



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

FOR

802.11b/g MINI-PCI RADIO MODULE

MODEL NUMBER: AIR-MP21G-A-K9/AP1100

FCC ID: LDK102048

REPORT NUMBER: 03U2180-1

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Prepared for
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LAB CODE:200065-0

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1. TEST RESULT CERTIFICATION

COMPANY NAME: CISCO SYSTEMS, INC.
170 WEST TASMAN
SAN JOSE, CA 95134, USA

EUT DESCRIPTION: 802.11B/G MINI PCI RADIO MODULE

MODEL: AIR-MP21G-A-K9/AP1100

DATE TESTED: AUGUST 4 – AUGUST 19, 2003

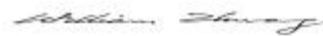

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART C	NO NON-COMPLIANCE NOTED

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: This document reports conditions under which testing was conducted and results of tests performed. 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.

Approved & Released For CCS By:

Tested By:



MIKE HECKROTTE
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EMC ENGINEER
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2. EUT DESCRIPTION

The EUT is an 802.11b/g radio module with a MiniPCI interface. It operates in the 2400 – 2483.5 MHz band. The antenna configuration consists of two dipole antennas for Transmit and Receive Diversity, each with a maximum gain of 2.2 dBi. The two antennas are constructed on a single printed circuit board assembly. The peak power output is 24.39 dBm (275 mW) in the 802.11b mode and 20.6 dBm (115 mW) in the 802.11g mode.

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4/1992, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

4. FACILITIES AND ACCREDITATION

The open area test sites and conducted 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 C63.7, ANSI C63.4 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>.

No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government.

5. CALIBRATION AND UNCERTAINTY

5.1. MEASURING INSTRUMENT CALIBRATION

The measurement instruments utilized to perform the tests documented in this report have been calibrated in accordance with the manufacturer's recommendations, and are traceable to national standards.

5.2. MEASUREMENT UNCERTAINTY

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

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%.

5.3. TEST AND MEASUREMENT EQUIPMENT

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

TEST AND MEASUREMENT EQUIPMENT LIST				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due Date
Quasi-Peak Adapter	HP	85650A	2521A01038	7/16/2004
SA Display Section	HP	85662A	2314A04793	7/16/2004
SA RF Section	HP	85680A	2314A02604	7/16/2004
Preamplifier	HP	8447D	2944A06833	8/22/2003
Antenna, Biconical	Eaton	94455-1	1214	3/6/04
Antenna, Log Periodic	EMCO	3146	9107-3163	3/06/04
EMI Test Receiver	R & S	ESHS 20	827129/006	7/17/2004
LISN, 10 kHz ~ 30 MHz	FCC	50/250-25-2	114	9/6/2003
Spectrum Analyzer	AGILENT	E4446A	US42070220	1/13/04
Pre-amplifier	MITEQ	NSP2600-SP	924341	4/25/04
Horn Antenna	EMCO	3115	6717	2/4/04
Power Meter	AGILENT	E4416A	0841291160	11/7/04
Power Sensor	Agilent	E9327A	US40440755	08/09/03
Antenna, Biconical	Eaton	94455-1	1214	3/6/04
Antenna, Log Periodic	EMCO	3146	9107-3163	3/06/04
Preamplifier	Miteq	NSP10023988	646456	4/26/04
High Pass Filter (4.57GHz)	FSY Microwave	FM-4570-9SS	003	N.C.R.

6. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

Device Type	Manufacturer	Model Number	Serial Number	FCC ID
Laptop	IBM	2647	78-B3952	Doc
Power Adapter	IBM	02K6665	11502K66657A2U81385RR	Doc
Power Supply	KRM	AEEC-350	9712154746	N/A

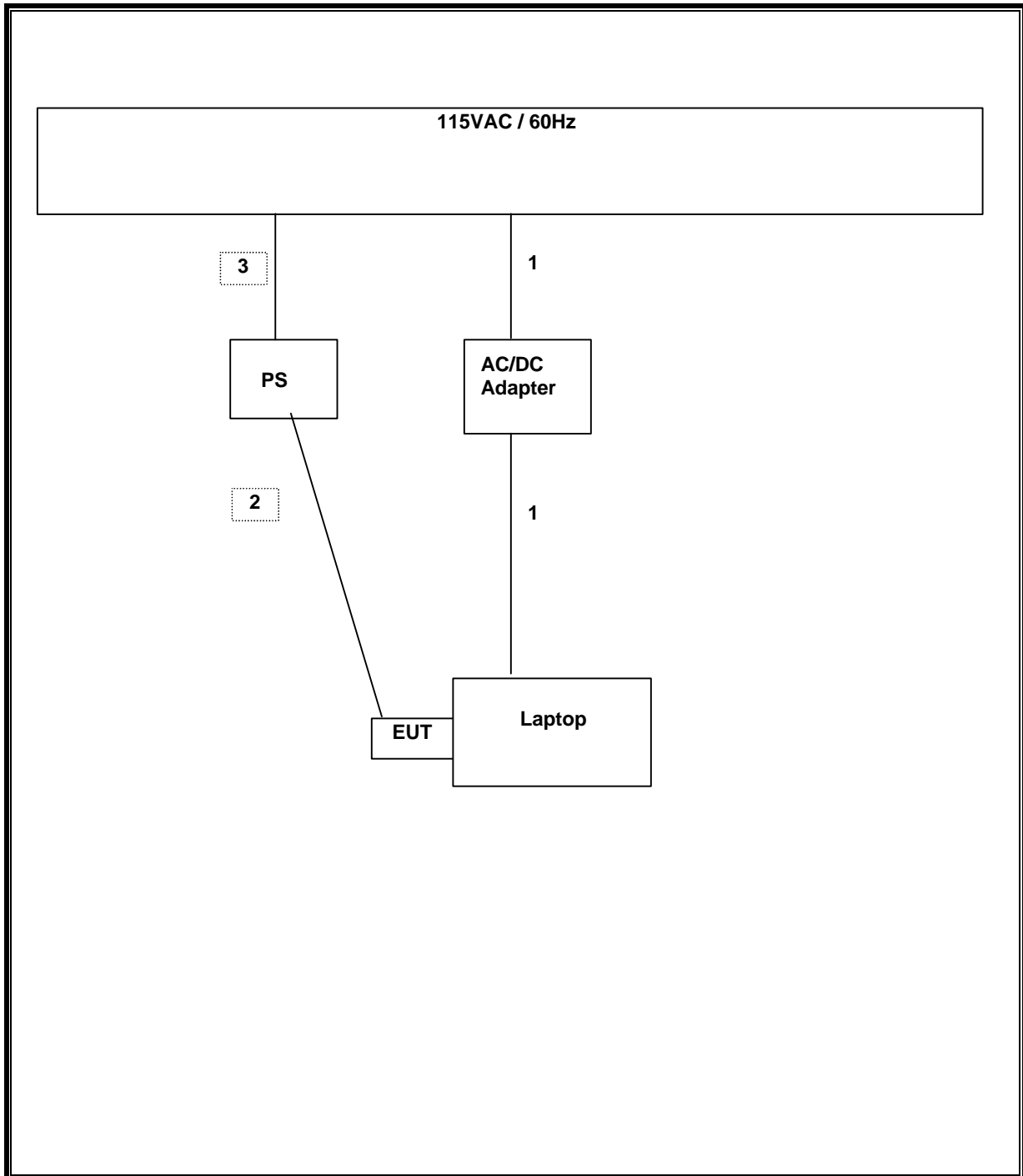
I/O CABLES

Cable No	I/O Port	# of I/O Port	Connector Type	Type of Cable	Cable Length	Data Traffic	Bundled	Remark
1	AC	1	US 115V	Un-shielded	2m	No	No	Integrated with Adapter
2	DC	1	DC	Un-shielded	1m	No	No	N/A
3	AC	1	US115	Un-shielded	1m	No	No	N/A

TEST SETUP

The EUT is 802.11b/g mini PCI radio. It was connected to a laptop via a cardbus-to-miniPCI adapter / extension board during the tests. Power was furnished by an external power supply set to 3.3 VDC. Test software exercised the radio card.

SETUP DIAGRAM



7. APPLICABLE LIMITS AND TEST RESULTS

7.1. 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 100 kHz. The sweep time is coupled.

RESULTS

No non-compliance noted:

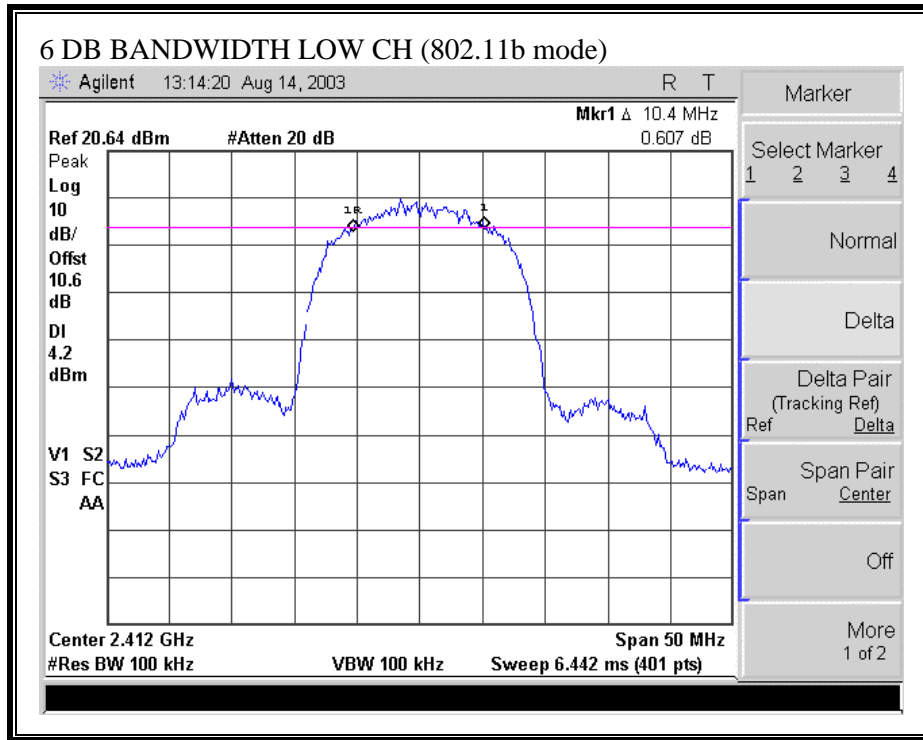
802.11b Mode

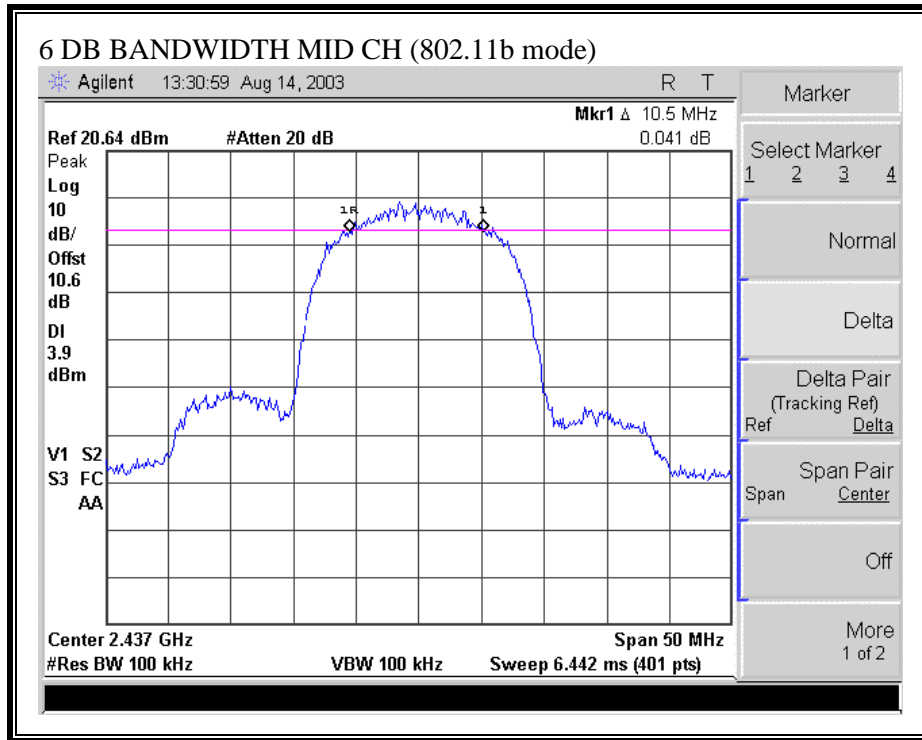
Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	10400	500	9900
Middle	2437	10500	500	10000
High	2462	10500	500	10000

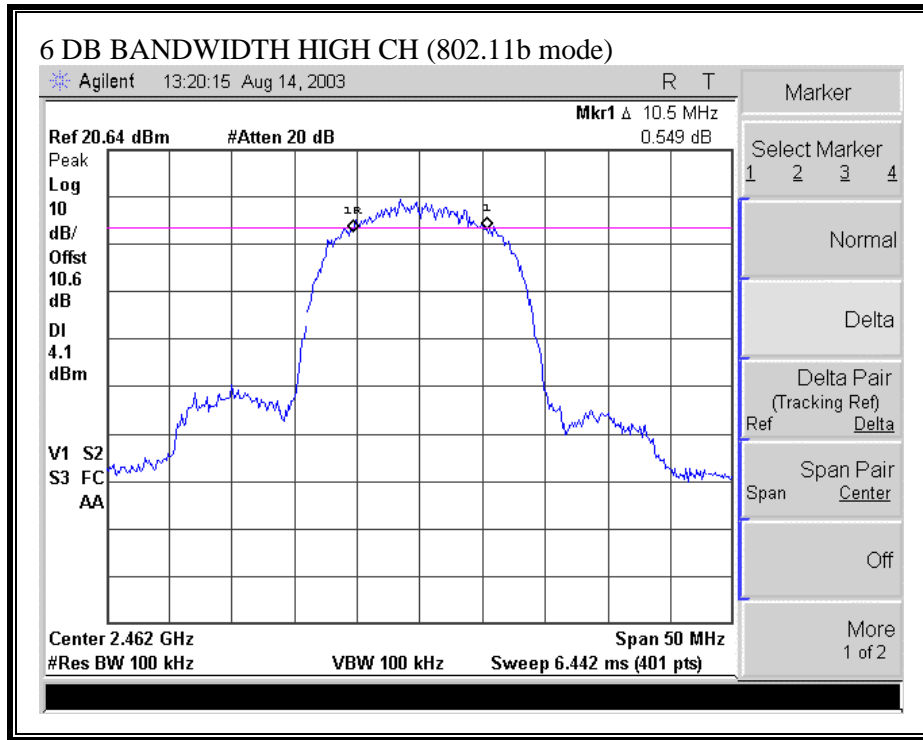
802.11g Normal Mode

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	16500	500	16000
Middle	2437	16500	500	16000
High	2462	16400	500	15900

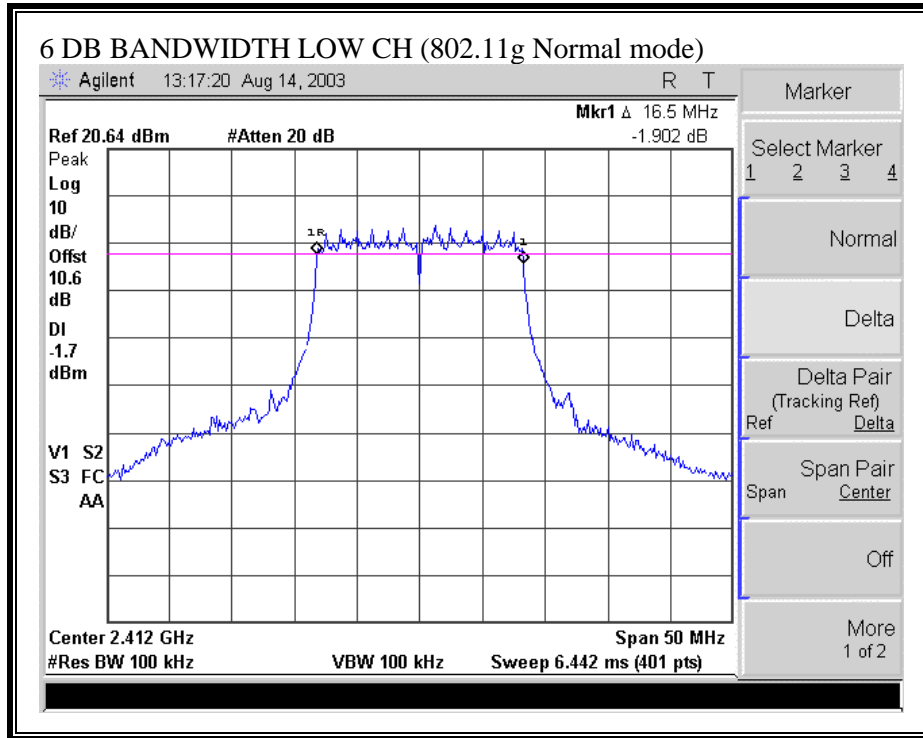
6 DB BANDWIDTH (802.11b MODE)

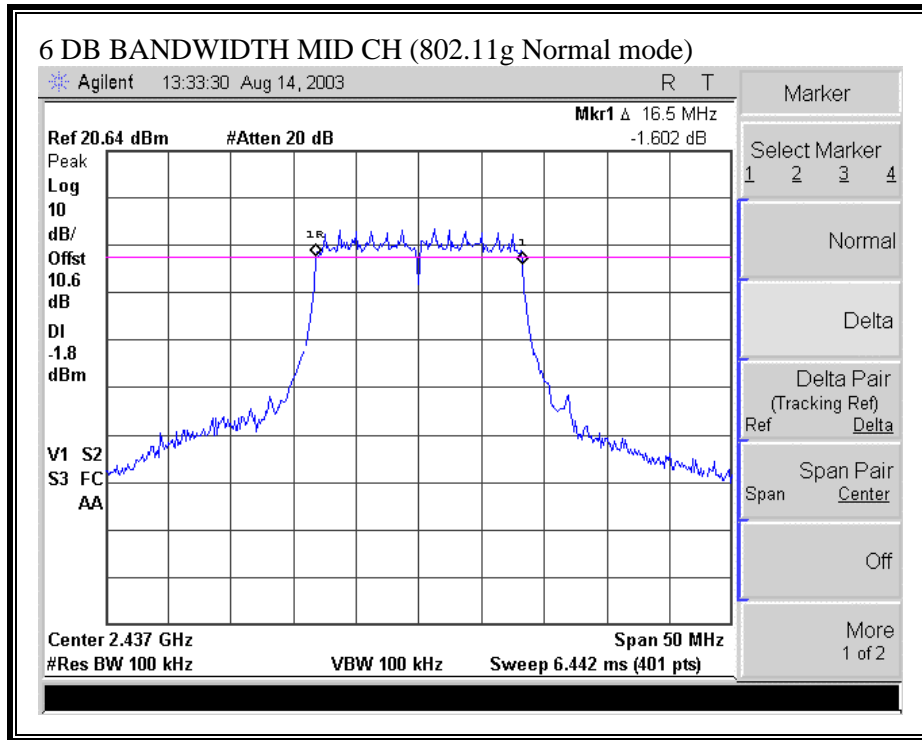


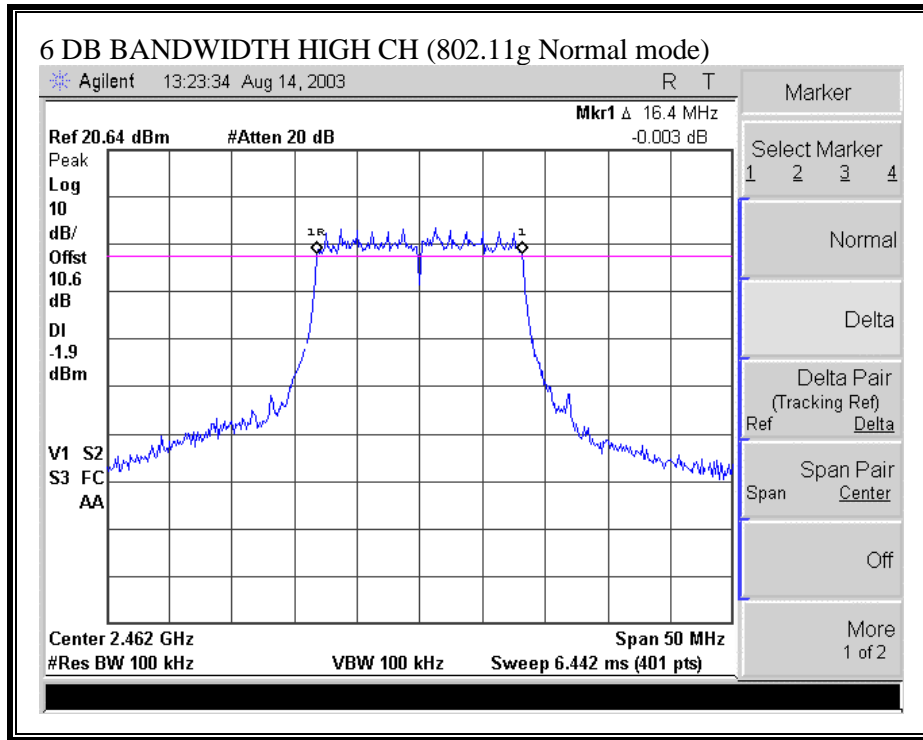




6 DB BANDWIDTH (802.11g NORMAL MODE)







7.2. 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:

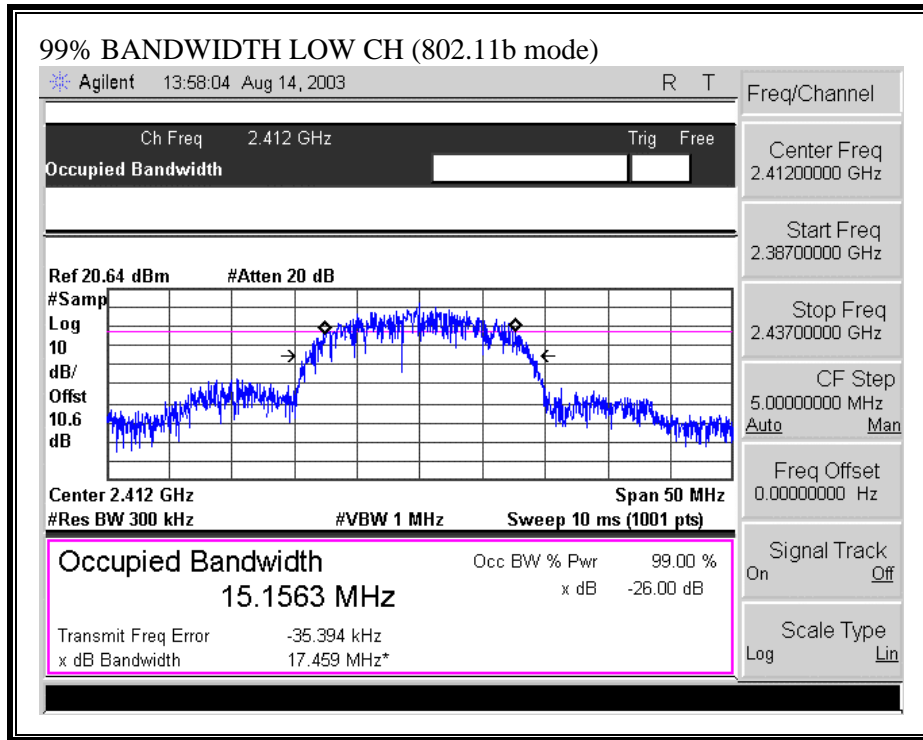
802.11b Mode

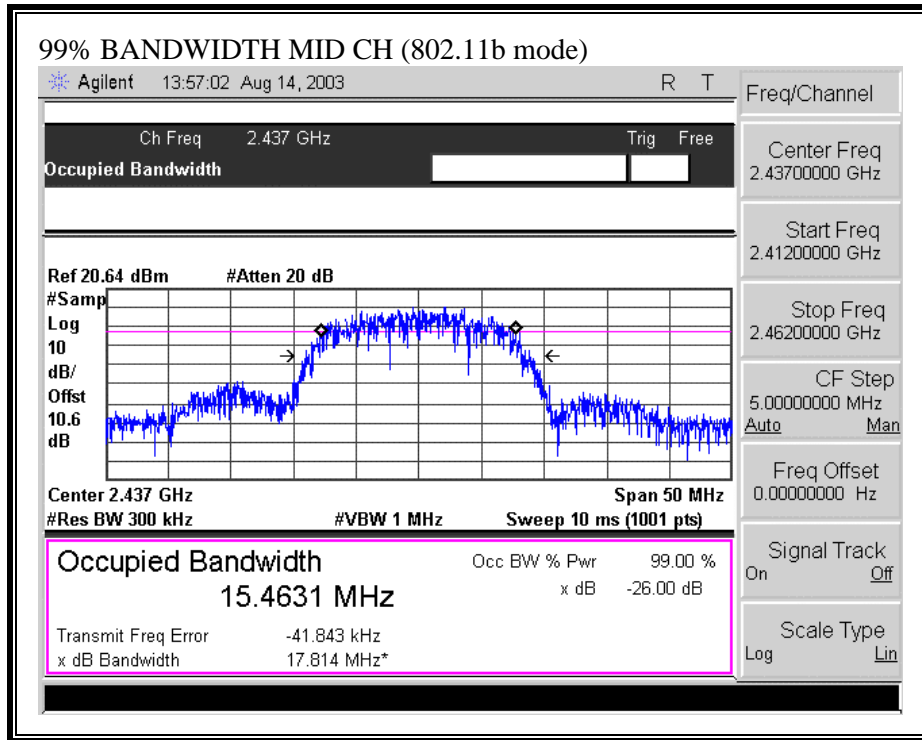
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	15.1563
Middle	2437	15.4631
High	2462	15.1808

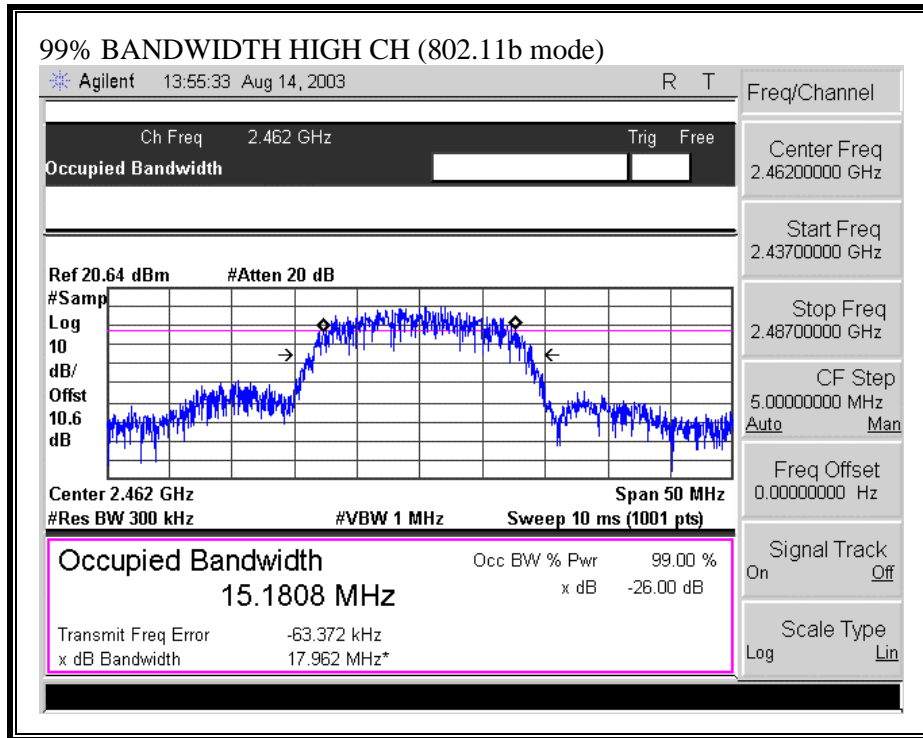
802.11g Normal Mode

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.2628
Middle	2437	16.4476
High	2462	16.3994

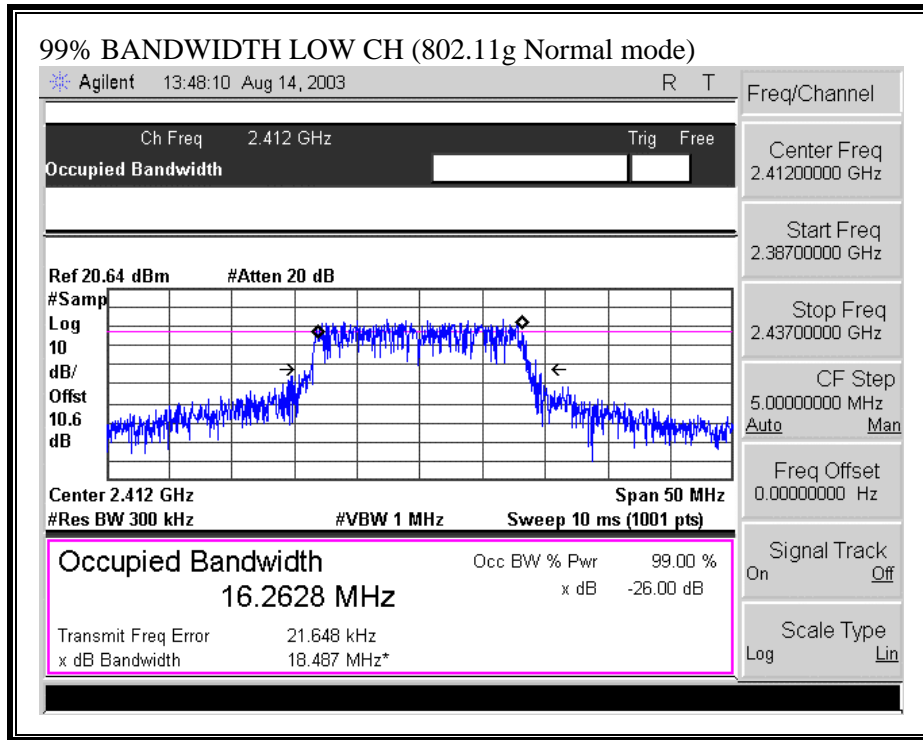
99% BANDWIDTH (802.11b MODE)

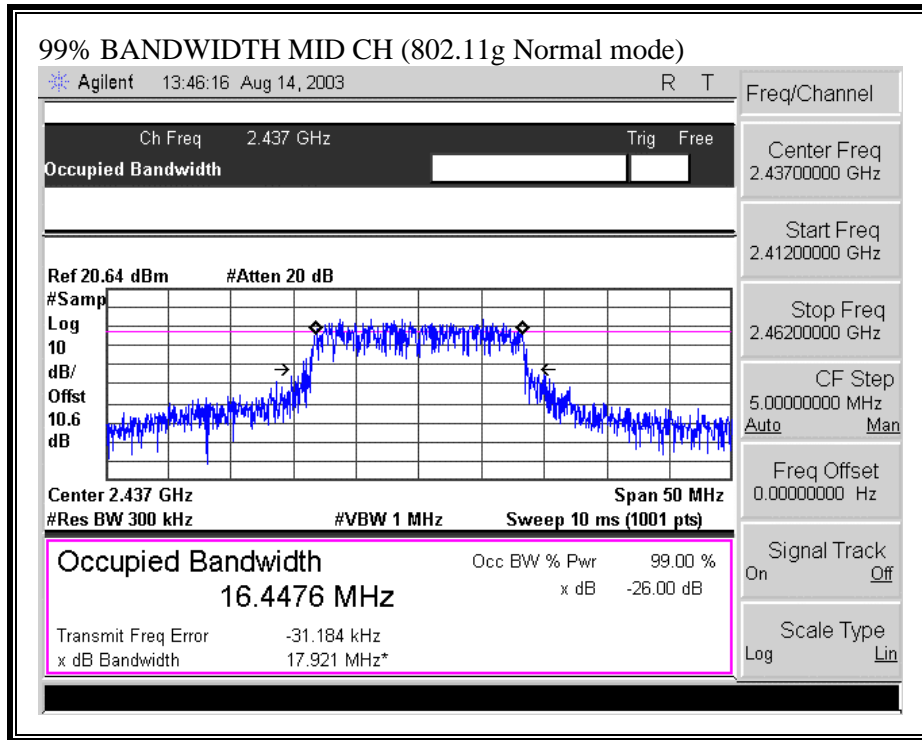


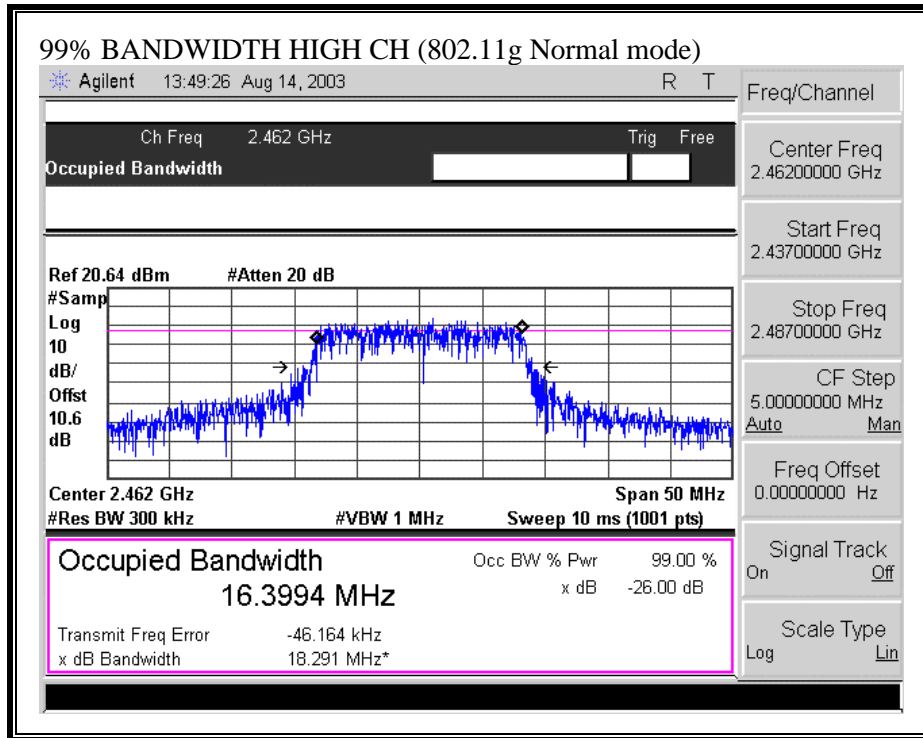




99% BANDWIDTH (802.11g NORMAL MODE)







7.3. 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) (4) Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum antenna gain is 2.2 dBi, therefore the limit is 30 dBm.

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

No non-compliance noted:

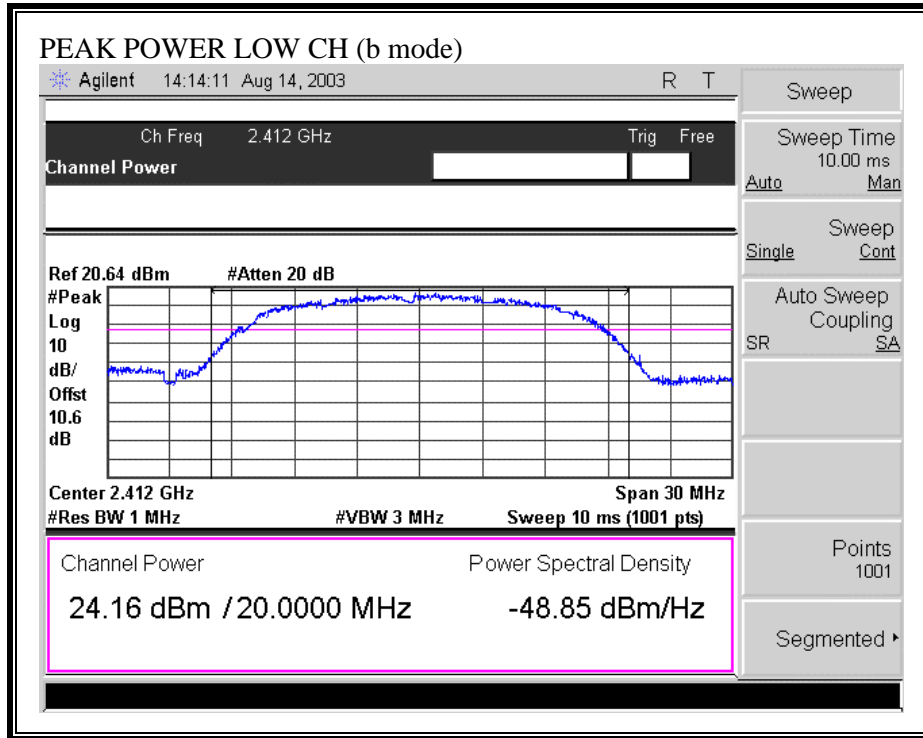
802.11b Mode

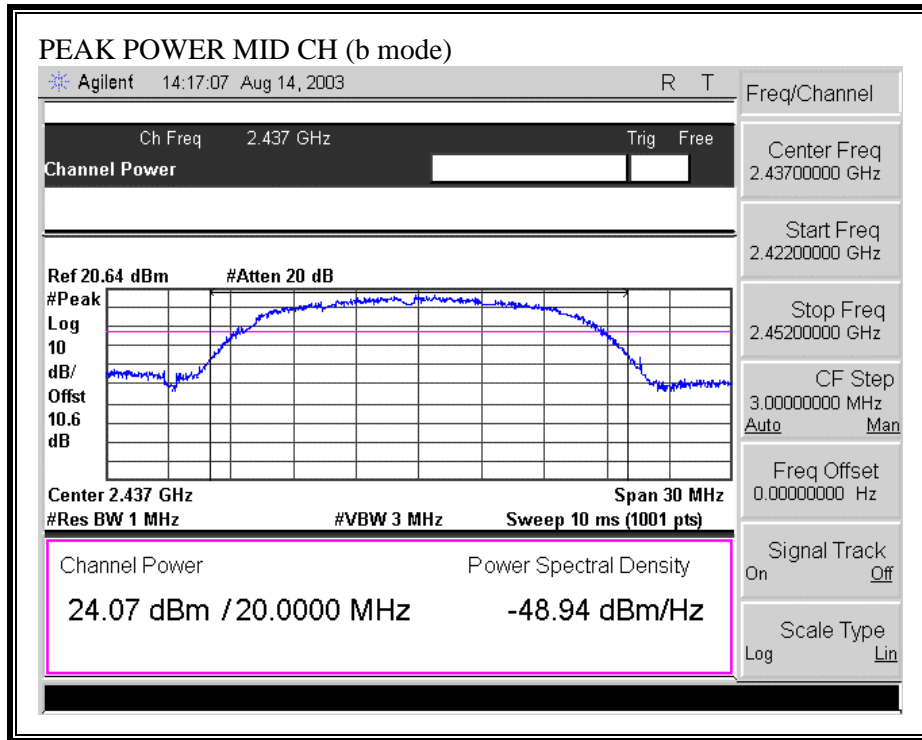
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	24.16	30	-5.84
Middle	2437	24.07	30	-5.93
High	2462	24.39	30	-5.61

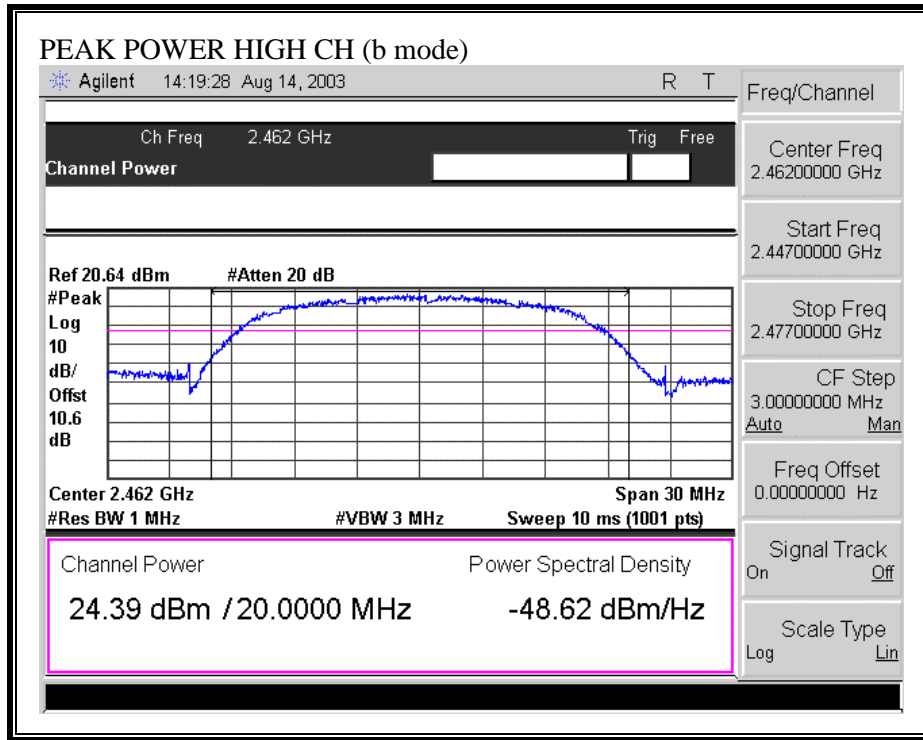
802.11g Normal Mode

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	20.18	30	-9.82
Middle	2437	20.60	30	-9.40
High	2462	20.53	30	-9.47

