



**FCC CFR47 PART 15 SUBPART C  
CERTIFICATION**

**TEST REPORT**

**FOR**

**WIRELESS 802.11B MESH NETWORKED ETHERNET SERVICE POINT**

**MODEL NUMBER: 1000S**

**FCC ID: REP-1000S-1**

**REPORT NUMBER: 03U2377-1**

**ISSUE DATE: JANUARY 21, 2004**

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## 1. TEST RESULT CERTIFICATION

**COMPANY NAME:** FIRETIDE  
928 NUUANU AVE., SUITE 200  
HONOLULU, HI 96817

**EUT DESCRIPTION:** WIRELESS 802.11B MESH NETWORKED ETHERNET SERVICE POINT

**MODEL:** 1000S

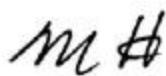
**DATE TESTED:** DECEMBER 11, 2003 TO JANUARY 13, 2004

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:



MIKE HECKROTTE  
CHIEF ENGINEER  
COMPLIANCE CERTIFICATION SERVICES

Tested By:



NEELESH RAJ  
EMC TECHNICIAN  
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## 2. EUT DESCRIPTION

The EUT is an 802.11b transceiver operating in the 2400-2483.5 MHz band.

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

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11b	25.40	346.74

The radio utilizes two identical external Omni Antennas (p/n# S151TR-2450S) for diversity, each with a maximum gain of 6.2 dBi.

### 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>.



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

## 5. CALIBRATION AND UNCERTAINTY

### 5.1. MEASURING INSTRUMENT CALIBRATION

The 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%.

### 5.3. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	Cal Due
EMI Test Receiver	R & S	ESHS 20	827129/006	7/17/2004
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	8379443	10/13/04
Line Filter	Lindgren	LMF-3489	497	CNR
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	10/13/04
Quasi-Peak Adaptor	HP	85650A	2521A01038	7/16/04
SA Display Section 3	HP	85662A	2314A04793	7/16/04
SA RF Section, 1.5 GHz	HP	85680A	2314A02604	7/16/04
Site C Preamplifier, 1300MHz	HP	8447D	2944A06550	8/18/04
Site C Antenna, Biconial	Eaton	94455-1	1214	3/6/04
Site C Antenna, Log Periodic	EMCO	3146	9107-3163	3/6/04
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	2238	2/4/04
Preamplifier, 1~26GHz	MITEQ	NSP2600-SP	924342	4/25/04
Preamplifier, 1 ~ 26 GHz	Miteq	NSP10023988	646456	4/25/04
Antenna, Horn 18 ~ 26 GHz	ARA	MWH-1826/B	1013	2/2/04
Peak Power Meter	Agilent	E4416A	GB41291160	11/7/04
Peak / Average Power Sensor	Agilent	E9327A	US40440755	11/7/04
Spectrum Analyzer 3Hz ~ 26.5GHz	Agilent	E4440A	US41421507	5/8/04
Spectrum Analyzer 20Hz ~ 44 GHz	Agilent	E4446A	US42510266	7/23/04
2.4-2.5 GHz Reject Filter	Microtronics	BRM50702	3	N/A
10dB Attenuator	Weinschel	56-10	1	N/A

## 6. SETUP OF EQUIPMENT UNDER TEST

### RF AND DIGITAL DEVICE SETUP

#### SUPPORT EQUIPMENT

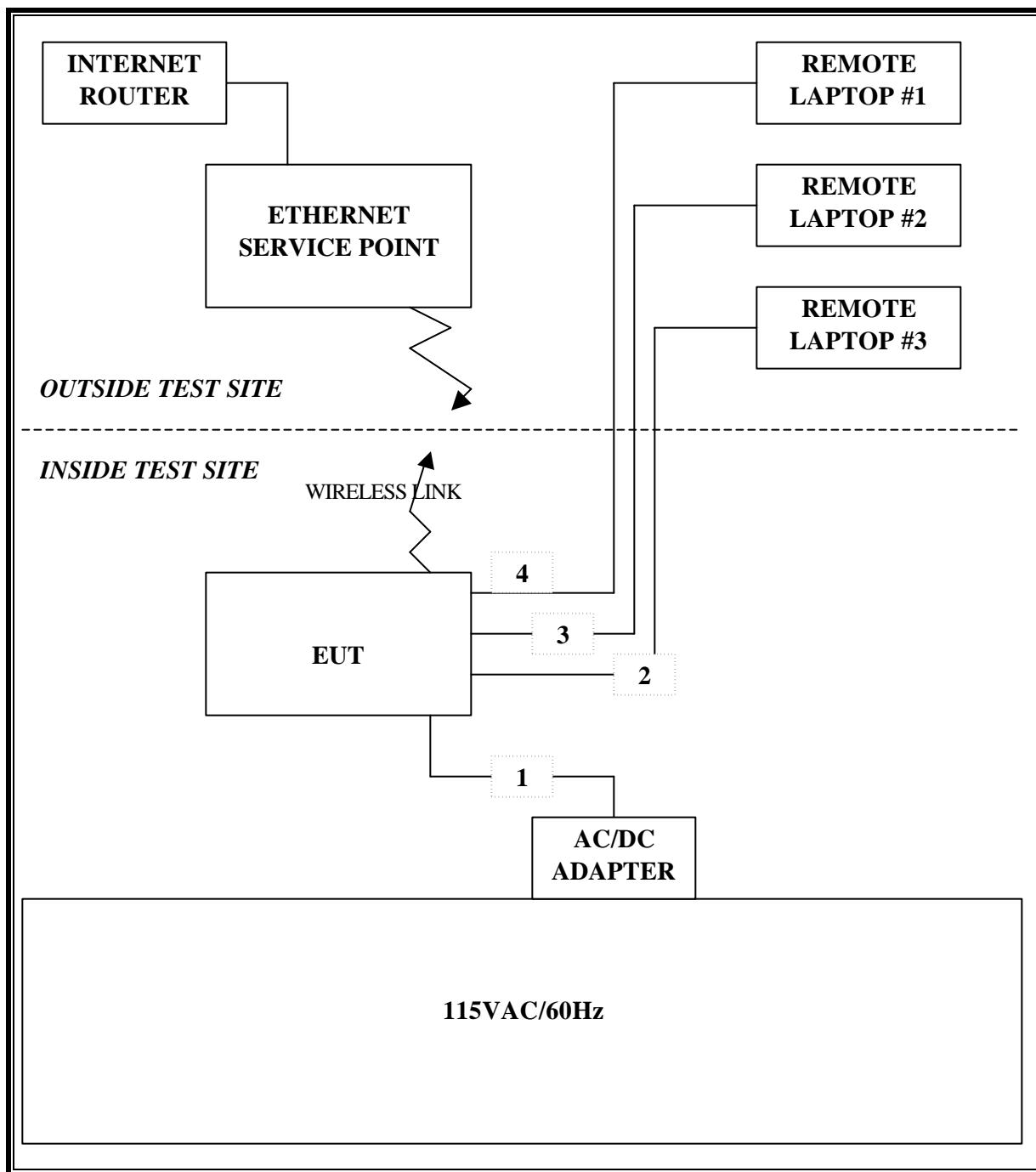
PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
<b>EUT</b>				
802.11b MESH NETWORKED ETHERNET SERVICE POINT	FIRETIDE	1000S	22	REP-1000S-1
AC/DC ADAPTER	JAMECO	DDU120100	N/A	N/A
<b>ACCESSORY EQUIPMENT (LOCATED OUTSIDE THE TEST SITE)</b>				
REMOTE LAPTOP#1	IBM THINKPAD 800	2654	78-PCX3703199	DoC
REMOTE LAPTOP#2	COMPAQ PRESARIO 900	PPP2140	9X2AKSBZEOEH	DoC
REMOTE LAPTOP#3	HP OMNIBOOK 600	OMNI BOOK 600CT	US52900569	B94600YX
MESH NETWORKED ETHERNET SERVICE POINT	FIRETIDE	1000S	21	REP-1000S-1
INTERNET ROUTER	LINKSYS	BEFSR11	40000820	DoC

#### I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	DC PWR	1	DC PWR	UNSHIELDED	1.86M	12VDC (2 PRONG)
2,3,4	ETHERNET	1	RJ45	UNSHIELDED	30M	N/A

#### TEST SETUP

During the testing process the EUT was in continuous transmit mode, and pinging the remote laptops via its ethernet ports. The EUT was running a program called "MRTD" which is a program designed to listen for other member radios and to form a mesh network for the purpose of structuring a multi-hop communications network. This program runs automatically, and does not require any user interaction.

**SETUP DIAGRAM FOR TESTS**

## 7. APPLICABLE LIMITS AND TEST RESULTS

### 7.1. 6 dB BANDWIDTH

#### LIMIT

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

#### TEST PROCEDURE

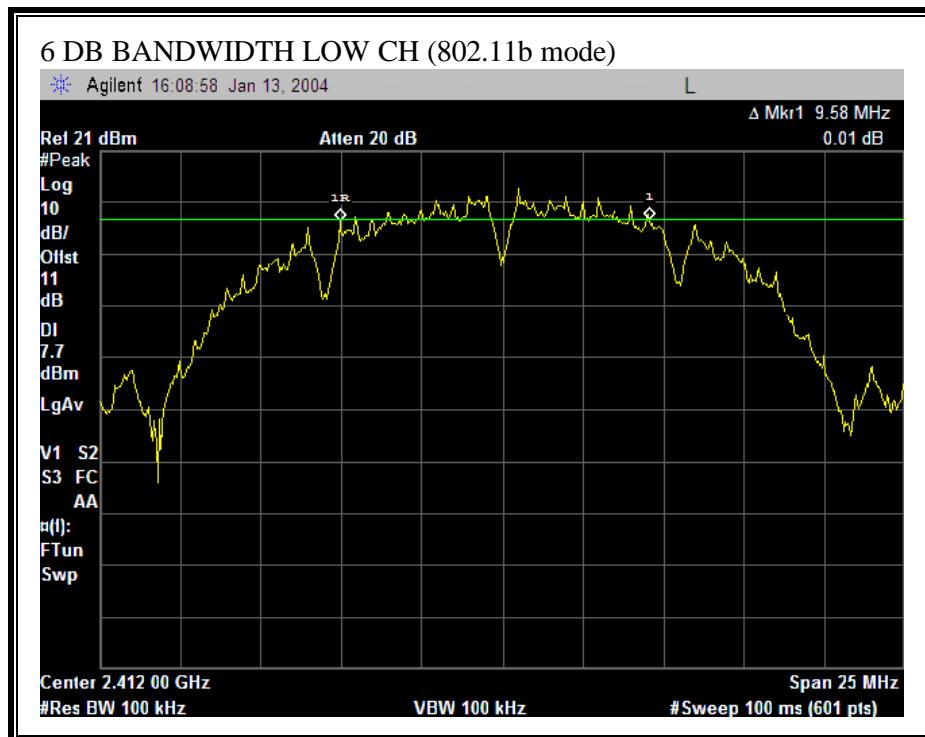
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

