

# FCC Test Report

APPLICANT : NetComm Wireless Limited  
EQUIPMENT : AirCard Hub  
BRAND NAME : NetComm  
MODEL NAME /  
MARKETING NAME : NHD1W  
FCC ID : XIA-NHD1W  
STANDARD : FCC 47 CFR FCC Part 15 Subpart B  
CLASSIFICATION : Certification

The product was received on Jan. 31, 2012 and completely tested on Mar. 24, 2012. 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 / Manager



**SPORTON INTERNATIONAL INC.**

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



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### SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.107	7.2.4	AC Conducted Emission	< 15.107 limits < RSS-Gen table 2 limits	PASS	Under limit 13.50 dB at 0.510 MHz
3.2	15.109	7.2.3.2	Radiated Emission	< 15.109 limits or < RSS-Gen table 1 limits (Section 6)	PASS	Under limit 3.40 dB at 237.090 MHz

# 1. General Description

## 1.1. Applicant

**NetComm Wireless Limited**

Level 2, 18-20 Orion Road Lane Cove, NSW Australia

## 1.2. Manufacturer

**NetComm Wireless Limited**

Level 2, 18-20 Orion Road Lane Cove, NSW Australia

## 1.3. Feature of Equipment Under Test

Product Feature & Specification	
Equipment	AirCard Hub
Brand Name	NetComm
Model Name / Marketing Name	NHD1W
FCC ID	XIA-NHD1W
Integrated Module	Brand Name : Ralink Model Name : RT3352F
Tx Frequency Range	2400 MHz ~ 2483.5 MHz
Rx Frequency Range	2400 MHz ~ 2483.5 MHz
Antenna Type	PCB Antenna
HW Version	V1.3
SW Version	V1.0.95.0
Type of Modulation	802.11b : DSSS (BPSK / QPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)
EUT Stage	Identical Prototype

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

## 1.4. Test Site

<b>Test Site</b>	SPORTON INTERNATIONAL INC.		
<b>Test Site Location</b>	No. 52, Hwa Ya 1 <sup>st</sup> Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978		
<b>Test Site No.</b>	<b>Sporton Site No.</b>		<b>FCC/IC Registration No.</b>
	CO05-HY	03CH07-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 47 CFR FCC Part 15 Subpart B
- ANSI C63.4-2003
- IC RSS-Gen Issue 3

**Remark:** All test items were verified and recorded according to the standards and without any deviation during the test.

## 1.6. Ancillary Equipment List

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Notebook	DELL	P20G	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
2.	Notebook	DELL	Vostro 1510	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	USB Dongle	ADATA	S101	FCC DoC	N/A	N/A
4.	USB Dongle	Transcend	4GB	FCC DoC	N/A	N/A
5.	USB Dongle	ADATA	4GB	FCC DoC	N/A	N/A
6.	Hotspot LOAD	Sierra Wireless	AirCard 763S	N7NAC763S	N/A	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: conduction (150 KHz to 30 MHz), radiation (30MHz to the 5th 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.

Item	EUT Configuration	Test Condition	
		EMI AC	EMI RE
1.	Data application transferred mode (EUT with notebook)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

