FCC Test Report

(PART 27)

Report No.:	RF190723C05-7
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
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FCC Registration / Designation Number:	788550 / TW0003

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Release Control Record

Issue No.	Description	Date Issued
RF190723C05-7	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 27, Subpart C, L

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

Prepared by : _____ , **Date:** Oct. 08, 2019

Gina Liu / Specialist

Approved by : _____ , **Date:** Oct. 08, 2019

Dylan Chiou / Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 27 & Part 2 (WCDMA)			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 27.50(d)(4)	Equivalent Isotropic Radiated Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement.
2.1055 27.54	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth	Pass	Meet the requirement of limit.
27.50(d)(5)	Peak to Average Ratio	Pass	Meet the requirement of limit.
27.53(h)	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 27.53(h)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 27.53(h)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -36.25 dB at 36.79 MHz.

Applied Standard: FCC Part 27 & Part 2 (LTE 4)			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 27.50(d)(4)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement.
2.1055 27.54	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth	Pass	Meet the requirement of limit.
27.50(d)(5)	Peak to Average Ratio	Pass	Meet the requirement of limit.
27.53(h)	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 27.53(h)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 27.53(h)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -29.36 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	WCDMA	QPSK
	LTE	QPSK, 16QAM, 64QAM
Frequency Range	WCDMA	1712.4 ~ 1752.6 MHz
	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	1710.7 ~ 1754.3 MHz
	LTE Band 4 (Channel Bandwidth: 3 MHz)	1711.5 ~ 1753.5 MHz
	LTE Band 4 (Channel Bandwidth: 5 MHz)	1712.5 ~ 1752.5 MHz
	LTE Band 4 (Channel Bandwidth: 10 MHz)	1715.0 ~ 1750.0 MHz
	LTE Band 4 (Channel Bandwidth: 15 MHz)	1717.5 ~ 1747.5 MHz
	LTE Band 4 (Channel Bandwidth: 20 MHz)	1720.0 ~ 1745.0 MHz
Emission Designator	WCDMA	4M19F9W
	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	1M09D7W
	LTE Band 4 (Channel Bandwidth: 3 MHz)	2M70G7D
	LTE Band 4 (Channel Bandwidth: 5 MHz)	4M50D7W
	LTE Band 4 (Channel Bandwidth: 10 MHz)	8M99D7W
	LTE Band 4 (Channel Bandwidth: 15 MHz)	13M5G7D
	LTE Band 4 (Channel Bandwidth: 20 MHz)	18M0D7W
Max. EIRP Power	WCDMA	54.08 mW
	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	42.56 mW
	LTE Band 4 (Channel Bandwidth: 3 MHz)	44.67 mW
	LTE Band 4 (Channel Bandwidth: 5 MHz)	48.42 mW
	LTE Band 4 (Channel Bandwidth: 10 MHz)	51.29 mW
	LTE Band 4 (Channel Bandwidth: 15 MHz)	53.83 mW
	LTE Band 4 (Channel Bandwidth: 20 MHz)	56.89 mW
Antenna Type	Loop Antenna with -5.2 dBi gain PIFA Antenna with -9.5 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.

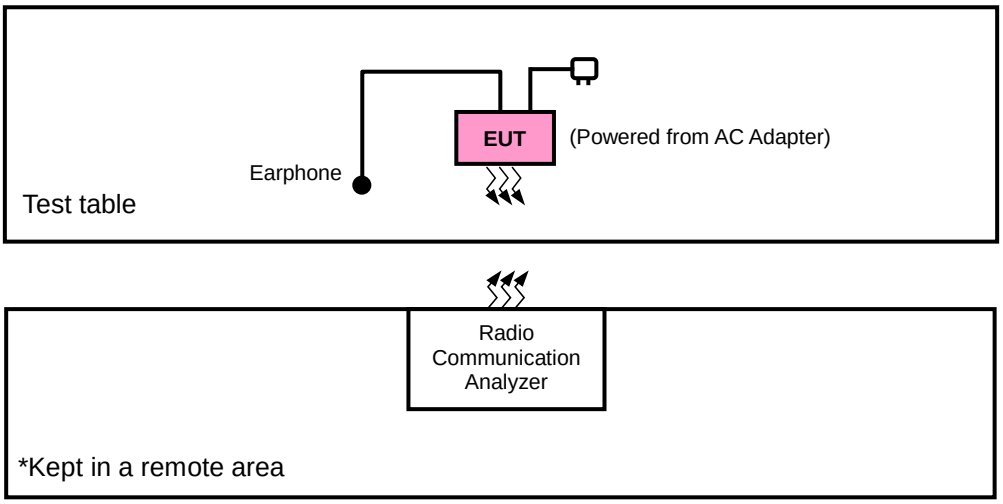
2. The EUT contains following accessory devices.

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

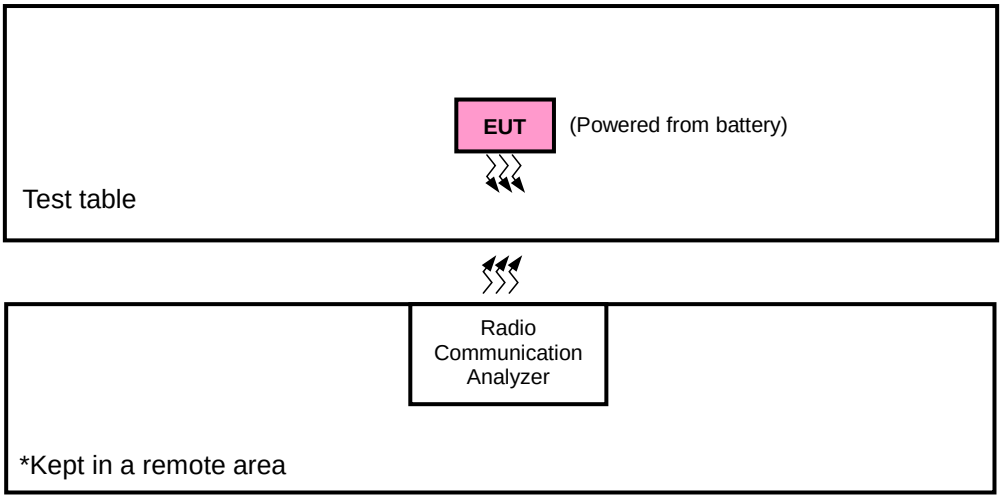
3. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

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
WCDMA	Y-plane	Y-plane
LTE Band 4	Y-plane	X-plane

WCDMA

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
-	EIRP	1312 to 1513	1312, 1413, 1513	WCDMA
-	Modulation Characteristics	1312 to 1513	1413	WCDMA
-	Frequency Stability	1312 to 1513	1312, 1513	WCDMA
-	Occupied Bandwidth	1312 to 1513	1312, 1413, 1513	WCDMA
-	Band Edge	1312 to 1513	1312, 1513	WCDMA
-	Peak to Average Ratio	1312 to 1513	1312, 1413, 1513	WCDMA
-	Conducted Emission	1312 to 1513	1312, 1413, 1513	WCDMA
-	Radiated Emission	1312 to 1513	1312, 1413, 1513	WCDMA

LTE Band 4

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	EIRP	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK, 16QAM, 64QAM	3 RB / 0 RB Offset
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK, 16QAM, 64QAM	1 RB / 7 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM, 64QAM	1 RB / 12 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK, 16QAM, 64QAM	1 RB / 24 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK, 16QAM, 64QAM	1 RB / 37 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM, 64QAM	1 RB / 50 RB Offset
-	Modulation Characteristics	20050 to 20300	20175	20 MHz	QPSK, 16QAM, 64QAM	100 RB / 0 RB Offset
-	Frequency Stability	19957 to 20393	19957, 20393	1.4 MHz	QPSK	1 RB / 0 RB Offset
		19965 to 20385	19965, 20385	3 MHz	QPSK	1 RB / 0 RB Offset
		19975 to 20375	19975, 20375	5 MHz	QPSK	1 RB / 0 RB Offset
		20000 to 20350	20000, 20350	10 MHz	QPSK	1 RB / 0 RB Offset
		20025 to 20325	20025, 20325	15 MHz	QPSK	1 RB / 0 RB Offset
		20050 to 20300	20050, 20300	20 MHz	QPSK	1 RB / 0 RB Offset
-	Occupied Bandwidth	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK, 16QAM, 64QAM	6 RB / 0 RB Offset
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK, 16QAM, 64QAM	15 RB / 0 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM, 64QAM	25 RB / 0 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK, 16QAM, 64QAM	50 RB / 0 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK, 16QAM, 64QAM	75 RB / 0 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM, 64QAM	100 RB / 0 RB Offset
-	Peak to Average Ratio	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK, 16QAM, 64QAM	3 RB / 0 RB Offset
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK, 16QAM, 64QAM	1 RB / 7 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM, 64QAM	1 RB / 12 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK, 16QAM, 64QAM	1 RB / 24 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK, 16QAM, 64QAM	1 RB / 37 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM, 64QAM	1 RB / 50 RB Offset

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	Band Edge	19957 to 20393	19957	1.4 MHz	QPSK	1 RB / 0 RB Offset
						6 RB / 0 RB Offset
			20393	1.4 MHz	QPSK	1 RB / 5 RB Offset
						6 RB / 0 RB Offset
		19965 to 20385	19965	3 MHz	QPSK	1 RB / 0 RB Offset
						15 RB / 0 RB Offset
			20385	3 MHz	QPSK	1 RB / 14 RB Offset
						15 RB / 0 RB Offset
		19975 to 20375	19975	5 MHz	QPSK	1 RB / 0 RB Offset
						25 RB / 0 RB Offset
			20375	5 MHz	QPSK	1 RB / 24 RB Offset
						25 RB / 0 RB Offset
		20000 to 20350	20000	10 MHz	QPSK	1 RB / 0 RB Offset
						50 RB / 0 RB Offset
			20350	10 MHz	QPSK	1 RB / 49 RB Offset
						50 RB / 0 RB Offset
		20025 to 20325	20025	15 MHz	QPSK	1 RB / 0 RB Offset
						75 RB / 0 RB Offset
			20325	15 MHz	QPSK	1 RB / 74 RB Offset
						75 RB / 0 RB Offset
		20050 to 20300	20050	20 MHz	QPSK	1 RB / 0 RB Offset
						100 RB / 0 RB Offset
			20300	20 MHz	QPSK	1 RB / 99 RB Offset
						100 RB / 0 RB Offset
-	Conducted Emission	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK	3 RB / 0 RB Offset
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK	1 RB / 7 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK	1 RB / 12 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK	1 RB / 24 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK	1 RB / 37 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK	1 RB / 50 RB Offset
-	Radiated Emission	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK	3 RB / 0 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK	1 RB / 12 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK	1 RB / 50 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	25 deg. C, 65 % RH	3.8 Vdc	Thomas Wei
Modulation Characteristics	25 deg. C, 65 % RH	3.8 Vdc	Wayne Lin
Frequency Stability	25 deg. C, 65 % RH	3.8 Vdc	Wayne Lin
Occupied Bandwidth	25 deg. C, 65 % RH	3.8 Vdc	Wayne Lin
Band Edge	25 deg. C, 65 % RH	3.8 Vdc	Wayne Lin
Peak to Average Ratio	25 deg. C, 65 % RH	3.8 Vdc	Wayne Lin
Conducted Emission	25 deg. C, 65 % 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 27
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

Fixed, mobile, and portable (hand-held) stations operating in the 1710–1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

4.1.2 Test Procedures

EIRP / ERP Measurement:

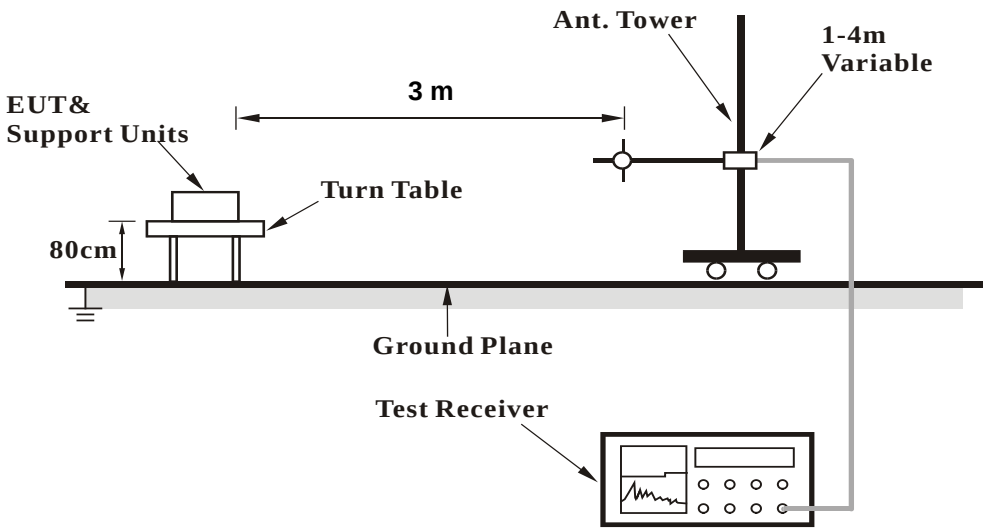
a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 5 MHz for WCDMA and 10 MHz for LTE mode.
b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height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

Conducted Power Measurement:

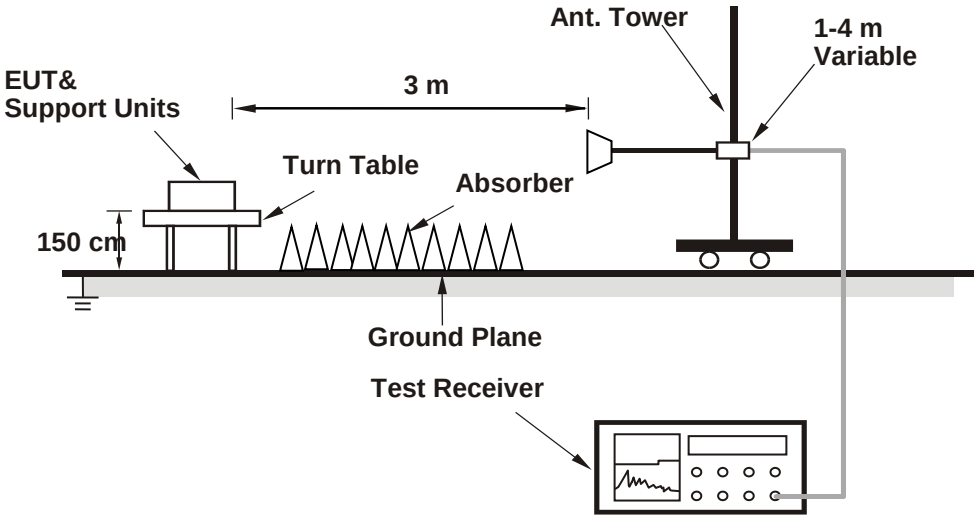
a. The EUT was set up for the maximum power with WCDMA and LTE link data modulation and link up with simulator.
b. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

4.1.3 Test Setup

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



<Radiated Emission above 1 GHz>



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

Conducted Power Measurement:

4.1.4 Test Results

Conducted Output Power (dBm)

Band	WCDMA IV		
Channel	1312	1413	1513
Frequency (MHz)	1712.4	1732.6	1752.6
RMC 12.2K	23.21	**23.27**	23.25
HSDPA Subtest-1	21.85	21.90	21.88
HSDPA Subtest-2	21.83	21.89	21.85
HSDPA Subtest-3	21.39	21.44	21.42
HSDPA Subtest-4	20.95	21.01	20.99
DC-HSDPA Subtest-1	21.78	21.83	21.81
DC-HSDPA Subtest-2	21.76	21.82	21.78
DC-HSDPA Subtest-3	21.32	21.37	21.36
DC-HSDPA Subtest-4	20.89	20.94	20.92
HSUPA Subtest-1	21.42	21.48	21.46
HSUPA Subtest-2	19.96	20.02	20.01
HSUPA Subtest-3	20.93	20.98	20.96
HSUPA Subtest-4	19.42	19.48	19.47
HSUPA Subtest-5	21.02	21.01	21.03

LTE Band 4

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		20050	20175	20300				Channel		20025	20175	20325	
		Frequency (MHz)		1720.0	1732.5	1745.0				Frequency (MHz)		1717.5	1732.5	1747.5	
20M	QPSK	1	0	22.67	22.73	22.74	0	15M	QPSK	1	0	22.65	22.65	22.74	0
		1	50	23.01	23.09	**23.11**	0			1	37	22.94	23.05	23.09	0
		1	99	22.75	22.80	22.82	0			1	74	22.70	22.70	22.77	0
		50	0	22.12	22.18	**22.20**	1			36	0	22.02	22.12	22.18	1
		50	25	22.06	22.09	22.12	1			36	19	22.00	22.03	22.09	1
		50	50	22.03	22.06	22.08	1			36	39	21.99	21.96	22.00	1
		100	0	22.09	22.18	**22.19**	1			75	0	22.04	22.18	22.13	1
	16QAM	1	0	22.18	22.27	22.28	1		16QAM	1	0	22.14	22.22	22.28	1
		1	50	22.41	22.47	22.50	1			1	37	22.40	22.42	22.49	1
		1	99	22.17	22.21	22.22	1			1	74	22.09	22.16	22.17	1
		50	0	21.24	21.30	21.33	2			36	0	21.18	21.22	21.33	2
		50	25	21.18	21.22	21.24	2			36	19	21.09	21.20	21.15	2
		50	50	21.11	21.16	21.17	2			36	39	21.02	21.08	21.14	2
		100	0	21.17	21.21	21.26	2			75	0	21.10	21.21	21.21	2
	64QAM	1	0	20.87	20.93	20.94	2		64QAM	1	0	20.79	20.88	20.89	2
		1	50	21.25	21.32	21.35	2			1	37	21.15	21.31	21.29	2
		1	99	20.96	21.05	21.06	2			1	74	20.93	21.02	21.06	2
		50	0	20.17	20.27	20.30	3			36	0	20.16	20.18	20.27	3
		50	25	20.12	20.18	20.22	3			36	19	20.06	20.13	20.14	3
		50	50	20.10	20.14	20.17	3			36	39	20.01	20.06	20.15	3
		100	0	20.15	20.25	20.28	3			75	0	20.11	20.22	20.28	3

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20000	20175	20350				Channel		19975	20175	20375	
		Frequency (MHz)		1715.0	1732.5	1750.0				Frequency (MHz)		1712.5	1732.5	1752.5	
10M	QPSK	1	0	22.61	22.72	22.67	0	5M	QPSK	1	0	22.60	22.48	22.42	0
		1	24	22.93	22.99	22.98	0			1	12	22.88	23.01	22.97	0
		1	49	22.55	22.69	22.63	0			1	24	22.60	22.62	22.50	0
		25	0	21.97	22.13	22.01	1			12	0	21.98	22.07	22.04	1
		25	12	22.01	21.94	22.05	1			12	6	21.95	21.92	21.77	1
		25	25	21.93	21.98	21.94	1			12	13	21.95	21.87	21.91	1
		50	0	21.92	22.00	22.05	1			25	0	21.89	22.07	22.05	1
	16QAM	1	0	22.01	22.13	22.09	1		16QAM	1	0	22.06	22.19	22.13	1
		1	24	22.26	22.25	22.45	1			1	12	22.26	22.33	22.36	1
		1	49	22.09	22.13	22.06	1			1	24	22.04	22.10	22.22	1
		25	0	21.05	21.24	21.27	2			12	0	21.04	21.21	21.10	2
		25	12	21.09	21.13	21.10	2			12	6	21.06	21.09	21.11	2
		25	25	21.01	21.10	21.08	2			12	13	20.98	21.07	21.13	2
		50	0	21.04	21.16	21.25	2			25	0	21.07	21.06	21.19	2
	64QAM	1	0	20.78	20.74	20.86	2		64QAM	1	0	20.66	20.72	20.86	2
		1	24	21.10	21.16	**21.22**	2			1	12	21.11	21.19	**21.26**	2
		1	49	20.76	20.90	20.86	2			1	24	20.79	20.93	21.01	2
		25	0	20.08	20.10	20.10	3			12	0	20.13	20.17	20.18	3
		25	12	20.04	20.06	20.07	3			12	6	20.06	20.01	20.09	3
		25	25	19.95	19.90	20.01	3			12	13	20.09	20.03	20.08	3
		50	0	20.02	20.20	20.16	3			25	0	20.03	20.14	20.06	3

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		19965	20175	20385				Channel		19957	20175	20393	
		Frequency (MHz)		1711.5	1732.5	1753.5				Frequency (MHz)		1710.7	1732.5	1754.3	
3M	QPSK	1	0	22.55	22.69	22.55	0	1.4M	QPSK	1	0	22.60	22.57	22.66	0
		1	7	22.99	23.02	22.96	0			1	2	22.94	22.95	22.94	0
		1	14	22.63	22.64	22.67	0			1	5	22.67	22.64	22.68	0
		8	0	22.03	21.99	22.10	1			3	0	22.94	23.08	23.08	0
		8	3	22.03	21.94	21.95	1			3	1	22.95	22.92	22.92	0
		8	7	21.89	22.00	21.87	1			3	3	22.90	22.89	23.02	0
		15	0	21.97	22.06	22.01	1			6	0	21.98	22.13	22.11	1
	16QAM	1	0	22.04	22.05	22.09	1		16QAM	1	0	21.97	22.20	22.11	1
		1	7	22.35	22.42	22.45	1			1	2	22.29	22.26	22.36	1
		1	14	22.00	22.13	22.13	1			1	5	22.01	22.09	22.03	1
		8	0	21.14	21.28	21.24	2			3	0	22.16	22.23	22.13	1
		8	3	21.16	21.14	21.08	2			3	1	21.99	22.21	22.08	1
		8	7	20.92	21.13	21.07	2			3	3	21.98	22.03	22.00	1
		15	0	20.99	21.08	21.20	2			6	0	21.07	21.11	21.11	2
	64QAM	1	0	20.73	20.79	20.86	2		64QAM	1	0	20.79	20.84	20.83	2
		1	7	21.11	21.24	21.21	2			1	2	21.17	**21.17**	21.16	2
		1	14	20.83	21.03	20.84	2			1	5	20.85	20.91	20.86	2
		8	0	20.03	20.16	20.13	3			3	0	21.10	21.12	**21.17**	2
		8	3	19.92	20.02	20.08	3			3	1	21.04	21.04	21.10	2
		8	7	19.93	20.03	20.09	3			3	3	20.98	21.02	20.99	2
		15	0	20.08	20.05	20.15	3			6	0	19.93	20.02	20.19	3

EIRP Power (dBm)

WCDMA							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
Y	1312	1712.4	-26.07	36.29	10.22	10.52	H
	1413	1732.6	-26.34	36.69	10.35	10.84	
	1513	1752.6	-26.71	36.98	10.27	10.64	
	1312	1712.4	-19.93	37.11	17.18	52.24	V
	1413	1732.6	-20.27	37.60	17.33	54.08	
	1513	1752.6	-20.40	37.65	17.25	53.09	

