

# FCC CFR47 PART 15 SUBPART C CLASS II PERMISSIVE CHANGE INDUSTRY CANADA RSS-210 ISSUE 7 CERTIFICATION TEST REPORT

#### **FOR**

Broadcom 802.11g WLAN PCI-E Mini Card (Tested inside of HP Harbour)

MODEL NUMBER: BCM94312HMG

FCC ID: QDS-BRCM1030 IC: 4324A-BRCM1030

REPORT NUMBER: 08U12023-1

**ISSUE DATE: SEPTEMBER 05, 2008** 

Prepared for

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NVLAP LAB CODE 200065-0

## **Revision History**

Rev.	Issue Date	Revisions	Revised By
	09/05/08	Initial Issue	T. Chan

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** BROADCOM CORPORATION

190 MATHILDA PLACE

SUNNYVALE, CA 94086, USA

**EUT DESCRIPTION:** Broadcom 802.11g WLAN PCI-E Mini Card

(Tested inside of HP Harbour)

MODEL: BCM94312HMG

SERIAL NUMBER: P201

**DATE TESTED:** SEPTEMBER 02 - 04, 2008

#### APPLICABLE STANDARDS

STANDARD TEST RESULTS

CFR 47 Part 15 Subpart C PASS

RSS-210 Issue 7 Annex 8 and RSS-GEN Issue 2 PASS

Compliance Certification Services, Inc. (CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All expressions of Pass/Fail in this report are opinions expressed by CCS based on interpretations of the test results. 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 CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by CCS 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

COMPLIANCE CERTIFICATION SERVICES

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, FCC CFR 47 Part 15, RSS-GEN Issue 2, and RSS-210 Issue 7.

#### 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

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

#### 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
Power Line Conducted Emission	+/- 2.3 dB
Radiated Emission	+/- 3.4 dB

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

## 5. EQUIPMENT UNDER TEST

# 5.1. DESCRIPTION OF EUT

The EUT is a Broadcom 802.11g WLAN PCI-E Mini Card and installed inside HP Harbour portable laptop.

The radio module is manufactured by Broadcom.

#### 5.2. DESCRIPTION OF CLASS II PERMISSIVE CHANGE

The major change filed under this application is adding portable platform, HP Harbour PC1501ZAC000.

#### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilize an 802.11 b/g antennas, with the following maximum gain

BCM943	BCM94312HMG Antenna list						
No	Antenna Manufacturer	Model number	Max Peak gain (2.4GHz)	Comments			
		6036B0044401 (TX1)		HP Harbour 8.9"			
1	Yageo	6036B0044501 (TX2)	TX2 0.55dBi (H)	(Yageo)			
		6036B0044401 (TX1)		HP Harbour 10.2"			
2	Yageo	6036B0044501 (TX2)	TX2 0.91dBi(H)	(Yageo)			
		81.EDG15.052 (Main)		HP Harbour 8.9"			
3	WNC	81.EDG15.053 (Aux)	Aux 1.91 (V)	(WNC)			
		81.EDG15.052 (Main)		HP Harbour 10.2"			
*4	WNC	81.EDG15.053 (Aux)	Main 2.08 (H)	(WNC)			

<sup>\*:</sup> Antenna under testing.

#### 5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Broadcom, rev. 4.170.86.0.

The test utility software used during testing was wl\_tool, rev. 4.170.RC86.0.

#### 5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case data rate for each mode is determined to be as follows, based on original test report 07U11426-1A.

Only the Radiated Emission and AC mains line conduction tests are performed.

#### 5.6. DESCRIPTION OF TEST SETUP

#### **SUPPORT EQUIPMENT**

PERIPHERAL SUPPORT EQUIPMENT LIST							
Description Manufacturer Model Serial Number FCC ID							
•							
Laptop	HP	PC1501ZAC000	78716SIOE	DoC			
AC Adapter	HP	PA-1300-04	CN-597950ALLW707U	N/A			

