Partial FCC RF Test Report

APPLICANT	:	Motion Computing Incorporated
EQUIPMENT	:	N6230 mini PCI-E WiFi a/b/g/n + BT module
BRAND NAME	:	Motion Computing Incorporated
MODEL NAME	:	62230ANHMW
FCC ID	:	Q3QIHW62230ANH
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DSS) Spread Spectrum Transmitter

The product was installed into Host (Brand Name: Motion Computing Incorporated, Model Name: CFT-003) during test.

This is a partial report which is included the Radiation Emission and Conducted Emission tests item. The product was received on Nov. 09, 2011 and completely tested on Nov. 29, 2011. 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:

Jones Tsai

Jones Tsai / Manager

Testing Laboratory 1190

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR1N0901A	Rev. 01	Conducted data refer to Intel 6230 Module Reports.	Jan. 03, 2012

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(d)	A8.5	Frequency Band Edges	≤ 20dBc	Pass	-
3.2	15.207	Gen 7.2.4	AC Conducted Emission	15.207(a)	Pass	Under limit 11.10 dB at 2.910 MHz
3.3	15.247(d)	A8.5	Transmitter Radiated Emission	15.209(a) & 15.247(d)	Pass	Under limit 4.67 dB at 2360.000 MHz
3.4	15.203 & 15.247(b)	A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Motion Computing Incorporated
8601 Ranch Road 2222; Building #2 Austin, Texas 78730 USA

1.2 Manufacturer

Motion Computing Incorporated
8601 Ranch Road 2222; Building #2 Austin, Texas 78730 USA

1.3 Factory

Pegatron Corporation
5F. No. 76, Li-Gong St., Beitou District, Taipei City 112, Taiwan, R.O.C.

1.4 Feature of Equipment Under Test

Product Feature & Specification	
Equipment	N6230 mini PCI-E WiFi a/b/g/n + BT module
Brand Name	Motion Computing Incorporated
Model Name	62230ANHMW
FCC ID	Q3QIHW62230ANH
Tx/Rx Frequency Range	2400 MHz ~ 2483.5 MHz
Number of Channels	79
Carrier Frequency of Each Channel	2402+n*1 MHz; n=0~78
Channel Spacing	1 MHz
Maximum Output Power to Antenna	Bluetooth (1Mbps) : 5.70 dBm (0.0037 W) Bluetooth EDR (2Mbps) : 1.24 dBm (0.0013 W) Bluetooth EDR (3Mbps) : 1.71 dBm (0.0015 W)
Antenna Type	PIFA Antenna
Type of Modulation	Bluetooth (1Mbps) : GFSK Bluetooth EDR (2Mbps) : π/4-DQPSK Bluetooth EDR (3Mbps) : 8-DPSK
EUT Stage	Production Unit

Host Information	
Brand Name	Motion Computing Incorporated
Model Name	CFT-003
FCC ID	Q3QTIRFID7960
Tx/Rx Frequency Range	13.56 MHz
Antenna Type	PCB Antenna
Type of Modulation	ASK

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.5 Testing Site

Test Site	SPORTON INTERNATIONAL INC.		
Test Site Location	No. 52, Hwa Ya 1st 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

1.6 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 Public Notice DA 00-705
- ANSI C63.4-2003
- IC RSS-210 Issue 8
- IC RSS-Gen Issue 3

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, recorded in a separate test report.

1.7 Ancillary Equipment List

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m
2.	Notebook	DELL	P20G	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	Bluetooth Earphone	Nokia	BH-102	PYAHS-107W	N/A	N/A
4.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A

2 Test Configuration of Equipment Under Test

2.1 RF Output Power

Preliminary tests were performed in different data rate and recorded the RF output power in the following table:

Band	Bluetooth RF Output Power		
Channel	00	39	78
Frequency	2402	2441	2480
Peak Power	5.44	5.70	5.65

Remark:

1. All the test data for each data rate were verified, but only the worst case was reported.
2. The data rate was set in 1Mbps for all the test items due to the highest RF output power.
3. The EUT is programmed to transmit signals continuously for all testing.

2.2 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: conduction (150 KHz to 30 MHz), radiation (9 KHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

Pre-scanned tests, X, Y, Z in three orthogonal panels, were conducted to determine the final configuration from all possible combinations, laptop / tablet modes.

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

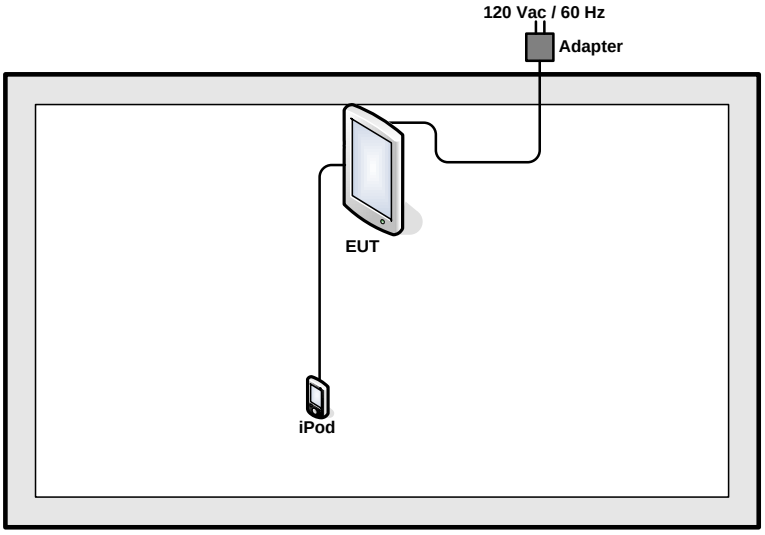
Test Cases			
Test Item	**Data Rate / Modulation**		
	Bluetooth 1Mbps GFSK	**Bluetooth EDR 2Mbps π/4-DQPSK**	**Bluetooth EDR 3Mbps 8-DPSK**
Radiated TCs	Mode 1: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz	N/A	N/A
AC Conducted Emission	Mode 1 : WLAN (2.4G) Link + Bluetooth Link + I- Pod + Adapter + Battery Mode 2 : WLAN (5G) Link + Bluetooth Link + I- Pod + Adapter + Battery		

Remark:

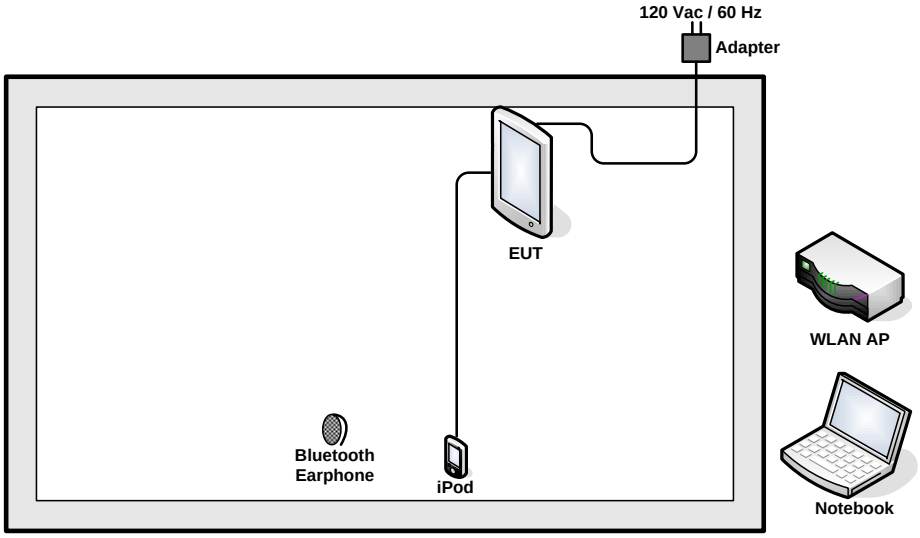
1. For radiated TCs, the data rate was set in 1Mbps due to the highest RF output power; only the data of these modes was reported.
2. For conducted emission, the worst case is mode 2; only the test data of this mode was reported.