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

LTE Band 4							
Channel Bandwidth: 1.4 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
Y	19957	1710.7	-27.36	36.45	9.09	8.11	H
	20175	1732.5	-27.42	36.80	9.38	8.67	
	20393	1754.3	-27.63	36.94	9.31	8.53	
	19957	1710.7	-21.46	37.28	15.82	38.19	V
	20175	1732.5	-21.34	37.63	16.29	42.56	
	20393	1754.3	-21.46	37.64	16.18	41.50	
Channel Bandwidth: 1.4 MHz / 16QAM							
Y	19957	1710.7	-28.29	36.45	8.16	6.55	H
	20175	1732.5	-28.25	36.80	8.55	7.16	
	20393	1754.3	-28.67	36.94	8.27	6.71	
	19957	1710.7	-22.44	37.28	14.84	30.48	V
	20175	1732.5	-22.51	37.63	15.12	32.51	
	20393	1754.3	-22.55	37.64	15.09	32.28	
Channel Bandwidth: 1.4 MHz / 64QAM							
Y	19957	1710.7	-29.37	36.45	7.08	5.11	H
	20175	1732.5	-29.51	36.80	7.29	5.36	
	20393	1754.3	-29.71	36.94	7.23	5.28	
	19957	1710.7	-23.54	37.28	13.74	23.66	V
	20175	1732.5	-23.34	37.63	14.29	26.85	
	20393	1754.3	-23.63	37.64	14.01	25.18	

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

LTE Band 4							
Channel Bandwidth: 3 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
Y	19965	1711.5	-27.13	36.45	9.32	8.55	H
	20175	1732.5	-27.11	36.80	9.69	9.31	
	20385	1753.5	-27.36	36.94	9.58	9.08	
	19965	1711.5	-21.15	37.28	16.13	41.02	V
	20175	1732.5	-21.13	37.63	16.50	44.67	
	20385	1753.5	-21.17	37.64	16.47	44.36	
Channel Bandwidth: 3 MHz / 16QAM							
Y	19965	1711.5	-28.01	36.45	8.44	6.98	H
	20175	1732.5	-28.03	36.80	8.77	7.53	
	20385	1753.5	-28.34	36.94	8.60	7.24	
	19965	1711.5	-22.19	37.28	15.09	32.28	V
	20175	1732.5	-22.21	37.63	15.42	34.83	
	20385	1753.5	-22.31	37.64	15.33	34.12	
Channel Bandwidth: 3 MHz / 64QAM							
Y	19965	1711.5	-29.08	36.45	7.37	5.46	H
	20175	1732.5	-29.22	36.80	7.58	5.73	
	20385	1753.5	-29.38	36.94	7.56	5.70	
	19965	1711.5	-23.29	37.28	13.99	25.06	V
	20175	1732.5	-23.13	37.63	14.50	28.18	
	20385	1753.5	-23.36	37.64	14.28	26.79	

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

LTE Band 4							
Channel Bandwidth: 5 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
Y	19975	1712.5	-26.78	36.45	9.67	9.27	H
	20175	1732.5	-26.80	36.80	10.00	10.00	
	20375	1752.5	-27.15	36.94	9.79	9.53	
	19975	1712.5	-20.81	37.28	16.47	44.36	V
	20175	1732.5	-20.78	37.63	16.85	48.42	
	20375	1752.5	-20.95	37.64	16.69	46.67	
Channel Bandwidth: 5 MHz / 16QAM							
Y	19975	1712.5	-27.75	36.45	8.70	7.41	H
	20175	1732.5	-27.81	36.80	8.99	7.93	
	20375	1752.5	-28.12	36.94	8.82	7.62	
	19975	1712.5	-21.97	37.28	15.31	33.96	V
	20175	1732.5	-21.90	37.63	15.73	37.41	
	20375	1752.5	-22.04	37.64	15.60	36.31	
Channel Bandwidth: 5 MHz / 64QAM							
Y	19975	1712.5	-28.84	36.45	7.61	5.77	H
	20175	1732.5	-28.92	36.80	7.88	6.14	
	20375	1752.5	-29.09	36.94	7.85	6.10	
	19975	1712.5	-23.08	37.28	14.20	26.30	V
	20175	1732.5	-22.81	37.63	14.82	30.34	
	20375	1752.5	-23.15	37.64	14.49	28.12	

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

LTE Band 4							
Channel Bandwidth: 10 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
Y	20000	1715.0	-26.73	36.64	9.91	9.79	H
	20175	1732.5	-26.60	36.80	10.20	10.47	
	20350	1750.0	-26.80	36.80	10.00	10.00	
	20000	1715.0	-20.68	37.44	16.76	47.42	V
	20175	1732.5	-20.53	37.63	17.10	51.29	
	20350	1750.0	-20.75	37.64	16.89	48.87	
Channel Bandwidth: 10 MHz / 16QAM							
Y	20000	1715.0	-27.72	36.64	8.92	7.80	H
	20175	1732.5	-27.55	36.80	9.25	8.41	
	20350	1750.0	-27.76	36.80	9.04	8.02	
	20000	1715.0	-21.83	37.44	15.61	36.39	V
	20175	1732.5	-21.64	37.63	15.99	39.72	
	20350	1750.0	-21.80	37.64	15.84	38.37	
Channel Bandwidth: 10 MHz / 64QAM							
Y	20000	1715.0	-28.83	36.64	7.81	6.04	H
	20175	1732.5	-28.66	36.80	8.14	6.52	
	20350	1750.0	-28.72	36.80	8.08	6.43	
	20000	1715.0	-22.97	37.44	14.47	27.99	V
	20175	1732.5	-22.57	37.63	15.06	32.06	
	20350	1750.0	-22.95	37.64	14.69	29.44	

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

LTE Band 4							
Channel Bandwidth: 15 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
Y	20025	1717.5	-26.19	36.45	10.26	10.62	H
	20175	1732.5	-26.39	36.80	10.41	10.99	
	20325	1747.5	-26.60	36.94	10.34	10.81	
	20025	1717.5	-20.17	37.28	17.11	51.40	V
	20175	1732.5	-20.32	37.63	17.31	53.83	
	20325	1747.5	-20.41	37.64	17.23	52.84	
Channel Bandwidth: 15 MHz / 16QAM							
Y	20025	1717.5	-27.28	36.45	9.17	8.27	H
	20175	1732.5	-27.30	36.80	9.50	8.91	
	20325	1747.5	-27.64	36.94	9.30	8.51	
	20025	1717.5	-21.42	37.28	15.86	38.55	V
	20175	1732.5	-21.35	37.63	16.28	42.46	
	20325	1747.5	-21.53	37.64	16.11	40.83	
Channel Bandwidth: 15 MHz / 64QAM							
Y	20025	1717.5	-28.32	36.45	8.13	6.50	H
	20175	1732.5	-28.36	36.80	8.44	6.98	
	20325	1747.5	-28.66	36.94	8.28	6.73	
	20025	1717.5	-22.53	37.28	14.75	29.85	V
	20175	1732.5	-22.33	37.63	15.30	33.88	
	20325	1747.5	-22.73	37.64	14.91	30.97	

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

LTE Band 4							
Channel Bandwidth: 20 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
Y	20050	1720.0	-25.84	36.45	10.61	11.51	H
	20175	1732.5	-26.05	36.80	10.75	11.89	
	20300	1745.0	-26.26	36.94	10.68	11.69	
	20050	1720.0	-19.88	37.28	17.40	54.95	V
	20175	1732.5	-20.08	37.63	17.55	56.89	
	20300	1745.0	-20.15	37.64	17.49	56.10	
Channel Bandwidth: 20 MHz / 16QAM							
Y	20050	1720.0	-27.00	36.45	9.45	8.81	H
	20175	1732.5	-26.93	36.80	9.87	9.71	
	20300	1745.0	-27.33	36.94	9.61	9.14	
	20050	1720.0	-21.13	37.28	16.15	41.21	V
	20175	1732.5	-21.03	37.63	16.60	45.71	
	20300	1745.0	-21.32	37.64	16.32	42.85	
Channel Bandwidth: 20 MHz / 64QAM							
Y	20050	1720.0	-28.02	36.45	8.43	6.97	H
	20175	1732.5	-28.10	36.80	8.70	7.41	
	20300	1745.0	-28.38	36.94	8.56	7.18	
	20050	1720.0	-22.21	37.28	15.07	32.14	V
	20175	1732.5	-22.13	37.63	15.50	35.48	
	20300	1745.0	-22.44	37.64	15.20	33.11	

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

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

N/A

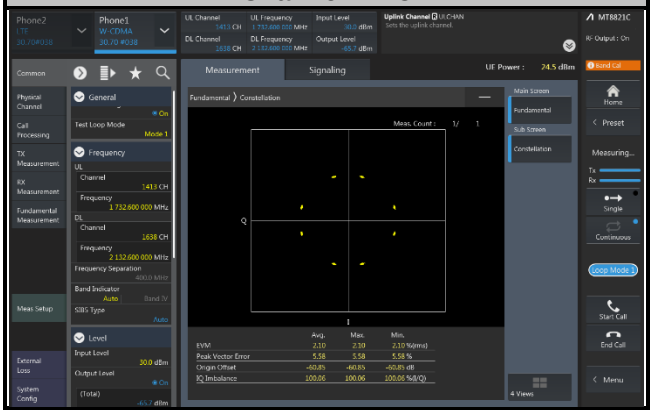
4.2.2 Test Setup

4.2.3 Test Procedure

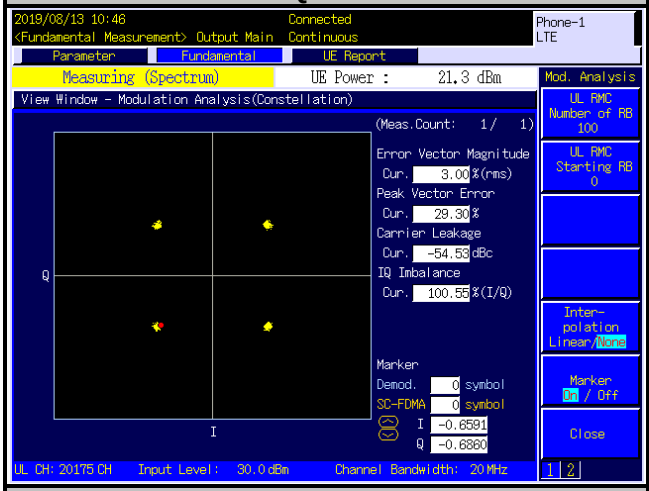
Connect the EUT to Communication Simulator via the antenna connector. The frequency band is set as EUT supported Modulation and Channels, the EUT output is matched with 50 ohm load, the waveform quality and constellation of the EUT was tested.

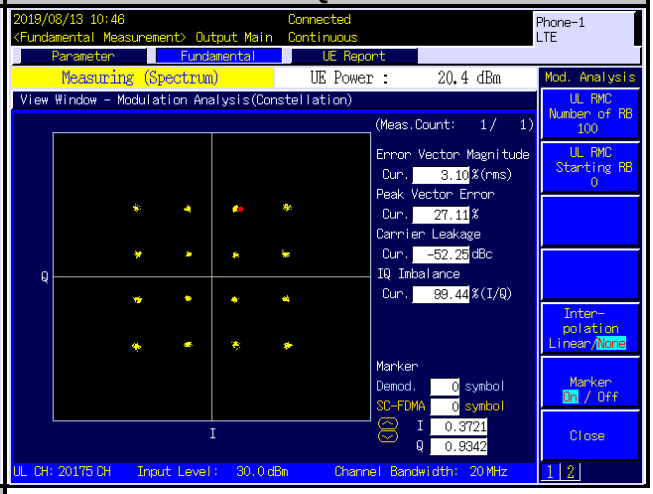
4.2.4 Test Results

Spectrum Plot of Measurement
WCDMA
Channel 1413

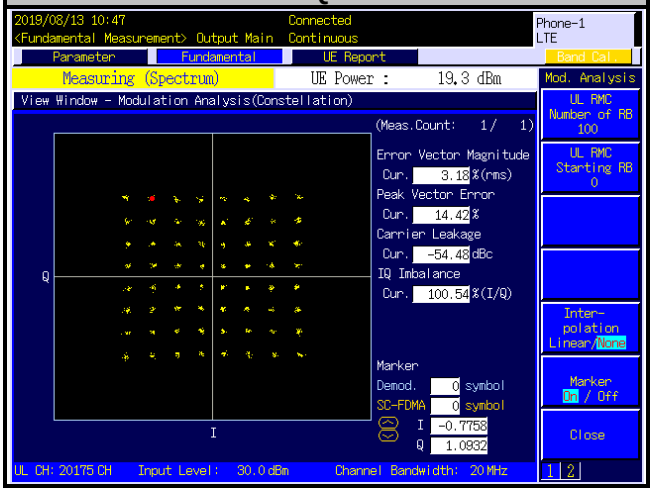


Spectrum Plot of Measurement	
LTE Band 4	
Channel 20175	
QPSK	16QAM





64QAM



4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

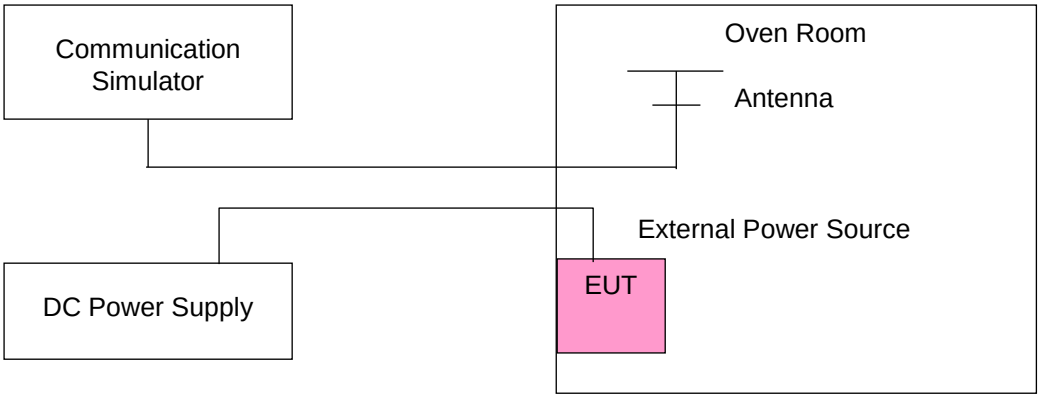
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

4.3.2 Test Procedure

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

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

4.3.3 Test Setup



4.3.4 Test Results

Frequency Error vs. Voltage

Voltage (Volts)	WCDMA			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.8	1712.400003	0.002	1752.600003	0.002
3.4	1712.400002	0.001	1752.600002	0.001
4.35	1712.400004	0.002	1752.600004	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. (℃)	WCDMA			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-25	1712.400002	0.001	1752.600004	0.002
-20	1712.400003	0.002	1752.600004	0.002
-10	1712.400002	0.001	1752.600002	0.001
0	1712.400002	0.001	1752.600002	0.001
10	1712.400003	0.002	1752.600001	0.001
20	1712.399996	-0.002	1752.599996	-0.002
30	1712.399998	-0.001	1752.599999	-0.001
40	1712.399999	-0.001	1752.599997	-0.002
50	1712.399997	-0.002	1752.599999	-0.001
55	1712.399997	-0.002	1752.599997	-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 4			
	Channel Bandwidth: 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.8	1710.700003	0.002	1754.300003	0.002
3.4	1710.700004	0.002	1754.300003	0.001
4.35	1710.700003	0.002	1754.300003	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. (℃)	LTE Band 4			
	Channel Bandwidth: 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-25	1710.700004	0.002	1754.300003	0.002
-20	1710.700003	0.002	1754.300002	0.001
-10	1710.700003	0.002	1754.300002	0.001
0	1710.700003	0.001	1754.300001	0.001
10	1710.700004	0.002	1754.300001	0.001
20	1710.699999	-0.001	1754.299997	-0.002
30	1710.699998	-0.001	1754.299997	-0.002
40	1710.699998	-0.001	1754.299997	-0.002
50	1710.699997	-0.002	1754.299997	-0.002
55	1710.699997	-0.002	1754.299997	-0.002

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 4			
	Channel Bandwidth: 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.8	1711.500004	0.002	1753.500003	0.001
3.4	1711.500003	0.002	1753.500002	0.001
4.35	1711.500002	0.001	1753.500001	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. (℃)	LTE Band 4			
	Channel Bandwidth: 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-25	1711.500002	0.001	1753.500001	0.001
-20	1711.500002	0.001	1753.500001	0.001
-10	1711.500002	0.001	1753.500002	0.001
0	1711.500003	0.002	1753.500002	0.001
10	1711.500001	0.001	1753.500004	0.002
20	1711.499999	-0.001	1753.499997	-0.002
30	1711.499999	-0.001	1753.499999	-0.001
40	1711.499996	-0.002	1753.499998	-0.001
50	1711.499997	-0.002	1753.499997	-0.002
55	1711.499998	-0.001	1753.499996	-0.002

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 4			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.8	1712.500002	0.001	1752.500004	0.002
3.4	1712.500003	0.002	1752.500002	0.001
4.35	1712.500003	0.002	1752.500003	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. (℃)	LTE Band 4			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-25	1712.500001	0.001	1752.500001	0.001
-20	1712.500004	0.002	1752.500003	0.002
-10	1712.500001	0.001	1752.500001	0.001
0	1712.500002	0.001	1752.500002	0.001
10	1712.500004	0.002	1752.500002	0.001
20	1712.499997	-0.002	1752.499999	-0.001
30	1712.499997	-0.002	1752.499998	-0.001
40	1712.499997	-0.002	1752.499997	-0.002
50	1712.499997	-0.002	1752.499999	-0.001
55	1712.499997	-0.002	1752.499997	-0.002

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 4			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.8	1715.000001	0.001	1750.000004	0.002
3.4	1715.000002	0.001	1750.000003	0.002
4.35	1715.000002	0.001	1750.000002	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. (℃)	LTE Band 4			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-25	1715.000004	0.002	1750.000001	0.001
-20	1715.000002	0.001	1750.000004	0.002
-10	1715.000001	0.001	1750.000001	0.001
0	1715.000004	0.002	1750.000002	0.001
10	1715.000004	0.002	1750.000002	0.001
20	1714.999996	-0.002	1749.999999	-0.001
30	1714.999999	-0.001	1749.999996	-0.002
40	1714.999998	-0.001	1749.999997	-0.002
50	1714.999998	-0.001	1749.999998	-0.001
55	1714.999996	-0.002	1749.999997	-0.002

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 4			
	Channel Bandwidth: 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.8	1717.500001	0.001	1747.500003	0.002
3.4	1717.500004	0.002	1747.500004	0.002
4.35	1717.500001	0.001	1747.500001	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. (℃)	LTE Band 4			
	Channel Bandwidth: 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-25	1717.500002	0.001	1747.500003	0.002
-20	1717.500004	0.002	1747.500004	0.002
-10	1717.500001	0.001	1747.500002	0.001
0	1717.500002	0.001	1747.500004	0.002
10	1717.500003	0.002	1747.500003	0.001
20	1717.499997	-0.002	1747.499999	-0.001
30	1717.499996	-0.002	1747.499997	-0.001
40	1717.499999	-0.001	1747.499999	-0.001
50	1717.499999	-0.001	1747.499998	-0.001
55	1717.499997	-0.002	1747.499997	-0.002

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 4			
	Channel Bandwidth: 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.8	1720.000002	0.001	1745.000001	0.001
3.4	1720.000001	0.001	1745.000002	0.001
4.35	1720.000001	0.001	1745.000001	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. (℃)	LTE Band 4			
	Channel Bandwidth: 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-25	1720.000003	0.002	1745.000003	0.002
-20	1720.000003	0.002	1745.000003	0.002
-10	1720.000002	0.001	1745.000003	0.002
0	1720.000004	0.002	1745.000001	0.001
10	1720.000004	0.002	1745.000002	0.001
20	1719.999999	-0.001	1744.999998	-0.001
30	1719.999997	-0.002	1744.999998	-0.001
40	1719.999998	-0.001	1744.999999	-0.001
50	1719.999997	-0.002	1744.999998	-0.001
55	1719.999998	-0.001	1744.999996	-0.002

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

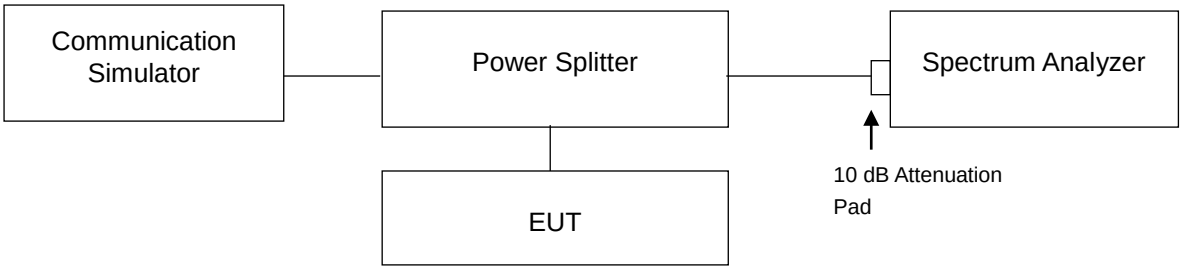
4.4.1 Limits of Occupied Bandwidth Measurement

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

4.4.2 Test Procedure

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

4.4.3 Test Setup

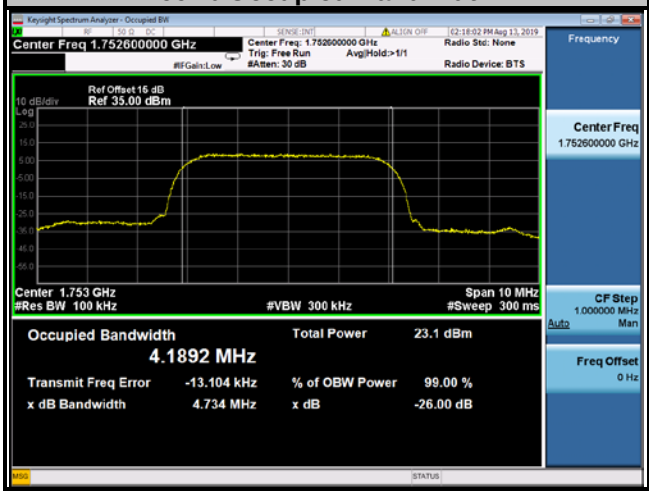


4.4.4 Test Result

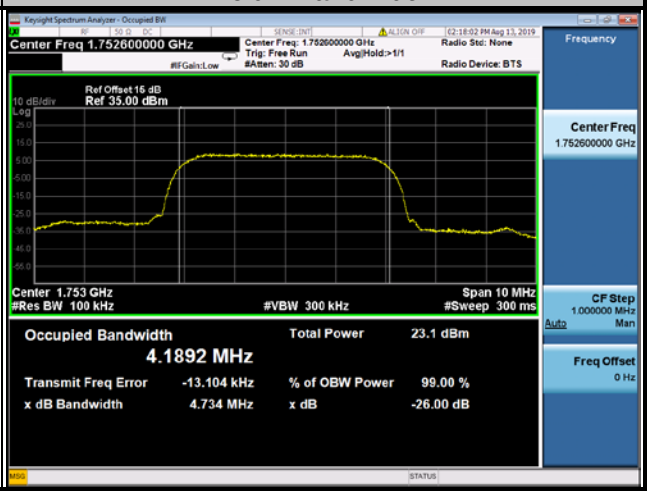
WCDMA			
Channel	**Frequency (MHz)**	**99 % Occupied Bandwidth (MHz)**	**26 dB Bandwidth (MHz)**
1312	1712.4	4.1885	4.714
1413	1732.6	4.1799	4.703
1513	1752.6	4.1892	4.734

