



**FCC CFR47 PART 15 SUBPART C  
CERTIFICATION  
TEST REPORT**

**FOR**

**802.11b/g PCIExpress Minicard**

**MODEL NUMBER: AR5BXB63**

**FCC ID: PPD-AR5BXB63**

**REPORT NUMBER: 06U10459-1**

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Revision History

Rev.	Issue Date	Revisions	Revised By
--	7/26/06	Initial Issue	MH

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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** ATHEROS COMMUNICATIONS, INC.  
5480 Great America Parkway  
Santa Clara, CA 95054, USA

**EUT DESCRIPTION:** 802.11b/g PCIe Minicard

**MODEL:** AR5BXB63

**SERIAL NUMBER:** XB63-022-L0071

**DATE TESTED:** JULY 21-23, 2006

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART C	NO NON-COMPLIANCE NOTED

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

Tested By:



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MIKE HECKROTTE  
ENGINEERING MANAGER  
COMPLIANCE CERTIFICATION SERVICES

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CHIN PANG  
EMC ENGINEER  
COMPLIANCE CERTIFICATION SERVICES

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 200 MHz	+/- 3.3 dB
Radiated Emission, 200 to 1000 MHz	+4.5 / -2.9 dB
Radiated Emission, 1000 to 2000 MHz	+4.5 / -2.9 dB
Power Line Conducted Emission	+/- 2.9 dB

Uncertainty figures are valid to a confidence level of 95%.

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is an 802.11b/g transceiver with a PCIExpress Minicard interface.

### 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

2400 to 2483.5 MHz Authorized Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11b	23.97	249.46
2412 - 2462	802.11g	26.99	500.03

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes two PIFA antennas for Transmit / Receive diversity with a maximum gain of 3.62 dBi.

### 5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed in the host support equipment during testing was AR5002, ANWI Diagnostic Kernel Drive.

The test utility software used during testing was Art Software Revision 5.3 Build #25 .

### 5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power. The highest measured output power was at 2412MHz. for b mode and 2437MHz for g mode.

The worst-case data rate for this channel is determined to be 1Mb/s for b mode and 6Mb/s for g mode, based on previous experience with Atheros 802.11 WLAN product design architectures.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	IBM	Thinkpad T43	L3-CA477	DoC
AC Adapter	IBM	92P1020	11S92P1020Z1Z9RM64478J	DoC

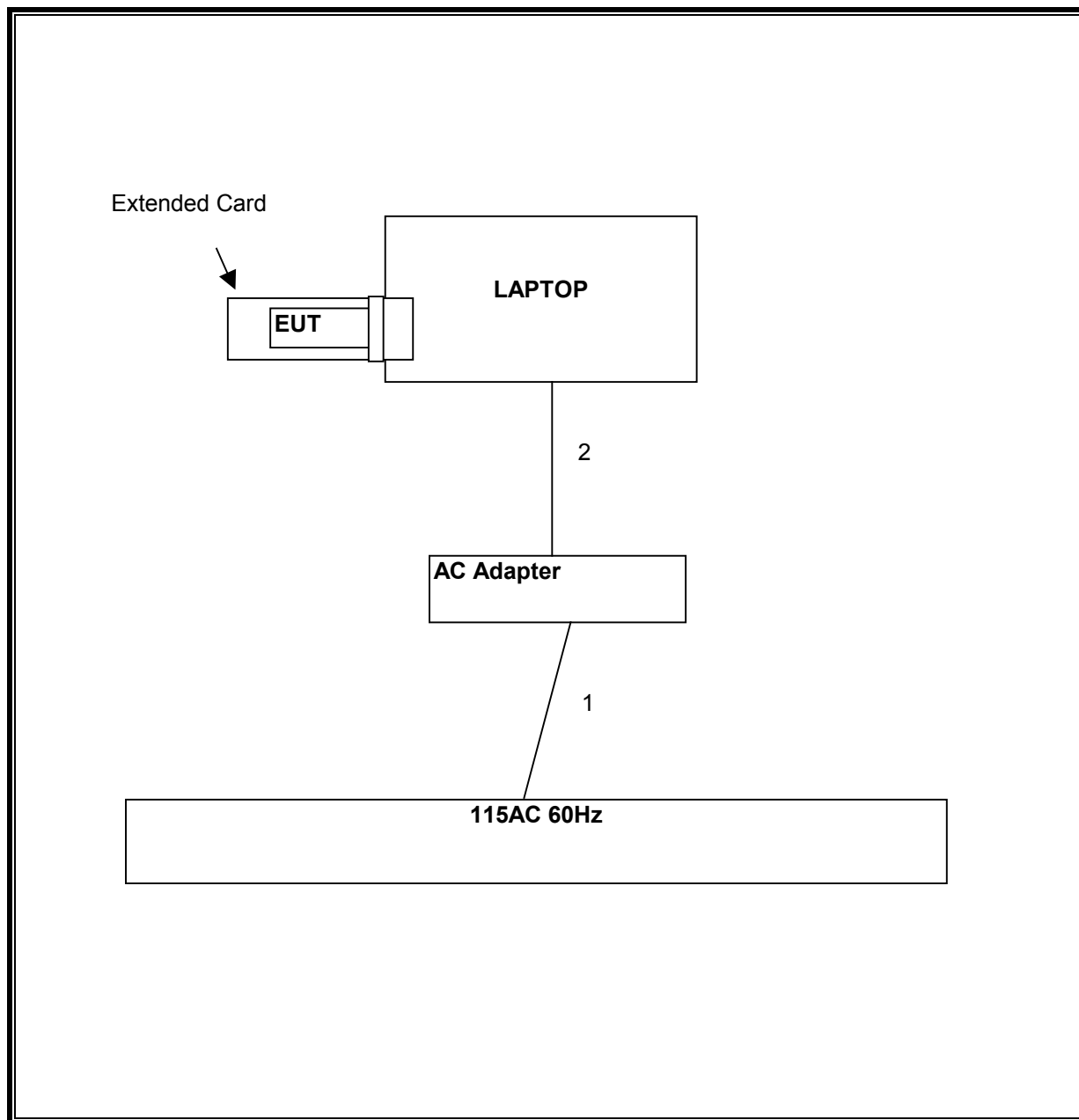
### I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US 115V	Un-shielded	2m	NA
2	DC	1	DC	Un-shielded	2m	NA

### TEST SETUP

The EUT is controlled by a host laptop computer via a PCIExpress Minicard extender board during the tests. Test software exercised the radio card.

**SETUP DIAGRAM FOR TESTS**





## 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	Cal Due
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	2238	4/22/2007
Preamplifier, 1 ~ 26.5 GHz	Agilent / HP	8449B	3008A00561	10/3/2007
EMI Receiver, 9 kHz ~ 2.9 GHz	Agilent / HP	8542E	3942A00286	2/4/2007
RF Filter Section	Agilent / HP	85420E	3705A00256	2/4/2007
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A121003	9/3/2006
EMI Test Receiver	R & S	ESHS 20	827129/006	6/3/2007
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	8/30/2006
Peak / Average Power Sensor	Agilent	E9327A	US40440755	12/2/2007
Peak Power Meter	Agilent / HP	E4416A	GB41291160	12/2/2007
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent / HP	E4446A	US42510266	10/19/2006
2.4GHz Reject Filter	MicrTronic	HP		CNR

## 7. LIMITS AND RESULTS

### 7.1. CHANNEL TESTS FOR THE 2400 TO 2483.5 MHz BAND

#### 7.1.1. 6 dB BANDWIDTH

##### LIMIT

§15.247 (a) (2) For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

##### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

##### RESULTS

No non-compliance noted:

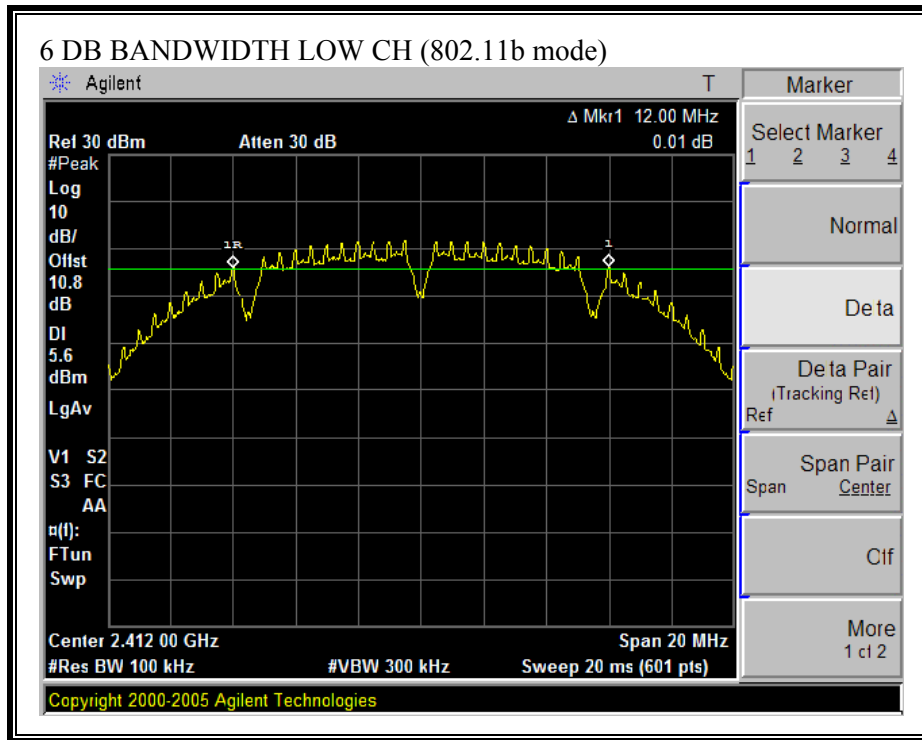
##### 802.11b Mode

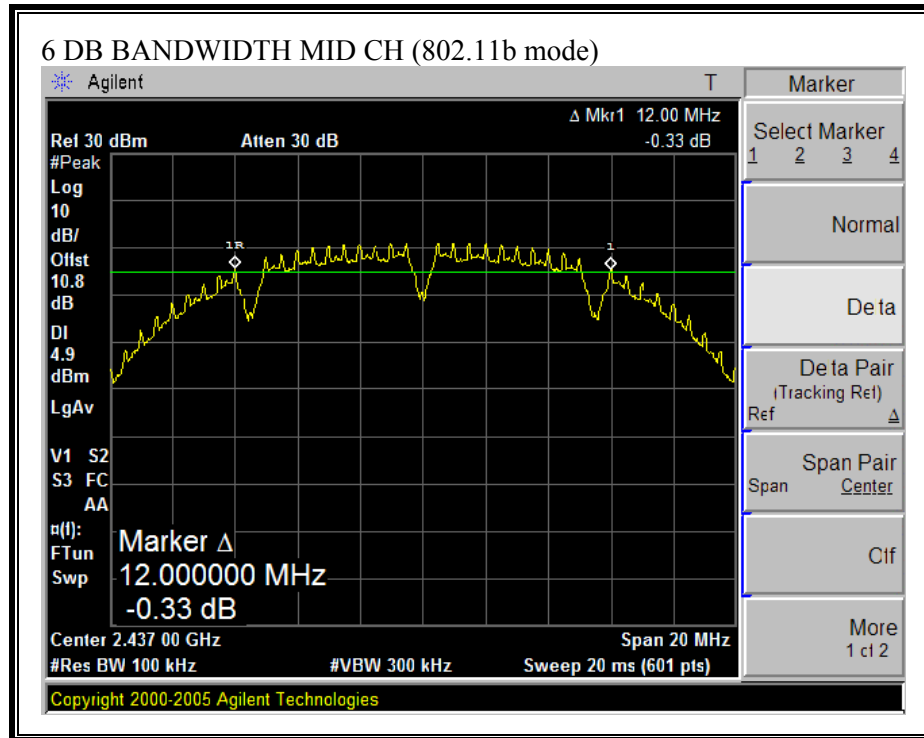
Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	12000	500	11500
Middle	2437	12000	500	11500
High	2462	12000	500	11500

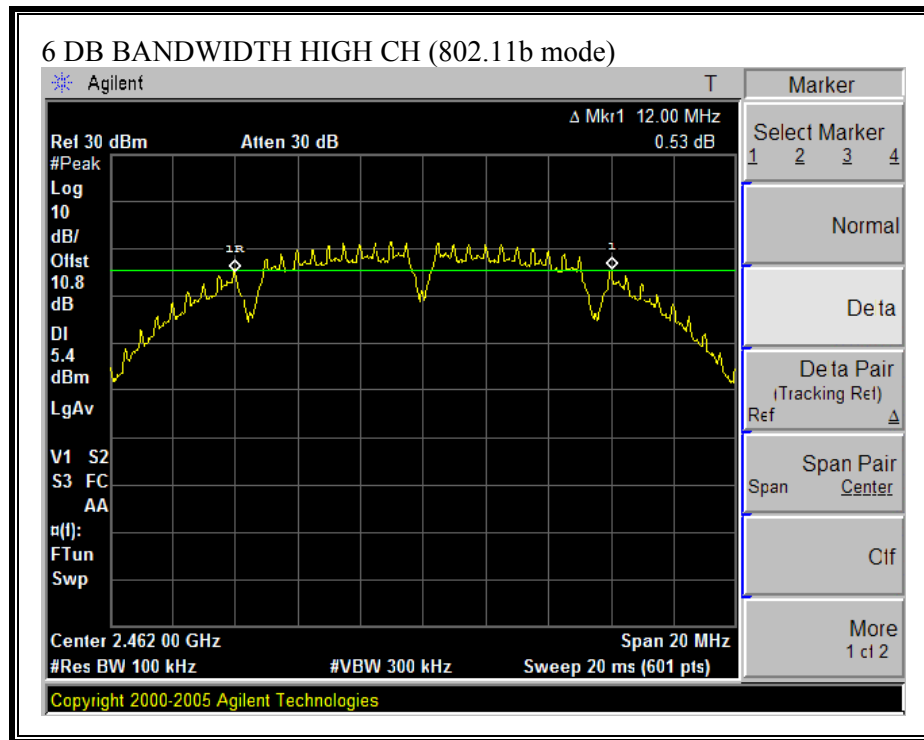
##### 802.11g Mode

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	16430	500	15930
Middle	2437	16430	500	15930
High	2462	16300	500	15800

