

FCC Test Report

(PART 27)

Report No.: RF191015C02-5

FCC ID: RC6-GRN70C

Test Model: GRN70C

Received Date: Oct. 15, 2019

Test Date: Oct. 30 ~ Dec. 04, 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
RF191015C02-5	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. 30 ~ Dec. 04, 2019

Standards: FCC Part 27, Subpart C, M

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 27 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 27.50(h)(2)	Equivalent Isotropic Radiated Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement.
2.1055 27.54	Frequency Stability	Pass	Meet the requirement of limit.
2.1049 27.53(m)(6)	Occupied Bandwidth	Pass	Meet the requirement of limit.
--	Peak to Average Ratio	Pass	Meet the requirement of limit.
27.53(m)(4)(6)	Out-of-Band Emissions Measurements	Pass	Meet the requirement of limit.
2.1051 27.53(m)(4)(6)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 27.53(m)(4)(6)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -13.3 dB at 5005.00 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	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
			Nov. 07, 2019	Nov. 06, 2020
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Nov. 25, 2018	Nov. 24, 2019
			Nov. 24, 2019	Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 25, 2018	Nov. 24, 2019
			Nov. 24, 2019	Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Nov. 25, 2018	Nov. 24, 2019
			Nov. 24, 2019	Nov. 23, 2020
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
			Nov. 25, 2019	Nov. 24, 2020
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	QPSK, 16QAM	
Frequency Range	LTE Band 7 (Channel Bandwidth: 5 MHz)	2502.5 ~ 2567.5 MHz
	LTE Band 7 (Channel Bandwidth: 10 MHz)	2505 ~ 2565 MHz
	LTE Band 7 (Channel Bandwidth: 15 MHz)	2507.5 ~ 2562.5 MHz
	LTE Band 7 (Channel Bandwidth: 20 MHz)	2510 ~ 2560 MHz
Max. EIRP Power	LTE Band 7 (Channel Bandwidth: 5 MHz)	346.737 mW (25.40dBm)
	LTE Band 7 (Channel Bandwidth: 10 MHz)	338.844 mW (25.30dBm)
	LTE Band 7 (Channel Bandwidth: 15 MHz)	338.844 mW (25.30dBm)
	LTE Band 7 (Channel Bandwidth: 20 MHz)	354.813 mW (25.50dBm)
Emission Designator	LTE Band 7 (Channel Bandwidth: 5 MHz)	4M54G7D
	LTE Band 7 (Channel Bandwidth: 10 MHz)	9M04G7D
	LTE Band 7 (Channel Bandwidth: 15 MHz)	13M5G7D
	LTE Band 7 (Channel Bandwidth: 20 MHz)	18M0G7D
Antenna Type	Fixed External Antenna with 4.7 dBi gain	
Accessory Device	Refer to Note as below	
Data Cable Supplied	Refer to Note as below	

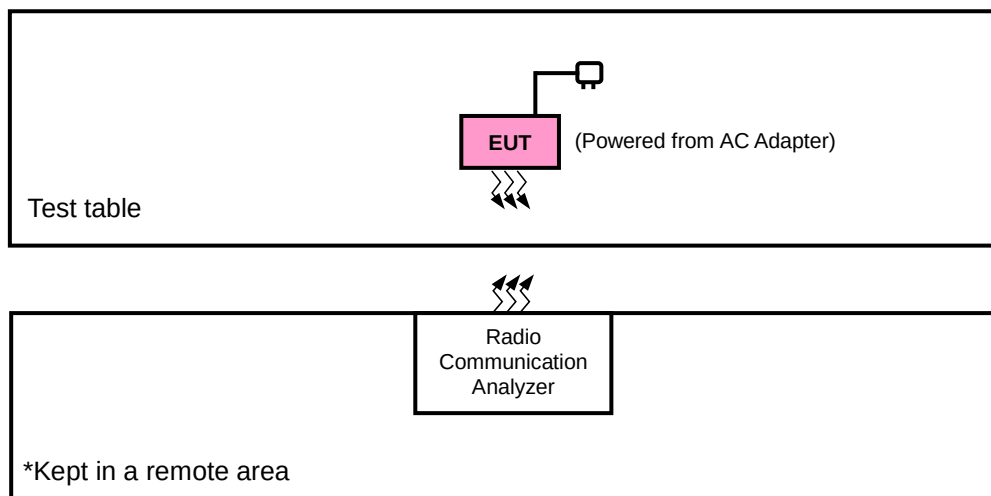
Note:

- 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	EIRP	Radiated Emission
LTE Band 7	Z-plane	Z-plane

LTE Band 7

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	EIRP	20775 to 21425	20775, 21100, 21425	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20800 to 21400	20800, 21100, 21400	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20825 to 21375	20825, 21100, 21375	15 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20850 to 21350	20850, 21100, 21350	20 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Modulation Characteristics	20850 to 21350	21110	20 MHz	QPSK, 16QAM	100 RB / 0 RB Offset
-	Frequency Stability	20775 to 21425	20775, 21425	5 MHz	QPSK	1 RB / 0 RB Offset
		20800 to 21400	20800, 21400	10 MHz	QPSK	1 RB / 0 RB Offset
		20825 to 21375	20825, 21375	15 MHz	QPSK	1 RB / 0 RB Offset
		20850 to 21350	20850, 21350	20 MHz	QPSK	1 RB / 0 RB Offset
-	Occupied Bandwidth	20775 to 21425	20775, 21100, 21425	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		20800 to 21400	20800, 21100, 21400	10 MHz	QPSK, 16QAM	50 RB / 0 RB Offset
		20825 to 21375	20825, 21100, 21375	15 MHz	QPSK, 16QAM	75 RB / 0 RB Offset
		20850 to 21350	20850, 21100, 21350	20 MHz	QPSK, 16QAM	100 RB / 0 RB Offset
-	Peak to Average Ratio	20775 to 21425	20775, 21100, 21425	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20800 to 21400	20800, 21100, 21400	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20825 to 21375	20825, 21100, 21375	15 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20850 to 21350	20850, 21100, 21350	20 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Out-of-Band Emissions	20775 to 21425	20775, 21425	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		20800 to 21400	20800, 21400	10 MHz	QPSK, 16QAM	50 RB / 0 RB Offset
		20825 to 21375	20825, 21375	15 MHz	QPSK, 16QAM	75 RB / 0 RB Offset
		20850 to 21350	20850, 21350	20 MHz	QPSK, 16QAM	100 RB / 0 RB Offset
-	Conducted Emission	20775 to 21425	20775, 21100, 21425	5 MHz	QPSK	1 RB / 0 RB Offset
		20800 to 21400	20800, 21100, 21400	10 MHz	QPSK	1 RB / 0 RB Offset
		20825 to 21375	20825, 21100, 21375	15 MHz	QPSK	1 RB / 0 RB Offset
		20850 to 21350	20850, 21100, 21350	20 MHz	QPSK	1 RB / 0 RB Offset
-	Radiated Emission	20775 to 21425	20775, 21100, 21425	5 MHz	QPSK	1 RB / 0 RB Offset
		20850 to 21350	20850, 21100, 21350	20 MHz	QPSK	1 RB / 0 RB Offset

Note:

1. This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.
2. For radiated emission above 1 GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the lowest, 5 MHz & highest channel bandwidth for final test.
3. For radiated emission below 1 GHz, choose the maximum EIRP power worst channel for final test.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
EIRP	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
Out-of-Band Emissions	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

3.1 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 27

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

The radiated peak output power shall be according to the specific rule Part 27.50(h)(2) that “Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2 watts transmitter output power” and 27.50(i) specific that “Peak transmit power must be measure over any interval of continuous transmission using instrumentation calibration in terms of rms-equivalent voltage.”

4.1.2 Test Procedures

EIRP 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. $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}.$

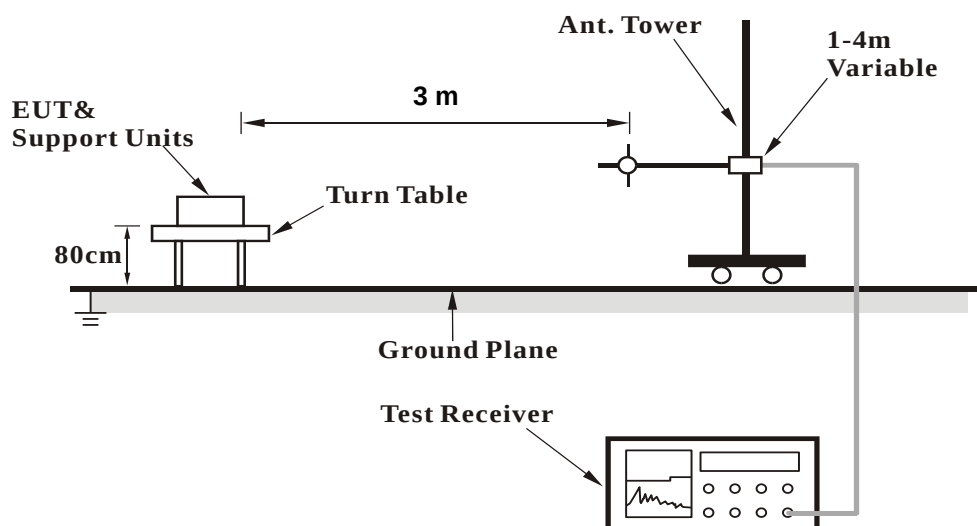
Conducted Power Measurement:

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

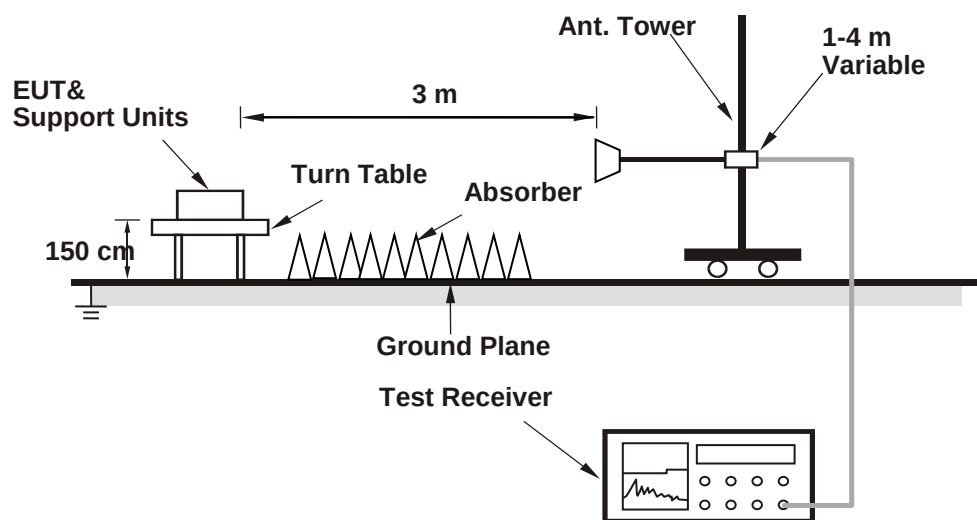
4.1.3 Test Setup

EIRP / ERP Measurement:

<Radiated Emission below or equal 1 GHz>



<Radiated Emission above 1 GHz>



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

Conducted Power Measurement:



4.1.4 Test Results

Conducted Output Power (dBm)

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 20775	Mid Ch 21100	High Ch 21425		Low Ch 20775	Mid Ch 21100	High Ch 21425	
			2502.5 MHz	2535.0 MHz	2567.5 MHz		2502.5 MHz	2535.0 MHz	2567.5 MHz	
7 / 5M	1	0	23.72	23.74	23.42	0	22.69	22.41	22.54	1
	1	12	23.70	23.58	23.66	0	22.69	22.41	22.64	1
	1	24	23.43	23.60	23.52	0	22.69	22.41	22.74	1
	12	0	22.57	22.70	22.66	1	22.69	21.61	21.64	2
	12	6	22.69	22.66	22.94	1	22.69	21.73	21.58	2
	12	13	22.69	22.74	22.76	1	21.54	21.72	21.80	2
	25	0	22.69	22.67	22.71	1	21.60	21.55	21.75	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 20800	Mid Ch 21100	High Ch 21400		Low Ch 20800	Mid Ch 21100	High Ch 21400	
			2505.0 MHz	2535.0 MHz	2565.0 MHz		2505.0 MHz	2535.0 MHz	2565.0 MHz	
7 / 10M	1	0	23.42	23.88	23.54	0	22.68	22.47	22.82	1
	1	24	23.40	23.66	23.66	0	22.52	22.49	22.48	1
	1	49	23.21	23.54	23.75	0	22.34	22.46	22.09	1
	25	0	22.63	22.72	22.88	1	21.71	21.83	21.85	2
	25	12	22.63	22.74	22.92	1	21.69	21.85	21.73	2
	25	25	22.69	22.81	22.81	1	21.75	21.89	21.85	2
	50	0	22.59	22.72	22.83	1	21.77	21.84	21.84	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 20825	Mid Ch 21100	High Ch 21375		Low Ch 20825	Mid Ch 21100	High Ch 21375	
			2507.5 MHz	2535.0 MHz	2562.5 MHz		2507.5 MHz	2535.0 MHz	2562.5 MHz	
7 / 15M	1	0	23.60	23.76	23.56	0	22.68	22.78	22.40	1
	1	37	23.41	23.58	23.64	0	22.44	22.46	22.38	1
	1	74	23.39	23.70	23.74	0	22.36	22.58	22.71	1
	36	0	22.71	22.77	22.97	1	21.63	21.72	22.01	2
	36	19	22.71	22.72	22.97	1	21.64	21.75	21.78	2
	36	39	22.64	22.82	22.69	1	21.59	21.75	21.96	2
	75	0	22.59	22.72	22.92	1	21.71	21.74	21.90	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 20850	Mid Ch 21100	High Ch 21350		Low Ch 20850	Mid Ch 21100	High Ch 21350	
			2510.0 MHz	2535.0 MHz	2560.0 MHz		2510.0 MHz	2535.0 MHz	2560.0 MHz	
7 / 20M	1	0	23.38	23.81	23.67	0	22.35	22.94	22.59	1
	1	50	23.44	23.54	23.71	0	22.49	22.83	22.79	1
	1	99	23.09	23.34	23.62	0	22.20	22.75	22.68	1
	50	0	22.58	22.75	23.14	1	21.66	21.78	21.76	2
	50	25	22.59	22.78	22.83	1	21.56	21.62	21.88	2
	50	50	22.46	22.85	22.98	1	21.45	21.82	21.86	2
	100	0	22.54	22.77	22.93	1	21.47	21.69	21.98	2

