FCC CFR47 PART 15 SUBPART C

CERTIFICATION

TEST REPORT

FOR

802.11 b/g ACCESS POINT

MODELS: AIR-AP521G-A-K9, AIR-LAP521G-A-K9

FCC ID: LDK102065

REPORT NUMBER: 07U10947-1, Revision B

ISSUE DATE: APRIL 3, 2007

Prepared for
CISCO SYSTEMS, INC.
170 WEST TASMAN DRIVE
SAN JOSE, CA 95134

Prepared by
COMPLIANCE CERTIFICATION SERVICES
47173 BENICIA STREET
FREMONT, CA 94538, USA
TEL: (510) 771-1000
FAX: (510) 661-0888

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
A	3/23/2007	Initial Issue based on CCS report 04U2603-1 FCC 2.4 DTS Report, modified model and FCC ID.	S. Radecki
B	04/03/07	Clarified model differences.	M. Heckrotte

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1. TEST RESULT CERTIFICATION

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

EUT DESCRIPTION: 802.11 b/g ACCESS POINT

MODEL TESTED: AIR-AP1131AG-A-K9-P

MODELS: AIR-AP521G-A-K9, AIR-LAP521G-A-K9

DATE TESTED: JULY 24 – JULY 29, 2004

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:

YAN ZHENG
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:

DAVID GARCIA
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

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2. EUT DESCRIPTION

2.1. DESCRIPTION OF EUT

The EUT is an 802.11 b/g access point.

The 2.4 GHz transmitter has a maximum peak conducted output power as follows:

Frequency Band (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11b	25.64	366.44
2412 - 2462	802.11g	24.82	303.39

The 2.4 GHz radio utilizes two identical internal inverted F antennas for diversity, each with a maximum gain of 4 dBi.

2.2. DESCRIPTION OF MODEL DIFFERENCES

Models AIR-AP521G-A-K9, AIR-LAP521G-A-K9 are depopulated versions of model AIR-AP131AG-A-K9, in which the 802.11a radio circuitry has been removed.

In our opinion preliminary tests demonstrate that the original data on the 802.11b/g radio of the fully populated version is also representative of the emissions characteristics of the depopulated version.

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3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4/2001, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

4. 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.

NVLAP LAB CODE 200065-0

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5. CALIBRATION AND UNCERTAINTY

5.1. 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.

5.2. 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%.

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5.3. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the radiated emissions below 1GHz and AC line conducted tests documented in this report:

Equip.	Manufacturer	Model	Serial No.	Calibration due
Spectrum Analyzer	Hewlett Packard/ E7401A		18-AUG-2003	18-AUG-2004
Spectrum Analyzer	Hewlett Packard/ E7405A		11-SEP-2003	11-SEP-2004
RF Filter Section	Hewlett Packard/ 85460A		11-JUL-2003	11-JUL-2004
EMI Receiver RF Section	Hewlett Packard/ 85462A		11-JUL-2003	11-JUL-2004
Bilog Antenna	Schaffner-Chase/ CBL6112B		23-OCT-2003	23-OCT-2004
LISN	Fischer Custom Communications/ FCC-LISN-50/250-50-2-01		26-AUG-2003	26-AUG-2004

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The following test and measurement equipment was utilized for the above 1 GHz tests documented in this report:

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**Cal Due**
EMI Test Receiver	R & S	ESIB40	4/24/2174	11/21/2004
Power Meter	Agilent	E4416A	GB41291160	11/7/04
Peak / Average Power Sensor	Agilent	E9327A	US40440755	11/7/04
30MHz---- 2Ghz	Sunol Sciences	JB1 Antenna	A121003	12/22/04
EMI Receiver, 9 kHz ~ 2.9 GHz	HP	8542E	3942A00286	11/21/04
RF Filter Section	HP	85420E	3705A00256	11/21/04
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	9001-3245	2/4/05
Antenna, Horn, 18 ~ 26 GHz	ARA	MWH-1826/B	1013	2/4/05
Amplifier 1-26GHz	MITEQ	NSP2600-SP	924342	4/25/05
Spectrum Analyzer	Agilent	E4446A	MY43360112	1/13/05

Equip.	**Manufacturer**	**Model**	**Serial No.**	**Calibration due**
Spectrum Analyzer	Hewlett Packard/ E7401A		18-AUG-2003	18-AUG-2004
Spectrum Analyzer	Hewlett Packard/ E7405A		11-SEP-2003	11-SEP-2004
RF Filter Section	Hewlett Packard/ 85460A		11-JUL-2003	11-JUL-2004
EMI Receiver RF Section	Hewlett Packard/ 85462A		11-JUL-2003	11-JUL-2004
Bilog Antenna	Schaffner-Chase/ CBL6112B		23-OCT-2003	23-OCT-2004
LISN	Fischer Custom Communications/ FCC-LISN-50/250-50-2-01		26-AUG-2003	26-AUG-2004

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SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST			
Description	**Manufacturer**	**Model**	**Serial Number**
Laptop PC	IBM	T20	78-F2737
AC Adapter	IBM	AA21131	N/A
AC Adapter	Cisco	PSA18U-480C	N/A

I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	AC	Unshielded	1.8	N/A
2	DC	1	DC	Unshielded	1.5	N/A
3	Serial	1	dB9 to RJ45	Unshielded	1.5	N/A
4	DC	1	DC	Unshielded	1.5	N/A
5	AC	1	AC	Unshielded	1.8	N/A

The following support equipment was utilized for the radiated emissions below 1GHz and AC line conducted tests documented in this report:

Sample Number	Equipment Details	Serial Number	Part Number
S01	AIR-AP1131G-x-K9	FHH08202078	
S02	AIR-PWRINJ3	FOC0750M0PK	
S03	AC Adapter	PHI07390EL8	34-1977-03
S04	IBM T20 Laptop	78-F2668	
S05	TBM T20 with AIR-CB21AG		
S06	IBM T20 with AIR-CB21AG		

TEST SETUP

The EUT is a stand alone access point. It was connected to a laptop PC via series port and test software was used to exercise the radio.

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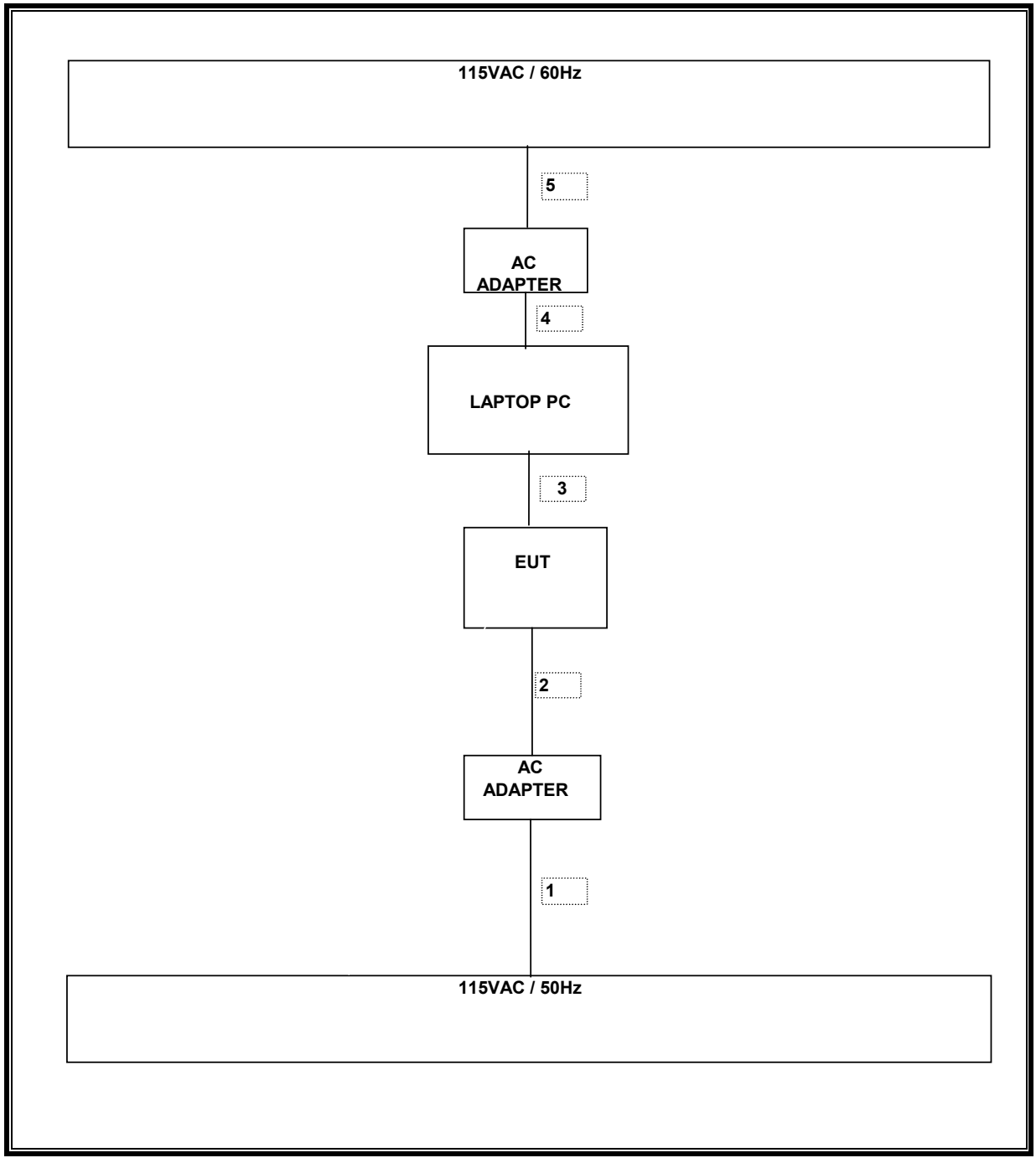
SETUP DIAGRAM FOR TESTS



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6. APPLICABLE LIMITS AND TEST RESULTS

6.1. 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	10083.33	500	9583
Middle	2437	10000.00	500	9500
High	2462	10083.33	500	9583

802.11g Mode

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	16416.67	500	15917
Middle	2437	16500.00	500	16000
High	2462	16416.67	500	15917

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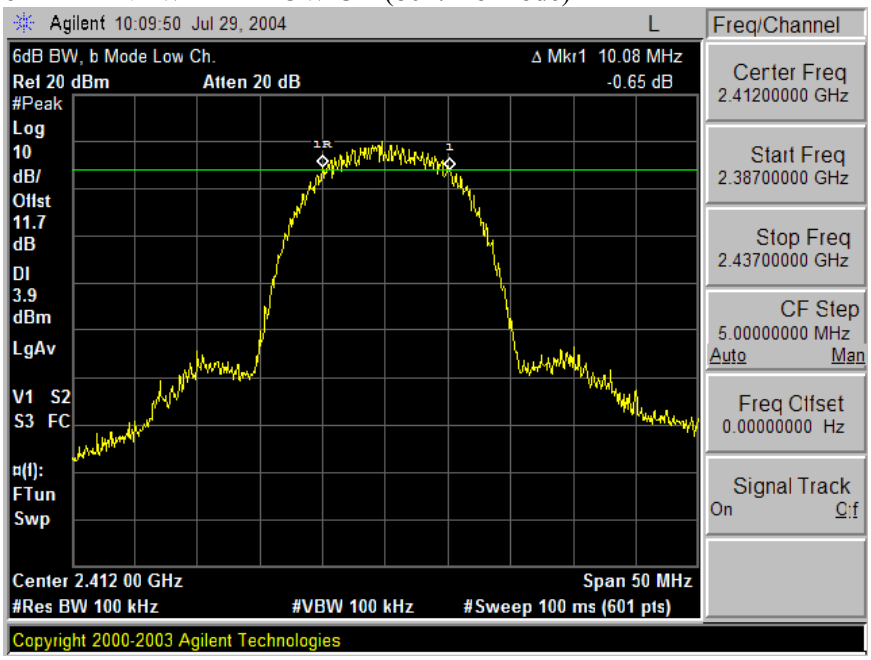
6 DB BANDWIDTH (802.11b MODE)

6 DB BANDWIDTH LOW CH (802.11b mode)



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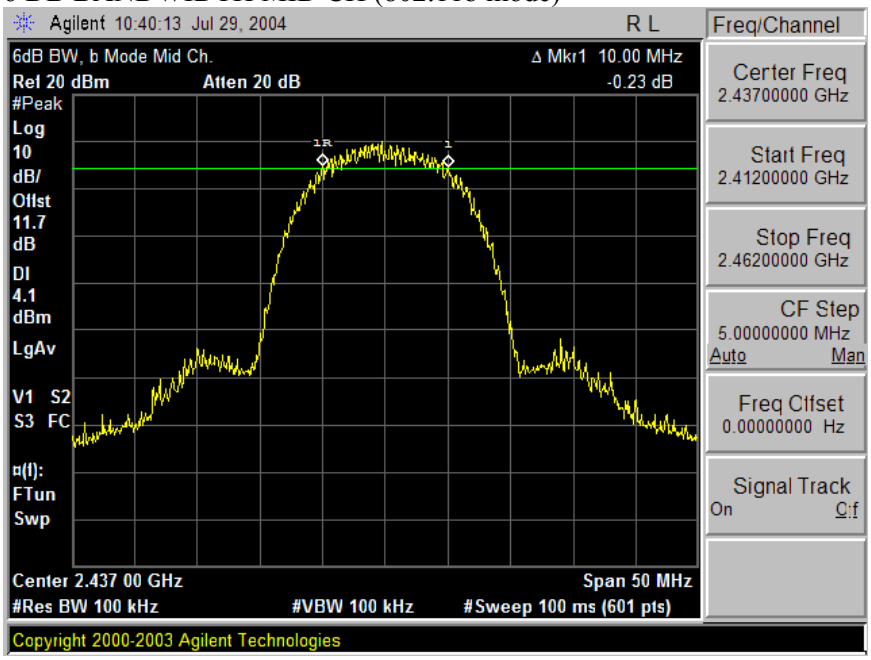
6 DB BANDWIDTH MID CH (802.11b mode)



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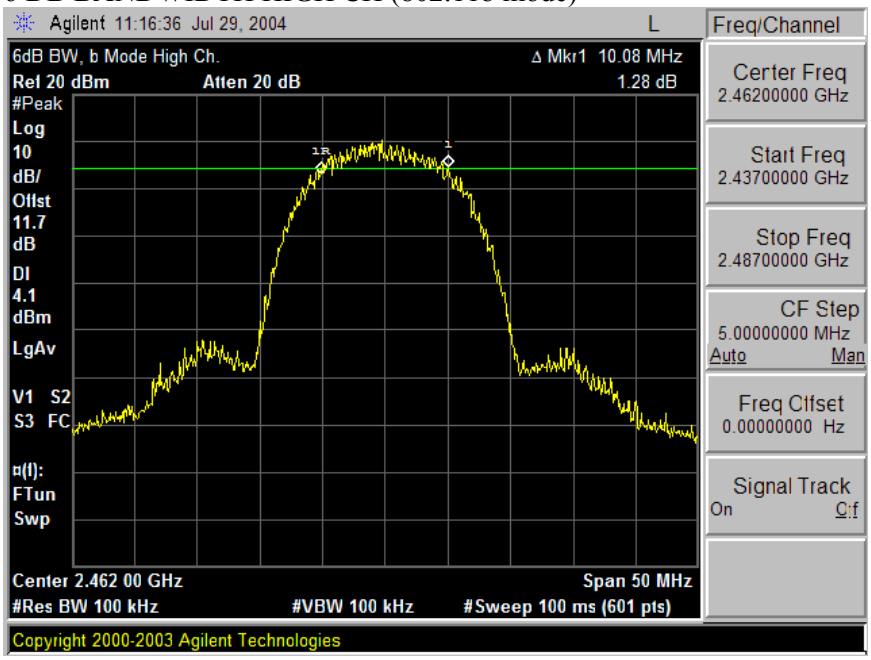
6 DB BANDWIDTH HIGH CH (802.11b mode)



