Lab Code: 200167-0

FCC PART 15.247

EMI MEASUREMENT AND TEST REPORT

For

Ruckus Wireless, Inc.

880 West Maude Ave.
Sunnyvale, CA 94085, USA

FCC ID: SG9VX211X
Model: VX211X

This Report Concerns:	Product type:
☒ Original Report	Wireless 802.11b/g USB Adaptor (2.4GHz)

Test Engineer:	Tom Chen
Report No.:	R0607052
Report Date:	2006-08-04
Reviewed By:	Staff Engineer: James Ma
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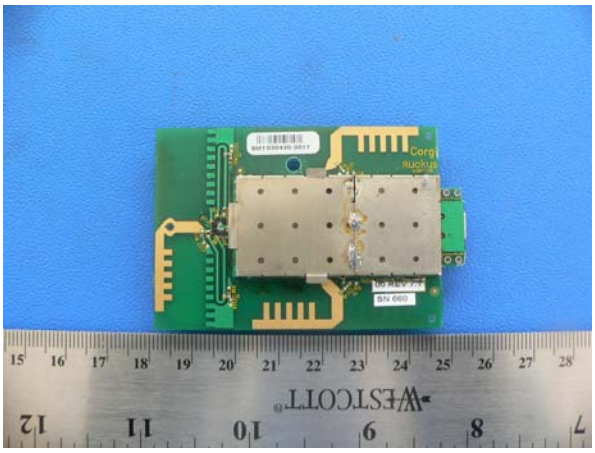
GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *Ruckus Wireless, Inc.* product, *FCC ID: SG9VX211X,* or the "EUT" as referred to this report is a Wireless 802.11b/g USB Adaptor (2.4GHz) which measures approximately 50mmL x 30mmW x 30mmH.

** The test data gathered are from production sample, serial number: N/A, provided by the manufacturer.*

EUT Photo



VX211X

Additional photos in Exhibit B

Objective

This type approval report is prepared on behalf of *Ruckus Wireless, Inc.* in accordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for Output Power, Antenna Requirements, 6 dB Bandwidth, and power spectral density, 100 kHz Bandwidth of Band Edges Measurement, Spurious Emissions, Conducted and Spurious Radiated Emissions.

Related Submittal(s)/Grant(s)

No Related Submittals.

Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Test Facility

The Test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at it's facility in Sunnyvale, California, USA.

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and is listed under FCC registration number: 90464 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at
http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm

SYSTEM TEST CONFIGURATION

Justification

The host system was configured for testing according to ANSI C63.4-2003.

The EUT was tested in the test operating mode to represent *worst*-case results during the final qualification test.

EUT Exercise Software

ART is using for testing, and the following power setting was used during the testing:

	2412 MHz	2437 MHz	2462 MHz	Data rate
802.11b	20 dBm	20 dBm	20 dBm	1Mbps
802.11g	20 dBm	20 dBm	20 dBm	6Mbps

Special Accessories

N/A

Equipment Modifications

No modifications were made to the EUT.

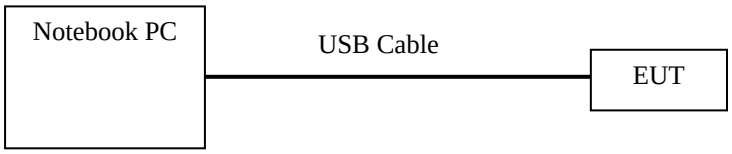
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Compaq	Laptop	Presario 2100	CNF43403FB

Interface Ports and Cabling

Cable Description	Length (M)	From	To
RF Cable	0.2	EUT Antenna Port	SA
USB cable	1.5	Laptop PC	EUT

Test Setup Block Diagram



SUMMARY OF TEST RESULTS

Results reported relate only to the product tested.

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.247(e)(i) §2.1091	RF Exposure	Compliant
§15.203	Antenna Requirement	Compliant
§ 15.207 (a)	Conducted Emissions	Compliant
§2.1051 & §15.247(d)	Spurious Emissions at Antenna Port	Compliant
§15.205	Restricted Band	Compliant
§15.209 (a) & §15.247(c)	Radiated Emissions	Compliant
§15.247 (a)(2)	6 dB Bandwidth	Compliant
§15.247 (b)(3)	Maximum Peak Output Power	Compliant
§ 15.247 (c)	100 kHz Bandwidth of Frequency Band Edge	Compliant
§15.247 (d)	Power Spectral Density	Compliant

§15.247(e)(i),§2.1091 - RF EXPOSURE

According to §15.247(e)(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

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

MPE Prediction

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$S = PG/4\pi R^2$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal: 18.3 (dBm)
Maximum peak output power at antenna input terminal: 67.61 (mW)
Prediction distance: 20 (cm)
Predication frequency: 2437 (MHz)
Antenna Gain (typical): 4.98 (dBi)
Antenna gain: 3.15 (numeric)
Power density at predication frequency at 20 cm: 0.042(mW/cm^2)

MPE limit for uncontrolled exposure at prediction frequency: 1.0 (mW/cm^2)

Test Result

The EUT is a modular device. The power density level at 20 cm is 0.042mW/cm^2, which is below the uncontrolled exposure limit of 1.0mW/cm^2 at 2437 MHz. for VX211X.

§15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to § 15.203, 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.

And according to § 15.247 (b) (4), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The antenna for this device is an integral antenna with gain of 4.98 dBi.

§15.207 (a) - CONDUCTED EMISSIONS

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are receiver, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at BACL is $\pm$2.4 dB.

Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.4 – 2003 measurement procedure. The specification used was FCC Class B limits.

External I/O cables were draped along the edge of the test table and bundle when necessary.

The EUT was connected with LISN-1.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal Date
Rohde & Schwarz	Artificial-Mains Network	ESH2-Z5	871884/039	2005-11-14
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2006-03-13

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Test Procedure

During the conducted emissions test, the power cord of the EUT was connected to the mains outlet of the LISN-1.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the peak detection mode, quasi-peak and average. Quasi-Peak readings are distinguished with a "QP". Average readings are distinguished with an "Ave".

Environmental Conditions

Temperature:	24° C
Relative Humidity:	50%
ATM Pressure:	1022 mbar

**The testing was performed by Tom Chen on 2006-07-10*

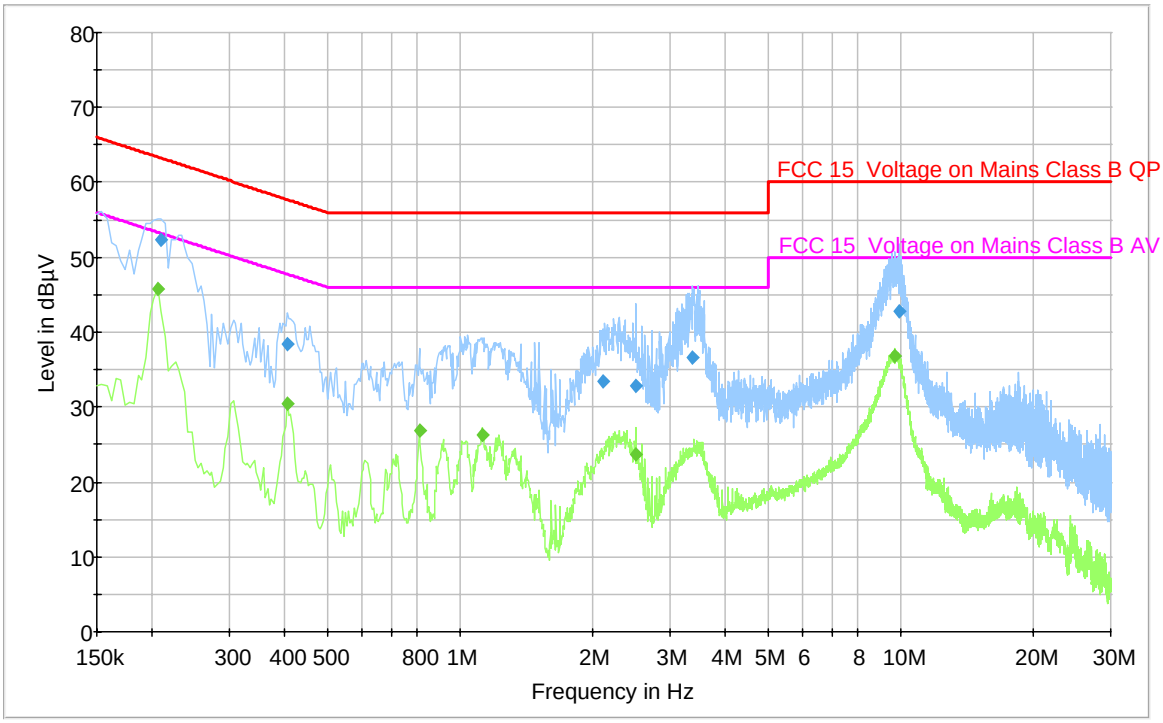
Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC Conducted limit for a Class B device, with the *worst* margin reading of:

-7.7 dB at **0.206000 MHz** in the **Line** conductor mode.

Conducted Emissions Test plot & data

Line



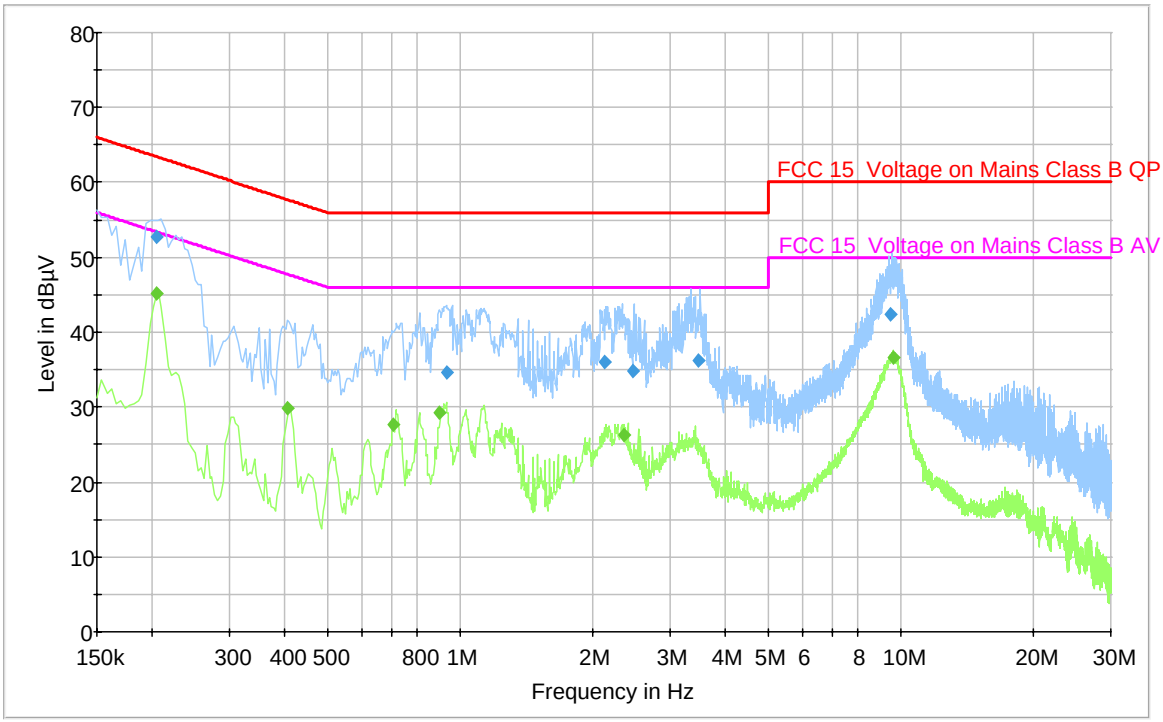
QP Measurements

Frequency (MHz)	Quasi-Peak (dBµV)	Line	Limit (dBµV)	Margin (dB)
0.210000	52.4	L1	63.2	10.8
9.914000	42.9	L1	60.0	17.1
0.406000	38.4	L1	57.7	19.4
3.382000	36.5	L1	56.0	19.5
2.114000	33.4	L1	56.0	22.6
2.502000	32.7	L1	56.0	23.3

Average Measurements

Frequency (MHz)	Average (dBµV)	Line	Limit (dBµV)	Margin (dB)
0.206000	45.7	L1	53.4	7.7
9.706000	36.9	L1	50.0	13.1
0.406000	30.4	L1	47.7	17.3
0.810000	26.9	L1	46.0	19.1
1.122000	26.2	L1	46.0	19.8
2.502000	23.7	L1	46.0	22.3

Neutral



QP Measurements

Frequency (MHz)	Quasi-Peak (dBµV)	Line	Limit (dBµV)	Margin (dB)
0.205000	52.7	N	63.4	10.7
9.517000	42.3	N	60.0	17.7
3.485000	36.2	N	56.0	19.8
2.129000	36.1	N	56.0	19.9
2.465000	34.9	N	56.0	21.1
0.937000	34.6	N	56.0	21.4

Average Measurements

Frequency (MHz)	Average (dBµV)	Line	Limit (dBµV)	Margin (dB)
0.205000	45.2	N	53.4	8.2
9.621000	36.6	N	50.0	13.4
0.901000	29.3	N	46.0	16.7
0.405000	29.8	N	47.8	17.9
0.705000	27.7	N	46.0	18.3
2.365000	26.2	N	46.0	19.8

§2.1051 & §15.247(d) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standard

Requirements: CFR 47, § 2.1051.