EIRP Power (dBm)

Modulation Type: QPSK

LTE Band 7, Channel Bandwidth: 5MHz

MODE		TX Channel 20775					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2502.50 (PK)	-25.40	16.10	0.20	16.30	33.00	-16.70
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2502.50 (PK)	-18.30	25.20	0.20	25.40	33.00	-7.60

MODE		TX Channel 21100					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2535.00 (PK)	-25.80	15.90	0.20	16.10	33.00	-16.90
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2535.00 (PK)	-18.80	24.80	0.20	25.00	33.00	-8.00

MODE		TX Channel 21425					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2567.50 (PK)	-26.10	15.90	0.20	16.10	33.00	-16.90
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2567.50 (PK)	-18.80	24.90	0.20	25.10	33.00	-7.90

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

LTE Band 7, Channel Bandwidth: 10MHz

MODE		TX Channel 20800					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2505.00 (PK)	-25.70	15.80	0.20	16.00	33.00	-17.00
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2505.00 (PK)	-18.40	25.10	0.20	25.30	33.00	-7.70

MODE		TX Channel 21100					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2535.00 (PK)	-26.10	15.60	0.20	15.80	33.00	-17.20
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2535.00 (PK)	-18.50	25.10	0.20	25.30	33.00	-7.70

MODE		TX Channel 21400					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2565.00 (PK)	-26.10	15.90	0.20	16.10	33.00	-16.90
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2565.00 (PK)	-18.60	25.10	0.20	25.30	33.00	-7.70

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

LTE Band 7, Channel Bandwidth: 15MHz

MODE		TX Channel 20825					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2507.50 (PK)	-25.60	15.90	0.20	16.10	33.00	-16.90
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2507.50 (PK)	-18.40	25.10	0.20	25.30	33.00	-7.70

MODE		TX Channel 21100					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2535.00 (PK)	-25.90	15.80	0.20	16.00	33.00	-17.00
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2535.00 (PK)	-18.80	24.80	0.20	25.00	33.00	-8.00

MODE		TX Channel 21375					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2562.50 (PK)	-26.40	15.60	0.20	15.80	33.00	-17.20
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2562.50 (PK)	-19.00	24.70	0.20	24.90	33.00	-8.10

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

LTE Band 7, Channel Bandwidth: 20MHz

MODE		TX Channel 20850					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2510.00 (PK)	-25.80	15.70	0.20	15.90	33.00	-17.10
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2510.00 (PK)	-18.80	24.70	0.20	24.90	33.00	-8.10

MODE		TX Channel 21100					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2535.00 (PK)	-25.50	16.20	0.20	16.40	33.00	-16.60
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2535.00 (PK)	-18.30	25.30	0.20	25.50	33.00	-7.50

MODE		TX Channel 21350					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2560.00 (PK)	-26.20	15.70	0.20	15.90	33.00	-17.10
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2560.00 (PK)	-18.50	25.20	0.20	25.40	33.00	-7.60

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

Modulation Type: 16QAM

LTE Band 7, Channel Bandwidth: 5MHz

MODE		TX Channel 20775					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2502.50 (PK)	-26.20	15.30	0.20	15.50	33.00	-17.50
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2502.50 (PK)	-19.70	23.80	0.20	24.00	33.00	-9.00

MODE		TX Channel 21100					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2535.00 (PK)	-26.90	14.80	0.20	15.00	33.00	-18.00
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2535.00 (PK)	-20.00	23.60	0.20	23.80	33.00	-9.20

MODE		TX Channel 21425					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2567.50 (PK)	-27.00	15.00	0.20	15.20	33.00	-17.80
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2567.50 (PK)	-20.00	23.70	0.20	23.90	33.00	-9.10

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

LTE Band 7, Channel Bandwidth: 10MHz

MODE		TX Channel 20800					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2505.00 (PK)	-26.70	14.80	0.20	15.00	33.00	-18.00
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2505.00 (PK)	-19.60	23.90	0.20	24.10	33.00	-8.90

MODE		TX Channel 21100					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2535.00 (PK)	-27.10	14.60	0.20	14.80	33.00	-18.20
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2535.00 (PK)	-19.60	24.00	0.20	24.20	33.00	-8.80

MODE		TX Channel 21400					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2565.00 (PK)	-27.20	14.80	0.20	15.00	33.00	-18.00
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2565.00 (PK)	-19.50	24.20	0.20	24.40	33.00	-8.60

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

LTE Band 7, Channel Bandwidth: 15MHz

MODE		TX Channel 20825					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2507.50 (PK)	-26.70	14.80	0.20	15.00	33.00	-18.00
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2507.50 (PK)	-19.50	24.00	0.20	24.20	33.00	-8.80

MODE		TX Channel 21100					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2535.00 (PK)	-26.90	14.80	0.20	15.00	33.00	-18.00
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2535.00 (PK)	-20.00	23.60	0.20	23.80	33.00	-9.20

MODE		TX Channel 21375					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2562.50 (PK)	-27.30	14.70	0.20	14.90	33.00	-18.10
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2562.50 (PK)	-19.90	23.80	0.20	24.00	33.00	-9.00

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

LTE Band 7, Channel Bandwidth: 20MHz

MODE		TX Channel 20850					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2510.00 (PK)	-26.90	14.60	0.20	14.80	33.00	-18.20
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2510.00 (PK)	-19.70	23.80	0.20	24.00	33.00	-9.00

MODE		TX Channel 21100					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2535.00 (PK)	-26.30	15.40	0.20	15.60	33.00	-17.40
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2535.00 (PK)	-19.20	24.40	0.20	24.60	33.00	-8.40

MODE		TX Channel 21350					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2560.00 (PK)	-27.10	14.80	0.20	15.00	33.00	-18.00
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	2560.00 (PK)	-19.60	24.10	0.20	24.30	33.00	-8.70

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

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

N/A

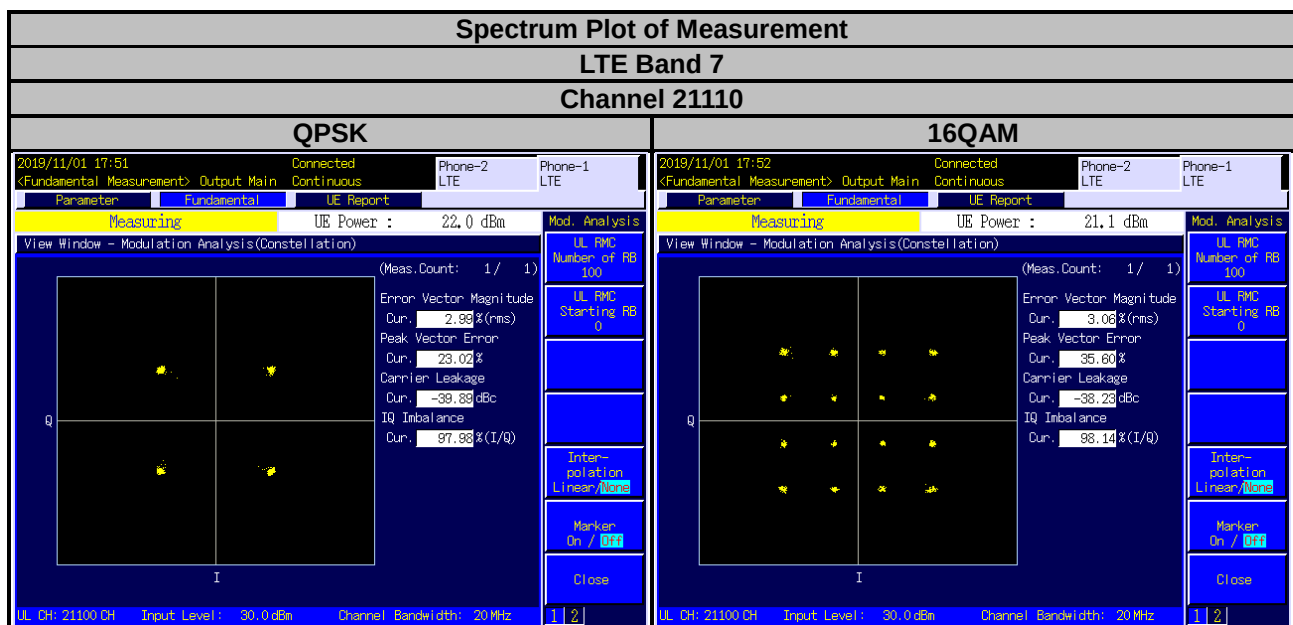
4.2.2 Test Setup



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

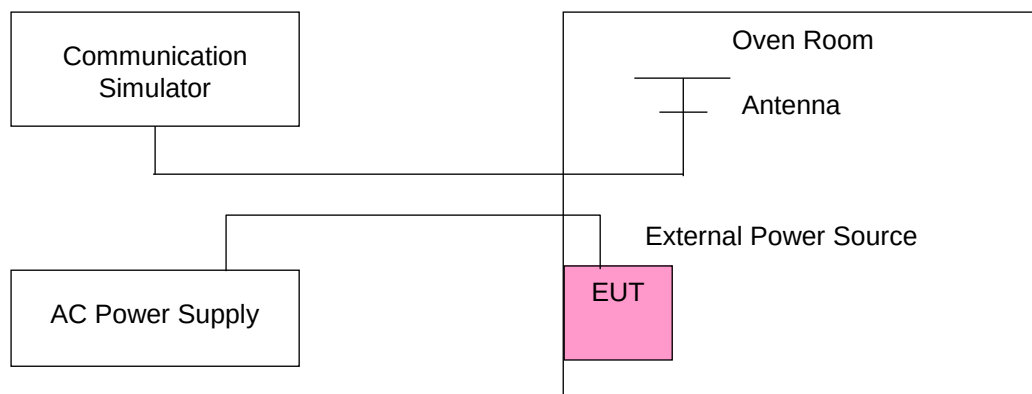
According to the FCC part 2.1055 shall be tested the frequency stability. The rule is defined that "The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block." The test extreme voltage is according to the 2.1055(d)(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment and the extreme temperature rule is comply with specification of EUT $-30^{\circ}\text{C} \sim 50^{\circ}\text{C}$.

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 $\pm 0.5^{\circ}\text{C}$ during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

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

4.3.3 Test Setup



4.3.4 Test Results

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 7			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
102	2502.500002	0.001	2567.500002	0.001
120	2502.500001	0.000	2567.500003	0.001
138	2502.500003	0.001	2567.500001	0.001

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 7			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	2502.500001	0.001	2567.500003	0.001
-20	2502.500004	0.002	2567.500001	0.000
-10	2502.500004	0.001	2567.500002	0.001
0	2502.500003	0.001	2567.500003	0.001
10	2502.500004	0.001	2567.500001	0.000
20	2502.499997	-0.001	2567.499998	-0.001
30	2502.499998	-0.001	2567.499998	-0.001
40	2502.499997	-0.001	2567.499997	-0.001
50	2502.499998	-0.001	2567.499997	-0.001

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 7			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
102	2505.000001	0.001	2565.000001	0.001
120	2505.000003	0.001	2565.000003	0.001
138	2505.000003	0.001	2565.000004	0.001

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 7			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	2505.000003	0.001	2565.000003	0.001
-20	2505.000001	0.000	2565.000001	0.001
-10	2505.000001	0.000	2565.000004	0.001
0	2505.000002	0.001	2565.000003	0.001
10	2505.000002	0.001	2565.000003	0.001
20	2504.999996	-0.002	2564.999996	-0.001
30	2504.999999	-0.001	2564.999999	-0.001
40	2504.999999	0.000	2564.999999	-0.001
50	2504.999998	-0.001	2564.999999	-0.001

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 7			
	Channel Bandwidth: 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
102	2507.500003	0.001	2562.500002	0.001
120	2507.500001	0.000	2562.500003	0.001
138	2507.500002	0.001	2562.500002	0.001

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 7			
	Channel Bandwidth: 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	2507.500002	0.001	2562.500001	0.001
-20	2507.500001	0.001	2562.500003	0.001
-10	2507.500003	0.001	2562.500002	0.001
0	2507.500003	0.001	2562.500003	0.001
10	2507.500004	0.002	2562.500002	0.001
20	2507.499999	-0.001	2562.499998	-0.001
30	2507.499998	-0.001	2562.499998	-0.001
40	2507.499999	-0.001	2562.499997	-0.001
50	2507.499996	-0.002	2562.499997	-0.001

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 7			
	Channel Bandwidth: 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
102	2510.000003	0.001	2560.000002	0.001
120	2510.000004	0.001	2560.000001	0.000
138	2510.000004	0.002	2560.000003	0.001

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 7			
	Channel Bandwidth: 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	2510.000004	0.001	2560.000004	0.002
-20	2510.000004	0.001	2560.000001	0.001
-10	2510.000002	0.001	2560.000002	0.001
0	2510.000003	0.001	2560.000004	0.001
10	2510.000003	0.001	2560.000003	0.001
20	2509.999998	-0.001	2559.999999	0.000
30	2509.999996	-0.001	2559.999996	-0.002
40	2509.999998	-0.001	2559.999999	0.000
50	2509.999998	-0.001	2559.999997	-0.001

4.4 Occupied Bandwidth Measurement

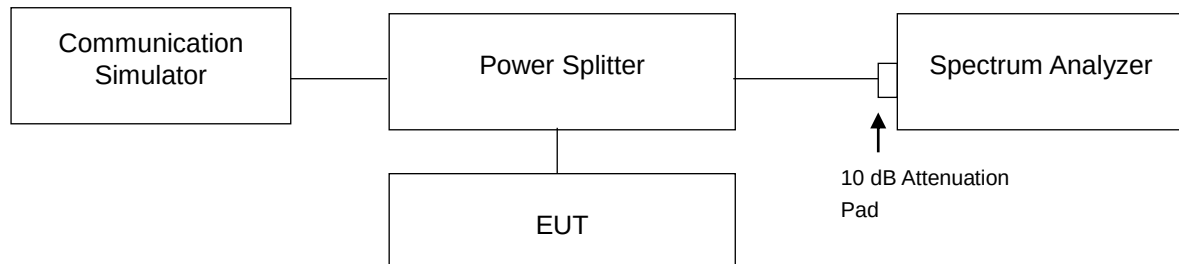
4.4.1 Limits of Occupied Bandwidth Measurement

