FCC CFR47 CERTIFICATION
CLASS II PERMISSIVE CHANGE
TEST REPORT

FOR

BROADCOM 802.11ag WIRELESS LAN PCI-E MINI CARD

MODEL NUMBER: BCM94311MCAG

FCC ID: QDS-BRCM1019

REPORT NUMBER: 06U10199-1

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Prepared for
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Revision History

Rev.	Issue Date	Revisions	Revised By
--	04/14/06	Initial Issue	Thu

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	Broadcom Corp. 190 Mathilda Place Sunnyvale, CA 94086, USA
EUT DESCRIPTION:	Broadcom 802.11ag Wireless LAN PCI-E Mini Card
MODEL:	BCM94311MCAG
SERIAL NUMBER:	407
DATE OF ORIGINAL TESTS:	March 31 to April 06, 2006

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART C & E	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: Tested By:

THU CHAN
EMC SUPERVISOR
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VIEN TRAN
EMC ENGINEER
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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 EUT is an 802.11a/b/g transceiver module, operating in the DTS 2400-2483.5 MHz, 5725-5850MHz, and UNII 5250 – 5350 MHz bands, and manufactured by Broadcom Corp.

5.2. CLASS II PERMISSIVE CHANGE DESCRIPTION

The EUT was originally tested and reported under CCS project no. 05U3487 and granted by TCB, with a PIFA antenna which has a peak gain of 3.24dBi at 2.4 GHz band and 5.7dBi at 5 GHz band.

The major change filed under this application is to add a PCB antenna of 1.66dBi maximum gain at 2.4 GHz band and 2.36dBi at 5 GHz band, the PCB antenna is manufactured by Amphenol, P/N EAX20. Therefore only Radiated emission and Power Line Conducted emission tests were conducted under this project, with verification performed on the original output power.

5.3. MAXIMUM OUTPUT POWER

The transmitter has the same maximum peak conducted output power as original.

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PCB antenna with a maximum gain of 1.66dBi for 2.4 GHz band and 2.36dBi for 5 GHz band.

5.5. SOFTWARE AND FIRMWARE

The EUT driver software installed in the host support equipment during testing was BCM94311, version. 3.100.53.0

The test utility software used during testing was wl_tools.

5.6. WORST-CASE CONFIGURASSSSION AND MODE

The worst-case channel is determined as the channel with the highest output power. The highest measured output powers were at 2437 MHz for 11b mode, 2437 MHz for 11g mode and 5825 MHz for 11a.

The worst-case data rate for these channels are determined to be 1 Mb/s for 11b mode, 6 Mb/s for 11g mode, and 6 Mb/s for 11a mode based on previous experience with WLAN product design architectures.

WORST-CASE POWER AND BITE RATE SETTING

802.11b						
CHANNEL	1	6	11	13		
(MHz)	2412	2437	2462	2472		
Band Edge						
(dBm)	19	x	19	10		
Emission						
(dBm)	19	19	x	19*		
Bit Rate						
(Mbps)	11 Mbps for Peak reading & 1 Mbps for Average reading					
*** NOTE:**	For the rest of the RF Conducted and Radiated Emission tests, channel 13 is set					
	to 19dBm for worst case power to cover all high channels_Channel 11 (19dBm) &					
	Channel 13 (10dBm).					

802.11g						
CHANNEL	1	2	6	10	11	13
(MHz)	2412	2417	2437	2457	2462	2472
Band Edge						
(dBm)	18	19	X	19	17	11
Emission						
(dBm)	19	x	19	x	x	19*
Bit Rate						
(Mbps)	54 Mbps for Peak reading & 6 Mbps for Average reading					
***NOTE:**	For the rest of the RF Conducted and Radiated Emission tests, channel 13 is set					
	to 19dBm for worst case power to cover all high channels_Channel 10 (19dBm),					
	Channel 11 (17dBm) & Channel 13 (11dBm)					

802.11a			
CHANNEL	149	157	165
(MHz)	5745	5785	5825
Band Edge			
(dBm)	17	17	17
Emission			
(dBm)	17	17	17
Bit Rate			
(Mbps)	54 Mbps for Peak reading & 6 Mbps for Average reading		

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	HP	Pavilion dv4030us	CNE52005T6	DoC
AC Adapter	HP	PPP0009S	CT 57BC30AU4RO0L0	DoC
Extended Card	ADEXELEC	PEX1-MINI	01/01/1900	N/A

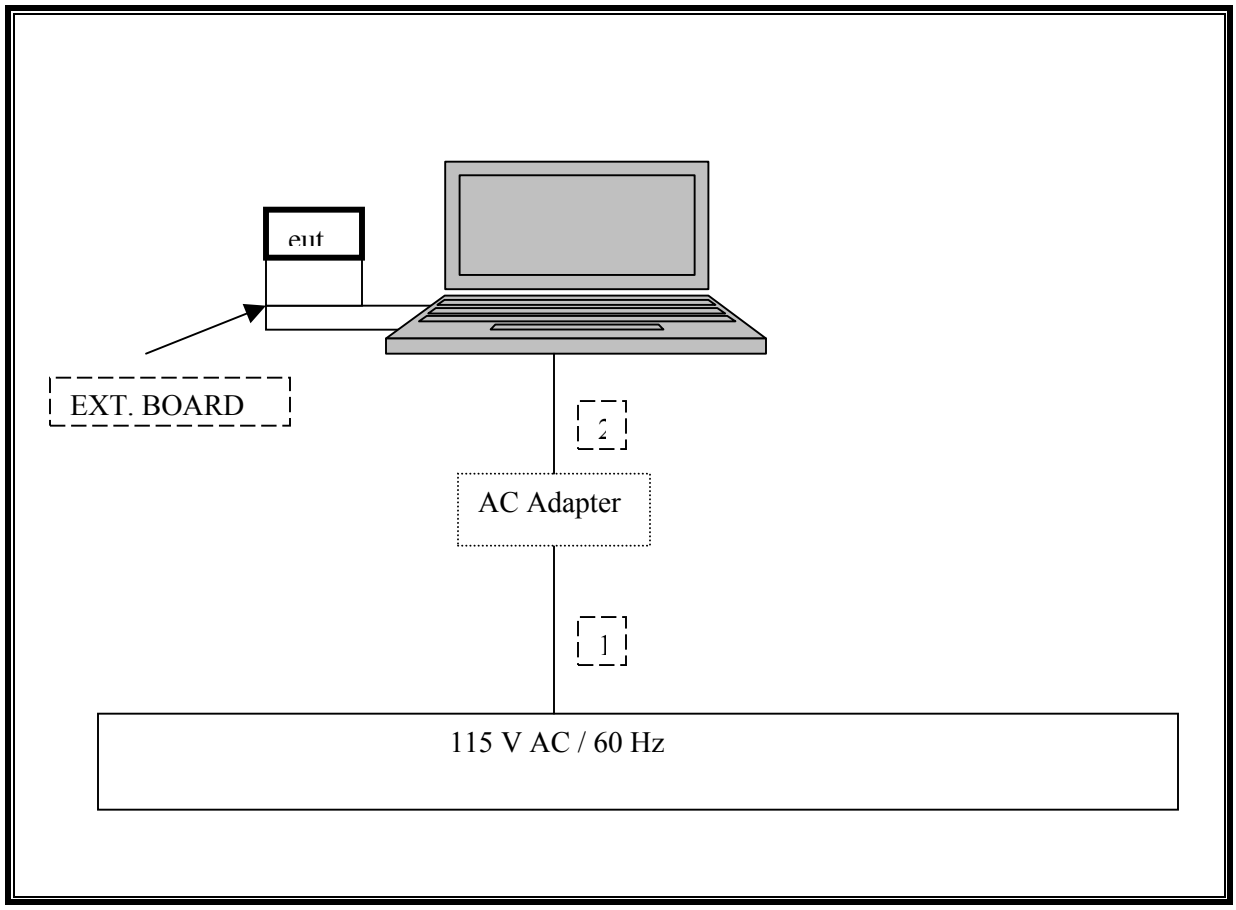
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identica Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC Power	1	AC power	Unshielded	1.5 m	N/A
2	DC Power	1	DC Power	Unshielded	1.5 m	N/A

TEST SETUP

The EUT is installed in a host laptop computer via a card bus-to-mini PCI adapter / extension board during the tests. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



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
Spectrum Analyzer 3 Hz ~ 44 GI	Agilent / HP	E4446A	US42510266	10/19/2006
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	2238	4/22/2006
Antenna, Horn 18 ~ 26 GHz	ARA	SWH-28	1007	6/2/2006
Antenna, Horn 26 ~ 40 GHz	ARA	MWH-2640/B	1029	12/3/2006
Preamplifier, 1 ~ 26.5 GHz	Agilent / HP	8449B	3008A00561	10/3/2007
PreAmplifier 26-40 GHz	MITEQ	NSP4000-SP2	924343	6/1/2006
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	8/30/2006
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BN	8379443	8/30/2006
EMI Test Receiver	R & S	ESHS 20	827129/006	6/3/2006
AC Power Source, 10 kVA	ACS	AFC-10K-AFC-2	J1568	CNR
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	3/3/2007
Peak Power Meter	Agilent / HP	E4416A	GB41291160	12/2/2007
4.0 High Pass Filter	Micro Tronics	HPM13351	3	N/A
2.4 - 2.5 Reject Filter	Micro Tronics	BRM50702	3	N/A
7.6 GHz High Pass Filter	Micro Tronics	HPM13350	1	N/A
5.75 - 5.8 Reject Filter	Micro Tronics	BRC13192	2	N/A
5.15 - 5.35 Reject Filter	Micro Tronics	BRC13192	2	N/A

7. LIMIT AND RESULTS

7.1. CHANNEL TESTS FOR THE 2400 TO 2483.5 MHz BAND

7.1.1. 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 10.7 dB (including 10 dB pad and 0.7 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

802.11b Mode (Gate Average Power)

Channel	Frequency (MHz)	Power (dBm)
1	2412	18.62
6	2437	19.12
11	2462	19.02
13	2472	10.27

802.11g Mode (Gate Average Power)

Channel	Frequency (MHz)	Power (dBm)
1	2412	17.45
2	2417	19.10
6	2437	19.13
10	2457	19.11
11	2462	17.09
13	2472	10.82

7.2. CHANNEL TESTS FOR THE 5725 TO 5850 MHz BAND

7.2.1. AVERAGE POWER

AVERAGE POWER LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

No non-compliance noted:

The cable assembly insertion loss of 11.7 dB (including 10 dB pad and 1.7 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

802.11a Mode (Gate Average Power)

Channel	Frequency (MHz)	Average Power (dBm)
Low	5745	17.32
Middle	5785	17.11
High	5825	16.97

7.3. RADIATED EMISSIONS

7.3.1. 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.

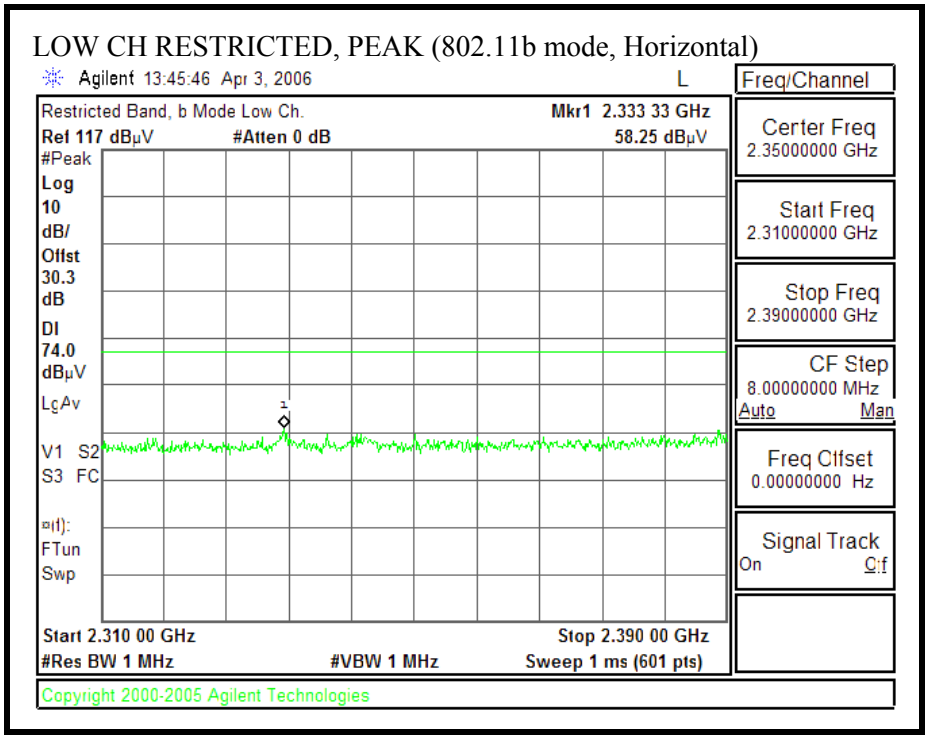
7.3.2. TRANSMITTER ABOVE 1 GHz FOR 2400 TO 2483.5 MHz BAND_b Mode

11b_ CHANNEL 1, 11 and 13

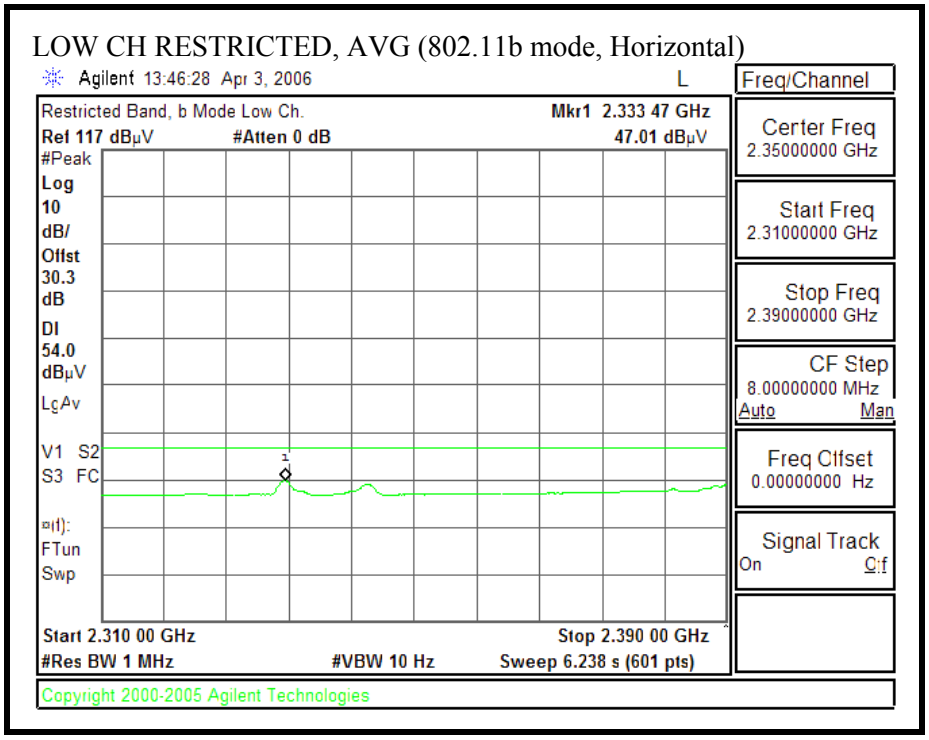
CHANNEL 1, 2412 MHz - POWER = 19dBm

RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, HORIZONTAL)

