

FCC RF Test Report

APPLICANT : Razer (Asia-Pacific) Pte Ltd.
EQUIPMENT : Charging Dock
BRAND NAME : Razer
MODEL NAME : RC30-004702
FCC ID : WX9RC30004702
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : Digital Transmission System (DTS)

The product was received on Sep. 28, 2010 and completely tested on Nov. 13, 2010. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.4-2003 and shown the compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:



Anderson Chiu / Deputy Manager



SPORTON INTERNATIONAL INC.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR092824-01	Rev. 01	Initial issue of report	Dec. 17, 2010

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	A8.2(a)	6dB Bandwidth	$\geq 0.5\text{MHz}$	Pass	-
3.1	-	Gen 4.4.1	99% Bandwidth	-	Pass	-
3.2	15.247(b)	A8.4	Power Output	$\leq 30\text{dBm}$	Pass	-
3.3	15.247(d)	A8.5	Frequency Band Edges	$\leq 20\text{dBc}$	Pass	-
3.4	15.247(d)	A8.5	Spurious Emission	$< 20\text{ dBc}$	Pass	-
3.5	15.247(e)	A8.2(b)	Power Spectral Density	$\leq 8\text{dBm}$	Pass	-
3.6	-	-	Number of Channels	-	Pass	-
3.7	15.207	Gen 7.2.2	AC Conducted Emission	15.207(a)	Pass	Under limit 6.6 dB at 0.262 MHz
3.8	15.247(d)	A8.5	Transmitter Radiated Emission	15.209(a) & 15.247(d)	Pass	Under limit 3.79 dB at 2387.9 MHz
3.9	15.203 & 15.247(b)	A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Razer (Asia-Pacific) Pte Ltd.

514 Chai Chee Lane #07-01~06 Singapore 469029

1.2 Manufacturer

Merry Electronics (Shenzhen) CO., LTD.

No. 50, MeiBao Road, Dalang Street, BaoAn District, Shenzhen City, Guangdong Province, China

1.3 Feature of Equipment Under Test

Product Feature & Specification	
Equipment	Charging Dock
Brand Name	Razer
Model Name	RC30-004702
FCC ID	WX9RC30004702
Tx/Rx Frequency Range	2404 MHz ~ 2476 MHz
Number of Channels	25
Maximum Output Power to Antenna	11.79 dBm (0.015 W)
Antenna Type	PCB Antenna with gain -2 dBi
HW Version	R1
SW Version	BBACHTX_1012_TF
Type of Modulation	GFSK
EUT Stage	Production Unit

Remark:

1. This test report recorded only product characteristics and test results of Digital Transmission System (DTS).
2. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Testing Site

Test Site	SPORTON INTERNATIONAL INC.		
Test Site Location	No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-3273456 / FAX: +886-3-3284978		
Test Site No.	Sporton Site No.		FCC/IC Registration No.
	CO05-HY	03CH05-HY	722060/4086B-1

1.5 Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 (Measurement Guidelines of DTS)
- ANSI C63.4-2003
- IC RSS-210 Issue 7

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B (DoC), recorded in a separate test report.

2 Test Configuration of Equipment Under Test

2.1 Test Mode

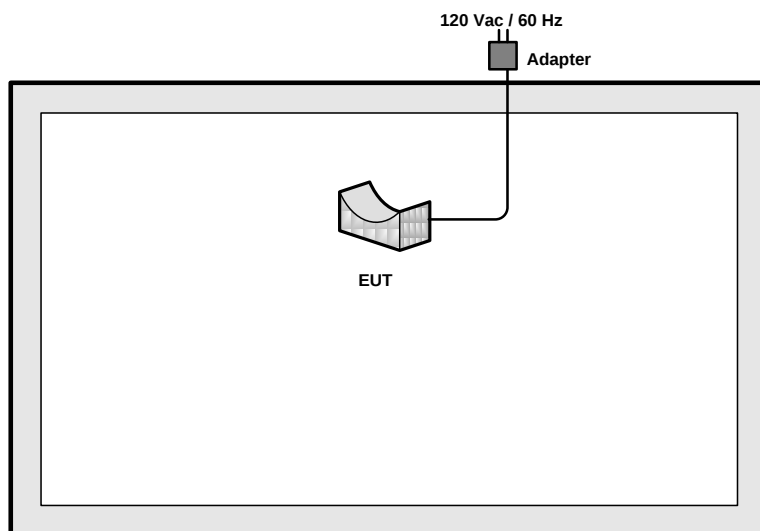
The EUT has been associated with peripherals pursuant to ANSI C63.4-2003 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conducted emission (150 kHz to 30 MHz), radiated emission (30 MHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

The following tables are showing the test modes as the worst cases and recorded in this report.

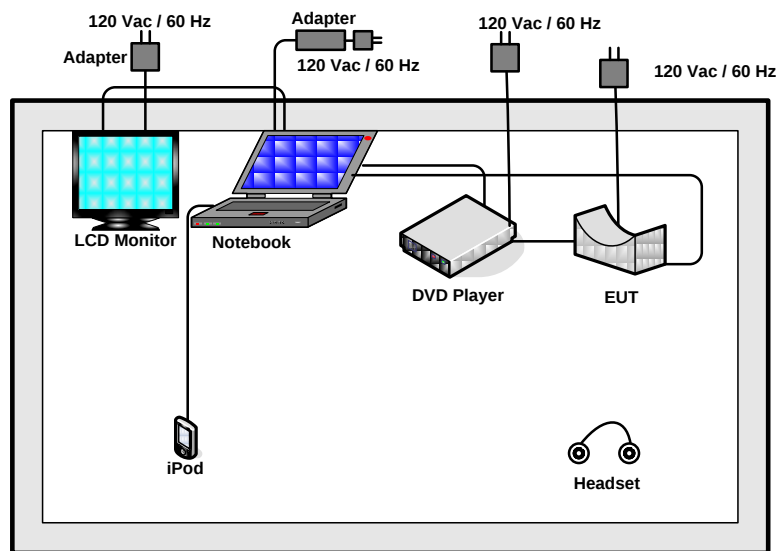
Test Cases	
Test Item	GFSK
Conducted TCs	Mode 1 : Low Ch_2404 MHz Mode 2 : Mid Ch_2440 MHz Mode 3 : High Ch_2476 MHz
Radiated TCs	Mode 1 : Low Ch_2404 MHz (Ant-0) Mode 2 : Mid Ch_2440 MHz (Ant-0) Mode 3 : High Ch_2476 MHz (Ant-0)
AC Conducted Emission	Mode 1 : Headset wireless link (stand alone) + Dock wireless link with DVD Player (MP3 Play) + Notebook (recording)

2.2 Connection Diagram of Test System

<Radiation>



<Conduction Test>





2.3 RF Utility

The programmed RF utility is to provide channel selection, power level, data rate and the application type. RF Utility can send transmitting signal for all testing. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

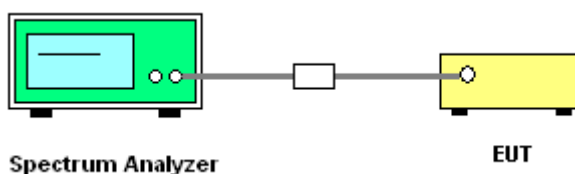
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 (Measurement Guidelines of DTS).
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz.
In order to make an accurate measurement, set the span greater than RBW. The 6 dB bandwidth must be greater than 500 kHz.
4. The marker-delta reading at this point is the 6 dB bandwidth of the emission.

3.1.4 Test Setup



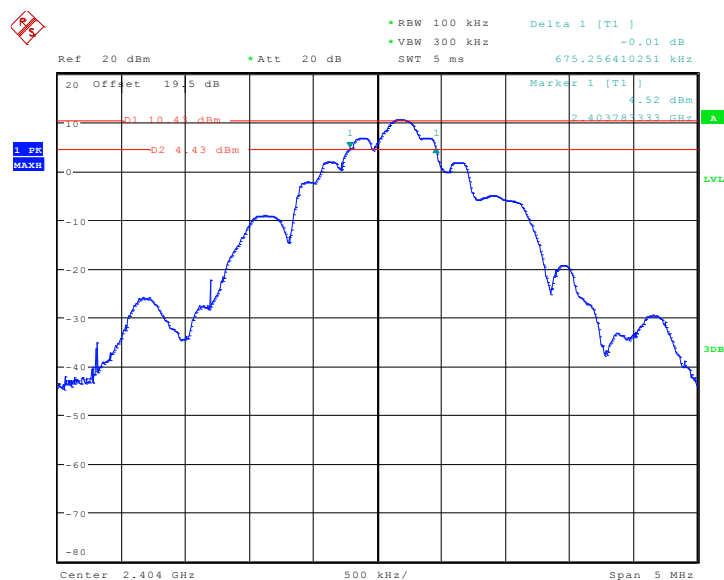


3.1.5 Test Result of 6dB Bandwidth

Test Mode :	Mode 1, 2, 3	Temperature :	24~26℃
Test Engineer :	Alan Liu	Relative Humidity :	50~53%

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
Low	2404	0.68	0.5	Pass
Mid	2440	0.70	0.5	Pass
High	2476	0.62	0.5	Pass

