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FCC RADIO TEST REPORT

Applicant's company	CastleNet Technology Inc.
Applicant Address	No.64, Chung-Shan Rd. Tu-Cheng City, Taipei 236 Taiwan R.O.C.
FCC ID	RK9-ASW802
Manufacturer's company	CastleNet Technology Inc.
Manufacturer Address	No.64, Chung-Shan Rd. Tu-Cheng City, Taipei 236 Taiwan R.O.C.

Product Name	ADSL Router
Brand Name	CTI
Model Name	ASW802+ /A/B
Test Rule	47 CFR FCC Part 15 Subpart C § 15.247
Test Freq. Range	2400 ~ 2483.5MHz
Received Date	Jul. 6, 2006
Final Test Date	Sep. 5, 2006
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.



Lab Code: 200079-0



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1. CERTIFICATE OF COMPLIANCE

Product Name : ADSL Router
Brand Name : CTI
Model Name : ASW802+ /A/B
Applicant : CastleNet Technology Inc.
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 Jul. 6, 2006 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.

Prepared By:
Tina Jao / Specialist

Tested By:
Carl Lee / Engineer

Reviewed By:
Roger Sheng / Manager

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	20.42 dB
4.2	15.247(b)(3)	Maximum Peak Conducted Output Power	Complies	8.18 dB
4.3	15.247(e)	Power Spectral Density	Complies	1.38 dB
4.4	15.247(a)(2)	6dB Spectrum Bandwidth	Complies	-
4.5	15.247(d)	Radiated Emissions	Complies	1.09 dB
4.6	15.247(d)	Band Edge Emissions	Complies	3.46 dB
4.7	15.203	Antenna Requirements	Complies	-

Test Items	Uncertainty	Remark
AC Power Line Conducted Emissions	±2.26dB	Confidence levels of 95%
Maximum Peak Conducted Output Power	±0.776dB	Confidence levels of 95%
Power Spectral Density	±0.506dB	Confidence levels of 95%
6dB Spectrum Bandwidth	±1.64×10 ⁻⁶	Confidence levels of 95%
Radiated Emissions (9kHz~30MHz)	±0.754dB	Confidence levels of 95%
Radiated Emissions (30MHz~1000MHz)	±1.89dB	Confidence levels of 95%
Radiated / Band Edge Emissions (1GHz~18GHz)	±1.89dB	Confidence levels of 95%
Radiated Emissions (18GHz~40GHz)	±1.86dB	Confidence levels of 95%
Temperature	±0.7°C	Confidence levels of 95%
Humidity	±3.2%	Confidence levels of 95%
DC / AC Power Source	±0.04%	Confidence levels of 95%

3. GENERAL INFORMATION

3.1. Product Details

EUT is an ADSL Router with IEEE 802.11b/g radio functions. The WLAN module configured within the EUT is "WMTO381". Only the radio detail of WLAN is shown in the table below. For more detailed features description, please refer to the manufacturer's specifications or user's manual.

Items	Description
Power Type	12V AC from adapter
Modulation	DSSS for IEEE 802.11b ; OFDM for IEEE 802.11g
Data Modulation	DSSS (BPSK / QPSK / CCK) ; OFDM (BPSK / QPSK / 16QAM / 64QAM)
Data Rate (Mbps)	DSSS (1/ 2/ 5.5/11) ; OFDM (6/9/12/18/24/36/48/54)
Frequency Range	2400 ~ 2483.5MHz
Channel Number	11
Channel Band Width (99%)	11b: 15.24 MHz ; 11g: 16.56 MHz
Conducted Output Power	11b: 21.67 dBm ; 11g: 21.82 dBm

3.2. Accessories

Power	Brand	Model	Rating
Adapter	OEM	AA-121A	INPUT: 120V AC OUTPUT: 12V AC
Others			
N/A			

3.3. Table for Filed Antenna

Ant.	Antenna Type	Connector	Gain (dBi)
1	Dipole Antenna	NA	1.42

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	WMTO381 WLAN Card Mode	11 Mbps	6	1
Maximum Peak Conducted Output Power Power Spectral Density 6dB Spectrum Bandwidth	11b/CCK	11 Mbps	1/6/11	NA
	11g/BPSK	6 Mbps	1/6/11	NA
Radiated Emissions 9kHz~1GHz	11g/BPSK	6 Mbps	6	1
Radiated Emissions 1GHz~10 th Harmonic	11b/CCK	11 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
Band Edge Emissions	11b/CCK	11 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 46405-4088	-
CO01-NH	Conduction	Dung Hu	-	IC 46405-4086	-
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
PC	COMPAQ	D330uT	DoC
Printer	HP	C2642A	B94C2642X
Monitor	DELL	E770s	DoC
Keyboard	HP	KB-0133	DoC
Mouse	HP	M-S69	JNZ211443
Modem	ACEEX	DM1414	IFAXDM1414
Terminal Load	-	-	-
CO (Remote Workstation)	TEXAS	TNEID4000C	-
Notebook	DELL	PP01L	DoC
Mouse	Microsoft	-	DoC
Notebook (Remote Workstation)	DELL	PP01L	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.

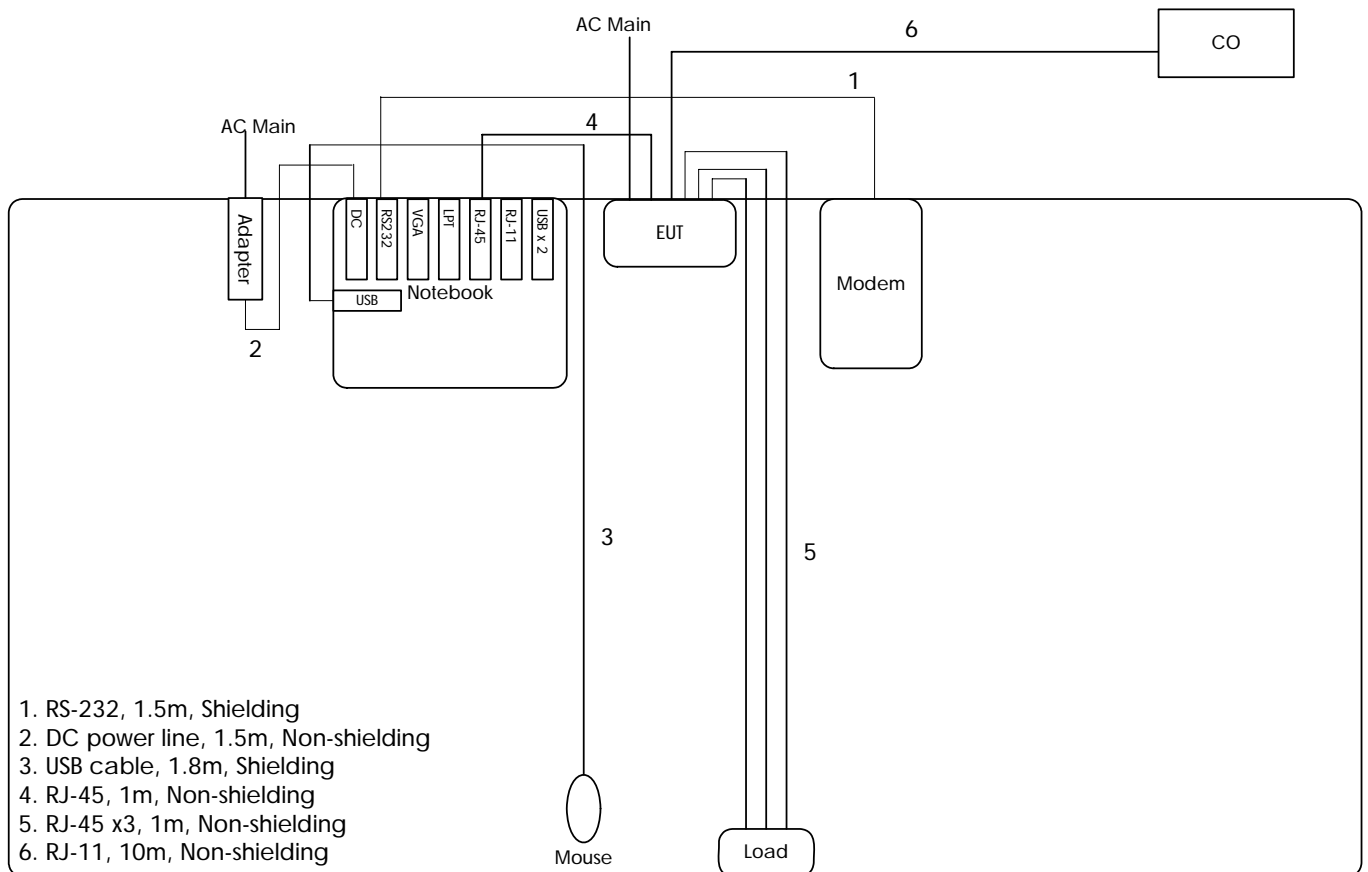
Power Parameters of IEEE 802.11b/g

Test Software Version	RADIOSCOPE		
Frequency	2412 MHz	2437 MHz	2462 MHz
IEEE 802.11b	1	1	1
IEEE 802.11g	1	1	1