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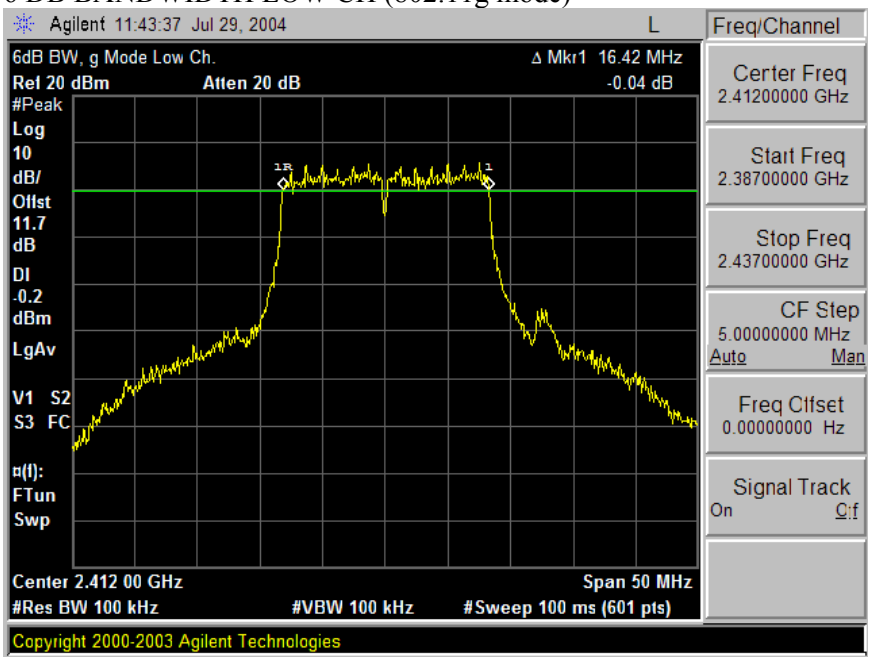
6 DB BANDWIDTH (802.11g MODE)

6 DB BANDWIDTH LOW CH (802.11g mode)



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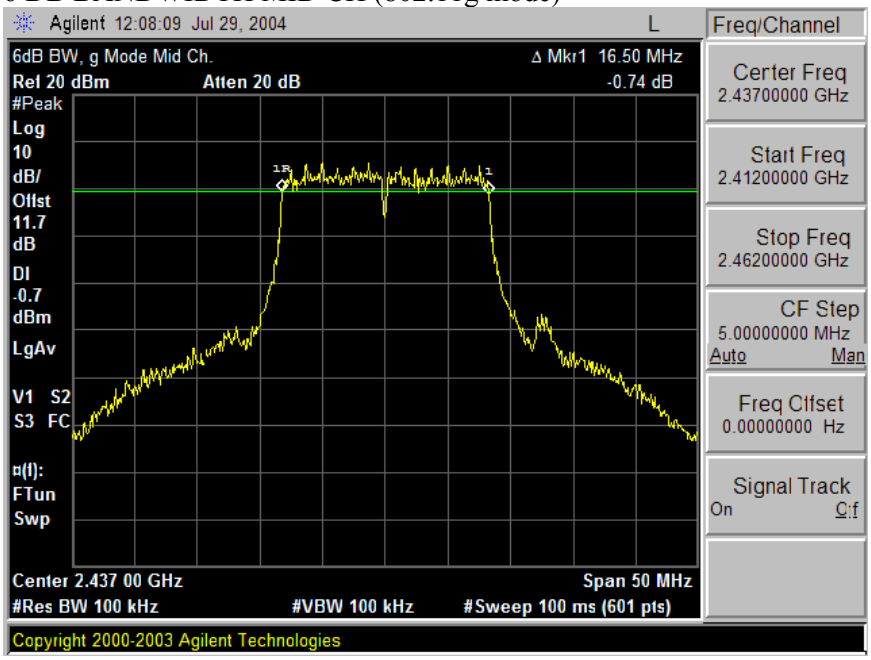
6 DB BANDWIDTH MID CH (802.11g mode)



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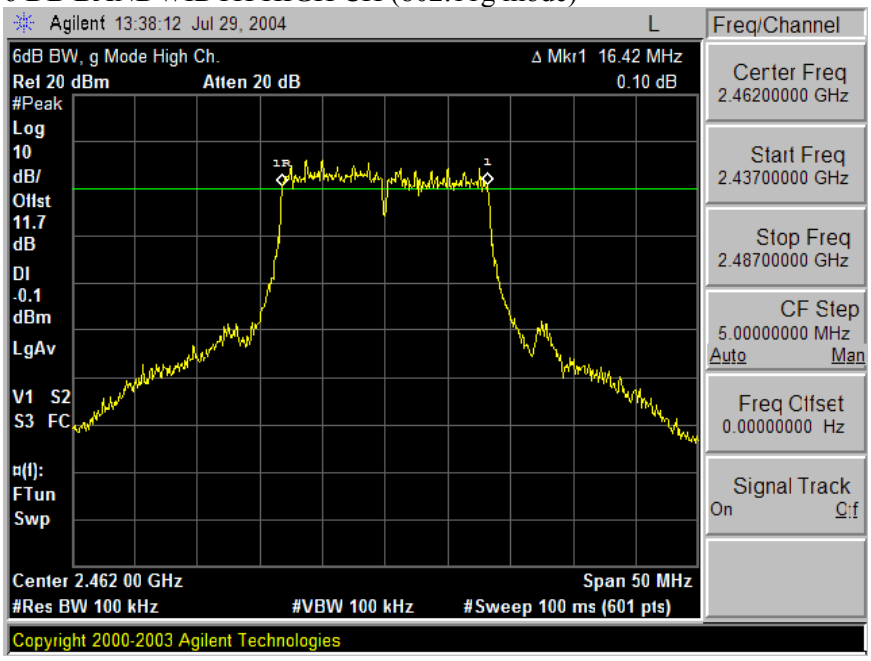
6 DB BANDWIDTH HIGH CH (802.11g mode)



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6.2. 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	13.957
Middle	2437	14.218
High	2462	14.394

802.11g Mode

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.355
Middle	2437	16.367
High	2462	16.339

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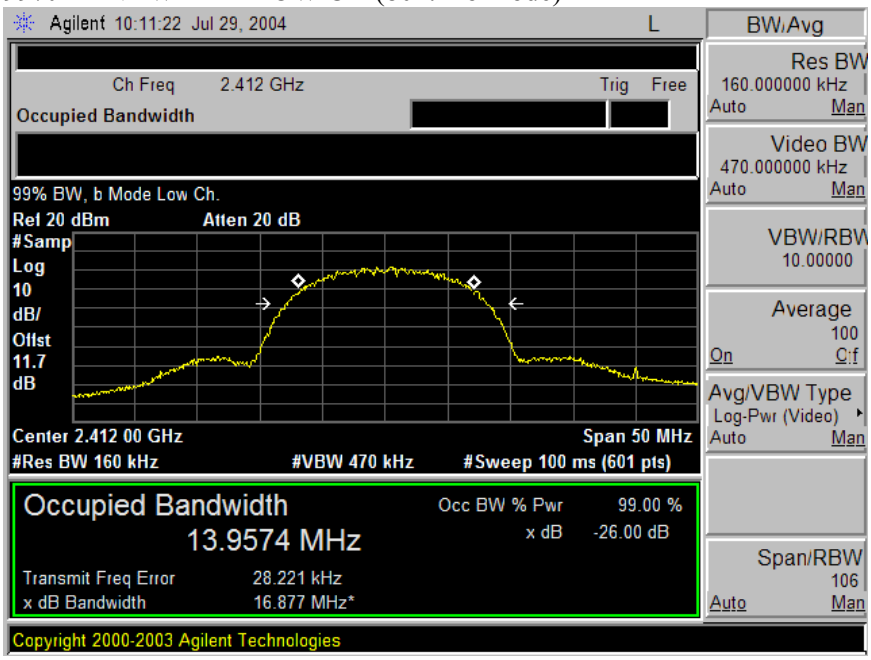
99% BANDWIDTH (802.11b MODE)

99% BANDWIDTH LOW CH (802.11b mode)



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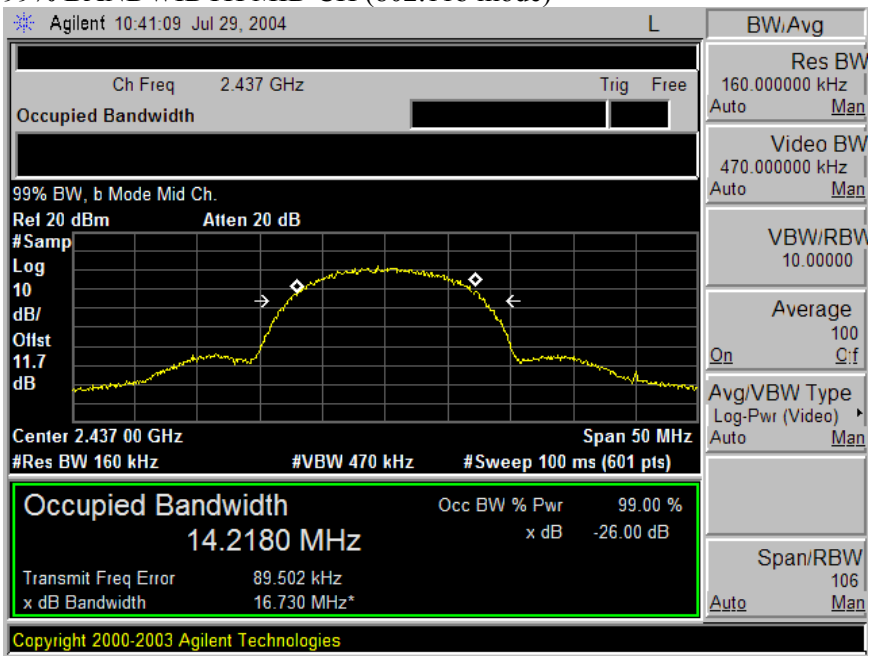
99% BANDWIDTH MID CH (802.11b mode)



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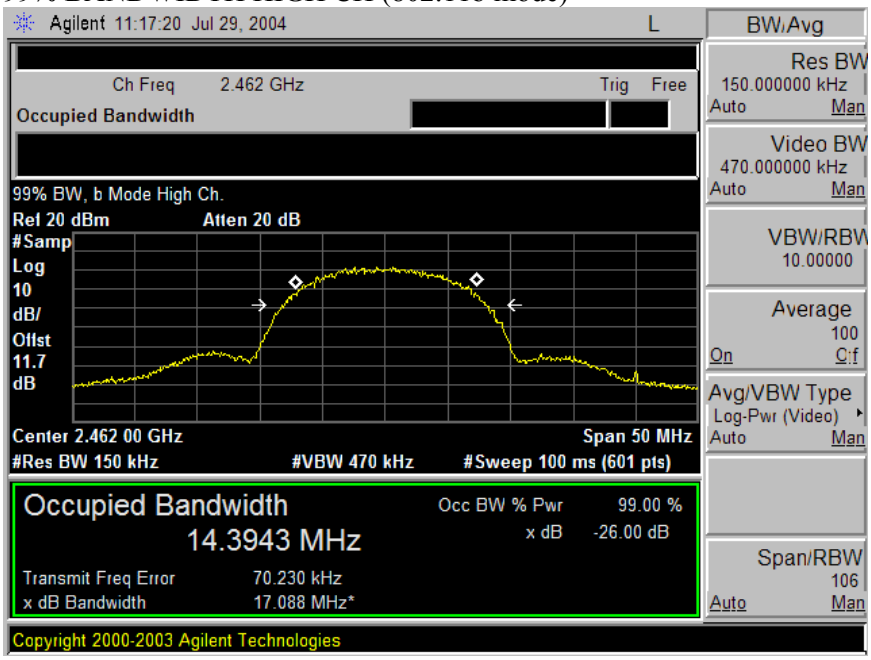
99% BANDWIDTH HIGH CH (802.11b mode)



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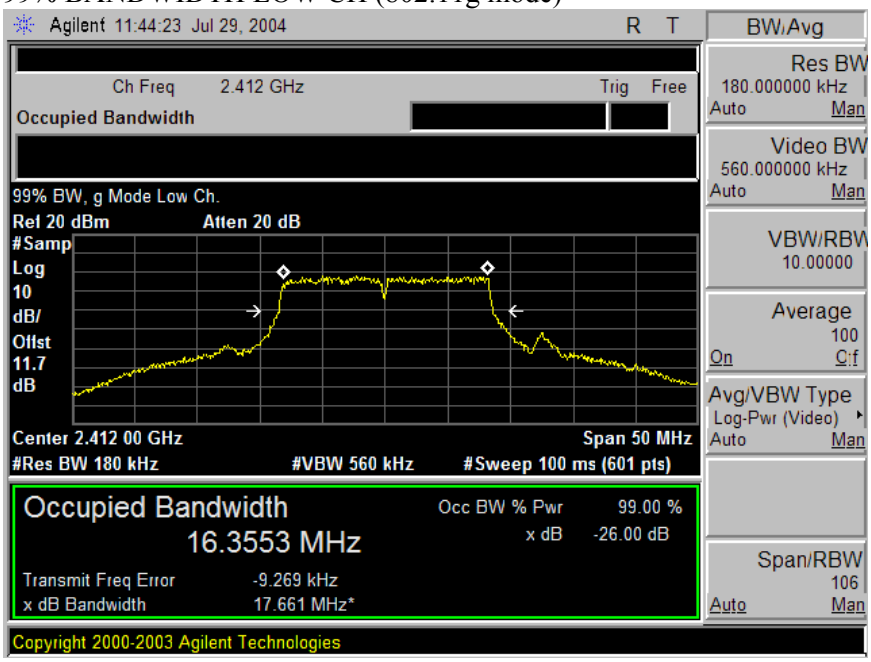
99% BANDWIDTH (802.11g MODE)

99% BANDWIDTH LOW CH (802.11g mode)



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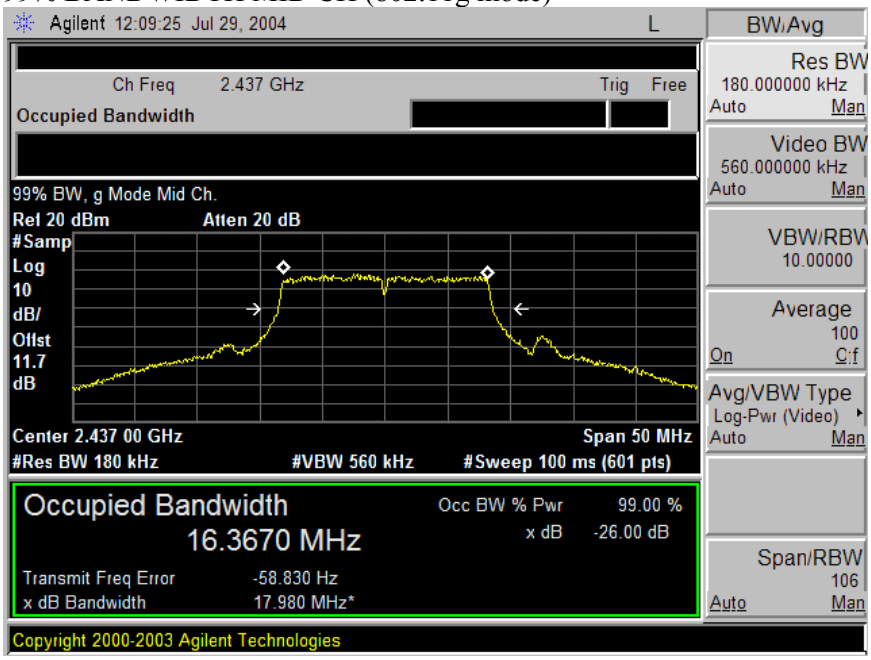
99% BANDWIDTH MID CH (802.11g mode)



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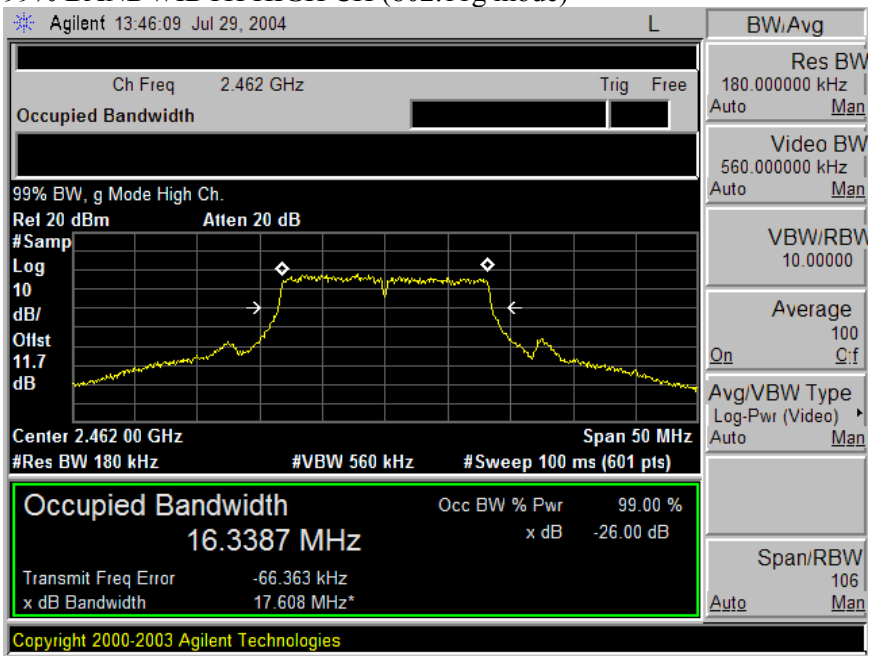
99% BANDWIDTH HIGH CH (802.11g mode)



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6.3. 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 4 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.