2.3 Connection Diagram of Test System

<Bluetooth Tx Mode>



<AC Conducted Emission Mode>



2.4 RF Utility

For Bluetooth function, the RF utility, “DRTU” was installed in EUT which was programmed in order to make the EUT for transmitting and receiving signals continuously.

3 Test Result

3.1 Band Edges Measurement

3.1.1 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. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

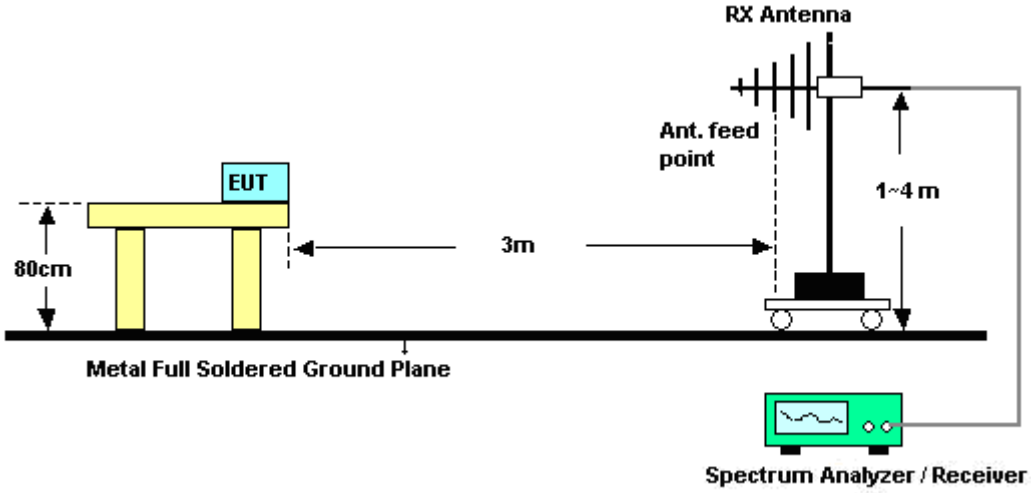
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedures

1. The testing follows the guidelines in ANSI C63.4-2003 and FCC Public Notice DA 00-705 Measurement Guidelines.
2. RF antenna conducted test: Set RBW = 300KHz, Video bandwidth (VBW) ≥ RBW. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 300k Hz 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: Applies 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 = 1MHz, Sweep: Auto for Peak; set RBW = 1MHz, VBW = 10 Hz, Sweep: Auto for Average. 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. See FCC Section 15.35(b) and (c).
4. In case the emission is fail due to the used RBW / VBW is too wide, marker-delta method of FCC Public Notice DA 00-705 will be followed.

3.1.4 Test Setup



3.1.5 Test Result of Radiated Band Edges

Test Mode :	Mode 1	**Temperature :**	21~24°C
Test Channel :	00	**Relative Humidity :**	52~58%
		Test Engineer :	Wii Chang

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
2362.06	47.45	-26.55	74	44.97	31.99	4.57	34.08	149	232	Peak
2362.06	36.47	-17.53	54	33.99	31.99	4.57	34.08	149	232	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
2321.97	46.44	-27.56	74	44.04	31.96	4.53	34.09	100	274	Peak
2321.97	36.24	-17.76	54	33.84	31.96	4.53	34.09	100	274	Average

Test Mode :	Mode 3	**Temperature :**	21~24°C
Test Channel :	78	**Relative Humidity :**	52~58%
		Test Engineer :	Wii Chang

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
2483.5	67.93	-6.07	74	65.1	32.09	4.64	33.9	100	224	Peak
2483.5	48.92	-5.08	54	46.09	32.09	4.64	33.9	100	224	Average

Summary results of marker-delta method:

Test mode	Maximum field strength of the fundamental emission (dBµV/m)	Delta Result (dB)	Average Result (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
Single Carrier Mode	104.42	55.62	48.8	54	-5.2	Pass
Hopping Mode	104.42	55.5	48.92	54	-5.08	Pass

Note : Average result = Maximum field strength – Delta result

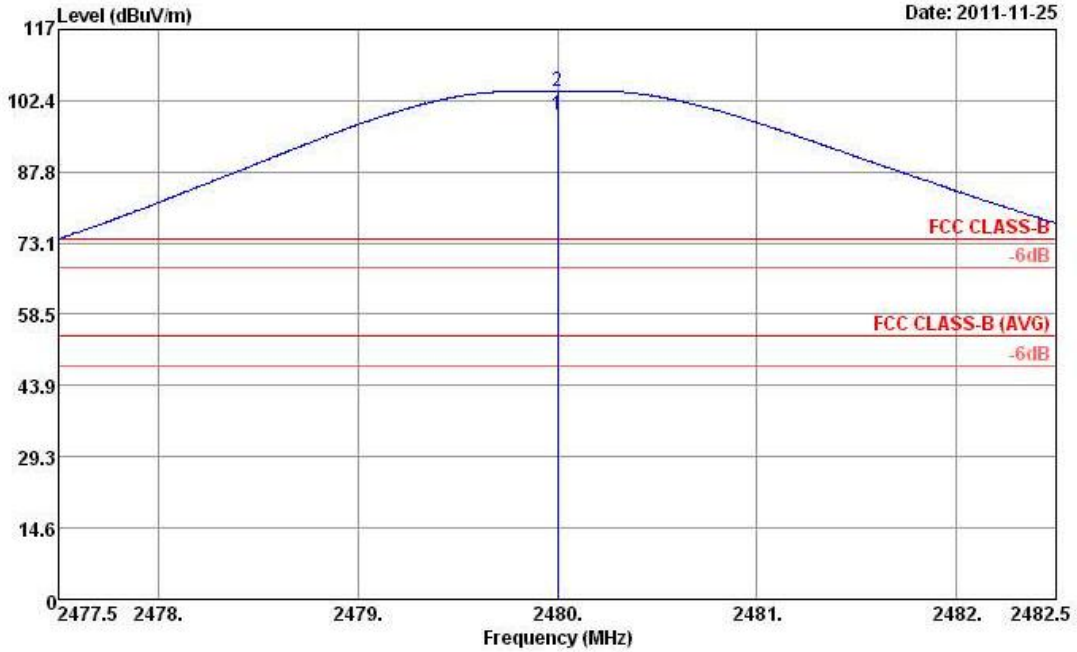
ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.5	61.78	-12.22	74	58.95	32.09	4.64	33.9	100	277	Peak
2483.5	45.11	-8.89	54	42.28	32.09	4.64	33.9	100	277	Average

