FCC Test Report
(Part 90)

Report No.:	RF200306C24-3
FCC ID:	2AARNWLTPH-8M
Test Model:	WLTPH-8M
Received Date:	Mar. 06, 2020
Test Date:	Mar. 18 ~ Apr. 16, 2020
Issued Date:	Apr. 21, 2020
Applicant:	PHIHONG TECHNOLOGY CO., LTD.
Address:	No. 568, Fuxing 3rd Rd., Guishan Dist., Taoyuan City, 333 Taiwan
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
RF200306C24-3	Original release	Apr. 21, 2020

1 Certificate of Conformity

Product:	LTE Module
Brand:	PHIHONG
Test Model:	WLTPH-8M
Sample Status:	Engineering Sample
Applicant:	PHIHONG TECHNOLOGY CO., LTD.
Test Date:	Mar. 18 ~ Apr. 16, 2020
Standards:	FCC Part 90, Subpart I, R

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:** Apr. 21, 2020

Pettie Chen / Senior Specialist

Approved by : Bruce Chen , **Date:** Apr. 21, 2020

Bruce Chen / Senior Project Engineer

2 Summary of Test Results

LTE Band 14

Applied Standard: FCC Part 90 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 90.542 (a)	Effective Radiated Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement.
2.1055 90.539 (d)	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth (*)	Pass	Meet the requirement of limit.
90.210 (n) & (b)	Emission Masks	Pass	Meet the requirement of limit.
2.1051 90.543 (e) (2) & (3)	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 90.543 (c) & (f)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 90.543 (c) & (f)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -14.8dB at 1591.00MHz.

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	3.04 dB
	30MHz ~ 200MHz	3.86 dB
	200MHz ~1000MHz	3.87 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESIB7	100187	May 30, 2019	May 29, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Jun. 10, 2019	Jun. 09, 2020
MXG Vector signal generator KEYSIGHT	N5182B	MY53052282	Dec. 23, 2019	Dec. 22, 2020
Radio Communication Analyzer Anritsu	MT8821C	6261806803	Jan. 18, 2020	Jan. 17, 2021
BILOG Antenna SCHWARZBECK	VULB9168	9168-161	Nov. 08, 2019	Nov. 07, 2020
BILOG Antenna SCHWARZBECK	VULB9168	9168-171	Nov. 11, 2019	Nov. 10, 2020
HORN Antenna SCHWARZBECK	9120D	209	Nov. 24, 2019	Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 24, 2019	Nov. 23, 2020
Preamplifier Agilent (Below 1GHz)	8447D	2944A10738	Aug. 20, 2019	Aug. 19, 2020
Preamplifier Agilent (Above 1GHz)	8449B	3008A02367	Feb. 18, 2020	Feb. 17, 2021
RF Coaxial Cable WOKEN With 5dB PAD	8D-FB	Cable-CH3-01	Aug. 20, 2019	Aug. 19, 2020
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH3-03 (223653/4)	Aug. 20, 2019	Aug. 19, 2020
RF signal cable HUBER+SUHNER& EMCI	SUCOFLEX 104&EMC104-SM-SM-8000	Cable-CH3-03 (309224+170907)	Aug. 20, 2019	Aug. 19, 2020
Software BV ADT	ADT_Radiated_V7.6.15.9.5	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Turn Table Controller BV ADT	SC100	SC93021702	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Standard Temperature And Humidity Chamber	MHU-225AU	920842	May 31, 2019	May 30, 2020
JFW 20dB attenuation	50HF-020-SMA	NA	NA	NA
True RMS Clamp Meter Fluke	325	31130711WS	May 21, 2019	May 20, 2020
DC power supply	U8002A	MY56330015	NA	NA

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 3.

3 General Information

3.1 General Description of EUT

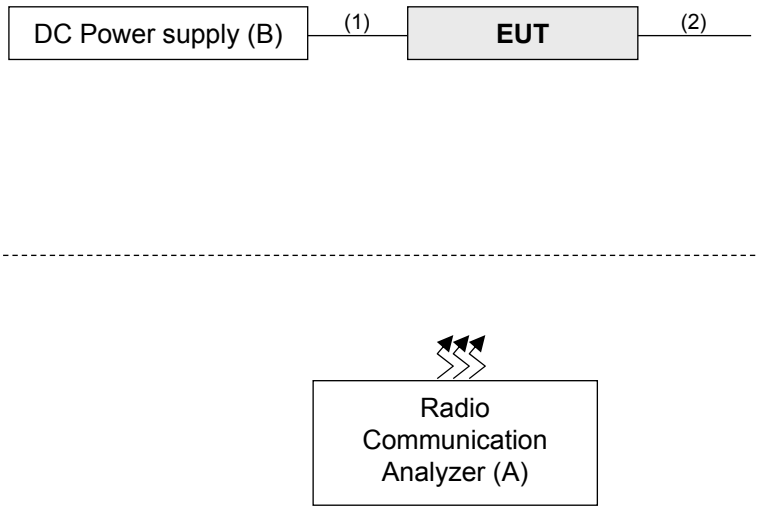
Product	LTE Module		
Brand	PHIHONG		
Test Model	WLTPH-8M		
Sample Status	Engineering Sample		
Power Supply Rating	3.8Vdc 10Vdc~35Vdc (for DC power supply)		
Modulation Type	QPSK, 16QAM		
Operating Frequency	LTE Band 14 (Channel Bandwidth 5MHz)	790.5MHz ~ 795.5MHz	
	LTE Band 14 (Channel Bandwidth 10MHz)	793MHz	
Max. ERP Power		QPSK	16QAM
	LTE Band 14 (Channel Bandwidth 5MHz)	212.814mW (23.28dBm)	166.725mW (22.22dBm)
	LTE Band 14 (Channel Bandwidth 10MHz)	213.796mW (23.30dBm)	159.221mW (22.02dBm)
Emission Designator		QPSK	16QAM
	LTE Band 14 (Channel Bandwidth 5MHz)	4M49G7D	4M49D7W
	LTE Band 14 (Channel Bandwidth 10MHz)	8M94G7D	8M94D7W
Antenna Type	Refer to Note as below		
Antenna Connector	Refer to Note as below		
Accessory Device	NA		
Cable Supplied	NA		

Note:

1. The following antennas were provided to the EUT.

Antenna No.	Brand	Model	Antenna Gain(dBi)	Antenna Type	Connector Type
LTE0EM99-AP150L1	Brito	LTE EMBEDDED ANTENNA	2	PCB	SMA ST. PLUG

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	-
B.	DC Power Supply	Topward	33010D	807748	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.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Power cable	1	1	-	0	-
2.	USB cable	1	1	Y	0	-

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 on Z-plane. Following channel(s) was (were) selected for the final test as listed below.

LTE Band 14

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
-	ERP	23305 to 23355	23305(790.5MHz), 23330(793.0MHz), 23355(795.5MHz)	5MHz	QPSK / 16QAM	1 RB / 0 RB Offset
		23330	23330(793.0MHz)	10MHz	QPSK / 16QAM	1 RB / 0 RB Offset
-	Modulation Characteristics	23330	23330(793.0MHz)	10MHz	QPSK / 16QAM	50RB / 0RB Offset
-	Frequency Stability	23305 to 23355	23305(790.5MHz), 23355(795.5MHz)	5MHz	QPSK	25RB / 0RB Offset
		23330	23330(793.0MHz)	10MHz	QPSK	50RB / 0RB Offset
-	Occupied Bandwidth	23305 to 23355	23305(790.5MHz), 23330(793.0MHz), 23355(795.5MHz)	5MHz	QPSK / 16QAM	25RB / 0RB Offset
		23330	23330(793.0MHz)	10MHz	QPSK / 16QAM	50RB / 0RB Offset
-	Emission Mask	23305 to 23355	23305(790.5MHz), 23330(793.0MHz), 23355(795.5MHz)	5MHz	QPSK	25RB / 0RB Offset
		23330	23330(793.0MHz)	10MHz	QPSK	50RB / 0RB Offset
-	Band Edge	23305 to 23355	23305(790.5MHz), 23355(795.5MHz)	5MHz	QPSK	1 RB / 0 RB Offset 1 RB /24 RB Offset 25RB / 0RB Offset
		23330	23330(793.0MHz)	10MHz	QPSK	1 RB / 0 RB Offset 1 RB / 49 RB Offset 50RB / 0RB Offset
-	Conducted Emission	23305 to 23355	23305(790.5MHz), 23330(793.0MHz), 23355(795.5MHz)	5MHz	QPSK	1 RB / 0 RB Offset
		23330	23330(793.0MHz)	10MHz	QPSK	1 RB / 0 RB Offset
-	Radiated Emission below 1GHz	23305 to 23355	23355(795.5MHz)	5MHz	QPSK	1 RB / 0 RB Offset
-	Radiated Emission above 1GHz	23305 to 23355	23305(790.5MHz), 23330(793.0MHz), 23355(795.5MHz)	5MHz	QPSK	1 RB / 0 RB Offset
		23330	23330(793.0MHz)	10MHz	QPSK	1 RB / 0 RB Offset

Note:

1. The conducted output power for QPSK and 16QAM, measured value of QPSK is higher than 16QAM mode. Therefore, only ERP, Modulation characteristics and occupied bandwidth items had been tested under QPSK and 16QAM modes, the other test items were performed under QPSK mode only.
2. For radiated emission below 1GHz, select the worst radiated emission (above 1GHz) channel for final testing.
3. For radiated emission above 1GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the lowest, 5MHz & highest channel bandwidth for final test.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
ERP	25deg. C, 70%RH	3.8Vdc	Willy Cheng
Modulation characteristics	24deg. C, 64%RH	3.8Vdc	Willy Cheng
Frequency Stability	24deg. C, 64%RH	3.8Vdc	Willy Cheng
Occupied Bandwidth	24deg. C, 64%RH	3.8Vdc	Willy Cheng
Emission Mask	24deg. C, 64%RH	3.8Vdc	Willy Cheng
Band Edge	24deg. C, 64%RH	3.8Vdc	Willy Cheng
Conducted Emission	24deg. C, 64%RH	3.8Vdc	Willy Cheng
Radiated Emission	23deg. C, 66%RH 23deg. C, 67%RH	120Vac, 60Hz	Adair Peng

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 90
ANSI 63.26-2015

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

References Test Guidance:

KDB 971168 D01 Power Meas License Digital Systems v03r01
KDB 971168 D02 Misc Rev Approv License Devices v02r01
ANSI/TIA/EIA-603-E 2016

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

LTE Band 14:
Control stations and mobile stations transmitting in the 758-768 MHz band and the 788-798 MHz band are limited to 30 watts ERP.
Portable stations (hand-held devices) transmitting in the 758-768 MHz band and the 788-798 MHz band are limited to 3 watts ERP.

