

FCC Test Report (Part 22 – LTE B5)

Report No.: RFBFOK-WTW-P22010278-5

FCC ID: RYQSTTM21VAPP

Test Model: STTM21VAPP

Received Date: Feb. 10, 2022

Test Date: Feb. 24 ~ Mar. 02, 2022

Issued Date: Mar. 15, 2022

Applicant: FIH CO., LTD.

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



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Release Control Record

Issue No.	Description	Date Issued
RFBFOK-WTW-P22010278-5	Original release	Mar. 15, 2022

1 Certificate of Conformity

Product: 4G cellular phone

Brand: SHARP

Test Model: STTM21VAPP

Applicant: FIH CO., LTD.

Test Date: Feb. 24 ~ Mar. 02, 2022

Standards: FCC Part 22, Subpart H

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

Prepared by : Celine Chou , **Date:** Mar. 15, 2022
Celine Chou / Senior Specialist

Approved by : Jeremy Lin , **Date:** Mar. 15, 2022
Jeremy Lin / Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 22 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 22.913 (a)	Effective radiated power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement
22.913 (d)	Peak To Average Ratio	Pass	Meet the requirement of limit.
2.1055 22.355	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth	Pass	Meet the requirement of limit.
22.917	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 22.917	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 22.917	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -24.24dB at 1673.00MHz.

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) ($\pm$)
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	2.93 dB
	200MHz ~ 1000MHz	2.95 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	1.94 dB

2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer Agilent	N9010A	MY52220314	Dec. 03, 2021	Dec. 02, 2022
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Apr. 12, 2021	Apr. 11, 2022
Broadband Horn Antenna SCHWARZBECK	BBHA 9170	148	Nov. 14, 2021	Nov. 13, 2022
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 14, 2021	Nov. 13, 2022
BILOG Antenna SCHWARZBECK	VULB 9168	9168-472	Oct. 28, 2021	Oct. 27, 2022
Fixed Attenuator WOKEN	MDCS18N-10	MDCS18N-10-01	Apr. 13, 2021	Apr. 12, 2022
Loop Antenna TESEQ	HLA 6121	45745	Jul. 21, 2021	Jul. 20, 2022
Preamplifier EMCI	EMC001340	980201	Sep. 15, 2021	Sep. 14, 2022
Preamplifier EMCI	EMC 012645	980115	Oct. 05, 2021	Oct. 04, 2022
Preamplifier EMCI	EMC 184045	980116	Oct. 05, 2021	Oct. 04, 2022
Preamplifier EMCI	EMC 330H	980112	Oct. 05, 2021	Oct. 04, 2022
Peak Power Analyzer KEYSIGHT	8990B	MY51000485	Jan. 18, 2022	Jan. 17, 2023
Wideband Power Sensor KEYSIGHT	N1923A	MY58020002	Jan. 17, 2022	Jan. 16, 2023
RF Coaxial Cable EMCI	EMC104-SM-SM-800 0	171005	Oct. 05, 2021	Oct. 04, 2022
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM-1000 (140807)	Oct. 05, 2021	Oct. 04, 2022
RF Coaxial Cable WOKEN	8D-FB	Cable-Ch10-01	Oct. 05, 2021	Oct. 04, 2022
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	NA	NA	NA
Temperature & Humidity Chamber TERCHY	HRM-120RF	931022	Jan. 03, 2022	Jan. 02, 2023
True RMS Clamp Meter Fluke	325	31130711WS	Jun. 02, 2021	Jun. 01, 2022
DC power supply Keysight	U8002A	MY56330015	NA	NA
Radio Communication Analyzer Anritsu	MT8821C	6261806803	Feb. 16, 2022	Feb. 15, 2023

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 10.

3 General Information

3.1 General Description of EUT

Product	4G cellular phone		
Brand	SHARP		
Test Model	STTM21VAPP		
Power Supply Rating	5Vdc from adapter or host equipment 3.85Vdc from battery		
Modulation Type	QPSK, 16QAM		
Operating Frequency	LTE Band 5 (Channel Bandwidth 1.4MHz)	824.7MHz ~ 848.3MHz	
	LTE Band 5 (Channel Bandwidth 3MHz)	825.5MHz ~ 847.5MHz	
	LTE Band 5 (Channel Bandwidth 5MHz)	826.5MHz ~ 846.5MHz	
	LTE Band 5 (Channel Bandwidth 10MHz)	829.0MHz ~ 844.0MHz	
Max. ERP Power		QPSK	16QAM
	LTE Band 5 (Channel Bandwidth 1.4MHz)	37.844mW (15.78dBm)	31.550mW (14.99dBm)
	LTE Band 5 (Channel Bandwidth 3MHz)	37.757mW (15.77dBm)	31.769mW (15.02dBm)
	LTE Band 5 (Channel Bandwidth 5MHz)	38.107mW (15.81dBm)	31.842mW (15.03dBm)
	LTE Band 5 (Channel Bandwidth 10MHz)	38.371mW (15.84dBm)	32.359mW (15.10dBm)
Emission Designator		QPSK	16QAM
	LTE Band 5 (Channel Bandwidth 1.4MHz)	1M09G7D	1M09D7W
	LTE Band 5 (Channel Bandwidth 3MHz)	2M69G7D	2M69D7W
	LTE Band 5 (Channel Bandwidth 5MHz)	4M50G7D	4M49D7W
	LTE Band 5 (Channel Bandwidth 10MHz)	8M98G7D	8M98D7W
Antenna Type	Refer to note		
Antenna Connector	Refer to note		
Accessory Device	Adapter, Battery		
Cable Supplied	0.95m shielded USB cable without core		

Note:

1. The EUT consumes power from the following Adapter & Battery.

Adapter	
Brand	RTF
Model	RT-C6
Input Power	100-240Vac, 50/60Hz, 0.35A
Output Power	5Vdc, 2A

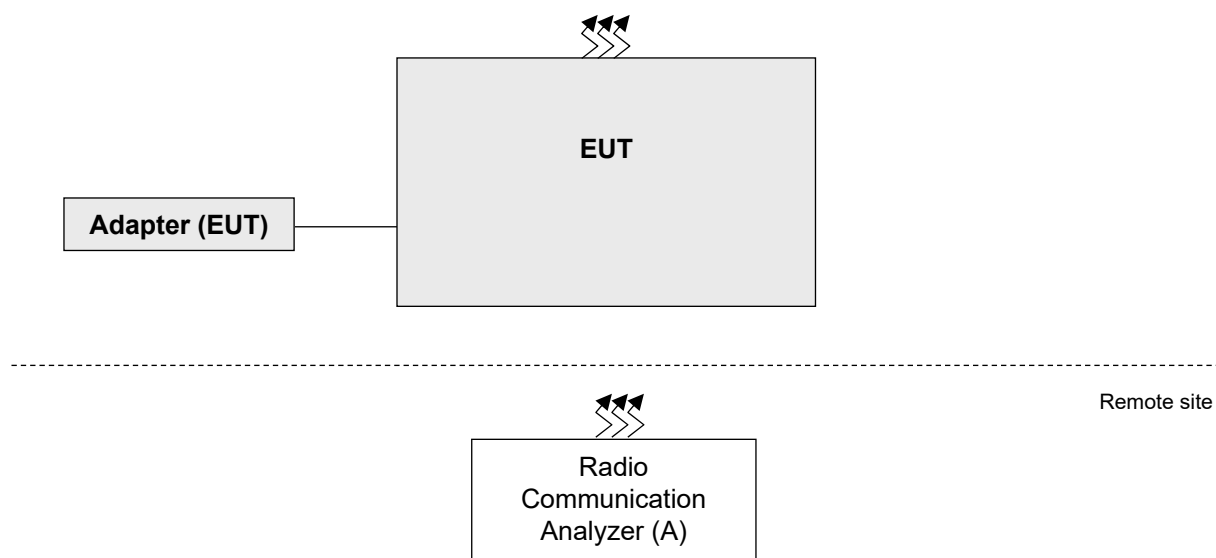
Battery	
Brand	ZHONGSHAN TIANMAO BATTERY CO., LTD.
Model	HE401
Rating	3.85Vdc, 3500mAh

2. The antenna information is listed as below.

No.	Type	Connector	Function	Gain (dBi)					
				B2	B4	B5	B12	B13	B66
Main Ant.	Loop	FIT	TX	1.0	-1.3	-4.8	-2.5	-4.3	-1.3
			RX	1.7	0.5	-6.5	-2.0	-4.3	0.5
Div Ant.	Loop	FIT	RX	-4.8	-2.8	-2.5	-4.6	-5.0	-2.8

* 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.

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. 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	-

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.

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 5	X-plane

LTE Band 5

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
-	ERP	20407 to 20643	20407 (824.7MHz), 20525 (836.5MHz), 20643 (848.3MHz)	1.4MHz	QPSK / 16QAM	1 RB / 0 RB Offset 1 RB / 2 RB Offset 1 RB / 5 RB Offset 3 RB / 0 RB Offset 3 RB / 1 RB Offset 3 RB / 3 RB Offset 6 RB / 0 RB Offset
		20415 to 20635	20415 (825.5MHz), 20525 (836.5MHz), 20635 (847.5MHz)	3MHz	QPSK / 16QAM	1 RB / 0 RB Offset 1 RB / 7 RB Offset 1 RB / 14 RB Offset 8 RB / 0 RB Offset 8 RB / 3 RB Offset 8 RB / 7 RB Offset 15 RB / 0 RB Offset
		20425 to 20625	20425 (826.5MHz), 20525 (836.5MHz), 20625 (846.5MHz)	5MHz	QPSK / 16QAM	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
		20450 to 20600	20450 (829.0MHz), 20525 (836.5MHz), 20600 (844.0MHz)	10MHz	QPSK / 16QAM	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
-	Modulation Characteristics	20450 to 20600	20525 (836.5MHz)	10MHz	QPSK / 16QAM	50 RB / 0 RB Offset
-	Frequency Stability	20407 to 20643	20407 (824.7MHz), 20643 (848.3MHz)	1.4MHz	QPSK	6 RB / 0 RB Offset
		20415 to 20635	20415 (825.5MHz), 20635 (847.5MHz)	3MHz	QPSK	15 RB / 0 RB Offset
		20425 to 20625	20425 (826.5MHz), 20625 (846.5MHz)	5MHz	QPSK	25 RB / 0 RB Offset
		20450 to 20600	20450 (829.0MHz), 20600 (844.0MHz)	10MHz	QPSK	50 RB / 0 RB Offset

