

FCC Test Report (Part 90 – LTE Band 14)

Report No.: RFBBQZ-WTW-P21031117

FCC ID: PY320400515

Test Model: MR5200

Received Date: Mar. 31, 2021

Test Date: Apr. 27 ~ May 04, 2021

Issued Date: May 17, 2021

Applicant and Manufacturer: NETGEAR INC.

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



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Release Control Record

Issue No.	Description	Date Issued
RFBBQZ-WTW-P21031117	Original release	May 17, 2021

1 Certificate of Conformity

Product: 5G MHS Travel Router

Brand: NETGEAR

Test Model: MR5200

Sample Status: Engineering sample

Applicant: NETGEAR INC.

Test Date: Apr. 27 ~ May 04, 2021

Standards: FCC Part 90, Subpart 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:** May 17, 2021
Pettie Chen / Senior Specialist

Approved by : Bruce Chen, **Date:** May 17, 2021
Bruce Chen / Senior Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 90 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 90.542 (a)(7)	Effective Radiated Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement of limit.
2.1055 90.539 (e)	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth	Pass	Meet the requirement of limit.
-	Emission Masks	Pass	Meet the requirement of limit.
2.1053 90.543 (e)(2)(3)	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 90.543 (e)(3)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 90.543 (e)(f)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is - 16.8dB at 1581.00MHz.

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	3.63 dB
	200MHz ~ 1000MHz	3.64 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	ESCI	100424	Dec. 31, 2020	Dec. 30, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Sep. 16, 2020	Sep. 15, 2021
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Nov. 03, 2020	Nov. 02, 2021
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-1170	Nov. 22, 2020	Nov. 21, 2021
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 22, 2020	Nov. 21, 2021
Preamplifier Agilent (Below 1GHz)	8447D	2944A10631	Jun. 08, 2020	Jun. 07, 2021
Preamplifier KEYSIGHT (Above 1GHz)	83017A	MY53270295	Jun. 08, 2020	Jun. 07, 2021
RF Coaxial Cable WOKEN With 5dB PAD	8D-FB	Cable-CH4-01	Aug. 16, 2020	Aug. 15, 2021
RF Coaxial Cable EMCI	EMC102-KM-KM-3000	150929	Aug. 16, 2020	Aug. 15, 2021
RF Coaxial Cable EMCI	EMC102-KM-KM-600	150928	Aug. 16, 2020	Aug. 15, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	MY 13380+295012/04	Jun. 08, 2020	Jun. 07, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH4-03 (250724)	Jun. 08, 2020	Jun. 07, 2021
Software BV ADT	ADT_Radiated_V7.6.15.9.5	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021703	NA	NA
Turn Table BV ADT	TT100	TT93021703	NA	NA
Turn Table Controller BV ADT	SC100	SC93021703	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Antenna Tower & Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
WIT Standard Temperature And Humidity Chamber	TH-4S-C	W981030	Jun. 01, 2020	May 31, 2021
JFW 20dB attenuation	50HF-020-SMA	NA	NA	NA
True RMS Clamp Meter Fluke	325	31130711WS	Jun. 06, 2020	Jun. 05, 2021

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 4.

3 General Information

3.1 General Description of EUT

Product	5G MHS Travel Router				
Brand	NETGEAR				
Test Model	MR5200				
Sample Status	Engineering Sample				
Power Supply Rating	5 or 9Vdc (adapter) 5Vdc (host equipment) 3.85Vdc (battery)				
Modulation Type	QPSK, 16QAM, 64QAM, 256QAM				
Operating Frequency	LTE Band 14 (Channel Bandwidth 5MHz)	790.5MHz ~ 795.5MHz			
	LTE Band 14 (Channel Bandwidth 10MHz)	793.0MHz			
Max. ERP Power (Internal Antenna)		QPSK	16QAM	64QAM	256QAM
	LTE Band 14 (Channel Bandwidth 5MHz)	221.309mW (23.45dBm)	175.792mW (22.45dBm)	149.624mW (21.75dBm)	118.850mW (20.75dBm)
	LTE Band 14 (Channel Bandwidth 10MHz)	238.232mW (23.77dBm)	189.234mW (22.77dBm)	164.816mW (22.17dBm)	130.918mW (21.17dBm)
Max. ERP Power (External Antenna)		QPSK	16QAM	64QAM	256QAM
	LTE Band 14 (Channel Bandwidth 5MHz)	226.464mW (23.55dBm)	179.887mW (22.55dBm)	158.489mW (22.00dBm)	125.893mW (21.00dBm)
	LTE Band 14 (Channel Bandwidth 10MHz)	246.037mW (23.91dBm)	195.434mW (22.91dBm)	170.216mW (22.31dBm)	135.207mW (21.31dBm)
Emission Designator		QPSK	16QAM	64QAM	256QAM
	LTE Band 14 (Channel Bandwidth 5MHz)	4M49G7D	4M49D7W	4M49D7W	4M49D7W
	LTE Band 14 (Channel Bandwidth 10MHz)	8M97G7D	8M97D7W	8M97D7W	8M97D7W
Antenna Type	Refer to Note				
Antenna Connector	Refer to Note				
Accessory Device	Adapter x1, battery x1				
Cable Supplied	1m shielded USB cable without core (Brand: NIENYI, model: NYS2371-1)				

Note:

1. This report is prepared for FCC class II permissive change. This report is issued as a supplementary report of BV CPS report no.: RFBBQZ-WTW-P20120749-5. Differences compared with the original report are changing model and adding LTE Band 14. Therefore, the EUT was tested and presented in the test report.
2. The EUT uses following adapter and battery.

Adapter	
Brand	NETGEAR
Model	AD2122F20
P/N	332-11106-01
Input Power	100-240Vac, 50-60Hz, 0.5A
Output Power	5Vdc, 2.0A 9Vdc, 1.8A

Battery	
Brand	NETGEAR
Model	W-20
Rating	3.85Vdc, 19.40Wh

3. The following antennas were provided to the EUT.

Internal Antenna

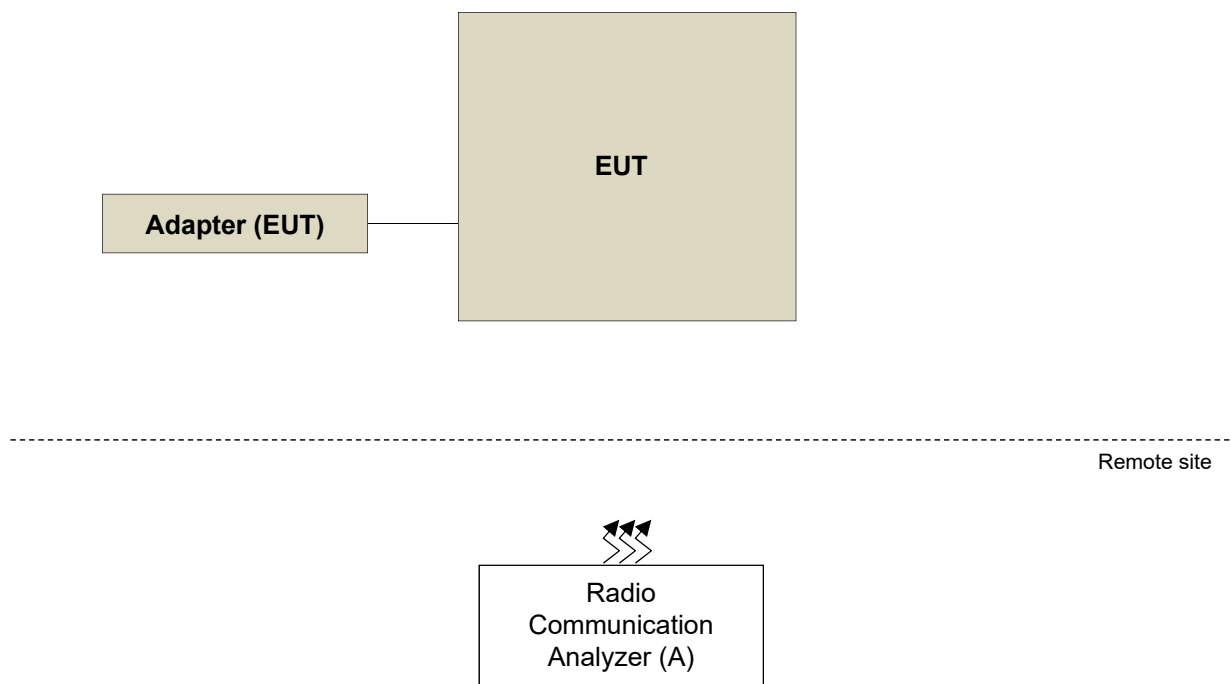
No.	Type	Connector	Gain (dBi)
			B14
1	Monopole	NA	0.16
2	Monopole	NA	0.67

External Antenna

No.	Type	Connector	Gain (dBi)
			B14
1	Monopole	TS-9 plugs	0.54
2	Monopole	TS-9 plugs	0.48

* 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	ERP		Radiated Emission	
	Internal Antenna	External Antenna	Internal Antenna	External Antenna
LTE Band 14	X-plane	Z-plane	X-plane	Z-plane

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 / 64QAM / 256QAM	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
		23330	23330 (793.0MHz)	10MHz	QPSK / 16QAM / 64QAM / 256QAM	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	23330	23330 (793.0MHz)	10MHz	QPSK / 16QAM / 64QAM / 256QAM	50 RB / 0 RB 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 / 64QAM / 256QAM	25RB / 0RB Offset
		23330	23330 (793.0MHz)	10MHz	QPSK / 16QAM / 64QAM / 256QAM	50RB / 0RB Offset
-	Emission Mask	23305 to 23355	23305 (790.5MHz), 23330 (793.0MHz), 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

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
-	Radiated Emission below 1GHz	23305 to 23355	23305 (790.5MHz)	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. 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 Section 6.6.3.1.4, choose the 5MHz & highest channel bandwidth for final test.
3. The output power for QPSK, 16QAM, 64QAM and 256QAM, measured value of QPSK is higher than 16QAM, 64QAM and 256QAM mode. Therefore, only Modulation characteristics, occupied bandwidth items had been tested under QPSK, 16QAM, 64QAM and 256QAM modes, the other test items were performed under QPSK mode only.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
ERP	22deg. C, 66%RH	120Vac, 60Hz	Han Wu
Modulation characteristics	22deg. C, 66%RH	120Vac, 60Hz	Gavin Wu
Frequency Stability	22deg. C, 66%RH	3.85Vdc	Gavin Wu
Occupied Bandwidth	22deg. C, 66%RH	120Vac, 60Hz	Gavin Wu
Emission Mask	22deg. C, 66%RH	120Vac, 60Hz	Gavin Wu
Conducted Emission	22deg. C, 66%RH	120Vac, 60Hz	Gavin Wu
Radiated Emission	22deg. C, 66%RH	120Vac, 60Hz	Hans Wu

3.4 EUT Operating Conditions

The EUT makes a call to the communication simulator. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency

3.5 General Description of Applied Standards and References

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

Test Standard:

FCC 47 CFR Part 2

FCC 47 CFR Part 90

ANSI/TIA/EIA-603-E 2016

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

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

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

EIRP / ERP Measurement:

- 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 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 5.2.7 and 5.2.2.4
 - $EIRP (dBm) = E (dB\mu V/m) + 20\log(D) - 104.8$; where D is the measurement distance (in the far field region) in m.
 - $ERP (dBm) = E (dB\mu V/m) + 20\log(D) - 104.8 - 2.15$; where D is the measurement distance (in the far field region) in m.

