



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

FOR

802.11 2.4GHz Wi-Fi Bridge/Router

MODEL NUMBER: Vivato 2.4 GHz Wi-Fi Bridge/Router

BRAND NAME: Vivato Wi-Fi Bridge/Router

FCC ID: QLNVP824BWFBR

REPORT NUMBER: 03U2189-1

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1. TEST RESULT CERTIFICATION

COMPANY NAME: VIVATO, INC.
12610 E. MIRABEAU PKWY, SUITE 900
SPOKANE, WA. 99216, USA

EUT DESCRIPTION: 802.11 2.4GHZ WI-FI BRIDGE/ROUTER

MODEL: VIVATO 2.4 GHZ WI-FI BRIDGE/ROUTER

DATE TESTED: AUGUST 25, 2003 TO AUGUST 27, 2003

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

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: This document reports conditions under which testing was conducted and results of tests performed. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document.

Approved & Released For CCS By:

Tested By:



THU CHAN
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES



YAN ZHENG
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. EUT DESCRIPTION

The EUT contains two identical transceivers that operate in frequency band of 2412 ~2462MHz. The maximum peak output power is 24.47dBm; and the gain of antenna is 2dBi.

3. TEST METHODOLOGY

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

4. FACILITIES AND ACCREDITATION

4.1. FACILITIES AND EQUIPMENT

The open area test sites and conducted measurement facilities used to collect the radiated data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

4.2. TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	 1300
Japan	VCCI	CISPR 22 Two OATS and one conducted Site	 R-1014, R-619, C-640
Norway	NEMKO	EN50081-1, EN50081-2, EN50082-1, EN50082-2, IEC61000-6-1, IEC61000-6-2, EN50083-2, EN50091-2, EN50130-4, EN55011, EN55013, EN55014-1, EN55104, EN55015, EN61547, EN55022, EN55024, EN61000-3-2, EN61000-3-3, EN60945, EN61326-1	 ELA 117
Norway	NEMKO	EN60601-1-2 and IEC 60601-1-2, the Collateral Standards for Electro-Medical Products. MDD, 93/42/EEC, AIMD 90/385/EEC	 ELA-171
Taiwan	BSMI	CNS 13438	 SL2-IN-E-1012
Canada	Industry Canada	RSS210 Low Power Transmitter and Receiver	 IC2324 A,B,C, and F

5. CALIBRATION AND UNCERTAINTY

5.1. MEASURING INSTRUMENT CALIBRATION

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

5.2. MEASUREMENT UNCERTAINTY

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

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

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

5.3. TEST AND MEASUREMENT EQUIPMENT

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

TEST AND MEASUREMENT EQUIPMENT LIST				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due Date
EMI Receiver, 9 kHz ~ 2.9 GHz	HP	8542E	3942A00286	11/20/03
Power Meter	Agilent	E4416A	GB41291150	11/07/04
Power Sensor	Agilent	E9327A	US40440755	11/07/04
Horn Antenna (1 - 18GHz)	EMCO	3115	6739	2/4/04
Antenna, Biconical	Eaton	94455-1	2238	3/6/04
Antenna, Log Periodic 200-1000MHz	EMCO	3146	9107-3163	3/06/04
Preamplifier	Miteq	NSP10023988	646456	4/26/04
High Pass Filter (4.57GHz)	FSY Microwave	FM-4570-9SS	003	N.C.R.
Spectrum Analyzer	Agilent	E4446A	US42070220	03/01/04

6. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST			
Device Type	Manufacturer	Model	Serial Number
Laptop	IBM	T23	78-1LTRH
Power Adapter	IBM	02K66749	11S02K6749Z1Z2UM250N6T
Power Adapter	N/A	AM-121000	710101040000

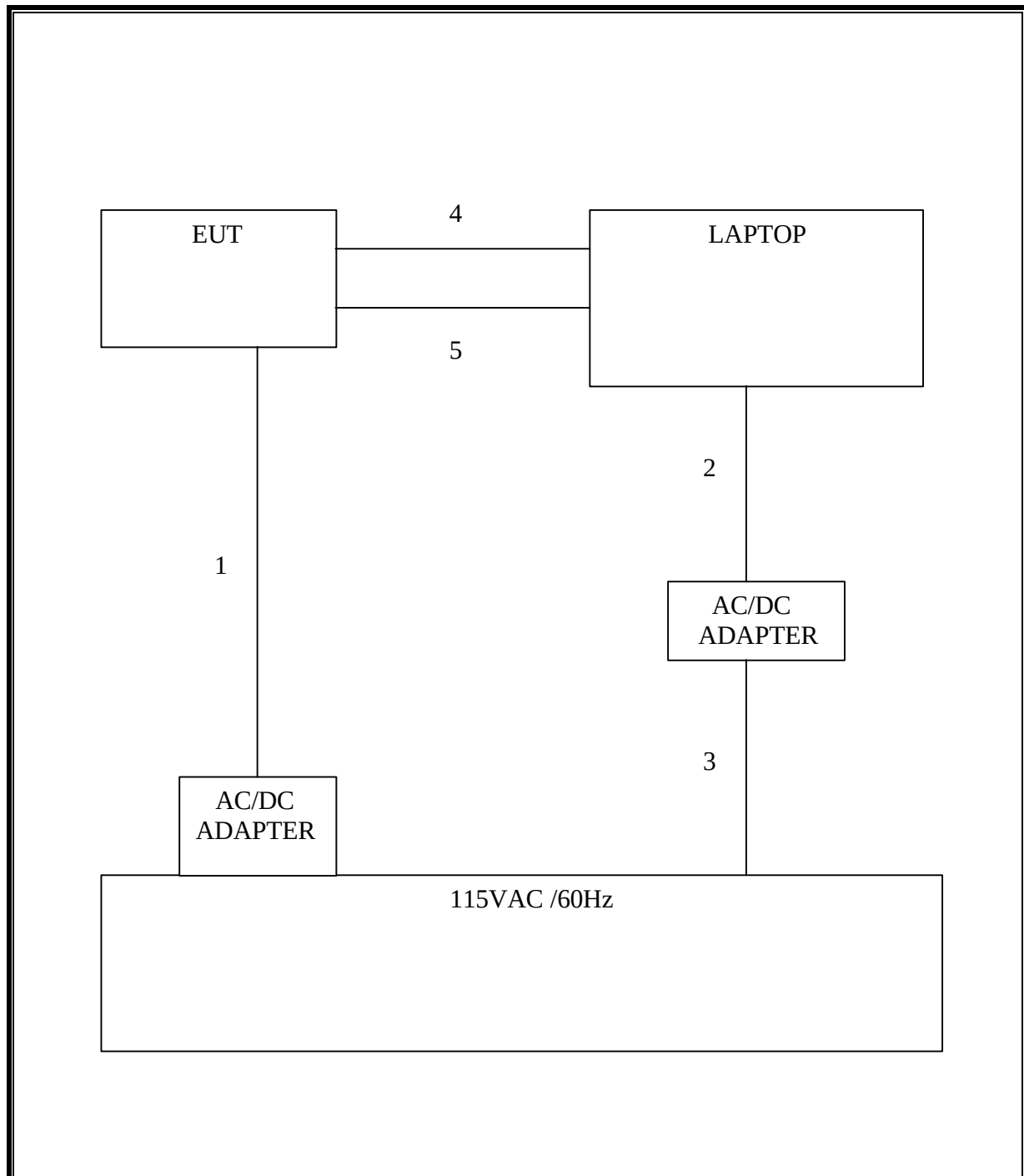
I/O CABLES

Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	DC	1	DC	Un-Shielded	2m	Integral with adapter
2	DC	1	DC	Un-Shielded	2m	Integral with adapter
3	AC	1	115V	Un-Shielded	2m	Integral with adapter
4	RS232/ RJ45	2	RS232/ RJ45	Un-Shielded	2m	N/A
5	RJ45	2	RJ45	Un-Shielded	2m	NA

TEST SETUP

The EUT was operated with laptop at transmit mode.

SETUP DIAGRAM



7. APPLICABLE LIMITS AND TEST RESULTS

7.1. 6 dB BANDWIDTH

LIMIT

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

TEST PROCEDURE

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

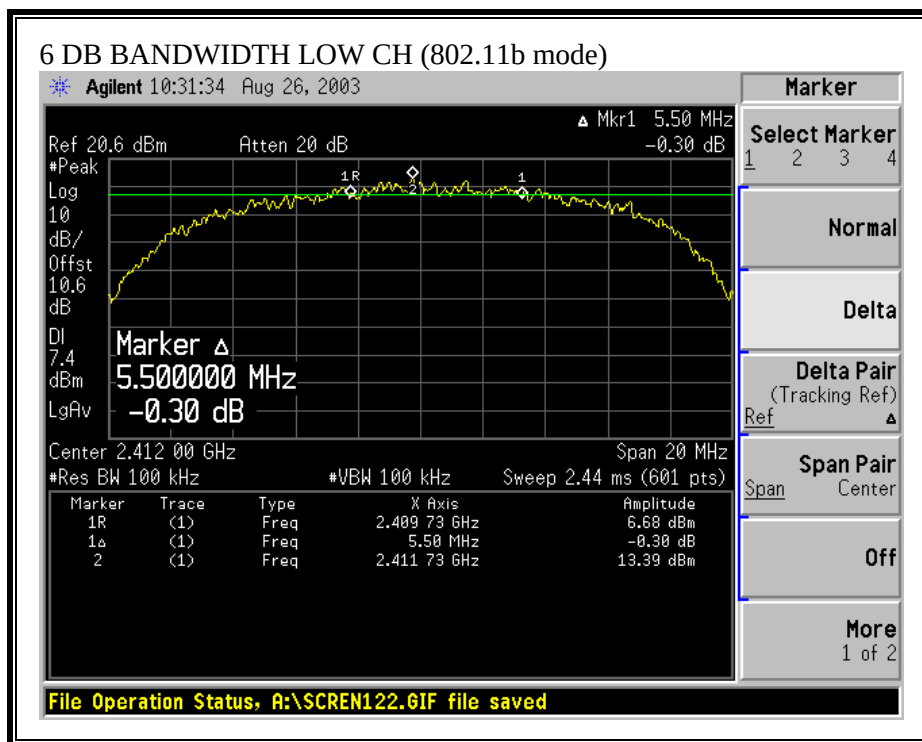
RESULTS

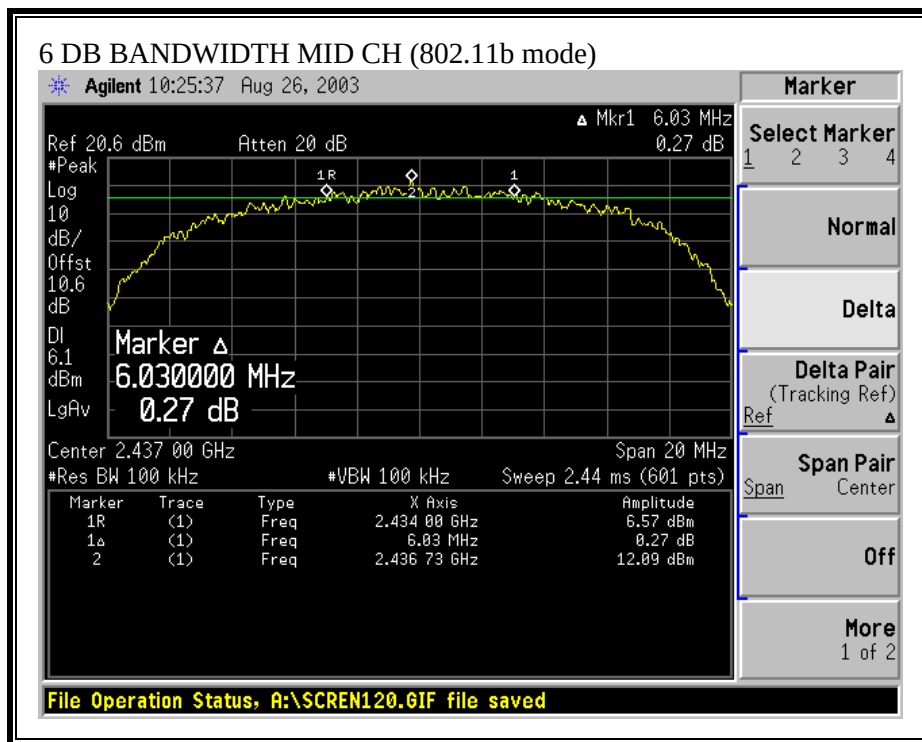
No non-compliance noted:

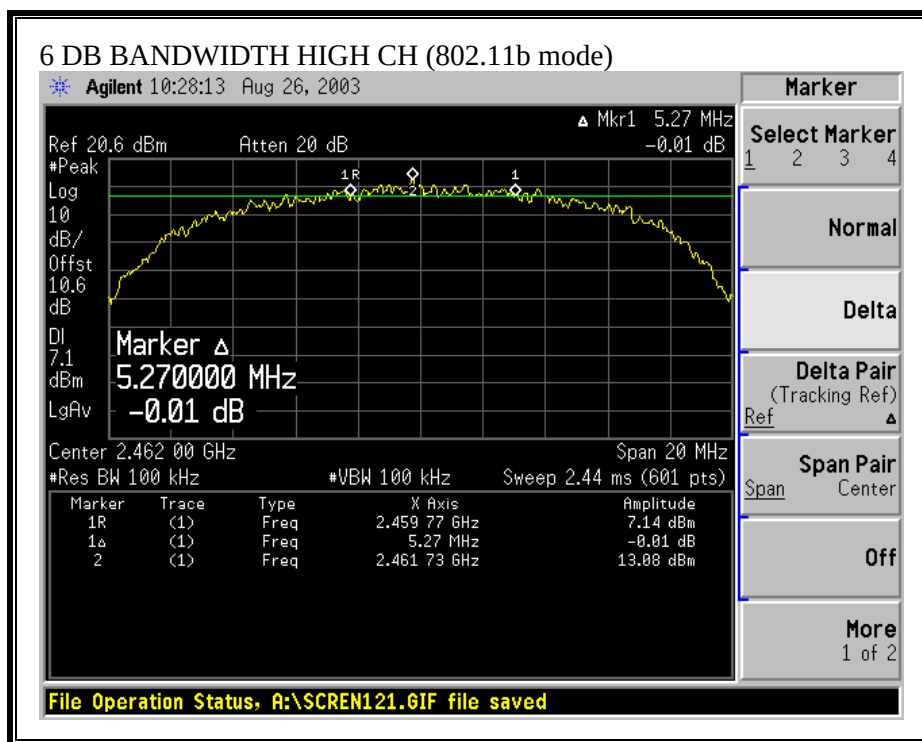
802.11b Mode

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	5500	500	5000
Middle	2437	6030	500	5530
High	2462	5270	500	4770

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.

