FCC Test Report

(PART 22)

Report No.:	RF200715C05
FCC ID:	L6AITF100-1
Test Model:	ITF100-1
Received Date:	Jul. 15, 2020
Test Date:	Aug. 11 ~ Nov. 02, 2020
Issued Date:	Nov. 03, 2020
Applicant:	BlackBerry Limited
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Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
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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
RF200715C05	Original Release	Nov. 03, 2020

1 Certificate of Conformity

Product: Radar H2

Brand: BlackBerry

Test Model: ITF100-1

Sample Status: Identical Prototype

Applicant: BlackBerry Limited

Test Date: Aug. 11 ~ Nov. 02, 2020

Standards: FCC Part 22, Subpart H

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

Prepared by : Lena Wang , **Date:** Nov. 03, 2020

Lena Wang / Specialist

Approved by : , **Date:** Nov. 03, 2020

Dylan Chiou / Senior Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 22 & Part 2			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 22.913 (a)	Effective Radiated Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement.
22.913 (d)	Peak to Average Ratio	Pass	Meet the requirement of limit.
2.1055 22.355	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth	Pass	Meet the requirement of limit.
22.917	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 22.917	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 22.917	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -24.00 dB at 1658.00 MHz.

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

2.1 Measurement Uncertainty

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

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

2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 16, 2020	Apr. 15, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jun. 12, 2020	Jun. 11, 2021
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Nov. 07, 2019	Nov. 06, 2020
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Nov. 08, 2019	Nov. 07, 2020
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Nov. 24, 2019	Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 24, 2019	Nov. 23, 2020
Loop Antenna EMCI	EM-6879	269	Sep. 16, 2019	Sep. 15, 2020
			Sep. 17, 2020	Sep. 16, 2021
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Jun. 08, 2020	Jun. 07, 2021
Preamplifier Agilent (Above 1GHz)	8449B	3008A02367	Feb. 18, 2020	Feb. 17, 2021
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM8000	CABLE-CH9-02 (248780+171006)	Jan. 18, 2020	Jan. 17, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	Jan. 18, 2020	Jan. 17, 2021
RF signal cable Woken	8D-FB	Cable-CH9-01	Jun. 08, 2020	Jun. 07, 2021
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower &Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Standard Temperature And Humidity Chamber TERCHY	MHU-225AU	920842	May 27, 2020	May 26, 2021
JFW 20dB attenuation	50HF-020-SMA	NA	NA	NA
True RMS Clamp Meter Fluke	325	31130711WS	Jun. 06, 2020	Jun. 05, 2021
Communications Tester-Wireless Agilent (for 2G/3G)	8960 Series 10	MY53201073	Jul. 01, 2019	Jun. 30, 2021

Radio Communication Analyzer Anritsu (for LTE)	MT8820C	6201300640	Aug. 19, 2019	Aug. 18, 2021
Radio Communication Analyzer Anritsu	MT8821C	6201462755	Feb. 13, 2020	Feb. 12, 2021
Radio Communication Tester ROHDE & SCHWARZ	CMU200	101095	Nov. 11, 2019	Nov. 10, 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 9.

3 General Information

3.1 General Description of EUT

Product	Radar H2		
Brand	BlackBerry		
Test Model	ITF100-1		
Status of EUT	Identical Prototype		
Power Supply Rating	7.2 Vdc (battery)		
Modulation Type	GPRS	GMSK	
	EDGE	GMSK, 8PSK	
	WCDMA	QPSK	
	LTE	QPSK, 16QAM	
Frequency Range	GPRS/EDGE	824.2 ~ 848.8 MHz	
	WCDMA	826.4 ~ 846.6 MHz	
	LTE 5 (Channel Bandwidth: 1.4 MHz)	824.7 ~ 848.3 MHz	
	LTE 5 (Channel Bandwidth: 3 MHz)	825.5 ~ 847.5 MHz	
	LTE 5 (Channel Bandwidth: 5 MHz)	826.5 ~ 846.5 MHz	
	LTE 5 (Channel Bandwidth: 10 MHz)	829 ~ 844 MHz	
Max. ERP Power	GPRS	1288.250 mW (31.10 dBm)	
	EDGE	1000.000 mW (30.00 dBm)	
	WCDMA	208.930 mW (23.20 dBm)	
		QPSK	16QAM
	LTE 5 (Channel Bandwidth: 1.4 MHz)	204.174 mW (23.10 dBm)	158.489 mW (22.00 dBm)
	LTE 5 (Channel Bandwidth: 3 MHz)	190.546 mW (22.80 dBm)	158.489 mW (22.00 dBm)
	LTE 5 (Channel Bandwidth: 5 MHz)	186.209 mW (22.70 dBm)	147.911 mW (21.70 dBm)
	LTE 5 (Channel Bandwidth: 10 MHz)	194.984 mW (22.90 dBm)	162.181 mW (22.10 dBm)
Emission Designator	GPRS	258KGXW	
	EDGE	256KG7W	
	WCDMA	4M07F9W	
	LTE 5 (Channel Bandwidth: 1.4 MHz)	1M09G7D	
	LTE 5 (Channel Bandwidth: 3 MHz)	2M70G7D	
	LTE 5 (Channel Bandwidth: 5 MHz)	4M49D7W	
	LTE 5 (Channel Bandwidth: 10 MHz)	8M98D7W	
Antenna Type	Refer to Note as below		
Accessory Device	Refer to Note as below		
Data Cable Supplied	Refer to Note as below		

Note:

1. The EUT contains following accessory devices.

Product	Brand	Model	Description
Battery	BlackBerry	BAT-63320-001	7.2 Vdc, 38 A

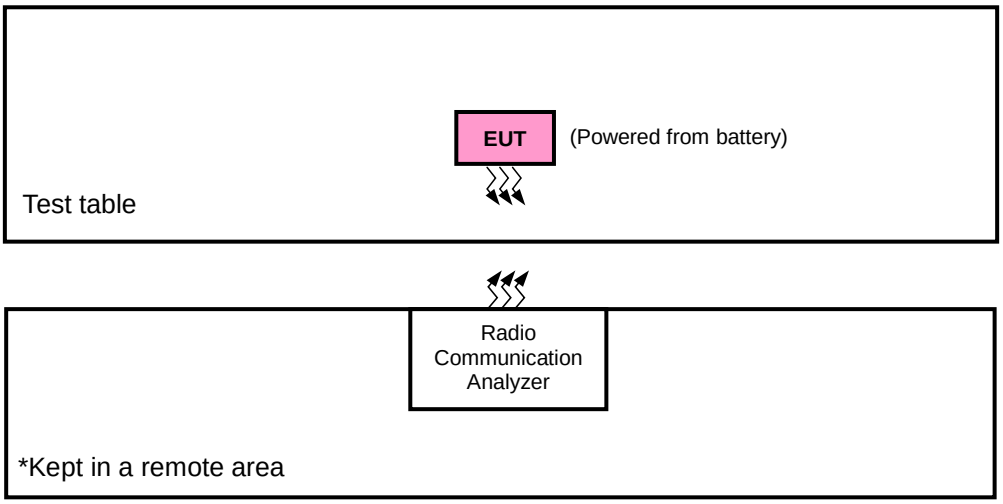
2. The antenna information is listed as below.

Antenna Type	Monopole with gnd resonator
Band	GSM 850 / WCDMA / LTE
	5
Gain (dBi)	0.57

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

3.2 Configuration of System under Test

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



3.2.1 Description of Support Units

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

3.3 Test Mode Applicability and Tested Channel Detail

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis, and antenna ports.
The worst case was found when positioned as the table below. Following channel(s) was (were) selected for the final test as listed below:

Band	ERP	Radiated Emission
GSM 850	Z-plane	Z-axis
WCDMA	Z-plane	Z-axis
LTE Band 5	Z-plane	Z-axis

GSM 850

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
-	ERP	128 to 251	128, 189, 251	GPRS, EDGE
-	Modulation Characteristics	128 to 251	189	GPRS, EDGE
-	Frequency Stability	128 to 251	128, 251	GPRS, EDGE
-	Occupied Bandwidth	128 to 251	128, 189, 251	GPRS, EDGE
-	Band Edge	128 to 251	128, 251	GPRS, EDGE
-	Peak to Average Ratio	128 to 251	128, 189, 251	GPRS, EDGE
-	Conducted Emission	128 to 251	128, 189, 251	GPRS, EDGE
-	Radiated Emission	128 to 251	128, 189, 251	GPRS

Note:

1. According ERP power test, pre-tested GPRS, EDGE modulation type and found GPRS was the worst. For radiated emission test, pre-tested GPRS, EDGE modulation type and found GPRS was the worst, therefore chosen for the final test.
2. For radiated emissions below 1 GHz, select the worst radiated emission channel for final testing.

WCDMA

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

Note: For radiated emissions below 1 GHz, select the worst radiated emission channel for final testing.

LTE Band 5

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	ERP	20407 to 20643	20407, 20525, 20643	1.4 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20415 to 20635	20415, 20525, 20635	3 MHz	QPSK, 16QAM	1 RB / 7 RB Offset
		20425 to 20625	20425, 20525, 20625	5 MHz	QPSK, 16QAM	1 RB / 12 RB Offset
		20450 to 20600	20450, 20525, 20600	10 MHz	QPSK, 16QAM	1 RB / 24 RB Offset
-	Modulation Characteristics	20450 to 20600	20525	10 MHz	QPSK, 16QAM	50 RB / 0 RB Offset
-	Frequency Stability	20407 to 20643	20407, 20643	1.4 MHz	QPSK	6 RB / 0 RB Offset
		20415 to 20635	20415, 20635	3 MHz	QPSK	15 RB / 0 RB Offset
		20425 to 20625	20425, 20625	5 MHz	QPSK	25 RB / 0 RB Offset
		20450 to 20600	20450, 20600	10 MHz	QPSK	50 RB / 0 RB Offset
-	Occupied Bandwidth	20407 to 20643	20407, 20525, 20643	1.4 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		20415 to 20635	20415, 20525, 20635	3 MHz	QPSK, 16QAM	15 RB / 0 RB Offset
		20425 to 20625	20425, 20525, 20625	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		20450 to 20600	20450, 20525, 20600	10 MHz	QPSK, 16QAM	50 RB / 0 RB Offset
-	Band Edge	20407 to 20643	20407	1.4MHz	QPSK	1 RB / 0 RB Offset
						6 RB / 0 RB Offset
			20643	1.4MHz	QPSK	1 RB / 5 RB Offset
						6 RB / 0 RB Offset
		20415 to 20635	20415	3 MHz	QPSK	1 RB / 0 RB Offset
						15 RB / 0 RB Offset
			20635	3 MHz	QPSK	1 RB / 14 RB Offset
						15 RB / 0 RB Offset
		20425 to 20625	20425	5 MHz	QPSK	1 RB / 0 RB Offset
						25 RB / 0 RB Offset
			20625	5 MHz	QPSK	1 RB / 24 RB Offset
						25 RB / 0 RB Offset
		20450 to 20600	20450	10 MHz	QPSK	1 RB / 0 RB Offset
						50 RB / 0 RB Offset
			20600	10 MHz	QPSK	1 RB / 49 RB Offset
						50 RB / 0 RB Offset
-	Peak to Average Ratio	20407 to 20643	20407, 20525, 20643	1.4 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20415 to 20635	20415, 20525, 20635	3 MHz	QPSK, 16QAM	1 RB / 7 RB Offset
		20425 to 20625	20425, 20525, 20625	5 MHz	QPSK, 16QAM	1 RB / 12 RB Offset
		20450 to 20600	20450, 20525, 20600	10 MHz	QPSK, 16QAM	1 RB / 24 RB Offset
-	Conducted Emission	20407 to 20643	20407, 20525, 20643	1.4 MHz	QPSK	1 RB / 0 RB Offset
		20415 to 20635	20415, 20525, 20635	3 MHz	QPSK	1 RB / 7 RB Offset
		20425 to 20625	20425, 20525, 20625	5 MHz	QPSK	1 RB / 12 RB Offset
		20450 to 20600	20450, 20525, 20600	10 MHz	QPSK	1 RB / 24 RB Offset
-	Radiated Emission	20407 to 20643	20407, 20525, 20643	1.4 MHz	QPSK	1 RB / 0 RB Offset
		20425 to 20625	20425, 20525, 20625	5 MHz	QPSK	1 RB / 12 RB Offset
		20450 to 20600	20450, 20525, 20600	10 MHz	QPSK	1 RB / 24 RB Offset

Note:

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

3. For radiated emissions below 1 GHz, select the worst radiated emission channel for final testing.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
ERP	25 deg. C, 65 % RH	7.2 Vdc	Han Wu
Modulation Characteristics	25 deg. C, 65 % RH	7.2 Vdc	Tank Wu
Frequency Stability	25 deg. C, 65 % RH	7.2 Vdc	James Yang
Occupied Bandwidth	25 deg. C, 65 % RH	7.2 Vdc	Tank Wu
Band Edge	25 deg. C, 65 % RH	7.2 Vdc	Tank Wu
Peak to Average Ratio	25 deg. C, 65 % RH	7.2 Vdc	Tank Wu
Conducted Emission	25 deg. C, 65 % RH	7.2 Vdc	Tank Wu
Radiated Emission	25 deg. C, 65 % RH	7.2 Vdc	Greg Lin, Han Wu

3.4 EUT Operating Conditions

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

3.5 General Description of Applied Standards and references

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

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

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

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

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

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

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

4.1.2 Test Procedures

EIRP / ERP Measurement:

a. All measurements were done at low, middle and high operational frequency range. RBW is 1 MHz for GPRS & EDGE, and 5 MHz for WCDMA, and 1.4 MHz、5 MHz、10 MHz for LTE mode, and VBW ≥ 3 x RBW .

b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.

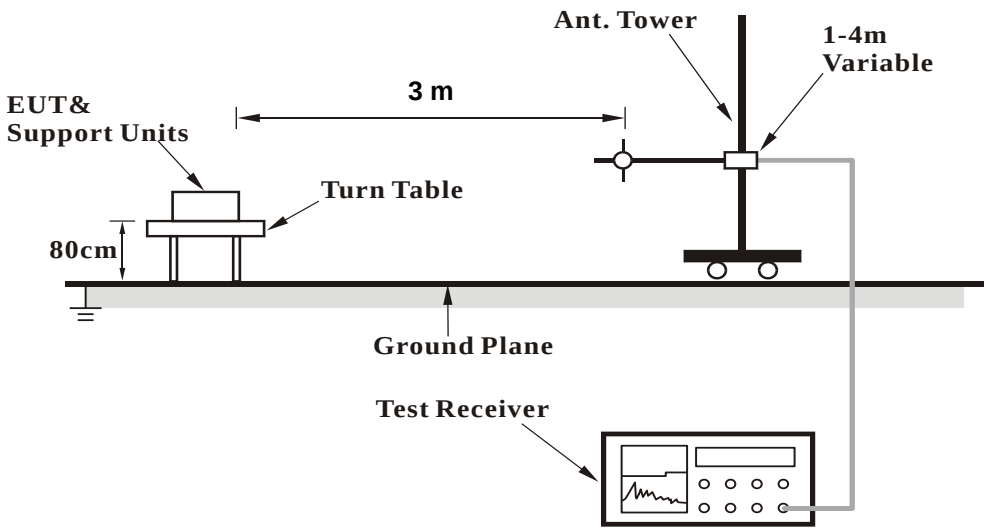
c. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.R.P power - 2.15 dB.

Conducted Power Measurement:

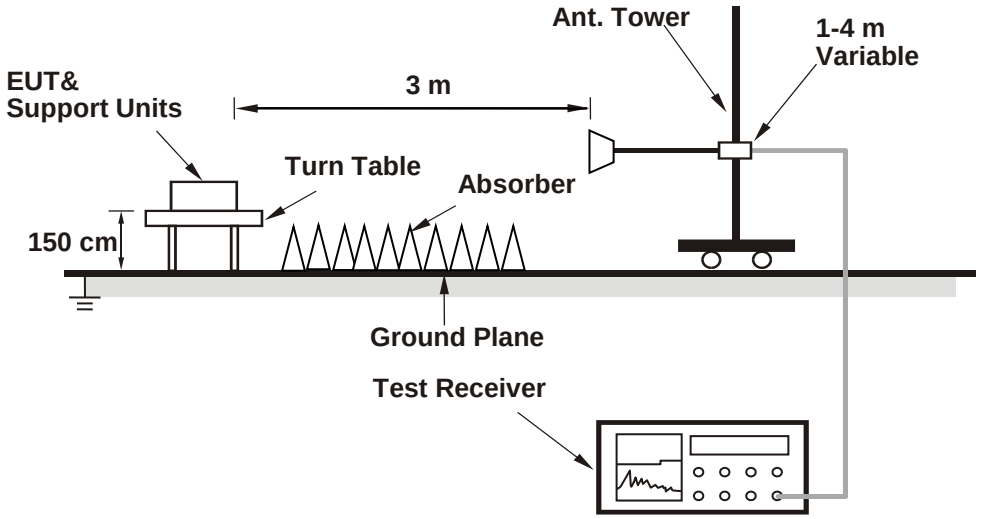
The EUT was set up for the maximum power with GPRS, EDGE, WCDMA, and LTE link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

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	GSM850		
Channel	128	189	251
Frequency (MHz)	824.2	836.4	848.8
GPRS (GMSK, 1Tx-slot)	31.45	31.38	31.35
GPRS (GMSK, 2Tx-slot)	31.31	31.34	31.40
GPRS (GMSK, 3Tx-slot)	31.35	31.33	31.30
GPRS (GMSK, 4Tx-slot)	31.37	31.33	31.39
DTM (GMSK, 2Tx-slot)	31.40	31.35	31.36
DTM (GMSK, 3Tx-slot)	31.32	31.35	31.37
EDGE (8PSK, 1Tx-slot)	30.69	30.69	30.70
EDGE (8PSK, 2Tx-slot)	30.65	30.65	30.67
EDGE (8PSK, 3Tx-slot)	30.61	30.60	30.64
EDGE (8PSK, 4Tx-slot)	30.68	30.61	30.64
DTM (8PSK, 2Tx-slot)	30.61	30.65	30.62
DTM (8PSK, 3Tx-slot)	30.60	30.69	30.70