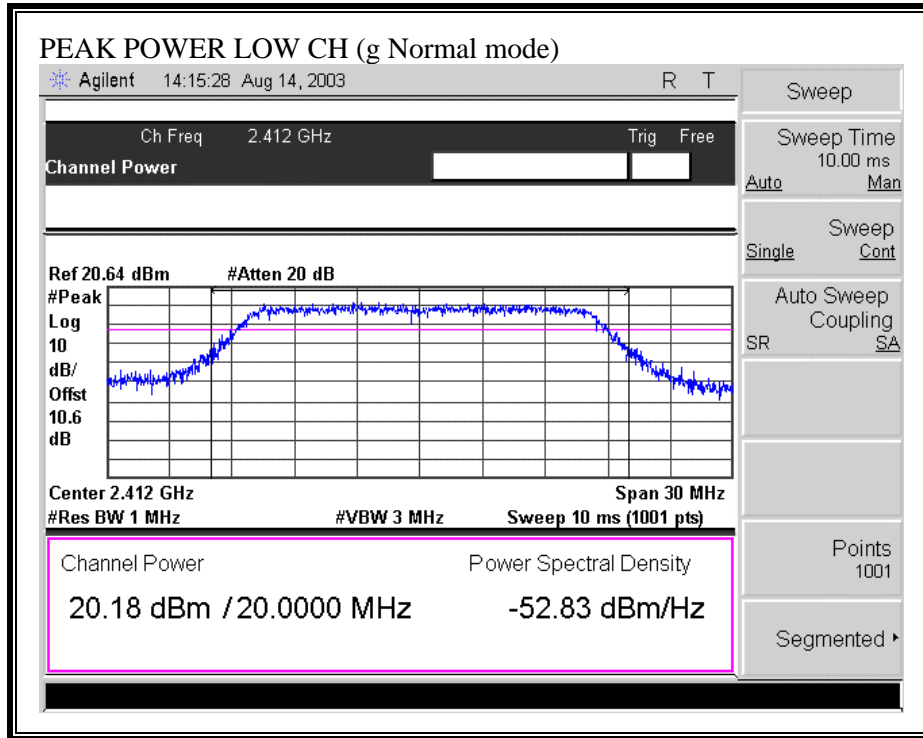
OUTPUT POWER (802.11b MODE)

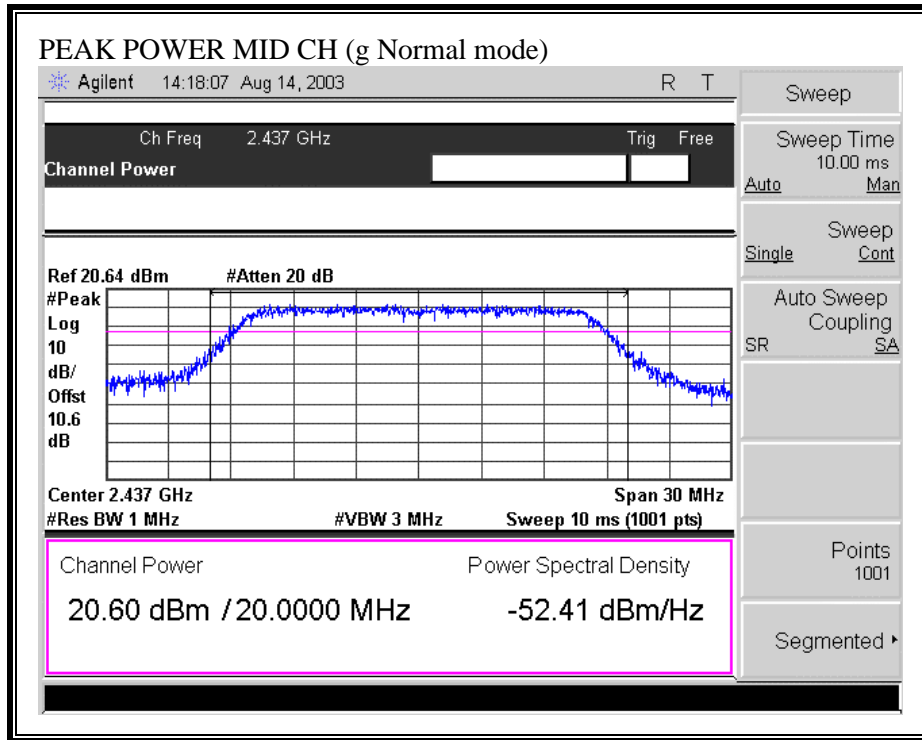


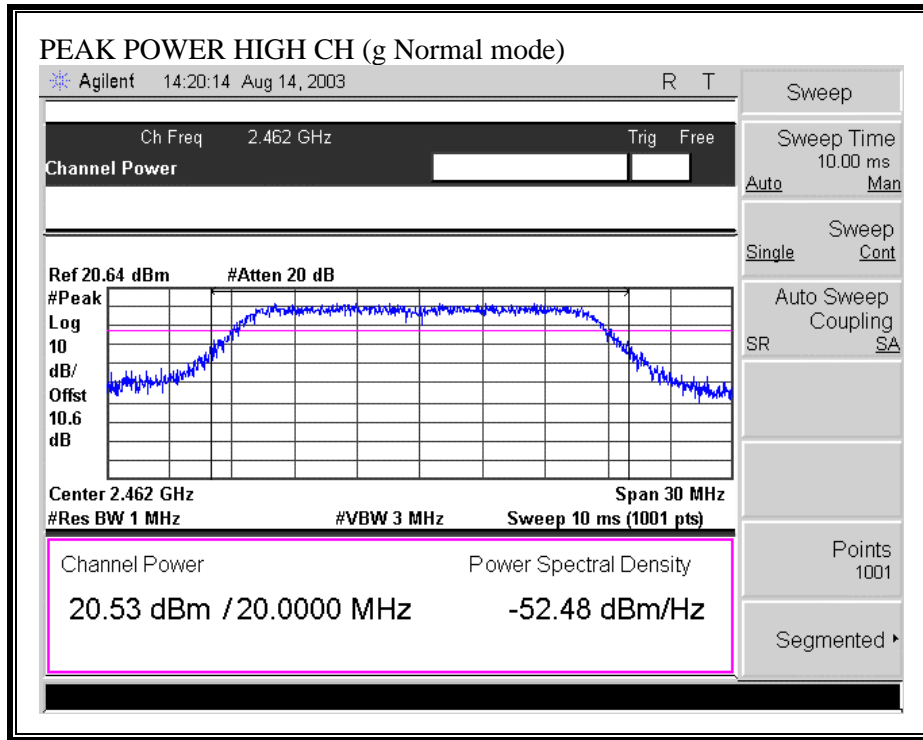




OUTPUT POWER (802.11g NORMAL MODE)







7.4. MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

§15.247 (b) (5) Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See §1.1307(b)(1) of this chapter.

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 mW and 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 / cm²

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

$$d = 0.282 * 10^{((P + G) / 20) / \sqrt{S}} \quad \text{Equation (1)}$$

where

- d = MPE distance in cm
- P = Power in dBm
- G = Antenna Gain in dBi
- S = Power Density Limit in mW / cm²

Equation (1) and the measured peak power is used to calculate the MPE distance.

LIMITS

S = 1.0 mW / cm² from 1.1310 Table 1

RESULTS

No non-compliance noted:

Mode	Power Density Limit (mW/cm ²)	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
802.11b	1.0	24.39	2.20	6.02
802.11g	1.0	20.60	2.20	3.89

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.

7.5. 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 10.64 dB (including 10 dB pad and 0.64 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

802.11b Mode

Channel	Frequency (MHz)	Average Power (dBm)
Low	2412	20.15
Middle	2437	20.10
High	2462	20.15

802.11g Normal Mode

Channel	Frequency (MHz)	Average Power (dBm)
Low	2412	14.65
Middle	2437	14.79
High	2462	14.61

7.6. 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:

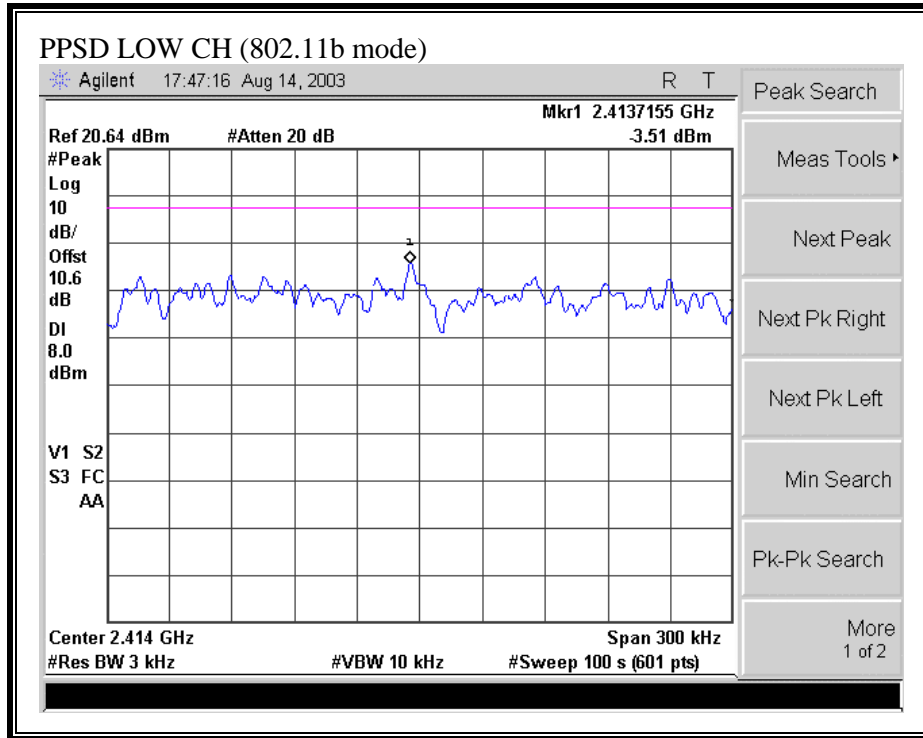
802.11b Mode

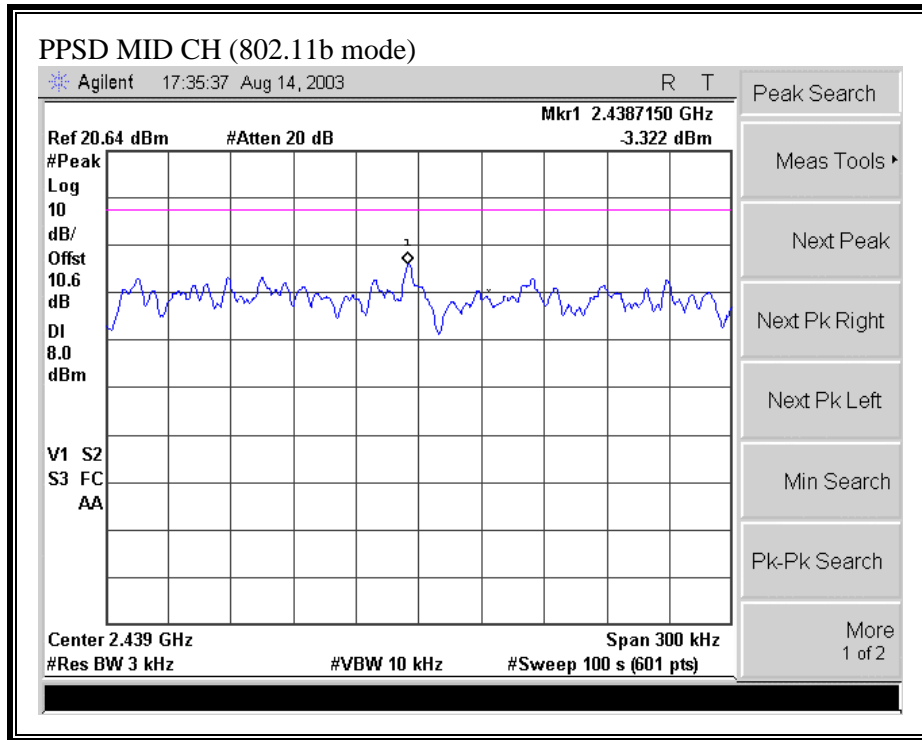
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-3.51	8	-11.51
Middle	2437	-3.32	8	-11.32
High	2462	-3.38	8	-11.38

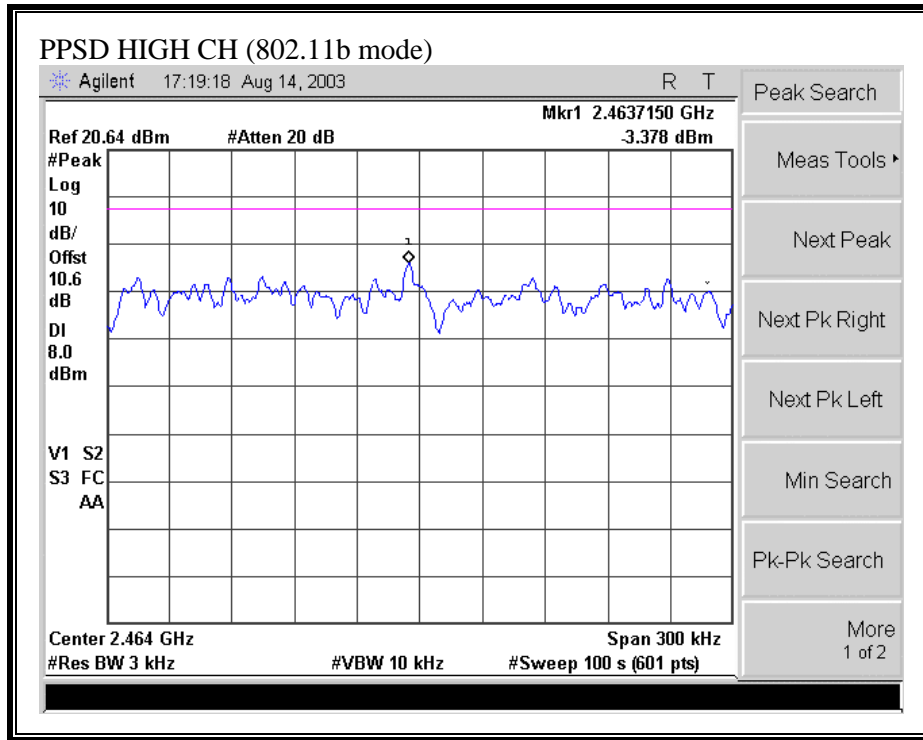
802.11g Normal Mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-9.29	8	-17.29
Middle	2437	-9.82	8	-17.82
High	2462	-10.51	8	-18.51

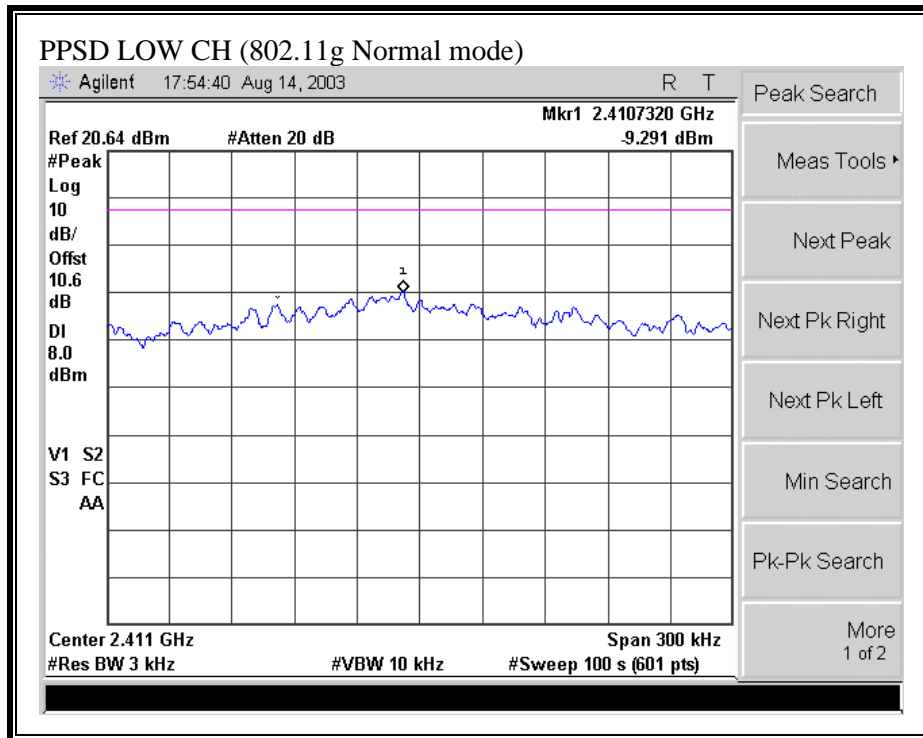
PEAK POWER SPECTRAL DENSITY (802.11b MODE)

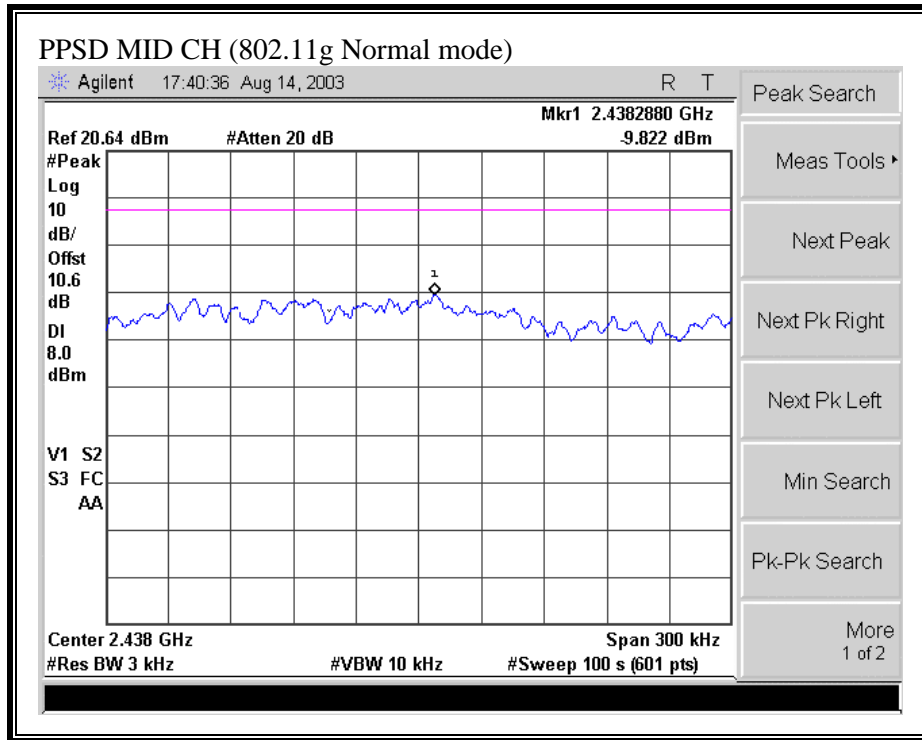


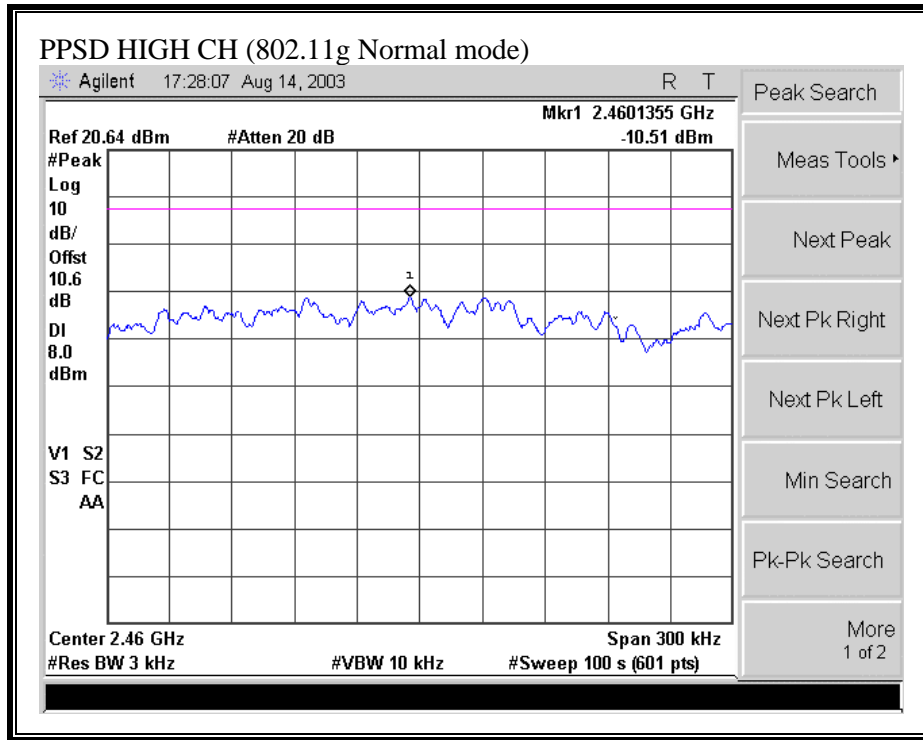




PEAK POWER SPECTRAL DENSITY (802.11g NORMAL MODE)







7.7. 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)).