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
-	Occupied Bandwidth	20407 to 20643	20407 (824.7MHz), 20525 (836.5MHz), 20643 (848.3MHz)	1.4MHz	QPSK / 16QAM	6 RB / 0RB Offset
		20415 to 20635	20415 (825.5MHz), 20525 (836.5MHz), 20635 (847.5MHz)	3MHz	QPSK / 16QAM	15 RB / 0RB Offset
		20425 to 20625	20425 (826.5MHz), 20525 (836.5MHz), 20625 (846.5MHz)	5MHz	QPSK / 16QAM	25RB / 0RB Offset
		20450 to 20600	20450 (829.0MHz), 20525 (836.5MHz), 20600 (844.0MHz)	10MHz	QPSK / 16QAM	50RB / 0RB Offset
-	Band Edge	20407 to 20643	20407 (824.7MHz), 20643 (848.3MHz)	1.4MHz	QPSK	1 RB / 0 RB Offset 1 RB / 5 RB Offset 6 RB / 0 RB Offset
		20415 to 20635	20415 (825.5MHz), 20635 (847.5MHz)	3MHz	QPSK	1 RB / 0 RB Offset 1 RB / 14 RB Offset 15 RB / 0 RB Offset
		20425 to 20625	20425 (826.5MHz), 20625 (846.5MHz)	5MHz	QPSK	1 RB / 0 RB Offset 1 RB / 24 RB Offset 25 RB / 0 RB Offset
		20450 to 20600	20450 (829.0MHz), 20600 (844.0MHz)	10MHz	QPSK	1 RB / 0 RB Offset 1 RB / 49 RB Offset 50 RB / 0 RB Offset
-	Peak to Average Ratio	20407 to 20643	20407 (824.7MHz), 20525 (836.5MHz), 20643 (848.3MHz)	1.4MHz	QPSK / 16QAM	1 RB / 0 RB Offset
		20415 to 20635	20415 (825.5MHz), 20525 (836.5MHz), 20635 (847.5MHz)	3MHz	QPSK / 16QAM	1 RB / 0 RB Offset
		20425 to 20625	20425 (826.5MHz), 20525 (836.5MHz), 20625 (846.5MHz)	5MHz	QPSK / 16QAM	1 RB / 0 RB Offset
		20450 to 20600	20450 (829.0MHz), 20525 (836.5MHz), 20600 (844.0MHz)	10MHz	QPSK / 16QAM	1 RB / 0 RB Offset
-	Conducted Emission	20407 to 20643	20407 (824.7MHz), 20525 (836.5MHz), 20643 (848.3MHz)	1.4MHz	QPSK	1 RB / 0 RB Offset
		20415 to 20635	20415 (825.5MHz), 20525 (836.5MHz), 20635 (847.5MHz)	3MHz	QPSK	1 RB / 0 RB Offset
		20425 to 20625	20425 (826.5MHz), 20525 (836.5MHz), 20625 (846.5MHz)	5MHz	QPSK	1 RB / 0 RB Offset
		20450 to 20600	20450 (829.0MHz), 20525 (836.5MHz), 20600 (844.0MHz)	10MHz	QPSK	1 RB / 0 RB Offset

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
-	Radiated Emission	20407 to 20643	20407 (824.7MHz), 20525 (836.5MHz), 20643 (848.3MHz)	1.4MHz	QPSK	1 RB / 0 RB Offset
		20425 to 20625	20425 (826.5MHz), 20525 (836.5MHz), 20625 (846.5MHz)	5MHz	QPSK	1 RB / 0 RB Offset
		20450 to 20600	20450 (829.0MHz), 20525 (836.5MHz), 20600 (844.0MHz)	10MHz	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 lowest, 5MHz & highest channel bandwidth for final test.
3. The output power for QPSK, 16QAM, and measured value of QPSK is higher than 16QAM mode. Therefore, only Modulation characteristics, occupied bandwidth and Peak to average ratio items had been tested under QPSK and 16QAM 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
ERP	25deg. C, 60%RH	3.85Vdc	James Yang
Modulation Characteristics	25deg. C, 60%RH	3.85Vdc	James Yang
Frequency Stability	25deg. C, 60%RH	3.85Vdc	James Yang
Occupied Bandwidth	25deg. C, 60%RH	3.85Vdc	James Yang
Band Edge	25deg. C, 60%RH	3.85Vdc	James Yang
Peak To Average Ratio	25deg. C, 60%RH	3.85Vdc	James Yang
Conducted Emission	25deg. C, 60%RH	3.85Vdc	James Yang
Radiated Emission	19deg. C, 65%RH 21deg. C, 71%RH	120Vac, 60Hz	Thomas Cheng Vincent Chen

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:

Test Standard:

FCC 47 CFR Part 2

FCC 47 CFR Part 22

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 and recorded as per the above standards.

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

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

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:

$$\text{EIRP} = P_{\text{Meas}} + G_T$$

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

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 5						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		20450	20525	20600
		Frequency (MHz)		829	836.5	844
10M	QPSK	1	0	22.61	22.79	22.65
		1	24	22.49	22.67	22.52
		1	49	22.44	22.62	22.47
		25	0	21.61	21.79	21.64
		25	12	21.57	21.75	21.60
		25	25	21.52	21.70	21.55
		50	0	21.56	21.74	21.59
10M	16QAM	1	0	21.87	22.05	21.90
		1	24	21.83	22.01	21.86
		1	49	21.82	22.00	21.85
		25	0	20.62	20.80	20.65
		25	12	20.60	20.78	20.63
		25	25	20.53	20.71	20.56
		50	0	20.56	20.74	20.59
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		20425	20525	20625
		Frequency (MHz)		826.5	836.5	846.5
5M	QPSK	1	0	22.61	22.76	22.63
		1	12	22.39	22.57	22.45
		1	24	22.43	22.54	22.40
		12	0	21.59	21.73	21.63
		12	6	21.49	21.68	21.56
		12	13	21.46	21.61	21.46
		25	0	21.51	21.65	21.52
5M	16QAM	1	0	21.81	21.98	21.84
		1	12	21.83	21.92	21.76
		1	24	21.80	21.90	21.75
		12	0	20.60	20.73	20.55
		12	6	20.53	20.69	20.61
		12	13	20.51	20.68	20.47
		25	0	20.50	20.73	20.54

LTE Band 5						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		20415	20525	20635
		Frequency (MHz)		825.5	836.5	847.5
3M	QPSK	1	0	22.59	22.72	22.59
		1	7	22.44	22.62	22.46
		1	14	22.41	22.56	22.45
		8	0	21.51	21.78	21.63
		8	3	21.54	21.68	21.60
		8	7	21.52	21.61	21.53
		15	0	21.56	21.66	21.54
3M	16QAM	1	0	21.86	21.96	21.81
		1	7	21.78	21.97	21.86
		1	14	21.74	21.91	21.81
		8	0	20.55	20.79	20.56
		8	3	20.55	20.73	20.59
		8	7	20.45	20.68	20.56
		15	0	20.54	20.69	20.57
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		20407	20525	20643
		Frequency (MHz)		824.7	836.5	848.3
1.4M	QPSK	1	0	22.41	22.73	22.45
		1	2	22.40	22.46	22.38
		1	5	22.33	22.53	22.39
		3	0	22.51	22.69	22.55
		3	1	22.39	22.67	22.51
		3	3	22.42	22.59	22.41
		6	0	21.42	21.53	21.53
1.4M	16QAM	1	0	21.77	21.86	21.72
		1	2	21.72	21.78	21.67
		1	5	21.67	21.94	21.76
		3	0	21.37	21.68	21.52
		3	1	21.35	21.72	21.43
		3	3	21.47	21.54	21.53
		6	0	20.33	20.68	20.55

ERP Power (dBm)

LTE Band 5						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		20450	20525	20600
		Frequency (MHz)		829	836.5	844
10M	QPSK	1	0	15.66	15.84	15.70
		1	24	15.54	15.72	15.57
		1	49	15.49	15.67	15.52
		25	0	14.66	14.84	14.69
		25	12	14.62	14.80	14.65
		25	25	14.57	14.75	14.60
		50	0	14.61	14.79	14.64
10M	16QAM	1	0	14.92	15.10	14.95
		1	24	14.88	15.06	14.91
		1	49	14.87	15.05	14.90
		25	0	13.67	13.85	13.70
		25	12	13.65	13.83	13.68
		25	25	13.58	13.76	13.61
		50	0	13.61	13.79	13.64
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		20425	20525	20625
		Frequency (MHz)		826.5	836.5	846.5
5M	QPSK	1	0	15.66	15.81	15.68
		1	12	15.44	15.62	15.50
		1	24	15.48	15.59	15.45
		12	0	14.64	14.78	14.68
		12	6	14.54	14.73	14.61
		12	13	14.51	14.66	14.51
		25	0	14.56	14.70	14.57
5M	16QAM	1	0	14.86	15.03	14.89
		1	12	14.88	14.97	14.81
		1	24	14.85	14.95	14.80
		12	0	13.65	13.78	13.60
		12	6	13.58	13.74	13.66
		12	13	13.56	13.73	13.52
		25	0	13.55	13.78	13.59

*ERP = Conducted + antenna gain (-4.8 dBi) - 2.15

LTE Band 5						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		20415	20525	20635
		Frequency (MHz)		825.5	836.5	847.5
3M	QPSK	1	0	15.64	15.77	15.64
		1	7	15.49	15.67	15.51
		1	14	15.46	15.61	15.50
		8	0	14.56	14.83	14.68
		8	3	14.59	14.73	14.65
		8	7	14.57	14.66	14.58
		15	0	14.61	14.71	14.59
3M	16QAM	1	0	14.91	15.01	14.86
		1	7	14.83	15.02	14.91
		1	14	14.79	14.96	14.86
		8	0	13.60	13.84	13.61
		8	3	13.60	13.78	13.64
		8	7	13.50	13.73	13.61
		15	0	13.59	13.74	13.62
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		20407	20525	20643
		Frequency (MHz)		824.7	836.5	848.3
1.4M	QPSK	1	0	15.46	15.78	15.50
		1	2	15.45	15.51	15.43
		1	5	15.38	15.58	15.44
		3	0	15.56	15.74	15.60
		3	1	15.44	15.72	15.56
		3	3	15.47	15.64	15.46
		6	0	14.47	14.58	14.58
1.4M	16QAM	1	0	14.82	14.91	14.77
		1	2	14.77	14.83	14.72
		1	5	14.72	14.99	14.81
		3	0	14.42	14.73	14.57
		3	1	14.40	14.77	14.48
		3	3	14.52	14.59	14.58
		6	0	13.38	13.73	13.60