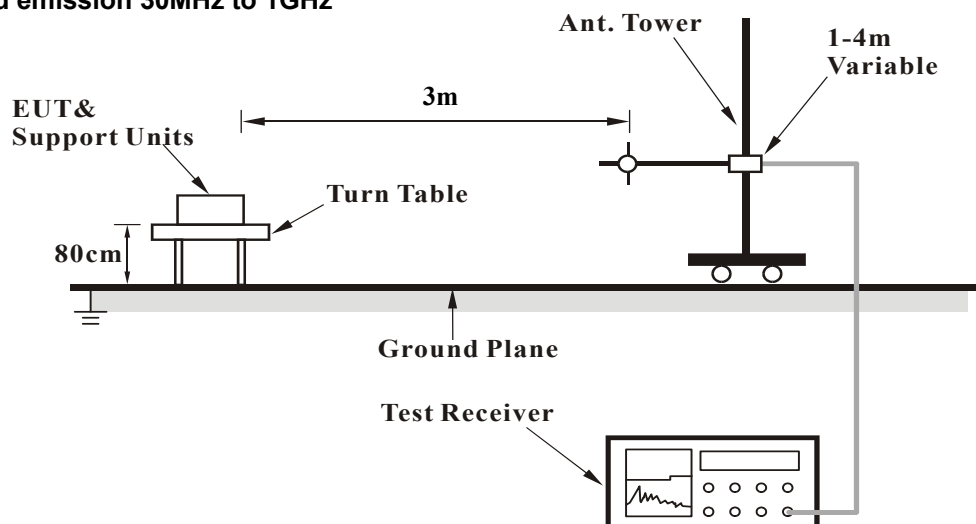
Conducted Power Measurement:

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

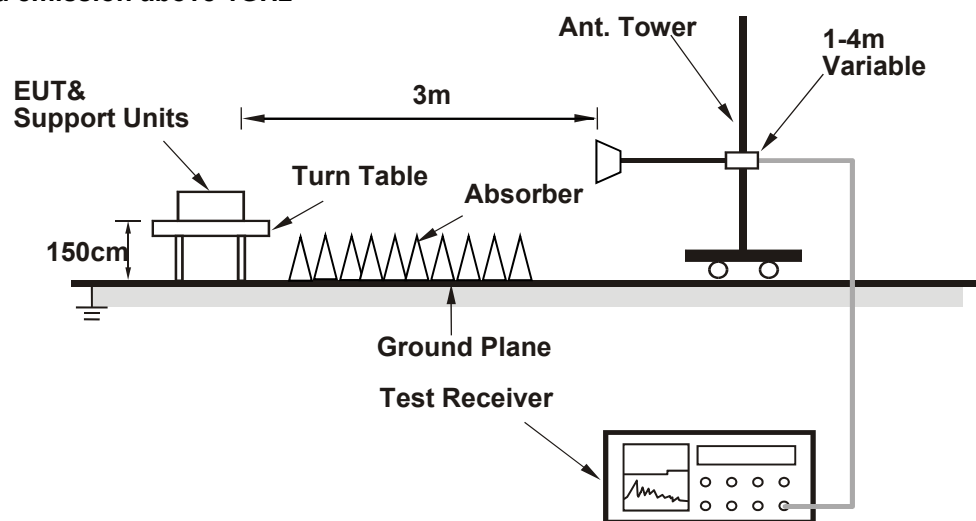
4.1.3 Test Setup

EIRP / ERP Measurement:

For radiated emission 30MHz to 1GHz

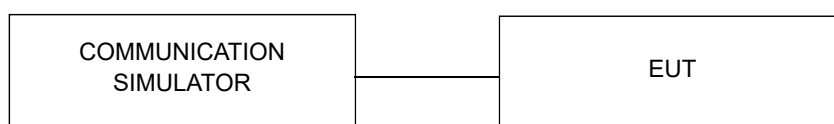


For radiated emission above 1GHz



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

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	RB Size	RB Offset	Mid
		Channel		23330
		Frequency (MHz)		793
10M	QPSK	1	0	23.39
		1	24	23.36
		1	49	23.27
		25	0	22.43
		25	12	22.41
		25	25	22.38
		50	0	22.39
10M	16QAM	1	0	22.67
		1	24	22.71
		1	49	22.68
		25	0	21.41
		25	12	21.38
		25	25	21.39
		50	0	21.43
10M	64QAM	1	0	21.61
		1	24	21.51
		1	49	21.53
		25	0	20.51
		25	12	20.47
		25	25	20.46
		50	0	20.49
10M	256QAM	1	0	18.43
		1	24	18.55
		1	49	18.23
		25	0	18.41
		25	12	18.37
		25	25	18.26
		50	0	18.35

LTE Band 14						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		23305	23330	23355
		Frequency (MHz)		790.5	793	795.5
5M	QPSK	1	0	23.22	23.37	23.16
		1	12	23.34	23.35	23.27
		1	24	23.14	23.19	23.09
		12	0	22.24	22.34	22.20
		12	6	22.38	22.40	22.36
		12	13	22.29	22.34	22.26
		25	0	22.33	22.33	22.20
5M	16QAM	1	0	22.57	22.62	22.49
		1	12	22.62	22.65	22.63
		1	24	22.67	22.67	22.55
		12	0	21.39	21.41	21.33
		12	6	21.33	21.34	21.18
		12	13	21.33	21.36	21.18
		25	0	21.27	21.33	21.22
5M	64QAM	1	0	21.46	21.52	21.42
		1	12	21.34	21.41	21.34
		1	24	21.35	21.43	21.37
		12	0	20.42	20.51	20.38
		12	6	20.29	20.39	20.27
		12	13	20.38	20.43	20.42
		25	0	20.41	20.41	20.39
5M	256QAM	1	0	18.37	18.41	18.35
		1	12	18.38	18.37	18.33
		1	24	18.20	18.36	18.13
		12	0	18.29	18.29	18.21
		12	6	18.11	18.17	18.08
		12	13	18.25	18.30	18.10
		25	0	18.23	18.35	18.27

ERP Power (dBm)

Internal Antenna

Modulation Type: QPSK

LTE Band 14, Channel Bandwidth: 5MHz

Mode		TX channel 23305, 23330, 23355						
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	790.50	20.05	34.77	-14.72	1.54 H	358	90.80	-70.75
2	793.00	20.35	34.77	-14.42	1.52 H	3	91.12	-70.77
3	795.50	20.65	34.77	-14.12	1.49 H	359	91.43	-70.78
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	790.50	23.15	34.77	-11.62	1.29 V	133	93.90	-70.75
2	793.00	23.36	34.77	-11.41	1.32 V	129	94.13	-70.77
3	795.50	23.45	34.77	-11.32	1.24 V	132	94.23	-70.78

LTE Band 14, Channel Bandwidth: 10MHz

Mode		TX channel 23330						
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	793.00	20.30	34.77	-14.47	1.50 H	358	91.07	-70.77
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	793.00	23.77	34.77	-11.00	1.33 V	135	94.54	-70.77

Remarks:

1. $ERP(dBm) = Raw\ Value(dBuV/m) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. $Margin\ value = ERP - Limit\ value$

Modulation Type: 16QAM

LTE Band 14, Channel Bandwidth: 5MHz

Mode		TX channel 23305, 23330, 23355						
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	790.50	19.05	34.77	-15.72	1.54 H	358	89.80	-70.75
2	793.00	19.35	34.77	-15.42	1.52 H	3	90.12	-70.77
3	795.50	19.65	34.77	-15.12	1.49 H	359	90.43	-70.78
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	790.50	22.15	34.77	-12.62	1.29 V	133	92.90	-70.75
2	793.00	22.36	34.77	-12.41	1.32 V	129	93.13	-70.77
3	795.50	22.45	34.77	-12.32	1.24 V	132	93.23	-70.78

LTE Band 14, Channel Bandwidth: 10MHz

Mode		TX channel 23330						
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	793.00	19.30	34.77	-15.47	1.50 H	358	90.07	-70.77
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	793.00	22.77	34.77	-12.00	1.33 V	135	93.54	-70.77

Remarks:

1. $ERP(dBm) = Raw\ Value(dBuV/m) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. $Margin\ value = ERP - Limit\ value$

Modulation Type: 64QAM

LTE Band 14, Channel Bandwidth: 5MHz

Mode		TX channel 23305, 23330, 23355						
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	790.50	18.25	34.77	-16.52	1.54 H	358	89.00	-70.75
2	793.00	18.55	34.77	-16.22	1.52 H	3	89.32	-70.77
3	795.50	18.85	34.77	-15.92	1.49 H	359	89.63	-70.78
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	790.50	21.35	34.77	-13.42	1.29 V	133	92.10	-70.75
2	793.00	21.66	34.77	-13.11	1.32 V	129	92.43	-70.77
3	795.50	21.75	34.77	-13.02	1.24 V	132	92.53	-70.78

LTE Band 14, Channel Bandwidth: 10MHz

Mode		TX channel 23330						
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	793.00	18.50	34.77	-16.27	1.50 H	358	89.27	-70.77
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	793.00	22.17	34.77	-12.60	1.33 V	135	92.94	-70.77

Remarks:

1. $ERP(dBm) = Raw\ Value(dBuV/m) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. $Margin\ value = ERP - Limit\ value$

Modulation Type: 256QAM

LTE Band 14, Channel Bandwidth: 5MHz

Mode		TX channel 23305, 23330, 23355						
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	790.50	17.25	34.77	-17.52	1.54 H	358	88.00	-70.75
2	793.00	17.55	34.77	-17.22	1.52 H	3	88.32	-70.77
3	795.50	17.85	34.77	-16.92	1.49 H	359	88.63	-70.78
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	790.50	20.35	34.77	-14.42	1.29 V	133	91.10	-70.75
2	793.00	20.66	34.77	-14.11	1.32 V	129	91.43	-70.77
3	795.50	20.75	34.77	-14.02	1.24 V	132	91.53	-70.78

LTE Band 14, Channel Bandwidth: 10MHz

Mode		TX channel 23330						
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	793.00	17.50	34.77	-17.27	1.50 H	358	88.27	-70.77
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	793.00	21.17	34.77	-13.60	1.33 V	135	91.94	-70.77

Remarks:

1. $ERP(dBm) = Raw\ Value(dBuV/m) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. $Margin\ value = ERP - Limit\ value$

External Antenna

Modulation Type: QPSK

LTE Band 14, Channel Bandwidth: 5MHz

Mode		TX channel 23305, 23330, 23355						
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	790.50	23.50	34.77	-11.27	1.00 H	189	94.25	-70.75
2	793.00	23.55	34.77	-11.22	1.00 H	188	94.32	-70.77
3	795.50	23.05	34.77	-11.72	1.00 H	191	93.83	-70.78
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	790.50	17.65	34.77	-17.12	1.78 V	199	88.40	-70.75
2	793.00	17.45	34.77	-17.32	1.81 V	197	88.22	-70.77
3	795.50	17.65	34.77	-17.12	1.87 V	202	88.43	-70.78