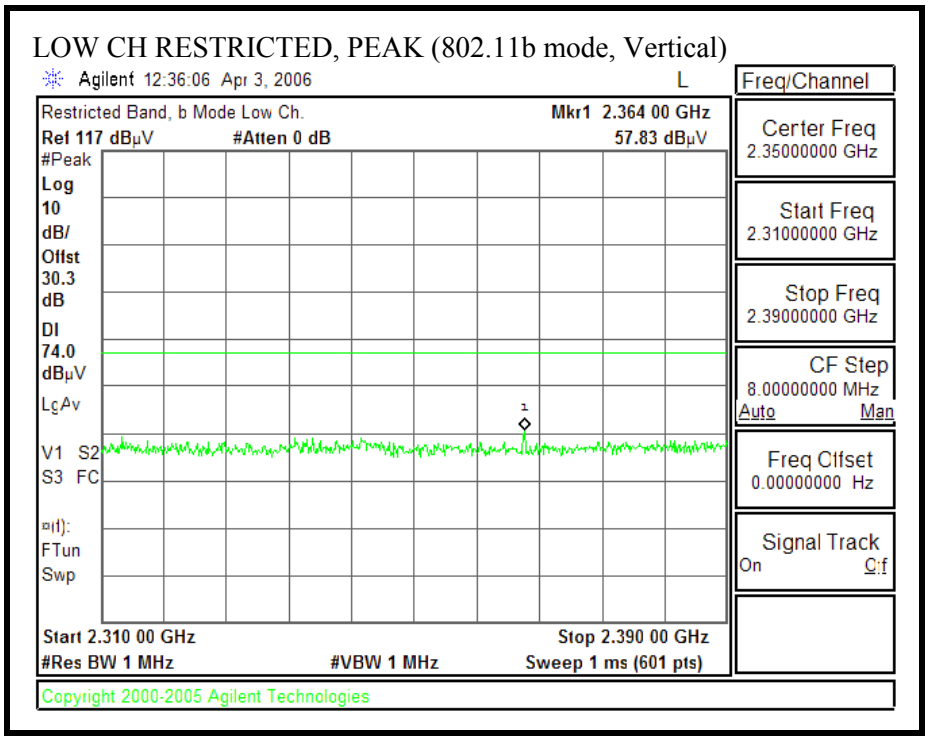
LOW CH RESTRICTED, PEAK (802.11b mode, Horizontal)



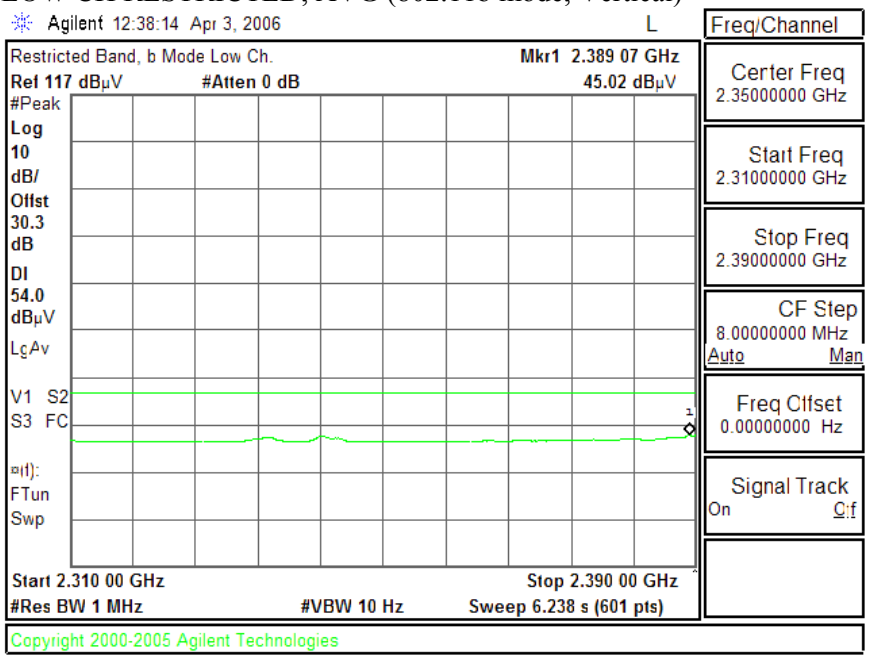
LOW CH RESTRICTED, AVG (802.11b mode, Horizontal)



RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, VERTICAL)



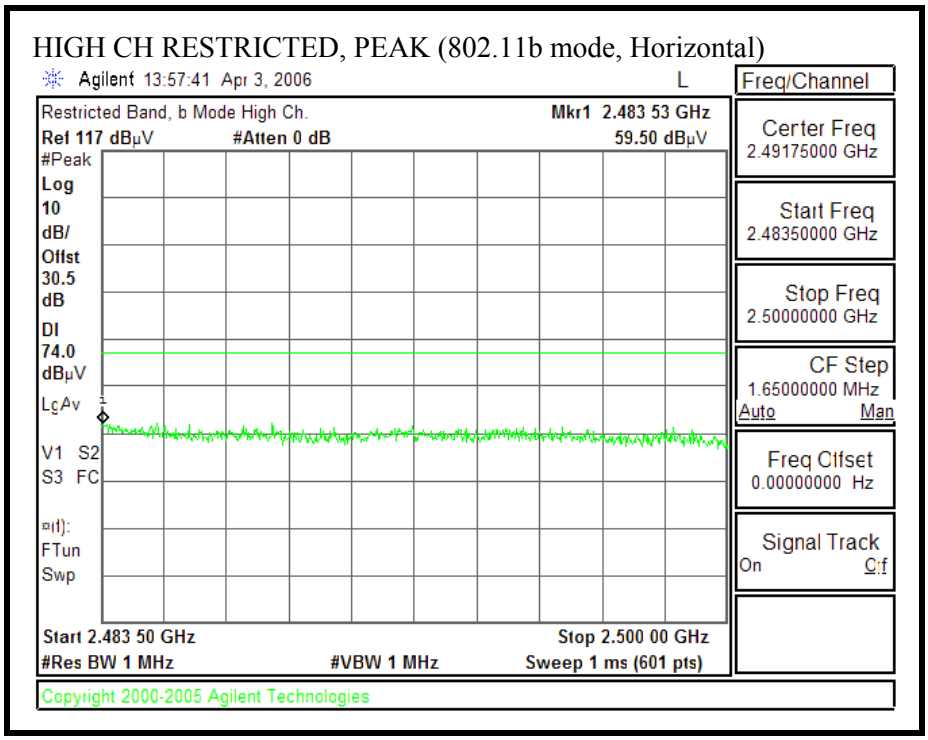
LOW CH RESTRICTED, AVG (802.11b mode, Vertical)



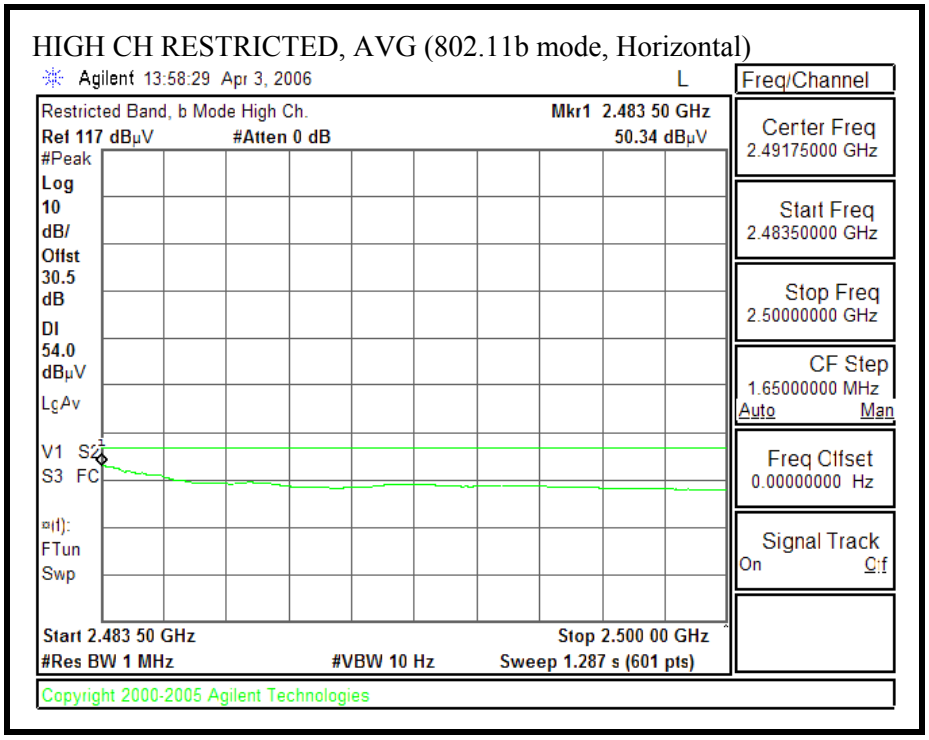
CHANNEL 11, 2462 MHz – POWER = 19dBm

RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, HORIZONTAL)

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

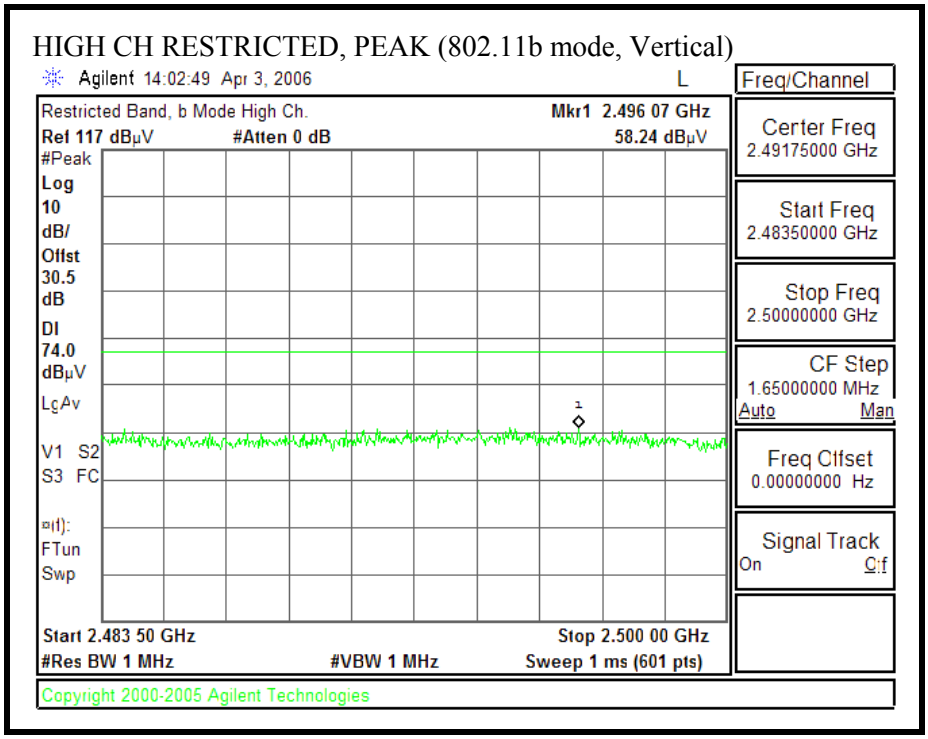


HIGH CH RESTRICTED, AVG (802.11b mode, Horizontal)

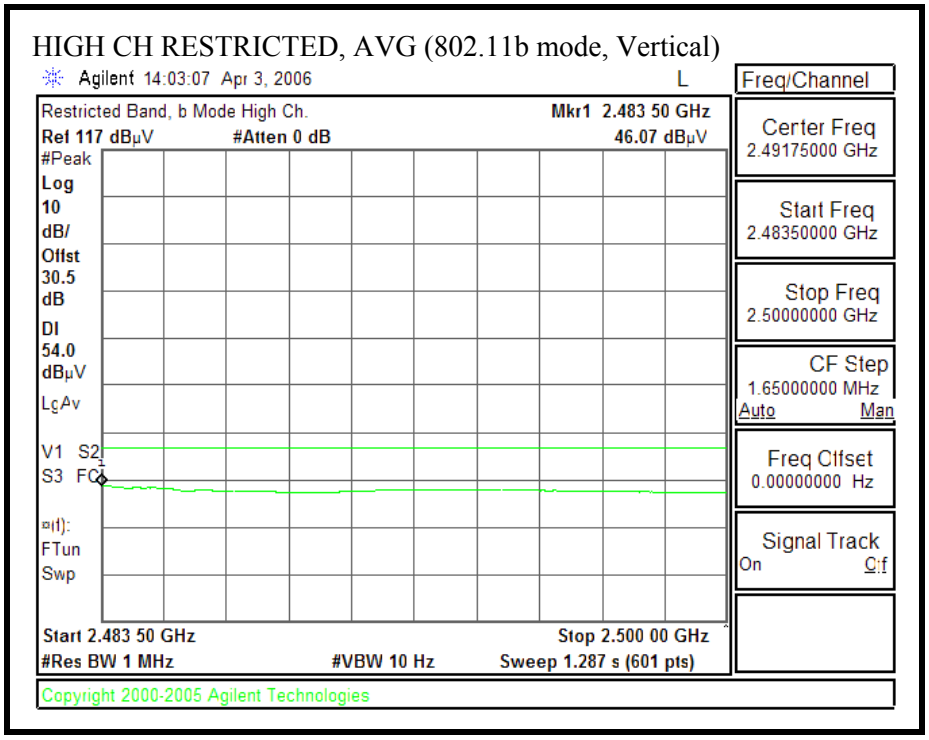


RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, VERTICAL)

