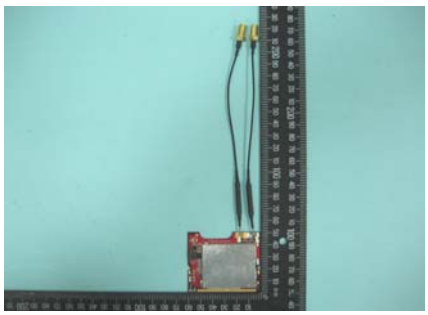
SPORTON International Inc.
No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, TaoYuan Hsien, Taiwan, R.O.C.
Ph: 886-3-327-3456 / FAX: 886-3-327-0973 / www.sporton.com.tw

FCC RADIO TEST REPORT

Applicant's company	**ZyXEL Communications Corporation**
Applicant Address	No. 6, Innovation Road II, Science Park, Hsin-Chu, Taiwan
FCC ID	**I88NWD670SH**
Manufacturer's company	**ZyXEL Communications Corporation**
Manufacturer Address	No. 6, Innovation Road II, Science Park, Hsin-Chu, Taiwan

Product Name	802.11g Wireless Super G High Power miniPCI Card
Brand Name	ZyXEL
Model Name	NWD670SH
Test Rule	47 CFR FCC Part 15 Subpart C § 15.247
Test Freq. Range	2400 ~ 2483.5MHz
Received Date	Jun. 11, 2007
Final Test Date	Jul. 09, 2007
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: Jul. 23, 2007

Report No.: FR761106

■ No additional attachment.

☐ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

Certificate No.: CB9607052

1. CERTIFICATE OF COMPLIANCE

Product Name	:	802.11g Wireless Super G High Power miniPCI Card
Brand Name	:	ZyXEL
Model Name	:	NWD670SH
Applicant	:	ZyXEL Communications Corporation
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 Jun. 11, 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	5.41 dB
4.2	15.247(b)(3)	Maximum Peak Conducted Output Power	Complies	3.10 dB
4.3	15.247(e)	Power Spectral Density	Complies	12.09 dB
4.4	15.247(a)(2)	6dB Spectrum Bandwidth	Complies	-
4.5	15.247(d)	Radiated Emissions	Complies	0.79 dB
4.6	15.247(d)	Band Edge Emissions	Complies	1.25 dB
4.7	15.203	Antenna Requirements	Complies	-

Test Items	Uncertainty	Remark
AC Power Line Conducted Emissions	±2.3dB	Confidence levels of 95%
Maximum Peak 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 (6/9/12/18/24/36/48/54/108)
Frequency Range	2400 ~ 2483.5MHz
Channel Number	11
Channel Band Width (99%)	11b: 15.57 MHz ; 11g: 16.51 MHz ; 11g Turbo: 32.76 MHz
Conducted Output Power	11b: 22.13 dBm ; 11g: 26.90 dBm ; 11g Turbo: 19.90 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

3.2. Accessories

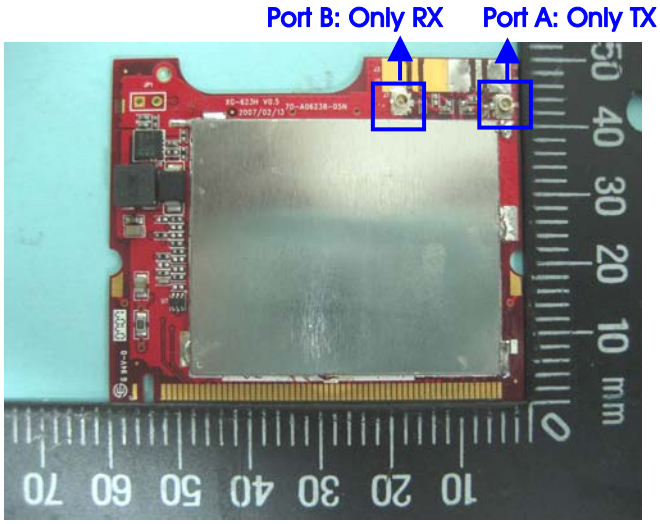
N/A

3.3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Quantify	Cable Loss	Cable Length
1	Wha Yu	C034-510499-A	Dipole Antenna	UFL	3.00	2	N/A	0.09 m
2	Wha Yu	C034-510514-A	Dipole Antenna	UFL	5.00	2	N/A	0.09 m
3	ZyXEL	ZyAIR EXT-108	Omni-Directional Antenna	UFL	8.00	1	7dB	9.5 m

Due to Ant.1 & Ant. 2 is the same type antenna, only the higher gain antenna “Ant.2” was tested and recorded in this report.

Note: The Three antennas are through an antenna cable; the antenna connector is transferred from R-SMA to UFL.



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	Turbo 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	11 Mbps	6	2/3
Maximum Peak Conducted Output Power Power Spectral Density 6dB Spectrum Bandwidth	11b/BPSK	1 Mbps	1/6/11	2/3
	11g/BPSK	6 Mbps	1/6/11	2/3
	11g/BPSK Turbo	12 Mbps	6	2/3
Radiated Emissions 9kHz~1GHz	11g/BPSK	6 Mbps	6	2/3
Radiated Emissions 1GHz~10th Harmonic	11b/BPSK	1 Mbps	1/6/11	2/3
	11g/BPSK	6 Mbps	1/6/11	2/3
	11g/BPSK Turbo	12 Mbps	6	2/3
Band Edge Emissions	11b/BPSK	1 Mbps	1/11	2/3
	11g/BPSK	6 Mbps	1/11	2/3
	11g/BPSK Turbo	12 Mbps	6	2/3

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	DELL	D520	E2KWM3945ABG
Printer	EPSON	LQ-300+	N/A
Modem	ACEEX	DM1414	IFAXDM1414
Power Supply	GW	PPS-3635 GPIB	N/A

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 Ant2 & Ant. 3

Test Software Version	ART		
Frequency	2412 MHz	2437 MHz	2462 MHz
IEEE 802.11b	16.5	22.5	17
IEEE 802.11g	14	22.5	14
IEEE 802.11g Turbo	-	16.5	-

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

The program was 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, the following programs were executed:

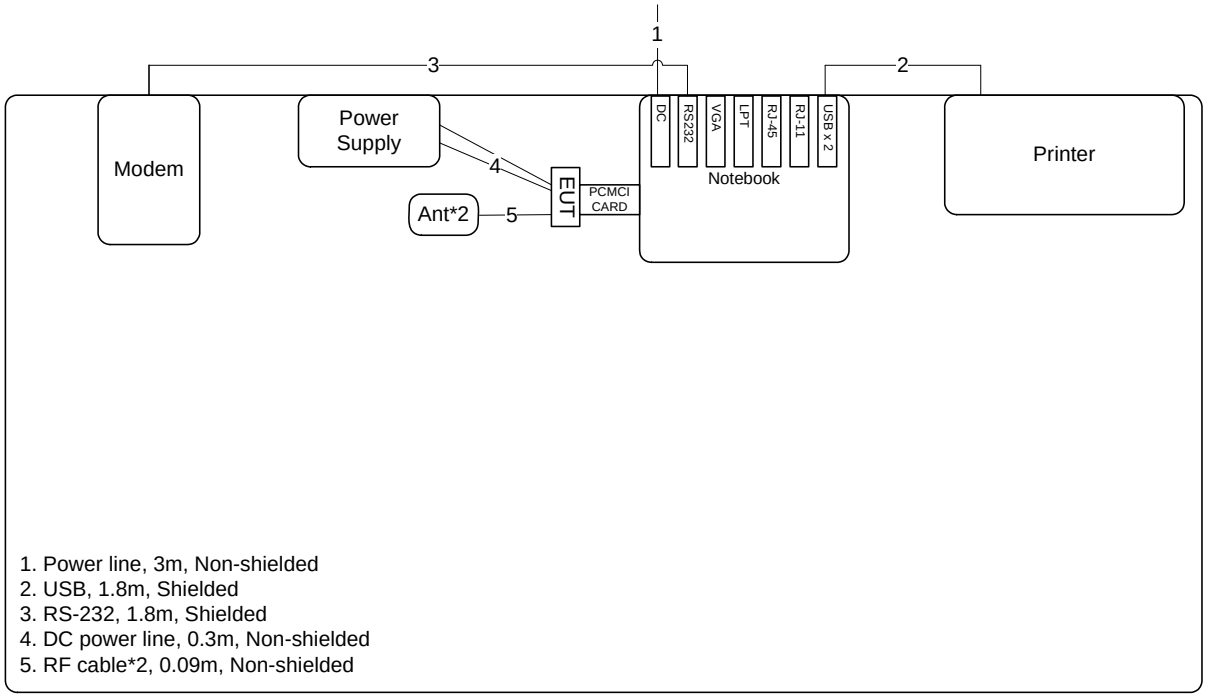
Executed " ART " to control the EUT continuously transmit RF signal.

3.9. Test Configurations

3.9.1. Radiation Emissions Test Configuration

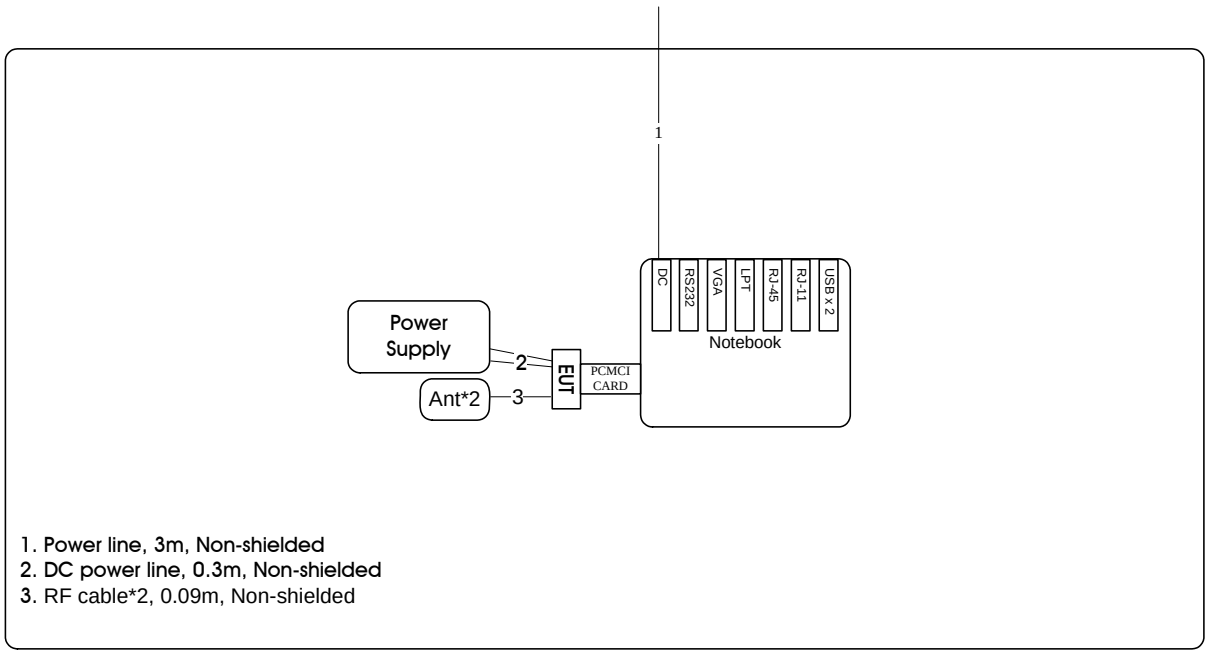
Ant. 2

Test Configuration: 9kHz~1GHz



1. Power line, 3m, Non-shielded
2. USB, 1.8m, Shielded
3. RS-232, 1.8m, Shielded
4. DC power line, 0.3m, Non-shielded
5. RF cable*2, 0.09m, Non-shielded

