



110 Nortech Parkway
San Jose, CA 95134
www.airespace.com

FCC Part 15 Certification Application

EMI Test Report and Technical Documentation on Airespace Access Point. Model: 1200

FCC ID: QTZAM1200ABG

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General Information

**Unit(s) Under Test:
(UUT)** Airespace Access Point (AP)

Model: 1200

Product Description: IEEE 802.11 A/B/G Access point

FCC ID: **QTZAM1200ABG**

Tested For: Airespace
110 Nortech Parkway
San Jose, Ca. 95134

Tested At: Elliott Laboratories
684 West Maude Ave
Sunnyvale, CA 94086

Tested By: Chris Byleckie, Sr. Test Engineer, Elliott Laboratories
Juan Martinez, Sr. Test Engineer, Elliott Laboratories
Trinh Waitt, (Independent Consultant for Airespace)

Test Specifications: FCC CFR 47, Part 15.247, 2.4 GHz DSSS

Test Dates: Aug 2003 & 10 Nov, 2003

Requested Certification: Part 15 Certification for IEEE 802.11 A/B/G access point radio. *(This report contains the data for the 802.11 B/G portions)*

Product Details

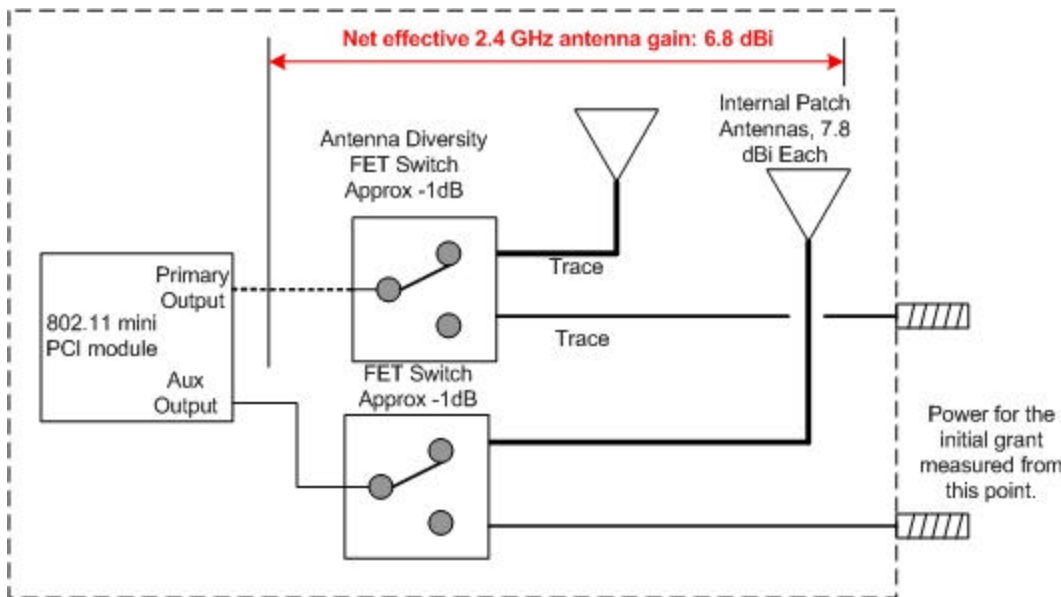
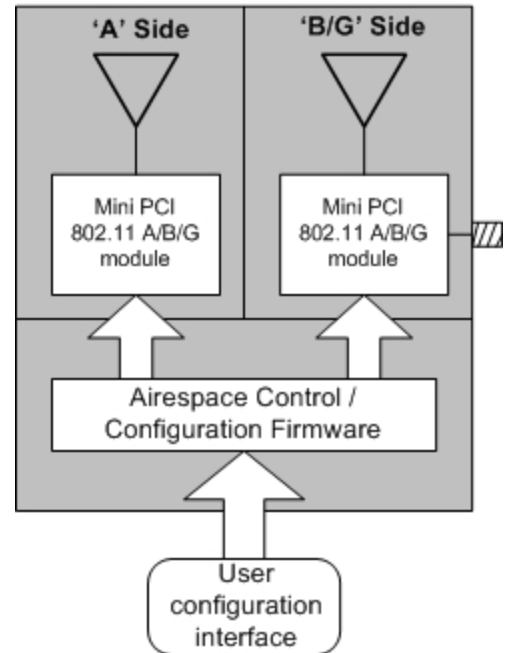
The Airespace access point radio utilizes two IEEE802.11 A/B/G mini PCI modules installed into mini PCI slots on a main board. There are two of these slots. One of the slots is associated with 802.11 A operation and the other is associated with 802.11 B/G operation. Though each module is 802.11 A/B/G capable, the actual function of the module is determined by the slot in which it is installed.

The mini PCI modules used by Airespace have received FCC modular approval as an IEEE802.11 A/B/G device (FCC ID: MCLJ07H06903).

The 802.11 modules are configured and controlled by the Airespace firmware within the access point. The user does not have access to the configuration of the module itself.

The access point has integral 802.11 A and 802.11 B antennas. There also is an option of utilizing external 802.11 B/G antennas. A block diagram of the 802.11 B/G antennas is below. The module switches rapidly between the two internal antennas and then quickly selects the antenna offering the best transmissions characteristics (S/N ratio, packet error rate, etc) thus, only one antenna is transmitting or receiving at any given point in time.

Access Point Radio



The effective gain of the 2.4 GHz internal antenna path (the antenna switch and the antenna itself) is 6.8dBi. The diagram outlines the RF path from the output of the mini PCI module within the AP to the integral antennas within the AP.

Test Methods

The tests are performed at a low, middle and high channel of the applicable band. The typical frequencies used for the Part 15.247, 2.4 GHz tests are listed below

ISM 802.11 B/G		
2400 - 2483.5 MHz		
Channel	Freq(MHz)	
Low CH 1	2412	
Mid CH 6	2437	
High Ch 11	2462	

The RF transmit power of the access point was measured while transmitting in the 802.11B and G mode to insure that the RF transmit power in the 802.11 G mode was not higher than when operating in the 802.11 B mode.

It was determined that the 802.11 G transmit power was NOT higher than 802.11 B transmit power. Therefore it was not necessary to re-verify some of the tested 802.11 B parameters of the access point since there was no reason that the performance of the access point would have degraded when operating in G mode.

The following tests that were performed in order to verify compliance of the access point while operating in the 802.11 G mode.

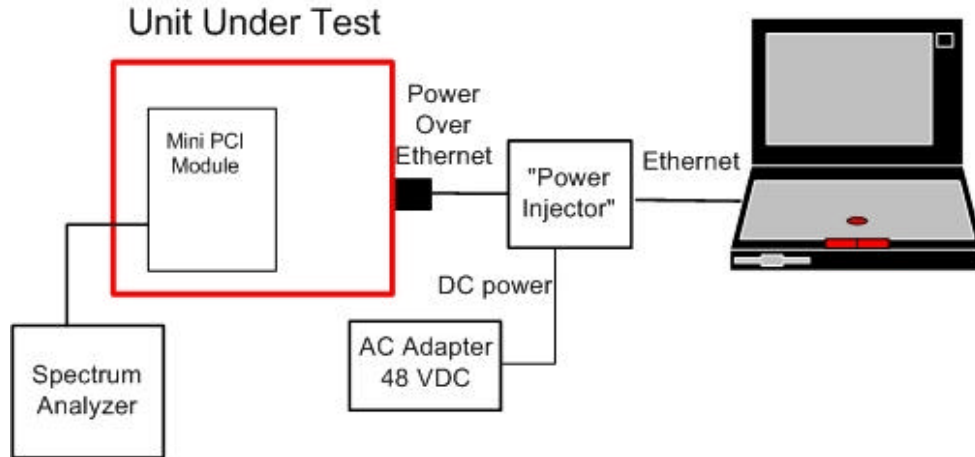
- Radiated emissions in restricted bands at the band edges (2390 MHz and 2483.5 MHz)
- RF Transmit power
- 6 dB bandwidth
- Power spectral density

The following tests that were performed in order to verify compliance of the access point while operating in the 802.11 B mode.

- Radiated emissions in restricted bands at the band edges (2390 MHz and 2483.5 MHz)
- RF Transmit power
- 6 dB bandwidth
- Power spectral density
- Out of band emissions
- Restricted band emissions

The tests listed below are performed using the basic “conducted” test setup shown below. In most cases, the UUT was running special diagnostic software to allow it to transmit random data on a particular channel indefinitely.

Part 15	Test
15.247(a)(1)	6dB Bandwidth
15.247(a)(1)(i)	Power Spectral Density
15.247(a)	RF Transmit Power



Basic Conducted RF Bench Test Setup

Unless otherwise noted, the support equipment for the bench tests is listed below.

Support Equipment				
Description	Model number	FCC ID or SN	Manufacturer	Power Cable
Laptop	Armada E 500	P3100T4X20DC12N2	Compaq	Laptop PS
Test Software	Atheros Radio Test		Atheros	
48VDC AC adapter	Generic		Generic	Standard Twin lead DC wire

NOTE: The “Power Injector” is simply a connector attached to wires “broken out” of the Ethernet cable. It is not really a “piece of equipment”.

Test Results Summary

This report presents the results of the tests that verify compliance with FCC Part 15.247..

A brief results summary of all the in this report is below.

Part 15 Paragraph	RSS-210 Paragraph	Test	Results
15.247(b)	6.2.2(o)(a) 3	Maximum Power Output at Antenna (802.11 B)	20.9 dBm Max
15.247(b)	6.2.2(o)(a) 3	Maximum Power Output at Antenna (802.11 G)	20.7 dBm Max
15.247(a)(2)	6.2.2(o)(e1)	6dB Bandwidth (802.11 B)	12.27 MHz Min
15.247(a)(2)	6.2.2(o)(e1)	6dB Bandwidth (802.11 G)	16.83 MHz Min
15.247(d)	6.2.2(o)(d1)	Power Spectral Density (802.11 B)	-9.5 dBm/3kHz Max
15.247(d)	6.2.2(o)(d1)	Power Spectral Density (802.11 G)	-11.5 dBm/3kHz Max
15.205	6.3(c)	Radiated Emissions in Restricted bands (bandedge)	52.63 dBuV

Test Facilities

The certification tests were performed at:

Elliott Labs
684 West Maude Ave
Sunnyvale, CA 94086

General:

Final radiated test measurements were taken in November 2003 at the Elliott Laboratories Open Area Test Site #4.

The test site contains separate areas for radiated and conducted emissions testing. Pursuant to section 2.948 of the Rules, construction, calibration, and equipment data has been filed with the Commission.

The FCC recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement with the exception of predictable local TV, radio, and mobile communications traffic. The test site contains separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent FCC requirements.

OATS:

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated emissions are performed in an open field environment. The test site is maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4 Guidelines.

Antenna, Antenna Mast and Turntable

The Horn antennas that are used to measure radiated emissions above 1000MHz are mounted on a non-conductive antenna mast equipped with a motor drive to vary the antenna height.