*ERP = Conducted + antenna gain (-4.8 dBi) - 2.15

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

N/A

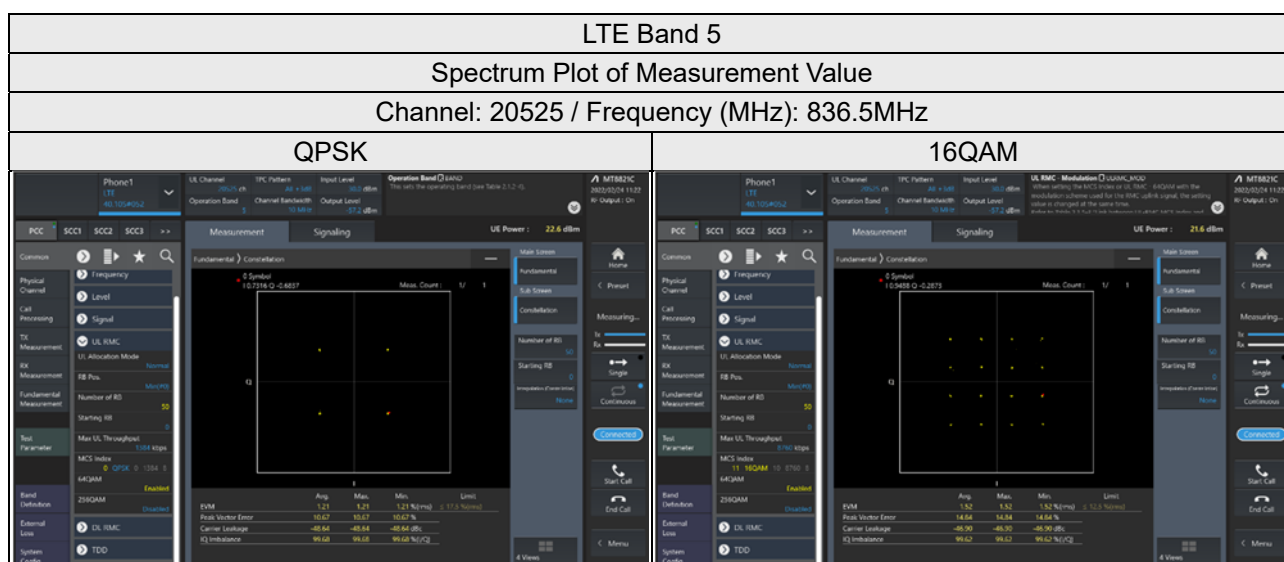
4.2.2 Test Procedure

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



4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

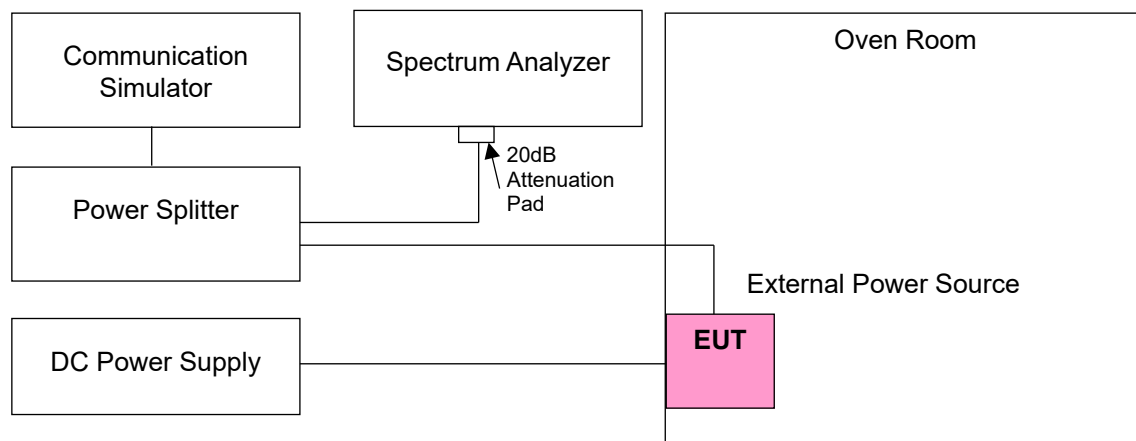
1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

4.3.2 Test Procedure

- Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
- EUT is connected the external power supply to control the DC 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 (Vdc)	LTE Band 5			
	Channel Bandwidth 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	824.700023	0.028	848.300031	0.037
3.30	824.700031	0.038	848.300037	0.044
4.43	824.700020	0.024	848.300012	0.014

Note: The applicant defined the normal working voltage is from 3.30Vdc to 4.43Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 5			
	Channel Bandwidth 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	824.700035	0.042	848.300024	0.028
-20	824.700023	0.028	848.300034	0.040
-10	824.700037	0.045	848.300034	0.040
0	824.700039	0.047	848.300019	0.022
10	824.700036	0.044	848.300036	0.042
20	824.699962	-0.046	848.299968	-0.038
30	824.699983	-0.021	848.299972	-0.033
40	824.699973	-0.033	848.299977	-0.027
50	824.699967	-0.040	848.299986	-0.017

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 5			
	Channel Bandwidth 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	825.500036	0.044	847.500019	0.022
3.30	825.500017	0.021	847.500024	0.028
4.43	825.500033	0.040	847.500024	0.028

Note: The applicant defined the normal working voltage is from 3.30Vdc to 4.43Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 5			
	Channel Bandwidth 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	825.500037	0.045	847.500017	0.020
-20	825.500010	0.012	847.500021	0.025
-10	825.500028	0.034	847.500036	0.042
0	825.500035	0.042	847.500020	0.024
10	825.500016	0.019	847.500013	0.015
20	825.499983	-0.021	847.499973	-0.032
30	825.499975	-0.030	847.499980	-0.024
40	825.499970	-0.036	847.499983	-0.020
50	825.499978	-0.027	847.499969	-0.037

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 5			
	Channel Bandwidth 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	826.500034	0.041	846.500027	0.032
3.30	826.500012	0.015	846.500036	0.043
4.43	826.500014	0.017	846.500024	0.028

Note: The applicant defined the normal working voltage is from 3.30Vdc to 4.43Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 5			
	Channel Bandwidth 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	826.500032	0.039	846.500022	0.026
-20	826.500016	0.019	846.500018	0.021
-10	826.500031	0.038	846.500021	0.025
0	826.500011	0.013	846.500023	0.027
10	826.500024	0.029	846.500014	0.017
20	826.499986	-0.017	846.499975	-0.030
30	826.499962	-0.046	846.499964	-0.043
40	826.499987	-0.016	846.499964	-0.043
50	826.499990	-0.012	846.499973	-0.032

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 5			
	Channel Bandwidth 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	829.000015	0.018	844.000033	0.039
3.30	829.000024	0.029	844.000032	0.038
4.43	829.000015	0.018	844.000037	0.044

Note: The applicant defined the normal working voltage is from 3.30Vdc to 4.43Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 5			
	Channel Bandwidth 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	829.000016	0.019	844.000040	0.047
-20	829.000025	0.030	844.000023	0.027
-10	829.000025	0.030	844.000031	0.037
0	829.000010	0.012	844.000022	0.026
10	829.000015	0.018	844.000019	0.023
20	828.999964	-0.043	843.999982	-0.021
30	828.999984	-0.019	843.999990	-0.012
40	828.999965	-0.042	843.999987	-0.015
50	828.999984	-0.019	843.999984	-0.019

4.4 Occupied Bandwidth Measurement

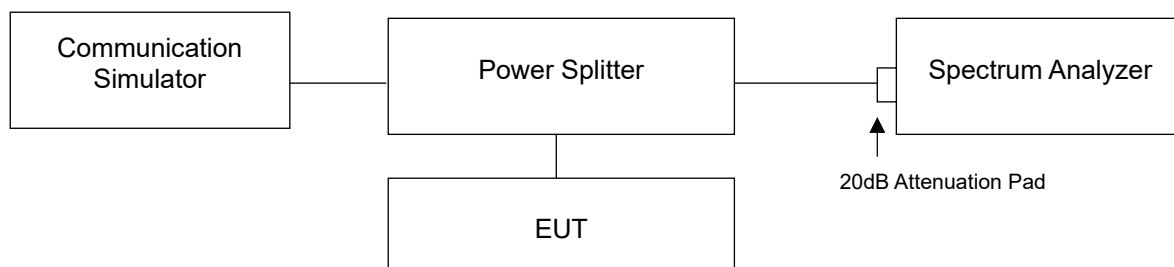
4.4.1 Test Procedure

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

- 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.
- The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set $\geq 3 \times \text{RBW}$.
- 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.
- 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.
- Set spectrum analyzer detection mode to peak, and the trace mode to max hold.
- 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).
- 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.
- 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.
- 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.