LTE Band 14, Channel Bandwidth: 10MHz

Mode		TX channel 23330						
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	793.00	23.91	34.77	-10.86	1.01 H	192	94.68	-70.77
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	793.00	17.51	34.77	-17.26	1.76 V	200	88.28	-70.77

Remarks:

1. $ERP(dBm) = Raw\ Value(dBuV/m) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. $Margin\ value = ERP - Limit\ value$

Modulation Type: 16QAM

LTE Band 14, Channel Bandwidth: 5MHz

Mode		TX channel 23305, 23330, 23355						
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	790.50	22.50	34.77	-12.27	1.00 H	189	93.25	-70.75
2	793.00	22.55	34.77	-12.22	1.00 H	188	93.32	-70.77
3	795.50	22.05	34.77	-12.72	1.00 H	191	92.83	-70.78
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	790.50	16.65	34.77	-18.12	1.78 V	199	87.40	-70.75
2	793.00	16.45	34.77	-18.32	1.81 V	197	87.22	-70.77
3	795.50	16.65	34.77	-18.12	1.87 V	202	87.43	-70.78

LTE Band 14, Channel Bandwidth: 10MHz

Mode		TX channel 23330						
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	793.00	22.91	34.77	-11.86	1.01 H	192	93.68	-70.77
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	793.00	16.51	34.77	-18.26	1.76 V	200	87.28	-70.77

Remarks:

1. $ERP(dBm) = Raw\ Value(dBuV/m) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. $Margin\ value = ERP - Limit\ value$

Modulation Type: 64QAM

LTE Band 14, Channel Bandwidth: 5MHz

Mode		TX channel 23305, 23330, 23355						
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	790.50	22.00	34.77	-12.77	1.00 H	189	92.75	-70.75
2	793.00	21.85	34.77	-12.92	1.00 H	188	92.62	-70.77
3	795.50	21.45	34.77	-13.32	1.00 H	191	92.23	-70.78
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	790.50	16.05	34.77	-18.72	1.78 V	199	86.80	-70.75
2	793.00	15.75	34.77	-19.02	1.81 V	197	86.52	-70.77
3	795.50	15.00	34.77	-19.77	1.87 V	202	85.78	-70.78

LTE Band 14, Channel Bandwidth: 10MHz

Mode		TX channel 23330						
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	793.00	22.31	34.77	-12.46	1.01 H	192	93.08	-70.77
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	793.00	15.85	34.77	-18.92	1.76 V	200	86.62	-70.77

Remarks:

1. $ERP(dBm) = Raw\ Value(dBuV/m) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. $Margin\ value = ERP - Limit\ value$

Modulation Type: 256QAM

LTE Band 14, Channel Bandwidth: 5MHz

Mode		TX channel 23305, 23330, 23355						
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	790.50	21.00	34.77	-13.77	1.00 H	189	91.75	-70.75
2	793.00	20.85	34.77	-13.92	1.00 H	188	91.62	-70.77
3	795.50	20.45	34.77	-14.32	1.00 H	191	91.23	-70.78
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	790.50	15.05	34.77	-19.72	1.78 V	199	85.80	-70.75
2	793.00	14.75	34.77	-20.02	1.81 V	197	85.52	-70.77
3	795.50	14.00	34.77	-20.77	1.87 V	202	84.78	-70.78

LTE Band 14, Channel Bandwidth: 10MHz

Mode		TX channel 23330						
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	793.00	21.31	34.77	-13.46	1.01 H	192	92.08	-70.77
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	793.00	14.85	34.77	-19.92	1.76 V	200	85.62	-70.77

Remarks:

1. $ERP(dBm) = Raw\ Value(dBuV/m) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. $Margin\ value = ERP - Limit\ value$

4.2 Modulation Characteristics Measurement

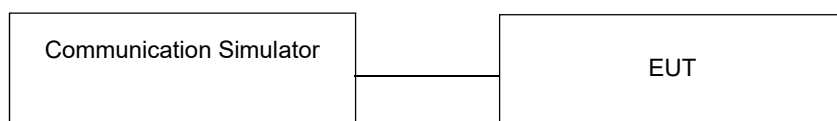
4.2.1 Limits of Modulation Characteristics

N/A

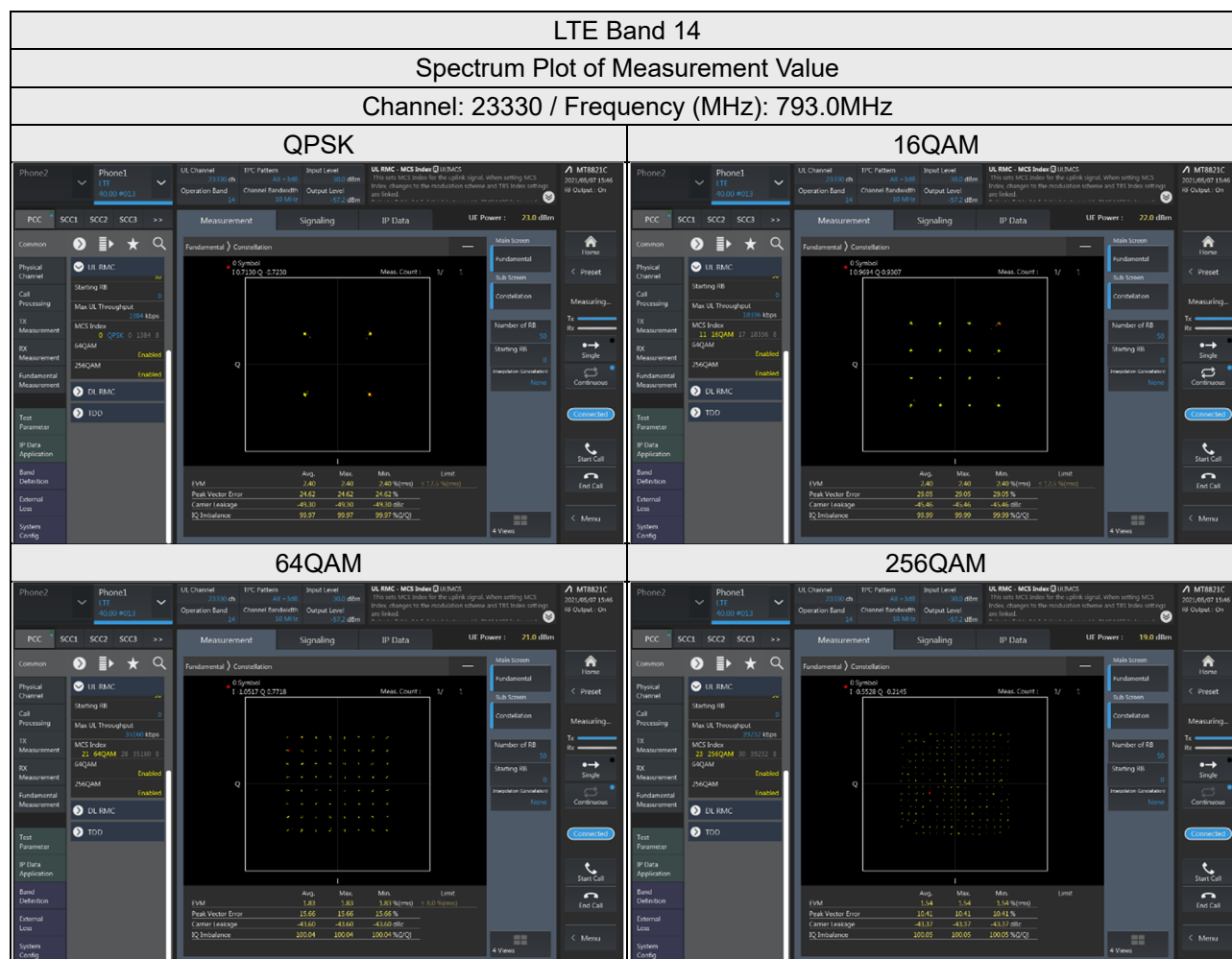
4.2.2 Test Procedure

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

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

- 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.

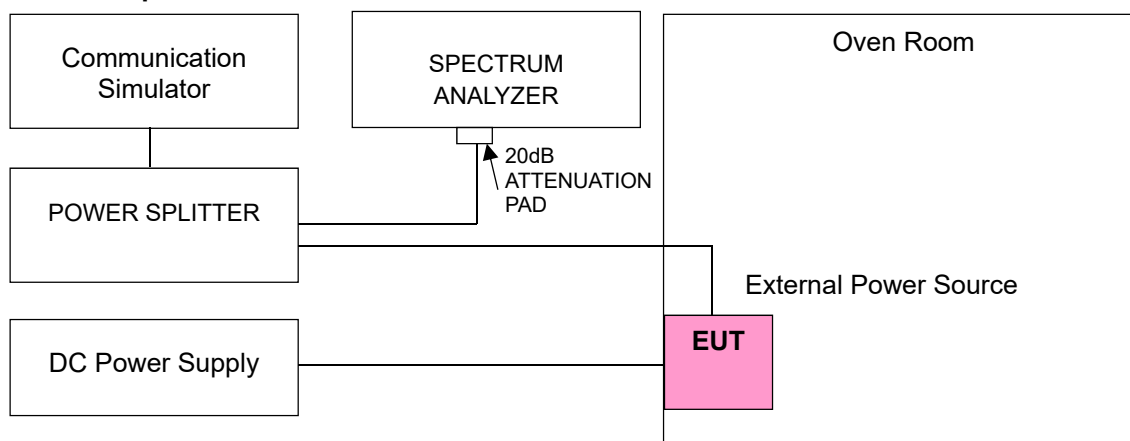
Note: The frequency error was recorded frequency error from the communication simulator.

4.3.3 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Radio Communication Analyzer Anritsu	MT8820C	6201010284	Dec. 28, 2020	Dec. 27, 2021
Temperature & Humidity Chamber TERCHY	HRM-120RF	931022	Dec. 24, 2020	Dec. 23, 2021
Digital Multimeter Fluke	87-III	70360742	Jun. 23, 2020	Jun. 22, 2021
DC Power Supply Topward	6306A	727263	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.

