

FCC Test Report

(PART 90 Subpart S)

Report No.: RF151229C25-9

FCC ID: M82-TREK733L

Test Model: TREK-733L

Received Date: Apr. 14, 2016

Test Date: Nov. 21 ~ Nov. 24, 2016

Issued Date: Nov. 25, 2016

Applicant: ADVANTECH CO., LTD

Address: No.1, Alley 20, Lane 26, Rueiguang Rd, Neihu District, Taipei, Taiwan 114

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 Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)



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 unless 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. The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

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	9
3.2.1 Description Of Support Units	9
3.3 Test Mode Applicability and Tested Channel Detail	10
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 Frequency Stability Measurement	17
4.2.1 Limits of Frequency Stability Measurement	17
4.2.2 Test Procedure	17
4.2.3 Test Setup.....	17
4.2.4 Test Results	18
4.3 Occupied Bandwidth Measurement	19
4.3.1 Limits Of Occupied Bandwidth Measurement	19
4.3.2 Test Procedure	19
4.3.3 Test Setup.....	19
4.3.4 Test Result.....	20
4.4 Emission Mask Measurement	21
4.4.1 Limits Of Emission Mask Measurement	21
4.4.2 Test Procedures.....	21
4.4.3 Test Setup.....	21
4.4.4 Test Results	22
4.5 Peak To Average Ratio.....	23
4.5.1 Limits of Peak To Average Ratio Measurement	23
4.5.2 Test Setup.....	23
4.5.3 Test Procedures.....	23
4.5.4 Test Results	24
4.6 Conducted Spurious Emissions	25
4.6.1 Limits of Conducted Spurious Emissions Measurement	25
4.6.2 Test Setup.....	25
4.6.3 Test Procedure	25
4.6.4 Test Results	26
4.7 Radiated Emission Measurement	29
4.7.1 Limits of Radiated Emission Measurement	29
4.7.2 Test Procedure	29
4.7.3 Deviation from Test Standard	29
4.7.4 Test Setup.....	30
4.7.5 Test Results	31
5 Pictures of Test Arrangements.....	34
Appendix – Information on the Testing Laboratories	35

Release Control Record

Issue No.	Description	Date Issued
RF151229C25-9	Original release.	Nov. 25, 2016

1 Certificate of Conformity

Product: Computer

Brand: Advantech

Test Model: TREK-733L

Sample Status: Engineering sample

Applicant: ADVANTECH CO., LTD

Test Date: Nov. 21 ~ Nov. 24, 2016

Standards: FCC Part 90, Subpart S

FCC Part 2

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 EMC characteristics under the conditions specified in this report.

Prepared by : Suntee Liu, **Date:** Nov. 25, 2016

Suntee Liu / Specialist

Approved by : Bruce Chen, **Date:** Nov. 25, 2016

Bruce Chen / Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 90 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 90.635 (b)	Maximum Peak Output Power Limit: max. 3 watts e.r.p peak power	PASS	Meet the requirement of limit.
2.1055 90.213	Frequency Stability	PASS	Meet the requirement of limit.
2.1049 90.209	Occupied Bandwidth	PASS	Meet the requirement of limit.
2.1051 90.691	Emission Masks	PASS	Meet the requirement of limit.
---	Peak To Average Ratio	PASS	Meet the requirement of limit.
2.1051 90.691	Conducted Spurious Emissions	PASS	Meet the requirement of limit.
2.1053 90.691	Radiated Spurious Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -26.00dB at 1635.80, 1641.00MHz.

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

2.2 Test Site And Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESIB7	100187	Apr. 18, 2016	Apr. 17, 2017
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Aug. 16, 2016	Aug. 15, 2017
BILOG Antenna SCHWARZBECK	VULB9168	9168-171	Jan. 07, 2016	Jan. 06, 2017
HORN Antenna SCHWARZBECK	9120D	209	Jan. 20, 2016	Jan. 19, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Jan. 18, 2016	Jan. 17, 2017
Preamplifier Agilent	8447D	2944A10738	Aug. 22, 2016	Aug. 21, 2017
Preamplifier Agilent	8449B	3008A01964	Aug. 22, 2016	Aug. 21, 2017
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH3-03 (214378)	Aug. 22, 2016	Aug. 21, 2017
RF signal cable HUBER+SUHNER	SUCOFLEX 106	Cable-CH3-03 (309224+12738)	Aug. 22, 2016	Aug. 21, 2017
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Turn Table Controller BV ADT	SC100	SC93021702	NA	NA
WIT Standard Temperature And Humidity Chamber	TH-4S-C	W981030	Jun. 08, 2016	Jun. 07, 2017
Mini-Circuits Power Splitter	ZN2PD-9G	NA	Jun. 09, 2016	Jun. 08, 2017
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 3.
 3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
 4. The FCC Site Registration No. is 988962.
 5. The IC Site Registration No. is IC 7450F-3.

