Lab Code: 200167-0

FCC PART 15 SUBPART C

MEASUREMENT AND TEST REPORT

For

AZALEA NETWORKS

673 S. Milpitas Bld., Ste 105
Milpitas, CA 95035, USA

FCC ID: URP-MSR1000

This Report Concerns:	Product type:
☒ Original Report	802.11a/b/g Wireless Mesh Networking Device

Test Engineer:	Dan Coronia
Report Number:	R0702061-247
Report Date:	2007-03-21
Reviewed By:	Hans Mellberg: VP of Engineering
Prepared By: (12)	**Bay Area Compliance Laboratories Corp. (BACL)** 1274 Anvilwood Ave. Sunnyvale, CA 94089 Tel: (408) 732-9162 Fax: (408) 732 9164

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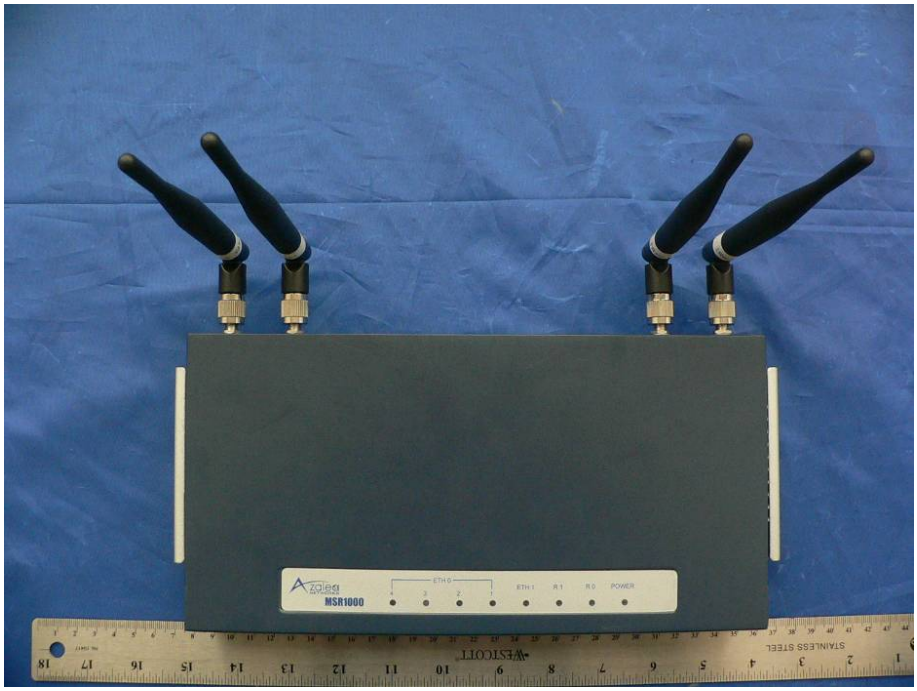
GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

This BACL measurement and test report has been compiled on behalf of *Azalea Networks* and their product *FCC ID: URP-MSR1000*, or the EUT as referred to in the rest of this report. The EUT is an 802.11 a/b/g wireless mesh networking device or router that operates on 2412-2462 MHz, 5180-5240 MHz and 5745-5805 MHz bands. It is designed to work in conjunction with neighboring routers in order to increase the efficiency of data transmissions in a high traffic environment.

** The test data gathered are from a production sample which is provided by the manufacturer with the serial number: 94V-0 0624.*

EUT Photo



Additional EUT photos in Exhibit C

Mechanical Description

The *Azalea Networks* product measures approximately 267 mm (L) x 135 mm (W) x 35 mm (H) and weighs approximately 1280 g; it is of metallic construction.

Objective

This type approval report is prepared on behalf of *Azalea Networks*. 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, Conducted and Radiated Spurious 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.

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. 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 values range from $\pm$2.0 for Conducted Emissions tests and $\pm$4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL.

Detailed instrumentation measurement uncertainties can be found in BACL report QAP-018.

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 testing mode to represent *worst*-case results during the final qualification test.

EUT Exercise Software

The EUT is programmed with the following data rate settings that were used during testing:

MODE	2412MHZ	2437MHZ	2462MHZ
802.11b	11 Mbps	11 Mbps	11 Mbps
802.11g	6 Mbps	6 Mbps	6 Mbps

Special Accessories

There were no special accessories were required, included, or intended for use with EUT during these tests.

Equipment Modifications

No modifications were made to the EUT.

Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
IBM	Laptop	T42	23736UU

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
§ 15.107 (a)	Conducted Emissions	Compliant
§15.205	Restricted Band	Compliant
§15.109 (a) & §15.247(c)	Radiated Spurious Emissions	Compliant
§15.247 (a)(2)	6 dB Bandwidth	Compliant, Please refer to FCC ID: NKRCM9
§15.247 (b)(3)	Maximum Peak Output Power	Compliant, Please refer to FCC ID: NKRCM9
§ 15.247 (c)	100 kHz Bandwidth of Frequency Band Edge	Compliant, Please refer to FCC ID: NKRCM9
§15.247 (d)	Power Spectral Density	Compliant, Please refer to FCC ID: NKRCM9

§ 15.247 (e) (i) and § 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 (minutes)
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

802.11b mode:

Maximum peak output power at antenna input terminal:	22.724 (dBm)
Maximum peak output power at antenna input terminal:	187.24 (mW)
Prediction distance:	20 (cm)
Predication frequency:	2437(MHz)
Antenna Gain (typical):	5 (dBi)
Antenna gain:	3.16 (numeric)
Power density at predication frequency at 20 cm:	0.118(mW/cm^2)

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

802.11g mode:

Maximum peak output power at antenna input terminal:	22.912 (dBm)
Maximum peak output power at antenna input terminal:	195.52 (mW)
Prediction distance:	20 (cm)
Predication frequency:	2462(MHz)
Antenna Gain (typical):	5 (dBi)
Antenna gain:	3.16 (numeric)
Power density at predication frequency at 20 cm:	0.123(mW/cm^2)

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

Test Result

The Power Density Level at 20 cm for b/g mode is:

802.11b mode = 0.118mW/cm^2

802.11g mode = 0.123mW/cm^2

which are both below the uncontrolled exposure limit of 1.0mW/cm^2.

Compliant

§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. 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 a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

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.

Result: The antennae for this device are four identical, dual band antennae with the gain of 5 dBi. Each antenna features a reverse polarity connection type to ensure that non-OEM antennae cannot be implemented by the end user:

2.4 GHz band
Antenna: 5 dBi

5.2GHz band
Antenna: 5 dBi

§15.107 - CONDUCTED EMISSIONS

Section 15.107 Conducted limits:

For an intentional radiator that is designed to be connected to the public utility (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 the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

** Decreases with the logarithm of the frequency.*

Test Setup

The measurement was performed at shielded 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	Calibration Date
Rohde & Schwarz	Artificial-Mains Network	ESH2-Z5	871884/039	2006-11-14
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

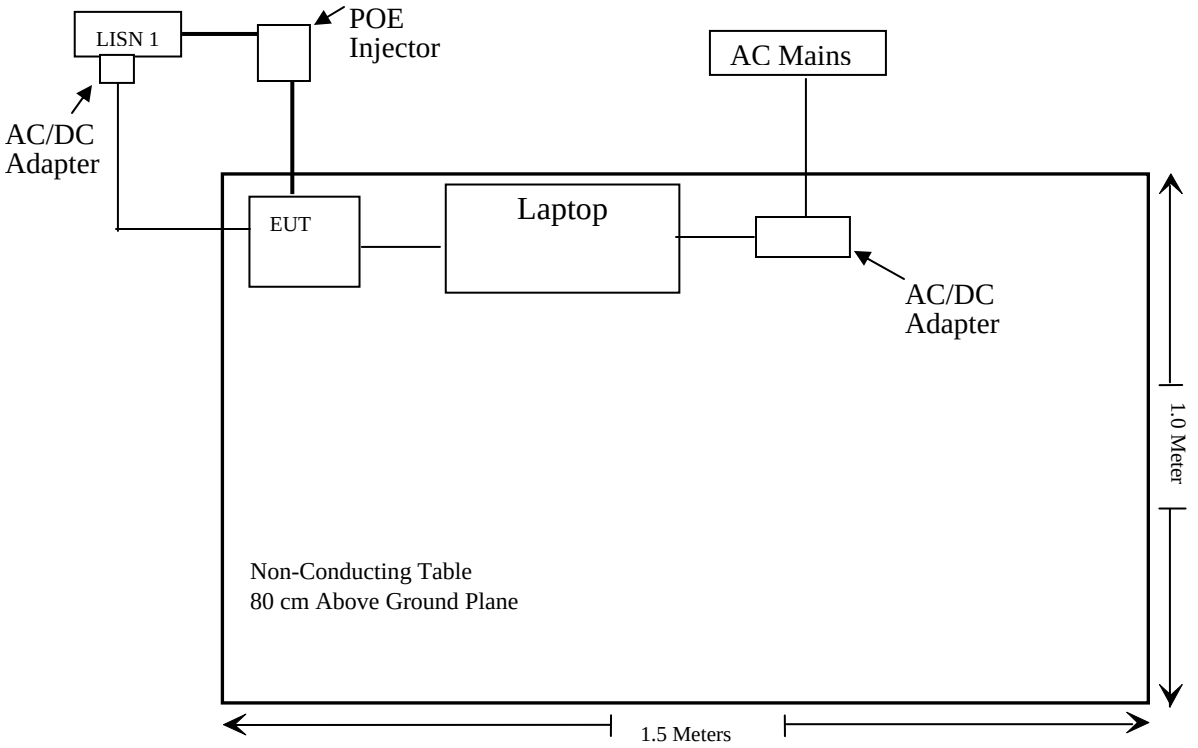
During the conducted emissions test, the power cord of the EUT was connected to the mains outlet of the LISN-1.

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".

Test Setup Diagram

Conducted Emissions



Environmental Conditions

Temperature:	20° C -23° C
Relative Humidity:	30% - 63%
ATM Pressure:	101.1 – 101.9 kPa

**The testing was performed by Dan Coronia from 2007-02-15, 22 to 03-14*

Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC standard's conducted emissions limits for Class B devices, with the *worst* margin reading of:

AC Adaptor:

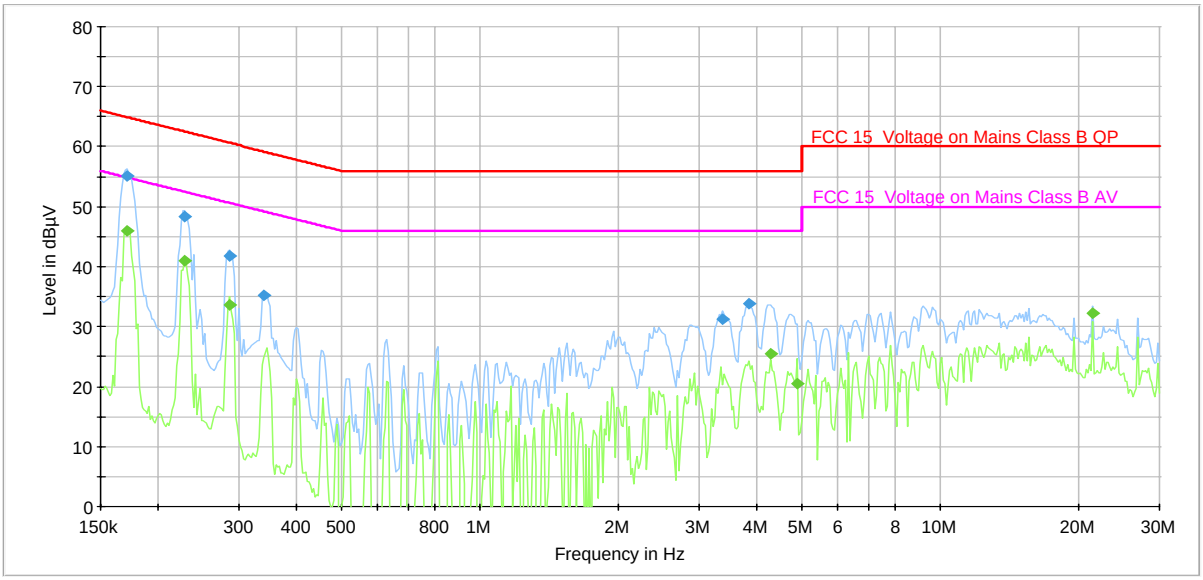
-9.0 dB at **0.171760 MHz** in the Line conductor mode

POE:

-4.3 dB at **16.777460 MHz** in the Neutral Line conductor mode

Adaptor:

120V/60 Hz Line:



