

## FCC Test Report

### (PART 24)

**Report No.:** RFBHAA-WTW-P20090611-1

**FCC ID:** JOYDA39

**Test Model:** AL-T51A2-2

**Series Model:** AL-T52V1, AL-T51A2-1 (refer to item 3.1 for more details)

**Received Date:** Sep. 26, 2020

**Test Date:** Sep. 29 ~ Oct. 06, 2020

**Issued Date:** Oct. 15, 2020

**Applicant:** Kyocera Corporation

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**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



This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification.

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### Release Control Record

Issue No.	Description	Date Issued
RFBHAA-WTW-P20090611-1	Original Release	Oct. 15, 2020

## 1 Certificate of Conformity

**Product:** Telematics Module

**Brand:** Kyocera

**Test Model:** AL-T51A2-2

**Series Model:** AL-T52V1, AL-T51A2-1 (refer to item 3.1 for more details)

**Sample Status:** Engineering Sample

**Applicant:** Kyocera Corporation

**Test Date:** Sep. 29 ~ Oct. 06, 2020

**Standards:** FCC Part 24, Subpart E

This report is issued as a supplementary report of RFBHAA-WTW-P20070391-1. This report shall be used combined together with its original report.

**Prepared by :**

*Pettie Chen*

**Date:**

Oct. 15, 2020

Pettie Chen / Senior Specialist

**Approved by :**

*Bruce Chen*

**Date:**

Oct. 15, 2020

Bruce Chen / 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 -26.4 dB at 35.82 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	3.63 dB
	200 MHz ~ 1000 MHz	3.64 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.29 dB
	18 GHz ~ 40 GHz	2.29 dB

## 2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Dec. 31, 2019	Dec. 30, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Sep. 16, 2020	Sep. 15, 2021
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Nov. 11, 2019	Nov. 10, 2020
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-1170	Nov. 24, 2019	Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 24, 2019	Nov. 23, 2020
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
Pre-amplifier (18GHz-40GHz) EMC	EMC184045B	980175	Sep. 04, 2020	Sep. 03, 2021
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 General Information

#### 3.1 General Description of EUT

<b>Product</b>	Telematics Module	
<b>Brand</b>	Kyocera	
<b>Test Model</b>	AL-T51A2-2	
<b>Series Model</b>	AL-T52V1, AL-T51A2-1	
<b>Status of EUT</b>	Engineering Sample	
<b>Power Supply Rating</b>	5Vdc	
<b>Modulation Type</b>	WCDMA	QPSK
	LTE	QPSK, 16QAM
<b>Frequency Range</b>	WCDMA Band 2	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
<b>Max. EIRP Power</b>	WCDMA Band 2	162.181 mW (22.10dBm)
	LTE Band 2 (Channel Bandwidth: 1.4 MHz)	457.088 mW (26.60dBm)
	LTE Band 2 (Channel Bandwidth: 3 MHz)	524.807 mW (27.20dBm)
	LTE Band 2 (Channel Bandwidth: 5 MHz)	446.684 mW (26.50dBm)
	LTE Band 2 (Channel Bandwidth: 10 MHz)	562.341 mW (27.50dBm)
	LTE Band 2 (Channel Bandwidth: 15 MHz)	416.869 mW (26.20dBm)
	LTE Band 2 (Channel Bandwidth: 20 MHz)	426.580 mW (26.30dBm)
<b>Antenna Type</b>	Refer to Note as below	
<b>Accessory Device</b>	Refer to Note as below	
<b>Data Cable Supplied</b>	Refer to Note as below	

Note:

1. This report is prepared for FCC class II permissive change. The differences compared with the original report (BV CPS report no.: RFBHAA-WTW-P20070391-1) are adding a model and changing software & memory capacity. The effective 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, 5, 12, 13
	AL-T51A2-1	Support WCDMA Band 2, 4, 5 and LTE Band 2, 4, 5, 12
	<b>AL-T51A2-2</b>	Support band same with AL-T51A2-1, just different memory and driver software

