



SPORTON International Inc.

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FCC RADIO TEST REPORT

Applicant's company	Billionton Systems Inc.
Applicant Address	No.21, Sui-Lih rd., Hsin-Chu, Taiwan
FCC ID	NLFGCBLARL
Manufacturer's company	Billionton Systems Inc.
Manufacturer Address	No.21, Sui-Lih rd., Hsin-Chu, Taiwan

Product Name	Cardbus Wireless LAN 11a / b / g card
Model Name	GCBWLARL / GCBWLARL-S
Test Rule Part(s)	47 CFR FCC Part 15 Subpart C § 15.247
Test Freq. Range	2400 ~ 2483.5MHz / 5725 ~ 5850MHz
Receive Date	May 17, 2006
Test Date	Jun. 5, 2006
Submission Type	Original Equipment



Statement

Test result included is only for the 802.11b/g part and 802.11a (5725 ~ 5850MHz) 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.

NVLAP[®]

Lab Code: 200079-0

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History of This Test Report

Original Issue Date: Jun. 8, 2006

Report No.: FR650316-AB

■ No additional attachment.

Additional attachment were issued as following record:



1. CERTIFICATE OF COMPLIANCE

Product Name : Cardbus Wireless LAN 11a / b / g card
Model Name : GCBWLARL / GCBWLARL-S
Applicant : Billington Systems Inc.
Test Rule Part(s) : 47 CFR FCC Part 15 Subpart C § 15.247

Sportun International as requested by the applicant to evaluate the EMC performance of the product sample received on May 17, 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.

Handwritten signature of Jacky Luo in blue ink, dated 12-6-06.

Prepared By:

Jacky Luo / Specialist

Handwritten signature of Carl Lee in blue ink, dated 12-6-06.

Tested By:

Carl Lee / Engineer

Handwritten signature of Wayne Hsu in blue ink, dated 12-6-06.

Reviewed By:

Wayne Hsu



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	12.11 dB
4.2	15.247(b)(3)	Maximum Peak Conducted Output Power	Complies	14.06 dB
4.3	15.247(e)	Power Spectral Density	Complies	19.14 dB
4.4	15.247(a)(2)	6dB Spectrum Bandwidth	Complies	-
4.5	15.247(d)	Radiated Emissions	Complies	0.94 dB
4.6	15.247(d)	Band Edge Emissions	Complies	0.45 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	±0.5dB	Confidence levels of 95%
Power Spectral Density	±0.71dB	Confidence levels of 95%
6dB Spectrum Bandwidth	±6.25×10-7	Confidence levels of 95%
Radiated Emissions/ Band Edge Emissions	±3.72dB	Confidence levels of 95%

3. GENERAL INFORMATION

3.1. Product Details

EUT is a Cardbus Wireless LAN 11a / b / g card with IEEE 802.11a/b/g radio functions. Only the RF detail of EUT 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	Host from Notebook
Modulation	DSSS for IEEE 802.11b ; OFDM for IEEE 802.11a/g
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 / 5725 ~ 5850MHz
Channel Number	11b/g: 11 ; 11a: 5
Channel Band Width (99%)	11b: 15.08 MHz ; 11g: 16.48 MHz ; 11a: 16.48 MHz
Conducted Output Power	11b: 15.94 dBm ; 11g: 12.83 dBm ; 11a: 12.71 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

3.2. Accessories

NA

3.3. Table for Filed Antenna

Ant.	Antenna Type	Connector	Gain (dBi)
1	PCB Antenna	NA	2.26 for 2.4GHz
			2.72 for 5GHz



3.4. Table for Carrier Frequencies

Frequency Allocation for 802.11a

Frequency Band	Channel No.	Frequency
5725~5850 MHz (USA/Canada/Taiwan)	149	5745 MHz
	153	5765 MHz
	157	5785 MHz
	161	5805 MHz
	165	5825 MHz

Frequency Allocation for 802.11b/g

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 11g / 11a	11 Mbps	6 /157	1
Max. 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
	11a/BPSK	6 Mbps	149/157/165	NA
Radiated Emissions Below 1GHz	11g/BPSK 11a / BPSK	6 Mbps	6 / 157	1
Radiated Emissions Above 1GHz Band Edge Emissions	11b/CCK	11 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
	11a/BPSK	6 Mbps	149/157/165	1
Band Edge Emissions	11b/CCK	11 Mbps	1/11	1
	11g/BPSK	6 Mbps	1/11	1
	11a/BPSK	6 Mbps	149/165	1

Note:

CRX=continuously receiving

EUT was pretested in different modes.

SST power amplifier and Triquint power is electrically identical.

Mode 1 is with SST power amplifier (model name: SST13LP05)

Mode 2 is with Triquint power amplifier (model name: TQM7M7001)

Mode 1 is the worst case. Only the worst case show in the report.

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	-	-	-
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
Modem	ACEEX	DM-1414	IFAXDM1414
FLASH	ASUS	-	-
Notebook	DELL	PPT(D400)	-

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	QA Test_QA2561		
Frequency	2412 MHz	2437 MHz	2462 MHz
IEEE 802.11b	A	A	A
IEEE 802.11g	3	3	3

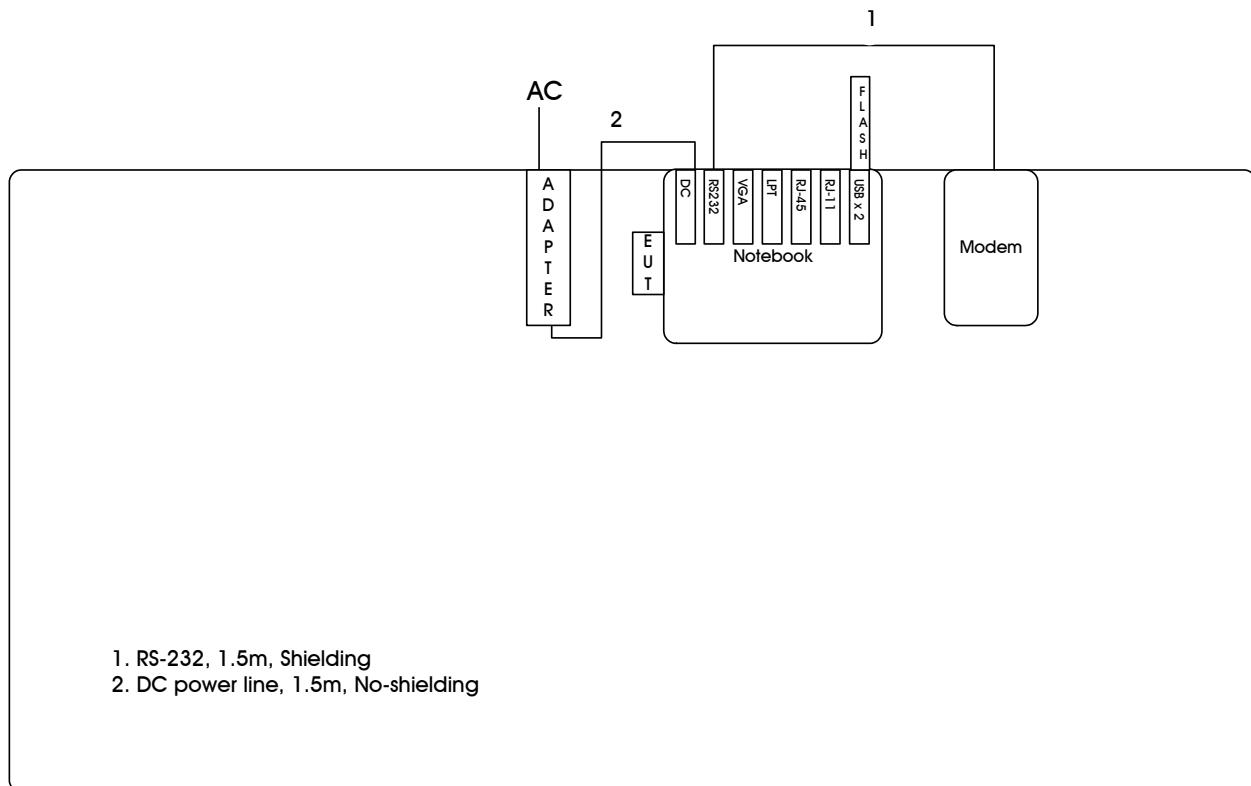
Power Parameters of IEEE 802.11a

Test Software Version	QA Test_QA2561		
Frequency	5745 MHz	5785 MHz	5825 MHz
IEEE 802.11a	15	17	17

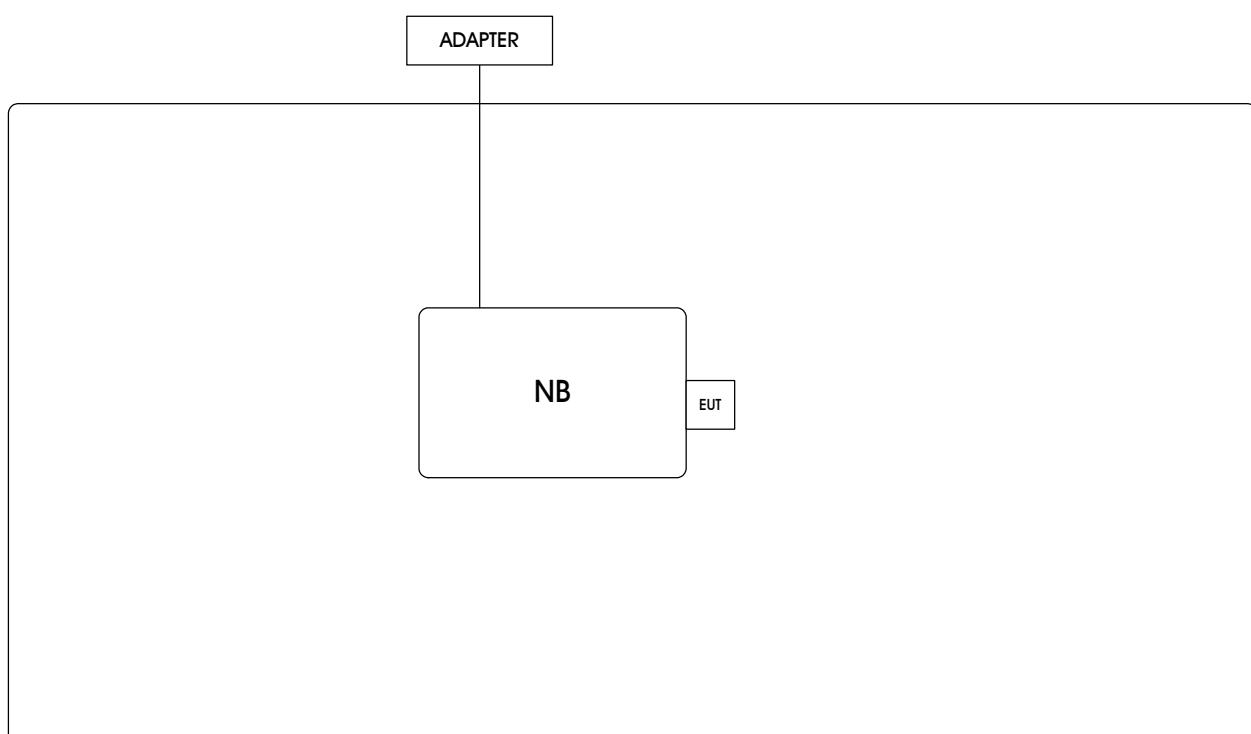
3.9. Test Configurations

3.9.1. Radiation Emissions Test Configuration

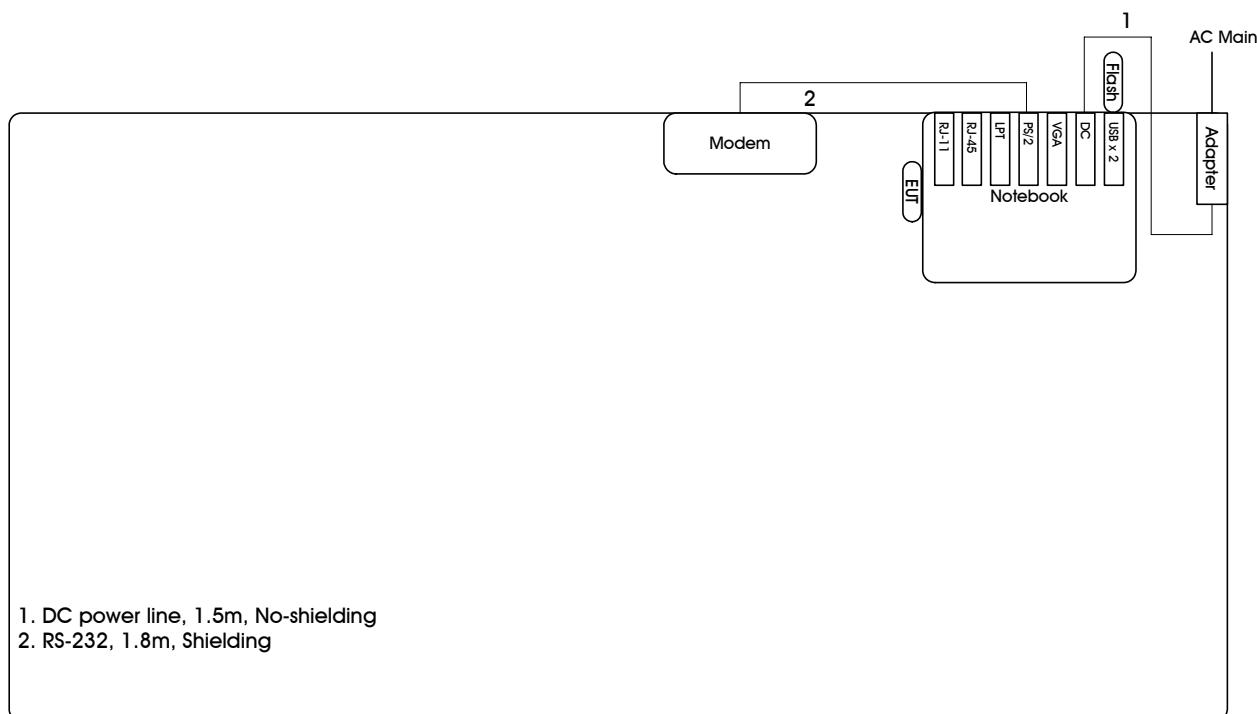
(9KHz~1GHz)



(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 a Low-power Radio-frequency Device 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

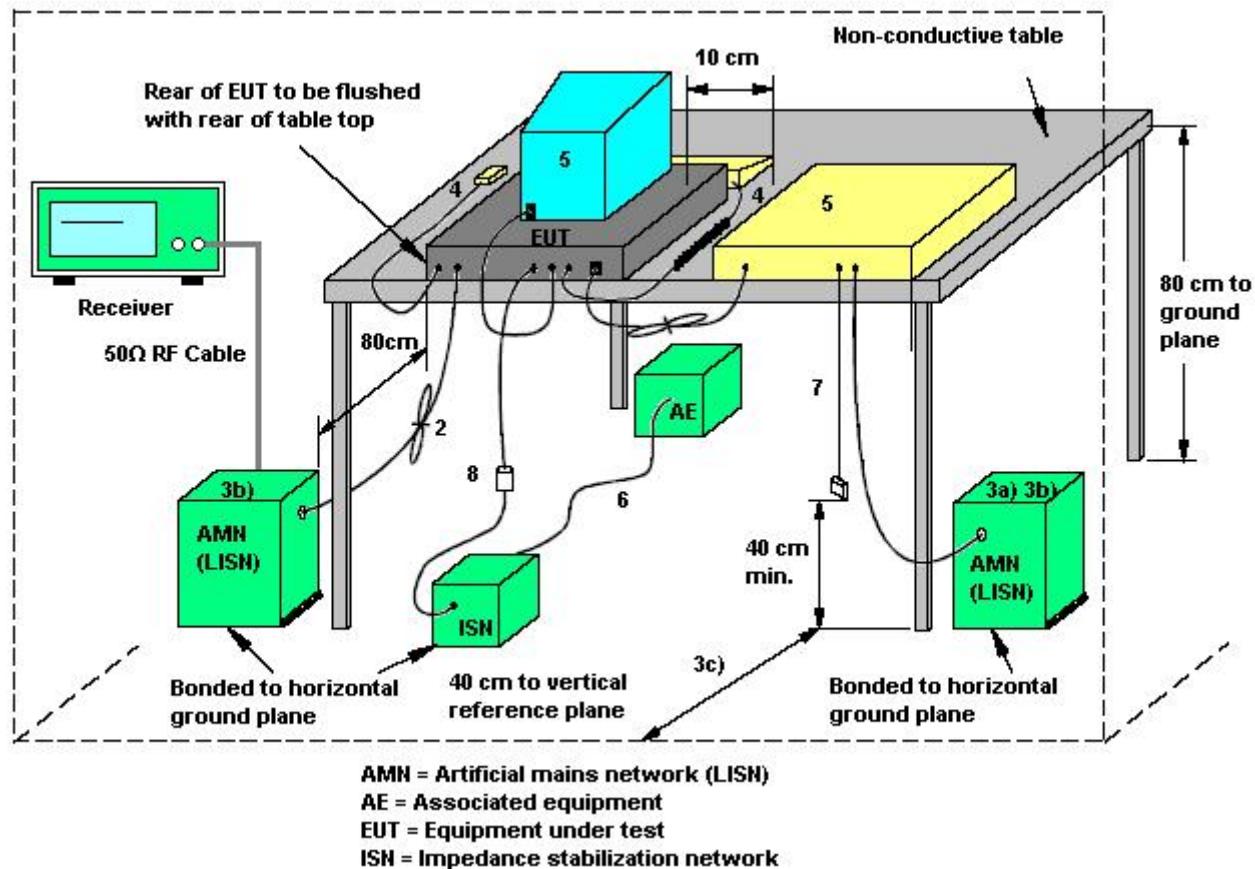
Please refer to section 5 in this report. The following table is the setting of the receiver.

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



1. If cables, which hang closer than 40 cm to the horizontal metal groundplane, cannot be shortened to appropriate length, the excess shall be folded back and forth forming a bundle 30 cm to 40 cm long.
2. Excess mains cord shall be bundled in the centre or shortened to appropriate length.
3. EUT is connected to one artificial mains network (AMN). All AMNs and ISNs may alternatively be connected to a vertical reference plane or metal wall.
4. All other units of a system are powered from a second AMN. A multiple outlet strip can be used for multiple mains cords.
5. AMN and ISN are 80 cm from the EUT and at least 80 cm from other units and other metal planes.
6. Mains cords and signal cables shall be positioned for their entire lengths, as far as possible, at 40 cm from the vertical reference plane.
7. Cables of hand operated devices, such as keyboards, mouses, etc. shall be placed as for normal usage.
8. Peripherals shall be placed at a distance of 10 cm from each other and from the controller, except for the monitor which, if this is an acceptable installation practice, shall be placed directly on the top of the controller.
9. I/O signal cable intended for external connection.
10. The end of the I/O signal cables which are not connected to an AE may be terminated, if required, using correct terminating impedance.
11. If used, the current probe shall be placed at 0,1 m from the ISN.