3 General Information

3.1 General Description of EUT

Product	Computer
Brand	Advantech
Test Model	TREK-733L
Sample Status	Engineering sample
Power Supply Rating	12 or 24Vdc (Car power system) 3.6Vdc (Battery)
Modulation Type	QPSK, OQPSK, HPSK
Operating Frequency	817.9MHz ~ 823.1MHz
Max. ERP Power	CDMA: 79.433mW (19.0dBm) EVDO: 79.433mW (18.7dBm)
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Stand, GPS + LTE antenna, LTE antenna, Core (For power cable), Battery
Data Cable Supplied	2.1m Display cable with 1 core 5m Coaxial cable without core (For GPS + LTE antenna) 5.1m Coaxial cable without core (For LTE antenna) 0.27m power cable with one external ferrite core

Note:

1. The EUT provides 1 completed transmitter (Fixed on chain 0) and 2 receivers.
2. The EUT uses following antennas.

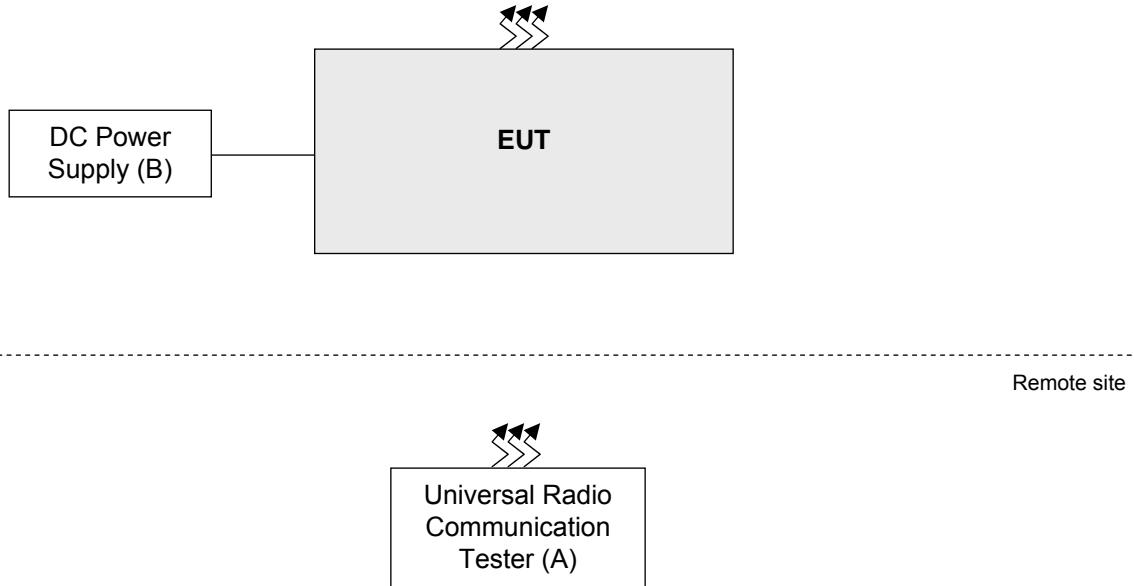
Antenna	Brand	Frequency Range (MHz)	Antenna Gain (dBi)	Antenna Type	Antenna Connector
WWAN (Main) – Chain 0	JEM	1850-1910	0.9	Dipole	SMA
		1710-1755	-0.5		
		824-849	0.5		
		777-787	0.2		
		704-716	0.2		
		1920-1980	-0.4		
WWAN (Aux) – Chain 1	JEM	1850-1910	1.2	Dipole	SMA
		1710-1755	1.8		
		824-849	-0.1		
		777-787	1		
		704-716	1		
		1920-1980	0.7		
WiFi & BT	JEM	2400-2483.5	2.87	PCB	i-pex(MHF)

3. The EUT was operated with following battery:

Battery
Brand: Formosan
Model: GP01NCR18650PF
Rating: 3.6Vdc, 2270mA

4. WLAN 2.4GHz, WWAN 2/3G and LTE 4G technologies can transmit at same time.
5. Spurious emission of the simultaneous operation (WLAN 2.4GHz, WWAN 2/3G and LTE 4G) has been evaluated and no non-compliance was found.

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.	Universal Radio Communication Tester	R&S	CMU200	123112	NA	-
B.	DC Power Supply	Topward	6603D	700637	NA	-

Note:

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

3.3 Test Mode Applicability and Tested Channel Detail

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

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
-	ERP	476 to 684	476, 580, 684	CDMA, EVDO
-	Frequency Stability	476 to 670	580	CDMA
-	Occupied Bandwidth	476 to 684	476, 580, 684	CDMA
-	Emission Masks	476 to 684	476, 580, 684	CDMA
-	Peak To Average Ratio	476 to 684	476, 580, 684	CDMA
-	Conducted Emission	476 to 684	476, 580, 684	CDMA
-	Radiated Emission Below 1GHz	476 to 670	476	CDMA
-	Radiated Emission Above 1GHz	476 to 684	476, 580, 684	CDMA

Test Condition:

Test Item	Environmental Conditions	Input Power (System)	Tested By
ERP	25deg. C, 69%RH	120Vac, 60Hz	Chris Lin
Frequency Stability	24deg. C, 64%RH	120Vac, 60Hz	Match Tsui
Occupied Bandwidth	24deg. C, 64%RH	120Vac, 60Hz	Match Tsui
Emission Masks	24deg. C, 64%RH	120Vac, 60Hz	Match Tsui
Peak To Average Ratio	24deg. C, 64%RH	120Vac, 60Hz	Match Tsui
Conducted Emission	24deg. C, 64%RH	120Vac, 60Hz	Match Tsui
Radiated Emission	24deg. C, 68%RH 25deg. C, 69%RH	120Vac, 60Hz	Chris 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

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 90

KDB 971168 D01 Power Meas License Digital Systems v02r02

ANSI/TIA/EIA-603-C 2004

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

Note: The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC).

