

FCC Test Report

(Part 27: LTE Band 4 & 12_Spot Check)

Report No.: RF171206E01C-5

FCC ID: NKRM14Q2SG

Test Model: M14Q2SG

Received Date: Jan. 02, 2019

Test Date: Jan. 08 ~ Jan. 14, 2019

Issued Date: Jan. 24, 2019

Applicant: Wistron NeWeb Corporation

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
(R.O.C)

Test Location: No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei Shan Hsiang, Taoyuan
Hsien 333, Taiwan, R.O.C.

FCC Registration / 788550 / TW0003

Designation Number:



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Table of Contents

Release Control Record	3
1 Certificate of Conformity	4
2 Summary of Test Results.....	5
2.1 Measurement Uncertainty.....	5
2.2 Test Site and Instruments	6
3 General Information	7
3.1 General Description of EUT	7
3.2 Configuration of System under Test.....	8
3.2.1 Description of Support Units	8
3.3 Test Mode Applicability and Tested Channel Detail	9
3.4 EUT Operating Conditions	11
3.5 General Description of Applied Standards.....	11
4 Test Types and Results.....	12
4.1 Output Power Measurement.....	12
4.1.1 Limits of Output Power Measurement	12
4.1.2 Test Procedures.....	12
4.1.3 Test Setup.....	13
4.1.4 Test Results	14
4.2 Occupied Bandwidth Measurement.....	18
4.2.1 Limits of Occupied Bandwidth Measurement	18
4.2.2 Test Procedure	18
4.2.3 Test Setup.....	18
4.2.4 Test Result	19
4.3 Band Edge Measurement	20
4.3.1 Limits of Band Edge Measurement	20
4.3.2 Test Setup.....	20
4.3.3 Test Procedures.....	20
4.3.4 Test Results	21
4.4 Peak to Average Ratio	23
4.4.1 Limits of Peak to Average Ratio Measurement	23
4.4.2 Test Setup.....	23
4.4.3 Test Procedures.....	23
4.4.4 Test Results	24
4.5 Conducted Spurious Emissions.....	25
4.5.1 Limits of Conducted Spurious Emissions Measurement	25
4.5.2 Test Setup.....	25
4.5.3 Test Procedure	25
4.5.4 Test Results	26
4.6 Radiated Emission Measurement.....	28
4.6.1 Limits of Radiated Emission Measurement	28
4.6.2 Test Procedure	28
4.6.3 Deviation from Test Standard	28
4.6.4 Test Setup.....	29
4.6.5 Test Results	30
5 Pictures of Test Arrangements	35
Appendix – Information of the Testing Laboratories	36

Release Control Record

Issue No.	Description	Date Issued
RF171206E01C-5	Original Release	Jan. 24, 2019

1 Certificate of Conformity

Product: LGA Module

Brand: Wistron NeWeb Corporation

Test Model: M14Q2SG

Sample Status: Engineering Sample

Applicant: Wistron NeWeb Corporation

Test Date: Jan. 08 ~ Jan. 14, 2019

Standards: FCC Part 27, Subpart C, L

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 : Polly Chen , **Date:** Jan. 24, 2019
Polly Chen / Specialist

Approved by : Bruce Chen , **Date:** Jan. 24, 2019
Bruce Chen / Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 27 & Part 2				
FCC Clause		Test Item	Result	Remarks
LTE Band 4	LTE Band 12			
2.1046 27.50 (d)(4)	2.1046 27.50 (b)(10)	Equivalent Isotropically Radiated Power	Pass	Meet the requirement of limit.
----	----	Peak To Average Ratio	NA	Refer to note 1
2.1055 27.54	2.1055 27.54	Frequency Stability Stay with the authorized bands of operation	Pass	Meet the requirement of limit.
2.1049 27.53(m)(6)	2.1049 27.53(m)(6)	Emission Bandwidth	Pass	Meet the requirement of limit.
2.1051 27.53(h)	2.1051 27.53(c)	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 27.53(h)	2.1051 27.53(c)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1051 27.53(h)	2.1051 27.53(c)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -37.5dB at 51.34MHz.

Note:

- Exhibit prepared for FCC Spot Check Verification report, the format, test items and amount of spot-check test data are decided by applicant's engineering judgment, for more details please refer to declaration letter exhibit. The original report please refer to report no.: RF171206E01B-2.
- 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	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	ESIB7	100187	May 29, 2018	May 28, 2019
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Sep. 25, 2018	Sep. 24, 2019
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Nov. 21, 2018	Nov. 20, 2019
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-1170	Nov. 25, 2018	Nov. 24, 2019
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 25, 2018	Nov. 24, 2019
Preamplifier Agilent (Below 1GHz)	8447D	2944A10631	Aug. 08, 2018	Aug. 07, 2019
Preamplifier KEYSIGHT (Above 1GHz)	83017A	MY53270295	Jul. 02, 2018	Jul. 01, 2019
RF signal cable HUBER+SUHNER	SUCOFLEX 104	MY 13380+295012/04	Aug. 08, 2018	Aug. 07, 2019
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH4-03 (250724)	Aug. 08, 2018	Aug. 07, 2019
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
WIT Standard Temperature And Humidity Chamber	TH-4S-C	W981030	Jun. 04, 2018	Jun. 03, 2019
JFW 20dB attenuation	50HF-020-SMA	NA	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 4.
3. The FCC Designation Number is TW0003. The number will be varied with the Lab location and scope as attached.
4. The IC Site Registration No. is 7450F-4.

3 General Information

3.1 General Description of EUT

Product	LGA Module	
Brand	Wistron NeWeb Corporation	
Test Model	M14Q2SG	
Status of EUT	Engineering Sample	
Power Supply Rating	5.0 Vdc (host equipment)	
Modulation Type	LTE	QPSK, 16QAM
Frequency Range	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	1710.7 ~ 1754.3 MHz
	LTE Band 4 (Channel Bandwidth: 3 MHz)	1711.5 ~ 1753.5 MHz
	LTE Band 4 (Channel Bandwidth: 5 MHz)	1712.5 ~ 1752.5 MHz
	LTE Band 4 (Channel Bandwidth: 10 MHz)	1715.0 ~ 1750.0 MHz
	LTE Band 4 (Channel Bandwidth: 15 MHz)	1717.5 ~ 1747.5 MHz
	LTE Band 4 (Channel Bandwidth: 20 MHz)	1720.0 ~ 1745.0 MHz
	LTE Band 12 (Channel Bandwidth: 1.4 MHz)	699.7 ~ 715.3 MHz
	LTE Band 12 (Channel Bandwidth: 3 MHz)	700.5 ~ 714.5 MHz
	LTE Band 12 (Channel Bandwidth: 5 MHz)	701.5 ~ 713.5 MHz
	LTE Band 12 (Channel Bandwidth: 10 MHz)	704.0 ~ 711.0 MHz
Emission Designator	LTE Band 4 (Channel Bandwidth: 20 MHz)	17M9W7D
	LTE Band 12 (Channel Bandwidth: 10 MHz)	8M94W7D
Max. EIRP Power	LTE Band 4 (Channel Bandwidth: 20 MHz)	263.027mW (24.2dBm)
Max. ERP Power	LTE Band 12 (Channel Bandwidth: 10 MHz)	81.283mW (19.1dBm)
Antenna Type	Dipole Antenna	
Antenna Gain	LTE Band 4	0.6 dBi
	LTE Band 12	-3.5 dBi
Accessory Device	N/A	
Data Cable Supplied	N/A	

