FCC CFR47 CERTIFICATION
CLASS II PERMISSIVE CHANGE
TEST REPORT

FOR

BROADCOM 802.11ag /DRAFT 802.11n
WIRELESS LAN PCI-E MINI CARD

MODEL NUMBER: BCM94321MC

FCC ID: QDS-BRCM1022-H

REPORT NUMBER: 06U10557-1

ISSUE DATE: DECEMBER 8, 2006

Prepared for
BROADCOM CORP.
190 MATHILDA PLACE
SUNNYVALE, CA 94086, USA

Prepared by
COMPLIANCE CERTIFICATION SERVICES
561F MONTEREY ROAD
MORGAN HILL, CA 95037, USA
TEL: (408) 463-0885
FAX: (408) 463-0888

LAB CODE:200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	12/08/06	Initial Issue	Thu

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	BROADCOM CORP. 190 MATHILDA PLACE SUNNYVALE, CA 94086, USA
EUT DESCRIPTION:	BROADCOM 802.11 AG /DRAFT 802.11n WIRELESS LAN PCI-E MINI CARD
MODEL:	BCM94321MC
SERIAL NUMBER:	944 & 976
DATE TESTED:	OCTOBER 20 TO NOVEMBER 28, 2006

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

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

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

THU CHAN
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:

VIEN TRAN
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

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

3. FACILITIES AND ACCREDITATION

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

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

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. MEASUREMENT UNCERTAINTY

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

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

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The radio card is an 802.11n MIMO transceiver chipset and is installed inside the tablet laptop (HP Pavilion tx 1000) with PIFA type of lower antenna gain.

The radio module is manufactured by Broadcom Corp.

5.2. CLASS II PERMISSIVE CHANGE DESCRIPTION

The radio card was originally tested and reported under CCS project no. 06U10233-1C and granted by TCB, with a PIFA antenna which has a peak gain of 3.9dBi @ 2.4GHz, 3.9dBi @ 5.15GHz, 5.6dBi @ 5.35GHz, & 5.8dBi @ 5.725GHz.

The major changes filed under this application are:

1. The 5GHz power amp has been modified from a SIGE to a Skyworks model and the associated layout and filter circuitry is slightly different. The power levels of the BCM94321MC with new PA will be identical to those in the original filing, as detailed in the operational description.
2. The top metal shield is modified to offer improved EMC suppression.
3. Add a portable platform, HP HSTNN-Q22C.

Therefore only Radiated Emissions (worst case) and Power Line Conducted Emissions tests were conducted under this project, with verification performed on the original output power.

5.3. TEST RESULT CONCLUSIONS

The worst-case data rates in each mode is based on the investigations by measuring the PSD, peak power, average power on conducted emissions, bandedge and 2nd harmonic (5GHz only) on radiated emissions across all the data rates, bandwidths, modulations and spatial stream modes.

For the Legacy Mode, the worst case is 1Mb/s @ 11b mode & 6Mb/s @ 11g mode.
For MCS Index and MIMO operation modes covered under this evaluation it was determined that MCS Index 0 is worst case for all testing performed at 20MHz (including Band-edge, Emissions testing, PSD).
MCS Index 32 is worst case for 40MHz mode.
Both MCS 0 and MCS 32 were set to CDD mode.

5.4. MAXIMUM OUTPUT POWER

The transmitter has the same maximum peak conducted output power as original project. Please refer to CCS Project #06U10233-1C.

5.5. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PIFA Stamped Metal antenna with a maximum gain of 2.94dBi for 2400-2500 MHz band and 2.42dBi for 4984-5985 MHz band. The antenna is manufactured by Fox Conn Co., part number WDAN-HQTT8001-DF for main antenna & WDAN-HQTT8003-DF for auxiliary antenna.

5.6. SOFTWARE AND FIRMWARE

The EUT was tested in the following manner:
- "epi_ttcp.exe" was used to transmit UDP packets to a broadcast IP address (192.168.66.255) – i.e. no ACK required. This test mode sends a continuous packetized data stream with duty cycles that vary dependant upon data rate/MCS Index selected.
- "wl ampdu" and "frameburst" were enabled to ensure worst case data packet transfer and duty cycle.
- Worst case packet length have also been used to ensure max duty cycle

5.7. CONFIGURATION AND MODE

Operating modes were changed directly in software with no other changes to the set up. Power levels were verified across all the MCS Index at the start of test and as required throughout testing.

Prior to each test a power meter was used to tune the gated average power within a Tx packet. The channel gates on the meter were set to ensure that, at the time of recording, only packet power was captured without including duty cycle off time.

Power was tuned for different modes, channels and antennas based on the power tuning table contained in the Operational Description submitted under the same filing.

Also the worst-case configuration has been evaluated at mobile position @ 2.4GHz band and portable X-position @ 5.8GHz have a higher readings by comparing the fundamental output power on both mobile and portable configurations.

5.8. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop PC	HP	Pavilion tx 1000	CNF634191D	DOC
AC Adapter	HP	DC359A	PPP09S	DOC

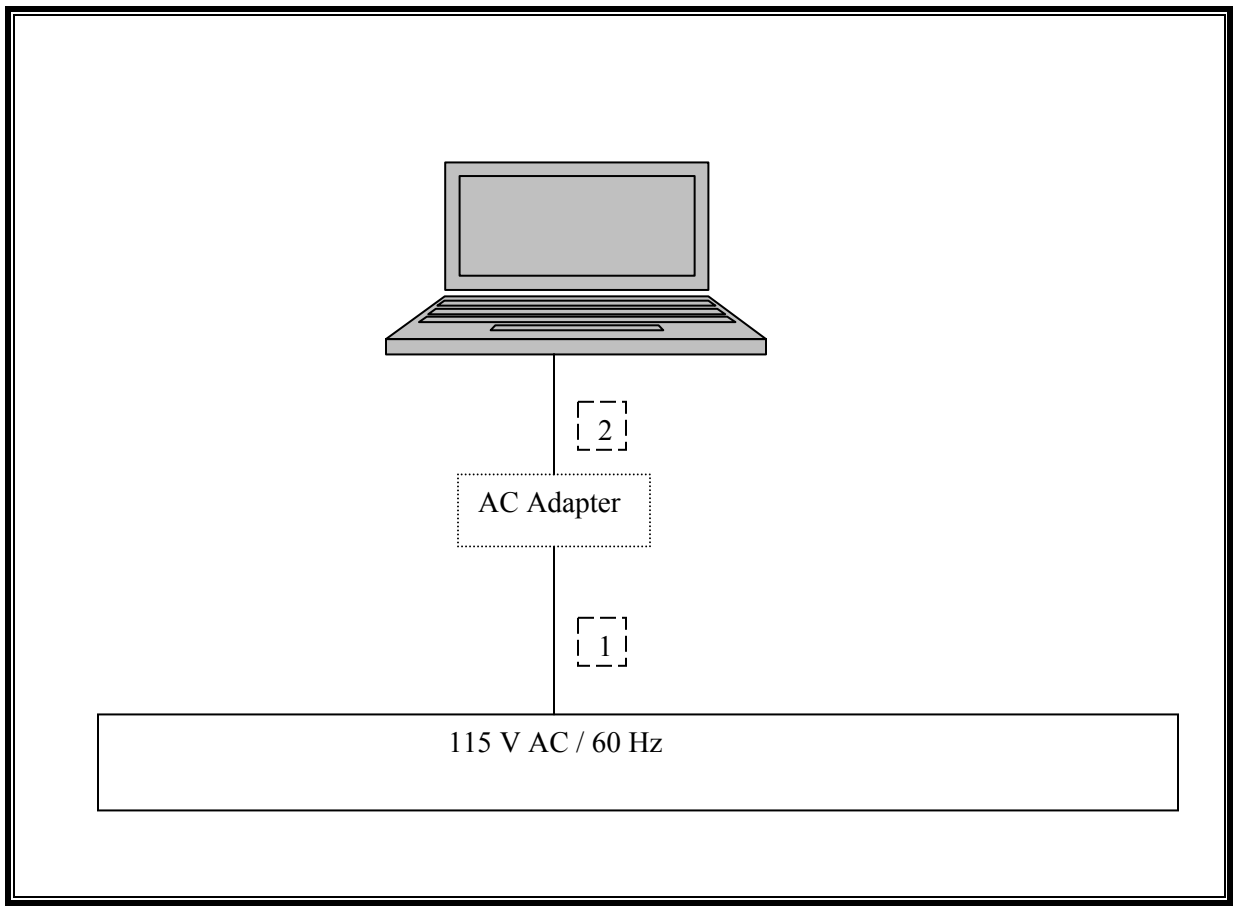
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	AC	Unshielded	1.2 m	N/A
2	DC	1	DC	Unshielded	1.2 m	N/A

TEST SETUP

The EUT is installed in a host laptop computer. Test software exercised the radio card.

SETUP DIAGRAM



6. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**Cal Due**
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	2238	4/22/2007
Preamplifier, 1 ~ 26.5 GHz	Agilent / HP	8449B	3008A00931	6/24/2007
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent / HP	E4446A	MY43360112	5/3/2007
EMI Receiver, 9 kHz ~ 2.9 GHz	Agilent / HP	8542E	3942A00286	2/4/2007
RF Filter Section	Agilent / HP	85420E	3705A00256	2/4/2007
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A121003	9/3/2007
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	8/30/2007
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	8379443	8/30/2007
EMI Test Receiver	R & S	ESHS 20	827129/006	11/3/2007
4.0 High Pass Filter	Micro Tronics	HPM13351	3	N/A
2.4 - 2.5 Band Reject Filter	Micro Tronics	N/A	1	N/A
Peak Power Meter	Agilent / HP	E4416A	GB41291160	12/2/2007
Antenna, Horn 26 ~ 40 GHz	ARA	MWH-2640/B	1029	4/13/2007
7.6 GHz High Pass Filter	Micro Tronics	HPM13350	1	N/A
5.75 - 5.8 Reject Filter	Micro Tronics	BRC13192	2	N/A
Preamplifier, 26 ~ 40 GHz	Miteq	NSP4000-SP2	924343	8/18/2007

7. LIMITS AND RESULT

LEGACY & MIMO MODES

7.1. RADIATED EMISSIONS

7.1.1. 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 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each 5 GHz band.

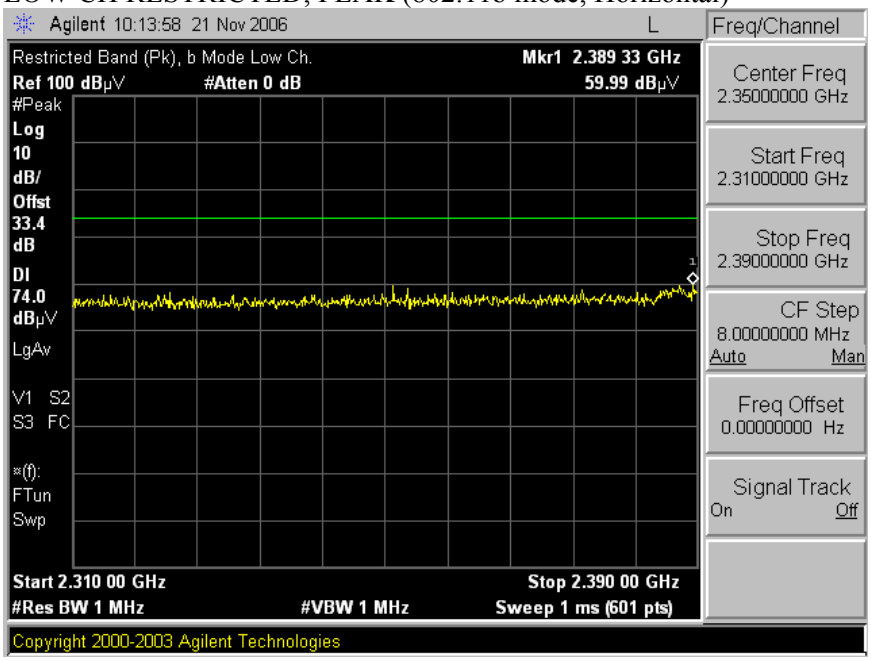
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

7.1.2. TRANSMITTER ABOVE 1 GHz FOR 2400 TO 2483.5 MHz BAND and 5725 TO 5850 BAND

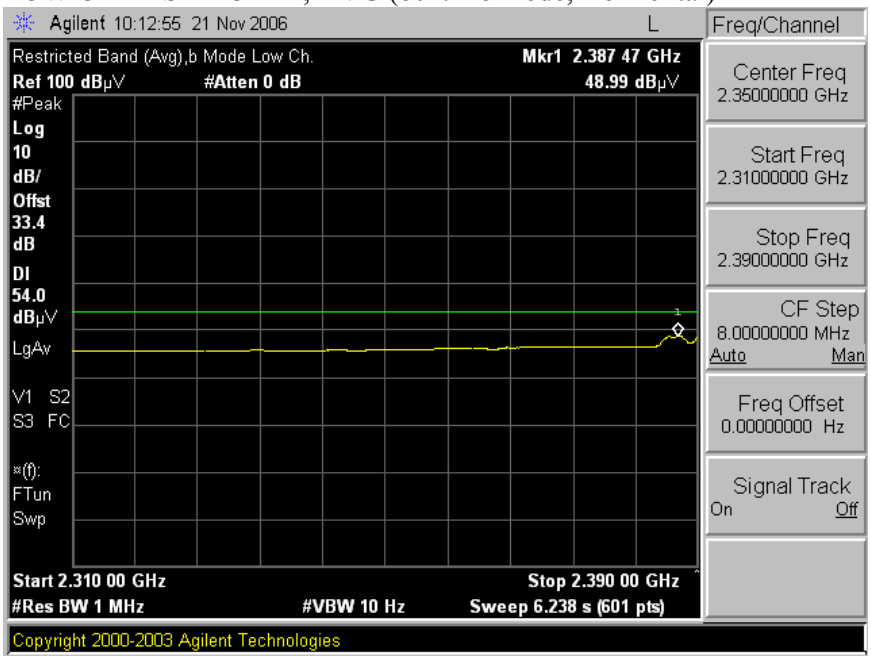
11b MODE

RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, 2412 MHz, HORIZONTAL)

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

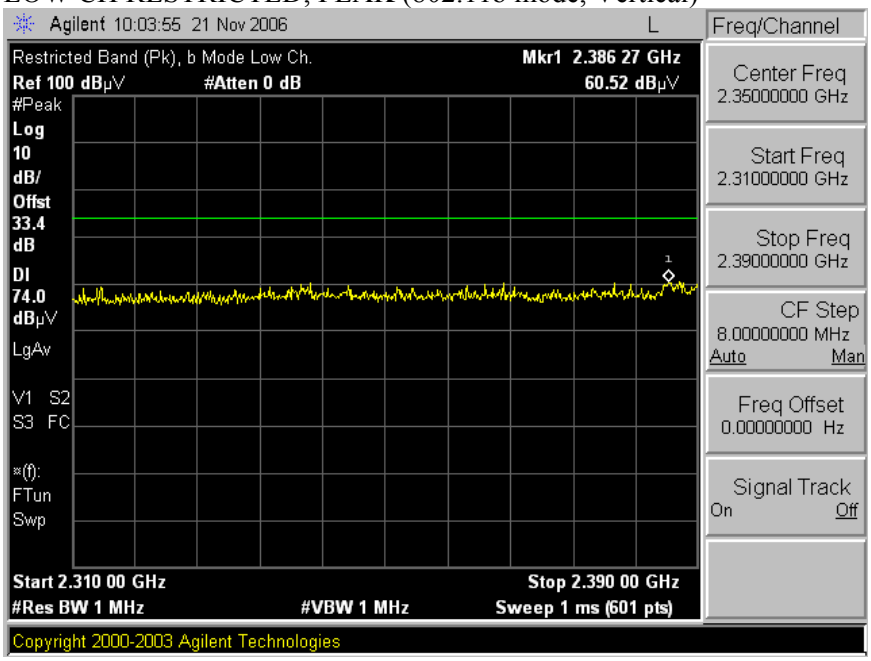


LOW CH RESTRICTED, AVG (802.11b mode, Horizontal)

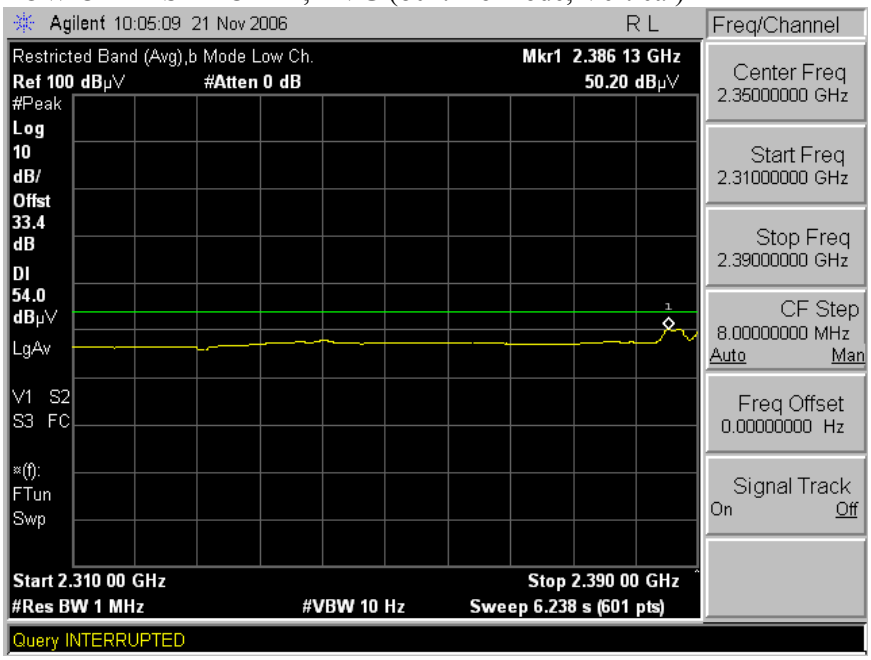


RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, 2412 MHz, VERTICAL)

