



# SPORTON International Inc.

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## FCC and IC RADIO TEST REPORT

Applicant's company	Realtek Semiconductor Corp.
Applicant Address	No. 2, Innovation Road II, Hsinchu Science Park, Hsinchu 300, Taiwan
FCC ID	TX2RTL8188CEB8
IC	6317A-RTL8188CEB8
Manufacturer's company	Realtek Semiconductor Corp.
Manufacturer Address	No. 2, Innovation Road II, Hsinchu Science Park, Hsinchu 300, Taiwan

Product Name	802.11b/g/n RTL8188CE Combo miniCard (Test inside HP laptop PC, HSTNN-F05C)
Brand Name	Realtek
Model Name	RTL8188CEB8
Test Rule	47 CFR FCC Part 15 Subpart C § 15.247 IC RSS-210 Annex 8
Test Freq. Range	2400 ~ 2483.5MHz
Received Date	Feb. 28, 2011
Final Test Date	Mar. 07, 2011
Submission Type	Class II Change
Class II Chang	Please refer to section 3.7

### Statement

**Test result included in this report is for the IEEE 802.11n and IEEE 802.11b/g part of the product.**

The test result in this report refers exclusively to the presented test model / sample.

Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full. The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.4-2003, 47 CFR FCC Part 15 Subpart C and IC RSS-210 issue 8.**

The test equipment used to perform the test is calibrated and traceable to NML/ROC.



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## History of This Test Report

Original Issue Date: Mar. 09, 2011

Report No.: FR080215-05AA & CR080215-05AA

- ☒ No additional attachment.
- ☐ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description



## 1. CERTIFICATE OF COMPLIANCE

Product Name : 802.11b/g/n RTL8188CE Combo miniCard  
(Test inside HP laptop PC, HSTNN-F05C)  
Brand Name : Realtek  
Model Name : RTL8188CEB8  
Applicant : Realtek Semiconductor Corp.  
Test Rule Part(s) : 47 CFR FCC Part 15 Subpart C § 15.247  
IC RSS-210 Annex 8

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Feb. 28, 2011 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.

*Jordan Hsiao 2011.3.14*

Jordan Hsiao

SPORTON INTERNATIONAL INC.

## 2. SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart C, IC RSS-210 Issue 8				
Part	Rule Section	Description of Test	Result	Under Limit
4.1	15.207/RSS-Gen 7.2.2	AC Power Line Conducted Emissions	Complies	16.15 dB
4.2	15.247(d)/A8.5	Radiated Emissions	Complies	9.24 dB
4.3	15.203/RSS-Gen 7.1.4	Antenna Requirements	Complies	-

Note:

The RF module is verified. Please reference Sporton project number: 080215.

The module inserts to Notebook, so this report tests above item.

The information for host Notebook:

Brand Name: HP

Model No.: HSTNN-F05C

Test Items	Uncertainty	Remark
AC Power Line Conducted Emissions	±2.3dB	Confidence levels of 95%
Maximum Conducted Output Power	±0.8dB	Confidence levels of 95%
Power Spectral Density	±0.5dB	Confidence levels of 95%
6dB Spectrum Bandwidth	±8.5×10 <sup>-8</sup>	Confidence levels of 95%
Radiated Emissions (9kHz~30MHz)	±0.8dB	Confidence levels of 95%
Radiated Emissions (30MHz~1000MHz)	±1.9dB	Confidence levels of 95%
Radiated / Band Edge Emissions (1GHz~18GHz)	±1.9dB	Confidence levels of 95%
Radiated Emissions (18GHz~40GHz)	±1.9dB	Confidence levels of 95%
Temperature	±0.7°C	Confidence levels of 95%
Humidity	±3.2%	Confidence levels of 95%
DC / AC Power Source	±1.4%	Confidence levels of 95%

### 3. GENERAL INFORMATION

#### 3.1. Product Details

##### IEEE 802.11n

Items	Description		
Product Type	WLAN (1TX, 1RX)		
Radio Type	Intentional Transceiver		
Power Type	From host system (Module) From Power Adapter and Battery (Notebook)		
Modulation	see the below table for IEEE 802.11n		
Data Modulation	OFDM (BPSK / QPSK / 16QAM / 64QAM)		
Data Rate (Mbps)	see the below table for IEEE 802.11n		
Frequency Range	2400 ~ 2483.5MHz		
Channel Number	11 for 20MHz bandwidth ; 7 for 40MHz bandwidth		
Channel Band Width (99%)	MCS0 (20MHz): 17.68 MHz ; MCS0 (40MHz): 36.16 MHz		
Conducted Output Power	MCS0 (20MHz): 25.99 dBm ; MCS0 (40MHz): 25.13 dBm		
Carrier Frequencies	Please refer to section 3.4		
Antenna	PIFA Antenna 1	Brand Name: Amphenol	TX 1: FX5170-15-004-C/ 0.76dBi RX 2: FX5170-15-001-C/ -2.11dBi
	PIFA Antenna 2	Brand Name: Foxconn	TX 1: WDAN-HMEDW005-DH / -1.85dBi RX 2: WDAN-HMEDW005-DH / 1.33dBi

### IEEE 802.11b/g

Items	Description		
Product Type	WLAN (1TX, 1RX)		
Radio Type	Intentional Transceiver		
Power Type	From host system (Module) From Power Adapter and Battery (Notebook)		
Modulation	DSSS for IEEE 802.11b ; OFDM for IEEE 802.11g		
Data Modulation	DSSS (BPSK / QPSK / CCK) ; OFDM (BPSK / QPSK / 16QAM / 64QAM)		
Data Rate (Mbps)	DSSS (1/ 2/ 5.5/11) ; OFDM (6/9/12/18/24/36/48/54)		
Frequency Range	2400 ~ 2483.5MHz		
Channel Number	11		
Channel Band Width (99%)	11b: 15.04 MHz ; 11g: 16.52 MHz		
Conducted Output Power	11b: 21.47 dBm ; 11g: 26.21 dBm		
Carrier Frequencies	Please refer to section 3.4		
Antenna	PIFA Antenna 1	Brand Name: Amphenol	TX 1: FX5170-15-004-C/ 0.76dBi RX 2: FX5170-15-001-C/ -2.11dBi
	PIFA Antenna 2	Brand Name: Foxconn	TX 1: WDAN-HMEDW005-DH / -1.85dBi RX 2: WDAN-HMEDW005-DH / 1.33dBi

### Antenna & Band width

Antenna	Single (TX)	
Band width Mode	20 MHz	40 MHz
IEEE 802.11b	V	X
IEEE 802.11g	V	X
IEEE 802.11n	V	V