4.3.4 Test Setup



4.3.5 Test Results

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 14			
	Channel Bandwidth: 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	790.500002	0.003	795.500003	0.004
3.40	790.500004	0.005	795.500001	0.002
4.40	790.500001	0.002	795.500001	0.001

Note: The applicant defined the normal working voltage is from 3.40Vdc to 4.40Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 14			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	790.500004	0.005	795.500003	0.004
-20	790.500002	0.002	795.500002	0.002
-10	790.500004	0.005	795.500002	0.002
0	790.500004	0.005	795.500002	0.002
10	790.500003	0.004	795.500001	0.002
20	790.499997	-0.004	795.499999	-0.002
30	790.499998	-0.003	795.499999	-0.002
40	790.499997	-0.004	795.499998	-0.002
50	790.499998	-0.002	795.499997	-0.004

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 14	
	Channel Bandwidth: 10 MHz	
	Frequency (MHz)	Frequency Error (ppm)
3.85	793.000003	0.003
3.40	793.000001	0.001
4.40	793.000002	0.003

Note: The applicant defined the normal working voltage is from 3.40Vdc to 4.40Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 14	
	Channel Bandwidth: 10 MHz	
	Frequency (MHz)	Frequency Error (ppm)
-30	793.000004	0.005
-20	793.000001	0.001
-10	793.000002	0.002
0	793.000002	0.002
10	793.000001	0.002
20	792.999999	-0.002
30	792.999999	-0.001
40	792.999999	-0.002
50	792.999997	-0.004

4.4 Occupied Bandwidth Measurement

4.4.1 Limits of Occupied Bandwidth Measurement

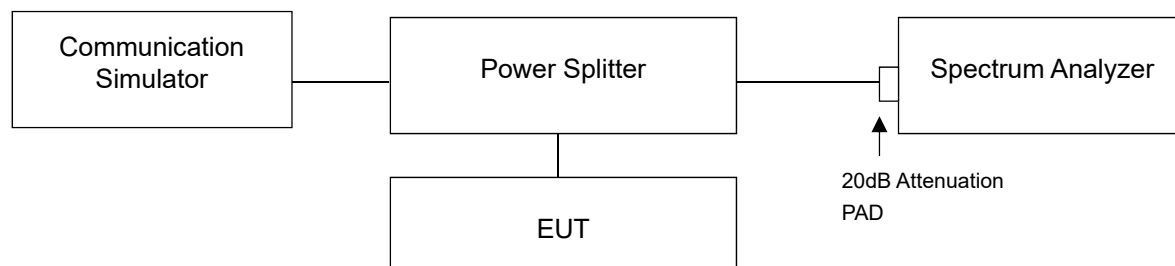
The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

4.4.2 Test Procedure

The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Measurement method, please refer to section 5.4.4 of ANSI C63.26. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

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

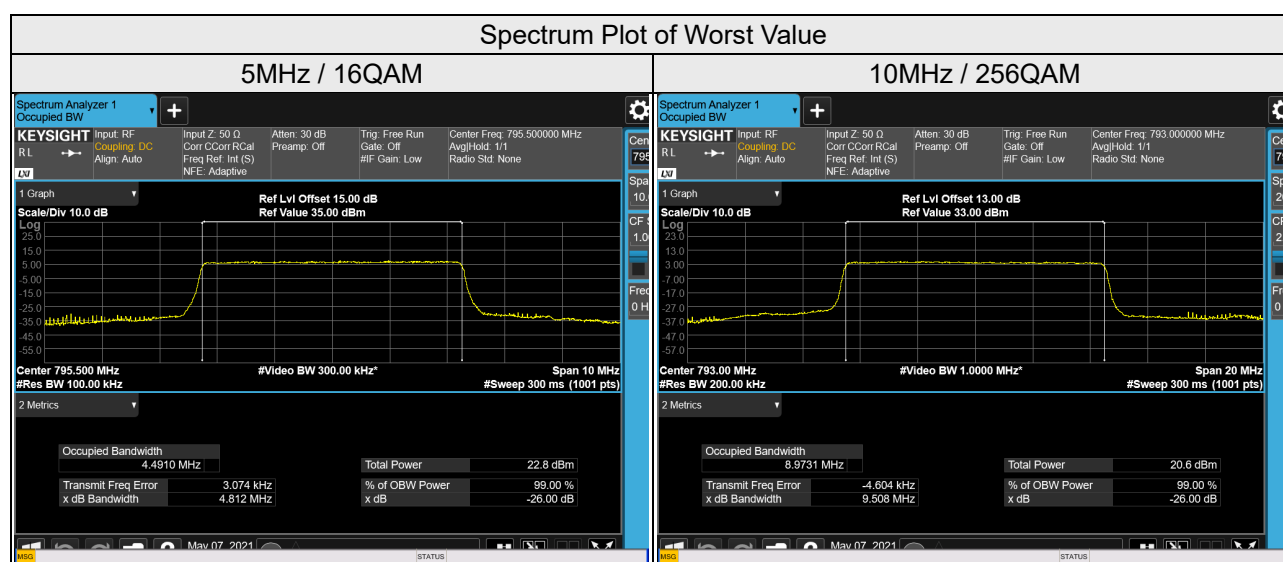
4.4.3 Test Setup



4.4.4 Test Result

LTE Band 14, Channel Bandwidth 5MHz					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)			
		QPSK	16QAM	64QAM	256QAM
23305	790.5	4.48	4.48	4.49	4.49
23330	793.0	4.49	4.49	4.49	4.49
23355	795.5	4.49	4.49	4.49	4.49

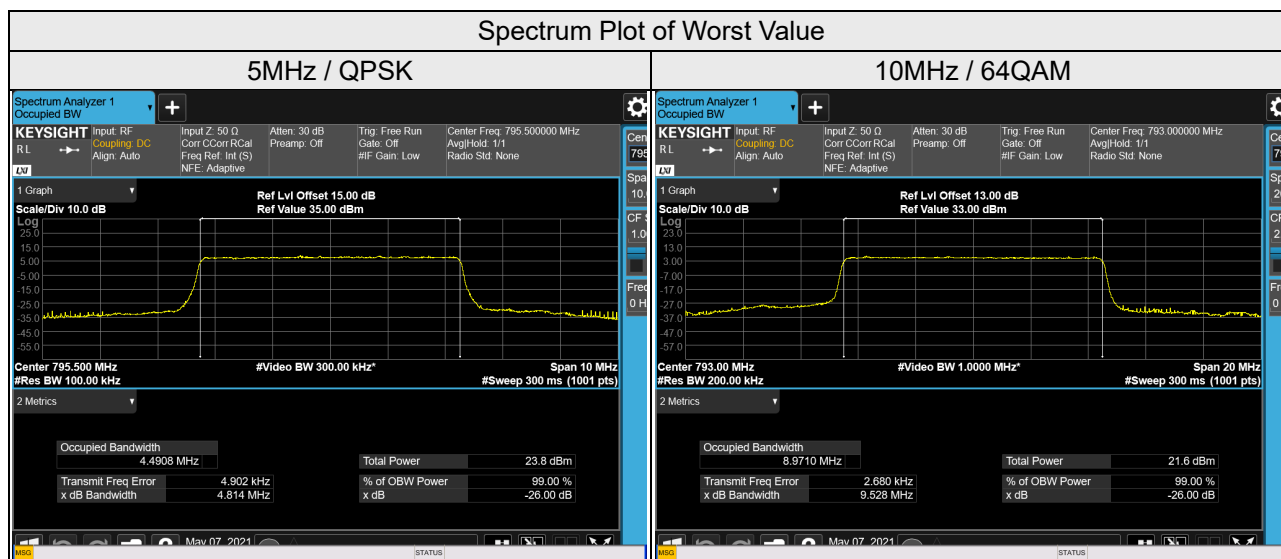
LTE Band 14, Channel Bandwidth 10MHz					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)			
		QPSK	16QAM	64QAM	256QAM
23330	793.0	8.97	8.97	8.97	8.97



26dB Bandwidth

LTE Band 14, Channel Bandwidth 5MHz					
Channel	Frequency (MHz)	26dB Bandwidth (MHz)			
		QPSK	16QAM	64QAM	256QAM
23305	790.5	4.80	4.81	4.79	4.79
23330	793.0	4.80	4.81	4.81	4.81
23355	795.5	4.81	4.81	4.81	4.81

LTE Band 14, Channel Bandwidth 10MHz					
Channel	Frequency (MHz)	26dB Bandwidth (MHz)			
		QPSK	16QAM	64QAM	256QAM
23330	793.0	9.52	9.52	9.53	9.51



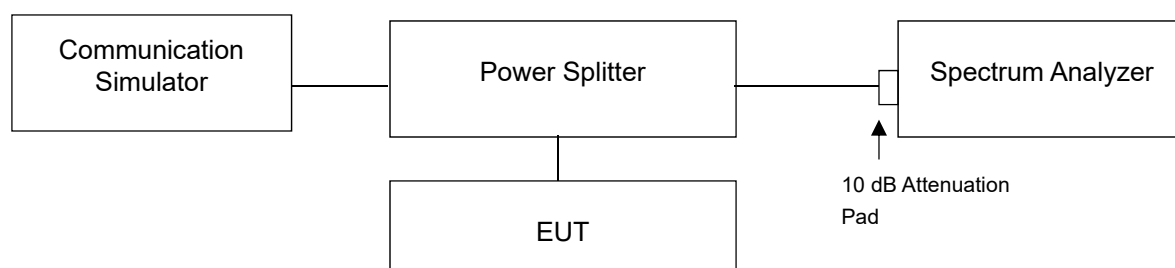
4.5 Emission Mask Measurement

4.5.1 Limits of Emission Mask Measurement

According to FCC part 90.543 (e), For operations in the 758-768 MHz and the 788-798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

- (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.

4.5.2 Test Setup



4.5.3 Test Procedures

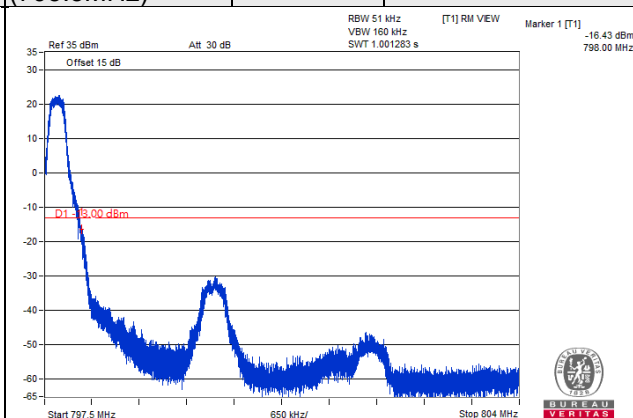
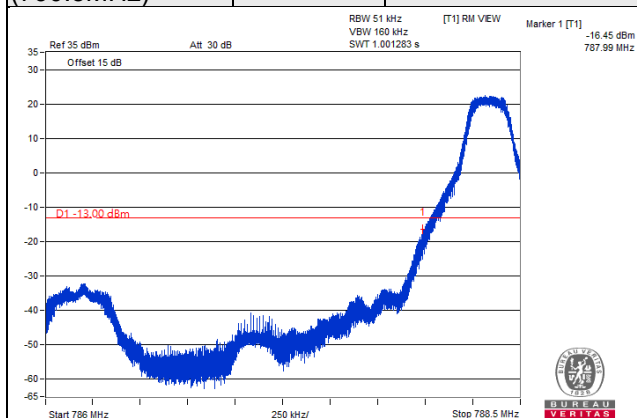
- a. The measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
- b. Record the test plot.