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

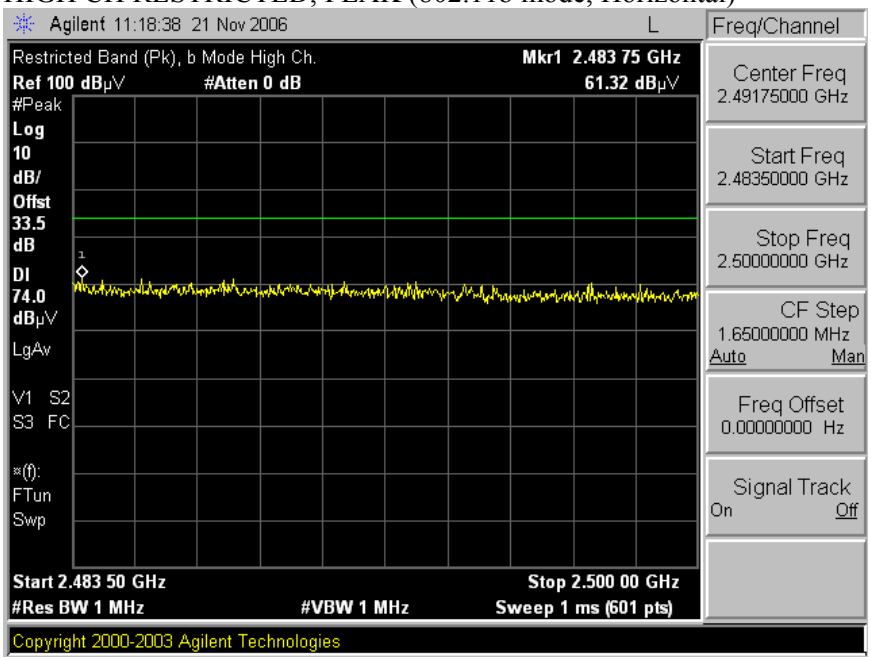


LOW CH RESTRICTED, AVG (802.11b mode, Vertical)

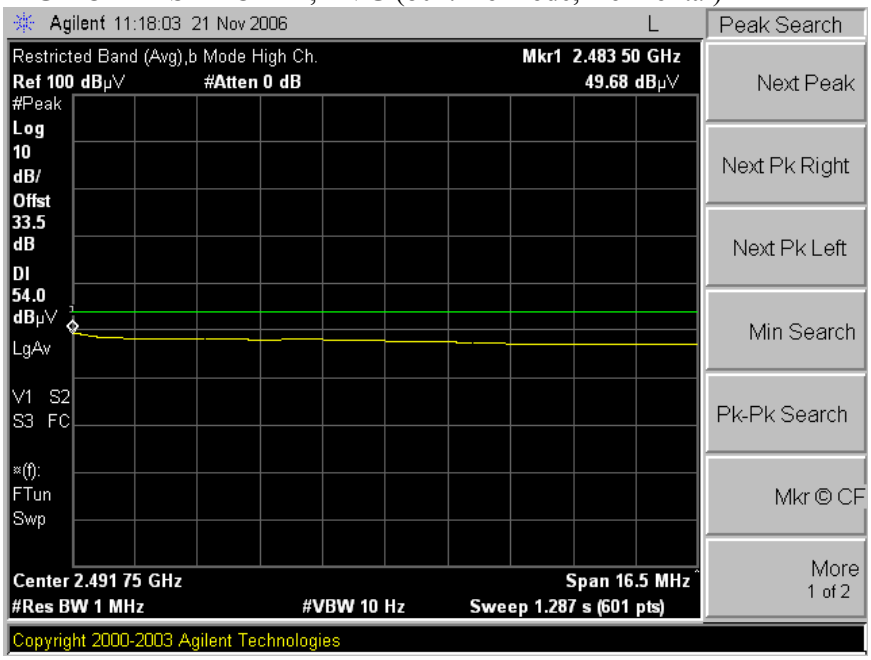


RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, 2457 MHz, HORIZONTAL)

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

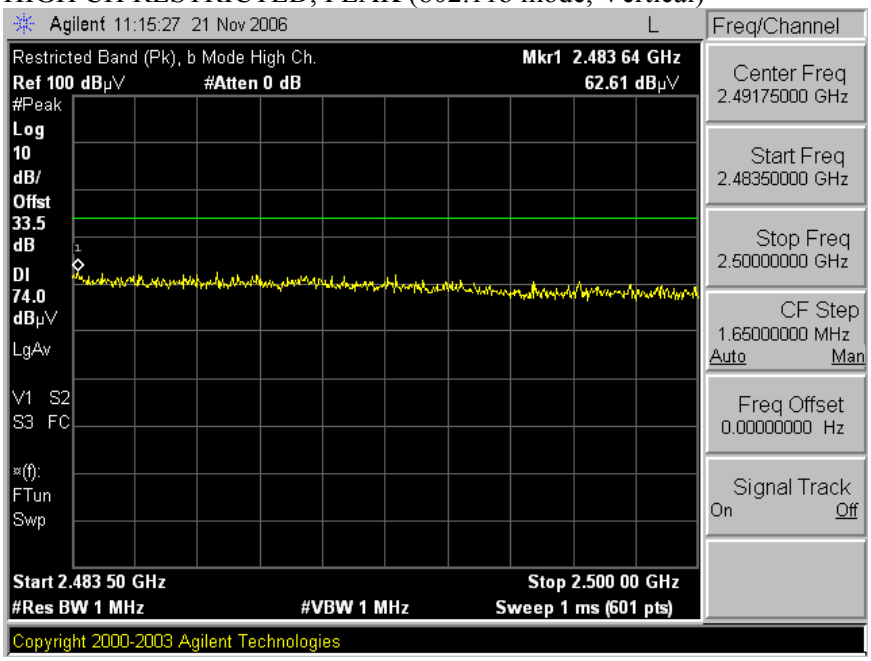


HIGH CH RESTRICTED, AVG (802.11b mode, Horizontal)

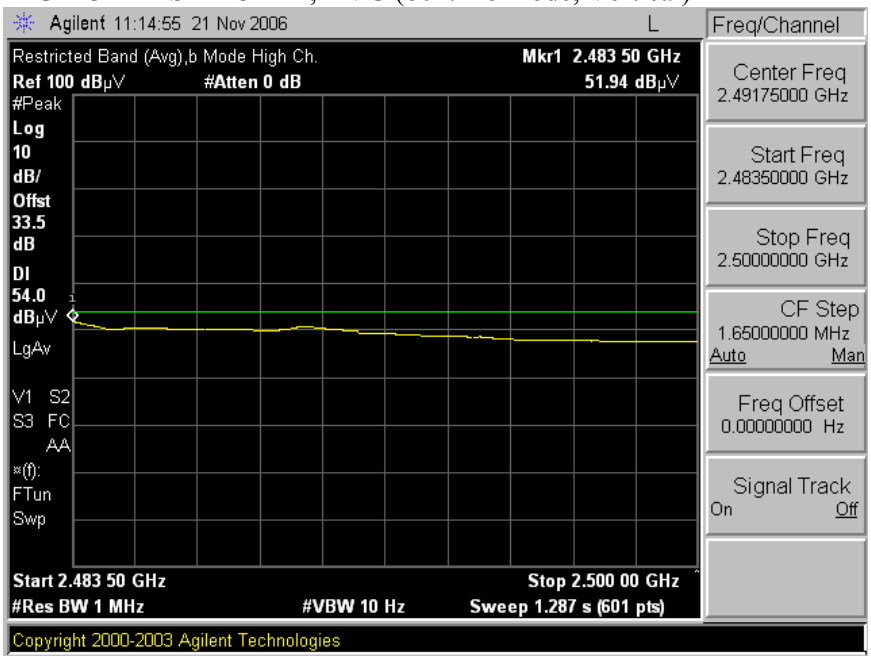


RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, 2457 MHz, VERTICAL)

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

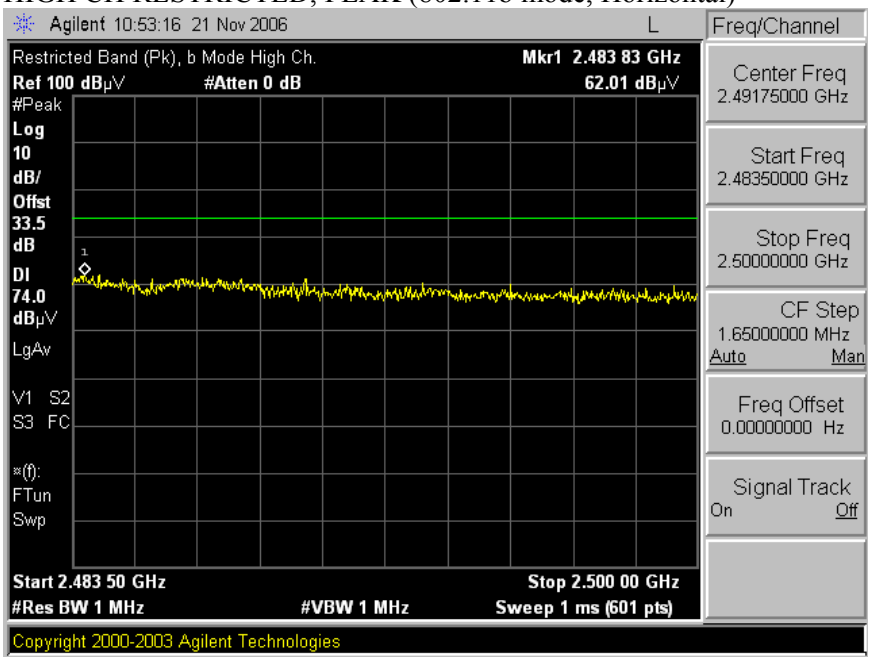


HIGH CH RESTRICTED, AVG (802.11b mode, Vertical)

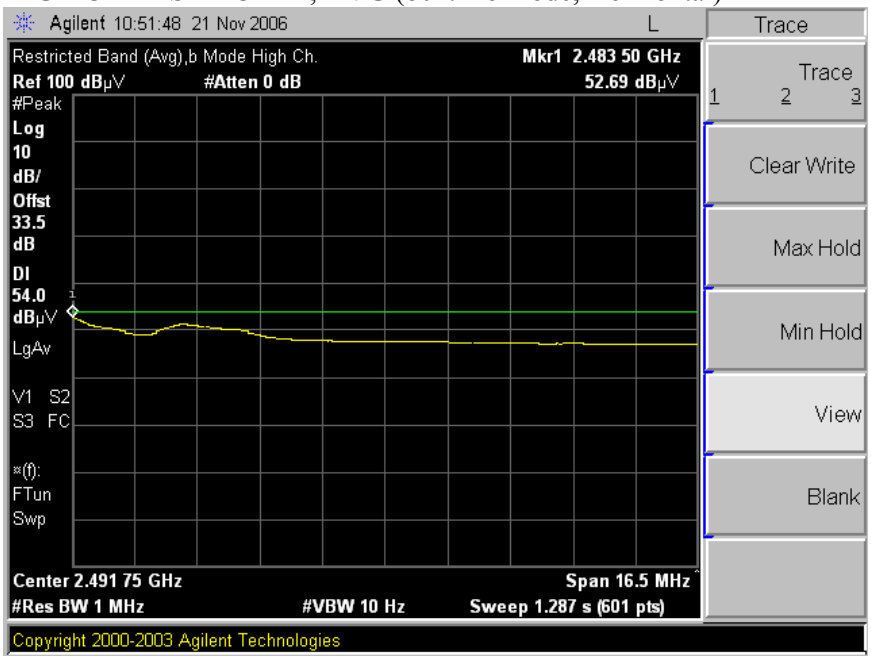


RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, 2462 MHz, HORIZONTAL)

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

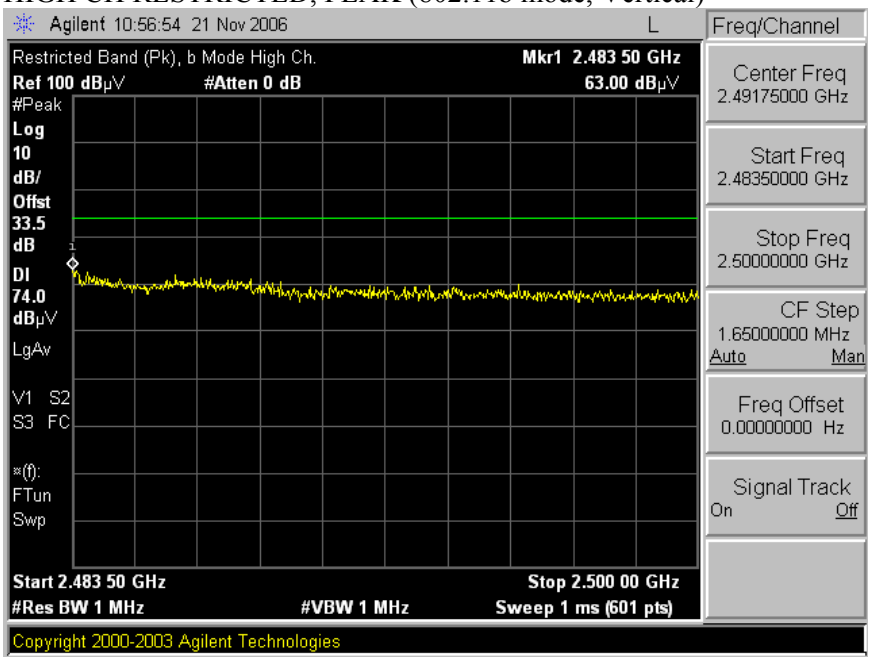


HIGH CH RESTRICTED, AVG (802.11b mode, Horizontal)

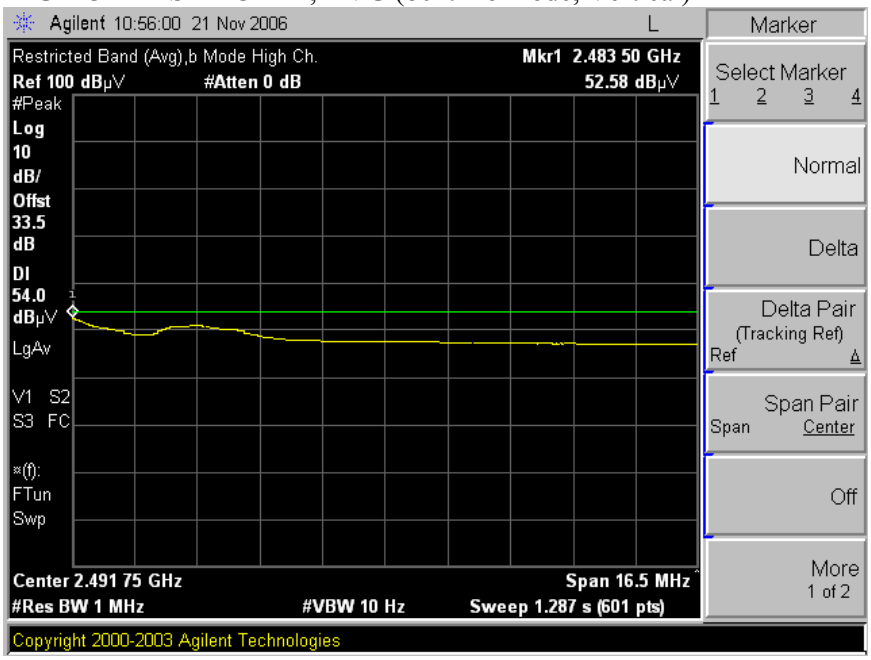


RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, 2462 MHz, VERTICAL)

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



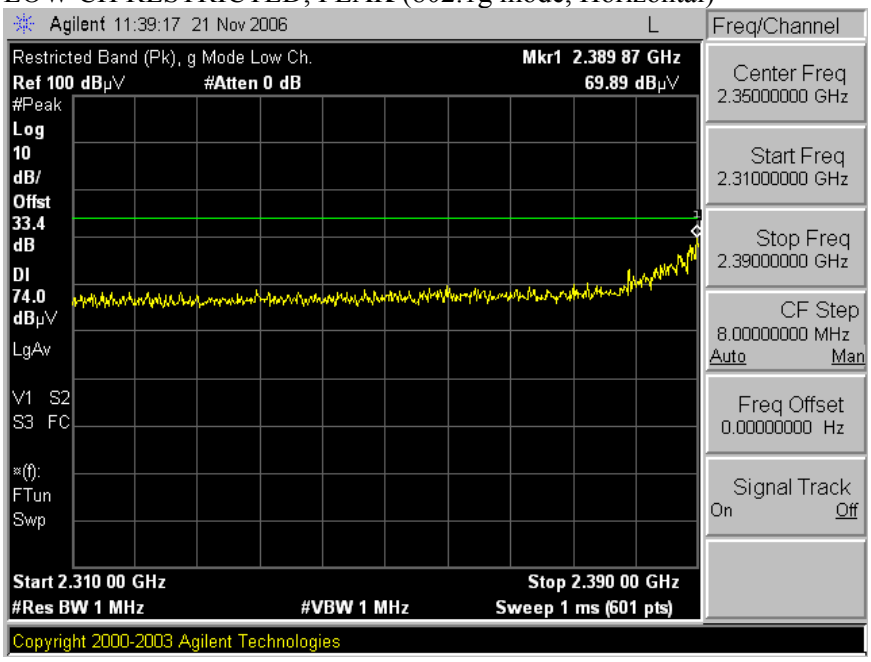
HIGH CH RESTRICTED, AVG (802.11b mode, Vertical)