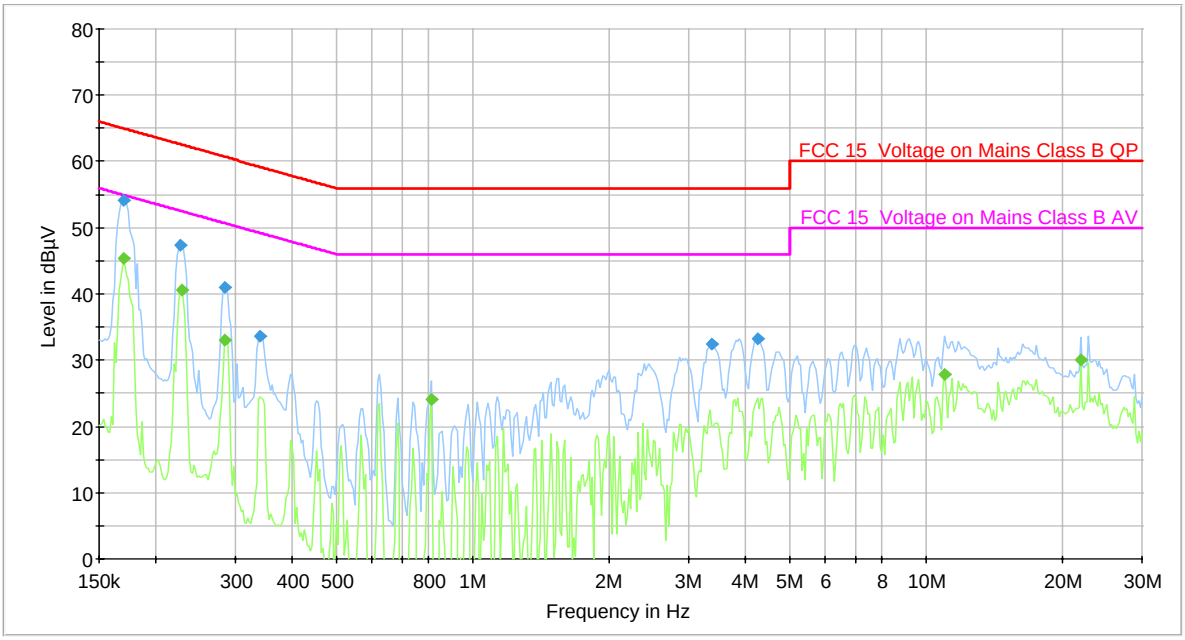
Quasi-Peak

Frequency (MHz)	Quasi Peak (dBµV)	Line	Correction Factor (dB)	Limit (dBµV)	Margin (dB)
0.171760	55.1	L1	0.1	64.9	-9.8
0.228820	48.4	L1	0.2	62.5	-14.1
0.228820	48.4	L1	0.2	62.5	-14.1
0.286020	41.8	L1	0.2	60.6	-18.8
0.340820	35.2	L1	0.3	59.2	-24.0
3.381890	31.3	L1	0.3	56.0	-24.7

Average

Frequency (MHz)	Average (dBµV)	Line	Correction Factor (dB)	Limit (dBµV)	Margin (dB)
0.171760	45.9	L1	0.1	54.9	-9.0
0.228820	40.9	L1	0.2	52.5	-11.6
0.228820	40.9	L1	0.2	52.5	-11.6
0.286020	33.7	L1	0.2	50.6	-17.0
4.295120	25.5	L1	0.3	46.0	-20.5
4.879150	20.5	L1	0.3	46.0	-25.5

120V/60 Hz Neutral:



Quasi-Peak

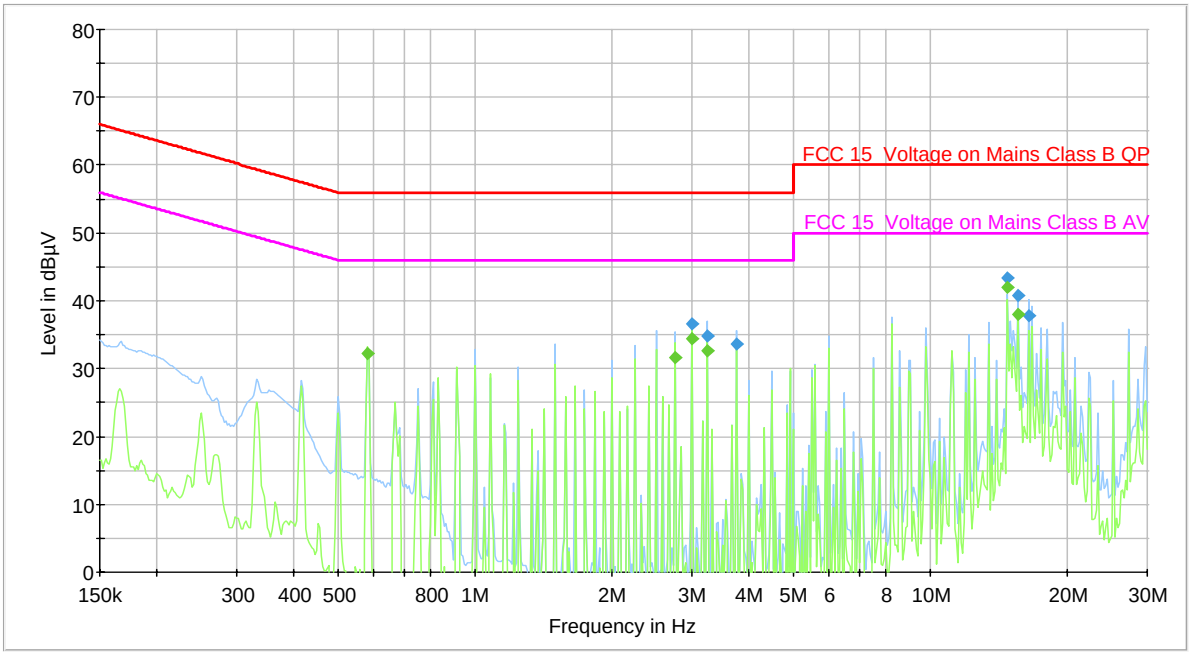
Frequency (MHz)	Quasi Peak (dBµV)	Line	Correction Factor (dB)	Limit (dBµV)	Margin (dB)
0.205000	51.4	Neutral	0.2	63.4	-12.0
0.309000	40.0	Neutral	0.2	60.0	-20.0
0.809000	27.9	Neutral	0.3	56.0	-28.1
0.409000	29.3	Neutral	0.4	57.7	-28.4
1.169000	26.7	Neutral	0.3	56.0	-29.3
1.369000	21.9	Neutral	0.2	56.0	-34.1

Average

Frequency (MHz)	Average (dBµV)	Line	Correction Factor (dB)	Limit (dBµV)	Margin (dB)
0.205000	39.3	Neutral	0.2	53.4	-14.1
0.809000	24.8	Neutral	0.3	46.0	-21.2
1.169000	24.3	Neutral	0.3	46.0	-21.7
0.309000	28.1	Neutral	0.2	50.0	-21.9
0.413000	21.2	Neutral	0.4	47.6	-26.4
0.681000	18.7	Neutral	0.3	46.0	-27.3

POE (Power over Ethernet):

120V/60 Hz Line:



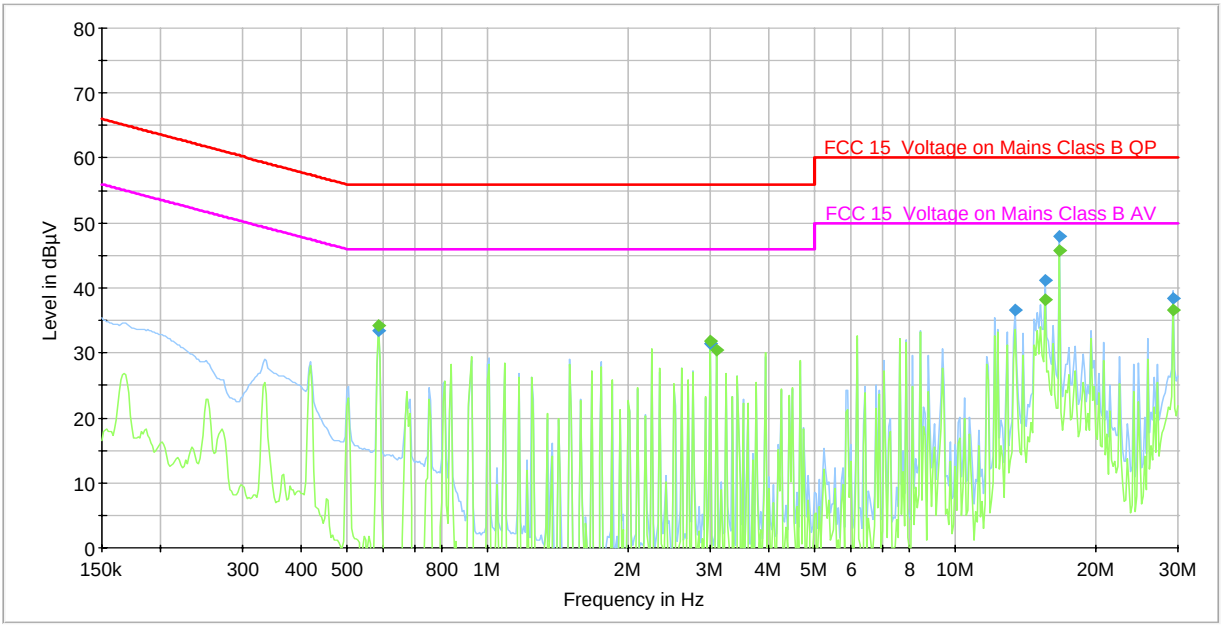
Quasi-Peak

Frequency (MHz)	Quasi Peak (dBµV)	Line	Correction Factor (dB)	Limit (dBµV)	Margin (dB)
14.769230	43.4	L1	0.5	60.0	-16.6
15.616420	40.9	L1	0.3	60.0	-19.1
3.000900	36.5	L1	0.3	56.0	-19.5
3.249800	34.8	L1	0.3	56.0	-21.3
16.512210	37.8	L1	0.4	60.0	-22.2
3.750990	33.6	L1	0.3	56.0	-22.4

Average

Frequency (MHz)	Average (dBµV)	Line	Correction Factor (dB)	Limit (dBµV)	Margin (dB)
14.769230	42.0	L1	0.5	50.0	-8.0
3.000900	34.5	L1	0.3	46.0	-11.5
15.616420	38.1	L1	0.3	50.0	-11.9
3.249800	32.7	L1	0.3	46.0	-13.3
0.581280	32.2	L1	0.3	46.0	-13.9
2.749070	31.6	L1	0.2	46.0	-14.4

120V/60 Hz Neutral:



Quasi-Peak

Frequency (MHz)	Quasi Peak (dBµV)	Line	Correction Factor (dB)	Limit (dBµV)	Margin (dB)
16.777460	48.0	Neutral	0.6	60.0	-12.0
15.616420	41.2	Neutral	0.3	60.0	-18.9
29.306470	38.3	Neutral	0.5	60.0	-21.7
0.585930	33.5	Neutral	0.3	56.0	-22.5
13.422440	36.6	Neutral	0.5	56.0	-23.4
3.000900	31.4	Neutral	0.3	56.0	-24.6

Average

Frequency (MHz)	Average (dBµV)	Line	Correction Factor (dB)	Limit (dBµV)	Margin (dB)
16.777460	45.7	Neutral	0.6	50.0	-4.3
15.616420	38.2	Neutral	0.3	50.0	-11.8
0.585930	34.1	Neutral	0.3	46.0	-11.9
29.306470	36.6	Neutral	0.5	50.0	-13.4
3.000900	31.8	Neutral	0.3	46.0	-14.2
3.098090	30.4	Neutral	0.3	46.0	-15.6

§15.205 & §15.109 & §15.247(c) - RADIATED SPURIOUS EMISSIONS

Applicable Standard

As per 15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As per 15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Field Strength (microvolts/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

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As per 15.247(c)(1)(i): Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

As Per 15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	960 – 1240	4. 5 – 5. 15
0.495 – 0.505	16.69475 – 16.69525	1300 – 1427	5. 35 – 5. 46
2.1735 – 2.1905	25.5 – 25.67	1435 – 1626.5	7.25 – 7.75
4.125 – 4.128	37.5 – 38.25	1645.5 – 1646.5	8.025 – 8.5
4.17725 – 4.17775	73 – 74.6	1660 – 1710	9.0 – 9.2
4.20725 – 4.20775	74.8 – 75.2	1718.8 – 1722.2	9.3 – 9.5
6.215 – 6.218	108 – 121.94	2200 – 2300	10.6 – 12.7
6.26775 – 6.26825	123 – 138	2310 – 2390	13.25 – 13.4
6.31175 – 6.31225	149.9 – 150.05	2483.5 – 2500	14.47 – 14.5
8.291 – 8.294	156.52475 – 156.52525	2690 – 2900	15.35 – 16.2
8.362 – 8.366	156.7 – 156.9	3260 – 3267	17.7 – 21.4
8.37625 – 8.38675	162.0125 –167.17	3.332 – 3.339	22.01 – 23.12
8.41425 – 8.41475	167.72 – 173.2	3 3458 – 3 358	23.6 – 24.0
12.29 – 12.293	240 – 285	3.600 – 4.400	31.2 – 31.8
12.51975 – 12.52025	322 – 335.4		36.43 – 36.5
12.57675 – 12.57725	399.9 – 410		Above 38.6
13.36 – 13.41	608 – 614		

As Per 15.247(d),In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

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.

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	Calibration Date
Sonoma Instruments	Pre amplifier	317	260408	2006-03-02
Agilent	Pre amplifier	8449B	3008A01978	2006-08-10
Sunol Science Corp	Combination Antenna	JB3 Antenna	A020106-3	2007-03-05
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.595 0K03	100337	2007-03-08
Sunol Science Corp	System Controller	S9V	113005-1	NR
Agilent	Spectrum Analyzer	E4440A	MY44303352	2007-02-23
A.R.A	Antenna Horn	DRG-118/A	1132	2006-08-17
Agilent	Spectrum Analyzer	8565EC	3946A00131	2007-01-24

* **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.