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in § 2.1057.

Measurement Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to 10^{th} harmonic.

Equipment Lists

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Analyzer, Spectrum	8565EC	3946A00131	2006-01-11

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Environmental Conditions

Temperature:	24° C
Relative Humidity:	50%
ATM Pressure:	1022 mbar

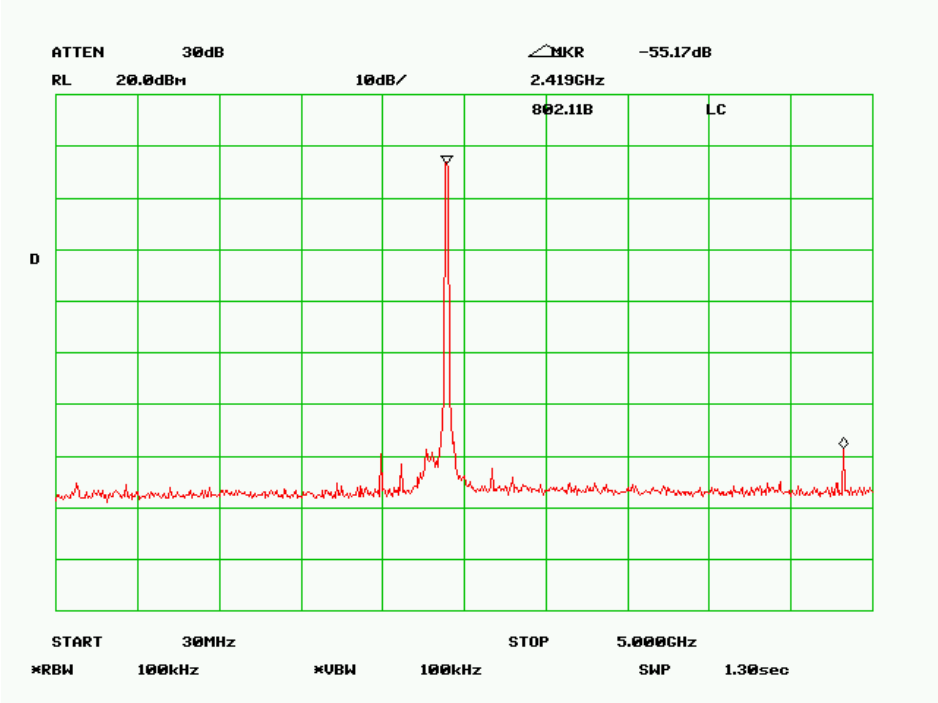
**The testing was performed by Tom Chen on 2006-07-10*

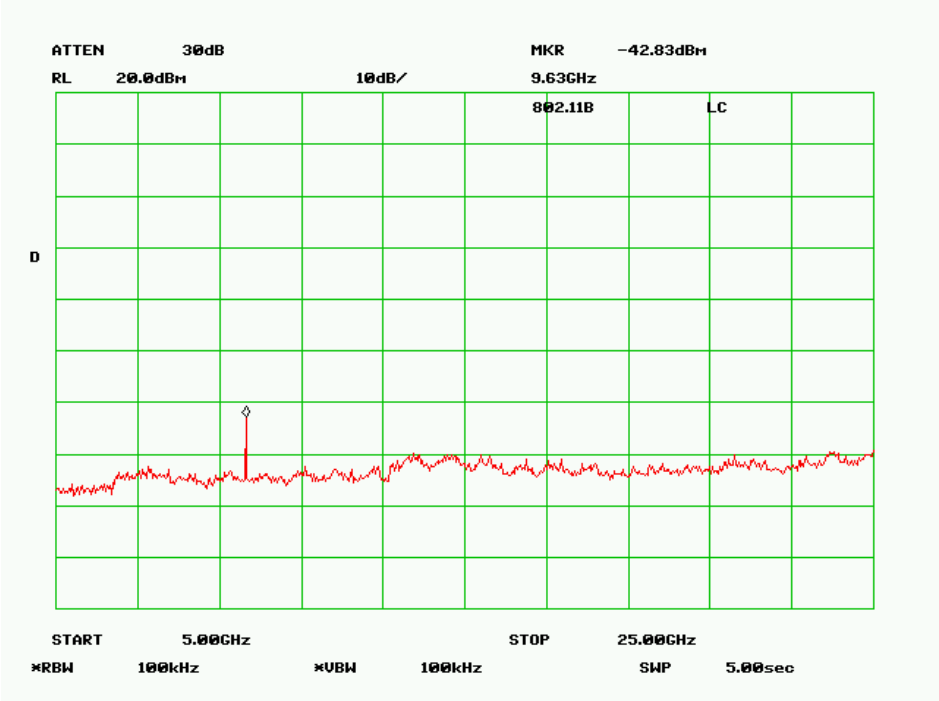
Measurement Result

Please refer to following pages for plots of spurious emissions.

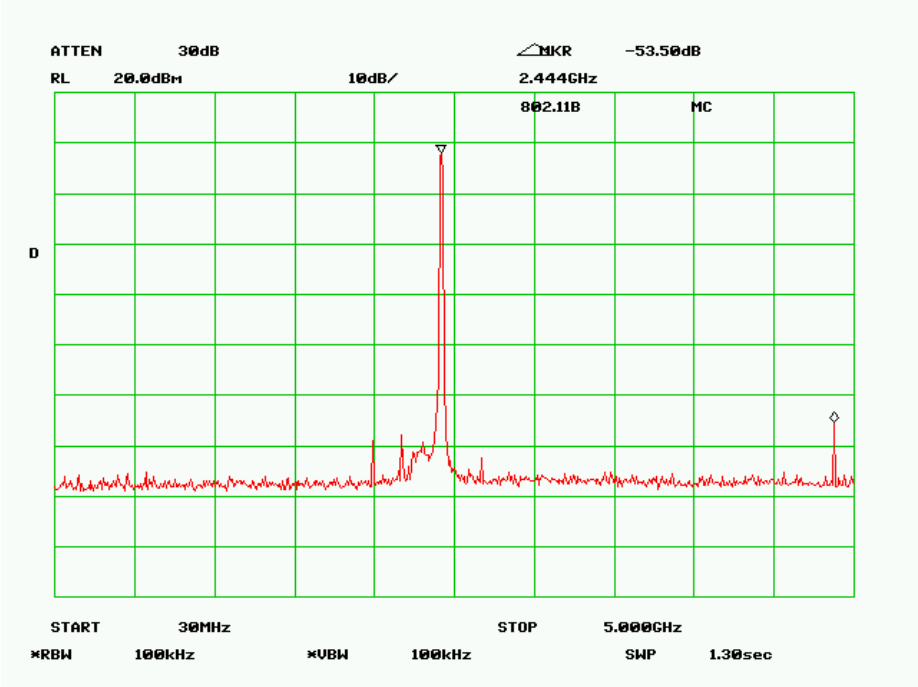
802.11b:

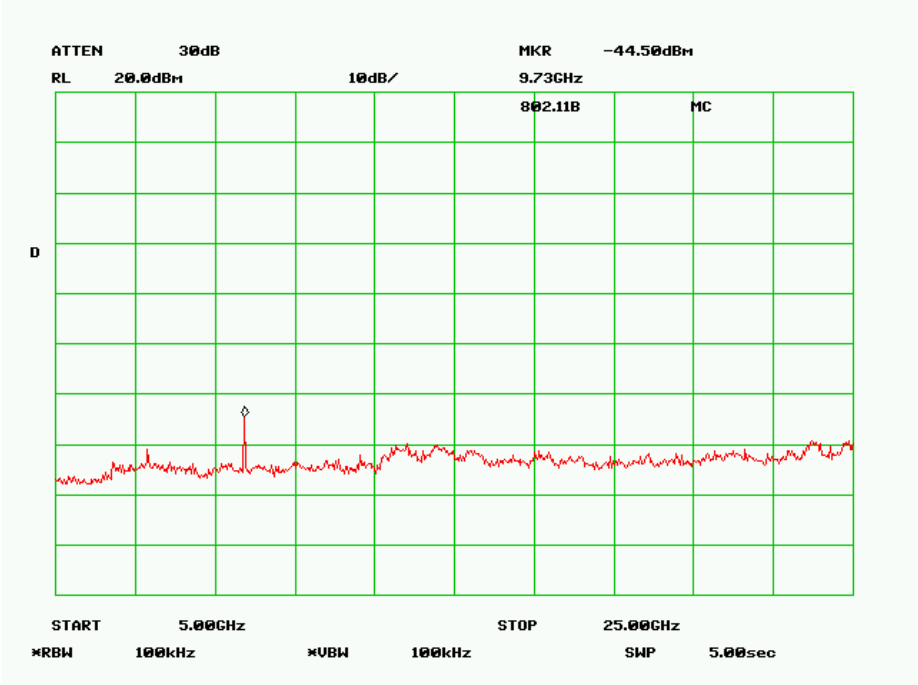
Low Channel



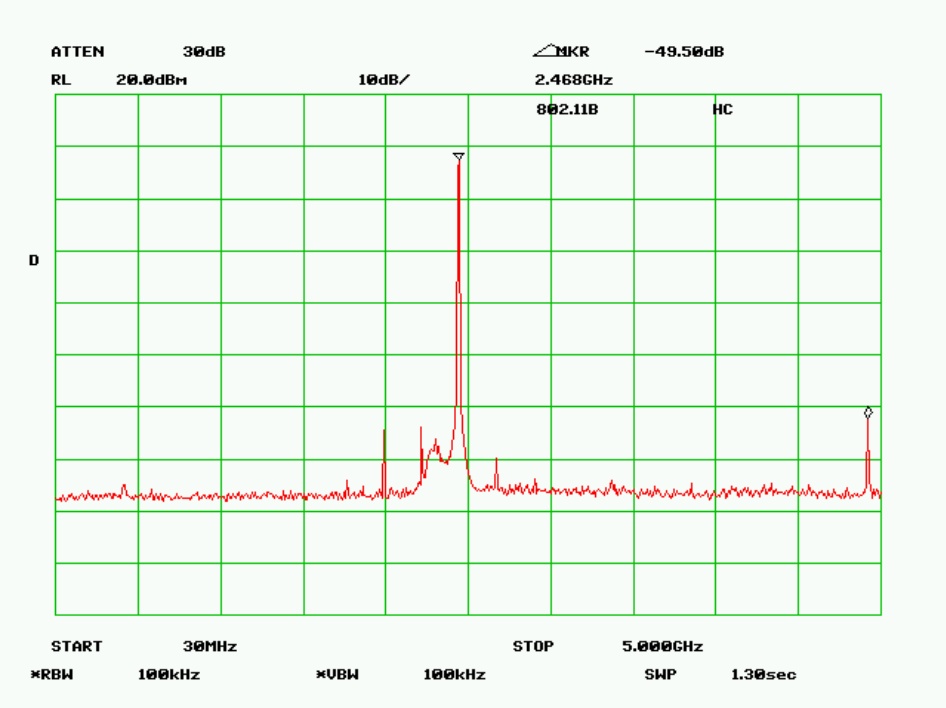


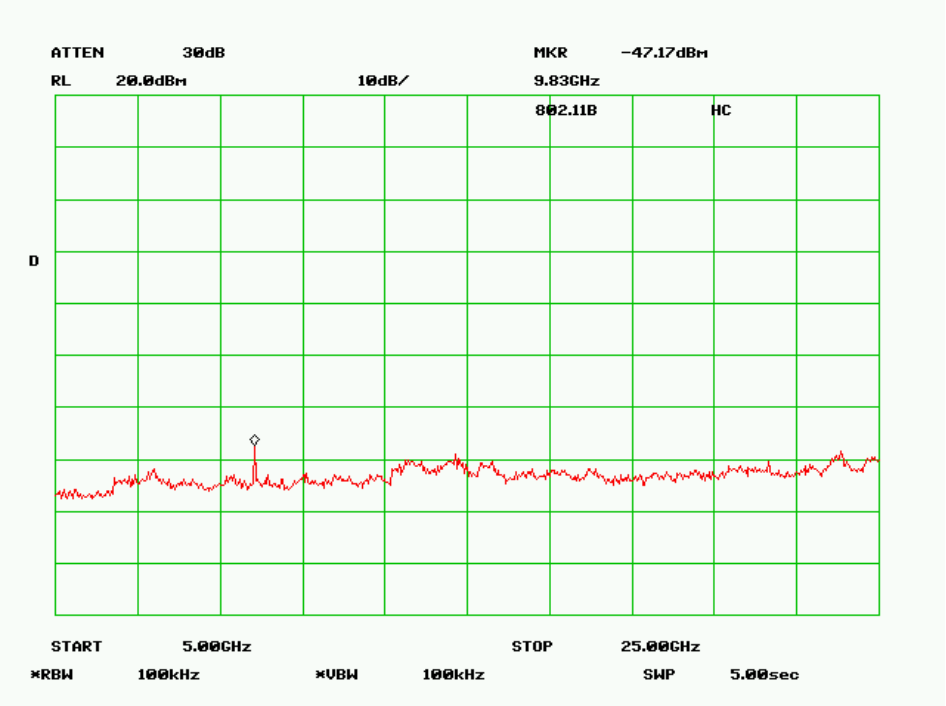
Mid Channel


ATTEN 30dB
MKR -53.50dB
RL 20.0dBm
10dB/
2.444GHz
802.11B
MC
D
START 30MHz
STOP 5.000GHz
*RBW 100kHz
*VBW 100kHz
SWP 1.30sec