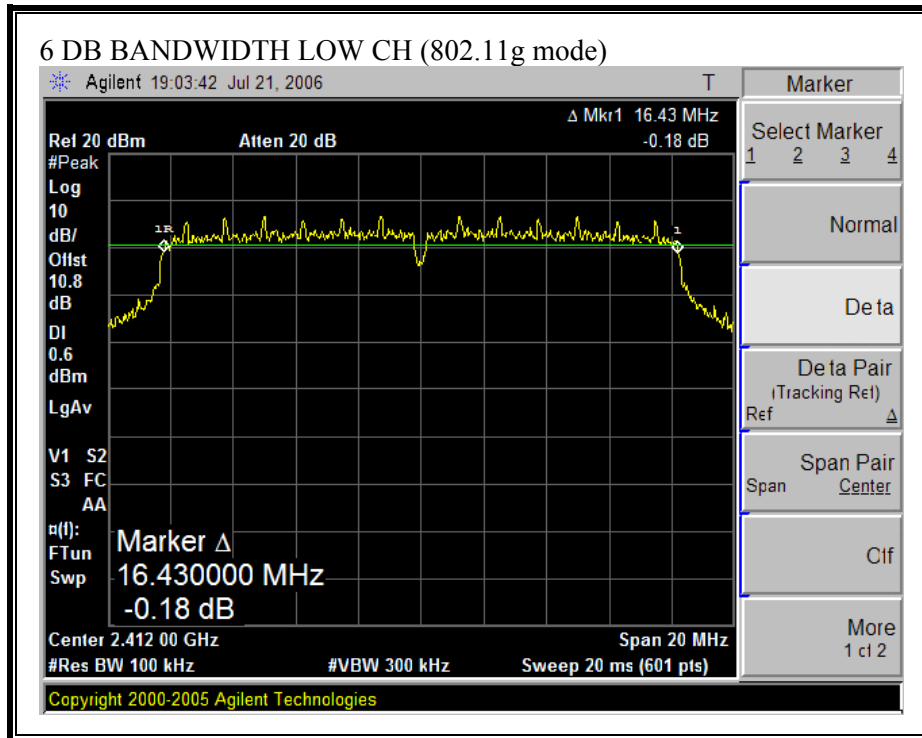
**6 DB BANDWIDTH (802.11b MODE)**

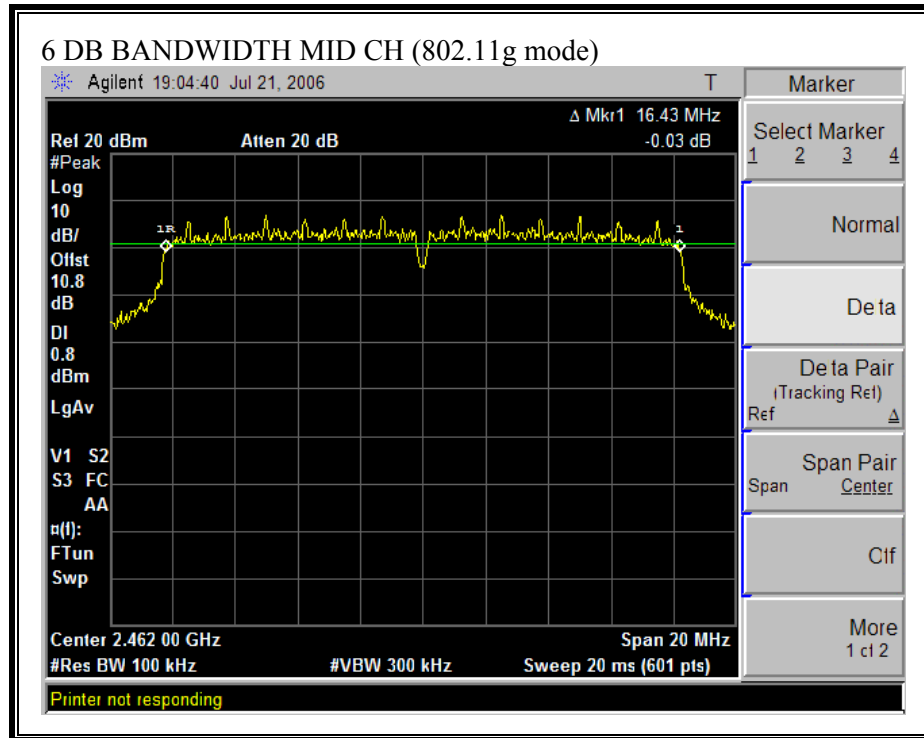


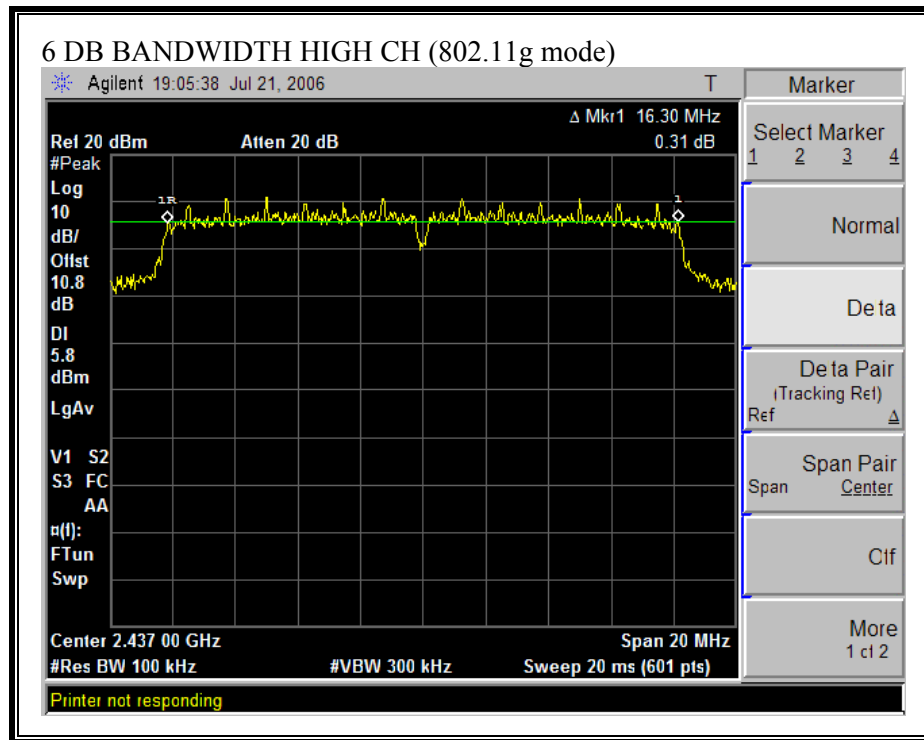




**6 DB BANDWIDTH (802.11g MODE)**









### 7.1.2. 99% BANDWIDTH

#### LIMIT

None; for reporting purposes only.

#### TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

#### RESULTS

No non-compliance noted:

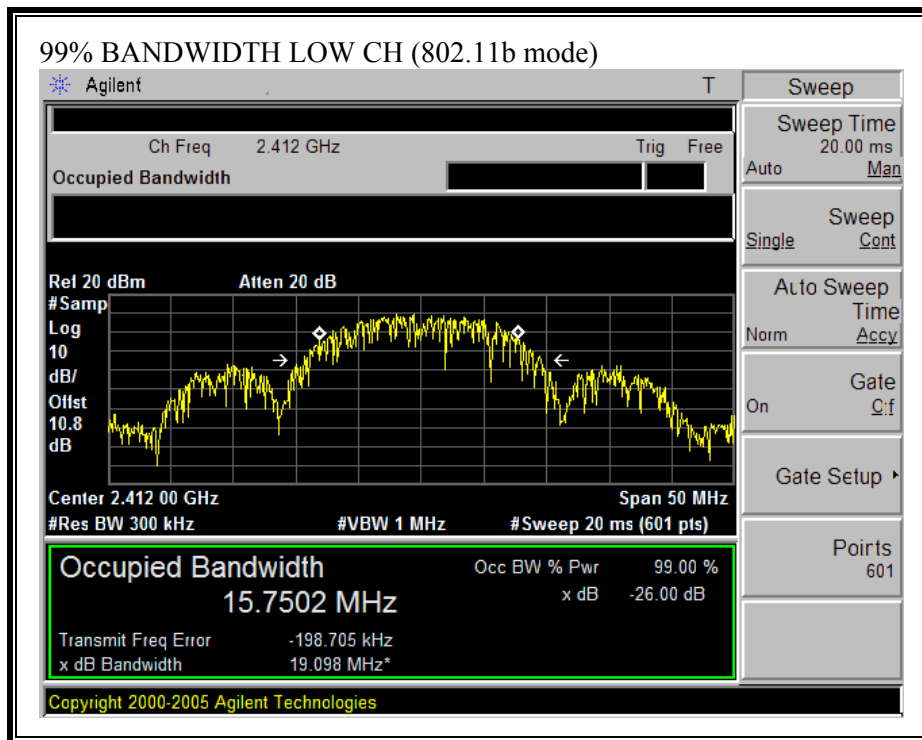
##### 802.11b Mode

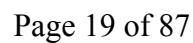
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	15.7502
Middle	2437	15.7922
High	2462	15.7615

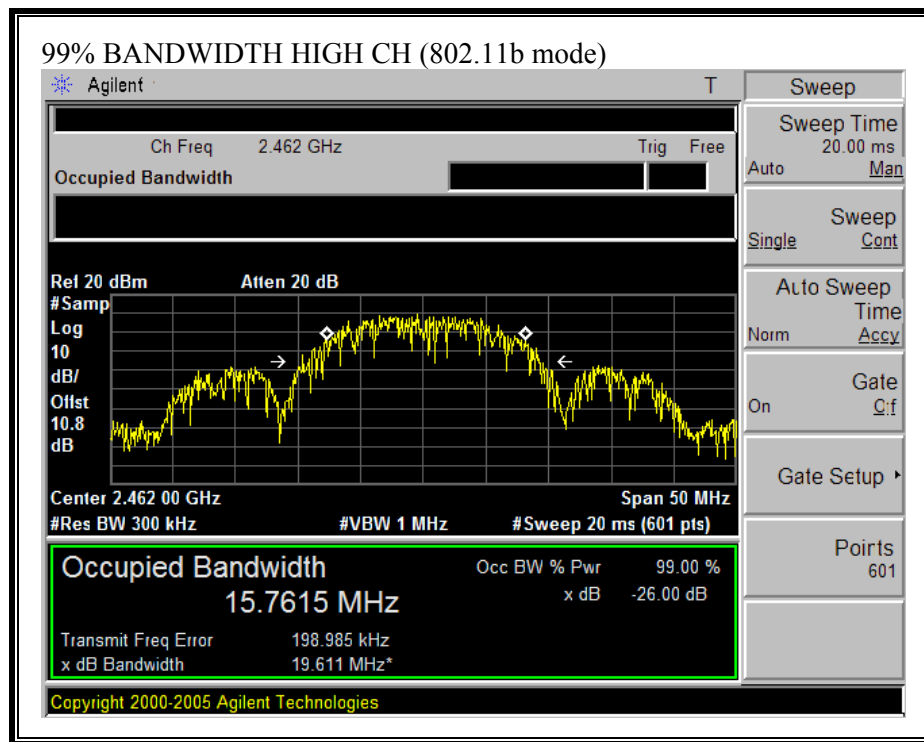
##### 802.11g Mode

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.5581
Middle	2437	16.5096
High	2462	16.5177

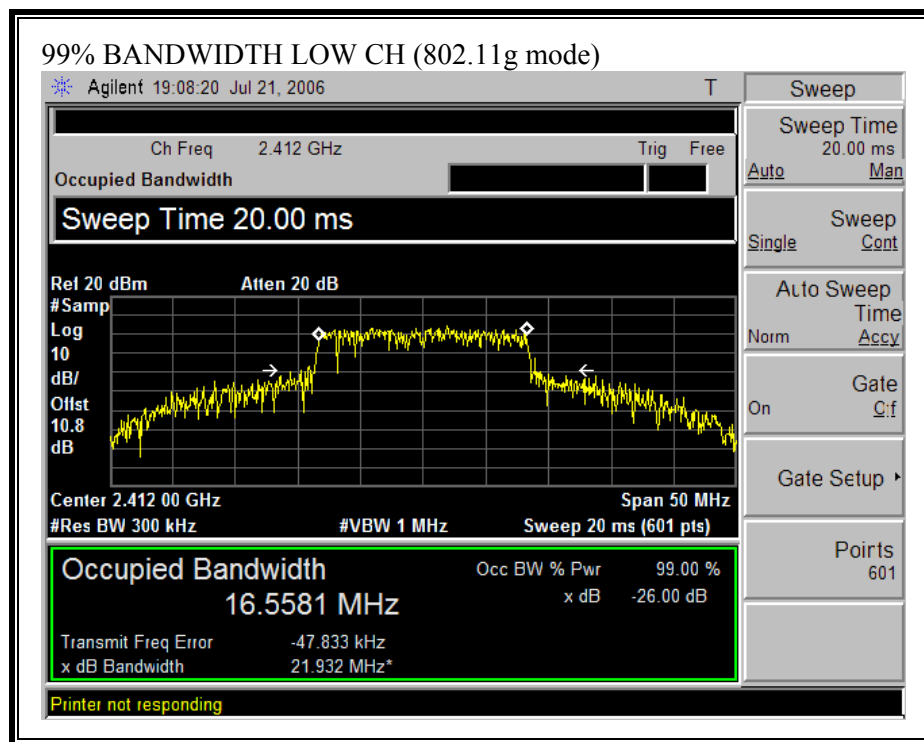
**99% BANDWIDTH (802.11b MODE)**

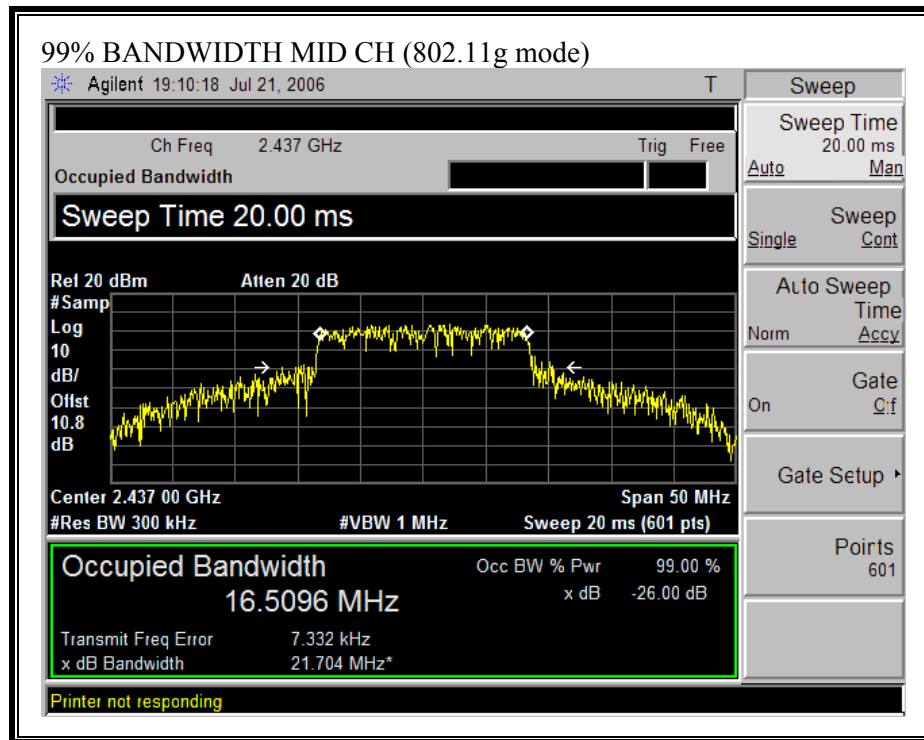


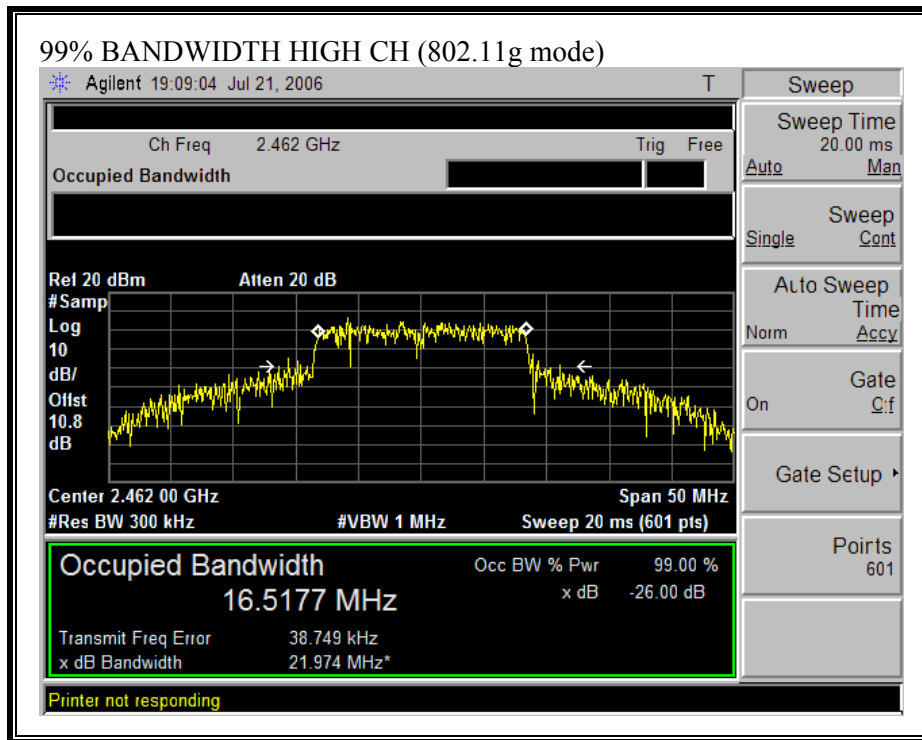




**99% BANDWIDTH (802.11g MODE)**







### **7.1.3. PEAK OUTPUT POWER**

#### **PEAK POWER LIMIT**

§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) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz , and 5725-5850 MHz bands: 1 watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

§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.

#### **TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer and the analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 99% bandwidth.



## **RESULTS**

The maximum antenna gain is 3.62 dBi for other than fixed, point-to-point operations, therefore the limit is 30 dBm.