Spectrum Plot of Worst Value

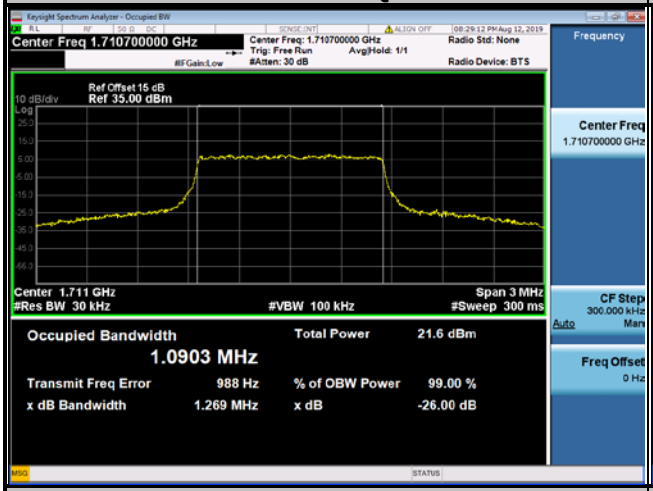
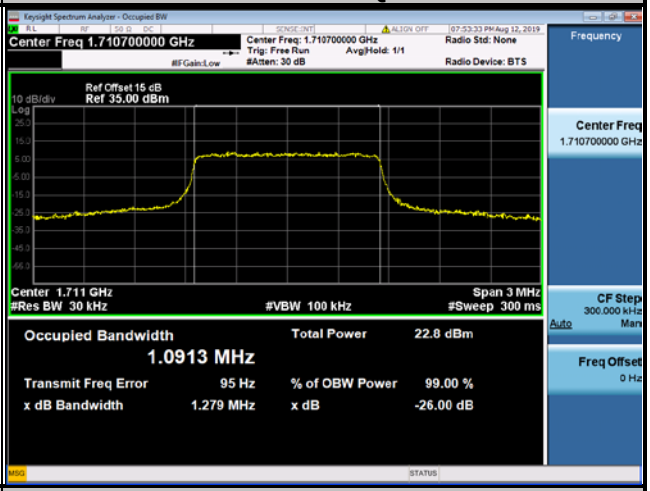
99 % Occupied Bandwidth



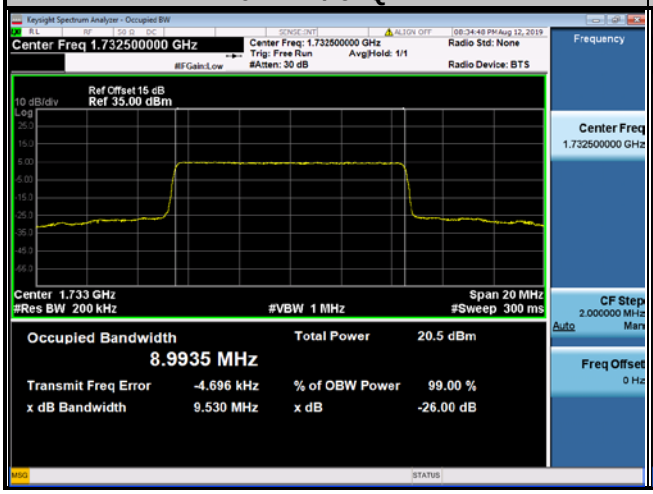
26 dB Bandwidth



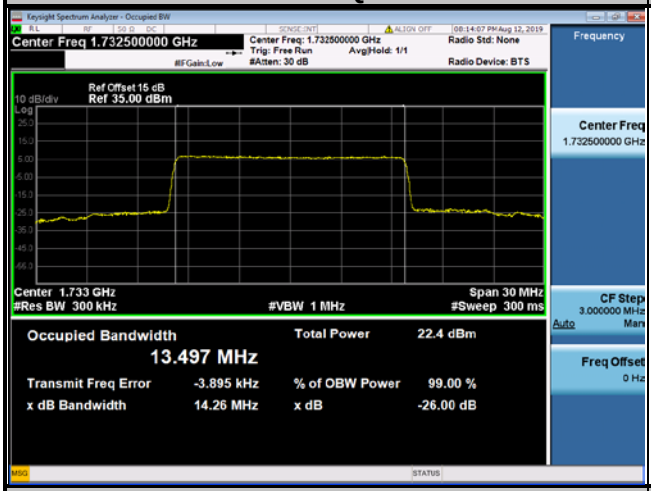
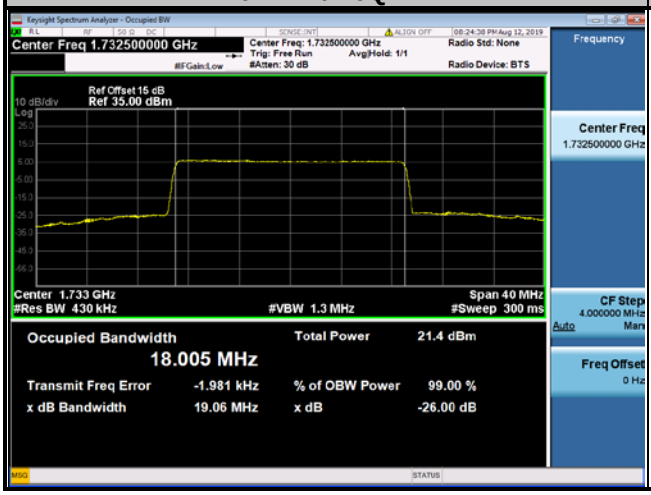
LTE Band 4							
Channel Bandwidth: 1.4 MHz							
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)			26 dB Bandwidth (MHz)		
		QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
19957	1710.7	1.0869	1.0913	1.0903	1.255	1.279	1.269
20175	1732.5	1.0870	1.0885	1.0903	1.254	1.264	1.268
20393	1754.3	1.0863	1.0882	1.0869	1.245	1.256	1.261
Channel Bandwidth: 3 MHz							
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)			26 dB Bandwidth (MHz)		
		QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
19965	1711.5	2.6997	2.6952	2.6964	2.872	2.880	2.872
20175	1732.5	2.7005	2.6952	2.6952	2.873	2.879	2.868
20385	1753.5	2.6968	2.6917	2.6914	2.871	2.865	2.864

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

LTE Band 4							
Channel Bandwidth: 5 MHz							
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)			26 dB Bandwidth (MHz)		
		QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
19975	1712.5	4.4952	4.4978	4.5038	4.799	4.792	4.787
20175	1732.5	4.4956	4.4973	4.5035	4.785	4.791	4.807
20375	1752.5	4.4896	4.4911	4.5013	4.769	4.775	4.778
Channel Bandwidth: 10 MHz							
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)			26 dB Bandwidth (MHz)		
		QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
20000	1715.0	8.9833	8.9902	8.9932	9.498	9.512	9.523
20175	1732.5	8.9907	8.9935	8.9935	9.512	9.524	9.530
20350	1750.0	8.9688	8.9759	8.9728	9.496	9.503	9.514

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

LTE Band 4							
Channel Bandwidth: 15 MHz							
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)			26 dB Bandwidth (MHz)		
		QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
20025	1717.5	13.470	13.460	13.454	14.250	14.240	14.240
20175	1732.5	13.497	13.484	13.479	14.260	14.260	14.250
20325	1747.5	13.459	13.448	13.442	14.250	14.230	14.230
Channel Bandwidth: 20 MHz							
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)			26 dB Bandwidth (MHz)		
		QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
20050	1720.0	17.932	17.947	17.939	19.040	19.050	19.040
20175	1732.5	17.980	18.005	18.000	19.060	19.060	19.070
20300	1745.0	17.937	17.956	17.950	19.030	19.050	19.030

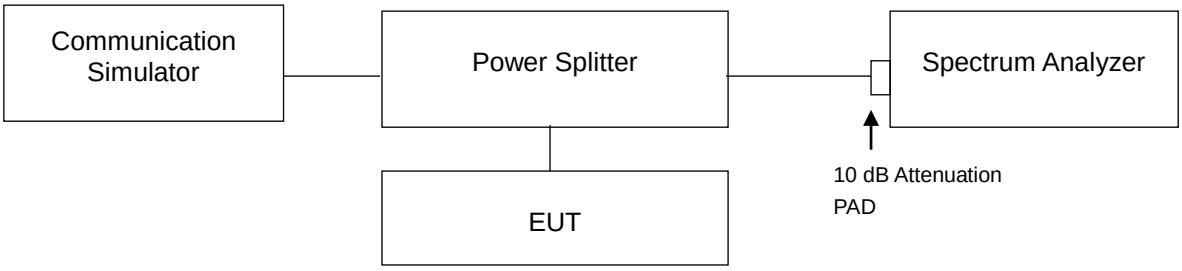
Spectrum Plot of Worst Value	
99 % Occupied Bandwidth	26 dB Bandwidth
15 MHz / QPSK	15 MHz / QPSK
	
20 MHz / 16QAM	20 MHz / 64QAM
	

4.5 Band Edge Measurement

4.5.1 Limits of Band Edge Measurement

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

4.5.2 Test Setup



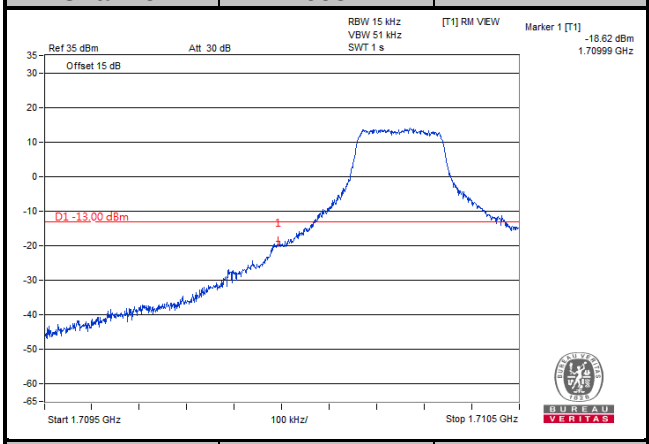
4.5.3 Test Procedures

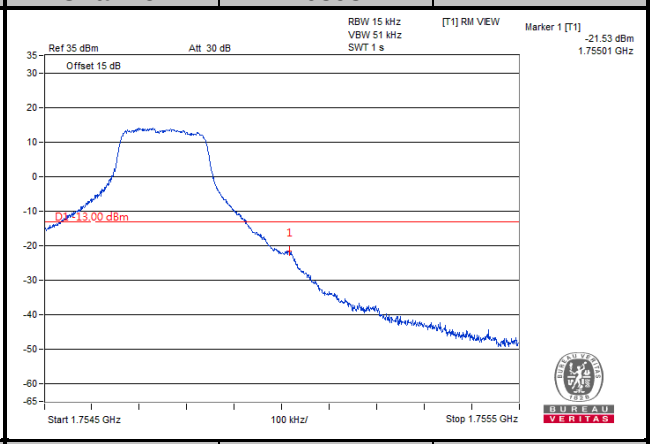
a. All measurements were done at low and high operational frequency range.
b. The center frequency of spectrum is the band edge frequency and span is 5 MHz. RB of the spectrum is 51 kHz and VB of the spectrum is 160 kHz (WCDMA).
c. The center frequency of spectrum is the band edge frequency and span 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

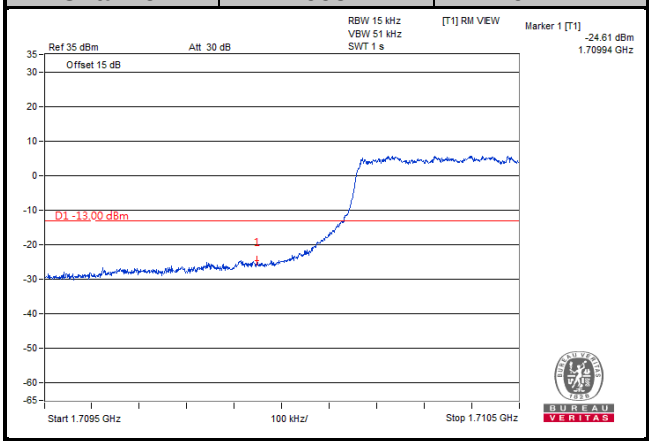
WCDMA			
Channel	1312	Channel	1513

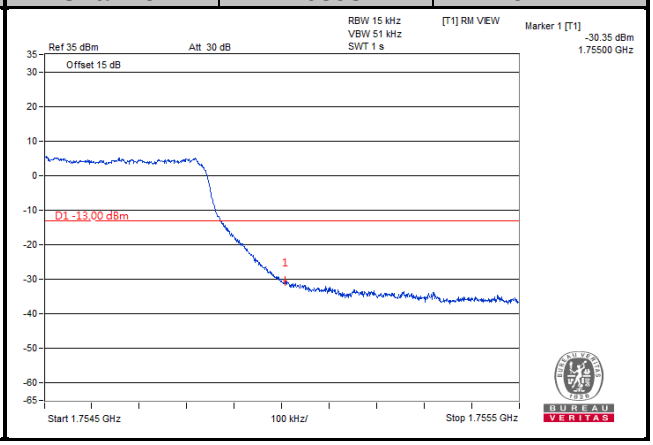
LTE Band 4					
Channel Bandwidth: 1.4 MHz					
Channel	19957	1 RB	Channel	20393	1 RB

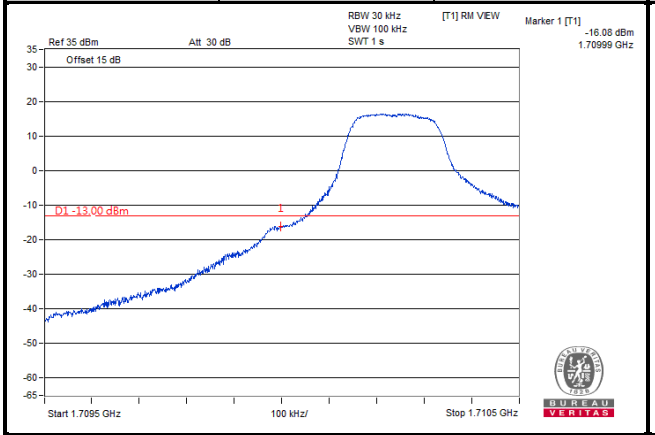
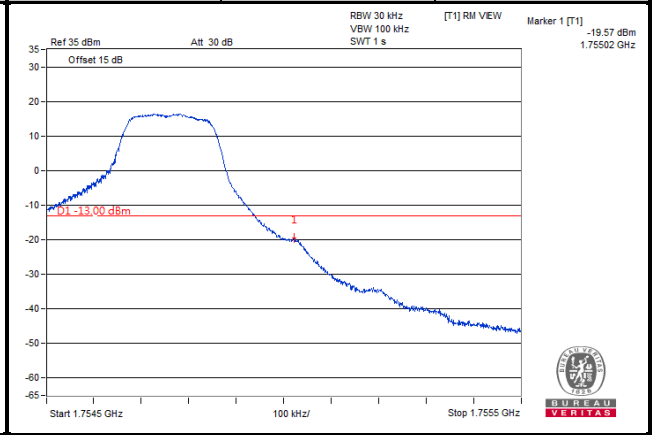
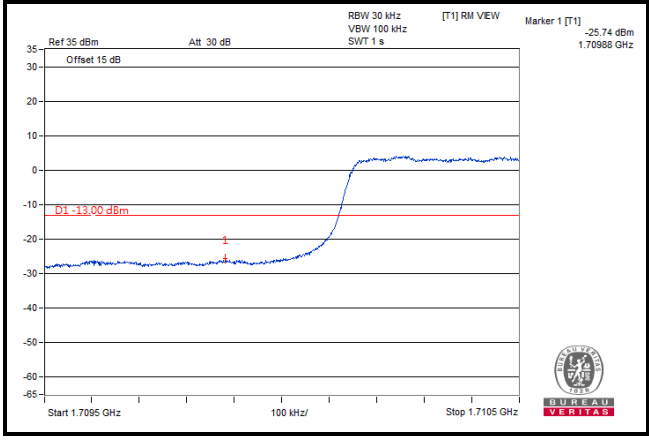
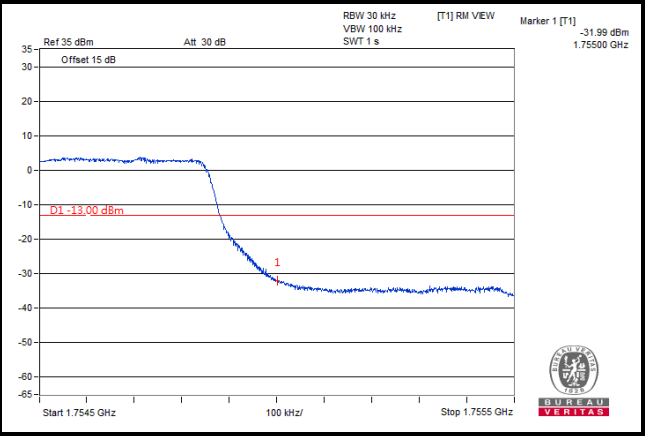


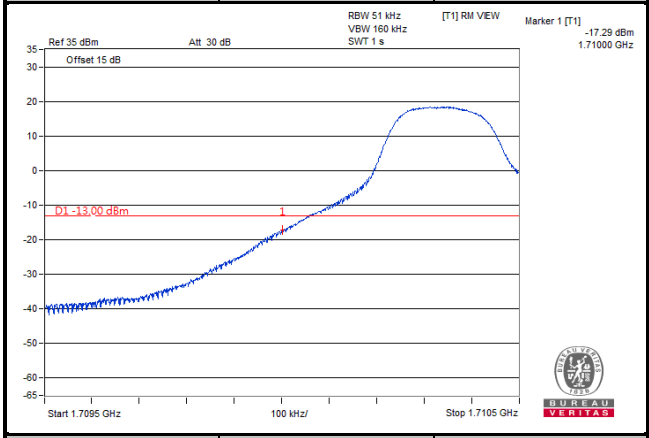
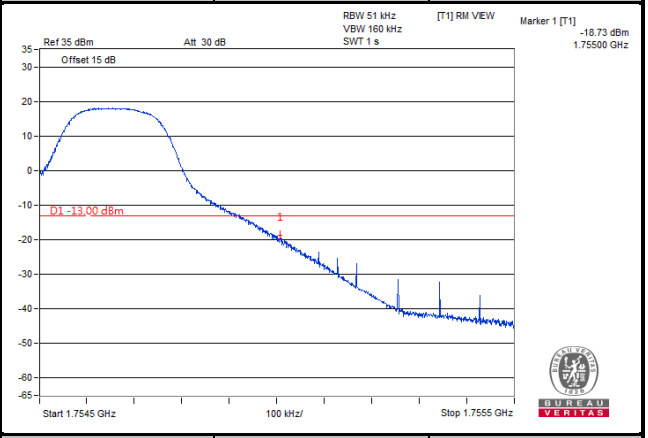
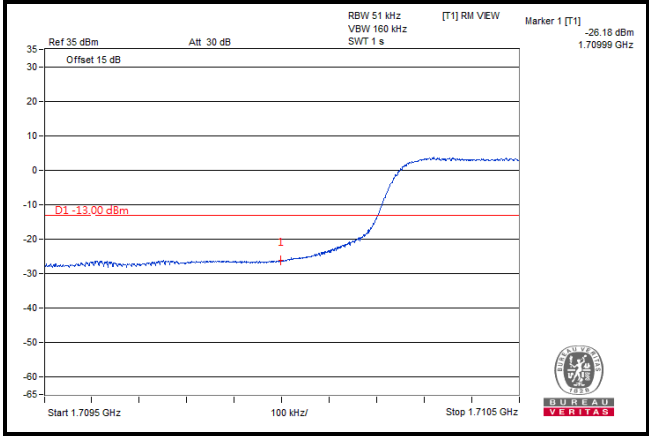
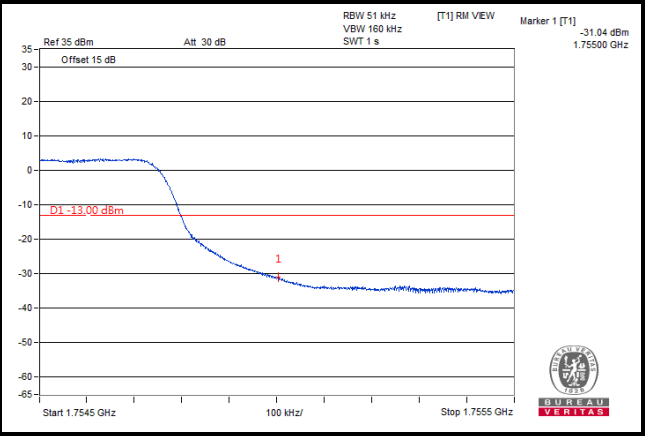


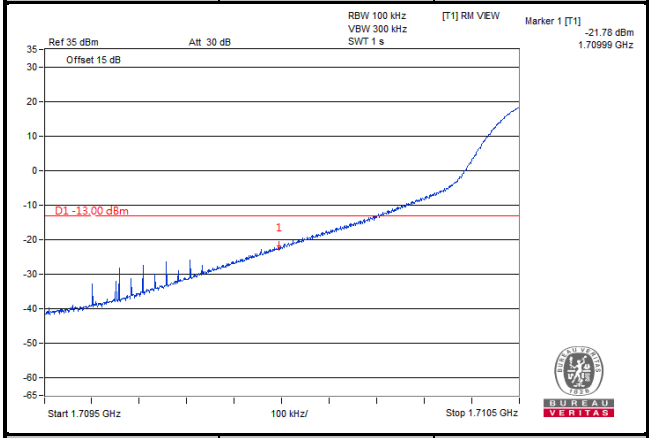
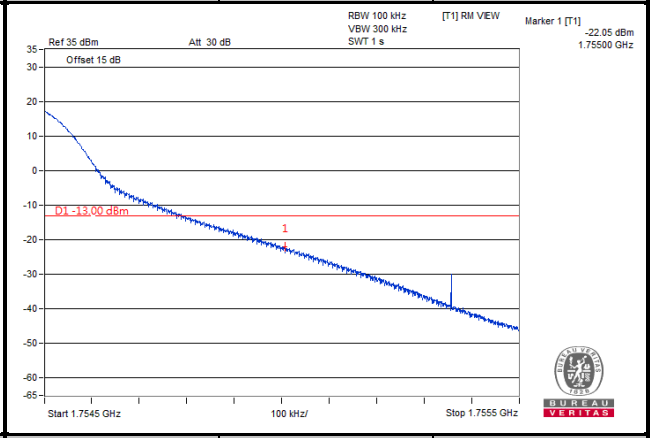
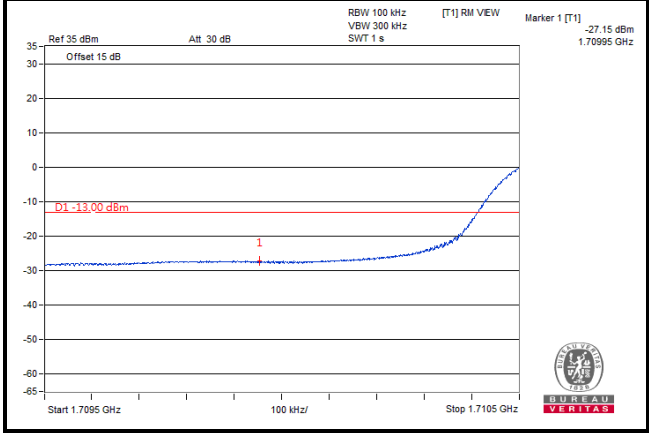
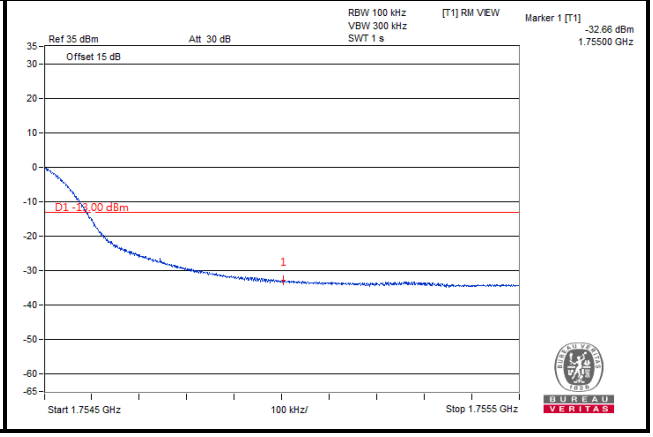
Channel	19957	6 RB	Channel	20393	6 RB