TEST PROCEDURE

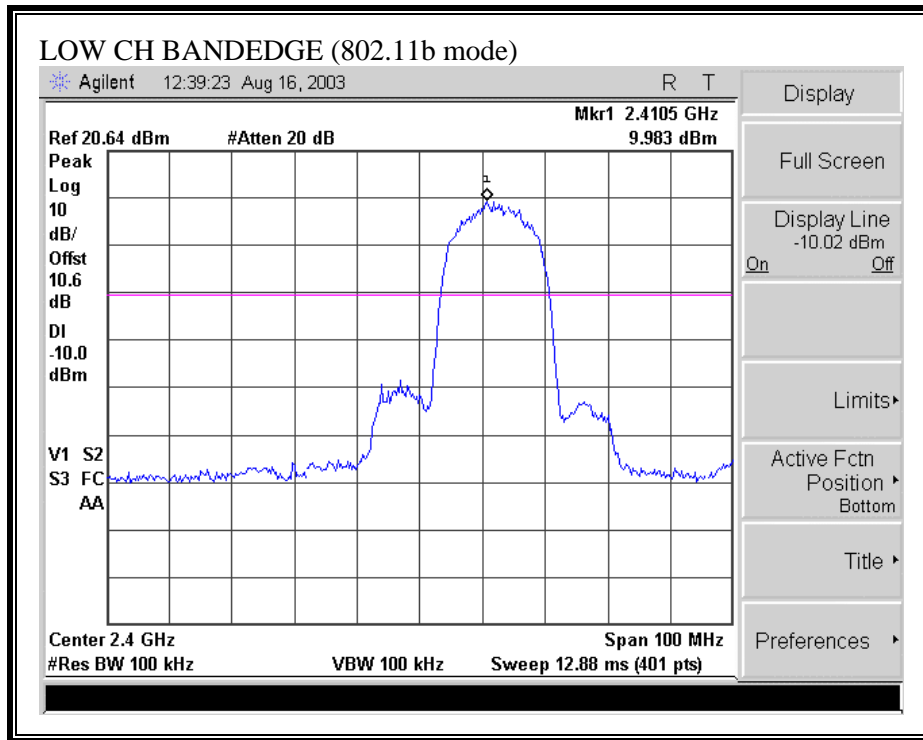
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

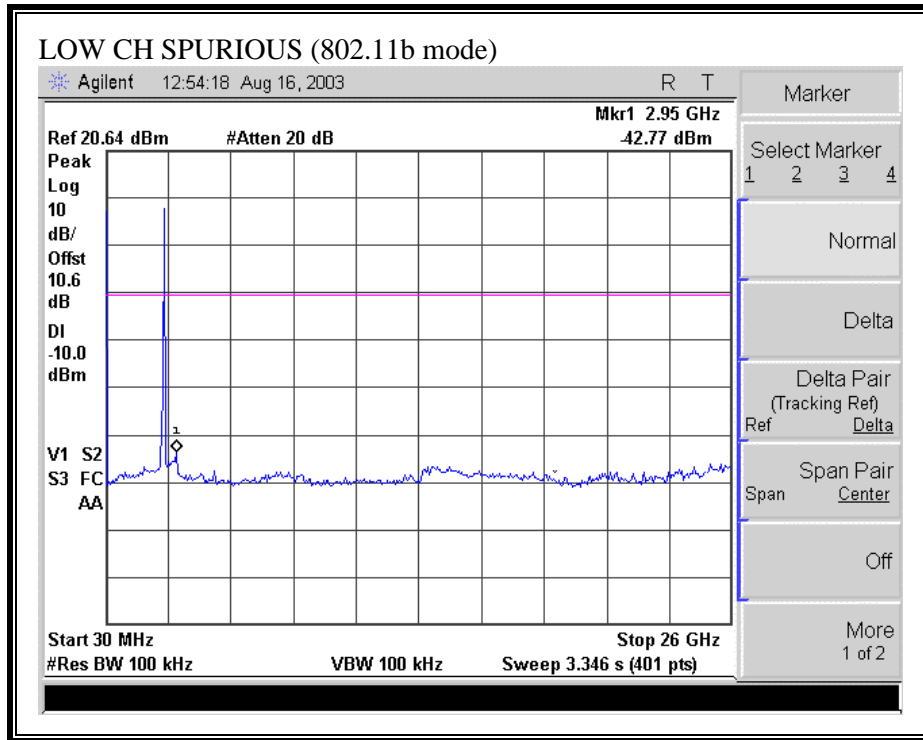
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

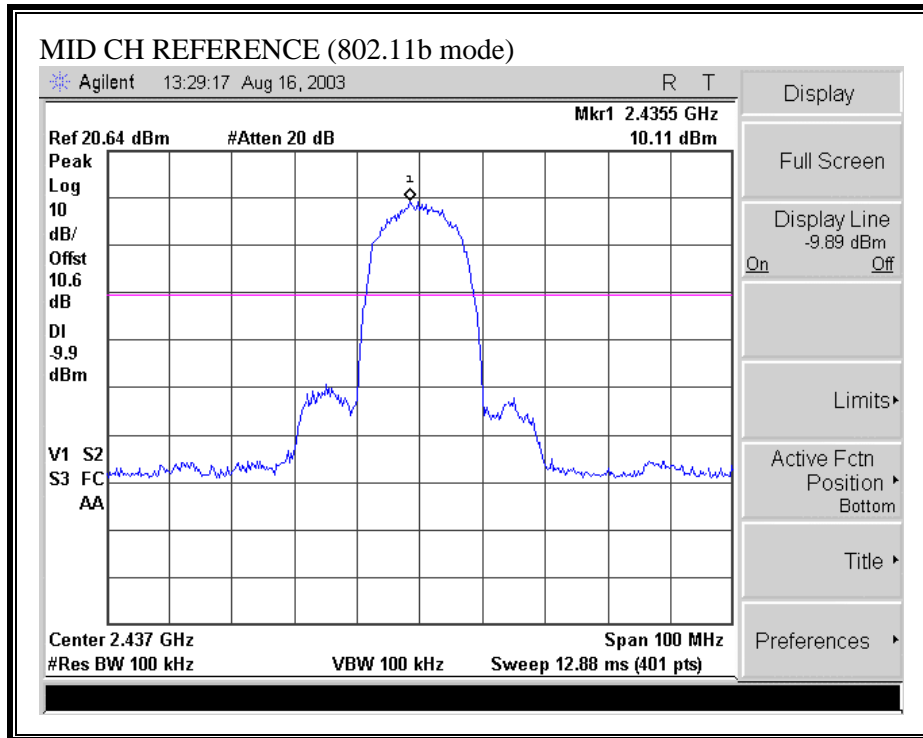
No non-compliance noted:

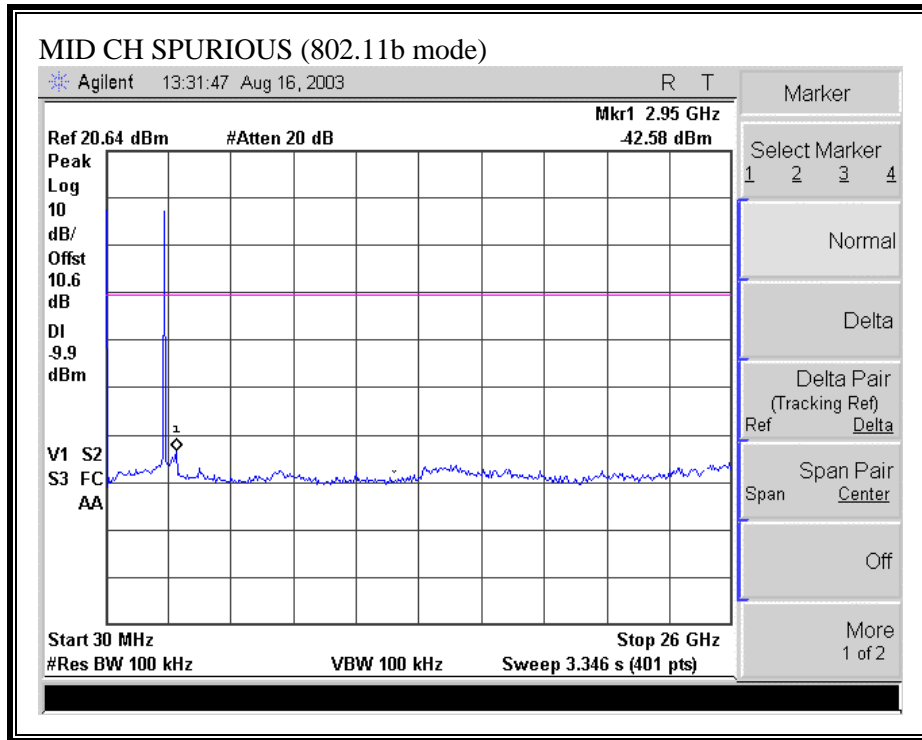
SPURIOUS EMISSIONS, LOW CHANNEL (802.11b MODE)



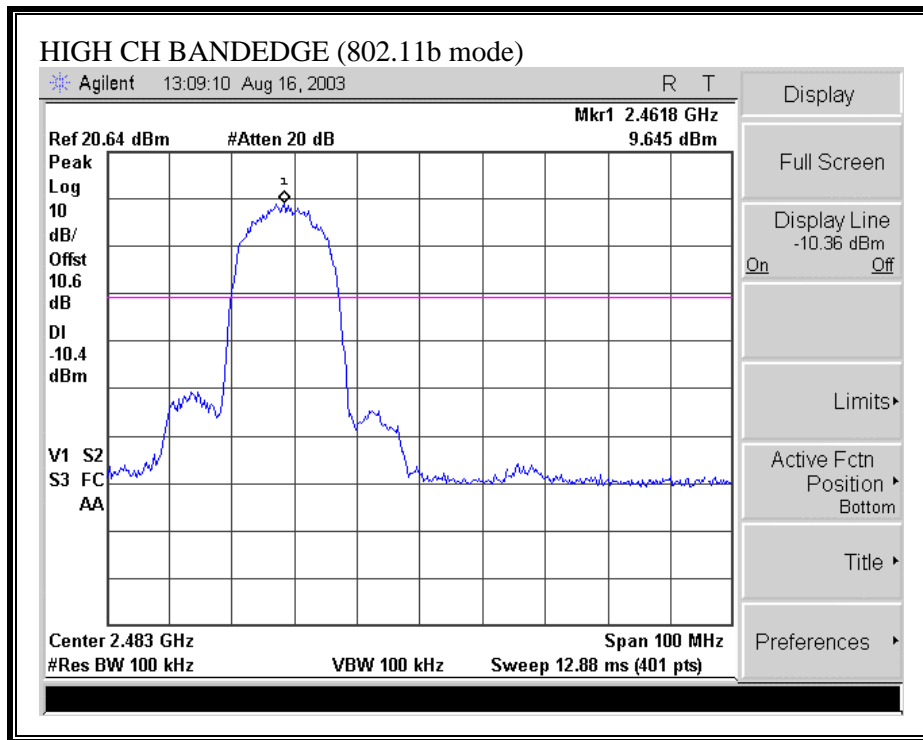


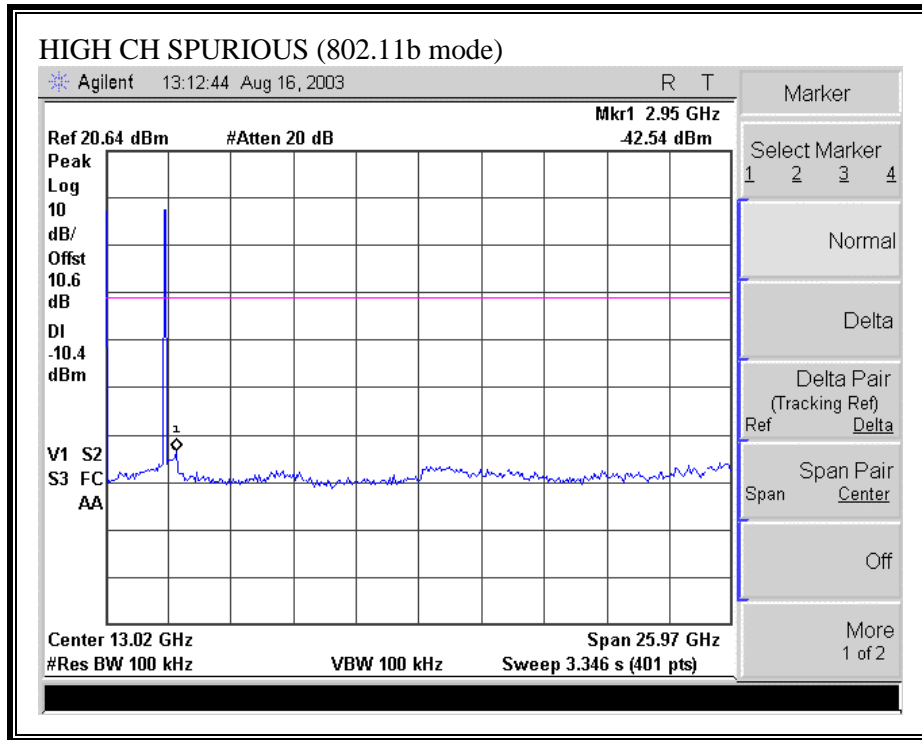
SPURIOUS EMISSIONS, MID CHANNEL (802.11b MODE)



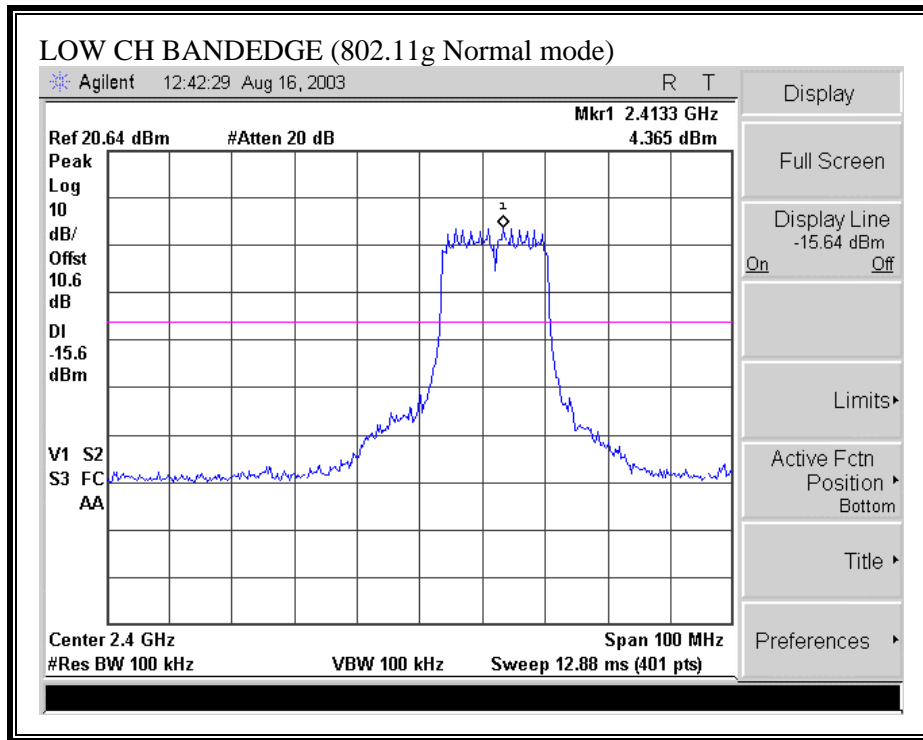


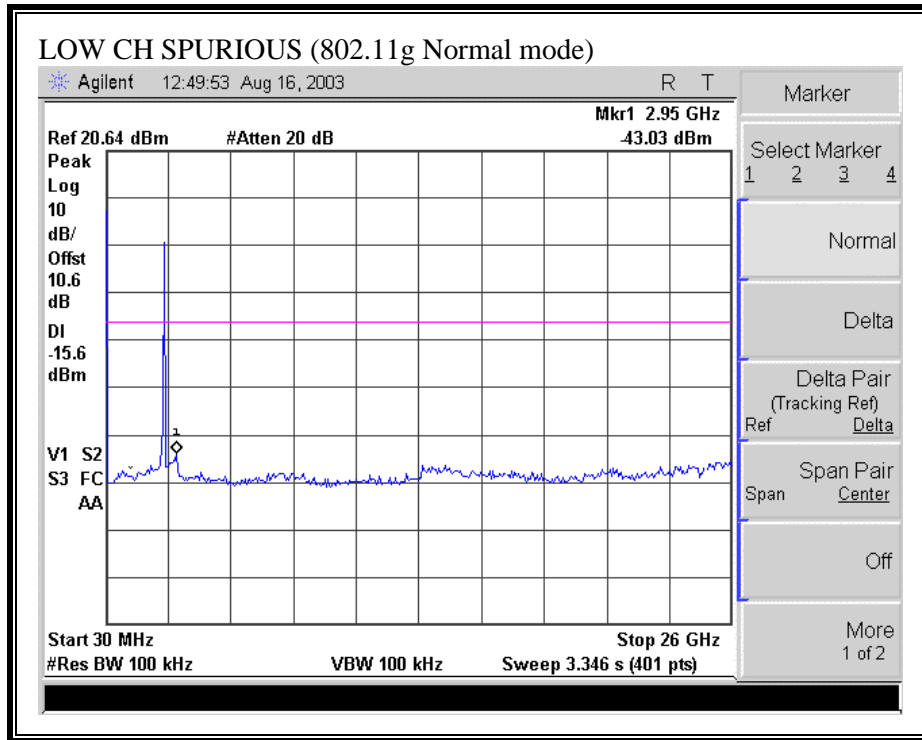
SPURIOUS EMISSIONS, HIGH CHANNEL (802.11b MODE)