4.4.2 Test Setup



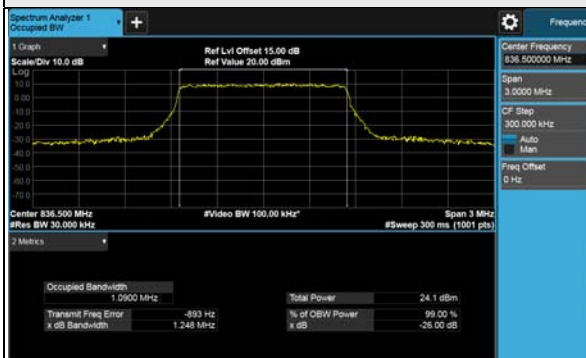
4.4.3 Test Result

Occupied Bandwidth

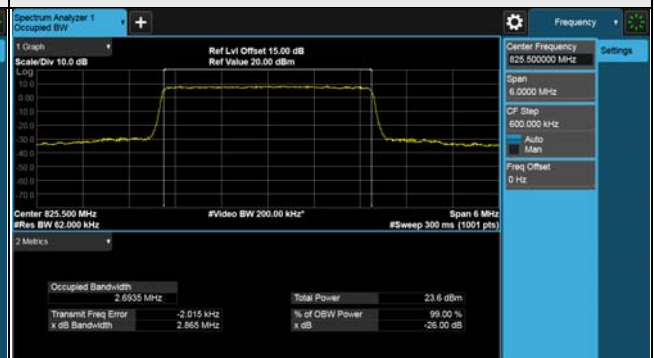
LTE Band 5, Channel Bandwidth 1.4MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
20407	824.7	1.09	1.09
20525	836.5	1.09	1.09
20643	848.3	1.09	1.09
LTE Band 5, Channel Bandwidth 3MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
20415	825.5	2.69	2.69
20525	836.5	2.69	2.69
20635	847.5	2.69	2.69
LTE Band 5, Channel Bandwidth 5MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
20425	826.5	4.50	4.49
20525	836.5	4.49	4.49
20625	846.5	4.50	4.49
LTE Band 5, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
20450	829.0	8.98	8.98
20525	836.5	8.96	8.96
20600	844.0	8.98	8.98

Spectrum Plot of Worst Value

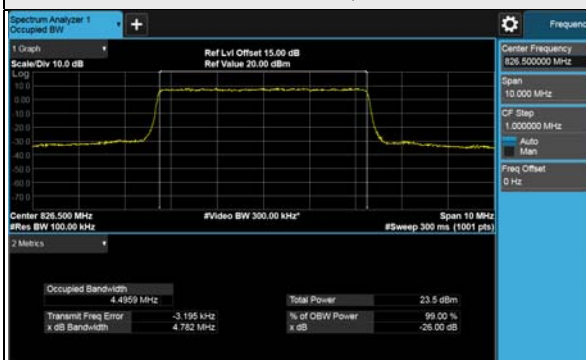
1.4MHz / QPSK



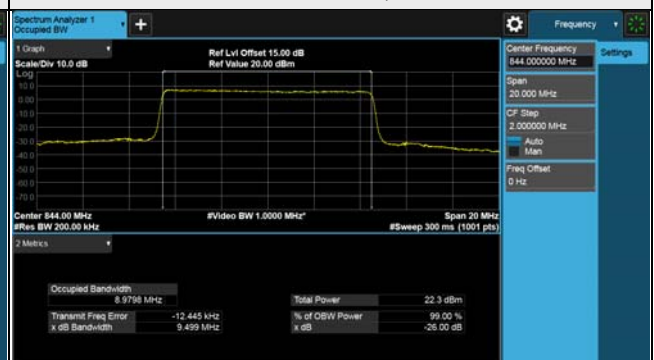
3MHz / QPSK



5MHz / QPSK



10MHz / 16QAM

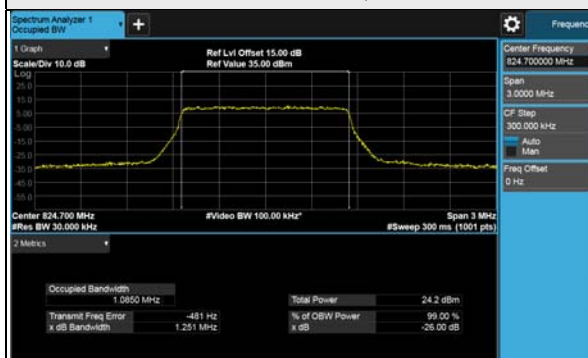


26dB Bandwidth

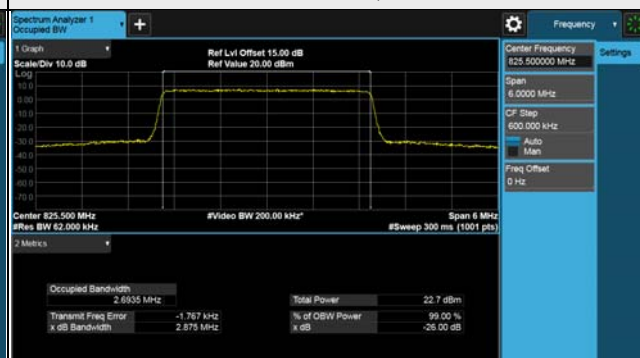
LTE Band 5, Channel Bandwidth 1.4MHz			
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		QPSK	16QAM
20407	824.7	1.25	1.25
20525	836.5	1.25	1.25
20643	848.3	1.25	1.25
LTE Band 5, Channel Bandwidth 3MHz			
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		QPSK	16QAM
20415	825.5	2.87	2.88
20525	836.5	2.87	2.87
20635	847.5	2.87	2.87
LTE Band 5, Channel Bandwidth 5MHz			
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		QPSK	16QAM
20425	826.5	4.78	4.78
20525	836.5	4.79	4.77
20625	846.5	4.79	4.77
LTE Band 5, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		QPSK	16QAM
20450	829.0	9.50	9.50
20525	836.5	9.50	9.49
20600	844.0	9.50	9.50

Spectrum Plot of Worst Value

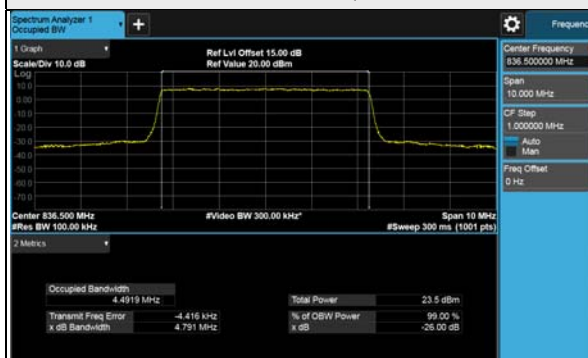
1.4MHz / QPSK



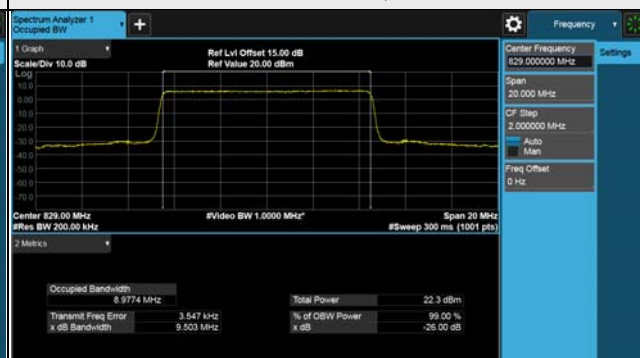
3MHz / 16QAM



5MHz / QPSK



10MHz / 16QAM

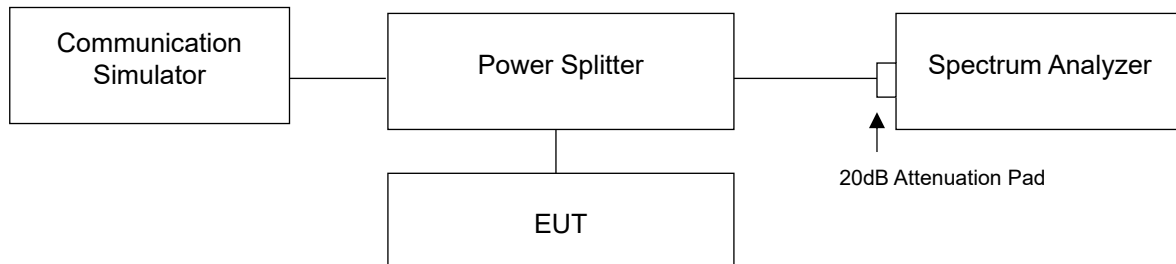


4.5 Band Edge Measurement

4.5.1 Limits of Band Edge Measurement

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

4.5.2 Test Setup



4.5.3 Test Procedures

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

4.5.4 Test Results

LTE Band 5, Channel Bandwidth 1.4MHz

Channel 20407
(824.7MHz)

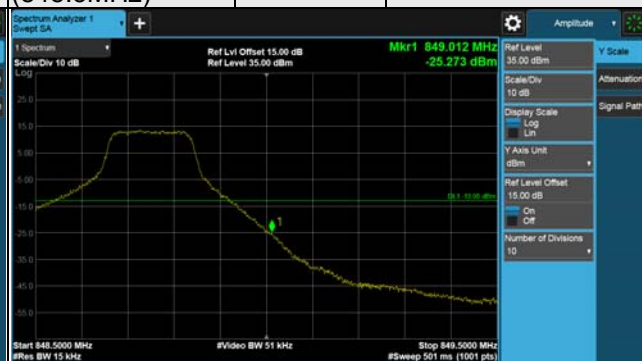
QPSK

1 RB / 0 RB Offset

Channel 20643
(848.3MHz)

QPSK

1 RB / 5 RB Offset



Channel 20407
(824.7MHz)