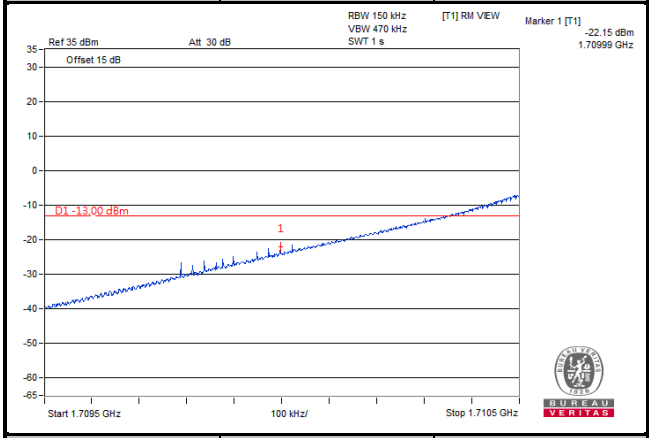
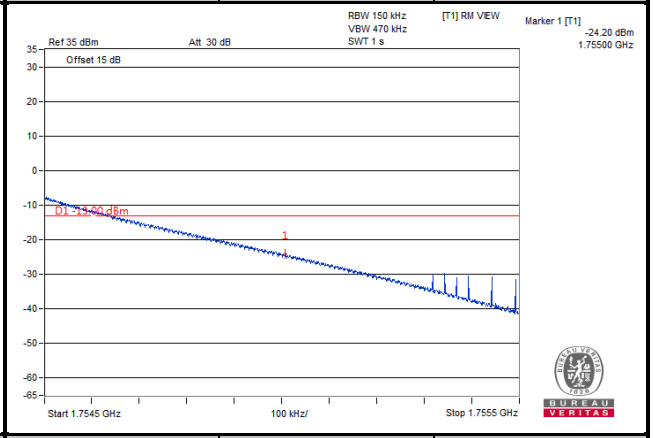
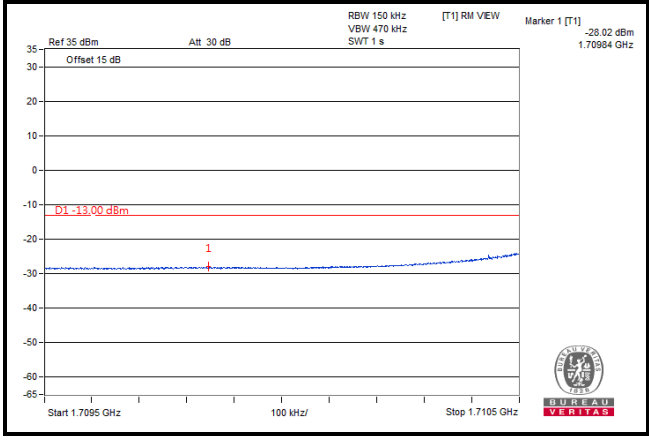
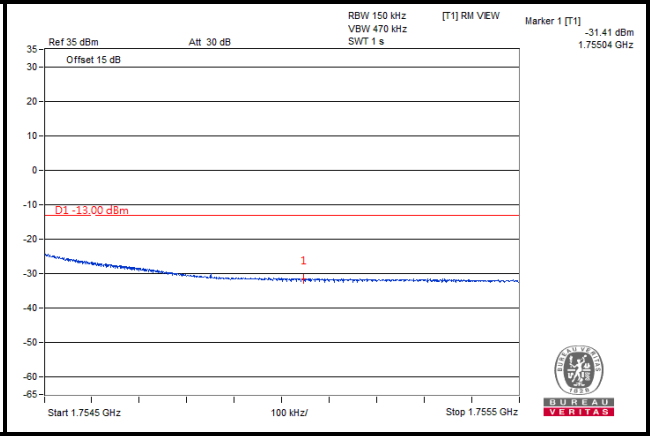


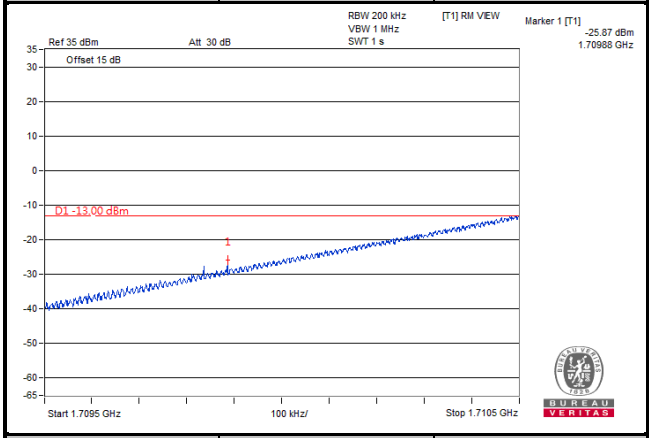
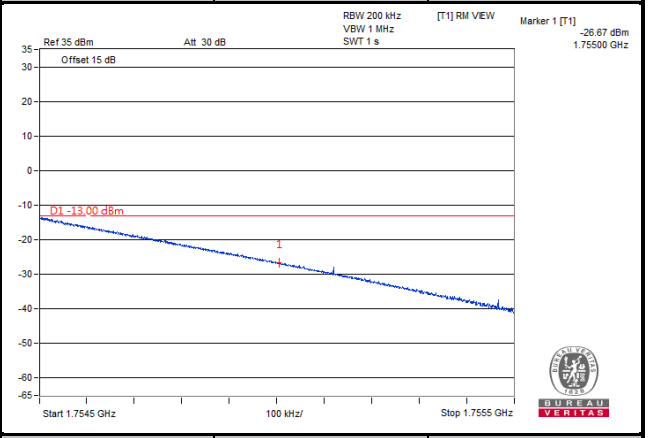
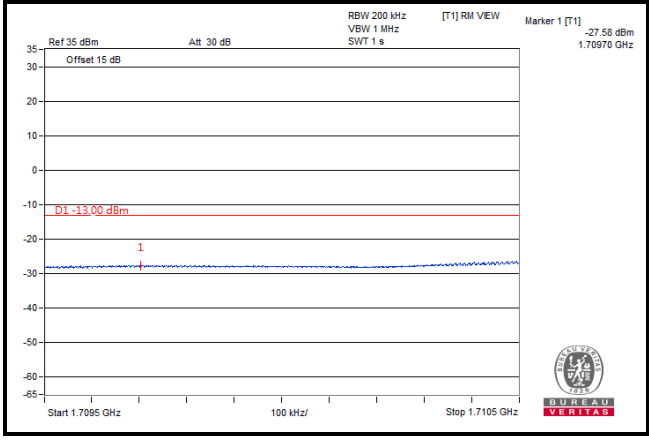
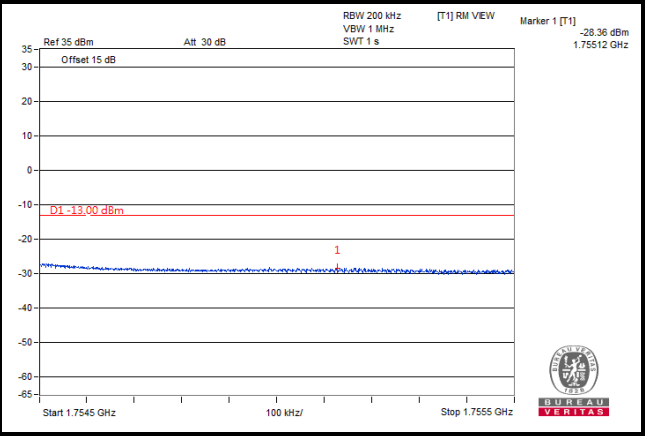


LTE Band 4					
Channel Bandwidth: 3 MHz					
Channel	19965	1 RB	Channel	20385	1 RB
					
Channel	19965	15 RB	Channel	20385	15 RB
					

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

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

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

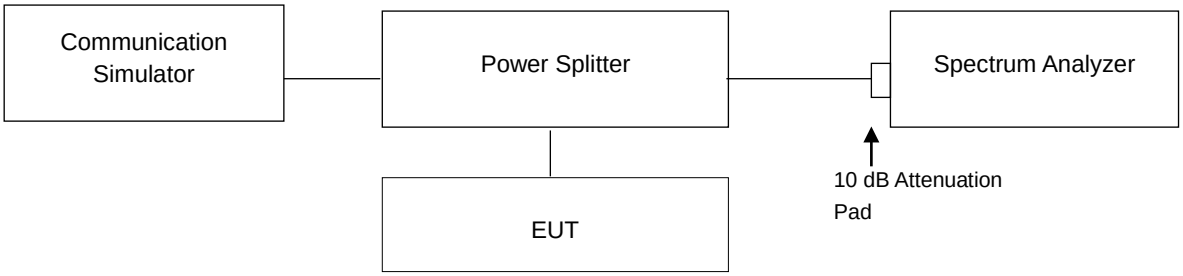
LTE Band 4					
Channel Bandwidth: 20 MHz					
Channel	20050	1 RB	Channel	20300	1 RB
					
Channel	20050	100 RB	Channel	20300	100 RB
					

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



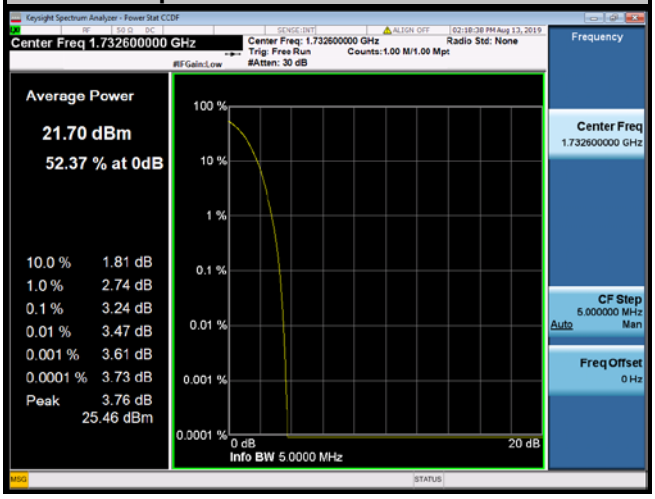
4.6.3 Test Procedures

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 %.

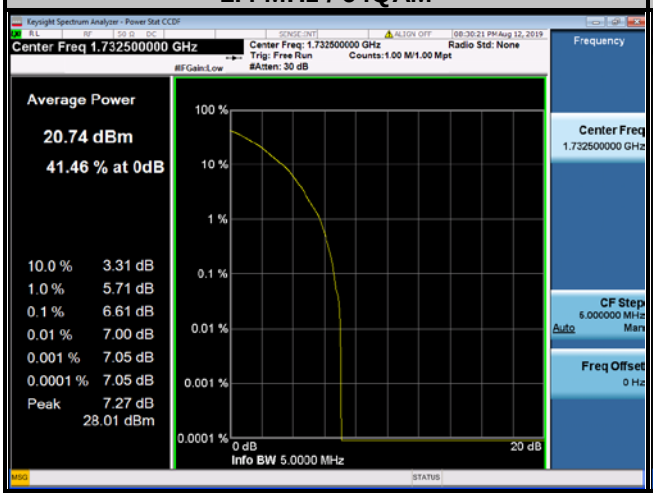
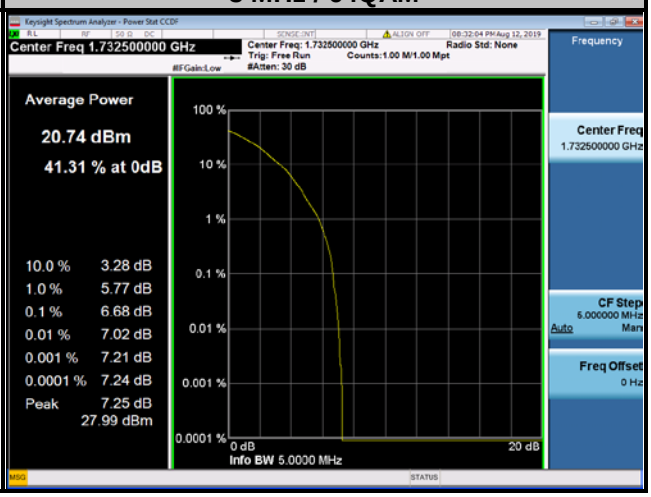
4.6.4 Test Results

WCDMA		
Channel	**Frequency (MHz)**	**Peak to Average Ratio (dB)**
1312	1712.4	3.07
1413	1732.6	3.24
1513	1752.6	2.88

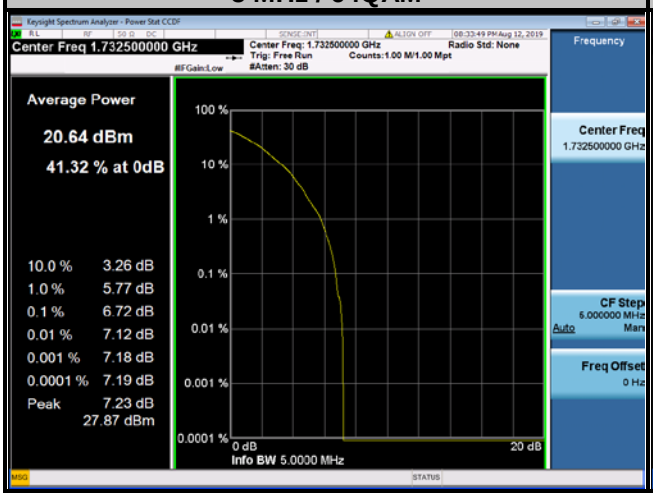
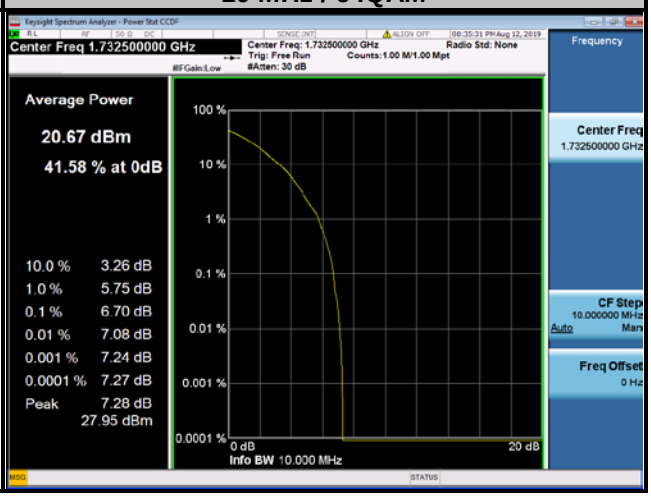
Spectrum Plot of Worst Value



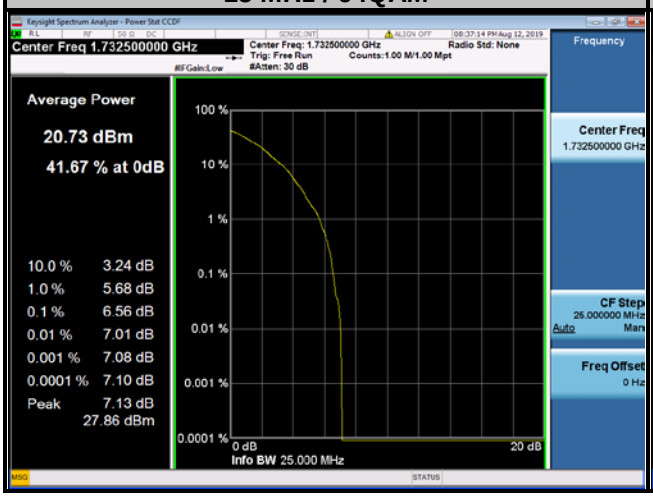
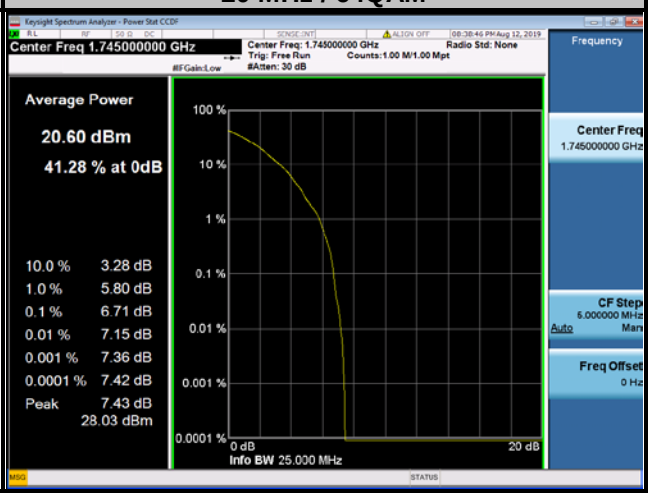
LTE Band 4									
Channel Bandwidth: 1.4 MHz					Channel Bandwidth: 3 MHz				
Channel	Frequency (MHz)	Peak to Average Ratio (dB)			Channel	Frequency (MHz)	Peak to Average Ratio (dB)		
		QPSK	16QAM	64QAM			QPSK	16QAM	64QAM
19957	1710.7	4.35	5.31	6.07	19965	1711.5	4.32	5.26	6.14
20175	1732.5	4.98	5.89	6.61	20175	1732.5	4.99	5.89	6.68
20393	1754.3	4.58	5.52	6.18	20385	1753.5	4.52	5.47	6.20

Spectrum Plot of Worst Value	
1.4 MHz / 64QAM	3 MHz / 64QAM
	

LTE Band 4									
Channel Bandwidth: 5 MHz					Channel Bandwidth: 10 MHz				
Channel	Frequency (MHz)	Peak to Average Ratio (dB)			Channel	Frequency (MHz)	Peak to Average Ratio (dB)		
		QPSK	16QAM	64QAM			QPSK	16QAM	64QAM
19975	1712.5	4.50	5.40	6.23	20000	1715.0	4.38	5.35	6.17
20175	1732.5	5.16	6.02	6.72	20175	1732.5	5.04	5.97	6.70
20375	1752.5	4.68	5.61	6.26	20350	1750.0	4.77	5.69	6.41

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

LTE Band 4									
Channel Bandwidth: 15 MHz					Channel Bandwidth: 20 MHz				
Channel	Frequency (MHz)	Peak to Average Ratio (dB)			Channel	Frequency (MHz)	Peak to Average Ratio (dB)		
		QPSK	16QAM	64QAM			QPSK	16QAM	64QAM
20025	1717.5	4.47	5.34	6.28	20050	1720.0	4.51	5.36	6.21
20175	1732.5	5.02	5.91	6.56	20175	1732.5	4.97	5.87	6.67
20325	1747.5	4.93	5.89	6.49	20300	1745.0	5.02	5.94	6.71

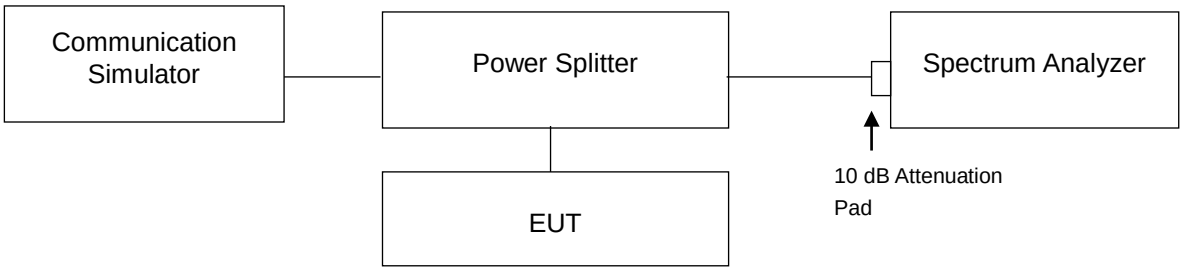
Spectrum Plot of Worst Value	
15 MHz / 64QAM	20 MHz / 64QAM
	

