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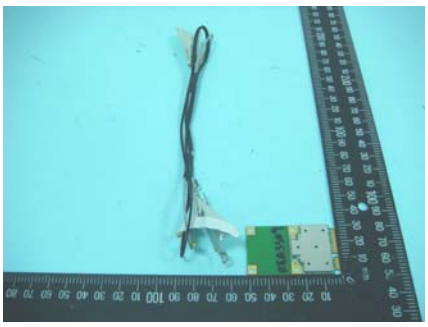
FCC RADIO TEST REPORT

Applicant's company	**Realtek Semiconductor Corp.**
Applicant Address	No. 2, Innovation Road II, Hsinchu Science Park, Hsinchu 300, Taiwan
FCC ID	**TX2-RTL8187SE**
Manufacturer's company	**Realtek Semiconductor Corp.**
Manufacturer Address	No. 2, Innovation Road II, Hsinchu Science Park, Hsinchu 300, Taiwan

Product Name	802.11b/g RTL8187SE miniCard
Brand Name	Realtek
Model Name	RTL8187SE
Test Rule	47 CFR FCC Part 15 Subpart C § 15.247
Test Freq. Range	2400 ~ 2483.5MHz
Received Date	Dec. 18, 2007
Final Test Date	Jan. 28, 2008
Submission Type	Original Equipment



Statement

Test result included is only for the 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** and **47 CFR FCC Part 15 Subpart C**.

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

Testing Laboratory
1190

Table of Contents

History of This Test Report

Original Issue Date: May 16, 2008

Report No.: FR7D1808

■ No additional attachment.

☐ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

1. CERTIFICATE OF COMPLIANCE

Product Name	:	802.11b/g RTL8187SE miniCard
Brand Name	:	Realtek
Model Name	:	RTL8187SE
Applicant	:	Realtek Semiconductor Corp.
Test Rule Part(s)	:	47 CFR FCC Part 15 Subpart C § 15.247

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Dec. 18, 2007 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.

Wayne Hsu

SPORTON INTERNATIONAL INC.

2. SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart C				
Part	**Rule Section**	**Description of Test**	**Result**	**Under Limit**
4.1	15.207	AC Power Line Conducted Emissions	Complies	5.95dB
4.2	15.247(b)(3)	Maximum Conducted Output Power	Complies	7.30 dB
4.3	15.247(e)	Power Spectral Density	Complies	19.45dB
4.4	15.247(a)(2)	6dB Spectrum Bandwidth	Complies	-
4.5	15.247(d)	Radiated Emissions	Complies	3.64 dB
4.6	15.247(d)	Band Edge Emissions	Complies	6.98 dB
4.7	15.203	Antenna Requirements	Complies	-

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	$\pm 8.5 \times 10^{-8}$	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℃	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

Items	Description
Power Type	From Host System
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: 14.35 MHz ; 11g: 16.31MHz
Conducted Output Power	11b: 21.07 dBm ; 11g: 22.70 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

3.2. Accessories

N/A

3.3. Table for Filed Antenna

1.	Ant. Type	PIFA	PK Gain(dBi)	3.95	2.	Ant. Type	PIFA	PK Gain(dBi)	2.11
	Connector	IPEX	Model No.	DQ661500301		Connector	IPEX	Model No.	DQ661500115
3.	Ant. Type	PIFA	PK Gain(dBi)	2.39	4.	Ant. Type	PIFA	PK Gain(dBi)	2.11
	Connector	IPEX	Model No.	AR830WIPI02A		Connector	IPEX	Model No.	AR320WIPI02B
5.	Ant. Type	PIFA	PK Gain(dBi)	2.48	6.	Ant. Type	PIFA	PK Gain(dBi)	2.41
	Connector	IPEX	Model No.	ARW62WIP101G		Connector	IPEX	Model No.	ARUMPWIPI02
7.	Ant. Type	PIFA	PK Gain(dBi)	2.32	8.	Ant. Type	PIFA	PK Gain(dBi)	0.78
	Connector	IPEX	Model No.	WDAN-GQMA6001-DF		Connector	IPEX	Model No.	WDAN-GQMA6002-DF
9.	Ant. Type	PIFA	PK Gain(dBi)	3.64	10.	Ant. Type	PIFA	PK Gain(dBi)	3.25
	Connector	IPEX	Model No.	021020168NC3587		Connector	IPEX	Model No.	021020168NC3586
11.	Ant. Type	PIFA	PK Gain(dBi)	2.86	12.	Ant. Type	PIFA	PK Gain(dBi)	0.64
	Connector	IPEX	Model No.	AAFQ5050001LK0		Connector	IPEX	Model No.	HFT40-IV17
13.	Ant. Type	PIFA	PK Gain(dBi)	0.79	14.	Ant. Type	PIFA	PK Gain(dBi)	1.34
	Connector	IPEX	Model No.	81.EE215.016.		Connector	IPEX	Model No.	ASAW001
15.	Ant. Type	PIFA	PK Gain(dBi)	0.63	16.	Ant. Type	PIFA	PK Gain(dBi)	0.61
	Connector	IPEX	Model No.	B1425050G0003		Connector	IPEX	Model No.	ASAT001
17.	Ant. Type	PIFA	PK Gain(dBi)	1.56	18.	Ant. Type	PIFA	PK Gain(dBi)	1.12
	Connector	IPEX	Model No.	ASAA001		Connector	IPEX	Model No.	HFT40
19.	Ant. Type	PIFA	PK Gain(dBi)	-0.92	20.	Ant. Type	PIFA	PK Gain(dBi)	2.24
	Connector	IPEX	Model No.	HFT60		Connector	IPEX	Model No.	HTL008
21	Ant. Type	PIFA	PK Gain(dBi)	2.82	22	Ant. Type	PIFA	PK Gain(dBi)	3.45
	Connector	IPEX	Model No.	HTL017		Connector	IPEX	Model No.	TBN001
23	Ant. Type	PIFA	PK Gain(dBi)	-1.11	24	Ant. Type	PIFA	PK Gain(dBi)	0.87
	Connector	IPEX	Model No.	TBN003		Connector	IPEX	Model No.	TIAN01
25	Ant. Type	PIFA	PK Gain(dBi)	1.76	26	Ant. Type	PIFA	PK Gain(dBi)	1.75
	Connector	IPEX	Model No.	WNC001		Connector	IPEX	Model No.	WNC002
27	Ant. Type	PIFA	PK Gain(dBi)	2.99	28	Ant. Type	PIFA	PK Gain(dBi)	-0.65
	Connector	IPEX	Model No.	U40		Connector	IPEX	Model No.	U40
29	Ant. Type	PIFA	PK Gain(dBi)	2.53	30	Ant. Type	PIFA	PK Gain(dBi)	0.94
	Connector	IPEX	Model No.	U50		Connector	IPEX	Model No.	U50
31	Ant. Type	PIFA	PK Gain(dBi)	2.29	32	Ant. Type	PIFA	PK Gain(dBi)	2.04
	Connector	IPEX	Model No.	MA-8 (06-941-03)		Connector	IPEX	Model No.	MA-8 (50-88-03)
33	Ant. Type	PIFA	PK Gain(dBi)	0.11	34	Ant. Type	PIFA	PK Gain(dBi)	2.75
	Connector	IPEX	Model No.	SA-1(06-926-11)		Connector	IPEX	Model No.	WDAN-GQMA3004-DF
35	Ant. Type	PIFA	PK Gain(dBi)	0.21	36	Ant. Type	PIFA	PK Gain(dBi)	0.95
	Connector	IPEX	Model No.	L45II-WLAN		Connector	IPEX	Model No.	L55II-ID1 & ID2
37	Ant. Type	PIFA	PK Gain(dBi)	1.15	38	Ant. Type	PIFA	PK Gain(dBi)	2.14
	Connector	IPEX	Model No.	L55II-ID3		Connector	IPEX	Model No.	L55II-ID4
39	Ant. Type	PIFA	PK Gain(dBi)	0.95	40	Ant. Type	PIFA	PK Gain(dBi)	2.21
	Connector	IPEX	Model No.	L55 RI		Connector	IPEX	Model No.	UM700-L
41	Ant. Type	PIFA	PK Gain(dBi)	-0.19	42	Ant. Type	PIFA	PK Gain(dBi)	-1.18
	Connector	IPEX	Model No.	W351		Connector	IPEX	Model No.	W651
43	Ant. Type	PIFA	PK Gain(dBi)	-0.35	44	Ant. Type	PIFA	PK Gain(dBi)	0.7
	Connector	IPEX	Model No.	W815UI1		Connector	IPEX	Model No.	NB0040-K

45	Ant. Type	PIFA	PK Gain(dBi)	0.8	46	Ant. Type	PIFA	PK Gain(dBi)	1.68
	Connector	IPEX	Model No.	TFF-A011MPXX-361		Connector	IPEX	Model No.	L45
47	Ant. Type	PIFA	PK Gain(dBi)	2.83	48	Ant. Type	PIFA	PK Gain(dBi)	2.82
	Connector	IPEX	Model No.	MCA50		Connector	IPEX	Model No.	GT1W (Main) / GT1W (Aux)
49	Ant. Type	PIFA	PK Gain(dBi)	0.91	50	Ant. Type	PIFA	PK Gain(dBi)	-0.34
	Connector	IPEX	Model No.	L390T (WM-1) / L390T (WM-2)		Connector	IPEX	Model No.	SK72TWIPI01+A (TX1) / SK72TWPI02+A (TX2)
51	Ant. Type	PIFA	PK Gain(dBi)	2.4	52	Ant. Type	PIFA	PK Gain(dBi)	2
	Connector	IPEX	Model No.	M02007051001 (WM-1) / M02007056001 (WM-2)		Connector	IPEX	Model No.	SKM74WIGP01+B (TX1) / SKM7TWMPI01+A (TX2)
53	Ant. Type	PIFA	PK Gain(dBi)	0.15	54	Ant. Type	PIFA	PK Gain(dBi)	3.29
	Connector	IPEX	Model No.	M540S (L) / M540S (R)		Connector	IPEX	Model No.	PE-230050 (TX1) / PE-230060 (TX2)
55	Ant. Type	PIFA	PK Gain(dBi)	1.85	56	Ant. Type	PIFA	PK Gain(dBi)	1.67
	Connector	IPEX	Model No.	PE-230080 (TX1) / PE-230090 (TX2)		Connector	IPEX	Model No.	M735 WM-1
57	Ant. Type	PIFA	PK Gain(dBi)	-0.66	58	Ant. Type	PIFA	PK Gain(dBi)	2.7
	Connector	IPEX	Model No.	M735 WM-2		Connector	IPEX	Model No.	M02007051001 (WM-1) / M02007051001 (WM-2)
59	Ant. Type	PIFA	PK Gain(dBi)	2.74	60	Ant. Type	PIFA	PK Gain(dBi)	0.42
	Connector	IPEX	Model No.	M02007051001 (WM-1) / M02007052001 (WM-2)		Connector	IPEX	Model No.	M570TU (WM-1) / M570TU (WM-2)
61	Ant. Type	PIFA	PK Gain(dBi)	2.4	62	Ant. Type	PIFA	PK Gain(dBi)	-0.38
	Connector	IPEX	Model No.	M735X (WM-2)		Connector	IPEX	Model No.	M735T (WM-1)
63	Ant. Type	PIFA	PK Gain(dBi)	1.2	64	Ant. Type	PIFA	PK Gain(dBi)	1.2
	Connector	IPEX	Model No.	VM8 (Main) / VM8 (Aux)		Connector	IPEX	Model No.	VM8D (Main) / VM8D (Aux)
65	Ant. Type	PIFA	PK Gain(dBi)	0.2	66	Ant. Type	PIFA	PK Gain(dBi)	0.2
	Connector	IPEX	Model No.	VM9 (Main) / VM9 (Aux)		Connector	IPEX	Model No.	VM9D (Main)/ VM9D (Aux)
67	Ant. Type	PIFA	PK Gain(dBi)	1.82	68	Ant. Type	PIFA	PK Gain(dBi)	-0.87
	Connector	IPEX	Model No.	JAL90		Connector	IPEX	Model No.	WDAN-TQ BD3002-DF
69	Ant. Type	PIFA	PK Gain(dBi)	-2.24	70	Ant. Type	PIFA	PK Gain(dBi)	-0.43
	Connector	IPEX	Model No.	WDAN-TQ BL5002-DF		Connector	IPEX	Model No.	WDAN-TQ TE1002-DF
71	Ant. Type	PIFA	PK Gain(dBi)	-0.37	72	Ant. Type	PIFA	PK Gain(dBi)	2.98
	Connector	IPEX	Model No.	WDAN-TQ BU2002-DF		Connector	IPEX	Model No.	VY150
73	Ant. Type	PIFA	PK Gain(dBi)	2.52	74	Ant. Type	PIFA	PK Gain(dBi)	2.80
	Connector	IPEX	Model No.	JAL90		Connector	IPEX	Model No.	N011
75	Ant. Type	PIFA	PK Gain(dBi)	0.39	76	Ant. Type	PIFA	PK Gain(dBi)	2.11
	Connector	IPEX	Model No.	S79-1800A10-J36		Connector	IPEX	Model No.	S79-1800A30-J36

Note: (1) Due to Ant.1 ~ Ant. 76 are the same type antenna, only the higher gain antenna "Ant.1" was tested and recorded in this report.

(2) The EUT has diversity function; It supports both transmit and receive Antenna Diversity.

3.4. Table for Carrier Frequencies

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	Auto	-	1
Maximum Peak Conducted Output Power	11b/BPSK	1 Mbps	1/6/11	NA
	11g/BPSK	6 Mbps	1/6/11	NA
Power Spectral Density 6dB Spectrum Bandwidth	11b/BPSK	1 Mbps	1/6/11	NA
	11g/BPSK	6 Mbps	1/6/11	NA
Radiated Emissions 9kHz~1GHz	Normal Link	Auto	-	1
Radiated Emissions 1GHz~10th Harmonic	11b/BPSK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
Band Edge Emissions	11b/BPSK	1 Mbps	1/11	1
	11g/BPSK	6 Mbps	1/11	1

3.6. Table for Testing Locations

Test Site No.	Site Category	Location	FCC Reg. No.	IC File No.	VCCI Reg. No
03CH03-HY	SAC	Hwa Ya	101377	IC 4088	-
CO04-HY	Conduction	Hwa Ya	101377	IC 4088	-
TH01-HY	OVEN Room	Hwa Ya	-	-	-

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 Supporting Units

Support Unit	Brand	Model	FCC ID
Notebook	ASUS	A8H	PPD-AR5BXB61
Modem	ACEEX	DM1414	IFAXDM1414
Mouse	QSKY	Lx-619B	DoC
Printer	EPSON	LQ-300+	N/A
Wireless AP	PLANEX	GW-AP54SGX	DOC

3.8. 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 802.11b/g

Test Software Version	REALTEK		
Frequency	2412 MHz	2437 MHz	2462 MHz
IEEE 802.11b	19	18	17
IEEE 802.11g	31	30	30

An executive program, EMCTEST.EXE under WIN XP, which generate a complete line of continuously repeating " H " pattern were used as the test software.

The programs were executed as follows :

a. Turn on the power of all equipment.

b. The NB sends " H" messages to the panel, and the panel displays " H " patterns on the screen.

c. The NB sends " H " messages to the printer, then the printer prints them on the paper.

d. The NB sends " H " messages to the modem.

e. Repeat the steps from b to d.

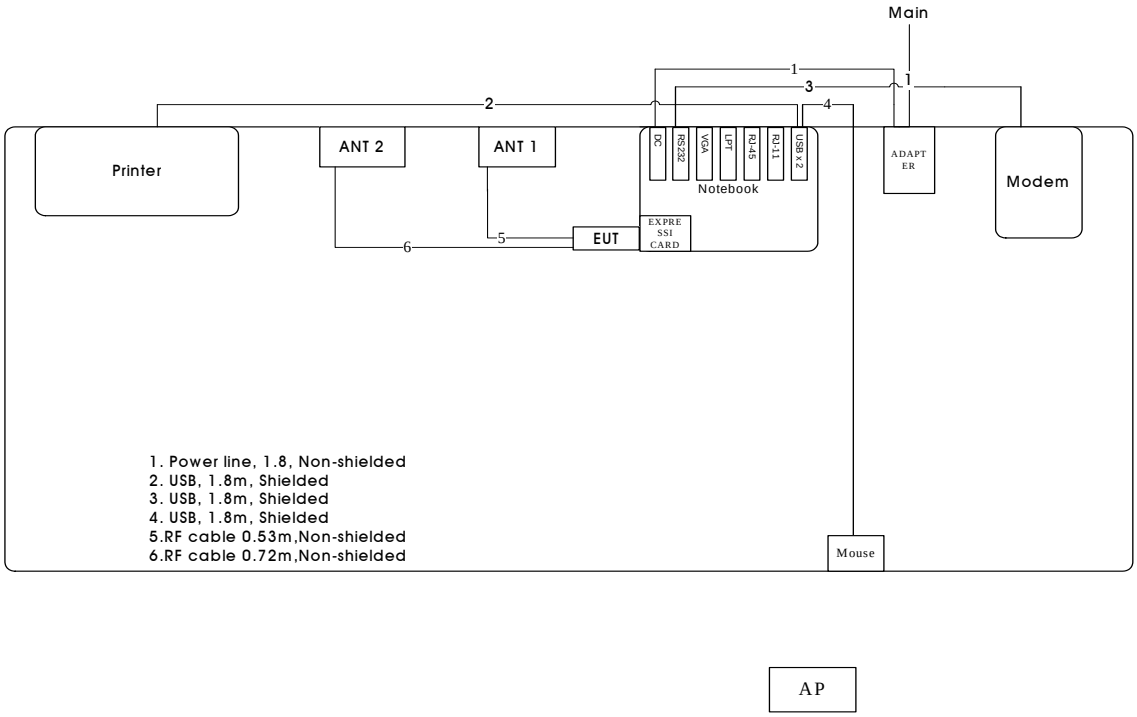
At the same time, "REALTEK" was executed to control the EUT continuously transmit RF signal.

Executed "ping.exe" to link with the remote workstation to receive and transmit signal by LAN and WLAN.

