FCC Test Report

(PART 24)

Report No.:	RFBHAA-WTW-P20070391-1
FCC ID:	JOYDA39
Test Model:	AL-T51A2-1
Series Model:	AL-T52V1 (refer to item 3.1 for more details)
Received Date:	Jul. 20, 2020
Test Date:	Aug. 05, 2020
Issued Date:	Sep. 01, 2020
Applicant:	Kyocera Corporation
Address:	2-1-1 Kagahara,Tsuzuki-ku Yokohama-city Kanagawa 224-8502 Japan
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location:	No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, Taiwan
FCC Registration / Designation Number:	788550 / TW0003

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Release Control Record

Issue No.	Description	Date Issued
RFBHAA-WTW-P20070391-1	Original Release	Sep. 01, 2020

1 Certificate of Conformity

Product:	Telematics Module
Brand:	Kyocera
Test Model:	AL-T51A2-1
Series Model:	AL-T52V1 (refer to item 3.1 for more details)
Sample Status:	Engineering Sample
Applicant:	Kyocera Corporation
Test Date:	Aug. 05, 2020
Standards:	FCC Part 24, Subpart E

This report is issued as a supplementary report of RF180129C24-1. This report shall be used combined together with its original report.

Prepared by : _____ , **Date:** Sep. 01, 2020

Gina Liu / Specialist

Approved by : _____ , **Date:** Sep. 01, 2020

Dylan Chiou / Senior Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 24 & Part 2			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 24.232	Effective Isotropic Radiated Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	N/A	Refer to Note 1
24.232(d)	Peak to Average Ratio	N/A	Refer to Note 1
2.1055 24.235	Frequency Stability	N/A	Refer to Note 1
2.1049	Occupied Bandwidth	N/A	Refer to Note 1
24.238	Band Edge Measurements	N/A	Refer to Note 1
2.1051 24.238	Conducted Spurious Emissions	N/A	Refer to Note 1
2.1053 24.238	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -31.1 dB at 3818.60 MHz.

N/A: Not Applicable

Note:

1. The effective isotropic radiated power and radiated spurious emissions test items are performed for the addendum, according to the worst case of the original report. Refer to original report for the other test data.
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	9 kHz ~ 30 MHz	3.04 dB
	30 MHz ~ 200 MHz	2.93 dB
	200 MHz ~ 1000 MHz	2.95 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB

2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 16, 2020	Apr. 15, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jun. 12, 2020	Jun. 11, 2021
Spectrum Analyzer KEYSIGHT	N9030B	MY57140953	Jul. 02, 2020	Jul. 01, 2021
MXG Vector signal generator Agilent	N5182B	MY53050162	Jan. 14, 2020	Jan. 13, 2021
Radio Communication Analyzer Anritsu	MT8820C	6201300640	Aug. 19, 2019	Aug. 18, 2020
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Nov. 07, 2019	Nov. 06, 2020
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Nov. 24, 2019	Nov. 23, 2020
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Nov. 08, 2019	Nov. 07, 2020
Loop Antenna TESEQ	HLA 6121	45745	Jul. 06, 2020	Jul. 05, 2021
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Jun. 08, 2020	Jun. 07, 2021
Preamplifier Agilent (Above 1GHz)	8449B	3008A02367	Feb. 18, 2020	Feb. 17, 2021
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM8000	CABLE-CH9-02 (248780+171006)	Jan. 18, 2020	Jan. 17, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	Jan. 18, 2020	Jan. 17, 2021
RF signal cable Woken	8D-FB	Cable-CH9-01	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
Pre-amplifier (18GHz-40GHz) EMC	EMC184045B	980175	Sep. 05, 2019	Sep. 04, 2020
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 9.

3 General Information

3.1 General Description of EUT

Product	Telematics Module	
Brand	Kyocera	
Test Model	AL-T51A2-1	
Series Model	AL-T52V1	
Status of EUT	Engineering Sample	
Power Supply Rating	5Vdc	
Modulation Type	WCDMA	QPSK
	LTE	QPSK, 16QAM
Frequency Range	WCDMA	1852.4 ~ 1907.6 MHz
	LTE Band 2 (Channel Bandwidth: 1.4 MHz)	1850.7 ~ 1909.3 MHz
	LTE Band 2 (Channel Bandwidth: 3 MHz)	1851.5 ~ 1908.5 MHz
	LTE Band 2 (Channel Bandwidth: 5 MHz)	1852.5 ~ 1907.5 MHz
	LTE Band 2 (Channel Bandwidth: 10 MHz)	1855.0 ~ 1905.0 MHz
	LTE Band 2 (Channel Bandwidth: 15 MHz)	1857.5 ~ 1902.5 MHz
	LTE Band 2 (Channel Bandwidth: 20 MHz)	1860.0 ~ 1900.0 MHz
Max. EIRP Power	WCDMA	181.970 mW (22.60dBm)
	LTE Band 2 (Channel Bandwidth: 1.4 MHz)	512.861 mW (27.10dBm)
	LTE Band 2 (Channel Bandwidth: 3 MHz)	575.440 mW (27.60dBm)
	LTE Band 2 (Channel Bandwidth: 5 MHz)	501.187 mW (27.00dBm)
	LTE Band 2 (Channel Bandwidth: 10 MHz)	602.560 mW (27.80dBm)
	LTE Band 2 (Channel Bandwidth: 15 MHz)	457.088 mW (26.60dBm)
	LTE Band 2 (Channel Bandwidth: 20 MHz)	467.735 mW (26.70dBm)
Antenna Type	Refer to Note as below	
Accessory Device	Refer to Note as below	
Data Cable Supplied	Refer to Note as below	

Note:

1. This report is prepared for FCC class II permissive change. The difference compared with the original report (BV CPS report no.: RF180129C24-1) is adding one model name, the new model only disable LTE Band 13 and changing RF components & circuit. The effective isotropic radiated power and radiated spurious emissions test items are performed for the addendum, according to the worst case of the original report. Refer to original report for the other test data.
2. All models are listed as below. (New model is marked in boldface.)