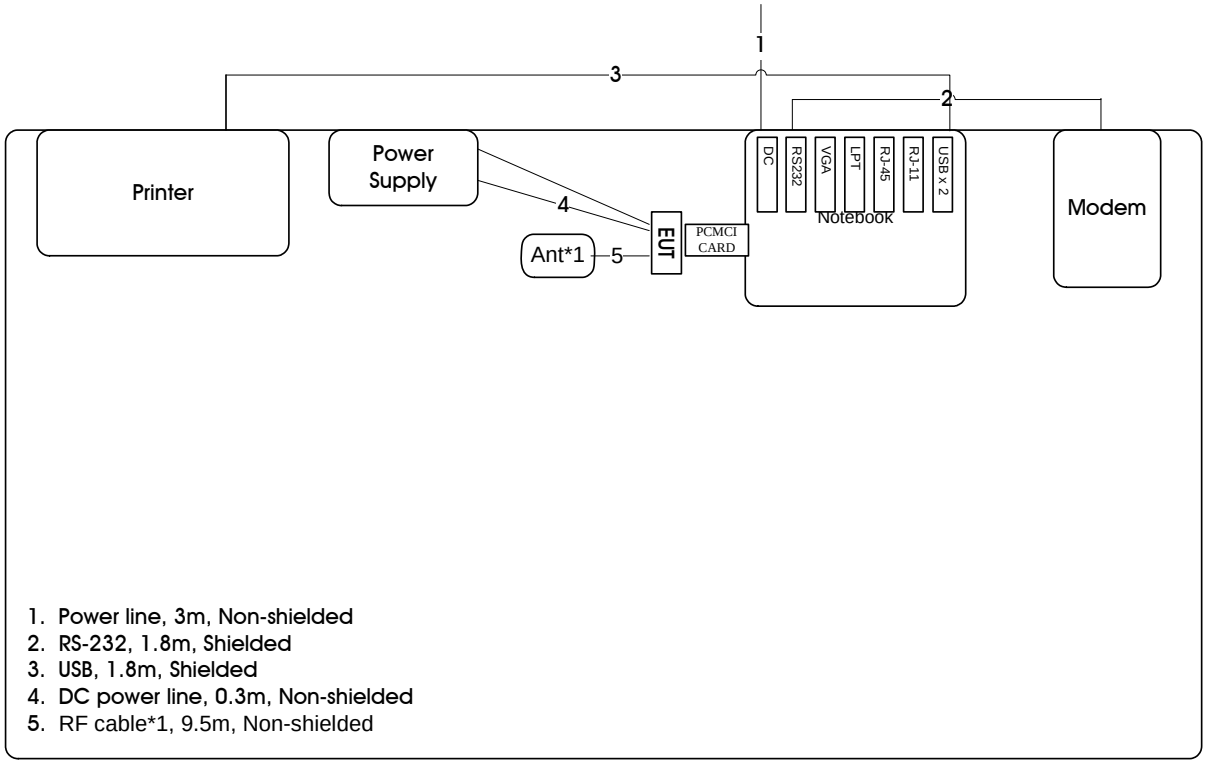
Test Configuration: Above 1GHz



1. Power line, 3m, Non-shielded
2. DC power line, 0.3m, Non-shielded
3. RF cable*2, 0.09m, Non-shielded

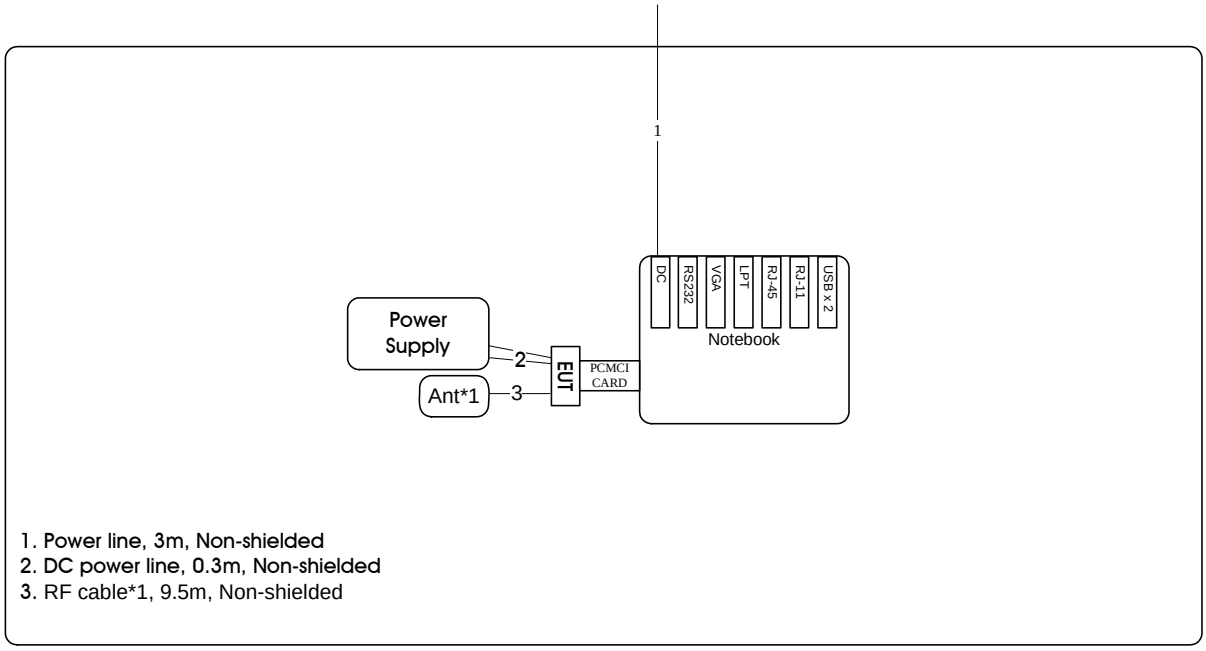
Ant. 3

Test Configuration: 9kHz~1GHz



1. Power line, 3m, Non-shielded
2. RS-232, 1.8m, Shielded
3. USB, 1.8m, Shielded
4. DC power line, 0.3m, Non-shielded
5. RF cable*1, 9.5m, Non-shielded

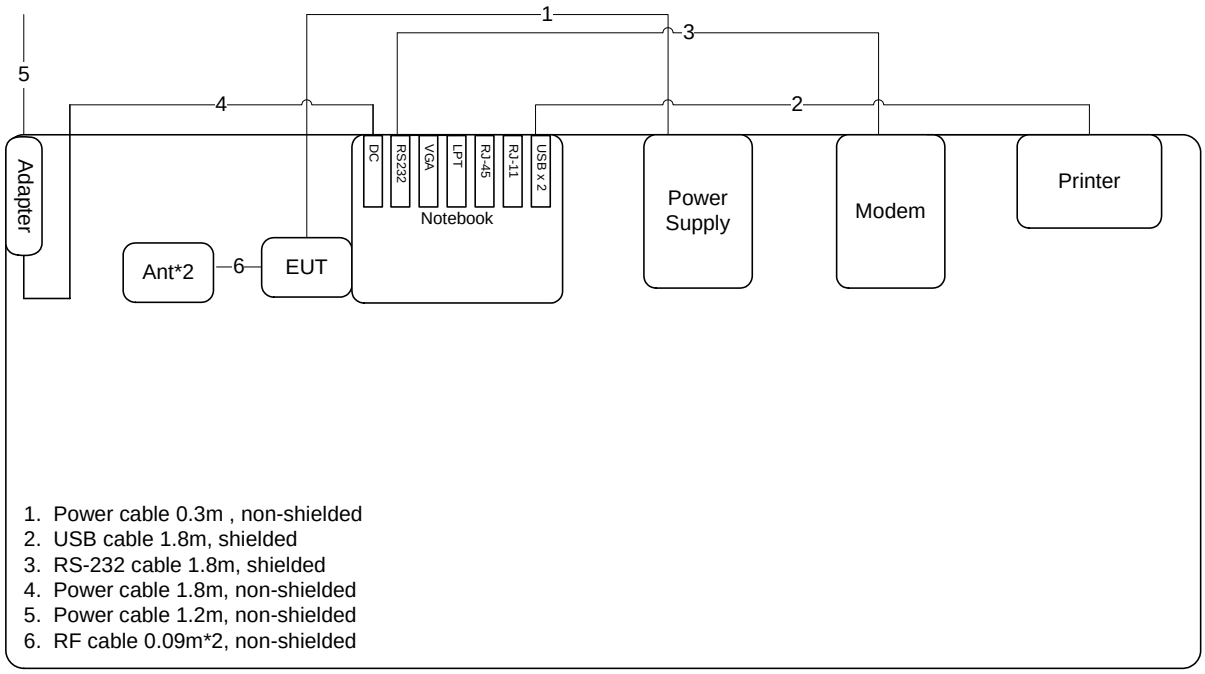
Test Configuration: Above 1GHz



1. Power line, 3m, Non-shielded
2. DC power line, 0.3m, Non-shielded
3. RF cable*1, 9.5m, Non-shielded

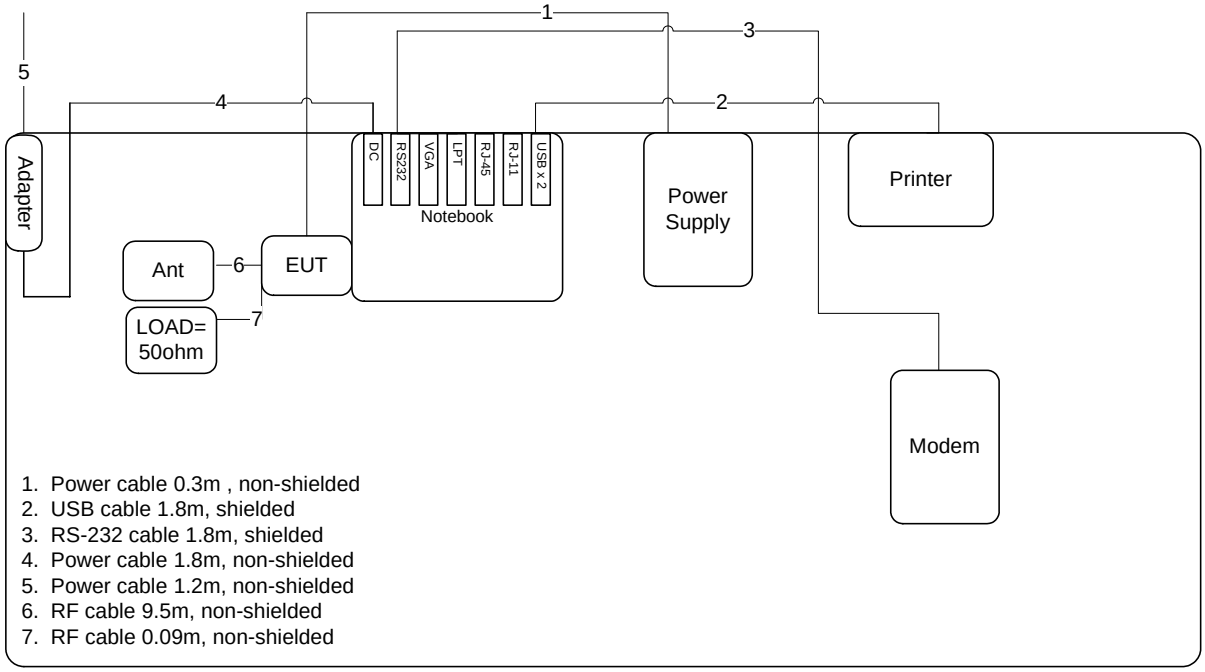
3.9.2. AC Power Line Conduction Emissions Test Configuration