### IEEE 802.11n spec

MCS Index	Nss	Modulation	R	NBPSC	NCBPS		NDBPS		Datarate(Mbps)			
									800nsGI		400nsGI	
					20MHz	40MHz	20MHz	40MHz	20MHz	40MHz	20MHz	40MHz
0	1	BPSK	1/2	1	52	108	26	54	6.5	13.5	7.200	15
1	1	QPSK	1/2	2	104	216	52	108	13.0	27.0	14.400	30
2	1	QPSK	3/4	2	104	216	78	162	19.5	40.5	21.700	45
3	1	16-QAM	1/2	4	208	432	104	216	26.0	54.0	28.900	60
4	1	16-QAM	3/4	4	208	432	156	324	39.0	81.0	43.300	90
5	1	64-QAM	2/3	6	312	648	208	432	52.0	108.0	57.800	120
6	1	64-QAM	3/4	6	312	648	234	486	58.5	121.5	65.000	135
7	1	64-QAM	5/6	6	312	648	260	540	65.0	135.0	72.200	150
8	2	BPSK	1/2	1	104	216	52	108	13.0	27.0	14.444	30
9	2	QPSK	1/2	2	208	432	104	216	26.0	54.0	28.889	60
10	2	QPSK	3/4	2	208	432	156	324	39.0	81.0	43.333	90
11	2	16-QAM	1/2	4	416	864	208	432	52.0	108.0	57.778	120
12	2	16-QAM	3/4	4	416	864	312	648	78.0	162.0	86.667	180
13	2	64-QAM	2/3	6	624	1296	416	864	104.0	216.0	115.556	240
14	2	64-QAM	3/4	6	624	1296	468	972	117.0	243.0	130.000	270
15	2	64-QAM	5/6	6	624	1296	520	1080	130.0	270.0	144.444	300

Symbol	Explanation
NSS	Number of spatial streams
R	Code rate
NBPSC	Number of coded bits per single carrier
NCBPS	Number of coded bits per symbol
NDBPS	Number of data bits per symbol
GI	guard interval



### 3.2. Accessories

Power	Brand	Model	Rating
Adapter (For Notebook)	HP	HSTNN-CA18	Power Rating: input: 100-240V ~ 1.0A 50-60Hz output: 19.5V, 2.05A Power cord: AC in: 1.8m / DC out: 1.5m
Battery (For Notebook)	HP	629836-141	Power Rating: 10.8V, 28Wh Type: Li-ion

### 3.3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1-1 (TX)	Amphenol	FX5170-15-004-C	PIFA Antenna	I-PEX	0.76
1-2 (RX)	Amphenol	FX5170-15-001-C	PIFA Antenna	I-PEX	-2.11
2-1 (TX)	Foxconn	WDAN-HMEDW005-DH	PIFA Antenna	I-PEX	-1.85
2-2 (RX)	Foxconn	WDAN-HMEDW005-DH	PIFA Antenna	I-PEX	1.33

Note: Due to Ant. 1 & Ant. 2 is the same type antenna, only the higher gain antenna "Ant. 2" was tested.

### 3.4. Table for Carrier Frequencies

For IEEE 802.11b/g, use Channel 1~Channel 11.

There are two bandwidth systems for IEEE 802.11n.

For both 20MHz bandwidth systems, use Channel 1~Channel 11.

For both 40MHz bandwidth systems, use Channel 3~Channel 9.

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
2400~2483.5MHz	1	2412 MHz	7	2442 MHz
	2	2417 MHz	8	2447 MHz
	3	2422 MHz	9	2452 MHz
	4	2427 MHz	10	2457 MHz
	5	2432 MHz	11	2462 MHz
	6	2437 MHz	-	-

### 3.5. Table for Test Modes

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate	Channel	Antenna
AC Power Line Conducted Emissions	Normal Link	-	-	2
Radiated Emissions 9kHz~1GHz	Normal Link	-	-	2
Radiated Emissions 1GHz~10 <sup>th</sup> Harmonic	11b/BPSK	1 Mbps	6	2

#### <For Co-location Test>:

The EUT could be applied with Bluetooth and wireless LAN function; therefore Co-location (please refer to Appendix C) tests are added for simultaneously transmit between Bluetooth and wireless LAN function. In addition, The Notebook also could be applied with WWAN module. But the WWAN module and EUT will not simultaneously transmit.

The Notebook could be applied with WWAN module list as below:

Interface	Brand	Model	FCC ID	IC ID
WWAN module	Qualcomm	Gobi2000	J9CGOBI2000-H	2723A-GOBI2000
WWAN module	Ericsson	F3307(KRD 131 16/61)	VV7-MBMF33071-H	287AG-MBMF33071
WWAN module	Ericsson	F3307(KRD 131 16/62)	VV7-MBMF33072-H	N/A
WWAN module	Ericsson	F5521gw	VV7-MBMF5521GW1	287AG-MBMF5521GW1

### 3.6. Table for Testing Locations

Test Site No.	Site Category	Location	FCC Reg. No.	IC File No.	VCCI Reg. No
03CH01-CB	SAC	Hsin Chu	187376	IC 4086D	-
CO01-CB	Conduction	Hsin Chu	187376	IC 4086D	-

Open Area Test Site (OATS); Semi Anechoic Chamber (SAC); Fully Anechoic Chamber (FAC).

Please refer section 6 for Test Site Address.

### 3.7. Table for Class II Change

This product is an extension of original one reported under Sporton project number: 022402

Below is the table for the change of the product with respect to the original one.

Modifications	Performance Checking
This Module is restricted only on the platform. The platform is a Notebook, which was defined as a mobile device. The information for host Notebook: Brand Name: HP Model No.: HSTNN-F05C	AC Conducted Emissions Radiated Emissions

### 3.8. Table for Supporting Units

Support Unit	Brand	Model	FCC ID
Mouse	Logitech	M-U0026	DoC
Modem	ACEEX	DM1414	IFAXDM1414
Notebook	DELL	1340	E2K4965AGNM
Wireless AP	BELKIN	WG7016G22-LF-AK	DOC

### 3.9. Table for Parameters of Test Software Setting

During testing, Channel & Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. 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.

#### Power Parameters of IEEE 802.11n

Test Software Version	Realtek		
Frequency	2412 MHz	2437 MHz	2462 MHz
MCS0 20MHz	43	52	44
Frequency	2422 MHz	2437 MHz	2452 MHz
MCS0 40MHz	43	46	44

#### Power Parameters of IEEE 802.11b/g

Test Software Version	Realtek		
Frequency	2412 MHz	2437 MHz	2462 MHz
IEEE 802.11b	40	44	41
IEEE 802.11g	45	52	46