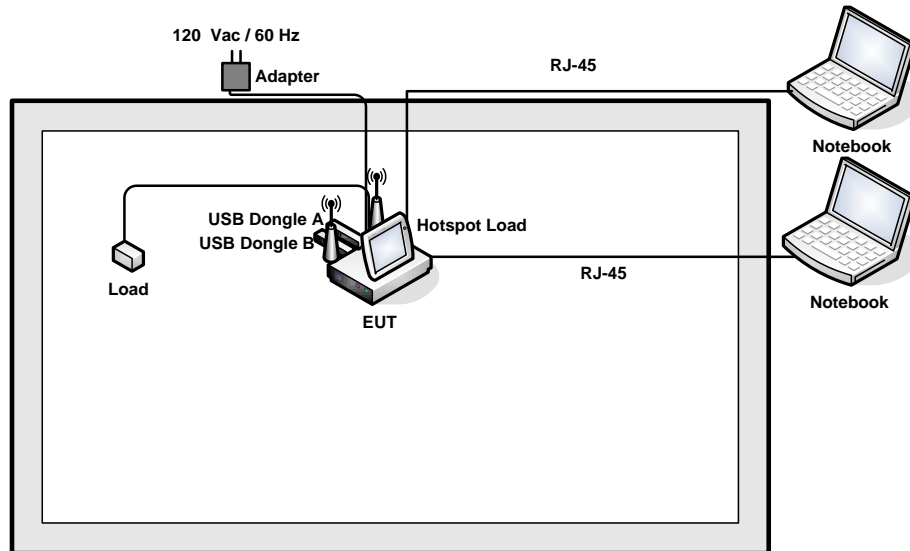
**Abbreviations:**

- EMI AC: AC conducted emissions
- EMI RE: EUT radiated emissions

Test Items	EUT Configure Mode	Function Type
AC Conducted Emission	1	Mode 1: WLAN Idle + LAN Link + WAN Link + Adapter + Hotspot LOAD + USB Dongle (Data Link with Notebook)
Radiated Emissions	1	Mode 1: WLAN Idle + LAN Link + WAN Link + Adapter + Hotspot LOAD + USB Dongle (Data Link with Notebook)

**Remark:** Link with Notebook means data application transferred mode between EUT and Notebook.

## 2.2. Connection Diagram of Test System



## 2.3. Test Software

The EUT was in WLAN idle mode during the testing. The Notebook controls the EUT to data link with Dongle A and Dongle B via RJ-45. Execute "Ping" and link with Notebook via RJ-45 Cable.



### 3. Test Result

#### 3.1. Test of AC Conducted Emission Measurement

##### 3.1.1 Limits 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.

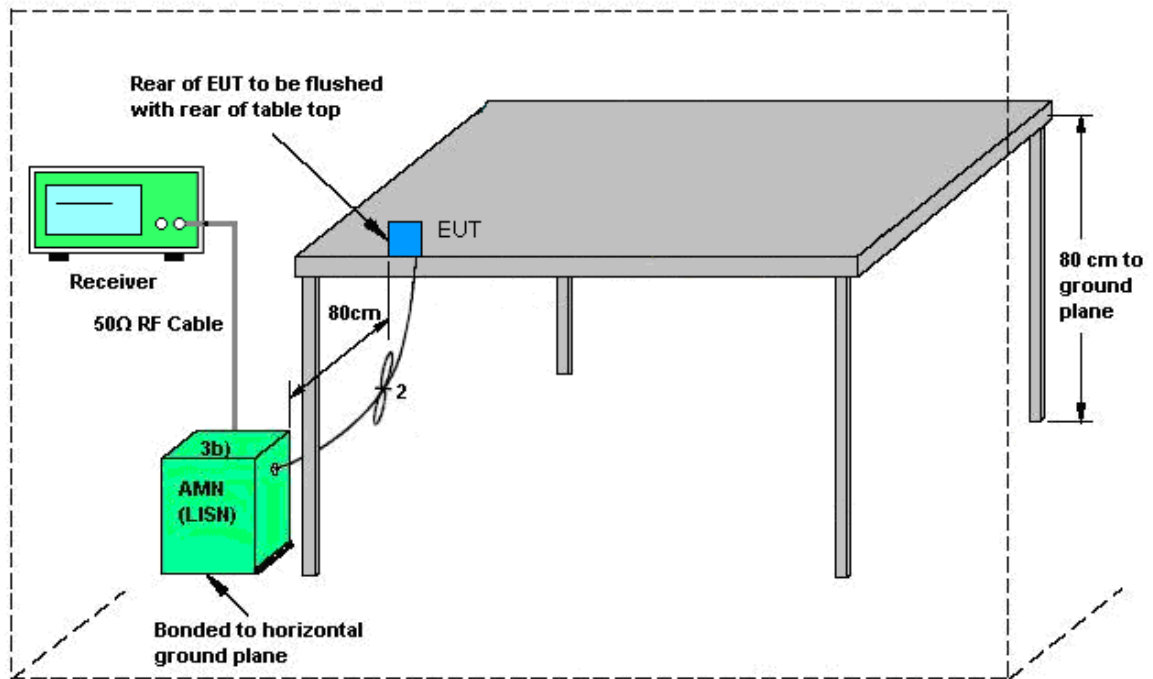
##### 3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