No non-compliance noted:

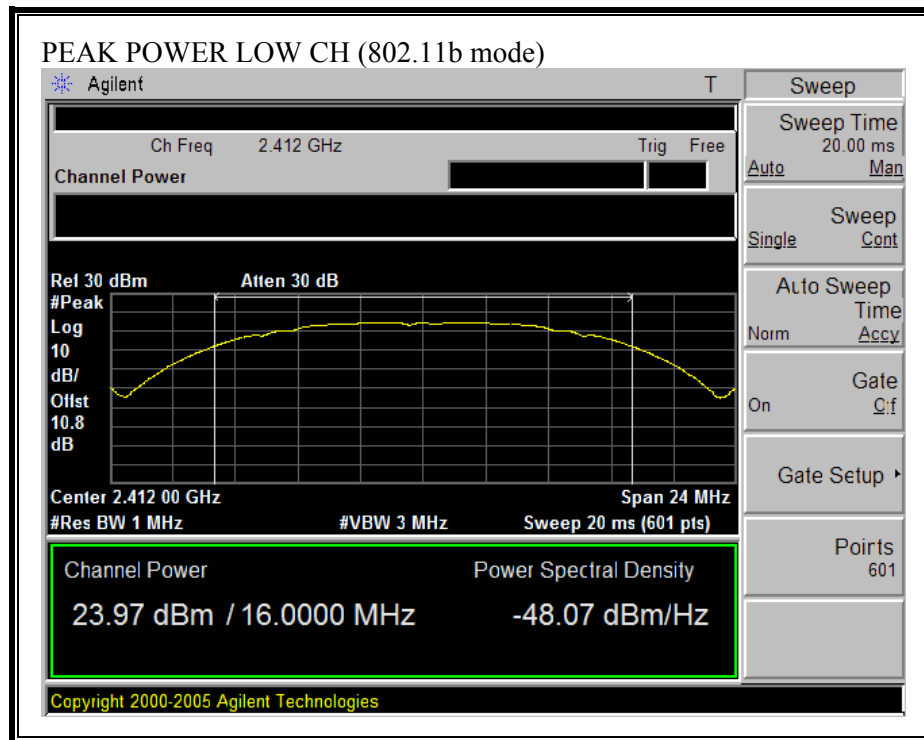
### 802.11b Mode

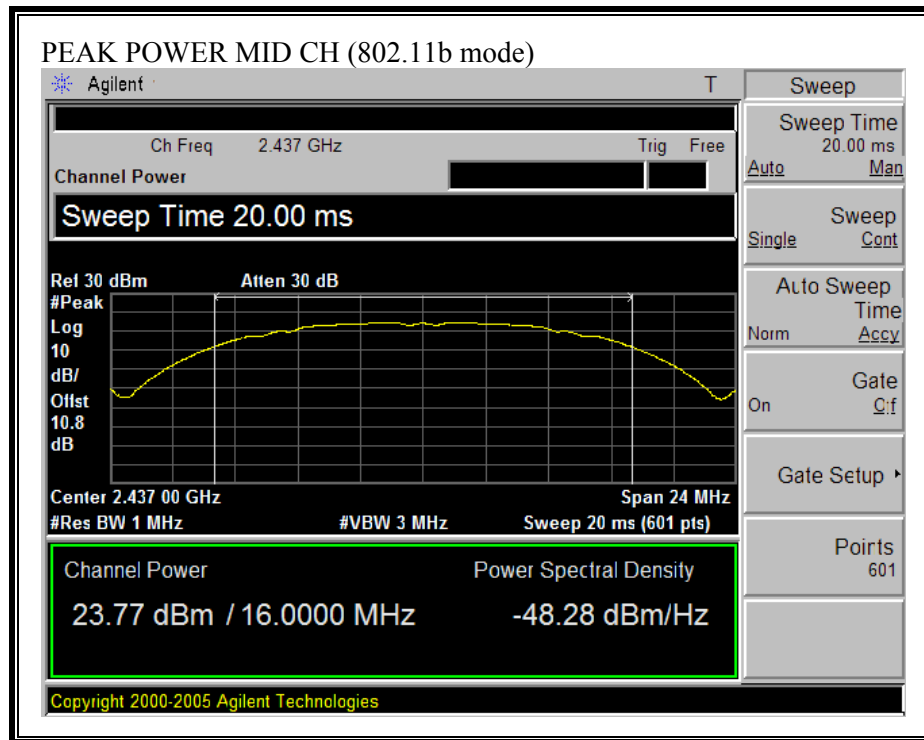
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	23.97	30	-6.03
Middle	2437	23.77	30	-6.23
High	2462	23.92	30	-6.08

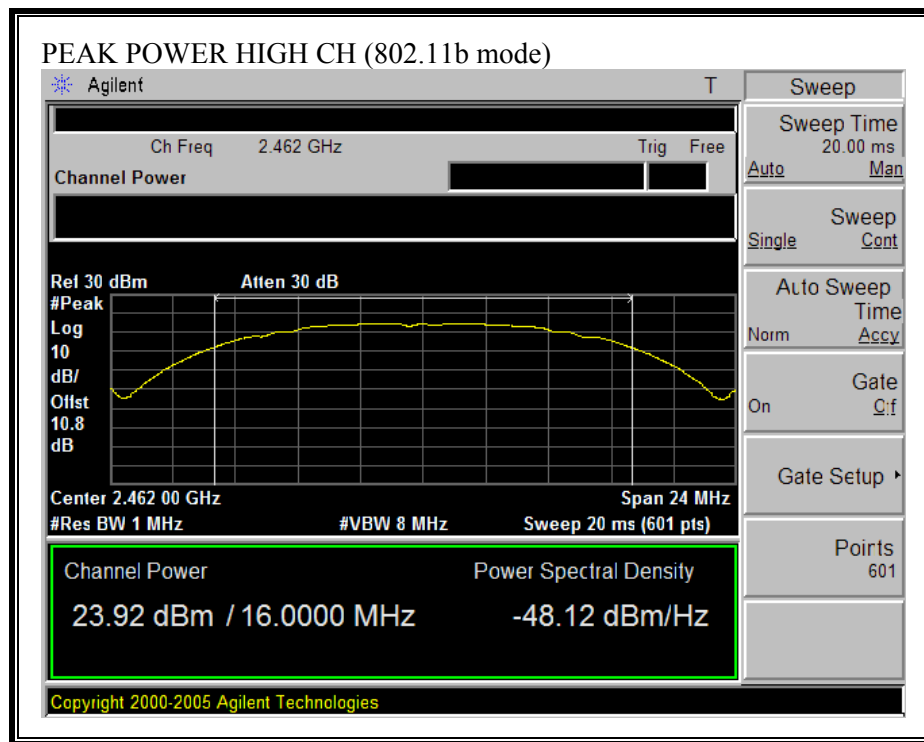
### 802.11g Mode

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	23.91	30	-6.09
Middle	2437	26.99	30	-3.01
High	2462	23.96	30	-6.04

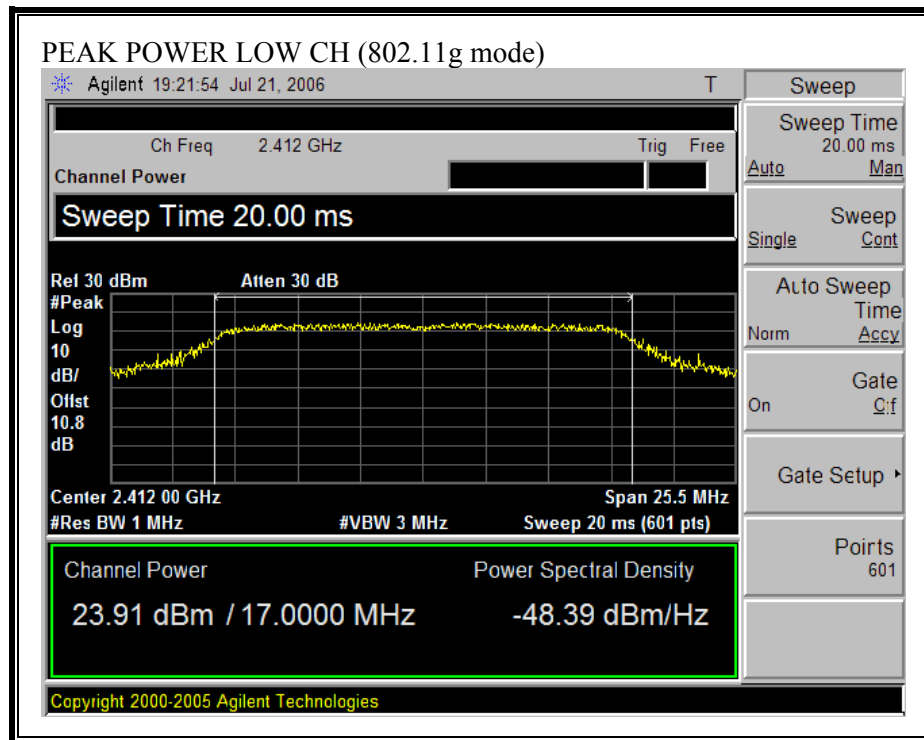
**OUTPUT POWER (802.11b MODE)**

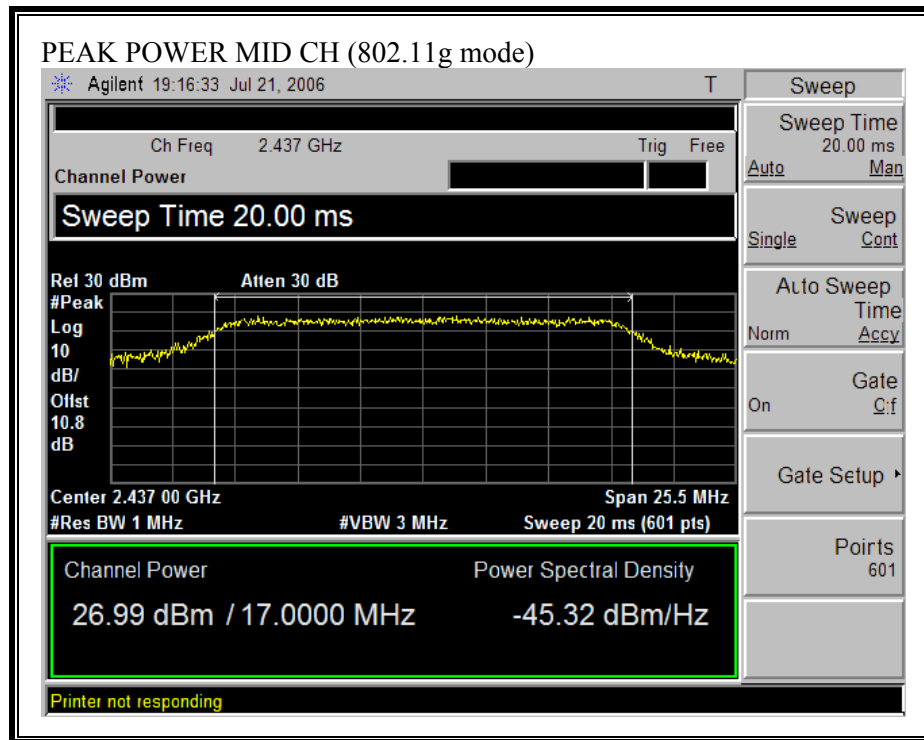


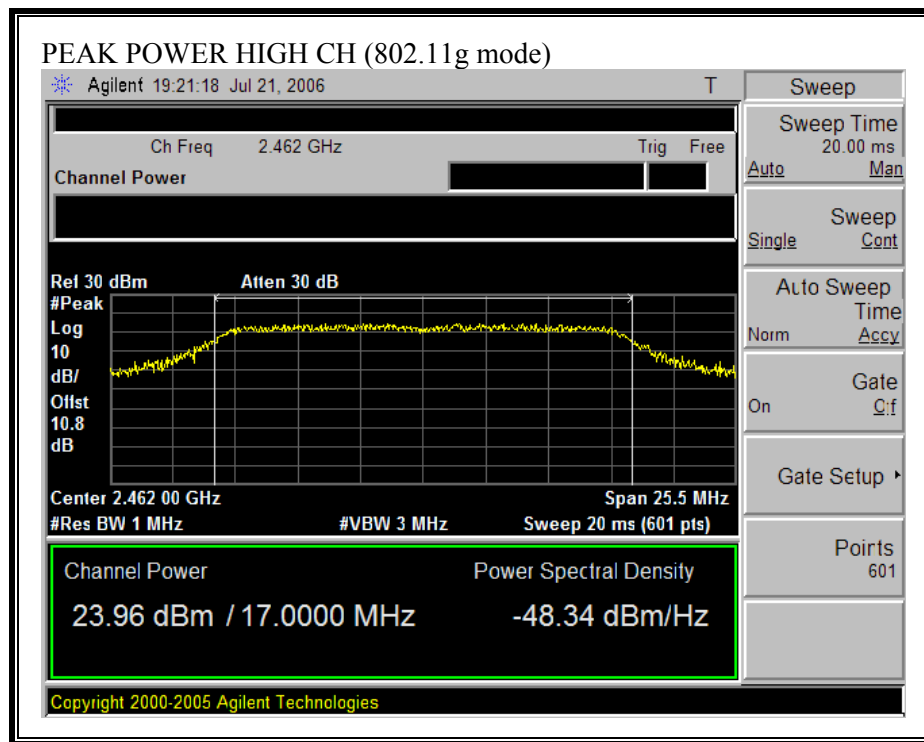




**OUTPUT POWER (802.11g MODE)**







#### 7.1.4. AVERAGE POWER

##### AVERAGE POWER LIMIT

None; for reporting purposes only.

##### TEST PROCEDURE

The transmitter output is connected to a power meter.

##### RESULTS

No non-compliance noted:

The cable assembly insertion loss of 10.75 dB (including 10 dB pad and 0.75 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

##### 802.11b Mode

Channel	Frequency (MHz)	Power (dBm)
Low	2412	20.60
Middle	2437	20.60
High	2462	20.90

##### 802.11g Mode

Channel	Frequency (MHz)	Power (dBm)
Low	2412	17.50
Middle	2437	20.70
High	2462	17.50



### 7.1.5. PEAK POWER SPECTRAL DENSITY

#### LIMIT

§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.

#### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer, the maximum level in a 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.

#### RESULTS

No non-compliance noted:

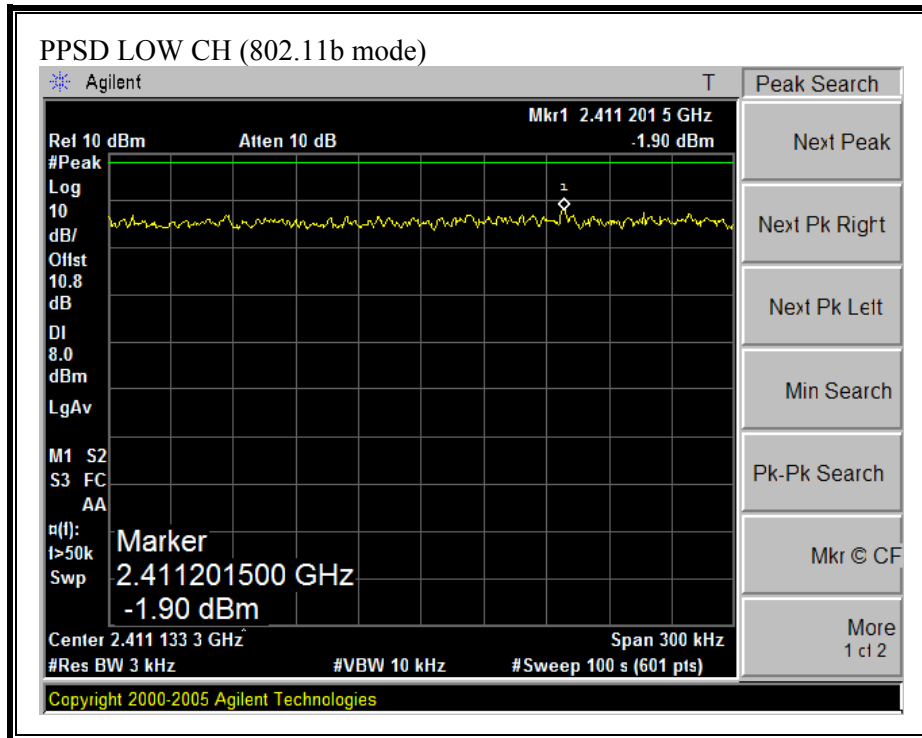
##### 802.11b Mode

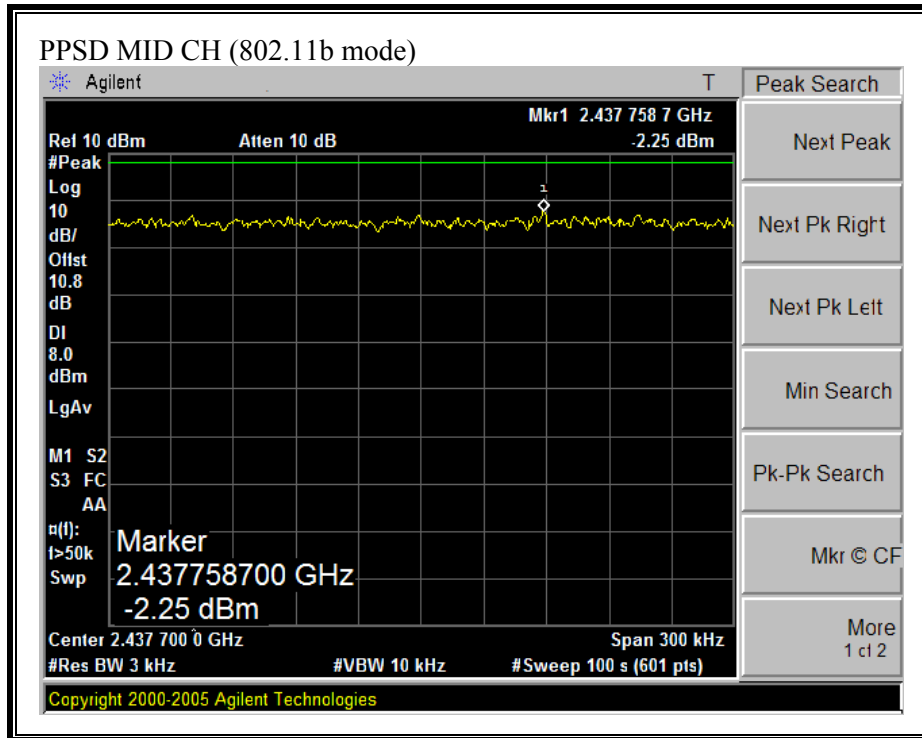
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-1.90	8	-9.90
Middle	2437	-2.25	8	-10.25
High	2462	-2.20	8	-10.20