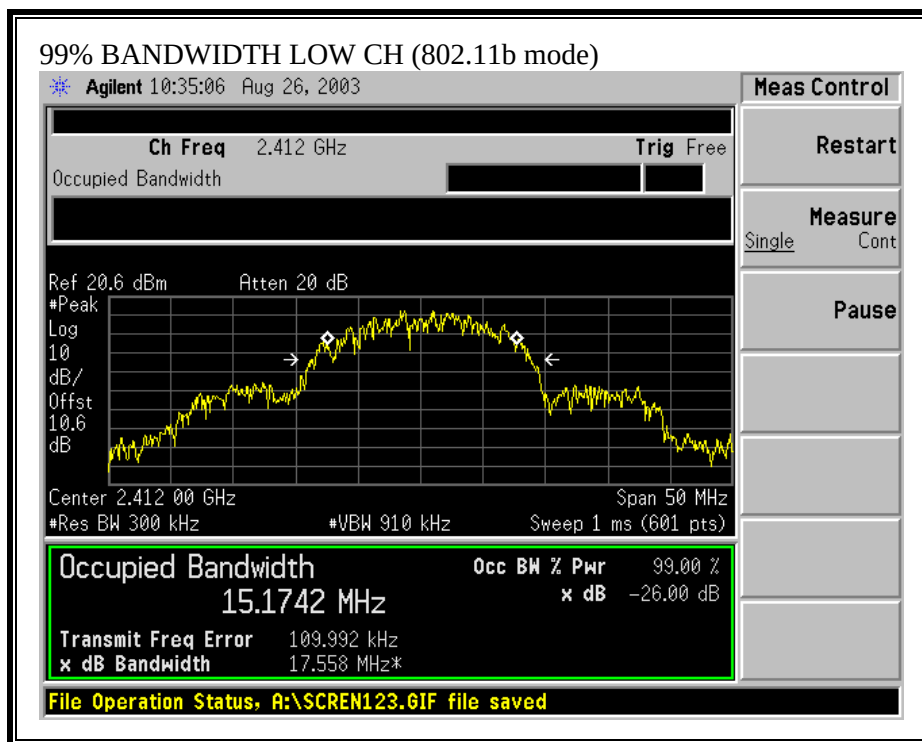
RESULTS

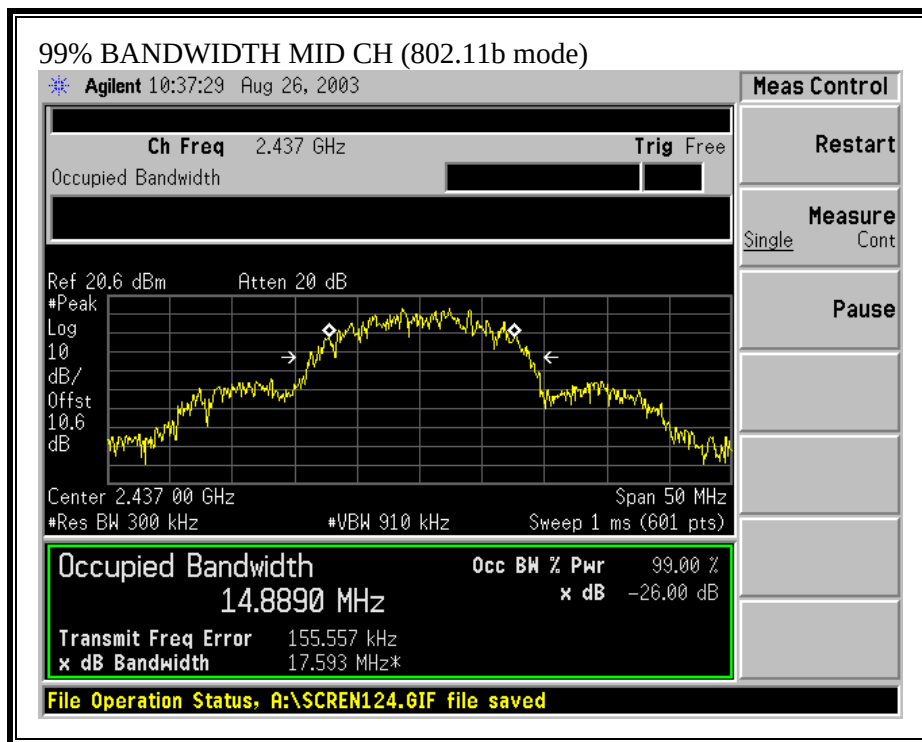
No non-compliance noted:

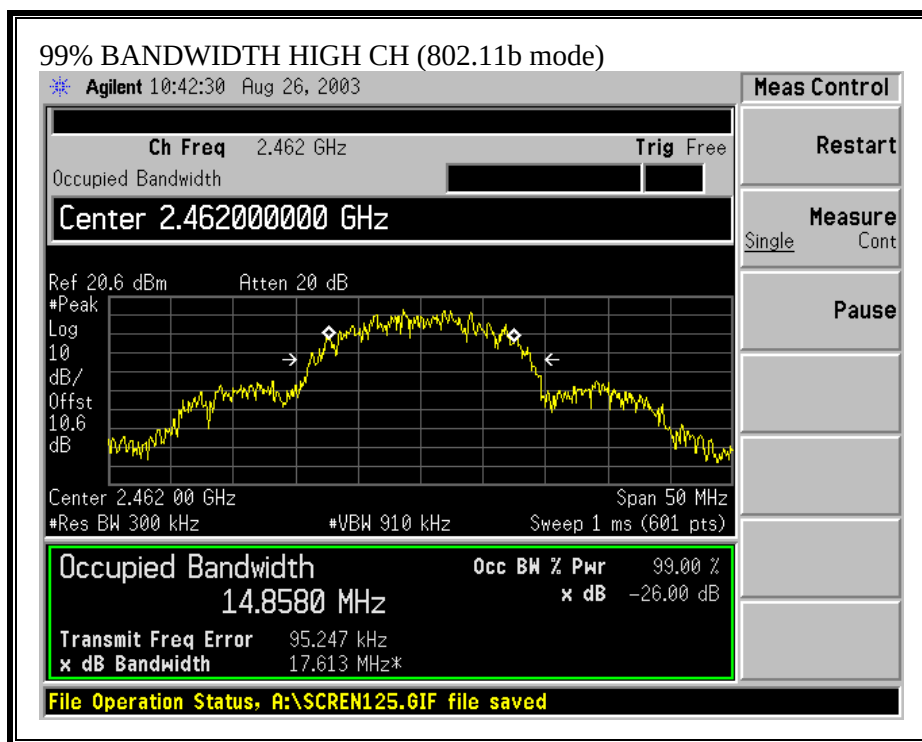
802.11b Mode

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	15.1742
Middle	2437	14.889
High	2462	14.858

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 2 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

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

RESULTS

No non-compliance noted:

Both transmitters were measured in order to determine the dominant transmitters.

802.11b Mode, WLAN 0

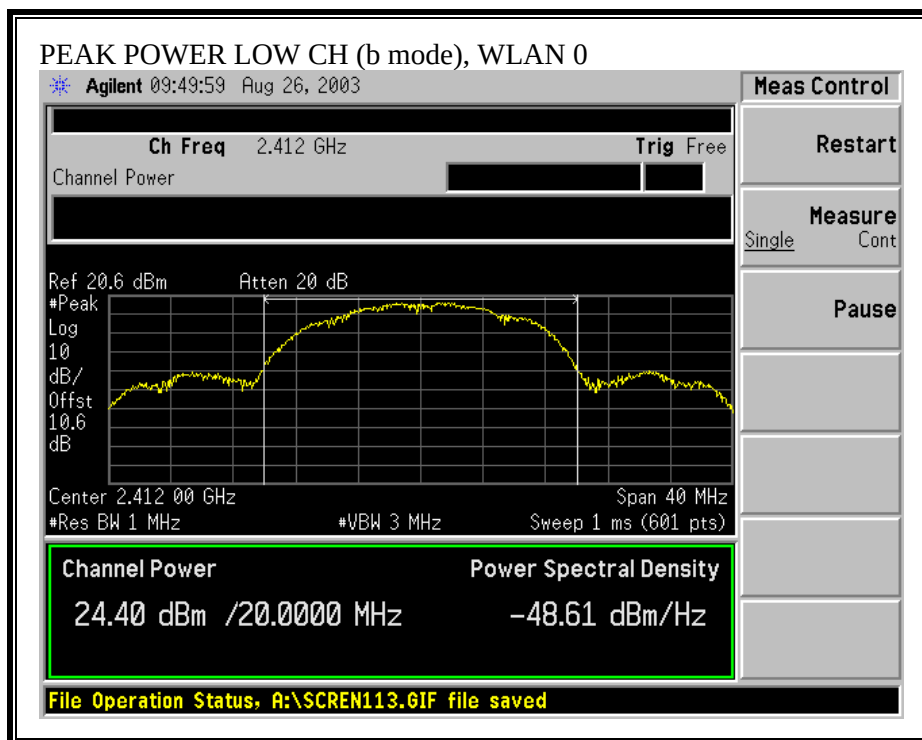
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	24.40	30	-5.60
Middle	2437	23.93	30	-6.07
High	2462	24.47	30	-5.53

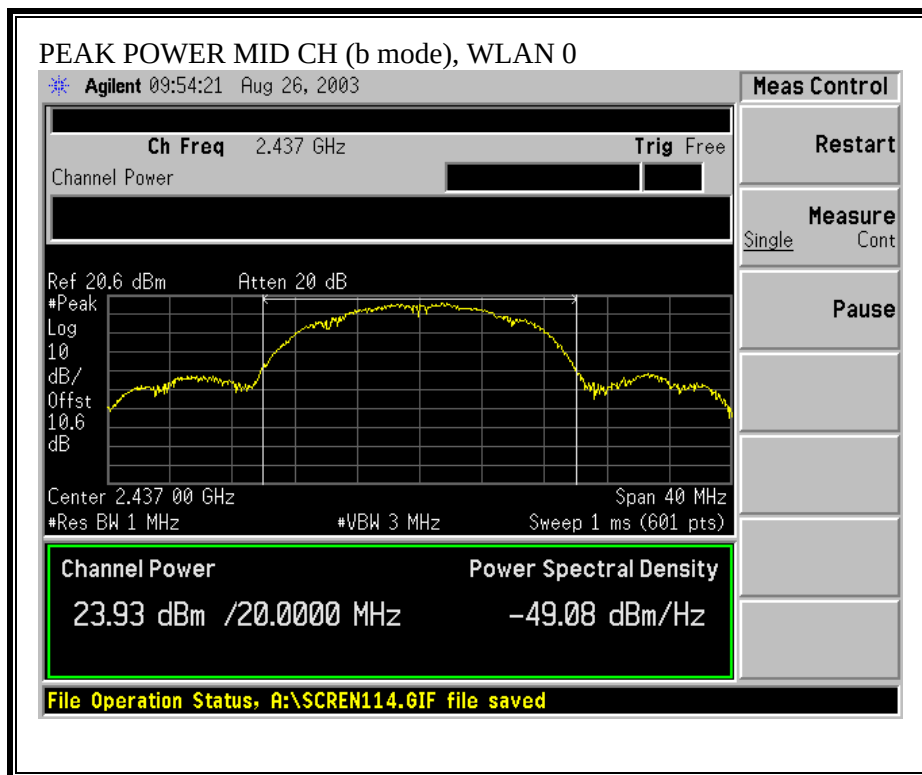
802.11b Mode, WLAN 1

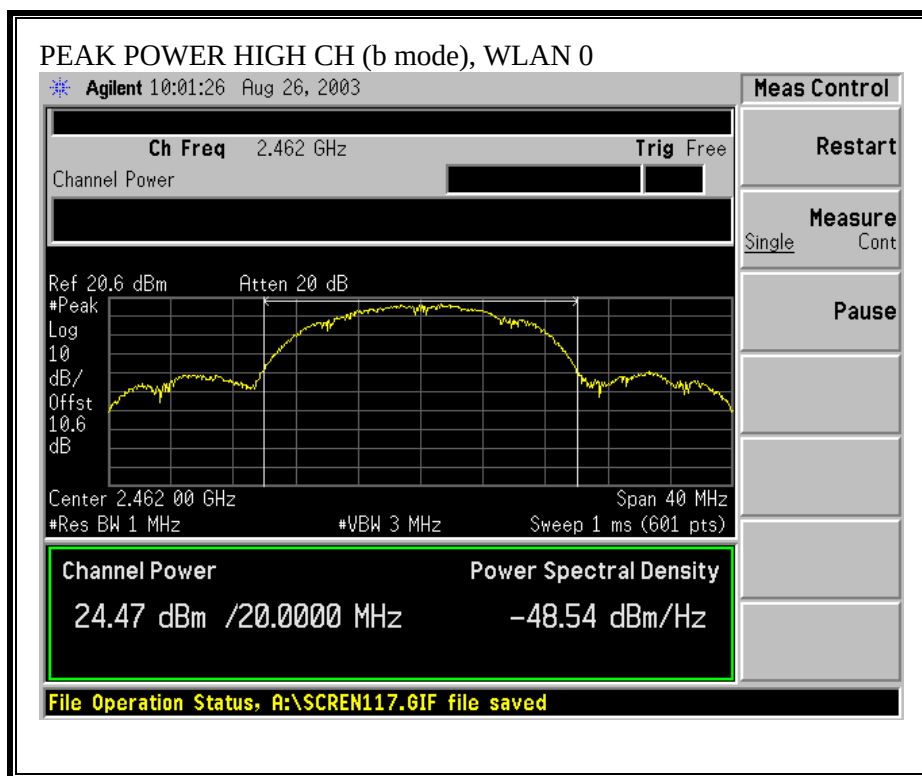
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	23.94	30	-6.06
Middle	2437	23.97	30	-6.03
High	2462	23.37	30	-6.63

Based on the power measurements, WLAN 0 is dominant.