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



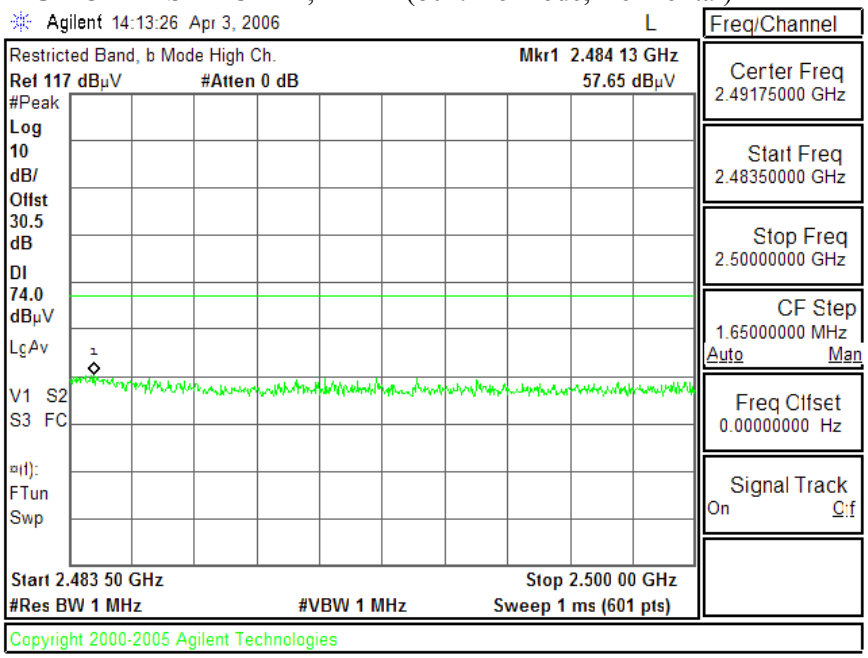
HIGH CH RESTRICTED, AVG (802.11b mode, Vertical)



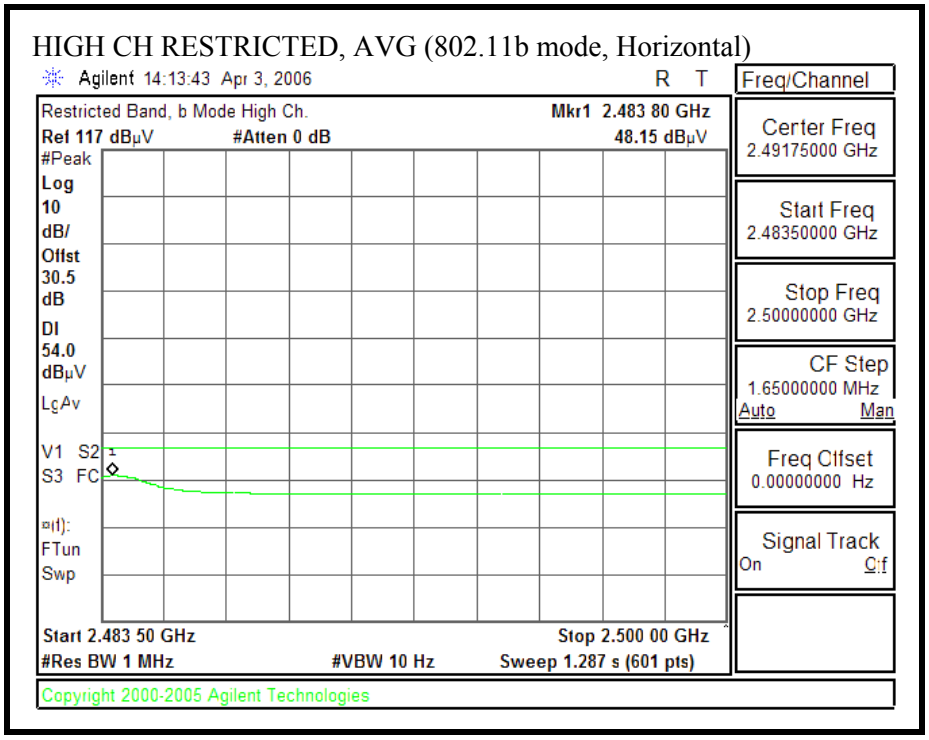
CHANNEL 13, 2472 MHz – POWER = 10dBm

RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, HORIZONTAL)

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

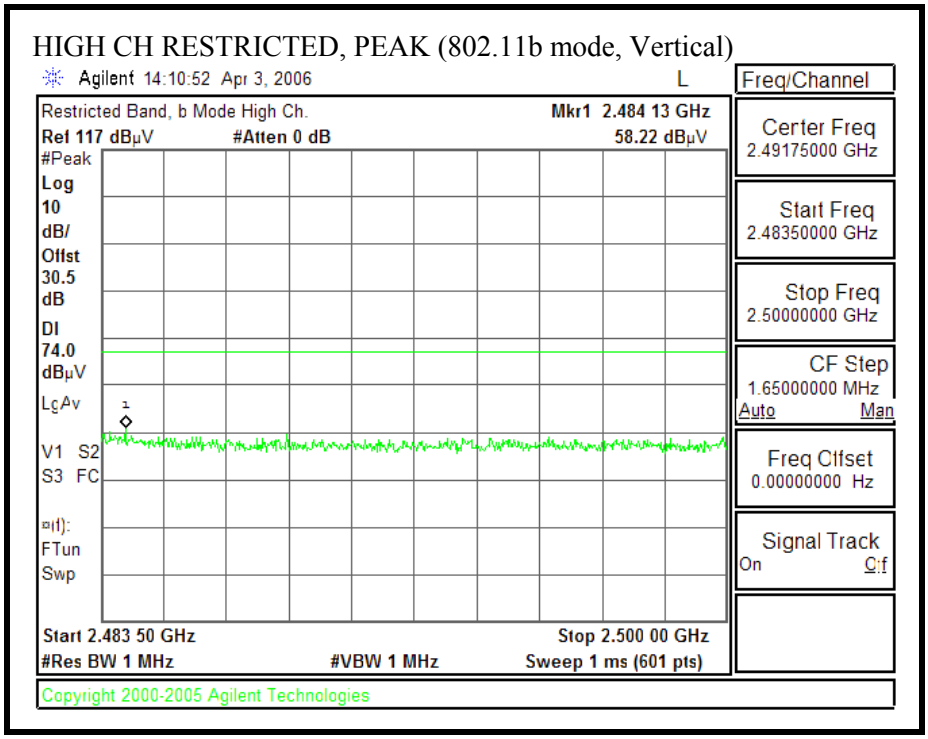


HIGH CH RESTRICTED, AVG (802.11b mode, Horizontal)

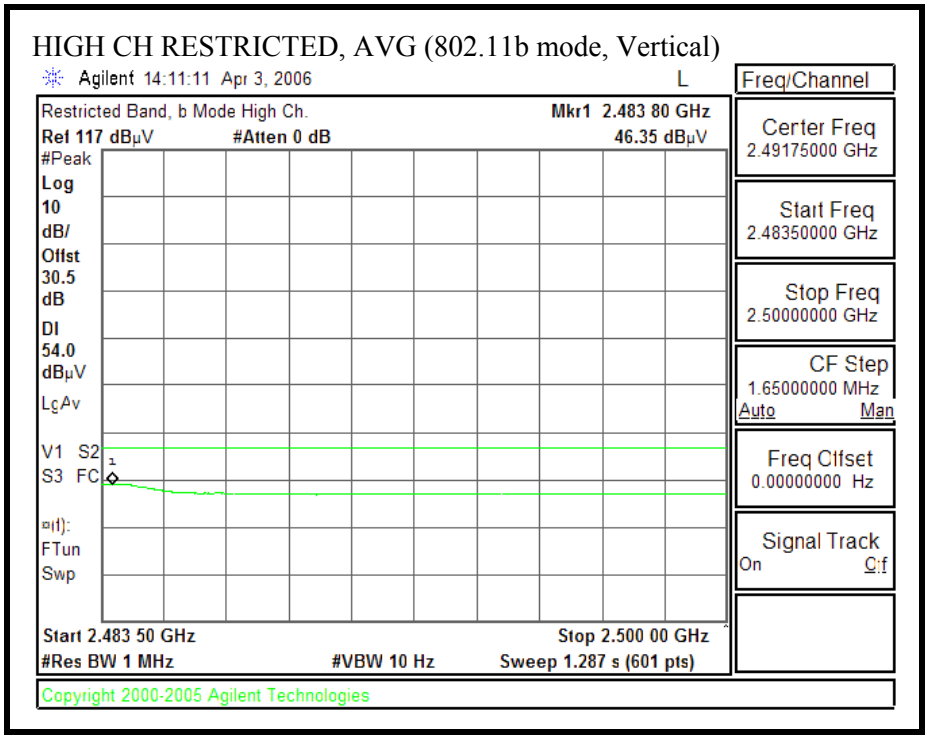


RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, VERTICAL)

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



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



HARMONICS AND SPURIOUS EMISSIONS (802.11b MODE)

Power: Channel 1, 6, & 13_Bit Rate: 11Mbps for Peak and 1Mbps for Average reading.

04/03/06 **High Frequency Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: VIEN TRAN
Project #: 06U10199
Company: BROADCOM
EUT Descrip.: 802.11ag Mini PCI Express Card
EUT M/N: BCM94311MCAG
Test Target: FCC 15.247
Mode Oper: 11b_2400-2483.5 MHz_CH1_2412 MHz, CH6_2437 MHz, CH13_2472 MHz

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T145 Agilent 3008A0056			FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
	Vien 187215002	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)
CH1_2412 MHz_Average = 19dBm															
4.824	3.0	47.4	41.8	33.6	2.9	-34.8	0.0	0.6	49.7	44.1	74	54	-24.3	-9.9	H
7.236	3.0	44.4	32.6	36.1	4.2	-34.7	0.0	0.6	50.6	38.8	74	54	-23.4	-15.2	H, NOISE FLOOR
4.824	3.0	45.2	36.8	33.6	2.9	-34.8	0.0	0.6	47.5	39.1	74	54	-26.5	-14.9	V
7.236	3.0	43.9	32.3	36.1	4.2	-34.7	0.0	0.6	50.1	38.5	74	54	-23.9	-15.5	V, NOISE FLOOR
CH6_2437 MH_Average = 19dBm															
4.874	3.0	51.3	47.9	33.7	3.0	-34.9	0.0	0.6	53.7	50.3	74	54	-20.3	-3.7	H
7.311	3.0	44.7	32.7	36.2	4.2	-34.7	0.0	0.6	51.0	39.0	74	54	-23.0	-15.0	H, NOISE FLOOR
4.874	3.0	47.8	42.6	33.7	3.0	-34.9	0.0	0.6	50.2	45.0	74	54	-23.8	-9.0	V
7.311	3.0	44.1	32.3	36.2	4.2	-34.7	0.0	0.6	50.4	38.6	74	54	-23.6	-15.4	V, NOISE FLOOR
CH13_2472 MHz_Average = 19dBm															
4.944	3.0	46.8	41.5	33.7	3.1	-34.9	0.0	0.6	49.4	44.1	74	54	-24.6	-9.9	H
7.416	3.0	44.0	32.4	36.3	4.2	-34.6	0.0	0.6	50.5	38.9	74	54	-23.5	-15.1	H, NOISE FLOOR
4.944	3.0	45.0	36.2	33.7	3.1	-34.9	0.0	0.6	47.6	38.8	74	54	-26.4	-15.2	V
7.416	3.0	43.6	32.0	36.3	4.2	-34.6	0.0	0.6	50.1	38.5	74	54	-23.9	-15.5	V, NOISE FLOOR
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		

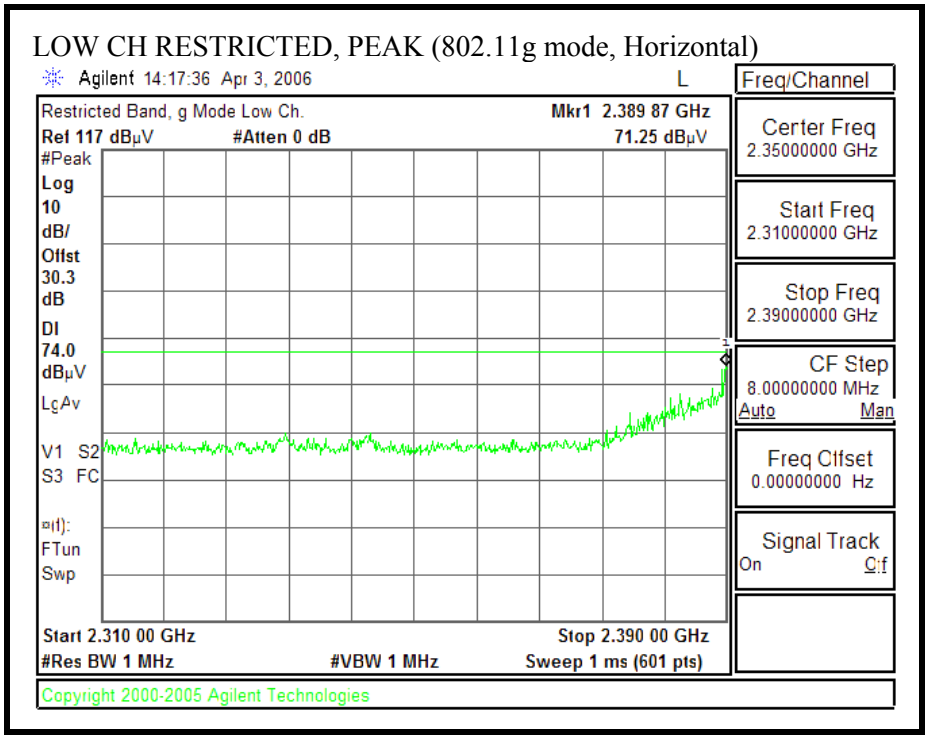
7.3.3. TRANSMITTER ABOVE 1 GHz FOR 2400 TO 2483.5 MHz BAND_g Mode