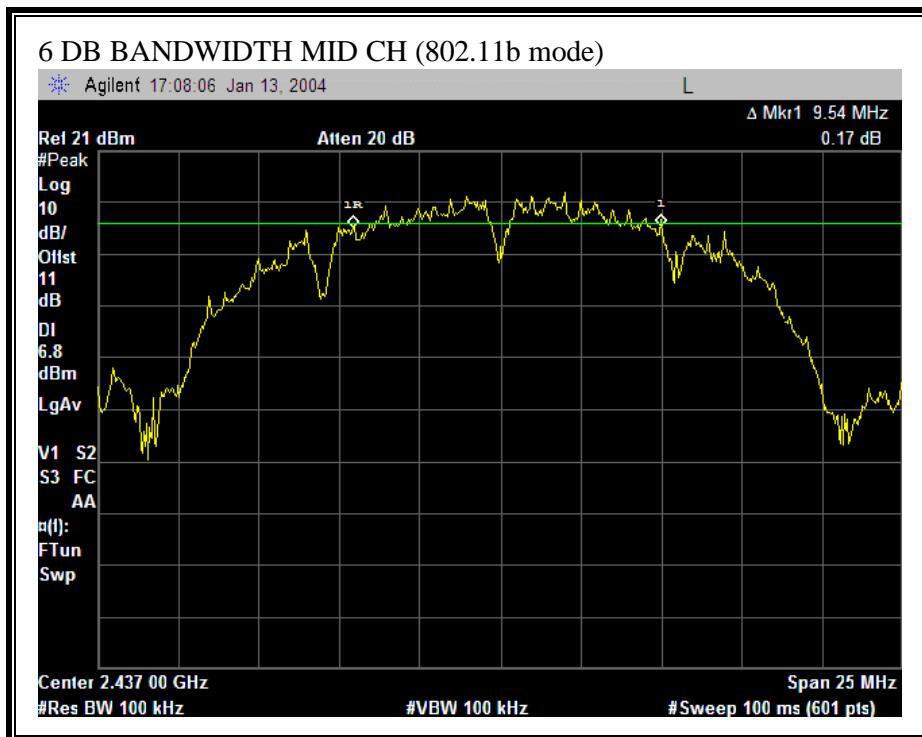
#### RESULTS

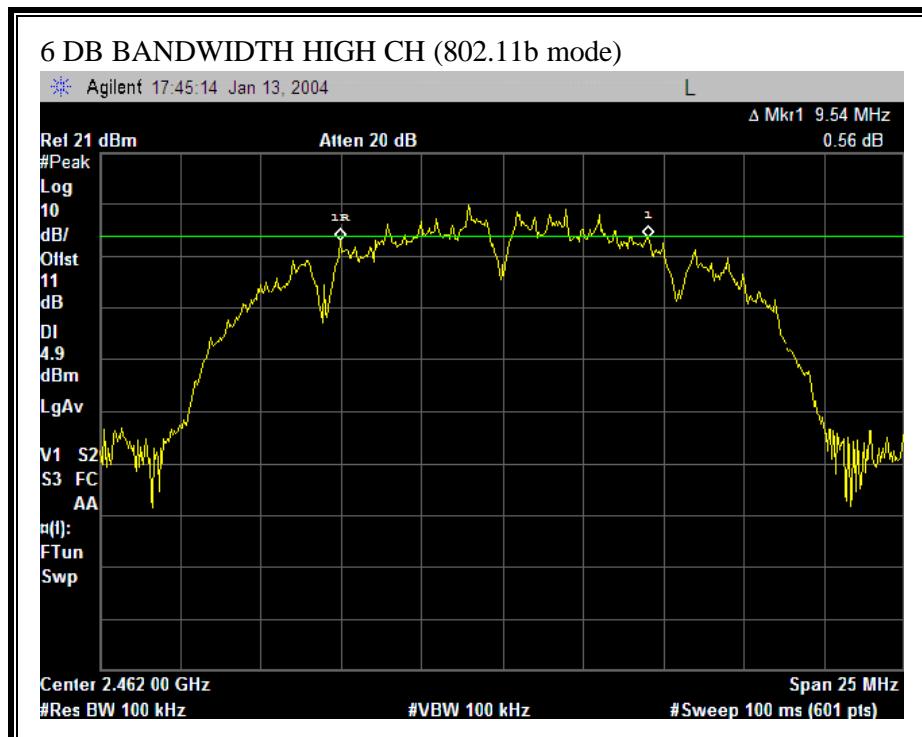
No non-compliance noted:

##### 802.11b Mode

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	9580	500	9080
Middle	2437	9540	500	9040
High	2462	9540	500	9040

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





## 7.2. 99% BANDWIDTH

### LIMIT

None; for reporting purposes only.

### TEST PROCEDURE

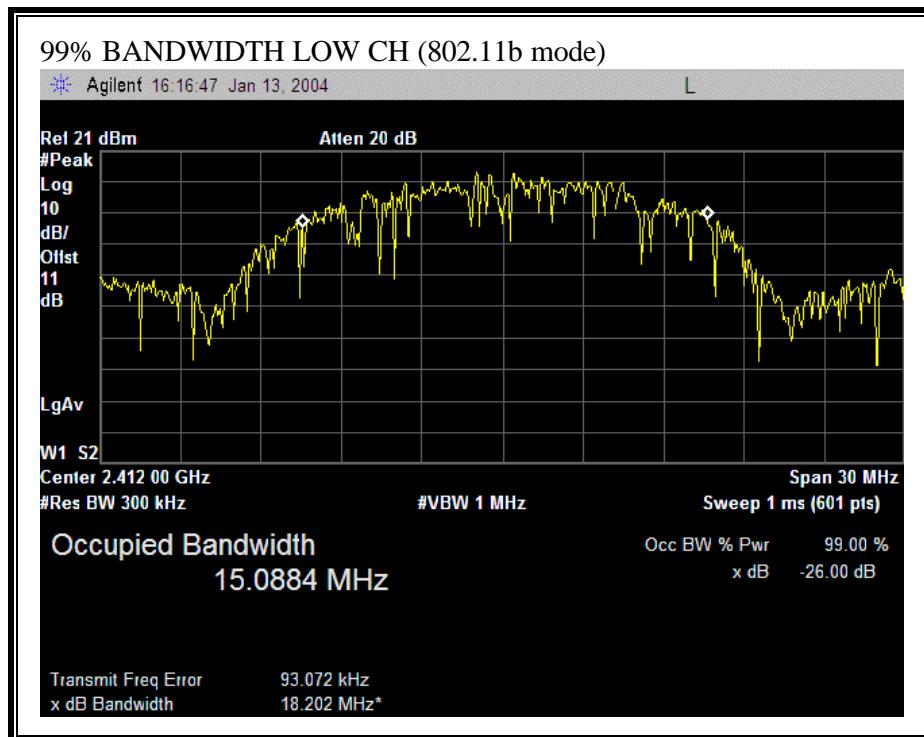
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

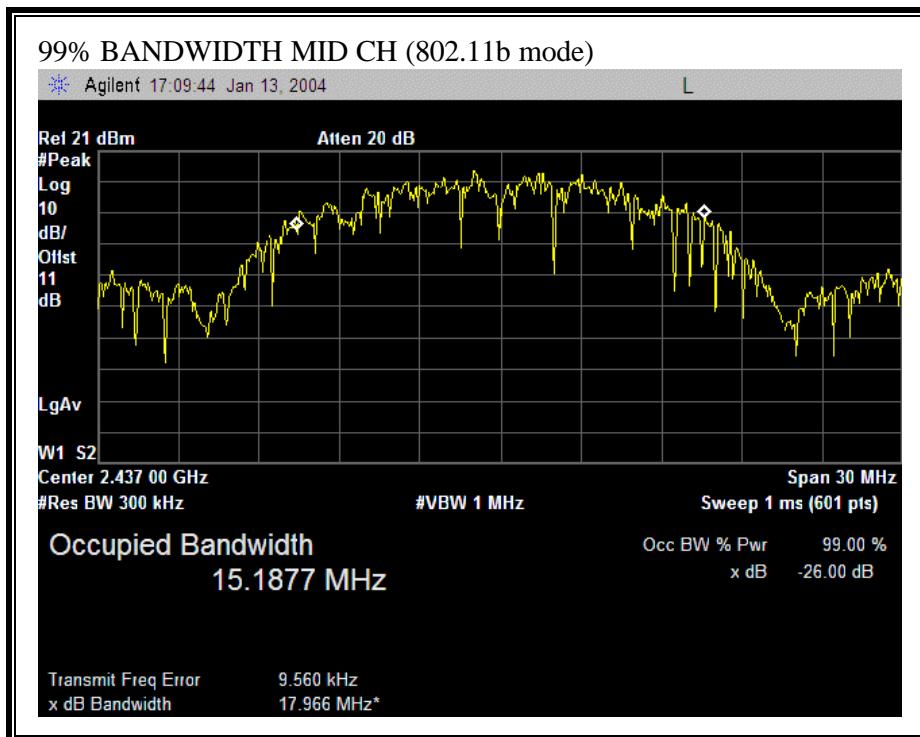
### RESULTS

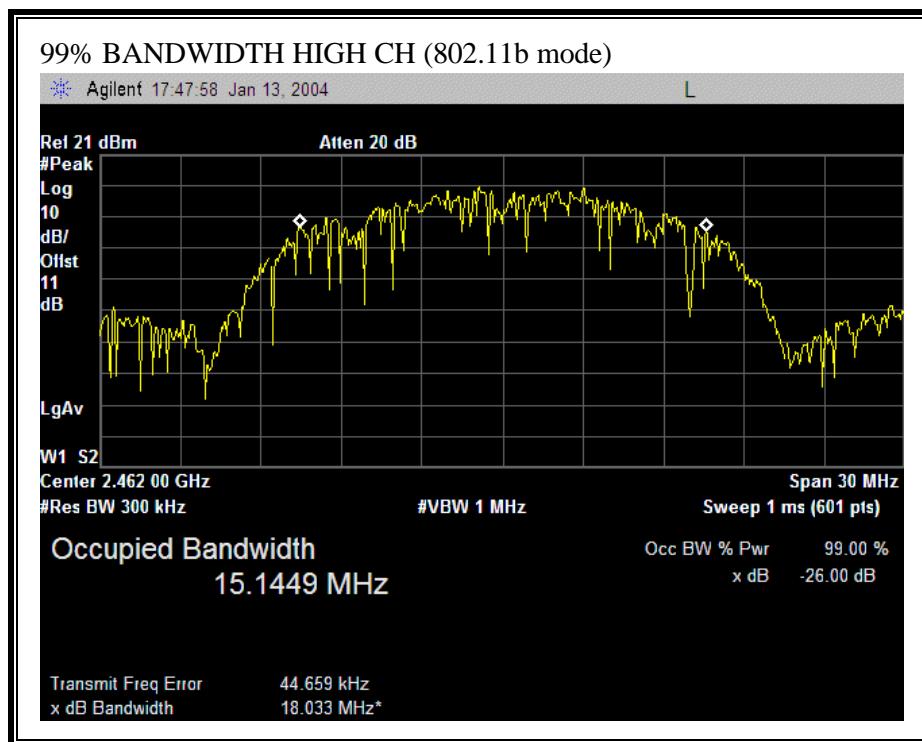
No non-compliance noted:

802.11b Mode

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	15.0884
Middle	2437	15.1877
High	2462	15.1449

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





### 7.3. PEAK OUTPUT POWER

#### PEAK POWER LIMIT

§15.247 (b) The maximum peak output power of the intentional radiator shall not exceed the following:

§15.247 (b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz , and 5725-5850 MHz bands: 1 watt.

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

The maximum antenna gain is 6.2 dBi, therefore the limit is 29.8 dBm.

#### TEST PROCEDURE

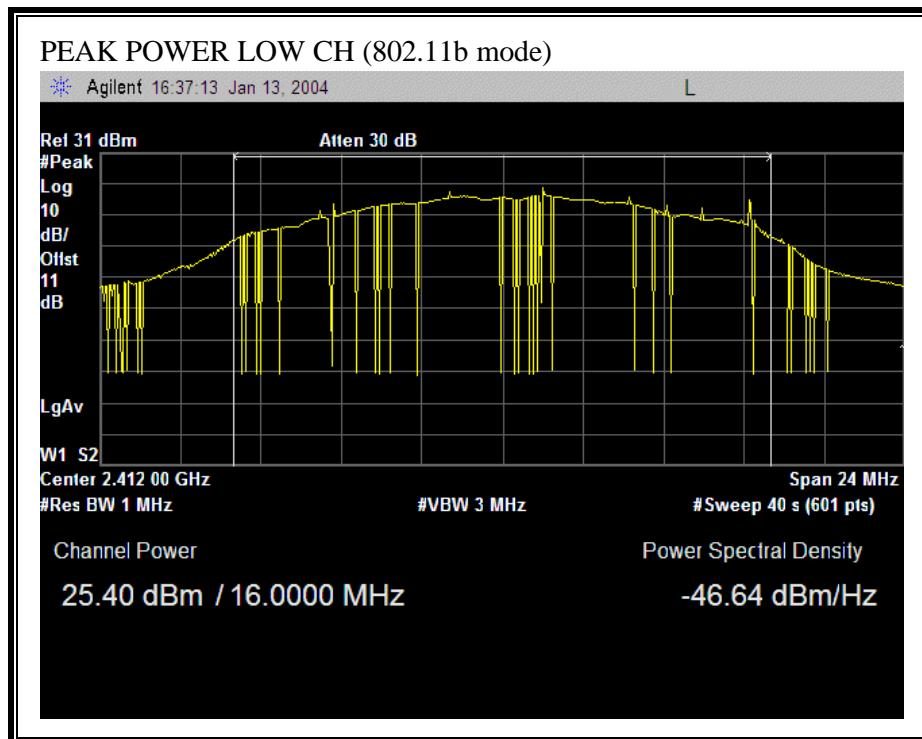
The transmitter output is connected to a spectrum analyzer and the analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 99% bandwidth.