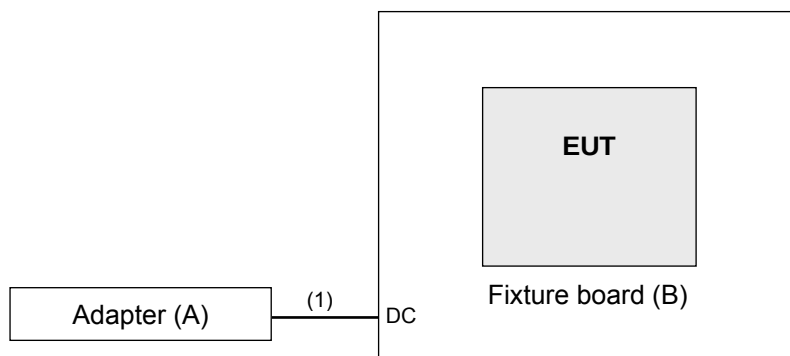
Note:

- Exhibit prepared for FCC Spot Check Verification report, the format, test items and amount of spot-check test data are decided by applicant's engineering judgment, for more details please refer to declaration letter exhibit. The original report please refer to report no.: RF171206E01B-2.
- The EUT uses following adapter. (For support unit only)

Brand	I.T.E POWER SUPPLY
Model	MU24-Y120200-A1
Input Power	100-240Vac, 50/60Hz, 0.7A
Output Power	12Vdc, 2A
Power Line	1.5m cable without core attached on adapter

- The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Configuration of System under Test



Remote site



3.2.1 Description of Support Units

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

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
1.	Adapter	I.T.E POWER SUPPLY	MU24-Y120200-A1	NA	NA	Provided by manufacturer
2.	Fixture board	NA	NA	NA	NA	Provided by manufacturer
3.	Radio Communication Analyzer	Anritsu	MT8860C	1702001	NA	-

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC cable	1	1.5	-	0	Attached on adapter

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

LTE Band 4

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	Conducted Output Power	19957 to 20393	19957(1710.7MHz), 20175(1732.5MHz), 20393(1754.3MHz)	1.4 MHz	QPSK, 16QAM	1 RB / 5 RB Offset
		19965 to 20385	19965(1711.5MHz), 20175(1732.5MHz), 20385(1753.5MHz)	3 MHz	QPSK, 16QAM	1 RB / 14 RB Offset
		19975 to 20375	19975(1712.5MHz), 20175(1732.5MHz), 20375(1752.5MHz)	5 MHz	QPSK, 16QAM	1 RB / 24 RB Offset
		20000 to 20350	20000(1715.0MHz), 20175(1732.5MHz), 20350(1750.0MHz)	10 MHz	QPSK, 16QAM	1 RB / 49 RB Offset
		20025 to 20325	20025(1717.5MHz), 20175(1732.5MHz), 20325(1747.5MHz)	15 MHz	QPSK, 16QAM	1 RB / 74 RB Offset
		20050 to 20300	20050(1720.0MHz), 20175(1732.5MHz), 20300(1745.0MHz)	20 MHz	QPSK, 16QAM	1 RB / 99 RB Offset
-	EIRP	20050 to 20300	20300(1745.0MHz)	20 MHz	QPSK	1 RB / 99 RB Offset
-	Occupied Bandwidth	20050 to 20300	20300(1745.0MHz)	20 MHz	QPSK, 16QAM	100 RB / 0 RB Offset
-	Peak to Average Ratio	20050 to 20300	20300(1745.0MHz)	20 MHz	QPSK, 16QAM	50 RB / 0 RB Offset
-	Band Edge	20050 to 20300	20300(1745.0MHz)	20MHz	QPSK / 16QAM	1 RB / 99 RB Offset
						100 RB / 0 RB Offset
-	Conducted Emission	20050 to 20300	20300(1745.0MHz)	20MHz	QPSK	100 RB / 0 RB Offset
-	Radiated Emission	20050 to 20300	20300(1745.0MHz)	20 MHz	QPSK	50 RB / 0 RB Offset

Note: This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.

LTE Band 12

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	Conducted Output Power	23017 to 23171	23017(699.7MHz), 23095(707.5MHz), 23173(715.3MHz)	1.4 MHz	QPSK, 16QAM	1 RB / 2 RB Offset
		23025 to 23165	23025(700.5MHz), 23095(707.5MHz), 23165(714.5MHz)	3 MHz	QPSK, 16QAM	1 RB / 7 RB Offset
		23035 to 23155	23035(701.5MHz), 23095(707.5MHz), 23155(713.5MHz)	5 MHz	QPSK, 16QAM	1 RB / 12 RB Offset
		23060 to 23130	23060(704.0MHz), 23095(707.5 MHz), 23130(711.0 MHz)	10 MHz	QPSK, 16QAM	1 RB / 24 RB Offset
-	ERP	23060 to 23130	23060(704.0MHz)	10 MHz	QPSK	1 RB / 24 RB Offset
-	Occupied Bandwidth	23060 to 23130	23060(704.0MHz)	10 MHz	QPSK, 16QAM	50 RB / 0 RB Offset
-	Peak to Average Ratio	23060 to 23130	23060(704.0MHz)	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Band Edge	23060 to 23130	23060(704.0MHz)	10 MHz	QPSK	1 RB / 0 RB Offset
						50 RB / 0 RB Offset
-	Conducted Emission	23060 to 23130	23060(704.0MHz)	10 MHz	QPSK	1 RB / 0 RB Offset
-	Radiated Emission	23060 to 23130	23060(704.0MHz)	10 MHz	QPSK	1 RB / 0 RB Offset

Note: This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.

Test Condition:

Test Item	Environmental Conditions	Input Power (System)	Tested By
ERP / EIRP/ Conducted Output Power	25deg. C, 70%RH	120Vac, 60Hz	Noah Chang
Occupied Bandwidth	25deg. C, 70%RH	120Vac, 60Hz	Noah Chang
Band Edge	25deg. C, 70%RH	120Vac, 60Hz	Noah Chang
Peak to Average Ratio	25deg. C, 70%RH	120Vac, 60Hz	Noah Chang
Conducted Emission	25deg. C, 70%RH	120Vac, 60Hz	Noah Chang
Radiated Emission	25deg. C, 70%RH	120Vac, 60Hz	Luis Lee

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

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

FCC 47 CFR Part 2

FCC 47 CFR Part 27

KDB 971168 D01 Power Meas License Digital Systems v03r01

ANSI/TIA/EIA-603-E 2016

ANSI 63.26-2015

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

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

Fixed, mobile, and portable (hand-held) stations operating in the 1710–1755 MHz band are limited to 1 watt EIRP.

Portable stations (hand-held devices) operating in the 704-716 MHz band are limited to 3 watts ERP

4.1.2 Test Procedures

EIRP / ERP Measurement:

- a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 5 MHz for WCDMA and 10 MHz for LTE mode.
- b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
- c. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value” of step b. Record the power level of S.G.
- d. $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}$. E.R.P power can be calculated from E.I.R.P power by subtracting the gain of dipole, $E.R.P \text{ power} = E.I.P.R \text{ power} - 2.15 \text{ dBi}$.

