FCC Test Report
(Part 27 – LTE Band 41)

Report No.:	RFBEDF-WTW-P21110165
FCC ID:	QI3BEC-B41-15
Test Model:	BEC B41-15
Received Date:	Nov. 10, 2021
Test Date:	Nov. 17 ~ Nov. 22, 2021
Issued Date:	Dec. 28, 2021
Applicant:	BILLION ELECTRIC CO., LTD.
Address:	8F., No.192, Sec. 2, Zhongxing Rd., Xindian Dist., New Taipei City 231, Taiwan (R.O.C.)
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location:	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, Taiwan
FCC Registration / Designation Number:	788550 / TW0003

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Release Control Record

Issue No.	Description	Date Issued
RFBCLD-WTW-P21110165	Original release	Dec. 28, 2021

1 Certificate of Conformity

Product:	4G LTE Cat.12 Module mPCIe
Brand:	BEC, BILLION
Test Model:	BEC B41-15
Sample Status:	Engineering sample
Applicant:	BILLION ELECTRIC CO., LTD.
Test Date:	Nov. 17 ~ Nov. 22, 2021
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 : Pettie Chen , **Date:** Dec. 28, 2021

Pettie Chen / Senior Specialist

Approved by : Jeremy Lin , **Date:** Dec. 28, 2021

Jeremy Lin / 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 Isotropically Radiated Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement of limit.
----	Peak To Average Ratio	Pass	Meet the requirement of limit.
2.1055 27.54	Frequency Stability Stay with the authorized bands of operation	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth	Pass	Meet the requirement of limit.
2.1051 27.53 (m)(4)(6)	Band Edge / 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 -15.80dB at 4997.0, 5186.00MHz.

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	9kHz ~ 30MHz	3.00 dB
	30MHz ~ 200MHz	2.91 dB
	200MHz ~1000MHz	2.93 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	1.76 dB
	18GHz ~ 40GHz	1.77 dB

2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 09, 2021	Apr. 08, 2022
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jun. 10, 2021	Jun. 09, 2022
BILOG Antenna SCHWARZBECK	VULB9168	9168-151	Oct. 26, 2021	Oct. 25, 2022
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Nov. 22, 2020	Nov. 21, 2021
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 22, 2020	Nov. 21, 2021
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Jun. 05, 2021	Jun. 04, 2022
Preamplifier Agilent (Above 1GHz)	8449B	3008A02367	Feb. 17, 2021	Feb. 16, 2022
Preamplifier EMCI	EMC 184045	980116	Oct. 05, 2021	Oct. 04, 2022
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM8000	CABLE-CH9-02 (248780+171006)	Jan. 16, 2021	Jan. 15, 2022
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	Jan. 16, 2021	Jan. 15, 2022
RF signal cable Woken	8D-FB	Cable-CH9-01	Jun. 05, 2021	Jun. 04, 2022
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower &Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Digital Multimeter Fluke	87-III	70360742	Jun. 24, 2021	Jun. 23, 2022
AC power supply Extech	6905S	1991553	NA	NA
Temperature & Humidity Chamber TERCHY	MHU-225AU	920842	Jun. 15, 2021	Jun. 14, 2022
Spectrum Analyzer Rohde & Schwarz	FSW43	101582	Apr. 01, 2021	Mar. 31, 2022
Radio Communication Analyzer Anritsu	MT8821C	6201462755	Feb. 07, 2021	Feb. 06, 2022

Note: 1. The calibration interval of the above test instruments is 12 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 LTE Cat.12 Module mPCIe			
Brand	BEC, BILLION			
Test Model	BEC B41-15			
Sample Status	Engineering sample			
Power Supply Rating	56Vdc (from PoE)			
Modulation Type	QPSK, 16QAM, 64QAM			
Operating Frequency	LTE Band 41 (Channel Bandwidth 5MHz)	2498.5MHz ~ 2687.5MHz		
	LTE Band 41 (Channel Bandwidth 10MHz)	2501.0MHz ~ 2685.0MHz		
	LTE Band 41 (Channel Bandwidth 15MHz)	2503.5MHz ~ 2682.5MHz		
	LTE Band 41 (Channel Bandwidth 20MHz)	2506.0MHz ~ 2680.0MHz		
Max. EIRP Power		QPSK	16QAM	64QAM
	LTE Band 41 (Channel Bandwidth 5MHz)	961.612mW (29.83dBm)	922.571mW (29.65dBm)	922.571mW (29.65dBm)
	LTE Band 41 (Channel Bandwidth 10MHz)	941.890mW (29.74dBm)	933.254mW (29.70dBm)	922.571mW (29.65dBm)
	LTE Band 41 (Channel Bandwidth 15MHz)	935.406mW (29.71dBm)	907.821mW (29.58dBm)	897.429mW (29.53dBm)
	LTE Band 41 (Channel Bandwidth 20MHz)	914.113mW (29.61dBm)	897.429mW (29.53dBm)	862.979mW (29.36dBm)
Emission Designator		QPSK	16QAM	64QAM
	LTE Band 41 (Channel Bandwidth 5MHz)	4M51G7D	4M50D7W	4M51D7W
	LTE Band 41 (Channel Bandwidth 10MHz)	8M97G7D	8M97D7W	8M98D7W
	LTE Band 41 (Channel Bandwidth 15MHz)	13M5G7D	13M5D7W	13M5D7W
	LTE Band 41 (Channel Bandwidth 20MHz)	17M9G7D	17M9D7W	17M9D7W
Antenna Type	Refer to Note as below			
Antenna Connector	Refer to Note as below			
Accessory Device	NA			
Cable Supplied	NA			

Note:

1. The EUT uses the following antennas.

Antenna No.	Brand	Model	Antenna Net Gain(dBi)	Antenna Type	Connector Type
1	Cortec	AN2600-6008BSM	7.1	Dipole	SMA
2	Grand-Tek Technology	SX-V2/ OA-L71-12-05-C5-BL	3.1	Dipole	SMA
3	Grand-Tek Technology	DA-B41-16-06-BL	12.5	PCB	ipex(MHF)

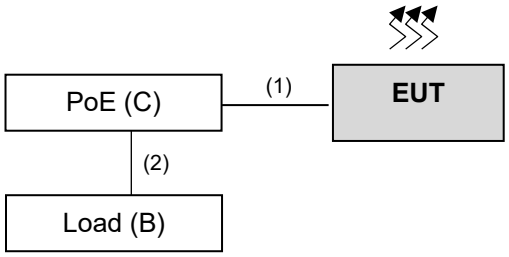
* The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

2. The EUT uses following PoE.

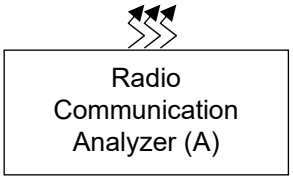
PoE (Support unit)	
Brand	BILLION
Model	BP035-560063PAX
Input Power	100-240Vac, 50/60Hz, 0.8A
Output Power	56Vdc, 0.625A

3. This module supports 1T4R. Only one of the two TX ports provided on the module (TX0 or TX1) may be active at any given time. Measurements were performed on port TX0 and are representative of port TX1.

3.2 Configuration of System under Test



Remote site



3.2.1 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Radio Communication Analyzer	Anritsu	MT8821C	6261806803	NA	-
B.	Load	NA	NA	NA	NA	-
C.	PoE	BILLION	BP035-560063PAX	NA	NA	Provided by client

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item A acted as a communication partner to transfer data.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Power cable	1	1.47	N	1	Provided by client
2.	LAN cable	1	1.5	N	0	-

Note: The core(s) is(are) originally attached to the cable(s).

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	Radiated Emission
LTE Band 41	Y-plane

LTE Band 41

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
-	EIRP	39675 to 41565	39675 (2498.5MHz), 40620 (2593.0MHz), 41565 (2687.5MHz)	5MHz	QPSK / 16QAM / 64QAM	1 RB / 0 RB Offset 1 RB / 12 RB Offset 1 RB / 24 RB Offset 12 RB / 0 RB Offset 12 RB / 6 RB Offset 12 RB / 13 RB Offset 25 RB / 0 RB Offset
		39700 to 41540	39700 (2501.0MHz), 40620 (2593.0MHz), 41540 (2685.0MHz)	10MHz	QPSK / 16QAM / 64QAM	1 RB / 0 RB Offset 1 RB / 24 RB Offset 1 RB / 49 RB Offset 25 RB / 0 RB Offset 25 RB / 12 RB Offset 25 RB / 25 RB Offset 50 RB / 0 RB Offset
		39725 to 41515	39725 (2503.5MHz), 40620 (2593.0MHz), 41515 (2682.5MHz)	15MHz	QPSK / 16QAM / 64QAM	1 RB / 0 RB Offset 1 RB / 37 RB Offset 1 RB / 74 RB Offset 36 RB / 0 RB Offset 36 RB / 19 RB Offset 36 RB / 39 RB Offset 75 RB / 0 RB Offset
		39750 to 41490	39750 (2506.0MHz), 40620 (2593.0MHz), 41490 (2680.0MHz)	20MHz	QPSK / 16QAM / 64QAM	1 RB / 0 RB Offset 1 RB / 50 RB Offset 1 RB / 99 RB Offset 50 RB / 0 RB Offset 50 RB / 25 RB Offset 50 RB / 50 RB Offset 100 RB / 0 RB Offset
-	Modulation Characteristics	39750 to 41490	40620 (2593.0MHz)	20MHz	QPSK / 16QAM / 64QAM	100 RB / 0 RB Offset
-	Frequency Stability	39675 to 41565	39675 (2498.5MHz), 41565 (2687.5MHz)	5MHz	QPSK	25 RB / 0 RB Offset
		39700 to 41540	39700 (2501.0MHz), 41540 (2685.0MHz)	10MHz	QPSK	50 RB / 0 RB Offset
		39725 to 41515	39725 (2503.5MHz), 41515 (2682.5MHz)	15MHz	QPSK	75 RB / 0 RB Offset
		39750 to 41490	39750 (2506.0MHz), 41490 (2680.0MHz)	20MHz	QPSK	100 RB / 0 RB Offset

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
-	Emission Bandwidth	39675 to 41565	39675 (2498.5MHz), 40620 (2593.0MHz), 41565 (2687.5MHz)	5MHz	QPSK / 16QAM / 64QAM	25 RB / 0 RB Offset
		39700 to 41540	39700 (2501.0MHz), 40620 (2593.0MHz), 41540 (2685.0MHz)	10MHz	QPSK / 16QAM / 64QAM	50 RB / 0 RB Offset
		39725 to 41515	39725 (2503.5MHz), 40620 (2593.0MHz), 41515 (2682.5MHz)	15MHz	QPSK / 16QAM / 64QAM	75 RB / 0 RB Offset
		39750 to 41490	39750 (2506.0MHz), 40620 (2593.0MHz), 41490 (2680.0MHz)	20MHz	QPSK / 16QAM / 64QAM	100 RB / 0 RB Offset
-	Out-of-Band Emissions	39675 to 41565	39675 (2498.5MHz), 41565 (2687.5MHz)	5MHz	QPSK	1 RB / 0 RB Offset 1 RB / 24 RB Offset 25 RB / 0 RB Offset
		39700 to 41540	39700 (2501.0MHz), 41540 (2685.0MHz)	10MHz	QPSK	1 RB / 0 RB Offset 1 RB / 49 RB Offset 50 RB / 0 RB Offset
		39725 to 41515	39725 (2503.5MHz), 41515 (2682.5MHz)	15MHz	QPSK	1 RB / 0 RB Offset 1 RB / 74 RB Offset 75 RB / 0 RB Offset
		39750 to 41490	39750 (2506.0MHz), 41490 (2680.0MHz)	20MHz	QPSK	1 RB / 0 RB Offset 1 RB / 99 RB Offset 100 RB / 0 RB Offset
-	Peak to Average Ratio	39675 to 41565	39675 (2498.5MHz), 40620 (2593.0MHz), 41565 (2687.5MHz)	5MHz	QPSK / 16QAM / 64QAM	1 RB / 0 RB Offset
		39700 to 41540	39700 (2501.0MHz), 40620 (2593.0MHz), 41540 (2685.0MHz)	10MHz	QPSK / 16QAM / 64QAM	1 RB / 0 RB Offset
		39725 to 41515	39725 (2503.5MHz), 40620 (2593.0MHz), 41515 (2682.5MHz)	15MHz	QPSK / 16QAM / 64QAM	1 RB / 0 RB Offset
		39750 to 41490	39750 (2506.0MHz), 40620 (2593.0MHz), 41490 (2680.0MHz)	20MHz	QPSK / 16QAM / 64QAM	1 RB / 0 RB Offset
-	Conducted Emission	39675 to 41565	39675 (2498.5MHz), 40620 (2593.0MHz), 41565 (2687.5MHz)	5MHz	QPSK	1 RB / 0 RB Offset
		39700 to 41540	39700 (2501.0MHz), 40620 (2593.0MHz), 41540 (2685.0MHz)	10MHz	QPSK	1 RB / 0 RB Offset
		39725 to 41515	39725 (2503.5MHz), 40620 (2593.0MHz), 41515 (2682.5MHz)	15MHz	QPSK	1 RB / 0 RB Offset
		39750 to 41490	39750 (2506.0MHz), 40620 (2593.0MHz), 41490 (2680.0MHz)	20MHz	QPSK	1 RB / 0 RB Offset

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
-	Radiated Emission (Frequency range below 1GHz)	39675 to 41565	40620 (2593.0MHz)	5MHz	QPSK	1 RB / 0 RB Offset
-	Radiated Emission (Frequency range above 1GHz)	39675 to 41565	39675 (2498.5MHz), 40620 (2593.0MHz), 41565 (2687.5MHz)	5MHz	QPSK	1 RB / 0 RB Offset
		39750 to 41490	39750 (2506.0MHz), 40620 (2593.0MHz), 41490 (2680.0MHz)	20MHz	QPSK	1 RB / 0 RB Offset

Note:

1. For radiated emission below 1GHz, select the worst radiated emission channel (above 1GHz) for final testing.
2. For radiated emission above 1GHz, according to 3GPP 36.521-1 Section 6.6.3.1.4.1, choose the 5MHz & highest channel bandwidth for final test.
3. The output power for QPSK, 16QAM and 64QAM, measured value of QPSK is higher than 16QAM, and 64QAM mode. Therefore, only Modulation characteristics, occupied bandwidth and Peak to average ratio items had been tested under QPSK, 16QAM and 64QAM modes, the other test items were performed under worse mode according to the maximum output power.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
EIRP / ERP	25deg. C, 60%RH	120Vac, 60Hz	James Yang
Modulation Characteristics	25deg. C, 60%RH	120Vac, 60Hz	James Yang
Frequency Stability	25deg. C, 60%RH	120Vac, 60Hz	James Yang
Occupied Bandwidth	25deg. C, 60%RH	120Vac, 60Hz	James Yang
Band Edge	25deg. C, 60%RH	120Vac, 60Hz	James Yang
Peak To Average Ratio	25deg. C, 60%RH	120Vac, 60Hz	James Yang
Conducted Emission	25deg. C, 60%RH	120Vac, 60Hz	James Yang
Radiated Emission	19deg. C, 69%RH 22deg. C, 66%RH	120Vac, 60Hz	Rex Wang Hans 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 27

ANSI/TIA/EIA-603-E 2016

ANSI 63.26-2015

References Test Guidance:

KDB 971168 D01 Power Meas License Digital Systems v03r01

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 stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

4.1.2 Test Procedures

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.

