



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

FOR

802.11 B/G ACCESS POINT

MODEL NUMBER: BWR54G1

FCC ID: TDK-BWR54G1

REPORT NUMBER: 05U3488-1B

ISSUE DATE: JULY 5, 2005

Prepared for
**BOUNTIFUL WIFI LLC
707 WEST 700 SOUTH, SUITE 202A
WOODS CROSS, UT 84087
U.S.A**

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

NVLAP[®]
LAB CODE:200065-0

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
A	6/15/05	Initial Issue	MH
B	7/5/05	Corrected Plots on Page 60-61	MH

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS.....	4
2. TEST METHODOLOGY	5
3. FACILITIES AND ACCREDITATION	5
4. CALIBRATION AND UNCERTAINTY.....	5
4.1. MEASURING INSTRUMENT CALIBRATION.....	5
4.2. MEASUREMENT UNCERTAINTY.....	5
5. EQUIPMENT UNDER TEST.....	6
5.1. DESCRIPTION OF EUT	6
5.2. MAXIMUM OUTPUT POWER	6
5.3. DESCRIPTION OF AVAILABLE ANTENNAS	6
5.4. SOFTWARE AND FIRMWARE	6
5.5. WORST-CASE CONFIGURATION AND MODE.....	6
5.6. MODIFICATION INFORMATION.....	7
5.7. DESCRIPTION OF TEST SETUP	8
6. TEST AND MEASUREMENT EQUIPMENT	10
7. LIMITS AND RESULTS	11
7.1. CHANNEL TESTS FOR THE 2400 TO 2483.5 MHz BAND	11
7.1.1. 6 dB BANDWIDTH	11
7.1.2. 99% BANDWIDTH.....	18
7.1.3. PEAK OUTPUT POWER	25
7.1.4. MAXIMUM PERMISSIBLE EXPOSURE	33
7.1.5. AVERAGE POWER.....	36
7.1.6. PEAK POWER SPECTRAL DENSITY	37
7.1.7. CONDUCTED SPURIOUS EMISSIONS.....	44
7.2. RADIATED EMISSIONS.....	57
7.2.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS	57
7.2.2. TRANSMITTER ABOVE 1 GHz FOR 2400 TO 2483.5 MHz BAND	60
7.2.3. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz	78
7.3. POWERLINE CONDUCTED EMISSIONS	82
8. SETUP PHOTOS	86

1 ATTESTATION OF TEST RESULTS

COMPANY NAME: BOUNTIFUL WIFI LLC
707 WEST 700 SOUTH, SUITE 202A
WOODS CROSS, UT 84087, U.S.A

EUT DESCRIPTION: 802.11b/g ACCESS POINT

MODEL: BWR54G1

SERIAL NUMBER: 01550

DATE TESTED: JUNE 10-14, 2005

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:



MIKE HECKROTTE
ENGINEERING MANAGER
COMPLIANCE CERTIFICATION SERVICES



CHIN PANG
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2 TEST METHODOLOGY

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

3 FACILITIES AND ACCREDITATION

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

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

4 CALIBRATION AND UNCERTAINTY

4.1 MEASURING INSTRUMENT CALIBRATION

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

4.2 MEASUREMENT UNCERTAINTY

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

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

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

5 EQUIPMENT UNDER TEST

5.1 DESCRIPTION OF EUT

The EUT is an 802.11b/g Access Point.

5.2 MAXIMUM OUTPUT POWER

The transmitter has a maximum 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	29.14	820.35
2412 - 2462	802.11g	28.40	691.83

5.3 DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes two identical Dipole antennas, each with a maximum gain of 2.2dBi. One is for transmit, the other is for receive.

5.4 SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 2005JUN07.

The test utility software used during testing was ART program “ ART 5.2build58 “

5.5 WORST-CASE CONFIGURATION AND MODE

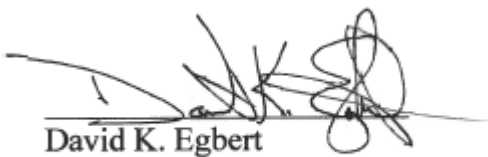
The worst-case channel is determined as the channel with the highest output power. The highest measured output power was at 2462MHz, b mode with data rate 1Mb/s.

5.6 MODIFICATION INFORMATION

A clamp-on ferrite was added to the AC adapter cable to comply with the radiated emission limit in the 30Mhz to 1000MHz range. The ferrite used is Fair-Rite Products Corporation, part number 0431167281.

Bountiful WiFi attests that this ferrite, or the equivalent solid (non clamp-on) ferrite, will be installed on the power cable, as shown in the photo below, on all units.




David K. Egbert
Bountiful WiFi

5.7 DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	IBM	ThinkPad	FX-0171	DoC
AC dapter	IBM	AA2131	11S02K6746Z1Z2UFI BM5CS	DoC
AC dapter	ITE	HK-B120-A05	43423499	DoC

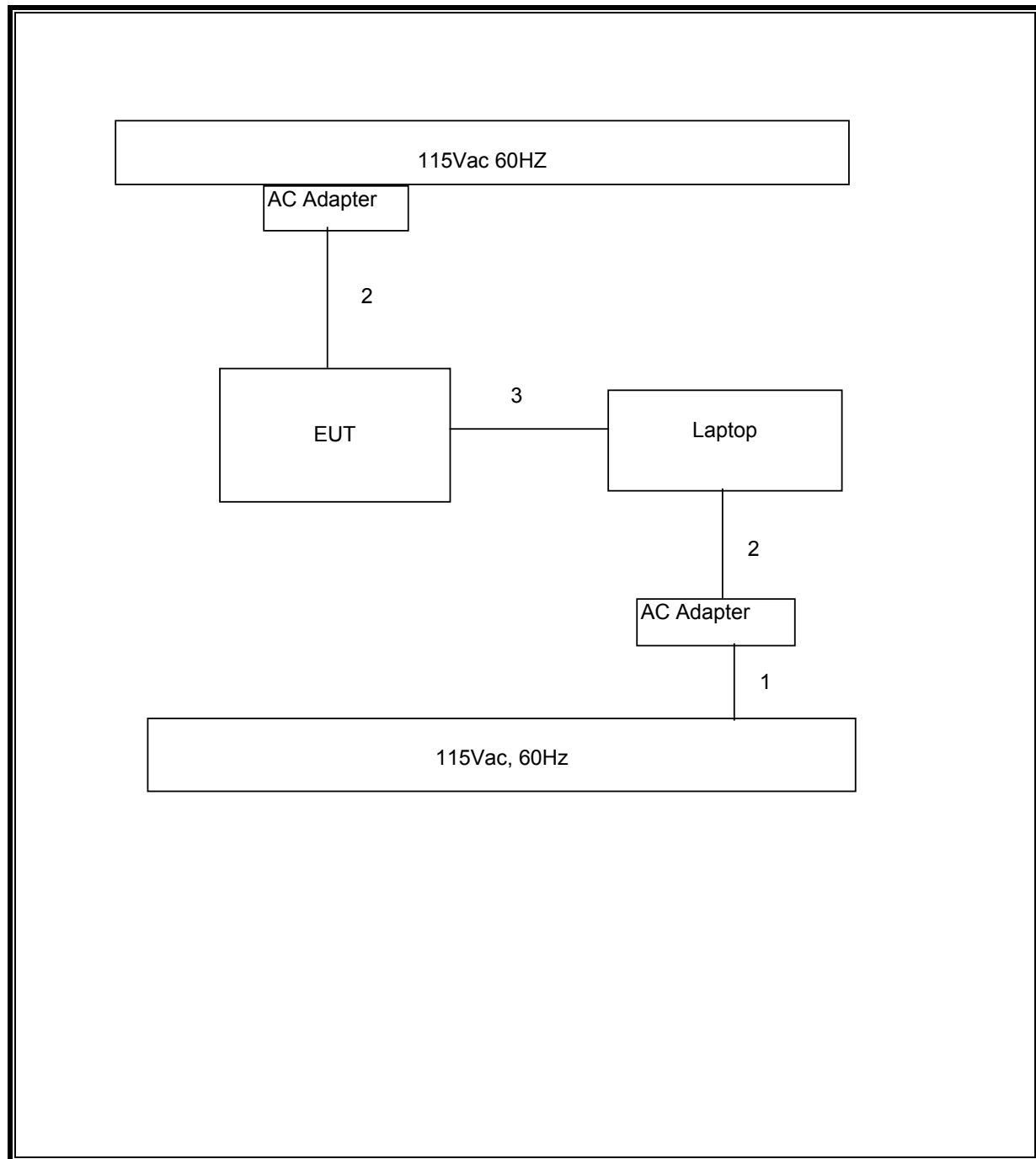
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US 115V	Un-shielded	2m	No
2	DC	1	DC	Un-shielded	1m	Yes
3	Ethernet	1	RJ45	Un-shielded	5m	Yes

TEST SETUP

The EUT Access Point is connected to a laptop computer via a RJ45 cable during the tests. Test software exercised the EUT.

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
EMI Test Receiver	R & S	ESHS 20	827129/006	10/22/2005
Site A Line Stabilizer / Conditioner	Tripplite	LC-1800a	A0051681	CNR
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	8/30/2005
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	8379443	10/21/2005
Spectrum Analyzer	HP	E4446A	US42510266	8/25/2005
Antenna, Horn 1 ~ 18 GHz	EMCO	3117	29310	9/12/2005
4.0 High Pass Filter	Micro Tronics	HPM13351	1	CNR
Amplifier 1-26GHz	MITEQ	NSP2600-SP	924342	8/17/2005
30MHz--- 2Ghz	Sunol Sciences	JB1 Antenna	A121003	9/12/2005
EMI Receiver, 9 kHz ~ 2.9 GHz	HP	8542E	3942A00286	3/6/2006
RF Filter Section	HP	85420E	3705A00256	3/6/2006
Peak Power Meter	Agilent	E4416A	GB41291160	2/9/2006
Peak / Average Power Sensor	Agilent	E9327A	US40440755	2/10/2006
Preamplifier, 1 ~ 26.5 GHz	HP	8449B	3008A00369	8/17/2005

7 LIMITS AND RESULTS

7.1 CHANNEL TESTS FOR THE 2400 TO 2483.5 MHz BAND

7.1.1 6 dB BANDWIDTH

LIMIT

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

TEST PROCEDURE

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

RESULTS

No non-compliance noted:

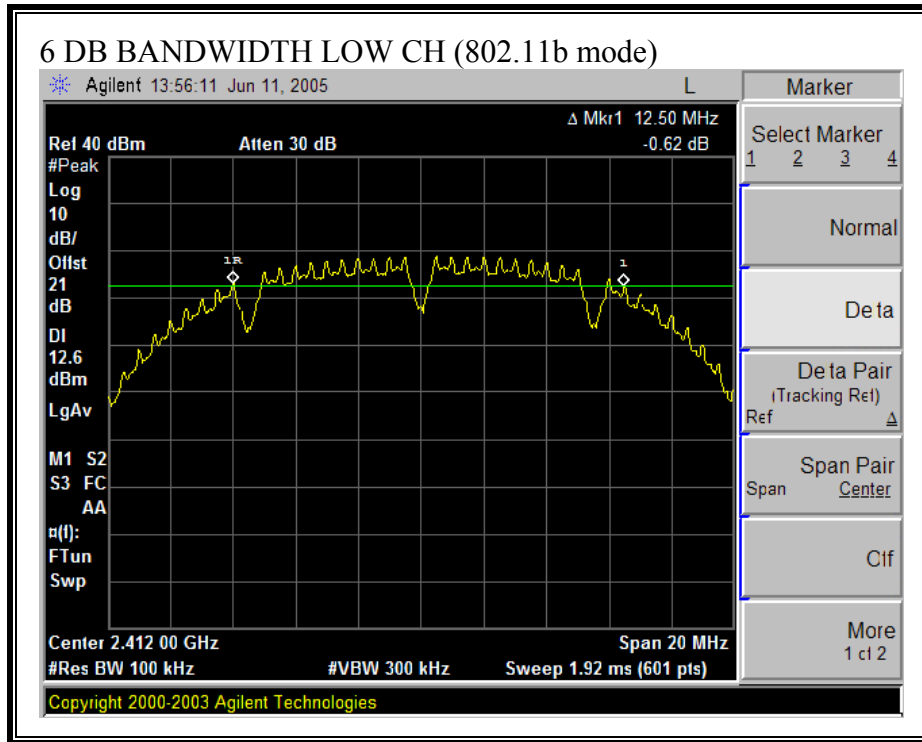
802.11b Mode

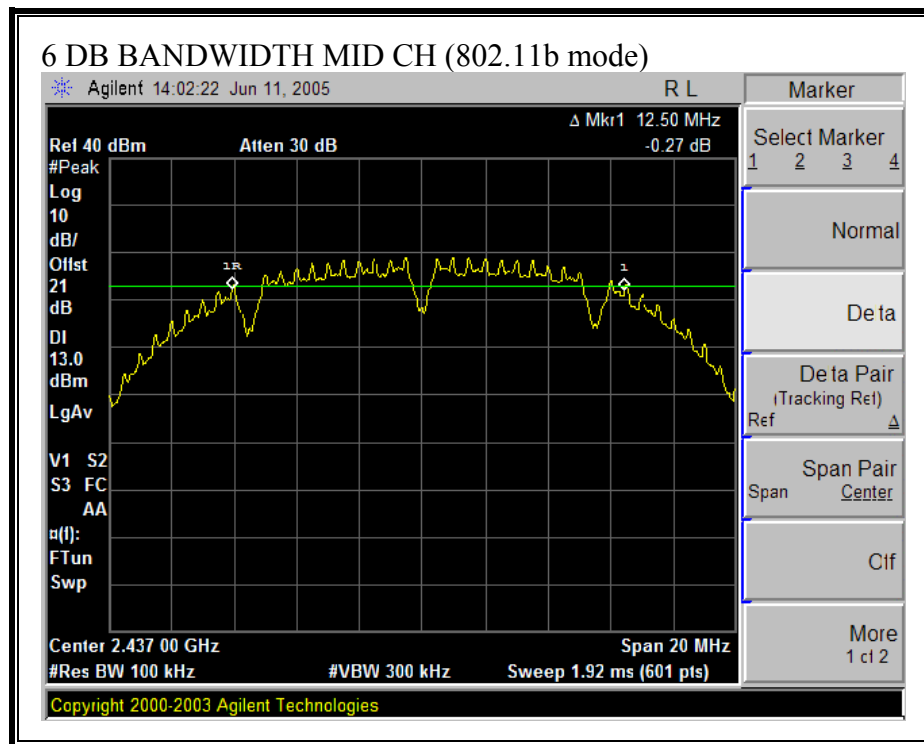
Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	12500	500	12000
Middle	2437	12500	500	12000
High	2462	12500	500	12000

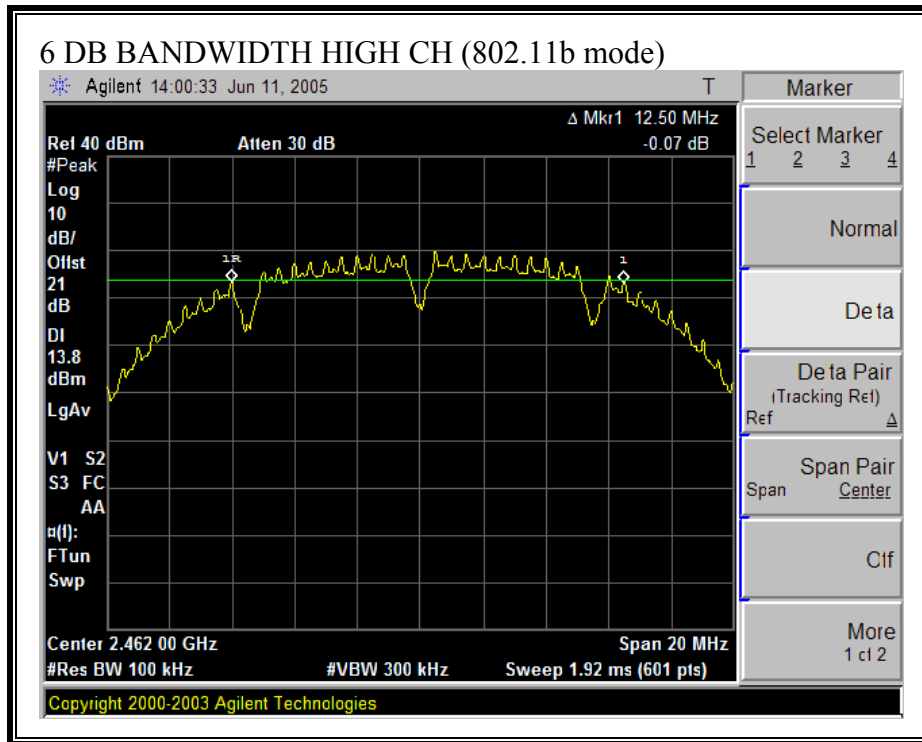
802.11g Mode

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	16440	500	15940
Middle	2437	16380	500	15880
High	2462	16440	500	15940

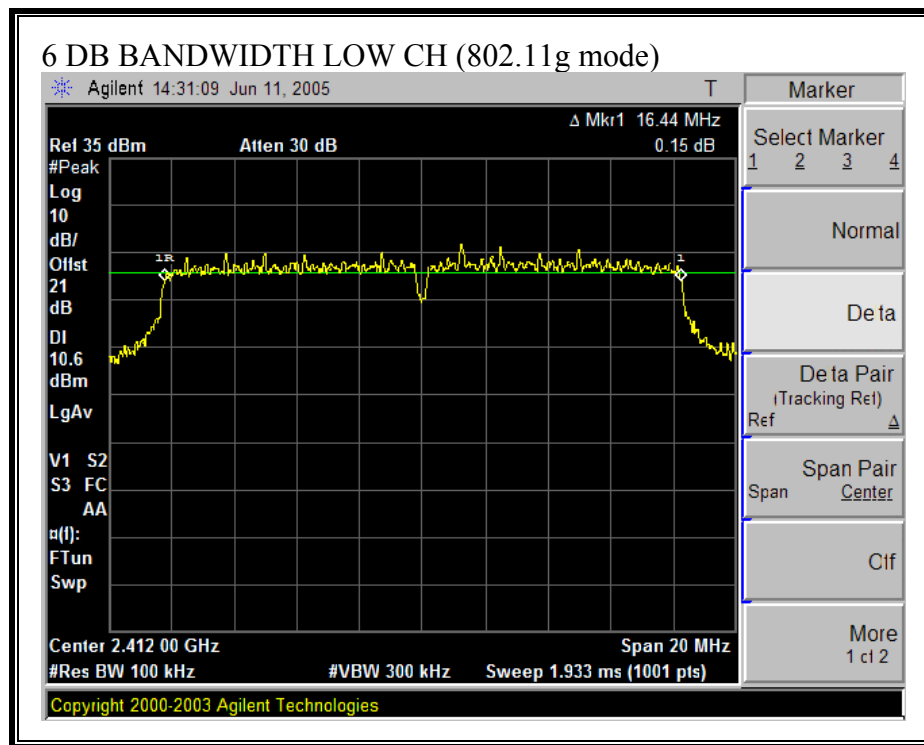
6 DB BANDWIDTH (802.11b MODE)