Summary results of marker-delta method:

Test mode	Maximum field strength of the fundamental emission (dBµV/m)	Delta Result (dB)	Average Result (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
Single Carrier Mode	98.19	54.7	43.49	54	-10.51	Pass
Hopping Mode	98.19	53.08	45.11	54	-8.89	Pass

Note : Average result = Maximum field strength – Delta result

Test Mode :	Mode 3	**Temperature :**	21~24°C
Test Channel :	78	**Relative Humidity :**	52~58%
Test Engineer :	Wii Chang	**Polarization :**	Horizontal

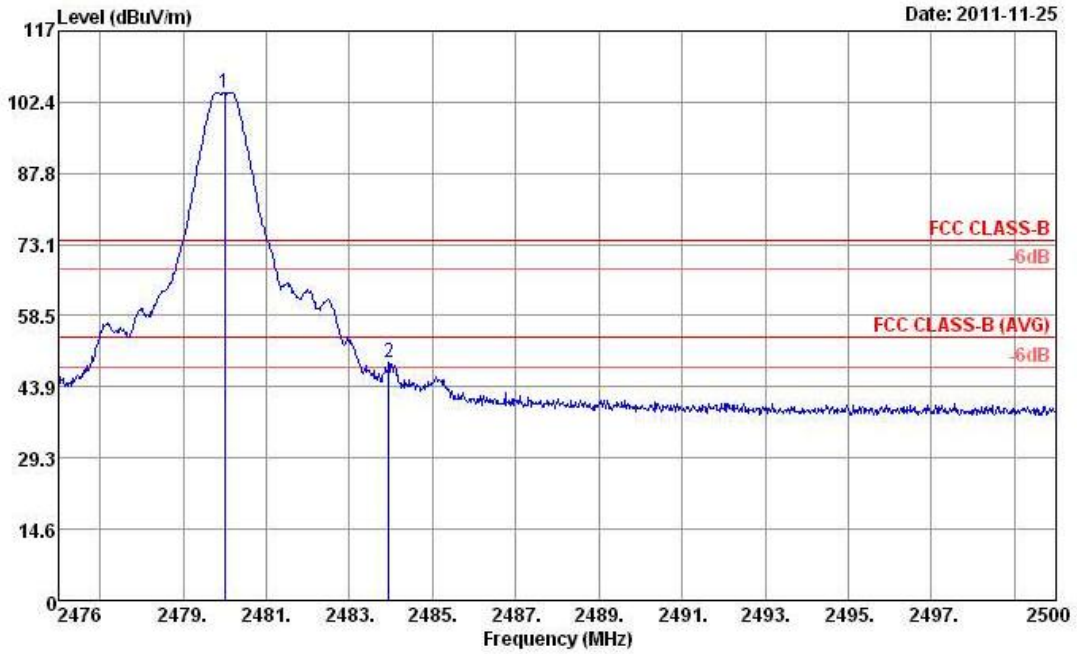


Site : 03CH05-HY
Condition : FCC CLASS-B 3m HF_ANT_110810 HORIZONTAL
Project : FR 1N0901
Mode : Mode 3

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 *	2480.00	99.37	45.37	54.00	96.54	32.09	4.64	33.90	100	224	Average
2 *	2480.00	104.42	30.42	74.00	101.59	32.09	4.64	33.90	100	224	Peak

* Maximum field strength of the fundamental emission

Test Mode :	Mode 3	**Temperature :**	21~24°C
Test Channel :	78	**Relative Humidity :**	52~58%
Test Engineer :	Wii Chang	**Polarization :**	Horizontal

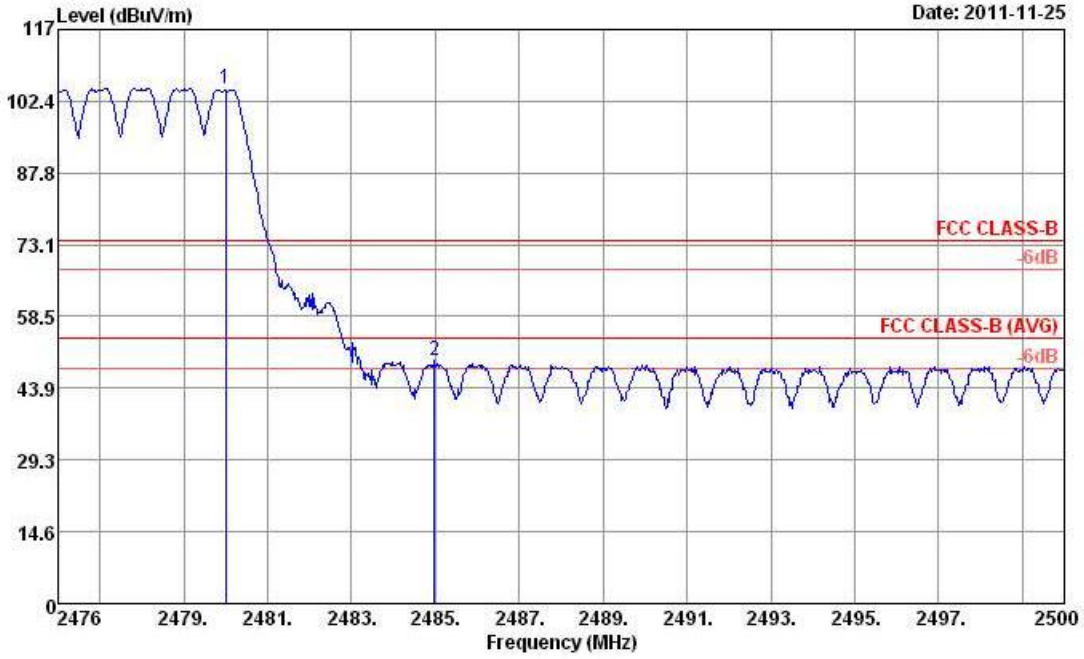


Site : 03CH05-HY
Condition : FCC CLASS-B 3m HF_ANT_110810 HORIZONTAL
Project : FR 1N0901
Mode : Mode 3

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 *	2480.00	104.43	30.43	74.00	101.60	32.09	4.64	33.90	100	224	Peak
2	2483.94	48.81	-25.19	74.00	45.98	32.09	4.64	33.90	100	224	Peak

* Marker-Delta Method (RBW/VBW=100KHz): 55.62 dB , single carrier Mode

Test Mode :	Mode 3	**Temperature :**	21~24°C
Test Channel :	78	**Relative Humidity :**	52~58%
Test Engineer :	Wii Chang	**Polarization :**	Horizontal