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RESULTS

No non-compliance noted:

802.11b Mode

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	25.42	30	-4.58
Middle	2437	25.49	30	-4.51
High	2462	25.64	30	-4.36

802.11g Mode

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	24.82	30	-5.18
Middle	2437	24.78	30	-5.22
High	2462	24.16	30	-5.84

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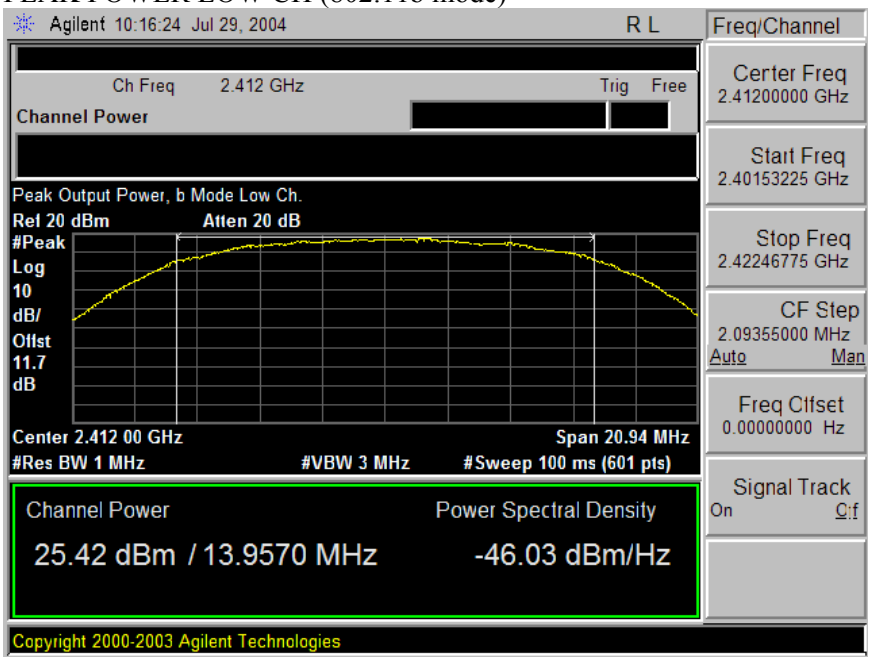
OUTPUT POWER (802.11b MODE)

PEAK POWER LOW CH (802.11b mode)



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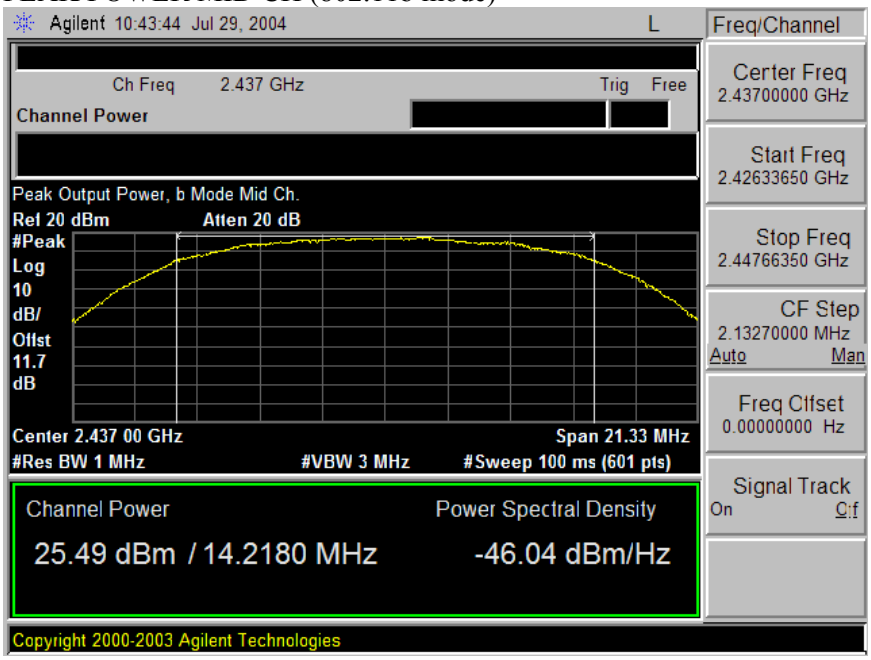
PEAK POWER MID CH (802.11b mode)



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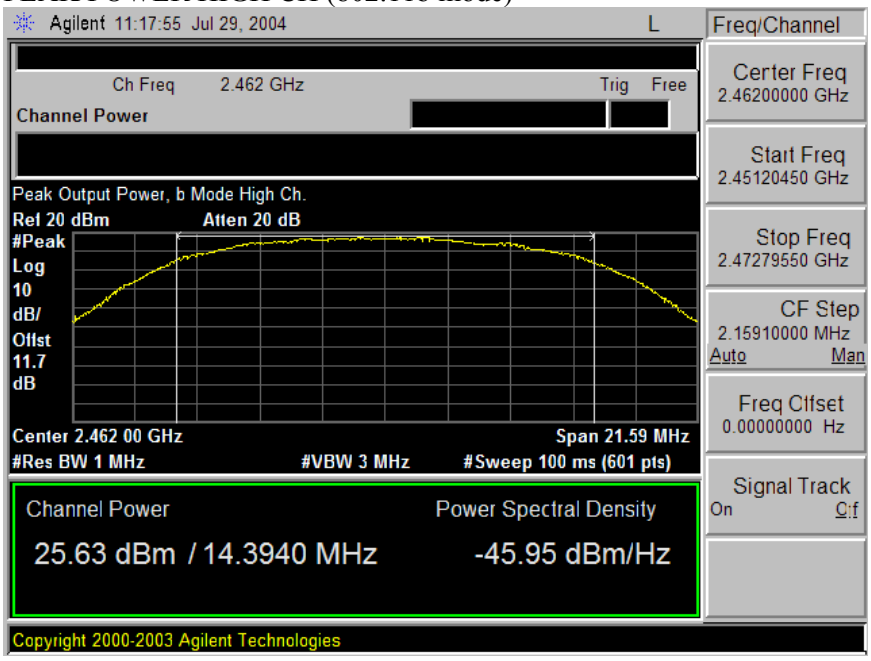
PEAK POWER HIGH CH (802.11b mode)



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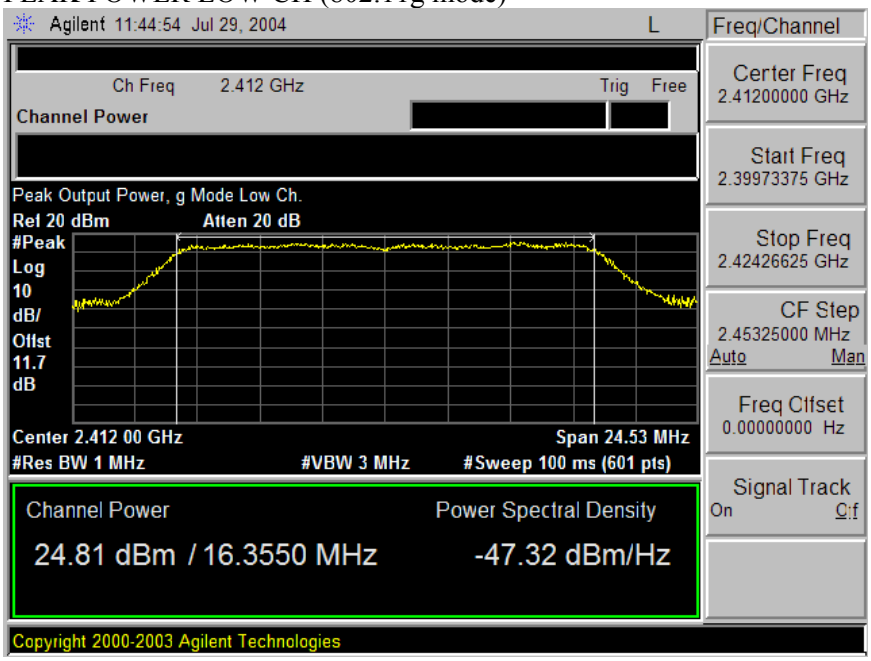
OUTPUT POWER (802.11g MODE)

PEAK POWER LOW CH (802.11g mode)



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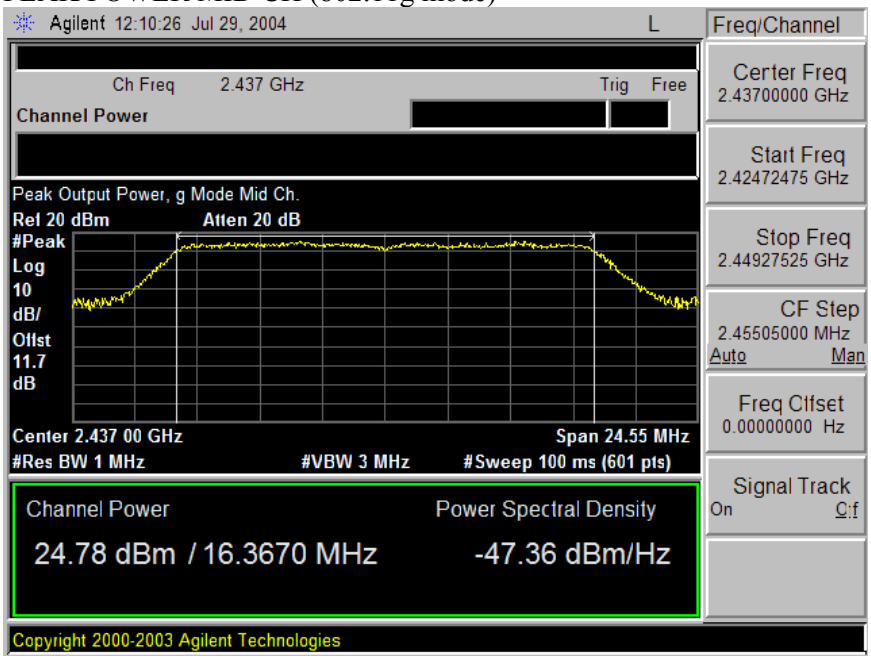
PEAK POWER MID CH (802.11g mode)



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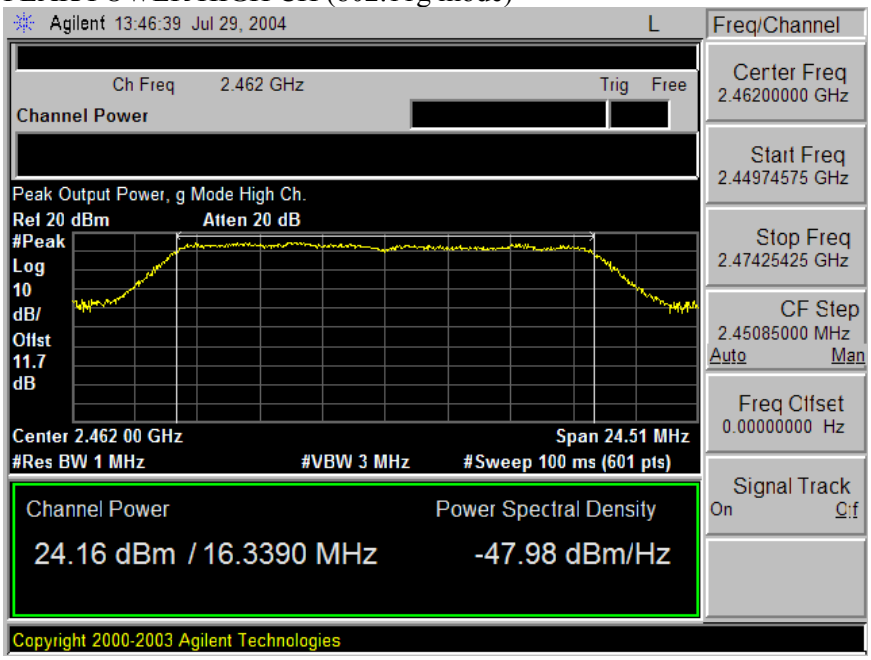
PEAK POWER HIGH CH (802.11g mode)



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6.4. 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.

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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 (mW) = P (W) / 1000 and
d (cm) =100 * d (m)

yields

$d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$
$d = 0.282 * \sqrt{(P * G / S)}$

where

d = distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power Density in mW/cm^2

Substituting the logarithmic form of power and gain using:

P (mW) = 10 ^ (P (dBm) / 10) and
G (numeric) = 10 ^ (G (dBi) / 10)

yields

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

where

d = MPE distance in cm
P = Power in dBm
G = Antenna Gain in dBi
S = Power Density Limit in mW/cm^2

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

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LIMITS

From §1.1310 Table 1 (B), S = 1.0 mW/cm^2

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	25.64	4.00	8.56
802.11g	1.0	24.82	4.00	7.78

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.

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6.5. 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 11.7 dB (including 10 dB pad and 1.7 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	19.90
Middle	2437	19.70
High	2462	19.90

802.11g Mode

Channel	Frequency (MHz)	Average Power (dBm)
Low	2412	17.00
Middle	2437	16.60
High	2462	16.90

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6.6. 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	-3.76	8	-11.76
Middle	2437	-3.64	8	-11.64
High	2462	-3.52	8	-11.52

802.11g Mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-8.36	8	-16.36
Middle	2437	-7.11	8	-15.11
High	2462	-8.52	8	-16.52

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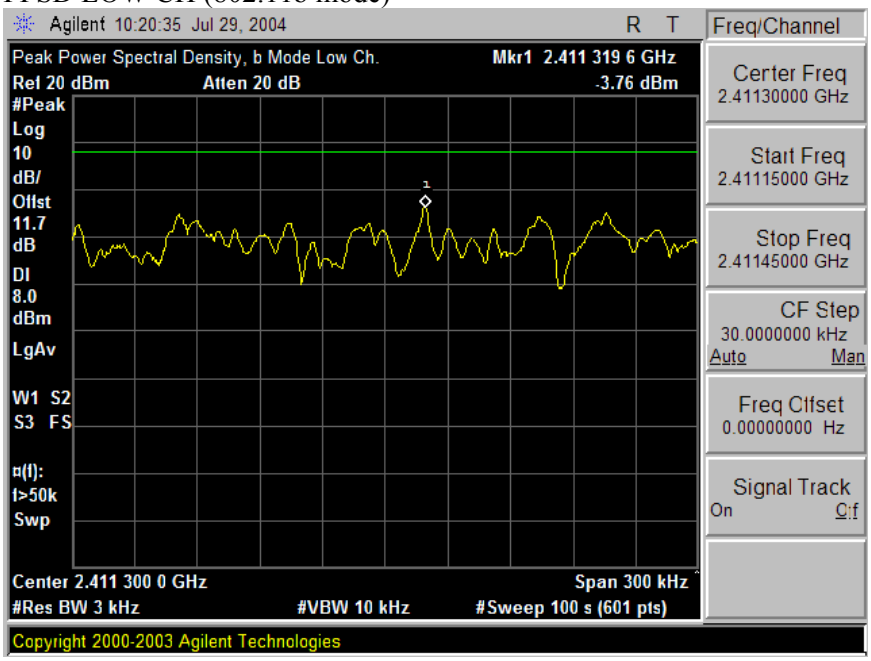
PEAK POWER SPECTRAL DENSITY (802.11b MODE)

PPSD LOW CH (802.11b mode)



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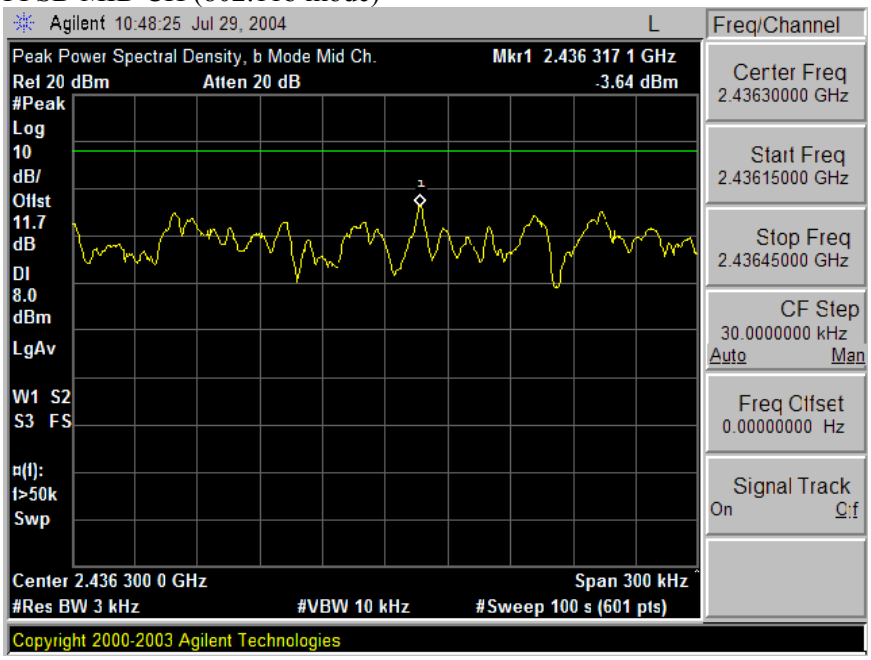
PPSD MID CH (802.11b mode)



