

FCC Test Report

(PART 22)

Report No.: RF191015C02-2

FCC ID: RC6-GRN70C

Test Model: GRN70C

Received Date: Oct. 15, 2019

Test Date: Oct. 23 ~ Oct. 30, 2019

Issued Date: Dec. 12, 2019

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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**FCC Registration /
Designation Number:** 788550 / TW0003



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Release Control Record

Issue No.	Description	Date Issued
RF191015C02-2	Original Release	Dec. 12, 2019

1 Certificate of Conformity

Product: 4G Mesh Router

Brand: Amigo

Test Model: GRN70C

Sample Status: Engineering Sample

Applicant: Amigo Technology Inc

Test Date: Oct. 23 ~ Oct. 30, 2019

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 : Gina Liu, **Date:** Dec. 12, 2019
Gina Liu / Specialist

Approved by : Dylan Chiou, **Date:** Dec. 12, 2019
Dylan Chiou / 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.
2.1046 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 -24.1 dB at 41.64 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	30 MHz ~ 200 MHz	3.59 dB
	200 MHz ~ 1000 MHz	3.60 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.29 dB
	18 GHz ~ 40 GHz	2.29 dB

2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent Technologies	N9038A	MY55420137	Apr. 15, 2019	Apr. 14, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jun. 12, 2019	Jun. 11, 2020
BILOG Antenna SCHWARZBECK	VULB 9168	9168-160	Nov. 21, 2018	Nov. 20, 2019
BILOG Antenna SCHWARZBECK	VULB 9168	9168-631	Nov. 26, 2018	Nov. 25, 2019
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Nov. 25, 2018	Nov. 24, 2019
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 15, 2019	Apr. 14, 2020
MXG Vector signal generator Agilent	N5182B	MY53050430	Nov. 29, 2018	Nov. 28, 2019
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Jul. 11, 2019	Jul. 10, 2020
Preamplifier Agilent (Above 1GHz)	8449B	3008A02367	Feb. 19, 2019	Feb. 18, 2020
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM8000	CABLE-CH9-02 (248780+171006)	Jan. 19, 2019	Jan. 18, 2020
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	Jul. 11, 2019	Jul. 10, 2020
RF signal cable WOKEN	8D-FB	Cable-CH9-01	Jul. 30, 2019	Jul. 29, 2020
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
Radio Communication Analyzer Anritsu	MT8820C	6201300640	Aug. 16, 2019	Aug. 15, 2021
Temperature & Humidity Chamber	GTH-120-40-CP-AR	MAA1306-019	Sep. 06, 2019	Sep. 05, 2020
AC Power Source	6905S	1991553	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	4G Mesh Router	
Brand	Amigo	
Test Model	GRN70C	
Status of EUT	Engineering Sample	
Power Supply Rating	12 Vdc (adapter)	
Modulation Type	LTE	QPSK, 16QAM
Frequency Range	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	LTE 5 (Channel Bandwidth: 1.4 MHz)	467.735 mW (26.70dBm)
	LTE 5 (Channel Bandwidth: 3 MHz)	446.684 mW (26.50dBm)
	LTE 5 (Channel Bandwidth: 5 MHz)	457.088 mW (26.60dBm)
	LTE 5 (Channel Bandwidth: 10 MHz)	457.088 mW (26.60dBm)
Emission Designator	LTE 5 (Channel Bandwidth: 1.4 MHz)	1M09D7W
	LTE 5 (Channel Bandwidth: 3 MHz)	2M70G7D
	LTE 5 (Channel Bandwidth: 5 MHz)	4M49G7D
	LTE 5 (Channel Bandwidth: 10 MHz)	8M96D7W
Antenna Type	Fixed External Antenna with 3.5 dBi gain	
Accessory Device	Refer to Note as below	
Data Cable Supplied	Refer to Note as below	

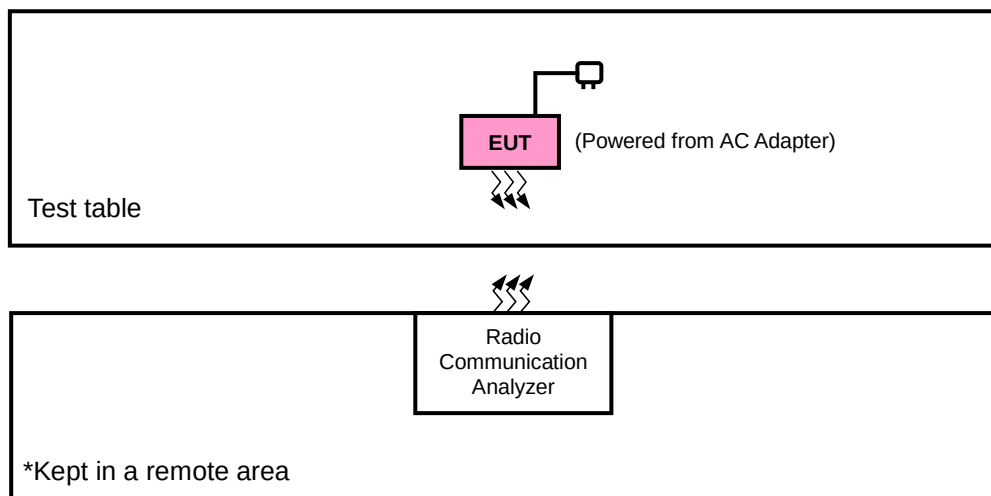
Note:

- The EUT contains following accessory devices.

Product	Brand	Model	Description
Adapter	Channel Well Technology	2ABB018F US	I/P: 100-240 Vac, 50/60 Hz, 0.6 A O/P: 12.0 Vdc, 1.5 A 1.2m non-shielded cable w/o core

- 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



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
LTE Band 5	X-plane	X-axis

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 / 0 RB Offset
		20425 to 20625	20425, 20525, 20625	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20450 to 20600	20450, 20525, 20600	10 MHz	QPSK, 16QAM	1 RB / 0 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	1 RB / 0 RB Offset
		20415 to 20635	20415, 20635	3 MHz	QPSK	1 RB / 0 RB Offset
		20425 to 20625	20425, 20625	5 MHz	QPSK	1 RB / 0 RB Offset
		20450 to 20600	20450, 20600	10 MHz	QPSK	1 RB / 0 RB Offset
-	Occupied Bandwidth	20407 to 20643	20407, 20525, 20643	1.4 MHz	QPSK, 16QAM	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
			20643	1.4MHz	QPSK	6 RB / 0 RB Offset
		20415 to 20635	20415	3 MHz	QPSK	1 RB / 5 RB Offset
			20635	3 MHz	QPSK	6 RB / 0 RB Offset
		20425 to 20625	20425	5 MHz	QPSK	1 RB / 0 RB Offset
			20625	5 MHz	QPSK	15 RB / 0 RB Offset
		20450 to 20600	20450	10 MHz	QPSK	1 RB / 24 RB Offset
			20600	10 MHz	QPSK	25 RB / 0 RB Offset
		20407 to 20643	20407, 20525, 20643	1.4 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
			20415, 20525, 20635	3 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20425 to 20625	20425, 20525, 20625	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
			20450, 20525, 20600	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	Conducted Emission	20407 to 20643	20407, 20525, 20643	1.4 MHz	QPSK	1 RB / 0 RB Offset
		20415 to 20635	20415, 20525, 20635	3 MHz	QPSK	1 RB / 0 RB Offset
		20425 to 20625	20425, 20525, 20625	5 MHz	QPSK	1 RB / 0 RB Offset
		20450 to 20600	20450, 20525, 20600	10 MHz	QPSK	1 RB / 0 RB Offset
-	Radiated Emission	20407 to 20643	20407, 20525, 20643	1.4 MHz	QPSK	1 RB / 0 RB Offset
		20425 to 20625	20425, 20525, 20625	5 MHz	QPSK	1 RB / 0 RB Offset
		20450 to 20600	20450, 20525, 20600	10 MHz	QPSK	1 RB / 0 RB Offset

Note:

1. This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.
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 emission below 1 GHz, choose the maximum ERP power worst channel for final test.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
ERP	25 deg. C, 65 % RH	120 Vac, 60 Hz	Greg Lin, Han Wu
Modulation Characteristics	25 deg. C, 65 % RH	120 Vac, 60 Hz	James Yang
Frequency Stability	25 deg. C, 65 % RH	120 Vac, 60 Hz	James Yang
Occupied Bandwidth	25 deg. C, 65 % RH	120 Vac, 60 Hz	James Yang
Band Edge	25 deg. C, 65 % RH	120 Vac, 60 Hz	James Yang
Peak to Average Ratio	25 deg. C, 65 % RH	120 Vac, 60 Hz	James Yang
Conducted Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	James Yang
Radiated Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	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 and VBW is 10 MHz for LTE mode.
- b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- c. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step b. Record the power level of S.G.
- d. $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}$. E.R.P power can be calculated from E.I.R.P power by subtracting the gain of dipole, $E.R.P \text{ power} = E.I.R.P \text{ power} - 2.15 \text{ dB}$.

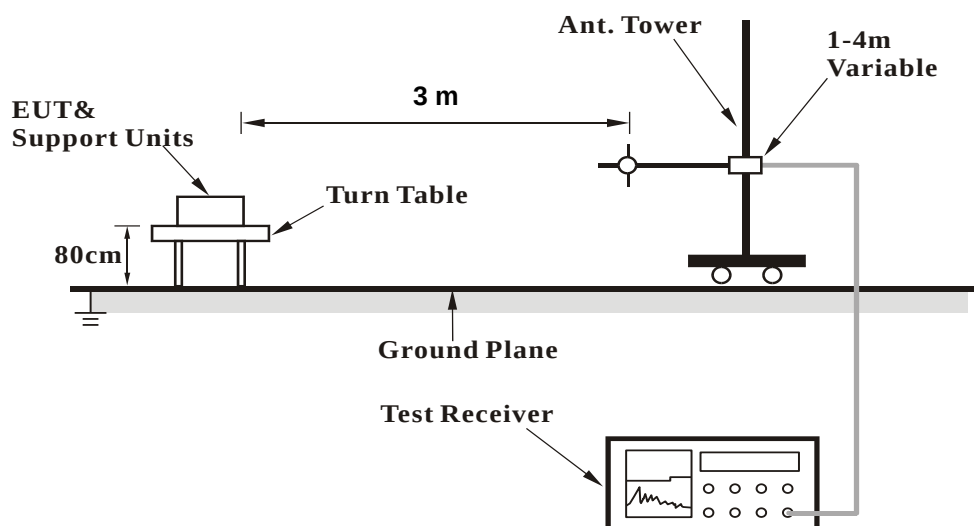
Conducted Power Measurement:

The EUT was set up for the maximum power with 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.

