FCC CFR47 PART 15 SUBPART C

Test Report

2.4 GHz 802.11n High-power Mini-PCI card

Model No: TRIDENT

FCC ID: P9J-2411

Report Number: 08PR013

Issue Date: 5 August 2008

Prepared for

Tropos Networks
555 Del Ray Avenue
Sunnyvale CA 94085

Prepared by

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El Granada CA 94018

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1. TEST AND TEST LOCATION INFORMATION

COMPANY NAME: TROPOS NETWORKS
555 DEL RAY AVENUE
SUNNYVALE CA 94085

EUT DESCRIPTION: 2.4 GHz 802.11n High-power Mini-PCI card

FCC ID: **P9J-2411**
MODEL No: Trident

DATE TESTED: 24 February – 7 April 2008

All radiated and AC line conducted tests were performed by

Bay Area Compliance Laboratories Corp.
1274 Anvilwood Avenue
Sunnyvale, CA 94089

All antenna port output conducted test were performed by

Tropos Networks
555 Del Ray Avenue
Sunnyvale CA 94085

5 August 2008

T.N. Cokenias
Agent for Tropos Networks

REPORT REVISION HISTORY

Revision Number	Description	Date
-	Original issue	5 August 2008

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. EQUIPMENT UNDER TEST

3.1. DESCRIPTION OF EUT

The EUT is a 2.4 GHz 802.11n transceiver module operating in the unlicensed 2400-2483.5 GHz band. Modulation is 802.11b/g in 20 MHz channel bandwidths.

3.2. MAXIMUM OUTPUT POWER

802.11b

	(MHz)	(dBm)	(mW)
Low	2412	28.1	646
Middle	2437	28.55	716
High	2462	28.32	679

802.11g

	(MHz)	(dBm)	(mW)
Low	2412	27.22	527
Middle	2437	27.93	621
High	2462	27.56	570

3.3. DESCRIPTION OF AVAILABLE ANTENNAS

The following antennas were qualified for this radio:

Antenna type	Antenna gain	Manufacturer	Model No.
Omni monopole	6 dBi	Tyco	1513760-1
Omni monopole	7.4 dBi	NCG Company	SF-245
Patch	12 dBi	Cushcraft	2401290(12NF

Note: The antenna and the EUT are professionally installed.

3.4. SOFTWARE AND FIRMWARE

Test software used to exercise the equipment was Atheros Radio Test (ART) Revision 0.5 Build #26 ART_11N

3.5. WORST-CASE CONFIGURATION AND MODE

Radiated and conducted emissions tests were performed for 802.11b and 802.11g modulations. Worst-case emissions are reported.

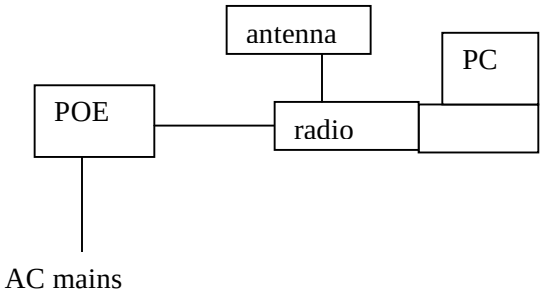
3.6. DESCRIPTION OF TEST SETUP

TEST SETUP

The radio module was placed in a test fixture connected to the pcmcia port of a laptop computer.

The laptop sets the channels and power levels of the radio via the IDU.

SETUP DIAGRAM FOR TESTS



Manufacturer	Description	Model	Serial Number	Calibration Date
DELL	Host PC	Latitude D505	CN-0H2049-48643-4Cn-1418	NA
Cincon	POE	TR60A-POE-L	006511	NA
DPS	Power Supply	DPS-3050	305002262	NA

3.7 Modifications to EUT

NONE.

TEST AND MEASUREMENT EQUIPMENT

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

BACL Test Equipment:

Manufacturer	Description	Model	Serial Number	Calibration Date
Ducommun Technologies	1-18GHz Preamplifier	ALN-09173030-01	990297-02	2007-10-18
Antenna Research Associates, Inc.	Horn Antenna	DRG-118/A	1132	2007-06-18
Agilent	Analyzer, Spectrum	E4446A	US44300386	2008-05-19
Sunol Science Corp	Combination Antenna	JB3 Antenna	A020106-3	2008-03-24
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.595 0K03	100044	2008-03-24
Sunol Science Corp	System Controller	SC99V	113005-1	NA

Tropos Networks Test Equipment: Antenna Port Conducted Tests

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**Cal Due**
Spectrum Analyzer	Agilent	E4440A	MY46186111	8/21/08

LIMITS AND RESULTS

3.7. ANTENNA PORT CHANNEL TESTS

3.7.1. 6 dB BANDWIDTH

LIMIT

Section 15.247(2): The 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 1% to 3% of the 6dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

RESULTS

No non-compliance noted:

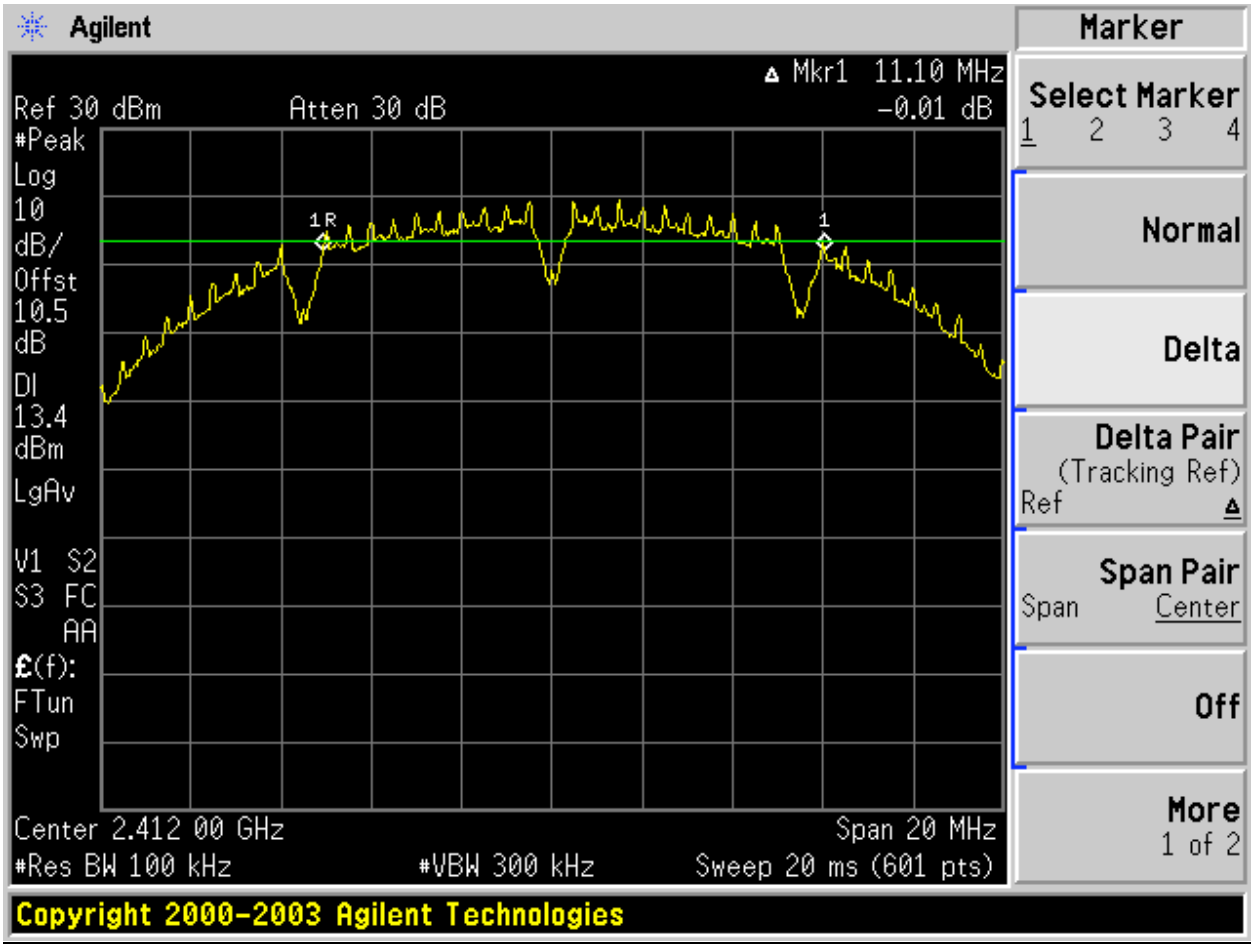
802.11b

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
Low	2412	11.1
Middle	2437	12.0
High	2462	11.0

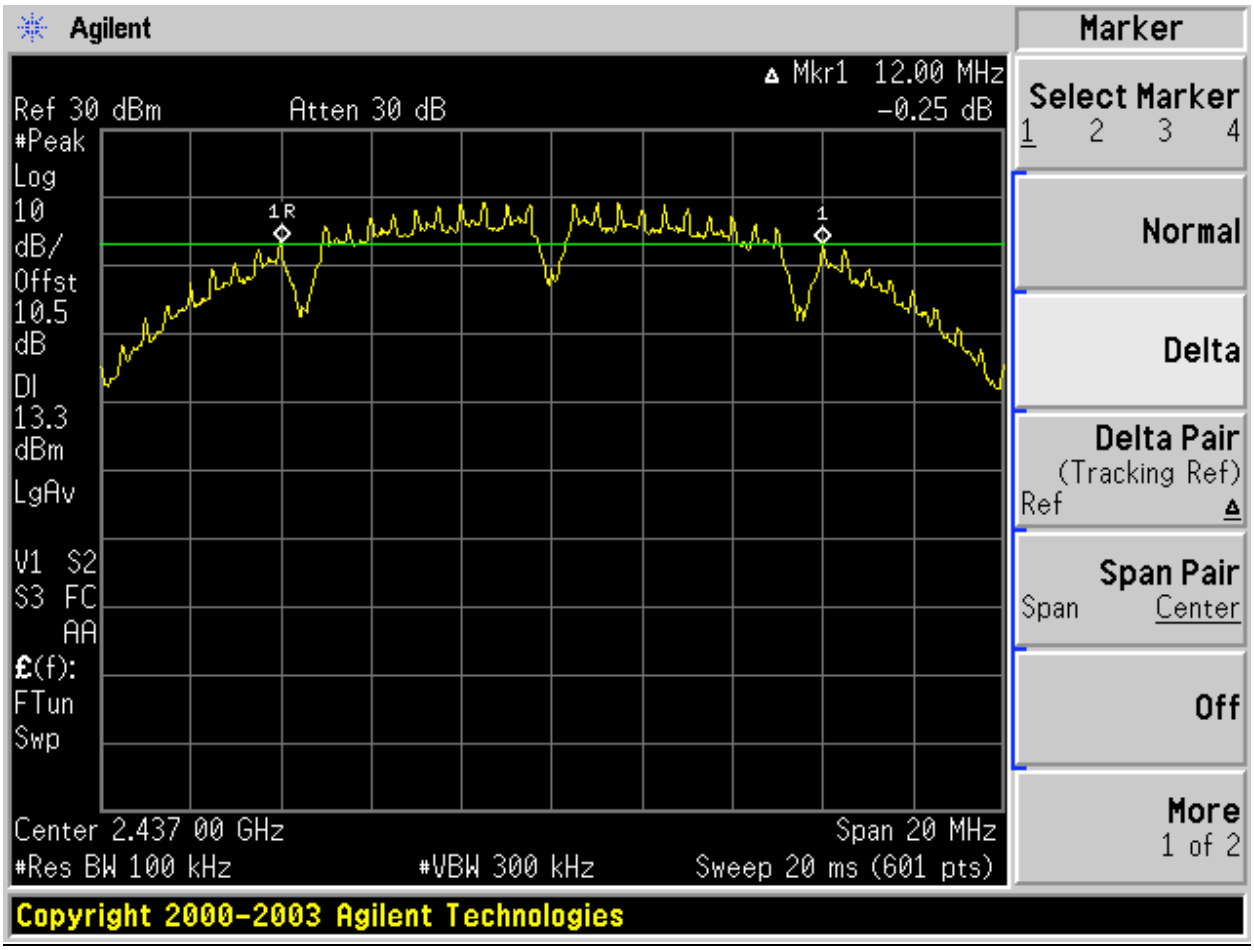
802.11g

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
Low	2412	16.5
Middle	2437	16.5
High	2462	16.1