4.1.5. Test Deviation

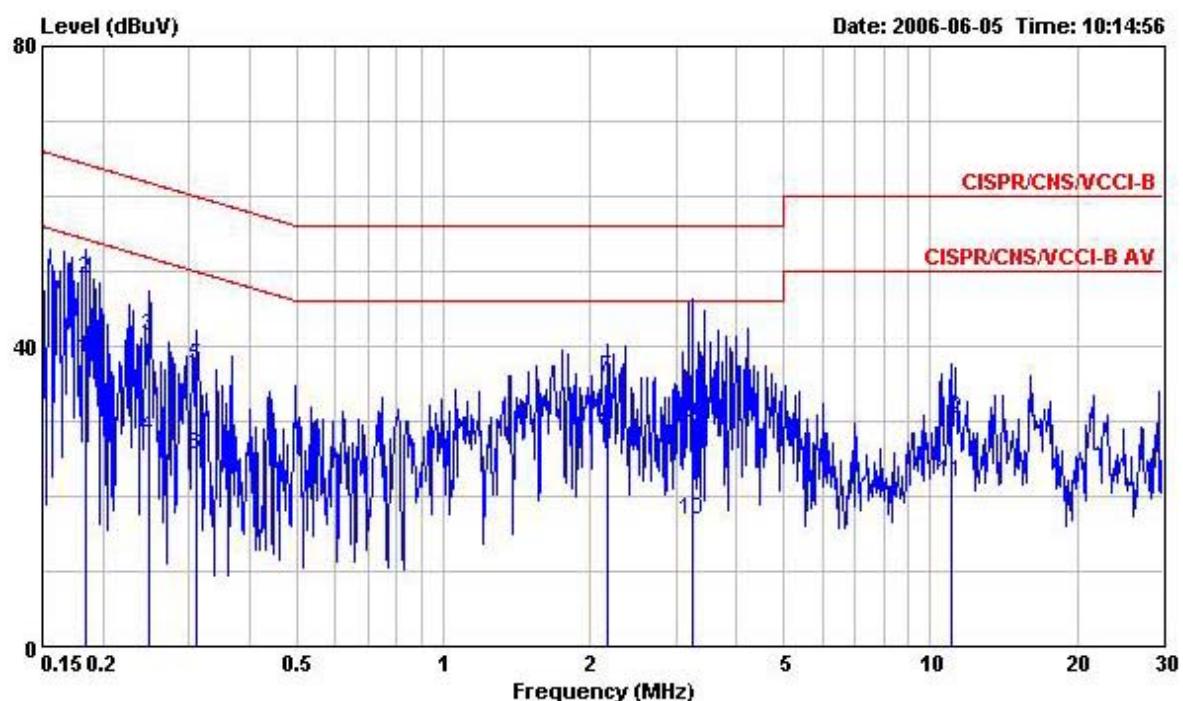
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

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

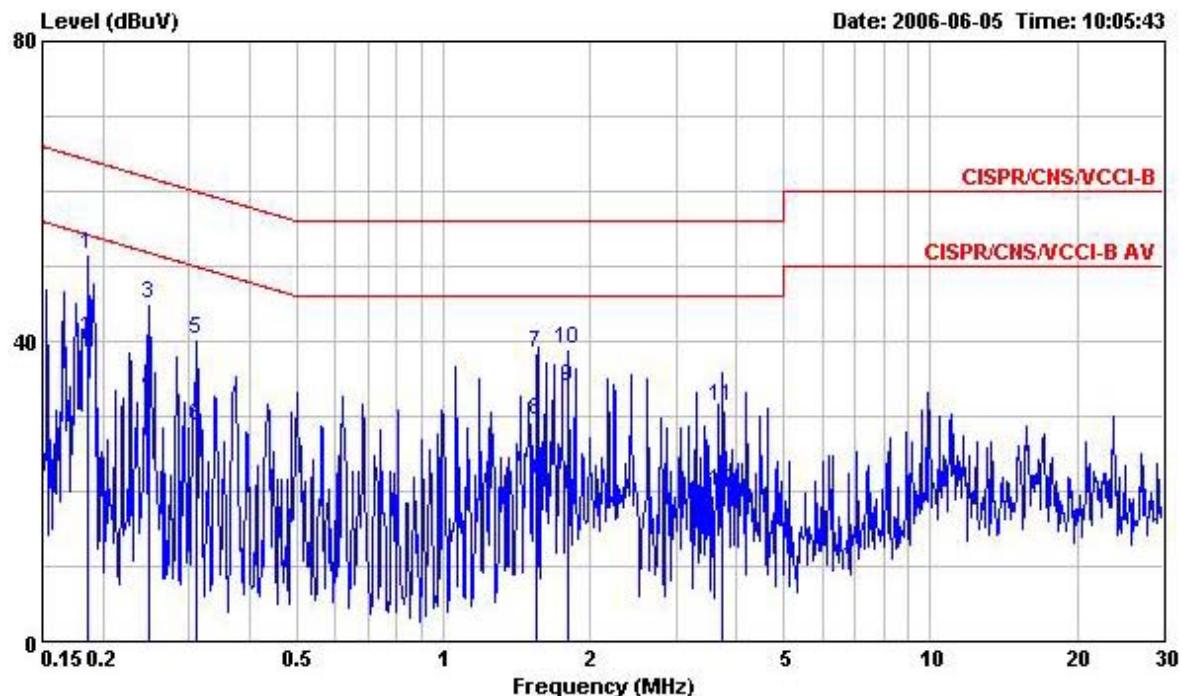
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	27°C	Humidity	53%
Test Engineer	Ted Chiu	Phase	Line
Configuration	Normal Link 802.11g Ch6 / 802.11a CH157		



Freq	Level	Over Limit	Limit Line	Read Level		LISN Factor	Cable Loss	Remark
				MHz	dBuV	dB	dBuV	dB
1	0.1844300	38.33	-15.95	54.28	38.19	0.10	0.04	Average
2	0.1844300	49.05	-15.23	64.28	48.91	0.10	0.04	QP
3	0.2494540	41.36	-20.42	61.78	41.20	0.10	0.06	QP
4	0.2494540	27.91	-23.87	51.78	27.75	0.10	0.06	Average
5	0.3099790	37.43	-22.54	59.97	37.25	0.10	0.08	QP
6	0.3099790	25.46	-24.51	49.97	25.28	0.10	0.08	Average
7	2.170	35.74	-20.26	56.00	35.42	0.10	0.22	QP
8	2.170	28.31	-17.69	46.00	27.99	0.10	0.22	Average
9	3.240	29.61	-26.39	56.00	29.17	0.10	0.34	QP
10	3.240	16.73	-29.27	46.00	16.29	0.10	0.34	Average
11	11.080	21.72	-28.28	50.00	20.82	0.30	0.60	Average
12	11.080	30.23	-29.77	60.00	29.33	0.30	0.60	QP

Temperature	27°C	Humidity	53%
Test Engineer	Ted Chiu	Phase	Neutral
Configuration	Normal Link 802.11g Ch6 / 802.11a CH157		



Freq	Level	Over	Limit	Read	LISN	Cable
		Limit	Line	Level	Factor	Loss
MHz	dBuV	dB	dBuV	dBuV	dB	dB
1 @ 0.1851370	51.71	-12.54	64.25	51.57	0.10	0.04 QP
2 @ 0.1851370	40.16	-14.09	54.25	40.02	0.10	0.04 Average
3 @ 0.2494540	45.03	-16.75	61.78	44.87	0.10	0.06 QP
4 @ 0.2494540	33.10	-18.68	51.78	32.94	0.10	0.06 Average
5 @ 0.3099790	40.29	-19.68	59.97	40.11	0.10	0.08 QP
6 @ 0.3099790	28.66	-21.31	49.97	28.48	0.10	0.08 Average
7 @ 1.550	38.50	-17.50	56.00	38.02	0.10	0.38 QP
8 @ 1.550	29.45	-16.55	46.00	28.97	0.10	0.38 Average
9 @ 1.800	33.89	-12.11	46.00	33.51	0.10	0.28 Average
10 @ 1.800	38.97	-17.03	56.00	38.59	0.10	0.28 QP
11 @ 3.740	31.34	-24.66	56.00	30.77	0.19	0.38 QP
12 @ 3.740	19.94	-26.06	46.00	19.37	0.19	0.38 Average

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 limit has to be reduced by the amount in dB that the gain of the antenna exceeds 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. Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted output power.

4.2.2. Measuring Instruments and Setting

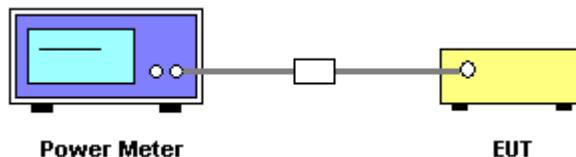
Please refer to section 5 in this report. The following table is the setting of the power meter.

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	802.11a/b/g

Configuration IEEE 802.11b

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	15.61	30.00	Complies
6	2437 MHz	15.94	30.00	Complies
11	2462 MHz	15.52	30.00	Complies

Configuration IEEE 802.11g

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	12.32	30.00	Complies
6	2437 MHz	12.83	30.00	Complies
11	2462 MHz	12.35	30.00	Complies

Configuration IEEE 802.11a

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
149	5745 MHz	12.57	30.00	Complies
157	5785 MHz	12.71	30.00	Complies
165	5825 MHz	11.54	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

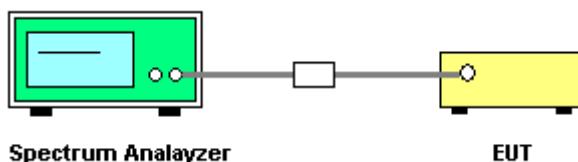
Please refer to section 5 in this report. The following table is the setting of Spectrum Analyzer.

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

4.3.6. There is no deviation with the original standard. 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	802.11a/b/g

Configuration IEEE 802.11b

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	-11.14	8.00	Complies
6	2437 MHz	-11.15	8.00	Complies
11	2462 MHz	-11.16	8.00	Complies

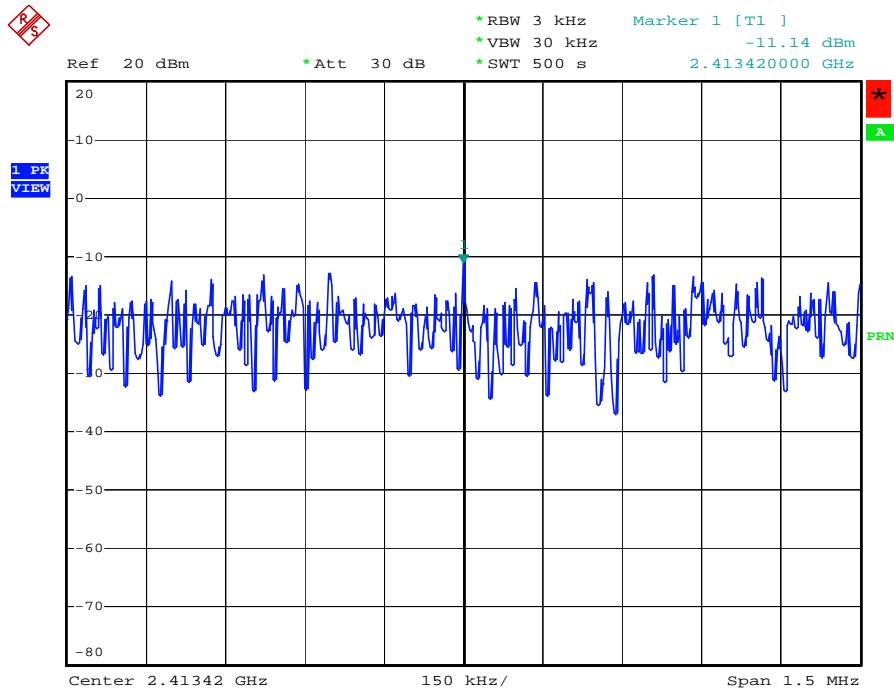
Configuration IEEE 802.11g

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	-22.70	8.00	Complies
6	2437 MHz	-22.39	8.00	Complies
11	2462 MHz	-22.69	8.00	Complies

Configuration IEEE 802.11a

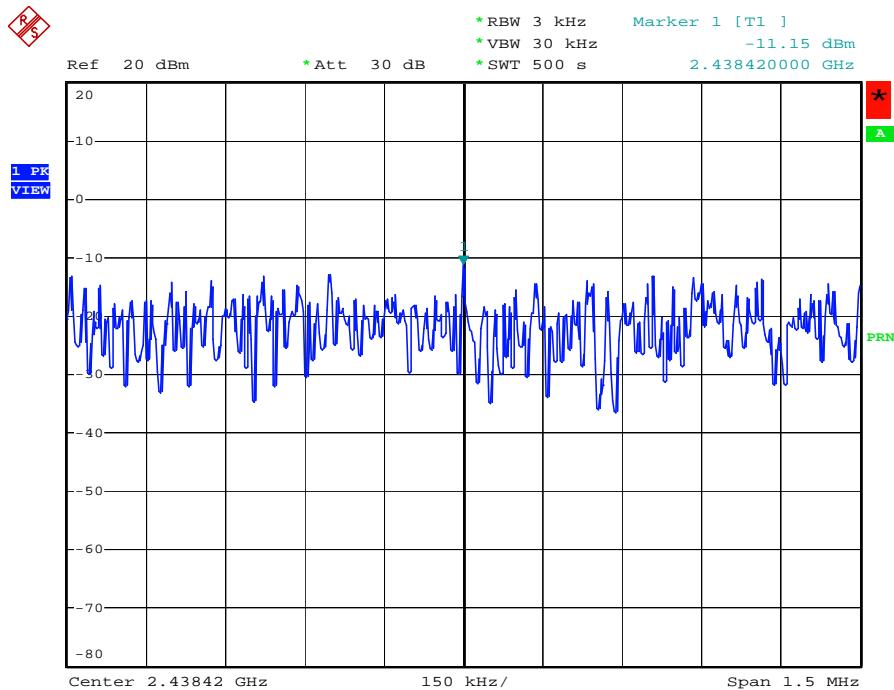
Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
149	5745 MHz	-21.66	8.00	Complies
157	5785 MHz	-21.63	8.00	Complies
165	5825 MHz	-22.99	8.00	Complies

Power Density Plot on Configuration IEEE 802.11b / 2412 MHz



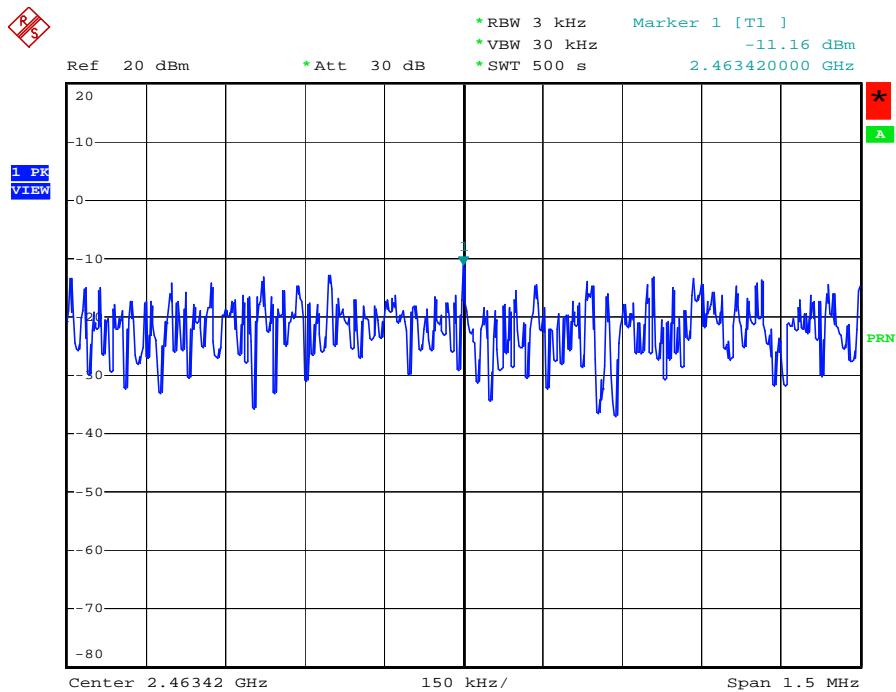
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Power Density Plot on Configuration IEEE 802.11b / 2437 MHz



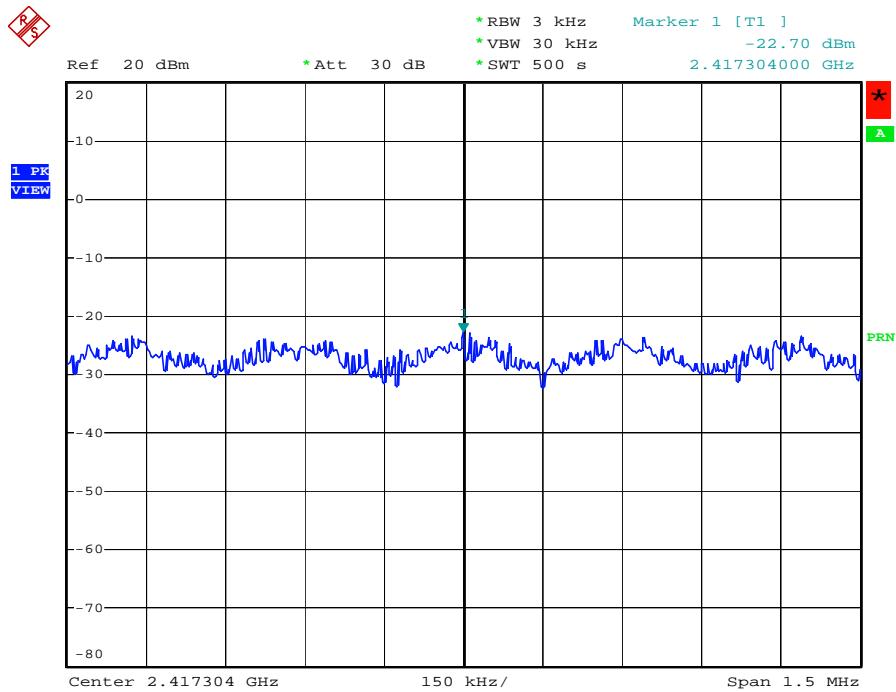
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Power Density Plot on Configuration IEEE 802.11b / 2462 MHz



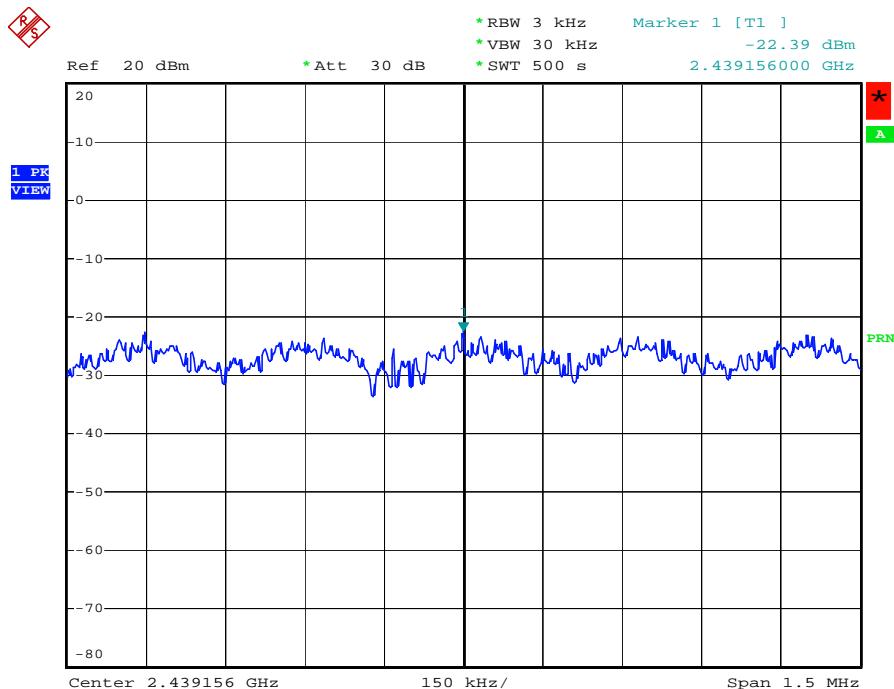
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Power Density Plot on Configuration IEEE 802.11g / 2412 MHz