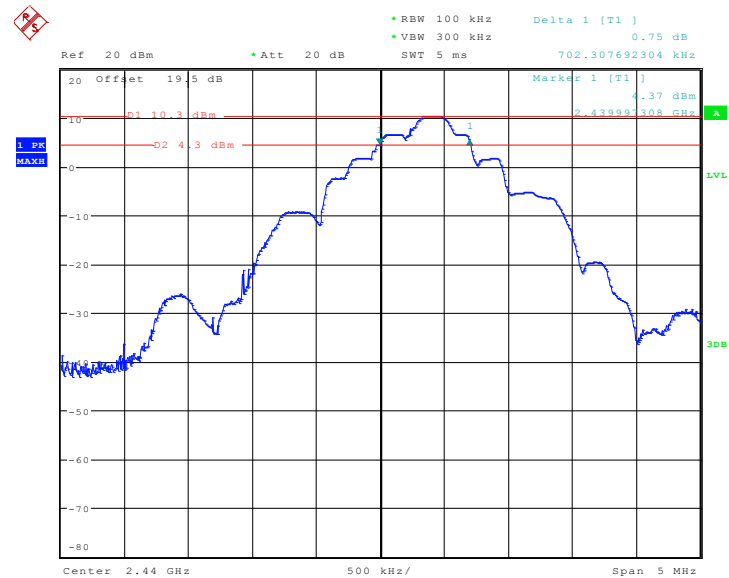
Mode 1 : 6 dB Bandwidth Plot on Low Channel



Date: 13.NOV.2010 14:26:55

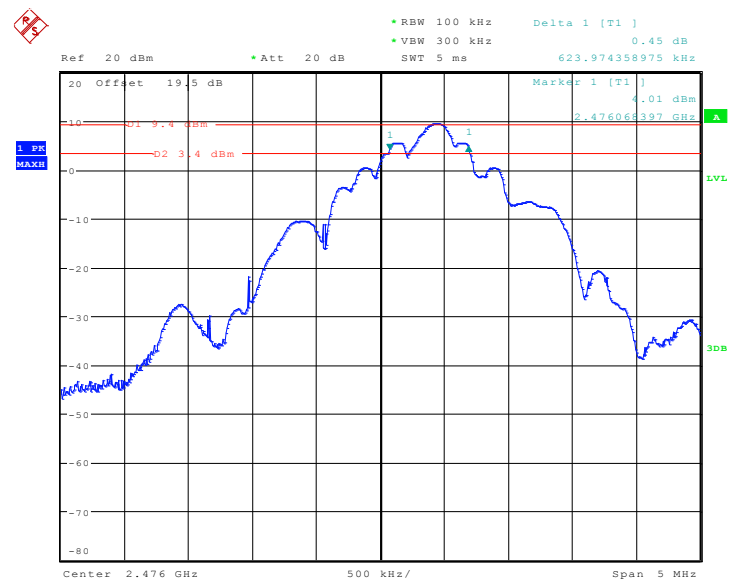


Mode 2 : 6 dB Bandwidth Plot on Mid Channel



Date: 13.NOV.2010 14:52:49

Mode 3 : 6 dB Bandwidth Plot on High Channel



Date: 13.NOV.2010 15:20:22

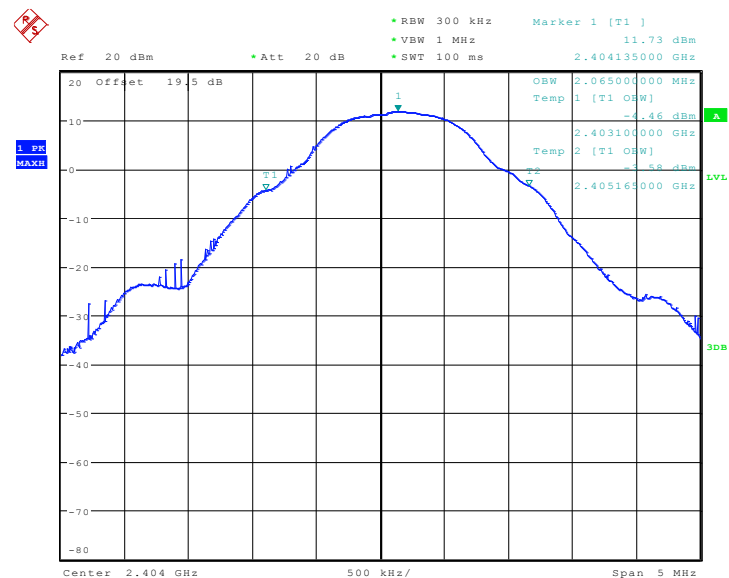


3.1.6 Test Result of 99% Occupied Bandwidth

Test Mode :	Mode 1, 2, 3	Temperature :	24~26℃
Test Engineer :	Alan Liu	Relative Humidity :	50~53%

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Pass/Fail
Low	2404	2.07	Pass
Mid	2440	2.10	Pass
High	2476	2.04	Pass

Mode 1 : 99% Occupied Bandwidth Plot on Low Channel



Date: 13.NOV.2010 14:28:01

3.2 Output Power Measurement

3.2.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna of directional gain greater than 6dBi are used the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

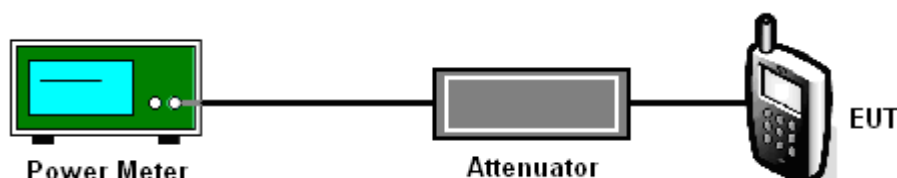
3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

3.2.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 (Measurement Guidelines of DTS).
2. The RF output of EUT was connected to the power meter by a low loss cable. Measure the power by power meter.

3.2.4 Test Setup



3.2.5 Test Result of Output Power

Test Mode :	Mode 1, 2, 3	Temperature :	24~26°C
Test Engineer :	Alan Liu	Relative Humidity :	50~53%

Channel	Frequency (MHz)	Measured Output Power (dBm)	Max. Limits (dBm)	Pass/Fail
Low	2404	11.43	30	Pass
Mid	2440	11.79	30	Pass
High	2476	11.23	30	Pass

3.3 Band Edges Measurement

3.3.1 Limit of Band Edges

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB.

3.3.2 Measuring Instruments

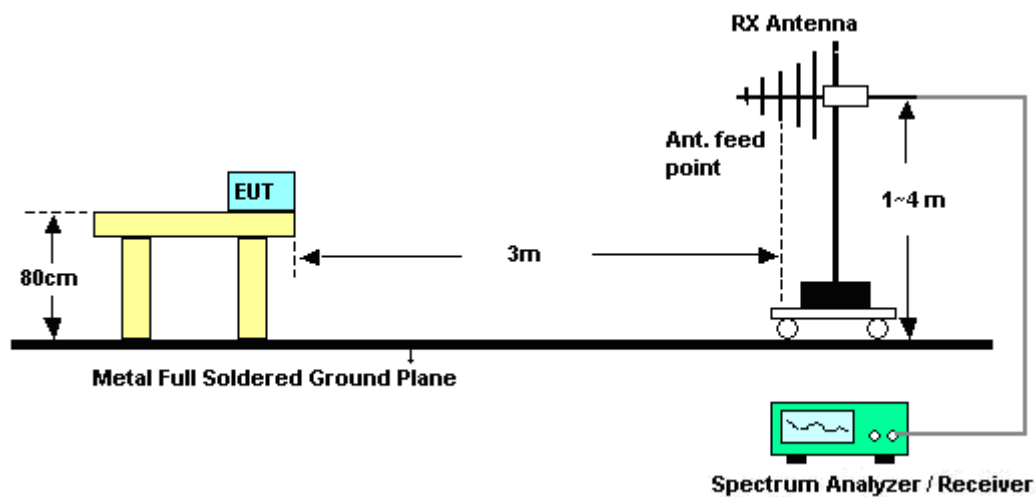
See list of measuring instruments of this test report.

3.3.3 Test Procedures

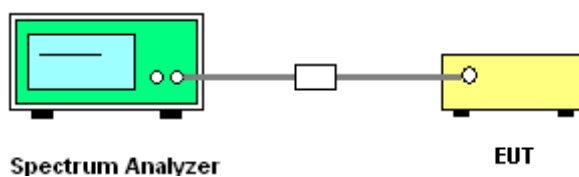
1. The testing follows the guidelines in ANSI C63.4-2003 and FCC KDB Publication No. 558074 (Measurement Guidelines of DTS).
2. Conducted emission test: Set RBW = 100 kHz, Video bandwidth (VBW) $\geq$ RBW. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW. Note: If the device complies with the use of power option 2 the attenuation under this paragraph shall be 30 dB instead of 20 dB.
3. Radiated emission test: Apply to band edge emissions that fall in the restricted bands listed in FCC Section 15.205. The maximum permitted average field strength is listed in FCC Section 15.209. A pre-amp is necessary for this measurement. For measurements above 1 GHz, set RBW = 1MHz, VBW = 10 Hz, Sweep=Auto. If the emission is pulsed, modify the unit for continuous operation; use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation as in FCC Section 15.35(b) and (c).