Maximum EIRP / ERP

The relevant equation for determining the maximum ERP or EIRP from the measured RF output power is given in Equation as follows:

$EIRP = P_{Meas} + G_T$

$ERP = P_{Meas} + G_T - 2.15$

where

ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as P_{Meas}, e.g., dBm or dBW)

P_{Meas} measured transmitter output power or PSD, in dBm or dBW

G_T gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

4.1.3 Test Setup

Conducted Power Measurement:

4.1.4 Test Results

Conducted Output Power (dBm)

LTE Band 41						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		39750	40620	41490
		Frequency (MHz)		2506	2593	2680
20M	QPSK	1	0	16.91	16.73	17.11
		1	50	16.05	16.42	16.85
		1	99	16.45	16.66	16.94
		50	0	16.40	16.19	16.75
		50	25	15.92	16.23	16.78
		50	50	16.25	16.38	16.81
		100	0	16.30	16.44	16.82
20M	16QAM	1	0	16.88	16.70	17.03
		1	50	16.01	16.31	16.79
		1	99	16.31	16.63	16.83
		50	0	16.32	16.17	16.45
		50	25	15.81	16.09	16.69
		50	50	16.01	16.27	16.67
		100	0	16.25	16.41	16.53
20M	64QAM	1	0	16.86	16.58	16.84
		1	50	15.84	16.27	16.71
		1	99	15.91	16.55	16.81
		50	0	16.17	16.09	16.23
		50	25	15.84	16.07	16.54
		50	50	15.93	15.89	16.59
		100	0	16.23	16.27	16.39

LTE Band 41						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		39725	40620	41515
		Frequency (MHz)		2503.5	2593	2682.5
15M	QPSK	1	0	16.86	16.62	17.21
		1	37	16.43	16.55	17.11
		1	74	16.52	16.46	17.12
		36	0	16.21	16.07	16.97
		36	19	16.19	16.18	16.83
		36	39	16.33	16.33	16.74
		75	0	16.29	16.38	16.93
15M	16QAM	1	0	16.73	16.58	17.08
		1	37	16.23	16.43	17.06
		1	74	16.36	16.36	17.02
		36	0	16.07	15.95	16.70
		36	19	16.25	16.08	16.81
		36	39	16.04	16.29	16.80
		75	0	16.31	16.43	16.81
15M	64QAM	1	0	16.71	16.45	17.03
		1	37	16.19	16.32	16.98
		1	74	16.17	16.25	16.73
		36	0	15.86	15.84	16.65
		36	19	16.12	16.07	16.77
		36	39	15.97	16.09	16.81
		75	0	16.11	16.21	16.66

LTE Band 41						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		39700	40620	41540
		Frequency (MHz)		2501	2593	2685
10M	QPSK	1	0	16.61	16.62	17.24
		1	24	16.38	16.41	17.06
		1	49	16.52	16.33	17.22
		25	0	16.55	16.37	17.18
		25	12	16.23	16.42	17.07
		25	25	16.32	16.46	17.21
		50	0	16.31	16.30	17.00
10M	16QAM	1	0	16.51	16.58	17.20
		1	24	16.31	16.30	16.94
		1	49	16.43	16.23	17.16
		25	0	16.34	16.33	17.05
		25	12	16.25	16.39	16.93
		25	25	16.10	16.31	17.09
		50	0	16.15	16.33	16.97
10M	64QAM	1	0	16.50	16.44	17.15
		1	24	16.26	16.23	16.77
		1	49	16.29	16.17	16.87
		25	0	16.43	16.27	17.01
		25	12	16.23	16.22	16.88
		25	25	16.08	16.27	17.06
		50	0	16.07	16.16	16.98

LTE Band 41						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		39675	40620	41565
		Frequency (MHz)		2498.5	2593	2687.5
5M	QPSK	1	0	16.89	16.57	17.33
		1	12	16.39	16.46	17.16
		1	24	16.18	16.21	16.85
		12	0	16.17	16.30	16.74
		12	6	16.25	16.37	17.08
		12	13	16.13	16.36	17.00
		25	0	16.16	16.33	16.89
5M	16QAM	1	0	16.61	16.51	17.15
		1	12	16.21	16.37	17.04
		1	24	15.98	16.01	16.82
		12	0	16.06	16.19	16.72
		12	6	16.19	16.30	16.92
		12	13	16.04	16.31	16.84
		25	0	16.06	16.29	16.87
5M	64QAM	1	0	16.58	16.60	17.15
		1	12	16.17	16.31	16.93
		1	24	15.95	15.95	16.66
		12	0	15.96	16.16	16.82
		12	6	16.17	16.25	16.90
		12	13	16.01	16.29	16.82
		25	0	16.07	16.23	16.83

EIRP Power (dBm)

LTE Band 41						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		39750	40620	41490
		Frequency (MHz)		2506	2593	2680
20M	QPSK	1	0	29.41	29.23	**29.61**
		1	50	28.55	28.92	29.35
		1	99	28.95	29.16	29.44
		50	0	28.90	28.69	29.25
		50	25	28.42	28.73	29.28
		50	50	28.75	28.88	29.31
		100	0	28.80	28.94	29.32
20M	16QAM	1	0	29.38	29.20	**29.53**
		1	50	28.51	28.81	29.29
		1	99	28.81	29.13	29.33
		50	0	28.82	28.67	28.95
		50	25	28.31	28.59	29.19
		50	50	28.51	28.77	29.17
		100	0	28.75	28.91	29.03
20M	64QAM	1	0	**29.36**	29.08	29.34
		1	50	28.34	28.77	29.21
		1	99	28.41	29.05	29.31
		50	0	28.67	28.59	28.73
		50	25	28.34	28.57	29.04
		50	50	28.43	28.39	29.09
		100	0	28.73	28.77	28.89

*EIRP = Conducted Output Power+ Gain (12.5dBi)

LTE Band 41						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		39725	40620	41515
		Frequency (MHz)		2503.5	2593	2682.5
15M	QPSK	1	0	29.36	29.12	**29.71**
		1	37	28.93	29.05	29.61
		1	74	29.02	28.96	29.62
		36	0	28.71	28.57	29.47
		36	19	28.69	28.68	29.33
		36	39	28.83	28.83	29.24
		75	0	28.79	28.88	29.43
15M	16QAM	1	0	29.23	29.08	**29.58**
		1	37	28.73	28.93	29.56
		1	74	28.86	28.86	29.52
		36	0	28.57	28.45	29.20
		36	19	28.75	28.58	29.31
		36	39	28.54	28.79	29.30
		75	0	28.81	28.93	29.31
15M	64QAM	1	0	29.21	28.95	**29.53**
		1	37	28.69	28.82	29.48
		1	74	28.67	28.75	29.23
		36	0	28.36	28.34	29.15
		36	19	28.62	28.57	29.27
		36	39	28.47	28.59	29.31
		75	0	28.61	28.71	29.16

*EIRP = Conducted Output Power+ Gain (12.5dBi)

LTE Band 41						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		39700	40620	41540
		Frequency (MHz)		2501	2593	2685
10M	QPSK	1	0	29.11	29.12	**29.74**
		1	24	28.88	28.91	29.56
		1	49	29.02	28.83	29.72
		25	0	29.05	28.87	29.68
		25	12	28.73	28.92	29.57
		25	25	28.82	28.96	29.71
		50	0	28.81	28.80	29.50
10M	16QAM	1	0	29.01	29.08	**29.70**
		1	24	28.81	28.80	29.44
		1	49	28.93	28.73	29.66
		25	0	28.84	28.83	29.55
		25	12	28.75	28.89	29.43
		25	25	28.60	28.81	29.59
		50	0	28.65	28.83	29.47
10M	64QAM	1	0	29.00	28.94	**29.65**
		1	24	28.76	28.73	29.27
		1	49	28.79	28.67	29.37
		25	0	28.93	28.77	29.51
		25	12	28.73	28.72	29.38
		25	25	28.58	28.77	29.56
		50	0	28.57	28.66	29.48

*EIRP = Conducted Output Power+ Gain (12.5dBi)

LTE Band 41						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		39675	40620	41565
		Frequency (MHz)		2498.5	2593	2687.5
5M	QPSK	1	0	29.39	29.07	**29.83**
		1	12	28.89	28.96	29.66
		1	24	28.68	28.71	29.35
		12	0	28.67	28.80	29.24
		12	6	28.75	28.87	29.58
		12	13	28.63	28.86	29.50
		25	0	28.66	28.83	29.39
5M	16QAM	1	0	29.11	29.01	**29.65**
		1	12	28.71	28.87	29.54
		1	24	28.48	28.51	29.32
		12	0	28.56	28.69	29.22
		12	6	28.69	28.80	29.42
		12	13	28.54	28.81	29.34
		25	0	28.56	28.79	29.37
5M	64QAM	1	0	29.08	29.10	**29.65**
		1	12	28.67	28.81	29.43
		1	24	28.45	28.45	29.16
		12	0	28.46	28.66	29.32
		12	6	28.67	28.75	29.40
		12	13	28.51	28.79	29.32
		25	0	28.57	28.73	29.33

*EIRP = Conducted Output Power+ Gain (12.5dBi)

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

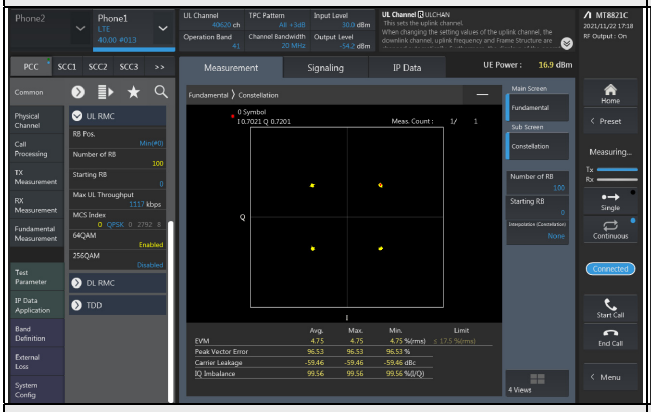
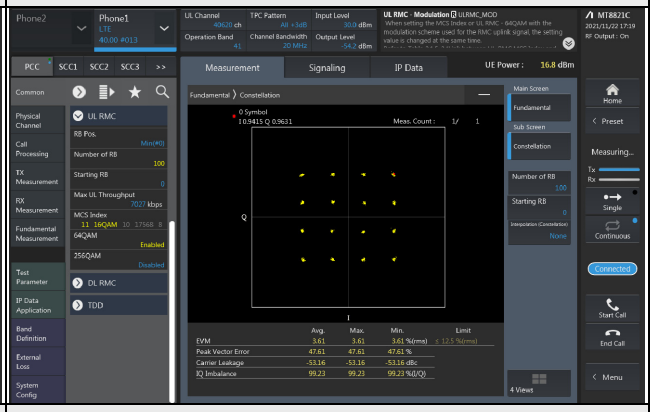
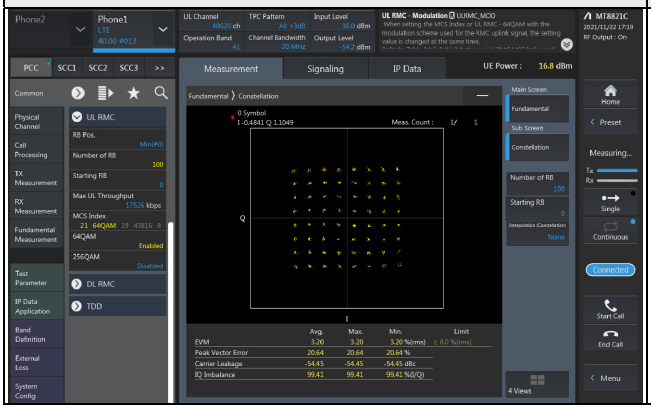
N/A

4.2.2 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.

4.2.3 Test Setup

4.2.4 Test Results

LTE Band 41	
Spectrum Plot of Measurement Value	
Channel: 40620 / Frequency (MHz): 2593.0MHz	
QPSK	16QAM
	
64QAM	
	

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℃ ~ 50℃.

4.3.2 Test Procedure

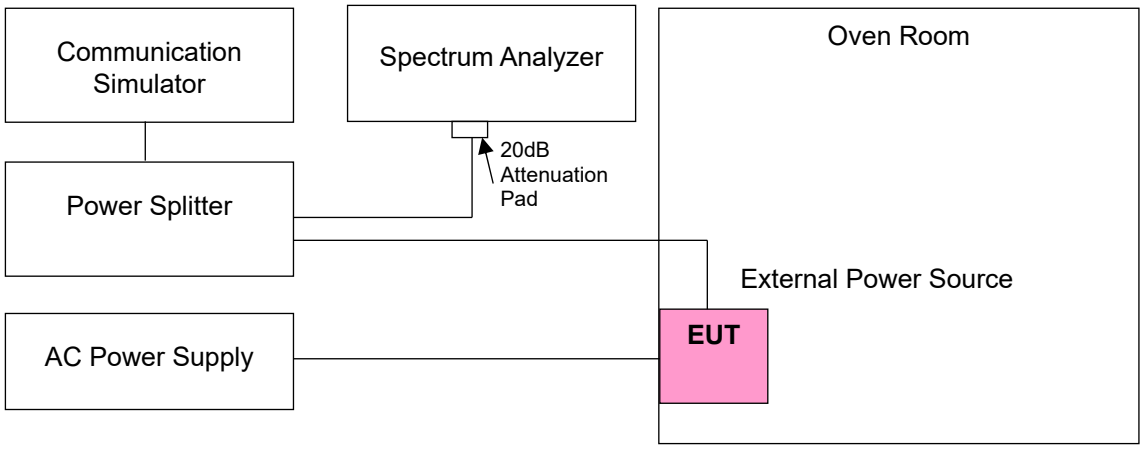
a. Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.

b. EUT is connected the external power supply to control the AC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.

c. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the ±0.5 ℃ during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

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

4.3.3 Test Setup



4.3.4 Test Results

Frequency Error vs. Voltage

Voltage (Vac)	LTE Band 41			
	Channel Bandwidth 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
120.0	2498.500001	0.001	2687.500004	0.001
102.0	2498.500003	0.001	2687.500001	0.000
138.0	2498.500001	0.001	2687.500004	0.001