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.

ERP or EIRP = PMeas + GT

Where

ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as PMeas, e.g., dBm or dBW)
PMeas measured transmitter output power or PSD, in dBm or dBW
GT gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

4.1.3 Test Setup

Conducted Power Measurement:

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

4.1.4 Test Results

Conducted Output Power (dBm)

LTE Band 14						
BW	MCS Index	Channel		23305	23330	23355
		Frequency (MHz)		790.5	793	795.5
5M	QPSK	1	0	23.37	**23.43**	23.41
		1	12	23.42	23.40	23.37
		1	24	23.14	23.09	22.99
		12	0	22.48	22.32	22.29
		12	6	22.44	22.47	22.46
		12	13	23.30	23.29	22.32
		25	0	22.37	22.29	22.43
	16QAM	1	0	**22.37**	22.18	22.21
		1	12	22.04	21.99	22.02
		1	24	22.11	21.87	22.15
		12	0	21.23	21.33	21.21
		12	6	21.26	21.30	21.46
		12	13	21.23	21.10	21.26
		25	0	21.37	21.39	21.44

LTE Band 14				
BW	MCS Index	Channel		23330
		Frequency (MHz)		793
10M	QPSK	1	0	**23.45**
		1	24	23.44
		1	49	23.15
		25	0	22.47
		25	12	22.41
		25	25	22.37
		50	0	22.38
	16QAM	1	0	**22.17**
		1	24	22.16
		1	49	22.07
		25	0	21.61
		25	12	21.56
		25	25	21.44
		50	0	21.36

ERP Power (dBm)

LTE Band 14						
BW	MCS Index	Channel		23305	23330	23355
		Frequency (MHz)		790.5	793	795.5
5M	QPSK	1	0	23.22	**23.28**	23.26
		1	12	23.27	23.25	23.22
		1	24	22.99	22.94	22.84
		12	0	22.33	22.17	22.14
		12	6	22.29	22.32	22.31
		12	13	23.15	23.14	22.17
		25	0	22.22	22.14	22.28
	16QAM	1	0	**22.22**	22.03	22.06
		1	12	21.89	21.84	21.87
		1	24	21.96	21.72	22.00
		12	0	21.08	21.18	21.06
		12	6	21.11	21.15	21.31
		12	13	21.08	20.95	21.11
		25	0	21.22	21.24	21.29

LTE Band 14				
BW	MCS Index	Channel		23330
		Frequency (MHz)		793
10M	QPSK	1	0	**23.30**
		1	24	23.29
		1	49	23.00
		25	0	22.32
		25	12	22.26
		25	25	22.22
		50	0	22.23
	16QAM	1	0	**22.02**
		1	24	22.01
		1	49	21.92
		25	0	21.46
		25	12	21.41
		25	25	21.29
		50	0	21.21

*ERP = Conducted + antenna gain (2dBi)-2.15

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

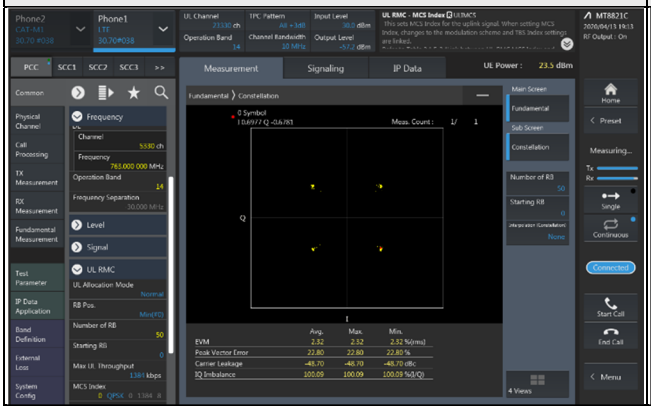
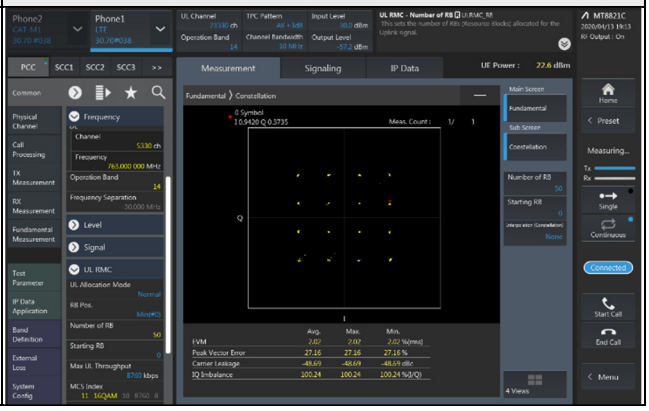
N/A

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

LTE Band 14	
Spectrum Plot of Measurement Value	
Channel: 23330 / Frequency (MHz): 793.0MHz	
QPSK	16QAM
	

4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

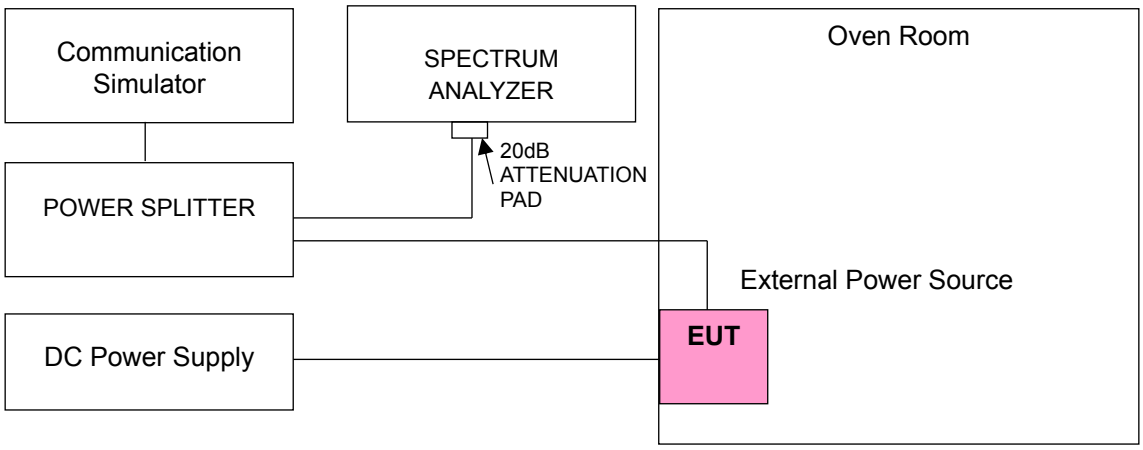
LTE Band 14:
The frequency stability of mobile, portable and control transmitters operating in the wideband segment must be 1.25 parts per million or better when AFC is locked to a base station, and 5 parts per million or better when AFC is not locked.

4.3.2 Test Procedure

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

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

4.3.3 Test Setup



4.3.4 Test Results

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 14			
	Channel Bandwidth: 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
10	790.500004	0.004	795.500003	0.003
12	790.500002	0.002	795.500002	0.003
35	790.500004	0.005	795.500003	0.004

Note: The applicant defined the normal working voltage is from 10Vdc to 35Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 14			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	790.500003	0.003	795.500002	0.002
-30	790.499998	-0.002	795.500002	0.002
-20	790.499998	-0.002	795.499998	-0.002
-10	790.500001	0.002	795.499999	-0.002
0	790.500003	0.003	795.500003	0.003
10	790.500003	0.003	795.500002	0.003
20	790.499998	-0.003	795.500002	0.003
30	790.499997	-0.003	795.499998	-0.002
40	790.499998	-0.003	795.500002	0.003
50	790.499996	-0.005	795.500002	0.003
60	790.499997	-0.003	795.500002	0.003
70	790.499997	-0.004	795.500002	0.002
85	790.499997	-0.004	795.499999	-0.002

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 14	
	Channel Bandwidth: 10 MHz	
	Frequency (MHz)	Frequency Error (ppm)
10	793.000002	0.003
12	793.000002	0.003
35	793.000003	0.004

Note: The applicant defined the normal working voltage is from 10Vdc to 35Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 14	
	Channel Bandwidth: 10 MHz	
	Frequency (MHz)	Frequency Error (ppm)
-40	793.000001	0.002
-30	793.000002	0.002
-20	793.000002	0.003
-10	793.000003	0.003
0	793.000003	0.004
10	793.000003	0.004
20	792.999998	-0.002
30	792.999997	-0.003
40	793.000001	0.002
50	792.999998	-0.003
60	792.999998	-0.002
70	792.999998	-0.003
85	792.999999	-0.001

4.4 Occupied Bandwidth Measurement

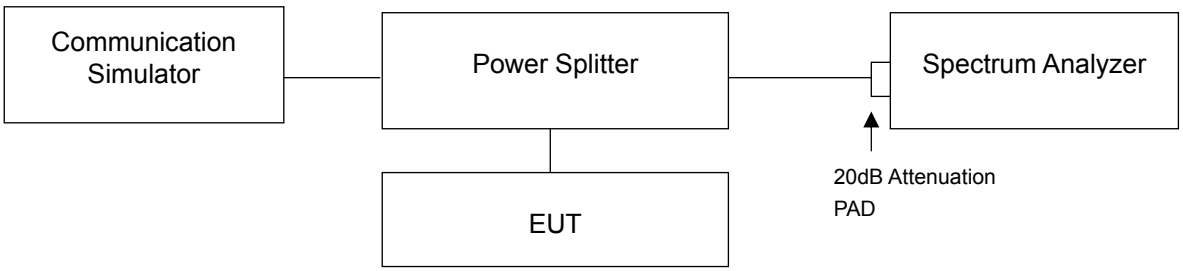
4.4.1 Limits of Occupied Bandwidth Measurement

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

4.4.2 Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW = 100kHz and VBW = 300kHz (Channel Bandwidth: 5MHz), RBW = 200kHz and VBW = 1MHz (Channel Bandwidth: 10MHz). The 26dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 26dB.