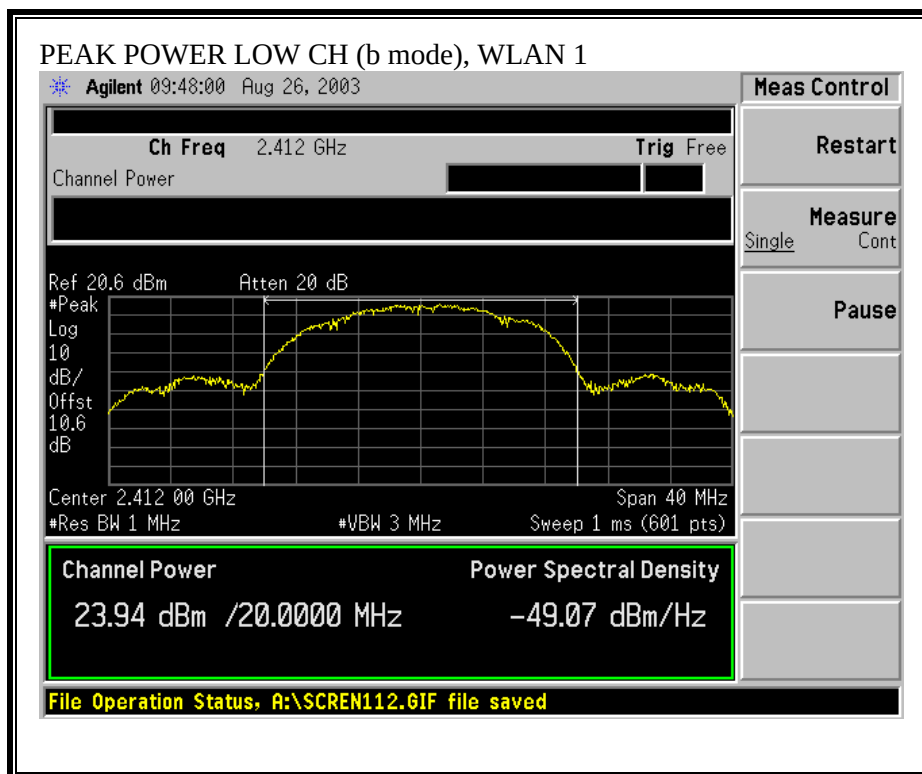
OUTPUT POWER (802.11b MODE), WLAN 0

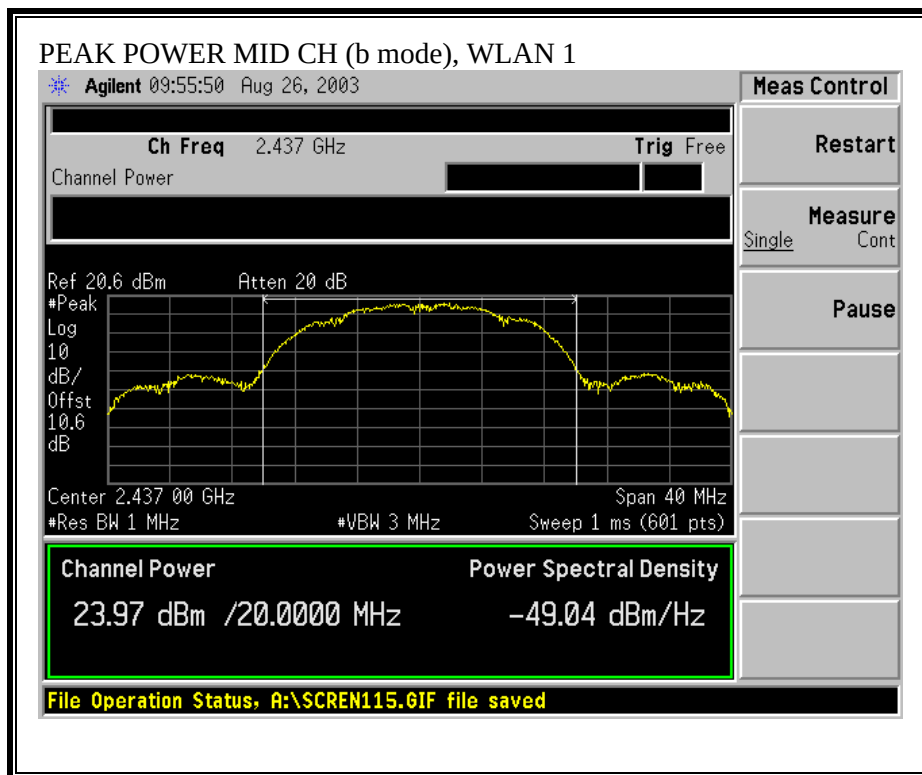


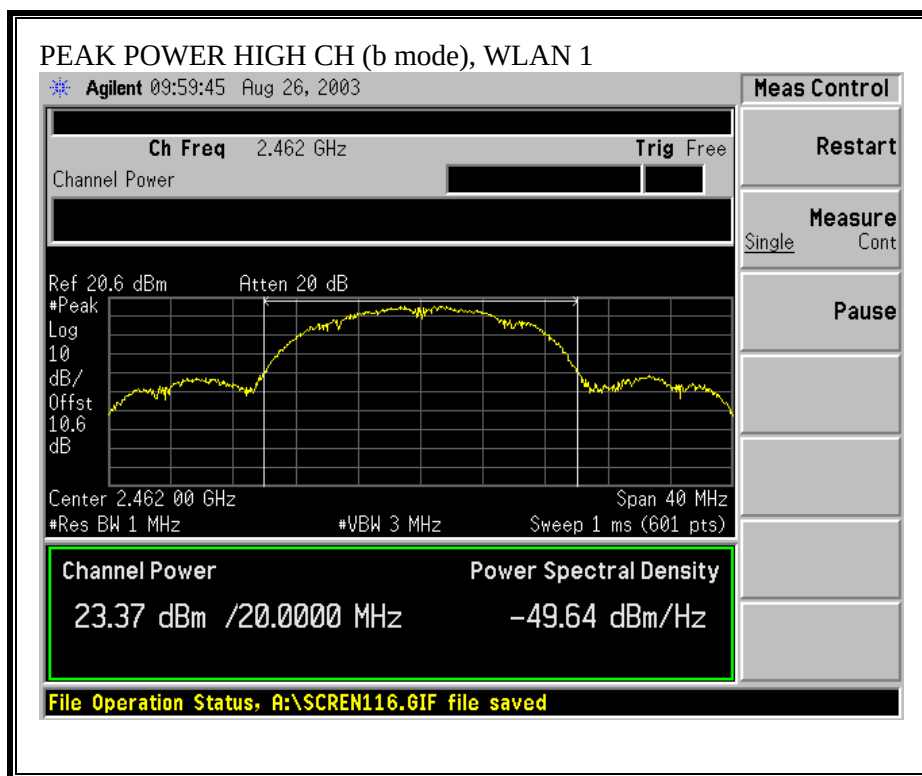




OUTPUT POWER (802.11b MODE), WLAN 1







7.4. MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

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

CALCULATIONS

Given

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

and

$$S = E^2 / 3770$$

where

E = Field Strength in Volts / meter

P = Power in Watts

G = Numeric antenna gain

d = distance in meters

S = Power Density in milliwatts / square centimeter

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

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

Changing to units of mW and cm, using:

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

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

yields

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

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

where

d = distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power Density in mW / cm²

Substituting the logarithmic form of power and gain using:

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

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

yields

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

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW / cm²

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

LIMITS

S = 1.0 mW / cm² from 1.1310 Table 1

RESULTS

No non-compliance noted:

Mode	Power Density Limit (mW/cm ²)	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
802.11b	1.0	24.47	2.00	5.94

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 10dB (including 10 dB pad and 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	21.80
Middle	2437	21.30
High	2462	21.30

7.6. PEAK POWER SPECTRAL DENSITY

LIMIT

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

TEST PROCEDURE

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

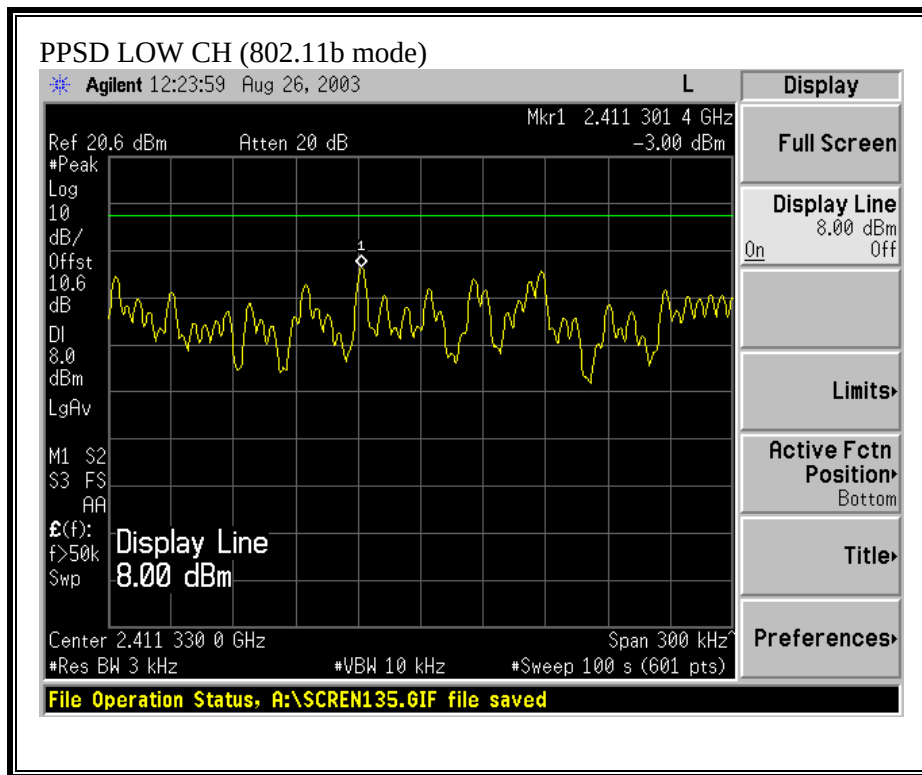
RESULTS

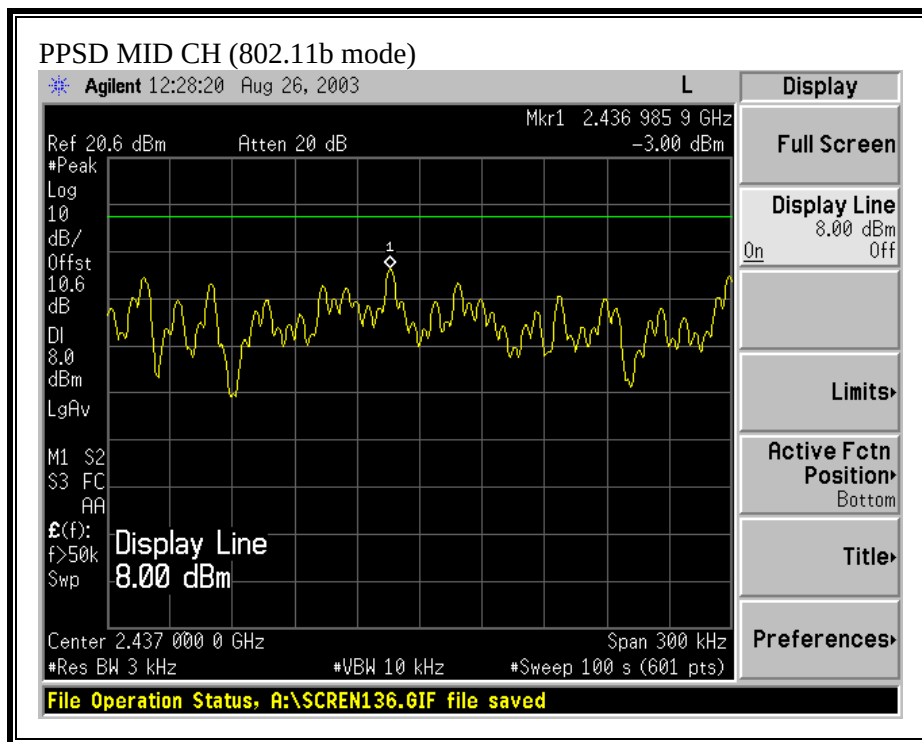
No non-compliance noted:

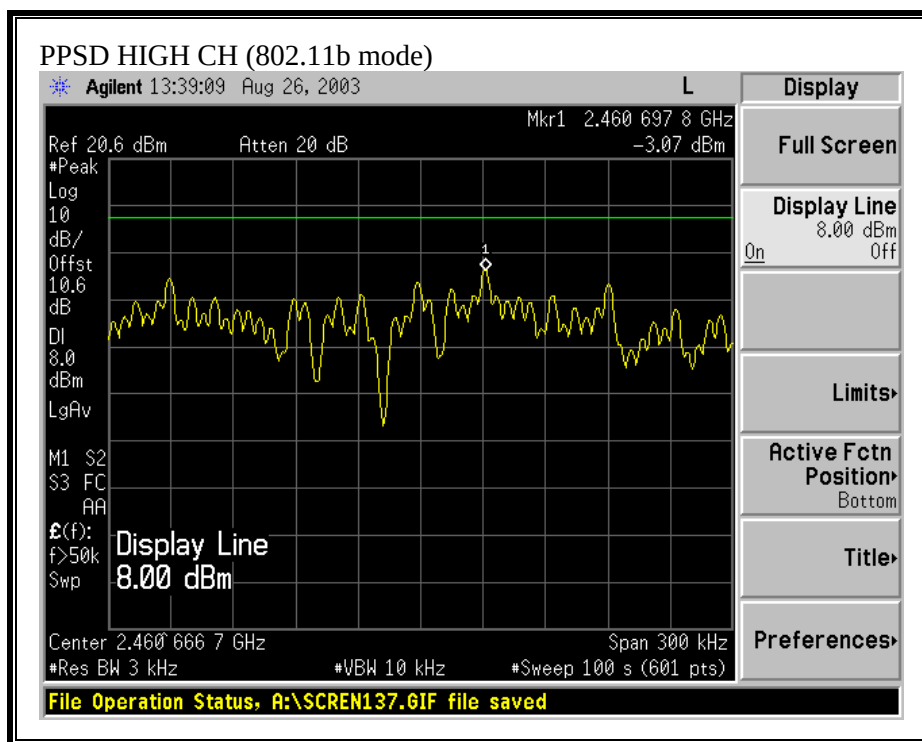
802.11b Mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-3.00	8	-11.00
Middle	2437	-3.00	8	-11.00
High	2462	-3.07	8	-11.07

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

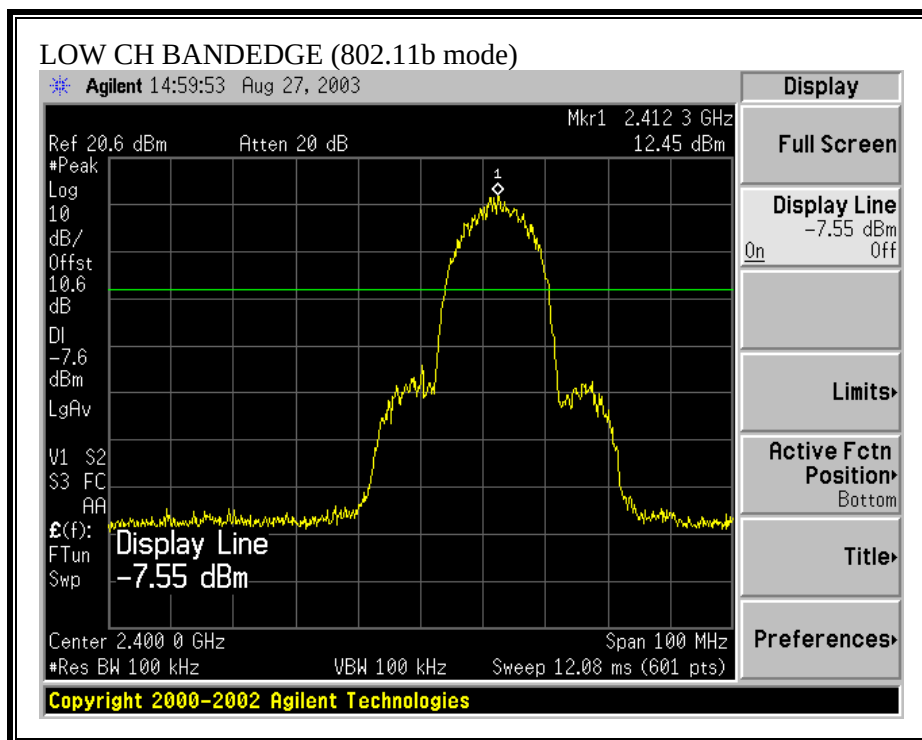
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