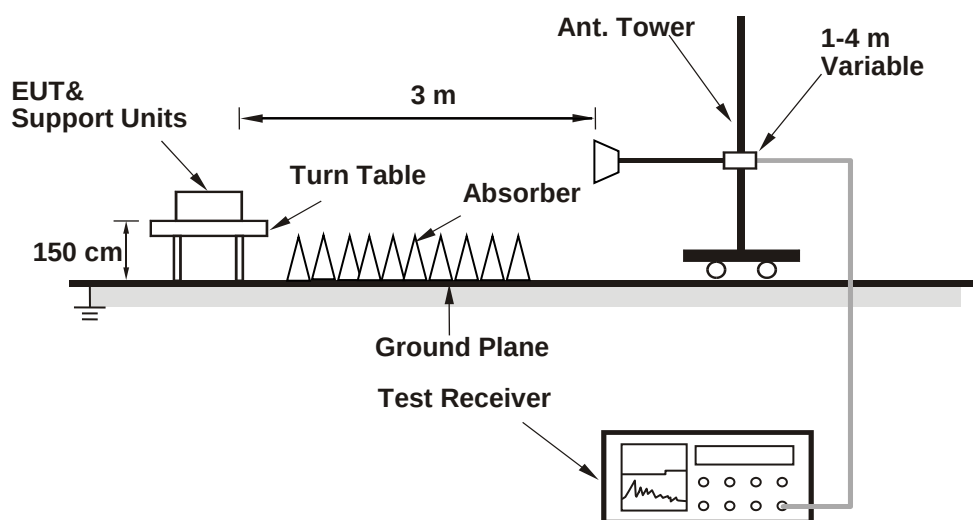
4.1.3 Test Setup

EIRP / ERP Measurement:

<Radiated Emission below or equal 1 GHz>

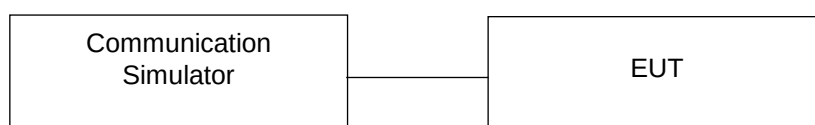


<Radiated Emission above 1 GHz>



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 / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 20407	Mid Ch 20525	High Ch 20643		Low Ch 20407	Mid Ch 20525	High Ch 20643	
			824.7 MHz	836.5 MHz	848.3 MHz		824.7 MHz	836.5 MHz	848.3 MHz	
5 / 1.4M	1	0	23.45	23.63	23.52	0	22.39	22.55	22.50	1
	1	2	23.42	23.41	23.34	0	22.39	22.50	22.51	1
	1	5	23.13	23.30	23.37	0	22.24	22.43	22.54	1
	3	0	23.41	23.44	23.56	0	22.48	22.52	22.28	1
	3	1	23.22	23.19	23.17	0	22.44	22.51	22.40	1
	3	3	23.40	23.61	23.54	0	22.36	22.49	22.46	1
	6	0	22.49	22.56	22.50	1	21.54	21.60	21.44	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 20415	Mid Ch 20525	High Ch 20635		Low Ch 20415	Mid Ch 20525	High Ch 20635	
			825.5 MHz	836.5 MHz	847.5 MHz		825.5 MHz	836.5 MHz	847.5 MHz	
5 / 3M	1	0	23.44	23.93	23.71	0	22.47	22.04	22.20	1
	1	7	23.47	23.26	23.42	0	22.11	22.17	22.15	1
	1	14	23.13	23.32	23.51	0	22.40	22.00	22.19	1
	8	0	22.64	22.44	22.59	1	21.58	21.50	21.72	2
	8	3	22.52	22.61	22.64	1	21.39	21.69	21.79	2
	8	7	22.53	22.56	22.71	1	21.66	21.72	21.74	2
	15	0	22.46	22.52	22.64	1	21.42	21.57	21.69	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 20425	Mid Ch 20525	High Ch 20625		Low Ch 20425	Mid Ch 20525	High Ch 20625	
			826.5 MHz	836.5 MHz	846.5 MHz		826.5 MHz	836.5 MHz	846.5 MHz	
5 / 5M	1	0	23.20	23.71	23.52	0	22.35	22.31	22.57	1
	1	12	23.50	23.62	23.43	0	22.43	22.56	22.46	1
	1	24	23.11	23.45	23.34	0	22.27	22.41	22.45	1
	12	0	22.55	22.44	22.55	1	21.54	21.37	21.61	2
	12	6	22.48	22.55	22.51	1	21.39	21.53	21.58	2
	12	13	22.47	22.51	22.62	1	21.39	21.49	21.67	2
	25	0	22.50	22.47	22.59	1	21.53	21.42	21.72	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 20450	Mid Ch 20525	High Ch 20600		Low Ch 20450	Mid Ch 20525	High Ch 20600	
			829.0 MHz	836.5 MHz	844.0 MHz		829.0 MHz	836.5 MHz	844.0 MHz	
5 / 10M	1	0	23.46	23.76	23.43	0	22.34	22.25	22.39	1
	1	24	23.29	23.58	23.40	0	22.19	22.32	22.36	1
	1	49	23.09	23.43	23.23	0	22.20	22.34	22.32	1
	25	0	22.58	22.58	22.56	1	21.50	21.72	21.34	2
	25	12	22.57	22.61	22.64	1	21.60	21.64	21.47	2
	25	25	22.57	22.54	22.60	1	21.50	21.40	21.50	2
	50	0	22.53	22.56	22.63	1	21.52	21.64	21.50	2

ERP Power
Modulation Type: QPSK
LTE Band 5, Channel Bandwidth: 1.4MHz

MODE		TX Channel 20407					
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	-4.80	22.80	3.90	26.70	38.50	-11.80
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	-9.60	18.70	3.90	22.60	38.50	-15.90

MODE		TX Channel 20525					
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	836.50	-5.40	22.10	3.80	25.90	38.50	-12.60
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	836.50	-10.20	17.90	3.80	21.70	38.50	-16.80

MODE		TX Channel 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	848.30	-4.60	23.10	3.40	26.50	38.50	-12.00
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	848.30	-9.70	18.40	3.40	21.80	38.50	-16.70

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 5, Channel Bandwidth: 3MHz

MODE		TX Channel 20415					
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	-5.00	22.60	3.90	26.50	38.50	-12.00
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	825.50	-10.10	18.20	3.90	22.10	38.50	-16.40

MODE		TX Channel 20525					
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	836.50	-4.80	22.70	3.80	26.50	38.50	-12.00
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	836.50	-10.00	18.10	3.80	21.90	38.50	-16.60

MODE		TX Channel 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	847.50	-4.60	23.00	3.40	26.40	38.50	-12.10
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	847.50	-9.90	18.30	3.40	21.70	38.50	-16.80

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 5, Channel Bandwidth: 5MHz

MODE		TX Channel 20425					
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	-4.90	22.70	3.90	26.60	38.50	-11.90
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	-9.60	18.70	3.90	22.60	38.50	-15.90

MODE		TX Channel 20525					
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	836.50	-5.10	22.30	3.80	26.10	38.50	-12.40
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	836.50	-9.90	18.20	3.80	22.00	38.50	-16.50

MODE		TX Channel 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	846.50	-4.90	22.70	3.40	26.10	38.50	-12.40
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	846.50	-9.70	18.50	3.40	21.90	38.50	-16.60

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 5, Channel Bandwidth: 10MHz

MODE		TX Channel 20450					
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	-5.00	22.70	3.90	26.60	38.50	-11.90
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	-9.80	18.40	3.90	22.30	38.50	-16.20

MODE		TX Channel 20525					
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	836.50	-4.60	22.80	3.80	26.60	38.50	-11.90
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	836.50	-9.50	18.60	3.80	22.40	38.50	-16.10

MODE		TX Channel 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	844.00	-4.90	22.60	3.70	26.30	38.50	-12.20
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	844.00	-9.60	18.80	3.70	22.50	38.50	-16.00

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

Modulation Type: 16QAM

LTE Band 5, Channel Bandwidth: 1.4MHz

MODE		TX Channel 20407					
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	-5.80	21.80	3.90	25.70	38.50	-12.80
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	-11.20	17.10	3.90	21.00	38.50	-17.50

MODE		TX Channel 20525					
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	836.50	-5.90	21.60	3.80	25.40	38.50	-13.10
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	836.50	-10.50	17.60	3.80	21.40	38.50	-17.10

MODE		TX Channel 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	848.30	-5.60	22.10	3.40	25.50	38.50	-13.00
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	848.30	-10.30	17.80	3.40	21.20	38.50	-17.30

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 5, Channel Bandwidth: 3MHz

MODE		TX Channel 20415					
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	-5.90	21.70	3.90	25.60	38.50	-12.90
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	-11.10	17.20	3.90	21.10	38.50	-17.40

MODE		TX Channel 20525					
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	836.50	-5.40	22.00	3.80	25.80	38.50	-12.70
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	836.50	-10.50	17.60	3.80	21.40	38.50	-17.10

MODE		TX Channel 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	847.50	-5.20	22.40	3.40	25.80	38.50	-12.70
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	847.50	-9.90	18.30	3.40	21.70	38.50	-16.80

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 5, Channel Bandwidth: 5MHz

MODE		TX Channel 20425					
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	-6.40	21.20	3.90	25.10	38.50	-13.40
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	826.50	-10.80	17.60	3.90	21.50	38.50	-17.00

MODE		TX Channel 20525					
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	836.50	-5.60	21.80	3.80	25.60	38.50	-12.90
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	836.50	-10.70	17.40	3.80	21.20	38.50	-17.30

MODE		TX Channel 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	846.50	-6.00	21.60	3.40	25.00	38.50	-13.50
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	846.50	-10.90	17.30	3.40	20.70	38.50	-17.80

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 5, Channel Bandwidth: 10MHz

MODE		TX Channel 20450					
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	-6.00	21.70	3.90	25.60	38.50	-12.90
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	-11.20	17.00	3.90	20.90	38.50	-17.60

MODE		TX Channel 20525					
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	836.50	-5.90	21.60	3.80	25.40	38.50	-13.10
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	836.50	-10.10	18.00	3.80	21.80	38.50	-16.70

MODE		TX Channel 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	844.00	-5.80	21.80	3.70	25.50	38.50	-13.00
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	844.00	-10.70	17.70	3.70	21.40	38.50	-17.10

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

N/A

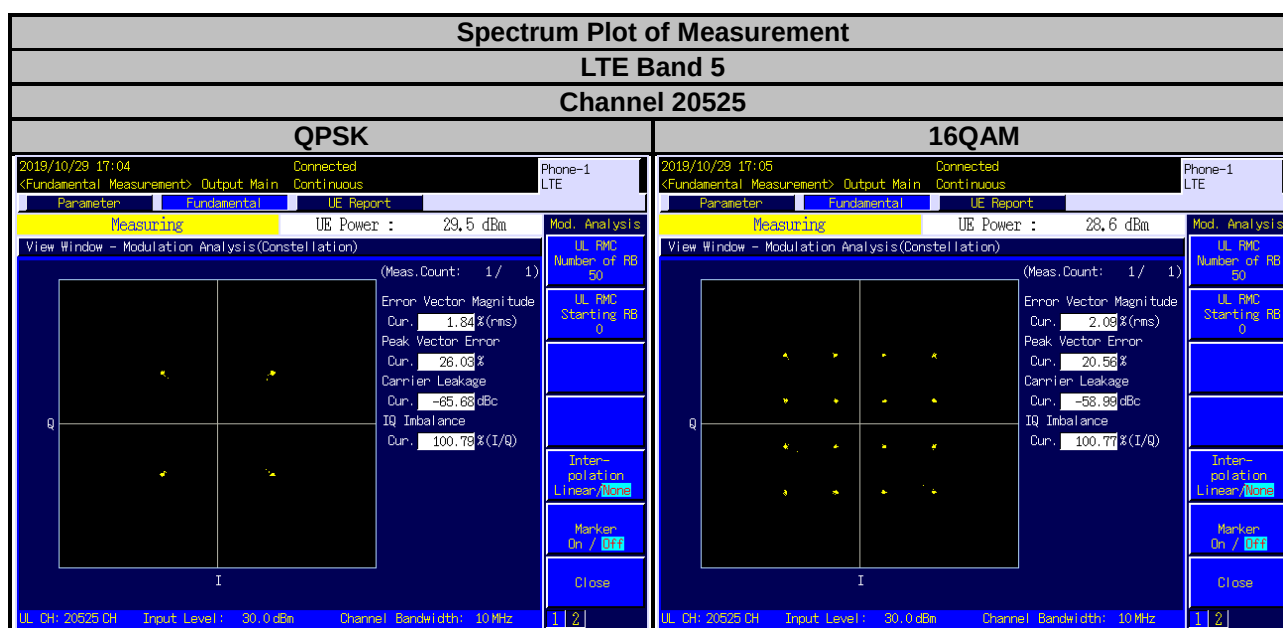
4.2.2 Test Setup



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



4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

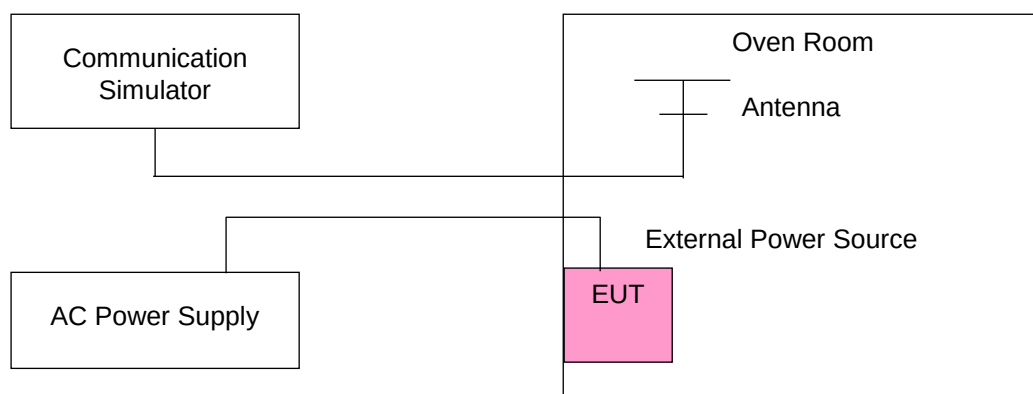
1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