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 mete, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

The spectrum analyzer or receiver is set as:

Below 1000MHz:

RBW = 100 kHz / VBW = 300 kHz / Sweep = Auto

Above 1000MHz:

(1) Peak: RBW = 1MHz / VBW = 1MHz / Sweep = Auto
(2) Average: RBW = 1MHz / VBW = 10Hz / Sweep = Auto

Corrected Amplitude & Margin Calculation

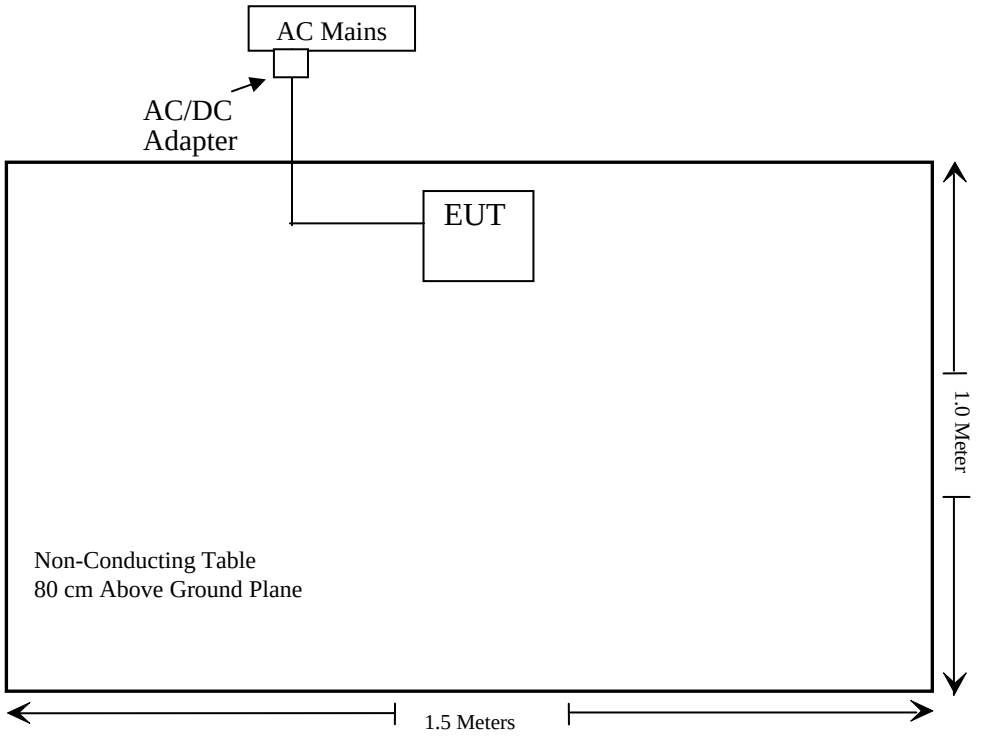
The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

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 Limit

Test Setup Diagram



Environmental Conditions

Temperature:	20 – 23 ° C
Relative Humidity:	30 – 63 %
ATM Pressure:	101.1 – 101.9 kPa

**The testing was performed by Dan Coronia from 2007-02-15, 22 to 03-14*

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:

Unintentional Emissions:

-19 dB at **669.392500 MHz** in the **Vertical** polarization for 30 MHz to 1000 MHz

Intentional Emissions

802.11b:

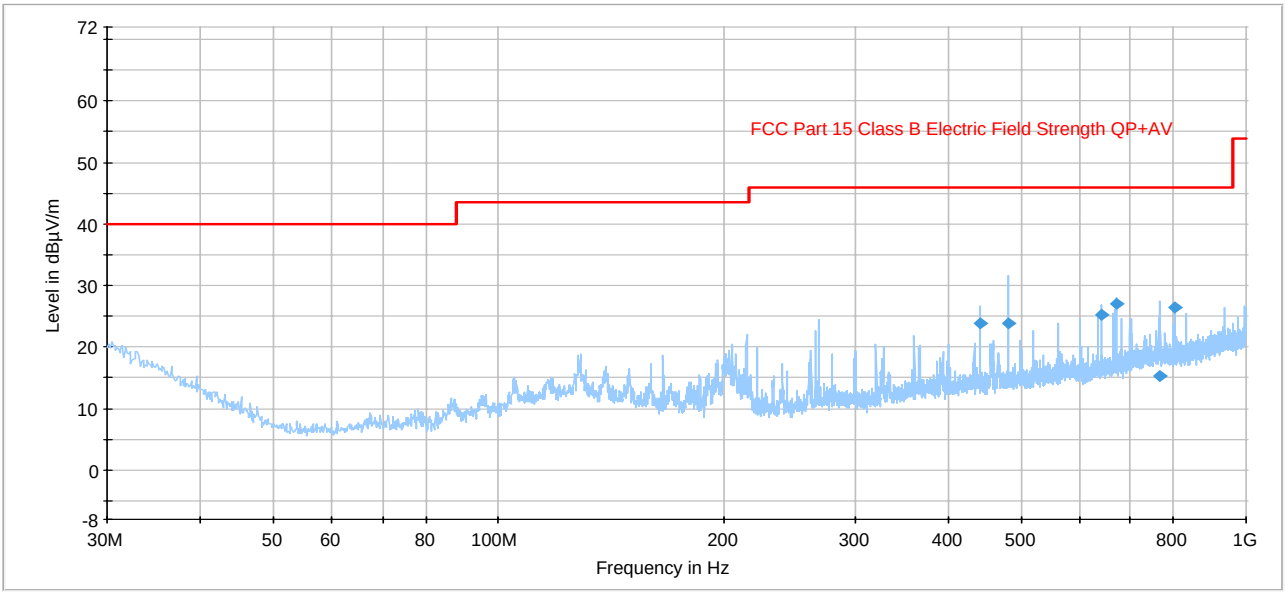
-8.8 dB at **7236.0000 MHz** in the **Vertical** polarization for Low Channel, 1GHz – 25GHz
-5.7 dB at **4874.0000 MHz** in the **Horizontal** polarization for Middle Channel, 1GHz – 25GHz
-7.5 dB at **4924.0000 MHz** in the **Horizontal** polarization for High Channel, 1GHz – 25GHz

802.11g:

-8.9 dB at **7236.0000 MHz** in the **Vertical** polarization for Low Channel, 1 GHz – 25GHz
-6.4 dB at **7371.0000 MHz** in the **Vertical** polarization for Middle Channel, 1GHz – 25GHz
-5.0 dB at **4924.0000 MHz** in the **Vertical** polarization for High Channel, 1GHz – 25GHz

Unintentional Radiated Emissions Test plot & data:

Primary scan 30MHz -1GHz



Frequency (MHz)	Quasi Peak (dBµV/m)	Antenna height (cm)	Polarity	Turntable Position (deg)	Limit (dBµV/m)	Margin (dB)
669.392500	27.0	100.0	V	115.0	46.0	-19.0
803.252500	26.5	102.0	V	248.0	46.0	-19.5
640.008750	25.2	101.0	H	347.0	46.0	-20.8
480.000000	23.9	116.0	V	122.0	46.0	-22.1
439.987500	23.9	156.0	V	137.0	46.0	-22.1
767.297500	15.2	101.0	H	10.0	46.0	-30.8

802.11b:

Low channel

Frequency (MHz)	Reading (dBuV)	Azimuth Degree	Height (m)	Pola. H / V	Antenna Factor (dB/m)	Cable loss (dB)	Pre-Amp. dB	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Comments
2412.0000	111.7	330	1.2	V	28.7	2.7	35.8	107.2			Fund/Peak
2412.0000	97.6	208	1.1	H	28.7	2.7	35.8	93.1			Fund/Peak
2412.0000	109.1	330	1.2	V	28.7	2.7	35.8	104.6			Ave
2412.0000	94.9	208	1.1	H	28.7	2.7	35.8	90.4			Ave
7236.0000	38.7	254	1.5	V	36.7	4.8	34.9	44.2	54	-8.8	Ave
9648.0000	38.4	276	1.4	V	38.1	5.5	36.9	44.1	54	-8.9	Ave
7236.0000	37.6	134	1.4	H	36.7	4.8	34.9	44.2	54	-9.8	Ave
9648.0000	37.4	316	1.3	H	38.1	5.5	36.9	44.1	54	-9.9	Ave
4824.0000	38.7	323	1.2	V	32.5	3.8	34.8	40.2	54	-13.8	Ave
9648.0000	51.0	276	1.4	V	38.1	5.5	36.9	57.8	74	-16.2	Peak
7236.0000	51.0	134	1.4	H	36.7	4.8	34.9	57.6	74	-16.4	Peak
7236.0000	51.0	254	1.5	V	36.7	4.8	34.9	57.5	74	-16.5	Peak
9648.0000	50.6	316	1.3	H	38.1	5.5	36.9	57.4	74	-16.6	Peak
4824.0000	35.3	300	1.7	H	32.5	3.8	34.8	36.9	54	-17.1	Ave
4824.0000	49.8	323	1.2	V	32.5	3.8	34.8	51.3	74	-22.7	Peak
4824.0000	48.5	300	1.7	H	32.5	3.8	34.8	50.0	74	-24.0	Peak

Middle channel

Frequency (MHz)	Reading (dBuV)	Azimuth Degree	Height (m)	Pola. H / V	Antenna Factor (dB/m)	Cable loss (dB)	Pre-Amp. dB	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Comments
2437.0000	112.7	300	1.3	V	28.7	2.7	35.8	108.2			Fund/Peak
2437.0000	98.6	220	1.1	H	28.7	2.7	35.8	94.1			Fund/Peak
2437.0000	110.3	300	1.3	V	28.7	2.7	35.8	105.8			Ave
2437.0000	95.9	220	1.1	H	28.7	2.7	35.8	91.4			Ave
4874.0000	46.8	155	1.2	H	32.5	3.8	34.8	48.3	54	-5.7	Ave
7311.0000	38.6	260	1.5	H	36.7	4.8	35.1	45.0	54	-9.0	Ave
7311.0000	38.2	200	1.4	V	36.7	4.8	35.1	44.5	54	-9.5	Ave
9748.0000	36.7	300	1.2	V	38.1	5.6	36.7	43.8	54	-10.2	Ave
9748.0000	35.9	286	1.6	H	38.1	5.6	36.7	43.0	54	-11.0	Ave
4874.0000	39.3	280	1.4	V	32.5	3.8	34.8	40.8	54	-13.2	Ave
9748.0000	50.8	300	1.2	V	38.1	5.6	36.7	55.9	74	-16.1	Peak
7311.0000	49.6	200	1.4	V	36.7	4.8	35.1	55.9	74	-18.1	Peak
7311.0000	49.1	260	1.5	H	36.7	4.8	35.1	55.4	74	-18.6	Peak
9748.0000	47.3	286	1.6	H	38.1	5.6	36.7	54.4	74	-19.6	Peak
4874.0000	50.6	280	1.4	V	32.5	3.8	34.8	52.1	74	-21.9	Peak
4874.0000	49.7	155	1.2	H	32.5	3.8	34.8	51.2	74	-22.8	Peak

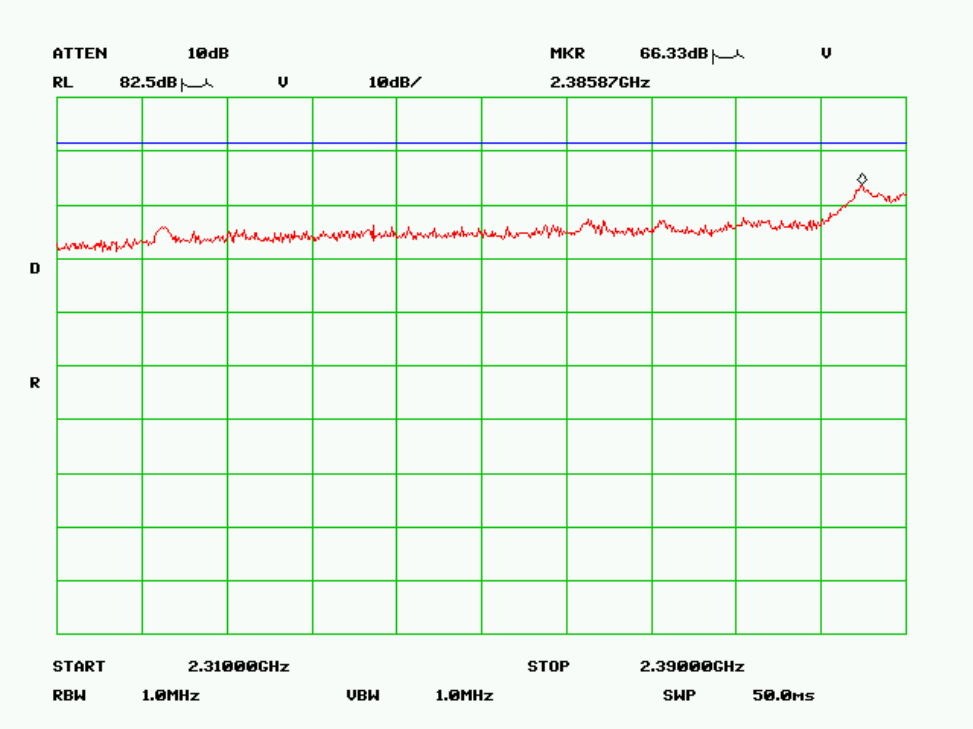
High channel

Frequency (MHz)	Reading (dBuV)	Azimuth Degree	Height (m)	Pola. H / V	Antenna Factor (dB/m)	Cable loss (dB)	Pre-Amp. dB	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Comments
2462.0000	110.8	320	1.2	V	28.7	2.7	35.8	106.3			Fund/Peak
2462.0000	96.7	260	1.6	H	28.7	2.7	35.8	92.2			Fund/Peak
2462.0000	108.6	320	1.2	V	28.7	2.7	35.8	104.1			Ave
2462.0000	95.3	256	1.6	H	28.7	2.7	35.8	90.8			Ave
4924.0000	45.1	220	1.5	H	32.5	3.9	35.0	46.5	54	-7.5	Ave
7386.0000	39.8	285	1.4	V	36.7	4.8	35.1	46.2	54	-7.8	Ave
7386.0000	38.5	200	1.5	H	36.7	4.8	35.1	44.9	54	-9.1	Ave
9848.0000	35.6	200	1.6	V	38.1	5.6	37.0	42.3	54	-11.7	Ave
9848.0000	34.5	280	1.2	H	38.1	5.6	37.0	41.2	54	-12.8	Ave
4924.0000	38.7	280	1.5	V	32.5	3.9	35.0	40.1	54	-13.9	Ave
7386.0000	50.8	285	1.4	V	36.7	4.8	35.1	57.2	74	-16.8	Peak
7386.0000	49.6	200	1.5	H	36.7	4.8	35.1	56.0	74	-18.0	Peak
9848.0000	47.9	200	1.6	V	38.1	5.6	37.0	54.6	74	-19.4	Peak
9848.0000	46.8	280	1.2	H	38.1	5.6	37.0	53.5	74	-20.5	Peak
4924.0000	49.6	280	1.5	V	32.5	3.9	35.0	51.0	74	-23.0	Peak
4924.0000	48.3	220	1.3	H	32.5	3.9	35.0	49.7	74	-24.3	Peak

