



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

**FOR**

**MP312gR mPCI 1x2 b/g RoHS Card**

**MODEL NUMBER: AGN3012MP-11**

**FCC ID: SA3-AGN3012MP1100**

**REPORT NUMBER: 06U10128-1**

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*Prepared for*  
**AIRGO NETWORKS, INC.  
900 ARASTADERO RD.  
PALO ALTO, CA 94304, USA**

*Prepared by*  
**COMPLIANCE CERTIFICATION SERVICES  
561F MONTEREY ROAD  
MORGAN HILL, CA 95037, USA  
TEL: (408) 463-0885  
FAX: (408) 463-0888**

**NVLAP<sup>®</sup>**  
**LAB CODE:200065-0**

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** AIRGO NETWORKS, INC.  
900 ARASTADERO RD.  
PALO ALTO, CA 94304, USA

**EUT DESCRIPTION:** MP312gR mPCI 1x2 b/g RoHS CARD

**MODEL:** AGN3012MP-11

**SERIAL NUMBER:** 1663,1655,1794

**DATE TESTED:** April 4 – 17, 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.

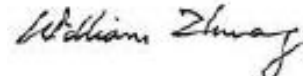
Approved & Released For CCS By:

Tested By:



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ALVIN ILARINA  
EMC SUPERVISOR  
COMPLIANCE CERTIFICATION SERVICES



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WILLIAM ZHUANG  
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 a RoHS mPCI b/g 1x2 Card.

The radio module is manufactured by Airgo Networks.

### 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	24.90	309.03
2412 - 2462	802.11g	29.03	799.83
2432-2442	SIMO	26.95	495.45

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes two monopole antennas in MIMO configuration for diversity, each with a maximum gain of 2.0 dBi.

### 5.4. SOFTWARE AND FIRMWARE

The EUT does not use firmware.

The EUT driver software installed in the host support equipment during testing was AGN300 True MIMO Wireless Adapter, rev. 2.0.3.30.

The test utility software used during testing was PTT 2.1.0.155.

### 5.5. WORST-CASE CONFIGURATION AND MODE

EUT was inserted into a host laptop computer with a software to control the operation of the EUT. EUT was tested for all three modes of operation, (802.11b, 802.11g, and SIMO).

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	Remarks
Laptop Computer	Dell	Inspiron 1150	11915129989	N/A
AC/DC Adapter	Dell	PA-1900-02D	CN-09T215-71615-47I-7634	N/A

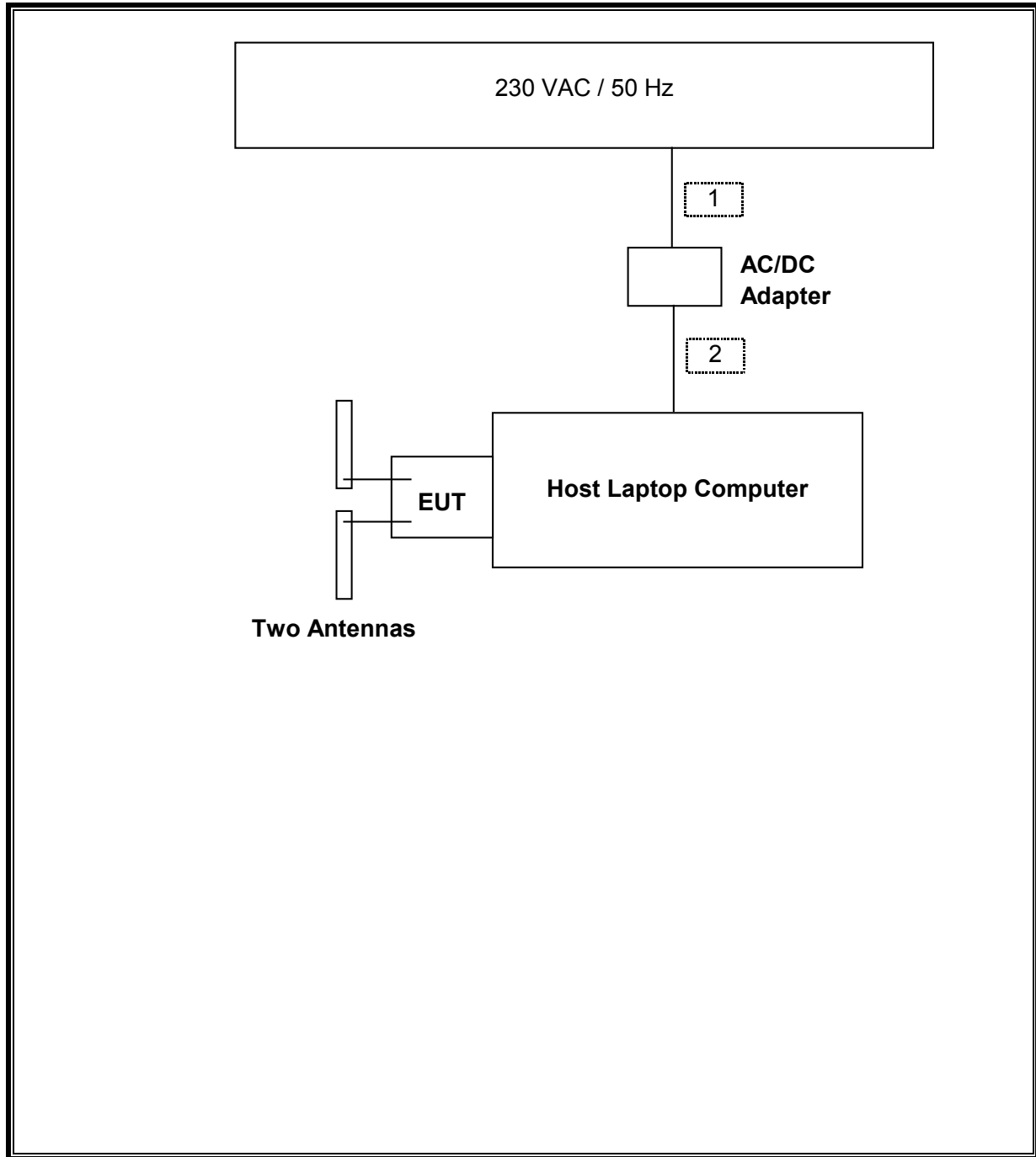
### I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	AC	Unshielded	0.5m	N/A
2	DC	1	DC	Unshielded	1m	N/A

### TEST SETUP

The EUT is installed in a host laptop computer via a cardbus-to-miniPCI adapter / extension 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
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent	E4446A	US42510266	10/19/2006
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	6717	4/22/2006
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A121003	9/3/2006
EMI Receiver, 9 kHz ~ 2.9 GHz	HP	8542E	3942A00286	2/4/2007
RF Filter Section	HP	85420E	3705A00256	2/4/2007
Preamplifier, 1300 MHz	HP	8447D	1937A02062	1/23/2007
Preamplifier, 1 ~ 26 GHz	Miteq	NSP2600-SP	924342	9/2/2006
EMI Test Receiver	R & S	ESHS 20	827129/006	6/3/2006
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	8/30/2006
Peak Power Meter	Agilent	E4416A	GB41291160	12/2/2007
Peak / Average Power Sensor	Agilent	E9327A	US40440755	12/2/2007
4.0 High Pass Filter	Micro Tronics	HPM13351	3	NCR

## 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:

TRANSMIT CHAIN 0

802.11b Mode

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>6 dB Bandwidth (kHz)</b>	<b>Minimum Limit (kHz)</b>	<b>Margin (kHz)</b>
Low	2412	14080	500	13580
Middle	2437	14080	500	13580
High	2462	14250	500	13750

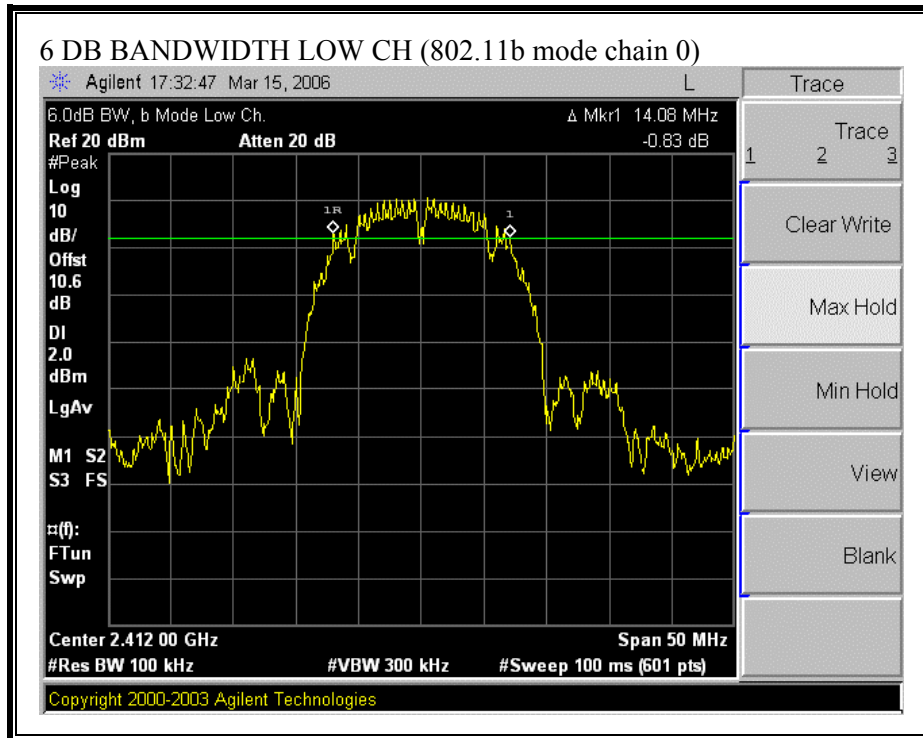
802.11g Mode

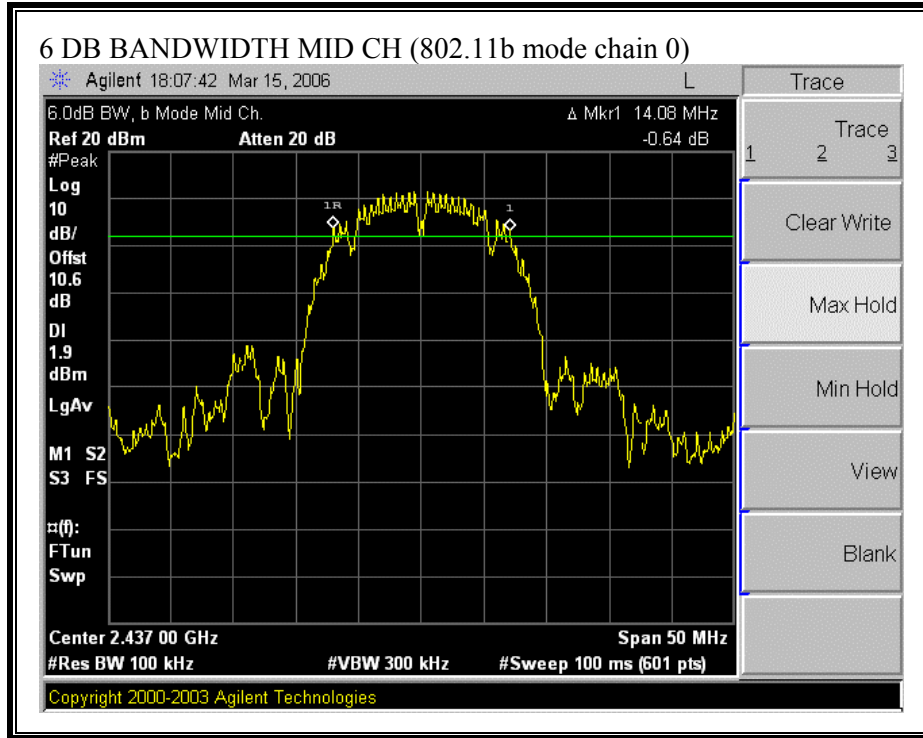
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>6 dB Bandwidth (kHz)</b>	<b>Minimum Limit (kHz)</b>	<b>Margin (kHz)</b>
Low	2412	15750	500	15250
Middle	2437	15500	500	15000
High	2462	15750	500	15250

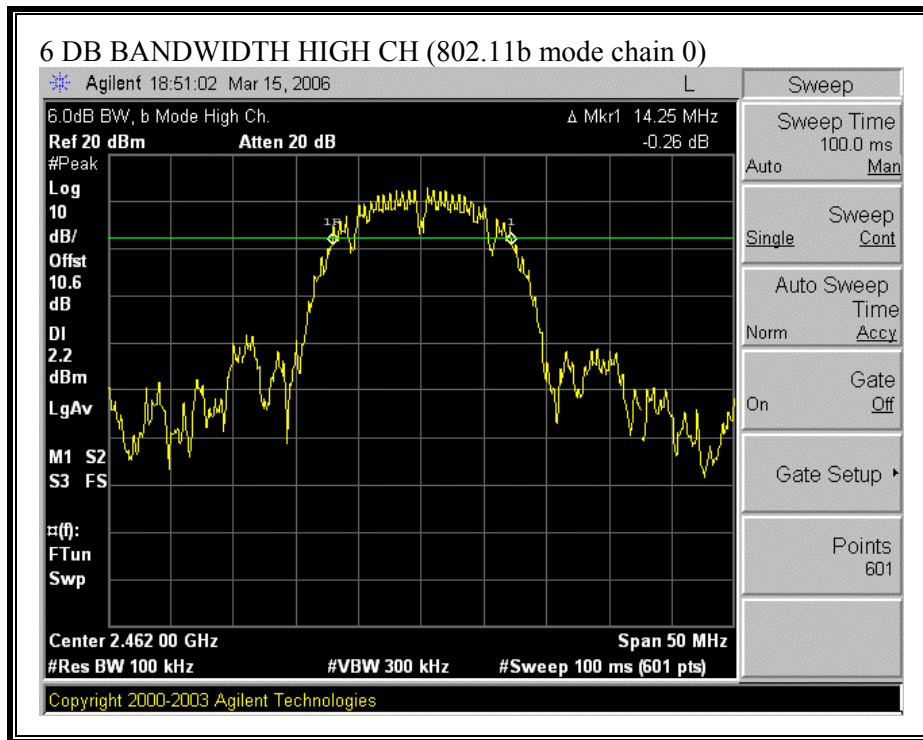
SIMO

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>6 dB Bandwidth (kHz)</b>	<b>Minimum Limit (kHz)</b>	<b>Margin (kHz)</b>
Low	2432	30350	500	29850
High	2442	30350	500	29850

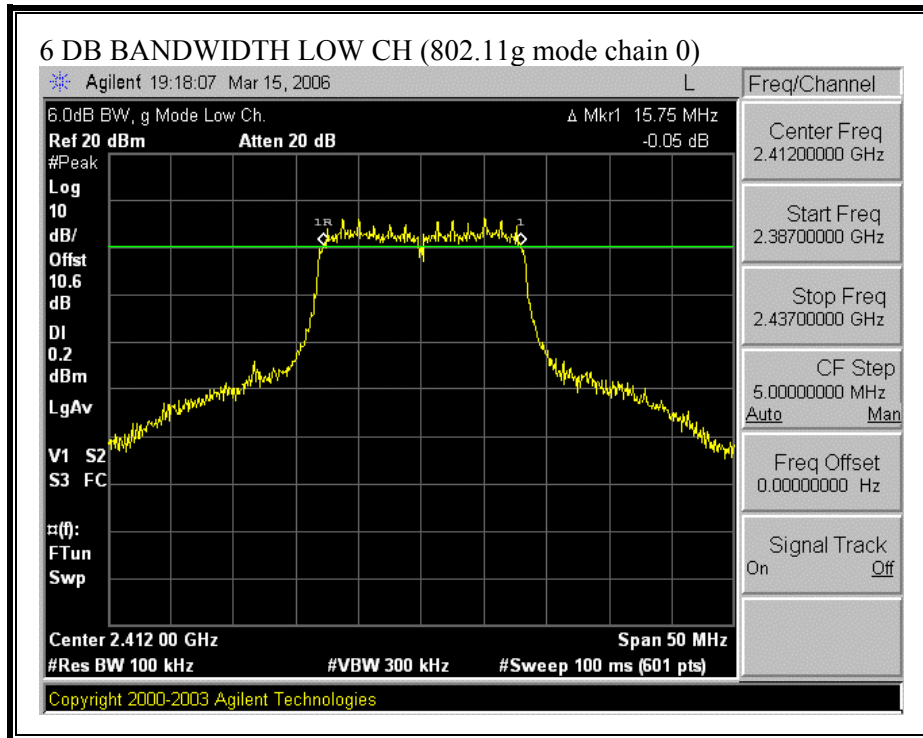
**6 DB BANDWIDTH (802.11b MODE CHAIN 0)**

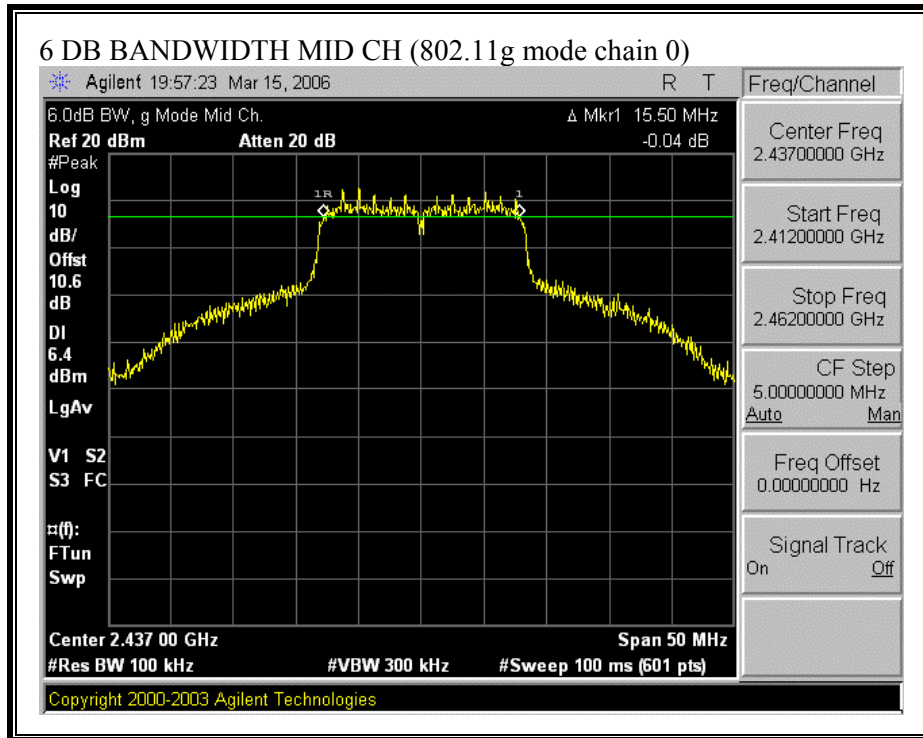




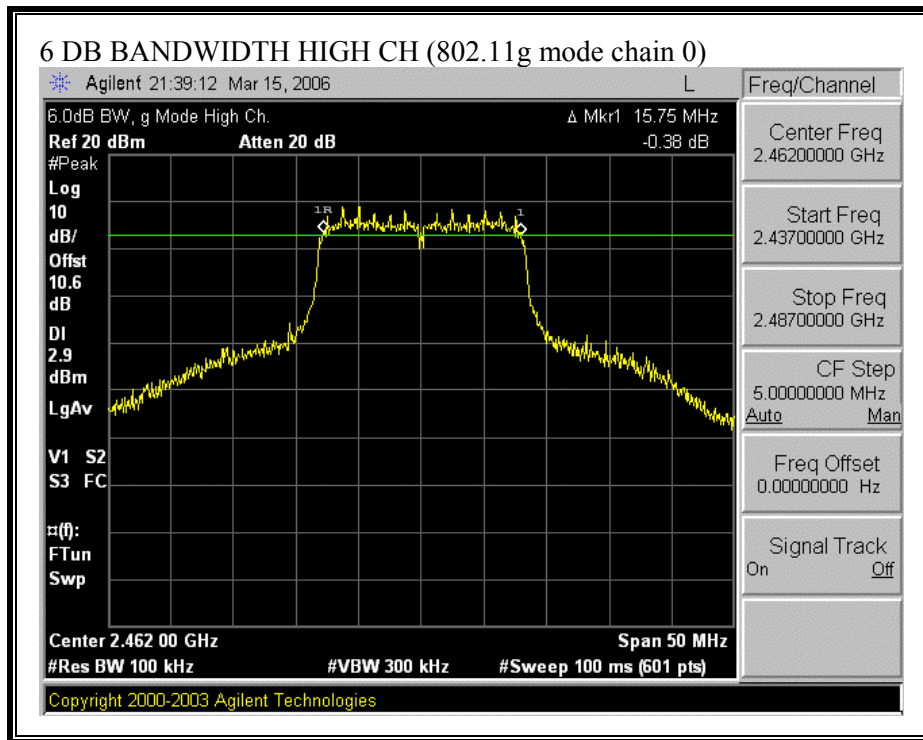


**6 DB BANDWIDTH (802.11g MODE CHAIN 0)**

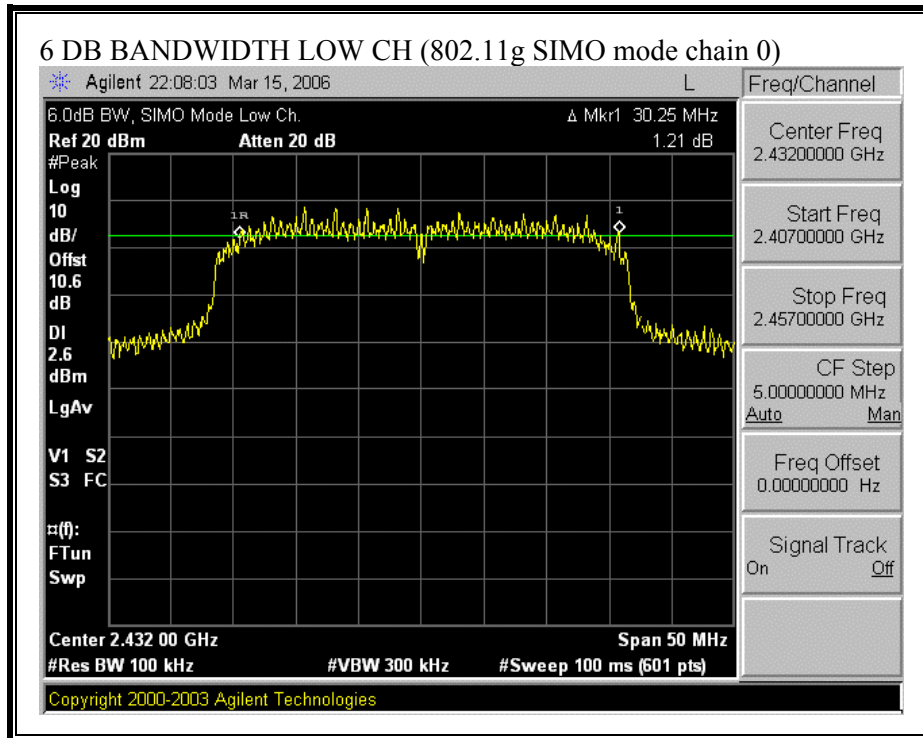


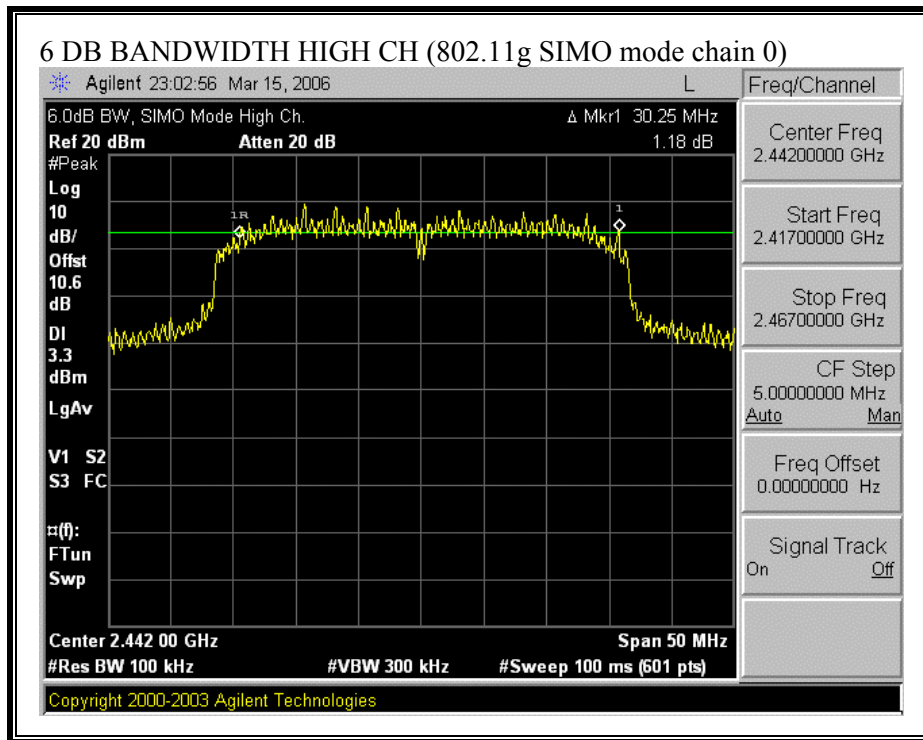






**6 DB BANDWIDTH (802.11g SIMO MODE CHAIN 0)**





### **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:

TRANSMIT CHAIN 0

802.11b Mode

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>99% Bandwidth Chain 0 (MHz)</b>
Low	2412	14.54
Middle	2437	14.68
High	2462	14.84

