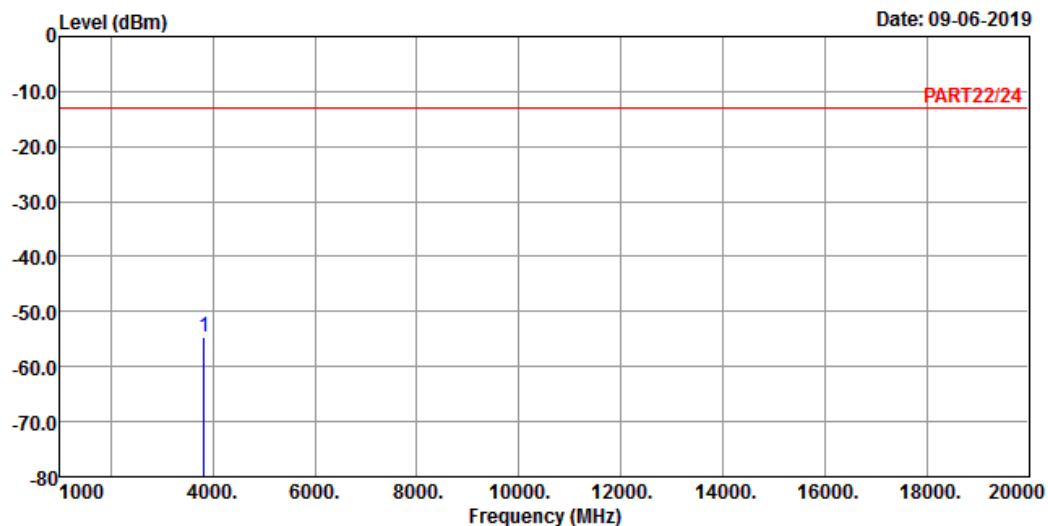


Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

A D T

Data: 3

Date: 09-06-2019



Site : 966 Chamber 5

Condition: PART22/24 HORIZONTAL

Remak : LTE Band 2 QPSK_5M Link_H-CH

Tested by: Thomas Wei

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

1 pp 3815.00 -54.47 -48.07 -13.00 -6.40 -41.47 Peak

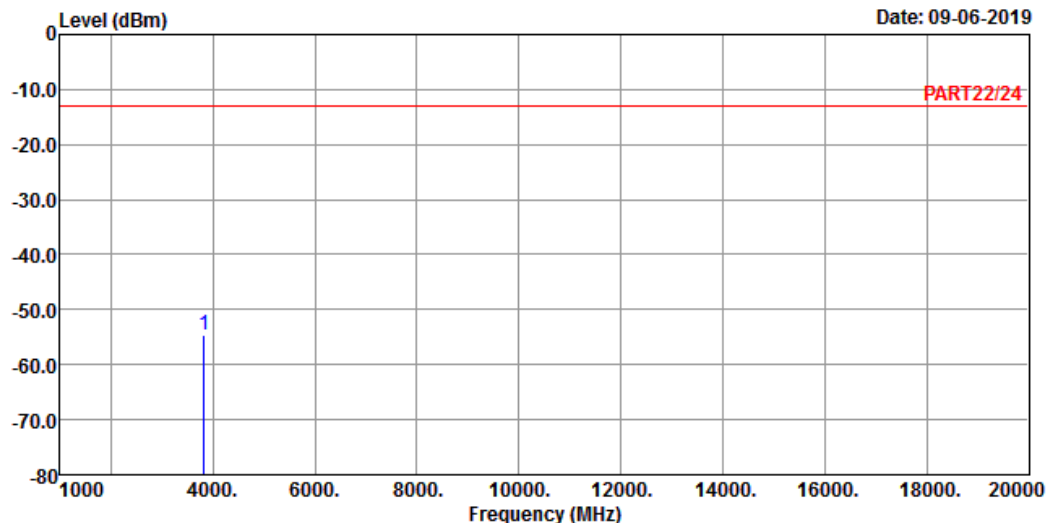


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 09-06-2019



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : LTE Band 2 QPSK_5M Link_H-CH