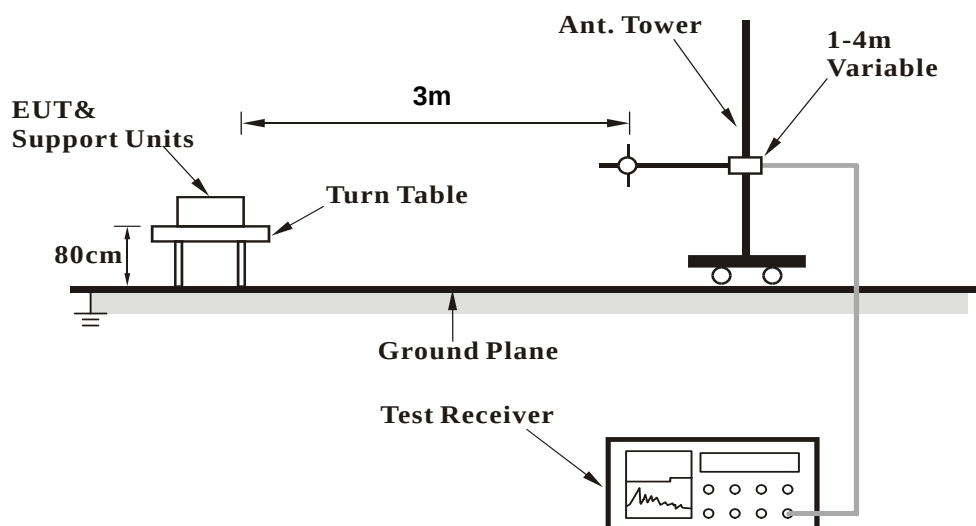
Conducted Power Measurement:

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

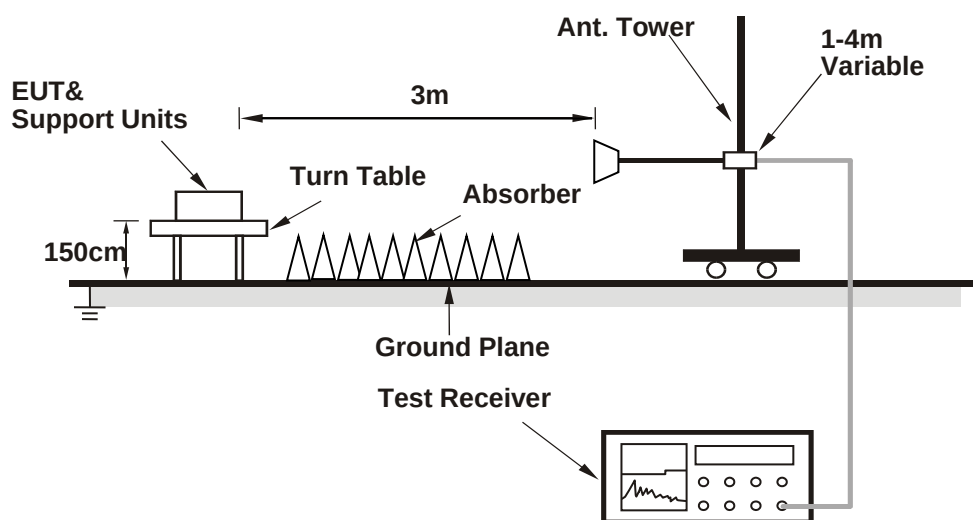
4.1.3 Test Setup

EIRP / ERP Measurement:

<Radiated Emission below or equal 1 GHz>

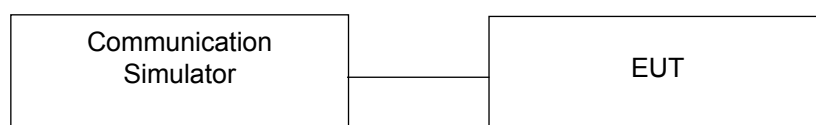


<Radiated Emission above 1 GHz>



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

Conducted Power Measurement:



4.1.4 Test Results

Conducted Output Power (dBm)

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 19957	Mid Ch 20175	High Ch 20393		Low Ch 19957	Mid Ch 20175	High Ch 20393	
			1710.7 MHz	1732.5 MHz	1754.3 MHz		1710.7 MHz	1732.5 MHz	1754.3 MHz	
4 / 1.4M	1	0	23.27	23.00	22.96	0	23.24	23.05	23.01	1
	1	2	23.23	23.24	23.16	0	23.26	23.16	23.01	1
	1	5	23.14	23.08	23.06	0	23.18	23.15	23.05	1
	3	0	22.25	22.16	22.10	0	22.24	22.33	21.97	1
	3	1	22.55	22.22	21.95	0	22.17	22.14	22.06	1
	3	3	22.56	22.60	22.18	0	22.36	22.52	22.12	1
	6	0	22.39	22.18	22.04	1	21.23	21.25	21.09	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 19965	Mid Ch 20175	High Ch 20385		Low Ch 19965	Mid Ch 20175	High Ch 20385	
			1711.5 MHz	1732.5 MHz	1753.5 MHz		1711.5 MHz	1732.5 MHz	1753.5 MHz	
4 / 3M	1	0	23.21	23.51	22.98	0	22.35	22.43	22.16	1
	1	7	23.15	23.45	23.17	0	22.42	22.17	22.14	1
	1	14	23.23	23.22	23.24	0	22.35	22.19	22.09	1
	8	0	22.39	22.29	22.10	1	21.69	21.92	21.75	2
	8	3	21.84	21.23	21.55	1	21.45	21.13	20.95	2
	8	7	22.21	22.11	21.74	1	21.27	21.16	20.95	2
	15	0	21.36	21.18	21.00	1	21.37	21.14	21.01	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 19975	Mid Ch 20175	High Ch 20375		Low CH 19975	Mid CH 20175	High CH 20375	
			1712.5 MHz	1732.5 MHz	1752.5 MHz		1712.5 MHz	1732.5 MHz	1752.5 MHz	
4 / 5M	1	0	23.14	23.50	23.01	0	22.24	22.27	22.01	1
	1	12	23.05	23.10	23.11	0	22.20	22.21	22.00	1
	1	24	23.15	23.15	23.17	0	22.25	22.25	22.07	1
	12	0	22.30	22.30	22.10	1	21.89	22.16	22.09	2
	12	6	22.02	22.13	21.58	1	21.23	21.29	21.06	2
	12	13	22.26	22.09	21.84	1	21.25	21.14	21.03	2
	25	0	21.23	21.24	20.98	1	21.28	21.19	20.95	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 20000	Mid Ch 20175	High Ch 20350		Low Ch 20000	Mid Ch 20175	High Ch 20350	
			1715.0 MHz	1732.5 MHz	1750.0 MHz		1715.0 MHz	1732.5 MHz	1750.0 MHz	
4 / 10M	1	0	23.30	23.31	23.32	0	22.32	22.33	22.34	1
	1	24	23.29	23.27	23.21	0	22.21	22.28	22.18	1
	1	49	23.19	23.18	23.27	0	22.22	22.17	22.14	1
	25	0	22.24	22.20	22.26	1	22.10	21.99	22.31	2
	25	12	22.31	22.01	22.72	1	21.42	21.15	21.22	2
	25	25	22.32	22.29	22.17	1	21.26	21.27	21.25	2
	50	0	21.27	21.11	21.10	1	21.00	20.79	20.82	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 20025	Mid Ch 20175	High Ch 20325		Low Ch 20025	Mid Ch 20175	High Ch 20325	
			1717.5 MHz	1732.5 MHz	1747.5 MHz		1717.5 MHz	1732.5 MHz	1747.5 MHz	
4 / 15M	1	0	23.28	23.51	23.41	0	22.29	22.49	22.31	1
	1	37	22.50	23.39	23.48	0	22.24	22.12	22.23	1
	1	74	23.21	23.17	23.02	0	22.24	22.20	22.20	1
	36	0	22.54	22.36	22.56	1	21.90	22.19	21.90	2
	36	19	22.33	22.34	22.24	1	21.56	21.41	21.30	2
	36	39	22.33	22.49	22.38	1	21.58	21.40	21.22	2
	75	0	21.31	21.84	21.49	1	21.00	20.79	21.20	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 20050	Mid Ch 20175	High Ch 20300		Low Ch 20050	Mid Ch 20175	High Ch 20300	
			1720.0 MHz	1732.5 MHz	1745.0 MHz		1720.0 MHz	1732.5 MHz	1745.0 MHz	
4 / 20M	1	0	23.34	23.22	23.55	0	22.26	22.33	22.37	1
	1	50	23.50	23.32	23.43	0	22.33	22.22	22.23	1
	1	99	23.32	23.14	23.11	0	22.23	22.15	22.18	1
	50	0	22.31	21.99	22.38	1	22.03	22.21	22.07	2
	50	25	22.06	21.93	22.46	1	21.89	22.11	22.13	2
	50	50	22.44	22.32	22.32	1	21.96	22.24	21.97	2
	100	0	21.88	22.30	21.99	1	21.99	22.23	21.85	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 23017	Mid Ch 23095	High Ch 23173		Low Ch 23017	Mid Ch 23095	High Ch 23173	
			699.7 MHz	707.5 MHz	715.3 MHz		699.7 MHz	707.5 MHz	715.3 MHz	
12 / 1.4M	1	0	23.54	23.86	23.58	0	23.62	23.83	23.52	1
	1	2	23.67	23.85	23.73	0	23.68	23.81	23.52	1
	1	5	23.75	23.82	23.78	0	23.68	23.73	23.78	1
	3	0	22.62	22.75	22.68	0	22.52	22.52	22.66	1
	3	1	22.87	22.83	22.59	0	22.85	22.75	22.60	1
	3	3	22.89	22.70	22.59	0	22.87	22.89	22.68	1
	6	0	22.68	22.57	22.60	1	21.63	21.70	21.49	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 23025	Mid Ch 23095	High Ch 23165		Low Ch 23025	Mid Ch 23095	High Ch 23165	
			700.5 MHz	707.5 MHz	714.5 MHz		700.5 MHz	707.5 MHz	714.5 MHz	
12 / 3M	1	0	23.89	23.96	23.99	0	22.69	22.87	22.90	1
	1	7	23.88	23.71	23.83	0	22.83	22.85	22.80	1
	1	14	23.87	23.95	23.71	0	22.88	22.81	22.63	1
	8	0	22.79	22.86	22.88	1	22.80	22.19	22.75	2
	8	3	22.43	22.50	22.74	1	21.78	21.70	21.89	2
	8	7	22.90	23.11	22.67	1	21.90	21.75	21.82	2
	15	0	21.69	21.77	21.62	1	21.76	21.84	21.78	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 23035	Mid Ch 23095	High Ch 23155		Low Ch 23035	Mid Ch 23095	High Ch 23155	
			701.5 MHz	707.5 MHz	713.5 MHz		701.5 MHz	707.5 MHz	713.5 MHz	
12 / 5M	1	0	23.77	24.14	23.65	0	22.72	22.95	22.76	1
	1	12	23.80	23.94	23.88	0	22.72	22.78	22.82	1
	1	24	23.50	23.84	23.53	0	22.80	22.86	22.68	1
	12	0	22.72	22.85	22.78	1	22.62	22.82	22.60	2
	12	6	22.75	22.52	22.47	1	21.58	21.76	21.78	2
	12	13	22.96	23.03	22.99	1	21.86	21.83	21.79	2
	25	0	21.61	21.85	21.66	1	21.75	21.76	21.83	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 23060	Mid Ch 23095	High Ch 23130		Low Ch 23060	Mid Ch 23095	High Ch 23130	
			704.0 MHz	707.5 MHz	711.0 MHz		704.0 MHz	707.5 MHz	711.0 MHz	
12 / 10M	1	0	24.23	23.59	23.75	0	22.92	22.58	22.80	1
	1	24	23.71	23.87	23.77	0	22.72	22.84	22.80	1
	1	49	23.84	23.83	23.73	0	22.78	22.79	22.72	1
	25	0	22.70	22.78	22.78	1	22.43	22.47	22.57	2
	25	12	22.28	22.28	22.72	1	21.61	21.65	21.73	2
	25	25	22.87	22.91	22.94	1	21.74	21.77	21.82	2
	50	0	21.79	21.76	21.78	1	21.00	20.79	21.52	2