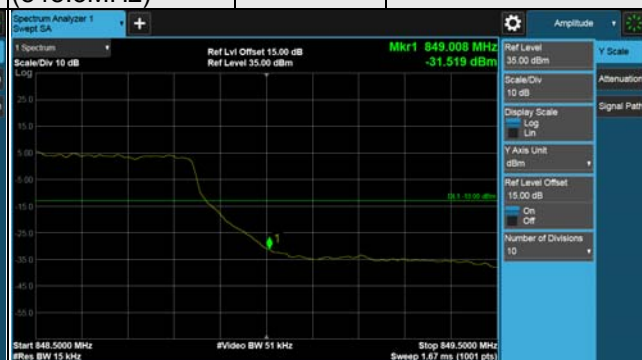
QPSK

6 RB / 0 RB Offset

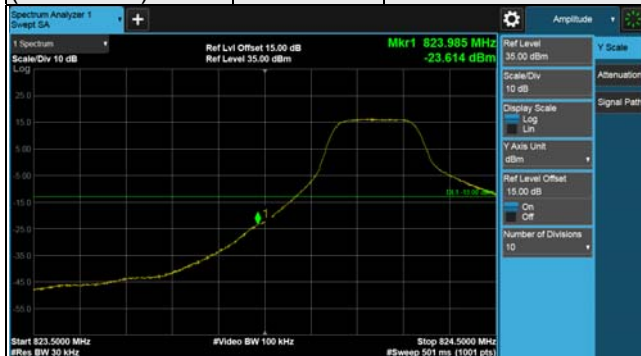
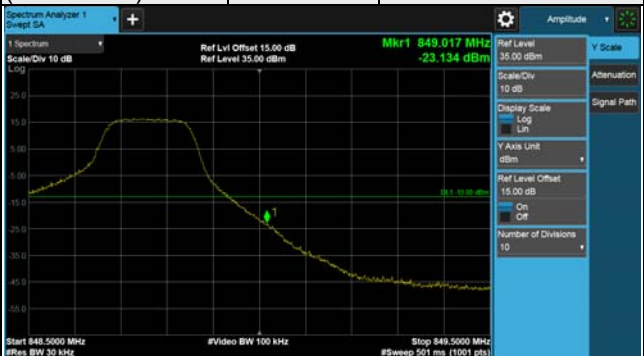
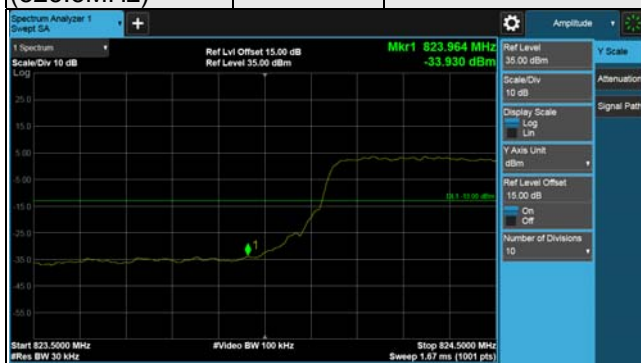
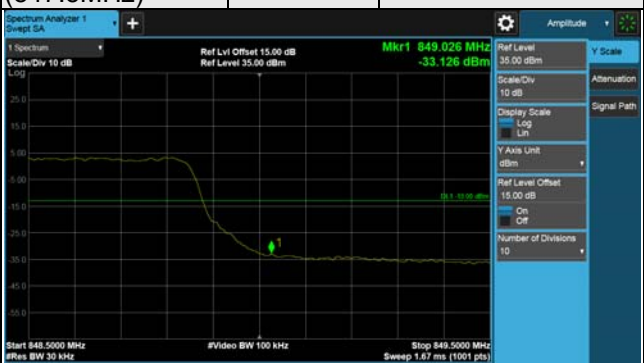
Channel 20643
(848.3MHz)

QPSK

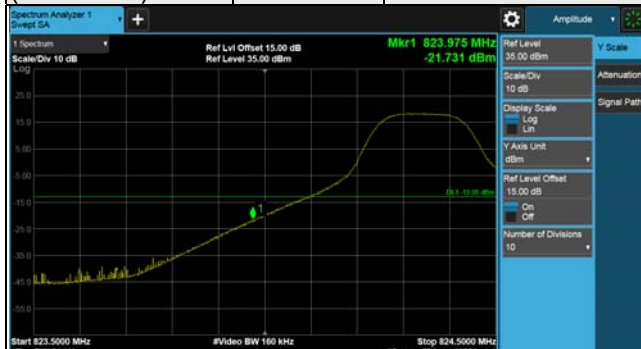
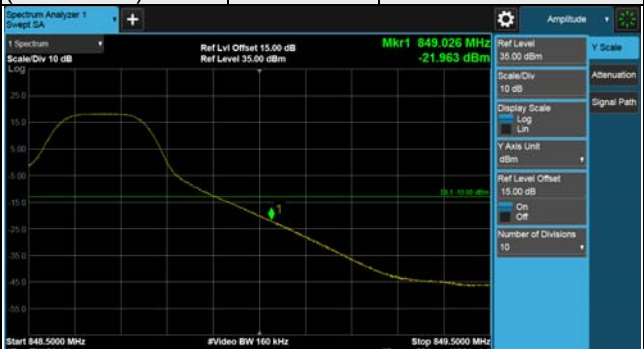
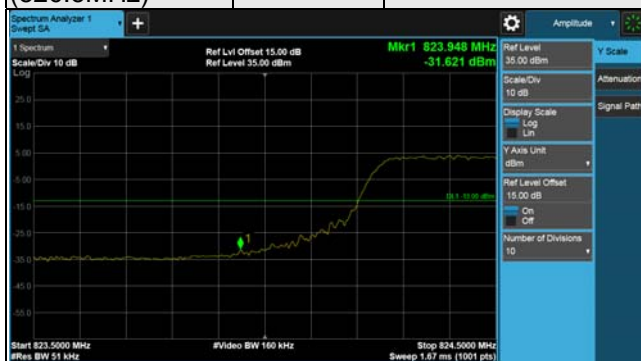
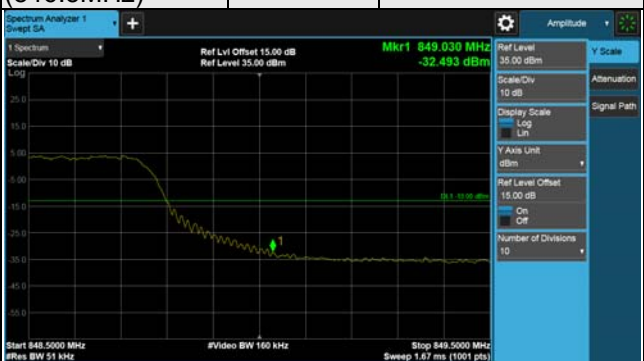
6 RB / 0 RB Offset



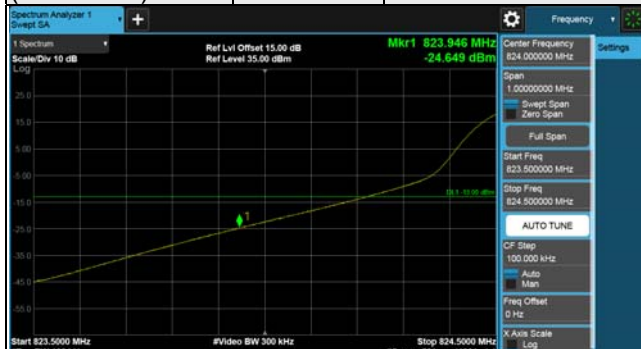
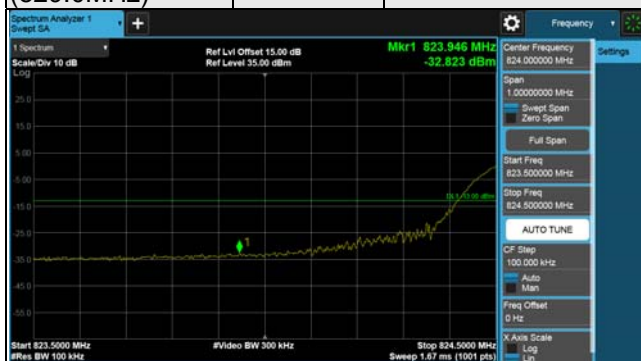
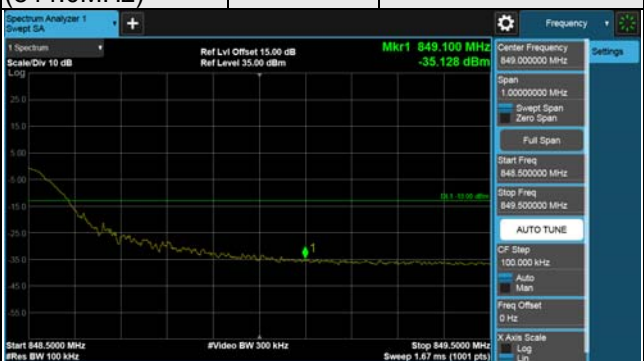
LTE Band 5, Channel Bandwidth 3MHz

Channel 20415 (825.5MHz)	QPSK	1 RB / 0 RB Offset	Channel 20635 (847.5MHz)	QPSK	1 RB / 14 RB Offset
					
Channel 20415 (825.5MHz)	QPSK	15 RB / 0 RB Offset	Channel 20635 (847.5MHz)	QPSK	15 RB / 0 RB Offset
					

LTE Band 5, Channel Bandwidth 5MHz

Channel 20425 (826.5MHz)	QPSK	1 RB / 0 RB Offset	Channel 20625 (846.5MHz)	QPSK	1 RB / 24 RB Offset
					
Channel 20425 (826.5MHz)	QPSK	25 RB / 0 RB Offset	Channel 20625 (846.5MHz)	QPSK	25 RB / 0 RB Offset
					

LTE Band 5, Channel Bandwidth 10MHz

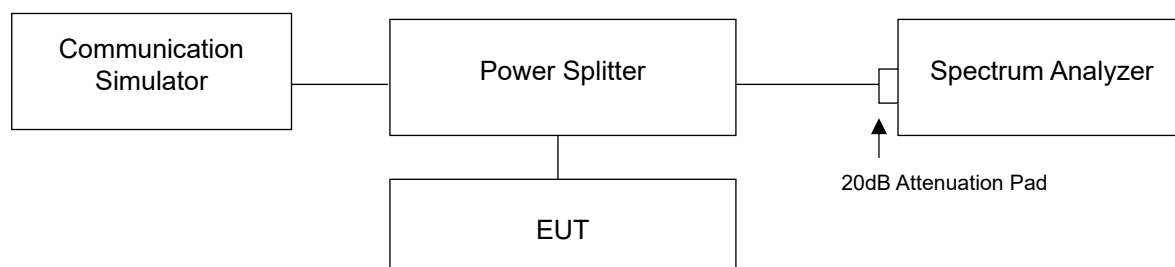
Channel 20450 (829.0MHz)	QPSK	1 RB / 0 RB Offset	Channel 20600 (844.0MHz)	QPSK	1 RB / 49 RB Offset
					
Channel 20450 (829.0MHz)	QPSK	50 RB / 0 RB Offset	Channel 20600 (844.0MHz)	QPSK	50 RB / 0 RB Offset
					
					
					

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

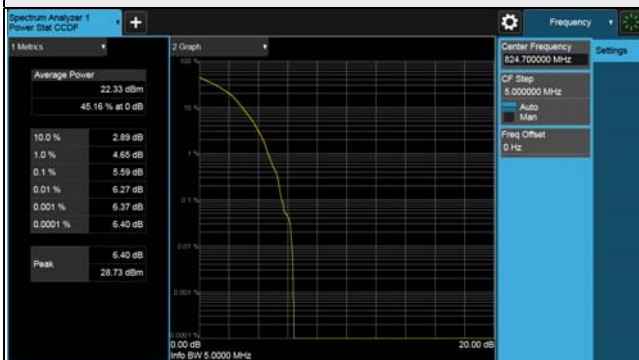
- Set resolution/measurement bandwidth $\geq$ signal's occupied bandwidth;
- Set the number of counts to a value that stabilizes the measured CCDF curve;
- Record the maximum PAPR level associated with a probability of 0.1%.