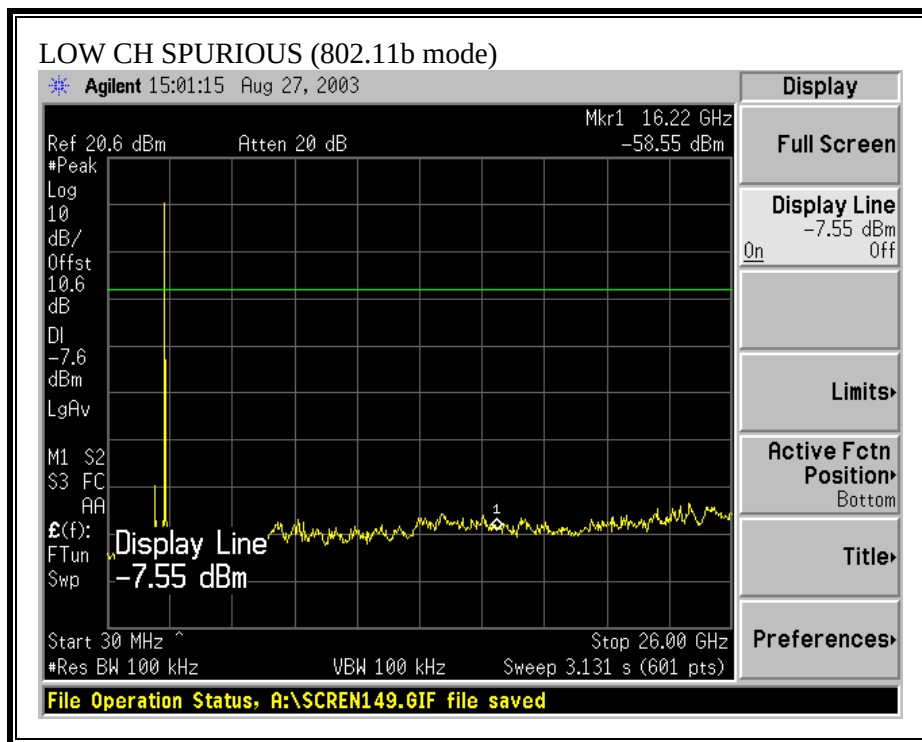
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

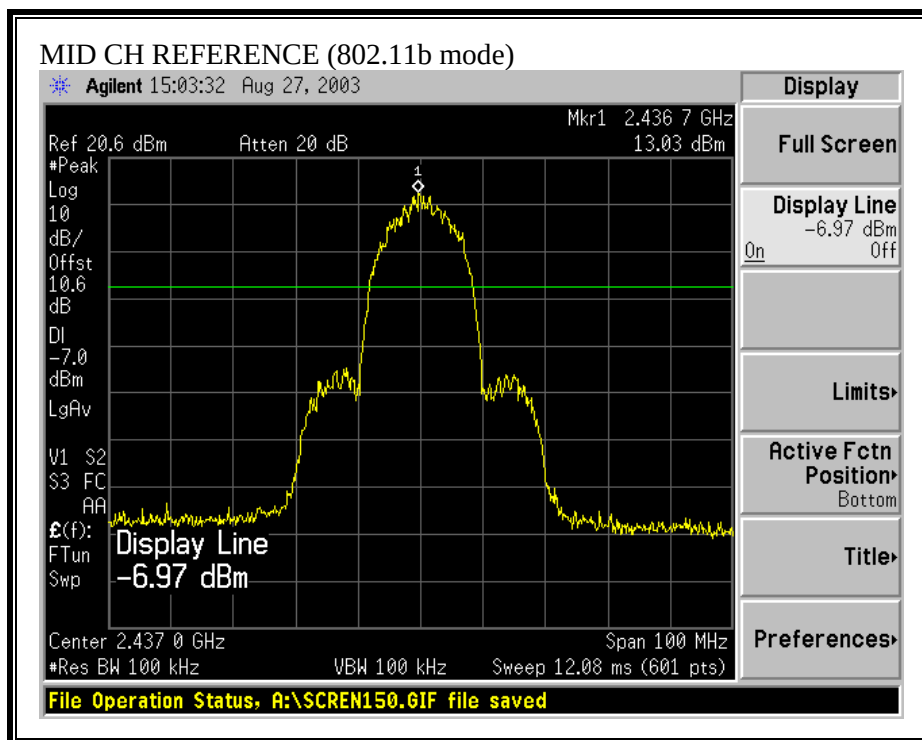
No non-compliance noted:

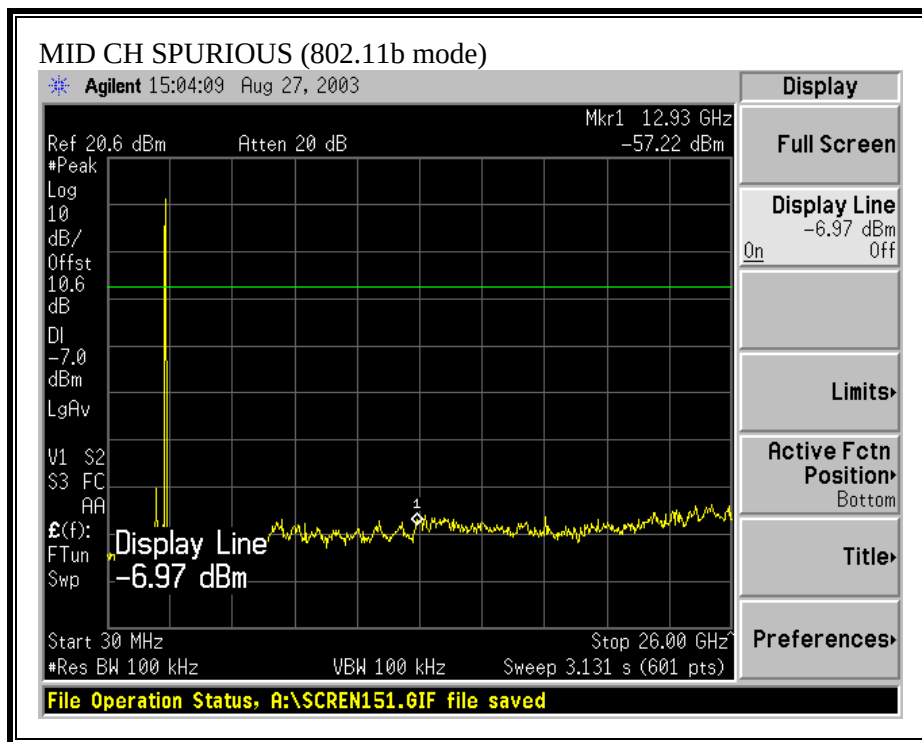
SPURIOUS EMISSIONS, LOW CHANNEL (802.11b MODE)



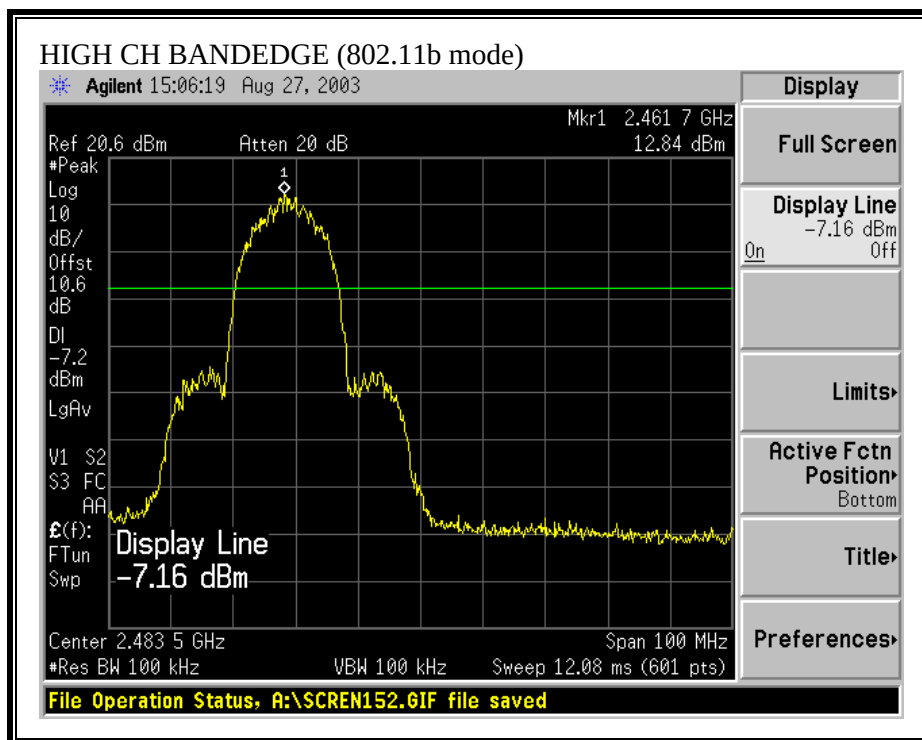


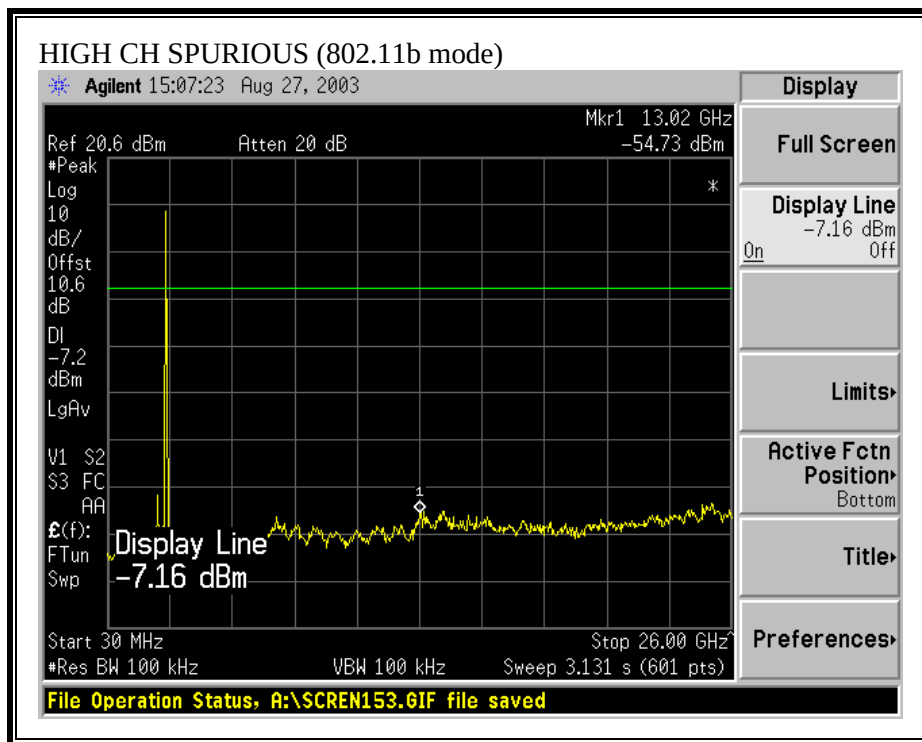
SPURIOUS EMISSIONS, MID CHANNEL (802.11b MODE)





SPURIOUS EMISSIONS, HIGH CHANNEL (802.11b MODE)





7.8. RADIATED EMISSIONS

LIMITS

§15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

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

² Above 38.6

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

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

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

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

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

TEST PROCEDURE

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

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

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

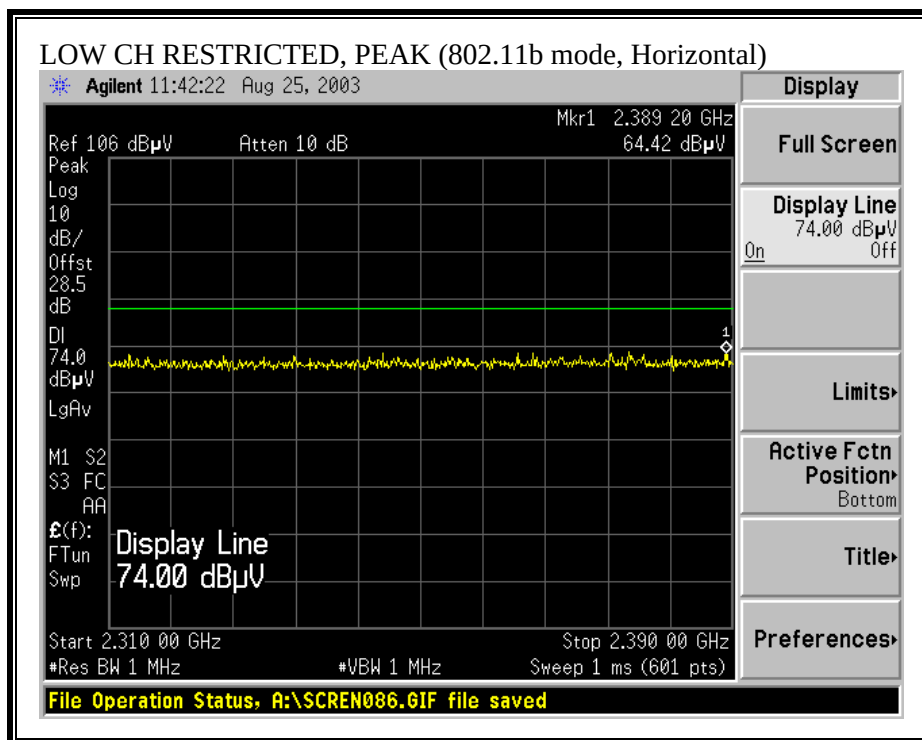
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