##### 3.1.3 Test Procedure

1. 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.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 KHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

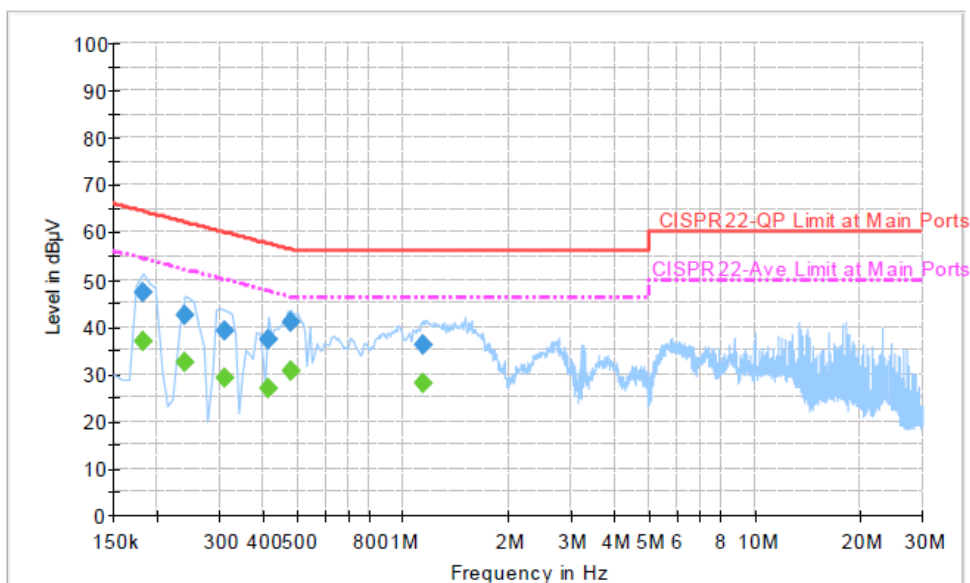
### 3.1.4 Test Setup



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

### 3.1.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	22~23°C
Test Engineer :	Kai-Chun Chu	Relative Humidity :	47~49%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	WLAN Idle + LAN Link + WAN Link + Adapter + Hotspot LOAD + USB Dongle (Data Link with Notebook)		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