Tested by: Thomas Wei

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

1 pp 3815.00 -54.55 -48.15 -13.00 -6.40 -41.55 Peak

Channel Bandwidth: 20 MHz / QPSK
Low Channel

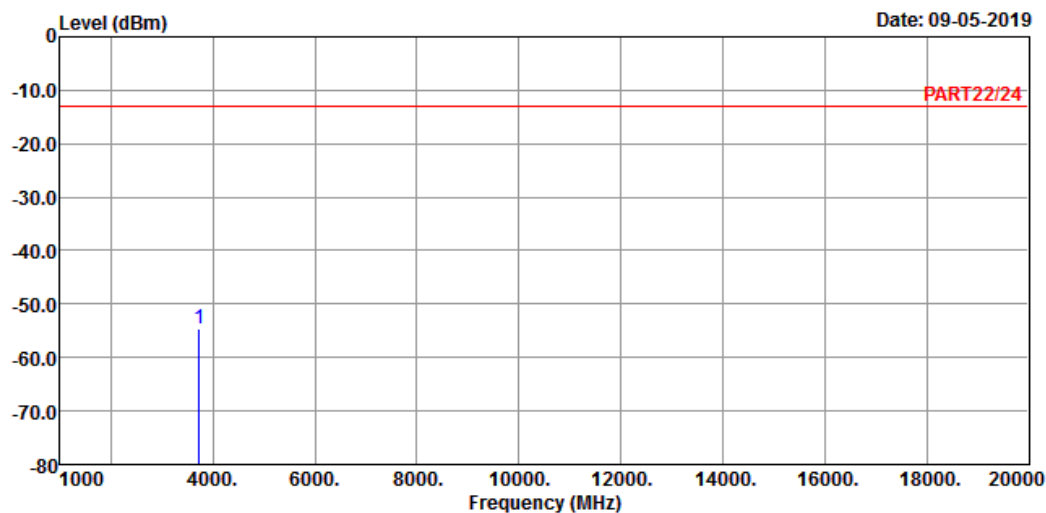


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3

Date: 09-05-2019



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

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

1 pp 3720.00 -54.67 -47.85 -13.00 -6.82 -41.67 Peak

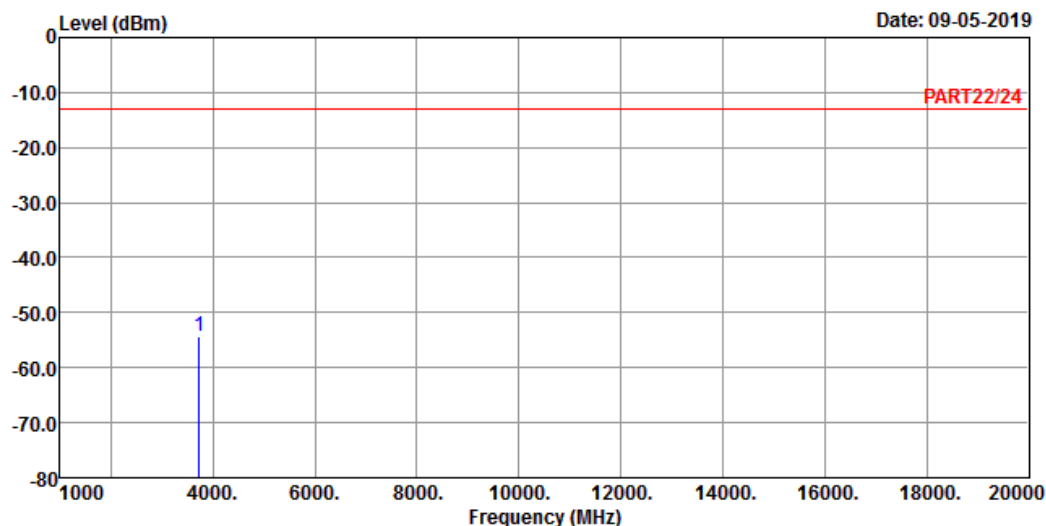


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 09-05-2019



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : LTE Band 2 QPSK_20M Link_L-CH