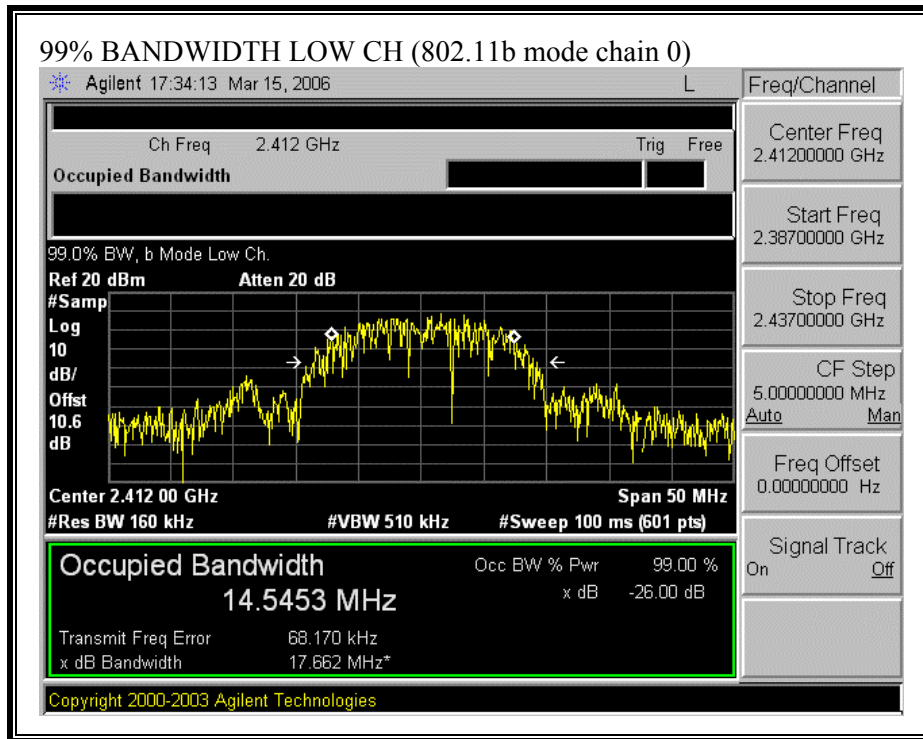
802.11g Mode

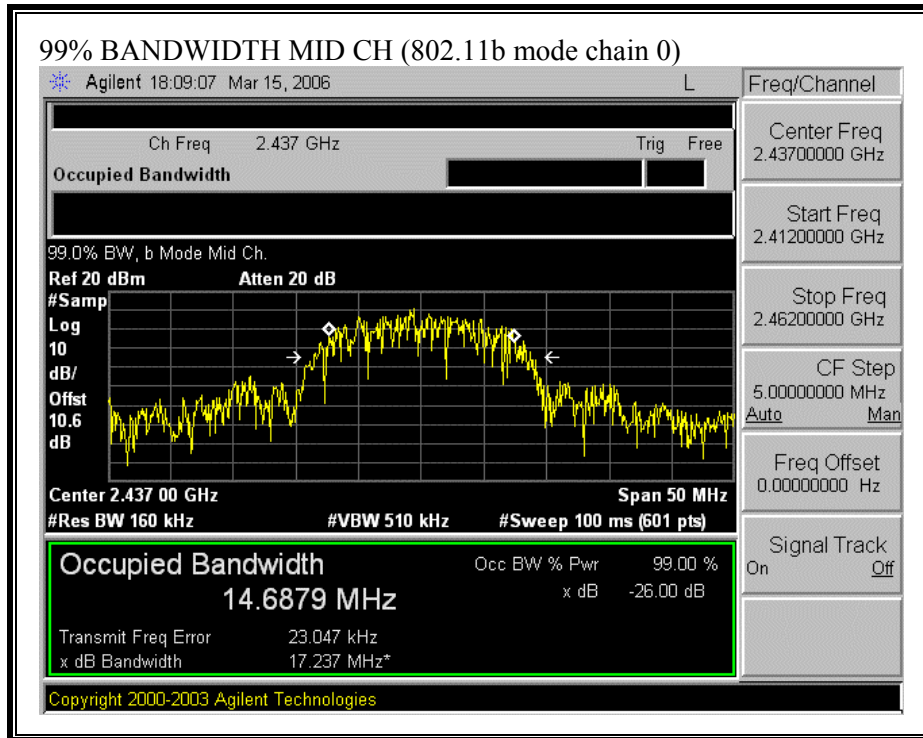
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>99% Bandwidth Chain 0 (MHz)</b>
Low	2412	16.29
Middle	2437	16.73
High	2462	16.2

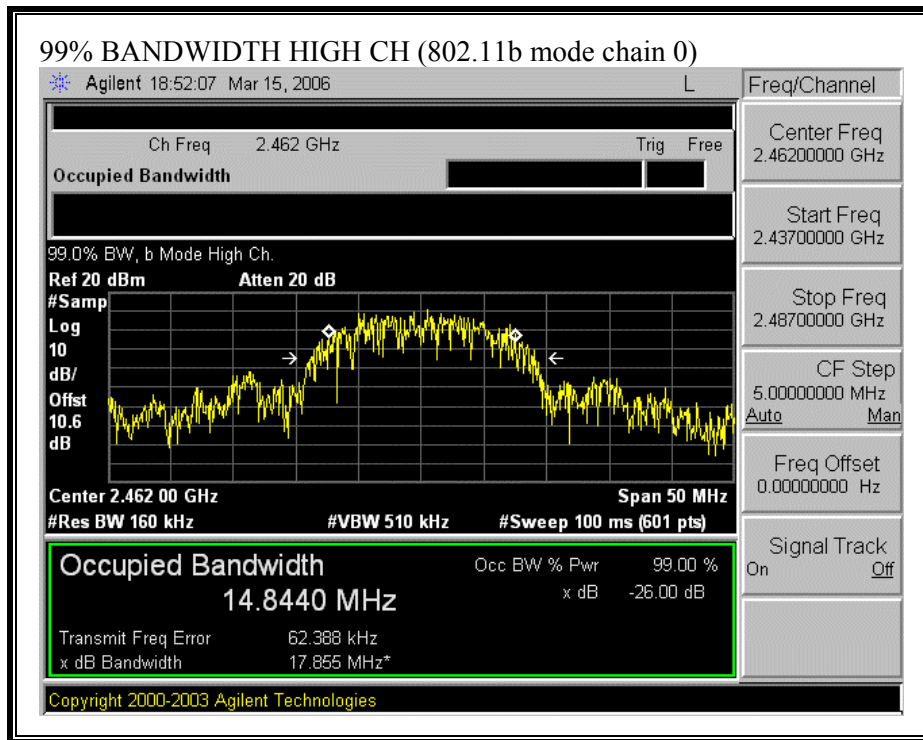
802.11g SIMO Mode

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>99% Bandwidth Chain 0 (MHz)</b>
Low	2432	32.33
High	2442	31.94

**99% BANDWIDTH (802.11b MODE CHAIN 0)**

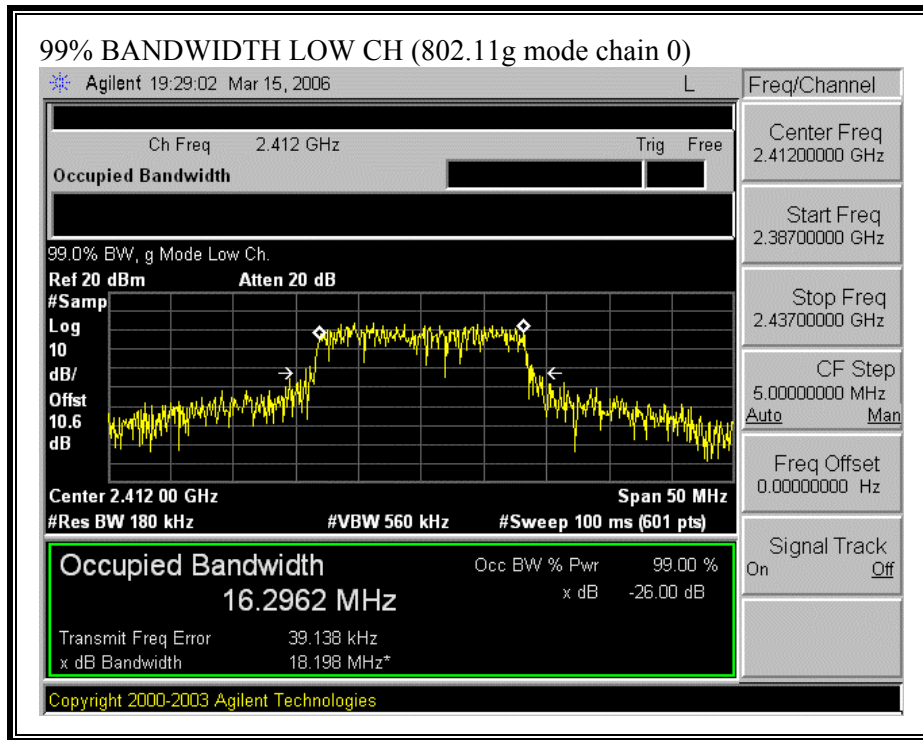


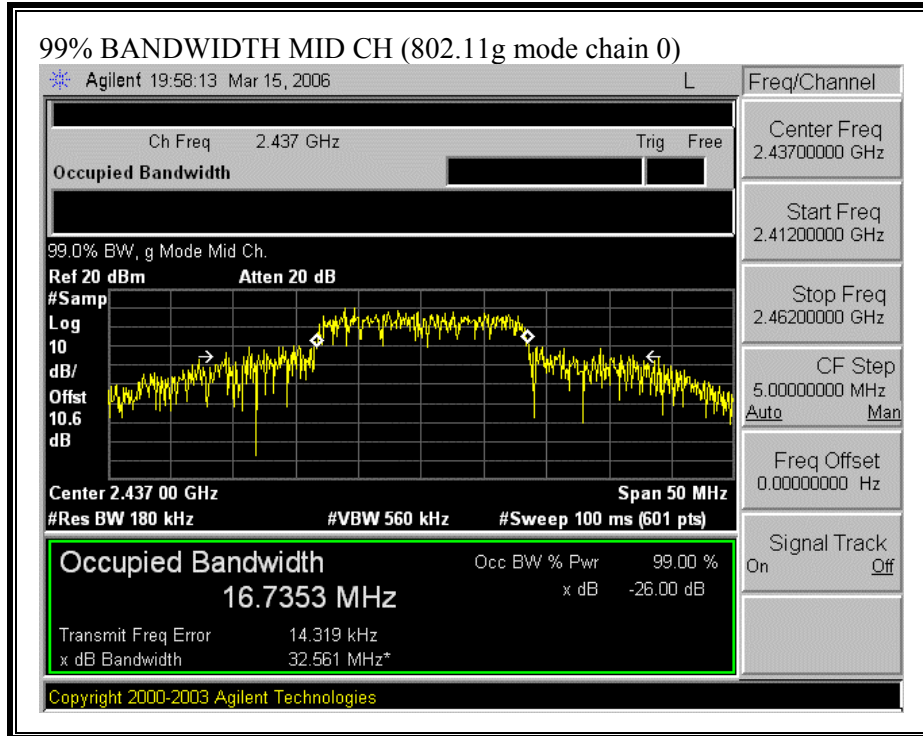


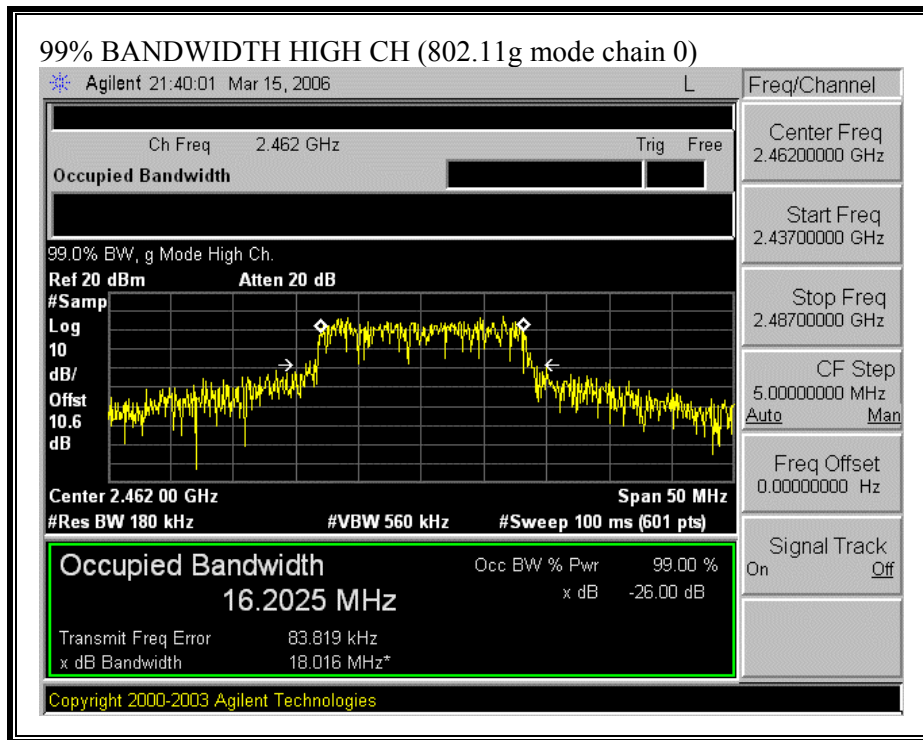




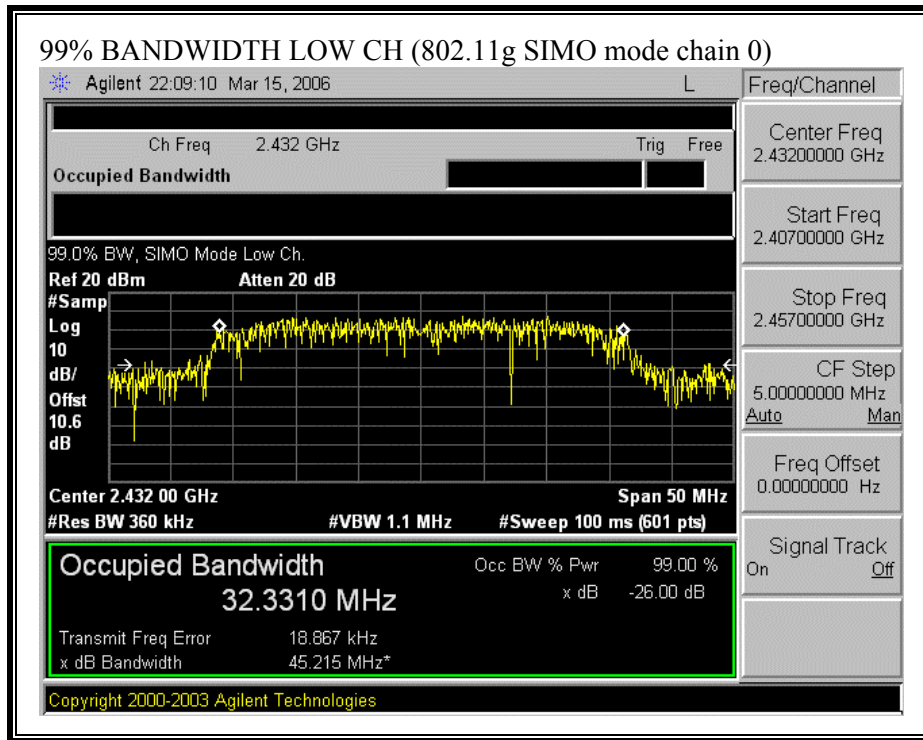
**99% BANDWIDTH (802.11g MODE CHAIN 0)**

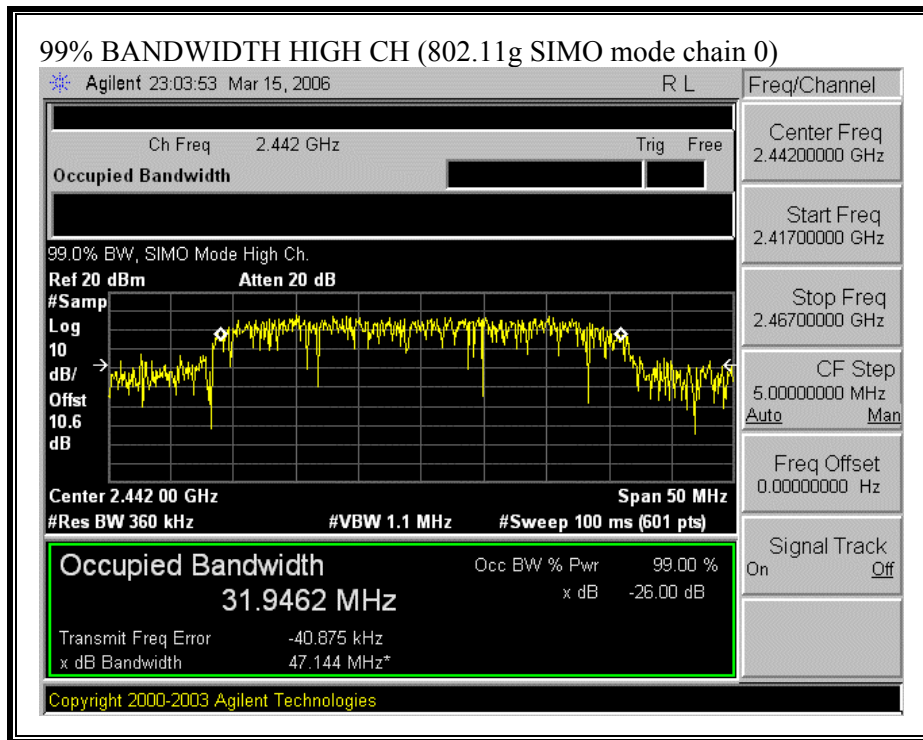






**99% BANDWIDTH (802.11g SIMO MODE CHAIN 0)**





### 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.

The test is performed in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005. The transmitter operates continuously therefore Power Output Option 2, Method # 1 is used.

## **RESULTS**

The maximum antenna gain is 2 dBi for other than fixed, point-to-point operations, therefore the limit is 30 dBm.

No non-compliance noted:

### 802.11b Mode

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Chain 0 (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>
Low	2412	23.19	30	-6.81
Middle	2437	23.84	30	-6.16
High	2462	24.90	30	-5.10

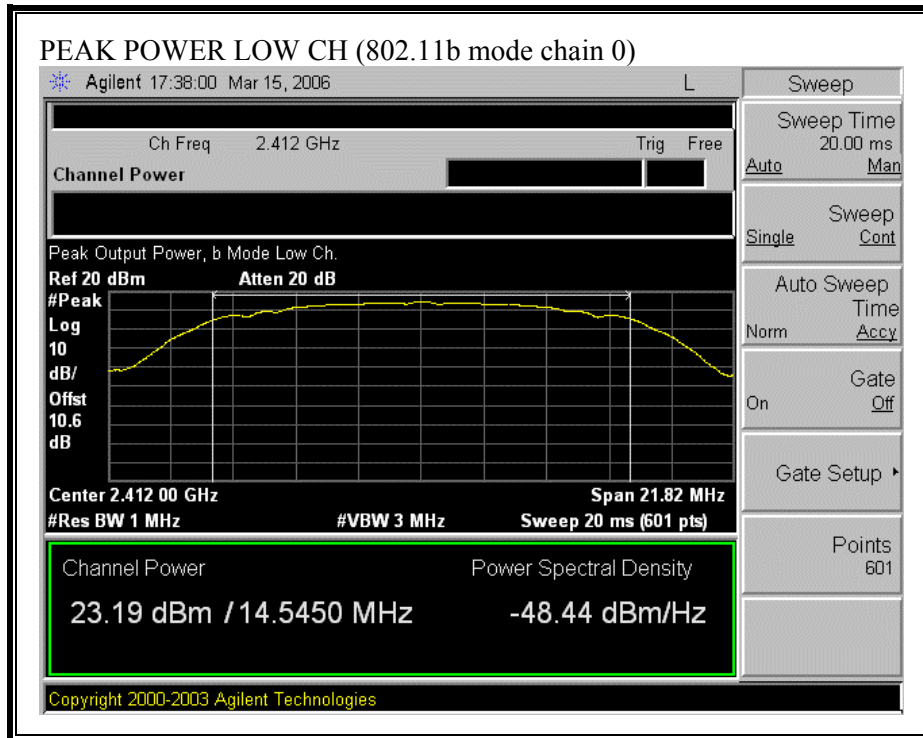
### 802.11g Mode

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Chain 0 (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>
Low	2412	23.72	30	-6.28
Middle	2437	29.03	30	-0.97
High	2462	26.20	30	-3.80

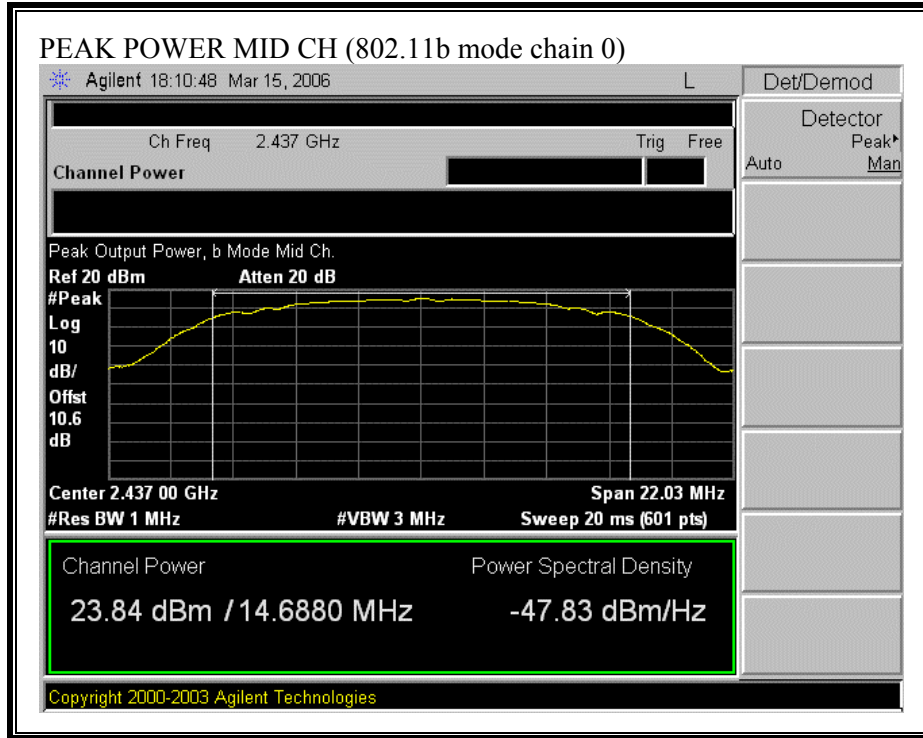
### 802.11g SIMO Mode

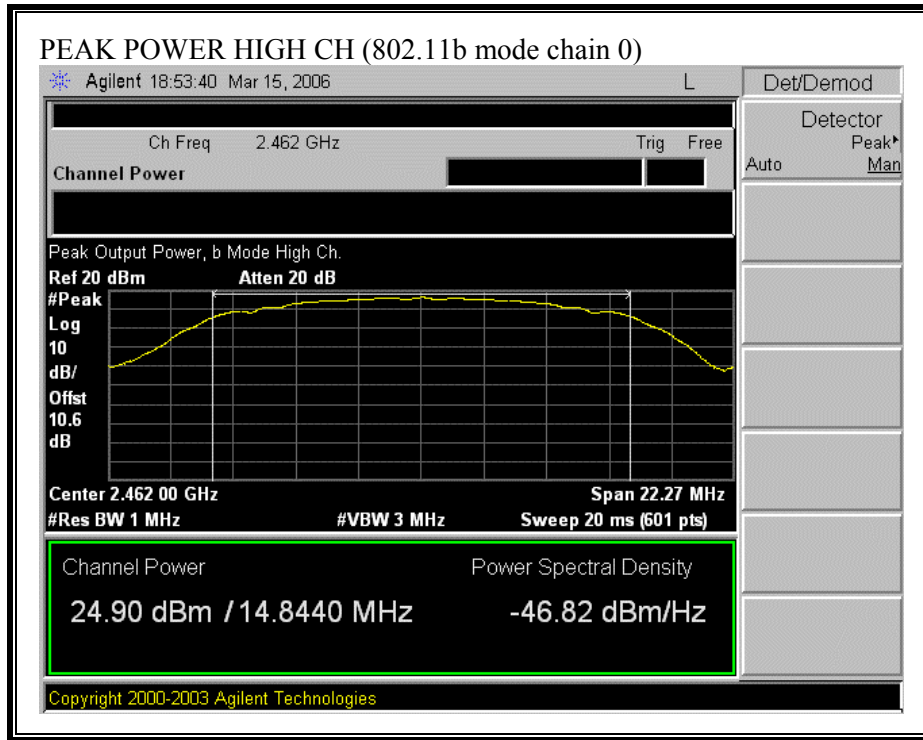
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Chain 0 (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>
Low	2432	26.42	30	-3.58
High	2442	26.95	30	-3.05

