

FCC RF Test Report

APPLICANT : VIZIO
EQUIPMENT : Active Noise Cancelling High Definition Headphone
BRAND NAME : VIZIO
MODEL NAME : XVTHP200
FCC ID : YLY-XVTHP200
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : Digital Transmission System (DTS)

The product was received on Oct. 06, 2010 and completely tested on Nov. 11, 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
FR000602	Rev. 01	Initial issue of report	Nov. 15, 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	15.207	Gen 7.2.2	AC Conducted Emission	15.207(a)	Pass	Under limit 18.3 dB at 0.166 MHz
3.7	15.247(d)	A8.5	Transmitter Radiated Emission	15.209(a) & 15.247(d)	Pass	Under limit 0.94 dB at 2388 MHz
3.8	15.203 & 15.247(b)	A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

VIZIO

39 Tesla Irvine, CA 92618

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	Active Noise Cancelling High Definition Headphone
Brand Name	VIZIO
Model Name	XVTHP200
FCC ID	YLY-XVTHP200
Tx/Rx Frequency Range	2412 MHz ~ 2462 MHz
Number of Channels	3
Maximum Output Power to Antenna	20.63 dBm (0.116 W)
Antenna Type	Chip Antenna with gain 2.5 dBi
Type of Antenna Connector	N/A
HW Version	20101102
SW Version	V19
Type of Modulation	OFDM
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.

1.6 Ancillary Equipment List

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	DVD Player	SONY	DVP-NS50P	FCC DoC	N/A	Unshielded, 1.8 m
2.	Speaker	Logitech	S-00019	FCC DoC	Unshielded, 1.6 m	Unshielded, 1.8 m
3.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A

2 Test Configuration of Equipment Under Test

2.1 Test Mode

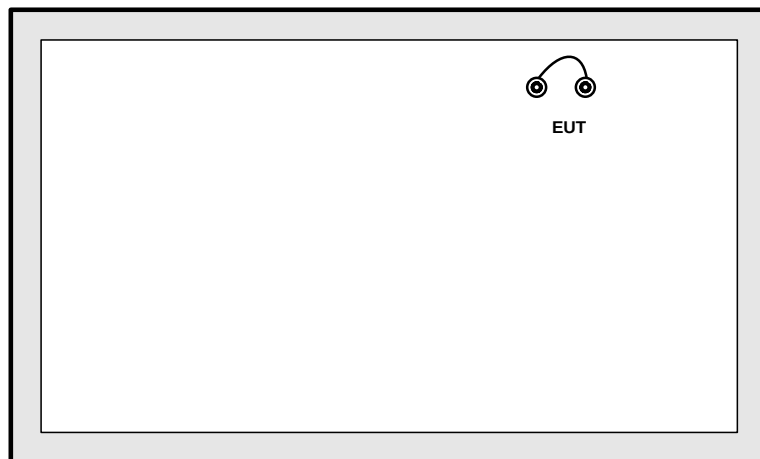
The EUT has been associated with peripherals pursuant to ANSI C63.4-2003 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conducted emission (150 kHz to 30 MHz), radiated emission (30 MHz to the 10th harmonic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

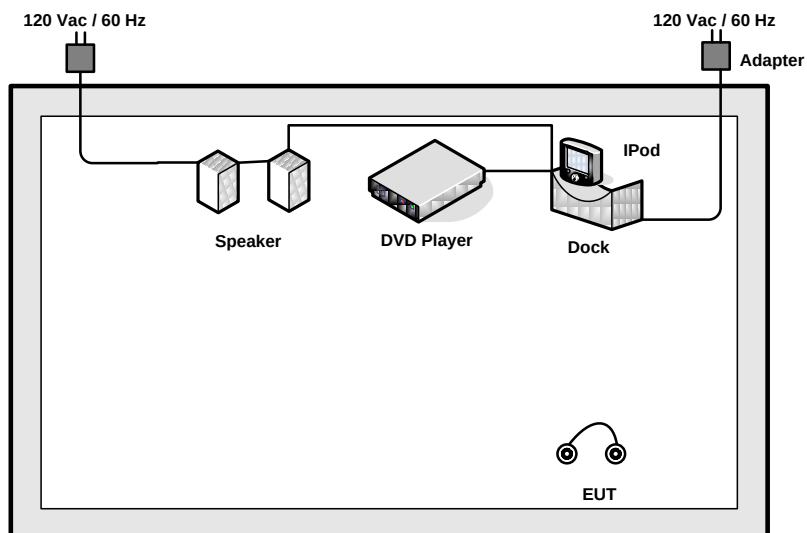
Test Cases		
Test Item	OFDM	
Conducted TCs	Mode 1 : CH 0_2412 MHz Mode 2 : CH 1_2438 MHz Mode 3 : CH 2_2462 MHz	
Radiated TCs	Mode 1 : CH 0_2412 MHz (Ant-0) Mode 2 : CH 1_2438 MHz (Ant-0) Mode 3 : CH 2_2462 MHz (Ant-0)	Mode 4 : CH 1_2438 MHz (Ant-1)
AC Conducted Emission	Mode 1 : Headset Link + Dock Link + Fully system + DVD Play-audio in	

2.2 Connection Diagram of Test System

<Radiation>



<Conduction>





2.3 RF Utility

To execute the programmed RF utility, "AM2G Test Software" 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.