Band	WCDMA V		
Channel	4132	4182	4233
Frequency (MHz)	826.4	836.4	846.6
RMC 12.2K	23.17	23.03	23.11
HSDPA Subtest-1	22.47	22.35	22.32
HSDPA Subtest-2	22.44	22.42	22.47
HSDPA Subtest-3	22.48	22.33	22.43
HSDPA Subtest-4	22.43	22.44	22.50
HSUPA Subtest-1	21.75	21.73	21.63
HSUPA Subtest-2	21.66	21.76	21.69
HSUPA Subtest-3	21.75	21.64	21.62
HSUPA Subtest-4	21.79	21.63	21.78
HSUPA Subtest-5	21.68	21.76	21.73

LTE Band 5

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20450	20525	20600				Channel		20425	20525	20625	
		Frequency (MHz)		829.0	836.5	844.0				Frequency (MHz)		826.5	836.5	846.5	
10M	QPSK	1	0	22.51	22.37	22.32	0	5M	QPSK	1	0	22.51	22.56	22.55	0
		1	24	22.35	22.57	22.50	0			1	12	22.40	22.30	22.60	0
		1	49	22.42	22.56	22.49	0			1	24	22.52	22.55	22.44	0
		25	0	21.55	21.35	21.38	1			12	0	21.40	21.48	21.58	1
		25	12	21.57	21.33	21.60	1			12	6	21.52	21.53	21.30	1
		25	25	21.46	21.35	21.36	1			12	13	21.60	21.60	21.48	1
		50	0	21.44	21.42	21.49	1			25	0	21.34	21.38	21.43	1
	16QAM	1	0	21.54	21.63	21.67	1		16QAM	1	0	21.57	21.61	21.70	1
		1	24	21.63	21.58	21.63	1			1	12	21.58	21.48	21.56	1
		1	49	21.46	21.51	21.70	1			1	24	21.55	21.61	21.55	1
		25	0	20.55	20.42	20.64	2			12	0	20.70	20.55	20.45	2
		25	12	20.42	20.43	20.44	2			12	6	20.54	20.55	20.66	2
		25	25	20.64	20.44	20.54	2			12	13	20.47	20.63	20.68	2
		50	0	20.45	20.65	20.60	2			25	0	20.59	20.52	20.52	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		20415	20525	20635				Channel		20407	20525	20643	
		Frequency (MHz)		825.5	836.5	847.5				Frequency (MHz)		824.7	836.5	848.3	
3M	QPSK	1	0	22.47	22.51	22.49	0	1.4M	QPSK	1	0	22.40	22.65	22.53	0
		1	7	22.55	22.52	22.49	0			1	2	22.40	22.60	22.41	0
		1	14	22.54	22.51	22.32	0			1	5	22.51	22.48	22.52	0
		8	0	21.36	21.37	21.35	1			3	0	21.42	21.34	21.49	0
		8	3	21.31	21.37	21.50	1			3	1	21.40	21.37	21.56	0
		8	7	21.45	21.50	21.46	1			3	3	21.55	21.30	21.41	0
		15	0	21.45	21.38	21.32	1			6	0	21.53	21.56	21.32	1
	16QAM	1	0	21.54	21.43	21.55	1		16QAM	1	0	21.53	21.50	21.50	1
		1	7	21.48	21.68	21.51	1			1	2	21.50	21.61	21.48	1
		1	14	21.48	21.62	21.43	1			1	5	21.40	21.46	21.67	1
		8	0	20.70	20.48	20.46	2			3	0	20.48	20.46	20.40	1
		8	3	20.57	20.69	20.52	2			3	1	20.63	20.68	20.52	1
		8	7	20.50	20.58	20.53	2			3	3	20.56	20.48	20.69	1
		15	0	20.68	20.46	20.48	2			6	0	20.47	20.41	20.50	2

ERP Power (dBm)

GPRS Mode

MODE		TX channel 128, 189, 251					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	824.20	-1.00	26.60	3.90	30.50	38.50	-8.00
2	836.40	-0.10	27.30	3.80	**31.10**	38.50	-7.40
3	848.80	-0.20	27.50	3.40	30.90	38.50	-7.60
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	824.20	-6.60	21.70	3.90	25.60	38.50	-12.90
2	836.40	-6.20	21.90	3.80	25.70	38.50	-12.80
3	848.80	-6.90	21.20	3.40	24.60	38.50	-13.90

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).
Correction Factor (dB)= Antenna Gain (dBi) – cable loss (dB) – 2.15 dB.

EDGE Mode

MODE		TX channel 128, 189, 251					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	824.20	-2.00	25.60	3.90	29.50	38.50	-9.00
2	836.40	-1.20	26.20	3.80	**30.00**	38.50	-8.50
3	848.80	-1.20	26.50	3.40	29.90	38.50	-8.60
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	824.20	-7.60	20.70	3.90	24.60	38.50	-13.90
2	836.40	-7.20	20.90	3.80	24.70	38.50	-13.80
3	848.80	-7.50	20.60	3.40	24.00	38.50	-14.50

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).
Correction Factor (dB)= Antenna Gain (dBi) – cable loss (dB) – 2.15 dB.

WCDMA Band 5

MODE		TX channel 4132, 4182, 4233					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	826.40	-8.40	19.20	3.90	23.10	38.50	-15.40
2	836.40	-8.10	19.40	3.80	**23.20**	38.50	-15.30
3	846.60	-8.60	19.00	3.40	22.40	38.50	-16.10
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	826.40	-16.10	12.20	3.90	16.10	38.50	-22.40
2	836.40	-15.90	12.20	3.80	16.00	38.50	-22.50
3	846.60	-16.60	11.60	3.40	15.00	38.50	-23.50

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).
Correction Factor (dB)= Antenna Gain (dBi) – cable loss (dB) – 2.15 dB.

Modulation Type: QPSK

LTE Band 5, Channel Bandwidth: 1.4MHz

MODE		TX channel 20407, 20525, 20643					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	824.70	-8.40	19.20	3.90	**23.10**	38.50	-15.40
2	836.50	-8.40	19.10	3.80	22.90	38.50	-15.60
3	848.30	-9.20	18.50	3.40	21.90	38.50	-16.60
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	824.70	-19.40	9.00	3.90	12.90	38.50	-25.60
2	836.50	-18.90	9.20	3.80	13.00	38.50	-25.50
3	848.30	-19.00	9.10	3.40	12.50	38.50	-26.00

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).
Correction Factor (dB)= Antenna Gain (dBi) – cable loss (dB) – 2.15 dB.

LTE Band 5, Channel Bandwidth: 3MHz

MODE		TX channel 20415, 20525, 20635					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	825.50	-8.70	18.90	3.90	**22.80**	38.50	-15.70
2	836.50	-8.90	18.60	3.80	22.40	38.50	-16.10
3	847.50	-9.10	18.50	3.40	21.90	38.50	-16.60
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	825.50	-19.40	9.00	3.90	12.90	38.50	-25.60
2	836.50	-19.50	8.60	3.80	12.40	38.50	-26.10
3	847.50	-18.90	9.30	3.40	12.70	38.50	-25.80

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).
Correction Factor (dB)= Antenna Gain (dBi) – cable loss (dB) – 2.15 dB.

LTE Band 5, Channel Bandwidth: 5MHz

MODE		TX channel 20425, 20525, 20625					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	826.50	-8.80	18.80	3.90	**22.70**	38.50	-15.80
2	836.50	-8.90	18.50	3.80	22.30	38.50	-16.20
3	846.50	-8.70	18.90	3.40	22.30	38.50	-16.20
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	826.50	-18.90	9.50	3.90	13.40	38.50	-25.10
2	836.50	-19.20	8.90	3.80	12.70	38.50	-25.80
3	846.50	-18.80	9.40	3.40	12.80	38.50	-25.70

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).
Correction Factor (dB)= Antenna Gain (dBi) – cable loss (dB) – 2.15 dB.

LTE Band 5, Channel Bandwidth: 10MHz

MODE		TX channel 20450, 20525, 20600					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	829.00	-9.00	18.70	3.90	22.60	38.50	-15.90
2	836.50	-8.40	19.10	3.80	**22.90**	38.50	-15.60
3	844.00	-8.80	18.80	3.70	22.50	38.50	-16.00
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	829.00	-19.00	9.20	3.90	13.10	38.50	-25.40
2	836.50	-18.70	9.40	3.80	13.20	38.50	-25.30
3	844.00	-19.10	9.30	3.70	13.00	38.50	-25.50

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).
Correction Factor (dB)= Antenna Gain (dBi) – cable loss (dB) – 2.15 dB.

Modulation Type: 16QAM

LTE Band 5, Channel Bandwidth: 1.4MHz

MODE		TX channel 20407, 20525, 20643					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	824.70	-9.50	18.10	3.90	**22.00**	38.50	-16.50
2	836.50	-9.40	18.10	3.80	21.90	38.50	-16.60
3	848.30	-10.30	17.40	3.40	20.80	38.50	-17.70
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	824.70	-20.40	8.00	3.90	11.90	38.50	-26.60
2	836.50	-20.10	8.00	3.80	11.80	38.50	-26.70
3	848.30	-20.00	8.10	3.40	11.50	38.50	-27.00

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).
Correction Factor (dB)= Antenna Gain (dBi) – cable loss (dB) – 2.15 dB.

LTE Band 5, Channel Bandwidth: 3MHz

MODE	TX channel 20415, 20525, 20635						
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	825.50	-9.50	18.10	3.90	**22.00**	38.50	-16.50
2	836.50	-9.60	17.80	3.80	21.60	38.50	-16.90
3	847.50	-10.10	17.50	3.40	20.90	38.50	-17.60
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	825.50	-20.40	8.00	3.90	11.90	38.50	-26.60
2	836.50	-20.40	7.70	3.80	11.50	38.50	-27.00
3	847.50	-20.10	8.10	3.40	11.50	38.50	-27.00

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).
Correction Factor (dB)= Antenna Gain (dBi) – cable loss (dB) – 2.15 dB.

LTE Band 5, Channel Bandwidth: 5MHz

MODE	TX channel 20425, 20525, 20625						
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	826.50	-9.80	17.80	3.90	**21.70**	38.50	-16.80
2	836.50	-9.60	17.80	3.80	21.60	38.50	-16.90
3	846.50	-9.70	17.90	3.40	21.30	38.50	-17.20
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	826.50	-19.90	8.50	3.90	12.40	38.50	-26.10
2	836.50	-20.40	7.70	3.80	11.50	38.50	-27.00
3	846.50	-19.60	8.60	3.40	12.00	38.50	-26.50

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).
Correction Factor (dB)= Antenna Gain (dBi) – cable loss (dB) – 2.15 dB.

LTE Band 5, Channel Bandwidth: 10MHz

MODE	TX channel 20450, 20525, 20600						
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	829.00	-9.80	17.90	3.90	21.80	38.50	-16.70
2	836.50	-9.10	18.30	3.80	**22.10**	38.50	-16.40
3	844.00	-9.40	18.20	3.70	21.90	38.50	-16.60
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	829.00	-20.20	8.00	3.90	11.90	38.50	-26.60
2	836.50	-19.50	8.60	3.80	12.40	38.50	-26.10
3	844.00	-19.90	8.50	3.70	12.20	38.50	-26.30

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).
Correction Factor (dB)= Antenna Gain (dBi) – cable loss (dB) – 2.15 dB.

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

N/A

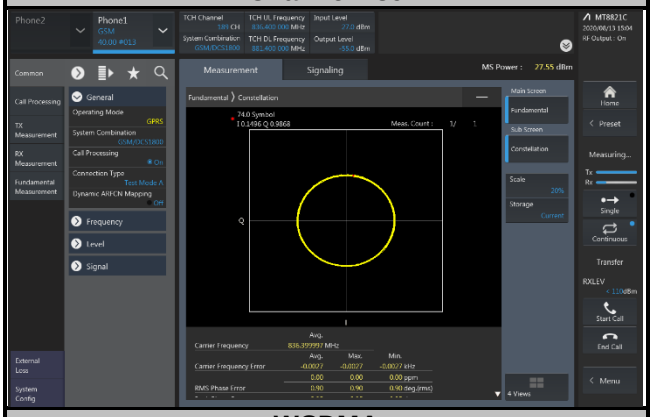
4.2.2 Test Setup

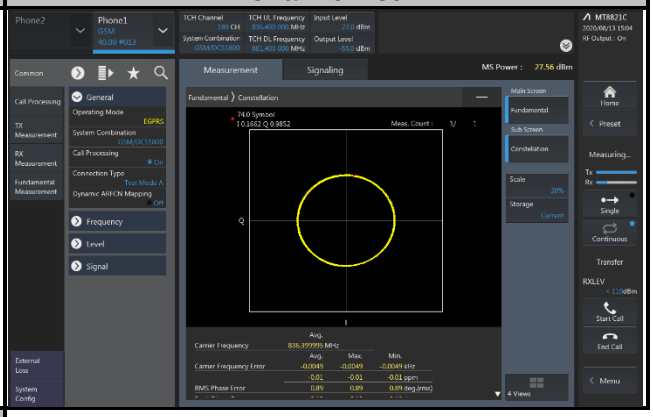
4.2.3 Test Procedure

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

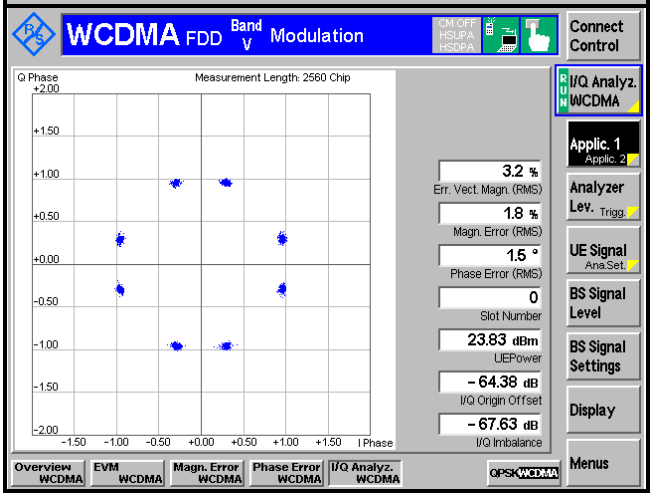
Spectrum Plot of Measurement	
GPRS	**EDGE**
Channel 189	**Channel 189**



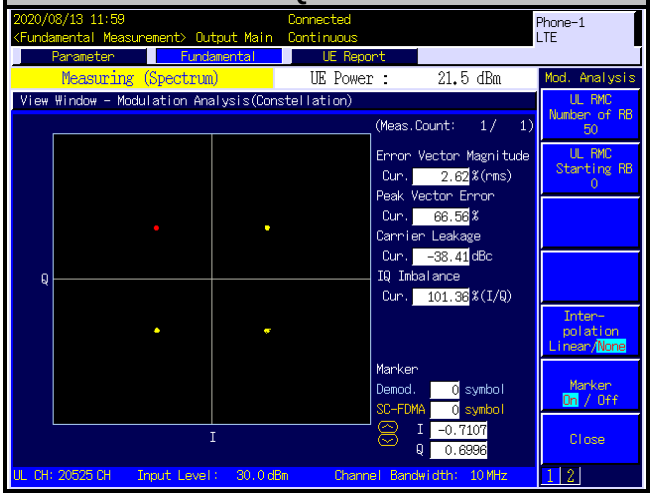


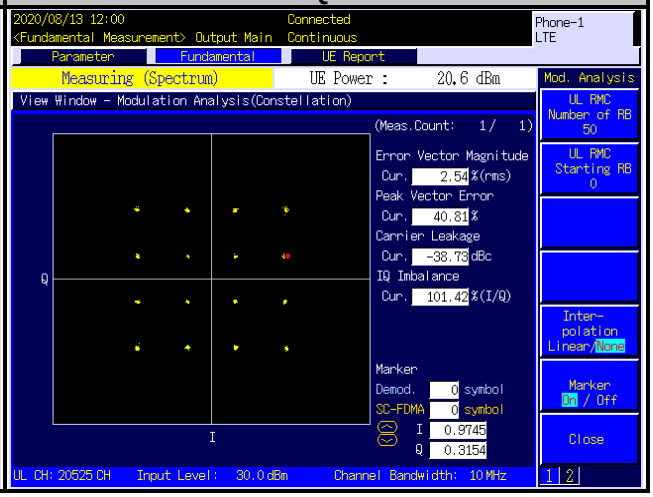
WCDMA

Channel 4182



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





4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

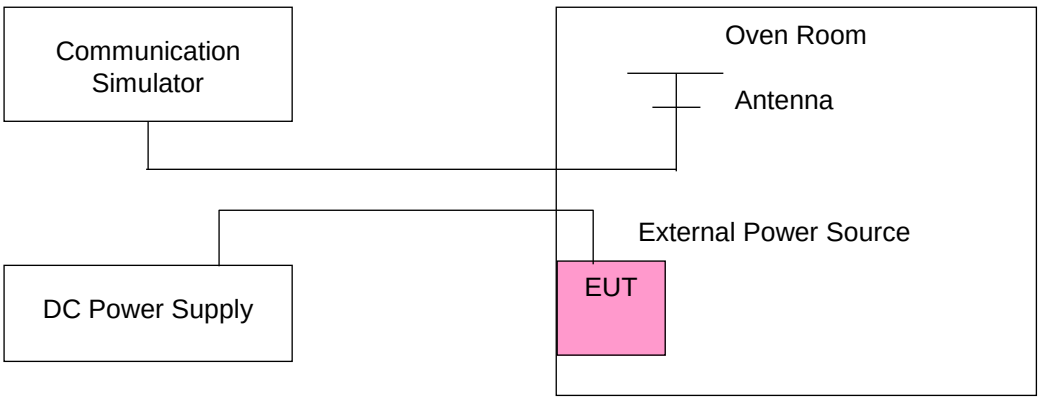
1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

4.3.2 Test Procedure

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

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

4.3.3 Test Setup



4.3.4 Test Results

Frequency Error vs. Voltage

Voltage (Volts)	GPRS				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
7.2	824.200001	0.002	848.800002	0.003	2.5
6.12	824.200003	0.004	848.800003	0.004	2.5
8.28	824.200002	0.003	848.800002	0.002	2.5

Note: The applicant defined the normal working voltage of the battery is from 6.12 Vdc to 8.28 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	GPRS				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	824.200002	0.002	848.800003	0.003	2.5
-20	824.200002	0.003	848.800001	0.001	2.5
-10	824.200001	0.002	848.800003	0.004	2.5
0	824.200003	0.004	848.800001	0.001	2.5
10	824.200001	0.001	848.800002	0.002	2.5
20	824.199998	-0.003	848.799996	-0.005	2.5
30	824.199998	-0.002	848.799999	-0.001	2.5
40	824.199997	-0.003	848.799999	-0.001	2.5
50	824.199996	-0.005	848.799997	-0.003	2.5