ANSI C63.4 specifies that the test height above the ground plane shall be 80cm unless the equipment is intended to be floor mounted. During the radiated emissions tests the equipment is positioned on a motorized turntable in conformance with the ANSI requirement.

Equipment Lists

Instrument Calibration

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

The following test equipment was used to perform the testing

Elliott Test Equipment

Manufacturer	Description	Model #	Asset #	Cal interval	Last Calibrated	Cal Due
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	868	12	3/14/2003	3/14/2004
Hewlett Packard	Microwave EMI test system (SA40, 30Hz - 40GHz), system 2	84125C	1410	12	4/2/2003	4/2/2004
Miteq	Preamplifier, 1-18GHz	AFS44	1346	12	1/6/2003	1/6/2004
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1534	12	3/20/2003	3/20/2004
Rohde & Schwarz	Power Sensor, 1uW-100mW, DC-18 GHz, 50ohm	NRV-Z51	1070	12	3/25/2003	3/25/2004
Rohde & Schwarz	Power Sensor 100uW - 10 Watts	NRV-Z53	1236	12	8/15/2002	8/15/2004

Detailed Test Results

Detailed test procedures and test results are contained in the following sections. In cases where the test setup differs from the Conducted RF test setup shown earlier, the test setup is also presented.

Test Conditions			
Temperature	Approx 15C	Humidity:	Approx 51%
ATM pressure	Approx 1003 mBar	Grounding:	None
Tested By	Trinh Waitt , Chris Byleckie	Date of Test:	Nov 10, 2003
Test Reference	Refer to individual test results		
Tested Range	Test Dependent		
Test Voltage	48 VDC to the AP		
Modifications	No modifications were made to the unit during the tests		

802.11 B Maximum RF Power Output at Antenna Terminals

Specifications:

FCC Specification: Paragraph 15.247(b)

Procedure:

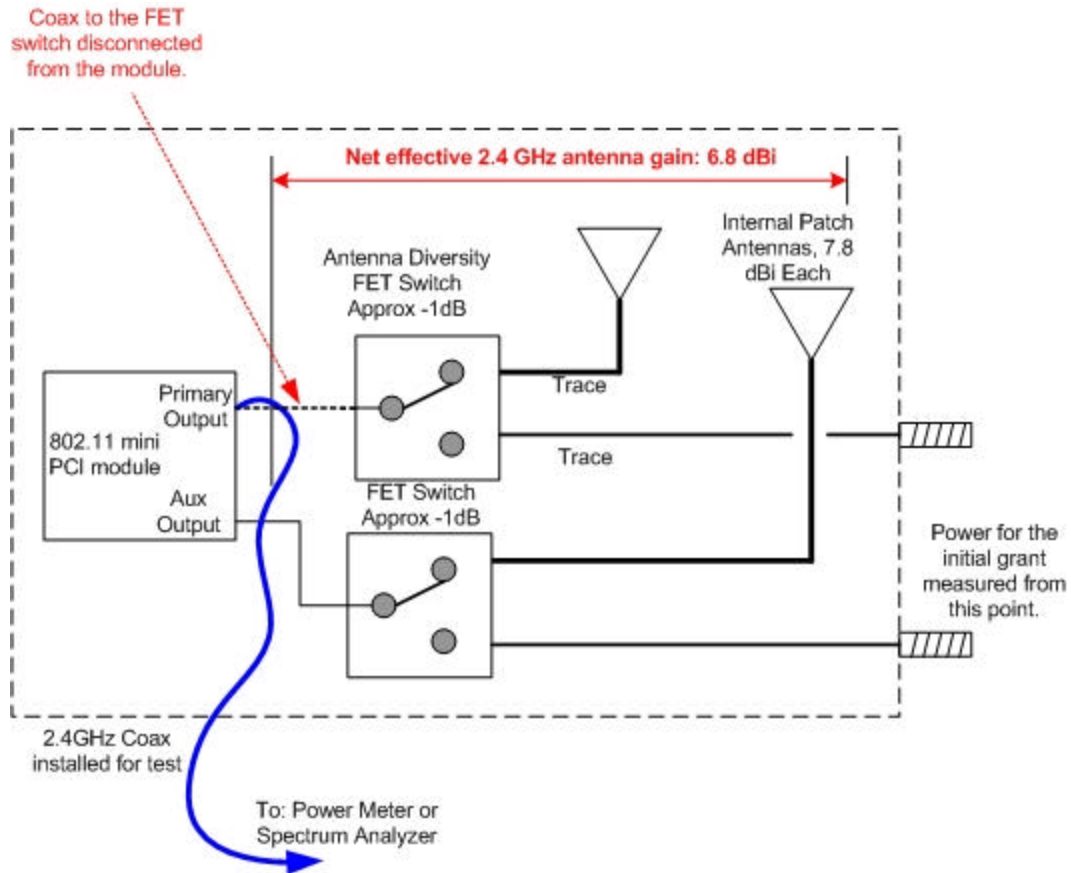
The test was configured as shown in the conducted RF test setup. The unit was tuned to the test channels and configured to transmit random data packets.

First the 26 dB bandwidth of the channel was determined and then the integration function of the analyzer set to measure the total integrated power over that bandwidth.

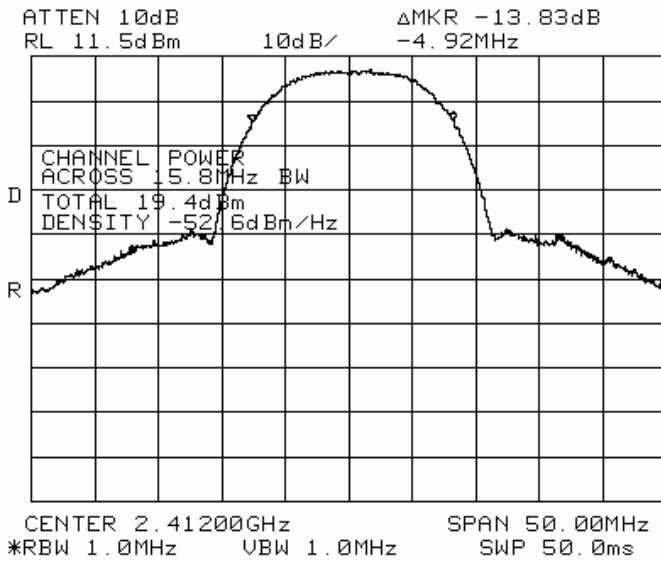
It was determined that the power setting for the channel 11 in mode G had to be reduced from the power setting used for the 'B' band channel 11 in order to pass radiated emissions in restricted bands at the 2483.5 MHz band edge. The power settings corresponding to the, maximum, 99% occupied channel power will be configured within the Airespace firmware. In the case of channel 11, the power settings are different from Mode B to Mode G.

RF Transmit Power Result:

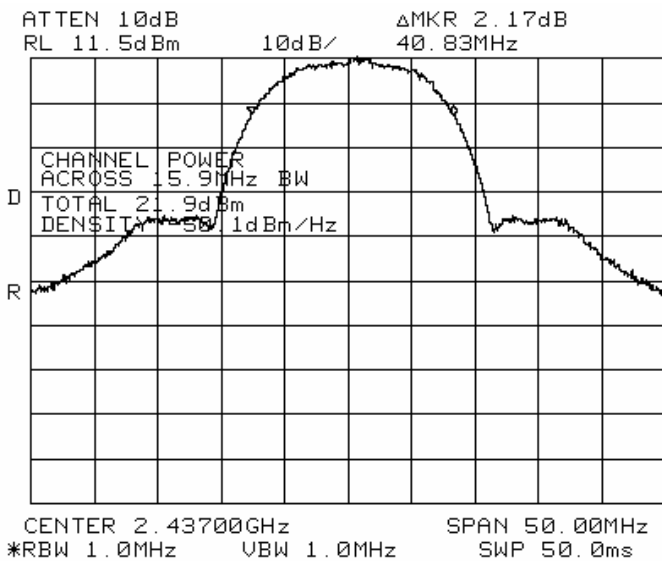
Freq	99% Occupied channel power measurement. Power shown is power into antenna (dBm)		99% Occupied channel power measurement. Power shown is power into antenna (Watts)		EIRP (dBm)		Spec (dBm MAX)	Delta from 36 dBm EIRP
	MHz	802.11 B	802.11 G	802.11 B	802.11 G	802.11 B		
2412	18.4	18.3	0.06918	0.06761	26.2	26.1	30	9.8
2437	20.9	20.7	0.12303	0.11749	28.7	28.5	30	7.3
2463	18.7	17.6	0.07413	0.05754	26.5	25.4	30	9.5



The 99% channel power bandwidth plots are below. The power shown in the plots is 1 dB higher than the power shown in the table above due to the fact that the power was measured directly at the output of the module. The power levels in the summary table above are 1 dB below the level shown on the plots due to the FET switch. The table above indicates the actual power into the antennas.

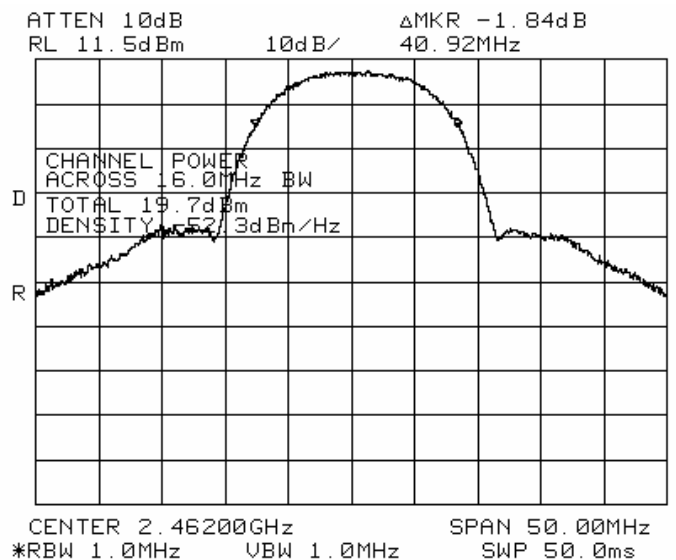


99% Channel power, 802.11 B Channel 1



99% Channel power, 802.11 B Channel 6

99% Channel power, 802.11 B Channel 11



Airspace.