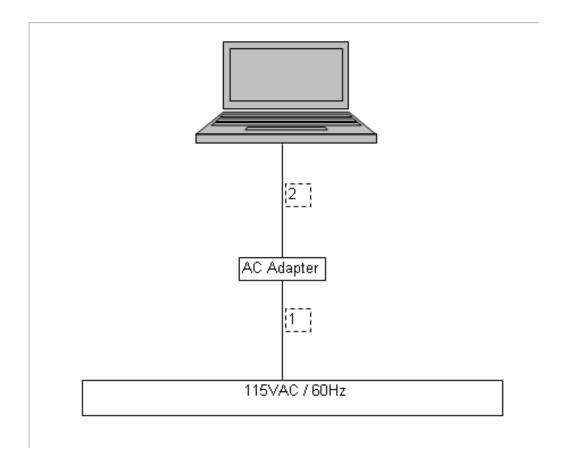
#### I/O CABLES

	I/O CABLE LIST									
Cable No.			Cable Type	Cable Length	Remarks					
1	AC	1	US115V	Unshielded	1.5m	N/A				
2	DC	1	DC	Unshielded	1.5m	Ferrite on Laptop's end				

#### **TEST SETUP**

The EUT is installed inside a host laptop computer 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	Asset	Cal Due		
Antenna, Horn, 18 GHz	EMCO	3115	C00945	04/15/09		
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00980	09/29/08		
Bilog Antenna	Sunol Sciences	JB1	C01016	10/13/08		
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	09/27/08		
Preamplifier, 1300 MHz	Agilent / HP	8447D	C01064	05/09/09		
RF Filter Section, 2.9 GHz	Agilent / HP	85420E	C00958	06/12/09		
Peak Power Meter	Agilent / HP	E4416A	C00963	12/02/08		
Peak / Average Power Sensor	Agilent	E9327A	C00964	12/02/08		
EMI Test Receiver, 30 MHz	R&S	ESHS 20	N02396	01/27/09		
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	N02481	09/15/08		
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	09/15/08		
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01012	08/07/09		

#### 7. RADIATED TEST RESULTS

#### 7.1. LIMITS AND PROCEDURE

#### **LIMITS**

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

#### **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.

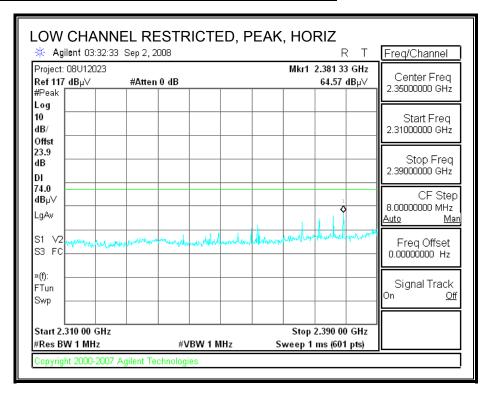
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

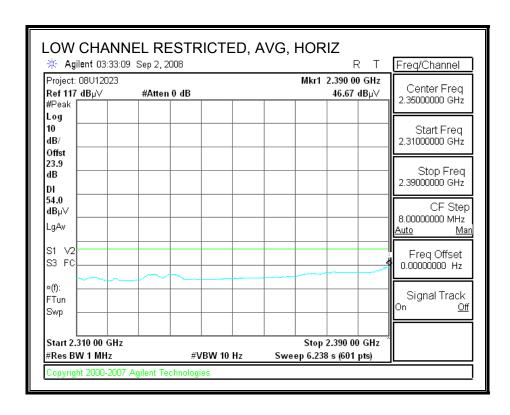
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The 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.

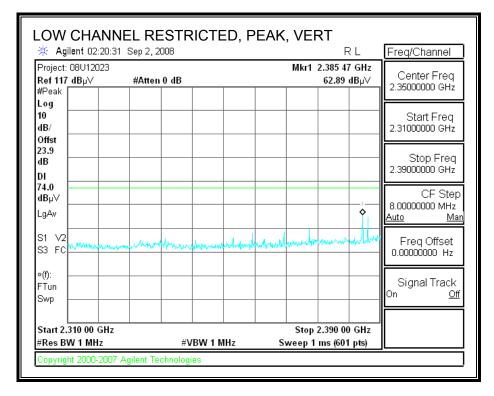
#### 7.2. TRANSMITTER ABOVE 1 GHz

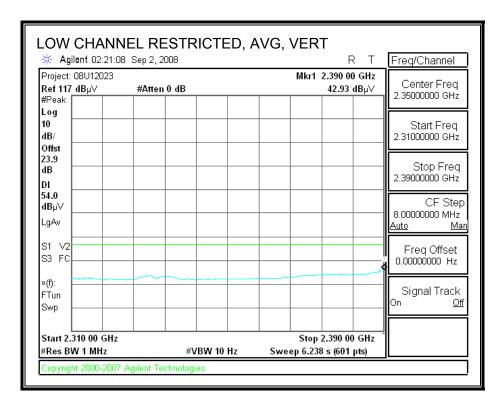
# 7.2.1. 802.11b MODE RESTRICTED BANDEDGE (LOW CHANNEL 1, HORIZONTAL)