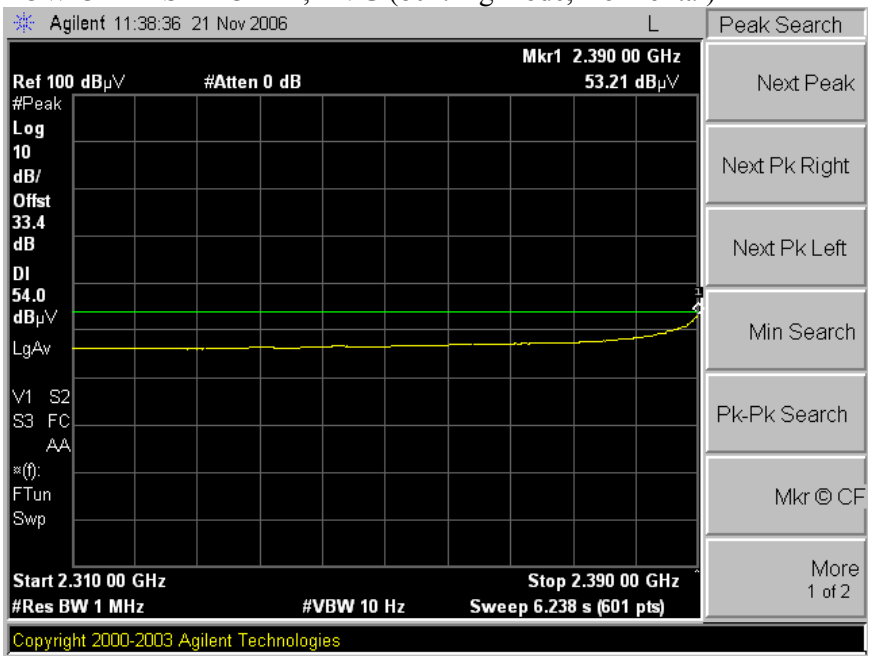
11g MODE

RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, 2412 MHz, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.1g mode, Horizontal)

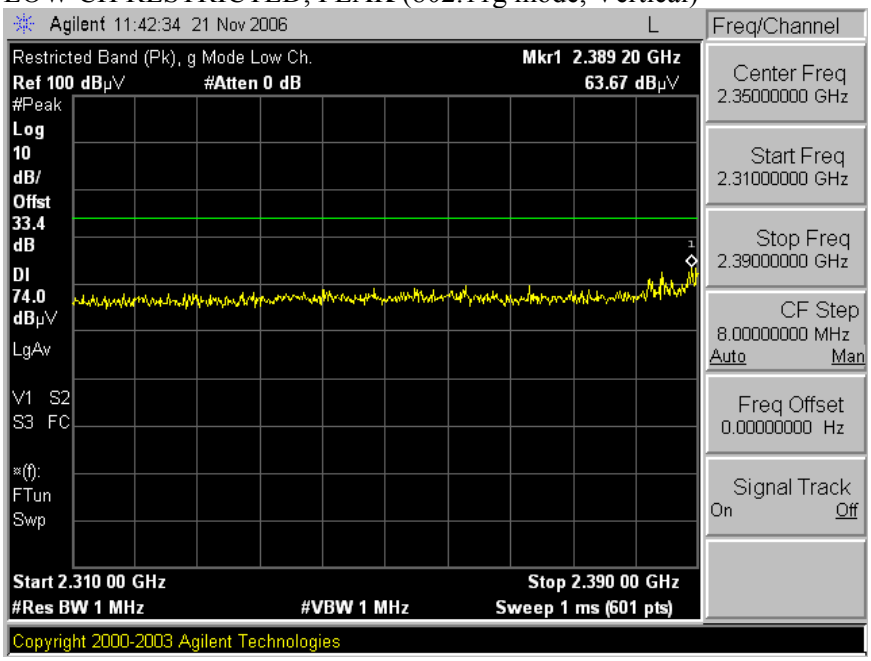


LOW CH RESTRICTED, AVG (802.11g mode, Horizontal)

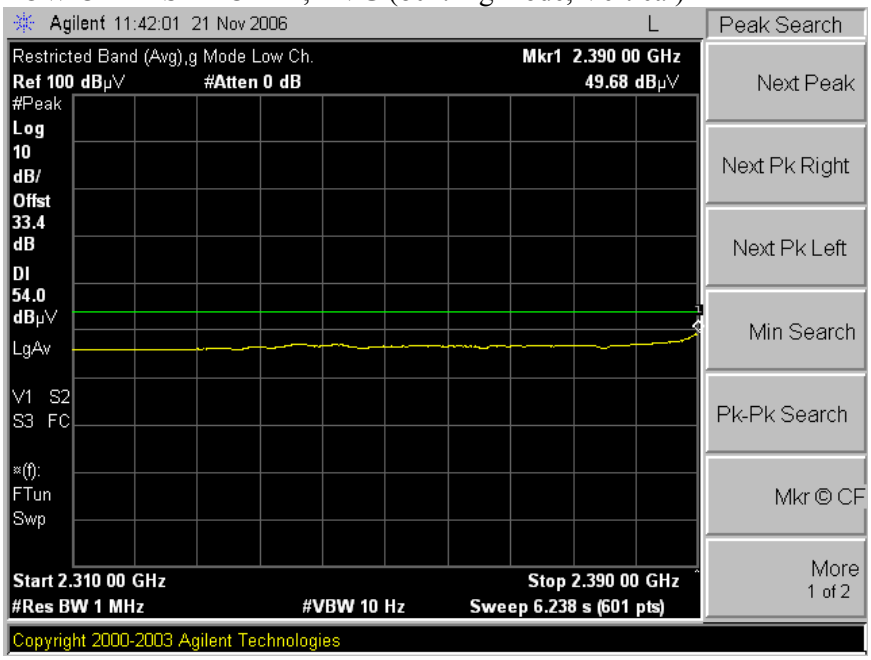


RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, 2412 MHz, VERTICAL)

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

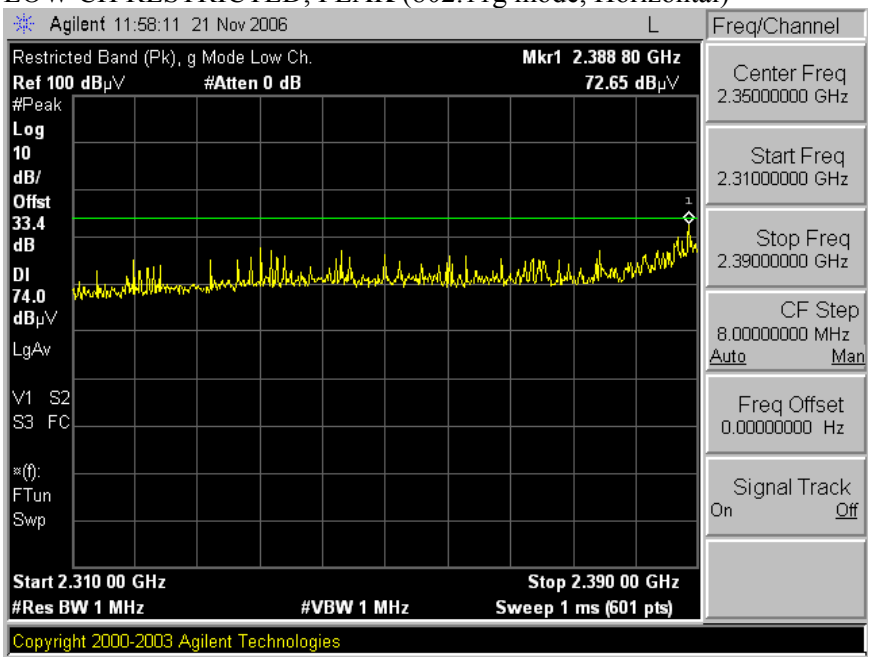


LOW CH RESTRICTED, AVG (802.11g mode, Vertical)

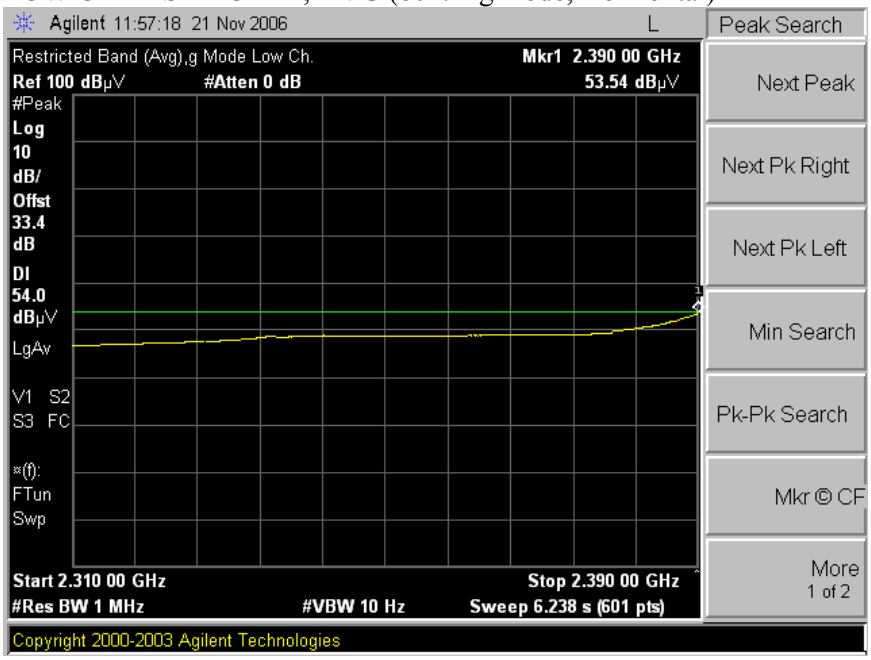


RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, 2417 MHz, HORIZONTAL)

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

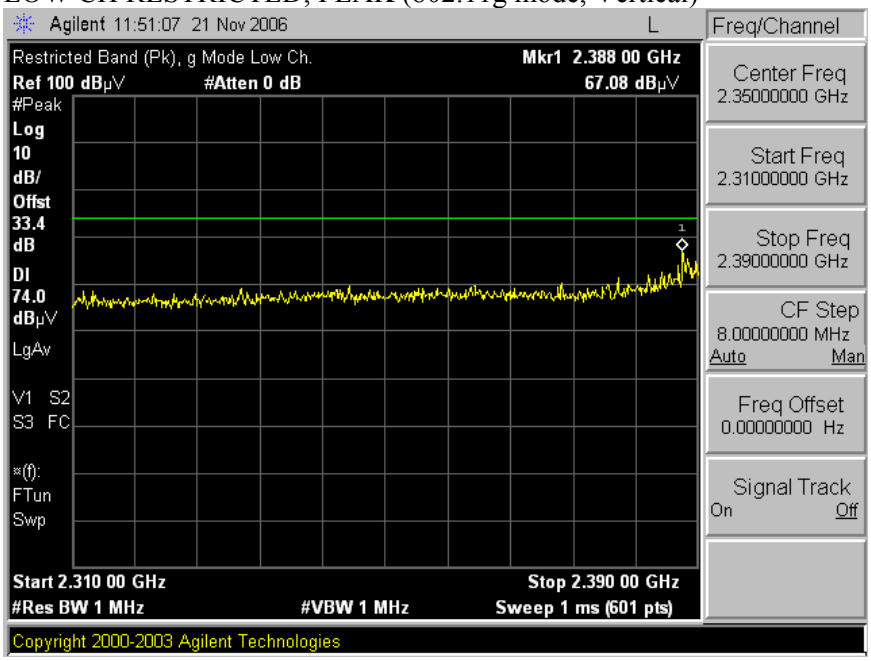


LOW CH RESTRICTED, AVG (802.11g mode, Horizontal)

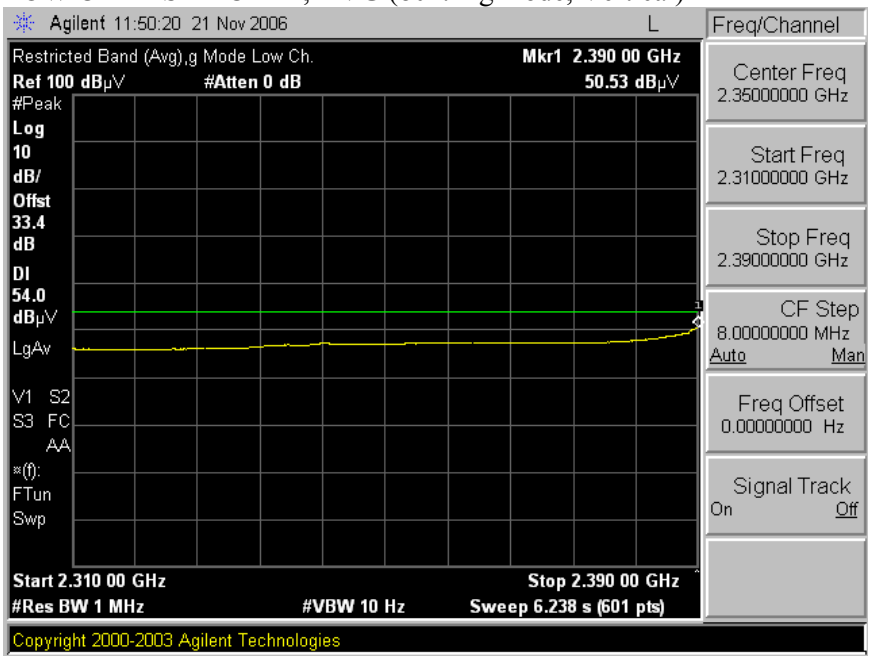


RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, 2417 MHz, VERTICAL)

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

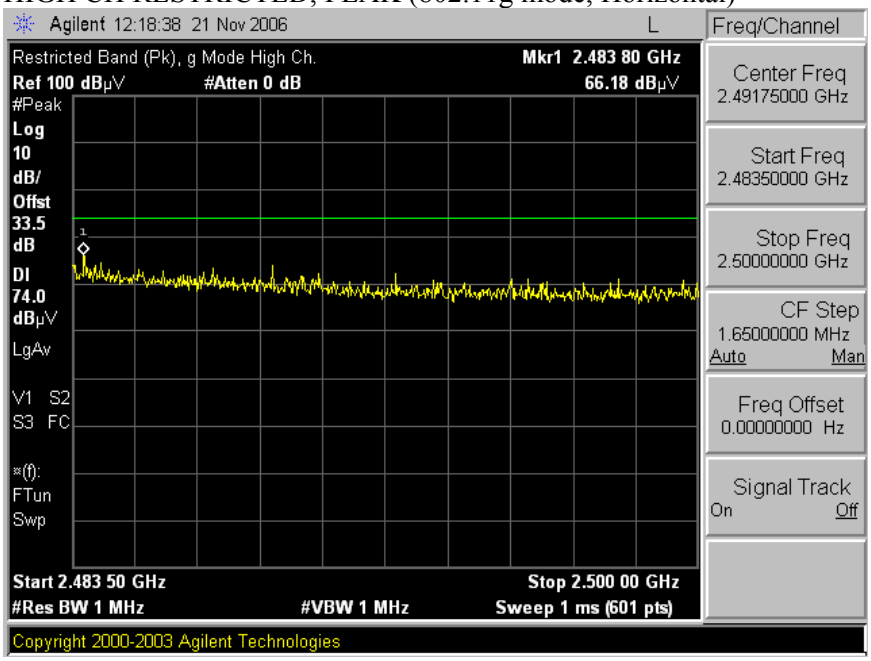


LOW CH RESTRICTED, AVG (802.11g mode, Vertical)

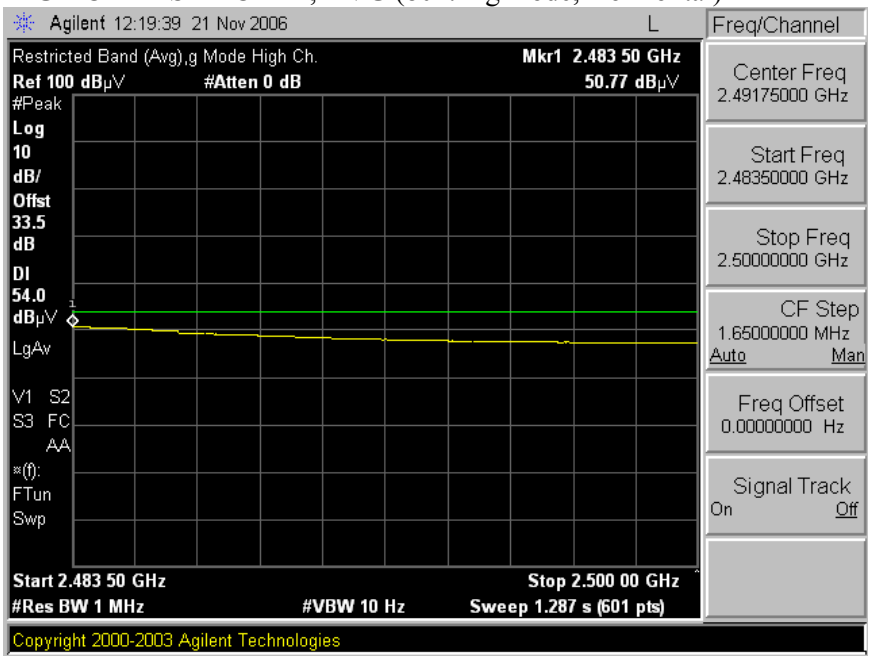


RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, 2457 MHz, HORIZONTAL)