4.3.2 Test Procedure

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

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

4.3.3 Test Setup



4.3.4 Test Results

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 1.4 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
102	824.700004	0.005	848.300002	0.002	2.5
120	824.700001	0.001	848.300004	0.004	2.5
138	824.700002	0.002	848.300002	0.002	2.5

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

Frequency Error vs. Temperature

Temp. (°C)	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	824.700001	0.001	848.300002	0.003	2.5
-20	824.700002	0.003	848.300002	0.002	2.5
-10	824.700002	0.002	848.300002	0.002	2.5
0	824.700002	0.003	848.300002	0.003	2.5
10	824.700001	0.001	848.300002	0.002	2.5
20	824.699998	-0.003	848.299997	-0.004	2.5
30	824.699998	-0.003	848.299997	-0.004	2.5
40	824.699997	-0.004	848.299997	-0.004	2.5
50	824.699996	-0.005	848.299997	-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)	
120	825.500003	0.003	847.500004	0.005	2.5
102	825.500002	0.002	847.500001	0.002	2.5
138	825.500002	0.002	847.500004	0.005	2.5

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

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 3 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	825.500003	0.003	847.500002	0.002	2.5
-20	825.500002	0.002	847.500002	0.002	2.5
-10	825.500002	0.003	847.500003	0.004	2.5
0	825.500003	0.004	847.500003	0.003	2.5
10	825.500002	0.002	847.500003	0.003	2.5
20	825.499997	-0.003	847.499999	-0.002	2.5
30	825.499999	-0.001	847.499998	-0.002	2.5
40	825.499997	-0.003	847.499998	-0.002	2.5
50	825.499998	-0.003	847.499999	-0.001	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)	
120	826.500004	0.005	846.500004	0.004	2.5
102	826.500001	0.002	846.500001	0.001	2.5
138	826.500003	0.003	846.500001	0.002	2.5

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

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	826.500004	0.005	846.500002	0.002	2.5
-20	826.500004	0.005	846.500002	0.003	2.5
-10	826.500003	0.003	846.500004	0.004	2.5
0	826.500001	0.001	846.500002	0.002	2.5
10	826.500003	0.004	846.500002	0.002	2.5
20	826.499997	-0.004	846.499999	-0.001	2.5
30	826.499998	-0.003	846.499996	-0.004	2.5
40	826.499999	-0.001	846.499997	-0.004	2.5
50	826.499997	-0.004	846.499996	-0.004	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)	
120	829.000004	0.004	844.000004	0.005	2.5
102	829.000002	0.003	844.000002	0.003	2.5
138	829.000002	0.002	844.000003	0.003	2.5

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

Frequency Error vs. Temperature

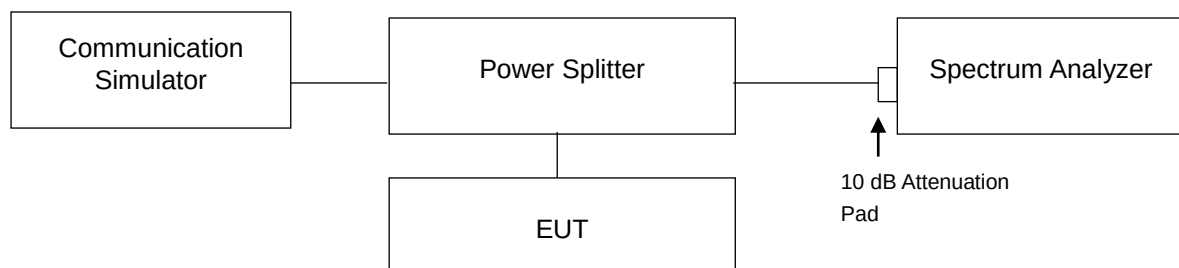
Temp. (°C)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 10 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	829.000004	0.004	844.000004	0.004	2.5
-20	829.000003	0.003	844.000002	0.002	2.5
-10	829.000003	0.004	844.000004	0.005	2.5
0	829.000003	0.003	844.000002	0.002	2.5
10	829.000002	0.002	844.000004	0.005	2.5
20	828.999997	-0.004	843.999999	-0.002	2.5
30	828.999998	-0.002	843.999996	-0.004	2.5
40	828.999999	-0.001	843.999996	-0.005	2.5
50	828.999998	-0.003	843.999997	-0.004	2.5

4.4 Occupied Bandwidth Measurement

4.4.1 Test Procedure

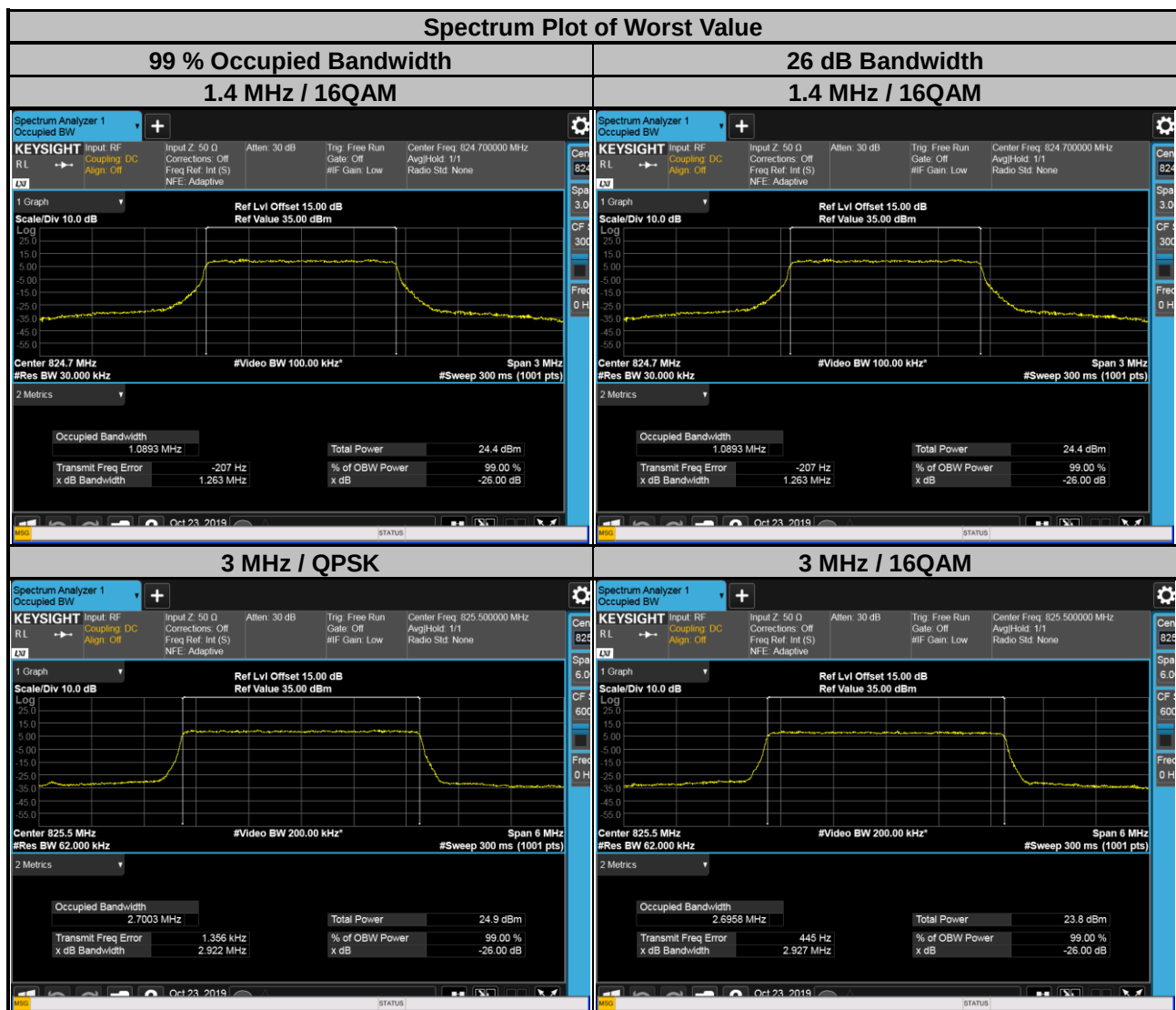
The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function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