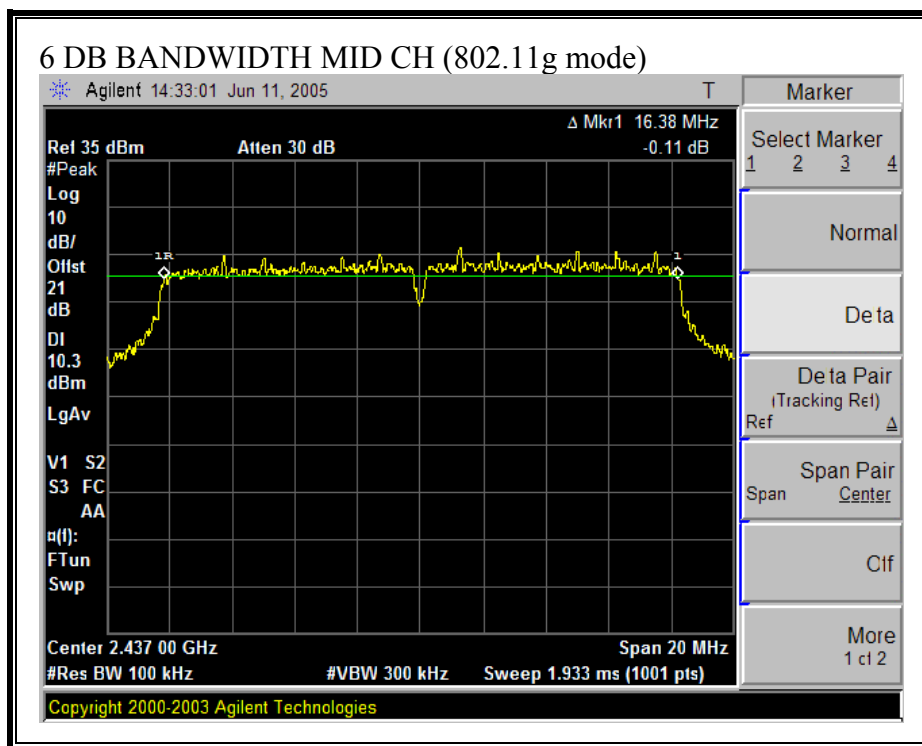


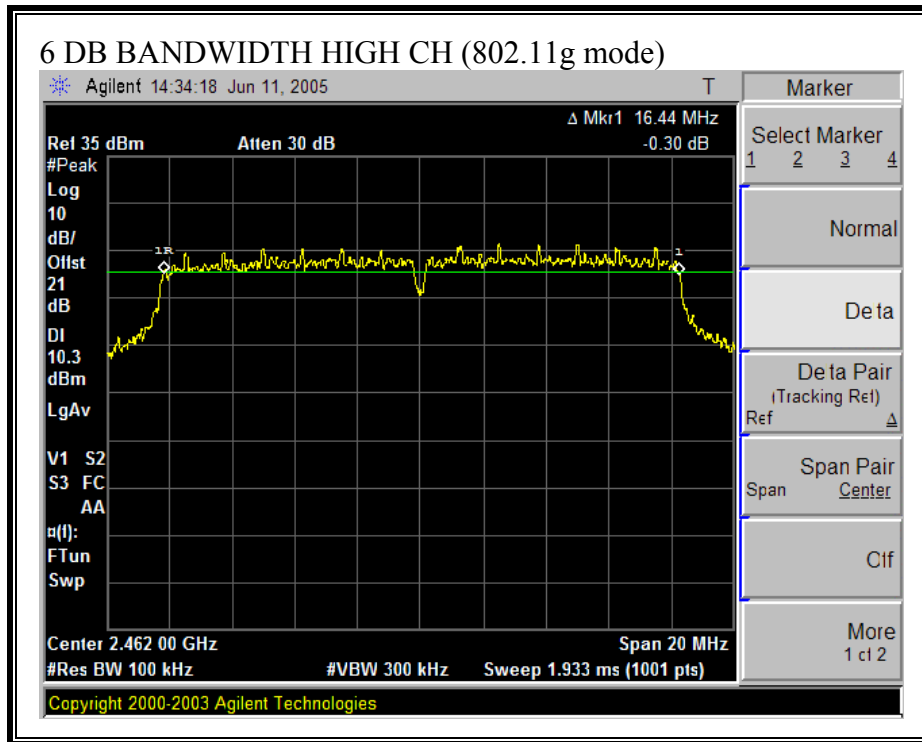




6 DB BANDWIDTH (802.11g MODE)







7.1.2 99% BANDWIDTH

LIMIT

None: for reporting purposes only.

TEST PROCEDURE

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

RESULTS

No non-compliance noted:

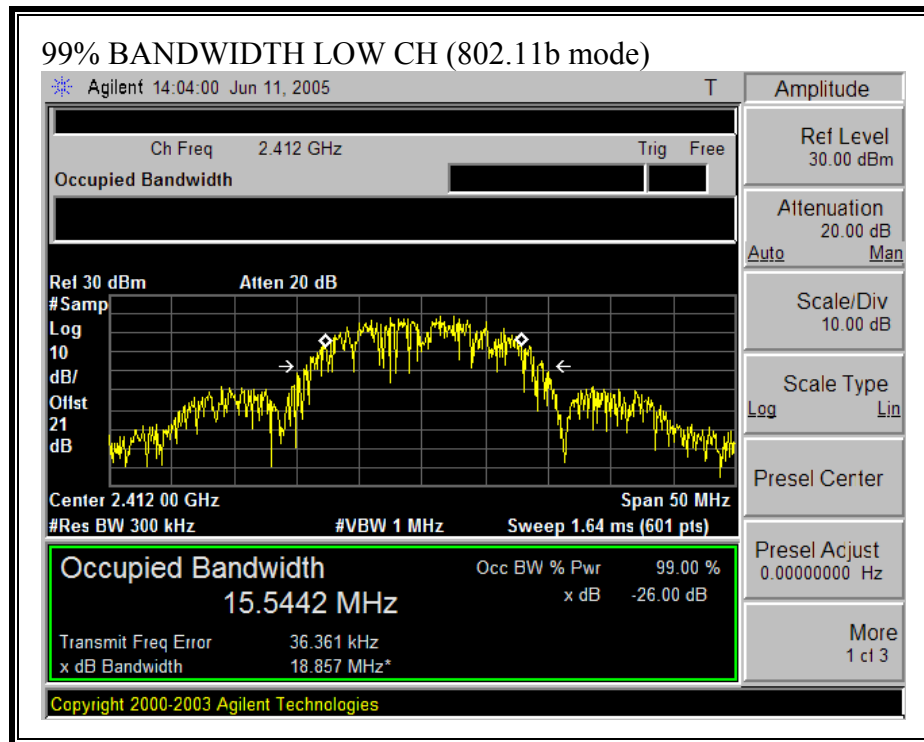
802.11b Mode

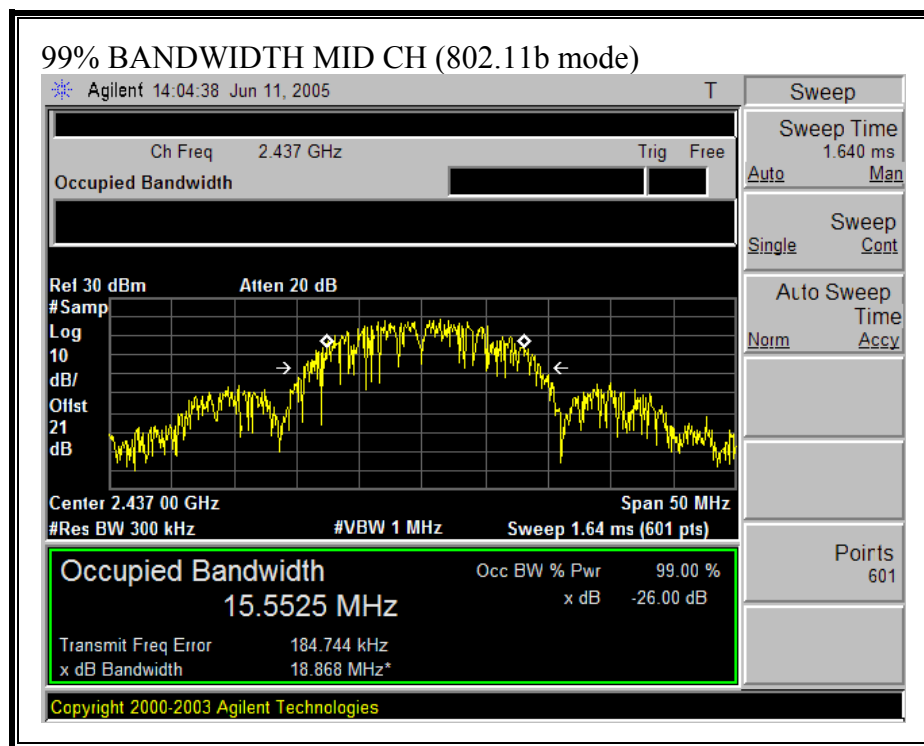
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	15.54
Middle	2437	15.55
High	2462	15.62

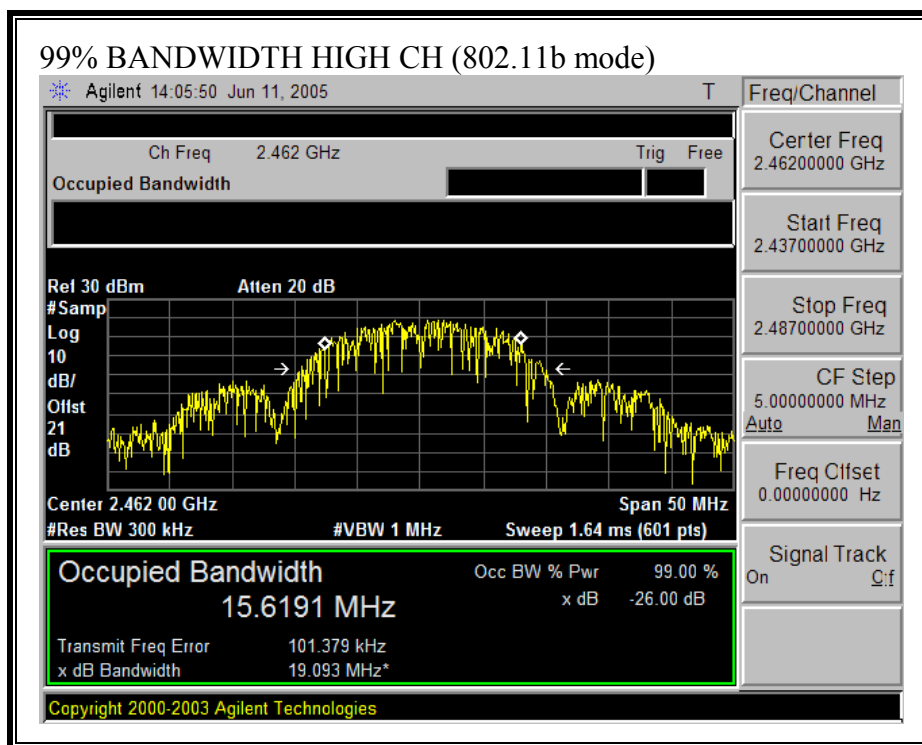
802.11g Mode

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.55
Middle	2437	16.56
High	2462	16.55

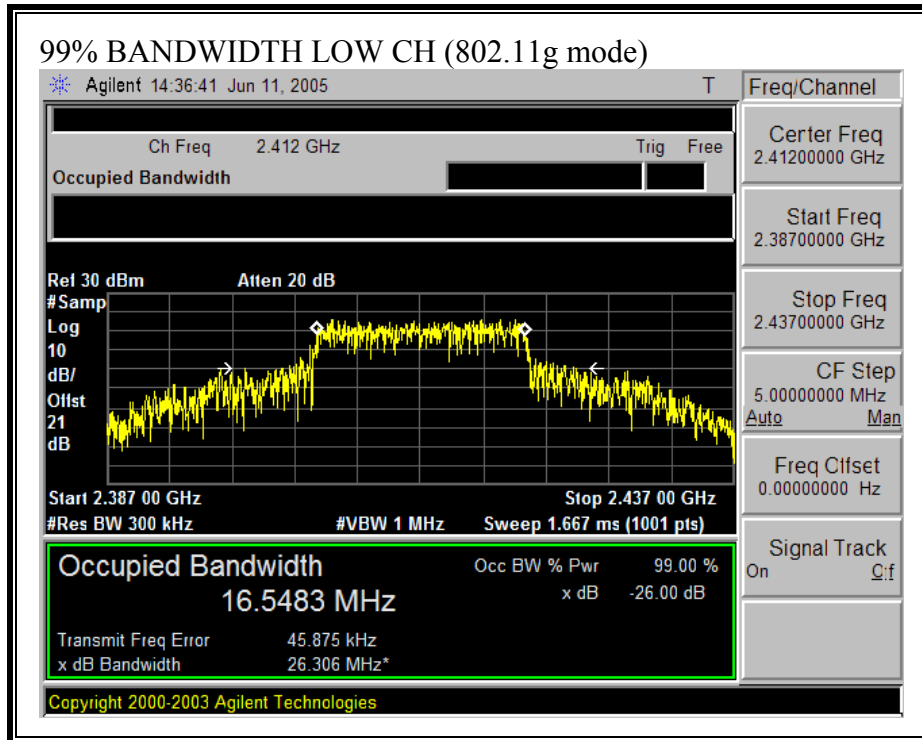
99% BANDWIDTH (802.11b MODE)

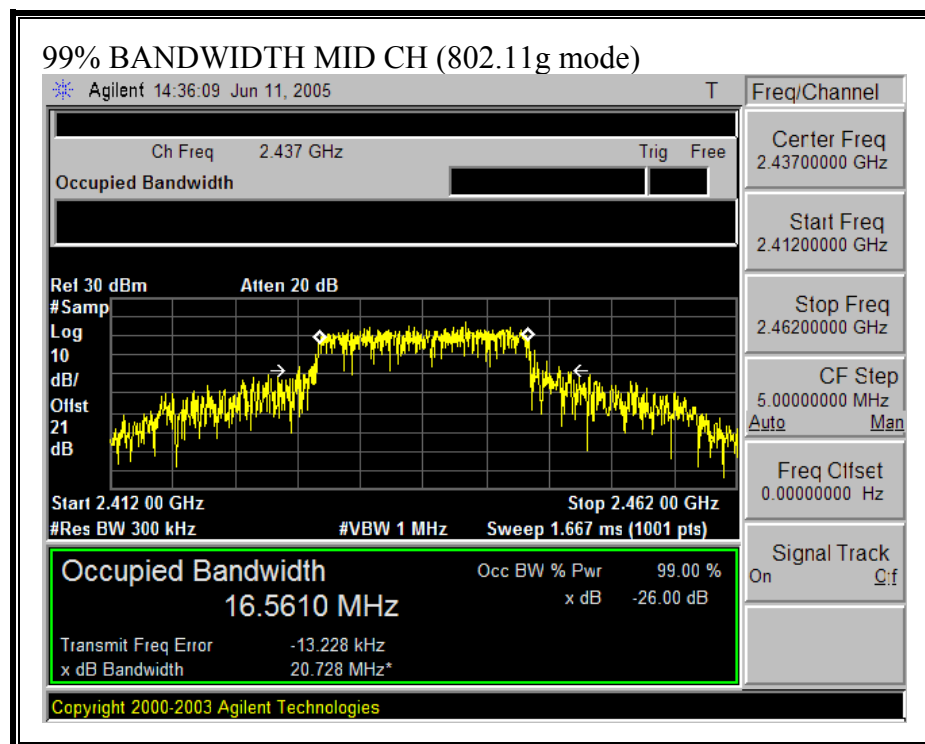


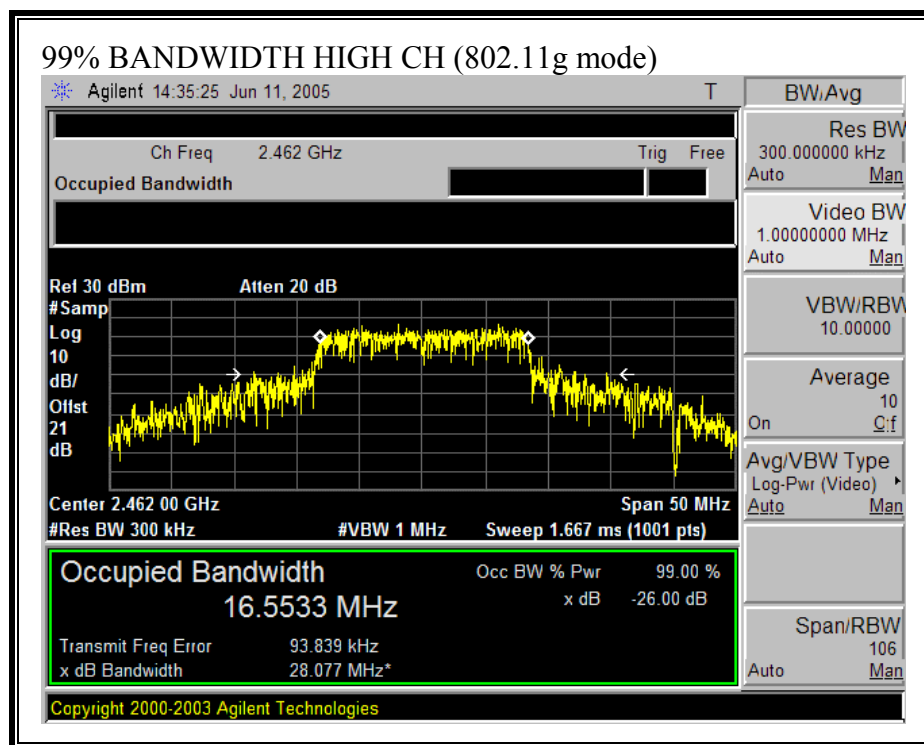




99% BANDWIDTH (802.11g MODE)







7.1.3 PEAK OUTPUT POWER

PEAK POWER LIMIT

§15.247 (b) The maximum peak conducted 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. 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) Except as shown in paragraphs (b)(4) (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.

§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 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 2.2 dBi for other than fixed, point-to-point operations, therefore the limit is 30 dBm.