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

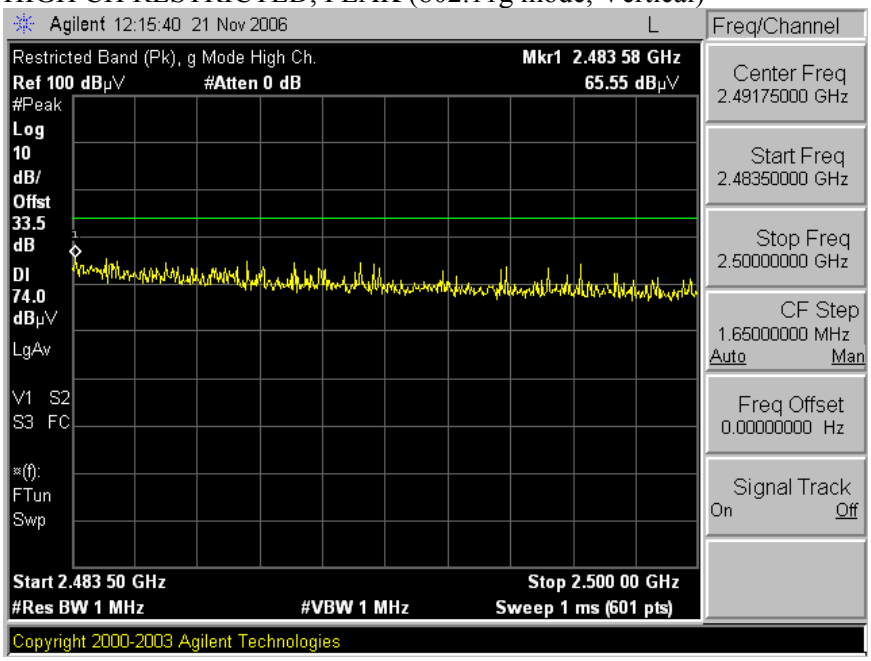


HIGH CH RESTRICTED, AVG (802.11g mode, Horizontal)

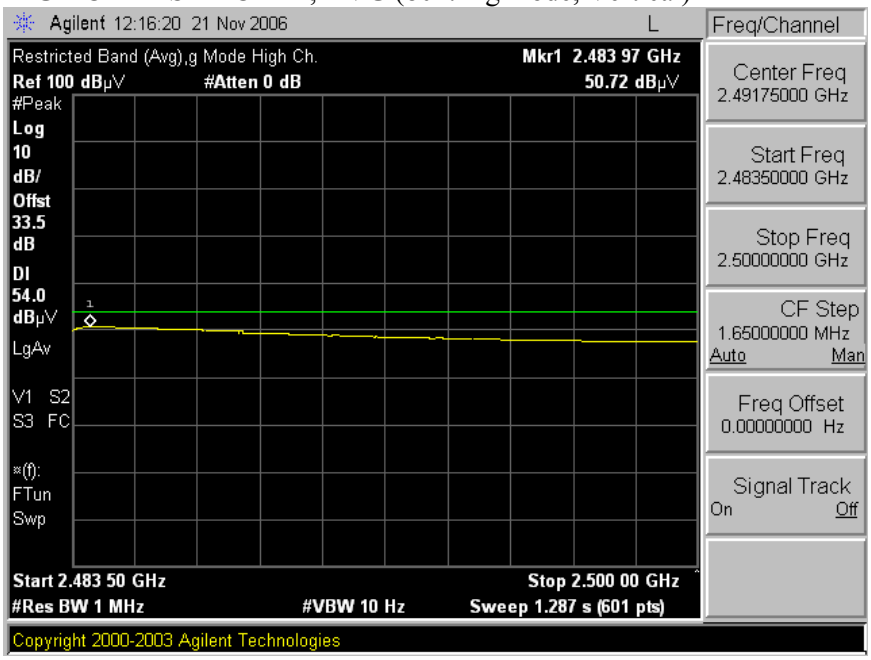


RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, 2457 MHz, VERTICAL)

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

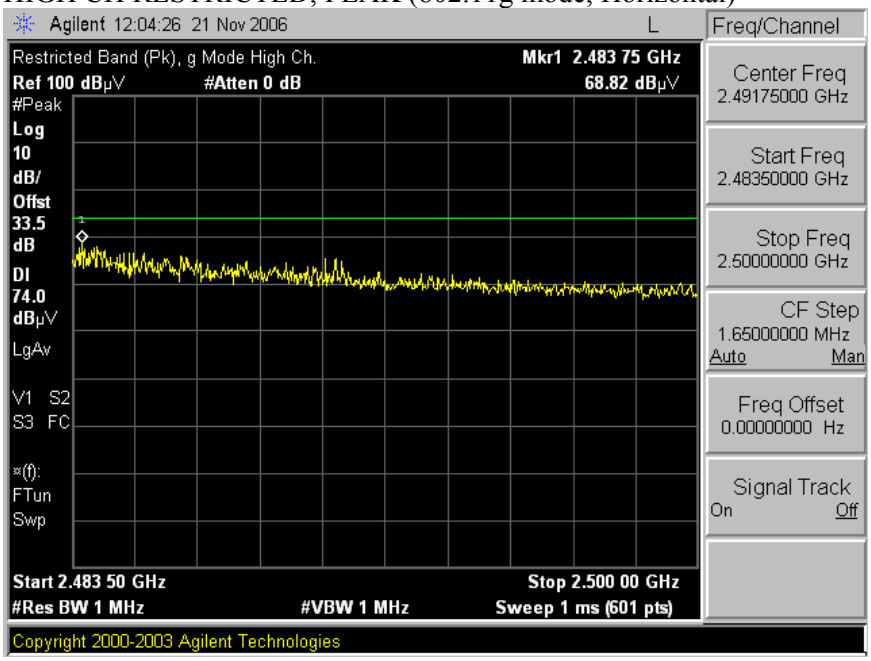


HIGH CH RESTRICTED, AVG (802.11g mode, Vertical)

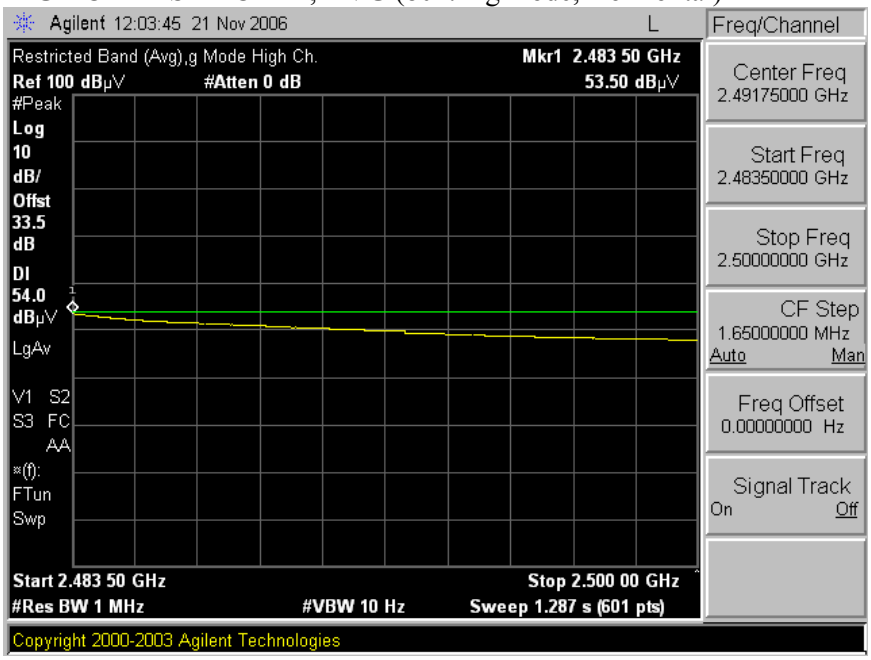


RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, 2462 MHz, HORIZONTAL)

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

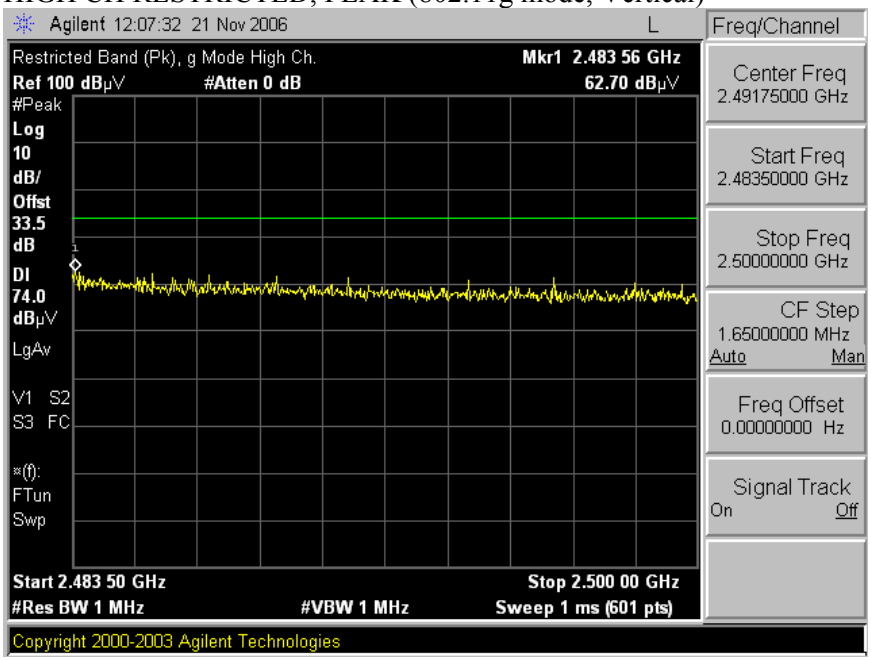


HIGH CH RESTRICTED, AVG (802.11g mode, Horizontal)

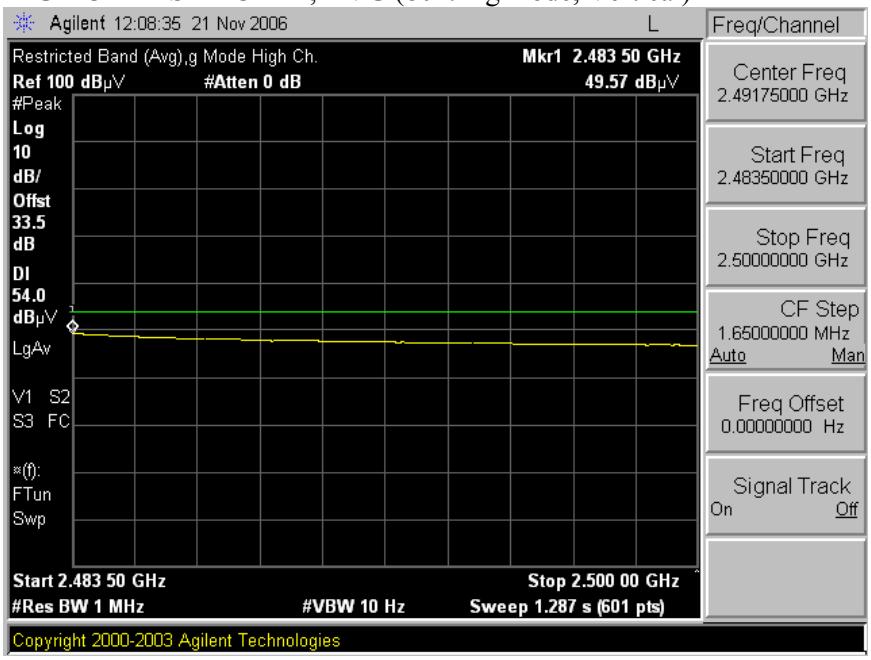


RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, 2462 MHz, VERTICAL)

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



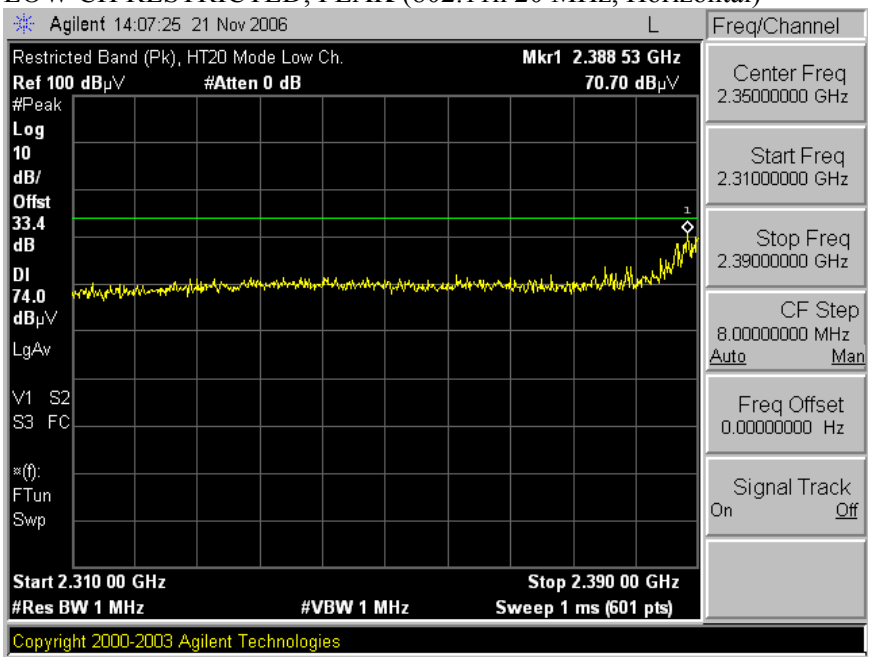
HIGH CH RESTRICTED, AVG (802.11g mode, Vertical)



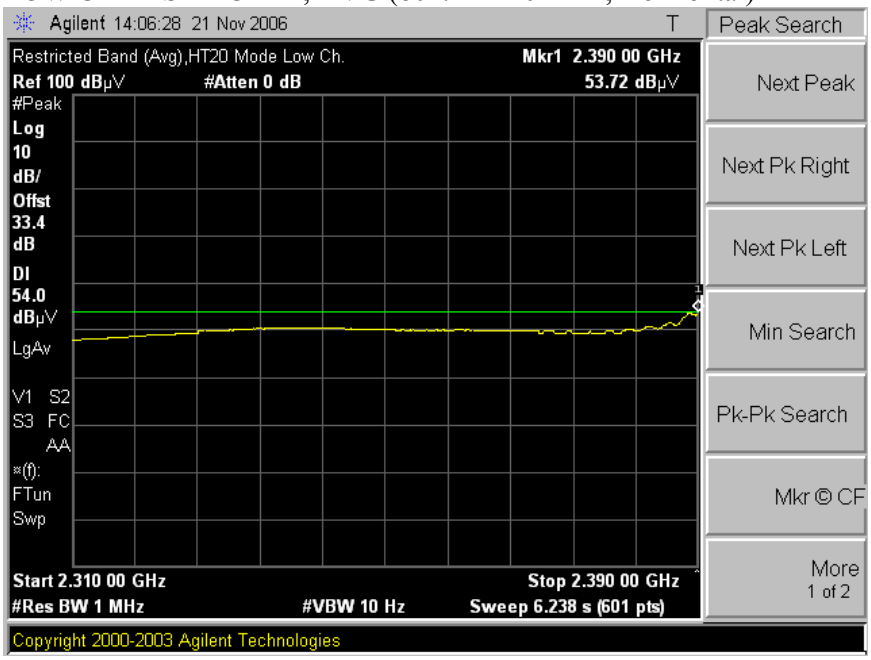
11n 20MHz MODE

RESTRICTED BANDEDGE (11n 20MHz, LOW CHANNEL, 2412 MHz, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11n 20 MHz, Horizontal)

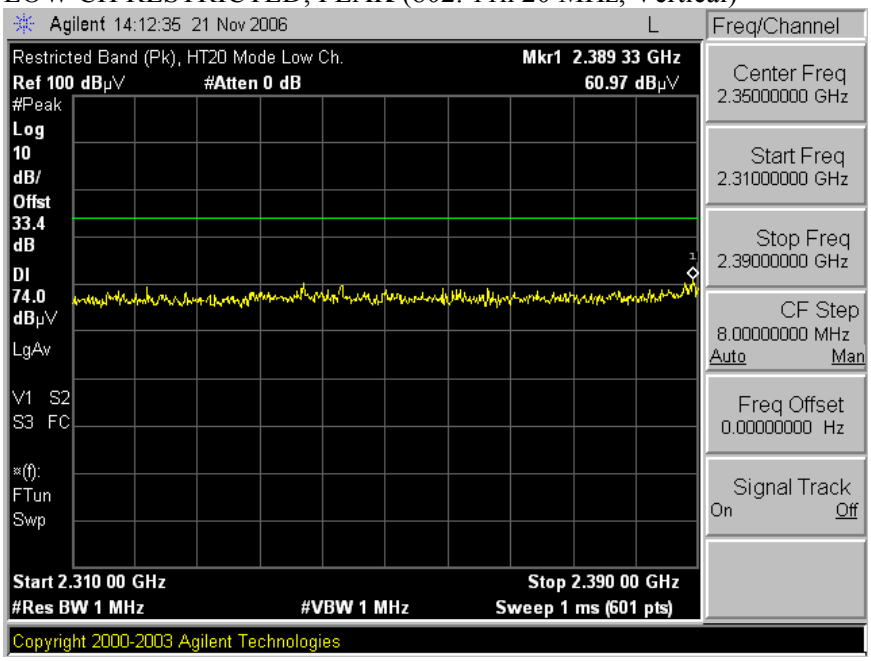


LOW CH RESTRICTED, AVG (802. 11n 20 MHz, Horizontal)