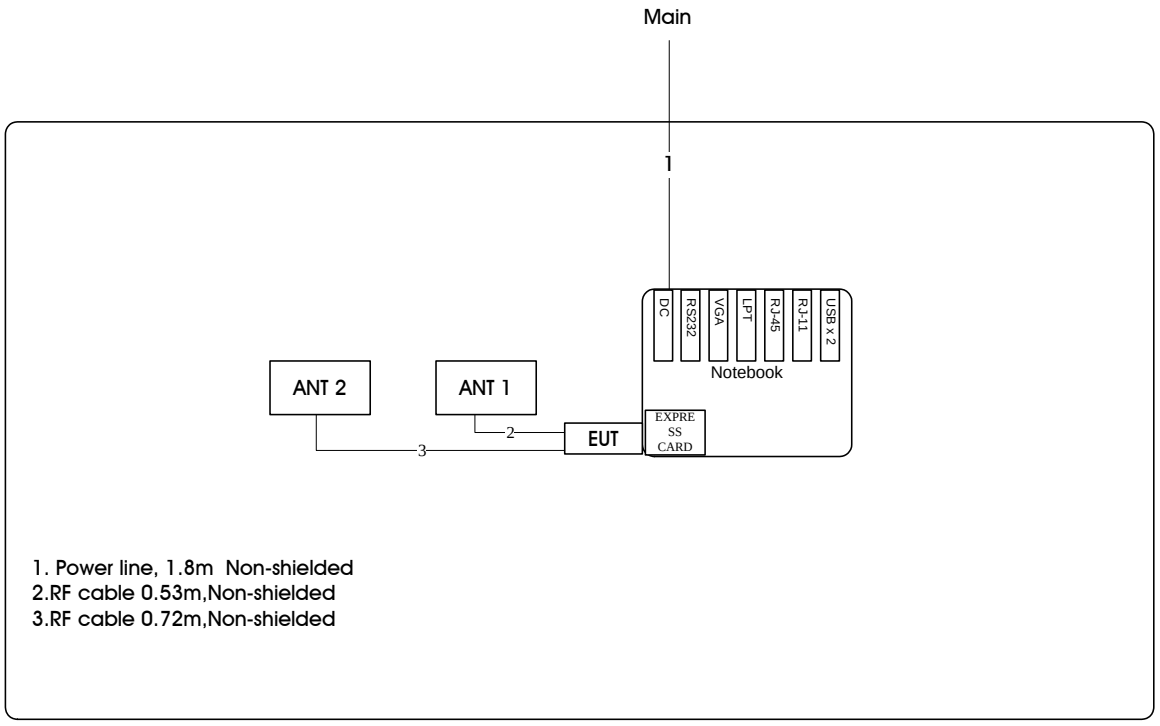
3.9. Test Configurations

3.9.1. Radiation Emissions Test Configuration

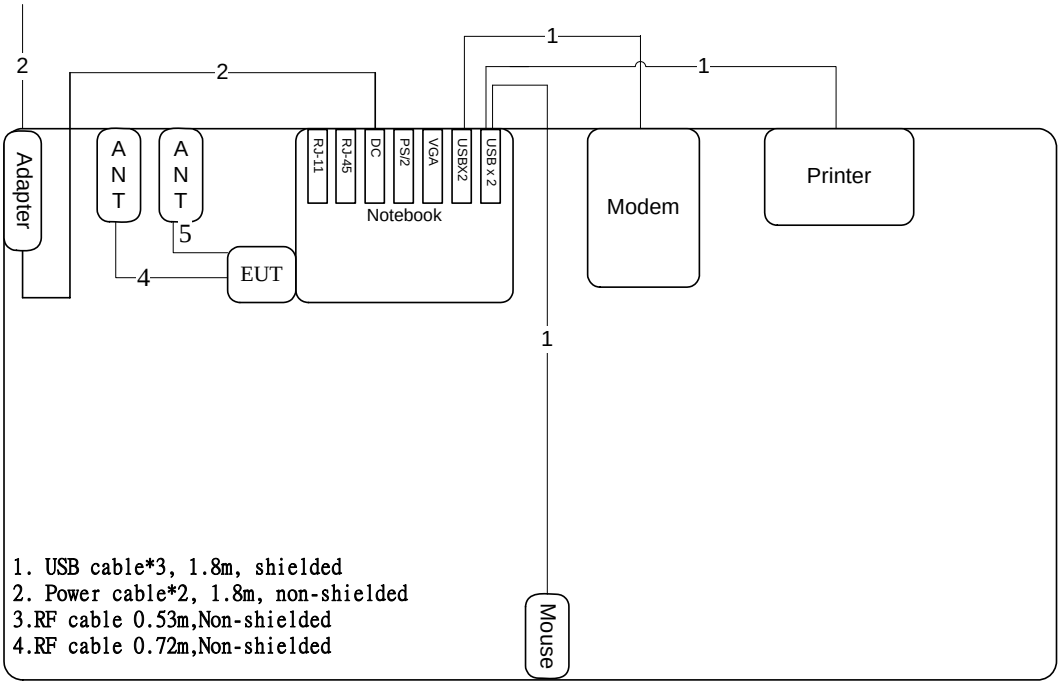
Test configuration: 9kHz~1GHz



Test configuration: Above 1GHz



3.9.2. 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

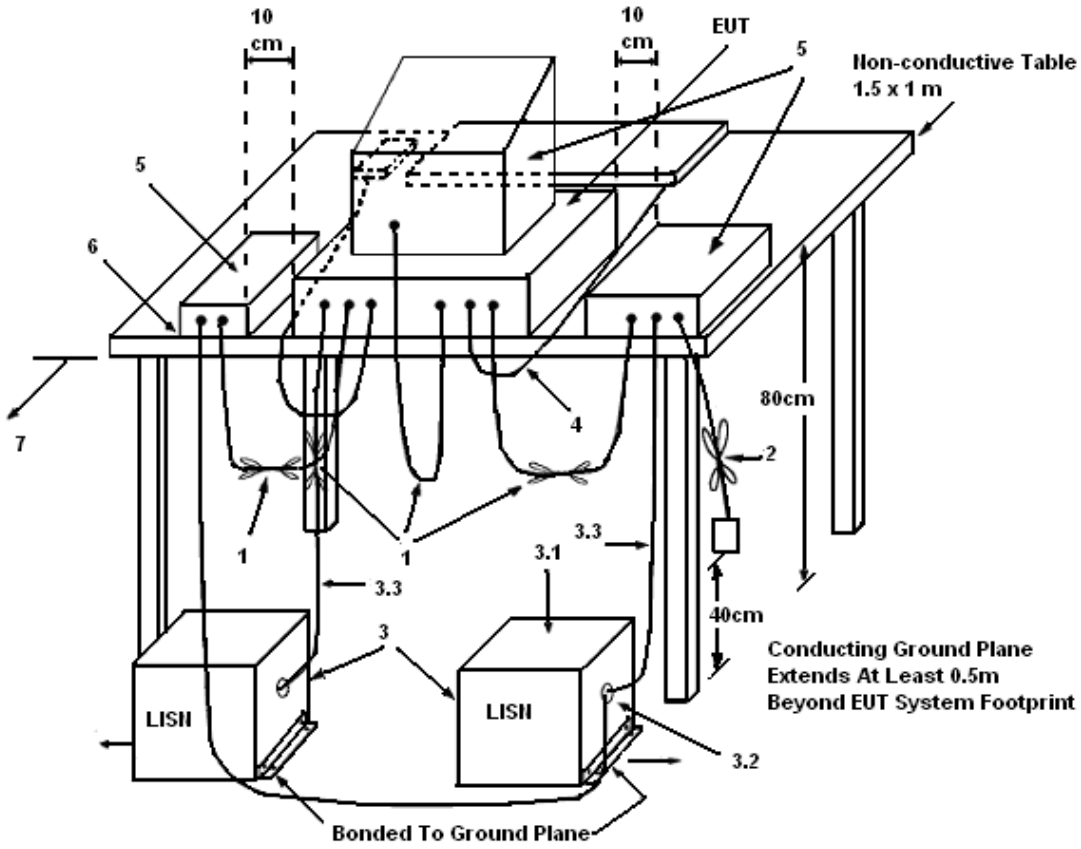
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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 Ω. 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

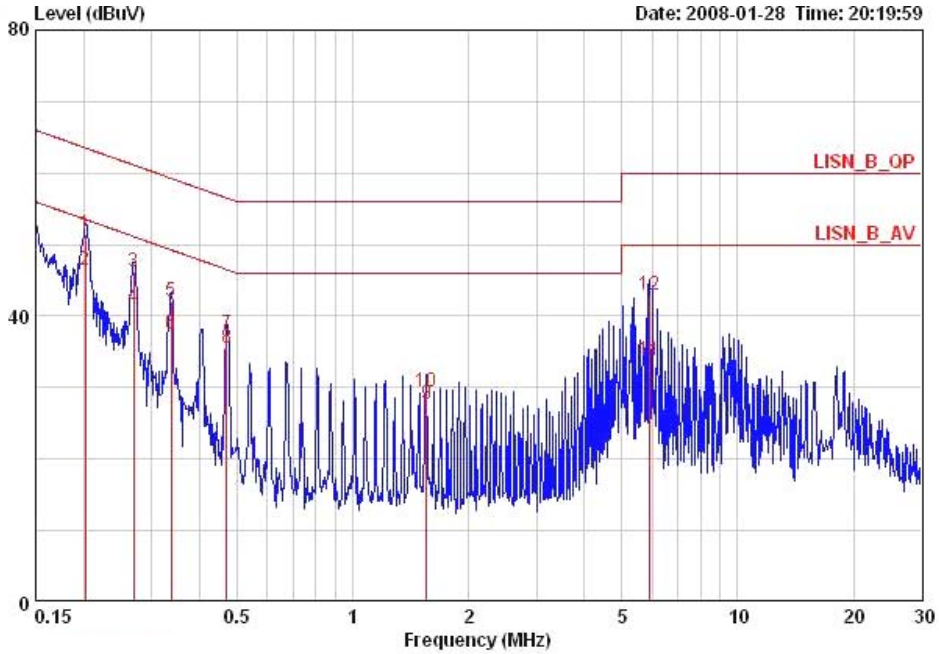
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

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

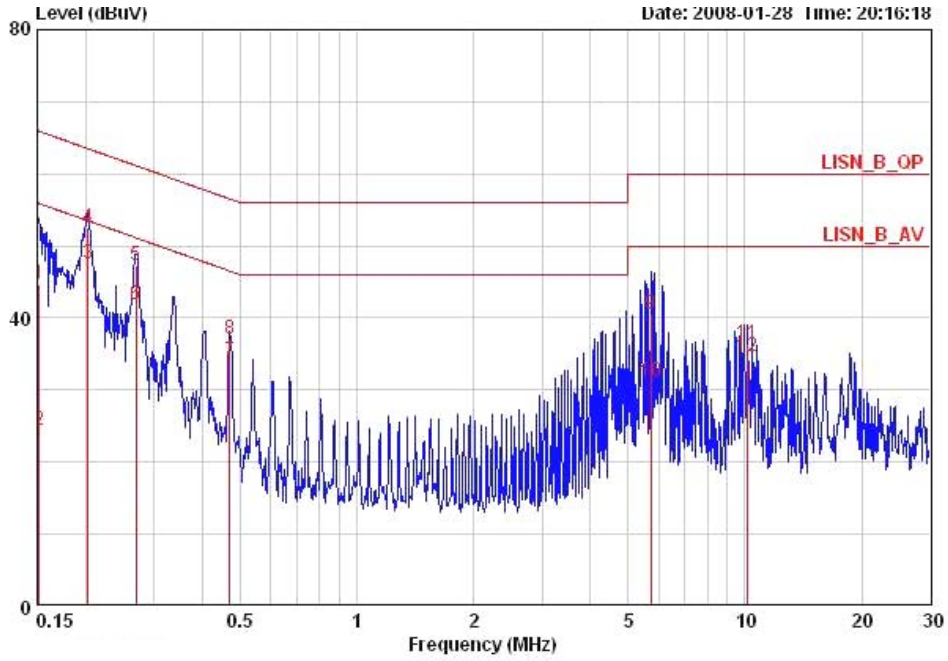
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	23℃	Humidity	54%
Test Engineer	Johnson Chang	Phase	Line
Configuration	Normal Link		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.20181	51.40	-12.14	63.54	51.10	0.10	0.20	QP	LINE
2 @	0.20181	46.39	-7.15	53.54	46.09	0.10	0.20	AVERAGE	LINE
3	0.27009	46.13	-14.99	61.12	45.83	0.10	0.20	QP	LINE
4	0.27009	41.22	-9.90	51.12	40.92	0.10	0.20	AVERAGE	LINE
5	0.33740	41.98	-17.29	59.27	41.68	0.10	0.20	QP	LINE
6	0.33740	37.49	-11.78	49.27	37.19	0.10	0.20	AVERAGE	LINE
7	0.47110	37.49	-19.01	56.49	37.20	0.09	0.20	QP	LINE
8	0.47110	35.52	-10.98	46.49	35.23	0.09	0.20	AVERAGE	LINE
9	1.552	27.68	-18.32	46.00	27.57	0.00	0.11	AVERAGE	LINE
10	1.552	29.42	-26.58	56.00	29.31	0.00	0.11	QP	LINE
11	5.929	33.85	-16.15	50.00	33.52	0.03	0.30	AVERAGE	LINE
12	5.929	43.01	-16.99	60.00	42.68	0.03	0.30	QP	LINE

Temperature	23℃	Humidity	54%
Test Engineer	Johnson Chang	Phase	Neutral
Configuration	Normal Link		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.15160	44.66	-21.25	65.91	44.16	0.30	0.20	QP	NEUTRAL
2	0.15160	24.45	-31.46	55.91	23.95	0.30	0.20	AVERAGE	NEUTRAL
3 @	0.20289	47.54	-5.95	53.49	47.14	0.20	0.20	AVERAGE	NEUTRAL
4	0.20289	52.59	-10.90	63.49	52.19	0.20	0.20	QP	NEUTRAL
5	0.27009	47.32	-13.80	61.12	46.95	0.17	0.20	QP	NEUTRAL
6	0.27009	41.96	-9.16	51.12	41.59	0.17	0.20	AVERAGE	NEUTRAL
7	0.47110	33.90	-12.59	46.49	33.60	0.10	0.20	AVERAGE	NEUTRAL
8	0.47110	37.07	-19.42	56.49	36.77	0.10	0.20	QP	NEUTRAL
9	5.717	40.51	-19.49	60.00	40.11	0.10	0.30	QP	NEUTRAL
10	5.717	31.07	-18.93	50.00	30.67	0.10	0.30	AVERAGE	NEUTRAL
11	10.167	36.32	-23.68	60.00	35.89	0.10	0.33	QP	NEUTRAL
12	10.167	34.74	-15.26	50.00	34.31	0.10	0.33	AVERAGE	NEUTRAL

Note:

Level = Read Level + LISN Factor + Cable Loss.

4.2. Maximum Conducted Output Power Measurement

4.2.1. Limit

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. The limited has to be reduced by the amount in dB that the gain of the antenna exceed 6dBi. 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.

4.2.2. Measuring Instruments and Setting

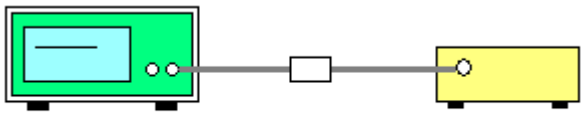
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RB	1000 kHz
VB	3000 kHz
Detector	PEAK
Trace	MAX HOLD
Sweep Time	Auto

4.2.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Test was performed in accordance with Measurement of Digital Transmission Systems Operating under Section 15.247 March 23, 2005.

4.2.4. Test Setup Layout



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. Test Result of Maximum Conducted Output Power

Temperature	23℃	Humidity	60%
Test Engineer	Jacky Ho	Configurations	802.11b/g

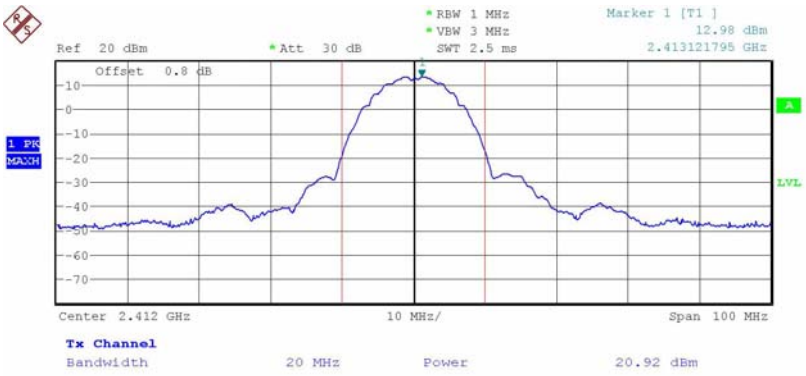
Configuration IEEE 802.11b

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	20.92	30.00	Complies
6	2437 MHz	20.98	30.00	Complies
11	2462 MHz	21.07	30.00	Complies

Configuration IEEE 802.11g

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	22.56	30.00	Complies
6	2437 MHz	22.36	30.00	Complies
11	2462 MHz	22.70	30.00	Complies

Conducted Output Power Plot on Configuration IEEE 802.11b / 2412 MHz

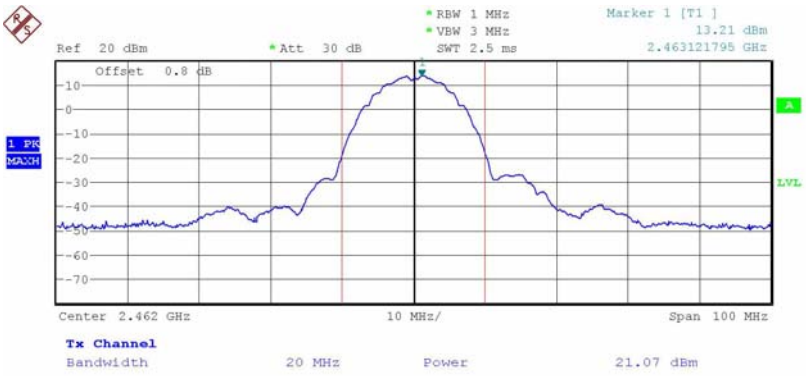


Date: 24.JAN.2008 08:38:26

Conducted Output Power Plot on Configuration IEEE 802.11b / 2437 MHz

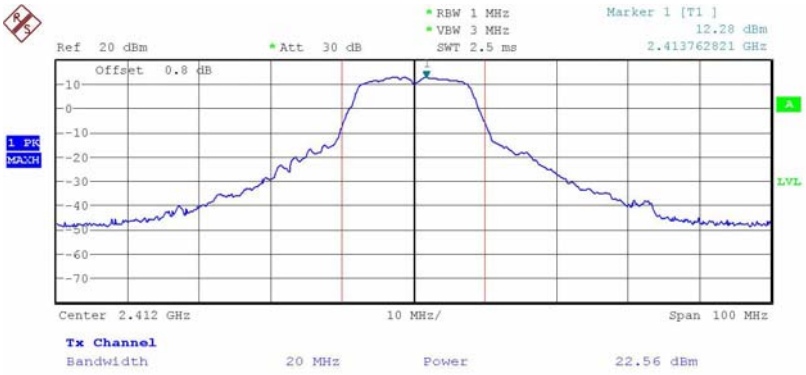
Date: 24.JAN.2008 08:39:42

Conducted Output Power Plot on Configuration IEEE 802.11b / 2462 MHz



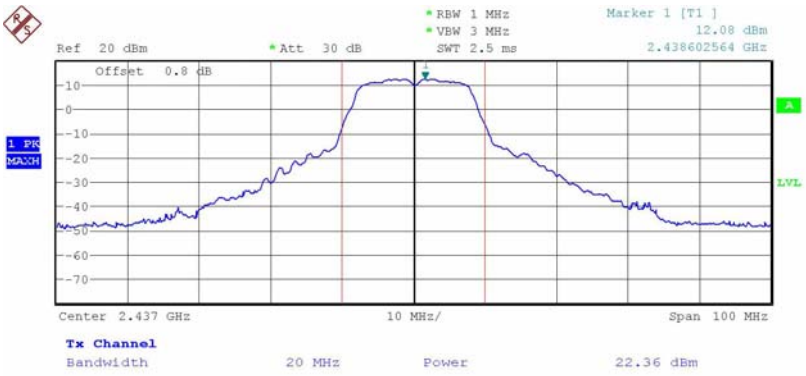
Date: 24.JAN.2008 08:40:16

Conducted Output Power Plot on Configuration IEEE 802.11g / 2412 MHz



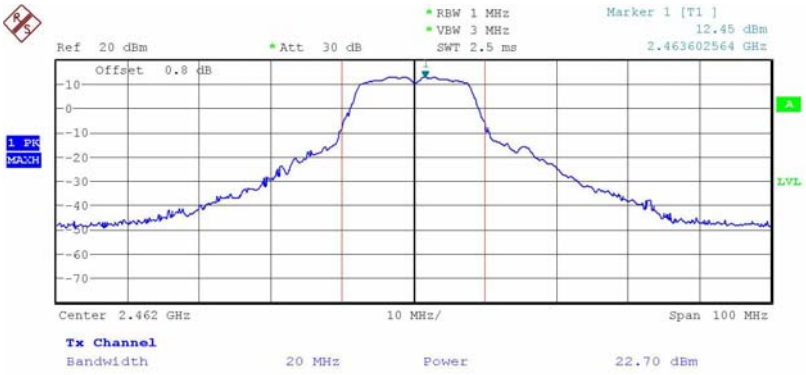
Date: 24.JAN.2008 08:41:21

Conducted Output Power Plot on Configuration IEEE 802.11g / 2437 MHz



Date: 24.JAN.2008 08:42:05

Conducted Output Power Plot on Configuration IEEE 802.11g / 2462 MHz



Date: 24.JAN.2008 08:42:34

4.3. Power Spectral Density Measurement

4.3.1. Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

4.3.2. Measuring Instruments and Setting

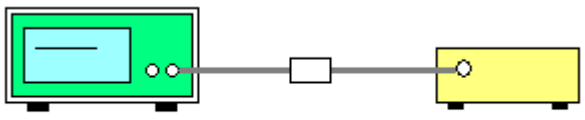
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	1.5MHz
RB	3 kHz
VB	30 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	500s

4.3.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyser.
2. Set RBW of spectrum analyzer to 3kHz and VBW to 30kHz. Set Detector to Peak, Trace to Max Hold.
3. Mark the frequency with maximum peak power as the center of the display of the spectrum.
4. Set the span to 1.5MHz and the sweep time to 500s and record the maximum peak value.

4.3.4. Test Setup Layout



4.3.5. Test Deviation

There is no deviation with the original standard.