4.4.2 Test Setup

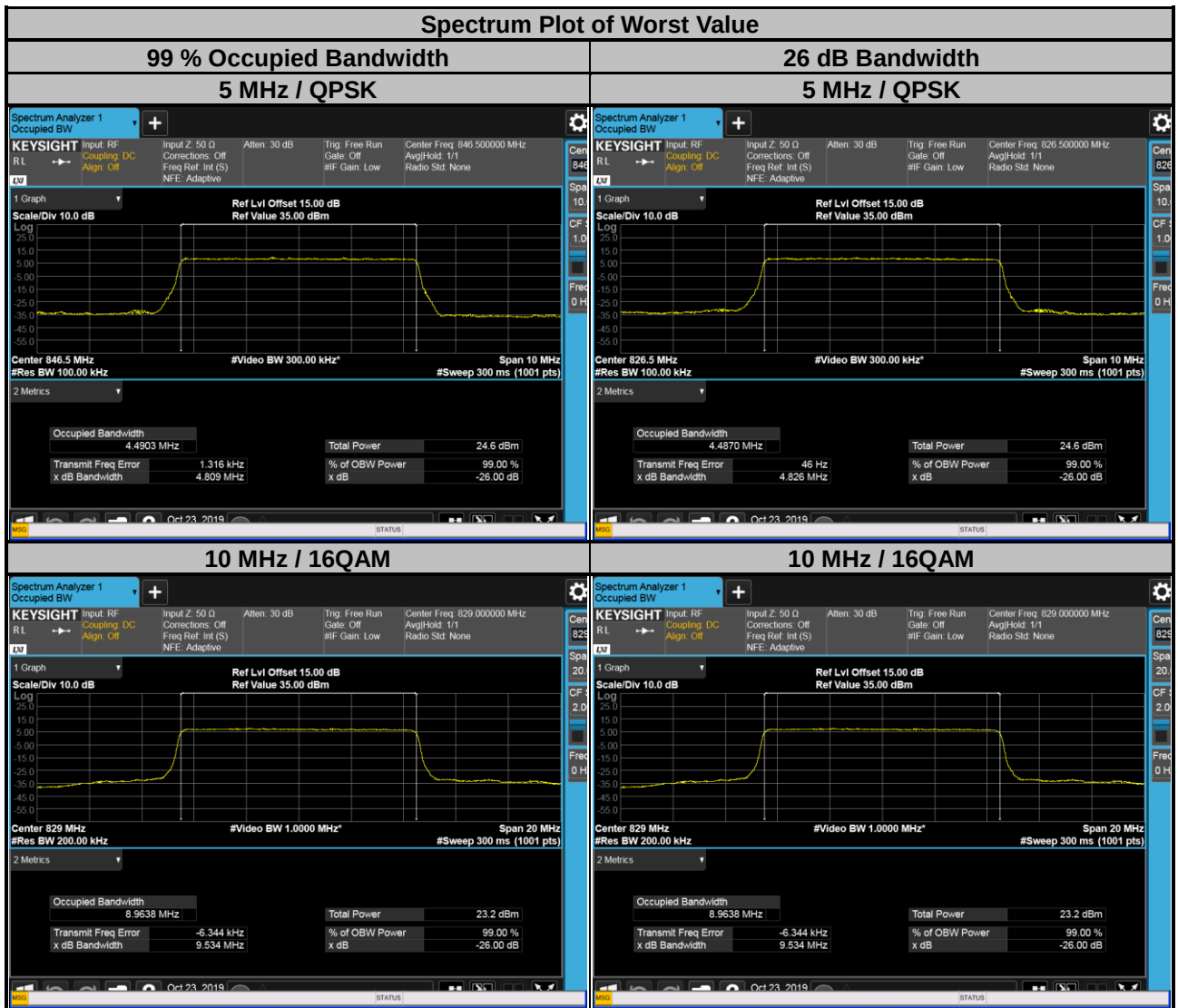


4.4.3 Test Result

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	1.0884	1.0893	1.245	1.263
20525	836.5	1.0874	1.0879	1.246	1.247
20643	848.3	1.0874	1.0874	1.248	1.255
Channel Bandwidth: 3 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
20415	825.5	2.7003	2.6958	2.922	2.927
20525	836.5	2.6991	2.6956	2.904	2.916
20635	847.5	2.6993	2.6959	2.906	2.913



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	4.4870	4.4876	4.826	4.825
20525	836.5	4.4839	4.4868	4.793	4.804
20625	846.5	4.4903	4.4897	4.809	4.817
Channel Bandwidth: 10 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
20450	829.0	8.9627	8.9638	9.516	9.534
20525	836.5	8.9497	8.9618	9.497	9.497
20600	844.0	8.9528	8.9564	9.520	9.498