**OUTPUT POWER (802.11b MODE CHAIN 0)**

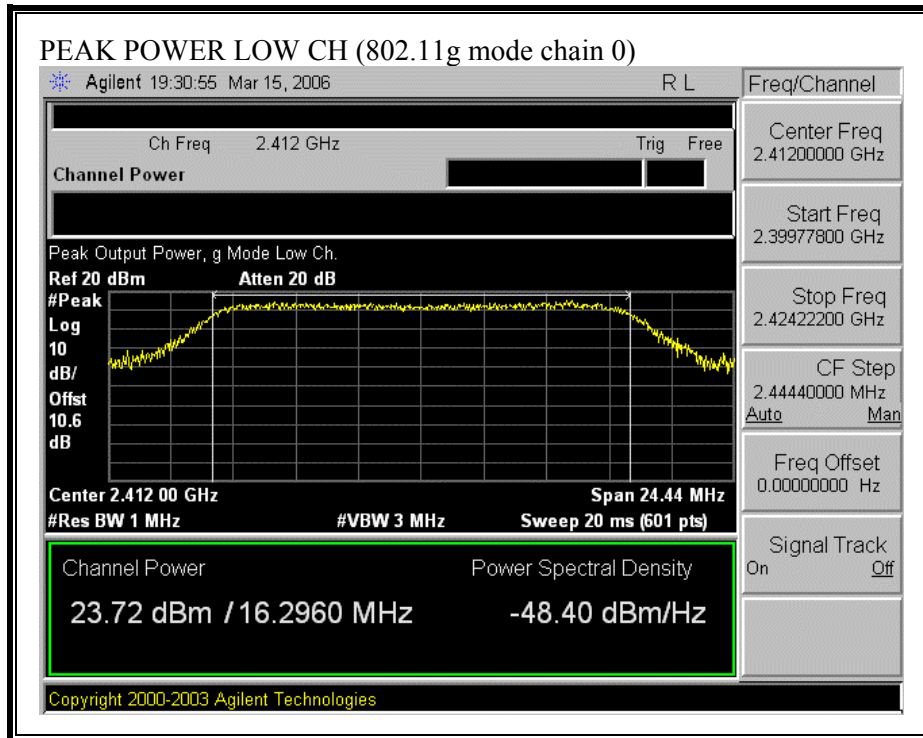


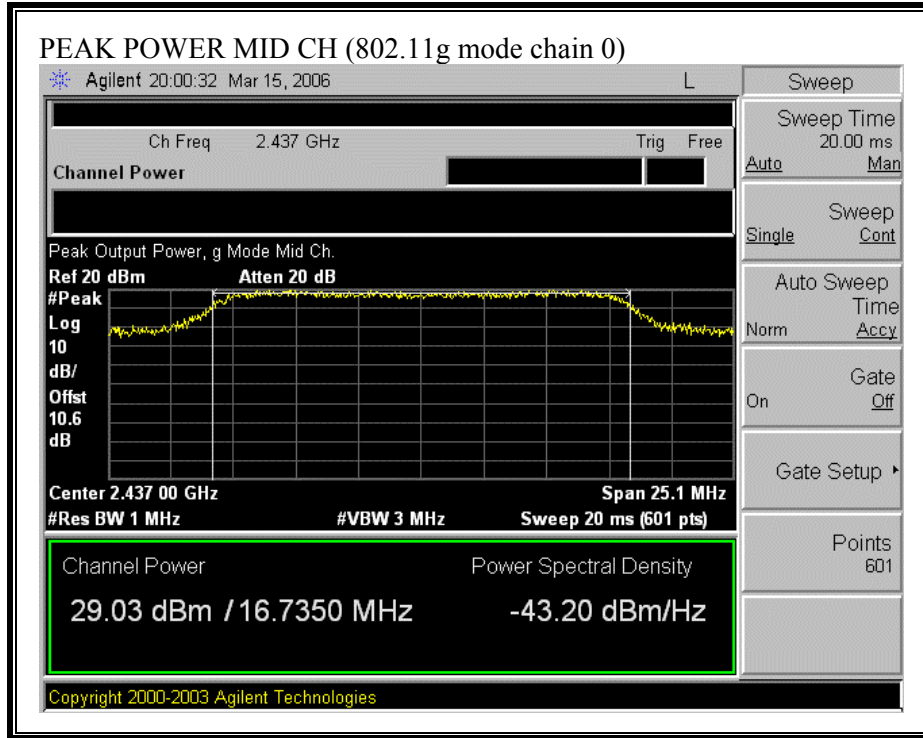


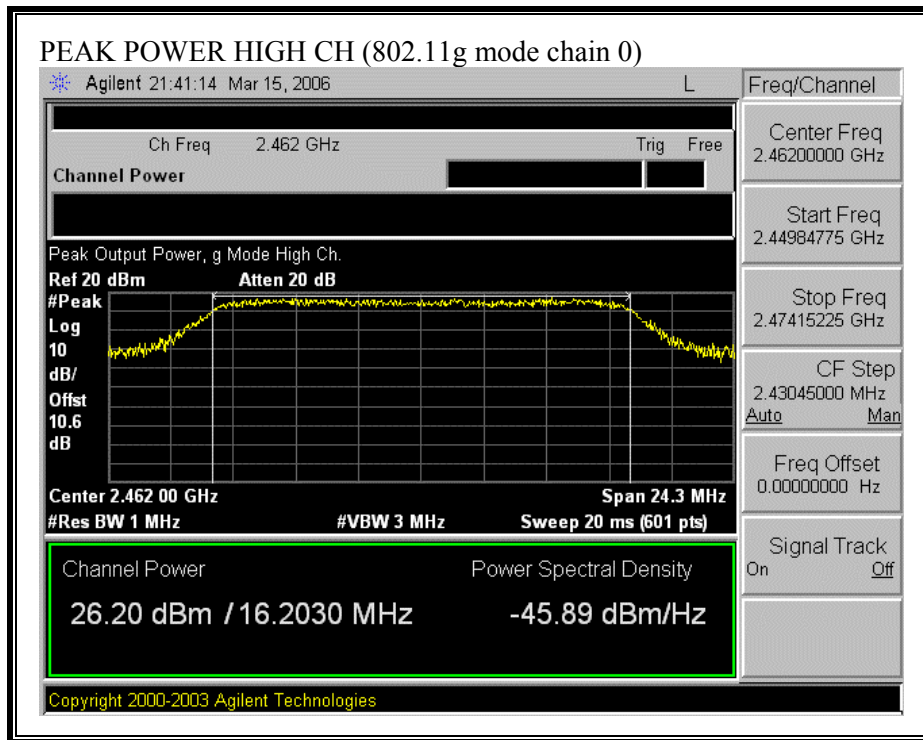




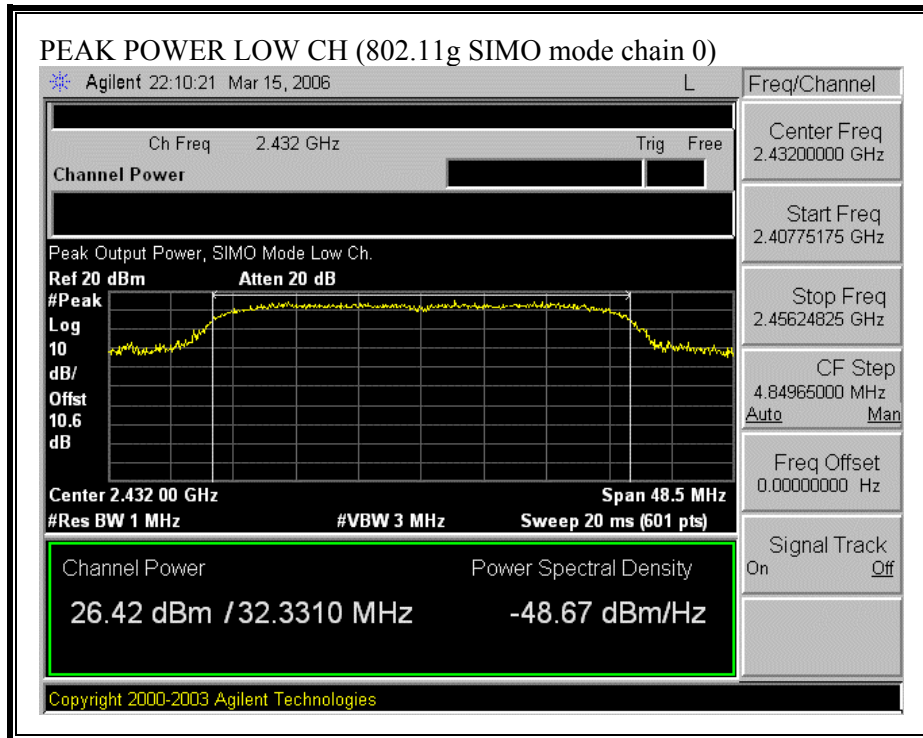
**OUTPUT POWER (802.11g MODE CHAIN 0)**

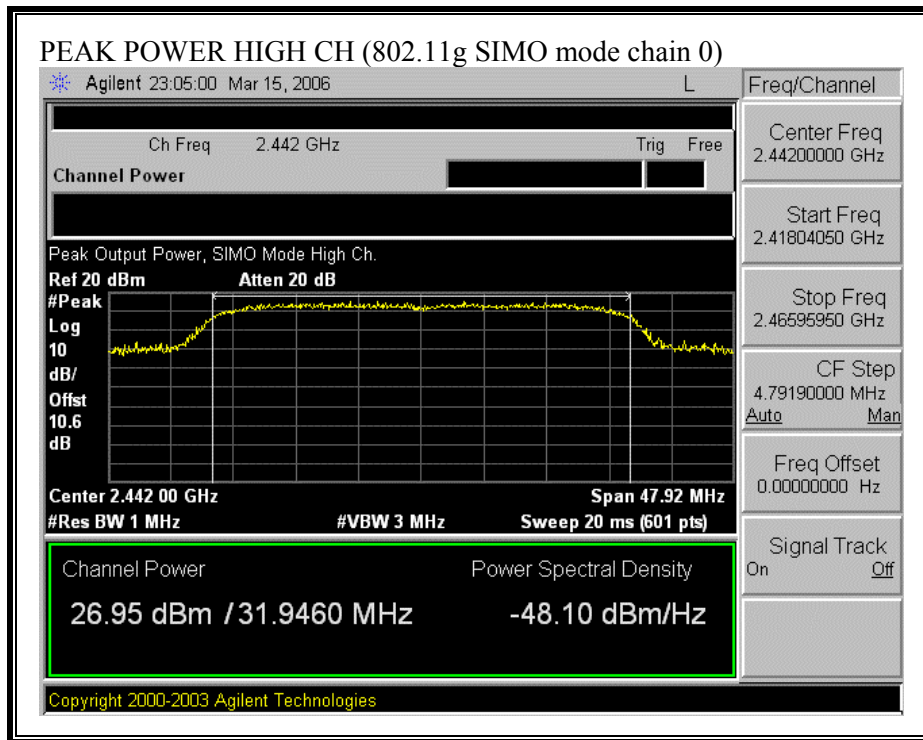






**OUTPUT POWER (802.11g SIMO MODE CHAIN 0)**





### 7.1.4. 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 and rearranging the terms to express the distance as a function of the remaining variables yields:

$$d = \sqrt{((30 * P * G) / (3770 * S))}$$

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

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

$$d \text{ (cm)} = 100 * d \text{ (m)}$$

yields

$$d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$$

$$d = 0.282 * \sqrt{(P * G / S)}$$

where

d = distance in cm

P = Power in mW

G = Numeric antenna gain

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

Substituting the logarithmic form of power and gain using:

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

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

yields

$$d = 0.282 * 10^{((P + G) / 20)} / \sqrt{S}$$

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>

Rearranging terms to calculate the power density at a specific distance yields

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

**LIMITS**

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

**RESULTS**

No non-compliance noted: (MPE distance equals 20 cm)

<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	24.90	2.00	0.10
802.11g	20.0	29.03	2.00	0.25
802.11g SIMO	20.0	26.95	2.00	0.16

## **7.1.5. 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 21.53 dB (including 20.55 dB pad and 0.98 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 Chain 0 (dBm)
Low	2412	19.84
Middle	2437	20.31
High	2462	21.40

802.11g Mode

Channel	Frequency (MHz)	Power Chain 0 (dBm)
Low	2412	16.93
Middle	2437	22.30
High	2462	19.20

802.11g SIMO Mode

Channel	Frequency (MHz)	Power Chain 0 (dBm)
Low	2412	15.81
High	2462	16.85

802.11g MIMO Mode

Channel	Frequency (MHz)	Power Chain 0 (dBm)
Low	2412	20.22
High	2462	20.59

## **7.1.6. 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 Chain 0 (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-1.75	8	-9.75
Middle	2437	-1.44	8	-9.44
High	2462	-0.01	8	-8.01

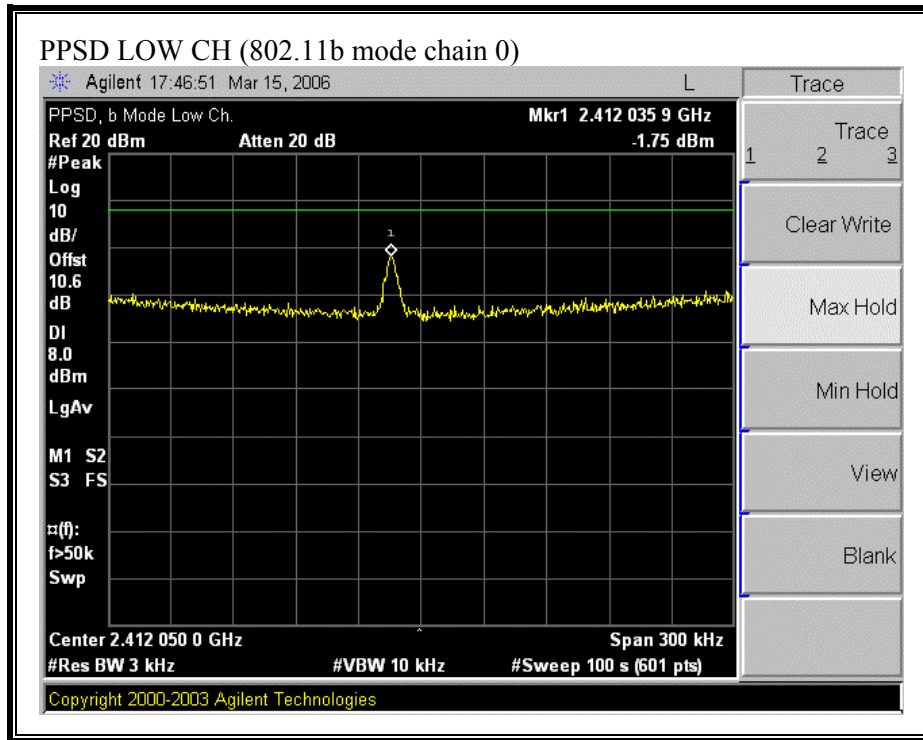
802.11g Mode

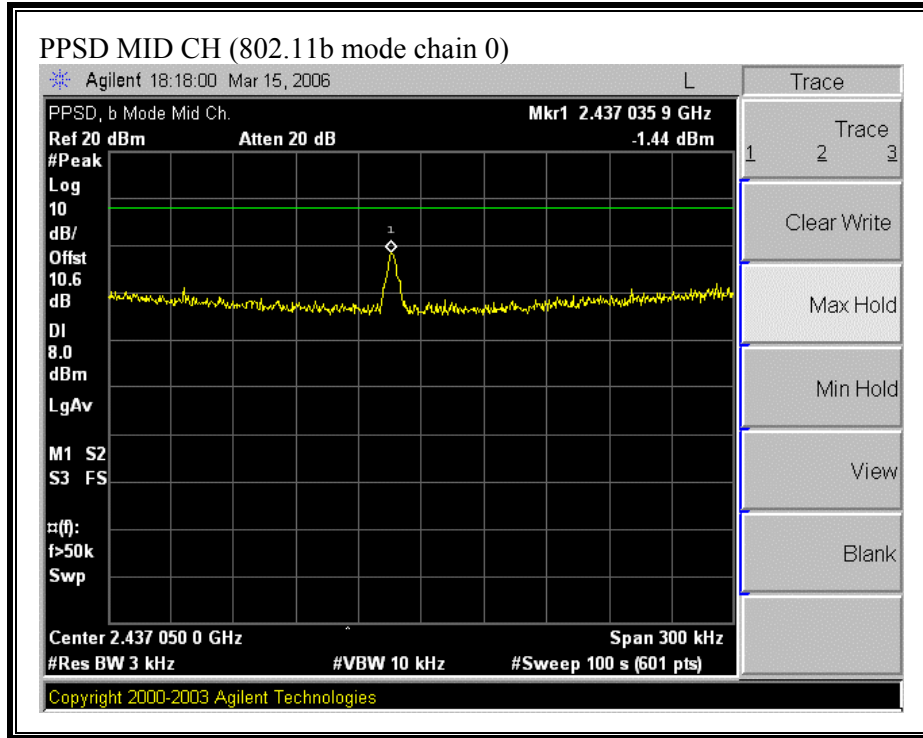
Channel	Frequency (MHz)	PPSD Chain 0 (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-4.13	8	-12.13
Middle	2437	0.39	8	-7.61
High	2462	-1.99	8	-9.99

802.11g SIMO Mode

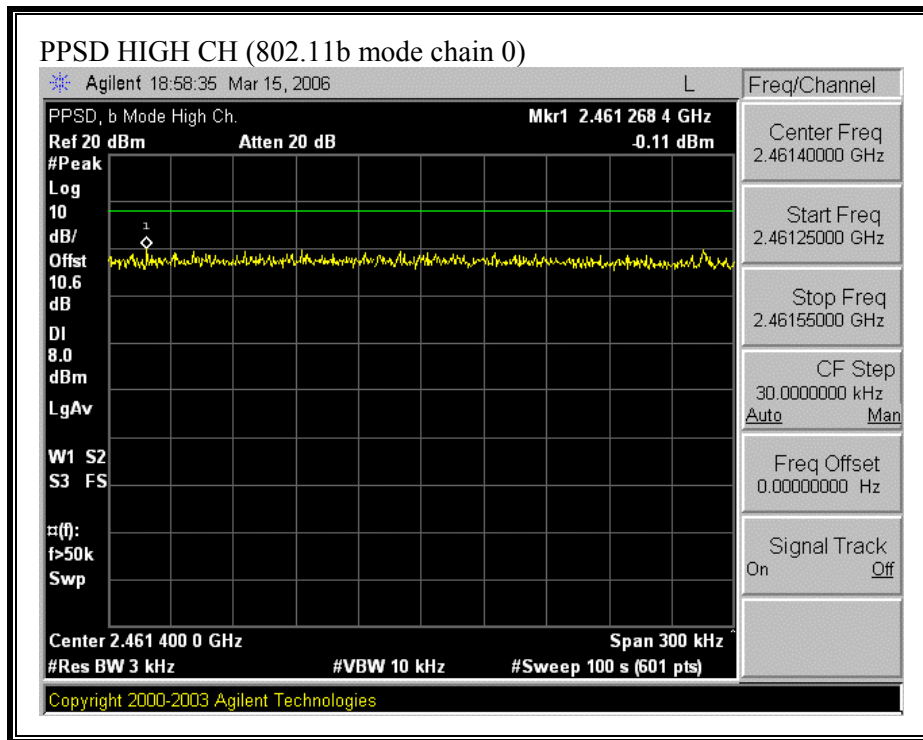
Channel	Frequency (MHz)	PPSD Chain 0 (dBm)	Limit (dBm)	Margin (dB)
Low	2432	-1.56	8	-9.56
High	2442	0.61	8	-7.39

**PEAK POWER SPECTRAL DENSITY (802.11b MODE CHAIN 0)**

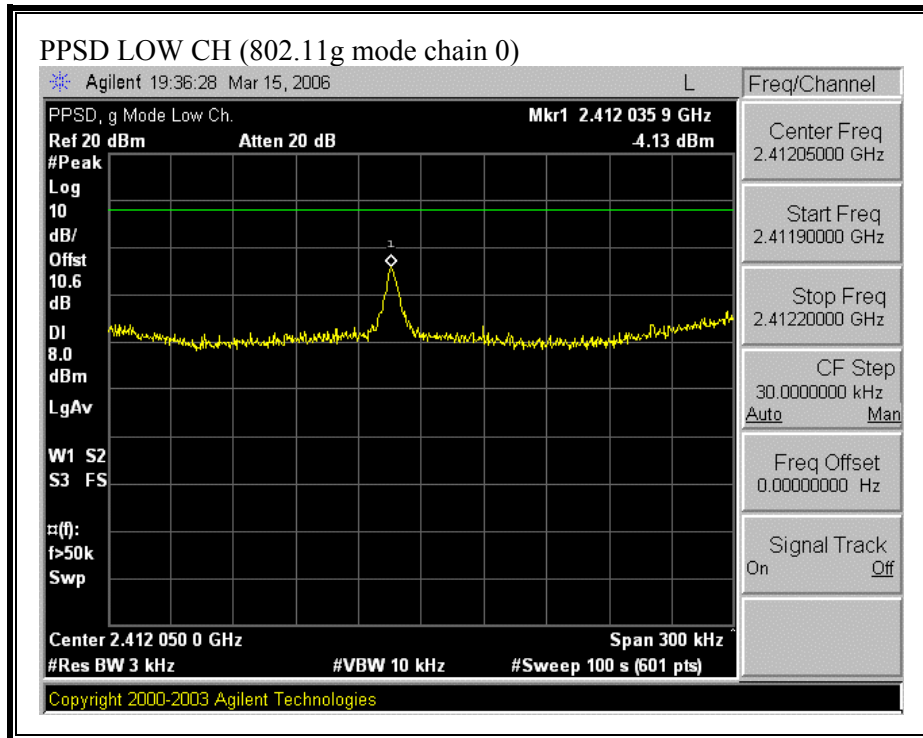


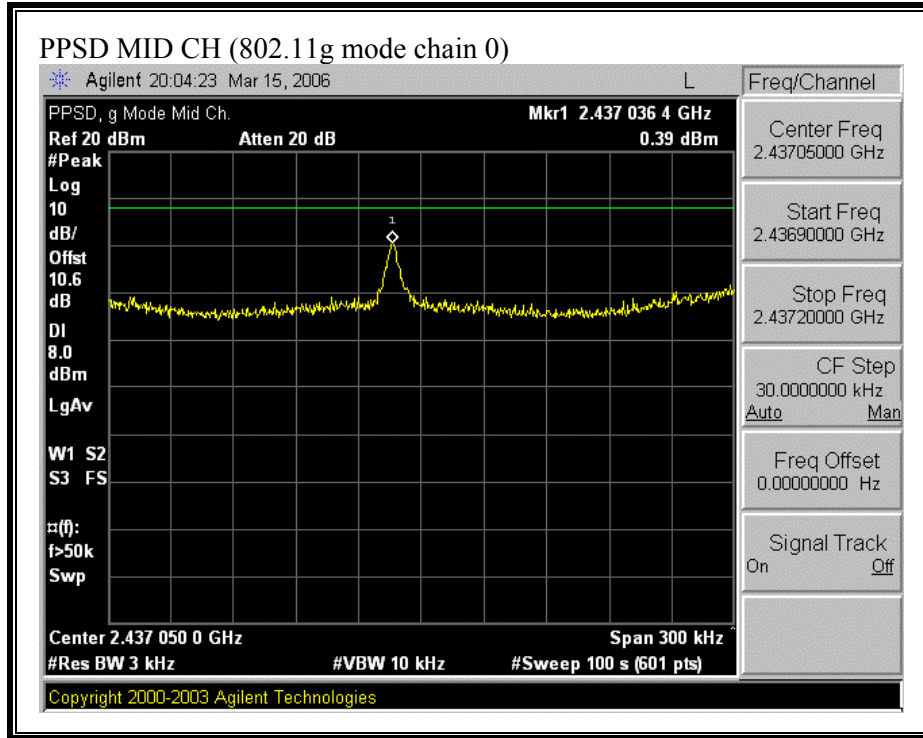


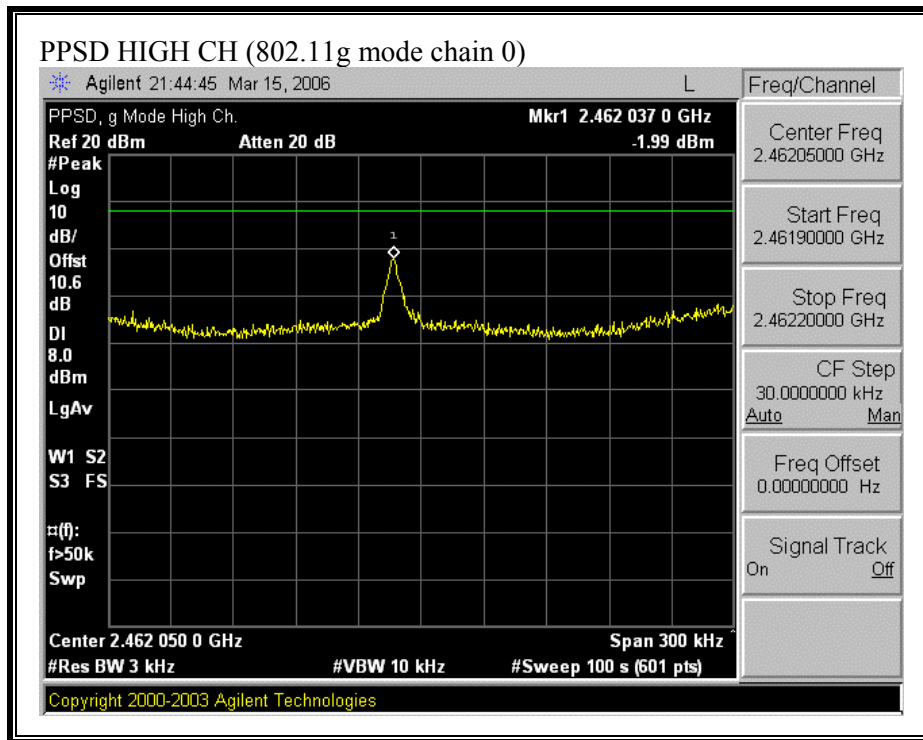




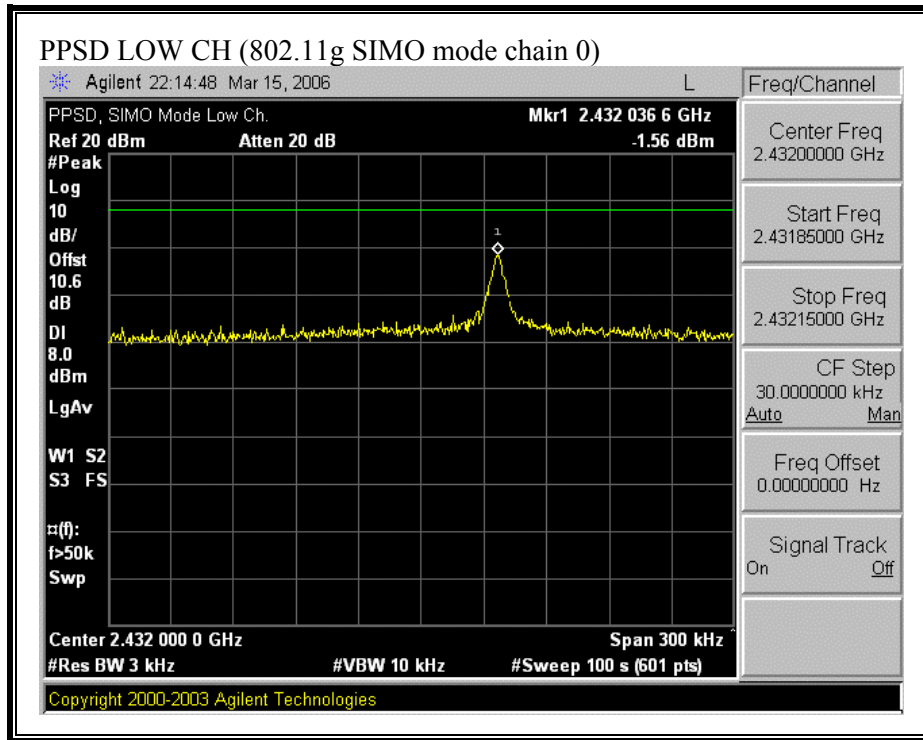
**PEAK POWER SPECTRAL DENSITY (802.11g MODE CHAIN 0)**