4.3.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.3.7. Test Result of Power Spectral Density

Temperature	23℃	Humidity	60%
Test Engineer	Jacky Ho	Configurations	802.11b/g

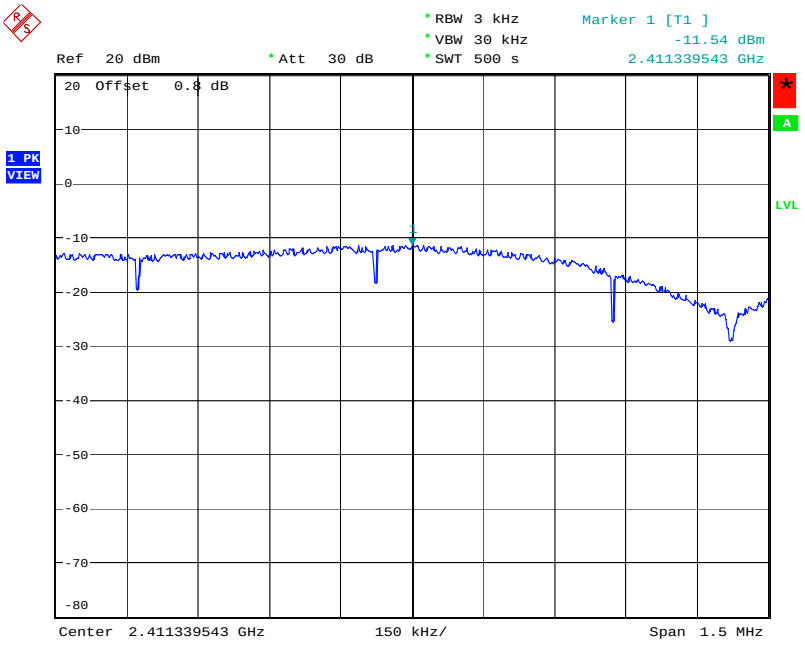
Configuration IEEE 802.11b

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	-11.54	8.00	Complies
6	2437 MHz	-11.51	8.00	Complies
11	2462 MHz	-11.45	8.00	Complies

Configuration IEEE 802.11g

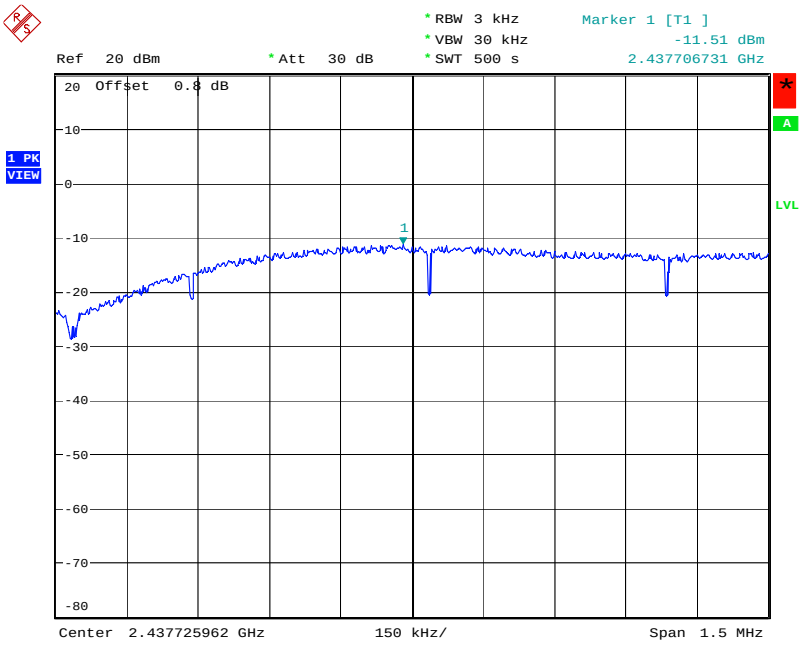
Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	-14.53	8.00	Complies
6	2437 MHz	-14.18	8.00	Complies
11	2462 MHz	-13.88	8.00	Complies

Power Density Plot on Configuration IEEE 802.11b / 2412 MHz



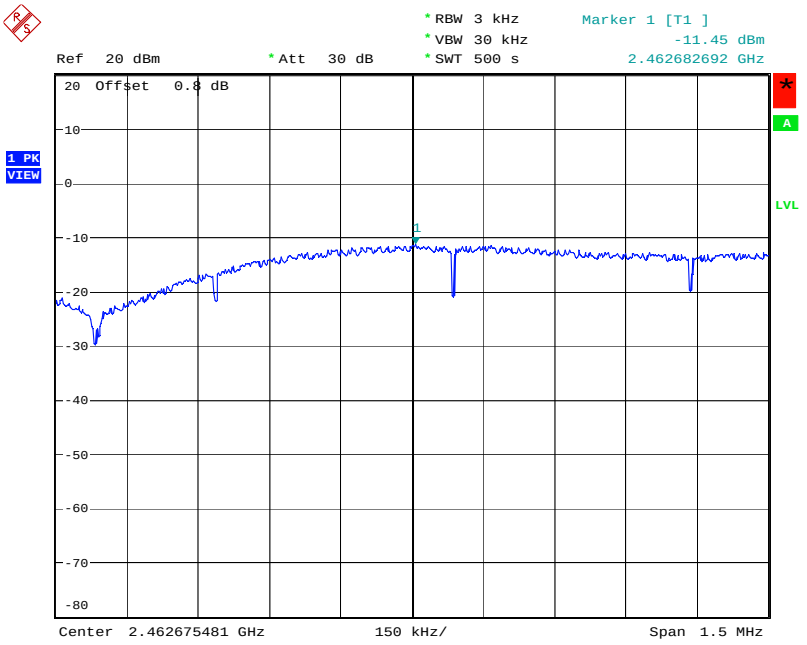
Date: 24.JAN.2008 08:49:23

Power Density Plot on Configuration IEEE 802.11b / 2437 MHz



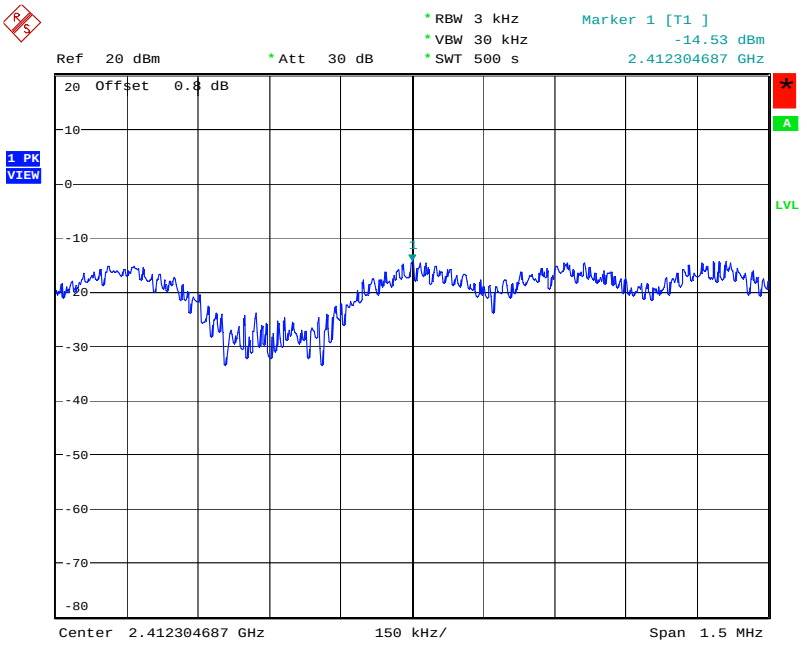
Date: 24.JAN.2008 08:50:41

Power Density Plot on Configuration IEEE 802.11b / 2462 MHz



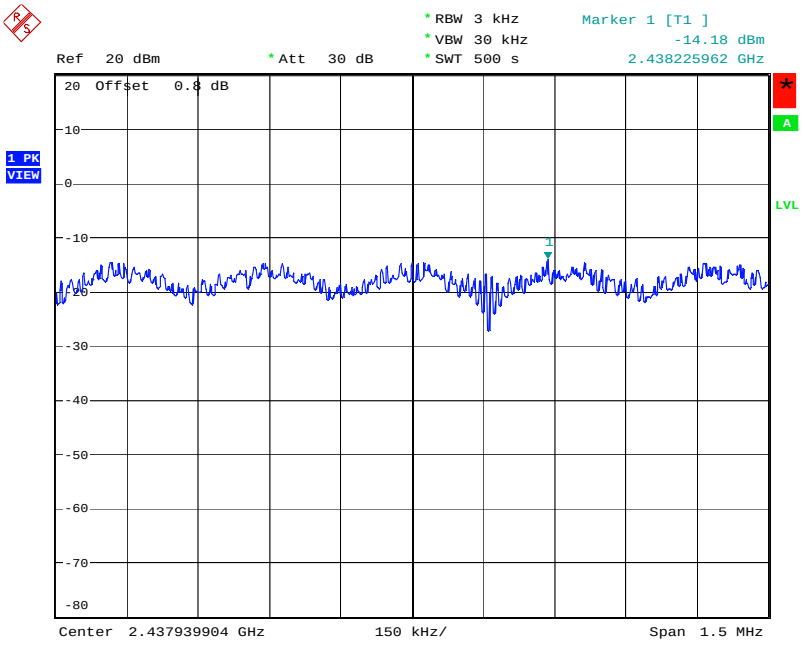
Date: 24.JAN.2008 08:51:46

Power Density Plot on Configuration IEEE 802.11g / 2412 MHz



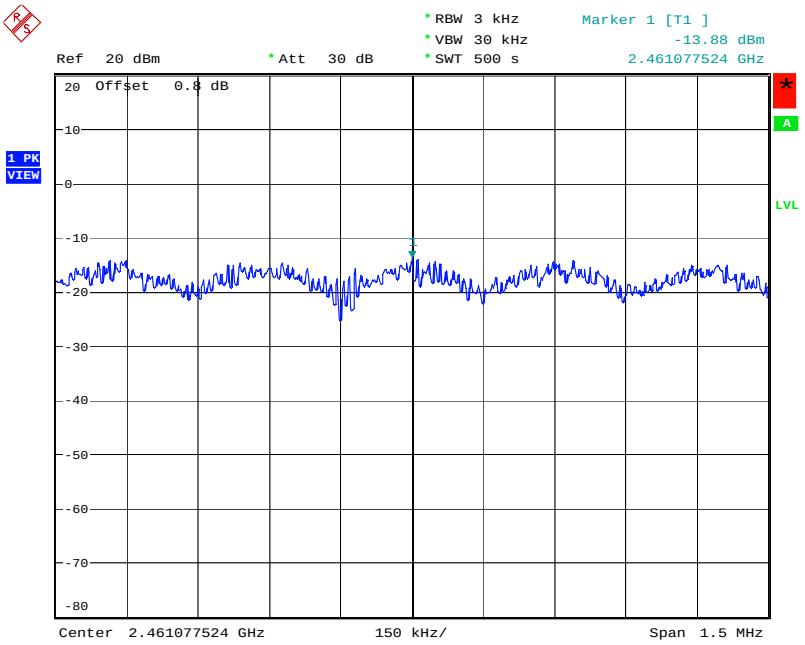
Date: 24.JAN.2008 08:53:25

Power Density Plot on Configuration IEEE 802.11g / 2437 MHz



Date: 24.JAN.2008 08:54:26

Power Density Plot on Configuration IEEE 802.11g / 2462 MHz



Date: 24.JAN.2008 08:55:20

4.4. 6dB Spectrum Bandwidth Measurement

4.4.1. Limit

For digital modulation systems, the minimum 6dB bandwidth shall be at least 500 kHz.

4.4.2. Measuring Instruments and Setting

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

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 6dB Bandwidth
RB	100 kHz
VB	100 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

4.4.3. Test Procedures

3. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
4. The resolution bandwidth of 100 kHz and the video bandwidth of 100 kHz were used.
5. Measured the spectrum width with power higher than 6dB below carrier.

4.4.4. Test Setup Layout

4.4.5. Test Deviation

There is no deviation with the original standard.

4.4.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.4.7. Test Result of 6dB Spectrum Bandwidth

Temperature	23℃	Humidity	60%
Test Engineer	Jacky Ho	Configurations	802.11b/g

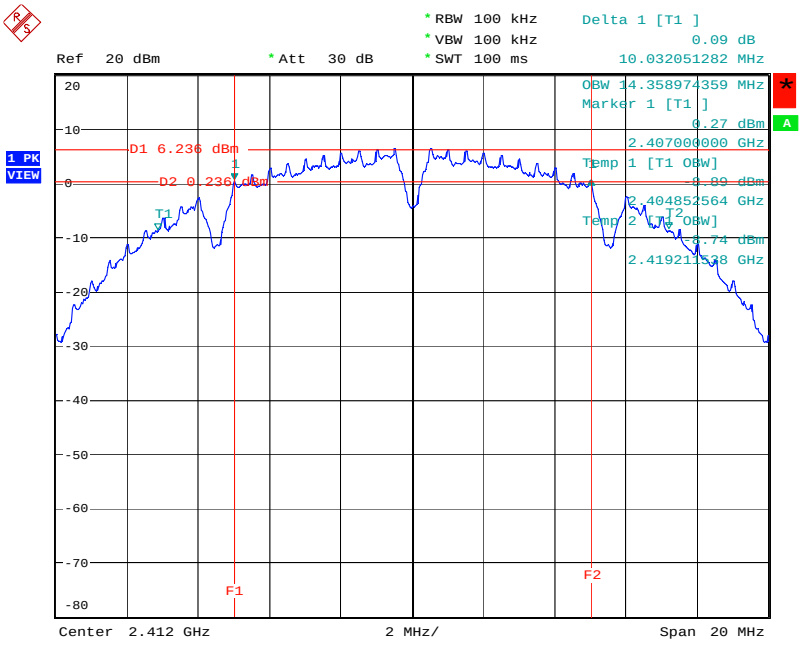
Configuration IEEE 802.11b

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	10.03	14.35	500	Complies
6	2437 MHz	9.58	14.32	500	Complies
11	2462 MHz	10.00	14.29	500	Complies

Configuration IEEE 802.11g

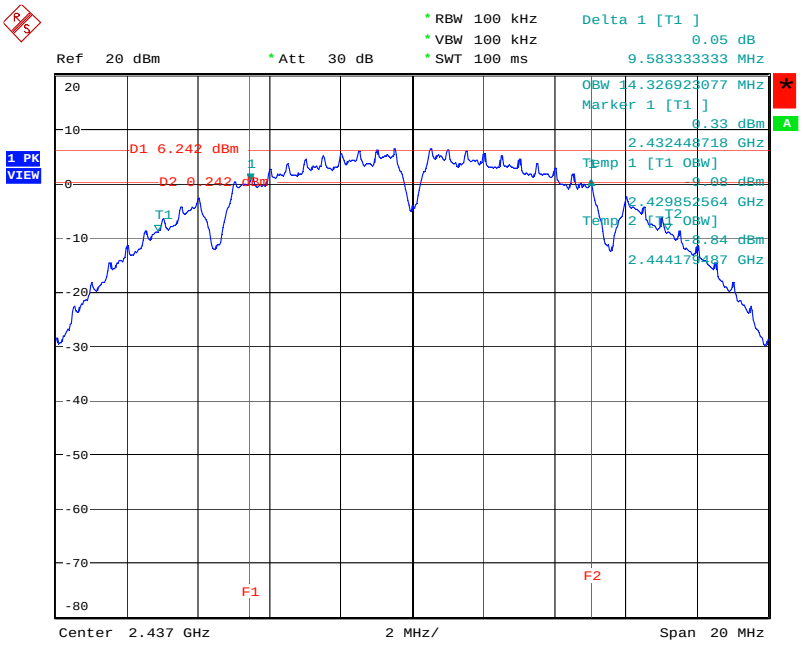
Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	16.34	16.31	500	Complies
6	2437 MHz	16.34	16.31	500	Complies
11	2462 MHz	16.34	16.31	500	Complies

6 dB Bandwidth Plot on Configuration IEEE 802.11b / 2412 MHz



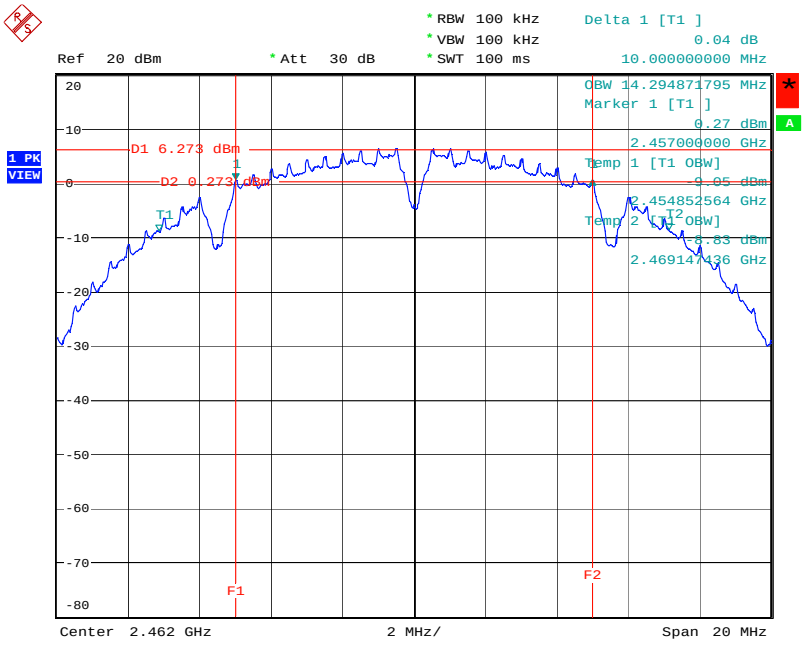
Date: 24.JAN.2008 08:48:57

6 dB Bandwidth Plot on Configuration IEEE 802.11b / 2437 MHz



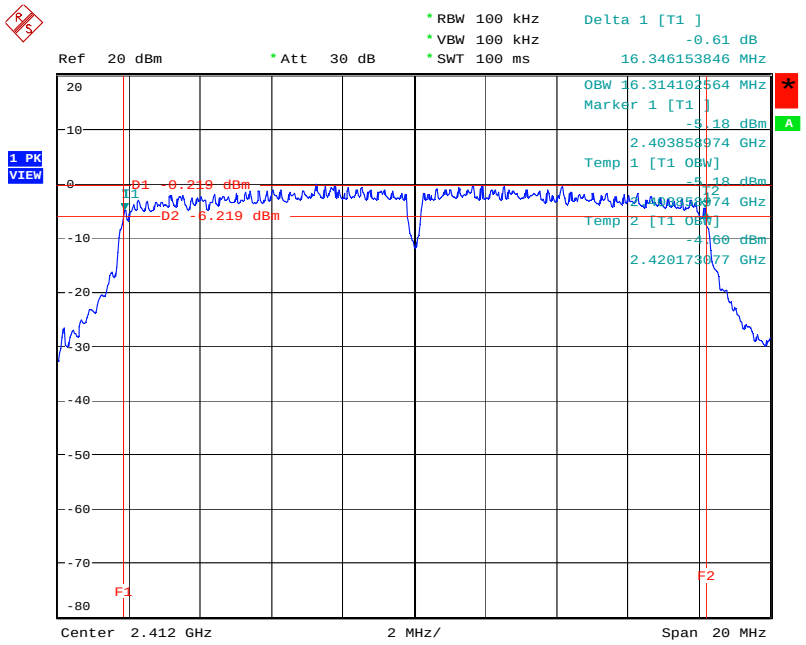
Date: 24.JAN.2008 08:50:25

6 dB Bandwidth Plot on Configuration IEEE 802.11b / 2462 MHz



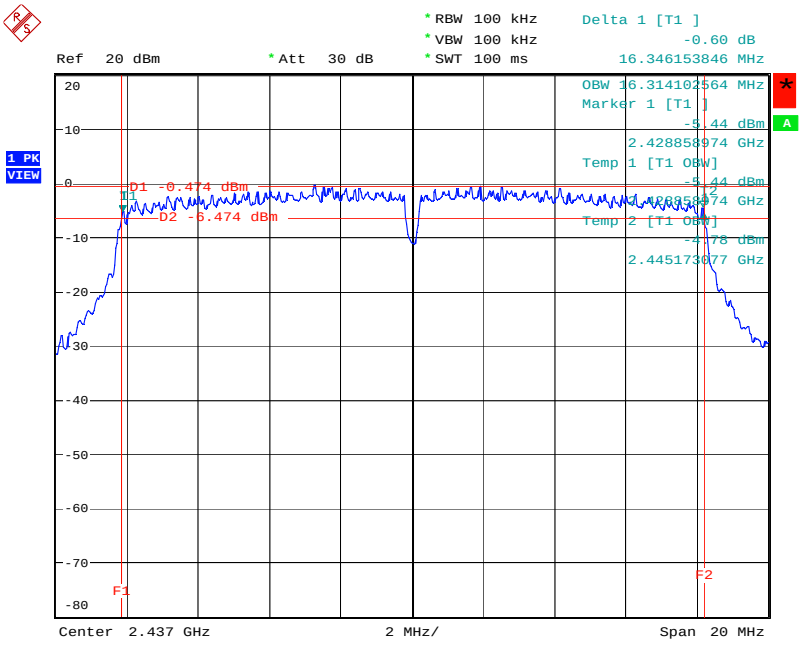
Date: 24.JAN.2008 08:51:31

6 dB Bandwidth Plot on Configuration IEEE 802.11g / 2412 MHz



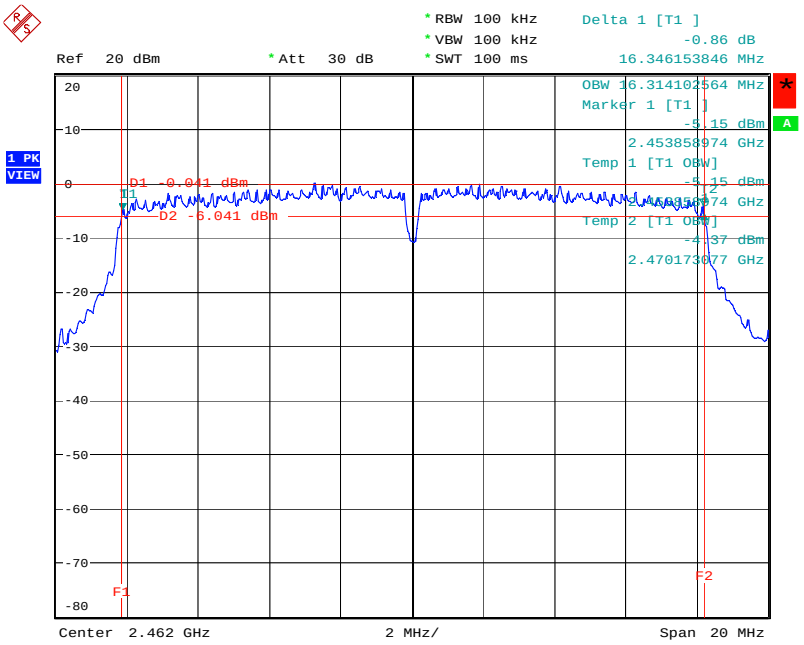
Date: 24.JAN.2008 08:53:00

6 dB Bandwidth Plot on Configuration IEEE 802.11g / 2437 MHz



Date: 24.JAN.2008 08:54:09

6 dB Bandwidth Plot on Configuration IEEE 802.11g / 2462 MHz



Date: 24.JAN.2008 08:55:04

4.5. Radiated Emissions Measurement

4.5.1. 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

4.5.2. 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)	100KHz / 100KHz for peak