Ant. 2



1. Power cable 0.3m , non-shielded
2. USB cable 1.8m, shielded
3. RS-232 cable 1.8m, shielded
4. Power cable 1.8m, non-shielded
5. Power cable 1.2m, non-shielded
6. RF cable 0.09m*2, non-shielded

Ant. 3



1. Power cable 0.3m , non-shielded
2. USB cable 1.8m, shielded
3. RS-232 cable 1.8m, shielded
4. Power cable 1.8m, non-shielded
5. Power cable 1.2m, non-shielded
6. RF cable 9.5m, non-shielded
7. RF cable 0.09m, non-shielded

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

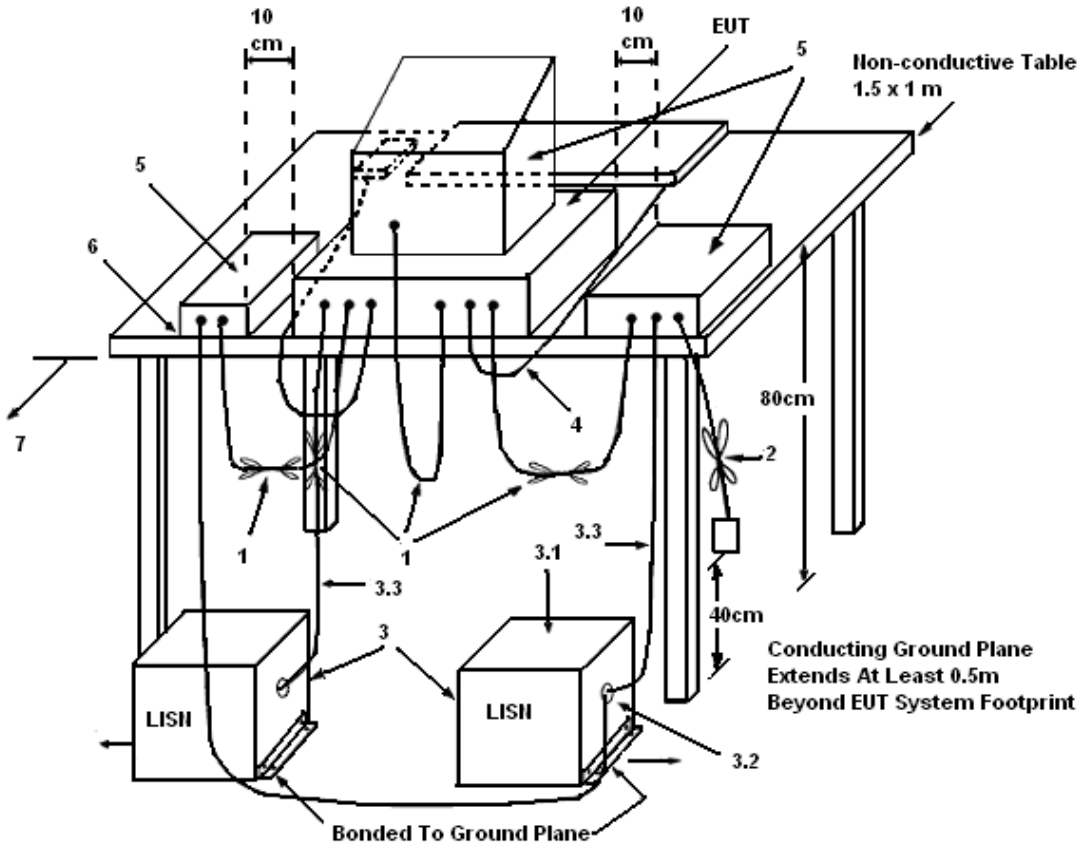
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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

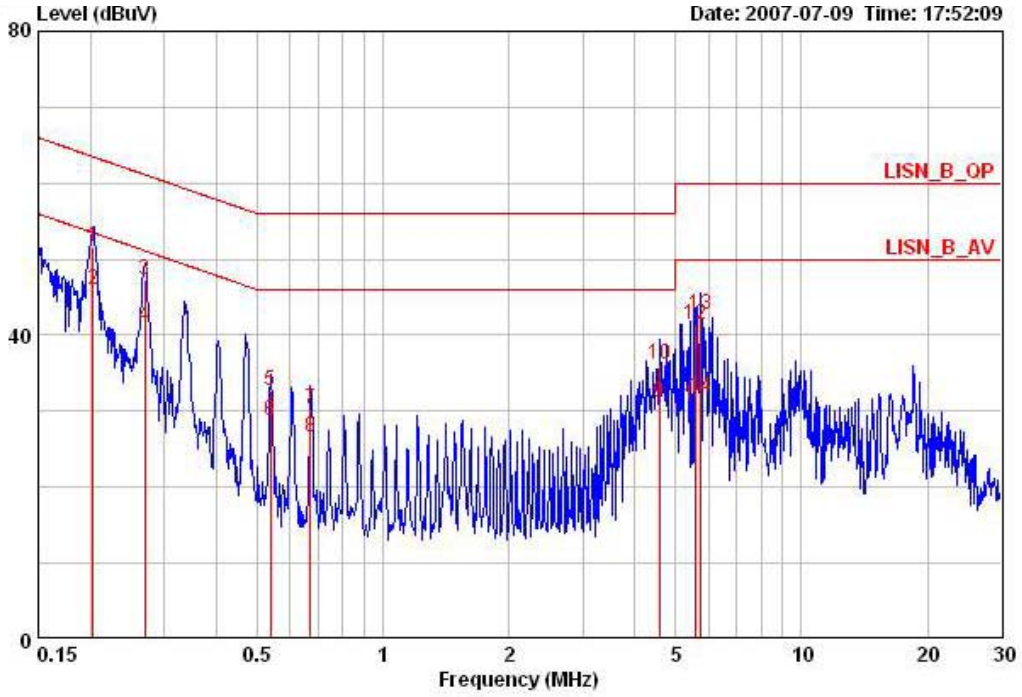
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

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

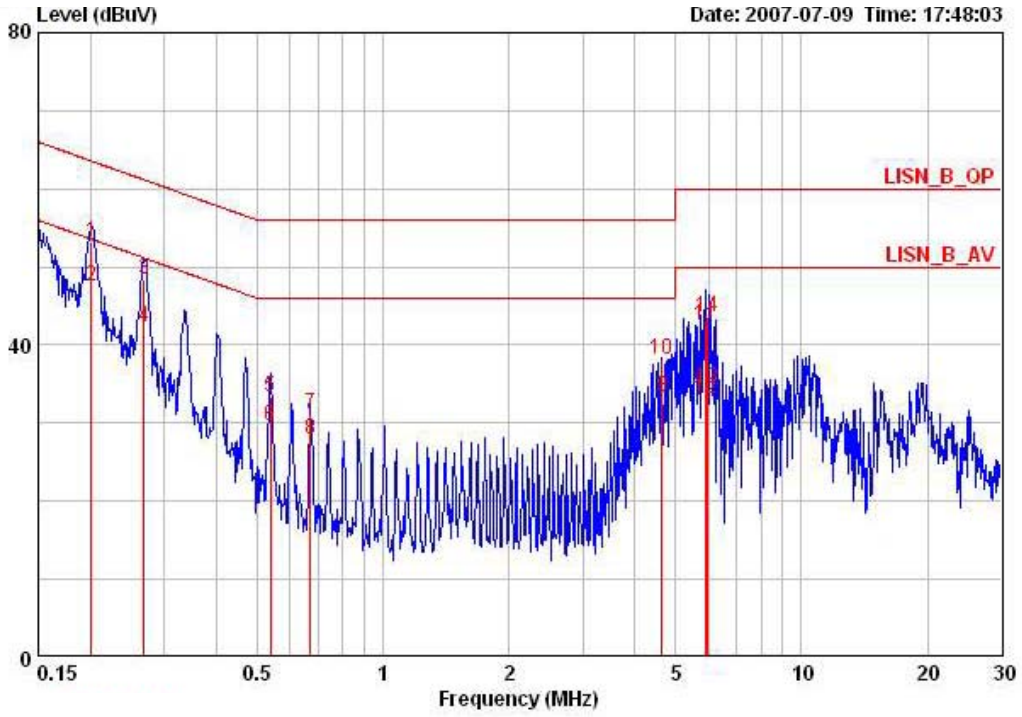
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	20℃	Humidity	59%
Test Engineer	Barry Chen	Phase	Line
Configuration	Normal Link / Ant. 2		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.20236	51.65	-11.86	63.51	51.35	0.10	0.20	QP	LINE
2	0.20236	46.10	-7.41	53.51	45.80	0.10	0.20	AVERAGE	LINE
3	0.26969	47.22	-13.91	61.13	46.92	0.10	0.20	QP	LINE
4	0.26969	41.18	-9.95	51.13	40.88	0.10	0.20	AVERAGE	LINE
5	0.53782	32.67	-23.34	56.00	32.39	0.08	0.20	QP	LINE
6	0.53782	28.82	-17.19	46.00	28.54	0.08	0.20	AVERAGE	LINE
7	0.67187	30.41	-25.60	56.00	30.15	0.06	0.20	QP	LINE
8	0.67187	26.67	-19.34	46.00	26.41	0.06	0.20	AVERAGE	LINE
9	4.574	31.27	-14.73	46.00	30.96	0.01	0.30	AVERAGE	LINE
10	4.574	36.22	-19.78	56.00	35.91	0.01	0.30	QP	LINE
11	5.584	30.69	-19.31	50.00	30.36	0.03	0.30	AVERAGE	LINE
12	5.584	41.50	-18.50	60.00	41.17	0.03	0.30	QP	LINE
13	5.718	42.75	-17.25	60.00	42.42	0.03	0.30	QP	LINE
14	5.718	31.72	-18.28	50.00	31.39	0.03	0.30	AVERAGE	LINE