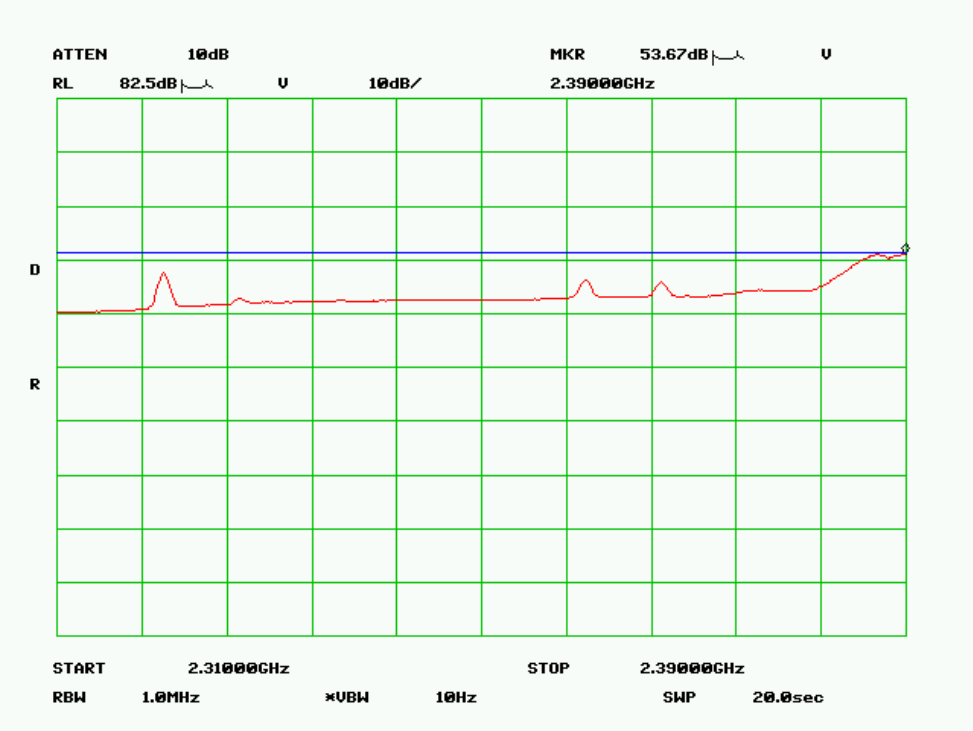
Restricted band edge

Low channel

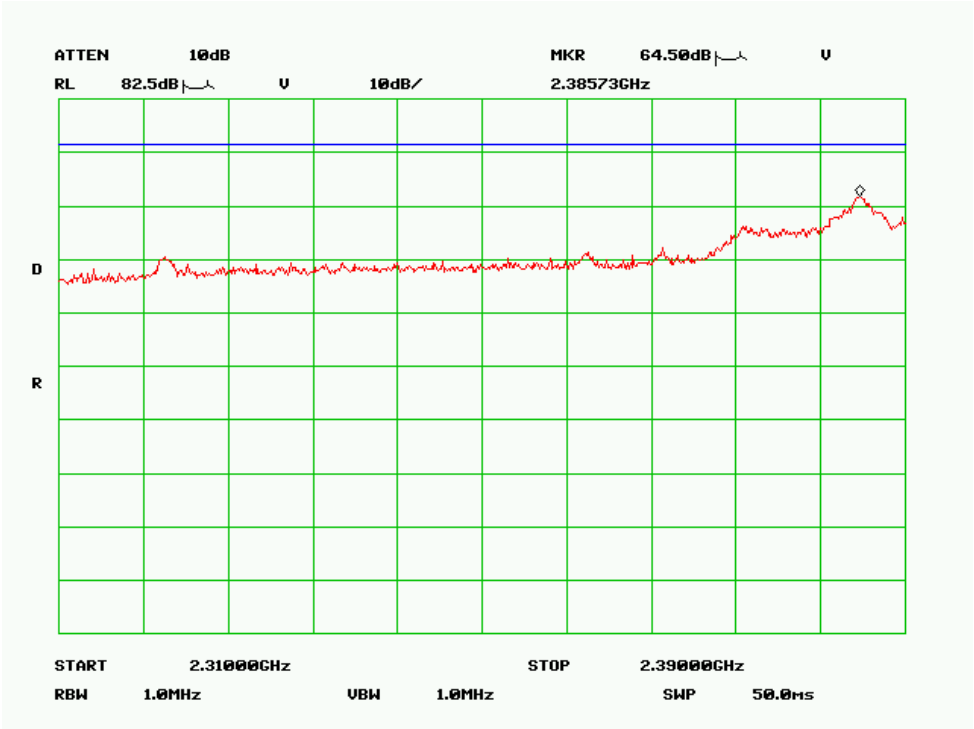
Peak, Horizontal



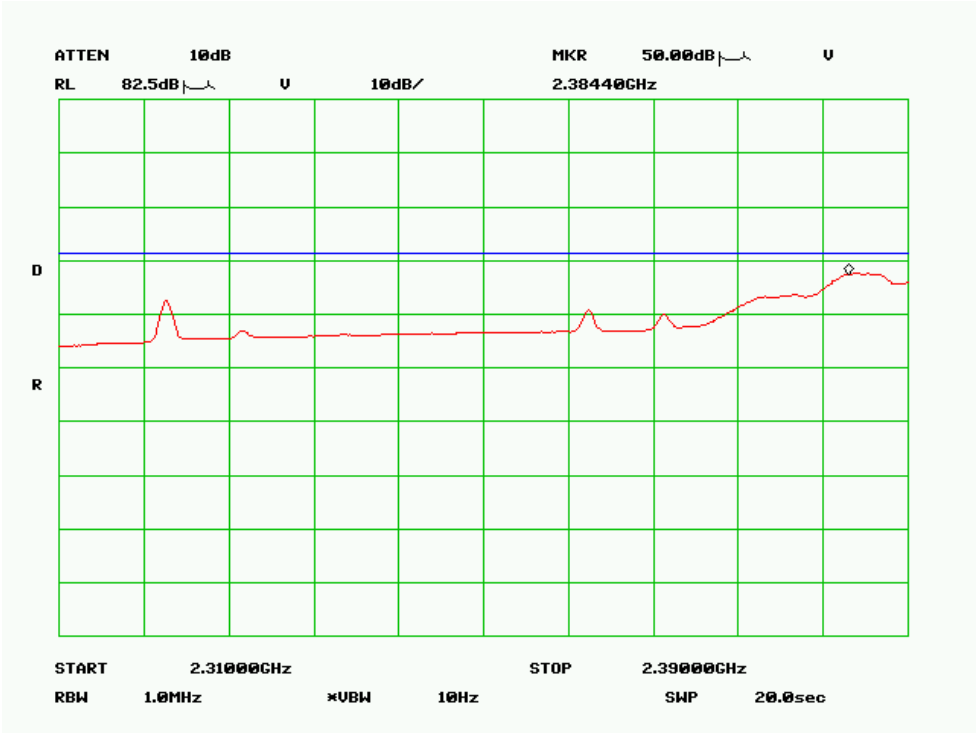
Average, Horizontal



Peak, Vertical

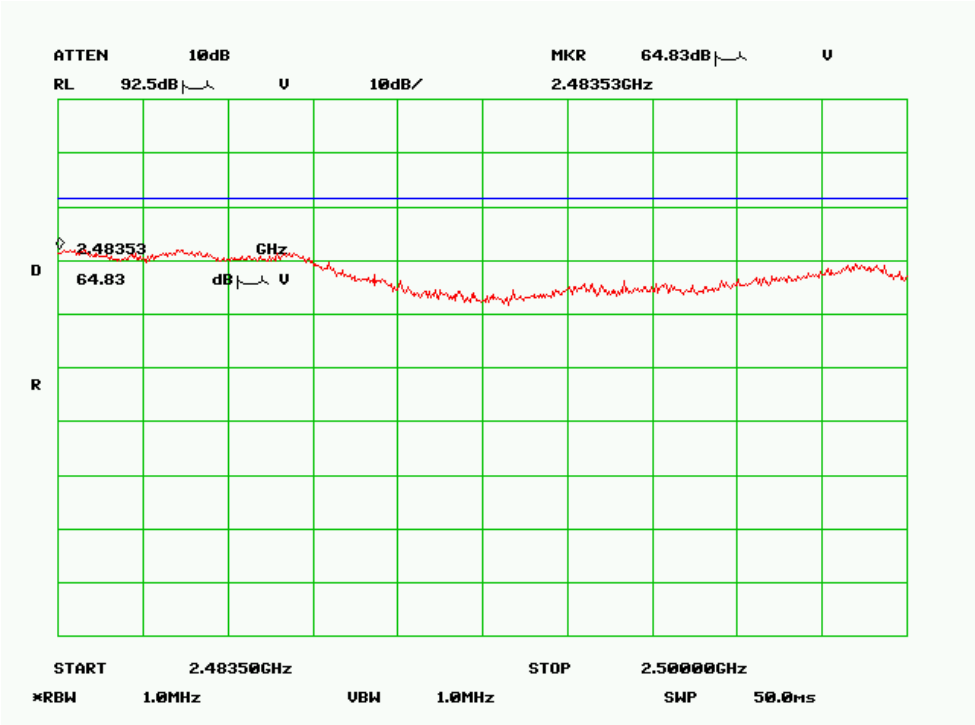


Average, Vertical

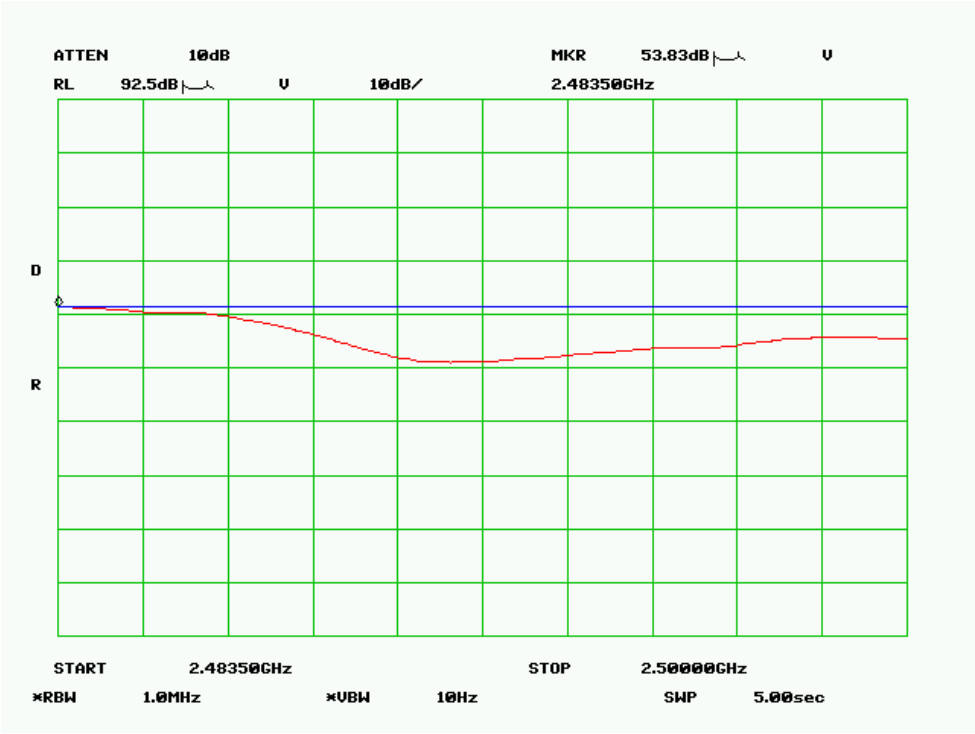


High channel

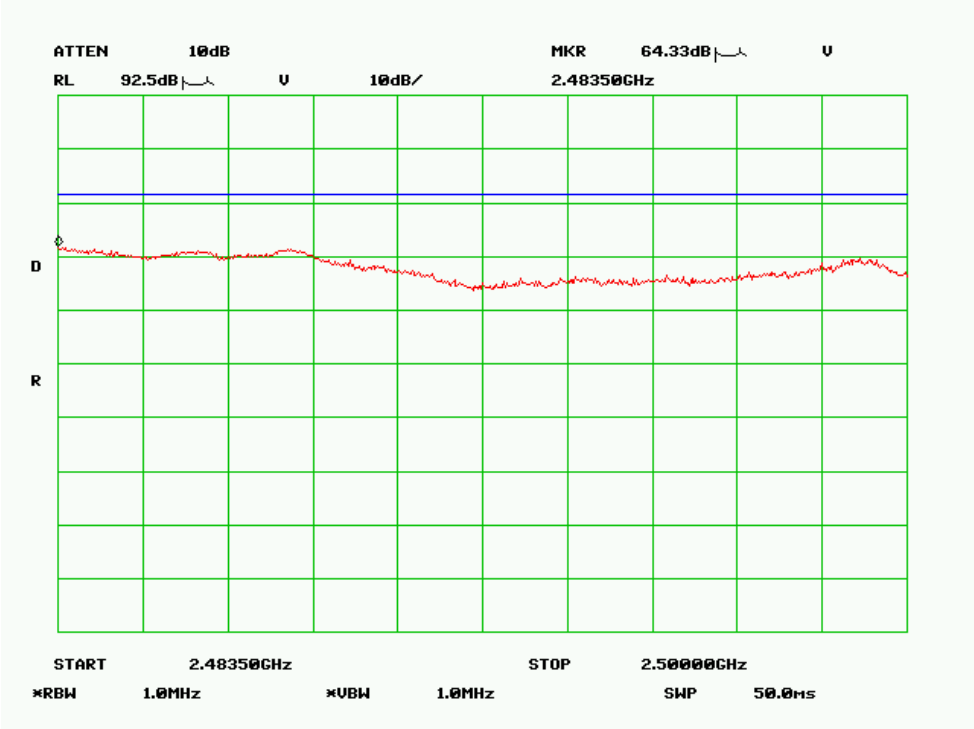
Peak, Horizontal



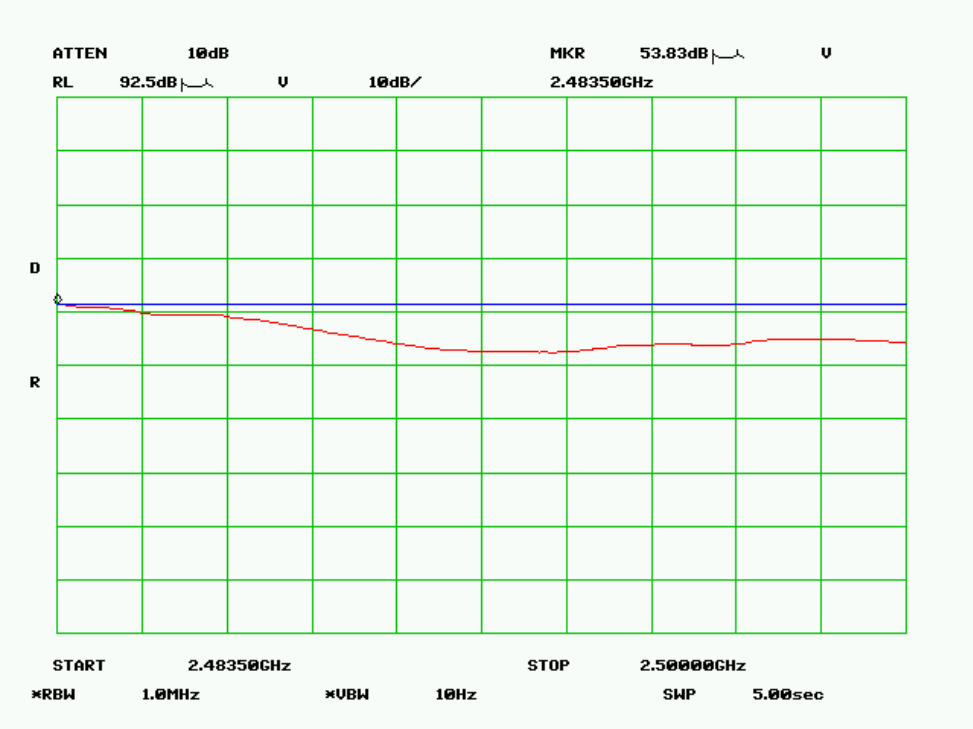
Average, Horizontal



Peak, Vertical



Peak, Vertical



802.11g:

Low channel

Frequency (MHz)	Reading (dBuV)	Azimuth Degree	Height (m)	Pola. H / V	Antenna Factor (dB/m)	Cable loss (dB)	Pre-Amp. dB	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Comments
2412.0000	114.9	343	1.0	V	28.7	2.7	35.8	110.4			Fund/Peak
2412.0000	101.3	323	1.3	H	28.7	2.7	35.8	96.8			Fund/Peak
2412.0000	105.6	343	1.0	V	28.7	2.7	35.8	101.1			Ave
2412.0000	91.9	323	1.3	H	28.7	2.7	35.8	87.4			Ave
7236.0000	38.5	295	1.2	V	36.7	4.8	34.9	45.1	54	-8.9	Ave
9648.0000	37.7	235	1.2	V	38.1	5.5	36.9	44.5	54	-9.5	Ave
7236.0000	37.7	308	1.4	H	36.7	4.8	34.9	44.2	54	-9.8	Ave
9648.0000	36.7	267	1.5	H	38.1	5.5	36.9	43.4	54	-10.6	Ave
4824.0000	40.1	196	1.6	V	32.5	3.8	34.8	41.6	54	-12.4	Ave
4824.0000	39.8	112	1.9	H	32.5	3.8	34.8	41.3	54	-12.7	Ave
9648.0000	51.6	267	1.5	H	38.1	5.5	36.9	58.4	74	-15.6	Peak
7236.0000	51.0	295	1.2	V	36.7	4.8	34.9	57.5	74	-16.5	Peak
9648.0000	50.5	235	1.2	V	38.1	5.5	36.9	57.3	74	-16.7	Peak
4824.0000	55.7	196	1.6	V	32.5	3.8	34.8	57.2	74	-16.8	Peak
7236.0000	50.3	308	1.4	H	36.7	4.8	34.9	56.9	74	-17.1	Peak
4824.0000	50.3	112	1.9	H	32.5	3.8	34.8	51.8	74	-22.2	Peak

Middle channel

Frequency (MHz)	Reading (dBuV)	Azimuth Degree	Height (m)	Pola. H / V	Antenna Factor (dB/m)	Cable loss (dB)	Pre-Amp. dB	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Comments
2457.0000	115.4	265	1.4	V	28.7	2.7	35.8	110.9			Fund/Peak
2457.0000	105.6	284	1.7	H	28.7	2.7	35.8	101.1			Fund/Peak