4.4.3 Test Setup

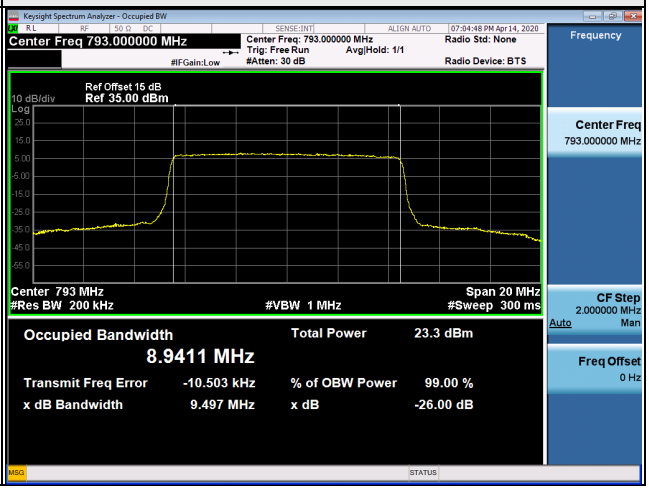


4.4.4 Test Result

Occupied Bandwidth

LTE Band 14, Channel Bandwidth 5MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
23305	790.5	4.49	4.49
23330	793	4.49	4.49
23355	795.5	4.49	4.49

LTE Band 14, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
23330	793	8.94	8.94

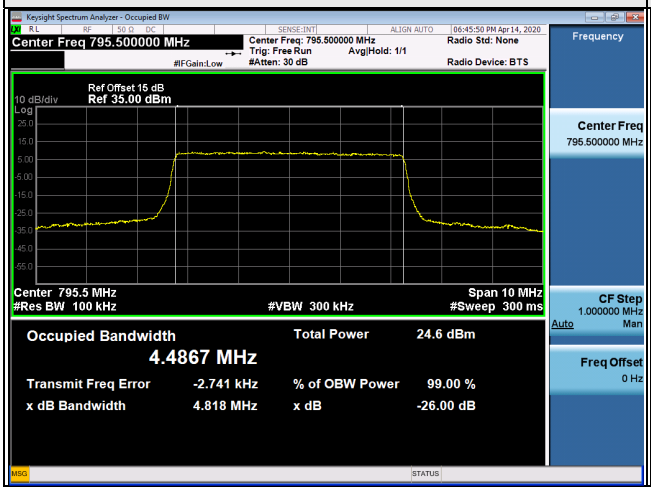
Spectrum Plot of Worst Value	
5MHz / 16QAM	10MHz / 16QAM
	

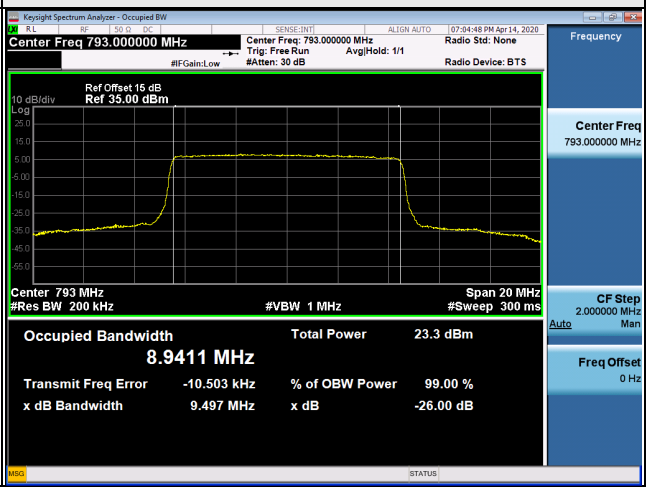
26dB Bandwidth

LTE Band 14, Channel Bandwidth 5MHz			
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		QPSK	16QAM
23305	790.5	4.80	4.81
23330	793	4.81	4.81
23355	795.5	4.82	4.81

LTE Band 14, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		QPSK	16QAM
23330	793	9.49	9.50

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



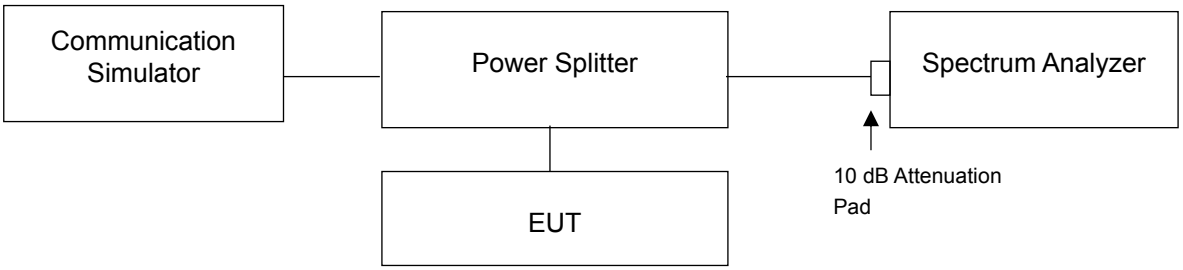


4.5 Emission Mask Measurement

4.5.1 Limits of Emission Mask Measurement

LTE Band 14:
According to FCC part 90.210 (b) shall be tested the emission mask. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:
(1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.
(2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.
(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

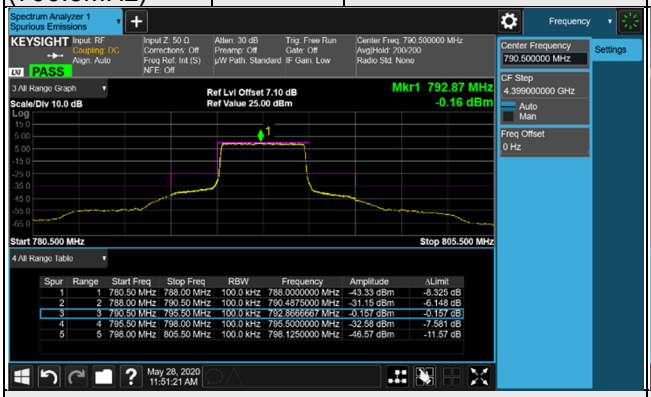
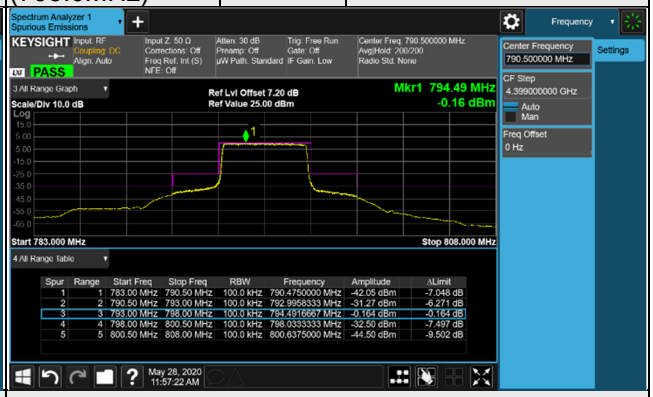
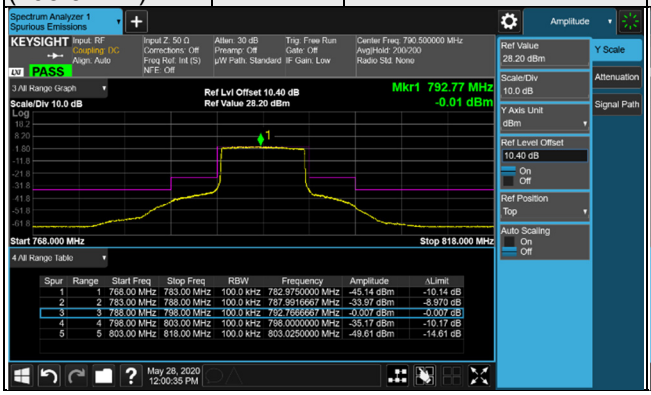
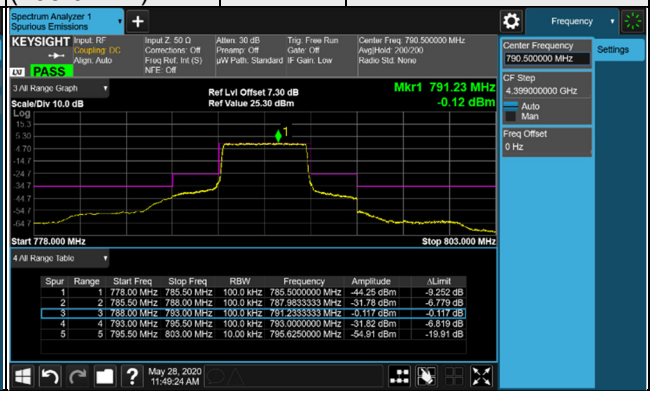
4.5.2 Test Setup



4.5.3 Test Procedures

a. The measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
b. Record the test plot.