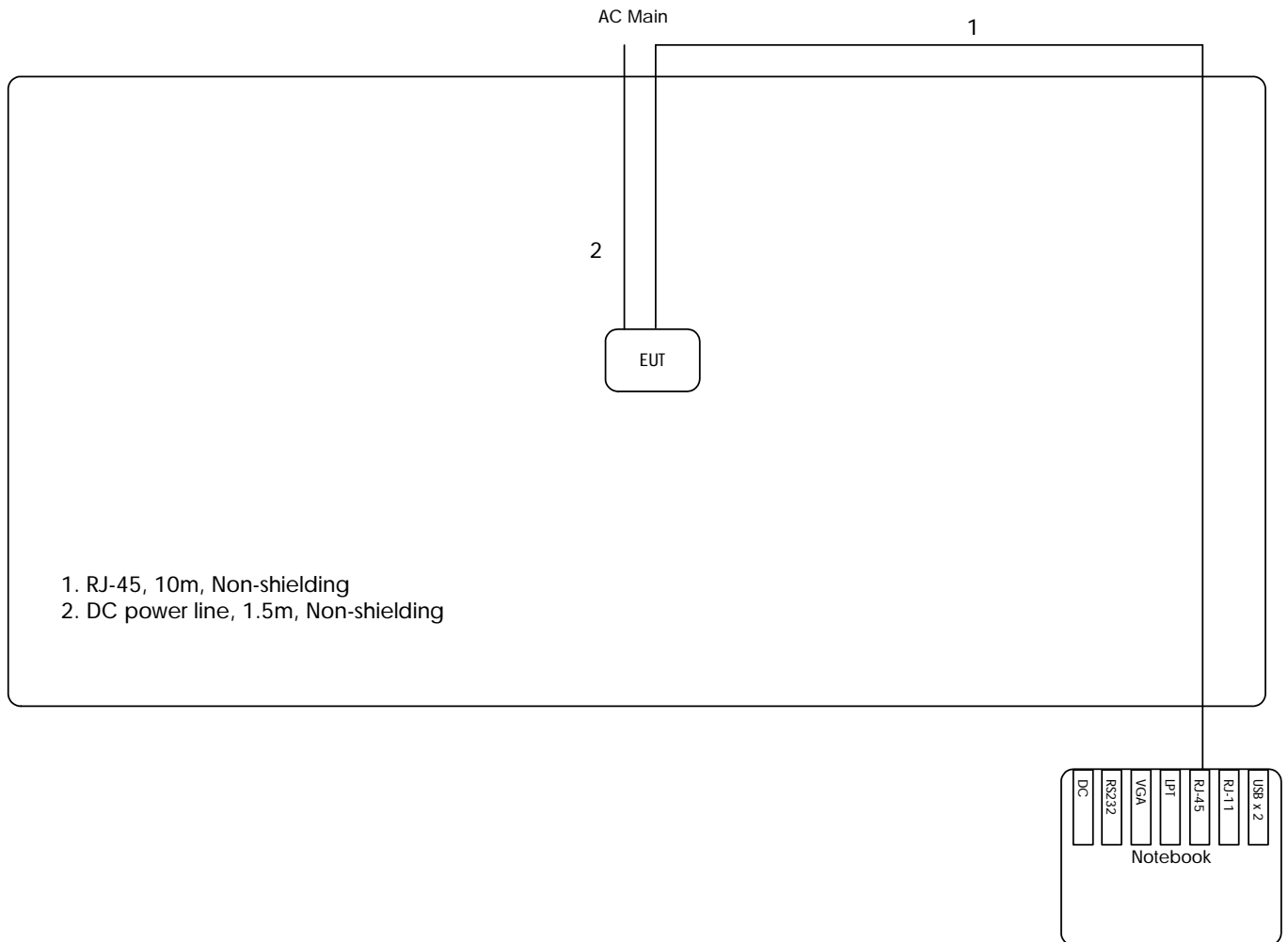
3.9. Test Configurations

3.9.1. Radiation Emissions Test Configuration

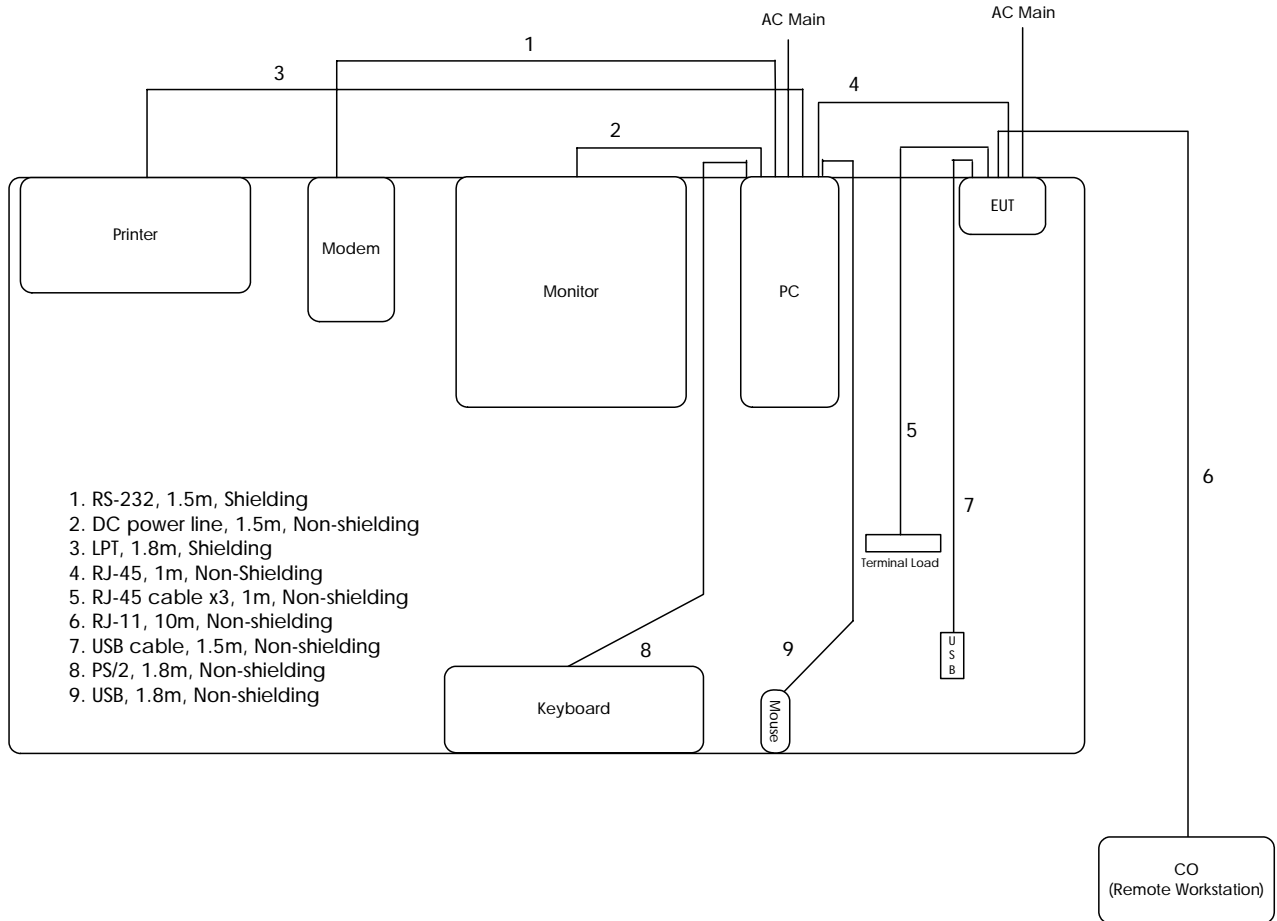
Below 1GHz



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

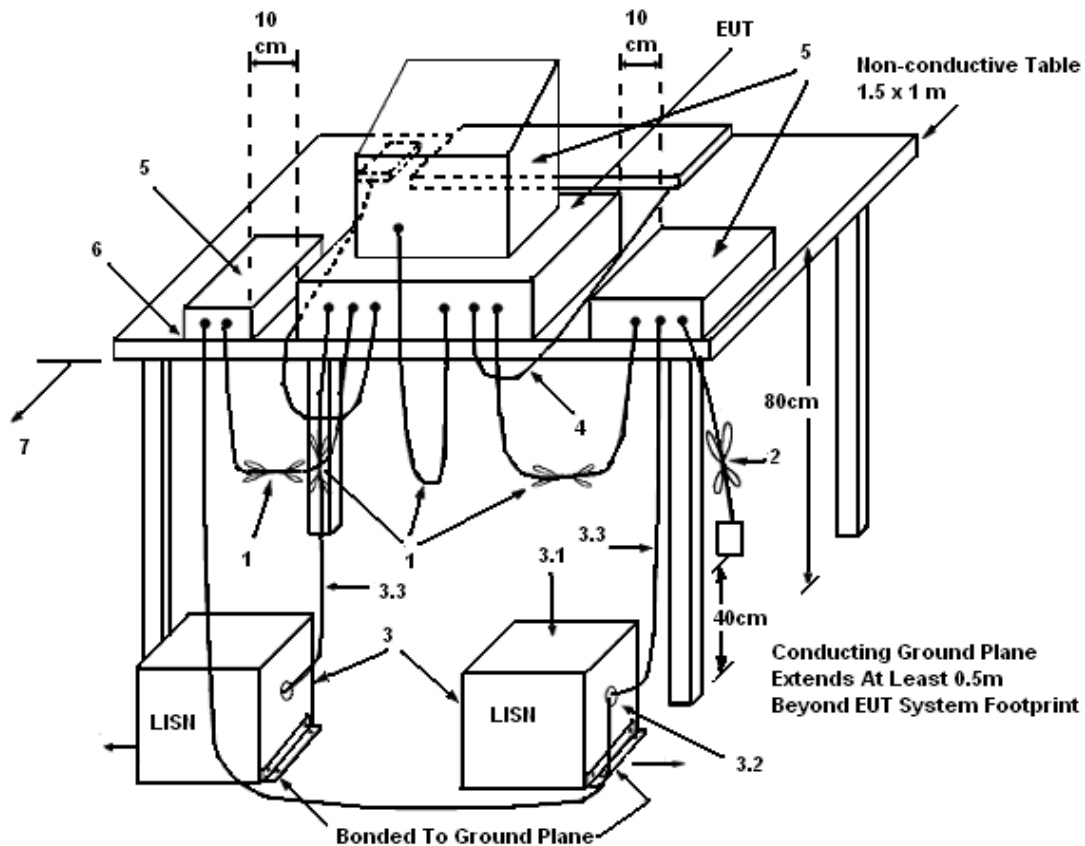
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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

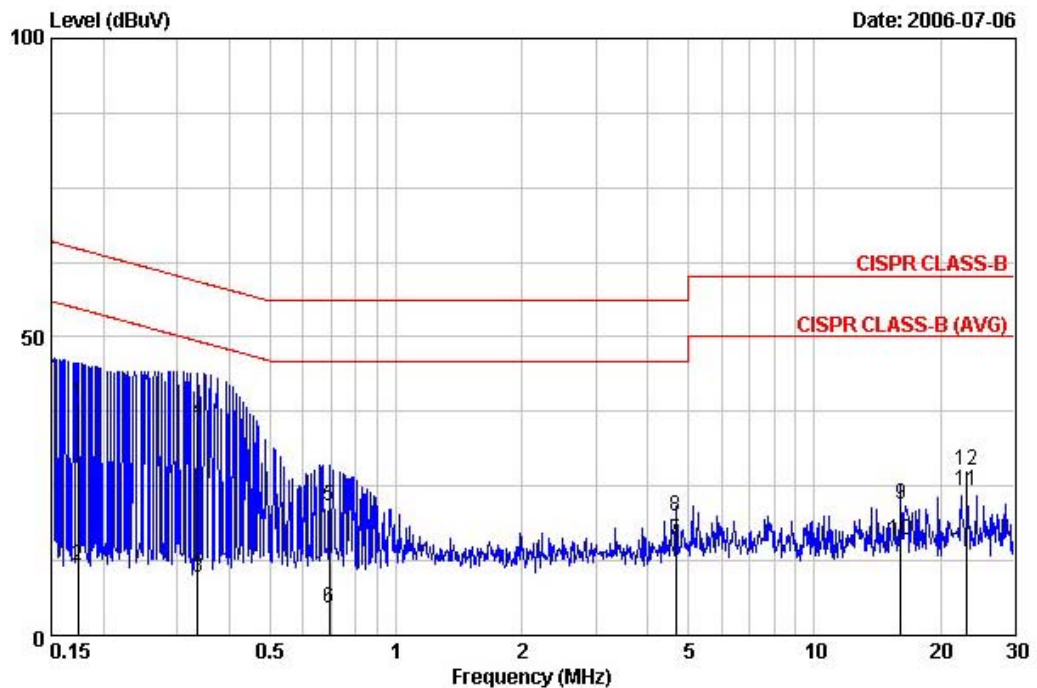
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

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

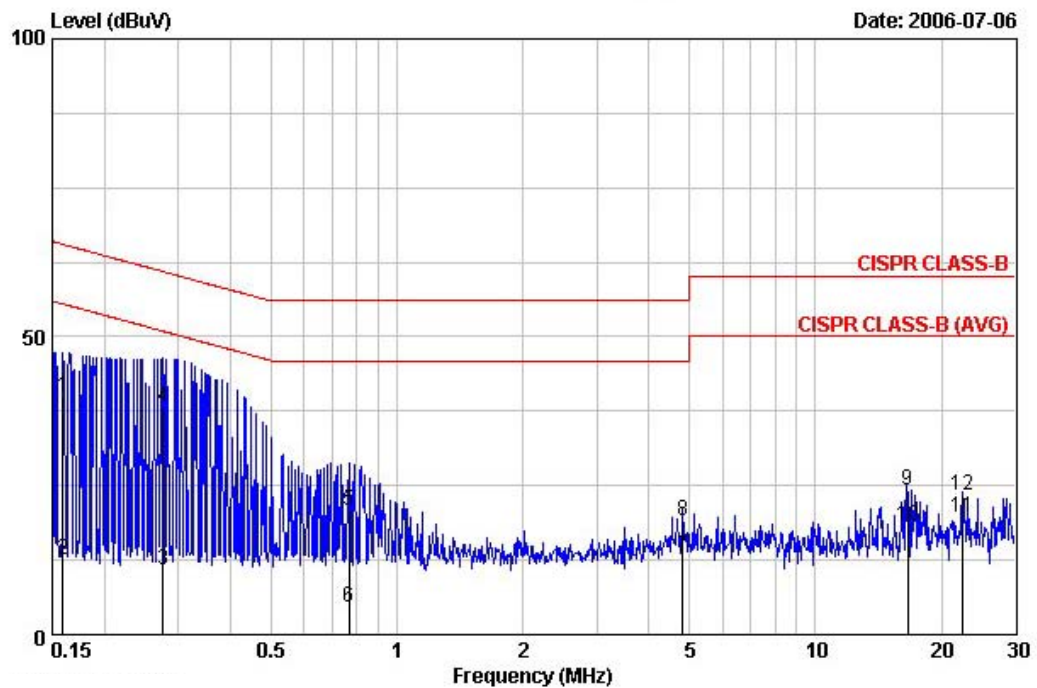
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	26°C	Humidity	41%
Test Engineer	Mark	Phase	Line
Configuration	WMTO381 WLAN Card Mode		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.174	39.09	-25.68	64.77	38.95	0.10	0.04	QP
2	0.174	11.74	-43.03	54.77	11.60	0.10	0.04	AVERAGE
3	0.336	9.70	-39.61	49.31	9.60	0.10	0.00	AVERAGE
4	0.336	36.03	-23.28	59.31	35.93	0.10	0.00	QP
5	0.694	21.56	-34.44	56.00	21.40	0.10	0.06	QP
6	0.694	4.57	-41.43	46.00	4.41	0.10	0.06	AVERAGE
7	4.672	16.08	-29.92	46.00	15.66	0.22	0.20	AVERAGE
8	4.672	20.06	-35.94	56.00	19.64	0.22	0.20	QP
9	16.058	21.84	-38.16	60.00	21.34	0.30	0.20	QP
10	16.058	15.97	-34.03	50.00	15.47	0.30	0.20	AVERAGE
11	23.129	24.22	-25.78	50.00	23.66	0.30	0.26	AVERAGE
12	23.129	27.70	-32.30	60.00	27.14	0.30	0.26	QP

Temperature	26°C	Humidity	41%
Test Engineer	Mark	Phase	Neutral
Configuration	WMTO381 WLAN Card Mode		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.159	39.81	-25.71	65.52	39.64	0.10	0.07	QP
2	0.159	12.48	-43.04	55.52	12.31	0.10	0.07	AVERAGE
3	0.276	10.85	-40.09	50.94	10.75	0.10	0.00	AVERAGE
4	0.276	38.10	-22.84	60.94	38.00	0.10	0.00	QP
5	0.767	20.87	-35.13	56.00	20.70	0.10	0.07	QP
6	0.767	4.45	-41.55	46.00	4.28	0.10	0.07	AVERAGE
7	4.816	13.21	-32.79	46.00	12.79	0.22	0.20	AVERAGE
8	4.816	18.97	-37.03	56.00	18.55	0.22	0.20	QP
9	16.594	24.30	-35.70	60.00	23.84	0.26	0.20	QP
10	16.594	18.33	-31.67	50.00	17.87	0.26	0.20	AVERAGE
11	22.455	19.66	-30.34	50.00	19.21	0.20	0.25	AVERAGE
12	22.455	23.22	-36.78	60.00	22.77	0.20	0.25	QP

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

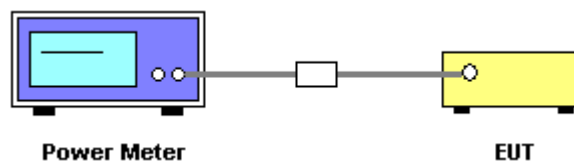
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

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	28°C	Humidity	58%
Test Engineer	Vic	Configurations	802.11b/g

Configuration IEEE 802.11b

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	20.13	30.00	Complies
6	2437 MHz	21.67	30.00	Complies
11	2462 MHz	19.80	30.00	Complies

Configuration IEEE 802.11g

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	18.76	30.00	Complies
6	2437 MHz	21.82	30.00	Complies
11	2462 MHz	18.45	30.00	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

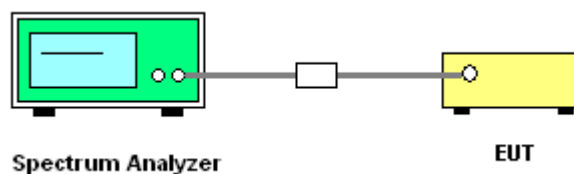
Please refer to section 5 of equipments list in this report. The following table is the setting of Spectrum Analyzer.