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ISM 6 dB bandwidth

Specifications

FCC Specification: Paragraph 15.247(a)(2)

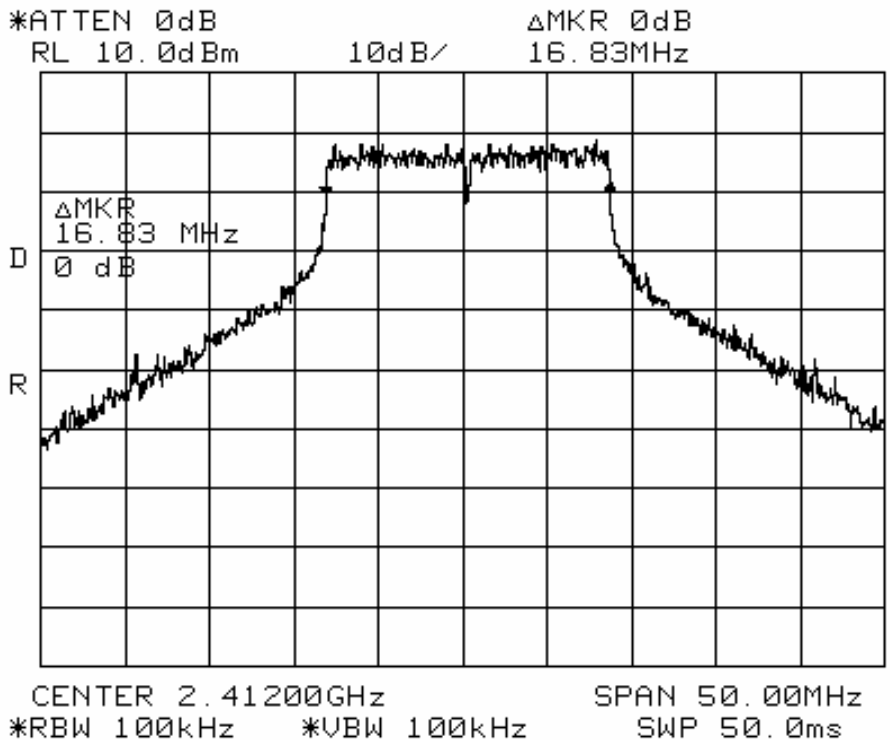
Procedure:

The Airespace AP access point operates on the standard IEEE 802.11 A / B channels. The 6dB bandwidth was measured on the low, middle and high channel of the 2.4 GHz ISM band using the bench conducted RF test setup. The spectrum analyzer was configured for MAX HOLD and the trace allowed to stabilize. A peak search was performed and the then delta-marker used to locate the point -6dB below the peak.

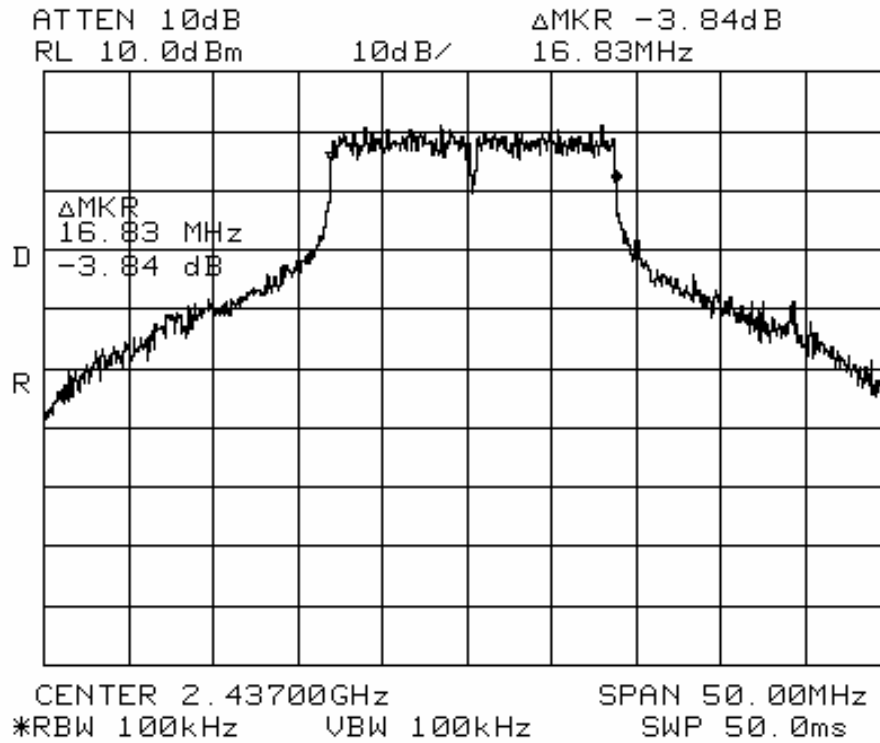
Once this was complete, the point was used as a reference and another delta measurement was performed and an attempt made to make the two markers “level” (0dB difference). The delta frequency between the two markers was measured as the 6 dB BW of the signal. The bandwidth test was performed at the power settings that will be used in the final system configuration.

Results:

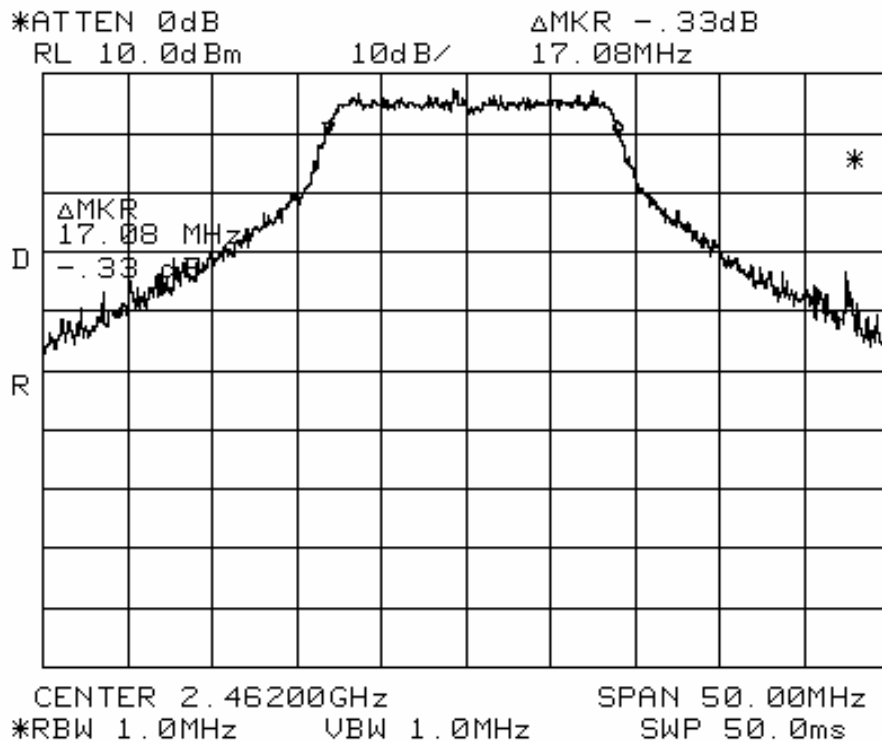
Chan	802.11 B 6 dB BW (MHz)	802.11 G 6 dB BW (MHz)	Spec (MHz)	Delta (MHz) (min)
1	12.27	16.83	0.5	11.77
6	12.27	16.83	0.5	11.77
11	12.27	17.08	0.5	11.77



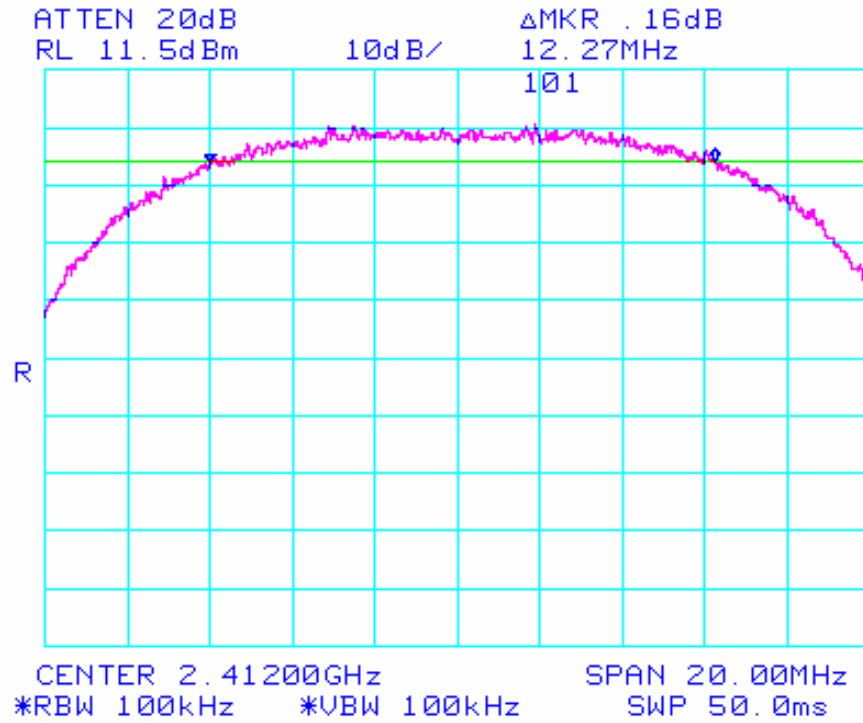
6 dB BW, Channel 1, 2412 MHz, 802.11 G



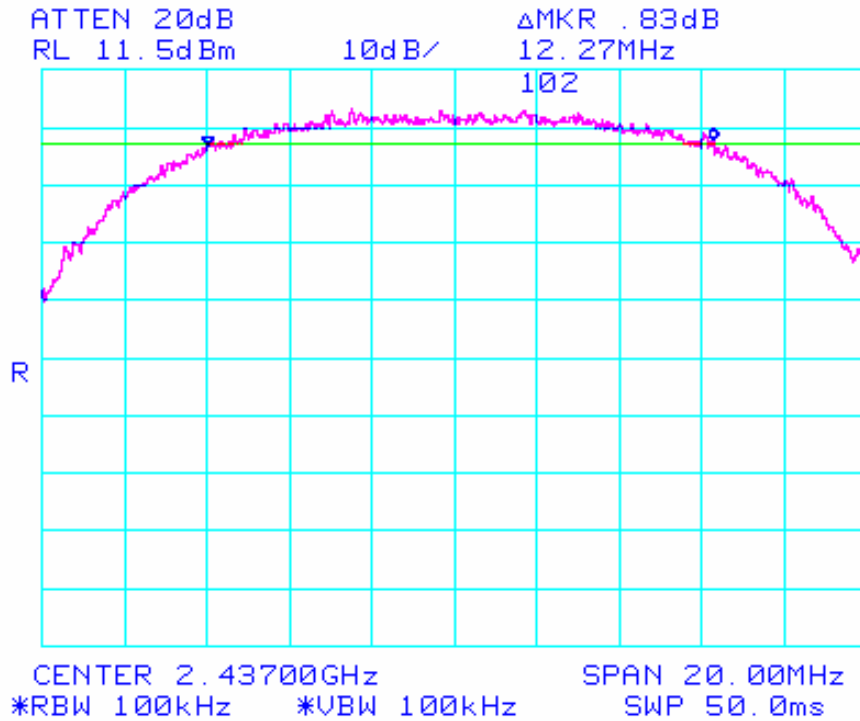
6 dB BW, Channel 6 , 2437 MHz, 802.11 G



6 dB BW, Channel 11, 2462 MHz, 802.11 G



6 dB BW, Channel 1, 2412 MHz, 802.11 B



6 dB BW, Channel 6, 24376 MHz, 802.11 B

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ISM Power Spectral Density

Specification: Paragraph: 15.247(4)(d)

Procedure

Initially the bandwidth of the entire channel was examined. Using MAX HOLD, the trace was allowed to stabilize. Once the trace was stable, a peak search was performed and the frequency with the maximum power was determined.