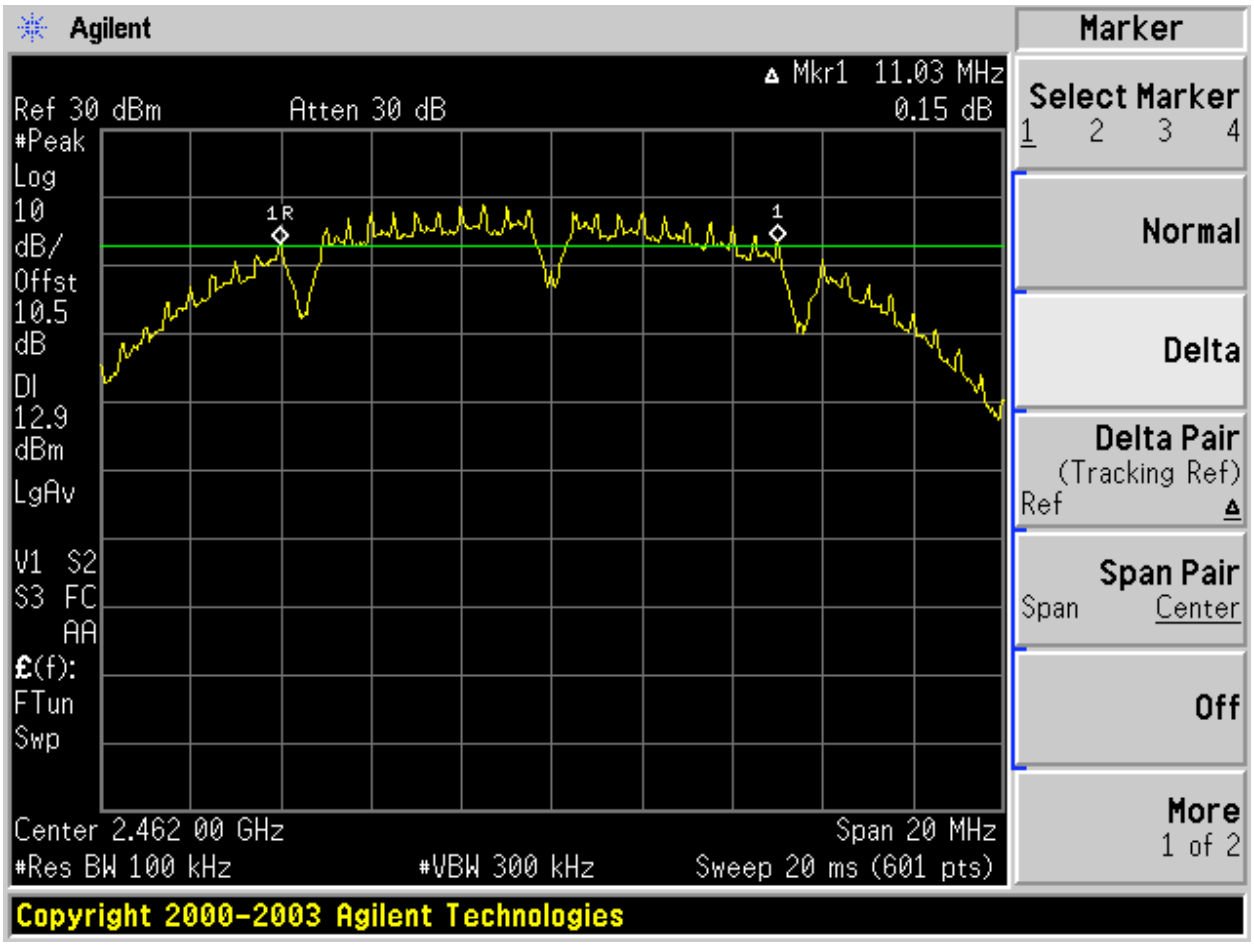
6 dB BANDWIDTH LOW CHANNEL 802.11b



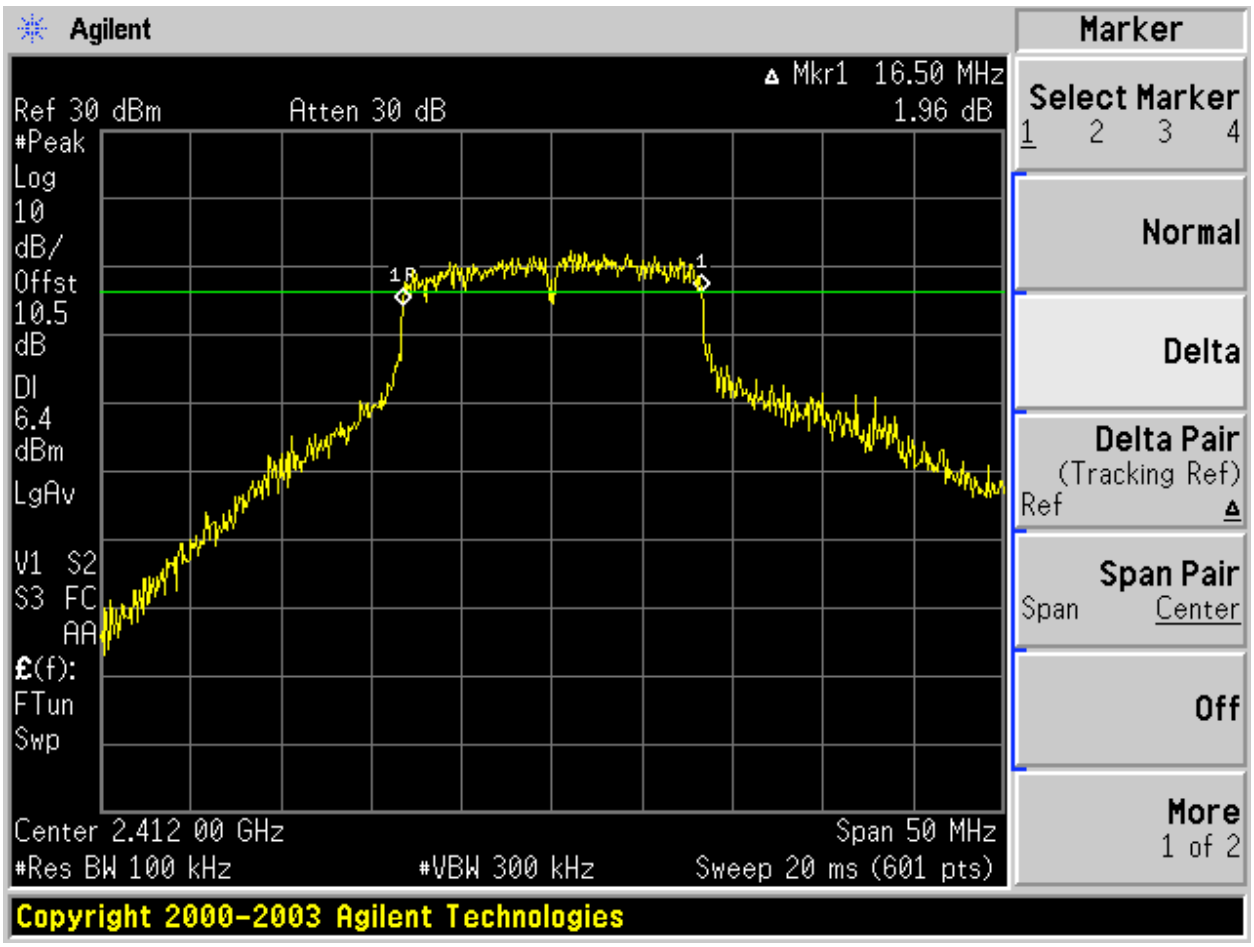
6 dB BANDWIDTH MID CHANNEL 802.11b



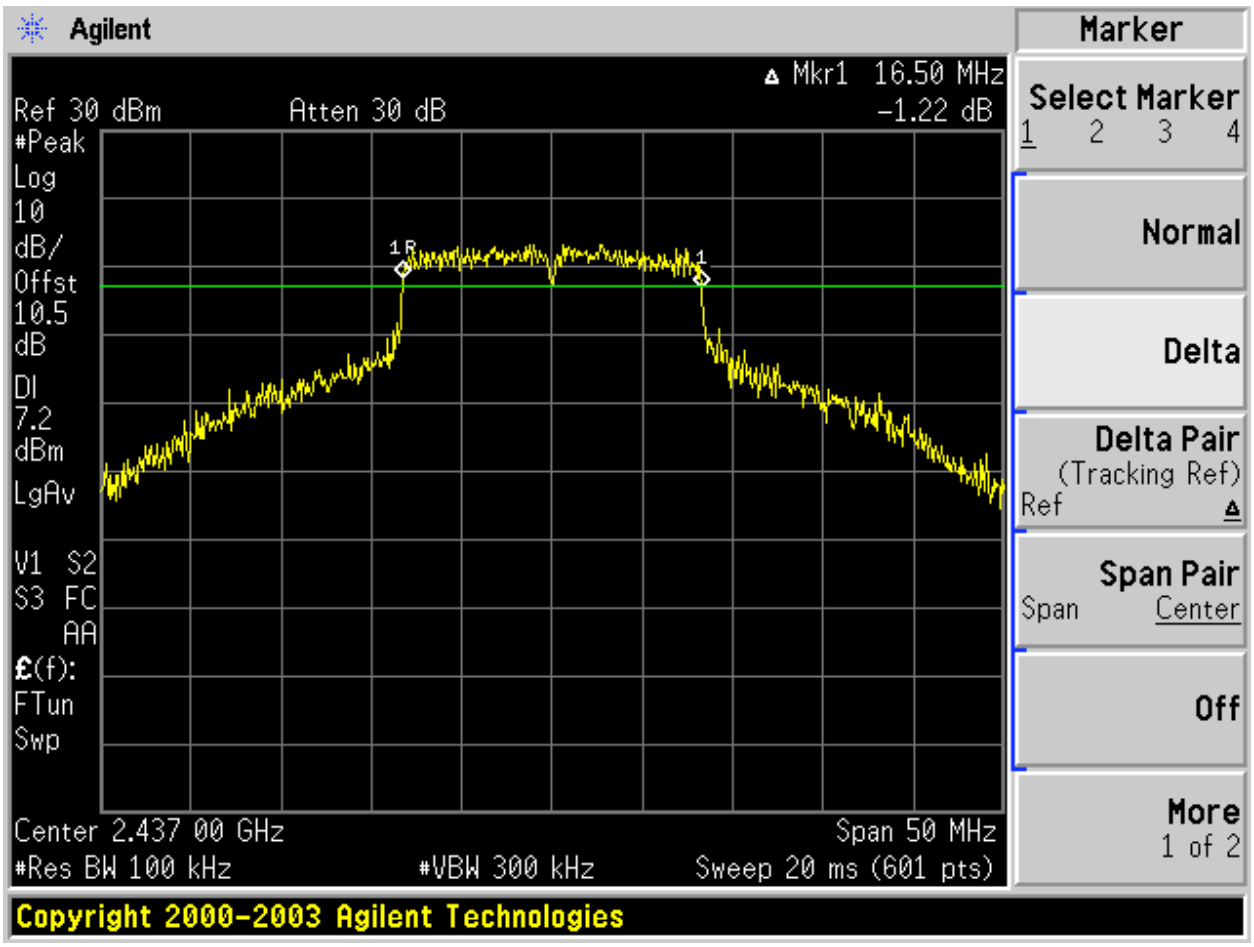
6 dB BANDWIDTH HIGH CHANNEL 802.11b



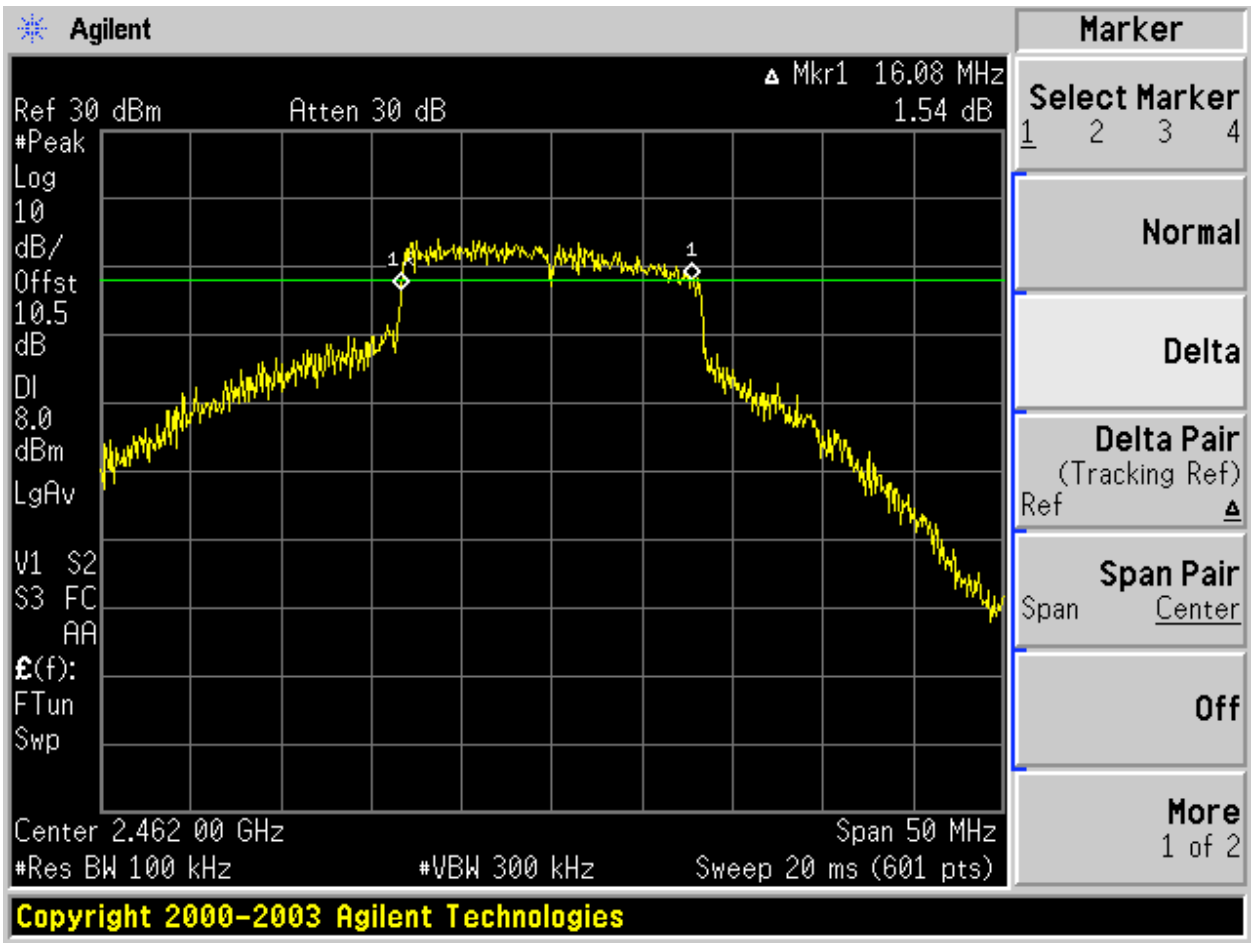
6 dB BANDWIDTH LOW CHANNEL 802.11g



6 dB BANDWIDTH MID CHANNEL 802.11g



6 dB BANDWIDTH HIGH CHANNEL 802.11g



POWER SPECTRAL DENSITY

LIMIT

15.247(e) For digitally modulated systems, the 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.

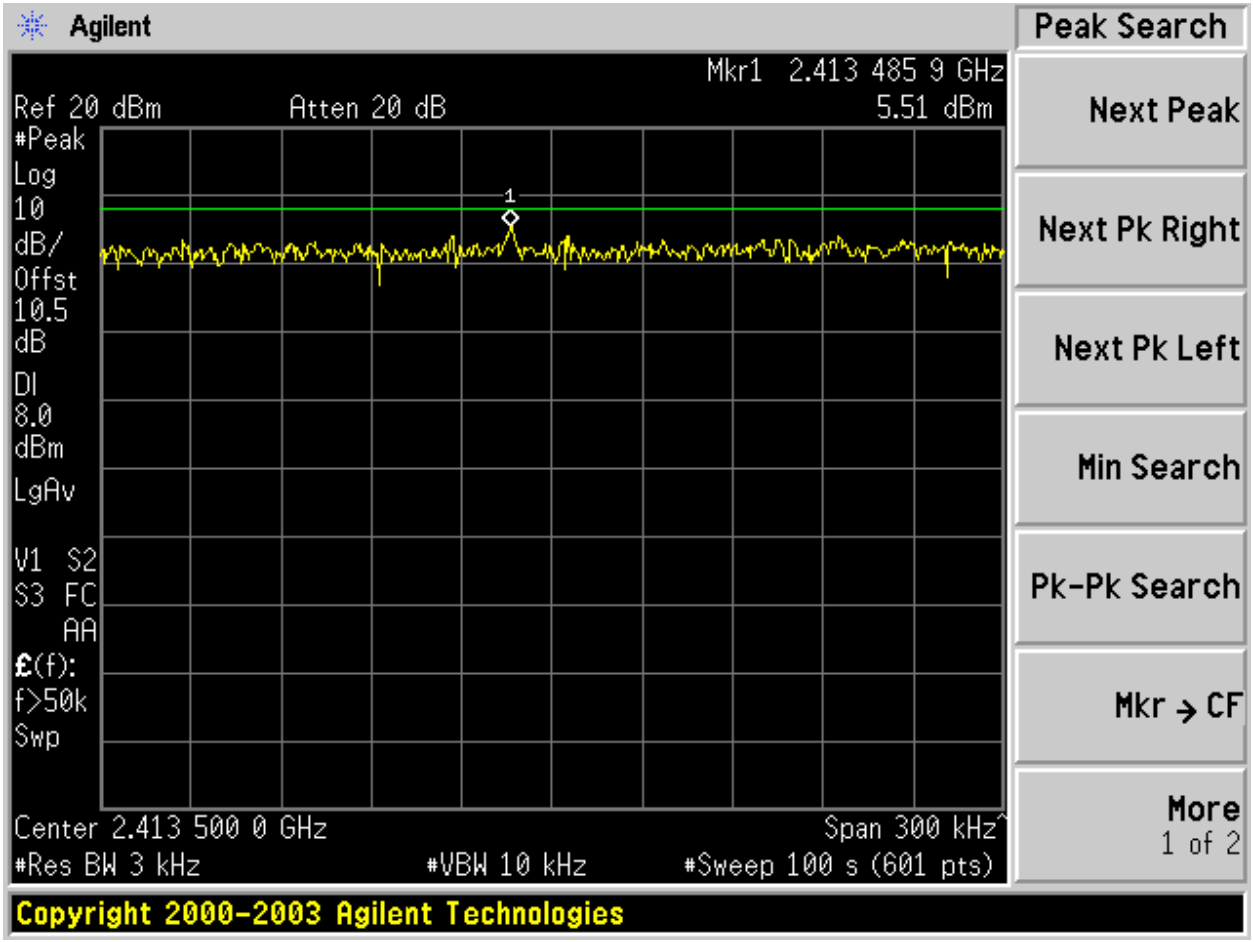
TEST PROCEDURE

Locate and zoom in on emission peak(s) within the passband. Set RBW = 3 kHz, VBW > RBW, sweep= (SPAN/3 kHz) = 300 kHz span/3kHz = 100 seconds. Record highest level using PEAK detector and PEAK SEARCH function.

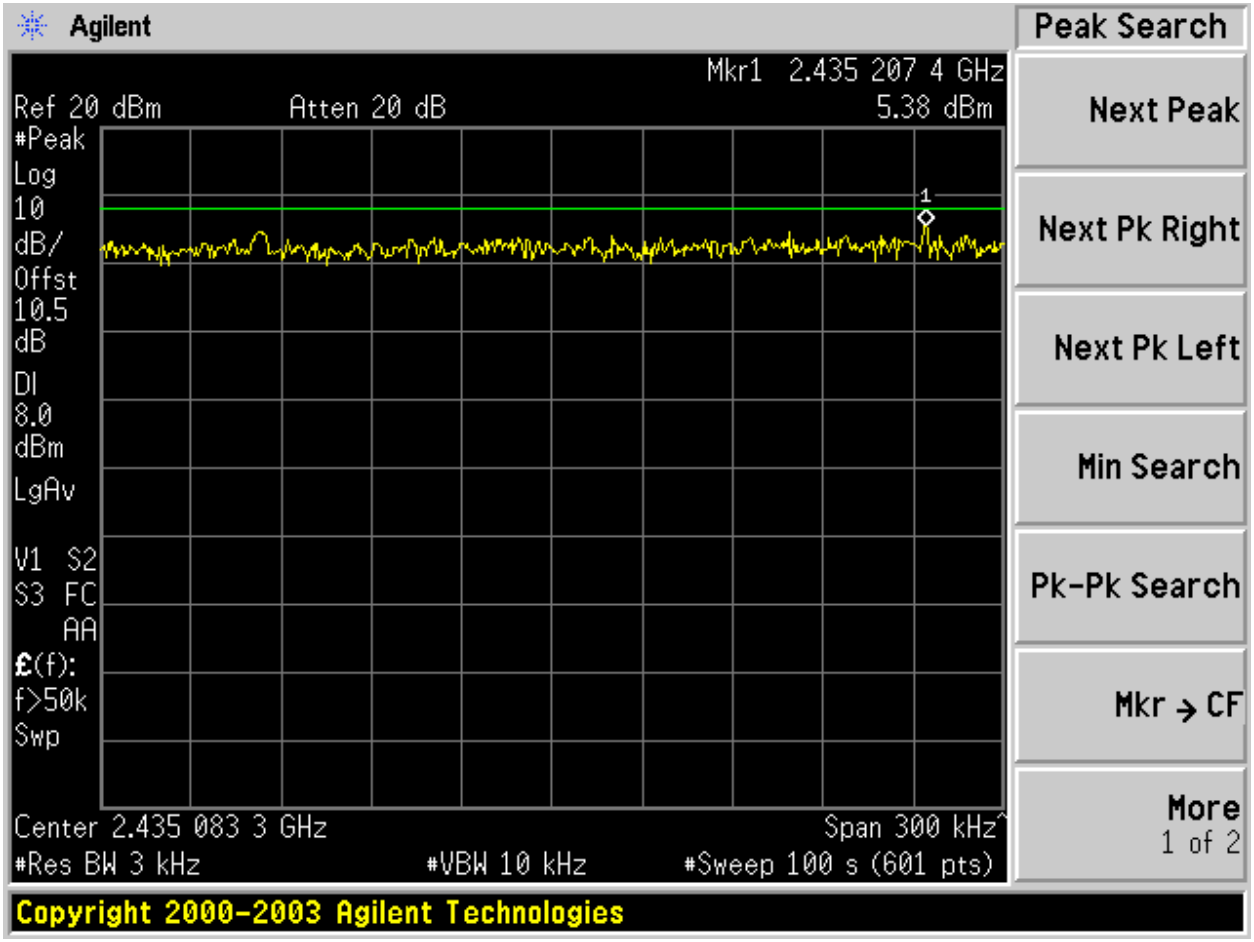
RESULTS

No non-compliance noted:

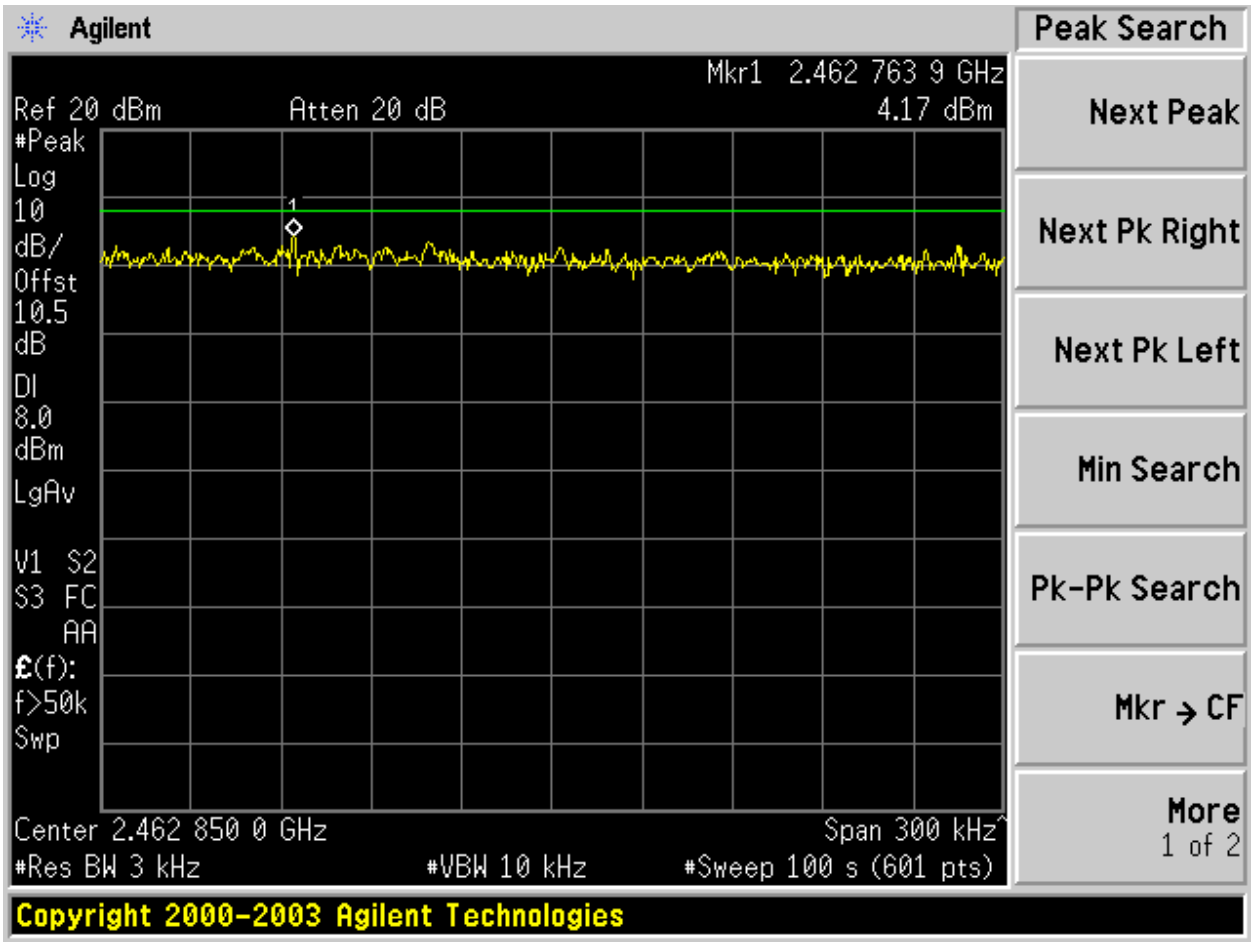
PSD LOW CHANNEL 802.11b



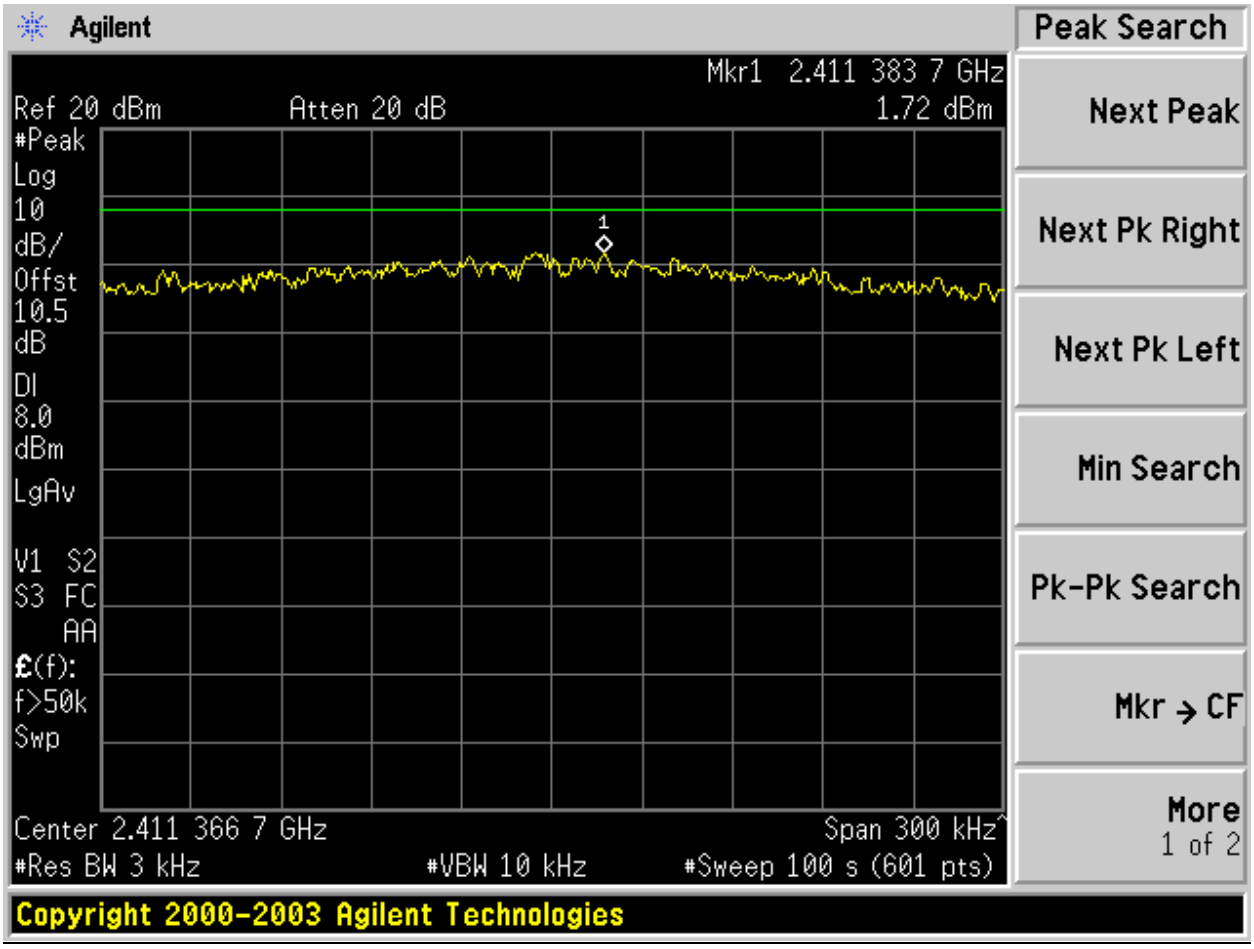
PSD MID CHANNEL 802.11b



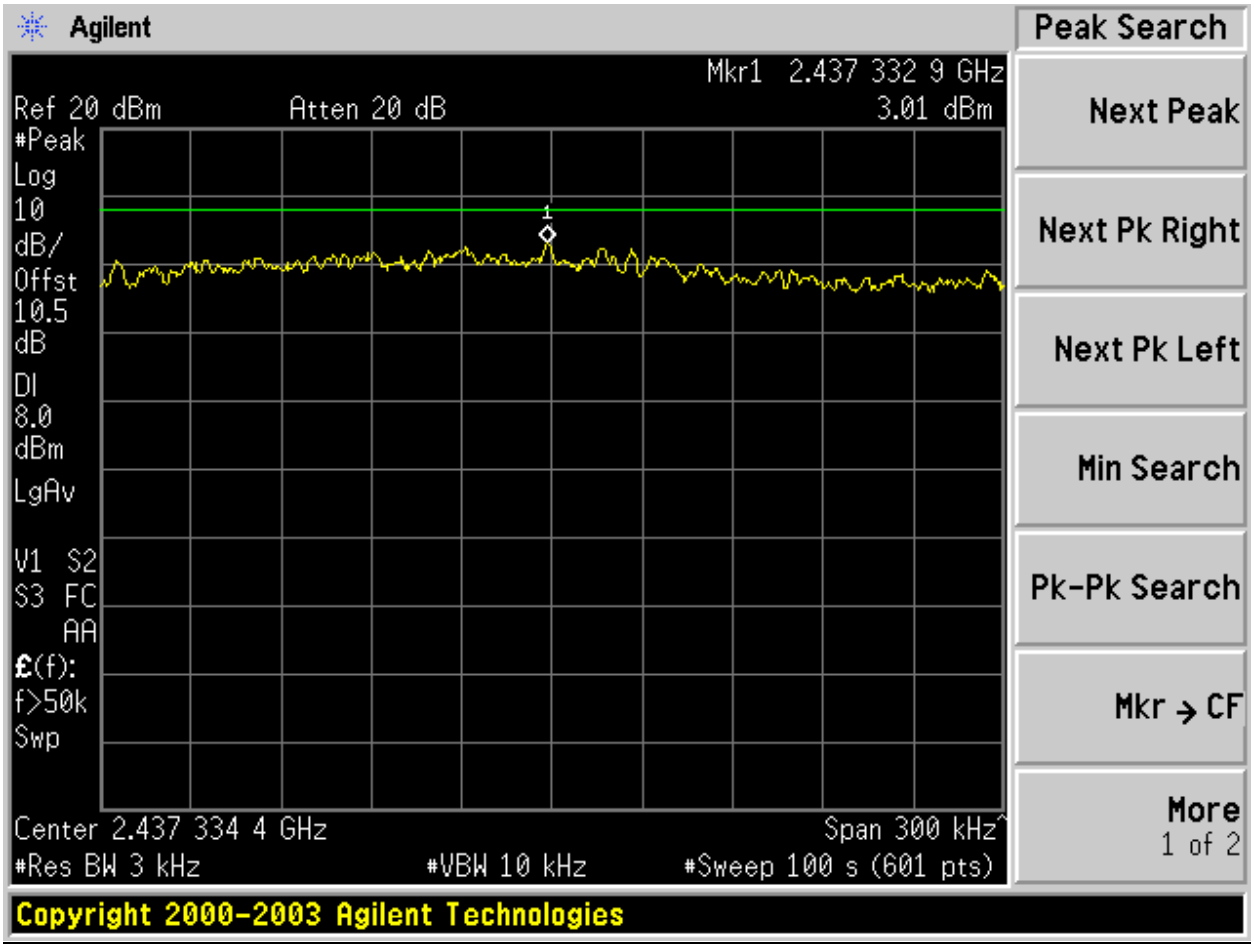
PSD HIGH CHANNEL 802.11b



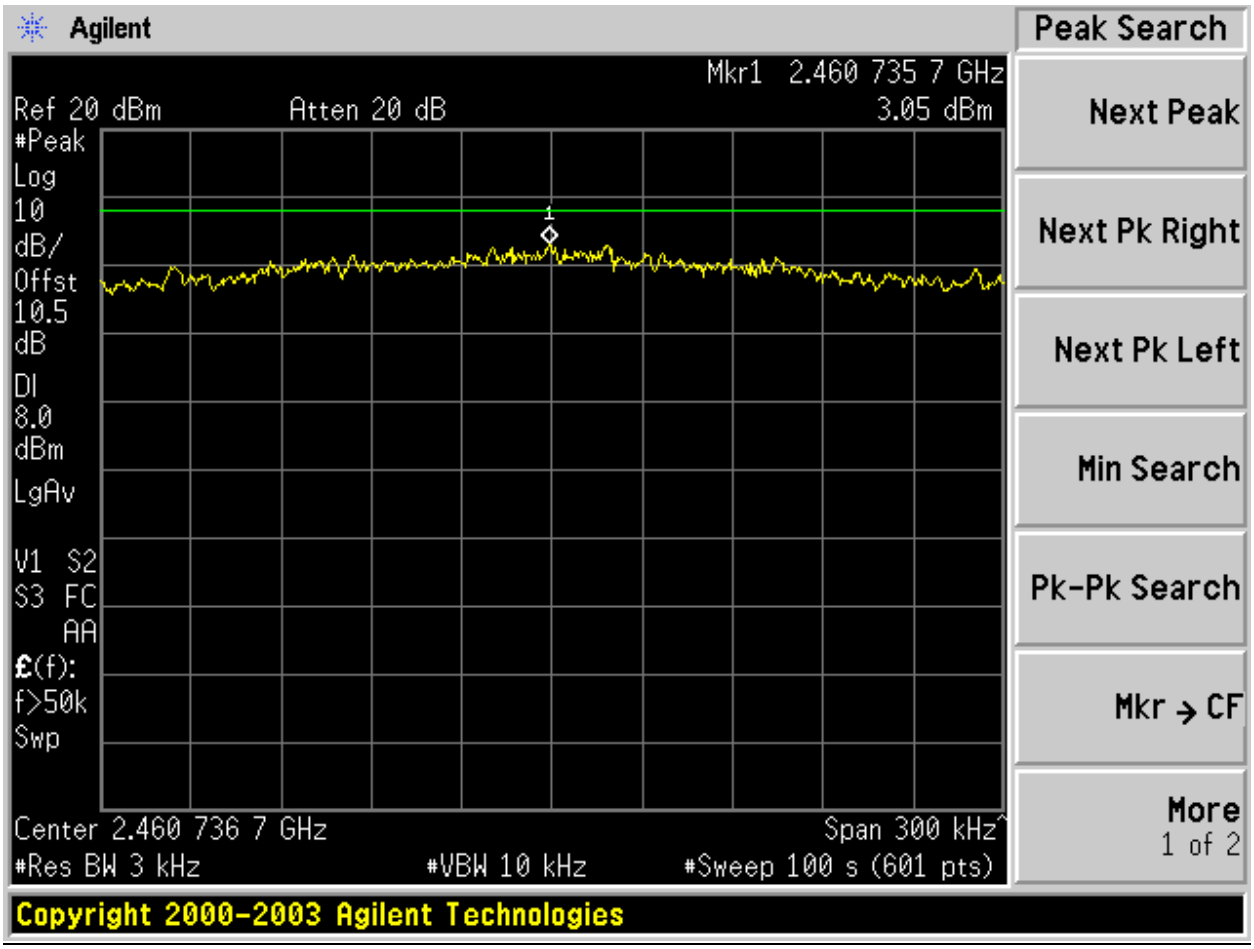
PSD LOW CHANNEL 802.11g



PSD MID CHANNEL 802.11g



PSD HIGH CHANNEL 802.11g



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 (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.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The built-in Channel Power function was used to measure peak output power.

RESULTS

No non-compliance noted:

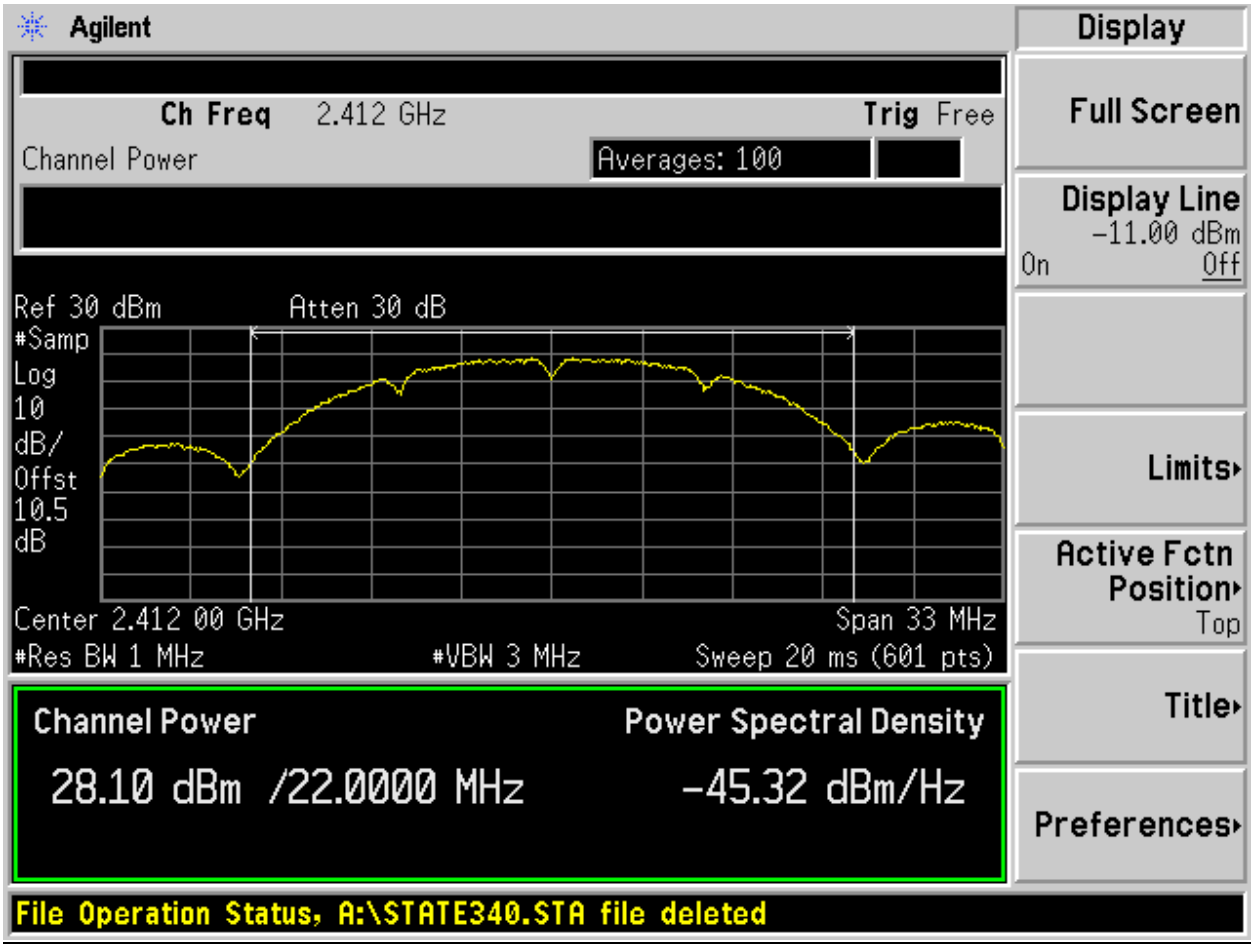
802.11b

	(MHz)	(dBm)	(mW)
Low	2412	28.1	646
Middle	2437	28.55	716
High	2462	28.32	679

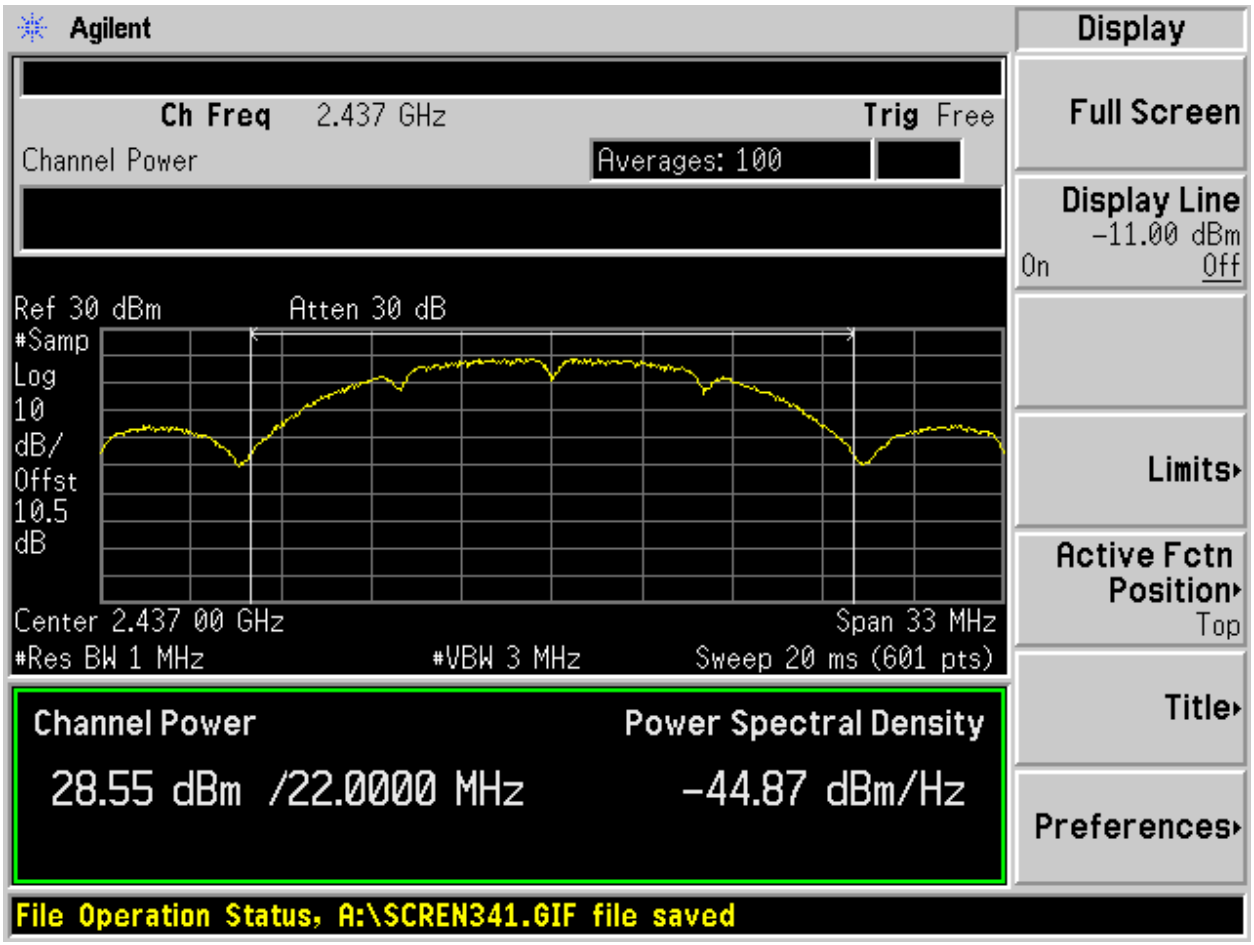
802.11g

	(MHz)	(dBm)	(mW)
Low	2412	27.22	527
Middle	2437	27.93	621
High	2462	27.56	570

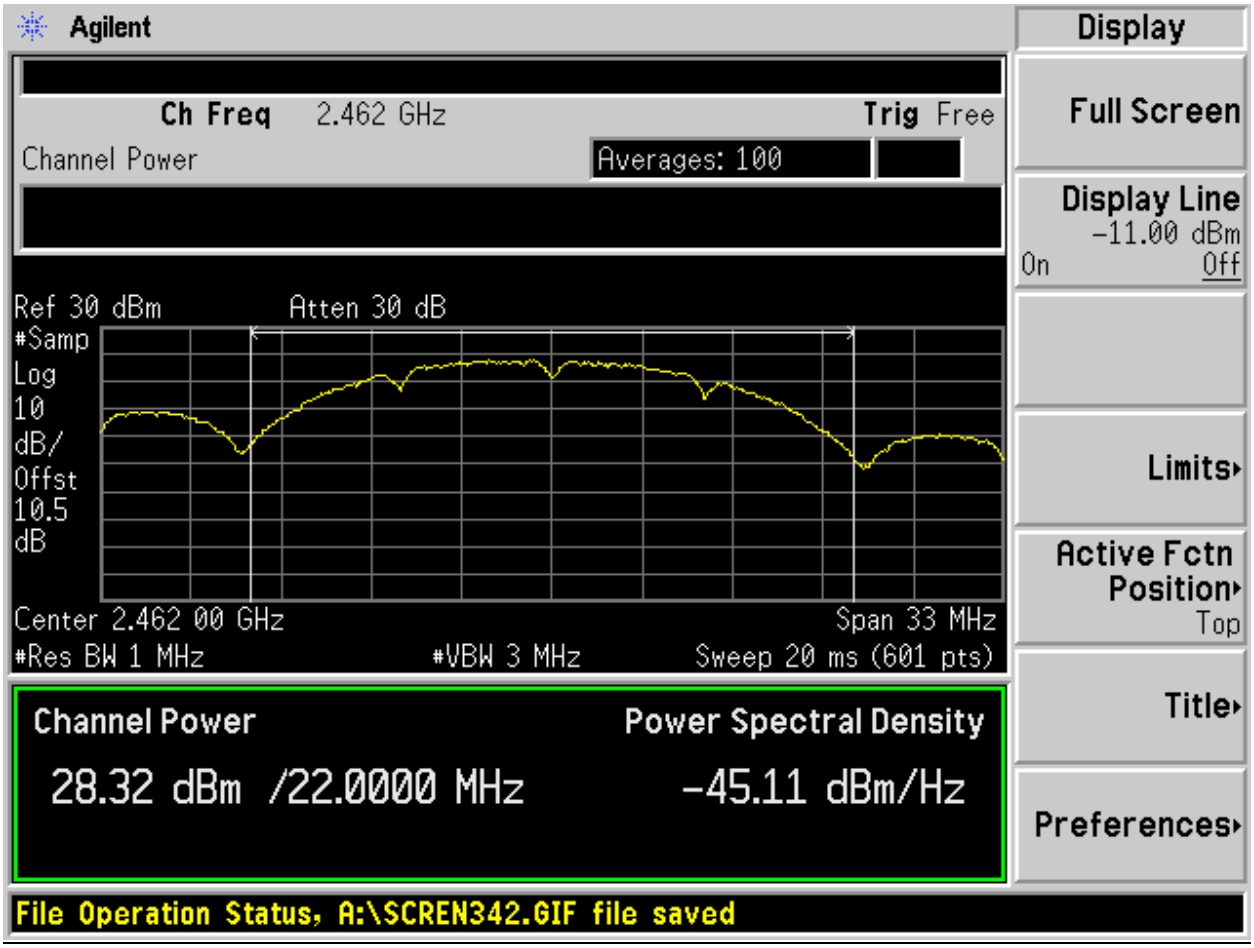
OUTPUT POWER LOW CHANNEL 802.11b



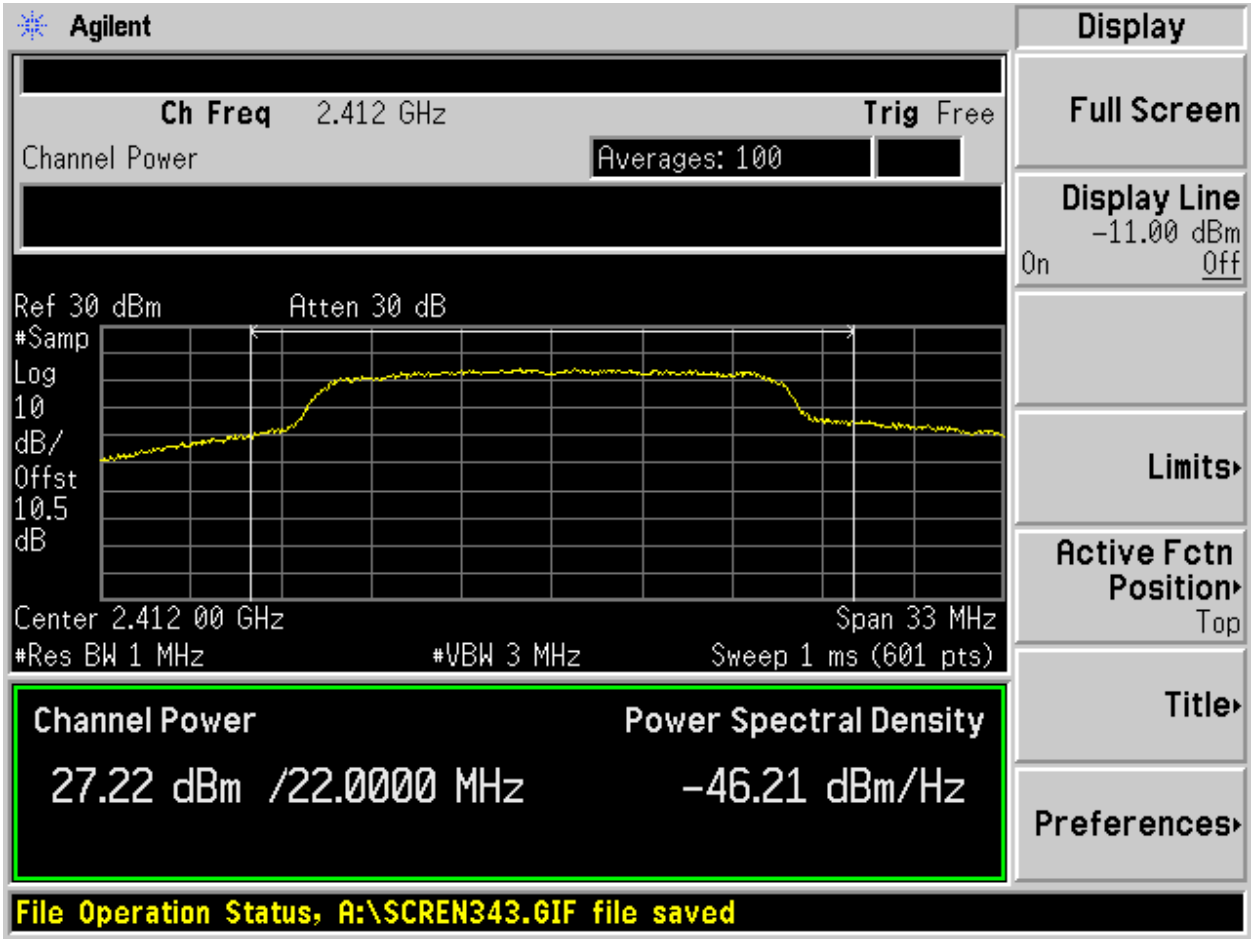
OUTPUT POWER MID CHANNEL 802.11b



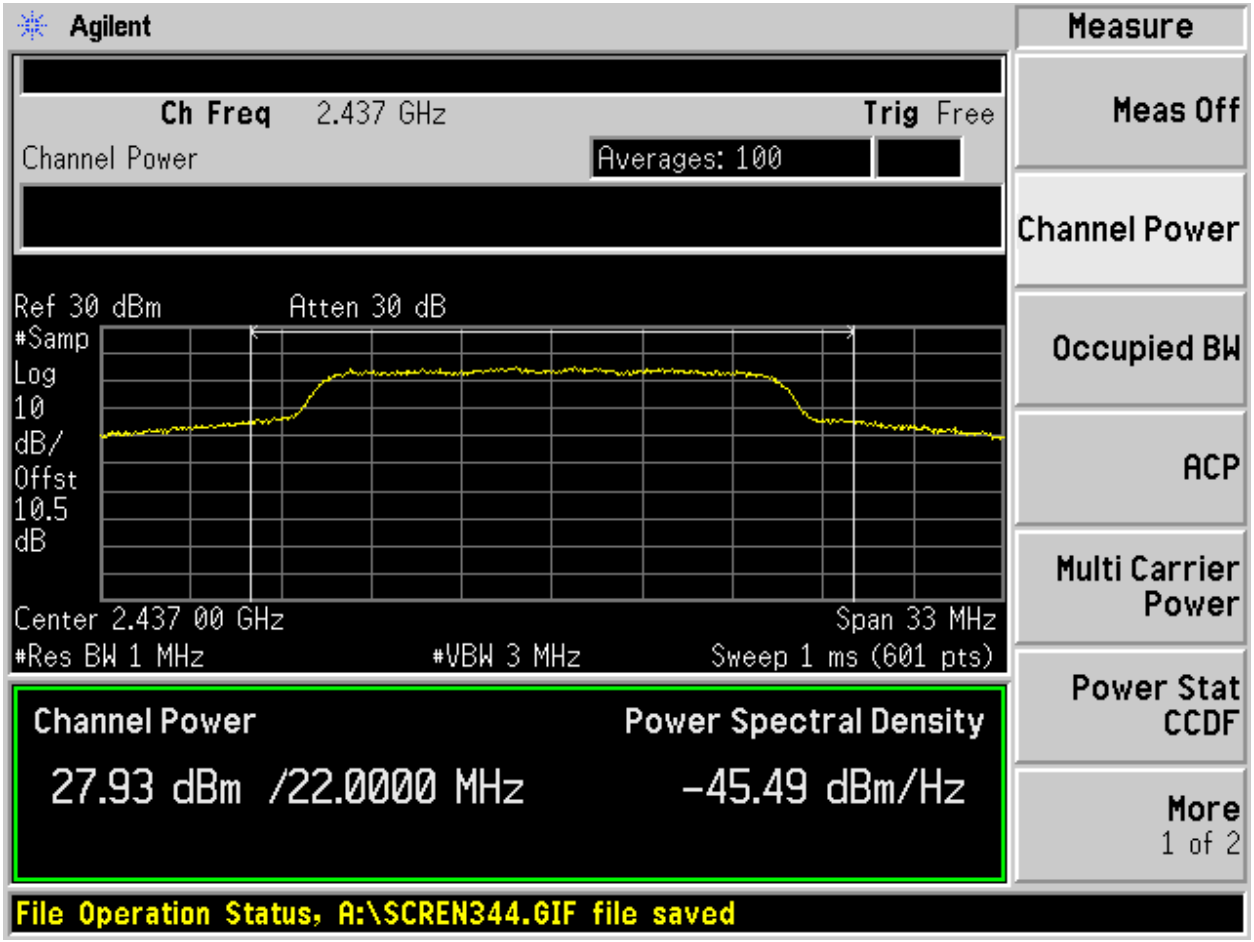
OUTPUT POWER HIGH CHANNEL 802.11b



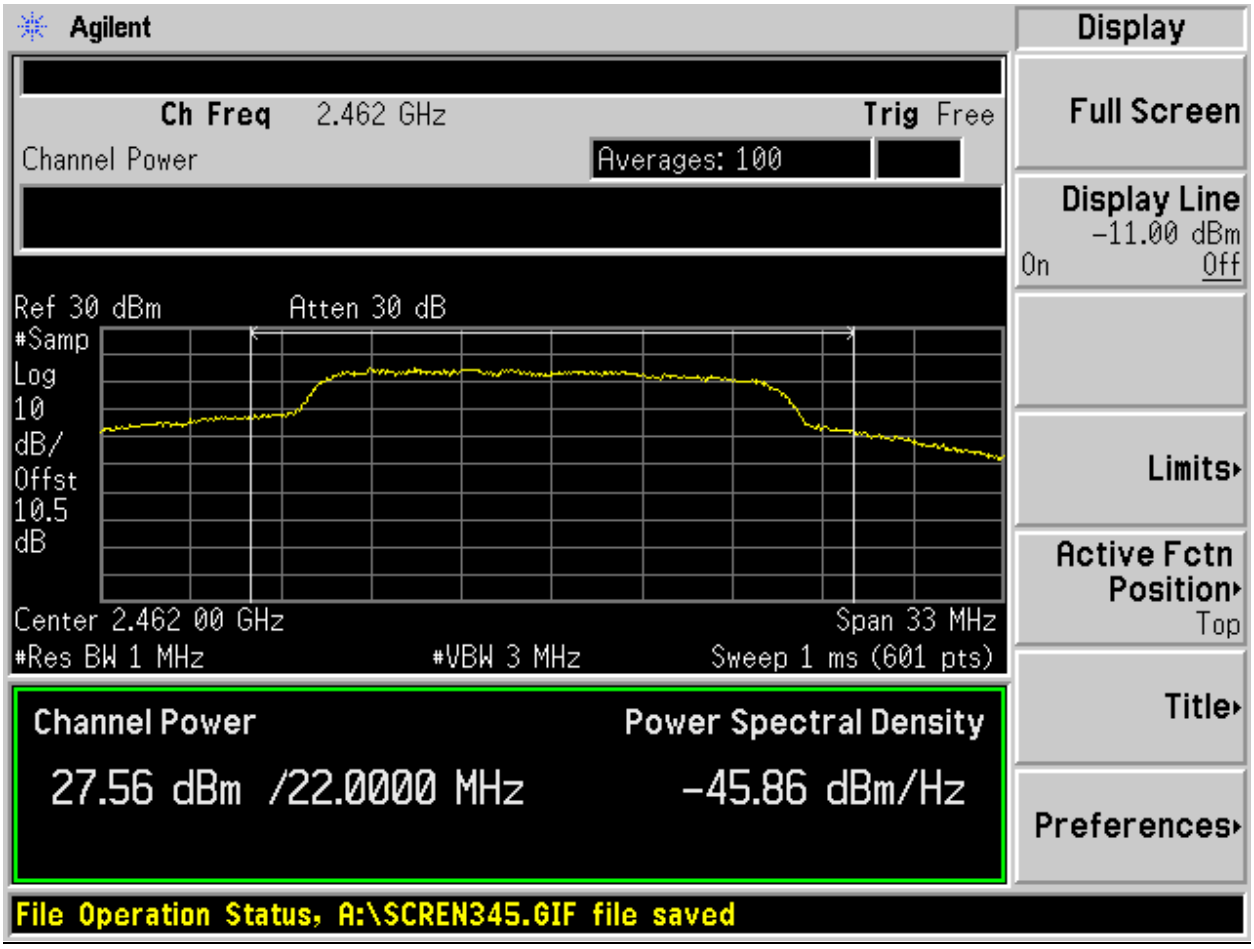
OUTPUT POWER LOW CHANNEL 802.11g



OUTPUT POWER MID CHANNEL 802.11g



OUTPUT POWER HIGH CHANNEL 802.11g



3.7.2. MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

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

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^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.

CALCULATIONS

Given

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

and

$S = E \wedge 2 / 3770$

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

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

LIMITS

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

RESULTS

No non-compliance noted:

Power Density Limit (mW/cm^2)	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
1.0	24.00	12.00	17.79
1.0	28.00	12.00	28.20

NOTE1: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

NOTE2: Point to multi-point output power is limited to 36 dBm eirp. Point to point operation is limited to 30 dBm + 12 dBi - (12dBi-6 dBi)/3 = 40 dBm eirp

3.7.3. 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

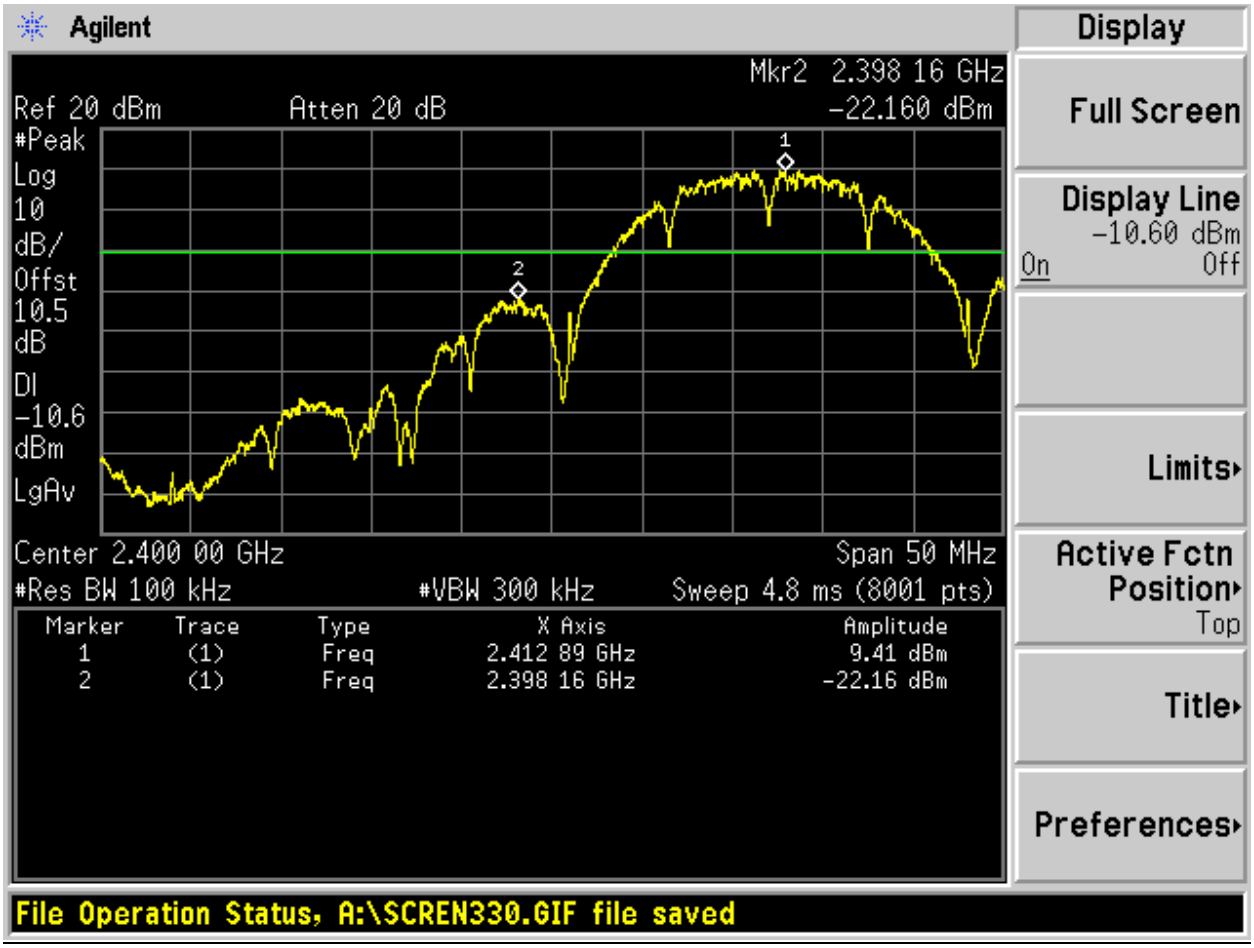
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

The spectrum from 30 MHz to 10 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

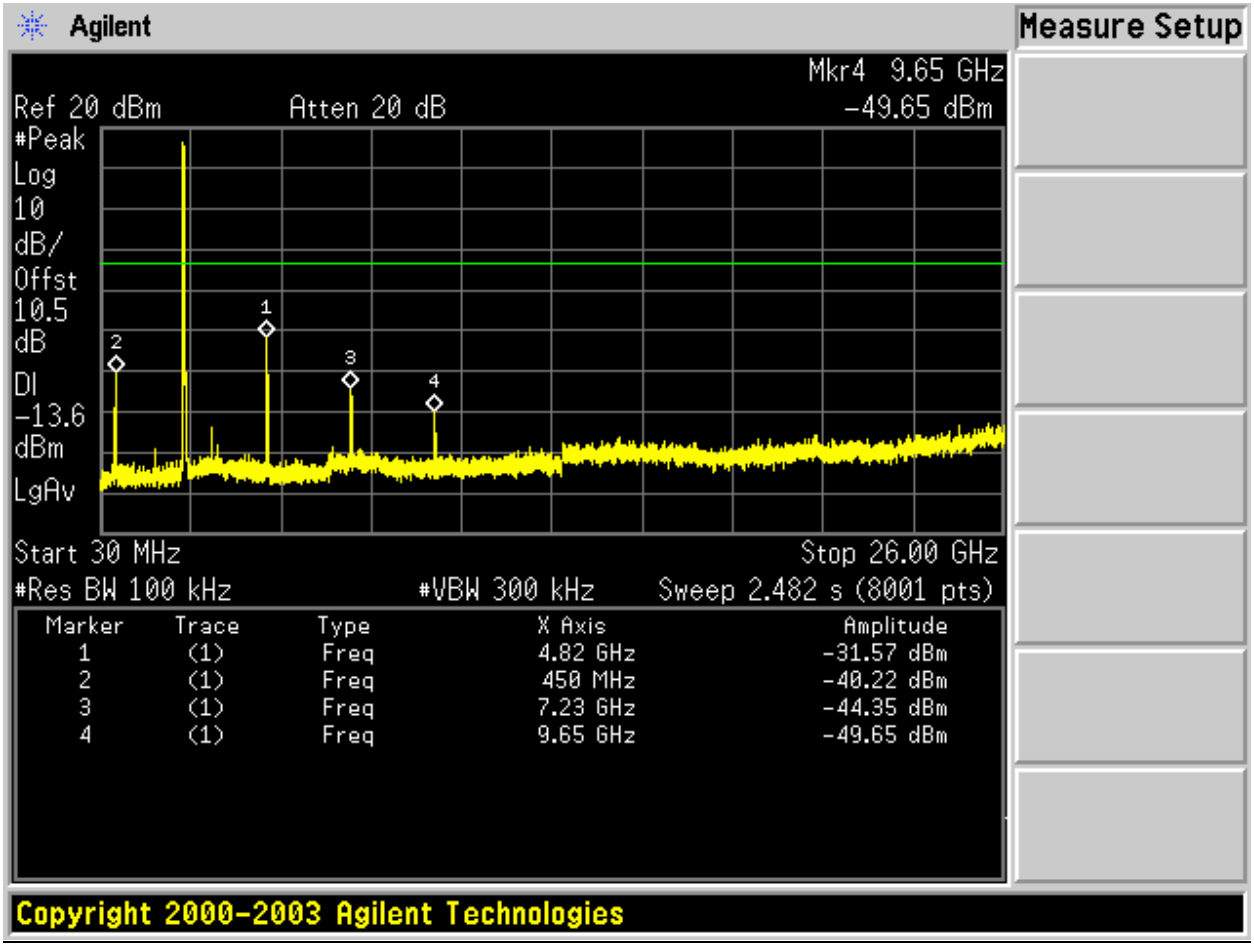
RESULTS

No non-compliance noted:

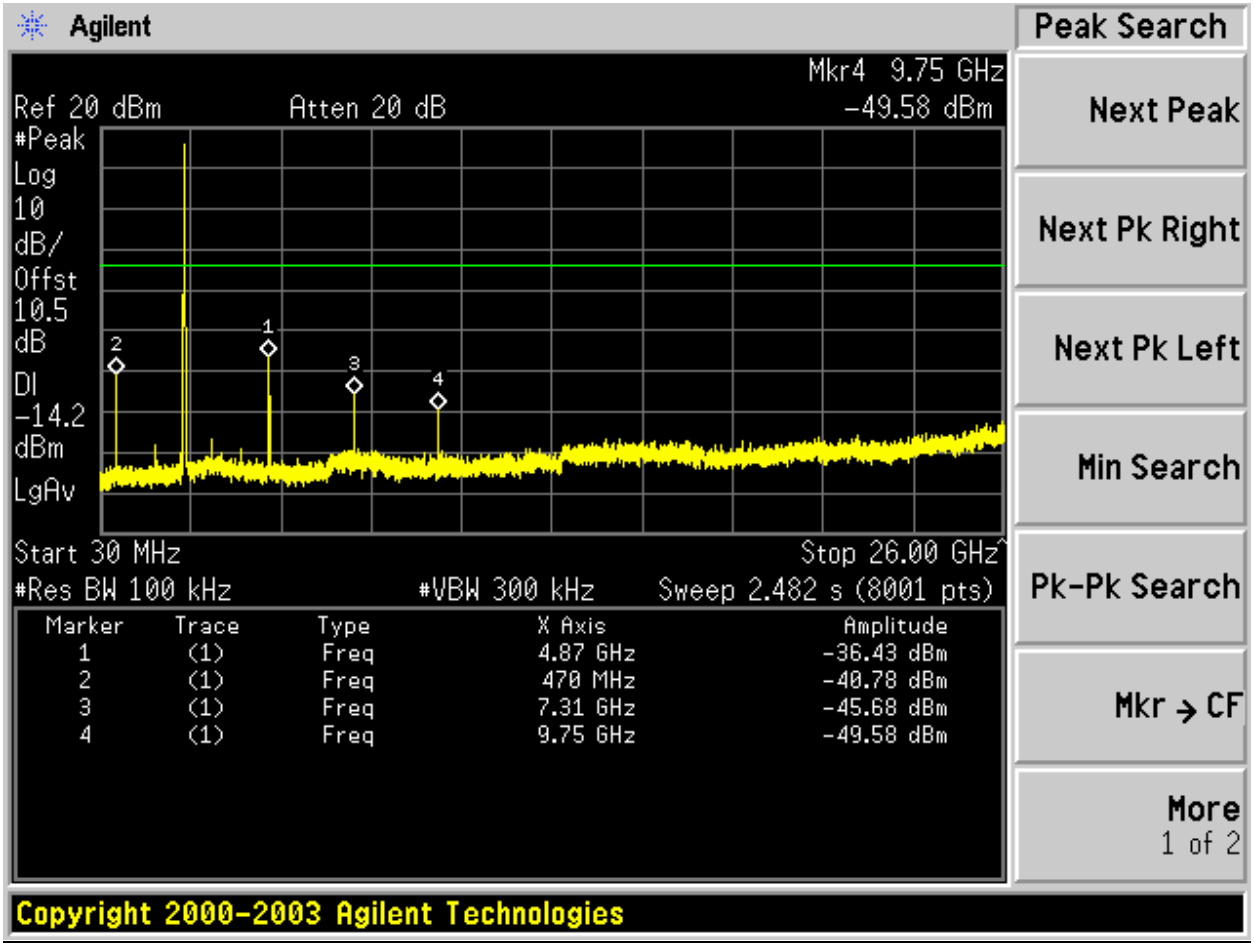
SPURIOUS EMISSIONS, LOW CHANNEL 802.11b (1 of 2)