11g_ CHANNEL 1, 2, 10, 11 and 13

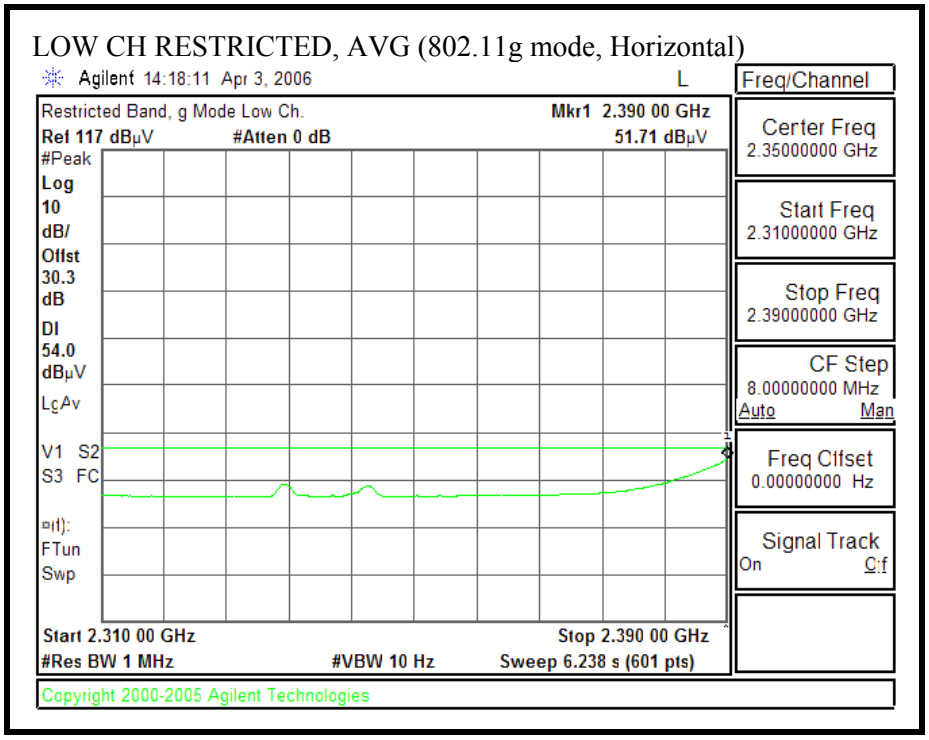
CHANNEL 1, 2412 MHz – POWER = 18dBm

RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, HORIZONTAL)

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

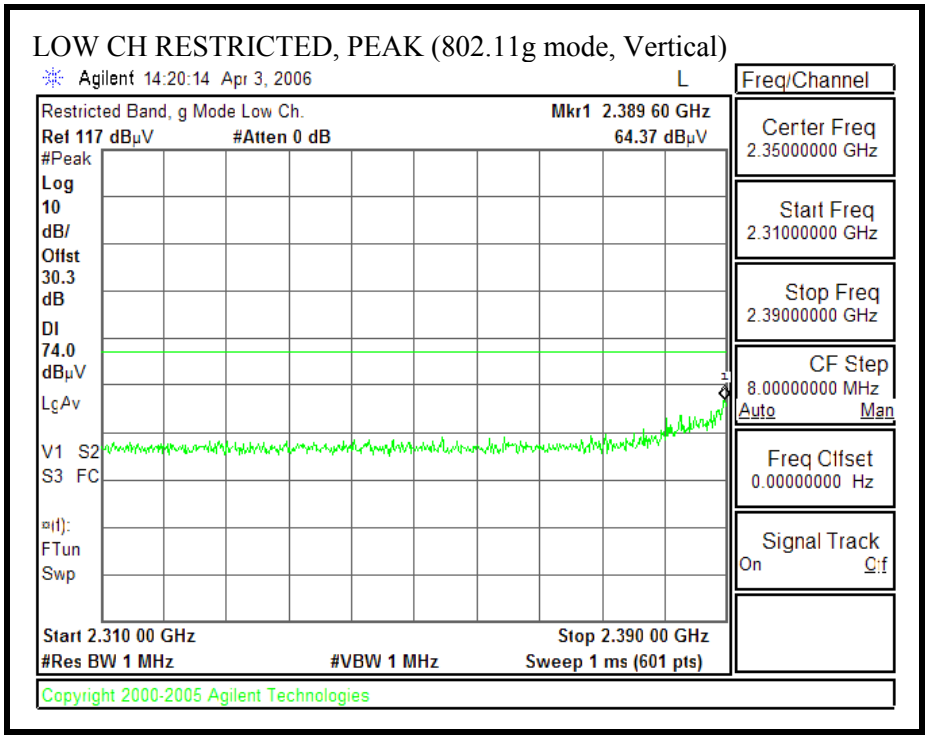


LOW CH RESTRICTED, AVG (802.11g mode, Horizontal)

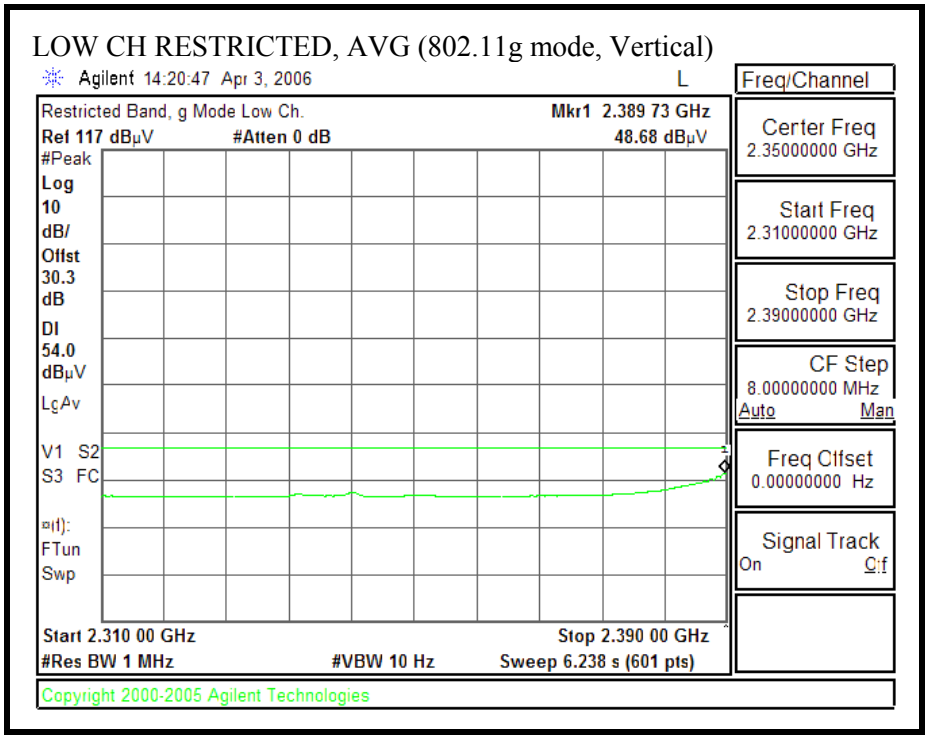


RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, VERTICAL)

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



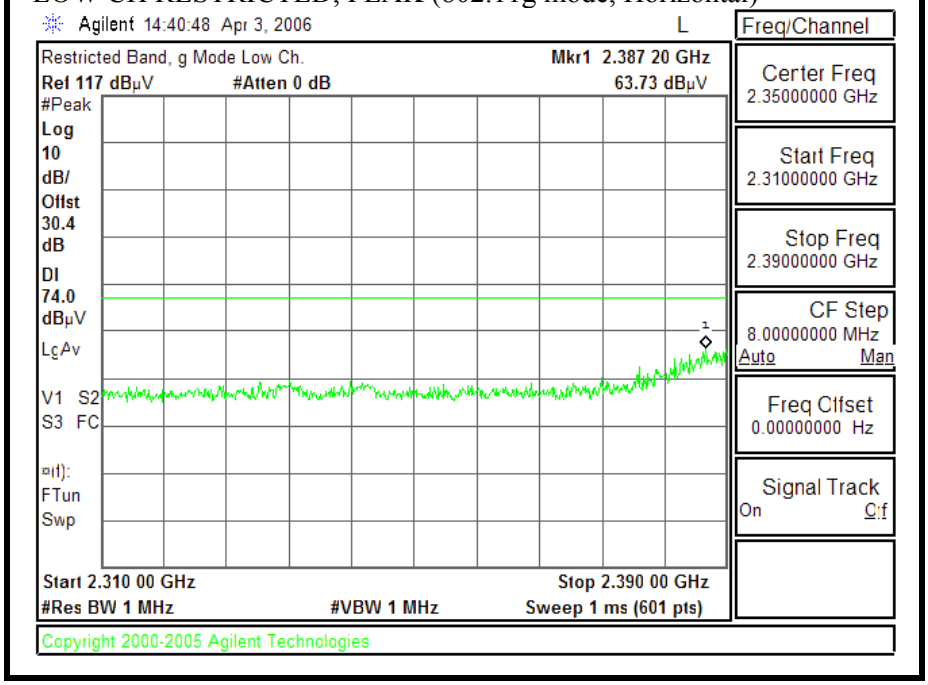
LOW CH RESTRICTED, AVG (802.11g mode, Vertical)



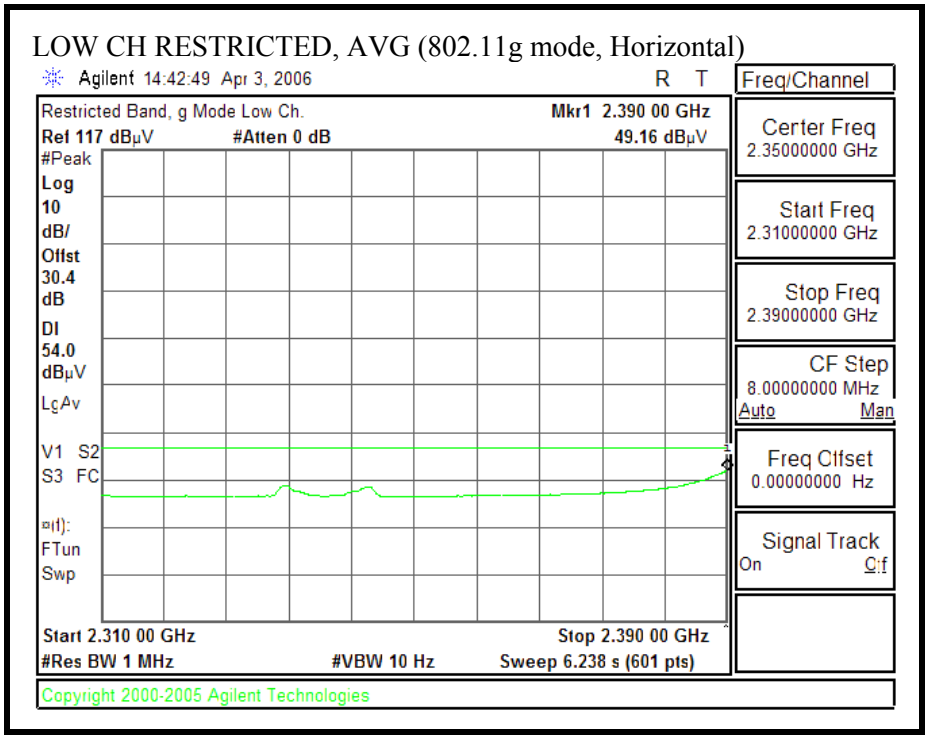
CHANNEL 2, 2417 MH – POWER = 19dBm

RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, HORIZONTAL)

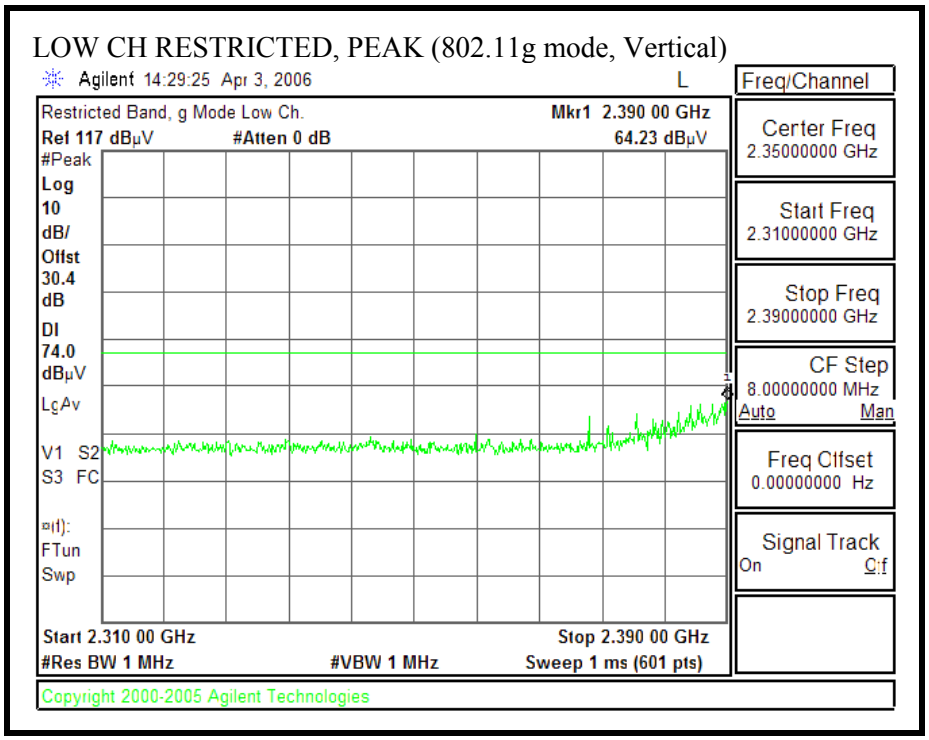
LOW CH RESTRICTED, PEAK (802.11g mode, Horizontal)



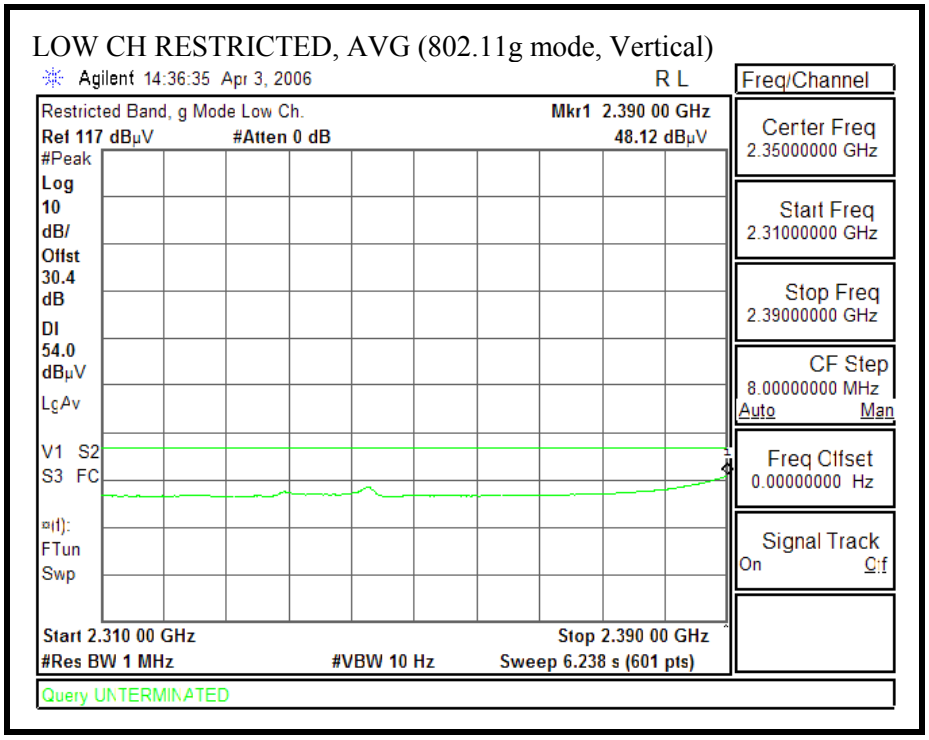
LOW CH RESTRICTED, AVG (802.11g mode, Horizontal)



RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, VERTICAL)



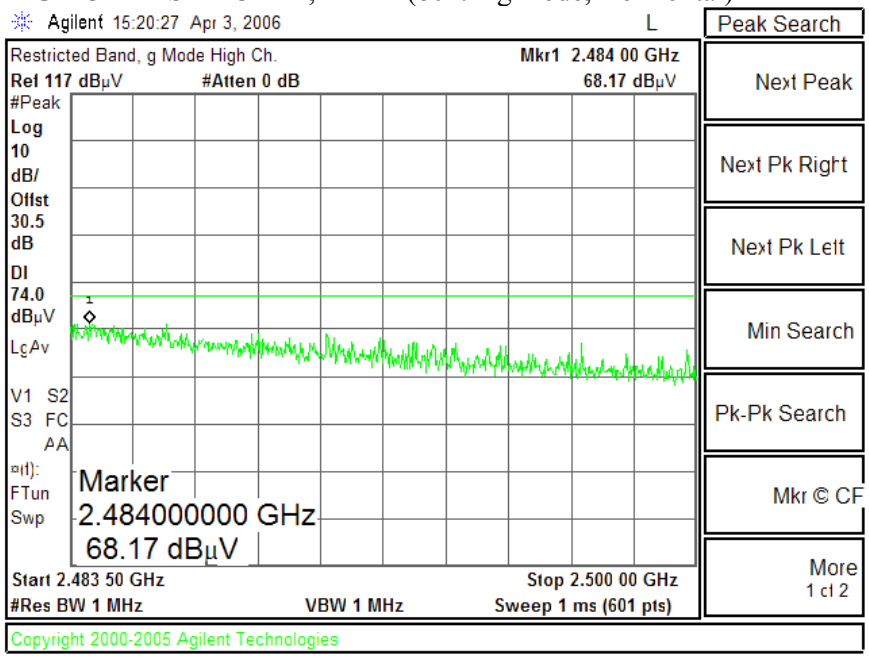
LOW CH RESTRICTED, AVG (802.11g mode, Vertical)



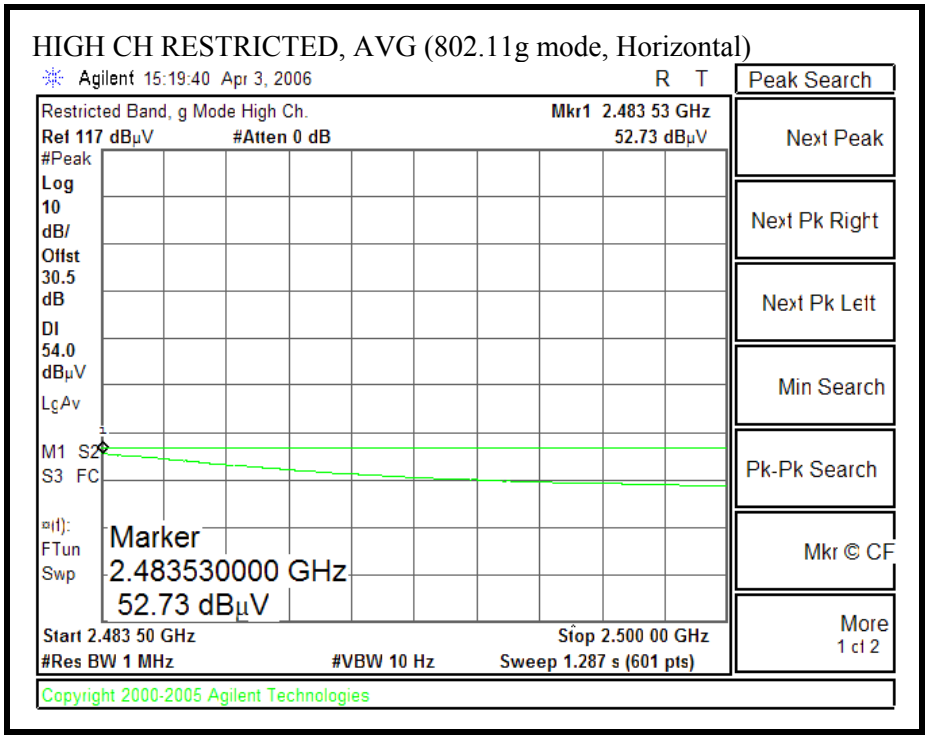
CHANNEL 10, 2457 MHz – POWER = 19dBm

RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, HORIZONTAL)

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

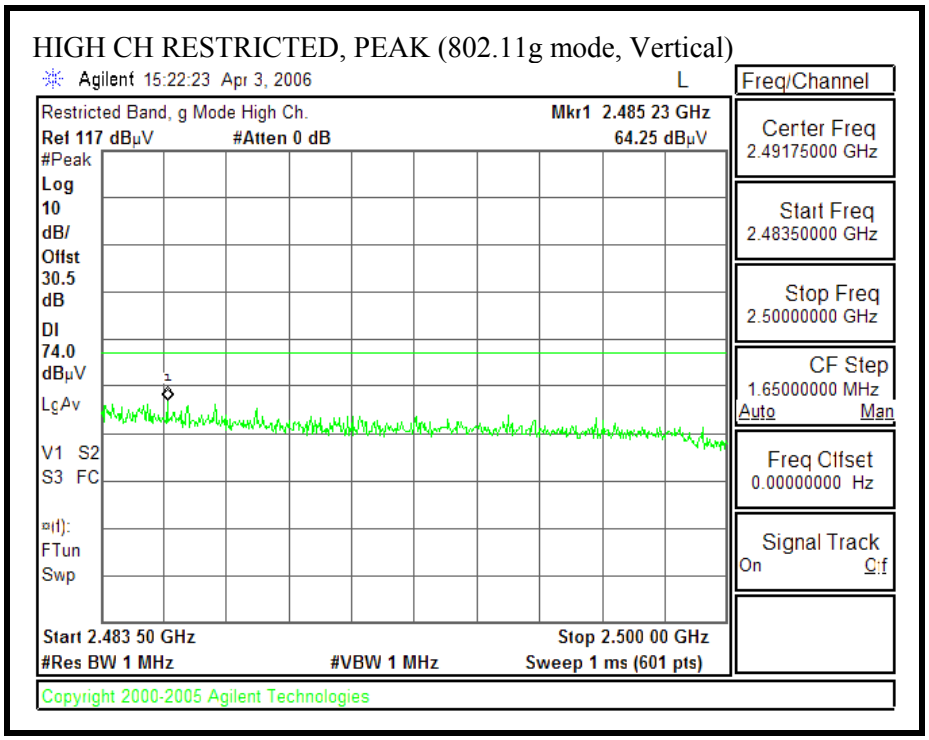


HIGH CH RESTRICTED, AVG (802.11g mode, Horizontal)

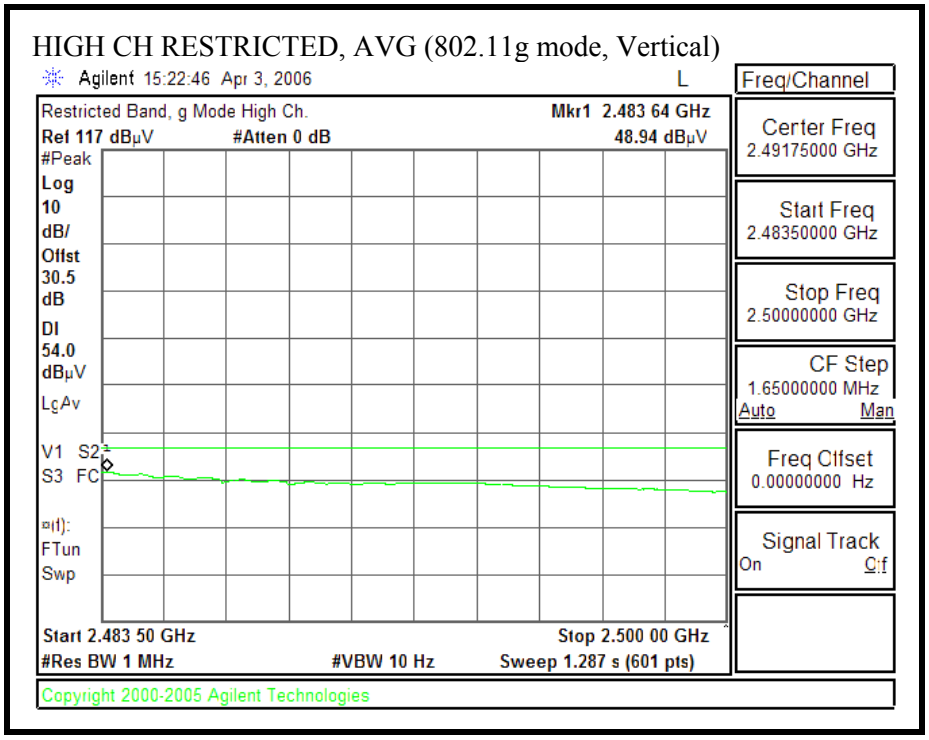


RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, VERTICAL)

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



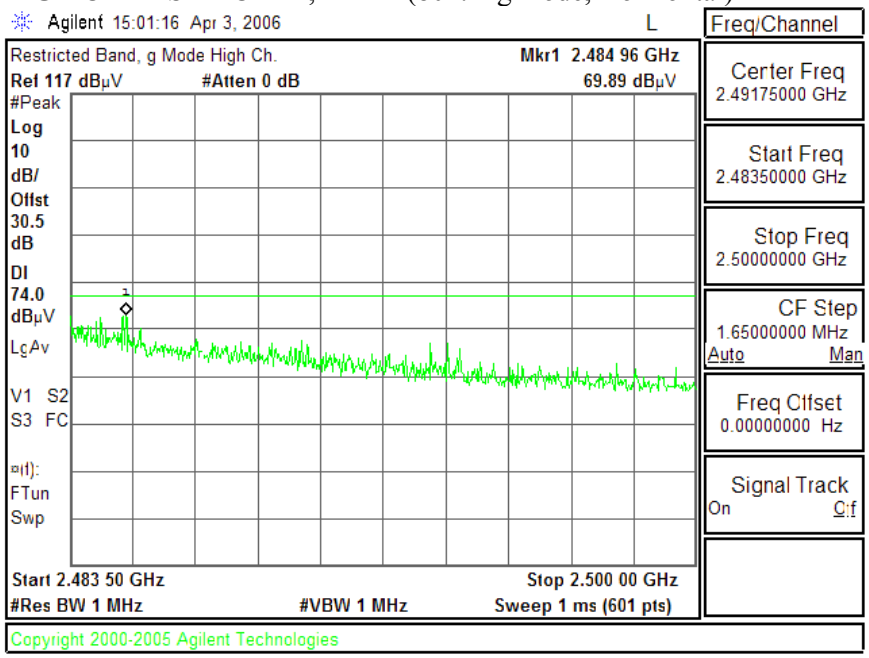
HIGH CH RESTRICTED, AVG (802.11g mode, Vertical)



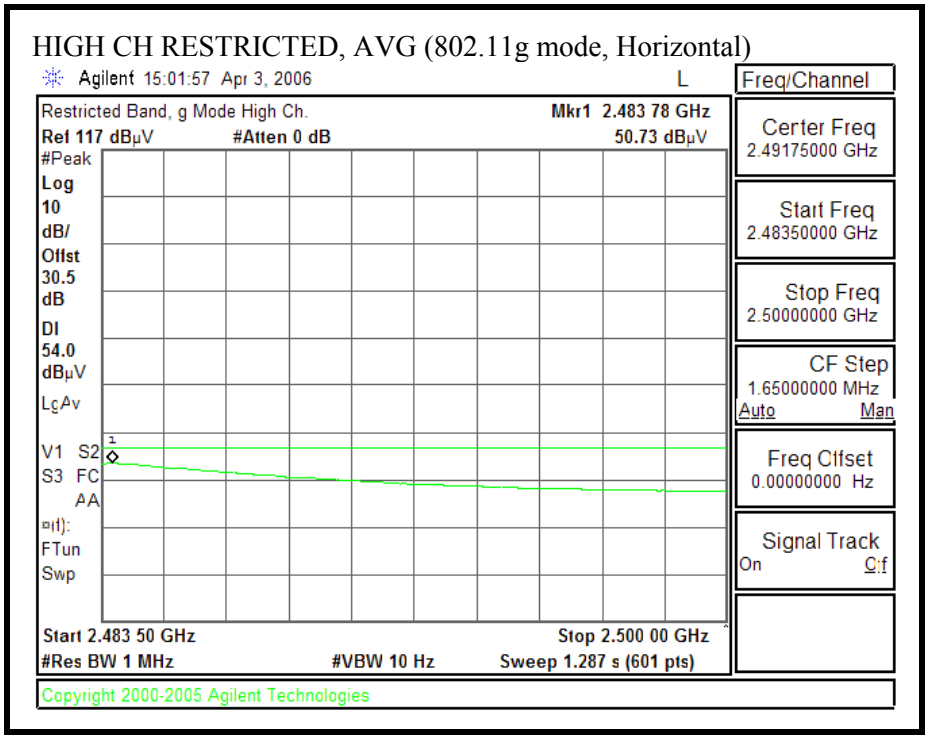
CHANNEL 11, 2462 MHz – POWER = 17dBm

RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, HORIZONTAL)