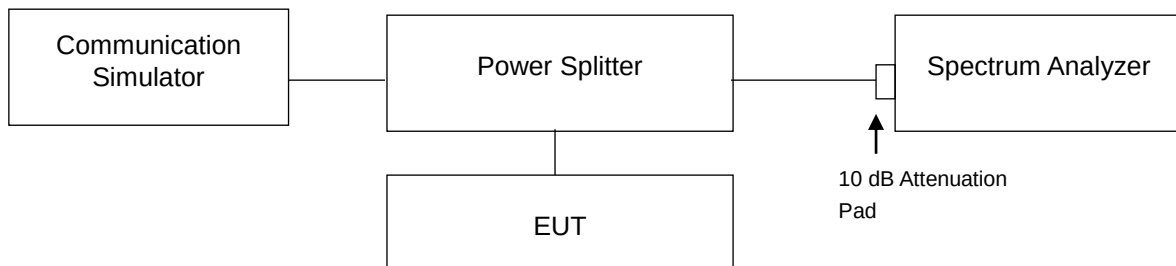


4.5 Band Edge Measurement

4.5.1 Limits of Band Edge Measurement

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

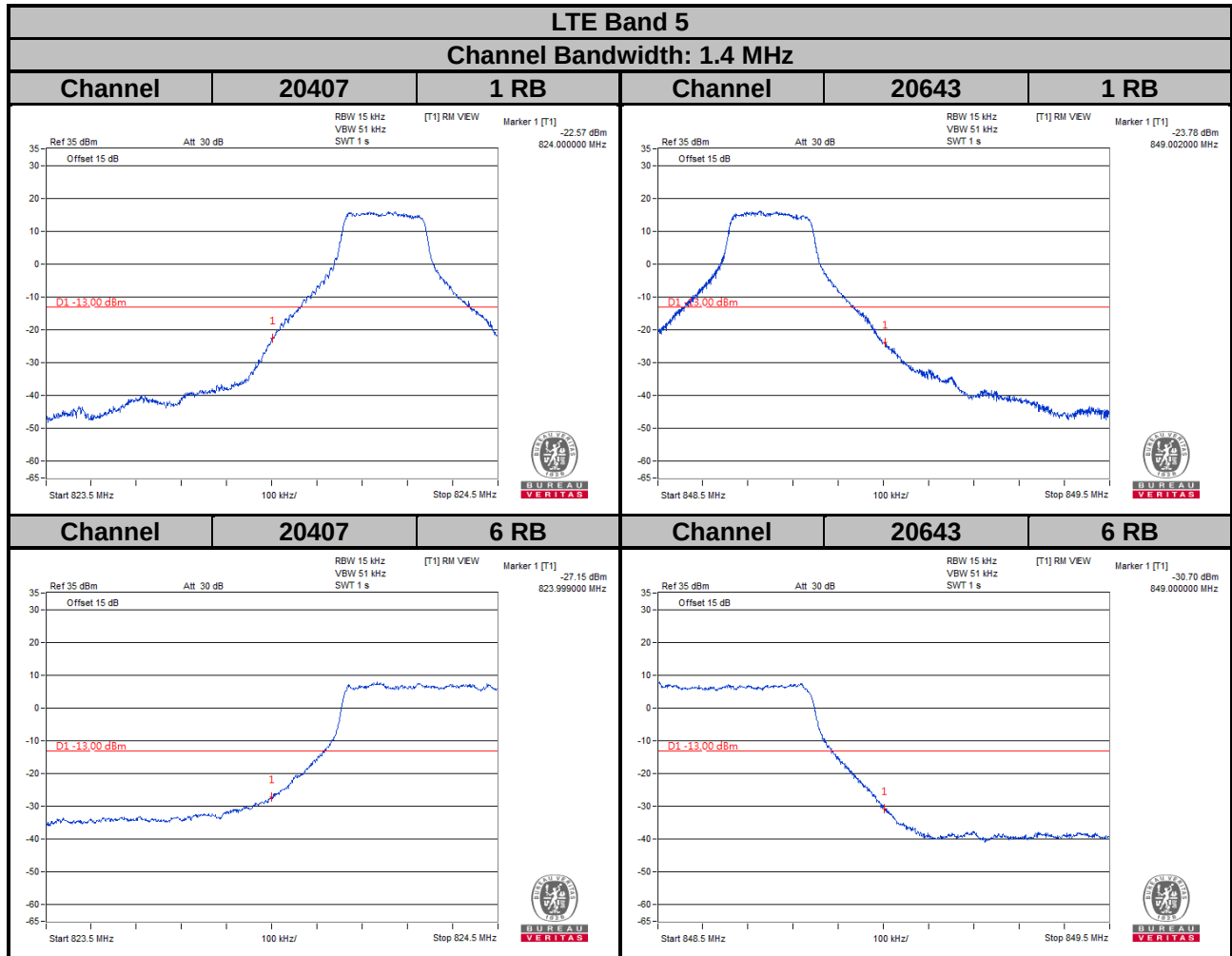
4.5.2 Test Setup

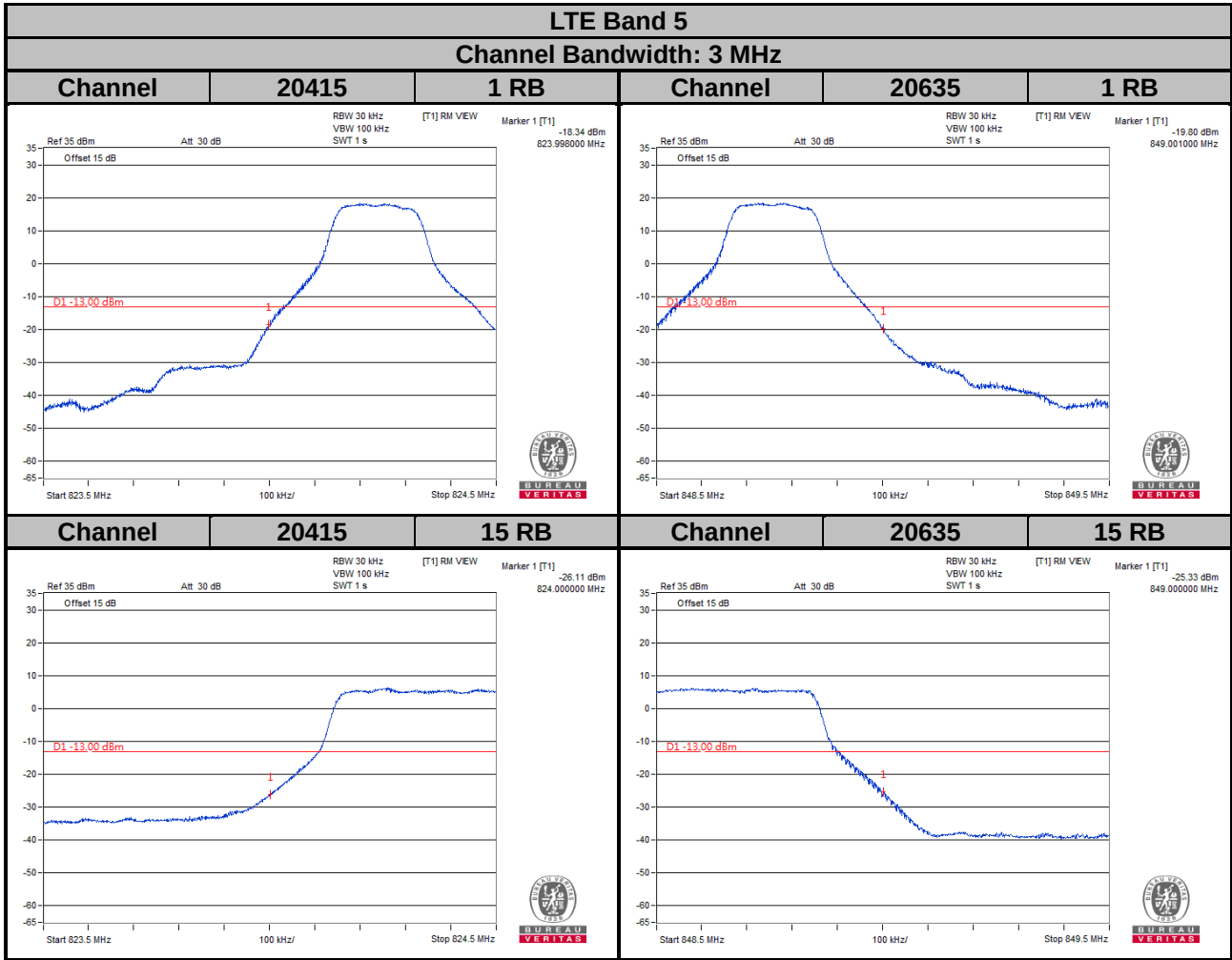


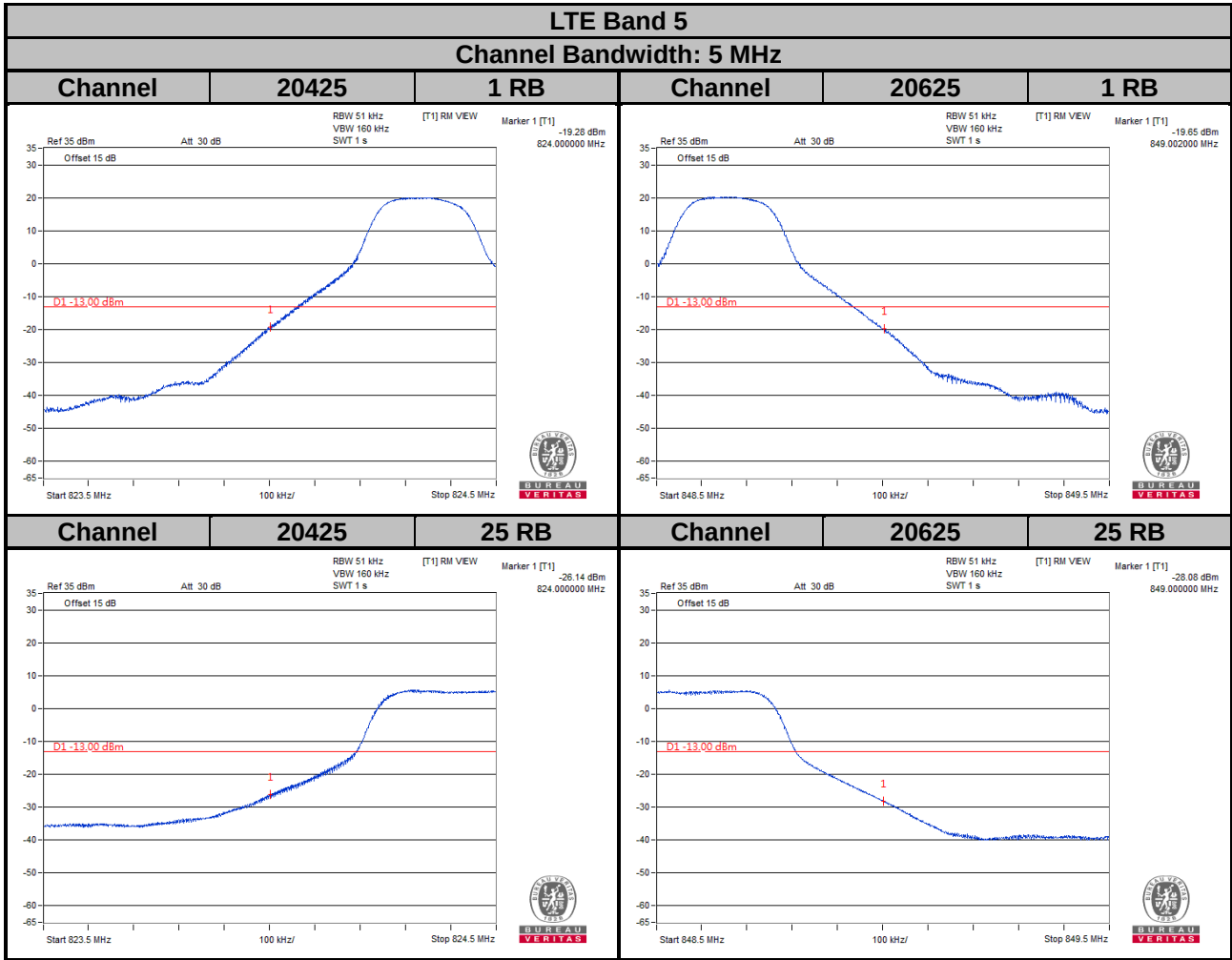
4.5.3 Test Procedures

- All measurements were done at low and high operational frequency range.
- The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 15 kHz and VB of the spectrum is 51 kHz (LTE Bandwidth 1.4 MHz).
- The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 30 kHz and VB of the spectrum is 100 kHz (LTE Bandwidth 3 MHz).
- The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 51 kHz and VB of the spectrum is 160 kHz (LTE Bandwidth 5 MHz).
- The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 100 kHz and VB of the spectrum is 300 kHz (LTE Bandwidth 10 MHz).
- Record the max trace plot into the test report.

4.5.4 Test Results

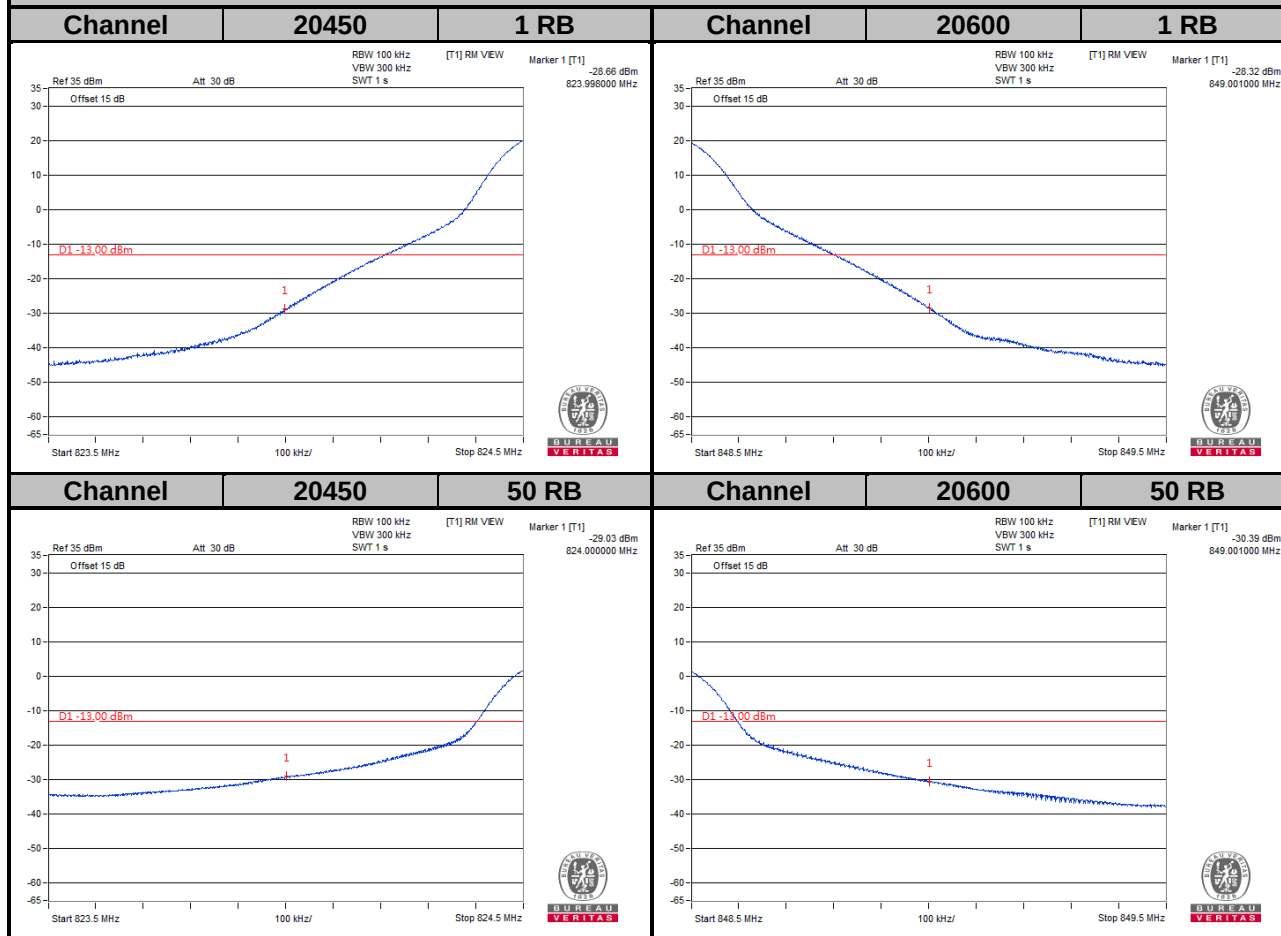






LTE Band 5

Channel Bandwidth: 10 MHz

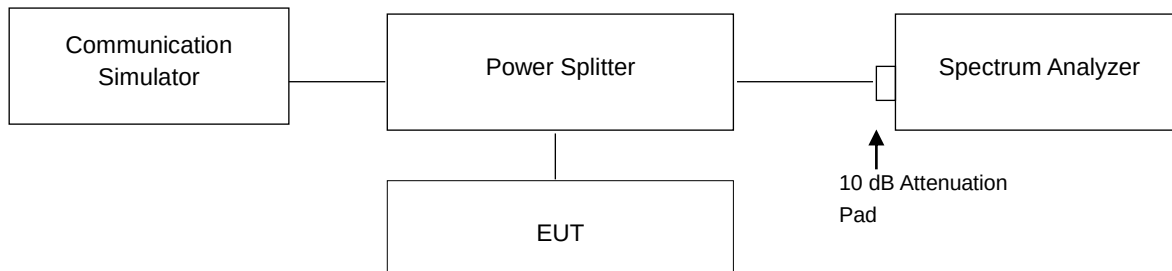


4.6 Peak to Average Ratio

4.6.1 Limits of Peak to Average Ratio Measurement

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

4.6.2 Test Setup



4.6.3 Test Procedures

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

4.6.4 Test Results

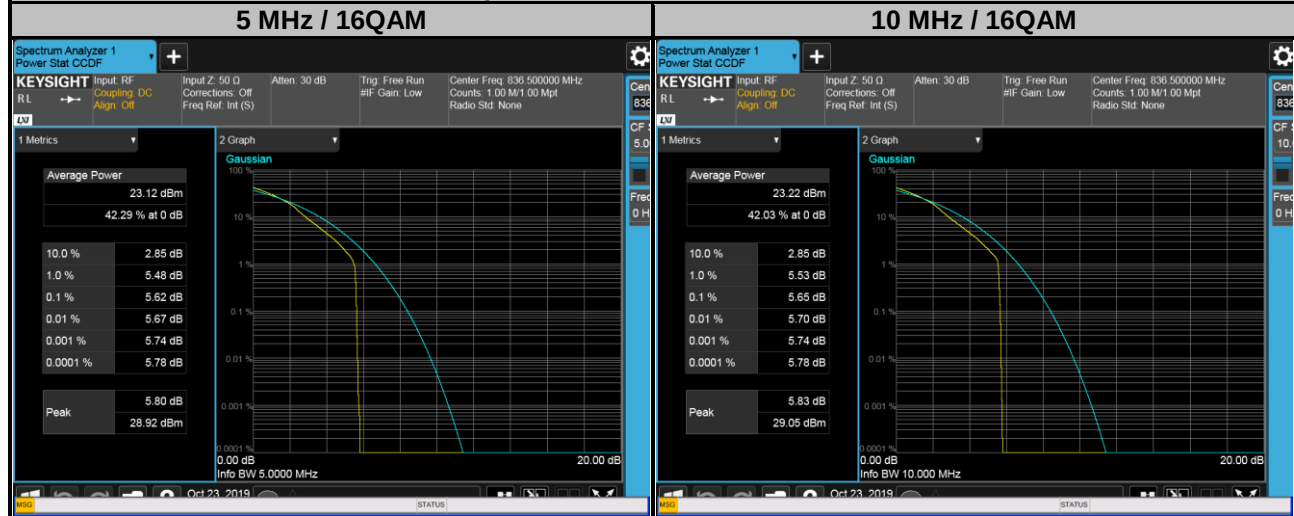
LTE Band 5							
Channel Bandwidth: 1.4 MHz				Channel Bandwidth: 3 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
20407	824.7	4.36	5.13	20415	825.5	4.34	5.11
20525	836.5	4.80	5.62	20525	836.5	4.88	5.67
20643	848.3	4.59	5.51	20635	847.5	4.69	5.50