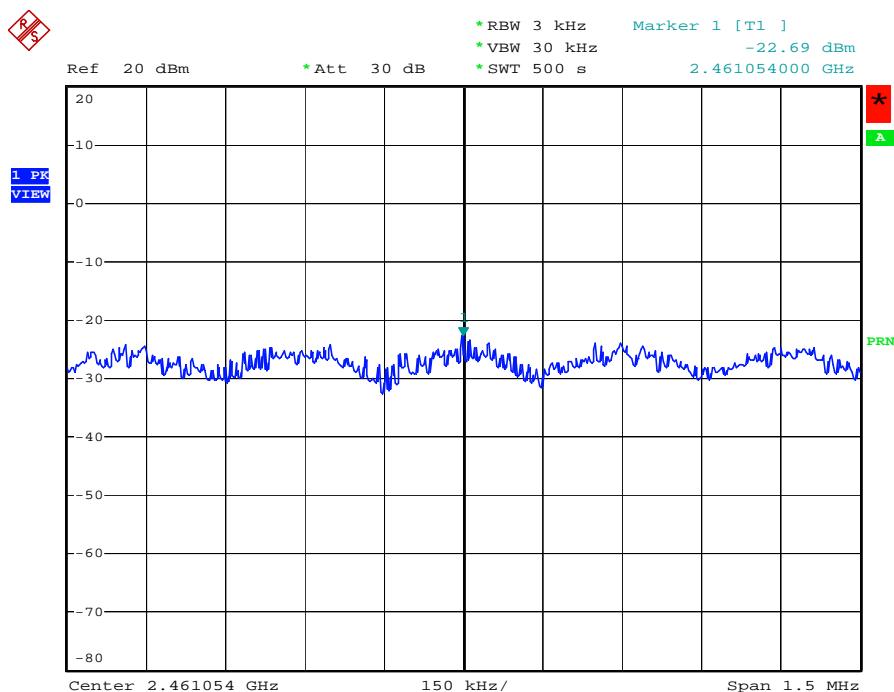
Date: 1.JUN.2006 12:03:25

Power Density Plot on Configuration IEEE 802.11g / 2437 MHz



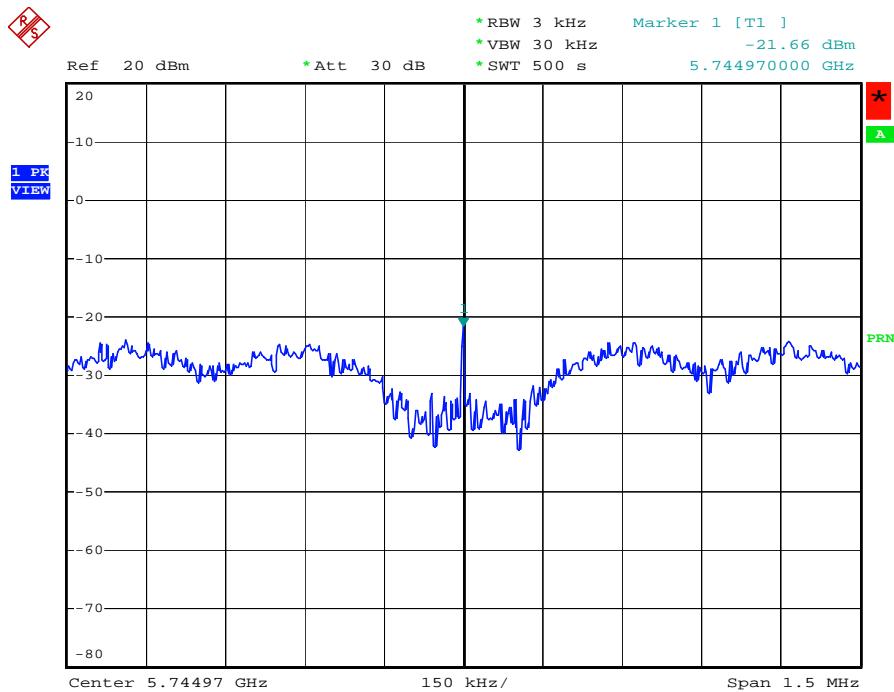
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Power Density Plot on Configuration IEEE 802.11g / 2462 MHz



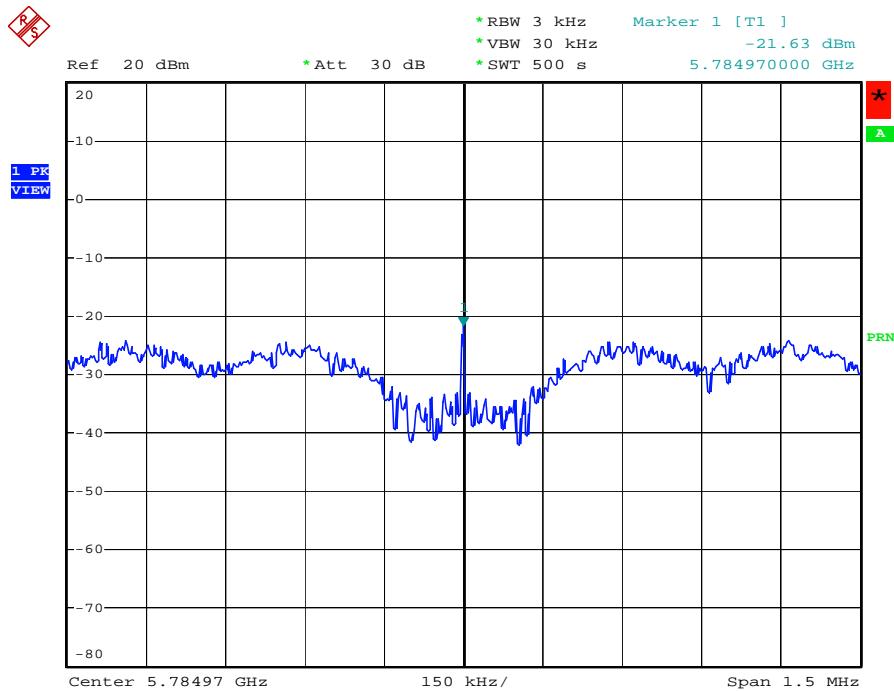
Date: 1.JUN.2006 13:23:25

Power Density Plot on Configuration IEEE 802.11a / 5745 MHz



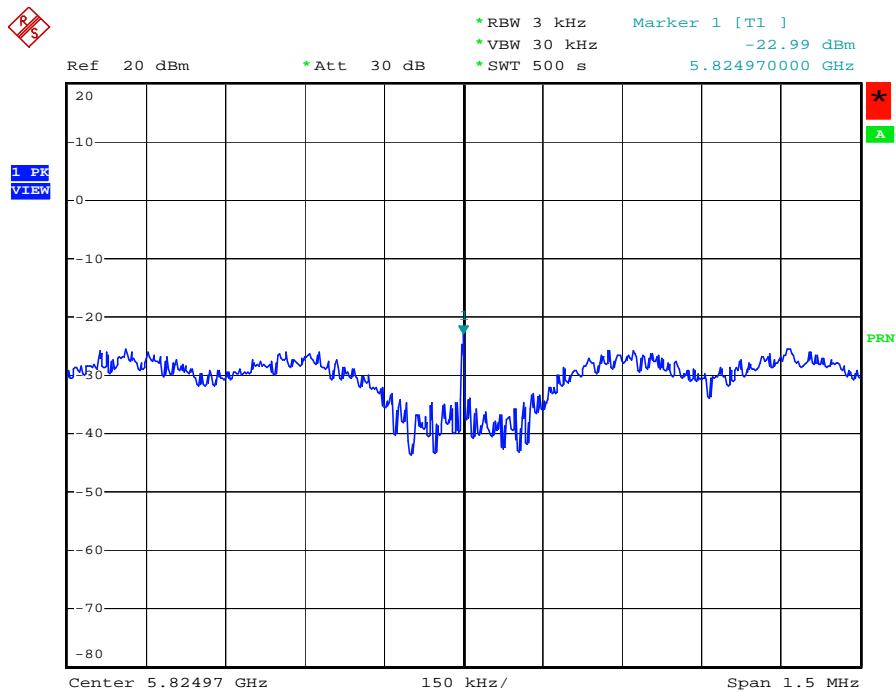
Date: 1.JUN.2006 12:44:52

Power Density Plot on Configuration IEEE 802.11a / 5785 MHz



Date: 1.JUN.2006 12:46:22

Power Density Plot on Configuration IEEE 802.11a / 5825 MHz



Date: 1.JUN.2006 13:20:34

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

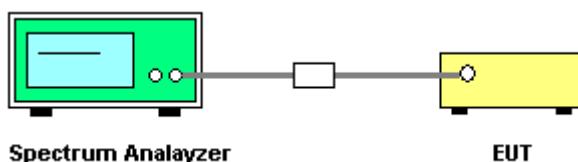
Please refer to section 5 in this report. The following table is the setting of the Spectrum Analyzer.

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	802.11a/b/g

Configuration IEEE 802.11b

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	11.80	15.04	500	Complies
6	2437 MHz	11.80	15.04	500	Complies
11	2462 MHz	11.80	15.08	500	Complies

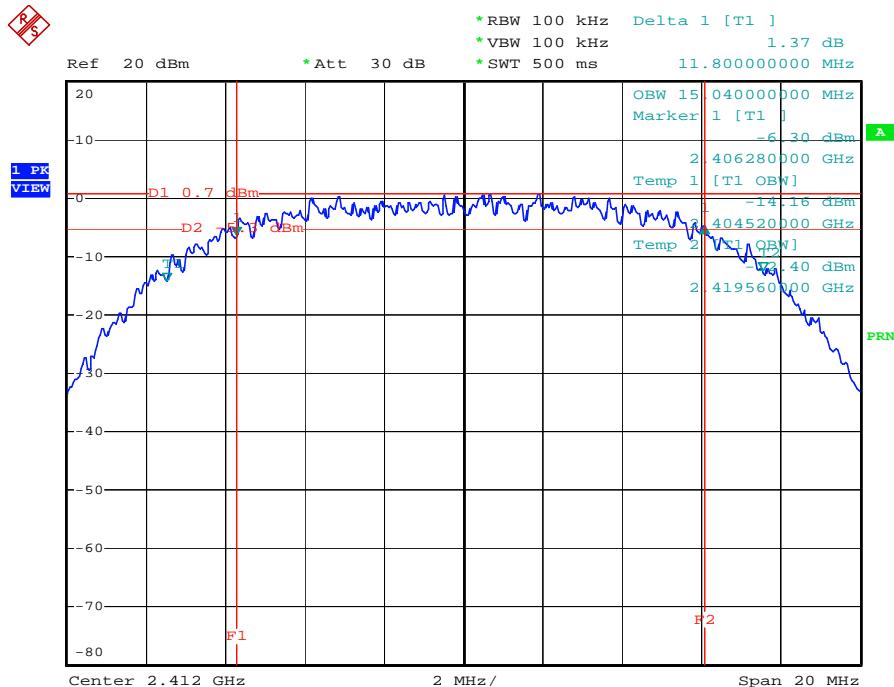
Configuration IEEE 802.11g

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	16.56	16.44	500	Complies
6	2437 MHz	16.60	16.48	500	Complies
11	2462 MHz	16.56	16.44	500	Complies

Configuration IEEE 802.11a

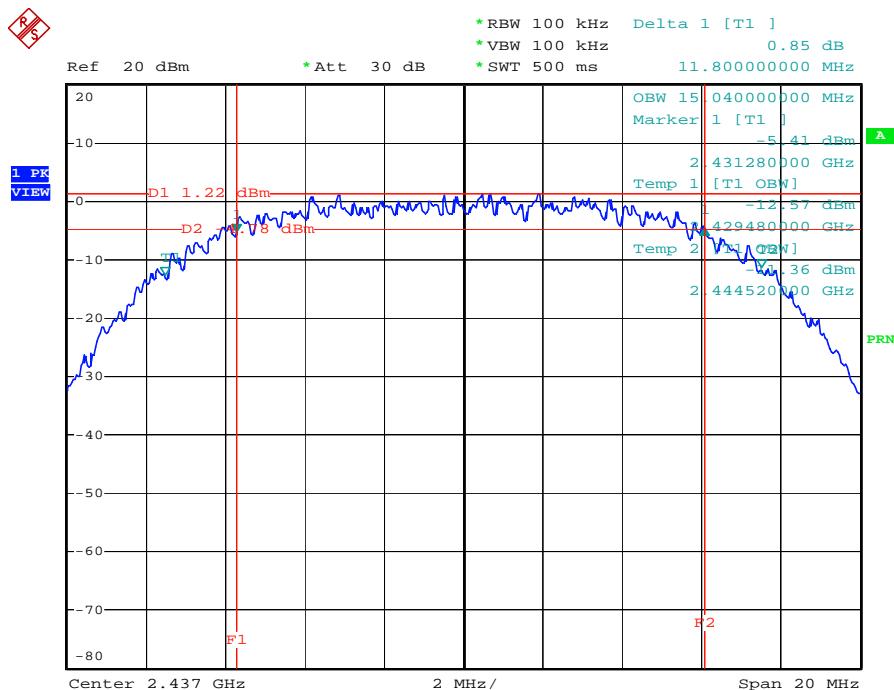
Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
149	5745 MHz	16.52	16.44	500	Complies
157	5785 MHz	16.56	16.48	500	Complies
165	5825 MHz	16.56	16.44	500	Complies