3.3.4 Test Setup

<Radiated Band Edges>



<Conducted Band Edges>



3.3.5 Test Result of Radiated Band Edges

Test Mode :	Mode 1	Temperature :	21~24℃
Test Channel :	Low	Relative Humidity :	50~53%
Test Engineer :	Wii Chen		

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2388.09	59.44	-14.56	74	57.35	31.7	4.47	34.08	102	116	Peak
2388.09	45.79	-8.21	54	43.7	31.7	4.47	34.08	102	116	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2387.9	63.09	-10.91	74	61	31.7	4.47	34.08	103	123	Peak
2387.9	50.21	-3.79	54	48.12	31.7	4.47	34.08	103	123	Average

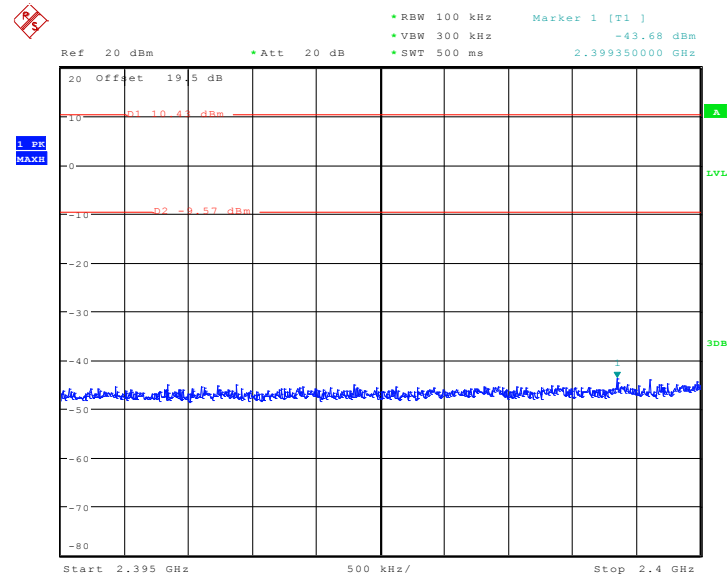
Test Mode :	Mode 3	Temperature :	21~24℃
Test Channel :	High	Relative Humidity :	50~53%
Test Engineer :	Wii Chen		

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2492.21	60.22	-13.78	74	57.88	31.8	4.62	34.08	111	228	Peak
2492.21	47.37	-6.63	54	45.03	31.8	4.62	34.08	111	228	Average

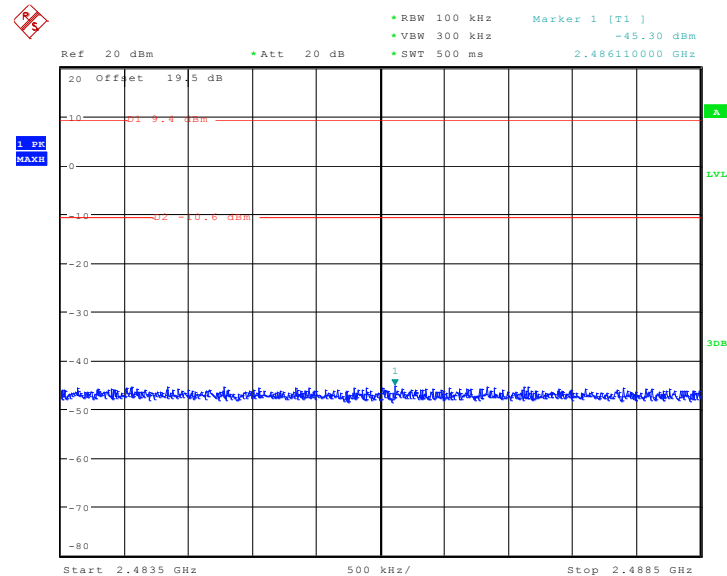
ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2492.4	60.57	-13.43	74	58.23	31.8	4.62	34.08	100	123	Peak
2492.4	48.46	-5.54	54	46.12	31.8	4.62	34.08	100	123	Average

**3.3.6 Test Plots of Conducted Band Edges**

Test Mode :	Mode 1 and 3	Temperature :	24~26℃
Test Channel :	Low and High	Relative Humidity :	50~53%
Test Engineer :	Alan Liu		

Low Band Edge Plot

Date: 13.NOV.2010 14:50:24

High Band Edge Plot

Date: 13.NOV.2010 15:21:49

3.4 Spurious Emission Measurement

3.4.1 Limit of Spurious Emission Measurement

All harmonics/spurs must be at least 20 dB down from the highest emission level within the authorized band.

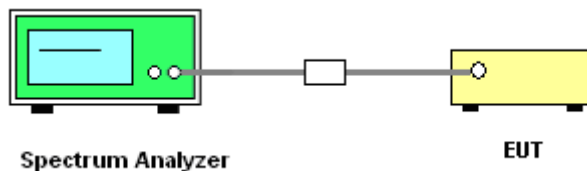
3.4.2 Measuring Instruments

See list of measuring instruments of this test report.

3.4.3 Test Procedure

1. The transmitter output was connected to the spectrum analyzer via a low lose cable.
2. Set RBW = 100 kHz, Video bandwidth (VBW) $\geq$ RBW, scan up through 10th harmonic. All harmonics/spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.

3.4.4 Test Setup

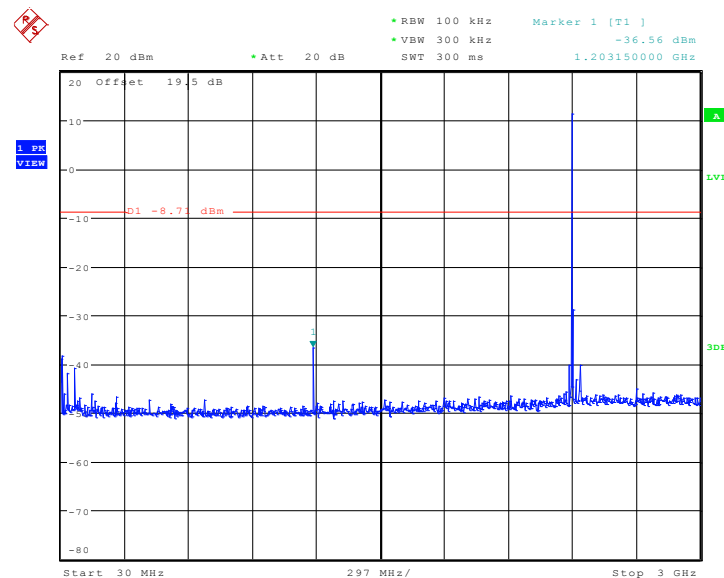




3.4.5 Test Plots of Spurious Emission

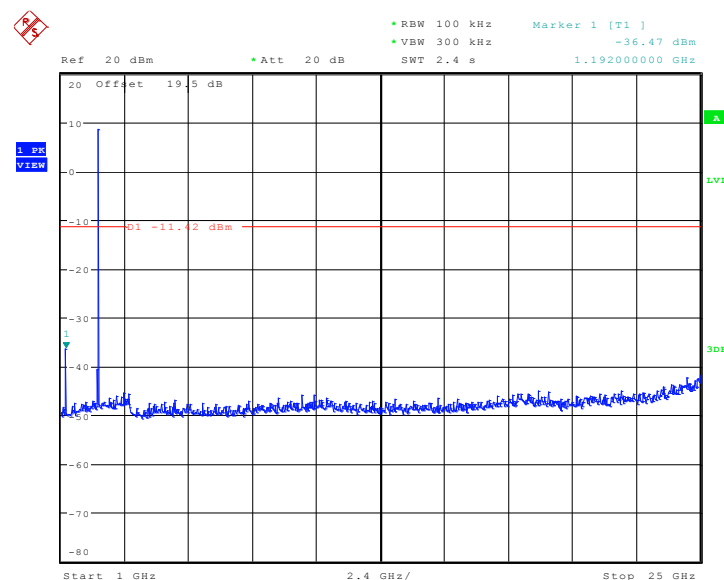
Test Mode :	Mode 1	Temperature :	24~26°C
Test Channel :	Low	Relative Humidity :	50~53%
Test Engineer :	Alan Liu		

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz



Date: 13.NOV.2010 14:37:03

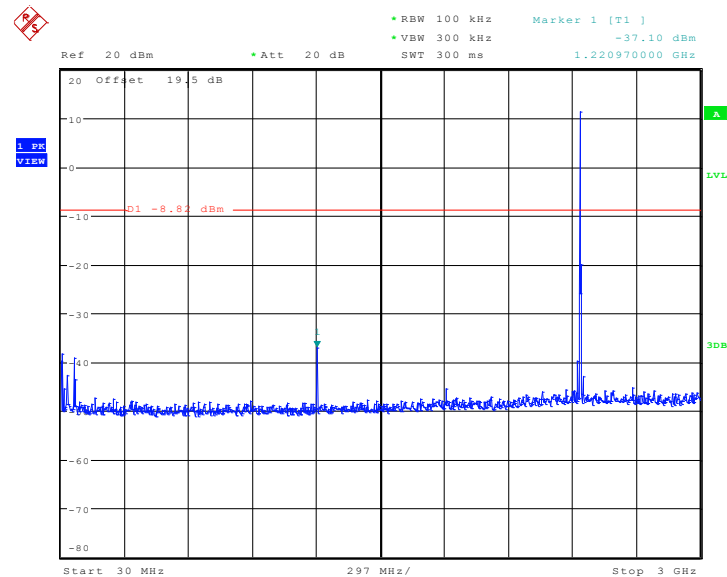
Conducted Spurious Emission Plot between 1 GHz ~ 25 GHz