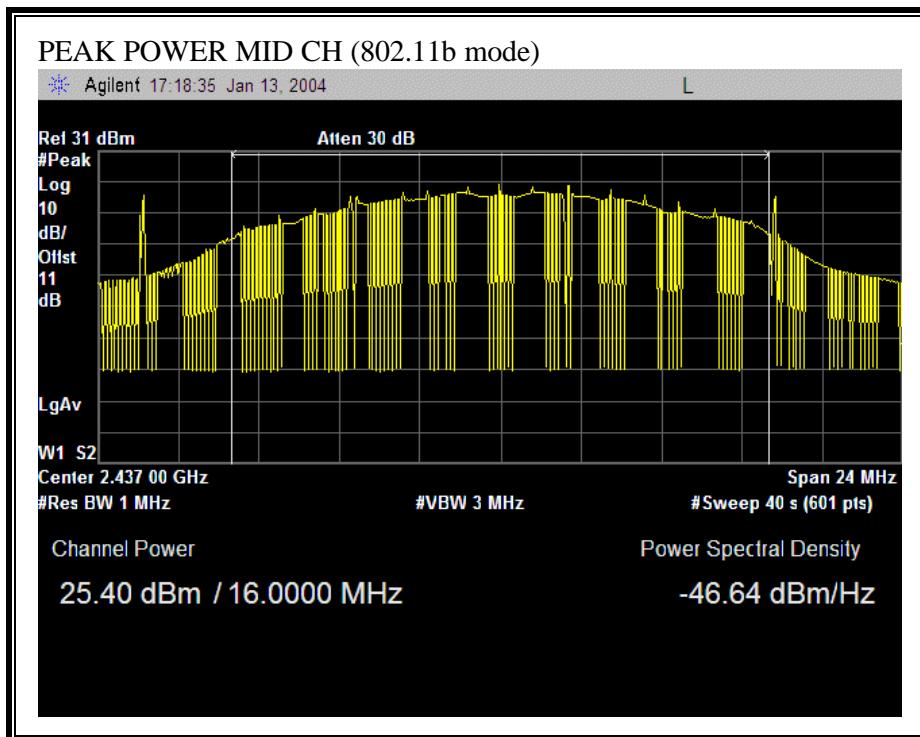
## **RESULTS**

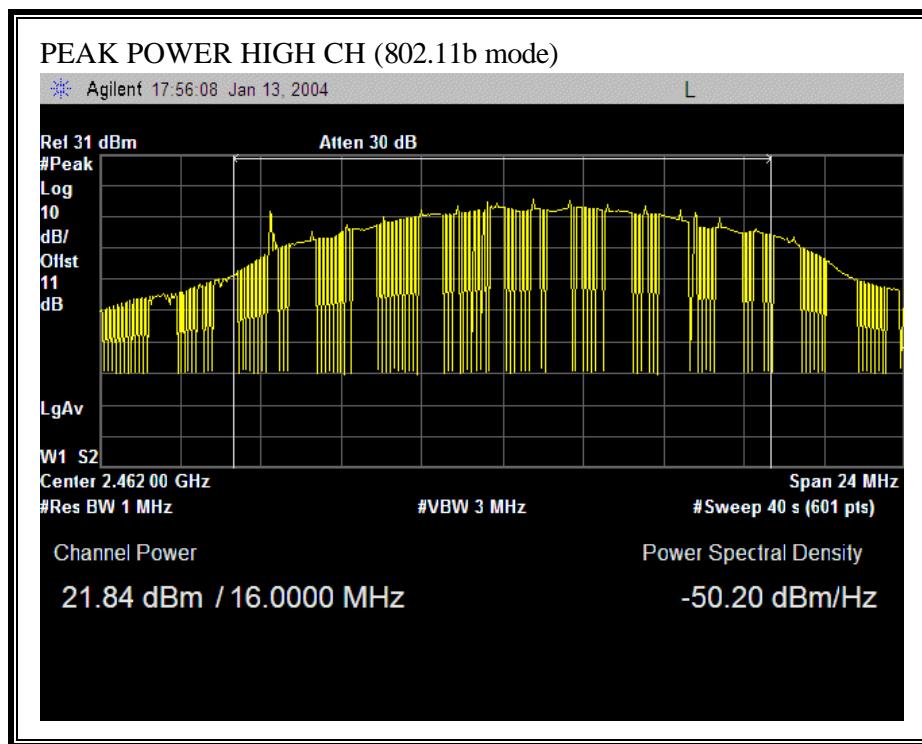
No non-compliance noted:

802.11b Mode

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Peak Power (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>
Low	2412	25.40	29.8	-4.40
Middle	2437	25.40	29.8	-4.40
High	2462	21.84	29.8	-7.96

**OUTPUT POWER (802.11b MODE)**





## 7.4. MAXIMUM PERMISSIBLE EXPOSURE

### LIMITS

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

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30–300	61.4	0.163	1.0	6
300–1500	.....	.....	f/300	6
1500–100,000	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f <sup>2</sup> )	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500	.....	.....	f/1500	30
1500–100,000	.....	.....	1.0	30

f = frequency in MHz

\* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

**CALCULATIONS**

Given

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

and

$$S = E^2 / 3770$$

where

E = Field Strength in Volts/meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power Density in milliwatts/square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

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

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

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

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

yields

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

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

where

d = distance in cm

P = Power in mW

G = Numeric antenna gain

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

Substituting the logarithmic form of power and gain using:

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

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

yields

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

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

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

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<sup>2</sup>

**RESULTS**

No non-compliance noted:

Mode	Power Density Limit (mW/cm <sup>2</sup> )	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
802.11b	1.0	25.40	6.20	10.72

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

## 7.5. AVERAGE POWER

### AVERAGE POWER LIMIT

None; for reporting purposes only.

### TEST PROCEDURE

The transmitter output is connected to a power meter.

### RESULTS

No non-compliance noted:

The cable assembly insertion loss of 11.0 dB (including 10 dB pad and 1.0 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	22.30
Middle	2437	22.70
High	2462	19.00

## 7.6. PEAK POWER SPECTRAL DENSITY

### LIMIT

§15.247 (d) For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### TEST PROCEDURE

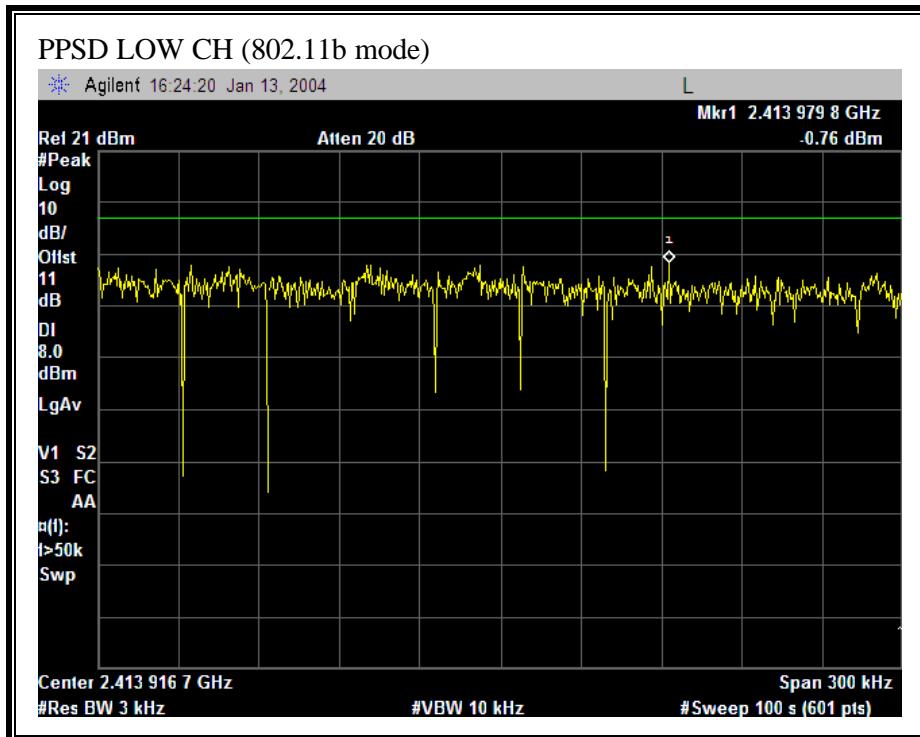
The transmitter output is connected to a spectrum analyzer, the maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer using RBW = 3 kHz and VBW > 3 kHz, sweep time = span / 3 kHz, and video averaging is turned off. The PPSD is the highest level found across the emission in any 3 kHz band.

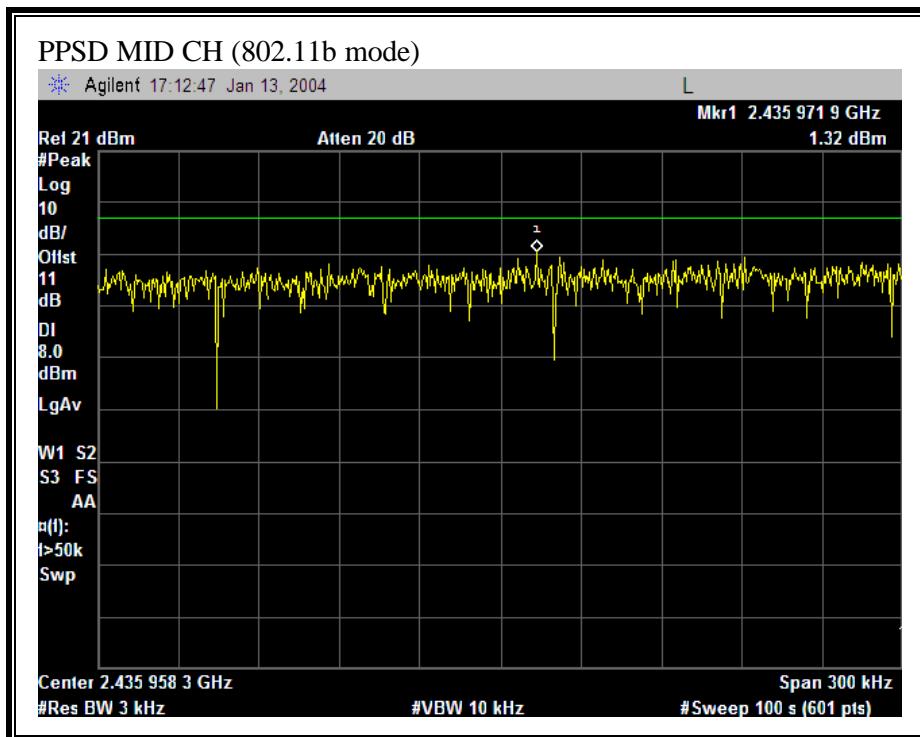
### RESULTS

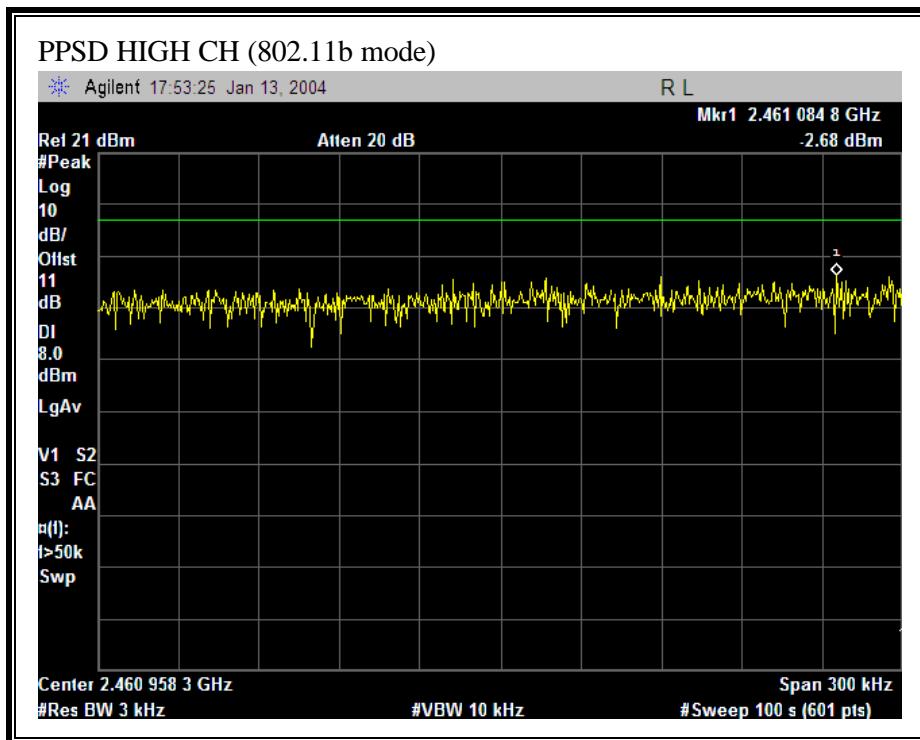
No non-compliance noted:

#### 802.11b Mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-0.76	8	-8.76
Middle	2437	1.32	8	-6.68
High	2462	-2.68	8	-10.68