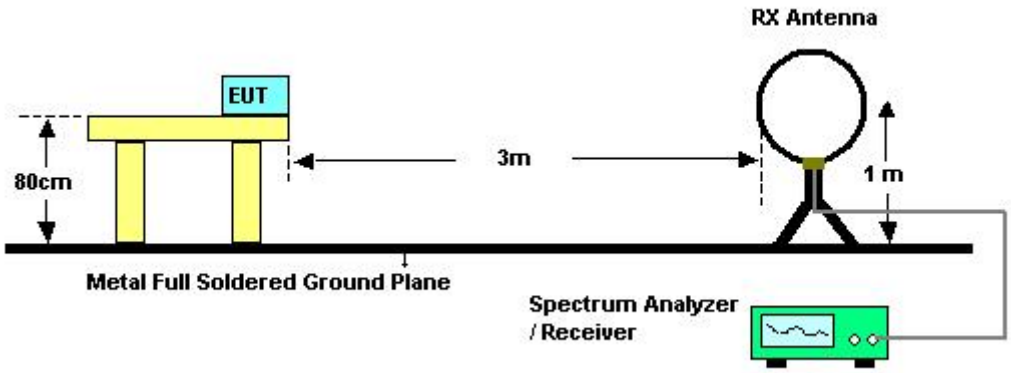
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

4.5.3. Test Procedures

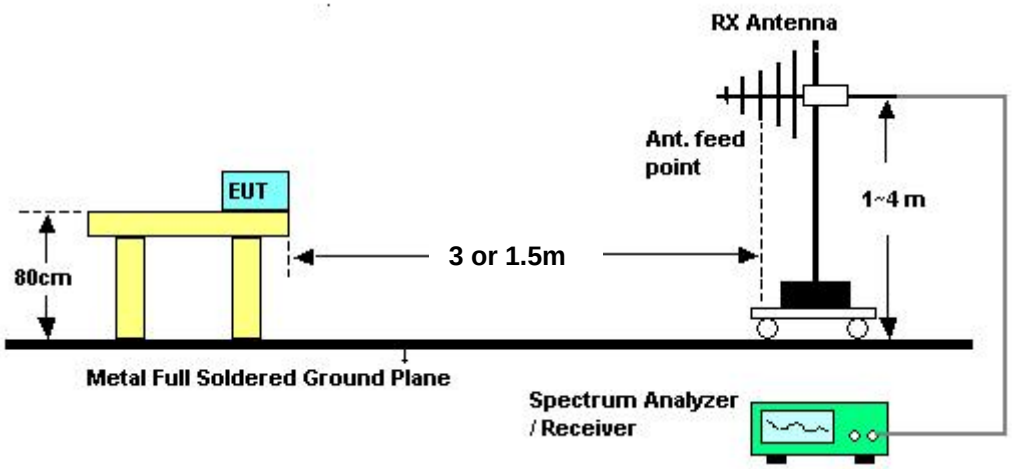
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting 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.

4.5.4. 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 form 3m to 1.5m.

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1.5m]) (dB);

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

4.5.5. Test Deviation

There is no deviation with the original standard.

4.5.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

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

Temperature	26℃	Humidity	56%
Test Engineer	Jex Chen		

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

Note:

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

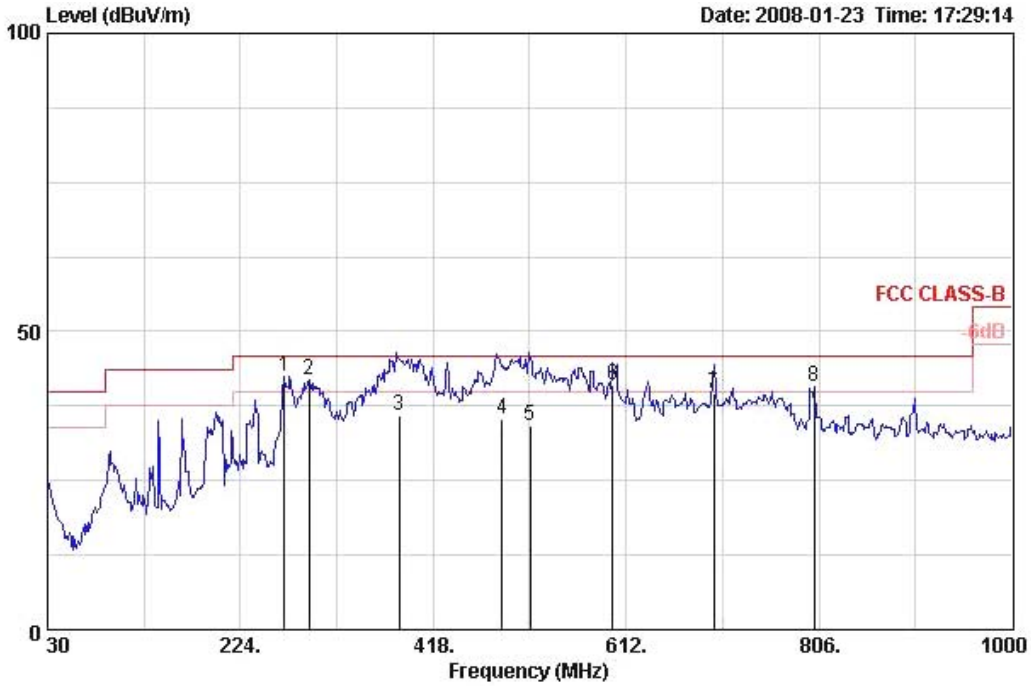
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

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

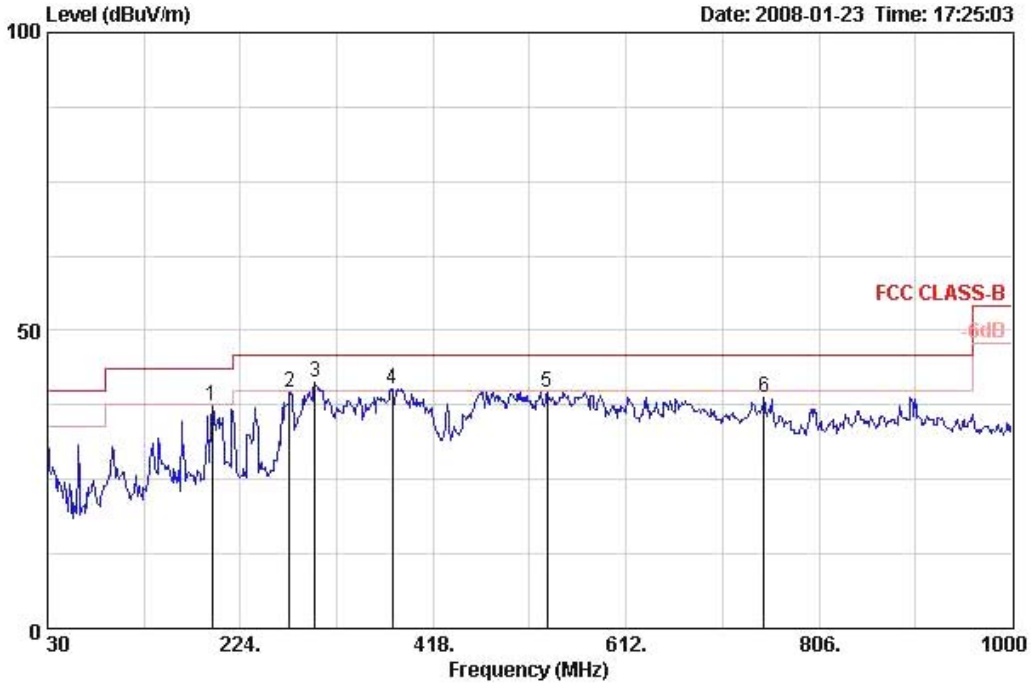
Temperature	26℃	Humidity	56%
Test Engineer	Jex Chen	Configurations	Normal Link

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg	
1 @	268.620	42.36	-3.64	46.00	57.74	13.46	2.50	31.34	Peak	100	-4	HORIZONTAL
2 !	292.870	42.02	-3.98	46.00	57.16	13.86	2.32	31.32	Peak	100	-4	HORIZONTAL
3	384.000	35.84	-10.16	46.00	48.10	16.22	2.61	31.10	QP	100	100	HORIZONTAL
4	486.860	35.37	-10.63	46.00	45.40	17.71	3.19	30.93	QP	100	320	HORIZONTAL
5	515.500	34.21	-11.79	46.00	43.60	18.21	3.27	30.88	QP	100	322	HORIZONTAL
6 !	598.420	41.00	-5.00	46.00	49.56	19.09	3.10	30.75	QP	100	325	HORIZONTAL
7	700.270	39.74	-6.26	46.00	46.86	19.80	3.60	30.52	QP	102	310	HORIZONTAL
8 !	801.150	40.72	-5.28	46.00	46.39	20.71	3.80	30.18	Peak	100	-4	HORIZONTAL

Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg	
1	195.870	37.42	-6.08	43.50	56.94	9.96	2.00	31.48	Peak	400	-5	VERTICAL
2	273.470	39.67	-6.33	46.00	55.07	13.44	2.50	31.34	Peak	400	-5	VERTICAL
3 !	298.690	41.18	-4.82	46.00	56.29	13.98	2.23	31.32	Peak	400	-5	VERTICAL
4 !	377.260	40.24	-5.76	46.00	52.74	16.06	2.56	31.12	Peak	400	-5	VERTICAL
5	532.460	39.69	-6.31	46.00	48.72	18.55	3.24	30.82	Peak	400	-5	VERTICAL
6	750.710	38.72	-7.28	46.00	44.78	20.31	3.90	30.27	Peak	400	-5	VERTICAL

Note:

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

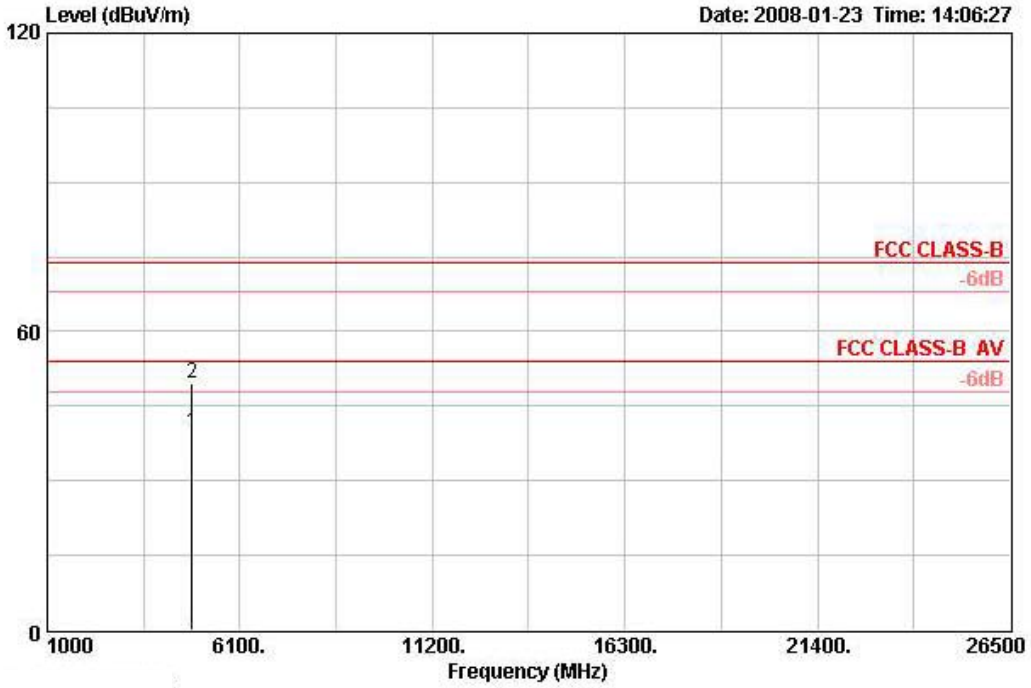
Emission level (dBuV/m) = 20 log Emission level (uV/m).

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

4.5.9. Results for Radiated Emissions (1GHz~10th Harmonic)

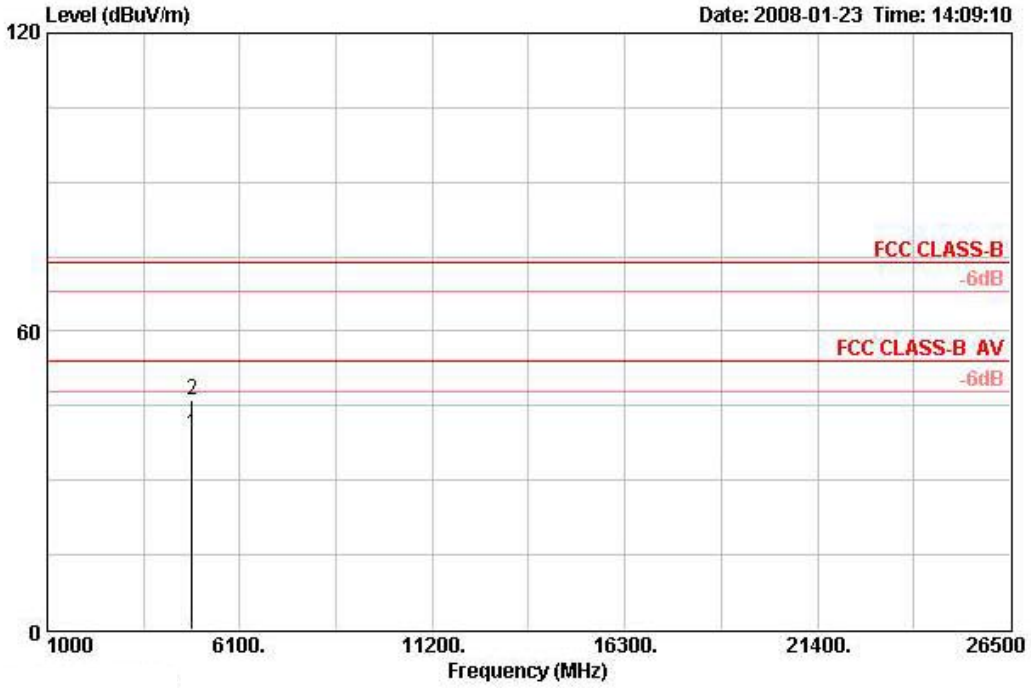
Temperature	26℃	Humidity	56%
Test Engineer	Jex Chen	Configurations	802.11b CH 1

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg	
1 @	4824.010	39.57	-14.43	54.00	35.29	33.06	6.40	35.16	AVERAGE	100	143	HORIZONTAL
2 @	4824.100	49.52	-24.48	74.00	45.23	33.06	6.40	35.16	PEAK	100	143	HORIZONTAL

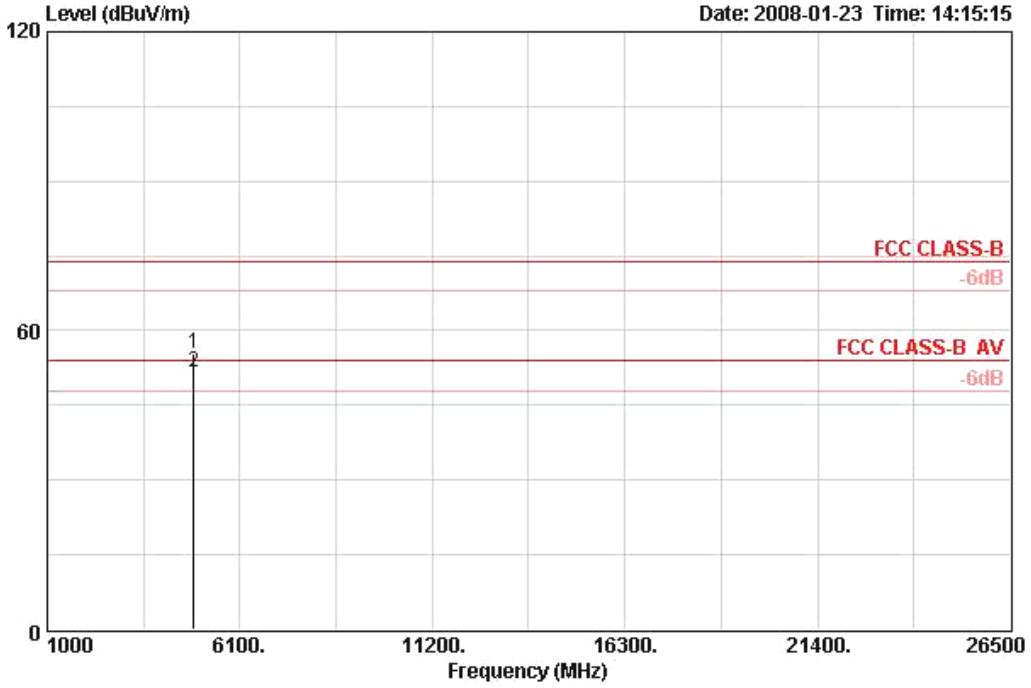
Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg	
1 @	4824.010	39.30	-14.70	54.00	35.02	33.06	6.40	35.16	AVERAGE	103	147	VERTICAL
2 @	4824.100	46.28	-27.72	74.00	41.99	33.06	6.40	35.16	PEAK	103	147	VERTICAL