ATTEN 30dB
MKR -44.50dBm
RL 20.0dBm
10dB/
9.73GHz
802.11B
MC
D
START 5.00GHz
STOP 25.00GHz
*RBW 100kHz
*VBW 100kHz
SWP 5.00sec

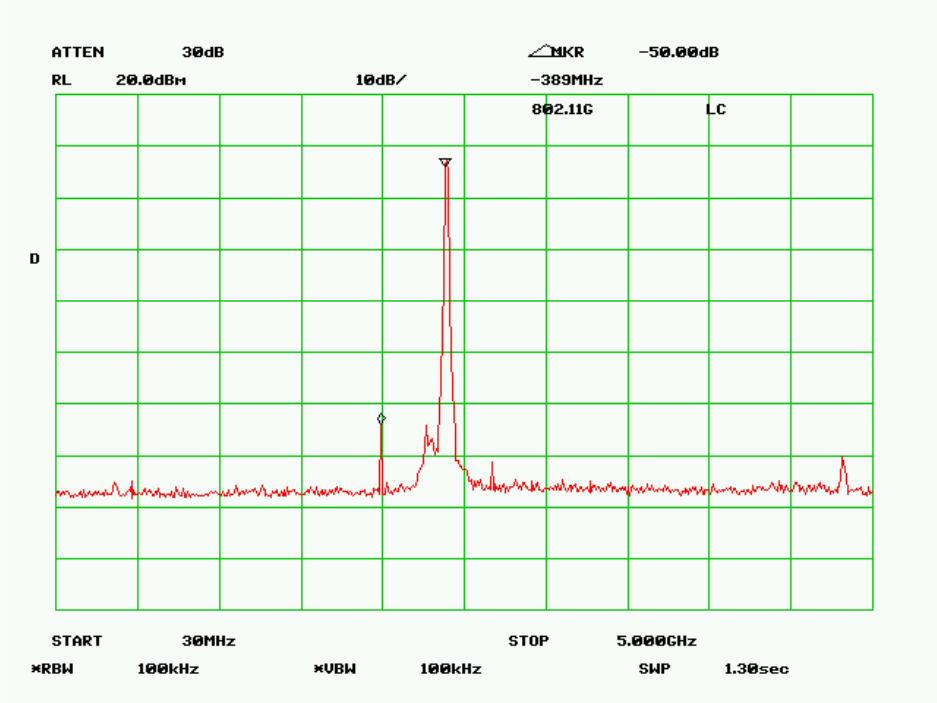
High Channel



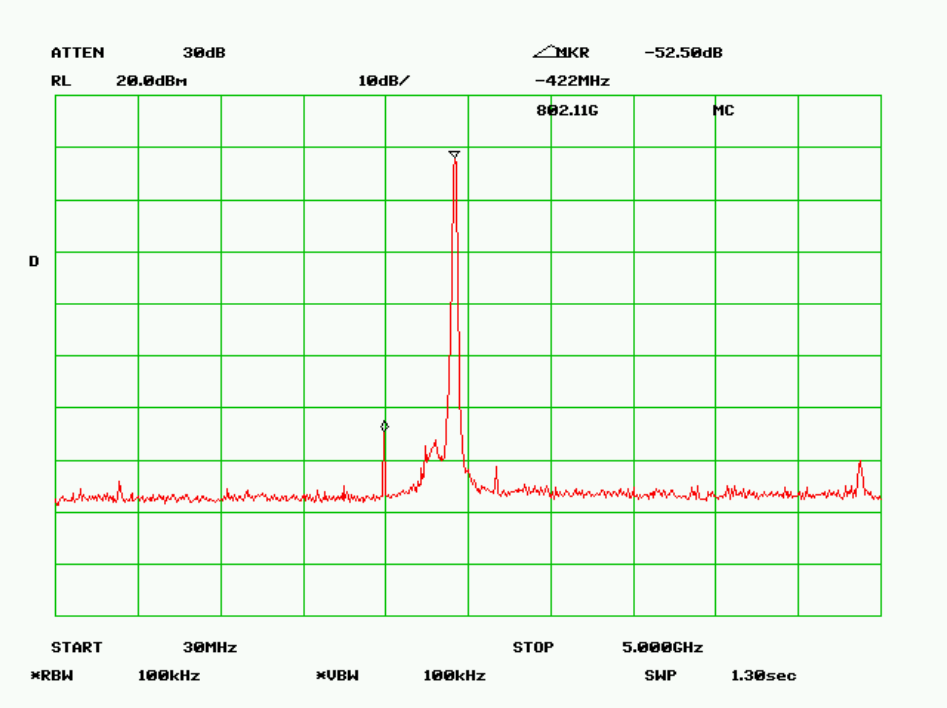


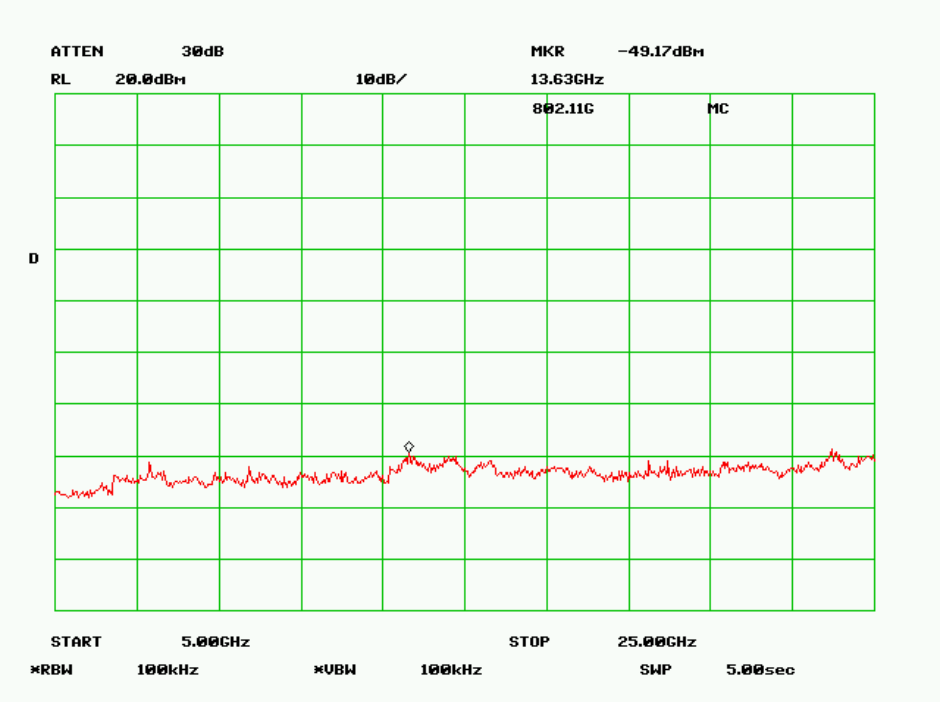
802.11g:

Low Channel

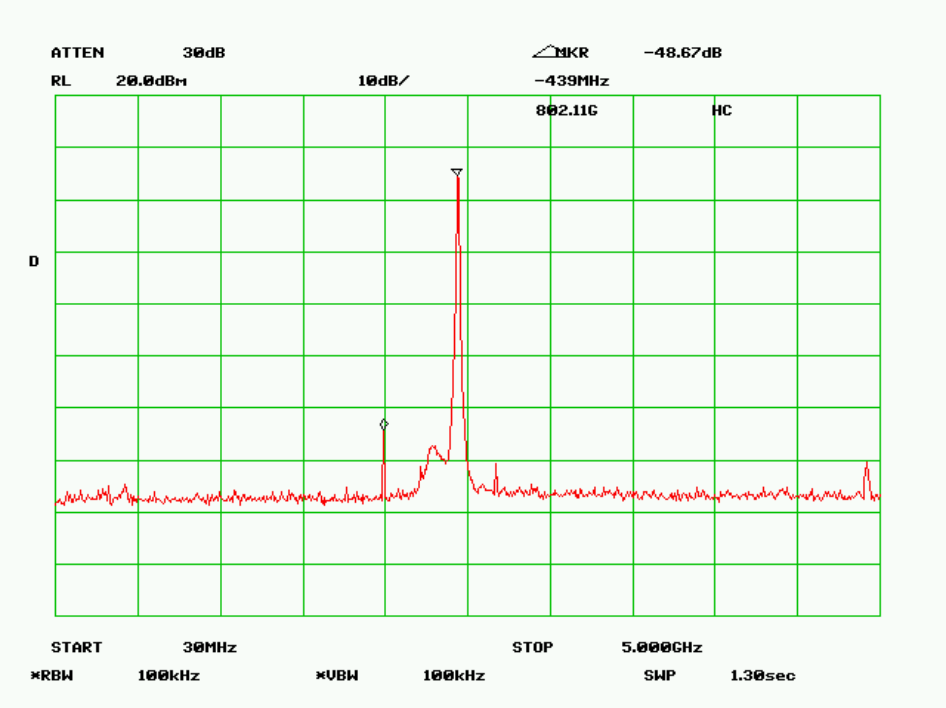


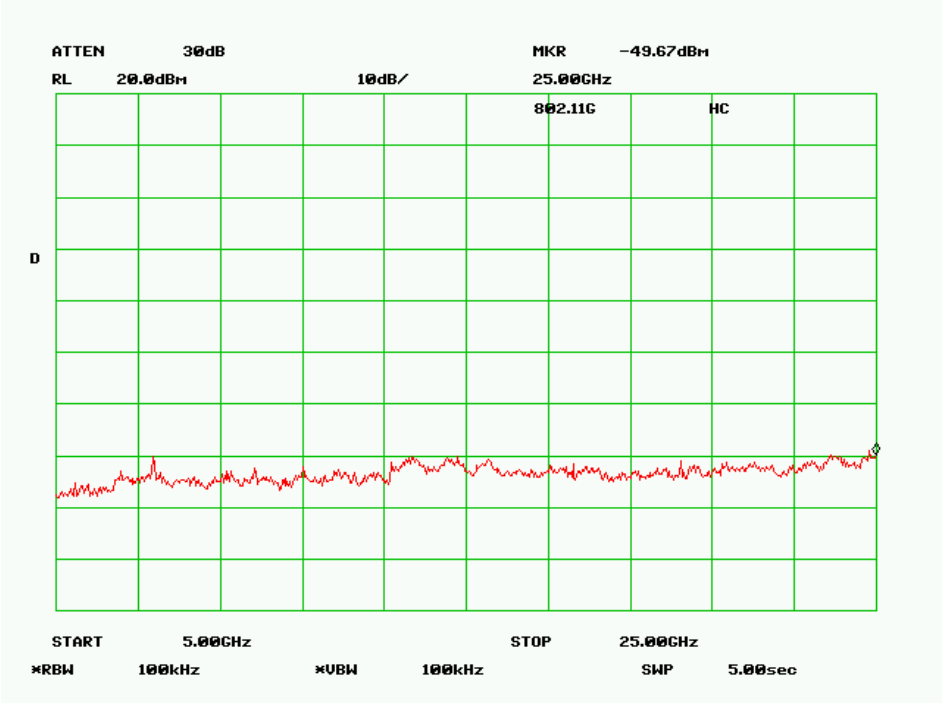
Mid Channel


ATTEN 30dB
MKR -52.50dB
RL 20.0dBm
10dB/
-422MHz
802.11G
MC
D
START 30MHz
STOP 5.000GHz
*RBW 100kHz
*VBW 100kHz
SWP 1.30sec


ATTEN 30dB
MKR -49.17dBm
RL 20.0dBm
10dB/
13.63GHz
802.11G
MC
D
START 5.00GHz
STOP 25.00GHz
*RBW 100kHz
*VBW 100kHz
SWP 5.00sec

High Channel





§15.205 & §15.209 & §15.247(c) - SPURIOUS RADIATED EMISSIONS

Measurement Uncertainty

All measurements involve certain levels of uncertainties. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is ±4.0 dB.