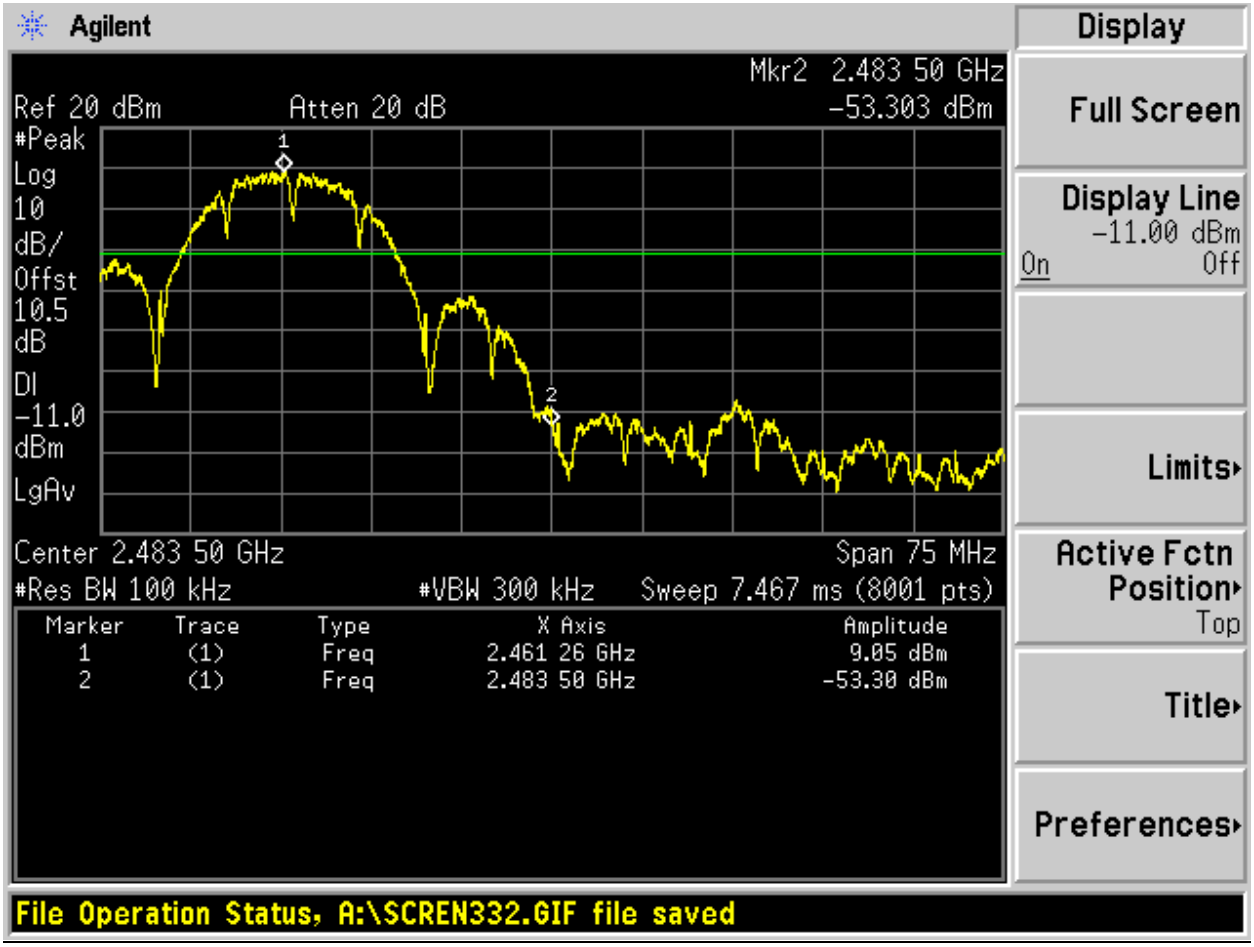
SPURIOUS EMISSIONS, LOW CHANNEL 802.11b (2 of 2)



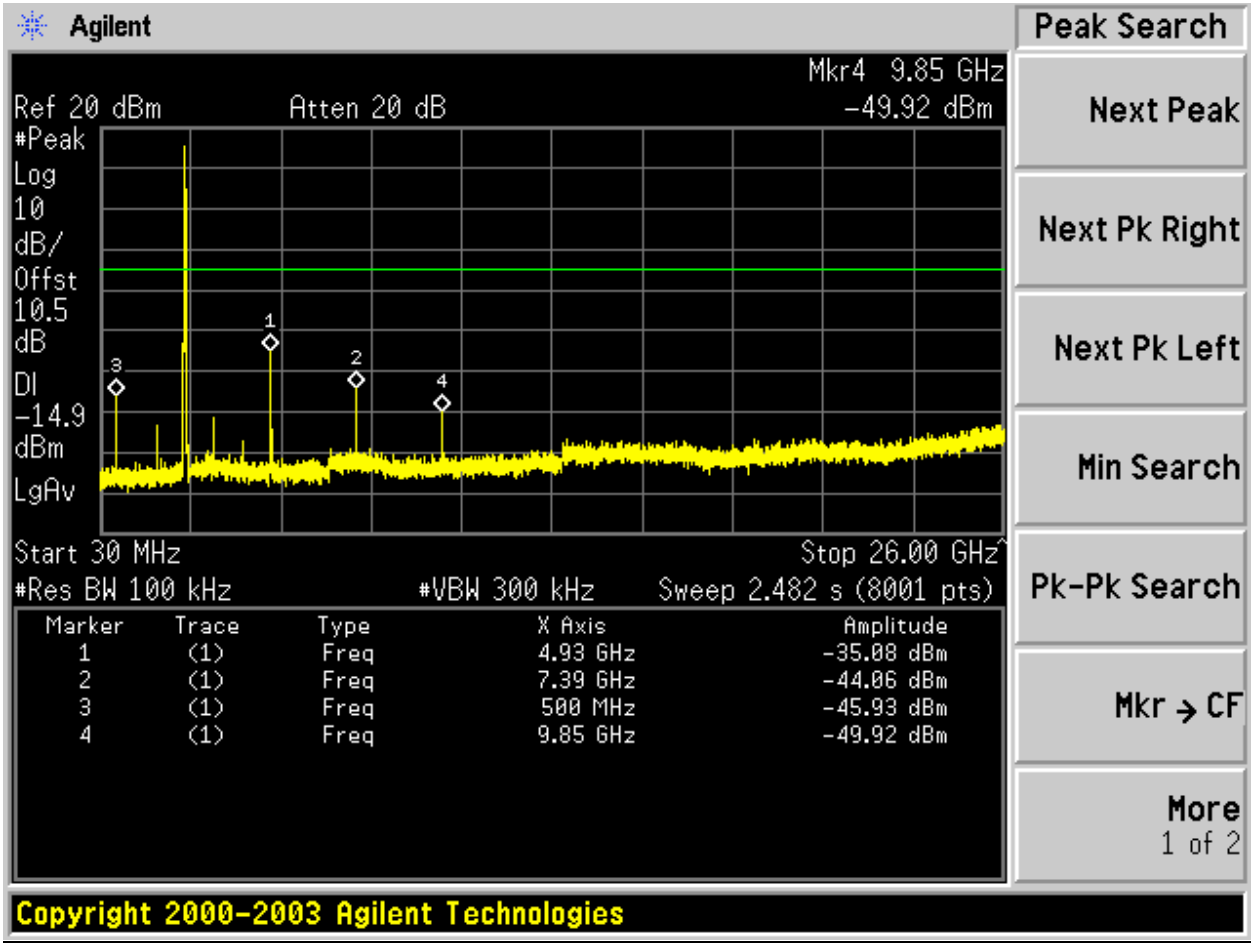
SPURIOUS EMISSIONS, MID CHANNEL 802.11b (1 of 1)



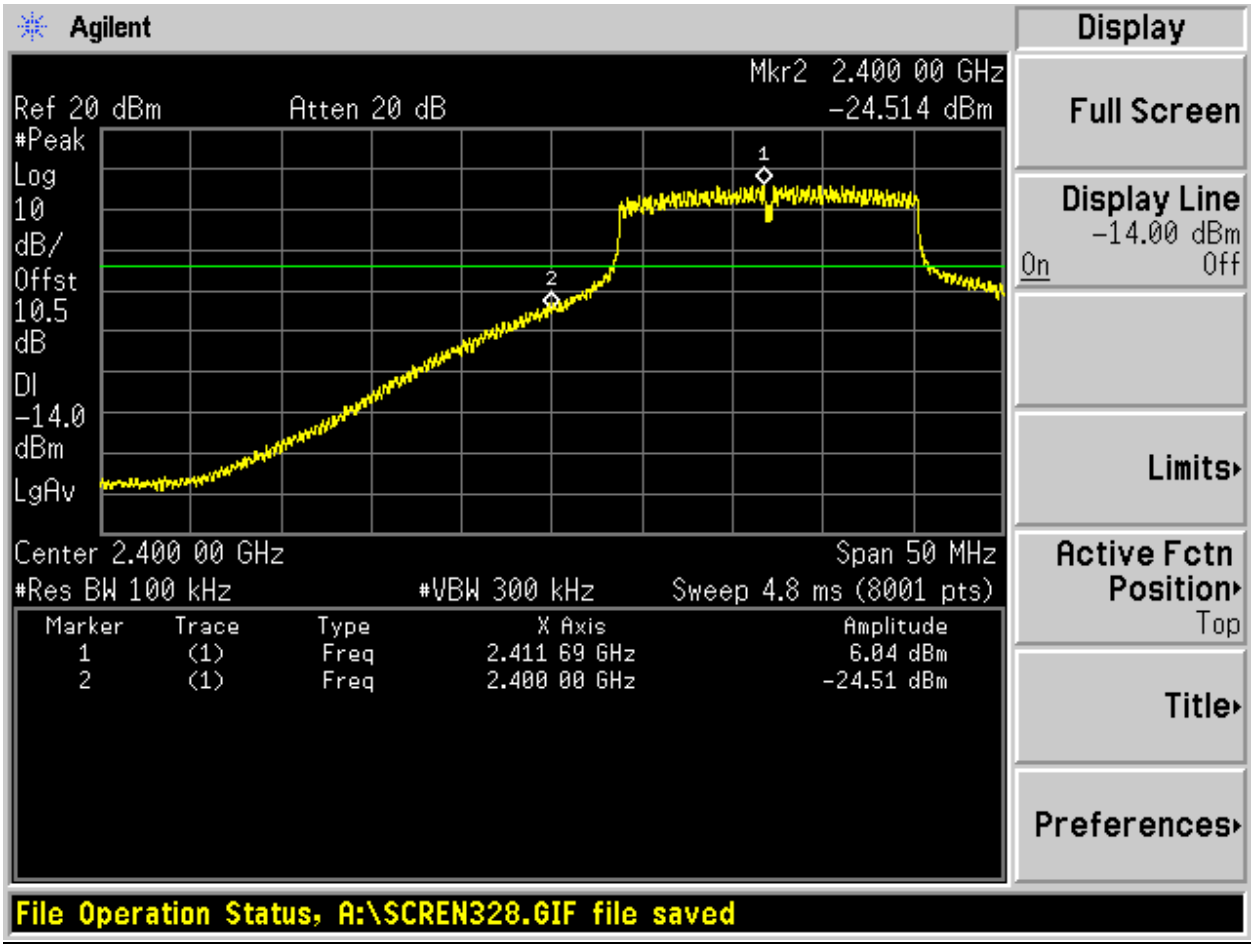
SPURIOUS EMISSIONS, HIGH CHANNEL 802.11b (1 of 2)



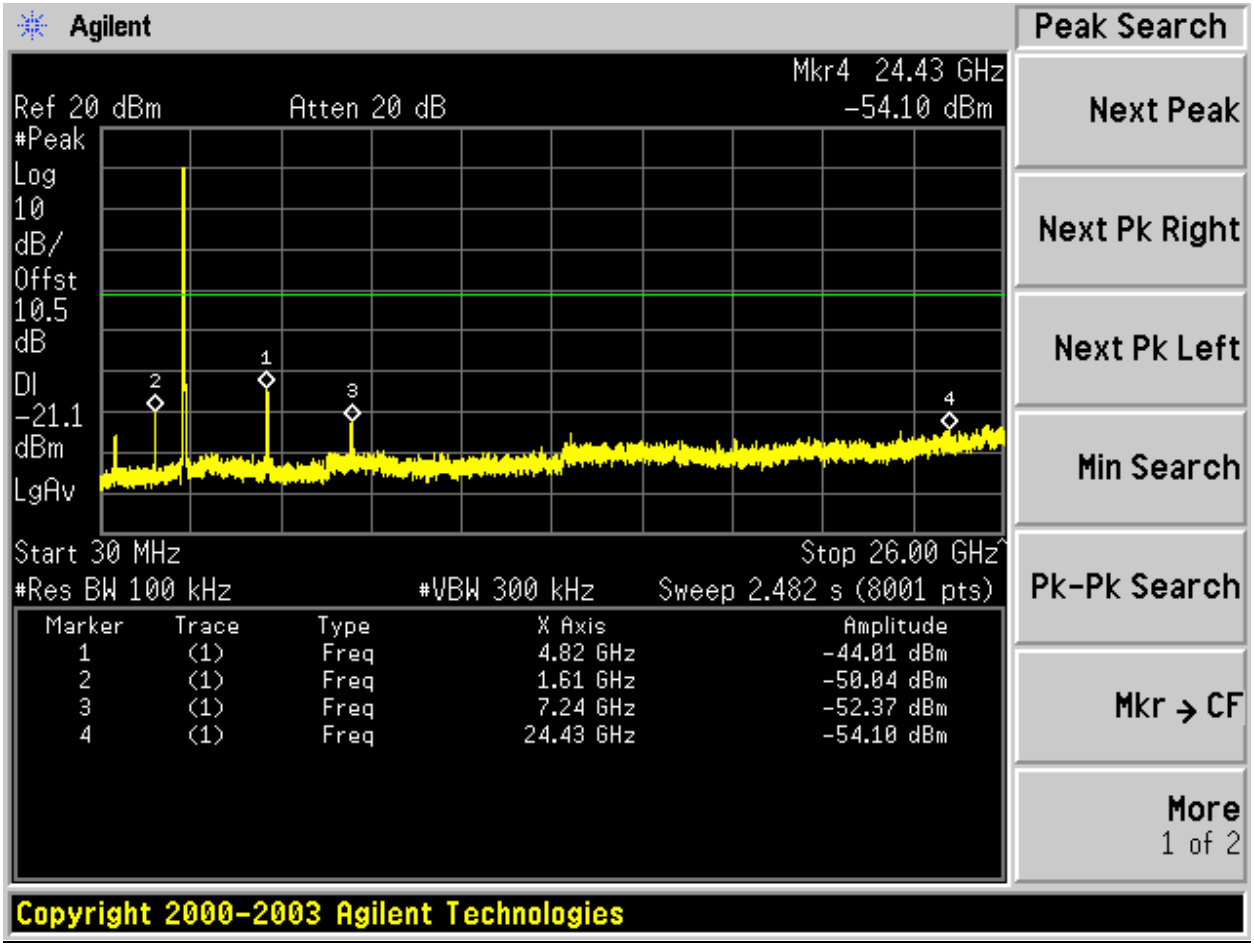
SPURIOUS EMISSIONS, HIGH CHANNEL 802.11b (2 of 2)



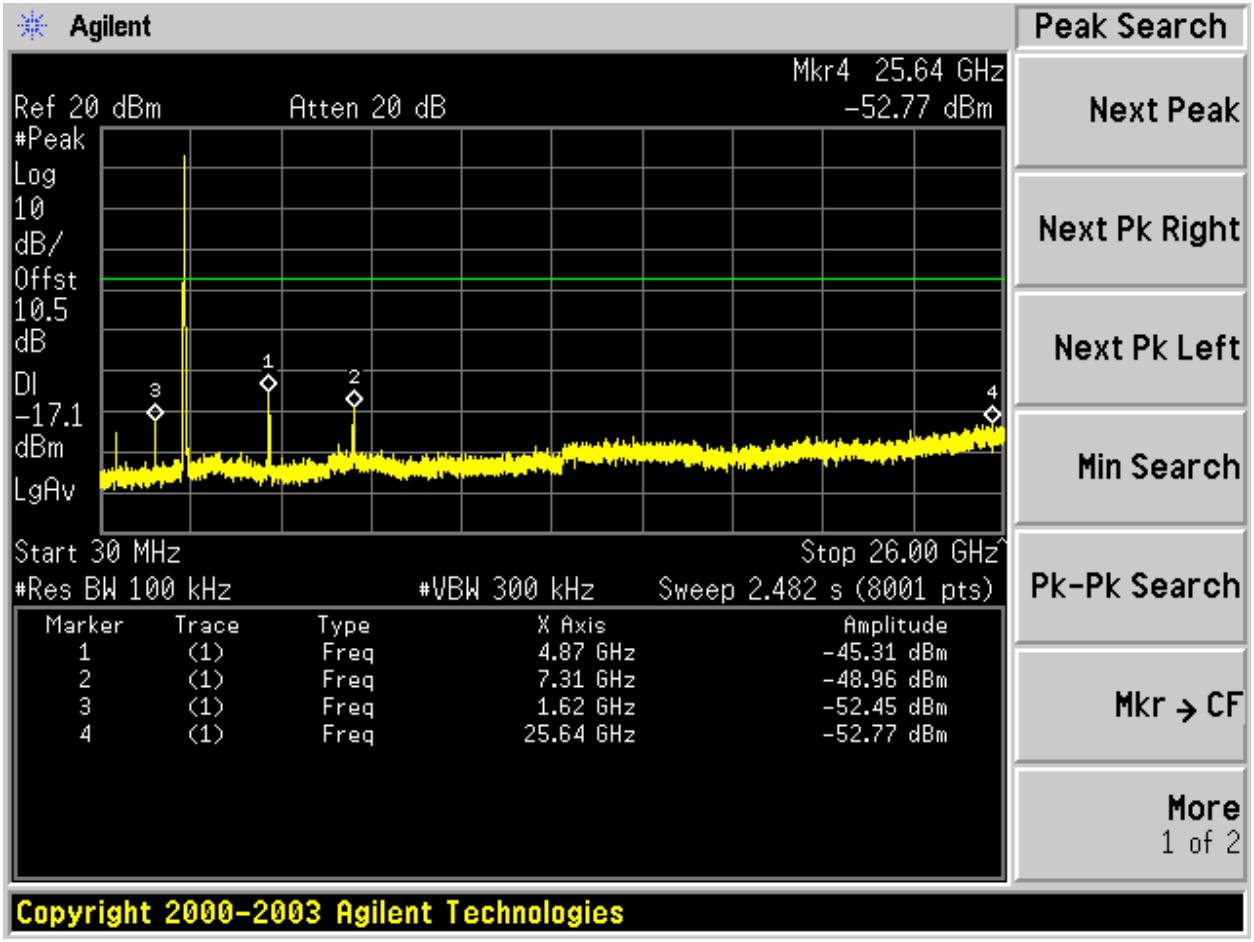
SPURIOUS EMISSIONS, LOW CHANNEL 802.11g (1 of 2)