The test report has been issued separately.

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

Per FCC Part 90.542(a)(6)(7),

Control stations and mobile stations transmitting in the 758-768 MHz band and the 788-798 MHz band are limited to 30 watts ERP.

Portable stations (hand-held devices) transmitting in the 758-768 MHz band and the 788-798 MHz band are limited to 3 watts ERP.

4.1.2 Test Procedures

EIRP / ERP MEASUREMENT:

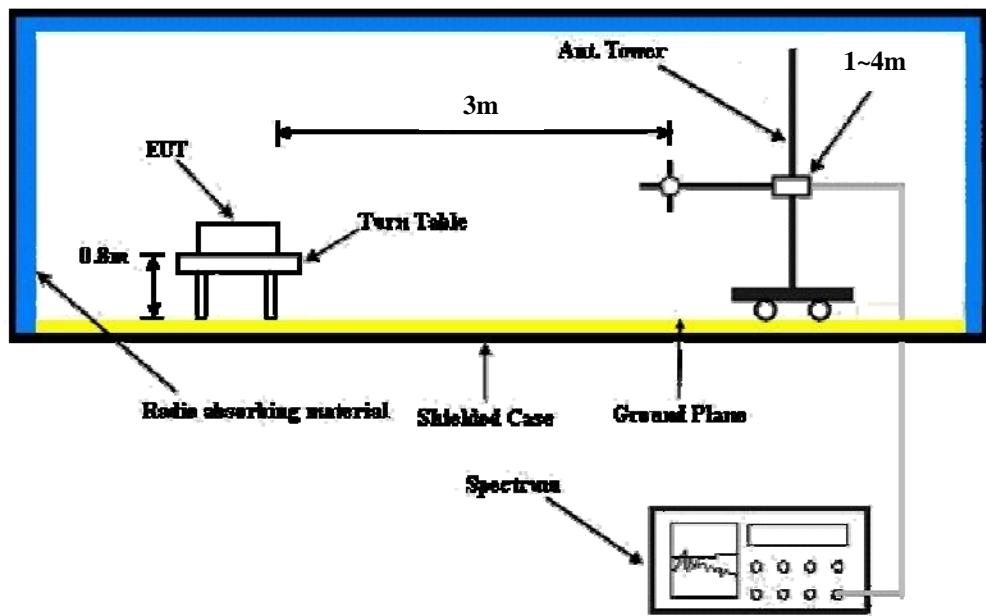
- a. The EUT was set up for the maximum power with CDMA, EVDO link data modulation. The power was measured with Agilent Spectrum Analyzer. All measurements were done at 1 channel. RWB and VBW is 5MHz for CDMA, EVDO.
- b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
- 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 power = E.I.R.P power - 2.15dBi.

Conducted Power Measurement:

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

4.1.3 Test Setup

EIRP / ERP Measurement:



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

Conducted Power Measurement:



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

4.1.4 Test Results

Conducted Output Power (dBm)

Band	CDMA2000 BC10		
Channel	476	580	684
Frequency (MHz)	817.9	820.5	823.1
RC1+SO55	23.08	23.11	23.02
RC3+SO55	23.05	23.09	22.98
RC3+SO32(+ F-SCH)	23.06	23.10	23.00
RC3+SO32(+SCH)	23.02	23.07	22.96
RTAP 153.6	23.06	23.10	22.99
RETAP 4096	23.02	23.06	22.95

CDMA Mode

MODE	TX channel 476						
------	----------------	--	--	--	--	--	--

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	817.90	-13.1	18.2	-0.2	18.0	34.8	-16.8

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	817.90	-12.9	19.2	-0.2	19.0	34.8	-15.8

MODE	TX channel 580						
------	----------------	--	--	--	--	--	--

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	820.50	-12.8	18.4	-0.1	18.3	34.8	-16.5

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	820.50	-13.1	19.0	-0.1	18.9	34.8	-15.9

MODE	TX channel 684						
------	----------------	--	--	--	--	--	--

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	823.10	-13.1	18.2	-0.1	18.1	34.8	-16.7

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	823.10	-12.9	19.1	-0.1	19.0	34.8	-15.8

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

EVDO Mode

MODE	TX channel 476						
------	----------------	--	--	--	--	--	--

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	817.90	-13.5	17.8	-0.2	17.6	34.8	-17.2

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	817.90	-13.2	18.8	-0.2	18.6	34.8	-16.2

MODE	TX channel 580						
------	----------------	--	--	--	--	--	--

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	820.50	-13.4	17.8	-0.1	17.7	34.8	-17.1

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	820.50	-13.4	18.7	-0.1	18.6	34.8	-16.2