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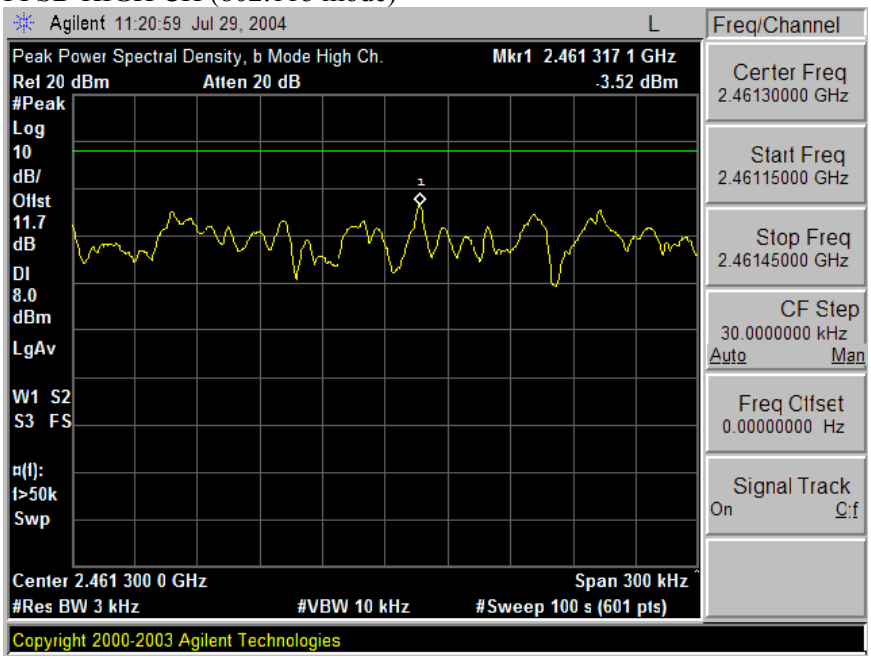
PPSD HIGH CH (802.11b mode)



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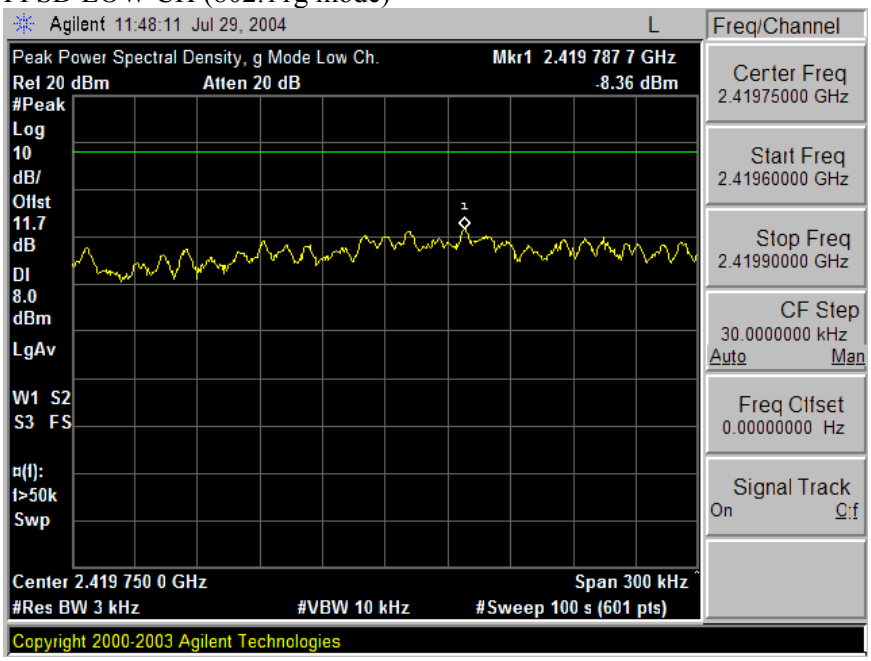
PEAK POWER SPECTRAL DENSITY (802.11g MODE)

PPSD LOW CH (802.11g mode)



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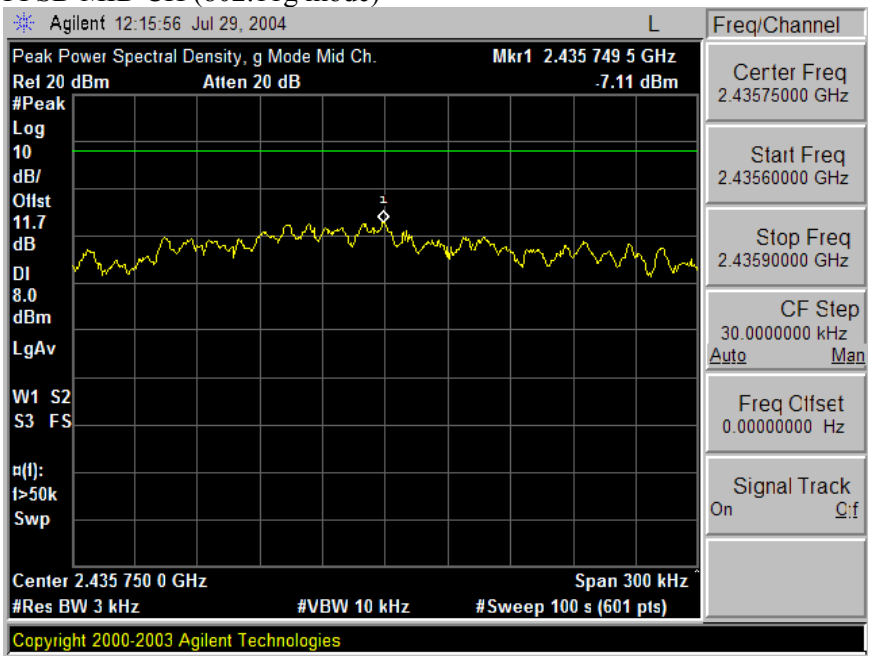
PPSD MID CH (802.11g mode)



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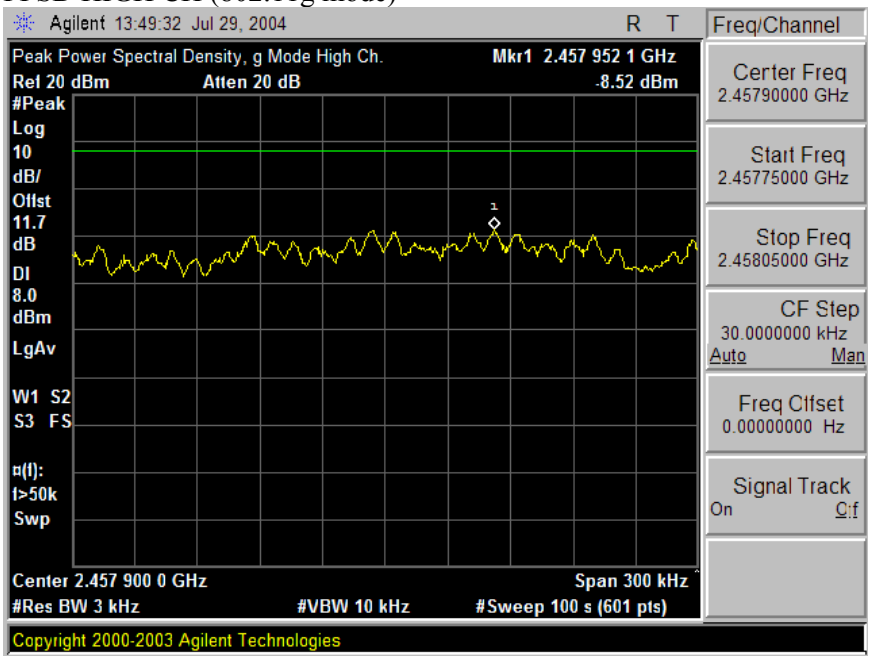
PPSD HIGH CH (802.11g mode)



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6.7. 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:

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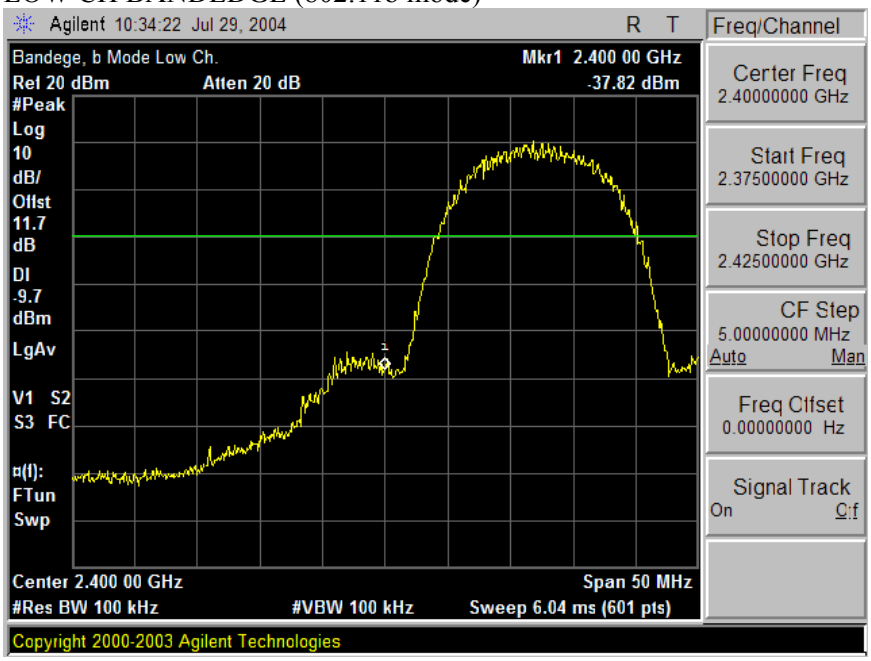
SPURIOUS EMISSIONS, LOW CHANNEL (802.11b MODE)

LOW CH BANDEDGE (802.11b mode)



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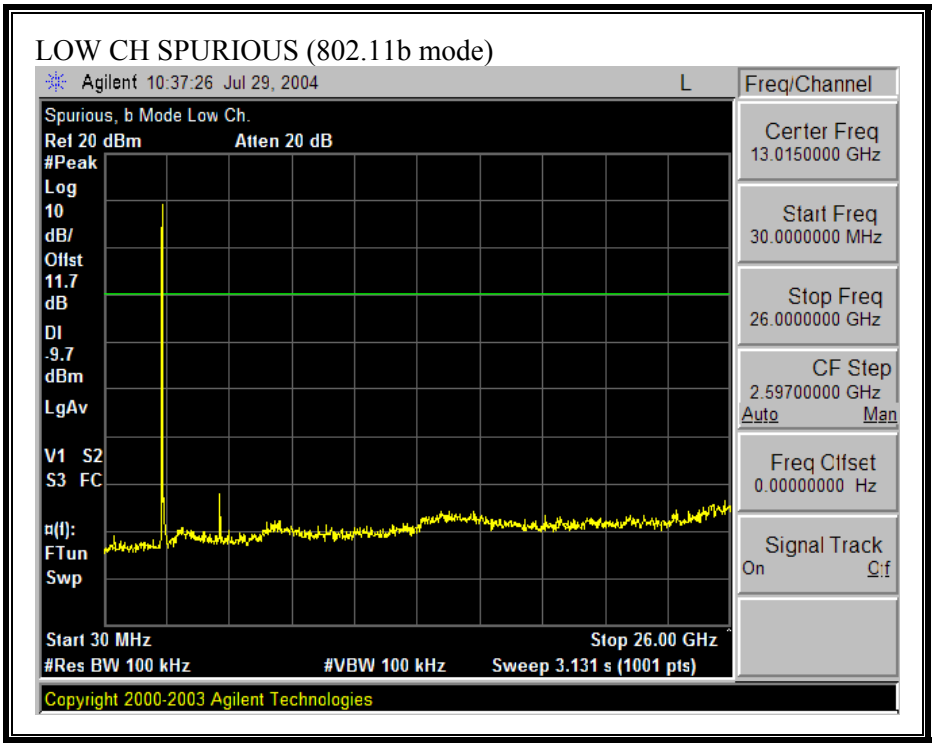
LOW CH SPURIOUS (802.11b mode)



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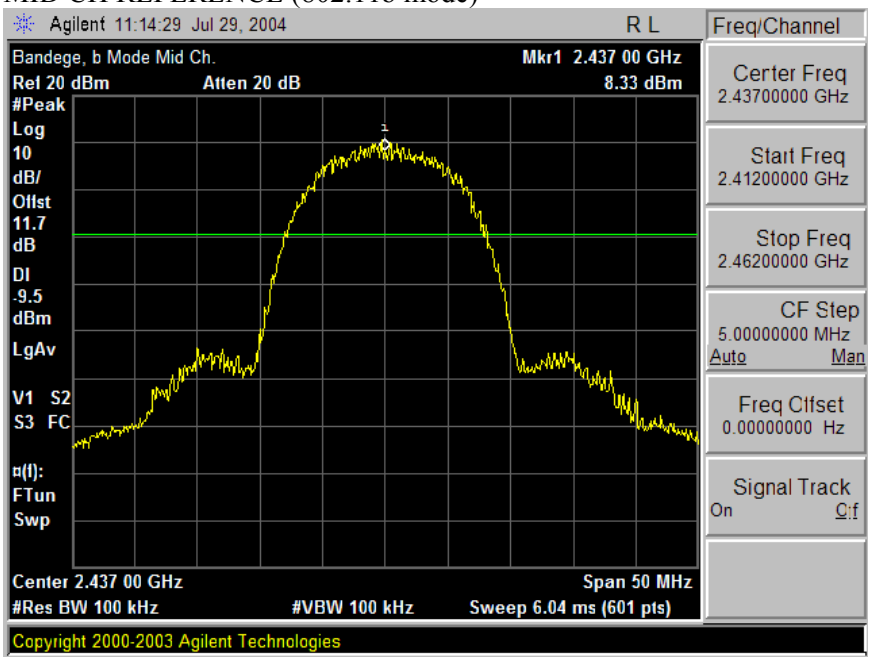
SPURIOUS EMISSIONS, MID CHANNEL (802.11b MODE)

MID CH REFERENCE (802.11b mode)



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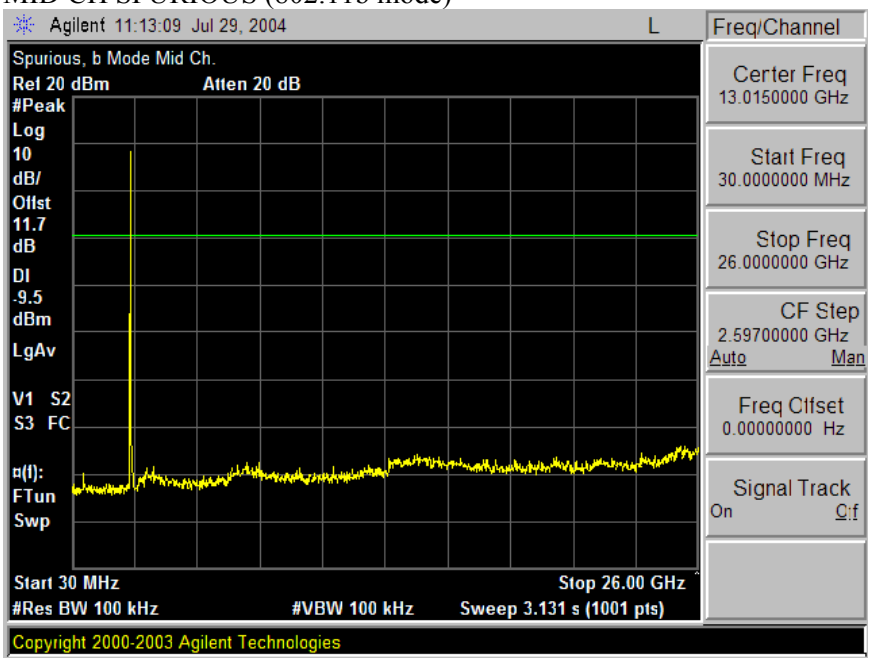
MID CH SPURIOUS (802.11b mode)