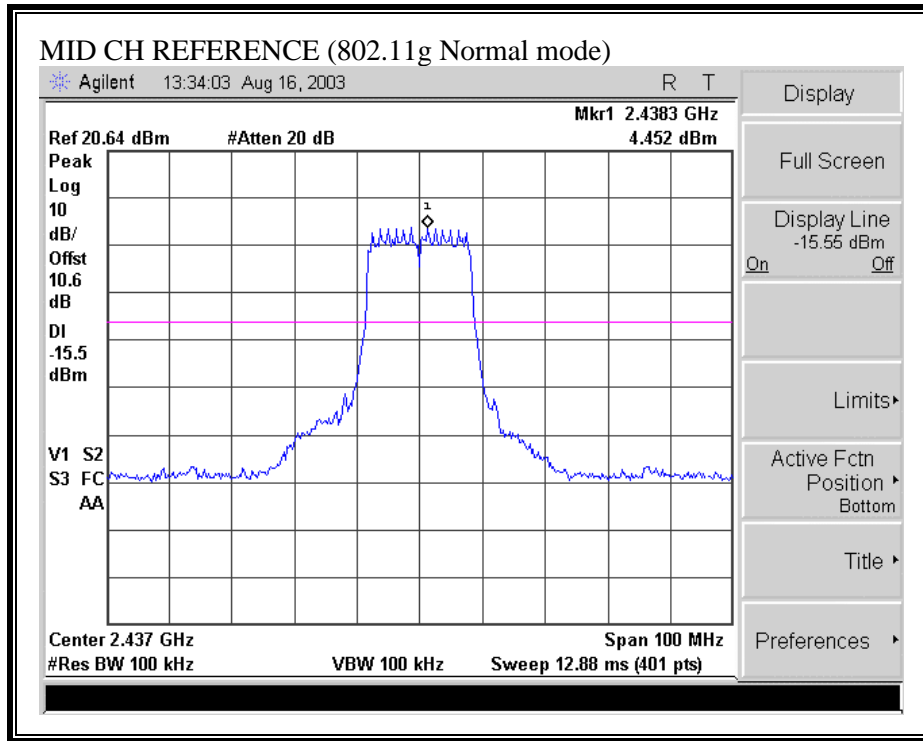


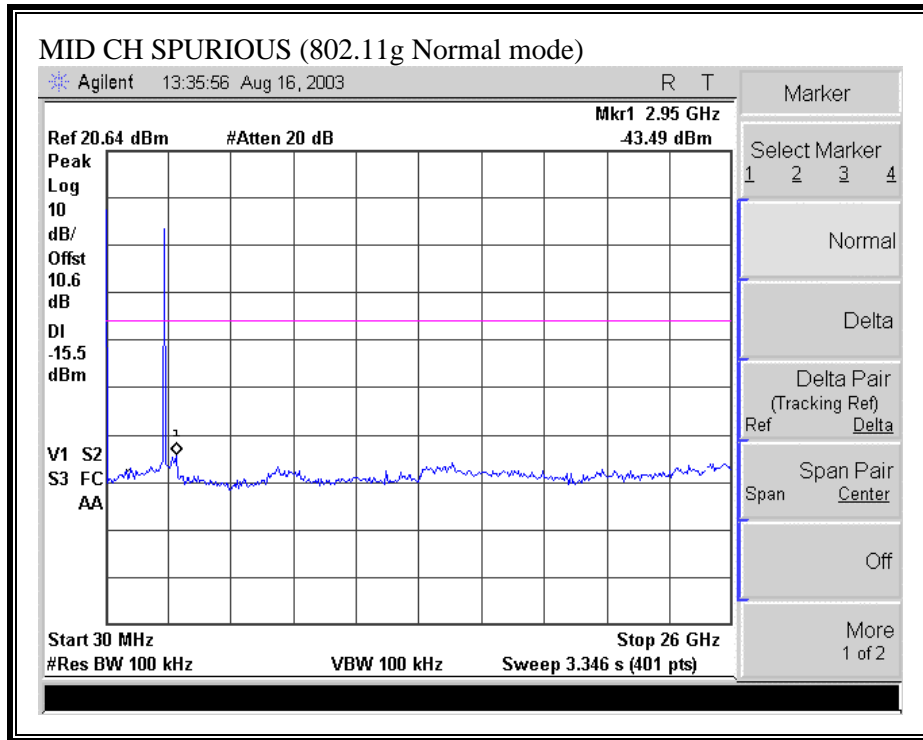
SPURIOUS EMISSIONS, LOW CHANNEL (802.11g NORMAL MODE)



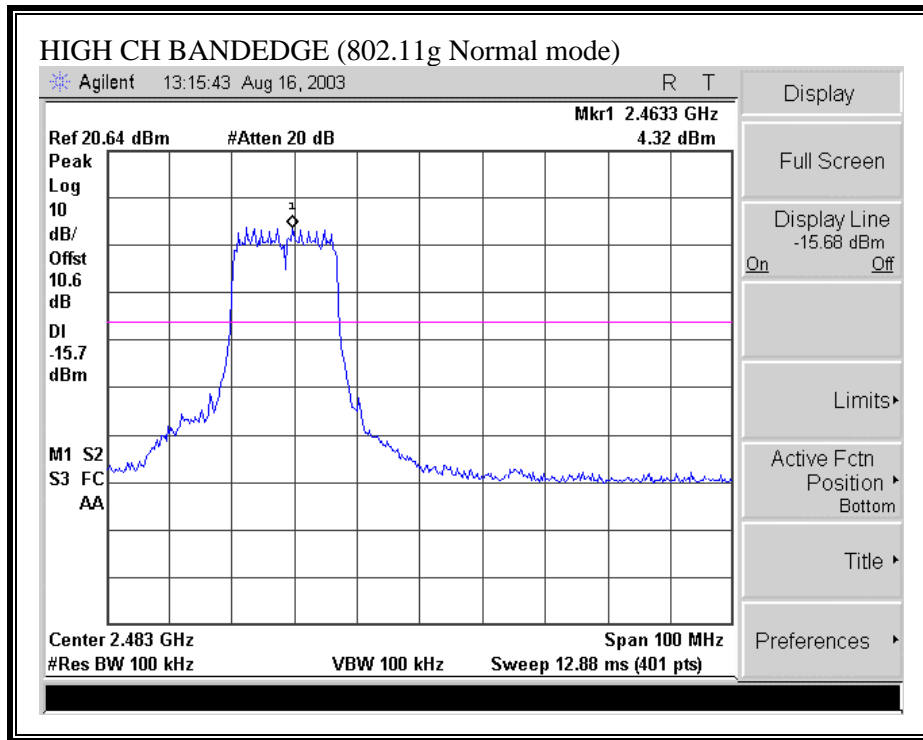


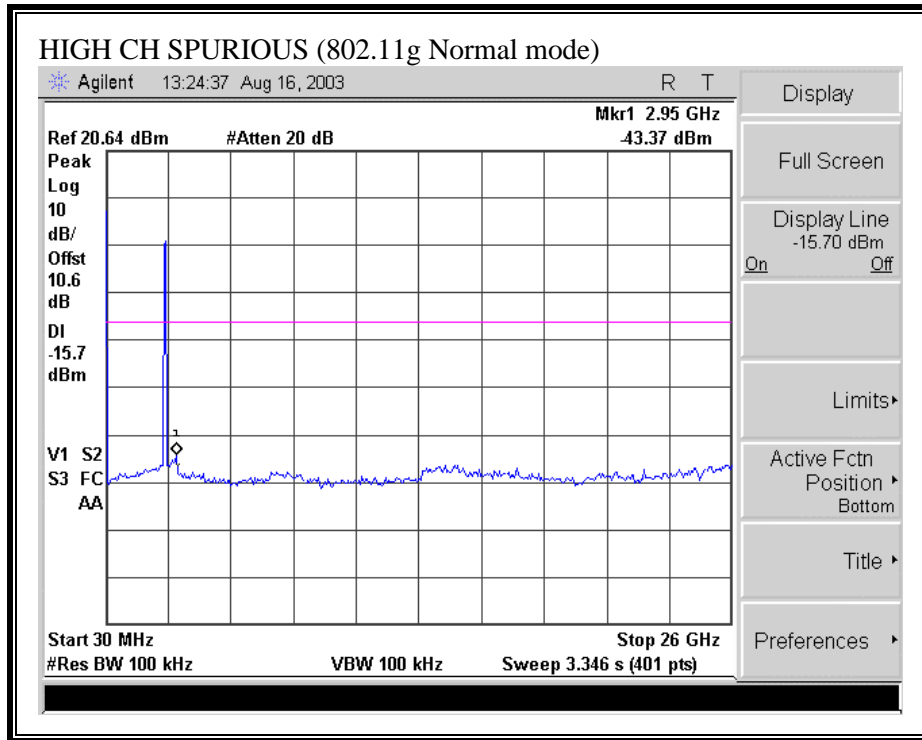
SPURIOUS EMISSIONS, MID CHANNEL (802.11g NORMAL MODE)





SPURIOUS EMISSIONS, HIGH CHANNEL (802.11g NORMAL MODE)





7.8. RADIATED 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
¹ 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	(²)
13.36 - 13.41			

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² 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.

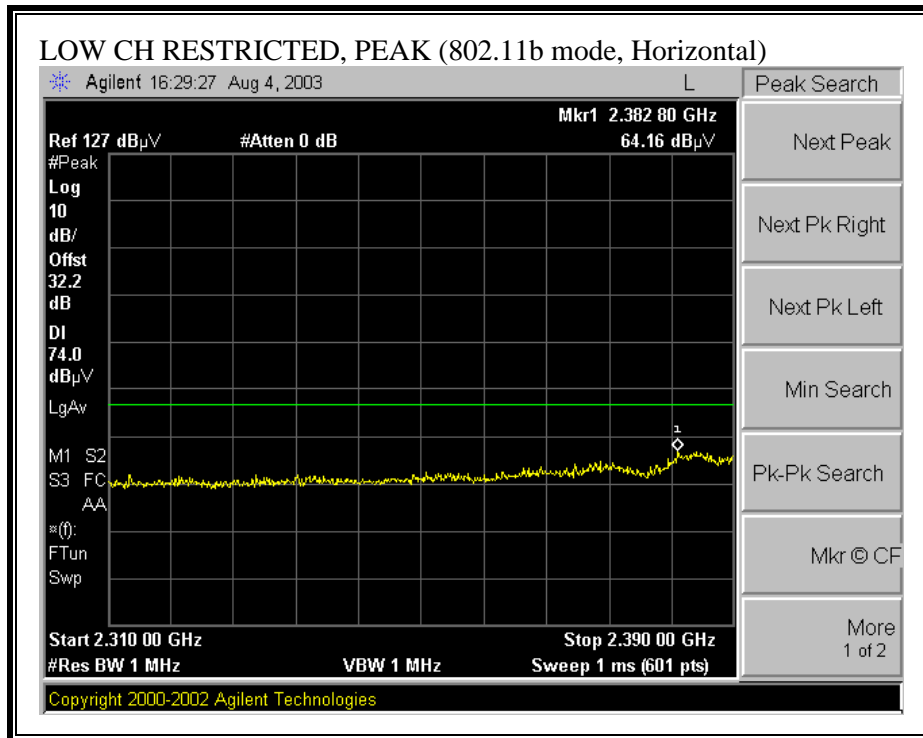
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

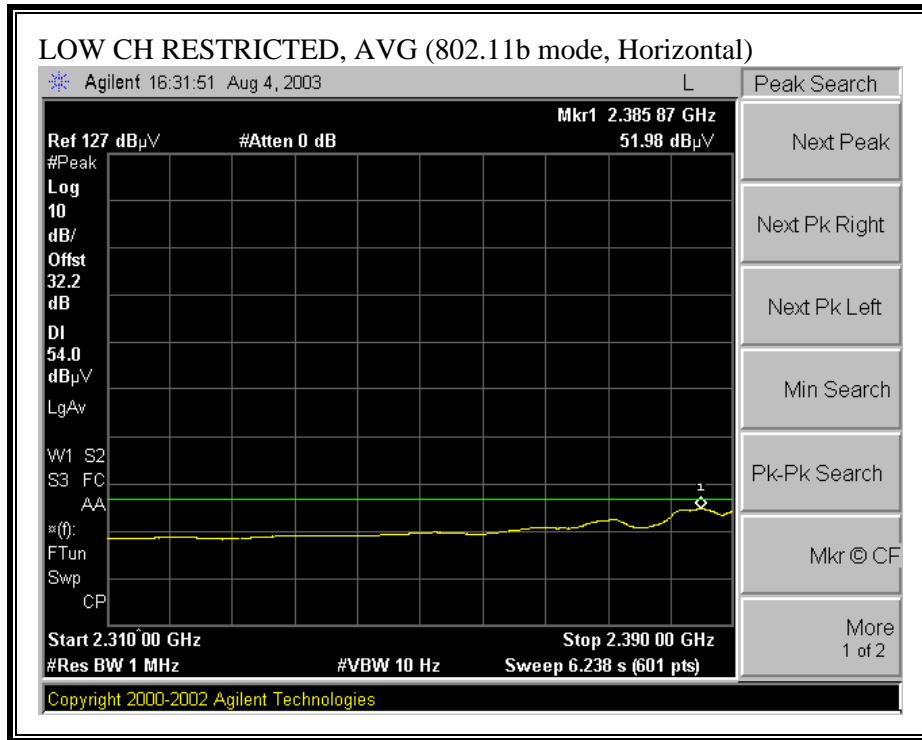
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

RESULTS

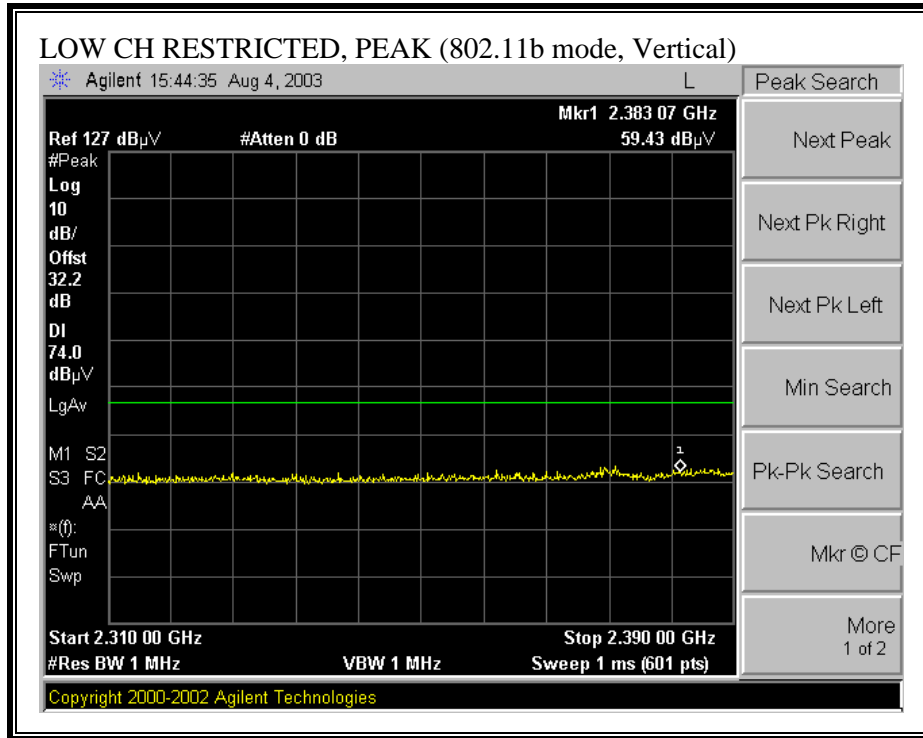
No non-compliance noted:

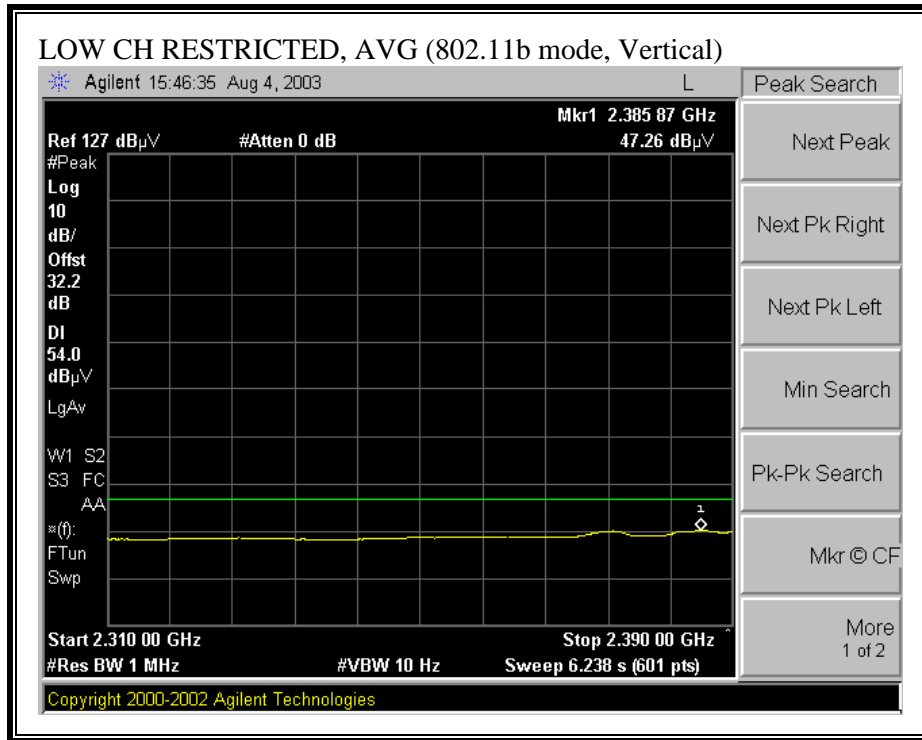
RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, HORIZONTAL)



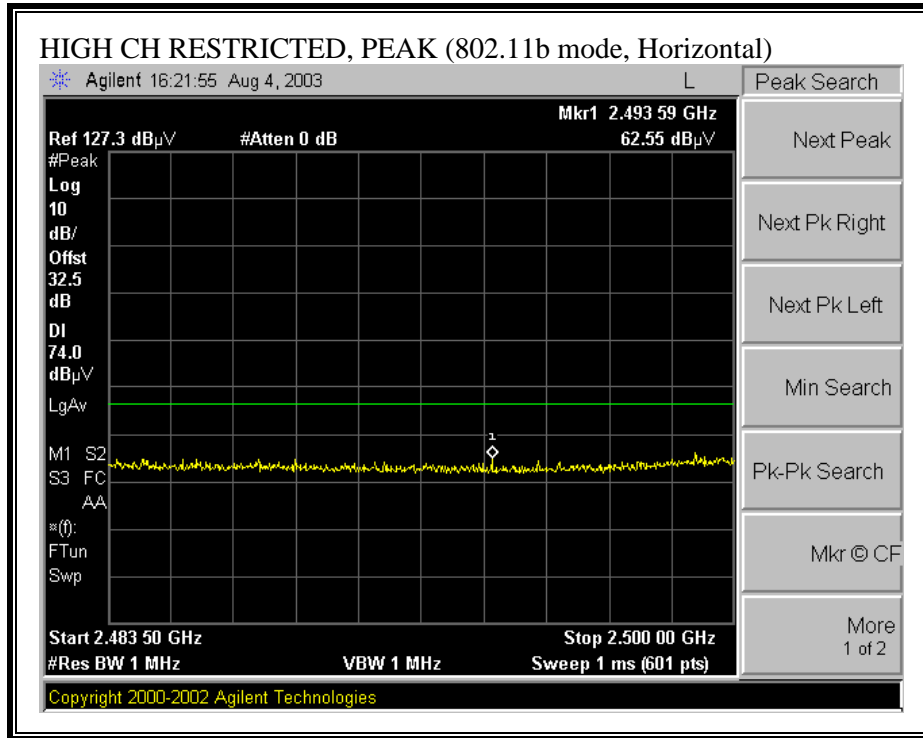


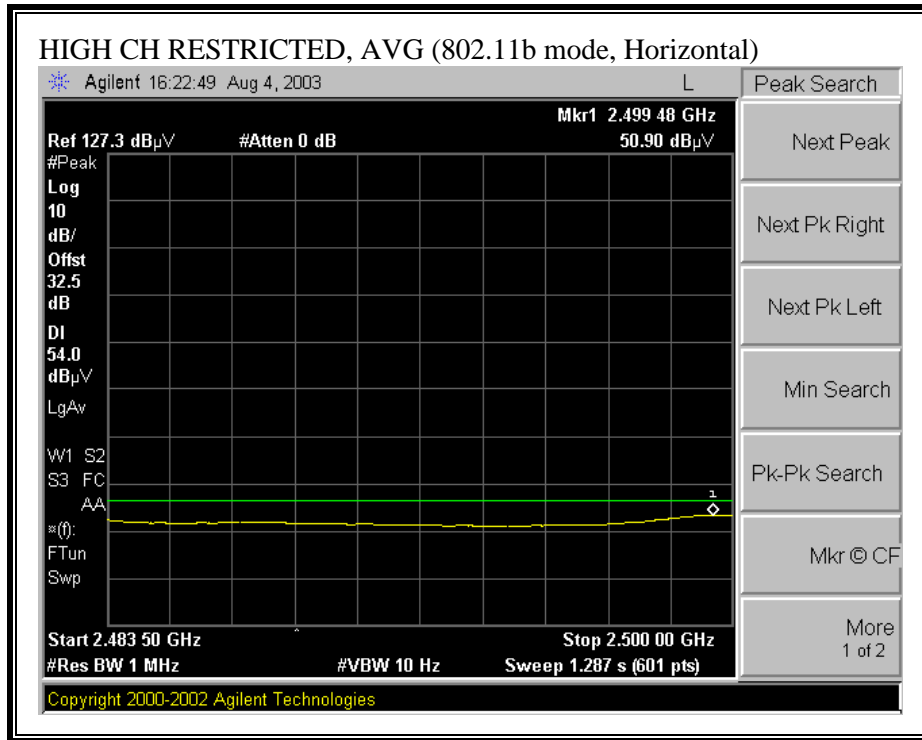
RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, VERTICAL)