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





## 7.7. CONDUCTED SPURIOUS EMISSIONS

### LIMITS

§15.247 (c) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

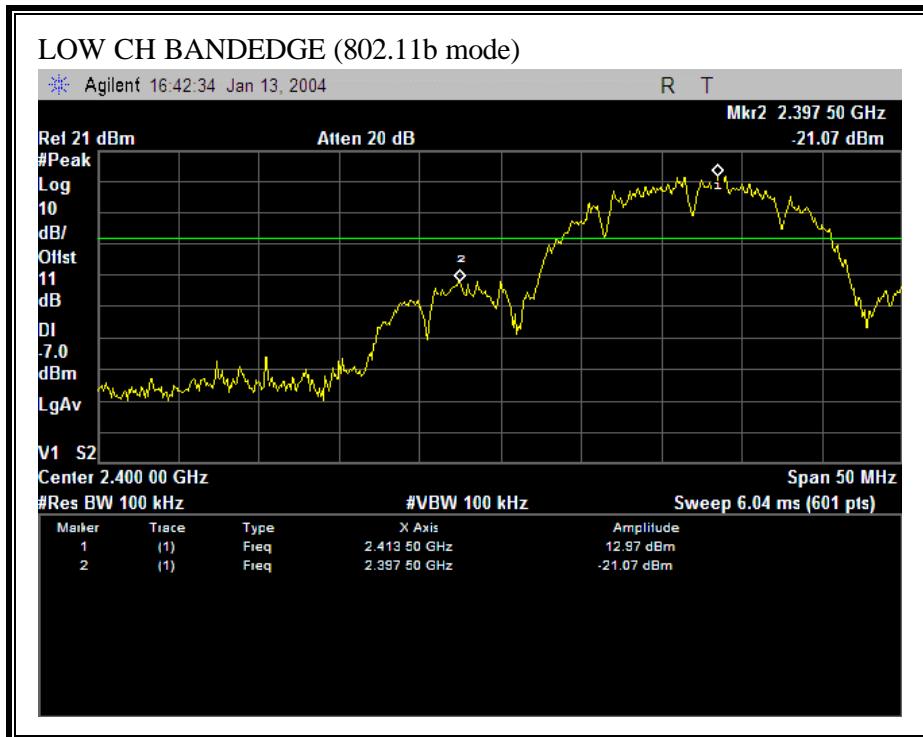
### TEST PROCEDURE

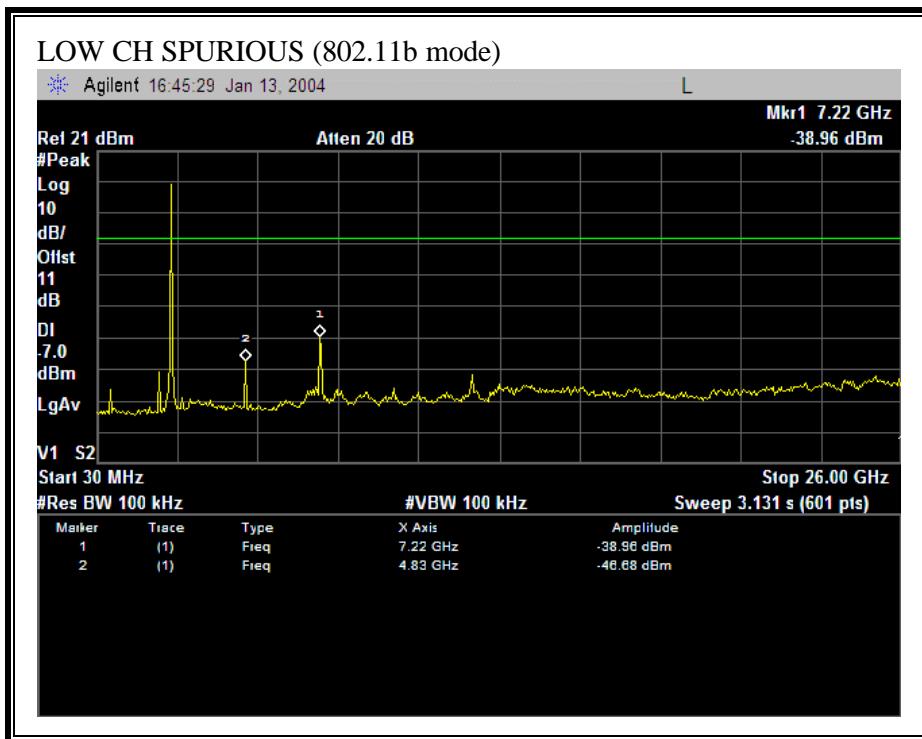
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

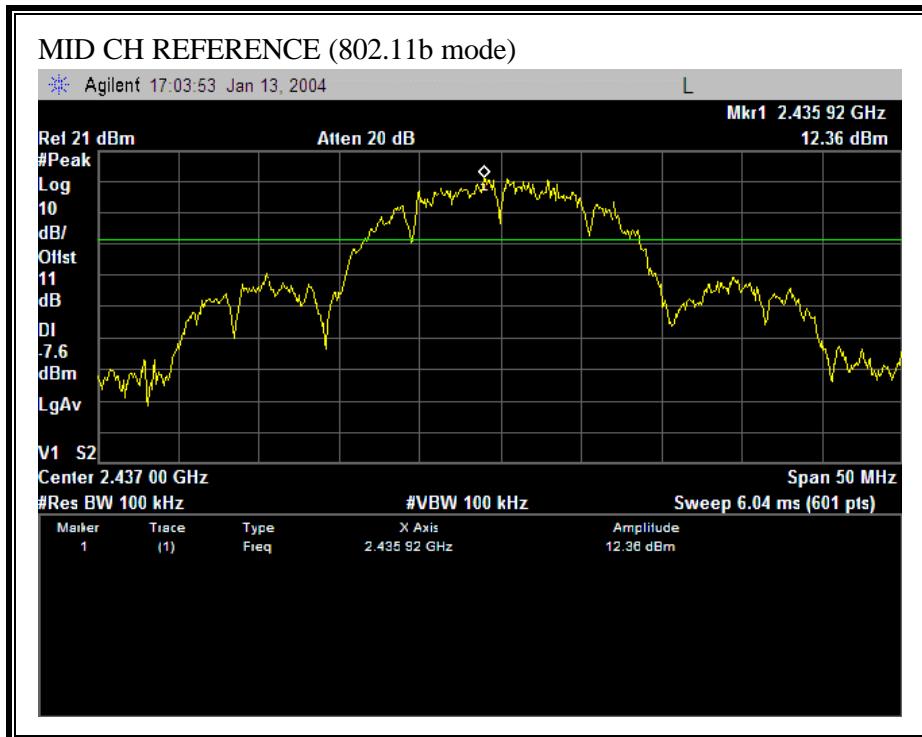
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

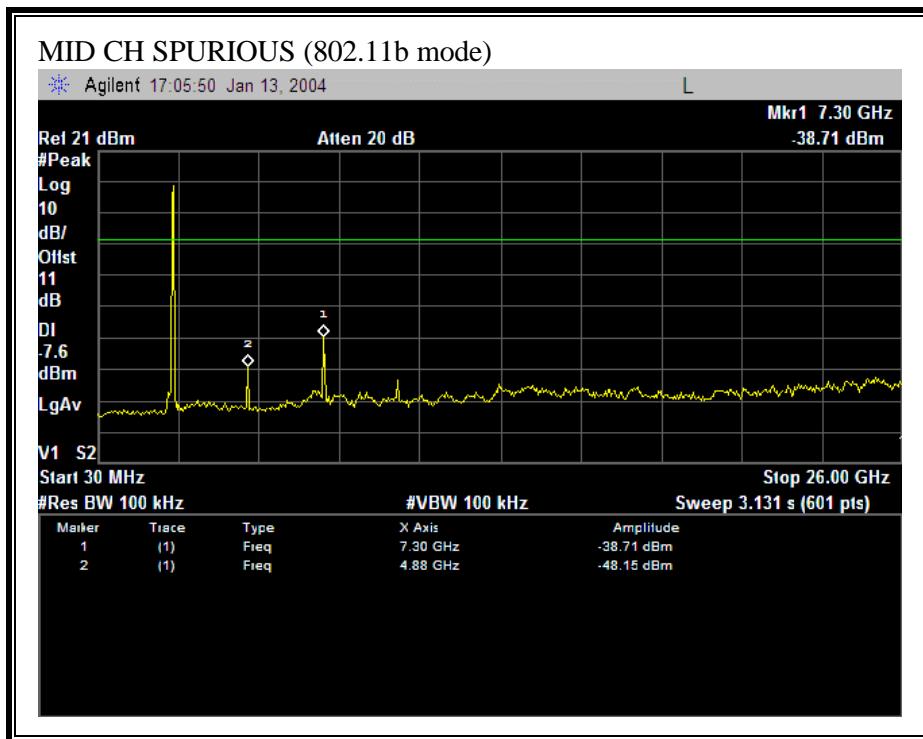
### RESULTS

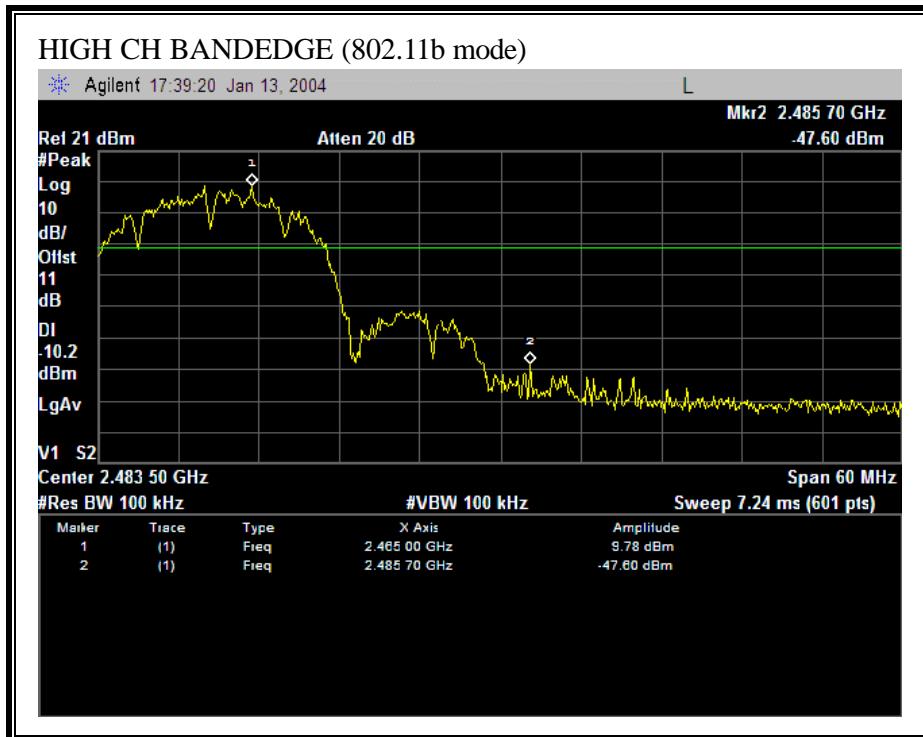
No non-compliance noted:

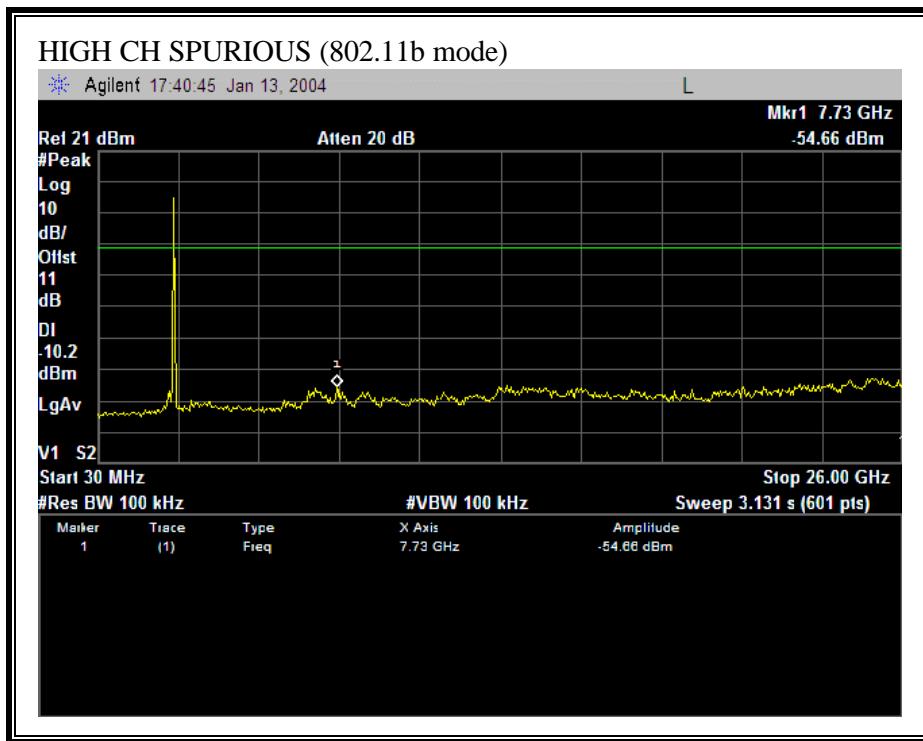
**SPURIOUS EMISSIONS, LOW CHANNEL (802.11b MODE)**



**SPURIOUS EMISSIONS, MID CHANNEL (802.11b MODE)**



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



## 7.8. RADIATED EMISSIONS

### 7.8.1. 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
<sup>1</sup> 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	( <sup>2</sup> )
13.36 - 13.41			