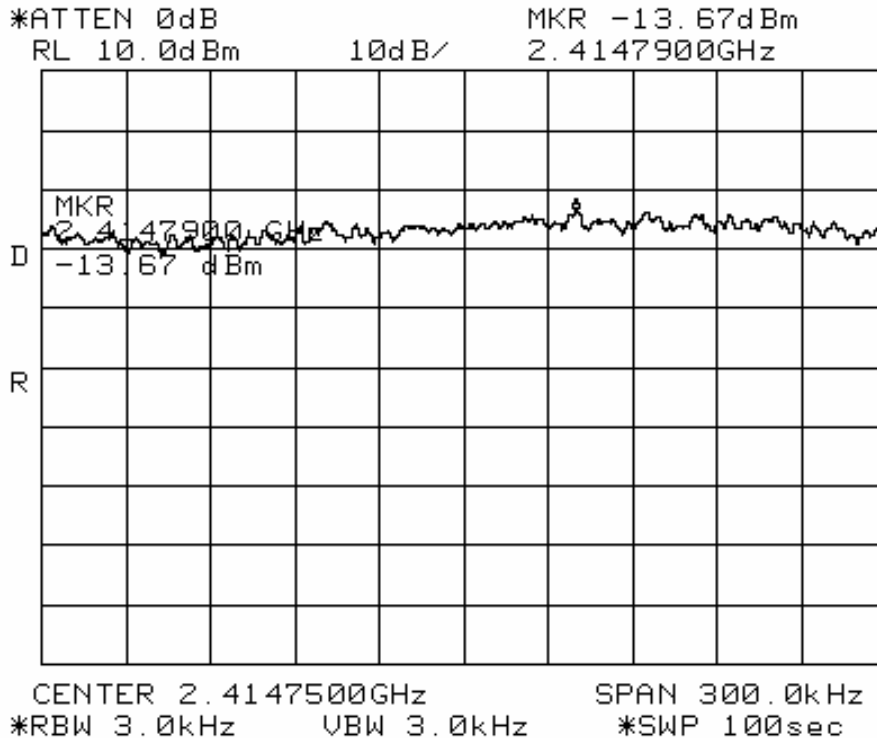
The measurement span was then narrowed to 300 kHz and centered on the “MAX power” frequency, the RBW set to 3 kHz and the sweep time set to 100 sec. This method averages the data for 1 second for every 3 kHz BW.

The analyzer was then set to MAX HOLD and a display line placed at +8dBm.

The power spectral density was measured at the low, middle and high-test channels with the appropriate power setting for the given test channel.

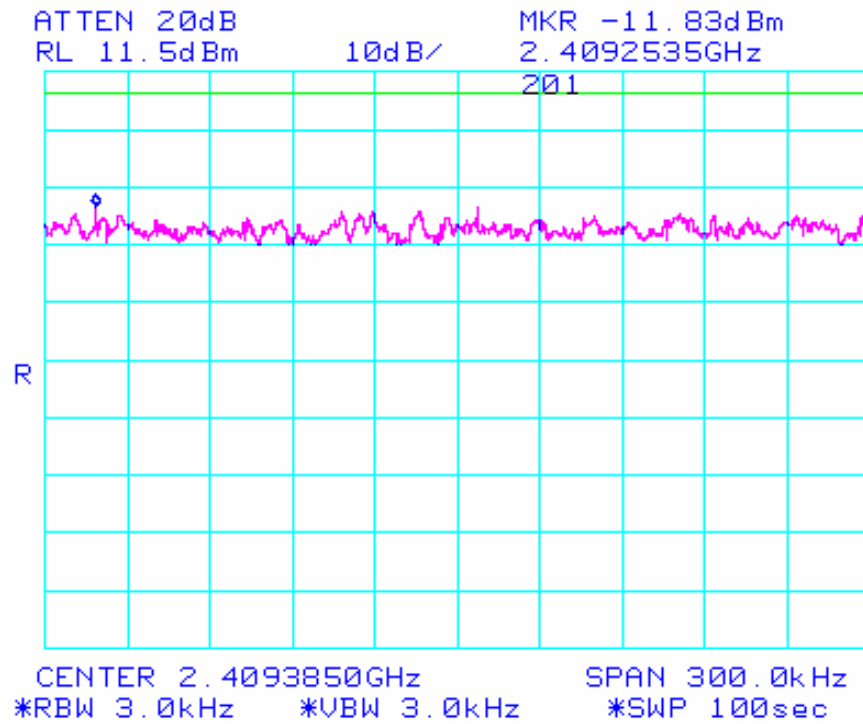
Results:

802.11a/b	Frequency	Measured PSD 802.11 B	Measured PSD 802.11 G	Specification	Delta (dB) (min)
Channel	(MHz)	(dBm/3 kHz)	(dBm/3 kHz)	dBm /	
1	2412	-11.83	-13.67	8dBm/3kHz	19.83
6	2437	-9.5	-11.5	8dBm/3kHz	17.5
11	2462	-12.33	-14	8dBm/3kHz	20.33

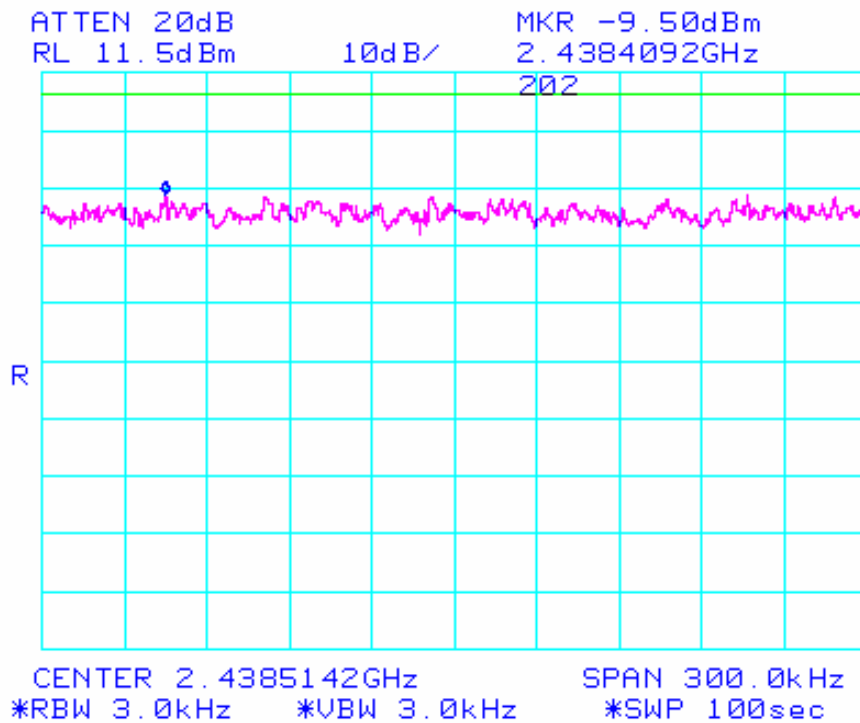


Power Spectral Density, 802.11 G, LOW Channel, 2412MHz

Power Spectral Density, 802.11 G, HIGH Channel, 2462MHz



Power Spectral Density, 802.11 B, LOW Channel, 2412MHz



Power Spectral Density, 802.11 B, MID Channel, 2437MHz

ISM Out of Band Emissions

Specifications:

FCC Part 15 Paragraph 15.247(c)

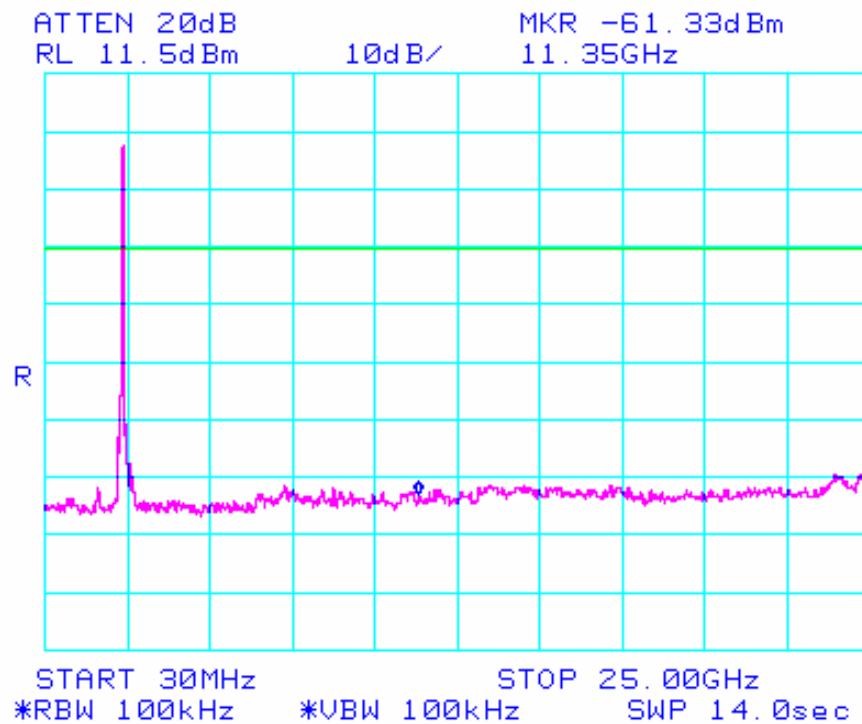
Procedure:

The test was configured as shown in the bench conducted RF test setup. The UUT was configured to transmit random data packets. The band from 1 GHz to 25GHz was examined for spurious emissions. This test was conducted the low middle and high channels. The UUT was configured to transmit on the appropriate power levels for Channels 1, 6 and 11.

Results:

The entire band of interest was examined at one time to clearly demonstrate compliance. There were no spurious emissions above the limit (-20dBc)

Out of Band Emissions Plots



OOB Emissions, Transmit on Channel 1 (2412MHz)

ISM Radiated Emissions in Restricted bands

Specifications:

FCC Part 15 Paragraph 15.247(c)

Procedure:

This test was conducted in a 5 meter anechoic chamber at Elliott Laboratories Fremont, California facility. The unit was placed on a rotating wooden table 80cm above the ground plane. A Horn antenna was secured to a mast 3 meters away. The unit was tested for out of band / restricted band emissions at the Low, Mid and High test channels. The UUT was configured set to transmit continuous data packets. The test equipment was configured as shown below.