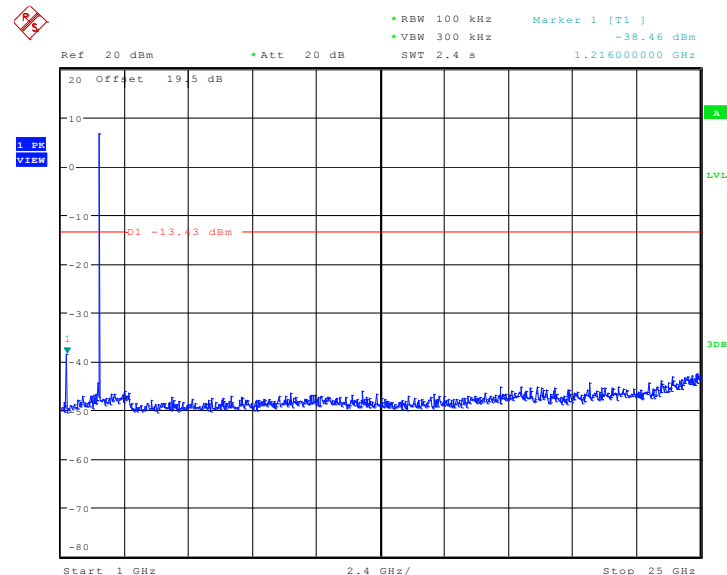
Date: 13.NOV.2010 14:37:19



Test Mode :	Mode 2	Temperature :	24~26°C
Test Channel :	Mid	Relative Humidity :	50~53%
Test Engineer :	Alan Liu		

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz

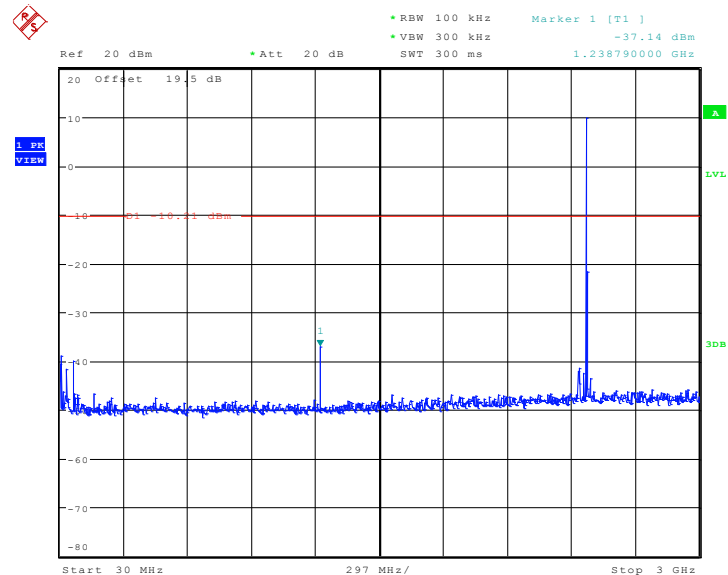
Date: 13.NOV.2010 15:02:33

Conducted Spurious Emission Plot between 1 GHz ~ 25 GHz

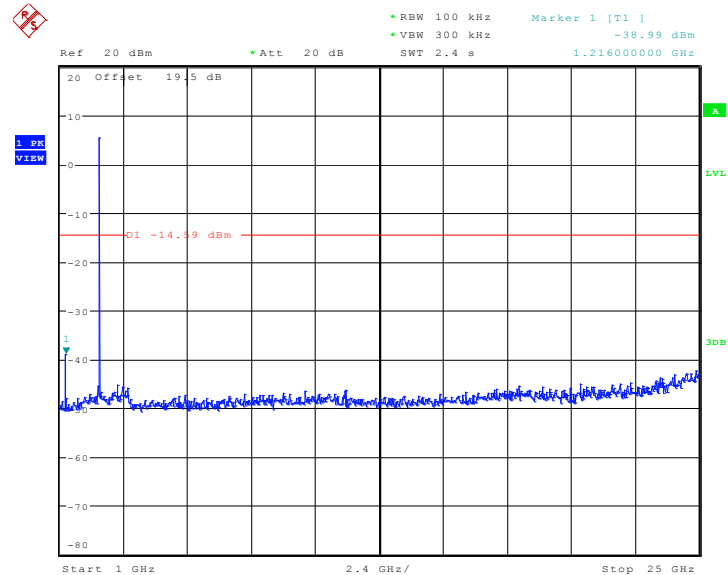
Date: 13.NOV.2010 15:02:50



Test Mode :	Mode 3	Temperature :	24~26°C
Test Channel :	High	Relative Humidity :	50~53%
Test Engineer :	Alan Liu		

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz

Date: 13.NOV.2010 15:18:41

Conducted Spurious Emission Plot between 1 GHz ~ 25 GHz

Date: 13.NOV.2010 15:18:58

3.5 Power Spectral Density Measurement

3.5.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

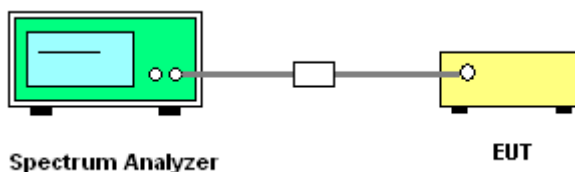
3.5.2 Measuring Instruments

See list of measuring instruments of this test report.

3.5.3 Test Procedures

1. The test follows FCC KDB Publication No. 558074 (Measurement Guidelines of DTS).
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. Take the measured data from spectrum analyzer.

3.5.4 Test Setup

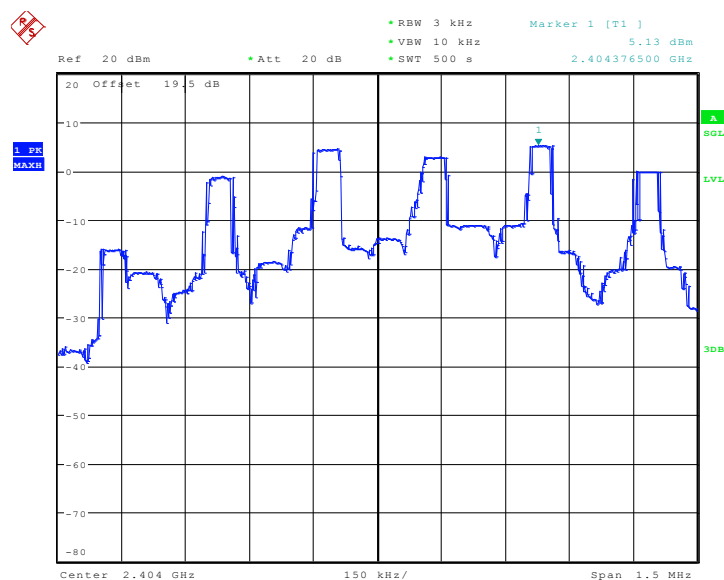


3.5.5 Test Result of Power Spectral Density

Test Mode :	Mode 1, 2, 3	Temperature :	24~26℃
Test Engineer :	Alan Liu	Relative Humidity :	50~53%

Channel	Frequency (MHz)	Measured PSD (dBm)	Max. Limits (dBm)	Pass/Fail
Low	2404	5.13	8	Pass
Mid	2440	5.01	8	Pass
High	2476	3.78	8	Pass