MODE	TX channel 684						
------	----------------	--	--	--	--	--	--

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	823.10	-13.4	17.9	-0.1	17.8	34.8	-17.0

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	823.10	-13.2	18.8	-0.1	18.7	34.8	-16.1

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

4.2 Frequency Stability Measurement

4.2.1 Limits of Frequency Stability Measurement

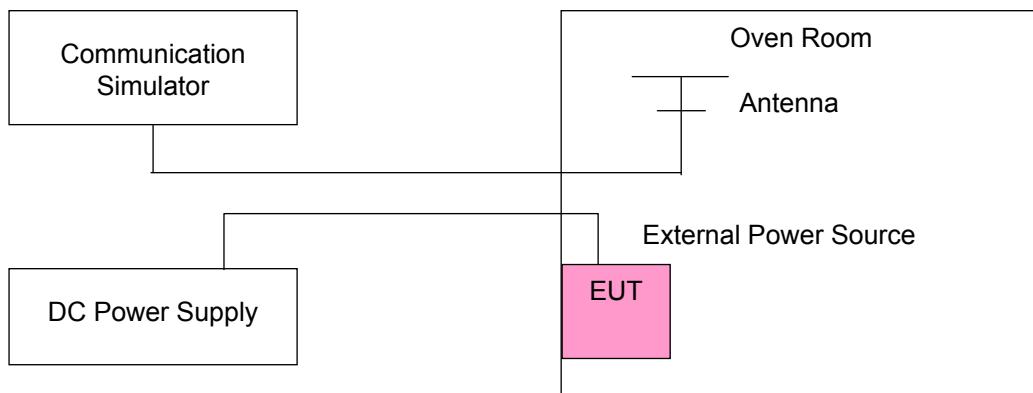
The frequency stability of mobile, portable and control transmitters operating in the wideband segment must be 1.25 parts per million or better when AFC is locked to a base station, and 5 parts per million or better when AFC is not locked.

4.2.2 Test Procedure

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

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

4.2.3 Test Setup



4.2.4 Test Results

Frequency Error vs. Voltage

Voltage (Volts)	Frequency Error (ppm)	Limit (ppm)
	CDMA	
26.4	-0.005	2.5
24	-0.004	2.5
21.6	-0.005	2.5

NOTE: The applicant defined the normal working voltage is from 21.6Vdc to 26.4Vdc.

Frequency Error vs. Temperature.

TEMP. (°C)	Frequency Error (ppm)	Limit (ppm)
	CDMA	
70	-0.008	2.5
60	-0.008	2.5
50	-0.007	2.5
40	-0.006	2.5
30	-0.006	2.5
20	-0.004	2.5
10	-0.006	2.5
0	-0.006	2.5
-10	-0.007	2.5
-20	-0.008	2.5

4.3 Occupied Bandwidth Measurement

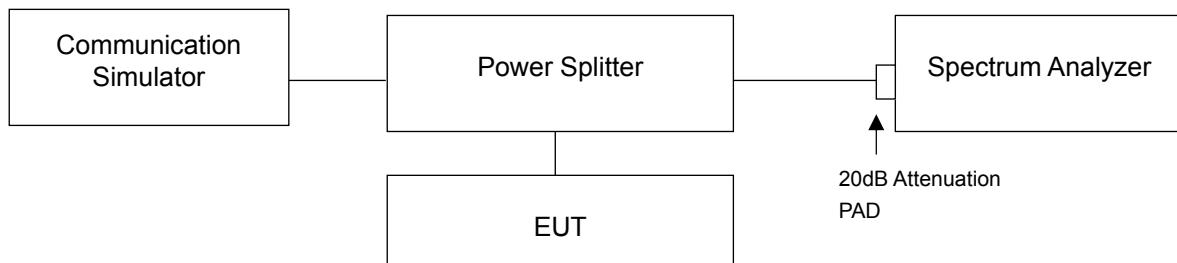
4.3.1 Limits Of Occupied Bandwidth Measurement

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.

4.3.2 Test Procedure

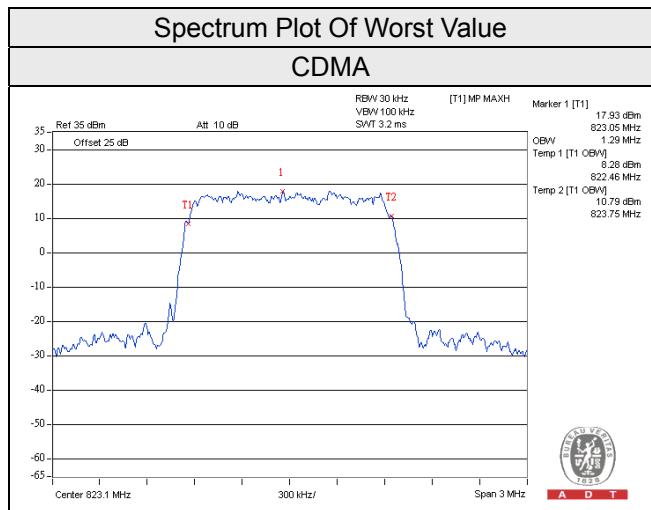
The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function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