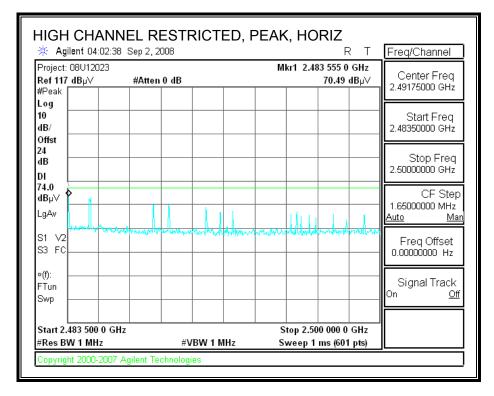


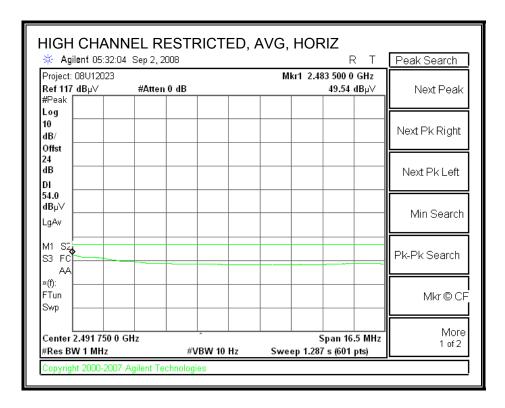
#### **RESTRICTED BANDEDGE (LOW CHANNEL 1, VERTICAL)**



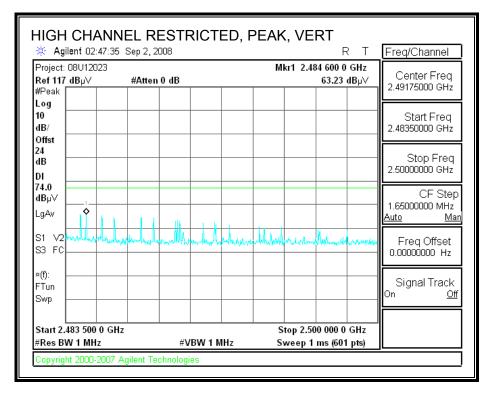


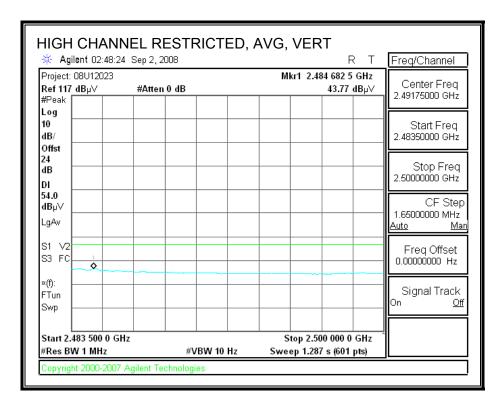
#### RESTRICTED BANDEDGE (HIGH CHANNEL 11, HORIZONTAL)