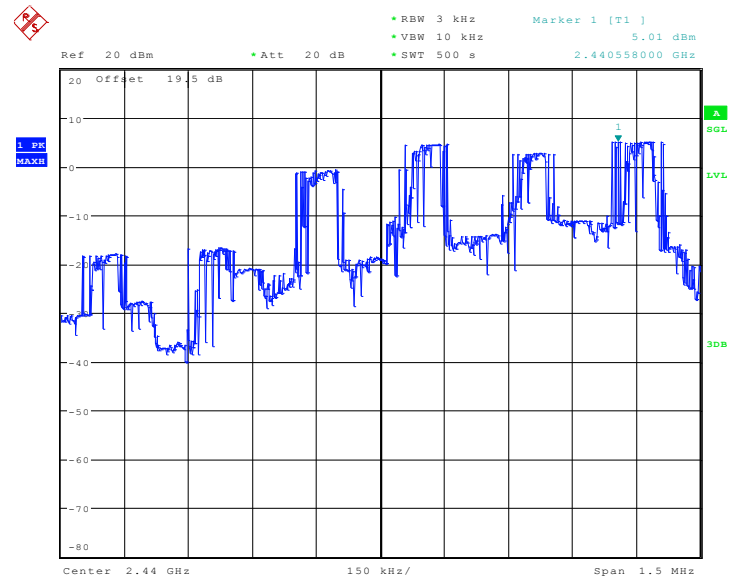
Mode 1 : PSD Plot on Low Channel



Date: 13.NOV.2010 14:36:42

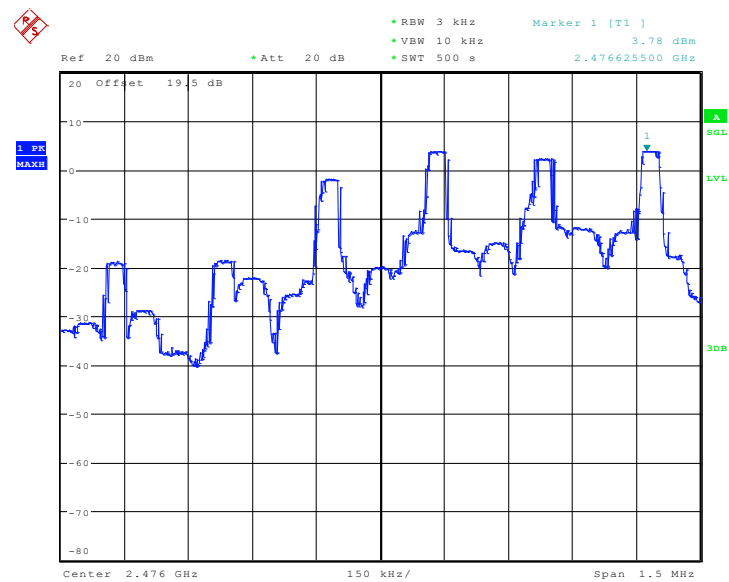


Mode 2 : PSD Plot on Mid Channel



Date: 13.NOV.2010 15:02:12

Mode 3 : PSD Plot on High Channel



Date: 13.NOV.2010 15:18:20

3.6 Number of Channel Measurement

3.6.1 Limits of Number of Hopping Frequency

Since this is a hybrid device, there is no minimum of hopping channels limit.

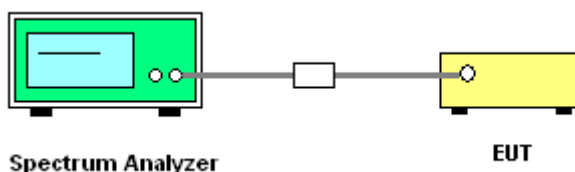
3.6.2 Measuring Instruments

See list of measuring instruments of this test report.

3.6.3 Test Procedure

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. The modulation types of EUT are irrelevant to number of hopping channels deviation.
4. The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:
Span = the frequency band of operation; $RBW \geq 1\%$ of the span; $VBW \geq RBW$; Sweep = auto;
Detector function = peak; Trace = max hold.
5. The number of hopping frequency used is defined as the device has the numbers of total channel.

3.6.4 Test Setup

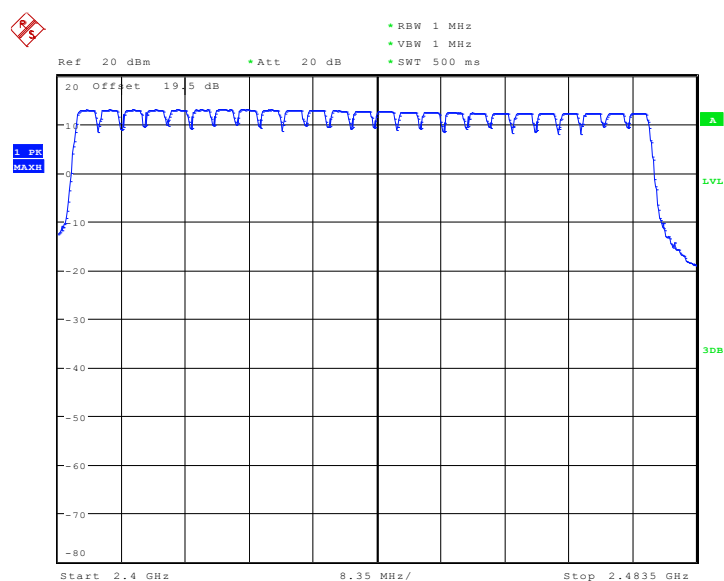




3.6.5 Test Result of Number of Hopping Frequency

Test Mode :	Mode 1~3	Temperature :	24~26℃
Test Engineer :	Alan Liu	Relative Humidity :	50~53%
Number of Hopping Channels (Channel)		Limits (Channel)	
25		N/A	

Number of Hopping Channel Plot



Date: 13.NOV.2010 16:48:04

3.7 AC Conducted Emission Measurement

3.7.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

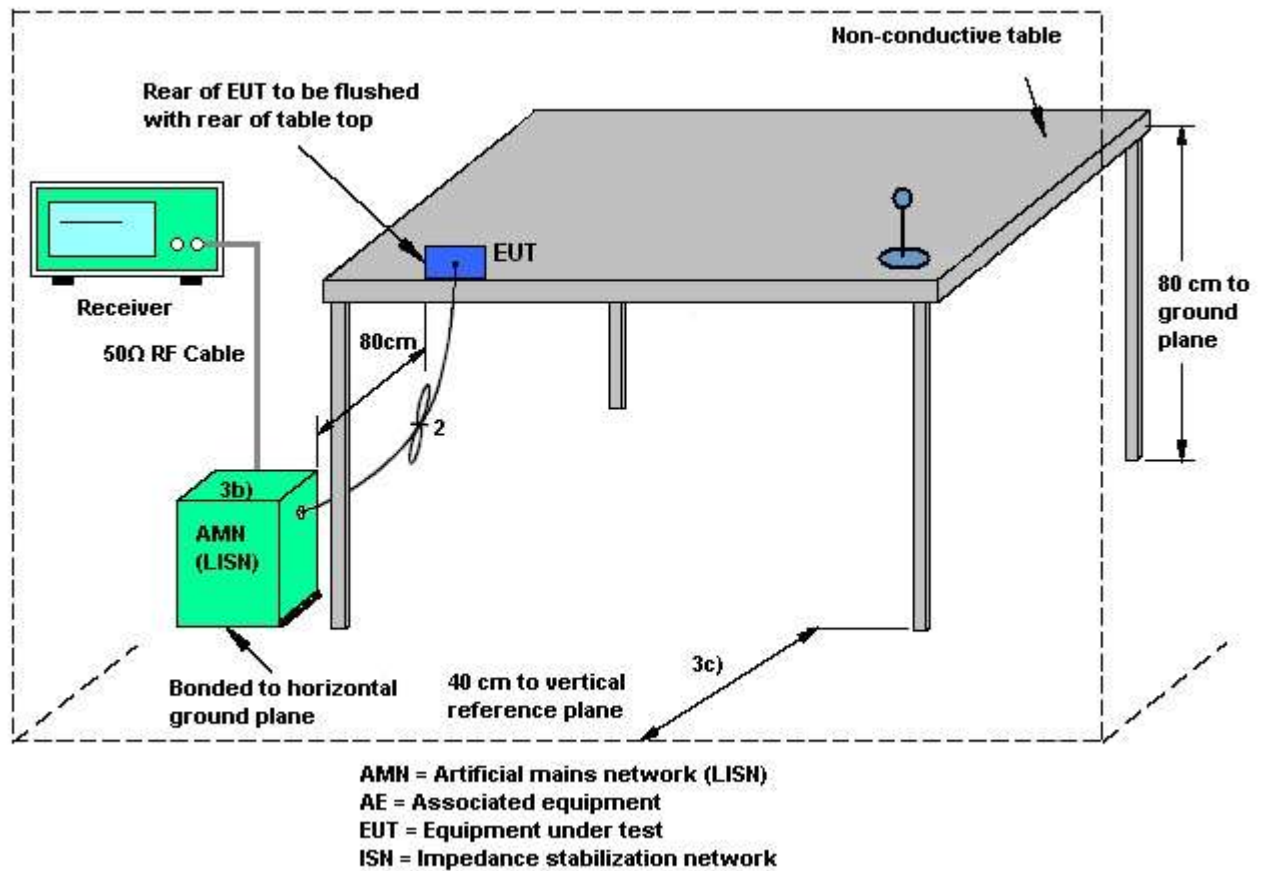
3.7.2 Measuring Instruments

See list of measuring instruments of this test report.