4.3.3 Test Setup



4.3.4 Test Result

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
		CDMA
476	817.90	1.27
580	820.50	1.26
684	823.10	1.29



4.4 Emission Mask Measurement

4.4.1 Limits Of Emission Mask Measurement

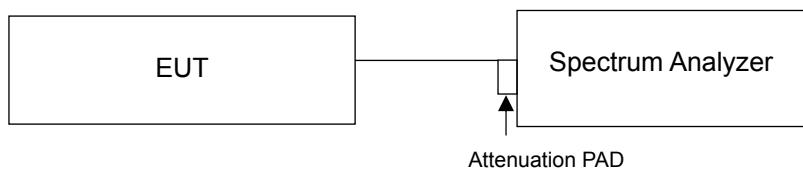
Per 90.210(n), Emission mask shall comply with 90.210(b)

- (1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.
- (2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.
- (3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB

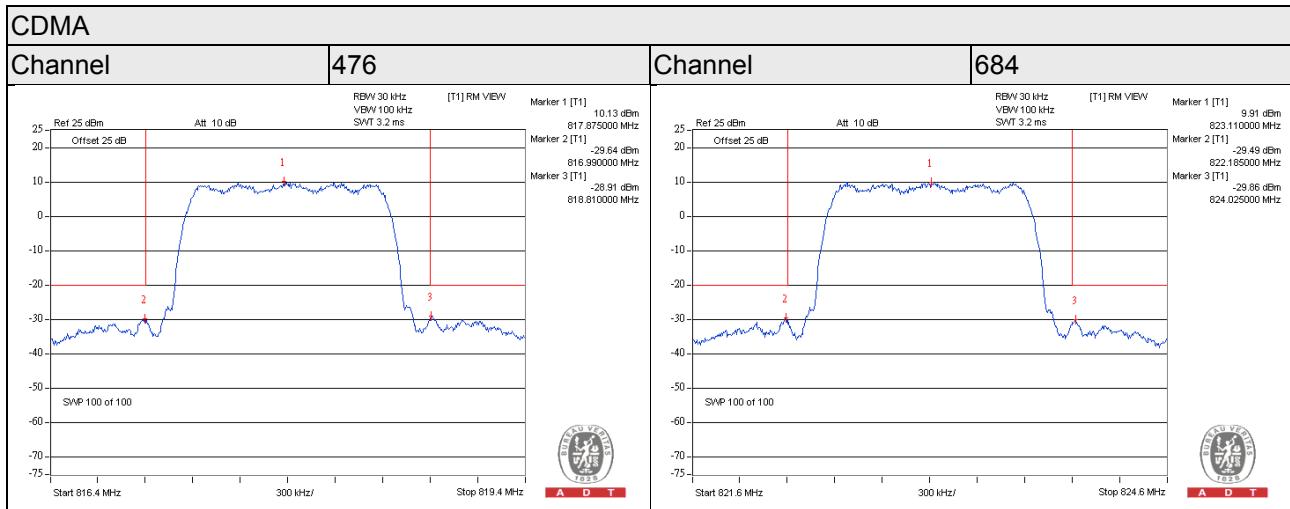
4.4.2 Test Procedures

1. The power was measured with Agilent Spectrum Analyzer. All measurements were done at 1 channel.
2. The measurement used the power splitter via EUT RF power connector between signal generator and spectrum analyzer.
3. Record the test plot.

4.4.3 Test Setup



4.4.4 Test Results

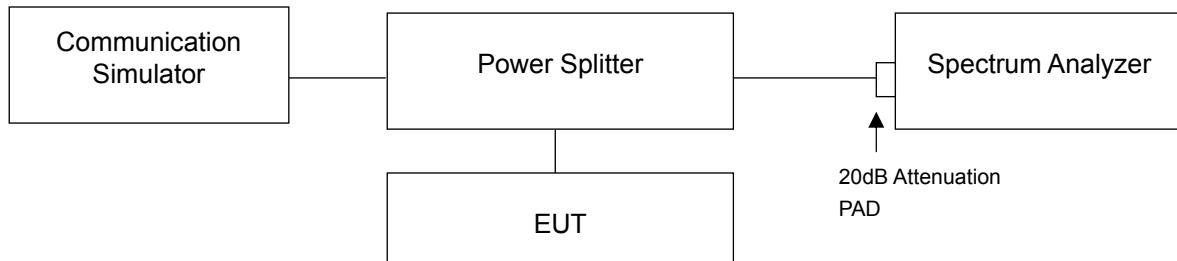


4.5 Peak To Average Ratio

4.5.1 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.