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	28°C	Humidity	58%
Test Engineer	Vic	Configurations	802.11b/g

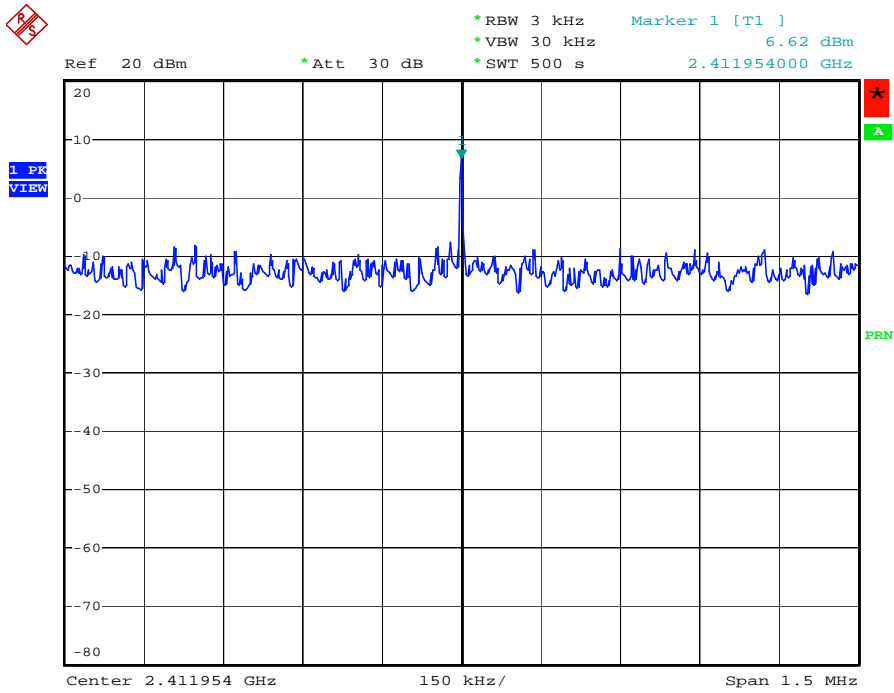
Configuration IEEE 802.11b

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	6.62	8.00	Complies
6	2437 MHz	6.01	8.00	Complies
11	2462 MHz	5.95	8.00	Complies

Configuration IEEE 802.11g

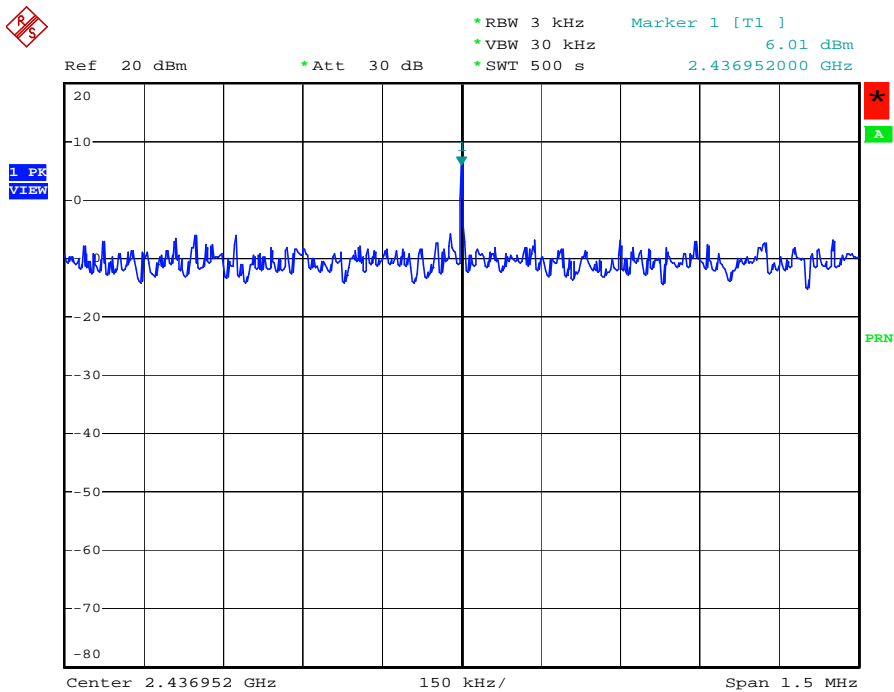
Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	6.13	8.00	Complies
6	2437 MHz	5.46	8.00	Complies
11	2462 MHz	5.65	8.00	Complies

Power Density Plot on Configuration IEEE 802.11b / 2412 MHz



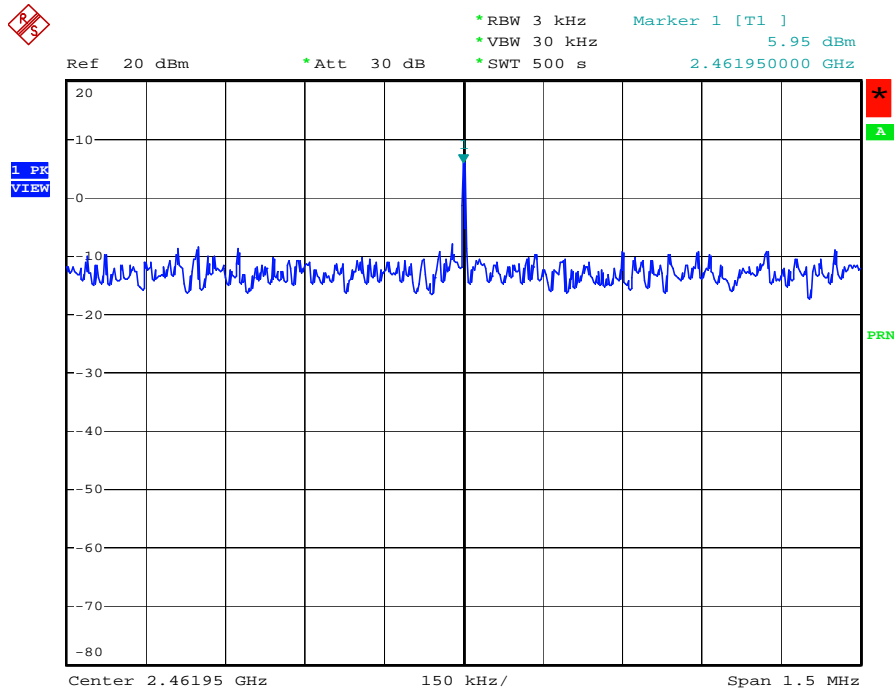
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Power Density Plot on Configuration IEEE 802.11b / 2437 MHz



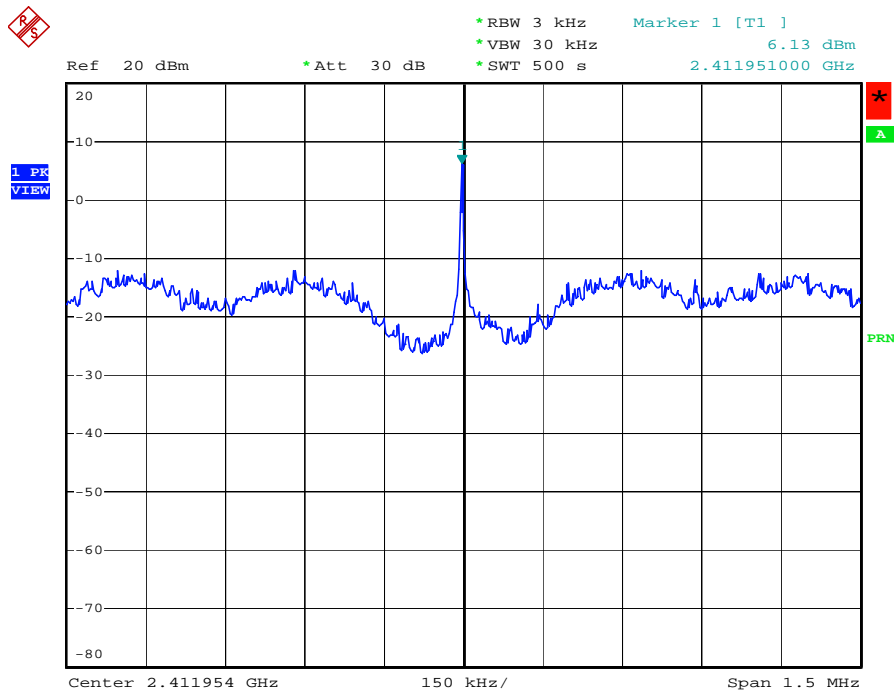
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Power Density Plot on Configuration IEEE 802.11b / 2462 MHz



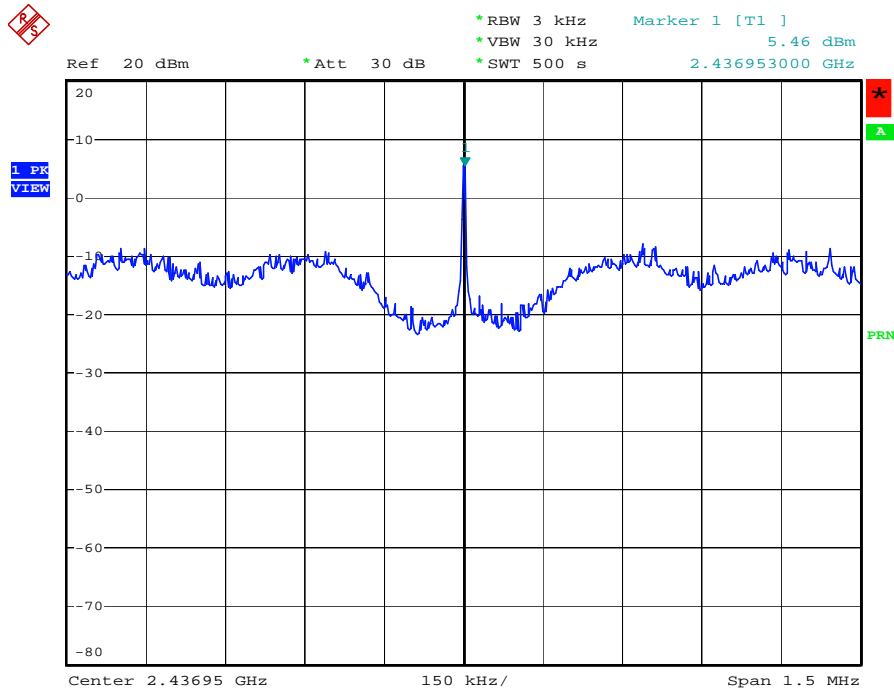
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Power Density Plot on Configuration IEEE 802.11g / 2412 MHz



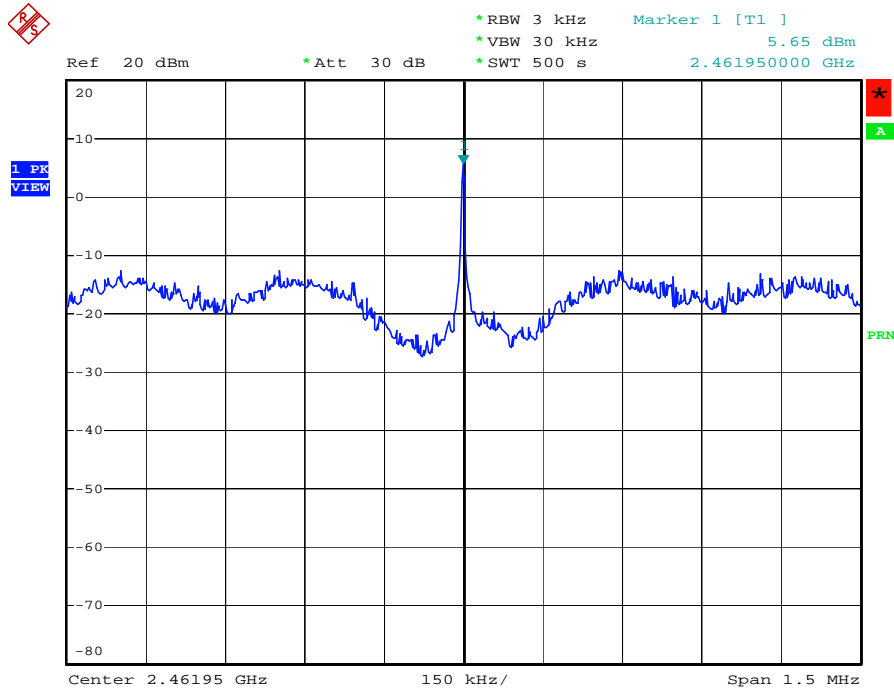
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Power Density Plot on Configuration IEEE 802.11g / 2437 MHz



Date: 2.AUG.2006 20:00:54

Power Density Plot on Configuration IEEE 802.11g / 2462 MHz



Date: 2.AUG.2006 20:07:49

4.4. 6dB Spectrum Bandwidth Measurement

4.4.1. Limit

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

4.4.2. Measuring Instruments and Setting

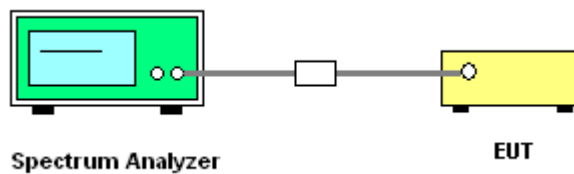
Please refer to section 5 of equipments list in this report. The following table is the setting of the Spectrum Analyzer.

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	28°C	Humidity	58%
Test Engineer	Vic	Configurations	802.11b/g

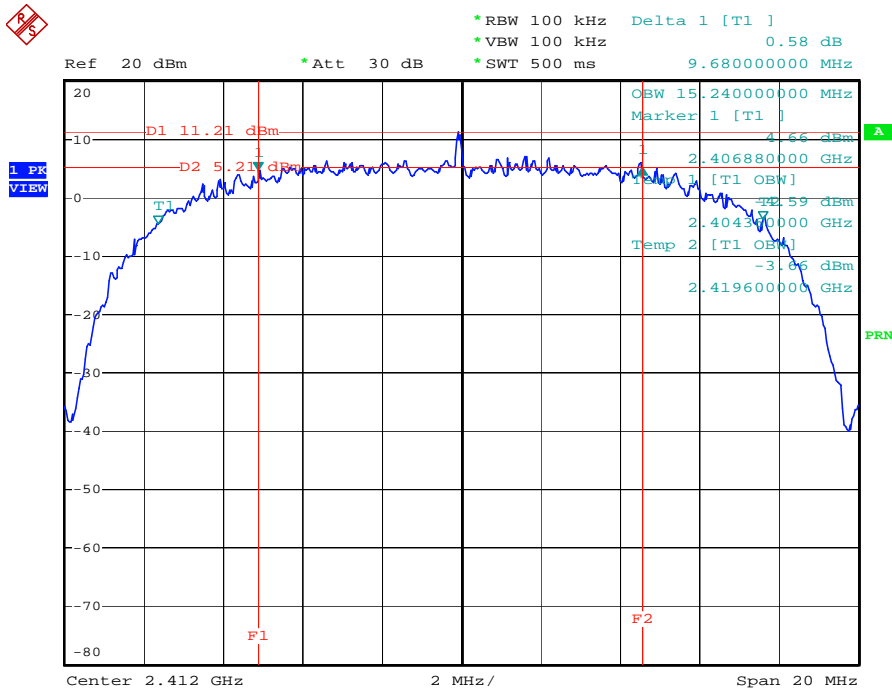
Configuration IEEE 802.11b

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	9.68	15.24	500	Complies
6	2437 MHz	11.12	15.24	500	Complies
11	2462 MHz	10.04	15.24	500	Complies