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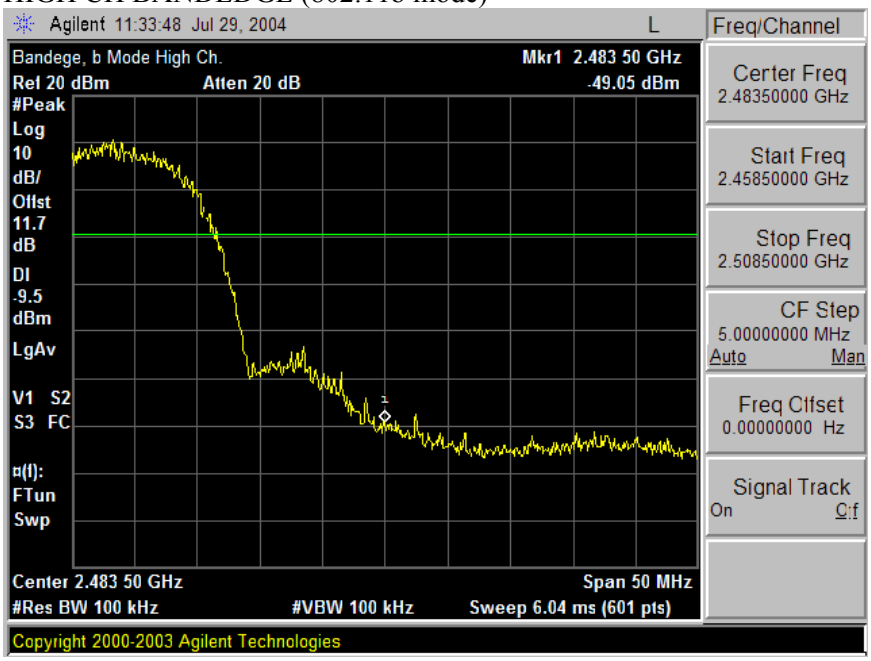
SPURIOUS EMISSIONS, HIGH CHANNEL (802.11b MODE)

HIGH CH BANDEDGE (802.11b mode)



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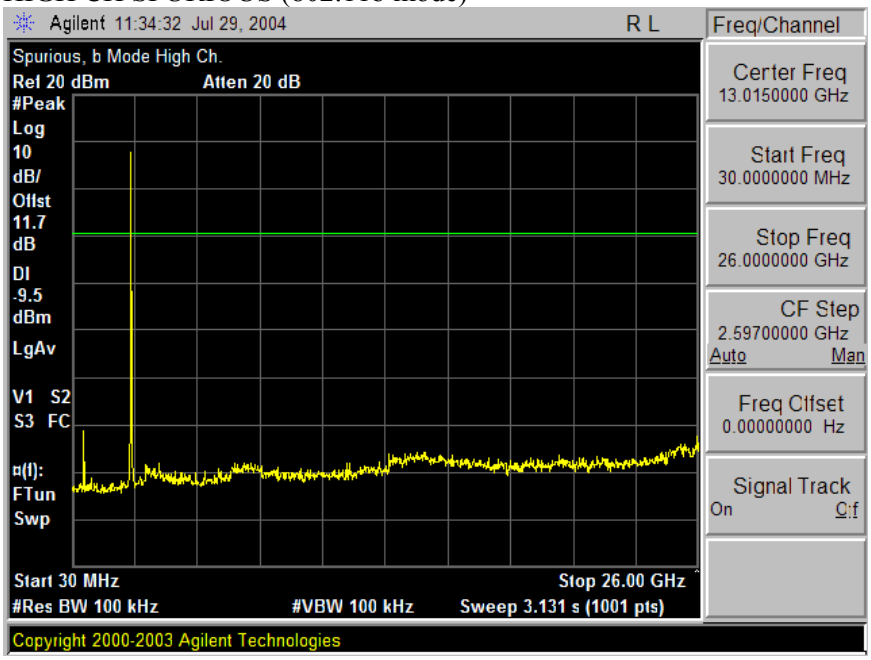
HIGH CH SPURIOUS (802.11b mode)



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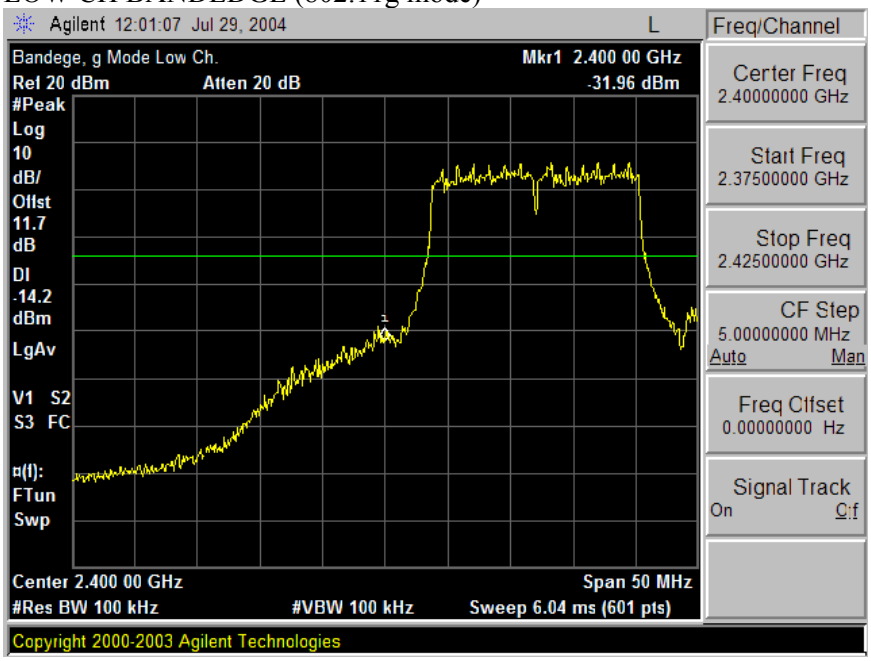
SPURIOUS EMISSIONS, LOW CHANNEL (802.11g MODE)

LOW CH BANDEDGE (802.11g mode)



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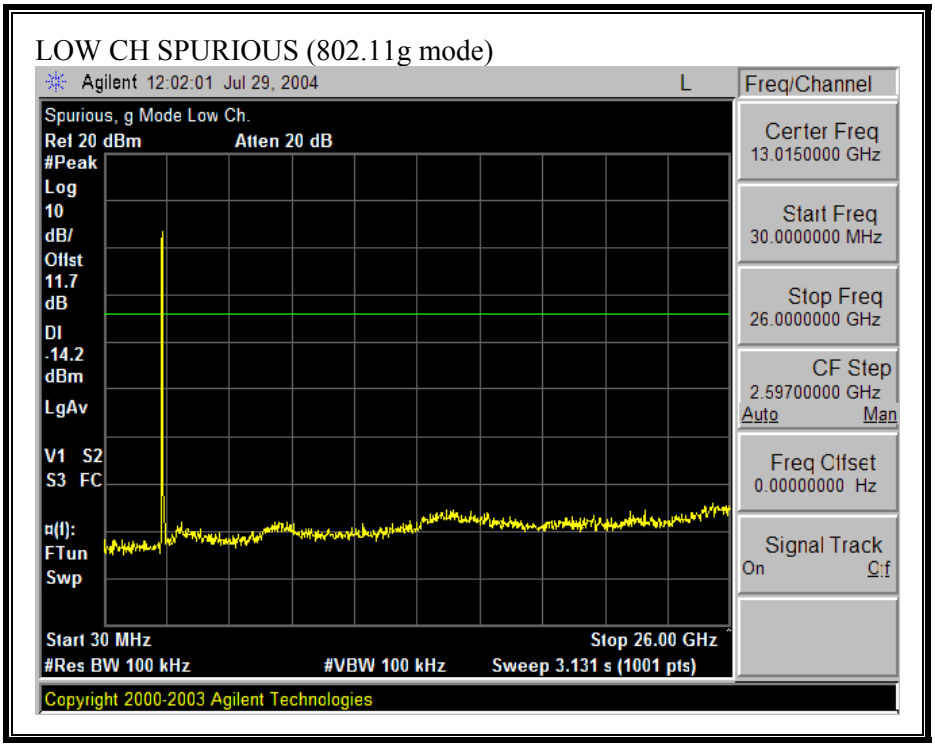
LOW CH SPURIOUS (802.11g mode)



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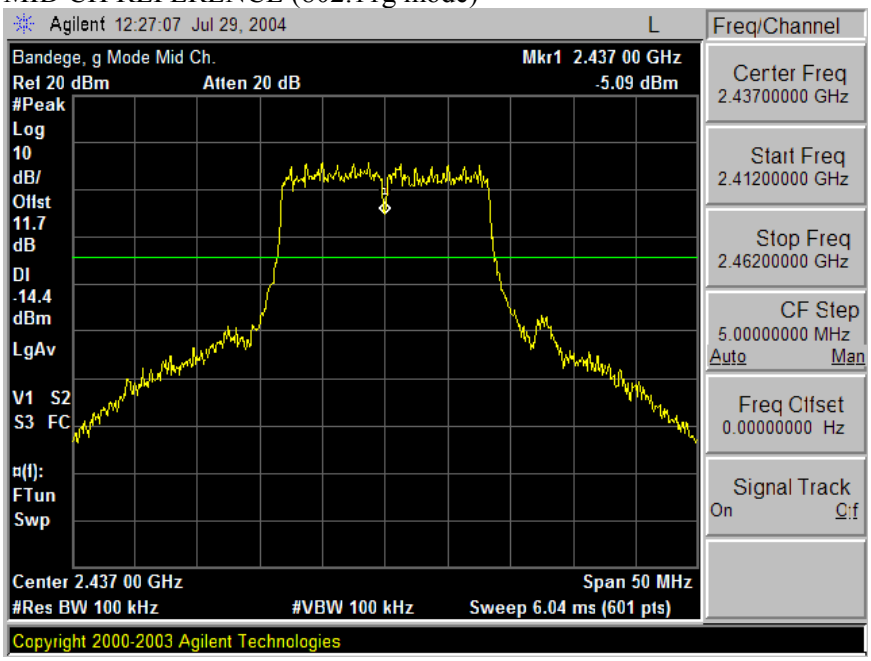
SPURIOUS EMISSIONS, MID CHANNEL (802.11g MODE)

MID CH REFERENCE (802.11g mode)



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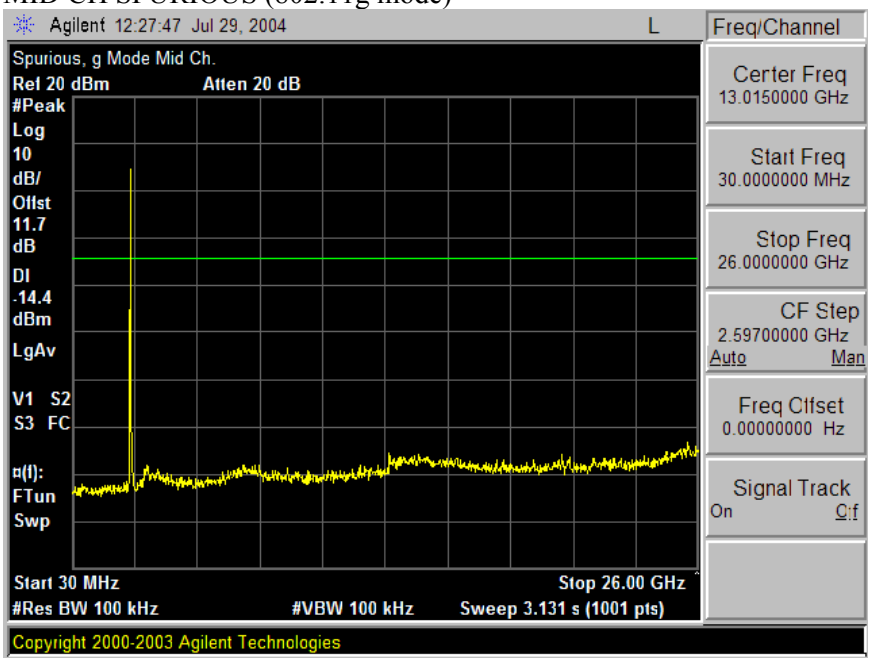
MID CH SPURIOUS (802.11g mode)



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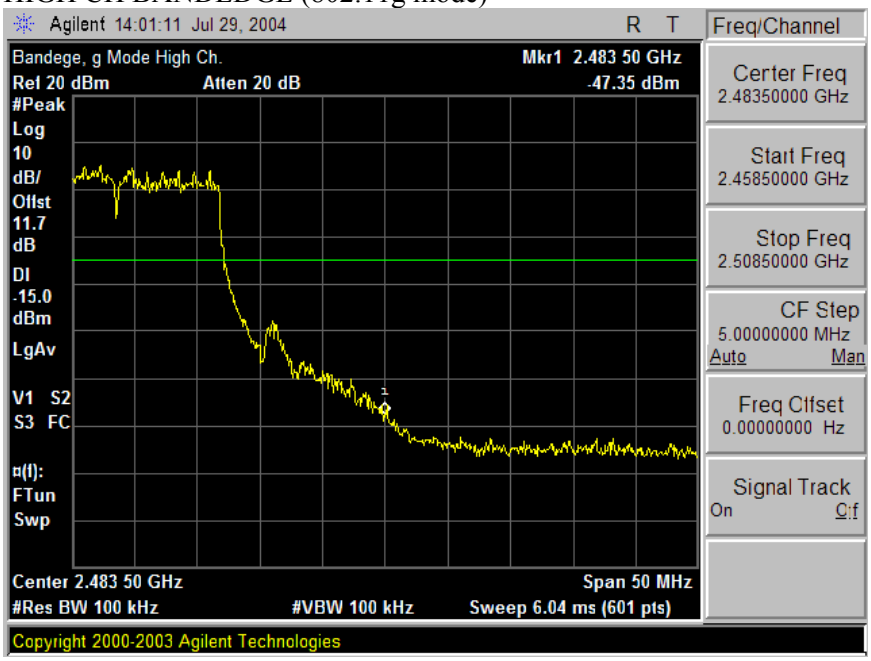
SPURIOUS EMISSIONS, HIGH CHANNEL (802.11g MODE)

HIGH CH BANDEDGE (802.11g mode)



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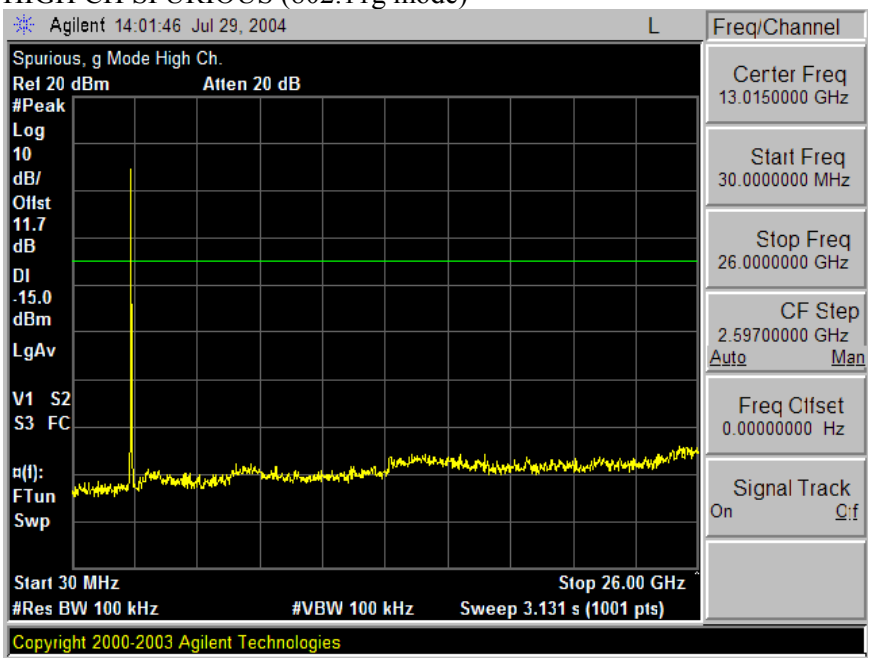
HIGH CH SPURIOUS (802.11g mode)



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6.8. RADIATED EMISSIONS

6.8.1. LIMITS AND PROCEDURES

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.

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§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.

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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.

CO-LOCATED TRANSMITTERS - SUPPLEMENTAL TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna The dominant transmitter is set to the worst case channel. The spurious emissions performance of the dominant transmitter is investigated as the settings of the non-dominant transmitter are varied. The spectrum is searched for intermodulation products. Worst-case results are reported.