Modulation Type: QPSK

EIRP Power (dBm)

LTE Band 4

Channel Bandwidth: 20MHz

MODE		TX channel 20300					
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	1745.00	-16.9	21.9	1.0	22.9	30.0	-7.1
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	1745.00	-16.0	23.2	1.0	24.2	30.0	-5.8

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

EIRP Power (dBm)

LTE Band 12

Channel Bandwidth: 10MHz

MODE		TX channel 23060					
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	704.00	-8.9	19.6	-0.5	19.1	34.8	-15.7
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	704.00	-13.2	18.4	-0.5	17.9	34.8	-16.9

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

4.2 Occupied Bandwidth Measurement

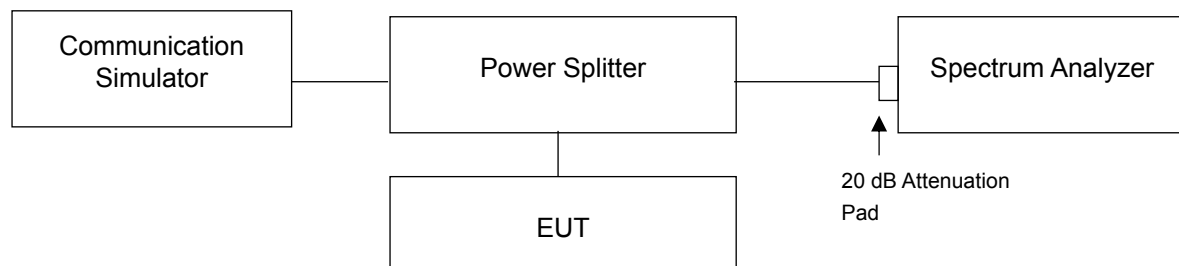
4.2.1 Limits of Occupied Bandwidth Measurement

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.

4.2.2 Test Procedure

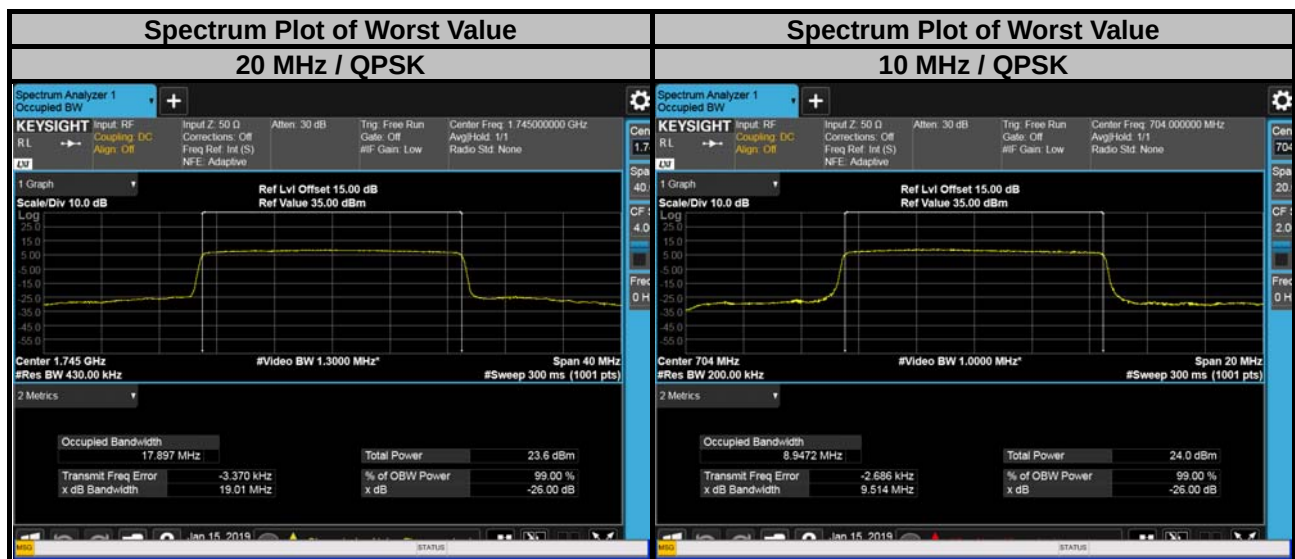
- The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
- Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