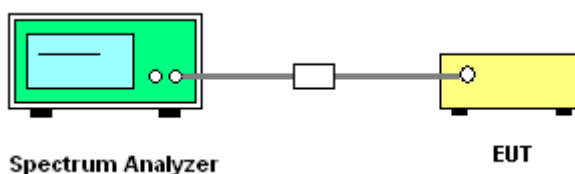
3.1.2 Measuring Instruments

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

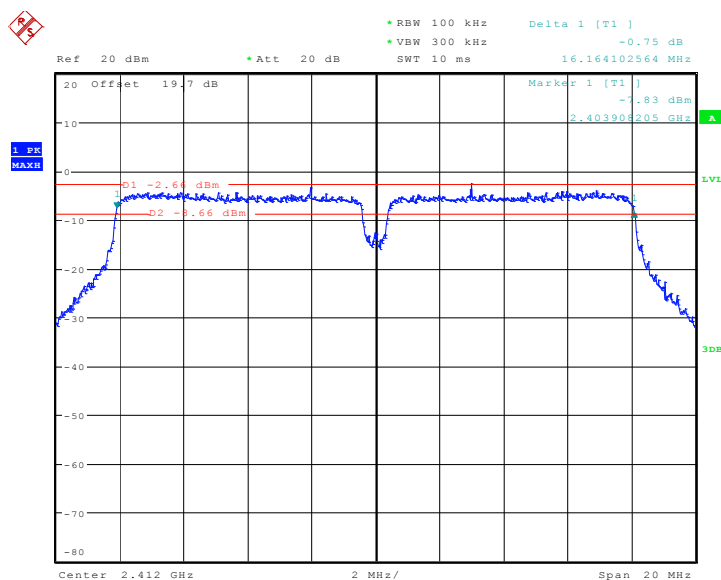


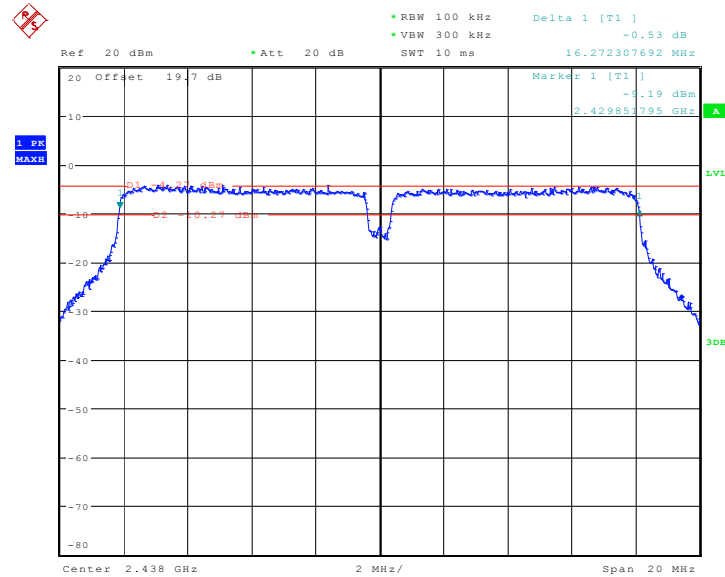
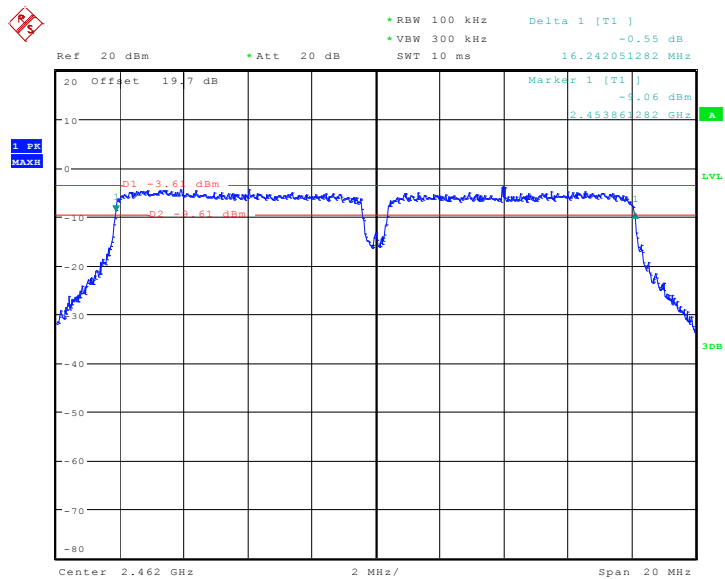
3.1.5 Test Result of 6dB Bandwidth

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
0	2412	16.16	0.5	Pass
1	2438	16.27	0.5	Pass
2	2462	16.24	0.5	Pass

Mode 1 : 6 dB Bandwidth Plot on Channel 0



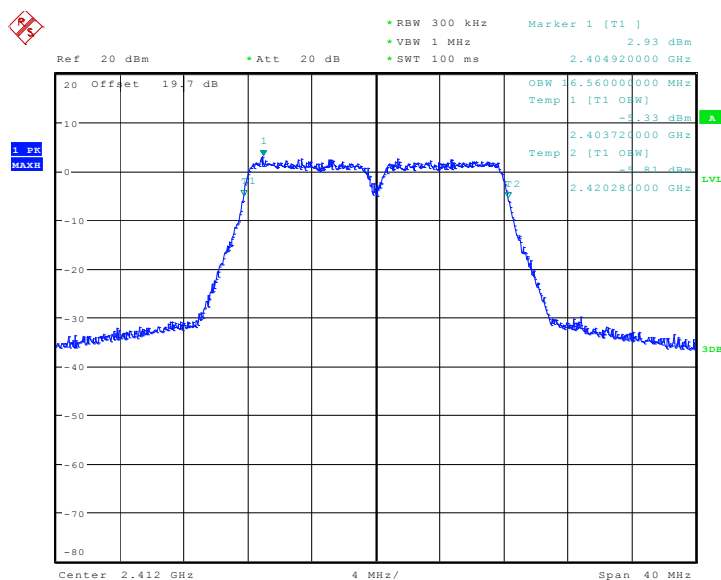
Mode 2 : 6 dB Bandwidth Plot on Channel 1

Mode 3 : 6 dB Bandwidth Plot on Channel 2


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%

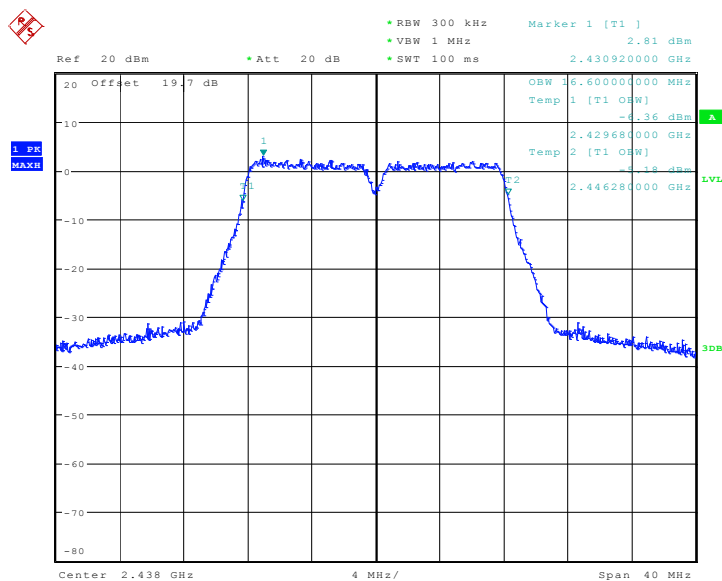
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Pass/Fail
0	2412	16.56	Pass
1	2438	16.60	Pass
2	2462	16.56	Pass

Mode 1 : 99% Occupied Bandwidth Plot on Channel 0

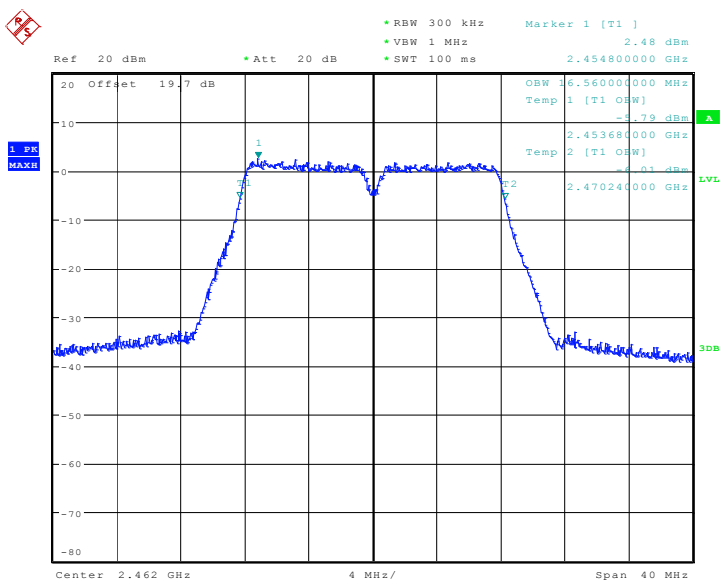




Mode 2 : 99% Occupied Bandwidth Plot on Channel 1



Mode 3 : 99% Occupied Bandwidth Plot on Channel 2



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.