The emissions up to 26 GHz were examined. Those emission falling within a restricted band were evaluated against the "restricted band emission limit" (54 dB μ V / 74 dB μ V), while those outside of a restricted band were evaluated against the "out of band emissions" limit (-20 dBc)

The EUT was rotated 360 degrees and the height of the antenna adjusted from 1 to 4 meters above the ground plane to determine the maximum level of the emission. The level of the emission was measured in two modes, "Peak" and "Average" using the following measurement bandwidths

Restricted Band Peak Measurements: RBW & VBW: 1 MHz

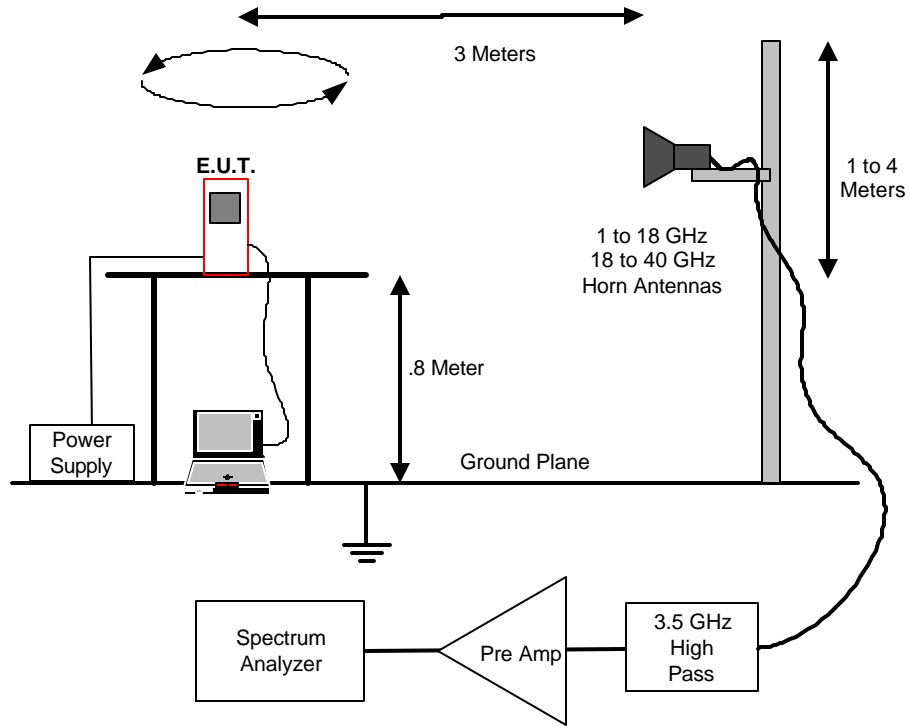
Restricted Band Average Measurements: RBW:1MHz & VBW:10 Hz.

All other measurements, RBW = 1MHz & VBW = 3MHz

video averaging on (100 samples).

The spectrum analyzer reading was corrected by the measurement software to take into account the various equipment characteristics (antenna factor, cable loss, pre-amplifier gain, HPF loss...) to obtain a final corrected measurement.

This procedure was repeated for channel 6 and 11 within the 802.11 B band. Since the transmit power was highest for 802.11 B, this test was performed only while transmitting in 802.11 B mode.



Radiated Emissions in Restricted Bands Test Setup

Support Equipment

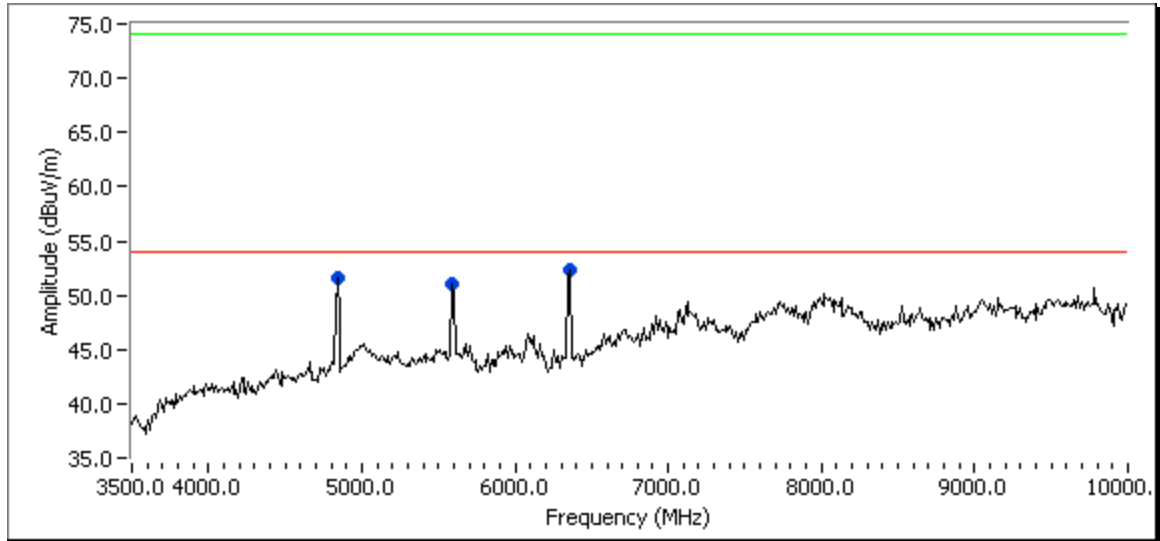
Description	Model number	FCC ID or SN	Mfg	Power Cable
Laptop	Armada E 500	P31000T4X20DC12N2	Compaq	Laptop PS
Test Software	Atheros Radio Test		Atheros	
48VDC AC adapter	Generic		Generic	Std Twin lead DC wire

Test Conditions

Temperature	Approx 15 C	Humidity:	Approx 51%
ATM pressure	Approx 1003 mBar	Grounding:	None
Tested By	Trinh Waitt, Chris Byleckie	Date of Test:	10 Nov 2003
Test Reference	FCC Part 15.205 IC Paragraph RSS210, 6.2.3 (c)		
Setup Method	ANSI C63.4		
Tested Range	1 GHz to 24 GHz		
Test Voltage	120 VAC / 60 Hz		
Modifications	No modifications were made to the unit		

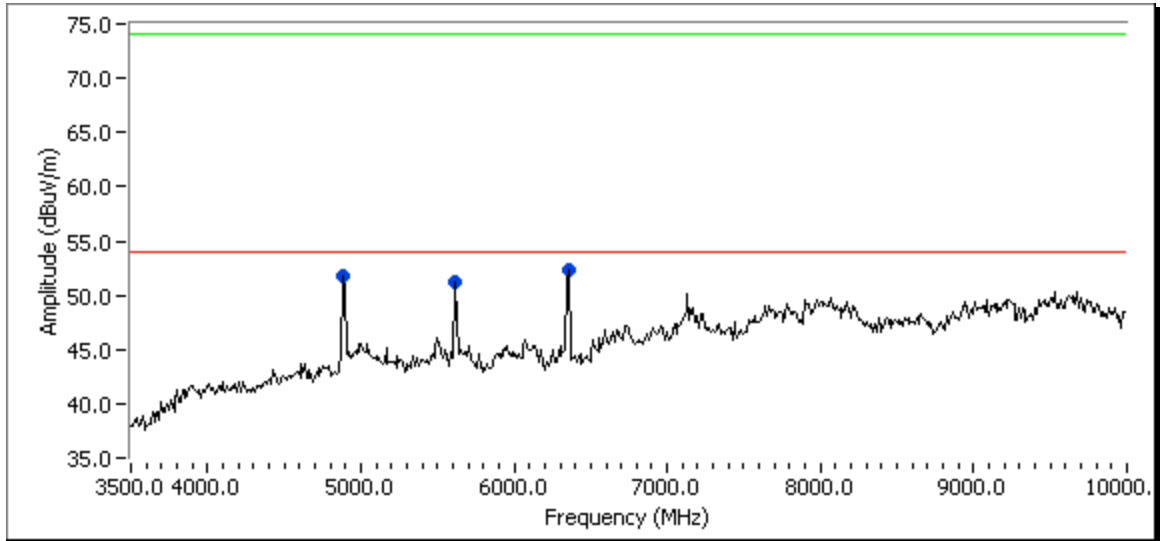
Results:

UUT
 Transmitting
 802.11 B on
 low Channel:
 2412 MHz



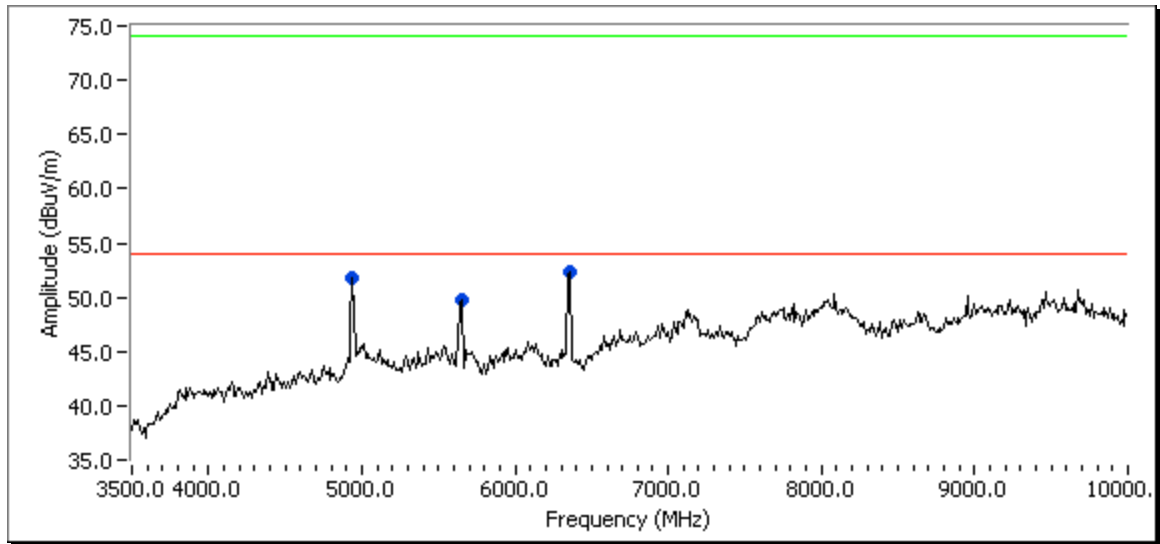
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
4824.102	40.5	V	54.0	-13.5	AVG	12	2.0
4824.102	52.6	V	74.0	-1.5	PK	12	2.0
5579.410	43.5	H	54.0	-10.5	AVG	120	1.5
5579.410	52.3	H	74.0	-1.7	PK	120	1.5
6336.042	50.5	H	54.0	-3.5	AVG	160	1.0
6336.042	53.3	H	74.0	-0.7	PK	160	1.0

UUT
 Transmitting
 802.11 B on
 mid Channel:
 2437 MHz



Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
4873.884	41.5	V	54.0	-12.5	AVG	359	1.5
4873.884	53.7	V	74.0	-20.3	PK	359	1.5
5605.804	44.9	H	54.0	-9.2	AVG	182	1.5
5605.804	53.1	H	74.0	-20.9	PK	182	1.5
6336.122	49.8	H	54.0	-4.2	AVG	150	1.0
6336.122	53.0	H	74.0	-21.0	PK	150	1.0

UUT
 Transmitting
 802.11 B on
 high Channel:
 2462 MHz



Frequency MHz	Level dBµV/m	Pol v/h	15.209 / 15.247		Detector Pk/QP/Avg	Azimuth degrees	Height meters
			Limit	Margin			
4924.043	41.6	H	54.0	-12.4	AVG	314	1.0
4924.043	53.7	H	74.0	-20.3	PK	314	1.0
5630.087	42.9	V	54.0	-11.1	AVG	3	1.0
5630.087	51.7	V	74.0	-22.3	PK	3	1.0
6335.937	50.2	V	54.0	-3.8	AVG	179	1.5
6335.937	53.0	V	74.0	-21.1	PK	179	1.5

ISM Radiated Emissions in Restricted bands (2.4 GHz Band Edges)

FCC Specifications: Paragraph 15.247(c)

Procedure:

Since this is a 2.4 GHz product, there is a restricted band that begins immediately at the high end of the operating band and another that begins 10 MHz below the low end of the operating band.