Configuration IEEE 802.11g

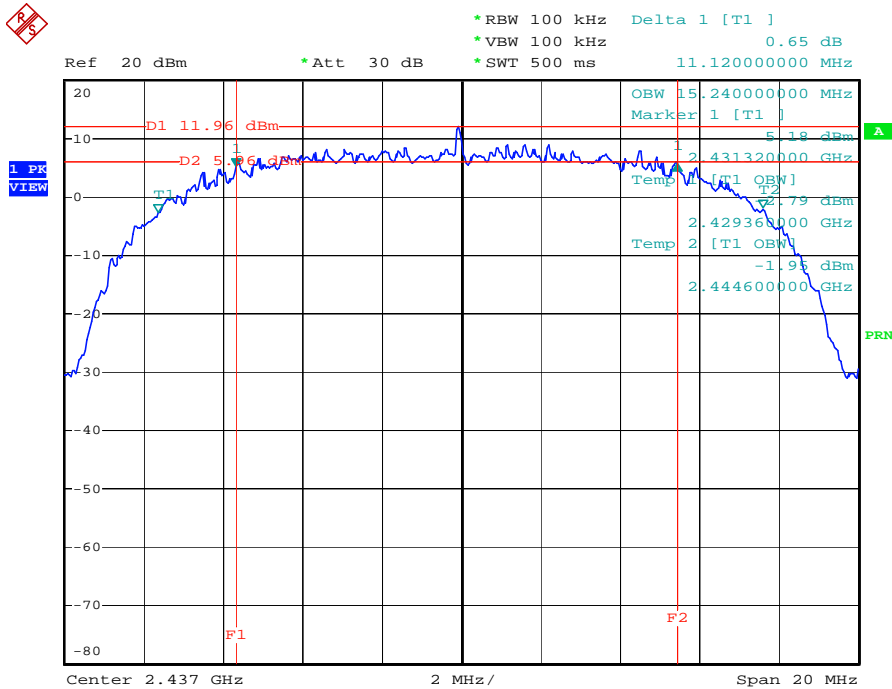
Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	15.04	16.48	500	Complies
6	2437 MHz	16.36	16.56	500	Complies
11	2462 MHz	15.08	16.48	500	Complies

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



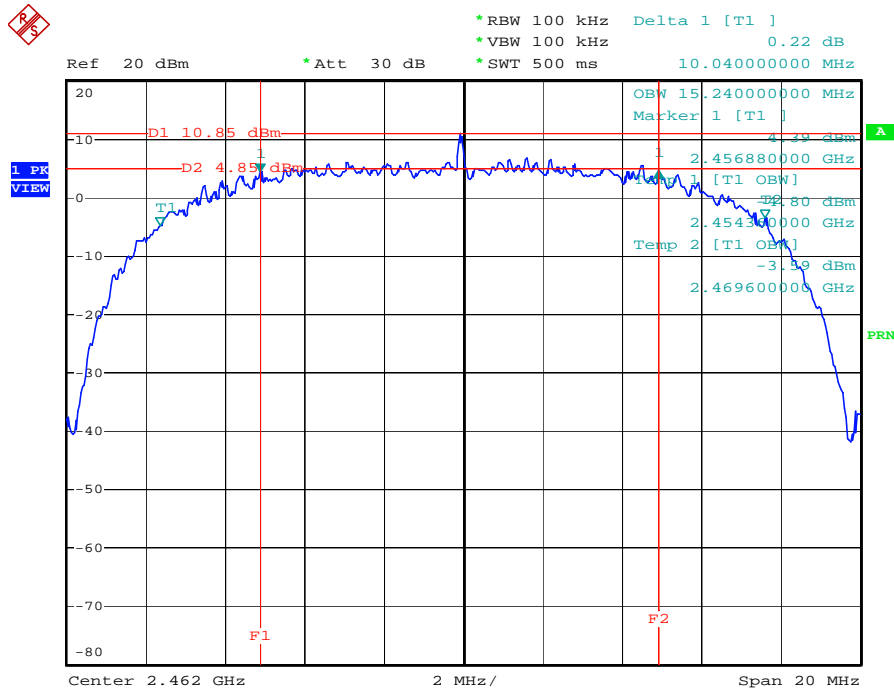
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6 dB Bandwidth Plot on Configuration IEEE 802.11b / 2437 MHz



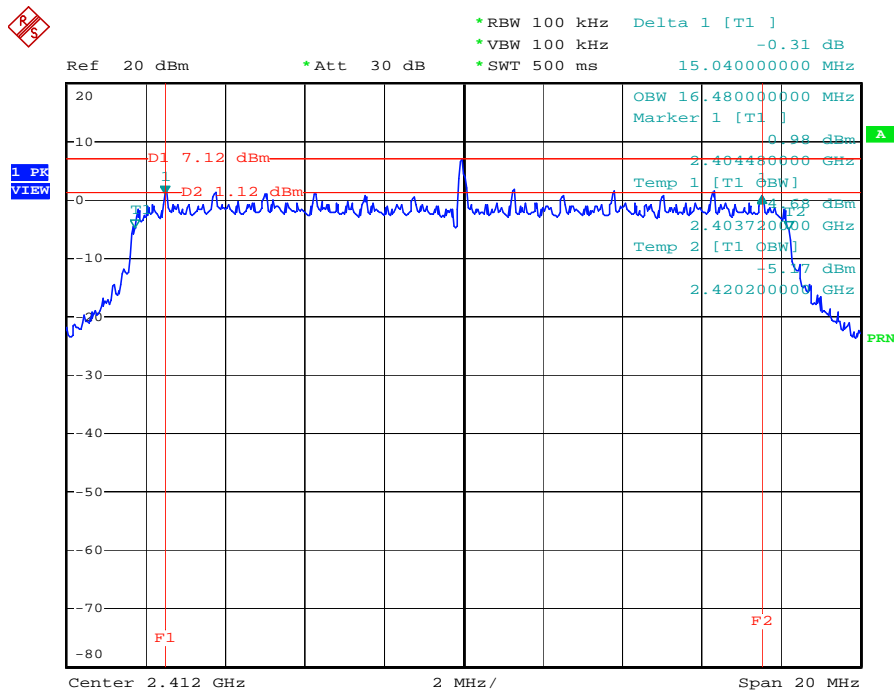
Date: 2.AUG.2006 20:18:30

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



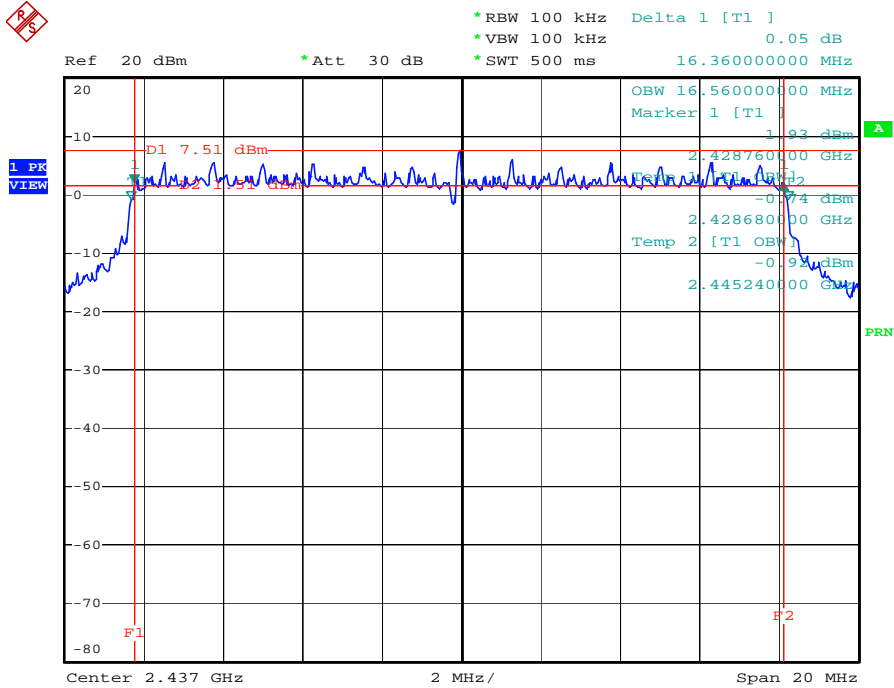
Date: 2.AUG.2006 20:15:33

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



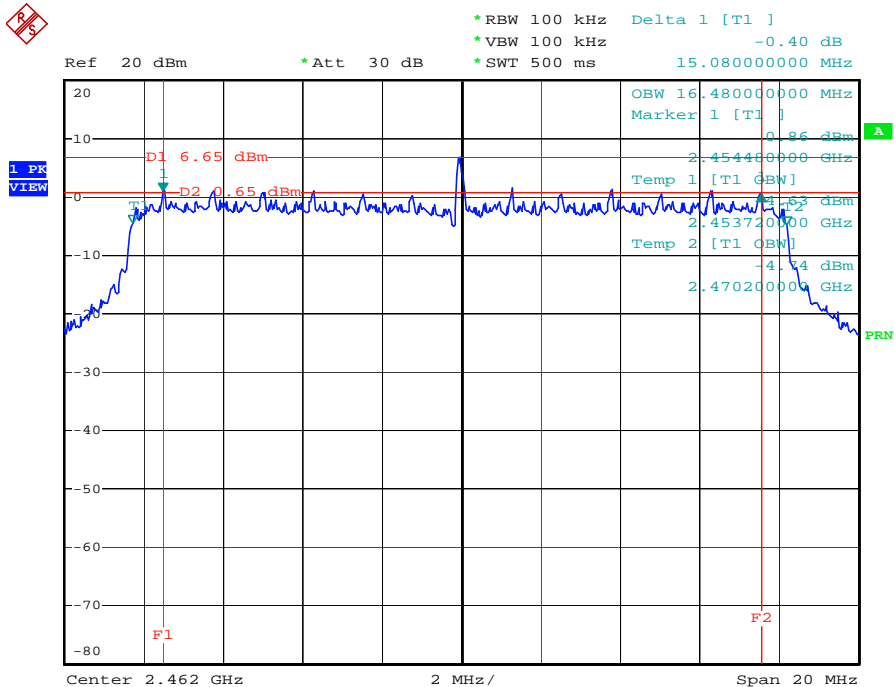
Date: 2.AUG.2006 19:53:48

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



Date: 2.AUG.2006 20:02:54

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



Date: 2.AUG.2006 20:04:45

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

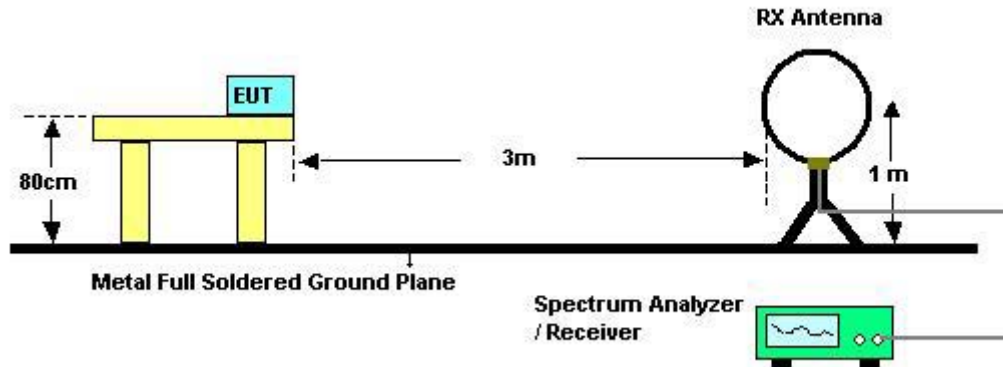
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz ~ 150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz ~ 30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz ~ 1000MHz / RB 120kHz for QP

4.5.3. Test Procedures

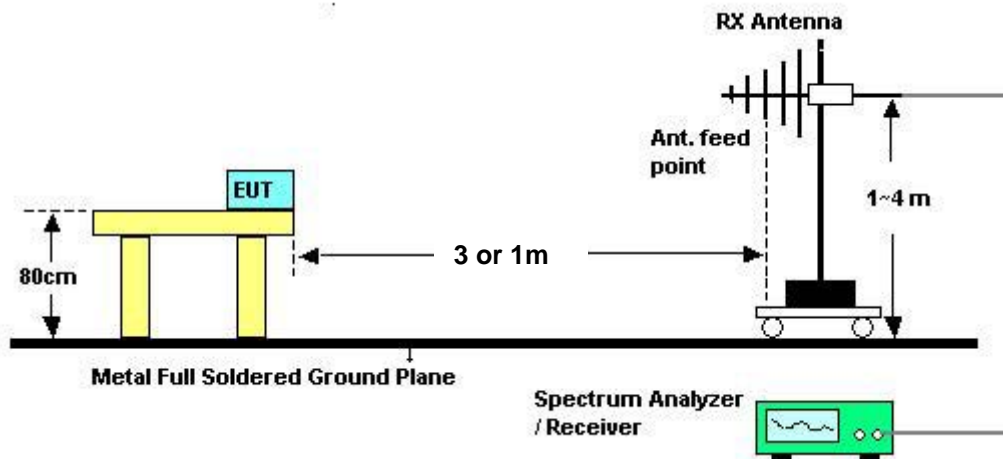
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting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

Distance extrapolation factor = $20 \log(\text{specific distance [3m]} / \text{test distance [1m]})$ (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [9.54 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	24°C	Humidity	56%
Test Engineer	Vic		

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

Note:

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

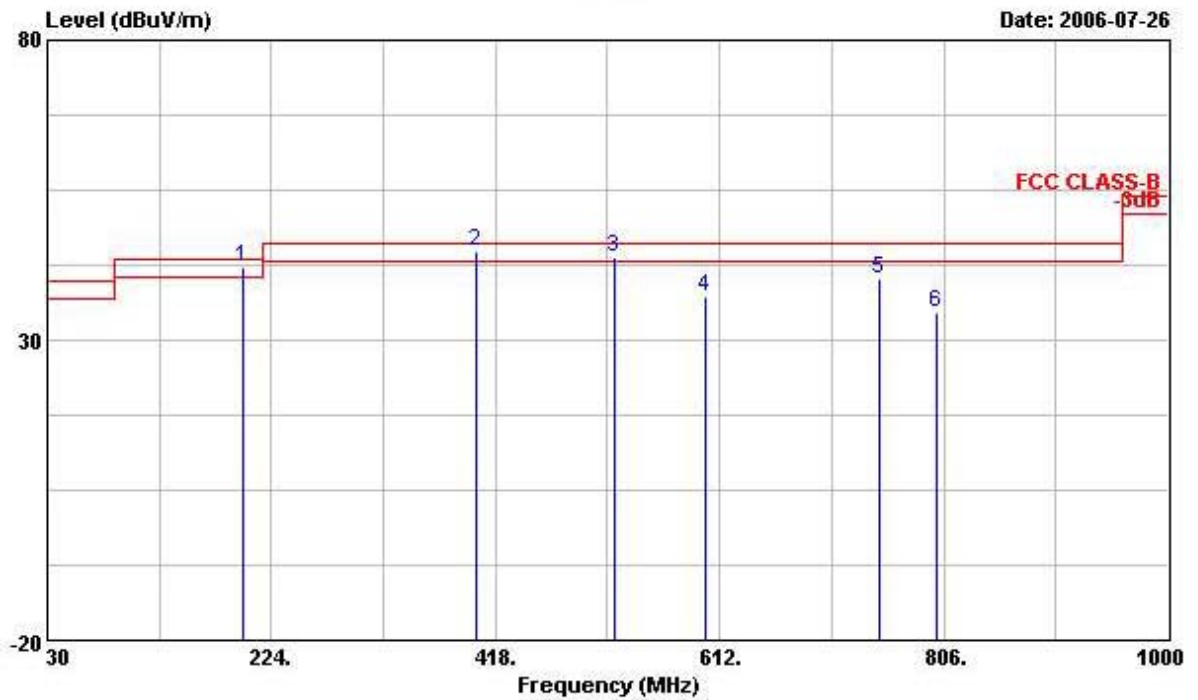
Distance extrapolation factor = $40 \log(\text{specific distance} / \text{test distance})$ (dB);

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

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

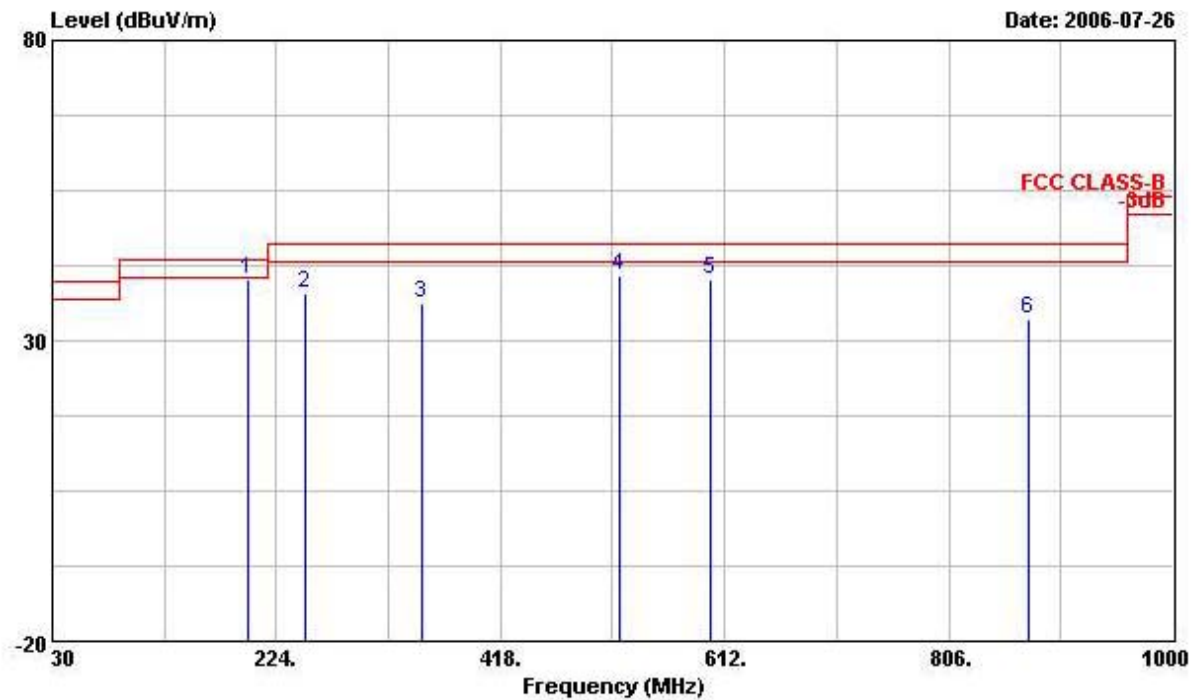
Temperature	24°C	Humidity	56%
Test Engineer	Ted Chiu	Configurations	802.11g CH 6

Horizontal



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBUV/m	dB	dBUV/m	dBuV	dB/m	dB	dB	
1 @	198.780	42.11	-1.39	43.50	58.33	9.64	2.30	28.16	QP
2 @	400.540	44.91	-1.09	46.00	54.13	16.57	3.37	29.16	QP
3 @	520.820	43.74	-2.26	46.00	51.23	18.28	3.92	29.69	QP
4	600.360	37.31	-8.69	46.00	43.20	19.30	4.49	29.68	Peak
5	749.740	40.09	-5.91	46.00	44.22	20.72	4.86	29.70	Peak
6	800.180	34.54	-11.46	46.00	38.38	20.75	5.36	29.95	Peak

Vertical



	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Remark
	MHz	dBUV/m	Limit	Line	Level	Factor	Loss	Factor	
			dB	dBUV/m	dBuV	dB/m	dB	dB	
1	198.780	40.08	-3.42	43.50	56.30	9.64	2.30	28.16	Peak
2	249.220	38.03	-7.97	46.00	51.20	12.69	2.50	28.36	Peak
3	350.100	36.24	-9.76	46.00	46.78	15.00	3.31	28.86	Peak
4	520.820	40.78	-5.22	46.00	48.27	18.28	3.92	29.69	Peak
5	600.360	40.27	-5.73	46.00	46.17	19.30	4.49	29.68	Peak
6	875.840	33.46	-12.54	46.00	36.84	20.98	5.46	29.82	Peak

Note:

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

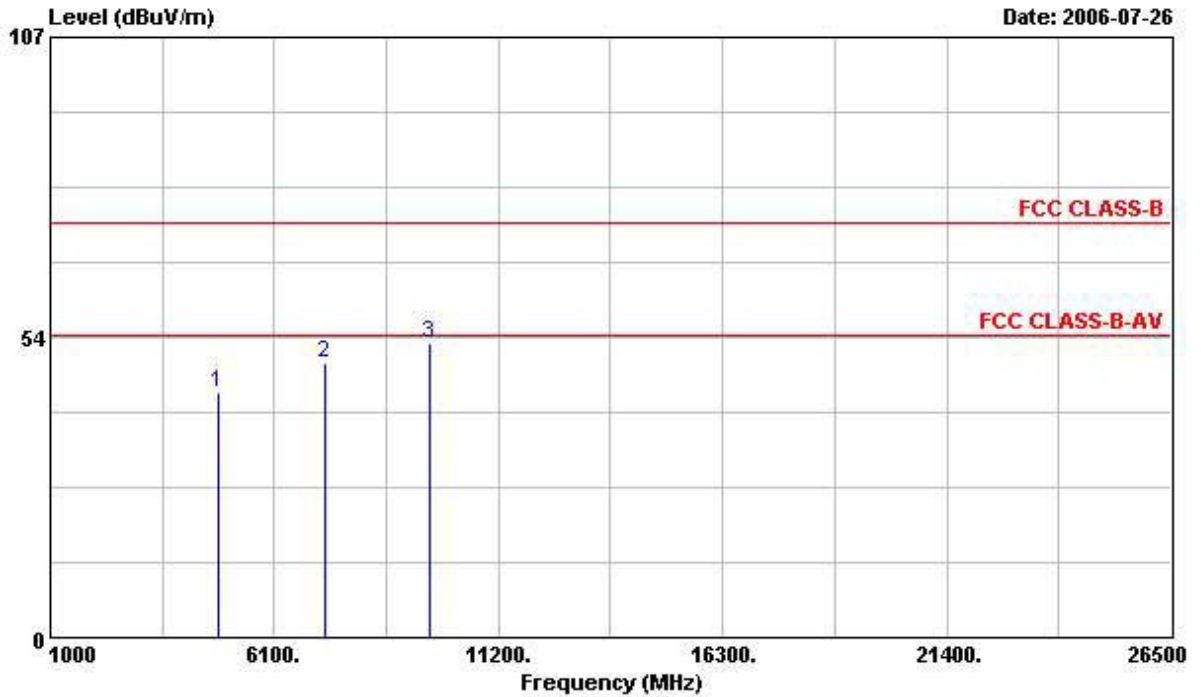
Emission level (dBUV/m) = 20 log Emission level (uV/m).

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

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

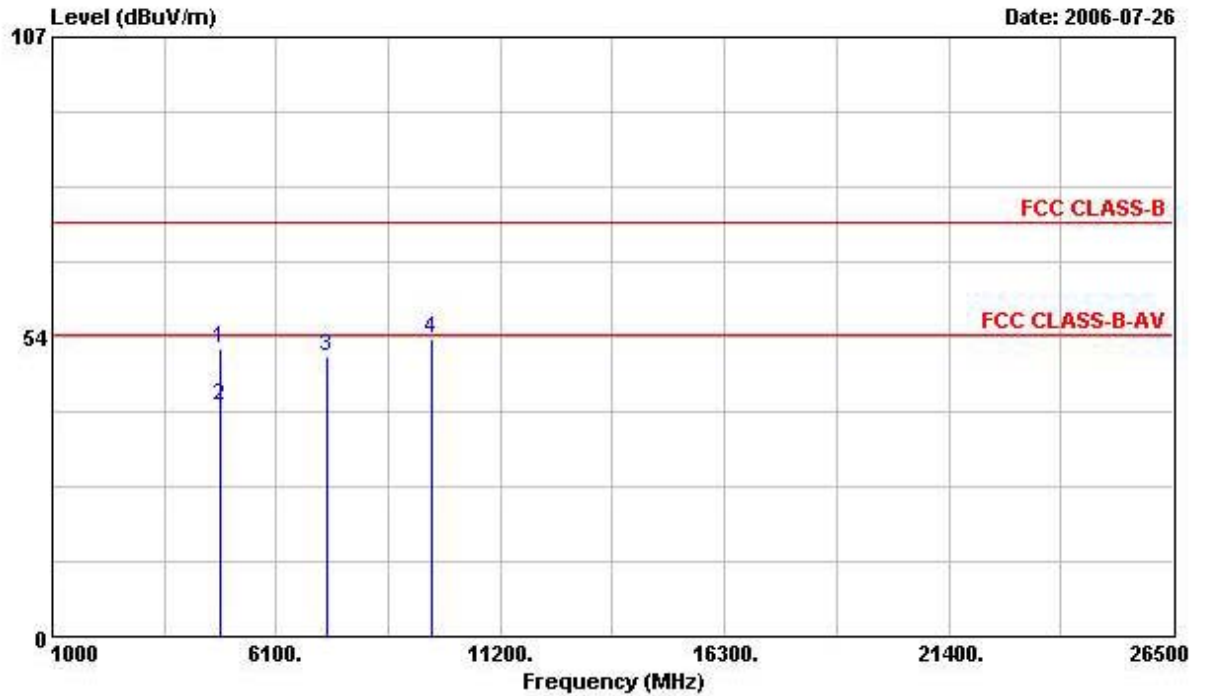
Temperature	24°C	Humidity	56%
Test Engineer	Ted Chiu	Configurations	802.11b CH 1

Horizontal



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4824.000	43.64	-30.36	74.00	39.72	33.09	3.15	32.32	PEAK
2	7236.000	48.86	-25.14	74.00	41.30	35.98	4.15	32.57	PEAK
3	9648.000	52.51	-21.49	74.00	42.31	38.58	4.42	32.80	PEAK

Vertical

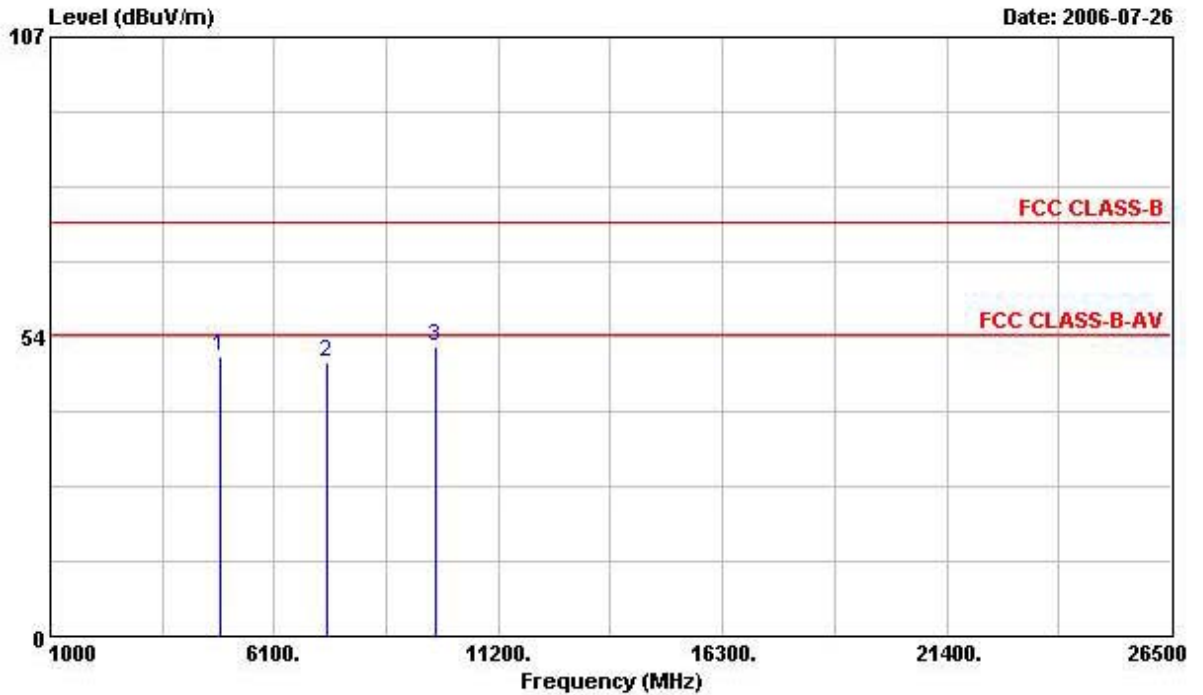


	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4824.000	51.42	-22.58	74.00	47.51	33.09	3.15	32.32	PEAK
2	4824.000	41.03	-12.97	54.00	37.11	33.09	3.15	32.32	Average
3	7236.000	49.88	-24.12	74.00	42.31	35.98	4.15	32.57	PEAK
4	9648.000	53.07	-20.93	74.00	42.87	38.58	4.42	32.80	PEAK