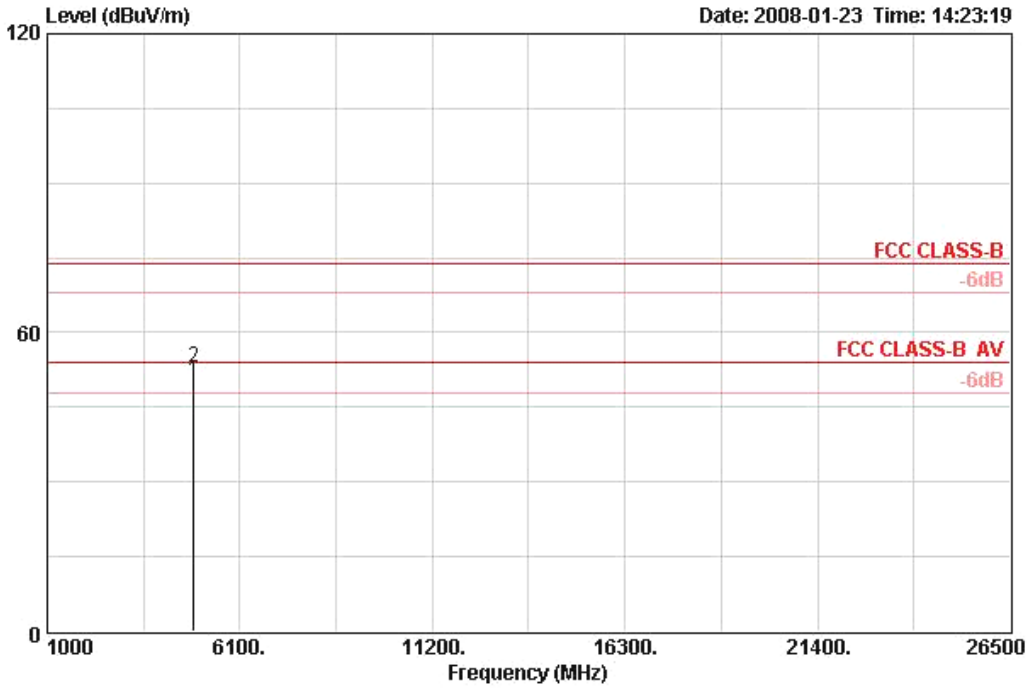
Temperature	26℃	Humidity	56%
Test Engineer	Jex Chen	Configurations	802.11b CH 6

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg	
1 @	4873.980	55.46	-18.54	74.00	51.04	33.16	6.42	35.15	PEAK	147	106	HORIZONTAL
2 @	4874.050	51.49	-2.51	54.00	47.06	33.16	6.42	35.15	AVERAGE	147	106	HORIZONTAL

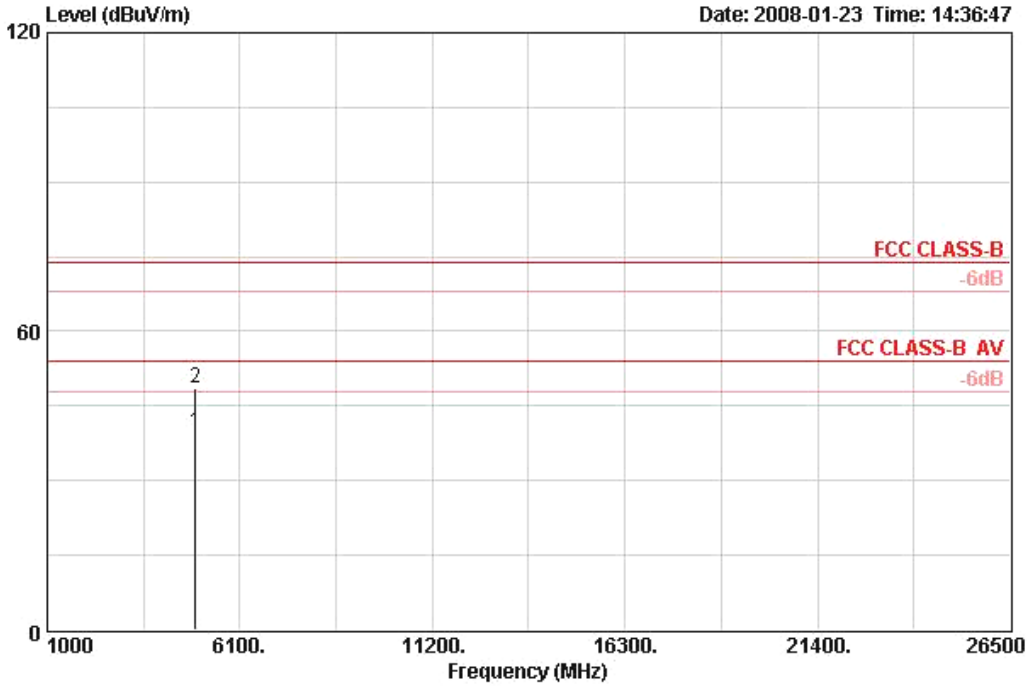
Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg	
1 @	4874.030	50.21	-3.79	54.00	45.78	33.16	6.42	35.15	AVERAGE	100	171	VERTICAL
2 @	4874.080	53.10	-20.90	74.00	48.68	33.16	6.42	35.15	PEAK	100	171	VERTICAL

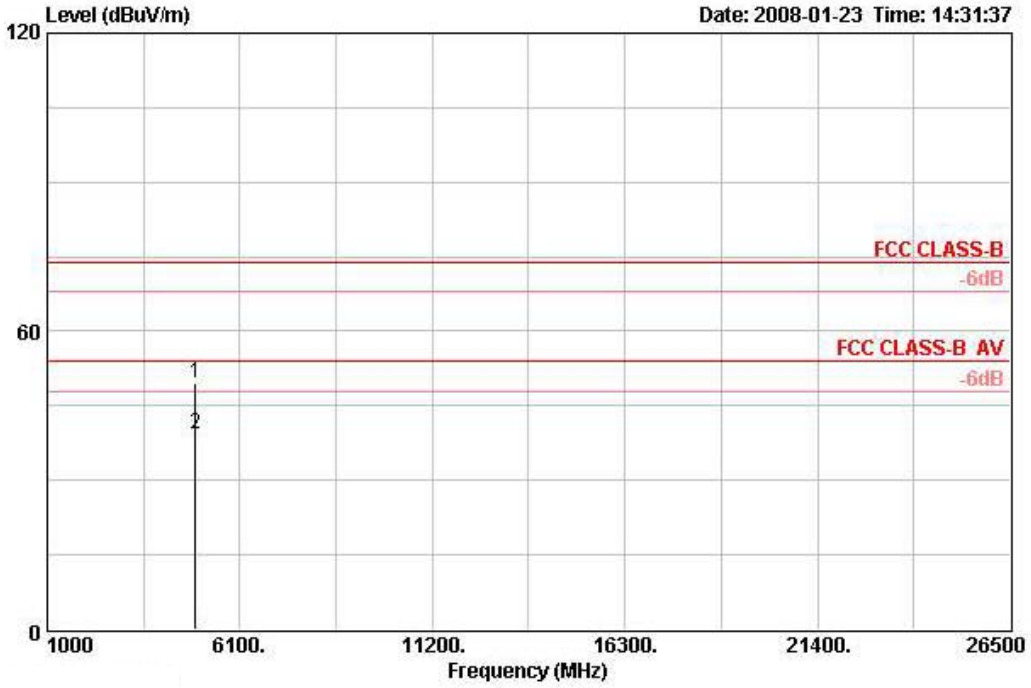
Temperature	26℃	Humidity	56%
Test Engineer	Jex Chen	Configurations	802.11b CH 11

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg	
1 @	4924.030	39.76	-14.24	54.00	35.21	33.26	6.44	35.14	AVERAGE	100	148	HORIZONTAL
2 @	4924.110	48.58	-25.42	74.00	44.02	33.26	6.44	35.14	PEAK	100	148	HORIZONTAL

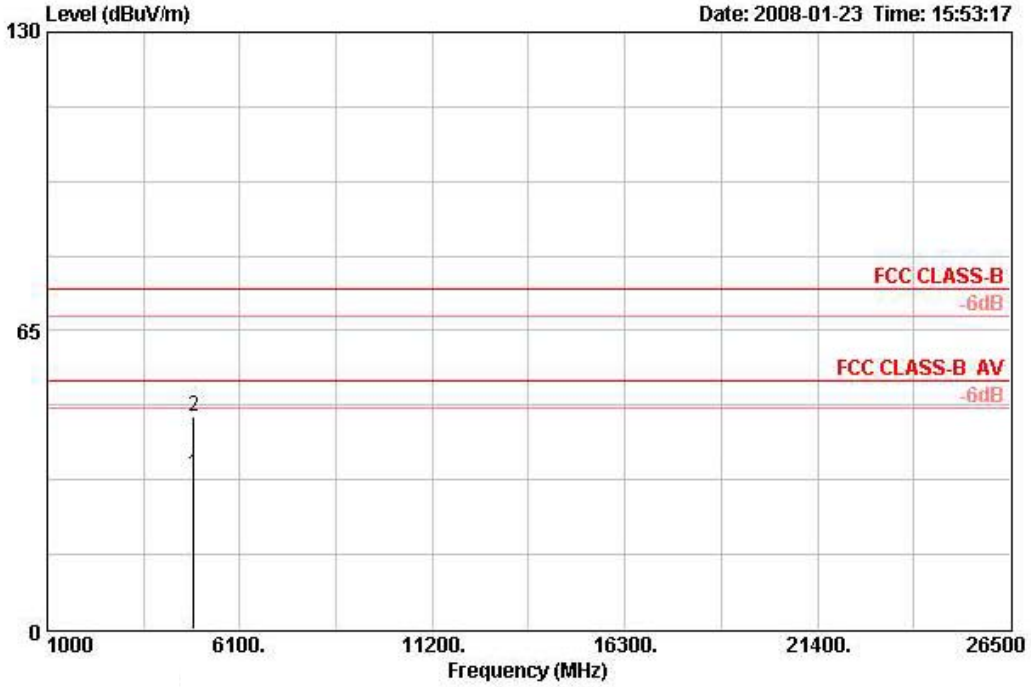
Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg	
1 @	4923.550	49.41	-24.59	74.00	44.86	33.26	6.44	35.14	PEAK	100	171	VERTICAL
2 @	4924.050	39.46	-14.54	54.00	34.90	33.26	6.44	35.14	AVERAGE	100	171	VERTICAL

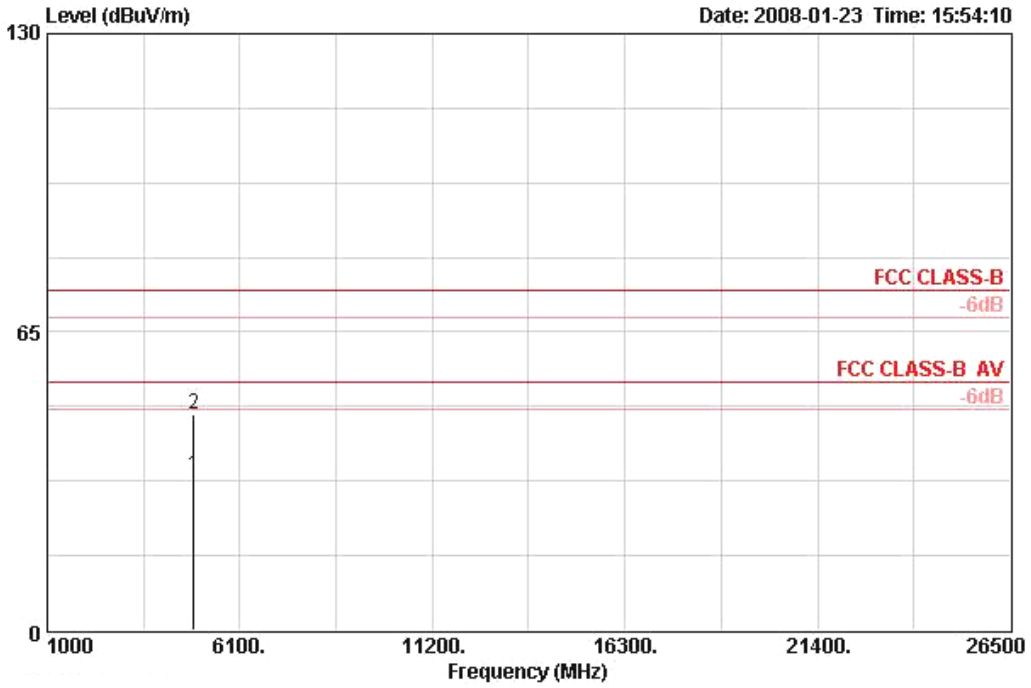
Temperature	26℃	Humidity	56%
Test Engineer	Jex Chen	Configurations	802.11g CH 1

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg	
1 @	4872.280	33.55	-20.45	54.00	29.13	33.16	6.42	35.15	AVERAGE	100	360	HORIZONTAL
2 @	4873.690	46.43	-27.57	74.00	42.00	33.16	6.42	35.15	PEAK	100	360	HORIZONTAL

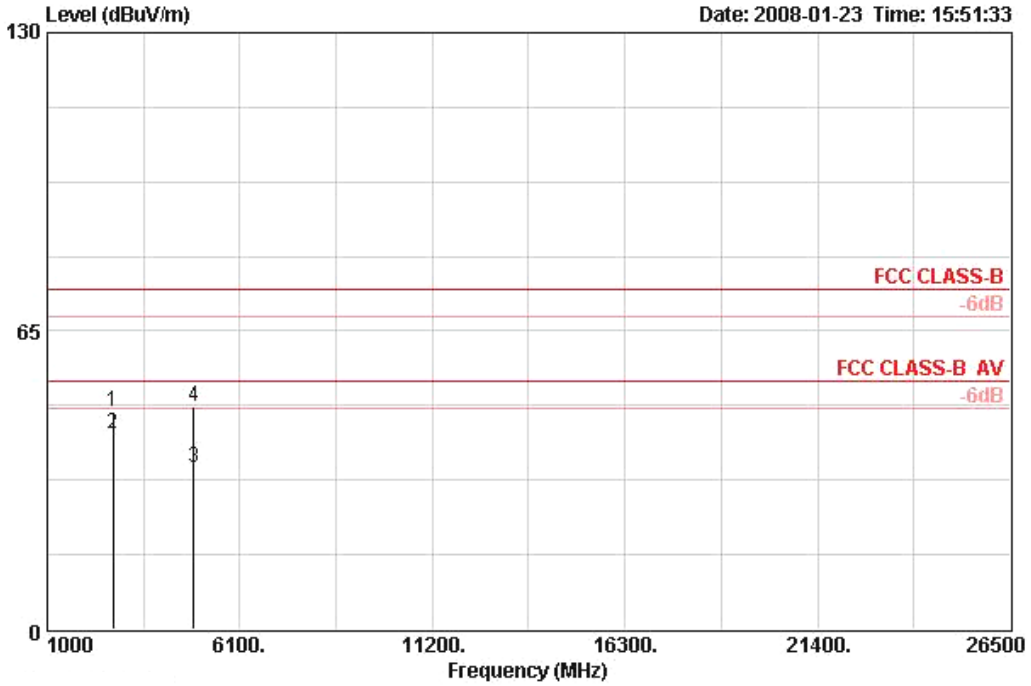
Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg	
1 @	4871.720	33.55	-20.45	54.00	29.13	33.16	6.42	35.15	AVERAGE	100	0	VERTICAL
2 @	4873.260	47.21	-26.79	74.00	42.79	33.16	6.42	35.15	PEAK	100	0	VERTICAL

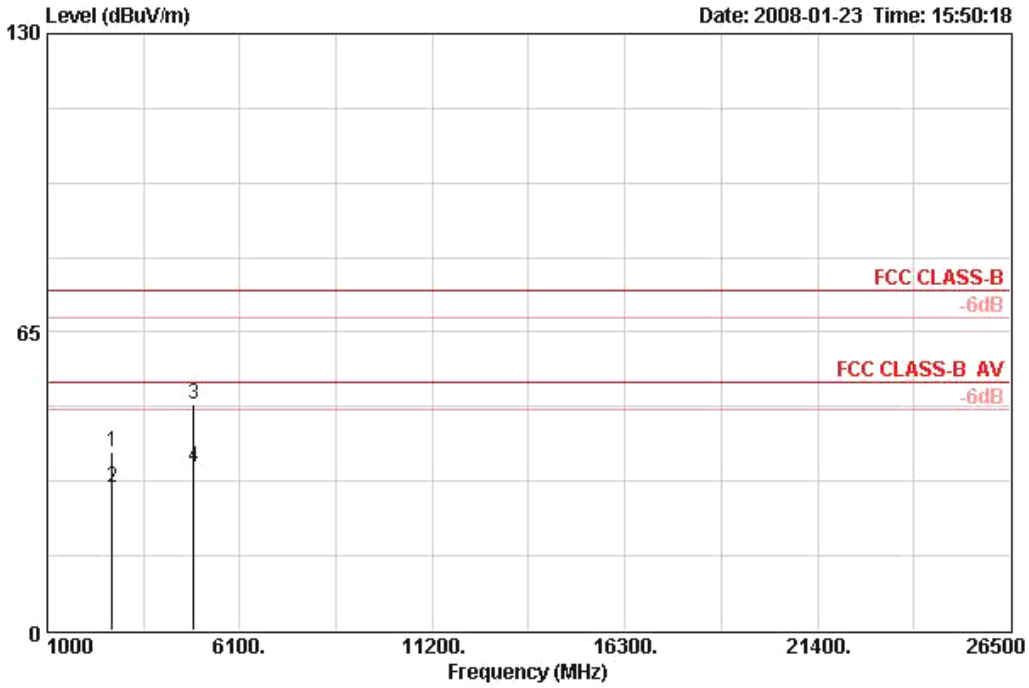
Temperature	26℃	Humidity	56%
Test Engineer	Jex Chen	Configurations	802.11g CH 6

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg	
1 @	2732.960	47.49	-26.51	74.00	49.07	29.15	4.42	35.14	PEAK	122	56	HORIZONTAL
2 @	2742.880	42.48	-11.52	54.00	44.01	29.20	4.42	35.14	AVERAGE	122	56	HORIZONTAL
3 @	4871.900	35.14	-18.86	54.00	30.72	33.16	6.42	35.15	AVERAGE	100	147	HORIZONTAL
4 @	4874.500	48.64	-25.36	74.00	44.22	33.16	6.42	35.15	PEAK	100	147	HORIZONTAL

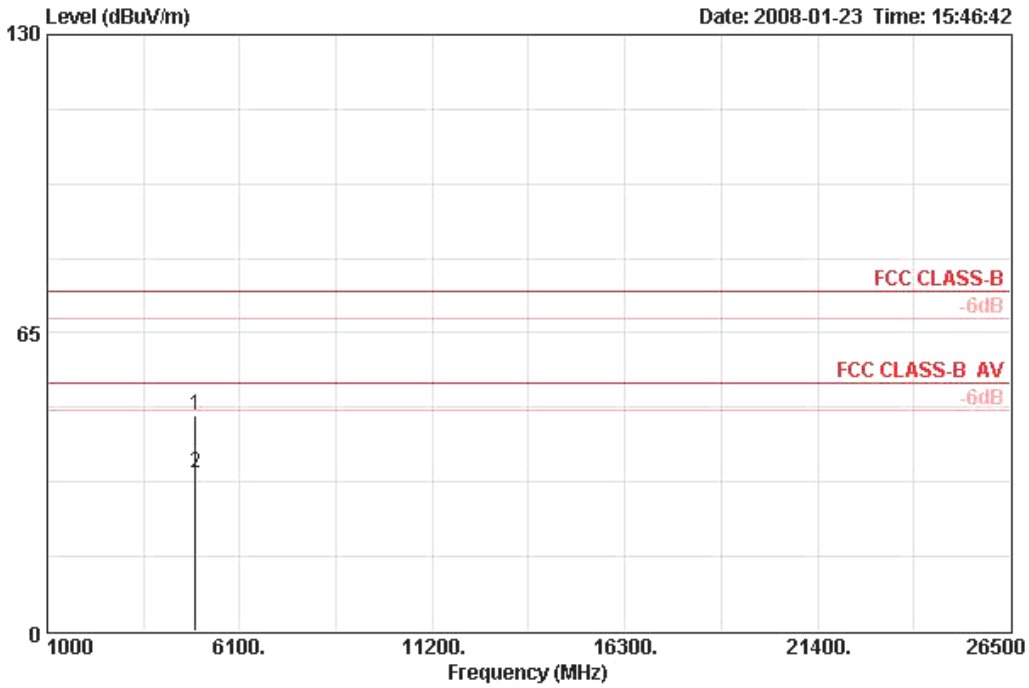
Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg	
1	2726.160	38.99	-35.01	74.00	40.57	29.15	4.42	35.14	PEAK	119	92	VERTICAL
2 @	2730.760	31.10	-22.90	54.00	32.68	29.15	4.42	35.14	AVERAGE	119	92	VERTICAL
3 @	4873.230	49.24	-24.76	74.00	44.81	33.16	6.42	35.15	PEAK	100	177	VERTICAL
4 @	4874.130	35.61	-18.39	54.00	31.19	33.16	6.42	35.15	AVERAGE	100	177	VERTICAL