Temperature	20℃	Humidity	59%
Test Engineer	Barry Chen	Phase	Neutral
Configuration	Normal Link / Ant. 2		

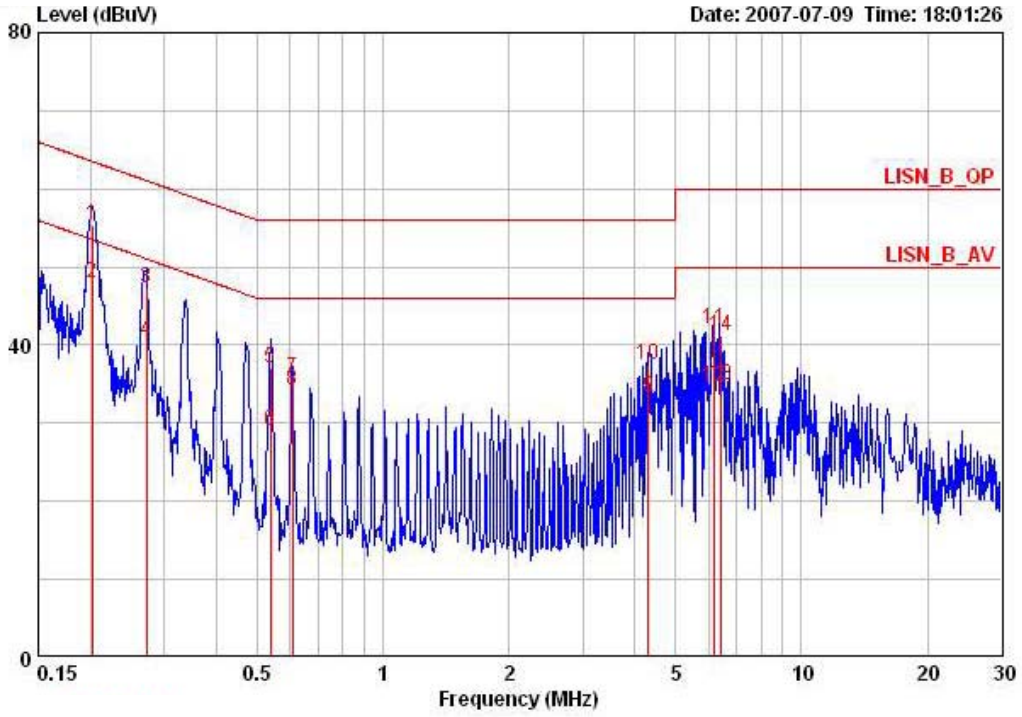


	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.20129	53.09	-10.47	63.56	52.69	0.20	0.20	QP	NEUTRAL
2	0.20129	47.60	-5.96	53.56	47.20	0.20	0.20	AVERAGE	NEUTRAL
3	0.26832	48.35	-12.82	61.17	47.98	0.17	0.20	QP	NEUTRAL
4	0.26832	42.39	-8.78	51.17	42.02	0.17	0.20	AVERAGE	NEUTRAL
5	0.53782	33.34	-22.66	56.00	33.04	0.10	0.20	QP	NEUTRAL
6	0.53782	29.59	-16.41	46.00	29.29	0.10	0.20	AVERAGE	NEUTRAL
7	0.67187	31.19	-24.81	56.00	30.89	0.10	0.20	QP	NEUTRAL
8	0.67187	27.96	-18.04	46.00	27.66	0.10	0.20	AVERAGE	NEUTRAL
9	4.638	33.46	-12.54	46.00	33.06	0.10	0.30	AVERAGE	NEUTRAL
10	4.638	38.25	-17.75	56.00	37.85	0.10	0.30	QP	NEUTRAL
11	5.914	42.61	-17.39	60.00	42.21	0.10	0.30	QP	NEUTRAL
12	5.914	33.22	-16.78	50.00	32.82	0.10	0.30	AVERAGE	NEUTRAL
13	5.981	34.38	-15.62	50.00	33.98	0.10	0.30	AVERAGE	NEUTRAL
14	5.981	43.62	-16.38	60.00	43.22	0.10	0.30	QP	NEUTRAL

Note:

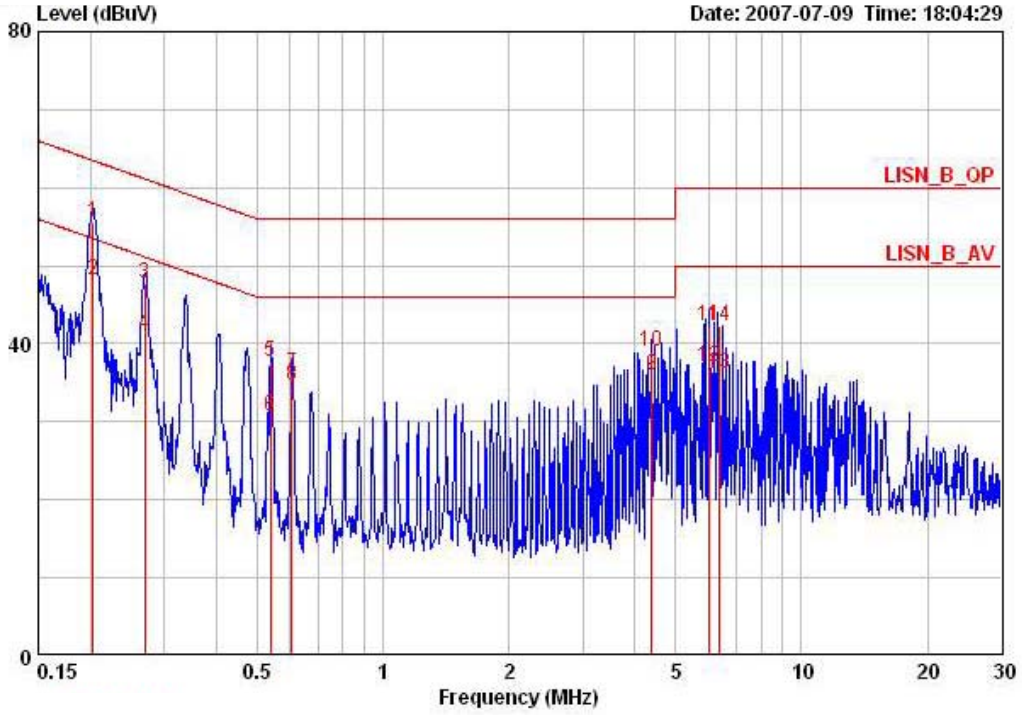
Level = Read Level + LISN Factor + Cable Loss.

Temperature	20℃	Humidity	59%
Test Engineer	Barry Chen	Phase	Line
Configuration	Normal Link / Ant. 3		



	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	55.29	-8.25	63.54	54.99	0.10	0.20	QP	LINE
2	0.20181	47.98	-5.56	53.54	47.68	0.10	0.20	AVERAGE	LINE
3	0.27152	47.28	-13.79	61.07	46.98	0.10	0.20	QP	LINE
4	0.27152	40.58	-10.49	51.07	40.28	0.10	0.20	AVERAGE	LINE
5	0.53782	37.02	-18.99	56.00	36.74	0.08	0.20	QP	LINE
6	0.53782	29.08	-16.93	46.00	28.80	0.08	0.20	AVERAGE	LINE
7	0.60752	35.79	-20.22	56.00	35.52	0.07	0.20	QP	LINE
8	0.60752	34.22	-11.79	46.00	33.95	0.07	0.20	AVERAGE	LINE
9	4.311	33.29	-12.71	46.00	32.99	0.00	0.30	AVERAGE	LINE
10	4.311	37.43	-18.57	56.00	37.13	0.00	0.30	QP	LINE
11	6.195	42.01	-17.99	60.00	41.63	0.04	0.34	QP	LINE
12	6.195	34.73	-15.27	50.00	34.35	0.04	0.34	AVERAGE	LINE
13	6.396	34.83	-15.17	50.00	34.41	0.04	0.38	AVERAGE	LINE
14	6.396	41.26	-18.74	60.00	40.84	0.04	0.38	QP	LINE

Temperature	20℃	Humidity	59%
Test Engineer	Barry Chen	Phase	Neutral
Configuration	Normal Link / Ant. 3		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.20289	55.55	-7.94	63.49	55.15	0.20	0.20	QP	NEUTRAL
2 @	0.20289	48.08	-5.41	53.49	47.68	0.20	0.20	AVERAGE	NEUTRAL
3	0.27009	47.72	-13.40	61.12	47.35	0.17	0.20	QP	NEUTRAL
4	0.27009	41.18	-9.94	51.12	40.81	0.17	0.20	AVERAGE	NEUTRAL
5	0.53782	37.65	-18.35	56.00	37.35	0.10	0.20	QP	NEUTRAL
6	0.53782	30.64	-15.36	46.00	30.34	0.10	0.20	AVERAGE	NEUTRAL
7	0.60431	36.15	-19.85	56.00	35.85	0.10	0.20	QP	NEUTRAL
8	0.60431	34.68	-11.32	46.00	34.38	0.10	0.20	AVERAGE	NEUTRAL
9	4.380	36.01	-9.99	46.00	35.61	0.10	0.30	AVERAGE	NEUTRAL
10	4.380	38.96	-17.04	56.00	38.56	0.10	0.30	QP	NEUTRAL
11	5.995	42.25	-17.75	60.00	41.85	0.10	0.30	QP	NEUTRAL
12	5.995	37.05	-12.95	50.00	36.65	0.10	0.30	AVERAGE	NEUTRAL
13	6.333	36.17	-13.83	50.00	35.70	0.10	0.37	AVERAGE	NEUTRAL
14	6.333	42.34	-17.66	60.00	41.87	0.10	0.37	QP	NEUTRAL

Note:

Level = Read Level + LISN Factor + Cable Loss.

4.2. Maximum Peak 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 power meter.

Power Meter Parameter	Setting
Filter No.	Auto
Measurement time	0.135 s ~ 26 s
Used Peak Sensor	NRV-Z32 (model 04)

4.2.3. Test Procedures

1. The transmitter output (antenna port) was connected to the power meter.
2. Turn on the EUT and power meter and then record the peak power value.
3. Repeat above procedures on all channels needed to be tested.