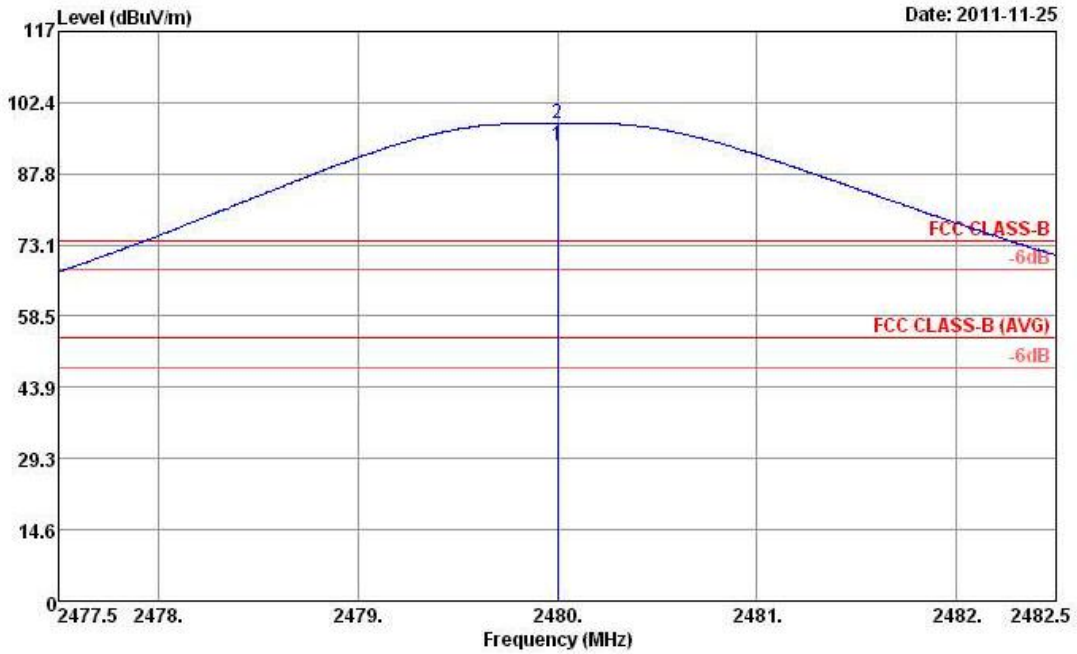


Site : 03CH05-HY
Condition : FCC CLASS-B 3m HF_ANT_110810 HORIZONTAL
Project : FR 1N0901
Mode : Mode 3

		Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
		MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	*	2480.00	104.91	30.91	74.00	102.08	32.09	4.64	33.90	100	224	Peak
2		2484.98	49.41	-24.59	74.00	46.58	32.09	4.64	33.90	100	224	Peak

* Marker-Delta Method (RBW/VBW=100KHz): 55.50 dB , Hopping Mode

Test Mode :	Mode 3	Temperature :	21~24°C
Test Channel :	78	Relative Humidity :	52~58%
Test Engineer :	Wii Chang	Polarization :	Vertical

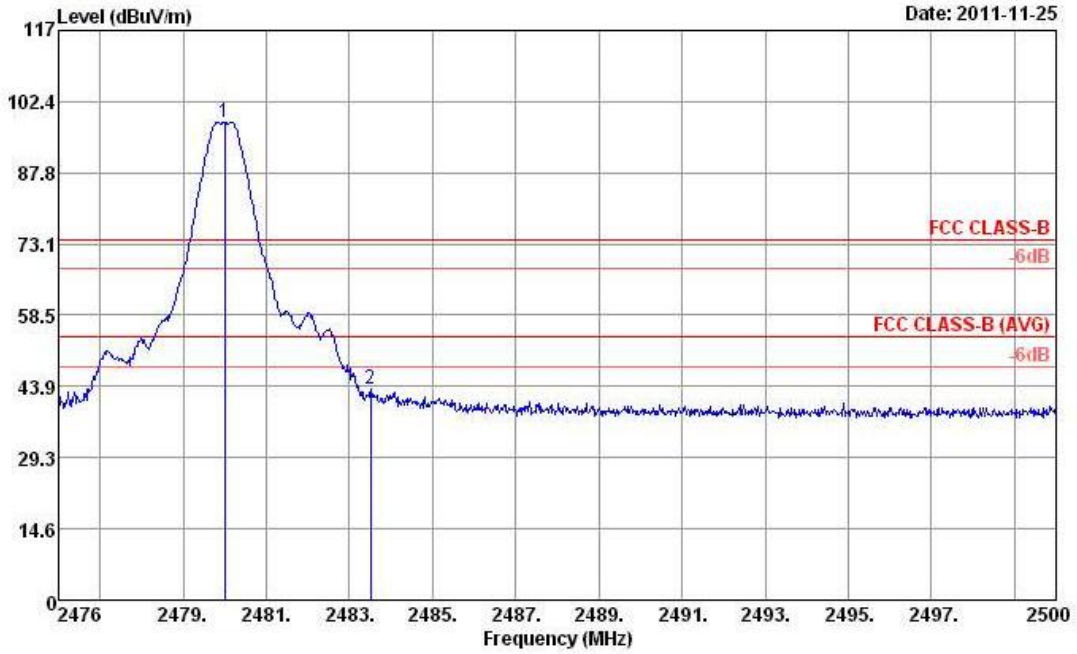


Site : 03CH05-HY
Condition : FCC CLASS-B 3m HF_ANT_110810 VERTICAL
Project : FR 1N0901
Mode : Mode 3

	Freq	Level	Over Limit	Limit Line	ReadLevel	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 *	2480.00	93.44	39.44	54.00	90.61	32.09	4.64	33.90	100	277	Average
2 *	2480.00	98.19	24.19	74.00	95.36	32.09	4.64	33.90	100	277	Peak

* Maximum field strength of the fundamental emission

Test Mode :	Mode 3	**Temperature :**	21~24°C
Test Channel :	78	**Relative Humidity :**	52~58%
Test Engineer :	Wii Chang	**Polarization :**	Vertical

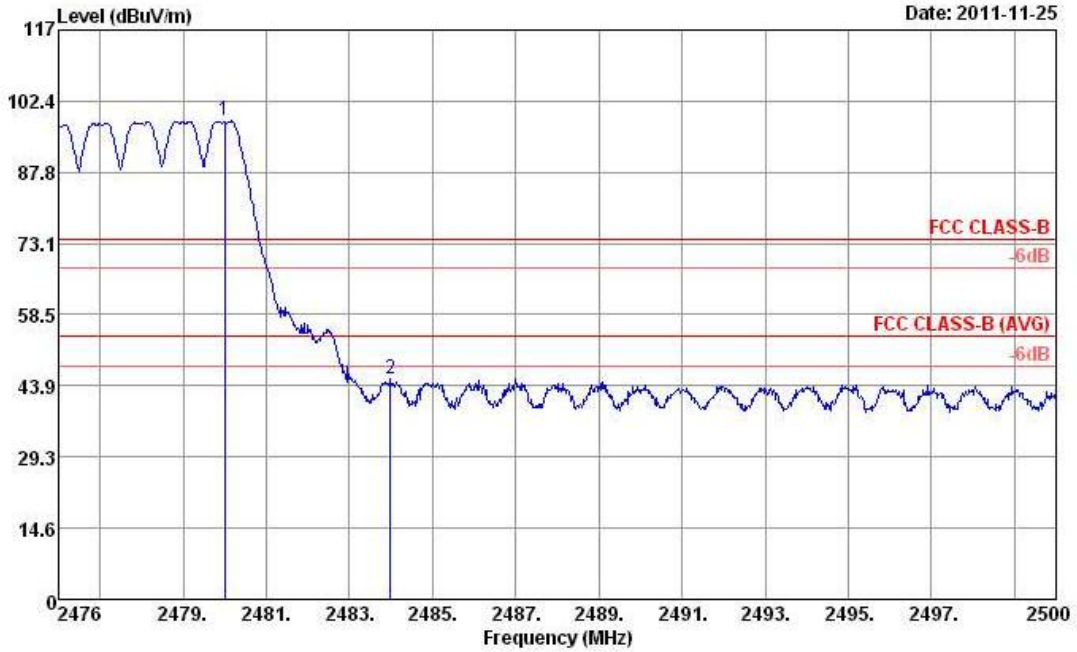


Site : 03CH05-HY
Condition : FCC CLASS-B 3m HF_ANT_110810 VERTICAL
Project : FR 1N0901
Mode : Mode 3

		Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
		MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	*	2480.00	98.16	24.16	74.00	95.33	32.09	4.64	33.90	100	277	Peak
2		2483.51	43.46	-30.54	74.00	40.63	32.09	4.64	33.90	100	277	Peak

* Marker-Delta Method (RBW/VBW=100KHz): 54.70 dB , single carrier Mode

Test Mode :	Mode 3	**Temperature :**	21~24°C
Test Channel :	78	**Relative Humidity :**	52~58%
Test Engineer :	Wii Chang	**Polarization :**	Vertical



Site : 03CH05-HY
Condition : FCC CLASS-B 3m HF_ANT_110810 VERTICAL
Project : FR 1N0901
Mode : Mode 3

		Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
		MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	*	2480.00	98.27	24.27	74.00	95.44	32.09	4.64	33.90	100	277	Peak
2		2483.99	45.19	-28.81	74.00	42.36	32.09	4.64	33.90	100	277	Peak

* Marker-Delta Method (RBW/VBW=100KHz): 53.08 dB , Hopping Mode

3.2 AC Conducted Emission Measurement

3.2.1 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.

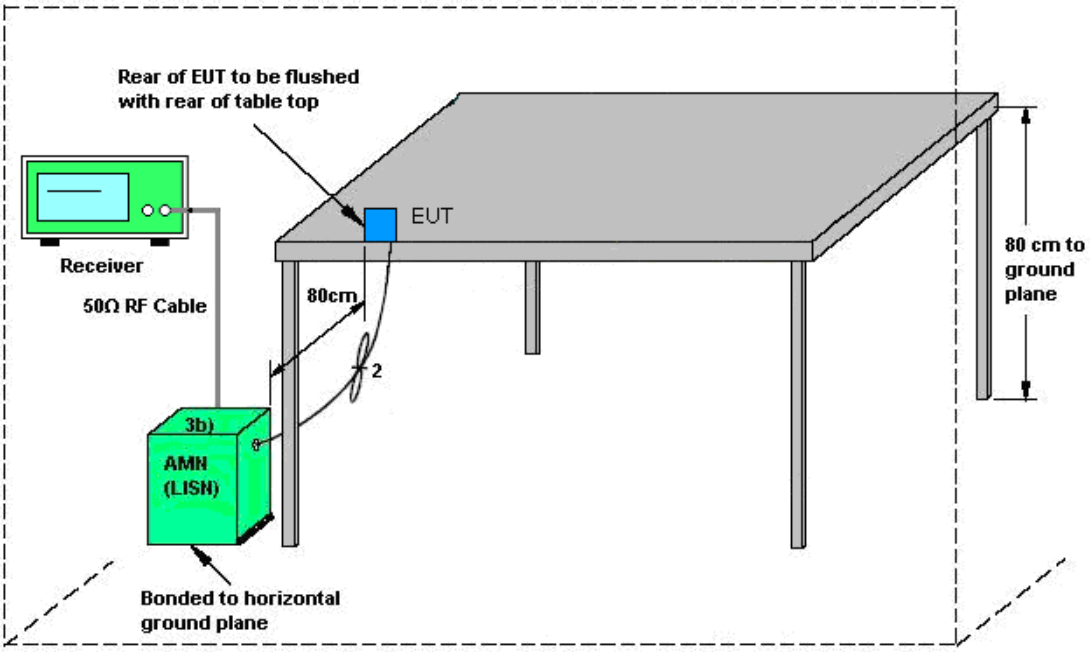
3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

3.2.3 Test Procedures

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

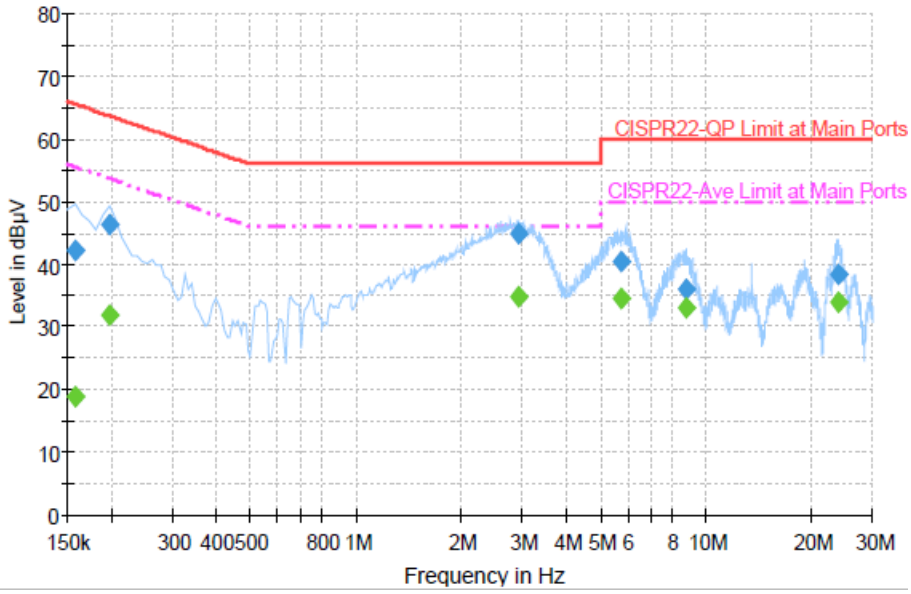
3.2.4 Test Setup



AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

3.2.5 Test Result of AC Conducted Emission

Test Mode :	Mode 2	**Temperature :**	20~22℃
Test Engineer :	Novic Chiang	**Relative Humidity :**	40~42%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Function Type :	WLAN (5G) Link + Bluetooth Link + I- Pod + Adapter + Battery		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