4.5.4 Test Results

LTE Band 14					
Channel Bandwidth: 5MHz			Channel Bandwidth: 5MHz		
Channel 23305 (790.5MHz)	QPSK	Full RB	Channel 23330 (793.0MHz)	QPSK	Full RB
					
Channel Bandwidth: 5MHz			Channel Bandwidth: 10MHz		
Channel 23355 (795.5MHz)	QPSK	Full RB	Channel 23330 (793.0MHz)	QPSK	Full RB
					

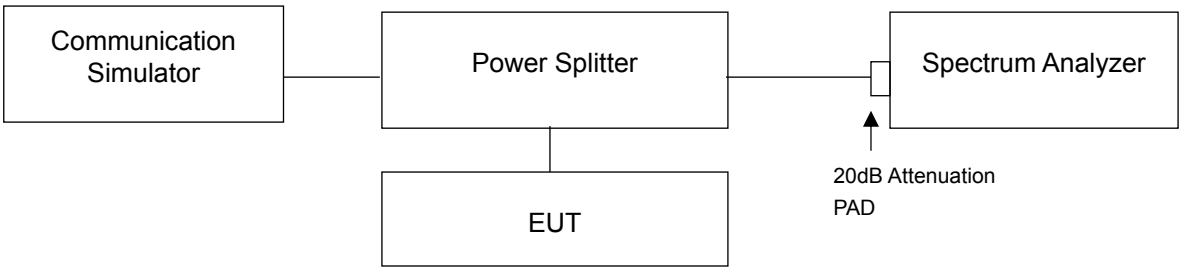
4.6 Band Edge Measurement

4.6.1 Limits of Band Edge Measurement

(1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.

(2) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB.

4.6.2 Test Setup



4.6.3 Test Procedures

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

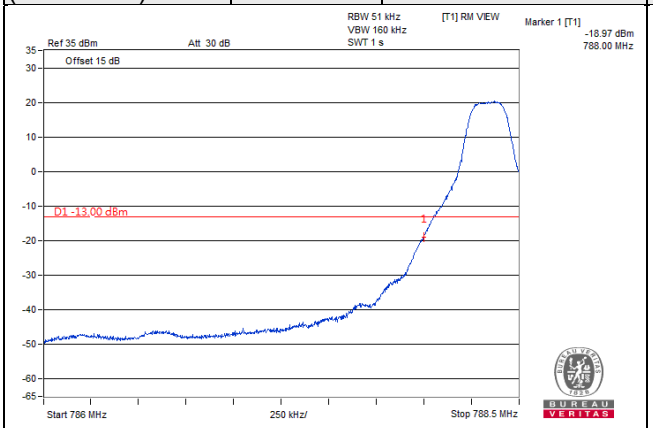
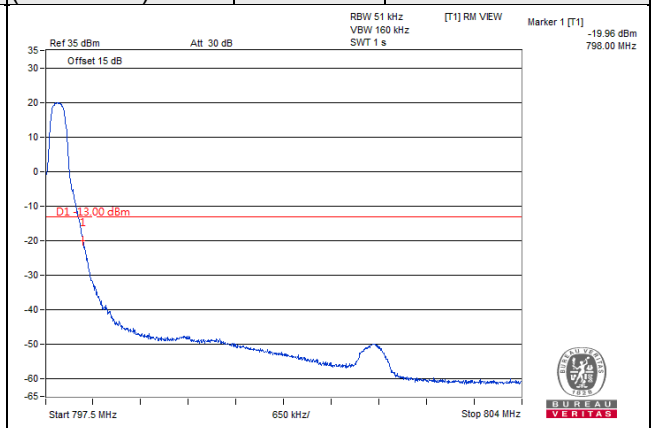
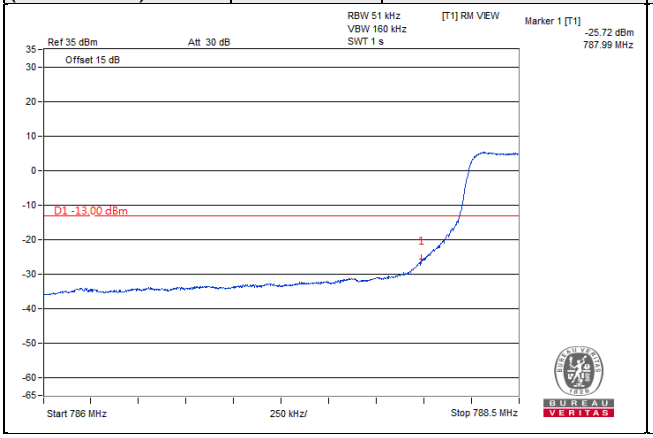
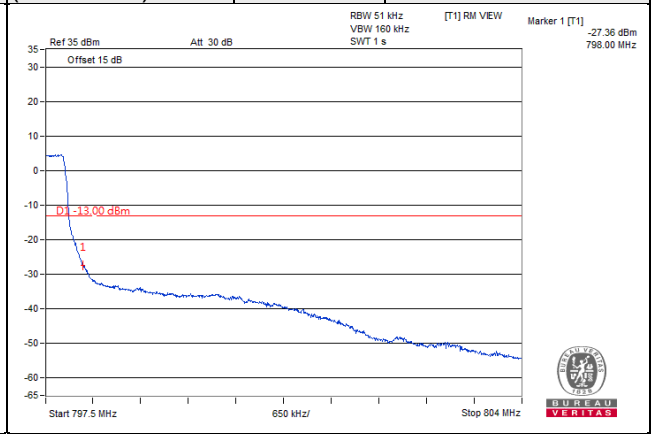
b. The band edge measurement used the power splitter via EUT RF power connector between signal generator and spectrum analyzer. This splitter loss, attenuator loss and cable loss are the worst loss 21 dB in the transmitted path track.

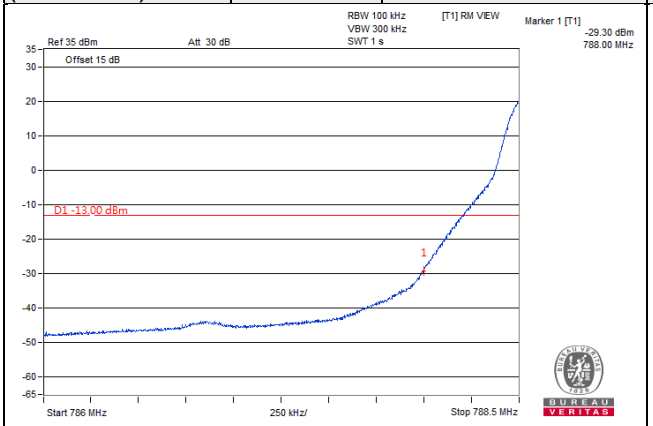
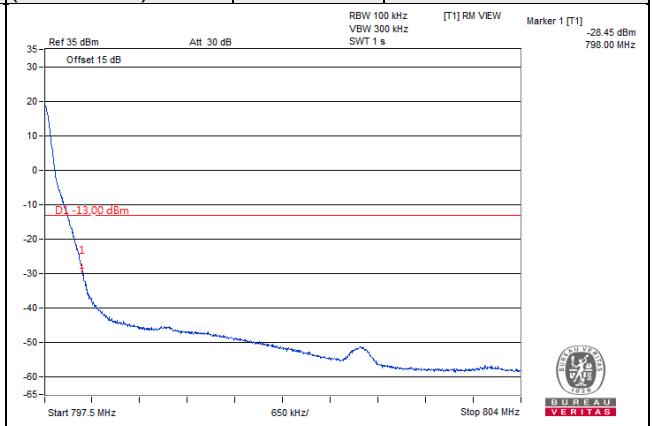
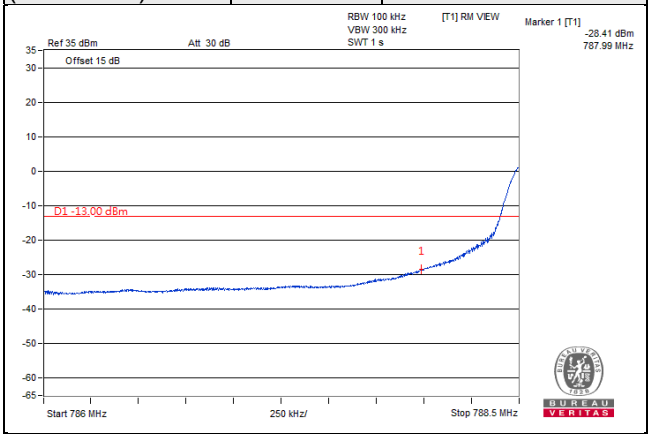
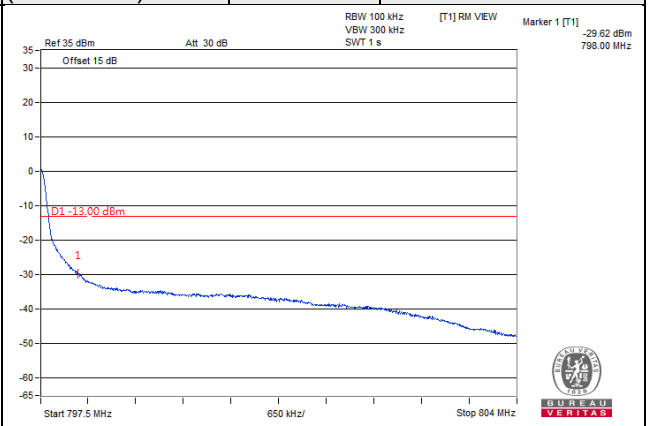
c. The center frequency of spectrum is the band edge frequency and span is 2.5MHz. RB of the spectrum is 51kHz and VB of the spectrum is 160kHz (LTE Channel Bandwidth 5MHz).