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 Peak Output Power

Temperature	23℃	Humidity	62%
Test Engineer	Beck Wu	Configurations	802.11b/g

Ant. 2

Configuration IEEE 802.11b

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	16.01	30.00	Complies
6	2437 MHz	22.13	30.00	Complies
11	2462 MHz	16.68	30.00	Complies

Configuration IEEE 802.11g

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	18.20	30.00	Complies
6	2437 MHz	26.90	30.00	Complies
11	2462 MHz	18.40	30.00	Complies

Configuration IEEE 802.11g Turbo

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
6	2437 MHz	19.90	30.00	Complies

Ant. 3

Configuration IEEE 802.11b

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	16.01	28.00	Complies
6	2437 MHz	22.13	28.00	Complies
11	2462 MHz	16.68	28.00	Complies

Configuration IEEE 802.11g

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	18.20	28.00	Complies
6	2437 MHz	26.90	28.00	Complies
11	2462 MHz	18.40	28.00	Complies

Configuration IEEE 802.11g Turbo

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
6	2437 MHz	19.90	28.00	Complies

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

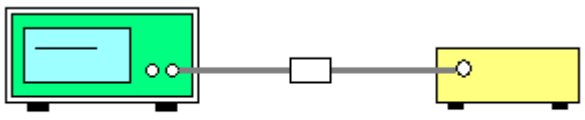
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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	62%
Test Engineer	Beck Wu	Configurations	802.11b/g

Ant. 2 & Ant. 3

Configuration IEEE 802.11b

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	-9.62	8.00	Complies
6	2437 MHz	-4.09	8.00	Complies
11	2462 MHz	-8.55	8.00	Complies

Configuration IEEE 802.11g

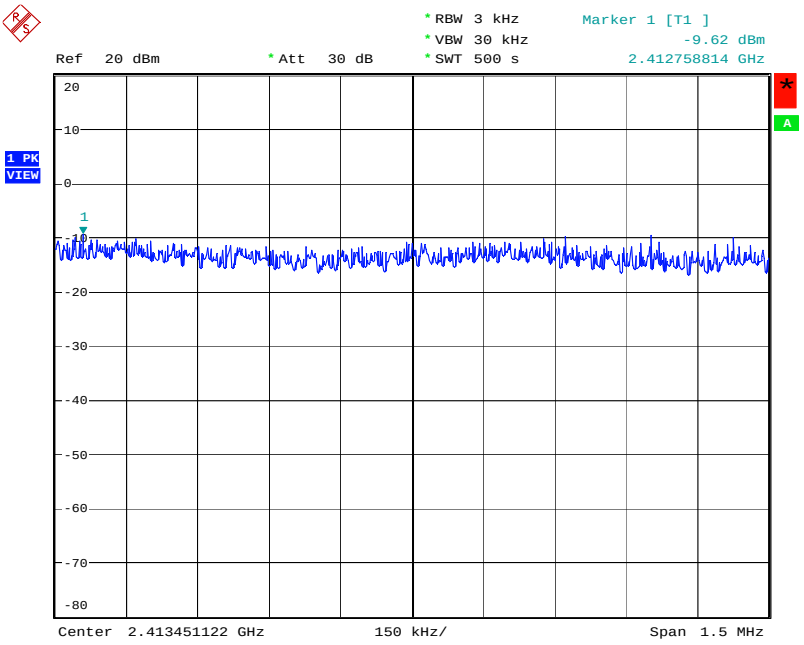
Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	-13.51	8.00	Complies
6	2437 MHz	-4.50	8.00	Complies
11	2462 MHz	-11.29	8.00	Complies

Configuration IEEE 802.11g Turbo

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
6	2437 MHz	-13.45	8.00	Complies

Ant.2 & Ant. 3

Power Density Plot on Configuration IEEE 802.11b / 2412 MHz



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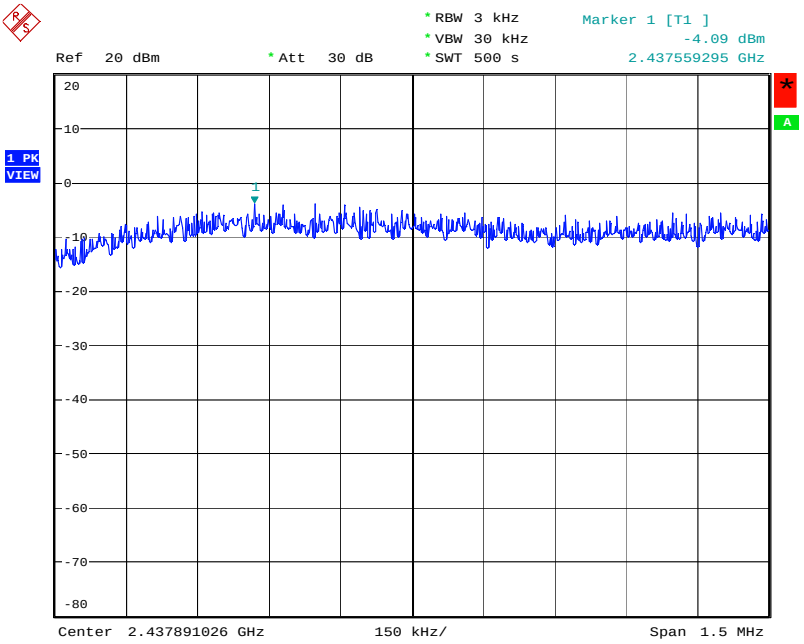
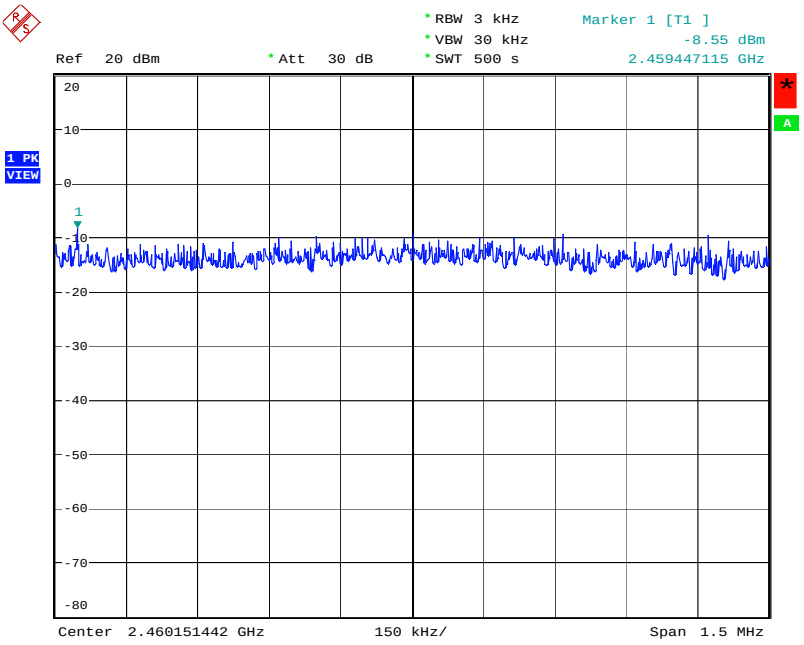
Power Density Plot on Configuration IEEE 802.11b / 2437 MHz

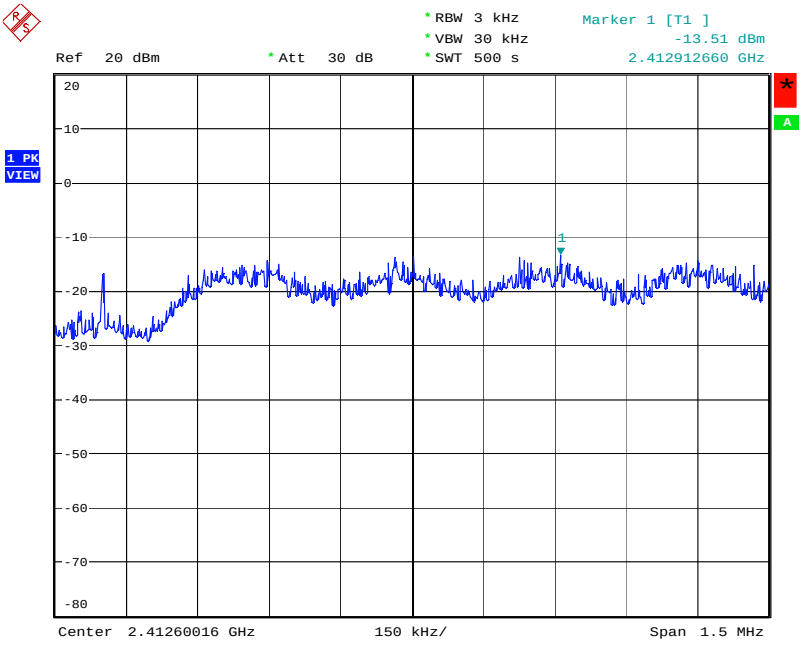


Date: 23.JUN.2007 10:41:22

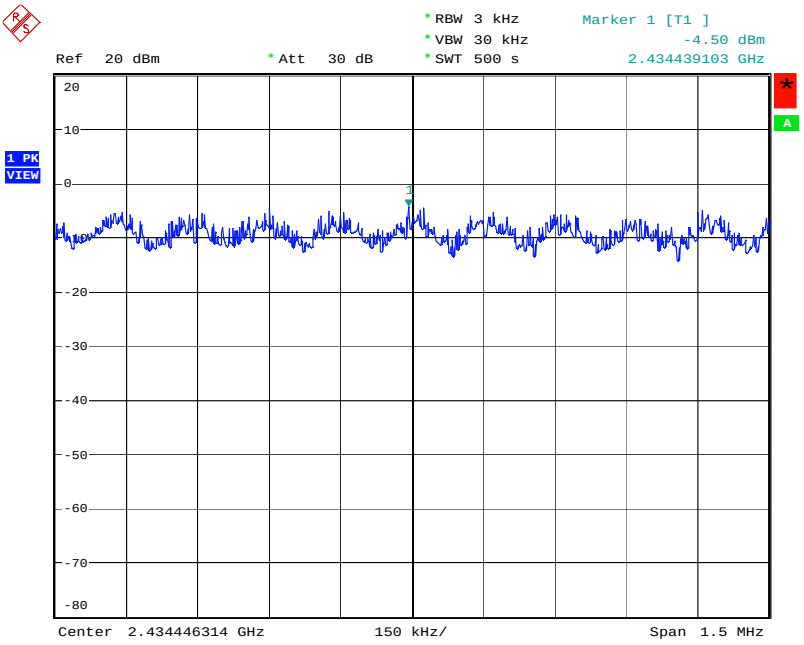
Power Density Plot on Configuration IEEE 802.11b / 2462 MHz