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

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 41			
	Channel Bandwidth 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	2498.500002	0.001	2687.500002	0.001
-20	2498.500001	0.000	2687.500002	0.001
-10	2498.500001	0.000	2687.500003	0.001
0	2498.500002	0.001	2687.500002	0.001
10	2498.500003	0.001	2687.500002	0.001
20	2498.499998	-0.001	2687.499999	-0.001
30	2498.499997	-0.001	2687.499997	-0.001
40	2498.499997	-0.001	2687.499998	-0.001
50	2498.499996	-0.001	2687.499997	-0.001
55	2498.499997	-0.001	2687.499996	-0.001

Frequency Error vs. Voltage

Voltage (Vac)	LTE Band 41			
	Channel Bandwidth 10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
120.0	2501.000004	0.002	2685.000003	0.001
102.0	2501.000004	0.002	2685.000001	0.000
138.0	2501.000001	0.001	2685.000003	0.001

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

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 41			
	Channel Bandwidth 10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	2501.000004	0.001	2685.000003	0.001
-20	2501.000001	0.001	2685.000004	0.001
-10	2501.000002	0.001	2685.000001	0.000
0	2501.000002	0.001	2685.000002	0.001
10	2501.000003	0.001	2685.000003	0.001
20	2500.999998	-0.001	2684.999997	-0.001
30	2500.999998	-0.001	2684.999998	-0.001
40	2500.999998	-0.001	2684.999996	-0.001
50	2500.999999	-0.001	2684.999997	-0.001
55	2500.999999	-0.001	2684.999997	-0.001

Frequency Error vs. Voltage

Voltage (Vac)	LTE Band 41			
	Channel Bandwidth 15MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
120.0	2503.500004	0.001	2682.500004	0.001
102.0	2503.500001	0.001	2682.500003	0.001
138.0	2503.500004	0.002	2682.500003	0.001

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

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 41			
	Channel Bandwidth 15MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	2503.500004	0.001	2682.500002	0.001
-20	2503.500002	0.001	2682.500002	0.001
-10	2503.500003	0.001	2682.500001	0.000
0	2503.500004	0.002	2682.500002	0.001
10	2503.500004	0.002	2682.500002	0.001
20	2503.499997	-0.001	2682.499998	-0.001
30	2503.499996	-0.001	2682.499999	-0.001
40	2503.499996	-0.001	2682.499998	-0.001
50	2503.499998	-0.001	2682.499998	-0.001
55	2503.499997	-0.001	2682.499997	-0.001

Frequency Error vs. Voltage

Voltage (Vac)	LTE Band 41			
	Channel Bandwidth 20MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
120	2506.000003	0.001	2680.000004	0.001
102	2506.000003	0.001	2680.000001	0.000
138	2506.000001	0.000	2680.000002	0.001

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

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 41			
	Channel Bandwidth 20MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	2506.000001	0.001	2680.000003	0.001
-20	2506.000002	0.001	2680.000003	0.001
-10	2506.000002	0.001	2680.000002	0.001
0	2506.000001	0.000	2680.000002	0.001
10	2506.000003	0.001	2680.000004	0.001
20	2505.999996	-0.002	2679.999999	0.000
30	2505.999997	-0.001	2679.999998	-0.001
40	2505.999999	-0.001	2679.999997	-0.001
50	2505.999998	-0.001	2679.999998	-0.001
55	2505.999999	0.000	2679.999998	-0.001

4.4 Emission Bandwidth Measurement

4.4.1 Limits of Emission Bandwidth Measurement

According to FCC 2.1049, the occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 % of the total mean power radiated by a given emission.

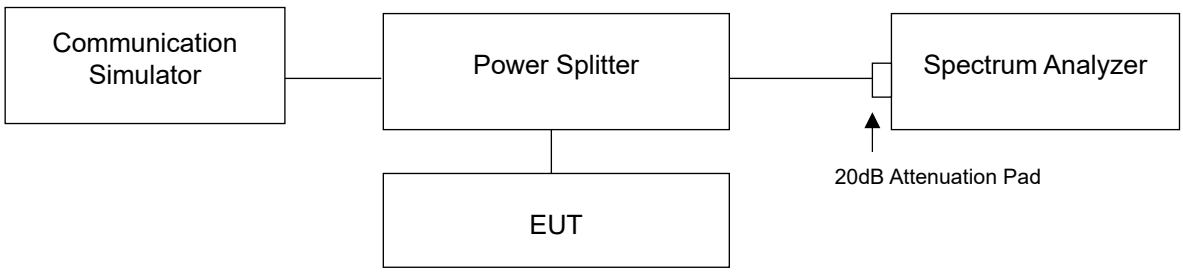
4.4.2 Test Procedure

For the 26dBc bandwidth measurement method, please refer to section 5.4.3 of ANSI C63.26.

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be wide enough to see sufficient roll off of the signal to make the measurement.
b) The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set ≥ 3 × RBW.
c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3.
d) The dynamic range of the spectrum analyzer at the selected RBW shall be more than 10 dB below the target "−X dB" requirement, i.e., if the requirement calls for measuring the −26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be at least 36 dB below the reference level.
e) Set spectrum analyzer detection mode to peak, and the trace mode to max hold.
f) Determine the following reference values: Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).
g) Determine the "−X dB amplitude" as equal to (Reference Value − X). Alternatively, this calculation can be performed on the spectrum analyzer using the delta-marker measurement function.
h) Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the "−X dB amplitude" determined in step f). If a marker is below this "−X dB amplitude" value it should be as close as possible to this value. The OBW is the positive frequency difference between the two markers.
i) The OBW shall be reported by providing plot(s) of the measuring instrument display, to include markers depicting the relevant frequency and amplitude information (e.g., marker table). The frequency and amplitude axis and scale shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

For the occupied bandwidth measurement method, please refer to section 5.4.4 of ANSI C63.26.

4.4.3 Test Setup



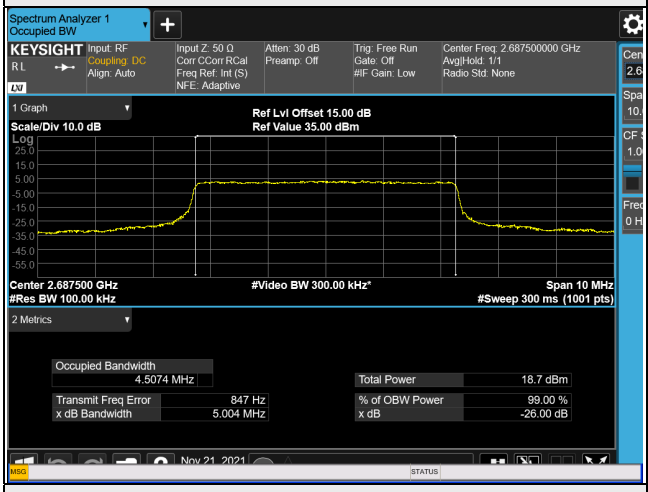
4.4.4 Test Result

Occupied Bandwidth

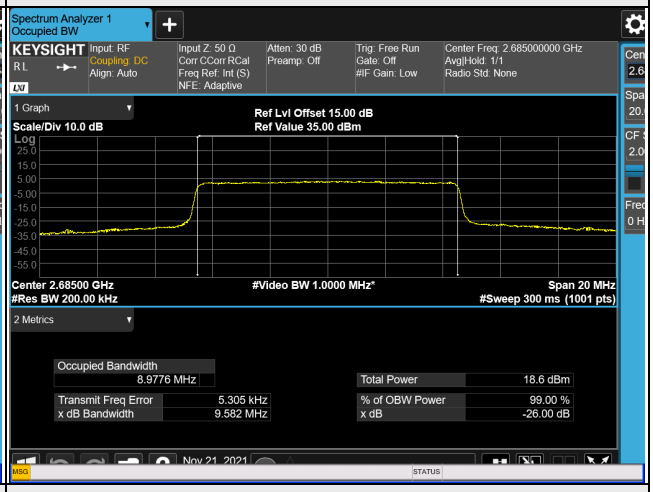
LTE Band 41, Channel Bandwidth 5MHz				
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)		
		QPSK	16QAM	64QAM
39675	2498.5	4.50	4.50	4.50
40620	2593.0	4.50	4.50	4.50
41565	2687.5	4.51	4.50	4.51
LTE Band 41, Channel Bandwidth 10MHz				
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)		
		QPSK	16QAM	64QAM
39700	2501.0	8.96	8.96	8.96
40620	2593.0	8.97	8.97	8.97
41540	2685.0	8.97	8.97	8.98
LTE Band 41, Channel Bandwidth 15MHz				
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)		
		QPSK	16QAM	64QAM
39725	2503.5	13.44	13.43	13.43
40620	2593.0	13.46	13.45	13.45
41515	2682.5	13.44	13.45	13.44
LTE Band 41, Channel Bandwidth 20MHz				
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)		
		QPSK	16QAM	64QAM
39750	2506.0	17.90	17.90	17.91
40620	2593.0	17.92	17.92	17.92
41490	2680.0	17.90	17.90	17.92

Spectrum Plot of Worst Value

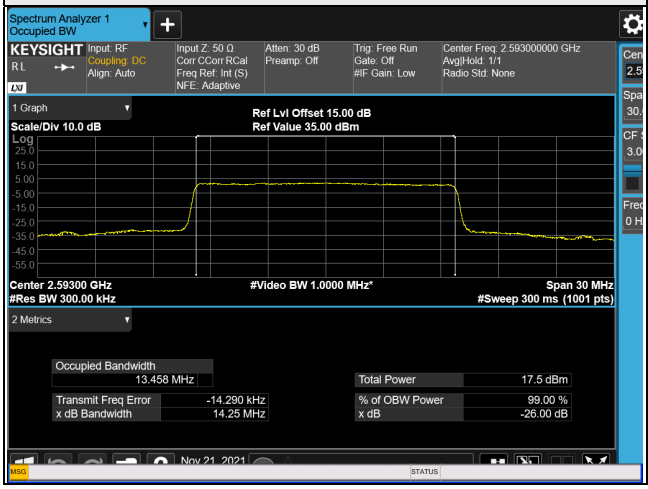
5MHz / QPSK



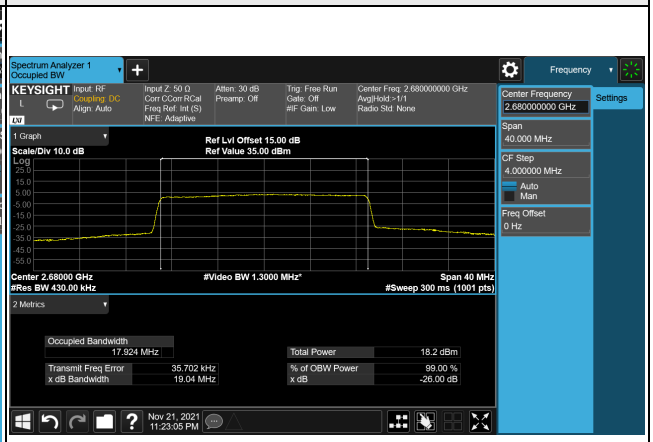
10MHz / 64QAM



15MHz / QPSK



20MHz / 64QAM

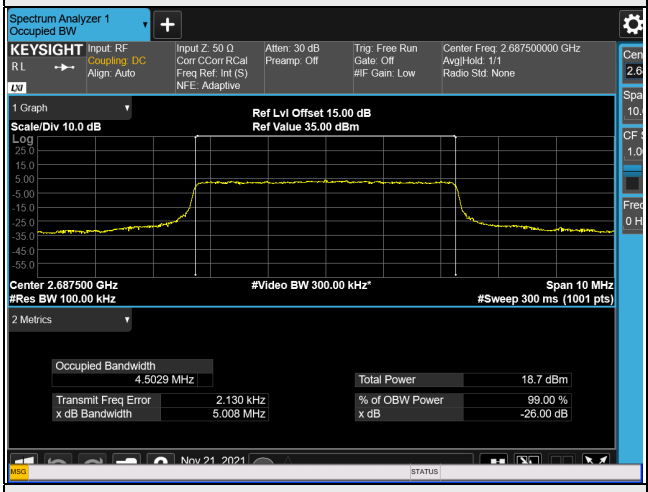


26dB Bandwidth

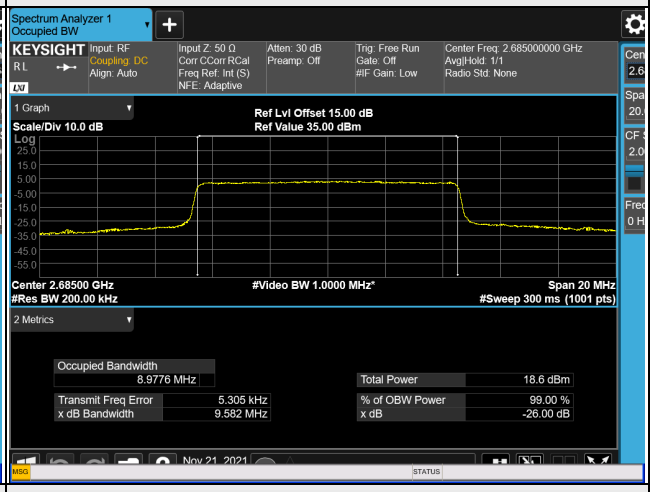
LTE Band 41, Channel Bandwidth 5MHz				
Channel	Frequency (MHz)	26dB Bandwidth (MHz)		
		QPSK	16QAM	64QAM
39675	2498.5	4.95	4.93	4.90
40620	2593.0	4.99	4.98	4.91
41565	2687.5	5.00	5.01	4.93
LTE Band 41, Channel Bandwidth 10MHz				
Channel	Frequency (MHz)	26dB Bandwidth (MHz)		
		QPSK	16QAM	64QAM
39700	2501.0	9.52	9.49	9.53
40620	2593.0	9.54	9.53	9.57
41540	2685.0	9.52	9.54	9.58
LTE Band 41, Channel Bandwidth 15MHz				
Channel	Frequency (MHz)	26dB Bandwidth (MHz)		
		QPSK	16QAM	64QAM
39725	2503.5	14.23	14.22	14.24
40620	2593.0	14.25	14.23	14.25
41515	2682.5	14.26	14.24	14.27
LTE Band 41, Channel Bandwidth 20MHz				
Channel	Frequency (MHz)	26dB Bandwidth (MHz)		
		QPSK	16QAM	64QAM
39750	2506.0	19.00	19.01	18.99
40620	2593.0	19.01	19.00	19.03
41490	2680.0	19.02	19.00	19.04