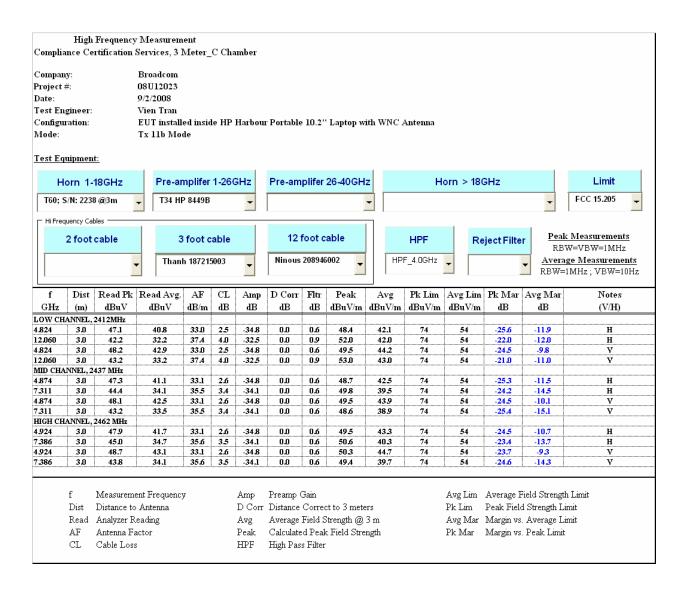


#### **RESTRICTED BANDEDGE (HIGH CHANNEL 11, VERTICAL)**



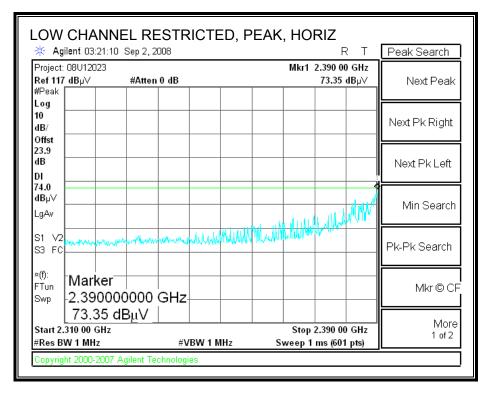


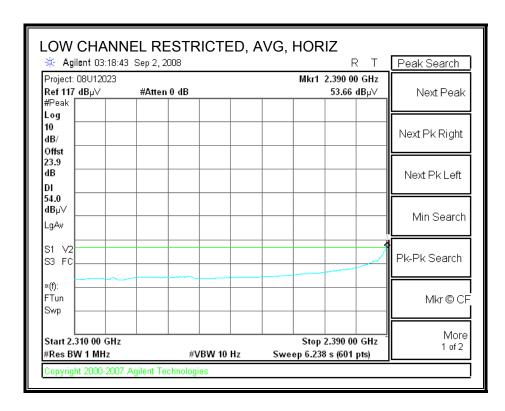
#### **HARMONICS AND SPURIOUS EMISSIONS**



# 7.2.2. 802.11g MODE Channel 1, 2412MHz

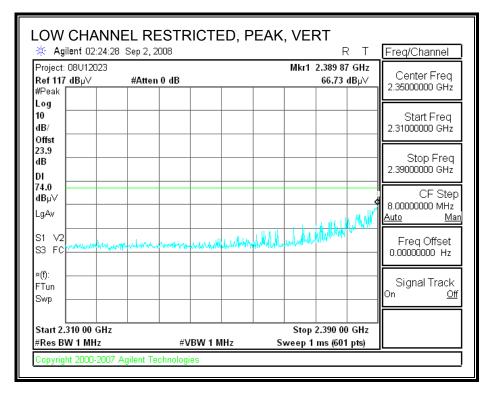
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

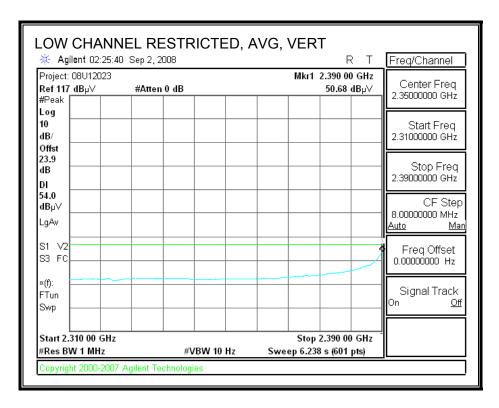




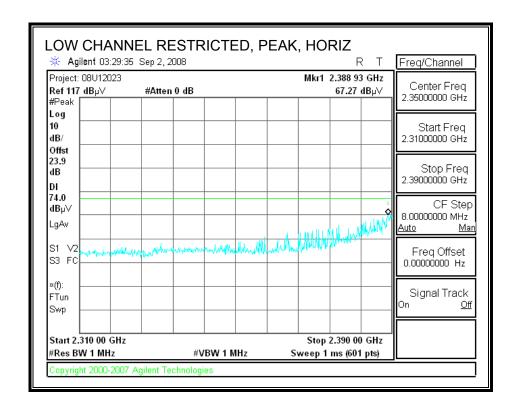
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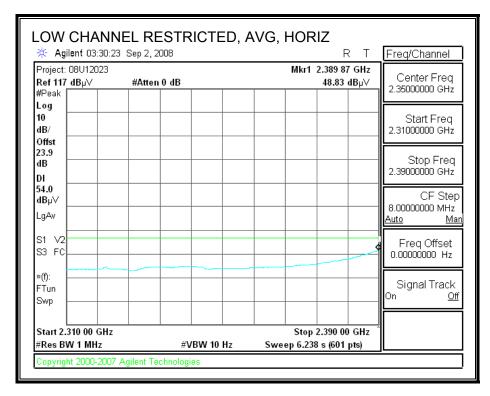
#### RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