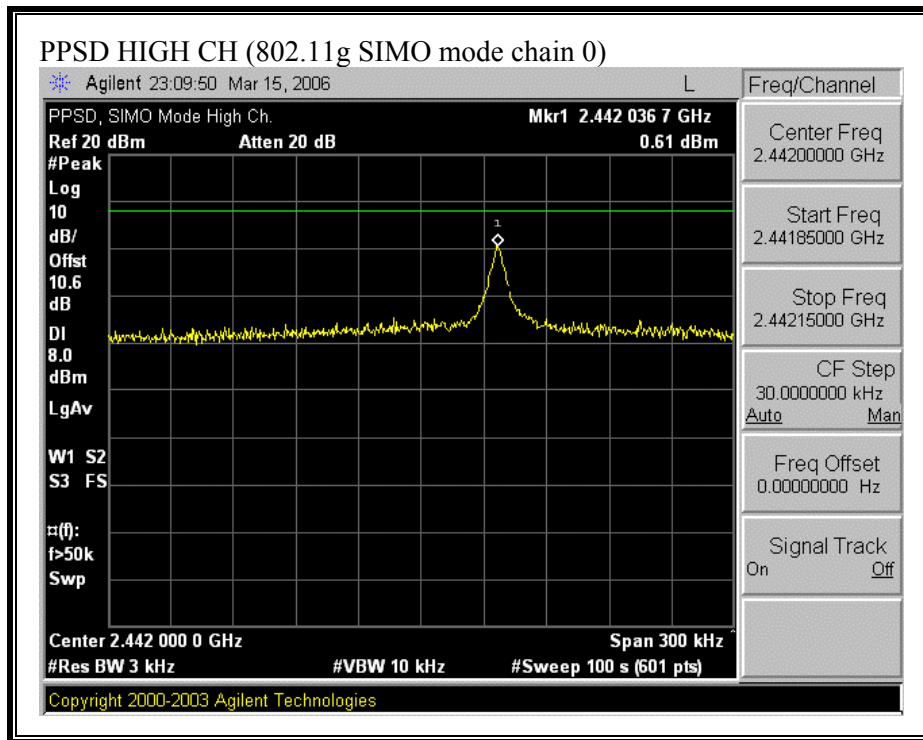






**PEAK POWER SPECTRAL DENSITY (802.11g SIMO MODE CHAIN 0)**





**PEAK POWER SPECTRAL DENSITY (802.11g SIMO MODE CHAIN 1)**

**7.1.7. 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 RMS averaging over a time interval, therefore the required attenuation is 30 dB.

**TEST PROCEDURE**

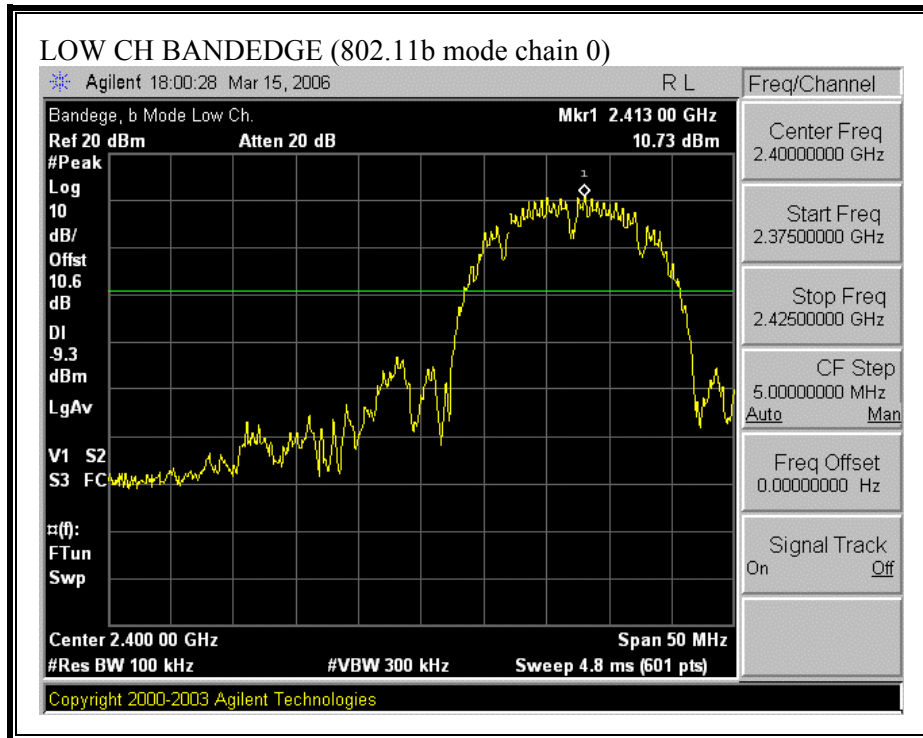
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

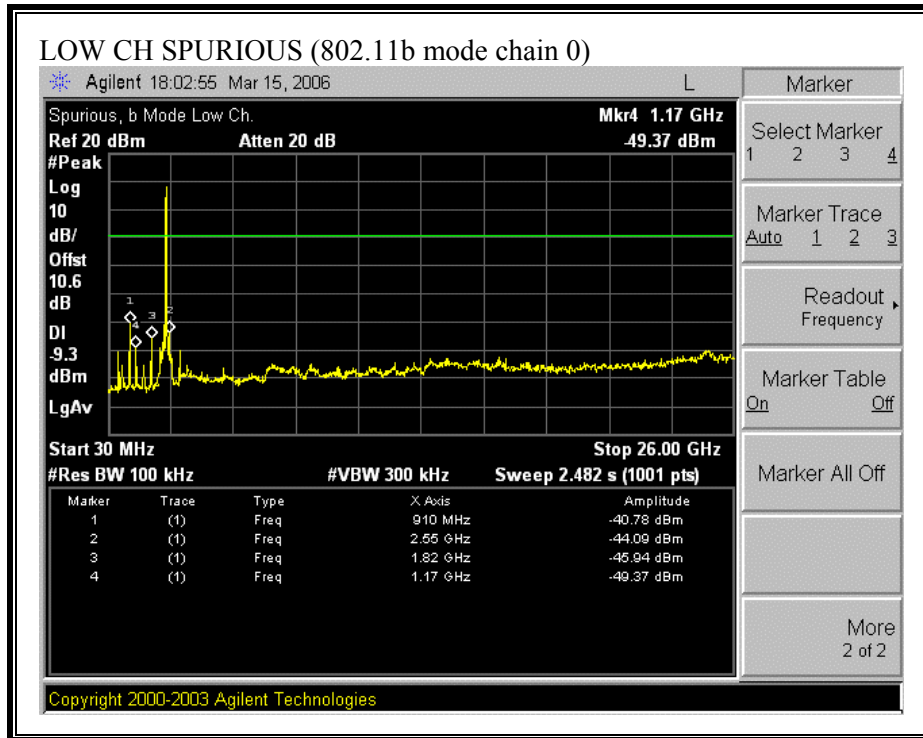
**RESULTS**

No non-compliance noted:

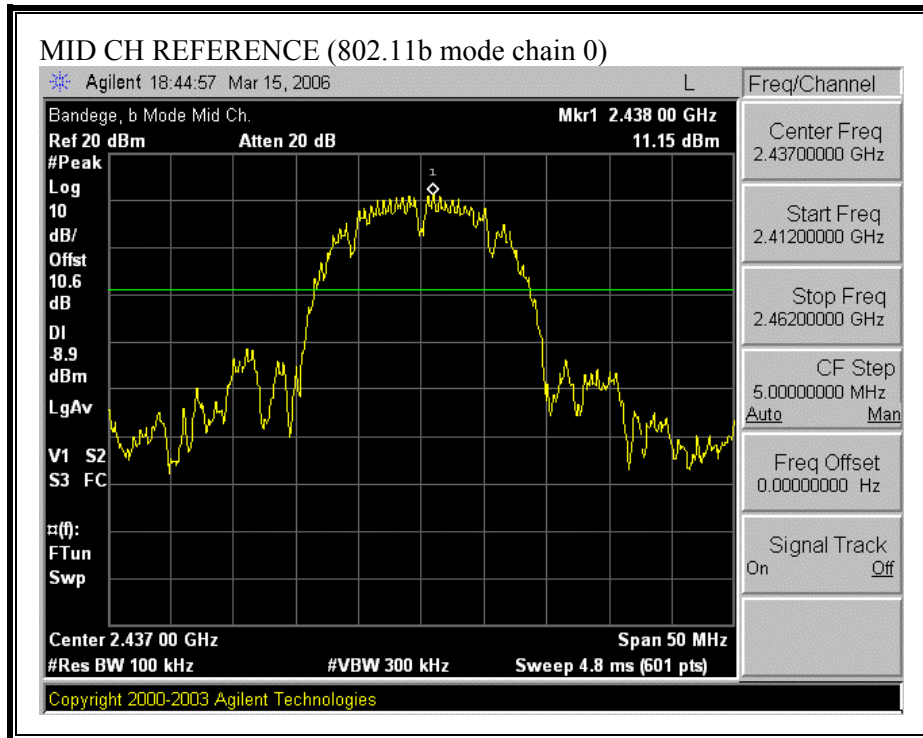
**SPURIOUS EMISSIONS, LOW CHANNEL (802.11b MODE CHAIN 0)**

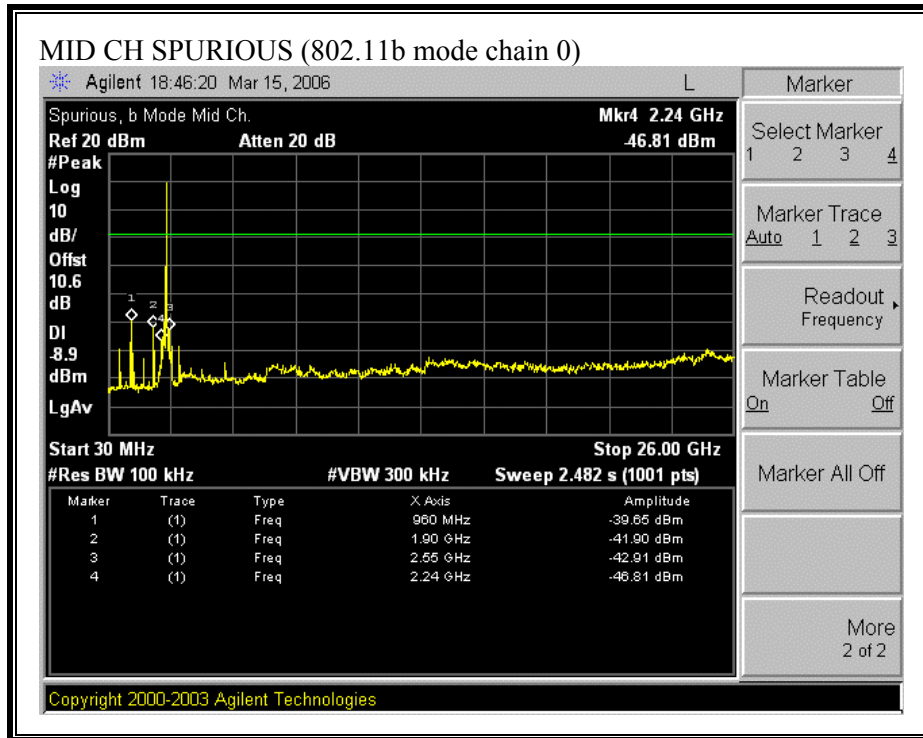




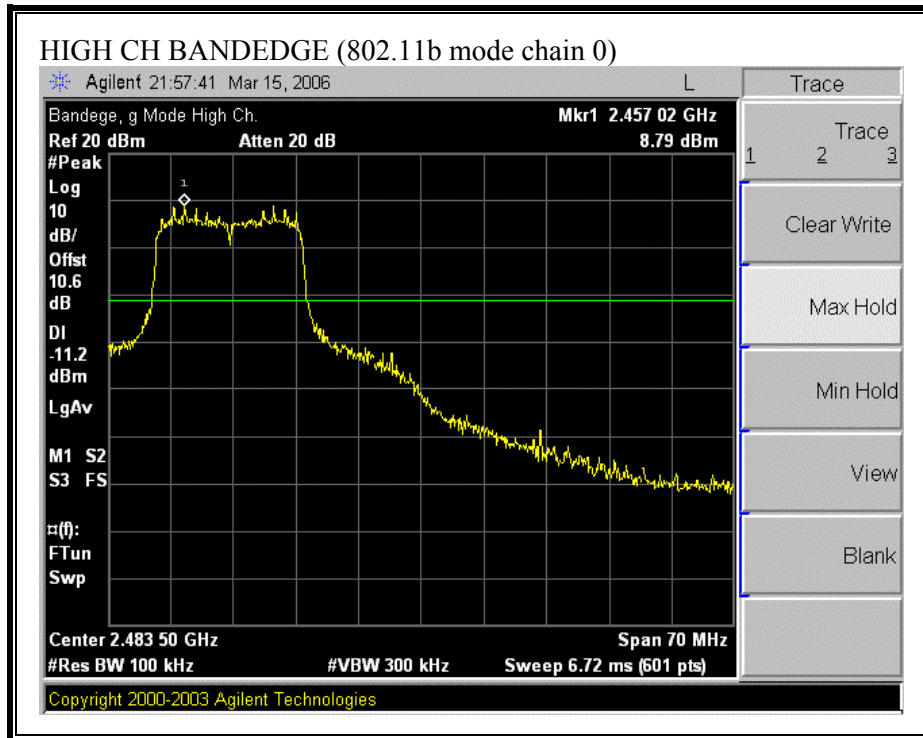


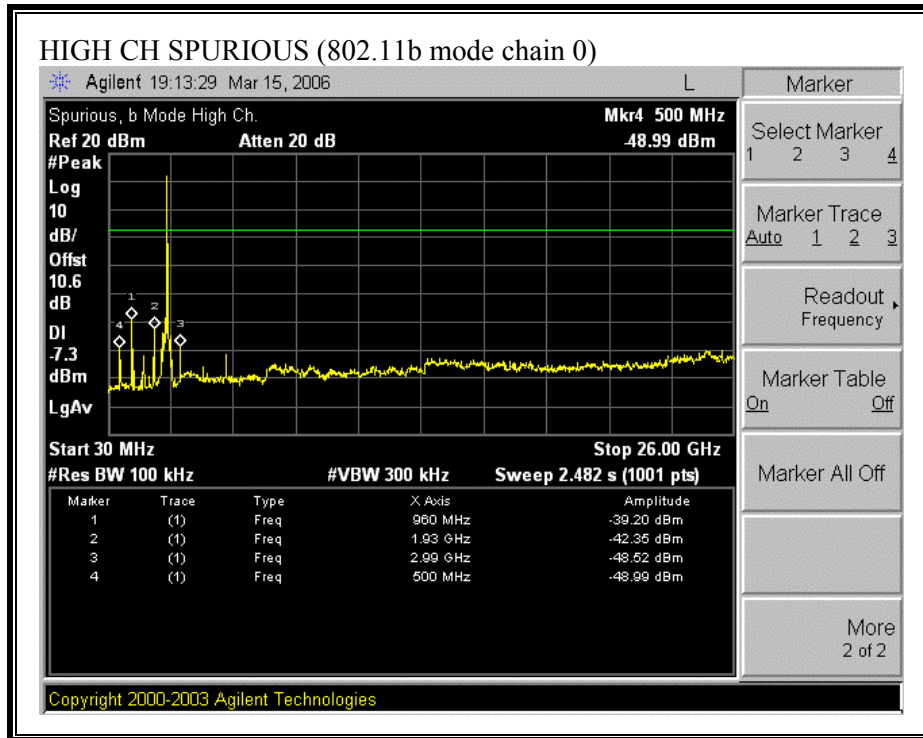
**SPURIOUS EMISSIONS, MID CHANNEL (802.11B MODE CHAIN 0)**



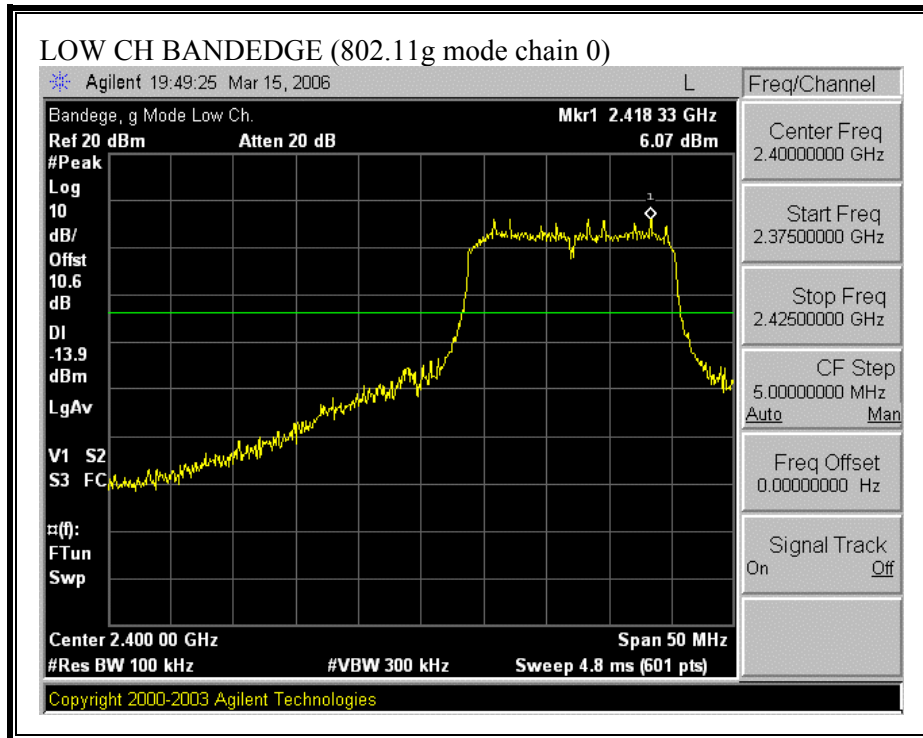


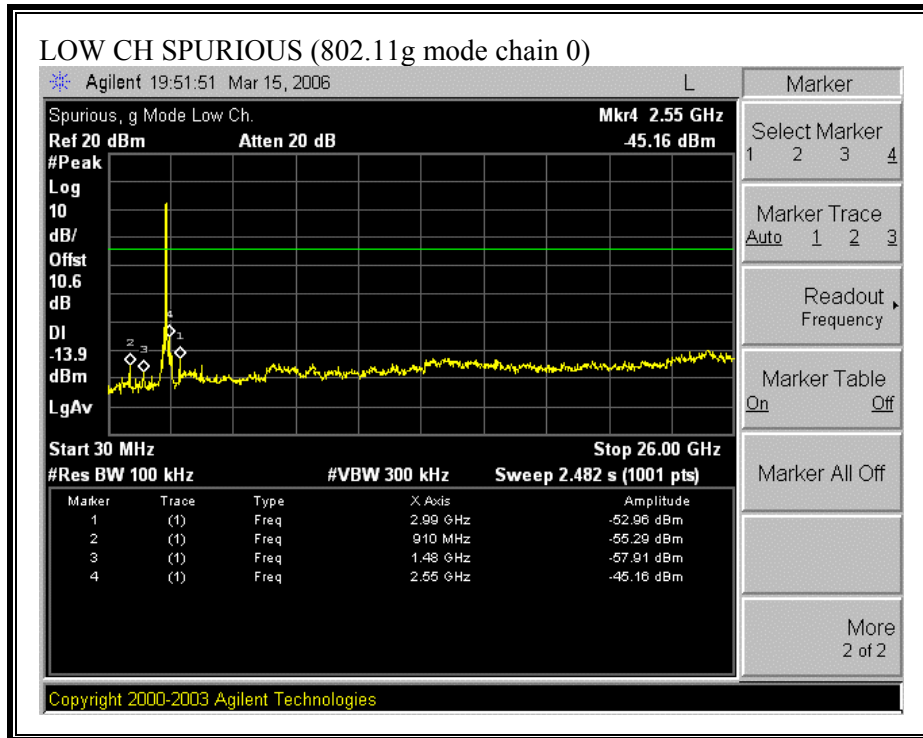
**SPURIOUS EMISSIONS, HIGH CHANNEL (802.11b MODE CHAIN 0)**