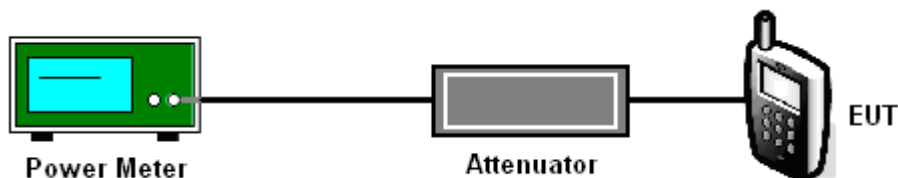
3.2.2 Measuring Instruments

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.
3. 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℃
Test Engineer :	Alan Liu	Relative Humidity :	50~53%

Channel	Frequency (MHz)	Measured Output Power (dBm)	Max. Limits (dBm)	Pass/Fail
0	2412	20.63	30	Pass
1	2438	20.18	30	Pass
2	2462	19.54	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

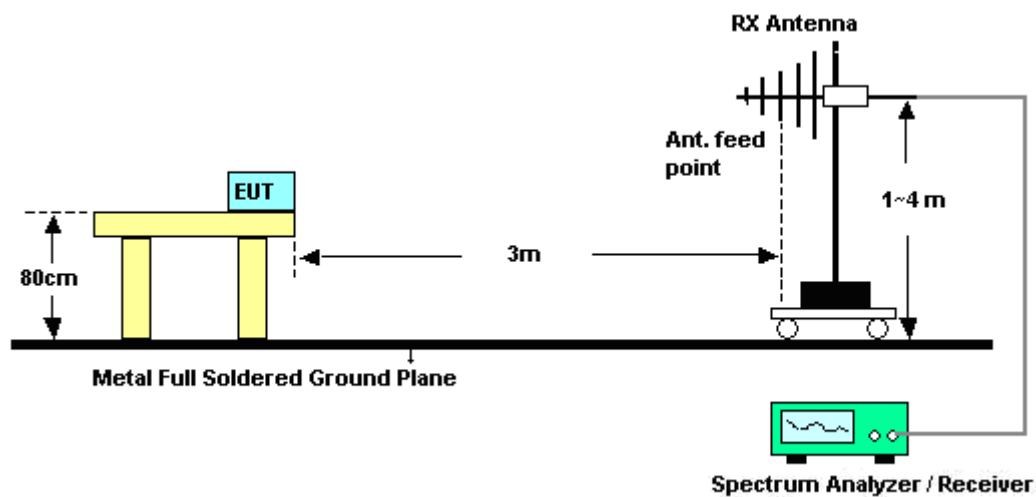
See list of measuring instruments of this test report.

3.3.3 Test Procedures

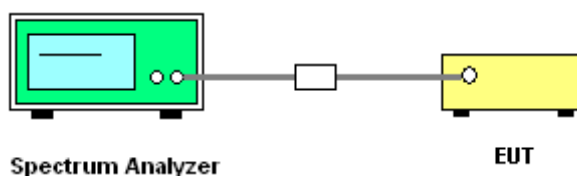
1. The testing follows the guidelines in ANSI C63.4-2003 and FCC KDB Publication No. 558074 (Measurement Guidelines of DTS).
2. Conducted emission test: Set RBW = 100 kHz, Video bandwidth (VBW) $\geq$ RBW. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized 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 :	23~24℃
		Relative Humidity :	47~48%
Test Channel :	0	Test Engineer :	Kay Wu

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
2388.28	63.71	-10.29	74	61.62	31.7	4.47	34.08	100	145	Peak
2388.28	50.64	-3.36	54	48.55	31.7	4.47	34.08	100	145	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
2389.61	63.95	-10.05	74	61.86	31.7	4.47	34.08	100	137	Peak
2389.61	51.05	-2.95	54	48.96	31.7	4.47	34.08	100	137	Average

Test Mode :	Mode 3	Temperature :	23~24℃
		Relative Humidity :	47~48%
Test Channel :	2	Test Engineer :	Kay Wu

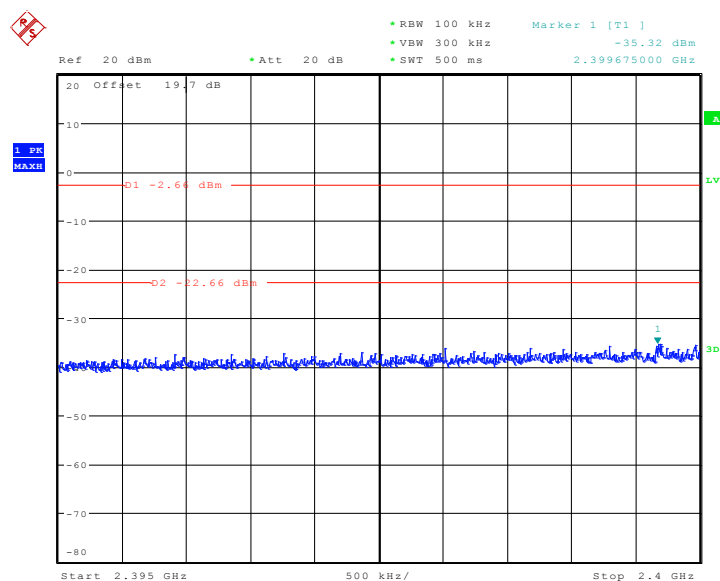
ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2491.45	59.8	-14.2	74	57.46	31.8	4.62	34.08	100	131	Peak
2491.45	45.93	-8.07	54	43.59	31.8	4.62	34.08	100	131	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
2487.65	60.81	-13.19	74	58.5	31.8	4.59	34.08	103	57	Peak
2487.65	47.65	-6.35	54	45.34	31.8	4.59	34.08	103	57	Average

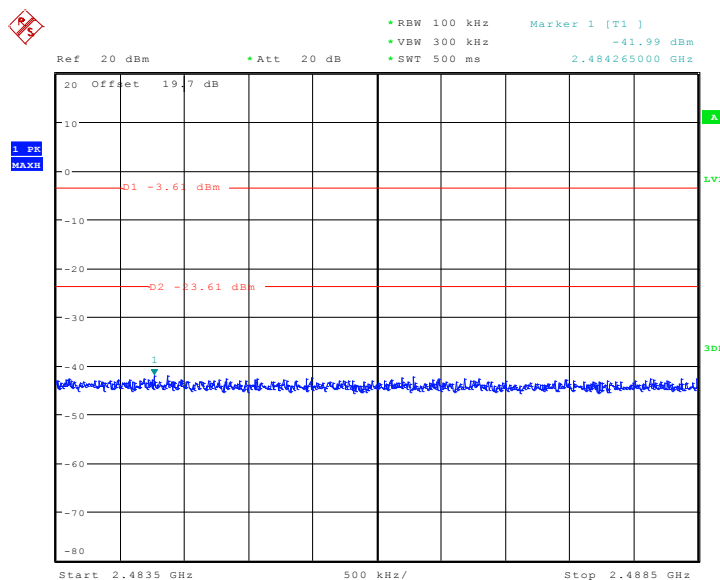
3.3.6 Test Plots of Conducted Band Edges

Test Mode :	Mode 1 and 3	Temperature :	24~26°C
		Relative Humidity :	50~53%
Test Channel :	0 and 2	Test Engineer :	Alan Liu

Low Band Edge Plot on Channel 0



High Band Edge Plot on Channel 2



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.

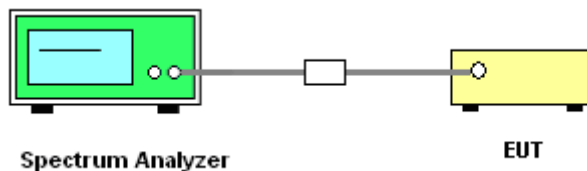
3.4.2 Measuring Instruments

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.