No non-compliance noted:

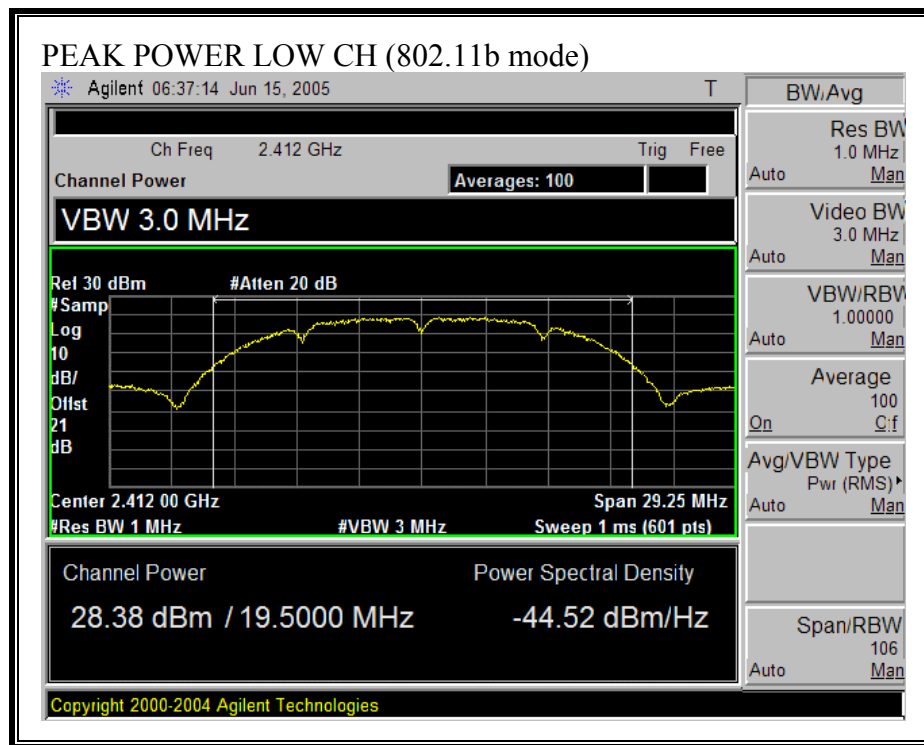
802.11b Mode

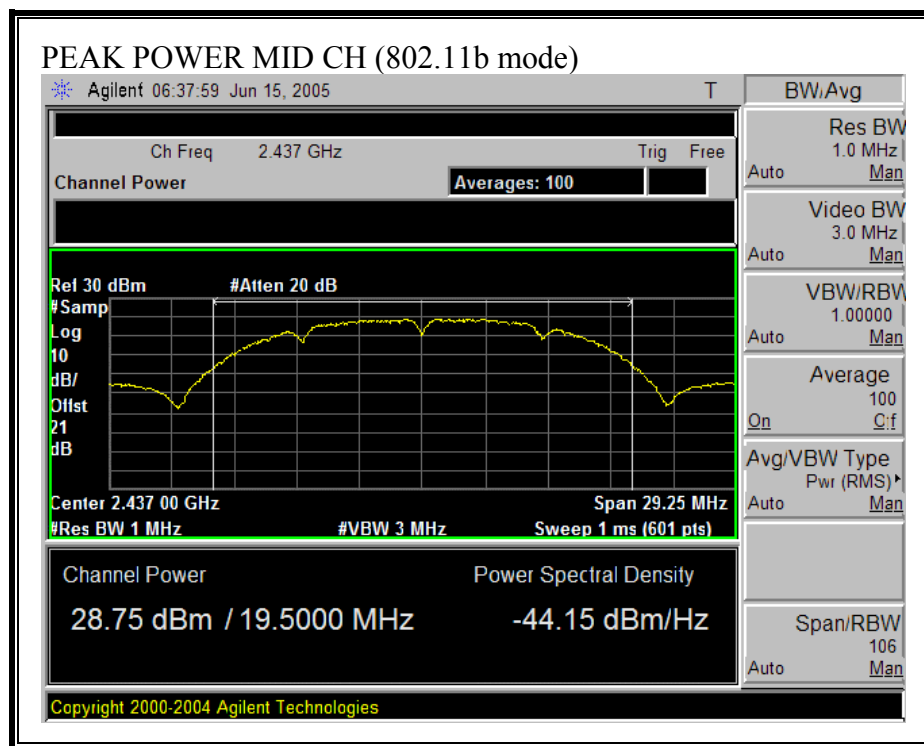
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	28.38	30	-1.62
Middle	2437	28.75	30	-1.25
High	2462	29.14	30	-0.86

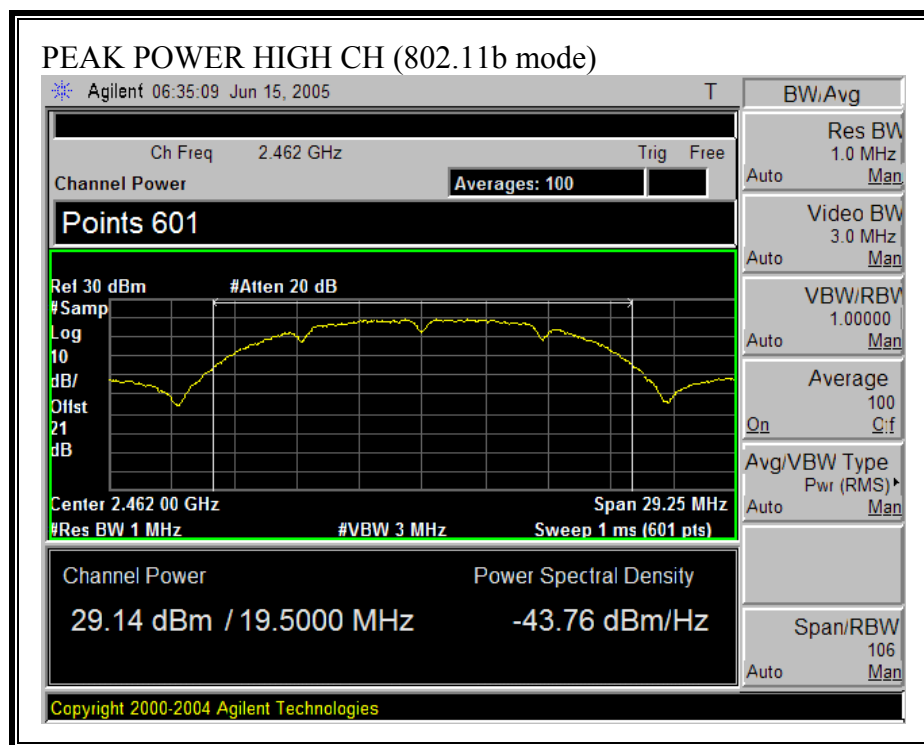
802.11g Mode

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	25.74	30	-4.26
Middle	2437	28.11	30	-1.89
High	2462	28.40	30	-1.60

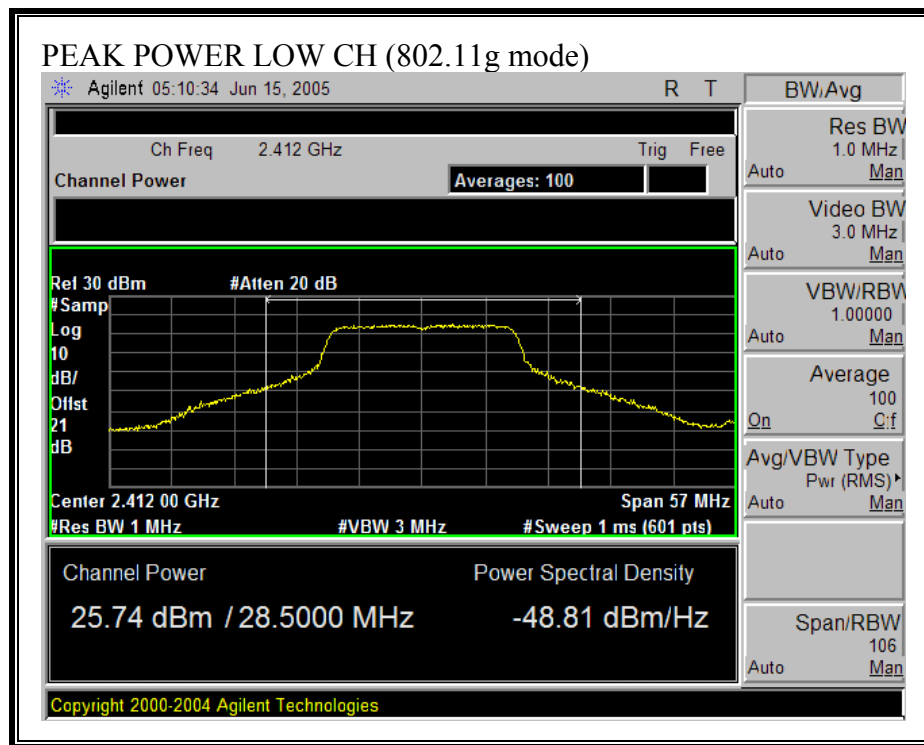
OUTPUT POWER (802.11b MODE)

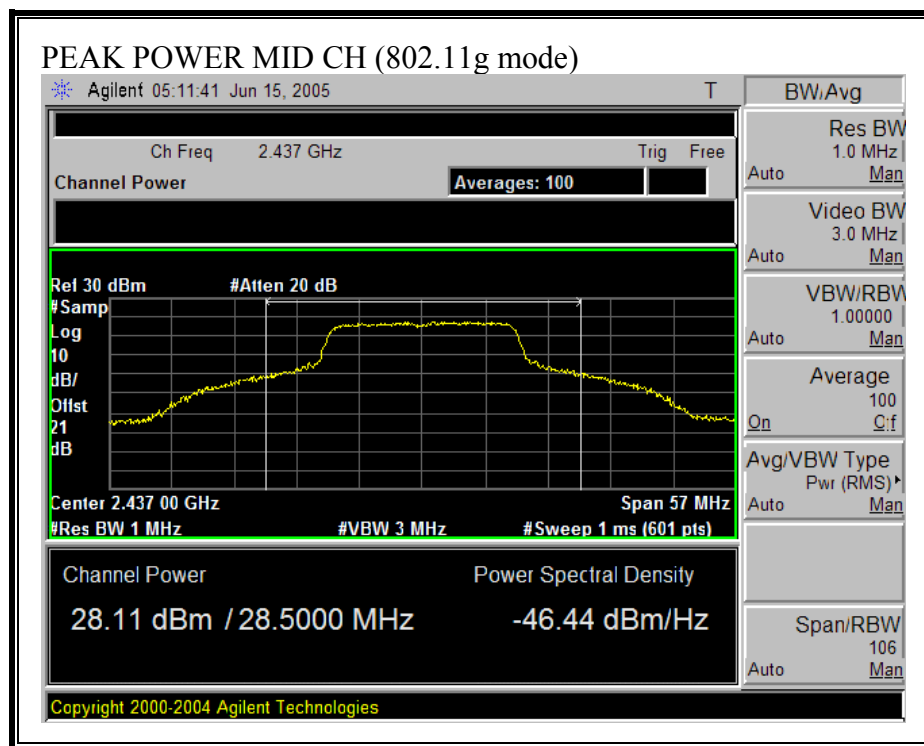


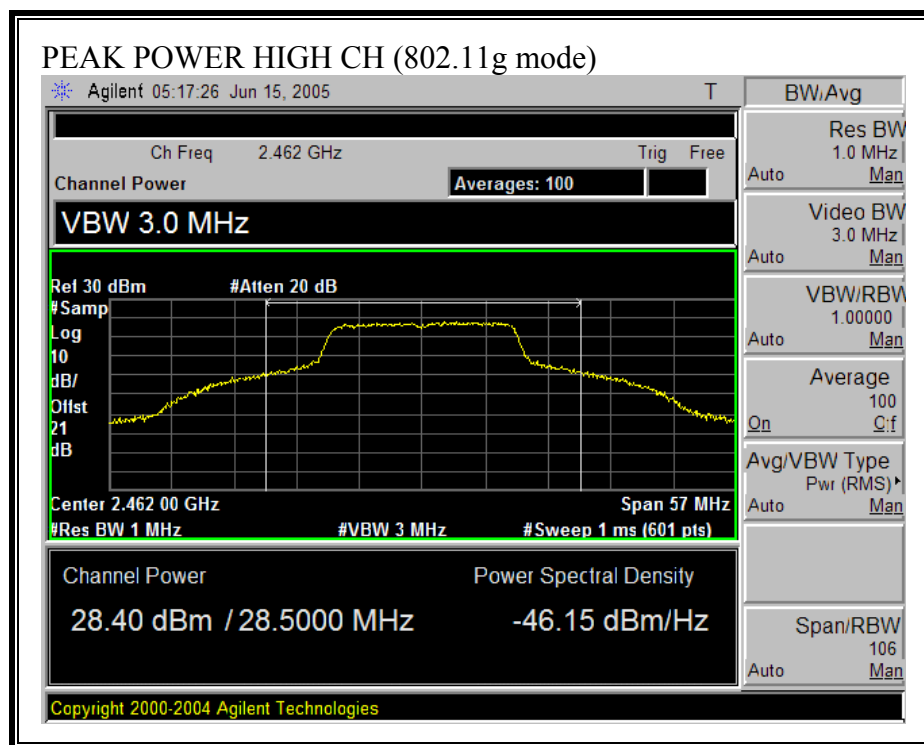




OUTPUT POWER (802.11g MODE)







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 ²)	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 ²)	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 ²)	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 ²)	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.

7.1.4.1

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/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

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

RESULTS

No non-compliance noted:

Mode	Power Density Limit (mW/cm²)	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
802.11b	1.0	29.14	2.20	10.41
802.11g	1.0	28.40	2.20	9.56

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.

7.1.5 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 21dB (including 20 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

802.11b Mode

Channel	Frequency (MHz)	Power (dBm)
Low	2412	28.48
Middle	2437	28.85
High	2462	29.25

802.11g Mode

Channel	Frequency (MHz)	Power (dBm)
Low	2412	25.80
Middle	2437	28.22
High	2462	27.60

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:

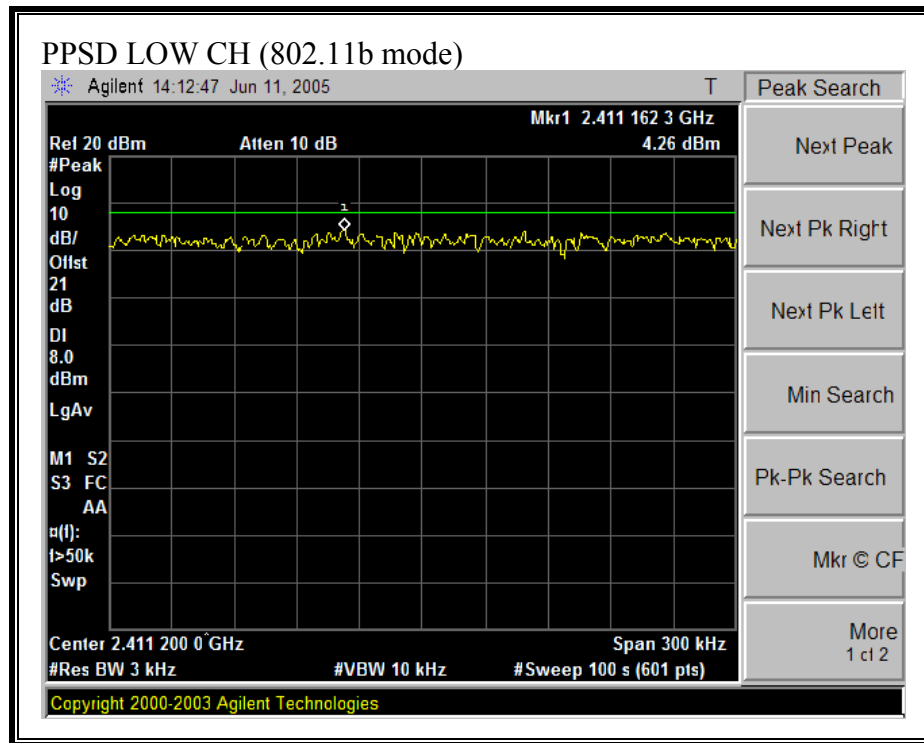
802.11b Mode

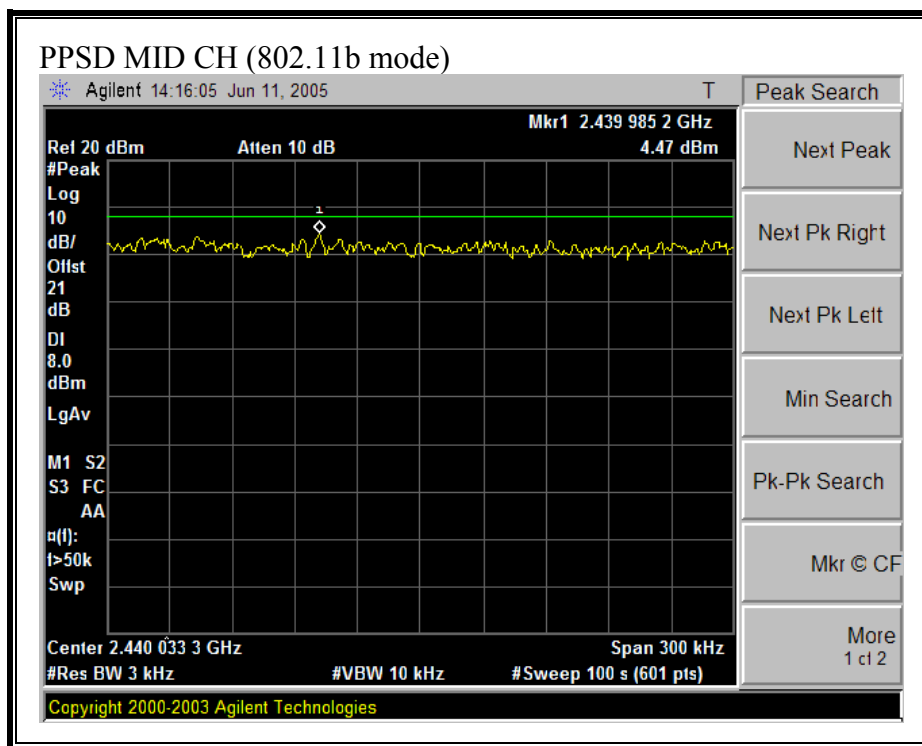
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	4.26	8	-3.74
Middle	2437	4.47	8	-3.53
High	2462	5.11	8	-2.89

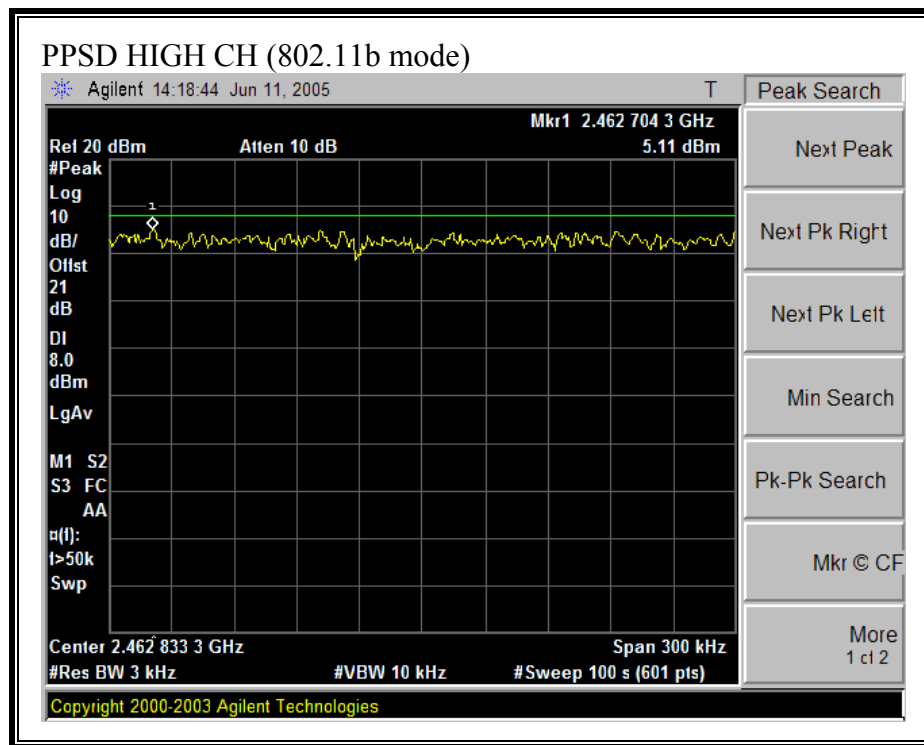
802.11g Mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	1.23	8	-6.77
Middle	2437	2.39	8	-5.61
High	2462	2.61	8	-5.39