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

4.4.2 Test Procedure

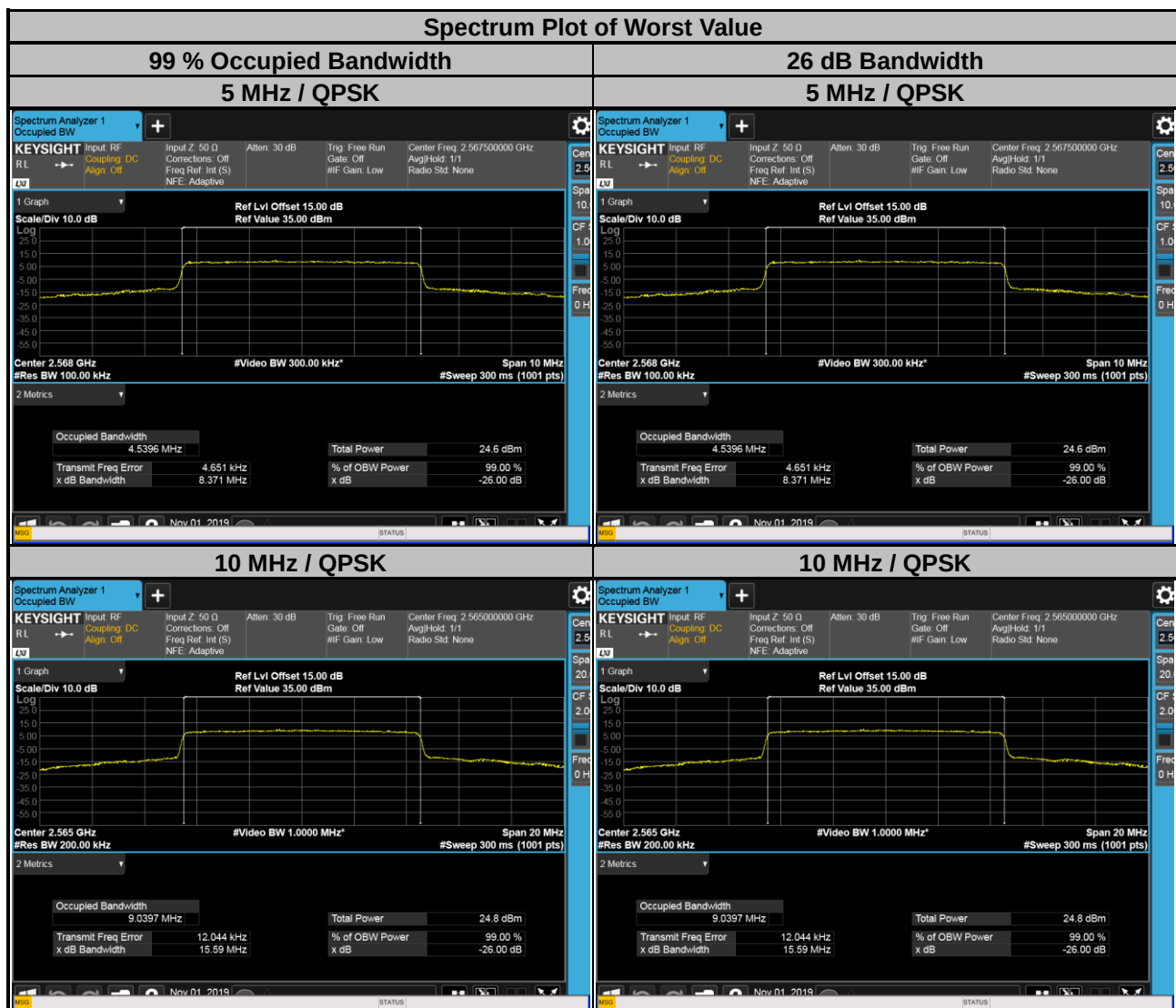
- The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
- Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

4.4.3 Test Setup

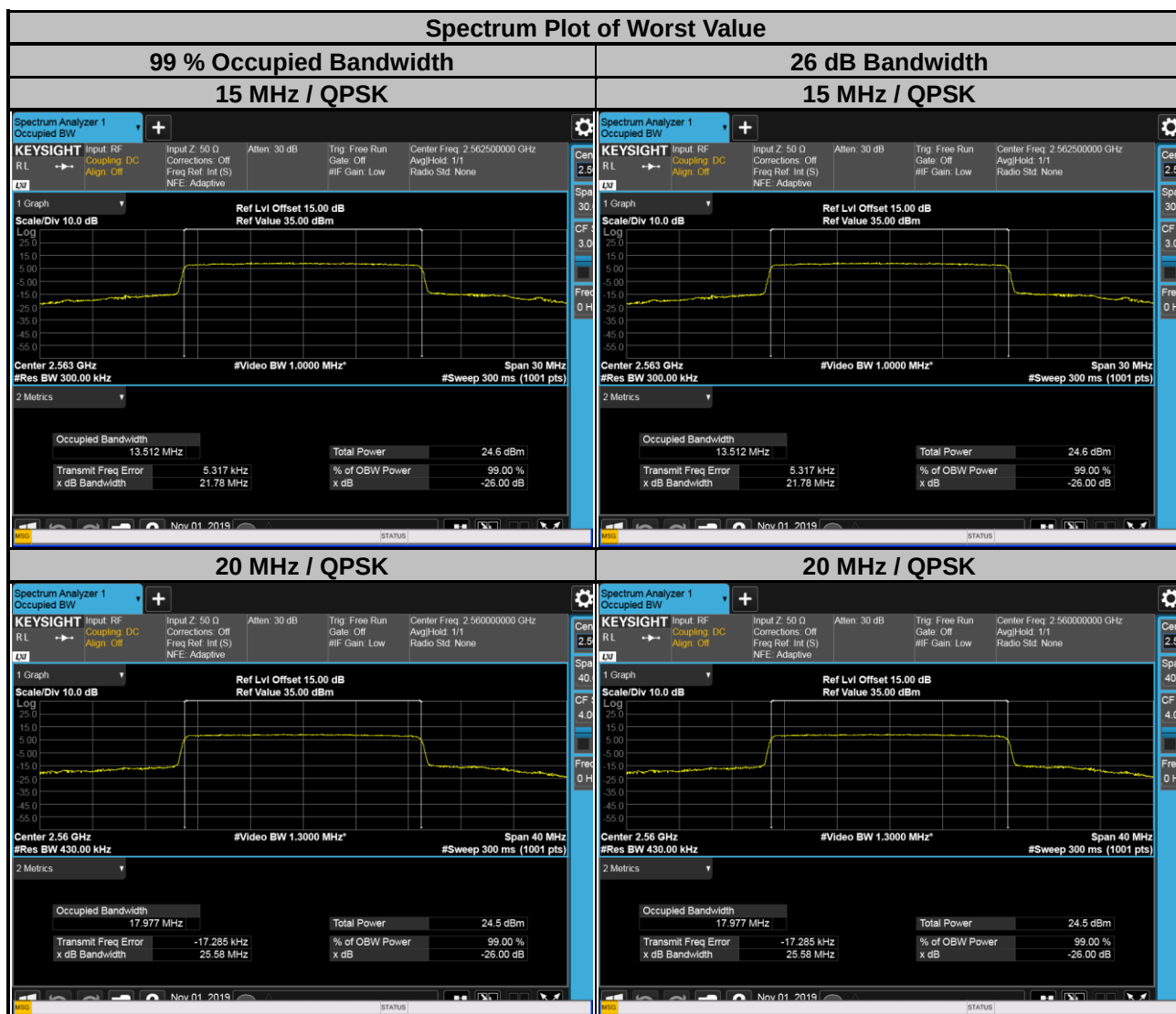


4.4.4 Test Results

LTE Band 7					
Channel Bandwidth: 5 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
20775	2502.5	4.4955	4.4938	4.885	4.892
21100	2535.0	4.4889	4.4909	4.850	4.849
21425	2567.5	4.5396	4.5179	8.371	7.629
Channel Bandwidth: 10 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
20800	2505.0	8.9558	8.9535	9.541	9.534
21100	2535.0	8.9557	8.9552	9.540	9.535
21400	2565.0	9.0397	8.9810	15.59	10.63



LTE Band 7					
Channel Bandwidth: 15 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
20825	2507.5	13.434	13.412	14.28	14.23
21100	2535.0	13.449	13.422	14.31	14.27
21375	2562.5	13.512	13.453	21.78	15.83
Channel Bandwidth: 20 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
20850	2510.0	17.887	17.891	19.03	19.01
21100	2535.0	17.899	17.900	19.06	19.01
21350	2560.0	17.977	17.963	25.58	19.09



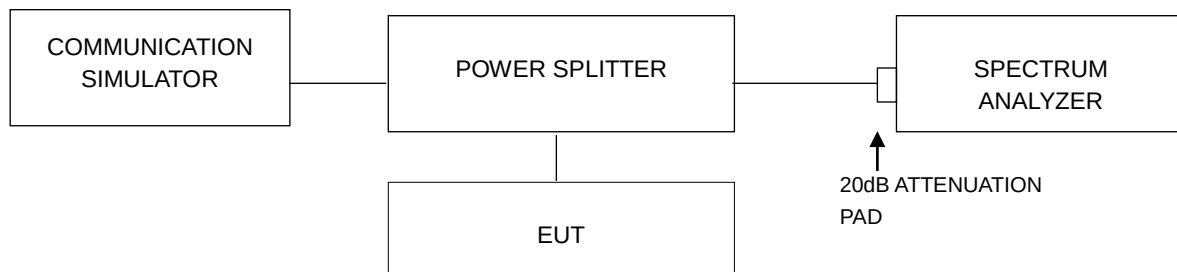
4.5 Out-of-Band Emissions Measurement

4.5.1 Limits of Out-of-Band Emissions Measurement

For LTE Band 7

According to FCC 27.53(m)(4) specified that power of any emission outside of the channel edge must be attenuated below the transmitting power (P) by a factor shall be not less than $40 + 10 \log (P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log (P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log (P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth. In addition, the attenuation factor shall not be less that $43 + 10 \log (P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log (P)$ dB at or below 2490.5 MHz. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the 1 megahertz band is 2495-2496 MHz, in which case a resolution bandwidth of at least one percent may be employed.

4.5.2 Test Setup



4.5.3 Test Procedures

- The EUT was set up for the rated peak power. The power was measured with Spectrum Analyzer. All measurements were done at 2 channels: low and high operational frequency range.
- The Out-of-Band Emissions measurement procedure refer 27.53(m)(6).
- Record the max trace plot into the test report.

Channel Bandwidth: 10MHz

Channel 20800
(2505MHz)

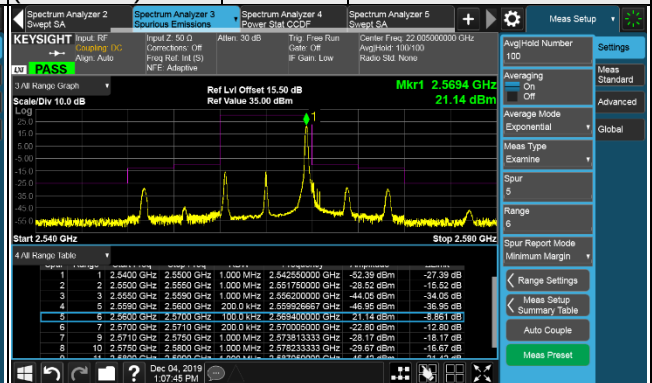
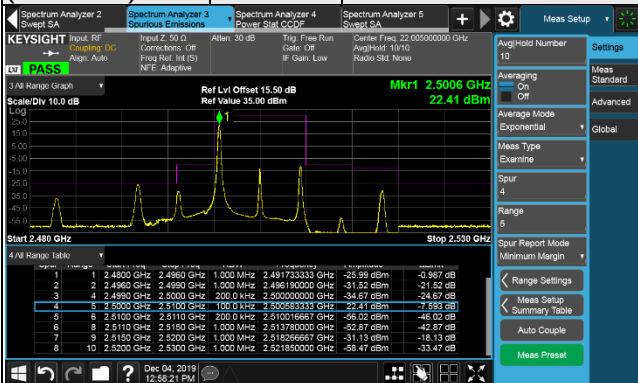
QPSK

1 RB / 0 RB Offset

Channel 21400
(2565MHz)

QPSK

1 RB / 49RB Offset



Channel 20800
(2505MHz)

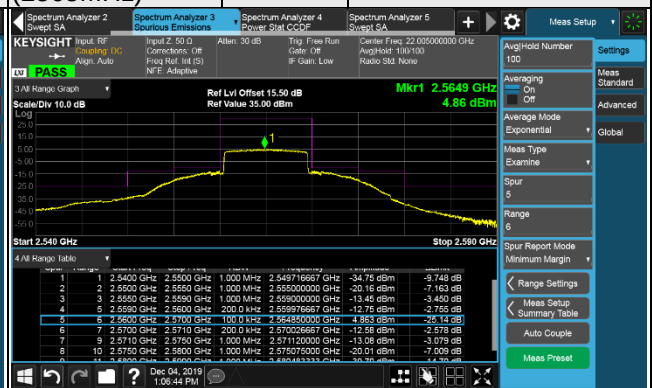
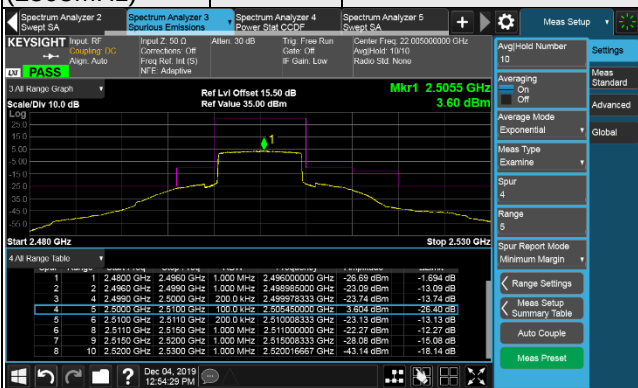
QPSK

50 RB / 0 RB Offset

Channel 21400
(2565MHz)

QPSK

50 RB / 0 RB Offset

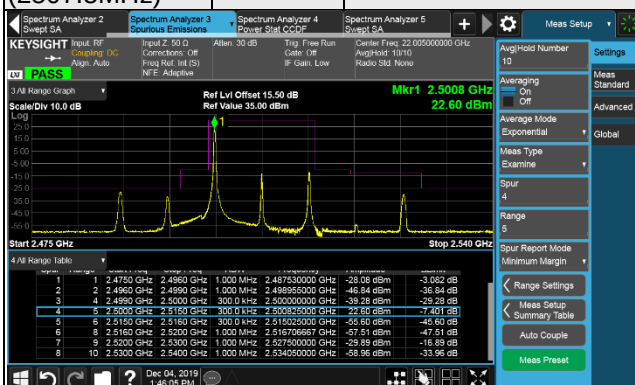


Channel Bandwidth: 15MHz

Channel 20825
(2507.5MHz)