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	4.31	5.08	20450	829.0	4.27	5.07
20525	836.5	4.87	5.62	20525	836.5	4.92	5.65
20625	846.5	4.52	5.33	20600	844.0	4.45	5.25

Spectrum Plot of Worst Value

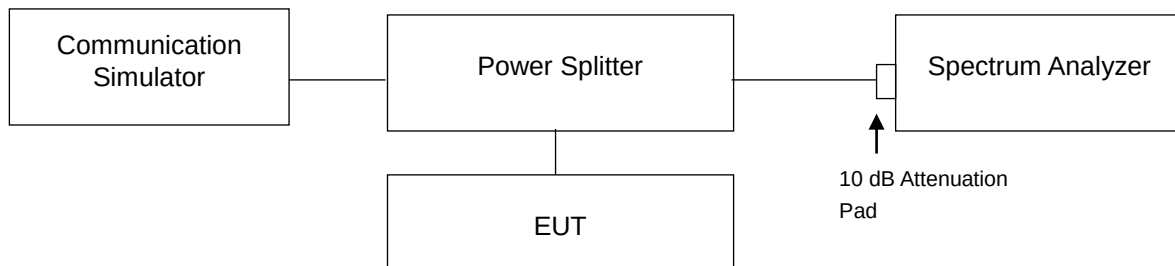


4.7 Conducted Spurious Emissions

4.7.1 Limits of Conducted Spurious Emissions Measurement

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

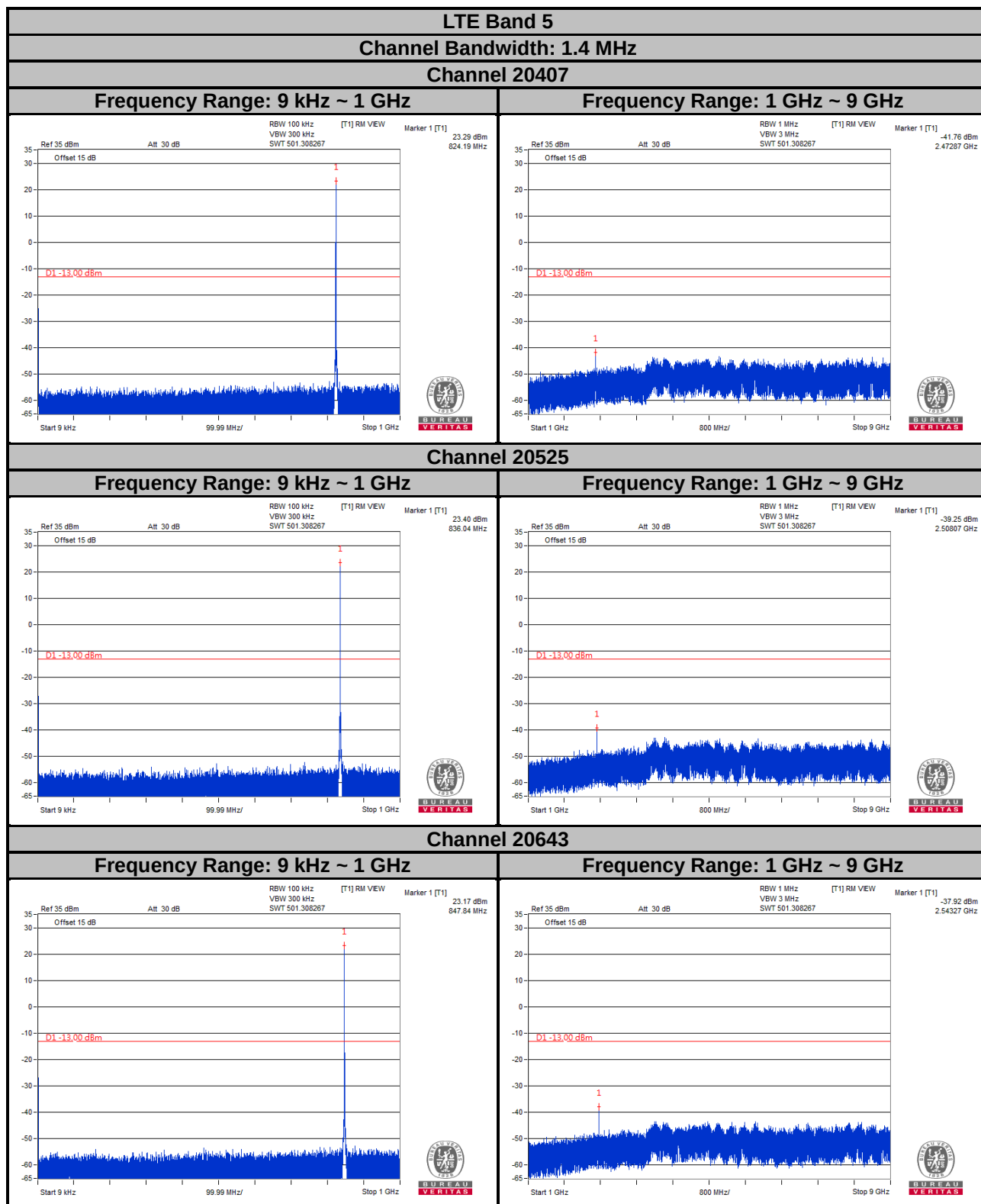
4.7.2 Test Setup



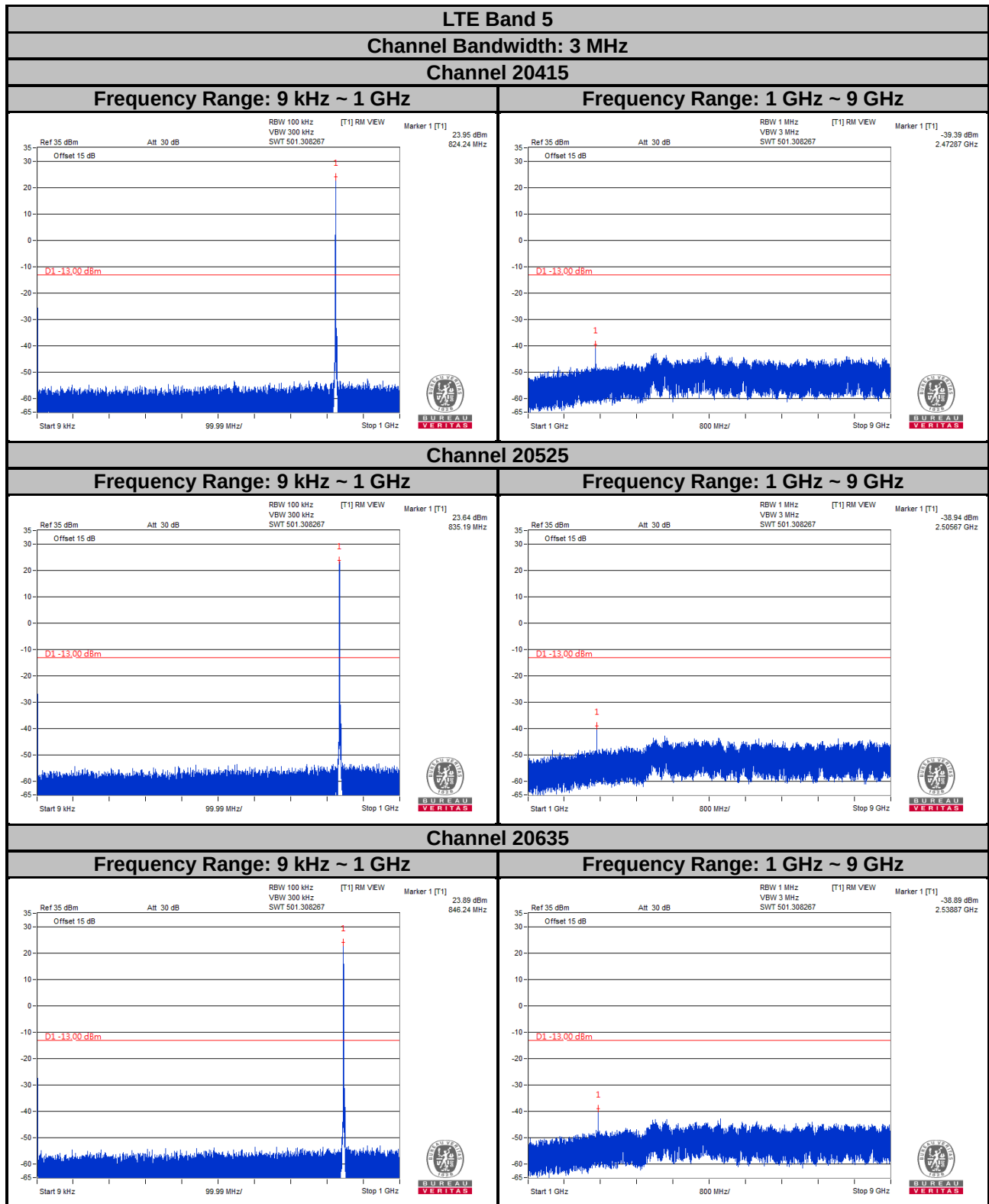
4.7.3 Test Procedure

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

4.7.4 Test Results



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



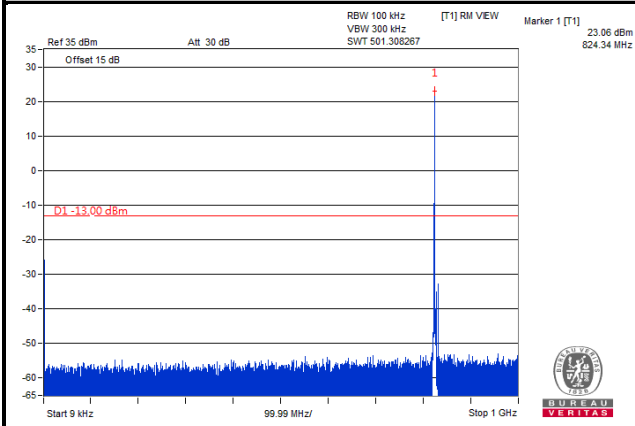
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 5