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



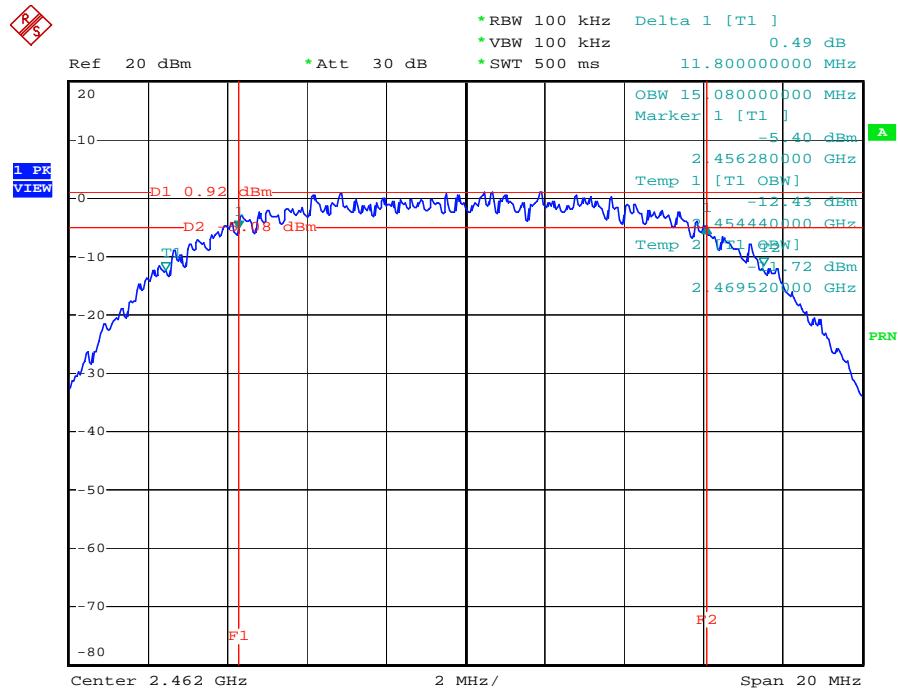
Date: 22.MAY.2006 20:48:39

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



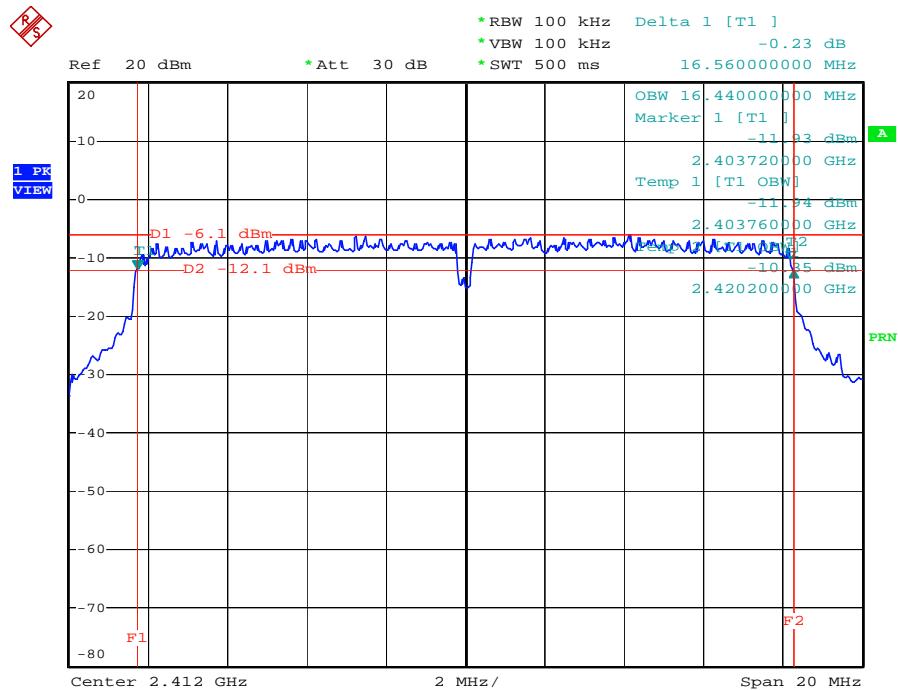
Date: 22.MAY.2006 20:55:31

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



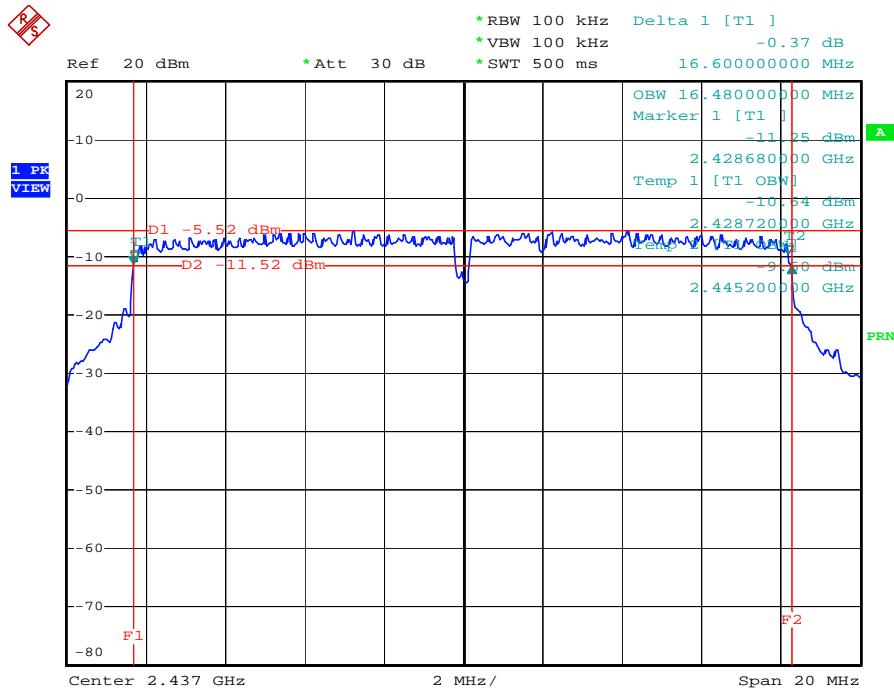
Date: 22.MAY.2006 20:57:04

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



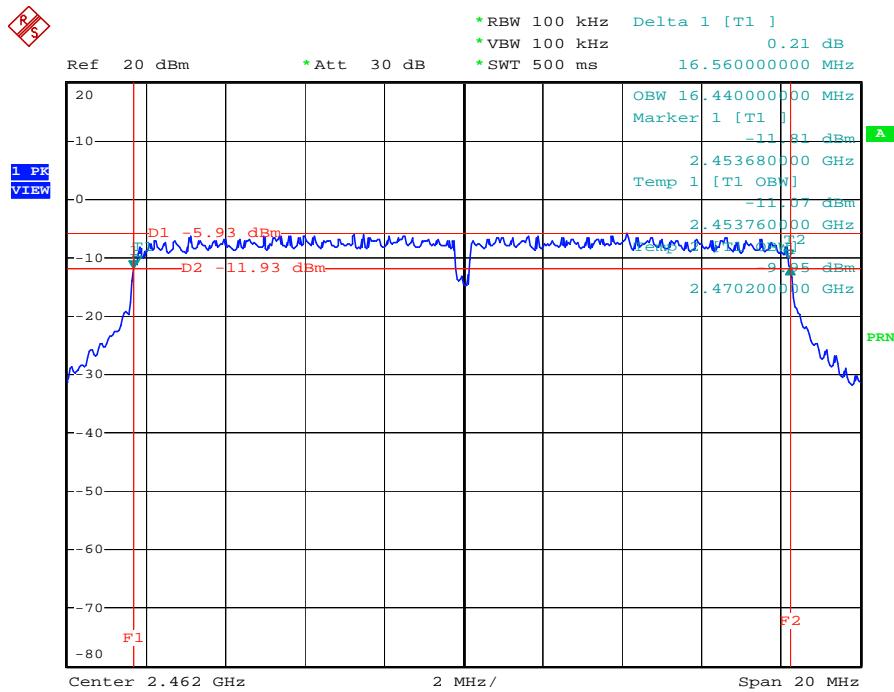
Date: 22.MAY.2006 21:08:08

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



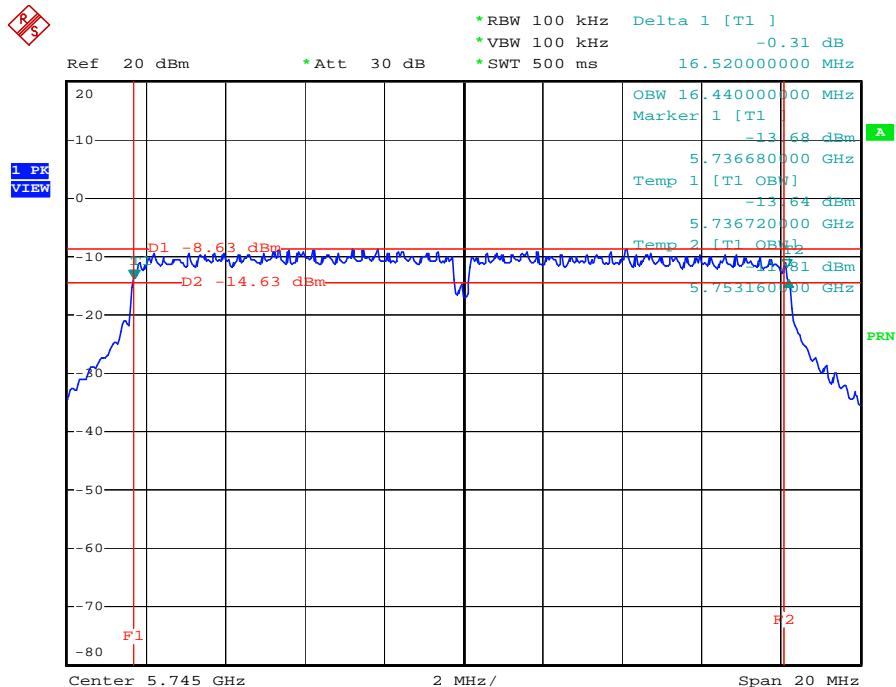
Date: 22.MAY.2006 21:10:33

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



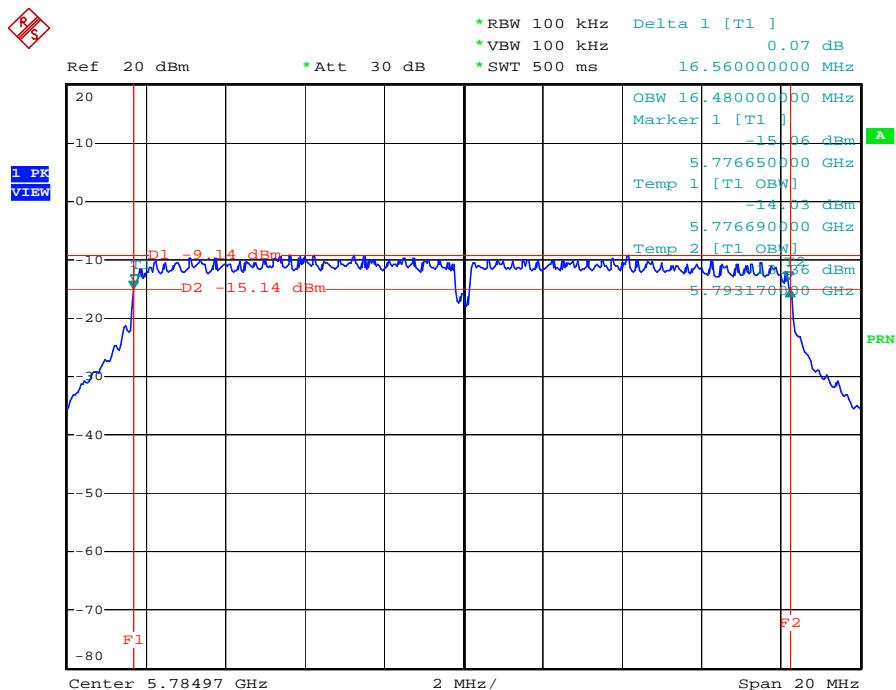
Date: 22.MAY.2006 21:16:57

6 dB Bandwidth Plot on Configuration IEEE 802.11a / 5745 MHz



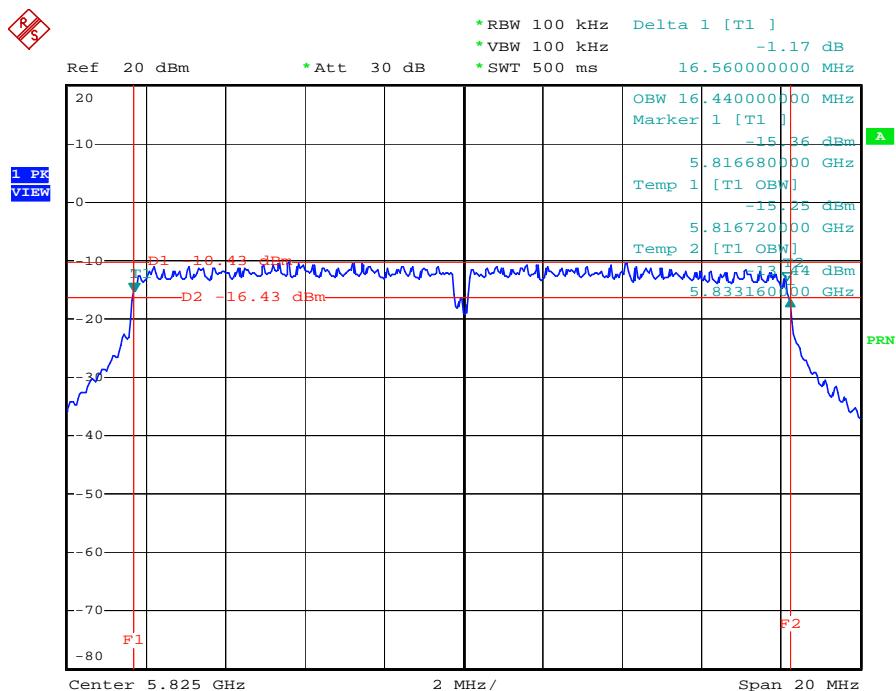
Date: 1.JUN.2006 12:39:25

6 dB Bandwidth Plot on Configuration IEEE 802.11a / 5785 MHz



Date: 1.JUN.2006 12:48:11

6 dB Bandwidth Plot on Configuration IEEE 802.11a / 5825 MHz



Date: 1.JUN.2006 12:49:54

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 (microvolt/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 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 (other emission)	100KHz / 100KHz for peak

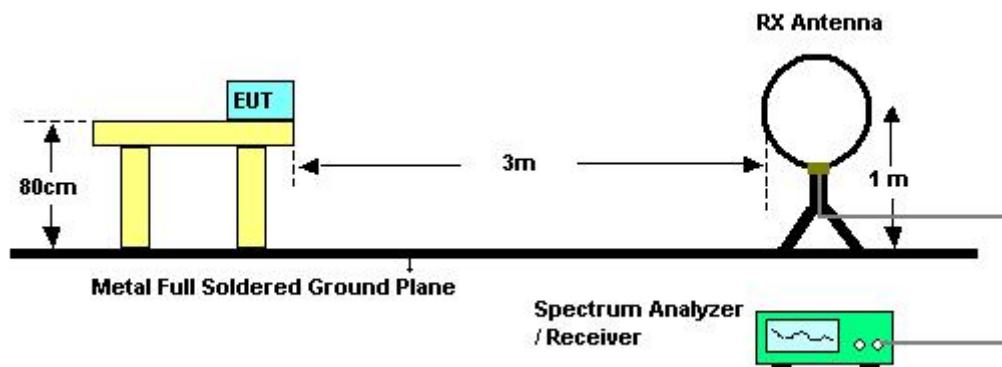
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

4.5.3. Test Procedures

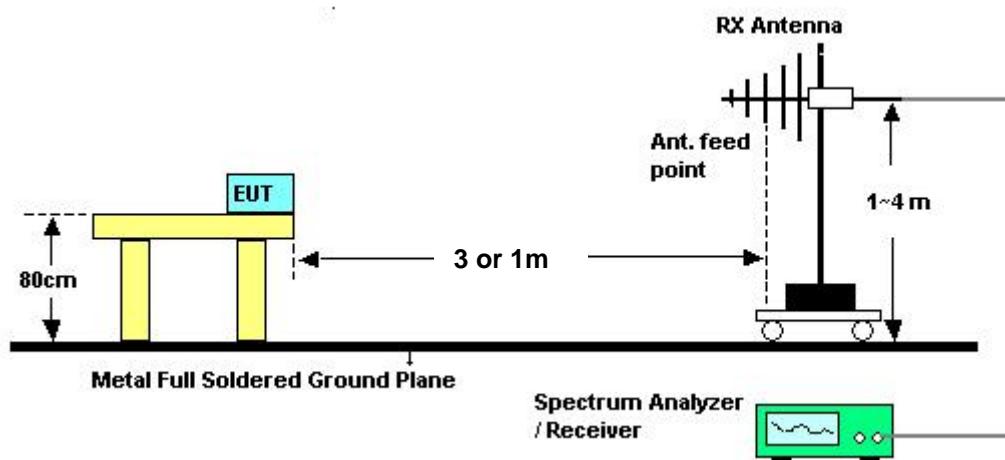
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting 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	27.4°C	Humidity	61%
Test Engineer	Kay		

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

Note:

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

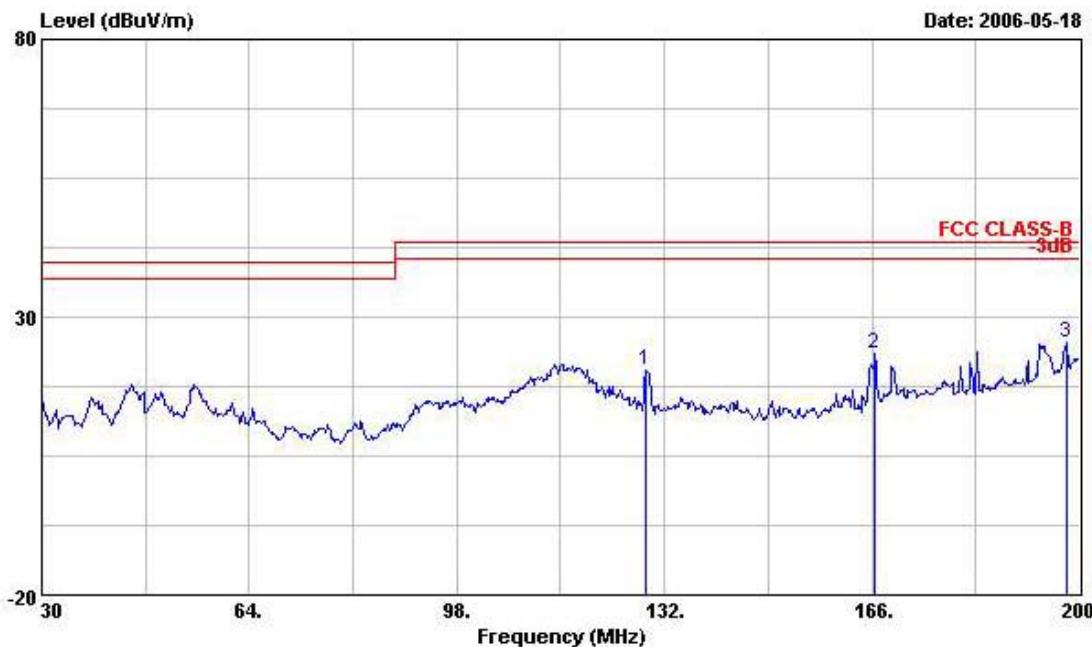
Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB);

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

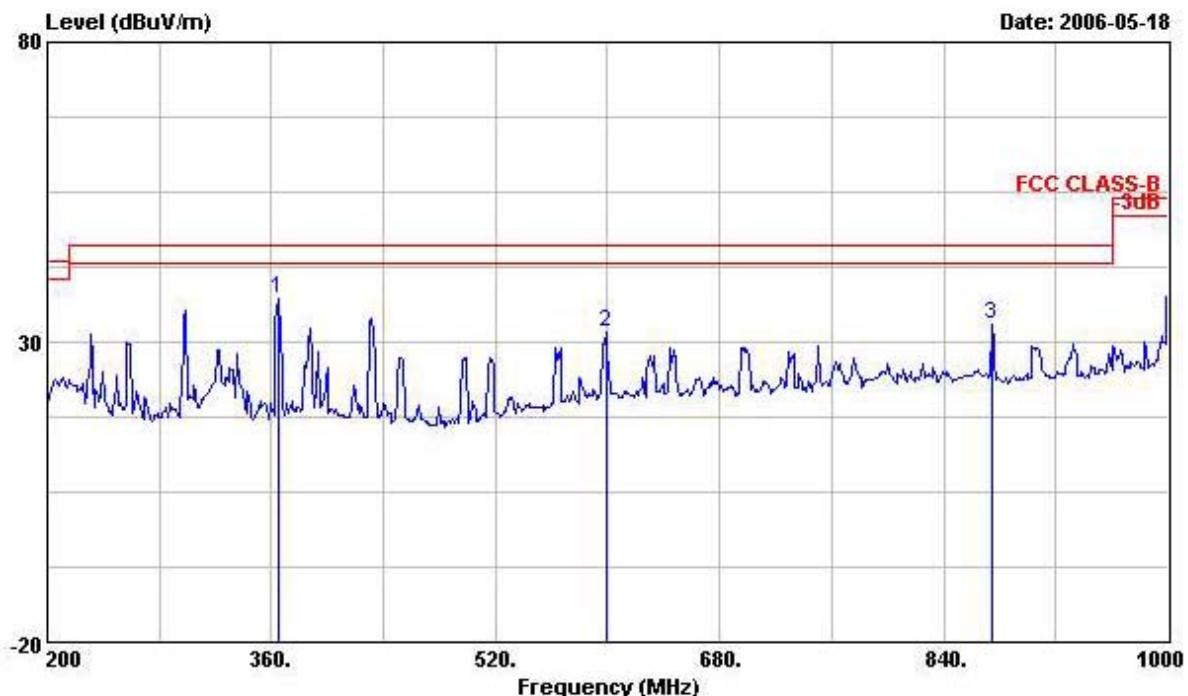
4.5.8. Results of Radiated Emissions (30MHz~1GHz)

Temperature	27.4°C	Humidity	61%
Test Engineer	Kay	Configurations	Mode 1 (802.11g Channel 6 & 802.11a Channel 157)

Horizontal

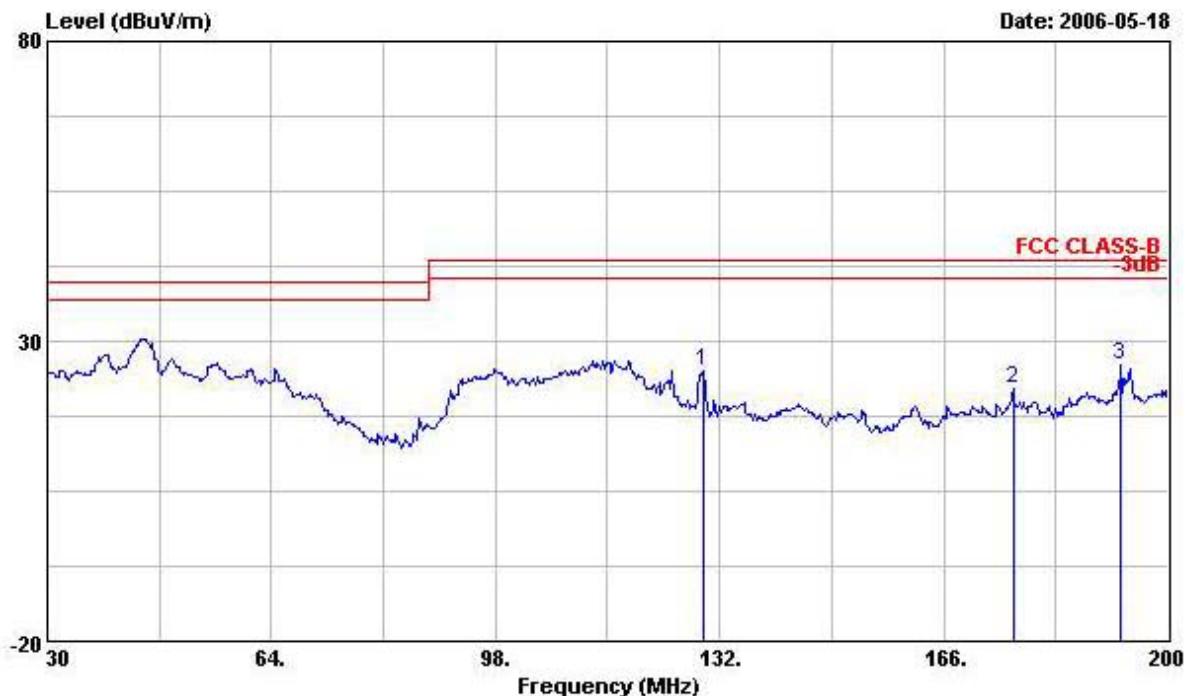


Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Remark
		Limit	Line	Level	Factor	Loss	Factor	
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1 @	128.940	20.37	-23.13	43.50	36.35	12.30	1.76	30.05 Peak
2 @	166.510	23.39	-20.11	43.50	38.39	13.31	1.93	30.24 Peak
3 @	197.790	25.27	-18.23	43.50	37.41	15.62	2.31	30.06 Peak

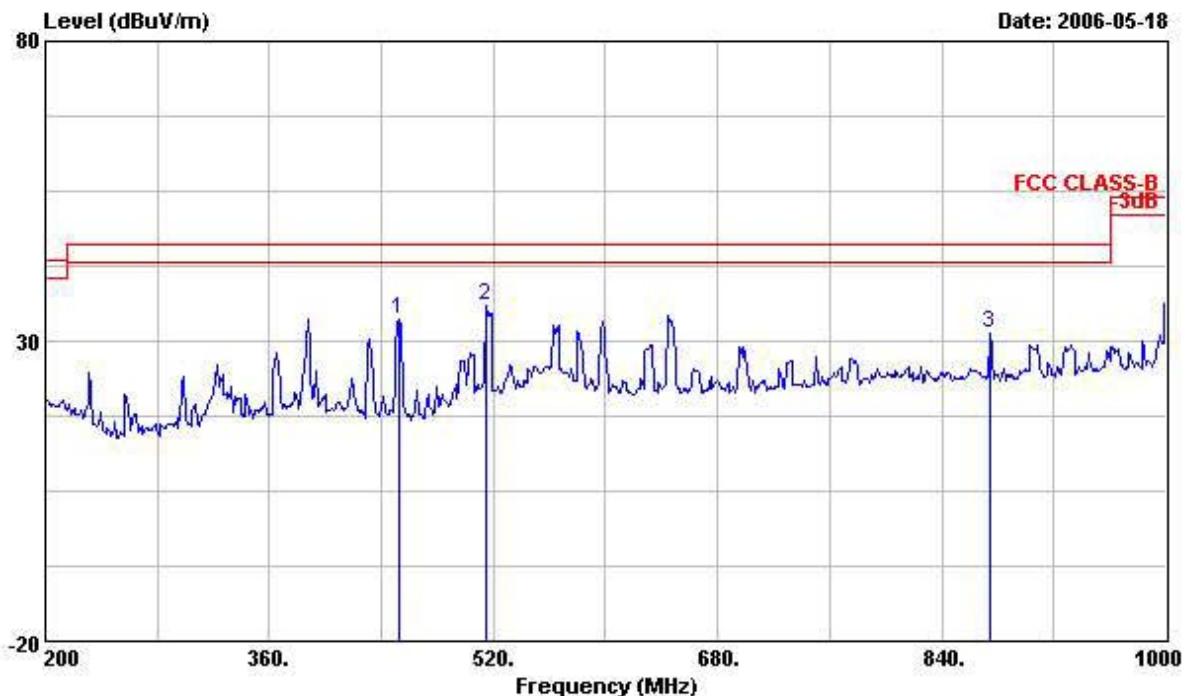


Freq	Level	Over Limit		Read Line	Antenna Factor	Cable Preamp		Remark
		MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	
1 0	365.600	37.24	-8.76	46.00	48.32	15.77	3.32	30.17 Peak
2 0	599.200	31.57	-14.43	46.00	36.68	20.36	4.47	29.94 Peak
3 0	874.400	32.80	-13.20	46.00	35.33	21.75	5.46	29.75 Peak