2457.0000	106.1	265	1.4	V	28.7	2.7	35.8	101.6			Ave
2457.0000	96.3	284	1.7	H	28.7	2.7	35.8	91.8			Ave
7371.0000	41.2	259	1.5	V	36.7	4.8	35.1	45.6	54	-6.4	Ave
4914.0000	45.8	182	1.7	H	32.5	3.9	35.0	47.1	54	-6.9	Ave
9828.0000	39.8	298	1.2	V	38.1	5.6	37.0	44.5	54	-7.5	Ave
7371.0000	39.2	340	1.2	H	36.7	4.8	35.1	45.6	54	-8.4	Ave
4914.0000	43.7	295	1.4	V	32.5	3.9	35.0	47.1	54	-8.9	Ave
9828.0000	37.8	235	1.4	H	38.1	5.6	37.0	44.5	54	-9.5	Ave
4914.0000	58.7	295	1.4	V	32.5	3.9	35.0	60.1	74	-13.9	Peak
4914.0000	57.6	182	1.7	H	32.5	3.9	35.0	59.0	74	-15.0	Peak
7371.0000	51.3	259	1.5	V	36.7	4.8	35.1	57.7	74	-16.3	Peak
7371.0000	50.3	340	1.2	H	36.7	4.8	35.1	56.7	74	-17.3	Peak
9828.0000	49.6	298	1.2	V	38.1	5.6	37.0	56.4	74	-17.6	Peak
9828.0000	49.6	235	1.4	H	38.1	5.6	37.0	56.3	74	-17.7	Peak

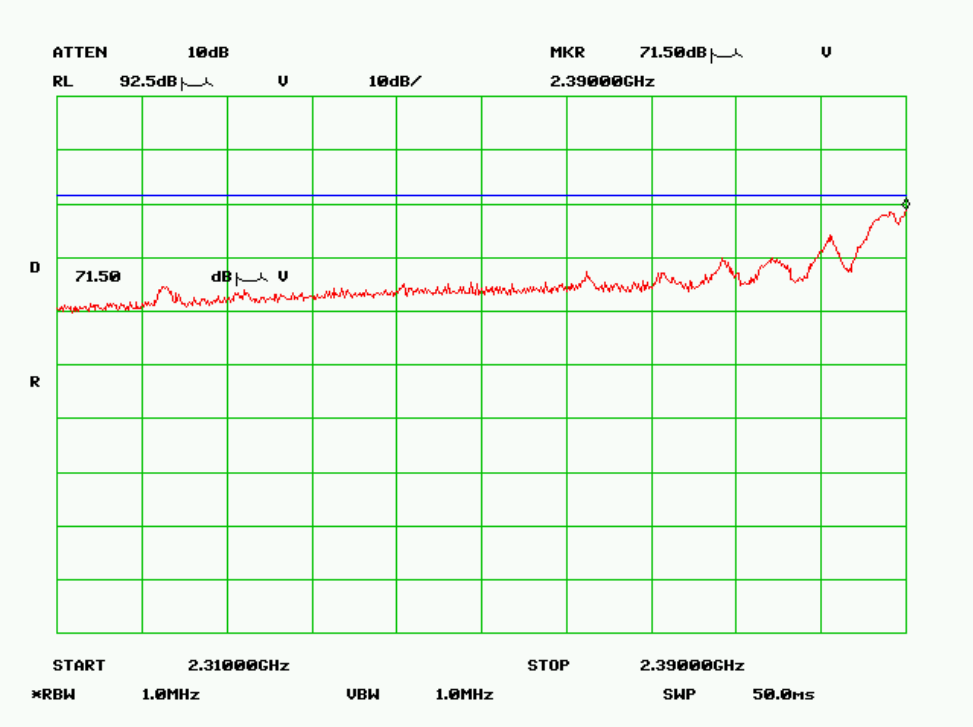
High channel

Frequency (MHz)	Reading (dBuV)	Azimuth Degree	Height (m)	Pola. H / V	Antenna Factor (dB/m)	Cable loss (dB)	Pre-Amp. dB	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Comments
2462.0000	114.4	348	1.2	V	28.7	2.7	35.8	110.0			Fund/Peak
2462.0000	101.6	341	1.2	H	28.7	2.7	35.8	97.2			Fund/Peak
2462.0000	104.6	348	1.2	V	28.7	2.7	35.8	100.2			Ave
2462.0000	93.0	341	1.2	H	28.7	2.7	35.8	88.5			Ave
4924.0000	47.6	330	1.4	V	32.5	3.9	35.0	46.5	54	-5.0	Ave
7386.0000	42.3	324	1.5	V	36.7	4.8	35.1	45.4	54	-5.3	Ave
4924.0000	45.2	282	1.1	H	32.5	3.9	35.0	46.5	54	-7.5	Ave
7386.0000	39.0	186	1.3	H	36.7	4.8	35.1	45.4	54	-8.6	Ave
9848.0000	37.7	342	1.2	H	38.1	5.6	37.0	44.5	54	-9.5	Ave
9848.0000	33.7	313	1.6	V	38.1	5.6	37.0	44.5	54	-13.5	Ave
4924.0000	61.3	330	1.4	V	32.5	3.9	35.0	62.7	74	-11.3	Peak
4924.0000	57.5	282	1.1	H	32.5	3.9	35.0	58.8	74	-15.2	Peak
7386.0000	51.0	186	1.3	H	36.7	4.8	35.1	57.4	74	-16.6	Peak
9848.0000	50.3	342	1.2	H	38.1	5.6	37.0	57.0	74	-17.0	Peak
7386.0000	49.7	324	1.5	V	36.7	4.8	35.1	56.1	74	-17.9	Peak
9848.0000	49.0	313	1.6	V	38.1	5.6	37.0	55.8	74	-18.2	Peak