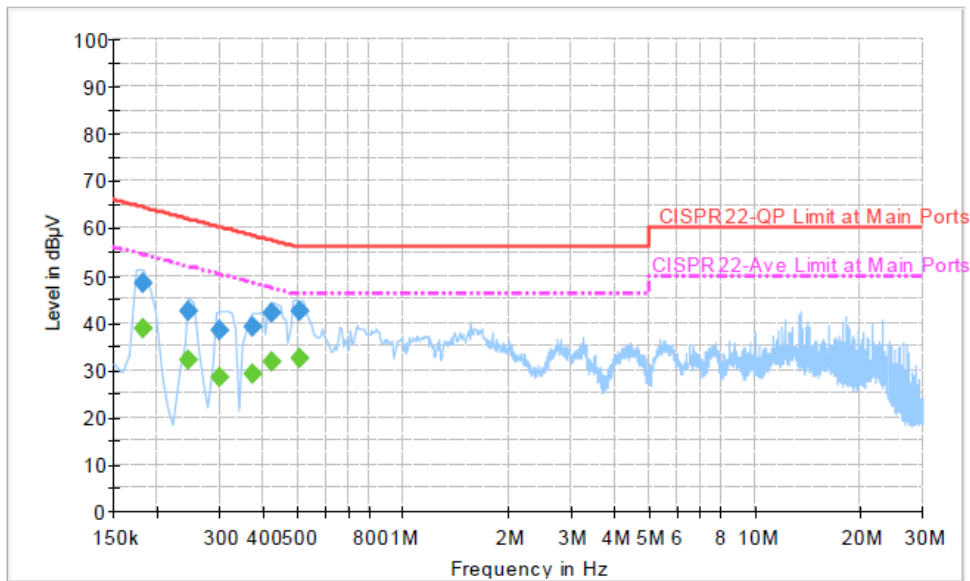
#### Final Result : QuasiPeak

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.182000	47.1	Off	L1	19.4	17.3	64.4
0.238000	42.3	Off	L1	19.4	19.9	62.2
0.310000	39.2	Off	L1	19.3	20.8	60.0
0.414000	37.1	Off	L1	19.4	20.5	57.6
0.478000	40.9	Off	L1	19.4	15.5	56.4
1.142000	36.1	Off	L1	19.4	19.9	56.0

#### Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.182000	37.0	Off	L1	19.4	17.4	54.4
0.238000	32.4	Off	L1	19.4	19.8	52.2
0.310000	29.3	Off	L1	19.3	20.7	50.0
0.414000	27.0	Off	L1	19.4	20.6	47.6
0.478000	30.8	Off	L1	19.4	15.6	46.4
1.142000	28.0	Off	L1	19.4	18.0	46.0

Test Mode :	Mode 1	Temperature :	22~23°C
Test Engineer :	Kai-Chun Chu	Relative Humidity :	47~49%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	WLAN Idle + LAN Link + WAN Link + Adapter + Hotspot LOAD + USB Dongle (Data Link with Notebook)		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



**Final Result : QuasiPeak**

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.182000	48.5	Off	N	19.4	15.9	64.4
0.246000	42.3	Off	N	19.4	19.6	61.9
0.302000	38.3	Off	N	19.3	21.9	60.2
0.374000	39.0	Off	N	19.4	19.4	58.4
0.422000	41.9	Off	N	19.4	15.5	57.4
0.510000	42.5	Off	N	19.3	13.5	56.0

**Final Result : Average**

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.182000	38.6	Off	N	19.4	15.8	54.4
0.246000	32.2	Off	N	19.4	19.7	51.9
0.302000	28.4	Off	N	19.3	21.8	50.2
0.374000	29.0	Off	N	19.4	19.4	48.4
0.422000	31.8	Off	N	19.4	15.6	47.4
0.510000	32.4	Off	N	19.3	13.6	46.0

## 3.2. Test of Radiated Emission Measurement

### 3.2.1. Limit of Radiated Emission

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

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

### 3.2.2. Measuring Instruments

See list of measuring instruments of this test report.