Vertical



Freq	Level	Over Limit	Limit Line	ReadAntenna		Cable Loss	Preamp Factor	Remark	
				MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m
1 0	129.620	24.95	-18.55	43.50	40.92	12.32	1.76	30.05	Peak
2 0	176.540	22.26	-21.24	43.50	36.05	14.20	2.22	30.21	Peak
3 0	192.860	25.95	-17.55	43.50	38.53	15.22	2.32	30.12	Peak



Freq	Level	Over Limit		Read Level	Antenna Factor	Cable Loss		Preamp Factor	Remark
		MHz	dBuV/m			dB	dBuV/m		
1 0	452.000	33.57	-12.43	46.00	43.66	16.38	3.67	30.14	Peak
2 0	515.200	35.93	-10.07	46.00	45.47	16.69	3.90	30.12	Peak
3 0	874.400	31.45	-14.55	46.00	33.98	21.75	5.46	29.75	Peak

Note:

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

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

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

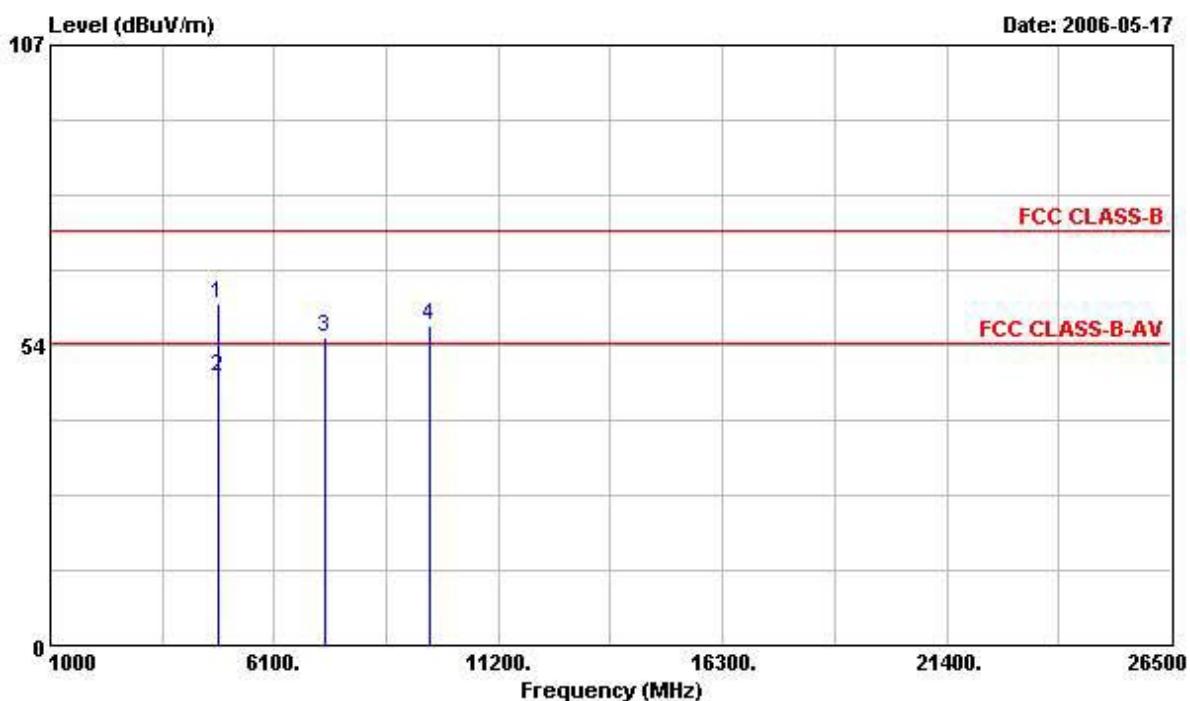
Pol. : V is Vertical Polarization ; H is Horizontal Polarization.



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

Temperature	27.4°C	Humidity	61%
Test Engineer	Kay	Configurations	Mode 1 (802.11b Channel 1)

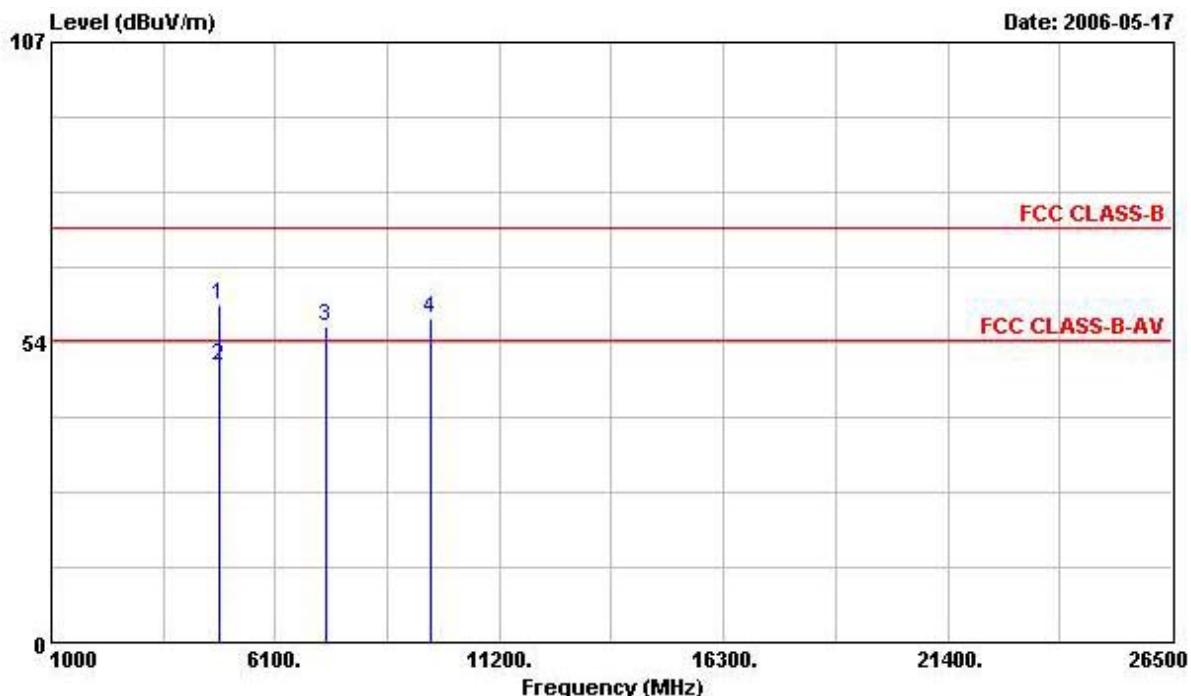
Horizontal



	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp
			Limit	Line	Level	Factor	Loss	Factor
	MHz	dBuW/m	dB	dBuV/m	dBuW	dB/m	dB	dB
1	4824.000	60.72	-13.28	74.00	57.02	33.09	3.15	32.54 Peak
2 @	4824.000	47.74	-6.26	54.00	44.04	33.09	3.15	32.54 Average
3	7232.000	54.83	-19.17	74.00	47.11	35.98	4.15	32.40 Peak
4	9648.000	57.15	-16.85	74.00	47.59	38.58	4.41	33.42 Peak



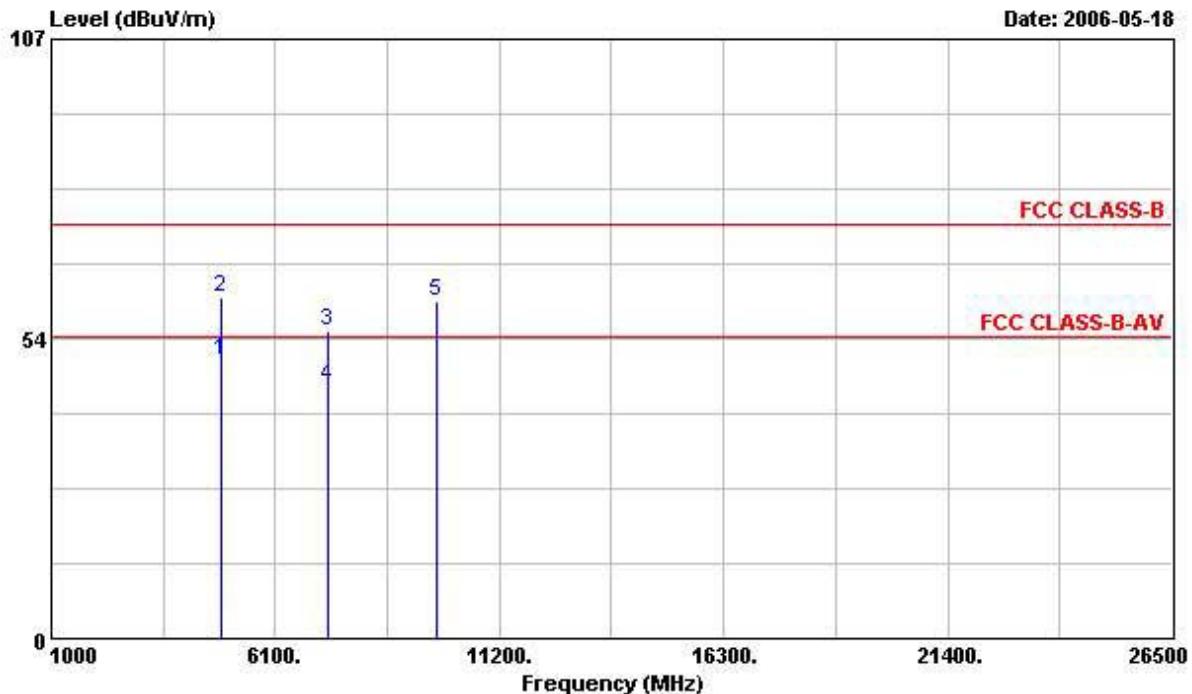
Vertical



Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Remark
		Limit	Line	Level	Factor	Loss	Factor	
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	
1	4824.000	60.28	-13.72	74.00	56.58	33.09	3.15	32.54 Peak
2	4824.000	49.43	-4.57	54.00	45.73	33.09	3.15	32.54 Average
3	7244.000	56.37	-17.63	74.00	48.68	35.98	4.16	32.46 Peak
4	9648.000	57.71	-16.29	74.00	48.14	38.58	4.41	33.42 Peak

Temperature	27.4°C	Humidity	61%
Test Engineer	Kay	Configurations	Mode 1 (802.11b Channel 6)

Horizontal



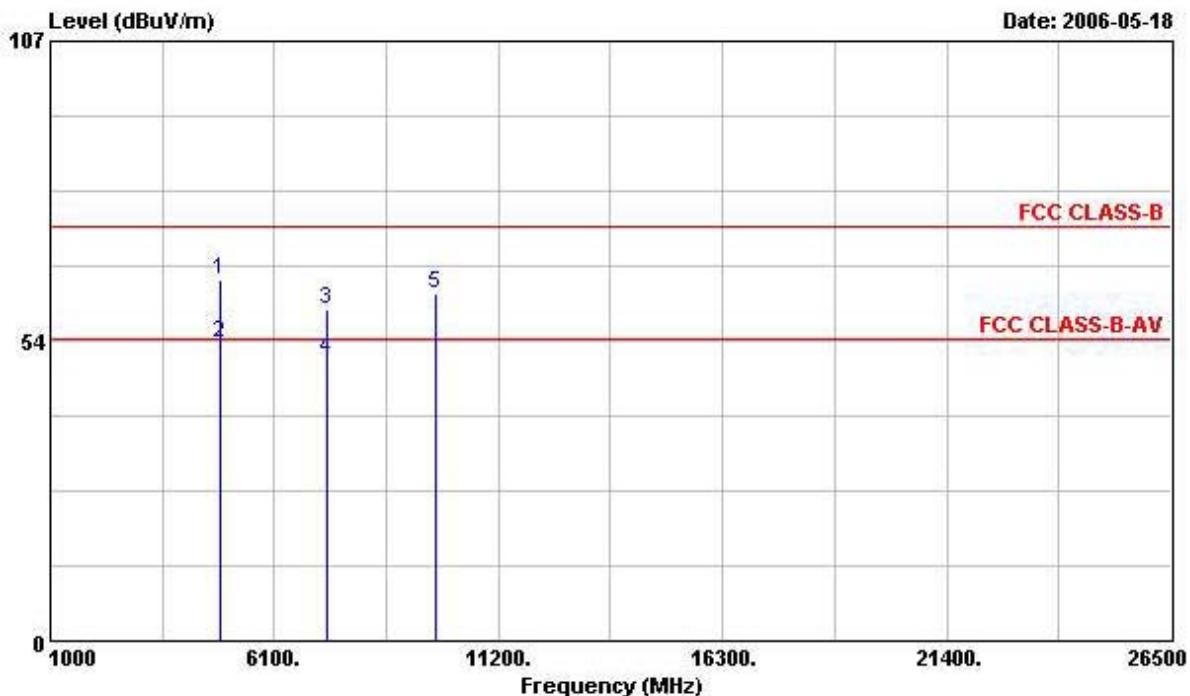
Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Remark
		Limit	Line	Level	Factor	Loss	Factor	
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	
1 0	4876.000	49.73	-4.27	54.00	45.92	33.18	3.18	32.55 Average
2	4876.000	60.76	-13.24	74.00	56.95	33.18	3.18	32.55 Peak
3	7308.000	54.84	-19.16	74.00	47.08	36.14	4.18	32.56 Peak
4 0	7308.000	44.90	-9.10	54.00	37.13	36.14	4.18	32.56 Average
5	9748.000	60.23	-13.77	74.00	50.45	38.77	4.45	33.44 Peak

Note:

Item 5 is on un-restricted band, so the limit is -20dBc for the field strength of fundamental emission.



Vertical



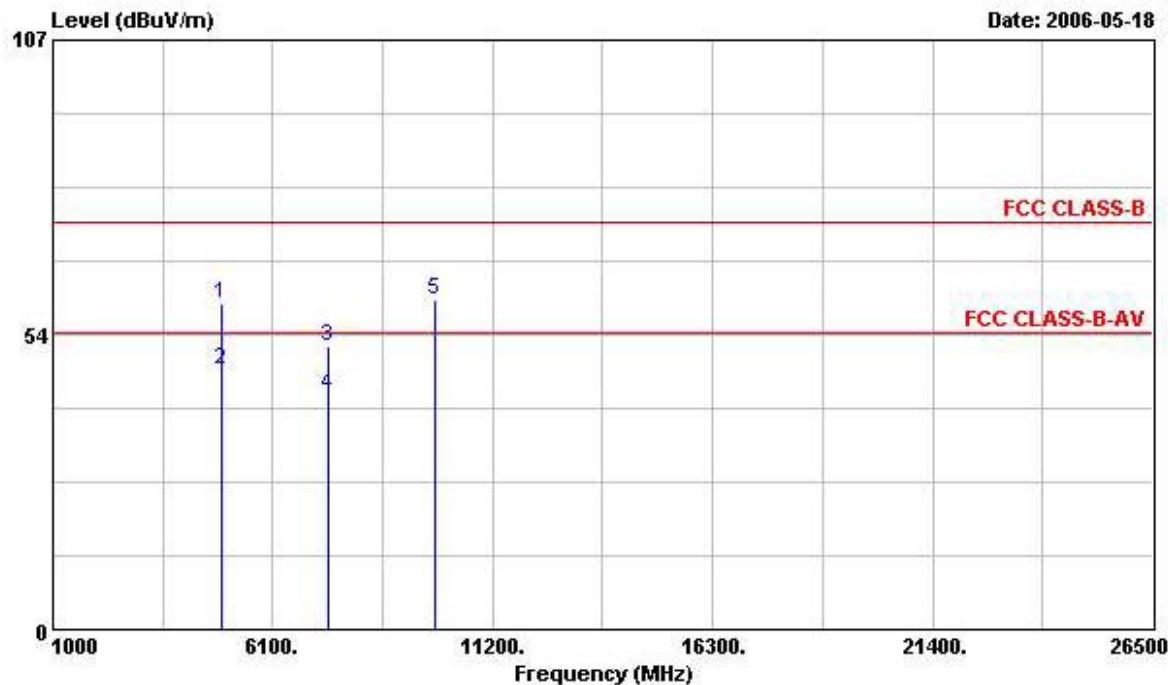
Freq	Level	Over Limit	Read		Antenna Factor	Cable Loss	Preamp Factor	Remark
			Line	dBuV				
MHz	dBuV/m	dB	dBuV/m	dB	dB/m	dB	dB	
1	4876.000	64.43	-9.57	74.00	60.62	33.18	3.18	32.55 Peak
2	4876.000	53.06	-0.94	54.00	49.25	33.18	3.18	32.55 Average
3	7308.000	59.19	-14.81	74.00	51.42	36.14	4.18	32.56 Peak
4	7308.000	50.22	-3.78	54.00	42.45	36.14	4.18	32.56 Average
5	9748.000	62.06	-11.94	74.00	52.28	38.77	4.44	33.44 Peak

Note:

Item 5 is on un-restricted band, so the limit is -20dBc for the field strength of fundamental emission.

Temperature	27.4°C	Humidity	61%
Test Engineer	Kay	Configurations	Mode 1 (802.11b Channel 11)

Horizontal

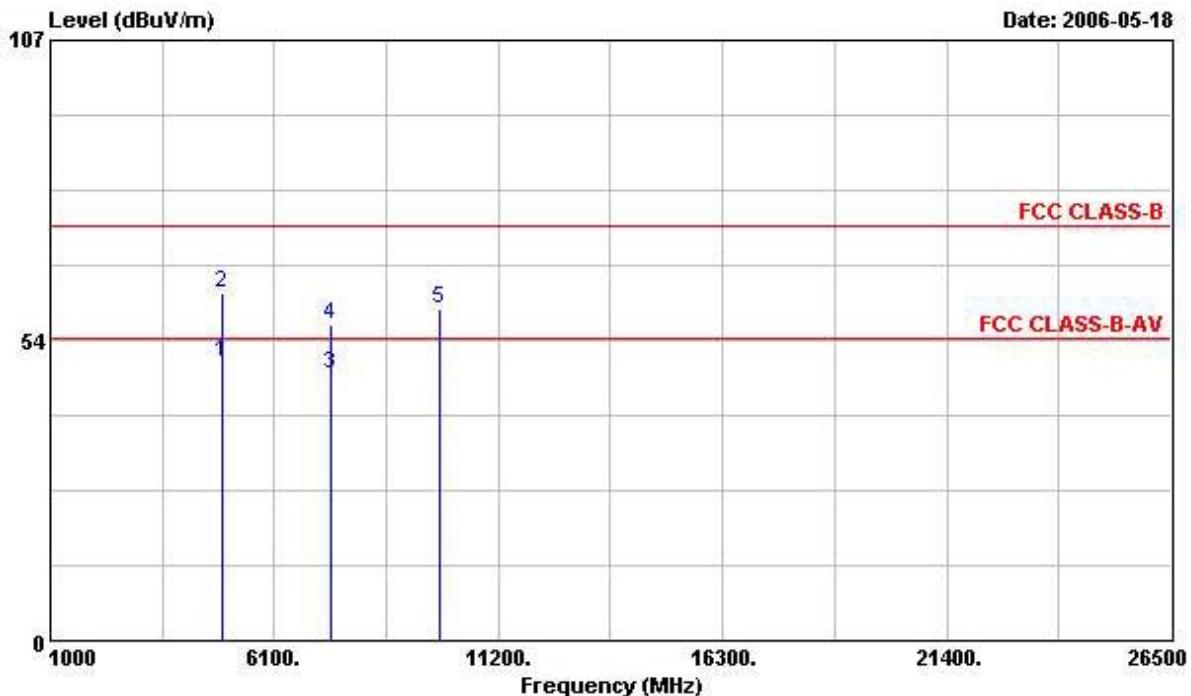


Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Remark
		Limit	Line	Antenna	Level	Factor	Loss	
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4924.000	59.04	-14.96	74.00	55.13	33.28	3.19	32.55 Peak
2	4924.000	47.07	-6.93	54.00	43.16	33.28	3.19	32.55 Average
3	7386.000	51.42	-22.58	74.00	43.57	36.35	4.21	32.71 Peak
4	7386.000	42.44	-11.56	54.00	34.59	36.35	4.21	32.71 Average
5	9848.000	59.95	-14.05	74.00	50.00	38.92	4.48	33.45 Peak

Note:

Item 5 is on un-restricted band, so the limit is -20dBc for the field strength of fundamental emission.