RESULTS

No non-compliance noted:

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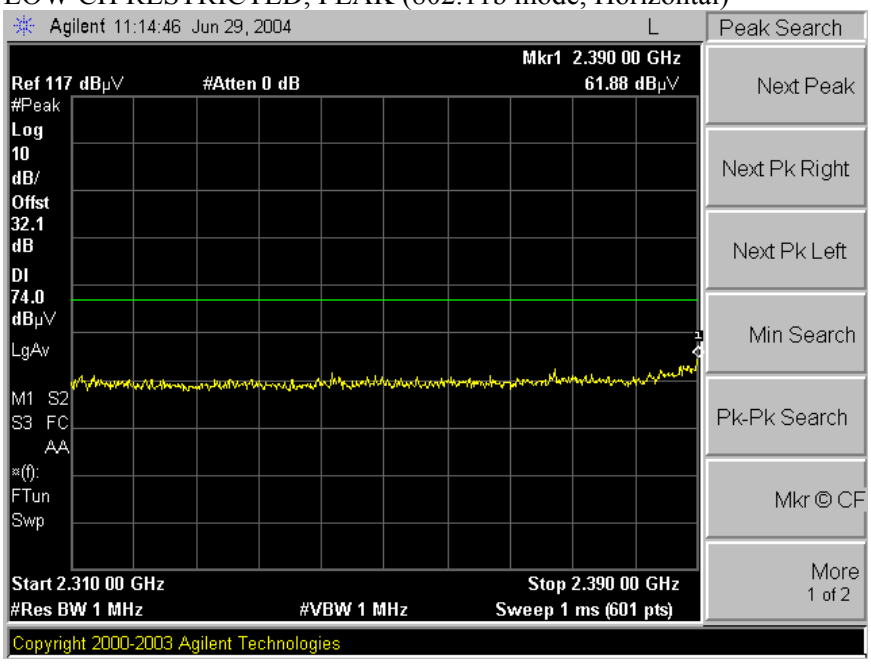
6.8.2. TRANSMITTER ABOVE 1 GHZ

RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11b mode, Horizontal)



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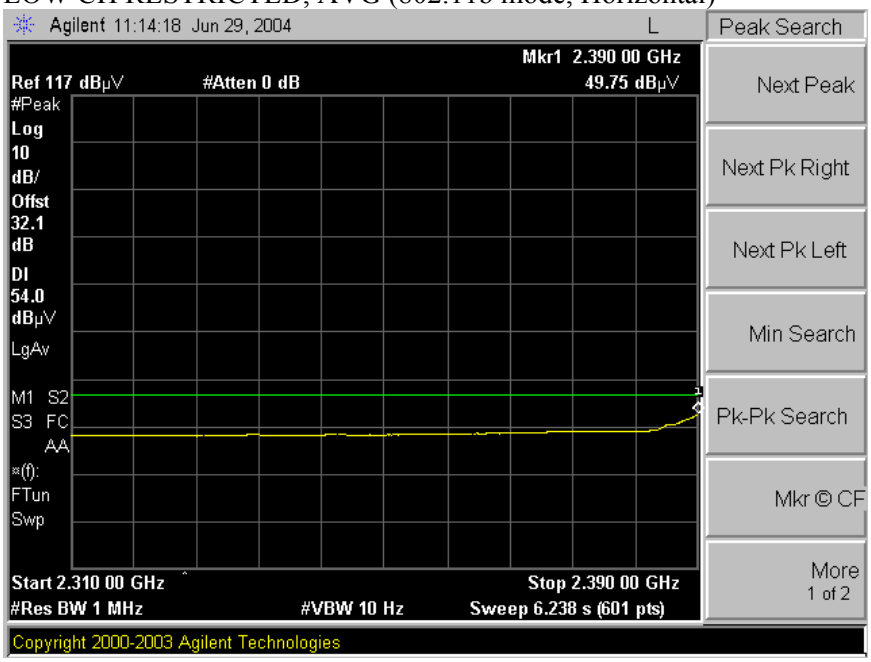
LOW CH RESTRICTED, AVG (802.11b mode, Horizontal)



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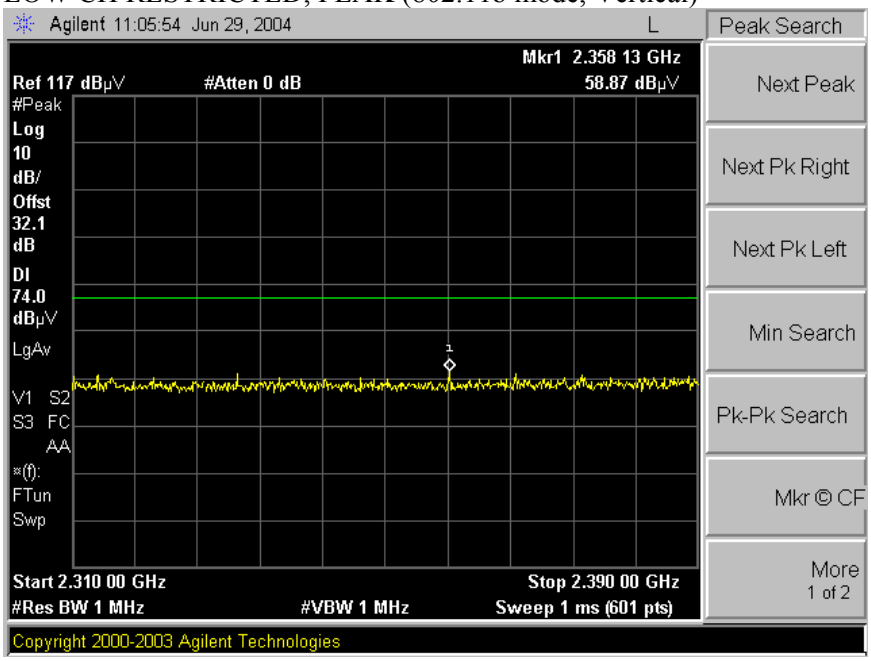
RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11b mode, Vertical)



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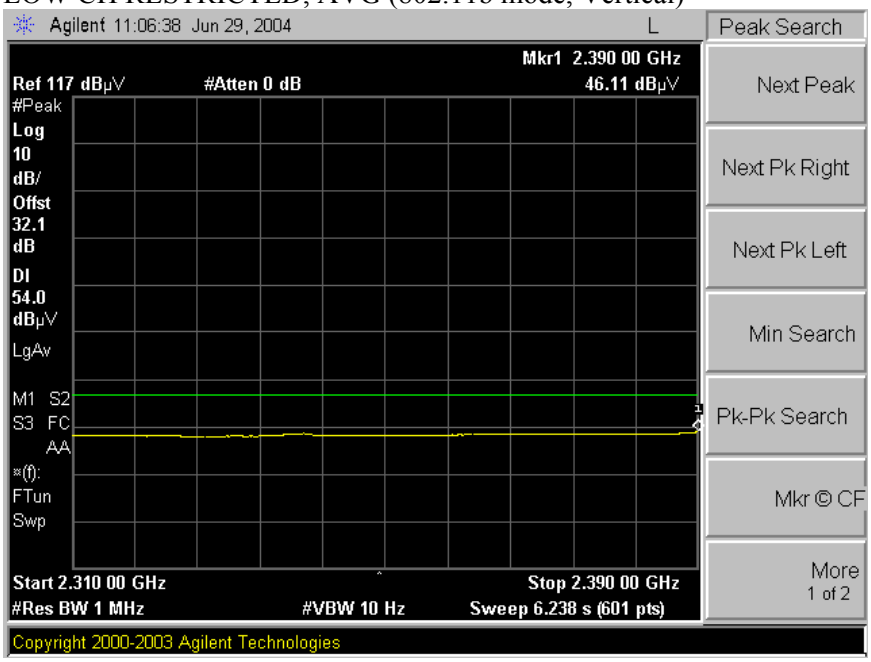
LOW CH RESTRICTED, AVG (802.11b mode, Vertical)



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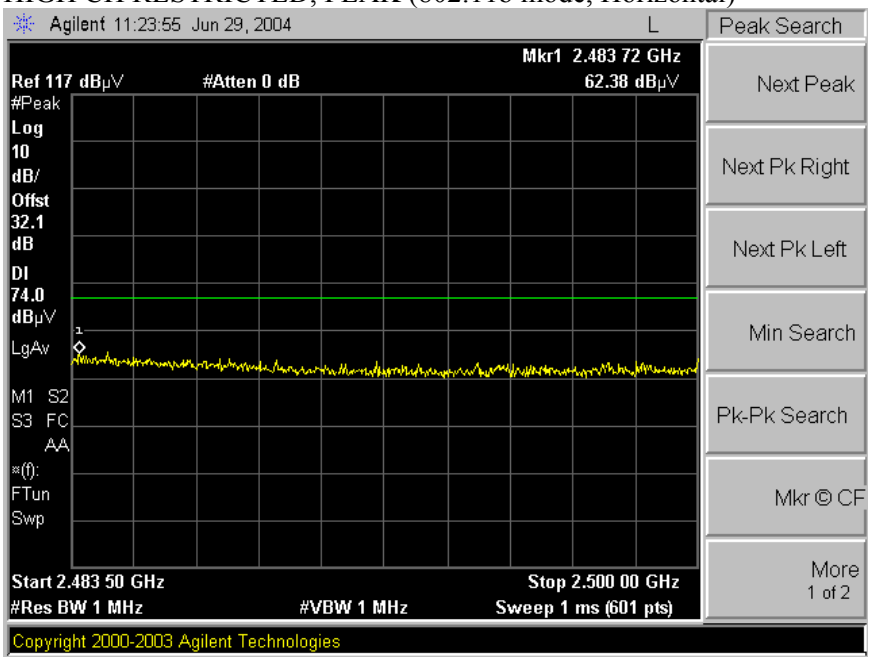
RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11b mode, Horizontal)



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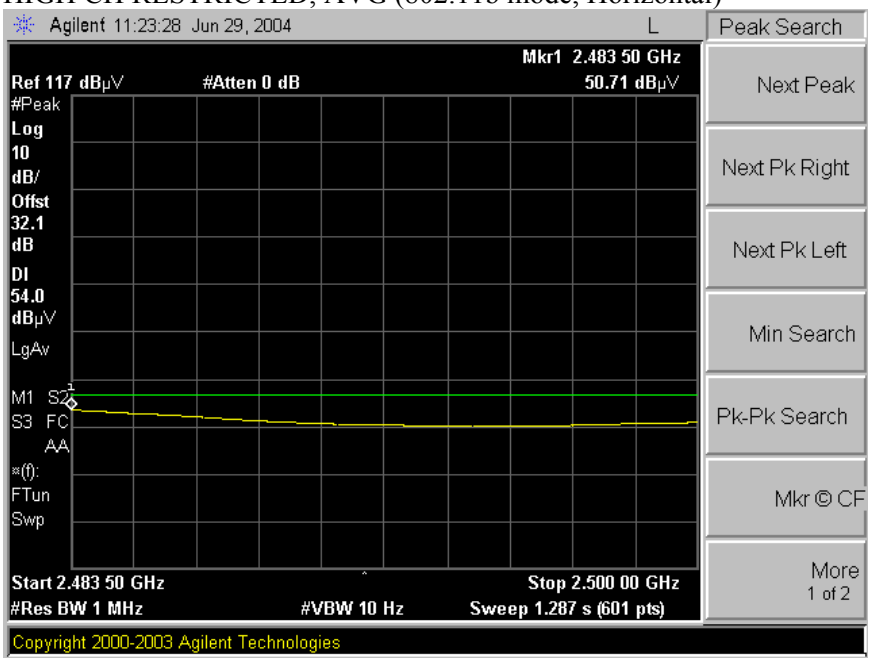
HIGH CH RESTRICTED, AVG (802.11b mode, Horizontal)



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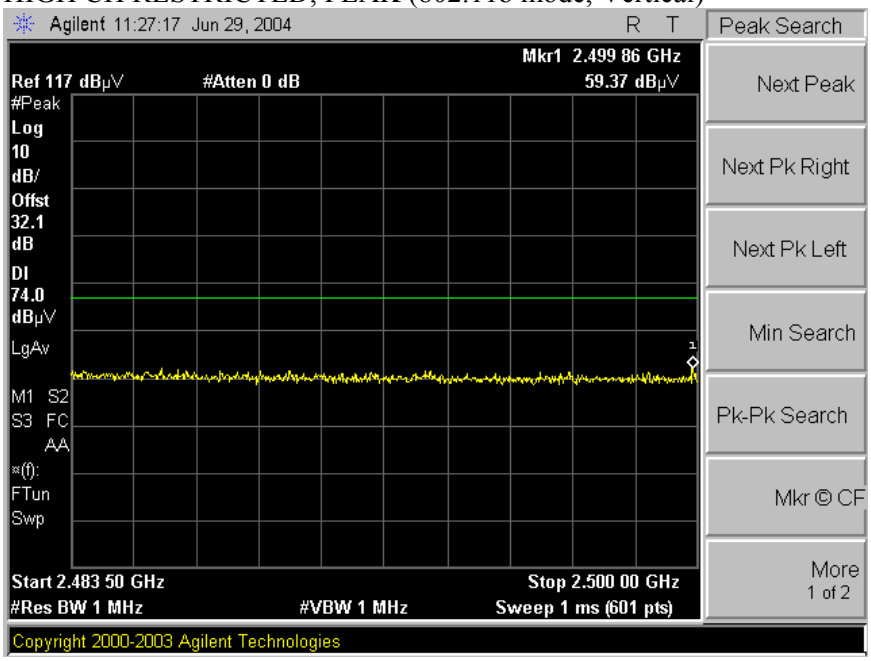
RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11b mode, Vertical)



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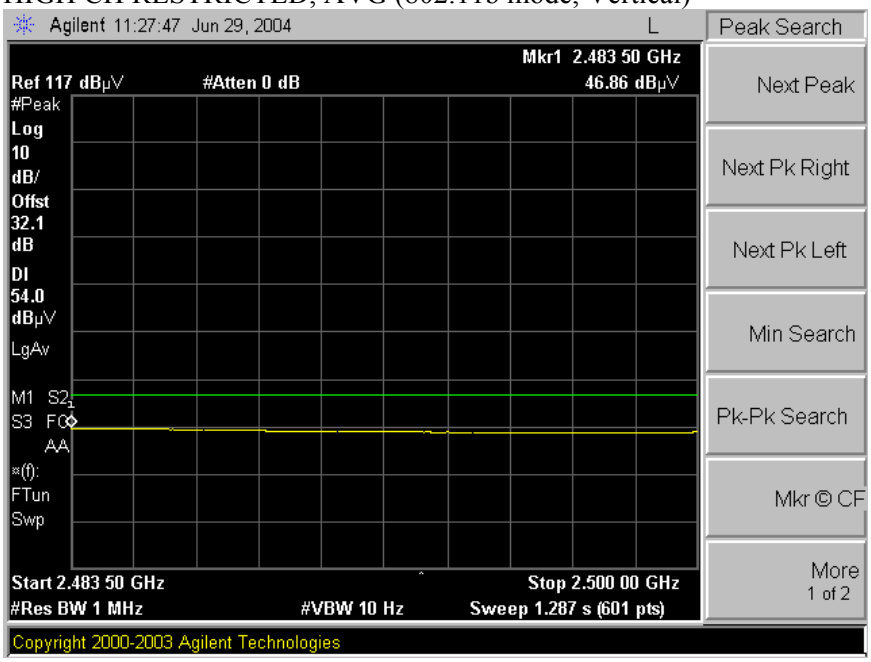
HIGH CH RESTRICTED, AVG (802.11b mode, Vertical)



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HARMONICS AND SPURIOUS EMISSIONS (b MODE)

06/30/04 **High Frequency Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: Yan Zheng
Project #: 04U2603-1
Company: Cisco
EUT Descrip.: Dual Band 2.4 / 5 GHz Access Point
EUT M/N: AIR-AP1131AG-x-K9
Test Target: FCC CLASS B
Mode Oper: TX mode, 2.4GHz Band, b mode

Test Equipment:

EMCO Horn 1-18GHz	Spectrum Analyzer	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz
T60; S/N: 2238 @3m	Agilent E4446A Analyzer	T87 Miteq 924342	T88 Miteq 16-40GHz	