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

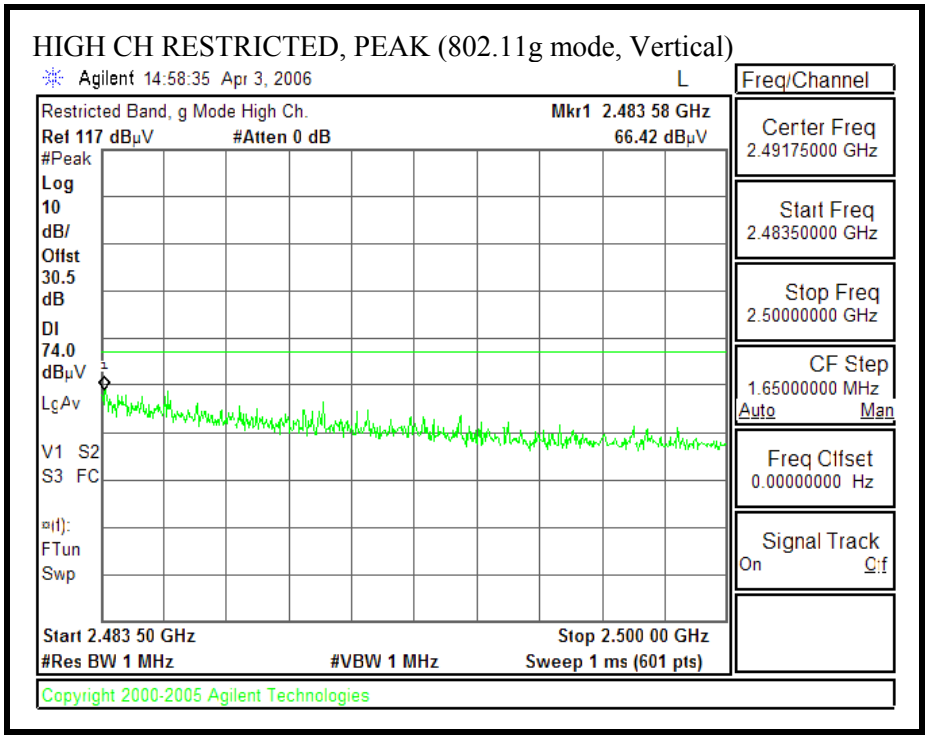


HIGH CH RESTRICTED, AVG (802.11g mode, Horizontal)

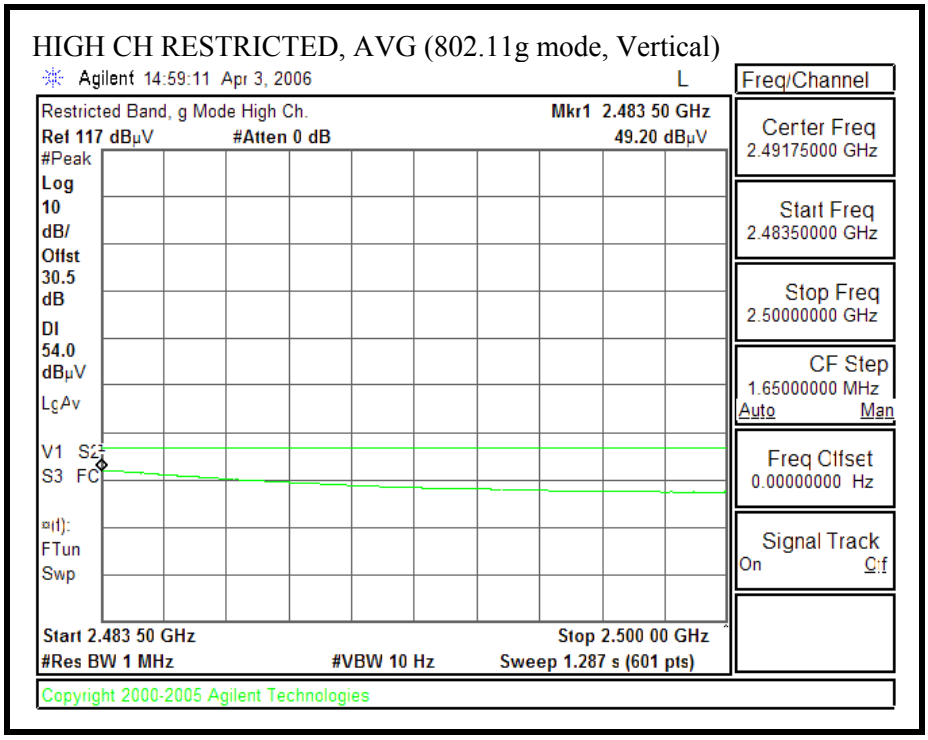


RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, VERTICAL)

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



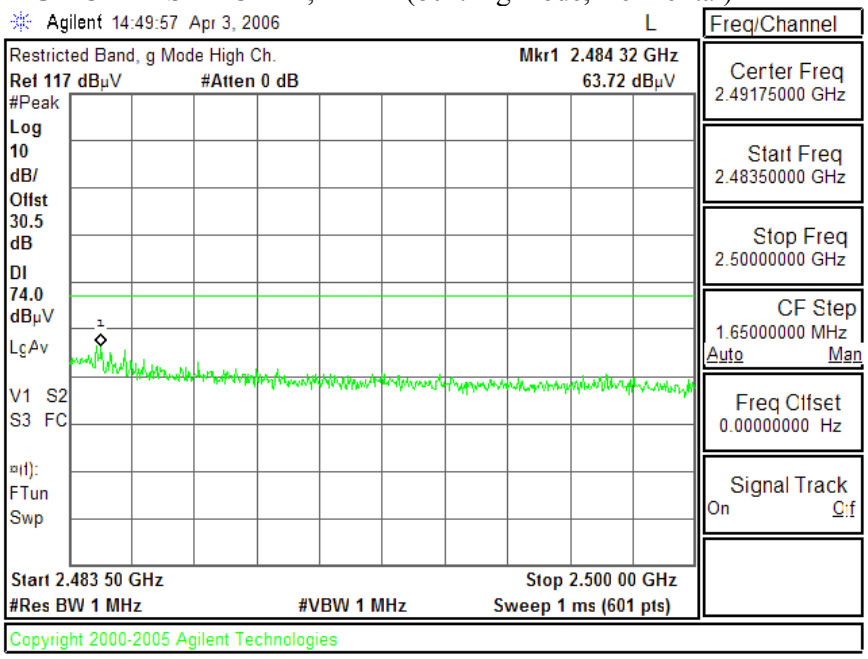
HIGH CH RESTRICTED, AVG (802.11g mode, Vertical)



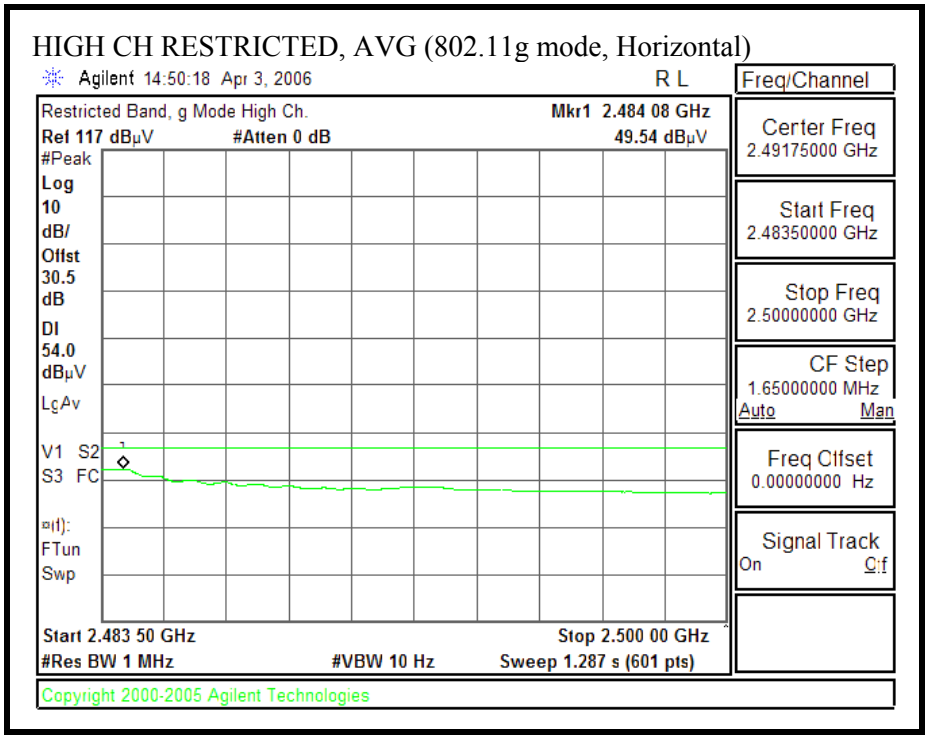
CHANNEL 13, 2472 MHz – POWER = 11dBm

RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, HORIZONTAL)

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

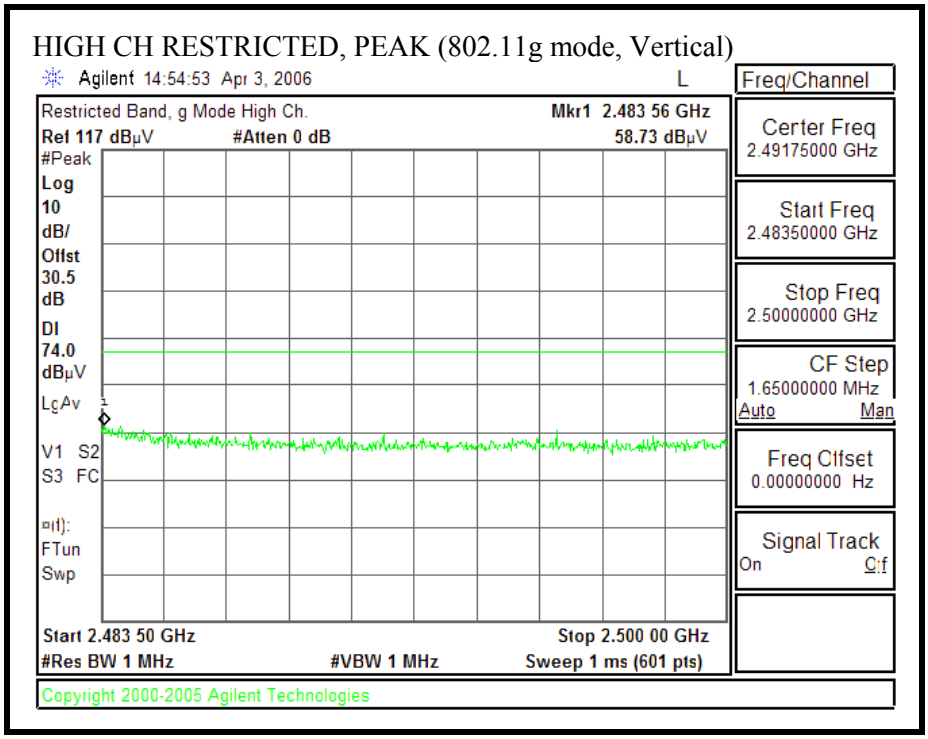


HIGH CH RESTRICTED, AVG (802.11g mode, Horizontal)

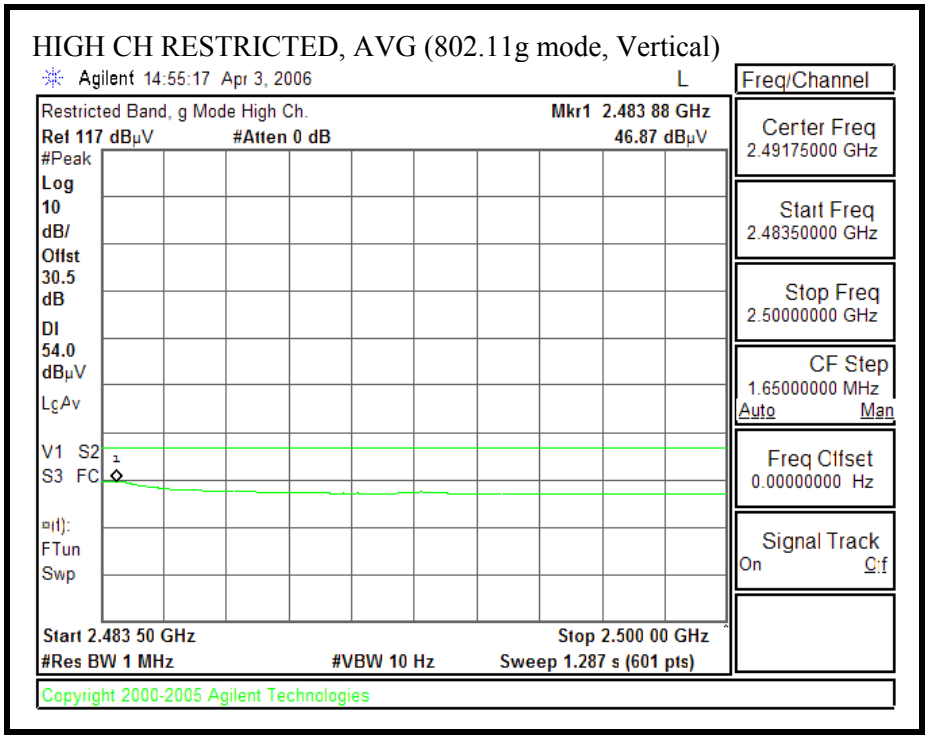


RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, VERTICAL)

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



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



HARMONICS AND SPURIOUS EMISSIONS (802.11g MODE)

Channel 1, 6, & 13_Bit Rate: 54Mbps for Peak and 6Mbps for Average reading.