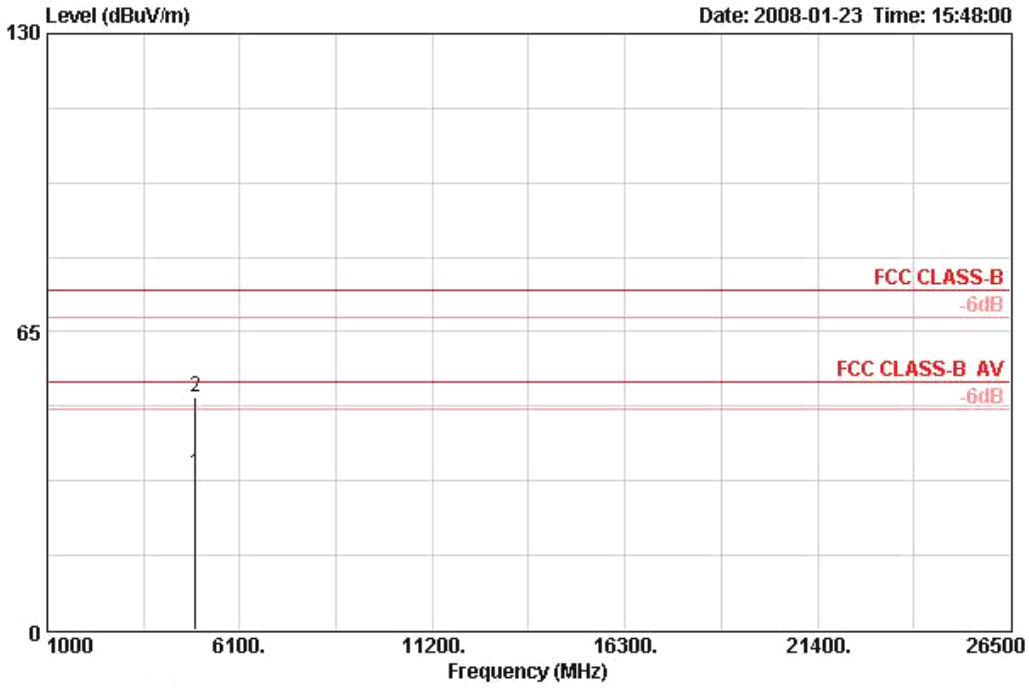
Temperature	26℃	Humidity	56%
Test Engineer	Jex Chen	Configurations	802.11g CH 11

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg	
1 @	4917.600	46.89	-27.11	74.00	42.37	33.23	6.44	35.14	PEAK	100	360	HORIZONTAL
2 @	4932.280	34.58	-19.42	54.00	30.03	33.26	6.44	35.14	AVERAGE	100	360	HORIZONTAL

Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg	
1 @	4922.710	34.20	-19.80	54.00	29.64	33.26	6.44	35.14	AVERAGE	100	0	VERTICAL
2 @	4924.180	50.57	-23.43	74.00	46.01	33.26	6.44	35.14	PEAK	100	0	VERTICAL

4.6. Band Edge Emissions Measurement

4.6.1. 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

4.6.2. Measuring Instruments and Setting

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

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	100 MHz
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	100 KHz /100 KHz for Peak

4.6.3. Test Procedures

1. The test procedure is the same as section 4.5.3, only the frequency range investigated is limited to 100MHz around bandedges.
2. In case the emission is fail due to the used RB/VB is too wide, marker-delta method of FCC Public Notice DA00-705 will be followed.

4.6.4. Test Setup Layout

This test setup layout is the same as that shown in section 4.5.4.

4.6.5. Test Deviation

There is no deviation with the original standard.

4.6.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.6.7. Test Result of Band Edge and Fundamental Emissions

Temperature	26℃	Humidity	56%
Test Engineer	Jex Chen	Configurations	802.11b CH 1, 6, 11

Channel 1

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg	
1 @	2386.000	54.45	-19.55	74.00	22.14	28.17	4.13	0.00	PEAK	144	0	HORIZONTAL
2 @	2386.600	46.39	-7.61	54.00	14.08	28.17	4.13	0.00	AVERAGE	144	0	HORIZONTAL
3 @	2412.800	98.84			66.48	28.21	4.15	0.00	AVERAGE	144	0	HORIZONTAL
4 @	2413.200	102.65			70.28	28.21	4.15	0.00	PEAK	144	0	HORIZONTAL

Item 3, 4 are the fundamental frequency at 2412 MHz.

Channel 6

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg	
1 @	2437.800	103.04			70.58	28.29	4.18	0.00	AVERAGE	141	359	HORIZONTAL
2 @	2438.200	106.88			74.42	28.29	4.18	0.00	PEAK	141	359	HORIZONTAL

Item 1, 2 are the fundamental frequency at 2437 MHz.

Channel 11

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg	
1 @	2461.200	97.09			64.57	28.32	4.20	0.00	AVERAGE	100	249	HORIZONTAL
2 @	2461.200	101.23			68.71	28.32	4.20	0.00	PEAK	100	249	HORIZONTAL
3 @	2487.100	57.72	-16.28	74.00	25.14	28.36	4.23	0.00	PEAK	100	249	HORIZONTAL
4 @	2487.900	46.41	-7.59	54.00	13.78	28.40	4.23	0.00	AVERAGE	100	249	HORIZONTAL

Item 1, 2 are the fundamental frequency at 2462 MHz.

Temperature	26℃	Humidity	56%
Test Engineer	Jex Chen	Configurations	802.11g CH 1, 6, 11

Channel 1

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg	
1 @	2390.000	46.32	-7.68	54.00	14.00	28.17	4.15	0.00	AVERAGE	136	-1	HORIZONTAL
2 @	2390.000	58.98	-15.02	74.00	26.65	28.17	4.15	0.00	PEAK	136	-1	HORIZONTAL
3 @	2413.600	101.87			69.50	28.21	4.15	0.00	PEAK	136	-1	HORIZONTAL
4 @	2414.400	92.60			60.24	28.21	4.15	0.00	AVERAGE	136	-1	HORIZONTAL

Item 3, 4 are the fundamental frequency at 2412 MHz.

Channel 6

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg	
1 @	2439.400	94.35			61.89	28.29	4.18	0.00	AVERAGE	139	72	HORIZONTAL
2 @	2440.400	103.74			71.28	28.29	4.18	0.00	PEAK	139	72	HORIZONTAL

Item 1, 2 are the fundamental frequency at 2437 MHz.

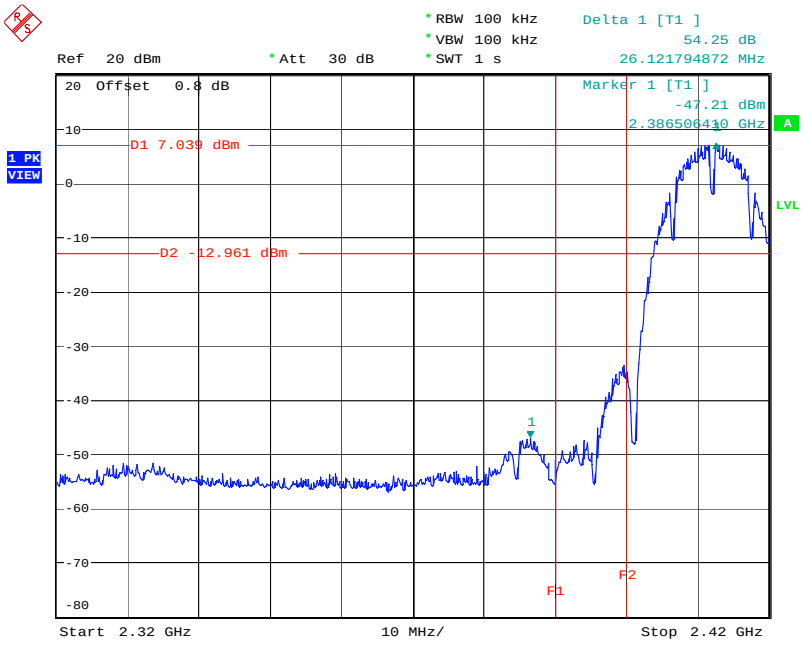
Channel 11

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg	
1 @	2464.400	100.58			68.05	28.32	4.20	0.00	PEAK	100	186	HORIZONTAL
2 @	2464.400	91.29			58.76	28.32	4.20	0.00	AVERAGE	100	186	HORIZONTAL
3 @	2483.500	47.02	-6.98	54.00	14.44	28.36	4.23	0.00	AVERAGE	100	186	HORIZONTAL
4 @	2483.700	59.31	-14.69	74.00	26.72	28.36	4.23	0.00	PEAK	100	186	HORIZONTAL

Item 1, 2 are the fundamental frequency at 2462 MHz.

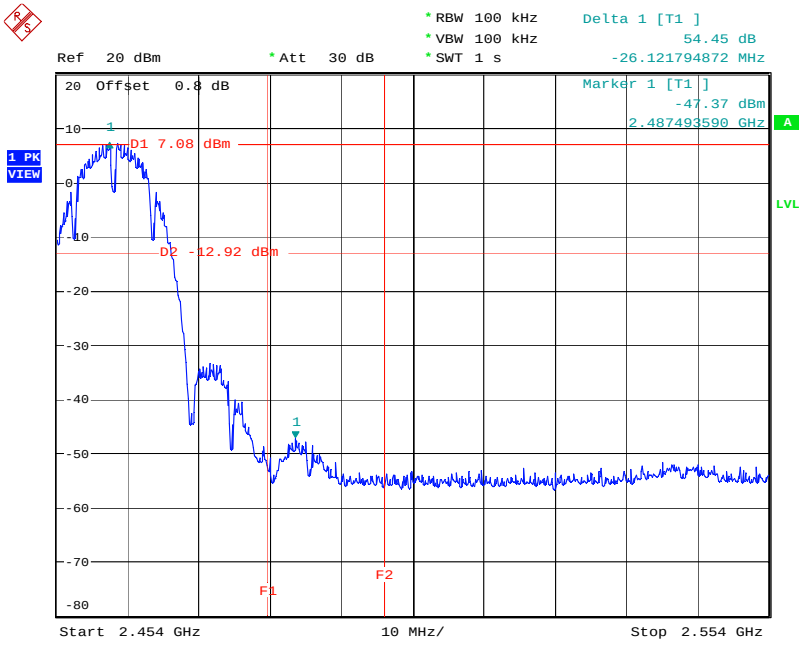
For Emission not in Restricted Band

Low Band Edge Plot on Configuration IEEE 802.11b / 2412 MHz



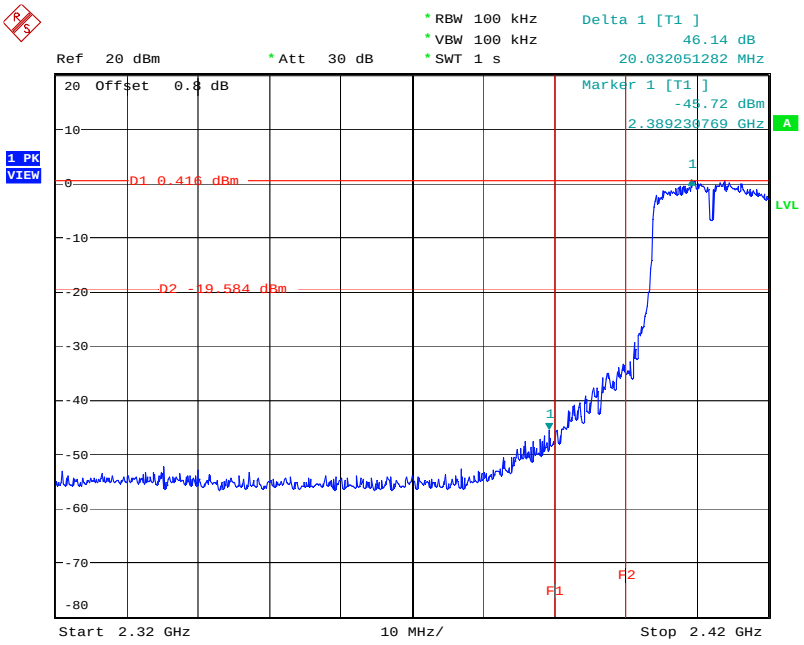
Date: 24.JAN.2008 08:49:31

High Band Edge Plot on Configuration IEEE 802.11b / 2462 MHz



Date: 24.JAN.2008 08:51:55

Low Band Edge Plot on Configuration IEEE 802.11g / 2412 MHz



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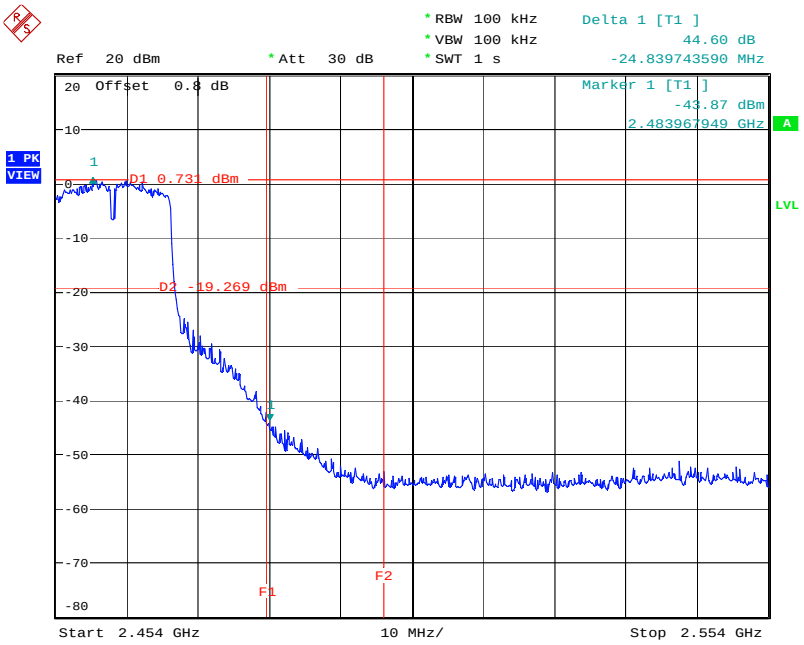
High Band Edge Plot on Configuration IEEE 802.11g / 2462 MHz



Date: 24.JAN.2008 08:55:28

4.7. Antenna Requirements

4.7.1. 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.

4.7.2. 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
EMC Receiver	R&S	ESCS 30	100174	9kHz – 2.75GHz	Mar. 03, 2007	Conduction (CO04-HY)
LISN	MessTec	NNB-2/16Z	99079	9kHz – 30MHz	Mar. 31, 2007	Conduction (CO04-HY)
LISN (Support Unit)	EMCO	3810/2NM	9703-1839	9kHz – 30MHz	Mar. 22, 2007	Conduction (CO04-HY)
RF Cable-CON	UTIFLEX	3102-26886-4	CB049	9kHz – 30MHz	Apr. 20, 2007	Conduction (CO04-HY)
ISN	SCHAFFNER	ISN T400	21653	9kHz –30MHz	Mar. 27, 2007	Conduction (CO04-HY)
EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	N/A	Conduction (CO04-HY)
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30 MHz - 1 GHz 3m	Jun. 14, 2007	Radiation (03CH03-HY)
Amplifier	SCHAFFNER	COA9231A	18667	9 kHz - 2 GHz	Jan. 14, 2008	Radiation (03CH03-HY)
Amplifier	Agilent	8449B	3008A02120	1 GHz - 26.5 GHz	Jun. 07, 2007	Radiation (03CH03-HY)
Amplifier	MITEQ	AMF-6F-260400	9121372	26.5 GHz - 40 GHz	Jan. 22, 2007*	Radiation (03CH03-HY)
Spectrum Analyzer	R&S	FSP40	100305	9 kHz - 40 GHz	Sep. 27, 2007	Radiation (03CH03-HY)
Loop Antenna	R&S	HFH2-Z2	860004/001	9 kHz - 30 MHz	May 23, 2006*	Radiation (03CH03-HY)
Bilog Antenna	SCHAFFNER	CBL 6112D	22237	30 MHz – 1 GHz	Jul. 21, 2007	Radiation (03CH03-HY)
Horn Antenna	EMCO	3115	6741	1GHz ~ 18GHz	May 04, 2007	Radiation (03CH03-HY)
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15 GHz - 40 GHz	Jan.18.2008	Radiation (03CH03-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	30 MHz - 1 GHz	Dec. 03, 2007	Radiation (03CH03-HY)
RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	1 GHz - 40 GHz	Dec. 03, 2007	Radiation (03CH03-HY)
Turn Table	HD	DS 420	420/650/00	0 – 360 degree	N/A	Radiation (03CH03-HY)
Antenna Mast	HD	MA 240	240/560/00	1 m - 4 m	N/A	Radiation (03CH03-HY)
Spectrum Analyzer	R&S	FSP30	100023	9kHz ~ 30GHz	Jan. 10, 2008	Conducted (TH01-HY)
Power Meter	R&S	NRVS	100444	DC ~ 40GHz	Jun. 27, 2007	Conducted (TH01-HY)
Power Sensor	R&S	NRV-Z51	100458	DC ~ 30GHz	Jun. 27, 2007	Conducted (TH01-HY)
Power Sensor	R&S	NRV-Z32	100057	30MHz ~ 6GHz	Jun. 27, 2007	Conducted (TH01-HY)
AC Power Source	HPC	HPA-500W	HPA-9100024	AC 0 ~ 300V	May 04, 2007*	Conducted (TH01-HY)
DC Power Source	G.W.	GPC-6030D	C671845	DC 1V ~ 60V	Mar. 03, 2007	Conducted (TH01-HY)
Temp. and Humidity Chamber	KSON	THS-C3L	612	N/A	Jan. 14, 2008	Conducted (TH01-HY)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
RF CABLE-1m	Jye Bao	RG142	CB034-1m	20MHz ~ 7GHz	Jan. 04, 2008	Conducted (TH01-HY)
RF CABLE-2m	Jye Bao	RG142	CB035-2m	20MHz ~ 1GHz	Jan. 04, 2008	Conducted (TH01-HY)
Vector Signal Generator	R&S	SMU200A	102098	100kHz ~ 6GHz	Nov. 14, 2007	Conducted (TH01-HY)
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Mar. 07, 2007	Conducted (TH01-HY)

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

Note: *Calibration Interval of instruments listed above is two year.