QPSK

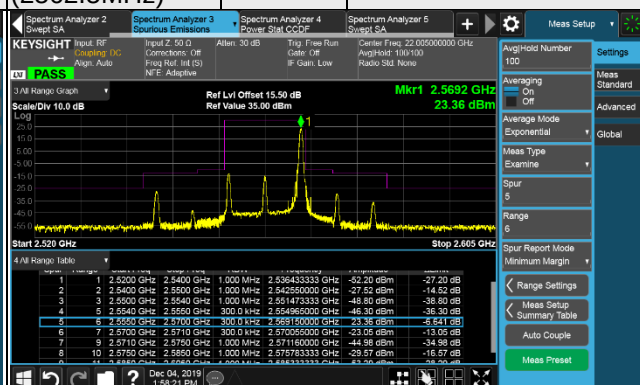
1 RB / 0 RB Offset



Channel 21375
(2562.5MHz)

QPSK

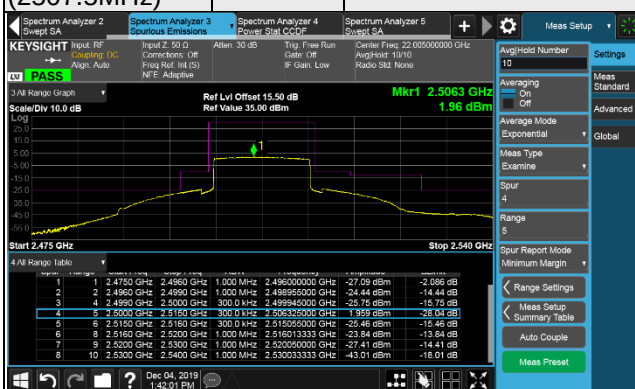
1 RB / 74RB Offset



Channel 20825
(2507.5MHz)

QPSK

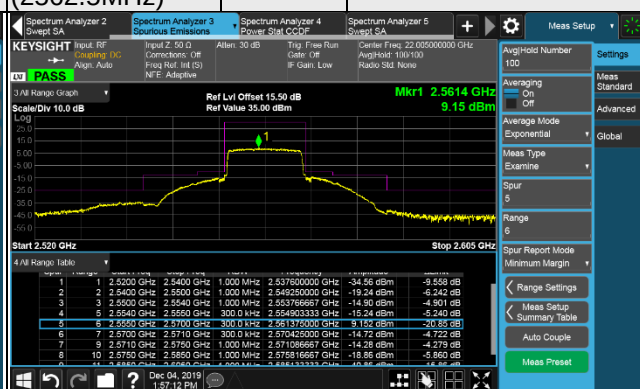
75 RB / 0 RB Offset



Channel 21375
(2562.5MHz)

QPSK

75 RB / 0 RB Offset



Channel Bandwidth: 20MHz

Channel 20850
(2510MHz)

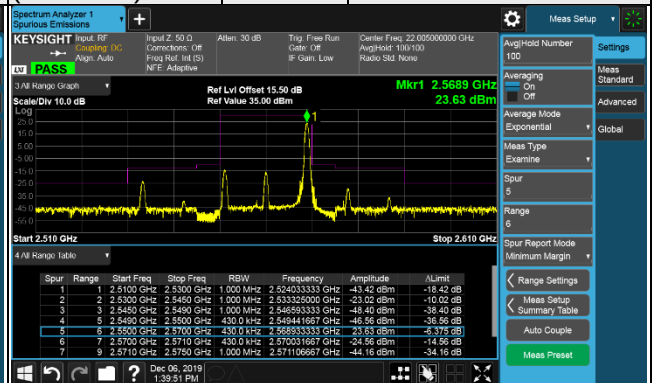
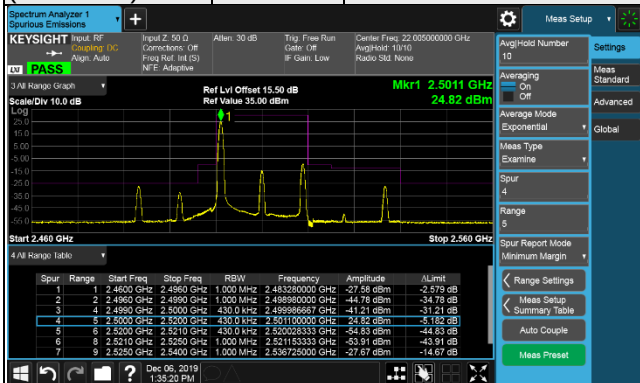
QPSK

1 RB / 0 RB Offset

Channel 21350
(2560MHz)

QPSK

1 RB / 99RB Offset



Channel 20850
(2510MHz)

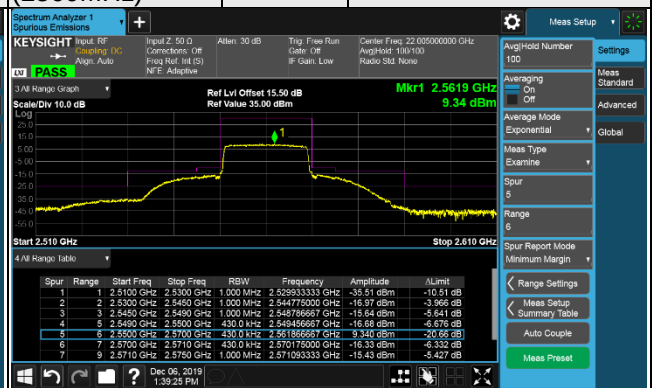
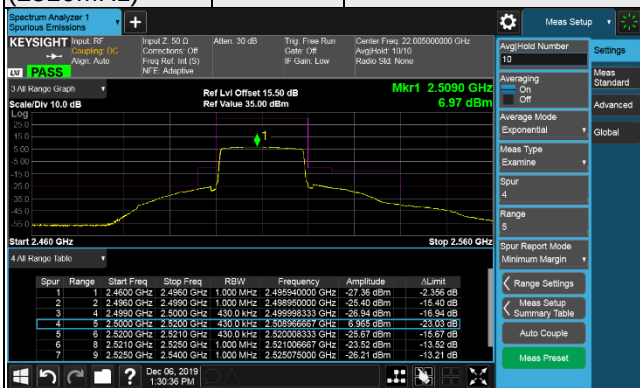
QPSK

100 RB / 0 RB Offset

Channel 21350
(2560MHz)

QPSK

100 RB / 0 RB Offset

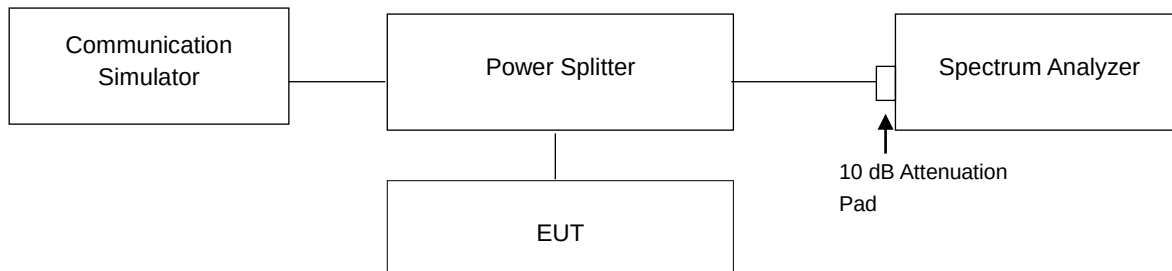


4.6 Peak to Average Ratio

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

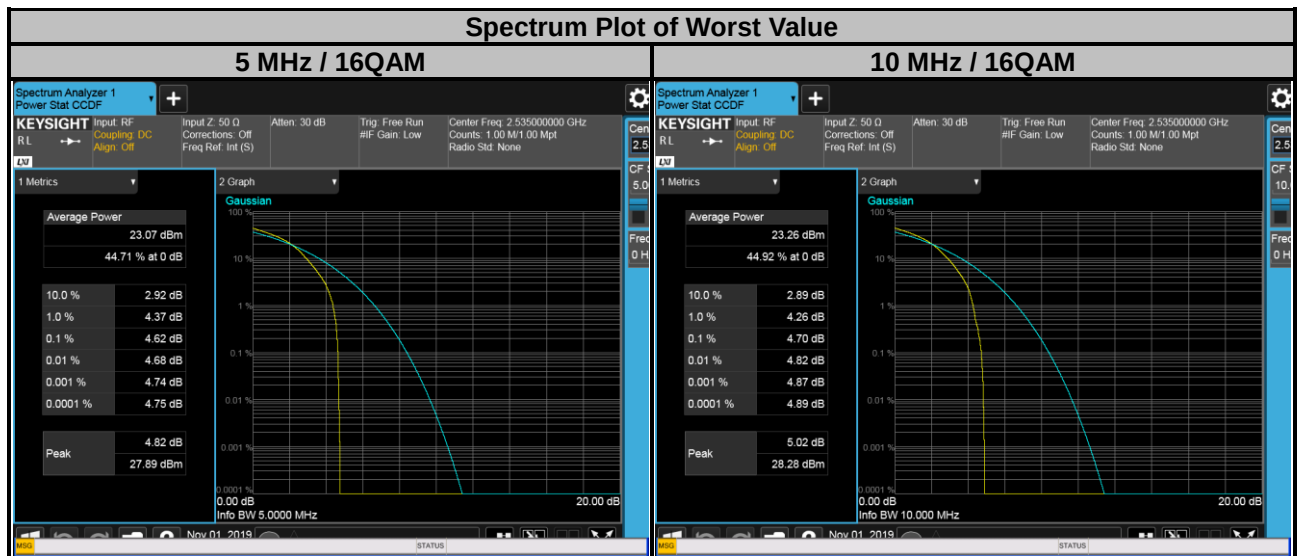


4.6.3 Test Procedures

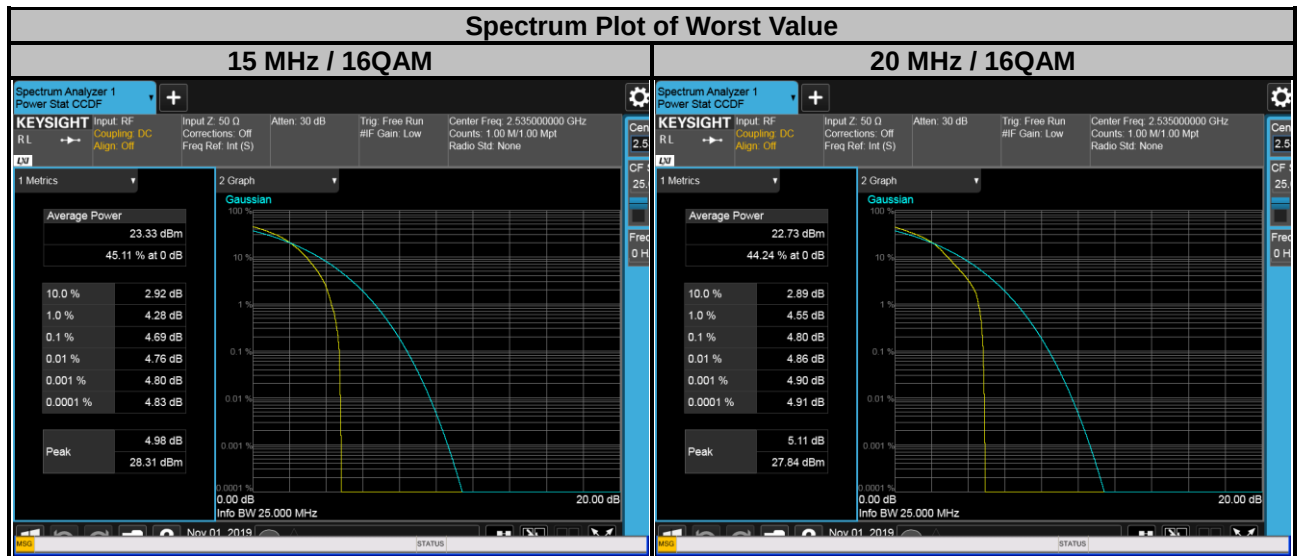
1. Set resolution/measurement bandwidth $\geq$ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1 %.

4.6.4 Test Results

LTE Band 7							
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
20775	2502.5	3.07	4.10	20800	2505.0	3.06	4.00
21100	2535.0	3.34	4.62	21100	2535.0	3.38	4.70
21425	2567.5	2.28	3.96	21400	2565.0	3.49	4.14



LTE Band 7							
Channel Bandwidth: 15 MHz				Channel Bandwidth: 20 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
20825	2507.5	3.02	3.95	20850	2510.0	3.11	4.00
21100	2535.0	3.39	4.69	21100	2535.0	3.48	4.80
21375	2562.5	3.55	4.36	21350	2560.0	3.34	4.73

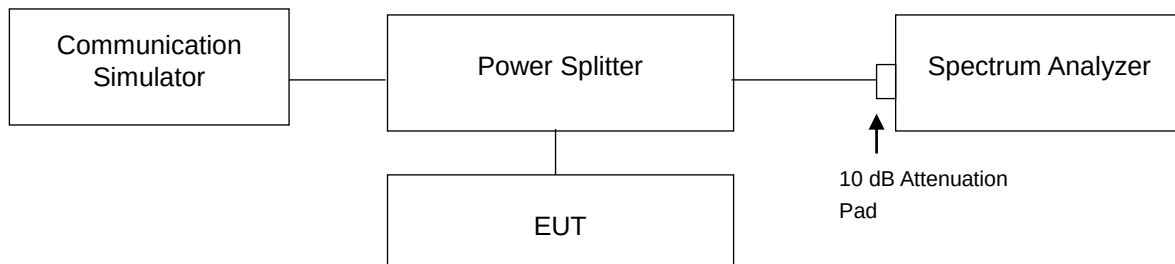


4.7 Conducted Spurious Emissions

4.7.1 Limits of Conducted Spurious Emissions Measurement

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $55 + 10 \log (P)$ dB. The limit of emission is equal to -25 dBm.