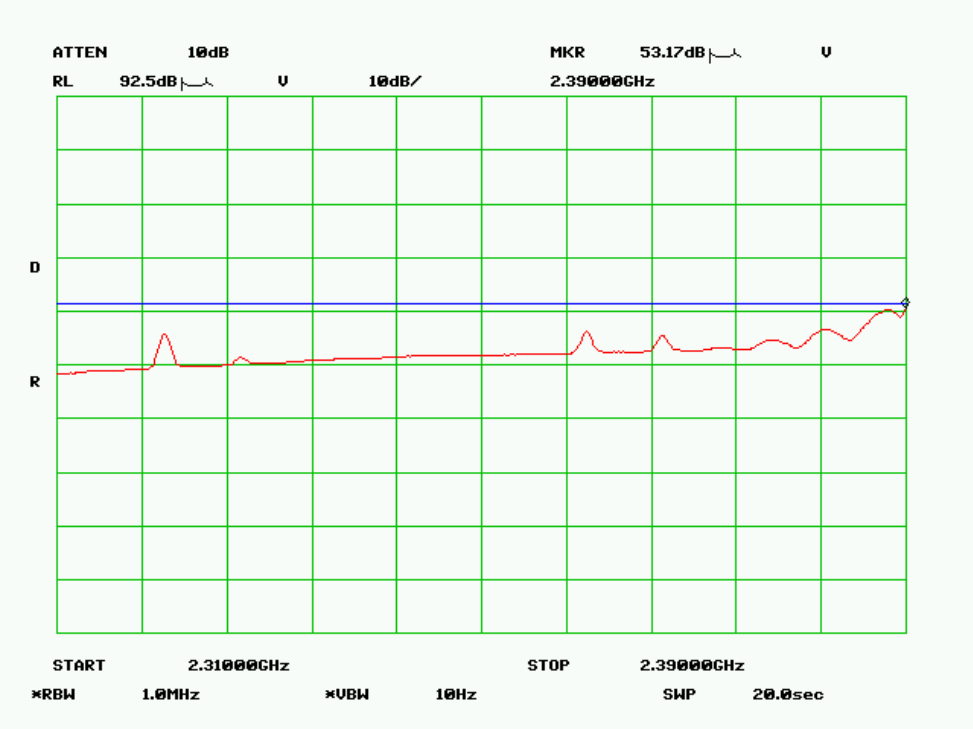
Restricted band edge

Low channel

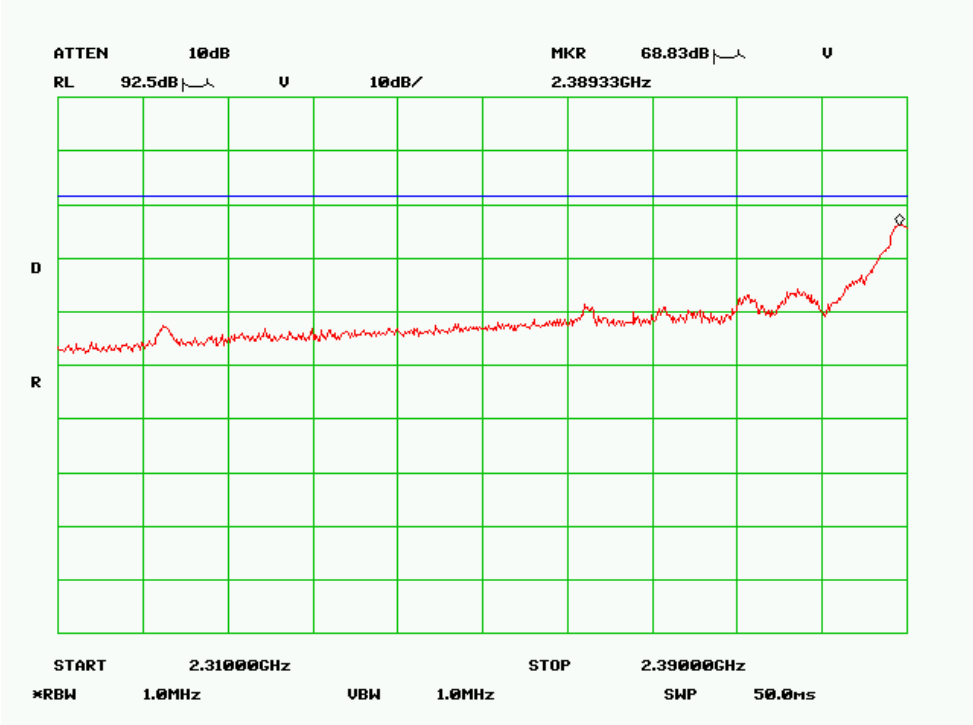
Peak, Horizontal



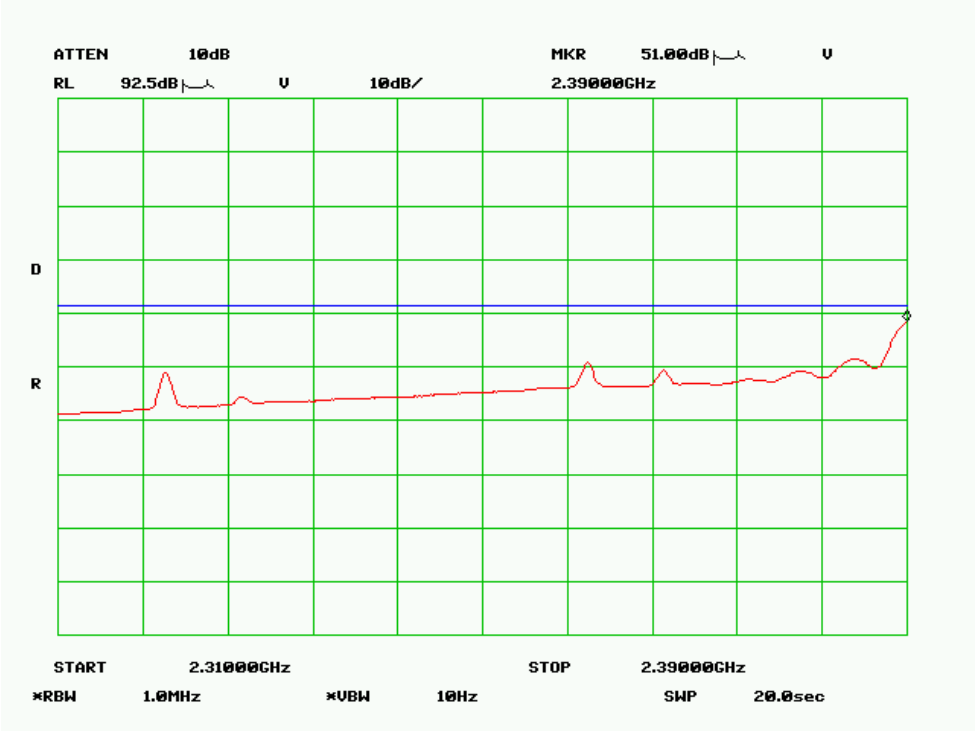
Average, Horizontal



Peak, Vertical

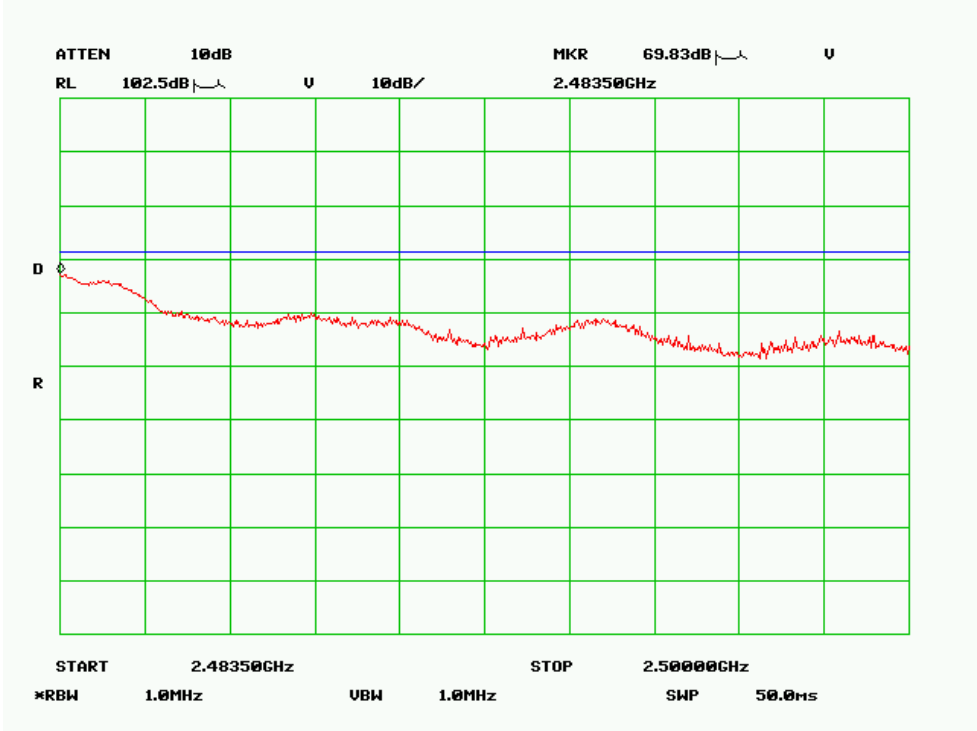


Average, Vertical

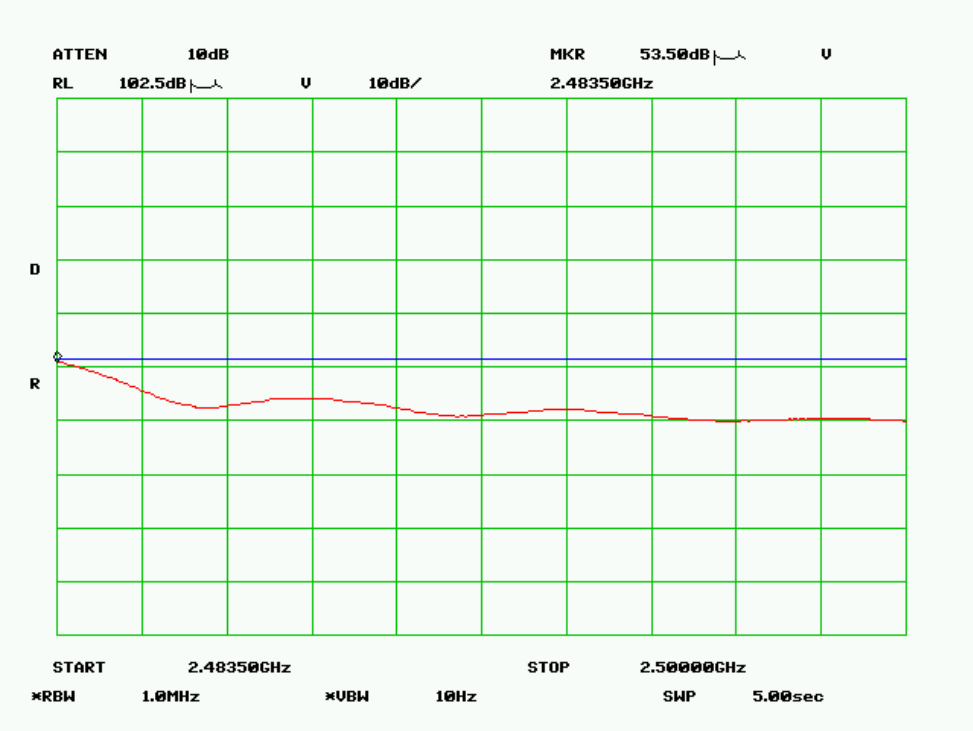


High channel

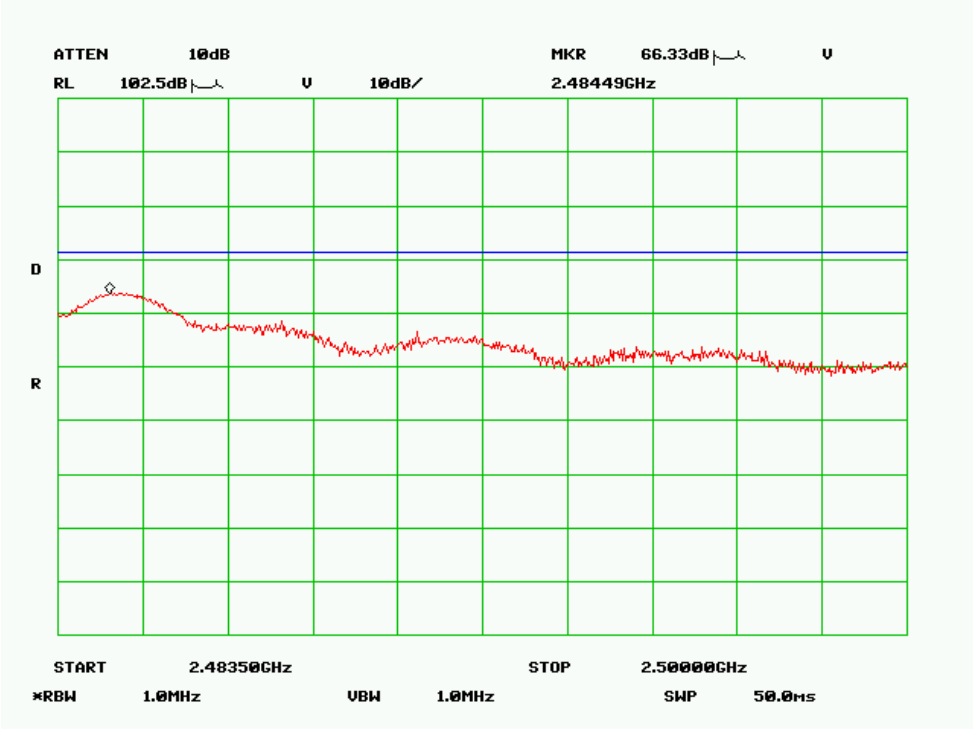
Peak, Horizontal



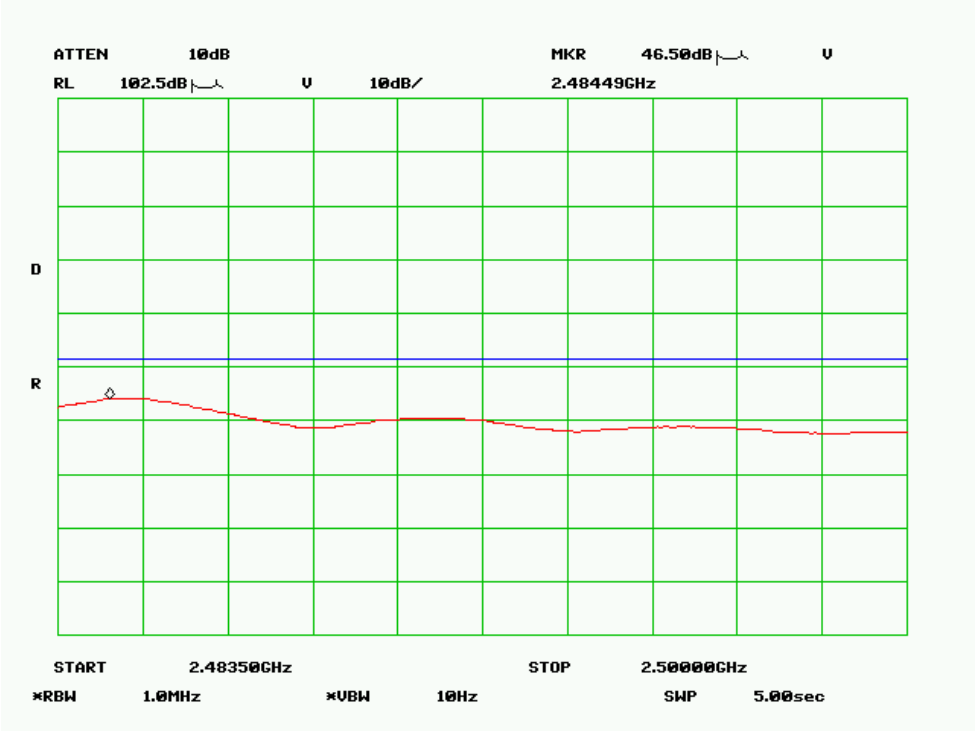
Average, Horizontal



Peak, Vertical



Average, Vertical



§15.247(a) (2) – 6 dB BANDWIDTH

Applicable Standard

According to §15.247(a)(2), systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz

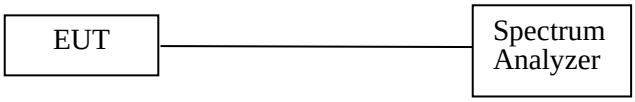
Measurement Procedure

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 List

Please refer to International Standard Laboratory report number **04LR018FC** (**FCC ID: NKRCM9**).