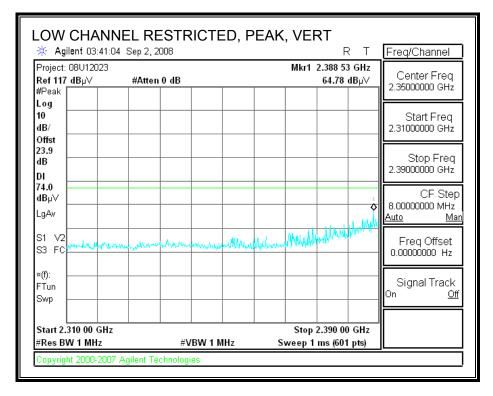


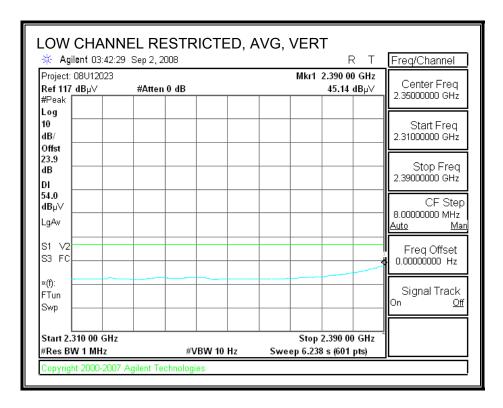
## Channel 2, 2417MHz RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



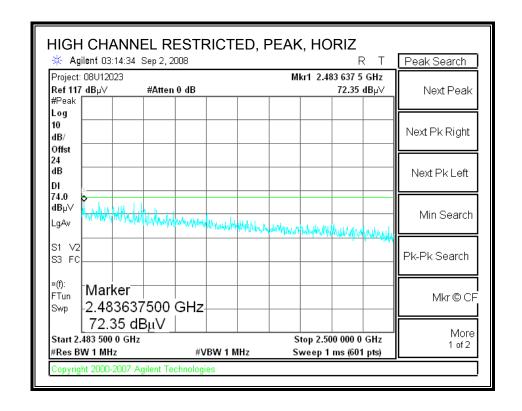


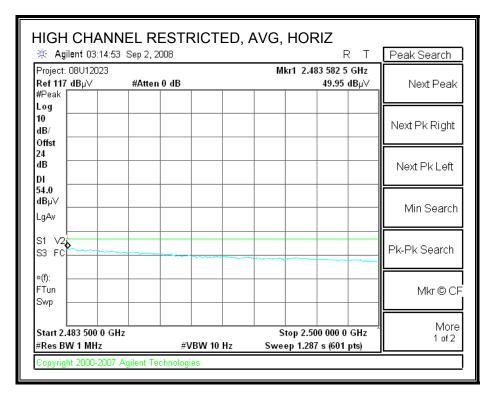
#### RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



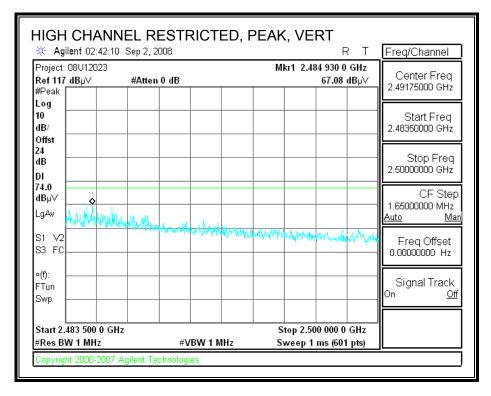


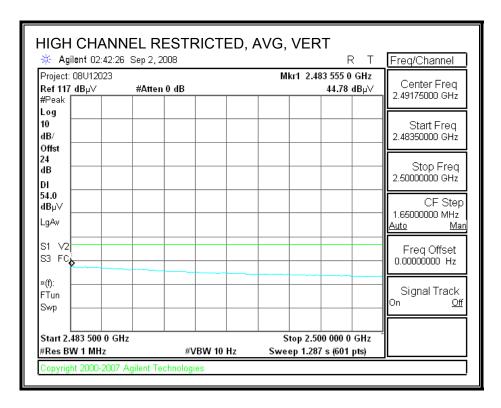
# **Channel 10, 2457MHz** RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