4.5.4 Test Results

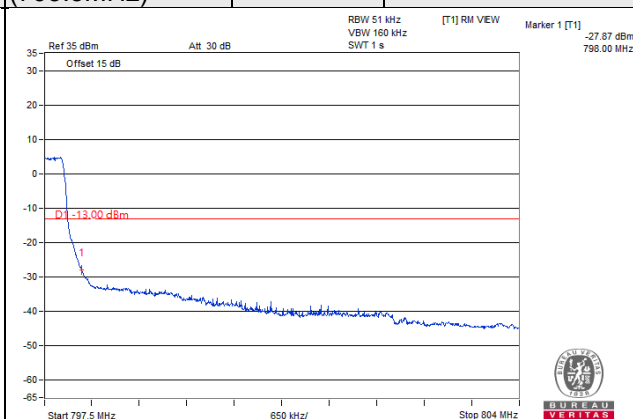
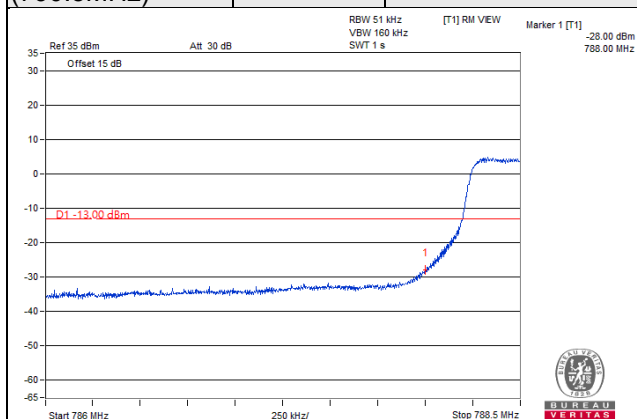
Band Edge

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
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Channel 23305 (790.5MHz)	QPSK	25 RB / 0 RB Offset	Channel 23355 (795.5MHz)	QPSK	25 RB / 0 RB Offset
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LTE Band 14, Channel Bandwidth 10MHz

Channel 23330
(793.0MHz)

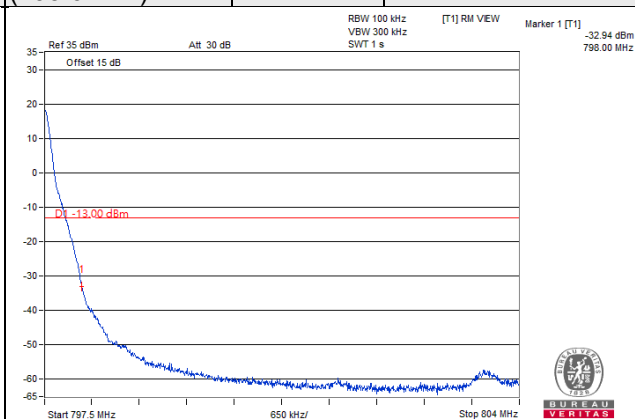
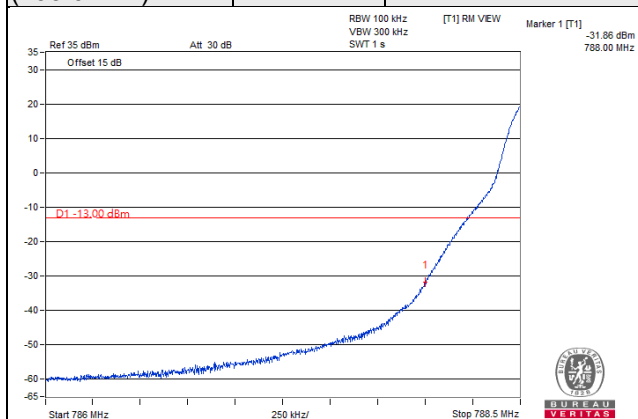
QPSK

1 RB / 0 RB Offset

Channel 23330
(793.0MHz)

QPSK

1 RB / 49 RB Offset



Channel 23330
(793.0MHz)

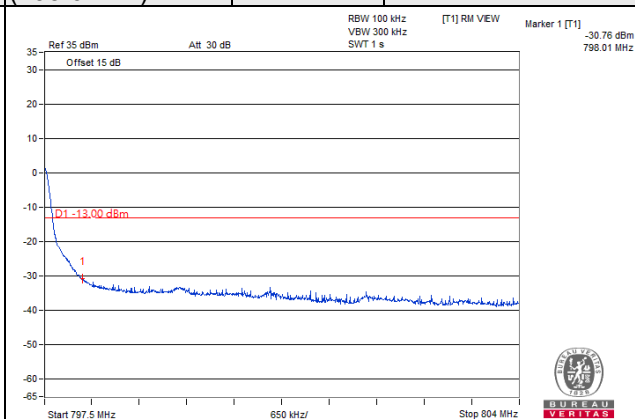
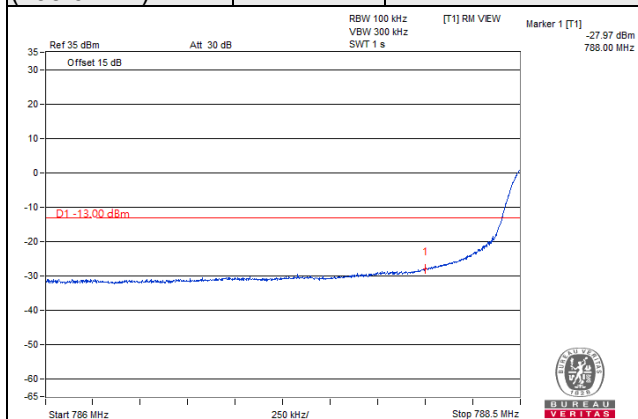
QPSK

50 RB / 0 RB Offset

Channel 23330
(793.0MHz)

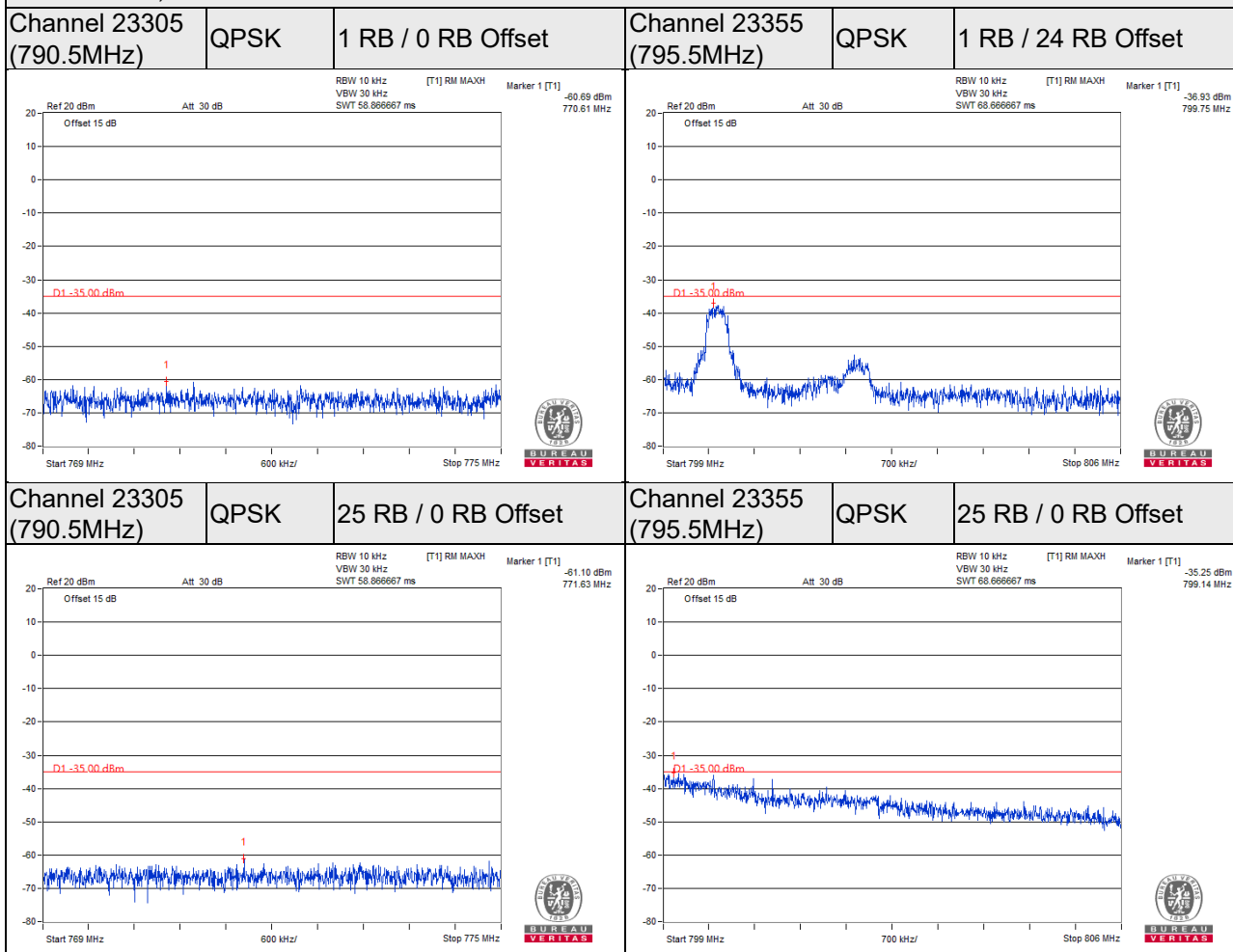
QPSK

50 RB / 0 RB Offset



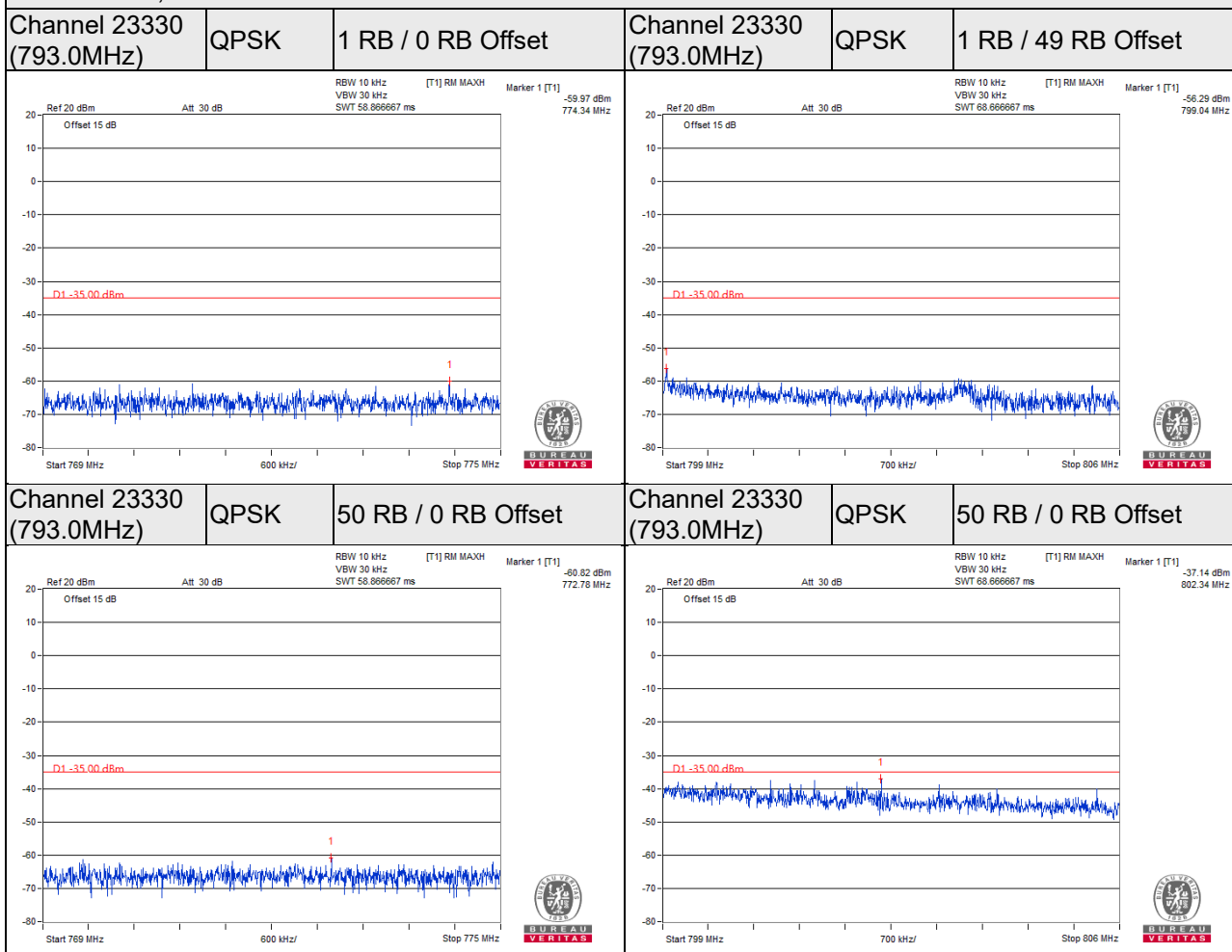
Out Of Band Emission

LTE Band 14, Channel Bandwidth 5MHz



For the 769-775MHz and 799-805MHz band, the FCC limit is $65 + 10\log(P[\text{watt}])$ 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, and the correction factor is compensated at the spectrum. By using a 10 kHz bandwidth on the spectrum analyzer.