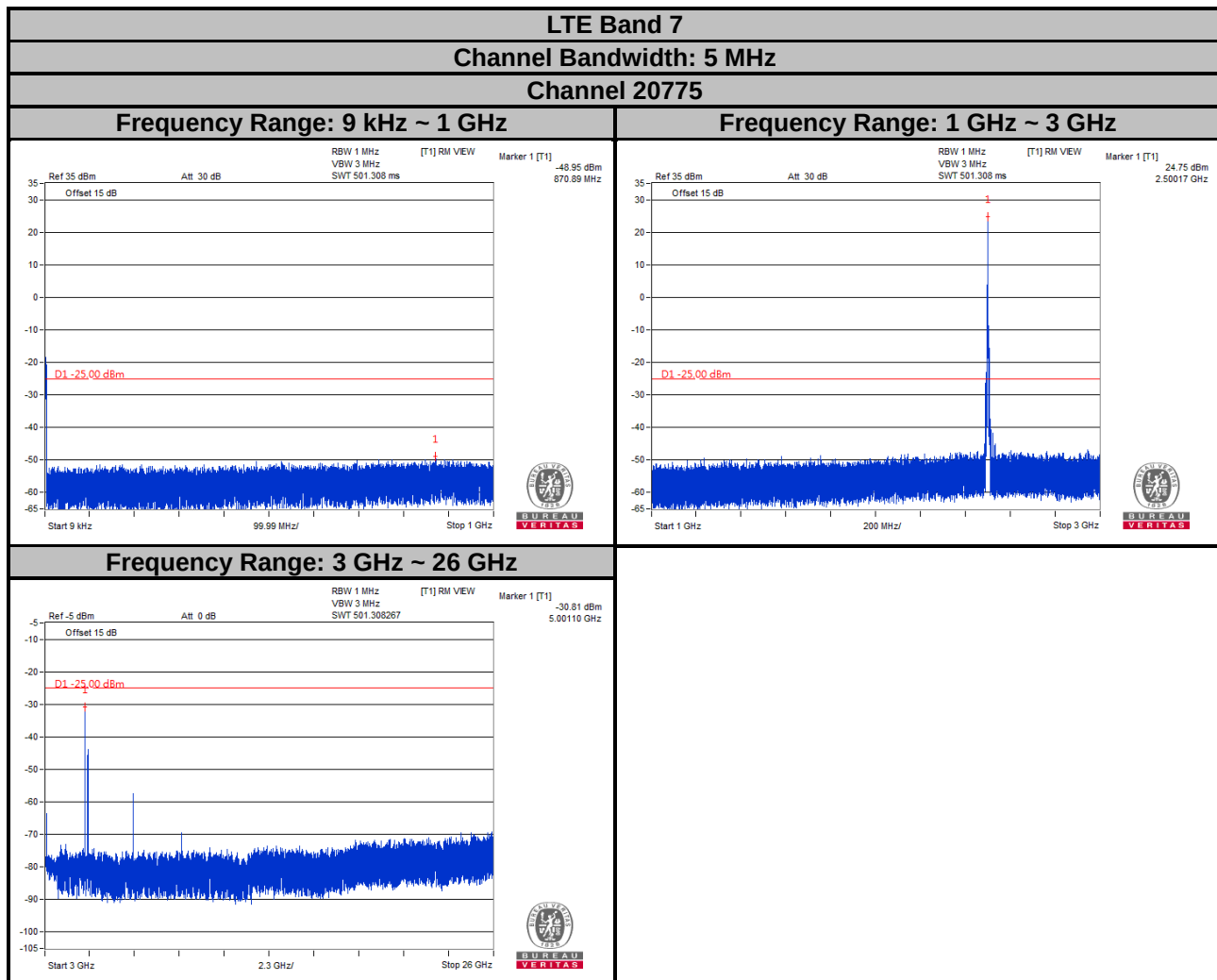
4.7.2 Test Setup



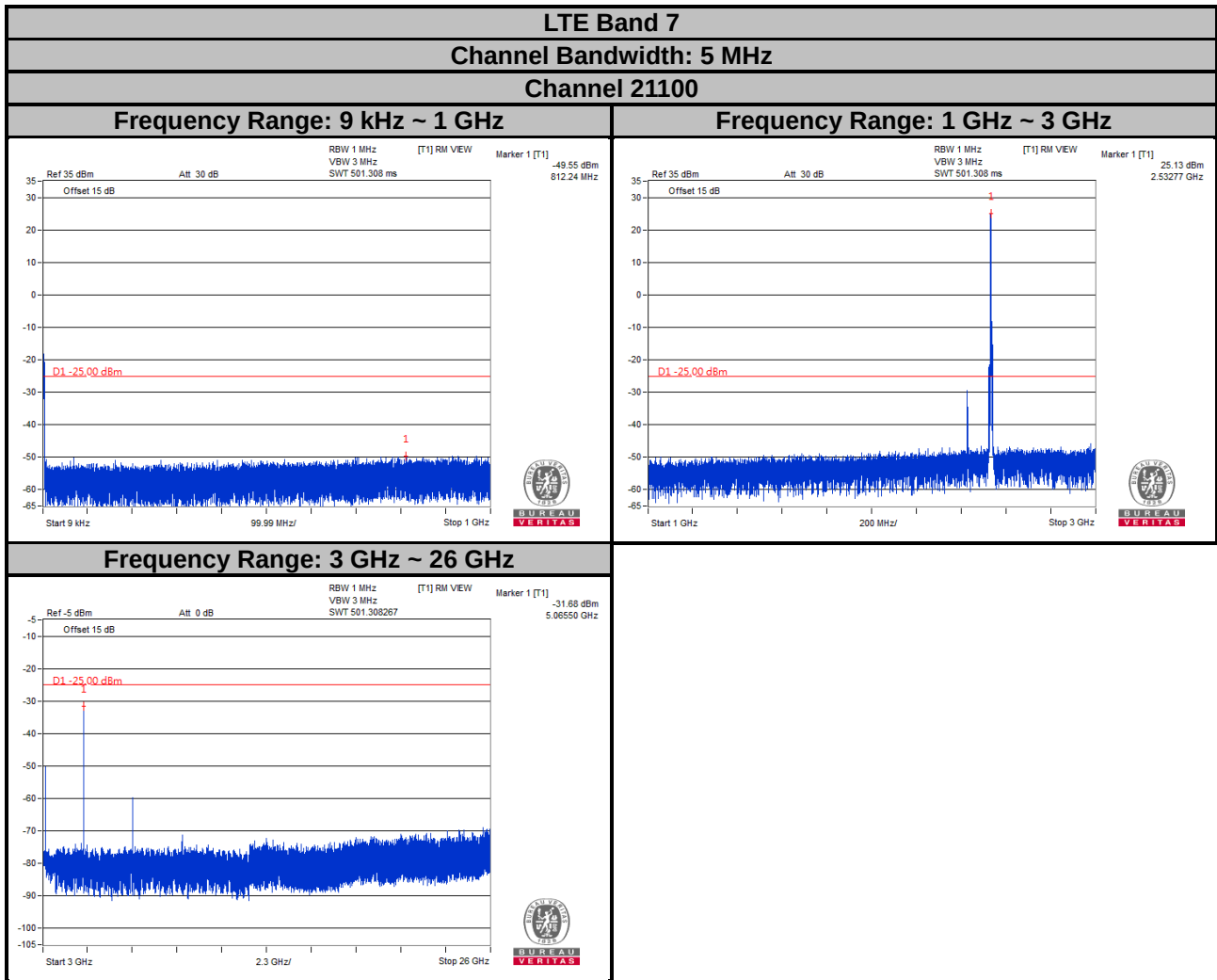
4.7.3 Test Procedure

- The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
- Measuring frequency range is from 9 kHz to 1 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 1 MHz and VBW = 3 MHz are used for conducted emission measurement.
- Measuring frequency range is from 1 GHz to 26 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 1 MHz and VBW = 3 MHz are used for conducted emission measurement.

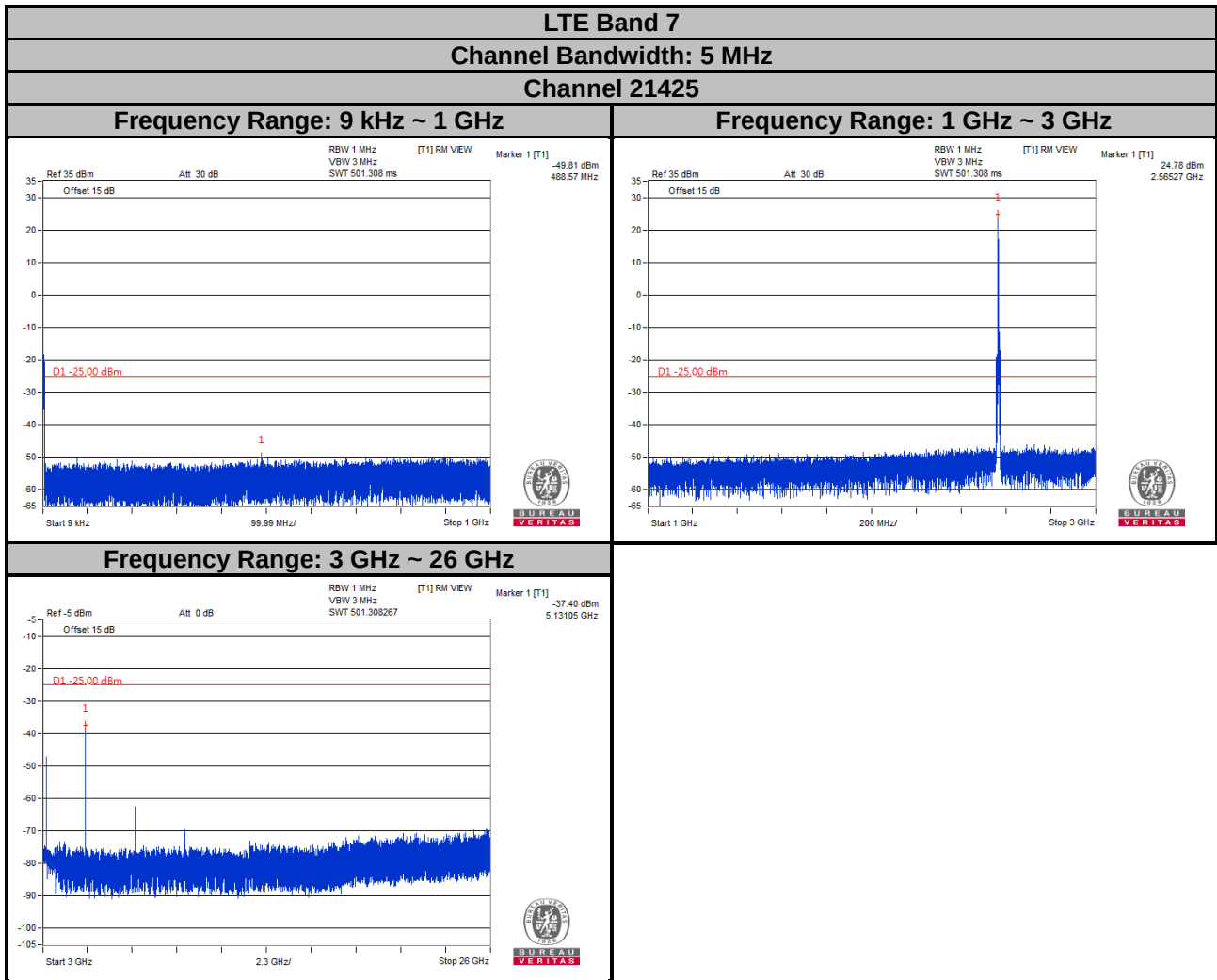
4.7.4 Test Results



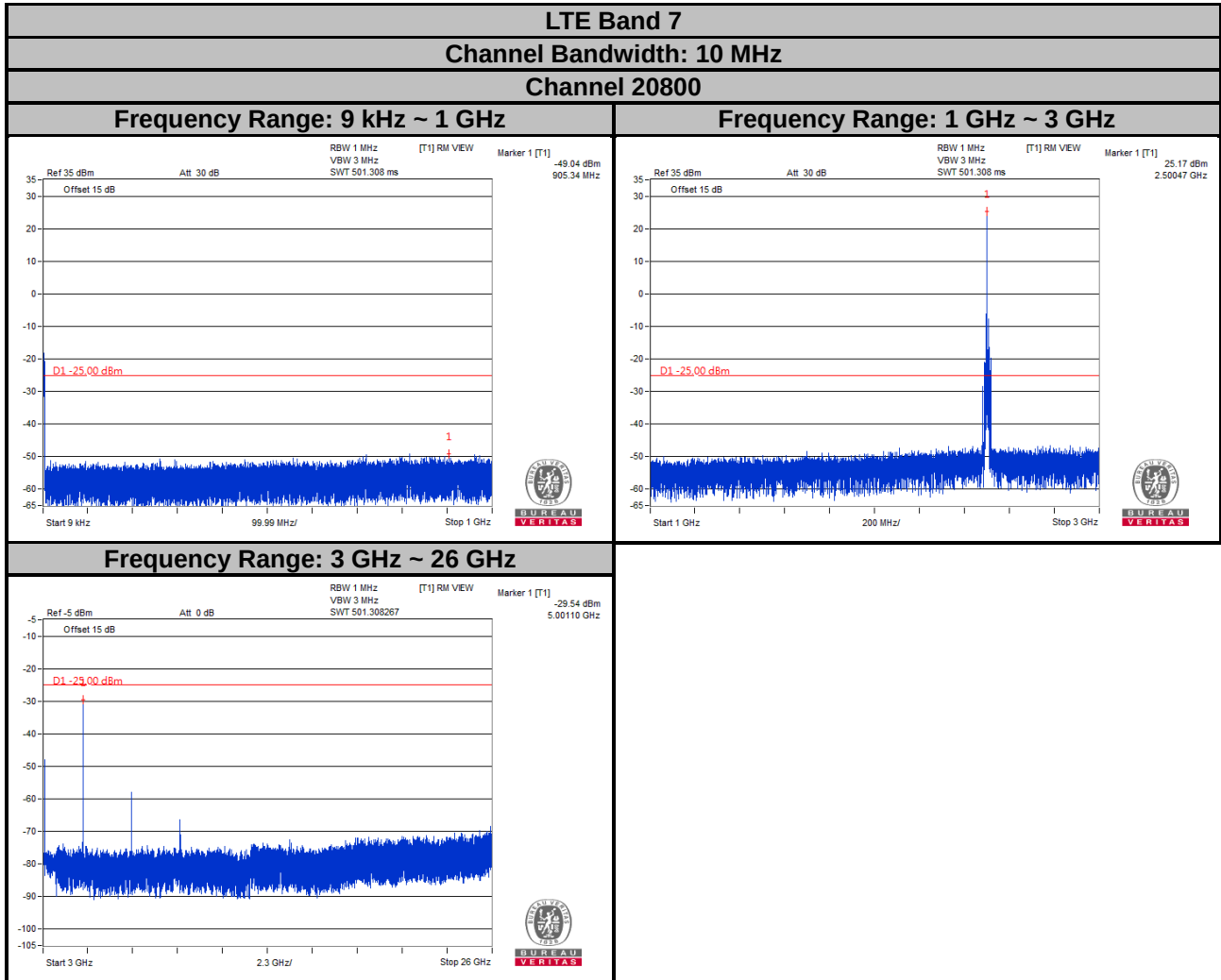
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