Spectrum Plot of Worst Value

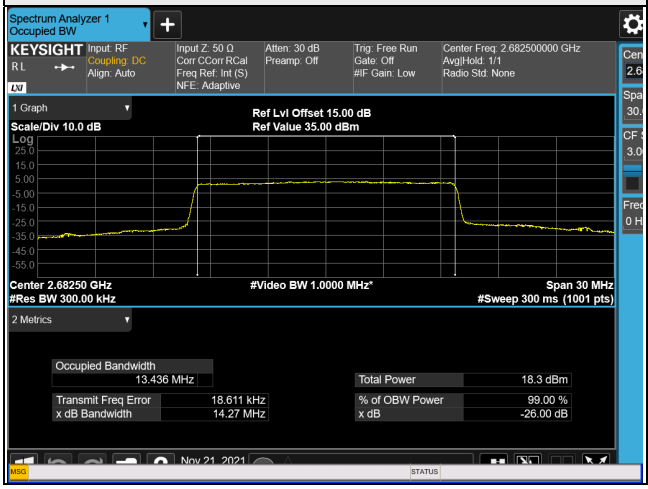
5MHz / 16QAM



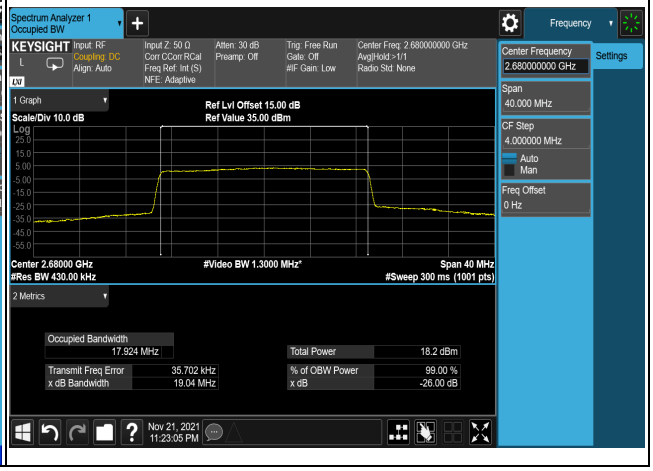
10MHz / 64QAM



15MHz / 64QAM



20MHz / 64QAM

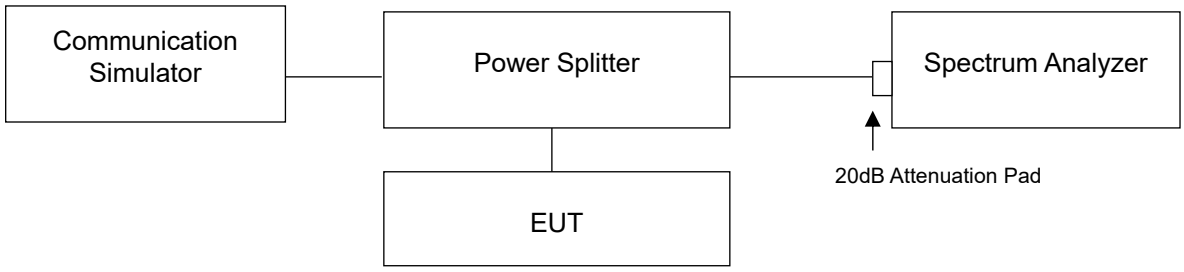


4.5 Channel Edge / Out-of-Band Emissions Measurement

4.5.1 Limits of Band Edge / Out-of-Band Emissions Measurement

According to FCC 27.53(m)(4) regulations, any transmit 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 2490.5MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5MHz. 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

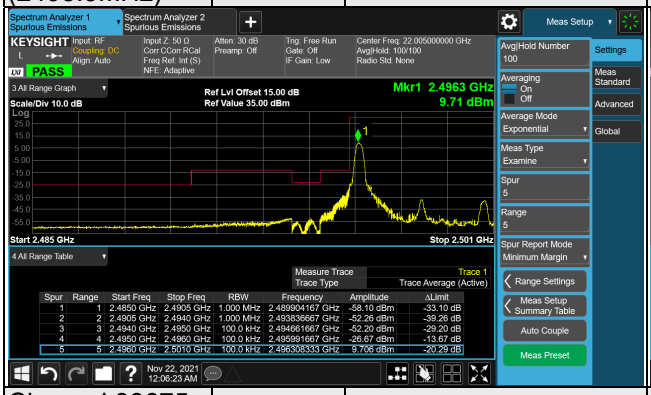
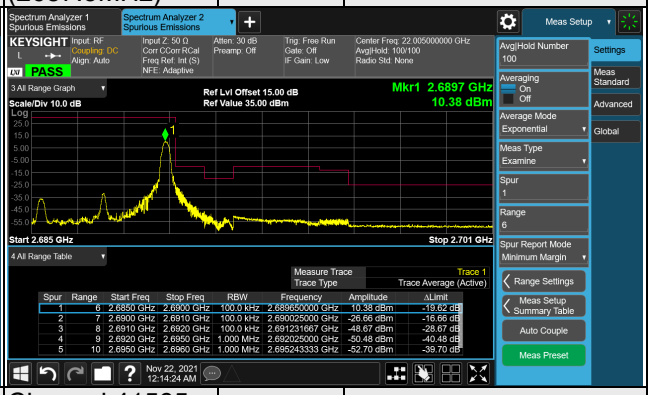
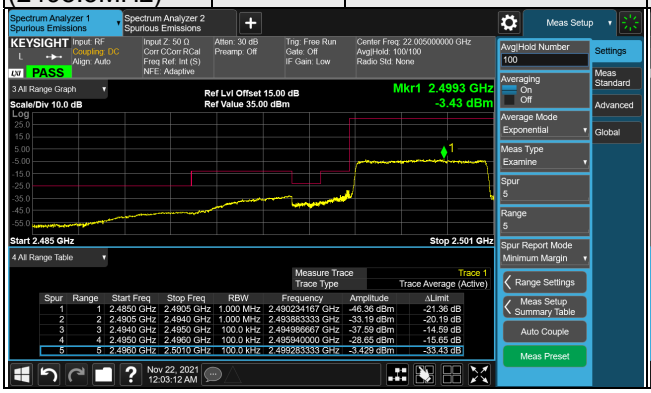
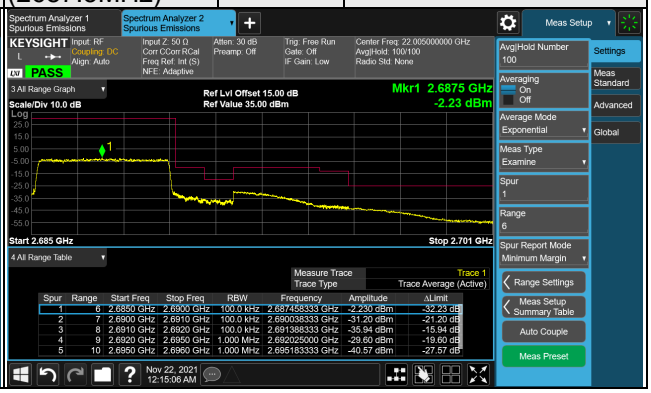
a. The EUT was set up for the rated peak power. The power was measured with Spectrum Analyzer. Band edge measurements were done at 2 channels: low and high operational frequency range.

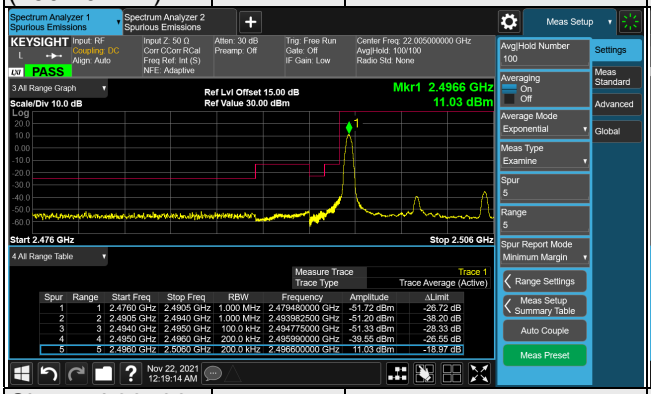
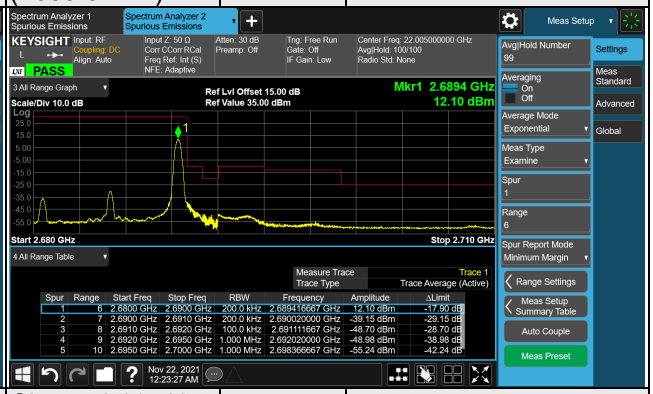
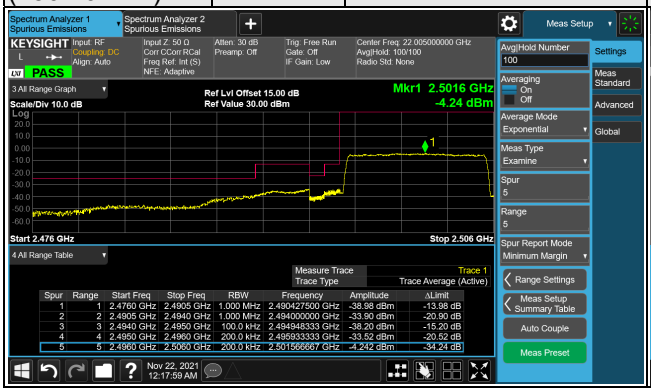
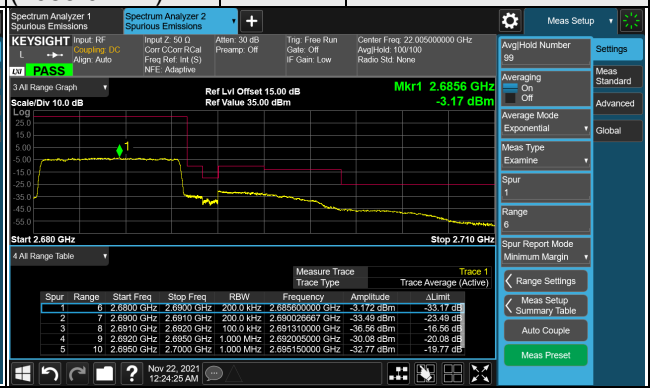
b. Measurement refer to ANSI C63.26 section 5.7.2 and FCC Part 27 section 27.53.

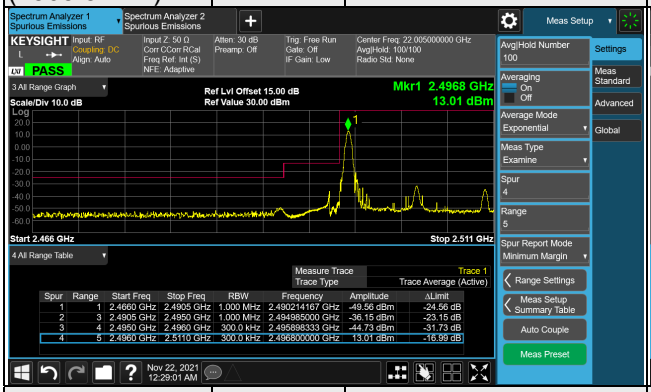
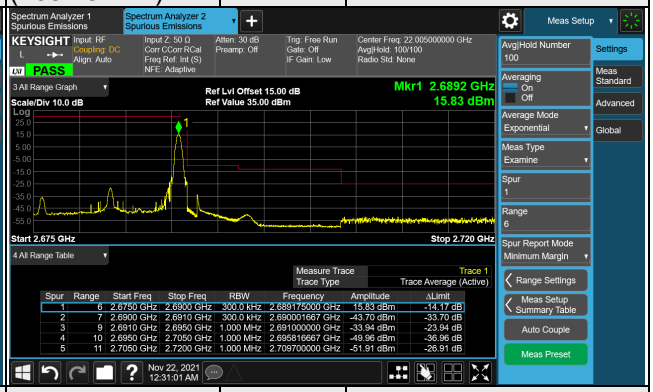
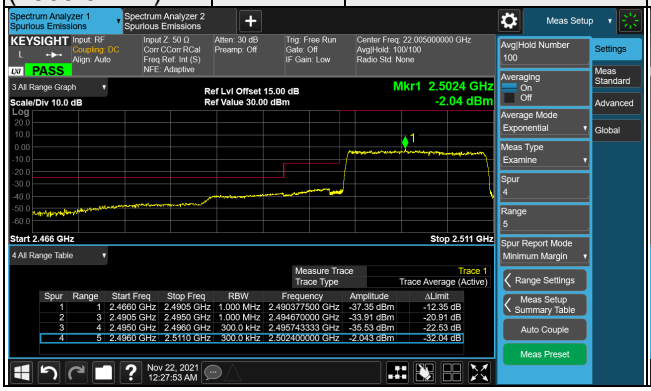
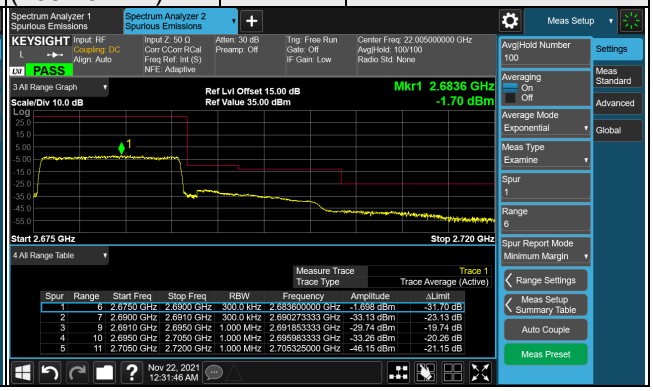
c. Record the max trace plot into the test report.