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

Antenna 1					
Antenna Type	AUX		Connector 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		Connector 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		Connector 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		Connector 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		Connector 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

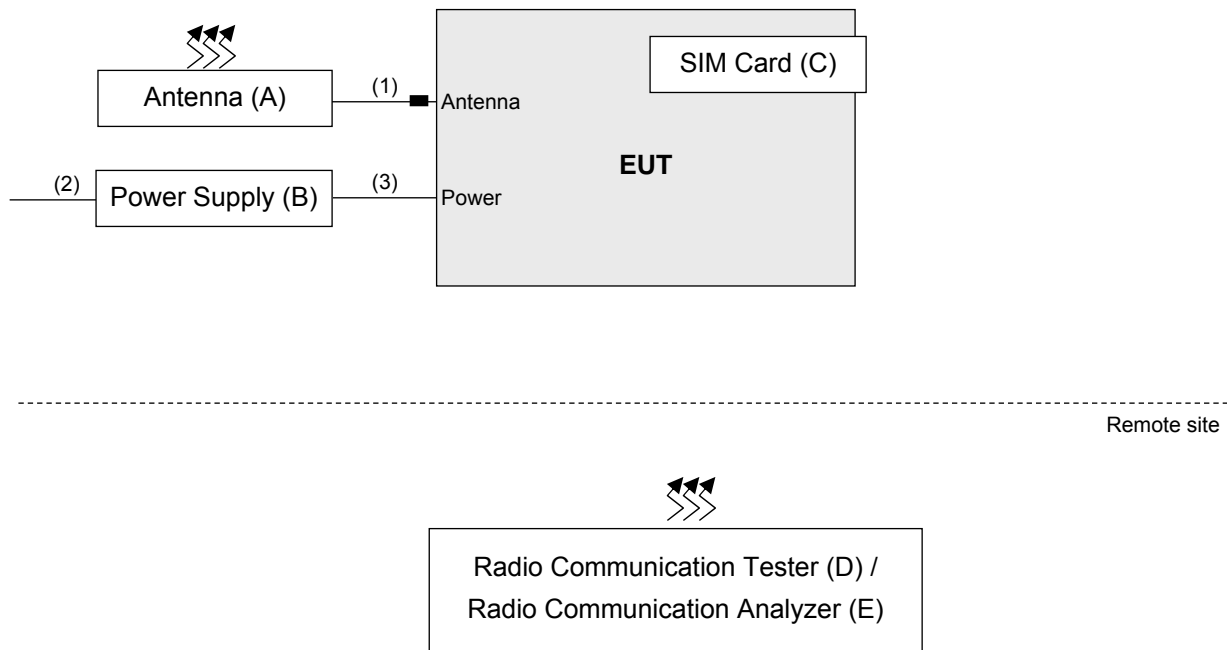
For WCDMA Band 2 and LTE Band 2: Antenna 2 was chosen for final test according to manufacturer's requirement.

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 Band 2

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	25deg. C, 70%RH	120Vac, 60Hz	Luis Lee
Radiated Emission	25deg. C, 70%RH	120Vac, 60Hz	Noah Chang