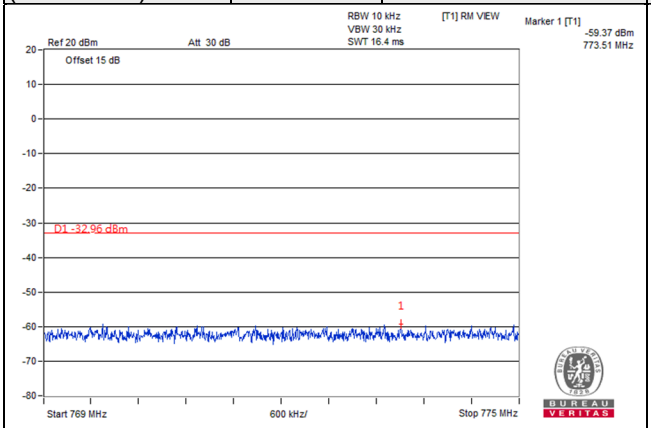
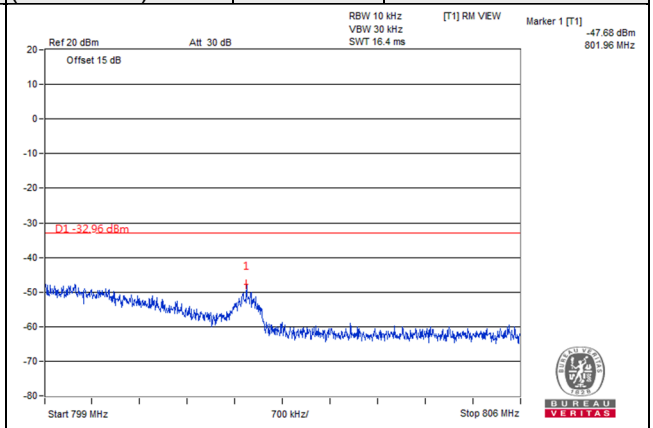
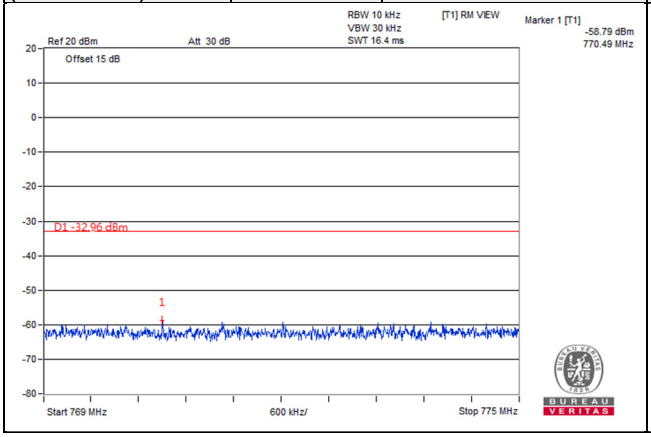
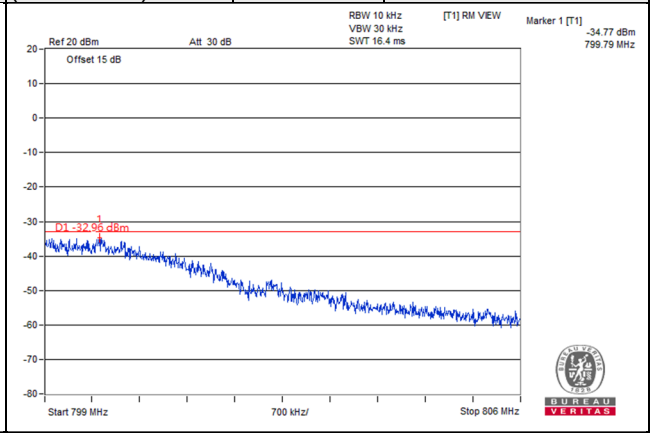
d. The center frequency of spectrum is the band edge frequency and span is 2.5MHz. RB of the spectrum is 100kHz and VB of the spectrum is 300kHz (LTE Channel Bandwidth 10MHz).

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

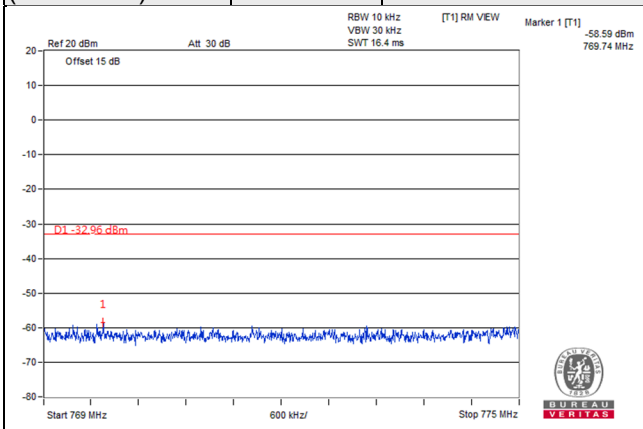
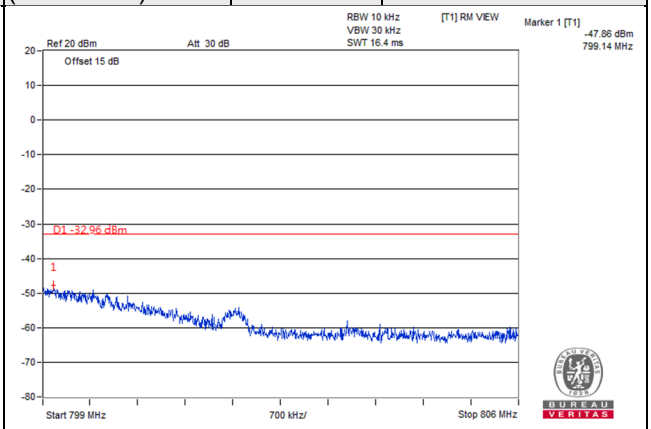
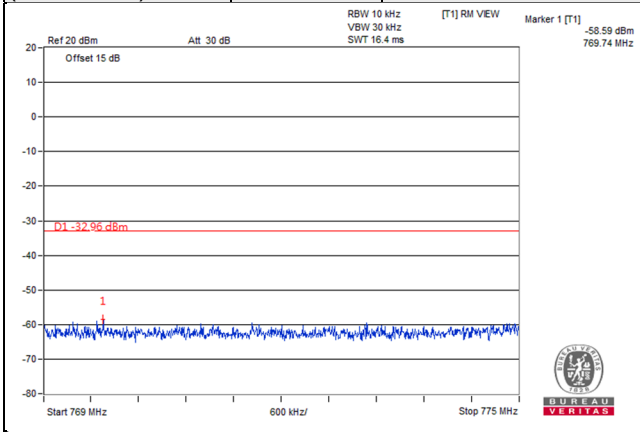
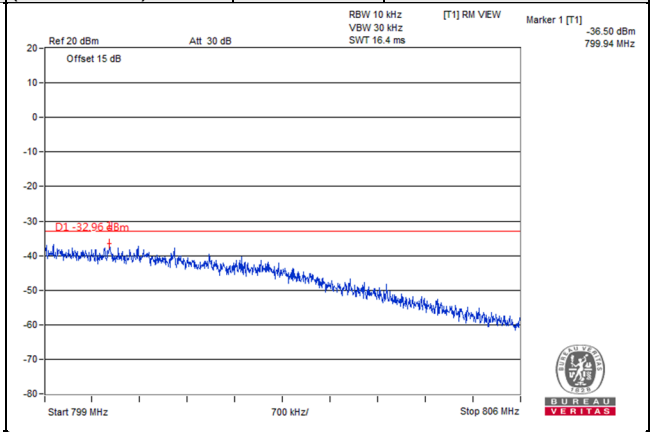
4.6.4 Test Results

LTE Band 14, Channel Bandwidth 5MHz					
Channel 23305 (790.5MHz)	QPSK	1 RB / 0 RB Offset	Channel 23355 (795.5MHz)	QPSK	1 RB / 24 RB Offset
					
Channel 23305 (790.5MHz)	QPSK	25 RB / 0 RB Offset	Channel 23355 (795.5MHz)	QPSK	25 RB / 0 RB Offset
					

LTE Band 14, Channel Bandwidth 10MHz					
Channel 23330 (793.0MHz)	QPSK	1 RB / 0 RB Offset	Channel 23330 (793.0MHz)	QPSK	1 RB / 49 RB Offset
					
Channel 23330 (793.0MHz)	QPSK	50 RB / 0 RB Offset	Channel 23330 (793.0MHz)	QPSK	50 RB / 0 RB Offset
					

LTE Band 14, Channel Bandwidth 5MHz					
Channel 23305 (790.5MHz)	QPSK	1 RB / 0 RB Offset	Channel 23355 (795.5MHz)	QPSK	1 RB / 24 RB Offset
					
Channel 23305 (790.5MHz)	QPSK	25 RB / 0 RB Offset	Channel 23355 (795.5MHz)	QPSK	25 RB / 0 RB Offset
					

For the 769 - 775 MHz and 799 - 806 MHz band, the FCC limit is 65+10log(P[watt]) in a 6.25 kHz bandwidth. Since it was not possible to set the resolution bandwidth to 6.25 kHz with the available equipment, a bandwidth of 10 kHz was used instead to show compliance. By using a 10 kHz bandwidth on the spectrum analyzer.
10log(10kHz/6.25kHz) = 2.04 dB
Limit line = -35 dBm + 2.04 dB =-32.96 dBm