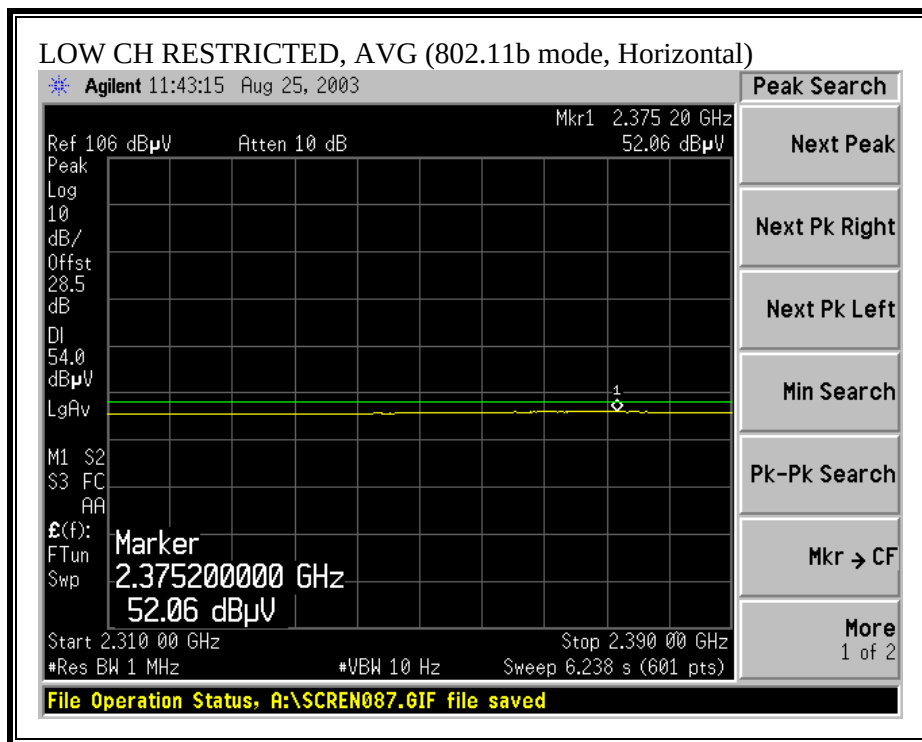
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

RESULTS

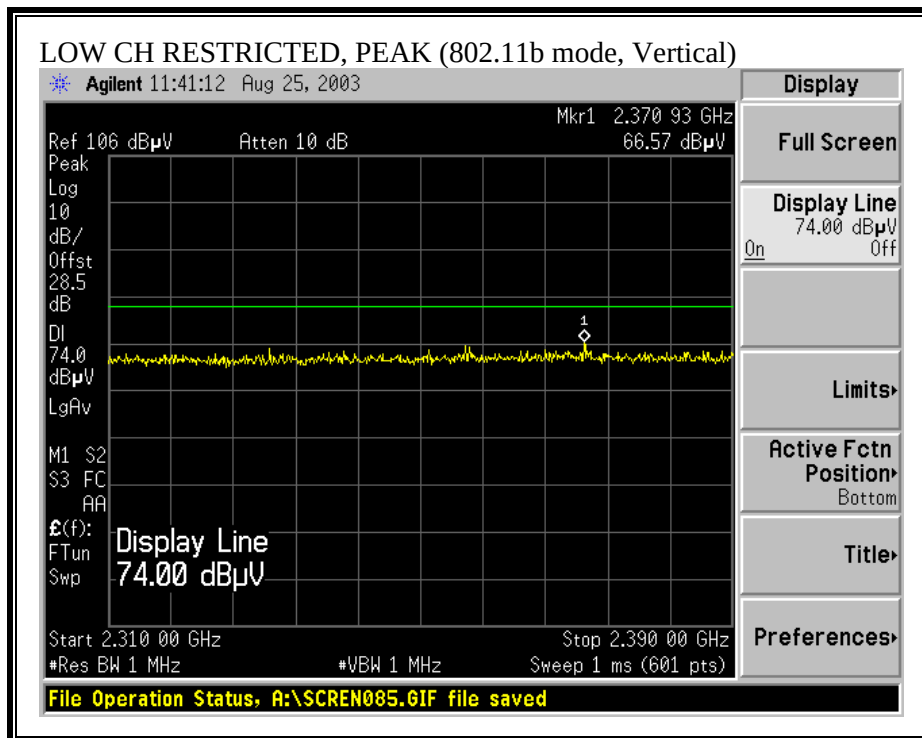
No non-compliance noted:

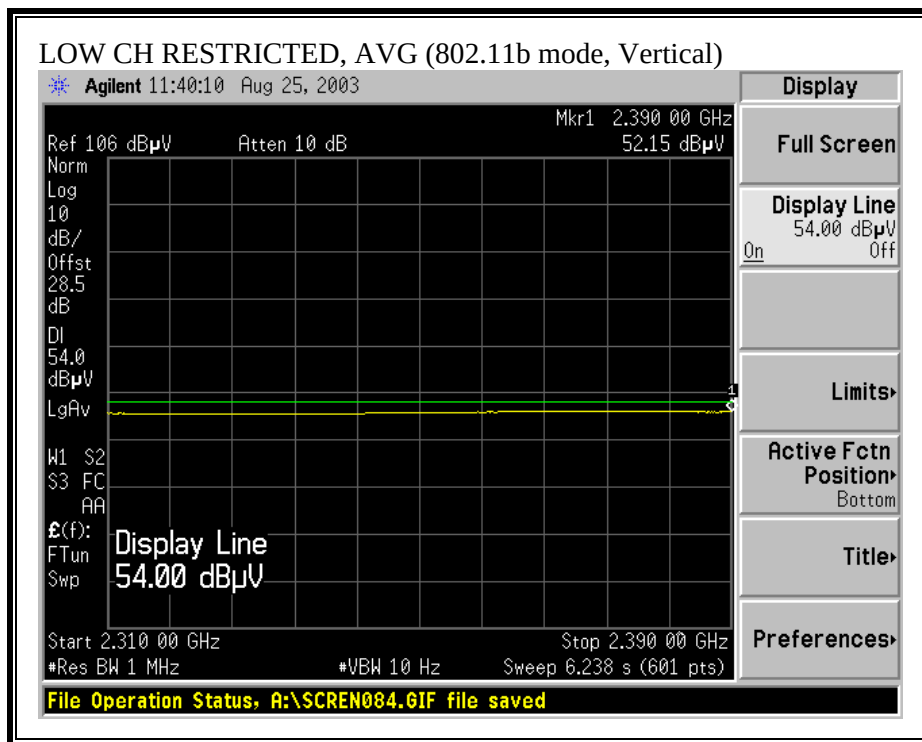
RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, HORIZONTAL).



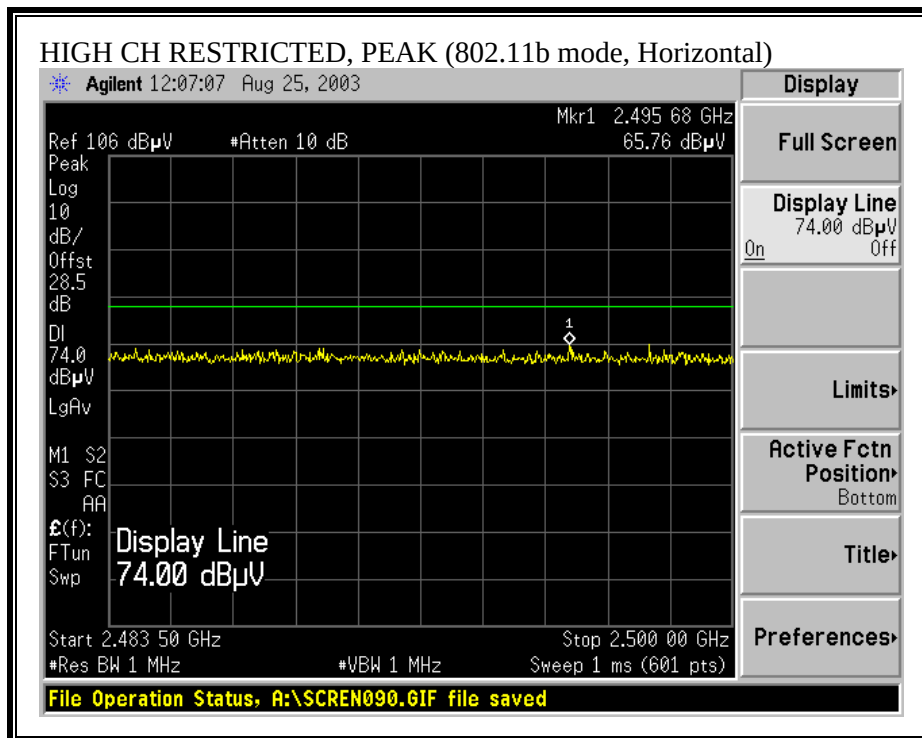


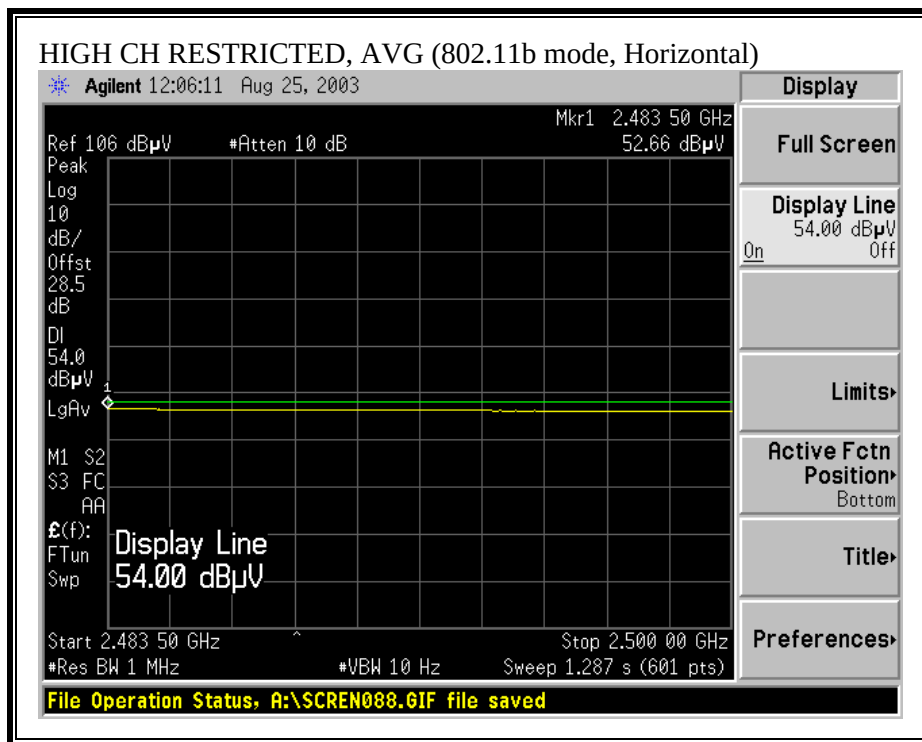
RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, VERTICAL)



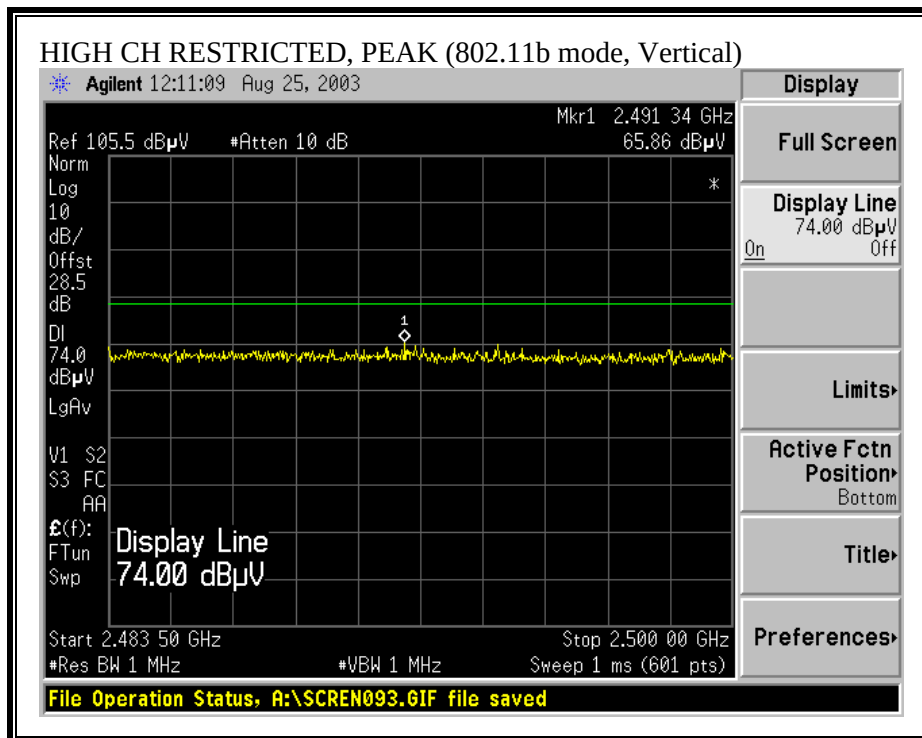


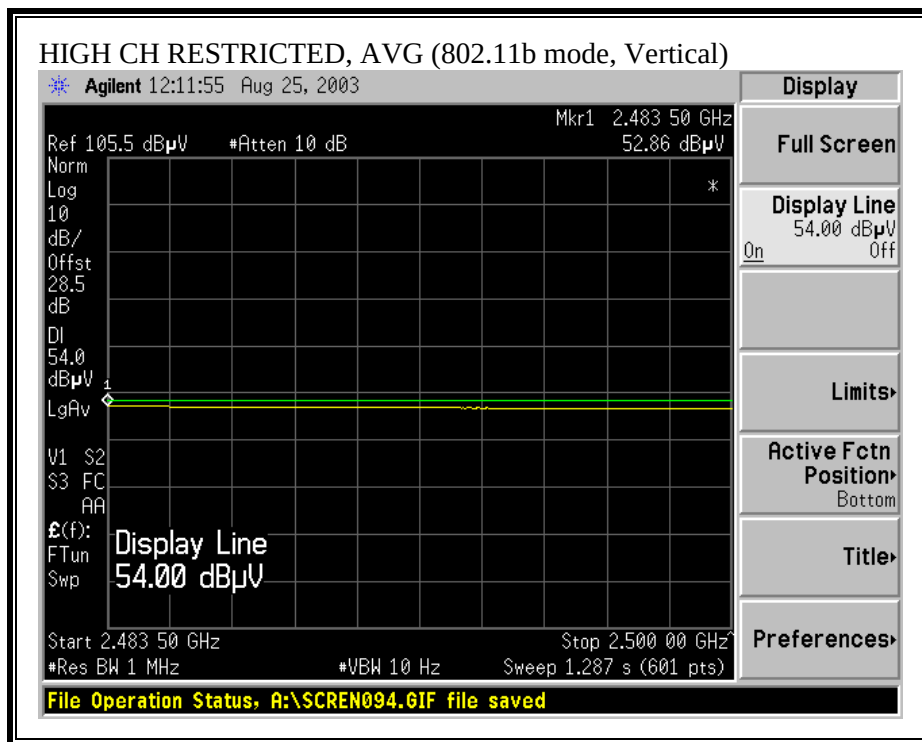
RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, VERTICAL)