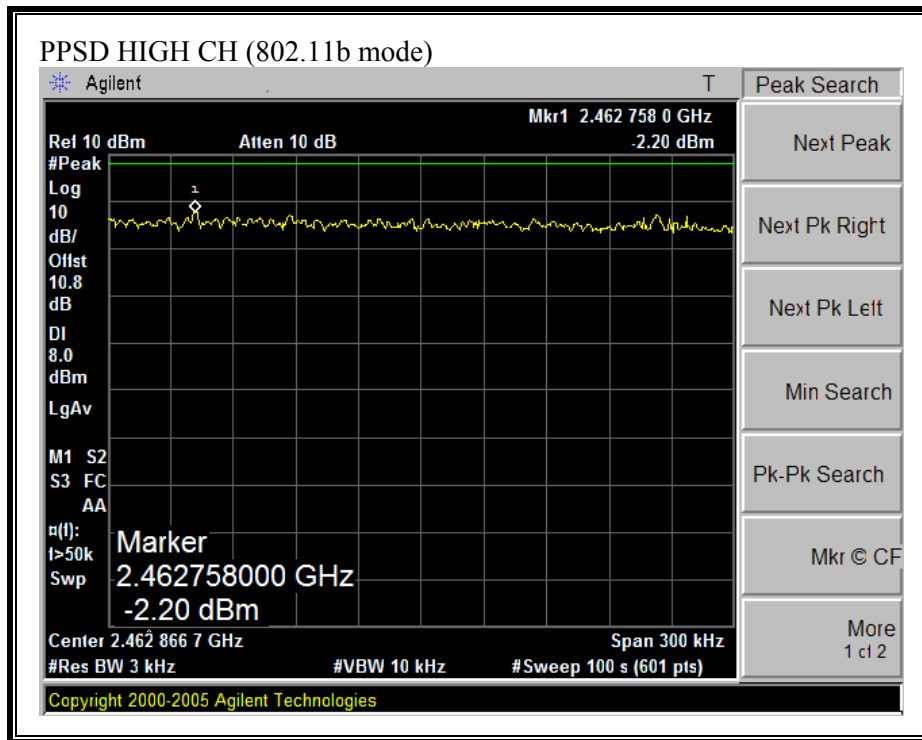
##### 802.11g Mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-7.48	8	-15.48
Middle	2437	-3.48	8	-11.48
High	2462	-6.51	8	-14.51

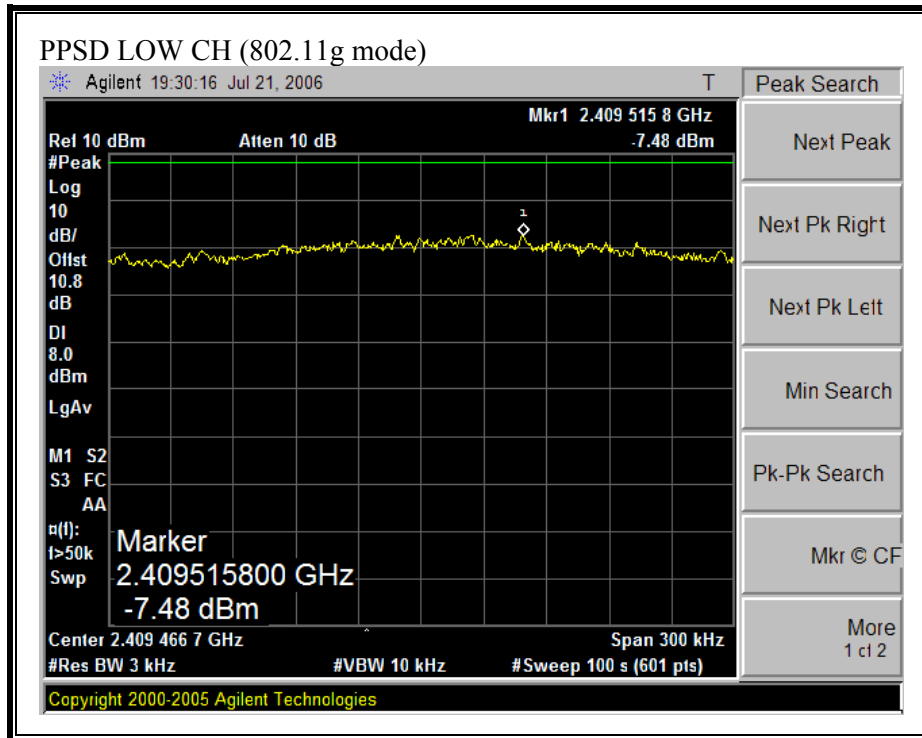
**PEAK POWER SPECTRAL DENSITY (802.11b MODE)**

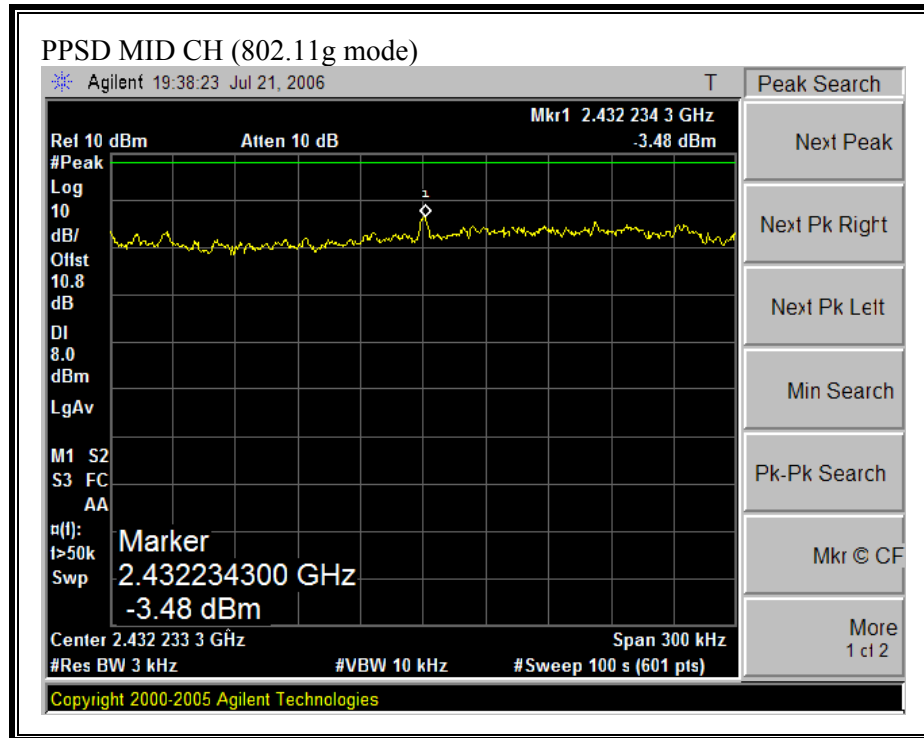


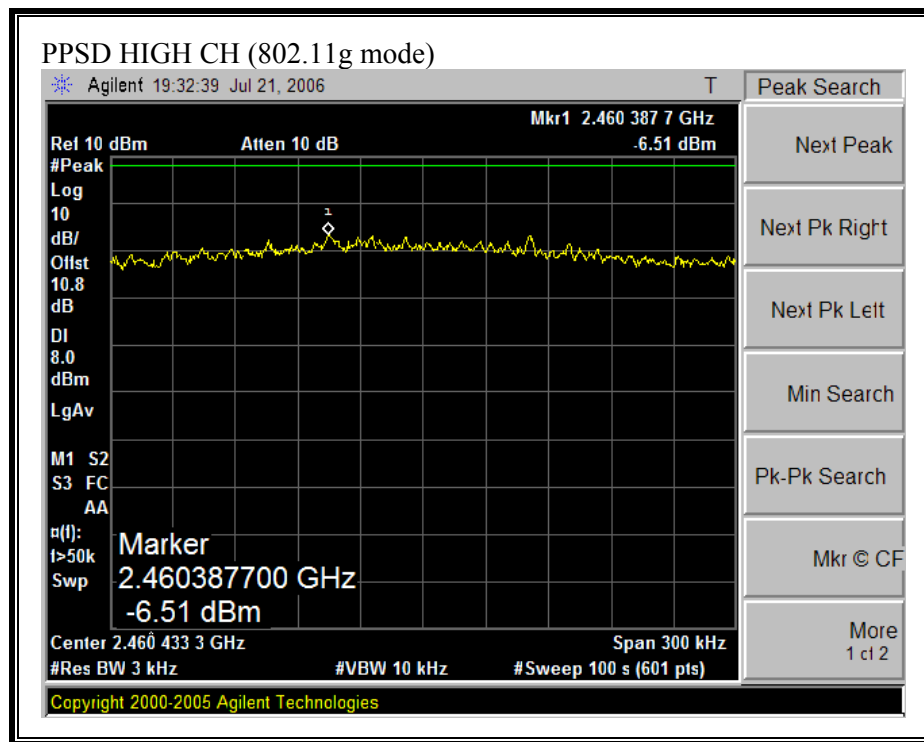




**PEAK POWER SPECTRAL DENSITY (802.11g MODE)**







## **7.1.6. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

§15.247 (c) In any 100 kHz bandwidth outside the frequency band 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. 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)).

Conducted power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

### **TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

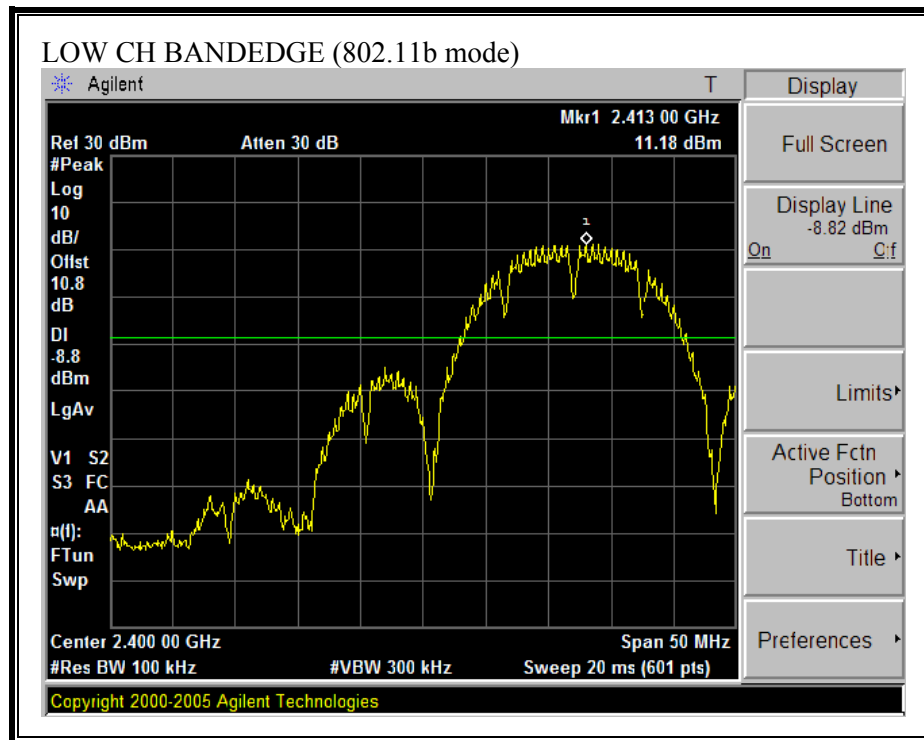
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

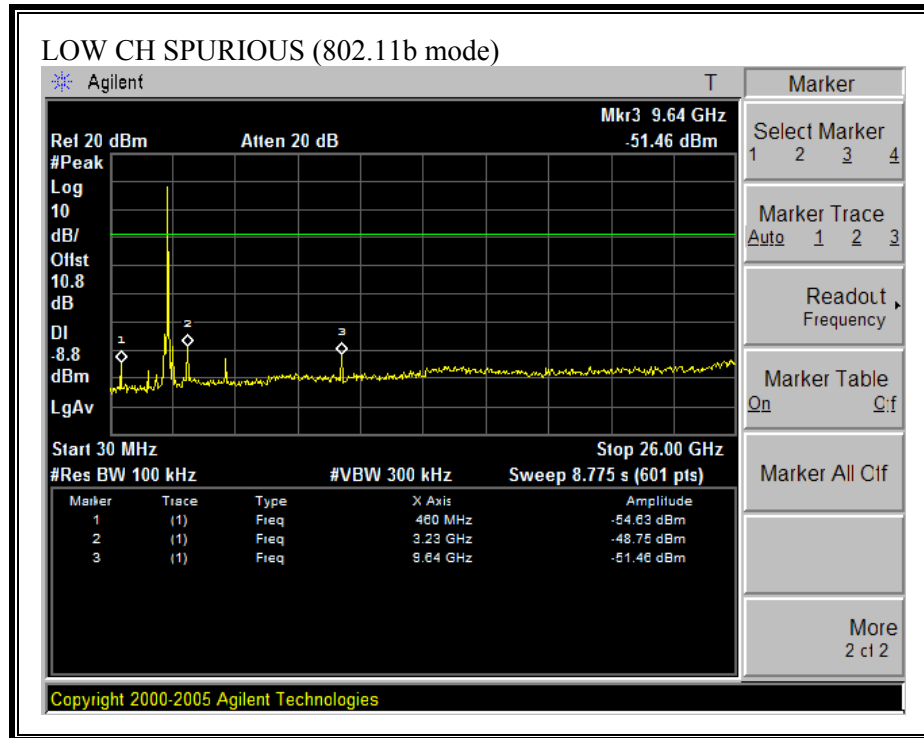
### **RESULTS**

No non-compliance noted:

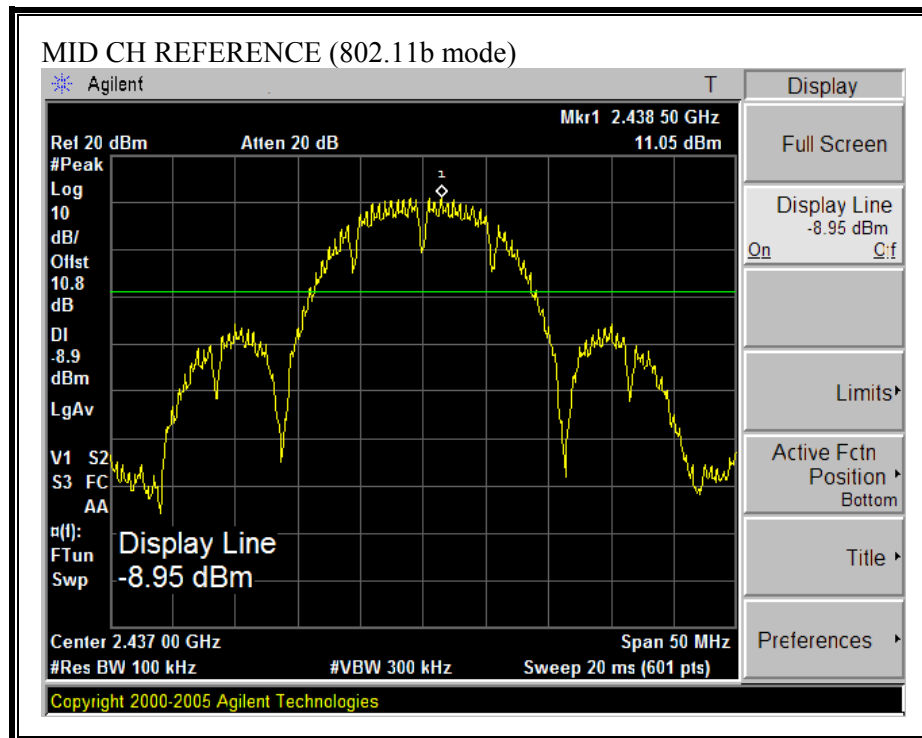


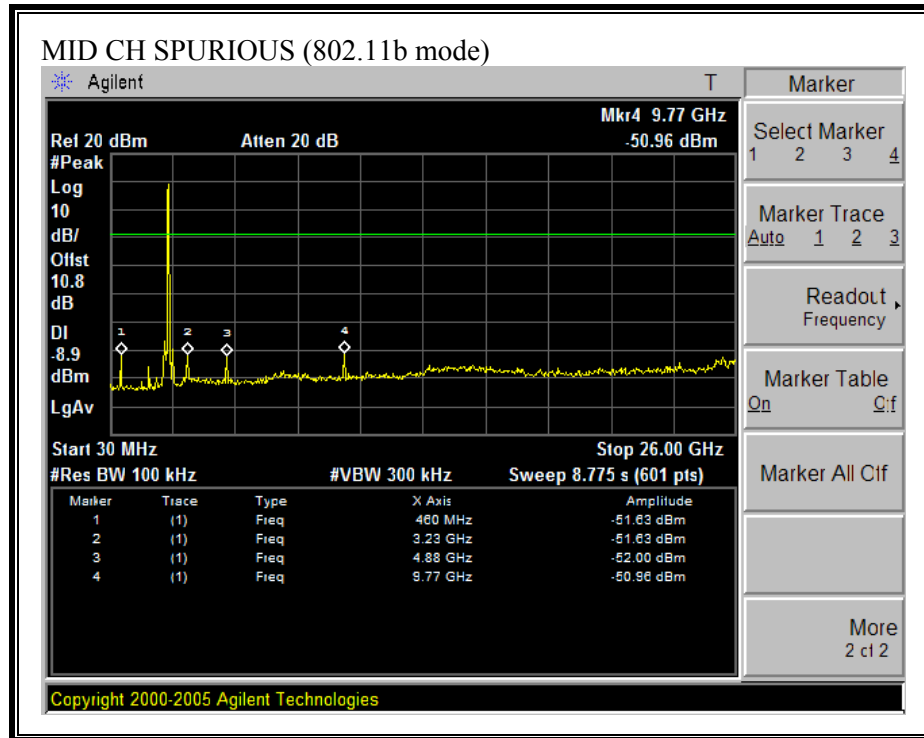
**SPURIOUS EMISSIONS, LOW CHANNEL (802.11b MODE)**