LTE Band 14, Channel Bandwidth 10MHz



For the 769-775MHz and 799-805MHz band, the FCC limit is $65+10\log(P[\text{watt}])$ 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, and the correction factor is compensated at the spectrum. By using a 10 kHz bandwidth on the spectrum analyzer.

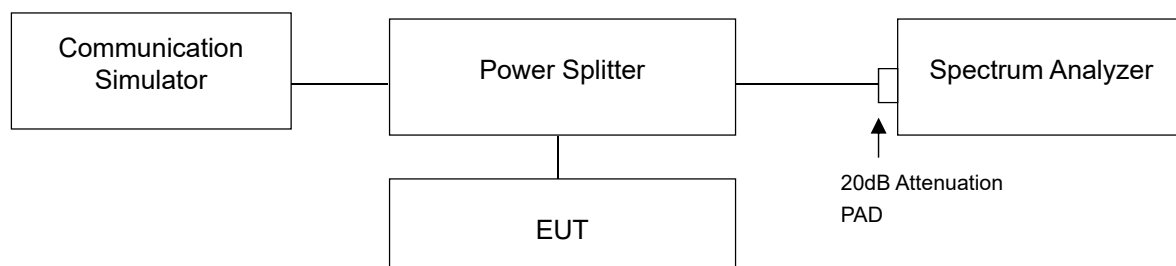
4.6 Conducted Spurious Emissions

4.6.1 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 .

4.6.2 Test Setup



4.6.3 Test Procedure

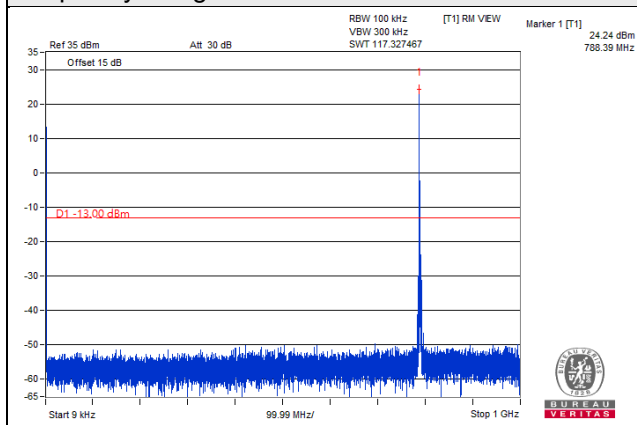
- The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
- Measuring frequency range is from 9kHz to 8GHz. 20dB attenuation pad is connected with spectrum. RBW=100kHz and VBW=300kHz for 9kHz to 1GHz and RBW=1MHz and VBW=3MHz for 1 GHz to 9GHz are used for LTE band conducted emission measurement.

4.6.4 Test Results

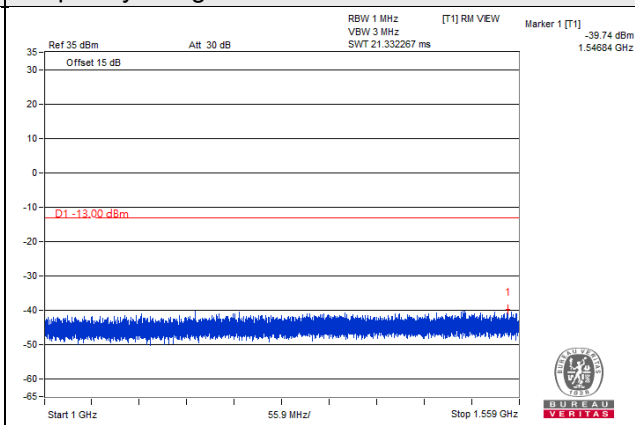
LTE Band 14, Channel Band width: 5MHz

Channel 23305 (790.5MHz)

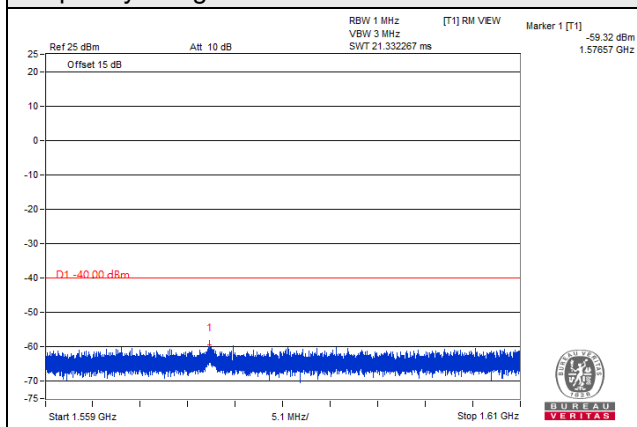
Frequency Range : 9kHz ~ 1GHz



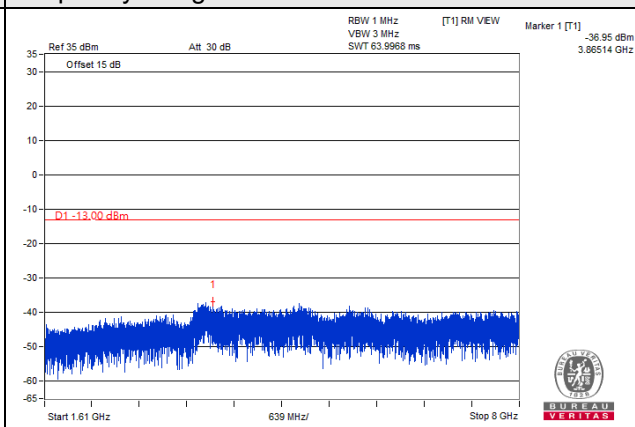
Frequency Range : 1GHz ~ 1.559GHz



Frequency Range : 1.559GHz ~ 1.61GHz



Frequency Range : 1.61GHz ~ 8GHz

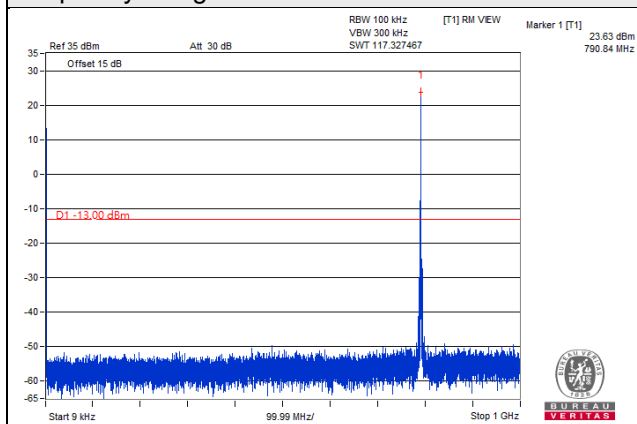


*The 9kHz signal over the limit is from Spectrum.

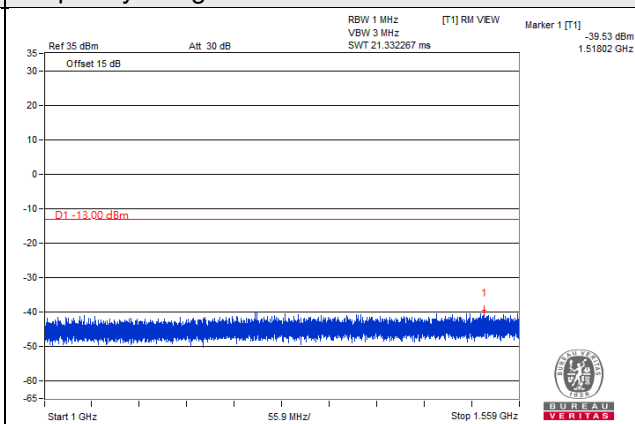
LTE Band 14, Channel Band width: 5MHz

Channel 23330 (793.0MHz)

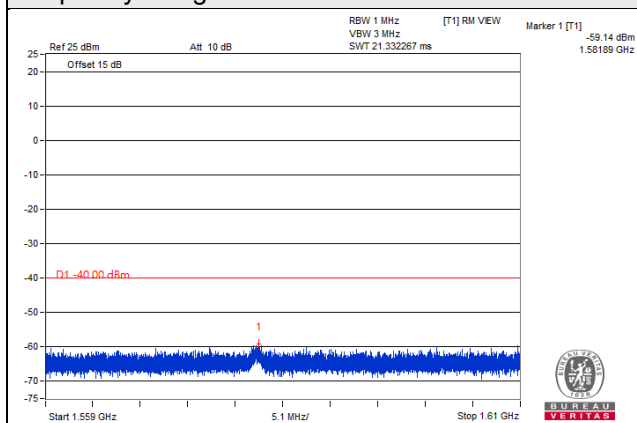
Frequency Range : 9kHz ~ 1GHz



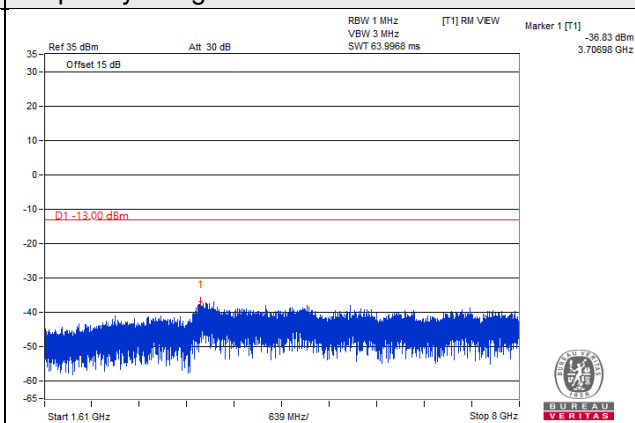
Frequency Range : 1GHz ~ 1.559GHz



Frequency Range : 1.559GHz ~ 1.61GHz



Frequency Range : 1.61GHz ~ 8GHz

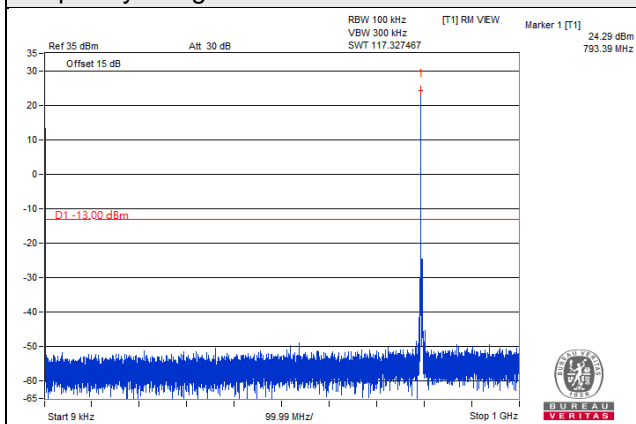


*The 9kHz signal over the limit is from Spectrum.