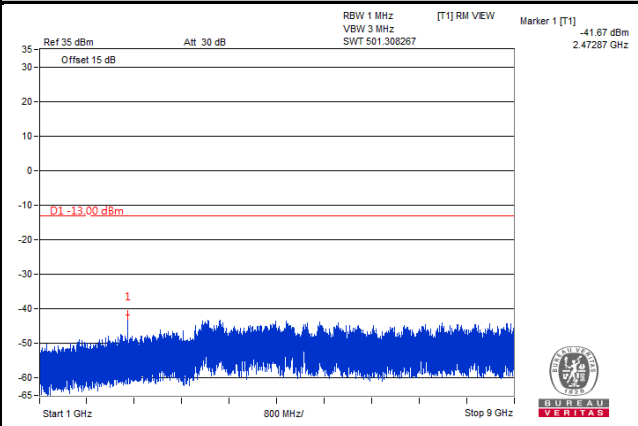
Channel Bandwidth: 5 MHz

Channel 20425

Frequency Range: 9 kHz ~ 1 GHz

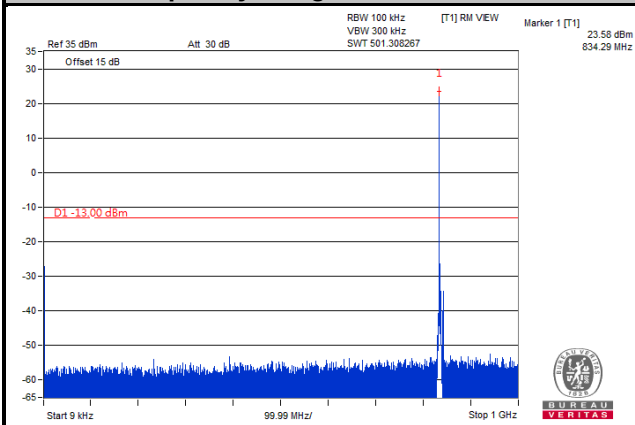


Frequency Range: 1 GHz ~ 9 GHz

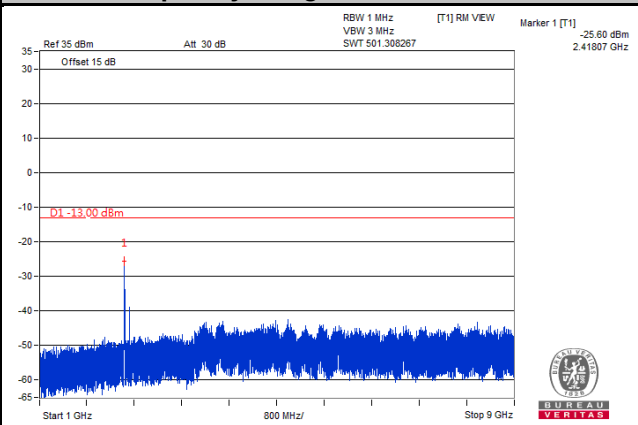


Channel 20525

Frequency Range: 9 kHz ~ 1 GHz

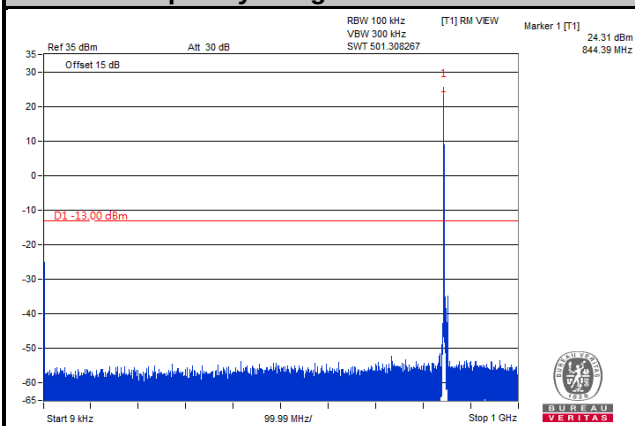


Frequency Range: 1 GHz ~ 9 GHz

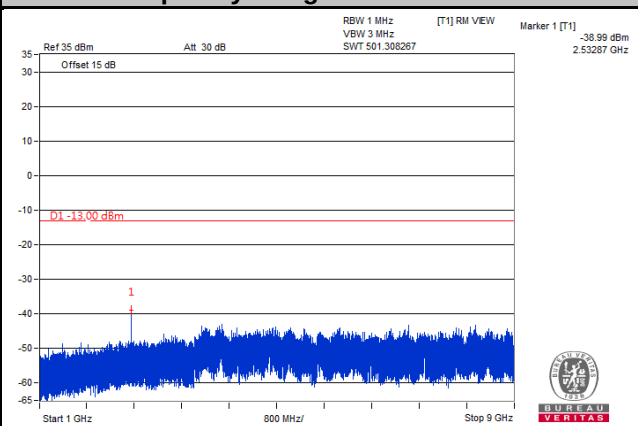


Channel 20625

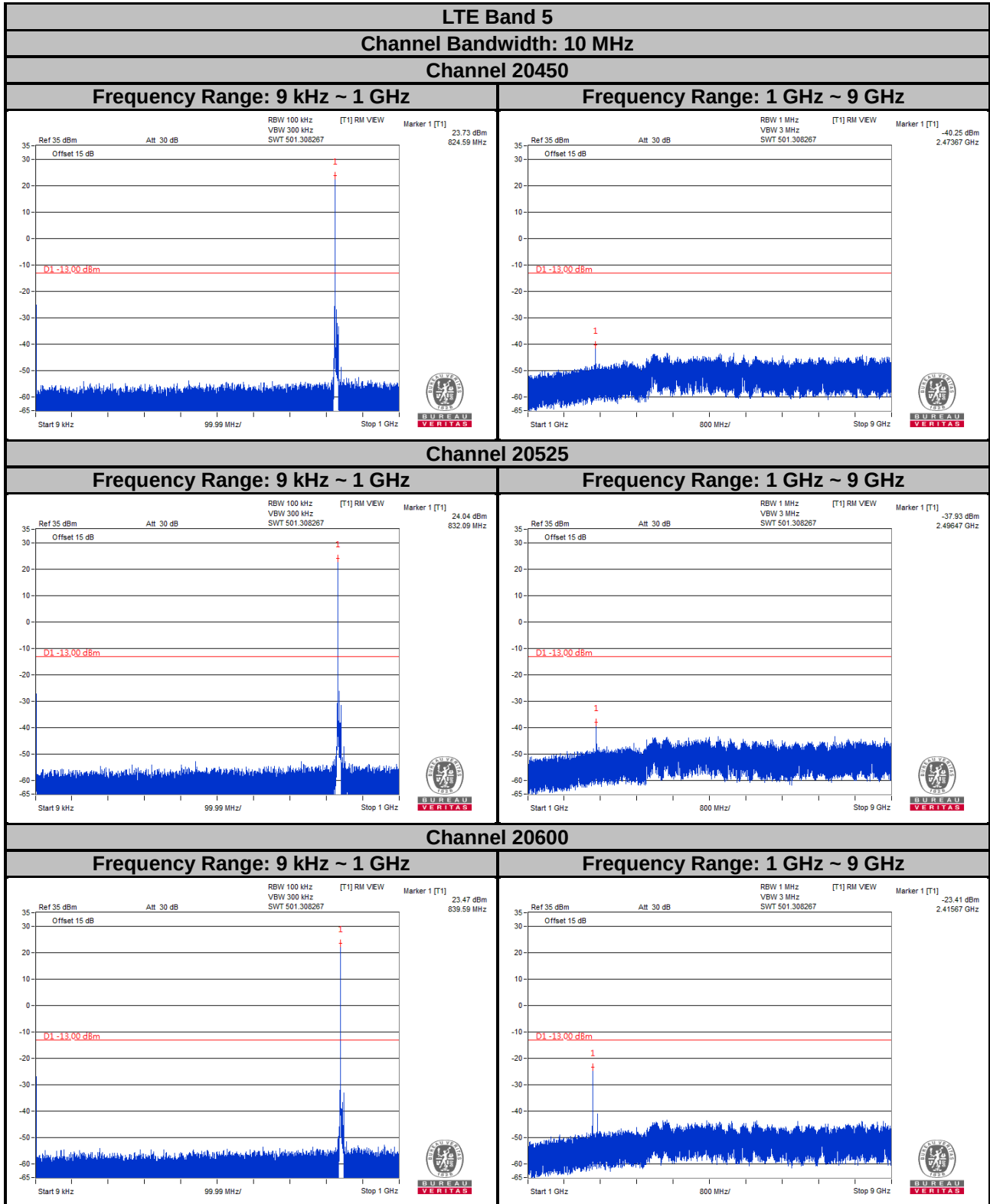
Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 9 GHz



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



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

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

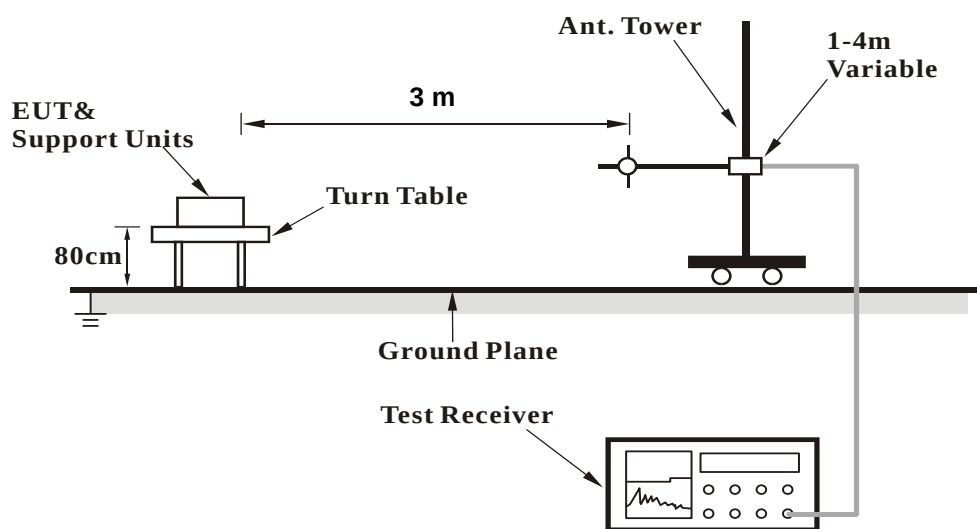
NOTE: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz.

4.8.3 Deviation from Test Standard

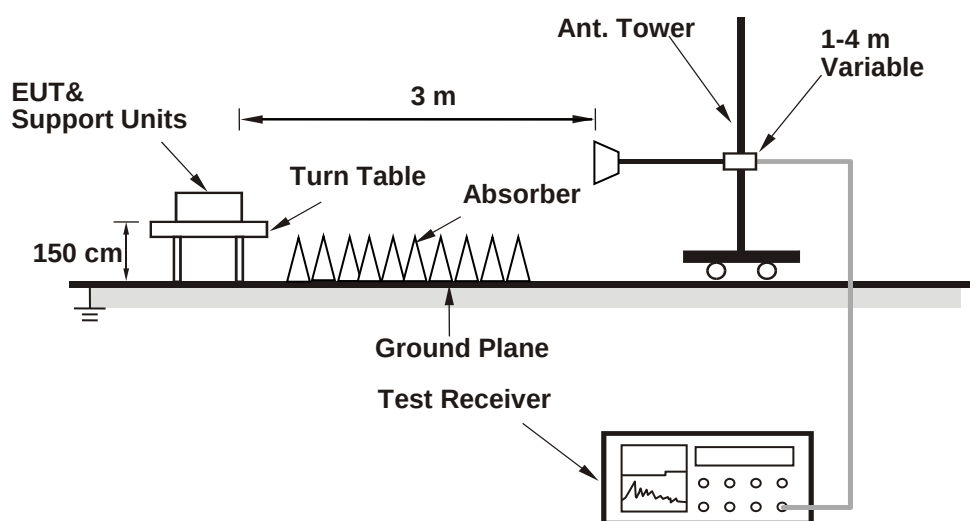
No deviation.