4.7 Conducted Spurious Emissions

4.7.1 Limits of Conducted Spurious Emissions Measurement

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

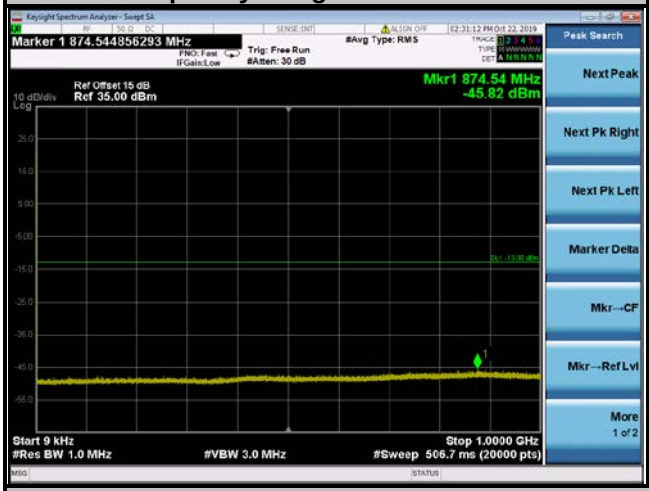
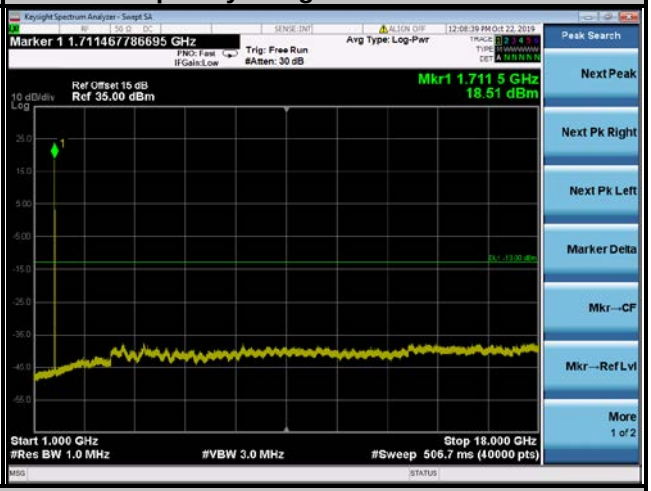
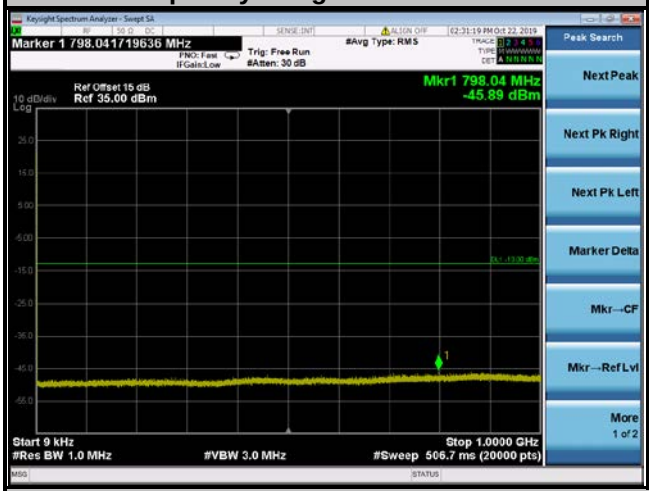
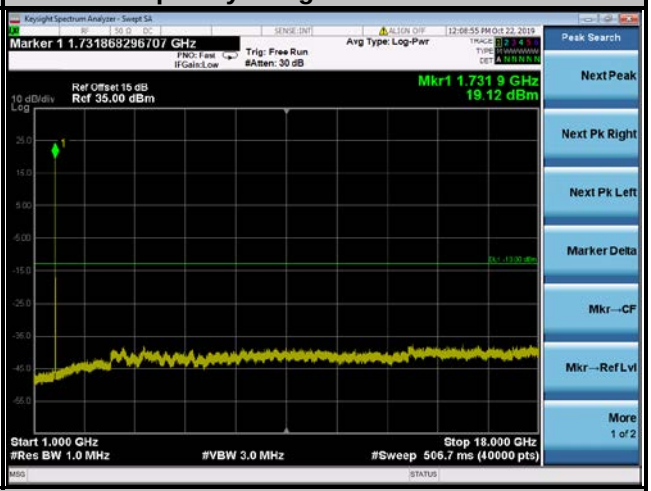
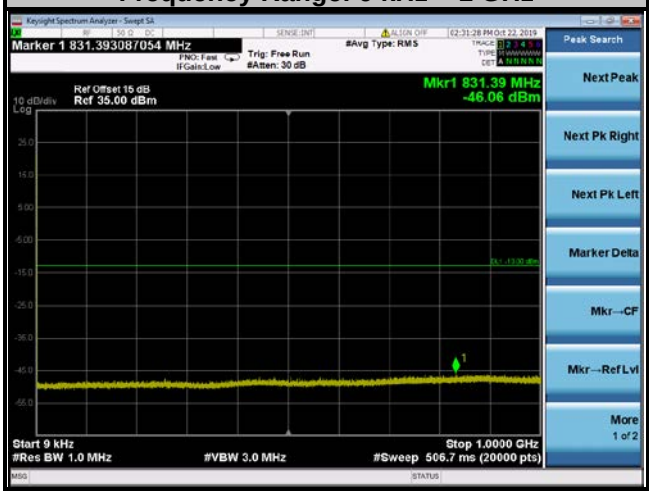
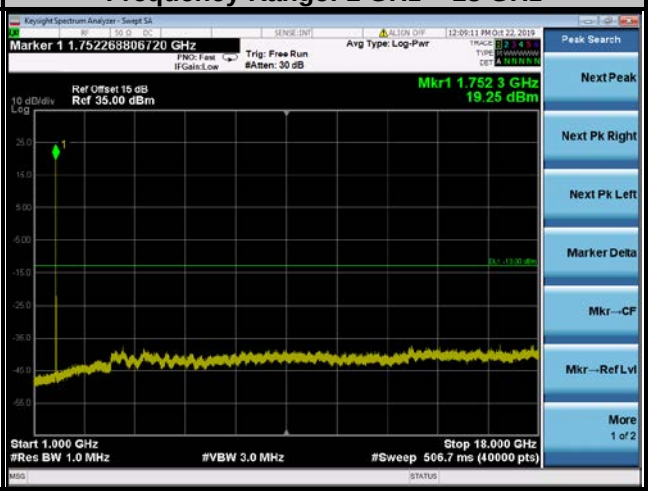
4.7.2 Test Setup



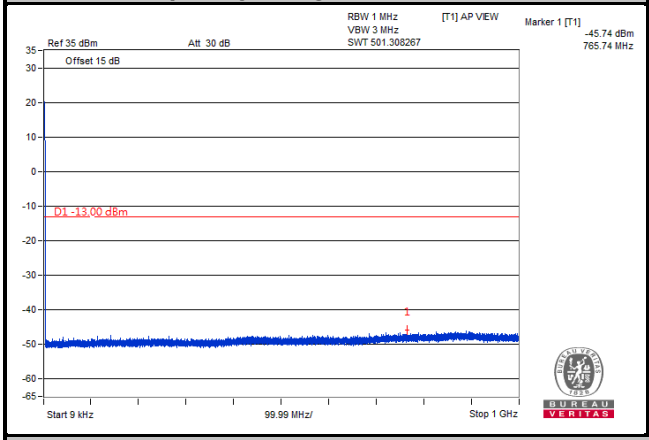
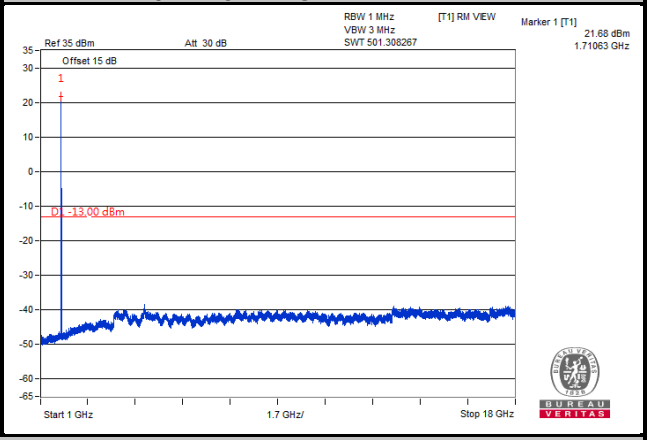
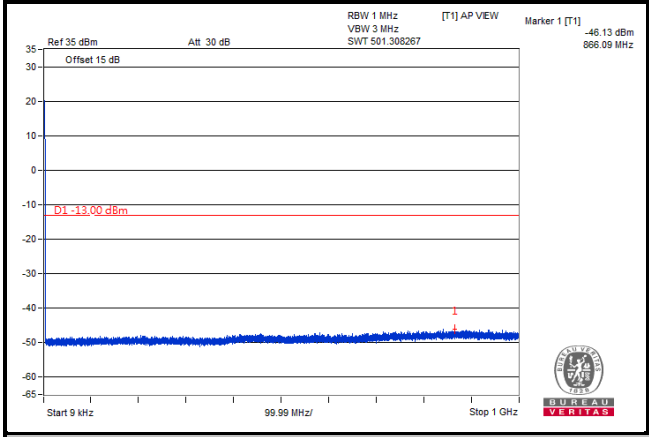
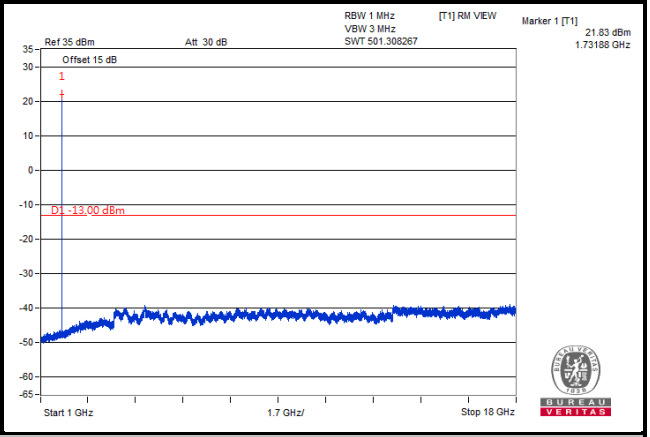
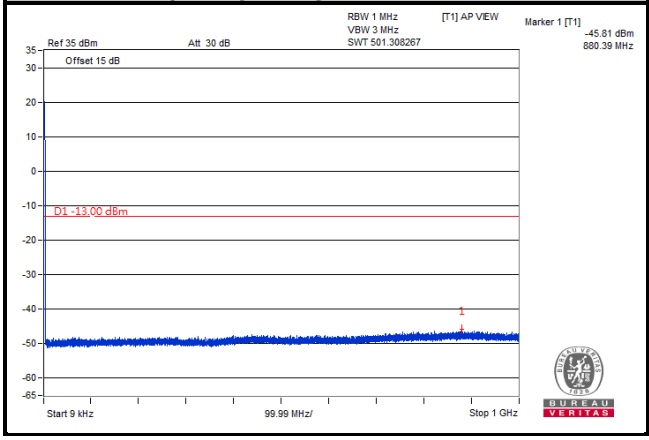
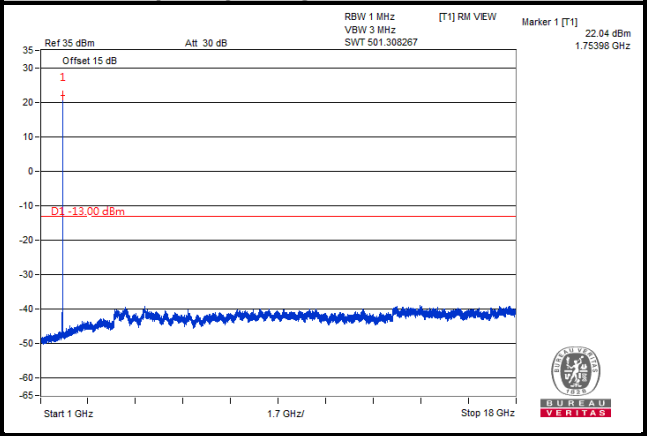
4.7.3 Test Procedure

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 18 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 1 MHz and VBW = 3 MHz is used for conducted emission measurement.

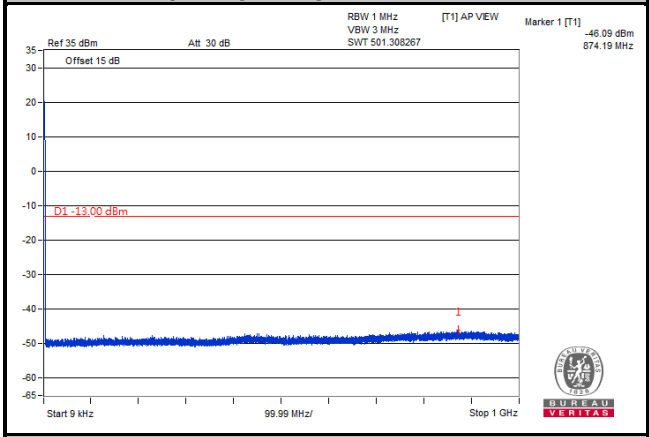
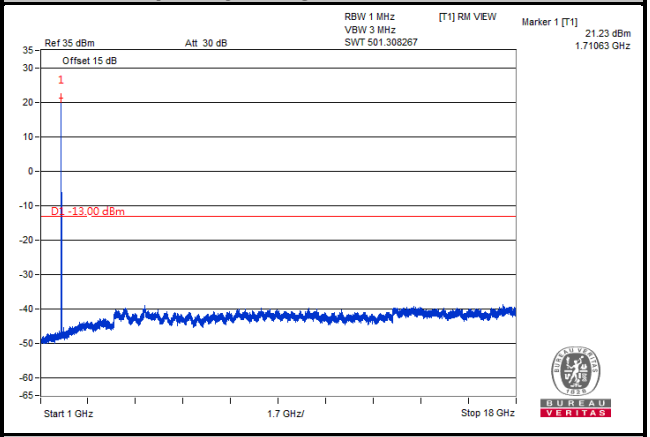
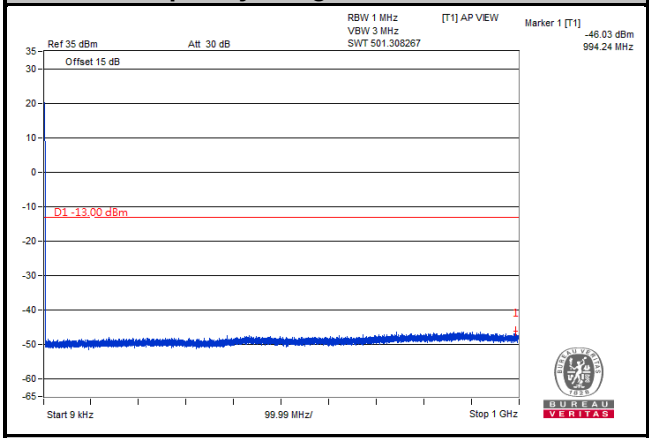
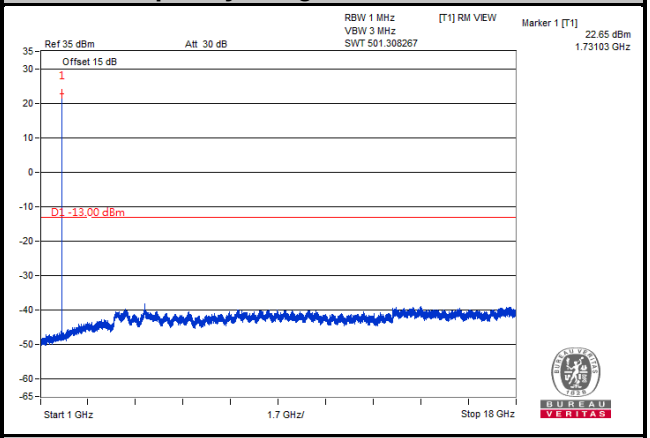
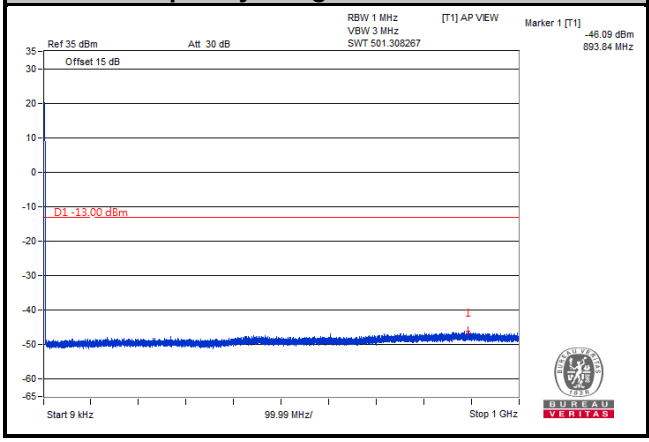
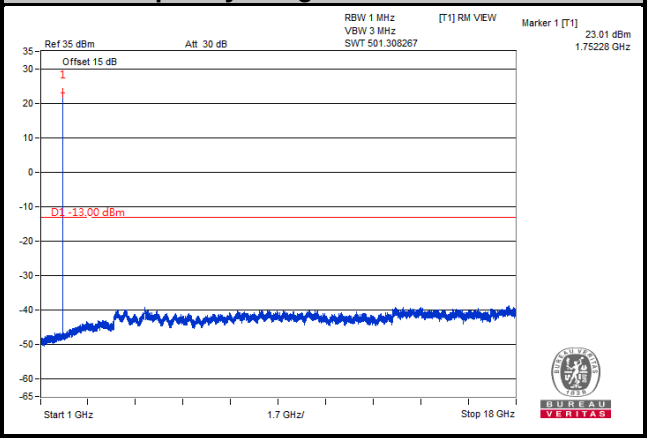
4.7.4 Test Results

WCDMA	
Channel 1312	
Frequency Range: 9 kHz ~ 1 GHz	**Frequency Range: 1 GHz ~ 18 GHz**
	
Channel 1413	
Frequency Range: 9 kHz ~ 1 GHz	**Frequency Range: 1 GHz ~ 18 GHz**
	
Channel 1513	
Frequency Range: 9 kHz ~ 1 GHz	**Frequency Range: 1 GHz ~ 18 GHz**
	

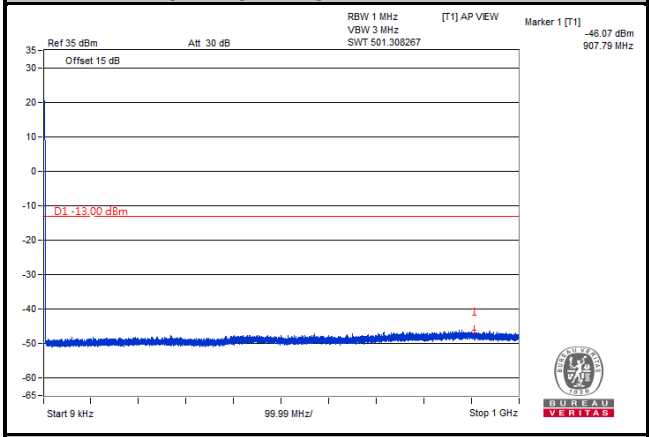
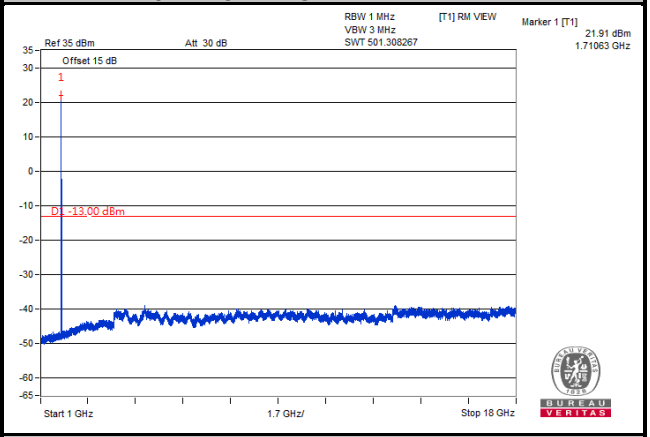
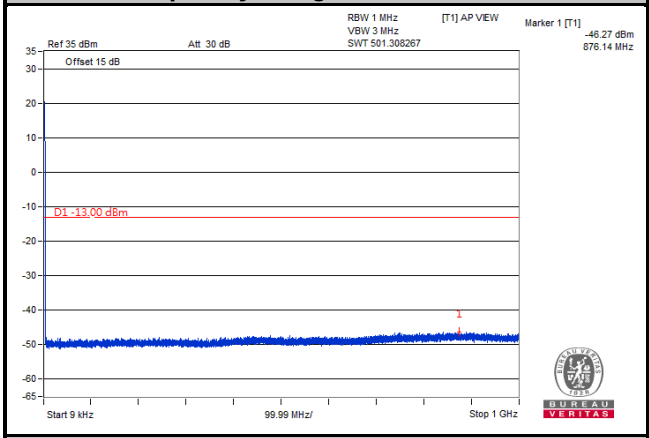
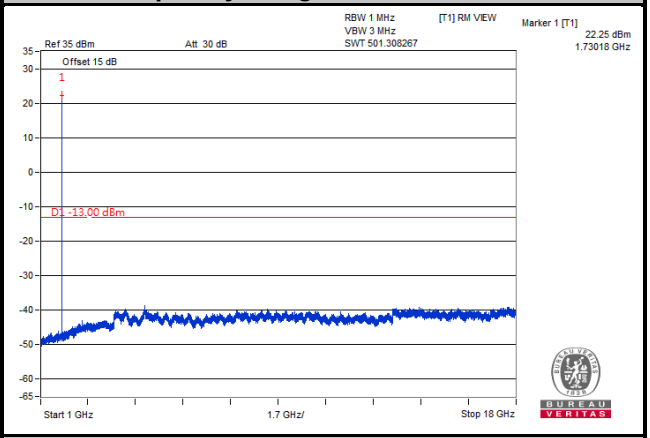
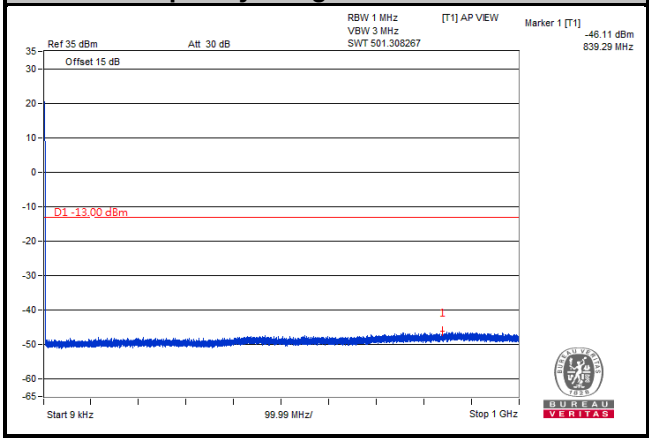
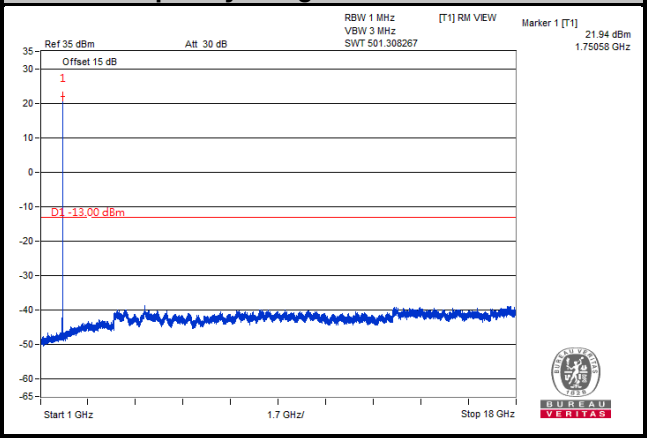
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 1.4 MHz	
Channel 19957	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	
Channel Bandwidth: 1.4 MHz	
Channel 20175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	
Channel Bandwidth: 1.4 MHz	
Channel 20393	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