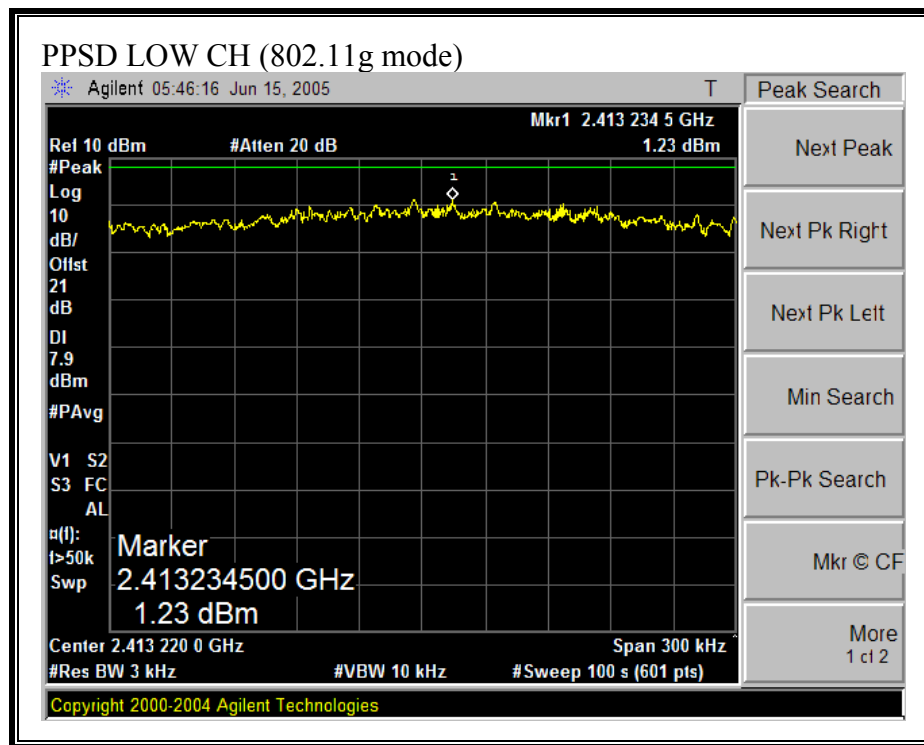
PEAK POWER SPECTRAL DENSITY (802.11b MODE)

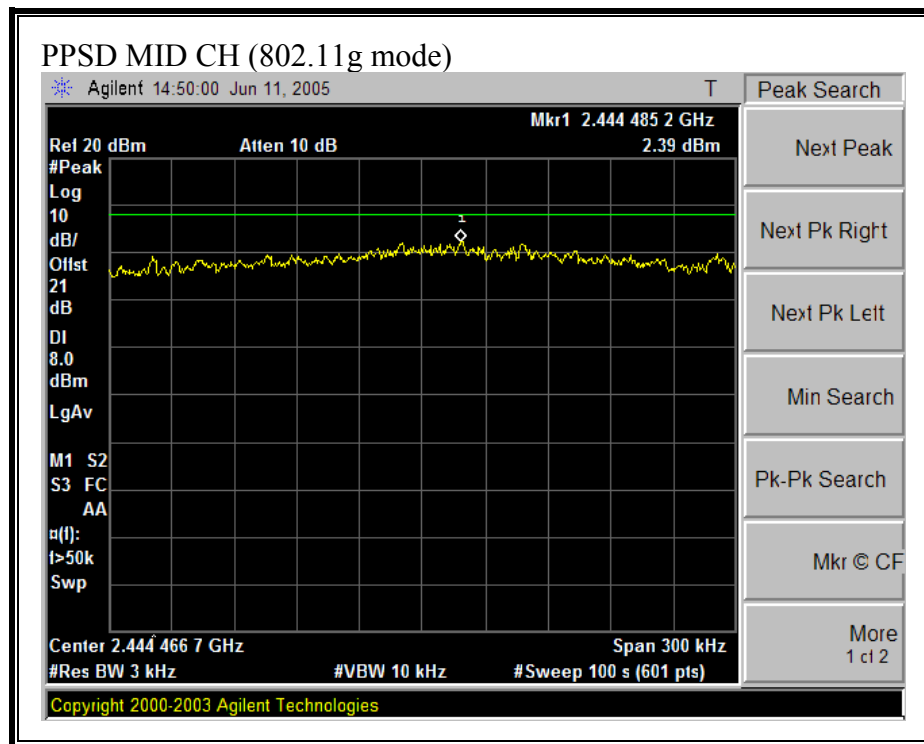


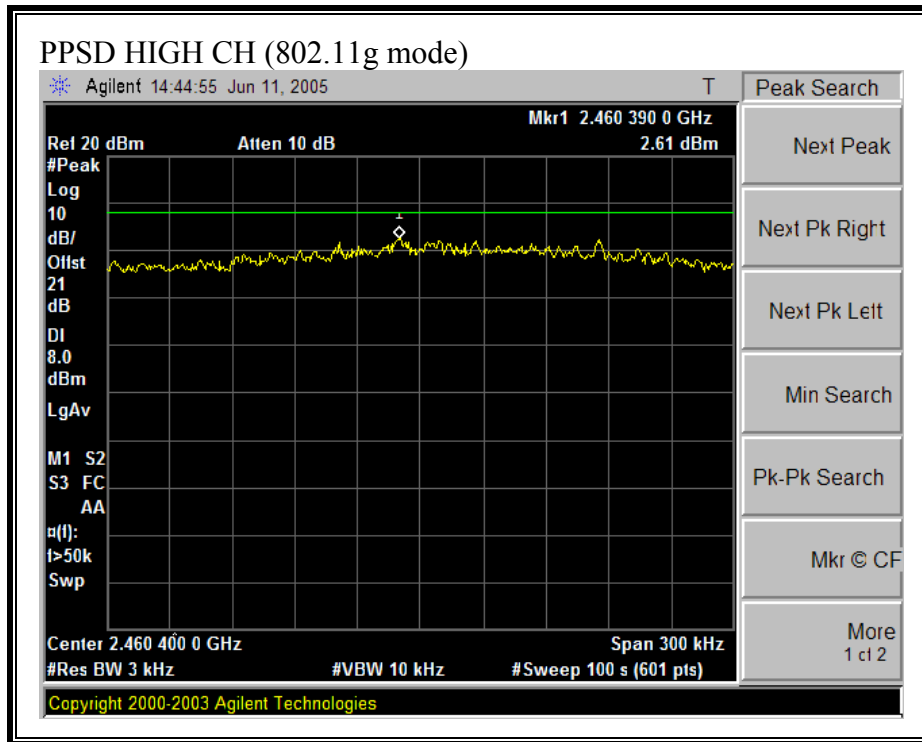




PEAK POWER SPECTRAL DENSITY (802.11g MODE)







7.1.7 CONDUCTED SPURIOUS EMISSIONS

7.1.7.1 LIMITS

§15.247 (d) 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions, which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Conducted power was measured based on the use of RMS averaging over a time interval, therefore the required attenuation is 30 dB.

7.1.7.2 TEST PROCEDURE

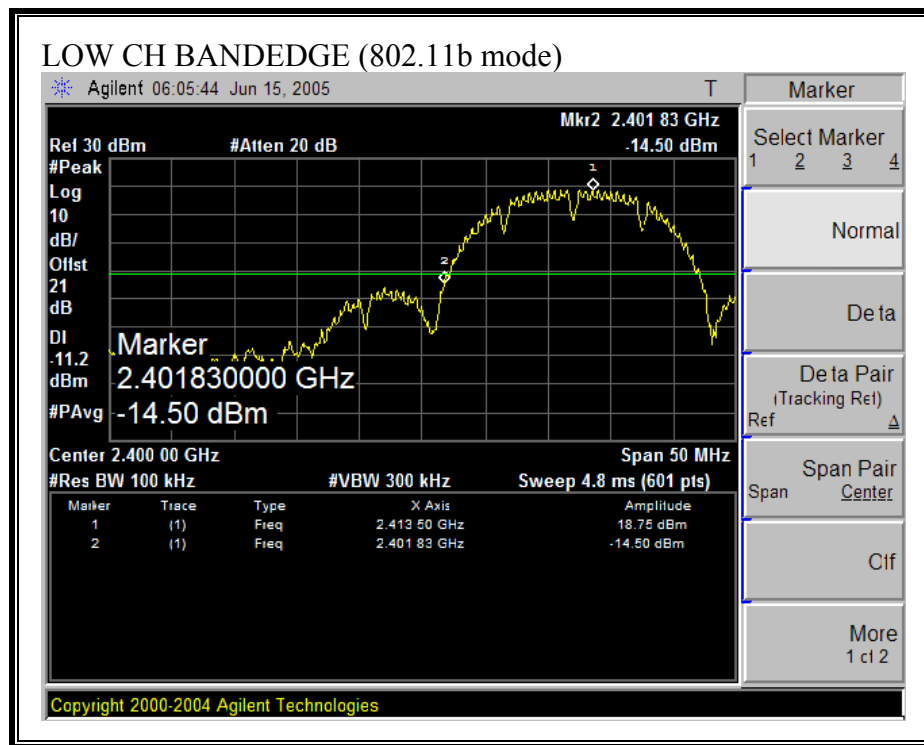
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

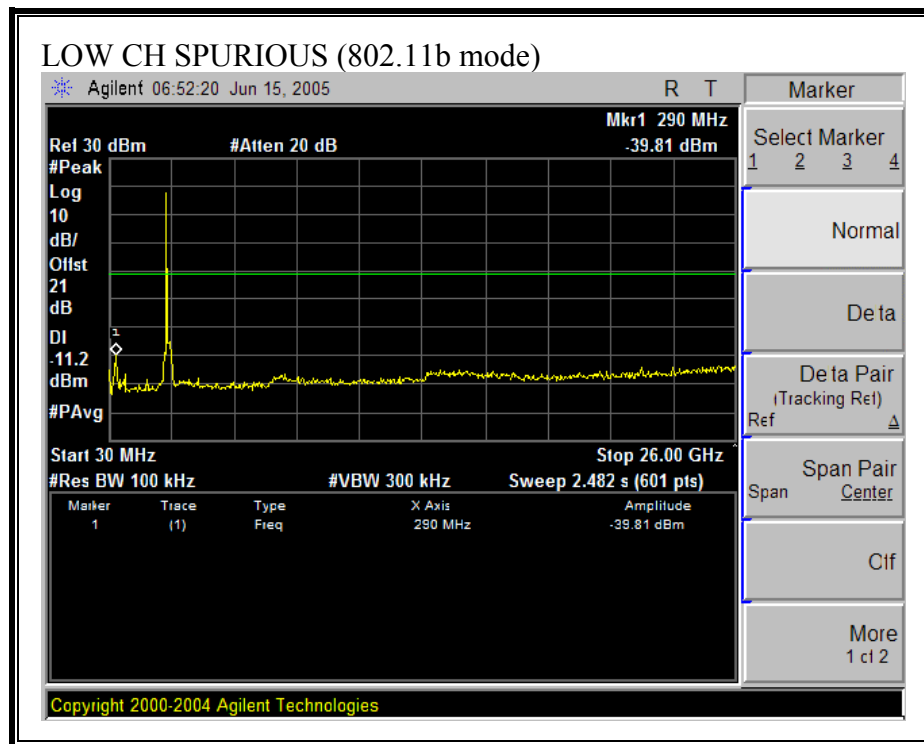
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

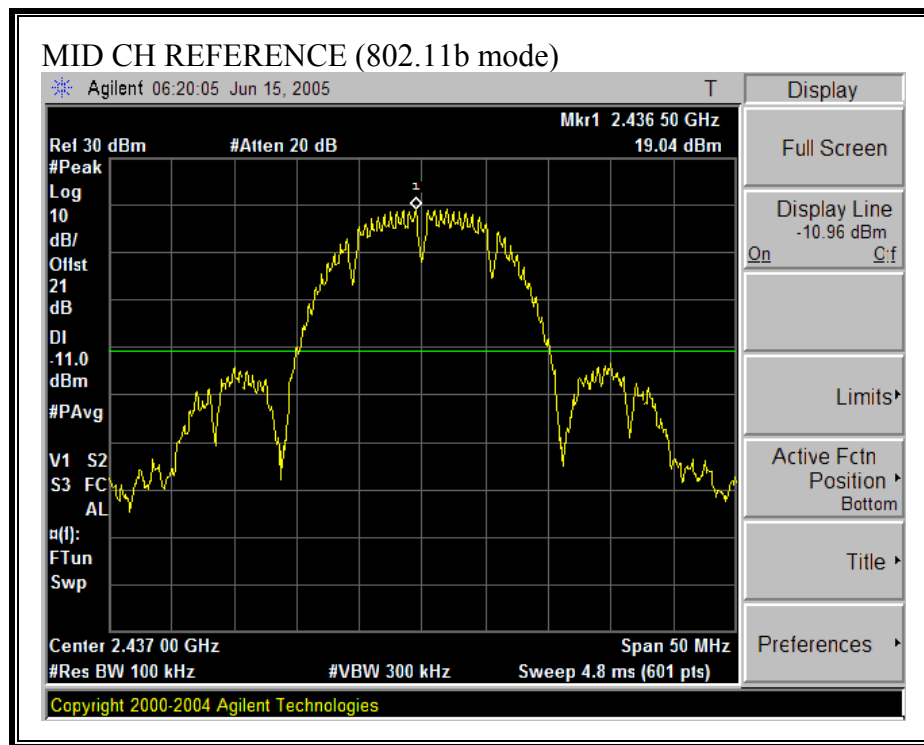
No non-compliance noted:

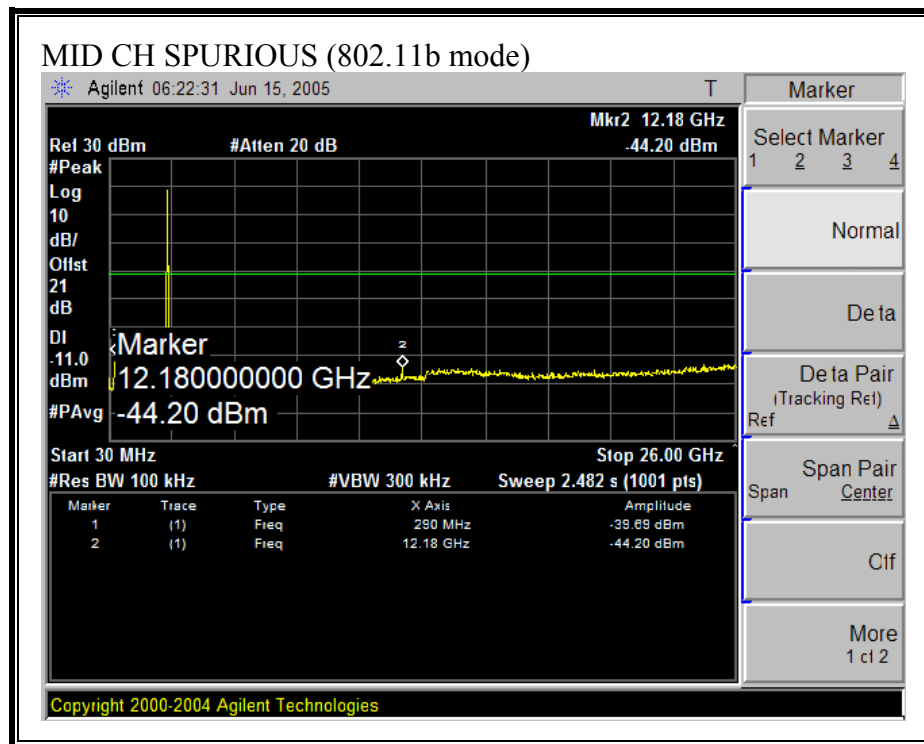
SPURIOUS EMISSIONS, LOW CHANNEL (802.11b MODE)



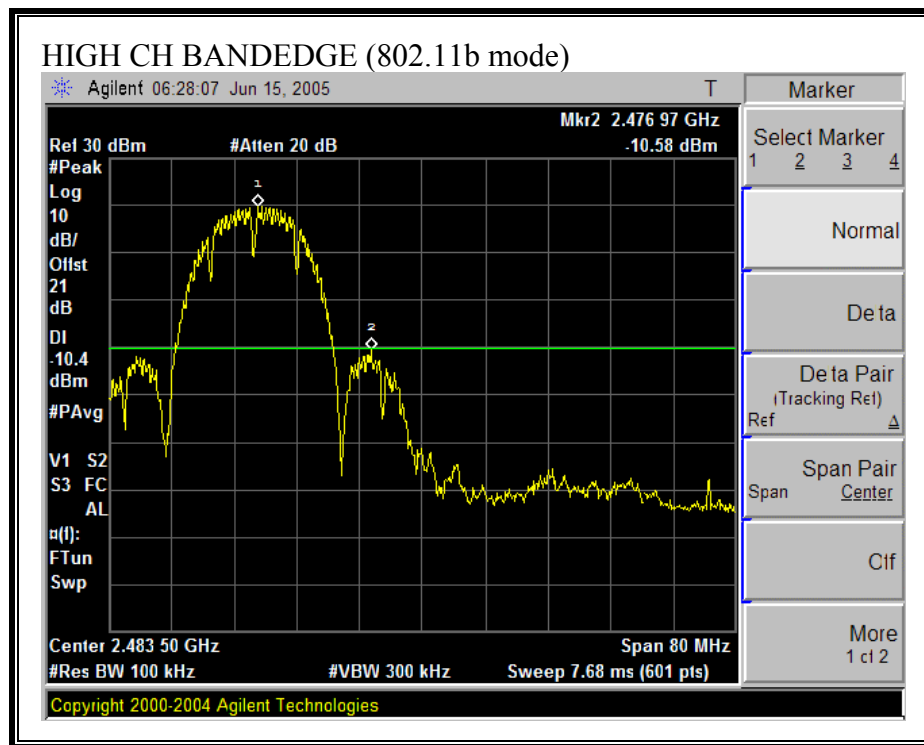


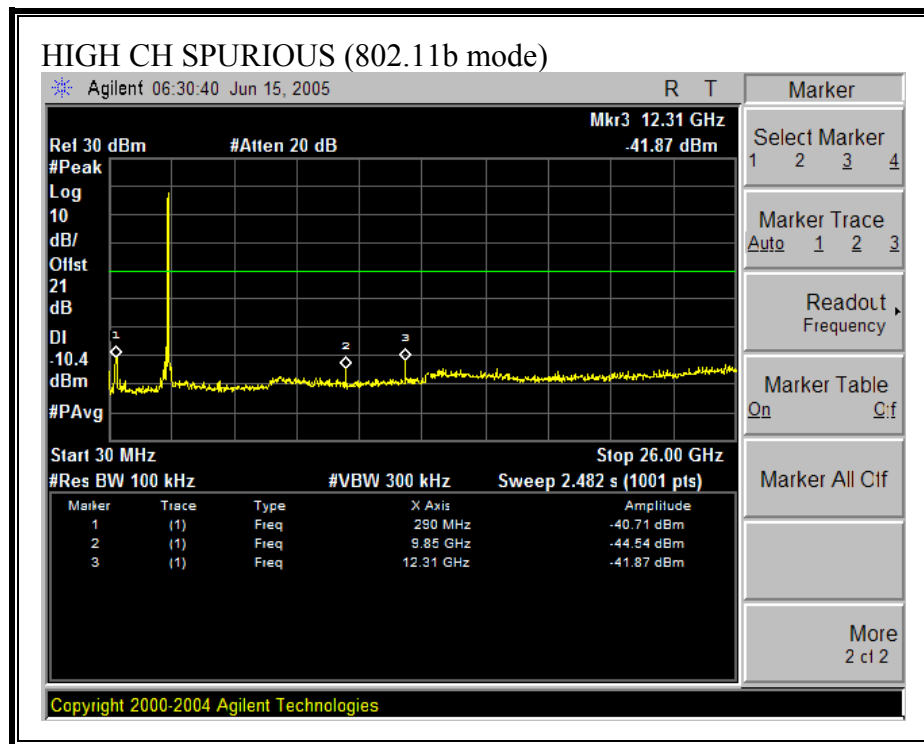
SPURIOUS EMISSIONS, MID CHANNEL (802.11b MODE)