### 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.

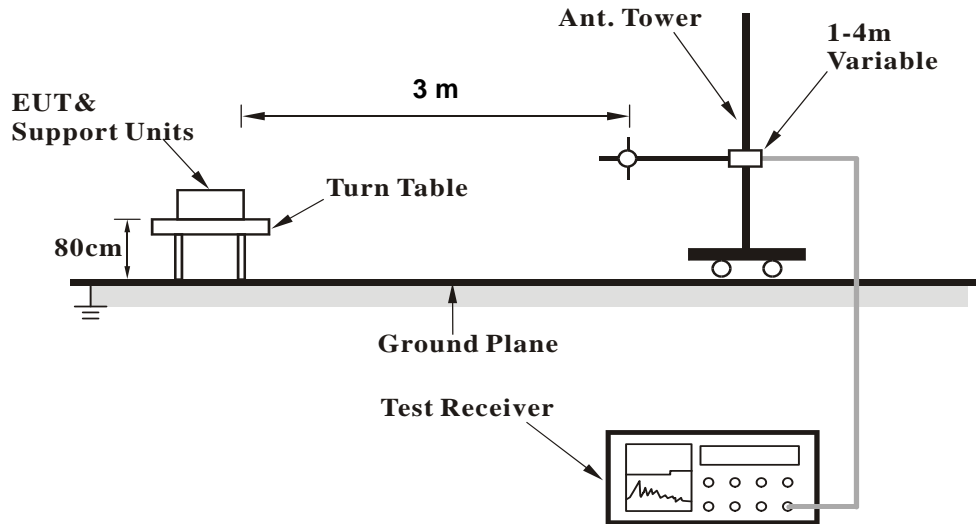
#### 4.1.2 Test Procedures

##### **EIRP / ERP Measurement:**

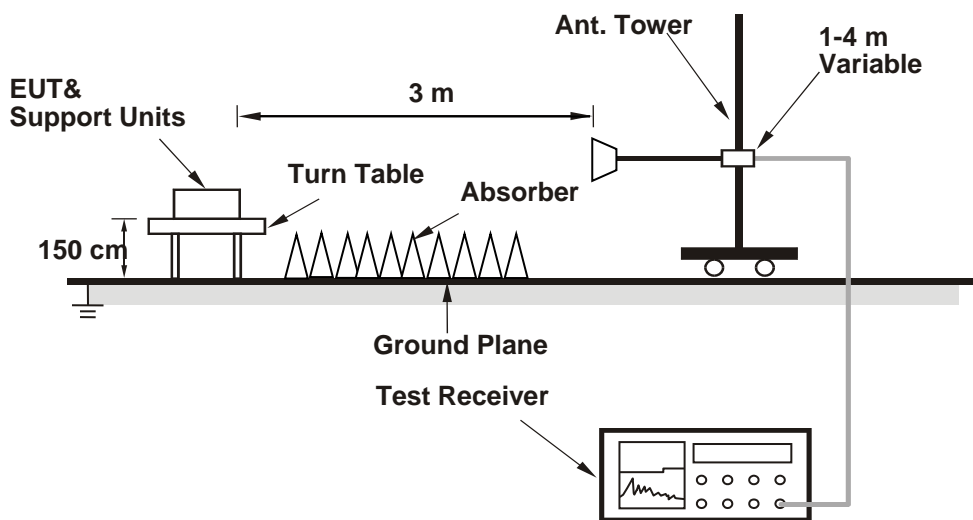
- a. All measurements were done at low, middle and high operational frequency range. RBW is 5 MHz for WCDMA, and 20 MHz for LTE mode, and  $VBW \geq 3 \times RBW$ .
- b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 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.  $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}$ . E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole,  $E.R.P \text{ power} = E.I.R.P \text{ power} - 2.15 \text{ dB}$ .

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)	-19.2	20.7	1.0	21.7	33.0	-11.3
9400	1880.00 (PK)	-19.4	20.7	1.1	21.8	33.0	-11.2
<b>9538</b>	<b>1907.60 (PK)</b>	<b>-19.4</b>	<b>21.0</b>	<b>1.1</b>	<b>22.1</b>	<b>33.0</b>	<b>-10.9</b>
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)	-23.4	15.4	1.0	16.4	33.0	-16.6
9400	1880.00 (PK)	-24.0	14.5	1.1	15.6	33.0	-17.4
9538	1907.60 (PK)	-23.7	14.7	1.1	15.8	33.0	-17.2

**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)	-25.9	14.0	1.0	15.0	33.0	-18.0
18900	1880.00 (PK)	-28.2	11.9	1.1	13.0	33.0	-20.0
19193	1909.30 (PK)	-28.4	12.0	1.1	13.1	33.0	-19.9
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)	-13.7	25.1	1.0	26.1	33.0	-6.9
18900	1880.00 (PK)	-15.3	23.2	1.1	24.3	33.0	-8.7
19193	1909.30 (PK)	-12.9	25.5	1.1	26.6	33.0	-6.4