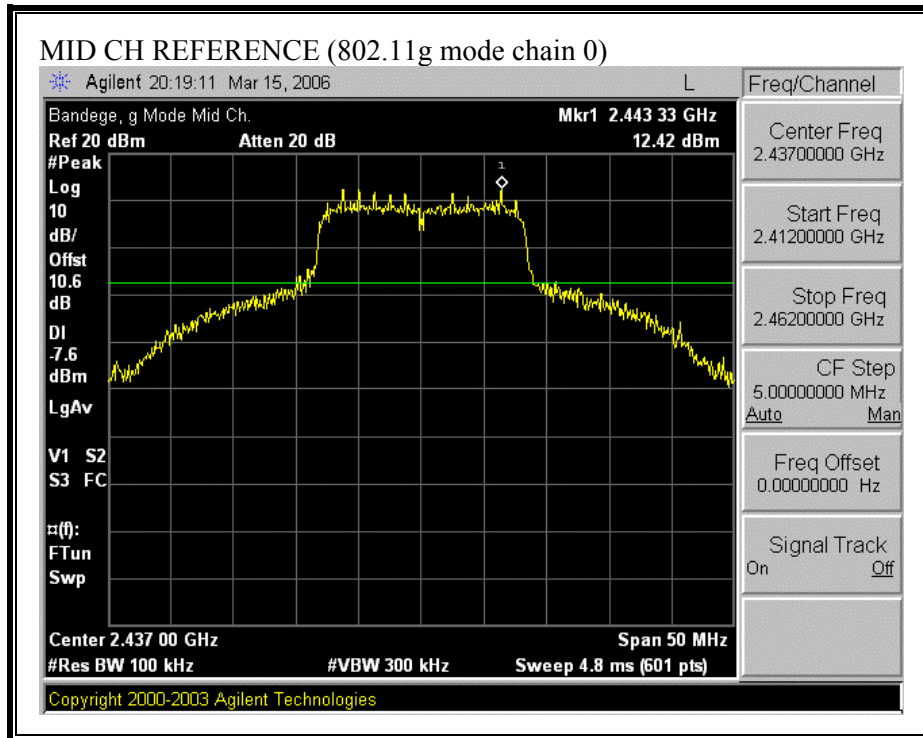


**SPURIOUS EMISSIONS, LOW CHANNEL (802.11g MODE CHAIN 0)**

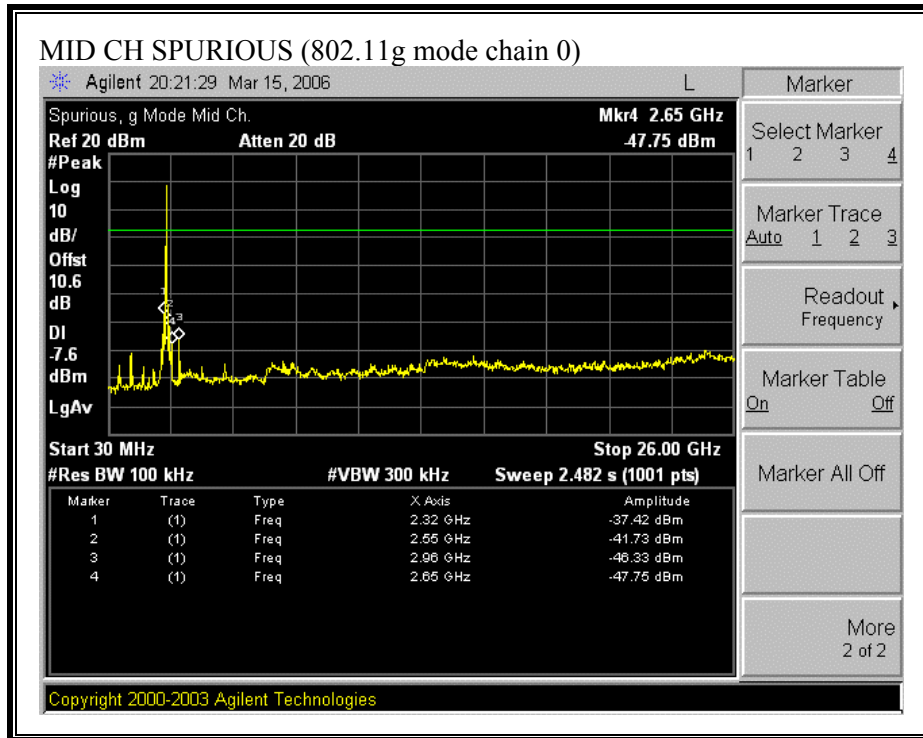




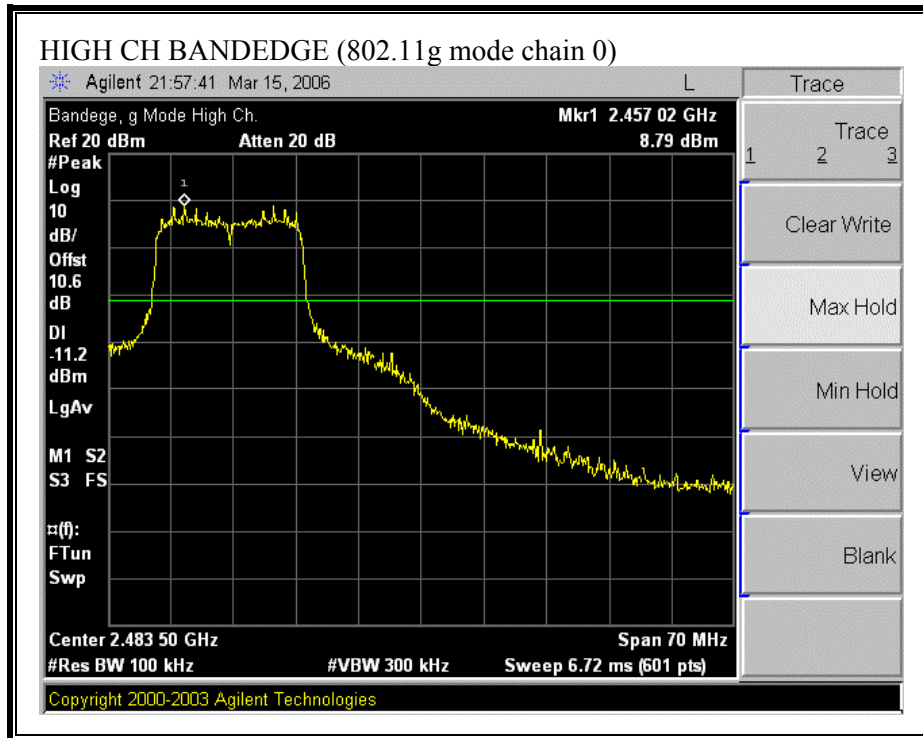
**SPURIOUS EMISSIONS, MID CHANNEL (802.11g MODE CHAIN 0)**

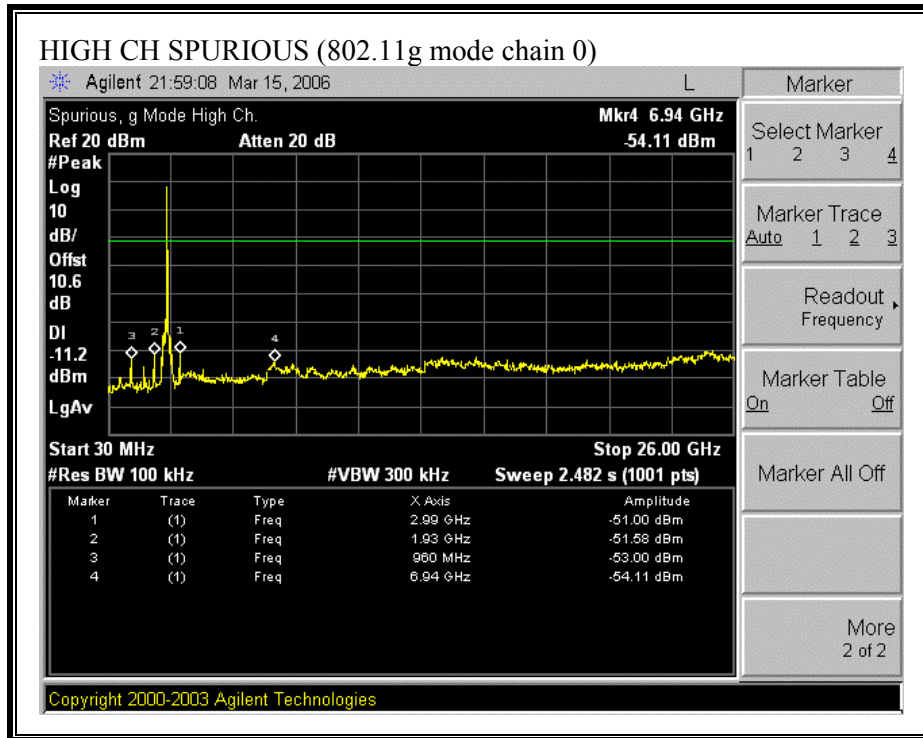




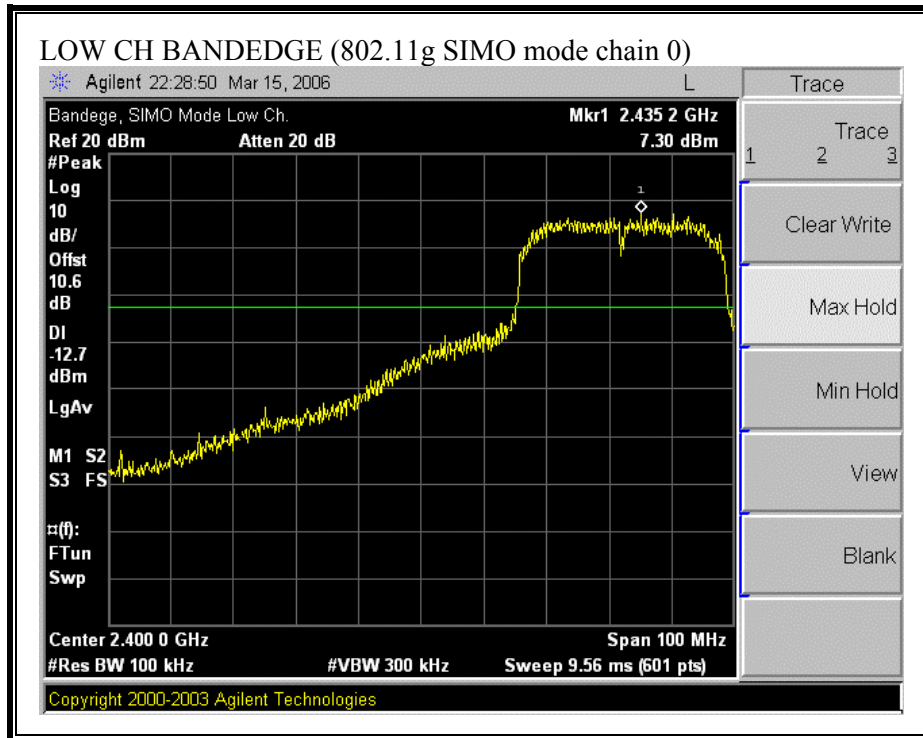


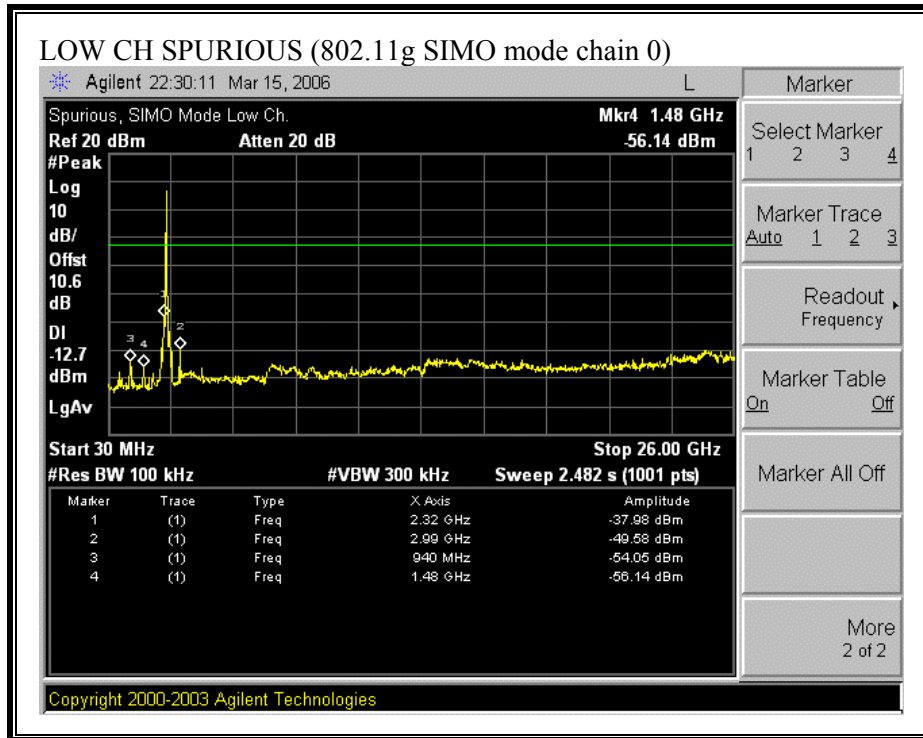
**SPURIOUS EMISSIONS, HIGH CHANNEL (802.11g MODE CHAIN 0)**



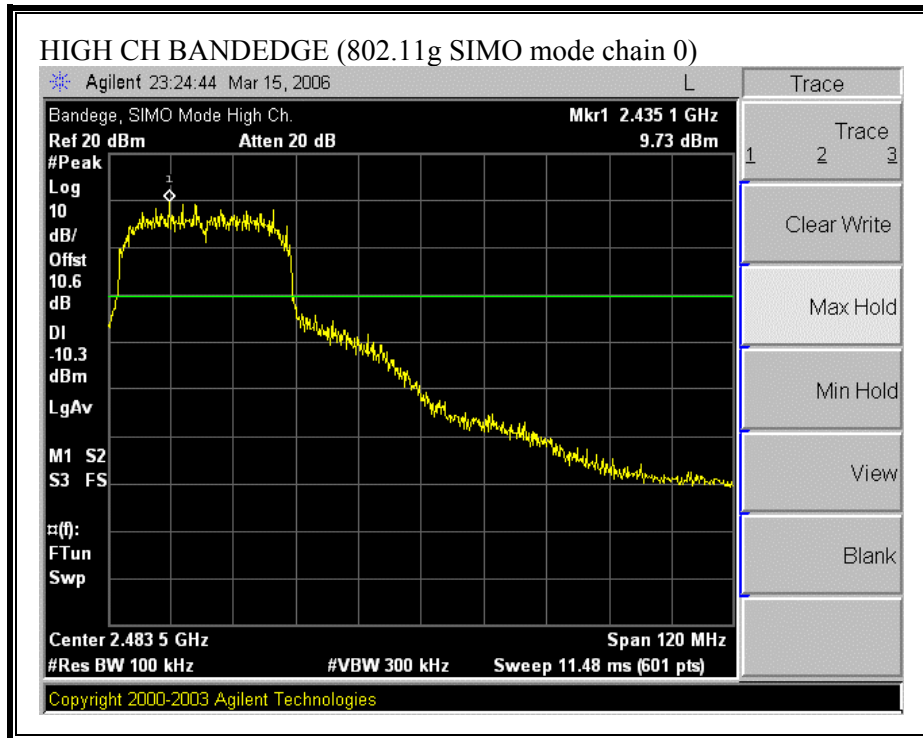


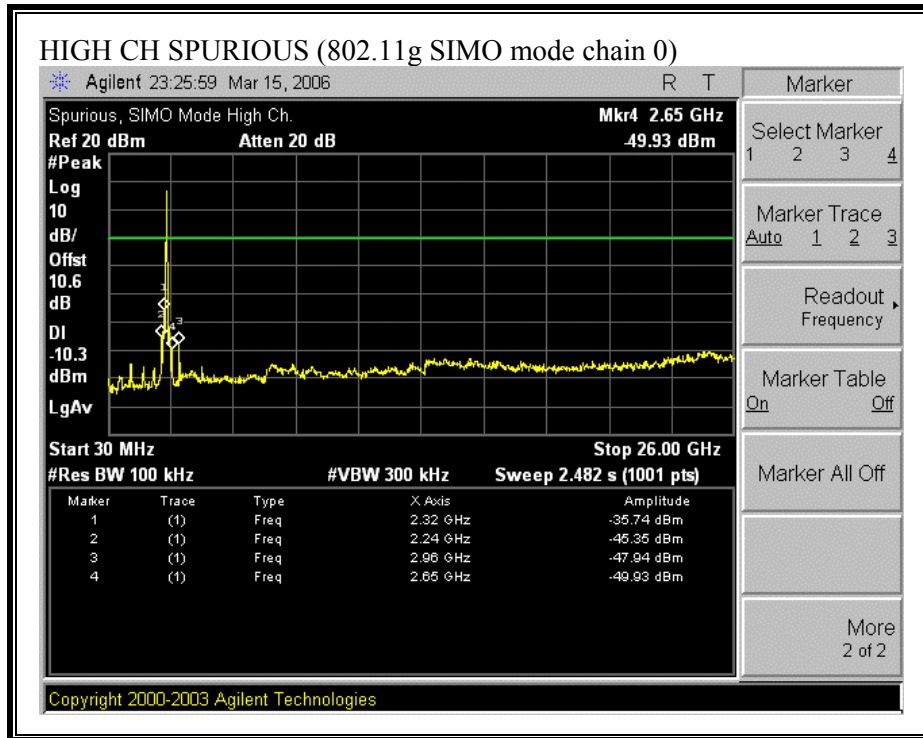
**SPURIOUS EMISSIONS, LOW CHANNEL (802.11g SIMO MODE CHAIN 0)**





**SPURIOUS EMISSIONS, HIGH CHANNEL (802.11g SIMO MODE CHAIN 0)**





## 7.2. RADIATED EMISSIONS

### 7.2.1. 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.

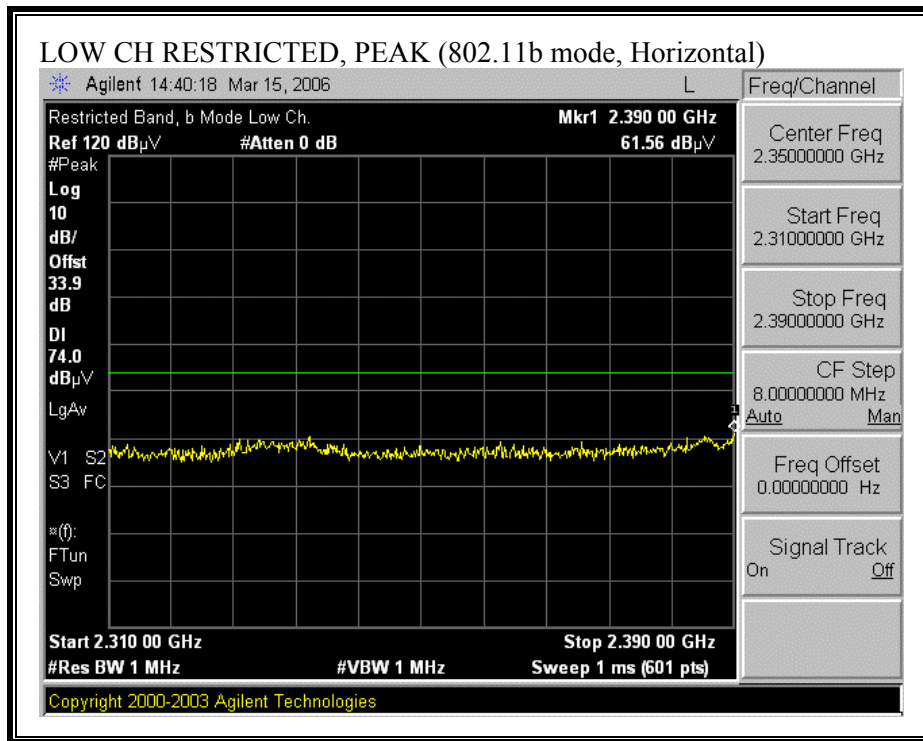
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

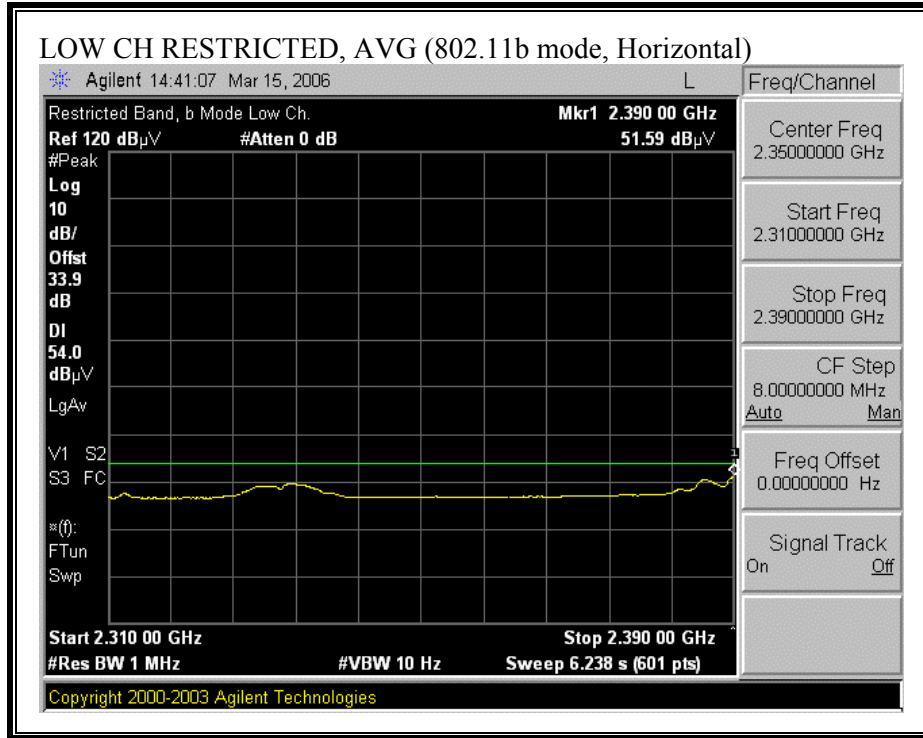
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each 5 GHz band.

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.

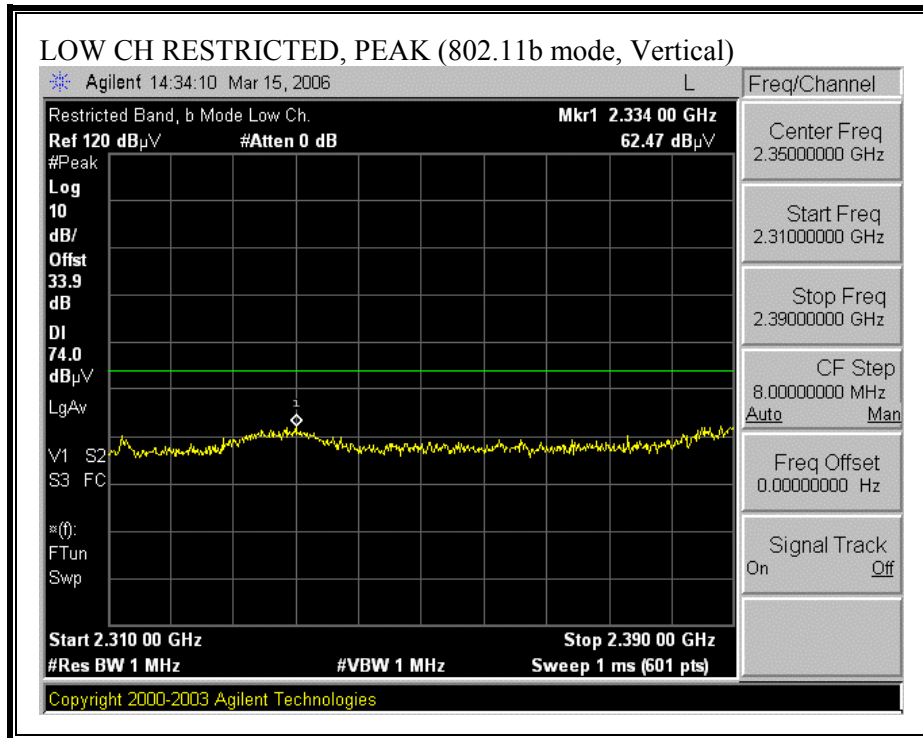
### 7.2.2. TRANSMITTER ABOVE 1 GHz - WITH WHIP ANTENNAS

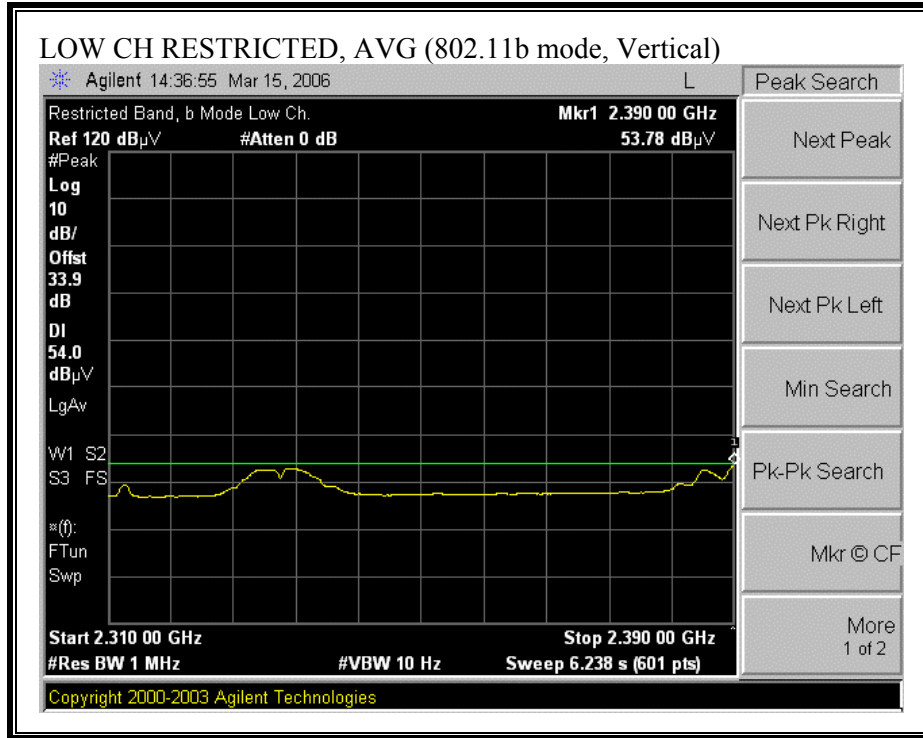
#### RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, HORIZONTAL)