Frequency Error vs. Voltage

Voltage (Volts)	EDGE				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
7.2	824.200004	0.004	848.800004	0.004	2.5
6.12	824.200002	0.002	848.800004	0.004	2.5
8.28	824.200001	0.001	848.800003	0.003	2.5

Note: The applicant defined the normal working voltage of the battery is from 6.12 Vdc to 8.28 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	EDGE				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	824.200001	0.001	848.800001	0.002	2.5
-20	824.200002	0.003	848.800002	0.002	2.5
-10	824.200003	0.004	848.800001	0.002	2.5
0	824.200003	0.004	848.800003	0.004	2.5
10	824.200003	0.003	848.800004	0.004	2.5
20	824.199999	-0.002	848.799997	-0.004	2.5
30	824.199999	-0.001	848.799997	-0.003	2.5
40	824.199997	-0.004	848.799997	-0.004	2.5
50	824.199999	-0.001	848.799996	-0.004	2.5

Frequency Error vs. Voltage

Voltage (Volts)	WCDMA				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
7.2	826.400003	0.003	846.600003	0.004	2.5
6.12	826.400004	0.005	846.600003	0.003	2.5
8.28	826.400003	0.004	846.600003	0.004	2.5

Note: The applicant defined the normal working voltage of the battery is from 6.12 Vdc to 8.28 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	WCDMA				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	826.400002	0.003	846.600002	0.003	2.5
-20	826.400003	0.004	846.600003	0.003	2.5
-10	826.400002	0.002	846.600004	0.005	2.5
0	826.400002	0.002	846.600002	0.002	2.5
10	826.400002	0.002	846.600003	0.003	2.5
20	826.399998	-0.002	846.599997	-0.004	2.5
30	826.399997	-0.004	846.599999	-0.001	2.5
40	826.399998	-0.002	846.599999	-0.002	2.5
50	826.399996	-0.004	846.599997	-0.003	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 1.4 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
7.2	824.700001	0.002	848.300002	0.002	2.5
6.12	824.700004	0.005	848.300004	0.004	2.5
8.28	824.700002	0.003	848.300003	0.003	2.5

Note: The applicant defined the normal working voltage of the battery is from 6.12 Vdc to 8.28 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 1.4 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	824.700003	0.004	848.300003	0.003	2.5
-20	824.700002	0.002	848.300001	0.002	2.5
-10	824.700002	0.002	848.300003	0.003	2.5
0	824.700003	0.004	848.300004	0.005	2.5
10	824.700001	0.001	848.300003	0.004	2.5
20	824.699998	-0.002	848.299997	-0.004	2.5
30	824.699997	-0.004	848.299997	-0.004	2.5
40	824.699998	-0.002	848.299998	-0.002	2.5
50	824.699999	-0.001	848.299996	-0.004	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 3 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
7.2	825.500003	0.004	847.500002	0.002	2.5
6.12	825.500001	0.001	847.500003	0.004	2.5
8.28	825.500003	0.004	847.500003	0.003	2.5

Note: The applicant defined the normal working voltage of the battery is from 6.12 Vdc to 8.28 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 3 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	825.500004	0.004	847.500001	0.001	2.5
-20	825.500001	0.001	847.500003	0.003	2.5
-10	825.500002	0.003	847.500002	0.003	2.5
0	825.500002	0.003	847.500004	0.004	2.5
10	825.500003	0.004	847.500003	0.004	2.5
20	825.499999	-0.002	847.499996	-0.004	2.5
30	825.499999	-0.001	847.499998	-0.003	2.5
40	825.499998	-0.002	847.499997	-0.004	2.5
50	825.499997	-0.004	847.499997	-0.003	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
7.2	826.500002	0.002	846.500002	0.003	2.5
6.12	826.500003	0.003	846.500002	0.002	2.5
8.28	826.500002	0.003	846.500002	0.003	2.5

Note: The applicant defined the normal working voltage of the battery is from 6.12 Vdc to 8.28 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	826.500002	0.002	846.500002	0.002	2.5
-20	826.500002	0.002	846.500003	0.003	2.5
-10	826.500003	0.003	846.500004	0.004	2.5
0	826.500001	0.002	846.500002	0.002	2.5
10	826.500002	0.003	846.500004	0.005	2.5
20	826.499998	-0.003	846.499999	-0.002	2.5
30	826.499996	-0.005	846.499997	-0.004	2.5
40	826.499998	-0.003	846.499998	-0.002	2.5
50	826.499998	-0.002	846.499998	-0.003	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 10 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
7.2	829.000003	0.004	844.000002	0.002	2.5
6.12	829.000004	0.004	844.000003	0.003	2.5
8.28	829.000002	0.003	844.000004	0.004	2.5

Note: The applicant defined the normal working voltage of the battery is from 6.12 Vdc to 8.28 Vdc.

Frequency Error vs. Temperature

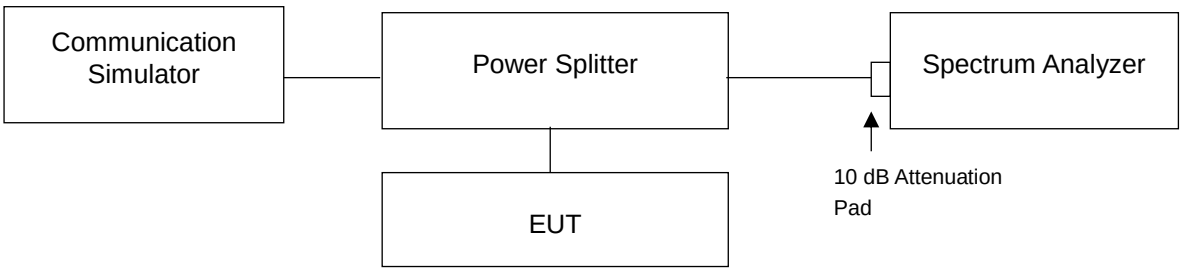
Temp. (℃)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 10 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	829.000003	0.004	844.000002	0.002	2.5
-20	829.000003	0.004	844.000002	0.002	2.5
-10	829.000003	0.003	844.000003	0.003	2.5
0	829.000003	0.004	844.000004	0.005	2.5
10	829.000001	0.001	844.000002	0.003	2.5
20	828.999997	-0.003	843.999998	-0.003	2.5
30	828.999997	-0.004	843.999998	-0.003	2.5
40	828.999997	-0.004	843.999996	-0.005	2.5
50	828.999998	-0.003	843.999997	-0.003	2.5

4.4 Occupied Bandwidth Measurement

4.4.1 Test Procedure

The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Refer to ANSI C63.26 section 5.4.4.Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.
For the 26dBc bandwidth measurement method, please refer to section 5.4.3 of ANSI C63.26.

4.4.2 Test Setup



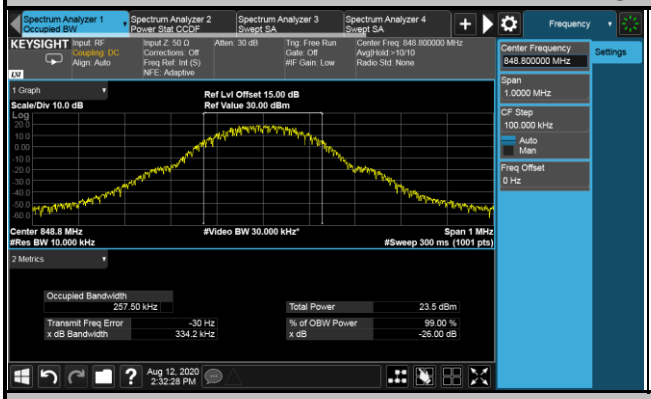
4.4.3 Test Result

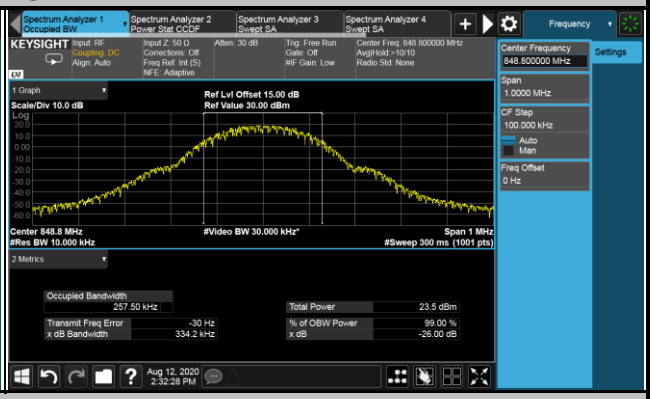
GPRS				EDGE			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (kHz)	26 dB Bandwidth (kHz)	Channel	Frequency (MHz)	99 % Occupied Bandwidth (kHz)	26 dB Bandwidth (kHz)
128	824.2	256.75	329.90	128	824.2	255.26	328.30
189	836.4	255.86	325.60	189	836.4	254.18	327.70
251	848.8	257.50	334.20	251	848.8	255.89	319.00

Spectrum Plot of Worst Value

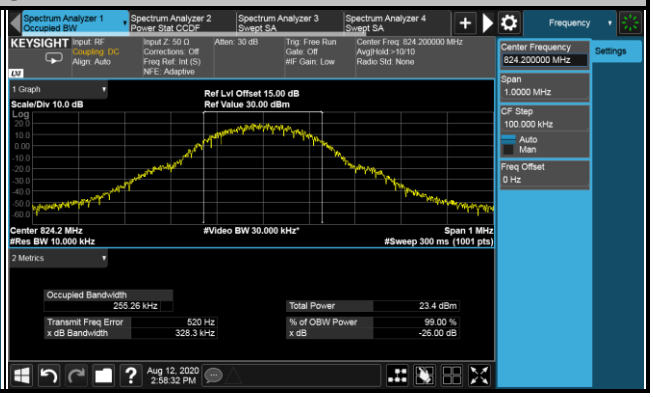
99 % Occupied Bandwidth	26 dB Bandwidth

GPRS

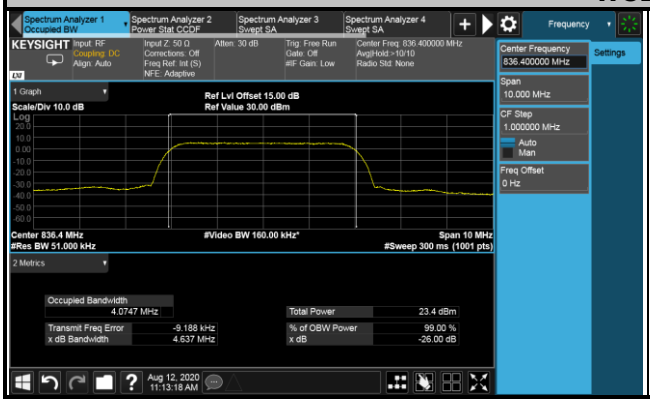




EDGE



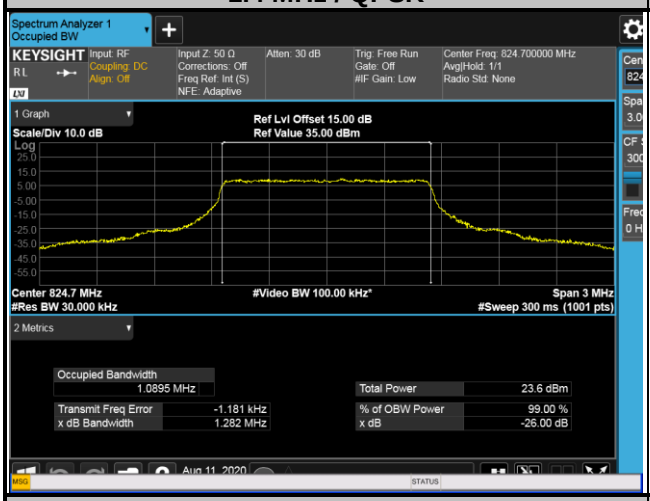
WCDMA			
Channel	**Frequency (MHz)**	**99 % Occupied Bandwidth (MHz)**	**26 dB Bandwidth (MHz)**
4132	826.4	4.06	4.62
4182	836.4	4.07	4.63
4233	846.6	4.06	4.64

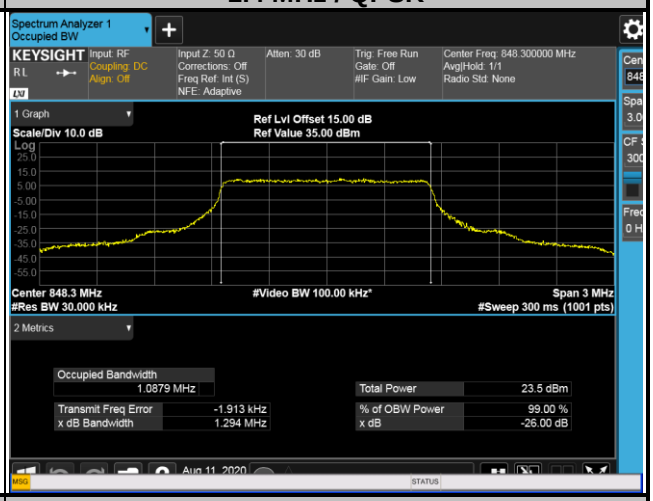
Spectrum Plot of Worst Value	
99 % Occupied Bandwidth	**26 dB Bandwidth**
WCDMA	
	

LTE Band 5					
Channel Bandwidth: 1.4 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
20407	824.7	1.0895	1.0885	1.282	1.286
20525	836.5	1.0891	1.0892	1.272	1.264
20643	848.3	1.0879	1.0889	1.294	1.278
Channel Bandwidth: 3 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
20415	825.5	2.6992	2.6938	2.911	2.924
20525	836.5	2.7005	2.6971	2.928	2.921
20635	847.5	2.6996	2.6941	2.916	2.927

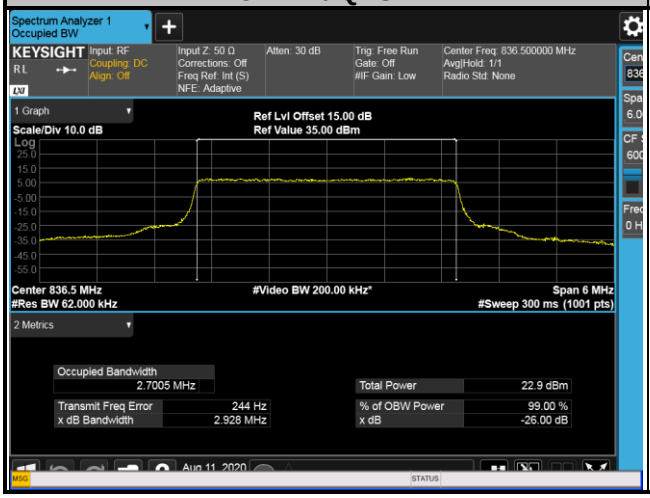
Spectrum Plot of Worst Value

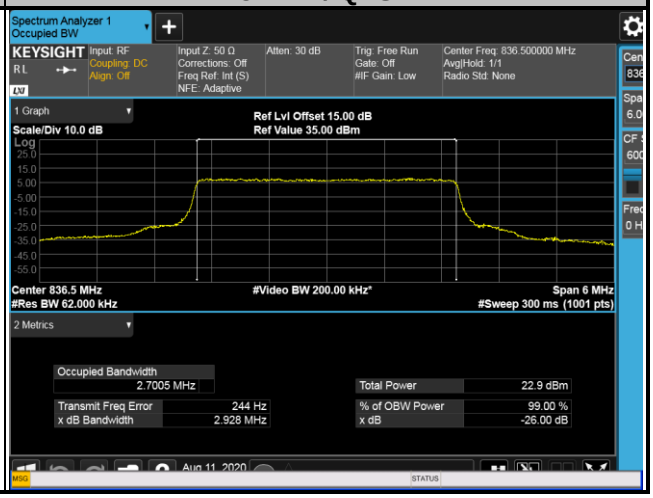
99 % Occupied Bandwidth	26 dB Bandwidth
1.4 MHz / QPSK	1.4 MHz / QPSK





3 MHz / QPSK	3 MHz / QPSK



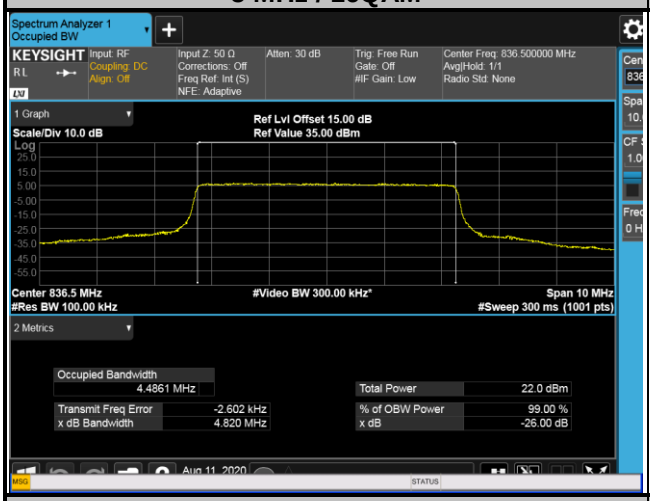


LTE Band 5					
Channel Bandwidth: 5 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
20425	826.5	4.4833	4.4855	4.826	4.832
20525	836.5	4.4843	4.4861	4.803	4.820
20625	846.5	4.4825	4.4809	4.780	4.809
Channel Bandwidth: 10 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
20450	829.0	8.9536	8.9574	9.518	9.526
20525	836.5	8.9750	8.9751	9.530	9.574
20600	844.0	8.9678	8.9746	9.547	9.547