Test Setup

The radiated emissions tests were performed in the 3-meter open area test site, using the setup in accordance with ANSI C63.4-2003. The specification used was the FCC 15 Subpart C limits.
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EUT Setup

The radiated emissions tests were performed using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15.209 limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal Date
Sonoma Instruments	Pre amplifier	317	260408	2006-02-03
Agilent	Pre amplifier	8449B	3008A01978	2005-08-10
Sunol Science Corp	Combination Antenna	JB3 Antenna	A020106-3	2006-02-14
A.R.A	Antenna, Horn	DRG-118/A	1132	2005-08-17
Sunol Science Corp	System Controller	SC99V	113005-1	N/R
Agilent	Spectrum analyzer	8565EC	3946A00131	2006-01-11
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.595 0K03	20-174821	2006-02-24

* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

Test Procedure

For the radiated emissions test, the EUT, and all support equipment power cords was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all
installation combinations.

All data was recorded in the peak detection mode. Quasi-peak readings performed only when an emissions
was found to be marginal (within -4 dBμV of specification limits), and are distinguished with a "**QP**" in
the data table.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

> Corrected Amplitude = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit.
The equation for margin calculation is as follows:

> Margin = Corrected Amplitude - FCC 15.247 Limit

Environmental Conditions

Temperature:	24° C
Relative Humidity:	50%
ATM Pressure:	1022 mbar

**The testing was performed by Tom Chen on 2006-07-10*

Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247, and had the worst margin of:

802.11b:

-27.1 dB at **30.240000 MHz** in the **Vertical** polarization for 30MHz – 1GHz.
-5.9 dB at **7236.0000 MHz** in the **Vertical** polarization for Low Channel, 1GHz – 25GHz.
-2.9 dB at **7311.0000 MHz** in the **Vertical** polarization for Middle Channel, 1GHz – 25GHz
-6.3 dB at **7386.0000 MHz** in the **Vertical** polarization for High Channel, 1GHz – 25GHz.

802.11g:

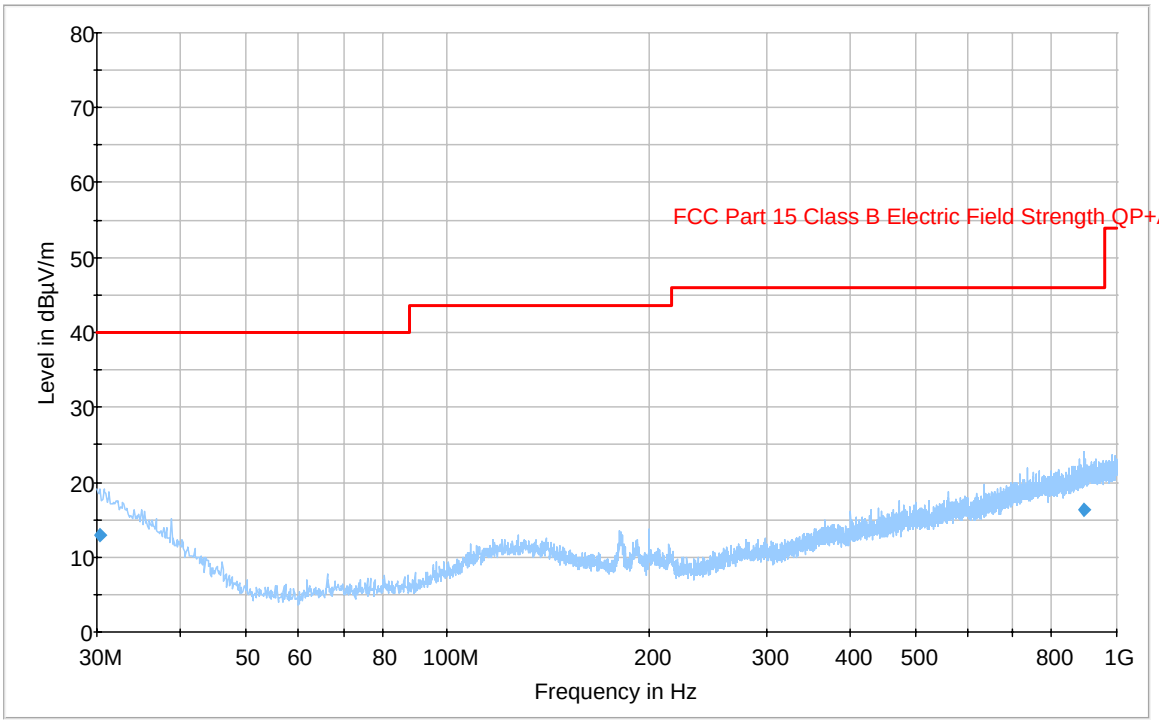
-27.7 dB at **30.932500 MHz** in the **Horizontal** polarization for 30MHz – 1GHz.
-12.4 dB at **7236.0000 MHz** in the **Vertical** polarization for Low Channel, 1GHz – 25GHz.

-6.4 dB at **4874.0000 MHz** in the **Vertical** polarization for Middle Channel, 1GHz – 25GHz.
-4.4 dB at **7386.0000 MHz** in the **Vertical** polarization for Low Channel, 1GHz – 25GHz.

Radiated Emissions Test plot & data

802.11b

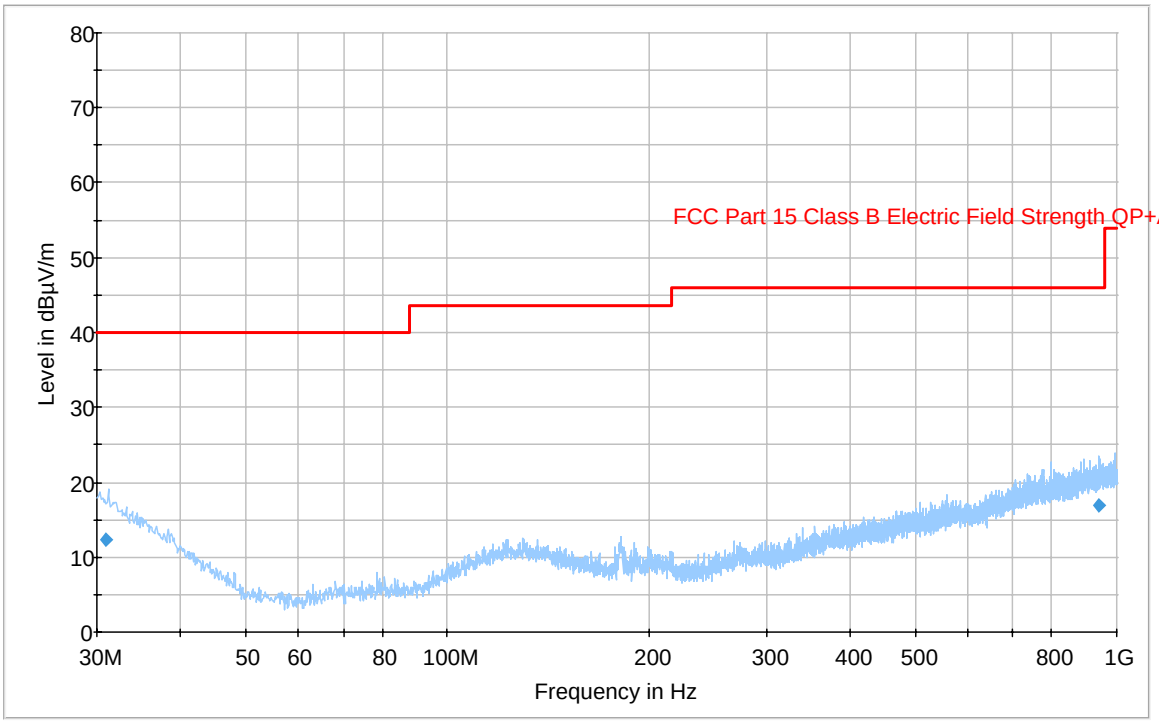
30MHz -1GHz



Frequency (MHz)	Quasi-Peak (dBµV/m)	Antenna height (cm)	Polarity	Turntable position (deg)	Margin (dB)	Limit (dBµV/m)
30.240000	12.9	125.0	V	340.0	27.1	40.0
894.307500	16.4	294.0	V	225.0	29.6	46.0

802.11g

30MHz -1GHz



Frequency (MHz)	Quasi-Peak (dBµV/m)	Antenna height (cm)	Polarity	Turntable position (deg)	Margin (dB)	Limit (dBµV/m)
30.932500	12.3	151.0	H	301.0	27.7	40.0
940.876250	16.9	360.0	H	97.0	29.1	46.0

802.11b

1GHz -25GHz, (Low channel 2412 MHz)

Frequency	Reading	Azimuth	Height	Polar	Antenna Factor	Cable loss	Amplifier	Corrected Reading	15.247		Comments
MHz	dBuV	Degrees	m	H / V	dB	dB	dB	dBuV/m	Limit (dBuV/m)	Margin	
7236.0000	41.8	212	1.3	V	36.7	4.2	34.7	48.1	54	-5.9	Ave
4824.0000	41.8	248	1.1	V	32.5	1.9	34.8	41.4	54	-12.6	Ave
4824.0000	41.8	260	1.2	H	32.5	1.9	34.8	41.4	54	-12.6	Ave
9648.0000	33.7	261	1.3	H	38.1	3.7	34.2	41.3	54	-12.7	Ave
7236.0000	33.8	293	1.4	H	36.7	4.2	34.7	40.1	54	-13.9	Ave
9648.0000	32.5	260	1.3	V	38.1	3.7	34.2	40.1	54	-13.9	Ave
7236.0000	52.3	212	1.3	V	36.7	4.2	34.7	58.6	74	-15.4	Peak
4824.0000	55.5	260	1.2	H	32.5	1.9	34.8	55.1	74	-18.9	Peak
4824.0000	55.2	248	1.1	V	32.5	1.9	34.8	54.8	74	-19.2	Peak
7236.0000	46.8	293	1.4	H	36.7	4.2	34.7	53.1	74	-20.9	Peak
9648.0000	45.2	261	1.3	H	38.1	3.7	34.2	52.8	74	-21.2	Peak
9648.0000	44.5	260	1.3	V	38.1	3.7	34.2	52.1	74	-21.9	Peak

1GHz -25GHz, (Middle channel 2437MHz)

Frequency	Reading	Azimuth	Height	Polar	Antenna Factor	Cable loss	Amplifier	Corrected Reading	15.247		Comments
MHz	dBuV	Degrees	m	H / V	dB	dB	dB	dBuV/m	Limit (dBuV/m)	Margin	
7311.0000	44.8	249	1.1	V	36.7	4.2	34.7	51.1	54	-2.9	Ave
4874.0000	45.8	96	1.1	V	32.5	1.9	34.8	45.4	54	-8.6	Ave
4874.0000	45.5	233	1.1	H	32.5	1.9	34.8	45.1	54	-8.9	Ave
7311.0000	35.3	286	1.5	H	36.7	4.2	34.7	41.6	54	-12.4	Ave
7311.0000	54.5	249	1.1	V	36.7	4.2	34.7	60.7	74	-13.3	Peak
4874.0000	58.8	96	1.1	V	32.5	1.9	34.8	58.4	74	-15.6	Peak
4874.0000	58.7	233	1.1	H	32.5	1.9	34.8	58.3	74	-15.7	Peak
7311.0000	48.7	286	1.5	H	36.7	4.2	34.7	54.9	74	-19.1	Peak

1GHz -25GHz, (High Channel 2462 MHz)

Frequency MHz	Reading dBuV	Azimuth Degrees	Height m	Polar H / V	Antenna Factor dB	Cable loss dB	Amplifier dB	Corrected Reading dBuV/m	15.247 Limit (dBuV/m)	15.247 Margin	Comments
7386.0000	41.5	254	1.1	V	36.7	4.2	34.7	47.7	54	-6.3	Ave
7386.0000	36.0	189	1.2	H	36.7	4.2	34.7	42.2	54	-11.8	Ave
4924.0000	41.2	169	1.4	V	32.5	1.9	34.8	40.8	54	-13.2	Ave
4924.0000	39.7	241	1.1	H	32.5	1.9	34.8	39.3	54	-14.7	Ave
7386.0000	52.3	254	1.1	V	36.7	4.2	34.7	58.6	74	-15.4	Peak
4924.0000	55.0	169	1.4	V	32.5	1.9	34.8	54.6	74	-19.4	Peak
7386.0000	48.2	189	1.2	H	36.7	4.2	34.7	54.4	74	-19.6	Peak
4924.0000	53.0	241	1.1	H	32.5	1.9	34.8	52.6	74	-21.4	Peak

802.11g

1GHz -25GHz, (Low channel 2412 MHz)