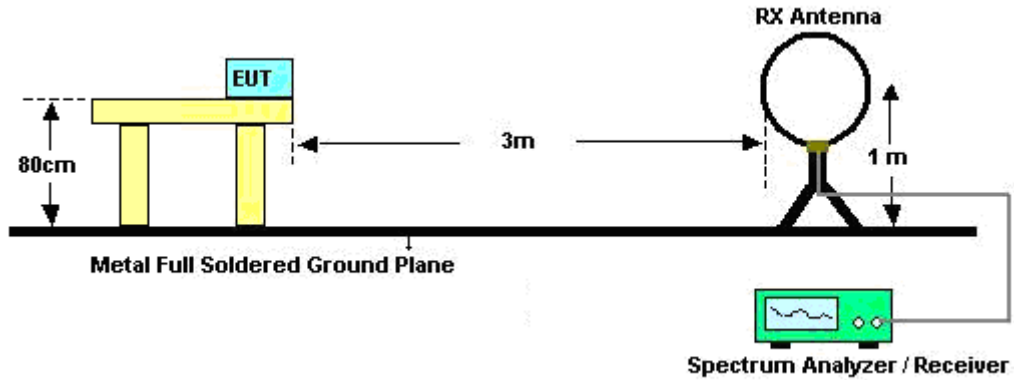


**3.2.3. Test Procedures**

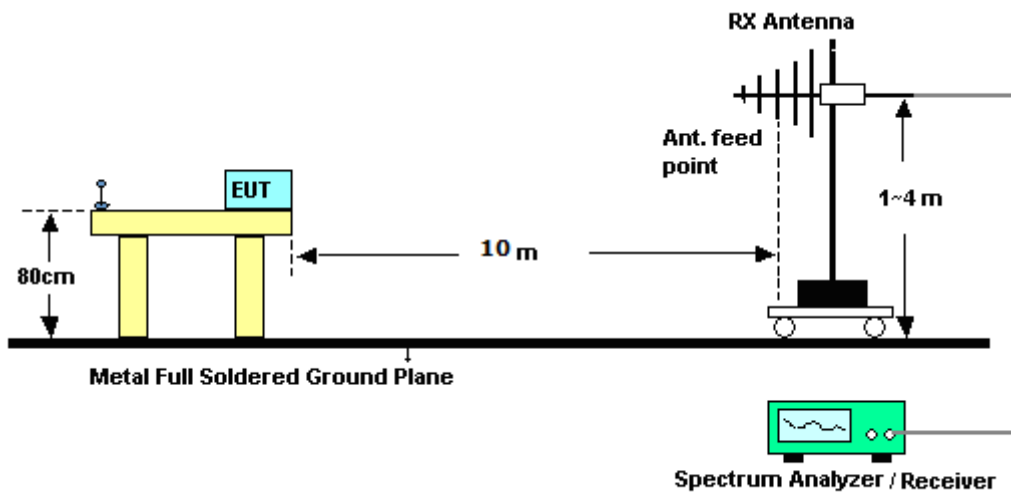
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is a Bi-Log antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.
7. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the quasi-peak method and reported
8. Emission level (dBuV/m) = 20 log Emission level (uV/m)
9. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

### 3.2.4. Test Setup of Radiated Emission

For radiated emissions below 30MHz



For radiated emissions above 30MHz



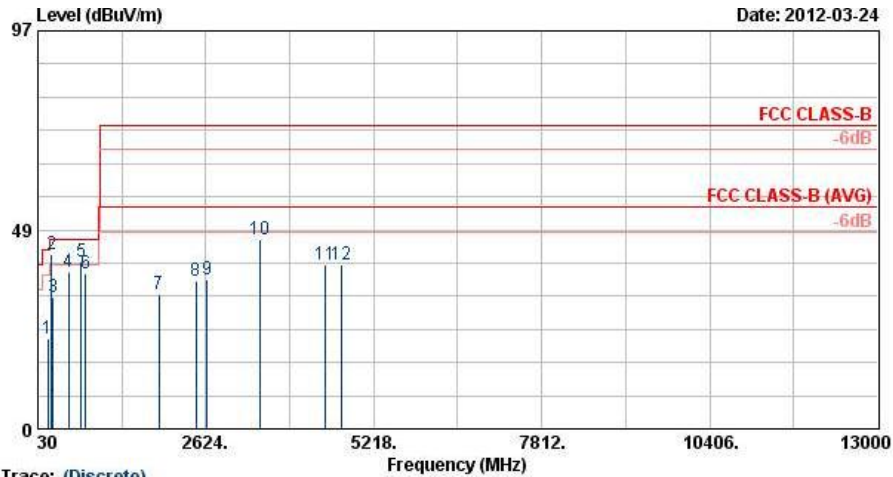
### 3.2.5. Test Results of Radiated Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 KHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.



3.2.6. Test Result of Radiated Emission

Test Mode :	Mode 1	Temperature :	21~22°C
Test Engineer :	Gavin Wu	Relative Humidity :	41~42%
Test Distance :	3m	Polarization :	Horizontal
Function Type :	WLAN Idle + LAN Link + WAN Link + Adapter + Hotspot LOAD + USB Dongle (Data Link with Notebook)		



Site : 03CH07-HY  
 Condition : FCC CLASS-B HF-ANT\_110816 HORIZONTAL  
 Project : FD 213125  
 Power : 120Vac/60Hz  
 Mode : Mode 1