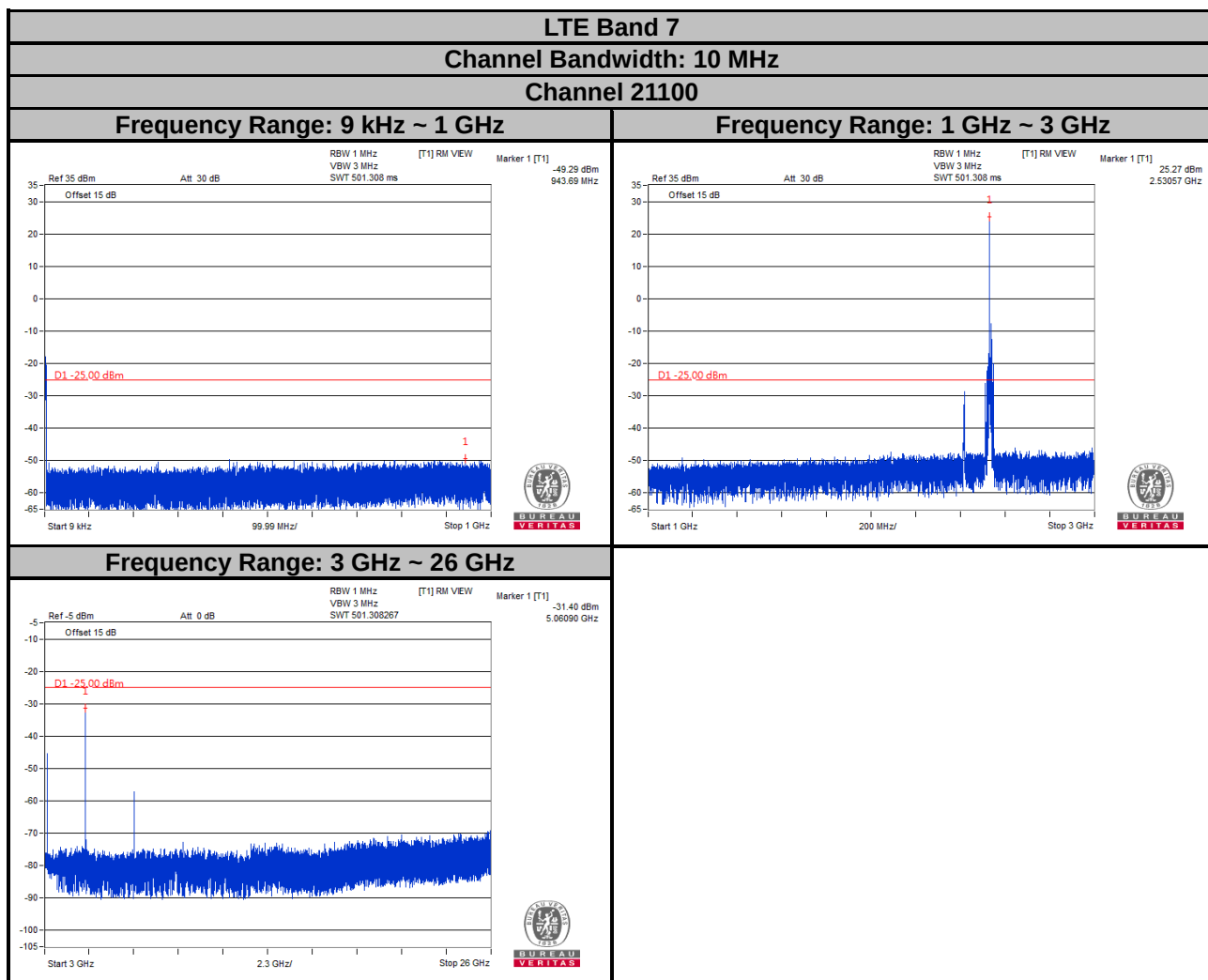
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



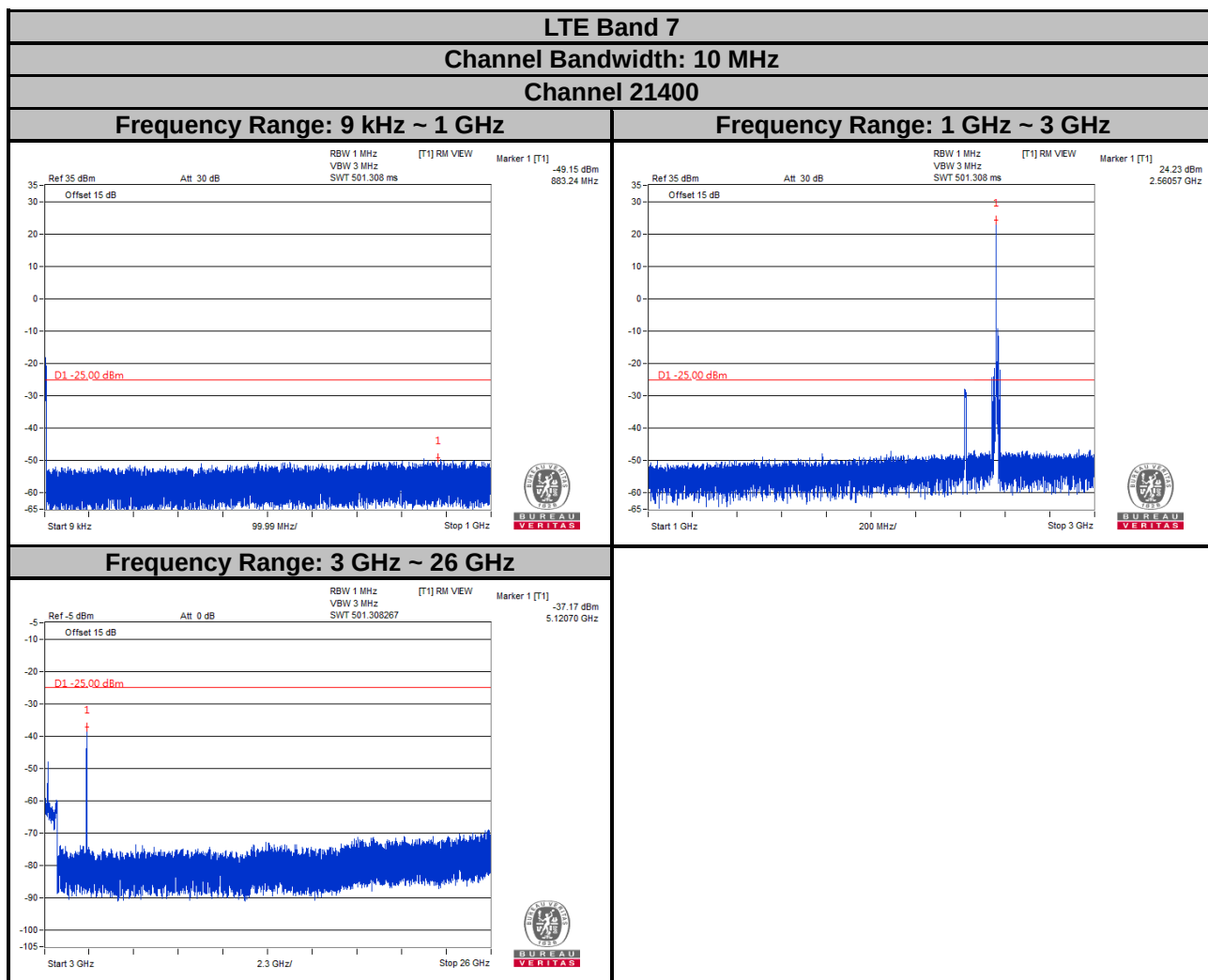
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



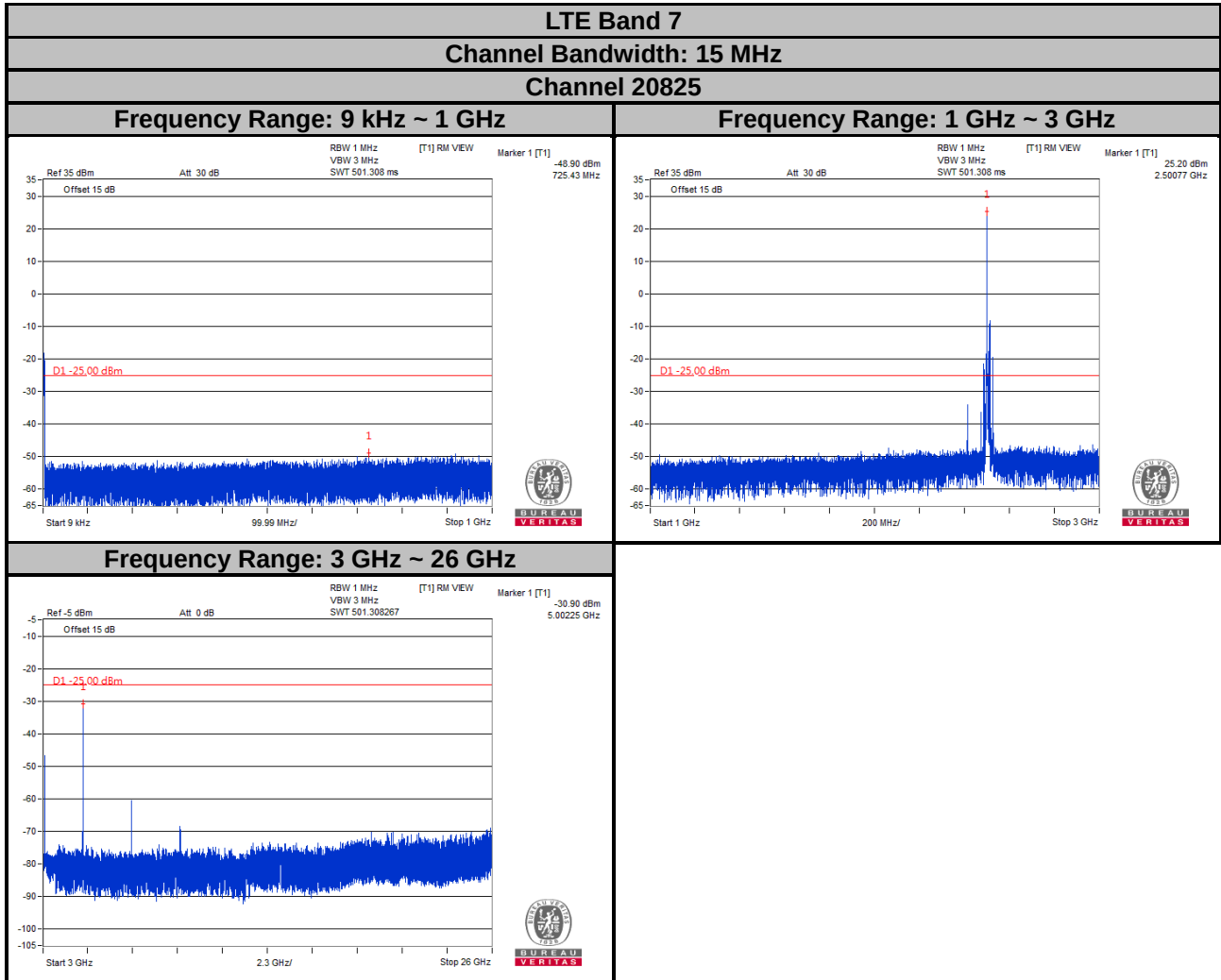
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



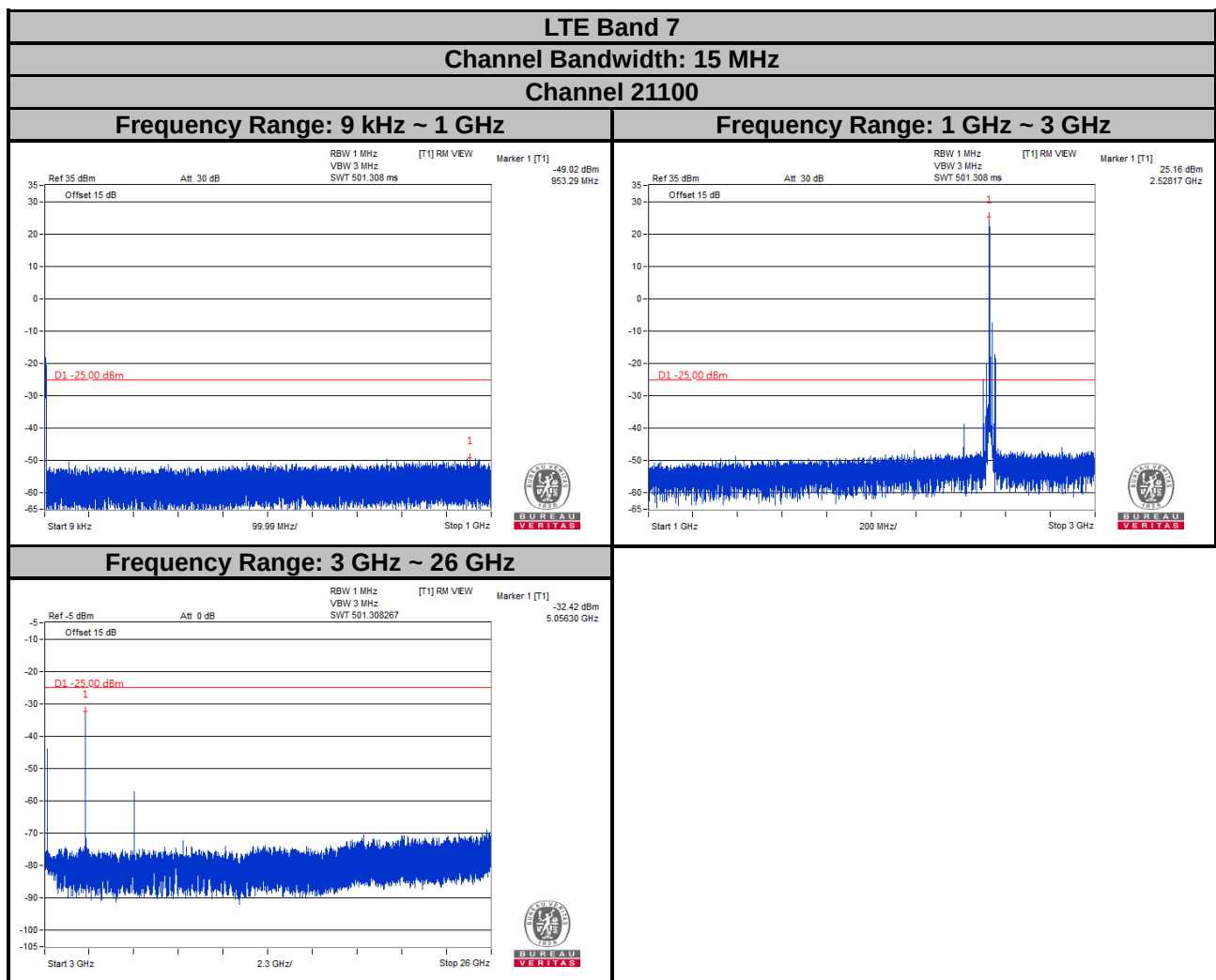
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