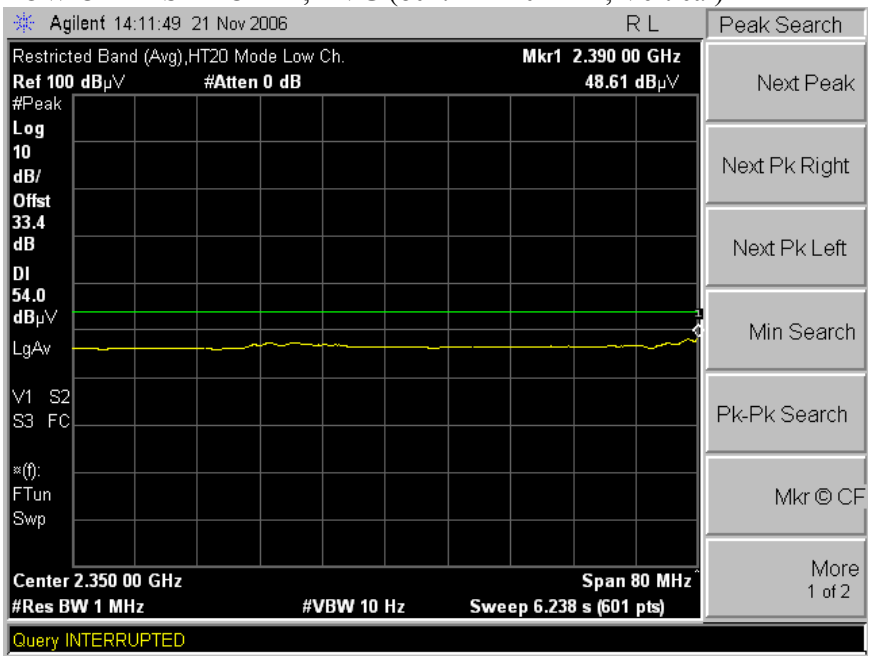


RESTRICTED BANDEDGE (11n 20 MHz, LOW CHANNEL, 2412 MHz, VERTICAL)

LOW CH RESTRICTED, PEAK (802. 11n 20 MHz, Vertical)

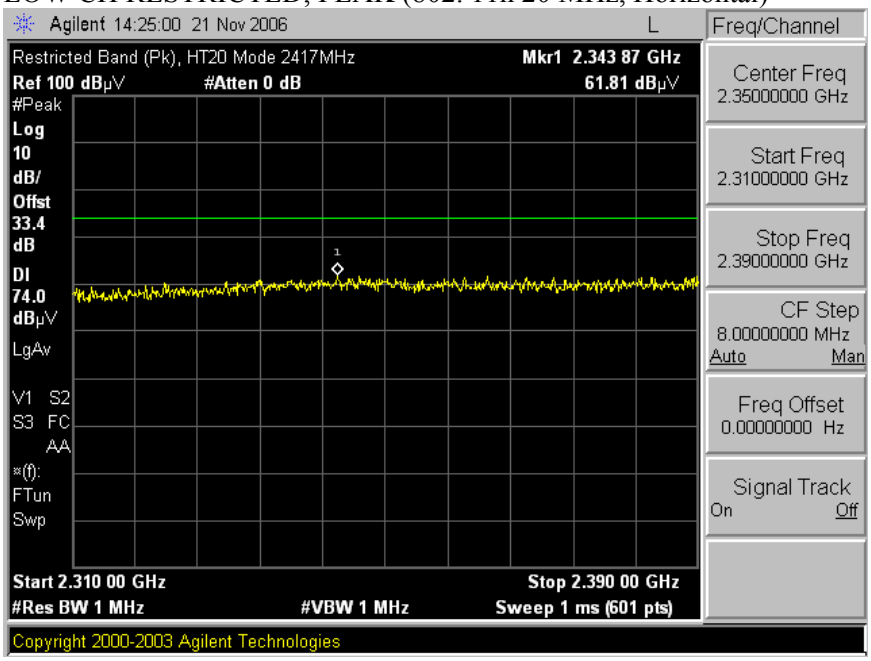


LOW CH RESTRICTED, AVG (802. 11n 20 MHz, Vertical)

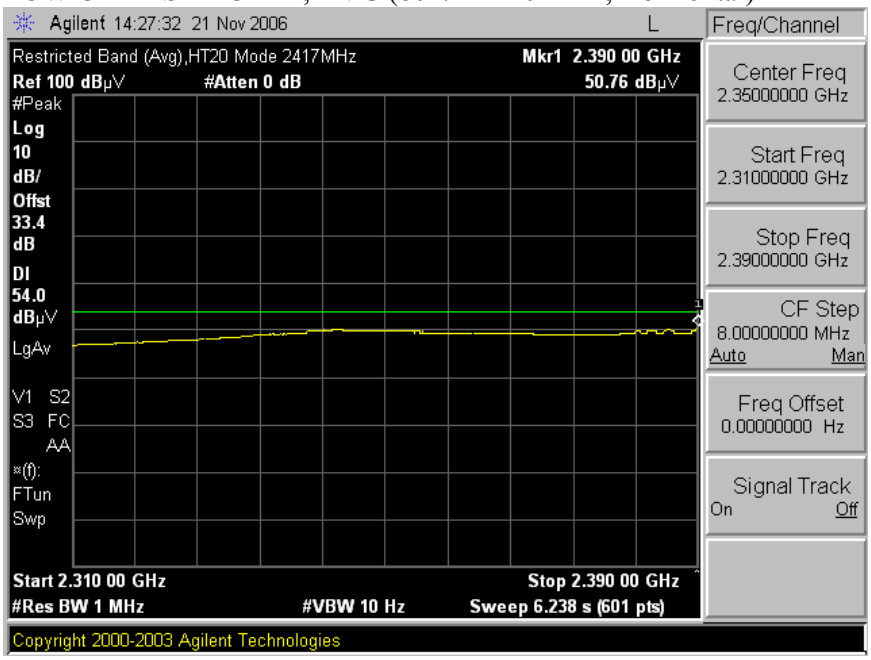


RESTRICTED BANDEDGE (11n 20 MHz, LOW CHANNEL, 2417 MHz, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802. 11n 20 MHz, Horizontal)

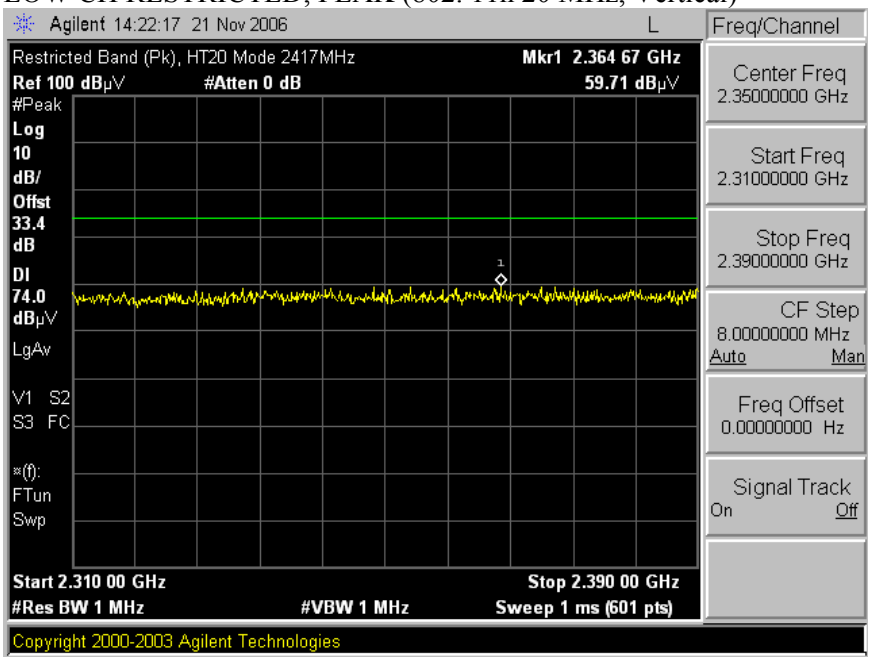


LOW CH RESTRICTED, AVG (802. 11n 20 MHz, Horizontal)

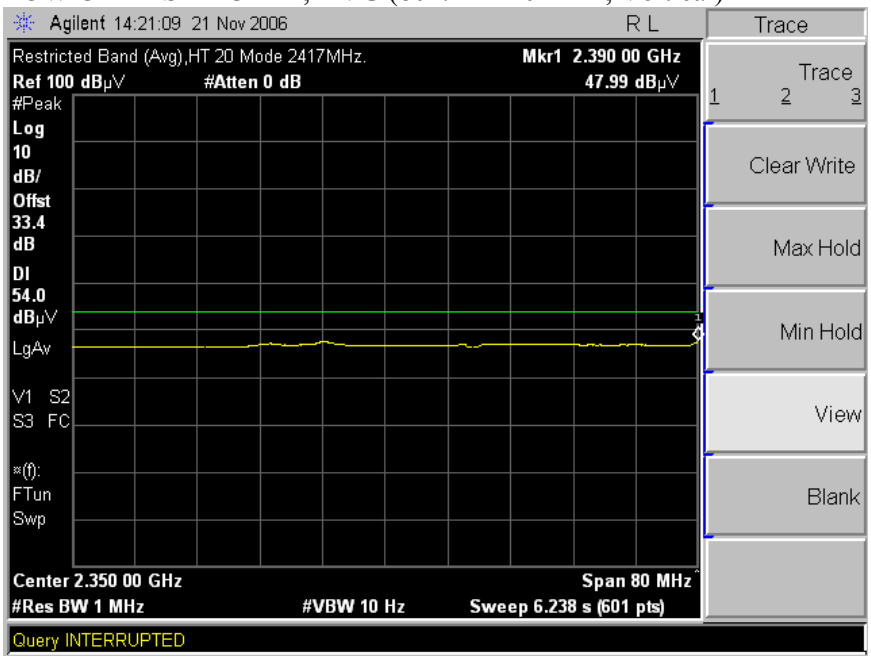


RESTRICTED BANDEDGE (11n 20 MHz, LOW CHANNEL, 2417 MHz, VERTICAL)

LOW CH RESTRICTED, PEAK (802. 11n 20 MHz, Vertical)

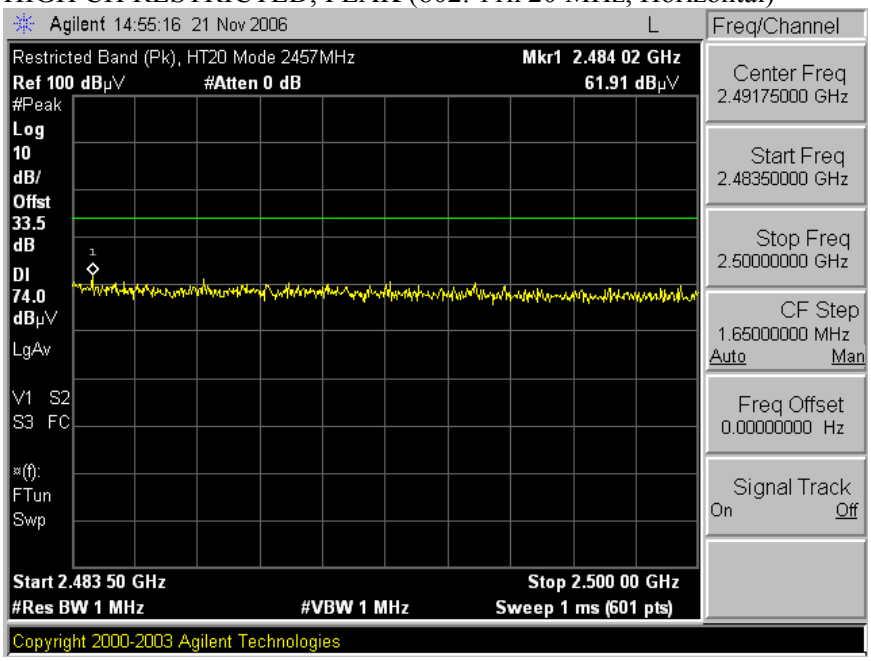


LOW CH RESTRICTED, AVG (802. 11n 20 MHz, Vertical)

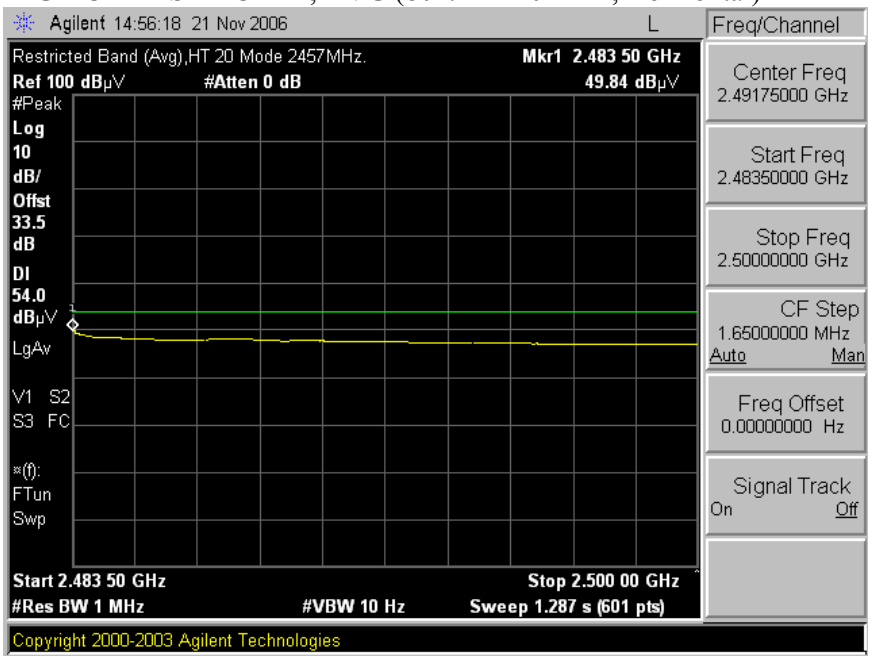


RESTRICTED BANDEDGE (11n 20 MHz, HIGH CHANNEL, 2457 MHz, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802. 11n 20 MHz, Horizontal)

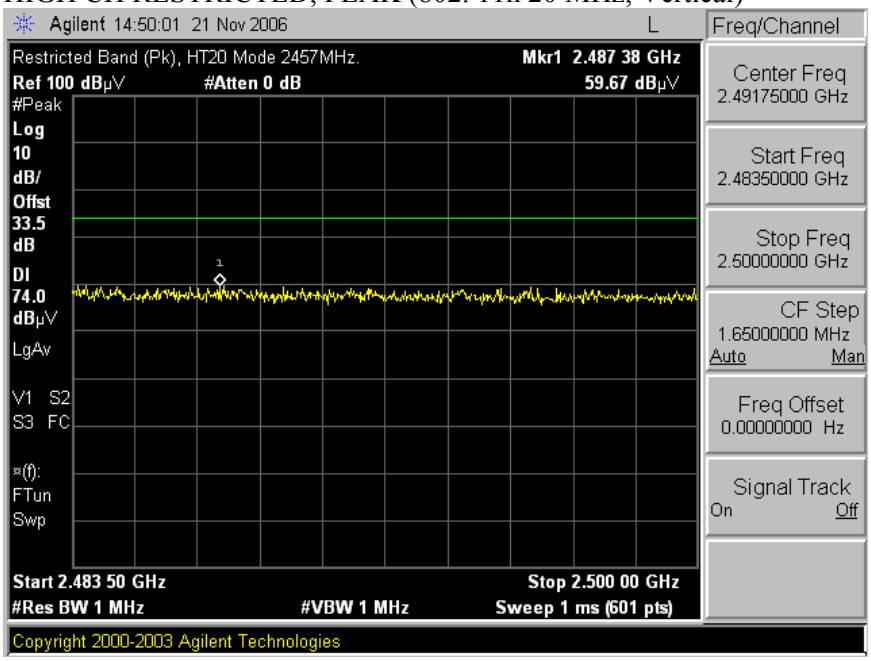


HIGH CH RESTRICTED, AVG (802. 11n 20 MHz, Horizontal)