LTE Band 14, Channel Bandwidth 10MHz					
Channel 23330 (793.0MHz)	QPSK	1 RB / 0 RB Offset	Channel 23330 (793.0MHz)	QPSK	1 RB / 49 RB Offset
					
Channel 23330 (793.0MHz)	QPSK	50 RB / 0 RB Offset	Channel 23330 (793.0MHz)	QPSK	50 RB / 0 RB Offset
					

For the 769 - 775 MHz and 799 - 806 MHz band, the FCC limit is 65+10log(P[watt]) in a 6.25 kHz bandwidth. Since it was not possible to set the resolution bandwidth to 6.25 kHz with the available equipment, a bandwidth of 10 kHz was used instead to show compliance. By using a 10 kHz bandwidth on the spectrum analyzer.
10log(10kHz/6.25kHz) = 2.04 dB
Limit line = -35 dBm + 2.04 dB =-32.96 dBm

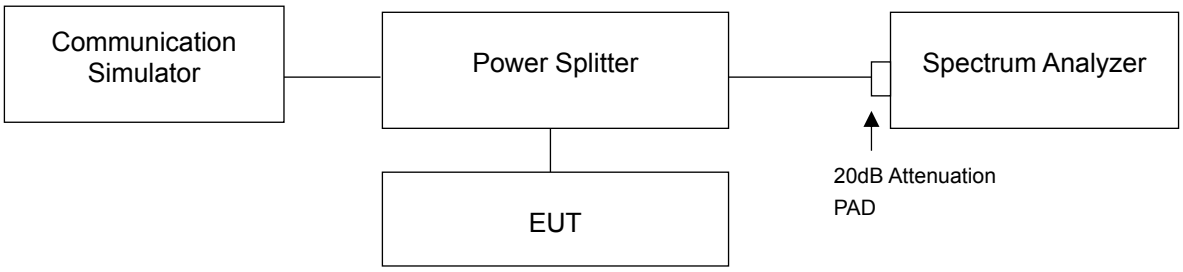
4.7 Conducted Spurious Emissions

4.7.1 Limits of Conducted Spurious Emissions Measurement

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 43 +10 $\log_{10}$(P) dB. The limit of emission equal to –13dBm.

For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to −70 dBW/MHz. The limit of emissions is equal to -40 dBm.

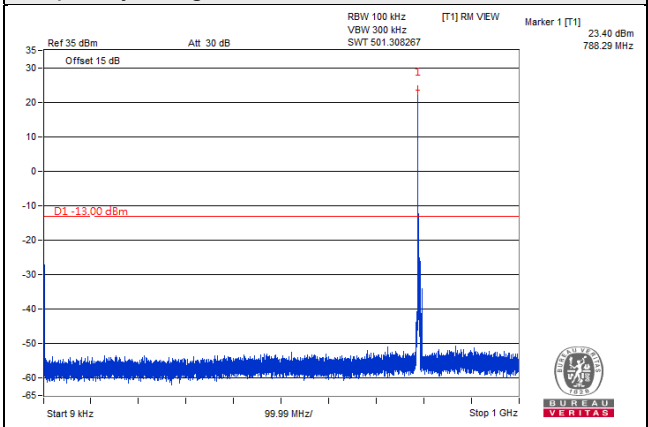
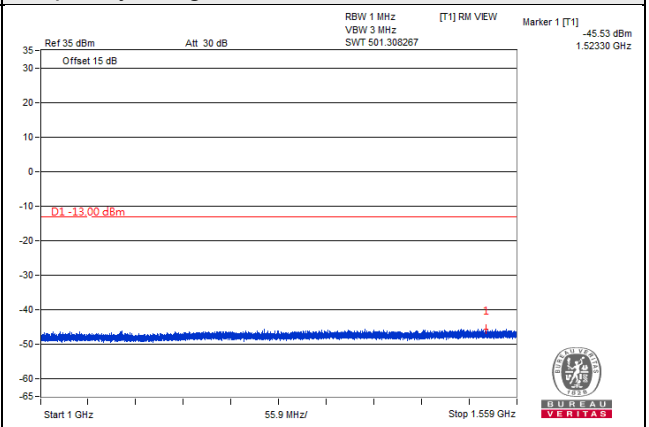
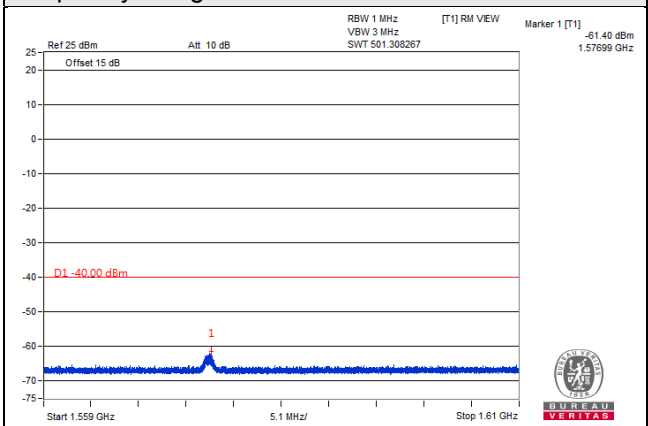
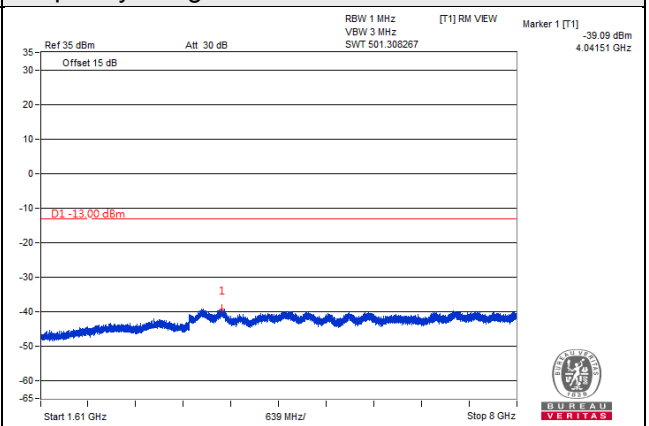
4.7.2 Test Setup

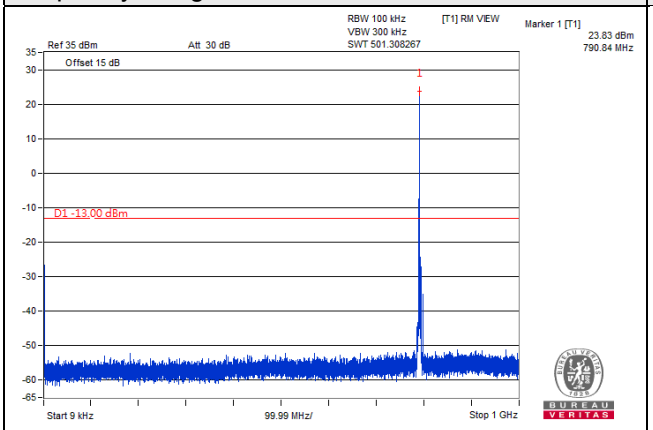
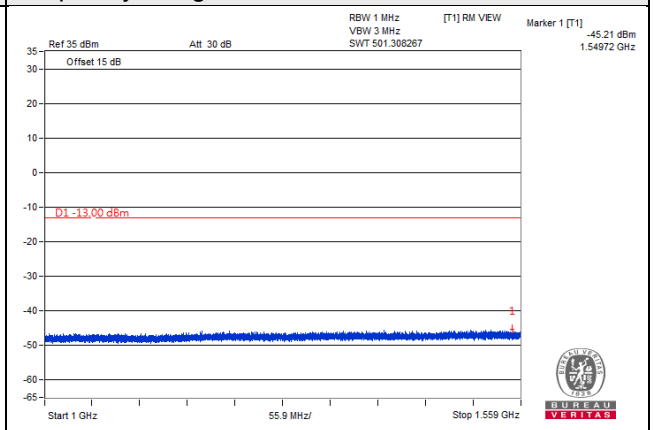
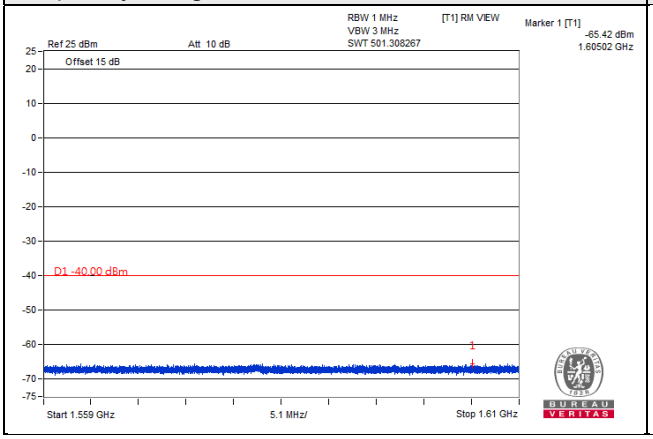
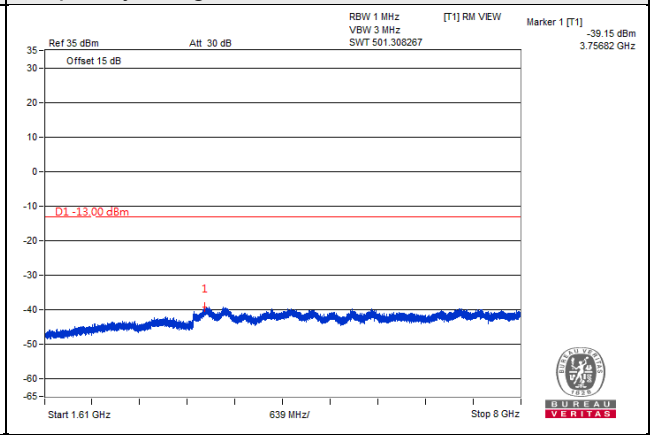