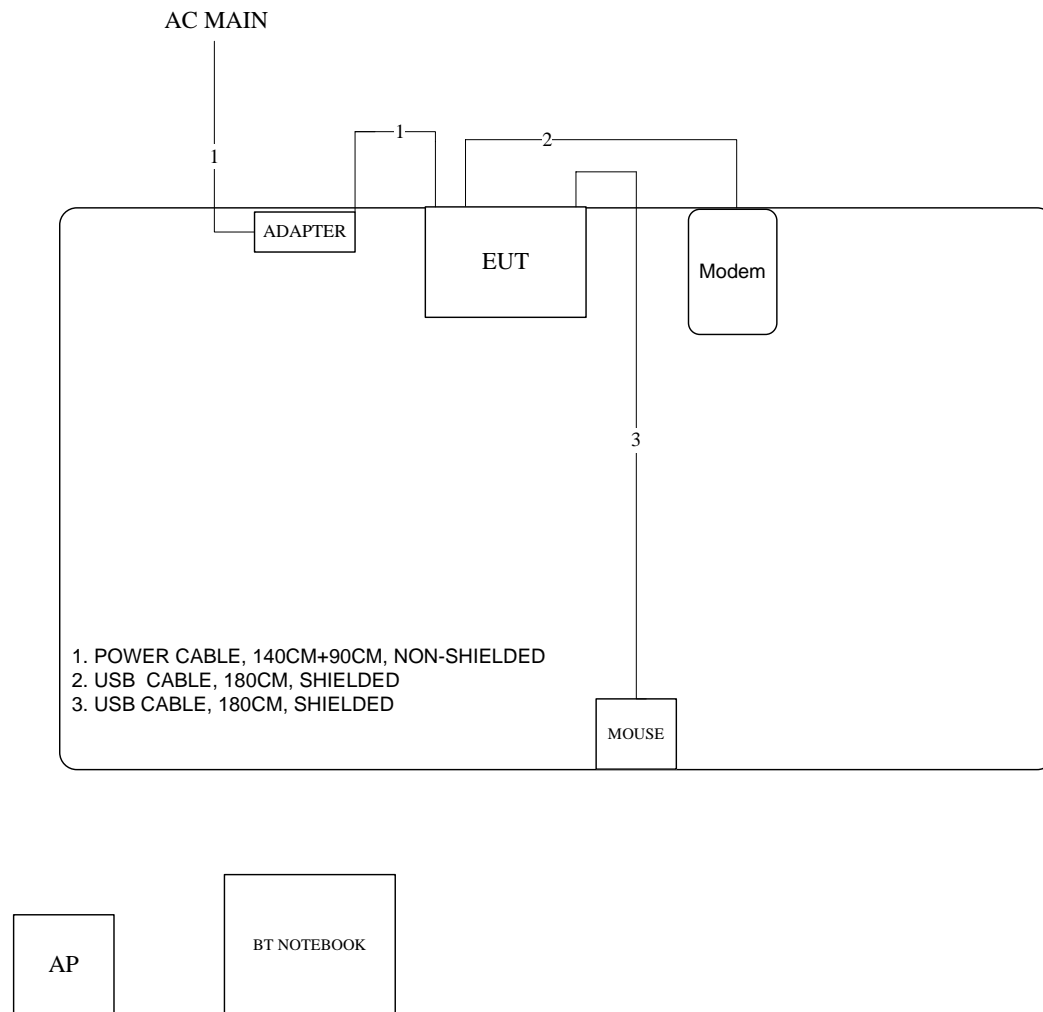
During the test, "REALTEK" under WIN XP was executed the test program to control the EUT continuously transmit RF signal.