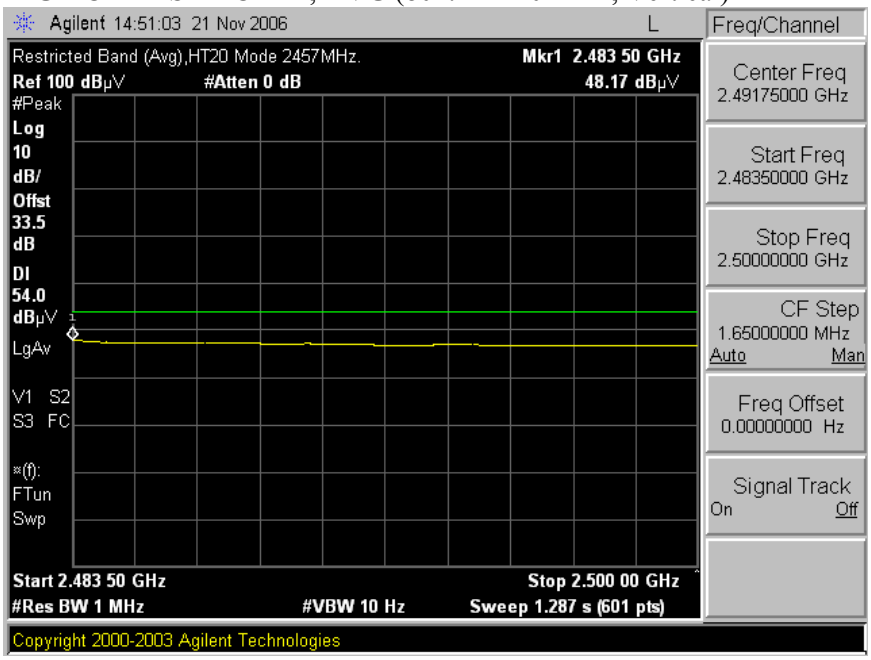


RESTRICTED BANDEDGE (11n 20 MHz, HIGH CHANNEL, 2457 MHz, VERTICAL)

HIGH CH RESTRICTED, PEAK (802. 11n 20 MHz, Vertical)

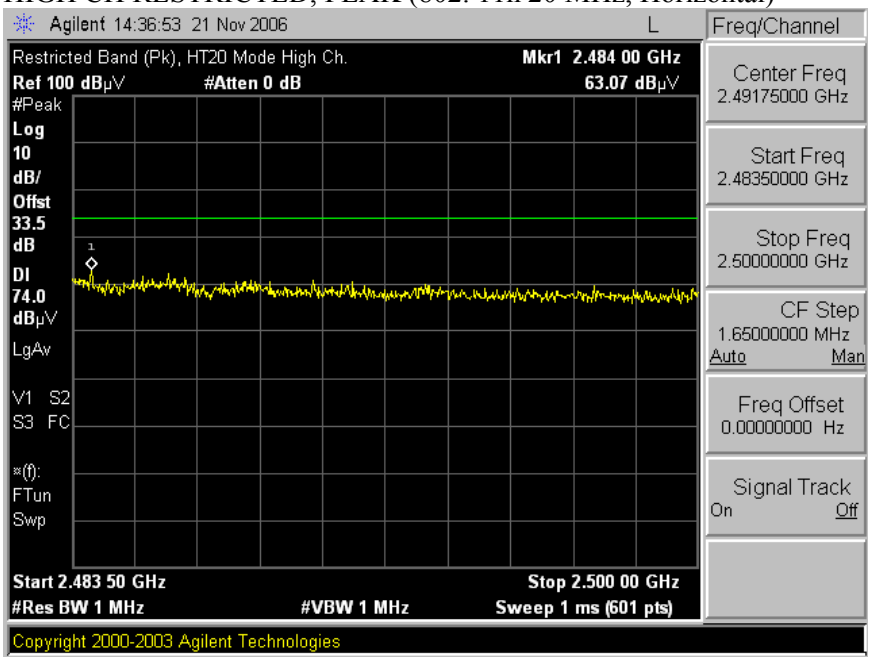


HIGH CH RESTRICTED, AVG (802. 11n 20 MHz, Vertical)

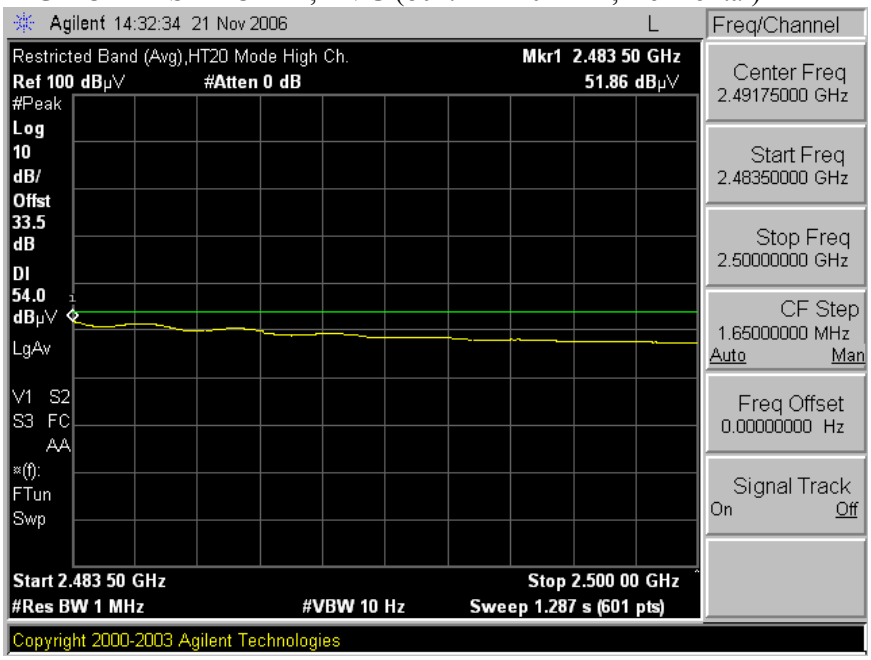


RESTRICTED BANDEDGE (11n 20 MHz, HIGH CHANNEL, 2462 MHz, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802. 11n 20 MHz, Horizontal)

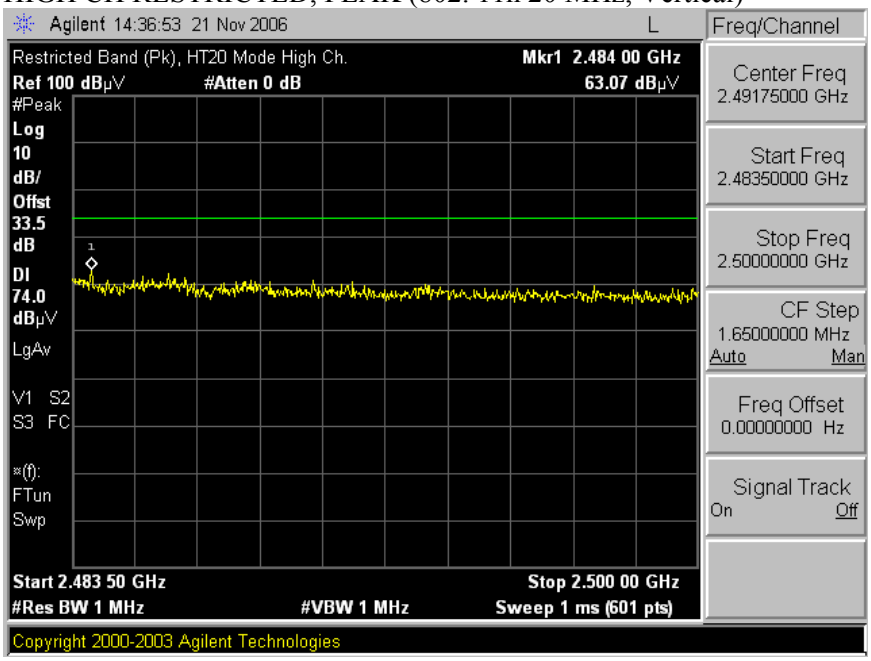


HIGH CH RESTRICTED, AVG (802. 11n 20 MHz, Horizontal)

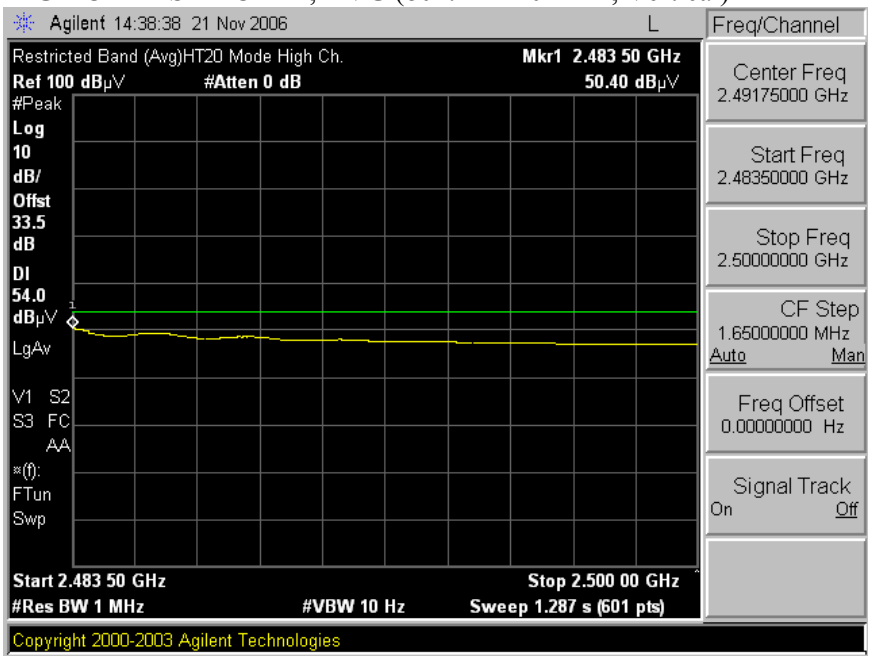


RESTRICTED BANDEDGE (11n 20 MHz, HIGH CHANNEL, 2462 MHz, VERTICAL)

HIGH CH RESTRICTED, PEAK (802. 11n 20 MHz, Vertical)



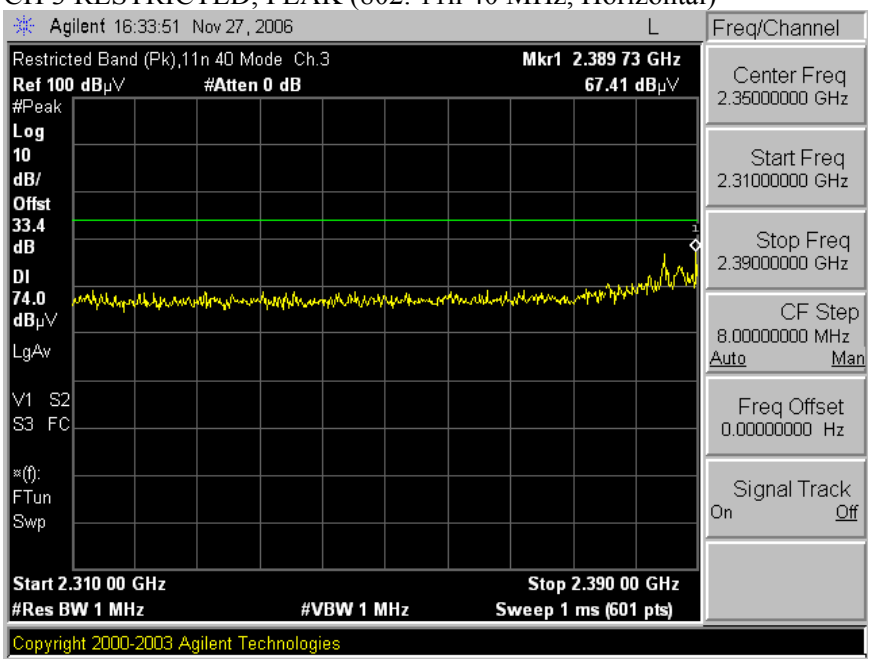
HIGH CH RESTRICTED, AVG (802. 11n 20 MHz, Vertical)



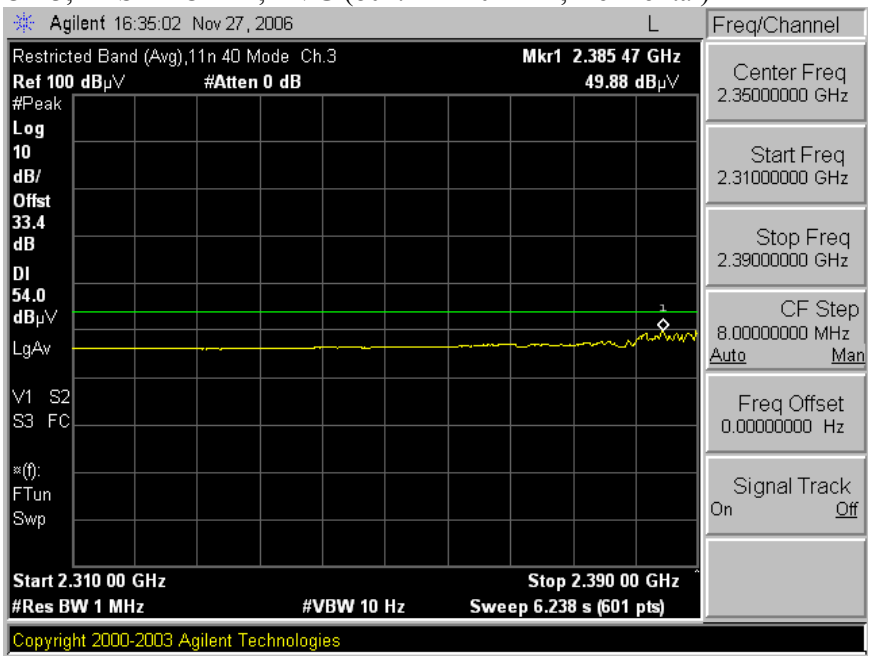
11n 40 MHz MODE

RESTRICTED BANDEDGE (11n 40 MHz, CHANNEL3, 2422 MHz, HORIZONTAL)

CH 3 RESTRICTED, PEAK (802. 11n 40 MHz, Horizontal)

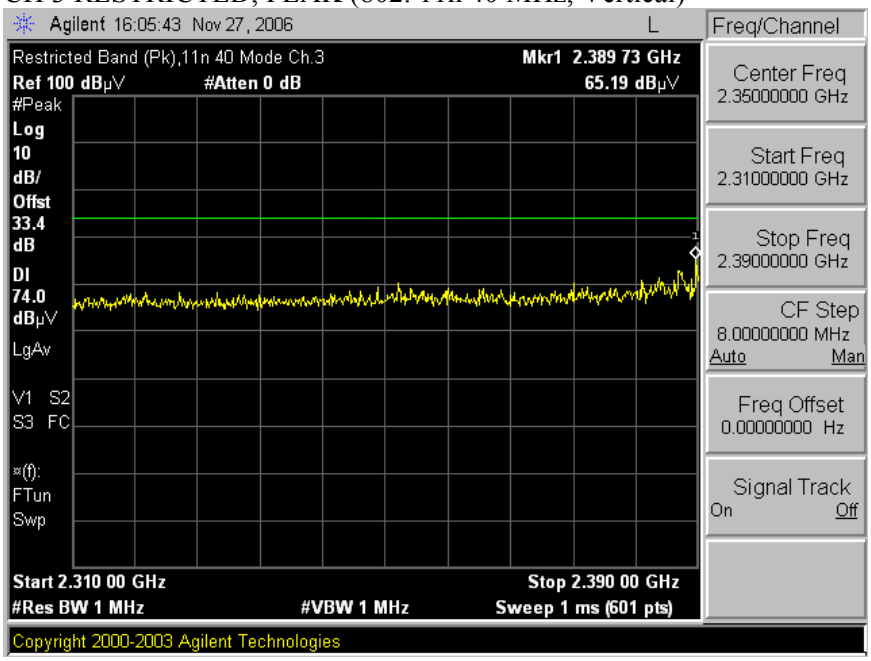


CH 3, RESTRICTED, AVG (802. 11n 40 MHz, Horizontal)

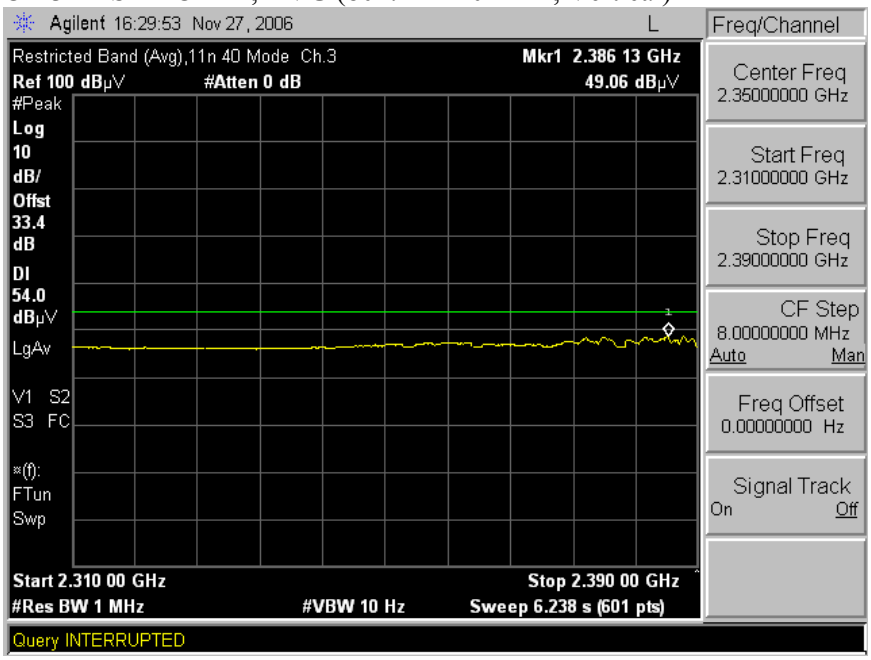


RESTRICTED BANDEDGE (11n 40 MHz, CHANNEL 3, 2422 MHz, VERTICAL)

CH 3 RESTRICTED, PEAK (802. 11n 40 MHz, Vertical)



CH 3 RESTRICTED, AVG (802. 11n 40 MHz, Vertical)



2.4 GHz BAND - HARMONICS AND SPURIOUS EMISSIONS (Worst case spot check)

(11b, 11g, 11n 20 MHz, & 11 n 40 MHz Modes)

High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Company: Broadcom
Project #: 06U10557
Date: 10/25/06
Test Engineer: Vien Tran
Configuration: Radio card installed inside HP tablet laptop
Mode: Tx 2.4 GHz Band_11b, 11g, 20MHz, & 40MHz Modes_Hi channel.