**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)	-25.9	14.0	1.0	15.0	33.0	-18.0
18900	1880.00 (PK)	-29.0	11.1	1.1	12.2	33.0	-20.8
19185	1908.50 (PK)	-32.4	8.0	1.1	9.1	33.0	-23.9
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)	-13.7	25.1	1.0	26.1	33.0	-6.9
18900	1880.00 (PK)	-15.0	23.5	1.1	24.6	33.0	-8.4
19185	1908.50 (PK)	-12.3	26.1	1.1	27.2	33.0	-5.8

**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)	-25.7	14.2	1.0	15.2	33.0	-17.8
18900	1880.00 (PK)	-25.7	14.4	1.1	15.5	33.0	-17.5
19175	1907.50 (PK)	-28.9	11.5	1.1	12.6	33.0	-20.4
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)	-13.4	25.4	1.0	26.4	33.0	-6.6
18900	1880.00 (PK)	-14.6	23.9	1.1	25.0	33.0	-8.0
19175	1907.50 (PK)	-13.0	25.4	1.1	26.5	33.0	-6.5

**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)	-25.4	14.6	1.0	15.6	33.0	-17.4
18900	1880.00 (PK)	-26.8	13.3	1.1	14.4	33.0	-18.6
19150	1905.00 (PK)	-27.3	13.1	1.1	14.2	33.0	-18.8
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)	-14.4	24.4	1.0	25.4	33.0	-7.6
18900	1880.00 (PK)	-14.7	23.8	1.1	24.9	33.0	-8.1
19150	1905.00 (PK)	-12.0	26.4	1.1	27.5	33.0	-5.5

**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)	-29.0	10.9	1.1	12.0	33.0	-21.0
18900	1880.00 (PK)	-28.8	11.3	1.1	12.4	33.0	-20.6
19125	1902.50 (PK)	-33.4	7.0	1.1	8.1	33.0	-24.9
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)	-13.7	25.0	1.1	26.1	33.0	-6.9
18900	1880.00 (PK)	-13.7	24.8	1.1	25.9	33.0	-7.1
19125	1902.50 (PK)	-13.3	25.1	1.1	26.2	33.0	-6.8

**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)	-30.3	9.6	1.1	10.7	33.0	-22.3
18900	1880.00 (PK)	-30.4	9.7	1.1	10.8	33.0	-22.2
19100	1900.00 (PK)	-31.0	9.4	1.1	10.5	33.0	-22.5
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)	-14.0	24.6	1.1	25.7	33.0	-7.3
18900	1880.00 (PK)	-14.9	23.6	1.1	24.7	33.0	-8.3
19100	1900.00 (PK)	-13.1	25.2	1.1	26.3	33.0	-6.7

**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)	-26.9	13.0	1.0	14.0	33.0	-19.0
18900	1880.00 (PK)	-29.2	10.9	1.1	12.0	33.0	-21.0
19193	1909.30 (PK)	-29.4	11.0	1.1	12.1	33.0	-20.9
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)	-14.7	24.1	1.0	25.1	33.0	-7.9
18900	1880.00 (PK)	-16.3	22.2	1.1	23.3	33.0	-9.7
19193	1909.30 (PK)	-13.9	24.5	1.1	25.6	33.0	-7.4

**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)	-26.9	13.0	1.0	14.0	33.0	-19.0
18900	1880.00 (PK)	-30.0	10.1	1.1	11.2	33.0	-21.8
19185	1908.50 (PK)	-33.4	7.0	1.1	8.1	33.0	-24.9
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)	-14.7	24.1	1.0	25.1	33.0	-7.9
18900	1880.00 (PK)	-16.0	22.5	1.1	23.6	33.0	-9.4
19185	1908.50 (PK)	-13.3	25.1	1.1	26.2	33.0	-6.8