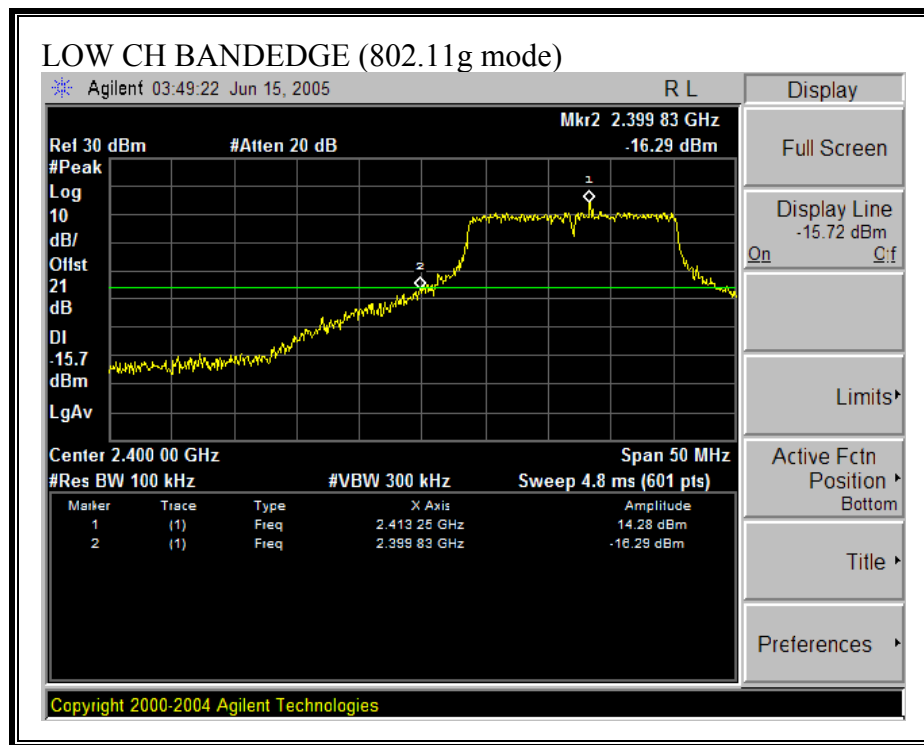


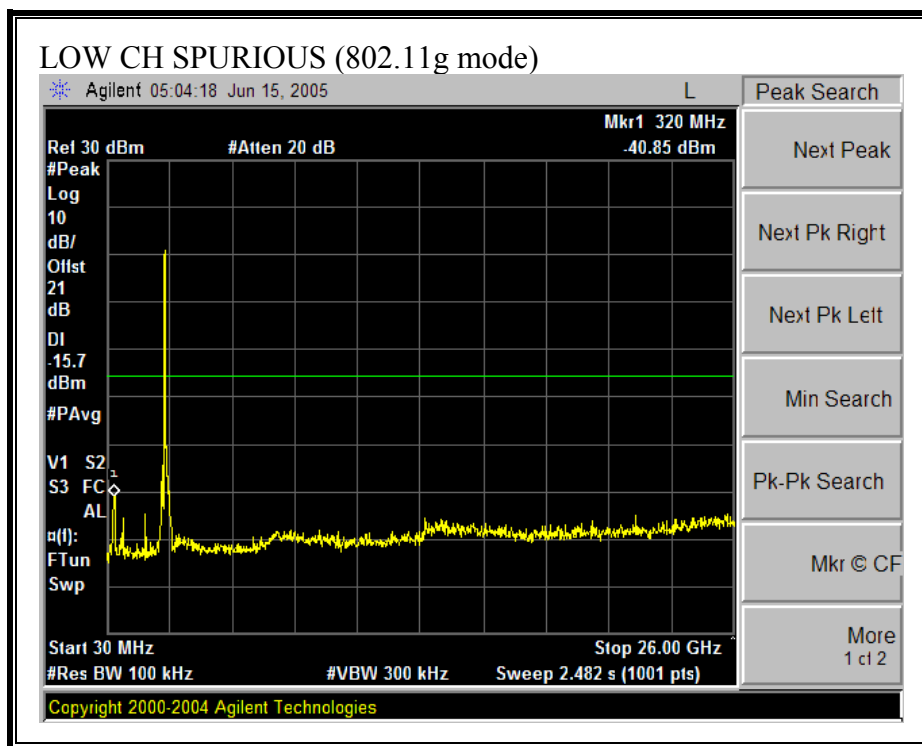
SPURIOUS EMISSIONS, HIGH CHANNEL (802.11b MODE)



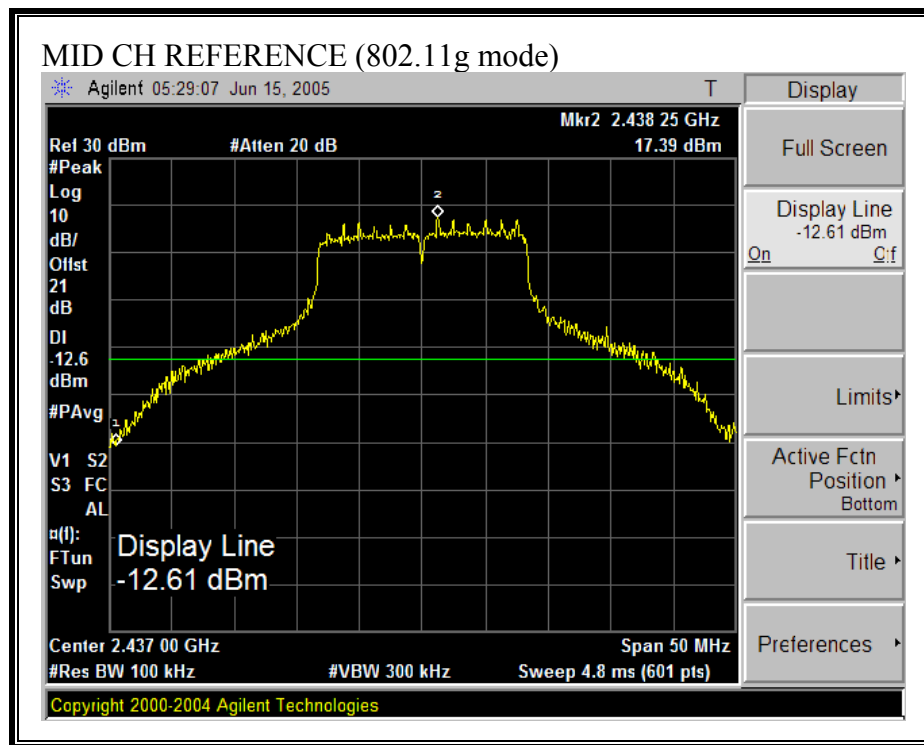


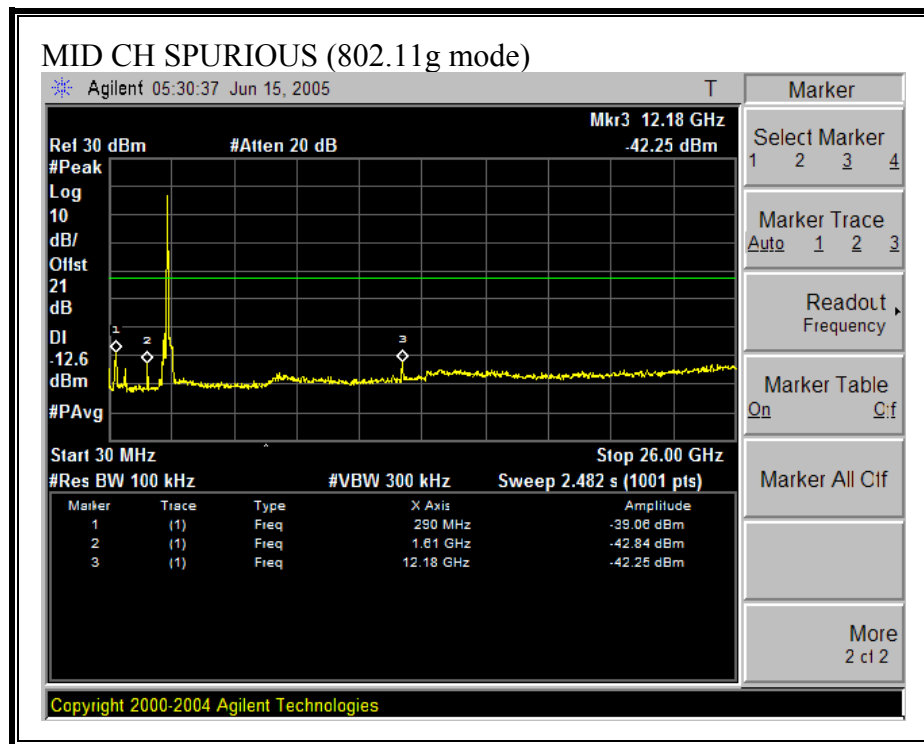
SPURIOUS EMISSIONS, LOW CHANNEL (802.11g MODE)



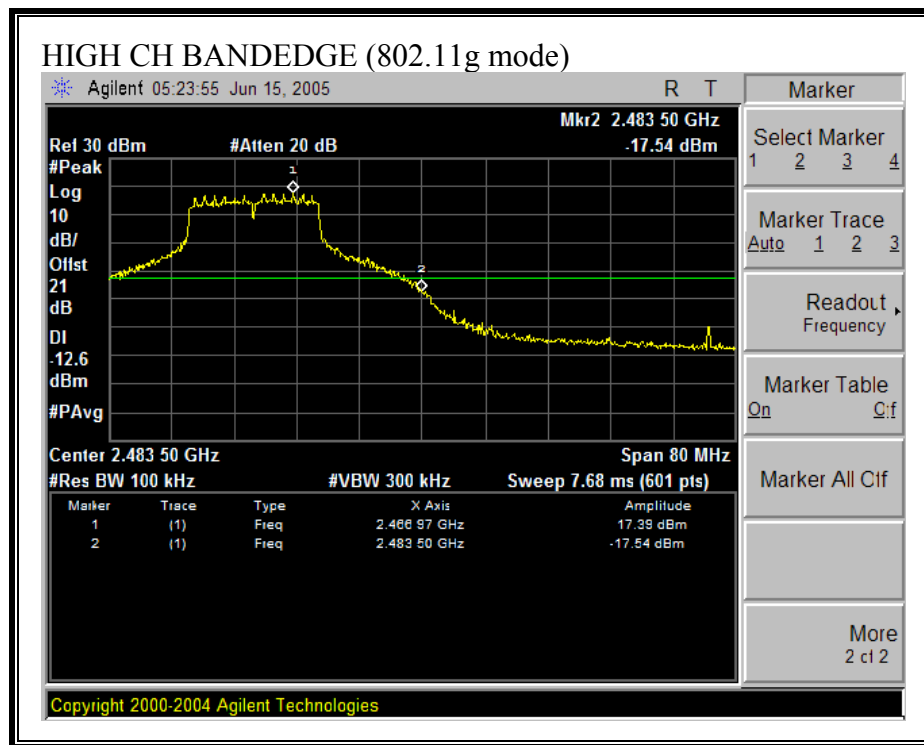


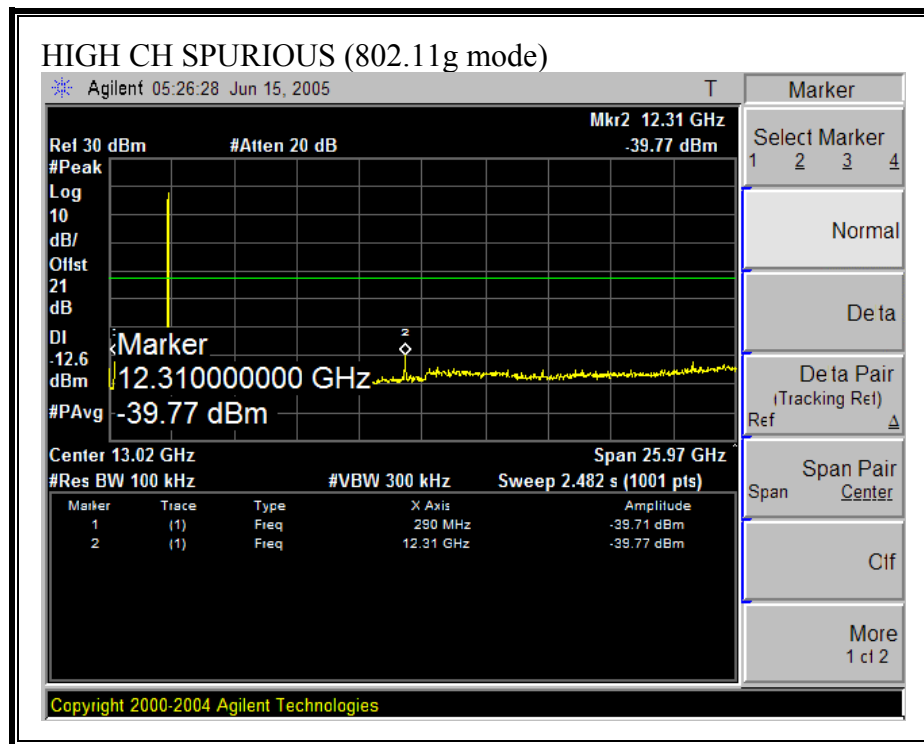
SPURIOUS EMISSIONS, MID CHANNEL (802.11g MODE)





SPURIOUS EMISSIONS, HIGH CHANNEL (802.11g MODE)





7.2 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
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 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	(²)
13.36 - 13.41	322 - 335.4		

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 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.

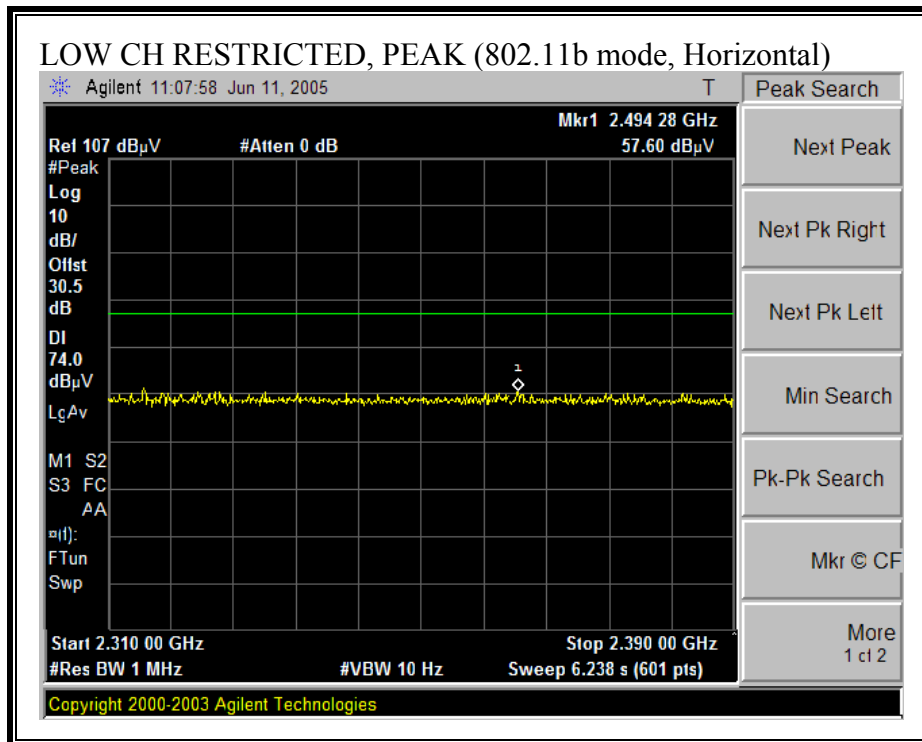
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

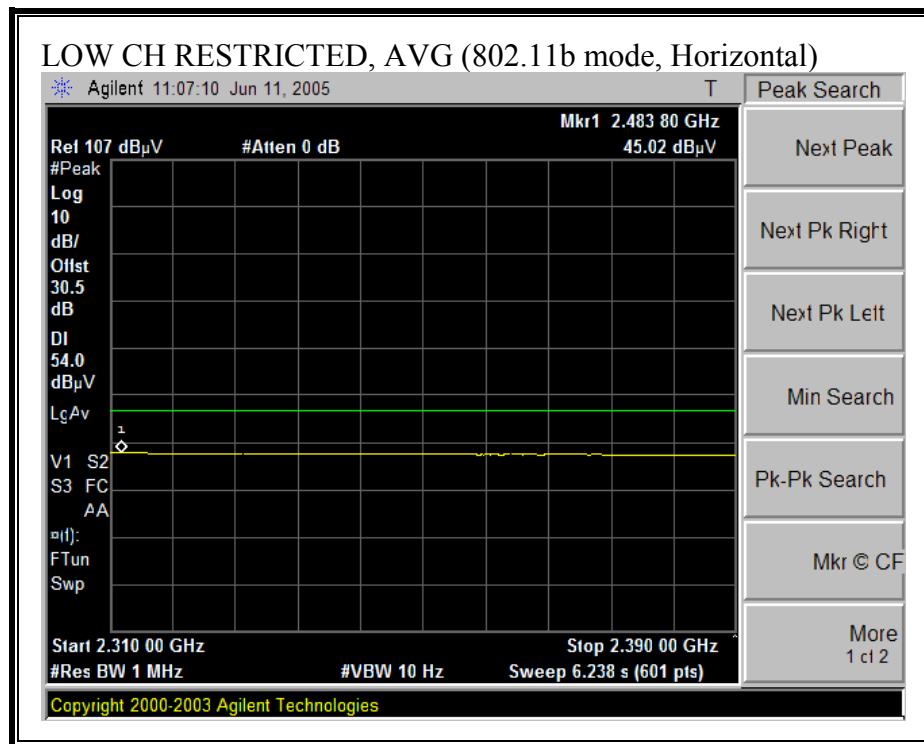
RESULTS

No non-compliance noted:

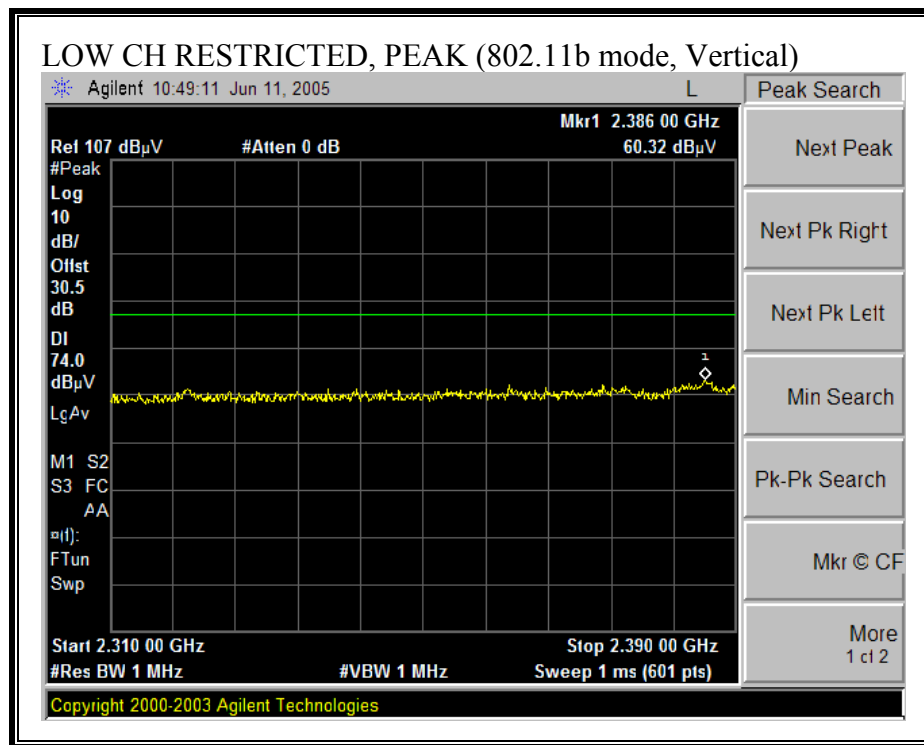
7.2.2 TRANSMITTER ABOVE 1 GHz FOR 2400 TO 2483.5 MHz BAND