08/25/03

High Frequency Measurement

Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: Yan Zheng

Project #: 03U2189

Company: VIVATO

EUT Descrip.: 802.11b Bridge Router

EUT M/N: Wi-Fi Bridge Router

Test Target: FCC Class B

Mode Oper: Transmitt, WLAN 0

Test Equipment:

EMCO Horn 1-18GHz

Pre-amplifier 1-26GHz

Spectrum Analyzer

Horn > 18GHz

T60; S/N: 2238 @1m

T63 Miteq646456

Agilent E4464A Analyzer

T117; ARA 18-26GHz; S/N:1013

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 1 (2412MHz)															
4.824	9.8	45.3	37.5	33.7	4.4	-35.3	0.0	1.0	49.1	41.3	74.0	54.0	-24.9	-12.7	V
4.824	9.8	44.9	35.2	33.7	4.4	-35.3	0.0	1.0	48.6	39.0	74.0	54.0	-25.4	-15.0	H

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

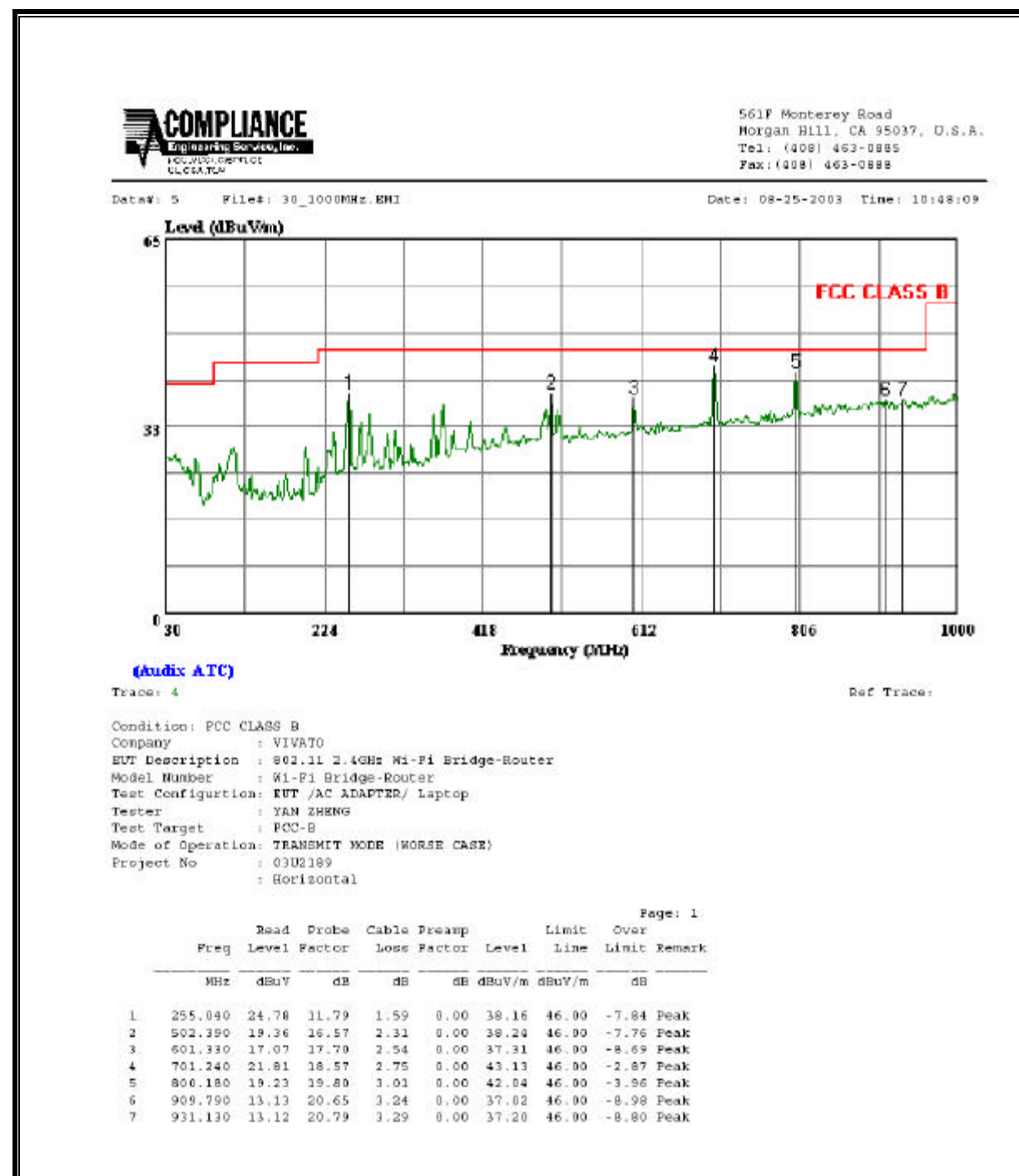
HARMONICS AND SPURIOUS EMISSIONS (b MODE, MID CHANNEL).

08/27/03 High Frequency Measurement															
Compliance Certification Services, Morgan Hill Open Field Site															
Test Engr:		Yan Zheng													
Project #:		03U2189													
Company:		VIVATO													
EUT Descrip.:		802.11b, Bridge Router													
EUT M/N:		Wi-Fi Bridge Router													
Test Target:		FCC Class B													
Mode Oper:		Transmitt, WLAN 0													
Test Equipment:															
EMCO Horn 1-18GHz				Pre-amplifier 1-26GHz				Spectrum Analyzer				Horn > 18GHz			
T60; S/N: 2238 @1m				T63 Miteq 646456				Agilent E4446A Analyzer				T117; ARA 18-26GHz; S/N:1013			
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
Channe 6 (2437MHz)															
4.874	9.8	43.4	30.7	33.8	3.8	-35.3	0.0	1.0	46.6	33.9	74.0	54.0	-27.4	-20.1	H
7.311	9.8	40.6	31.0	37.3	4.8	-34.6	0.0	1.0	49.1	39.5	74.0	54.0	-24.9	-14.5	H
7.311	9.8	40.3	30.9	37.3	4.8	-34.6	0.0	1.0	48.8	39.4	74.0	54.0	-25.2	-14.6	V
4.874	9.8	44.6	37.0	33.8	3.8	-35.3	0.0	1.0	47.8	40.2	74.0	54.0	-26.2	-13.8	V
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							

08/25/03 High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site															
Test Engr: Yan Zheng Project #: 03U2189 Company: VIVATO EUT Descrp.: 802.11b Bridge Router EUT M/N: Wi-Fi Bridge Router Test Target: FCC Class B Mode Oper: Transmitt, WLAN 0															
Test Equipment:															
EMCO Horn 1-18GHz T60; S/N: 2238 @1m				Pre-amplifer 1-26GHz T63 Miteq646456				Spectrum Analyzer Agilent E4446A Analyzer				Horn > 18GHz T117; ARA 18-26GHz; S/N:1013			
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
Channe 11 (2462MHz)															
4.924	9.8	43.0	30.7	33.8	4.5	-35.3	0.0	1.0	46.9	34.6	74.0	54.0	-27.1	-19.4	H
7.386	9.8	42.2	30.7	37.4	5.7	-34.5	0.0	1.0	51.7	40.2	74.0	54.0	-22.3	-13.8	H
7.386	9.8	42.3	30.6	37.4	5.7	-34.5	0.0	1.0	51.9	40.1	74.0	54.0	-22.1	-13.9	V
4.924	9.8	44.8	31.6	33.8	4.5	-35.3	0.0	1.0	48.7	35.5	74.0	54.0	-25.3	-18.5	V
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															

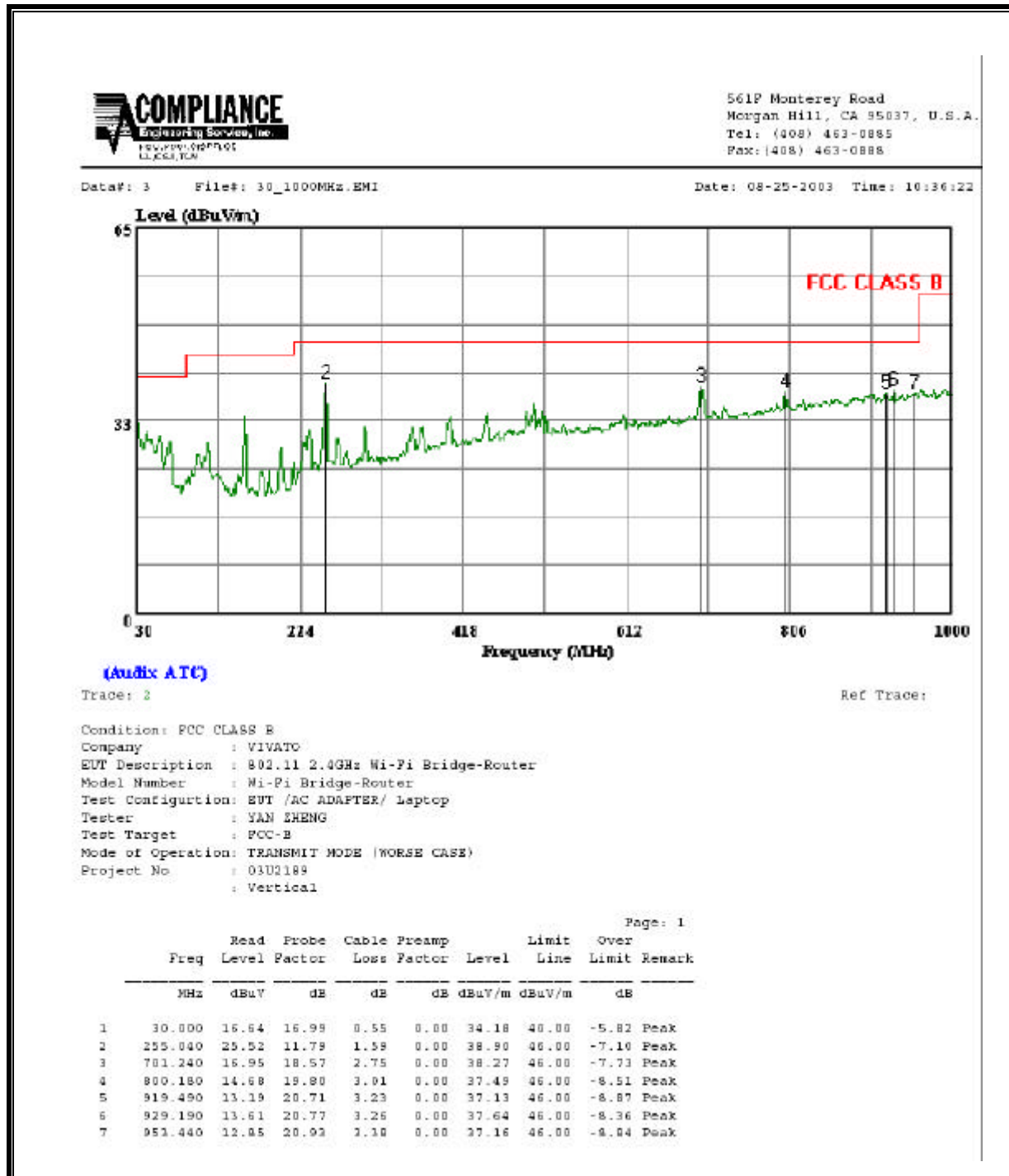
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)

HORIZONTAL



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

VERTICAL



7.9. CO-LOCATED RADIATED EMISSIONS

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 two collocated radios are the same model, however the sample used as WLAN 0 has a slightly higher output power, therefore it is designated as the dominant transmitter.

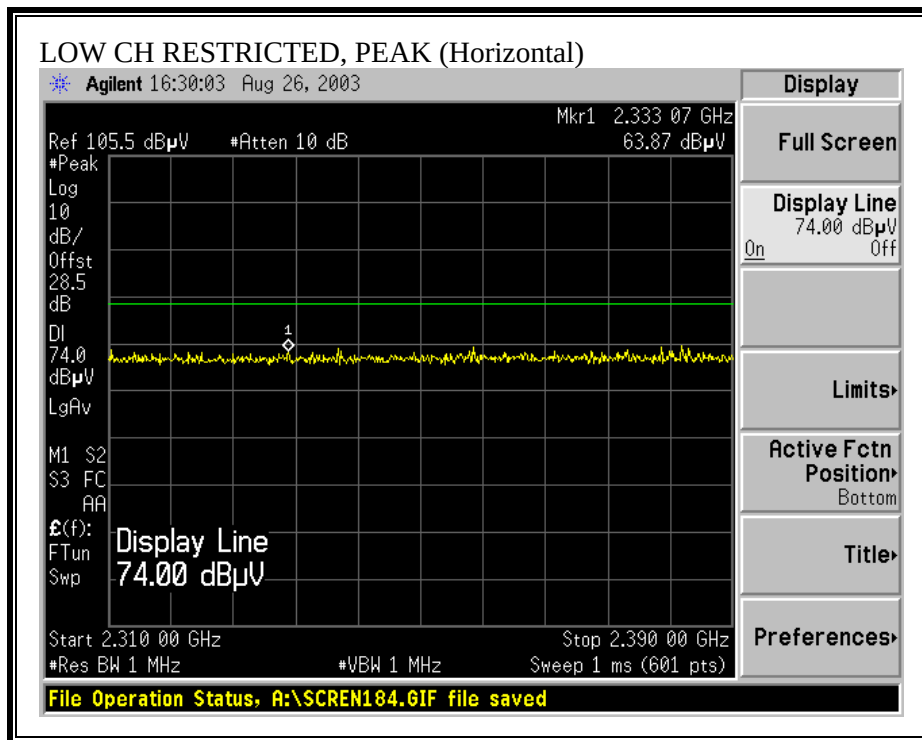
The spurious emissions performance with the dominant transmitter set in turn to each fixed channel (L/M/H) is investigated as the channel of the non-dominant transmitter is varied over the other available channels. The two radios are not designed to operate on the same channel simultaneously; therefore this condition was not investigated. The worst-case results were with the dominant transmitter set to 2462 MHz. There was no difference in the performance of the dominant radio as the settings of the non-dominant radio were varied. Worst-case results are reported.