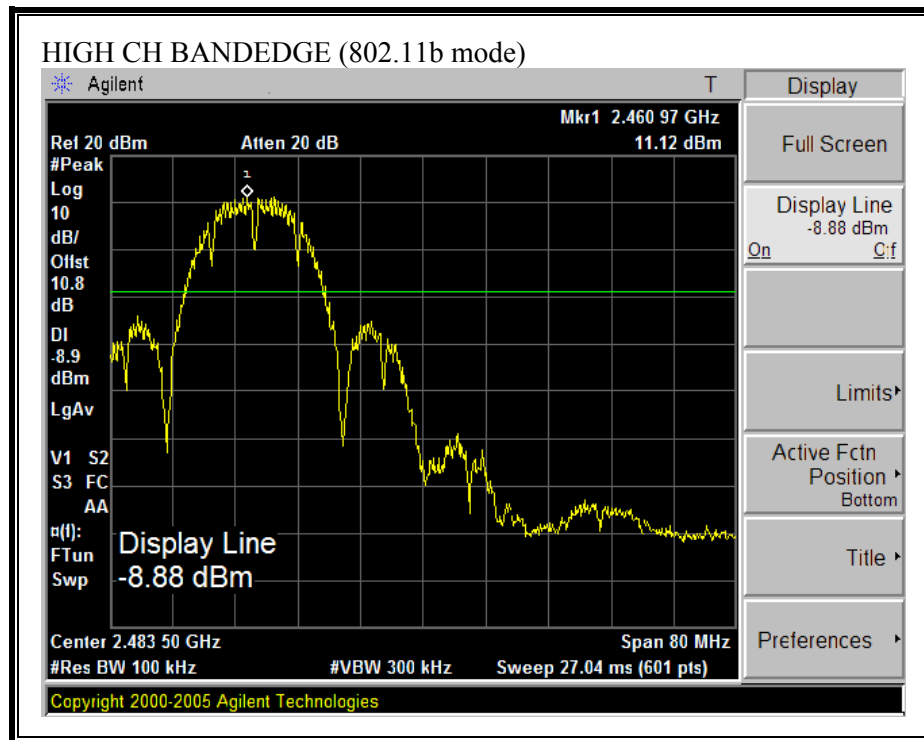


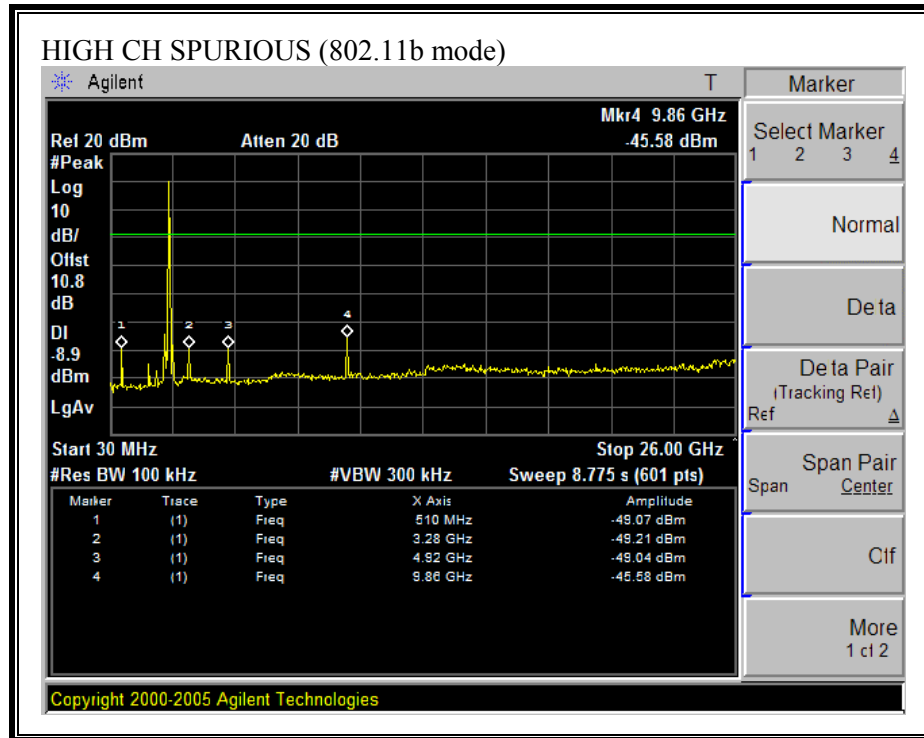
**SPURIOUS EMISSIONS, MID CHANNEL (802.11b MODE)**



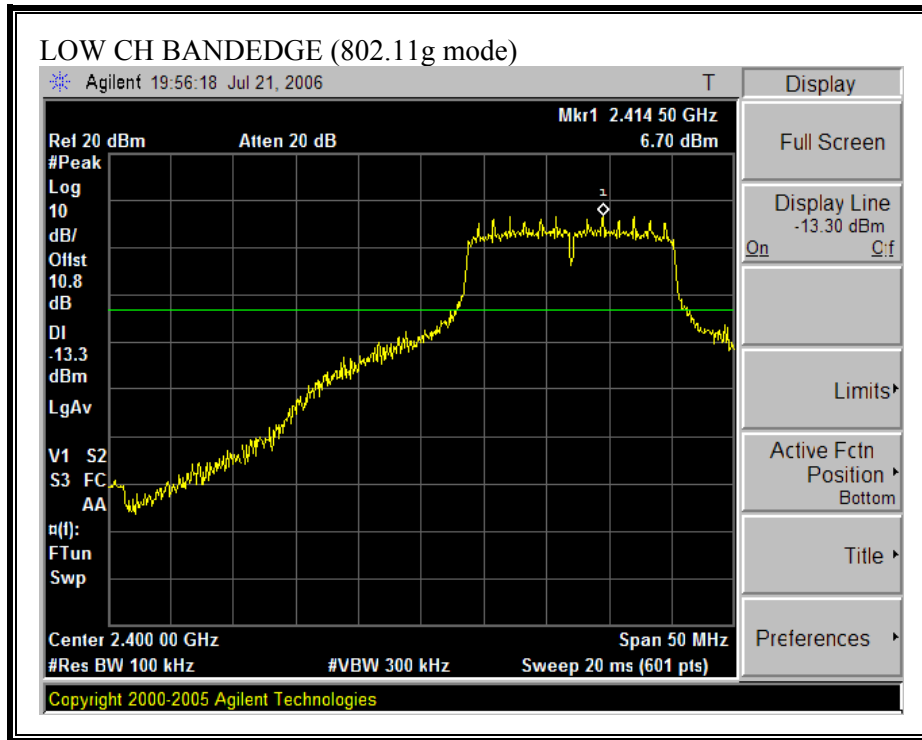


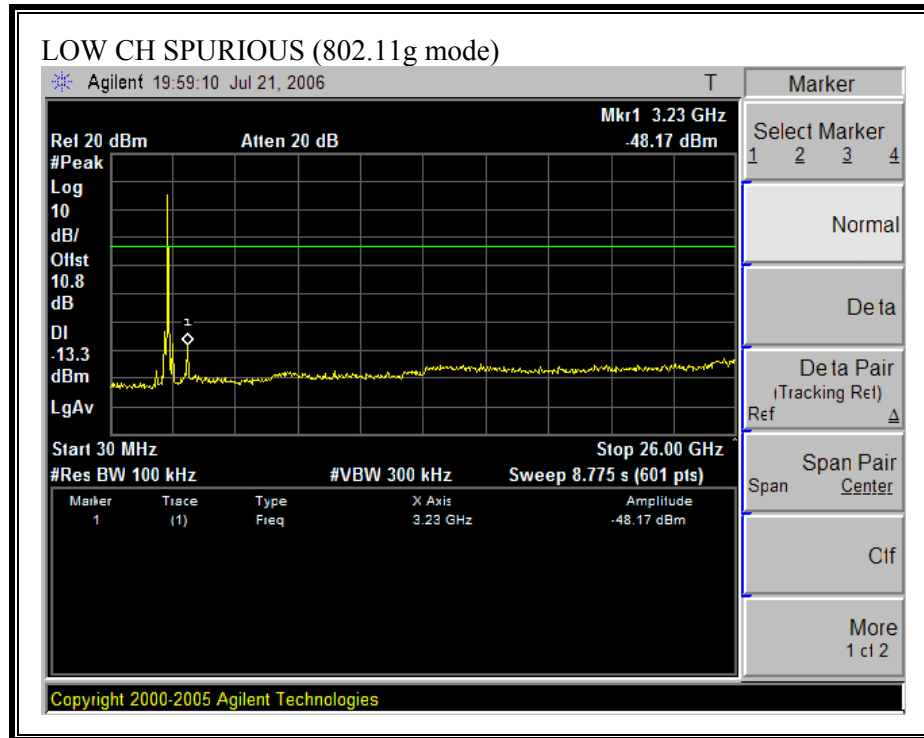
**SPURIOUS EMISSIONS, HIGH CHANNEL (802.11b MODE)**





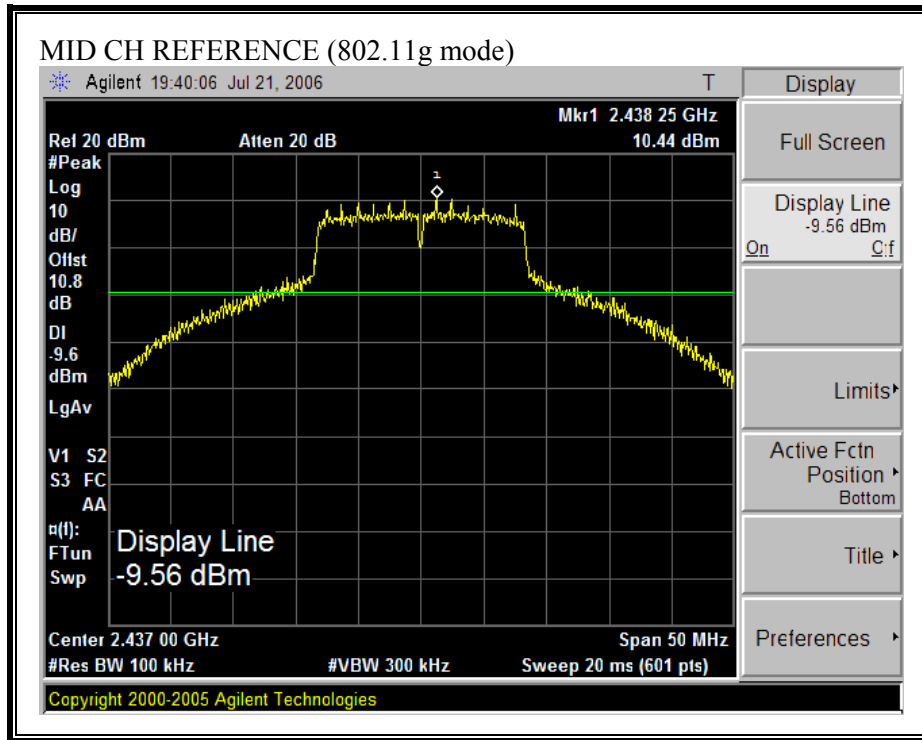
**SPURIOUS EMISSIONS, LOW CHANNEL (802.11g MODE)**

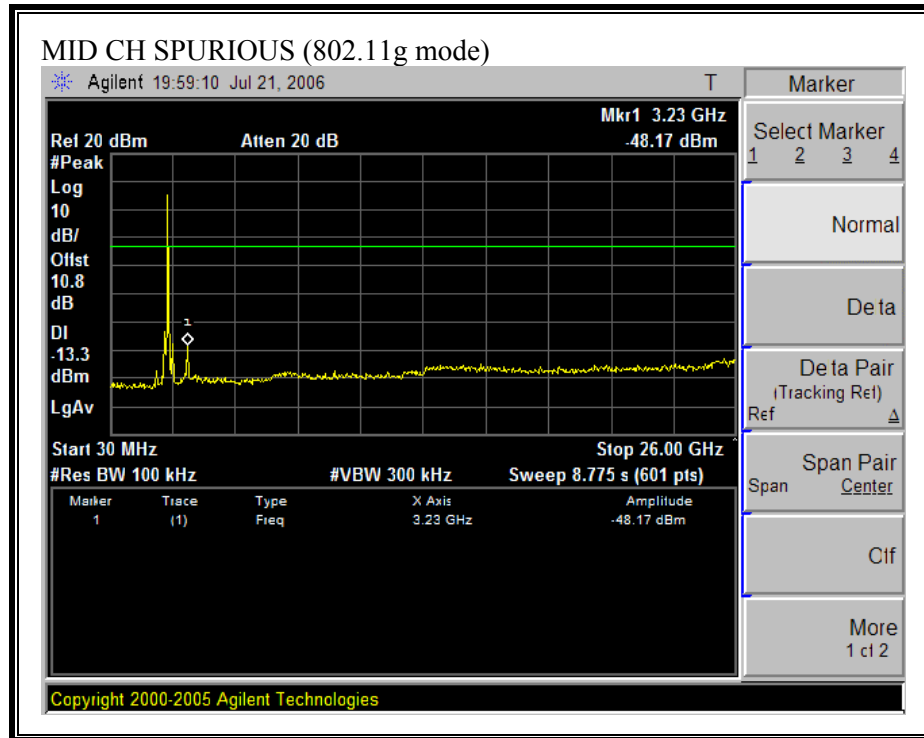




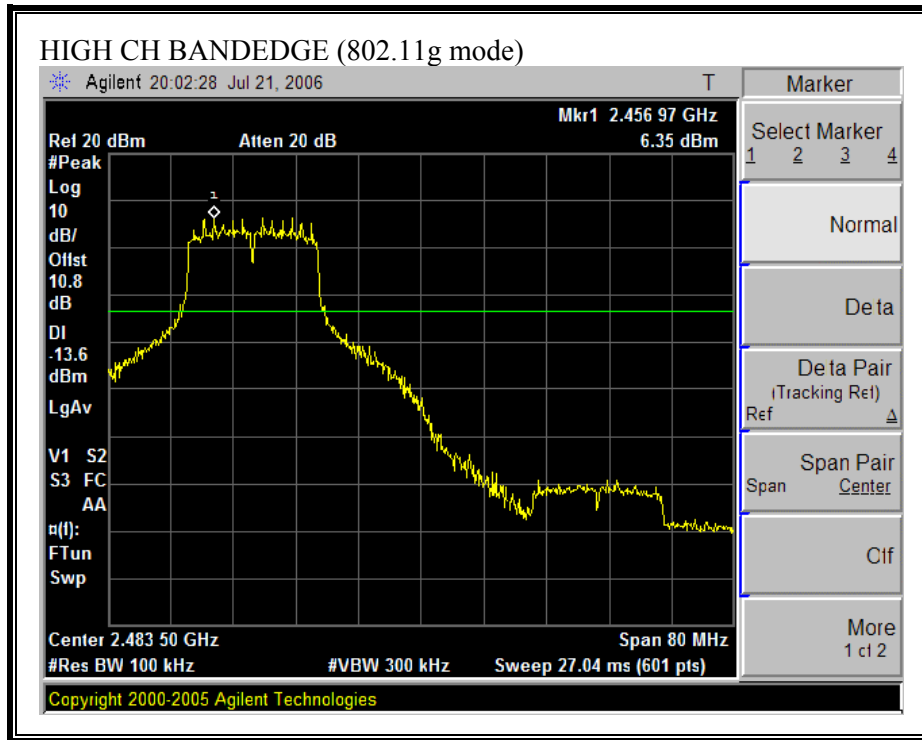


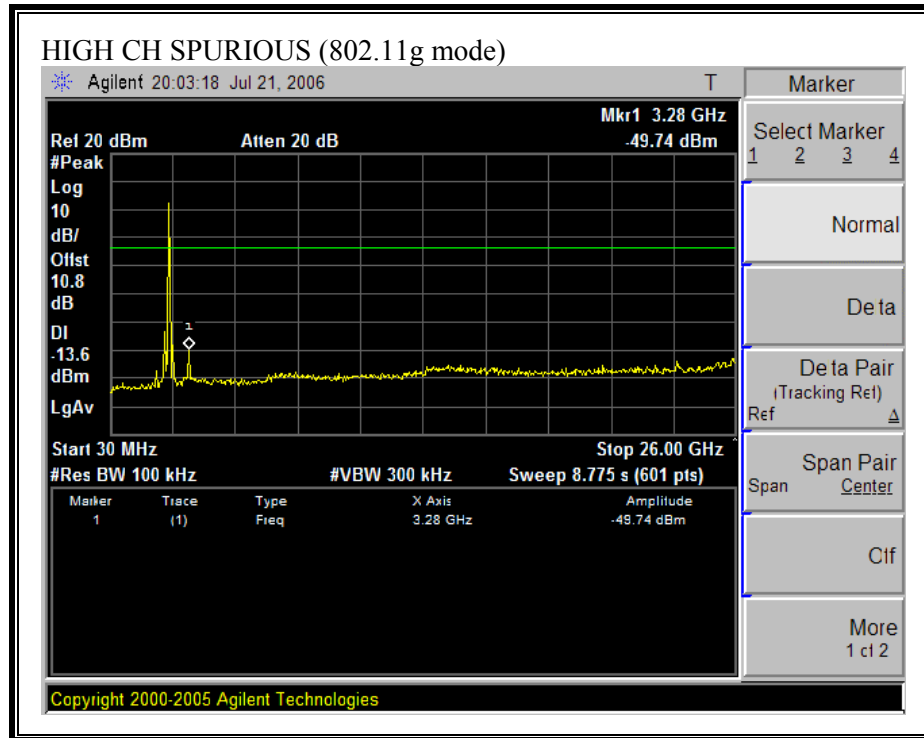
**SPURIOUS EMISSIONS, MID CHANNEL (802.11g MODE)**





**SPURIOUS EMISSIONS, HIGH CHANNEL (802.11g MODE)**





## 7.2. MAXIMUM PERMISSIBLE EXPOSURE

### LIMITS

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0 .....	614	1.63	*(100)	6
3.0–30 .....	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30–300 .....	61.4	0.163	1.0	6
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	5	6
(B) 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 <sup>2</sup> )	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
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

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

## **CALCULATIONS**

Given

$$E = \sqrt{(30 * P * G) / d}$$

and

$$S = E^2 / 3770$$

where

E = Field Strength in Volts/meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power Density in milliwatts/square centimeter

Combining equations yields:

$$S = (30 * P * G) / (3770 * (d^2))$$

Changing to units of Power to mW and Distance to cm, using:

$$P (W) = P (mW) / 1000 \text{ and}$$

$$d (m) = d (cm) / 100$$

and substituting the logarithmic form of power and gain using:

$$P (mW) = 10^{(P (dBm) / 10)} \text{ and}$$

$$G (\text{numeric}) = 10^{(G (dBi) / 10)}$$

yields

$$S = 0.0795 * 10^{((P + G) / 10)} / (d^2)$$

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW/cm<sup>2</sup>

## **LIMITS**

From §1.1310 Table 1 (B), the maximum value of  $S = 1.0 \text{ mW/cm}^2$

## **RESULTS**

No non-compliance noted:

<b>Mode</b>	<b>MPE Distance (cm)</b>	<b>Output Power (dBm)</b>	<b>Antenna Gain (dBi)</b>	<b>Power Density (mW/cm<sup>2</sup>)</b>
802.11b	20.0	23.97	3.62	0.11
802.11g	20.0	26.99	3.62	0.23

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

## 7.3. RADIATED EMISSIONS

### 7.3.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS

#### LIMITS

§15.205 (a) Except as shown 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	399.9 - 410	4.5 - 5.15
<sup>1</sup> 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	( <sup>2</sup> )
13.36 - 13.41			

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.