4.5.2 Test Setup

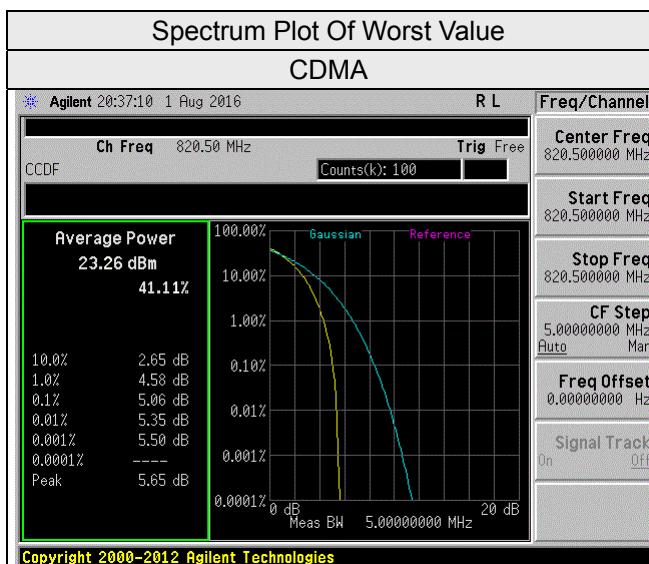


4.5.3 Test Procedures

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%.

4.5.4 Test Results

Channel	Frequency (MHz)	Peak To Average Ratio (dB)
		CDMA
476	817.90	4.90
580	820.50	5.06
684	823.10	4.58



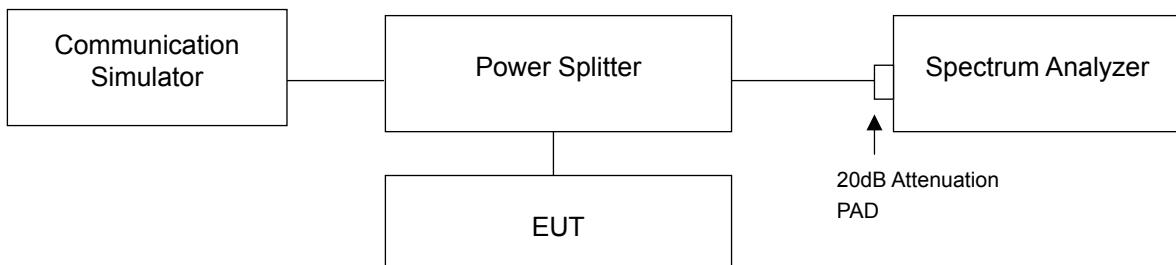
4.6 Conducted Spurious Emissions

4.6.1 Limits of Conducted Spurious Emissions Measurement

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

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

4.6.2 Test Setup

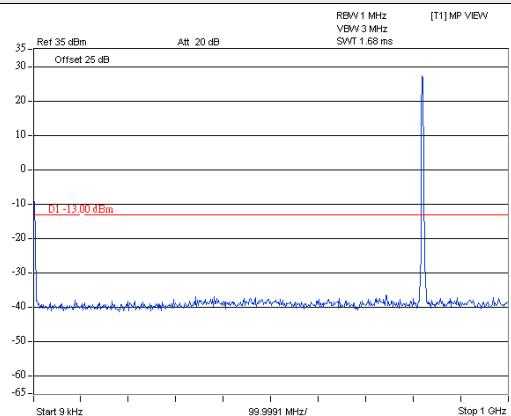
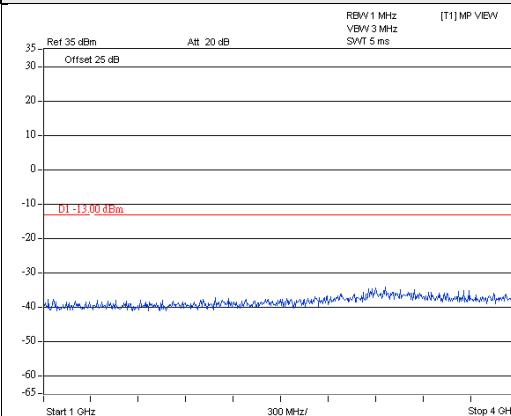
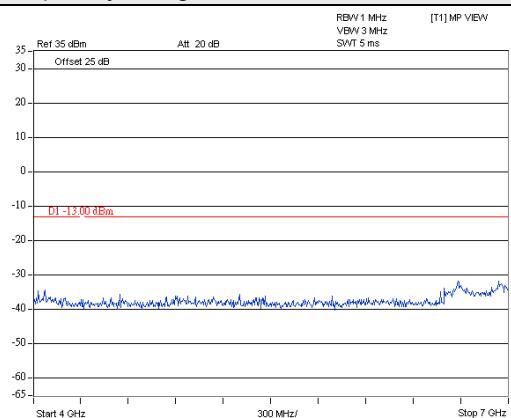
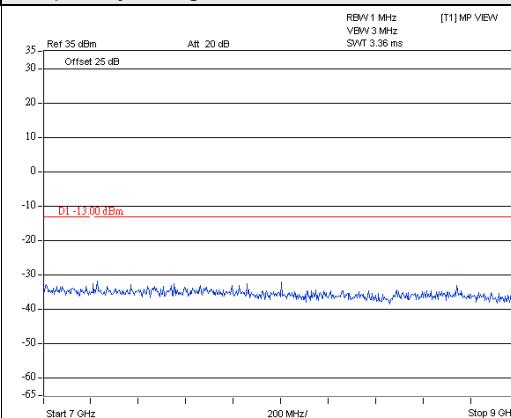