Tested by: Thomas Wei

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

1 pp 3720.00 -54.33 -47.51 -13.00 -6.82 -41.33 Peak

Middle Channel

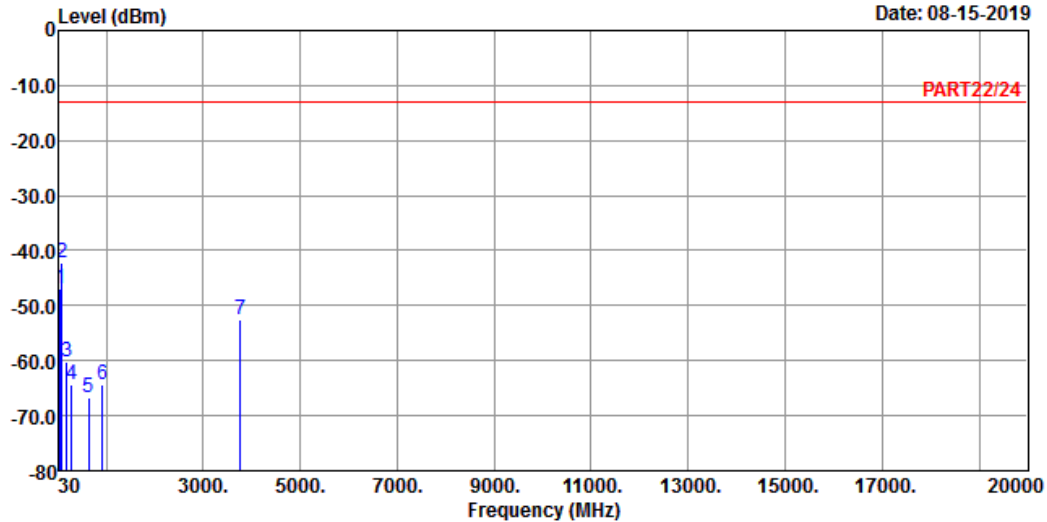


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 08-15-2019



Site : 966 Chamber 5

Condition: PART22/24 HORIZONTAL

Remak : LTE Band 2 QPSK_20M Link_M-CH

Tested by: Thomas Wei

	Freq	Level	Read	Limit	Over	
	MHz	dBm	Level	Line	Factor	Limit Remark
	MHz	dBm	dBm	dBm	dB	dB
1	43.58	-46.86	-45.39	-13.00	-1.47	-33.86 Peak
2 pp	77.53	-42.18	-31.98	-13.00	-10.20	-29.18 Peak
3	189.08	-60.12	-53.00	-13.00	-7.12	-47.12 Peak
4	288.02	-64.45	-57.68	-13.00	-6.77	-51.45 Peak
5	630.43	-66.78	-65.95	-13.00	-0.83	-53.78 Peak
6	926.28	-64.30	-65.52	-13.00	1.22	-51.30 Peak
7	3760.00	-52.66	-46.01	-13.00	-6.65	-39.66 Peak

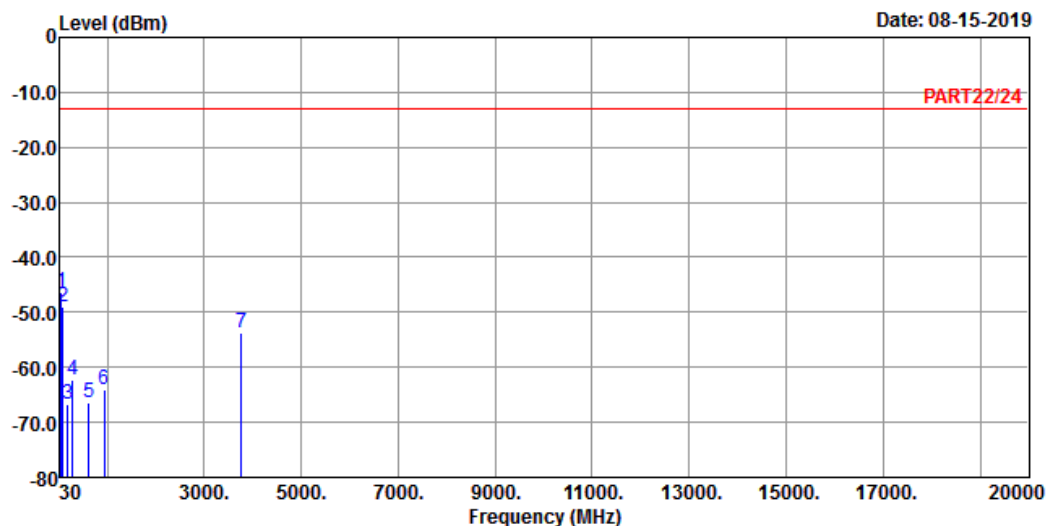


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 08-15-2019



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : LTE Band 2 QPSK_20M Link_M-CH

Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	53.28	-46.43	-40.62	-13.00	-5.81	-33.43	Peak
2	77.53	-48.90	-38.70	-13.00	-10.20	-35.90	Peak
3	186.17	-66.60	-59.39	-13.00	-7.21	-53.60	Peak
4	290.93	-62.33	-55.50	-13.00	-6.83	-49.33	Peak
5	617.82	-66.29	-65.49	-13.00	-0.80	-53.29	Peak
6	937.92	-63.96	-65.47	-13.00	1.51	-50.96	Peak
7	3760.00	-53.73	-47.08	-13.00	-6.65	-40.73	Peak