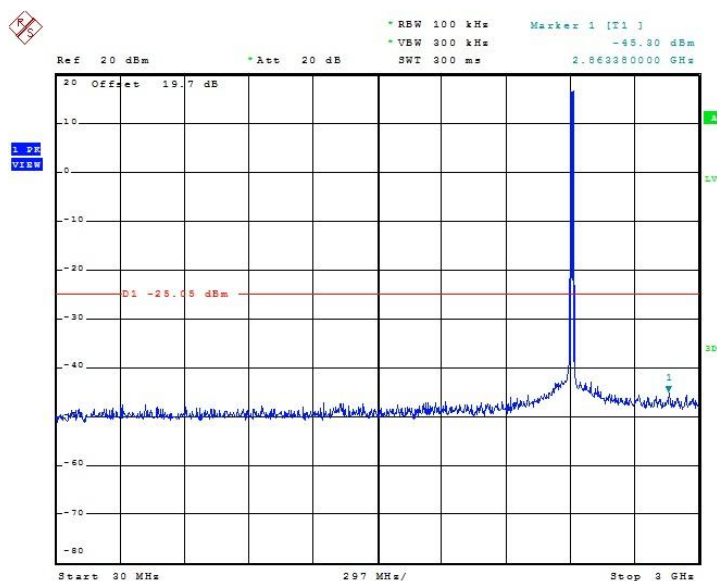
3.4.4 Test Setup



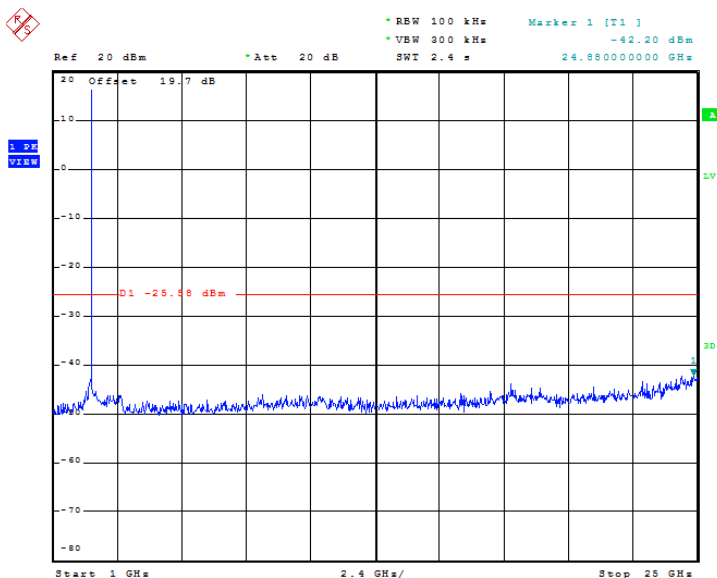
3.4.5 Test Plots of Spurious Emission

Test Mode :	Mode 1	Temperature :	24~26°C
		Relative Humidity :	50~53%
Test Channel :	0	Test Engineer :	Alan Liu

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz



Conducted Spurious Emission Plot between 1 GHz ~ 25 GHz





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

Ref 20 dBm Att 20 dB RBW 100 kHz VSW 300 kHz SWT 300 ms Marker 1 [T1] -47.24 dBm 531.930000000 MHz

20 Offset 19.7 dB

10

0

-10

-20

-30

-40

-50

-60

-70

-80

D1 -24.54 dBm

1

Start 30 MHz 297 MHz/ Stop 3 GHz

• RBW 100 kHz
 • VBW 300 kHz
 • SWT 2.4 #

Marker 1 [T1]
 -41.80 dBm
 24.90400000 GHz

Ref 20 dBm
 • Att 20 dB

20 Offset 19.7 dB
 -10
 -20
 -30
 -40
 -50
 -60
 -70
 -80

D1 -25.67 dBm
 -25.67 dBm

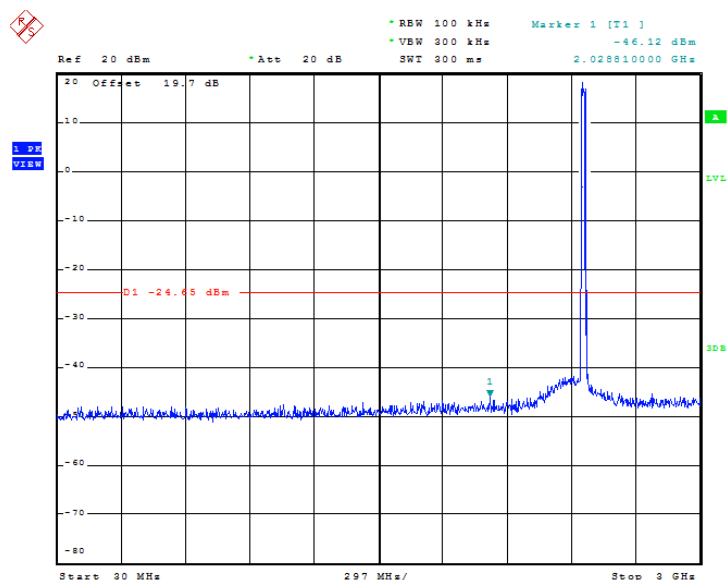
Start 1 GHz
 2.4 GHz/
 Stop 25 GHz

1.24 View
 A
 LVL
 3dB

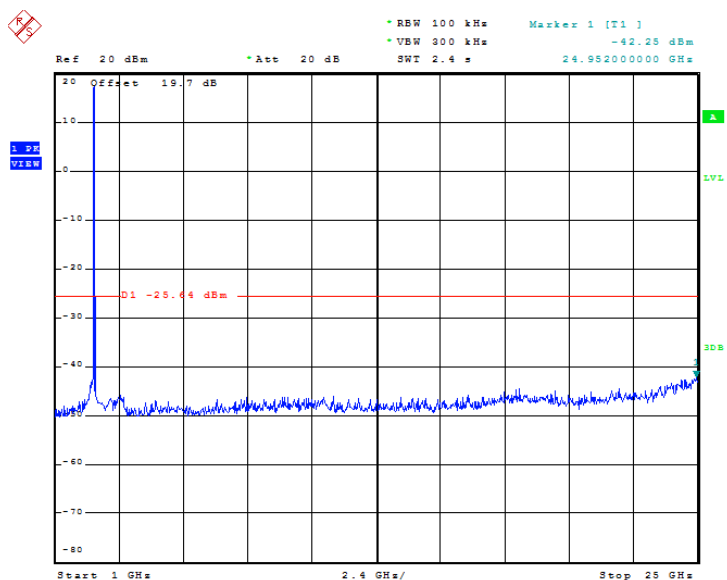


Test Mode :	Mode 3	Temperature :	24~26°C
		Relative Humidity :	50~53%
Test Channel :	2	Test Engineer :	Alan Liu

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz



Conducted Spurious Emission Plot between 1 GHz ~ 25 GHz



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.