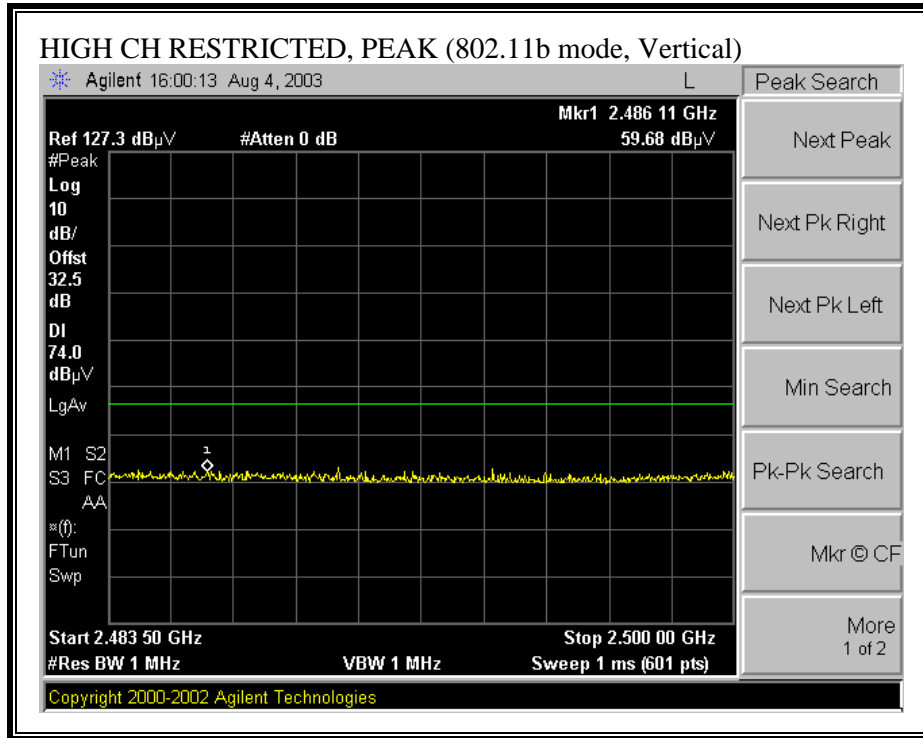


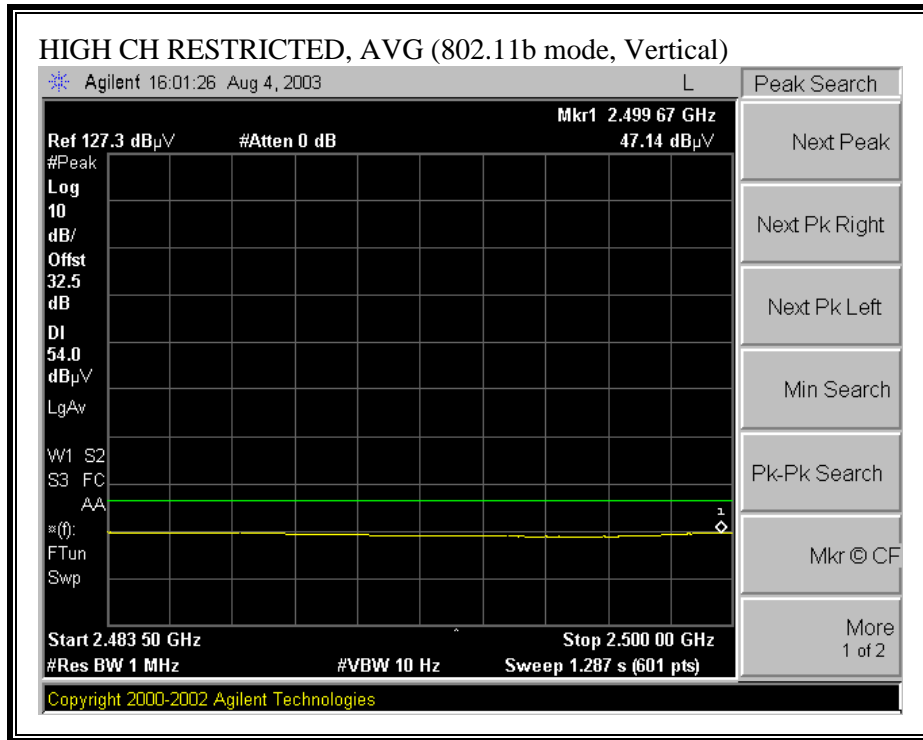
RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS (b MODE, LOW CHANNEL)

08/05/03 High Frequency Measurement																
Compliance Certification Services, Morgan Hill Open Field Site																
Test Engr: William Zhuang																
Project #: 03U2080																
Company Name: CISCO																
EUT Descr.: 802.11b/g mini-PCI Card																
EUT M/N: Orian 1200C Smt 07220009																
Test Target: FCC15.247																
Mode Oper: 802.11b Transmit																
Test Equipment:																
EMCO Horn 1-18GHz				Pre-amplifier 1-26GHz				Spectrum Analyzer				Horn > 18GHz				
T73; S/N: 6717 @ 1m				T86 Miteq 924341				Agilent E4446A Analyzer								
Hi Frequency Cables																
<input checked="" type="checkbox"/> (2 ft) <input type="checkbox"/> (2 ~ 3 ft) <input type="checkbox"/> (4 ~ 6 ft) <input checked="" type="checkbox"/> (12 ft)																
Peak Measurements: 1 MHz Resolution Bandwidth 1 MHz Video Bandwidth Average Measurements: 1 MHz Resolution Bandwidth 10Hz Video Bandwidth																
f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes	
4.824	9.8	63.0	49.2	33.9	3.9	-45.6	0.0	1.0	56.1	42.4	74.0	54.0	-17.9	-11.6	V, Low Ch	
4.824	9.8	58.9	45.3	33.9	3.9	-45.6	0.0	1.0	52.0	38.5	74.0	54.0	-22.0	-15.5	H, Low Ch	
7.236	9.8	56.9	46.4	36.7	4.9	-46.6	0.0	1.0	52.8	42.3	74.0	54.0	-21.2	-11.7	V, Low Ch	
7.236	9.8	60.6	42.0	36.7	4.9	-46.6	0.0	1.0	56.6	38.0	74.0	54.0	-17.4	-16.0	H, Low Ch	
9.648	9.8	52.4	46.1	38.8	5.8	-45.2	0.0	1.0	52.7	46.4	74.0	54.0	-21.3	-7.6	V, Low Ch	
9.648	9.8	49.0	38.2	38.8	5.8	-45.2	0.0	1.0	49.3	38.6	74.0	54.0	-24.7	-15.4	H, Low Ch	
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									

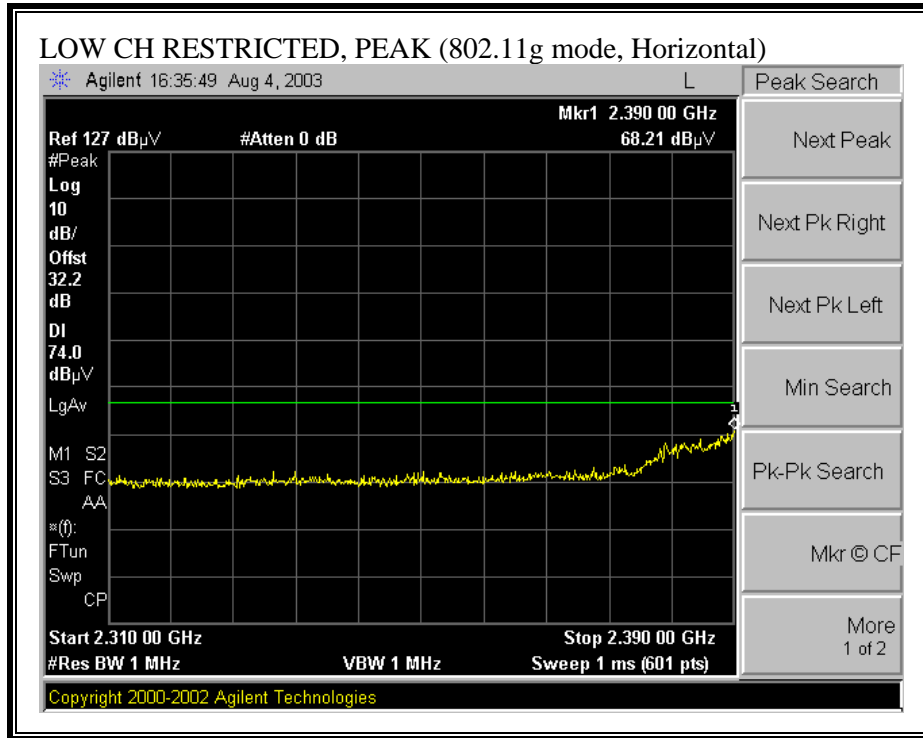
HARMONICS AND SPURIOUS EMISSIONS (b MODE, MID CHANNEL)

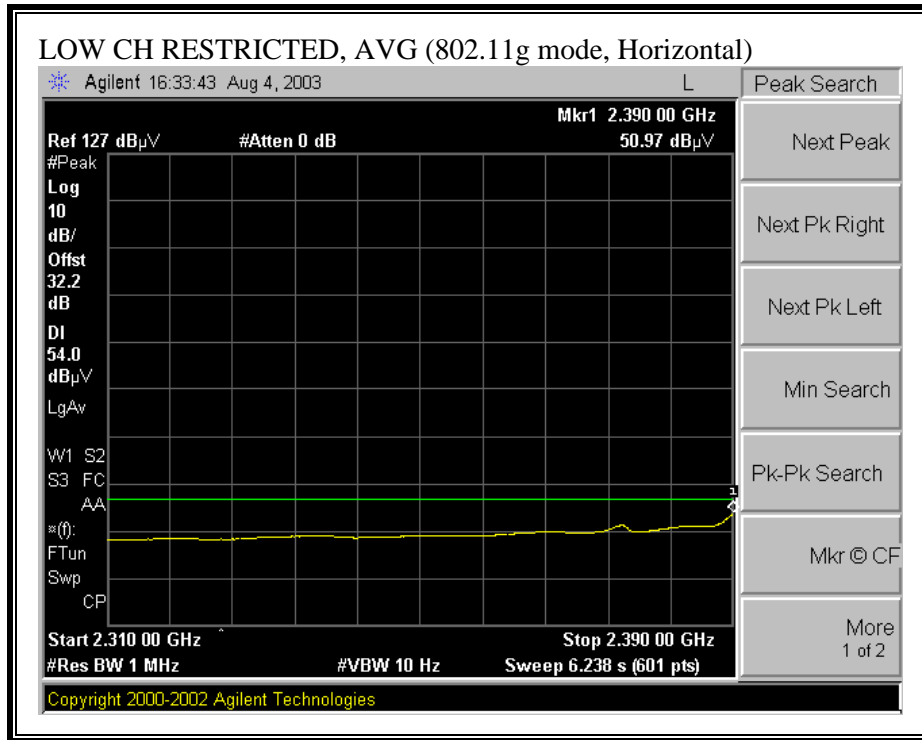
08/05/03 High Frequency Measurement																
Compliance Certification Services, Morgan Hill Open Field Site																
Test Engr: William Zhuang																
Project #: 03U2080																
Company Name: CISCO																
EUT Descr.: 802.11b/g mini-PCI Card																
EUT M/N: Orian 1200C Smt 07220009																
Test Target: FCC15.247																
Mode Oper: 802.11b Transmit																
Test Equipment:																
EMCO Horn 1-18GHz				Pre-amplifier 1-26GHz				Spectrum Analyzer				Horn > 18GHz				
T73; S/N: 6717 @ 1m				T86 Miteq 924341				Agilent E4446A Analyzer								
Hi Frequency Cables																
<input checked="" type="checkbox"/> (2 ft) <input type="checkbox"/> (2 ~ 3 ft) <input type="checkbox"/> (4 ~ 6 ft) <input checked="" type="checkbox"/> (12 ft)																
Peak Measurements: 1 MHz Resolution Bandwidth 1 MHz Video Bandwidth Average Measurements: 1 MHz Resolution Bandwidth 10Hz Video Bandwidth																
f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes	
4.874	9.8	59.3	46.3	33.9	3.9	-45.6	0.0	1.0	52.4	39.4	74.0	54.0	-21.6	-14.6	V, Mid Ch	
4.874	9.8	54.4	41.6	33.9	3.9	-45.6	0.0	1.0	47.5	34.8	74.0	54.0	-26.5	-19.2	H, Mid Ch	
7.311	9.8	55.9	45.8	36.8	4.9	-46.6	0.0	1.0	52.0	41.9	74.0	54.0	-22.0	-12.1	V, Mid Ch	
7.311	9.8	53.1	42.1	36.8	4.9	-46.6	0.0	1.0	49.2	38.3	74.0	54.0	-24.8	-15.7	H, Mid Ch	
9.748	9.8	51.3	44.8	38.7	5.8	-45.1	0.0	1.0	51.7	45.2	74.0	54.0	-22.3	-8.8	V, Mid Ch	
9.748	9.8	50.0	37.8	38.7	5.8	-45.1	0.0	1.0	50.4	38.2	74.0	54.0	-23.6	-15.8	H, Mid Ch	
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									

HARMONICS AND SPURIOUS EMISSIONS (b MODE, HIGH CHANNEL)

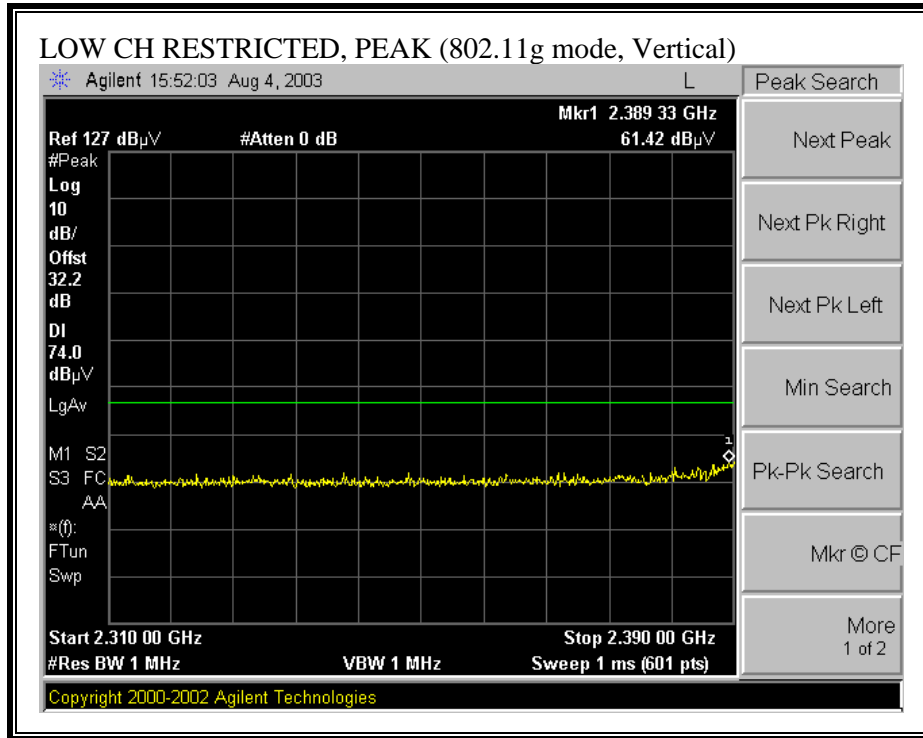
08/05/03 High Frequency Measurement																
Compliance Certification Services, Morgan Hill Open Field Site																
Test Engr: William Zhuang																
Project #: 03U2080																
Company Name: CISCO																
EUT Descr.: 802.11b/g mini-PCI Card																
EUT M/N: Orian 1200C Smt 07220009																
Test Target: FCC15.247																
Mode Oper: 802.11b Transmit																
Test Equipment:																
EMCO Horn 1-18GHz				Pre-amplifier 1-26GHz				Spectrum Analyzer				Horn > 18GHz				
T73; S/N: 6717 @ 1m				T86 Miteq 924341				Agilent E4446A Analyzer								
Hi Frequency Cables																
<input checked="" type="checkbox"/> (2 ft) <input type="checkbox"/> (2 ~ 3 ft) <input type="checkbox"/> (4 ~ 6 ft) <input checked="" type="checkbox"/> (12 ft)																
Peak Measurements:																
1 MHz Resolution Bandwidth																
1MHz Video Bandwidth																
Average Measurements:																
1 MHz Resolution Bandwidth																
10Hz Video Bandwidth																
f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes	
4.924	9.8	64.5	51.2	34.0	3.9	-45.7	0.0	1.0	57.7	44.4	74.0	54.0	-16.3	-9.6	V, High Ch	
4.924	9.8	60.8	48.1	34.0	3.9	-45.7	0.0	1.0	54.0	41.2	74.0	54.0	-20.0	-12.8	H, High Ch	
7.386	9.8	56.0	46.4	36.9	5.0	-46.5	0.0	1.0	52.3	42.7	74.0	54.0	-21.7	-11.3	V, High Ch	
7.386	9.8	56.8	47.1	36.9	5.0	-46.5	0.0	1.0	53.1	43.4	74.0	54.0	-20.9	-10.6	H, High Ch	
9.848	9.8	54.1	49.4	38.7	5.8	-45.0	0.0	1.0	54.5	49.9	74.0	54.0	-19.5	-4.1	V, High Ch	
9.848	9.8	51.5	43.6	38.7	5.8	-45.0	0.0	1.0	51.9	44.1	74.0	54.0	-22.1	-9.9	H, High Ch	
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									

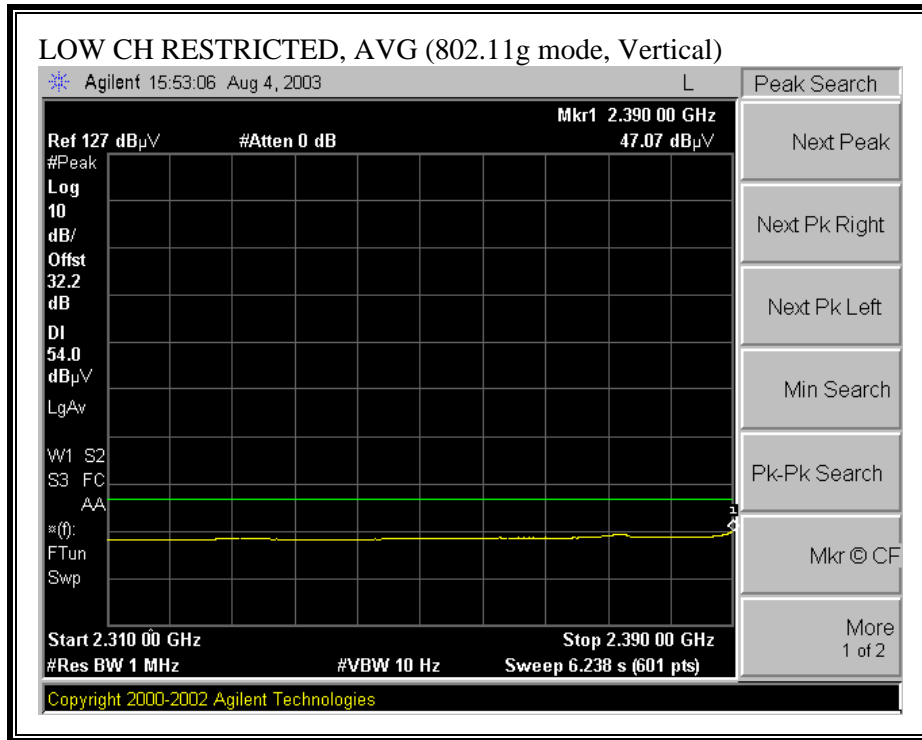
RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, HORIZONTAL)