Brand	Model	Difference
Kyocera	AL-T52V1	Support WCDMA Band 2, 4, 5 and LTE Band 2, 4, 12, 13, 26
	AL-T51A2-1	**Support WCDMA Band 2, 4, 5 and LTE Band 2, 4, 12, 26**

3. The EUT uses following antennas (support units).

Antenna 1					
Antenna Type	AUX		**Connecter Type**	SMA	
Manufacturer	YOKOWO		**Part Number**	86769-459B1	
Band	**B12**	**B13**	**B5 / B26**	**B4**	**B2**
Frequency (MHz)	**704**	**782**	**832**	**1730**	**1880**
Gain (dBi)	3.1	3.2	3.8	2.6	2.0

Antenna 2				
Antenna Type	AUX	**Connecter Type**	SMA	
Manufacturer	taoglas	**Part Number**	TG.30.8113	
Band	**B12**	**B5 / B26**	**B4**	**B2**
Frequency (MHz)	**700-800**	**824-960**	**1710-1880**	**1850-1990**
Free Space Straight Gain (dBi)	1.1	0.3	1.9	2.7
Free Space Bent Gain (dBi)	2.6	1.5	2.7	3.1

Antenna 3				
Antenna Type	AUX	**Connecter Type**	Inverted-F	
Manufacturer	MinebeaMitsumi	**Part Number**	DN4E 66T30	
Band	**B12 / B13**	**B5 / B26**	**B4**	**B2**
Frequency (MHz)	**700-800**	**824-960**	**1710-1880**	**1850-1990**
Gain (dBd)	-0.3	-0.3	0.4	0.4
Gain (dBi)	1.85	1.85	2.55	2.55

dBi = dBd + 2.15

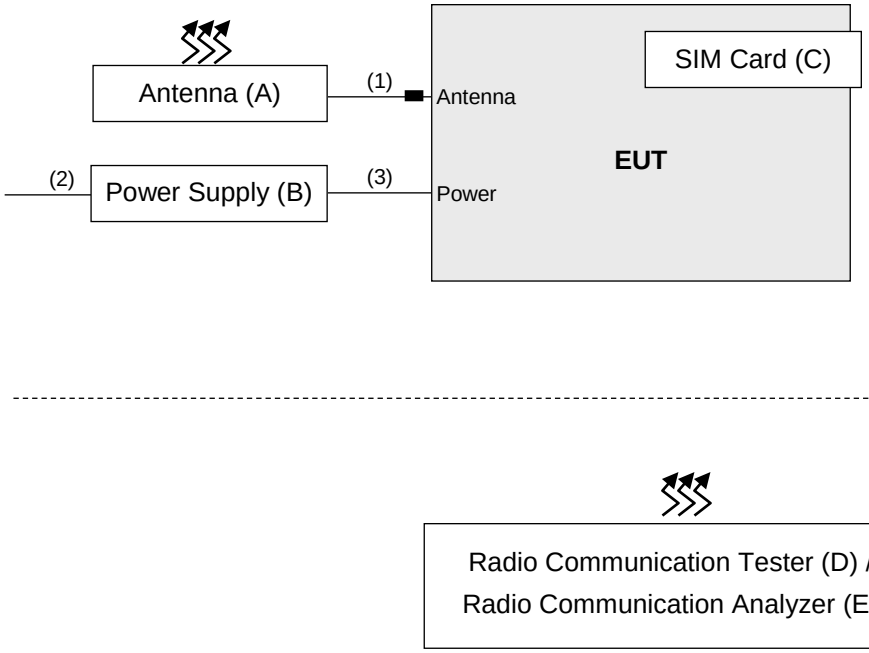
Antenna 4				
Antenna Type	External	**Connecter Type**	Inverted-F	
Manufacturer	Mitsumi Electric	**Part Number**	KJK966 T30	
Band	**B12 / B13**	**B5 / B26**	**B4**	**B2**
Frequency (MHz)	**700-800**	**824-960**	**1710-1880**	**1850-1990**
Gain (dBi)	1.0	1.0	0.4	0.4

Antenna 5				
Antenna Type	External	**Connecter Type**	Inverted-F	
Manufacturer	HARADA INDUSTRY	**Part Number**	TD2K 66 T30	
Band	**B12 / B13**	**B5 / B26**	**B4**	**B2**
Frequency (MHz)	**700-800**	**824-960**	**1710-1880**	**1850-1990**
Gain (dBi)	-2.1	-2.1	-1.2	-1.2

For WCDMA Band 2 and LTE Band 2: Antenna 2 was chosen for final test according to manufacturer's requirement.
For WCDMA Band 4, 5 and LTE Band 4, 5, 12, 13, 26: Antenna 1 was chosen for final test according to manufacturer's requirement.

4. 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.	Antenna	taoglas	TG.30.8113	NA	NA	Provided by manufacturer
B.	Power Supply	Inspower	DC400-20D	212004	FCC DoC Approved	Provided by manufacturer Input:100-240Vac, 0.4A, 50-60Hz Output: 5Vdc, 3A
C.	SIM Card	NA	NA	NA	NA	Provided by manufacturer
D.	Radio Communication Tester	R&S	CMU200	123112	NA	-
E.	Radio Communication Analyzer	Anritsu	MT8820C	6201300640	NA	-

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Antenna	1	3	N	1	Provided by manufacturer
2.	Power	1	1.75	N	0	Provided by manufacturer
3.	Module cable	2	0.08	N	0	Attached on EUT

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

3.3 Test Mode Applicability and Tested Channel Detail

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports. The worst case was found when positioned on Z-plane. Following channel(s) was (were) selected for the final test as listed below.