4.8.4 Test Setup

<Radiated Emission below or equal 1 GHz>



<Radiated Emission above 1 GHz>



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

4.8.5 Test Results

Below 1GHz

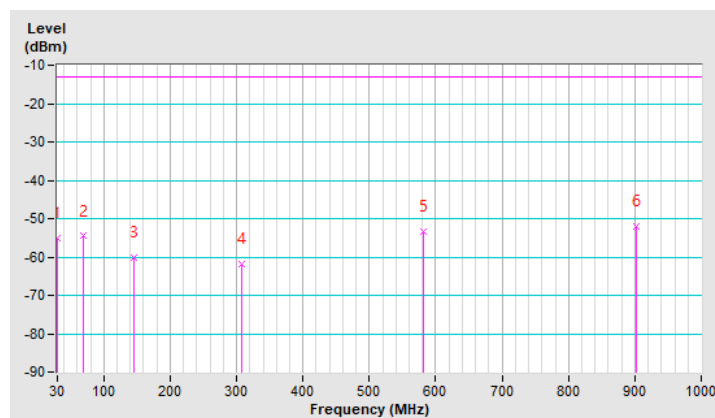
LTE Band 5, Channel Bandwidth: 1.4MHz

Mode	TX channel 20407 (824.7MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 68%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	30.00	-57.0	-35.7	-19.4	-55.1	-13.0	-42.1
2	68.80	-45.9	-53.8	-0.8	-54.6	-13.0	-41.6
3	145.43	-53.2	-57.2	-3.1	-60.3	-13.0	-47.3
4	308.39	-55.4	-65.7	3.9	-61.8	-13.0	-48.8
5	581.93	-52.5	-57.2	3.7	-53.5	-13.0	-40.5
6	903.00	-57.5	-55.6	3.6	-52.0	-13.0	-39.0

Remarks:

- ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).
- Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

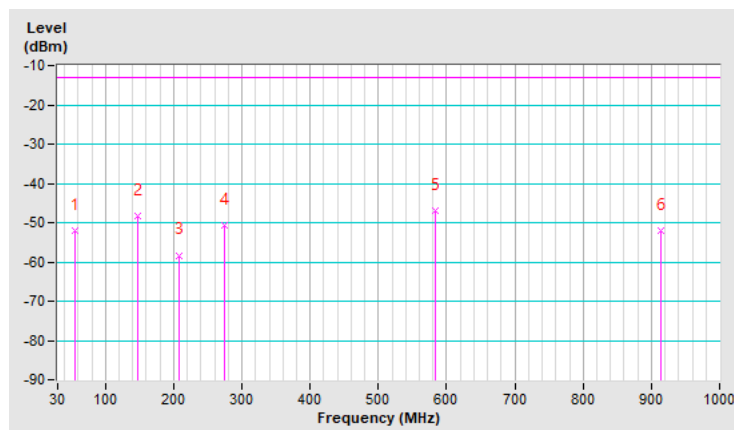


Mode	TX channel 20407 (824.7MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 68%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

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	56.19	-43.0	-46.9	-5.1	-52.0	-13.0	-39.0
2	147.37	-44.0	-45.4	-2.9	-48.3	-13.0	-35.3
3	208.48	-53.1	-56.3	-2.0	-58.3	-13.0	-45.3
4	275.41	-51.6	-49.0	-1.6	-50.6	-13.0	-37.6
5	582.90	-47.2	-50.9	3.8	-47.1	-13.0	-34.1
6	913.67	-58.2	-55.6	3.5	-52.1	-13.0	-39.1

Remarks:

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).



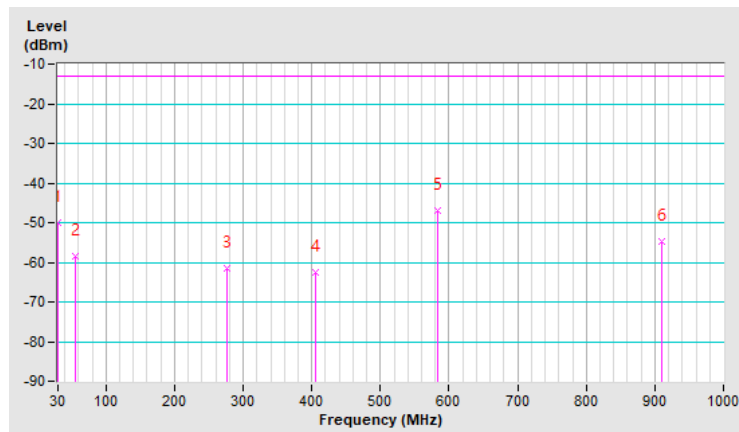
LTE Band 5, Channel Bandwidth: 5MHz

Mode	TX channel 20425 (826.5MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 68%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	30.97	-51.6	-31.3	-18.8	-50.1	-13.0	-37.1
2	55.22	-53.8	-53.1	-5.4	-58.5	-13.0	-45.5
3	276.38	-55.0	-60.0	-1.6	-61.6	-13.0	-48.6
4	406.36	-60.1	-66.0	3.3	-62.7	-13.0	-49.7
5	582.90	-46.0	-50.8	3.8	-47.0	-13.0	-34.0
6	909.79	-60.0	-58.1	3.5	-54.6	-13.0	-41.6

Remarks:

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

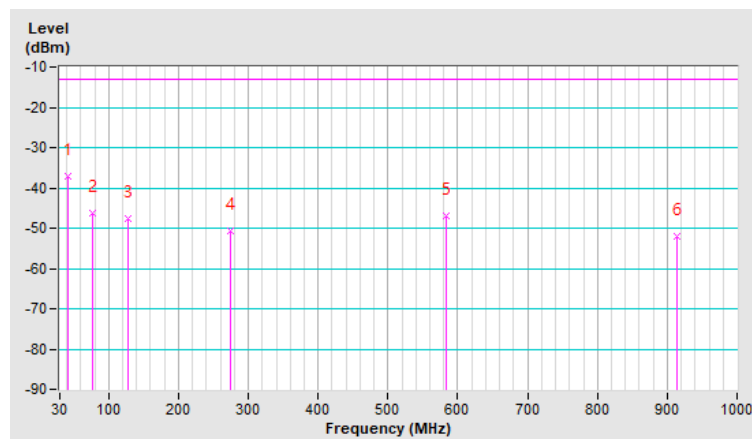


Mode	TX channel 20425 (826.5MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 68%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

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	41.64	-26.0	-24.8	-12.3	-37.1	-13.0	-24.1
2	76.56	-38.4	-46.6	0.3	-46.3	-13.0	-33.3
3	127.00	-39.6	-44.2	-3.3	-47.5	-13.0	-34.5
4	275.41	-51.6	-49.0	-1.6	-50.6	-13.0	-37.6
5	582.90	-47.2	-50.9	3.8	-47.1	-13.0	-34.1
6	913.67	-58.2	-55.6	3.5	-52.1	-13.0	-39.1

Remarks:

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).



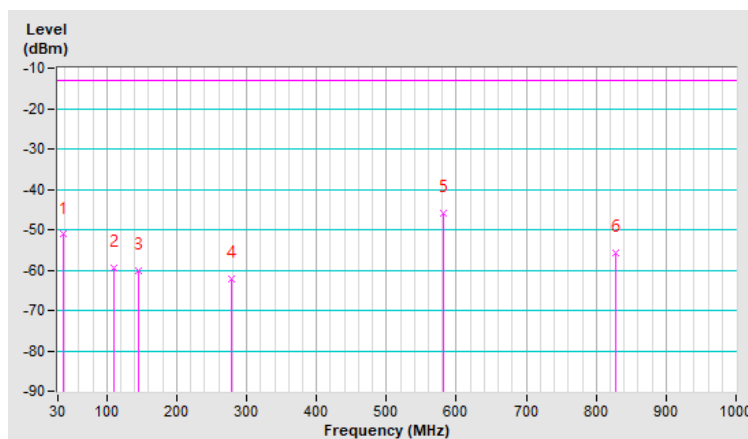
LTE Band 5, Channel Bandwidth: 10MHz

Mode	TX channel 20450 (829.0MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 68%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	38.73	-51.9	-37.0	-14.2	-51.2	-13.0	-38.2
2	110.51	-49.5	-57.0	-2.6	-59.6	-13.0	-46.6
3	145.43	-53.2	-57.2	-3.1	-60.3	-13.0	-47.3
4	279.29	-55.5	-60.5	-1.6	-62.1	-13.0	-49.1
5	580.96	-44.9	-49.7	3.8	-45.9	-13.0	-32.9
6	827.34	-60.6	-59.8	3.9	-55.9	-13.0	-42.9

Remarks:

- ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).
- Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

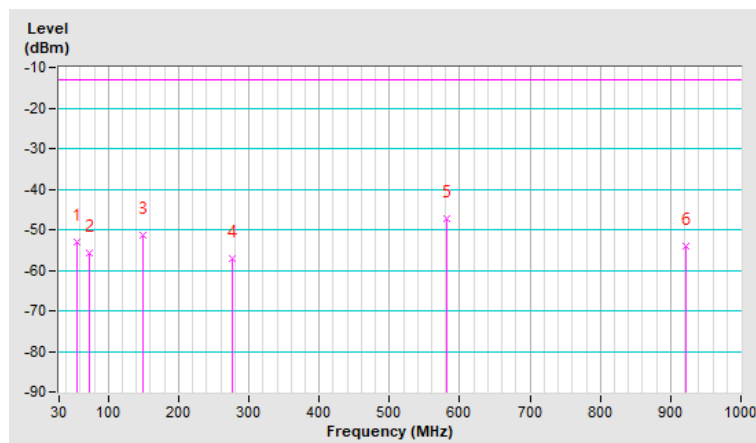


Mode	TX channel 20450 (829.0MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 68%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

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	56.19	-44.0	-48.0	-5.1	-53.1	-13.0	-40.1
2	73.65	-47.9	-55.7	0.1	-55.6	-13.0	-42.6
3	149.31	-47.0	-48.4	-3.0	-51.4	-13.0	-38.4
4	277.35	-58.2	-55.5	-1.6	-57.1	-13.0	-44.1
5	580.96	-47.2	-51.0	3.8	-47.2	-13.0	-34.2
6	922.40	-60.2	-57.6	3.6	-54.0	-13.0	-41.0

Remarks:

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).



Above 1GHz

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	Han Wu		

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	-53.4	-45.7	0.9	-44.8	-13.0	-31.8
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	-51.9	-44.7	0.9	-43.8	-13.0	-30.8

Remarks:

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

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

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	-53.2	-45.6	0.8	-44.8	-13.0	-31.8
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	-52.4	-45.1	0.8	-44.3	-13.0	-31.3

Remarks:

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

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

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	-53.5	-45.9	0.7	-45.2	-13.0	-32.2
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	-52.3	-45.0	0.7	-44.3	-13.0	-31.3

Remarks:

1. $ERP (dBm) = S.G \text{ Value (dBm)} + \text{Correction Factor (dB)}$.
2. $\text{Correction Factor (dB)} = \text{Substitution Antenna Gain (dB)} + \text{Cable Loss (dB)}$.

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	Han Wu		

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	-53.9	-46.1	0.9	-45.2	-13.0	-32.2
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	-52.2	-45.0	0.9	-44.1	-13.0	-31.1

Remarks:

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

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

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	-53.5	-45.8	0.8	-45.0	-13.0	-32.0
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	-52.2	-44.9	0.8	-44.1	-13.0	-31.1

Remarks:

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

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

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	-53.5	-46.0	0.7	-45.3	-13.0	-32.3
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	-52.2	-44.9	0.7	-44.2	-13.0	-31.2

Remarks:

1. $ERP (dBm) = S.G \text{ Value (dBm)} + \text{Correction Factor (dB)}$.
2. $\text{Correction Factor (dB)} = \text{Substitution Antenna Gain (dB)} + \text{Cable Loss (dB)}$.

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	Han Wu		

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	-53.3	-45.7	0.9	-44.8	-13.0	-31.8
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	-52.4	-45.1	0.9	-44.2	-13.0	-31.2

Remarks:

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

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

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	-53.3	-45.7	0.8	-44.9	-13.0	-31.9
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	-51.9	-44.6	0.8	-43.8	-13.0	-30.8

Remarks:

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

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

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	-53.4	-45.7	0.7	-45.0	-13.0	-32.0
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	-52.2	-44.9	0.7	-44.2	-13.0	-31.2

Remarks:

1. $ERP (dBm) = S.G \text{ Value (dBm)} + \text{Correction Factor (dB)}$.
2. $\text{Correction Factor (dB)} = \text{Substitution Antenna Gain (dB)} + \text{Cable Loss (dB)}$.

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.

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

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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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