§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)
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.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

## **TEST PROCEDURE**

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

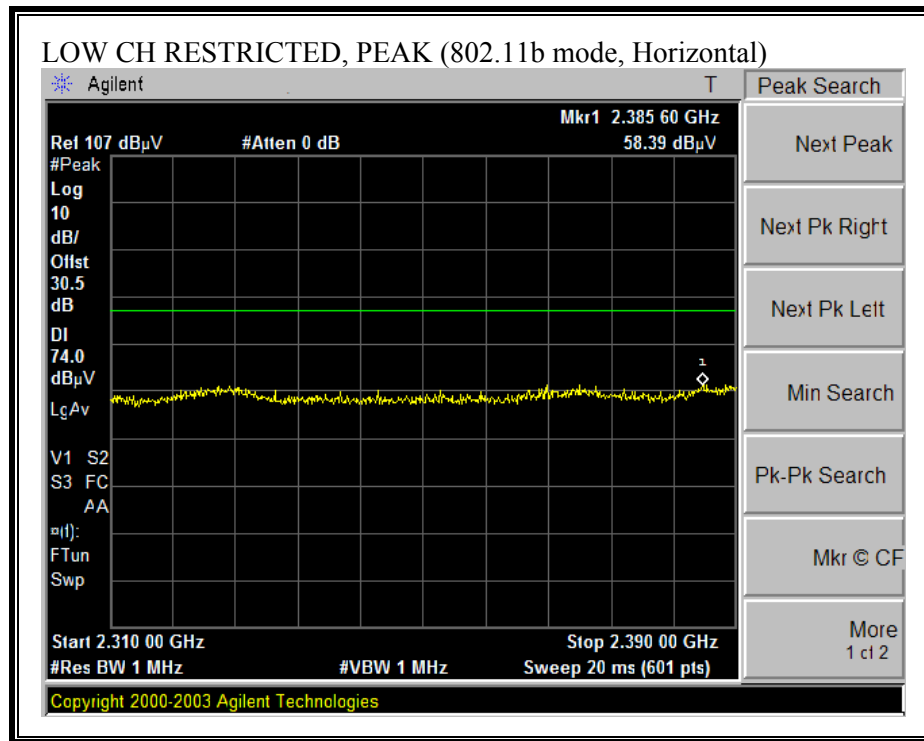
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

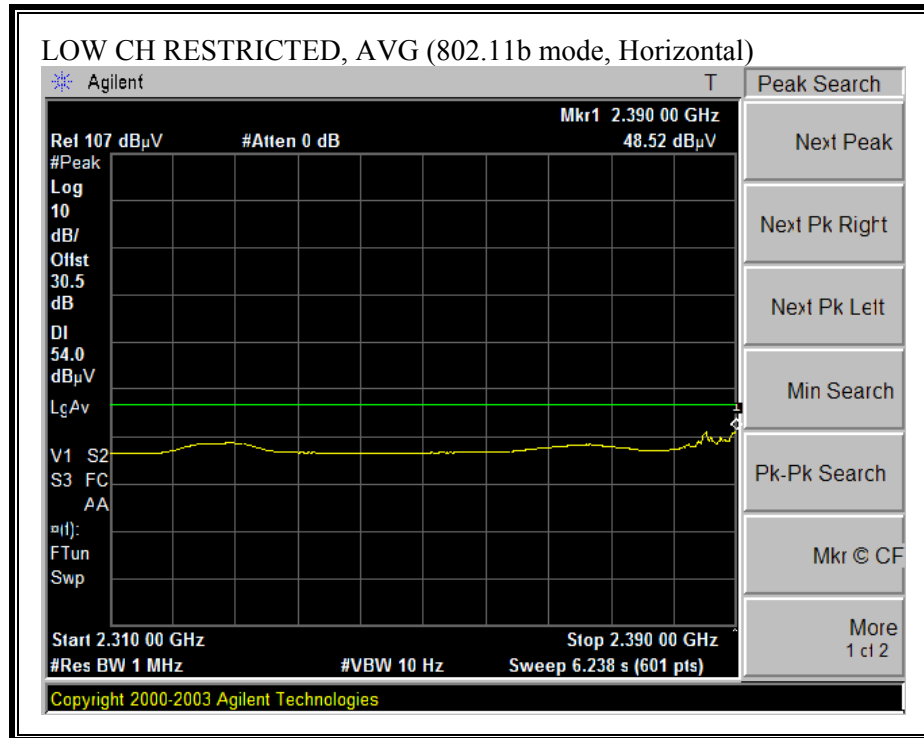
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each 5 GHz band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

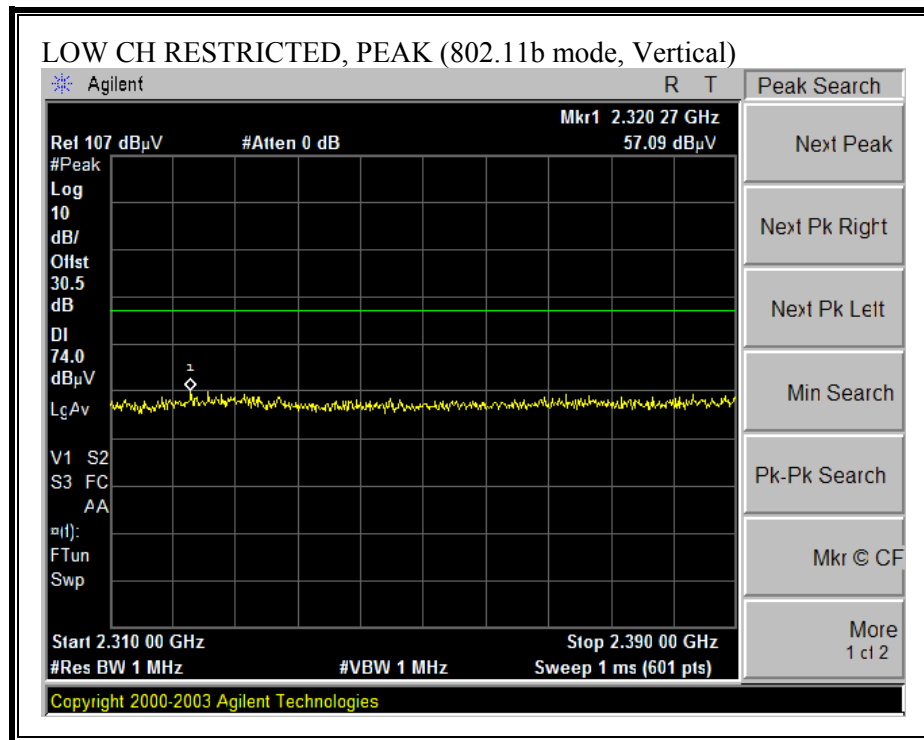
### 7.3.2. TRANSMITTER ABOVE 1 GHz FOR 2400 TO 2483.5 MHz BAND

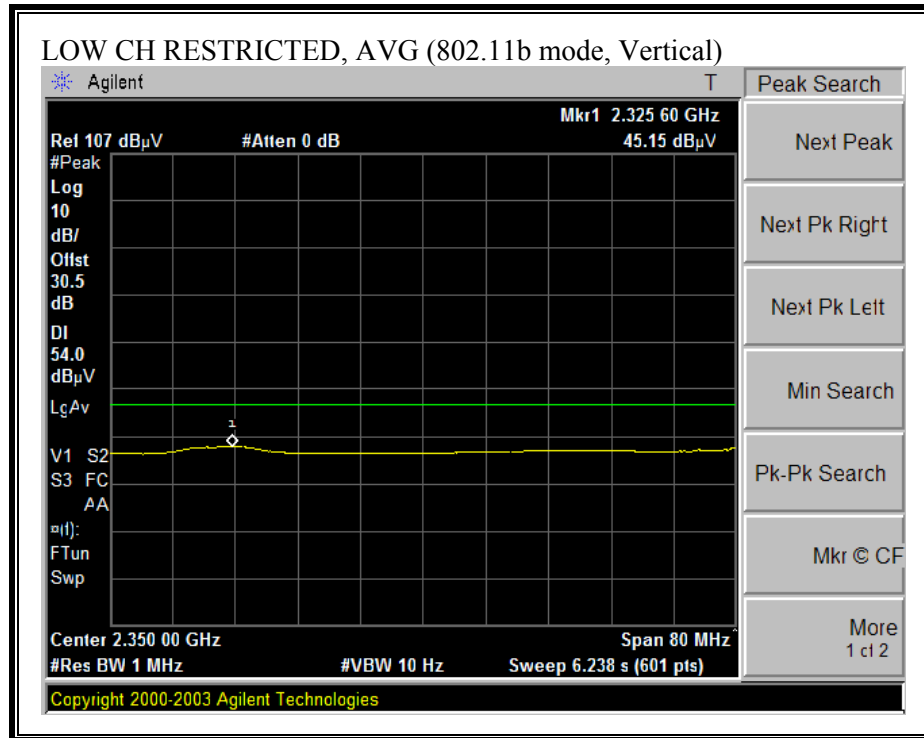
#### RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, HORIZONTAL)



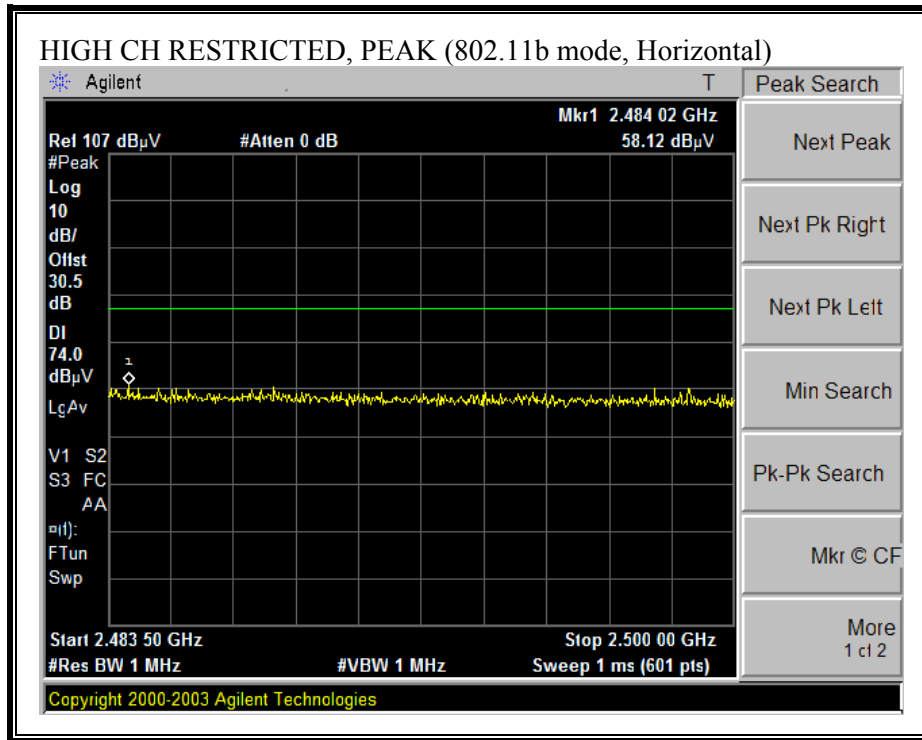


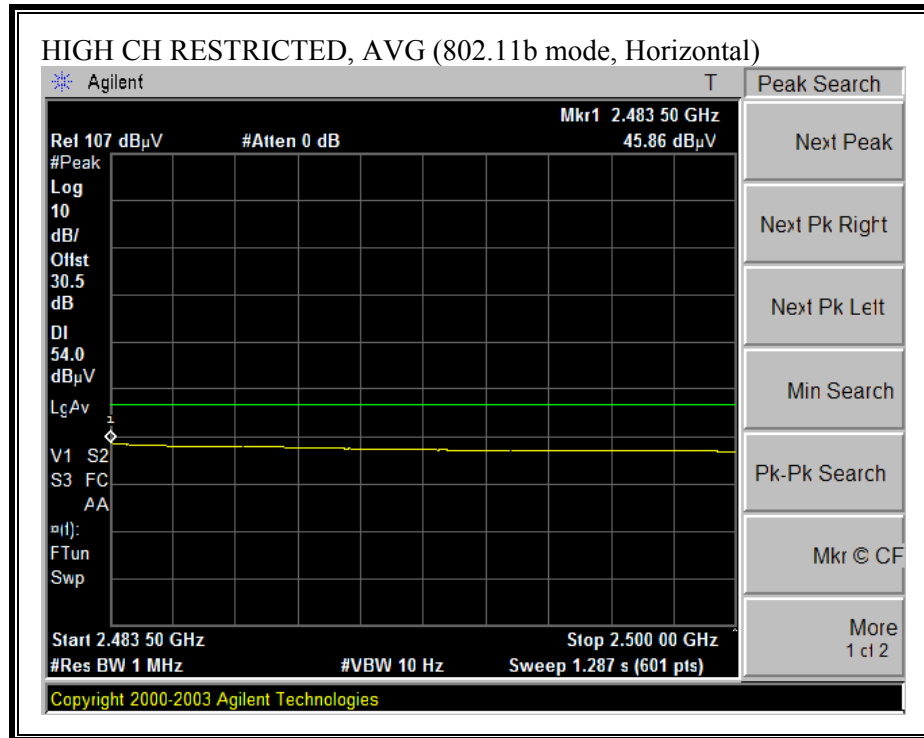
**RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, VERTICAL)**





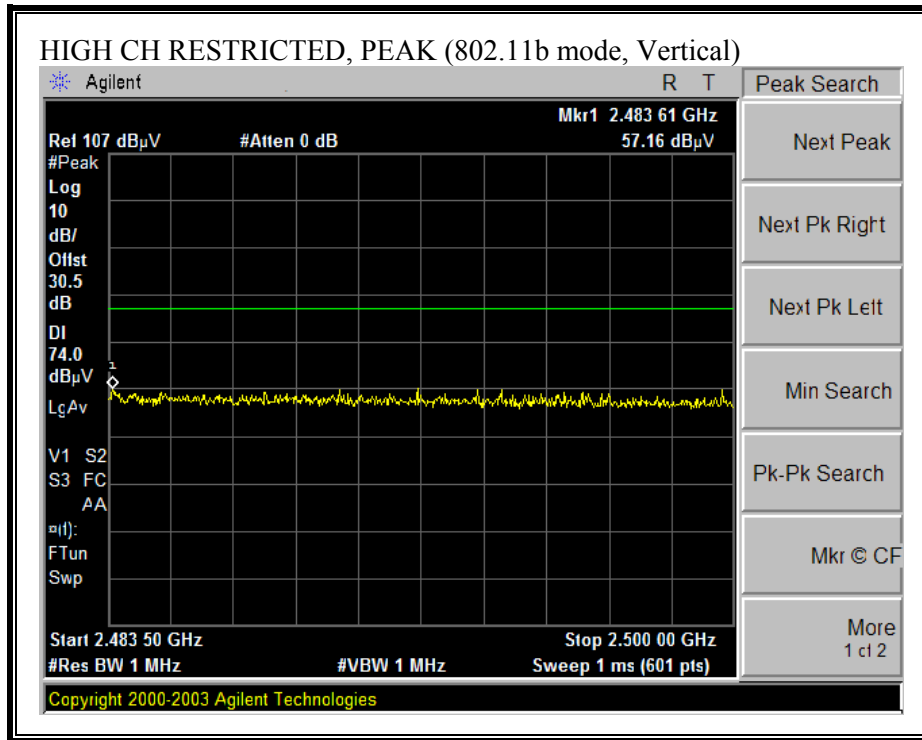
**RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, HORIZONTAL)**