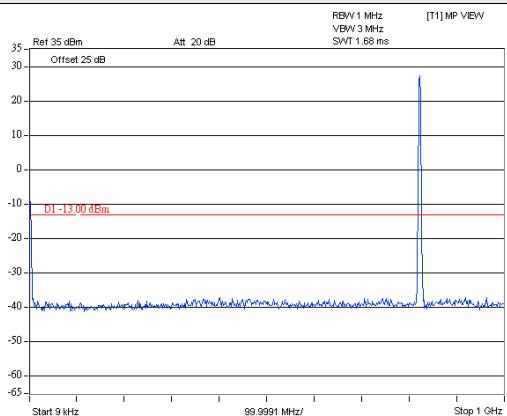
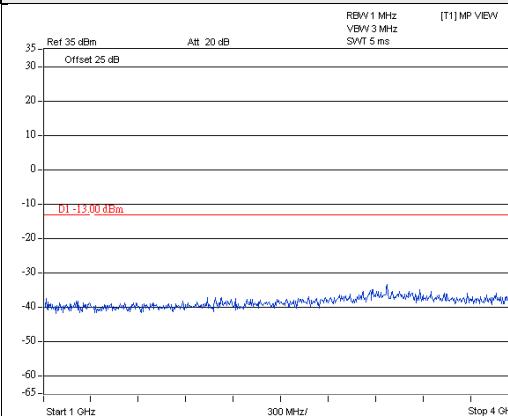
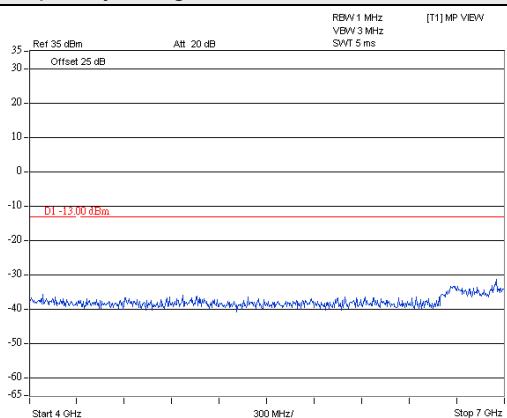
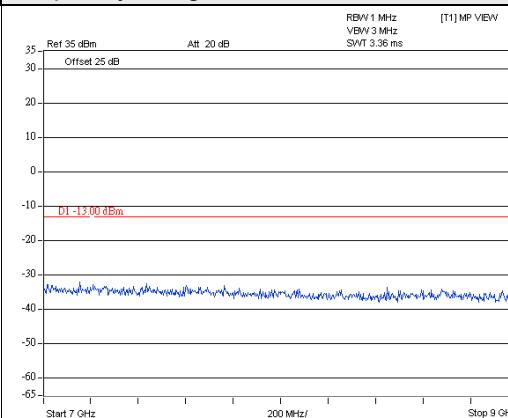
4.6.3 Test Procedure

- The EUT was set up for the maximum peak power with LTE link data modulation. The power was measured with Agilent Spectrum Analyzer.
- The conducted spurious emission used the power splitter via EUT RF power connector between signal generator and spectrum analyzer.
- When the spectrum scanned from 30MHz to 8GHz, it shall be connected to the band reject filter attenuated the carried frequency. The spectrum set RB=1MHz, VB=3MHz.

4.6.4 Test Results



CDMA
Channel 580
Frequency Range : 9kHz~1GHz

Frequency Range : 1GHz~4GHz

Frequency Range : 4GHz~7GHz

Frequency Range : 7GHz~9GHz


CDMA
Channel 684
Frequency Range : 9kHz~1GHz

Frequency Range : 1GHz~4GHz

Frequency Range : 4GHz~7GHz

Frequency Range : 7GHz~9GHz


4.7 Radiated Emission Measurement

4.7.1 Limits of Radiated Emission Measurement

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

(2) For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.

4.7.2 Test Procedure

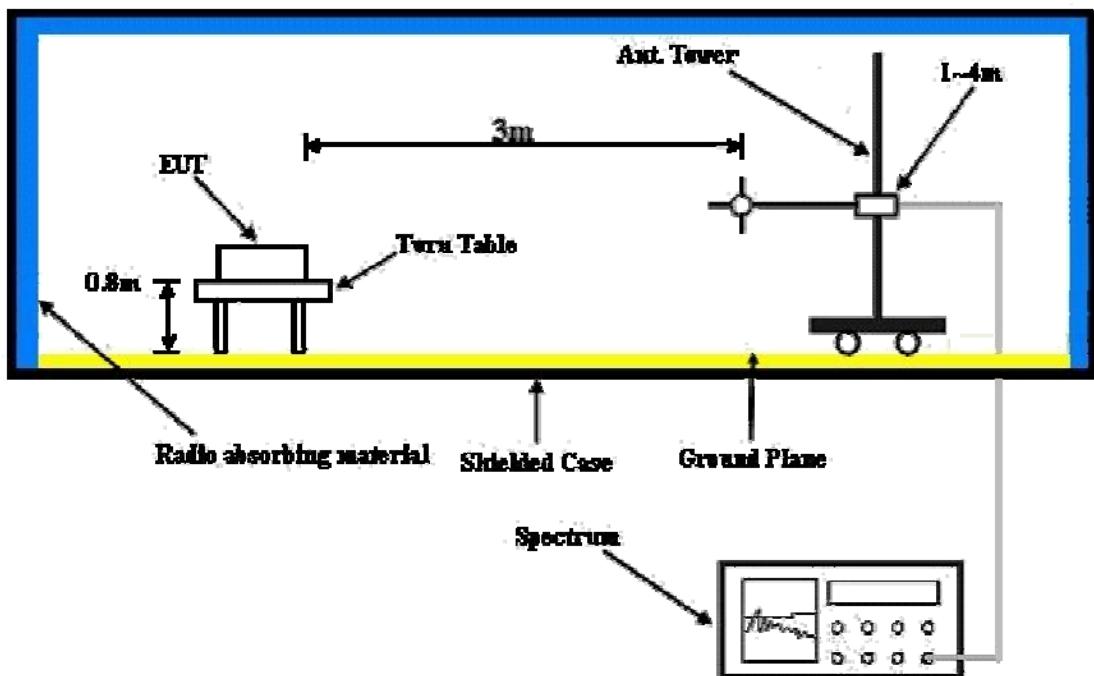
- a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from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