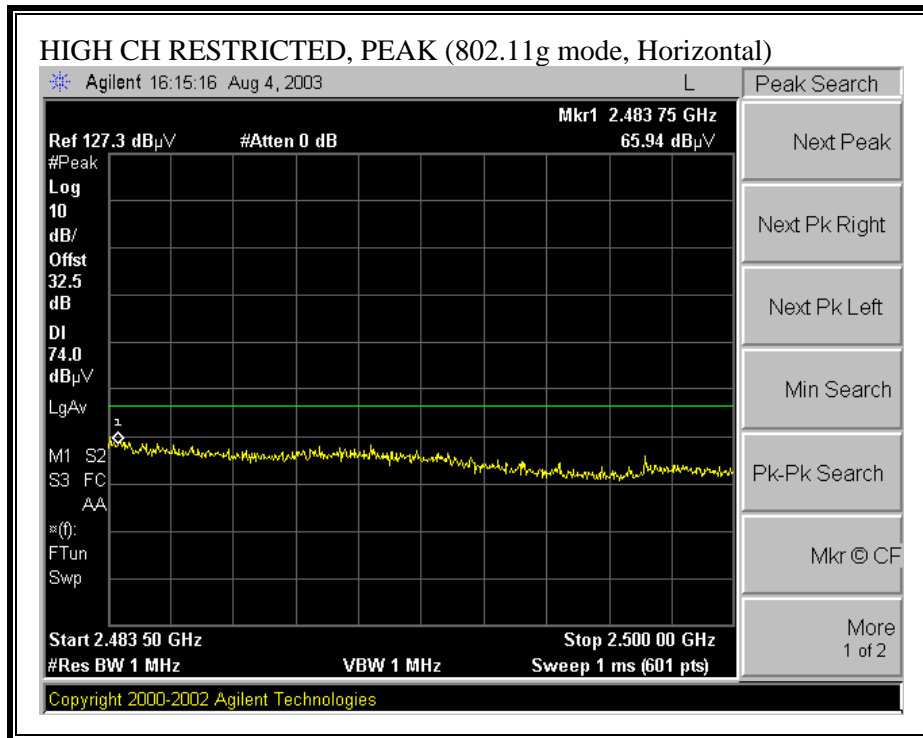


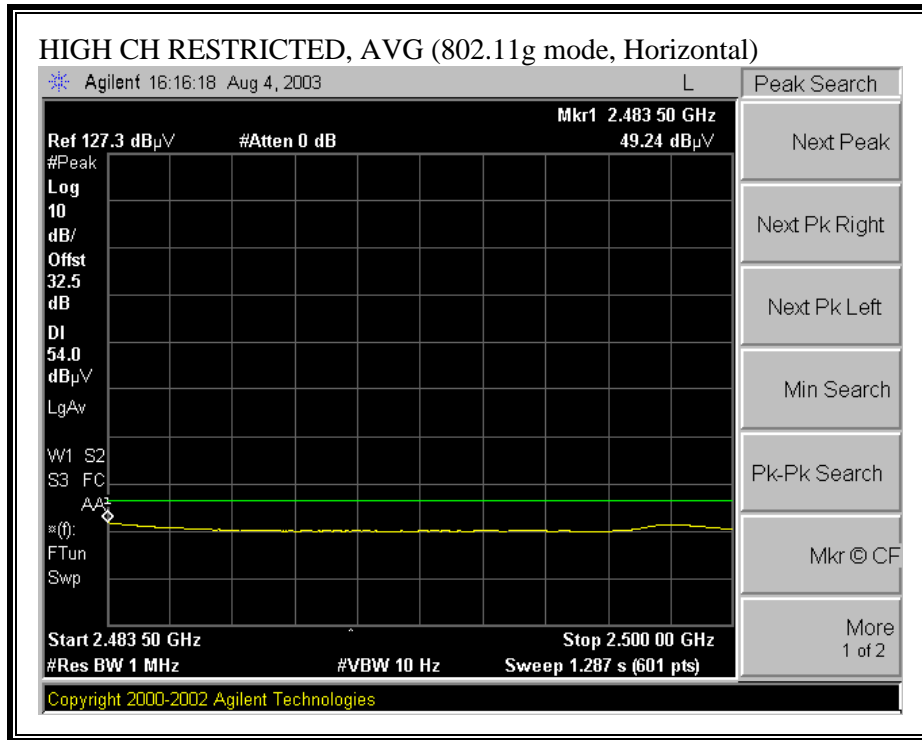
RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, VERTICAL)



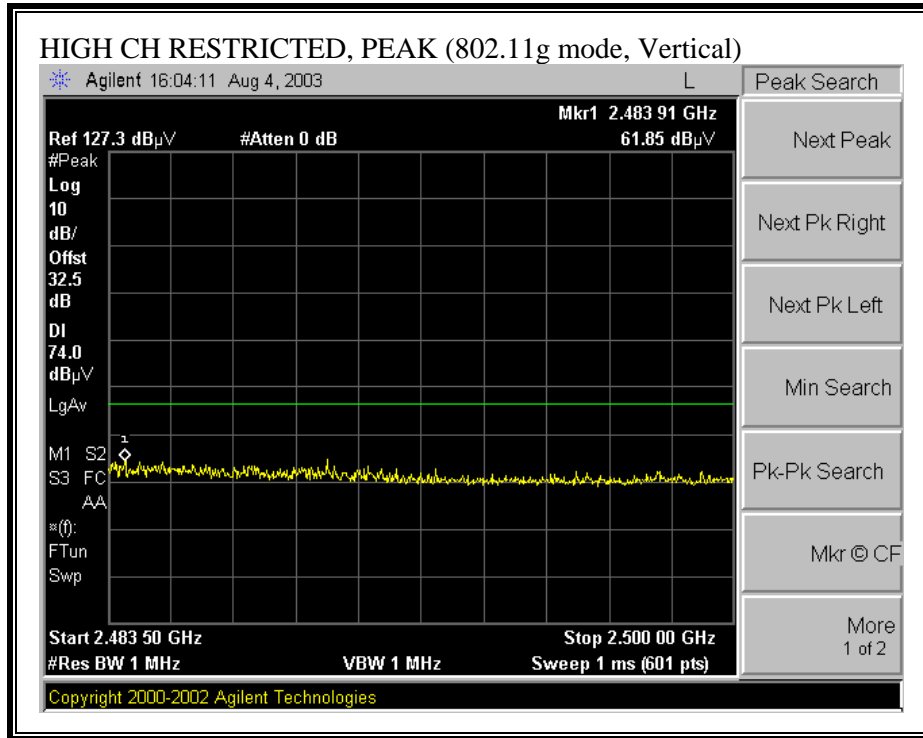


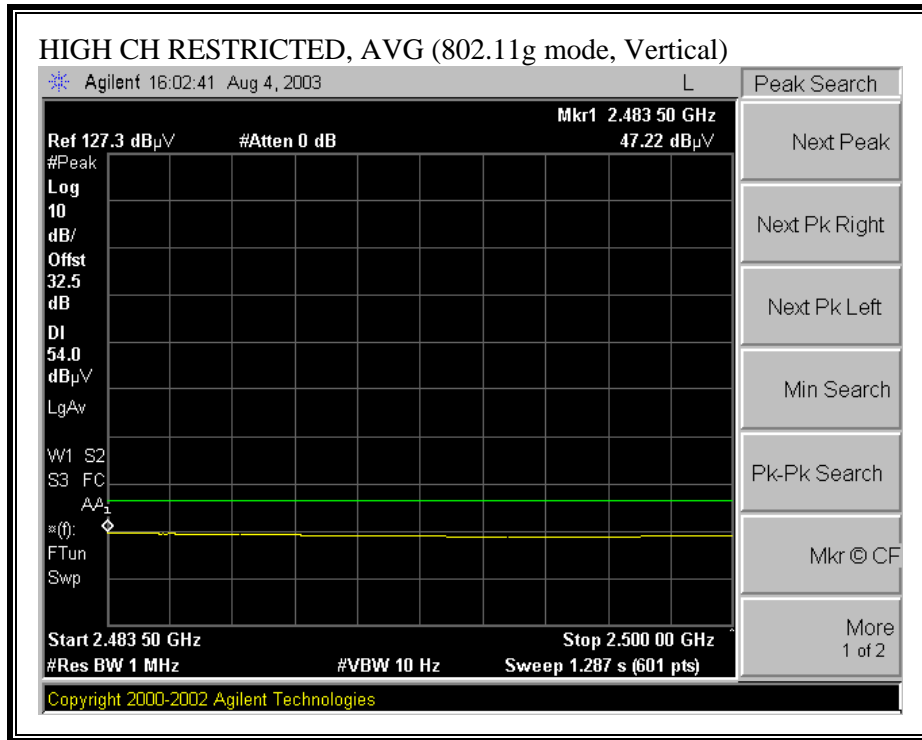
RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS (g NORMAL MODE, LOW CHANNEL)

08/05/03 High Frequency Measurement
 Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: William Zhuang
 Project #: 03U2180
 Company Name: CISCO
 EUT Descr.: 802.11b/g mini-PCI Card
 EUT M/N: Orian 1200C Smt 07220009
 Test Target: FCC15.247
 Mode Oper: 802.11g Transmit

Test Equipment:

EMCO Horn 1-18GHz	Pre-amplifier 1-26GHz	Spectrum Analyzer	Horn > 18GHz
T73; S/N: 6717 @ 1m	T86 Miteq 924341	Agilent E4446A Analyzer	

Hi Frequency Cables
 (2 ft) (2 ~ 3 ft) (4 ~ 6 ft) (12 ft)

		<u>Peak Measurements:</u>				<u>Average Measurements:</u>					
		1 MHz Resolution Bandwidth				1 MHz Resolution Bandwidth					
		1MHz Video Bandwidth				10Hz Video Bandwidth					

f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
4.824	9.8	57.3	47.0	33.9	3.9	-45.6	0.0	1.0	50.4	40.1	74.0	54.0	-23.6	-13.9	V, Low Ch
4.824	9.8	52.2	39.7	33.9	3.9	-45.6	0.0	1.0	45.4	32.9	74.0	54.0	-28.6	-21.1	H, Low Ch
7.236	9.8	53.0	40.3	36.7	4.9	-46.6	0.0	1.0	49.0	36.2	74.0	54.0	-25.0	-17.8	V, Low Ch
7.236	9.8	53.7	40.2	36.7	4.9	-46.6	0.0	1.0	49.6	36.2	74.0	54.0	-24.4	-17.8	H, Low Ch
9.648	9.8	52.4	47.2	38.8	5.8	-45.2	0.0	1.0	52.8	47.5	74.0	54.0	-21.2	-6.5	V, Low Ch
9.648	9.8	50.3	40.0	38.8	5.8	-45.2	0.0	1.0	50.7	40.4	74.0	54.0	-23.3	-13.6	H, Low Ch

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		

HARMONICS AND SPURIOUS EMISSIONS (g NORMAL MODE, MID CHANNEL)

08/05/03 High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: William Zhuang
Project #: 03U2180
Company Name: CISCO
EUT Descr.: 802.11b/g mini-PCI Card
EUT M/N: Orian 1200C Smt 07220009
Test Target: FCC15.247
Mode Oper: 802.11g Transmit

Test Equipment:

EMCO Horn 1-18GHz Pre-amplifier 1-26GHz Spectrum Analyzer Horn > 18GHz

T73; S/N: 6717 @ 1m T86 Miteq 924341 Agilent E4446A Analyzer

Hi Frequency Cables: (2 ft) (2 ~ 3 ft) (4 ~ 6 ft) (12 ft)

Peak Measurements: 1 MHz Resolution Bandwidth, 1 MHz Video Bandwidth
Average Measurements: 1 MHz Resolution Bandwidth, 10Hz Video Bandwidth

f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
4.874	9.8	56.9	44.9	33.9	3.9	-45.6	0.0	1.0	50.1	38.1	74.0	54.0	-23.9	-15.9	V, Mid Ch
4.874	9.8	52.9	45.8	33.9	3.9	-45.6	0.0	1.0	46.0	38.9	74.0	54.0	-28.0	-15.1	H, Mid Ch
7.311	9.8	52.2	40.1	36.8	4.9	-46.6	0.0	1.0	48.3	36.3	74.0	54.0	-25.7	-17.7	V, Mid Ch
7.311	9.8	53.6	39.7	36.8	4.9	-46.6	0.0	1.0	49.8	35.8	74.0	54.0	-24.2	-18.2	H, Mid Ch
								1.0							H
								1.0							H
								1.0							H
								1.0							H
								1.0							H
								1.0							H
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								1.0							H
								1.0							H
								1.0							H
								1.0							H
								1.0							H
								1.0							H

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

HARMONICS AND SPURIOUS EMISSIONS (g NORMAL MODE, HIGH CHANNEL)

08/05/03 High Frequency Measurement
 Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: William Zhuang
 Project #: 03U2180
 Company Name: CISCO
 EUT Descr.: 802.11b/g mini-PCI Card
 EUT M/N: Orian 1200C Smt 07220009
 Test Target: FCC15.247
 Mode Oper: 802.11g Transmit

Test Equipment:

EMCO Horn 1-18GHz Pre-amplifier 1-26GHz Spectrum Analyzer Horn > 18GHz
 T73; S/N: 6717 @ 1m T86 Miteq 924341 Agilent E4446A Analyzer

Hi Frequency Cables
 (2 ft) (2 ~ 3 ft) (4 ~ 6 ft) (12 ft)

Peak Measurements: 1 MHz Resolution Bandwidth 1 MHz Video Bandwidth
 Average Measurements: 1 MHz Resolution Bandwidth 10Hz Video Bandwidth

f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
4.924	9.8	58.2	45.7	34.0	3.9	-45.7	0.0	1.0	51.4	38.9	74.0	54.0	-22.6	-15.1	V, High Ch
4.924	9.8	53.5	41.9	34.0	3.9	-45.7	0.0	1.0	46.6	35.1	74.0	54.0	-27.4	-18.9	H, High Ch
7.386	9.8	53.8	40.1	36.9	5.0	-46.5	0.0	1.0	50.1	36.4	74.0	54.0	-23.9	-17.6	V, High Ch
7.386	9.8	54.1	39.9	36.9	5.0	-46.5	0.0	1.0	50.4	36.2	74.0	54.0	-23.6	-17.8	H, High Ch
								1.0							H
								1.0							H
								1.0							H
								1.0							H
								1.0							H
								1.0							H
								1.0							H
								1.0							H
								1.0							H

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

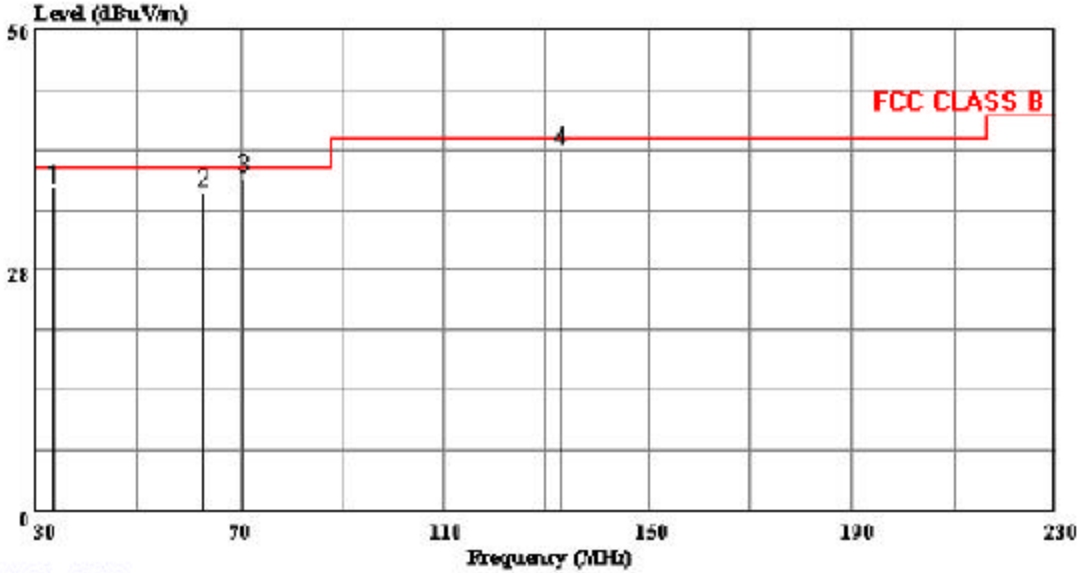
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)



561F Monterey Road
 Morgan Hill, CA 95037, U.S.A.
 Tel: (408) 463-0885
 Fax: (408) 463-0888

Data#: 4 File#: EMI32.EMI

Date: 08-18-2003 Time: 16:21:26



(Auxiliary ATC)

Trace:

Ref Trace:

Condition: FCC CLASS B 3m CHAMBER 030306 1185 VERTICAL
 Company : CISCO SYSTEMS
 EUT Description : 802.11b/g mini PCI Card
 Model Number : AIR-MP21G-A-K9/AP1100
 Test Configuration: EUT, LAPTOP, AC ADAPTER, CD POWER SUPPLY
 Tester : YAN ZHENG
 Test Target : FCC-B
 Mode of Operation: Tx (Worst Case)
 Project No : 03U2180

Page: 1

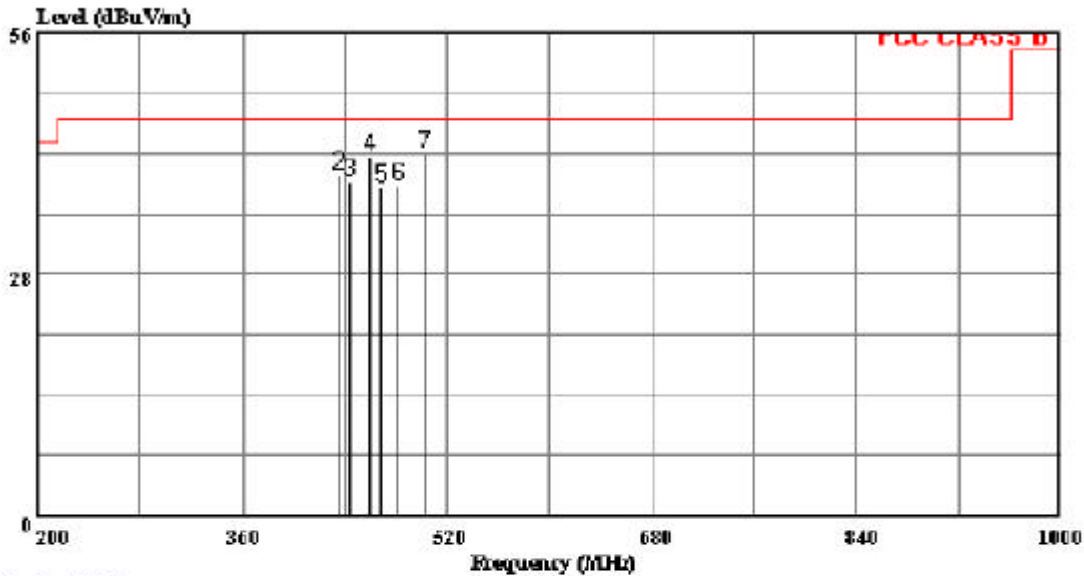
	Read	Probe	Cable	Preamp	Limit	Over	
Freq	Level	Factor	Loss	Factor	Level	Line	Limit Remark
MHz	dBuV	dB	dB	dB	dBuV/m	dBuV/m	dB
1	33.400	19.97	16.94	0.60	0.00	37.51	40.00 -2.49 Peak
2	62.800	26.15	10.24	0.75	0.00	37.14	40.00 -2.86 Peak
3	70.400	30.34	7.71	0.81	0.00	38.86	40.00 -1.14 Peak
4	132.800	31.53	9.42	1.10	0.00	42.05	43.50 -1.45 Peak



561P Monterey Road
 Morgan Hill, CA 95037, U.S.A.
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 Fax: (408) 463-0888

Data#: 5 File#: EMI32.EMI

Date: 08-19-2003 Time: 16:43:42



(Auxiliary ATC)

Trace:

Ref Trace:

Condition: FCC CLASS B 3m CHAMBER 030305 1185 VERTICAL
 Company : CISCO SYSTEMS
 EUT Description : 802.11b/g mini PCI Card
 Model Number : AIR-ME21G-A-K9/AP1100
 Test Configuration: EUT, LAPTOP, AC ADAPTER, CD POWER SUPPLY
 Tester : YAN ZHENG
 Test Target : FCC-B
 Mode of Operation: Tx (Worst Case)
 Project No : 03U2180

Page: 1

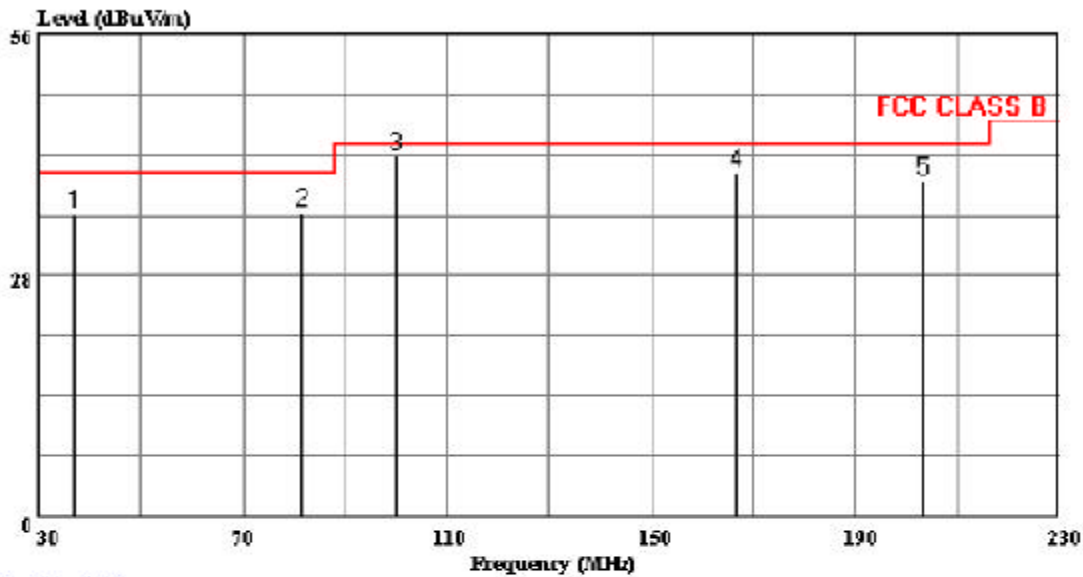
	Preq	Read Level	Probe Factor	Cable Loss	Preamp Factor	Limit Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	200.000	27.22	8.99	1.38	0.00	37.59	43.50	-5.91	Peak
2	435.200	22.08	15.24	2.12	0.00	39.44	46.00	-6.56	Peak
3	443.200	21.12	15.41	2.15	0.00	38.68	46.00	-7.32	Peak
4	459.200	23.81	15.75	2.18	0.00	41.75	46.00	-4.25	Peak
5	467.200	19.97	15.90	2.23	0.00	38.10	46.00	-7.90	Peak
6	481.600	19.79	16.20	2.30	0.00	38.29	46.00	-7.71	Peak
7	501.600	23.08	16.56	2.30	0.00	41.95	46.00	-4.05	Peak