Spectrum Plot of Worst Value

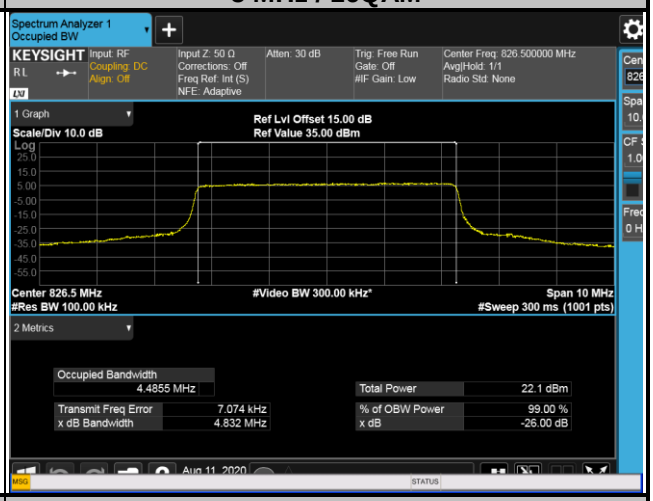
99 % Occupied Bandwidth

5 MHz / 16QAM

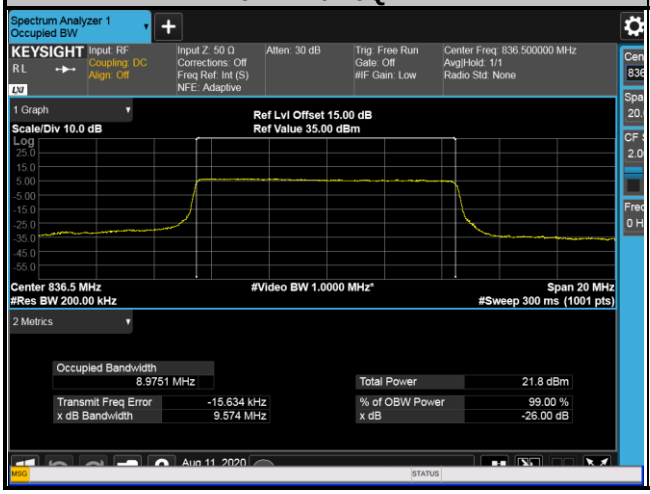


26 dB Bandwidth

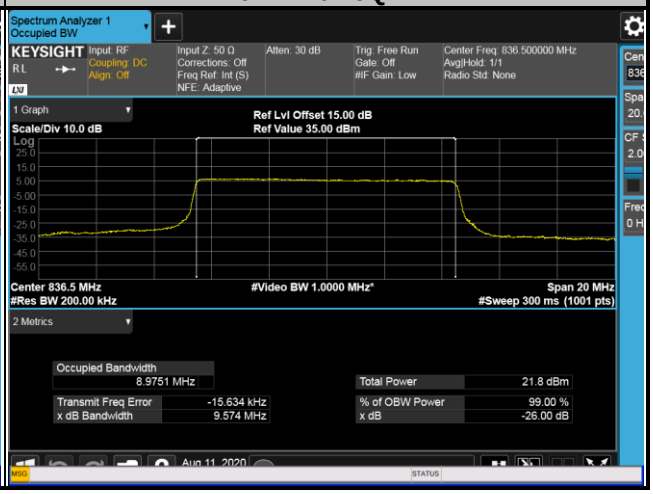
5 MHz / 16QAM



10 MHz / 16QAM



10 MHz / 16QAM

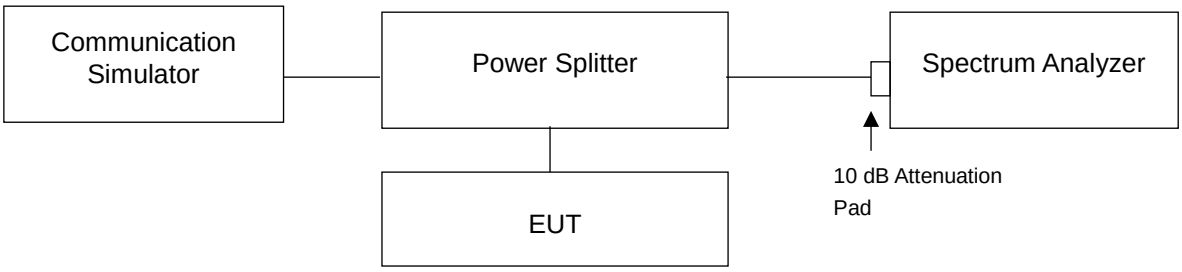


4.5 Band Edge Measurement

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.

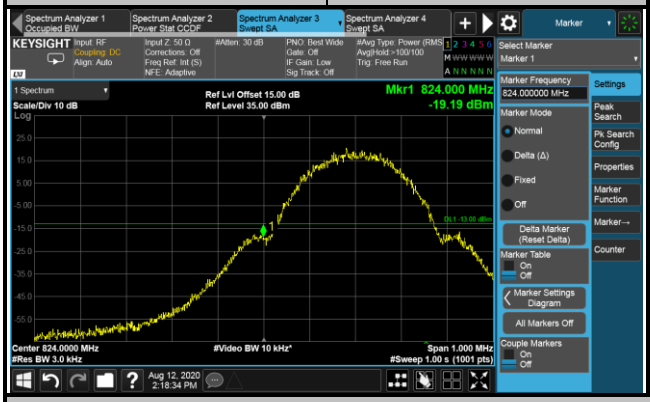
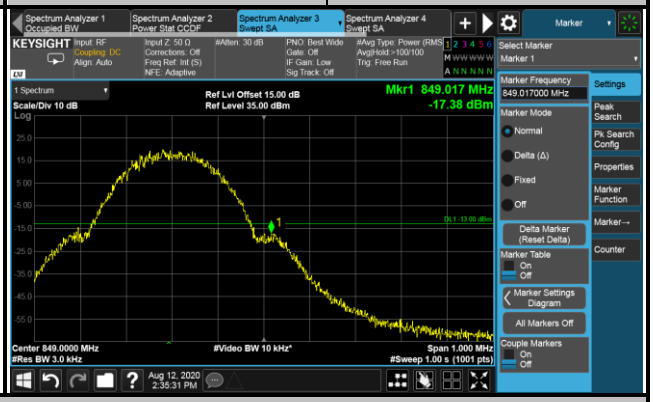
4.5.2 Test Setup

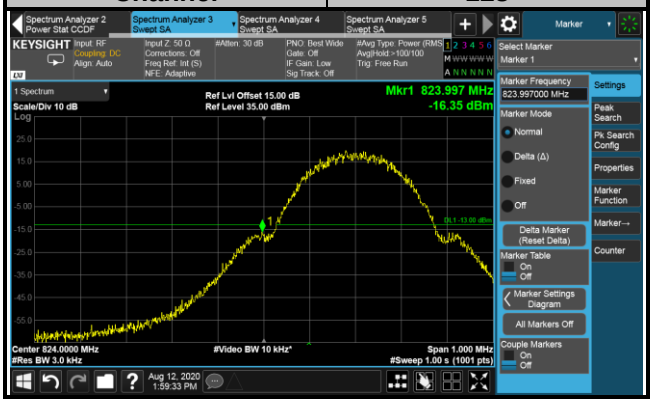
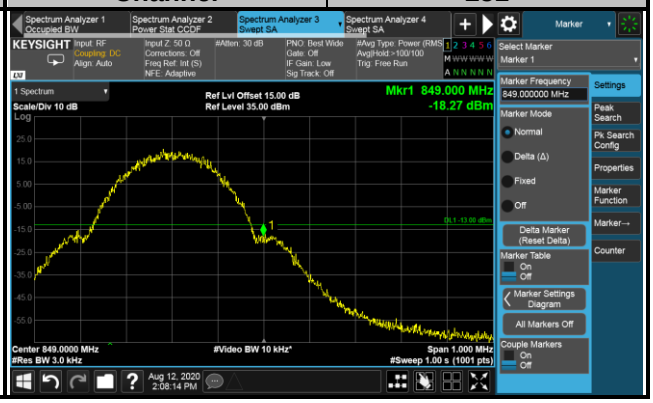


4.5.3 Test Procedures

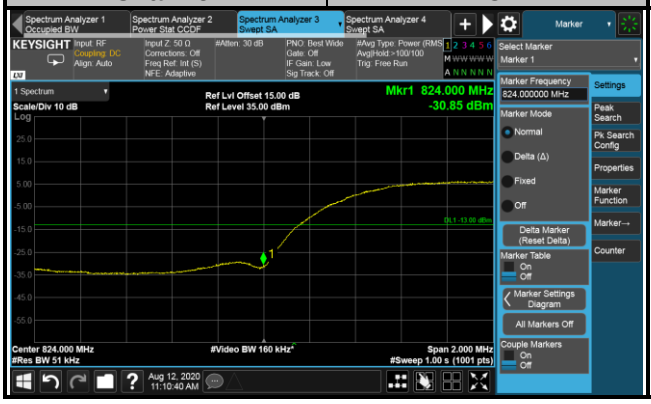
a. All measurements were done at low and high operational frequency range.
b. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 3 kHz and VB of the spectrum is 10 kHz (GPRS/EDGE).
c. The center frequency of spectrum is the band edge frequency and span is 2 MHz. RB of the spectrum is 51 kHz and VB of the spectrum is 160 kHz (WCDMA).
d. 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).
e. 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).
f. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 62 kHz or 51 kHz and VB of the spectrum is 200 kHz or 160kHz (LTE Bandwidth 5 MHz).
g. 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).
h. Record the max trace plot into the test report.

4.5.4 Test Results

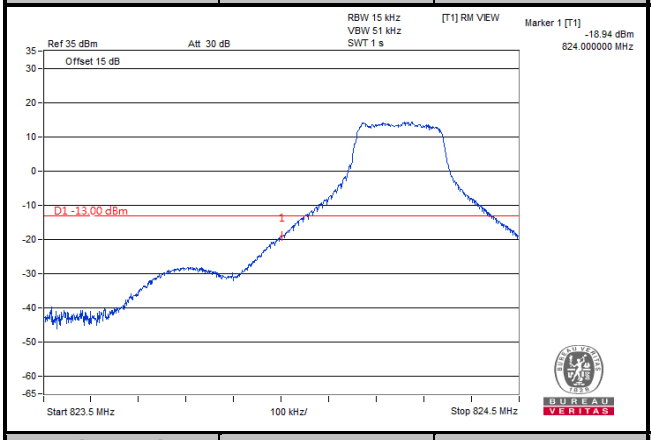
GPRS			
Channel	128	Channel	251
			

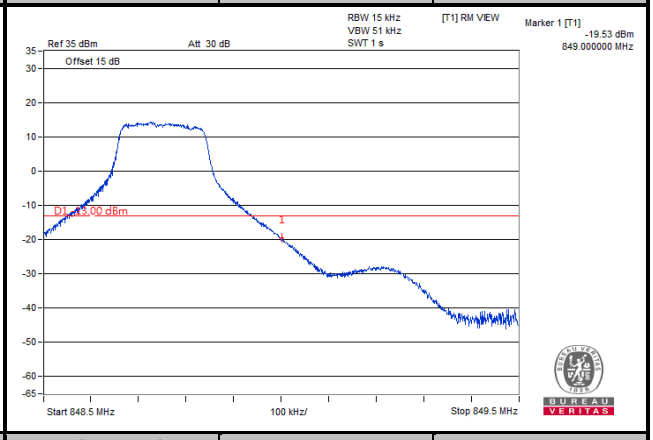
EDGE			
Channel	128	Channel	251
			

WCDMA			
Channel	4132	Channel	4233

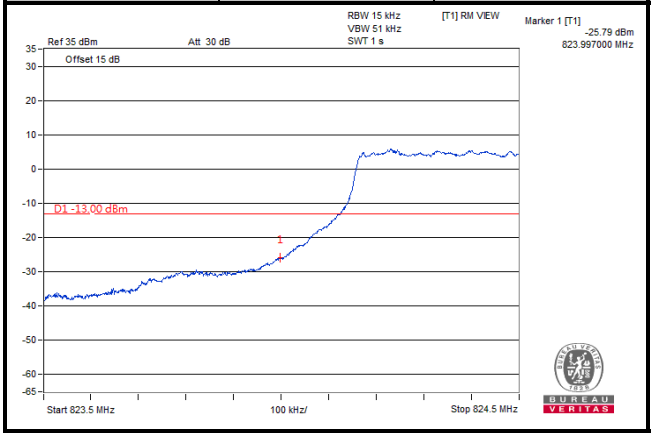


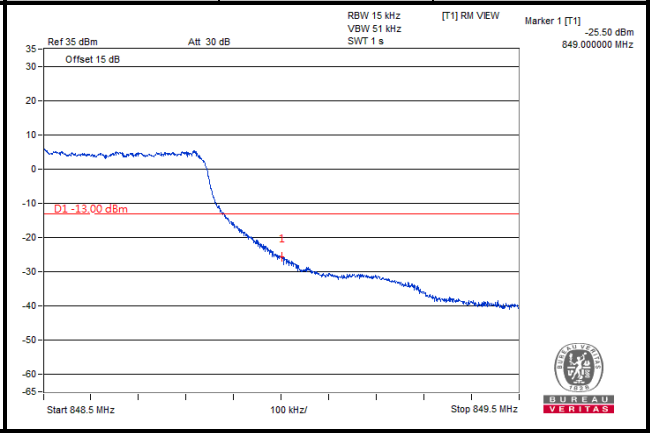
LTE Band 5					
Channel Bandwidth: 1.4 MHz					
Channel	20407	1 RB	Channel	20643	1 RB

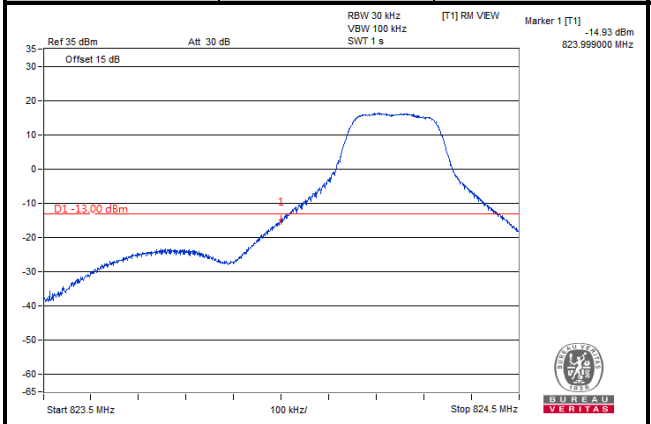
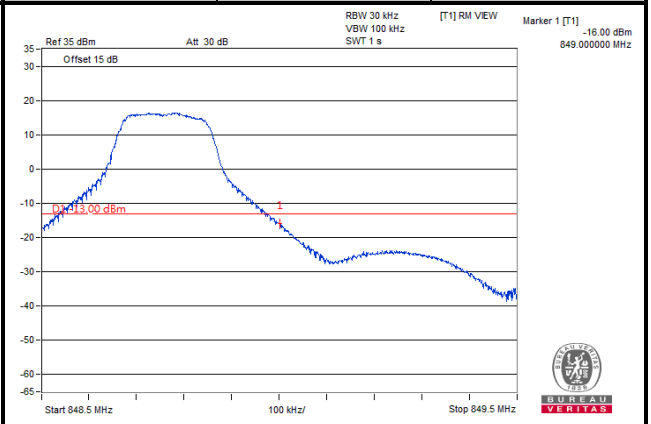
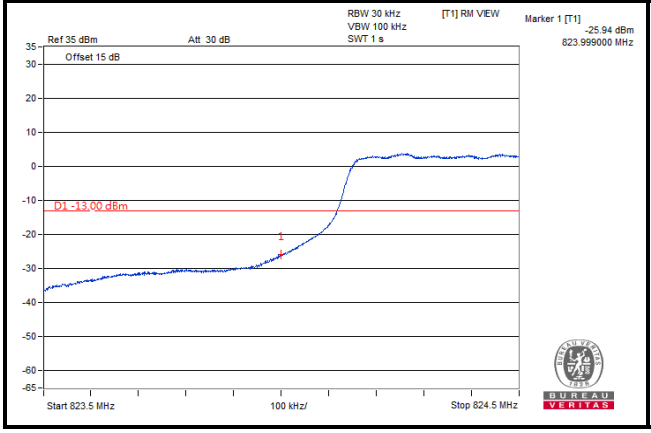
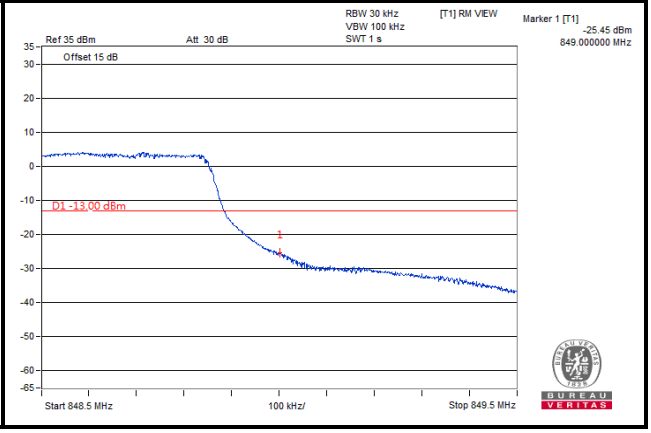


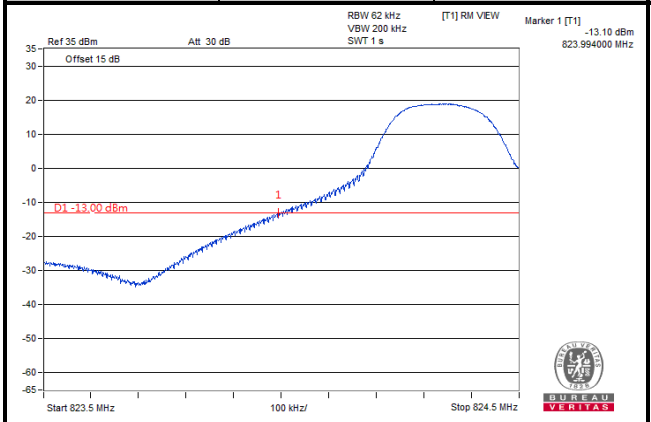
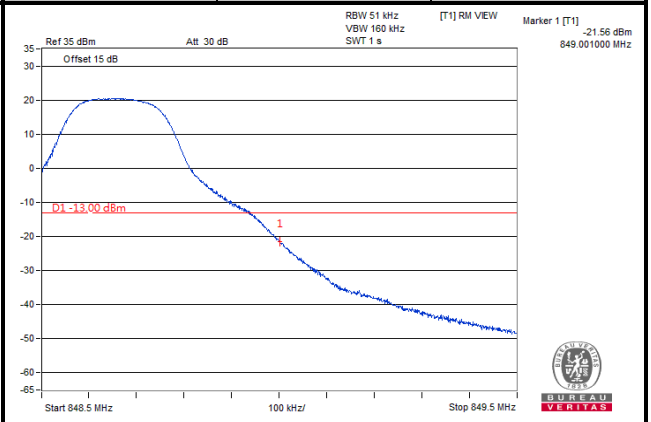
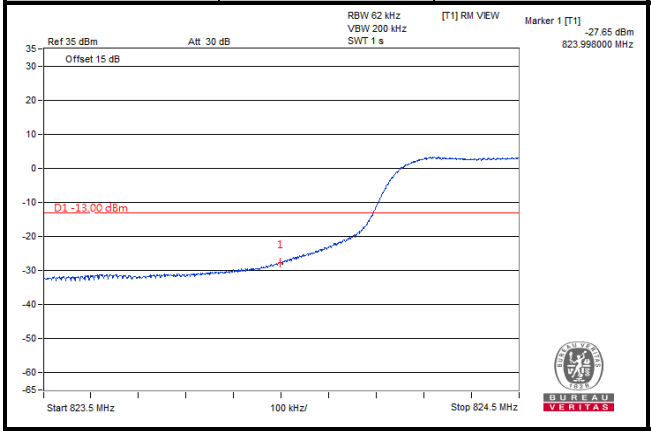
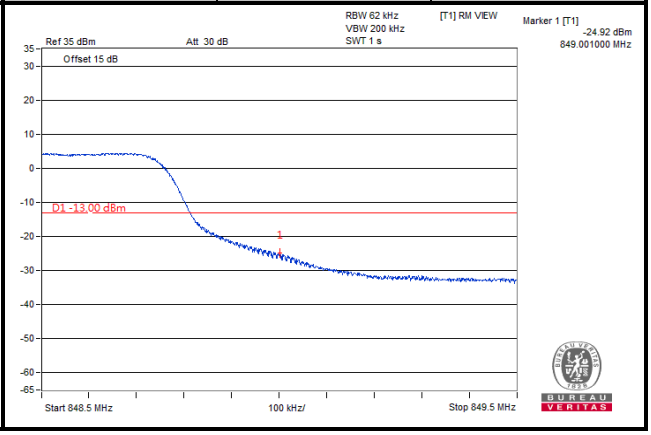