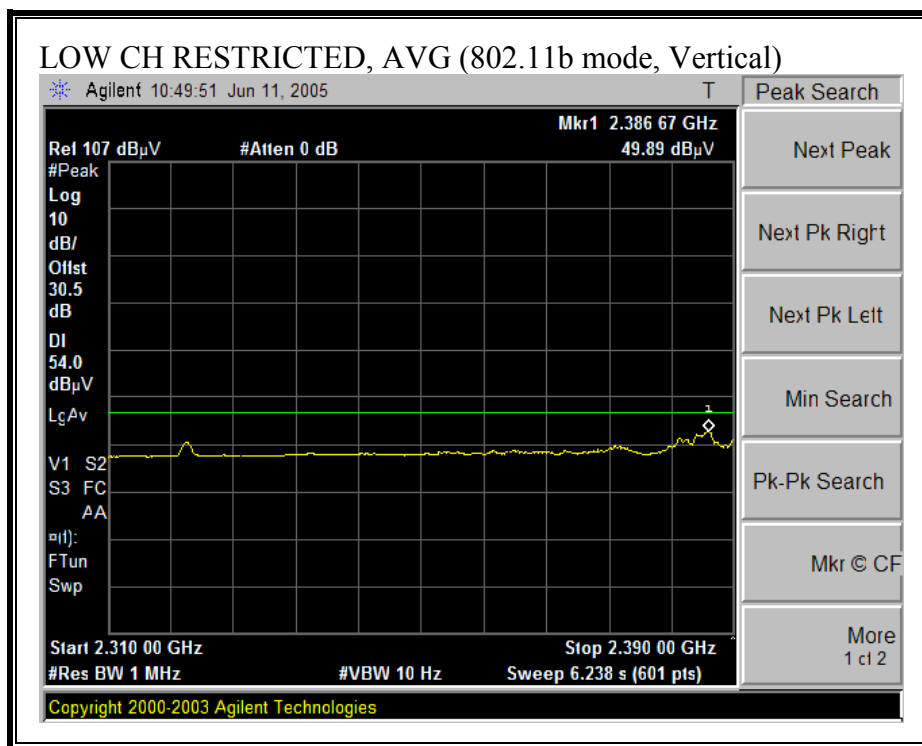
RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, HORIZONTAL)



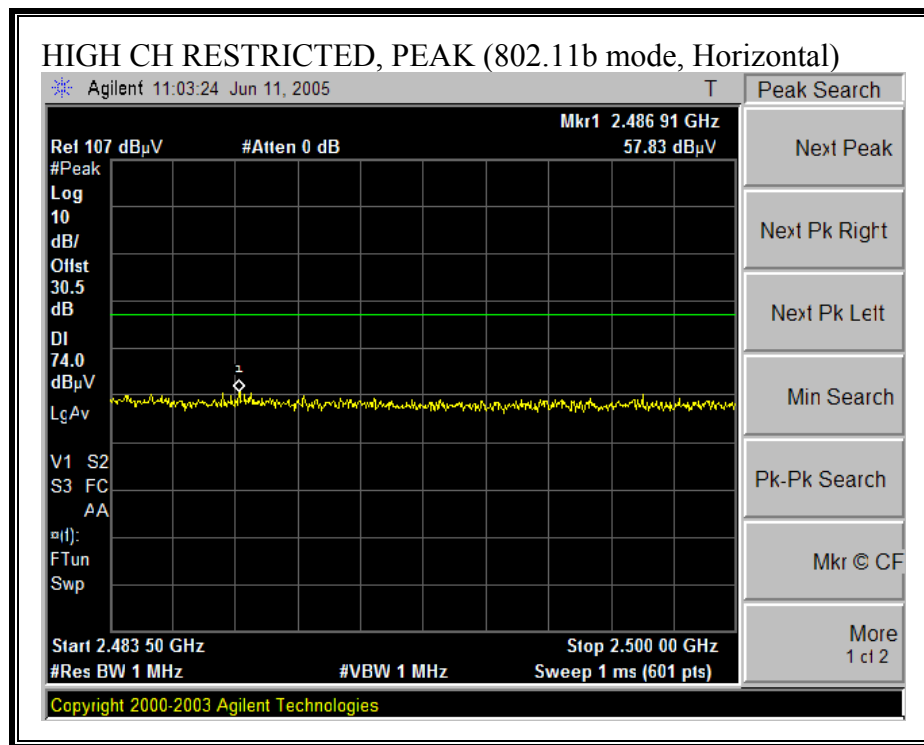


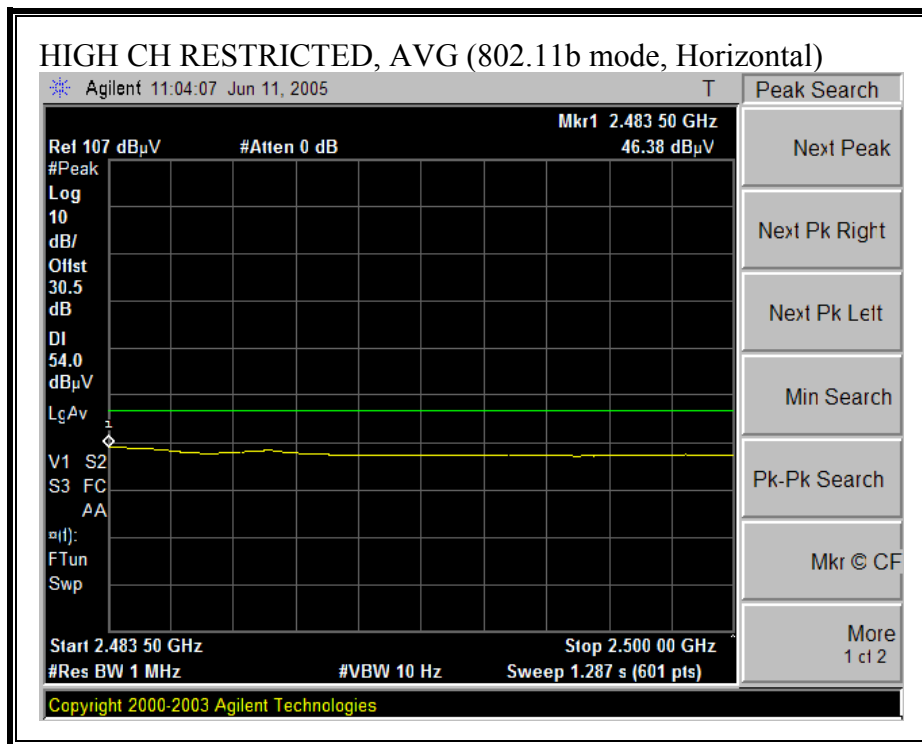
RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, VERTICAL)



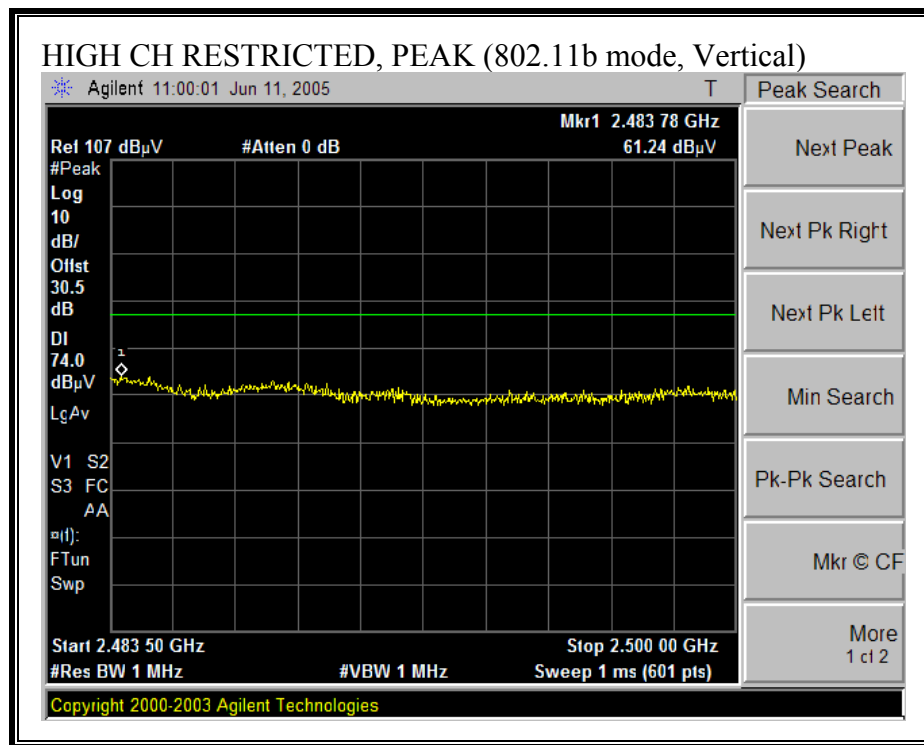


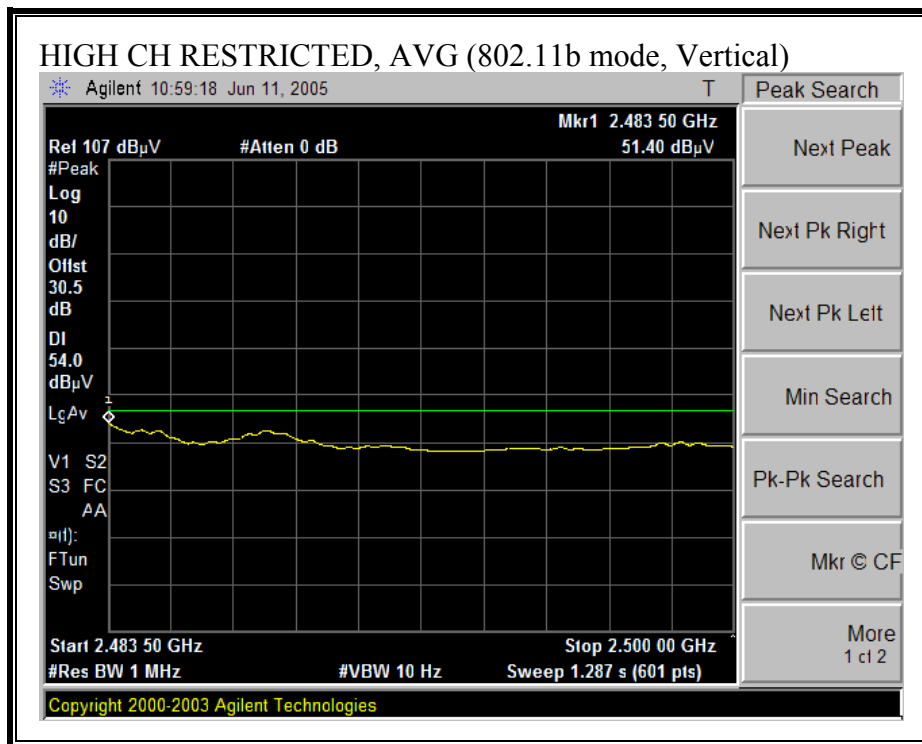
RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, VERTICAL)

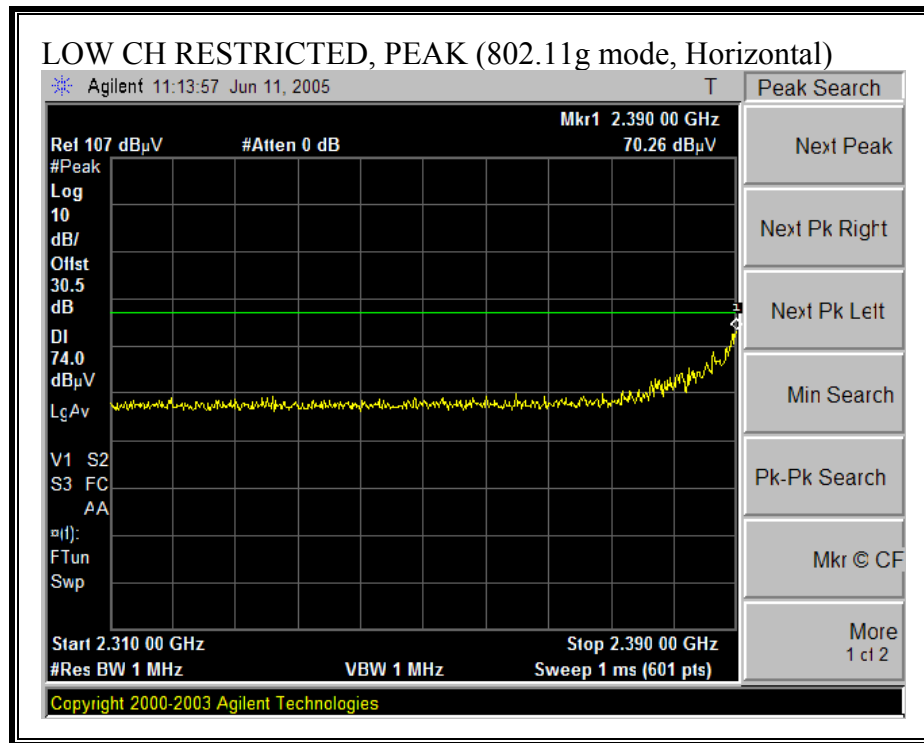


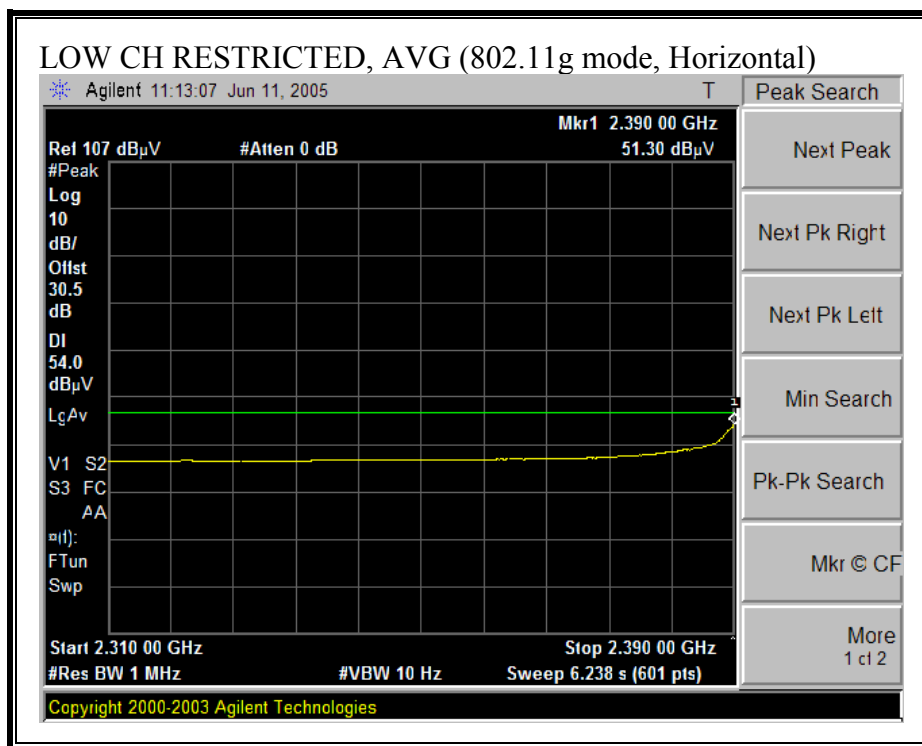


HARMONICS AND SPURIOUS EMISSIONS (b MODE)

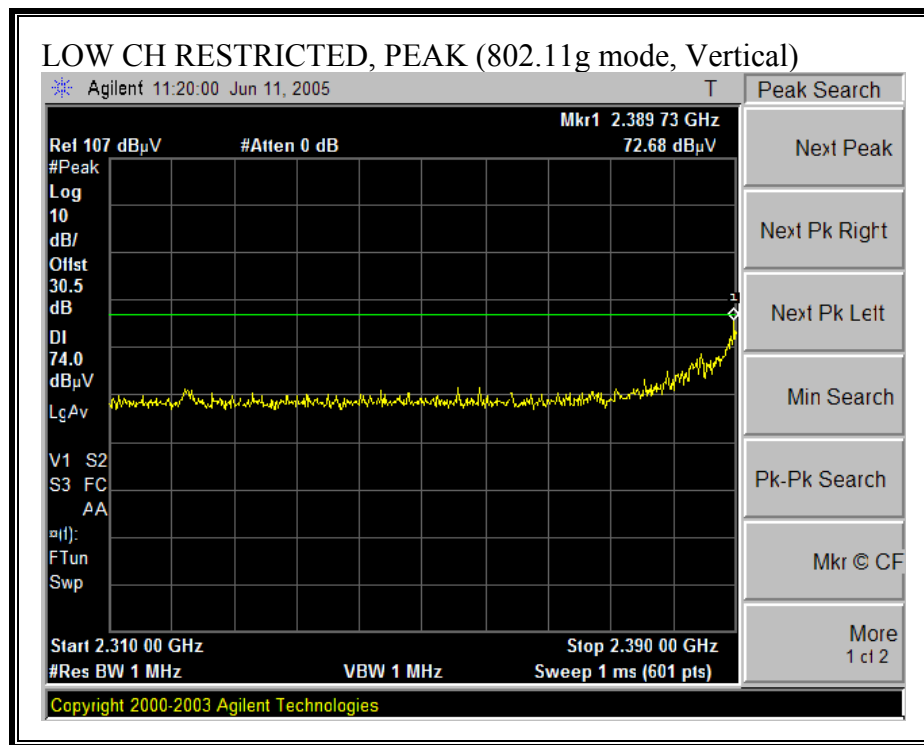
06/11/05 High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site															
Test Engr:Chin Pang Project #:05U3488-1 Company:Card Access Inc. EUT Descip.:802.11b/g Access Point 1 antenna Set EUT M/N:BWR54G1 Test Target:FCC 15.247 Mode Oper:TX, b mode Average Power Meter: Low = 28.48dBm, Mid = 28.85dBm, High = 29.25 dBm															
Test Equipment:															
EMCO Horn 1-18GHz T73; S/N: 6717 @3m		Pre-amplifier 1-26GHz T63 Miteq 646456		Pre-amplifier 26-40GHz		Horn > 18GHz		Limit FCC 15.205							
Hi Frequency Cables				HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz ; VBW=10Hz							
2 foot cable		3 foot cable		4 foot cable		12 foot cable		HPF_4.0GHz		Reject Filter					
4_Thanh		12_Neelsh													
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fldr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch															
4.824	3.0	57.4	53.0	33.7	4.1	-37.9	0.0	0.6	57.9	53.5	74	54	-16.1	-0.5	V
4.824	3.0	55.5	53.0	33.7	4.1	-37.9	0.0	0.6	56.0	53.5	74	54	-18.0	-0.5	H
Mid Ch															
4.874	3.0	55.7	52.9	33.8	4.1	-37.9	0.0	0.6	56.3	53.5	74	54	-17.7	-0.5	V
7.311	3.0	46.6	36.8	35.5	5.4	-36.9	0.0	0.6	51.2	41.4	74	54	-22.8	-12.6	V
4.874	3.0	55.1	51.8	33.8	4.1	-37.9	0.0	0.6	55.7	52.4	74	54	-18.3	-1.6	H
7.311	3.0	45.0	36.0	35.5	5.4	-36.9	0.0	0.6	49.6	40.6	74	54	-24.4	-13.4	H
High Ch															
4.924	3.0	54.0	51.0	33.8	4.1	-37.9	0.0	0.6	54.7	51.7	74	54	-19.3	-2.3	V
7.386	3.0	49.0	43.5	35.6	5.4	-36.9	0.0	0.6	53.8	48.3	74	54	-20.2	-5.7	V
4.924	3.0	55.0	51.6	33.8	4.1	-37.9	0.0	0.6	55.7	52.3	74	54	-18.3	-1.7	H
7.386	3.0	52.7	48.3	35.6	5.4	-36.9	0.0	0.6	57.5	53.1	74	54	-16.5	-0.9	H
Note: No other emissions were detected above f															
f	Measurement Frequency			Amp	Preamp Gain			Avg Lim	Average Field Strength Limit						
Dist	Distance to Antenna			D Corr	Distance Correct to 3 meters			Pk Lim	Peak Field Strength Limit						
Read	Analyzer Reading			Avg	Average Field Strength @ 3 m			Avg Mar	Margin vs. Average Limit						
AF	Antenna Factor			Peak	Calculated Peak Field Strength			Pk Mar	Margin vs. Peak Limit						
CL	Cable Loss			HPF	High Pass Filter										