Power Density Plot on Configuration IEEE 802.11g / 2412 MHz

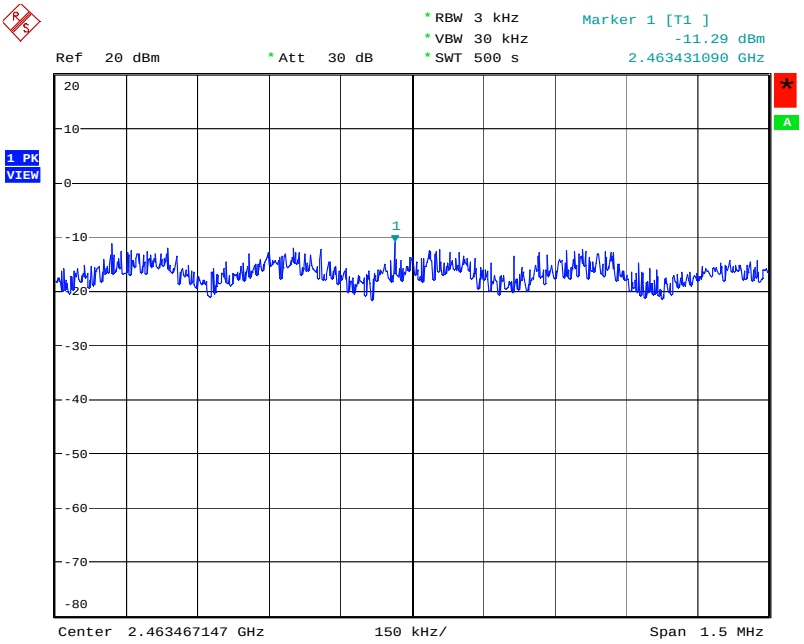


Power Density Plot on Configuration IEEE 802.11g / 2437 MHz



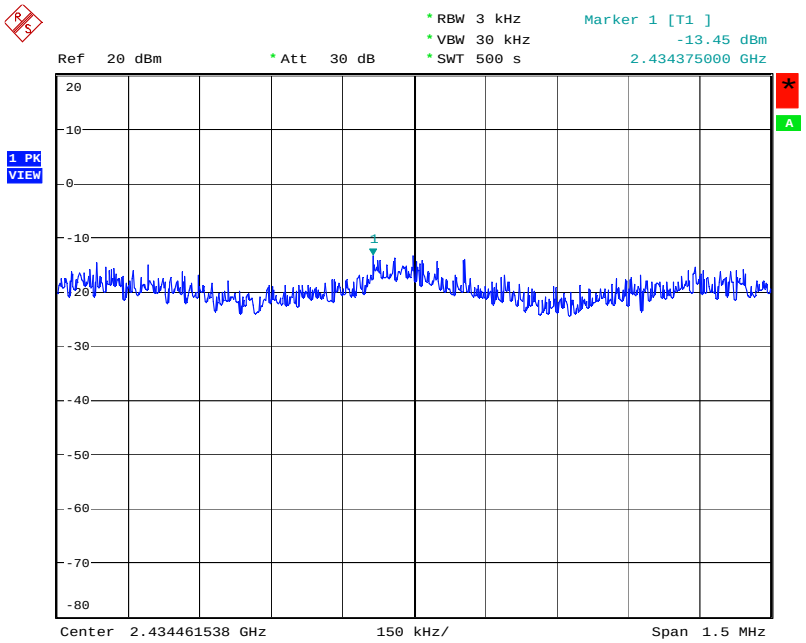
Date: 23.JUN.2007 11:14:24

Power Density Plot on Configuration IEEE 802.11g / 2462 MHz



Date: 23.JUN.2007 11:28:36

Power Density Plot on Configuration IEEE 802.11g Turbo / 2437 MHz



Date: 23.JUN.2007 11:06:16

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

1. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
2. The resolution bandwidth of 100 kHz and the video bandwidth of 100 kHz were used.
3. 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	62%
Test Engineer	Beck Wu	Configurations	802.11b/g

Ant.2 & Ant. 3

Configuration IEEE 802.11b

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	12.01	15.48	500	Complies
6	2437 MHz	12.05	15.57	500	Complies
11	2462 MHz	11.08	15.54	500	Complies

Configuration IEEE 802.11g

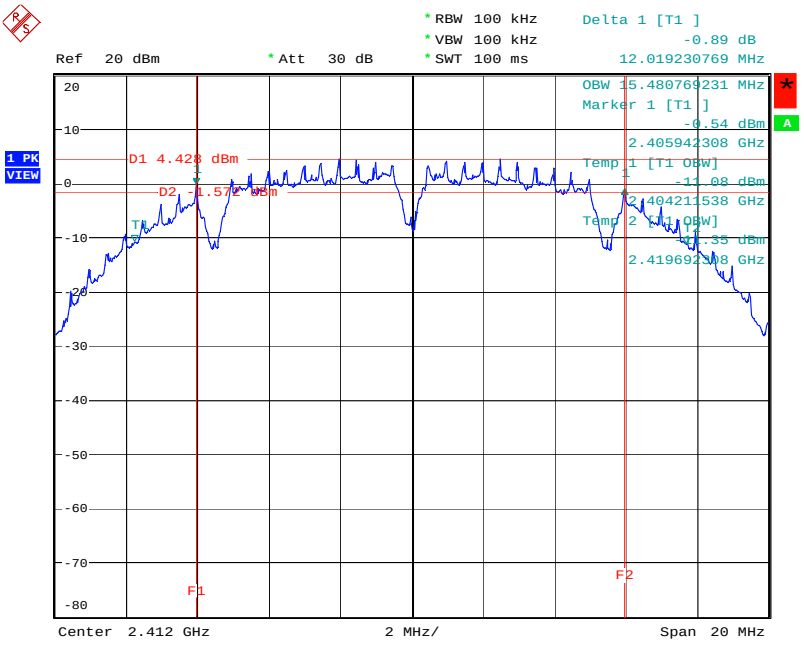
Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	16.31	16.47	500	Complies
6	2437 MHz	8.23	8.36	500	Complies
11	2462 MHz	16.34	16.51	500	Complies

Configuration IEEE 802.11g Turbo

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
6	2437 MHz	30.76	32.76	500	Complies

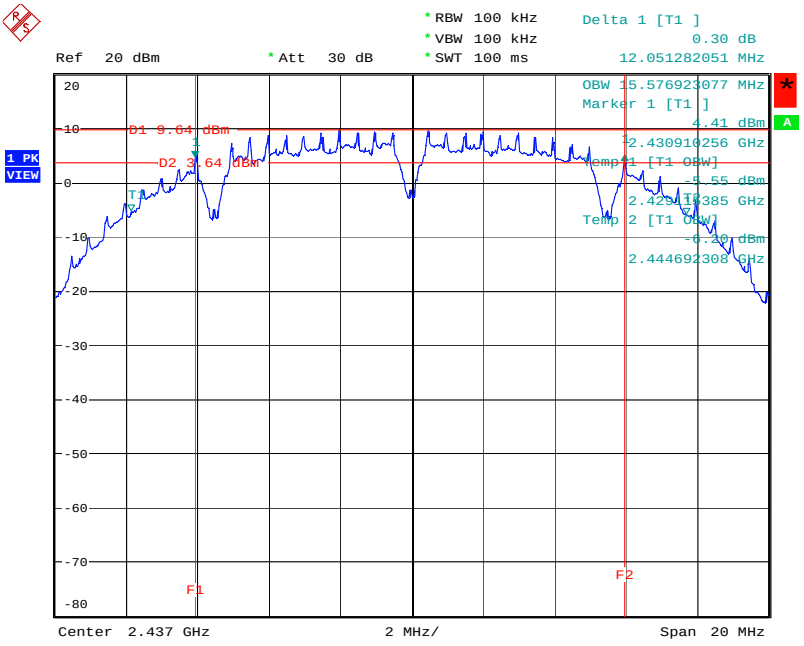
Ant. 2 & Ant. 3

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



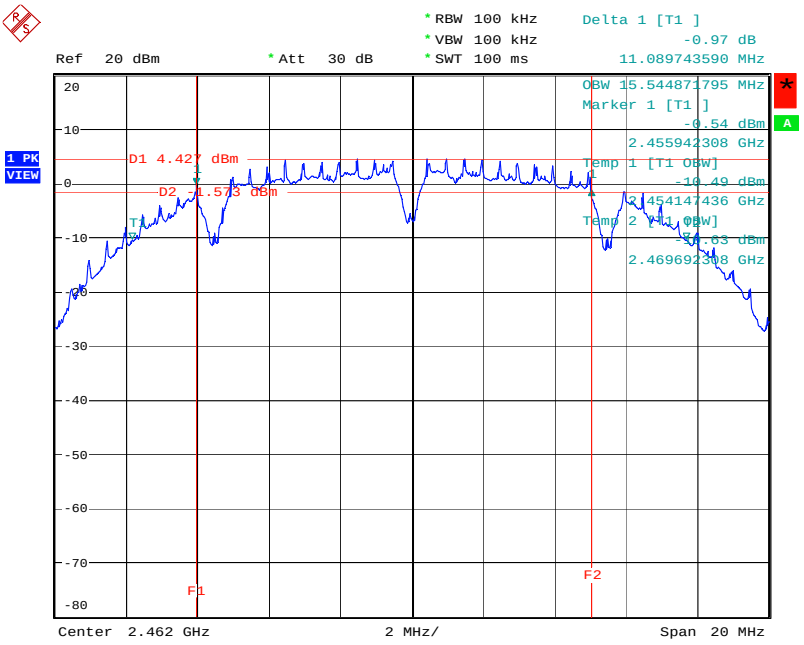
Date: 23.JUN.2007 10:38:57

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



Date: 23.JUN.2007 10:41:06

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



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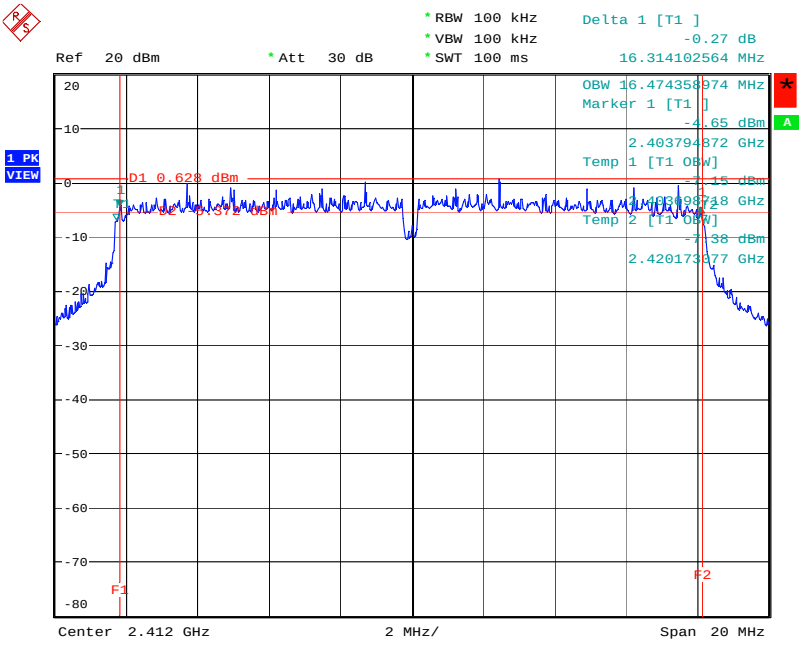
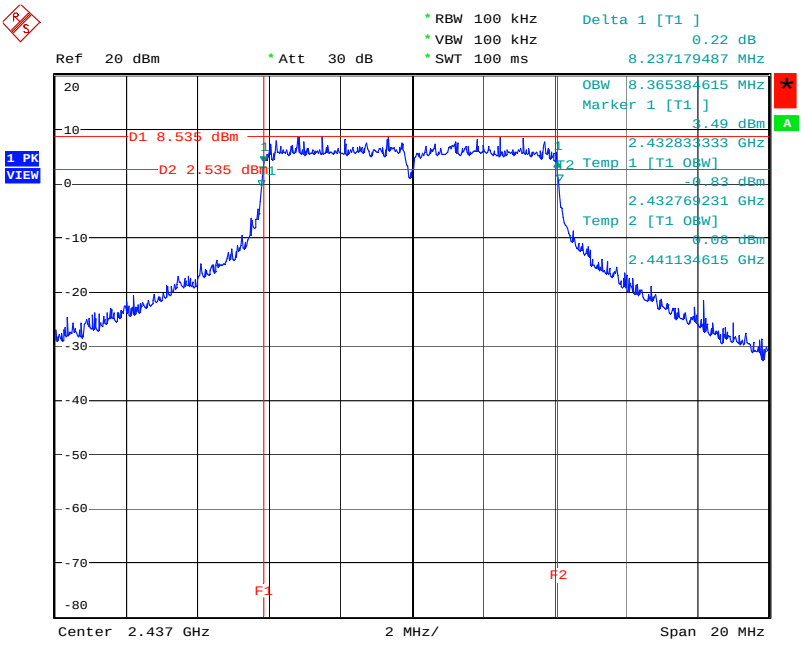
6 dB Bandwidth Plot on Configuration IEEE 802.11g / 2412 MHz