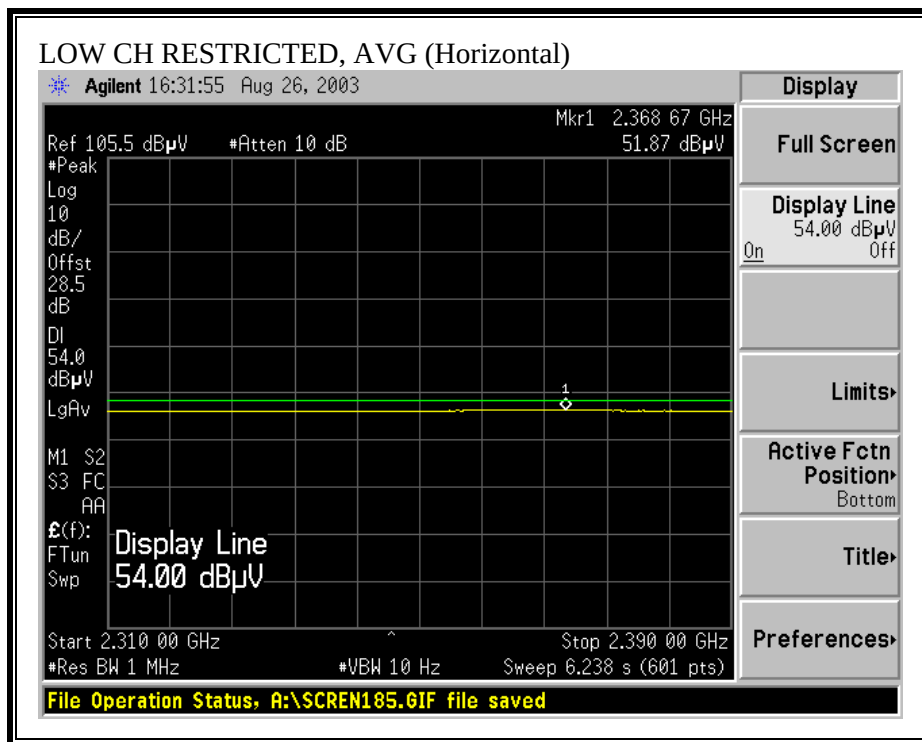
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

RESULTS

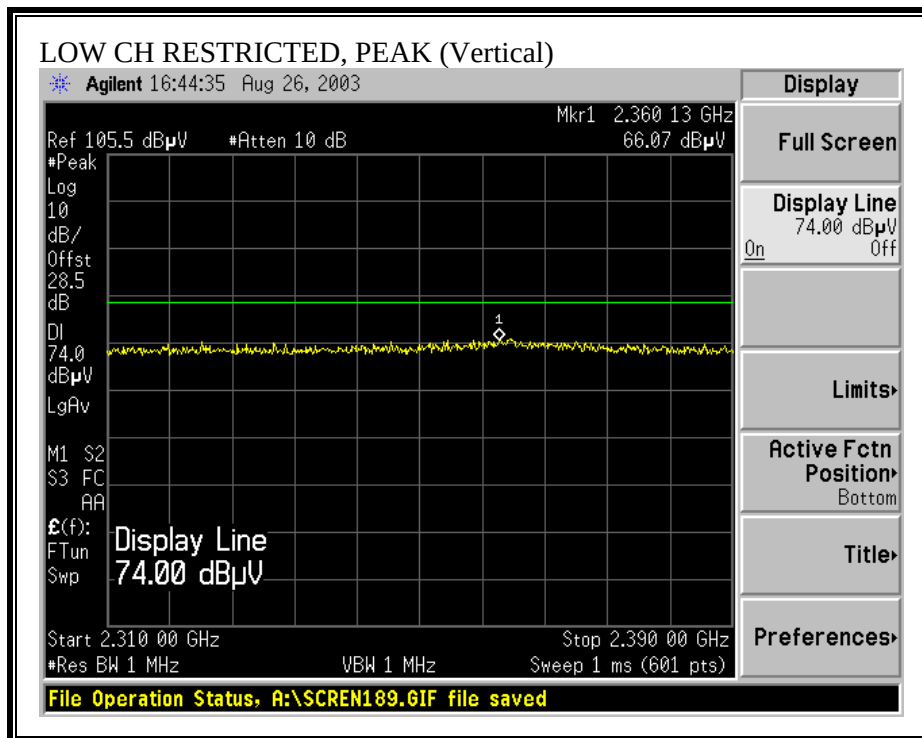
No non-compliance noted:

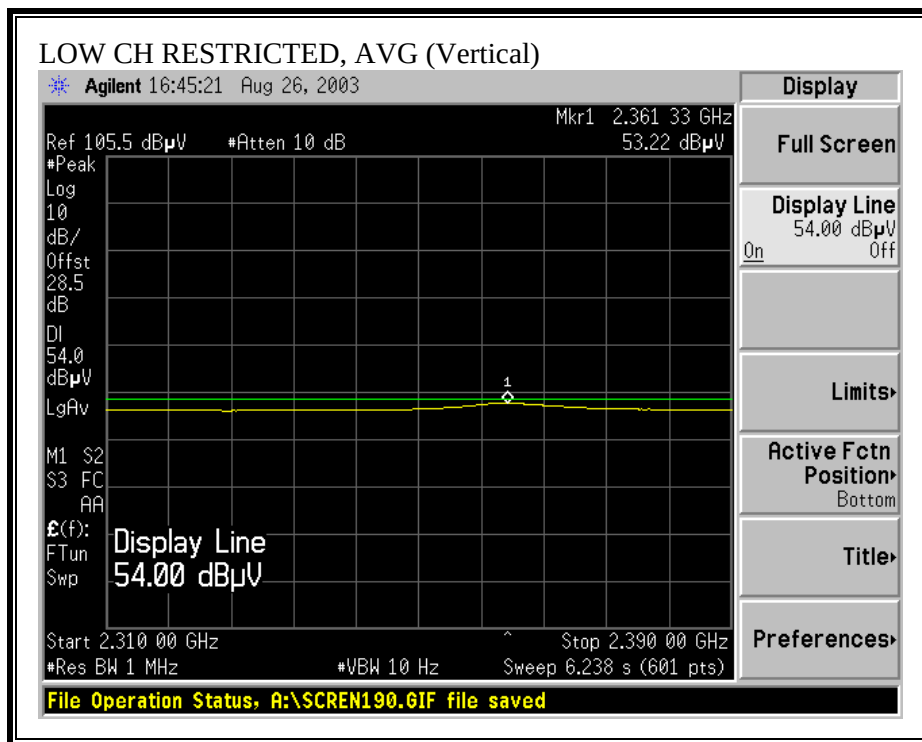
WORST-CASE RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



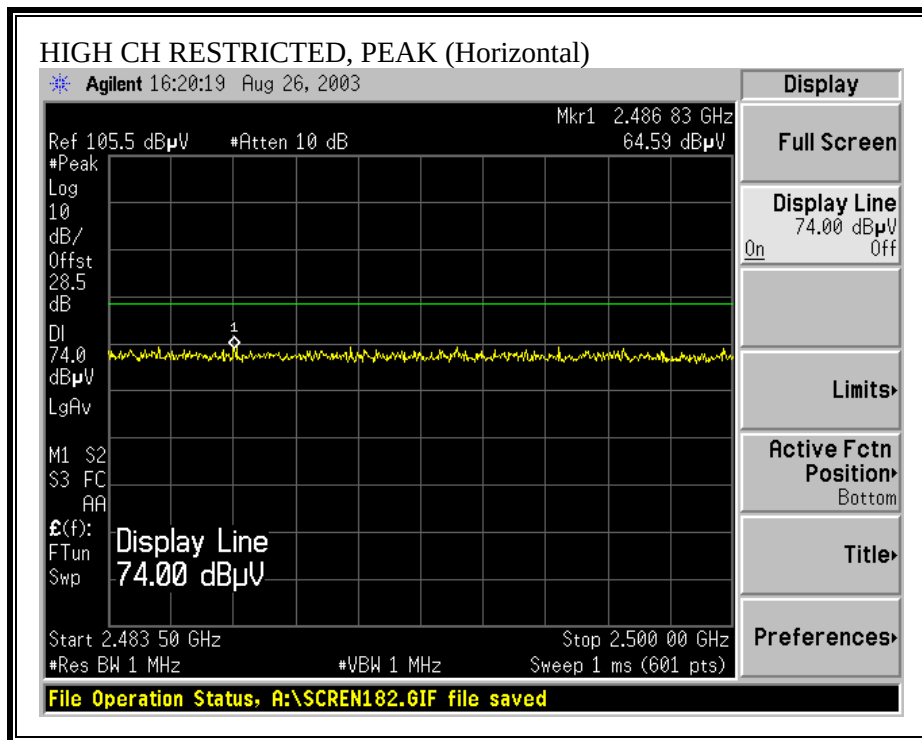


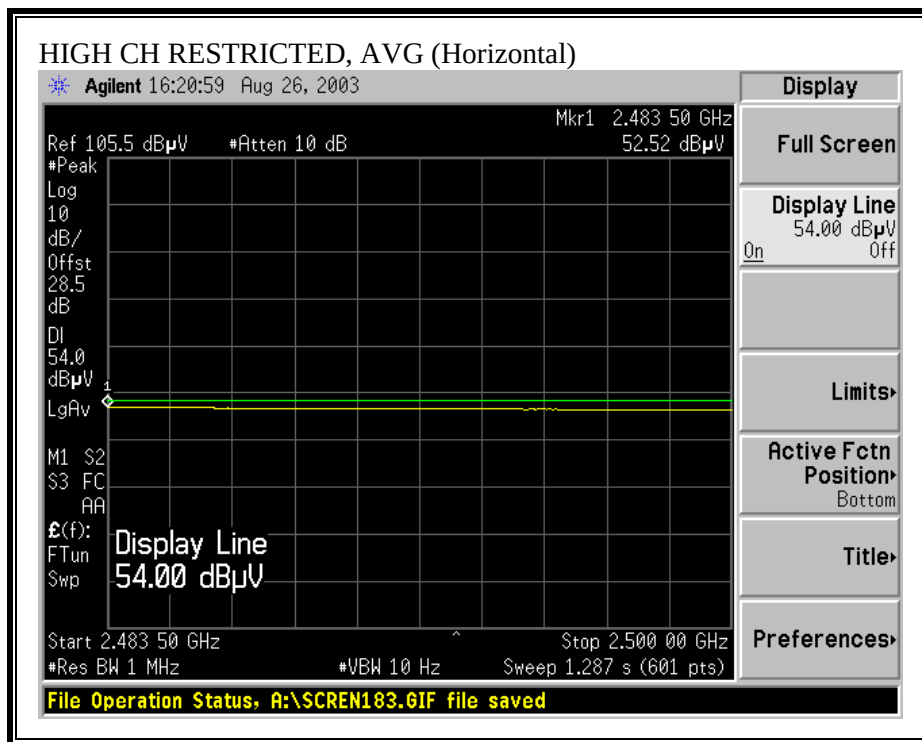
WORST-CASE RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



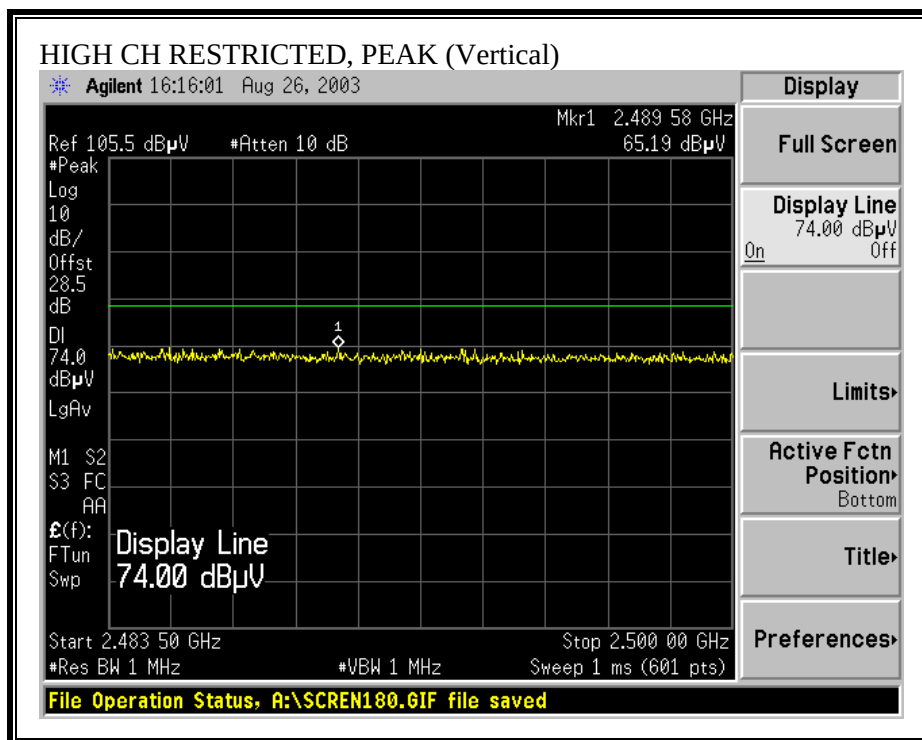


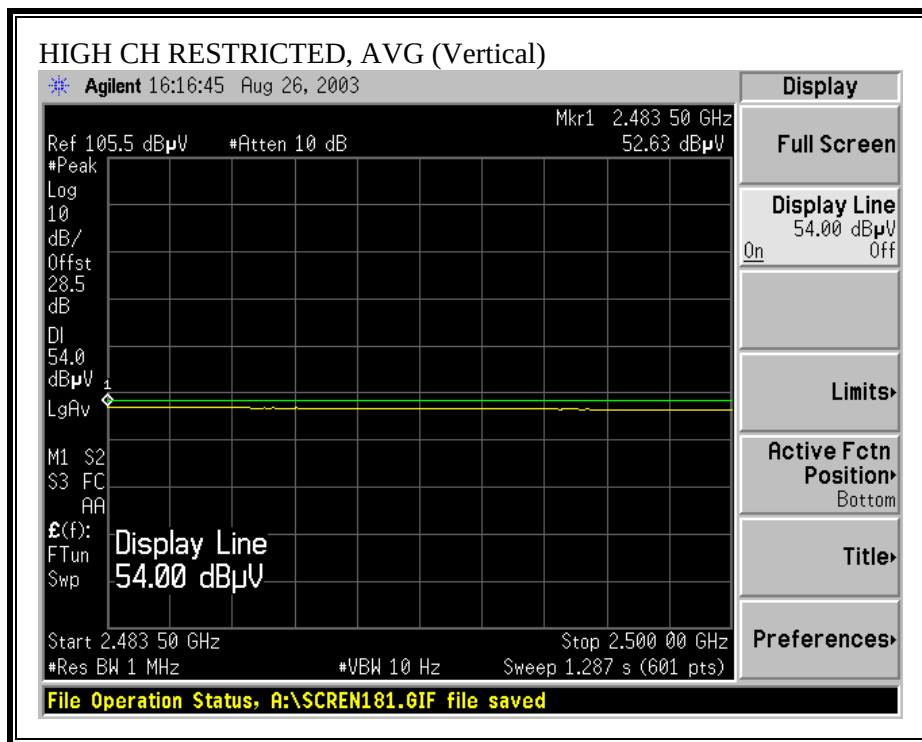
WORST-CASE RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





WORST-CASE RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





WORST-CASE HARMONICS AND SPURIOUS EMISSIONS

09/09/03 **High Frequency Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: Yan Zheng
Project #: 03U2189
Company: VIVATO
EUT Descrip.: 802.11b Bridge Router
EUT M/N: Wi-Fi Bridge Router
Test Target:
Mode Oper: TRANSMIT, CO-LOCATION, WROSE CASE

Test Equipment:

EMCO Horn 1-18GHz
T60; S/N: 2238 @1m

Pre-amplifier 1-26GHz
T63 Miteq 646456

Spectrum Analyzer
Agilent E4446A Analyzer

Horn > 18GHz
T117; ARA 18-26GHz; S/N:1013

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
WORST-CASE CHANNEL (11) ON DOMINANT RADIO (WLAN0)															
4.924	9.8	42.2	30.6	33.8	4.5	-35.3	0.0	1.0	46.1	34.5	74.0	54.0	-27.9	-19.5	V
4.924	9.8	42.9	30.3	33.8	4.5	-35.3	0.0	1.0	46.8	34.2	74.0	54.0	-27.2	-19.8	H
7.386	9.8	43.3	30.7	37.4	5.7	-34.5	0.0	1.0	52.8	40.2	74.0	54.0	-21.2	-13.8	H
7.386	9.8	43.9	30.6	37.4	5.7	-34.5	0.0	1.0	53.4	40.1	74.0	54.0	-20.6	-13.9	V

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

NOTE: CHANNEL SETTING OF NON-DOMINANT TRANSMITTER DOESNT AFFECT DOMINANT EMISSIONS.