Vertical



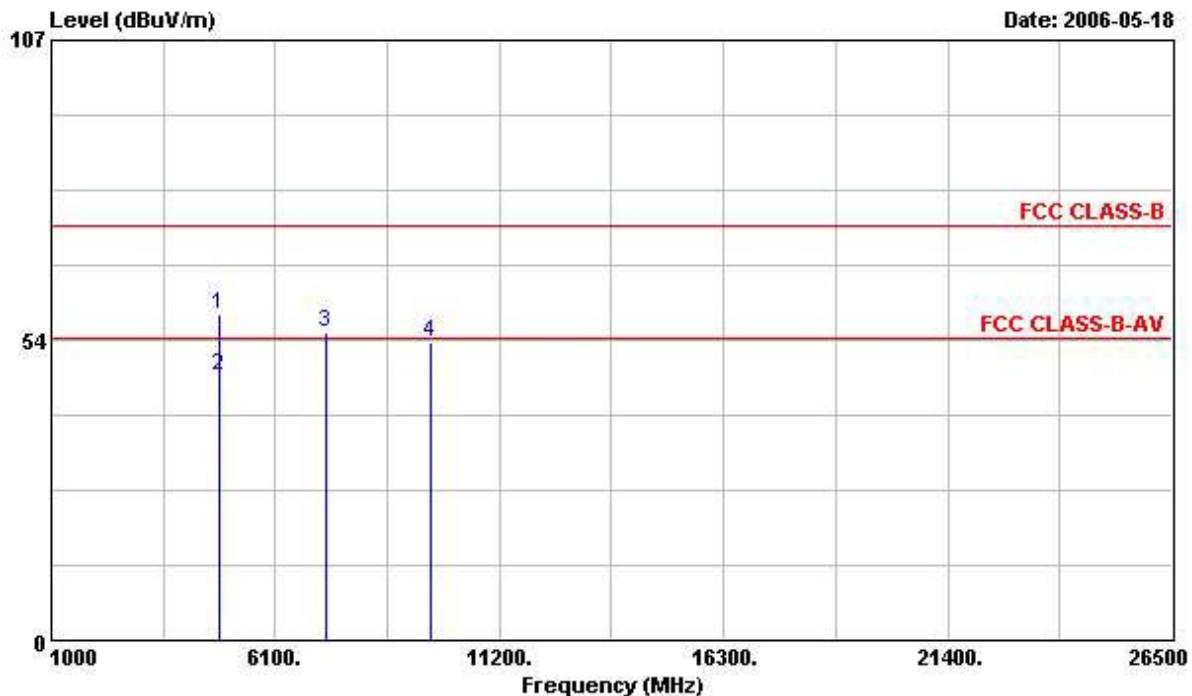
Freq	Level	Over Limit		Read	Antenna	Cable Preamp		Remark
		MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	
1 @	4924.000	49.50	-4.50	54.00	45.59	33.28	3.19	32.55 Average
2	4924.000	62.02	-11.98	74.00	58.11	33.28	3.19	32.55 Peak
3 @	7388.000	47.51	-6.49	54.00	39.71	36.35	4.21	32.76 Average
4	7388.000	56.15	-17.85	74.00	48.36	36.35	4.21	32.76 Peak
5	9848.000	59.25	-14.75	74.00	49.30	38.92	4.48	33.45 Peak

Note:

Item 5 is on un-restricted band, so the limit is -20dBc for the field strength of fundamental emission.



Temperature	27.4°C	Humidity	61%
Test Engineer	Kay	Configurations	Mode 1 (802.11g Channel 1)

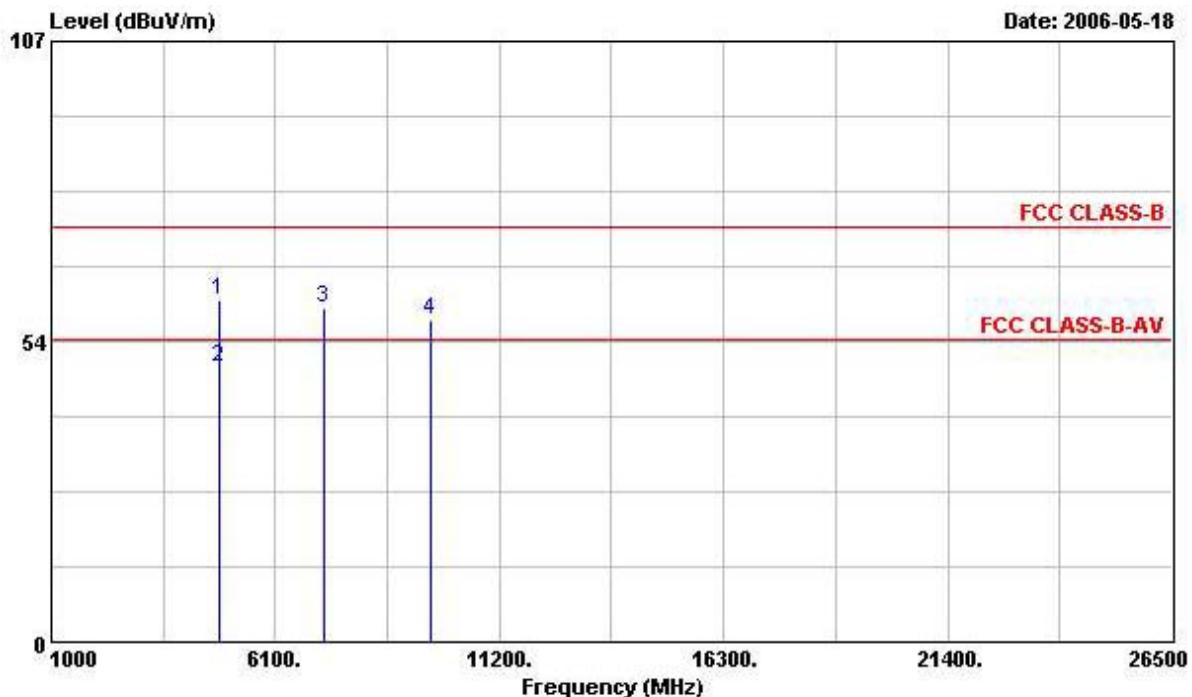
Horizontal

Freq	Level	Over Limit	Limit Line	Read		Antenna		Cable Loss	Preamp Factor	Remark
				MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB
1	4828.000	58.17	-15.83	74.00	54.47	33.09	3.15	32.54	32.54	Peak
2	4828.000	47.26	-6.74	54.00	43.56	33.09	3.15	32.54	32.54	Average
3	7236.000	55.07	-18.93	74.00	47.39	35.98	4.15	32.46	32.46	Peak
4	9648.000	53.29	-20.71	74.00	43.72	38.58	4.41	33.42	33.42	Peak

Note:

Item 3 is on un-restricted band, so the limit is -20dBc for the field strength of fundamental emission.

Vertical



Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Remark
		Limit	Line	Level	Factor	dB/m	dB	
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	
1	4828.000	60.80	-13.20	74.00	57.10	33.09	3.15	32.54 Peak
2	4828.000	48.75	-5.25	54.00	45.05	33.09	3.15	32.54 Average
3	7228.000	59.54	-14.46	74.00	51.85	35.94	4.15	32.40 Peak
4	9648.000	57.28	-16.72	74.00	47.71	38.58	4.41	33.42 Peak

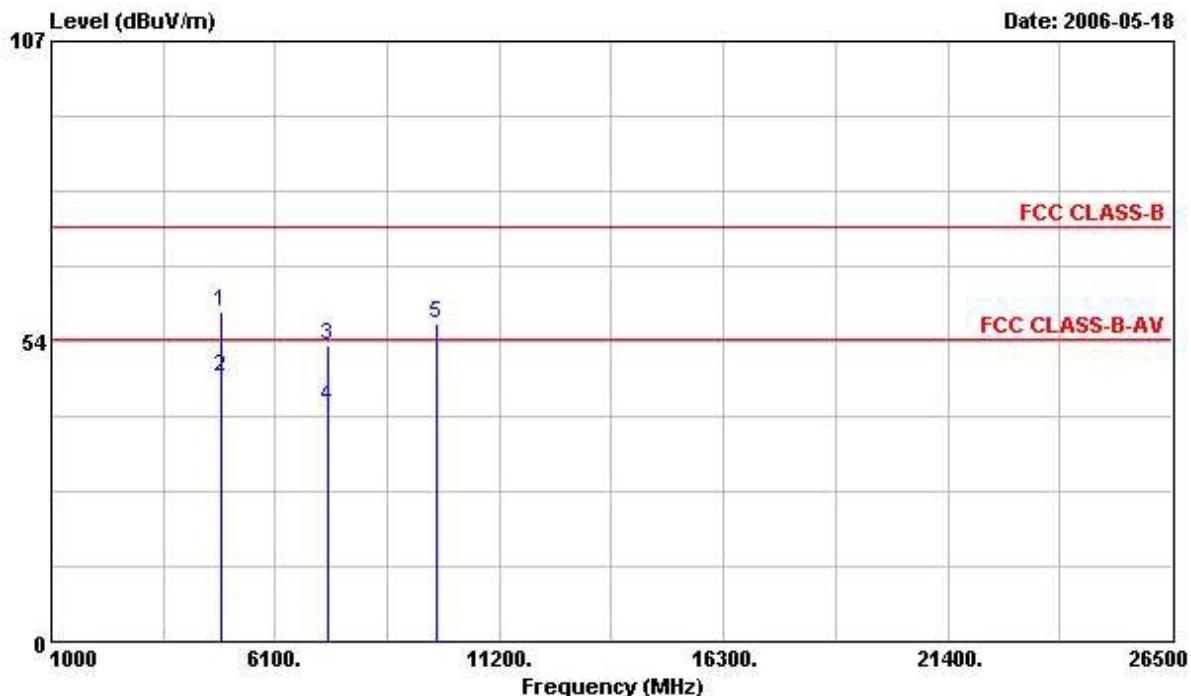
Note:

Item 3,4 is on un-restricted band, so the limit is -20dBc for the field strength of fundamental emission.



Temperature	27.4°C	Humidity	61%
Test Engineer	Kay	Configurations	Mode 1 (802.11g Channel 6)

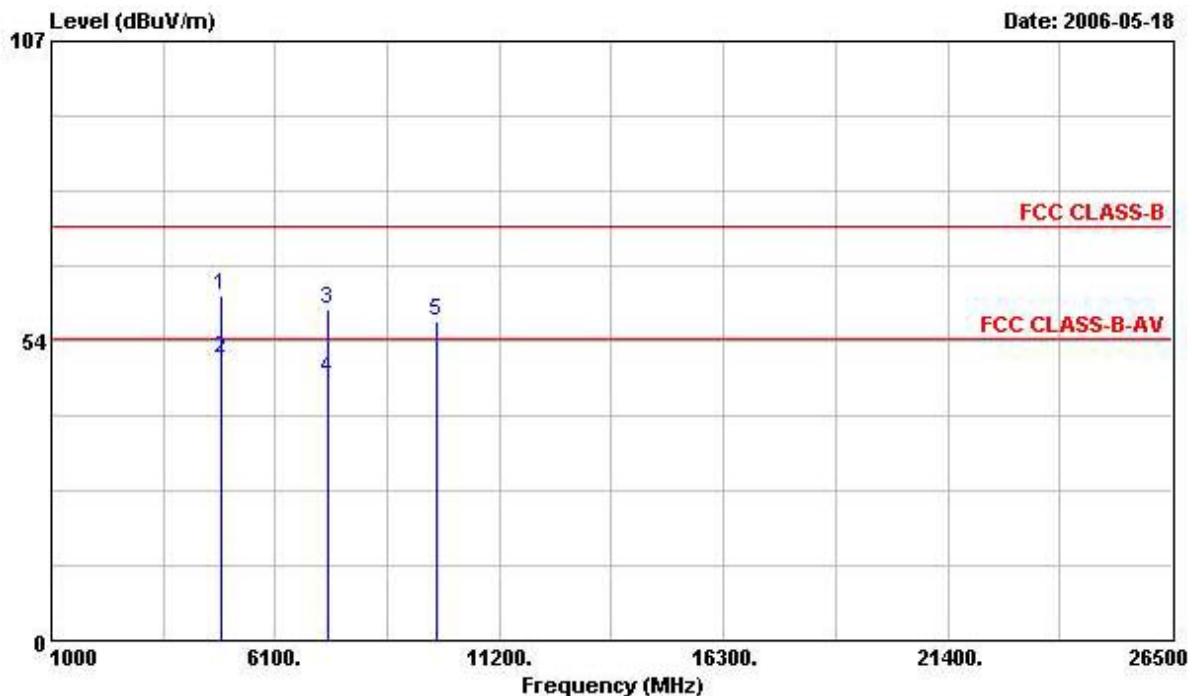
Horizontal



	Freq	Level	Over	Limit	Read		Cable	Preamp
			Limit	Line	Antenna	Level		
	MHz	dBuW/m	dB	dBuW/m	dBuV	dB/m	dB	dB
1	4876.000	58.75	-15.25	74.00	54.94	33.18	3.18	32.55 Peak
2	4876.000	47.30	-6.70	54.00	43.49	33.18	3.18	32.55 Average
3	7316.000	52.86	-21.14	74.00	45.11	36.19	4.18	32.61 Peak
4	7316.000	42.06	-11.94	54.00	34.30	36.19	4.18	32.61 Average
5	9748.000	56.53	-17.47	74.00	46.75	38.77	4.45	33.44 Peak

Note:

Item 5 is on un-restricted band, so the limit is -20dBc for the field strength of fundamental emission.

Vertical


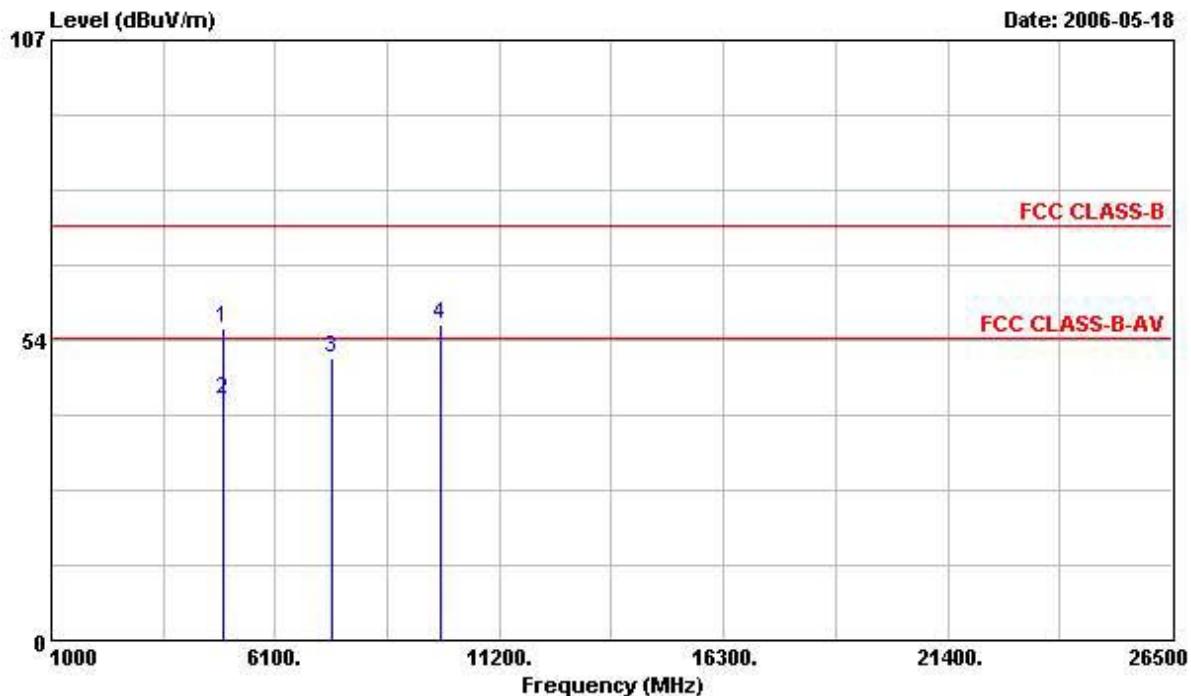
Freq	Level	Over Limit		Read		Antenna Factor	Cable Preamp		Remark
		MHz	dBuV/m	dB	dBuV/m		dBuV	dB/m	
1	4876.000	61.66	-12.34	74.00	57.84	33.18	3.18	32.55	Peak
2	4876.000	50.20	-3.80	54.00	46.39	33.18	3.18	32.55	Average
3	7304.000	59.10	-14.90	74.00	51.33	36.14	4.18	32.56	Peak
4	7304.000	46.79	-7.21	54.00	39.02	36.14	4.18	32.56	Average
5	9756.000	57.14	-16.86	74.00	47.36	38.77	4.45	33.44	Peak

Note:

Item 5 is on un-restricted band, so the limit is -20dBc for the field strength of fundamental emission.



Temperature	27.4°C	Humidity	61%
Test Engineer	Kay	Configurations	Mode 1 (802.11g Channel 11)

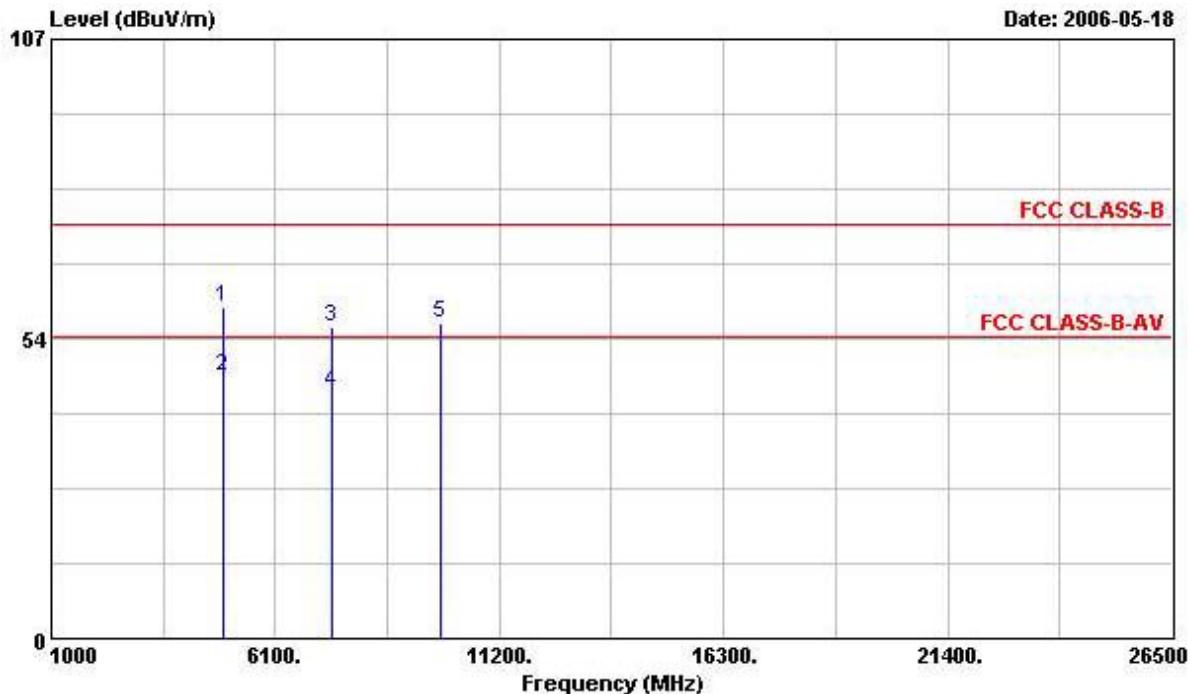
Horizontal

Freq	Level	Over Limit	Limit Line	Read		Antenna		Cable Loss	Preamp Factor	Remark
				MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	
1	4928.000	55.48	-18.52	74.00	51.57	33.28	3.19	32.55	32.55	Peak
2	4928.000	42.91	-11.09	54.00	39.00	33.28	3.19	32.55	32.55	Average
3	7386.000	50.17	-23.83	74.00	42.32	36.35	4.21	32.71	32.71	Peak
4	9848.000	56.21	-17.79	74.00	46.26	38.92	4.48	33.45	33.45	Peak

Note:

Item 4 is on un-restricted band, so the limit is -20dBc for the field strength of fundamental emission.