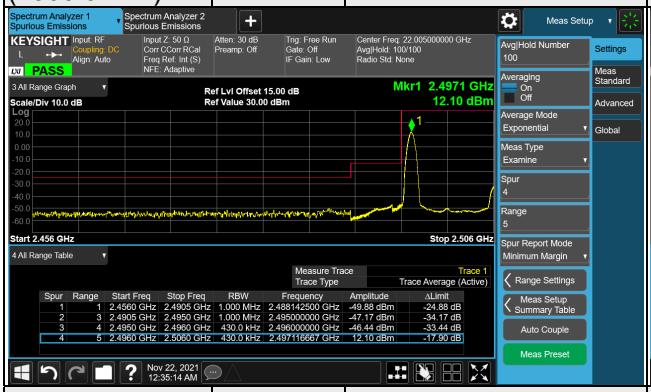
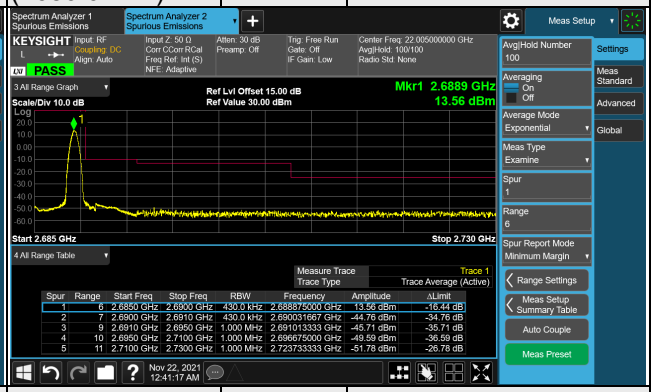
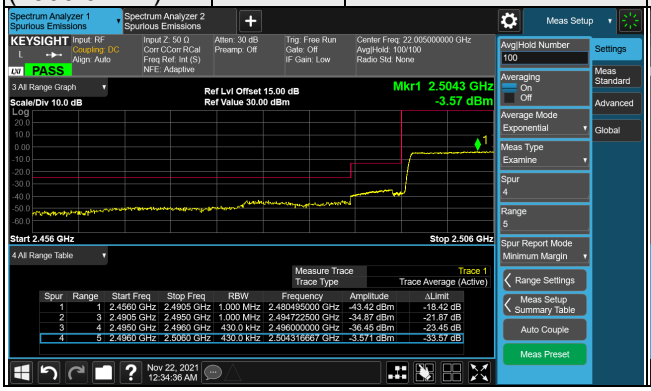
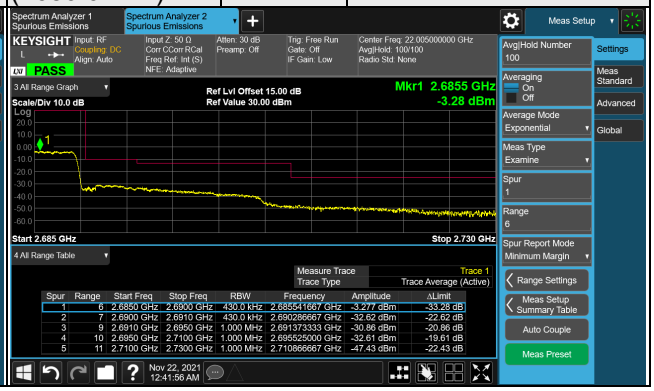
4.5.4 Test Results

Out-of-Band Emission

LTE Band 41, Channel Bandwidth 5MHz					
Channel 39675 (2498.5MHz)	QPSK	1 RB / 0 RB Offset	Channel 41565 (2687.5MHz)	QPSK	1 RB / 24 RB Offset
					
Channel 39675 (2498.5MHz)	QPSK	25 RB / 0 RB Offset	Channel 41565 (2687.5MHz)	QPSK	25 RB / 0 RB Offset
					

LTE Band 41, Channel Bandwidth 10MHz					
Channel 39700 (2501.0MHz)	QPSK	1 RB / 0 RB Offset	Channel 41540 (2685.0MHz)	QPSK	1 RB / 49 RB Offset
					
Channel 39700 (2501.0MHz)	QPSK	50 RB / 0 RB Offset	Channel 41540 (2685.0MHz)	QPSK	50 RB / 0 RB Offset
					

LTE Band 41, Channel Bandwidth 15MHz					
Channel 39725 (2503.5MHz)	QPSK	1 RB / 0 RB Offset	Channel 41515 (2682.5MHz)	QPSK	1 RB / 74 RB Offset
					
Channel 39725 (2503.5MHz)	QPSK	75 RB / 0 RB Offset	Channel 41515 (2682.5MHz)	QPSK	75 RB / 0 RB Offset
					

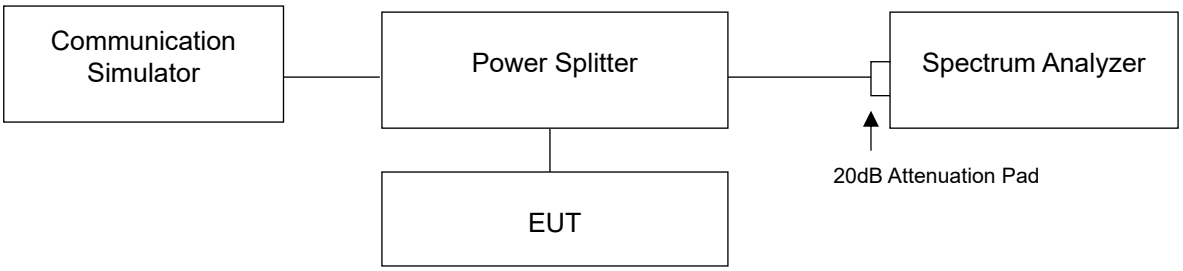
LTE Band 41, Channel Bandwidth 20MHz					
Channel 39750 (2506.0MHz)	QPSK	1 RB / 0 RB Offset	Channel 41490 (2680.0MHz)	QPSK	1 RB / 99 RB Offset
					
Channel 39750 (2506.0MHz)	QPSK	100 RB / 0 RB Offset	Channel 41490 (2680.0MHz)	QPSK	100 RB / 0 RB Offset
					

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

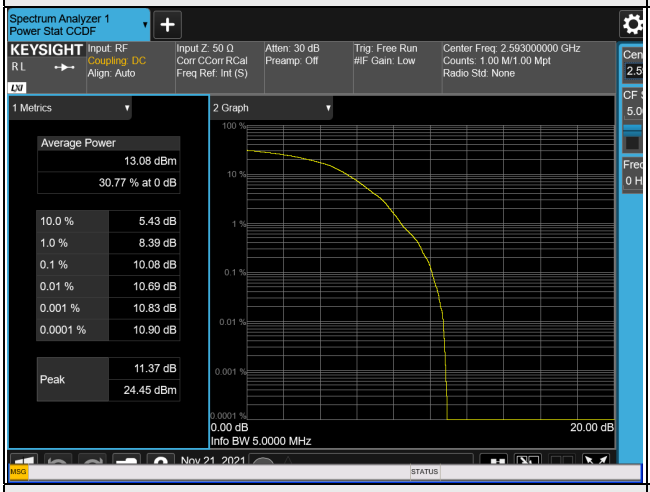
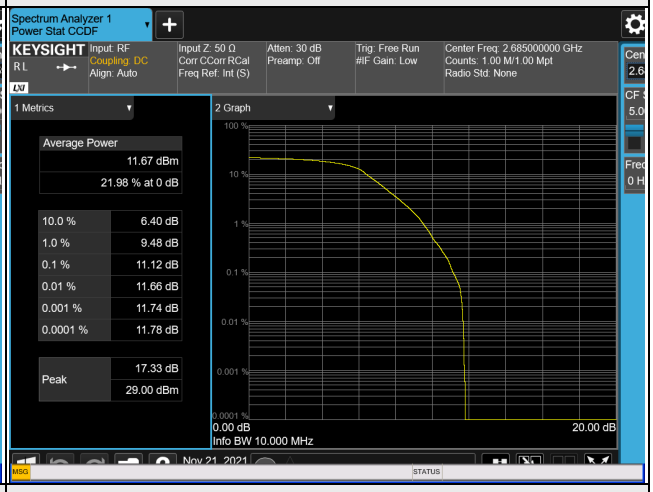
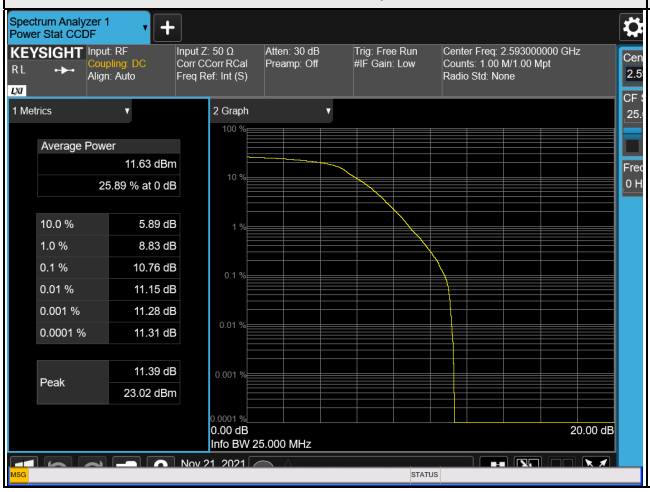
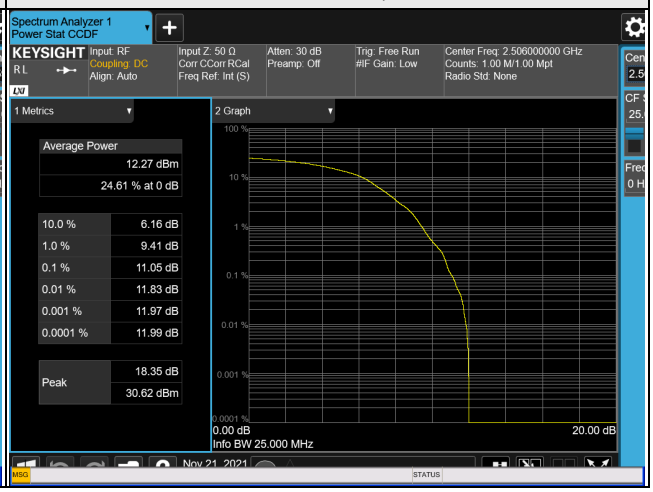
a. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;

b. Set the number of counts to a value that stabilizes the measured CCDF curve;

c. Record the maximum PAPR level associated with a probability of 0.1%.

4.6.4 Test Results

LTE Band 41, Channel Bandwidth 5MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
39675	2498.5	8.79	8.86	9.95
40620	2593.0	8.60	9.23	10.08
41565	2687.5	9.19	9.69	9.77
LTE Band 41, Channel Bandwidth 10MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
39700	2501.0	9.48	8.53	9.76
40620	2593.0	8.39	9.46	9.86
41540	2685.0	11.12	9.96	9.52
LTE Band 41, Channel Bandwidth 15MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
39725	2503.5	9.50	10.49	10.23
40620	2593.0	9.48	10.76	9.15
41515	2682.5	8.53	9.06	9.38
LTE Band 41, Channel Bandwidth 20MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
39750	2506.0	8.71	9.28	11.05
40620	2593.0	8.39	9.17	10.25
41490	2680.0	9.06	8.85	9.41

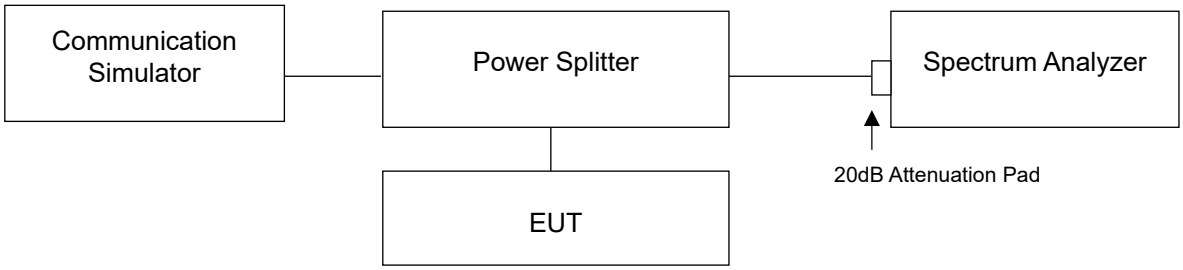
Spectrum Plot of Worst Value	
5MHz / 64QAM	10MHz / QPSK
	
15MHz / 16QAM	20MHz / 64QAM
	

4.7 Conducted Spurious Emissions

4.7.1 Limits of Conducted Spurious Emissions Measurement

According to FCC 27.53(m)(4), on any frequency outside a licensee's frequency block, The power of any emission shall be attenuated below the transmitter power (P) by at least 55 + 10 log (P) dB. The emission limit equal to –25dBm.

4.7.2 Test Setup



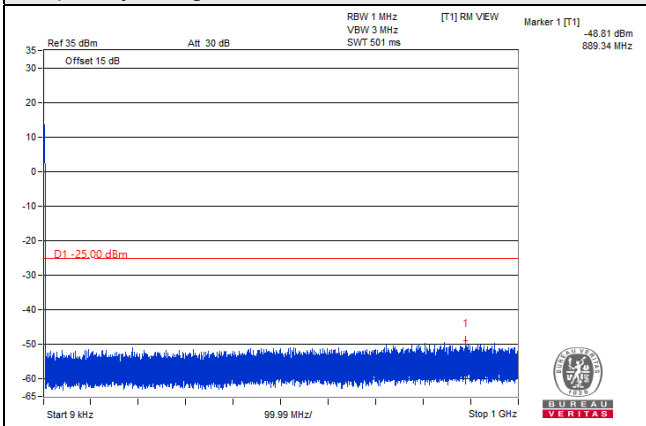
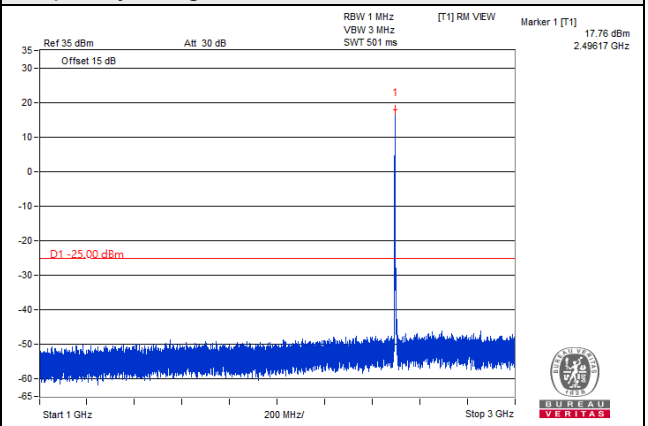
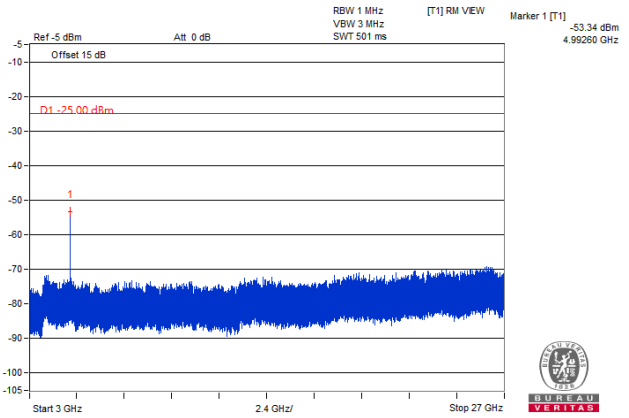
4.7.3 Test Procedure

a. All measurements were done at low, middle and high channels operational frequency range.