4.2.3 Test Setup



4.2.4 Test Result

LTE Band 4				LTE Band 12			
Channel Bandwidth: 20 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
20300	1745.0	17.89	17.88	23060	704.0	8.94	8.94



4.3 Band Edge Measurement

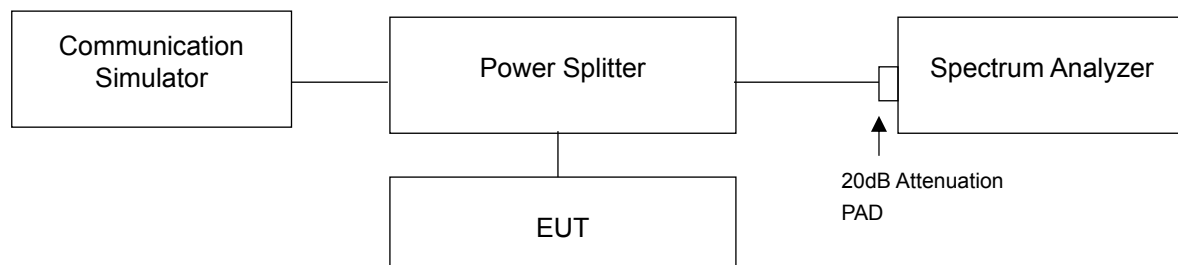
4.3.1 Limits of Band Edge Measurement

For operations in the 704-716 MHz band, the power of any emission outside a 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, by at least $43 + 10 \log (P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater.

However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

For operations in the 1710–1755 MHz bands, 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.

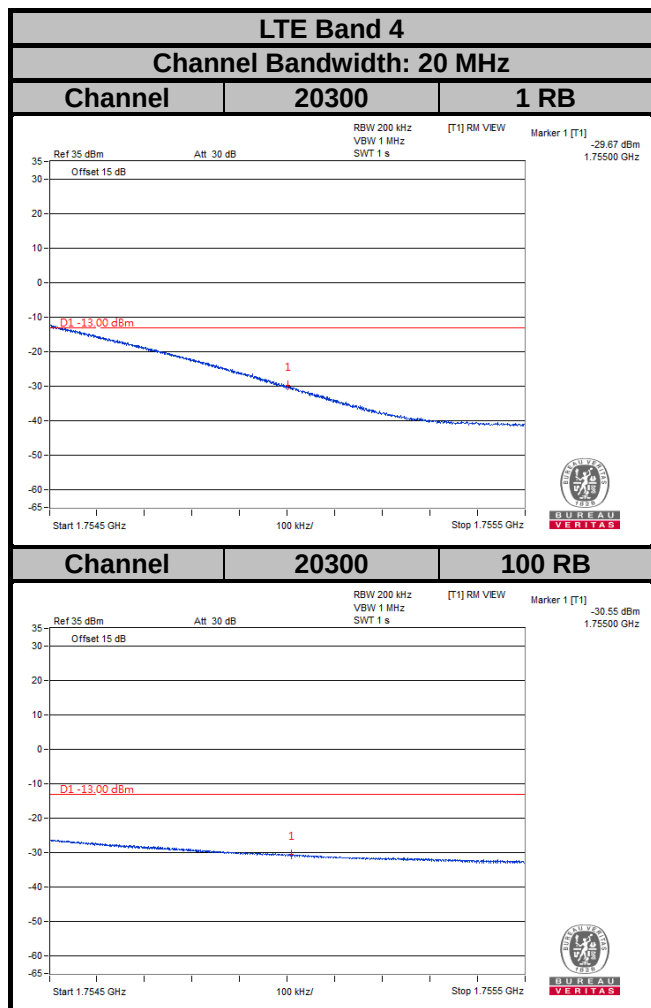
4.3.2 Test Setup

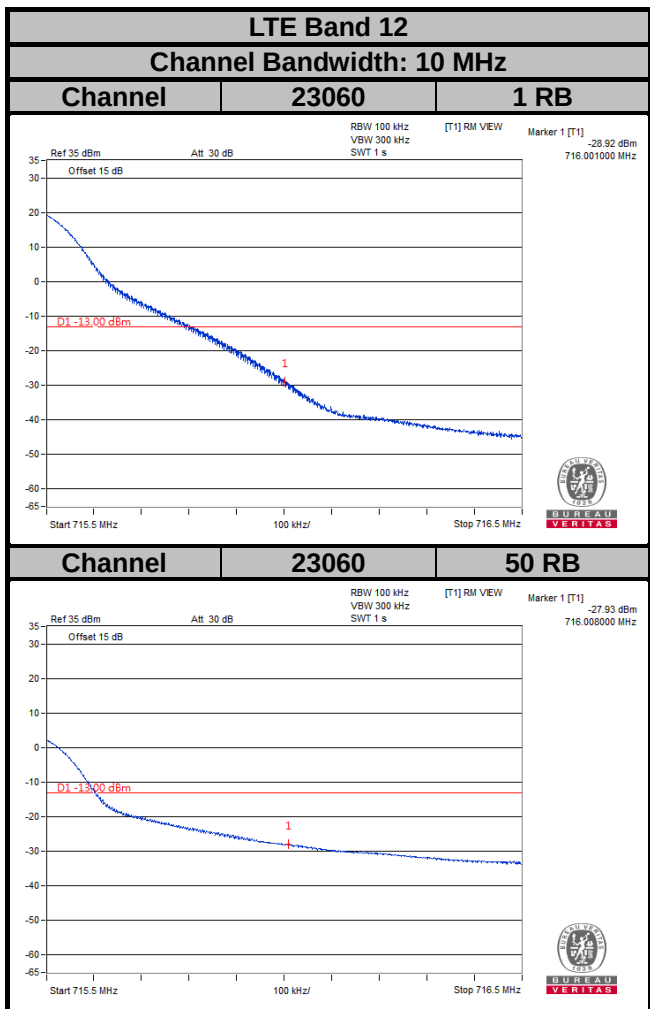


4.3.3 Test Procedures

- All measurements were done at low and high operational frequency range.
- The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 200 kHz and VB of the spectrum is 1 MHz (LTE Bandwidth 10 MHz).
- The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 300 kHz and VB of the spectrum is 1 MHz (LTE Bandwidth 20 MHz).
- Record the max. trace plot into the test report.

4.3.4 Test Results





Channel

23060

50 RB

Ref 35 dBm Att 30 dB Offset 15 dB

RBW 100 kHz VBW 300 kHz SWT 1 s (T1) RM VIEW

Marker 1 [T1] -27.93 dBm

716.008000 MHz

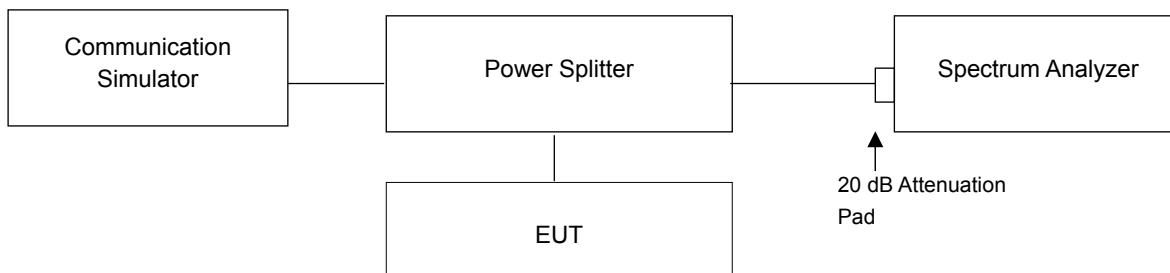
Start 715.5 MHz
100 kHz
Stop 716.5 MHz


4.4 Peak to Average Ratio

4.4.1 Limits of Peak to Average Ratio Measurement

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB.