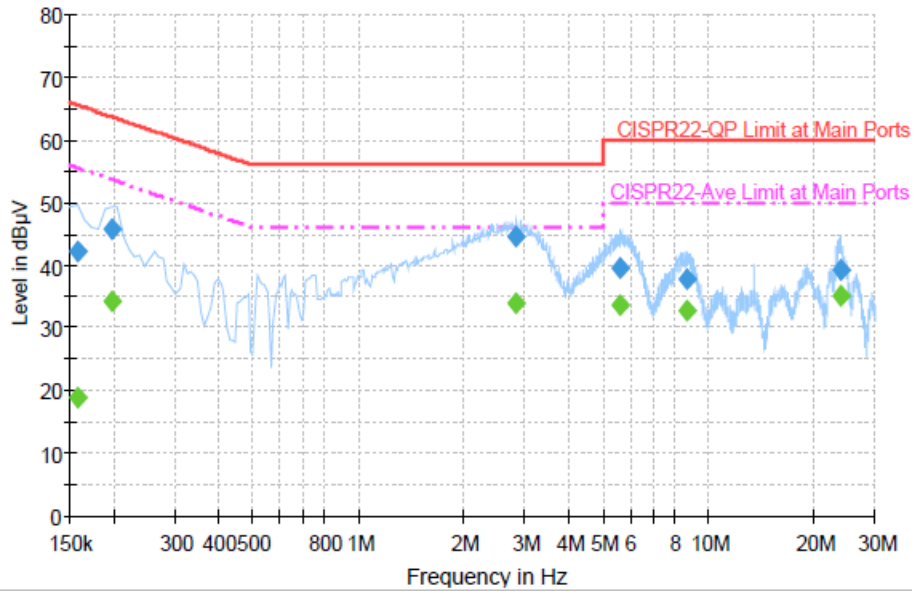
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	42.2	Off	L1	19.4	23.4	65.6
0.198000	46.3	Off	L1	19.4	17.4	63.7
2.910000	44.9	Off	L1	19.4	11.1	56.0
5.750000	40.4	Off	L1	19.5	19.6	60.0
8.806000	36.1	Off	L1	19.6	23.9	60.0
24.062000	38.3	Off	L1	19.7	21.7	60.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	18.8	Off	L1	19.4	36.8	55.6
0.198000	31.8	Off	L1	19.4	21.9	53.7
2.910000	34.7	Off	L1	19.4	11.3	46.0
5.750000	34.6	Off	L1	19.5	15.4	50.0
8.806000	32.9	Off	L1	19.6	17.1	50.0
24.062000	33.9	Off	L1	19.7	16.1	50.0

Test Mode :	Mode 2	**Temperature :**	20~22℃
Test Engineer :	Novic Chiang	**Relative Humidity :**	40~42%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral
Function Type :	WLAN (5G) Link + Bluetooth Link + I- Pod + Adapter + Battery		
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)
0.158000	42.1	Off	N	19.4	23.5	65.6
0.198000	45.9	Off	N	19.4	17.8	63.7
2.822000	44.6	Off	N	19.5	11.4	56.0
5.614000	39.6	Off	N	19.5	20.4	60.0
8.670000	37.8	Off	N	19.6	22.2	60.0
23.822000	39.2	Off	N	19.8	20.8	60.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	18.8	Off	N	19.4	36.8	55.6
0.198000	34.2	Off	N	19.4	19.5	53.7
2.822000	34.0	Off	N	19.5	12.0	46.0
5.614000	33.6	Off	N	19.5	16.4	50.0
8.670000	32.7	Off	N	19.6	17.3	50.0
23.822000	35.0	Off	N	19.8	15.0	50.0

3.3 Radiated Emission Measurement

3.3.1 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. 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

3.3.2 Measuring Instruments

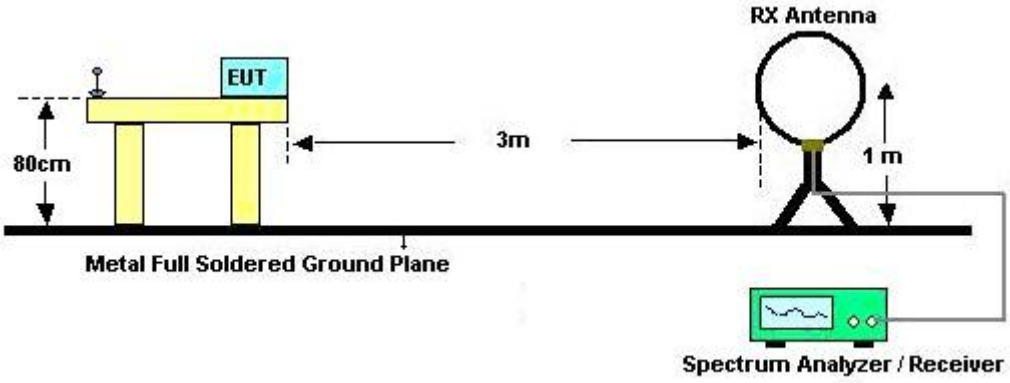
See list of measuring instruments of this test report.

3.3.3 Test Procedures

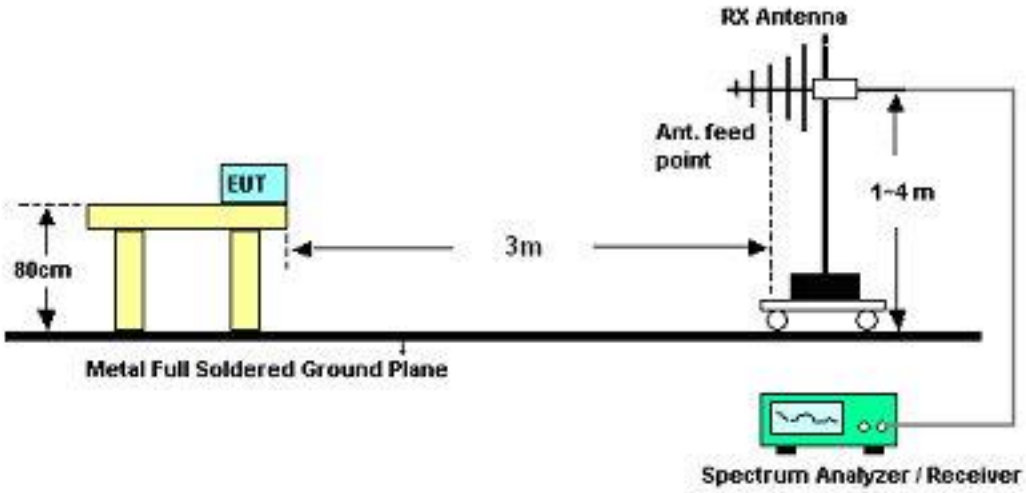
1. The testing follows the guidelines in FCC Public Notice DA 00-705 Measurement Guidelines.
2. Use the following spectrum analyzer settings:
   (1) Span = wide enough to fully capture the emission being measured; RBW = 1 MHz for f ≥ 1 GHz, 100 KHz for f < 1 GHz; VBW ≥ RBW; Sweep = auto; Detector function = 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 (specific distance [3m] / 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.
4. Measured average value for the peak value is greater than 54 dBuv/m

3.3.4 Test Setup

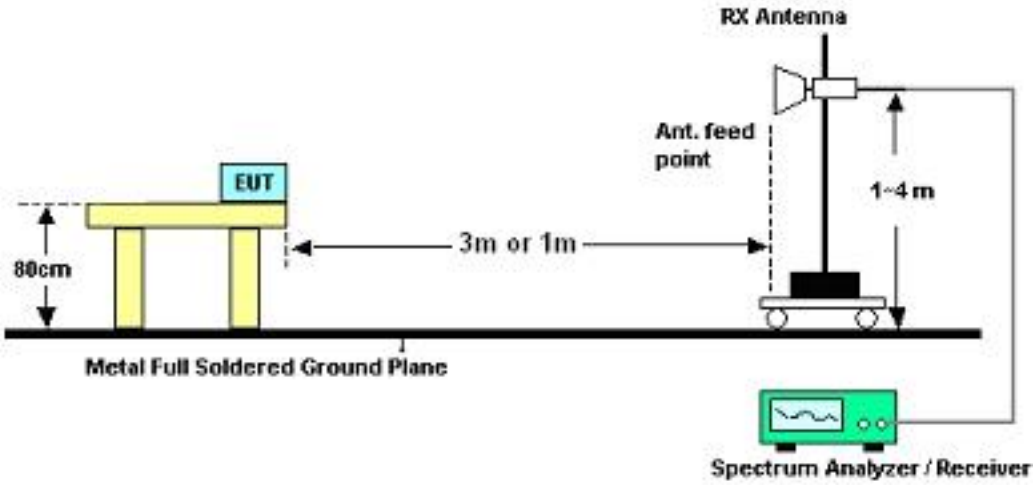
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.3.5 Test Results of Radiated Emissions (9 KHz ~ 30 MHz)