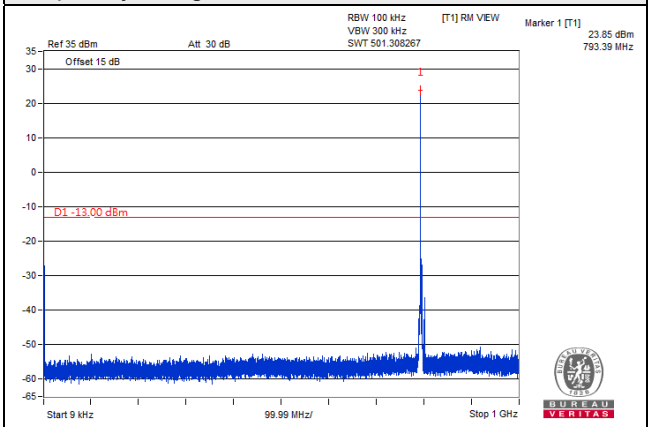
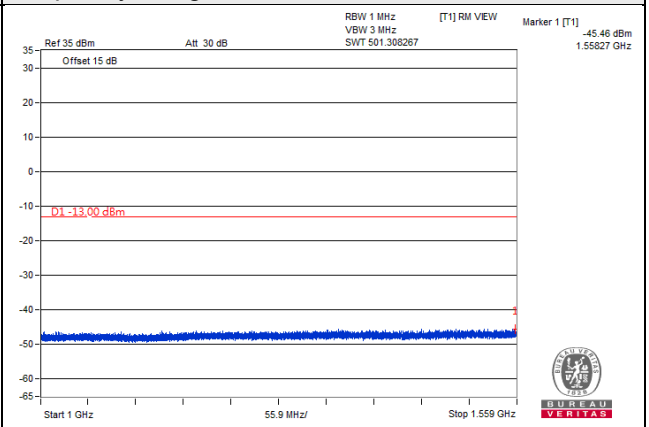
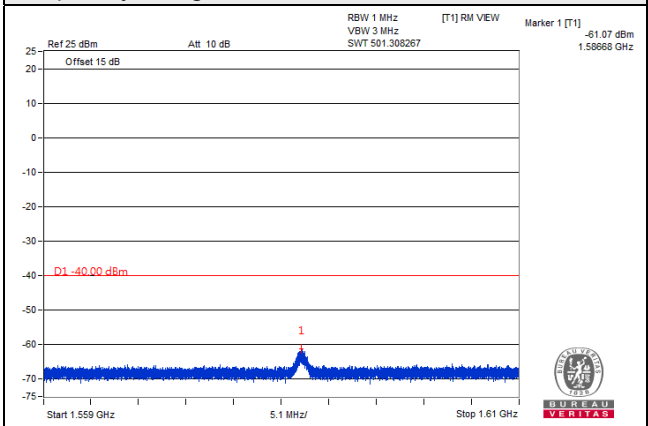
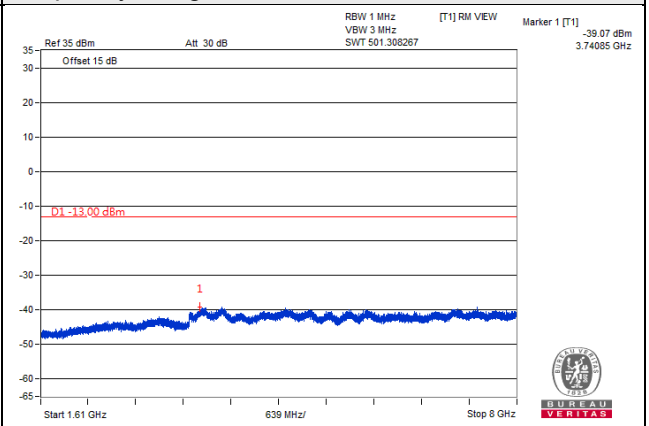
4.7.3 Test Procedure

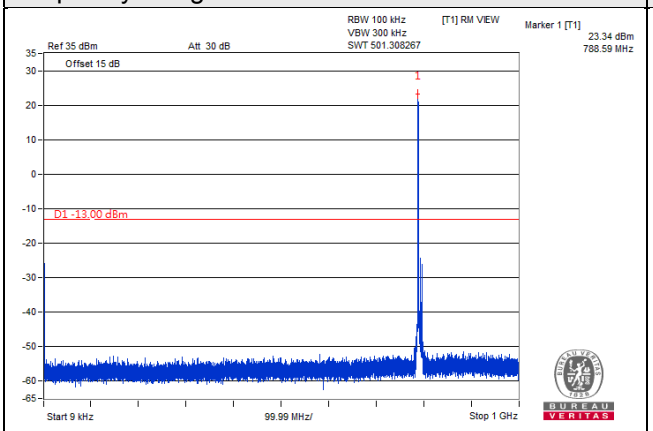
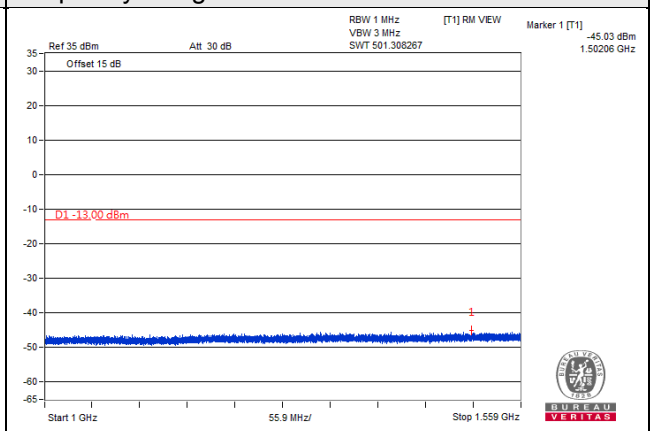
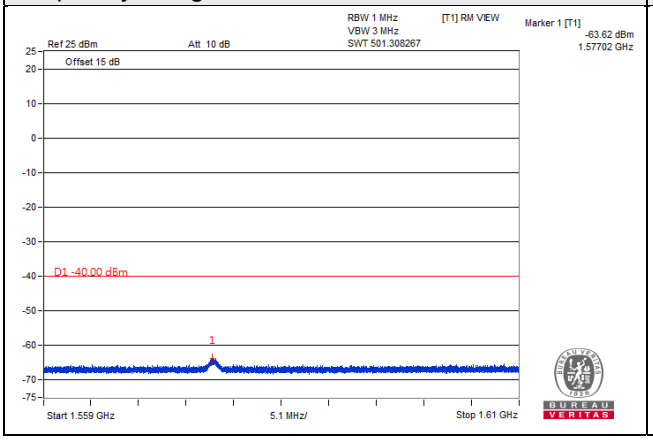
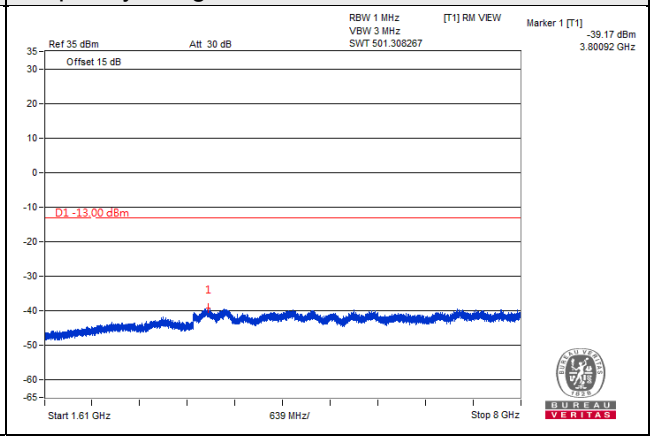
a. The EUT was set up for the maximum peak power with LTE link data modulation. The power was measured with Agilent Spectrum Analyzer.
b. The conducted spurious emission used the power splitter via EUT RF power connector between signal generator and spectrum analyzer.
c. When the spectrum scanned from 9 kHz to 8GHz. 10 dB attenuation pad is connected with spectrum. RBW = 100 kHz and VBW = 300 kHz are used for conducted emission (below 1GHz) measurement. RBW = 1 MHz and VBW = 3 MHz are used for conducted emission (above 1GHz) measurement.

4.7.4 Test Results

LTE Band 14, Channel Band width: 5MHz	
Channel 23305 (790.5MHz)	
Frequency Range : 9kHz~1GHz	Frequency Range : 1GHz~1.559GHz
	
Frequency Range : 1.559GHz~1.61GHz	Frequency Range : 1.61GHz~8GHz
	

LTE Band 14, Channel Band width: 5MHz	
Channel 23330 (793.0MHz)	
Frequency Range : 9kHz~1GHz	Frequency Range : 1GHz~1.559GHz
	
Frequency Range : 1.559GHz~1.61GHz	Frequency Range : 1.61GHz~8GHz
	

LTE Band 14, Channel Band width: 5MHz	
Channel 23355 (795.5MHz)	
Frequency Range : 9kHz~1GHz	Frequency Range : 1GHz~1.559GHz
	
Frequency Range : 1.559GHz~1.61GHz	Frequency Range : 1.61GHz~8GHz
	

LTE Band 14, Channel Band width: 10MHz	
Channel 23330 (793.0MHz)	
Frequency Range : 9kHz~1GHz	Frequency Range : 1GHz~1.559GHz
	
Frequency Range : 1.559GHz~1.61GHz	Frequency Range : 1.61GHz~8GHz
	

4.8 Radiated Emission Measurement

4.8.1 Limits of Radiated Emission Measurement

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 43 +10 $\log_{10}$(P) dB. The limit of emission equal to –13dBm.