Hi Frequency Cables
☐ (2 ft) ☐ (2 ~ 3 ft) ☑ (4 ~ 6 ft) ☑ (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
Channel 2412 MHz															
4.243	9.8	51.3	46.5	32.8	4.1	-44.2	0.0	1.0	44.9	40.1	74.0	54.0	-29.1	-13.9	V
4.243	9.8	55.3	53.3	32.8	4.1	-44.2	0.0	1.0	48.9	46.9	74.0	54.0	-25.1	-7.1	H
4.824	9.8	48.2	37.1	33.1	4.4	-44.7	0.0	1.0	42.0	30.9	74.0	54.0	-32.0	-23.1	V
4.824	9.8	55.5	42.5	33.1	4.4	-44.7	0.0	1.0	49.3	36.3	74.0	54.0	-24.7	-17.7	H
7.236	9.8	46.3	34.9	36.1	5.6	-44.6	0.0	1.0	44.5	33.1	74.0	54.0	-29.5	-20.9	V
7.236	9.8	47.3	35.7	36.1	5.6	-44.6	0.0	1.0	45.5	33.9	74.0	54.0	-28.5	-20.1	H
Channel 2437 MHz															
4.276	9.8	49.8	44.9	32.8	4.1	-44.2	0.0	1.0	43.4	38.5	74.0	54.0	-30.6	-15.5	V
4.276	9.8	55.5	53.3	32.8	4.1	-44.2	0.0	1.0	49.1	46.9	74.0	54.0	-24.9	-7.1	H
4.874	9.8	46.8	36.2	33.1	4.5	-44.7	0.0	1.0	40.6	30.0	74.0	54.0	-33.4	-24.0	V
4.874	9.8	51.5	39.2	33.1	4.5	-44.7	0.0	1.0	45.4	33.0	74.0	54.0	-28.6	-21.0	H
7.311	9.8	45.2	34.5	36.2	5.7	-44.5	0.0	1.0	43.5	32.8	74.0	54.0	-30.5	-21.2	V
7.311	9.8	46.8	35.6	36.2	5.7	-44.5	0.0	1.0	45.1	33.9	74.0	54.0	-28.9	-20.1	H
Channel 2462 MHz															
4.309	9.8	49.8	44.9	32.8	4.1	-44.2	0.0	1.0	43.4	38.5	74.0	54.0	-30.6	-15.5	V
4.309	9.8	53.7	51.0	32.8	4.1	-44.2	0.0	1.0	47.3	44.6	74.0	54.0	-26.7	-9.4	H
4.924	9.8	47.0	36.6	33.2	4.5	-44.8	0.0	1.0	40.9	30.5	74.0	54.0	-33.1	-23.5	V
4.924	9.8	52.3	40.8	33.2	4.5	-44.8	0.0	1.0	46.2	34.7	74.0	54.0	-27.8	-19.3	H
7.386	9.8	47.5	35.4	36.3	5.7	-44.5	0.0	1.0	46.0	33.9	74.0	54.0	-28.0	-20.1	V
7.386	9.8	48.5	36.8	36.3	5.7	-44.5	0.0	1.0	47.0	35.3	74.0	54.0	-27.0	-18.7	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		

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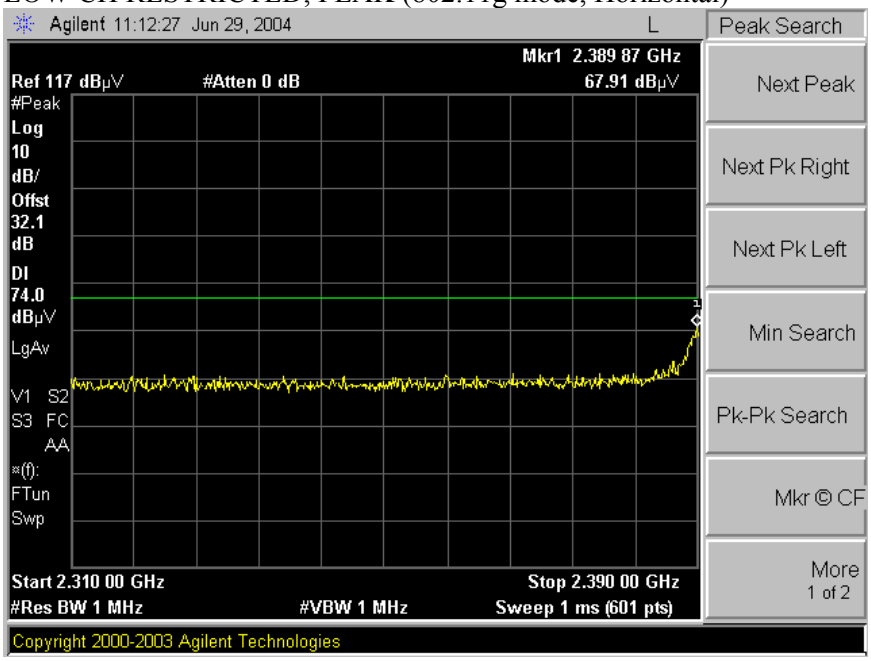
RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11g mode, Horizontal)



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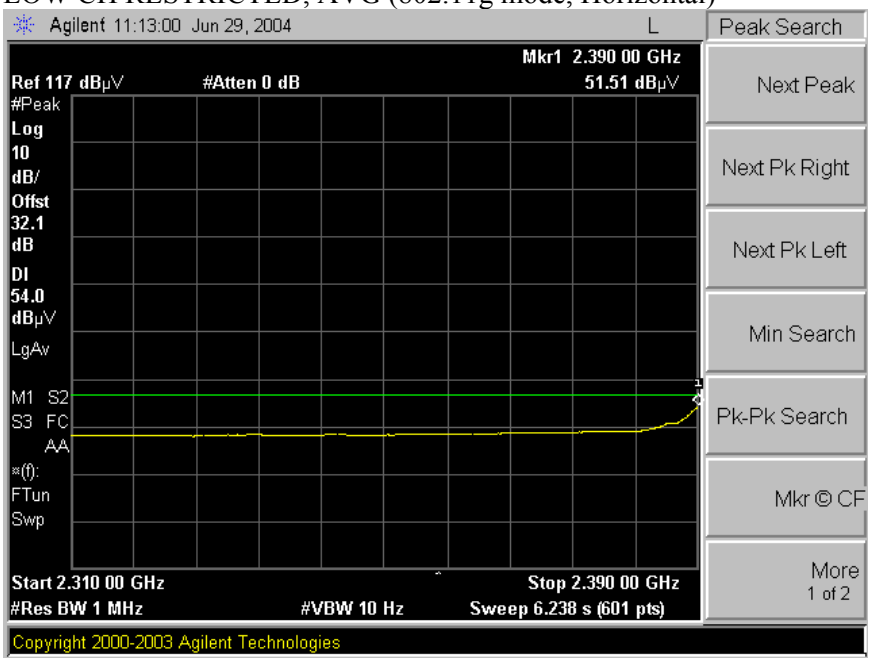
LOW CH RESTRICTED, AVG (802.11g mode, Horizontal)



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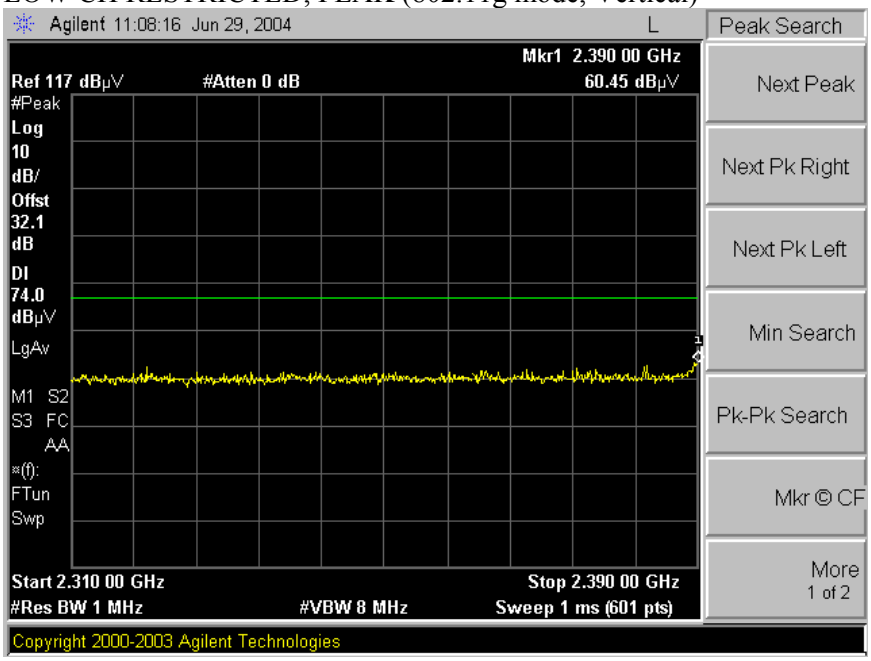
RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11g mode, Vertical)



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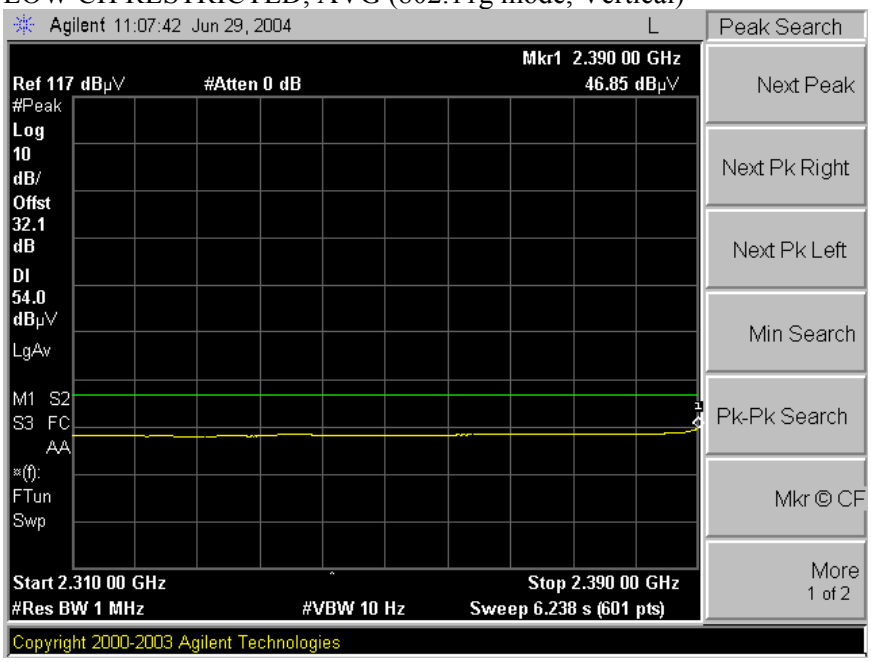
LOW CH RESTRICTED, AVG (802.11g mode, Vertical)



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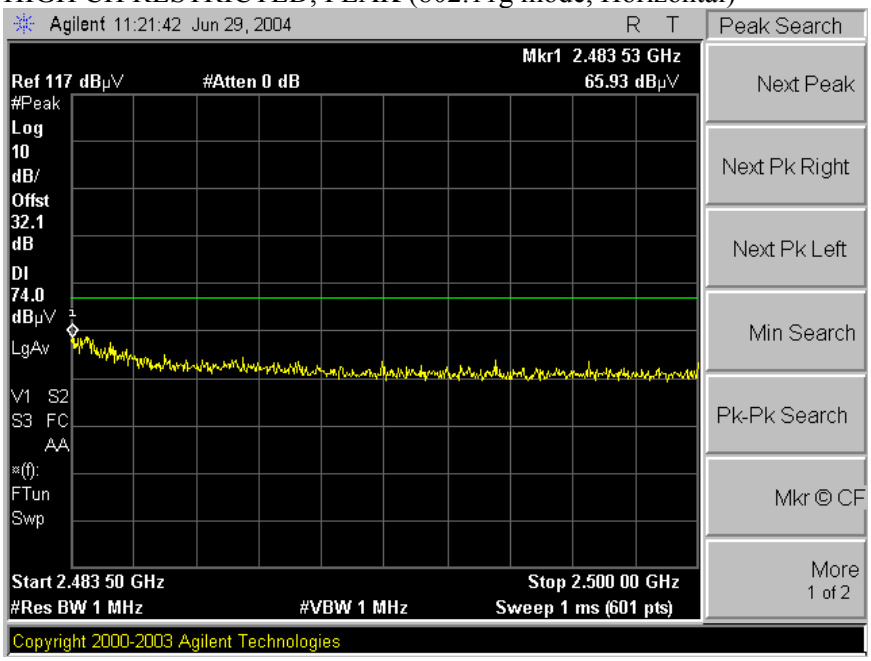
RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11g mode, Horizontal)



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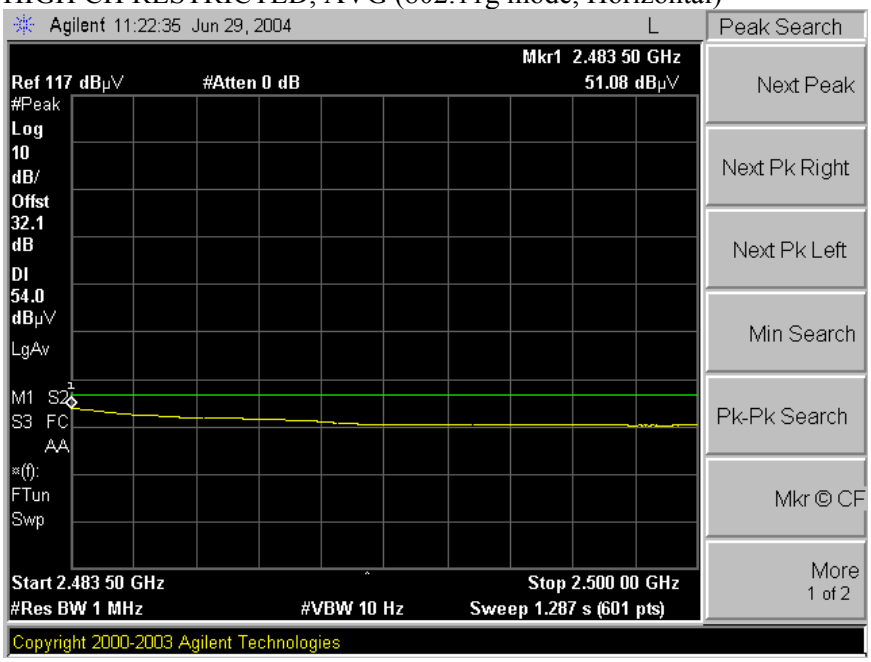
HIGH CH RESTRICTED, AVG (802.11g mode, Horizontal)



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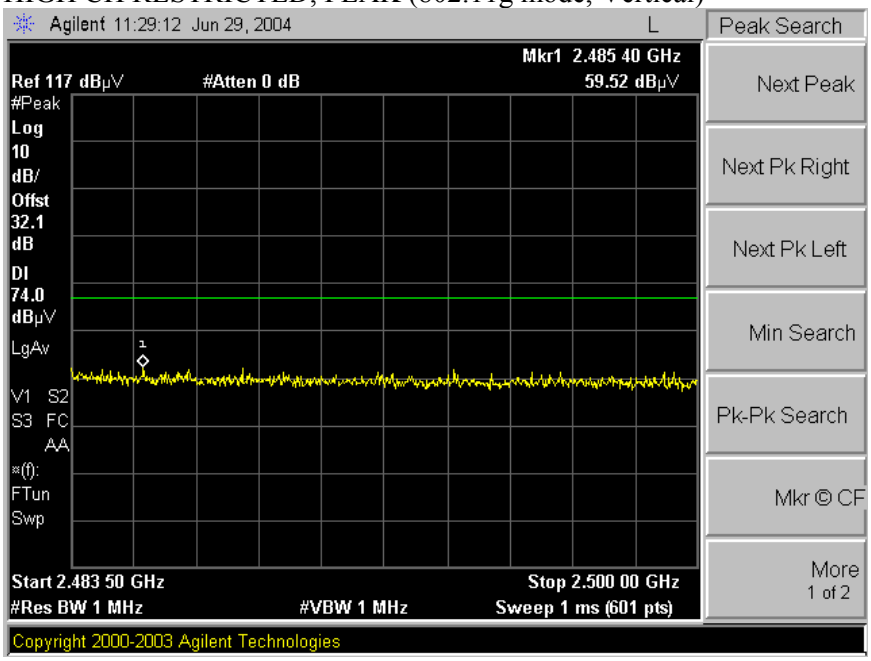
RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11g mode, Vertical)



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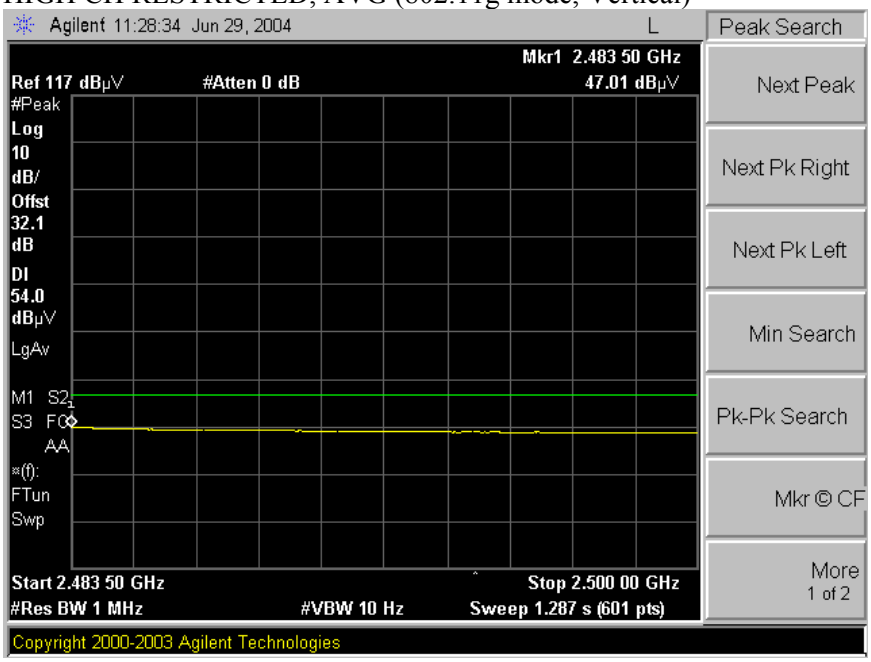
HIGH CH RESTRICTED, AVG (802.11g mode, Vertical)