4.4.2 Test Setup

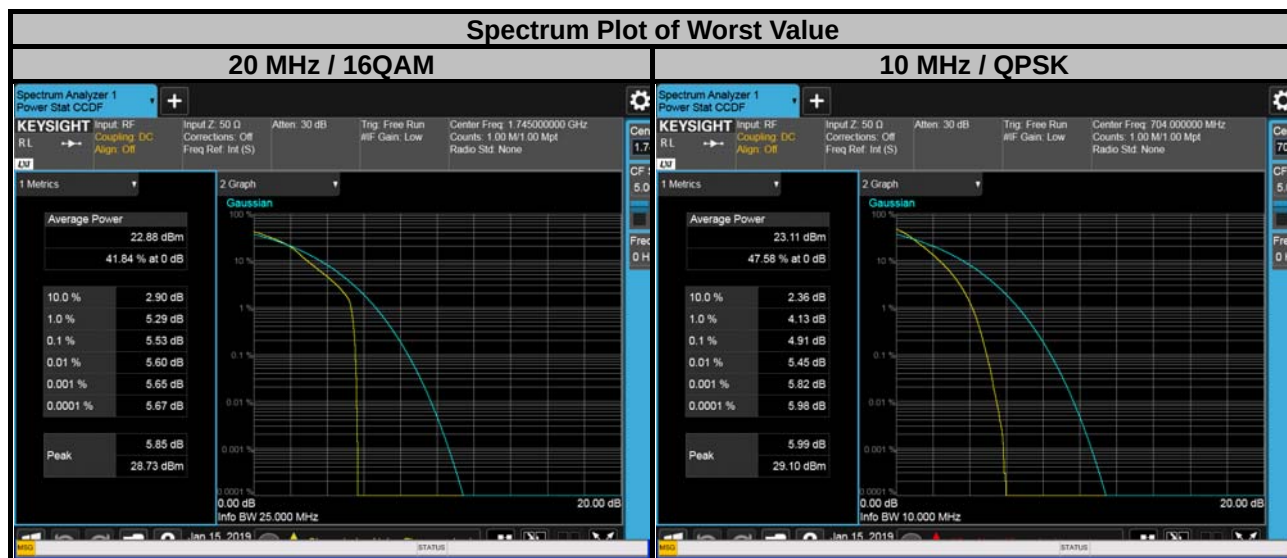


4.4.3 Test Procedures

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

4.4.4 Test Results

LTE Band 4				LTE Band 12			
Channel Bandwidth: 20 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
20300	1745.0	4.72	5.53	23060	704.0	4.91	4.03

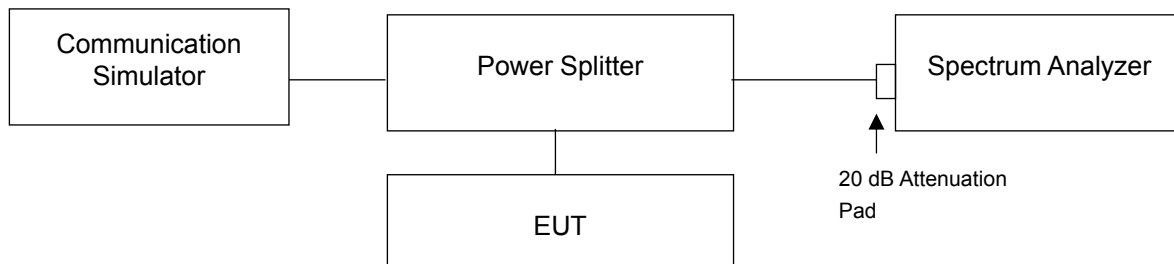


4.5 Conducted Spurious Emissions

4.5.1 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 is equal to -13 dBm.

4.5.2 Test Setup



4.5.3 Test Procedure

- The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
- Measuring frequency range is from 9 kHz to 1 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 100 kHz and VBW = 300 kHz is used for conducted emission measurement.
- Measuring frequency range is from 1 GHz to 27 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 1 MHz and VBW = 3 MHz is used for conducted emission measurement.

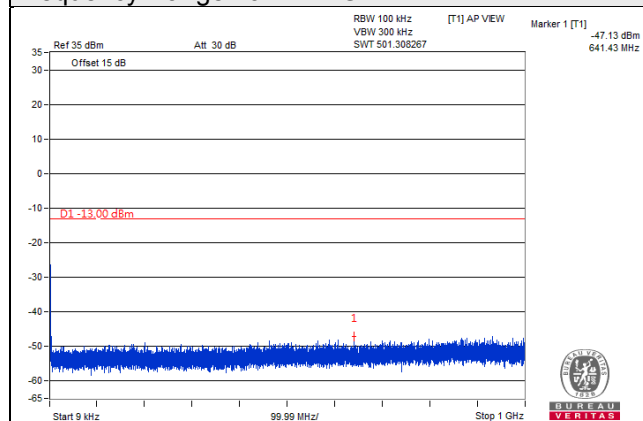
4.5.4 Test Results

LTE Band 4

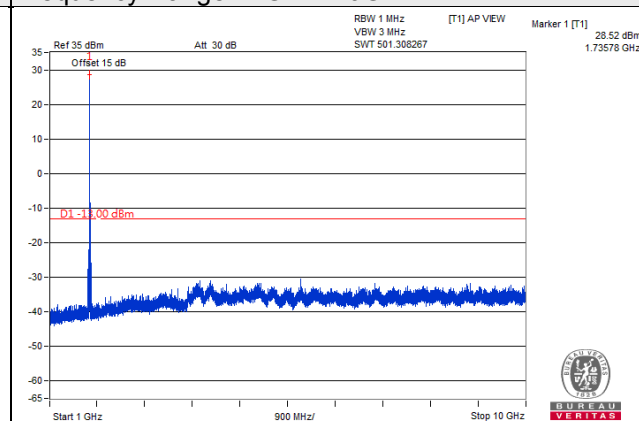
Channel Bandwidth: 20MHz

Channel 20300 (1745.0MHz)

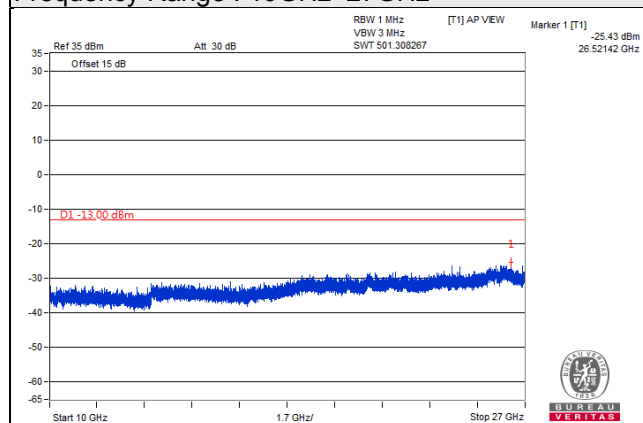
Frequency Range : 9kHz~1GHz



Frequency Range : 1GHz~10GHz



Frequency Range : 10GHz~27GHz



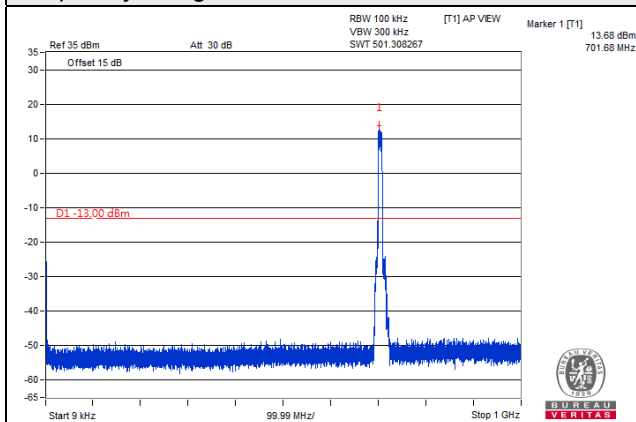
Note: For 9kHz, the signal is from spectrum analyzer.