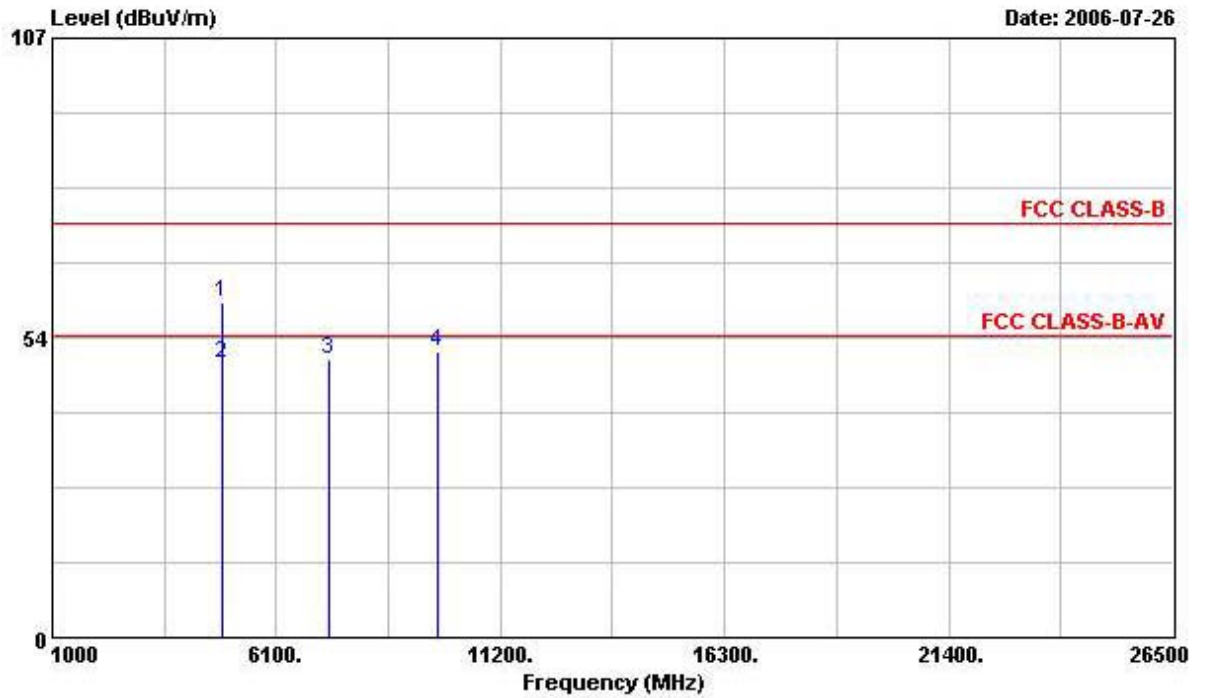
Temperature	24°C	Humidity	56%
Test Engineer	Ted Chiu	Configurations	802.11b CH 6

Horizontal



	Freq	Level	Over Limit	Limit Line	ReadAntenna	Cable	Preamp	Remark
	MHz	dBUV/m	dB	dBUV/m	dBuV	dB/m	dB	dB
1	4876.000	49.89	-24.11	74.00	45.84	33.18	3.16	32.30 PEAK
2	7311.000	49.08	-24.92	74.00	41.35	36.14	4.18	32.59 PEAK
3	9748.000	51.57	-22.43	74.00	41.15	38.77	4.44	32.80 PEAK

Vertical

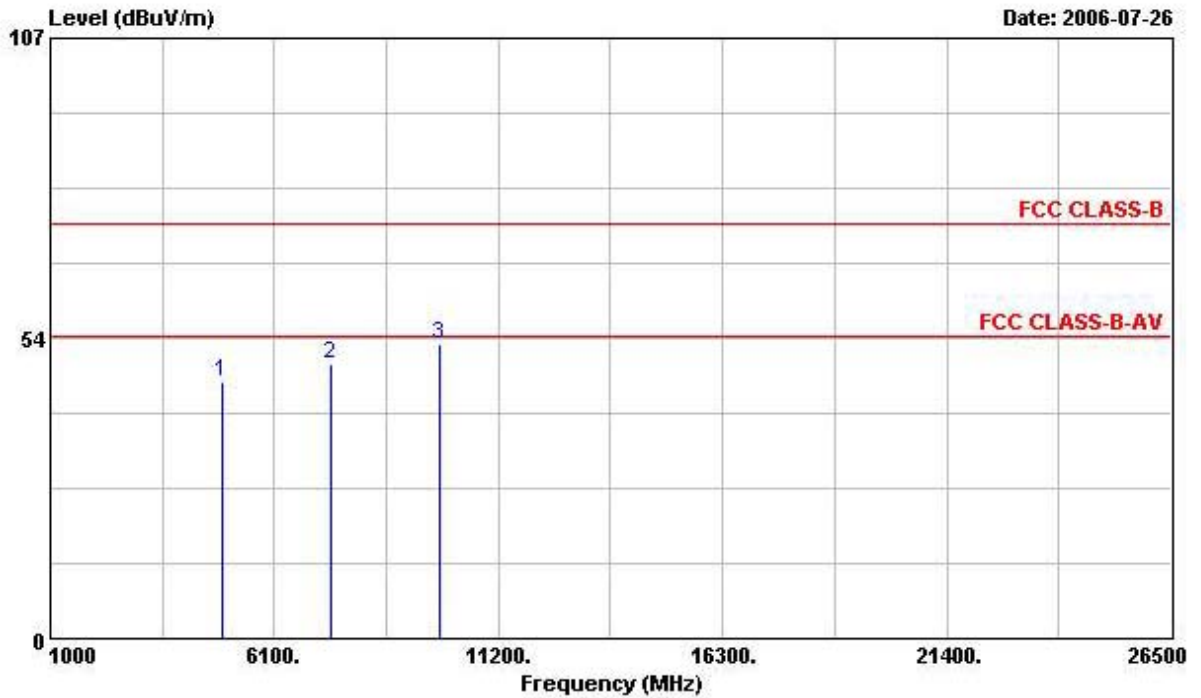


	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4876.000	59.82	-14.18	74.00	55.78	33.18	3.16	32.30	PEAK
2	4876.000	48.84	-5.16	54.00	44.79	33.18	3.16	32.30	Average
3	7311.000	49.57	-24.43	74.00	41.84	36.14	4.18	32.59	PEAK
4	9748.000	51.04	-22.96	74.00	40.62	38.77	4.44	32.80	PEAK



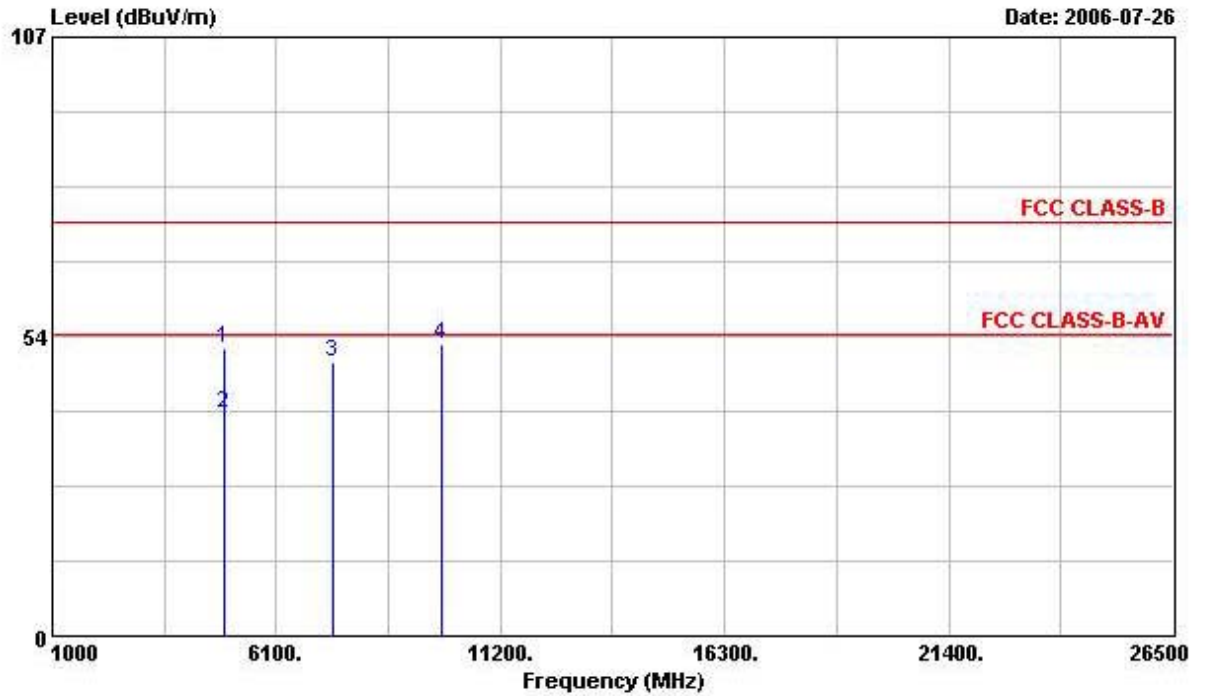
Temperature	24°C	Humidity	56%
Test Engineer	Ted Chiu	Configurations	802.11b CH 11

Horizontal



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBUV/m	dB	dBUV/m	dBuV	dB/m	dB	dB	
1	4924.000	45.75	-28.25	74.00	41.56	33.28	3.19	32.28	PEAK
2	7386.000	48.92	-25.08	74.00	40.99	36.35	4.21	32.63	PEAK
3	9848.000	52.51	-21.49	74.00	41.90	38.92	4.48	32.79	PEAK

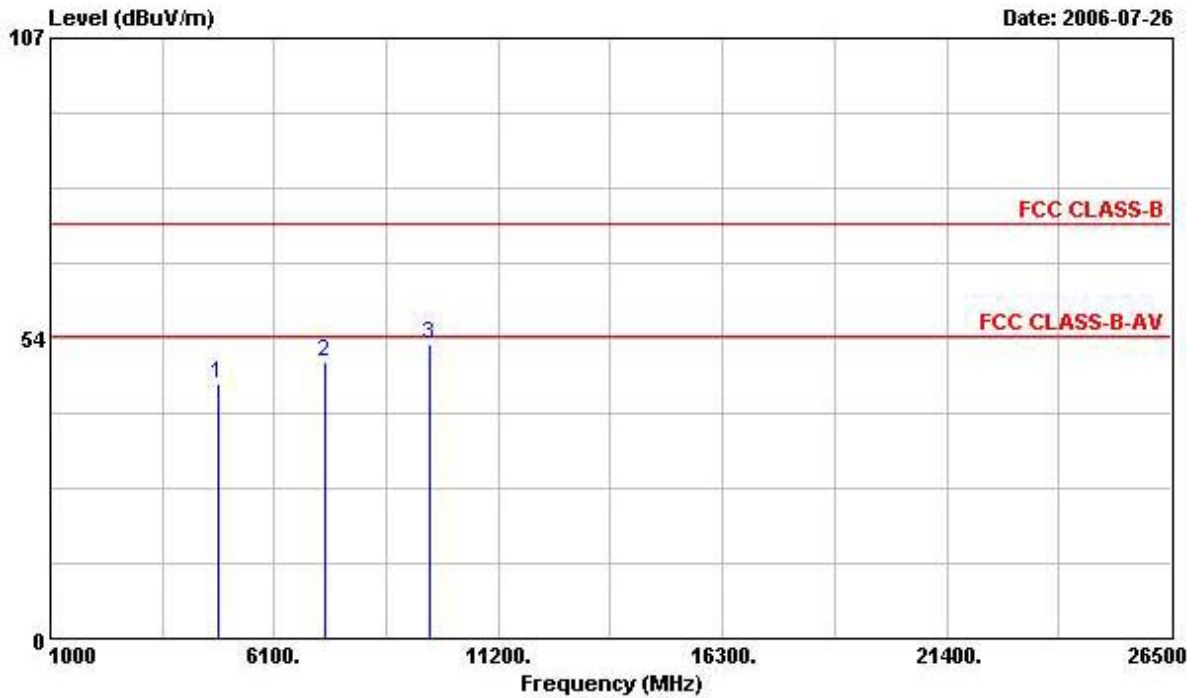
Vertical



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBUV/m	dB	dBUV/m	dBuV	dB/m	dB	dB	
1	4924.000	51.23	-22.77	74.00	47.04	33.28	3.19	32.28	PEAK
2	4924.000	39.91	-14.09	54.00	35.72	33.28	3.19	32.28	Average
3	7386.000	48.81	-25.19	74.00	40.88	36.35	4.21	32.63	PEAK
4	9848.000	51.92	-22.08	74.00	41.31	38.92	4.48	32.79	PEAK

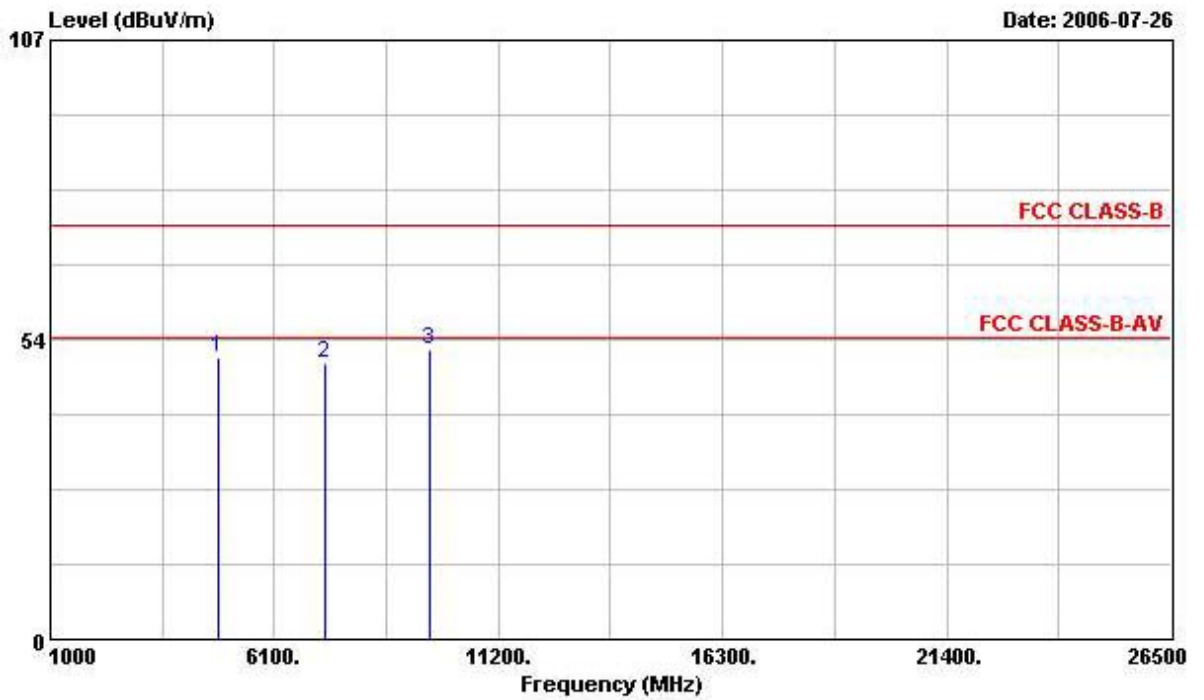
Temperature	24°C	Humidity	56%
Test Engineer	Ted Chiu	Configurations	802.11g CH 1