Test Engineer :	Wii Chang	**Temperature :**	21~24°C
		Relative Humidity :	52~58%

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 (specific distance / test distance) (dB);

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

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

Test Mode :	Mode 1	**Temperature :**	21~24°C
Test Channel :	00	**Relative Humidity :**	52~58%
Test Engineer :	Wii Chang	**Polarization :**	Horizontal
Remark :	1. 2402 MHz is Fundamental Signals which can be ignored. 2. 7260 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. For example, 103.14 dBuV/m - 20dB = 83.14 dBuV/m.		

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	22.26	-17.74	40	33.32	19.8	0.7	31.56	-	-	Peak
199.83	22.7	-20.8	43.5	43.59	9.1	1.46	31.45	-	-	Peak
233.31	26.31	-19.69	46	45.54	10.68	1.59	31.5	-	-	Peak
335.7	28.23	-17.77	46	43.7	13.96	1.87	31.3	-	-	Peak
384	28.91	-17.09	46	42.83	15.32	1.98	31.22	100	32	Peak
479.9	23.22	-22.78	46	34.44	17.7	2.19	31.11	-	-	Peak
2362.06	36.47	-17.53	54	33.99	31.99	4.57	34.08	149	232	Average
2362.06	47.45	-26.55	74	44.97	31.99	4.57	34.08	149	232	Peak
2402	97.99	-	-	95.47	32.02	4.58	34.08	149	232	Average
2402	103.14	-	-	100.62	32.02	4.58	34.08	149	232	Peak
2484	34.77	-19.23	54	32.12	32.09	4.64	34.08	149	232	Average
2484	47.14	-26.86	74	44.49	32.09	4.64	34.08	149	232	Peak
2522	54.75	-28.39	83.14	51.98	32.15	4.68	34.06	149	232	Peak
4804	49.18	-24.82	74	67.33	33.84	6.5	58.49	100	0	Peak
7206	45.87	-37.27	83.14	59.66	35.6	8.25	57.64	100	0	Peak

Test Mode :	Mode 1	**Temperature :**	21~24°C
Test Channel :	00	**Relative Humidity :**	52~58%
Test Engineer :	Wii Chang	**Polarization :**	Vertical
Remark :	2402 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
32.7	30.44	-9.56	40	43.5	17.76	0.72	31.54	100	51	Peak
84	25.14	-14.86	40	47.64	8.02	1.03	31.55	-	-	Peak
131.25	29.28	-14.22	43.5	48.17	11.4	1.23	31.52	-	-	Peak
307.7	21.78	-24.22	46	37.93	13.33	1.8	31.28	-	-	Peak
335.7	21.06	-24.94	46	36.53	13.96	1.87	31.3	-	-	Peak
384	24.82	-21.18	46	38.74	15.32	1.98	31.22	-	-	Peak
2321.97	36.24	-17.76	54	33.84	31.96	4.53	34.09	100	274	Average
2321.97	46.44	-27.56	74	44.04	31.96	4.53	34.09	100	274	Peak
2402	92.64	-	-	90.12	32.02	4.58	34.08	100	274	Average
2402	98.65	-	-	96.13	32.02	4.58	34.08	100	274	Peak
2484	32.87	-21.13	54	30.22	32.09	4.64	34.08	100	274	Average
2484	45.69	-28.31	74	43.04	32.09	4.64	34.08	100	274	Peak
4804	44.98	-29.02	74	63.13	33.84	6.5	58.49	100	0	Peak

Test Mode :	Mode 2	**Temperature :**	21~24°C
Test Channel :	39	**Relative Humidity :**	52~58%
Test Engineer :	Wii Chang	**Polarization :**	Horizontal
Remark :	1. 2441 MHz is Fundamental Signals which can be ignored. 2. 2562 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level.		

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	21.83	-18.17	40	32.89	19.8	0.7	31.56	-	-	Peak
167.7	19.02	-24.48	43.5	39.46	9.74	1.36	31.54	-	-	Peak
195.51	23.51	-19.99	43.5	44.66	8.86	1.45	31.46	-	-	Peak
335.7	25.54	-20.46	46	41.01	13.96	1.87	31.3	-	-	Peak
384	28.13	-17.87	46	42.05	15.32	1.98	31.22	100	22	Peak
479.9	24.28	-21.72	46	35.5	17.7	2.19	31.11	-	-	Peak
2322	42.35	-11.65	54	39.95	31.96	4.53	34.09	100	227	Average
2322	50.51	-23.49	74	48.11	31.96	4.53	34.09	100	227	Peak
2441	98.08	-	-	95.49	32.06	4.61	34.08	100	227	Average
2441	103.9	-	-	101.31	32.06	4.61	34.08	100	227	Peak
2492	32.45	-21.55	54	29.79	32.1	4.64	34.08	100	227	Average
2492	43.8	-30.2	74	41.14	32.1	4.64	34.08	100	227	Peak
2562	52.54	-31.36	83.9	49.62	32.19	4.76	34.03	100	227	Peak
4882	50.85	-23.15	74	68.85	33.82	6.54	58.36	100	0	Peak
7323	45.88	-28.12	74	59.57	35.6	8.42	57.71	100	0	Peak

Test Mode :	Mode 2	**Temperature :**	21~24°C
Test Channel :	39	**Relative Humidity :**	52~58%
Test Engineer :	Wii Chang	**Polarization :**	Vertical
Remark :	1. 2441 MHz is Fundamental Signals which can be ignored. 2. 2562 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level.		

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
32.16	30.82	-9.18	40	43.2	18.44	0.72	31.54	100	62	Peak
87.78	25.62	-14.38	40	47.64	8.46	1.06	31.54	-	-	Peak
133.95	28.71	-14.79	43.5	47.59	11.4	1.24	31.52	-	-	Peak
306.3	21.56	-24.44	46	37.7	13.34	1.8	31.28	-	-	Peak
335.7	21.11	-24.89	46	36.58	13.96	1.87	31.3	-	-	Peak
384	26.16	-19.84	46	40.08	15.32	1.98	31.22	-	-	Peak
2322	42.66	-11.34	54	40.26	31.96	4.53	34.09	100	269	Average
2322	48.45	-25.55	74	46.05	31.96	4.53	34.09	100	269	Peak
2441	92.86	-	-	90.27	32.06	4.61	34.08	100	269	Average
2441	98.05	-	-	95.46	32.06	4.61	34.08	100	269	Peak
2496	32.47	-21.53	54	29.81	32.1	4.64	34.08	100	269	Average
2496	44.71	-29.29	74	42.05	32.1	4.64	34.08	100	269	Peak
2562	48.63	-29.42	78.05	45.71	32.19	4.76	34.03	100	269	Peak
4882	46.26	-27.74	74	64.26	33.82	6.54	58.36	100	0	Peak

Test Mode :	Mode 3	**Temperature :**	21~24°C
Test Channel :	78	**Relative Humidity :**	52~58%
Test Engineer :	Wii Chang	**Polarization :**	Horizontal
Remark :	1. 2480 MHz is Fundamental Signals which can be ignored. 2. 2600 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level.		