For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to −70 dBW/MHz. The limit of emissions is equal to -40 dBm.

4.8.2 Test Procedure

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

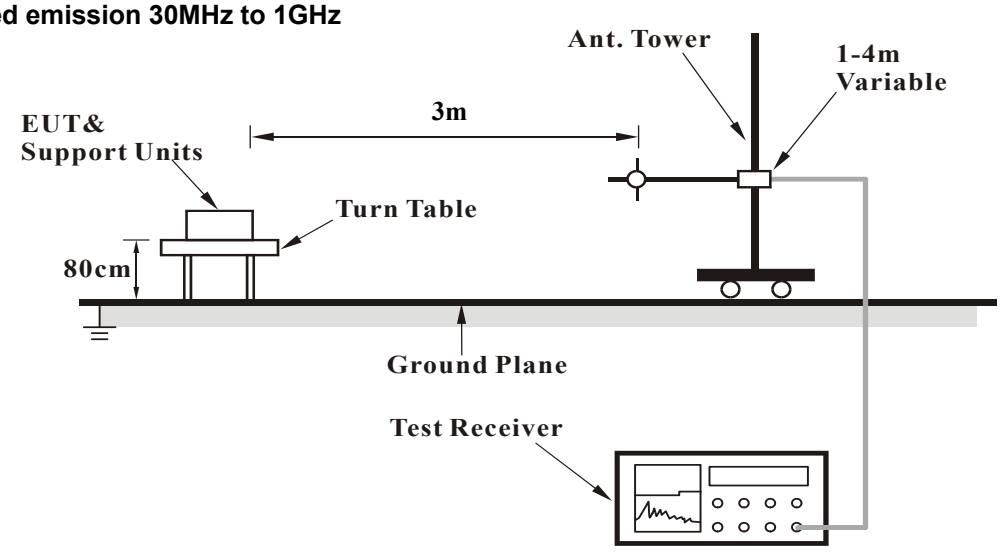
NOTE: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.

4.8.3 Deviation from Test Standard

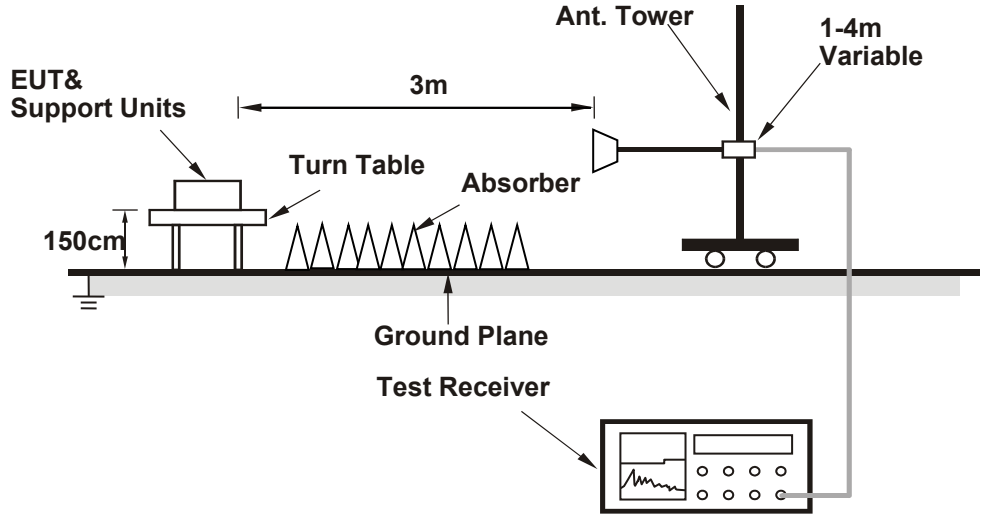
No deviation.

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).

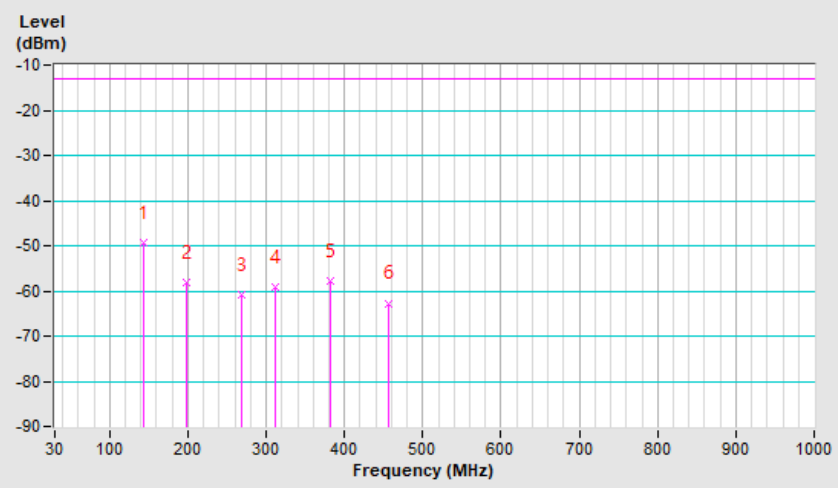
4.8.5 Test Results

Below 1GHz

LTE Band 14, Channel Bandwidth: 5MHz

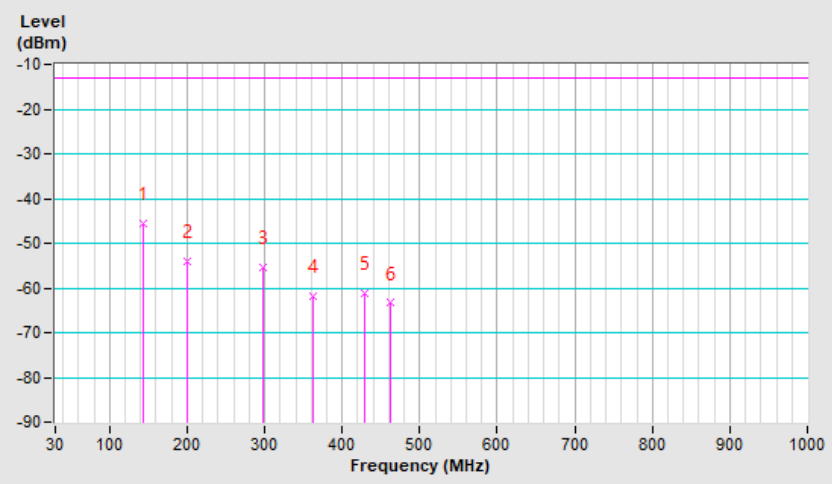
Mode	TX channel 23355 (795.5MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	23deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Adair Peng		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	142.46	-41.8	-49.0	-0.3	-49.3	-13.0	-36.3
2	197.29	-47.6	-63.2	5.2	-58.0	-13.0	-45.0
3	268.99	-54.6	-66.2	5.3	-60.9	-13.0	-47.9
4	312.57	-53.3	-64.4	5.1	-59.3	-13.0	-46.3
5	381.45	-54.0	-63.0	5.3	-57.7	-13.0	-44.7
6	455.96	-60.8	-67.7	5.0	-62.7	-13.0	-49.7



Mode	TX channel 23355 (795.5MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	23deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Adair Peng		

Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	143.87	-40.9	-45.4	-0.3	-45.7	-13.0	-32.7
2	200.10	-50.6	-59.6	5.4	-54.2	-13.0	-41.2
3	297.10	-54.2	-60.6	5.1	-55.5	-13.0	-42.5
4	363.17	-59.2	-67.1	5.2	-61.9	-13.0	-48.9
5	429.25	-59.2	-66.4	5.2	-61.2	-13.0	-48.2
6	461.58	-61.4	-68.4	5.0	-63.4	-13.0	-50.4



Above 1GHz

LTE Band 14, Channel Bandwidth: 5MHz

Mode	TX channel 23305 (790.5MHz)	Frequency Range	1 ~ 10GHz
Environmental Conditions	23deg. C, 67%RH	Input Power	120Vac, 60Hz
Tested By	Adair Peng		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1581.00	-60.8	-62.2	5.3	-56.9	-40.0	-16.9
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1581.00	-59.8	-60.3	5.3	-55.0	-40.0	-15.0

Mode	TX channel 23330 (793.0MHz)	Frequency Range	1 ~ 10GHz
Environmental Conditions	23deg. C, 67%RH	Input Power	120Vac, 60Hz
Tested By	Adair Peng		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1586.00	-60.7	-62.2	5.3	-56.9	-40.0	-16.9
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1586.00	-60.0	-60.5	5.3	-55.2	-40.0	-15.2

Mode	TX channel 23355 (795.5MHz)	Frequency Range	1 ~ 10GHz
Environmental Conditions	23deg. C, 67%RH	Input Power	120Vac, 60Hz
Tested By	Adair Peng		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1591.00	-61.0	-62.6	5.3	-57.3	-40.0	-17.3
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	**1591.00**	**-59.6**	**-60.1**	**5.3**	**-54.8**	**-40.0**	**-14.8**

LTE Band 14, Channel Bandwidth: 10MHz

Mode	TX channel 23330 (793.0MHz)	Frequency Range	1 ~ 10GHz
Environmental Conditions	23deg. C, 67%RH	Input Power	120Vac, 60Hz
Tested By	Adair Peng		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1586.00	-61.0	-62.5	5.3	-57.2	-40.0	-17.2
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1586.00	-60.4	-60.9	5.3	-55.6	-40.0	-15.6

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:

Linko EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
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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