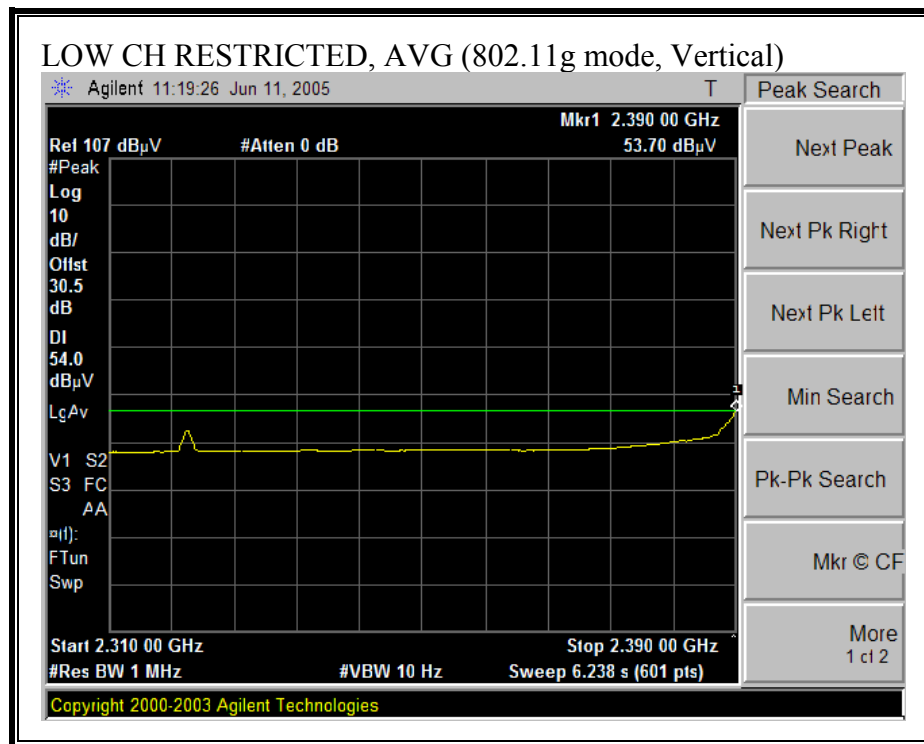
RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, HORIZONTAL)



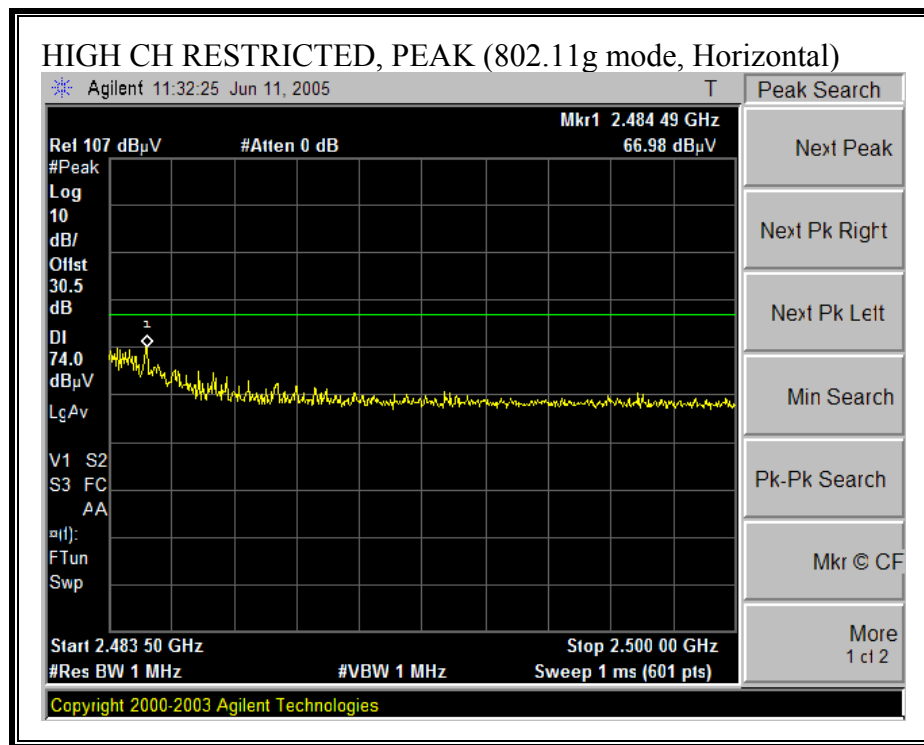


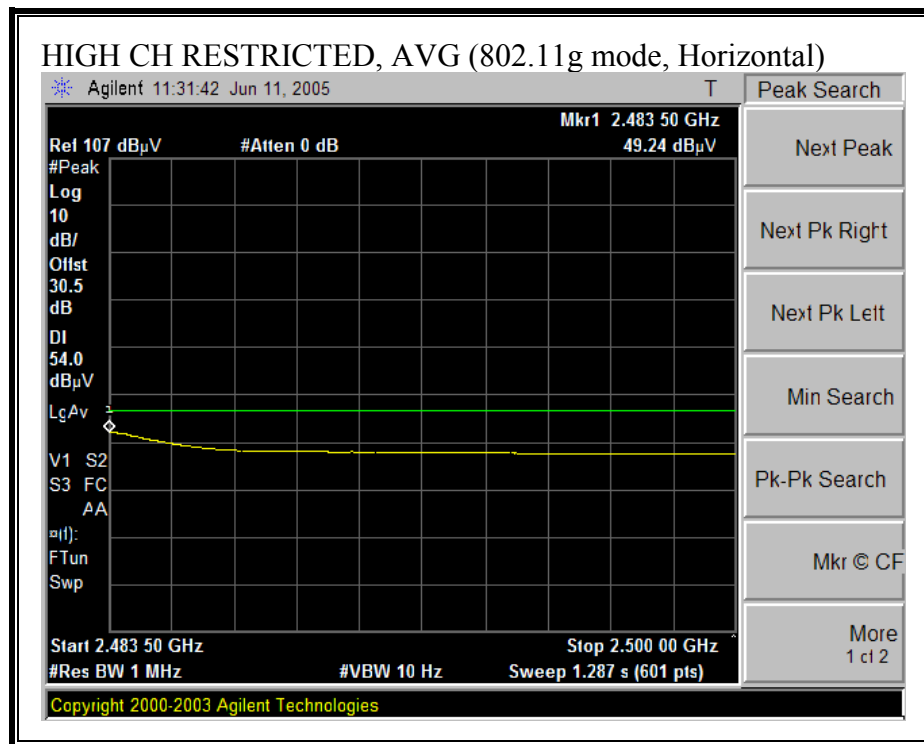
RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, VERTICAL)



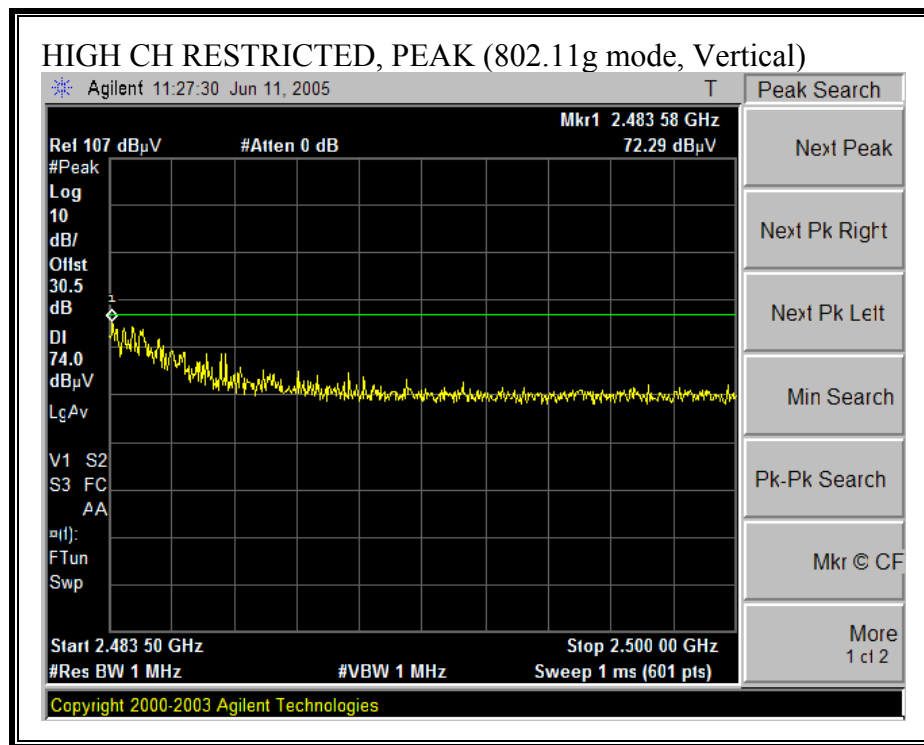


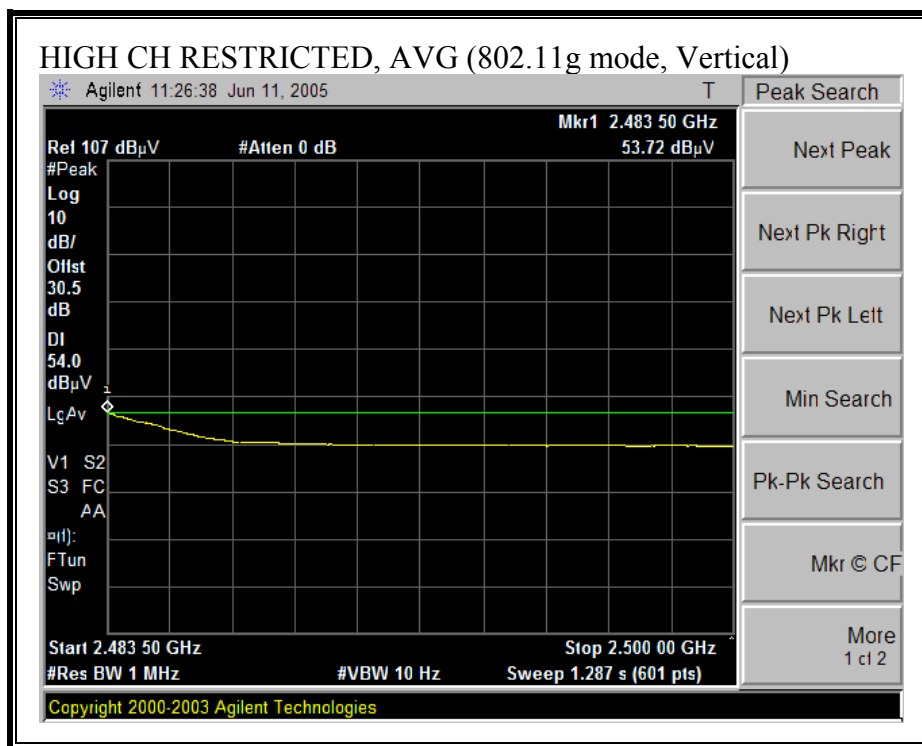
RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, VERTICAL)



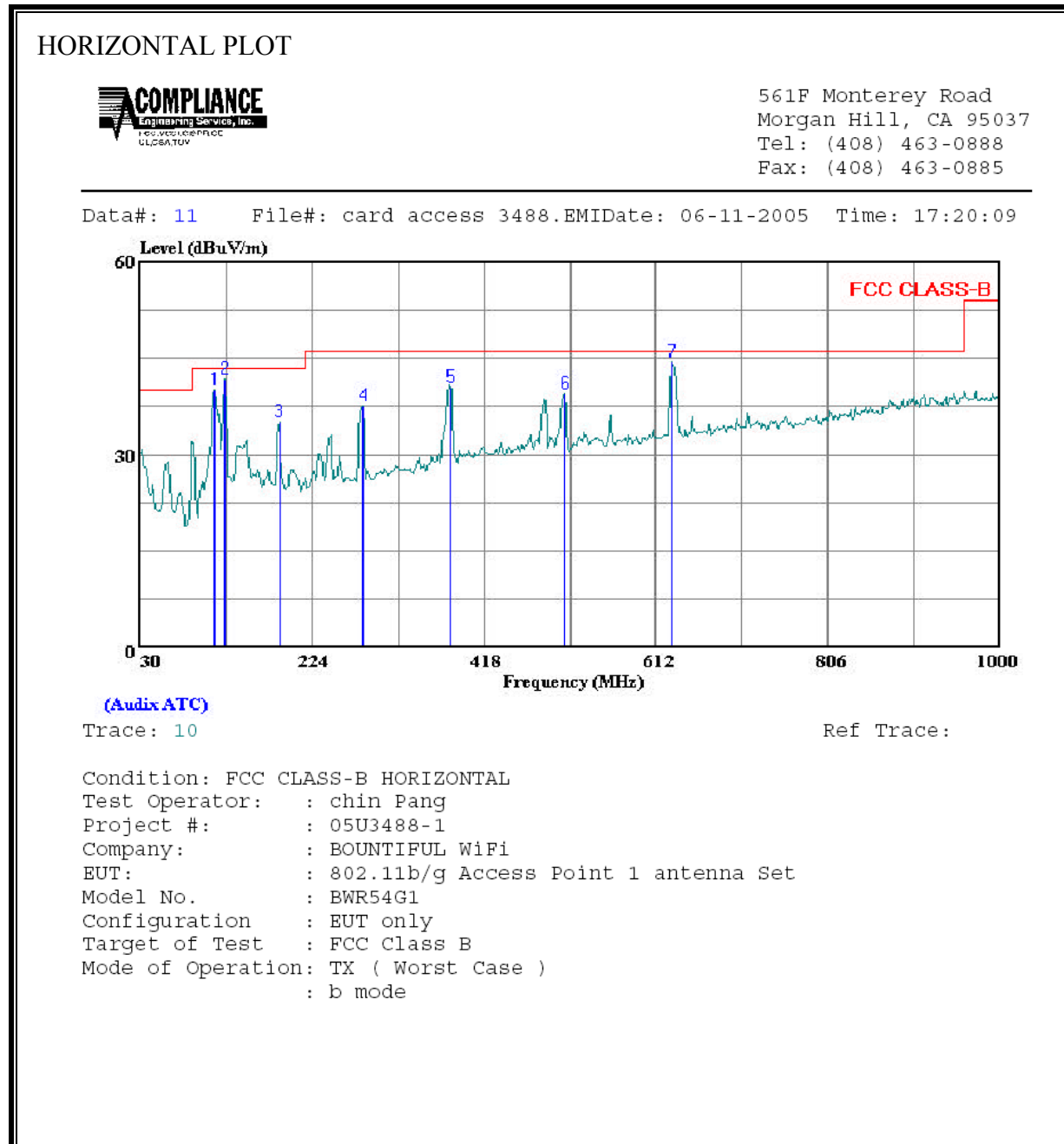


HARMONICS AND SPURIOUS EMISSIONS (g MODE)

06/11/05 High Frequency Measurement															
Compliance Certification Services, Morgan Hill Open Field Site															
Test Engr: Chin Pang															
Project #: 05U3488-1															
Company: Card Access Inc.															
EUT Descrip.: 802.11b/g Access Point 1 antenna Set															
EUT M/N: BWR54G1															
Test Target: FCC 15.247															
Mode Oper.: TX, g mode															
Average Power Meter: Low = 25.80dBm, Mid = 28.22 dBm, High = 27.60 dBm															
art=18															
Test Equipment:															
EMCO Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz		Limit							
T73; S/N: 6717 @3m		T63 Miteq 646456						FCC 15.205							
Hi Frequency Cables															
2 foot cable		3 foot cable		4 foot cable		12 foot cable		HPF		Reject Filter		Peak Measurements			
				4_Thanh		12_Neelsh		HPF_4.0GHz				RBW=VBW=1MHz			
Average Measurements															
RBW=1MHz ; VBW=10Hz															
f	Dist	Read Pk	Read Avg.	AF	CL	Amp	D Corr	Fltr	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)
Low Ch															
4.824	3.0	56.0	41.5	33.7	4.1	-37.9	0.0	0.6	56.5	42.0	74	54	-17.5	-12.0	V
12.185	3.0	54.0	38.5	38.5	7.3	-37.7	0.0	0.9	63.1	47.6	74	54	-10.9	-6.4	V
4.824	3.0	53.5	40.0	33.7	4.1	-37.9	0.0	0.6	54.0	40.5	74	54	-20.0	-13.5	H
12.060	3.0	56.0	40.5	38.5	7.3	-37.6	0.0	0.9	65.1	49.6	74	54	-8.9	-4.4	H
Mid Ch															
4.874	3.0	53.0	40.6	33.8	4.1	-37.9	0.0	0.6	53.6	41.2	74	54	-20.4	-12.8	V
7.311	3.0	46.0	34.0	35.5	5.4	-36.9	0.0	0.6	50.6	38.6	74	54	-23.4	-15.4	V
12.185	3.0	53.1	38.6	38.5	7.3	-37.7	0.0	0.9	62.2	47.7	74	54	-11.8	-6.3	V
4.874	3.0	53.7	41.6	33.8	4.1	-37.9	0.0	0.6	54.3	42.2	74	54	-19.7	-11.8	H
7.311	3.0	47.7	35.0	35.5	5.4	-36.9	0.0	0.6	52.3	39.6	74	54	-21.7	-14.4	H
12.185	3.0	51.0	36.0	38.5	7.3	-37.7	0.0	0.9	60.1	45.1	74	54	-13.9	-8.9	H
High Ch															
4.924	3.0	53.8	39.6	33.8	4.1	-37.9	0.0	0.6	54.5	40.3	74	54	-19.5	-13.7	V
7.386	3.0	48.6	35.0	35.6	5.4	-36.9	0.0	0.6	53.4	39.8	74	54	-20.6	-14.2	V
12.310	3.0	51.7	37.4	38.5	7.3	-37.8	0.0	0.9	60.7	46.4	74	54	-13.3	-7.6	V
4.924	3.0	54.2	42.0	33.8	4.1	-37.9	0.0	0.6	54.9	42.7	74	54	-19.1	-11.3	H
7.386	3.0	57.0	43.3	35.6	5.4	-36.9	0.0	0.6	61.8	48.1	74	54	-12.2	-5.9	H
12.310	3.0	52.3	37.5	38.5	7.3	-37.8	0.0	0.9	61.3	46.5	74	54	-12.7	-7.5	H
Note: No other emissions were detected above the system noise floor.															
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit										
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit										
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit										
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit										
CL	Cable Loss	HPF	High Pass Filter												