4.6.4 Test Results

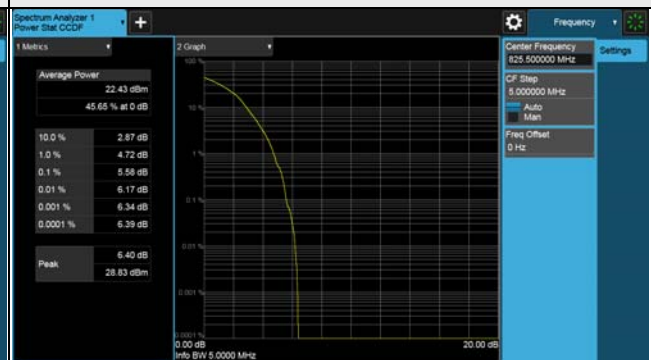
LTE Band 5, Channel Bandwidth 1.4MHz			
Channel	Frequency (MHz)	Peak To Average Ratio (dB)	
		QPSK	16QAM
20407	824.7	4.70	5.59
20525	836.5	4.36	5.46
20643	848.3	4.32	5.54
LTE Band 5, Channel Bandwidth 3MHz			
Channel	Frequency (MHz)	Peak To Average Ratio (dB)	
		QPSK	16QAM
20415	825.5	4.50	5.58
20525	836.5	4.32	5.31
20635	847.5	4.39	5.42
LTE Band 5, Channel Bandwidth 5MHz			
Channel	Frequency (MHz)	Peak To Average Ratio (dB)	
		QPSK	16QAM
20425	826.5	4.56	5.60
20525	836.5	4.26	5.44
20625	846.5	4.63	5.66
LTE Band 5, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	Peak To Average Ratio (dB)	
		QPSK	16QAM
20450	829.0	4.47	5.59
20525	836.5	4.21	5.26
20600	844.0	4.57	5.74

Spectrum Plot of Worst Value

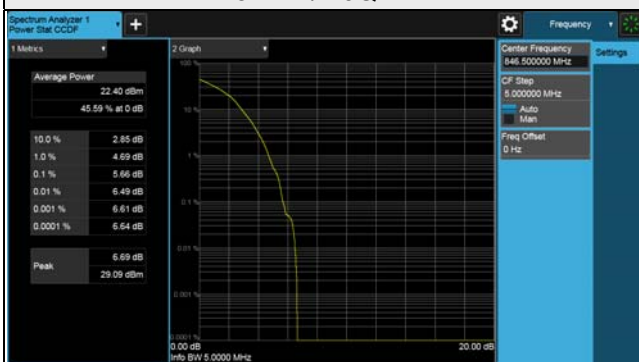
1.4MHz / 16QAM



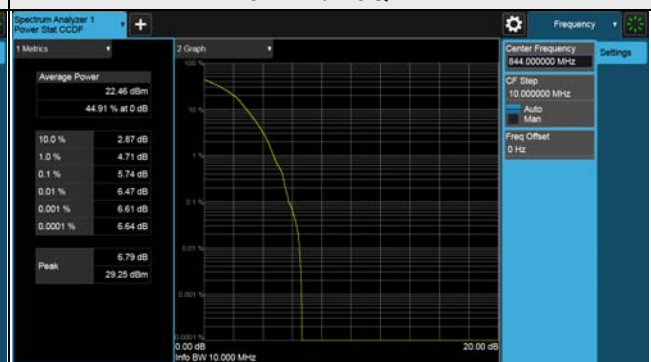
3MHz / 16QAM



5MHz / 16QAM



10MHz / 16QAM

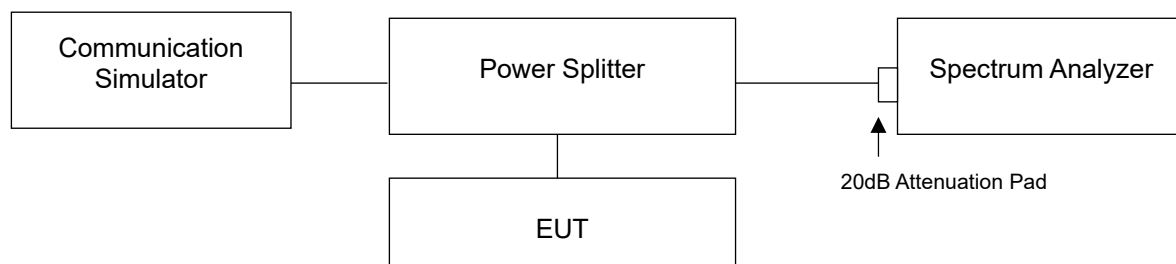


4.7 Conducted Spurious Emissions

4.7.1 Limits of Conducted Spurious Emissions Measurement

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

4.7.2 Test Setup



4.7.3 Test Procedure

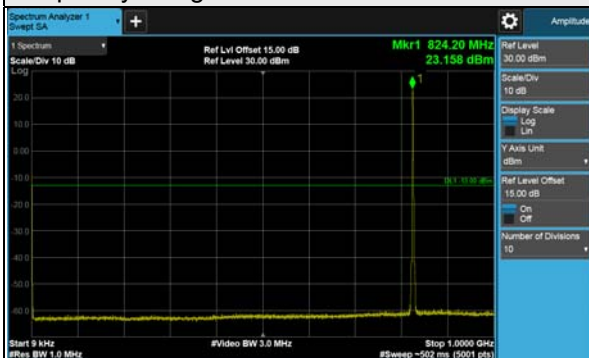
- a. All measurements were done at low, middle and high channels operational frequency range.
- a. Measuring frequency range is from 9kHz to 9GHz. 20dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz are used for conducted emission measurement.

4.7.4 Test Results

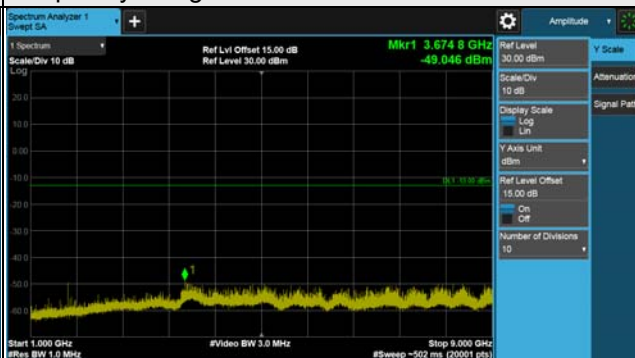
LTE Band 5, Channel Bandwidth 1.4MHz

Channel 20407 (824.7MHz)

Frequency Range : 9kHz ~ 1GHz



Frequency Range : 1GHz ~ 9GHz

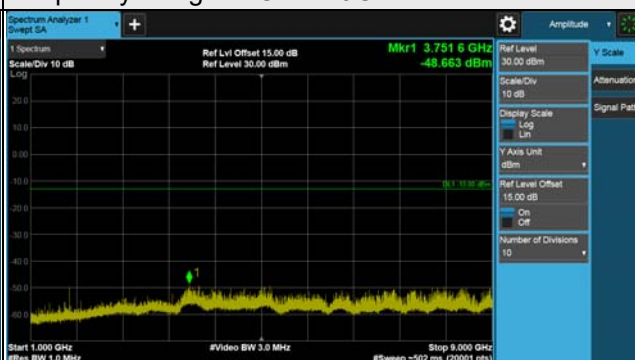


Channel 20525 (836.5MHz)

Frequency Range : 9kHz ~ 1GHz



Frequency Range : 1GHz ~ 9GHz

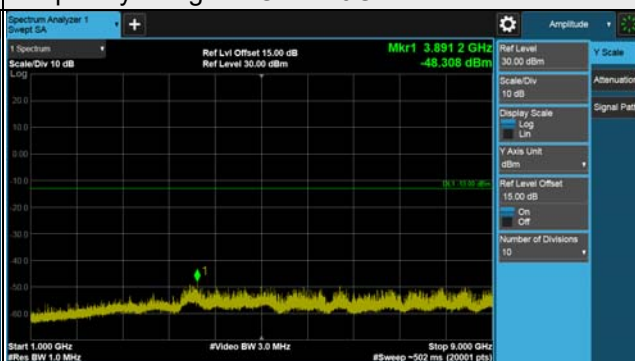


Channel 20643 (848.3MHz)

Frequency Range : 9kHz ~ 1GHz



Frequency Range : 1GHz ~ 9GHz



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

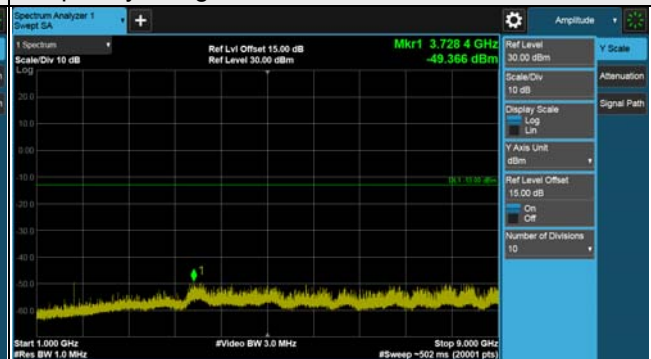
LTE Band 5, Channel Bandwidth 3MHz

Channel 20415 (825.5MHz)

Frequency Range : 9kHz ~ 1GHz



Frequency Range : 1GHz ~ 9GHz

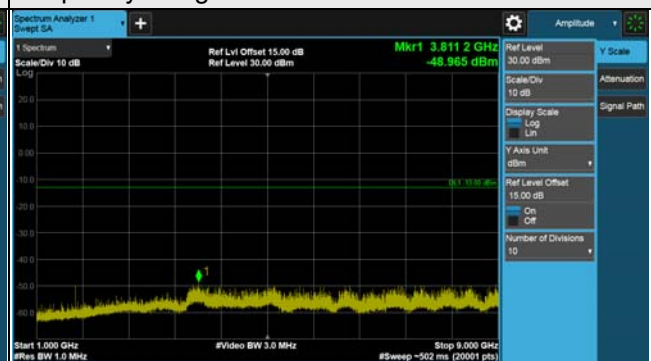


Channel 20525 (836.5MHz)

Frequency Range : 9kHz ~ 1GHz



Frequency Range : 1GHz ~ 9GHz

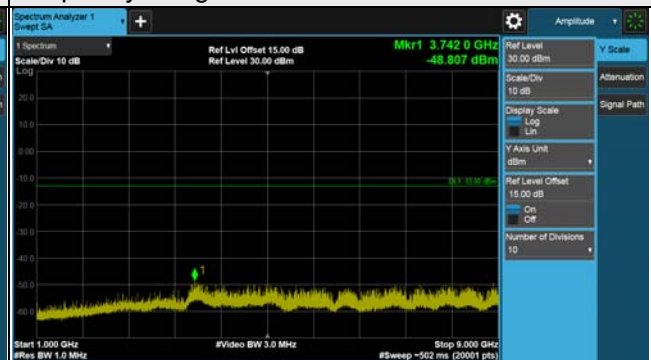


Channel 20635 (847.5MHz)