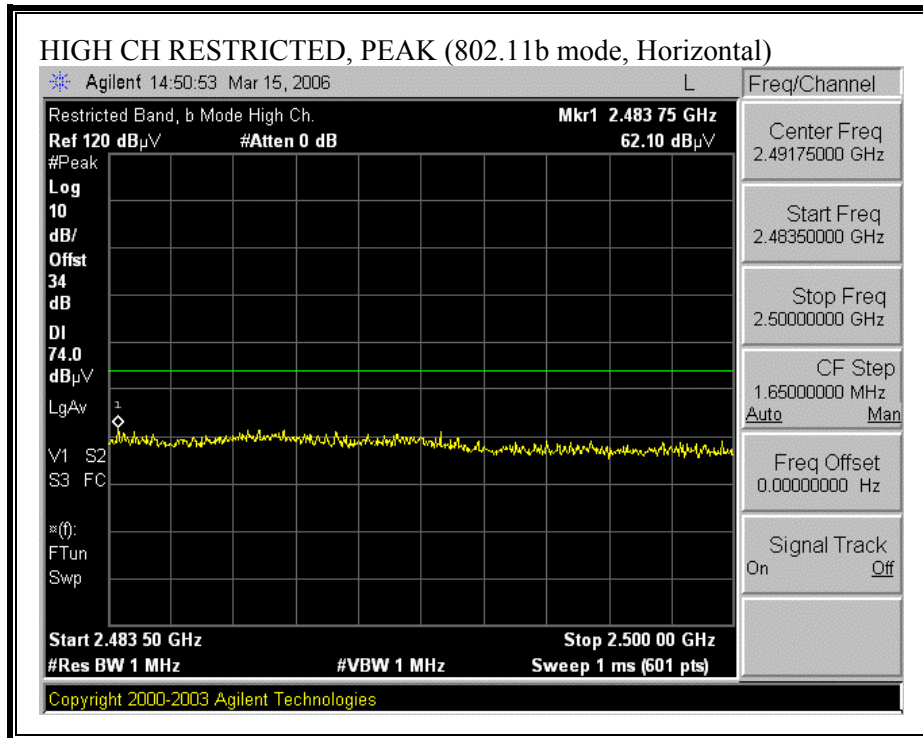


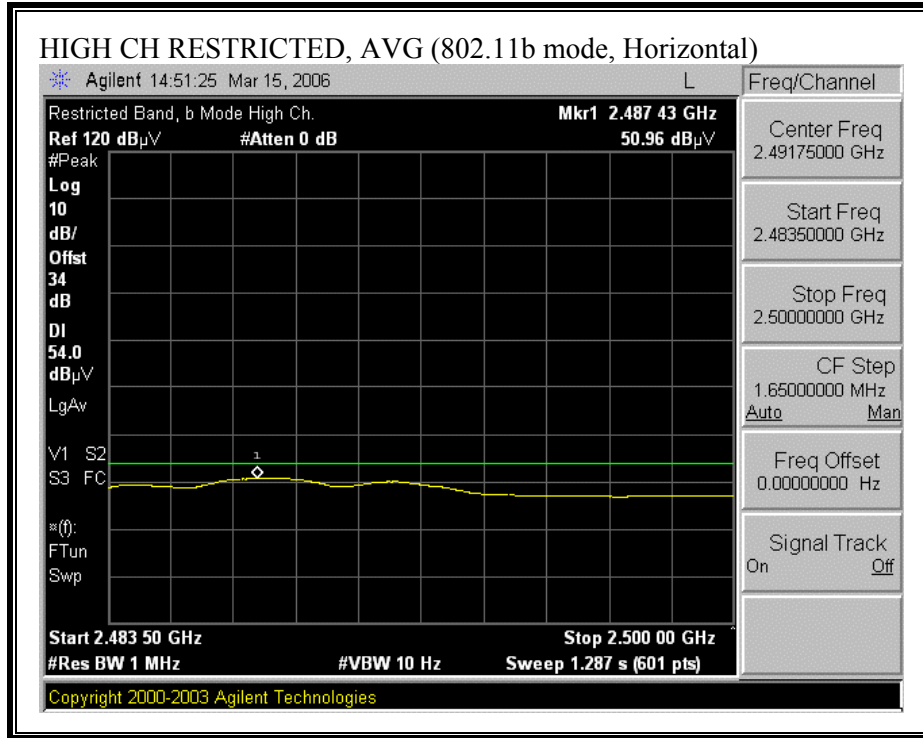
**RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, VERTICAL)**





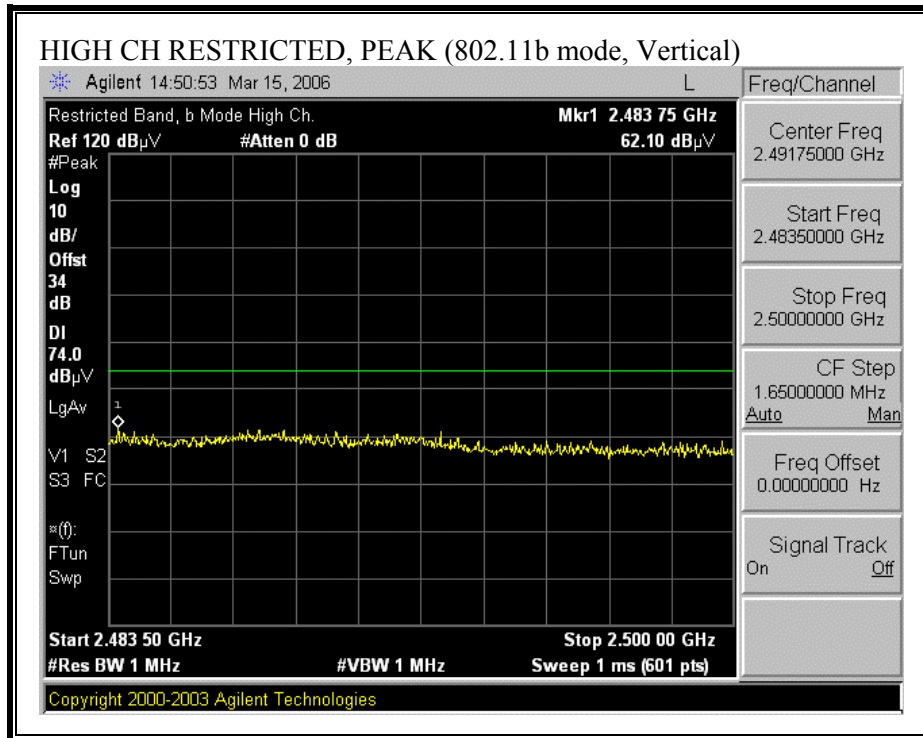
**RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, HORIZONTAL)**

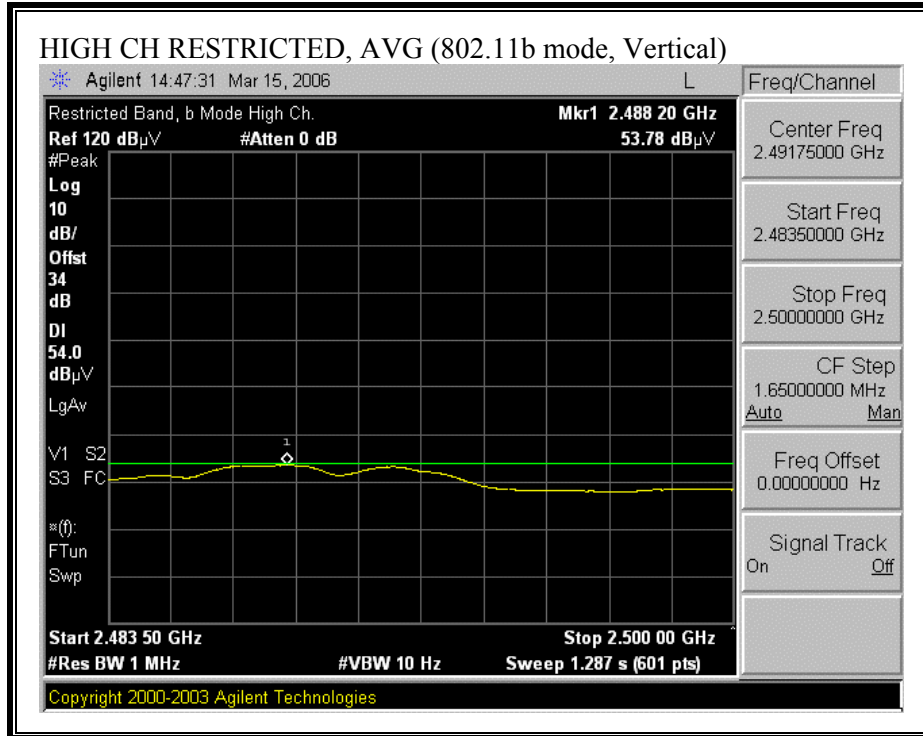






**RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, VERTICAL)**

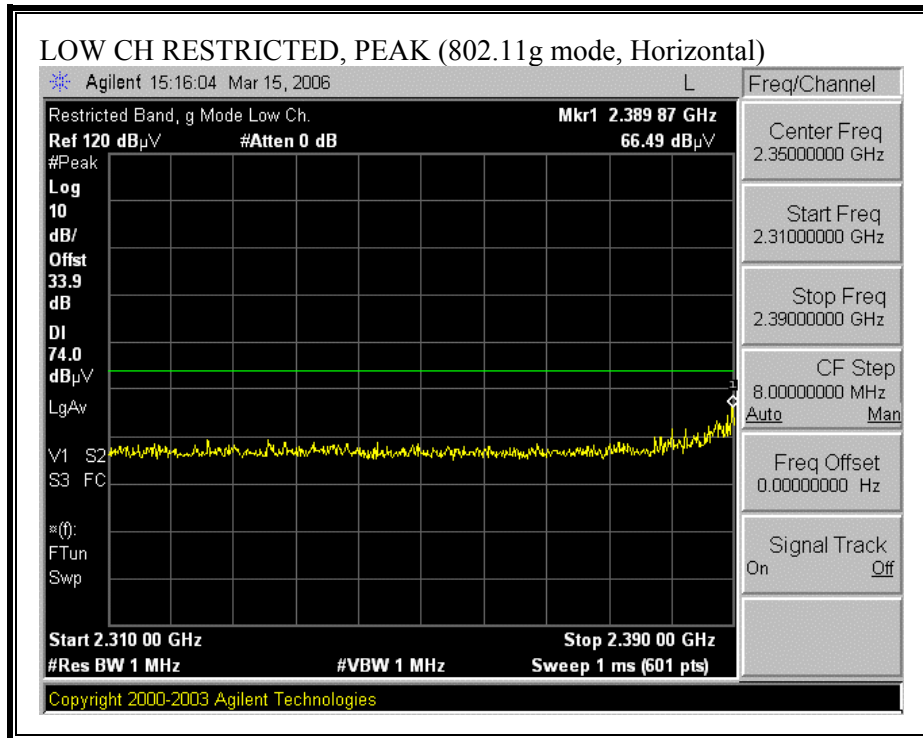


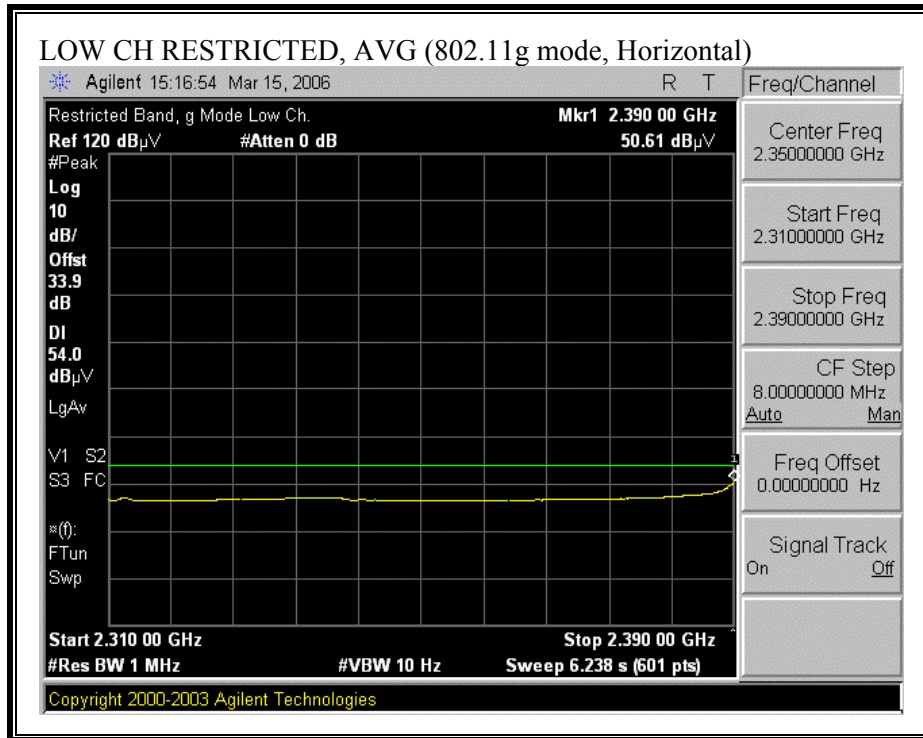


**HARMONICS AND SPURIOUS EMISSIONS (b MODE)**

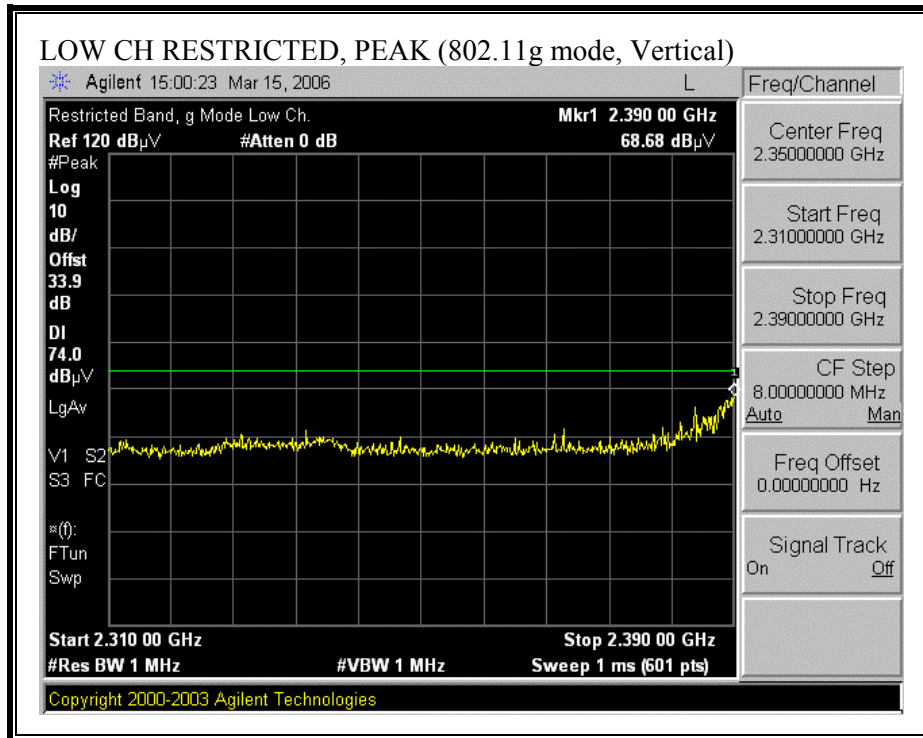
03/13/06 High Frequency Measurement															
Compliance Certification Services, Morgan Hill Open Field Site															
Test Engr: William Zhuang															
Project #: 06U10128															
Company: Tom Cokenias / Airgo															
EUT Descrip.:															
EUT M/N: 1x2															
Test Target:															
Mode Oper: Tx On, b Mode															
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									
f	Dist	Read Pk	Read Avg.	AF	CL	Amp	D Corr	Ftr	Peak	Avg	Pk Lim	Avg Lim	Pk Mar	Avg Mar	Notes
GHz	(m)	dBuV	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	dB	(V/H)
<b>b Mode, Low Ch. 2412MHz</b>															
4.824	3.0	46.5	42.3	33.6	3.6	-36.5	0.0	0.6	47.8	43.7	74.0	54.0	-26.2	-10.3	V
7.236	3.0	49.5	43.9	36.1	4.3	-36.2	0.0	0.6	54.3	48.7	74.0	54.0	-19.7	-5.3	V
9.648	3.0	44.1	32.7	38.1	5.0	-37.0	0.0	0.8	51.0	39.7	74.0	54.0	-23.0	-14.3	V
4.824	3.0	42.9	31.7	33.6	3.6	-36.5	0.0	0.6	44.2	33.0	74.0	54.0	-29.8	-21.0	H
7.236	3.0	47.0	41.1	36.1	4.3	-36.2	0.0	0.6	51.8	45.9	74.0	54.0	-22.2	-8.1	H
9.648	3.0	43.1	31.5	38.1	5.0	-37.0	0.0	0.8	50.1	38.4	74.0	54.0	-23.9	-15.6	H
<b>b Mode, Mid Ch. 2437MHz</b>															
4.874	3.0	45.8	40.6	33.7	3.6	-36.5	0.0	0.6	47.2	42.0	74.0	54.0	-26.8	-12.0	V
7.311	3.0	52.8	48.5	36.2	4.4	-36.2	0.0	0.6	57.8	53.5	74.0	54.0	-16.2	-0.5	V
9.748	3.0	42.7	31.4	38.1	5.0	-37.0	0.0	0.8	49.8	38.4	74.0	54.0	-24.2	-15.6	V
4.874	3.0	42.5	30.7	33.7	3.6	-36.5	0.0	0.6	44.0	32.2	74.0	54.0	-30.0	-21.8	H
7.311	3.0	51.6	46.1	36.2	4.4	-36.2	0.0	0.6	56.5	51.1	74.0	54.0	-17.5	-2.9	H
9.748	3.0	42.6	31.3	38.1	5.0	-37.0	0.0	0.8	49.6	38.4	74.0	54.0	-24.4	-15.6	H
<b>b Mode, High Ch. 2462MHz</b>															
4.924	3.0	43.6	33.1	33.7	3.6	-36.5	0.0	0.6	45.1	34.6	74.0	54.0	-28.9	-19.4	V
7.386	3.0	52.6	48.8	36.2	4.4	-36.2	0.0	0.6	57.6	53.9	74.0	54.0	-16.4	-0.1	V
9.848	3.0	43.6	31.1	38.2	5.0	-37.0	0.0	0.8	50.6	38.2	74.0	54.0	-23.4	-15.8	V
4.924	3.0	42.4	30.6	33.7	3.6	-36.5	0.0	0.6	43.9	32.1	74.0	54.0	-30.1	-21.9	H
7.386	3.0	49.0	43.1	36.2	4.4	-36.2	0.0	0.6	54.1	48.1	74.0	54.0	-19.9	-5.9	H

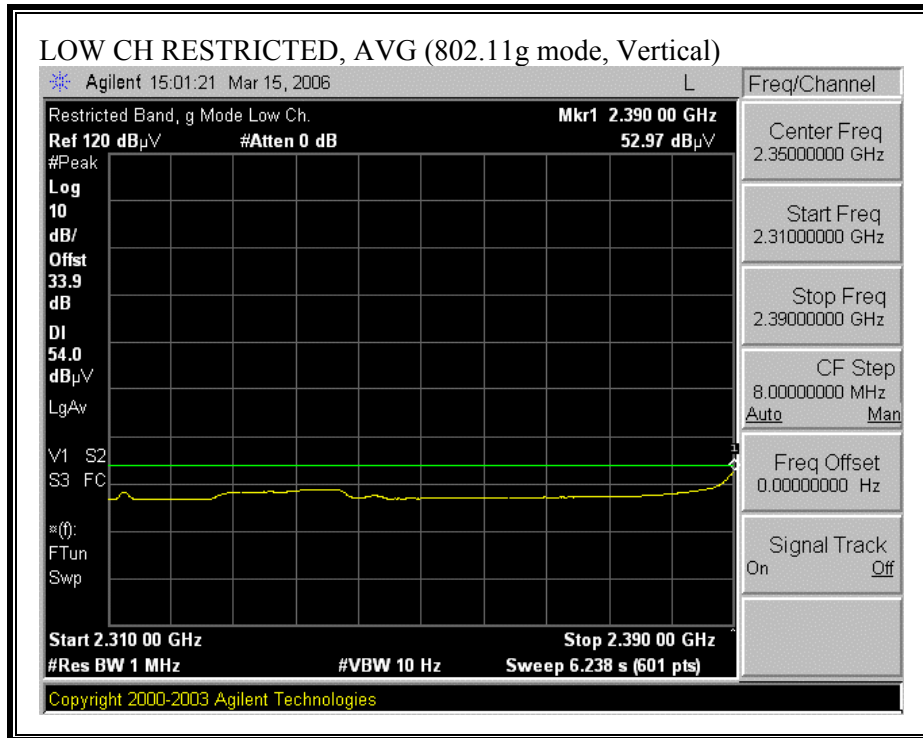
**RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, HORIZONTAL)**



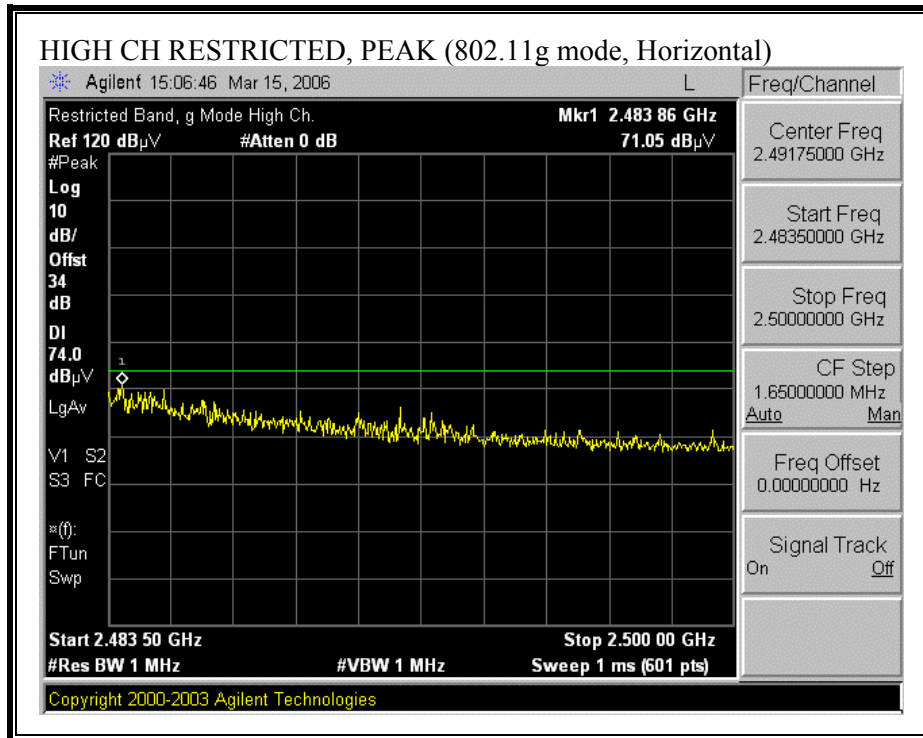


**RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, VERTICAL)**

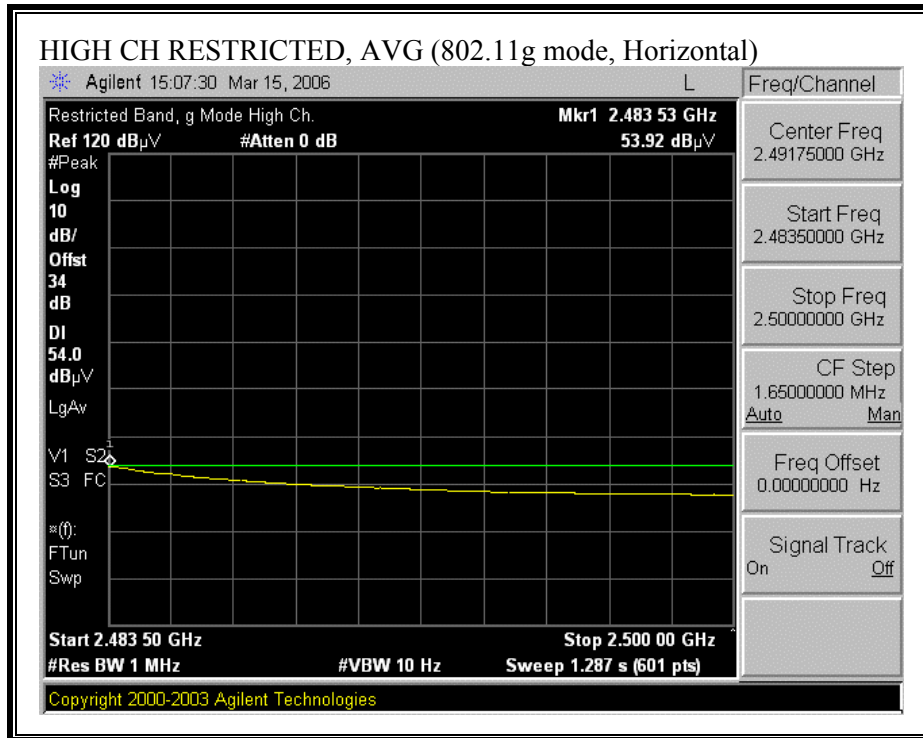




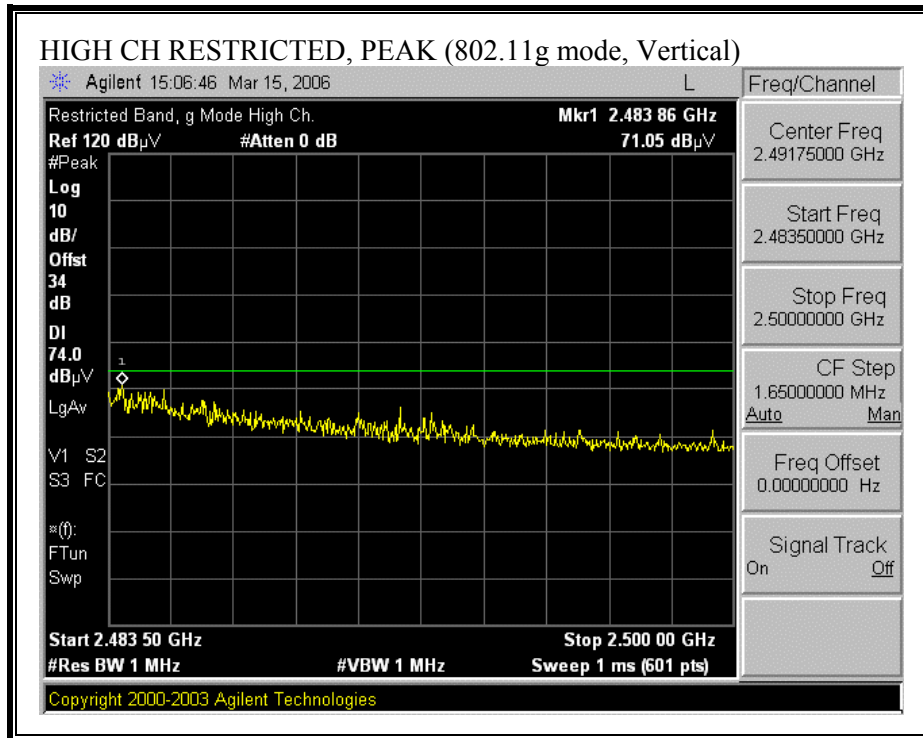
**RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, HORIZONTAL)**