Test Setup Diagram



Environmental Conditions

Please refer to International Standard Laboratory report number **04LR018FC** (**FCC ID: NKRCM9**).

**The testing was performed by International Standard Laboratory*

Test Results

802.11b (6dB BW)

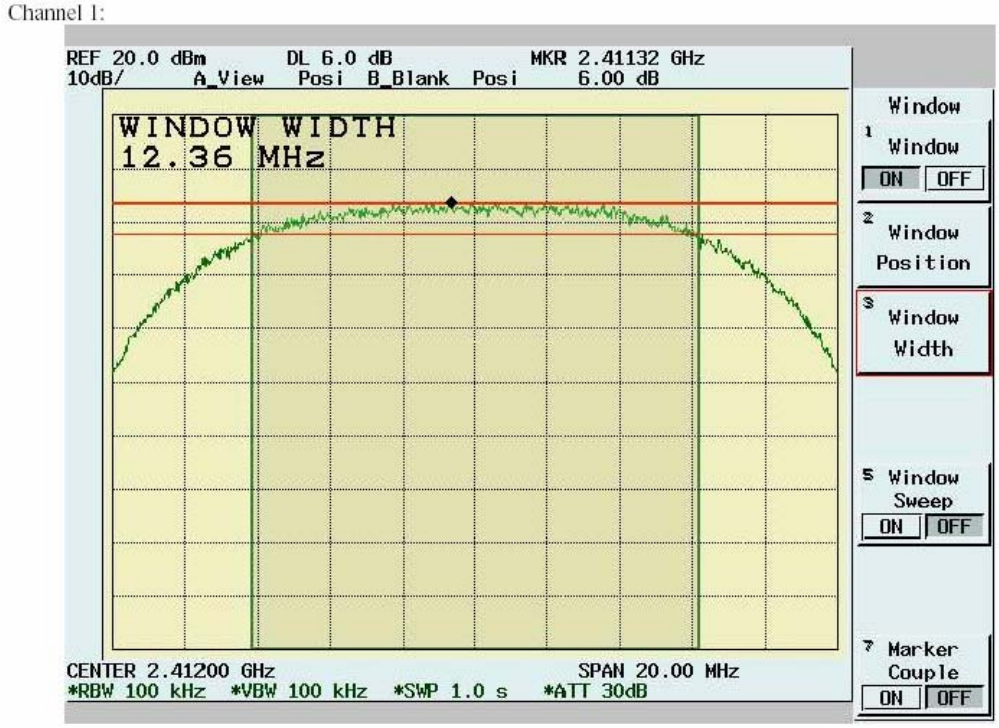
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Pass/Fail
1	2412	12.36	0.5	Pass
6	2437	11.80	0.5	Pass
11	2462	12.08	0.5	Pass

802.11g (6dB BW)

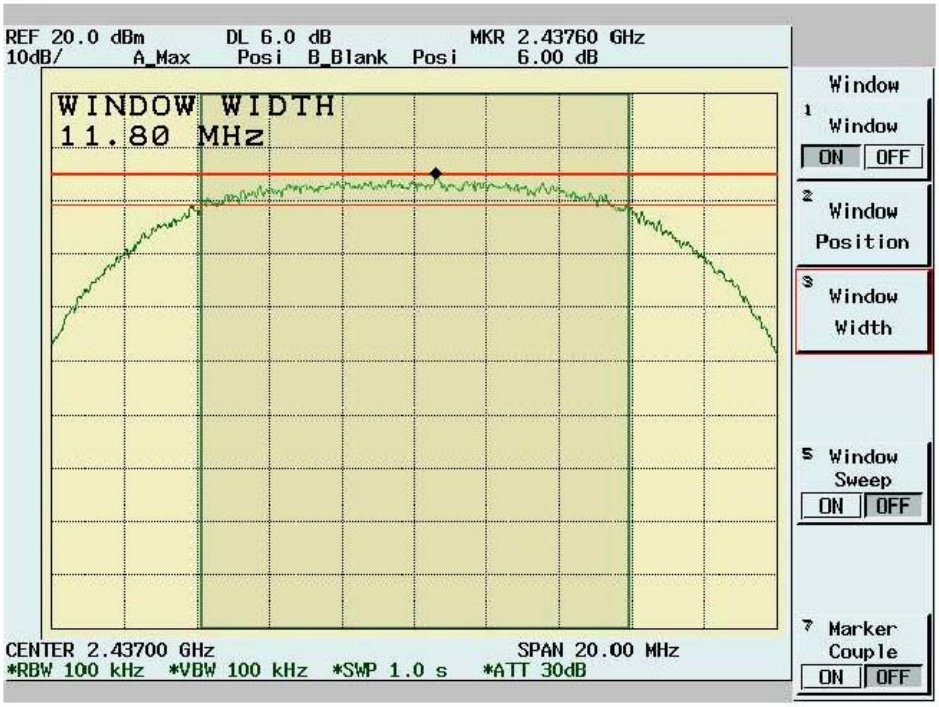
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Pass/Fail
1	2412	16.36	0.5	Pass
6	2437	16.4	0.5	Pass
11	2462	16.4	0.5	Pass

802.11b

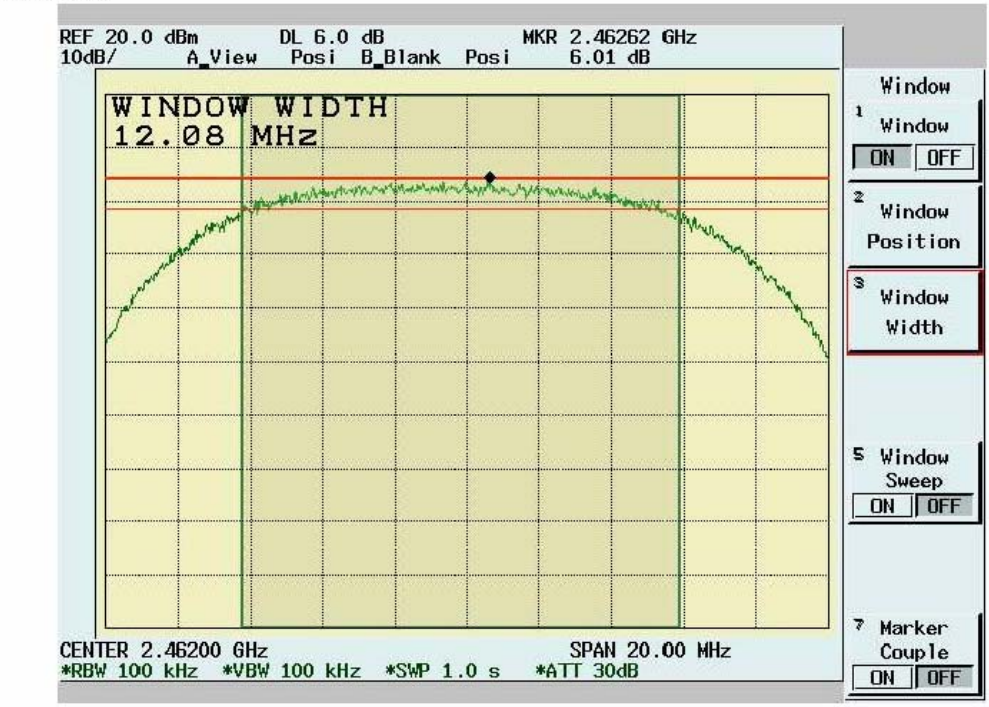
Channel 1:



Channel 6:



Channel 11:

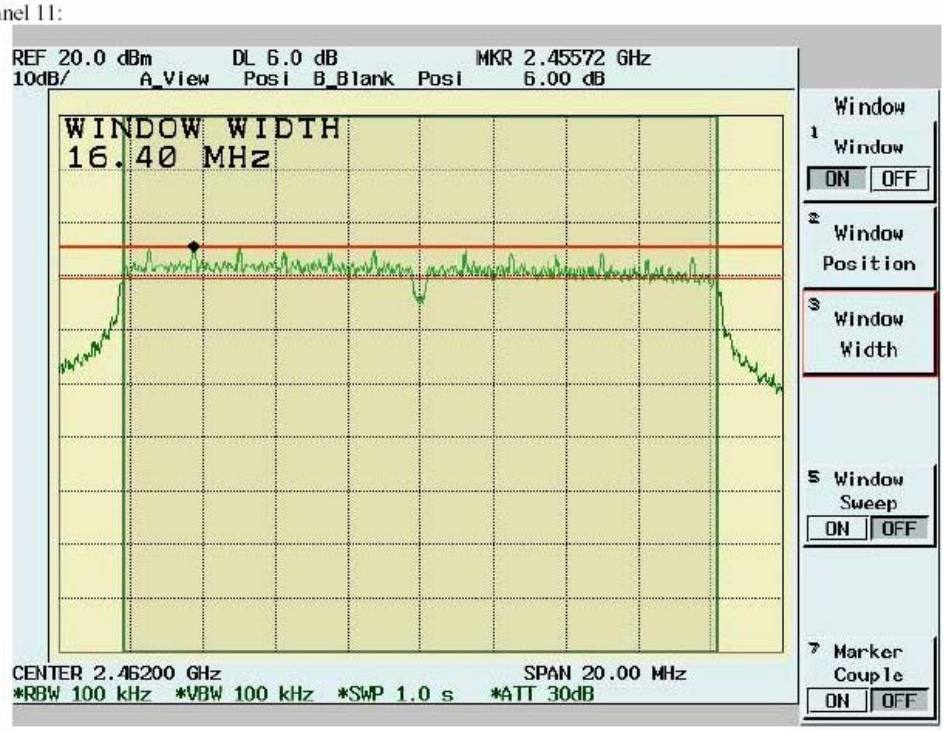


802.11g

Channel 1:

Channel 6:

Channel 11:



§15.247(b) - PEAK OUTPUT POWER MEASUREMENT

Applicable Standard

§15.247(b) The maximum peak output power of the intentional radiator shall not exceed the following:

§15.247(b) (3) For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

§15.247(b) (4) (i) Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

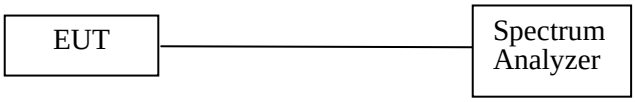
Measurement Procedure

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 List

Please refer to International Standard Laboratory report number **04LR018FC** (**FCC ID: NKRCM9**).

Test Setup Diagram



Environmental Conditions

Please refer to International Standard Laboratory report number **04LR018FC** (**FCC ID: NKRCM9**).

**The testing was performed by International Standard Laboratory*

Test Result

802.11b:

Channel	Frequency (MHz)	Analyzer Reading (dBm)	Cable Loss (dB)	Peak Power Output (mw)	Peak Output (dBm)	Limit (dBm)	Pass/Fail
1	2412	21.499	1.1	181.93	22.599	30	Pass
6	2437	21.624	1.1	187.24	22.724	30	Pass
11	2462	21.624	1.1	187.24	22.724	30	Pass

802.11g:

Channel	Frequency (MHz)	Analyzer Reading (dBm)	Cable Loss (dB)	Peak Power Output (mw)	Peak Output (dBm)	Limit (dBm)	Pass/Fail
1	2412	21.781	1.1	194.13	22.881	30	Pass
6	2437	21.531	1.1	183.27	22.631	30	Pass
11	2462	21.812	1.1	195.52	22.912	30	Pass

§15.247(d) - 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)).

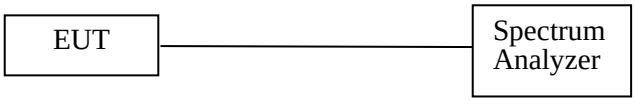
Measurement Procedure

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 List

Please refer to International Standard Laboratory report number **04LR018FC** (**FCC ID: NKRCM9**).

Test Setup Diagram



Environmental Conditions

Please refer to International Standard Laboratory report number **04LR018FC** (**FCC ID: NKRCM9**).

**The testing was performed by International Standard Laboratory*

Measurement Result

Please refer to following pages for plots of band edge.

802.11b:

Channel	Frequency (MHz)	Spectrum Reading (dBuV)	Carrier - Outsideband Limit: >20dB (dB)	Pass/Fail
1	2412.6	117.21	--	--
Outside band	2397	83.91	33.3	Pass
11	2462.6	117.12	--	--
Outside band	2476.5	85.6	31.52	Pass

Note: Two RF output(MAIN & AUX) have been test,the worse data shown above.

802.11g:

Channel	Frequency (MHz)	Spectrum Reading (dBuV)	Carrier - Outsideband Limit: >20dB (dB)	Pass/Fail
1	2413.2	108.07	--	---
Outside band	2399.7	80.21	27.86	Pass
11	2455.7	108.84	--	---
Outside band	2474.2	78.61	30.23	Pass

Note: Two RF output(MAIN & AUX) have been test,the worse data shown above.