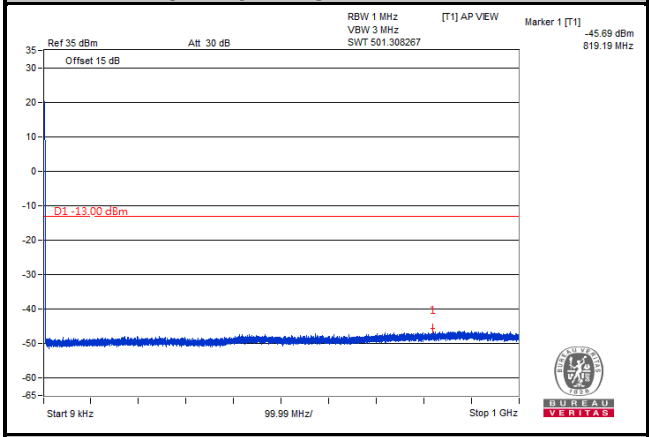
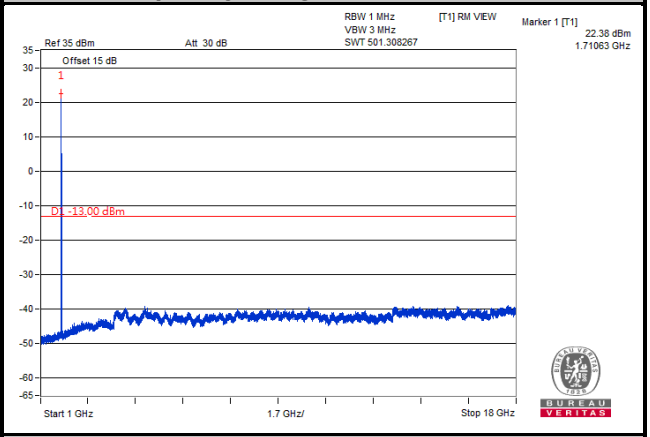
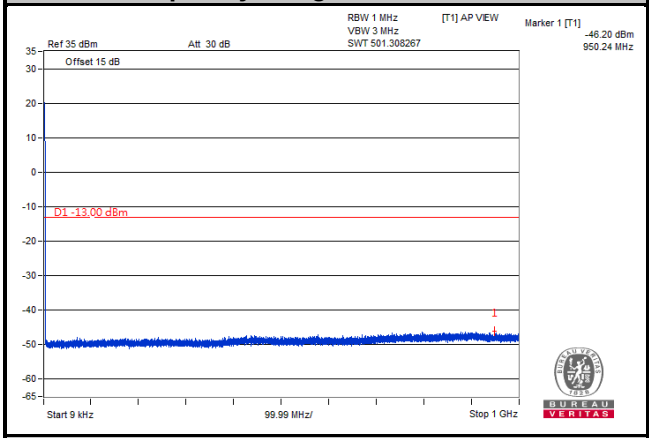
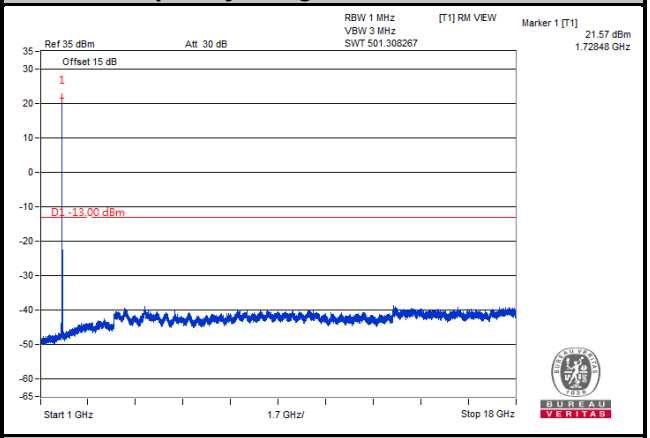
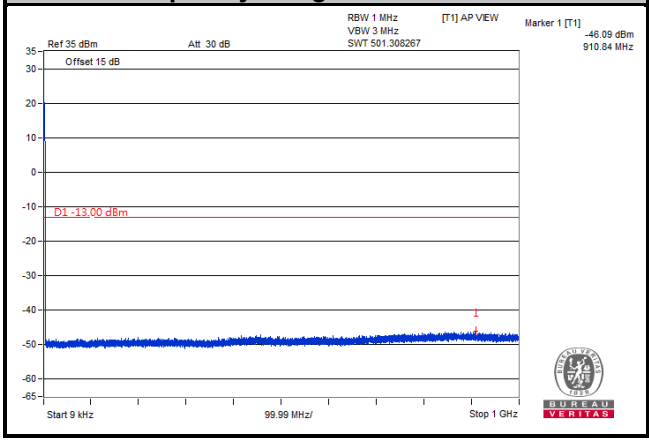
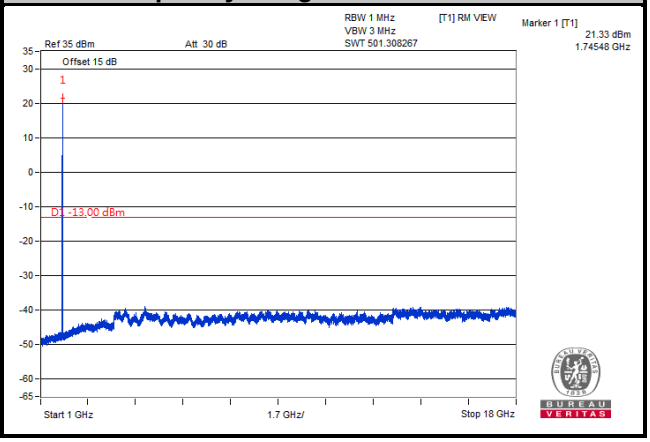
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 3 MHz	
Channel 19965	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	
Channel Bandwidth: 3 MHz	
Channel 20175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	
Channel Bandwidth: 3 MHz	
Channel 20385	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

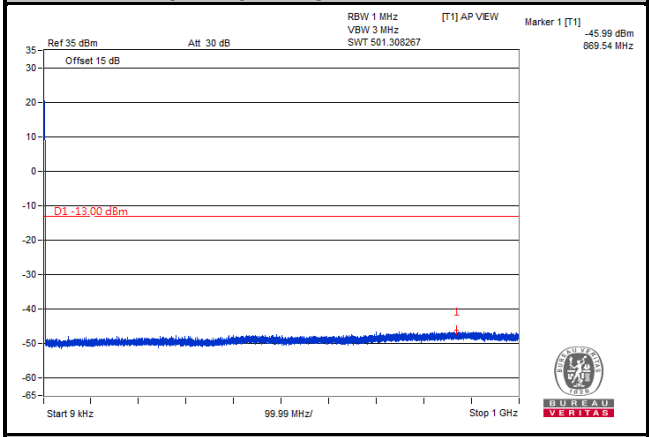
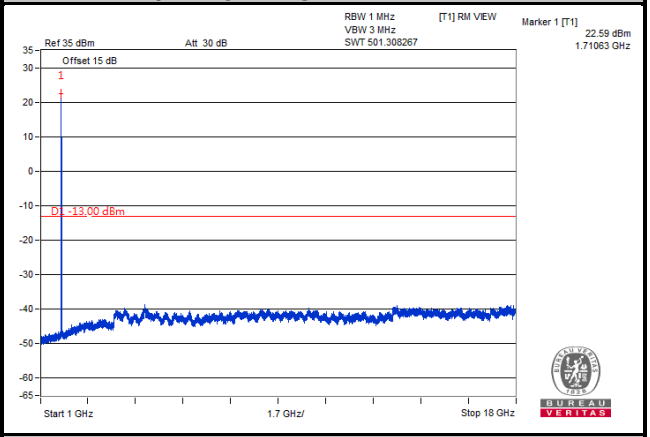
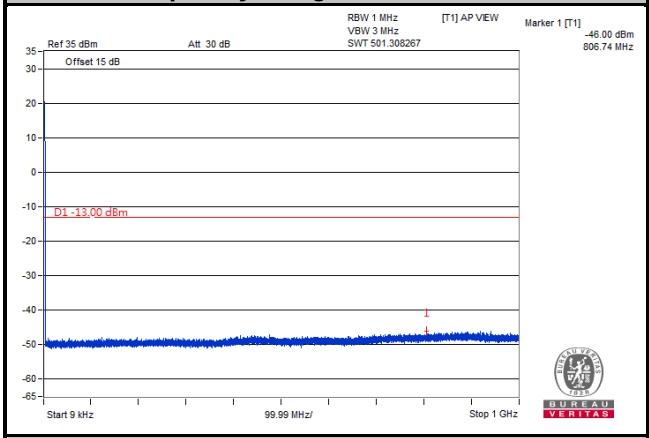
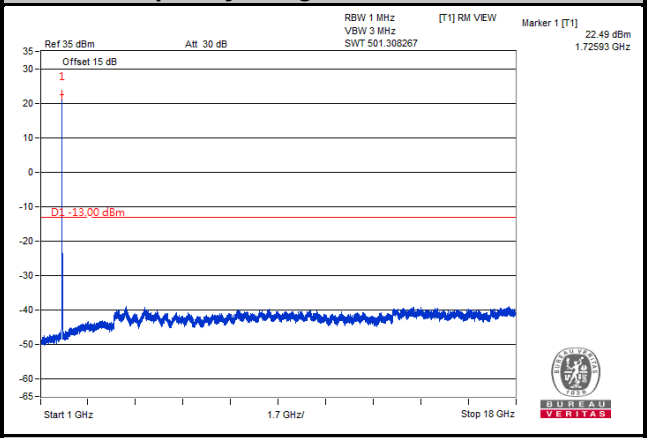
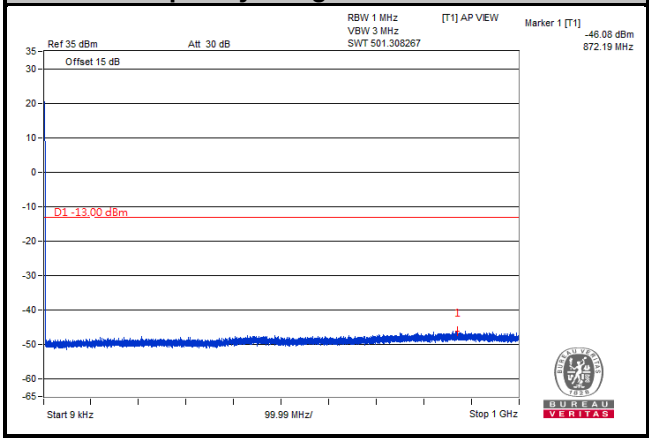
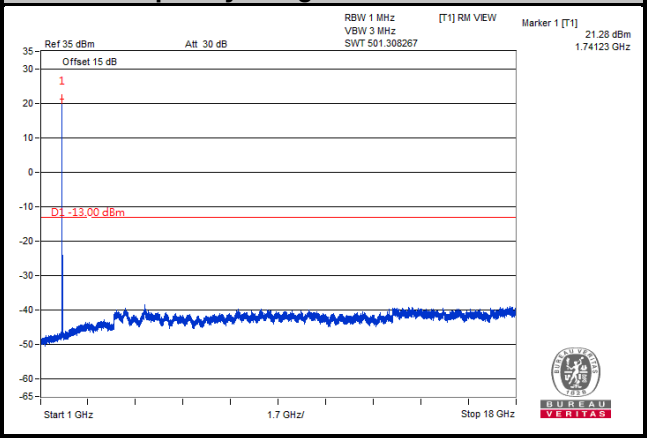
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 5 MHz	
Channel 19975	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	
Channel Bandwidth: 5 MHz	
Channel 20175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	
Channel Bandwidth: 5 MHz	
Channel 20375	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

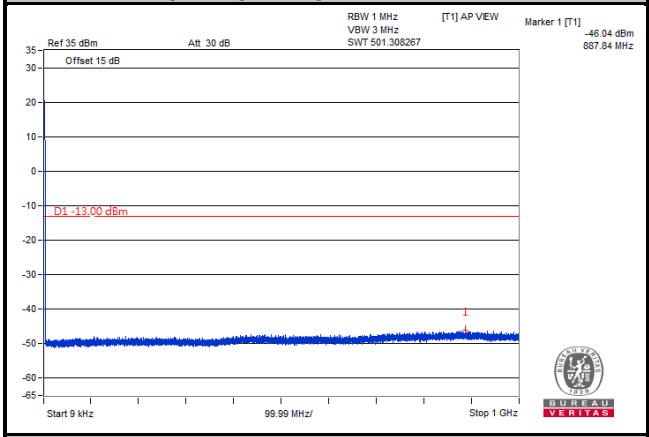
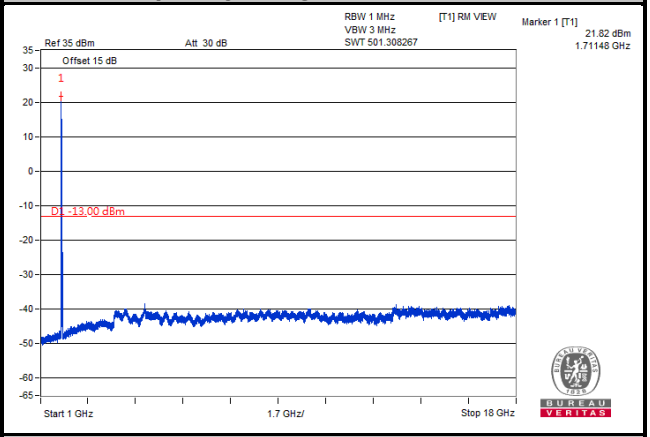
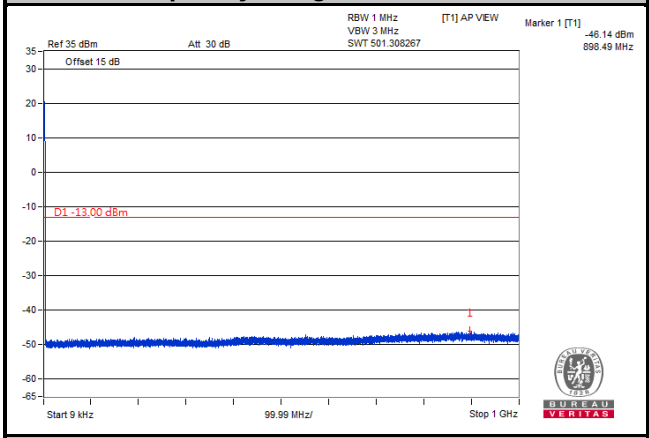
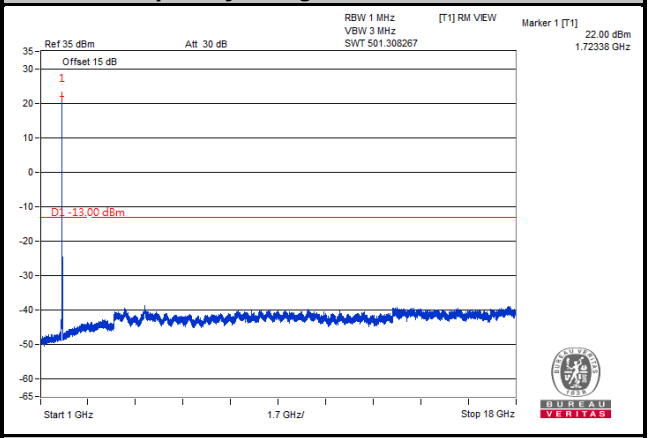
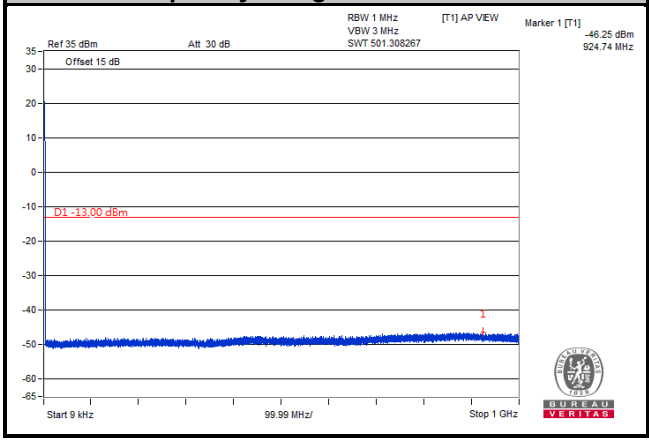
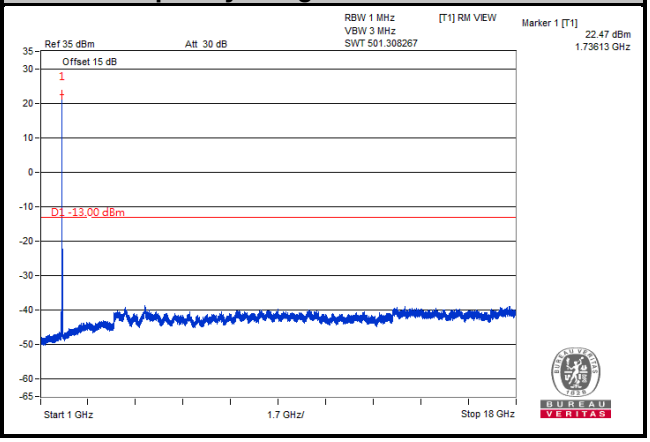
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 10 MHz	
Channel 20000	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	
Channel Bandwidth: 10 MHz	
Channel 20175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	
Channel Bandwidth: 10 MHz	
Channel 20350	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

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

LTE Band 4	
Channel Bandwidth: 15 MHz	
Channel 20025	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	
Channel Bandwidth: 15 MHz	
Channel 20175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	
Channel Bandwidth: 15 MHz	
Channel 20325	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

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

LTE Band 4	
Channel Bandwidth: 20 MHz	
Channel 20050	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	
Channel Bandwidth: 20 MHz	
Channel 20175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	
Channel Bandwidth: 20 MHz	
Channel 20300	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 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

a. The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 43 +10 log (P) dB. The limit of emission 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.

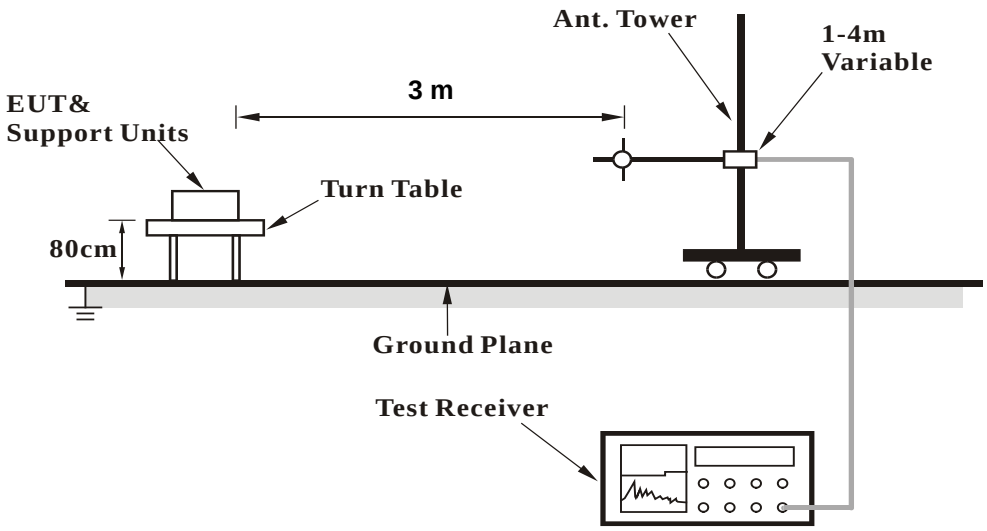
Note: The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

4.8.3 Deviation from Test Standard

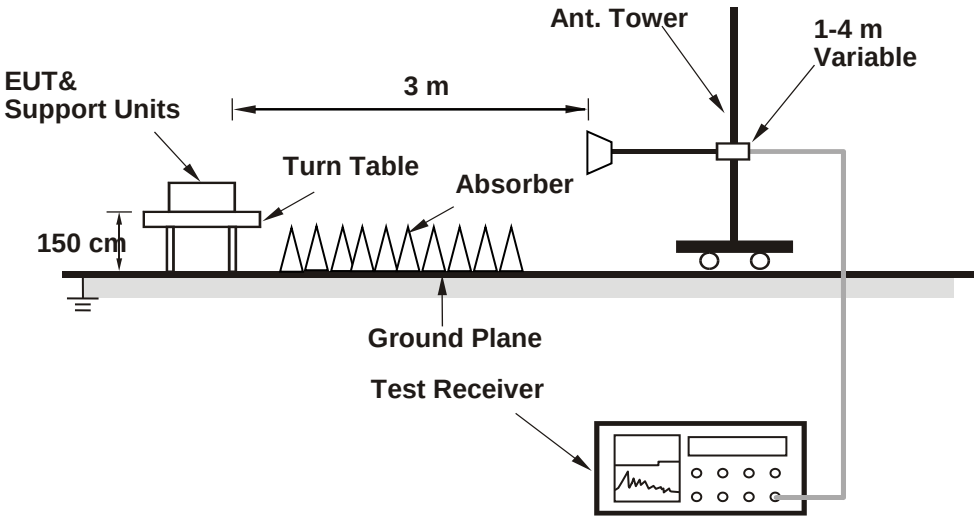
No deviation.