Page 66 of 75

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TEL: (408) 463-0885 FAX: (408) 463-0888

7.10. POWERLINE CONDUCTED EMISSIONS

LIMIT

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

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

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

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

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

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

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

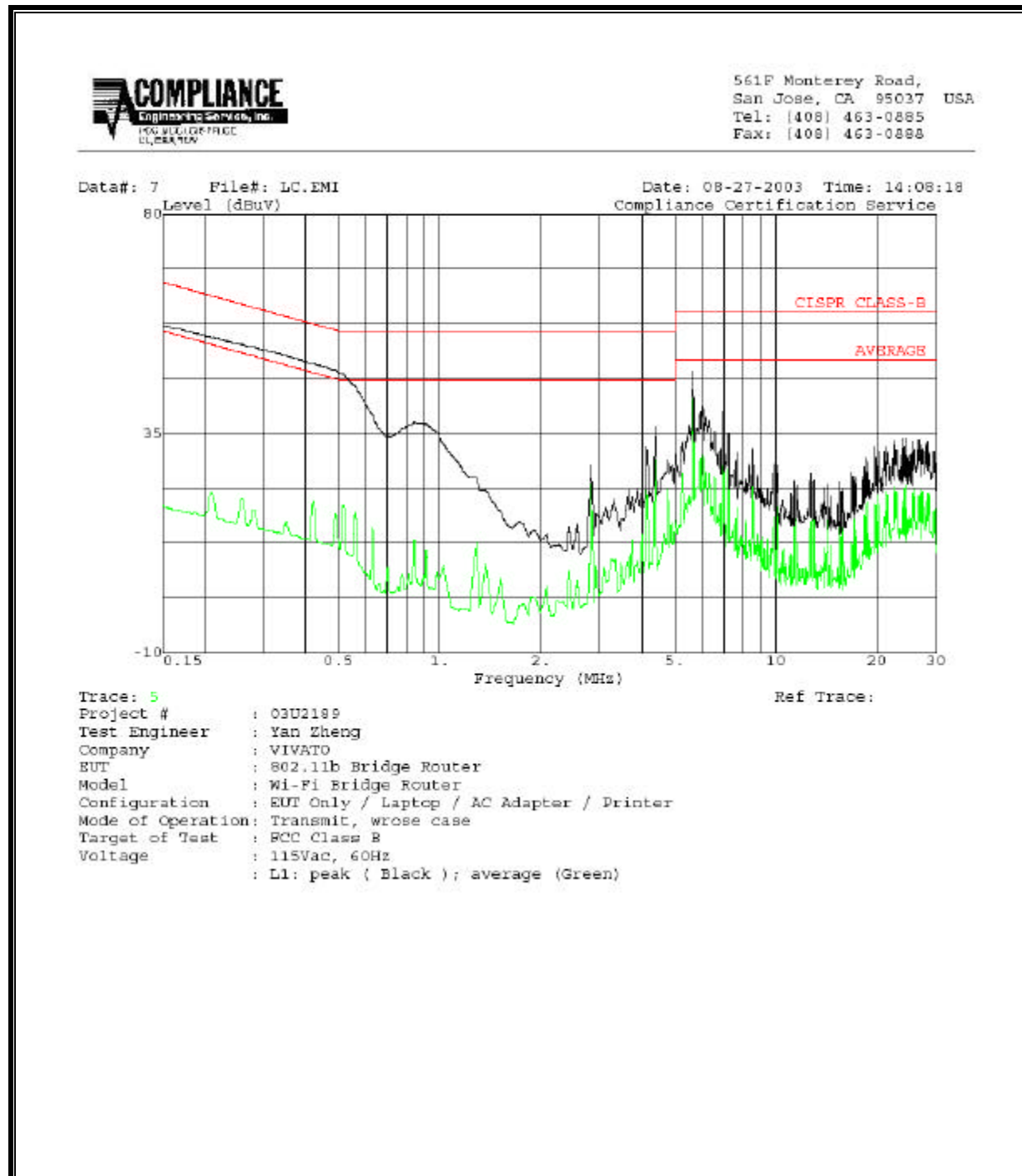
RESULTS

No non-compliance noted:

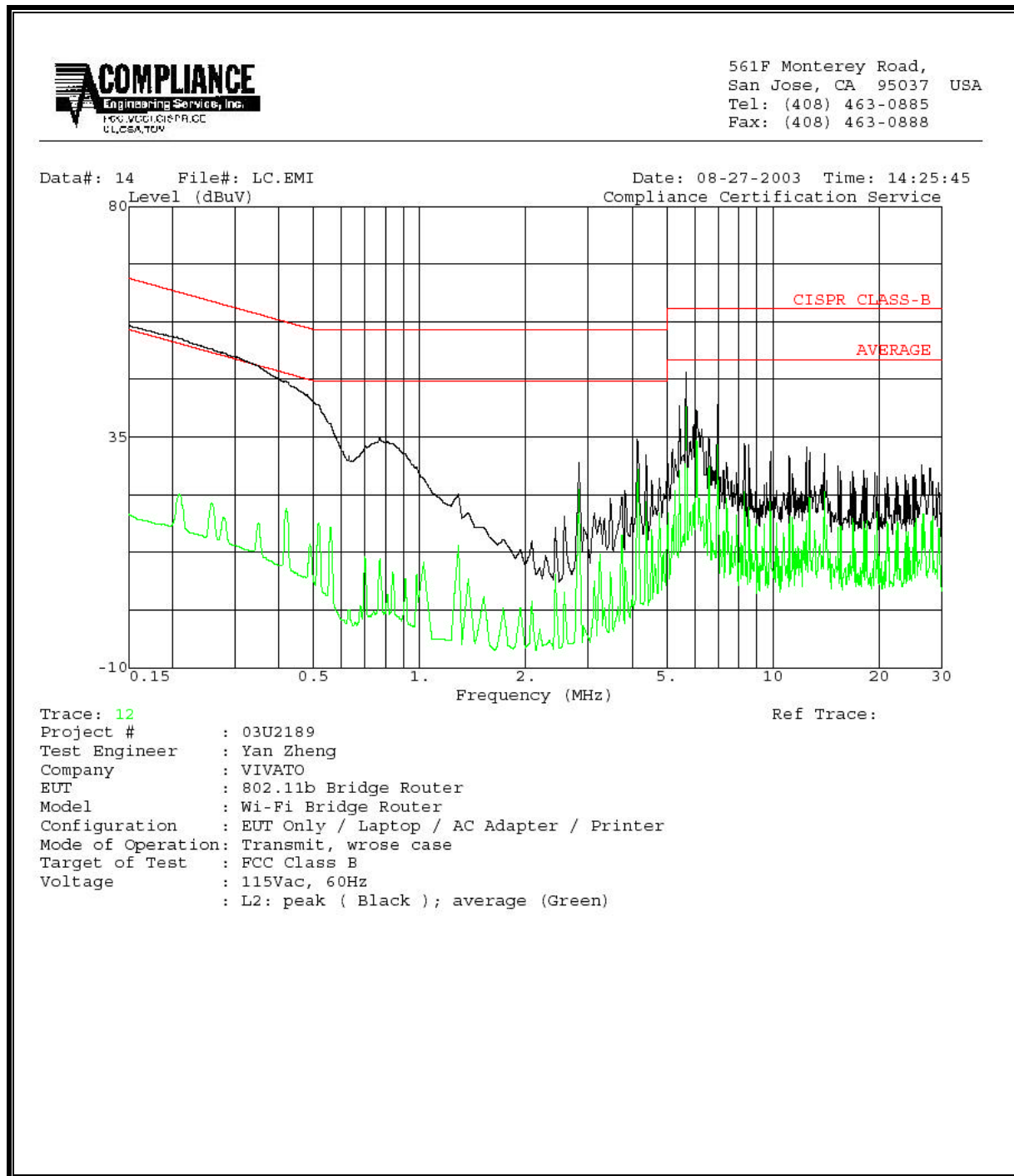
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.42	51.39	--	23.85	0.00	58.37	48.37	-6.98	-24.52	L1
4.41	36.79	--	31.29	0.00	56.00	46.00	-19.21	-14.71	L1
5.68	48.20	--	43.38	0.00	60.00	50.00	-11.80	-6.62	L1
0.15	56.96	--	20.99	0.00	66.00	56.00	-9.04	-35.01	L2
4.14	36.61	--	30.77	0.00	56.00	46.00	-19.39	-15.23	L2
5.74	48.56	--	44.97	0.00	60.00	50.00	-11.44	-5.03	L2
6 Worst Data									

LINE 1 RESULTS

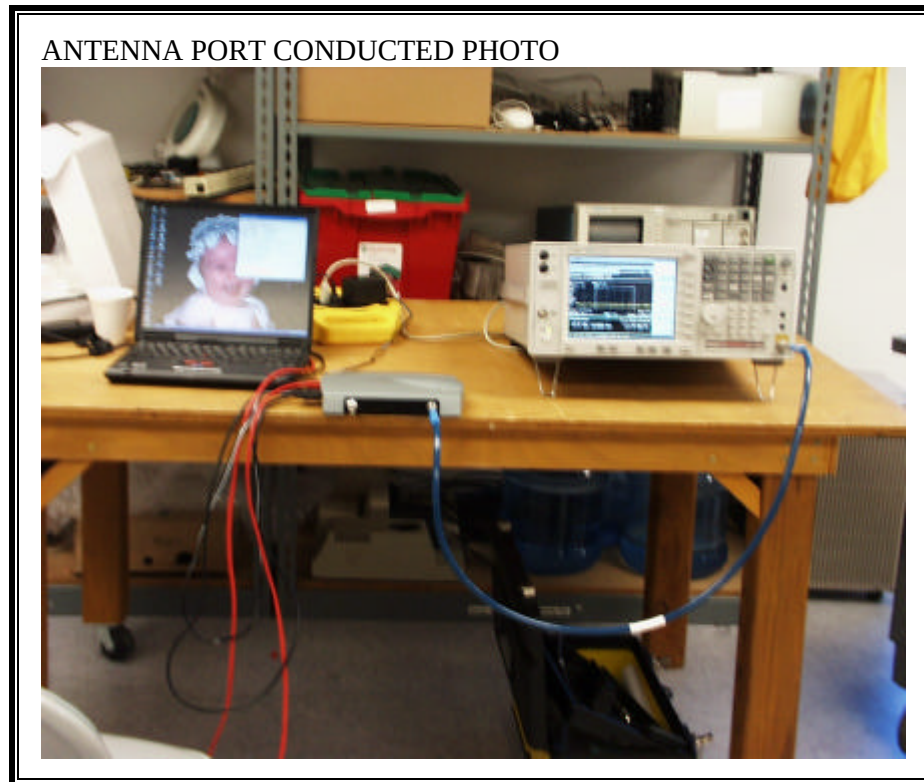


LINE 2 RESULTS



8. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



RADIATED RF MEASUREMENT SETUP

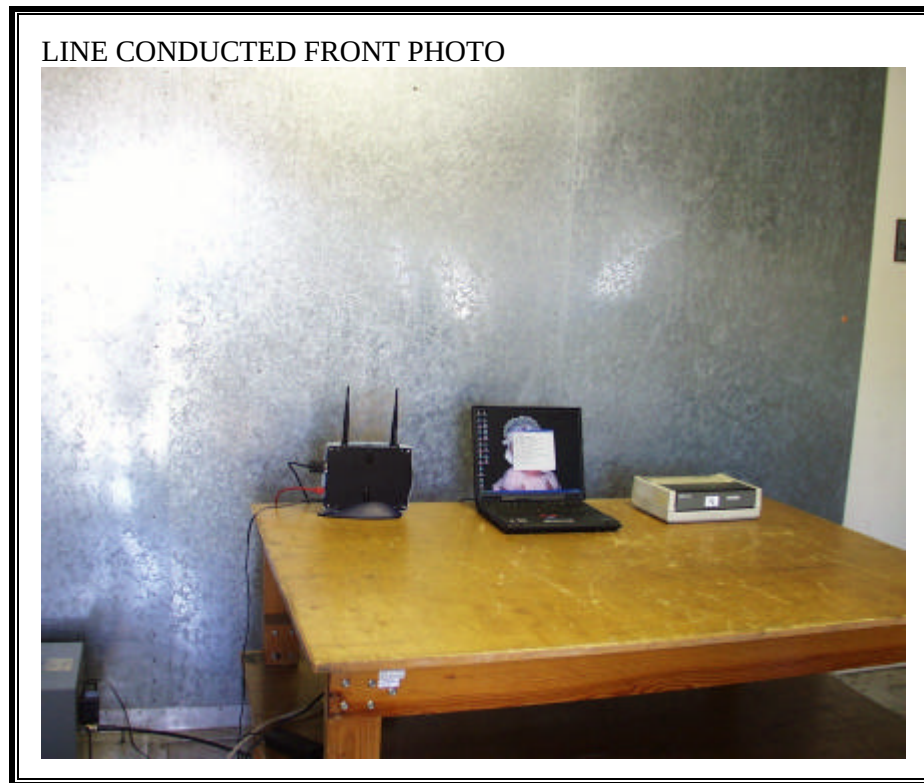
RADIATED FRONT PHOTO



RADIATED BACK PHOTO



POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP



LINE CONDUCTED BACK PHOTO



END OF REPORT