Frequency MHz	Reading dBuV	Azimuth Degrees	Height m	Polar H / V	Antenna Factor dB	Cable loss dB	Amplifier dB	Corrected Reading dBuV/m	15.247 Limit (dBuV/m)	15.247 Margin	Comments
7236.0000	35.3	216	1.1	V	36.7	4.2	34.7	41.6	54	-12.4	Ave
7236.0000	33.8	186	1.1	H	36.7	4.2	34.7	40.1	54	-13.9	Ave
9648.0000	31.0	199	1.2	H	38.1	3.7	34.2	38.6	54	-15.4	Ave
9648.0000	30.8	120	1.2	V	38.1	3.7	34.2	38.5	54	-15.5	Ave
4824.0000	38.0	229	1.2	H	32.5	1.9	34.8	37.6	54	-16.4	Ave
7236.0000	50.3	216	1.1	V	36.7	4.2	34.7	56.6	74	-17.4	Peak
4824.0000	55.7	229	1.2	H	32.5	1.9	34.8	55.3	74	-18.7	Peak
4824.0000	35.3	258	1.3	V	32.5	1.9	34.8	34.9	54	-19.1	Ave
7236.0000	47.7	186	1.1	H	36.7	4.2	34.7	53.9	74	-20.1	Peak
4824.0000	52.7	258	1.3	V	32.5	1.9	34.8	52.3	74	-21.7	Peak
9648.0000	44.7	120	1.2	V	38.1	3.7	34.2	52.3	74	-21.7	Peak
9648.0000	44.3	199	1.2	H	38.1	3.7	34.2	52.0	74	-22.0	Peak

1GHz -25GHz, (Middle channel 2437MHz)

Frequency	Reading	Azimuth	Height	Polar	Antenna Factor	Cable loss	Amplifier	Corrected Reading	15.247		
MHz	dBuV	Degrees	m	H / V	dB	dB	dB	dBuV/m	Limit (dBuV/m)	Margin	Comments
4874.0000	48.0	130	1.6	V	32.5	1.9	34.8	47.6	54	-6.4	Ave
7311.0000	40.5	259	1.6	V	36.7	4.2	34.7	46.7	54	-7.3	Ave
4874.0000	46.8	219	1.3	H	32.5	1.9	34.8	46.4	54	-7.6	Ave
4874.0000	65.2	130	1.6	V	32.5	1.9	34.8	64.8	74	-9.2	Peak
4874.0000	64.7	219	1.3	H	32.5	1.9	34.8	64.3	74	-9.7	Peak
7311.0000	56.3	259	1.6	V	36.7	4.2	34.7	62.6	74	-11.4	Peak
7311.0000	36.0	287	1.8	H	36.7	4.2	34.7	42.2	54	-11.8	Ave
9748.0000	31.5	292	1.6	H	38.1	3.7	34.2	39.1	54	-14.9	Ave
9748.0000	31.3	229	1.6	V	38.1	3.7	34.2	39.0	54	-15.0	Ave
7311.0000	51.2	287	1.8	H	36.7	4.2	34.7	57.4	74	-16.6	Peak
9748.0000	44.7	292	1.6	H	38.1	3.7	34.2	52.3	74	-21.7	Peak
9748.0000	44.2	229	1.6	V	38.1	3.7	34.2	51.8	74	-22.2	Peak

1GHz -25GHz, (High Channel 2462 MHz)

Frequency	Reading	Azimuth	Height	Polar	Antenna Factor	Cable loss	Amplifier	Corrected Reading	15.247		
MHz	dBuV	Degrees	m	H / V	dB	dB	dB	dBuV/m	Limit (dBuV/m)	Margin	Comments
7386.0000	43.3	102	1.3	V	36.7	4.2	34.7	49.6	54	-4.4	Ave
4924.0000	45.8	222	1.2	H	32.5	1.9	34.8	45.4	54	-8.6	Ave
7386.0000	58.5	102	1.3	V	36.7	4.2	34.7	64.7	74	-9.3	Peak
7386.0000	36.8	214	1.3	H	36.7	4.2	34.7	43.1	54	-10.9	Ave
4924.0000	62.8	222	1.2	H	32.5	1.9	34.8	62.4	74	-11.6	Peak
4924.0000	42.3	221	1.8	V	32.5	1.9	34.8	41.9	54	-12.1	Ave
4924.0000	59.0	221	1.8	V	32.5	1.9	34.8	58.6	74	-15.4	Peak
7386.0000	52.2	214	1.3	H	36.7	4.2	34.7	58.4	74	-15.6	Peak

§15.247(a)(2) – 6 dB BANDWIDTH

Applicable Standard

According to §15.247(a)(2), for digital modulation techniques, the minimum 6dB bandwidth shall be at least 500 kHz.

Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emissions bandwidth. (6 dB bandwidth for DTS)
4. Repeat above procedures until all frequencies measured were complete.

Equipment Lists

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Analyzer, Spectrum	8565EC	3946A00131	2006-01-11

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Environmental Conditions

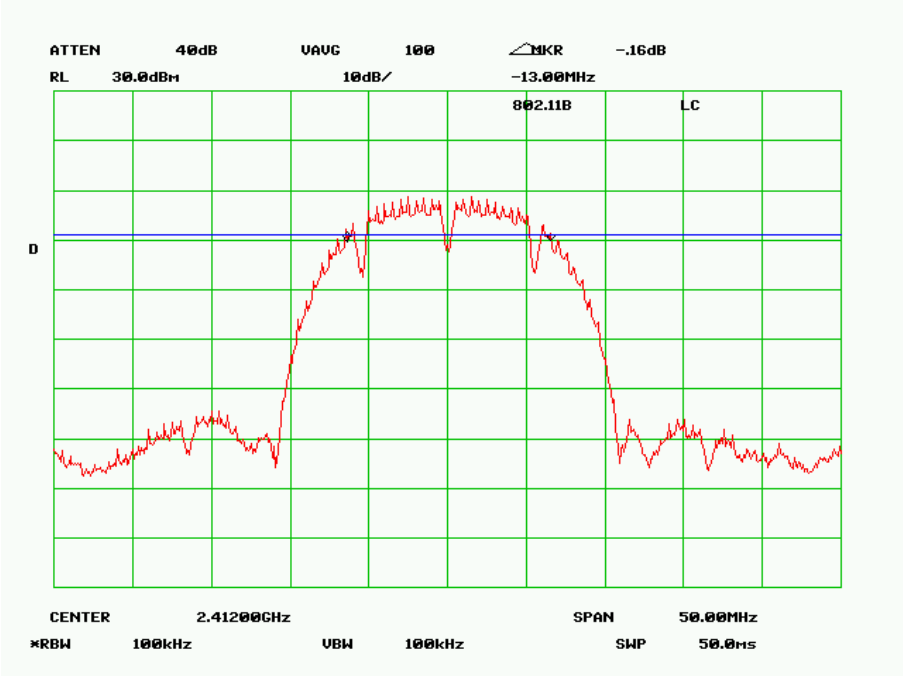
Temperature:	24° C
Relative Humidity:	50%
ATM Pressure:	1022 mbar

**The testing was performed by Tom Chen on 2006-07-10*

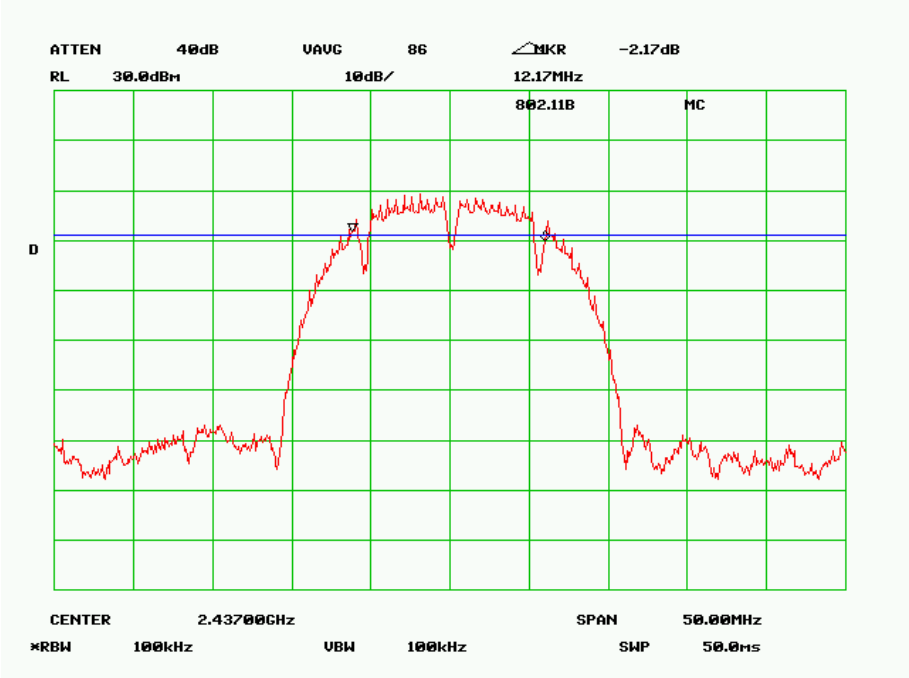
Test Result

802.11b:

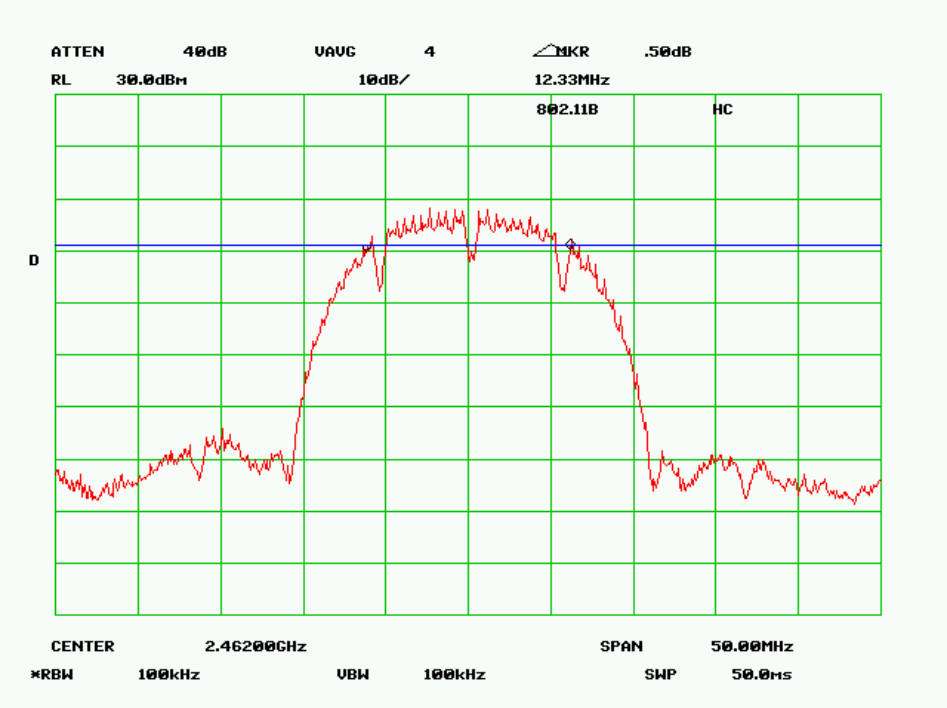
Low Channel



Middle Channel

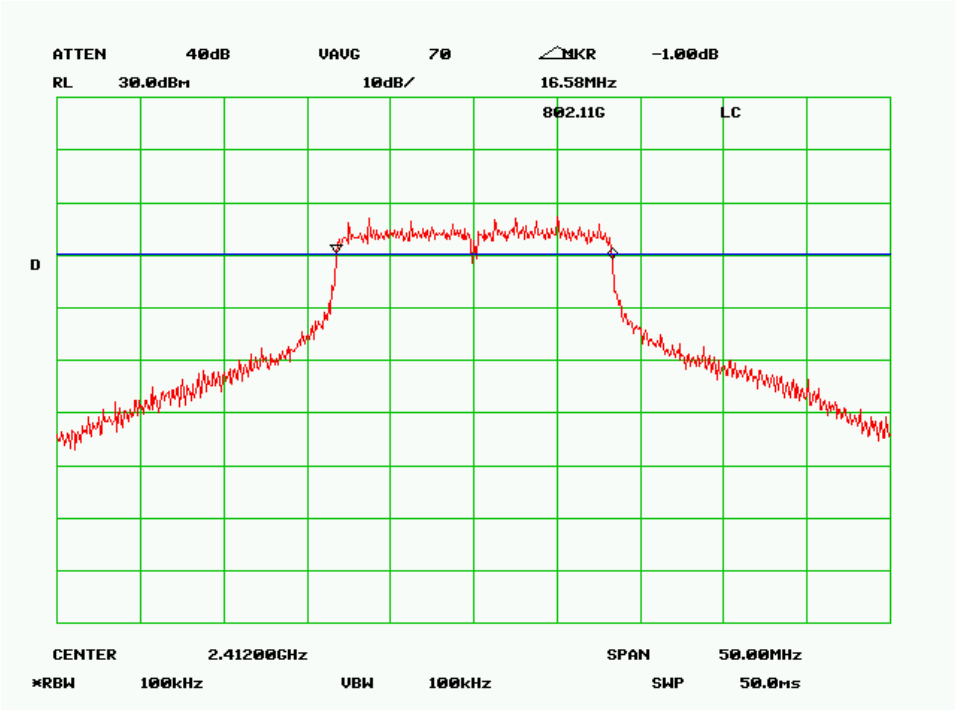


High Channel

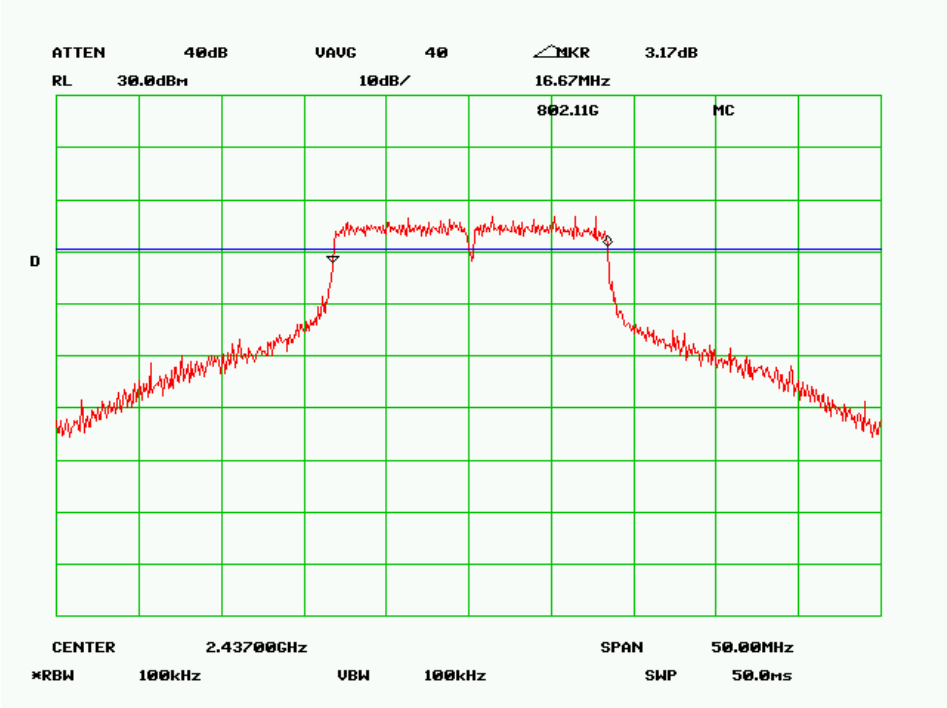


802.11g:

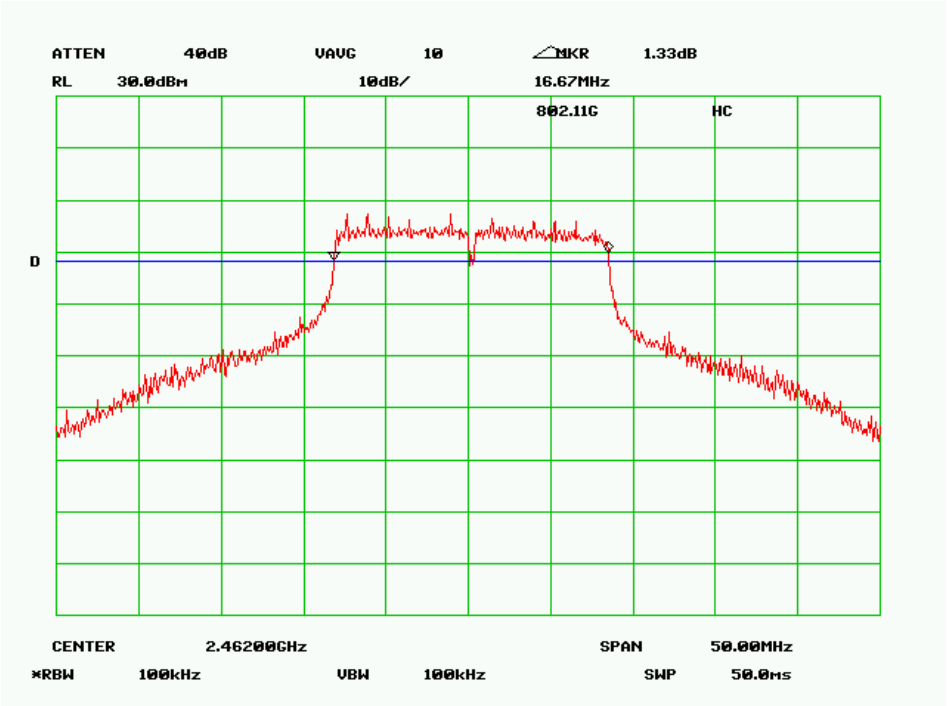
Low Channel



Mid. Channel



High Channel



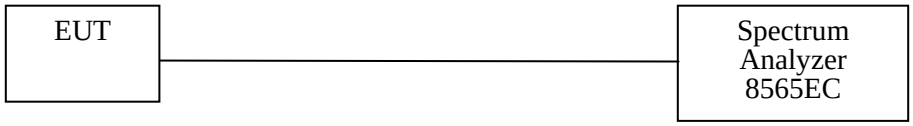
§15.247(b)(3) - PEAK OUTPUT POWER MEASUREMENT

Applicable Standard

According to §15.247(b) (3), for systems using digital modulation in 2400-2483.5 MHz: 1 Watt

Measurement Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to a spectrum analyzer.
3. Add a correction factor to the display.



Equipment Lists

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Spectrum analyzer	8565EC	3946A00131	2006-01-11

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Environmental Conditions

Temperature:	24° C
Relative Humidity:	50%
ATM Pressure:	1022 mbar

**The testing was performed by Tom Chen on 2006-07-10*

Measurement Result

RF Output Power

802.11b:

Frequency	Reading	Output in mw	FCC 15.247	Result
MHz	dBm	mw	Limit (mw)	
2412	17.5	56.23	1000	Pass
2437	18.3	67.61	1000	Pass
2462	16.9	48.98	1000	Pass

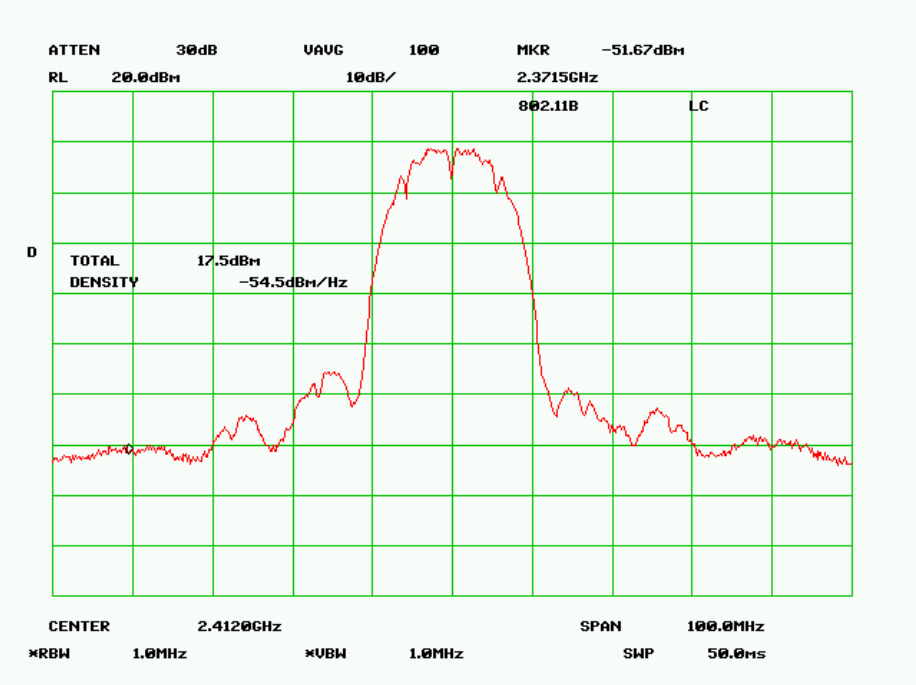
802.11g:

Frequency	Reading	Output in mw	FCC 15.247	Result
MHz	dBm	mw	Limit (mw)	
2412	17.3	53.70	1000	Pass
2437	17.9	61.66	1000	Pass
2462	17.6	57.54	1000	Pass

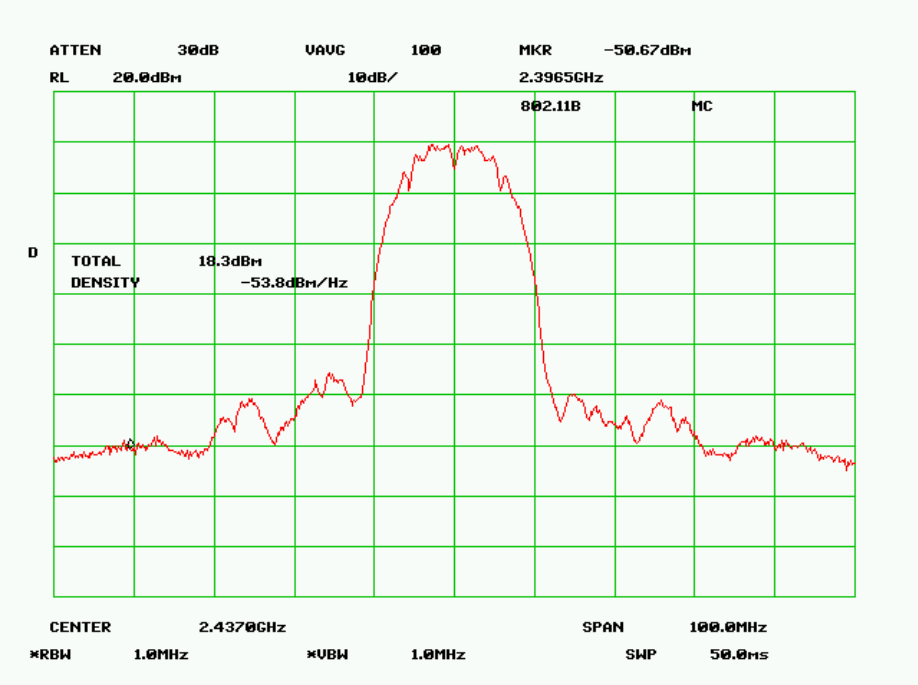
Test Result

802.11b:

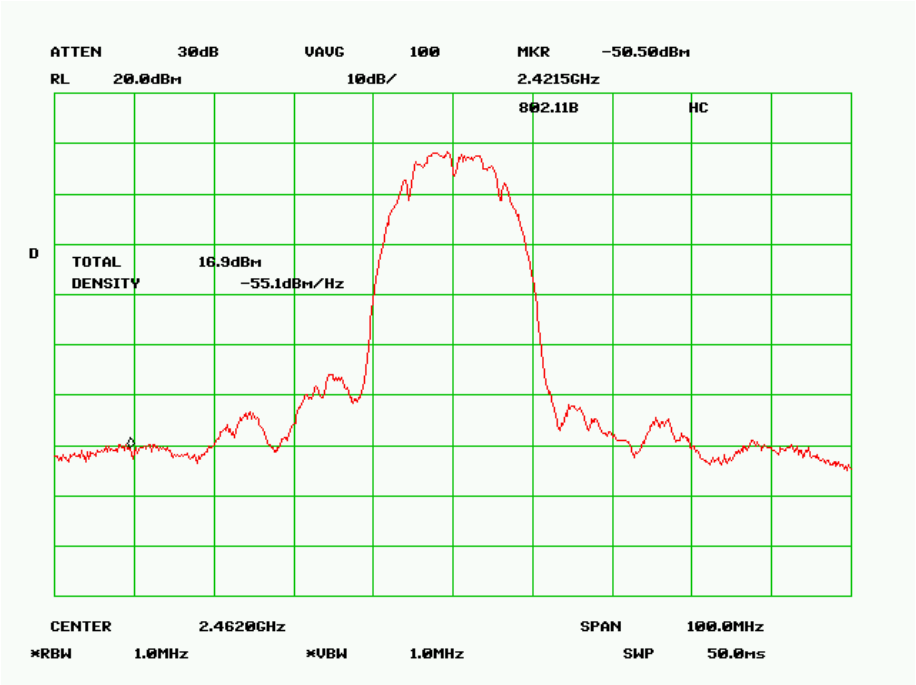
Low Channel



Mid Channel

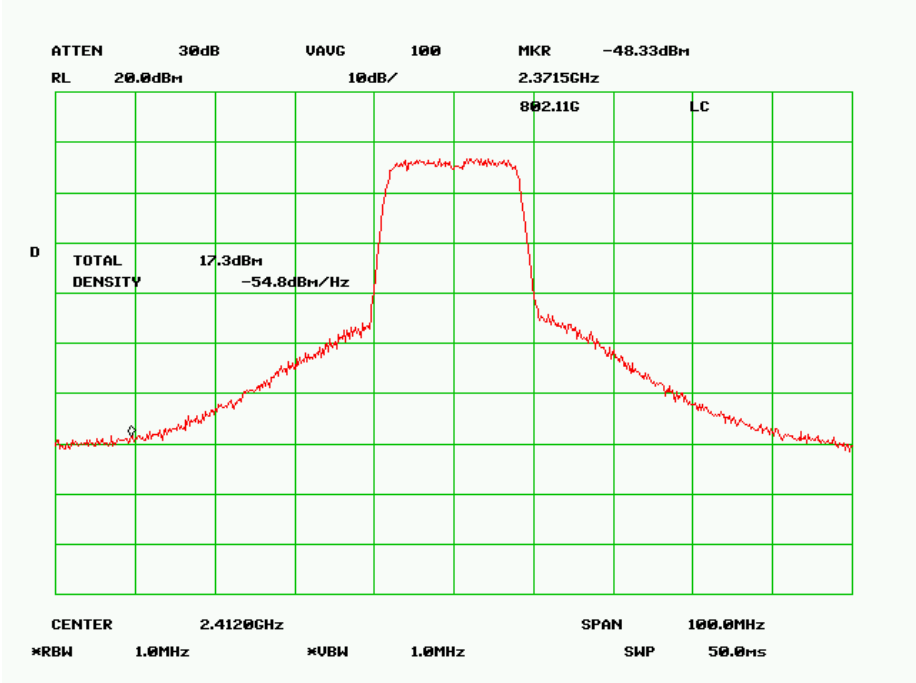


High Channel

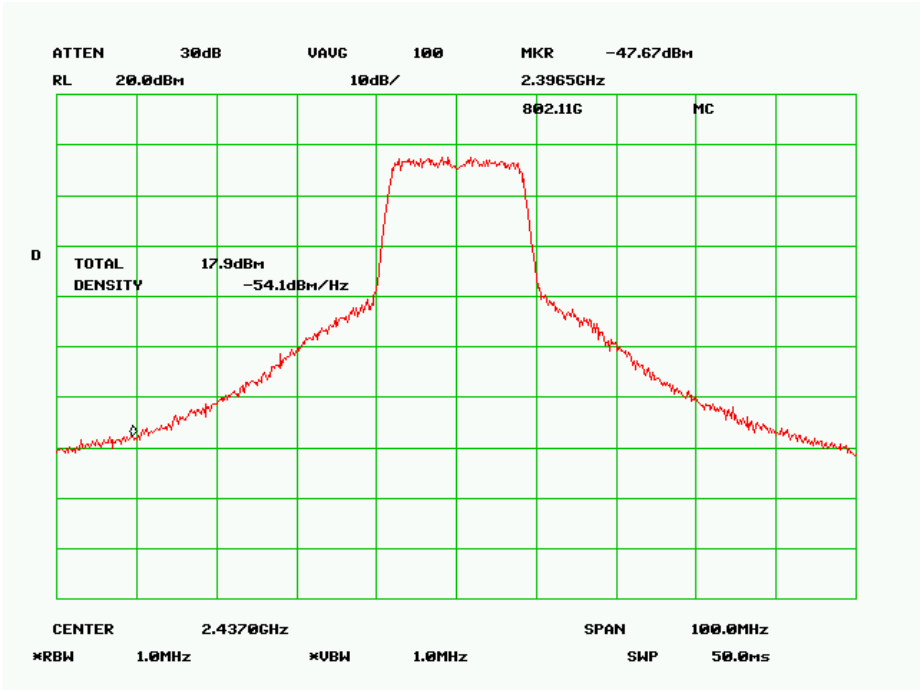


802.11g:

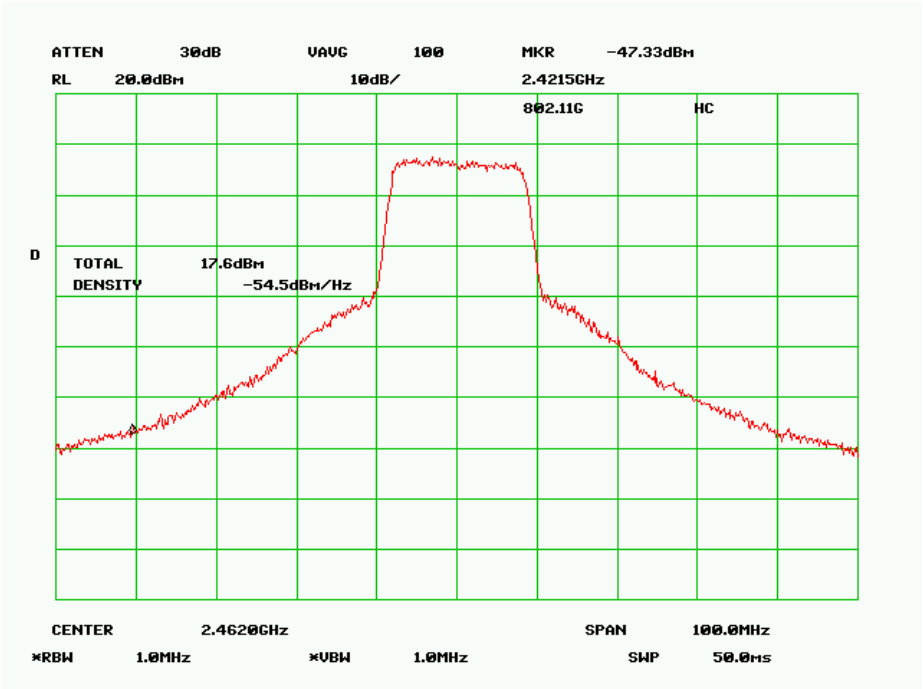
Low Channel



Mid Channel



High Channel



§15.247(c) - 100 KHZ BANDWIDTH OF BAND EDGES

Applicable Standard

According to §15.247(d), in *any* 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emissions limits specified in §15.209(a) see §15.205(c)).

Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Equipment Lists

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Spectrum analyzer	8565EC	3946A00131	2006-01-11

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Environmental Conditions

Temperature:	24° C
Relative Humidity:	50%
ATM Pressure:	1022 mbar

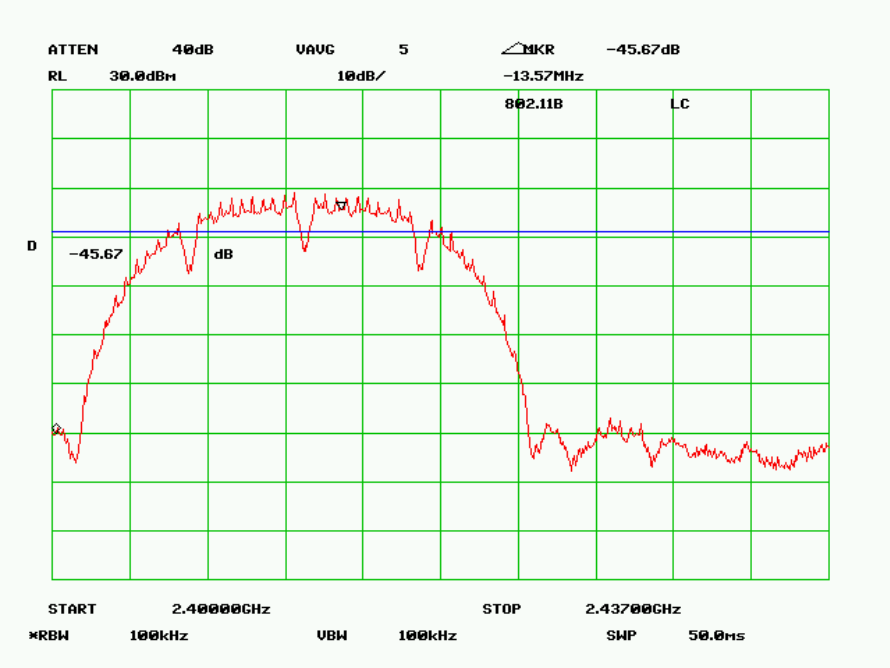
**The testing was performed by Tom Chen on 2006-07-10*

Measurement Result

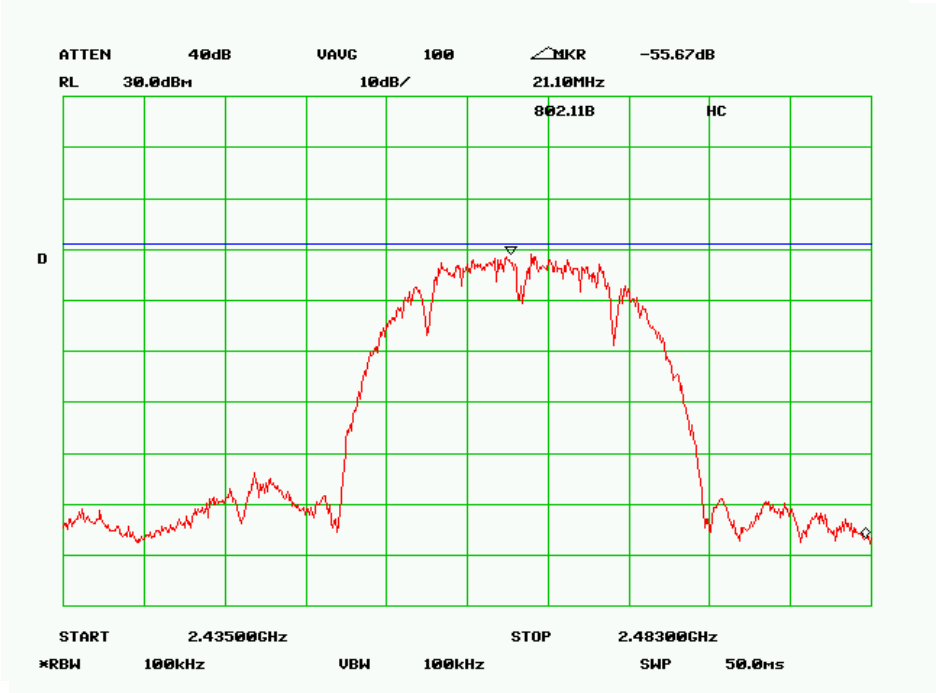
Please refer to following pages for plots of band edge.

802.11b:

Low Channel

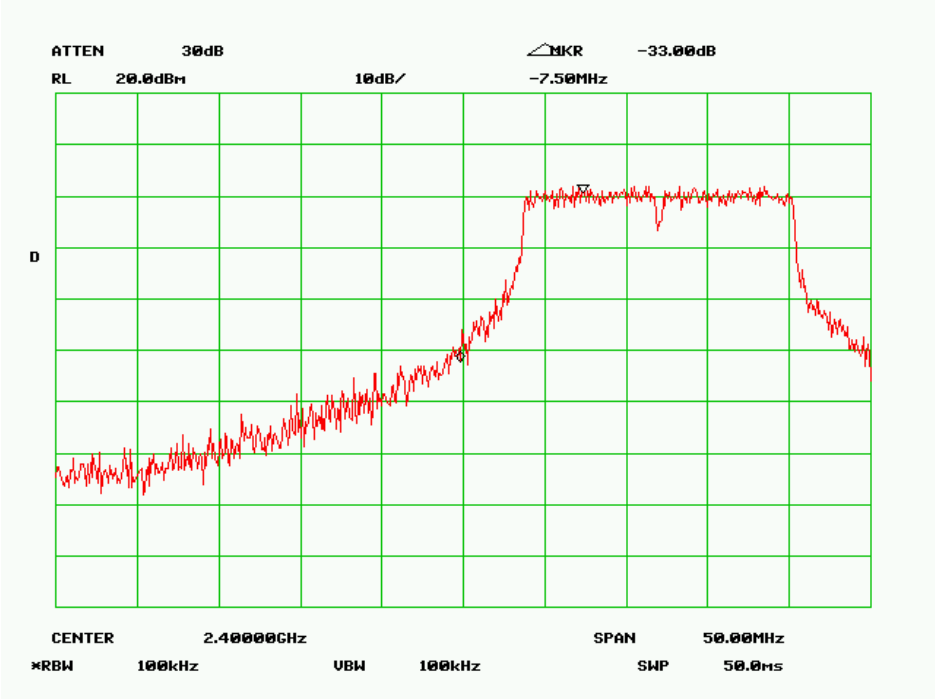


High Channel

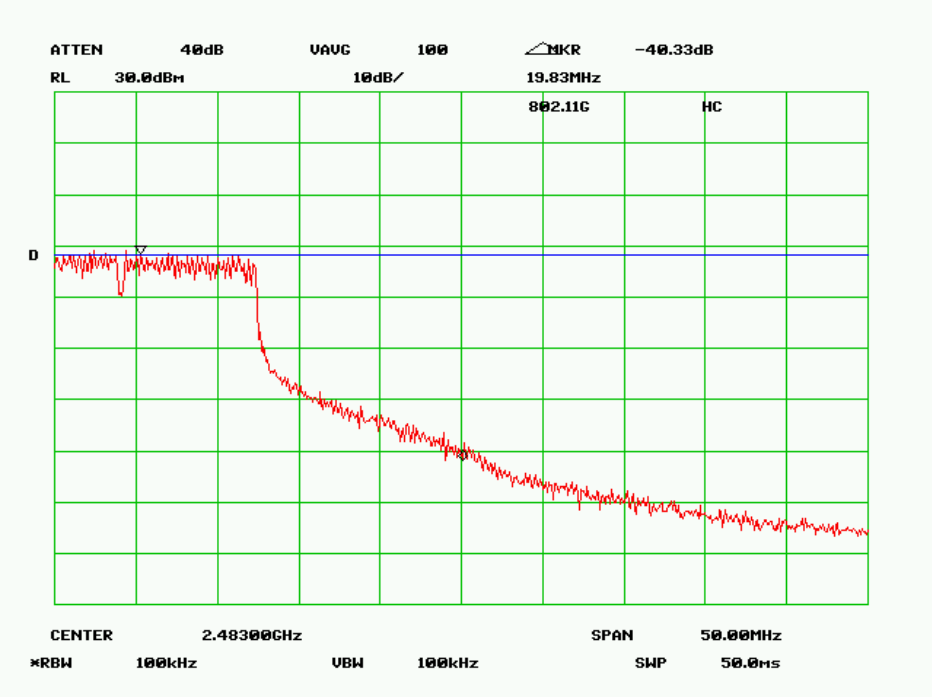


802.11g:

Low Channel



High Channel



§15.247(d) - POWER SPECTRAL DENSITY

Applicable Standard

According to §15.247 (d), for direct sequence systems, the peak 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.

Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of SA on any frequency be measured and set SA to 1.5MHz span mode. And then, set RBW and VBW of spectrum analyzer to proper value. (DTS)
4. Repeat above procedures until all frequencies measured were complete.

Equipment Lists

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Spectrum analyzer	8565EC	3946A00131	2006-01-11

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Environmental Conditions

Temperature:	24° C
Relative Humidity:	50%
ATM Pressure:	1022 mbar

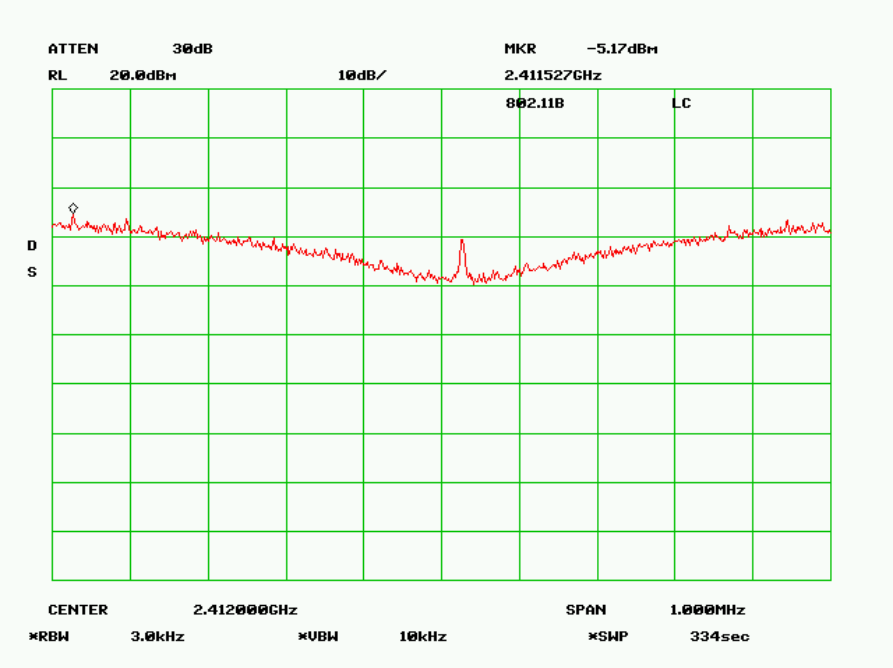
**The testing was performed by Tom Chen on 2006-07-10*

Measurement Result

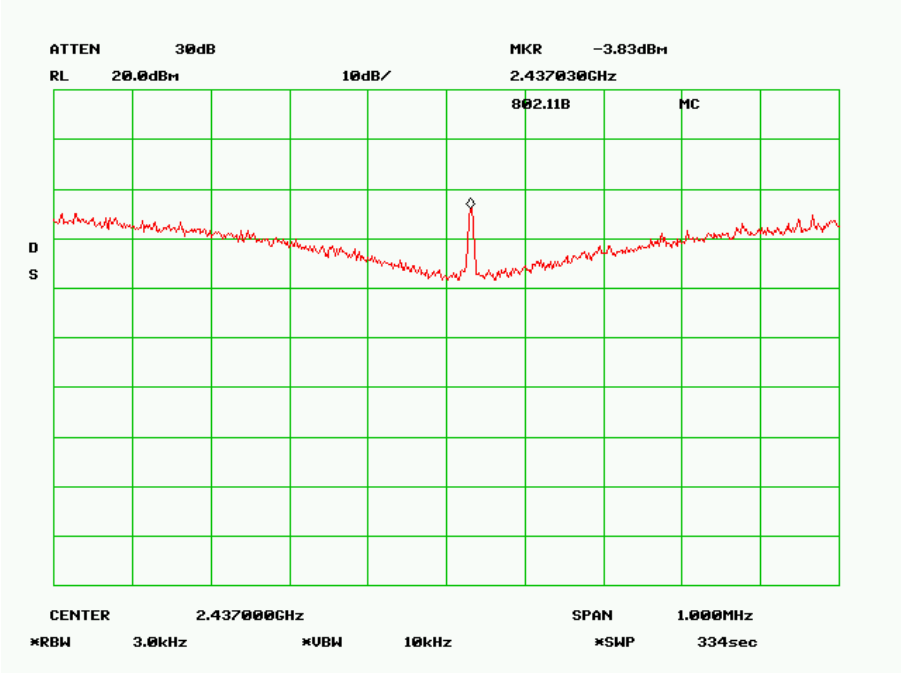
Test Result

802.11b:

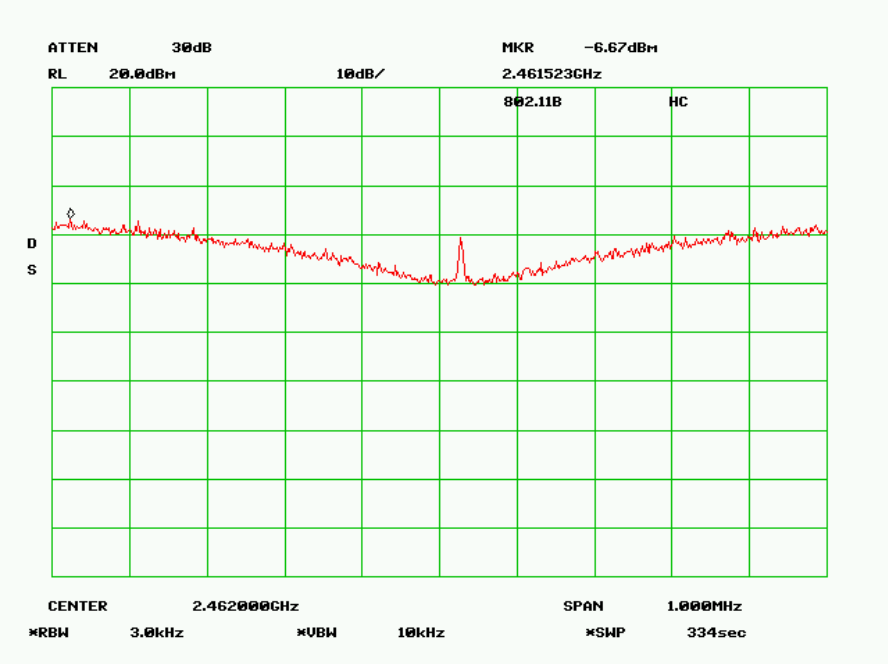
Low Channel



Mid. Channel

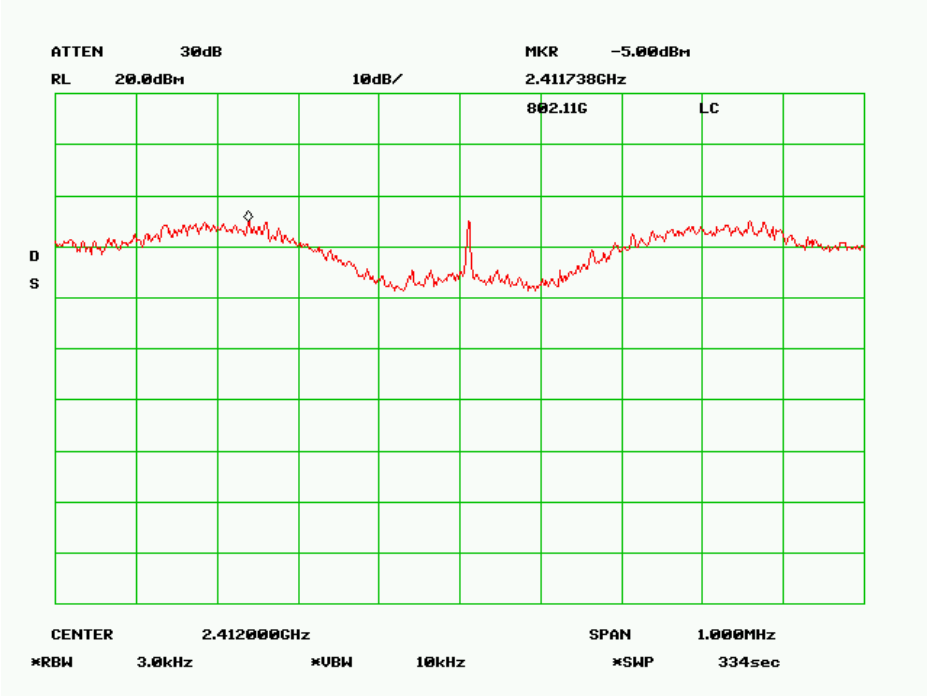


High Channel

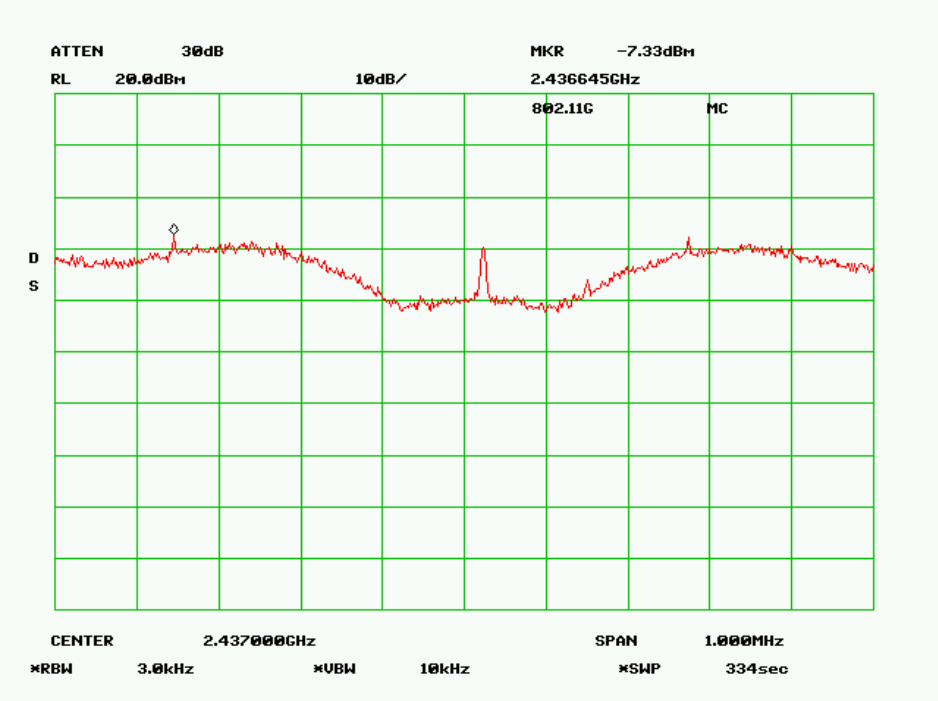


802.11g:

Low Channel



Mid Channel



High Channel