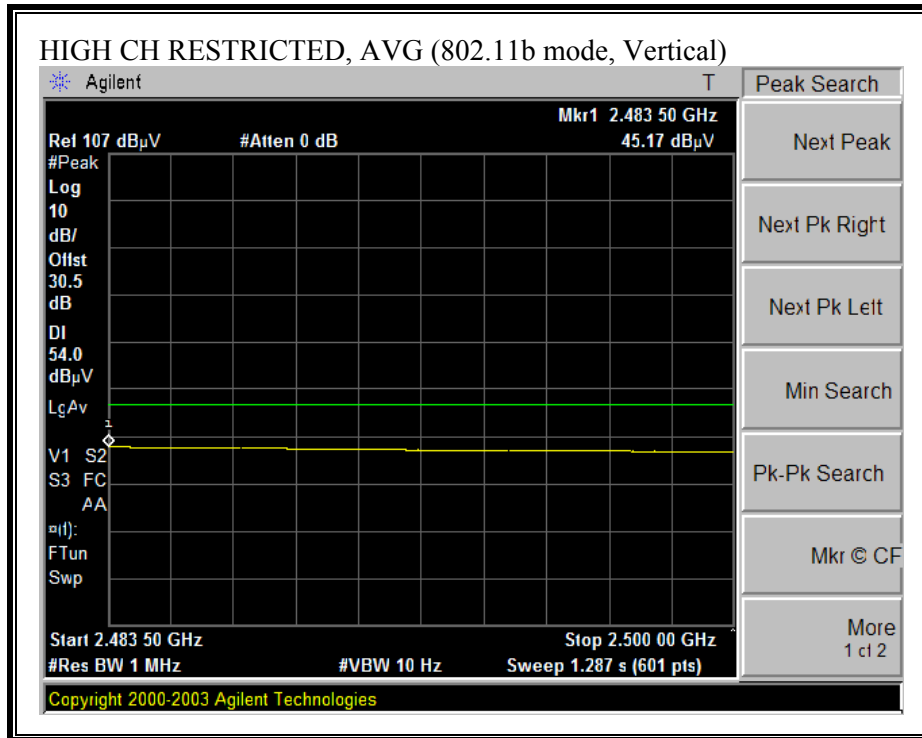






**RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, VERTICAL)**

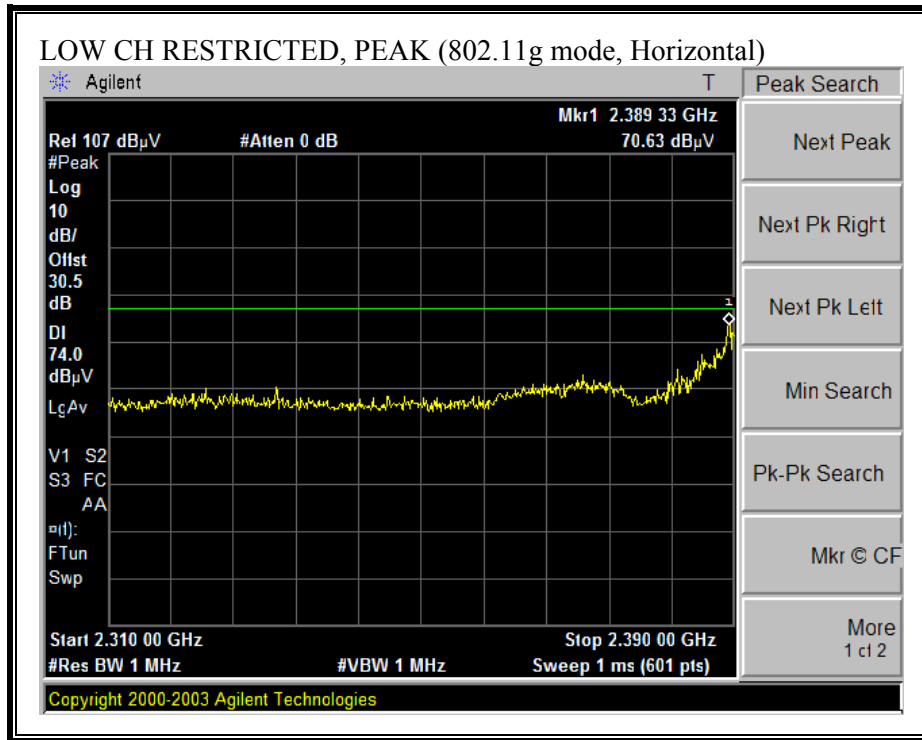


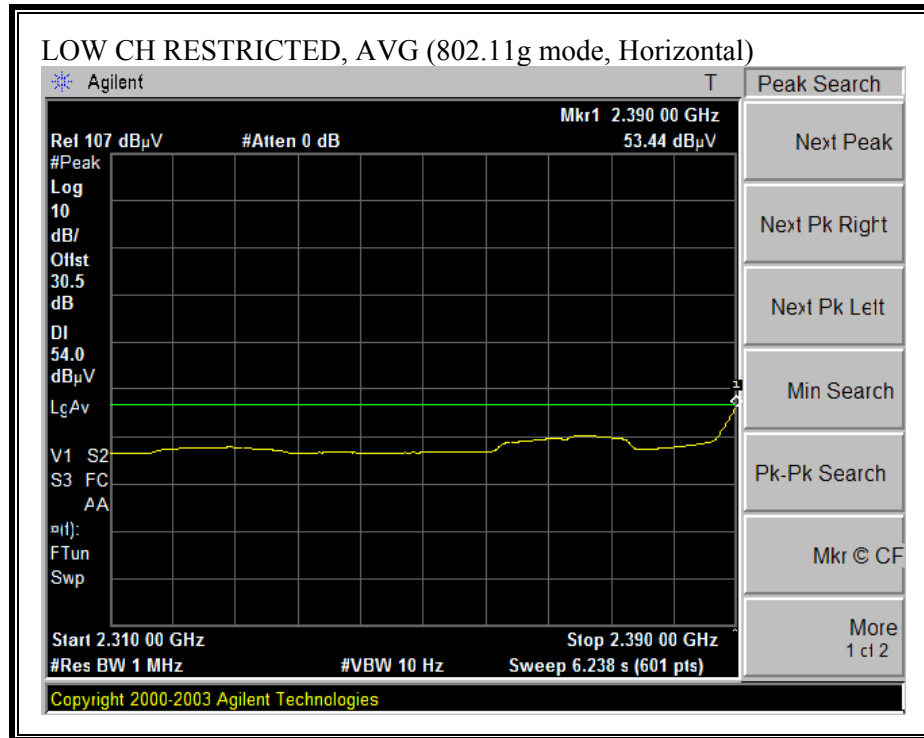


## HARMONICS AND SPURIOUS EMISSIONS (b MODE)

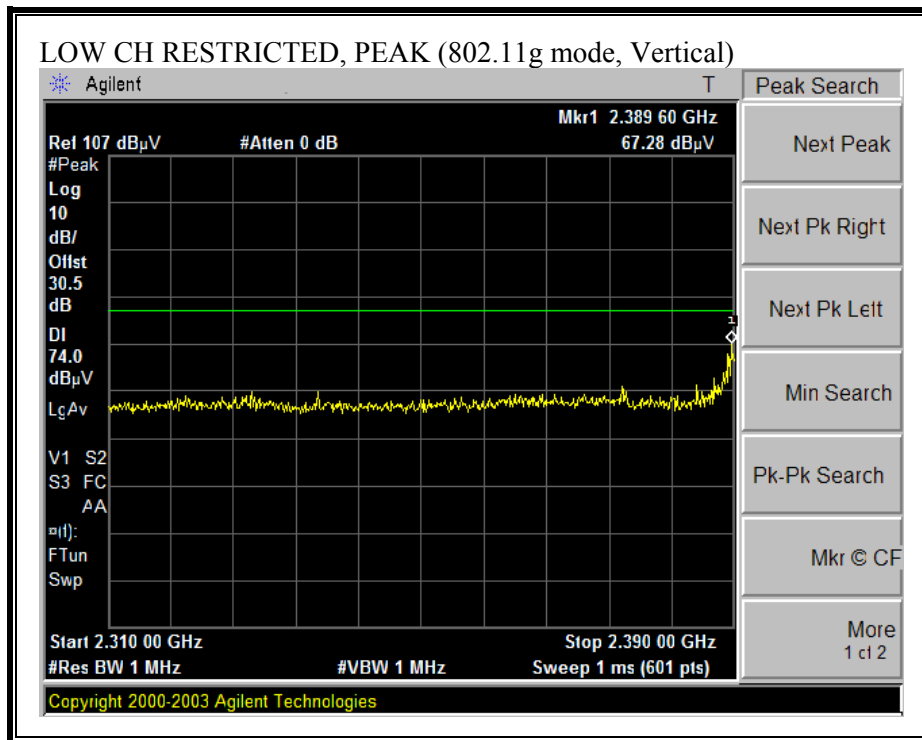
High Frequency Measurement															
Compliance Certification Services, Morgan Hill Open Field Site															
Company: Atheros															
Project #: 06U10459															
Date: 7/21/2006															
Test Engineer: Chin Pang															
Configuration: EUT/Laptop															
Mode: TX, b mode															
Average Power Meter: Low = 20 dBm, Mid = 20 dBm, High = 20dBm															
Test Equipment:															
Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz		Limit							
T60; S/N: 2238 @3m		T145 Agilent 3008A005						FCC 15.205							
Hi Frequency Cables															
2 foot cable		3 foot cable		12 foot cable		HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz ; VBW=10Hz					
		Chin 197538001		Chin 200354001				R_001							
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch, 2412MHz															
4.824	3.0	50.6	42.4	33.0	3.2	-34.8	0.0	0.0	52.0	43.8	74	54	-22.0	-10.2	V
4.824	3.0	51.4	44.0	33.0	3.2	-34.8	0.0	0.0	52.8	45.4	74	54	-21.2	-8.6	H
Mid h, 2437MHzC															
4.874	3.0	49.3	42.2	33.1	3.2	-34.9	0.0	0.0	50.7	43.6	74	54	-23.3	-10.4	V
7.311	3.0	51.0	38.0	35.5	3.6	-34.7	0.0	0.0	55.4	42.4	74	54	-18.6	-11.6	V
4.874	3.0	50.5	44.6	33.1	3.2	-34.9	0.0	0.0	51.9	46.0	74	54	-22.1	-8.0	H
7.311	3.0			35.5	3.6	-34.7	0.0	0.0	4.4	4.4	74	54	-69.6	-49.6	H
High Ch, 2462MHz															
4.924	3.0	49.0	42.0	33.1	3.2	-34.9	0.0	0.0	50.5	43.5	74	54	-23.5	-10.5	V
7.386	3.0	50.0	37.2	35.6	3.6	-34.6	0.0	0.0	54.5	41.7	74	54	-19.5	-12.3	V
4.924	3.0	51.5	45.0	33.1	3.2	-34.9	0.0	0.0	53.0	46.5	74	54	-21.0	-7.5	H
7.386	3.0	50.1	37.3	35.6	3.6	-34.6	0.0	0.0	54.6	41.8	74	54	-19.4	-12.2	H
Rev. 5.1.6															
Note: No other emissions were detected above the system noise floor.															
f	Measurement Frequency			Amp	Preamp Gain			Avg Lim	Average Field Strength Limit						
Dist	Distance to Antenna			D Corr	Distance Correct to 3 meters			Pk Lim	Peak Field Strength Limit						
Read	Analyzer Reading			Avg	Average Field Strength @ 3 m			Avg Mar	Margin vs. Average Limit						
AF	Antenna Factor			Peak	Calculated Peak Field Strength			Pk Mar	Margin vs. Peak Limit						
CL	Cable Loss			HPF	High Pass Filter										

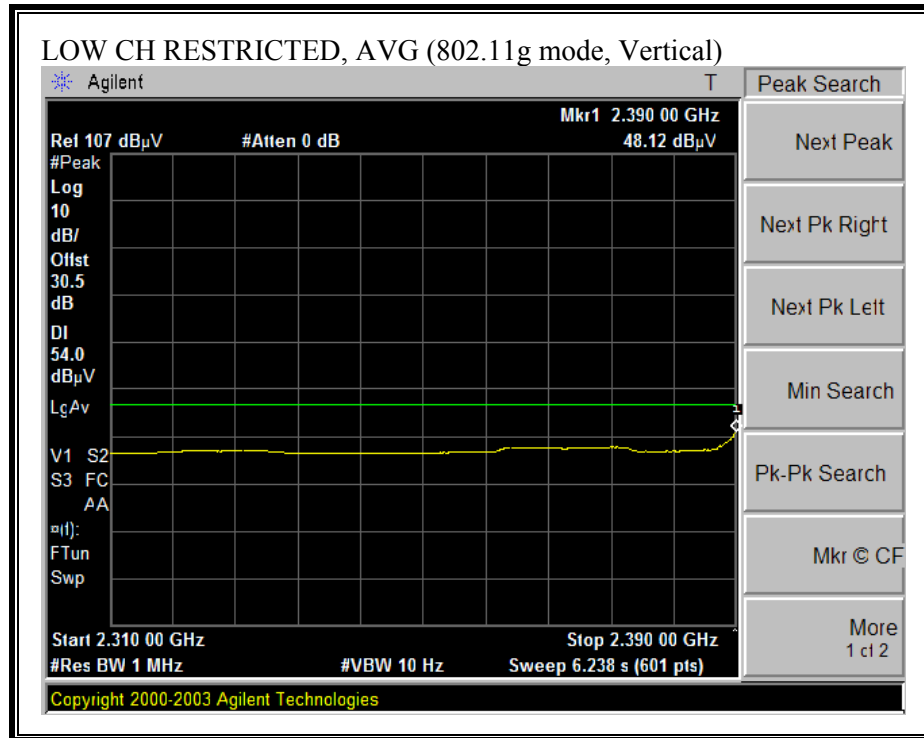
**RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, HORIZONTAL)**