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

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

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

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

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

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

**TEST PROCEDURE**

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

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

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

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

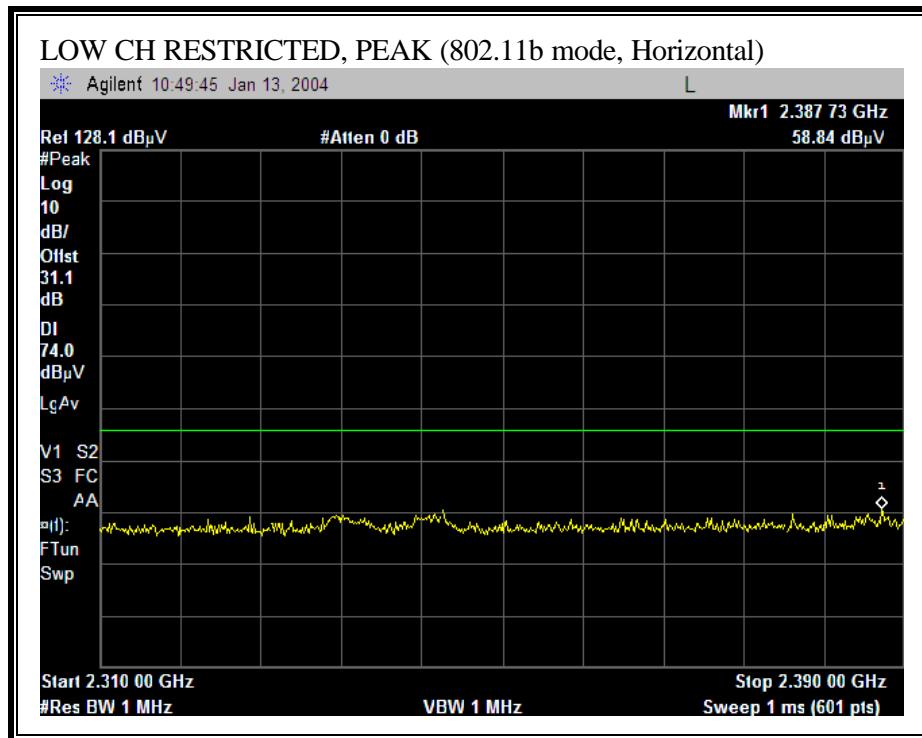
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

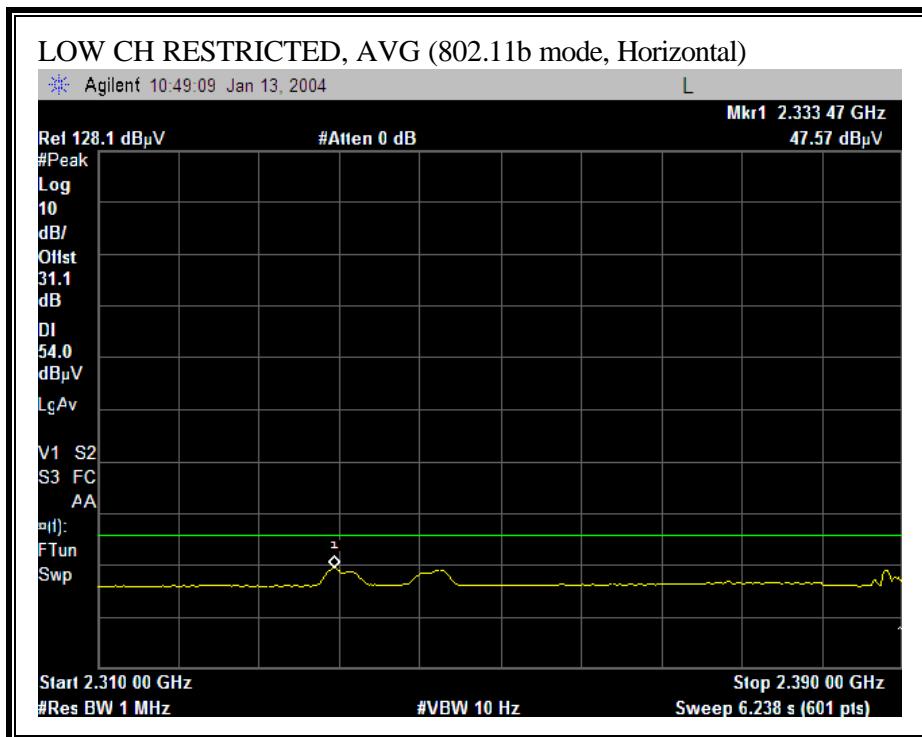
**RESULTS**

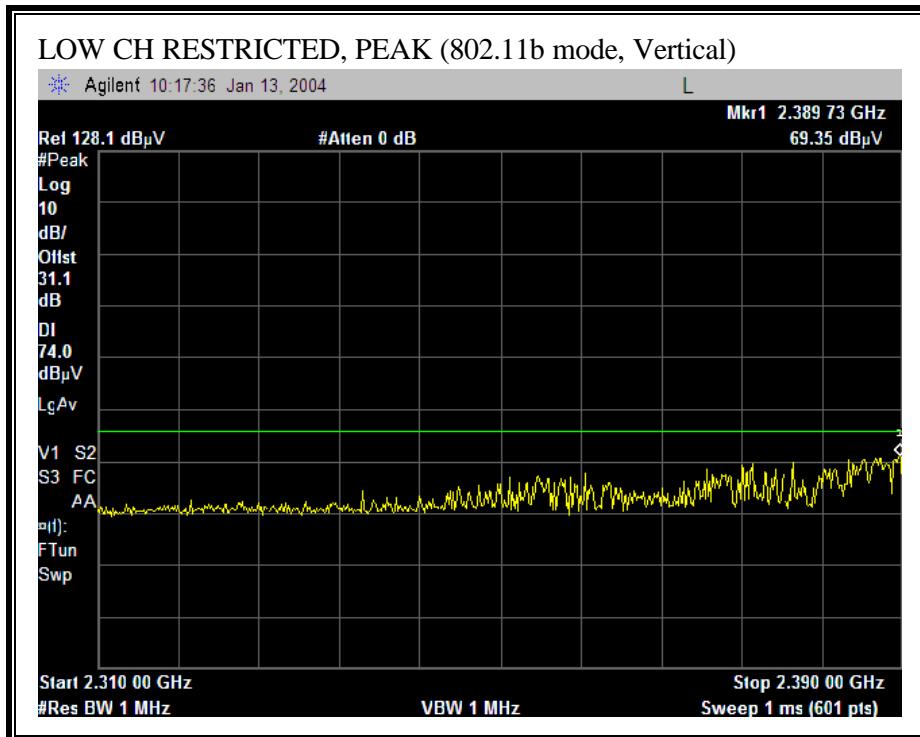
No non-compliance noted:

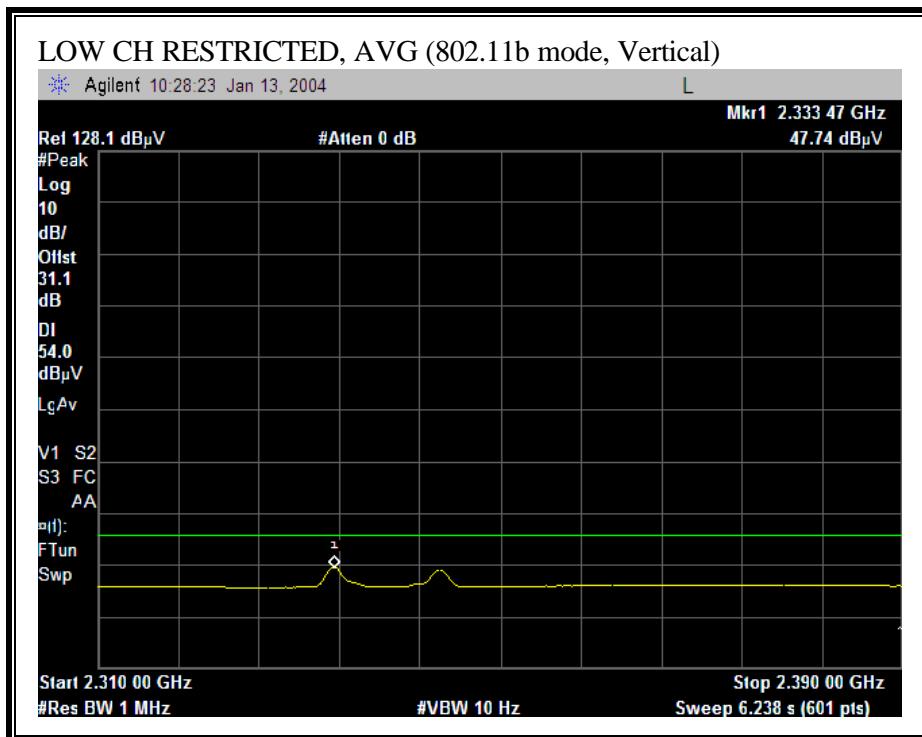
## 7.8.2. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHZ

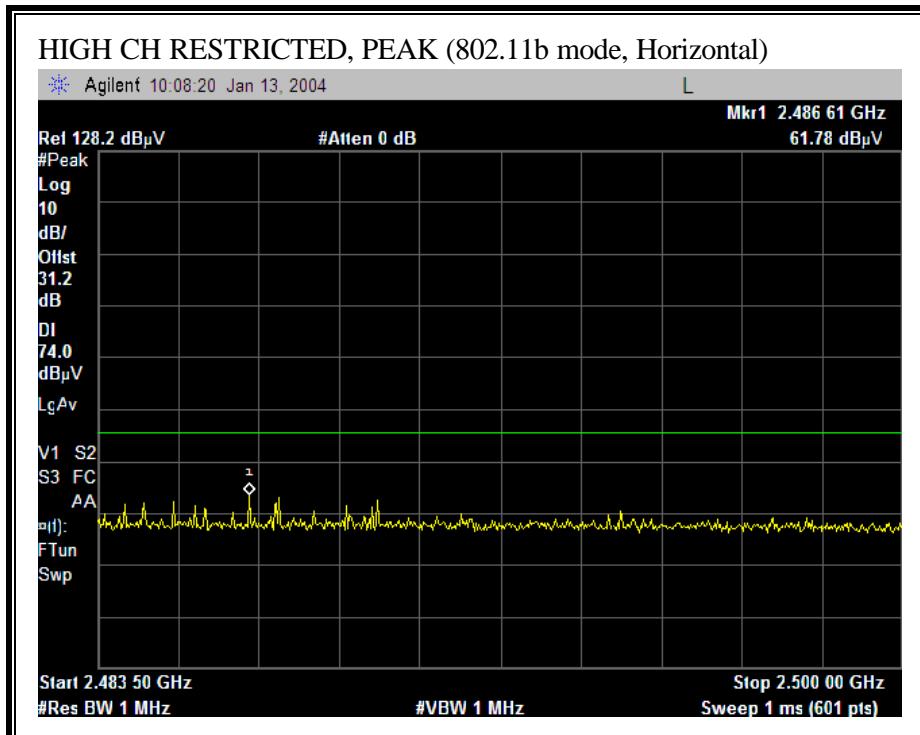
### RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, HORIZONTAL)