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
30.54	21.91	-18.09	40	33.63	19.12	0.71	31.55	-	-	Peak
196.86	23.6	-19.9	43.5	44.69	8.92	1.45	31.46	-	-	Peak
232.5	27.05	-18.95	46	46.4	10.56	1.59	31.5	-	-	Peak
335.7	25.4	-20.6	46	40.87	13.96	1.87	31.3	-	-	Peak
384	28.63	-17.37	46	42.55	15.32	1.98	31.22	100	11	Peak
479.9	24.15	-21.85	46	35.37	17.7	2.19	31.11	-	-	Peak
2360	49.33	-4.67	54	46.61	31.99	4.57	33.84	100	224	Average
2360	53.61	-20.39	74	50.89	31.99	4.57	33.84	100	224	Peak
2480	99.35	-	-	96.52	32.09	4.64	33.9	100	224	Average
2480	104.87	-	-	102.04	32.09	4.64	33.9	100	224	Peak
2483.5	48.92	-5.08	54	46.09	32.09	4.64	33.9	100	224	Average
2483.5	67.93	-6.07	74	65.1	32.09	4.64	33.9	100	224	Peak
2600	53.88	-30.99	84.87	50.88	32.24	4.84	34.08	100	224	Peak
4960	50.33	-23.67	74	68.14	33.81	6.57	58.19	100	0	Peak
7440	45.78	-28.22	74	59.34	35.6	8.63	57.79	100	0	Peak

Test Mode :	Mode 3	**Temperature :**	21~24°C
Test Channel :	78	**Relative Humidity :**	52~58%
Test Engineer :	Wii Chang	**Polarization :**	Vertical
Remark :	2480 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
32.16	30.15	-9.85	40	42.53	18.44	0.72	31.54	100	31	Peak
86.43	24.97	-15.03	40	47.25	8.22	1.05	31.55	-	-	Peak
131.52	29	-14.5	43.5	47.89	11.4	1.23	31.52	-	-	Peak
306.3	21.94	-24.06	46	38.08	13.34	1.8	31.28	-	-	Peak
384	26.37	-19.63	46	40.29	15.32	1.98	31.22	-	-	Peak
599.6	27.97	-18.03	46	36.53	19.89	2.42	30.87	-	-	Peak
2360	45.79	-8.21	54	43.07	31.99	4.57	33.84	100	277	Average
2360	50.74	-23.26	74	48.02	31.99	4.57	33.84	100	277	Peak
2480	93.52	-	-	90.69	32.09	4.64	33.9	100	277	Average
2480	98.21	-	-	95.38	32.09	4.64	33.9	100	277	Peak
2483.5	45.11	-8.89	54	42.28	32.09	4.64	33.9	100	277	Average
2483.5	61.78	-12.22	74	58.95	32.09	4.64	33.9	100	277	Peak
4960	45.99	-28.01	74	63.8	33.81	6.57	58.19	200	0	Peak

3.4 Antenna Requirements

3.4.1 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. 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.

3.4.2 Antenna Connected Construction

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

3.4.3 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	Test Date	Due Date	Remark
Power Meter	Anritsu	ML2495A	0932001	N/A	Sep. 18, 2011	Nov. 25, 2011	Sep. 17, 2012	Conducted (TH02-HY)
Power Sensor	Anritsu	MA2411B	0846202	N/A	Sep. 18, 2011	Nov. 29, 2011	Sep. 17, 2012	Conducted (TH02-HY)
Power Meter	Agilent	E4416A	GB41292344	N/A	Feb. 18, 2011	Nov. 29, 2011	Feb. 17, 2012	Conducted (TH02-HY)
Power Sensor	Agilent	E9327A	US40441548	N/A	Feb. 18, 2011	Nov. 29, 2011	Feb. 17, 2012	Conducted (TH02-HY)
EMI Test Receive	R&S	ESCI 7	100724	9kHz~7GHz	Aug. 22, 2011	Nov. 29, 2011	Aug. 21, 2012	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100081	9KHz – 30MHz	Dec. 03, 2010	Nov. 29, 2011	Dec. 02, 2011	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100080	9KHz – 30MHz	Dec. 01, 2010	Nov. 29, 2011	Nov. 30, 2011	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	Nov. 29, 2011	N/A	Conduction (CO05-HY)
Spectrum Analyzer	R&S	FSP30	101352	9KHz-30GHz	Nov. 03, 2011	Nov. 25, 2011	Nov. 02, 2012	Radiation (03CH05-HY)
COM-POWER	Double Ridge Horn	AH-118	701030	1GHz~18GHz	N/A	Nov. 25, 2011	N/A	Radiation (03CH05-HY)
Bilog Antenna	SCHAFFNER	CBL6111C	2725	30MHz ~ 1GHz	Oct. 22, 2011	Nov. 25, 2011	Oct. 21, 2012	Radiation (03CH05-HY)
Turn Table	HD	Deis HD 2000	420/611	0 - 360 degree	N/A	Nov. 25, 2011	N/A	Radiation (03CH05-HY)
Antenna Mast	HD	MA 240	240/666	1 m - 4 m	N/A	Nov. 25, 2011	N/A	Radiation (03CH05-HY)
Horn Antenna	ESCO	3117	66584	1GHz ~ 18GHz	Aug. 04, 2011	Nov. 25, 2011	Aug. 03, 2012	Radiation (03CH05-HY)
COM-POWER	COM-POWER	PA-103	161075	1KHz - 1GHz	Mar. 29, 2011	Nov. 25, 2011	Mar. 28, 2012	Radiation (03CH05-HY)
Pre Amplifier	EMCI	EMC051845	SN980048	1GHz~18GHz	Jul. 19, 2011	Nov. 25, 2011	Jul. 18, 2012	Radiation (03CH05-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	159087	1GHz~18GHz	Feb. 21, 2011	Nov. 25, 2011	Feb. 20, 2012	Radiation (03CH05-HY)
Pre Amplifier	Agilent	8449B	3008A01917	1GHz- 26.5GHz	Apr. 14, 2011	Nov. 25, 2011	Apr. 13, 2012	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 Uc(y)	**1.13**		
Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(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 Uc(y)	**1.27**		
Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(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 Γ1 = 0.197 Antenna VSWR Γ2 = 0.194 Uncertainty = 20Log(1-Γ1*Γ2)	+0.34 / -0.35	U-Shape	0.244	1	0.244
Combined Standard Uncertainty Uc(y)	**2.36**				
Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.72**				

Appendix A. Photographs of EUT

Please refer to Sporton report number EP1N0901 as below.