LTE Band 12

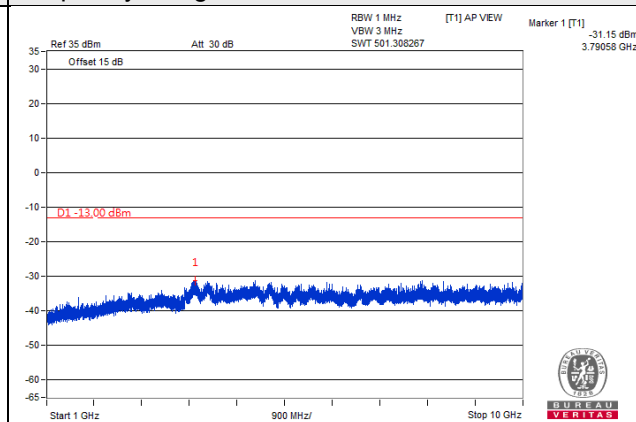
Channel Band width: 10MHz

Channel 23060 (704MHz)

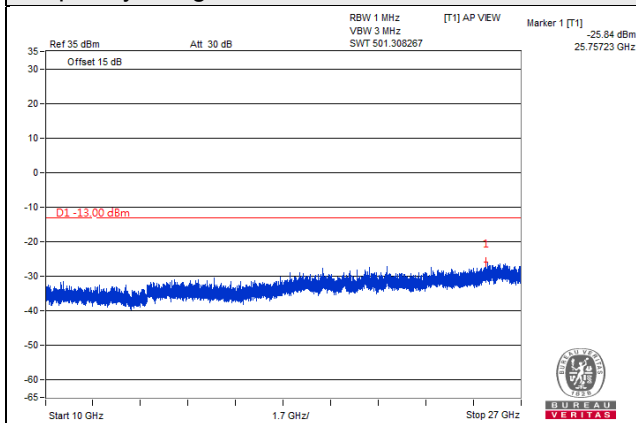
Frequency Range : 9kHz~1GHz



Frequency Range : 1GHz~10GHz



Frequency Range : 10GHz~27GHz



Note: For 9kHz, the signal is from spectrum analyzer.

4.6 Radiated Emission Measurement

4.6.1 Limits of Radiated Emission Measurement

- a. 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 is equal to -13 dBm.

4.6.2 Test Procedure

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

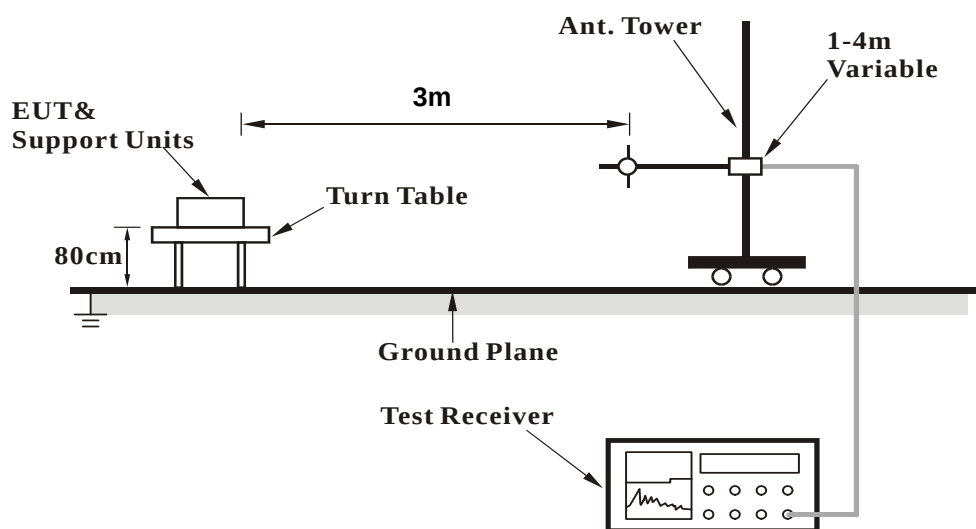
Note: The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

4.6.3 Deviation from Test Standard

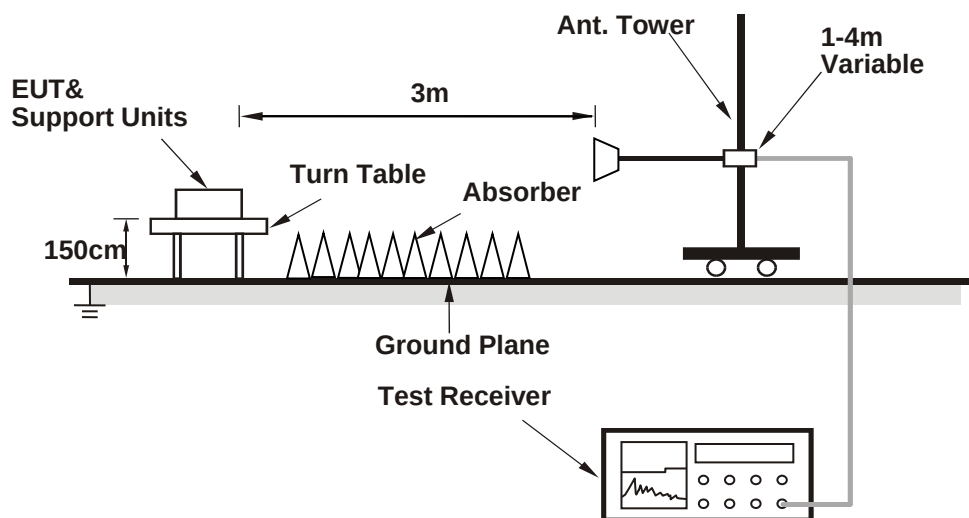
No deviation.

4.6.4 Test Setup

<Radiated Emission below or equal 1 GHz>



<Radiated Emission above 1 GHz>



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

4.6.5 Test Results

Below 1GHz

LTE Band 4

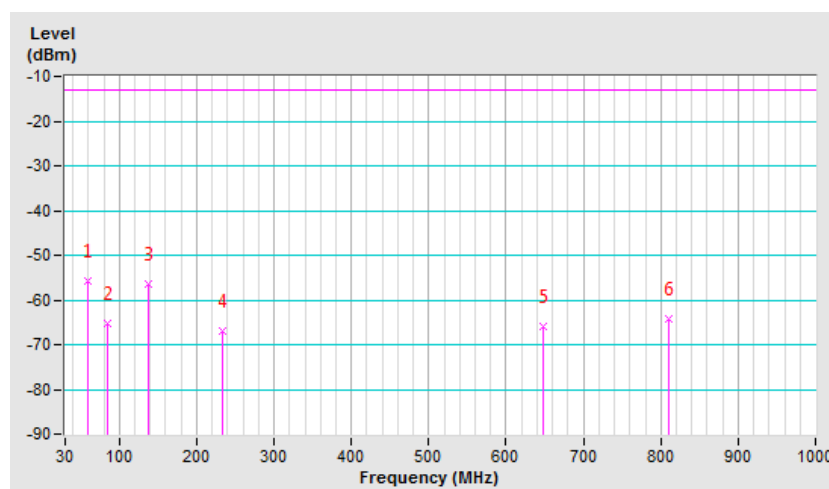
Channel Bandwidth: 20MHz

Mode	TX channel 20300 (1745.0MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	25deg. C, 70%RH	Input Power	120Vac, 60Hz
Tested By	Luis Lee		