WCDMA

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
-	EIRP	9262 to 9538	9262 (1852.4MHz), 9400 (1880.0MHz), 9538 (1907.6MHz)	WCDMA
-	Radiated Emission	9262 to 9538	9538 (1907.6MHz)	WCDMA

LTE Band 2

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	EIRP	18607 to 19193	18607 (1850.70MHz), 18900 (1880.00MHz), 19193 (1909.30MHz)	1.4MHz	QPSK	1 RB / 5 RB Offset
		18615 to 19185	18615 (1851.50MHz), 18900 (1880.00MHz), 19185 (1908.50MHz)	3MHz	QPSK	1 RB / 14 RB Offset
		18625 to 19175	18625 (1852.50MHz), 18900 (1880.00MHz), 19175 (1907.50MHz)	5MHz	QPSK	1 RB / 24 RB Offset
		18650 to 19150	18650 (1855.00MHz), 18900 (1880.00MHz), 19150 (1905.00MHz)	10MHz	QPSK	1 RB / 49 RB Offset
		18675 to 19125	18675 (1857.50MHz), 18900 (1880.00MHz), 19125 (1902.50MHz)	15MHz	QPSK	1 RB / 74 RB Offset
		18700 to 19100	18700 (1860.00MHz), 18900 (1880.00MHz), 19100 (1900.00MHz)	20MHz	QPSK	1 RB / 99 RB Offset
-	Radiated Emission	18607 to 19193	19193 (1909.3MHz)	1.4 MHz	QPSK	1 RB / 0 RB Offset

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
EIRP	26 deg. C, 58 % RH	120 Vac, 60 Hz	Greg Lin
Radiated Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Greg Lin

3.4 EUT Operating Conditions

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

3.5 General Description of Applied Standards and references

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

Test Standard:
FCC 47 CFR Part 2
FCC 47 CFR Part 24
ANSI 63.26-2015

NOTE: 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
ANSI/TIA/EIA-603-E 2016

NOTE: All test items have been performed as a reference to the above KDB test guidance.

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

Mobile / Portable station are limited to 2 watts e.i.r.p.

4.1.2 Test Procedures

EIRP / ERP Measurement:

a. All measurements were done at low, middle and high operational frequency range. RBW is 5 MHz for WCDMA, and 20 MHz for LTE mode, and VBW ≥ 3 x RBW.

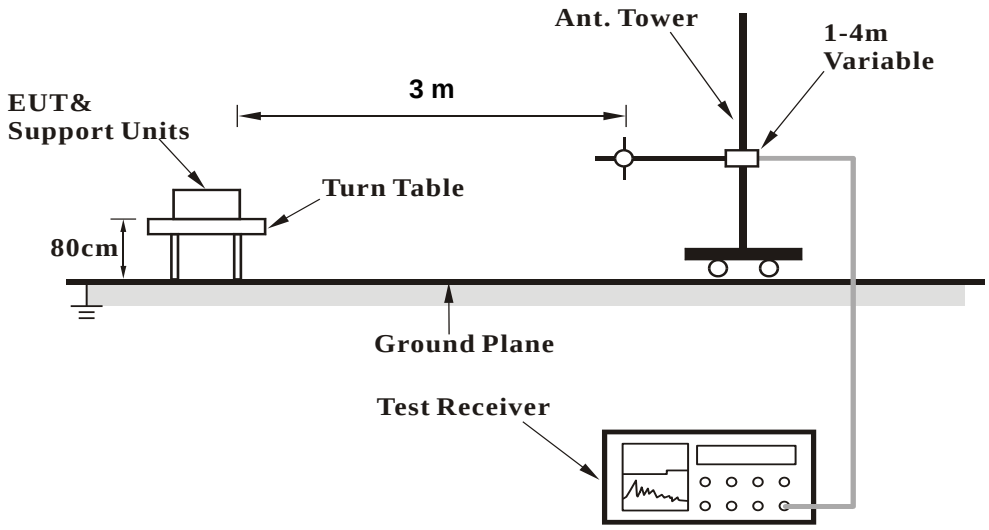
b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical 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.

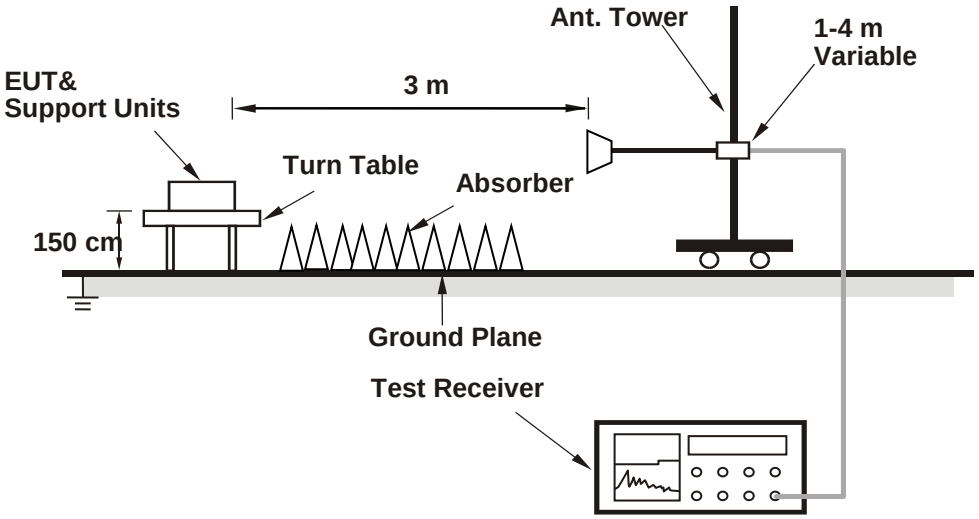
d. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.R.P power - 2.15 dB.

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).