### 3.10. Test Configurations

#### 3.10.1. Radiation Emissions Test Configuration

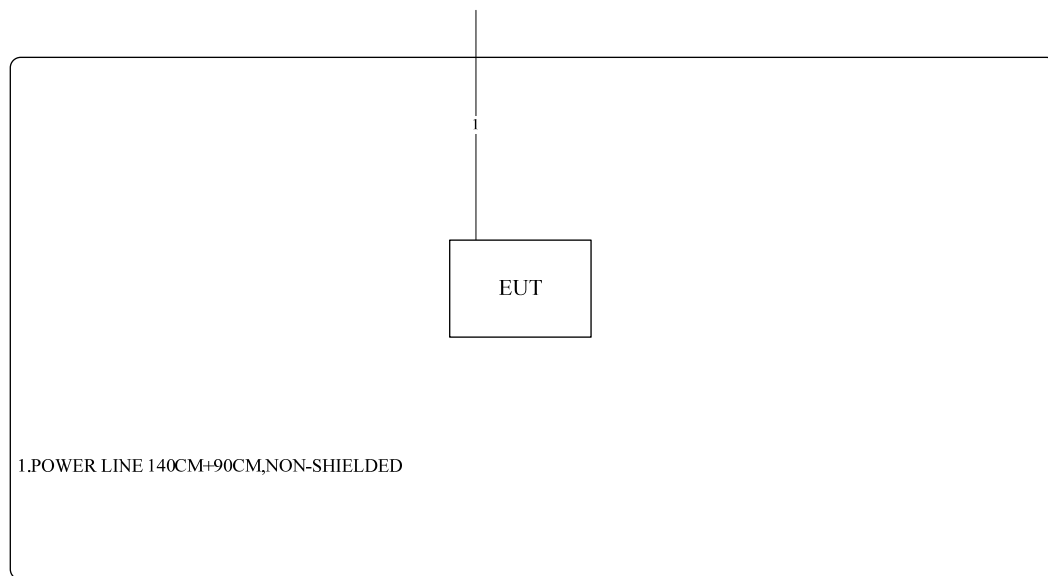
<For WLAN Function>

Test Configuration: 9KHz~1GHz

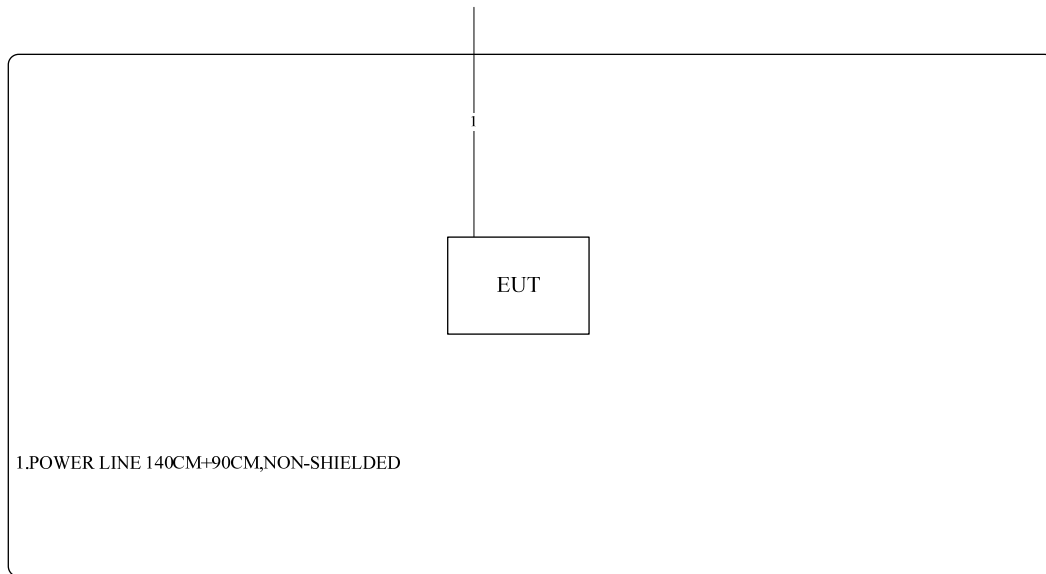


<For WLAN Function>

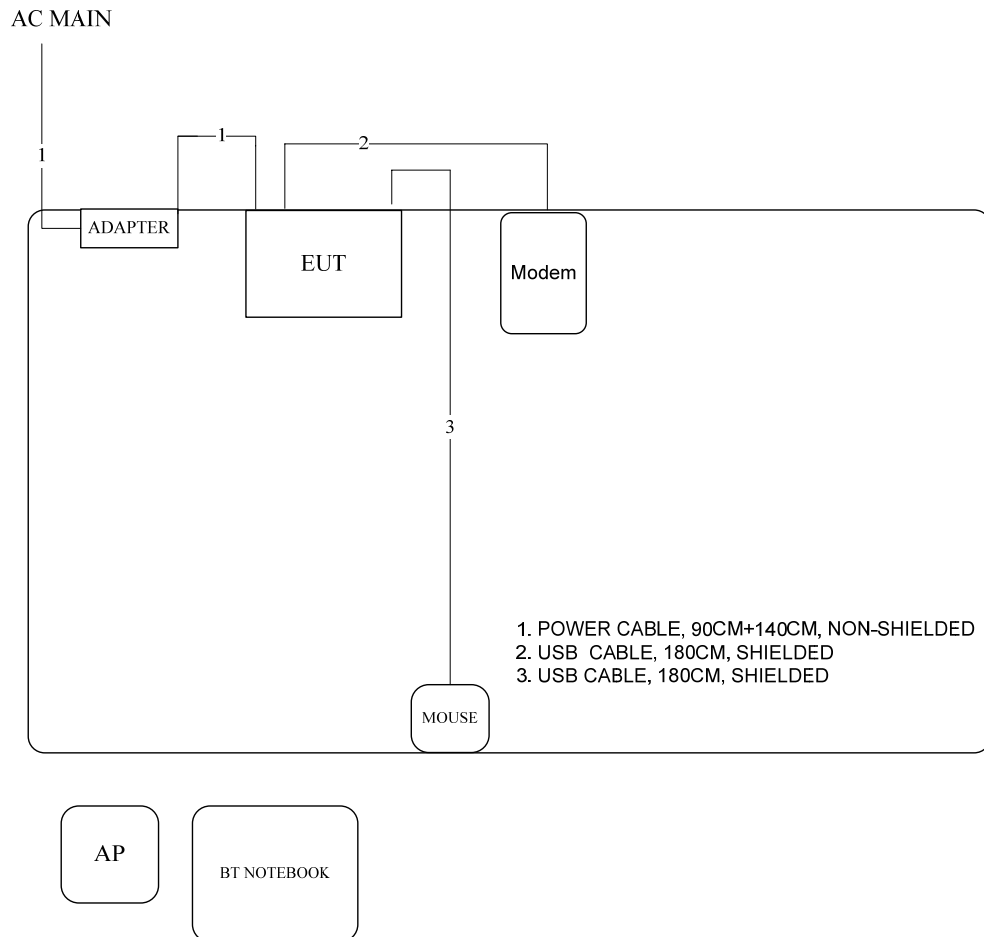
Test Configuration: above 1GHz



<For Co-location>



### 3.10.2. AC Power Line Conduction Emissions Test Configuration



## 4. TEST RESULT

### 4.1. AC Power Line Conducted Emissions Measurement

#### 4.1.1. Limit

For this product which is designed to be connected to the 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 below limits table.

Frequency (MHz)	QP Limit (dBuV)	AV Limit (dBuV)
0.15~0.5	66~56	56~46
0.5~5	56	46
5~30	60	50

#### 4.1.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

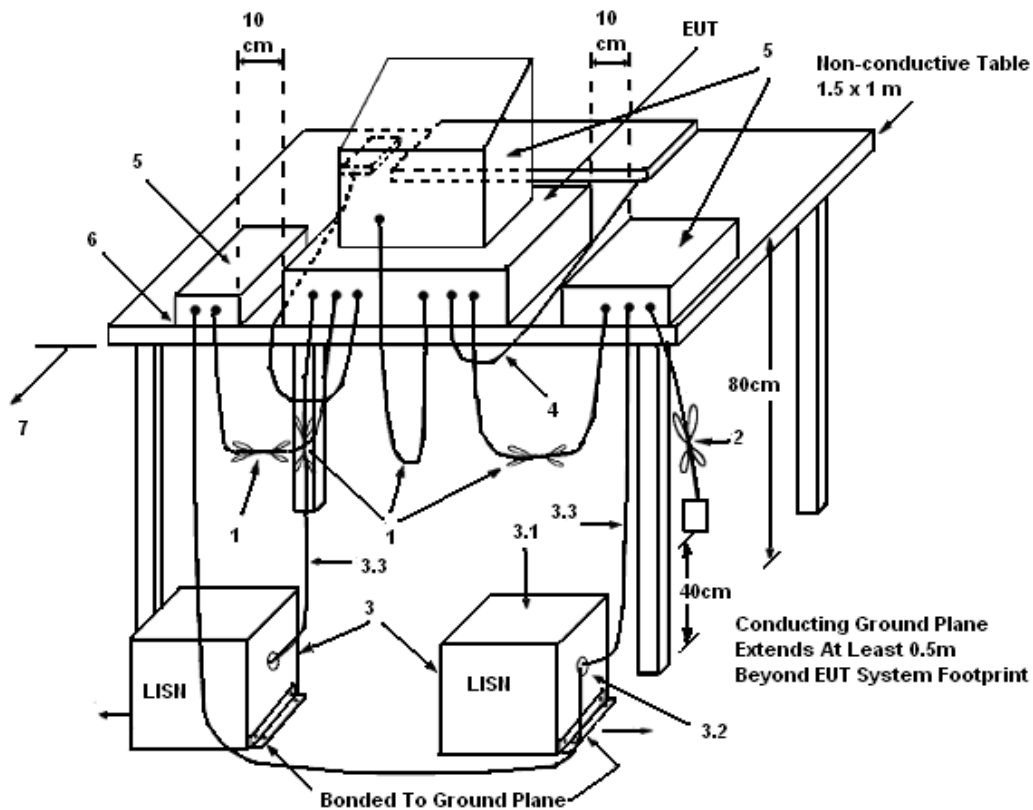
Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 KHz

#### 4.1.3. Test Procedures

1. Configure the EUT according to ANSI C63.4. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 KHz to 30 MHz was searched.
5. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The measurement has to be done between each power line and ground at the power terminal.



#### 4.1.4. Test Setup Layout



#### LEGEND:

- (1) Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- (2) I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- (3) EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50  $\Omega$ . LISN can be placed on top of, or immediately beneath, reference ground plane.
  - (3.1) All other equipment powered from additional LISN(s).
  - (3.2) Multiple outlet strip can be used for multiple power cords of non-EUT equipment.
  - (3.3) LISN at least 80 cm from nearest part of EUT chassis.
- (4) Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.
- (5) Non-EUT components of EUT system being tested.
- (6) Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.
- (7) Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.

#### 4.1.5. Test Deviation

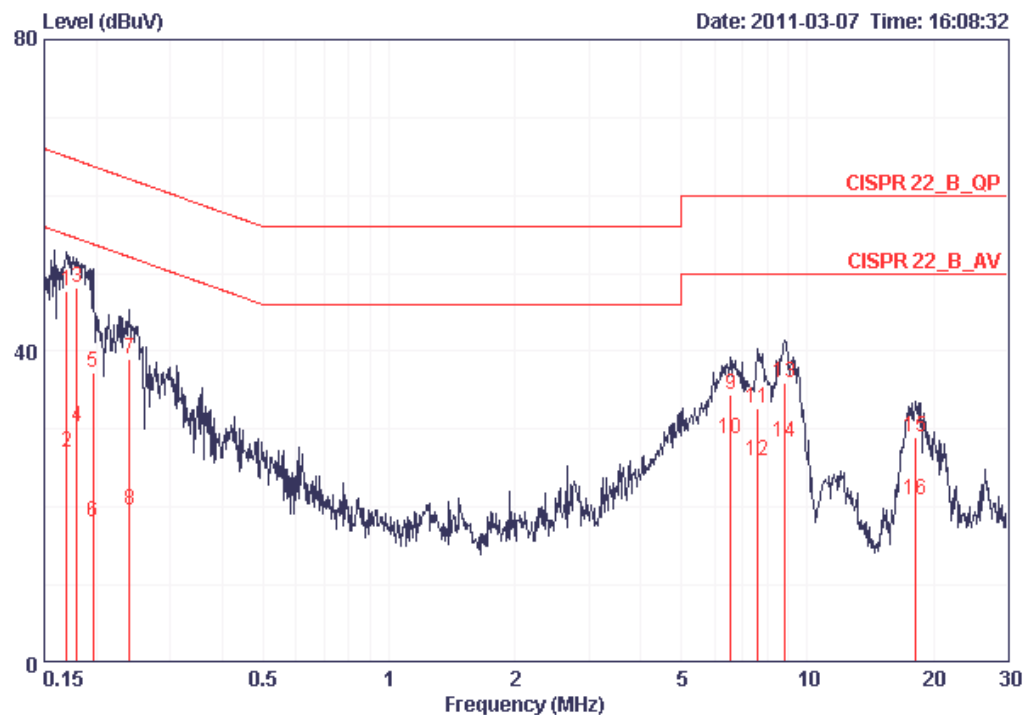
There is no deviation with the original standard.