802.11b:


REF 127.0 dBµV
10dB/ A_View Posi B_Blank Posi
MKR 2.4126 GHz
117.21 dBµV
MARKER
2.4126 GHz
MKR Setup
1 Marker No.
1
2 Marker ON
3 Marker OFF
4 Active Marker
7 Reset Marker
CENTER 2.3750 GHz
SPAN 100.0 MHz
*RBW 100 kHz *VBW 100 kHz *SWP 200 ms *ATT 30dB


REF 127.0 dBµV
10dB/ A_View Posi B_Blank Posi
MKR 2.4626 GHz
117.12 dBµV
MARKER
2.4626 GHz
MKR Setup
1 Marker No.
1
2 Marker ON
3 Marker OFF
4 Active Marker
7 Reset Marker
CENTER 2.5000 GHz
SPAN 100.0 MHz
*RBW 100 kHz *VBW 100 kHz *SWP 200 ms *ATT 30dB

802.11g:


REF 117.0 dBµV
10dB/ A_View Posi B_Blank Posi
MKR 2.4132 GHz
108.07 dBµV
MARKER
2.4132 GHz
MKR Setup
1 Marker No.
1
2 Marker ON
3 Marker OFF
4 Active Marker
7 Reset Marker
CENTER 2.3750 GHz
SPAN 100.0 MHz
*RBW 100 kHz *VBW 100 kHz *SWP 200 ms *ATT 30dB


REF 117.0 dBµV
10dB/ A_View Posi B_Blank Posi
MKR 2.4557 GHz
108.84 dBµV
MARKER
2.4557 GHz
MKR Setup
1 Marker No.
1
2 Marker ON
3 Marker OFF
4 Active Marker
7 Reset Marker
CENTER 2.5000 GHz
SPAN 100.0 MHz
*RBW 100 kHz *VBW 100 kHz *SWP 200 ms *ATT 30dB

§15.247(e) – PEAK POWER SPECTRAL DENSITY

Applicable Standard

According to §15.247 (e), 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.

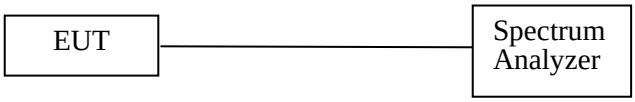
Measurement Procedure

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. The maximum level in 3 kHz bandwidth is measured with the spectrum analyzer using RBW= 3 kHz and VBW > 3 kHz, sweep time = span / 3 kHz, and video averaging is turned off, the PPSD is the highest level found across the emission in any 3 kHz band.
4. Repeat above procedures until all frequencies measured were complete.

Equipment List

Please refer to International Standard Laboratory report number **04LR018FC** (**FCC ID: NKRCM9**).

Test Setup Diagram



Environmental Conditions

Please refer to International Standard Laboratory report number **04LR018FC** (**FCC ID: NKRCM9**).

**The testing was performed by International Standard Laboratory*

802.11b:

Channel	Frequency (MHz)	Spectrum Reading (dBm/3kHz)	Cable Loss (dB)	Peak Power Output (dBm/3kHz)	Limit (dBm/3kHz)	Pass/Fail
1	2412	-11.34	1.1	-10.24	8	Pass
6	2437	-11.07	1.1	-9.97	8	Pass
11	2462	-9.8	1.1	-8.7	8	Pass

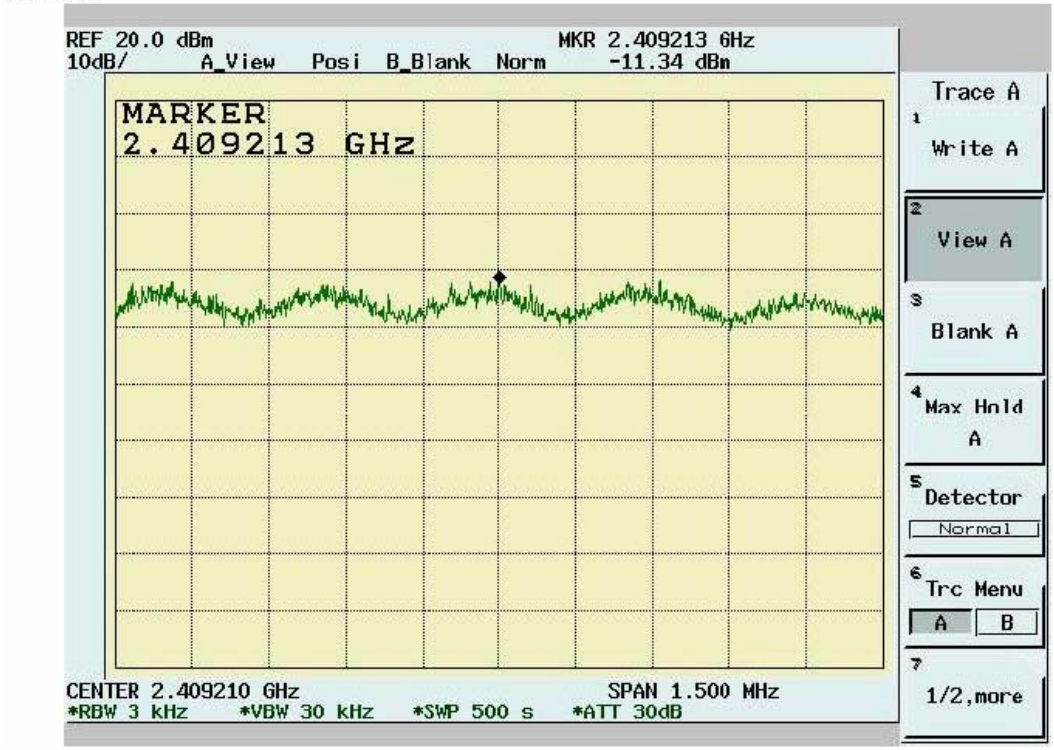
802.11g:

Channel	Frequency (MHz)	Spectrum Reading (dBm/3kHz)	Cable Loss (dB)	Peak Power Output (dBm/3kHz)	Limit (dBm/3kHz)	Pass/Fail
1	2412	-2.27	1.1	-1.17	8	Pass
6	2437	-2.43	1.1	-1.33	8	Pass
11	2462	-2.37	1.1	-1.27	8	Pass

Note: Two RF output (MAIN & AUX) have been test, the worse data shown above.

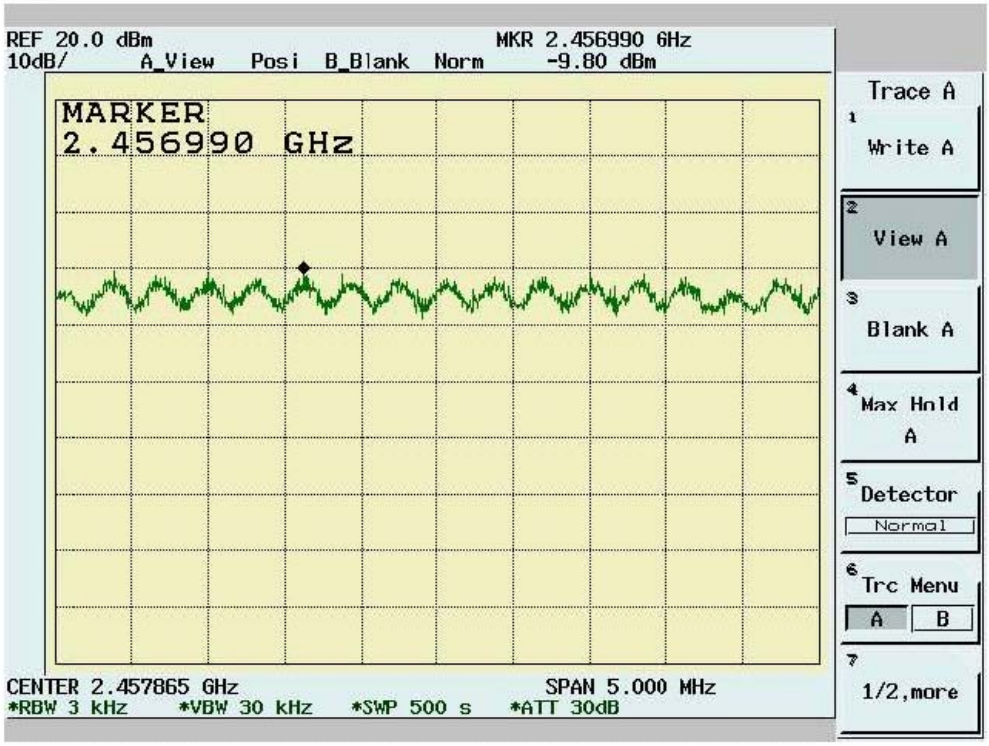
802.11b:

Channel 1



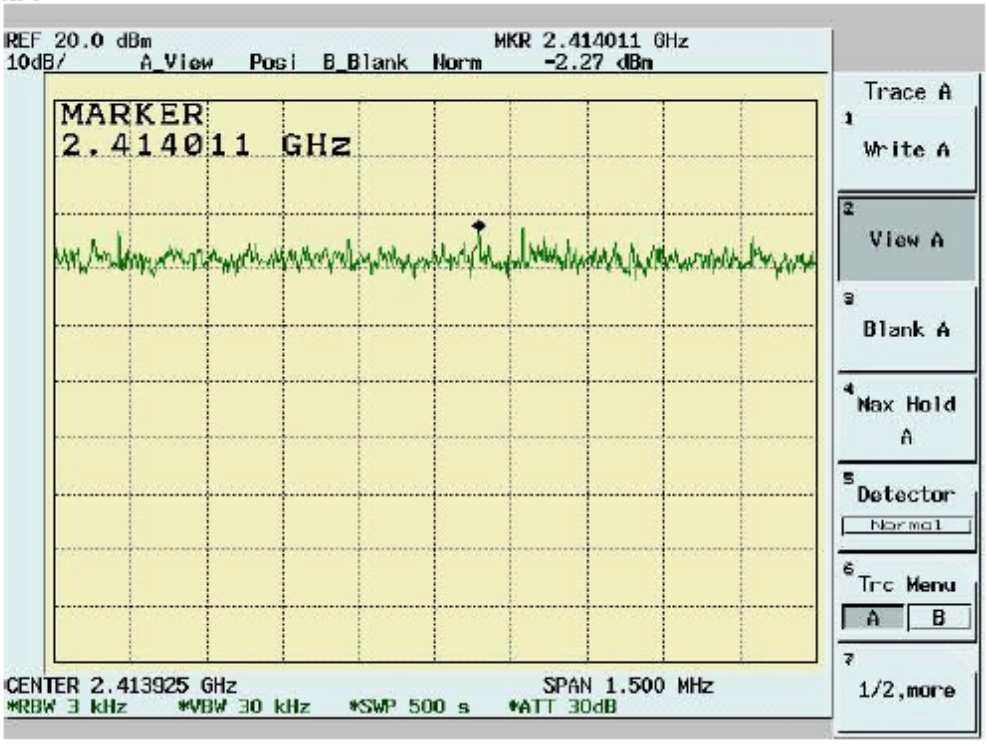
Channel 6

Channel 11

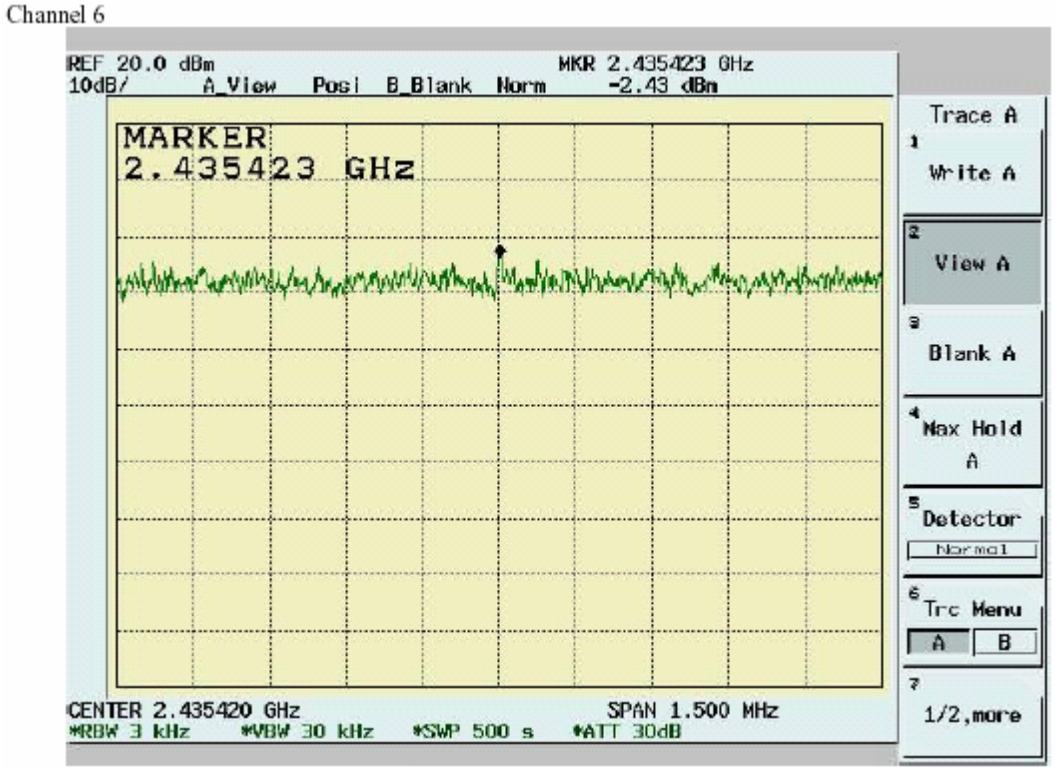


802.11g:

Channel 1



Channel 6



Channel 11