Frequency Range : 9kHz ~ 1GHz



Frequency Range : 1GHz ~ 9GHz



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

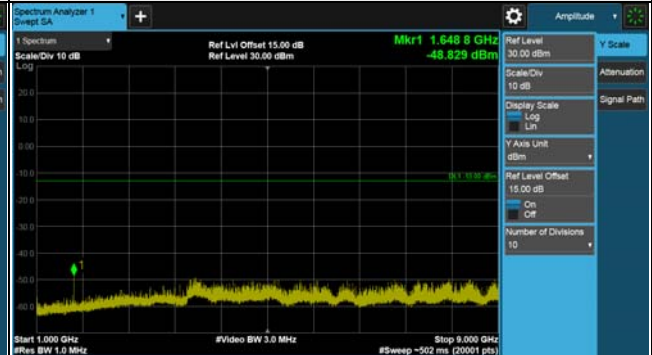
LTE Band 5, Channel Bandwidth 5MHz

Channel 20425 (826.5MHz)

Frequency Range : 9kHz ~ 1GHz

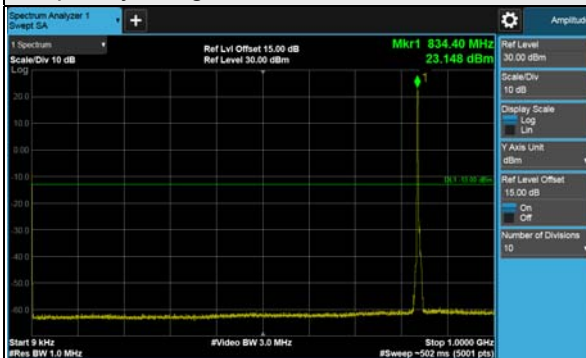


Frequency Range : 1GHz ~ 9GHz

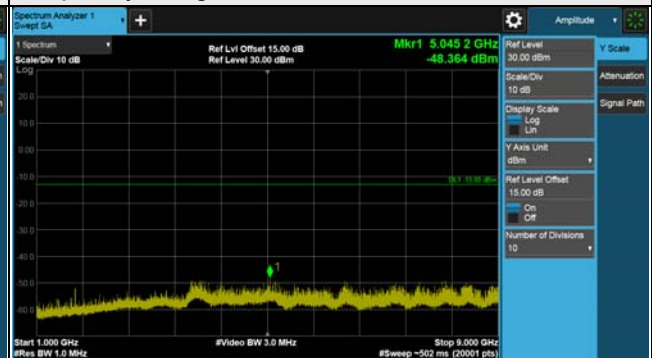


Channel 20525 (836.5MHz)

Frequency Range : 9kHz ~ 1GHz

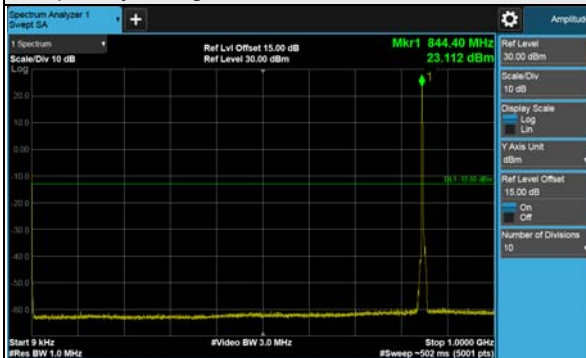


Frequency Range : 1GHz ~ 9GHz

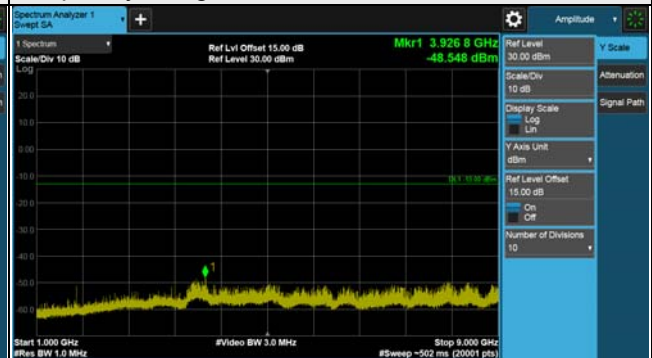


Channel 20625 (846.5MHz)

Frequency Range : 9kHz ~ 1GHz



Frequency Range : 1GHz ~ 9GHz



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

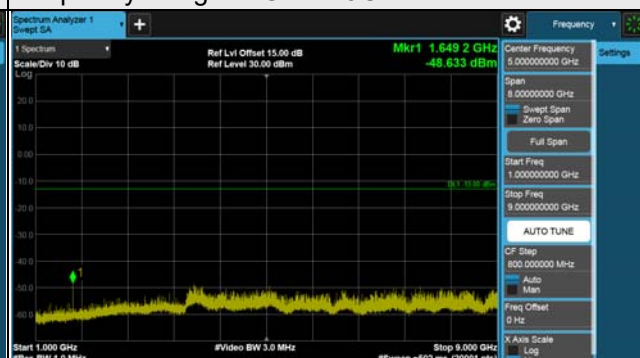
LTE Band 5, Channel Bandwidth 10MHz

Channel 20450 (829.0MHz)

Frequency Range : 9kHz ~ 1GHz

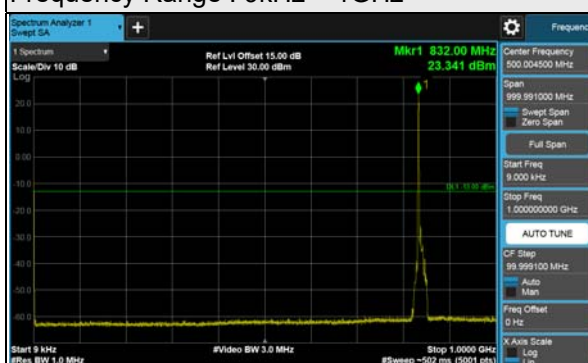


Frequency Range : 1GHz ~ 9GHz

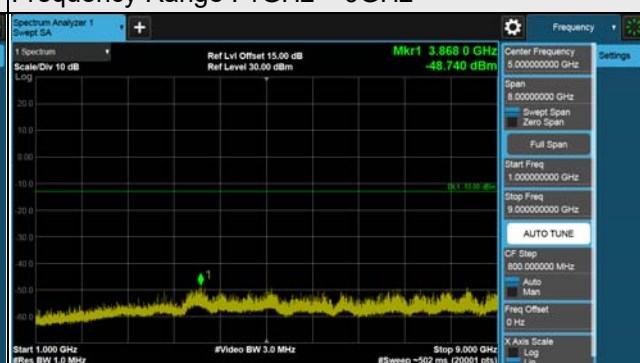


Channel 20525 (836.5MHz)

Frequency Range : 9kHz ~ 1GHz

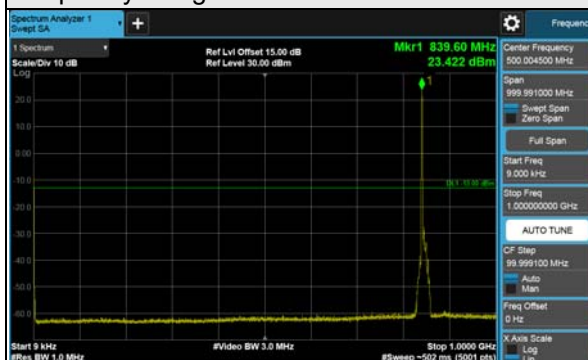


Frequency Range : 1GHz ~ 9GHz

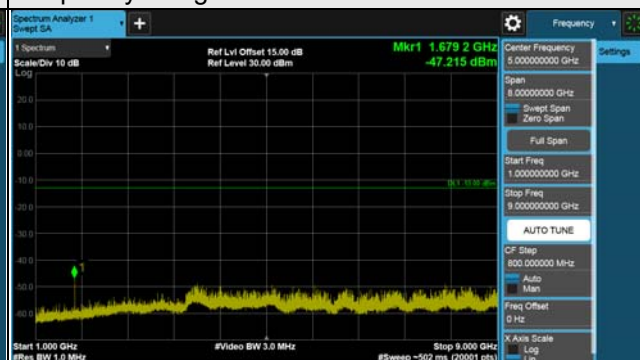


Channel 20600 (844.0MHz)

Frequency Range : 9kHz ~ 1GHz



Frequency Range : 1GHz ~ 9GHz



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

4.8 Radiated Emission Measurement

4.8.1 Limits of Radiated Emission Measurement

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

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
 - $\text{EIRP (dBm)} = E (\text{dB}\mu\text{V/m}) + 20\log(D) - 104.8$; where D is the measurement distance (in the far field region) in m.
 - $\text{ERP (dBm)} = E (\text{dB}\mu\text{V/m}) + 20\log(D) - 104.8 - 2.15$; where D is the measurement distance (in the far field region) in m.