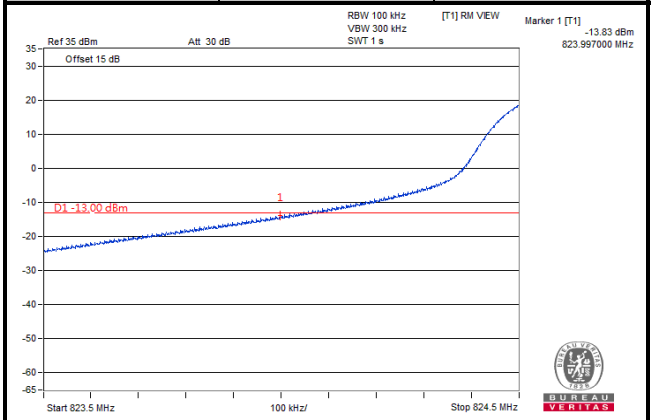
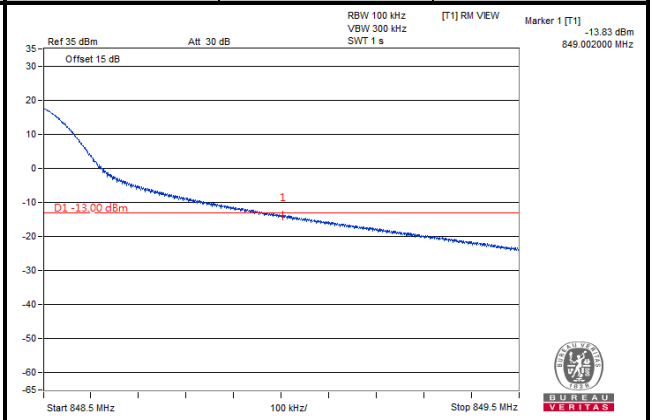
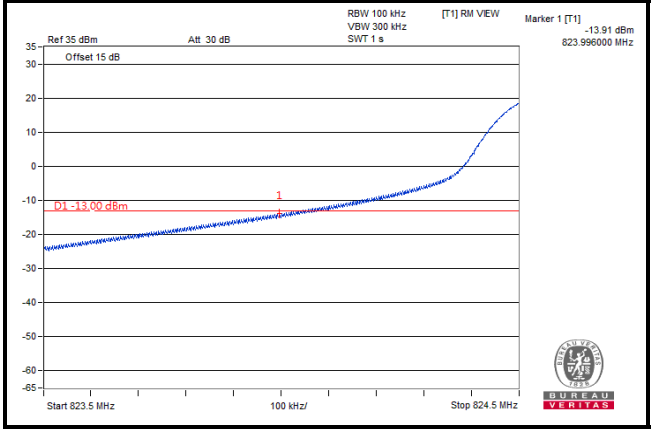
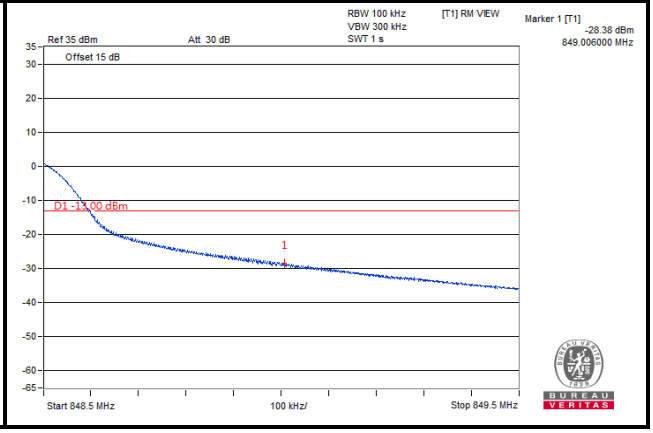
Channel	20407	6 RB	Channel	20643	6 RB





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

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

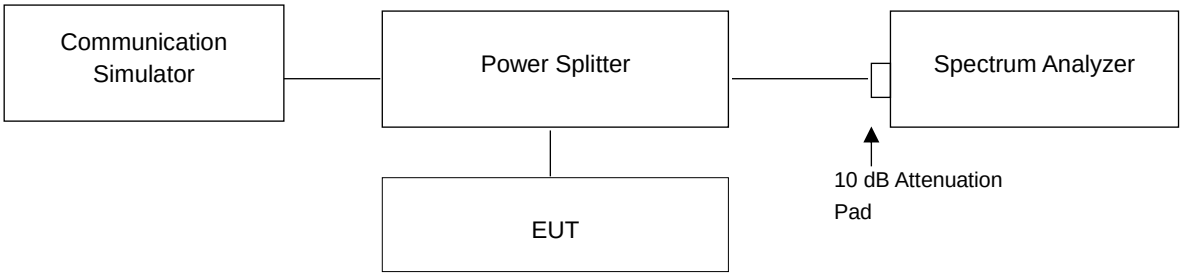
LTE Band 5					
Channel Bandwidth: 10 MHz					
Channel	20450	1 RB	Channel	20600	1 RB
					
Channel	20450	50 RB	Channel	20600	50 RB
					

4.6 Peak to Average Ratio

4.6.1 Limits of Peak to Average Ratio Measurement

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

4.6.2 Test Setup



4.6.3 Test Procedures

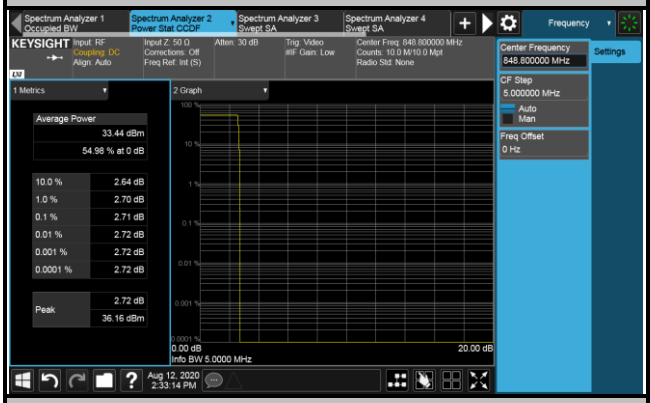
1. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1 %.

4.6.4 Test Results

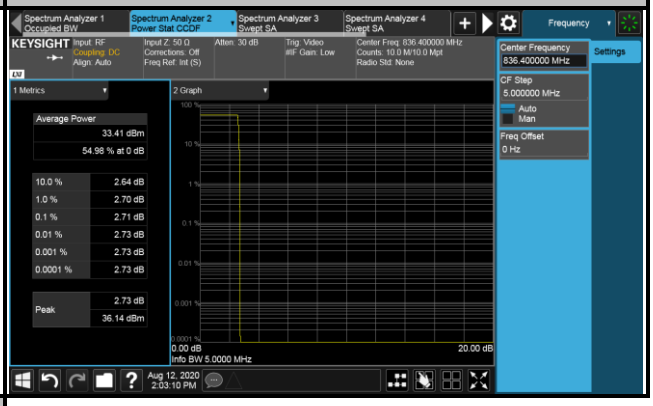
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)
		GPRS	EDGE			WCDMA
128	824.2	2.70	2.70	4132	826.4	3.30
189	836.4	2.70	2.71	4182	836.4	3.02
251	848.8	2.71	2.70	4233	846.6	3.13

Spectrum Plot of Worst Value

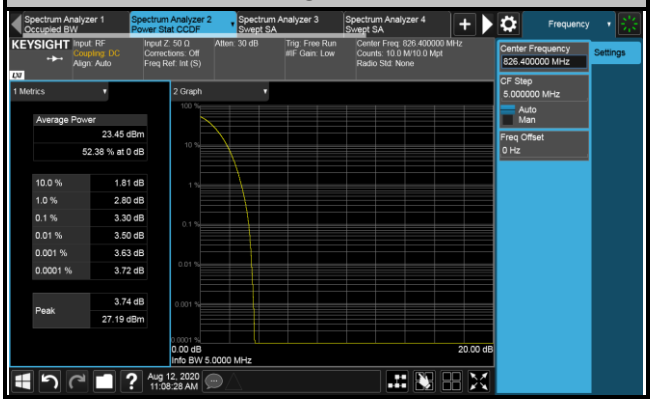
GPRS



EDGE



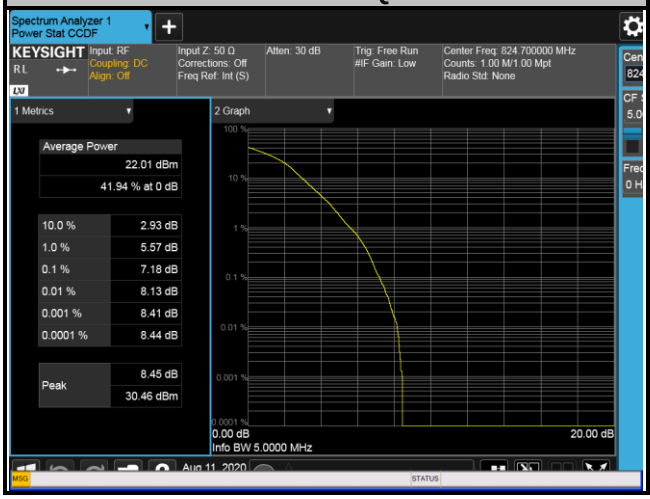
WCDMA



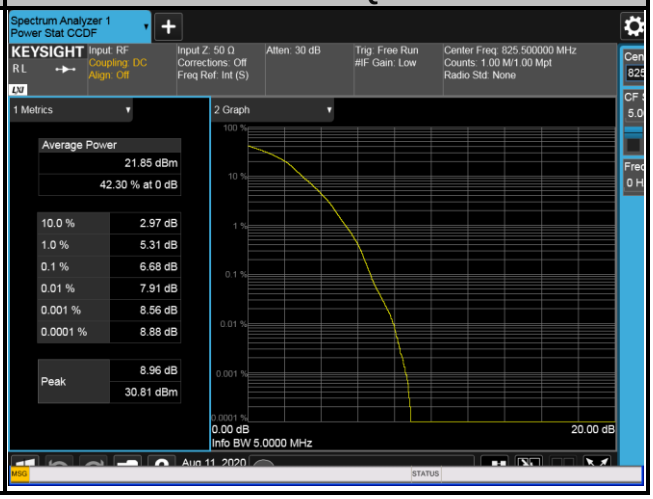
LTE Band 5							
Channel Bandwidth: 1.4 MHz				Channel Bandwidth: 3 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
20407	824.7	6.00	7.18	20415	825.5	5.74	6.68
20525	836.5	5.61	6.39	20525	836.5	4.96	5.86
20643	848.3	5.94	6.87	20635	847.5	5.77	6.48

Spectrum Plot of Worst Value

1.4 MHz / 16QAM



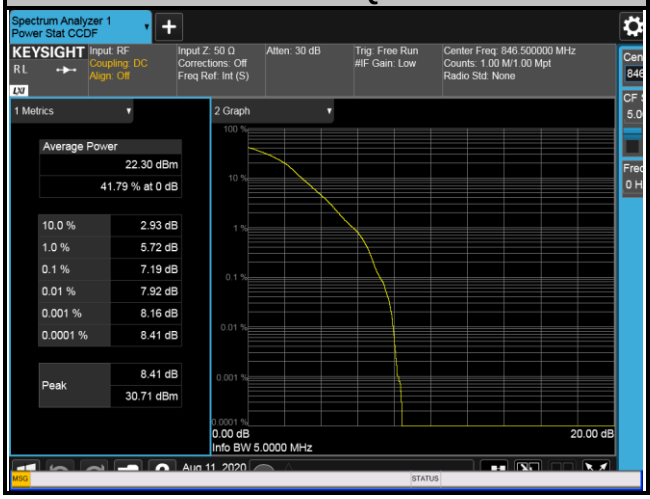
3 MHz / 16QAM



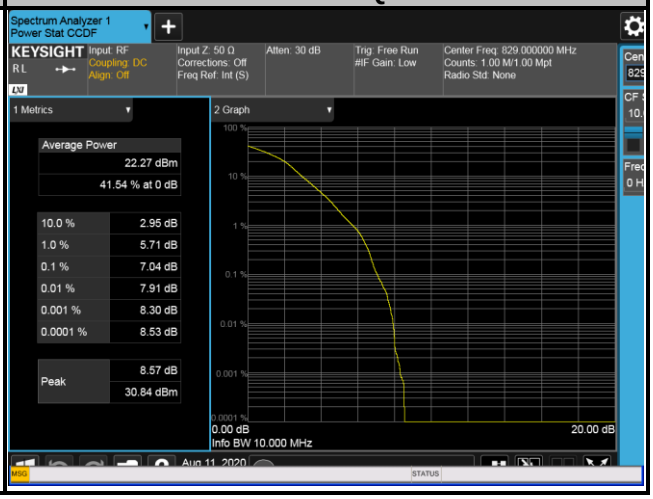
LTE Band 5							
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
20425	826.5	6.13	7.02	20450	829.0	5.95	7.04
20525	836.5	5.01	5.72	20525	836.5	4.85	5.56
20625	846.5	6.04	7.19	20600	844.0	5.96	6.92