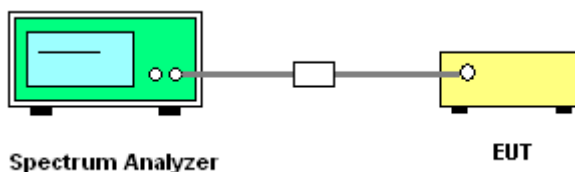
3.5.2 Measuring Instruments

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

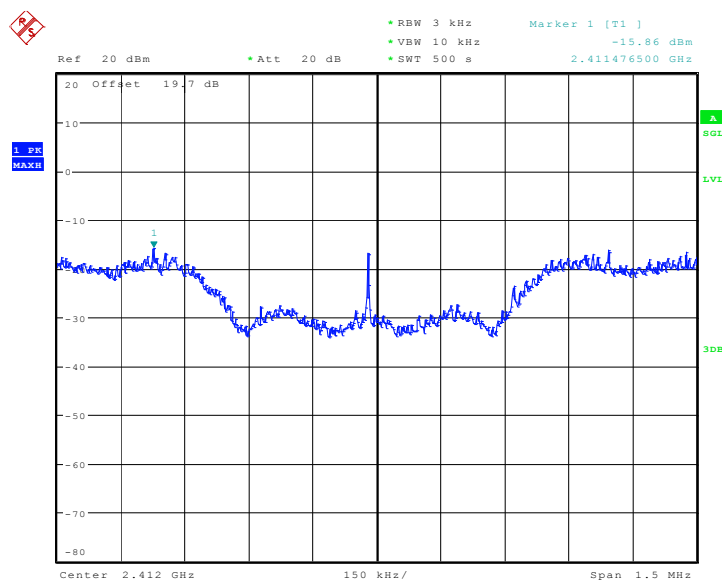


3.5.5 Test Result of Power Spectral Density

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

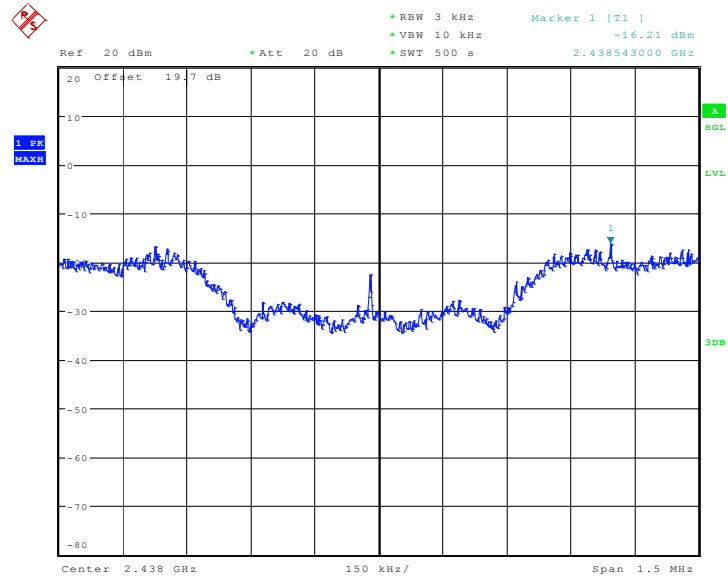
Channel	Frequency (MHz)	Measured PSD (dBm)	Max. Limits (dBm)	Pass/Fail
0	2412	-15.86	8	Pass
1	2438	-16.21	8	Pass
2	2462	-16.47	8	Pass

Mode 1 : PSD Plot on Channel 0

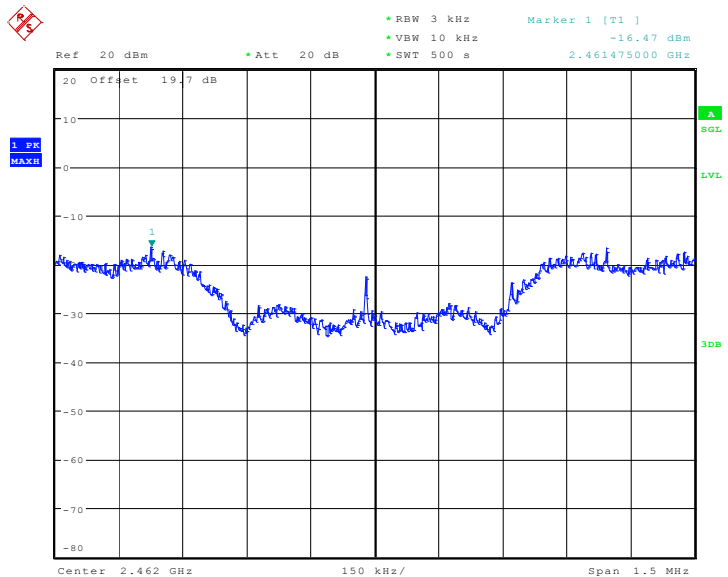




Mode 2 : PSD Plot on Channel 1



Mode 3 : PSD Plot on Channel 2



3.6 AC Conducted Emission Measurement

3.6.1 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.

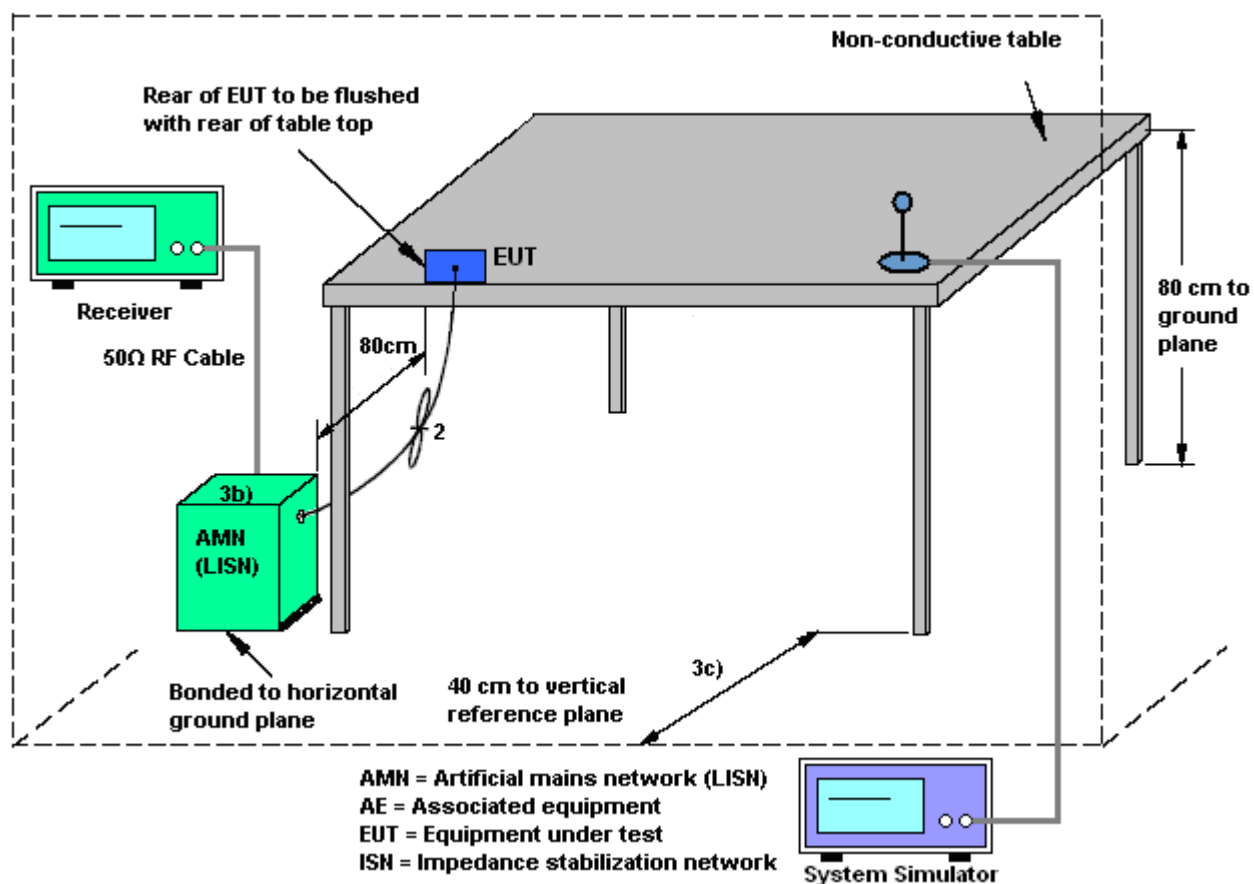
3.6.2 Measuring Instruments

See list of measuring instruments of this test report.