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Data#: 12 File#: EMI32.EMI

Date: 08-18-2003 Time: 17:10:26



(Auxil ATT)

Trace:

Ref Trace:

Condition: FCC CLASS B 3m CHAMBER 030306 1185 HORIZONTAL
 Company : CISCO SYSTEMS
 EUT Description : 802.11b/g mini PCI Card
 Model Number : AIR-MP21G-A-K9/AP1100
 Test Configuration: EUT, LAPTOP, AC ADAPTER, CD POWER SUPPLY
 Tester : YAN SHENG
 Test Target : FCC-B
 Mode of Operation: Tx (Worst Case)
 Project No : 03U2180

Page: 1

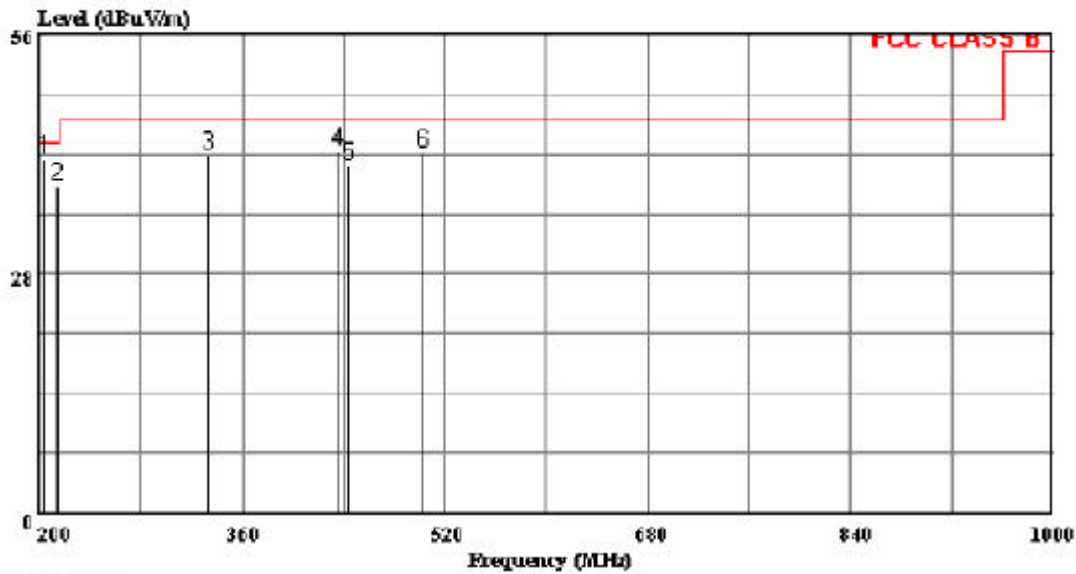
	Read Freq	Probe Level	Probe Factor	Cable Loss	Preamplifier	Limit Level	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV/m	dBuV/m	dB
1	36.800	17.80	16.77	0.57	0.00	35.14	40.00	-4.86 Peak
2	81.400	27.94	6.70	0.83	0.00	35.48	40.00	-4.52 Peak
3	99.800	32.26	8.84	0.95	0.00	42.05	43.50	-1.45 Peak
4	166.400	29.99	8.75	1.29	0.00	40.03	43.50	-3.47 Peak
5	203.400	28.42	9.22	1.38	0.00	39.02	43.50	-4.48 Peak



561F Monterey Road
 Morgan Hill, CA 95037, U.S.A.
 Tel: (408) 463-0885
 Fax: (408) 463-0888

Data#: 8 File#: EMI32.EMI

Date: 08-18-2003 Time: 16:51:06



(Auxiliary ATC)

Trace:

Ref Trace:

Condition: FCC CLASS B 3m CHAMBER 030306 1185 HORIZONTAL
 Company : CISCO SYSTEMS
 EUT Description : 802.11b/g mini PCI Card
 Model Number : AIR-NP21G-A-K9/AP1100
 Test Configuration: EUT, LAPTOP, AC ADAPTER, CD POWER SUPPLY
 Tester : YAN SHENG
 Test Target : FCC-B
 Mode of Operation: Tx (Worst Case)
 Project No : 03U2180

Page: 1

	Read Freq	Probe Level	Cable Factor	Preamp Loss	Limit Level	Over Line	Remark
	MHz	dBuV	dB	dB	dBuV/m	dBuV/m	dB
1	203.200	30.99	9.12	1.38	0.00	41.49	43.50 -2.01 Peak
2	213.600	26.98	9.81	1.40	0.00	38.19	43.50 -5.31 Peak
3	333.600	27.14	12.93	1.86	0.00	41.93	46.00 -4.07 Peak
4	435.200	25.07	15.24	2.12	0.00	42.43	46.00 -3.57 Peak
5	493.200	23.27	15.41	2.15	0.00	40.83	46.00 -5.17 Peak
6	501.600	23.39	16.56	2.30	0.00	42.26	46.00 -3.74 Peak

7.9. 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 μ 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.

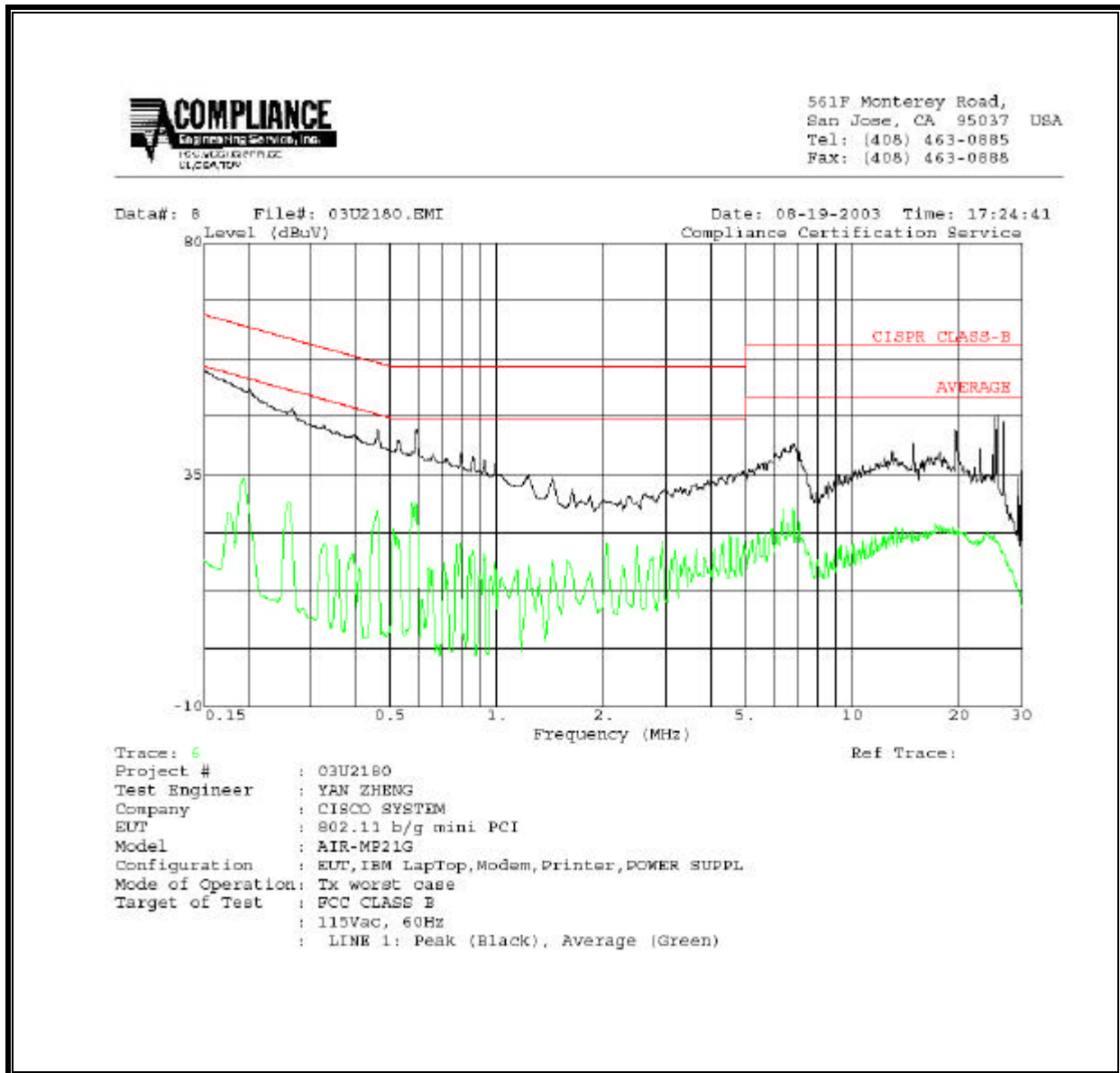
RESULTS

No non-compliance noted:

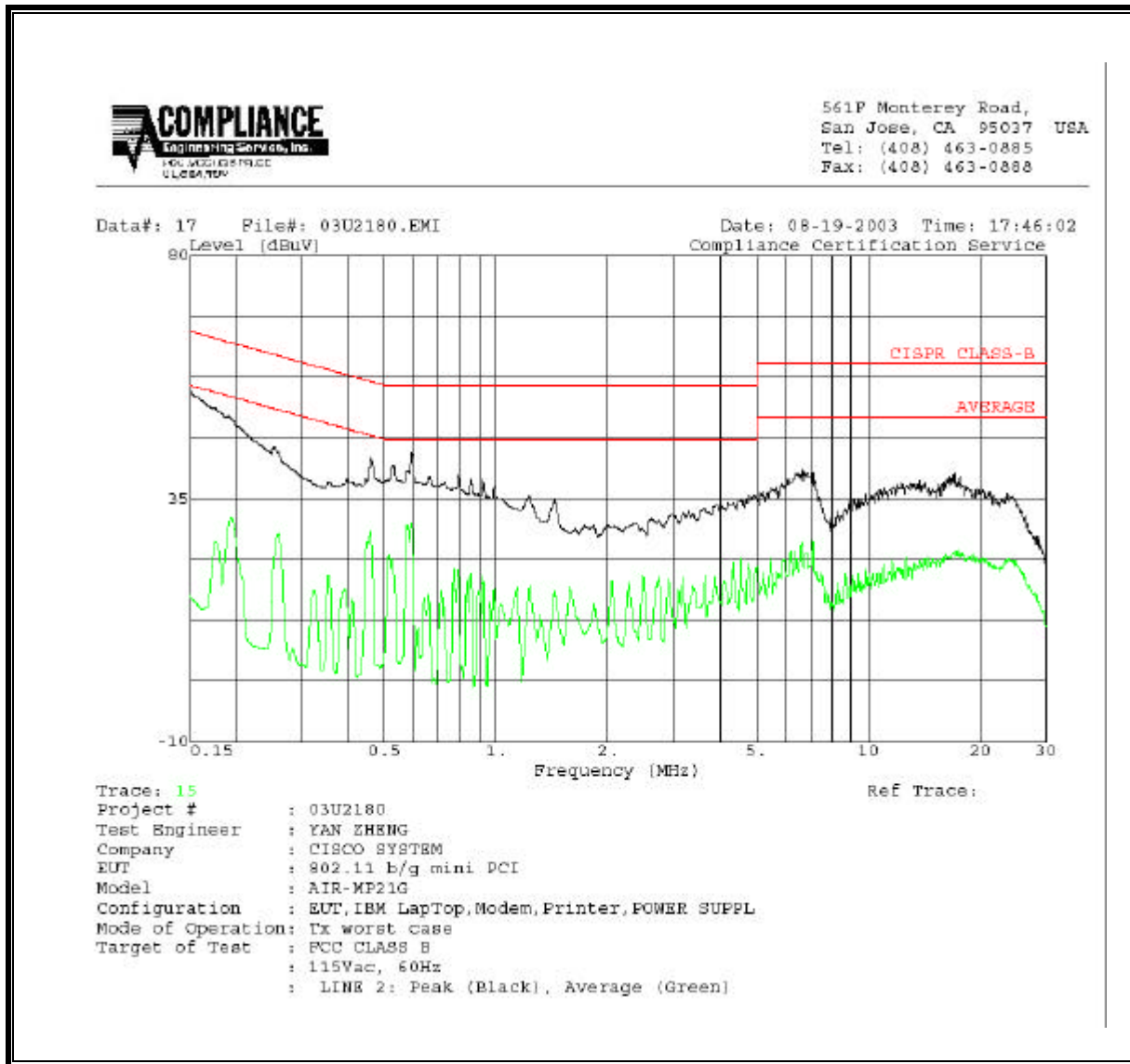
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.15	55.16		18.31	0.00	66.00	56.00	-66.00	-37.69	L1
0.60	44.79		33.50	0.00	56.00	46.00	-56.00	-12.50	L1
25.59	47.54		28.47	0.00	60.00	50.00	-60.00	-21.53	L1
0.15	54.83		18.06	0.00	65.97	55.97	-65.97	-37.91	L2
0.60	44.27		33.01	0.00	56.00	46.00	-56.00	-12.99	L2
6.81	42.22		29.29	0.00	60.00	50.00	-60.00	-20.71	L2
6 Worst Data									

LINE 1 RESULTS

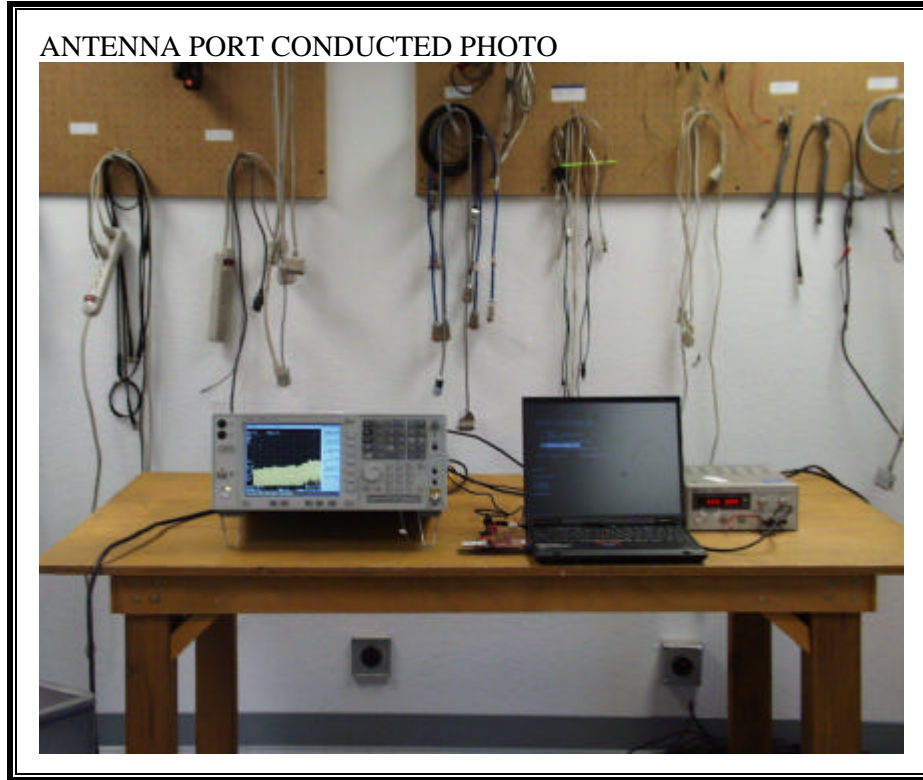


LINE 2 RESULTS

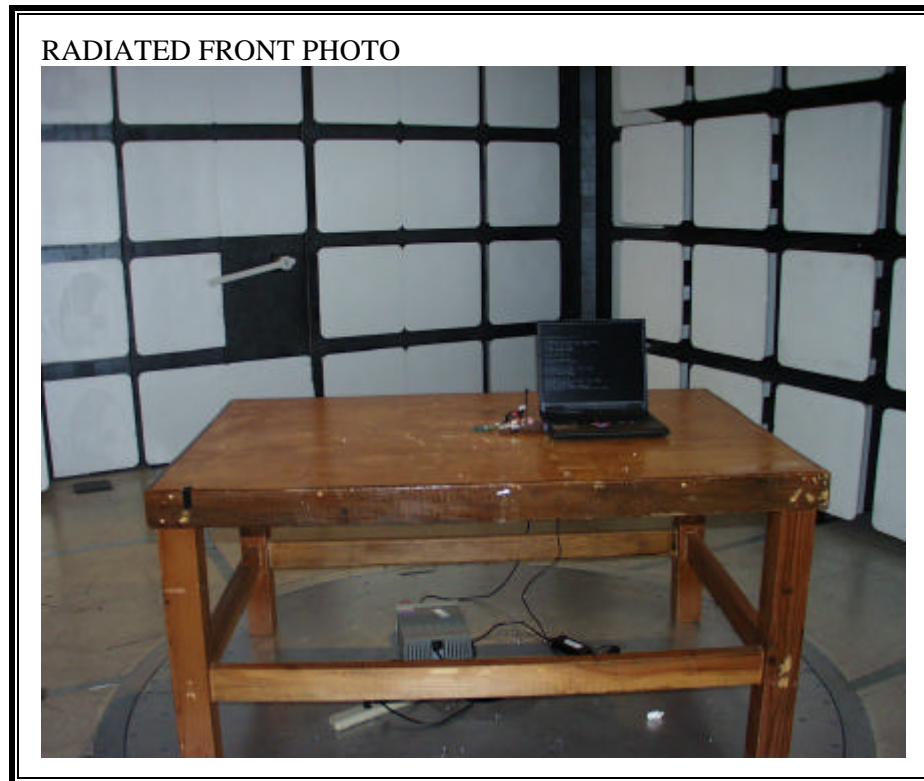


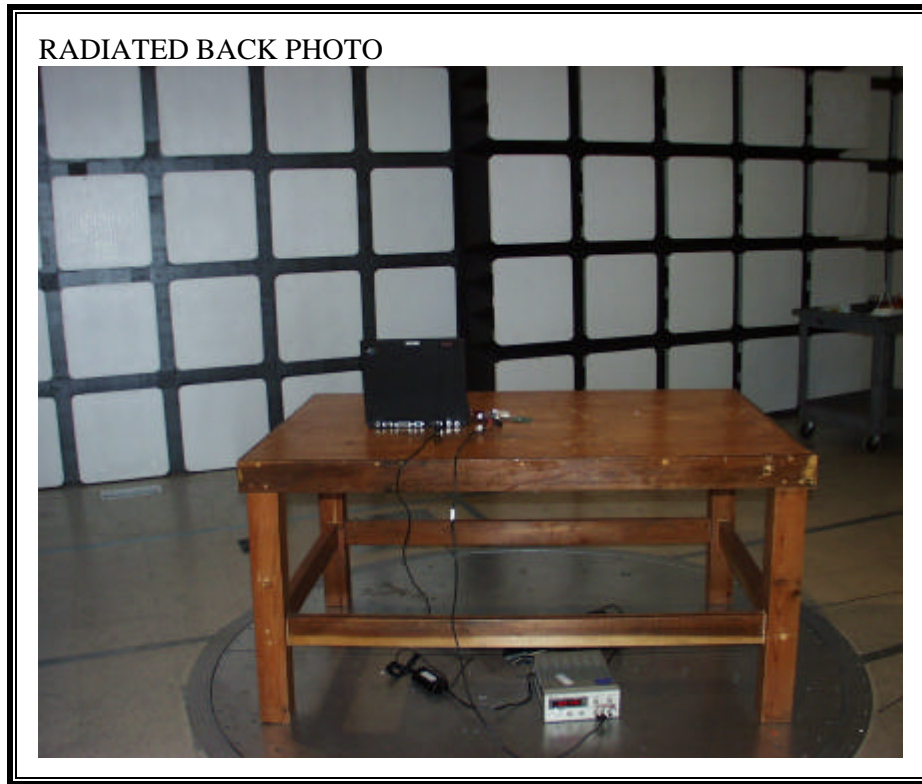
8. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



RADIATED RF MEASUREMENT SETUP





POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP





END OF REPORT