**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)	-26.7	13.2	1.0	14.2	33.0	-18.8
18900	1880.00 (PK)	-26.7	13.4	1.1	14.5	33.0	-18.5
19175	1907.50 (PK)	-29.9	10.5	1.1	11.6	33.0	-21.4
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)	-14.4	24.4	1.0	25.4	33.0	-7.6
18900	1880.00 (PK)	-15.6	22.9	1.1	24.0	33.0	-9.0
19175	1907.50 (PK)	-14.0	24.4	1.1	25.5	33.0	-7.5

**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)	-26.4	13.6	1.0	14.6	33.0	-18.4
18900	1880.00 (PK)	-27.8	12.3	1.1	13.4	33.0	-19.6
19150	1905.00 (PK)	-28.3	12.1	1.1	13.2	33.0	-19.8
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)	-15.4	23.4	1.0	24.4	33.0	-8.6
18900	1880.00 (PK)	-15.6	22.9	1.1	24.0	33.0	-9.0
19150	1905.00 (PK)	-13.0	25.4	1.1	26.5	33.0	-6.5

**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)	-30.0	9.9	1.1	11.0	33.0	-22.0
18900	1880.00 (PK)	-29.8	10.3	1.1	11.4	33.0	-21.6
19125	1902.50 (PK)	-34.4	6.0	1.1	7.1	33.0	-25.9
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)	-14.7	24.0	1.1	25.1	33.0	-7.9
18900	1880.00 (PK)	-14.7	23.8	1.1	24.9	33.0	-8.1
19125	1902.50 (PK)	-14.3	24.1	1.1	25.2	33.0	-7.8

**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)	-31.3	8.6	1.1	9.7	33.0	-23.3
18900	1880.00 (PK)	-31.4	8.7	1.1	9.8	33.0	-23.2
19100	1900.00 (PK)	-31.0	9.4	1.1	10.5	33.0	-22.5
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)	-15.0	23.6	1.1	24.7	33.0	-8.3
18900	1880.00 (PK)	-15.9	22.6	1.1	23.7	33.0	-9.3
19100	1900.00 (PK)	-14.1	24.2	1.1	25.3	33.0	-7.7

**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.

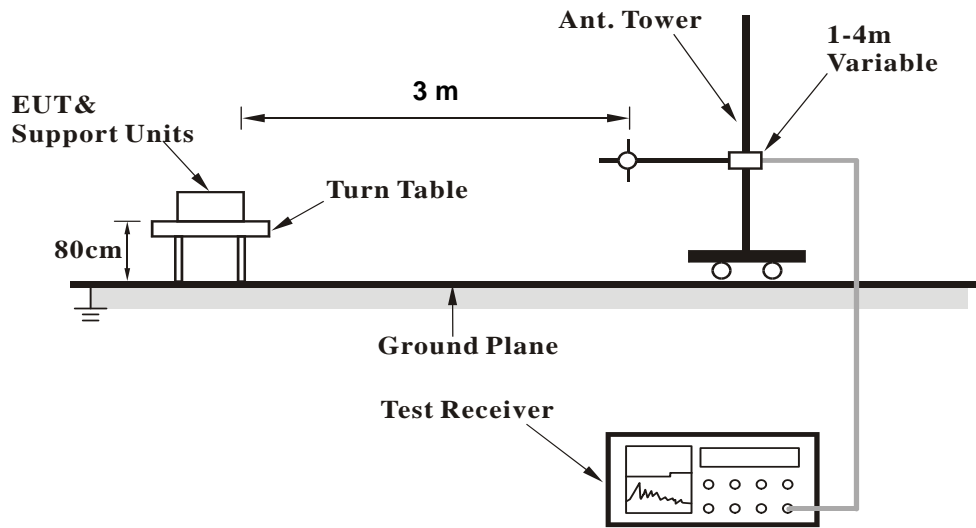
**NOTE:** The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz.