3.6.3 Test Procedures

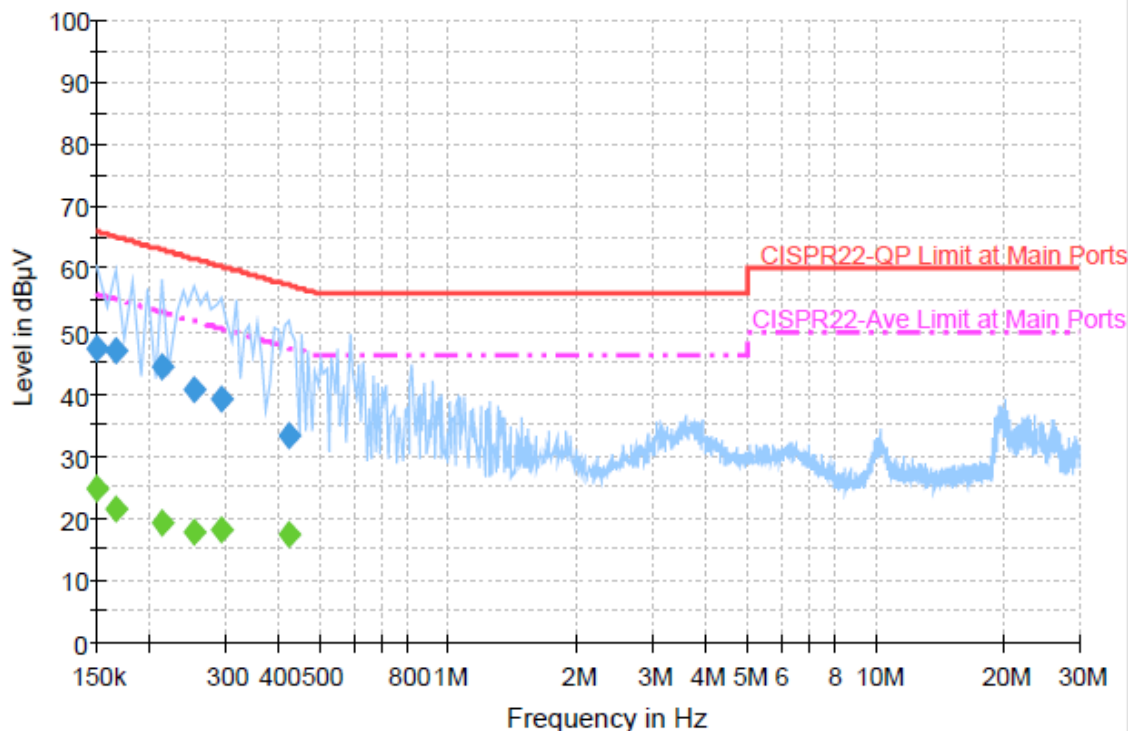
1. The testing follows the guidelines in ANSI C63.4-2003.
2. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
3. Connect EUT to the power mains through a line impedance stabilization network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

3.6.4 Test Setup



3.6.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	20~22°C
Test Engineer :	Novic Chiang	Relative Humidity :	42~44%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	Headset Link + Dock Link + Fully system + DVD Play-audio in		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		

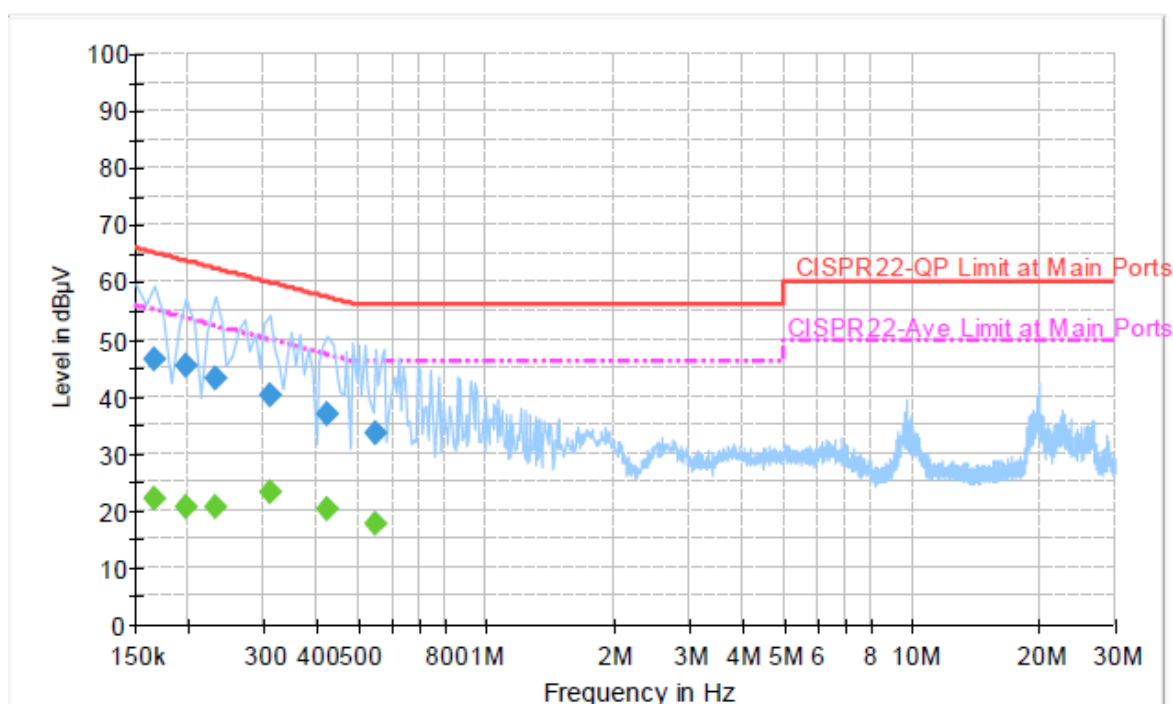

Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	47.2	Off	L1	19.4	18.8	66.0
0.166000	46.9	Off	L1	19.3	18.3	65.2
0.214000	44.2	Off	L1	19.3	18.8	63.0
0.254000	40.7	Off	L1	19.3	20.9	61.6
0.294000	39.0	Off	L1	19.3	21.4	60.4
0.422000	33.1	Off	L1	19.4	24.3	57.4

Final Result 2

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	24.6	Off	L1	19.4	31.4	56.0
0.166000	21.4	Off	L1	19.3	33.8	55.2
0.214000	19.3	Off	L1	19.3	33.7	53.0
0.254000	17.8	Off	L1	19.3	33.8	51.6
0.294000	18.0	Off	L1	19.3	32.4	50.4
0.422000	17.5	Off	L1	19.4	29.9	47.4

Test Mode :	Mode 1	Temperature :	20~22°C
Test Engineer :	Novic Chiang	Relative Humidity :	42~44%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	Headset Link + Dock Link + Fully system + DVD Play-audio in		
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)
0.166000	46.4	Off	N	19.3	18.8	65.2
0.198000	45.4	Off	N	19.3	18.3	63.7
0.230000	43.0	Off	N	19.4	19.4	62.4
0.310000	40.4	Off	N	19.3	19.6	60.0
0.422000	36.9	Off	N	19.4	20.5	57.4
0.550000	33.6	Off	N	19.3	22.4	56.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.166000	22.3	Off	N	19.3	32.9	55.2
0.198000	20.5	Off	N	19.3	33.2	53.7
0.230000	20.6	Off	N	19.4	31.8	52.4
0.310000	23.3	Off	N	19.3	26.7	50.0
0.422000	20.2	Off	N	19.4	27.2	47.4
0.550000	17.6	Off	N	19.3	28.4	46.0

3.7 Radiated Emission Measurement

3.7.1 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

3.7.2 Measuring Instruments

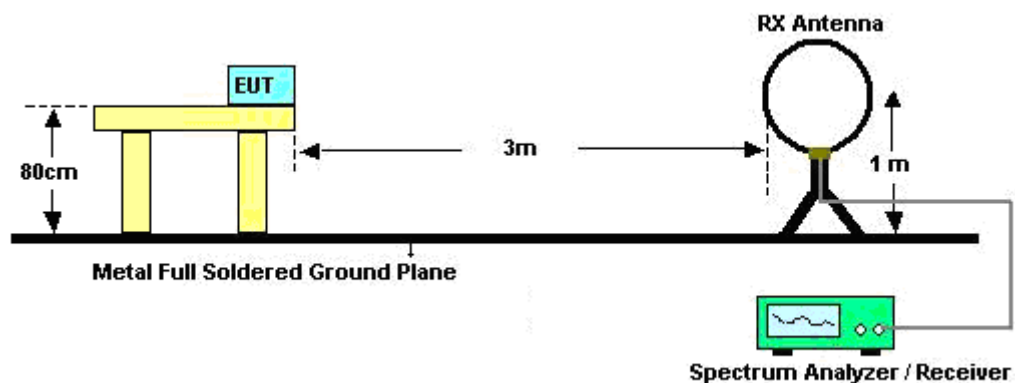
See list of measuring instruments of this test report.