4.1.4 Test Results

EIRP Power (dBm)

WCDMA Band II

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
Channel	**FREQ. (MHz)**	**READING (dBm)**	**S.G POWER VALUE (dBm)**	**CORRECTION FACTOR (dB)**	**EIRP (dBm)**	**LIMIT (dBm)**	**MARGIN (dB)**
9262	1852.40 (PK)	-18.10	22.10	0.10	22.20	33.00	-10.80
9400	1880.00 (PK)	-18.30	22.20	0.00	22.20	33.00	-10.80
9538	**1907.60 (PK)**	**-18.00**	**22.70**	**-0.10**	**22.60**	**33.00**	**-10.40**
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
Channel	**FREQ. (MHz)**	**READING (dBm)**	**S.G POWER VALUE (dBm)**	**CORRECTION FACTOR (dB)**	**EIRP (dBm)**	**LIMIT (dBm)**	**MARGIN (dB)**
9262	1852.40 (PK)	-23.80	16.60	0.10	16.70	33.00	-16.30
9400	1880.00 (PK)	-24.50	16.10	0.00	16.10	33.00	-16.90
9538	1907.60 (PK)	-24.50	16.30	-0.10	16.20	33.00	-16.80

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

QPSK

LTE Band 2, Channel Bandwidth 1.4MHz

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
Channel	**FREQ. (MHz)**	**READING (dBm)**	**S.G POWER VALUE (dBm)**	**CORRECTION FACTOR (dB)**	**EIRP (dBm)**	**LIMIT (dBm)**	**MARGIN (dB)**
18607	1850.70 (PK)	-24.90	15.30	0.10	15.40	33.00	-17.60
18900	1880.00 (PK)	-27.30	13.20	0.00	13.20	33.00	-19.80
19193	1909.30 (PK)	-27.30	13.40	-0.10	13.30	33.00	-19.70
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
Channel	**FREQ. (MHz)**	**READING (dBm)**	**S.G POWER VALUE (dBm)**	**CORRECTION FACTOR (dB)**	**EIRP (dBm)**	**LIMIT (dBm)**	**MARGIN (dB)**
18607	1850.70 (PK)	-14.00	26.40	0.10	26.50	33.00	-6.50
18900	1880.00 (PK)	-15.90	24.70	0.00	24.70	33.00	-8.30
19193	1909.30 (PK)	-13.60	27.20	-0.10	27.10	33.00	-5.90

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

LTE Band 2, Channel Bandwidth 3MHz

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
Channel	**FREQ. (MHz)**	**READING (dBm)**	**S.G POWER VALUE (dBm)**	**CORRECTION FACTOR (dB)**	**EIRP (dBm)**	**LIMIT (dBm)**	**MARGIN (dB)**
18615	1851.50 (PK)	-25.10	15.10	0.10	15.20	33.00	-17.80
18900	1880.00 (PK)	-27.80	12.70	0.00	12.70	33.00	-20.30
19185	1908.50 (PK)	-31.10	9.60	-0.10	9.50	33.00	-23.50
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
Channel	**FREQ. (MHz)**	**READING (dBm)**	**S.G POWER VALUE (dBm)**	**CORRECTION FACTOR (dB)**	**EIRP (dBm)**	**LIMIT (dBm)**	**MARGIN (dB)**
18615	1851.50 (PK)	-14.00	26.40	0.10	26.50	33.00	-6.50
18900	1880.00 (PK)	-15.60	25.00	0.00	25.00	33.00	-8.00
19185	1908.50 (PK)	-13.10	27.70	-0.10	27.60	33.00	-5.40

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

LTE Band 2, Channel Bandwidth 5MHz

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
Channel	**FREQ. (MHz)**	**READING (dBm)**	**S.G POWER VALUE (dBm)**	**CORRECTION FACTOR (dB)**	**EIRP (dBm)**	**LIMIT (dBm)**	**MARGIN (dB)**
18625	1852.50 (PK)	-24.70	15.50	0.10	15.60	33.00	-17.40
18900	1880.00 (PK)	-24.50	16.00	0.00	16.00	33.00	-17.00
19175	1907.50 (PK)	-27.60	13.10	-0.10	13.00	33.00	-20.00
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
Channel	**FREQ. (MHz)**	**READING (dBm)**	**S.G POWER VALUE (dBm)**	**CORRECTION FACTOR (dB)**	**EIRP (dBm)**	**LIMIT (dBm)**	**MARGIN (dB)**
18625	1852.50 (PK)	-13.70	26.70	0.10	26.80	33.00	-6.20
18900	1880.00 (PK)	-15.10	25.50	0.00	25.50	33.00	-7.50
19175	1907.50 (PK)	-13.70	27.10	-0.10	27.00	33.00	-6.00

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

LTE Band 2, Channel Bandwidth 10MHz

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
Channel	**FREQ. (MHz)**	**READING (dBm)**	**S.G POWER VALUE (dBm)**	**CORRECTION FACTOR (dB)**	**EIRP (dBm)**	**LIMIT (dBm)**	**MARGIN (dB)**
18650	1855.00 (PK)	-24.30	16.00	0.00	16.00	33.00	-17.00
18900	1880.00 (PK)	-25.80	14.70	0.00	14.70	33.00	-18.30
19150	1905.00 (PK)	-26.00	14.70	-0.10	14.60	33.00	-18.40
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
Channel	**FREQ. (MHz)**	**READING (dBm)**	**S.G POWER VALUE (dBm)**	**CORRECTION FACTOR (dB)**	**EIRP (dBm)**	**LIMIT (dBm)**	**MARGIN (dB)**
18650	1855.00 (PK)	-14.70	25.80	0.00	25.80	33.00	-7.20
18900	1880.00 (PK)	-15.40	25.20	0.00	25.20	33.00	-7.80
19150	**1905.00 (PK)**	**-12.90**	**27.90**	**-0.10**	**27.80**	**33.00**	**-5.20**

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

LTE Band 2, Channel Bandwidth 15MHz

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
Channel	**FREQ. (MHz)**	**READING (dBm)**	**S.G POWER VALUE (dBm)**	**CORRECTION FACTOR (dB)**	**EIRP (dBm)**	**LIMIT (dBm)**	**MARGIN (dB)**
18675	1857.50 (PK)	-27.90	12.40	0.00	12.40	33.00	-20.60
18900	1880.00 (PK)	-27.70	12.80	0.00	12.80	33.00	-20.20
19125	1902.50 (PK)	-32.10	8.60	-0.10	8.50	33.00	-24.50
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
Channel	**FREQ. (MHz)**	**READING (dBm)**	**S.G POWER VALUE (dBm)**	**CORRECTION FACTOR (dB)**	**EIRP (dBm)**	**LIMIT (dBm)**	**MARGIN (dB)**
18675	1857.50 (PK)	-14.00	26.50	0.00	26.50	33.00	-6.50
18900	1880.00 (PK)	-14.30	26.30	0.00	26.30	33.00	-6.70
19125	1902.50 (PK)	-14.10	26.70	-0.10	26.60	33.00	-6.40