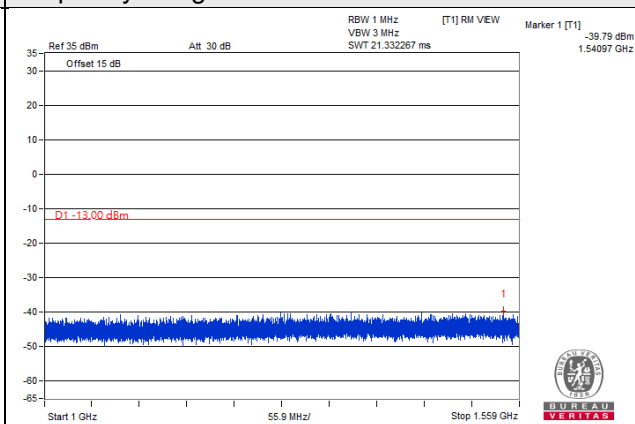
LTE Band 14, Channel Band width: 5MHz

Channel 23355 (795.5MHz)

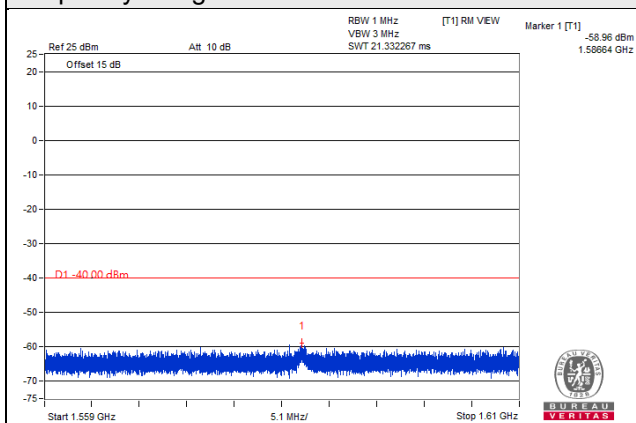
Frequency Range : 9kHz ~ 1GHz



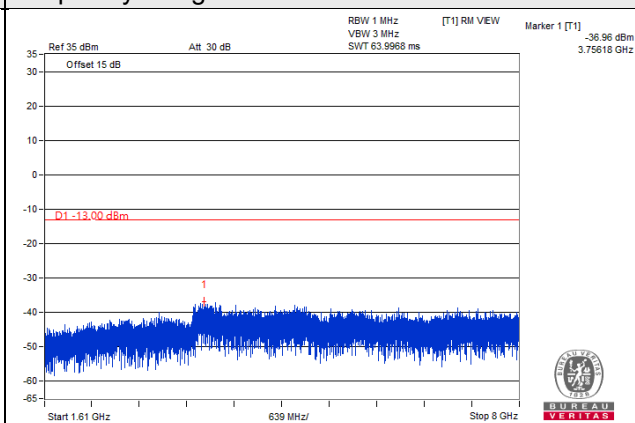
Frequency Range : 1GHz ~ 1.559GHz



Frequency Range : 1.559GHz ~ 1.61GHz



Frequency Range : 1.61GHz ~ 8GHz

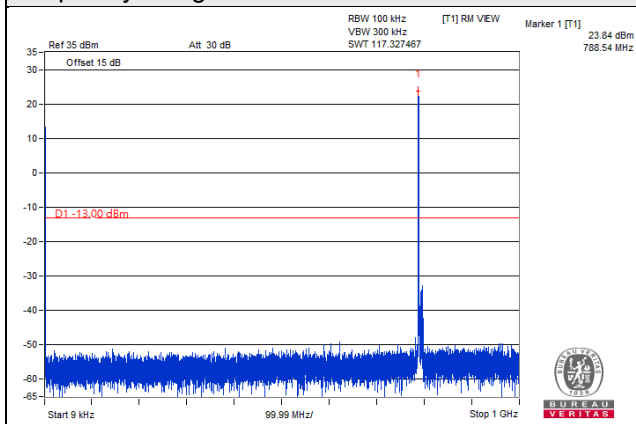


*The 9kHz signal over the limit is from Spectrum.

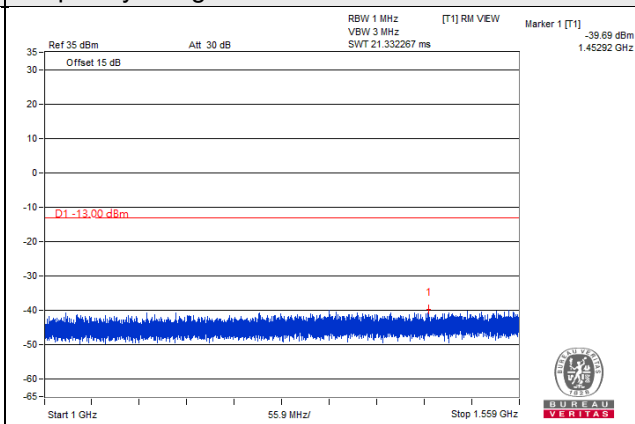
LTE Band 14, Channel Band width: 10MHz

Channel 23330 (793.0MHz)

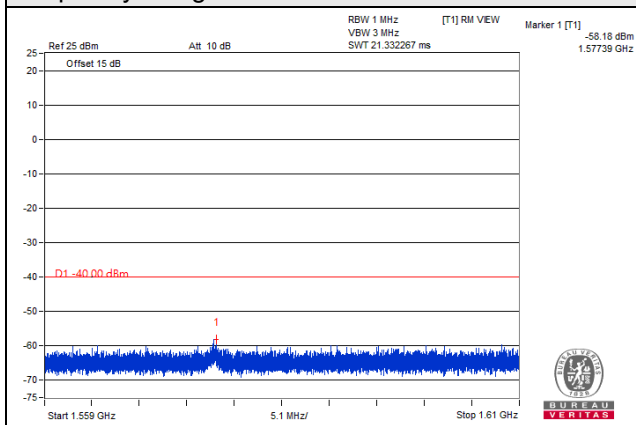
Frequency Range : 9kHz ~ 1GHz



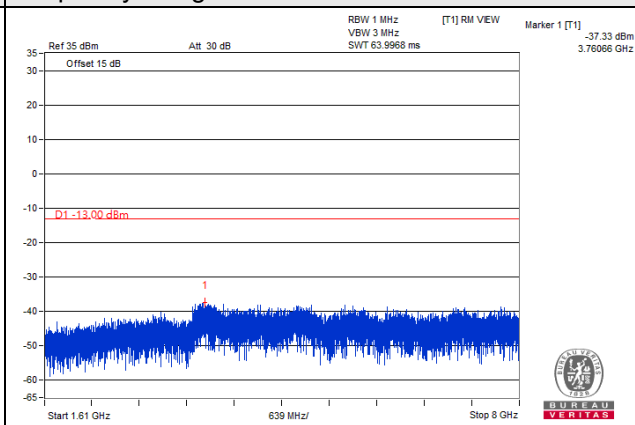
Frequency Range : 1GHz ~ 1.559GHz



Frequency Range : 1.559GHz ~ 1.61GHz



Frequency Range : 1.61GHz ~ 8GHz



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

4.7 Radiated Emission Measurement

4.7.1 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 .

4.7.2 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 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:

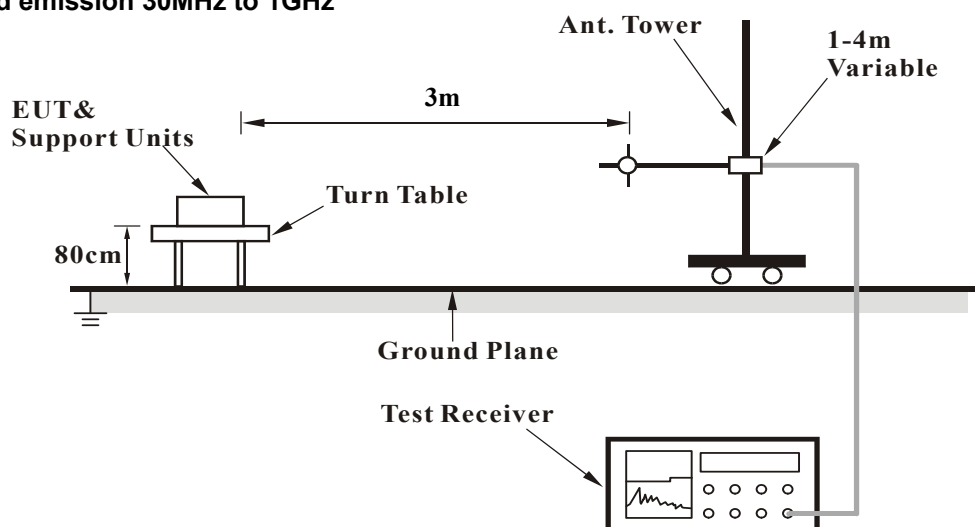
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.
2. The emission levels were against the limit of frequency range 9 kHz ~ 30 MHz:
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

4.7.3 Deviation from Test Standard

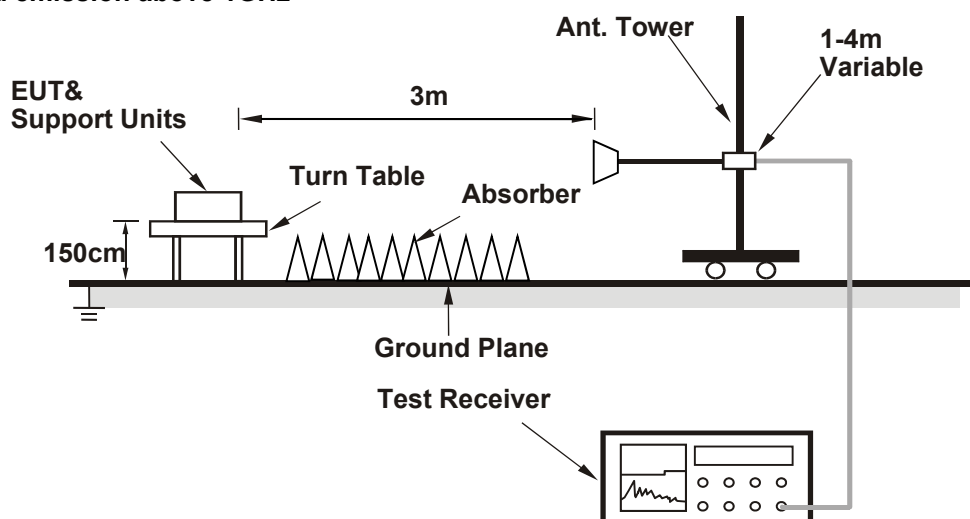
No deviation.