Horizontal



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBUV/m	dB	dBUV/m	dBuV	dB/m	dB	dB	
1	4824.000	45.27	-28.73	74.00	41.35	33.09	3.15	32.32	PEAK
2	7236.000	49.22	-24.78	74.00	41.66	35.98	4.15	32.57	PEAK
3	9648.000	52.31	-21.69	74.00	42.11	38.58	4.42	32.80	PEAK

Vertical

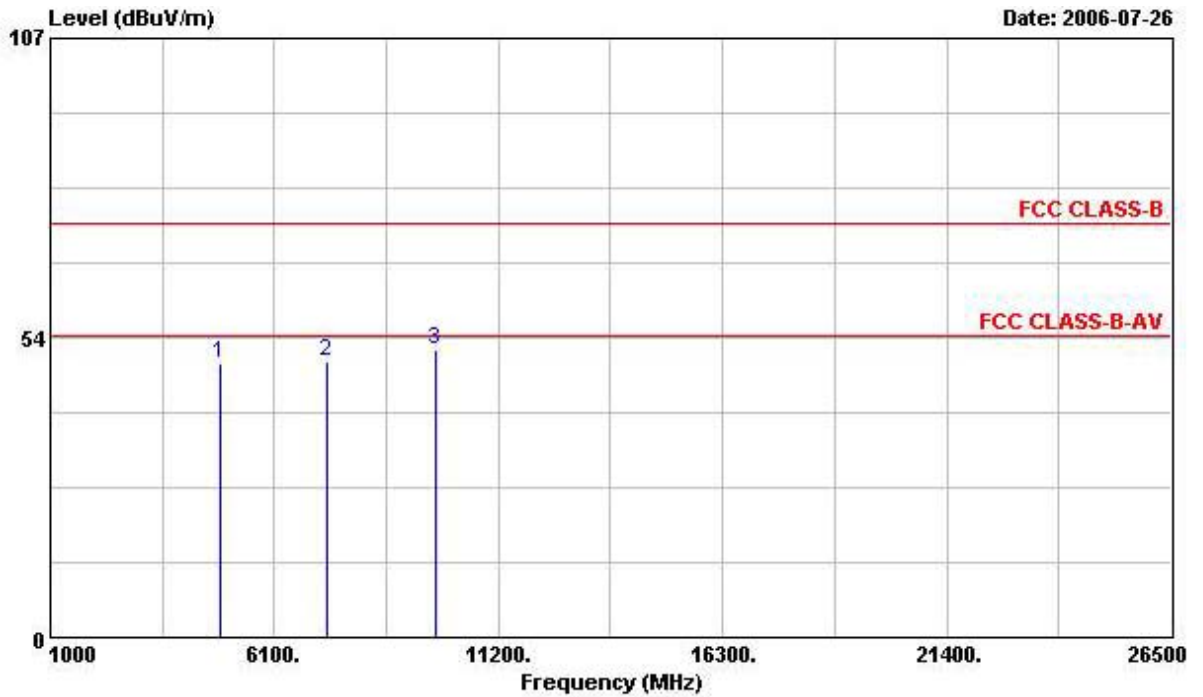


	Freq	Level	Over Limit	Limit Line	Read&Antenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBUV/m	dB	dBUV/m	dBuV	dB/m	dB	dB	
1	4824.000	50.28	-23.72	74.00	46.37	33.09	3.15	32.32	PEAK
2	7236.000	49.11	-24.89	74.00	41.55	35.98	4.15	32.57	PEAK
3	9648.000	51.91	-22.09	74.00	41.72	38.58	4.42	32.80	PEAK



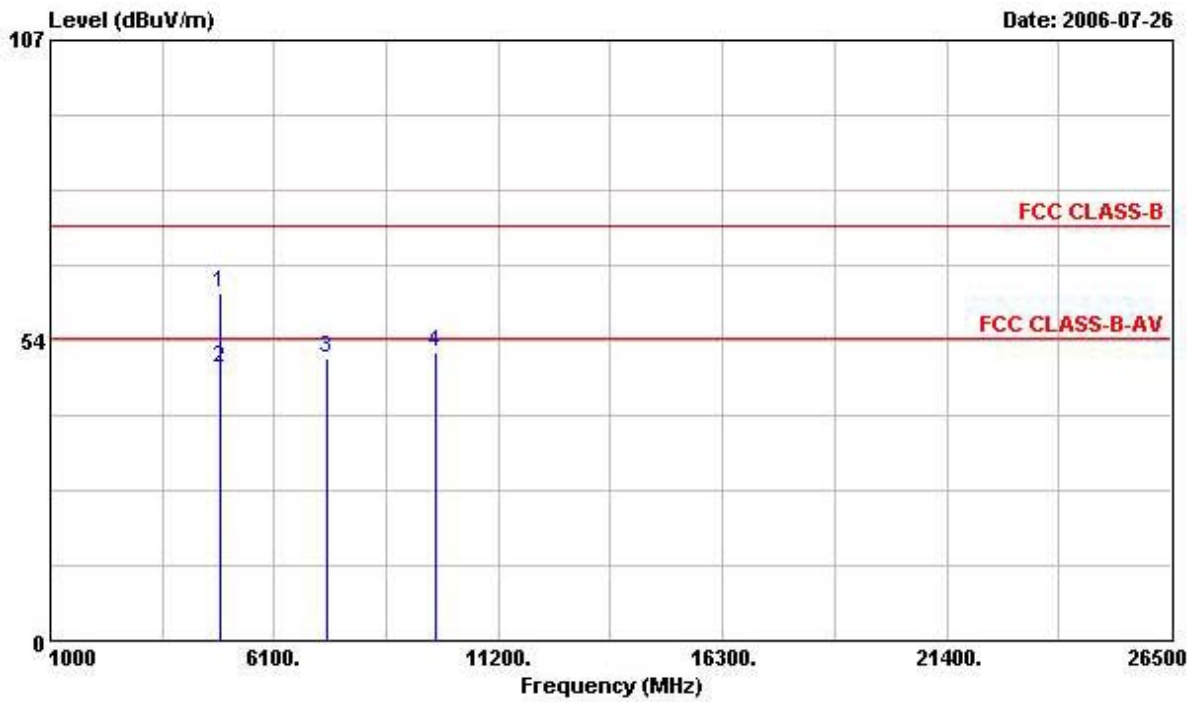
Temperature	24°C	Humidity	56%
Test Engineer	Ted Chiu	Configurations	802.11g CH 6

Horizontal



	Freq	Level	Over Limit	Limit Line	Read&Antenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBUV/m	dB	dBUV/m	dBuV	dB/m	dB	dB	
1	4868.000	49.02	-24.98	74.00	44.98	33.18	3.16	32.30	PEAK
2	7311.000	49.22	-24.78	74.00	41.48	36.14	4.18	32.59	PEAK
3	9748.000	51.35	-22.65	74.00	40.93	38.77	4.44	32.80	PEAK

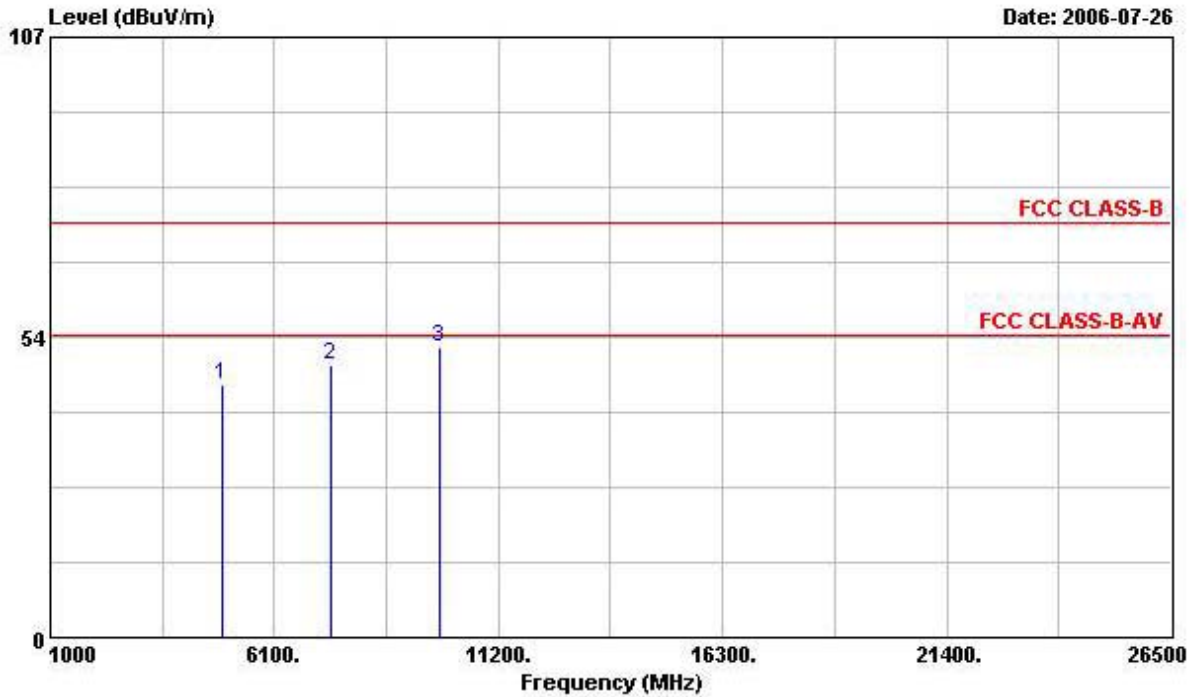
Vertical



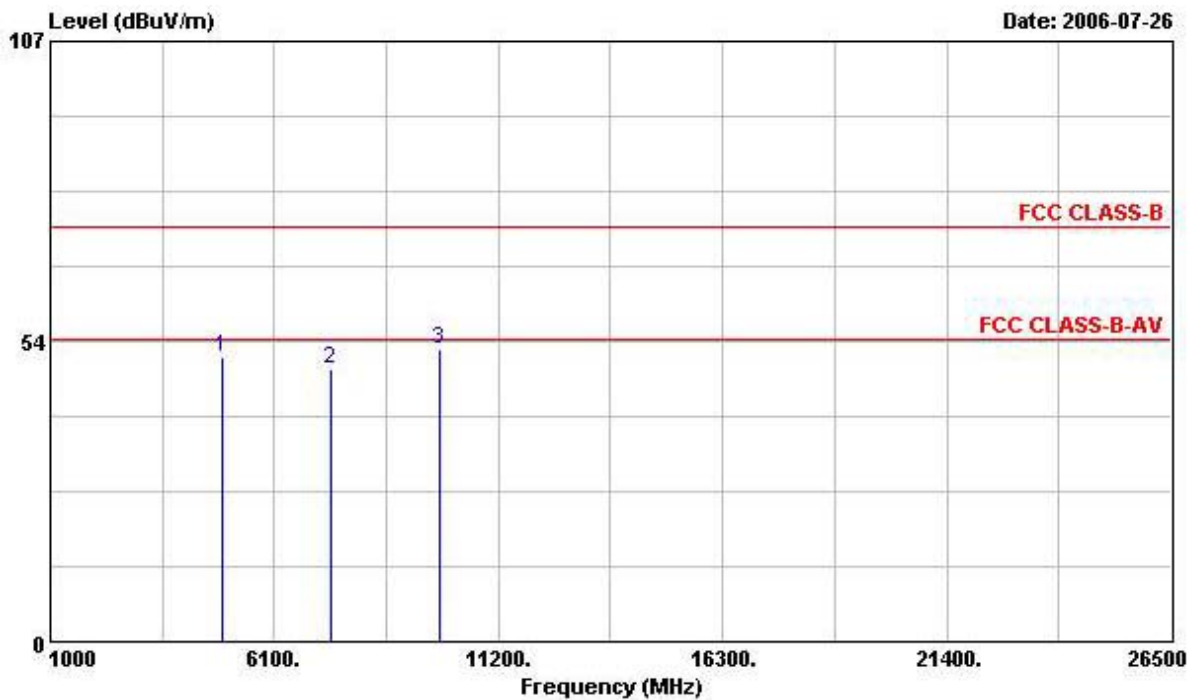
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4876.000	61.95	-12.05	74.00	57.90	33.18	3.16	32.30	PEAK
2	4876.000	48.49	-5.51	54.00	44.44	33.18	3.16	32.30	Average
3	7311.000	50.30	-23.70	74.00	42.57	36.14	4.18	32.59	PEAK
4	9748.000	51.51	-22.49	74.00	41.10	38.77	4.44	32.80	PEAK

Temperature	24°C	Humidity	56%
Test Engineer	Ted Chiu	Configurations	802.11g CH 11

Horizontal



	Freq	Level	Over Limit	Limit Line	ReadAntenna	Cable	Preamp	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	4924.000	45.15	-28.85	74.00	40.97	33.28	3.19	32.28 PEAK
2	7386.000	48.46	-25.54	74.00	40.53	36.35	4.21	32.63 PEAK
3	9848.000	51.87	-22.13	74.00	41.26	38.92	4.48	32.79 PEAK

Vertical


	Freq	Level	Over	Limit	Read&Antenna	Cable	Preamp	
	MHz	dBuV/m	Limit	Line	Level	Loss	Factor	Remark
			dB	dBuV/m	dBuV	dB	dB	
1	4928.000	50.72	-23.28	74.00	46.53	33.28	3.19	32.28 PEAK
2	7386.000	48.64	-25.36	74.00	40.71	36.35	4.21	32.63 PEAK
3	9848.000	52.06	-21.94	74.00	41.45	38.92	4.48	32.79 PEAK

Note:

The amplitude of spurious emissions which 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.