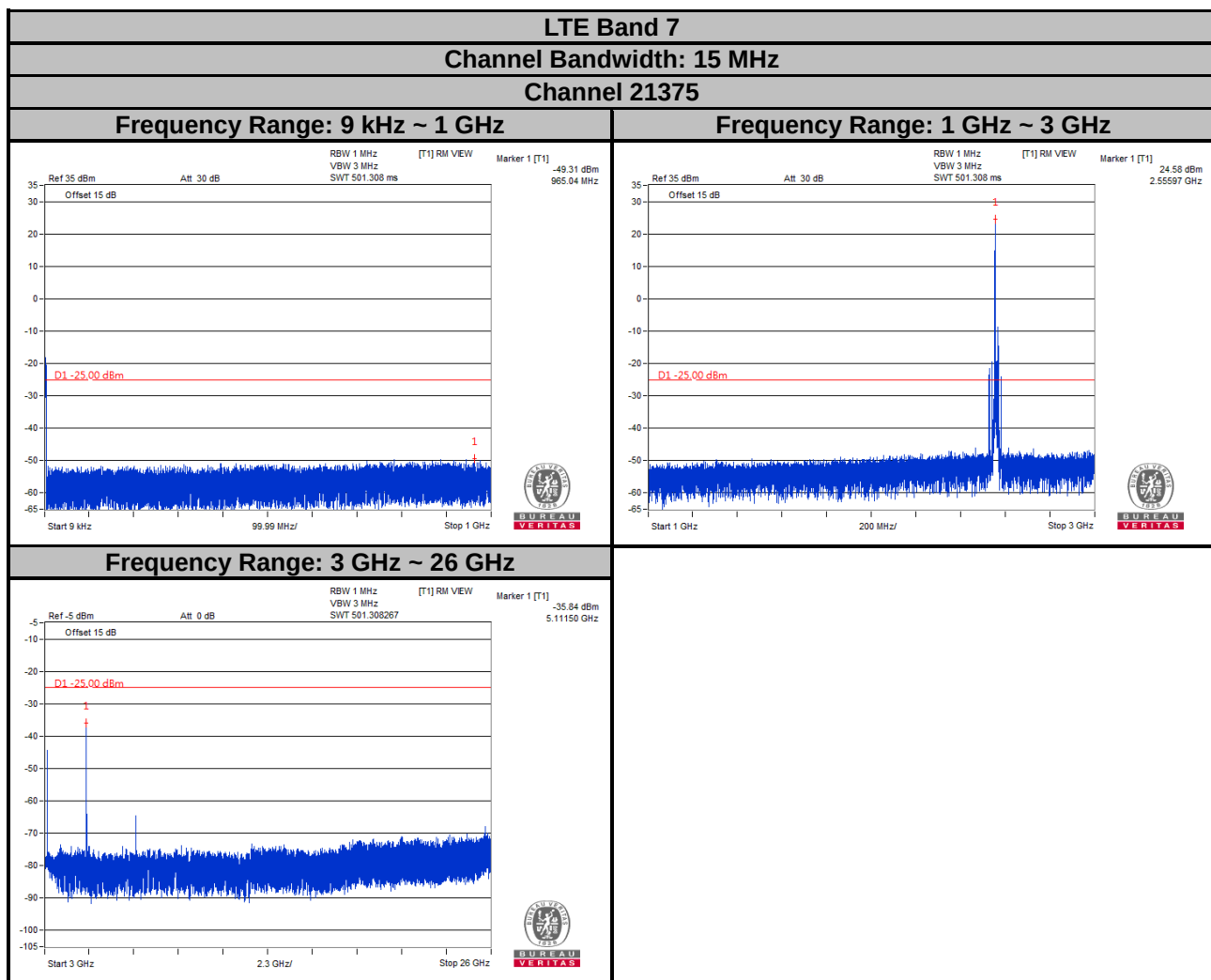
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



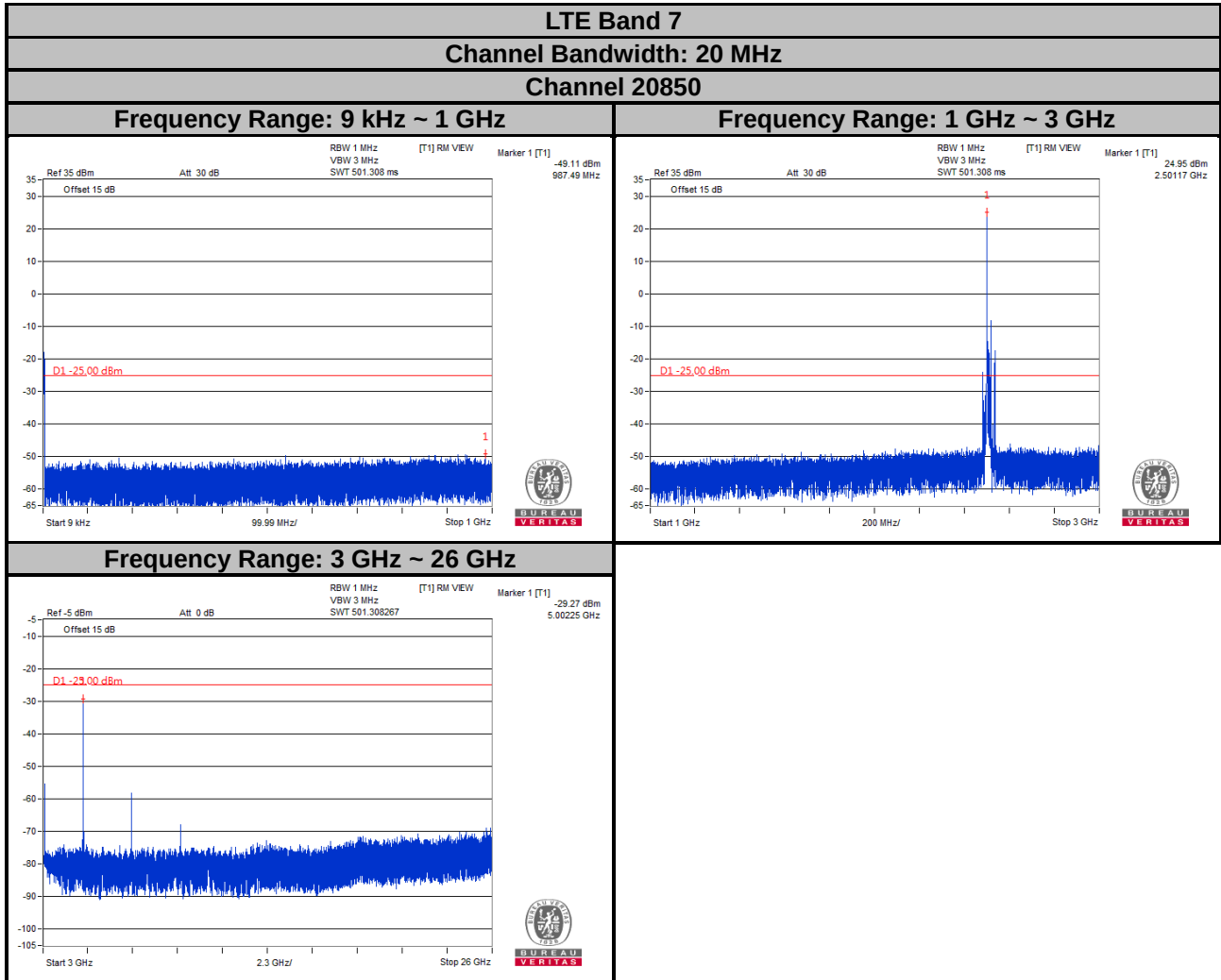
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



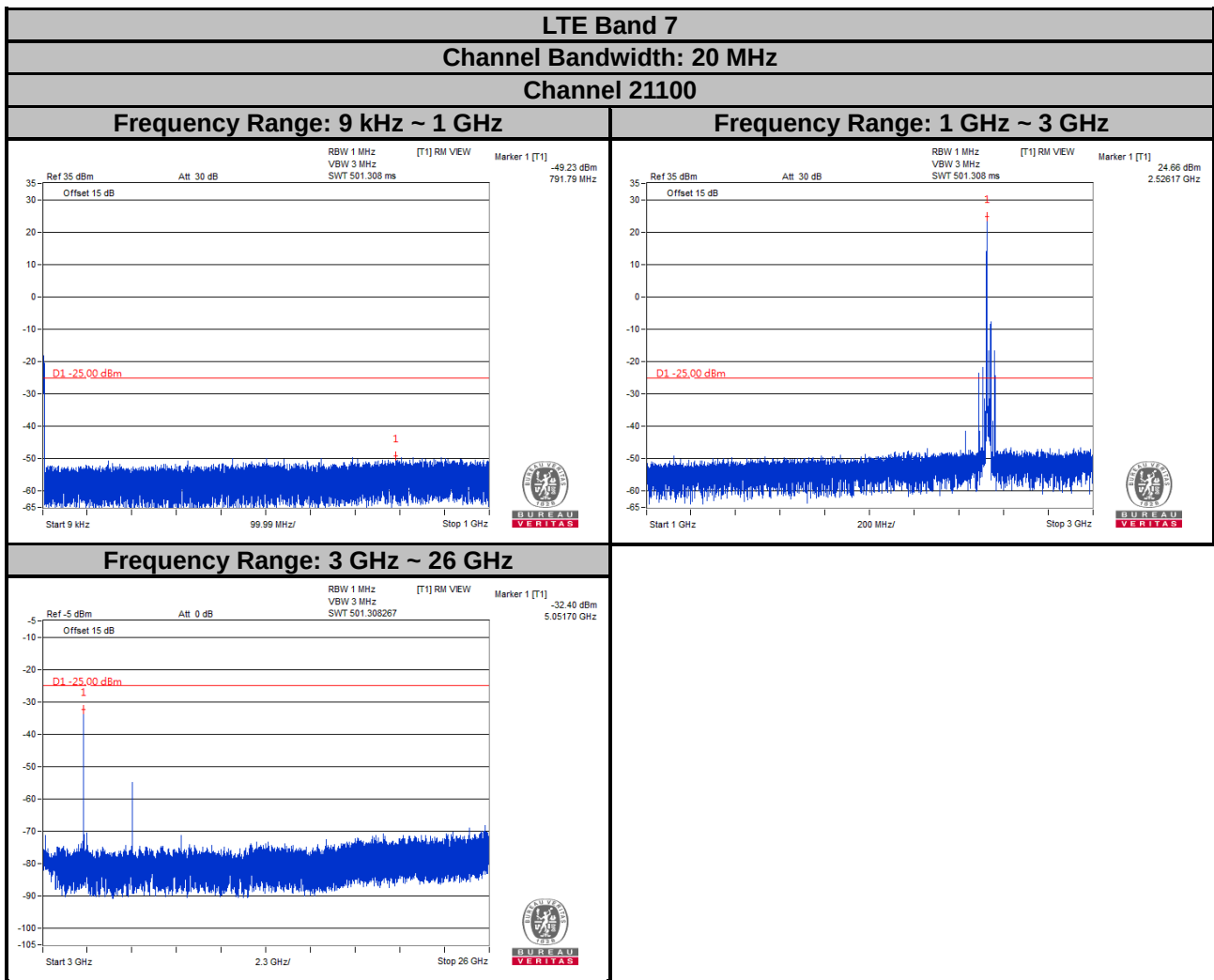
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



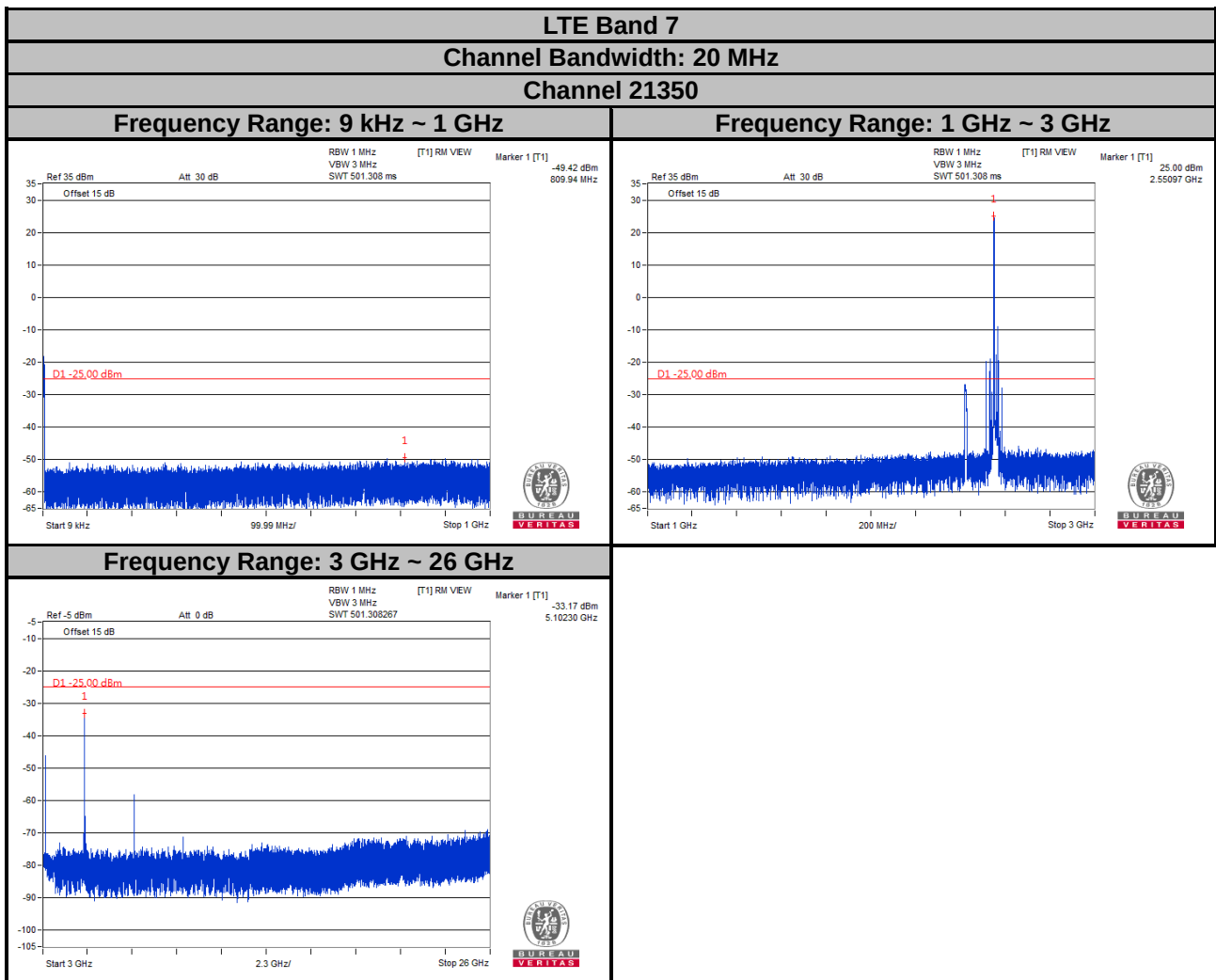
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



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



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



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

4.8 Radiated Emission Measurement

4.8.1 Limits of Radiated Emission Measurement

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $55 + 10 \log (P)$ dB. The limit of emission is equal to -25 dBm.