3.7.3 Test Procedures

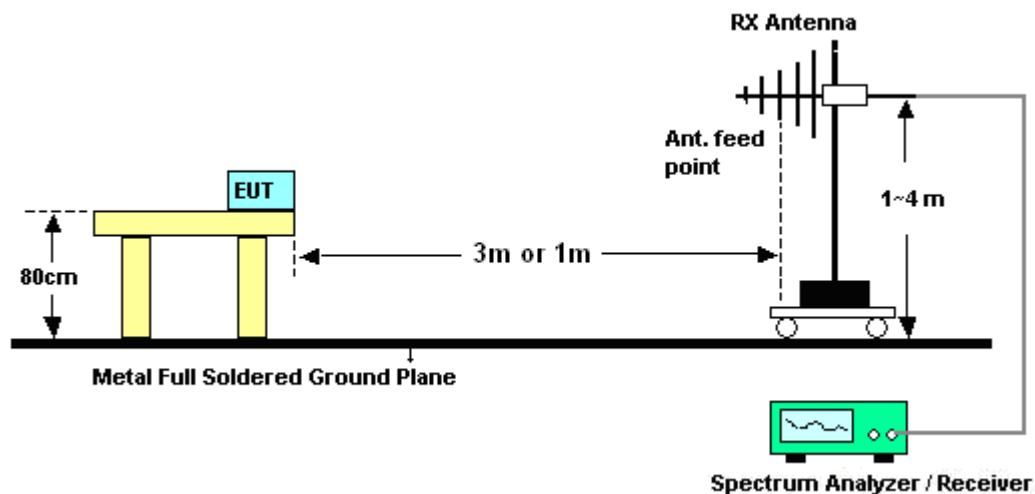
- The testing follows the guidelines in FCC KDB Publication No. 558074 (Measurement Guidelines of DTS).
- Use the following spectrum analyzer settings:
 - Span = wide enough to fully capture the emission being measured; RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
 - 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)
- 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.

3.7.4 Test Setup

For radiated emissions below 30MHz



For radiated emissions above 30MHz



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

Test Engineer :	Kay Wu	Temperature :	23~24℃	
		Relative Humidity :	47~48%	

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.

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

Test Mode :	Mode 1	Temperature :	23~24℃
Test Channel :	0	Relative Humidity :	47~48%
Test Engineer :	Kay Wu	Polarization :	Horizontal
Remark :	2412 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
30.81	20.3	-19.7	40	33.49	17.78	0.58	31.55	400	125	Peak
59.16	17.96	-22.04	40	43.22	5.56	0.73	31.55	-	-	Peak
212.79	19.03	-24.47	43.5	40.21	9.03	1.26	31.47	-	-	Peak
813.1	24.37	-21.63	46	31.21	21.12	2.57	30.53	-	-	Peak
896.4	25.93	-20.07	46	31.96	21.75	2.7	30.48	-	-	Peak
990.9	27.6	-26.4	54	30.63	23.89	3.31	30.23	-	-	Peak
2388.28	50.64	-3.36	54	48.55	31.7	4.47	34.08	100	145	Average
2388.28	63.71	-10.29	74	61.62	31.7	4.47	34.08	100	145	Peak
2412	91.82	-	-	89.69	31.71	4.5	34.08	100	145	Average
2412	104.01	-	-	101.88	31.71	4.5	34.08	100	145	Peak
2490	43.62	-10.38	54	41.28	31.8	4.62	34.08	100	145	Average
2490	55.62	-18.38	74	53.28	31.8	4.62	34.08	100	145	Peak
7236	50.42	-33.59	84.01	64.19	35.21	8.03	57.01	100	0	Peak



Test Mode :	Mode 1	Temperature :	23~24°C
Test Channel :	0	Relative Humidity :	47~48%
Test Engineer :	Kay Wu	Polarization :	Vertical
Remark :	2412 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
31.08	19.86	-20.14	40	33.05	17.78	0.58	31.55	-	-	Peak
178.23	22.11	-21.39	43.5	43.82	8.58	1.23	31.52	-	-	Peak
298.11	23.88	-22.12	46	41.47	12.14	1.55	31.28	-	-	Peak
371.4	29.1	-16.9	46	44.55	14.03	1.77	31.25	-	-	Peak
384	29.65	-16.35	46	44.74	14.36	1.77	31.22	100	56	Peak
960.1	29.57	-24.43	54	33.91	23.17	2.85	30.36	-	-	Peak
2389.61	51.05	-2.95	54	48.96	31.7	4.47	34.08	100	137	Average
2389.61	63.95	-10.05	74	61.86	31.7	4.47	34.08	100	137	Peak
2412	90.27	-	-	88.14	31.71	4.5	34.08	100	137	Average
2412	99.99	-	-	97.86	31.71	4.5	34.08	100	137	Peak
2486	41.96	-12.04	54	39.67	31.78	4.59	34.08	100	137	Average
2486	53.71	-20.29	74	51.42	31.78	4.59	34.08	100	137	Peak
7236	50.12	-29.87	79.99	63.87	35.21	8.05	57.01	100	0	Peak



Test Mode :	Mode 2	Temperature :	23~24℃
Test Channel :	1	Relative Humidity :	47~48%
Test Engineer :	Kay Wu	Polarization :	Horizontal
Remark :	2438 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
30.27	21	-19	40	33.62	18.36	0.58	31.56	-	-	Peak
156.09	26.62	-16.88	43.5	47.1	9.88	1.14	31.5	400	35	Peak
178.23	22.1	-21.4	43.5	43.81	8.58	1.23	31.52	-	-	Peak
303.5	26.27	-19.73	46	43.73	12.26	1.55	31.27	-	-	Peak
362.3	28.57	-17.43	46	44.34	13.8	1.71	31.28	-	-	Peak
960.1	28.04	-25.96	54	32.38	23.17	2.85	30.36	-	-	Peak
2390	51.49	-2.51	54	49.37	31.7	4.5	34.08	102	133	Average
2390	63.45	-10.55	74	61.33	31.7	4.5	34.08	102	133	Peak
2438	90.59	-	-	88.39	31.75	4.53	34.08	102	133	Average
2438	100.92	-	-	98.74	31.73	4.53	34.08	102	133	Peak
2496	45.2	-8.8	54	42.86	31.8	4.62	34.08	102	133	Average
2496	57.17	-16.83	74	54.83	31.8	4.62	34.08	102	133	Peak
7314	50.16	-23.84	74	63.89	35.14	8.1	56.97	100	0	Peak