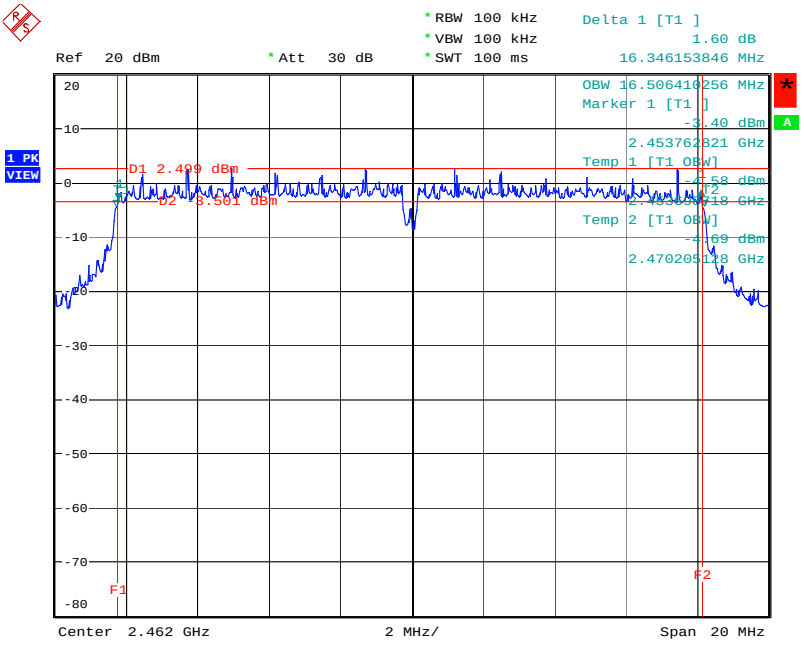
Date: 23.JUN.2007 11:04:02

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



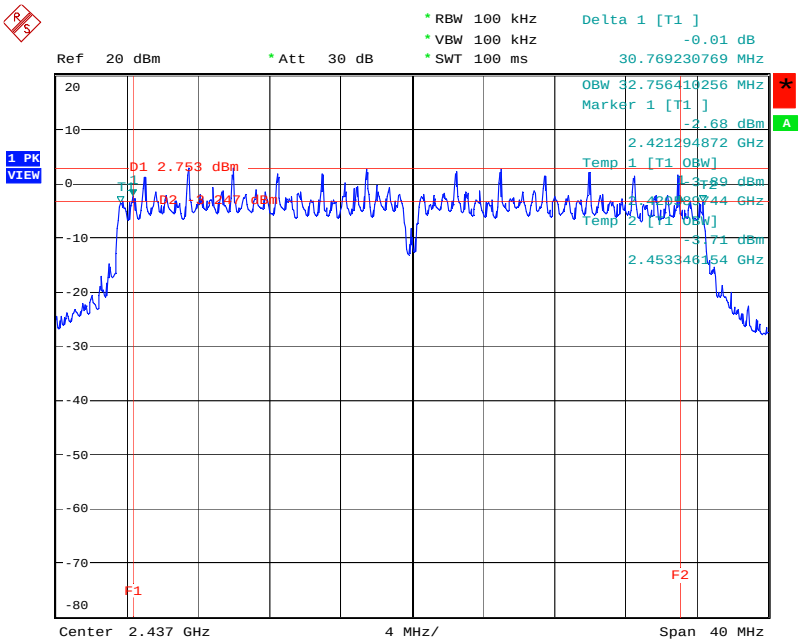
Date: 23.JUN.2007 11:14:07

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



Date: 23.JUN.2007 11:28:21

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



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

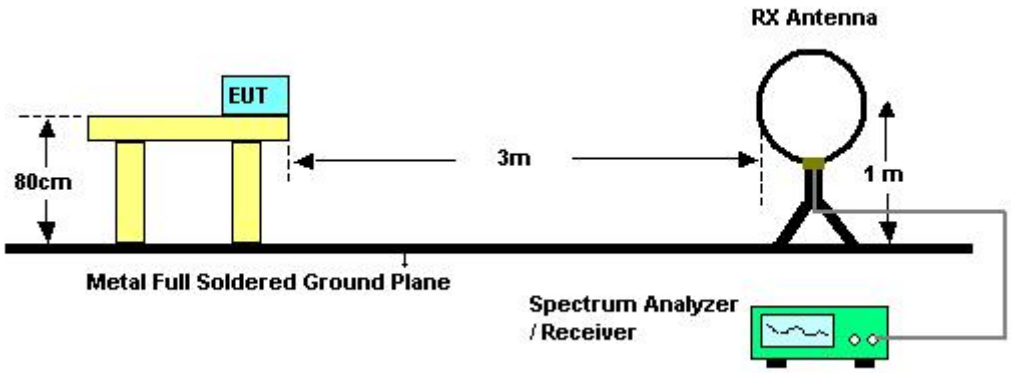
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

4.5.3. Test Procedures

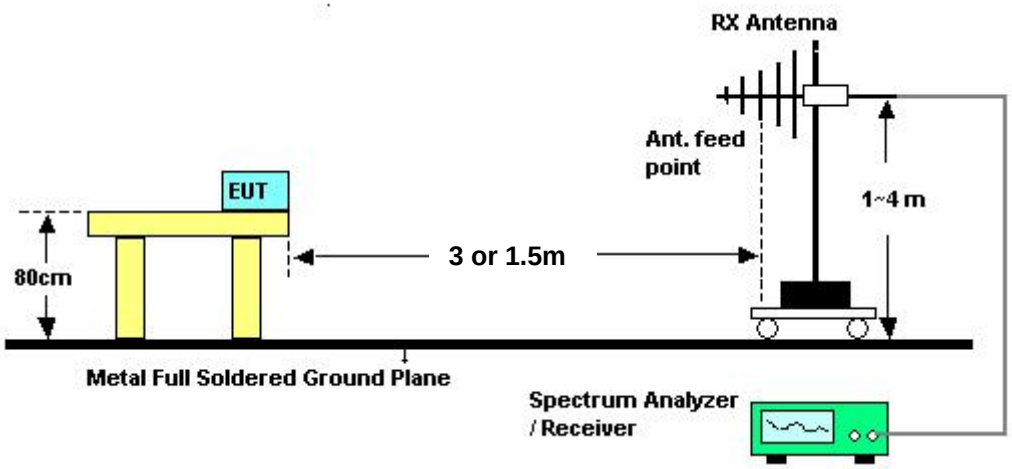
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting 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	23℃	Humidity	62%
Test Engineer	Jacky Ho	Configurations	802.11g CH 6 / Ant. 2 & Ant. 3

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.

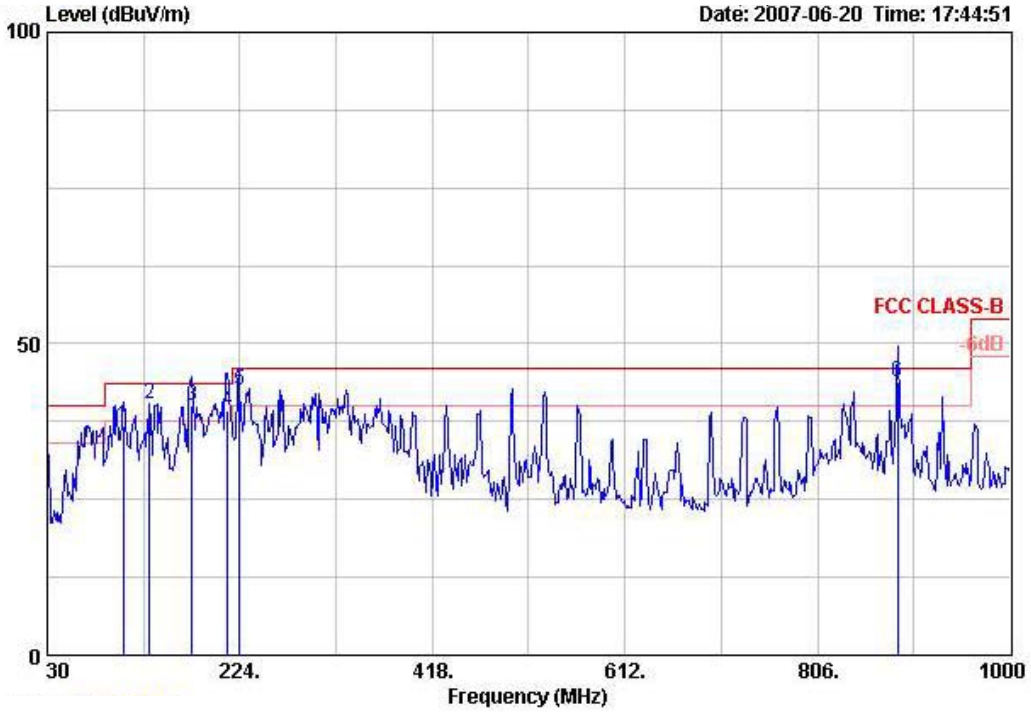
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