### 4.2.3 Deviation from Test Standard

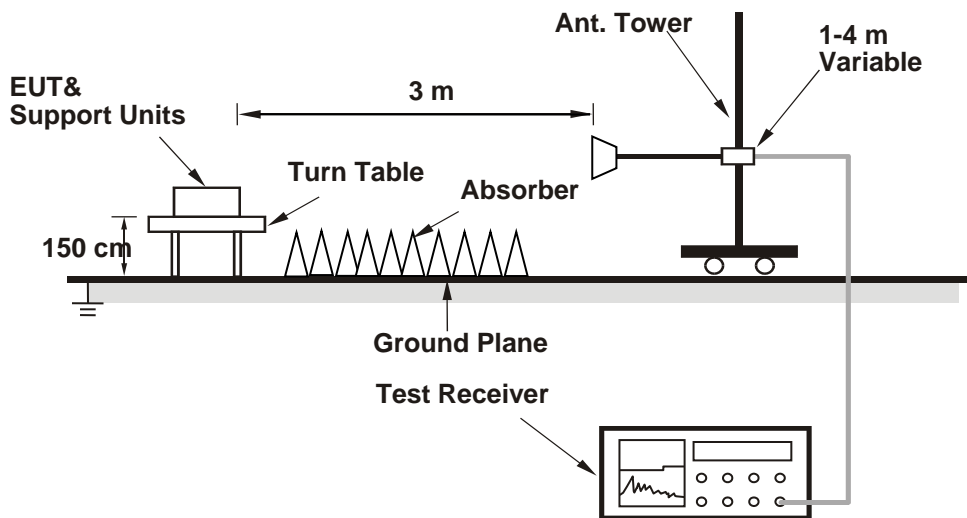
No deviation.

#### 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**

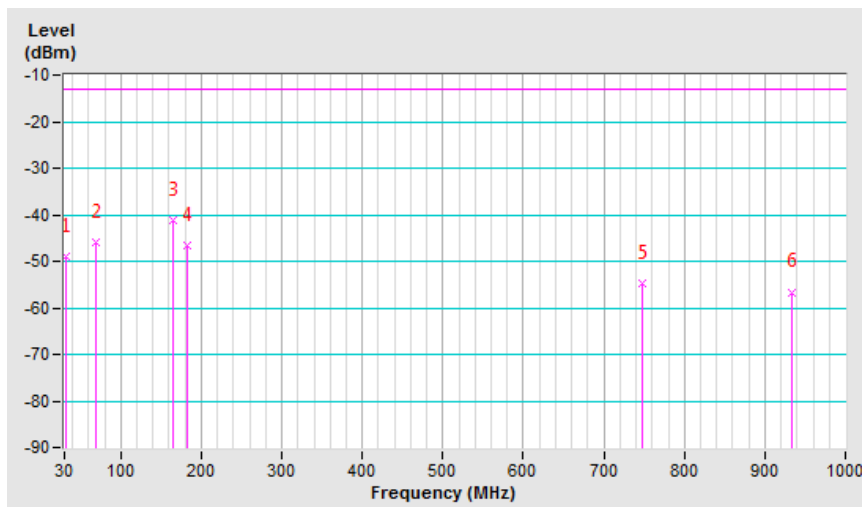
**WCDMA II**

<b>Mode</b>	TX channel 9538 (1907.6MHz)	<b>Frequency Range</b>	Below 1000 MHz
<b>Environmental Conditions</b>	25deg. C, 70%RH	<b>Input Power</b>	120Vac, 60Hz
<b>Tested By</b>	Noah Chang		

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	31.94	-52.6	-37.1	-11.9	-49.0	-13.0	-36.0
2	68.80	-39.7	-40.5	-5.3	-45.8	-13.0	-32.8
3	165.80	-35.0	-42.3	1.2	-41.1	-13.0	-28.1
4	183.26	-38.1	-49.9	3.3	-46.6	-13.0	-33.6
5	747.80	-58.4	-59.5	4.7	-54.8	-13.0	-41.8
6	934.04	-63.7	-60.5	3.9	-56.6	-13.0	-43.6