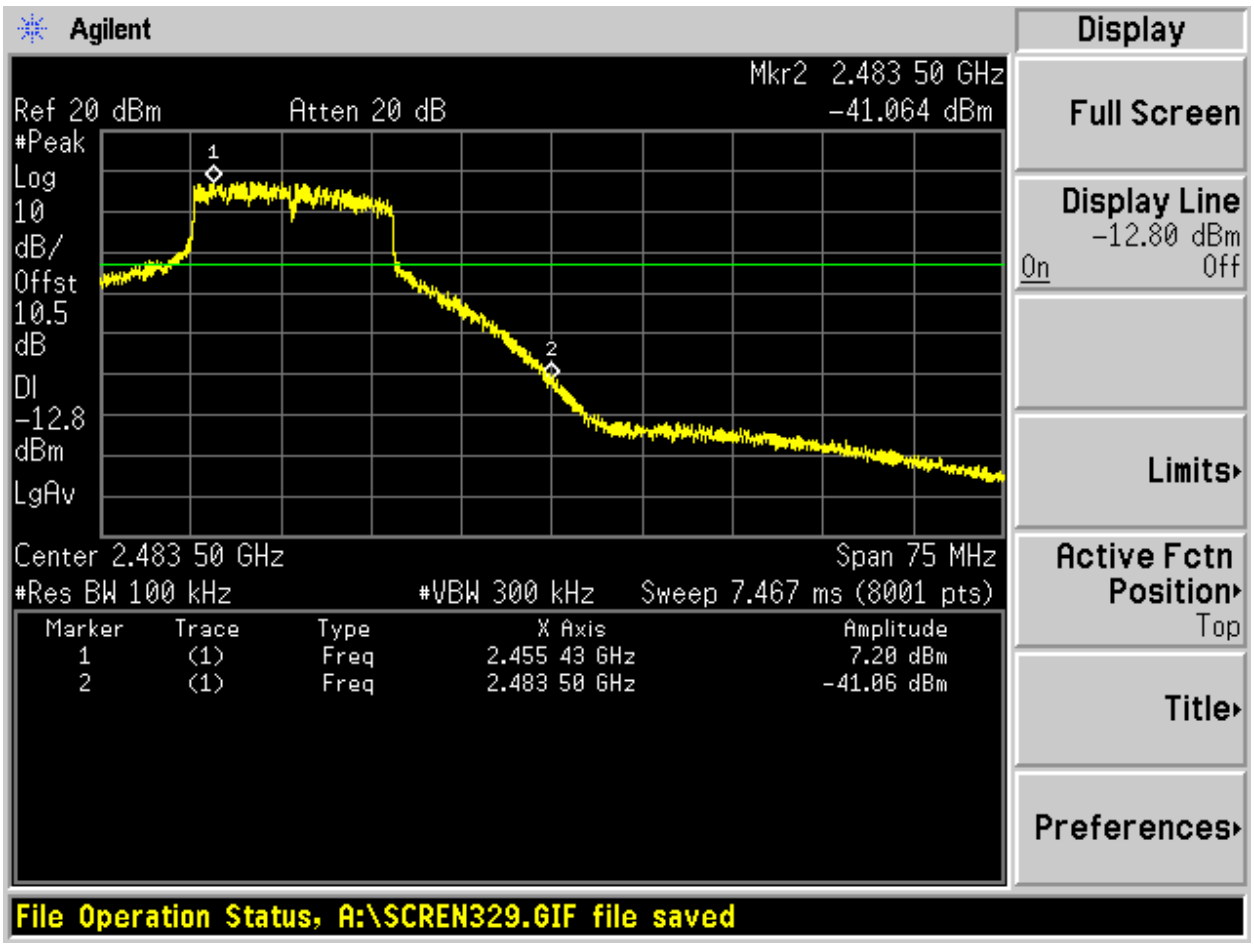
SPURIOUS EMISSIONS, LOW CHANNEL 802.11g (2 of 2)



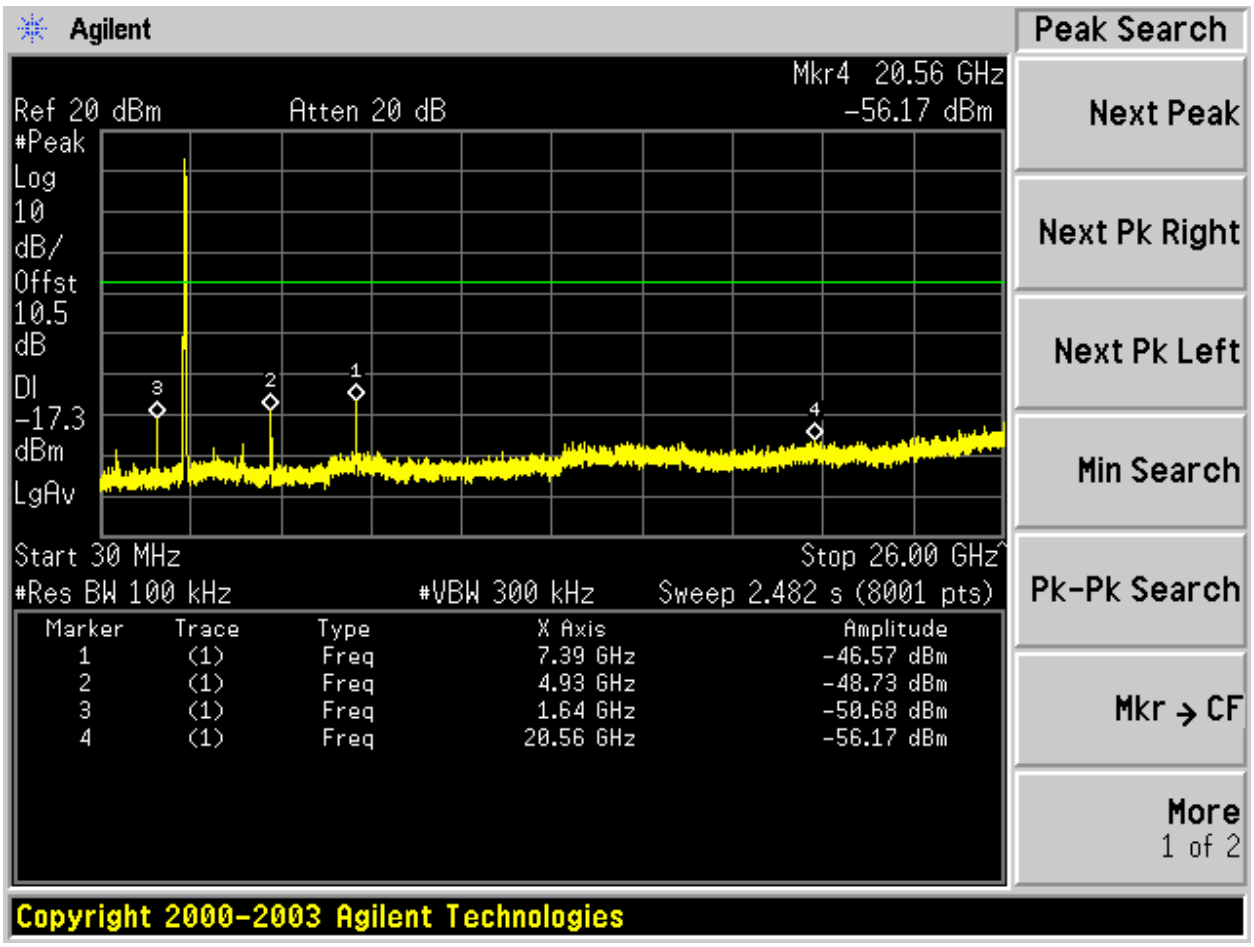
SPURIOUS EMISSIONS, MID CHANNEL 802.11g (1 of 1)



SPURIOUS EMISSIONS, HIGH CHANNEL 802.11g (1 of 2)



SPURIOUS EMISSIONS, HIGH CHANNEL5 802.11g (2 of 2)



3.8. RADIATED EMISSIONS

3.8.1. 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 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2] Above 38.6

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

§15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

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

TEST PROCEDURE

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

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

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

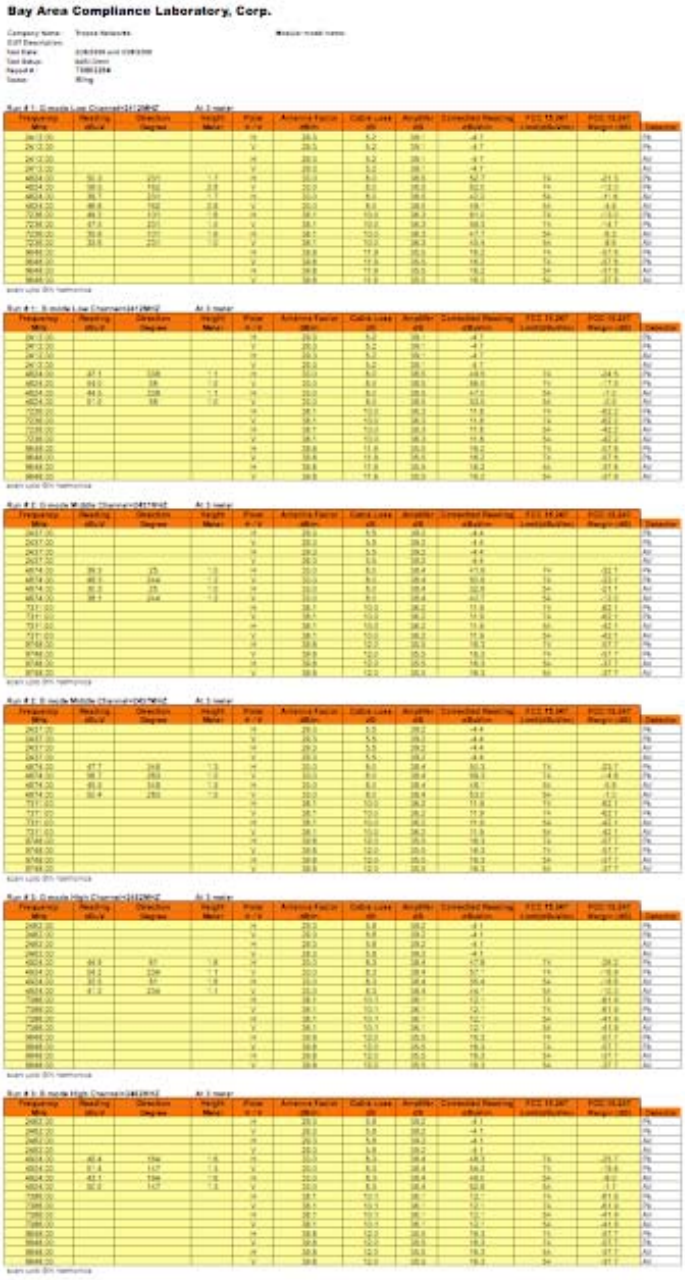
The spectrum from 30 MHz to 24.85 GHz is investigated with the transmitter set to the lowest, middle, and high transmit channels: 2412MHz, 2437 MHz and 2462 MHz.

Testing was performed with three antennas: 6 dBi omni, 7.4 dBi omni and 12 dBi panel.

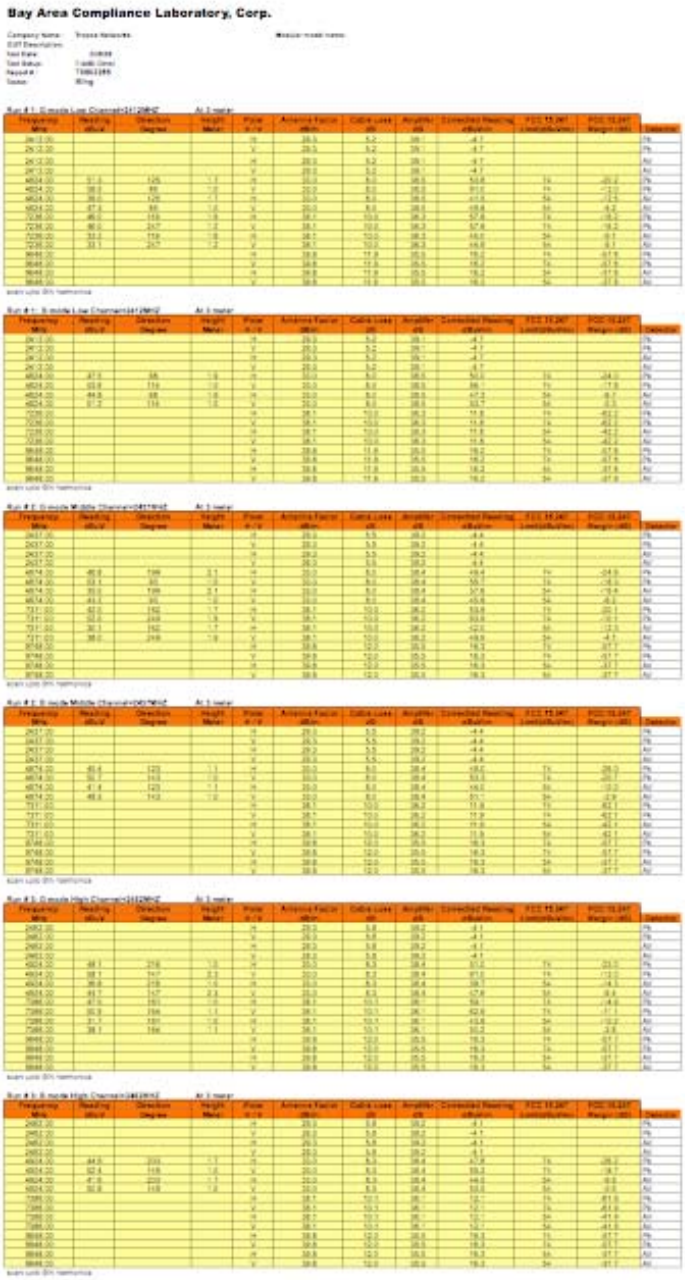
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

3.8.2. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHZ HARMONICS AND SPURIOUS EMISSIONS

Bay Area Compliance Laboratory, Corp.



7.4 dBi



Bay Area Compliance Laboratory, Corp.

Bay Area Compliance Laboratory, Corp.

Company Name : Trapeo Networks Modular model name:
EUT Description:
Test Date: 2/28/08
Test Setup: 12dBi patch
Report # : T08022264
Tester: Ming

Run # 1: G mode Low Channel=2412MHZ At 3 meter

Frequency MHz	Reading dBuV	Direction Degree	Height Meter	Polar H / V	Antenna Factor dBm	Cable Loss dB	Amplifier dB	Corrected Reading dBuV/m	FCC 15.247 Limit(dBuV/m)	FCC 15.247 Margin (dB)	Detector
2412.00				H	29.3	5.2	39.1	-4.7			Pk
2412.00				V	29.3	5.2	39.1	-4.7			Pk
2412.00				H	29.3	5.2	39.1	-4.7			AV
2412.00				V	29.3	5.2	39.1	-4.7			AV
4824.00	50.0	151	1.3	H	33.0	8.0	38.5	52.4	74	-21.6	Pk
4824.00	55.5	151	1.0	V	33.0	8.0	38.5	57.9	74	-16.1	Pk
4824.00	37.7	151	1.3	H	33.0	8.0	38.5	40.2	54	-13.8	AV
4824.00	41.8	151	1.0	V	33.0	8.0	38.5	44.3	54	-9.7	AV
7236.00	45.2	159	1.0	H	38.1	10.0	36.3	58.0	74	-16.0	Pk
7236.00	50.5	179	1.0	V	38.1	10.0	36.3	62.3	74	-11.7	Pk
7236.00	32.8	159	1.0	H	38.1	10.0	36.3	44.4	54	-9.6	AV
7236.00	36.0	179	1.0	V	38.1	10.0	36.3	47.8	54	-6.2	AV
9648.00				H	39.8	11.9	35.5	16.2	74	-57.8	Pk
9648.00				V	39.8	11.9	35.5	16.2	74	-57.8	Pk
9648.00				H	39.8	11.9	35.5	16.2	54	-37.8	AV
9648.00				V	39.8	11.9	35.5	16.2	54	-37.8	AV

scan upto 5th harmonics

Run # 1: B mode Low Channel=2412MHZ At 3 meter

Frequency MHz	Reading dBuV	Direction Degree	Height Meter	Polar H / V	Antenna Factor dBm	Cable Loss dB	Amplifier dB	Corrected Reading dBuV/m	FCC 15.247 Limit(dBuV/m)	FCC 15.247 Margin (dB)	Detector
2412.00				H	29.3	5.2	39.1	-4.7			Pk
2412.00				V	29.3	5.2	39.1	-4.7			Pk
2412.00				H	29.3	5.2	39.1	-4.7			AV
2412.00				V	29.3	5.2	39.1	-4.7			AV
4824.00	45.0	70	1.5	H	33.0	8.0	38.5	50.5	74	-23.5	Pk
4824.00	57.2	360	1.3	V	33.0	8.0	38.5	59.7	74	-14.3	Pk
4824.00	45.2	70	1.5	H	33.0	8.0	38.5	47.7	54	-6.3	AV
4824.00	51.1	360	1.3	V	33.0	8.0	38.5	53.6	54	-0.4	AV
7236.00				H	38.1	10.0	36.3	11.8	74	-62.2	Pk
7236.00				V	38.1	10.0	36.3	11.8	74	-62.2	Pk
7236.00				H	38.1	10.0	36.3	11.8	54	-42.2	AV
7236.00				V	38.1	10.0	36.3	11.8	54	-42.2	AV
9648.00				H	39.8	11.9	35.5	16.2	74	-57.8	Pk
9648.00				V	39.8	11.9	35.5	16.2	74	-57.8	Pk
9648.00				H	39.8	11.9	35.5	16.2	54	-37.8	AV
9648.00				V	39.8	11.9	35.5	16.2	54	-37.8	AV

scan upto 5th harmonics

Run # 2: G mode Middle Channel=2437MHZ At 3 meter

Frequency MHz	Reading dBuV	Direction Degree	Height Meter	Polar H / V	Antenna Factor dBm	Cable Loss dB	Amplifier dB	Corrected Reading dBuV/m	FCC 15.247 Limit(dBuV/m)	FCC 15.247 Margin (dB)	Detector
2437.00				H	29.3	5.5	39.2	-4.4			Pk
2437.00				V	29.3	5.5	39.2	-4.4			Pk
2437.00				H	29.3	5.5	39.2	-4.4			AV
2437.00				V	29.3	5.5	39.2	-4.4			AV
4874.00	49.8	0	1.1	H	33.0	8.0	38.4	52.4	74	-21.6	Pk
4874.00	54.0	0	1.3	V	33.0	8.0	38.4	56.6	74	-17.4	Pk
4874.00	37.5	0	1.1	H	33.0	8.0	38.4	40.1	54	-13.9	AV
4874.00	42.1	0	1.3	V	33.0	8.0	38.4	44.7	54	-9.3	AV
7311.00	48.3	113	1.5	H	38.1	10.0	36.2	60.2	74	-13.8	Pk
7311.00	45.4	186	2.2	V	38.1	10.0	36.2	58.3	74	-15.7	Pk
7311.00	35.4	113	1.5	H	38.1	10.0	36.2	48.3	54	-5.7	AV
7311.00	33.2	186	2.2	V	38.1	10.0	36.2	45.1	54	-8.9	AV
9748.00				H	39.8	12.0	35.5	16.3	74	-57.7	Pk
9748.00				V	39.8	12.0	35.5	16.3	74	-57.7	Pk
9748.00				H	39.8	12.0	35.5	16.3	54	-37.7	AV
9748.00				V	39.8	12.0	35.5	16.3	54	-37.7	AV

scan upto 5th harmonics

Run # 2: B mode Middle Channel=2437MHZ At 3 meter

Frequency MHz	Reading dBuV	Direction Degree	Height Meter	Polar H / V	Antenna Factor dBm	Cable Loss dB	Amplifier dB	Corrected Reading dBuV/m	FCC 15.247 Limit(dBuV/m)	FCC 15.247 Margin (dB)	Detector
2437.00				H	29.3	5.5	39.2	-4.4			Pk
2437.00				V	29.3	5.5	39.2	-4.4			Pk
2437.00				H	29.3	5.5	39.2	-4.4			AV
2437.00				V	29.3	5.5	39.2	-4.4			AV
4874.00	47.1	352	1.2	H	33.0	8.0	38.4	49.7	74	-24.3	Pk
4874.00	53.2	360	1.2	V	33.0	8.0	38.4	55.8	74	-18.2	Pk
4874.00	44.0	352	1.2	H	33.0	8.0	38.4	46.6	54	-7.4	AV
4874.00	51.1	360	1.2	V	33.0	8.0	38.4	53.7	54	-0.3	AV
7311.00				H	38.1	10.0	36.2	11.9	74	-62.1	Pk
7311.00				V	38.1	10.0	36.2	11.9	74	-62.1	Pk
7311.00				H	38.1	10.0	36.2	11.9	54	-42.1	AV
7311.00				V	38.1	10.0	36.2	11.9	54	-42.1	AV
9748.00				H	39.8	12.0	35.5	16.3	74	-57.7	Pk
9748.00				V	39.8	12.0	35.5	16.3	74	-57.7	Pk
9748.00				H	39.8	12.0	35.5	16.3	54	-37.7	AV
9748.00				V	39.8	12.0	35.5	16.3	54	-37.7	AV