#### 4.1.6. EUT Operation during Test

The EUT was placed on the test table and programmed in normal function.

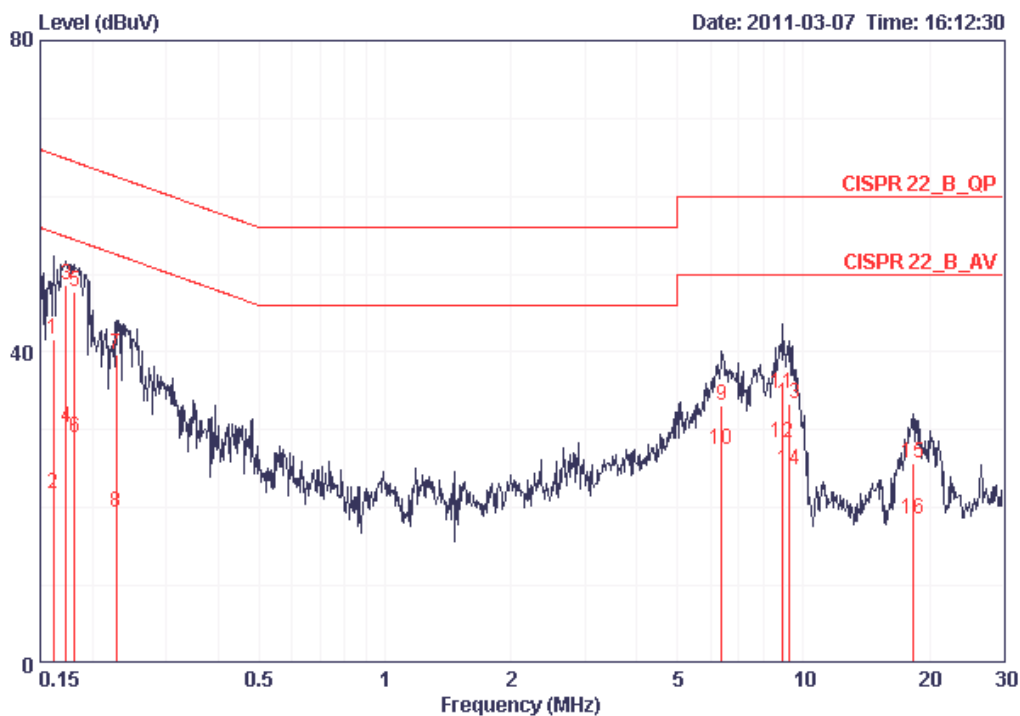
#### 4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	17°C	Humidity	61%
Test Engineer	Peter Wu	Phase	Line
Configuration	Normal Link		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.16944	47.63	-17.35	64.99	47.37	0.06	0.20	QP
2	0.16944	26.92	-28.06	54.99	26.66	0.06	0.20	AVERAGE
3	0.17961	48.10	-16.40	64.50	47.84	0.06	0.20	QP
4	0.17961	30.26	-24.24	54.50	30.00	0.06	0.20	AVERAGE
5	0.19654	37.19	-26.56	63.76	36.94	0.05	0.20	QP
6	0.19654	18.07	-35.68	53.76	17.82	0.05	0.20	AVERAGE
7	0.24037	39.08	-23.00	62.08	38.84	0.04	0.20	QP
8	0.24037	19.61	-32.47	52.08	19.37	0.04	0.20	AVERAGE
9	6.557	34.40	-25.60	60.00	33.78	0.23	0.39	QP
10	6.557	28.74	-21.26	50.00	28.12	0.23	0.39	AVERAGE
11	7.566	32.78	-27.22	60.00	32.11	0.27	0.40	QP
12	7.566	25.86	-24.14	50.00	25.19	0.27	0.40	AVERAGE
13	8.822	35.94	-24.06	60.00	35.32	0.32	0.30	QP
14	8.822	28.27	-21.73	50.00	27.65	0.32	0.30	AVERAGE
15	18.039	28.96	-31.04	60.00	27.74	0.72	0.50	QP
16	18.039	20.98	-29.02	50.00	19.76	0.72	0.50	AVERAGE

Temperature	17°C	Humidity	61%
Test Engineer	Peter Wu	Phase	Neutral
Configuration	Normal Link		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.16155	41.59	-23.80	65.38	41.29	0.10	0.20	QP
2	0.16155	21.78	-33.61	55.38	21.48	0.10	0.20	AVERAGE
3	0.17307	48.66	-16.15	64.81	48.37	0.09	0.20	QP
4	0.17307	30.25	-24.56	54.81	29.96	0.09	0.20	AVERAGE
5	0.18152	47.68	-16.74	64.42	47.39	0.09	0.20	QP
6	0.18152	28.94	-25.48	54.42	28.65	0.09	0.20	AVERAGE
7	0.22797	39.78	-22.75	62.52	39.50	0.08	0.20	QP
8	0.22797	19.36	-33.17	52.52	19.08	0.08	0.20	AVERAGE
9	6.386	33.06	-26.94	60.00	32.42	0.27	0.37	QP
10	6.386	27.52	-22.48	50.00	26.88	0.27	0.37	AVERAGE
11	8.916	34.63	-25.37	60.00	33.97	0.36	0.30	QP
12	8.916	28.43	-21.57	50.00	27.77	0.36	0.30	AVERAGE
13	9.253	33.41	-26.59	60.00	32.74	0.37	0.30	QP
14	9.253	24.83	-25.17	50.00	24.16	0.37	0.30	AVERAGE
15	18.328	25.79	-34.21	60.00	24.56	0.73	0.50	QP
16	18.328	18.42	-31.58	50.00	17.19	0.73	0.50	AVERAGE

Note:

Level = Read Level + LISN Factor + Cable Loss.