4.7.4 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).

4.7.5 Test Results

Internal Antenna

Below 1GHz

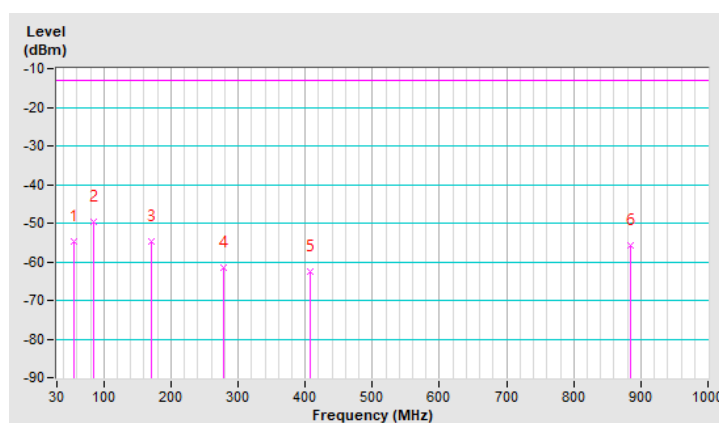
LTE Band 14, Channel Bandwidth 10MHz

Mode	TX channel 23305 (790.5MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	25deg. C, 70%RH	Input Power	120Vac, 60Hz
Tested By	Hans Wu		

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	55.30	-54.8	-13.0	-41.8	1.50 H	146	51.7	-106.5
2	84.83	-49.7	-13.0	-36.7	1.50 H	173	62.0	-111.7
3	170.58	-54.7	-13.0	-41.7	2.00 H	137	52.0	-106.7
4	277.42	-61.5	-13.0	-48.5	1.00 H	296	44.3	-105.8
5	406.75	-62.4	-13.0	-49.4	2.00 H	98	40.8	-103.2
6	884.72	-55.6	-13.0	-42.6	1.00 H	58	36.3	-91.9

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.

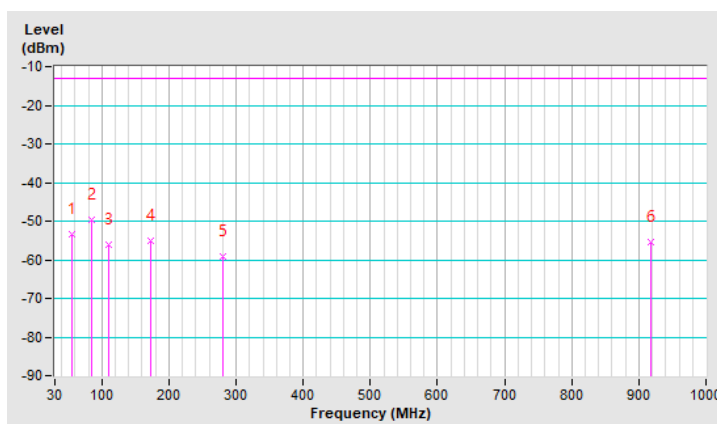


Mode	TX channel 23305 (790.5MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	25deg. C, 70%RH	Input Power	120Vac, 60Hz
Tested By	Hans Wu		

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	55.30	-53.5	-13.0	-40.5	1.50 V	119	53.0	-106.5
2	84.83	-49.8	-13.0	-36.8	1.00 V	196	61.9	-111.7
3	110.13	-56.2	-13.0	-43.2	2.00 V	308	53.2	-109.4
4	171.99	-55.1	-13.0	-42.1	2.00 V	120	51.7	-106.8
5	280.23	-59.3	-13.0	-46.3	2.00 V	105	46.4	-105.7
6	917.06	-55.4	-13.0	-42.4	1.00 V	277	35.4	-90.8

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 14, Channel Bandwidth: 5MHz

Mode	TX channel 23305 (790.5MHz)	Frequency Range	1GHz ~ 8GHz
Environmental Conditions	25deg. C, 70%RH	Input Power	120Vac, 60Hz
Tested By	Hans Wu		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1581.00	-60.3	-40.0	-20.3	1.13 H	178	36.5	-96.8
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1581.00	-58.1	-40.0	-18.1	1.06 V	173	38.7	-96.8

Remarks:

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

Mode	TX channel 23330 (793.0MHz)	Frequency Range	1GHz ~ 8GHz
Environmental Conditions	25deg. C, 70%RH	Input Power	120Vac, 60Hz
Tested By	Hans Wu		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1586.00	-60.1	-40.0	-20.1	1.04 H	187	36.7	-96.8
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1586.00	-59.1	-40.0	-19.1	1.00 V	146	37.7	-96.8

Remarks:

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

Mode	TX channel 23355 (795.5MHz)	Frequency Range	1GHz ~ 8GHz
Environmental Conditions	25deg. C, 70%RH	Input Power	120Vac, 60Hz
Tested By	Hans Wu		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1591.00	-60.2	-40.0	-20.2	1.08 H	175	36.6	-96.8
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1591.00	-59.2	-40.0	-19.2	1.29 V	98	37.6	-96.8

Remarks:

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

LTE Band 14, Channel Bandwidth: 10MHz

Mode	TX channel 23330 (793.0MHz)	Frequency Range	1GHz ~ 8GHz
Environmental Conditions	25deg. C, 70%RH	Input Power	120Vac, 60Hz
Tested By	Hans Wu		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1586.00	-59.5	-40.0	-19.5	1.13 H	190	37.3	-96.8
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1586.00	-58.8	-40.0	-18.8	1.06 V	153	38.0	-96.8

Remarks:

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

External Antenna

Below 1GHz

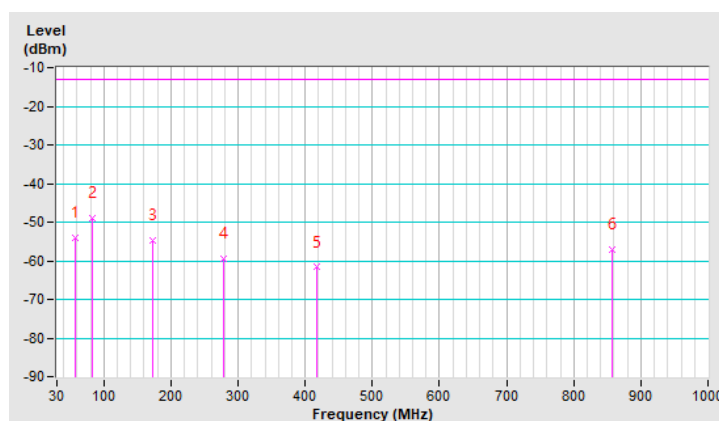
LTE Band 14, Channel Bandwidth 10MHz

Mode	TX channel 23305 (790.5MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	25deg. C, 70%RH	Input Power	120Vac, 60Hz
Tested By	Hans Wu		

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	56.71	-54.1	-13.0	-41.1	1.00 H	141	52.7	-106.8
2	83.42	-49.0	-13.0	-36.0	1.00 H	195	62.5	-111.5
3	171.99	-54.7	-13.0	-41.7	2.00 H	107	52.1	-106.8
4	277.42	-59.6	-13.0	-46.6	2.00 H	273	46.2	-105.8
5	416.59	-61.7	-13.0	-48.7	1.00 H	115	41.3	-103.0
6	858.01	-57.1	-13.0	-44.1	1.50 H	63	35.3	-92.4

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.

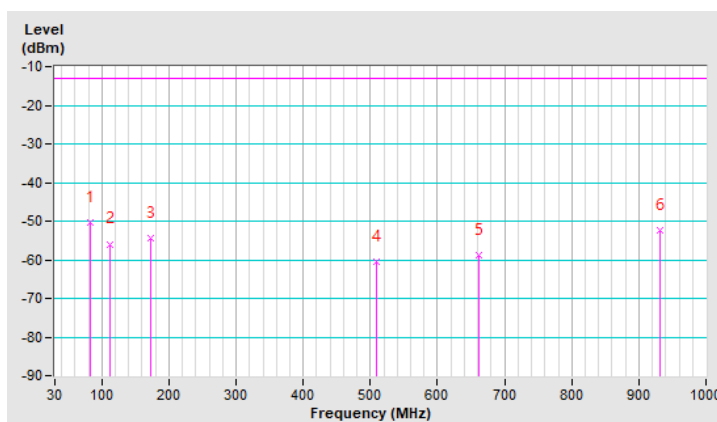


Mode	TX channel 23305 (790.5MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	25deg. C, 70%RH	Input Power	120Vac, 60Hz
Tested By	Hans Wu		

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	83.42	-50.4	-13.0	-37.4	2.00 V	166	61.1	-111.5
2	112.94	-55.9	-13.0	-42.9	1.00 V	316	53.3	-109.2
3	171.99	-54.3	-13.0	-41.3	1.00 V	137	52.5	-106.8
4	509.38	-60.4	-13.0	-47.4	1.50 V	272	40.6	-101.0
5	661.20	-58.9	-13.0	-45.9	2.00 V	295	38.5	-97.4
6	932.52	-52.4	-13.0	-39.4	1.50 V	237	38.2	-90.6

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 14, Channel Bandwidth: 5MHz

Mode	TX channel 23305 (790.5MHz)	Frequency Range	1GHz ~ 8GHz
Environmental Conditions	25deg. C, 70%RH	Input Power	120Vac, 60Hz
Tested By	Hans Wu		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1581.00	-56.8	-40.0	-16.8	1.68 H	165	40.0	-96.8
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1581.00	-57.0	-40.0	-17.0	1.71 V	158	39.8	-96.8

Remarks:

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

Mode	TX channel 23330 (793.0MHz)	Frequency Range	1GHz ~ 8GHz
Environmental Conditions	25deg. C, 70%RH	Input Power	120Vac, 60Hz
Tested By	Hans Wu		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1586.00	-57.0	-40.0	-17.0	1.73 H	162	39.8	-96.8
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1586.00	-56.9	-40.0	-16.9	1.66 V	164	39.9	-96.8

Remarks:

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

Mode	TX channel 23355 (795.5MHz)	Frequency Range	1GHz ~ 8GHz
Environmental Conditions	25deg. C, 70%RH	Input Power	120Vac, 60Hz
Tested By	Hans Wu		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1591.00	-57.2	-40.0	-17.2	1.73 H	162	39.6	-96.8
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1591.00	-58.2	-40.0	-18.2	1.70 V	161	38.6	-96.8

Remarks:

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

LTE Band 14, Channel Bandwidth: 10MHz

Mode	TX channel 23330 (793.0MHz)	Frequency Range	1GHz ~ 8GHz
Environmental Conditions	25deg. C, 70%RH	Input Power	120Vac, 60Hz
Tested By	Hans Wu		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1586.00	-58.1	-40.0	-18.1	1.63 H	155	38.7	-96.8
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1586.00	-57.2	-40.0	-17.2	1.72 V	174	39.6	-96.8

Remarks:

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

5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

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

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

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