4.6. 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	24°C	Humidity	56%
Test Engineer	Ted Chiu	Configurations	802.11b CH 1, 11

Channel 1

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	2390.000	63.21	-10.79	74.00	33.03	28.29	1.88	0.00	Peak
2 @	2411.650	115.97				28.33	1.88	0.00	Peak
1	2390.000	47.89	-6.11	54.00	17.71	28.29	1.88	0.00	Average
2 @	2411.650	104.39				28.33	1.88	0.00	Average

Item 1 is Band Edge.

Channel 11

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1 #	2461.810	115.42				28.43	1.91	0.00	Peak
2	2483.500	63.61	-10.39	74.00	33.21	28.47	1.94	0.00	Peak
1 @	2461.810	103.90				28.43	1.91	0.00	Average
2	2483.500	45.09	-8.91	54.00	14.69	28.47	1.94	0.00	Average

Item 2 is Band Edge.



Temperature	24°C	Humidity	56%
Test Engineer	Ted Chiu	Configurations	802.11g CH 1, 11

Channel 1

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	2390.000	70.54	-3.46	74.00	40.36	28.29	1.88	0.00	Peak
2 #	2412.220	113.47				28.33	1.88	0.00	Peak
1	2390.000	50.02	-3.98	54.00	19.84	28.29	1.88	0.00	Average
2 @	2412.220	104.84				28.33	1.88	0.00	Average

Item 1 is Band Edge.

Channel 11

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1 #	2462.380	111.68				28.43	1.91	0.00	Peak
2	2483.500	66.10	-7.90	74.00	35.70	28.47	1.94	0.00	Peak
1 @	2462.380	103.09				28.43	1.91	0.00	Average
2	2483.500	45.88	-8.12	54.00	15.48	28.47	1.94	0.00	Average

Item 2 is Band Edge.

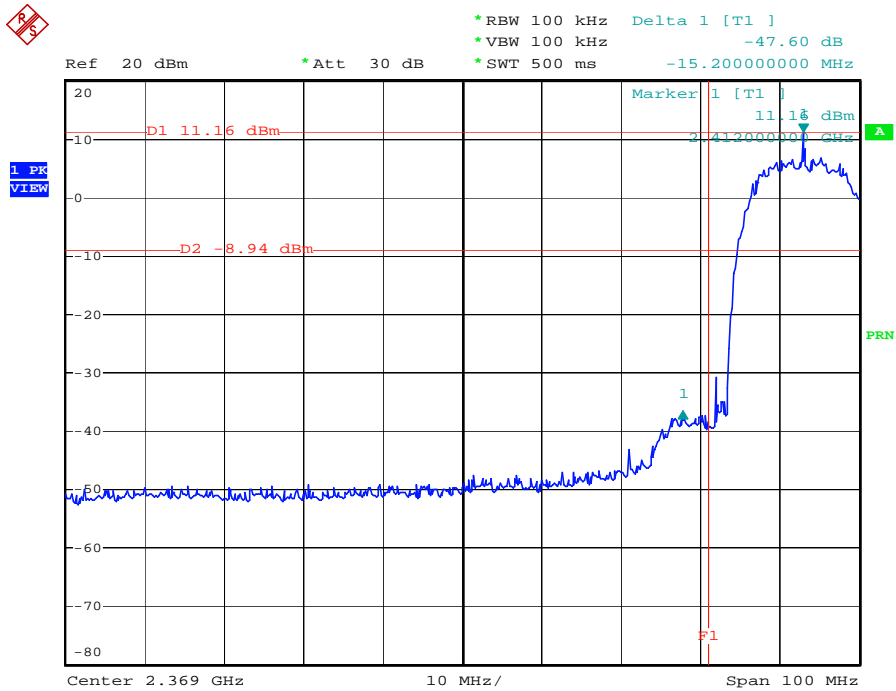
Note:

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

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

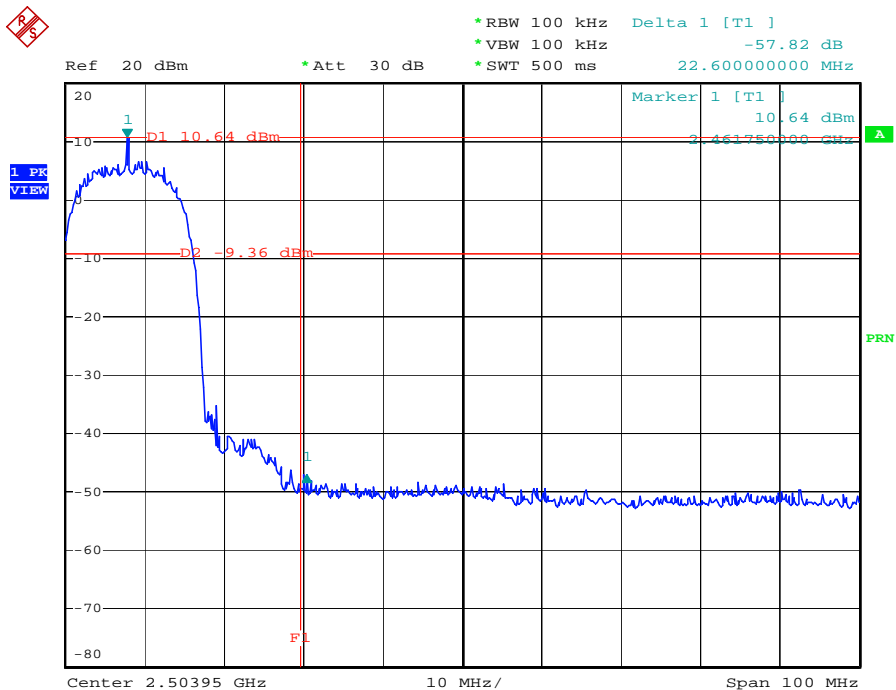
For Emission not in Restricted Band

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



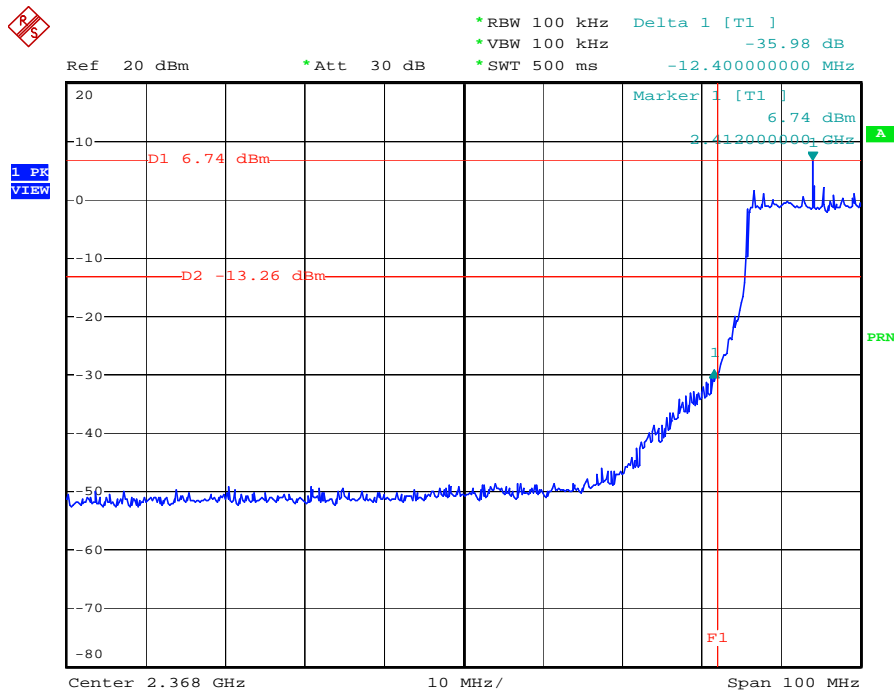
Date: 2.AUG.2006 20:24:04

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



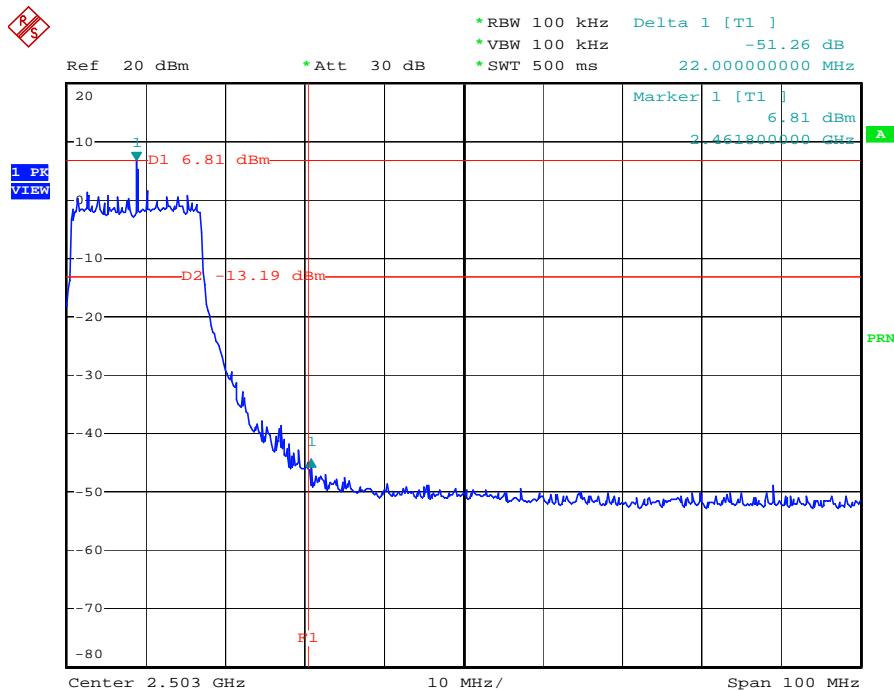
Date: 2.AUG.2006 20:12:56

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



Date: 2.AUG.2006 19:55:58

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



Date: 2.AUG.2006 20:06:12

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
Receiver	R&S	ESCS 30	100357	9 kHz - 2.75 GHz	Sep. 08, 2005	Conduction (CO01-NH)
LISN	FCC	FCC-LISN-50-32-2-01	05002	9kHz – 30MHz	Apr. 11, 2006	Conduction (CO01-NH)
LISN	KYORITSU	KNW-407	8-693-10	9kHz – 30MHz	Nov. 25, 2005	Conduction (CO01-NH)
Power Filter	CORCOM	MR12030	N/A	30A*2	N/A	Conduction (CO01-NH)
RF Cable-CON	Suhner Switzerland	RG223/U	CB004	9kHz – 30MHz	Dec. 19, 2005	Conduction (CO01-NH)
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30 MHz - 1 GHz 3m	Jun. 15, 2006	Radiation (03CH03-HY)
Amplifier	SCHAFFNER	CPA9231A	3565	9 kHz - 2 GHz	Jan. 18, 2006	Radiation (03CH03-HY)
Amplifier	Agilent	8449B	3008A02120	1 GHz - 26.5 GHz	May 29, 2006	Radiation (03CH03-HY)
Spectrum Analyzer	R&S	FSP40	100004/040	9 kHz - 40 GHz	Sep. 30, 2005	Radiation (03CH03-HY)
Bilog Antenna	SCHAFFNER	CBL 6112D	22237	30 MHz – 1 GHz	Jul. 24, 2006	Radiation (03CH03-HY)
Horn Antenna	EMCO	3115	6903	1GHz ~ 18GHz	Mar. 15, 2006	Radiation (03CH03-HY)
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15 GHz - 40 GHz	NCR	Radiation (03CH03-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	30 MHz - 1 GHz	Dec.02, 2005	Radiation (03CH03-HY)
RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	1 GHz - 40 GHz	Dec.02, 2005	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	Nov. 26, 2005	Conducted (TH01-HY)
Power Meter	R&S	NRVS	100764	DC ~ 40GHz	Jul, 20, 2006	Conducted (TH01-HY)
Power Sensor	R&S	NRV-Z51	100666	DC ~ 40GHz	Jul. 19, 2006	Conducted (TH01-HY)
Power Sensor	R&S	NRV-Z32	100057	30MHz ~ 6GHz	Jun, 10, 2006	Conducted (TH01-HY)
DC Power Source	G.W.	GPC-6030D	C671845	DC 1V ~ 60V	Dec. 28, 2005	Conducted (TH01-HY)
Temp. and Humidity Chamber	KSON	THS-C3L	612	N/A	Oct. 01, 2005	Conducted (TH01-HY)
RF CABLE-1m	Jye Bao	RG142	CB034-1m	20MHz ~ 7GHz	Dec. 30, 2005	Conducted (TH01-HY)
RF CABLE-2m	Jye Bao	RG142	CB035-2m	20MHz ~ 1GHz	Dec. 30, 2005	Conducted (TH01-HY)
Oscilloscope	Tektronix	TDS1012	CO38515	100MHz / 1GS/s	Jun. 20, 2006	Conducted (TH01-HY)
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Dec. 30, 2005	Conducted (TH01-HY)
Data Generator	Tektronix	DG2030	063-2920-50	0.1Hz~400MHz	Jun. 16, 2006	Conducted (TH01-HY)

Note: Calibration Interval of instruments listed above is one year. NCR: Non-Calibration required.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Amplifier	MITEQ	AMF-6F-260400	923364	26.5 GHz - 40 GHz	Jan. 24, 2006*	Radiation (03CH03-HY)
Loop Antenna	R&S	HFH2-Z2	860004/001	9 kHz - 30 MHz	May 23, 2006*	Radiation (03CH03-HY)
AC Power Source	HPC	HPA-500W	HPA-9100024	AC 0 ~ 300V	Apr. 21, 2005*	Conducted (TH01-HY)

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 2 nd Rd., Taipei 114, Taiwan, R.O.C. TEL : 886-2-2794-8886 FAX : 886-2-2794-9777
JHUBEI	ADD : No.8, Lane 728, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C. TEL : 886-3-656-9065 FAX : 886-3-656-9085

7. NVLAP CERTIFICATE OF ACCREDITATION

United States Department of Commerce
National Institute of Standards and Technology

NVLAP[®]

Certificate of Accreditation to ISO/IEC 17025:1999

NVLAP LAB CODE: 200079-0

Sporton International, Inc. Hwa Ya EMC Laboratory
Tao Yuan Hsien 333
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*is recognized by the National Voluntary Laboratory Accreditation Program for conformance with criteria set forth in
NIST Handbook 150:2001 and all requirements of ISO/IEC 17025:1999.
Accreditation is granted for specific services, listed on the Scope of Accreditation, for:*

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

2006-01-01 through 2006-12-31
Effective dates



[Signature]
For the National Institute of Standards and Technology

NVLAP-01C (REV. 2005-05-19)