Remarks:

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

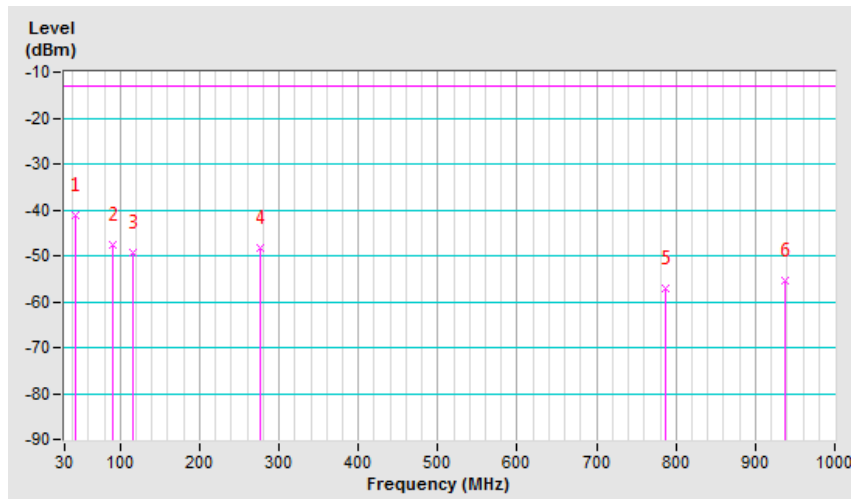


<b>Mode</b>	TX channel 9538 (1907.6MHz)	<b>Frequency Range</b>	Below 1000 MHz
<b>Environmental Conditions</b>	25deg. C, 70%RH	<b>Input Power</b>	120Vac, 60Hz
<b>Tested By</b>	Noah Chang		

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	43.58	-34.9	-30.8	-10.3	-41.1	-13.0	-28.1
2	90.14	-42.7	-48.6	1.1	-47.5	-13.0	-34.5
3	115.36	-42.6	-49.6	0.3	-49.3	-13.0	-36.3
4	276.38	-50.6	-53.6	5.3	-48.3	-13.0	-35.3
5	786.60	-63.2	-61.2	4.2	-57.0	-13.0	-44.0
6	937.92	-64.3	-59.4	3.9	-55.5	-13.0	-42.5

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

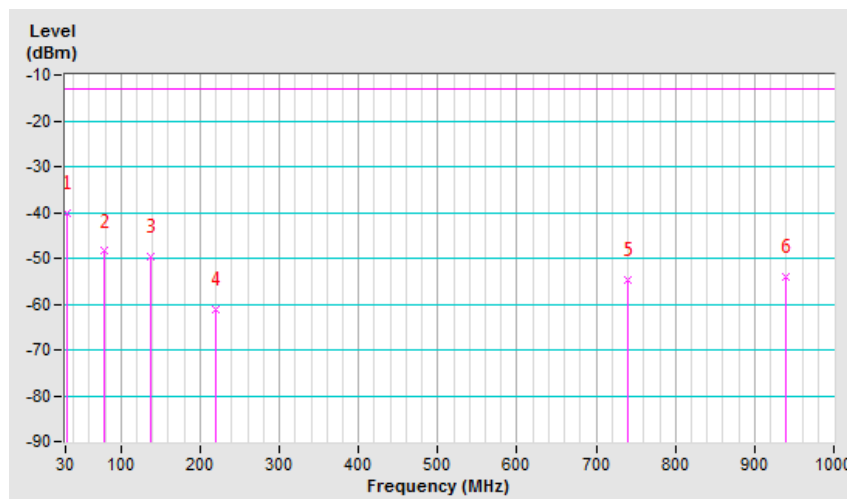
<b>Mode</b>	TX channel 19193 (1909.3MHz)	<b>Frequency Range</b>	Below 1000 MHz
<b>Environmental Conditions</b>	25deg. C, 70%RH	<b>Input Power</b>	120Vac, 60Hz
<b>Tested By</b>	Noah Chang		