Spectrum Plot of Worst Value

5 MHz / 16QAM



10 MHz / 16QAM

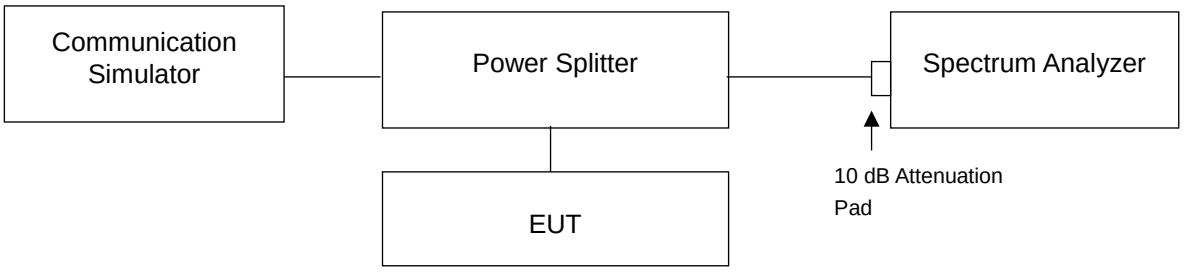


4.7 Conducted Spurious Emissions

4.7.1 Limits of Conducted Spurious Emissions Measurement

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

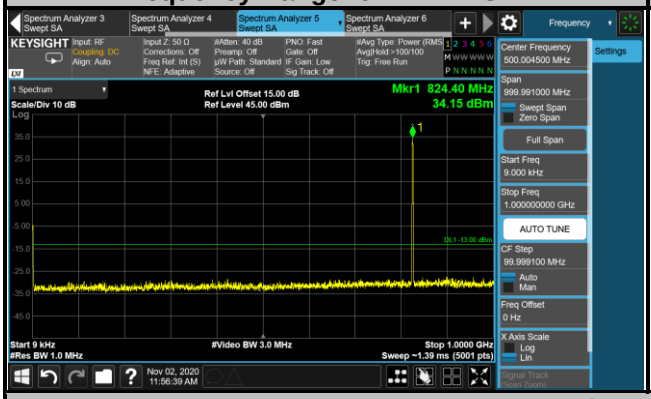
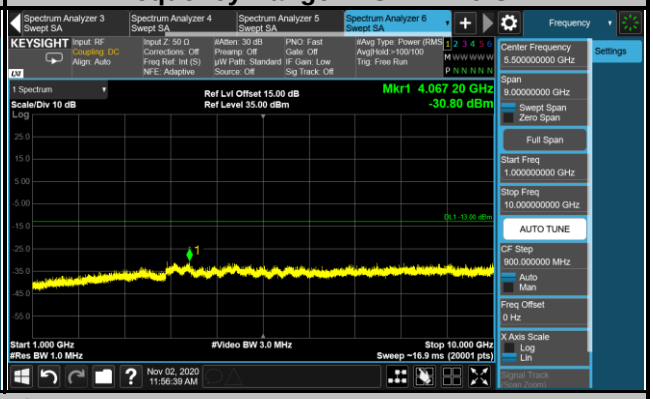
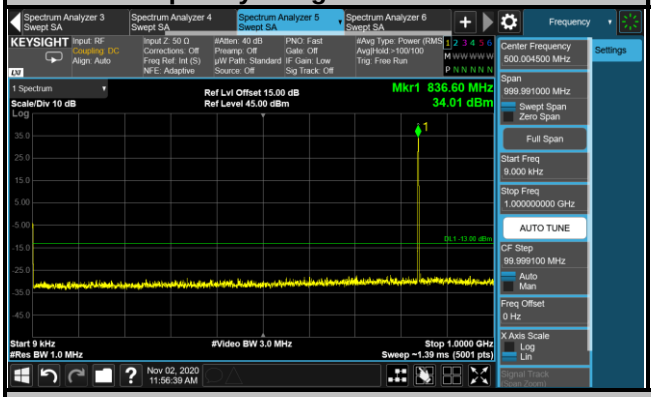
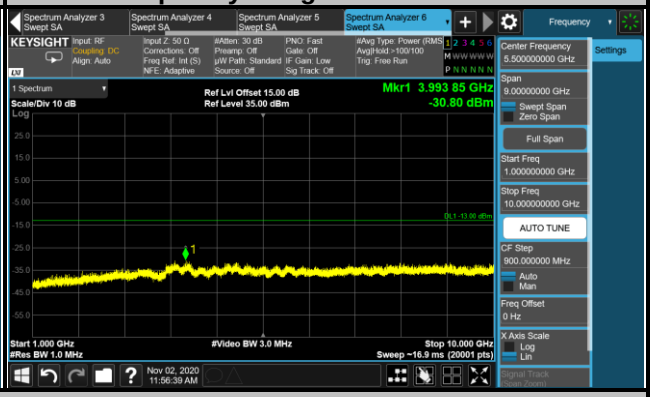
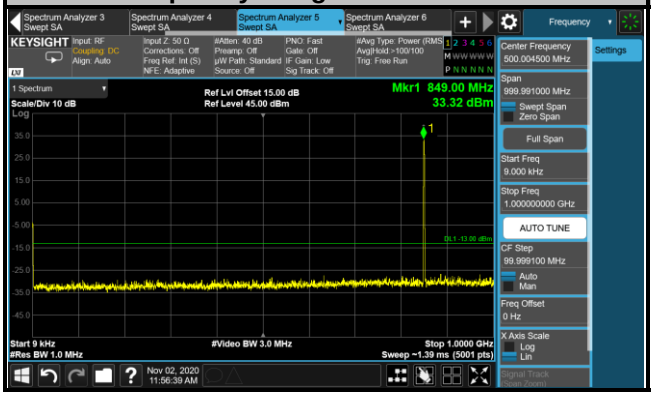
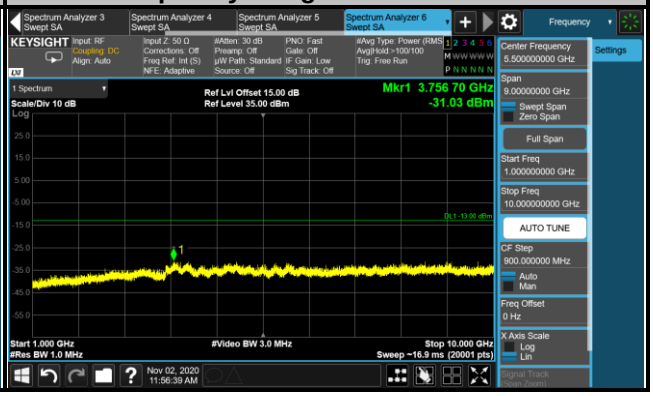
4.7.2 Test Setup



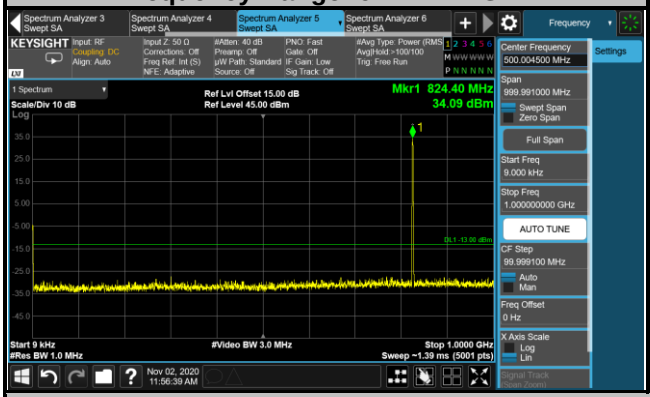
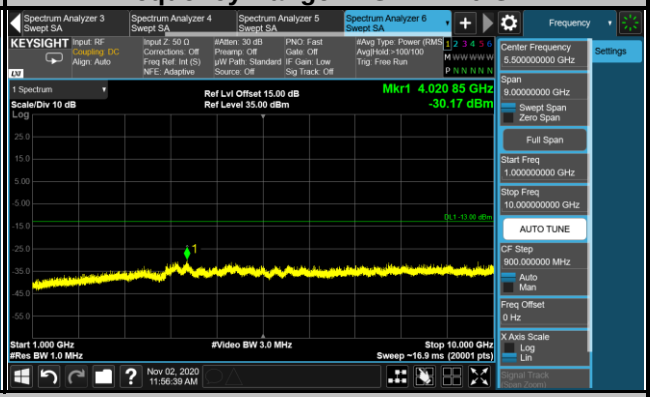
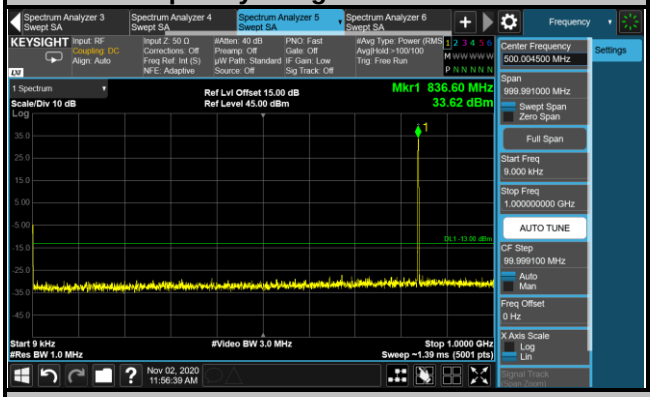
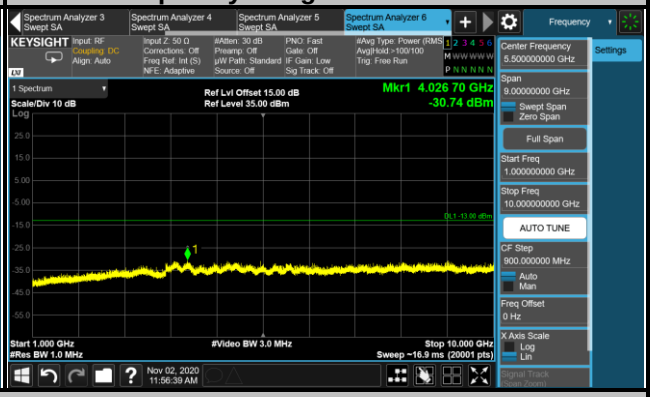
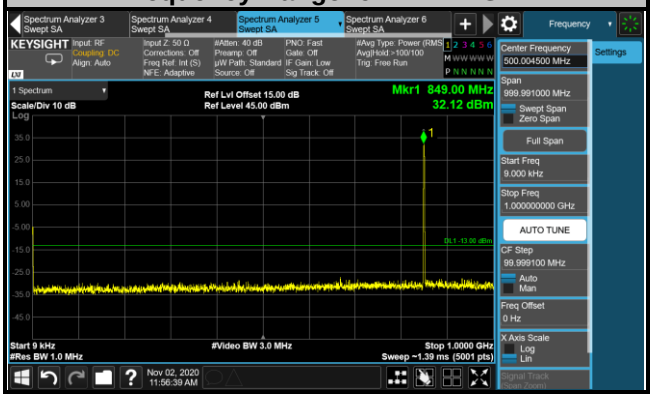
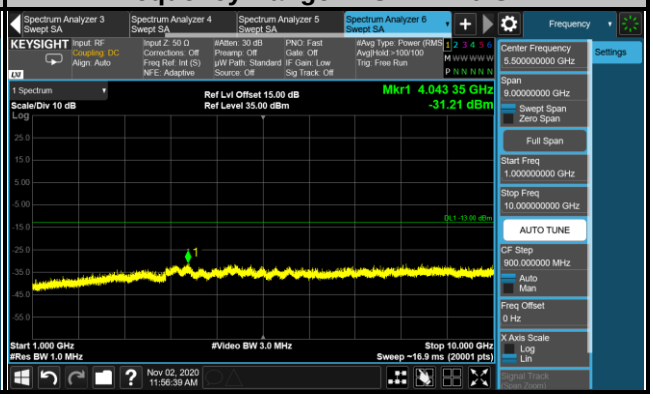
4.7.3 Test Procedure

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

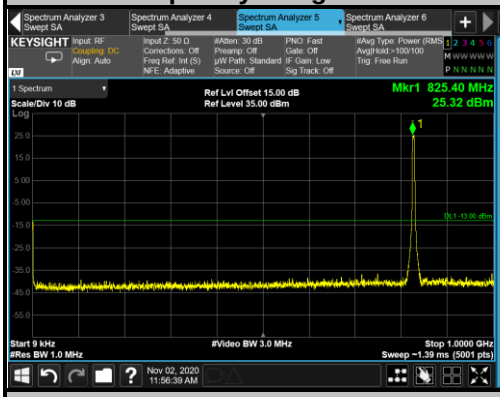
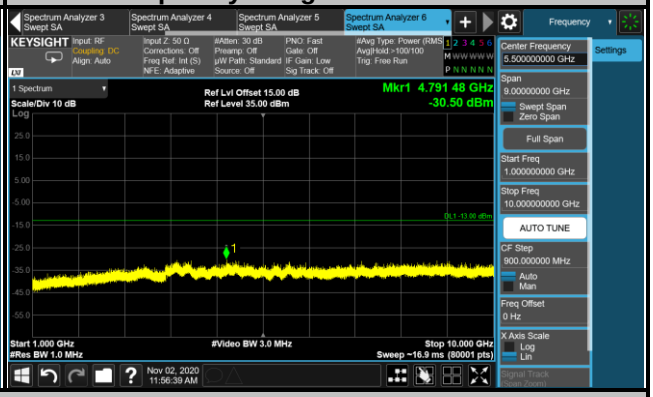
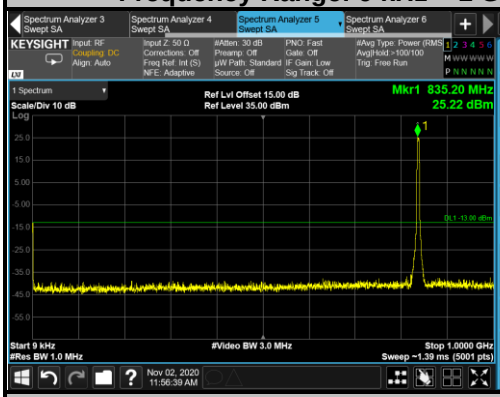
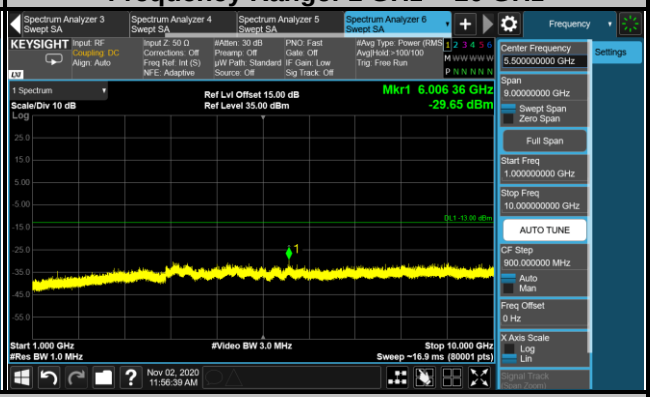
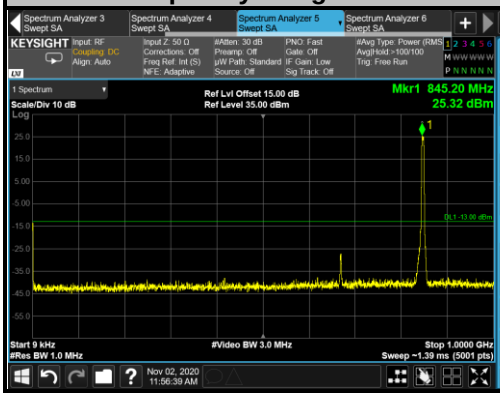
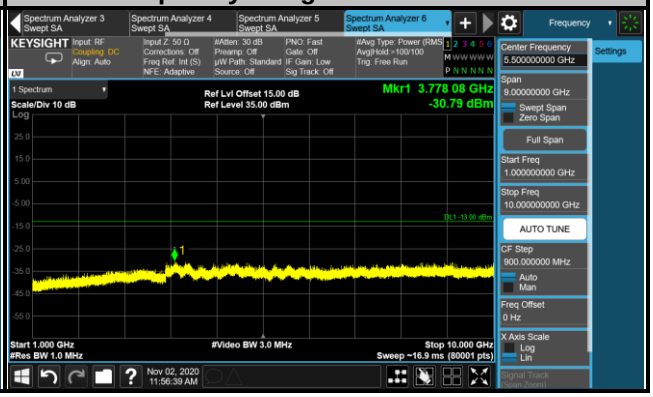
4.7.4 Test Results

GPRS	
Channel 128	
Frequency Range: 9 kHz ~ 1 GHz	**Frequency Range: 1 GHz ~ 10 GHz**
	
Channel 189	
Frequency Range: 9 kHz ~ 1 GHz	**Frequency Range: 1 GHz ~ 10 GHz**
	
Channel 251	
Frequency Range: 9 kHz ~ 1 GHz	**Frequency Range: 1 GHz ~ 10 GHz**
	

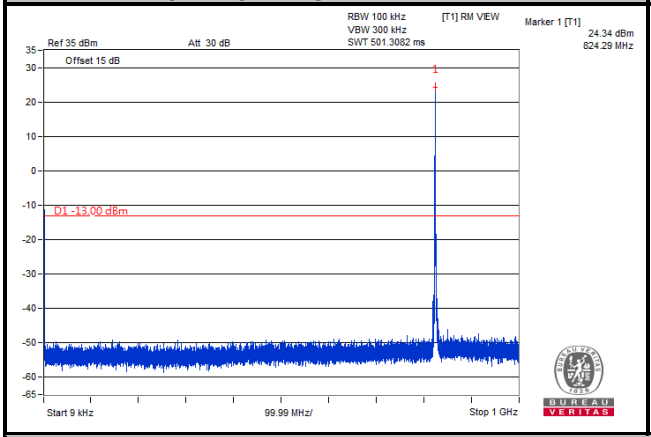
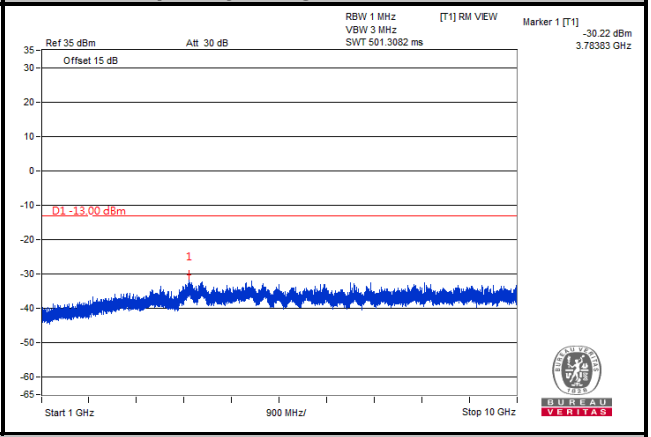
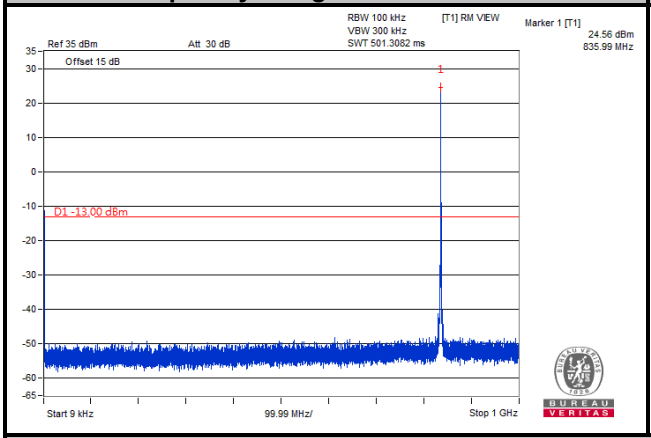
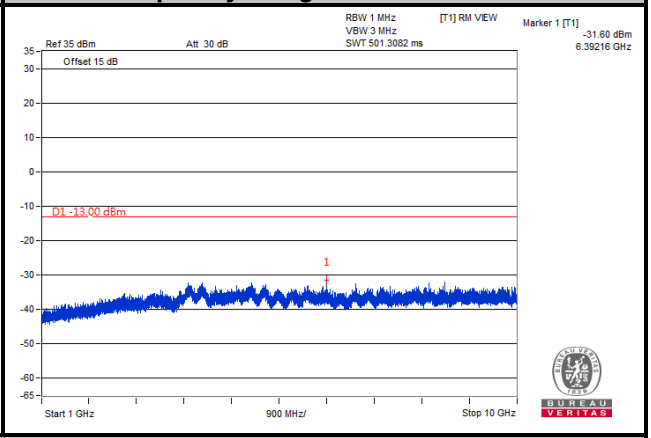
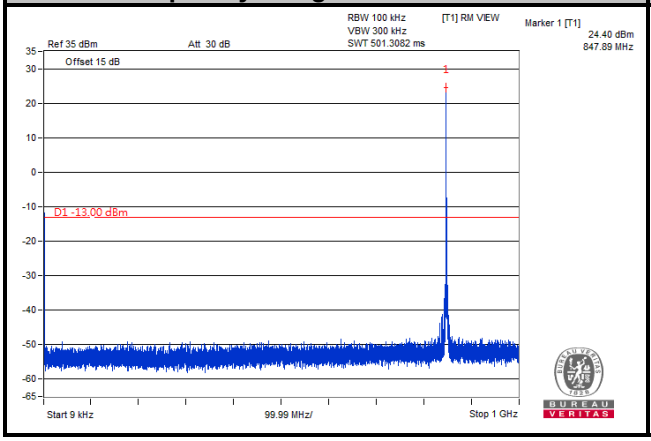
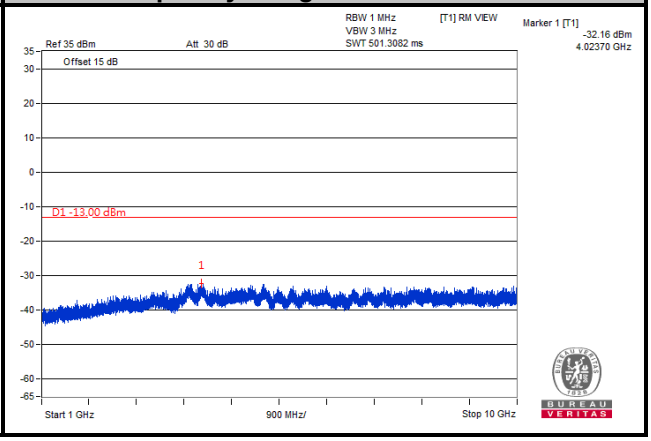
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