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

WCDMA:

Low Channel

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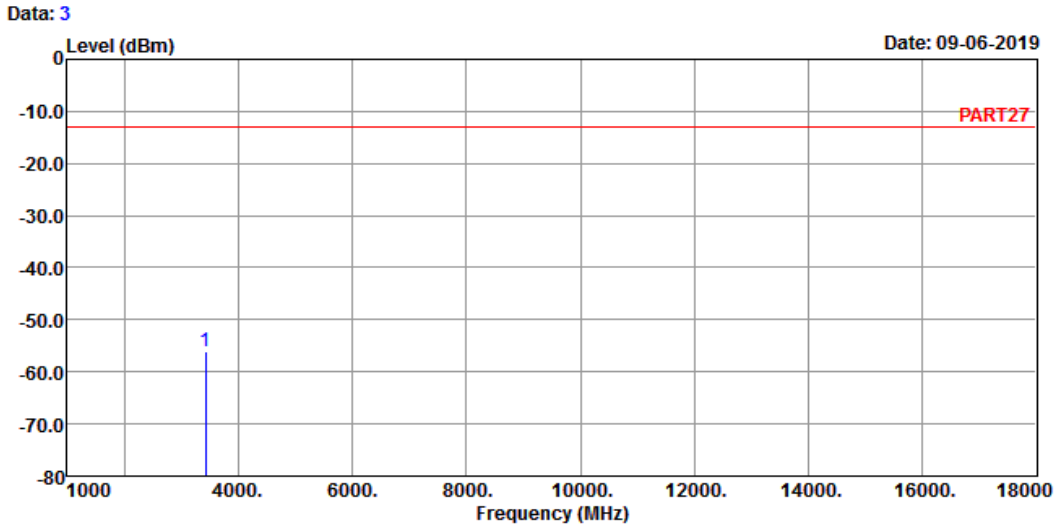

Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remark : WCDMA Band 4 Link_L-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3424.80	-55.97	-47.63	-13.00	-8.34	-42.97	Peak

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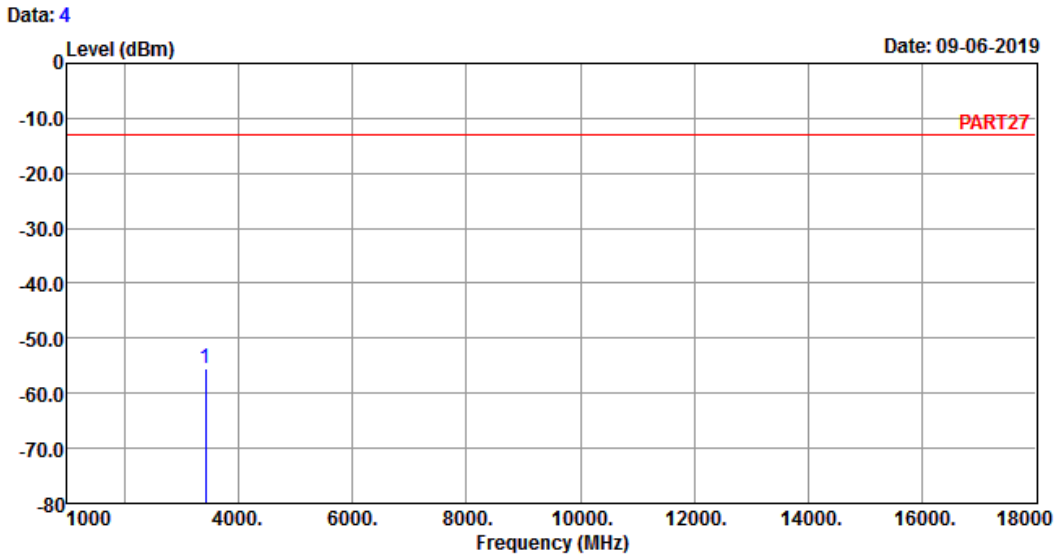

Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remark : WCDMA Band 4 Link_L-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3424.80	-55.53	-47.19	-13.00	-8.34	-42.53	Peak

Middle Channel

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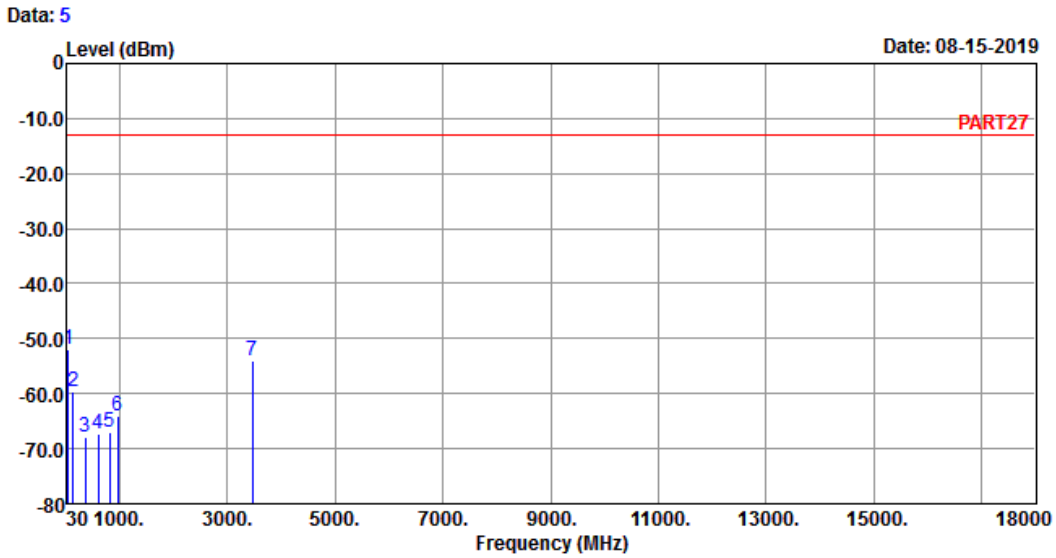
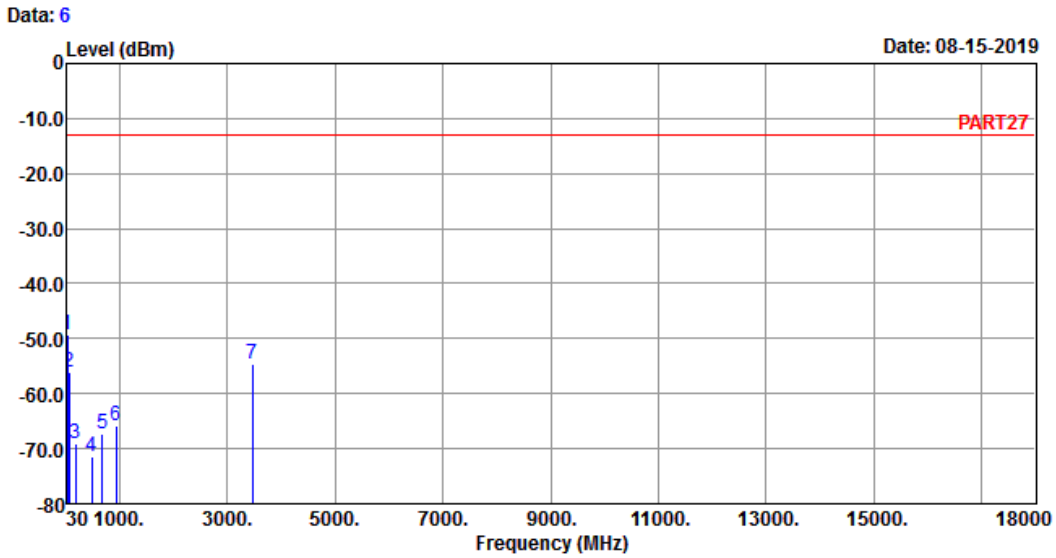


Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remark : WCDMA Band 4 Link_M-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	53.28	-52.03	-46.22	-13.00	-5.81	-39.03	Peak
2	132.82	-59.50	-50.82	-13.00	-8.68	-46.50	Peak
3	358.83	-67.76	-61.57	-13.00	-6.19	-54.76	Peak
4	602.30	-67.44	-66.68	-13.00	-0.76	-54.44	Peak
5	821.52	-67.00	-67.54	-13.00	0.54	-54.00	Peak
6	967.02	-64.13	-66.54	-13.00	2.41	-51.13	Peak
7	3465.20	-54.07	-46.19	-13.00	-7.88	-41.07	Peak



Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remark : WCDMA Band 4 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	36.79	-49.25	-48.26	-13.00	-0.99	-36.25	Peak
2	70.74	-56.21	-47.59	-13.00	-8.62	-43.21	Peak
3	181.32	-68.95	-61.58	-13.00	-7.37	-55.95	Peak
4	486.87	-71.55	-66.69	-13.00	-4.86	-58.55	Peak
5	684.75	-67.30	-66.96	-13.00	-0.34	-54.30	Peak
6	934.04	-65.78	-67.19	-13.00	1.41	-52.78	Peak
7	3465.20	-54.63	-46.75	-13.00	-7.88	-41.63	Peak

High Channel

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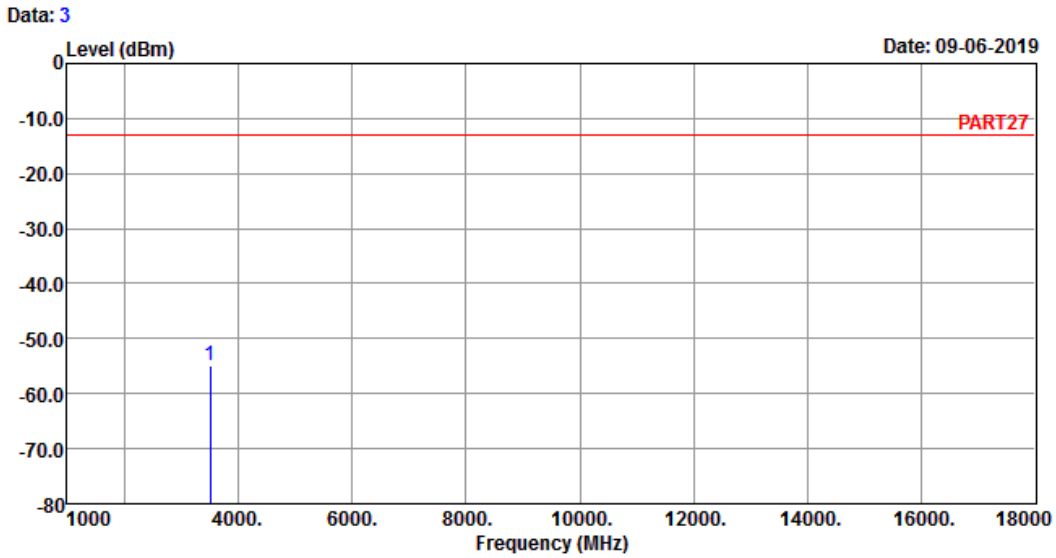

Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remark : WCDMA Band 4 Link_H-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3505.20	-54.93	-47.48	-13.00	-7.45	-41.93	Peak

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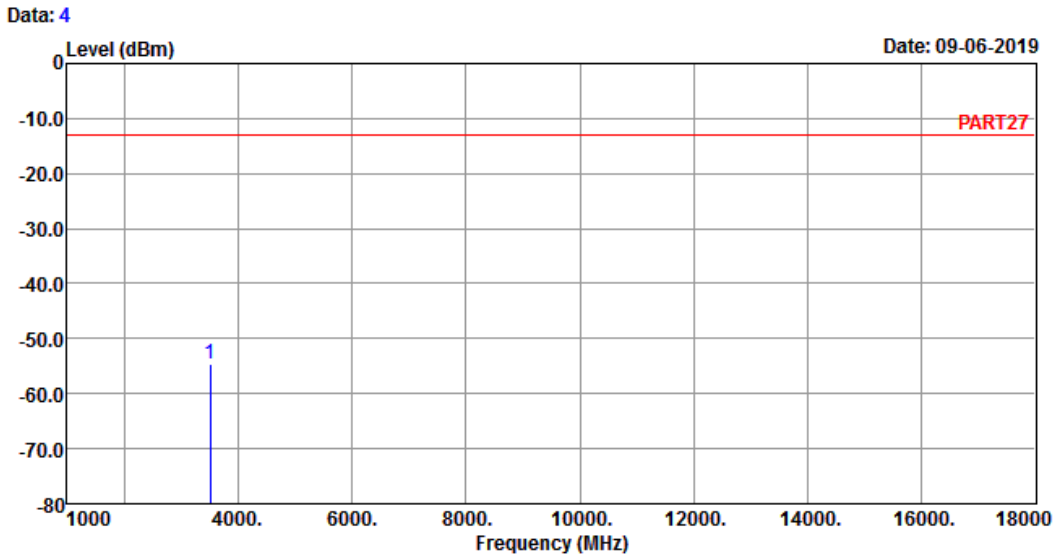

Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remark : WCDMA Band 4 Link_H-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3505.20	-54.50	-47.05	-13.00	-7.45	-41.50	Peak

LTE Band 4

Channel Bandwidth: 1.4 MHz / QPSK

Low Channel

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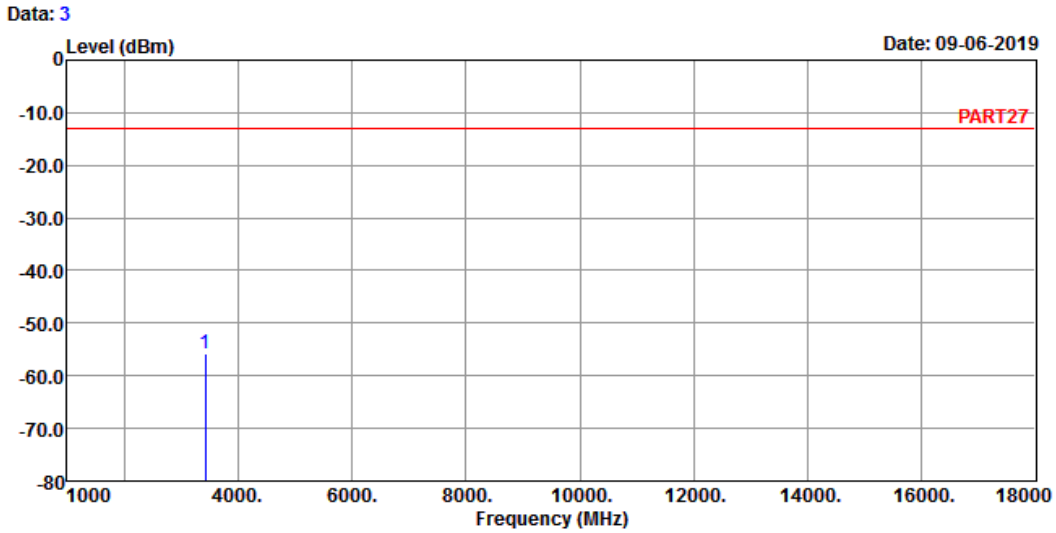
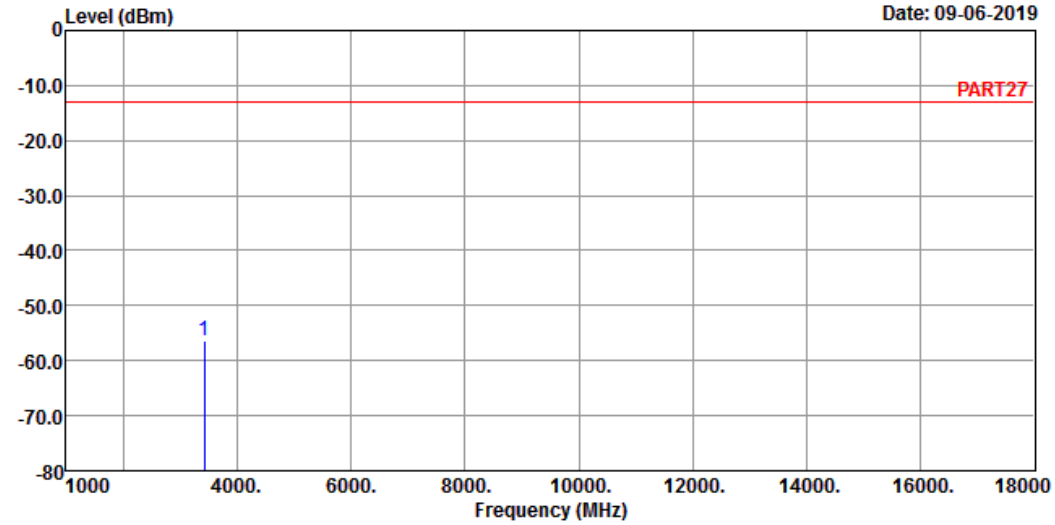


Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remak : LTE Band 4 QPSK_1.4M Link_L-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3421.40	-55.73	-47.39	-13.00	-8.34	-42.73	Peak

Data: 4

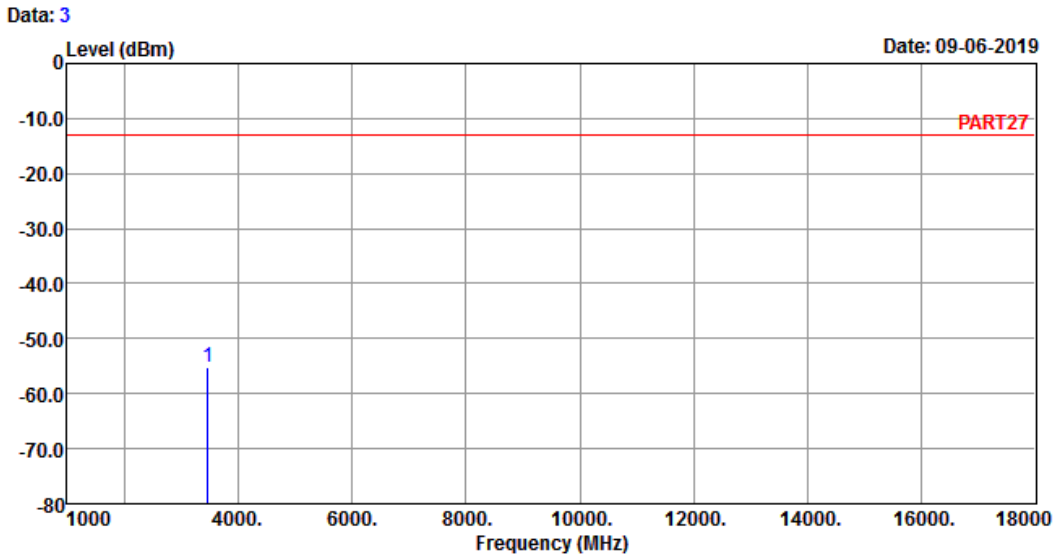


Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : LTE Band 4 QPSK_1.4M Link_L-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3421.40	-56.34	-48.00	-13.00	-8.34	-43.34	Peak

Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remak : LTE Band 4 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	3465.00	-55.18	-47.30	-13.00	-7.88	-42.18	Peak

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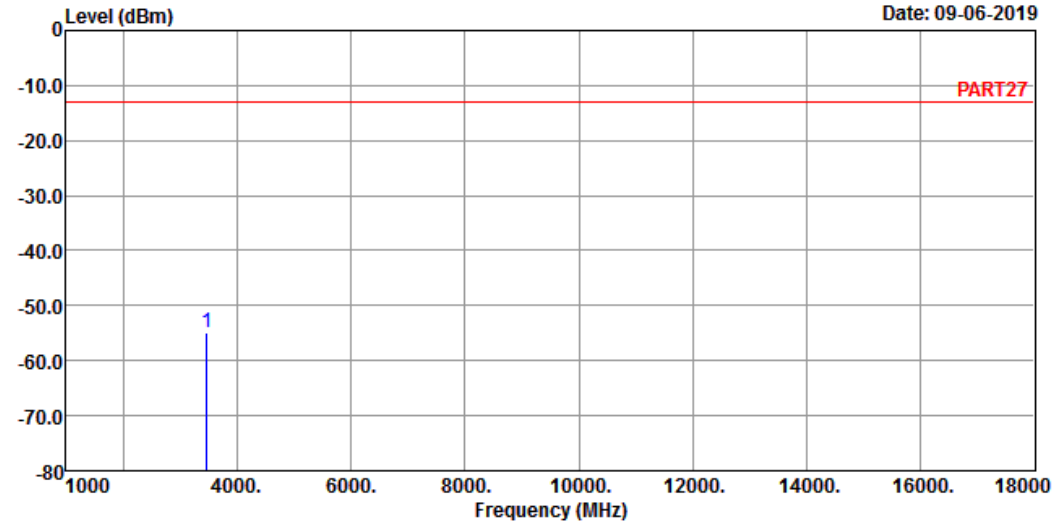
Data: 4

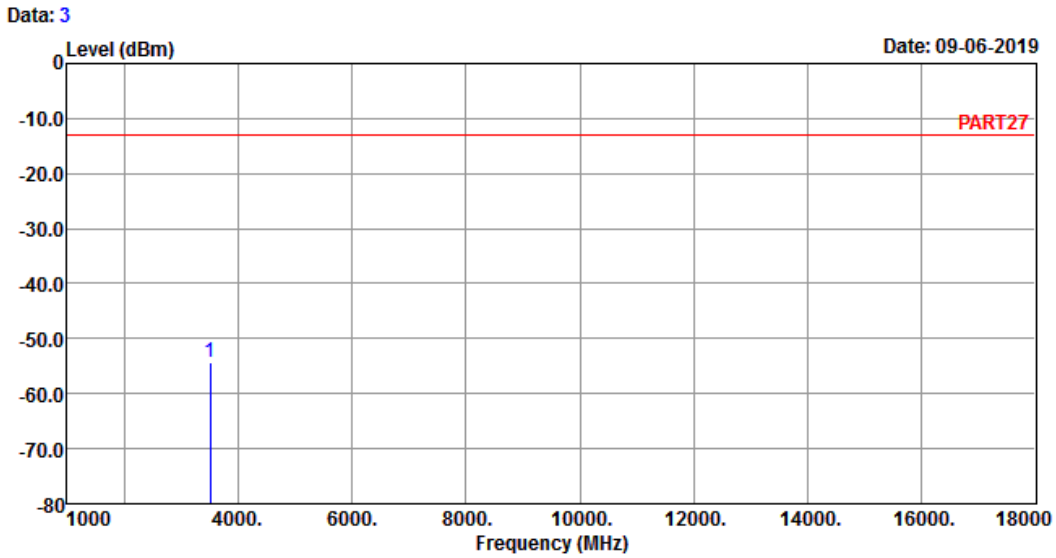


Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : LTE Band 4 QPSK_1.4M Link_M-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3465.00	-54.86	-46.98	-13.00	-7.88	-41.86	Peak

High Channel

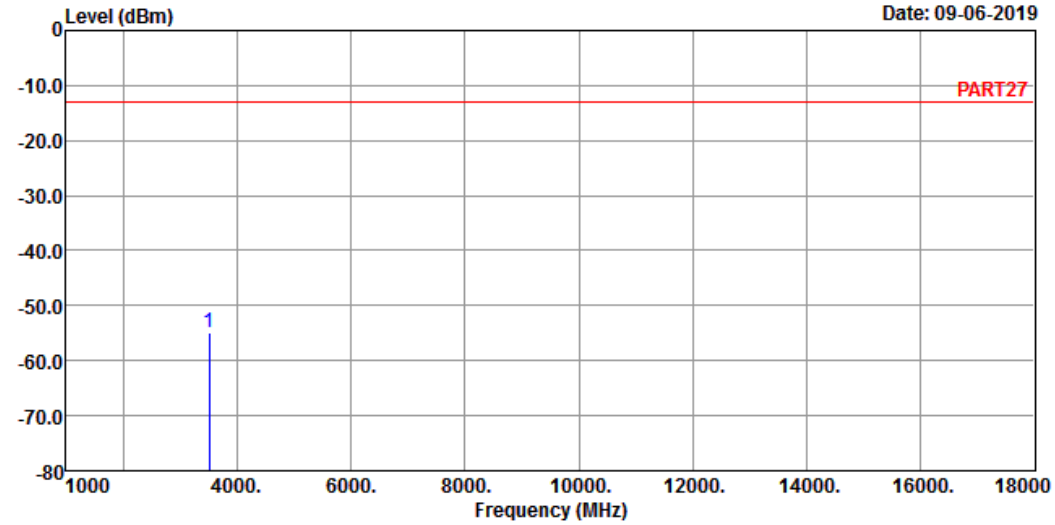
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remak : LTE Band 4 QPSK_1.4M 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	3508.60	-54.37	-46.92	-13.00	-7.45	-41.37	Peak

Data: 4

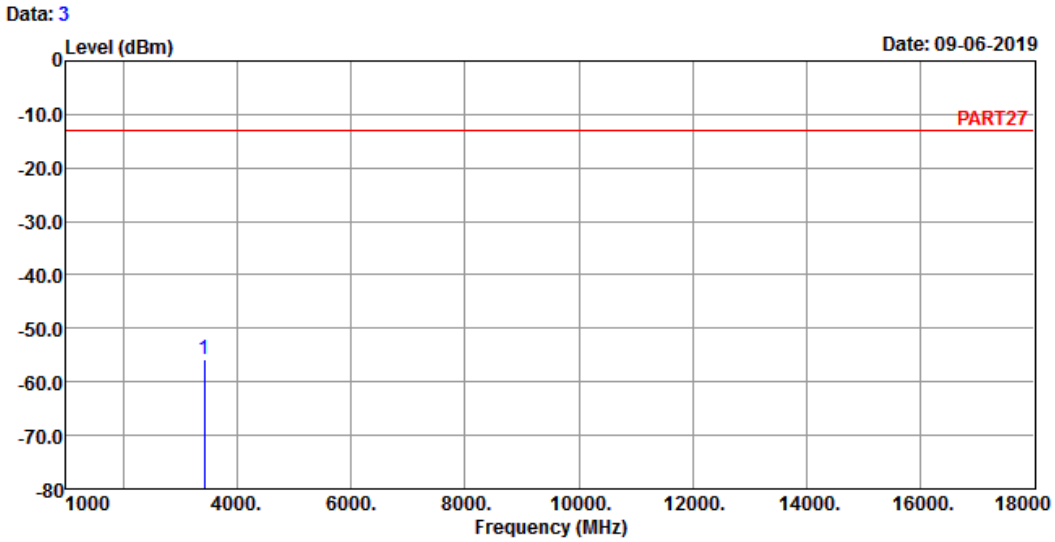


Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : LTE Band 4 QPSK_1.4M Link_H-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3508.60	-54.89	-47.44	-13.00	-7.45	-41.89	Peak