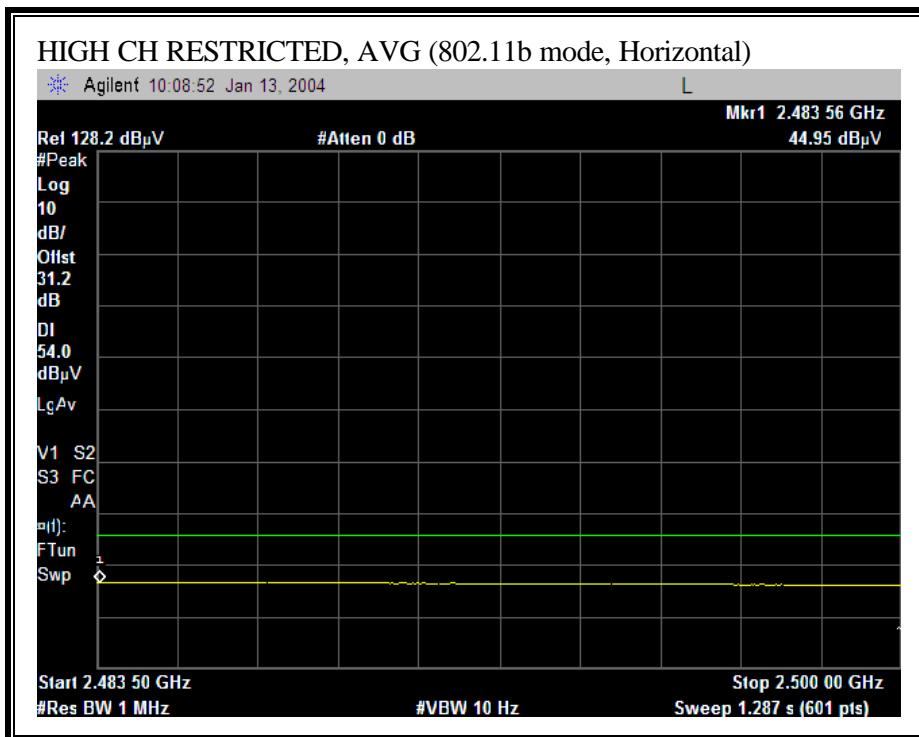


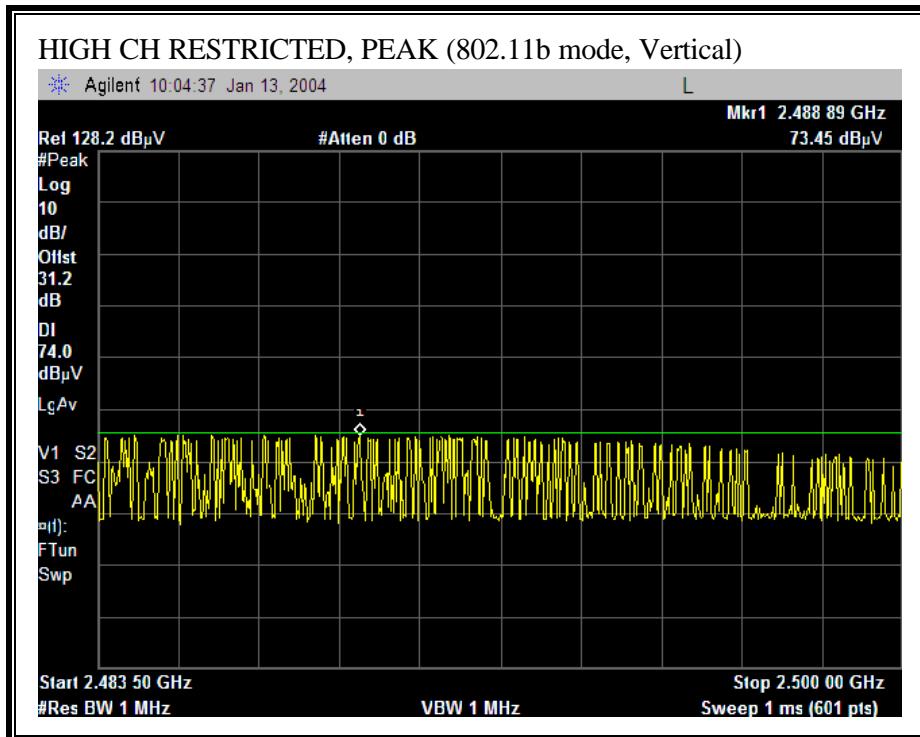


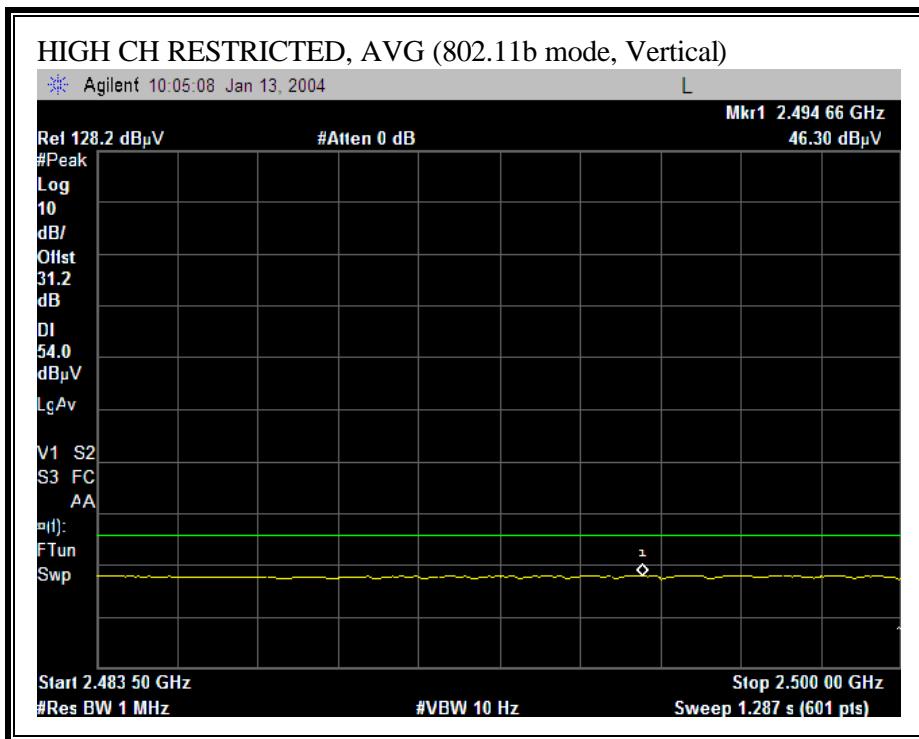
**RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, VERTICAL)**



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



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



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

03U2377 High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site																				
Test Engn: NEELESH RAJ Project #: 03U2377 Company: FIRETIDE EUT Descrip.: 802.11b MESH NETWORKED ETHERNET SERVICE POINT EUT M/N: 1000S Test Target: FCC 15.240/15.205 Mode Oper: TX																				
Test Equipment:																				
EMCO Hora 1-18GHz	Pre-amplifier 1-26GHz	Spectrum Analyzer	Hora > 18GHz				Limit													
T60; S/N: 2238 @3m	T87 Mitet 924342	Agilent E4446A Analyzer					FCC 15.205													
H Frequency Cables: <input type="checkbox"/> (2 ft) <input checked="" type="checkbox"/> (2-3 ft) <input type="checkbox"/> (4-6 ft) <input checked="" type="checkbox"/> (12 ft) <table> <tr> <td>Peak Measurements:</td> <td>Average Measurements:</td> </tr> <tr> <td>1 MHz Resolution Bandwidth</td> <td>1 MHz Resolution Bandwidth</td> </tr> <tr> <td>10MHz Video Bandwidth</td> <td>10Hz Video Bandwidth</td> </tr> </table>															Peak Measurements:	Average Measurements:	1 MHz Resolution Bandwidth	1 MHz Resolution Bandwidth	10MHz Video Bandwidth	10Hz Video Bandwidth
Peak Measurements:	Average Measurements:																			
1 MHz Resolution Bandwidth	1 MHz Resolution Bandwidth																			
10MHz Video Bandwidth	10Hz Video Bandwidth																			
f GHz	Dist feet	Read Pk dBuV	Read Avg dBuV	AF dB	CL dB	Amp dB	D Corr dB	HPF dBuV/m	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes					
LOW CHANNEL HARMONICS (2412 MHz)																				
4.824	9.8	72.2	40.0	33.1	2.9	-44.7	0.0	1.0	64.0	32.3	74.0	54.0	-9.8	-21.7	V					
12.060	9.8	48.0	31.5	39.3	5.1	-42.2	0.0	1.0	51.2	34.7	74.0	54.0	-22.8	-19.3	V					
4.824	9.8	61.4	32.9	23.1	2.9	-44.7	0.0	1.0	53.7	25.2	74.0	54.0	-20.3	-28.8	H					
12.060	9.8	44.2	31.6	29.3	5.1	-42.2	0.0	1.0	47.4	34.8	74.0	54.0	-26.6	-19.2	H					
MIDDLE CHANNEL HARMONICS (2437 MHz)																				
4.874	9.8	68.0	36.2	33.1	3.0	-44.7	0.0	1.0	60.3	28.6	74.0	54.0	-13.7	-25.4	V					
7.311	9.8	74.3	33.8	36.2	3.8	-44.5	0.0	1.0	70.8	30.2	74.0	54.0	-3.2	-23.8	V					
12.185	9.8	46.4	31.7	39.4	5.2	-42.4	0.0	1.0	49.5	34.8	74.0	54.0	-24.5	-19.2	V					
4.874	9.8	53.8	32.0	33.1	3.0	-44.7	0.0	1.0	46.2	24.3	74.0	54.0	-27.8	-29.7	H					
7.311	9.8	60.2	31.6	36.2	3.8	-44.5	0.0	1.0	56.6	28.0	74.0	54.0	-17.4	-26.0	H					
12.185	9.8	43.3	31.6	39.4	5.2	-42.4	0.0	1.0	46.4	34.7	74.0	54.0	-27.6	-19.3	H					
HIGH CHANNEL HARMONICS (2462 MHz)																				
4.924	9.8	47.6	33.2	33.2	3.0	-44.8	0.0	1.0	39.9	25.6	74.0	54.0	-34.1	-28.4	V					
7.386	9.8	49.1	31.8	36.3	3.8	-44.5	0.0	1.0	45.7	28.5	74.0	54.0	-28.3	-25.5	V					
12.310	9.8	41.2	32.0	39.4	5.2	-42.5	0.0	1.0	44.2	35.0	74.0	54.0	-29.8	-19.0	V					
4.924	9.8	46.5	32.0	33.2	3.0	-44.8	0.0	1.0	38.9	24.4	74.0	54.0	-35.1	-29.0	H					
7.386	9.8	48.3	31.7	36.3	3.8	-44.5	0.0	1.0	44.9	28.3	74.0	54.0	-29.1	-25.7	H					
12.310	9.8	42.0	31.6	39.4	5.2	-42.5	0.0	1.0	45.0	34.6	74.0	54.0	-29.0	-19.4	H					
NO OTHER SPURIOUS EMISSIONS DETECTED ABOVE THE SYSTEM NOISE FLOOR -20dB TO THE LIMIT																				
f	Measurement Frequency			Amp	Preamp Gain							Avg Lim	Average Field Strength Limit							
Dist	Distance to Antenna			D-Corr	Distance Correct to 3 meters							Pk Lim	Peak Field Strength Limit							
Read	Analyzer Reading			Avg	Average Field Strength @ 3 m							Avg Mar	Margin vs. Average Limit							
AF	Antenna Factor			Peak	Calculated Peak Field Strength							Pk Mar	Margin vs. Peak Limit							
CL	Cable Loss			HPF	High Pass Filter															

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

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



FCC, VCCI, CISPR, CE, AUSTEL, NZ  
UL, CSA, TUV, BSMI, DHHS, NVLAP

561F MONTEREY ROAD, SAN JOSE, CA 95037-9001  
PHONE: (408) 463-0885 FAX: (408) 463-0888

**Company:** Firetide  
**EUT Description:** 802.11b Mesh Networking Service Point, model: 1000S  
**Test Configuration:** EUT, 3 Laptops, Ethernet Router, Remote Service Point  
**Type of Test:** FCC Class B 15.209  
**Mode of Operation:** TX/RX on at mid channel

A-Site     B-Site     C-Site     F-Site     6 Worst Data     Descending

Freq. (MHz)	Reading (dBuV)	AF (dB)	Closs (dB)	Pre-amp (dB)	Level (dBuV/m)	Limit FCC_B	Margin (dB)	Pol (H/V)	Az (Deg)	Height (Meter)	Mark (P/Q/A)
<b>VERTICAL</b>											
125.00	49.20	11.84	1.76	27.07	35.73	43.50	-7.77	3mV	0.00	1.00	P
133.30	46.70	13.73	1.84	27.04	35.23	43.50	-8.27	3mV	0.00	1.00	P
166.60	48.80	16.67	2.05	26.82	40.71	43.50	-2.79	3mV	0.00	1.00	P
225.00	49.50	12.32	2.31	26.59	37.54	46.00	-8.46	3mV	0.00	1.00	P
233.33	53.10	12.39	2.36	26.55	41.30	46.00	-4.70	3mV	0.00	1.00	P
250.00	49.30	12.53	2.45	26.48	37.80	46.00	-8.20	3mV	0.00	1.00	P
266.60	48.30	13.58	2.53	26.46	37.95	46.00	-8.05	3mV	0.00	1.00	P
300.00	47.80	15.68	2.69	26.42	39.75	46.00	-6.25	3mV	0.00	1.00	P
333.30	47.80	15.87	2.85	26.66	39.86	46.00	-6.14	3mV	0.00	1.00	P
366.60	45.10	16.06	3.01	26.89	37.28	46.00	-8.72	3mV	0.00	1.00	P
400.00	50.80	16.25	3.17	27.13	43.09	46.00	-2.91	3mV	0.00	1.00	P
433.00	52.00	16.87	3.31	27.29	44.89	46.00	-1.11	3mV	0.00	1.00	P
466.60	46.90	17.51	3.45	27.46	40.40	46.00	-5.60	3mV	0.00	1.00	P
500.00	50.90	18.14	3.59	27.62	45.01	46.00	-0.99	3mV	0.00	1.00	P
525.00	48.00	18.37	3.71	27.68	42.41	46.00	-3.59	3mV	0.00	1.00	P
533.30	47.80	18.45	3.75	27.70	42.30	46.00	-3.70	3mV	0.00	1.00	P
566.60	46.40	18.76	3.91	27.77	41.30	46.00	-4.70	3mV	0.00	1.00	P
600.00	43.70	19.07	4.07	27.85	38.99	46.00	-7.01	3mV	0.00	1.00	P
633.30	47.50	19.94	4.18	27.75	43.87	46.00	-2.13	3mV	0.00	1.00	P
666.60	42.00	20.82	4.28	27.64	39.46	46.00	-6.54	3mV	0.00	1.00	P
733.30	42.90	21.71	4.49	27.50	41.60	46.00	-4.40	3mV	0.00	1.00	P
766.60	43.30	21.73	4.59	27.47	42.16	46.00	-3.84	3mV	0.00	1.00	P
833.30	43.90	22.23	4.83	27.33	43.63	46.00	-2.37	3mV	0.00	1.00	P
866.60	45.20	22.71	4.97	27.23	45.65	46.00	-0.35	3mV	0.00	1.00	QP
933.30	44.00	23.63	5.22	26.99	45.86	46.00	-0.14	3mV	0.00	1.00	QP