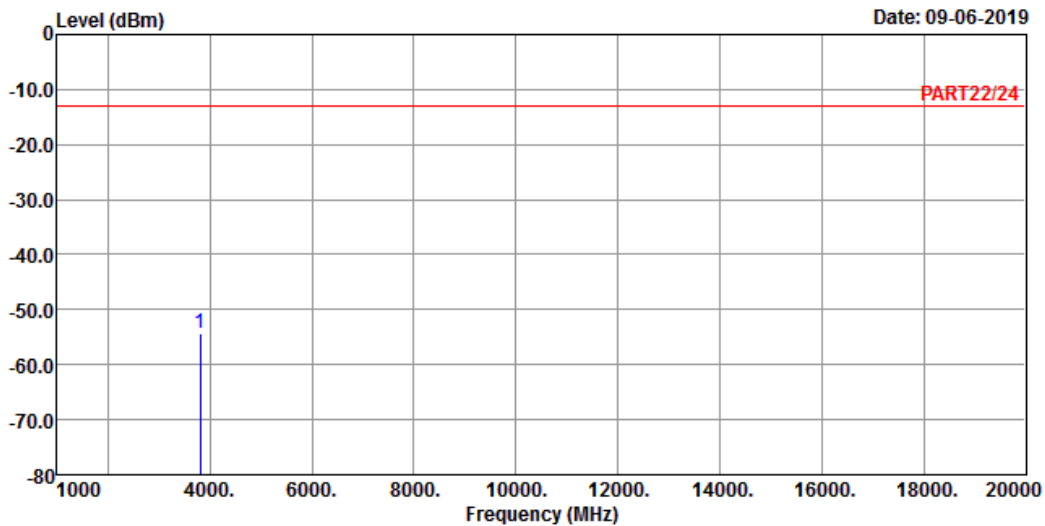
High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 Chamber 5

Condition: PART22/24 HORIZONTAL

Remak : LTE Band 2 QPSK_20M Link_H-CH

Tested by: Thomas Wei

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

1 pp 3800.00 -54.35 -47.92 -13.00 -6.43 -41.35 Peak

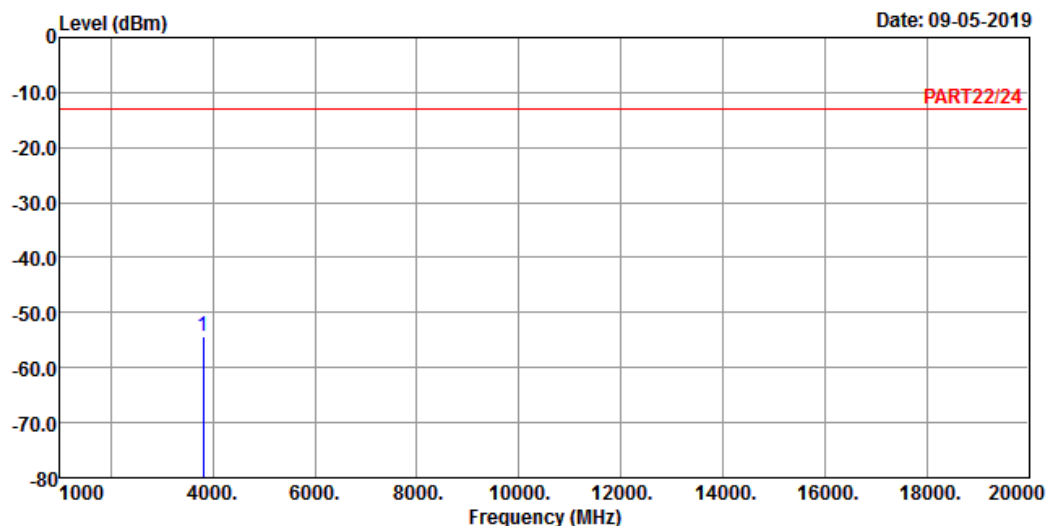


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 09-05-2019



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : LTE Band 2 QPSK_20M Link_H-CH

Tested by: Thomas Wei

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

1 pp 3800.00 -54.33 -47.90 -13.00 -6.43 -41.33 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.

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