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

LTE Band 2, Channel Bandwidth 20MHz

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
Channel	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
18700	1860.00 (PK)	-29.10	11.20	0.00	11.20	33.00	-21.80
18900	1880.00 (PK)	-29.20	11.30	0.00	11.30	33.00	-21.70
19100	1900.00 (PK)	-29.40	11.30	-0.10	11.20	33.00	-21.80
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
Channel	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
18700	1860.00 (PK)	-14.40	26.10	0.00	26.10	33.00	-6.90
18900	1880.00 (PK)	-15.50	25.10	0.00	25.10	33.00	-7.90
19100	1900.00 (PK)	-14.00	26.80	-0.10	26.70	33.00	-6.30

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

16QAM

LTE Band 2, Channel Bandwidth 1.4MHz

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
Channel	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
18607	1850.70 (PK)	-25.80	14.40	0.10	14.50	33.00	-18.50
18900	1880.00 (PK)	-28.10	12.40	0.00	12.40	33.00	-20.60
19193	1909.30 (PK)	-28.40	12.30	-0.10	12.20	33.00	-20.80
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
Channel	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
18607	1850.70 (PK)	-15.00	25.40	0.10	25.50	33.00	-7.50
18900	1880.00 (PK)	-16.80	23.80	0.00	23.80	33.00	-9.20
19193	1909.30 (PK)	-14.70	26.10	-0.10	26.00	33.00	-7.00

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

LTE Band 2, Channel Bandwidth 3MHz

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
Channel	**FREQ. (MHz)**	**READING (dBm)**	**S.G POWER VALUE (dBm)**	**CORRECTION FACTOR (dB)**	**EIRP (dBm)**	**LIMIT (dBm)**	**MARGIN (dB)**
18615	1851.50 (PK)	-26.10	14.10	0.10	14.20	33.00	-18.80
18900	1880.00 (PK)	-28.90	11.60	0.00	11.60	33.00	-21.40
19185	1908.50 (PK)	-31.80	8.90	-0.10	8.80	33.00	-24.20
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
Channel	**FREQ. (MHz)**	**READING (dBm)**	**S.G POWER VALUE (dBm)**	**CORRECTION FACTOR (dB)**	**EIRP (dBm)**	**LIMIT (dBm)**	**MARGIN (dB)**
18615	1851.50 (PK)	-14.80	25.60	0.10	25.70	33.00	-7.30
18900	1880.00 (PK)	-16.40	24.20	0.00	24.20	33.00	-8.80
19185	1908.50 (PK)	-14.20	26.60	-0.10	26.50	33.00	-6.50

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

LTE Band 2, Channel Bandwidth 5MHz

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
Channel	**FREQ. (MHz)**	**READING (dBm)**	**S.G POWER VALUE (dBm)**	**CORRECTION FACTOR (dB)**	**EIRP (dBm)**	**LIMIT (dBm)**	**MARGIN (dB)**
18625	1852.50 (PK)	-25.70	14.50	0.10	14.60	33.00	-18.40
18900	1880.00 (PK)	-25.60	14.90	0.00	14.90	33.00	-18.10
19175	1907.50 (PK)	-28.40	12.30	-0.10	12.20	33.00	-20.80
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
Channel	**FREQ. (MHz)**	**READING (dBm)**	**S.G POWER VALUE (dBm)**	**CORRECTION FACTOR (dB)**	**EIRP (dBm)**	**LIMIT (dBm)**	**MARGIN (dB)**
18625	1852.50 (PK)	-14.50	25.90	0.10	26.00	33.00	-7.00
18900	1880.00 (PK)	-16.10	24.50	0.00	24.50	33.00	-8.50
19175	1907.50 (PK)	-14.60	26.20	-0.10	26.10	33.00	-6.90

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

LTE Band 2, Channel Bandwidth 10MHz

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
Channel	**FREQ. (MHz)**	**READING (dBm)**	**S.G POWER VALUE (dBm)**	**CORRECTION FACTOR (dB)**	**EIRP (dBm)**	**LIMIT (dBm)**	**MARGIN (dB)**
18650	1855.00 (PK)	-25.10	15.20	0.00	15.20	33.00	-17.80
18900	1880.00 (PK)	-26.70	13.80	0.00	13.80	33.00	-19.20
19150	1905.00 (PK)	-26.80	13.90	-0.10	13.80	33.00	-19.20
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
Channel	**FREQ. (MHz)**	**READING (dBm)**	**S.G POWER VALUE (dBm)**	**CORRECTION FACTOR (dB)**	**EIRP (dBm)**	**LIMIT (dBm)**	**MARGIN (dB)**
18650	1855.00 (PK)	-15.90	24.60	0.00	24.60	33.00	-8.40
18900	1880.00 (PK)	-16.30	24.30	0.00	24.30	33.00	-8.70
19150	**1905.00 (PK)**	**-13.90**	**26.90**	**-0.10**	**26.80**	**33.00**	**-6.20**

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

LTE Band 2, Channel Bandwidth 15MHz

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
Channel	**FREQ. (MHz)**	**READING (dBm)**	**S.G POWER VALUE (dBm)**	**CORRECTION FACTOR (dB)**	**EIRP (dBm)**	**LIMIT (dBm)**	**MARGIN (dB)**
18675	1857.50 (PK)	-28.70	11.60	0.00	11.60	33.00	-21.40
18900	1880.00 (PK)	-28.50	12.00	0.00	12.00	33.00	-21.00
19125	1902.50 (PK)	-32.90	7.80	-0.10	7.70	33.00	-25.30
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
Channel	**FREQ. (MHz)**	**READING (dBm)**	**S.G POWER VALUE (dBm)**	**CORRECTION FACTOR (dB)**	**EIRP (dBm)**	**LIMIT (dBm)**	**MARGIN (dB)**
18675	1857.50 (PK)	-14.90	25.60	0.00	25.60	33.00	-7.40
18900	1880.00 (PK)	-15.20	25.40	0.00	25.40	33.00	-7.60
19125	1902.50 (PK)	-14.90	25.90	-0.10	25.80	33.00	-7.20