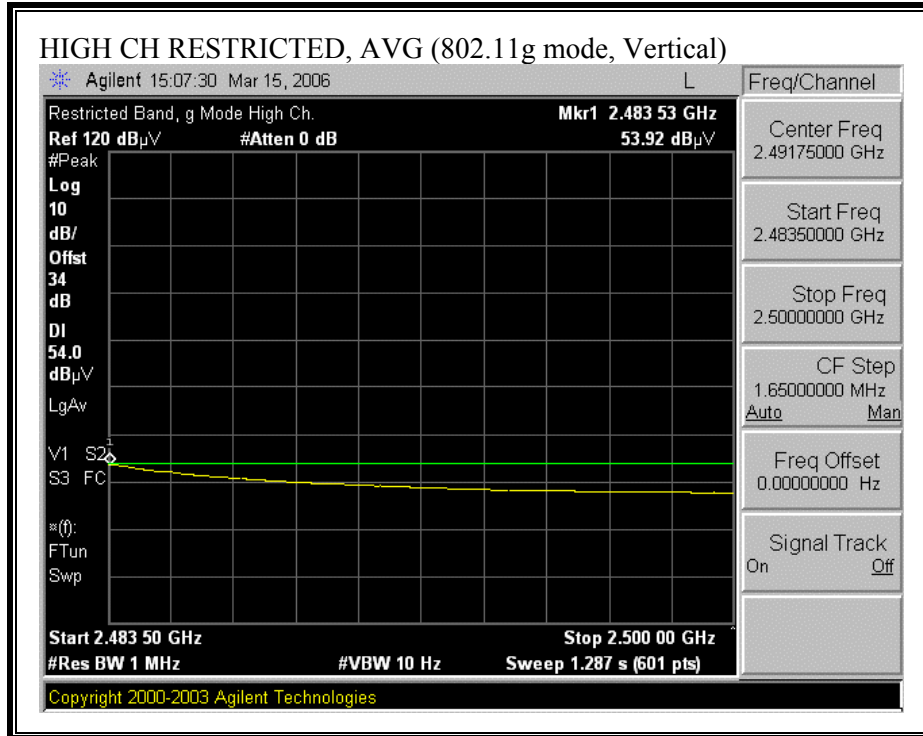






**RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, VERTICAL)**

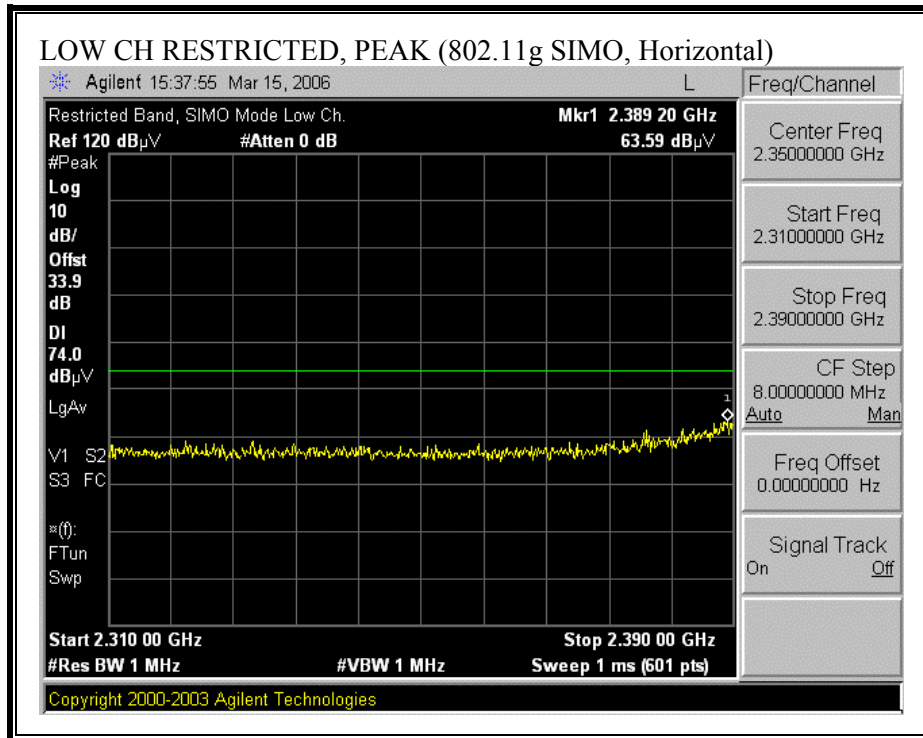


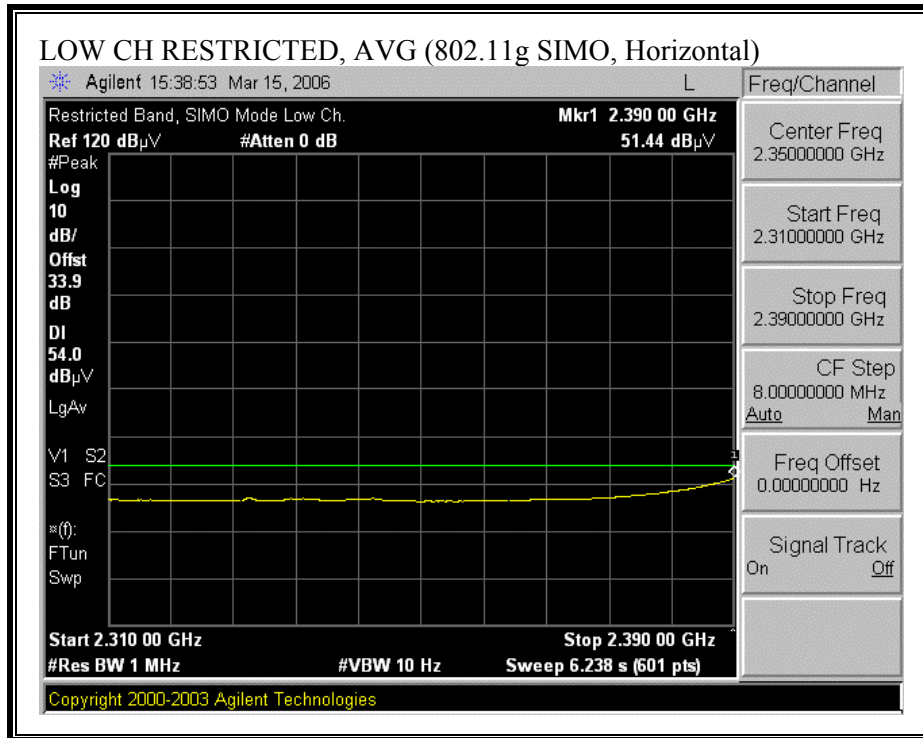


**HARMONICS AND SPURIOUS EMISSIONS (g MODE)**

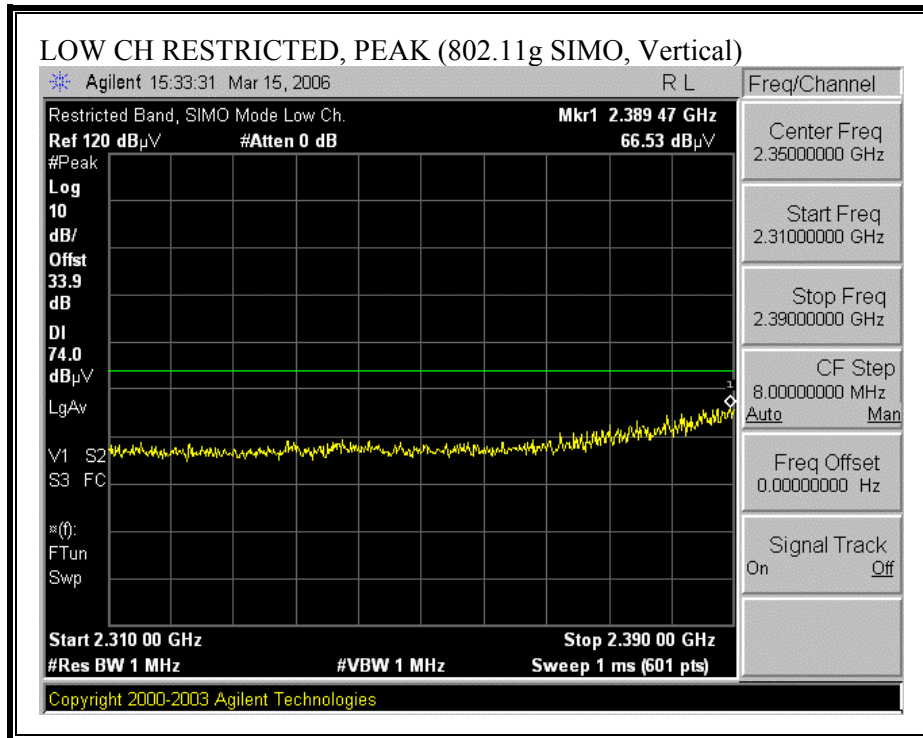
03/13/06 High Frequency Measurement																
Compliance Certification Services, Morgan Hill Open Field Site																
Test Engr: William Zhuang																
Project #: 06U10128																
Company: Tom Cokenias / Airgo																
EUT Descrip.:																
EUT M/N: 1x2																
Test Target:																
Mode Oper: Tx On, g Mode																
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												
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)	
<b>g Mode, Low Ch. 2412MHz, 17.5dBm</b>																
4.824	3.0	42.5	30.6	33.6	3.6	-36.5	0.0	0.6	43.8	31.9	74.0	54.0	-30.2	-22.1	V	
7.236	3.0	48.5	34.0	36.1	4.3	-36.2	0.0	0.6	53.3	38.8	74.0	54.0	-20.7	-15.2	V	
9.648	3.0	43.5	31.8	38.1	5.0	-37.0	0.0	0.8	50.5	38.7	74.0	54.0	-23.5	-15.3	V	
4.824	3.0	42.3	30.8	33.6	3.6	-36.5	0.0	0.6	43.7	32.1	74.0	54.0	-30.3	-21.9	H	
7.236	3.0	43.6	31.2	36.1	4.3	-36.2	0.0	0.6	48.4	36.1	74.0	54.0	-25.6	-17.9	H	
9.648	3.0	44.6	31.8	38.1	5.0	-37.0	0.0	0.8	51.6	38.7	74.0	54.0	-22.4	-15.3	H	
<b>g Mode, Mid Ch. 2437MHz, 22dBm</b>																
4.874	3.0	46.8	34.1	33.7	3.6	-36.5	0.0	0.6	48.2	35.6	74.0	54.0	-25.8	-18.4	V	
7.311	3.0	62.6	48.0	36.2	4.4	-36.2	0.0	0.6	67.6	52.9	74.0	54.0	-6.4	-1.1	V	
9.748	3.0	43.4	31.6	38.1	5.0	-37.0	0.0	0.8	50.4	38.6	74.0	54.0	-23.6	-15.4	V	
4.874	3.0	43.7	31.1	33.7	3.6	-36.5	0.0	0.6	45.2	32.5	74.0	54.0	-28.8	-21.5	H	
7.311	3.0	53.0	39.6	36.2	4.4	-36.2	0.0	0.6	58.0	44.5	74.0	54.0	-16.0	-9.5	H	
9.748	3.0	43.7	31.6	38.1	5.0	-37.0	0.0	0.8	50.8	38.7	74.0	54.0	-23.2	-15.3	H	
<b>g Mode, High Ch. 2462MHz, 19.5dBm</b>																
4.924	3.0	42.3	30.9	33.7	3.6	-36.5	0.0	0.6	43.8	32.4	74.0	54.0	-30.2	-21.6	V	
7.386	3.0	61.7	47.2	36.2	4.4	-36.2	0.0	0.6	66.7	52.2	74.0	54.0	-7.3	-1.8	V	
9.848	3.0	43.2	31.2	38.2	5.0	-37.0	0.0	0.8	50.3	38.3	74.0	54.0	-23.7	-15.7	V	
4.924	3.0	42.9	30.6	33.7	3.6	-36.5	0.0	0.6	44.4	32.1	74.0	54.0	-29.6	-21.9	H	
7.386	3.0	57.4	42.8	36.2	4.4	-36.2	0.0	0.6	62.4	47.9	74.0	54.0	-11.6	-6.1	H	
9.848	3.0	43.1	31.2	38.2	5.0	-37.0	0.0	0.8	50.2	38.3	74.0	54.0	-23.8	-15.7	H	

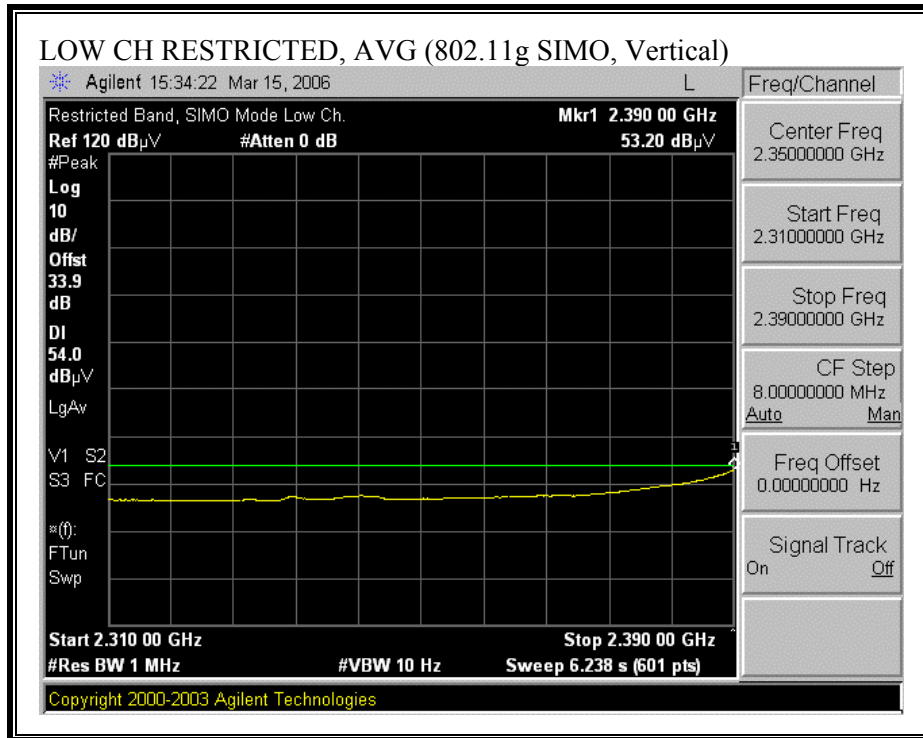
**RESTRICTED BANDEDGE (SIMO MODE, LOW CHANNEL, HORIZONTAL)**





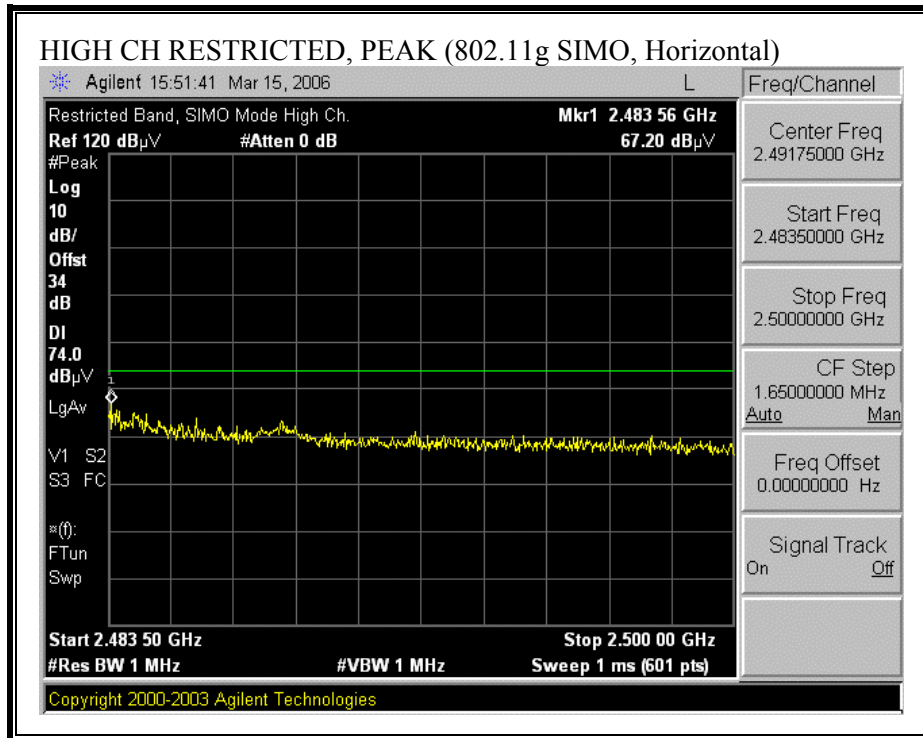
**RESTRICTED BANDEDGE (SIMO MODE, LOW CHANNEL, VERTICAL)**

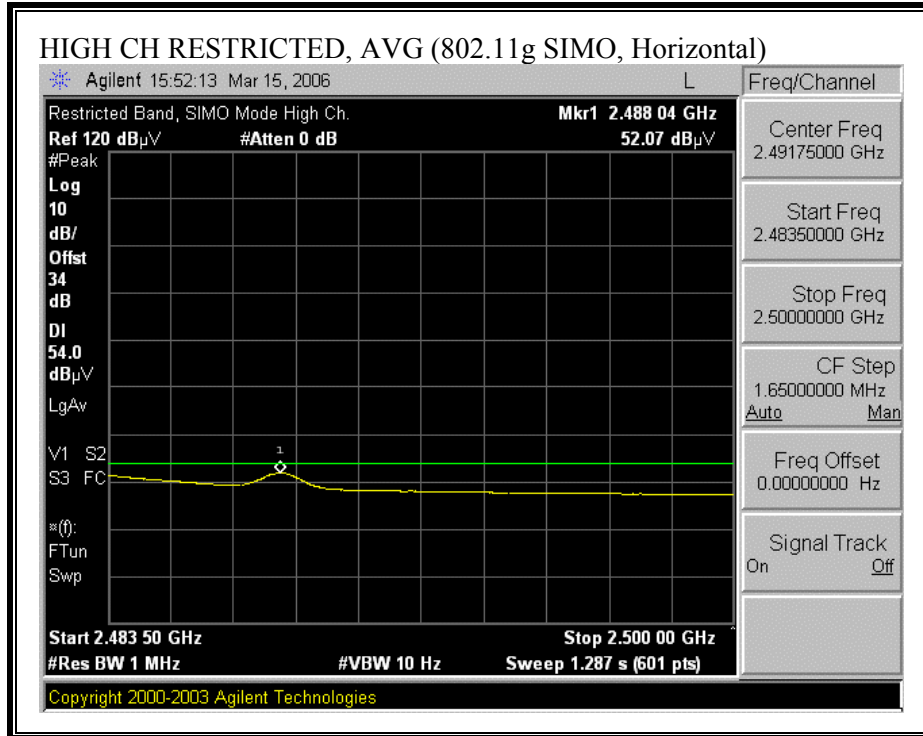




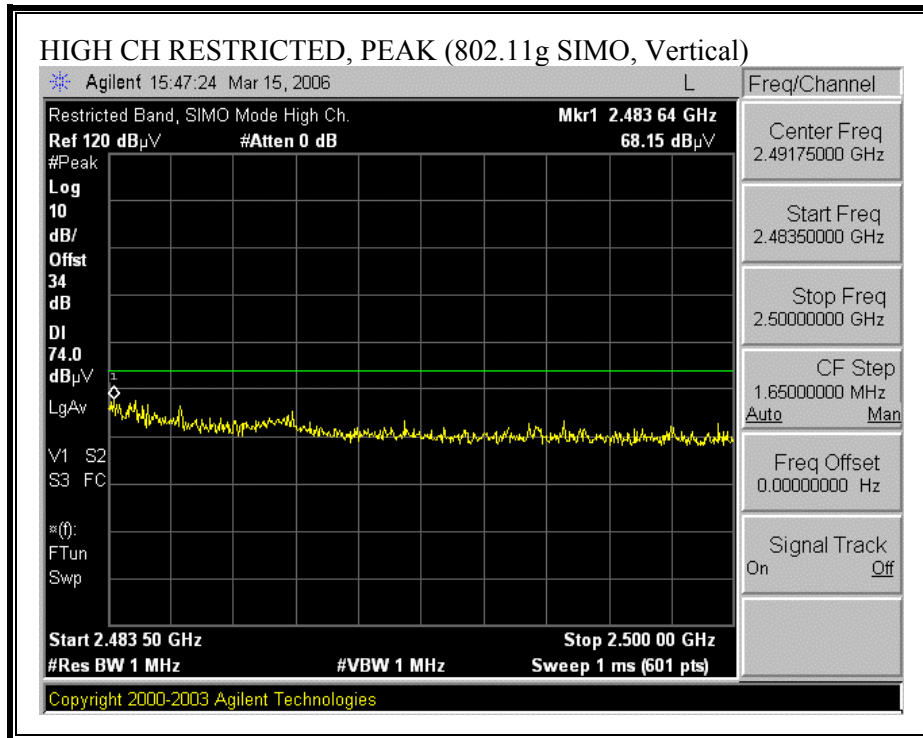


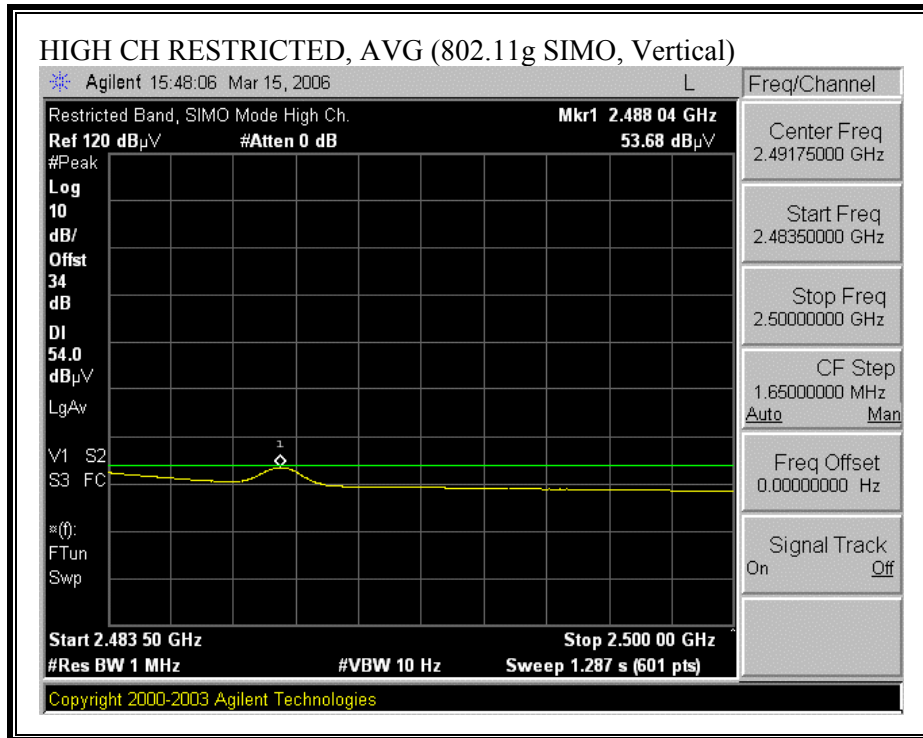
**RESTRICTED BANDEDGE (SIMO MODE, HIGH CHANNEL, HORIZONTAL)**