04/03/06 **High Frequency Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: VIEN TRAN
Project #: 06U10199
Company: BROADCOM
EUT Descrip.: 802.11ag Mini PCI Express Card
EUT M/N: BCM94311MCAG
Test Target: FCC 15.247
Mode Oper: 11g_2400-2483.5 MHz_CH1_2412 MHz, CH6_2437 MHz, CH13_2472 MHz

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T145 Agilent 3008A0056			FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
	Vien 187215002	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)
CH1_2412 MHz_Average = 19dBm															
4.824	3.0	43.0	31.3	33.6	2.9	-34.8	0.0	0.6	45.3	33.6	74	54	-28.7	-20.4	H
7.236	3.0	43.9	32.0	36.1	4.2	-34.7	0.0	0.6	50.1	38.2	74	54	-23.9	-15.8	H, NOISE FLOOR
4.824	3.0	42.6	31.0	33.6	2.9	-34.8	0.0	0.6	44.9	33.3	74	54	-29.1	-20.7	V
7.236	3.0	43.3	31.6	36.1	4.2	-34.7	0.0	0.6	49.5	37.8	74	54	-24.5	-16.2	V, NOISE FLOOR
CH6_2437 MH_Average = 19dBm															
4.874	3.0	46.5	35.8	33.7	3.0	-34.9	0.0	0.6	48.9	38.2	74	54	-25.1	-15.8	H
7.311	3.0	43.3	32.3	36.2	4.2	-34.7	0.0	0.6	49.6	38.6	74	54	-24.4	-15.4	H, NOISE FLOOR
4.874	3.0	43.8	31.6	33.7	3.0	-34.9	0.0	0.6	46.2	34.0	74	54	-27.8	-20.0	V
7.311	3.0	43.0	32.3	36.2	4.2	-34.7	0.0	0.6	49.3	38.6	74	54	-24.7	-15.4	V, NOISE FLOOR
CH13_2472 MHz_Average = 19dBm															
4.944	3.0	43.3	31.4	33.7	3.1	-34.9	0.0	0.6	45.9	34.0	74	54	-28.1	-20.0	H
7.416	3.0	44.0	32.1	36.3	4.2	-34.6	0.0	0.6	50.5	38.6	74	54	-23.5	-15.4	H, NOISE FLOOR
4.944	3.0	42.9	31.3	33.7	3.1	-34.9	0.0	0.6	45.5	33.9	74	54	-28.5	-20.1	V
7.416	3.0	44.0	32.1	36.3	4.2	-34.6	0.0	0.6	50.5	38.6	74	54	-23.5	-15.4	V, NOISE FLOOR
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		

7.3.4. TRANSMITTER ABOVE 1 GHz FOR 5725 TO 5850 MHz BAND_a Mode

HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)

Channel 149, 157, & 165_Bit Rate: 54Mbps for Peak and 6Mbps for Average reading.

06/09/05 **High Frequency Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: VIEN TRAN
Project #: 05U3487
Company: BROADCOM
EUT Descrip.:802.11ag Mini PCI Express Card
EUT M/N:BCM94311MCAG
Test Target: DGT
Mode Oper:11a_5745 - 5825 MHz_TX LOW, MID, HI CHANNEL _ HARMONIC & SPUR

Test Equipment:

EMCO Horn 1-18GHz: T73; S/N: 6717 @3m
Pre-amplifer 1-26GHz: T63 Miteq 646456
Pre-amplifer 26-40GHz:
Horn >18GHz:
Limit: FCC 15.209

Hi Frequency Cables: 2 foot cable: 2_Vien; 3 foot cable:; 4 foot cable:; 12 foot cable: 12 Vien

HPF: HPF_7.6GHz
Reject Filter: R_001

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)
CH 149=5745 MHz															
11.490	3.0	47.1	34.5	38.3	5.3	-37.2	0.0	0.7	54.3	41.7	74	54	-19.7	-12.3	V
17.235	3.0	44.0	33.0	42.4	6.1	-35.9	0.0	0.6	57.2	46.2	74	54	-16.8	-7.8	V
11.490	3.0	46.0	33.7	38.3	5.3	-37.2	0.0	0.7	53.2	40.9	74	54	-20.8	-13.1	H
17.235	3.0	44.0	33.7	42.4	6.1	-35.9	0.0	0.6	57.2	46.9	74	54	-16.8	-7.1	H
CH 157=5785 MHz															
11.570	3.0	51.2	37.9	38.3	5.4	-37.2	0.0	0.7	58.4	45.1	74	54	-15.6	-8.9	V
17.355	3.0	46.0	36.5	43.0	6.1	-35.8	0.0	0.6	60.0	50.5	74	54	-14.0	-3.5	V
11.570	3.0	50.0	37.4	38.3	5.4	-37.2	0.0	0.7	57.2	44.6	74	54	-16.8	-9.4	H
17.355	3.0	44.0	33.0	43.0	6.1	-35.8	0.0	0.6	58.0	47.0	74	54	-16.0	-7.0	H
CH 165=5825 MHz															
11.650	3.0	53.2	41.1	38.4	5.4	-37.3	0.0	0.7	60.4	48.3	74	54	-13.6	-5.7	V
17.475	3.0	44.0	32.4	43.7	6.1	-35.8	0.0	0.6	58.7	47.1	74	54	-15.3	-6.9	V
11.650	3.0	51.6	40.5	38.4	5.4	-37.3	0.0	0.7	58.8	47.7	74	54	-15.2	-6.3	H
17.475	3.0	43.9	33.4	43.7	6.1	-35.8	0.0	0.6	58.6	48.1	74	54	-15.4	-5.9	H
NO OTHER EMISSIONS WERE DETECTED ABOVE NOISE FLOOR AFTER 3rd HARMONIC															

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		

7.3.5. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

2.4 GHz BAND

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

HORIZONTAL

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

Data#: 14 File#: 30-1000.emi Date: 04-04-2006 Time: 10:58:22
Audix ATC

Condition: FCC CLASS-B HORIZONTAL
Test Operator : Vien Tran
Project # : 06U10199
Company : Broadcom
EUT : 802.11ag WLAN PCI-E Mini Card
Model No : BCM94311MCAG
S/N :
Configuration : EUT on extended card & laptop
Mode of operation: Tx Worst Case_2.4 GHz Band
Target of Test : FCC class B

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	30.000	9.57	20.45	30.02	40.00	-9.98	Peak
2	162.890	25.53	13.68	39.21	43.50	-4.29	Peak
3	293.840	25.28	15.42	40.70	46.00	-5.30	Peak
4	436.430	23.76	18.89	42.65	46.00	-3.35	Peak
5	667.290	16.74	22.66	39.40	46.00	-6.60	Peak
6	882.630	14.39	25.73	40.12	46.00	-5.88	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#: 12 File#: 30-1000.emi Date: 04-04-2006 Time: 10:50:04
Audix ATC

Condition: FCC CLASS-B VERTICAL
Test Operator : Vien Tran
Project # : 06U10199
Company : Broadcom
EUT : 802.11ag WLAN PCI-E Mini Card
Model No : BCM94311MCAG
S/N :
Configuration : EUT on extended card & laptop
Mode of operation: Tx Worst Case_2.4 GHz Band
Target of Test : FCC class B

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	33.880	13.85	19.05	32.90	40.00	-7.10	Peak
2	106.630	19.89	12.87	32.76	43.50	-10.74	Peak
3	306.450	23.56	15.82	39.39	46.00	-6.61	Peak
4	436.430	24.09	18.89	42.98	46.00	-3.02	Peak
5	609.090	17.01	21.66	38.67	46.00	-7.33	Peak
6	958.290	15.00	26.50	41.50	46.00	-4.50	Peak

5.8 GHz BAND

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

HORIZONTAL

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

Data#: 18 File#: 30-1000.emi Date: 04-04-2006 Time: 11:09:31
Audix ATC

Condition: FCC CLASS-B HORIZONTAL
Test Operator : Vien Tran
Project # : 06U10199
Company : Broadcom
EUT : 802.11ag WLAN PCI-E Mini Card
Model No : BCM94311MCAG
S/N :
Configuration : EUT on extended card & laptop
Mode of operation: Tx Worst Case_5.8 GHz Band
Target of Test : FCC class B

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	31.940	8.71	19.94	28.65	40.00	-11.35	Peak
2	163.860	23.04	13.66	36.70	43.50	-6.80	Peak
3	306.450	26.72	15.82	42.55	46.00	-3.45	Peak
4	436.430	24.49	18.89	43.38	46.00	-2.62	Peak
5	638.190	17.41	22.15	39.56	46.00	-6.44	Peak
6	870.990	16.32	25.57	41.89	46.00	-4.11	QP
7	870.990	18.73	25.57	44.30	46.00	-1.70	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#: 20 File#: 30-1000.emi Date: 04-04-2006 Time: 11:16:20
Audix ATC

Condition: FCC CLASS-B VERTICAL
Test Operator : Vien Tran
Project # : 06U10199
Company : Broadcom
EUT : 802.11ag WLAN PCI-E Mini Card
Model No : BCM94311MCAG
S/N :
Configuration : EUT on extended card & laptop
Mode of operation: Tx Worst Case_5.8 GHz Band
Target of Test : FCC class B

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	33.880	13.81	19.05	32.86	40.00	-7.14	Peak
2	204.600	21.89	13.91	35.80	43.50	-7.70	Peak
3	321.000	21.18	16.19	37.37	46.00	-8.63	Peak
4	438.370	21.81	18.93	40.75	46.00	-5.25	Peak
5	832.190	15.65	24.95	40.60	46.00	-5.40	Peak
6	943.740	14.35	26.43	40.78	46.00	-5.22	Peak

7.4. 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:

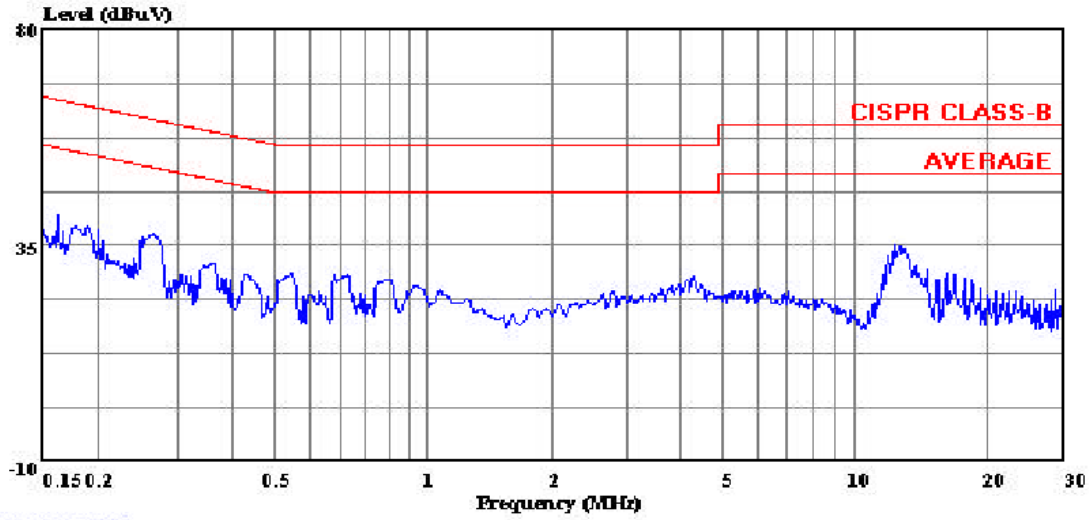
6 WORST EMISSIONS FOR 2.4 GHz BAND

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
0.18	38.66	--	--	0.00	64.49	54.49	-25.83	-15.83	L1
0.27	37.14	--	--	0.00	61.21	51.21	-24.07	-14.07	L1
0.36	31.26	--	--	0.00	58.73	48.73	-27.47	-17.47	L1
0.18	40.94	--	--	0.00	64.49	54.49	-23.55	-13.55	L2
0.27	38.12	--	--	0.00	61.21	51.21	-23.09	-13.09	L2
0.36	32.25	--	--	0.00	58.73	48.73	-26.48	-16.48	L2
6 Worst Data									

LINE 1 RESULTS

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

Data#: 7 File#: abg card.EMI Date: 04-05-2006 Time: 12:27:04



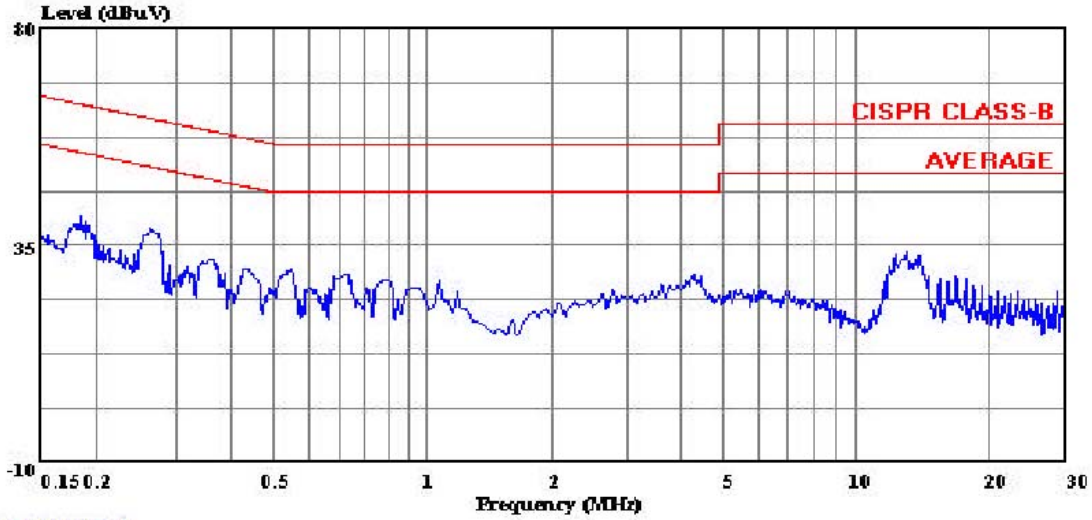
Trace: Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Vien Tran
Project # : 06U10199
Company : Broadcom
EUT Description : 802.11ag WLAN PCI-E Mini Card
Model : BCM94311MCAG
S/N :
EUT Config : EUT on extended card & laptop
Mode Of Operation: Tx Worst case_2.4 GHz Band
Target : FCC Class B
Power Source : 115VAC, 60 Hz
: L1: Peak (Black)

LINE 2 RESULTS

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

Data#: 13 File#: abg card.EMI Date: 04-05-2006 Time: 12:56:00



Trace: Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Vien Tran
Project # : 06U10199
Company : Broadcom
EUT Description : 802.11ag WLAN PCI-E Mini Card
Model : BCM94311MCAG
S/N :
EUT Config : EUT on extended card & laptop
Mode Of Operation: Tx Worst case_2.4 GHz Band
Target : FCC Class B
Power Source : 115VAC, 60 Hz
: L2: Peak (Black), Avg (Green)