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

 <p>FCC, VCCI, CISPR, CE, AUSTEL, NZ UL, CSA, TUV, BSMI, DHHS, NVLAP</p> <p>561F MONTEREY ROAD, SAN JOSE, CA 95037-9001 PHONE: (408) 463-0885 FAX: (408) 463-0888</p>											
<i>Project #:</i>	03U2377-1			<i>Report #:</i>	121203C01			<i>Date &amp; Time:</i>	12/12/03 9:51 AM		
<i>Test Engr:</i>	Frank Ibrahim										
<i>Company:</i>	Firetide			<i>EUT Description:</i>	802.11b Mesh Networking Service Point, model: 1000S						
<i>Test Configuration:</i>	EUT, 3 Laptops, Ethernet Router, Remote Service Point			<i>Type of Test:</i>	FCC Class B 15.209						
<i>Mode of Operation:</i>	TX/RX on all mid channel										
<input type="radio"/> A-Site	<input type="radio"/> B-Site	<input checked="" type="radio"/> C-Site	<input type="radio"/> D-Site	<input type="radio"/> E-Site	<input type="radio"/> F-Site		<input type="radio"/> 6 Worst Data				Descending
Freq. (MHz)	Reading (dBuV)	AF (dB)	Closs (dB)	Pre-amp (dB)	Level (dBuV/m)	Limit FCC_B	Margin (dB)	Pol (H/V)	Az (Deg)	Height (Meter)	Mark (P/Q/A)
HORIZONTAL											
166.60	49.40	16.67	2.05	26.82	41.31	43.50	-2.19	3mH	0.00	1.00	P
225.00	50.50	12.32	2.31	26.59	38.54	46.00	-7.46	3mH	0.00	1.00	P
233.30	54.00	12.39	2.36	26.55	42.20	46.00	-3.80	3mH	0.00	1.00	P
250.00	49.10	12.53	2.45	26.48	37.60	46.00	-8.40	3mH	0.00	1.00	P
266.60	48.90	13.58	2.53	26.46	38.55	46.00	-7.45	3mH	0.00	1.00	P
300.00	48.30	15.68	2.69	26.42	40.25	46.00	-5.75	3mH	0.00	1.00	P
333.30	51.30	15.87	2.85	26.66	43.36	46.00	-2.64	3mH	0.00	1.00	P
366.60	46.90	16.06	3.01	26.89	39.08	46.00	-6.92	3mH	0.00	1.00	P
400.00	50.70	16.25	3.17	27.13	42.99	46.00	-3.01	3mH	0.00	1.00	P
433.30	50.80	16.88	3.31	27.29	43.70	46.00	-2.30	3mH	0.00	1.00	P
466.60	47.90	17.51	3.45	27.46	41.40	46.00	-4.60	3mH	0.00	1.00	P
500.00	50.50	18.14	3.59	27.62	44.61	46.00	-1.39	3mH	0.00	1.00	P
533.30	48.80	18.45	3.75	27.70	43.30	46.00	-2.70	3mH	0.00	1.00	P
566.60	46.20	18.76	3.91	27.77	41.10	46.00	-4.90	3mH	0.00	1.00	P
600.00	44.50	19.07	4.07	27.85	39.79	46.00	-6.21	3mH	0.00	1.00	P
633.30	49.30	19.94	4.18	27.75	45.67	46.00	-0.33	3mH	0.00	1.00	P
666.60	41.00	20.82	4.28	27.64	38.46	46.00	-7.54	3mH	0.00	1.00	P
733.30	41.70	21.71	4.49	27.50	40.40	46.00	-5.60	3mH	0.00	1.00	P
766.60	44.70	21.73	4.59	27.47	43.56	46.00	-2.44	3mH	0.00	1.00	P
833.30	45.20	22.23	4.83	27.33	44.93	46.00	-1.07	3mH	0.00	1.00	QP
866.60	44.90	22.71	4.97	27.23	45.35	46.00	-0.65	3mH	0.00	1.00	QP
933.30	42.70	23.63	5.22	26.99	44.56	46.00	-1.44	3mH	0.00	1.00	QP

### 7.8.4. WORST-CASE RADIATED EMISSIONS ABOVE 1 GHz

#### SPURIOUS EMISSIONS 1000 TO 2000 MHz (WORST-CASE CONFIGURATION, VERTICAL AND HORIZONTAL)

<p>01/13/04 High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site</p> <p>Test Engy: NEELESH RAJ Project #: 03U2377 Company: FIRETIDE EUT Descrip.: 802.11b MESH NETWORKED ETHERNET SERVICE POINT EUT M/N: 1000S Test Target: FCC Mode Oper: TX(WORST CASE) AND PINGING</p> <p><u>Test Equipment:</u></p> <table border="1"> <tr> <td>EMCO Horn 1-18GHz T60; S/N: 2238 @3m</td> <td>Pre-amplifier 1-26GHz T63 Miteq 646456</td> <td>Spectrum Analyzer Agilent E4446A Analyzer</td> <td>Horn &gt; 18GHz</td> <td>Limit FCC 15.209</td> </tr> </table> <p>Hi Frequency Cables  <input type="checkbox"/> (2 ft) <input checked="" type="checkbox"/> (2~3 ft) <input type="checkbox"/> (4~6 ft) <input checked="" type="checkbox"/> (12 ft)     </p> <table border="1"> <tr> <td>Peak Measurements:</td> <td>Average Measurements:</td> </tr> <tr> <td>1 MHz Resolution Bandwidth</td> <td>1 MHz Resolution Bandwidth</td> </tr> <tr> <td>1MHz Video Bandwidth</td> <td>10Hz Video Bandwidth</td> </tr> </table> <table border="1"> <thead> <tr> <th>f GHz</th> <th>Dist feet</th> <th>Read Pk dBuV</th> <th>Read Avg dBuV</th> <th>AF dB/m</th> <th>CL dB</th> <th>Amp dB</th> <th>D Corr dB</th> <th>HPF</th> <th>Peak dBuV/m</th> <th>Avg dBuV/m</th> <th>Pk Lim dBuV/m</th> <th>Avg Lim dBuV/m</th> <th>Pk Mar dB</th> <th>Avg Mar dB</th> <th>Notes</th> </tr> </thead> <tbody> <tr> <td colspan="16" style="text-align: center;">CPU=133.33MHz</td> </tr> <tr> <td>1.333</td> <td>9.8</td> <td>63.0</td> <td>52.9</td> <td>25.6</td> <td>1.2</td> <td>-36.4</td> <td>0.0</td> <td>1.0</td> <td>54.3</td> <td>44.2</td> <td>74.0</td> <td>54.0</td> <td>-19.7</td> <td>-9.8</td> <td>V</td> </tr> <tr> <td>1.333</td> <td>9.8</td> <td>65.5</td> <td>53.7</td> <td>25.6</td> <td>1.2</td> <td>-36.4</td> <td>0.0</td> <td>1.0</td> <td>56.8</td> <td>44.9</td> <td>74.0</td> <td>54.0</td> <td>-17.2</td> <td>-9.1</td> <td>H</td> </tr> <tr> <td colspan="16" style="text-align: center;">NO OTHER EMISSIONS FOUND FROM THE CPU-20dB TO THE LIMIT UPTO 2 GHz</td> </tr> </tbody> </table> <p>     f Measurement Frequency      Dist Distance to Antenna      Read Analyzer Reading      AF Antenna Factor      CL Cable Loss      Amp Preamp Gain      D Corr Distance Correct to 3 meters      Avg Average Field Strength @ 3 m      Peak Calculated Peak Field Strength      HPF High Pass Filter      Avg Lim Average Field Strength Limit      Pk Lim Peak Field Strength Limit      Avg Mar Margin vs. Average Limit      Pk Mar Margin vs. Peak Limit   </p>																		EMCO Horn 1-18GHz T60; S/N: 2238 @3m	Pre-amplifier 1-26GHz T63 Miteq 646456	Spectrum Analyzer Agilent E4446A Analyzer	Horn > 18GHz	Limit FCC 15.209	Peak Measurements:	Average Measurements:	1 MHz Resolution Bandwidth	1 MHz Resolution Bandwidth	1MHz Video Bandwidth	10Hz Video Bandwidth	f GHz	Dist feet	Read Pk dBuV	Read Avg dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes	CPU=133.33MHz																1.333	9.8	63.0	52.9	25.6	1.2	-36.4	0.0	1.0	54.3	44.2	74.0	54.0	-19.7	-9.8	V	1.333	9.8	65.5	53.7	25.6	1.2	-36.4	0.0	1.0	56.8	44.9	74.0	54.0	-17.2	-9.1	H	NO OTHER EMISSIONS FOUND FROM THE CPU-20dB TO THE LIMIT UPTO 2 GHz															
EMCO Horn 1-18GHz T60; S/N: 2238 @3m	Pre-amplifier 1-26GHz T63 Miteq 646456	Spectrum Analyzer Agilent E4446A Analyzer	Horn > 18GHz	Limit FCC 15.209																																																																																																								
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## 7.9. POWERLINE CONDUCTED EMISSIONS

### LIMIT

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency.

### TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The resolution bandwidth is set to 9 kHz for both peak detection and quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

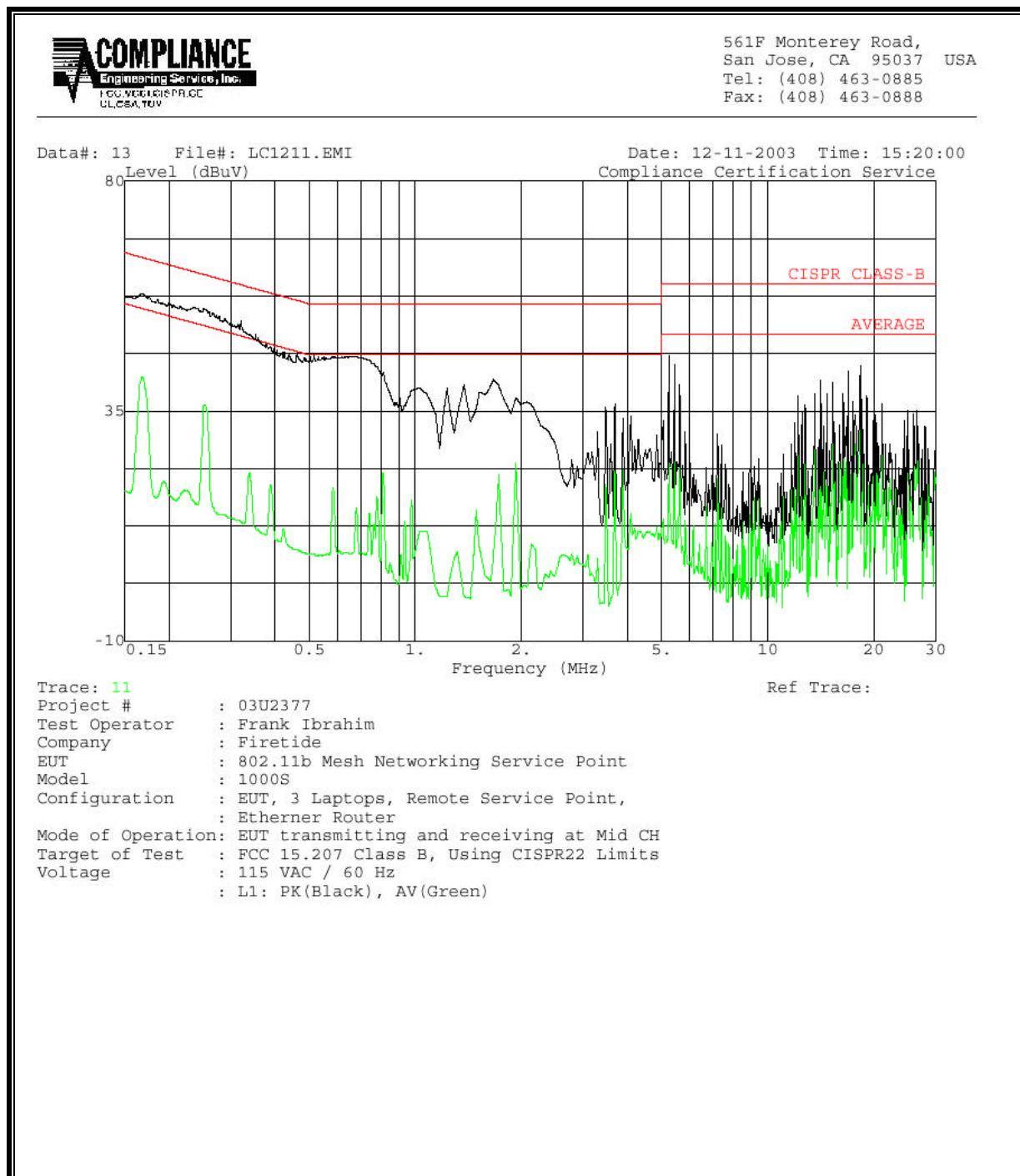
Line conducted data is recorded for both NEUTRAL and HOT lines.