Vertical



Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Remark
		Limit	Line	Level	Factor	Loss	Factor	
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	
1	4928.000	59.03	-14.97	74.00	55.12	33.28	3.19	32.55 Peak
2	4928.000	46.70	-7.30	54.00	42.79	33.28	3.19	32.55 Average
3	7380.000	55.46	-18.54	74.00	47.66	36.31	4.21	32.71 Peak
4	7380.000	44.09	-9.91	54.00	36.28	36.31	4.21	32.71 Average
5	9848.000	56.14	-17.86	74.00	46.19	38.92	4.48	33.45 Peak

Note:

Item 5 is on un-restricted band, so the limit is -20dBc for the field strength of fundamental emission.

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

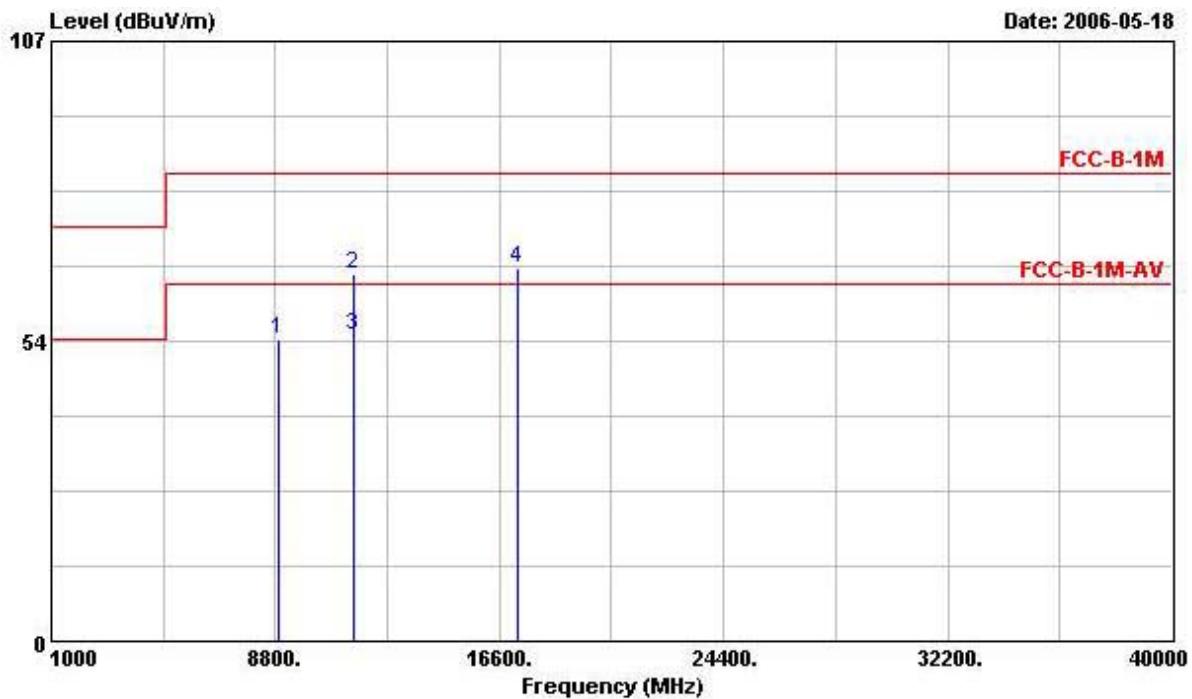
Emission level (dBuV/m) = 20 log Emission level (uV/m).

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

Pol. : V is Vertical Polarization ; H is Horizontal Polarization.

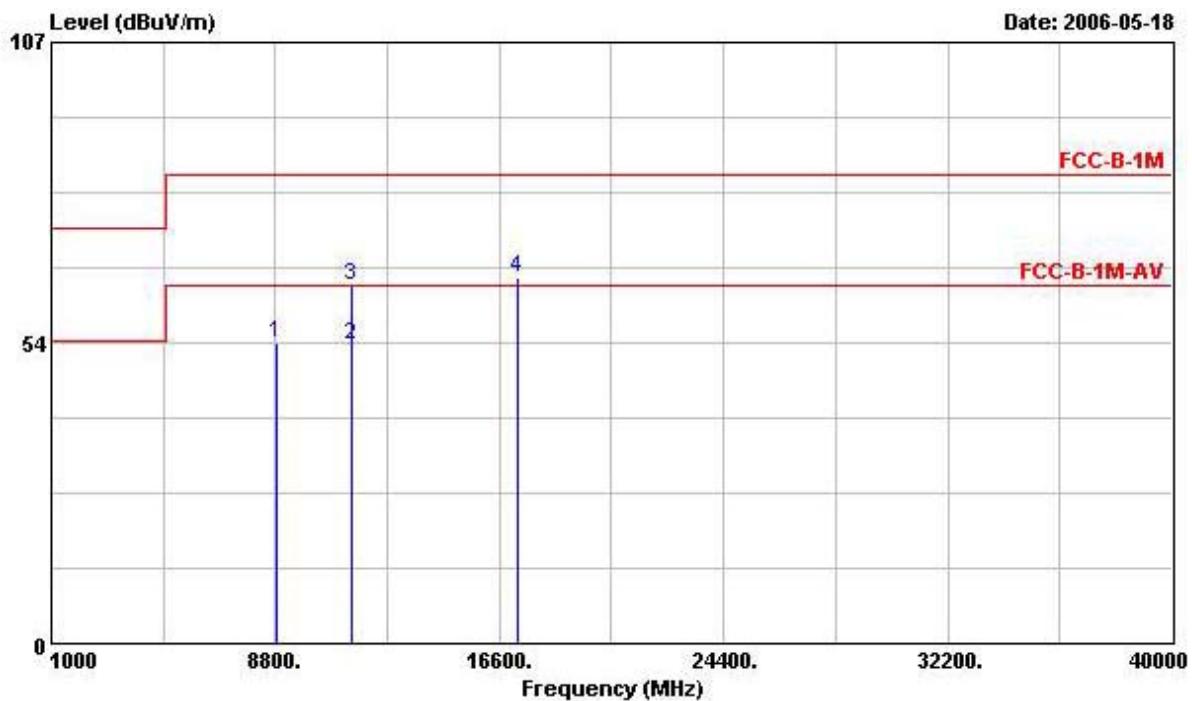
Temperature	27.4°C	Humidity	61%
Test Engineer	Kay	Configurations	Mode 1 (802.11a Channel 149)

Horizontal



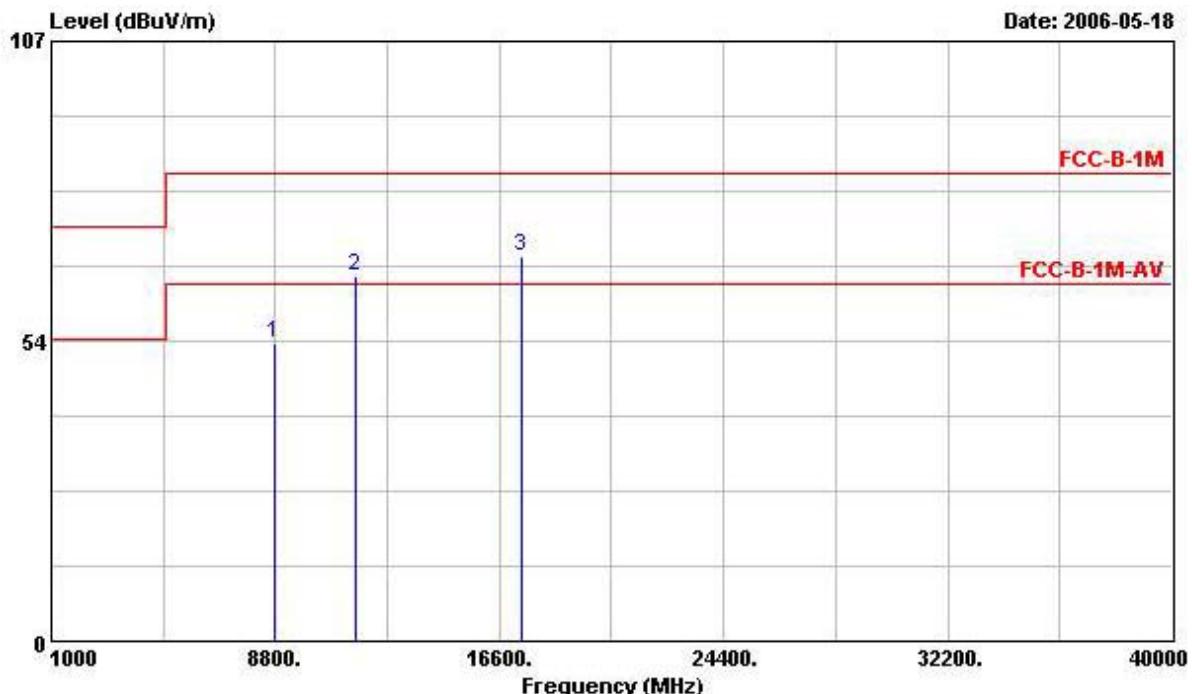
Freq	Level	Over Limit		Read	Antenna	Cable Preamp		Remark
		Line	Limit			Level	Factor	
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	8888.000	53.78	-29.76	83.54	44.33	38.48	4.21	33.24 Peak
2	11492.000	65.60	-17.94	83.54	53.91	39.28	4.78	32.38 Peak
3	11492.000	54.49	-9.05	63.54	42.81	39.28	4.78	32.38 Average
4	17240.000	66.59	-16.95	83.54	49.33	43.05	6.21	32.01 Peak

Vertical

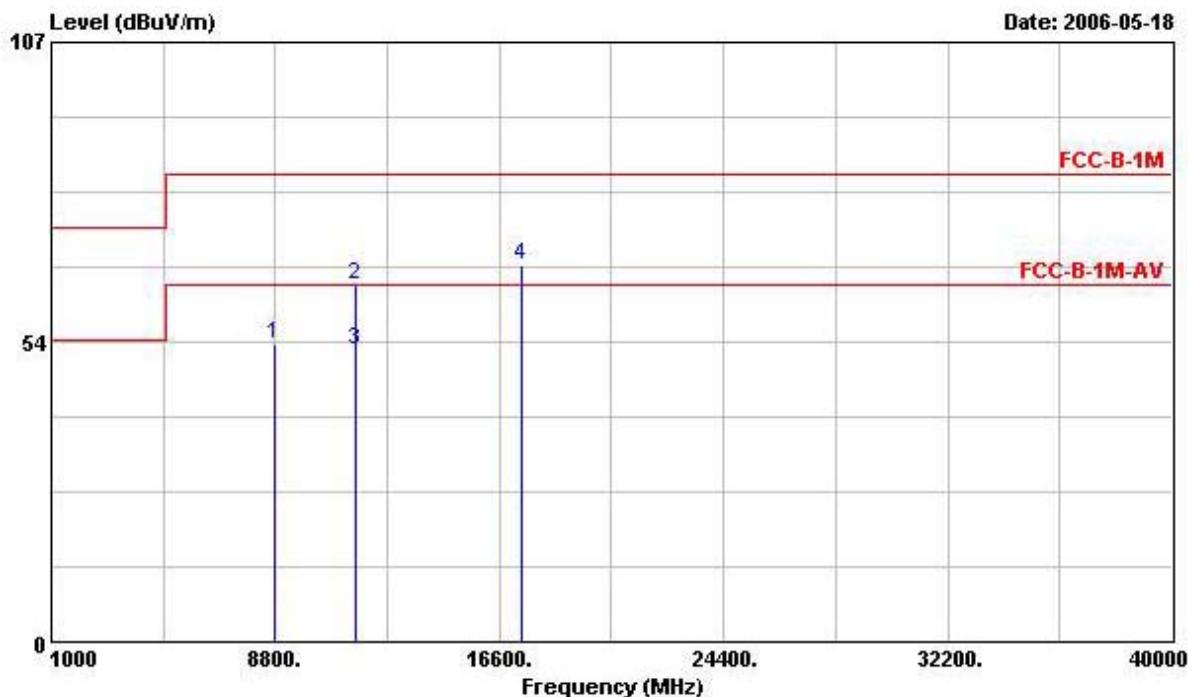


Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Remark
		Limit	Line	Level	Factor	Loss	Factor	
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	8824.000	53.60	-29.94	83.54	44.11	38.46	4.23	33.21 Peak
2	11484.000	53.28	-10.26	63.54	41.60	39.28	4.78	32.38 Average
3	11484.000	63.80	-19.74	83.54	52.12	39.28	4.78	32.38 Peak
4	17230.000	65.18	-18.36	83.54	47.93	43.05	6.21	32.02 Peak

Temperature	27.4°C	Humidity	61%
Test Engineer	Kay	Configurations	Mode 1 (802.11a Channel 157)

Horizontal


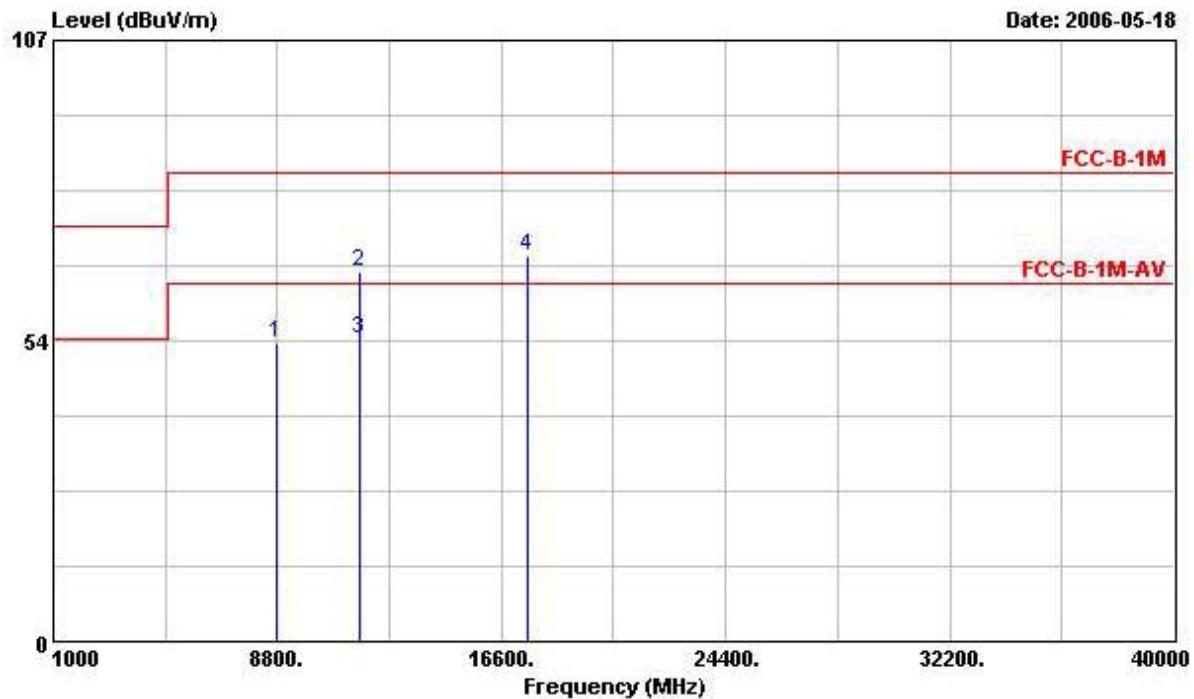
Freq	Level	Over Limit		Read		Antenna Factor	Cable Preamp		Remark
		Line	Limit	Antenna	Level		Cable Loss	Preamp Factor	
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m		dB	dB	
1	8772.000	53.21	-30.33	83.54	43.69	38.45	4.24	33.18	Peak
2	11572.000	65.10	-18.44	83.54	53.43	39.24	4.82	32.40	Peak
3	17360.000	68.63	-14.91	83.54	50.25	44.08	6.26	31.95	Peak

Vertical


Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Remark
		Limit	Line	Level	Factor	Loss	Factor	
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	
1	8760.000	53.21	-30.33	83.54	43.67	38.45	4.25	33.16 Peak
2	11572.000	63.63	-19.91	83.54	51.95	39.24	4.82	32.40 Peak
3	11572.000	52.04	-11.50	63.54	40.37	39.24	4.82	32.40 Average
4	17352.000	67.28	-16.26	83.54	48.92	44.08	6.24	31.96 Peak

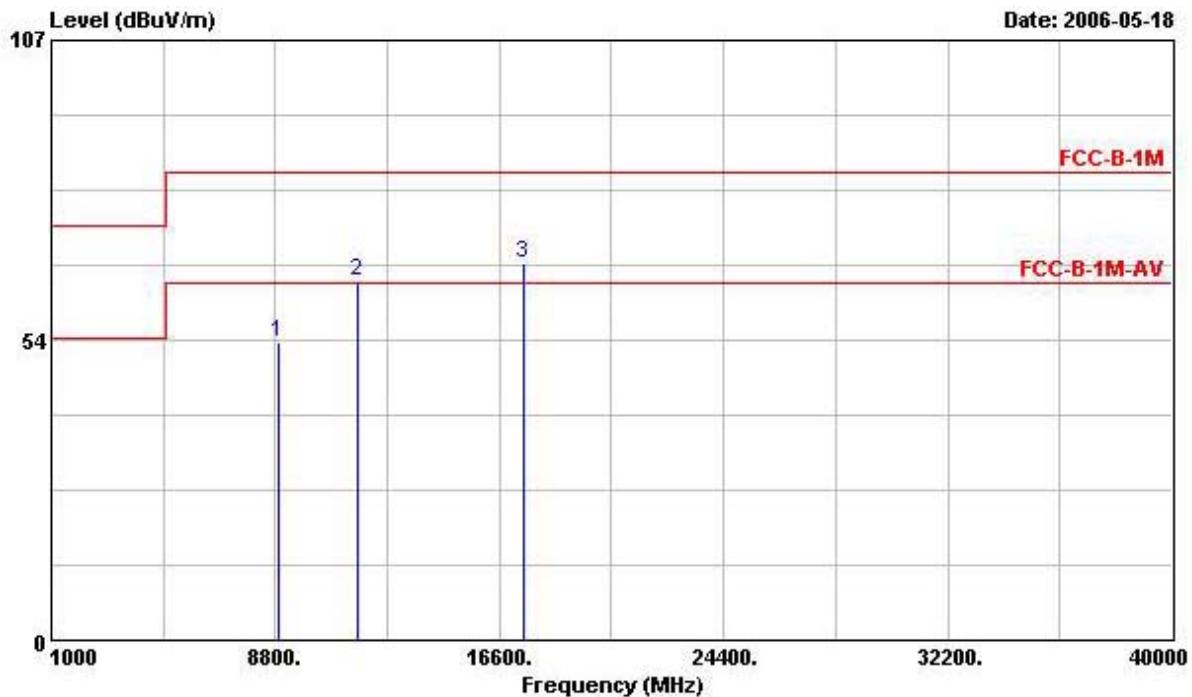
Temperature	27.4°C	Humidity	61%
Test Engineer	Kay	Configurations	Mode 1 (802.11a Channel 165)

Horizontal



Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Remark
		Limit	Line	Level	Factor	Loss	Factor	
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	
1	8788.000	53.27	-30.27	83.54	43.74	38.46	4.24	33.18 Peak
2	11652.000	65.87	-17.67	83.54	54.24	39.18	4.87	32.41 Peak
3	11652.000	53.96	-9.58	63.54	42.33	39.18	4.87	32.41 Average
4	17478.000	68.61	-14.93	83.54	49.12	45.11	6.29	31.91 Peak

Vertical



Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Remark
		Line	Limit	Level	Factor	Loss	Factor	
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	8928.000	53.10	-30.44	83.54	43.69	38.48	4.20	33.27 Peak
2	11652.000	64.12	-19.42	83.54	52.49	39.18	4.87	32.41 Peak
3	17470.000	67.28	-16.26	83.54	47.81	45.11	6.28	31.91 Peak

Note:

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

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

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

Pol. : V is Vertical Polarization ; H is Horizontal Polarization.