7.2.3 WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

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



HORIZONTAL DATA

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	114.390	25.64	14.46	40.10	43.50	-3.40	Peak
2	126.030	26.57	15.25	41.82	43.50	-1.68	Peak
3	187.140	22.13	12.87	35.00	43.50	-8.50	Peak
4	281.230	22.62	14.99	37.61	46.00	-8.39	Peak
5	380.170	22.93	17.59	40.52	46.00	-5.48	Peak
6	509.180	19.08	20.36	39.44	46.00	-6.56	Peak
7	630.430	22.44	22.00	44.44	46.00	-1.56	Peak

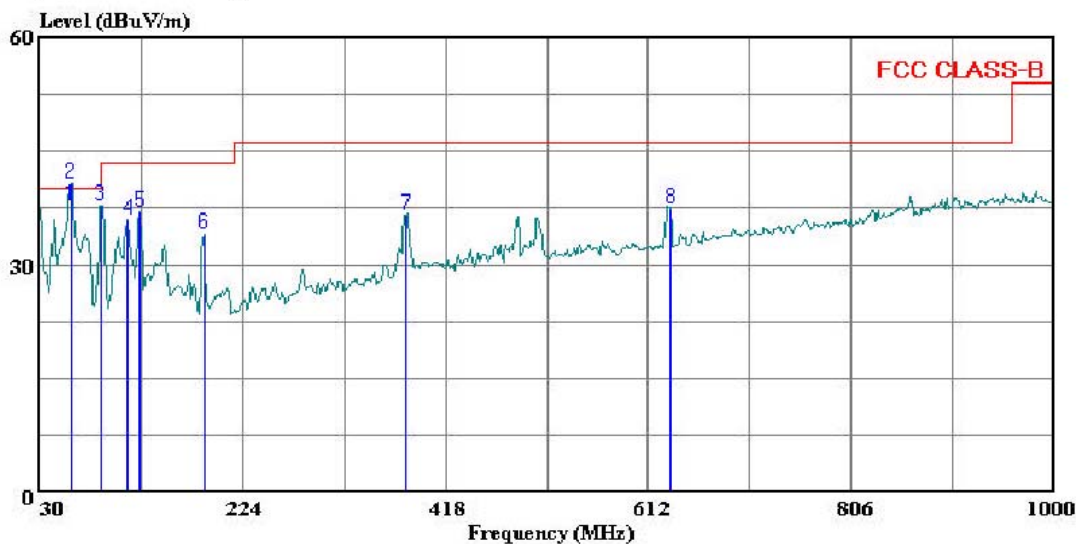
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT



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

Data#: 15 File#: card access 3488.EMIDate: 06-11-2005 Time: 17:24:51



(Audix ATC)

Trace: 12

Ref Trace:

Condition: FCC CLASS-B VERTICAL

Test Operator: : chin Pang

Project #: : 05U3488-1

Company: : BOUNTIFUL WiFi

EUT: : 802.11b/g Access Point 1 antenna Set

Model No. : BWR54G1

Configuration : EUT only

Target of Test : FCC Class B

Mode of Operation: TX (Worst Case)

: b mode

: add a ferite on power cable

VERTICAL DATA

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	60.070	29.09	8.71	37.80	40.00	-2.20	QP
2 *	60.070	31.92	8.71	40.63	40.00	0.63	Peak
3	88.200	29.21	8.56	37.77	43.50	-5.73	Peak
4	114.390	21.43	14.46	35.89	43.50	-7.61	Peak
5	126.030	21.65	15.25	36.90	43.50	-6.60	Peak
6	187.140	21.26	12.87	34.13	43.50	-9.37	Peak
7	380.170	19.05	17.59	36.64	46.00	-9.36	Peak
8	633.340	15.31	22.05	37.36	46.00	-8.64	Peak

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 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.

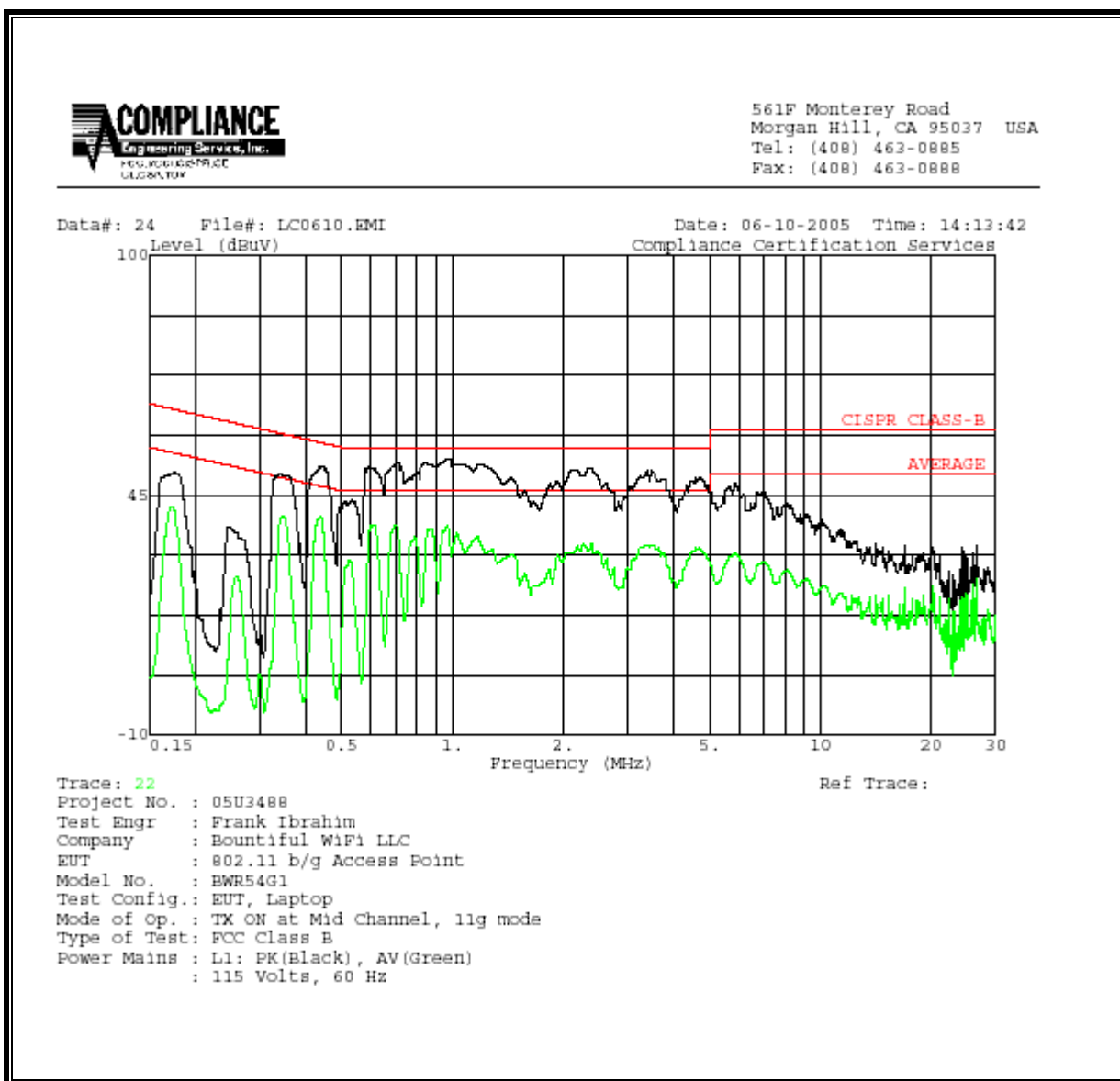
RESULTS

No non-compliance noted:

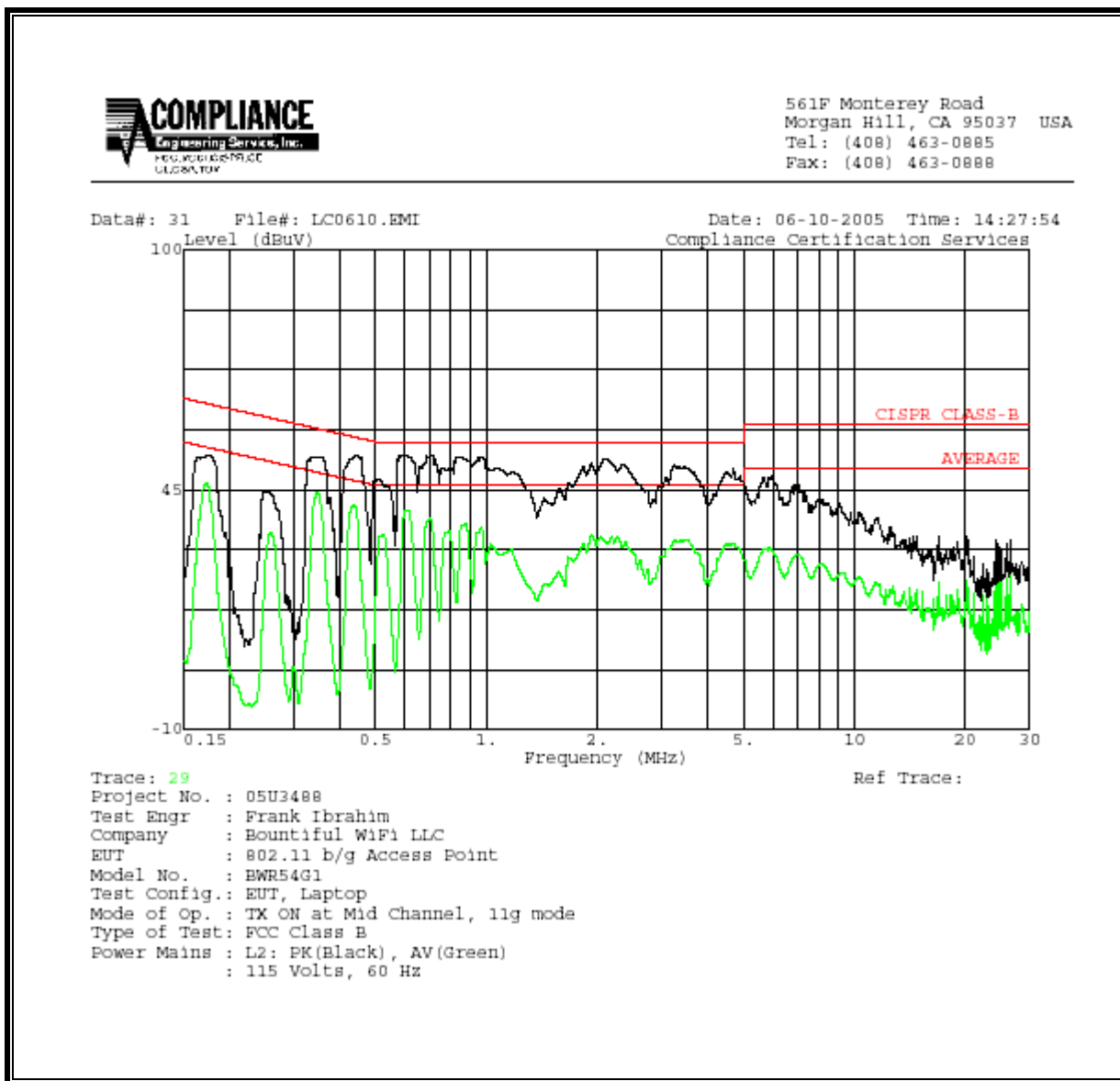
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	FCC B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.71	52.47	--	38.00	0.00	56.00	46.00	-3.53	-8.00	L1
0.97	53.40	--	27.84	0.00	56.00	46.00	-2.60	-18.16	L1
2.33	51.28	--	33.50	0.00	56.00	46.00	-4.72	-12.50	L1
0.60	52.80	--	40.24	0.00	56.00	46.00	-3.20	-5.76	L2
0.97	52.34	--	36.26	0.00	56.00	46.00	-3.66	-9.74	L2
2.11	51.94	--	34.30	0.00	56.00	46.00	-4.06	-11.70	L2
6 Worst Data									

LINE 1 RESULTS

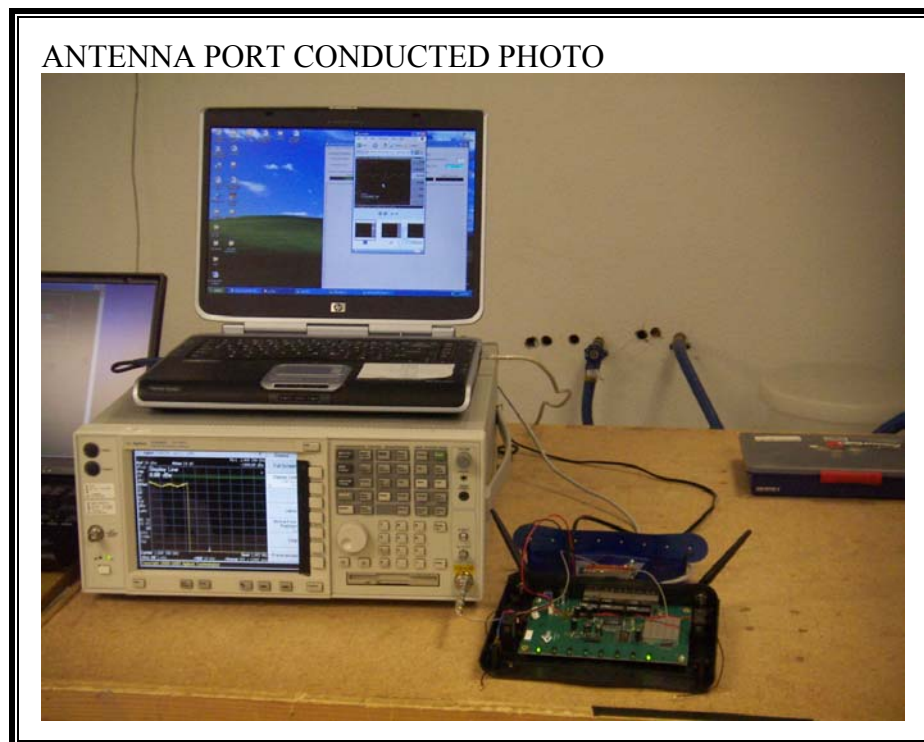


LINE 2 RESULTS

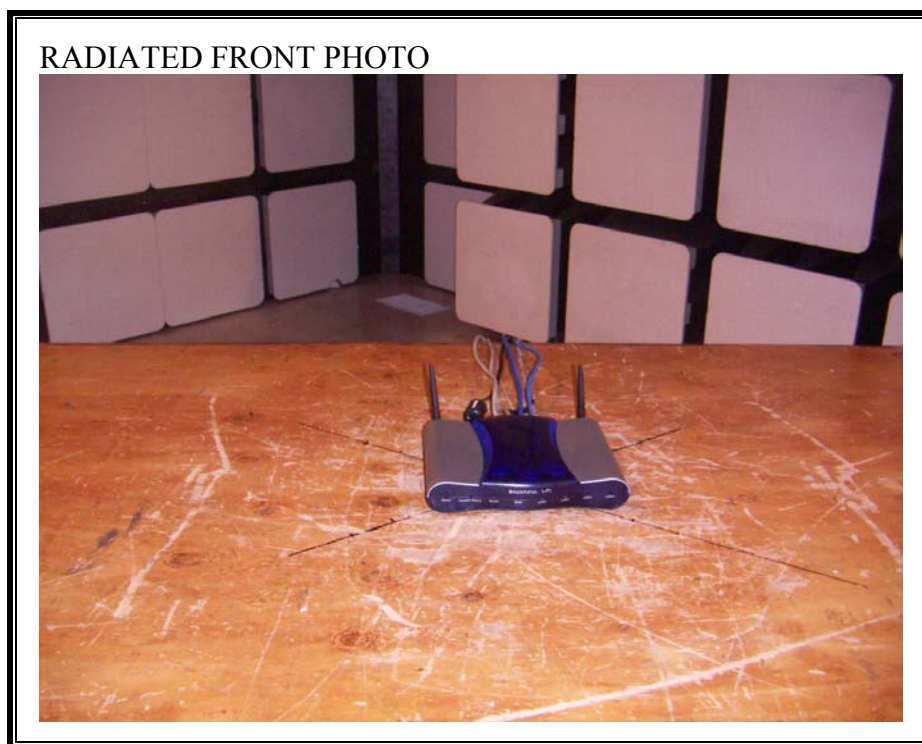


8 SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



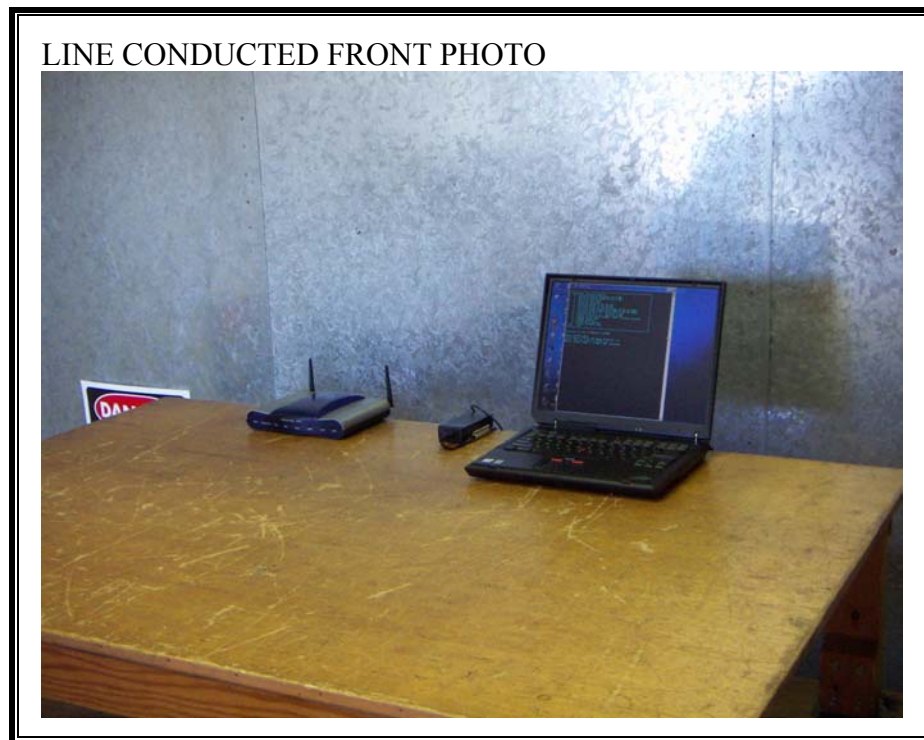
RADIATED RF MEASUREMENT SETUP



RADIATED BACK PHOTO



POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP





END OF REPORT