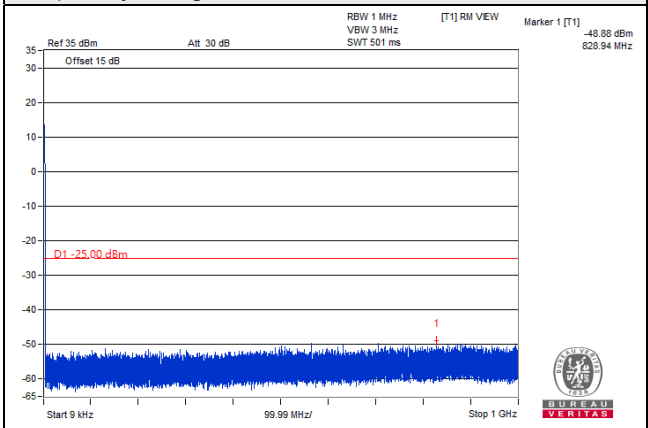
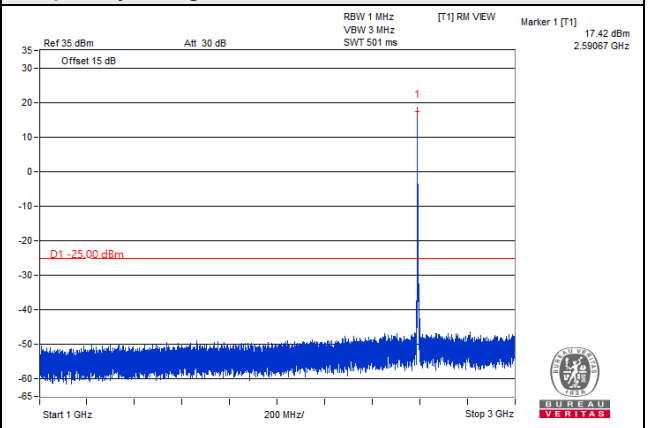
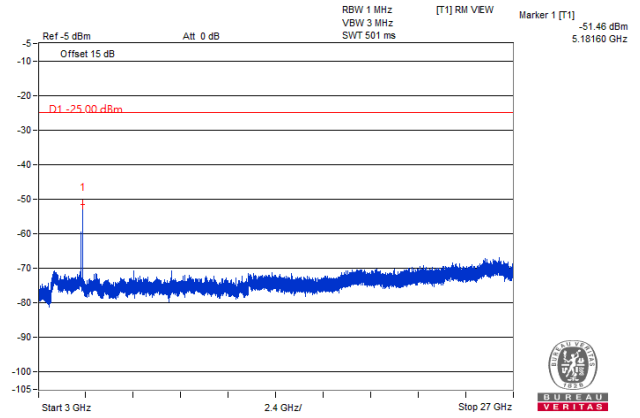
b. Measuring frequency range is from 9kHz to 1GHz. 20dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz are used for LTE Band 41 conducted emission measurement.

c. Measuring frequency range is from 1GHz to 27GHz. 20dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz are used for conducted emission measurement.

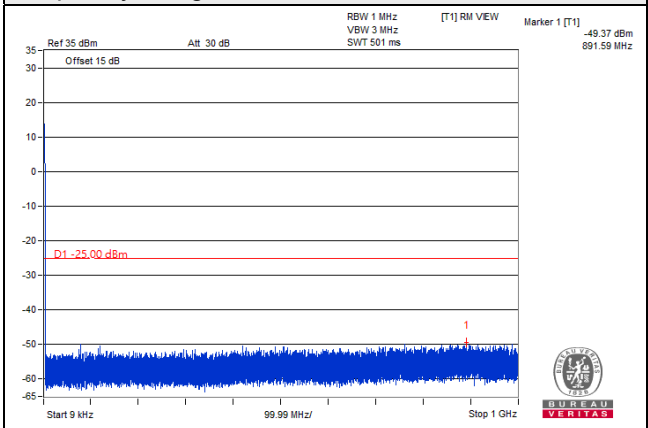
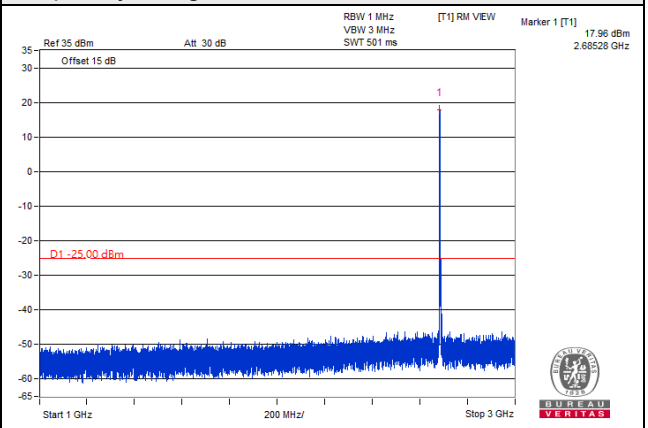
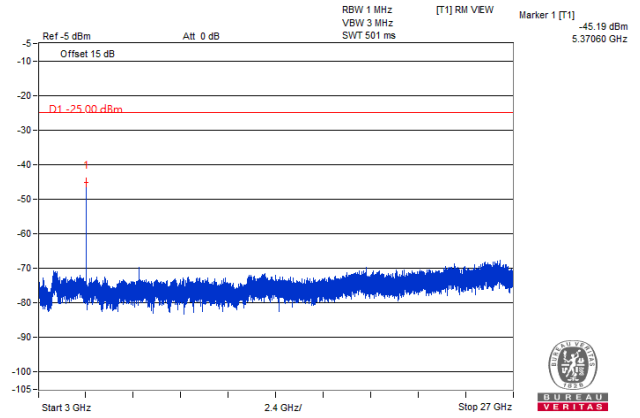
4.7.4 Test Results

LTE Band 41, Channel Bandwidth 5MHz	
Channel 39675 (2498.5MHz)	
Frequency Range : 9kHz ~ 1GHz	Frequency Range : 1GHz ~ 3GHz
	
Frequency Range : 3GHz ~ 27GHz	
	

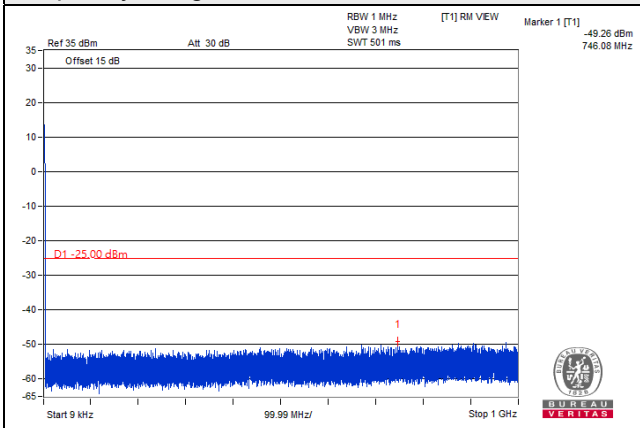
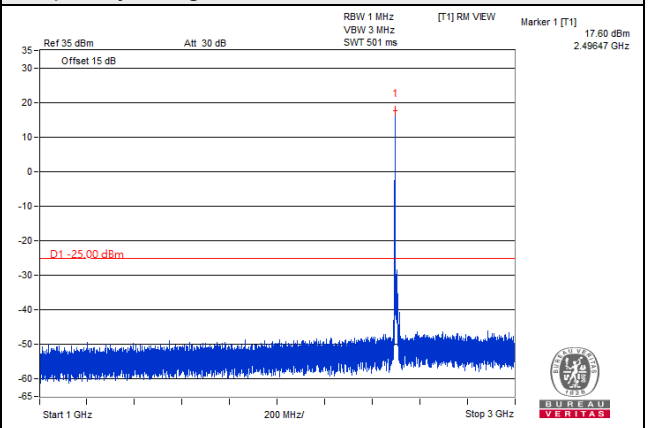
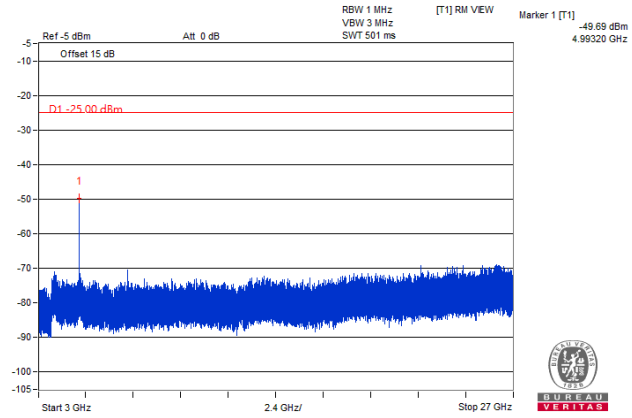
*The 9kHz signal over the limit is from Spectrum.

LTE Band 41, Channel Bandwidth 5MHz	
Channel 40620 (2593.0MHz)	
Frequency Range : 9kHz ~ 1GHz	Frequency Range : 1GHz ~ 3GHz
	
Frequency Range : 3GHz ~ 27GHz	
	

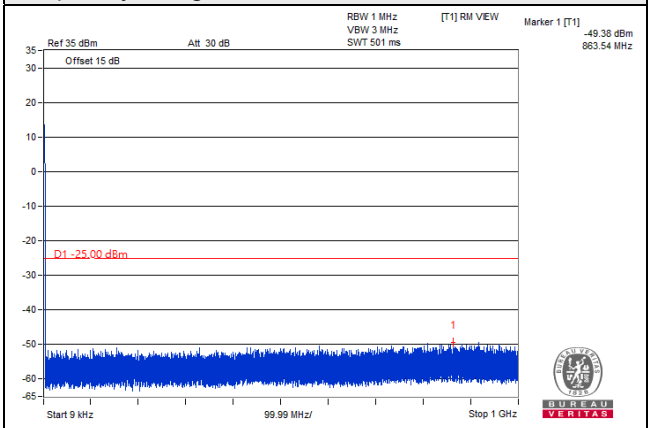
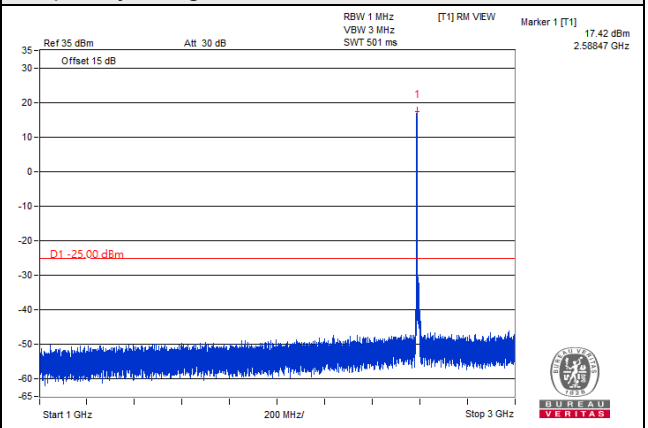
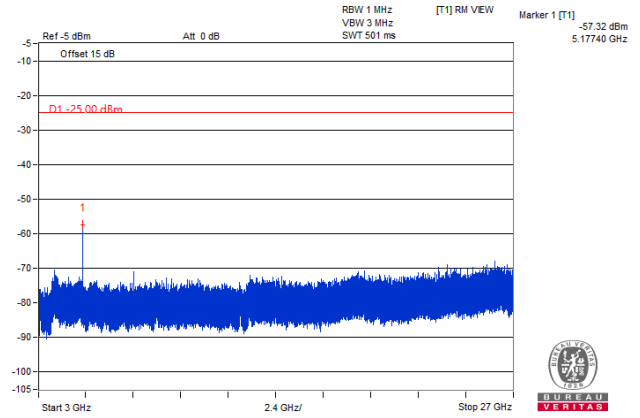
*The 9kHz signal over the limit is from Spectrum.

LTE Band 41, Channel Bandwidth 5MHz	
Channel 41565 (2687.5MHz)	
Frequency Range : 9kHz ~ 1GHz	Frequency Range : 1GHz ~ 3GHz
	
Frequency Range : 3GHz ~ 27GHz	
	

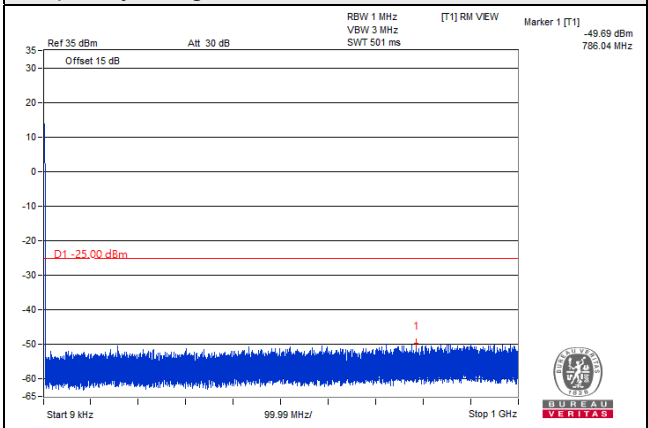
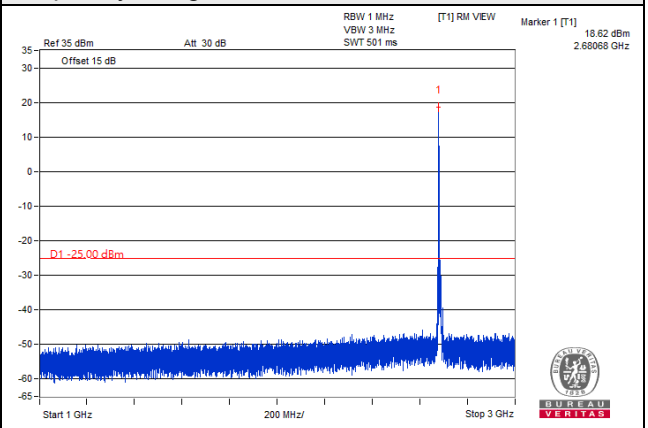
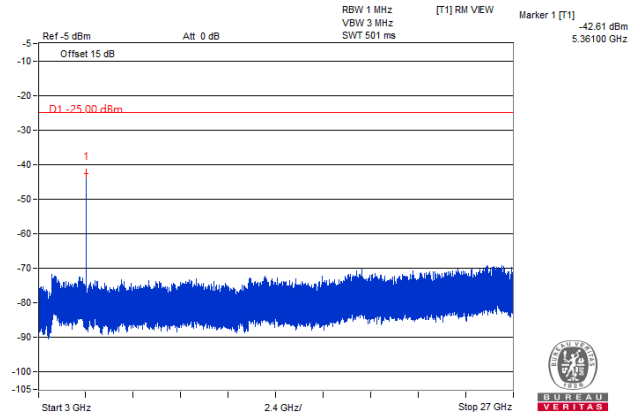
*The 9kHz signal over the limit is from Spectrum.