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

4.7.3 Deviation from Test Standard

No deviation.

4.7.4 Test Setup



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

4.7.5 Test Results

Below 1GHz

CDMA Mode

Mode	TX channel 476	Frequency Range	Below 1000 MHz
Environmental Conditions	24deg. C, 68%RH	Input Power	120Vac, 60Hz
Tested By	Chris Lin		

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	80.44	-48.3	-55.2	-1.2	-56.4	-13.0	-43.4
2	222.06	-57.1	-65.8	-1.6	-67.4	-13.0	-54.4
3	454.86	-64.8	-66.0	-2.1	-68.1	-13.0	-55.1
4	625.58	-59.8	-58.6	-2.3	-60.9	-13.0	-47.9
5	774.96	-61.0	-55.4	-2.6	-58.0	-13.0	-45.0
6	932.10	-67.2	-61.1	-1.2	-62.3	-13.0	-49.3

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	80.44	-50.1	-54.7	-1.2	-55.9	-13.0	-42.9
2	179.38	-52.0	-53.9	-1.5	-55.4	-13.0	-42.4
3	276.38	-61.4	-59.6	-1.7	-61.3	-13.0	-48.3
4	629.46	-61.9	-56.7	-2.4	-59.1	-13.0	-46.1
5	778.84	-61.6	-54.8	-2.6	-57.4	-13.0	-44.4
6	935.98	-61.1	-53.4	-1.2	-54.6	-13.0	-41.6

Remarks:

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

Above 1GHz

CDMA Mode

Mode	TX channel 476	Frequency Range	Above 1000MHz
Environmental Conditions	25deg. C, 69%RH	Input Power	120Vac, 60Hz
Tested By	Chris Lin		

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	1635.80	-43.5	-47.0	5.5	-41.5	-13.0	-28.5
2	2453.70	-52.5	-52.7	6.5	-46.2	-13.0	-33.2
3	3271.60	-55.1	-53.0	6.9	-46.1	-13.0	-33.1

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	1635.80	-43.1	-44.5	5.5	-39.0	-13.0	-26.0
2	2453.70	-55.0	-52.9	6.5	-46.4	-13.0	-33.4
3	3271.60	-57.4	-53.8	6.9	-46.9	-13.0	-33.9

Remarks:

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

Mode	TX channel 580	Frequency Range	Above 1000MHz
Environmental Conditions	25deg. C, 69%RH	Input Power	120Vac, 60Hz
Tested By	Chris Lin		

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	1641.00	-44.0	-47.4	5.5	-41.9	-13.0	-28.9
2	2461.50	-52.1	-52.3	6.5	-45.8	-13.0	-32.8
3	3282.00	-54.3	-52.3	6.9	-45.4	-13.0	-32.4

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	1641.00	-43.2	-44.5	5.5	-39.0	-13.0	-26.0
2	2461.50	-57.5	-55.2	6.5	-48.7	-13.0	-35.7
3	3282.00	-57.6	-54.0	6.9	-47.1	-13.0	-34.1

Remarks:

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

Mode	TX channel 684	Frequency Range	Above 1000MHz
Environmental Conditions	25deg. C, 69%RH	Input Power	120Vac, 60Hz
Tested By	Chris Lin		

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	1646.20	-45.0	-48.2	5.5	-42.7	-13.0	-29.7
2	2469.30	-50.5	-50.6	6.5	-44.1	-13.0	-31.1
3	3292.40	-58.8	-56.8	6.9	-49.9	-13.0	-36.9

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	1646.20	-46.1	-47.2	5.5	-41.7	-13.0	-28.7
2	2469.30	-55.5	-53.1	6.5	-46.6	-13.0	-33.6
3	3292.40	-57.8	-54.3	6.9	-47.4	-13.0	-34.4

Remarks:

1. Output Power (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 on 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 accredited and approved according to ISO/IEC 17025.

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

Linko EMC/RF Lab

Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565
Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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

--- END ---