4.8.2 Test Procedure

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

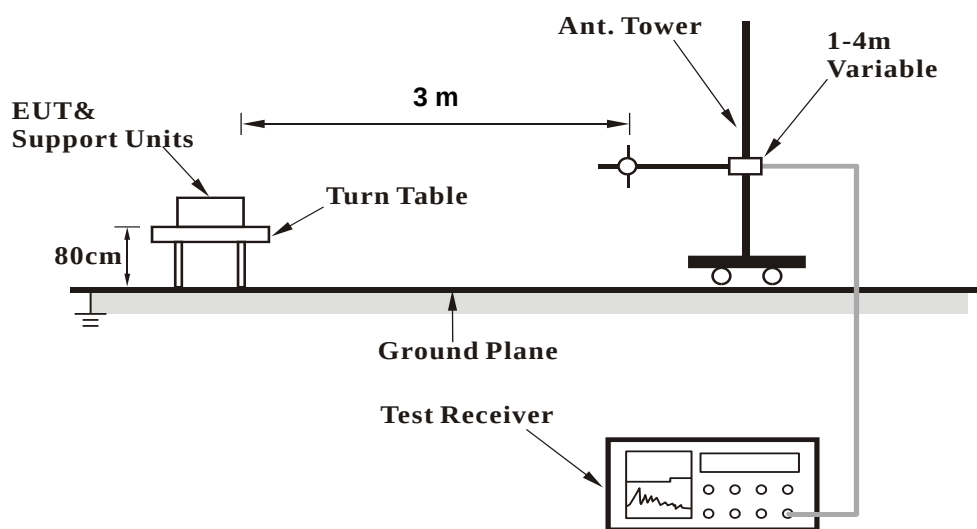
NOTE: The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

4.8.3 Deviation from Test Standard

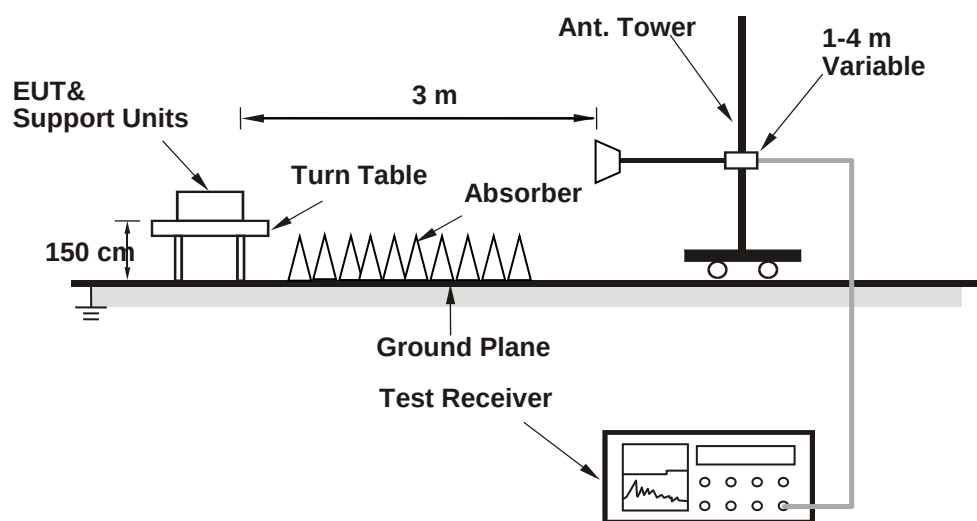
No deviation.

4.8.4 Test Setup

<Radiated Emission below or equal 1 GHz>



<Radiated Emission above 1 GHz>



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

4.8.5 Test Results

Below 1GHz

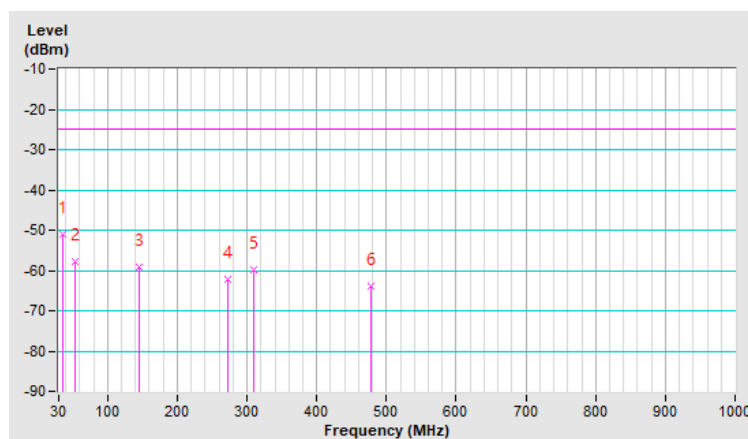
LTE Band 7, Channel Bandwidth: 5MHz

Mode	TX channel 20775 (2502.5MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 68%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)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	36.79	-54.5	-35.9	-15.2	-51.1	-25.0	-26.1
2	54.25	-55.8	-52.1	-5.7	-57.8	-25.0	-32.8
3	145.43	-54.2	-56.0	-3.1	-59.1	-25.0	-34.1
4	272.5	-58.0	-60.8	-1.5	-62.3	-25.0	-37.3
5	309.36	-55.5	-63.6	3.9	-59.7	-25.0	-34.7
6	478.14	-63.8	-67.6	3.7	-63.9	-25.0	-38.9

Remarks:

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

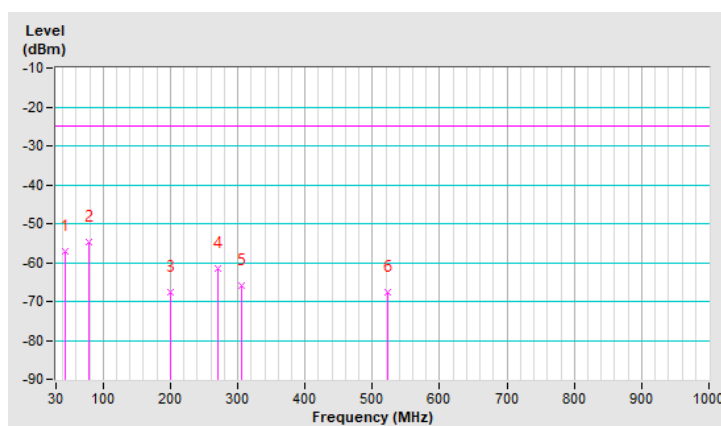


Mode	TX channel 20775 (2502.5MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 68%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	43.58	-48.7	-45.9	-11.3	-57.2	-25.0	-32.2
2	78.50	-49.5	-55.3	0.6	-54.7	-25.0	-29.7
3	200.72	-66.5	-65.4	-2.3	-67.7	-25.0	-42.7
4	270.56	-63.4	-60.0	-1.4	-61.4	-25.0	-36.4
5	305.48	-65.9	-69.6	3.8	-65.8	-25.0	-40.8
6	523.73	-68.2	-71.4	3.8	-67.6	-25.0	-42.6

Remarks:

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



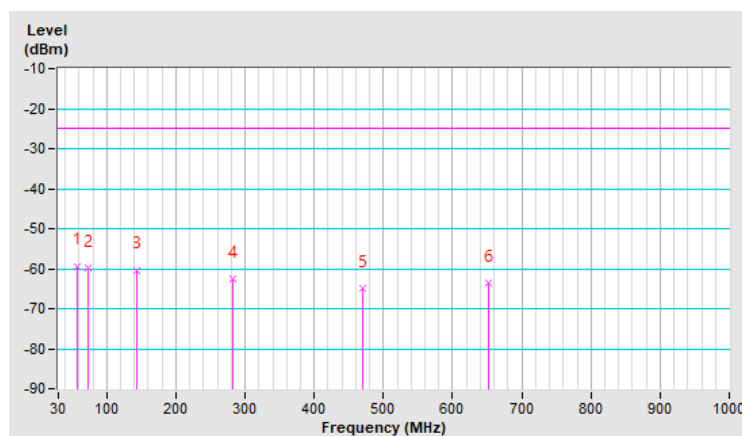
LTE Band 7, Channel Bandwidth: 20MHz

Mode	TX channel 21100 (2535.0MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 68%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)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	57.16	-55.7	-54.6	-4.7	-59.3	-25.0	-34.3
2	73.65	-54.1	-60.0	0.1	-59.9	-25.0	-34.9
3	143.49	-55.1	-57.2	-3.1	-60.3	-25.0	-35.3
4	283.17	-58.4	-60.8	-1.7	-62.5	-25.0	-37.5
5	469.41	-64.7	-68.4	3.5	-64.9	-25.0	-39.9
6	651.77	-65.8	-67.2	3.6	-63.6	-25.0	-38.6

Remarks:

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

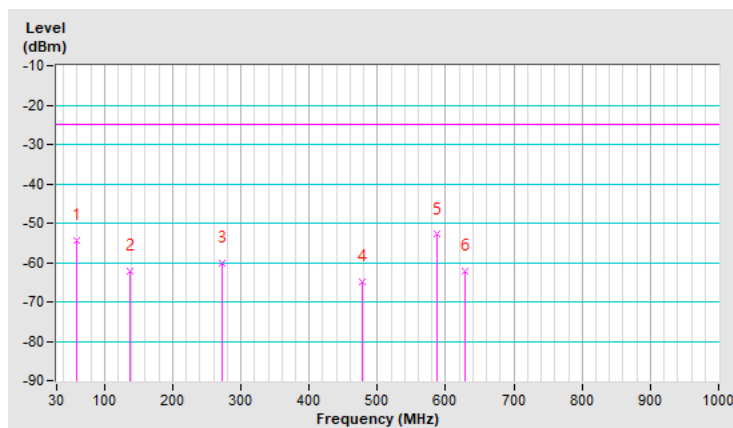


Mode	TX channel 21100 (2535.0MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 68%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	60.07	-47.6	-51.0	-3.4	-54.4	-25.0	-29.4
2	136.70	-59.1	-59.1	-3.2	-62.3	-25.0	-37.3
3	271.53	-62.5	-58.9	-1.4	-60.3	-25.0	-35.3
4	477.17	-64.7	-68.5	3.6	-64.9	-25.0	-39.9
5	587.75	-55.5	-56.7	3.8	-52.9	-25.0	-27.9
6	628.49	-67.1	-65.9	3.6	-62.3	-25.0	-37.3

Remarks:

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



Above 1GHz

LTE Band 7, Channel Bandwidth: 5MHz

Mode	TX channel 20775 (2502.5MHz)	Frequency Range	1GHz ~ 27GHz
Environmental Conditions	22deg. C, 68%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)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	5005.00	-53.5	-41.2	1.4	-39.8	-25.0	-14.8
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	5005.00	-50.7	-39.7	1.4	-38.3	-25.0	-13.3

Remarks:

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

Mode	TX channel 21100 (2535MHz)	Frequency Range	1GHz ~ 27GHz
Environmental Conditions	22deg. C, 68%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)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	5070.00	-53.9	-41.4	1.4	-40.0	-25.0	-15.0
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	5070.00	-51.5	-40.1	1.4	-38.7	-25.0	-13.7

Remarks:

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

Mode	TX channel 21425 (2567.5MHz)	Frequency Range	1GHz ~ 27GHz
Environmental Conditions	22deg. C, 68%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)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	5135.00	-53.5	-41.3	1.4	-39.9	-25.0	-14.9
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	5135.00	-51.6	-39.8	1.4	-38.4	-25.0	-13.4

Remarks:

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

LTE Band 7, Channel Bandwidth: 20MHz

Mode	TX channel 20850 (2510MHz)	Frequency Range	1GHz ~ 27GHz
Environmental Conditions	22deg. C, 68%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)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	5020.00	-53.7	-41.3	1.4	-39.9	-25.0	-14.9
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	5020.00	-51.0	-39.9	1.4	-38.5	-25.0	-13.5

Remarks:

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

Mode	TX channel 21100 (2535MHz)	Frequency Range	1GHz ~ 27GHz
Environmental Conditions	22deg. C, 68%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)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	5070.00	-41.5	1.4	-40.1	-25.0	-15.1	-41.5
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	5070.00	-51.3	-39.9	1.4	-38.5	-25.0	-13.5

Remarks:

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

Mode	TX channel 21350 (2560MHz)	Frequency Range	1GHz ~ 27GHz
Environmental Conditions	22deg. C, 68%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)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	5120.00	-53.6	-41.3	1.4	-39.9	-25.0	-14.9
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	5120.00	-51.8	-40.0	1.4	-38.6	-25.0	-13.6

Remarks:

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

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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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