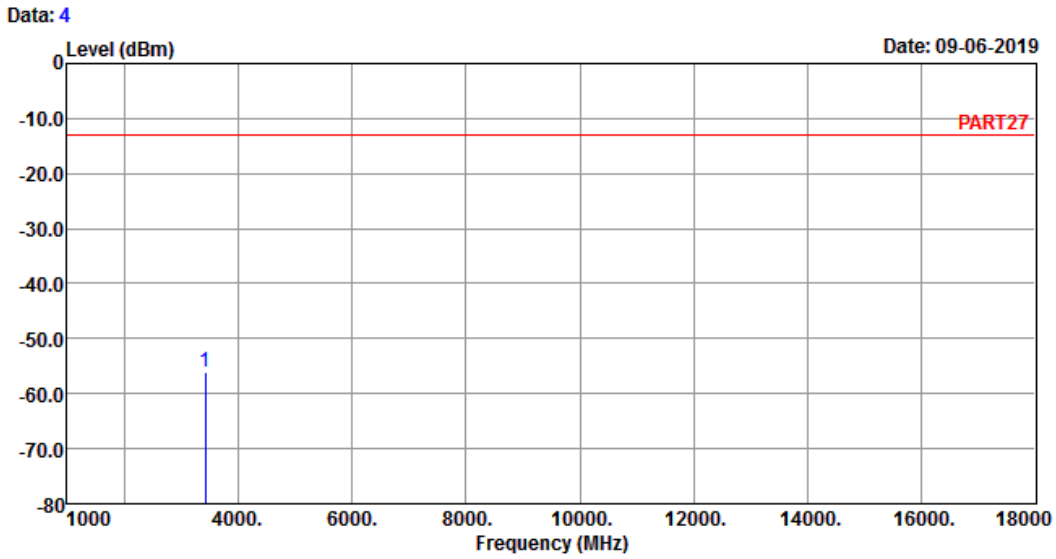
Channel Bandwidth: 5 MHz / QPSK
Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remak : LTE Band 4 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	3425.00	-55.68	-47.34	-13.00	-8.34	-42.68	Peak

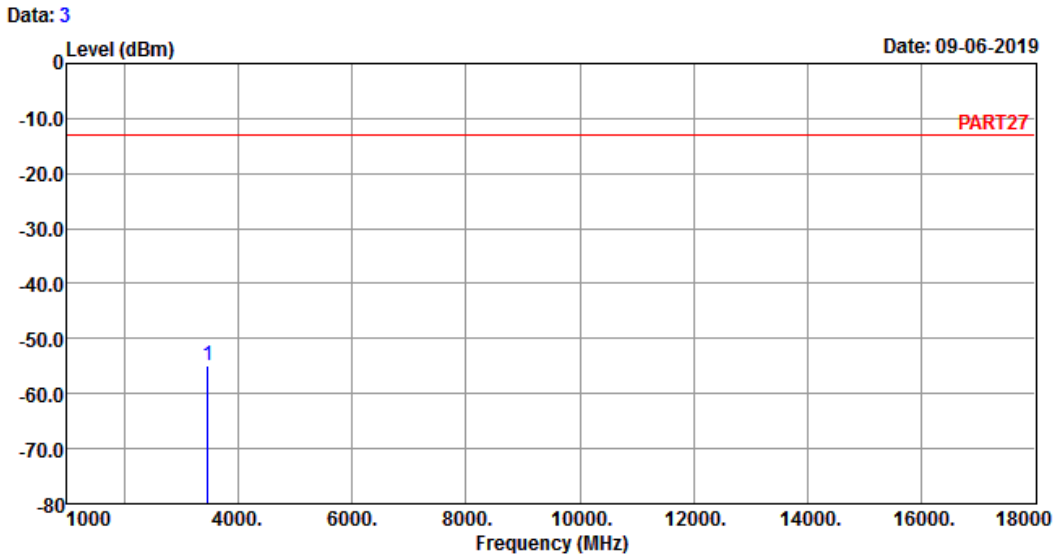


Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : LTE Band 4 QPSK_5M Link_L-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3425.00	-56.22	-47.88	-13.00	-8.34	-43.22	Peak

Middle Channel

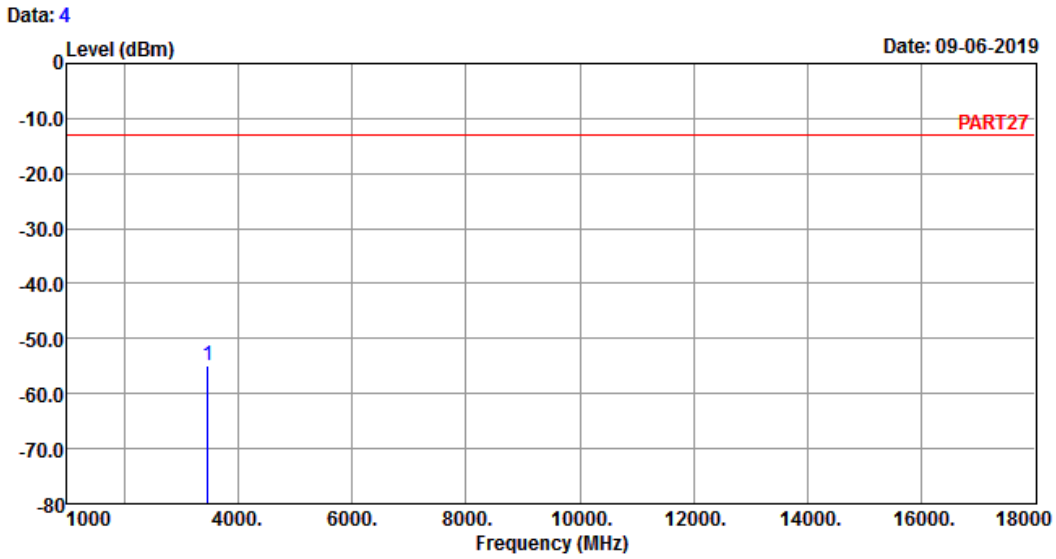
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remak : LTE Band 4 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	3465.00	-55.04	-47.16	-13.00	-7.88	-42.04	Peak

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

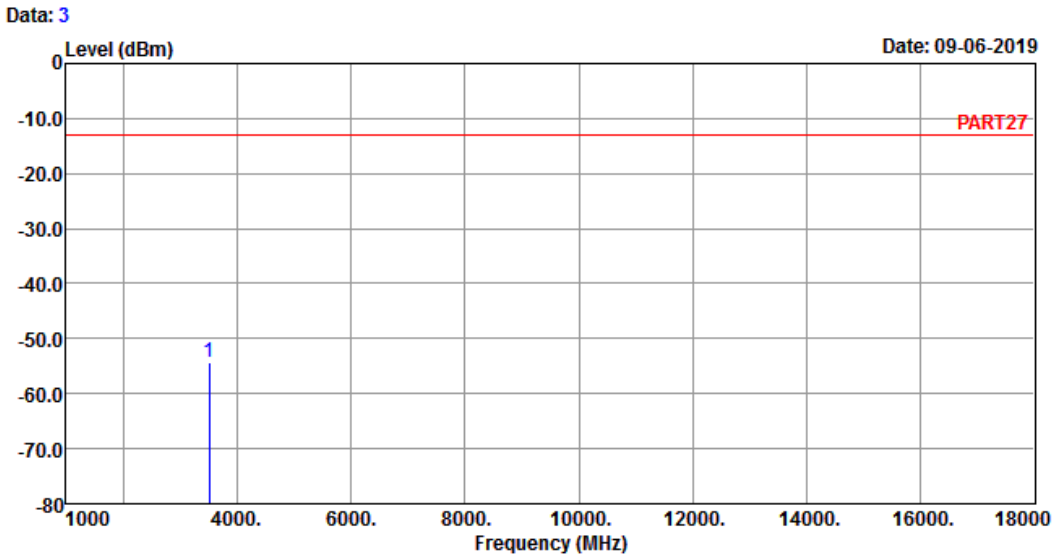


Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : LTE Band 4 QPSK_5M Link_M-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3465.00	-54.78	-46.90	-13.00	-7.88	-41.78	Peak

High Channel

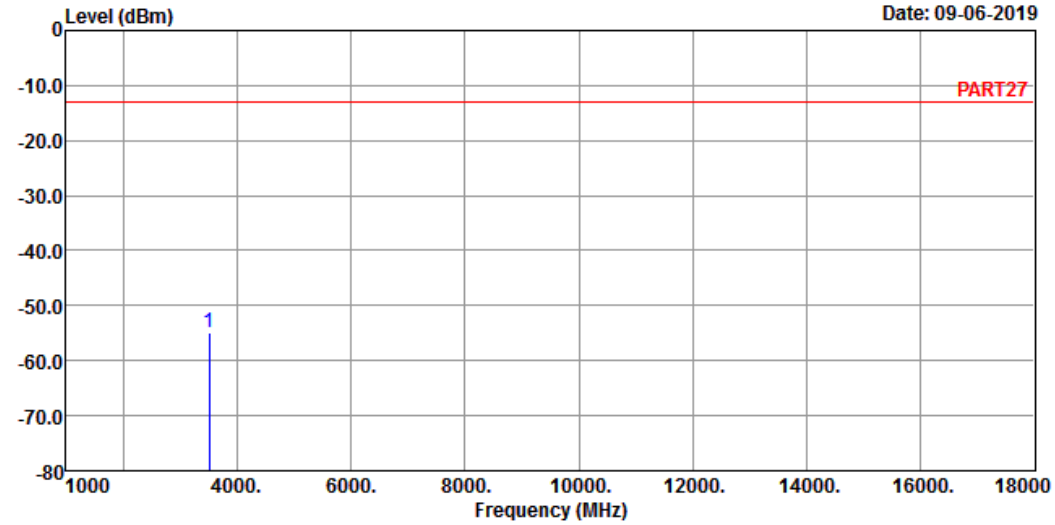
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remak : LTE Band 4 QPSK_5M 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	3505.00	-54.22	-46.77	-13.00	-7.45	-41.22	Peak

Data: 4

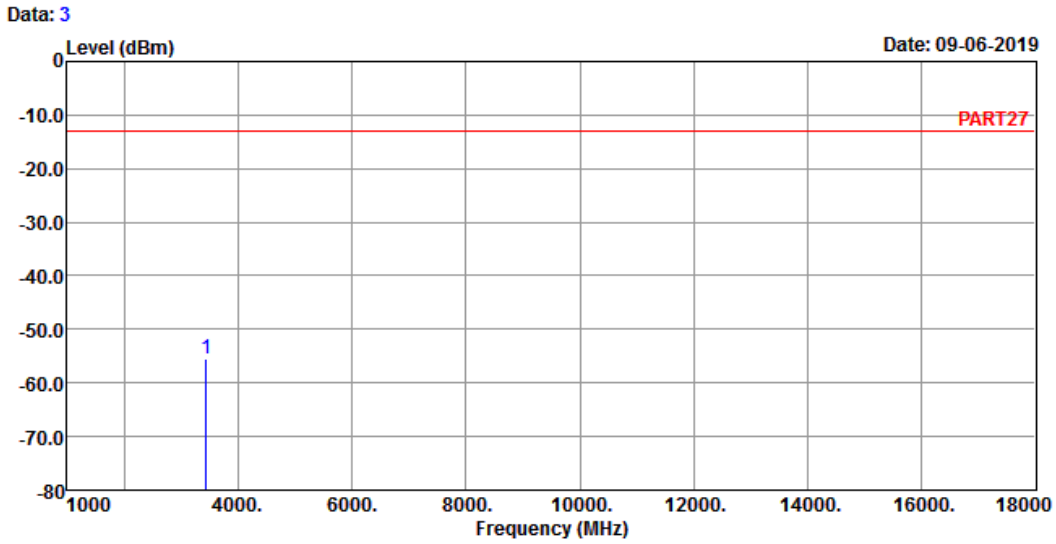


Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : LTE Band 4 QPSK_5M Link_H-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3505.00	-54.78	-47.33	-13.00	-7.45	-41.78	Peak

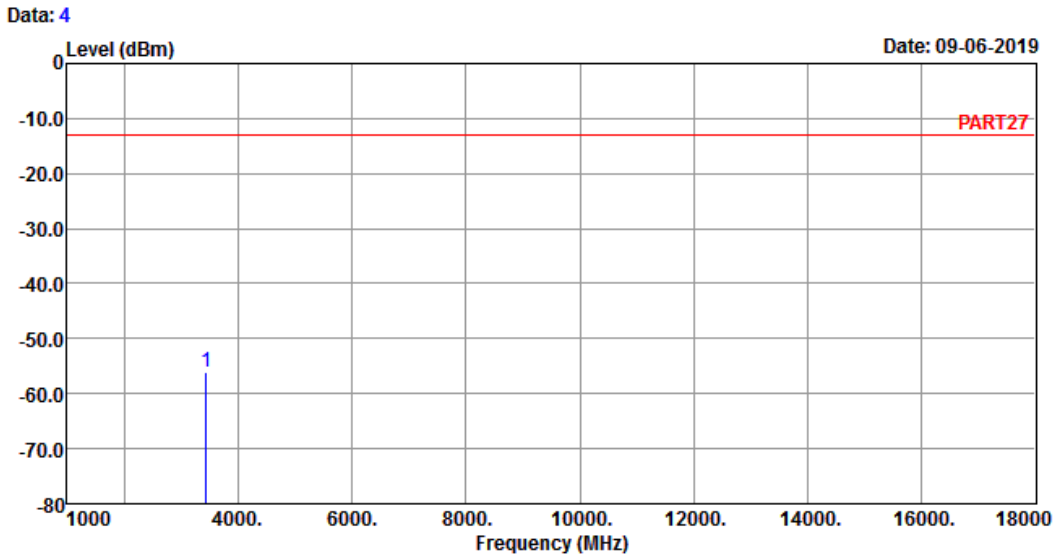
Channel Bandwidth: 20 MHz / QPSK
Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remak : LTE Band 4 QPSK_20M 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	3440.00	-55.43	-47.21	-13.00	-8.22	-42.43	Peak

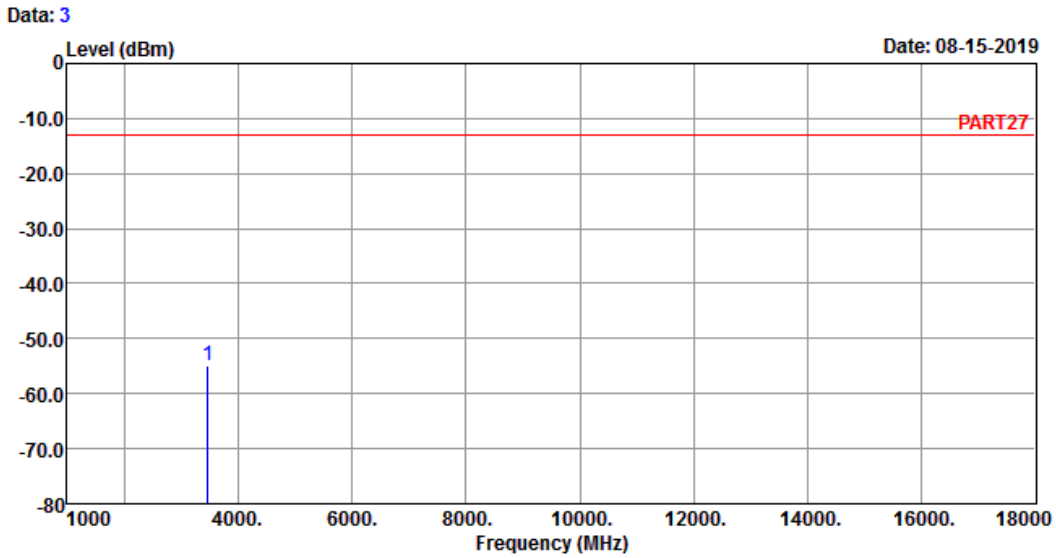


Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : LTE Band 4 QPSK_20M Link_L-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3440.00	-56.10	-47.88	-13.00	-8.22	-43.10	Peak

Middle Channel

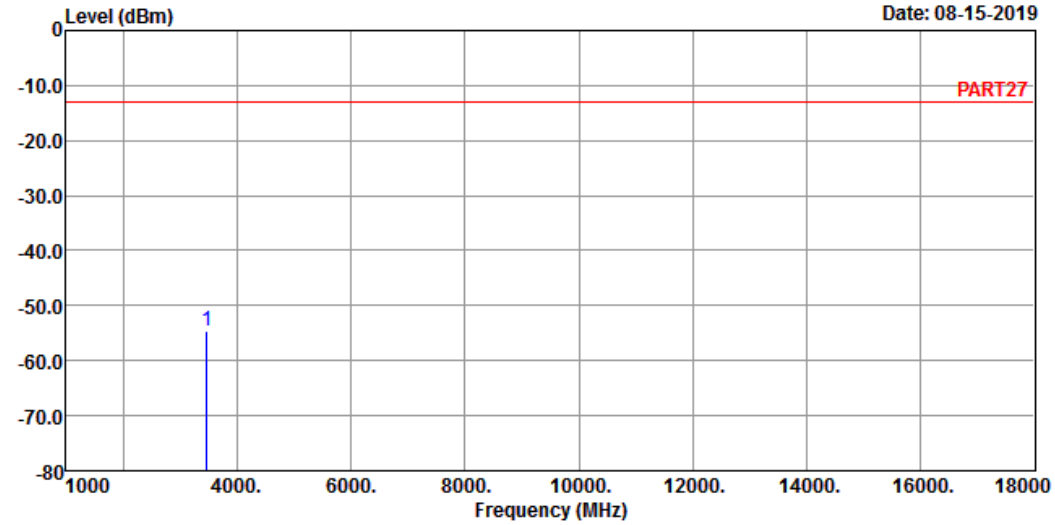
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remak : LTE Band 4 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	3465.00	-54.96	-47.08	-13.00	-7.88	-41.96	Peak

Data: 4

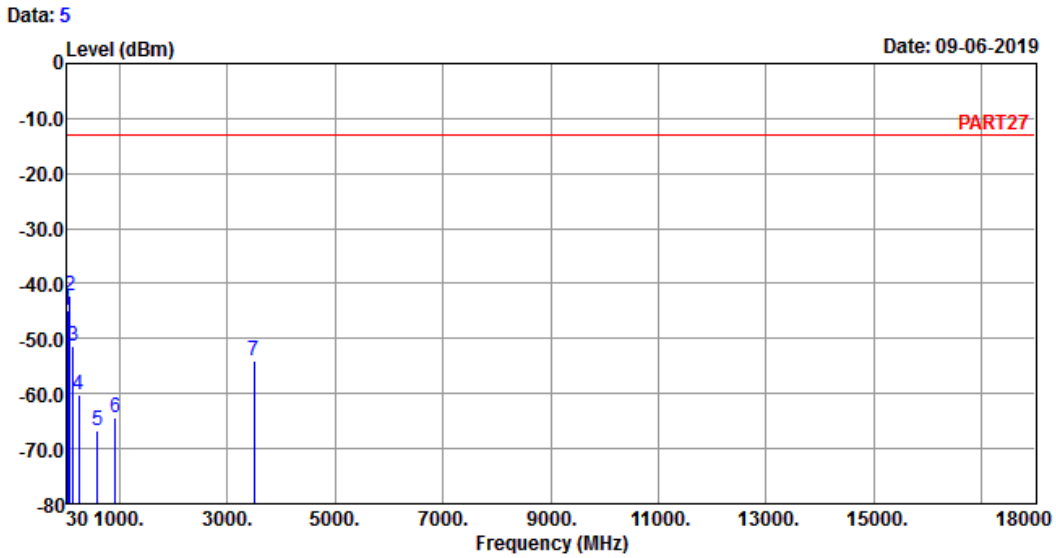


Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : LTE Band 4 QPSK_20M Link_M-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3465.00	-54.72	-46.84	-13.00	-7.88	-41.72	Peak

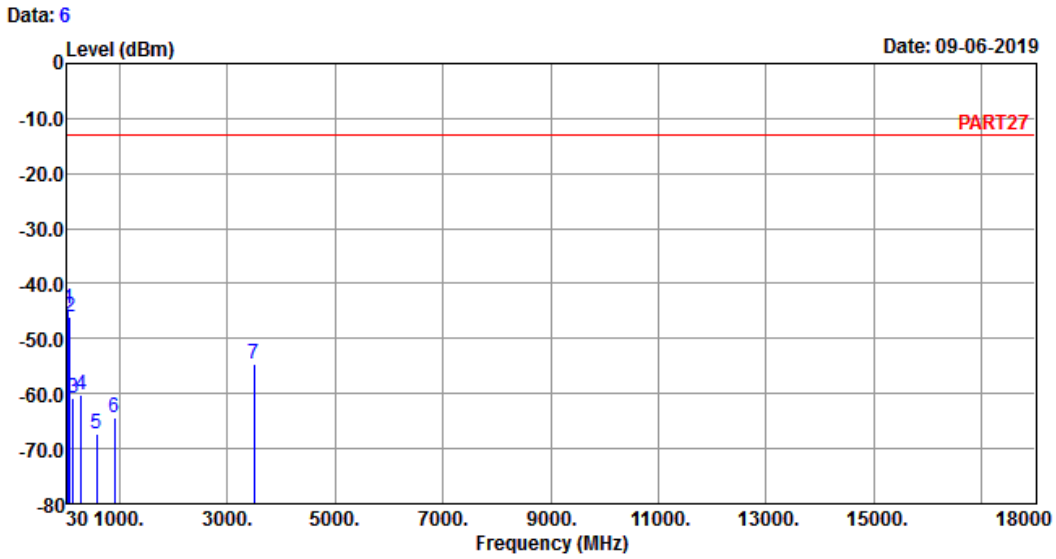
High Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remak : LTE Band 4 QPSK_20M Link_H-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	32.91	-44.89	-43.80	-13.00	-1.09	-31.89	Peak
2 pp	77.53	-42.36	-32.16	-13.00	-10.20	-29.36	Peak
3	135.73	-51.44	-42.77	-13.00	-8.67	-38.44	Peak
4	245.34	-60.34	-54.15	-13.00	-6.19	-47.34	Peak
5	597.45	-66.58	-65.71	-13.00	-0.87	-53.58	Peak
6	923.37	-64.33	-65.48	-13.00	1.15	-51.33	Peak
7	3490.00	-54.10	-46.45	-13.00	-7.65	-41.10	Peak



Site : 966 Chamber 5
Condition: PART27 VERTICAL
Remak : LTE Band 4 QPSK_20M 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	43.58	-44.59	-43.12	-13.00	-1.47	-31.59	Peak
2	78.50	-46.14	-35.71	-13.00	-10.43	-33.14	Peak
3	134.76	-60.74	-52.07	-13.00	-8.67	-47.74	Peak
4	290.93	-60.10	-53.27	-13.00	-6.83	-47.10	Peak
5	571.26	-67.25	-65.29	-13.00	-1.96	-54.25	Peak
6	913.67	-64.45	-65.36	-13.00	0.91	-51.45	Peak
7	3490.00	-54.55	-46.90	-13.00	-7.65	-41.55	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:

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Fax: 886-2-26051924

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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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