3.7.3 Test Procedures

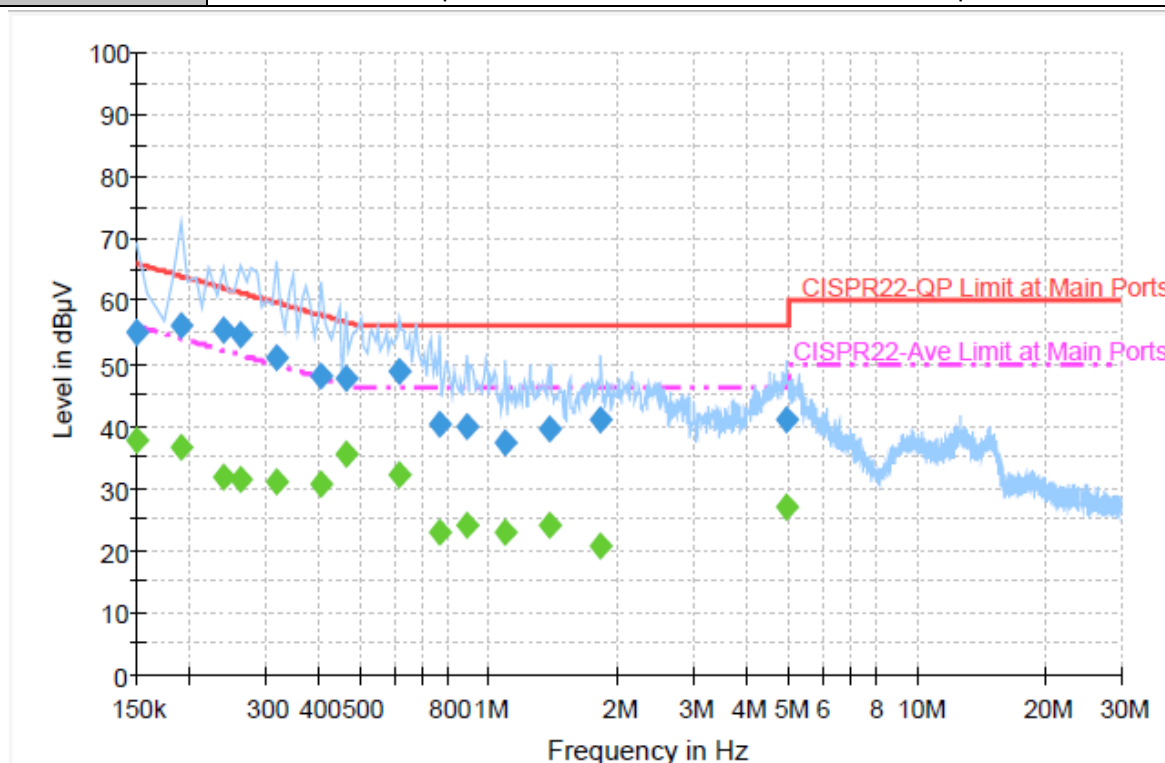
6. The testing follows the guidelines in ANSI C63.4-2003.
7. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
8. Connect EUT to the power mains through a line impedance stabilization network (LISN).
9. All the support units are connecting to the other LISN.
10. The LISN provides 50 ohm coupling impedance for the measuring instrument.
11. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
12. Both sides of AC line were checked for maximum conducted interference.
13. The frequency range from 150 kHz to 30 MHz was searched.
14. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

3.7.4 Test Setup



3.7.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	20~22°C
Test Engineer :	Novic Chiang	Relative Humidity :	44~46%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	Headset wireless link (stand alone) + Dock wireless link with DVD Player (MP3 Play) + Notebook (recording)		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Final Result 1

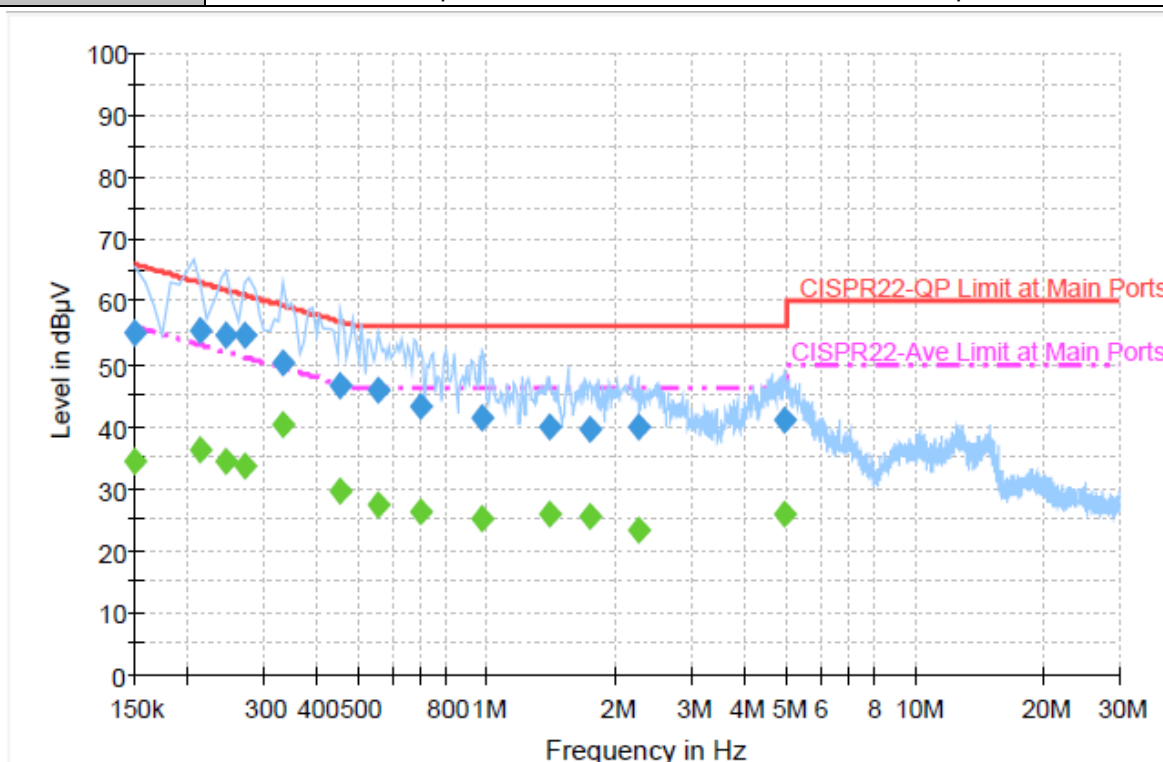
Frequency (MHz)	QuasiPeak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	55.1	Off	L1	19.4	10.9	66.0
0.190000	56.1	Off	L1	19.4	7.9	64.0
0.238000	55.3	Off	L1	19.4	6.9	62.2
0.262000	54.8	Off	L1	19.3	6.6	61.4
0.318000	51.1	Off	L1	19.3	8.7	59.8
0.406000	48.1	Off	L1	19.4	9.6	57.7
0.462000	47.5	Off	L1	19.3	9.2	56.7
0.614000	48.7	Off	L1	19.3	7.3	56.0
0.766000	40.3	Off	L1	19.4	15.7	56.0
0.886000	39.8	Off	L1	19.4	16.2	56.0
1.094000	37.3	Off	L1	19.4	18.7	56.0
1.382000	39.7	Off	L1	19.4	16.3	56.0
1.822000	41.0	Off	L1	19.5	15.0	56.0
4.974000	40.8	Off	L1	19.6	15.2	56.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	37.6	Off	L1	19.4	18.4	56.0
0.190000	36.6	Off	L1	19.4	17.4	54.0
0.238000	31.7	Off	L1	19.4	20.5	52.2
0.262000	31.5	Off	L1	19.3	19.9	51.4
0.318000	31.0	Off	L1	19.3	18.8	49.8
0.406000	30.6	Off	L1	19.4	17.1	47.7
0.462000	35.4	Off	L1	19.3	11.3	46.7
0.614000	32.0	Off	L1	19.3	14.0	46.0
0.766000	22.7	Off	L1	19.4	23.3	46.0
0.886000	23.8	Off	L1	19.4	22.2	46.0
1.094000	22.7	Off	L1	19.4	23.3	46.0
1.382000	23.9	Off	L1	19.4	22.1	46.0
1.822000	20.7	Off	L1	19.5	25.3	46.0
4.974000	26.8	Off	L1	19.6	19.2	46.0



Test Mode :	Mode 1	Temperature :	20~22°C
Test Engineer :	Novic Chiang	Relative Humidity :	44~46%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	Headset wireless link (stand alone) + Dock wireless link with DVD Player (MP3 Play) + Notebook (recording)		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	55.1	Off	N	19.4	10.9	66.0
0.214000	55.4	Off	N	19.4	7.6	63.0
0.246000	54.7	Off	N	19.4	7.2	61.9
0.270000	54.5	Off	N	19.3	6.6	61.1
0.334000	50.3	Off	N	19.3	9.1	59.4
0.454000	46.5	Off	N	19.3	10.3	56.8
0.558000	45.9	Off	N	19.3	10.1	56.0
0.702000	43.3	Off	N	19.5	12.7	56.0
0.974000	41.2	Off	N	19.4	14.8	56.0
1.398000	39.7	Off	N	19.4	16.3	56.0
1.742000	39.4	Off	N	19.5	16.6	56.0
2.246000	39.9	Off	N	19.5	16.1	56.0
4.982000	40.9	Off	N	19.6	15.1	56.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	34.2	Off	N	19.4	21.8	56.0
0.214000	36.3	Off	N	19.4	16.7	53.0
0.246000	34.4	Off	N	19.4	17.5	51.9
0.270000	33.6	Off	N	19.3	17.5	51.1
0.334000	40.2	Off	N	19.3	9.2	49.4
0.454000	29.6	Off	N	19.3	17.2	46.8
0.558000	27.2	Off	N	19.3	18.8	46.0
0.702000	26.2	Off	N	19.5	19.8	46.0
0.974000	25.0	Off	N	19.4	21.0	46.0
1.398000	25.8	Off	N	19.4	20.2	46.0
1.742000	25.6	Off	N	19.5	20.4	46.0
2.246000	23.1	Off	N	19.5	22.9	46.0
4.982000	25.8	Off	N	19.6	20.2	46.0

3.8 Radiated Emission Measurement

3.8.1 Limit of Radiated Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.8.2 Measuring Instruments

See list of measuring instruments of this test report.