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

LTE Band 2, Channel Bandwidth 20MHz

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
Channel	**FREQ. (MHz)**	**READING (dBm)**	**S.G POWER VALUE (dBm)**	**CORRECTION FACTOR (dB)**	**EIRP (dBm)**	**LIMIT (dBm)**	**MARGIN (dB)**
18700	1860.00 (PK)	-30.00	10.30	0.00	10.30	33.00	-22.70
18900	1880.00 (PK)	-30.00	10.50	0.00	10.50	33.00	-22.50
19100	1900.00 (PK)	-30.20	10.50	-0.10	10.40	33.00	-22.60
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
Channel	**FREQ. (MHz)**	**READING (dBm)**	**S.G POWER VALUE (dBm)**	**CORRECTION FACTOR (dB)**	**EIRP (dBm)**	**LIMIT (dBm)**	**MARGIN (dB)**
18700	1860.00 (PK)	-15.30	25.20	0.00	25.20	33.00	-7.80
18900	1880.00 (PK)	-16.30	24.30	0.00	24.30	33.00	-8.70
19100	1900.00 (PK)	-14.80	26.00	-0.10	25.90	33.00	-7.10

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

4.2 Radiated Emission Measurement

4.2.1 Limits of Radiated Emission Measurement

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

4.2.2 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 = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.
d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.R.P power - 2.15 dB.

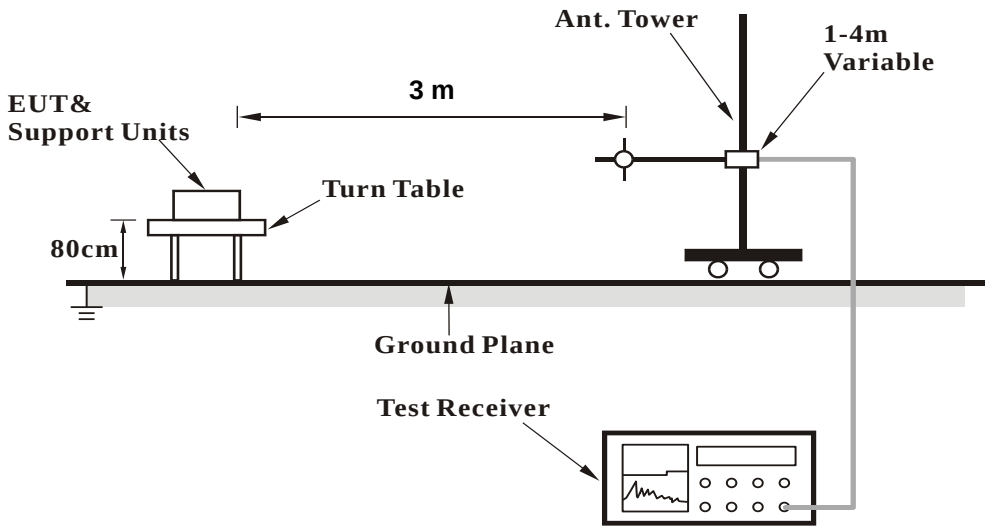
NOTE: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz.

4.2.3 Deviation from Test Standard

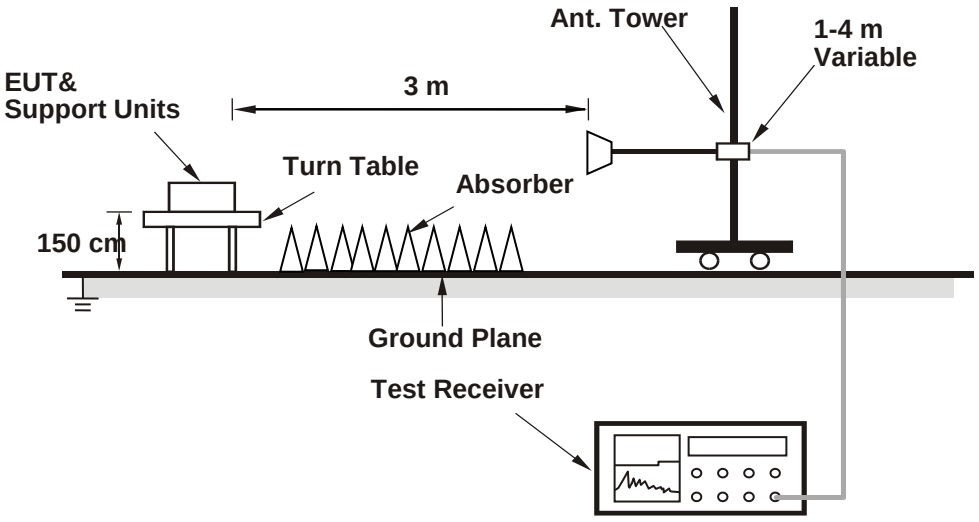
No deviation.

4.2.4 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).