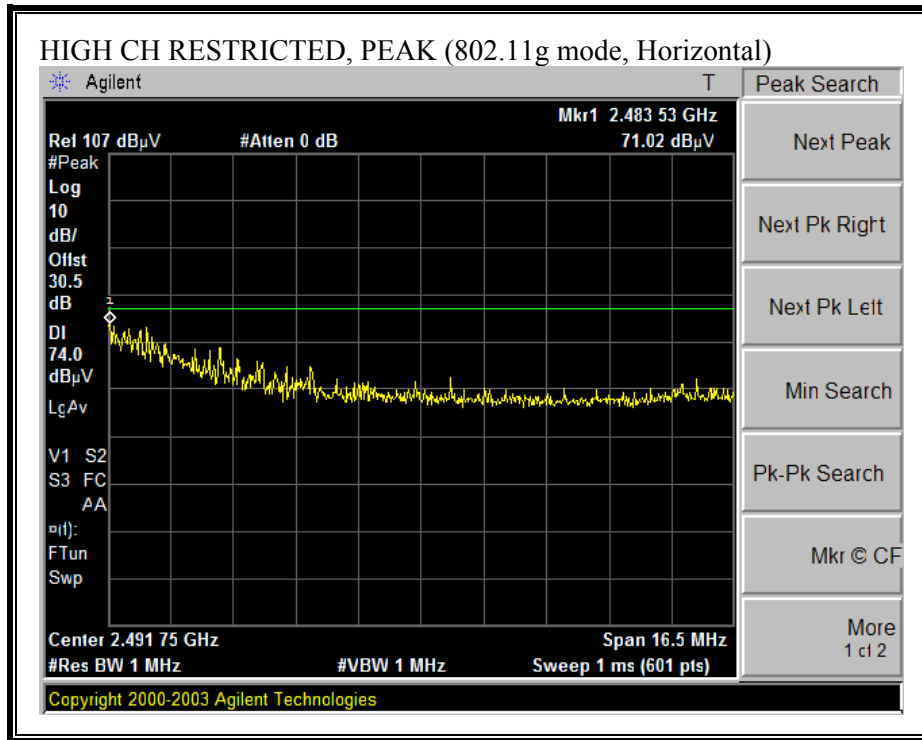


**RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, VERTICAL)**

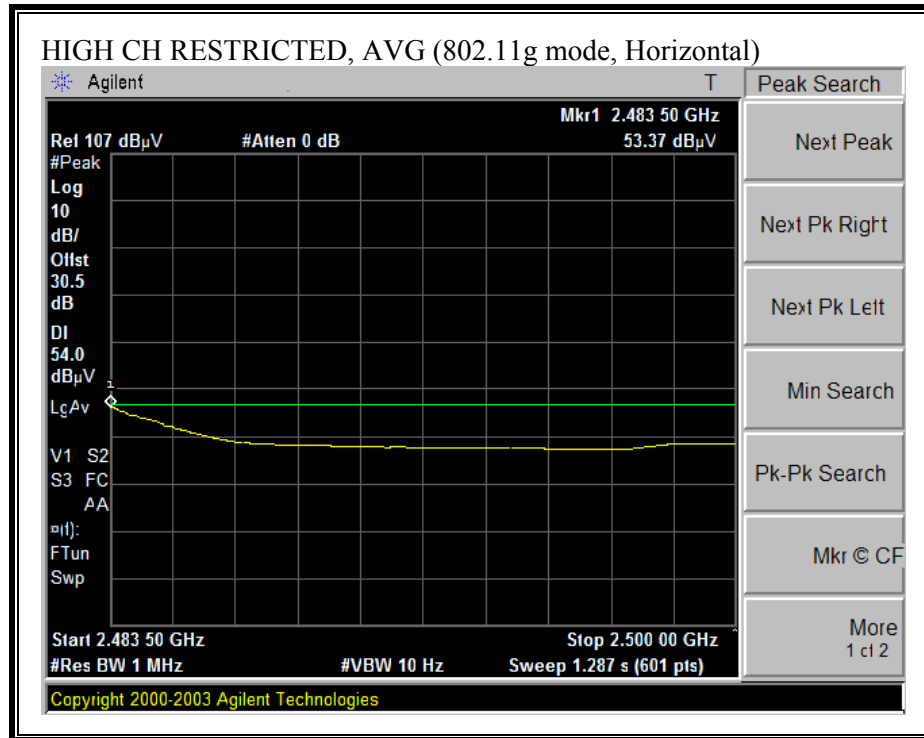




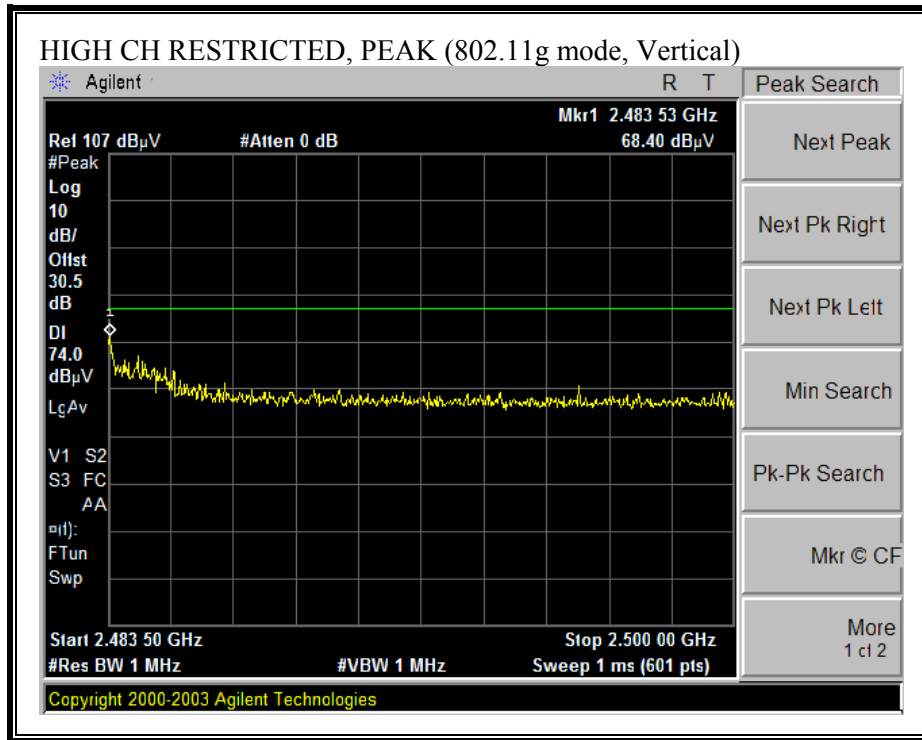
**RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, HORIZONTAL)**

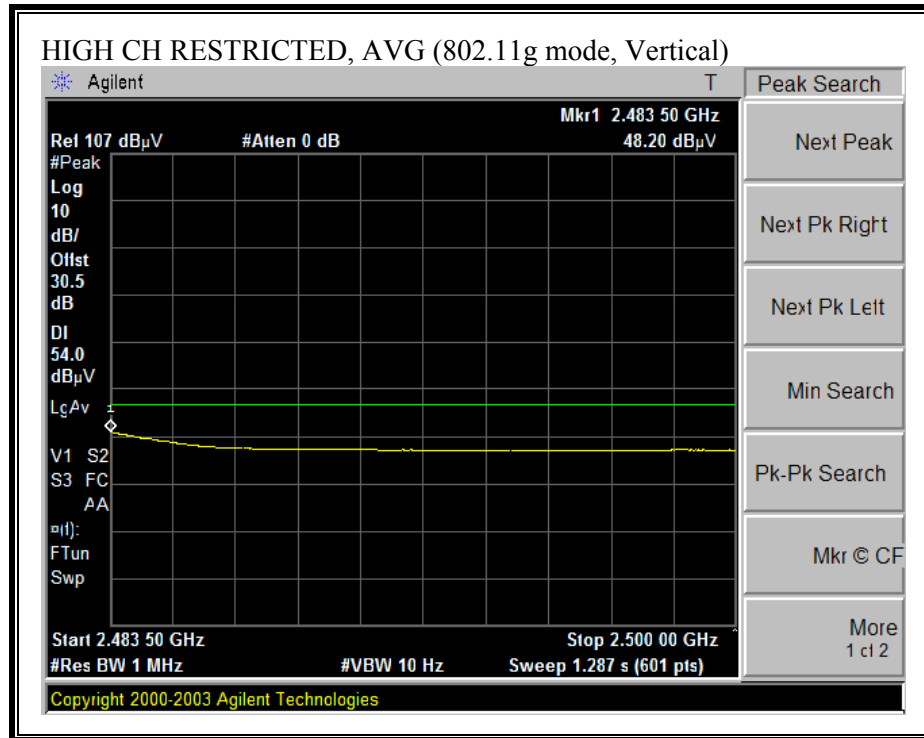






**RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, VERTICAL)**





## HARMONICS AND SPURIOUS EMISSIONS (g MODE)

High Frequency Measurement															
Compliance Certification Services, Morgan Hill Open Field Site															
Company: Atheros															
Project #: 06U10459															
Date: 7/21/2006															
Test Engineer: Chin Pang															
Configuration: EUT/Laptop															
Mode: TX, g mode															
Average Power Meter: Low = 17.5dBm, Mid = 20 dBm, High = 17.5dBm															
Test Equipment:															
Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz		Limit							
T60; S/N: 2238 @3m		T145 Agilent 3008A005						FCC 15.205							
Hi Frequency Cables															
2 foot cable		3 foot cable		12 foot cable		HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz ; VBW=10Hz					
		Chin 197538001		Chin 200354001				R_001							
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch, 2412MHz															
4.824	3.0	49.2	36.0	33.0	3.2	-34.8	0.0	0.0	50.6	37.4	74	54	-23.4	-16.6	V
4.824	3.0	49.4	37.0	33.0	3.2	-34.8	0.0	0.0	50.8	38.4	74	54	-23.2	-15.6	H
Mid h, 2437MHzC															
4.874	3.0	49.5	37.5	33.1	3.2	-34.9	0.0	0.0	50.9	38.9	74	54	-23.1	-15.1	V
7.311	3.0	50.7	37.5	35.5	3.6	-34.7	0.0	0.0	55.1	41.9	74	54	-18.9	-12.1	V
4.874	3.0	49.0	37.0	33.1	3.2	-34.9	0.0	0.0	50.4	38.4	74	54	-23.6	-15.6	H
7.311	3.0	50.0	37.4	35.5	3.6	-34.7	0.0	0.0	54.4	41.8	74	54	-19.6	-12.2	H
High Ch, 2462MHz															
4.924	3.0	50.0	37.0	33.1	3.2	-34.9	0.0	0.0	51.5	38.5	74	54	-22.5	-15.5	V
7.386	3.0	50.0	37.3	35.6	3.6	-34.6	0.0	0.0	54.5	41.8	74	54	-19.5	-12.2	V
4.924	3.0	49.0	36.0	33.1	3.2	-34.9	0.0	0.0	50.5	37.5	74	54	-23.5	-16.5	H
7.386	3.0	49.4	37.0	35.6	3.6	-34.6	0.0	0.0	53.9	41.5	74	54	-20.1	-12.5	H
Rev. 5.1.6															
Note: No other emissions were detected above the system noise floor.															
f	Measurement Frequency			Amp	Preamp Gain			Avg Lim	Average Field Strength Limit						
Dist	Distance to Antenna			D Corr	Distance Correct to 3 meters			Pk Lim	Peak Field Strength Limit						
Read	Analyzer Reading			Avg	Average Field Strength @ 3 m			Avg Mar	Margin vs. Average Limit						
AF	Antenna Factor			Peak	Calculated Peak Field Strength			Pk Mar	Margin vs. Peak Limit						
CL	Cable Loss			HPF	High Pass Filter										

### 7.3.3. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

#### SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

##### HORIZONTAL DATA

Condition: FCC CLASS-B HORIZONTAL  
Test Operator: : Chin Pang  
Company: : Atheros  
Project #: : 06U10459  
Configuration: : EUT with Laptop  
Mode of Operation: TX ( Worst Case )

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	159.010	21.72	13.85	35.56	43.50	-7.94	Peak
2	169.680	26.18	13.40	39.58	43.50	-3.92	Peak
3	235.640	22.48	13.30	35.78	46.00	-10.22	Peak
4	455.830	19.42	19.33	38.75	46.00	-7.25	Peak
5	502.390	15.35	20.24	35.59	46.00	-10.41	Peak
6	799.210	15.06	24.56	39.62	46.00	-6.38	Peak

**SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)**

VERTICAL DATA

Condition: FCC CLASS-B VERTICAL  
Test Operator: : Chin Pang  
Company: : Atheros  
Project #: : 06U10459  
Configuration: : EUT with Laptop  
Mode of Operation: TX ( Worst Case )

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	94.990	19.36	10.12	29.48	43.50	-14.02	Peak
2	169.680	17.96	13.40	31.36	43.50	-12.14	Peak
3	235.640	16.20	13.30	29.50	46.00	-16.50	Peak
4	358.830	17.51	17.12	34.63	46.00	-11.37	Peak
5	401.510	14.73	18.08	32.81	46.00	-13.19	Peak
6	500.450	16.99	20.23	37.23	46.00	-8.77	Peak
7	515.000	7.73	20.46	28.19	46.00	-17.81	Peak
8	798.240	12.44	24.53	36.97	46.00	-9.03	Peak

## 7.4. POWERLINE CONDUCTED EMISSIONS

### LIMIT

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, 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  $\mu$ H/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 PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The resolution bandwidth is set to 9 kHz for both peak detection and quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

Line conducted data is recorded for both NEUTRAL and HOT lines.

### RESULTS

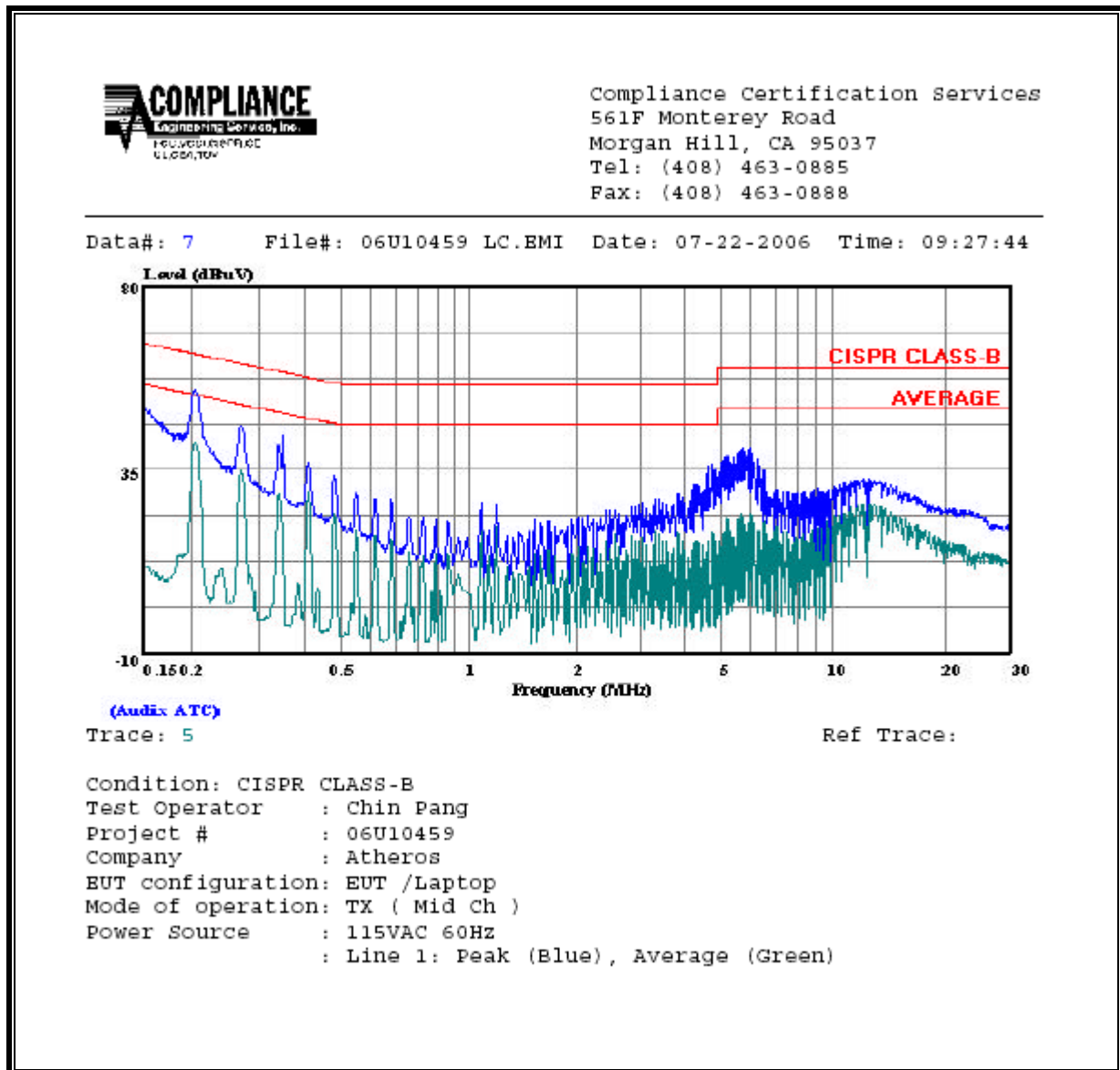
No non-compliance noted:

# **6 WORST EMISSIONS**

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.20	54.72	--	40.82	0.00	63.45	53.45	-8.73	-12.63	L1
0.27	45.82	--	34.70	0.00	61.06	51.06	-15.24	-16.36	L1
5.84	40.14	--	24.31	0.00	60.00	50.00	-19.86	-25.69	L1
0.21	51.42	--	40.21	0.00	63.37	53.37	-11.95	-13.16	L2
0.27	42.78	--	33.33	0.00	61.00	51.00	-18.22	-17.67	L2
5.77	38.44	--	23.65	0.00	60.00	50.00	-21.56	-26.35	L2
6 Worst Data									



## LINE 1 RESULTS

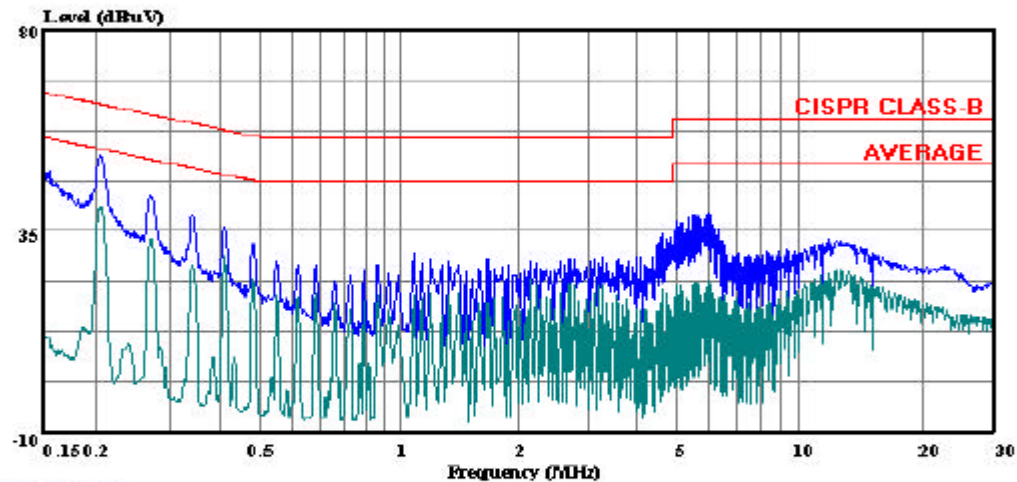


## LINE 2 RESULTS



Compliance Certification Services  
561F Monterey Road  
Morgan Hill, CA 95037  
Tel: (408) 463-0885  
Fax: (408) 463-0888

Data#: 14 File#: 06U10459 LC.EMI Date: 07-22-2006 Time: 09:46:34



(Audix ATC)

Trace: 12

Ref Trace:

Condition: CISPR CLASS-B  
Test Operator : Chin Pang  
Project # : 06U10459  
Company : Atheros  
EUT configuration: EUT /Laptop  
Mode of operation: TX ( Mid Ch )  
Power Source : 115VAC 60Hz  
: Line 2: Peak (Blue), Average (Green)