EDGE	
Channel 128	
Frequency Range: 9 kHz ~ 1 GHz	**Frequency Range: 1 GHz ~ 10 GHz**
	
Channel 189	
Frequency Range: 9 kHz ~ 1 GHz	**Frequency Range: 1 GHz ~ 10 GHz**
	
Channel 251	
Frequency Range: 9 kHz ~ 1 GHz	**Frequency Range: 1 GHz ~ 10 GHz**
	

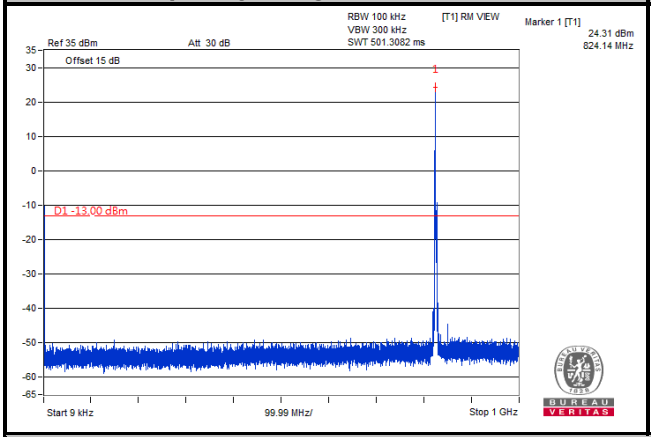
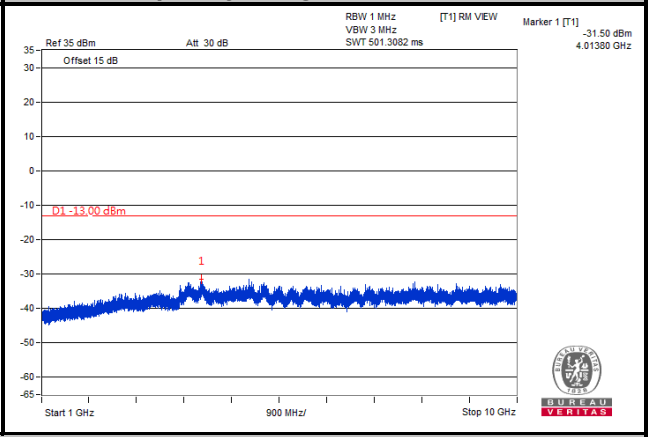
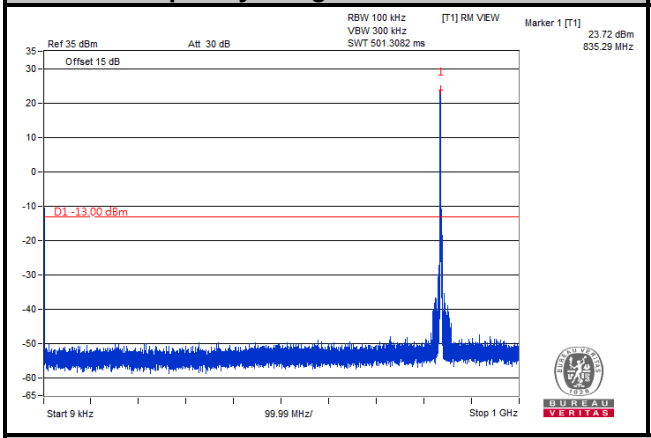
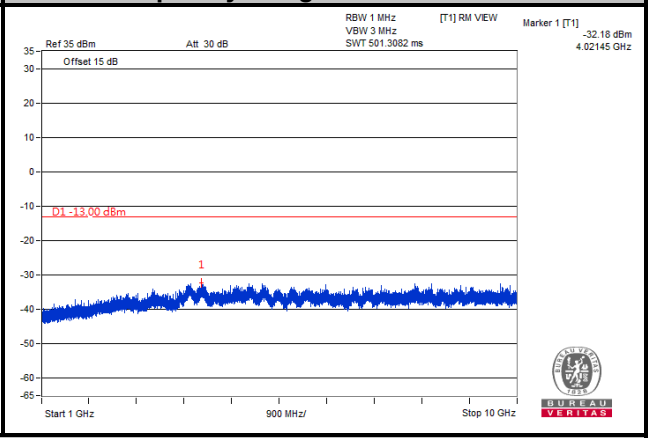
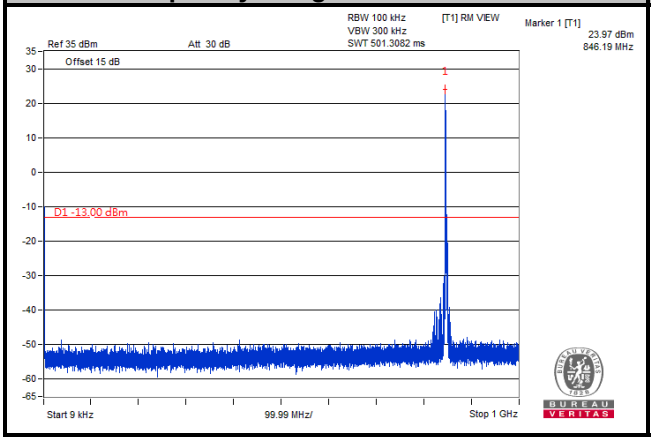
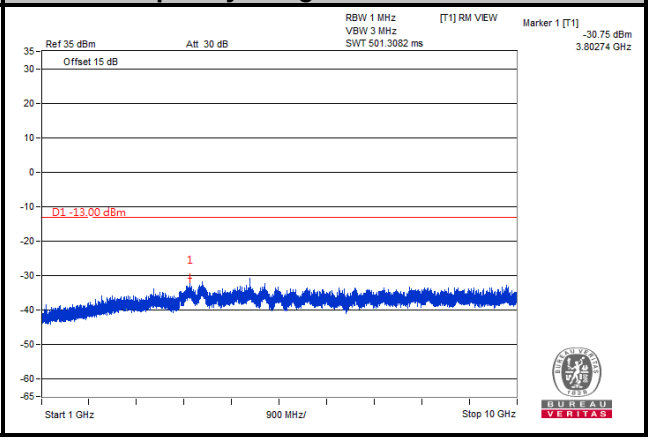
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

WCDMA	
Channel 4132	
Frequency Range: 9 kHz ~ 1 GHz	**Frequency Range: 1 GHz ~ 10 GHz**
	
Channel 4182	
Frequency Range: 9 kHz ~ 1 GHz	**Frequency Range: 1 GHz ~ 10 GHz**
	
Channel 4233	
Frequency Range: 9 kHz ~ 1 GHz	**Frequency Range: 1 GHz ~ 10 GHz**
	

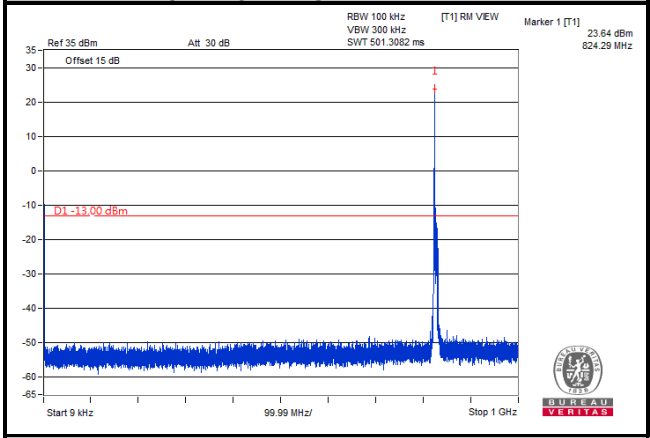
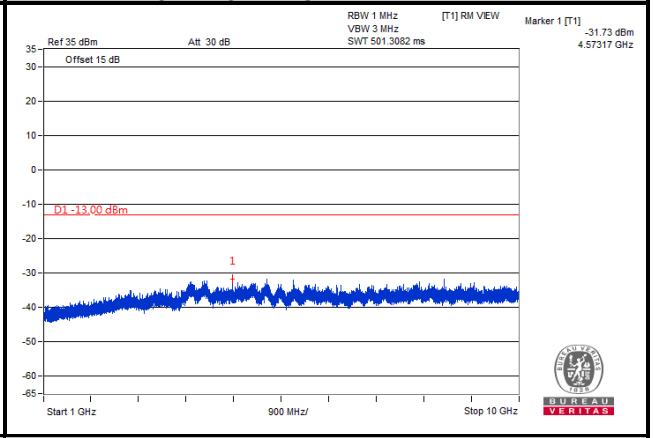
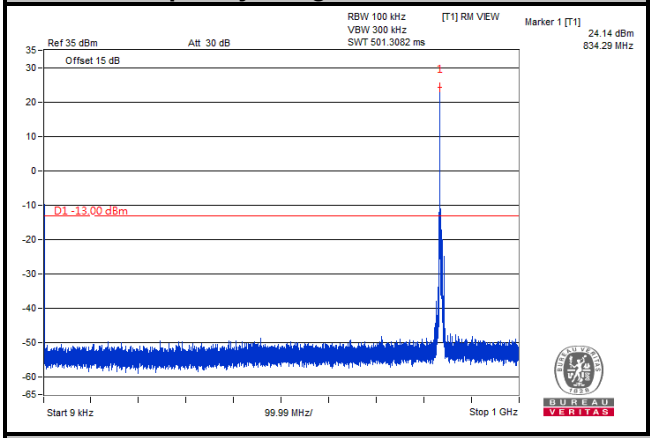
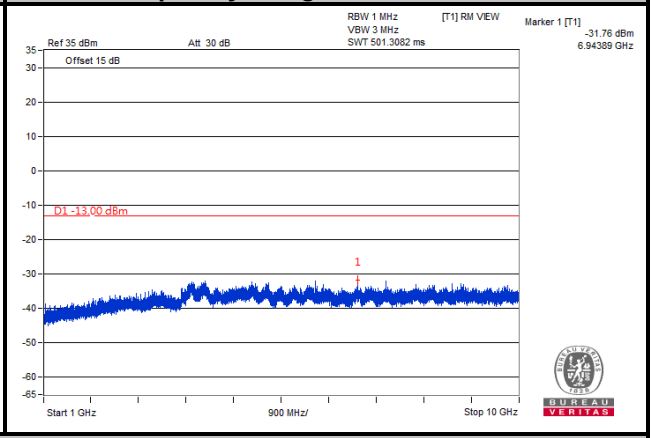
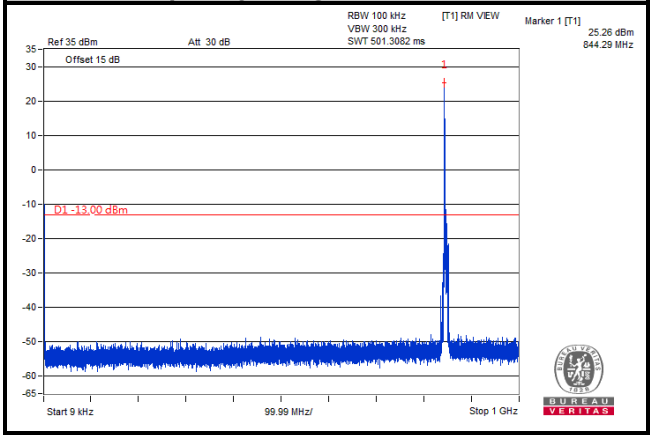
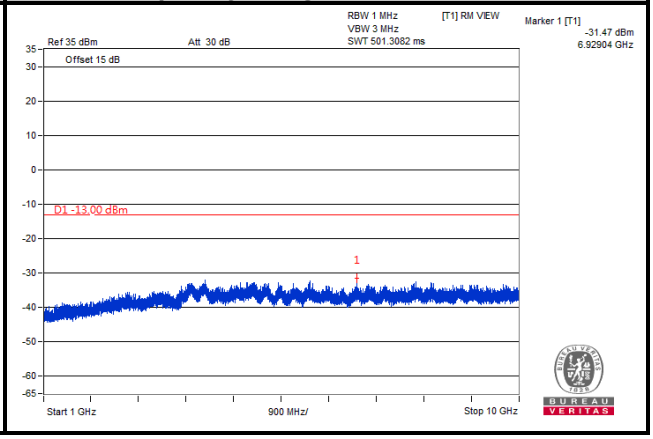
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 5	
Channel Bandwidth: 1.4 MHz	
Channel 20407	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Channel 20525	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Channel 20643	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	

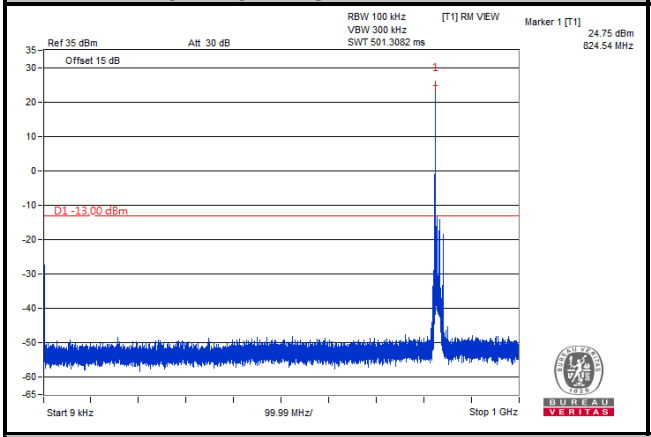
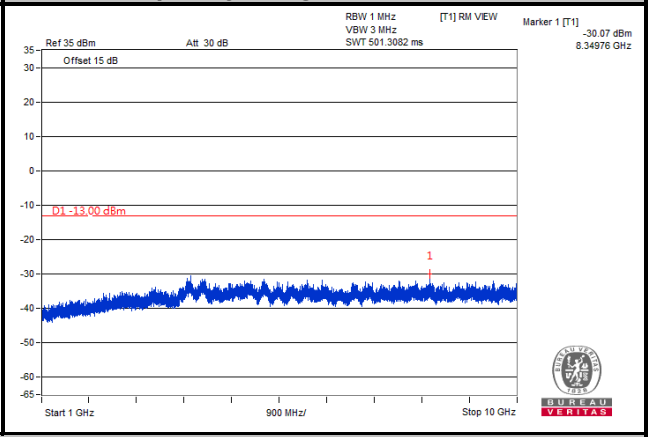
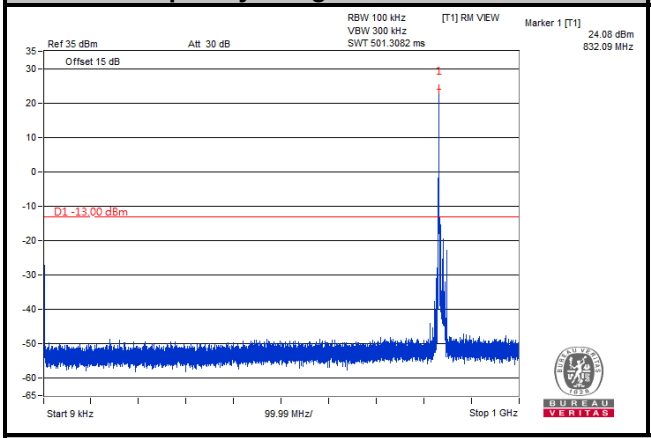
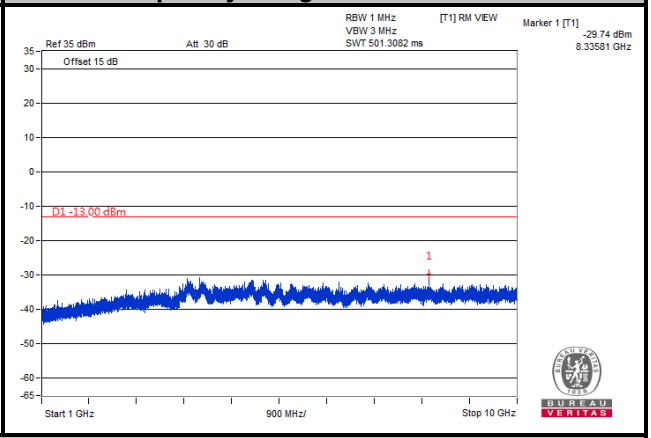
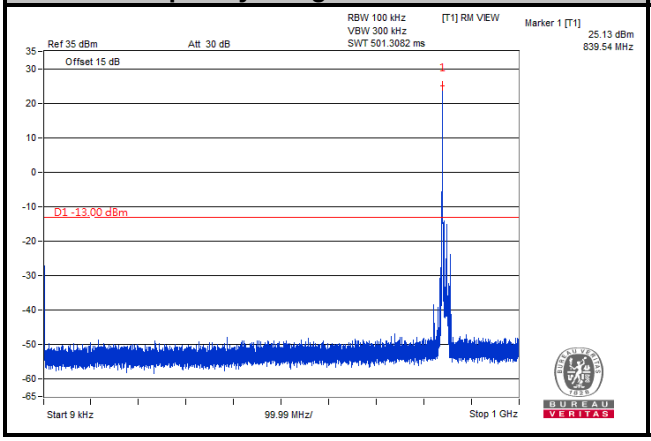
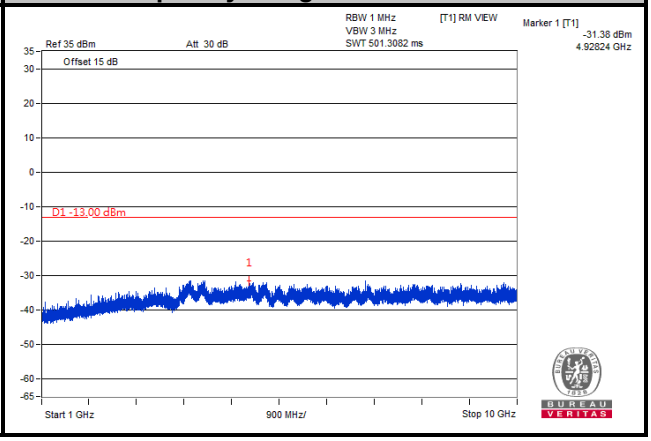
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 5	
Channel Bandwidth: 3 MHz	
Channel 20415	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Channel 20525	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Channel 20635	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	