4.2.5 Test Results

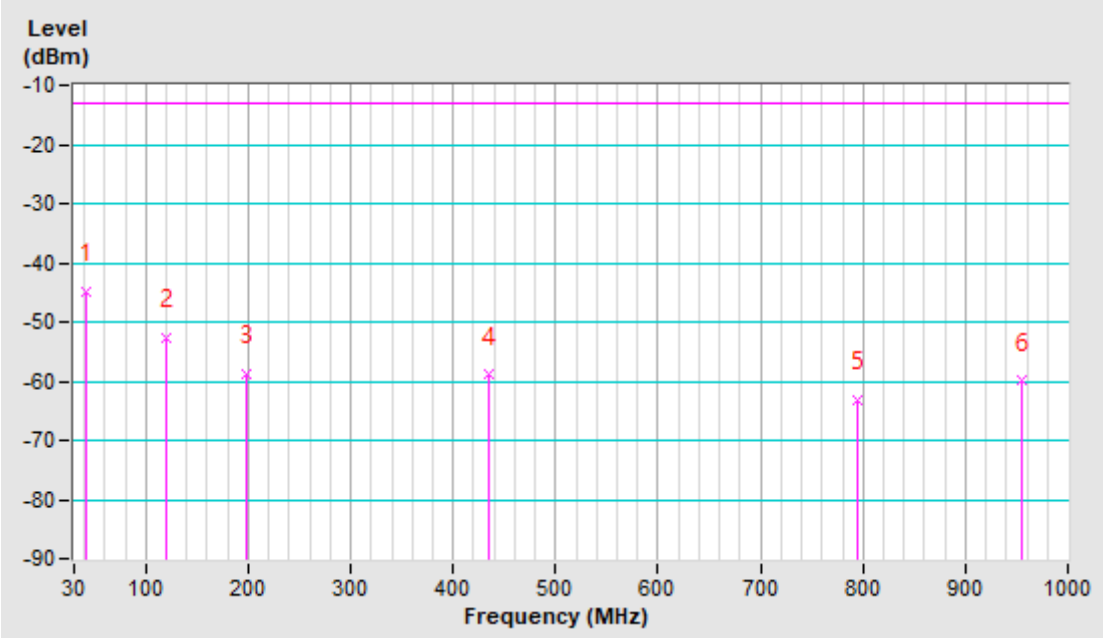
BELOW 1GHz

WCDMA II

Mode	TX channel 9538 (1907.6MHz)	**Frequency Range**	Below 1000 MHz
Environmental Conditions	22deg. C, 68%RH	**Input Power**	120Vac, 60Hz
Tested By	Greg Lin		

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	41.64	-46.90	-32.50	-12.30	-44.80	-13.00	-31.80
2	120.21	-44.80	-49.40	-3.20	-52.60	-13.00	-39.60
3	197.81	-50.40	-56.40	-2.40	-58.80	-13.00	-45.80
4	435.46	-58.70	-62.60	3.60	-59.00	-13.00	-46.00
5	794.36	-68.60	-67.10	4.00	-63.10	-13.00	-50.10
6	955.38	-68.50	-63.80	3.80	-60.00	-13.00	-47.00

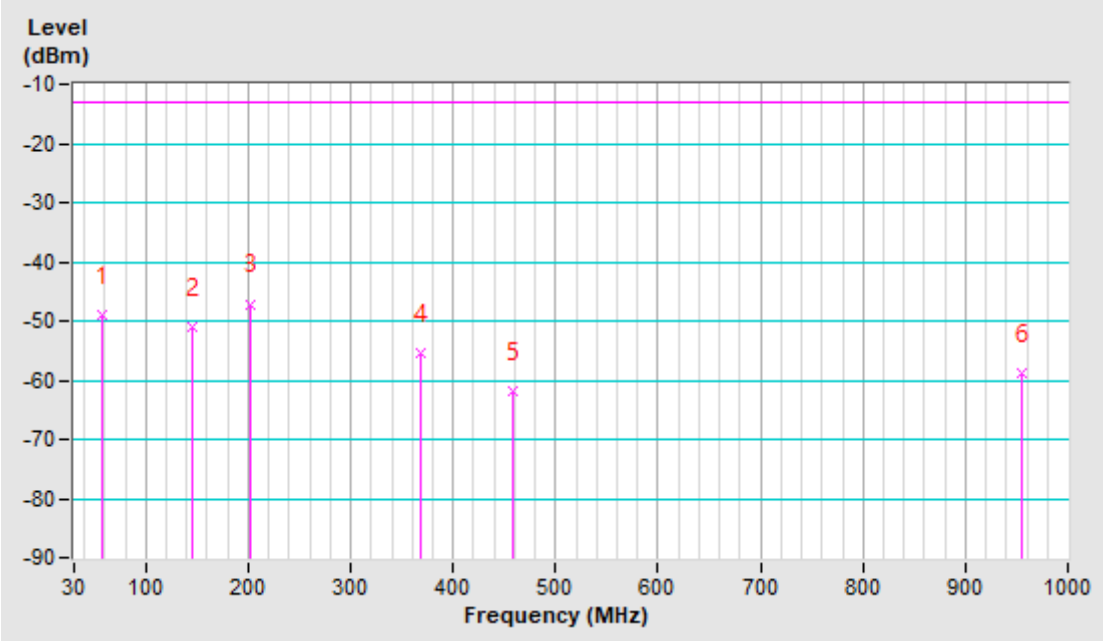
Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).



Mode	TX channel 9538 (1907.6MHz)	**Frequency Range**	Below 1000 MHz
Environmental Conditions	22deg. C, 68%RH	**Input Power**	120Vac, 60Hz
Tested By	Greg Lin		

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	57.16	-42.20	-44.40	-4.70	-49.10	-13.00	-36.10
2	145.43	-49.00	-47.90	-3.10	-51.00	-13.00	-38.00
3	202.66	-45.60	-45.00	-2.10	-47.10	-13.00	-34.10
4	367.56	-55.10	-59.30	3.80	-55.50	-13.00	-42.50
5	457.77	-61.60	-65.20	3.50	-61.70	-13.00	-48.70
6	955.38	-68.30	-62.70	3.80	-58.90	-13.00	-45.90