#### 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	31.94	-43.8	-28.3	-11.9	-40.2	-13.0	-27.2
2	78.50	-42.8	-46.3	-2.2	-48.5	-13.0	-35.5
3	136.70	-43.3	-49.3	-0.3	-49.6	-13.0	-36.6
4	220.12	-53.5	-66.7	5.4	-61.3	-13.0	-48.3
5	740.04	-58.3	-59.6	4.8	-54.8	-13.0	-41.8
6	939.86	-61.1	-57.9	3.9	-54.0	-13.0	-41.0

Remarks:

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



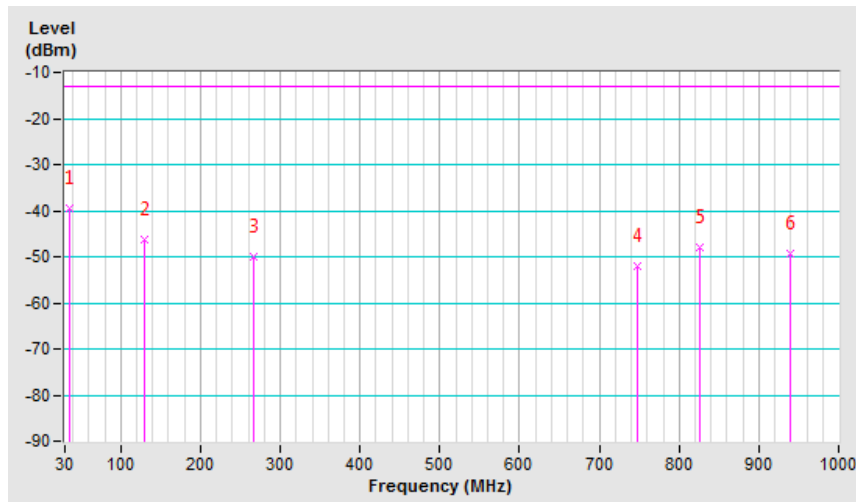


<b>Mode</b>	TX channel 19193 (1909.3MHz)	<b>Frequency Range</b>	Below 1000 MHz
<b>Environmental Conditions</b>	25deg. C, 70%RH	<b>Input Power</b>	120Vac, 60Hz
<b>Tested By</b>	Noah Chang		

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	35.82	-30.9	-28.0	-11.4	-39.4	-13.0	-26.4
2	128.94	-40.9	-46.1	-0.1	-46.2	-13.0	-33.2
3	266.68	-53.0	-55.3	5.3	-50.0	-13.0	-37.0
4	747.80	-57.6	-56.7	4.7	-52.0	-13.0	-39.0
5	825.40	-54.3	-51.9	4.0	-47.9	-13.0	-34.9
6	939.86	-58.2	-53.3	3.9	-49.4	-13.0	-36.4

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

<b>Mode</b>	TX channel 9538 (1907.6MHz)	<b>Frequency Range</b>	1GHz-20GHz
<b>Environmental Conditions</b>	25deg. C, 70%RH	<b>Input Power</b>	120Vac, 60Hz
<b>Tested By</b>	Noah Chang		

#### 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)	-70.2	-63.4	7.1	-56.3	-13.0	-43.3

#### ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

NO.	FREQ. (MHz)	READING (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	EIRP (dBm)	LIMIT (dBm)	MARGIN (dB)
1	3815.20 (PK)	-72.5	-64.8	7.1	-57.7	-13.0	-44.7

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

<b>Mode</b>	TX channel 19193 (1909.3MHz)	<b>Frequency Range</b>	1GHz-20GHz
<b>Environmental Conditions</b>	25deg. C, 70%RH	<b>Input Power</b>	120Vac, 60Hz
<b>Tested By</b>	Noah Chang		

#### 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)	-60.3	-53.6	7.1	-46.5	-13.0	-33.5

#### 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	3818.60 (PK)	-59.3	-51.6	7.1	-44.5	-13.0	-31.5

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](http://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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