Restricted Bands close to the ISM operating band

This test was conducted on a 3-meter OATS #4 at Elliott labs Sunnyvale facility. There are three steps to performing this test.

STEP 1) The first involves making a radiated measurement of the fundamental signal with the UUT on the operating channel closest to the edge of the band. The unit was placed on a rotating wooden table 80cm above the OATS ground plane. A Horn antenna was secured to a mast 3 meters away. The test equipment was configured as shown below.

The EUT was rotated 360 degrees and the height of the antenna adjusted from 1 to 4 meters above the ground plane to determine the maximum level of the emission. The level of the fundamental emission was measured in two modes, "Peak" and "Average" using RBW and VBW of 1MHz/1MHz and 1MHz/10Hz respectively.

STEP 2) A second measurement (conducted) is made using narrower bandwidths (100 kHz) to determine a Δ dB (delta dB) level between the peak of the fundamental level (measured in a 100 kHz BW) and the highest level within the restricted band near the operating band.

STEP 3) A third and final measurement (conducted) is made to determine the apparent drop in fundamental carrier power when the RBW is narrowed from 1MHz (in the reference measurement) to 100kHz (for the delta dB measurement). This is referred to below as the "BW Delta".

The level of the emission in the restricted band is then calculated using the following formulas.

<p style="margin: 0;">Restricted band level (AVG) = AVG reference level - delta dB - BW Delta dB</p> <p style="margin: 0;">Restricted band level (Peak) = Peak reference level - delta dB - BW Delta dB</p>

Radiated Emissions in Restricted bands (2.4 GHz Band Edges) Results

802.11 G Band Edge (Restricted band @ 2.390GHz)											
Pol	Fundamental Ref Msmt		dBc Msmt		RBW Delta msmt dB	Radiated Level at Band Edge		Specification		Delta (dB below Limit)	
	Peak dbuv/m	Avg dbuv/m	Peak dBc	Avg dBc		Peak dBuv/m	Avg dBuv/m	Peak dBuv/m	Avg dBuv/m	Peak dBuv/m	Avg dBuv/m
Vert	111.9	101.5	40.2	45.2	5.62	66.11	50.68	74	54	7.89	3.32
Horz	104.2	93.8	40.2	45.2	5.62	58.41	42.98	74	54	15.59	11.02

802.11 G Band Edge (Restricted band @ 2.4835GHz)											
Pol	Fundamental Ref Msmt		dBc Msmt		RBW Delta msmt dB	Radiated Level at Band Edge		Specification		Delta (dB below Limit)	
	Peak dbuv/m	Avg dbuv/m	Peak dBc	Avg dBc		Peak dBuv/m	Avg dBuv/m	Peak dBuv/m	Avg dBuv/m	Peak dBuv/m	Avg dBuv/m
Vert	111.9	102.3	39.5	43.2	6.93	65.47	52.2	74	54	8.53	1.8
Horz	104	92.5	39.5	43.2	6.93	57.57	42.4	74	54	16.43	11.6

802.11 B Band Edge (Restricted band @ 2.390GHz)											
Pol	Fundamental Ref Msmt		dBc Msmt	RBW Delta msmt dB	Radiated Level at Band Edge		Specification		Delta (dB below Limit)		
	Peak dbuv/m	Avg dbuv/m			Peak dBuv/m	Avg dBuv/m	Peak dBuv/m	Avg dBuv/m	Peak dBuv/m	Avg dBuv/m	
Vert	113.40	106.20	50.00	9.50	53.90	46.70	74	54	20.10	7.30	
Horz	102.60	95.40	50.00	9.50	43.10	35.90	74	54	30.90	18.10	

802.11 B Band Edge (Restricted band @ 2.4835GHz)											
Pol	Fundamental Ref Msmt		dBc + RBW Msmt	Delta msmt dB	Radiated Level at Band Edge		Specification		Delta (dB below Limit)		
	Peak dbuv/m	Avg dbuv/m			Peak dBuv/m	Avg dBuv/m	Peak dBuv/m	Avg dBuv/m	Peak dBuv/m	Avg dBuv/m	
Vert	112.40	105.70	52.35		60.05	53.35	74	54	13.95	.65	
Horz	103.70	96.40	46.71	7.80	49.19	41.89	74	54	24.81	12.11	

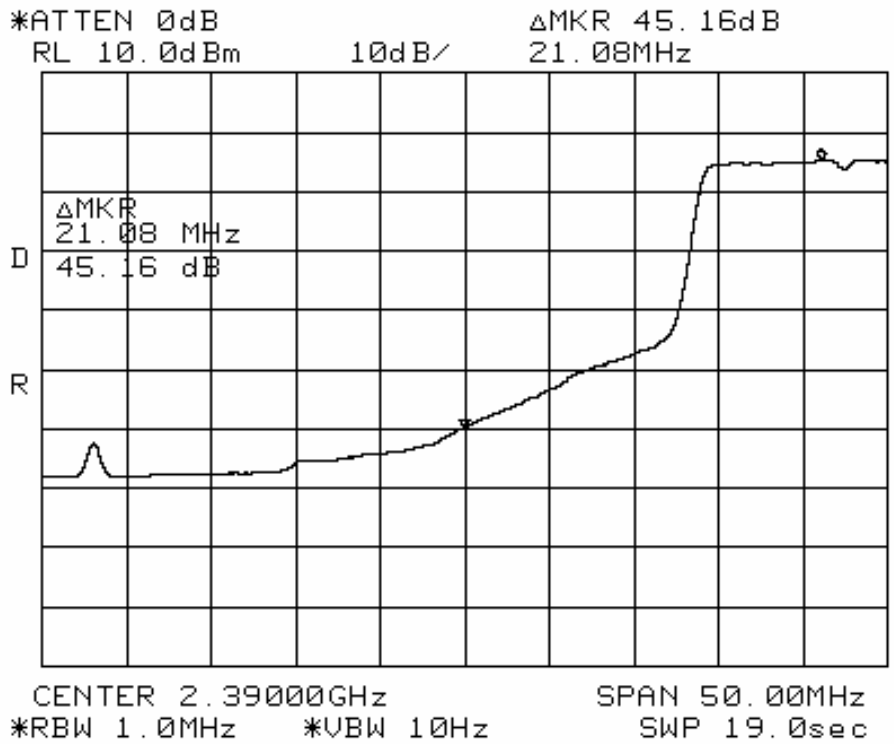
Radiated emissions at band edge sample calculation (802.11 B, 2483.5MHz Avg, Vert):

$$\text{Emission Level} = \text{Fund Ref Msmt} - \text{Delta Msmt} - \text{RBW Delta Msmt}$$

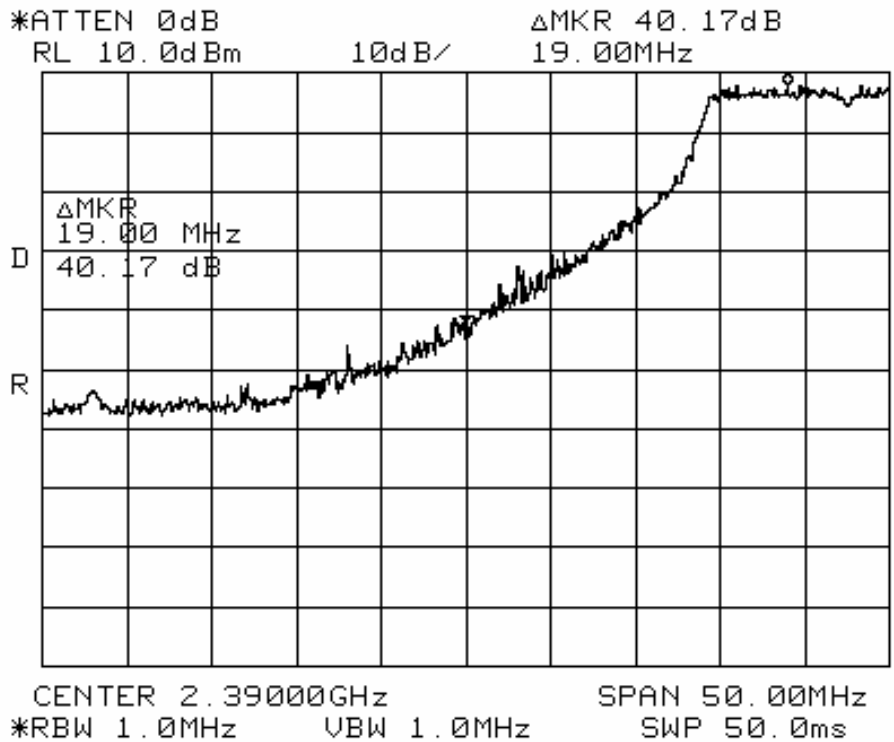
Example: 105.3dBuV/m – 52.35dBc = 53.35dBuv/m
 54 dBuv/m - 53.35dBuv/m = .65dB margin