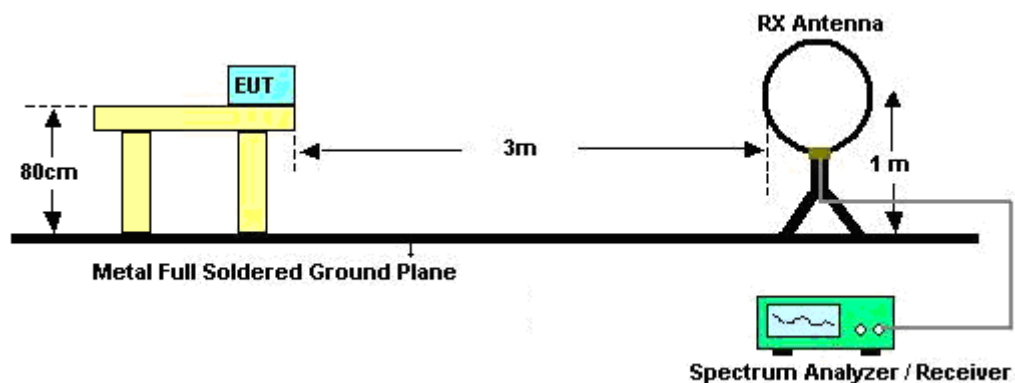
3.8.3

3.8.4 Test Procedures

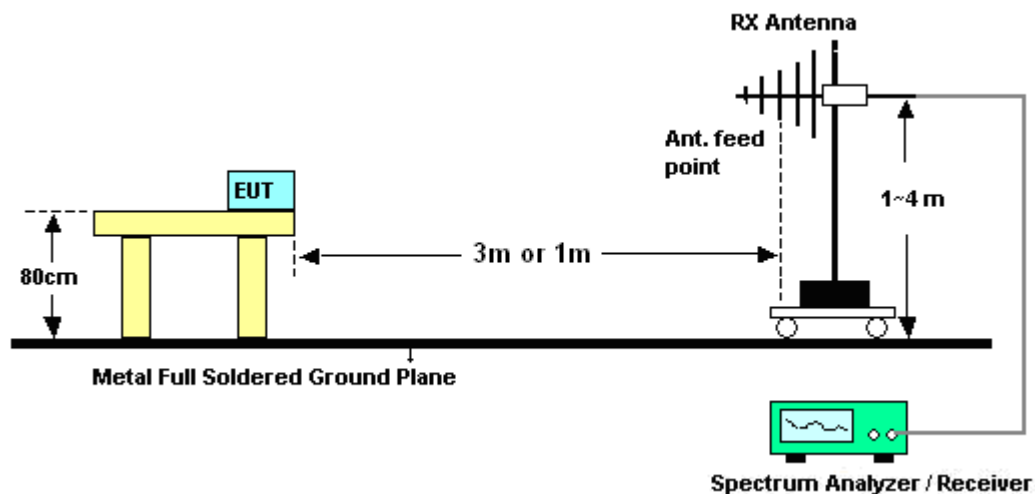
1. The testing follows the guidelines in FCC KDB Publication No. 558074 (Measurement Guidelines of DTS).
2. Use the following spectrum analyzer settings:
 - (1) Span = wide enough to fully capture the emission being measured; RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
 - (2) Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m.
Distance extrapolation factor = $20 \log (\text{specific distance [3m]} / \text{test distance [1m]})$ (dB)
3. Follow the guidelines in ANSI C63.4-2003 with respect to maximizing the emission by rotating the EUT, measuring the emission for three EUT orthogonal planes, and adjusting the measurement antenna height and polarization. A pre-amp and a high pass filter are used for this test in order to get the good signal level.

3.8.5 Test Setup

For radiated emissions below 30MHz



For radiated emissions above 30MHz



3.8.6 Test Results of Radiated Emissions (9 kHz ~ 30 MHz)

Test Engineer :	Wii Chen	Temperature :	21~24℃	
		Relative Humidity :	50~53%	

Frequency (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:

The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

3.8.7 Test Result of Radiated Emission (30 MHz ~ 10th Harmonic)

Test Mode :	Mode 1	Temperature :	21~24℃
Test Channel :	Low	Relative Humidity :	50~53%
Test Engineer :	Wii Chen	Polarization :	Horizontal
Remark :	2404 MHz is Fundamental Signals which can be ignored.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
30	19.83	-20.17	40	32.45	18.36	0.58	31.56	-	-	Peak
126.39	19.82	-23.68	43.5	39.33	10.94	1.07	31.52	-	-	Peak
240.06	26.19	-19.81	46	45.37	10.99	1.34	31.51	-	-	Peak
384	22.19	-23.81	46	37.28	14.36	1.77	31.22	-	-	Peak
575.8	26.01	-19.99	46	36.42	18.32	2.18	30.91	-	-	Peak
832	30.6	-15.4	46	37.24	21.26	2.61	30.51	100	85	Peak
2388.09	45.79	-8.21	54	43.7	31.7	4.47	34.08	102	116	Average
2388.09	59.44	-14.56	74	57.35	31.7	4.47	34.08	102	116	Peak
2404	108.71	-	-	106.58	31.71	4.5	34.08	102	116	Average
2404	109.83	-	-	107.7	31.71	4.5	34.08	102	116	Peak
2486	41.28	-12.72	54	38.99	31.78	4.59	34.08	102	116	Average
2486	54.13	-19.87	74	51.84	31.78	4.59	34.08	102	116	Peak
4808	47.94	-26.06	74	64.2	33.76	6.42	56.44	100	0	Peak



Test Mode :	Mode 1	Temperature :	21~24℃
Test Channel :	Low	Relative Humidity :	50~53%
Test Engineer :	Wii Chen	Polarization :	Vertical
Remark :	2404 MHz is Fundamental Signals which can be ignored.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
71.85	30.88	-9.12	40	55.62	5.94	0.84	31.52	100	96	Peak
121.8	33.41	-10.09	43.5	52.95	10.91	1.07	31.52	-	-	Peak
240.06	29.45	-16.55	46	48.63	10.99	1.34	31.51	-	-	Peak
496	29.63	-16.37	46	41.71	16.97	2.04	31.09	-	-	Peak
575.8	35.76	-10.24	46	46.17	18.32	2.18	30.91	-	-	Peak
799.8	32.03	-13.97	46	38.98	21.02	2.57	30.54	-	-	Peak
2387.9	50.21	-3.79	54	48.12	31.7	4.47	34.08	103	123	Average
2387.9	63.09	-10.91	74	61	31.7	4.47	34.08	103	123	Peak
2404	110.81	-	-	108.68	31.71	4.5	34.08	103	123	Average
2404	111.82	-	-	109.69	31.71	4.5	34.08	103	123	Peak
2500	41.72	-12.28	54	39.38	31.8	4.62	34.08	103	123	Average
2500	53.87	-20.13	74	51.53	31.8	4.62	34.08	103	123	Peak
4808	49.1	-24.9	74	65.36	33.76	6.42	56.44	100	0	Peak



Test Mode :	Mode 2	Temperature :	21~24℃
Test Channel :	Mid	Relative Humidity :	50~53%
Test Engineer :	Wii Chen	Polarization :	Horizontal
Remark :	2440 MHz is Fundamental Signals which can be ignored.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
46.2	34.54	-5.46	40	55.88	9.49	0.73	31.56	100	63	Peak
117.48	22.35	-21.15	43.5	42.13	10.67	1.07	31.52	-	-	Peak
240.06	26.29	-19.71	46	45.47	10.99	1.34	31.51	-	-	Peak
384	22.96	-23.04	46	38.05	14.36	1.77	31.22	-	-	Peak
575.8	25.79	-20.21	46	36.2	18.32	2.18	30.91	-	-	Peak
832	30.48	-15.52	46	37.12	21.26	2.61	30.51	-	-	Peak
2364	44.8	-9.2	54	42.78	31.66	4.44	34.08	106	224	Average
2364	55.58	-18.42	74	53.56	31.66	4.44	34.08	106	224	Peak
2440	111.2	-	-	108.97	31.75	4.56	34.08	106	224	Average
2440	112.27	-	-	110.04	31.75	4.56	34.08	106	224	Peak
2490	42.42	-11.58	54	40.08	31.8	4.62	34.08	106	224	Average
2490	55.06	-18.94	74	52.72	31.8	4.62	34.08	106	224	Peak
4880	46.82	-27.18	74	63.04	33.78	6.49	56.49	100	0	Peak