Test Mode :	Mode 2	Temperature :	23~24℃
Test Channel :	1	Relative Humidity :	47~48%
Test Engineer :	Kay Wu	Polarization :	Vertical
Remark :	2438 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
31.35	19.96	-20.04	40	33.15	17.78	0.58	31.55	-	-	Peak
88.32	24.55	-18.95	43.5	47.18	8.07	0.84	31.54	400	142	Peak
164.73	14.97	-28.53	43.5	36.04	9.31	1.14	31.52	-	-	Peak
822.9	24.24	-21.76	46	30.96	21.19	2.61	30.52	-	-	Peak
941.9	25.35	-20.65	46	30.17	22.74	2.85	30.41	-	-	Peak
976.2	27.86	-26.14	54	31.32	23.53	3.31	30.3	-	-	Peak
2388	53.06	-0.94	54	50.97	31.7	4.47	34.08	107	55	Average
2388	64.9	-9.1	74	62.81	31.7	4.47	34.08	107	55	Peak
2438	92.84	-	-	90.64	31.75	4.53	34.08	107	55	Average
2438	103.59	-	-	101.41	31.73	4.53	34.08	107	55	Peak
2484	44.86	-9.14	54	42.57	31.78	4.59	34.08	107	55	Average
2484	57.04	-16.96	74	54.75	31.78	4.59	34.08	107	55	Peak



Test Mode :	Mode 3	Temperature :	23~24℃
Test Channel :	2	Relative Humidity :	47~48%
Test Engineer :	Kay Wu	Polarization :	Horizontal
Remark :	2462 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
160.41	24.24	-19.26	43.5	44.97	9.63	1.14	31.5	-	-	Peak
171.48	32.14	-11.36	43.5	53.59	8.86	1.23	31.54	400	0	Peak
298.11	25.53	-20.47	46	43.12	12.14	1.55	31.28	-	-	Peak
374.9	28.2	-17.8	46	43.54	14.13	1.77	31.24	-	-	Peak
384	29.52	-16.48	46	44.61	14.36	1.77	31.22	-	-	Peak
960.1	27.96	-26.04	54	32.3	23.17	2.85	30.36	-	-	Peak
2390	52.3	-1.7	54	50.18	31.7	4.5	34.08	100	131	Average
2390	63.51	-10.49	74	61.39	31.7	4.5	34.08	100	131	Peak
2462	88.74	-	-	86.49	31.77	4.56	34.08	100	131	Average
2462	99.52	-	-	97.27	31.77	4.56	34.08	100	131	Peak
2491.45	45.93	-8.07	54	43.59	31.8	4.62	34.08	100	131	Average
2491.45	59.8	-14.2	74	57.46	31.8	4.62	34.08	100	131	Peak



Test Mode :	Mode 3	Temperature :	23~24℃
Test Channel :	2	Relative Humidity :	47~48%
Test Engineer :	Kay Wu	Polarization :	Vertical
Remark :	2462 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
31.08	19.37	-20.63	40	32.56	17.78	0.58	31.55	-	-	Peak
130.71	22.66	-20.84	43.5	42.25	10.86	1.07	31.52	-	-	Peak
208.47	15.68	-27.82	43.5	37.12	8.76	1.26	31.46	-	-	Peak
848.1	25.08	-20.92	46	31.55	21.38	2.65	30.5	-	-	Peak
953.1	26.48	-19.52	46	31	23.01	2.85	30.38	100	0	Peak
996.5	28.15	-25.85	54	30.6	24	3.77	30.22	-	-	Peak
2384	50.74	-3.26	54	48.67	31.68	4.47	34.08	103	57	Average
2384	63.15	-10.85	74	61.08	31.68	4.47	34.08	103	57	Peak
2462	91.55	-	-	89.3	31.77	4.56	34.08	103	57	Average
2462	101.56	-	-	99.31	31.77	4.56	34.08	103	57	Peak
2487.65	47.65	-6.35	54	45.34	31.8	4.59	34.08	103	57	Average
2487.65	60.81	-13.19	74	58.5	31.8	4.59	34.08	103	57	Peak



Test Mode :	Mode 4	Temperature :	23~24°C
Test Channel :	1	Relative Humidity :	47~48%
Test Engineer :	Kay Wu	Polarization :	Horizontal
Remark :	2438 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
99.66	26.04	-17.46	43.5	47.28	9.39	0.95	31.58	400	0	Peak
178.23	21.34	-22.16	43.5	43.05	8.58	1.23	31.52	-	-	Peak
298.11	25.14	-20.86	46	42.73	12.14	1.55	31.28	-	-	Peak
307	26.69	-19.31	46	44.06	12.36	1.55	31.28	-	-	Peak
384	28.44	-17.56	46	43.53	14.36	1.77	31.22	-	-	Peak
978.3	27.67	-26.33	54	31.04	23.6	3.31	30.28	-	-	Peak
2386	47.63	-6.37	54	45.54	31.7	4.47	34.08	100	132	Average
2386	58.48	-15.52	74	56.39	31.7	4.47	34.08	100	132	Peak
2438	90.3	-	-	88.1	31.75	4.53	34.08	100	132	Average
2438	100.44	-	-	98.21	31.75	4.56	34.08	100	132	Peak
2486	45.75	-8.25	54	43.46	31.78	4.59	34.08	100	132	Average
2486	56.94	-17.06	74	54.65	31.78	4.59	34.08	100	132	Peak
7314	49.21	-24.79	74	62.94	35.15	8.1	56.98	100	0	Peak



Test Mode :	Mode 4	Temperature :	23~24℃
Test Channel :	1	Relative Humidity :	47~48%
Test Engineer :	Kay Wu	Polarization :	Vertical
Remark :	2438 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
30.81	20.83	-19.17	40	34.02	17.78	0.58	31.55	400	287	Peak
174.45	24.25	-19.25	43.5	45.88	8.67	1.23	31.53	-	-	Peak
298.11	25.18	-20.82	46	42.77	12.14	1.55	31.28	-	-	Peak
824.3	24.23	-21.77	46	30.94	21.2	2.61	30.52	-	-	Peak
931.4	25.22	-20.78	46	30.37	22.5	2.78	30.43	-	-	Peak
985.3	28.33	-25.67	54	31.53	23.75	3.31	30.26	-	-	Peak
2388	52.66	-1.34	54	50.57	31.7	4.47	34.08	102	97	Average
2388	64.84	-9.16	74	62.75	31.7	4.47	34.08	102	97	Peak
2438	92.48	-	-	90.28	31.75	4.53	34.08	102	97	Average
2438	103.03	-	-	100.85	31.73	4.53	34.08	102	97	Peak
2484	46.94	-7.06	54	44.65	31.78	4.59	34.08	102	97	Average
2484	58.64	-15.36	74	56.35	31.78	4.59	34.08	102	97	Peak
7314	49.34	-24.66	74	63.09	35.15	8.08	56.98	100	0	Peak

3.8 Antenna Requirements

3.8.1 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.

3.8.2 Antenna Connected Construction

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

3.8.3 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
System Simulator	R&S	CMU200	117995	N/A	Mar. 19, 2009	Mar. 18, 2011	Conducted (TH02-HY)
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)
Thermal Chamber	Ten Billion	TTH-D35P	TBN-930701	N/A	Jul. 30, 2010	Jul. 29, 2011	Conducted (TH02-HY)
EMI Test Receive	R&S	ESCS 30	100356	9KHz – 2.75GHz	Aug. 16, 2010	Aug. 15, 2011	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100081	9kHz~30MHz	Nov. 30, 2009	Nov. 29, 2010	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100080	9kHz~30MHz	Nov. 23, 2009	Nov. 22, 2010	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	N/A	Conduction (CO05-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)

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 EP000602 as below.