LTE Band 41, Channel Bandwidth 10MHz	
Channel 39700 (2501.0MHz)	
Frequency Range : 9kHz ~ 1GHz	Frequency Range : 1GHz ~ 3GHz
	
Frequency Range : 3GHz ~ 27GHz	
	

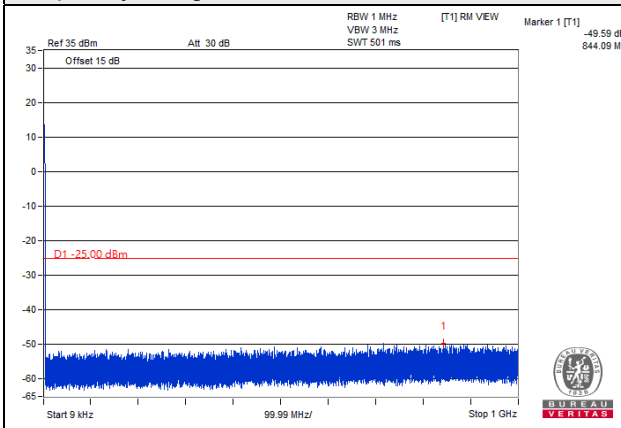
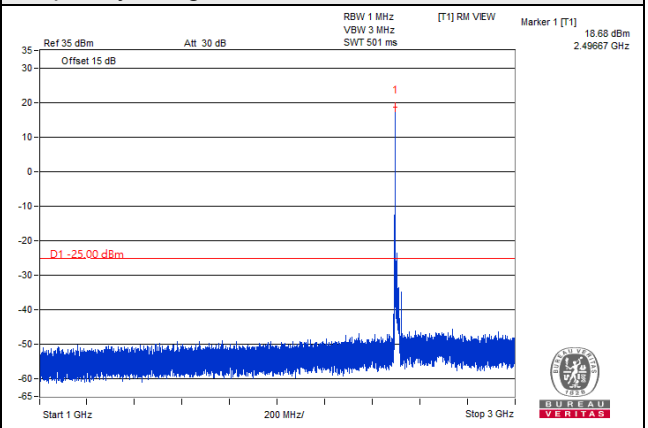
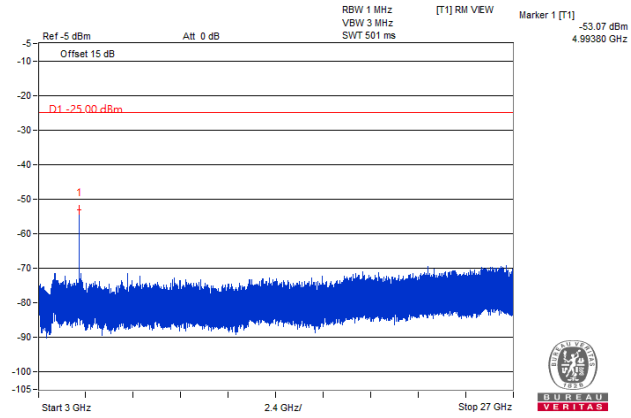
*The 9kHz signal over the limit is from Spectrum.

LTE Band 41, Channel Bandwidth 10MHz	
Channel 40620 (2593.0MHz)	
Frequency Range : 9kHz ~ 1GHz	Frequency Range : 1GHz ~ 3GHz
	
Frequency Range : 3GHz ~ 27GHz	
	

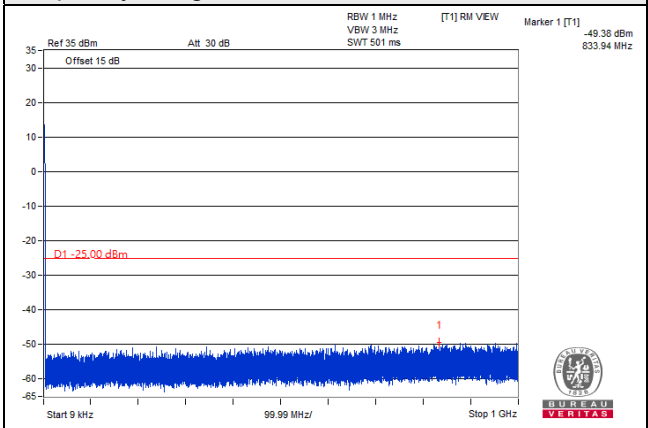
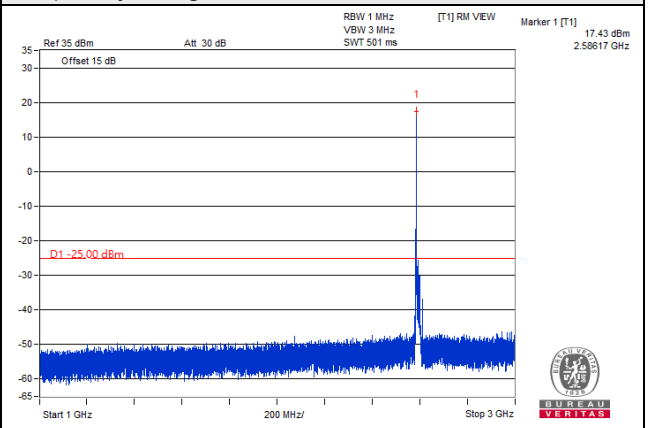
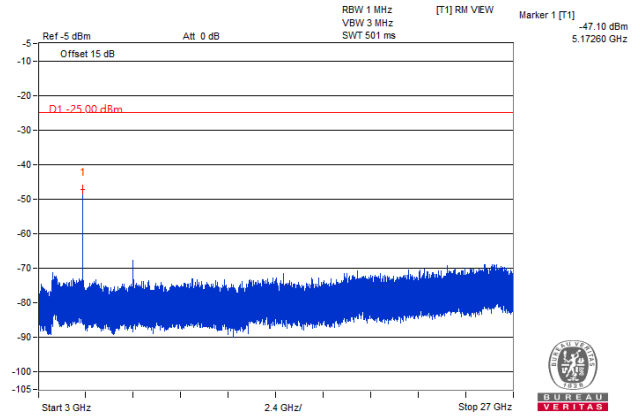
*The 9kHz signal over the limit is from Spectrum.

LTE Band 41, Channel Bandwidth 10MHz	
Channel 41540 (2685.0MHz)	
Frequency Range : 9kHz ~ 1GHz	Frequency Range : 1GHz ~ 3GHz
	
Frequency Range : 3GHz ~ 27GHz	
	

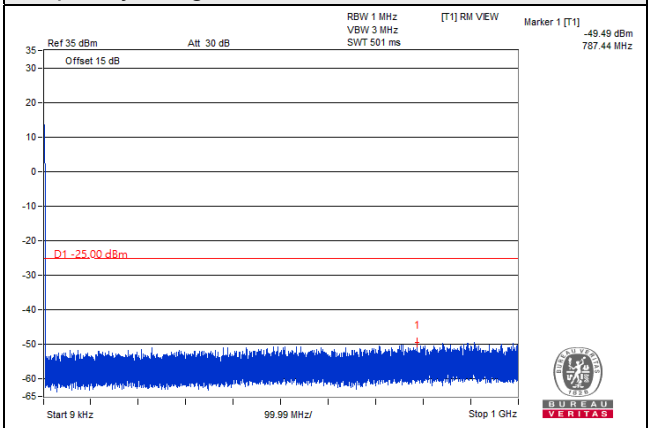
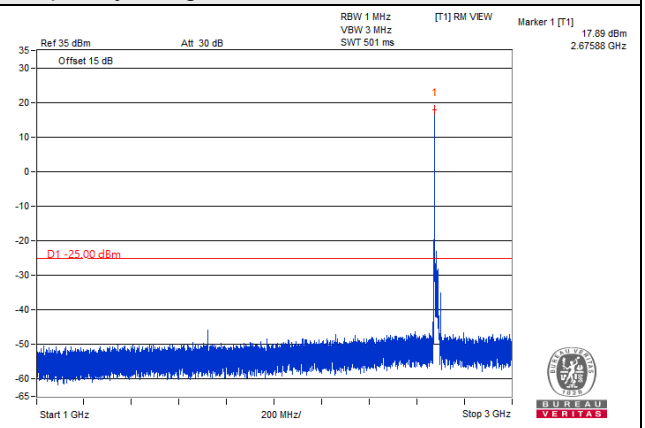
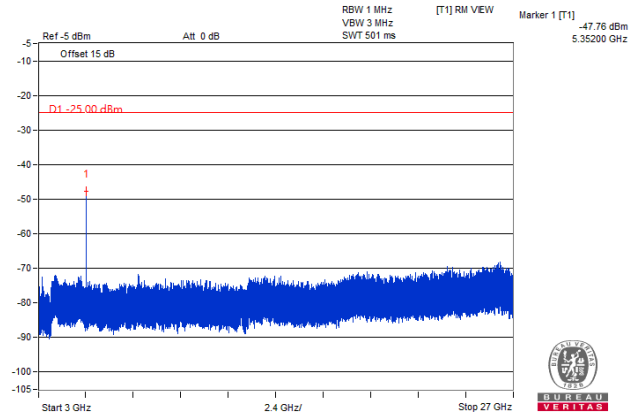
*The 9kHz signal over the limit is from Spectrum.

LTE Band 41, Channel Bandwidth 15MHz	
Channel 39725 (2503.5MHz)	
Frequency Range : 9kHz ~ 1GHz	Frequency Range : 1GHz ~ 3GHz
	
Frequency Range : 3GHz ~ 27GHz	
	

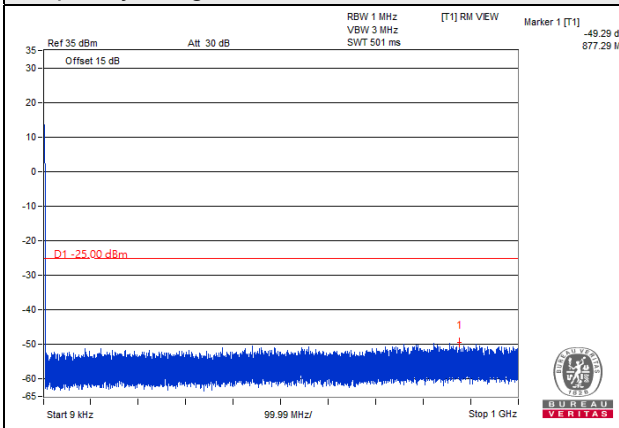
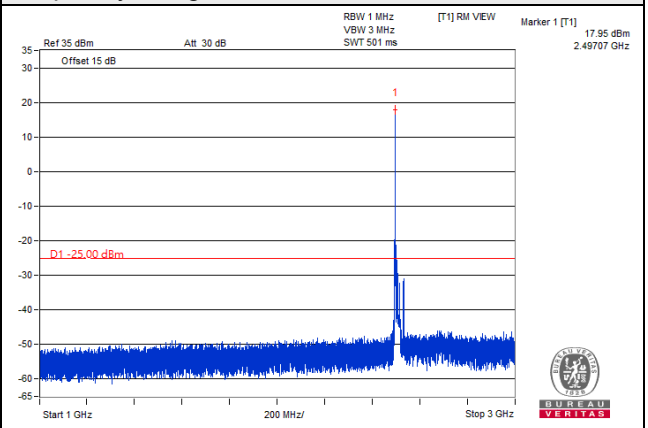
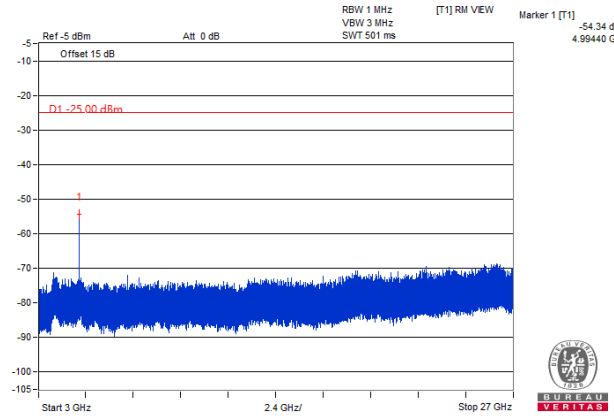
*The 9kHz signal over the limit is from Spectrum.

LTE Band 41, Channel Bandwidth 15MHz	
Channel 40620 (2593.0MHz)	
Frequency Range : 9kHz ~ 1GHz	Frequency Range : 1GHz ~ 3GHz
	
Frequency Range : 3GHz ~ 27GHz	
	

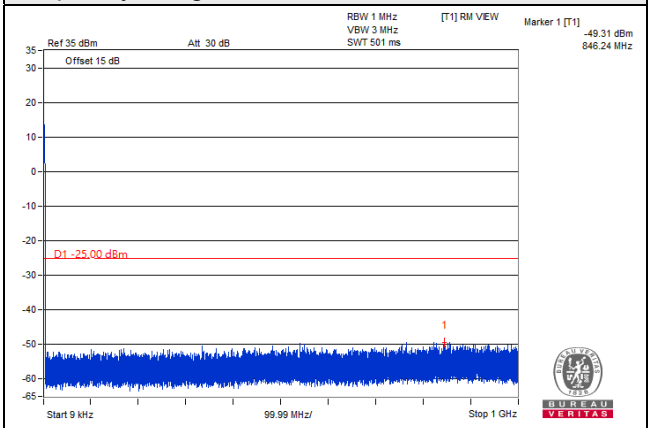
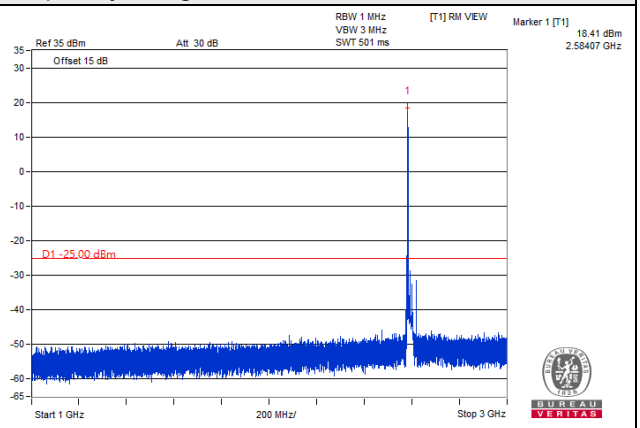
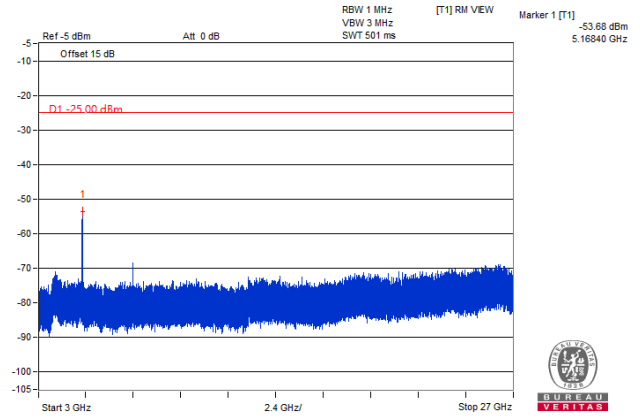
*The 9kHz signal over the limit is from Spectrum.