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 2nd 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. : L1190-070110

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

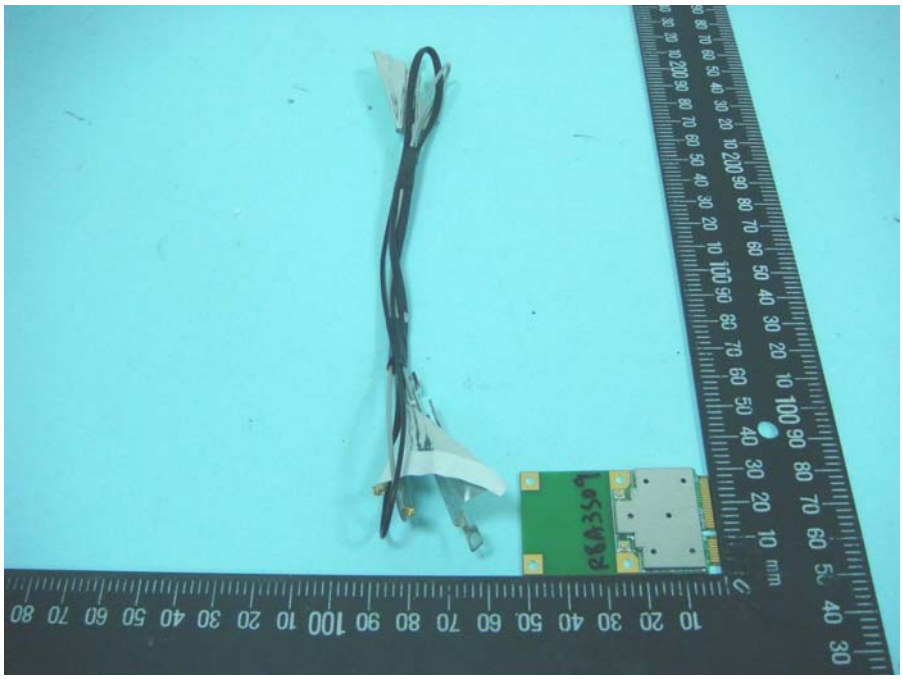
Accreditation Criteria	:	ISO/IEC 17025:2005
Accreditation Number	:	1190
Originally Accredited	:	December 15, 2003
Effective Period	:	January 10, 2007 to January 09, 2010
Accredited Scope	:	Testing Field, see described in the Appendix
Specific Accreditation Program	:	Accreditation Program for Designated Testing Laboratory for Commodities Inspection Accreditation Program for Telecommunication Equipment Testing Laboratory

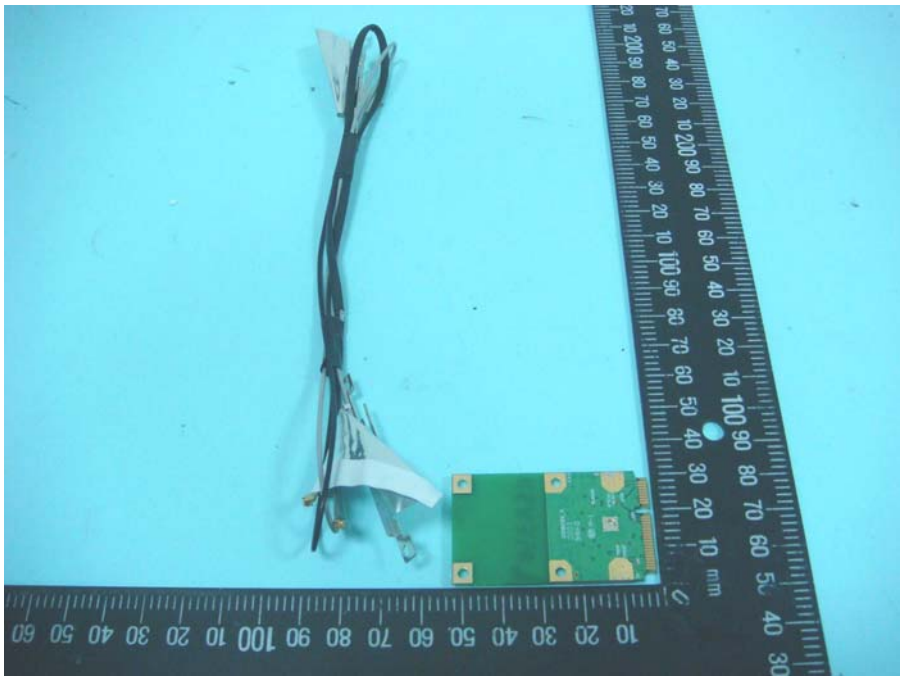
Jay-San Chen
President, Taiwan Accreditation Foundation
Date : January 10, 2007

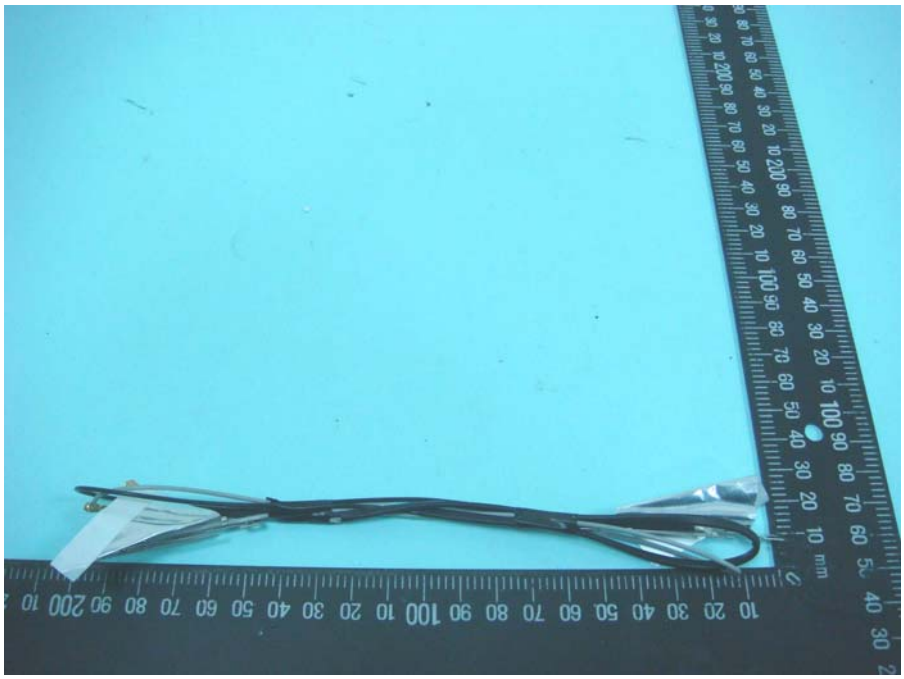
P1, total 9 pages

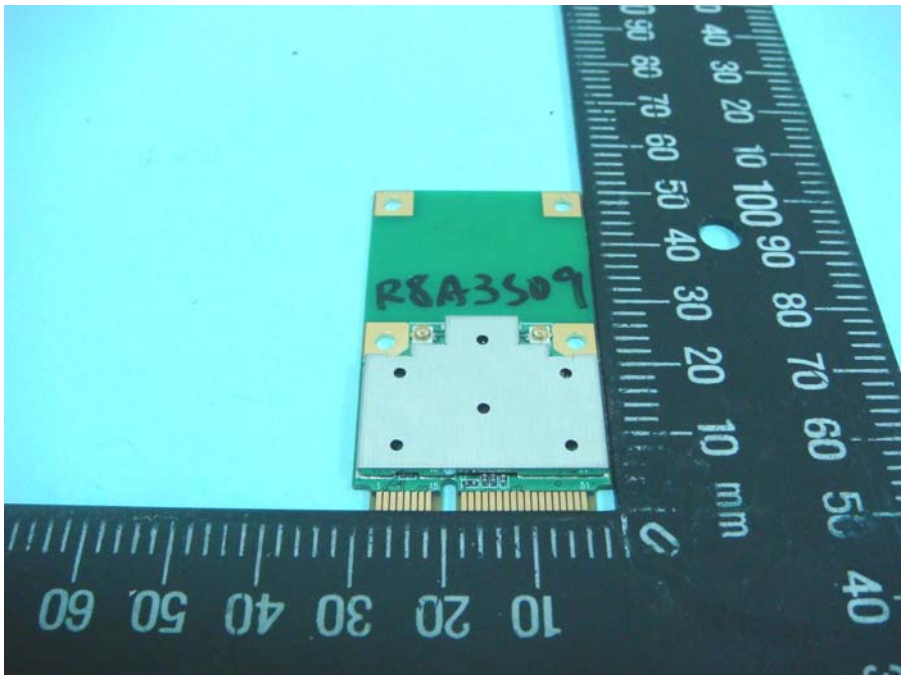
The Appendix forms an integral part of this Certificate, which shall be invalid when used without the Appendix.

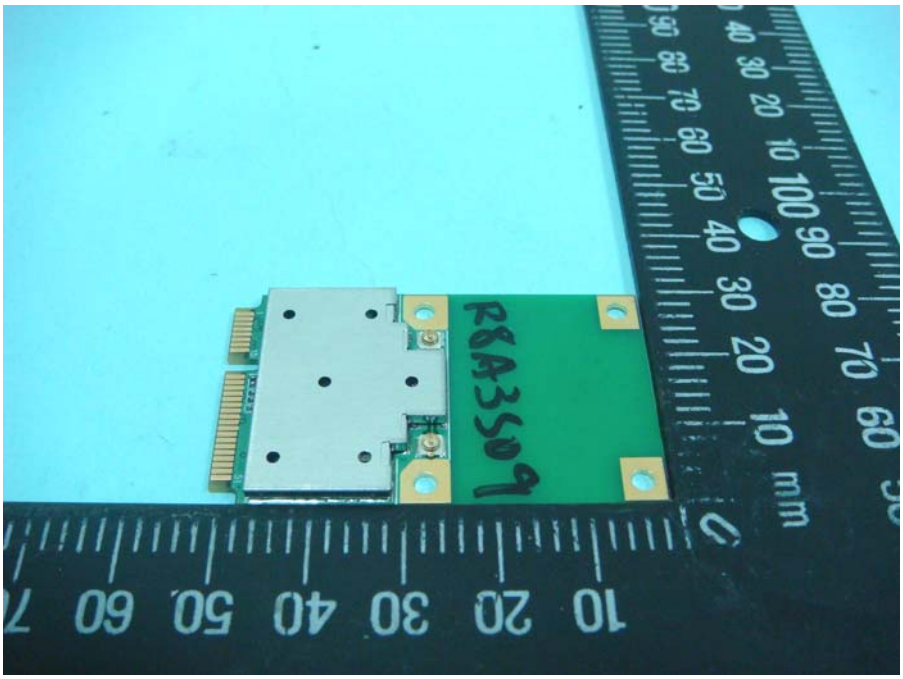
APPENDIX A. Photographs of EUT

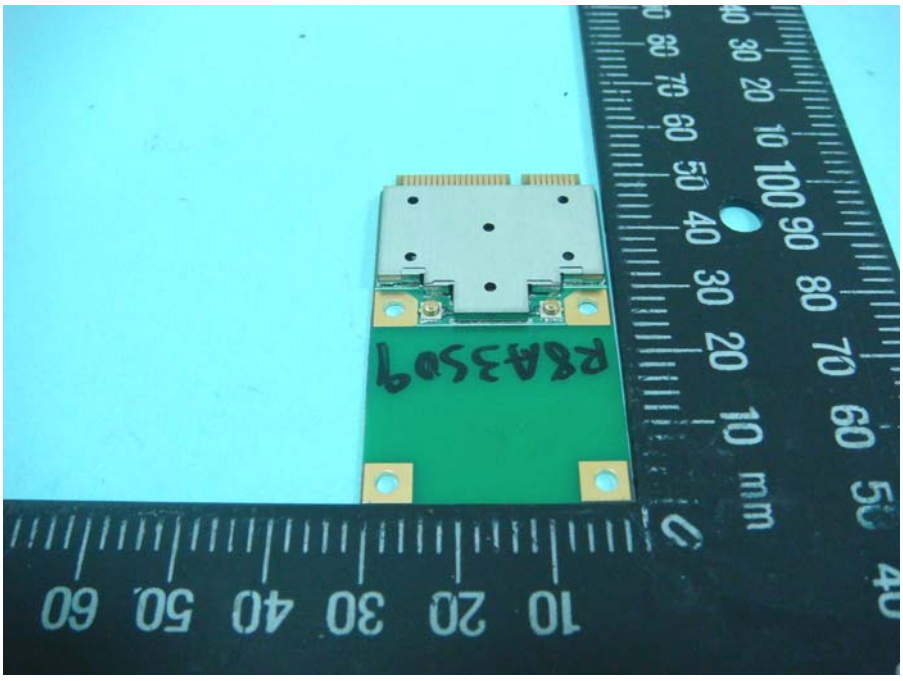







R8A3509





SPORTON International Inc.
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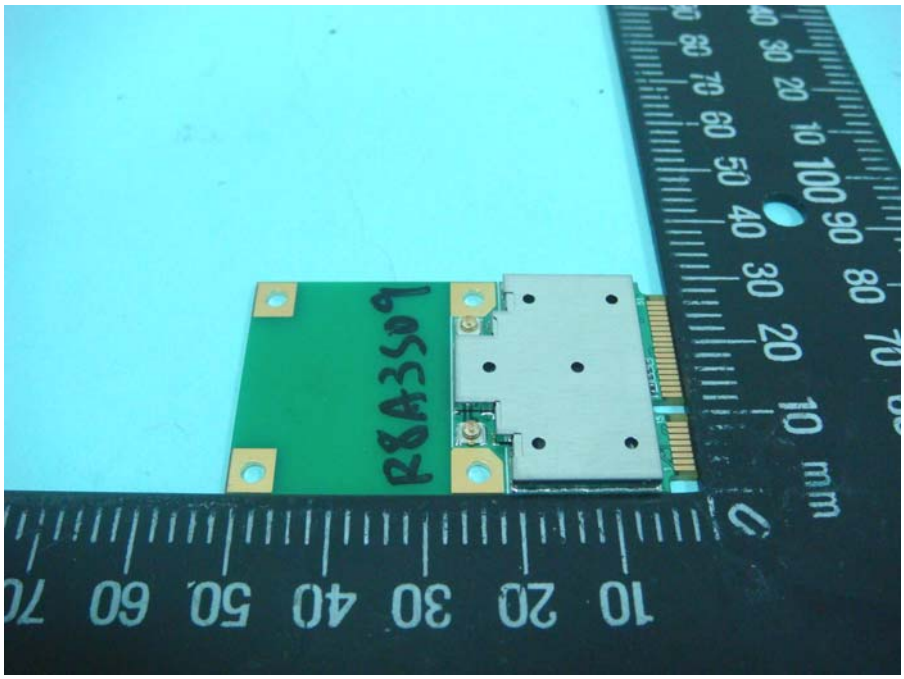
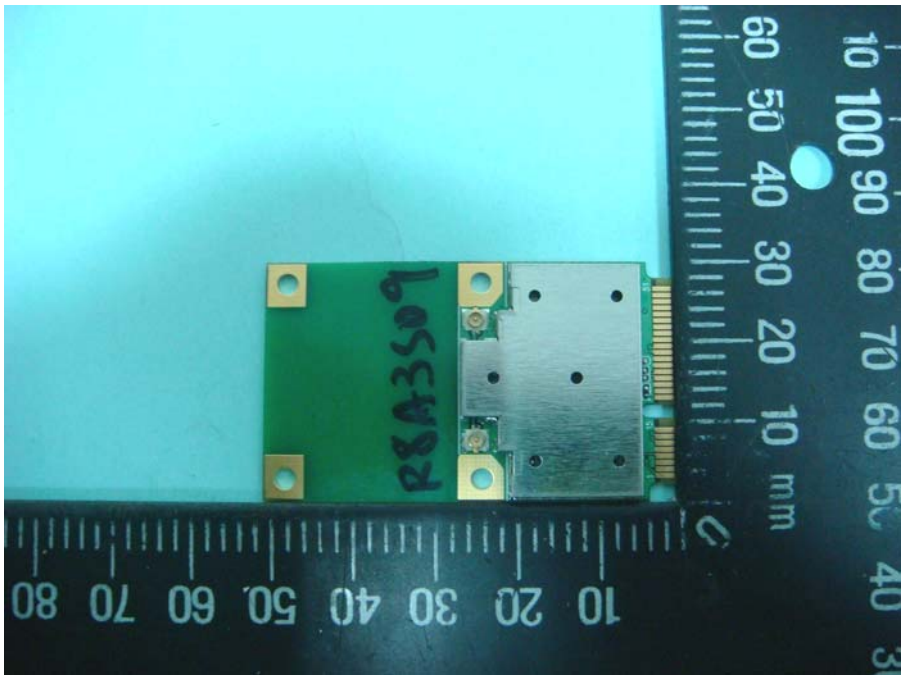
FAX : 886-2-2696-2255





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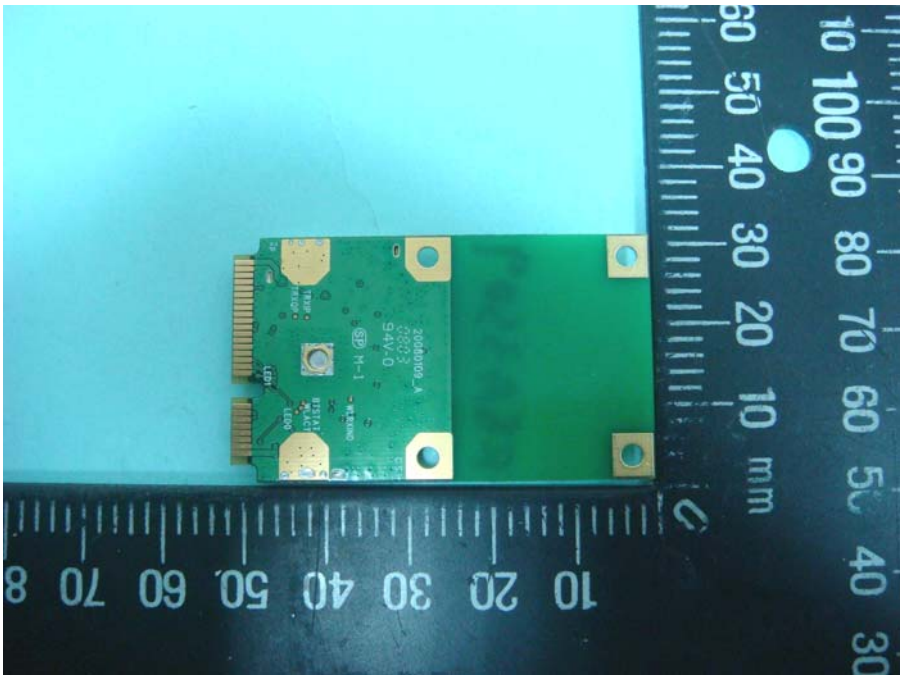