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

LTE Band 5	
Channel Bandwidth: 5 MHz	
Channel 20425	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Channel 20525	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Channel Bandwidth: 5 MHz	
Channel 20625	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	

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

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

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

4.8 Radiated Emission Measurement

4.8.1 Limits of Radiated Emission Measurement

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

4.8.2 Test Procedure

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

NOTE:

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

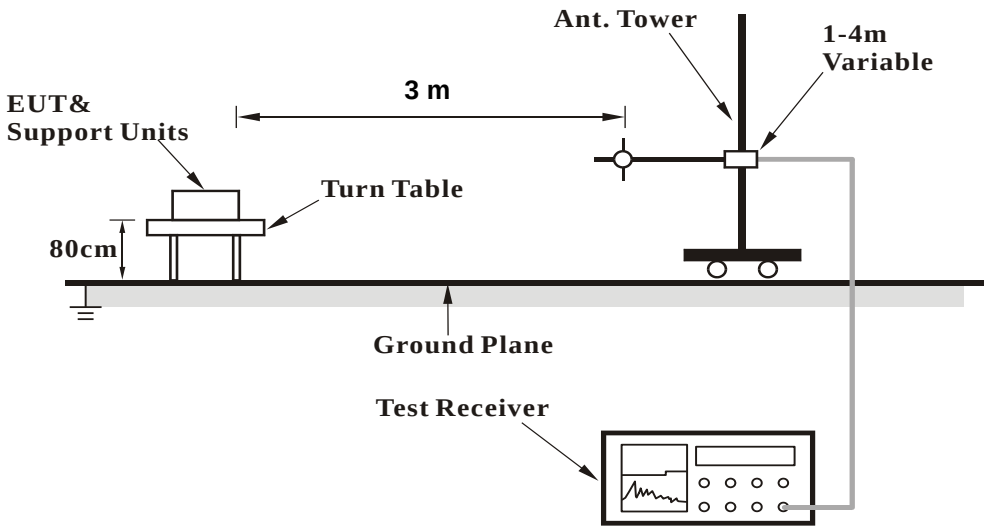
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

4.8.3 Deviation from Test Standard

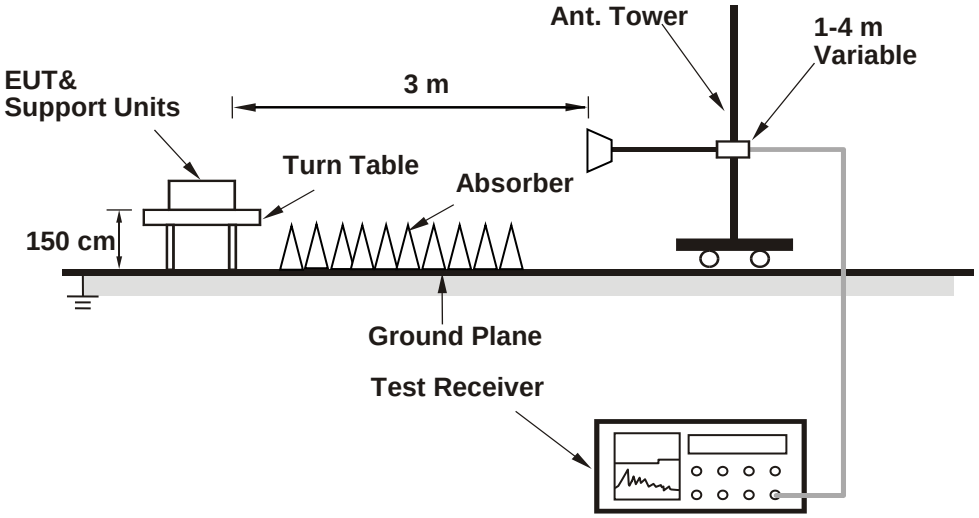
No deviation.

4.8.4 Test Setup

<Radiated Emission below or equal 1 GHz>



<Radiated Emission above 1 GHz>



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

4.8.5 Test Results

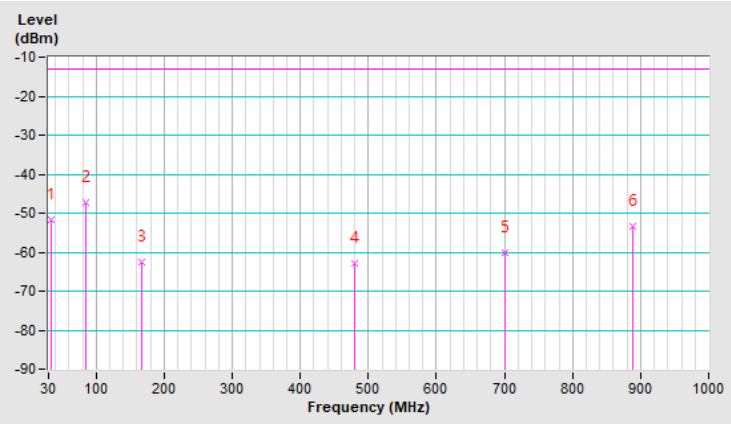
Below 1GHz

Mode	TX channel 128 (824.2MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	33.88	-52.40	-34.50	-17.10	-51.60	-13.00	-38.60
2	85.29	-38.80	-47.70	0.30	-47.40	-13.00	-34.40
3	166.77	-53.80	-59.70	-2.90	-62.60	-13.00	-49.60
4	480.08	-60.50	-66.50	3.60	-62.90	-13.00	-49.90
5	700.27	-60.90	-63.80	3.50	-60.30	-13.00	-47.30
6	889.42	-58.60	-57.00	3.50	-53.50	-13.00	-40.50

Remarks:

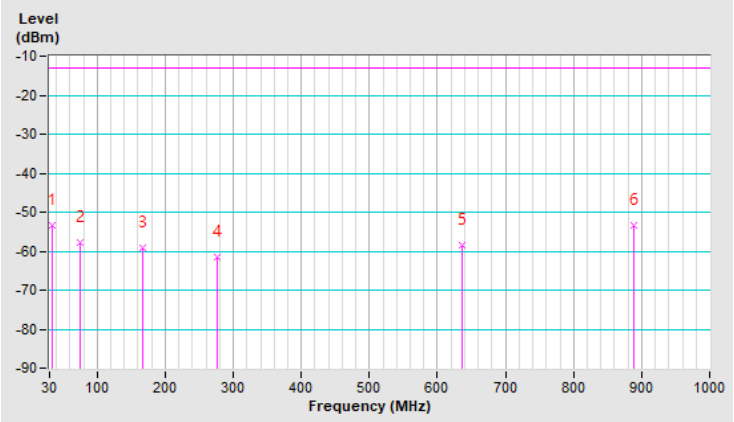
1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).



Mode	TX channel 128 (824.2MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	33.88	-40.50	-36.20	-17.10	-53.30	-13.00	-40.30
2	74.62	-50.10	-58.00	0.10	-57.90	-13.00	-44.90
3	166.77	-53.80	-56.40	-2.90	-59.30	-13.00	-46.30
4	277.35	-62.80	-60.00	-1.60	-61.60	-13.00	-48.60
5	637.22	-61.10	-62.10	3.60	-58.50	-13.00	-45.50
6	889.42	-59.40	-56.90	3.50	-53.40	-13.00	-40.40

Remarks:
1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).



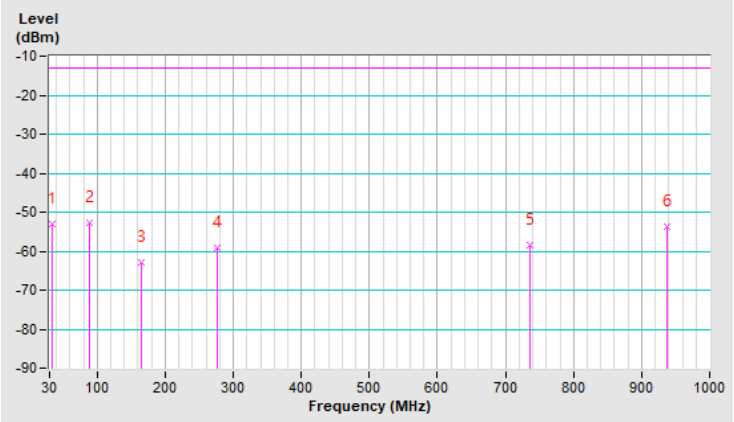
WCDMA Band 5

Mode	TX channel 4132 (826.4MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	33.88	-54.00	-36.10	-17.10	-53.20	-13.00	-40.20
2	89.17	-42.80	-52.70	-0.10	-52.80	-13.00	-39.80
3	165.80	-54.00	-59.80	-3.00	-62.80	-13.00	-49.80
4	276.38	-52.60	-57.60	-1.60	-59.20	-13.00	-46.20
5	736.16	-60.50	-62.20	3.70	-58.50	-13.00	-45.50
6	937.92	-59.90	-57.60	3.80	-53.80	-13.00	-40.80

Remarks:

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

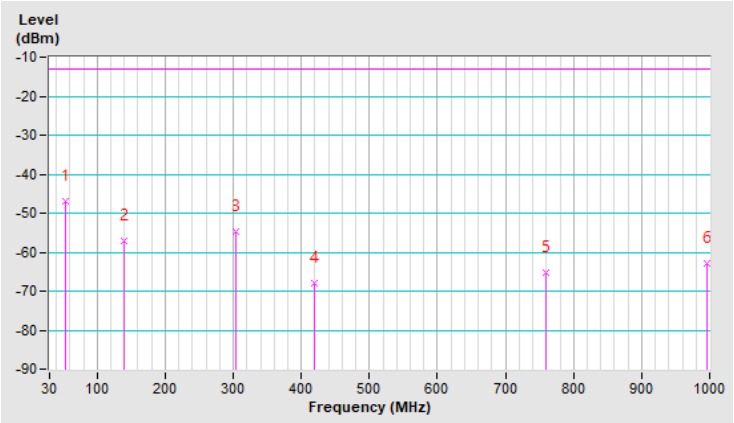


Mode	TX channel 4132 (826.4MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	54.25	-38.00	-41.20	-5.70	-46.90	-13.00	-33.90
2	138.64	-51.90	-53.80	-3.20	-57.00	-13.00	-44.00
3	303.54	-52.60	-58.30	3.70	-54.60	-13.00	-41.60
4	419.94	-65.50	-71.40	3.50	-67.90	-13.00	-54.90
5	760.41	-70.10	-68.90	3.80	-65.10	-13.00	-52.10
6	996.12	-70.80	-66.20	3.30	-62.90	-13.00	-49.90

Remarks:

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).



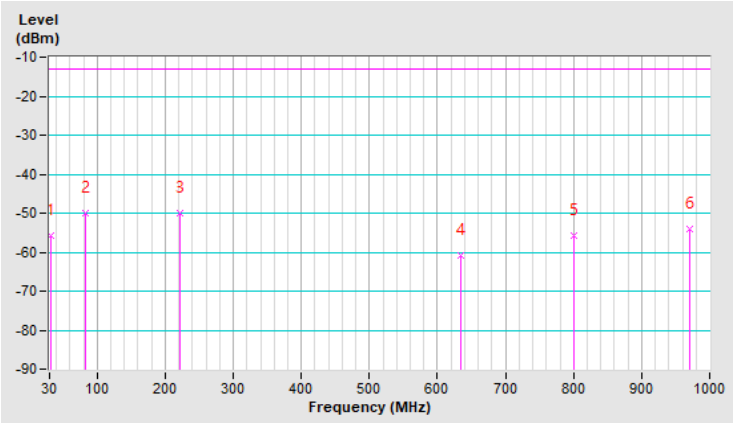
LTE Band 5, Channel Bandwidth: 10MHz

Mode	TX channel 20450 (829.0MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	31.94	-56.90	-37.30	-18.30	-55.60	-13.00	-42.60
2	82.38	-42.50	-50.40	0.40	-50.00	-13.00	-37.00
3	222.06	-39.90	-48.20	-1.90	-50.10	-13.00	-37.10
4	633.34	-60.80	-64.40	3.60	-60.80	-13.00	-47.80
5	800.18	-59.20	-59.70	4.00	-55.70	-13.00	-42.70
6	970.90	-60.50	-57.70	3.70	-54.00	-13.00	-41.00

Remarks:

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

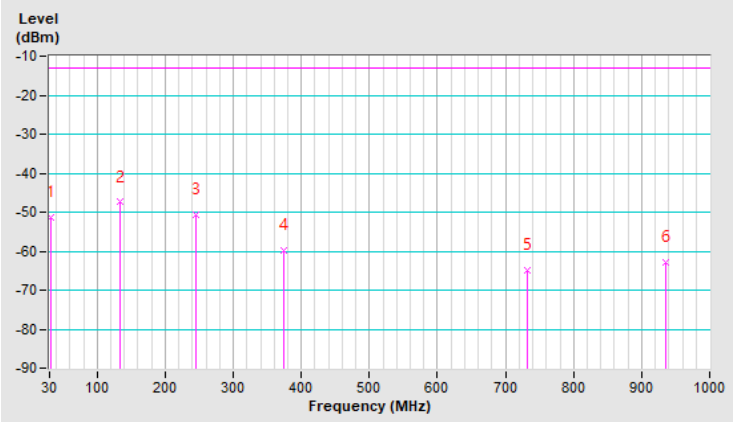


Mode	TX channel 20450 (829.0MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	32.91	-38.60	-33.70	-17.70	-51.40	-13.00	-38.40
2	132.82	-41.10	-44.20	-3.30	-47.50	-13.00	-34.50
3	245.34	-47.40	-49.10	-1.60	-50.70	-13.00	-37.70
4	373.38	-57.20	-63.40	3.70	-59.70	-13.00	-46.70
5	731.31	-69.50	-68.60	3.60	-65.00	-13.00	-52.00
6	935.98	-69.50	-66.50	3.70	-62.80	-13.00	-49.80

Remarks:

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).



Above 1GHz
GSM Mode

Mode	TX channel 128 (824.2MHz)	Frequency Range	1GH~18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1648.00	-55.20	-47.50	0.90	-46.60	-13.00	-33.60
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1648.00	-58.90	-51.50	0.90	-50.60	-13.00	-37.60

Remarks:
1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

Mode	TX channel 189 (836.4MHz)	Frequency Range	1GH~18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1672.80	-55.80	-48.10	0.80	-47.30	-13.00	-34.30
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1672.80	-58.40	-51.00	0.80	-50.20	-13.00	-37.20

Remarks:
1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

Mode	TX channel 251 (848.8MHz)	Frequency Range	1GH~18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1697.60	-55.40	-47.80	0.70	-47.10	-13.00	-34.10
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1697.60	-58.10	-50.80	0.70	-50.10	-13.00	-37.10

Remarks:
1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

WCDMA Band 5

Mode	TX channel 4132 (826.4MHz)	Frequency Range	1GH~18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1652.80	-56.10	-48.40	0.90	-47.50	-13.00	-34.50
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1652.80	-58.10	-50.90	0.90	-50.00	-13.00	-37.00

Remarks:
1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

Mode	TX channel 4182 (836.4MHz)	Frequency Range	1GH~18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1672.80	-56.50	-48.80	0.80	-48.00	-13.00	-35.00
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1672.80	-58.60	-51.30	0.80	-50.50	-13.00	-37.50

Remarks:
1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

Mode	TX channel 4233 (846.6MHz)	Frequency Range	1GH~18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1693.20	-55.90	-48.30	0.70	-47.60	-13.00	-34.60
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1693.20	-58.20	-50.90	0.70	-50.20	-13.00	-37.20

Remarks:
1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

LTE Band 5, Channel Bandwidth: 1.4MHz

Mode	TX channel 20407 (824.7MHz)	Frequency Range	1GH~18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1649.40	-46.80	-39.00	0.90	-38.10	-13.00	-25.10
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1649.40	-45.80	-38.50	0.90	-37.60	-13.00	-24.60

Remarks:
1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

Mode	TX channel 20525 (836.5MHz)	Frequency Range	1GH~18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1673.00	-46.80	-39.10	0.80	-38.30	-13.00	-25.30
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1673.00	-45.60	-38.30	0.80	-37.50	-13.00	-24.50

Remarks:
1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

Mode	TX channel 20643 (848.3MHz)	Frequency Range	1GH~18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1696.60	-46.80	-39.20	0.70	-38.50	-13.00	-25.50
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1696.60	-45.10	-37.80	0.70	-37.10	-13.00	-24.10

Remarks:
1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

LTE Band 5, Channel Bandwidth: 5MHz

Mode	TX channel 20425 (826.5MHz)	Frequency Range	1GH~18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1653.00	-46.20	-38.50	0.90	-37.60	-13.00	-24.60
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1653.00	-45.40	-38.10	0.90	-37.20	-13.00	-24.20

Remarks:
1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

Mode	TX channel 20525 (836.5MHz)	Frequency Range	1GH~18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1673.00	-47.00	-39.30	0.80	-38.50	-13.00	-25.50
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1673.00	-45.40	-38.00	0.80	-37.20	-13.00	-24.20

Remarks:
1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

Mode	TX channel 20625 (846.5MHz)	Frequency Range	1GH~18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1693.00	-46.50	-39.00	0.70	-38.30	-13.00	-25.30
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1693.00	-45.80	-38.50	0.70	-37.80	-13.00	-24.80

Remarks:
1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

LTE Band 5, Channel Bandwidth: 10MHz

Mode	TX channel 20450 (829.0MHz)	Frequency Range	1GH~18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1658.00	-46.20	-38.60	0.90	-37.70	-13.00	-24.70
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	**1658.00**	**-45.10**	**-37.90**	**0.90**	**-37.00**	**-13.00**	**-24.00**

Remarks:
1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

Mode	TX channel 20525 (836.5MHz)	Frequency Range	1GH~18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1673.00	-46.70	-39.00	0.80	-38.20	-13.00	-25.20
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1673.00	-45.80	-38.40	0.80	-37.60	-13.00	-24.60

Remarks:
1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

Mode	TX channel 20600 (844.0MHz)	Frequency Range	1GH~18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1688.00	-46.80	-39.10	0.70	-38.40	-13.00	-25.40
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1688.00	-45.20	-37.90	0.70	-37.20	-13.00	-24.20

Remarks:

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).

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.

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

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