scan upto 5th harmonics

Run # 3: G mode High Channel=2462MHZ At 3 meter

Frequency MHz	Reading dBuV	Direction Degree	Height Meter	Polar H / V	Antenna Factor dBm	Cable Loss dB	Amplifier dB	Corrected Reading dBuV/m	FCC 15.247 Limit(dBuV/m)	FCC 15.247 Margin (dB)	Detector
2462.00				H	29.3	5.8	39.2	-4.1			Pk
2462.00				V	29.3	5.8	39.2	-4.1			Pk
2462.00				H	29.3	5.8	39.2	-4.1			AV
2462.00				V	29.3	5.8	39.2	-4.1			AV
4924.00	44.2	153	1.5	H	33.0	8.3	38.4	47.1	74	-26.9	Pk
4924.00	50.5	0	1.3	V	33.0	8.3	38.4	53.4	74	-20.6	Pk
4924.00	32.9	153	1.5	H	33.0	8.3	38.4	35.8	54	-18.3	AV
4924.00	35.5	0	1.3	V	33.0	8.3	38.4	38.4	54	-14.6	AV
7386.00				H	38.1	10.1	36.1	12.1	74	-61.9	Pk
7386.00				V	38.1	10.1	36.1	12.1	74	-61.9	Pk
7386.00				H	38.1	10.1	36.1	12.1	54	-41.9	AV
7386.00				V	38.1	10.1	36.1	12.1	54	-41.9	AV
9648.00				H	39.8	12.0	35.5	16.3	74	-57.7	Pk
9648.00				V	39.8	12.0	35.5	16.3	74	-57.7	Pk
9648.00				H	39.8	12.0	35.5	16.3	54	-37.7	AV
9648.00				V	39.8	12.0	35.5	16.3	54	-37.7	AV

scan upto 5th harmonics

Run # 3: B mode High Channel=2462MHZ At 3 meter

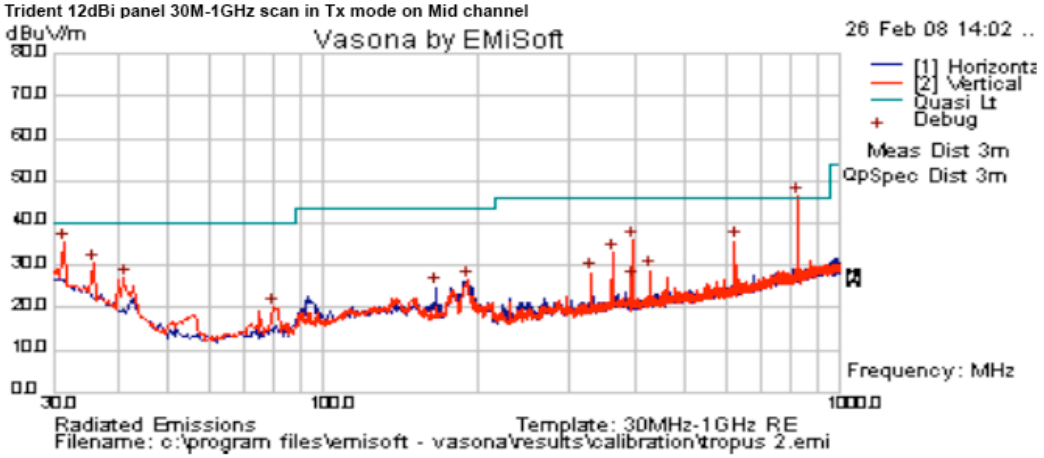
Frequency MHz	Reading dBuV	Direction Degree	Height Meter	Polar H / V	Antenna Factor dBm	Cable Loss dB	Amplifier dB	Corrected Reading dBuV/m	FCC 15.247 Limit(dBuV/m)	FCC 15.247 Margin (dB)	Detector
2462.00				H	29.3	5.8	39.2	-4.1			Pk
2462.00				V	29.3	5.8	39.2	-4.1			Pk
2462.00				H	29.3	5.8	39.2	-4.1			AV
2462.00				V	29.3	5.8	39.2	-4.1			AV
4924.00	47.3	153	1.6	H	33.0	8.3	38.4	50.2	74	-23.8	Pk
4924.00	50.8	150	1.3	V	33.0	8.3	38.4	53.7	74	-20.3	Pk
4924.00	44.5	153	1.6	H	33.0	8.3	38.4	47.4	54	-6.6	AV
4924.00	49.0	150	1.3	V	33.0	8.3	38.4	51.9	54	-2.1	AV
7386.00				H	38.1	10.1	36.1	12.1	74	-61.9	Pk
7386.00				V	38.1	10.1	36.1	12.1	74	-61.9	Pk
7386.00				H	38.1	10.1	36.1	12.1	54	-41.9	AV
7386.00				V	38.1	10.1	36.1	12.1	54	-41.9	AV
9648.00				H	39.8	12.0	35.5	16.3	74	-57.7	Pk
9648.00				V	39.8	12.0	35.5	16.3	74	-57.7	Pk
9648.00				H	39.8	12.0	35.5	16.3	54	-37.7	AV
9648.00				V	39.8	12.0	35.5	16.3	54	-37.7	AV

scan upto 5th harmonics

1. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

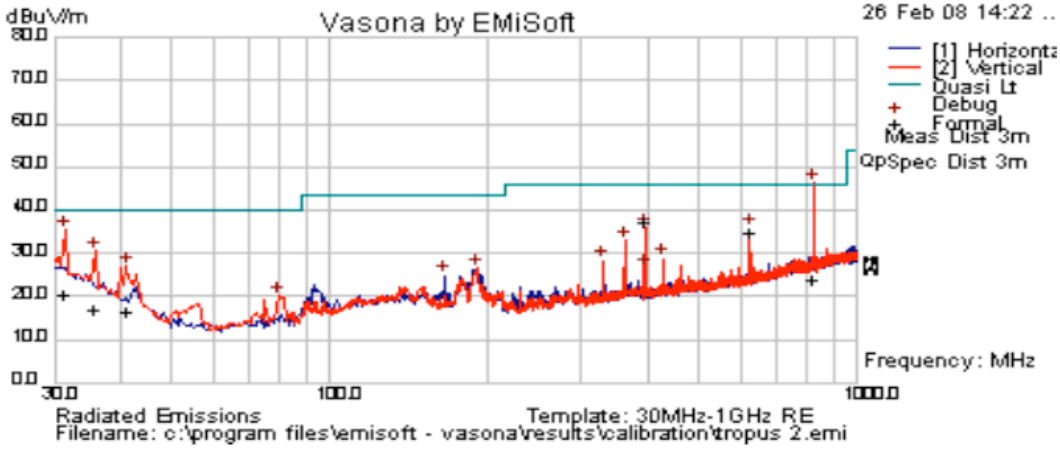
Tropos Networks T0802264

Trident 12dBi panel 30M-1GHz scan in Tx mode on Mid channel



Peak Scan

No	Frequency	Raw data d	Cable Loss	AF+Pre Am	Corrected d	Measureme	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail
1	830.25	42.44	11.89	-8.06	46.27	Peak [Scan	V	100	0	46	0.27	Fail
2	31.455	34.17	10.42	-8.96	35.63	Peak [Scan	V	100	0	40	-4.37	Pass
3	35.82	32.37	10.44	-12.21	30.6	Peak [Scan	V	200	0	40	-9.4	Pass
4	395.205	38.2	11.23	-13.47	35.96	Peak [Scan	V	100	0	46	-10.04	Pass
5	626.065	35.11	11.65	-11.05	35.71	Peak [Scan	V	100	0	46	-10.29	Pass
6	41.155	32.44	10.45	-15.74	27.16	Peak [Scan	V	100	0	40	-12.84	Pass
7	362.225	35.52	11.18	-13.73	32.97	Peak [Scan	V	100	0	46	-13.03	Pass
8	190.05	33.04	10.82	-17.36	26.5	Peak [Scan	V	100	0	43.5	-17	Pass
9	428.185	30.53	11.28	-13.06	28.75	Peak [Scan	V	100	0	46	-17.25	Pass
10	329.245	31.72	11.12	-14.57	28.28	Peak [Scan	V	100	0	46	-17.72	Pass
11	164.83	30.68	10.78	-16.68	24.78	Peak [Scan	H	200	0	43.5	-18.72	Pass
12	396.175	28.52	11.23	-13.48	26.28	Peak [Scan	V	100	0	46	-19.72	Pass
13	79.955	30.01	10.53	-20.33	20.21	Peak [Scan	V	100	0	40	-19.79	Pass



Quasi-Peak Scan

No	Frequency	Raw data d	Cable Loss	AF+Pre Am	Corrected d	Measureme	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail
1	830.05	17.94	11.89	-8.06	21.78	Quasi Max	V	179	4	46	-24.22	Pass
2	31.345	16.7	10.42	-8.87	18.25	Quasi Max	V	285	193	40	-21.75	Pass
3	35.688	16.38	10.44	-12.11	14.71	Quasi Max	V	367	207	40	-25.29	Pass
4	395.245	37.05	11.23	-13.47	34.81	Quasi Max	V	108	159	46	-11.19	Pass
5	625.85	31.68	11.65	-11.06	32.27	Quasi Max	V	98	169	46	-13.73	Pass
6	41.096	19.37	10.45	-15.7	14.13	Quasi Max	V	129	241	40	-25.87	Pass

3.9. 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.

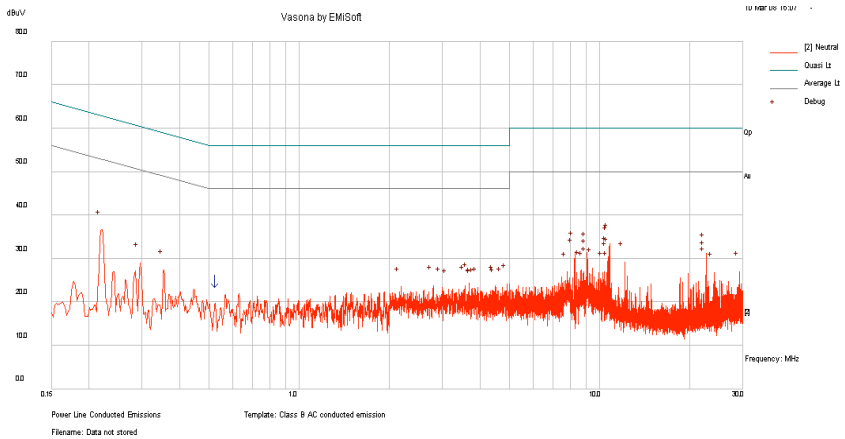
Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

No non-compliance noted:

Tropos Networks
Model: Blowfish
Trident 2.4 radio
120V / 60Hz
Class B
External 5V supply - card ON

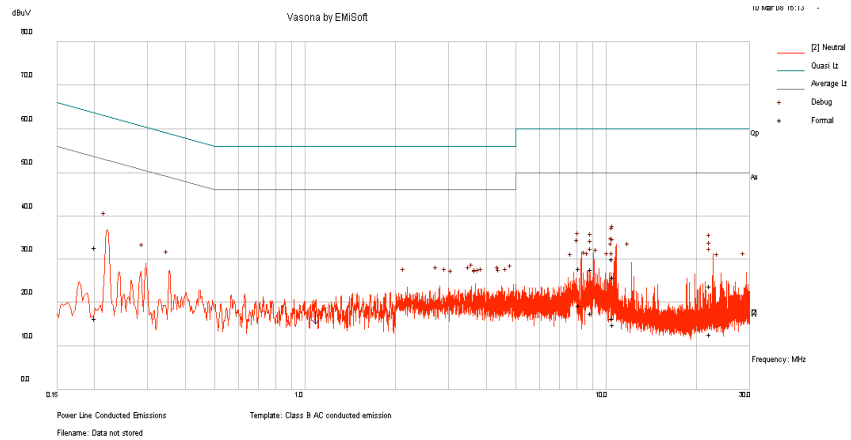
Peak graph - Neutral



Peak Measurements

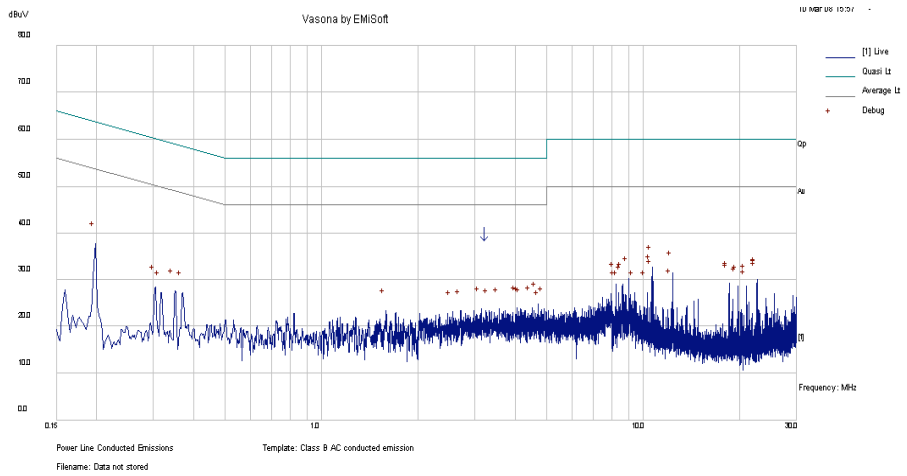
No	Frequency	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measureme	Line	Limit dBuV	Margin dB	Pass /Fail
1	0.221	24.33	12.2	0	36.53	Peak [Scan	Neutral	52.79	-16.26	Pass
2	10.788	21.05	12.4	0	33.45	Peak [Scan	Neutral	50	-16.55	Pass
3	10.725	20.32	12.4	0	32.72	Peak [Scan	Neutral	50	-17.28	Pass
4	8.275	19.13	12.4	0	31.53	Peak [Scan	Neutral	50	-18.47	Pass
5	9.077	19.06	12.4	0	31.46	Peak [Scan	Neutral	50	-18.54	Pass
6	22.596	18.61	12.5	0	31.11	Peak [Scan	Neutral	50	-18.89	Pass
7	10.667	18.03	12.4	0	30.43	Peak [Scan	Neutral	50	-19.57	Pass
8	10.766	17.76	12.4	0	30.16	Peak [Scan	Neutral	50	-19.84	Pass
9	8.214	17.57	12.4	0	29.97	Peak [Scan	Neutral	50	-20.03	Pass
10	9.115	17.35	12.4	0	29.75	Peak [Scan	Neutral	50	-20.25	Pass
11	22.613	16.94	12.5	0	29.44	Peak [Scan	Neutral	50	-20.56	Pass
12	10.63	16.87	12.4	0	29.27	Peak [Scan	Neutral	50	-20.73	Pass
13	12.111	16.81	12.4	0	29.21	Peak [Scan	Neutral	50	-20.79	Pass
14	0.296	16.71	12.2	0	28.91	Peak [Scan	Neutral	50.37	-21.46	Pass
15	0.355	15.04	12.32	0	27.35	Peak [Scan	Neutral	48.84	-21.49	Pass
16	3.674	12.07	12.3	0	24.37	Peak [Scan	Neutral	46	-21.63	Pass
17	4.922	11.9	12.3	0	24.2	Peak [Scan	Neutral	46	-21.8	Pass
18	9.089	15.67	12.4	0	28.07	Peak [Scan	Neutral	50	-21.93	Pass
19	22.637	15.41	12.5	0	27.91	Peak [Scan	Neutral	50	-22.09	Pass
20	9.46	15.39	12.4	0	27.79	Peak [Scan	Neutral	50	-22.21	Pass
21	2.793	11.47	12.29	0	23.76	Peak [Scan	Neutral	46	-22.24	Pass
22	4.484	11.42	12.3	0	23.72	Peak [Scan	Neutral	46	-22.28	Pass
23	3.575	11.36	12.3	0	23.66	Peak [Scan	Neutral	46	-22.34	Pass
24	2.18	11.14	12.28	0	23.42	Peak [Scan	Neutral	46	-22.58	Pass
25	2.987	11.07	12.3	0	23.37	Peak [Scan	Neutral	46	-22.63	Pass
26	4.745	11.06	12.3	0	23.36	Peak [Scan	Neutral	46	-22.64	Pass
27	3.937	10.98	12.3	0	23.28	Peak [Scan	Neutral	46	-22.72	Pass
28	8.684	14.87	12.4	0	27.27	Peak [Scan	Neutral	50	-22.73	Pass
29	4.508	10.91	12.3	0	23.21	Peak [Scan	Neutral	46	-22.79	Pass
30	8.663	14.73	12.4	0	27.13	Peak [Scan	Neutral	50	-22.87	Pass
31	3.763	10.82	12.3	0	23.12	Peak [Scan	Neutral	46	-22.88	Pass
32	3.844	10.78	12.3	0	23.08	Peak [Scan	Neutral	46	-22.92	Pass
33	3.139	10.65	12.3	0	22.95	Peak [Scan	Neutral	46	-23.05	Pass
34	10.346	14.52	12.4	0	26.92	Peak [Scan	Neutral	50	-23.08	Pass
35	10.695	14.51	12.4	0	26.91	Peak [Scan	Neutral	50	-23.09	Pass
36	8.857	14.5	12.4	0	26.9	Peak [Scan	Neutral	50	-23.1	Pass
37	29.226	14.4	12.5	0	26.9	Peak [Scan	Neutral	50	-23.1	Pass
38	3.745	10.55	12.3	0	22.85	Peak [Scan	Neutral	46	-23.15	Pass
39	7.811	14.43	12.4	0	26.83	Peak [Scan	Neutral	50	-23.17	Pass
40	24.001	14.51	12.3	0	26.81	Peak [Scan	Neutral	50	-23.19	Pass

Peak graph showing Quasi-Peak & Average Measurement locations



Tropos Networks
Model: Blowfish
Trident 2.4 radio
120V / 60Hz
Class B
External 5V supply - card ON