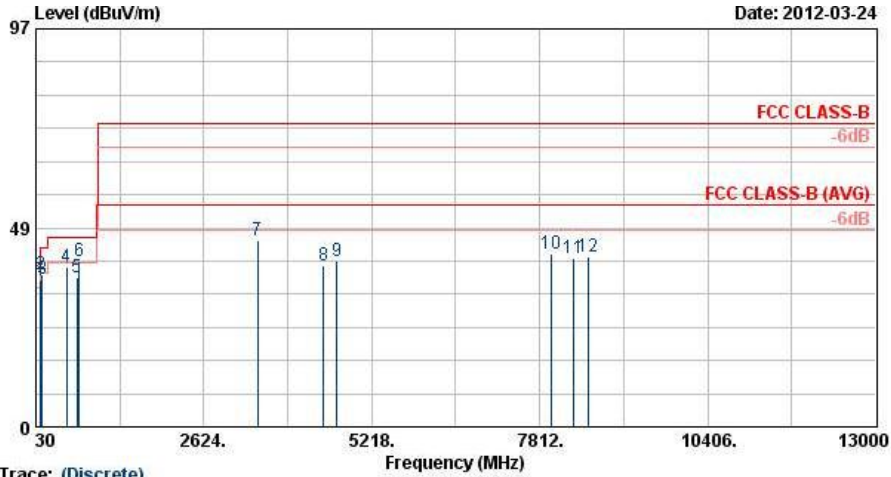
Trace: (Discrete)

	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	184.98	22.12	-21.38	43.50	43.42	8.95	1.27	31.52	---	---	Peak
2 @	237.09	42.60	-3.40	46.00	60.85	11.66	1.52	31.43	102	116	Peak
3	265.98	32.10	-13.90	46.00	49.05	12.82	1.62	31.39	---	---	Peak
4	500.20	38.07	-7.93	46.00	48.59	18.10	2.45	31.07	---	---	Peak
5 !	699.70	40.58	-5.42	46.00	47.87	20.59	2.94	30.82	---	---	Peak
6	766.20	37.83	-8.17	46.00	43.85	21.59	3.09	30.69	---	---	Peak
7	1900.00	32.98	-41.02	74.00	55.36	30.74	5.28	58.40	---	---	Peak
8	2470.00	36.13	-37.87	74.00	56.22	32.15	6.14	58.39	---	---	Peak
9	2638.00	36.27	-37.73	74.00	56.07	32.33	6.33	58.47	---	---	Peak
10	3454.00	46.20	-27.80	74.00	64.73	32.79	7.71	59.03	108	166	Peak
11	4476.00	40.01	-33.99	74.00	56.51	34.05	9.03	59.58	---	---	Peak
12	4718.00	39.89	-34.11	74.00	55.96	34.10	9.09	59.26	---	---	Peak





Test Mode :	Mode 1	Temperature :	21~22°C
Test Engineer :	Gavin Wu	Relative Humidity :	41~42%
Test Distance :	3m	Polarization :	Vertical
Function Type :	WLAN Idle + LAN Link + WAN Link + Adapter + Hotspot LOAD + USB Dongle (Data Link with Notebook)		



Trace: (Discrete)

Site : 03CH07-HY  
 Condition : FCC CLASS-B HF-ANT\_110816 VERTICAL  
 Project : FD\_213125  
 Power : 120Vac/60Hz  
 Mode : Mode 1

	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Remark
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	
			dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	99.66	35.76	-7.74	43.50	56.51	9.80	0.99	31.54	---	---	Peak
2	119.10	37.02	-6.48	43.50	55.88	11.61	1.10	31.56	---	---	Peak
3	124.50	35.94	-7.56	43.50	54.68	11.70	1.12	31.56	---	---	Peak
4	500.20	38.83	-7.17	46.00	49.35	18.10	2.45	31.07	---	---	Peak
5	659.80	36.32	-9.68	46.00	44.05	20.27	2.86	30.86	---	---	Peak
6 !	699.70	40.36	-5.64	46.00	47.65	20.59	2.94	30.82	115	207	Peak
7	3454.00	45.54	-28.46	74.00	64.07	32.79	7.71	59.03	100	0	Peak
8	4468.00	39.46	-34.54	74.00	55.96	34.05	9.03	59.58	---	---	Peak
9	4676.00	40.43	-33.57	74.00	56.59	34.10	9.08	59.34	---	---	Peak
10	7982.00	42.21	-31.79	74.00	53.76	35.80	10.79	58.13	---	---	Peak
11	8340.00	41.28	-32.72	74.00	52.52	35.94	10.95	58.12	---	---	Peak
12	8558.00	41.47	-32.53	74.00	52.63	36.04	11.03	58.23	---	---	Peak