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

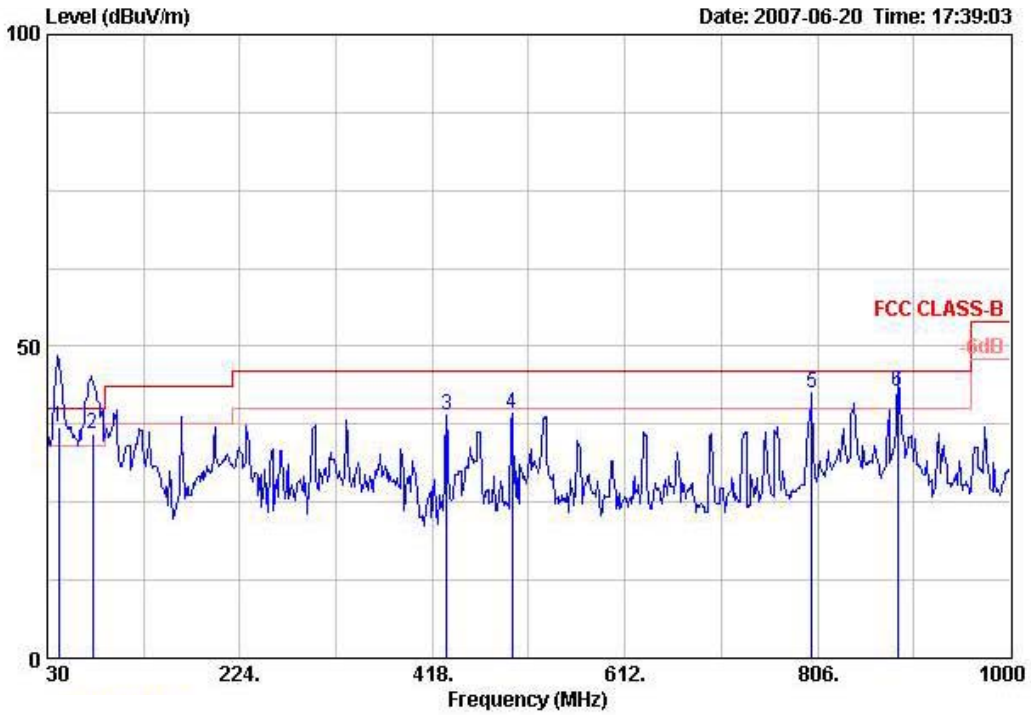
Temperature	23℃	Humidity	62%
Test Engineer	Jacky Ho	Configurations	802.11g CH 6 / Ant. 2

Horizontal



	Freq	Read Level	Level	Limit Line	Over Limit	Antenna Factor	Preamp Factor	Cable Loss	Remark	Ant Pos	Table Pos	Pol/Phase
	MHz	dBuV	dBuV/m	dBuV/m	dB	dB/m	dB	dB		cm	deg	
1	106.630	50.00	36.66	43.50	-6.84	12.11	25.95	0.50	QP	241	158	HORIZONTAL
2 !	132.820	40.29	40.29	43.50	-3.21	0.00	0.00	0.00	Peak	100	0	HORIZONTAL
3 !	175.500	55.00	40.17	43.50	-3.33	9.93	25.45	0.69	QP	198	33	HORIZONTAL
4 !	211.390	53.00	39.24	43.50	-4.26	10.69	25.45	1.00	QP	191	25	HORIZONTAL
5 !	224.000	42.60	42.60	46.00	-3.40	0.00	0.00	0.00	Peak	100	0	HORIZONTAL
6 *	887.000	45.00	43.97	46.00	-2.03	21.48	25.16	2.66	QP	100	57	HORIZONTAL

Vertical



	Freq	Read Level	Level	Limit Line	Over Limit	Antenna Factor	Preamp Factor	Cable Loss	Remark	Ant Pos	Table Pos	Pol/Phase
	MHz	dBuV	dBuV/m	dBuV/m	dB	dB/m	dB	dB		cm	deg	
1 !	41.900	50.00	37.09	40.00	-2.91	13.06	26.55	0.58	QP	143	74	VERTICAL
2 !	76.000	54.50	35.88	40.00	-4.12	7.21	26.20	0.37	QP	131	112	VERTICAL
3	432.550	38.97	38.97	46.00	-7.03	0.00	0.00	0.00	Peak	400	0	VERTICAL
4	498.510	39.36	39.36	46.00	-6.64	0.00	0.00	0.00	Peak	400	0	VERTICAL
5 !	800.180	42.53	42.53	46.00	-3.47	0.00	0.00	0.00	Peak	400	0	VERTICAL
6 !	887.000	43.70	42.67	46.00	-3.33	21.47	25.15	2.65	QP	105	158	VERTICAL

Note:

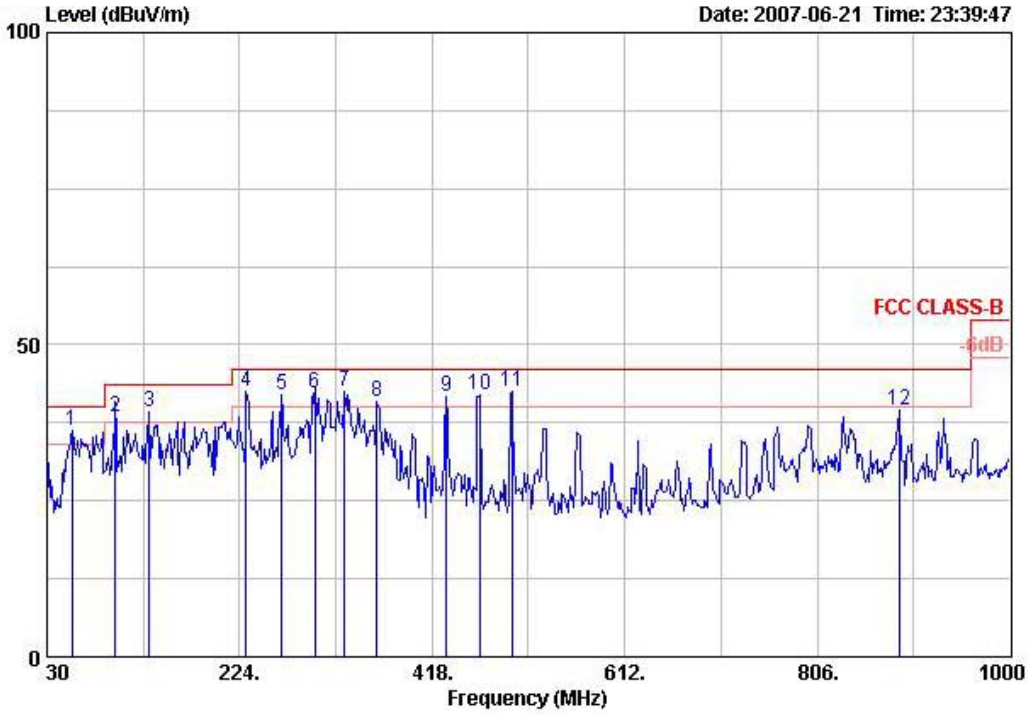
The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.

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

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

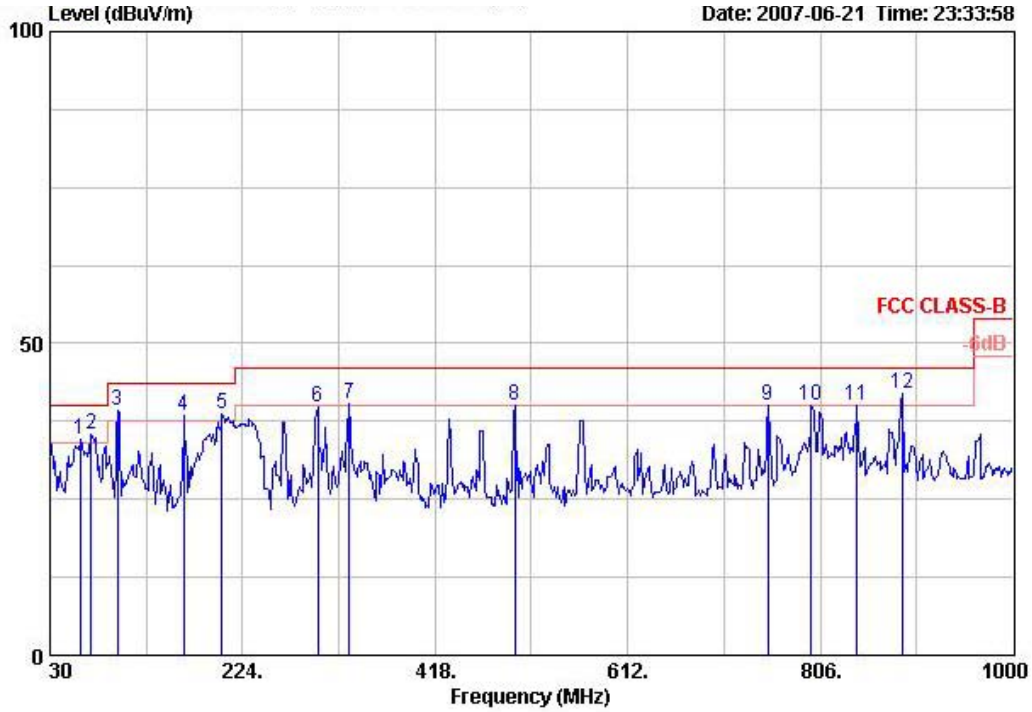
Temperature	23℃	Humidity	62%
Test Engineer	Sam Chen	Configurations	802.11g CH 6 / Ant. 3

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 @	55.220	36.30	-3.70	40.00	54.13	8.00	0.43	26.26	Peak	100	0
2 @	98.700	38.41	-5.09	43.50	53.00	11.01	0.36	25.96	QP	100	0
3 @	132.820	39.14	-4.36	43.50	52.04	12.35	0.62	25.87	Peak	100	0
4 @	230.790	42.59	-3.41	46.00	55.56	11.39	1.08	25.44	Peak	100	0
5 @	266.680	41.96	-4.04	46.00	52.43	13.65	1.15	25.26	Peak	100	0
6 @	300.000	42.10	-3.90	46.00	52.00	13.90	1.14	24.94	QP	100	20
7 @	329.730	42.47	-3.53	46.00	51.56	14.73	1.15	24.97	Peak	100	0
8 @	362.710	40.96	-5.04	46.00	49.21	15.61	1.27	25.13	Peak	100	0
9 @	432.550	41.59	-4.41	46.00	48.95	16.96	1.49	25.80	Peak	100	0
10 @	466.500	42.01	-3.99	46.00	49.14	17.40	1.55	26.07	Peak	100	0
11 @	498.510	42.50	-3.50	46.00	49.27	17.78	1.80	26.33	Peak	100	0
12 @	889.420	39.53	-6.47	46.00	40.57	21.48	2.66	25.18	Peak	100	0

Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 @	60.070	34.73	-5.27	40.00	53.50	7.10	0.51	26.38	Peak	400	0
2 @	71.710	35.34	-4.66	40.00	54.15	6.96	0.39	26.16	Peak	400	0
3 @	97.900	39.16	-4.34	43.50	53.91	10.82	0.42	26.00	Peak	400	0
4 @	164.830	38.43	-5.07	43.50	53.02	10.35	0.72	25.66	Peak	400	0
5 @	203.630	38.68	-4.82	43.50	52.71	10.45	0.97	25.46	Peak	400	0
6 @	299.660	39.87	-6.13	46.00	49.77	13.90	1.14	24.94	Peak	400	0
7 @	331.670	40.26	-5.74	46.00	49.29	14.79	1.15	24.97	Peak	400	0
8 @	498.510	39.96	-6.04	46.00	46.73	17.78	1.80	26.33	Peak	400	0
9 @	753.620	40.13	-5.87	46.00	42.56	20.15	2.48	25.06	Peak	400	0
10 @	797.270	40.07	-5.93	46.00	42.08	20.67	2.50	25.18	Peak	400	0
11 @	842.860	40.10	-5.90	46.00	41.14	21.30	2.53	24.86	Peak	400	0
12 @	888.450	41.90	-4.10	46.00	42.94	21.48	2.66	25.17	Peak	400	0

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.