**RESTRICTED BANDEDGE (SIMO, HIGH CHANNEL, VERTICAL)**



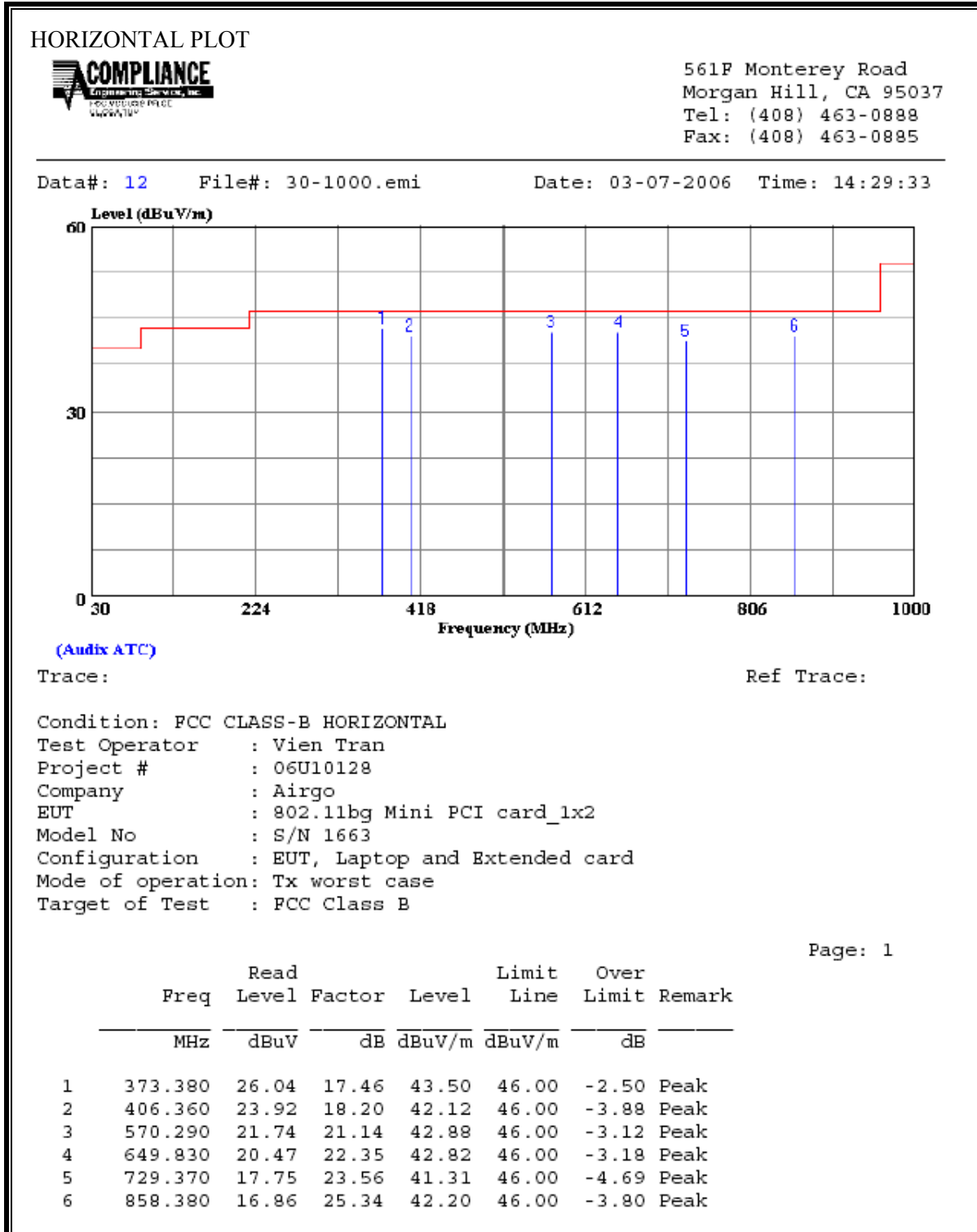


**HARMONICS AND SPURIOUS EMISSIONS (SIMO MODE)**

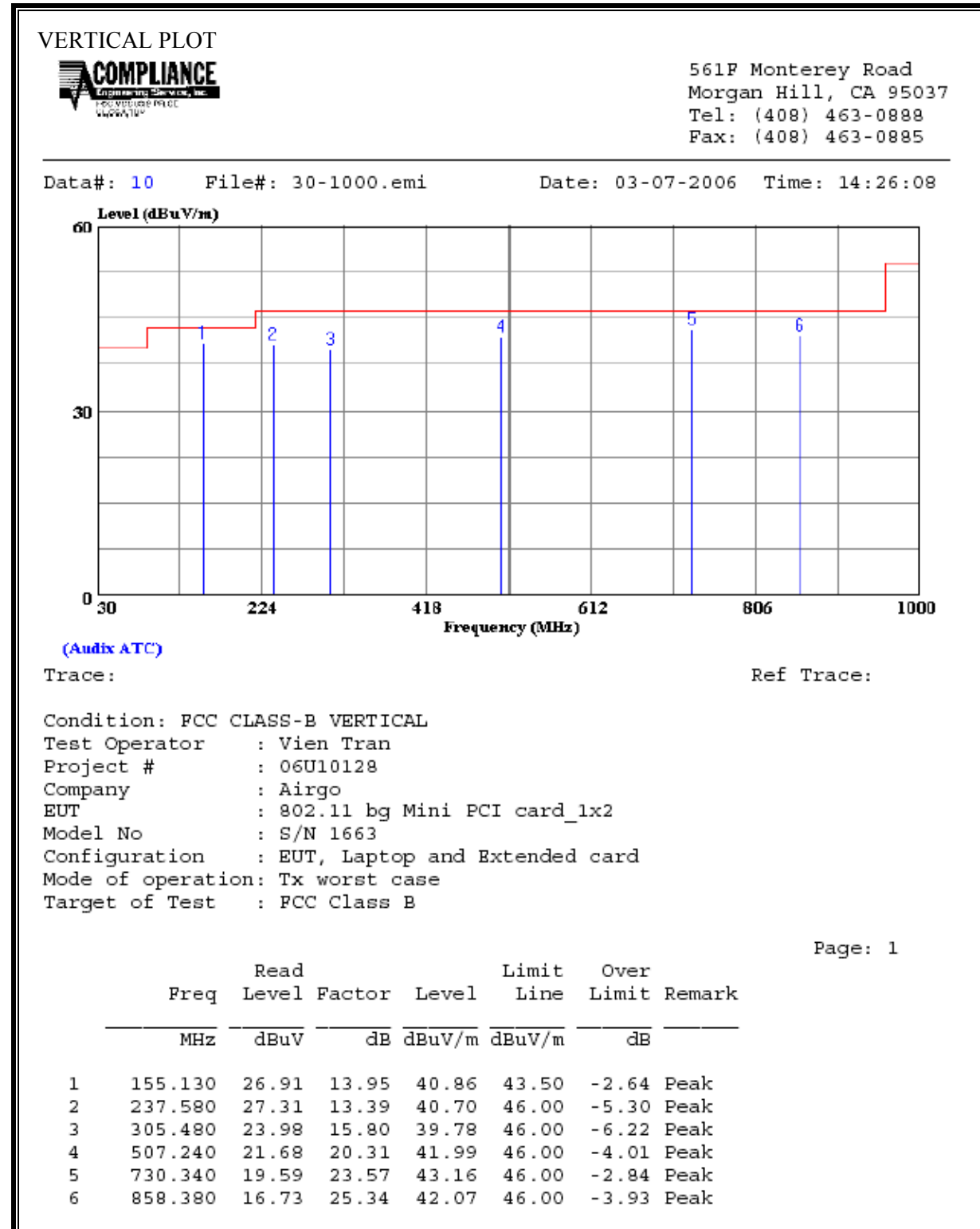
03/13/06 High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site  Test Engr: William Zhuang Project #: 06U10128 Company: Tom Cokenias / Airgo EUT Descrip.: EUT M/N: 1x2 Test Target: Mode Oper: Tx On, SIMO Mode															
f	Dist	Read	Avg	AF	CL	Amp	D Corr	Fltr	Peak	Avg	Pk Lim	Avg Lim	Pk Mar	Avg Mar	Notes
GHz	(m)	Pk dBuV	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	dB	(V/H)
SIMO Mode, Low Ch. 2432MHz, 19dBm															
4.864	3.0	42.9	30.8	33.7	3.6	-36.5	0.0	0.6	44.3	32.2	74.0	54.0	-29.7	-21.8	V
7.296	3.0	50.0	36.5	36.1	4.4	-36.2	0.0	0.6	54.9	41.4	74.0	54.0	-19.1	-12.6	V
9.728	3.0	44.0	31.6	38.1	5.0	-37.0	0.0	0.8	51.0	38.6	74.0	54.0	-23.0	-15.4	V
4.864	3.0	42.5	30.8	33.7	3.6	-36.5	0.0	0.6	43.9	32.3	74.0	54.0	-30.1	-21.7	H
7.296	3.0	48.6	35.5	36.1	4.4	-36.2	0.0	0.6	53.5	40.4	74.0	54.0	-20.5	-13.6	H
9.728	3.0	43.2	31.6	38.1	5.0	-37.0	0.0	0.8	50.2	38.6	74.0	54.0	-23.8	-15.4	H
SIMO Mode, Mid Ch. 2437MHz, 21.5dBm															
4.874	3.0	43.6	32.1	33.7	3.6	-36.5	0.0	0.6	45.1	33.5	74.0	54.0	-28.9	-20.5	V
7.311	3.0	60.1	46.2	36.2	4.4	-36.2	0.0	0.6	65.0	51.1	74.0	54.0	-9.0	-2.9	V
9.748	3.0	43.6	31.9	38.1	5.0	-37.0	0.0	0.8	50.6	38.9	74.0	54.0	-23.4	-15.1	V
4.874	3.0	42.7	31.0	33.7	3.6	-36.5	0.0	0.6	44.2	32.5	74.0	54.0	-29.8	-21.5	H
7.311	3.0	54.4	41.3	36.2	4.4	-36.2	0.0	0.6	59.3	46.2	74.0	54.0	-14.7	-7.8	H
9.748	3.0	44.5	31.8	38.1	5.0	-37.0	0.0	0.8	51.5	38.8	74.0	54.0	-22.5	-15.2	H
SIMO Mode, High Ch. 2442MHz, 20.5dBm															
4.884	3.0	42.8	30.9	33.7	3.6	-36.5	0.0	0.6	44.3	32.3	74.0	54.0	-29.7	-21.7	V
7.326	3.0	60.4	46.5	36.2	4.4	-36.2	0.0	0.6	65.4	51.5	74.0	54.0	-8.6	-2.6	V
9.768	3.0	42.9	31.7	38.2	5.0	-37.0	0.0	0.8	49.9	38.7	74.0	54.0	-24.1	-15.3	V
4.884	3.0	43.4	30.9	33.7	3.6	-36.5	0.0	0.6	44.8	32.4	74.0	54.0	-29.2	-21.6	H
7.326	3.0	54.7	41.0	36.2	4.4	-36.2	0.0	0.6	59.6	45.9	74.0	54.0	-14.4	-8.1	H
9.768	3.0	43.6	31.7	38.2	5.0	-37.0	0.0	0.8	50.6	38.7	74.0	54.0	-23.4	-15.3	H

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

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



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



### 7.3. 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

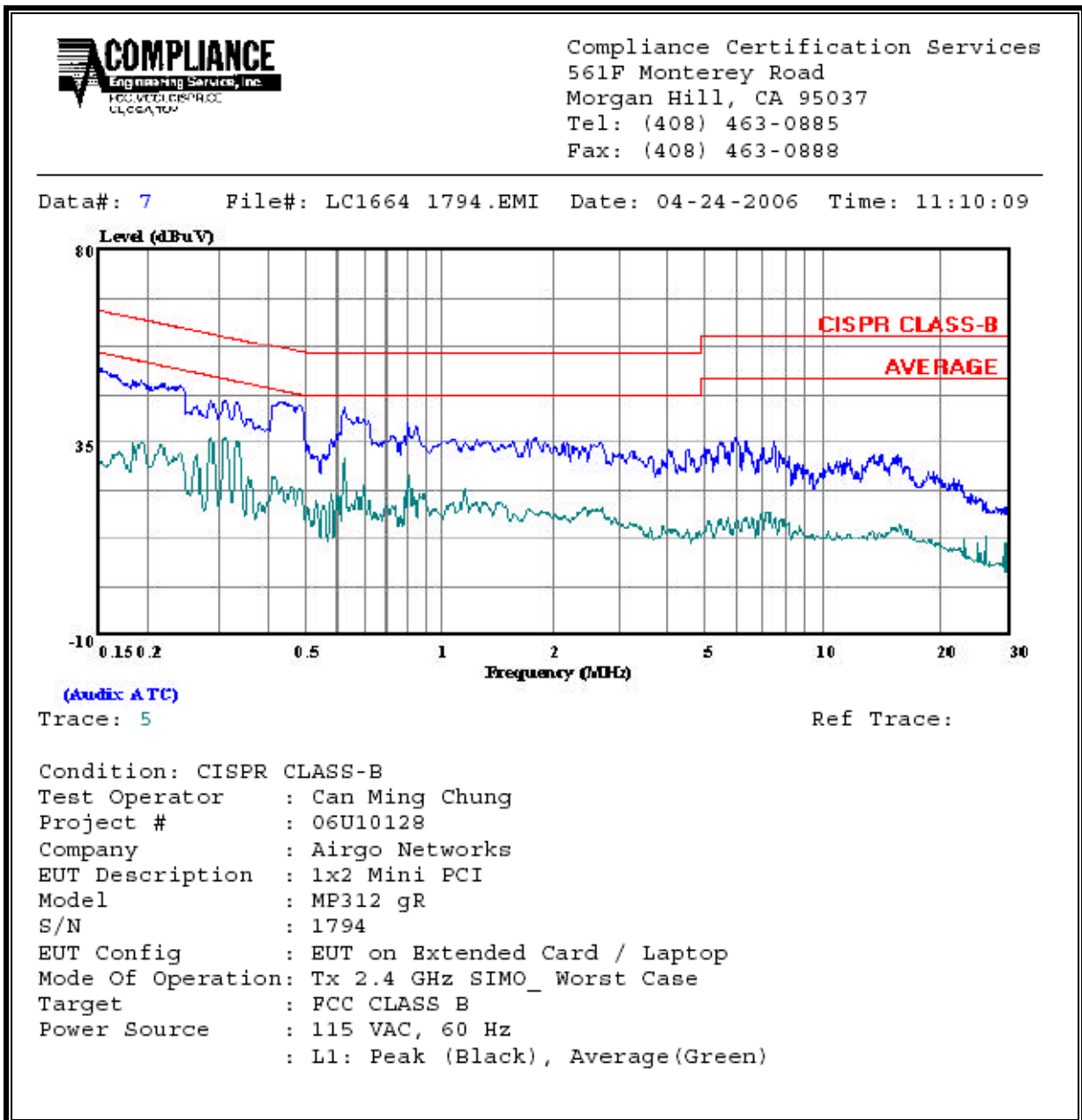
No non-compliance noted:



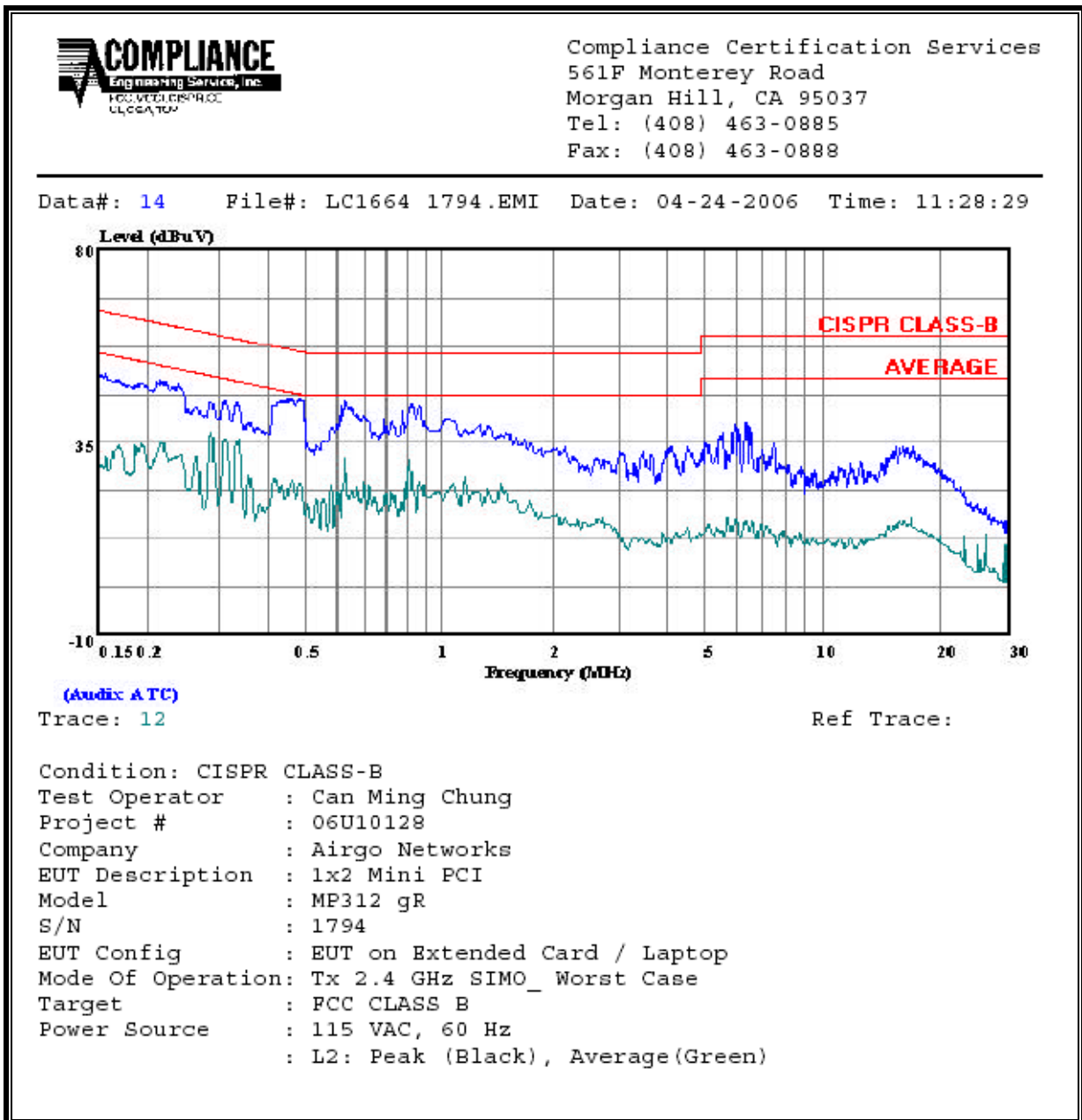
**6 WORST EMISSIONS**

CONDUCTED EMISSIONS DATA (115VAC 60Hz)										
Freq. (MHz)	Reading			Class (dB)	Limit QP	FCC B		Margin		Remark L1 / L2
	PK (dBuV)	QP (dBuV)	AV (dBuV)			AV	QP (dB)	AV (dB)		
0.19	49.16	--	34.93	0.00	63.99	53.99	-14.83	-19.06	L1	
0.63	43.20	--	31.21	0.00	56.00	46.00	-12.80	-14.79	L1	
7.61	35.22	--	18.94	0.00	60.00	50.00	-24.78	-31.06	L1	
0.22	49.26	--	37.61	0.00	62.86	52.86	-13.60	-15.25	L2	
0.63	44.96	--	31.13	0.00	56.00	46.00	-11.04	-14.87	L2	
6.49	39.76	--	17.55	0.00	60.00	50.00	-20.24	-32.45	L2	
6 Worst Data										

**LINE 1 RESULTS**

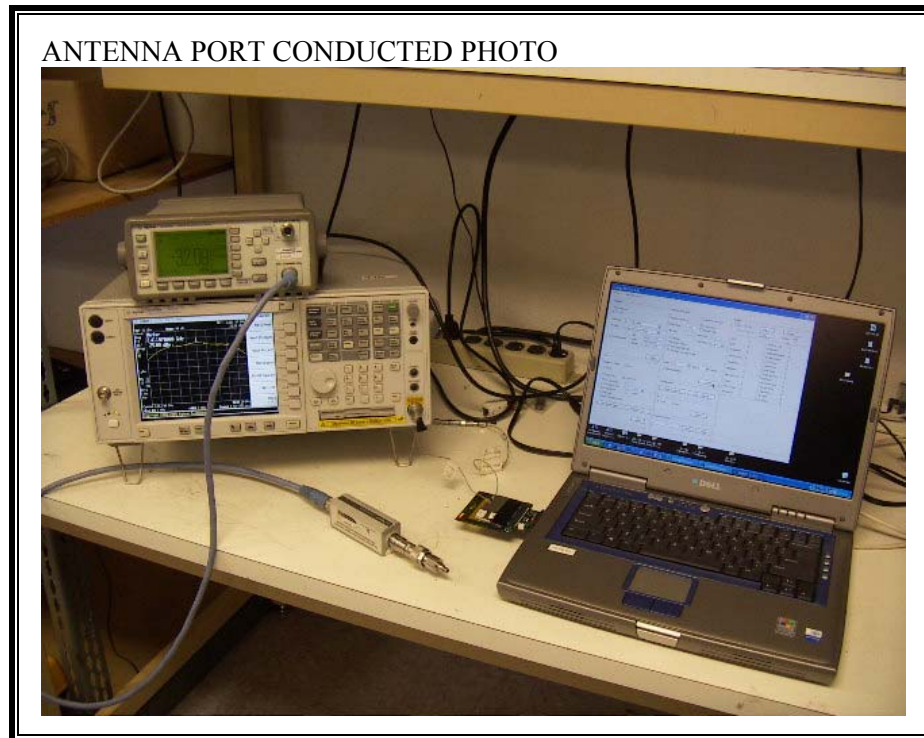


**LINE 2 RESULTS**

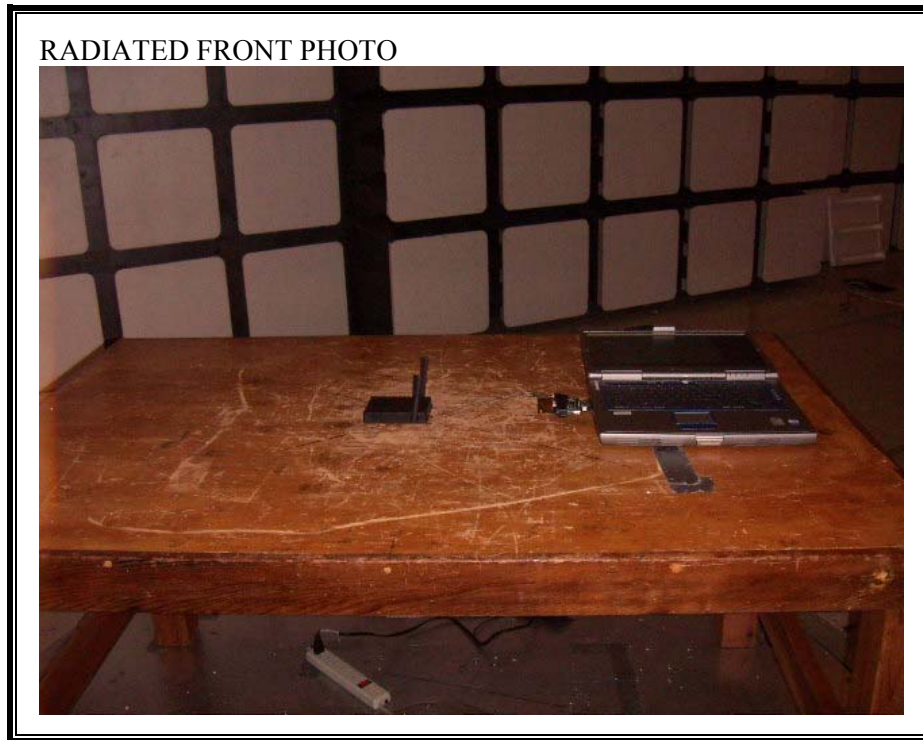


## 8. SETUP PHOTOS

### ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



**RADIATED RF MEASUREMENT SETUP**

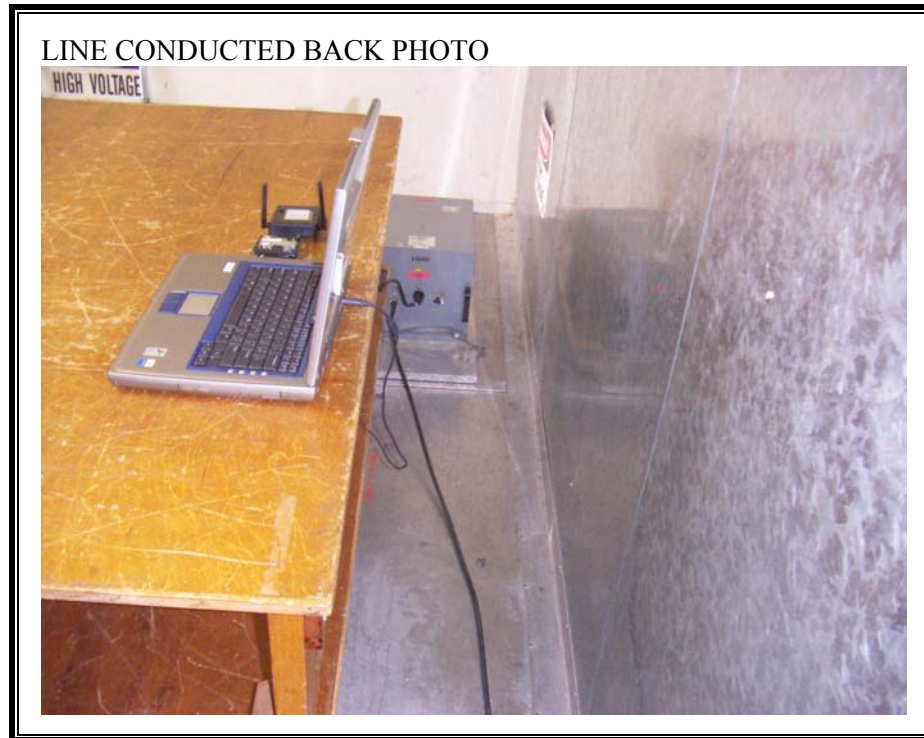


RADIATED BACK PHOTO



**POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP**





**END OF REPORT**