-dBc and BW Delta measurement for the low band edge restricted band @ 2390.0 MHz

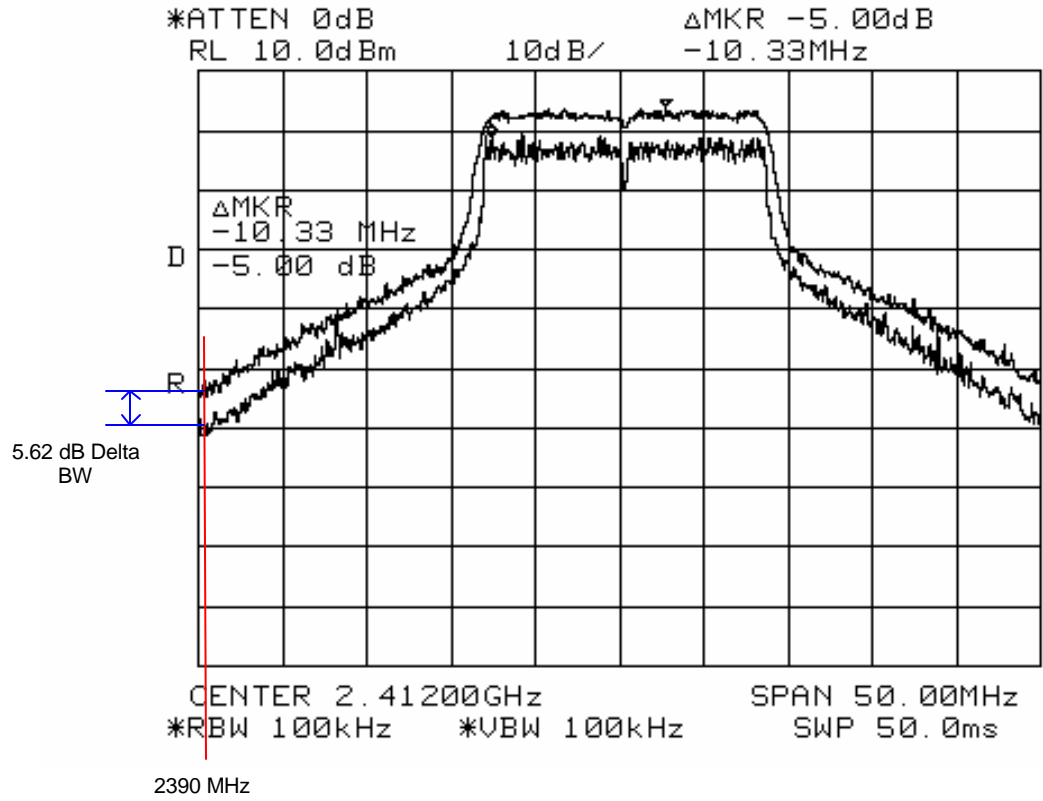
802.11 G dBc
Measurement, AVG



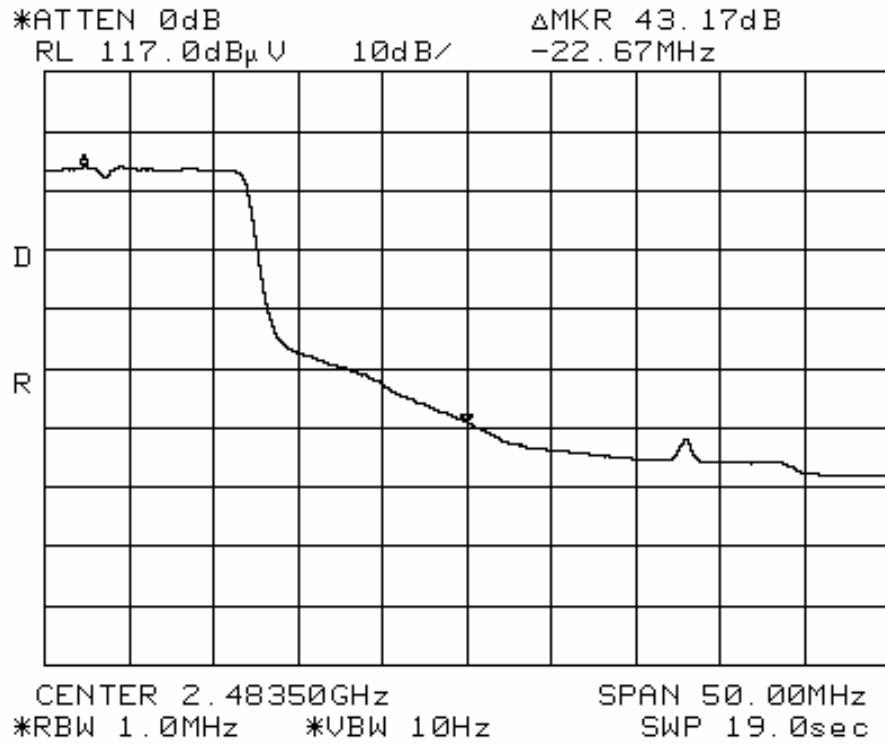
802.11 G dBc
Measurement,
PEAK



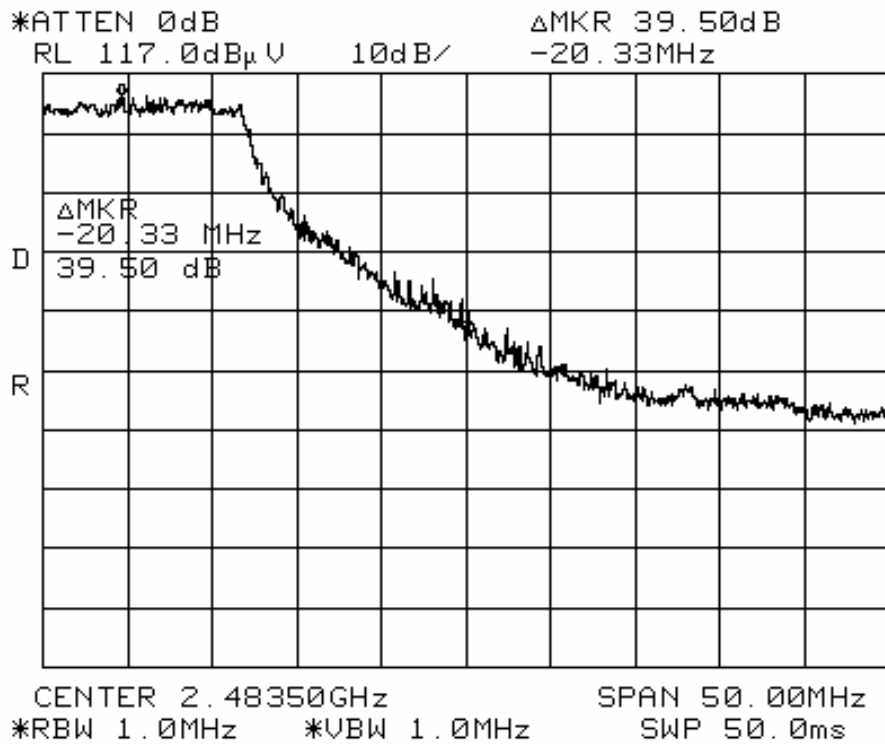
802.11 G
2390 MHz BW
delta
measurement.

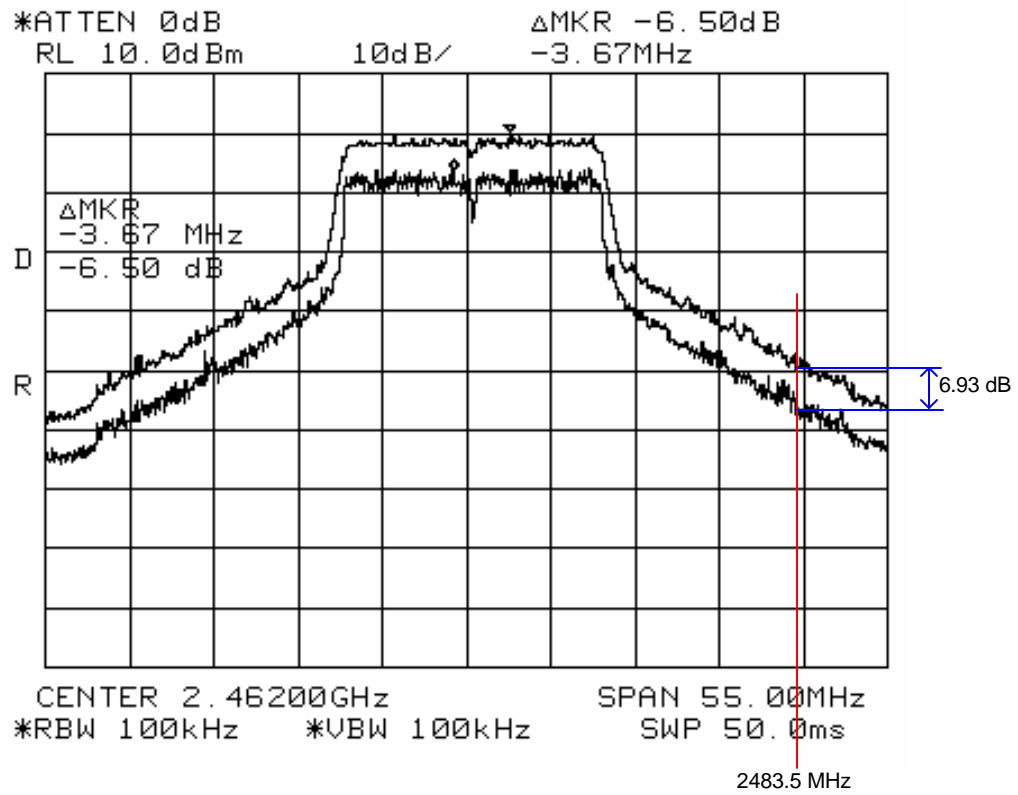


802.11 G 2483.5
MHz
-dBc
Measurement,
AVG

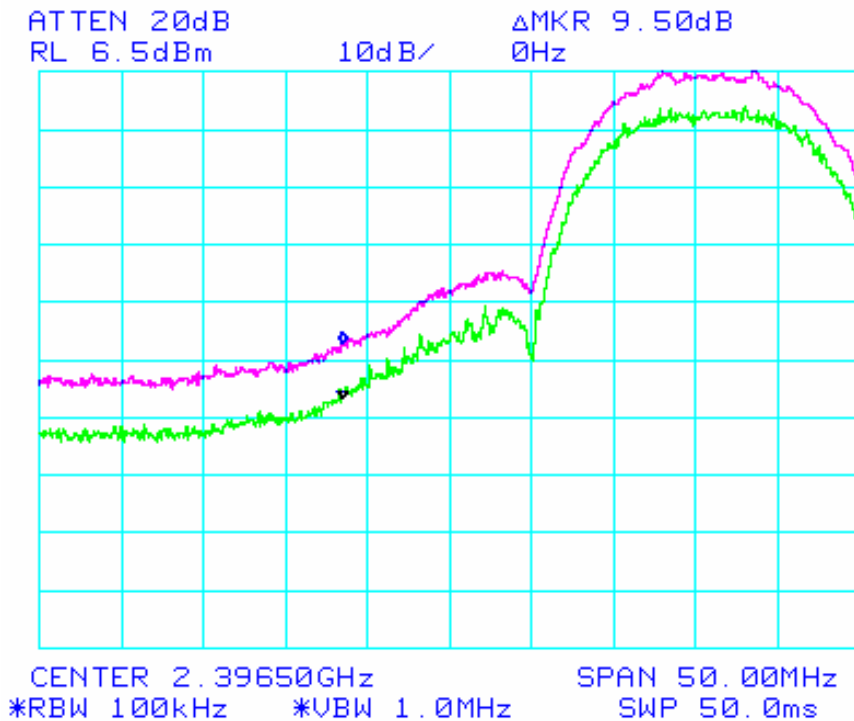
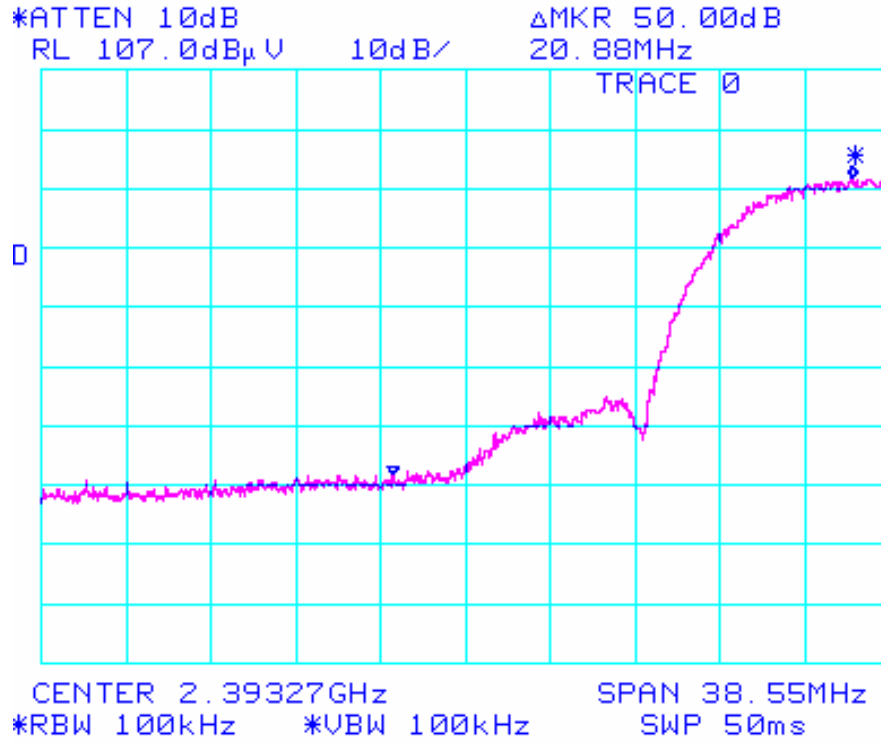