## 4.2. Radiated Emissions Measurement

### 4.2.1. Limit

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/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

### 4.2.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for peak

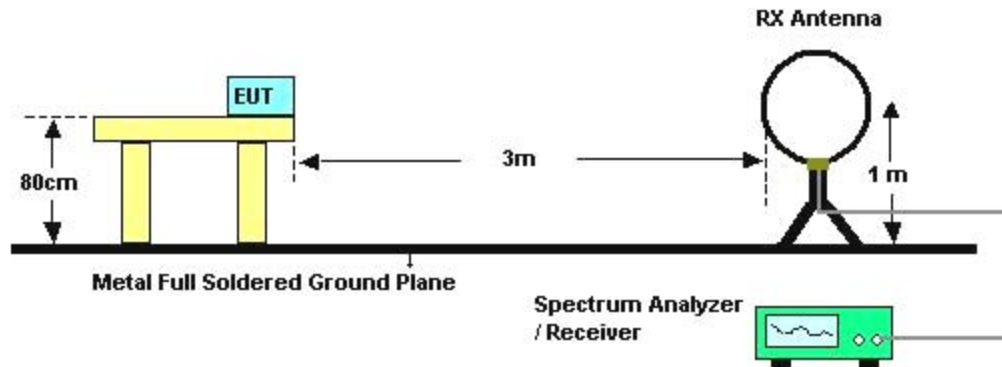
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

#### 4.2.3. Test Procedures

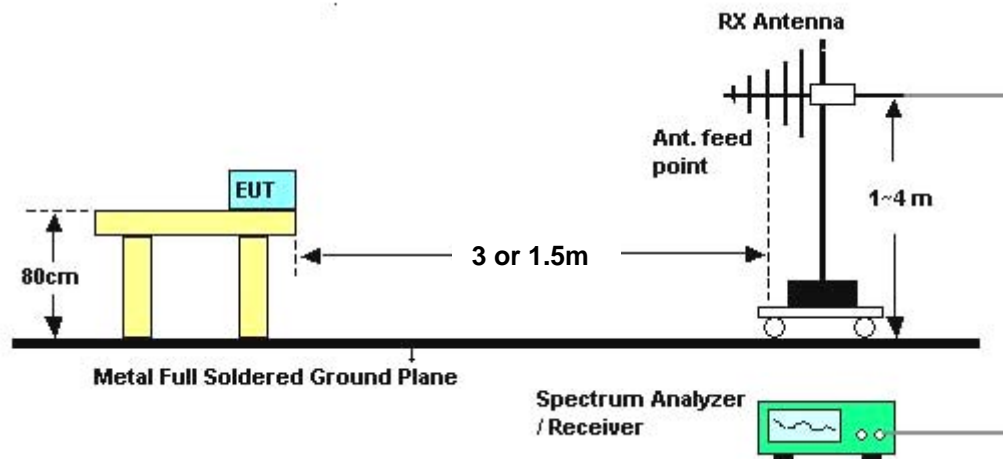
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 m to 4 m) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

#### 4.2.4. Test Setup Layout

For radiated emissions below 30MHz



For radiated emissions above 30MHz



Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1.5m.

Distance extrapolation factor =  $20 \log (\text{specific distance [3m]} / \text{test distance [1.5m]})$  (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

#### 4.2.5. Test Deviation

There is no deviation with the original standard.

#### 4.2.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

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

Temperature	15°C	Humidity	60%
Test Engineer	Sam Chen	Configurations	Normal Link
Evaluating Date	Mar. 05, 2011		

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

**Note:**

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

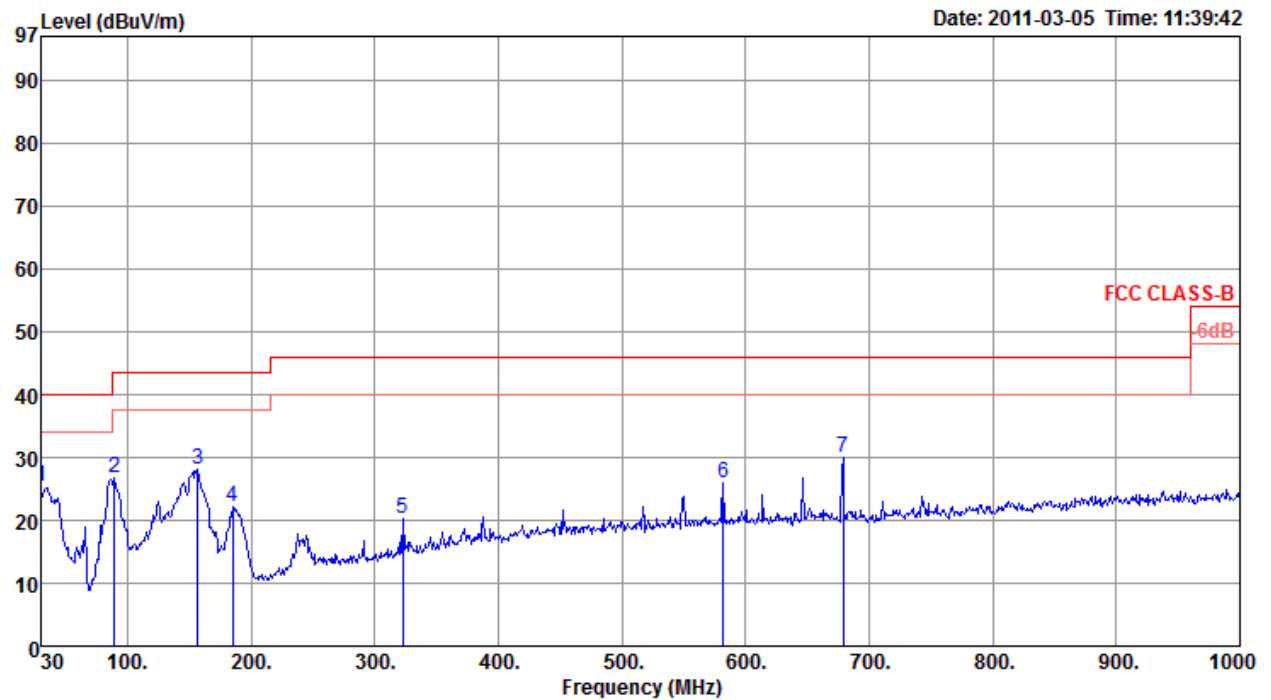
Distance extrapolation factor =  $40 \log (\text{specific distance} / \text{test distance})$  (dB);