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

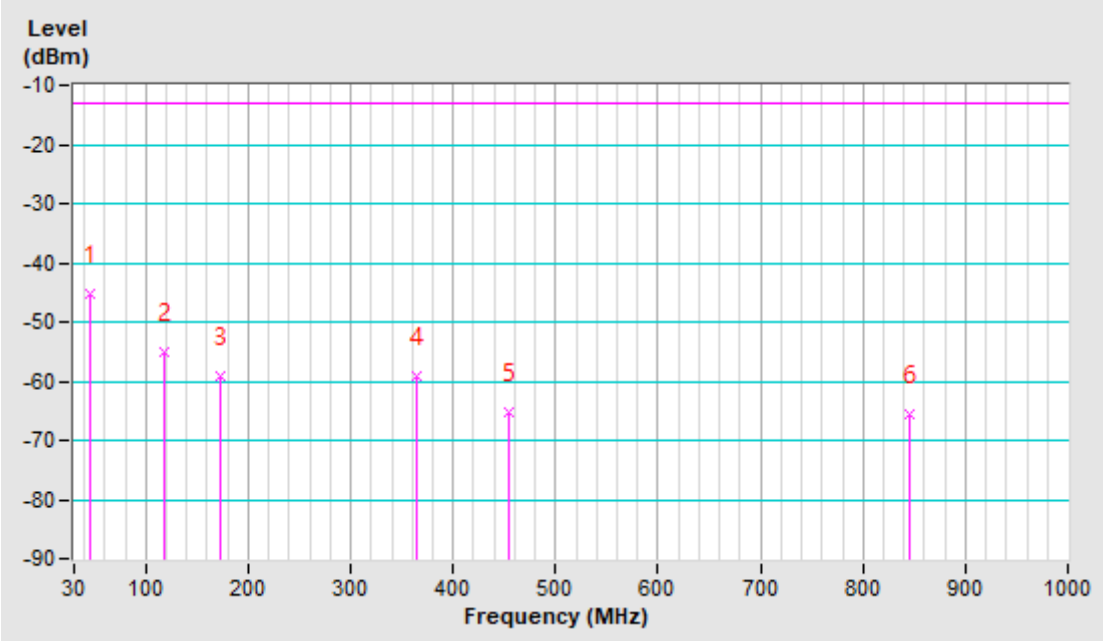


LTE BAND 2, CHANNEL BANDWIDTH: 1.4MHz

Mode	TX channel 19193 (1909.3MHz)	**Frequency Range**	Below 1000 MHz
Environmental Conditions	22deg. C, 68%RH	**Input Power**	120Vac, 60Hz
Tested By	Greg Lin		

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	46.49	-45.90	-35.50	-9.90	-45.40	-13.00	-32.40
2	118.27	-47.50	-52.30	-2.90	-55.20	-13.00	-42.20
3	173.56	-51.80	-56.40	-2.80	-59.20	-13.00	-46.20
4	363.68	-56.70	-63.10	3.90	-59.20	-13.00	-46.20
5	453.89	-65.20	-68.70	3.50	-65.20	-13.00	-52.20
6	844.80	-72.20	-69.10	3.60	-65.50	-13.00	-52.50

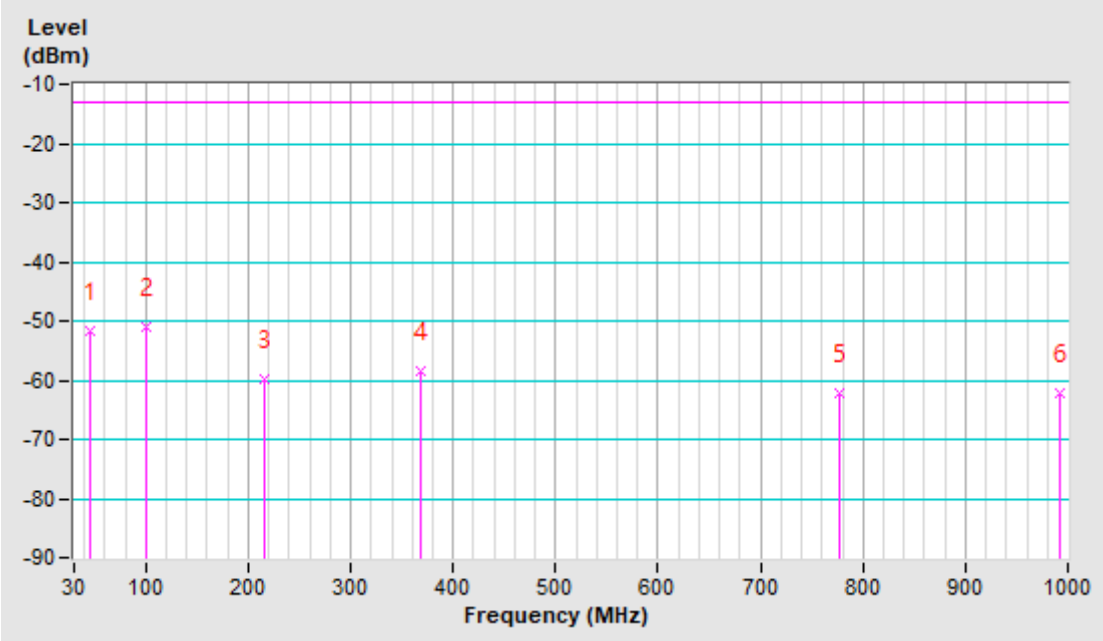
Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).



Mode	TX channel 19193 (1909.3MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 68%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

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	46.49	-43.40	-41.70	-9.90	-51.60	-13.00	-38.60
2	99.84	-42.80	-49.50	-1.50	-51.00	-13.00	-38.00
3	215.27	-56.00	-57.70	-2.00	-59.70	-13.00	-46.70
4	367.56	-58.00	-62.20	3.80	-58.40	-13.00	-45.40
5	776.90	-69.30	-66.20	4.00	-62.20	-13.00	-49.20
6	992.24	-72.20	-65.70	3.40	-62.30	-13.00	-49.30

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



Above 1GHz

WCDMA Band II

Mode	TX channel 9538 (1907.6MHz)	Frequency Range	1GHz-20GHz
Environmental Conditions	22deg. C, 68%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

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	3815.20 (PK)	-64.80	-56.50	1.40	-55.10	-13.00	-42.10
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	3815.20 (PK)	-66.70	-58.50	1.40	-57.10	-13.00	-44.10

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

LTE Band 2, Channel Bandwidth 1.4MHz

Mode	TX channel 19193 (1909.3MHz)	Frequency Range	1GHz-20GHz
Environmental Conditions	22deg. C, 68%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

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	3818.60 (PK)	-55.10	-46.80	1.40	-45.40	-13.00	-32.40
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	**3818.60 (PK)**	**-53.70**	**-45.50**	**1.40**	**-44.10**	**-13.00**	**-31.10**

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 according to ISO/IEC 17025.

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

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Web Site: www.bureauveritas-adt.com

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

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