LTE Band 41, Channel Bandwidth 15MHz	
Channel 41515 (2682.5MHz)	
Frequency Range : 9kHz ~ 1GHz	Frequency Range : 1GHz ~ 3GHz
	
Frequency Range : 3GHz ~ 27GHz	
	

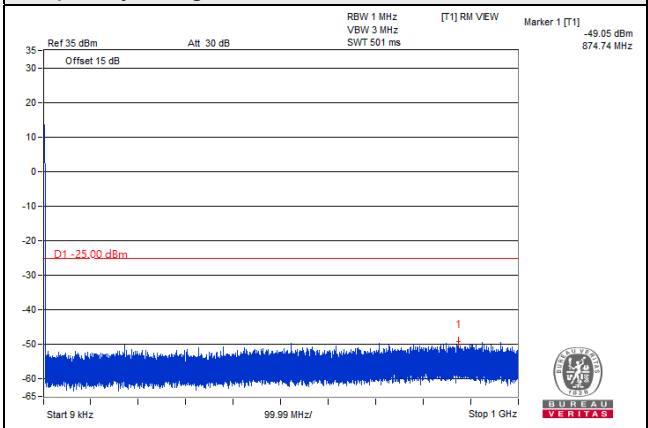
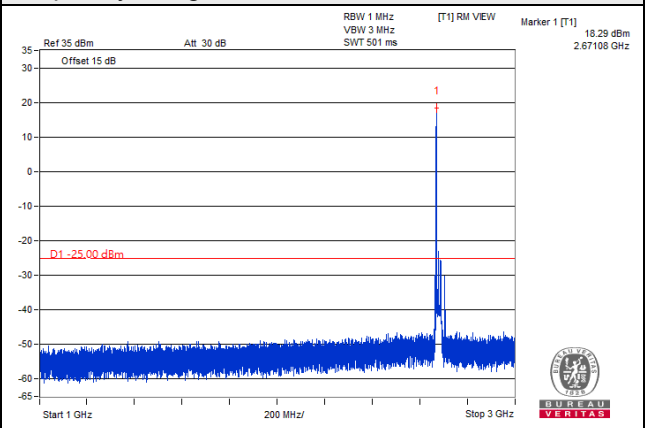
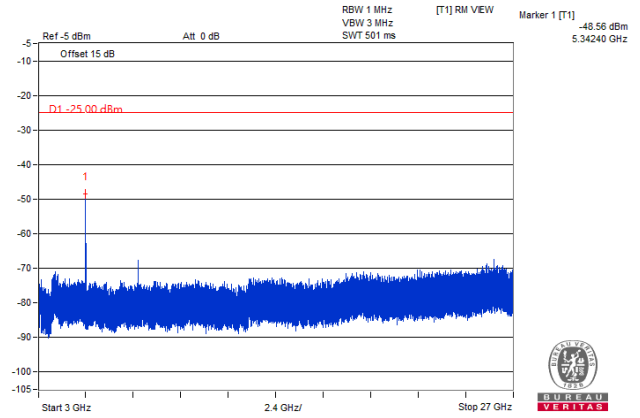
*The 9kHz signal over the limit is from Spectrum.

LTE Band 41, Channel Bandwidth 20MHz	
Channel 39750 (2506.0MHz)	
Frequency Range : 9kHz ~ 1GHz	Frequency Range : 1GHz ~ 3GHz
	
Frequency Range : 3GHz ~ 27GHz	
	

*The 9kHz signal over the limit is from Spectrum.

LTE Band 41, Channel Bandwidth 20MHz	
Channel 40620 (2593.0MHz)	
Frequency Range : 9kHz ~ 1GHz	Frequency Range : 1GHz ~ 3GHz
	
Frequency Range : 3GHz ~ 27GHz	
	

*The 9kHz signal over the limit is from Spectrum.

LTE Band 41, Channel Bandwidth 20MHz	
Channel 41490 (2680.0MHz)	
Frequency Range : 9kHz ~ 1GHz	Frequency Range : 1GHz ~ 3GHz
	
Frequency Range : 3GHz ~ 27GHz	
	

*The 9kHz signal over the limit is from Spectrum.

4.8 Radiated Emission Measurement

4.8.1 Limits of Radiated Emission Measurement

In the FCC 27.53(m)(4),On any frequency outside a licensee's frequency block, The power of any emission shall be attenuated below the transmitter power (P) by at least 55 + 10 log (P) dB. The emission limit equal to –25dBm.

4.8.2 Test Procedure

a. In the semi-anechoic chamber, EUT placed on the 0.8m(below or equal 1GHz) and/or 1.5m(above 1GHz) 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 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.

b. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

c. Perform a field strength measurement and record the worse read value, is the field strength value via a spectrum reading obtained corrected for antenna factor, cable loss and pre-amplifier factor and then mathematically convert the measured field strength level to EIRP/ERP level.

d. Following C63.26 section 5.5 and 5.2.7
   - EIRP (dBm) = E (dBμV/m) + 20log(D) - 104.8; where D is the measurement distance (in the far field region) in m.
   - ERP (dBm) = E (dBμV/m) + 20log(D) - 104.8 - 2.15; where D is the measurement distance (in the far field region) in m.

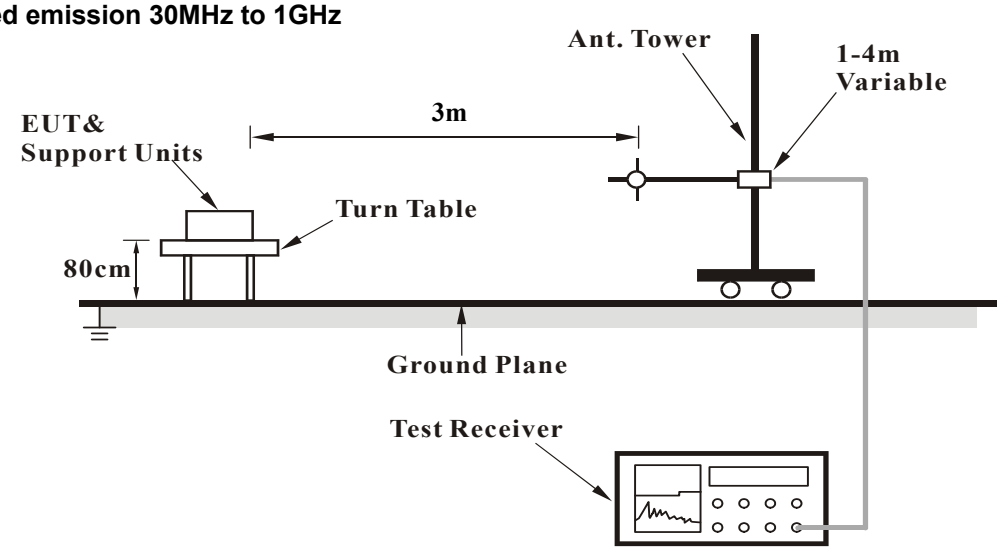
Note:
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.
2. The emission levels were against the limit of frequency range 9 kHz ~ 30 MHz:
   The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

4.8.3 Deviation from Test Standard

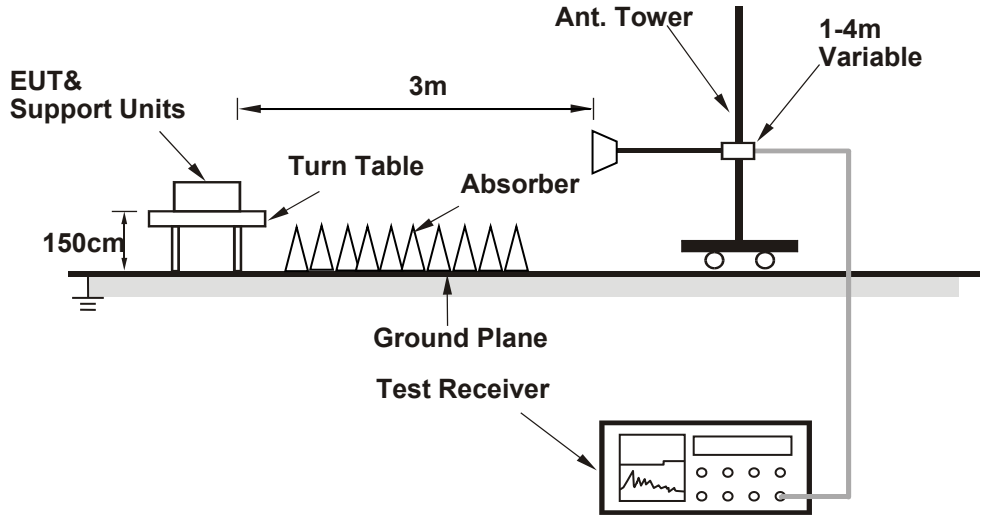
No deviation.

4.8.4 Test Setup

For radiated emission 30MHz to 1GHz



For radiated emission above 1GHz



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

4.8.5 Test Results

Below 1GHz

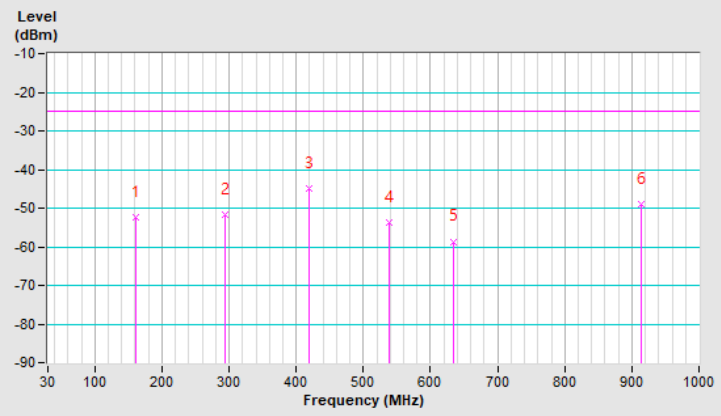
LTE Band 41, Channel Bandwidth 5MHz

Mode	TX channel 40620 (2593.0MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	19deg. C, 69%RH	Input Power	120Vac, 60Hz
Tested By	Rex Wang		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	160.95	-52.21	-25.00	-27.21	1.50 H	15	51.78	-103.99
2	294.81	-51.80	-25.00	-26.80	1.50 H	15	50.57	-102.37
3	418.97	-44.97	-25.00	-19.97	1.00 H	15	54.69	-99.66
4	539.25	-53.77	-25.00	-28.77	2.00 H	15	43.32	-97.09
5	633.34	-58.64	-25.00	-33.64	1.00 H	15	36.44	-95.08
6	914.64	-49.03	-25.00	-24.03	1.00 H	15	40.49	-89.52

Remarks:

1. EIRP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value
4. The other EIRP levels were very low against the limit.

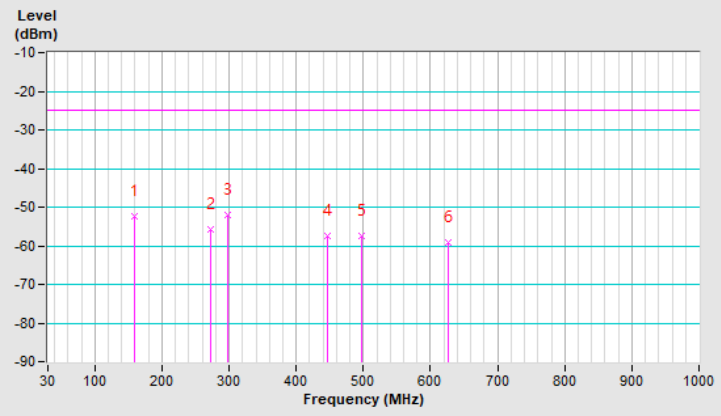


Mode	TX channel 40620 (2593.0MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	19deg. C, 69%RH	Input Power	120Vac, 60Hz
Tested By	Rex Wang		

Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	159.98	-52.36	-25.00	-27.36	1.00 V	15	51.48	-103.84
2	271.53	-55.91	-25.00	-30.91	1.50 V	15	47.18	-103.09
3	298.69	-52.14	-25.00	-27.14	2.00 V	15	50.08	-102.22
4	447.10	-57.43	-25.00	-32.43	1.00 V	15	41.41	-98.84
5	497.54	-57.29	-25.00	-32.29	1.00 V	15	40.59	-97.88
6	625.58	-59.01	-25.00	-34.01	1.25 V	4	36.19	-95.20

Remarks:

1. EIRP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value
4. The other EIRP levels were very low against the limit.



Above 1GHz

LTE Band 41, Channel Bandwidth 5MHz

Mode	TX channel 39675 (2498.5MHz)	Frequency Range	1GHz ~ 27GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Hans Wu		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	**4997.00**	**-40.80**	**-25.00**	**-15.80**	**1.62 H**	**243**	**47.40**	**-88.20**
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	4997.00	-45.10	-25.00	-20.10	1.63 V	187	43.10	-88.20

Remarks:

1. EIRP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value
4. The other EIRP levels were very low against the limit.

Mode	TX channel 40620 (2593.0MHz)	Frequency Range	1GHz ~ 27GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Hans Wu		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	**5186.00**	**-40.80**	**-25.00**	**-15.80**	**1.57 H**	**236**	**47.20**	**-88.00**
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5186.00	-42.60	-25.00	-17.60	1.61 V	197	45.40	-88.00

Remarks:

1. EIRP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value
4. The other EIRP levels were very low against the limit.

Mode	TX channel 41565 (2687.5MHz)	Frequency Range	1GHz ~ 27GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Hans Wu		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5375.00	-46.10	-25.00	-21.10	1.55 H	239	42.00	-88.10
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5375.00	-44.70	-25.00	-19.70	1.64 V	190	43.40	-88.10

Remarks:

1. EIRP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value
4. The other EIRP levels were very low against the limit.

LTE Band 41, Channel Bandwidth 20MHz

Mode	TX channel 39750 (2506.0MHz)	Frequency Range	1GHz ~ 27GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Hans Wu		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5012.00	-41.90	-25.00	-16.90	2.96 H	3	46.20	-88.10
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5012.00	-42.40	-25.00	-17.40	1.95 V	348	45.70	-88.10

Remarks:

1. EIRP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value
4. The other EIRP levels were very low against the limit.

Mode	TX channel 40620 (2593.0MHz)	Frequency Range	1GHz ~ 27GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Hans Wu		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5186.00	-41.90	-25.00	-16.90	3.01 H	0	46.10	-88.00
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5186.00	-42.00	-25.00	-17.00	1.93 V	346	46.00	-88.00

Remarks:

1. EIRP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value
4. The other EIRP levels were very low against the limit.

Mode	TX channel 41490 (2680.0MHz)	Frequency Range	1GHz ~ 27GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Hans Wu		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5360.00	-42.10	-25.00	-17.10	1.99 H	347	46.20	-88.30
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5360.00	-42.40	-25.00	-17.40	1.97 V	344	45.90	-88.30

Remarks:

1. EIRP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value
4. The other EIRP levels were very low against the limit.

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 and approved according to ISO/IEC 17025.

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

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Web Site: www.bureauveritas-adt.com

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

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