### 4. List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Test Receive	R&S	ESCS 30	100356	9KHz ~ 2.75GHz	Oct. 27, 2011	Feb. 25, 2012	Oct. 26, 2012	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100081	9KHz ~ 30MHz	Dec. 09, 2011	Feb. 25, 2012	Dec. 08, 2012	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100080	9KHz ~ 30MHz	Dec. 06, 2011	Feb. 25, 2012	Dec. 05, 2012	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	Feb. 25, 2012	N/A	Conduction (CO05-HY)
Bilog Antenna	SCHAFFNER	CBL6111C	2726	30MHz ~ 1GHz	Oct. 22, 2011	Mar. 23, 2012 ~ Mar. 24, 2012	Oct. 21, 2012	Radiation (03CH07-HY)
Spectrum Analyzer	R&S	FSP30	101067	9KHz ~ 30GHz	Dec. 06, 2011	Mar. 23, 2012 ~ Mar. 24, 2012	Dec. 05, 2012	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Aug. 10, 2011	Mar. 23, 2012 ~ Mar. 24, 2012	Aug. 09, 2012	Radiation (03CH07-HY)
Pre Amplifier	Agilent	8449B	3008A02362	1GHz ~ 26.5GHz	Dec. 05, 2011	Mar. 23, 2012 ~ Mar. 24, 2012	Dec. 04, 2012	Radiation (03CH07-HY)
Pre Amplifier	COM-POWER	PA-103A	161241	10 ~ 1000MHz 32dB GAIN	Mar 29, 2011	Mar. 23, 2012 ~ Mar. 24, 2012	Mar 28, 2012	Radiation (03CH07-HY)
EMI TEST RECEIVER	R&S	ESCI 7	100724	9kHz ~ 7GHz	Aug. 22, 2011	Mar. 23, 2012 ~ Mar. 24, 2012	Aug. 21, 2012	Radiation (03CH07-HY)
Pre Amplifier	EMCI	EMC051845	SN980048	1GHz ~ 18GHz	Jul. 18, 2011	Mar. 23, 2012 ~ Mar. 24, 2012	Jul. 17, 2012	Radiation (03CH07-HY)
Loop Antenna	R&S	HFH2-Z2	860004/001	9 kHz~30 MHz	Jul. 29, 2010	Mar. 23, 2012 ~ Mar. 24, 2012	Jul. 28, 2012	Radiation (03CH07-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
<b>Combined Standard Uncertainty <math>U_c(y)</math></b>	<b>1.13</b>		
<b>Measuring Uncertainty for a Level of Confidence of 95% (<math>U = 2U_c(y)</math>)</b>	<b>2.26</b>		

### 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
<b>Combined Standard Uncertainty <math>U_c(y)</math></b>	<b>1.27</b>		
<b>Measuring Uncertainty for a Level of Confidence of 95% (<math>U = 2U_c(y)</math>)</b>	<b>2.54</b>		



**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	$\pm 0.10$	Normal (k=2)	0.10	1	0.10
Antenna Factor Calibration	$\pm 1.70$	Normal (k=2)	0.85	1	0.85
Cable Loss Calibration	$\pm 0.50$	Normal (k=2)	0.25	1	0.25
Receiver Correction	$\pm 2.00$	Rectangular	1.15	1	1.15
Antenna Factor Directional	$\pm 1.50$	Rectangular	0.87	1	0.87
Site Imperfection	$\pm 2.80$	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
<b>Combined Standard Uncertainty <math>U_c(y)</math></b>	<b>2.36</b>				
<b>Measuring Uncertainty for a Level of Confidence of 95% (<math>U = 2U_c(y)</math>)</b>	<b>4.72</b>				



## **Appendix A. Photographs of EUT**

Please refer to Sporton report number EP213125 as below.