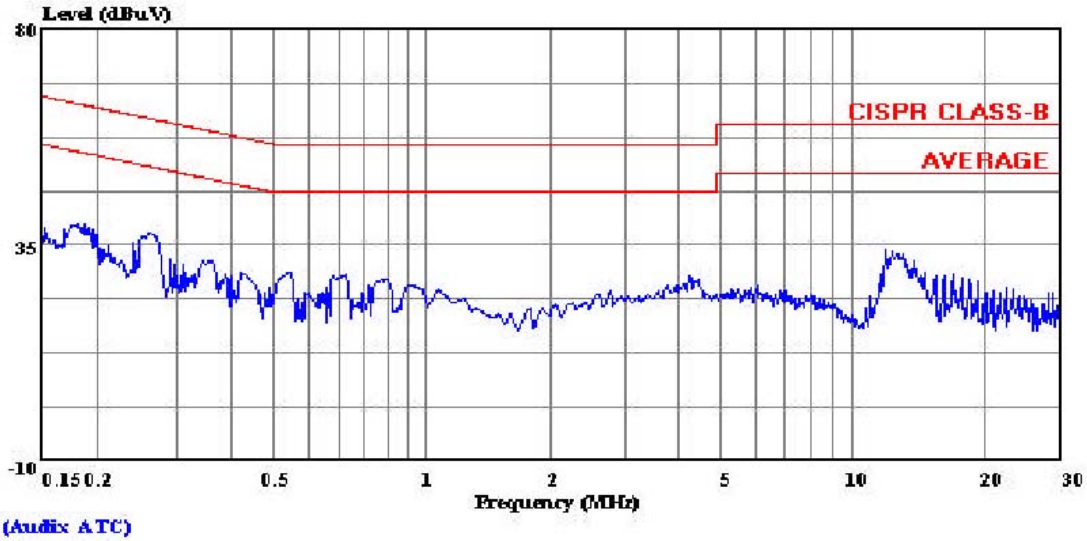
6 WORST EMISSIONS FOR 5 GHz BAND

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
0.18	39.52	--	--	0.00	64.49	54.49	-24.97	-14.97	L1
0.26	37.46	--	--	0.00	61.43	51.43	-23.97	-13.97	L1
0.36	31.50	--	--	0.00	58.73	48.73	-27.23	-17.23	L1
0.18	39.30	--	--	0.00	64.49	54.49	-25.19	-15.19	L2
0.26	38.50	--	--	0.00	61.43	51.43	-22.93	-12.93	L2
0.36	32.40	--	--	0.00	58.73	48.73	-26.33	-16.33	L2
6 Worst Data									

LINE 1 AND RESULTS

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

Data#: 21 File#: abg card.EMI Date: 04-05-2006 Time: 13:36:18



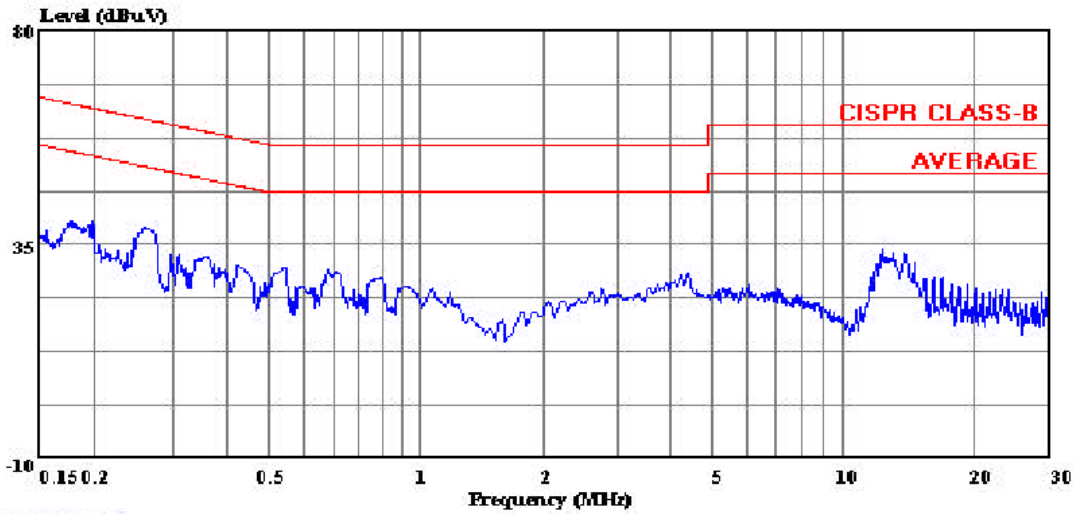
Trace: Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Vien Tran
Project # : 06U10199
Company : Broadcom
EUT Description : 802.11ag WLAN PCI-E Mini Card
Model : BCM94311MCAG
S/N :
EUT Config : EUT on extended card & laptop
Mode Of Operation: Tx Worst case_11a_5 GHz Band
Target : FCC Class B
Power Source : 115VAC, 60 Hz
: L1: Peak (Black), Avg (Green)

LINE 2 AND RESULTS

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

Data#: 28 File#: abg card.EMI Date: 04-05-2006 Time: 13:57:16



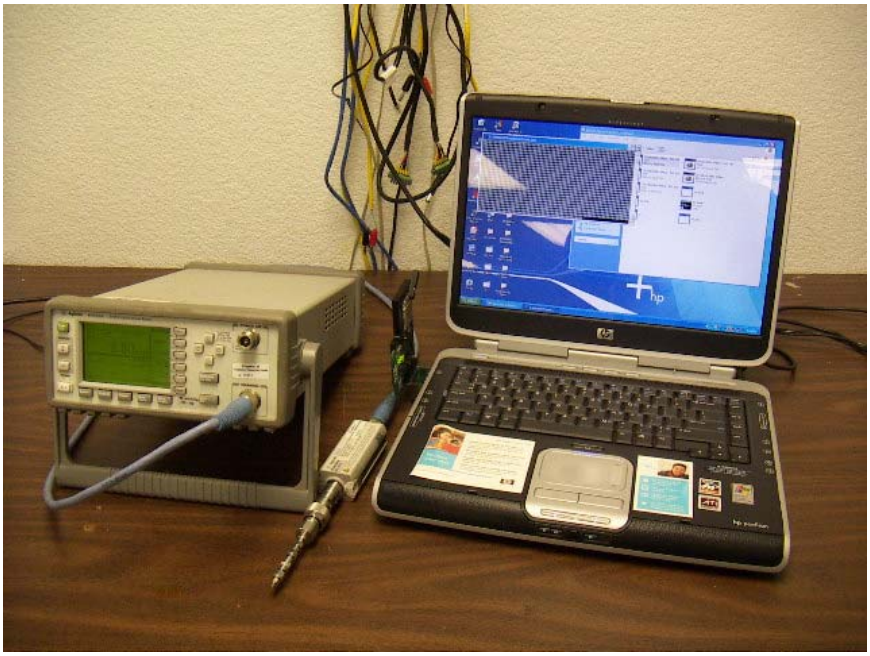
Trace: Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Vien Tran
Project # : 06U10199
Company : Broadcom
EUT Description : 802.11ag WLAN PCI-E Mini Card
Model : BCM94311MCAG
S/N :
EUT Config : EUT on extended card & laptop
Mode Of Operation: Tx Worst case_11a_5 GHz Band
Target : FCC Class B
Power Source : 115VAC, 60 Hz
: L2: Peak (Black), Avg (Green)

8. SETUP PHOTOS

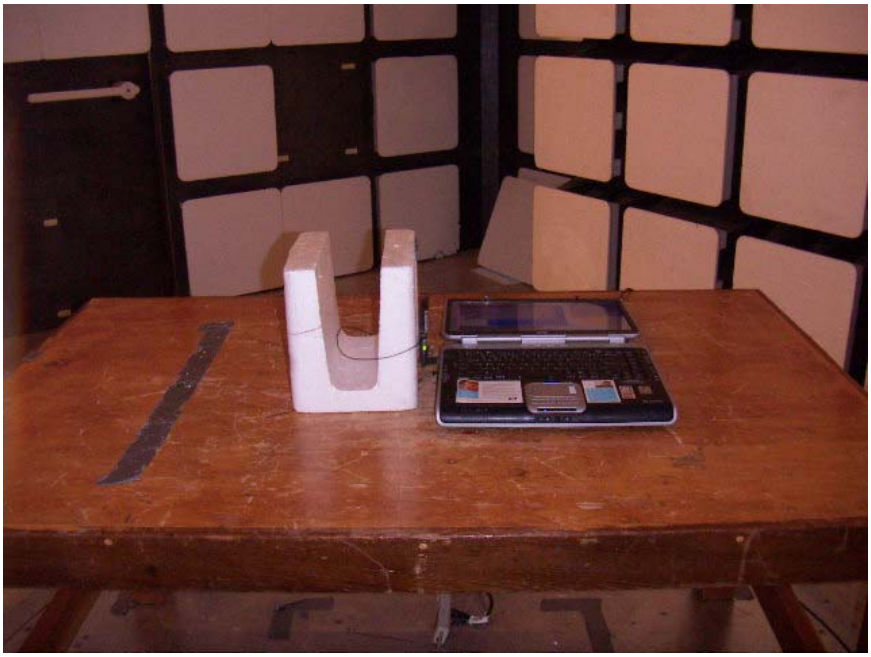
ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP

ANTENNA PORT CONDUCTED PHOTO

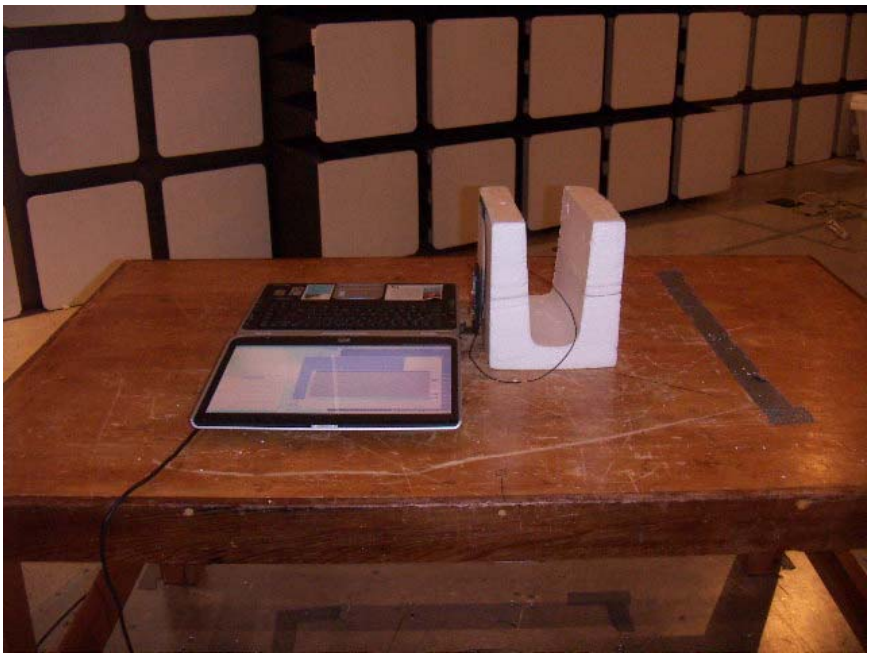


RADIATED RF MEASUREMENT SETUP

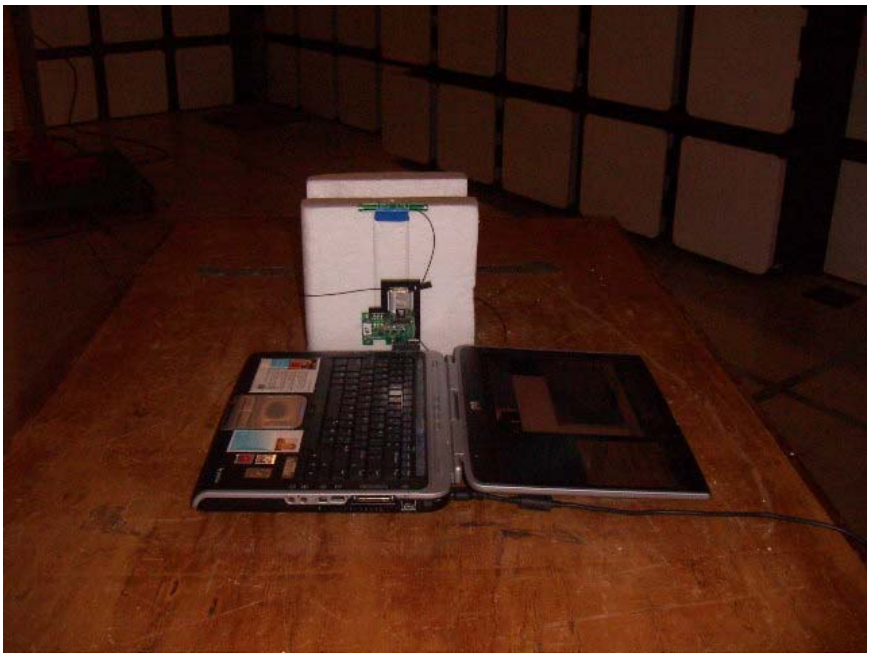
RADIATED FRONT PHOTO



RADIATED BACK PHOTO

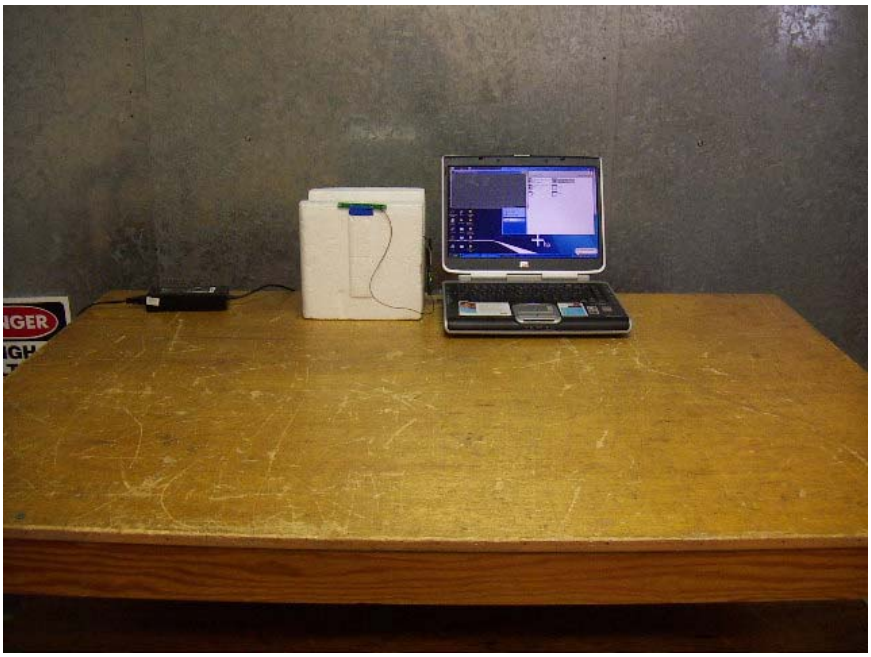


RADIATED SIDE PHOTO



POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP

LINE CONDUCTED FRONT PHOTO



LINE CONDUCTED BACK PHOTO

END OF REPORT