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

#### 4.2.8. Results of Radiated Emissions (30MHz~1GHz)

Temperature	15°C	Humidity	60%
Test Engineer	Sam Chen	Configurations	Normal Link

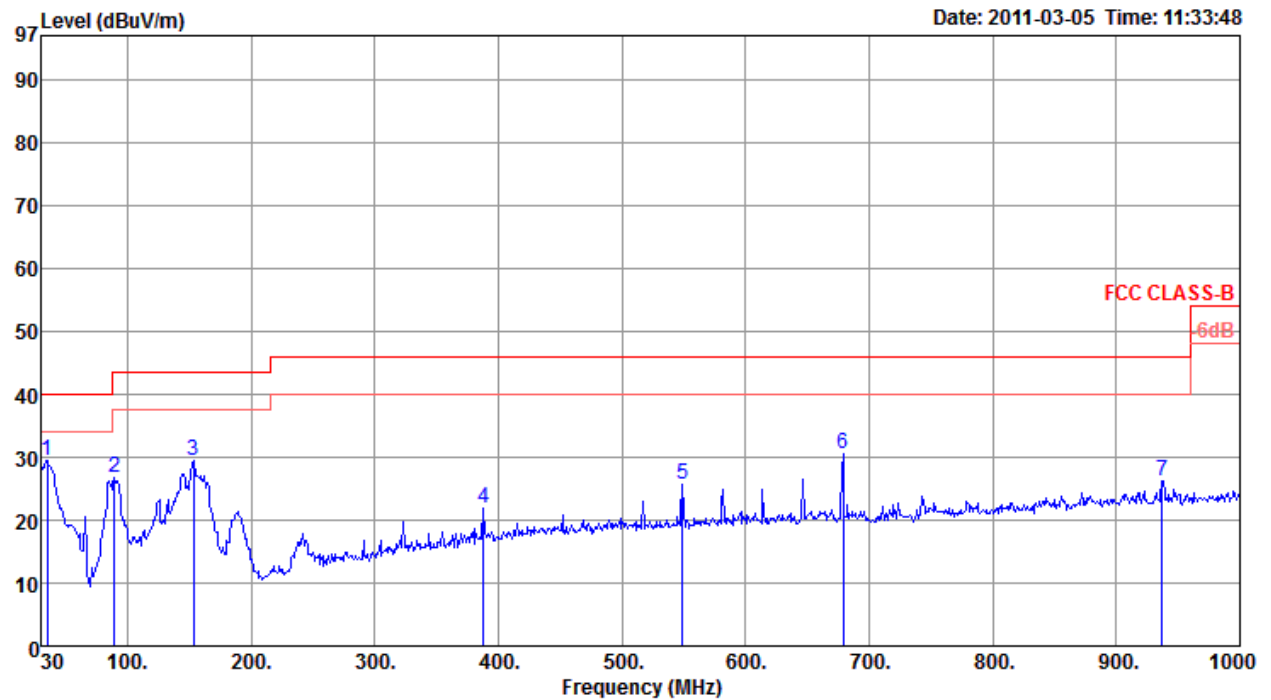
##### Horizontal



	Freq	Level	Limit	Over	Read	Cable	Preamp	Antenna	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	Loss	Factor	Factor	deg	cm		
1 p	30.00	25.48	40.00	-14.52	34.37	0.50	27.80	18.41	0	100	Peak	HORIZONTAL
2	89.17	26.67	43.50	-16.83	44.45	1.10	27.65	8.77	0	100	Peak	HORIZONTAL
3	157.07	28.19	43.50	-15.31	43.92	1.49	27.31	10.09	0	100	Peak	HORIZONTAL
4	185.20	22.02	43.50	-21.48	38.29	1.62	27.17	9.28	0	100	Peak	HORIZONTAL
5	322.94	20.35	46.00	-25.65	31.16	2.15	27.06	14.10	0	100	Peak	HORIZONTAL
6	581.93	25.95	46.00	-20.05	32.60	2.86	28.10	18.59	0	100	Peak	HORIZONTAL
7	678.93	30.09	46.00	-15.91	35.70	3.38	28.02	19.03	0	100	Peak	HORIZONTAL



### Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1 p	34.85	29.47	40.00	-10.53	41.44	0.50	27.80	15.33	0	400	Peak	VERTICAL
2	89.17	26.72	43.50	-16.78	44.50	1.10	27.65	8.77	0	400	Peak	VERTICAL
3	153.19	29.56	43.50	-13.94	45.13	1.47	27.33	10.29	0	400	Peak	VERTICAL
4	387.93	21.77	46.00	-24.23	31.12	2.28	27.52	15.89	0	400	Peak	VERTICAL
5	548.95	25.64	46.00	-20.36	32.76	2.80	28.10	18.18	0	400	Peak	VERTICAL
6	678.93	30.48	46.00	-15.52	36.09	3.38	28.02	19.03	0	400	Peak	VERTICAL
7	936.95	26.26	46.00	-19.74	28.56	3.60	27.25	21.35	0	400	Peak	VERTICAL

### Note:

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

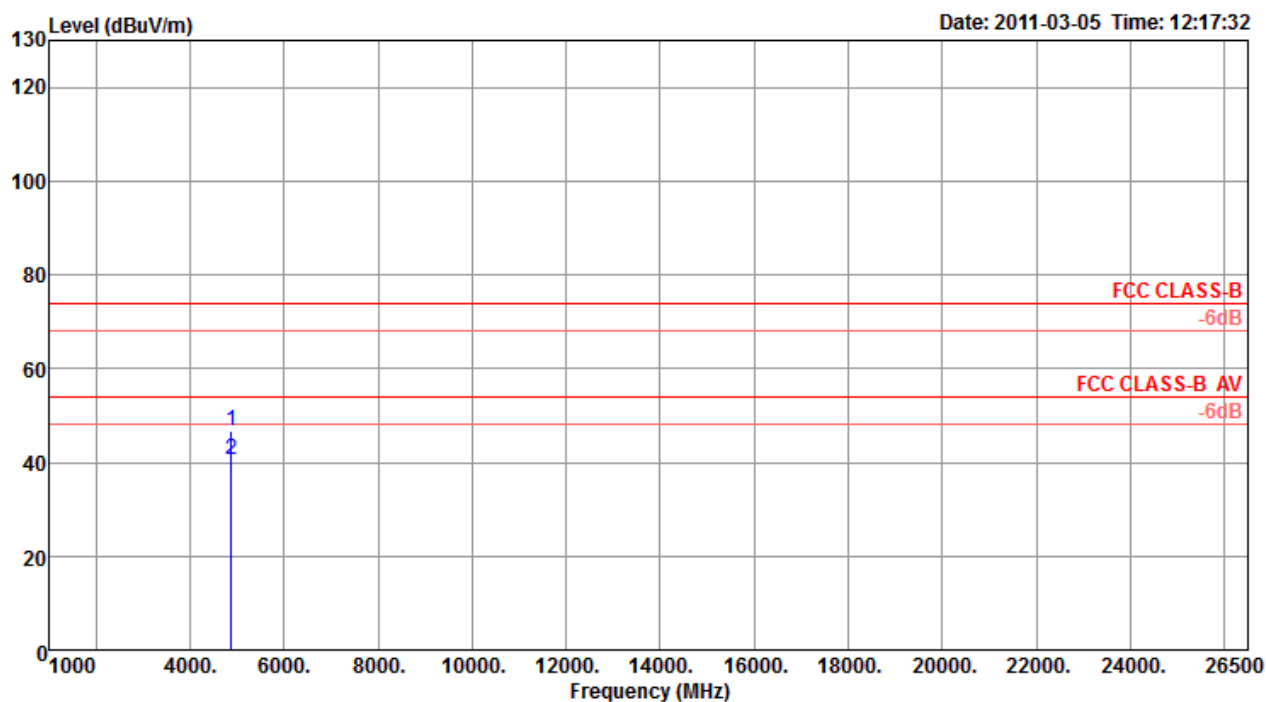
Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