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T144 Miteq 3008A00931			FCC 15.205

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
Vien 177079005		Vien 197209005	HPF_4.0GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
11b_Ch 11, 2462 MHz															
4.924	3.0	54.8	53.0	33.1	3.4	-36.5	0.0	0.6	55.5	53.7	74	54	-18.5	-0.3	H
7.386	3.0	43.9	33.4	35.6	3.9	-36.2	0.0	0.6	47.8	37.3	74	54	-26.2	-16.7	H
4.924	3.0	52.3	49.8	33.1	3.4	-36.5	0.0	0.6	53.0	50.5	74	54	-21.0	-3.5	V
7.386	3.0	44.7	33.6	35.6	3.9	-36.2	0.0	0.6	48.6	37.5	74	54	-25.4	-16.5	V
11g_Ch 11, 2462 MHz															
4.924	3.0	53.9	44.6	33.1	3.4	-36.5	0.0	0.6	54.6	45.3	74	54	-19.4	-8.7	H
7.386	3.0	45.8	33.4	35.6	3.9	-36.2	0.0	0.6	49.7	37.3	74	54	-24.3	-16.7	H
4.924	3.0	52.0	42.6	33.1	3.4	-36.5	0.0	0.6	52.7	43.3	74	54	-21.3	-10.7	V
7.386	3.0	44.3	33.5	35.6	3.9	-36.2	0.0	0.6	48.2	37.4	74	54	-25.8	-16.6	V
20 MHz Bandwidth_Ch 11, 2462 MHz															
4.924	3.0	49.0	39.8	33.1	3.4	-36.5	0.0	0.6	49.7	40.5	74	54	-24.3	-13.5	H
7.386	3.0	46.3	34.4	35.6	3.9	-36.2	0.0	0.6	50.2	38.3	74	54	-23.8	-15.7	H
4.924	3.0	47.7	38.0	33.1	3.4	-36.5	0.0	0.6	48.4	38.7	74	54	-25.6	-15.3	V
7.386	3.0	44.1	33.5	35.6	3.9	-36.2	0.0	0.6	48.0	37.4	74	54	-26.0	-16.6	V
40 MHz Bandwidth_Ch 9, 2452 MHz															
4.904	3.0	47.3	34.3	33.1	3.4	-36.5	0.0	0.6	47.9	34.9	74	54	-26.1	-19.1	H
7.356	3.0	44.7	33.8	35.5	3.9	-36.2	0.0	0.6	48.6	37.7	74	54	-25.4	-16.3	H
4.904	3.0	44.8	33.7	33.1	3.4	-36.5	0.0	0.6	45.4	34.3	74	54	-28.6	-19.7	V
7.356	3.0	43.5	33.2	35.5	3.9	-36.2	0.0	0.6	47.4	37.1	74	54	-26.6	-16.9	V
			No other emissions were detected above system noise floor												

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

5.8 GHz BAND - HARMONICS AND SPURIOUS EMISSIONS (Worst case spot check)

(11a, 20MHz, & 40 MHz Modes)

High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Company: Broadcom
Project #: 06U10557
Date: 10/20/06
Test Engineer: Vien Tran
Configuration: Radio card installed inside HP tablet laptop
Mode: Tx 5.8 GHz Band_Legacy, 20 MHz Bandwidth, & 40MHz Bandwidth

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T144 Miteq 3008A00931			FCC 15.205

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
Vien 177079005		Vien 197209005	HPF_7.6GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Legacy, Ch 157_5785 MHz															
11.570	3.0	54.2	42.5	37.4	5.0	-35.8	0.0	0.7	61.5	49.8	74	54	-12.5	-4.2	H
11.570	3.0	50.7	40.2	37.4	5.0	-35.8	0.0	0.7	58.0	47.5	74	54	-16.0	-6.5	V
20 MHz Bandwidth, Ch 157_5785 MHz															
11.570	3.0	54.4	42.9	37.4	5.0	-35.8	0.0	0.7	61.7	50.2	74	54	-12.3	-3.8	H
11.570	3.0	52.4	40.9	37.4	5.0	-35.8	0.0	0.7	59.7	48.2	74	54	-14.3	-5.8	V
40 MHz Bandwidth, Ch 151_5755 MHz															
11.510	3.0	51.1	40.0	37.4	5.0	-35.8	0.0	0.7	58.4	47.3	74	54	-15.6	-6.7	H
11.510	3.0	49.9	38.0	37.4	5.0	-35.8	0.0	0.7	57.2	45.3	74	54	-16.8	-8.7	V
			No other emissions were detected above system noise floor												

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

7.1.3. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

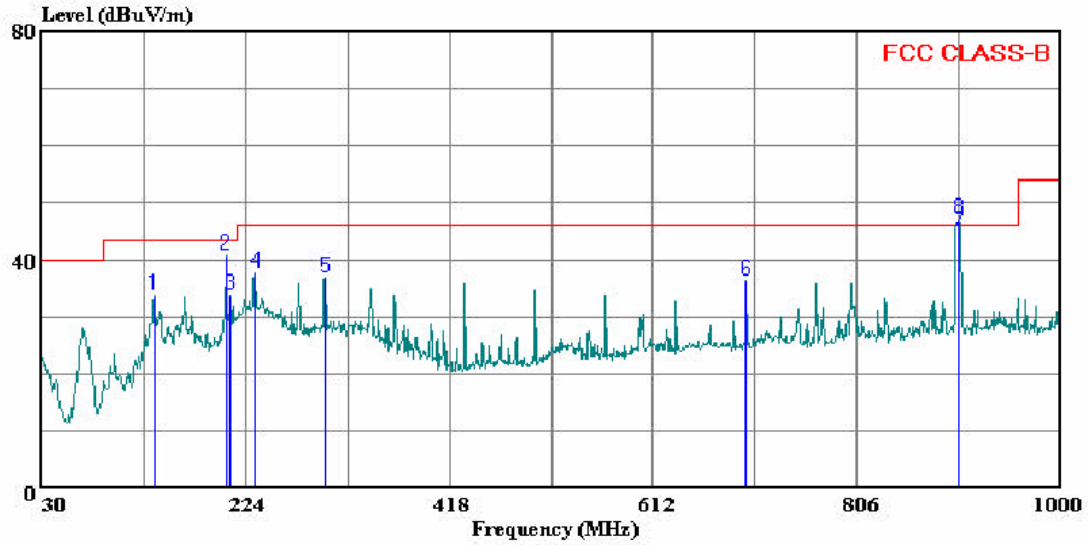
2.4 GHz BAND

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

HORIZONTAL PLOT

COMPLIANCE Engineering Services, Inc.
561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 5 File#: 06U10557.EMI Date: 10-23-2006 Time: 10:45:16



(Audix ATC)

Trace: 2 Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator:: Vien Tran
Company: : Broadcom
Project #: : 06U10557
Configuration:: EUT/Laptop
Mode of Oper.:: TX 2.4 GHz Band (Worst Case)
Target: : FCC Class B

HORIZONTAL DATA

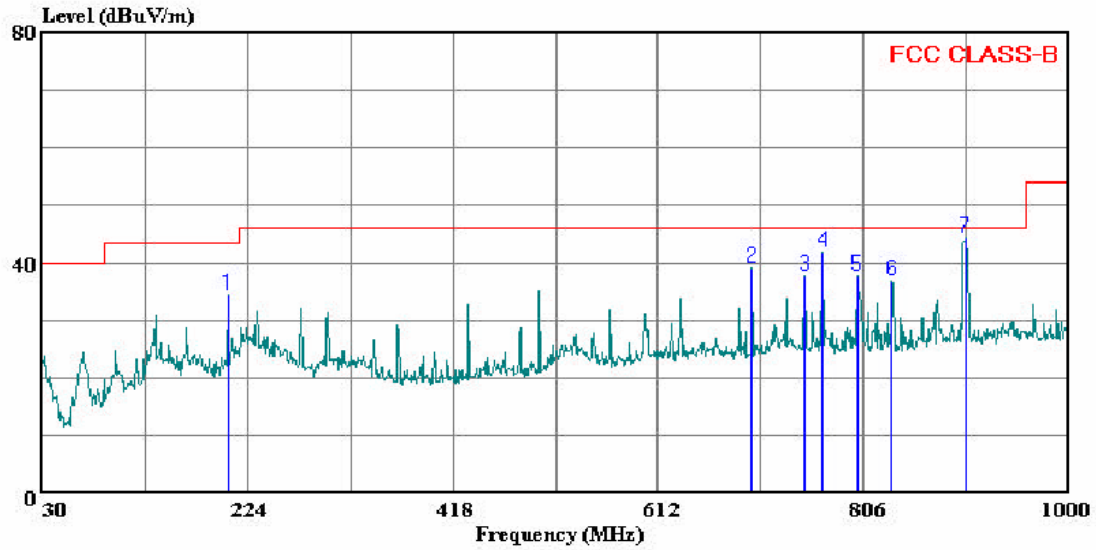
		Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1		136.700	47.00	-13.29	33.71	43.50	-9.79	Peak
2		205.570	55.10	-14.41	40.69	43.50	-2.81	Peak
3		209.450	48.60	-14.90	33.70	43.50	-9.80	Peak
4		232.730	52.60	-14.90	37.70	46.00	-8.30	Peak
5		299.660	49.20	-12.39	36.81	46.00	-9.19	Peak
6		700.270	40.10	-3.91	36.19	46.00	-9.81	Peak
7		903.000	46.20	-1.32	44.88	46.00	-1.12	QP
8	*	903.000	48.30	-1.32	46.98	46.00	0.98	Peak

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

VERTICAL PLOT

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

Data#: 7 File#: 06U10557.EMI Date: 10-23-2006 Time: 10:52:00



(Audix ATC)

Trace: 6 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator:: Vien Tran
Company: : Broadcom
Project #: : 06U10557
Configuration:: EUT/Laptop
Mode of Oper.:: TX 2.4 GHz Band (Worst Case)
Target: : FCC Class B

VERTICAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	205.570	48.80	-14.41	34.39	43.50	-9.11	Peak
2	700.270	43.00	-3.91	39.09	46.00	-6.91	Peak
3	750.710	40.70	-3.13	37.57	46.00	-8.43	Peak
4	767.200	44.70	-2.86	41.84	46.00	-4.16	Peak
5	800.180	40.10	-2.37	37.73	46.00	-8.27	Peak
6	833.160	39.00	-2.08	36.92	46.00	-9.08	Peak
7	902.030	45.50	-1.33	44.17	46.00	-1.83	Peak

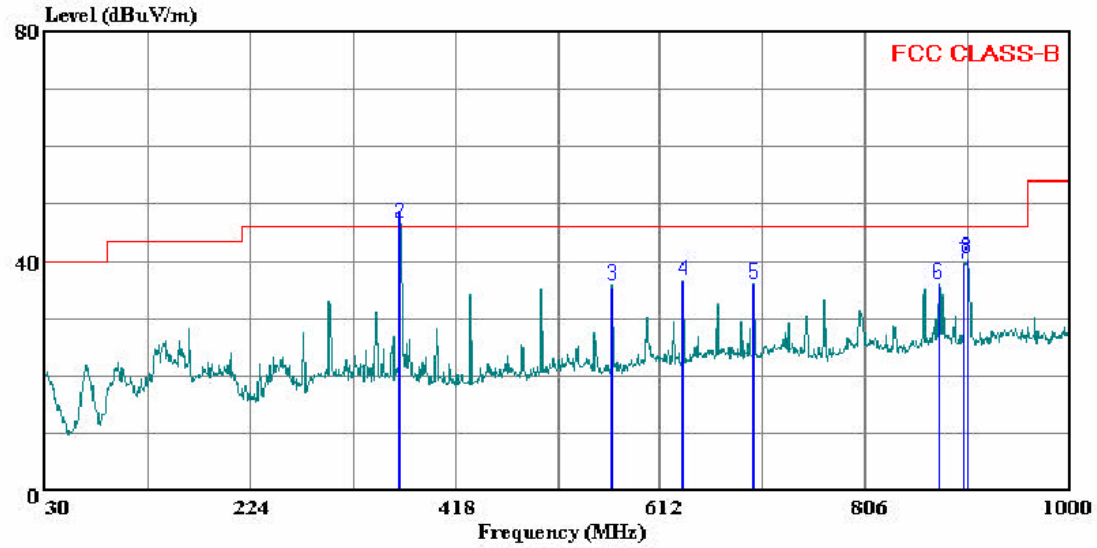
5 GHz BAND

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

HORIZONTAL PLOT

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

Data#: 11 File#: 06U10557.EMI Date: 10-23-2006 Time: 11:12:27



(Audix ATC)

Trace: 8 Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator:: Vien Tran
Company: : Broadcom
Project #: : 06U10557
Configuration:: EUT/Laptop
Mode of Oper.:: TX 5.2 GHz Band (Worst Case)
Target: : FCC Class B

HORIZONTAL DATA

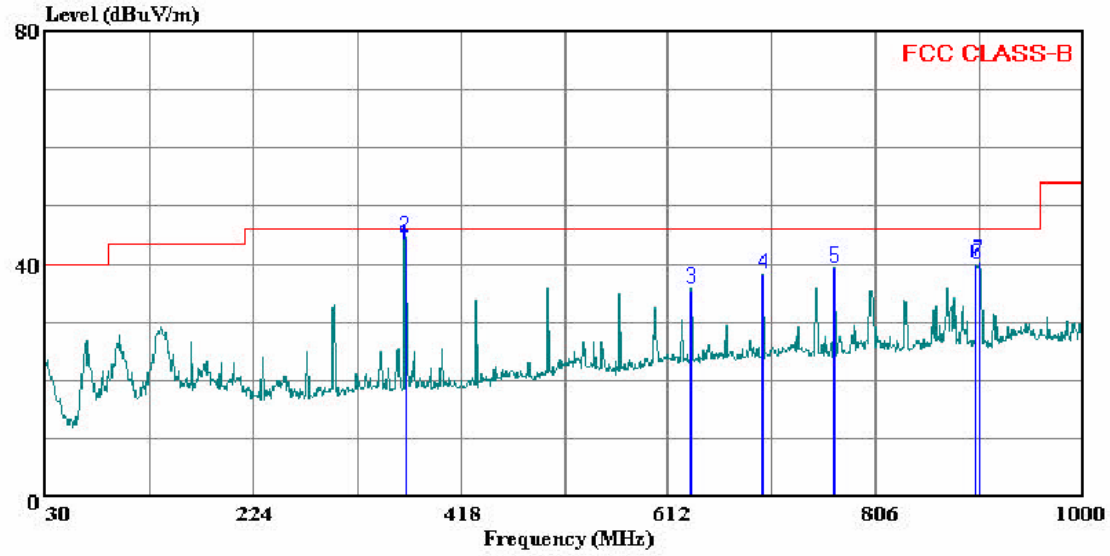
		Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1		365.620	55.85	-10.78	45.07	46.00	-0.93	QP
2	*	365.620	57.40	-10.78	46.62	46.00	0.62	Peak
3		566.410	42.30	-6.44	35.86	46.00	-10.14	Peak
4		633.340	41.70	-5.20	36.50	46.00	-9.50	Peak
5		700.270	39.80	-3.91	35.89	46.00	-10.11	Peak
6		875.840	37.60	-1.54	36.06	46.00	-9.94	Peak
7		900.090	40.90	-1.37	39.53	46.00	-6.47	Peak
8		902.030	41.70	-1.33	40.37	46.00	-5.63	Peak

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

VERTICAL

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

Data#: 15 File#: 06U10557.EMI Date: 10-23-2006 Time: 12:02:46



Trace: 12 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator:: Vien Tran
Company: : Broadcom
Project #: : 06U10557
Configuration:: EUT/Laptop
Mode of Oper.:: TX 5.2 GHz Band (Worst Case)
Target: : FCC Class B

VERTICAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	366.590	53.90	-10.74	43.16	46.00	-2.84	QP
2	366.590	55.30	-10.74	44.56	46.00	-1.44	Peak
3	633.340	41.00	-5.20	35.80	46.00	-10.20	Peak
4	700.270	42.00	-3.91	38.09	46.00	-7.91	Peak
5	767.200	42.10	-2.86	39.24	46.00	-6.76	Peak
6	900.090	41.30	-1.37	39.93	46.00	-6.07	Peak
7	902.030	41.70	-1.33	40.37	46.00	-5.63	Peak

7.2. 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:

2.4 GHz BAND

6 WORST EMISSIONS

2.4 GHz BAND

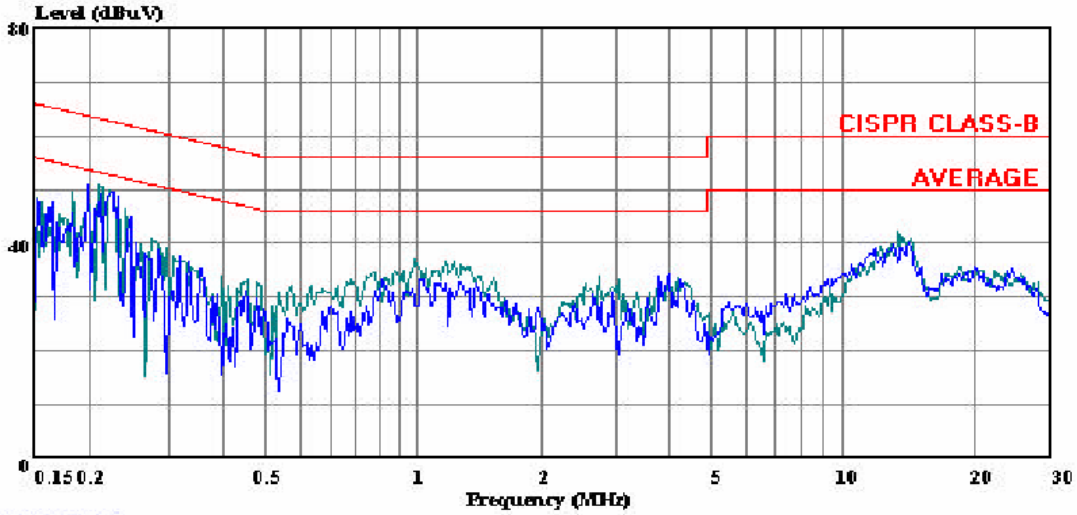
CONDUCTED EMISSIONS DATA (115VAC 60Hz)

Freq.	Reading			Closs	Limit	FCC_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.22	50.80	--	--	0.00	62.71	52.71	-11.91	-1.91	L1
1.09	36.90	--	--	0.00	56.00	46.00	-19.10	-9.10	L1
13.48	42.19	--	--	0.00	60.00	50.00	-17.81	-7.81	L1
0.22	49.36	--	--	0.00	62.71	52.71	-13.35	-3.35	L2
1.09	33.19	--	--	0.00	56.00	46.00	-22.81	-12.81	L2
13.48	39.32	--	--	0.00	60.00	50.00	-20.68	-10.68	L2
6 Worst Data									

LINE 1 & LINE 2RESULTS

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

Data#: 2 File#: 06U10557.EMI Date: 10-23-2006 Time: 16:23:45



(Audix ATC)

Trace: 1 Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Vien Tran
Project # : 06U10557
Company : Broadcom
EUT configuration: Radio installed in tablet laptop
Mode of operation: Tx 2.4GHz Band
Power Source : 115VAC / 60Hz
: L1: Peak(Green), L2: Peak (Blue)

5 GHz BAND

6 WORST EMISSIONS

5 GHz BAND

CONDUCTED EMISSIONS DATA (115VAC 60Hz)

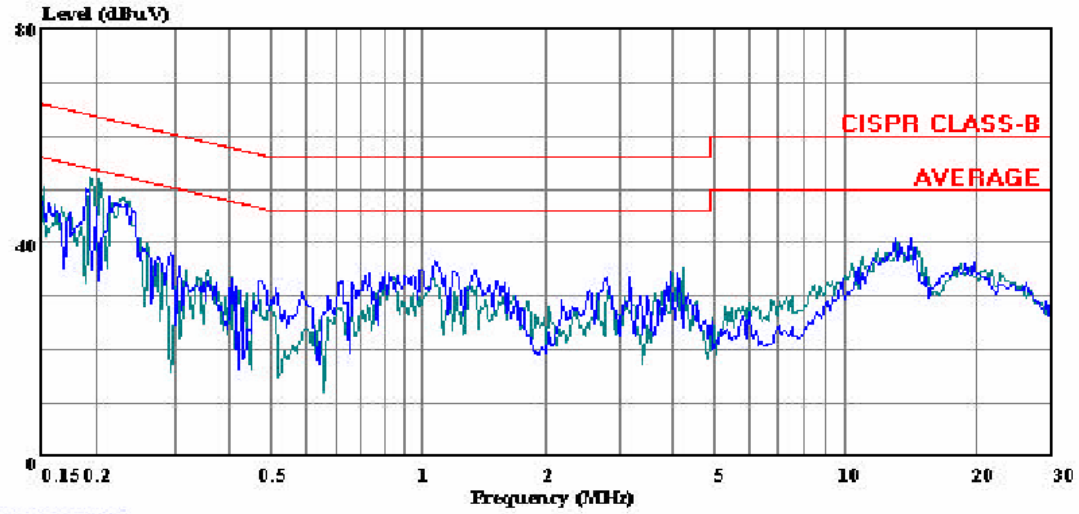
Freq.	Reading			Closs	Limit	FCC_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.20	51.90	--	--	0.00	63.49	53.49	-11.59	-1.59	L1
1.17	33.94	--	--	0.00	56.00	46.00	-22.06	-12.06	L1
13.34	40.20	--	--	0.00	60.00	50.00	-19.80	-9.80	L1
0.19	50.33	--	--	0.00	64.04	54.04	-13.71	-3.71	L2
1.17	36.74	--	--	0.00	56.00	46.00	-19.26	-9.26	L2
13.13	40.85	--	--	0.00	60.00	50.00	-19.15	-9.15	L2

6 Worst Data

LINE 1 & LINE 2 RESULTS

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

Data#: 4 File#: 06U10557.EMI Date: 10-23-2006 Time: 16:35:26



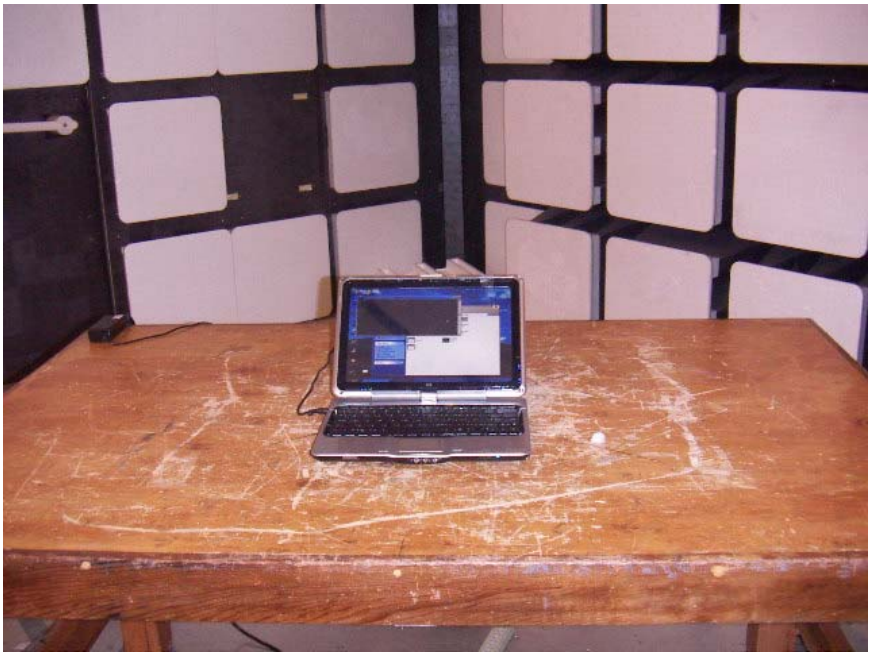
Trace: 3 Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Vien Tran
Project # : 06U10557
Company : Broadcom
EUT configuration: Radio installed in tablet laptop
Mode of operation: Tx 5GHz Band
Power Source : 115VAC / 60Hz
: L1: Peak(Blue), L2: Peak(Green)

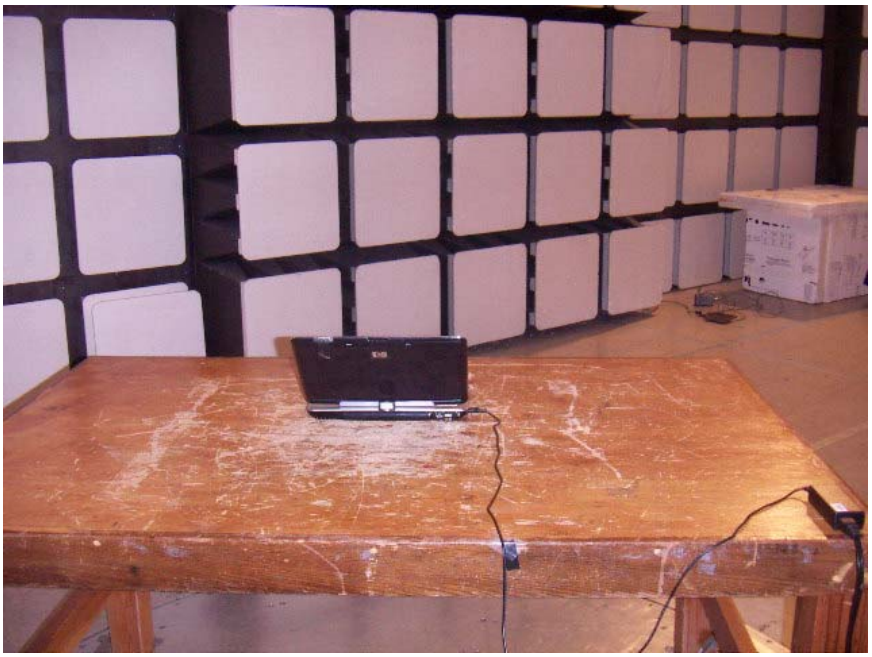
8. SETUP PHOTOS

RADIATED RF MEASUREMENT SETUP FOR RADIATED EMISSION BELOW 1 GHz

RADIATED FRONT PHOTO



RADIATED BACK PHOTO



RADIATED RF MEASUREMENT SETUP FOR MOBILE CONFIGURATION (ABOVE 1 GHz)

WORST CASE CONFIGURATION FOR 2.4 GHz BAND

RADIATED FRONT PHOTO

RADIATED BACK PHOTO

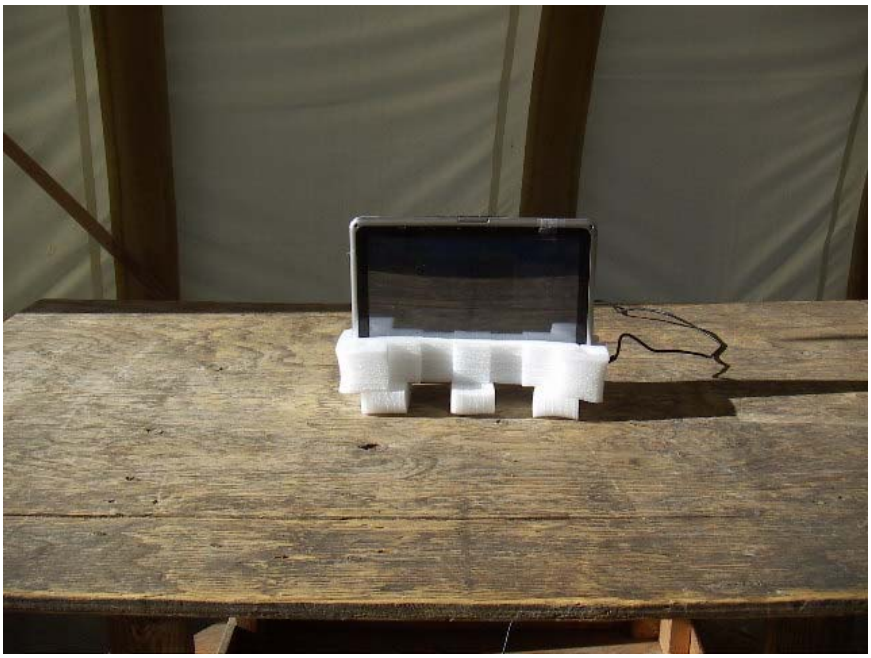
RADIATED RF MEASUREMENT SETUP FOR PORTABLE CONFIGURATION (ABOVE 1 GHz)

WORST CASE CONFIGURATION FOR 5 GHz BAND

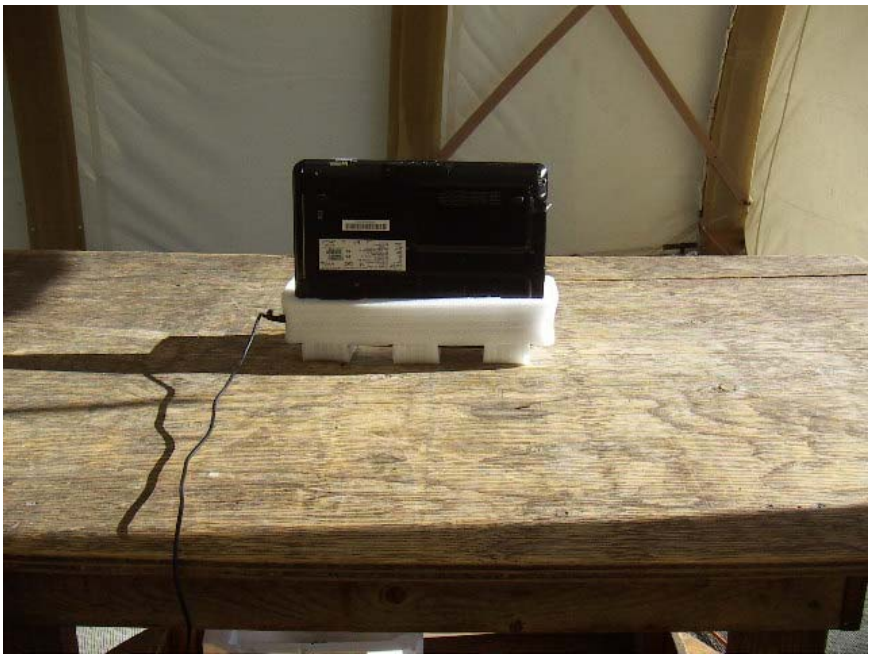
X-AXIS FRONT PHOTO

X-AXIS BACK PHOTO

Y-AXIS FRONT PHOTO

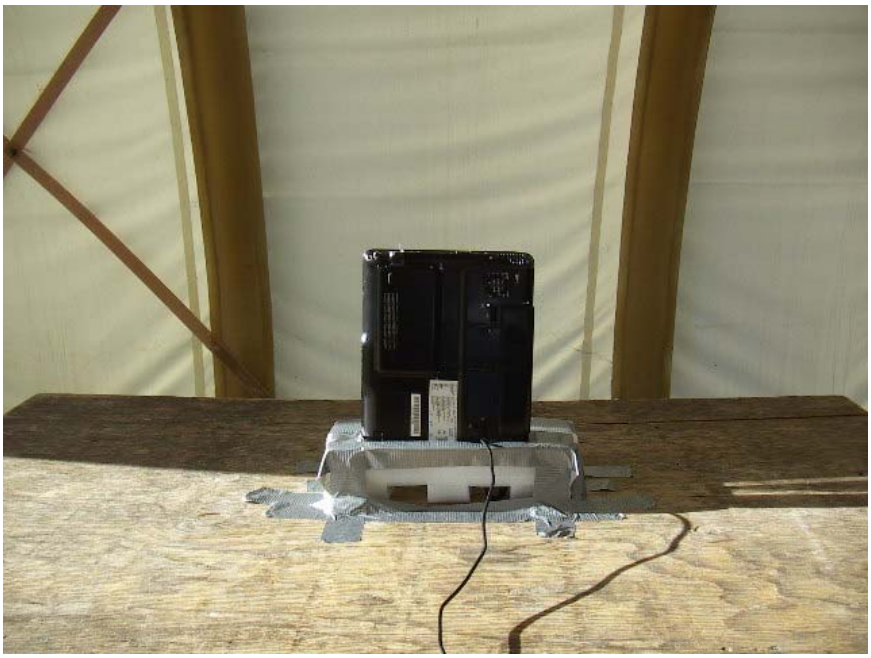


Y-AXIS BACK PHOTO



Z-AXIS FRONT PHOTO

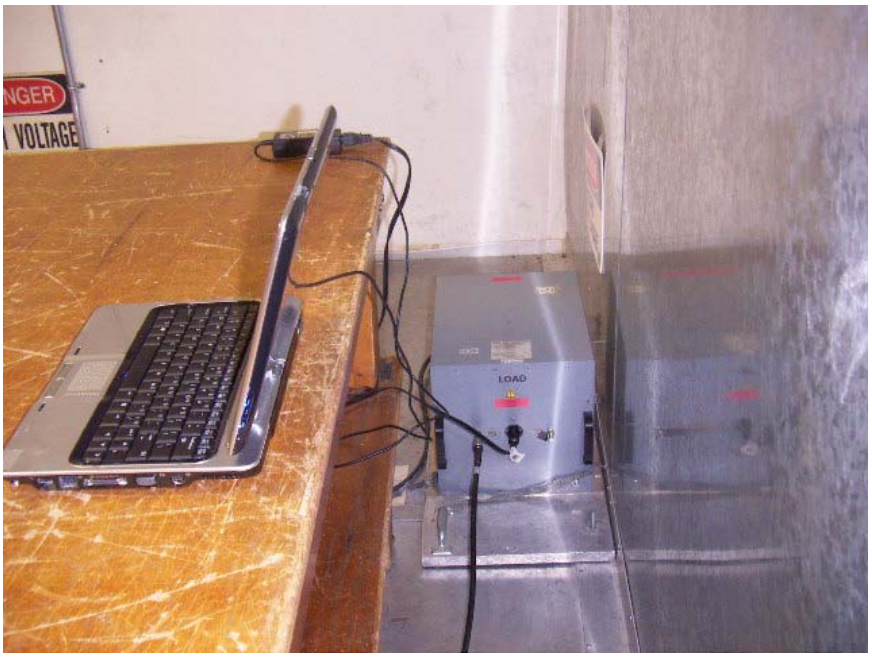
Z-AXIS BACK PHOTO



POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP

LINE CONDUCTED FRONT PHOTO

LINE CONDUCTED BACK PHOTO



END OF REPORT