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 (microvolt/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 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 (other emission)	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	27.4°C	Humidity	61%
Test Engineer	Kay	Configurations	Mode 1(802.11b Channel 1, 11)

Channel 1

Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Remark
		Limit	Line	Level	Factor	Loss	Factor	
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1 0	2385.810	64.80	-9.20	74.00	34.62	28.29	1.89	0.00 Peak
2 0	2412.980	105.89			75.68	28.33	1.89	0.00 Peak
1 0	2387.330	53.29	-0.71	54.00	23.11	28.29	1.89	0.00 Average
2 0	2409.370	98.11			67.90	28.33	1.89	0.00 Average

Item 2 is fundamental frequency at 2412 MHz.

Channel 11

Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Remark
		Limit	Line	Level	Factor	Loss	Factor	
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1 0	2458.770	106.86			76.49	28.43	1.94	0.00 Peak
2 0	2487.650	65.49	-8.51	74.00	35.05	28.50	1.94	0.00 Peak
1 0	2459.530	99.03			68.66	28.43	1.94	0.00 Average
2 0	2486.700	53.55	-0.45	54.00	23.14	28.47	1.94	0.00 Average

Item 1 is fundamental frequency at 2462 MHz.



Temperature	27.4°C	Humidity	61%
Test Engineer	Kay	Configurations	Mode 1(802.11g Channel 1, 11)

Channel 1

Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Remark
		Limit	Line	Level	Factor	Loss	Factor	
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1 0	2389.990	64.39	-9.61	74.00	34.21	28.29	1.89	0.00 Peak
2 0	2419.060	105.16			74.95	28.33	1.89	0.00 Peak
1 0	2389.990	52.22	-1.78	54.00	22.04	28.29	1.89	0.00 Average
2 0	2418.300	95.85			65.64	28.33	1.89	0.00 Average

Item 2 is fundamental frequency at 2412 MHz.

Channel 11

Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Remark
		Limit	Line	Level	Factor	Loss	Factor	
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1 0	2458.770	103.34			72.97	28.43	1.94	0.00 Peak
2 0	2483.660	67.86	-6.14	74.00	37.45	28.47	1.94	0.00 Peak
1 0	2458.580	94.26			63.92	28.43	1.91	0.00 Average
2 0	2483.560	53.37	-0.63	54.00	22.96	28.47	1.94	0.00 Average

Item 1 is fundamental frequency at 2462 MHz.

Note:

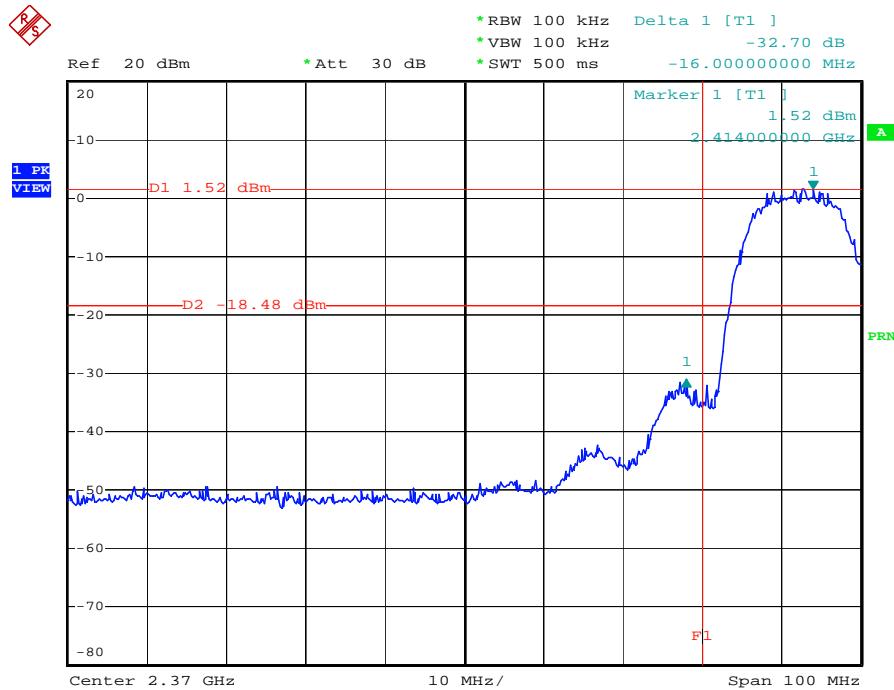
Emission level (dBuV/m) = 20 log Emission level (uV/m).

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

Receiving maximum band edge emissions are Vertical Polarization.

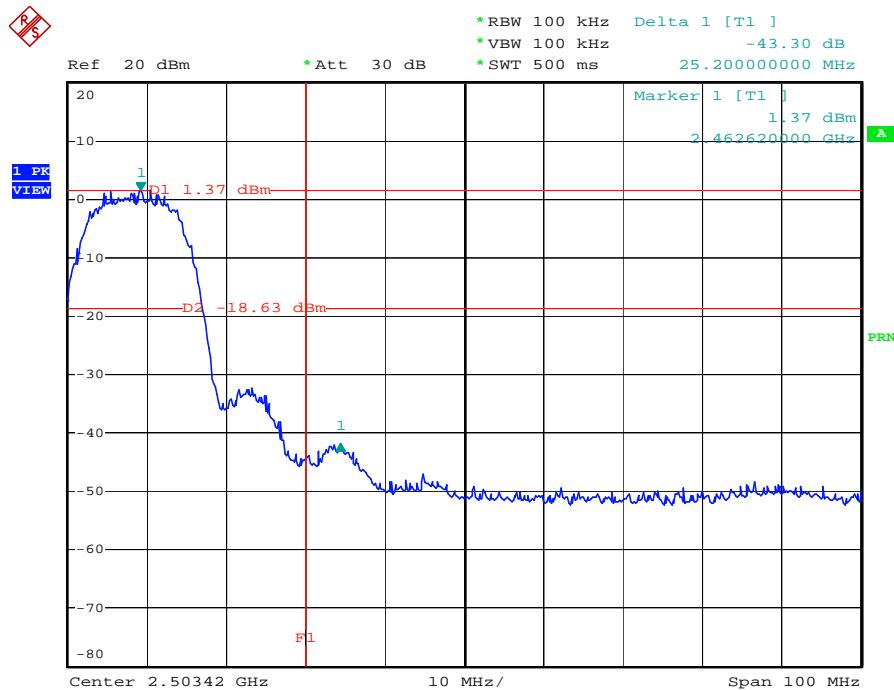
For Emission not in Restricted Band

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



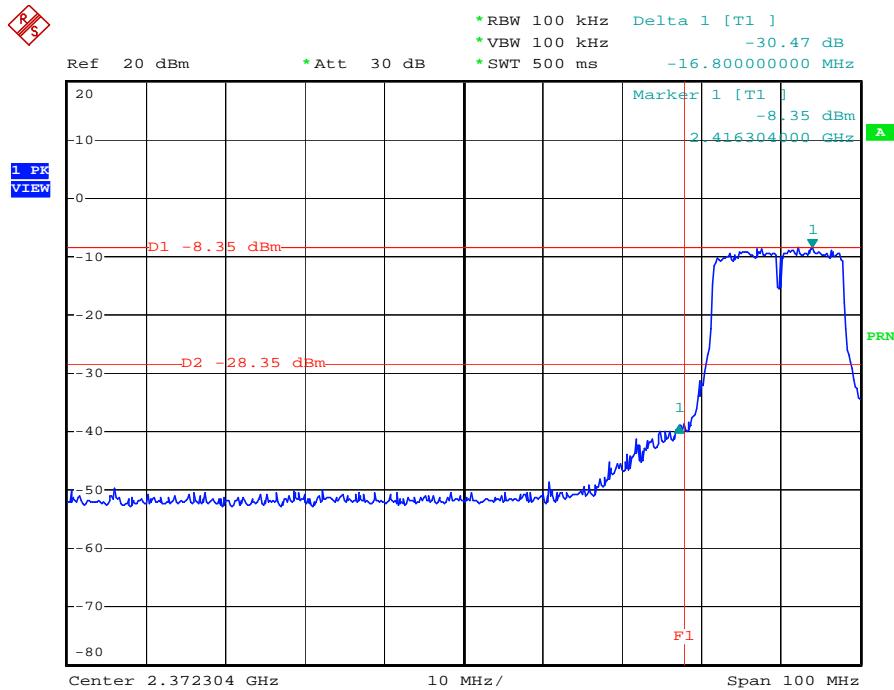
Date: 1.JUN.2006 11:49:59

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



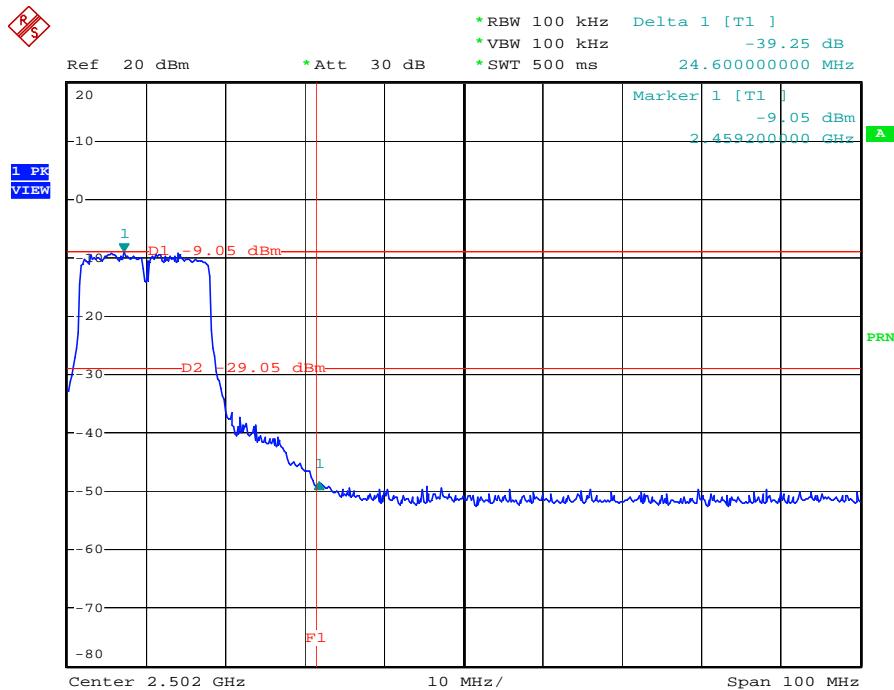
Date: 1.JUN.2006 11:55:28

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



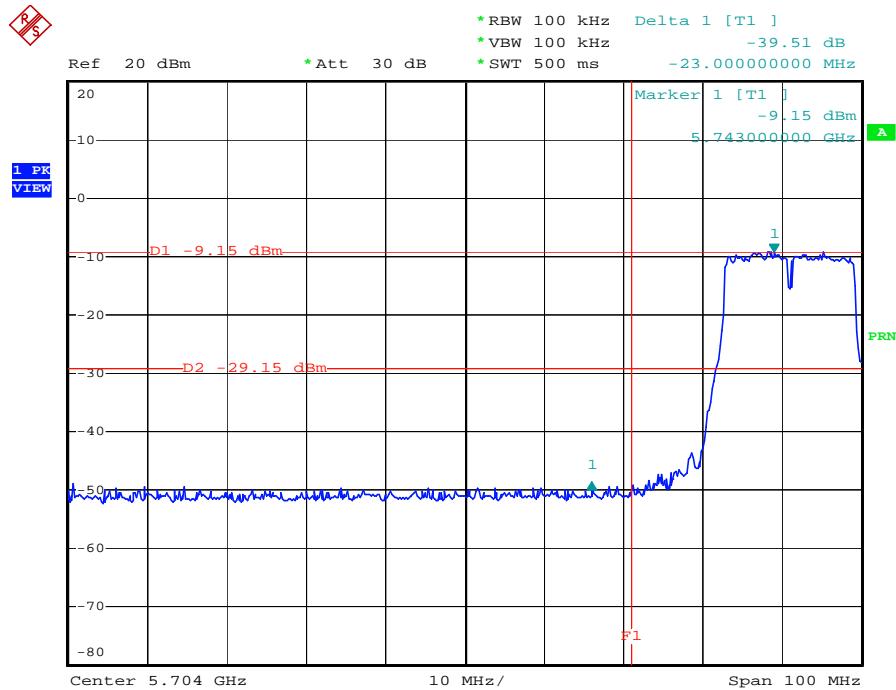
Date: 1.JUN.2006 12:05:05

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



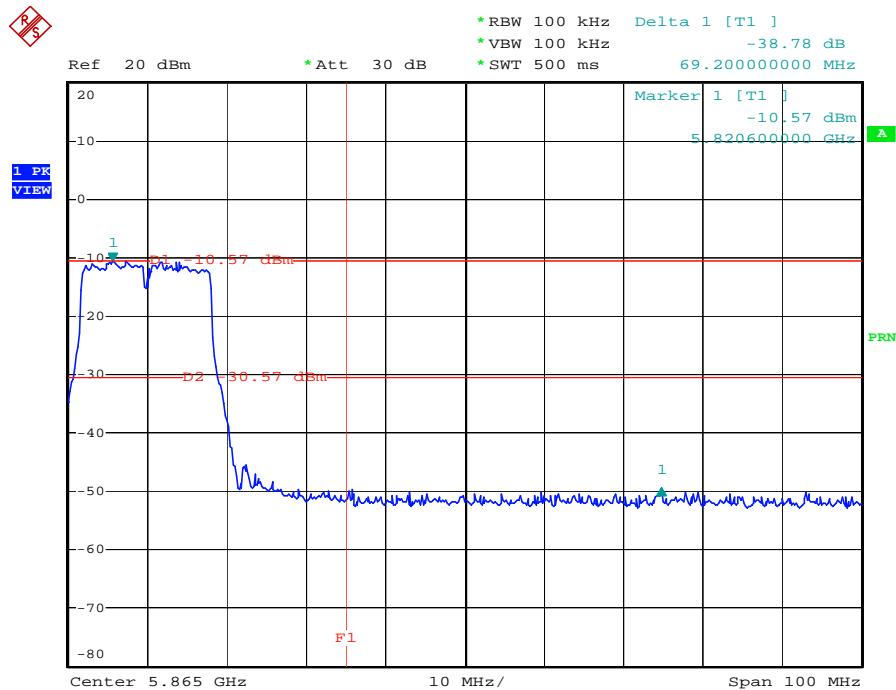
Date: 1.JUN.2006 12:06:42

Low Band Edge Plot on Configuration IEEE 802.11a / 5745 MHz



Date: 1.JUN.2006 12:43:10

High Band Edge Plot on Configuration IEEE 802.11a / 5825 MHz



Date: 1.JUN.2006 12:52:13



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, all antenna connectors comply with the requirements.

5. LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30 MHz - 1 GHz 3m	Jun. 16, 2005	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 30, 2006	Radiation (03CH03-HY)
Spectrum Analyzer	R&S	FSP40	100004/040	9 kHz - 40 GHz	Sep. 30, 2005	Radiation (03CH03-HY)
Biconical Antenna	SCHWARZBECK	VHBB 9124	301	30 MHz - 200 MHz	Jul. 22, 2005	Radiation (03CH03-HY)
Log Antenna	SCHWARZBECK	VUSLP 9111	221	200 MHz - 1 GHz	Jul. 22, 2005	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	100444	DC ~ 40GHz	Jul. 06, 2005	Conducted (TH01-HY)
Power sensor	R&S	NRV-Z55	100049	DC ~ 40GHz	Jul. 06, 2005	Conducted (TH01-HY)
Power Sensor	R&S	NRV-Z32	100057	30MHz ~ 6GHz	Apr. 27, 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)
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Dec. 30, 2005	Conducted (TH01-HY)
EMC Receiver	R&S	ESCS 30	100174	9kHz - 2.75GHz	Feb. 22, 2006	Conduction (CO04-HY)
LISN	MessTec	NNB-2/16Z	99079	9kHz - 30MHz	Dec. 19, 2005	Conduction (CO04-HY)
LISN (Support Unit)	EMCO	3810/2NM	9708-1839	9kHz - 30MHz	Mar. 18, 2006	Conduction (CO04-HY)
RF Cable-CON	UTIFLEX	3102-26886-4	CB049	9kHz - 30MHz	Apr. 20, 2006	Conduction (CO04-HY)
EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	N/A	Conduction (CO04-HY)
Data Generator	Tektronix	DG2030	063-2920-50	0.1Hz~400MHz	Jun. 02, 2005	Conducted (TH01-HY)

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

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)
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15 GHz - 40 GHz	Jun. 09, 2004*	Radiation (03CH03-HY)
AC power source	HPC	HPA-500W	HPA-9100024	AC 0 ~ 300V	Apr. 21, 2005*	Conducted (TH01-HY)
Oscilloscope	Tektronix	TDS1012	CO38515	100MHz / 1GS/s	Apr. 15, 2005*	Conducted (TH01-HY)

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



6. SPORTON COMPANY PROFILE

SPORTON Lab. was established in 1986 with one shielded room: the first private EMI test facility, offering local manufacturers an alternative EMI test familial apart from ERSO. In 1988, one 3M and 10M/3M open area test site were setup and also obtained official accreditation from FCC, VCCI and NEMKO. In 1993, a Safety laboratory was founded and obtained accreditation from UL of USA, CSA of Canada and TUV (Rhineland & PS) of Germany. In 1995, one EMC lab, including EMI and EMS test facilities was setup. In 1997, SPORTON Group has provided financial expense to relocate the headquarter to Orient Scientific Park in Taipei Hsien to offer more comprehensive, more qualified and better service to local suppliers and manufactures. In 1999, Safety Group and Component Group were setup. In 2001, SPORTON has established 3M/10M chamber in Hwa Ya Technology Park.

6.1. Test Location

SHIJR	ADD : 6Fl., No. 106, Sec. 1, Shintai 5th Rd., Shijr City, Taipei, Taiwan 221, R.O.C. TEL : 02-2696-2468 FAX : 02-2696-2255
HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL : 03-327-3456 FAX : 03-318-0055
LINKOU	ADD : No. 30-2, Dingfu Tsuen, Linkou Shiang, Taipei, Taiwan 244, R.O.C TEL : 02-2601-1640 FAX : 02-2601-1695
DUNGHU	ADD : No. 3, Lane 238, Kangle St., Neihu Chiu, Taipei, Taiwan 114, R.O.C. TEL : 02-2631-4739 FAX : 02-2631-9740
JUNGHE	ADD : 7Fl., No. 758, Jungjeng Rd., Junghe City, Taipei, Taiwan 235, R.O.C. TEL : 02-8227-2020 FAX : 02-8227-2626
NEIHU	ADD : 4Fl., No. 339, Hsin Hu 2 nd Rd., Taipei 114, Taiwan, R.O.C. TEL : 02-2794-8886 FAX : 02-2794-9777
JHUBEI	ADD : No.8, Lane 728, Bo-ai St., Jhubei City, Hsinchu County 302, Taiwan, R.O.C. TEL : 03-656-9065 FAX : 03-656-9085



7. NVLAP CERTIFICATE OF ACCREDITATION

United States Department of Commerce
National Institute of Standards and Technology



Certificate of Accreditation to ISO/IEC 17025:1999

NVLAP LAB CODE: 200079-0

Sportun International, Inc. Hwa Ya EMC Laboratory

Tao Yuan Hsien 333
TAIWAN

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



For the National Institute of Standards and Technology