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	59.10	-51.6	-48.0	-7.8	-55.8	-13.0	-42.8
2	84.32	-58.7	-64.6	-0.5	-65.1	-13.0	-52.1
3	136.70	-50.2	-56.2	-0.3	-56.5	-13.0	-43.5
4	233.70	-58.3	-72.2	5.4	-66.8	-13.0	-53.8
5	648.86	-67.3	-70.8	4.8	-66.0	-13.0	-53.0
6	809.88	-69.9	-68.2	4.0	-64.2	-13.0	-51.2

Remarks:

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

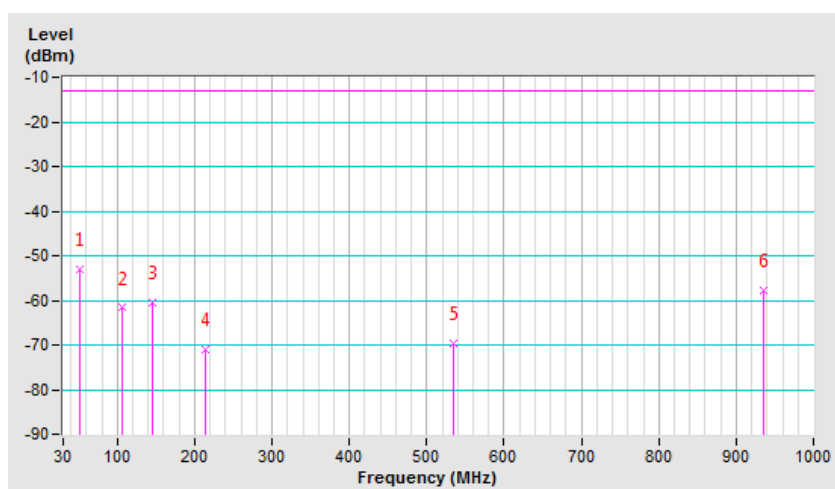


Mode	TX channel 20300 (1745.0MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	25deg. C, 70%RH	Input Power	120Vac, 60Hz
Tested By	Luis Lee		

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	51.34	-46.3	-44.1	-8.9	-53.0	-13.0	-40.0
2	105.66	-55.7	-62.3	0.6	-61.7	-13.0	-48.7
3	144.46	-57.6	-60.3	-0.3	-60.6	-13.0	-47.6
4	214.30	-70.1	-76.5	5.4	-71.1	-13.0	-58.1
5	534.40	-70.2	-74.4	4.7	-69.7	-13.0	-56.7
6	935.98	-66.5	-61.7	3.9	-57.8	-13.0	-44.8

Remarks:

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



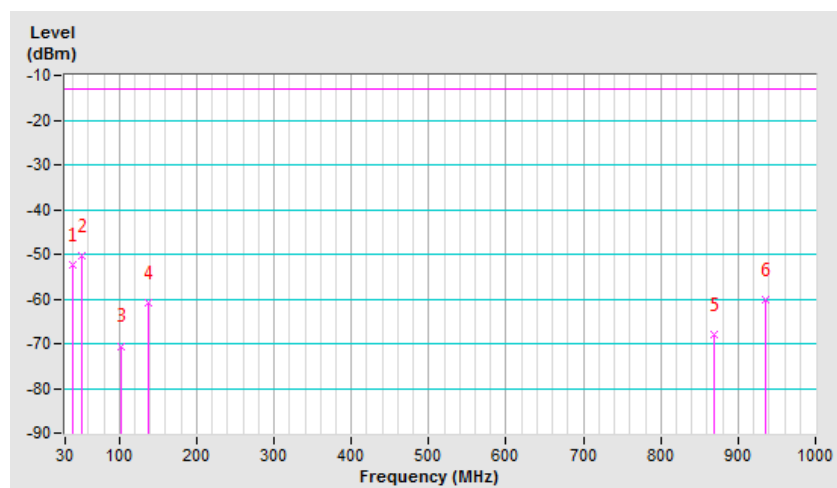
LTE Band 12

Mode	TX channel 23060 (704MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	25deg. C, 70%RH	Input Power	120Vac, 60Hz
Tested By	Luis Lee		

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	39.70	-52.4	-41.4	-10.9	-52.3	-13.0	-39.3
2	51.34	-47.1	-41.6	-8.9	-50.5	-13.0	-37.5
3	101.78	-60.8	-71.3	0.8	-70.5	-13.0	-57.5
4	136.70	-52.2	-60.4	-0.3	-60.7	-13.0	-47.7
5	868.08	-71.8	-72.0	3.9	-68.1	-13.0	-55.1
6	935.98	-64.8	-63.9	3.9	-60.0	-13.0	-47.0

Remarks:

- ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).
- Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

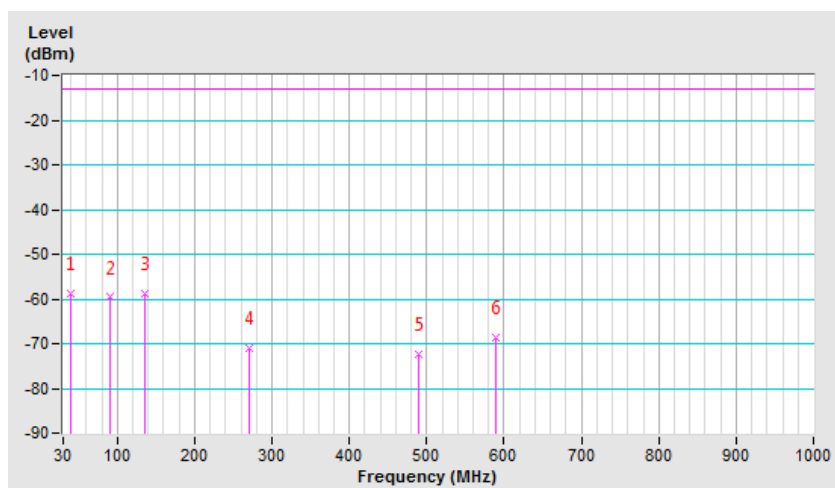


Mode	TX channel 23060 (704MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	25deg. C, 70%RH	Input Power	120Vac, 60Hz
Tested By	Luis Lee		

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	39.70	-48.6	-47.9	-10.9	-58.8	-13.0	-45.8
2	90.14	-52.8	-60.8	1.1	-59.7	-13.0	-46.7
3	134.76	-52.0	-58.4	-0.3	-58.7	-13.0	-45.7
4	270.56	-72.0	-76.2	5.3	-70.9	-13.0	-57.9
5	489.78	-69.2	-77.4	5.0	-72.4	-13.0	-59.4
6	588.72	-69.4	-73.1	4.5	-68.6	-13.0	-55.6

Remarks:

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



Above 1GHz

LTE Band 4

Channel Bandwidth: 20MHz

Mode	TX channel 20300 (1745.0MHz)	Frequency Range	Above 1000MHz
Environmental Conditions	25deg. C, 70%RH	Input Power	120Vac, 60Hz
Tested By	Luis Lee		

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	3490.00	-74.0	-68.7	7.2	-61.5	-13.0	-48.5
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	3490.00	-74.0	-67.1	7.2	-59.9	-13.0	-46.9

Remarks:

1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).

2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

LTE Band 12

Channel Bandwidth: 10MHz

Mode	TX channel 23060 (704MHz)	Frequency Range	Above 1000MHz
Environmental Conditions	25deg. C, 65%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	1408.00	-69.0	-70.9	4.7	-66.2	-13.0	-53.2
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	1408.00	-68.3	-70.0	4.7	-65.3	-13.0	-52.3

Remarks:

1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).

2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

5 Pictures of Test Arrangements

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

Appendix – Information of the Testing Laboratories

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