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HARMONICS AND SPURIOUS EMISSIONS (g MODE)

06/30/04 **High Frequency Measurement**

Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: Yan Zheng
Project #: 04U2603-1
Company: Cisco
EUT Descrip.: Dual Band 2.4 / 5 GHz Access Point
EUT M/N: AIR-AP1131AG-x-K9
Test Target: FCC CLASS B
Mode Oper: TX mode, 2.4GHz Band, g mode

Test Equipment:

EMCO Horn 1-18GHz	Spectrum Analyzer	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz
T60; S/N: 2238 @3m	Agilent E4446A Analyzer	T87 Miteq 924342	T88 Miteq 16-40GHz	

Hi Frequency Cables: ☐ (2 ft) ☐ (2 ~ 3 ft) ☑ (4 ~ 6 ft) ☑ (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
g mode															
Channel 2412 MHz															
4.243	9.8	51.7	46.4	32.8	4.1	-44.2	0.0	1.0	45.3	40.0	74.0	54.0	-28.7	-14.0	V
4.243	9.8	55.5	53.2	32.8	4.1	-44.2	0.0	1.0	49.1	46.8	74.0	54.0	-24.9	-7.2	H
4.824	9.8	45.2	35.1	33.1	4.4	-44.7	0.0	1.0	39.0	28.9	74.0	54.0	-35.0	-25.1	V
4.824	9.8	51.1	38.9	33.1	4.4	-44.7	0.0	1.0	44.9	32.7	74.0	54.0	-29.1	-21.3	H
7.236	9.8	45.4	34.2	36.1	5.6	-44.6	0.0	1.0	43.6	32.4	74.0	54.0	-30.4	-21.6	V
7.236	9.8	46.6	35.2	36.1	5.6	-44.6	0.0	1.0	44.8	33.4	74.0	54.0	-29.2	-20.6	H
Channel 2437 MHz															
4.276	9.8	50.9	45.1	32.8	4.1	-44.2	0.0	1.0	44.5	38.7	74.0	54.0	-29.5	-15.3	V
4.276	9.8	56.7	53.4	32.8	4.1	-44.2	0.0	1.0	50.3	47.0	74.0	54.0	-23.7	-7.0	H
4.874	9.8	46.0	35.3	33.1	4.5	-44.7	0.0	1.0	39.8	29.1	74.0	54.0	-34.2	-24.9	V
4.874	9.8	49.1	37.2	33.1	4.5	-44.7	0.0	1.0	42.9	31.0	74.0	54.0	-31.1	-23.0	H
7.311	9.8	45.1	34.0	36.2	5.7	-44.5	0.0	1.0	43.4	32.3	74.0	54.0	-30.6	-21.7	V
7.311	9.8	46.1	35.5	36.2	5.7	-44.5	0.0	1.0	44.4	33.8	74.0	54.0	-29.6	-20.2	H
Channel 2462 MHz															
4.309	9.8	49.8	44.9	32.8	4.1	-44.2	0.0	1.0	43.4	38.5	74.0	54.0	-30.6	-15.5	V
4.309	9.8	53.4	50.8	32.8	4.1	-44.2	0.0	1.0	47.0	44.4	74.0	54.0	-27.0	-9.6	H
4.924	9.8	45.8	35.9	33.2	4.5	-44.8	0.0	1.0	39.7	29.8	74.0	54.0	-34.3	-24.2	V
4.924	9.8	51.9	40.1	33.2	4.5	-44.8	0.0	1.0	45.8	34.0	74.0	54.0	-28.2	-20.0	H
7.386	9.8	47.3	34.9	36.3	5.7	-44.5	0.0	1.0	45.8	33.4	74.0	54.0	-28.2	-20.6	V
7.386	9.8	48.1	36.5	36.3	5.7	-44.5	0.0	1.0	46.6	35.0	74.0	54.0	-27.4	-19.0	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		

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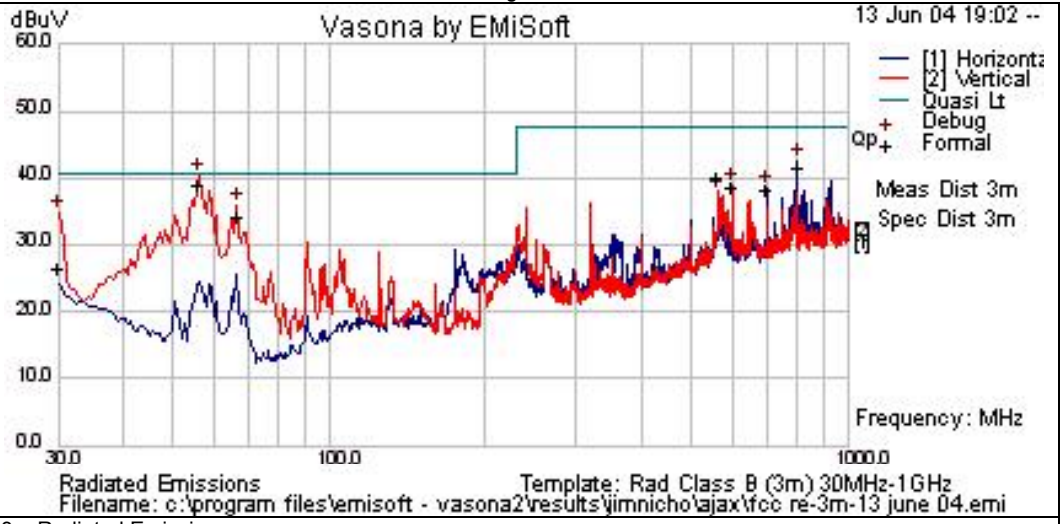
6.8.3. WORST-CASE BELOW 1 GHz

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

VERTICAL AND HORIZONTAL PLOT

Graphical Test Results

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'.
Please refer to the results table for the detectors used during formal measurements



Title: 3m Radiated Emissions

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VERTICAL AND HORIZONTAL DATA

Test Results Table

Frequency MHz	Raw dBuV	Cable Loss dB	AF dB	Level dBuV	Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
30	5.3	0.6	18.6	24.6	Qp	V	98	359	40.5	-15.9	Pass	
56	29.5	0.8	7	37.4	Qp	V	123	204	40.5	-3.2	Pass	
66.272	24.8	0.9	6.6	32.4	Qp	V	163	86	40.5	-8.1	Pass	
560	16.5	2.5	19.2	38.2	Qp	V	98	66	47.5	-9.2	Pass	
600	15.2	2.6	19	36.8	Qp	V	104	96	47.5	-10.7	Pass	
700	14.4	2.8	19.3	36.4	Qp	H	307	62	47.5	-11	Pass	
800	16.5	3	20.1	39.6	Qp	H	198	220	47.5	-7.9	Pass	

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6.9. 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 µH/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:

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WORST EMISSIONS

Test Results Table

Frequency MHz	Raw dBuV	Cable Loss dB	Factors dB	Level dBuV	Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
0.266	17.2	20.2	0	37.5	Av	L	51.2	-13.8	Pass	
0.266	27.1	20.2	0	47.4	Qp	L	61.2	-13.8	Pass	
0.268	17.3	20.2	0	37.5	Av	N	51.2	-13.7	Pass	
0.268	26.9	20.2	0	47.2	Qp	N	61.2	-14	Pass	
0.406	23.5	20.1	0	43.6	Qp	N	57.7	-14.1	Pass	
0.406	15.8	20.1	0	35.9	Av	N	47.7	-11.8	Pass	
0.41	24	20.1	0	44.1	Qp	L	57.6	-13.5	Pass	
0.41	16.6	20.1	0	36.7	Av	L	47.6	-11	Pass	
0.662	15.3	20	0	35.4	Av	L	46	-10.6	Pass	
0.662	25.7	20	0	45.8	Qp	L	56	-10.2	Pass	
0.677	13.1	20	0	33.2	Av	N	46	-12.8	Pass	
0.677	24.3	20	0	44.4	Qp	N	56	-11.6	Pass	
1.06	22.8	20	0	42.9	Qp	L	56	-13.1	Pass	
1.06	9.1	20	0	29.1	Av	L	46	-16.9	Pass	
2.002	22	20	0	42.1	Qp	L	56	-13.9	Pass	
2.002	4.7	20	0	24.8	Av	L	46	-21.2	Pass	
2.362	22.1	20	0	42.2	Qp	L	56	-13.8	Pass	
2.362	4.4	20	0	24.5	Av	L	46	-21.5	Pass	
3.021	2.9	20.1	0	23	Av	N	46	-23	Pass	
3.021	20.1	20.1	0	40.2	Qp	N	56	-15.8	Pass	
3.436	3.8	20.1	0	24	Av	L	46	-22	Pass	
3.436	21.8	20.1	0	41.9	Qp	L	56	-14.1	Pass	
3.689	22.2	20.1	0	42.4	Qp	L	56	-13.6	Pass	
3.689	5.6	20.1	0	25.8	Av	L	46	-20.2	Pass	
4.059	21.9	20.1	0	42	Qp	N	56	-14	Pass	
4.059	3.3	20.1	0	23.4	Av	N	46	-22.6	Pass	
4.97	22	20.1	0.1	42.2	Qp	N	56	-13.8	Pass	
4.97	5.6	20.1	0.1	25.8	Av	N	46	-20.2	Pass	
5.89	24.3	20.2	0.1	44.5	Qp	L	60	-15.5	Pass	
5.89	8.3	20.2	0.1	28.5	Av	L	50	-21.5	Pass	

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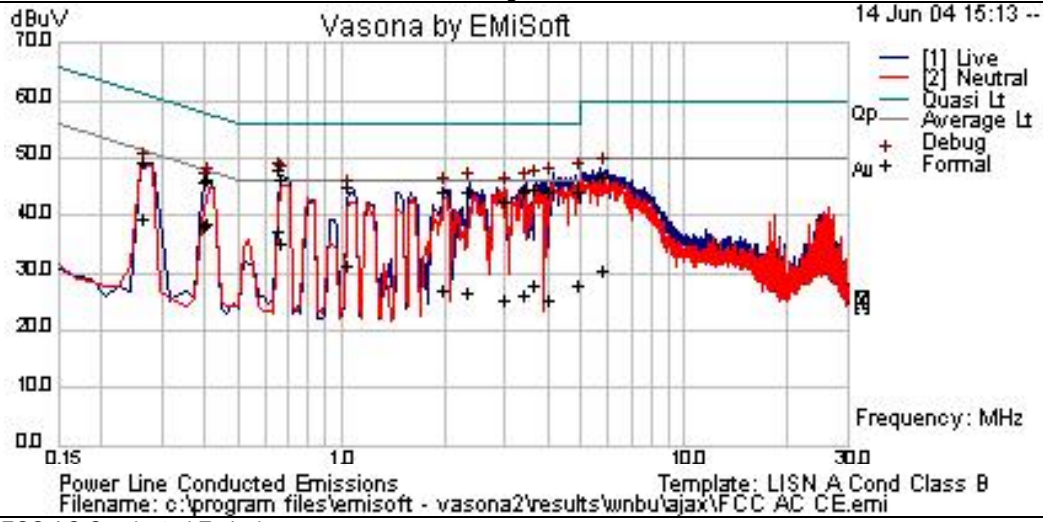
LINE 1 AND LINE 2 RESULTS

Graphical Test Results
Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'.
Please refer to the results table for the detectors used during formal measurements



Title: FCC AC Conducted Emissions

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7. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP

ANTENNA PORT CONDUCTED PHOTO

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RADIATED RF MEASUREMENT SETUP, FRONT

RADIATED PHOTO

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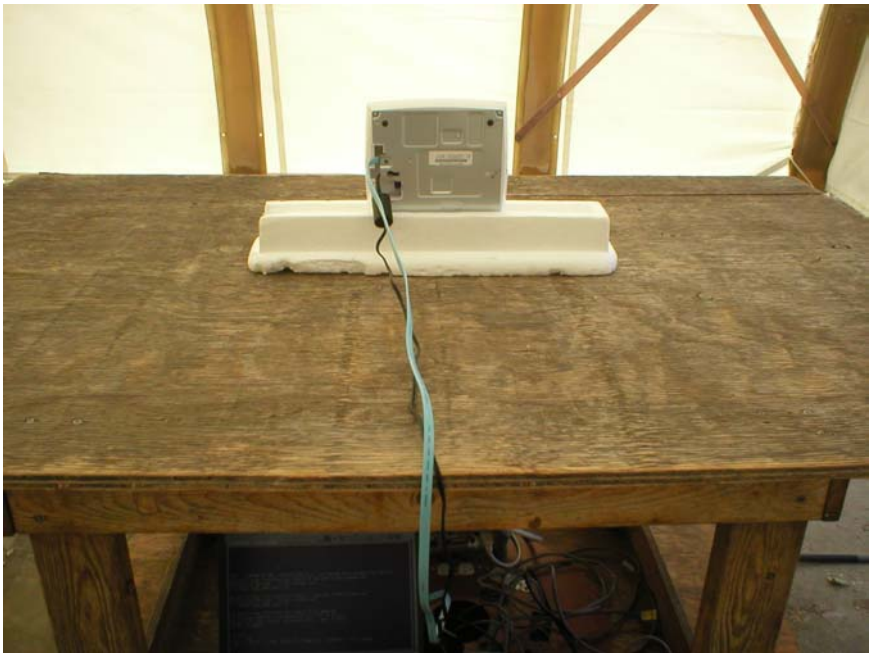
RADIATED RF MEASUREMENT SETUP, BACK

RADIATED PHOTO



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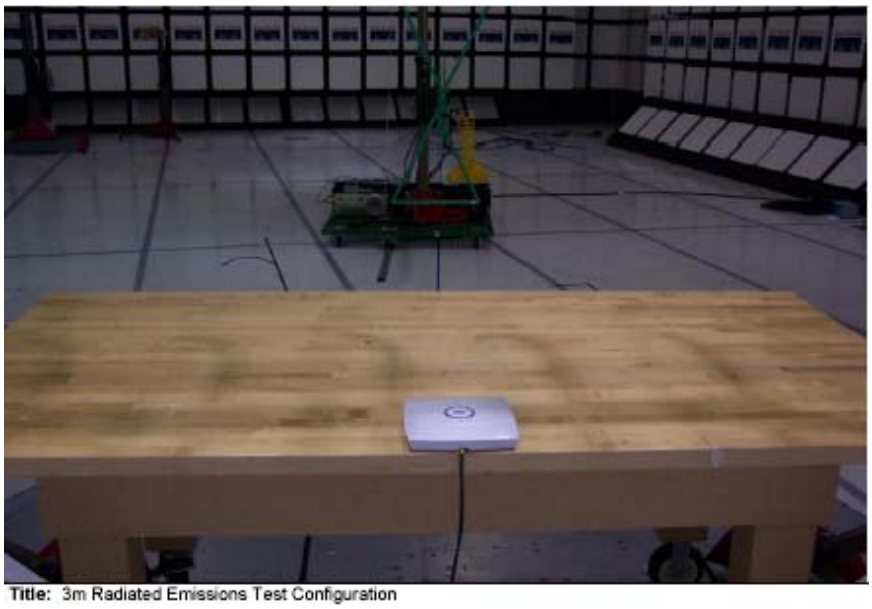
RADIATED RF MEASUREMENT SETUP, BELOW 1GHz

RADIATED PHOTO



Title: 3m Radiated Emissions Test Configuration

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POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP

LINE CONDUCTED PHOTO

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8. APPENDIX A: MANUFACTURER'S DECLARATION OF MODEL DIFFERENCES

Cisco Systems

Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
http://www.cisco.com

April 3, 2007

Dear Mr. Kuo,

Per your request, the transmit power of model AIR-AP521G-A-K9 & AIR-LAP521G-A-K9 (FCCID: LDK102065; IC: 2461B-102065) has been verified and is within 0.5 dB of measurements of model AIR-AP1131AG-A-K9 (FCCID:LDK102054; IC: 2461B-102054).

The new model AIR-AP521G-A-K9 & AIR-LAP521G-A-K9 is a depopulated version of old model AIR-AP1131AG-A-K9, in which the 802.11a radio circuitry has been removed. The new model AIR-AP521G-A-K9 & AIR-LAP521G-A-K9 is identical to the 802.11b/g radio circuitry plus the digital device portion of old model AIR-AP1131AG-A-K9.

Please let me know if you have any questions or concerns.

Regards,

Trinh Waitt
EMC Compliance Engineer
E-Mail: twaitt@cisco.com
Direct: 408-853-5571

END OF REPORT

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