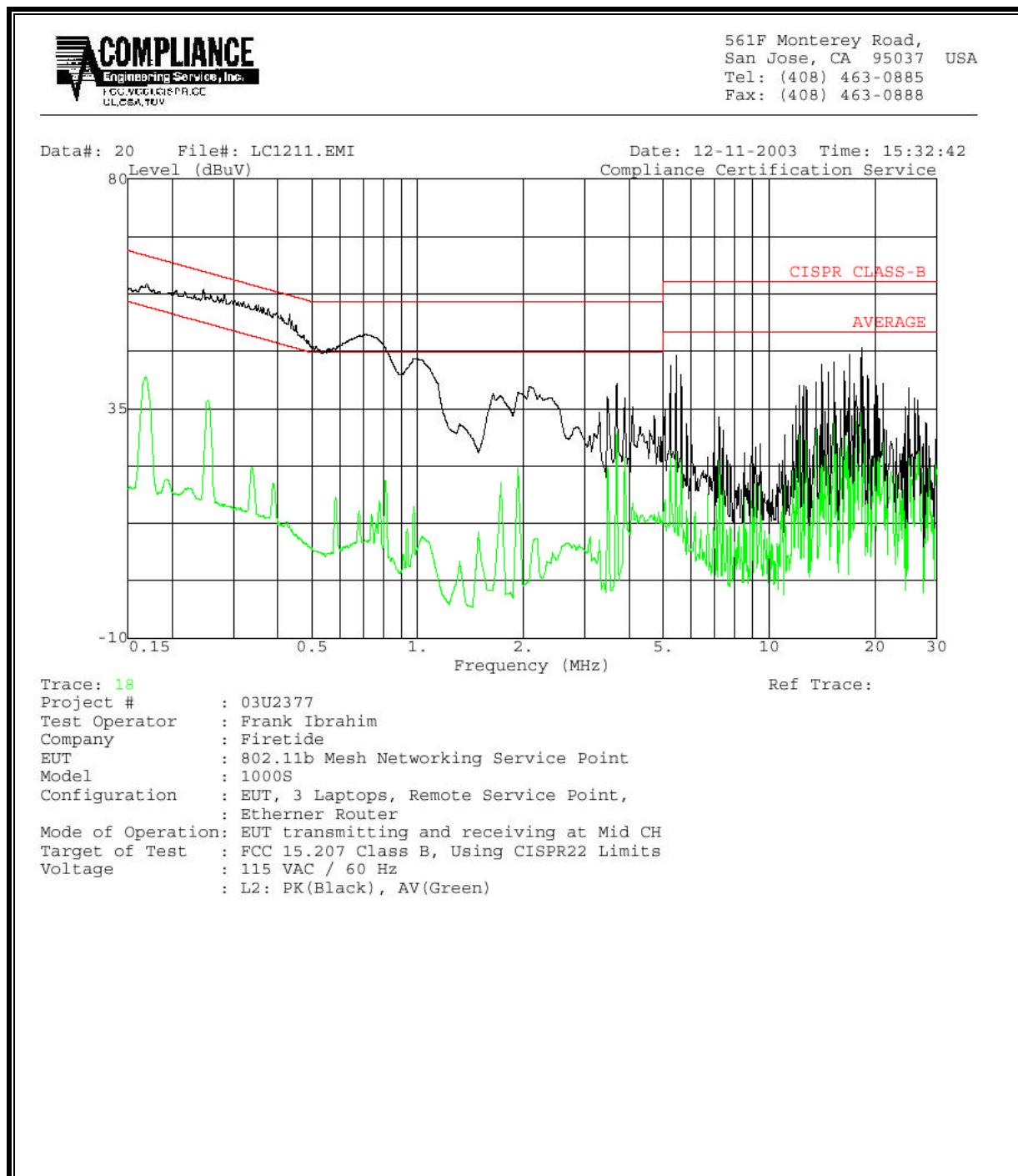
### RESULTS

No non-compliance noted:

**8 WORST EMISSIONS**

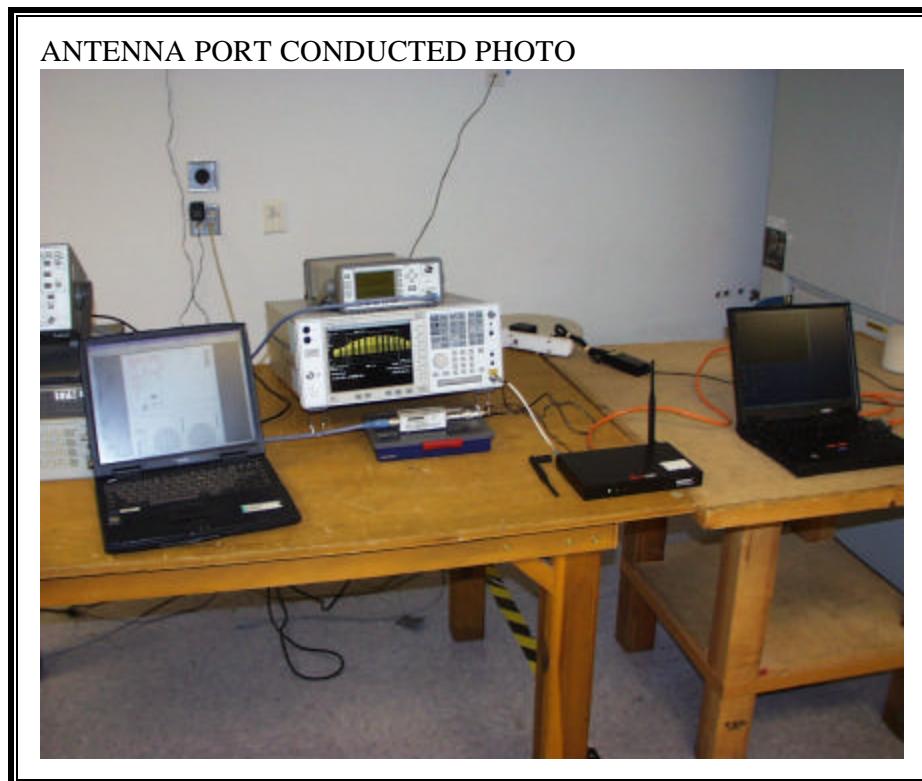
CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq. (MHz)	Reading			Closs (dB)	Limit QP	EN_B AV	Margin		Remark L1 / L2
	PK (dBuV)	QP (dBuV)	AV (dBuV)				QP (dB)	AV (dB)	
0.17	58.02	--	41.54	0.00	65.49	55.49	-7.47	-13.95	L1
0.24	55.01	--	36.17	0.00	63.46	53.46	-8.45	-17.29	L1
0.32	52.74	--	22.90	0.00	61.14	51.14	-8.40	-28.24	L1
0.35	49.96	--	12.15	0.00	60.23	50.23	-10.27	-38.08	L1
0.17	59.42	--	41.00	0.00	65.46	55.46	-6.04	-14.46	L2
0.25	58.50	--	36.58	0.00	63.26	53.26	-4.76	-16.68	L2
0.43	53.46	--	12.05	0.00	57.91	47.91	-4.45	-35.86	L2
0.71	49.52	--	9.05	0.00	56.00	46.00	-6.48	-36.95	L2
8 Worst Data									

**LINE 1 RESULTS**

**LINE 2 RESULTS**

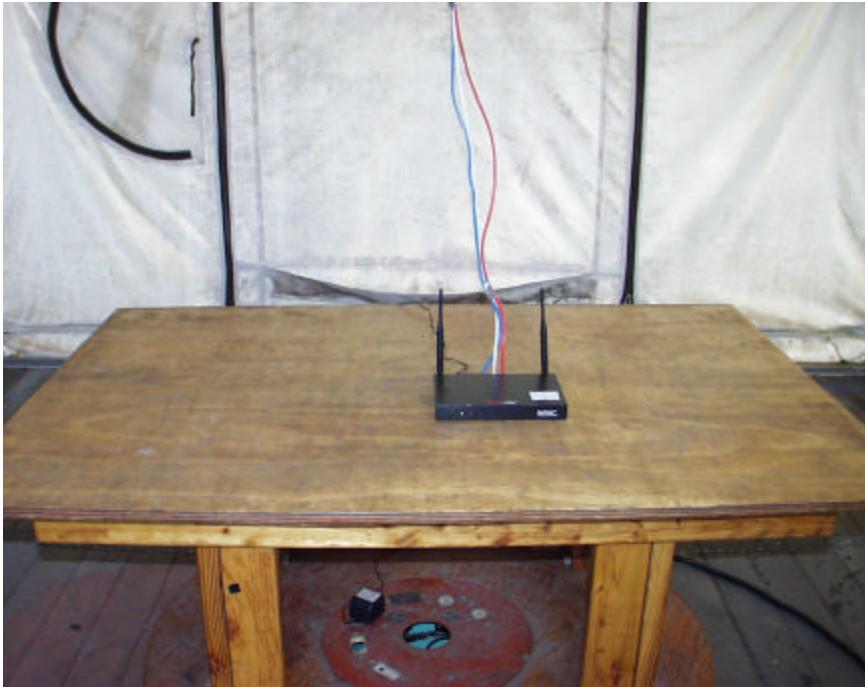
## 8. SETUP PHOTOS

### ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP

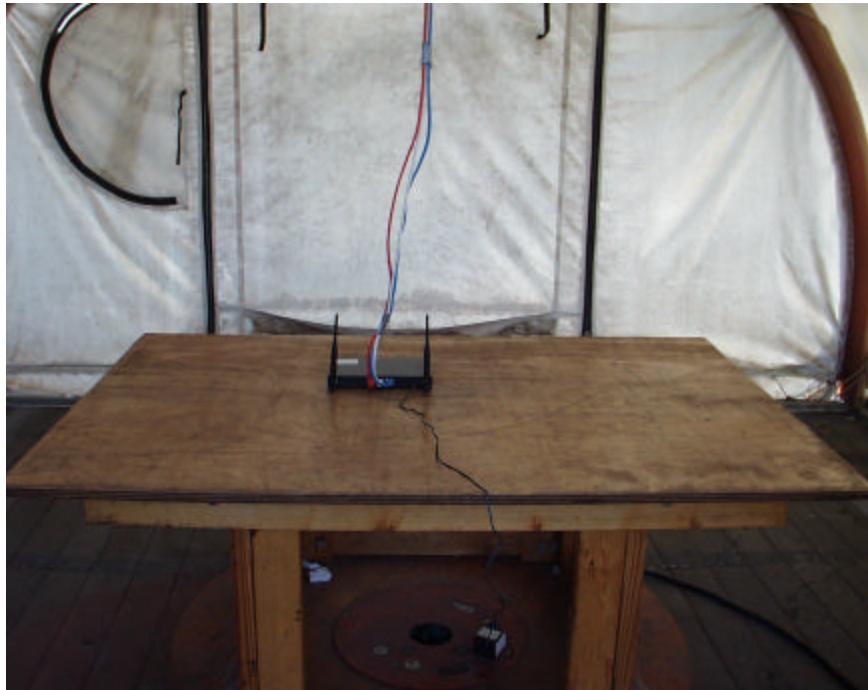


**RADIATED RF MEASUREMENT SETUP**

RADIATED FRONT PHOTO



RADIATED BACK PHOTO

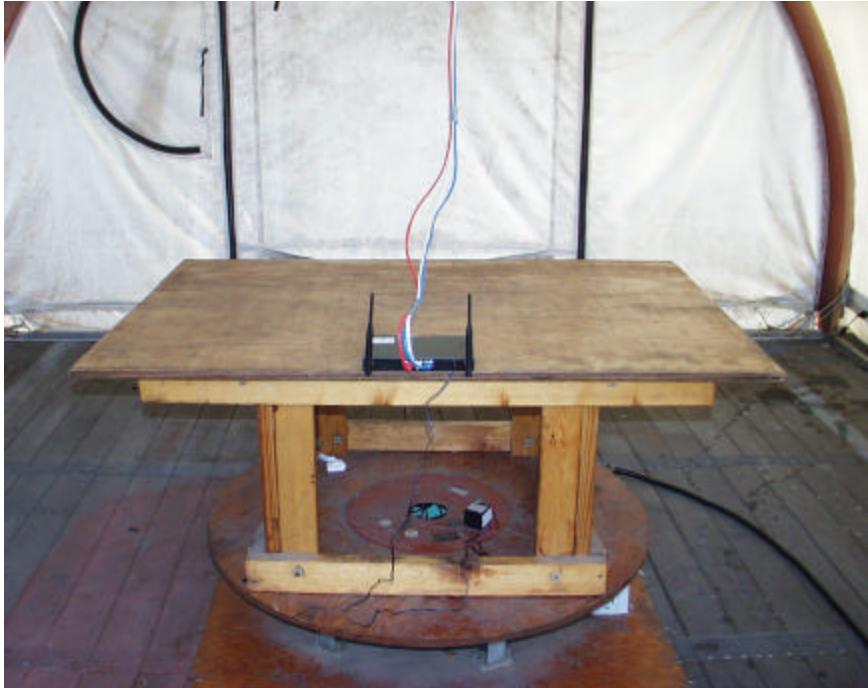


**DIGITAL DEVICE RADIATED EMISSIONS SETUP**

DIGITAL DEVICE FRONT PHOTO



DIGITAL DEVICE BACK PHOTO



**POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP**

LINE CONDUCTED FRONT PHOTO



LINE CONDUCTED BACK PHOTO

**END OF REPORT**