Test Mode :	Mode 2	Temperature :	21~24℃
Test Channel :	Mid	Relative Humidity :	50~53%
Test Engineer :	Wii Chen	Polarization :	Vertical
Remark :	2440 MHz is Fundamental Signals which can be ignored.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
72.12	31.63	-8.37	40	56.37	5.94	0.84	31.52	100	74	Peak
121.53	33.81	-9.69	43.5	53.36	10.9	1.07	31.52	-	-	Peak
240.06	29.51	-16.49	46	48.69	10.99	1.34	31.51	-	-	Peak
463.8	29.39	-16.61	46	42.37	16.23	1.92	31.13	-	-	Peak
575.8	35.55	-10.45	46	45.96	18.32	2.18	30.91	-	-	Peak
799.8	32.21	-13.79	46	39.16	21.02	2.57	30.54	-	-	Peak
2364	45.67	-8.33	54	43.65	31.66	4.44	34.08	104	124	Average
2364	55.25	-18.75	74	53.23	31.66	4.44	34.08	104	124	Peak
2440	110.7	-	-	108.47	31.75	4.56	34.08	104	124	Average
2440	111.65	-	-	109.42	31.75	4.56	34.08	104	124	Peak
2488	42.77	-11.23	54	40.46	31.8	4.59	34.08	104	124	Average
2488	54.66	-19.34	74	52.35	31.8	4.59	34.08	104	124	Peak
4880	50.06	-23.94	74	66.28	33.78	6.49	56.49	100	0	Peak



Test Mode :	Mode 3	Temperature :	21~24℃
Test Channel :	High	Relative Humidity :	50~53%
Test Engineer :	Wii Chen	Polarization :	Horizontal
Remark :	2476 MHz is Fundamental Signals which can be ignored.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
83.19	26.87	-13.13	40	50.42	7.16	0.84	31.55	100	41	Peak
117.75	22.58	-20.92	43.5	42.36	10.67	1.07	31.52	-	-	Peak
240.06	26.79	-19.21	46	45.97	10.99	1.34	31.51	-	-	Peak
384	22.59	-23.41	46	37.68	14.36	1.77	31.22	-	-	Peak
575.8	25.96	-20.04	46	36.37	18.32	2.18	30.91	-	-	Peak
832	30.31	-15.69	46	36.95	21.26	2.61	30.51	-	-	Peak
2328	42.63	-11.37	54	40.68	31.63	4.41	34.09	111	228	Average
2328	54.16	-19.84	74	52.21	31.63	4.41	34.09	111	228	Peak
2476	109.58	-	-	107.29	31.78	4.59	34.08	111	228	Average
2476	110.66	-	-	108.37	31.78	4.59	34.08	111	228	Peak
2492.21	47.37	-6.63	54	45.03	31.8	4.62	34.08	111	228	Average
2492.21	60.22	-13.78	74	57.88	31.8	4.62	34.08	111	228	Peak
4952	48.2	-25.8	74	64.39	33.79	6.57	56.55	100	0	Peak



Test Mode :	Mode 3	Temperature :	21~24℃
Test Channel :	High	Relative Humidity :	50~53%
Test Engineer :	Wii Chen	Polarization :	Vertical
Remark :	2476 MHz is Fundamental Signals which can be ignored.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
72.39	31.8	-8.2	40	56.47	6.02	0.84	31.53	100	52	Peak
121.8	34.04	-9.46	43.5	53.58	10.91	1.07	31.52	-	-	Peak
240.06	29.64	-16.36	46	48.82	10.99	1.34	31.51	-	-	Peak
415.5	26.19	-19.81	46	40.42	15.12	1.82	31.17	-	-	Peak
575.8	35.83	-10.17	46	46.24	18.32	2.18	30.91	-	-	Peak
799.8	32.21	-13.79	46	39.16	21.02	2.57	30.54	-	-	Peak
2390	42.34	-11.66	54	40.22	31.7	4.5	34.08	100	123	Average
2390	53.68	-20.32	74	51.56	31.7	4.5	34.08	100	123	Peak
2476	110.23	-	-	107.94	31.78	4.59	34.08	100	123	Average
2476	111.31	-	-	109.02	31.78	4.59	34.08	100	123	Peak
2492.4	48.46	-5.54	54	46.12	31.8	4.62	34.08	100	123	Average
2492.4	60.57	-13.43	74	58.23	31.8	4.62	34.08	100	123	Peak
4952	50.18	-23.82	74	66.37	33.79	6.57	56.55	100	0	Peak

3.9 Antenna Requirements

3.9.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

3.9.2 Antenna Connected Construction

The antennas type used in this product is PCB Antenna without connector and it is considered to meet antenna requirement.

3.9.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Due Date	Remark
Spectrum Analyzer	R&S	FSP30	101329	9kHz~30GHz	Apr. 26, 2010	Apr. 25, 2011	Conducted (TH02-HY)
Power Meter	Anritsu	ML2495A	0932001	N/A	Sep. 13, 2010	Sep. 12, 2011	Conducted (TH02-HY)
Power Sensor	Anritsu	MA2411B	0846202	N/A	Sep. 14, 2010	Sep. 13, 2011	Conducted (TH02-HY)
Spectrum Analyzer	R&S	FSP30	101352	9KHz-40GHz	Nov. 3, 2010	Nov. 2, 2011	Radiation (03CH05-HY)
Amplifier	COM-POWER	PA-103	161069	1KHz - 1GHz	Mar. 29, 2010	Mar. 28, 2011	Radiation (03CH05-HY)
Bilog Antenna	SCHAFFNER	CBL6111C	2725	30MHz ~ 1GHz	Nov. 6, 2010	Nov. 5, 2011	Radiation (03CH05-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	15GHz- 40GHz	Oct. 18, 2010	Oct. 17, 2011	Radiation (03CH05-HY)
Pre Amplifier	Agilent	8449B	3008A01917	1GHz- 26.5GHz	Apr. 15, 2010	Apr. 14, 2011	Radiation (03CH05-HY)
Turn Table	HD	Deis HD 2000	420/611	0 - 360 degree	N/A	N/A	Radiation (03CH05-HY)
Antenna Mast	HD	MA 240	240/666	1 m - 4 m	N/A	N/A	Radiation (03CH05-HY)
Horn Antenna	ESCO	3117	00066584	1GHz ~ 18GHz	Aug. 05, 2010	Aug. 04, 2011	Radiation (03CH05-HY)
Loop Antenna	R&S	HFH2-Z2	860004/001	9 kHz~30 MHz	Jul. 29, 2010	Jul. 28, 2011	Radiation (03CH05-HY)
EMI Test Receive	R&S	ESCS 30	100356	9KHz – 2.75GHz	Aug. 16, 2010	Aug. 15, 2011	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	N/A	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100081	9KHz – 30MHz	Dec. 03, 2010	Dec. 02, 2011	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100080	9KHz – 30MHz	Dec. 01, 2010	Nov. 30, 2011	Conduction (CO05-HY)

5 Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Contribution	Uncertainty of X_i		$u(X_i)$
	dB	Probability Distribution	
Receiver Reading	0.10	Normal (k=2)	0.05
Cable Loss	0.10	Normal (k=2)	0.05
AMN Insertion Loss	2.50	Rectangular	0.63
Receiver Specification	1.50	Rectangular	0.43
Site Imperfection	1.39	Rectangular	0.80
Mismatch	+0.34 / -0.35	U-Shape	0.24
Combined Standard Uncertainty $U_c(y)$	1.13		
Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.26		

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Contribution	Uncertainty of X_i		$u(X_i)$
	dB	Probability Distribution	
Receiver Reading	0.41	Normal (k=2)	0.21
Antenna Factor Calibration	0.83	Normal (k=2)	0.42
Cable Loss Calibration	0.25	Normal (k=2)	0.13
Pre-Amplifier Gain Calibration	0.27	Normal (k=2)	0.14
RCV/SPA Specification	2.50	Rectangular	0.72
Antenna Factor Interpolation for Frequency	1.00	Rectangular	0.29
Site Imperfection	1.43	Rectangular	0.83
Mismatch	+0.39 / -0.41	U-Shape	0.28
Combined Standard Uncertainty $U_c(y)$	1.27		
Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.54		

Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

Contribution	Uncertainty of X_i		$u(X_i)$	C_i	$C_i * u(X_i)$
	dB	Probability Distribution			
Receiver Reading	± 0.10	Normal (k=2)	0.10	1	0.10
Antenna Factor Calibration	± 1.70	Normal (k=2)	0.85	1	0.85
Cable Loss Calibration	± 0.50	Normal (k=2)	0.25	1	0.25
Receiver Correction	± 2.00	Rectangular	1.15	1	1.15
Antenna Factor Directional	± 1.50	Rectangular	0.87	1	0.87
Site Imperfection	± 2.80	Triangular	1.14	1	1.14
Mismatch Receiver VSWR $\Gamma_1 = 0.197$ Antenna VSWR $\Gamma_2 = 0.194$ Uncertainty = $20\text{Log}(1-\Gamma_1\Gamma_2)$	+0.34 / -0.35	U-Shape	0.244	1	0.244
Combined Standard Uncertainty $U_c(y)$	2.36				
Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	4.72				



Appendix A. Photographs of EUT

Please refer to Sporton report number EP092824-01 as below.