802.11 G 2483.5
MHz
-dBc
Measurement,
PEAK





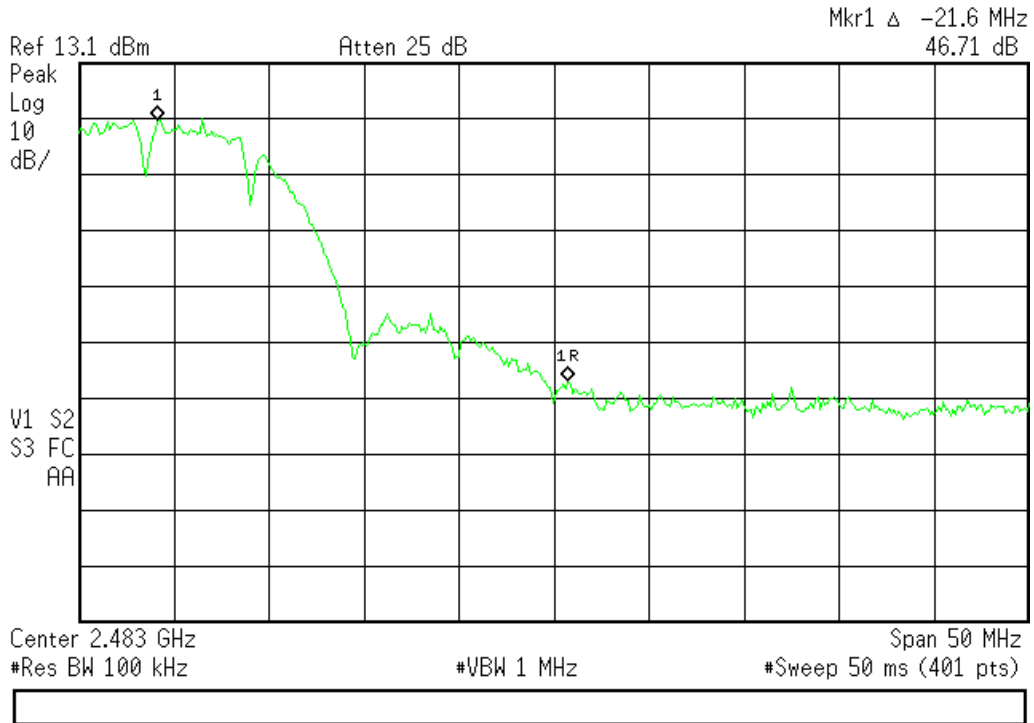
802.11 G 2483.5 MHz BW Delta Measurement



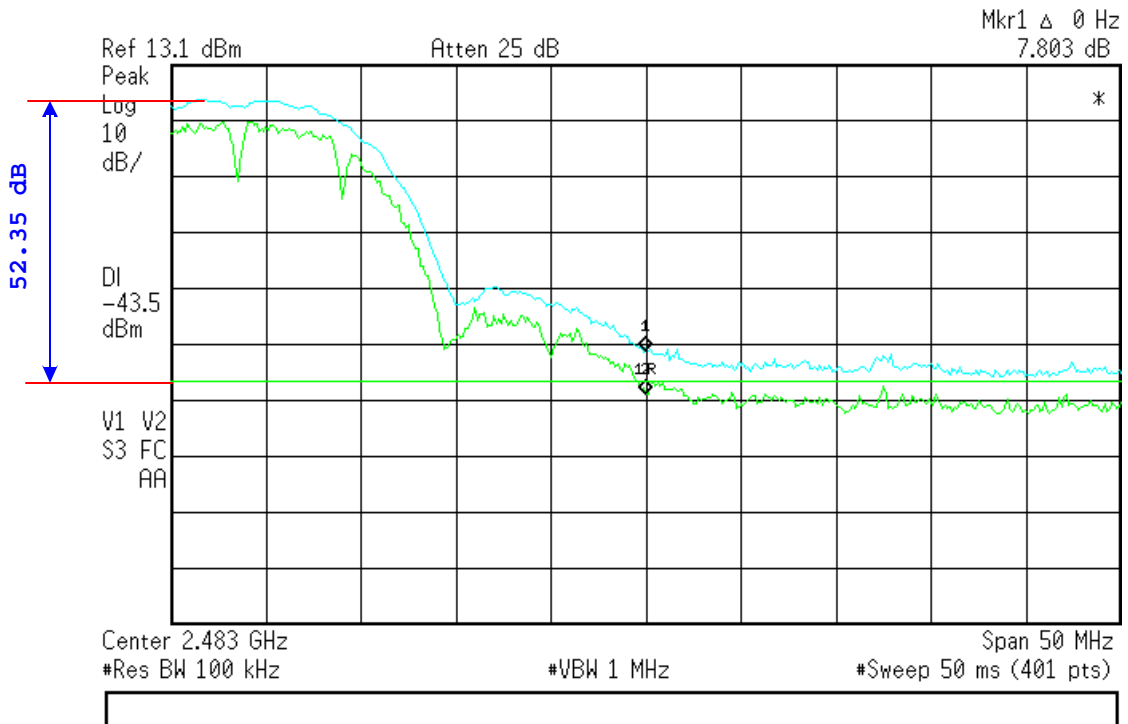
**802.11 B
Radiated Emissions in Restricted bands**

-dBc and BW Delta measurement for the low band edge restricted band @ 2390.0 MHz

Agilent 19:07:28 Aug 19, 2003



Agilent 20:48:20 Aug 19, 2003



802.11 B
Radiated Emissions in Restricted bands
-dBc and BW Delta measurement for the high band edge restricted band @ 2483.5 MHz

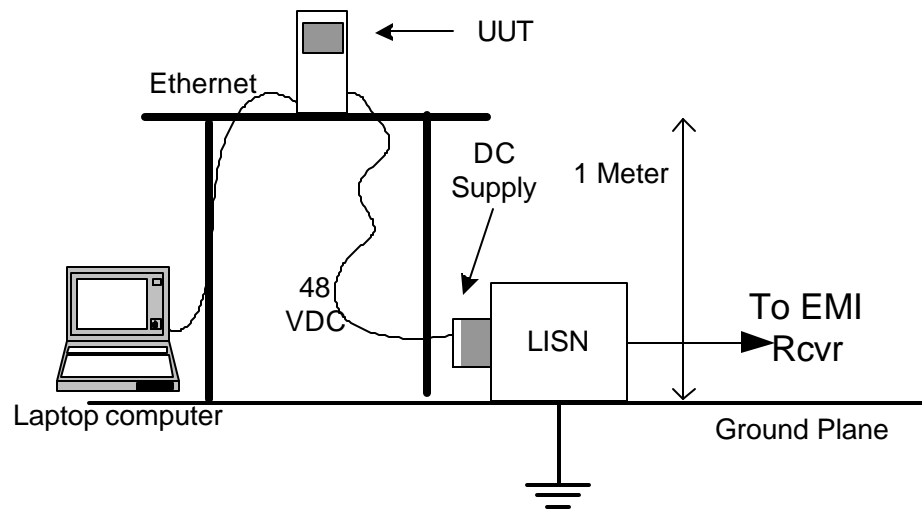
AC Line Conducted Emissions

Specification: CISPR 22

Procedure:

The test was set up according to the guidelines set forth in EN55022:1998 and FCC Part 2 for AC Line Conducted Emissions. The measurement used a LISN line on each AC line and an EMI receiver. A peak scan was made over the measurement frequency range (150 kHz to 30 MHz). The highest peaks were then marked and re-measured and quasi-peaked and averaged.

The test was configured as shown below. The product was tested while running on 120 VAC @ 60 Hz .



Results:

The "Quasi-peak" and the AVG results for the unit transmitting packets are contained in the table on the next page

Quasi Peak Test Results, CISPR 22 Class B limits

Freq (MHz)	Line	QP Level (dBuV)	Class B QP Limit (dBuV)	Delta (dB)	Freq (MHz)	Line	Class B QP Limit (dBuV)	Spec (dBuV)	Delta (dB)
	Neutral					Neutral			
25.83	Line	40.97	60	19.03	25.65.	Neutral	40.05	60	19.95
26.35	Line	47.89	60	12.11	26.35	Neutral	43.48	60	16.52
26.62	Line	41.25	60	18.75	26.62	Neutral	42.53	60	17.47
26.85	Line	46.92	60	13.08	26.84	Neutral	46.86	60	13.14
27.1	Line	46.91	60	13.09	27.1	Neutral	43.35	60	16.65
27.29	Line	58.75	60	1.25	27.59	Neutral	48.14	60	11.86
27.6	Line	46.98	60	13.02	27.86	Neutral	41.28	60	18.72
27.83	Line	48.61	60	11.39	28/09	Neutral	46.23	60	13.77
28.12	Line	41.46	60	18.54	28.32	Neutral	48.92	60	11.08
29.58	Line	45.29	60	14.71	28.57	Neutral	45.2	60	14.8

AVG Test Results, CISPR 22, Class B limits

Freq (MHz)	Line	AVG Level (dBuV)	Class B AVG limit (dBuV)	Delta (dB)	Freq (MHz)	Line	AVG Level (dBuV)	Class B AVG limit (dBuV)	Delta (dB)
	Neutral					Neutral			
25.83	Line	25.475	50	24.53	25.65.	Neutral	30.7	50	19.3
26.35	Line	30.23	50	19.77	26.35	Neutral	30.35	50	19.65
26.62	Line	31.44	50	18.56	26.62	Neutral	33.05	50	16.95
26.85	Line	34.257	50	15.74	26.84	Neutral	32.17	50	17.83
27.1	Line	29.59	50	20.41	27.1	Neutral	30.37	50	19.63
27.29	Line	36.118	50	13.9	27.59	Neutral	27.96	50	22.04
27.6	Line	28.64	50	21.36	27.86	Neutral	31.04	50	18.96
27.83	Line	29.9	50	20.1	28/09	Neutral	31.55	50	18.45
28.12	Line	34.03	50	15.97	28.32	Neutral	35.91	50	14.09
29.58	Line	32.43	50	17.57	28.57	Neutral	28.19	50	21.81