Note:

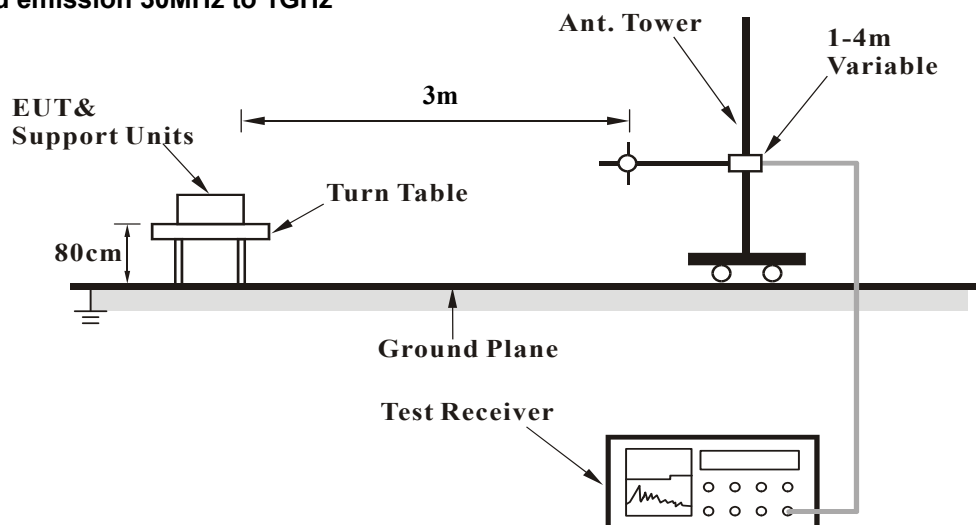
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.
2. The emission levels were against the limit of frequency range 9 kHz ~ 30 MHz:
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

4.8.3 Deviation from Test Standard

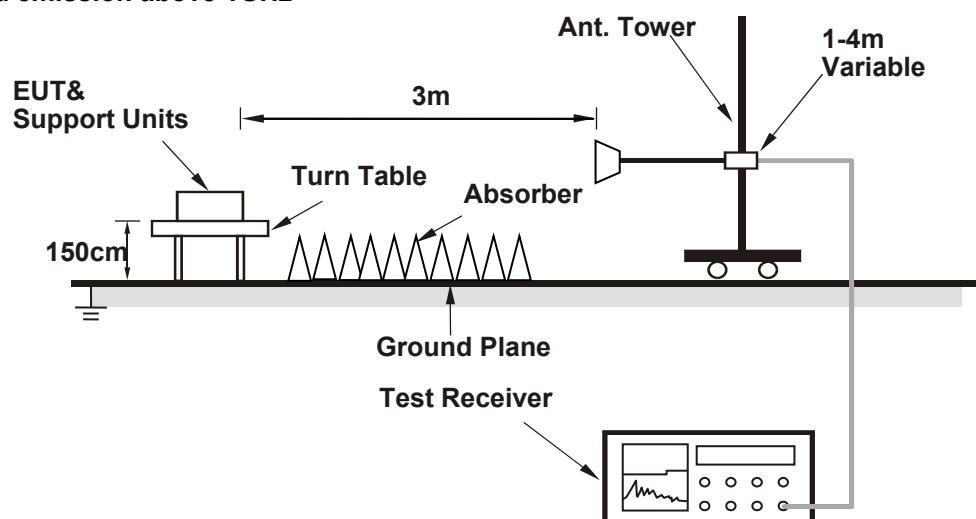
No deviation.

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

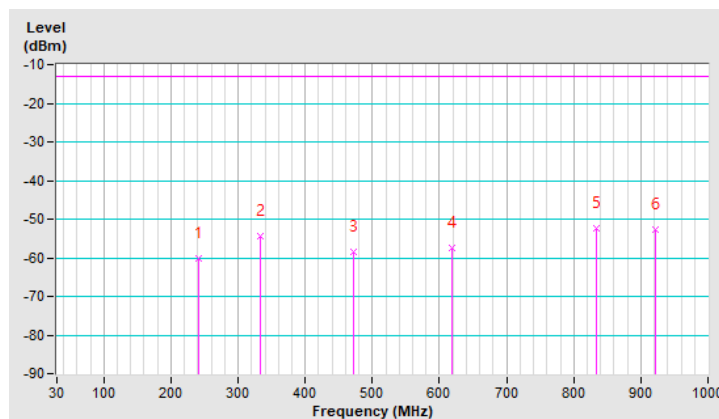
LTE Band 5, Channel Bandwidth 10MHz

Mode	TX channel 20525 (836.5MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	19deg. C, 65%RH	Input Power	120Vac, 60Hz
Tested By	Thomas Cheng		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	241.46	-60.08	-13.00	-47.08	2.24 H	307	52.03	-112.11
2	333.61	-54.28	-13.00	-41.28	2.41 H	154	53.89	-108.17
3	472.32	-58.31	-13.00	-45.31	1.49 H	294	46.04	-104.35
4	618.79	-57.32	-13.00	-44.32	2.92 H	188	43.18	-100.50
5	833.16	-52.39	-13.00	-39.39	2.11 H	125	43.99	-96.38
6	921.43	-52.70	-13.00	-39.70	1.96 H	5	42.59	-95.29

Remarks:

1. $ERP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. $Margin\ value = ERP - Limit\ value$
4. The other ERP levels were very low against the limit.

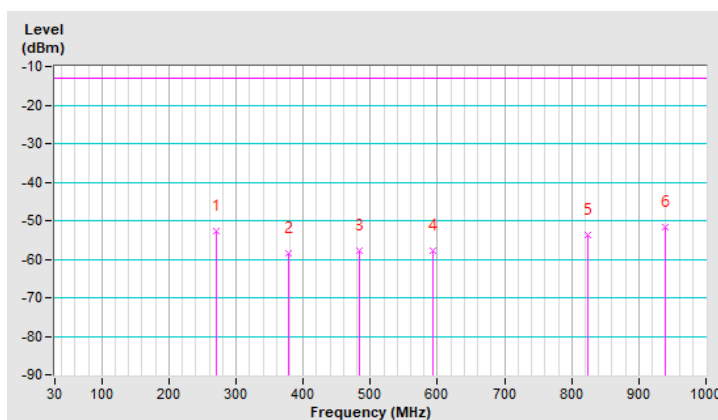


Mode	TX channel 20525 (836.5MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	19deg. C, 65%RH	Input Power	120Vac, 60Hz
Tested By	Thomas Cheng		

Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	269.59	-52.85	-13.00	-39.85	2.15 V	143	58.05	-110.90
2	377.26	-58.32	-13.00	-45.32	1.98 V	351	48.71	-107.03
3	483.96	-57.65	-13.00	-44.65	2.69 V	79	46.37	-104.02
4	592.60	-57.71	-13.00	-44.71	2.31 V	284	43.38	-101.09
5	824.43	-53.60	-13.00	-40.60	1.75 V	339	42.96	-96.56
6	938.89	-51.69	-13.00	-38.69	1.69 V	126	43.25	-94.94

Remarks:

1. $ERP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.



Above 1GHz

LTE Band 5, Channel Bandwidth 1.4MHz

Mode	TX channel 20407 (824.7MHz)	Frequency Range	1GHz ~ 9GHz
Environmental Conditions	21deg. C, 71%RH	Input Power	120Vac, 60Hz
Tested By	Vincent Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1649.40	-37.88	-13.00	-24.88	1.69 H	347	84.32	-122.20
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1649.40	-50.72	-13.00	-37.72	1.56 V	227	71.48	-122.20

Remarks:

1. $ERP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. $Margin\ value = ERP - Limit\ value$
4. The other ERP levels were very low against the limit.

Mode	TX channel 20525 (836.5MHz)	Frequency Range	1GHz ~ 9GHz
Environmental Conditions	21deg. C, 71%RH	Input Power	120Vac, 60Hz
Tested By	Vincent Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1673.00	-37.42	-13.00	-24.42	1.65 H	341	84.77	-122.19
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1673.00	-50.33	-13.00	-37.33	2.04 V	298	71.86	-122.19

Remarks:

1. $ERP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. $Margin\ value = ERP - Limit\ value$
4. The other ERP levels were very low against the limit.

Mode	TX channel 20643 (848.3MHz)	Frequency Range	1GHz ~ 9GHz
Environmental Conditions	21deg. C, 71%RH	Input Power	120Vac, 60Hz
Tested By	Vincent Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1696.60	-37.66	-13.00	-24.66	3.14 H	207	84.53	-122.19
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1696.60	-50.56	-13.00	-37.56	2.74 V	45	71.63	-122.19

Remarks:

1. $ERP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. $Margin\ value = ERP - Limit\ value$
4. The other ERP levels were very low against the limit.

LTE Band 5, Channel Bandwidth 5MHz

Mode	TX channel 20425 (826.5MHz)	Frequency Range	1GHz ~ 9GHz
Environmental Conditions	21deg. C, 71%RH	Input Power	120Vac, 60Hz
Tested By	Vincent Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1653.00	-37.97	-13.00	-24.97	2.31 H	41	84.23	-122.20
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1653.00	-50.52	-13.00	-37.52	1.87 V	321	71.68	-122.20

Remarks:

1. $ERP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

Mode	TX channel 20525 (836.5MHz)	Frequency Range	1GHz ~ 9GHz
Environmental Conditions	21deg. C, 71%RH	Input Power	120Vac, 60Hz
Tested By	Vincent Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1673.00	-37.70	-13.00	-24.70	1.12 H	341	84.49	-122.19
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1673.00	-50.31	-13.00	-37.31	1.56 V	274	71.88	-122.19

Remarks:

1. $ERP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

Mode	TX channel 20625 (846.5MHz)	Frequency Range	1GHz ~ 9GHz
Environmental Conditions	21deg. C, 71%RH	Input Power	120Vac, 60Hz
Tested By	Vincent Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1693.00	-37.81	-13.00	-24.81	3.21 H	145	84.38	-122.19
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1693.00	-50.41	-13.00	-37.41	2.47 V	151	71.78	-122.19

Remarks:

1. $ERP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. $Margin\ value = ERP - Limit\ value$
4. The other ERP levels were very low against the limit.

LTE Band 5, Channel Bandwidth 10MHz

Mode	TX channel 20450 (829.0MHz)	Frequency Range	1GHz ~ 9GHz
Environmental Conditions	21deg. C, 71%RH	Input Power	120Vac, 60Hz
Tested By	Vincent Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1658.00	-37.55	-13.00	-24.55	2.31 H	145	84.65	-122.20
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1658.00	-50.34	-13.00	-37.34	3.14 V	225	71.86	-122.20

Remarks:

1. $ERP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

Mode	TX channel 20525 (836.5MHz)	Frequency Range	1GHz ~ 9GHz
Environmental Conditions	21deg. C, 71%RH	Input Power	120Vac, 60Hz
Tested By	Vincent Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1673.00	-37.24	-13.00	-24.24	2.13 H	224	84.95	-122.19
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1673.00	-50.11	-13.00	-37.11	1.74 V	264	72.08	-122.19

Remarks:

1. $ERP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

Mode	TX channel 20600 (844.0MHz)	Frequency Range	1GHz ~ 9GHz
Environmental Conditions	21deg. C, 71%RH	Input Power	120Vac, 60Hz
Tested By	Vincent Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1688.00	-37.33	-13.00	-24.33	1.47 H	269	84.87	-122.20
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1688.00	-50.31	-13.00	-37.31	1.64 V	204	71.89	-122.20

Remarks:

1. $ERP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. $Margin\ value = ERP - Limit\ value$
4. The other ERP 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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The address and road map of all our labs can be found in our web site also.

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