#### 4.2.9. Results for Radiated Emissions (1GHz~10<sup>th</sup> Harmonic)

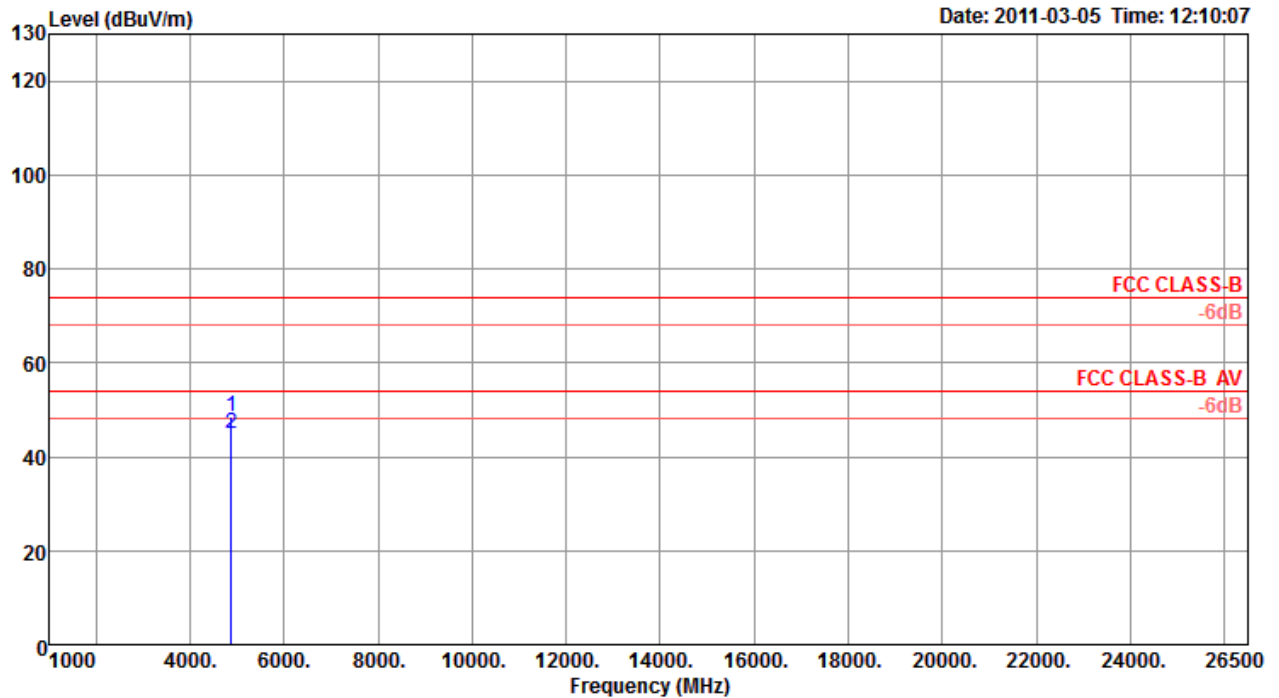
Temperature	15°C	Humidity	60%
Test Engineer	Sam Chen	Configurations	IEEE 802.11b CH 6

##### Horizontal



	Freq	Level	Limit	Over	Read	Cable	Preamp	Antenna	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1 p	4873.89	46.88	74.00	-27.12	46.46	3.01	35.15	32.56	313	100	Peak	HORIZONTAL
2 a	4873.94	40.51	54.00	-13.49	40.09	3.01	35.15	32.56	313	100	Average	HORIZONTAL

### Vertical



	Freq	Level	Limit	Over	Read	Cable	Preamp	Antenna	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1 p	4873.90	48.66	74.00	-25.34	48.24	3.01	35.15	32.56	186	102	Peak	VERTICAL
2 a	4873.92	44.76	54.00	-9.24	44.34	3.01	35.15	32.56	186	102	Average	VERTICAL

### Note:

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

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

### **4.3. Antenna Requirements**

#### **4.3.1. Limit**

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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 provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

#### **4.3.2. Antenna Connector Construction**

Please refer to section 3.3 in this test report; antenna connector complied with the requirements.

## 5. LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMI Test Receiver	R&S	ESCS 30	100377	9kHz ~ 2.75GHz	Sep. 01, 2010	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Oct. 28, 2010	Conduction (CO01-CB)
V- LISN	Schwarzbeck	NSLK 8127	8127-478	9K ~ 30MHz	Nov. 16, 2010	Conduction (CO01-CB)
PULSE LIMITER	R&S	ESH3-Z2	100430	9K~30MHz	Jan. 04, 2011	Conduction (CO01-CB)
COND Cable	-	Cable	-	0.15MHz~30MHz	Dec. 04, 2010	Conduction (CO01-CB)
BILOG ANTENNA	Schaffner	CBL6112D	22021	20MHz ~ 2GHz	Oct. 17, 2010	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Nov. 13, 2010	Radiation (03CH01-CB)
Horn Antenna	SCHWARZBEAK	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Oct. 08, 2010	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Nov. 17, 2010	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Nov. 06, 2010	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26.5GHz ~ 40GHz	Nov. 17, 2010	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP	100304	9kHz ~ 40GHz	Nov. 06, 2010	Radiation (03CH01-CB)
EMI Test Receiver	R&S	ESCS 30	100355	9KHz ~ 2.75GHz	Mar. 06, 2010	Radiation (03CH01-CB)
Loop Antenna	R&S	HFH2-Z2	860004/001	9 kHz - 30 MHz	Sep. 09, 2010*	Radiation (03CH01-CB)
Turn Table	INN CO	CO 2000	N/A	0 ~ 360 degree	N/A	Radiation (03CH01-CB)
Antenna Mast	INN CO	CO2000	N/A	1 m - 4 m	N/A	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-1	-	30 MHz - 1 GHz	Nov. 17, 2010	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-1	-	1 GHz – 26.5 GHz	Nov. 17, 2010	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-2	-	1 GHz – 26.5 GHz	Nov. 17, 2010	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-3	-	1 GHz - 40 GHz	Nov. 17, 2010	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-4	-	1 GHz - 40 GHz	Nov. 17, 2010	Radiation (03CH01-CB)

Note: Calibration Interval of instruments listed above is one year.

Note: For “\*” Calibration Interval of instruments listed above is two years.

## 6. TEST LOCATION

SHIJR	ADD : 6Fl., No. 106, Sec. 1, Shintai 5th Rd., Shijr City, Taipei, Taiwan 221, R.O.C. TEL : 886-2-2696-2468 FAX : 886-2-2696-2255
HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL : 886-3-327-3456 FAX : 886-3-318-0055
LINKOU	ADD : No. 30-2, Dingfu Tsuen, Linkou Shiang, Taipei, Taiwan 244, R.O.C TEL : 886-2-2601-1640 FAX : 886-2-2601-1695
DUNGHU	ADD : No. 3, Lane 238, Kangle St., Neihu Chiu, Taipei, Taiwan 114, R.O.C. TEL : 886-2-2631-4739 FAX : 886-2-2631-9740
JUNGHE	ADD : 7Fl., No. 758, Jungjeng Rd., Junghe City, Taipei, Taiwan 235, R.O.C. TEL : 886-2-8227-2020 FAX : 886-2-8227-2626
NEIHU	ADD : 4Fl., No. 339, Hsin Hu 2 <sup>nd</sup> Rd., Taipei 114, Taiwan, R.O.C. TEL : 886-2-2794-8886 FAX : 886-2-2794-9777
JHUBEI	ADD : No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C. TEL : 886-3-656-9065 FAX : 886-3-656-9085

## 7. TAF CERTIFICATE OF ACCREDITATION



Certificate No. : L1190-091230

財團法人全國認證基金會  
Taiwan Accreditation Foundation

### Certificate of Accreditation

This is to certify that

**Sporton International Inc.**  
**EMC & Wireless Communications Laboratory**  
No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien,  
Taiwan, R.O.C.

**is accredited in respect of laboratory**

Accreditation Criteria	: ISO/IEC 17025:2005
Accreditation Number	: 1190
Originally Accredited	: December 15, 2003
Effective Period	: January 10, 2010 to January 09, 2013
Accredited Scope	: Testing Field, see described in the Appendix
Specific Accreditation Program	: Accreditation Program for Designated Testing Laboratory for Commodities Inspection Accreditation Program for Telecommunication Equipment Testing Laboratory Accreditation Program for BSMI Mutual Recognition Arrangement with Foreign Authorities



Jay-San Chen  
President, Taiwan Accreditation Foundation  
Date : December 30, 2009

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The Appendix forms an integral part of this Certificate, which shall be invalid when use without the Appendix