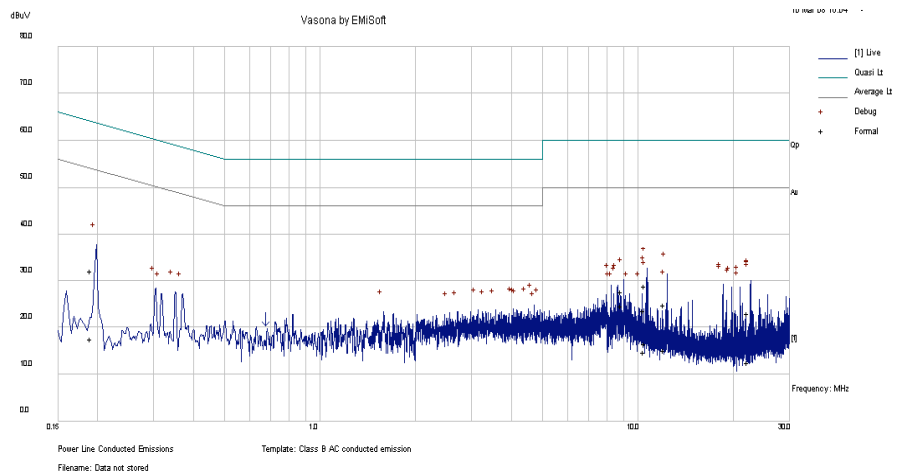
Peak graph - Line



Peak Measurements

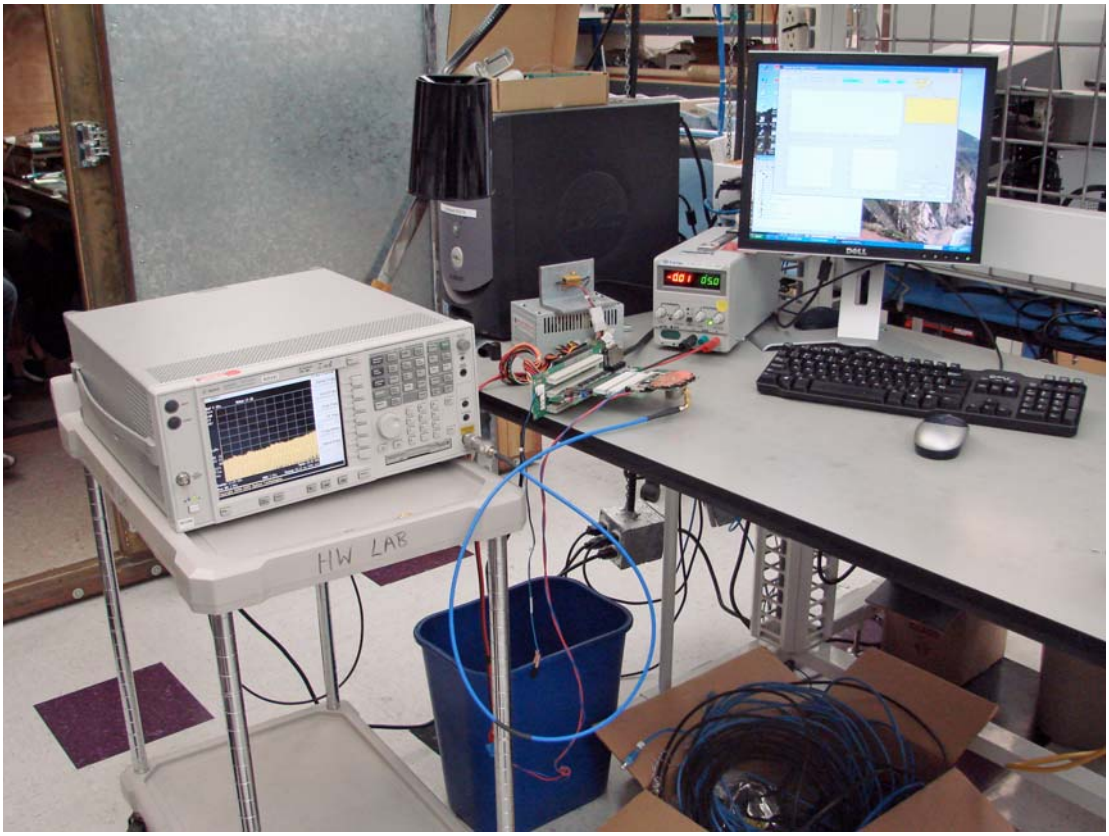
No	Frequency	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measureme	Line	Limit dBuV	Margin dB	Pass /Fail
1	0.199	25.61	12.17	0	37.78	Peak [Scan	Live	53.67	-15.89	Pass
2	10.7	20.26	12.4	0	32.66	Peak [Scan	Live	50	-17.34	Pass
3	12.357	19	12.4	0	31.4	Peak [Scan	Live	50	-18.6	Pass
4	10.63	18.13	12.4	0	30.53	Peak [Scan	Live	50	-19.47	Pass
5	9.029	17.82	12.4	0	30.22	Peak [Scan	Live	50	-19.78	Pass
6	22.601	17.53	12.5	0	30.03	Peak [Scan	Live	50	-19.97	Pass
7	22.579	17.24	12.5	0	29.74	Peak [Scan	Live	50	-20.26	Pass
8	10.719	17.1	12.4	0	29.5	Peak [Scan	Live	50	-20.5	Pass
9	22.628	16.71	12.5	0	29.21	Peak [Scan	Live	50	-20.79	Pass
10	18.496	16.63	12.5	0	29.12	Peak [Scan	Live	50	-20.88	Pass
11	8.217	16.56	12.4	0	28.96	Peak [Scan	Live	50	-21.04	Pass
12	8.663	16.5	12.4	0	28.9	Peak [Scan	Live	50	-21.1	Pass
13	18.528	16.32	12.5	0	28.82	Peak [Scan	Live	50	-21.18	Pass
14	4.708	12.41	12.3	0	24.71	Peak [Scan	Live	46	-21.29	Pass
15	0.37	14.84	12.35	0	27.19	Peak [Scan	Live	48.5	-21.31	Pass
16	0.35	15.31	12.31	0	27.62	Peak [Scan	Live	48.97	-21.35	Pass
17	20.928	16.09	12.5	0	28.59	Peak [Scan	Live	50	-21.41	Pass
18	8.611	16.08	12.4	0	28.48	Peak [Scan	Live	50	-21.52	Pass
19	19.718	16.07	12.4	0	28.47	Peak [Scan	Live	50	-21.53	Pass
20	0.305	16.09	12.21	0	28.3	Peak [Scan	Live	50.11	-21.81	Pass
21	19.674	15.56	12.4	0	27.96	Peak [Scan	Live	50	-22.04	Pass
22	4.508	11.58	12.3	0	23.88	Peak [Scan	Live	46	-22.12	Pass
23	4.053	11.58	12.3	0	23.88	Peak [Scan	Live	46	-22.12	Pass
24	4.146	11.58	12.16	0	23.74	Peak [Scan	Live	46	-22.26	Pass
25	3.135	11.44	12.3	0	23.74	Peak [Scan	Live	46	-22.26	Pass
26	4.92	11.39	12.3	0	23.69	Peak [Scan	Live	46	-22.31	Pass
27	3.569	11.32	12.3	0	23.62	Peak [Scan	Live	46	-22.38	Pass
28	12.34	15.15	12.4	0	27.55	Peak [Scan	Live	50	-22.45	Pass
29	4.183	11.47	12.05	0	23.52	Peak [Scan	Live	46	-22.48	Pass
30	20.976	14.96	12.5	0	27.46	Peak [Scan	Live	50	-22.54	Pass
31	3.325	11.09	12.3	0	23.39	Peak [Scan	Live	46	-22.61	Pass
32	0.316	14.92	12.24	0	27.16	Peak [Scan	Live	49.81	-22.65	Pass
33	1.588	10.94	12.3	0	23.24	Peak [Scan	Live	46	-22.76	Pass
34	2.717	10.99	12.22	0	23.21	Peak [Scan	Live	46	-22.79	Pass
35	8.393	14.78	12.4	0	27.18	Peak [Scan	Live	50	-22.82	Pass
36	10.286	14.77	12.4	0	27.17	Peak [Scan	Live	50	-22.83	Pass
37	9.426	14.69	12.4	0	27.09	Peak [Scan	Live	50	-22.91	Pass
38	8.236	14.69	12.4	0	27.09	Peak [Scan	Live	50	-22.91	Pass
39	2.551	10.76	12.25	0	23.01	Peak [Scan	Live	46	-22.99	Pass
40	4.792	10.7	12.3	0	23	Peak [Scan	Live	46	-23	Pass

Peak graph showing Quasi-Peak & Average Measurement locations



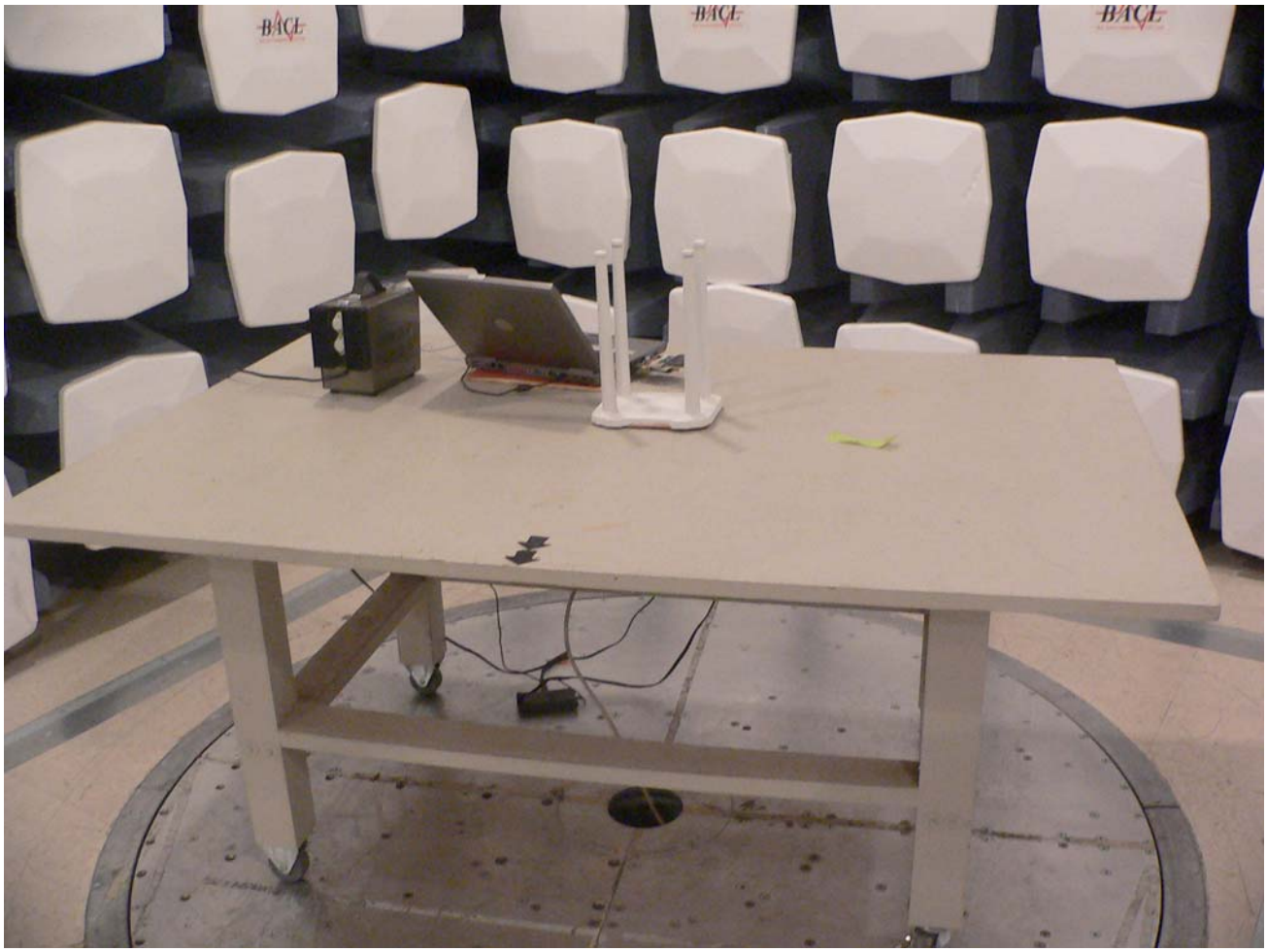
SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP

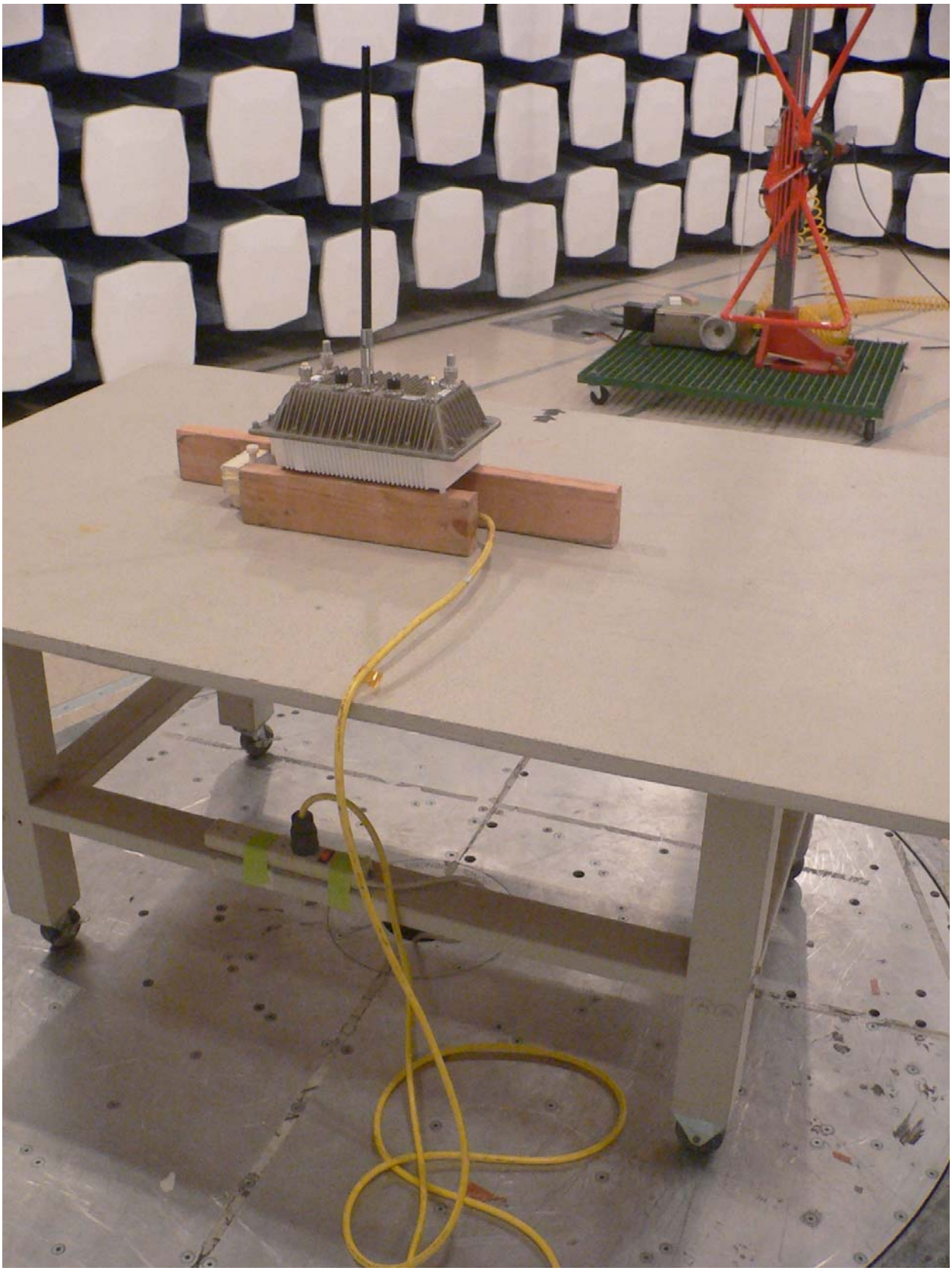


RADIATED RF MEASUREMENT SETUP

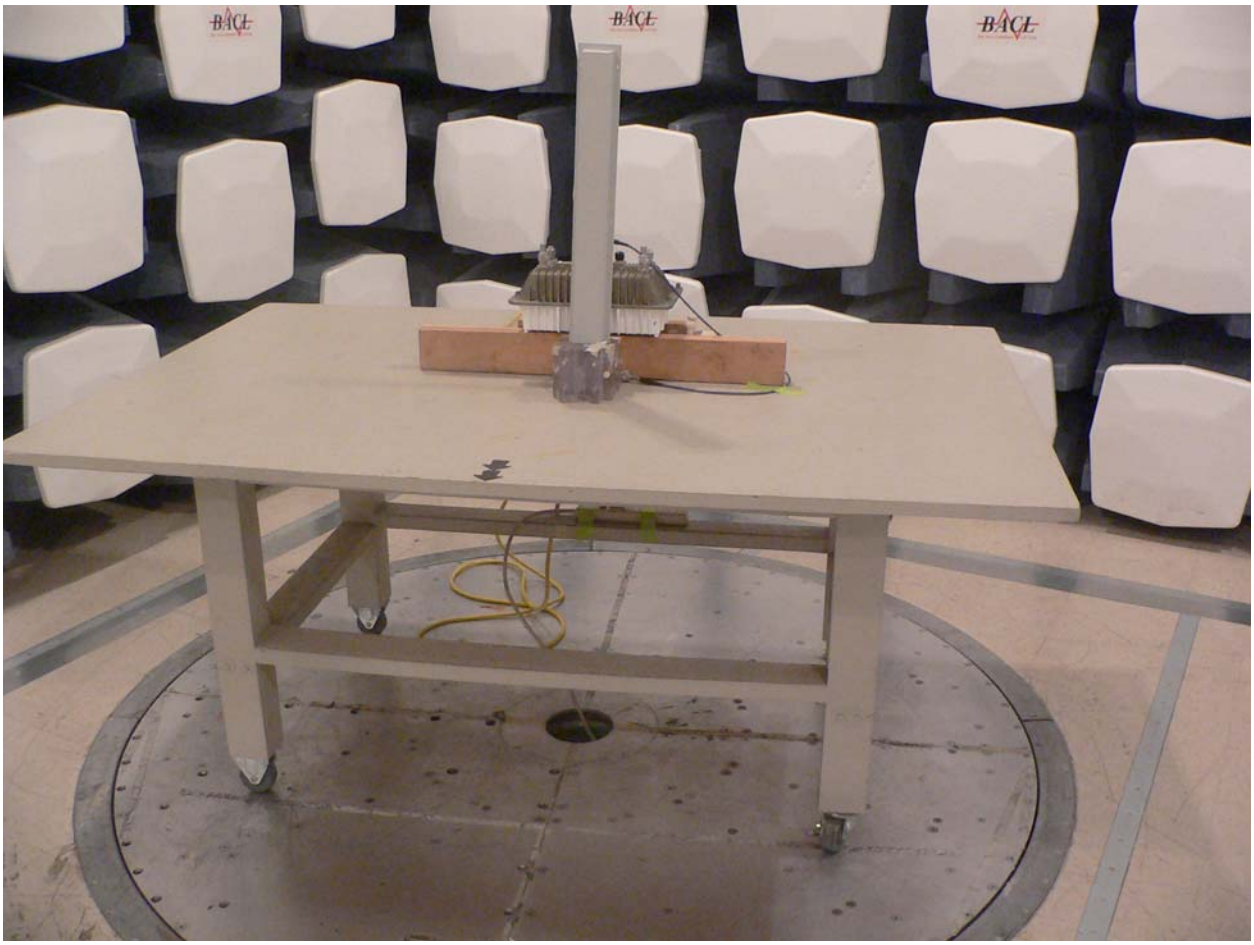
6 dBi Antenna



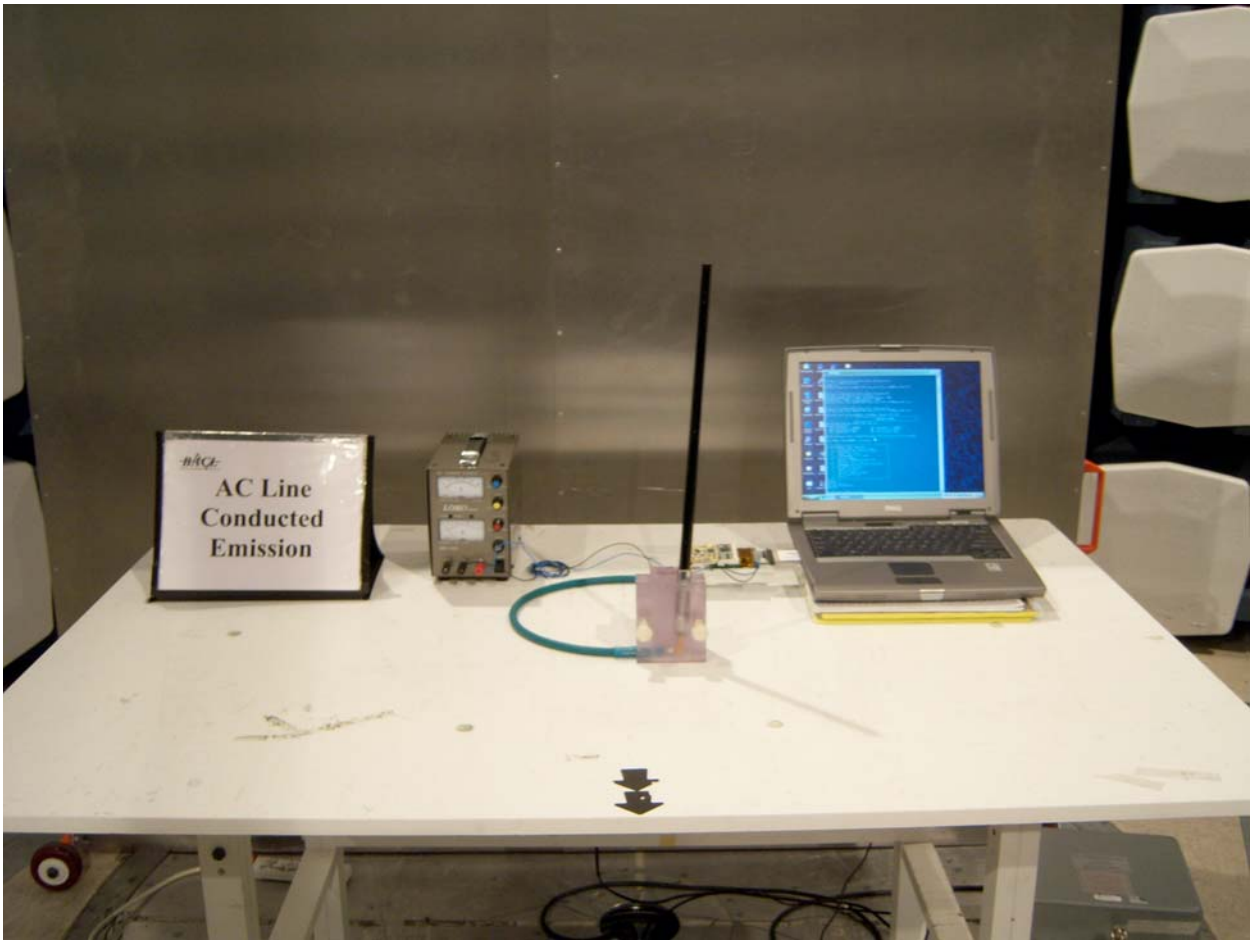
7.4 dBi



12 dBi antenna



POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP



END OF REPORT