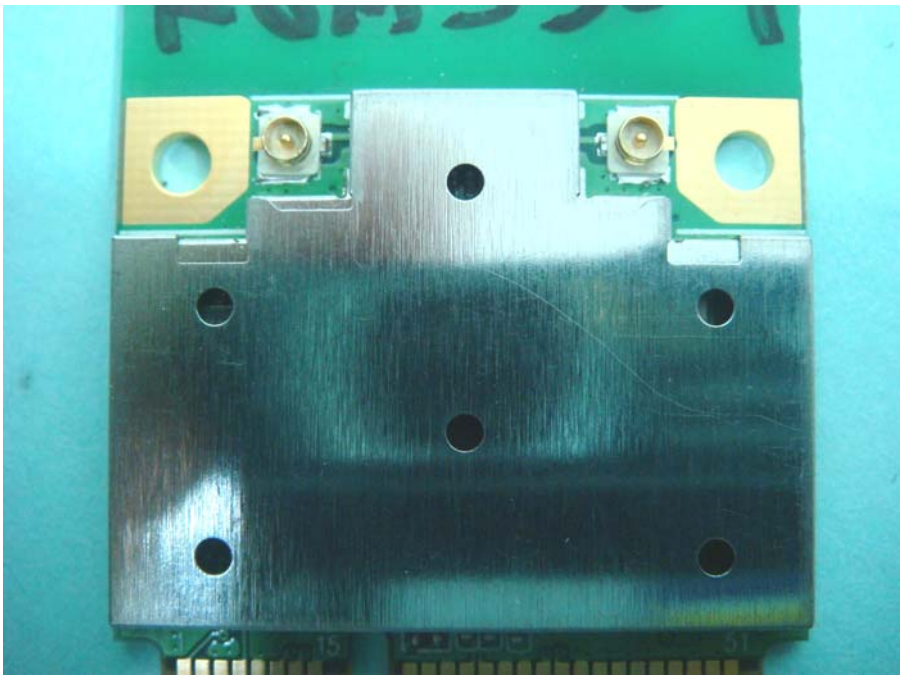

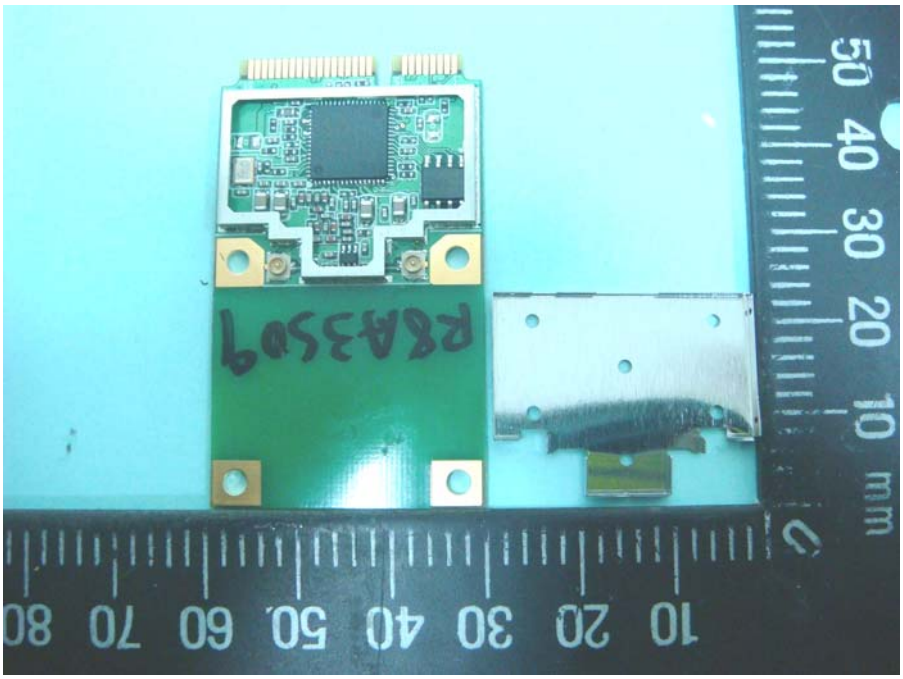
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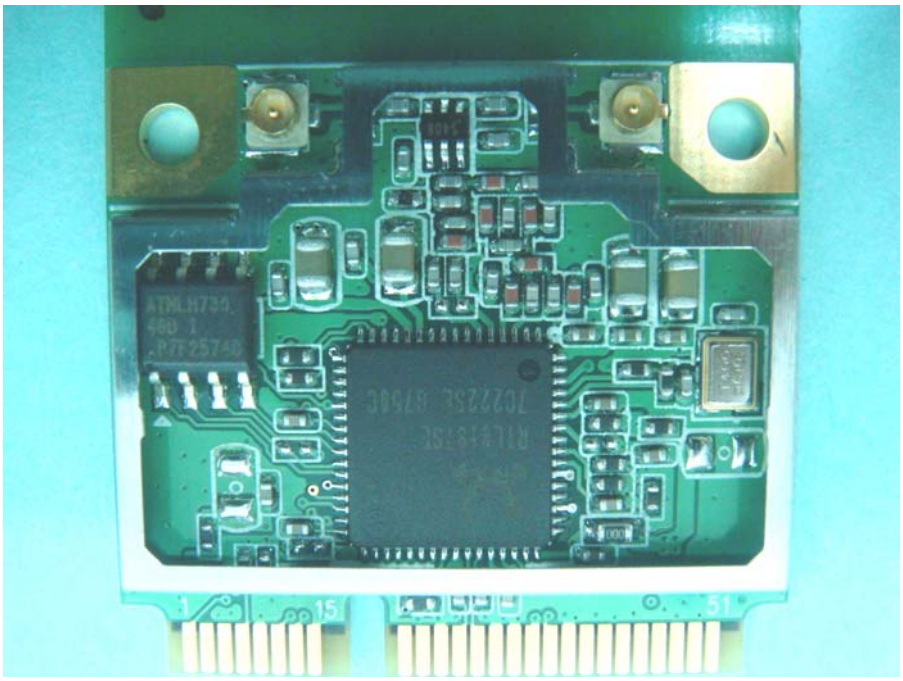
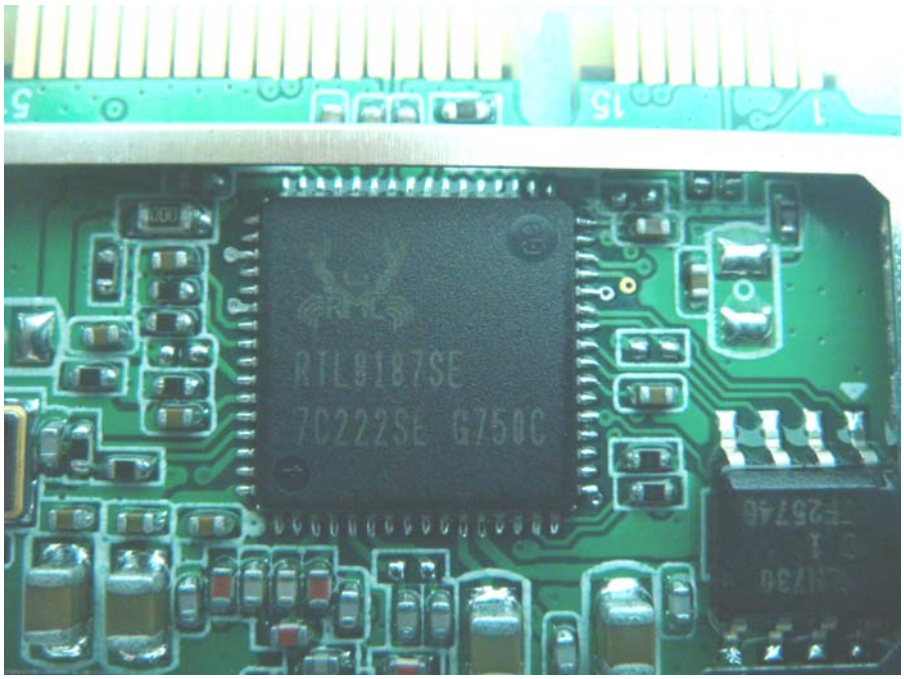
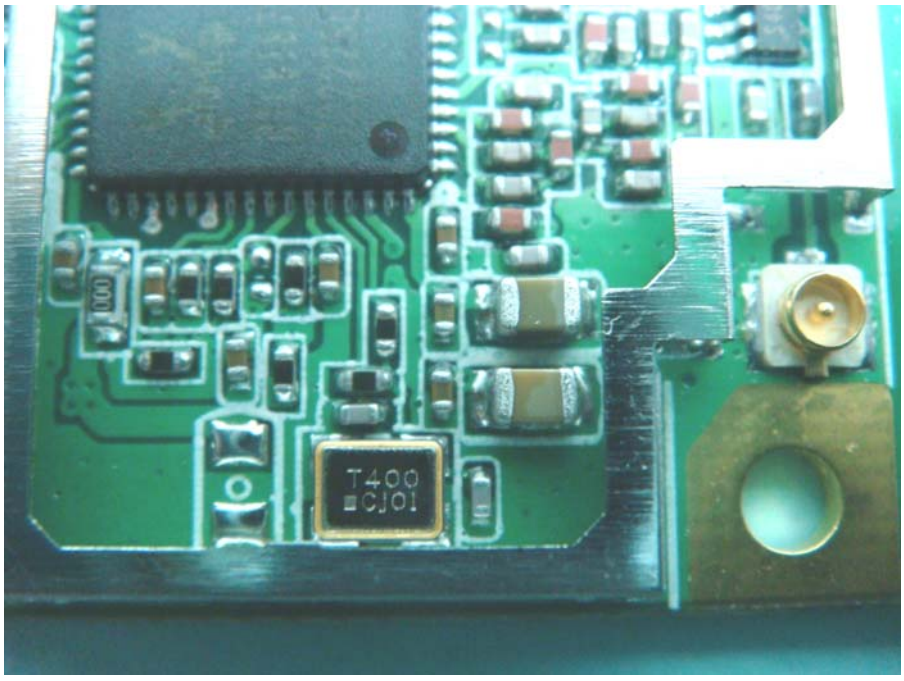
10 20 30 40 50 60 70 80







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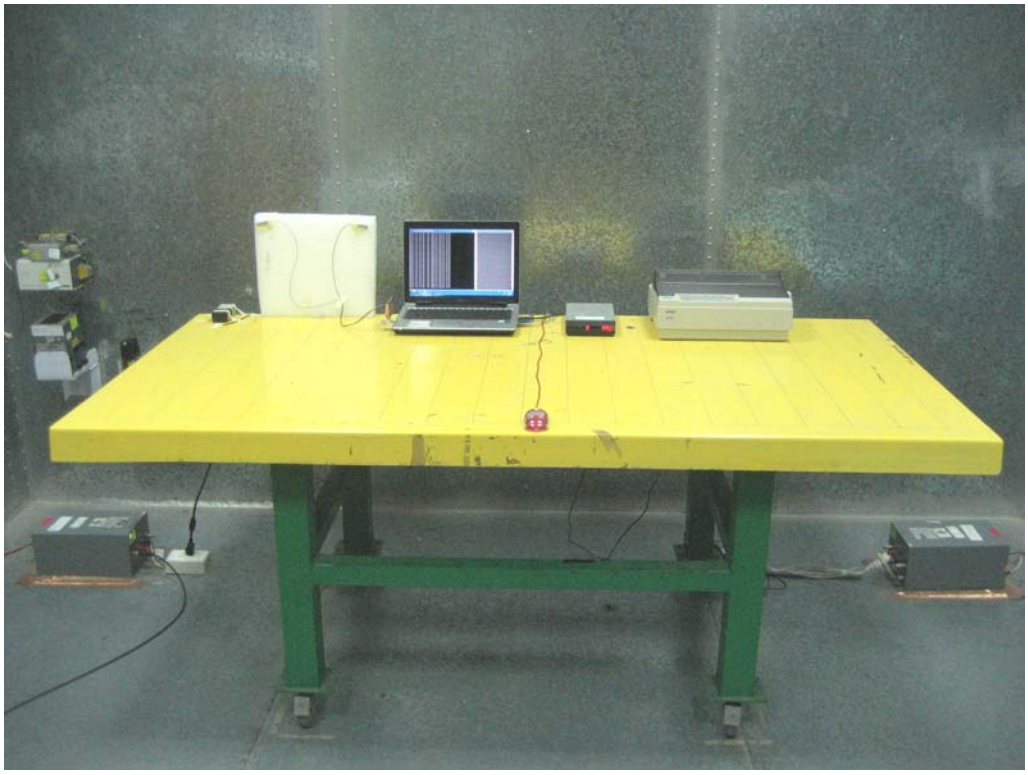
Appendix B. Test Photos

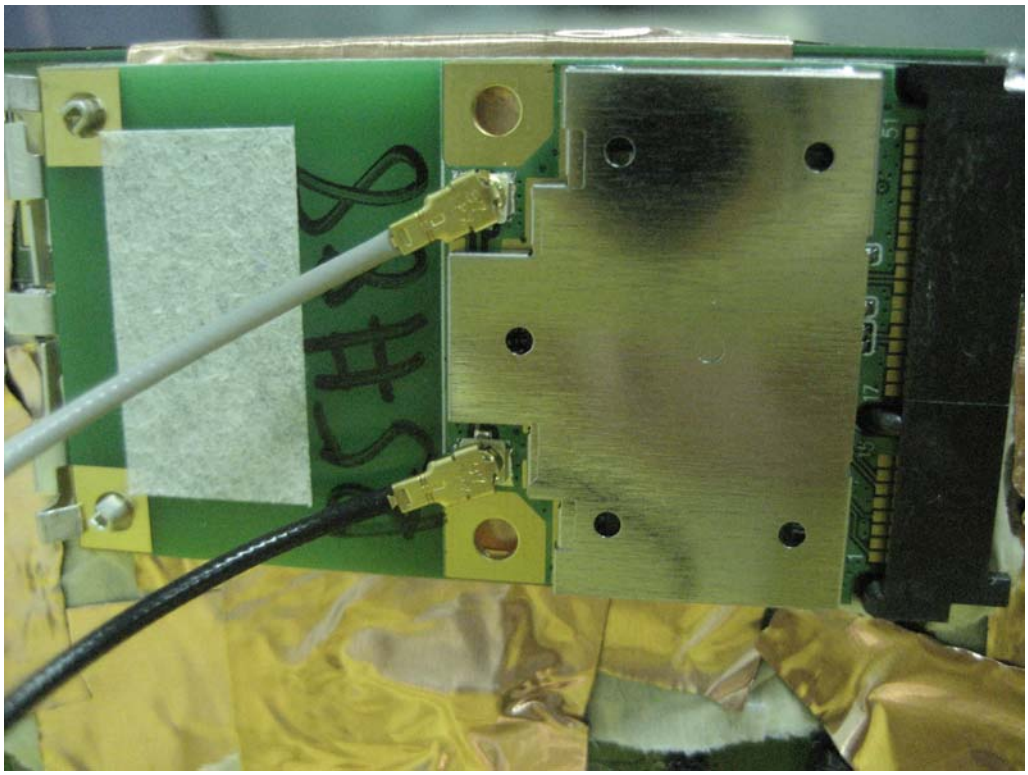
1. Photographs of Conducted Emissions Test Configuration

FRONT VIEW



REAR VIEW

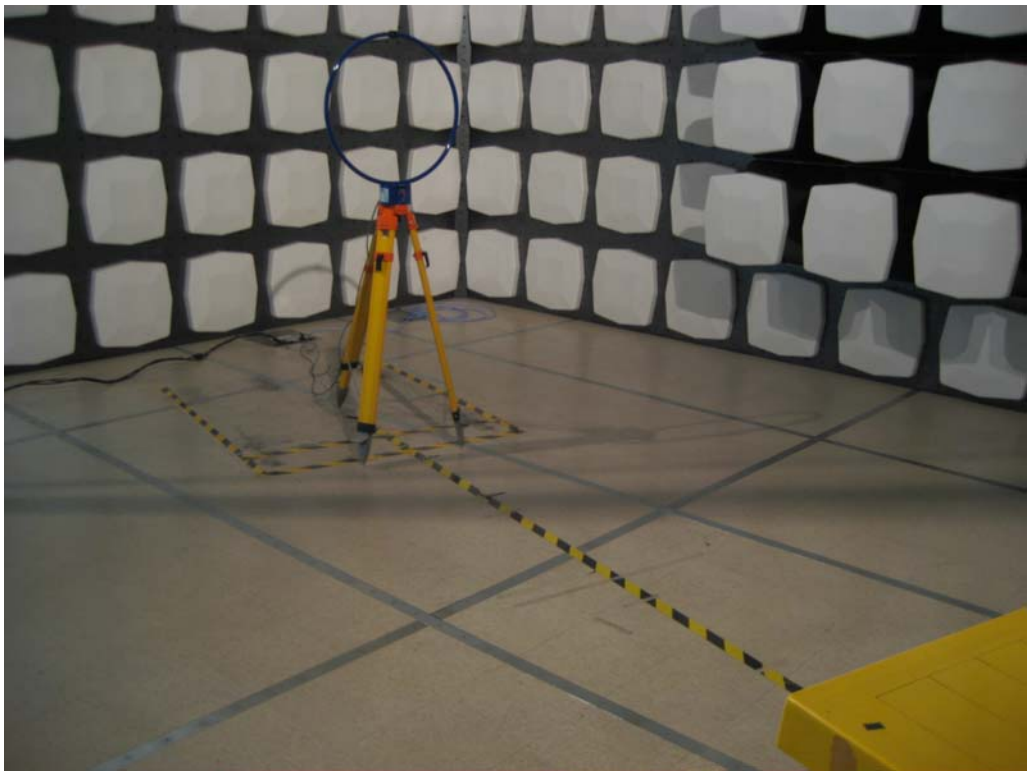
SIDE VIEW



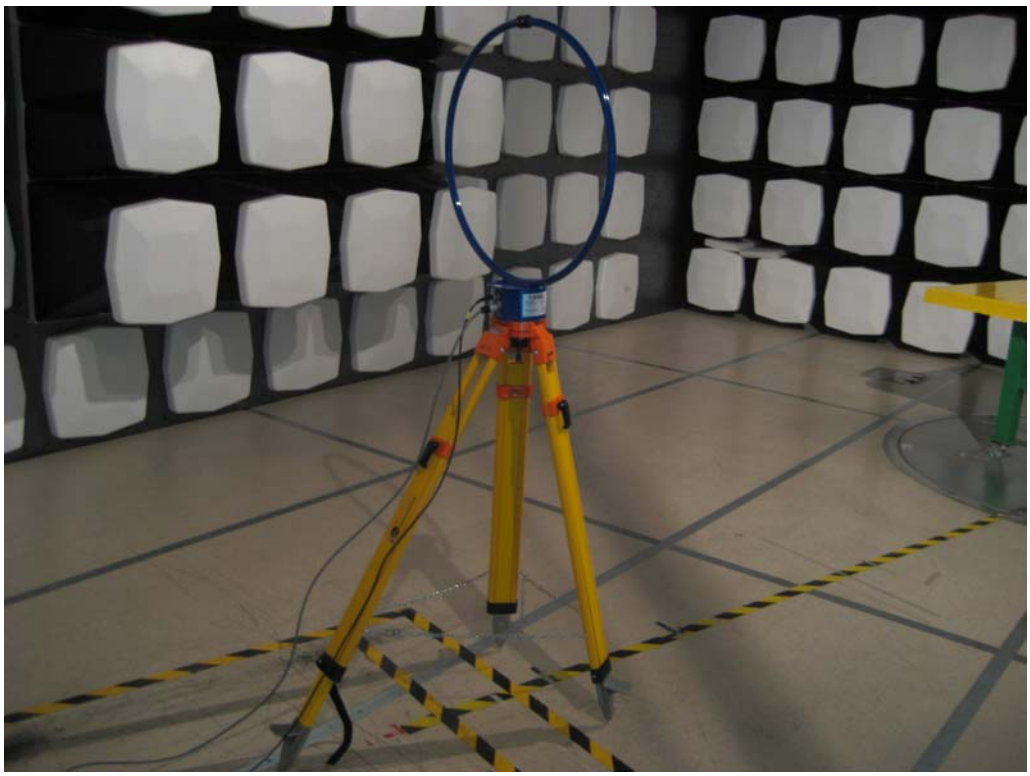
2. Photographs of Radiated Emissions Test Configuration

9kHz ~30MHz

FRONT VIEW



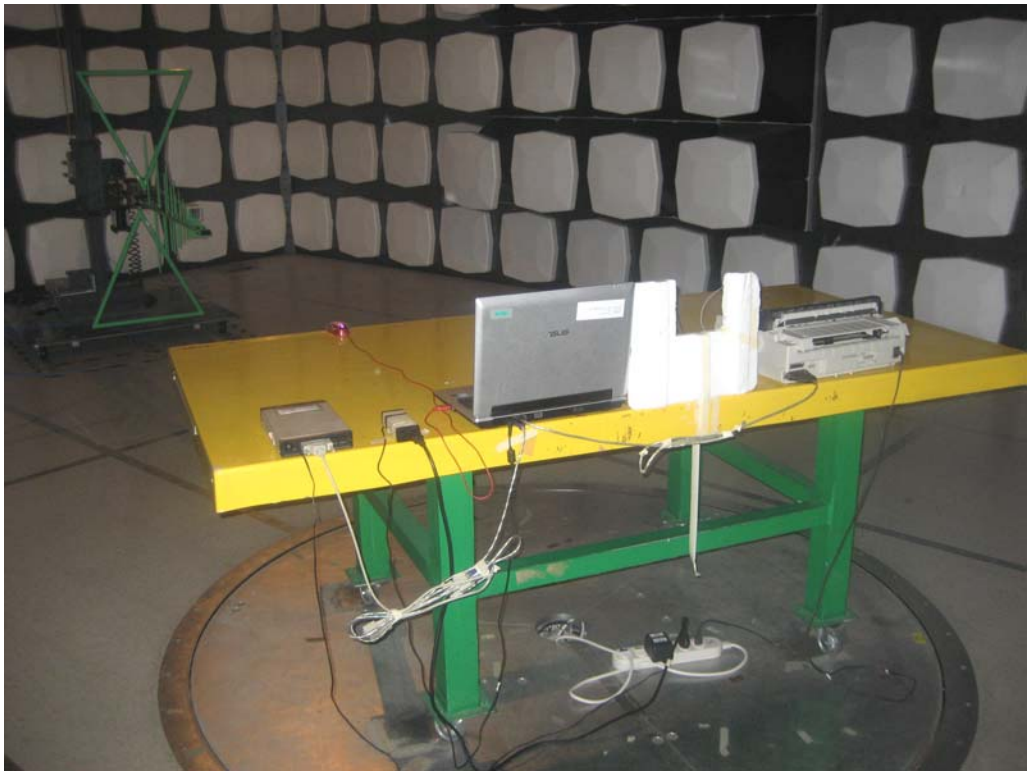
REAR VIEW



30MHz~1GHz

FRONT VIEW

REAR VIEW



Above 1GHz

FRONT VIEW

REAR VIEW

Appendix C. Maximum Permissible Exposure

1. Maximum Permissible Exposure

1.1. Applicable Standard

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2 m normally can be maintained between the user and the device.

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm^2)	Averaging Time $\|E\|^2$,$\|H\|^2$ or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm^2)	Averaging Time $\|E\|^2$,$\|H\|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

Note: f = frequency in MHz ; *Plane-wave equivalent power density

1.2. MPE Calculation Method

E (V/m) $= \frac{\sqrt{30 \times P \times G}}{d}$ Power Density: *Pd* (W/m^2) $= \frac{E^2}{377}$

E = Electric field (V/m)

P = Peak RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

Pd $= \frac{30 \times P \times G}{377 \times d^2}$

From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.

1.3. Calculated Result and Limit

Antenna Type : PIFA Antenna

Max Conducted Power for IEEE 802.11b/g : 22.70dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
3.95	2.4831	22.7000	186.2087	0.092034	1	Complies