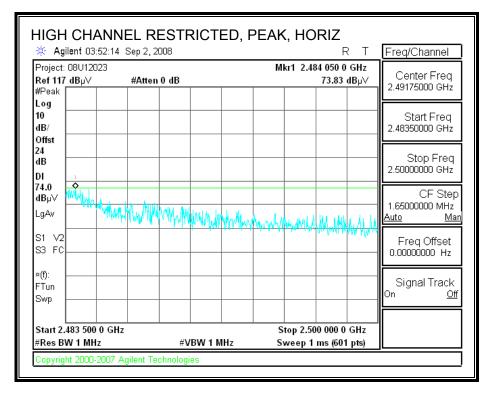


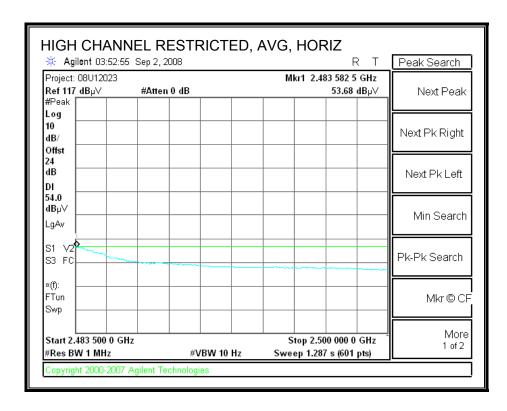
#### RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



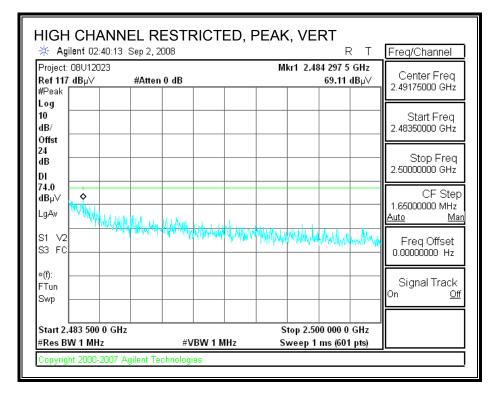


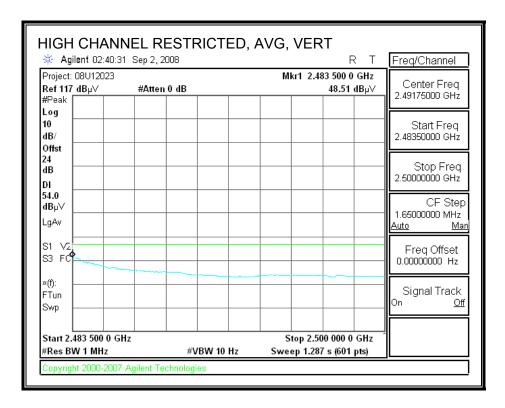
# <u>Channel 11, 2462MHz</u> <u>RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)</u>



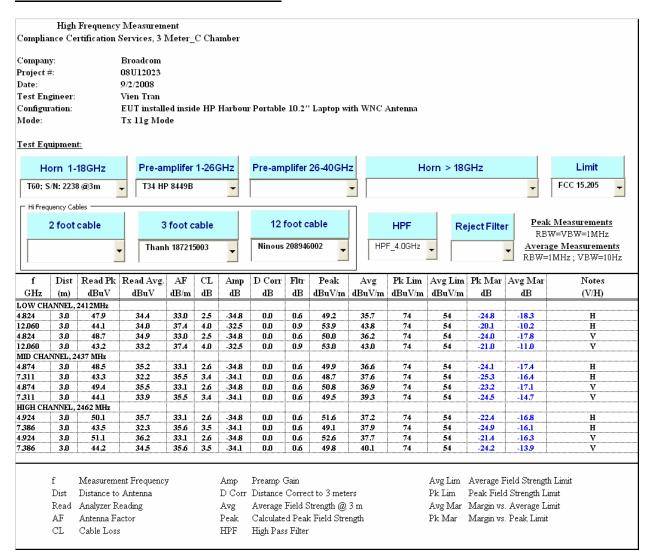


#### RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

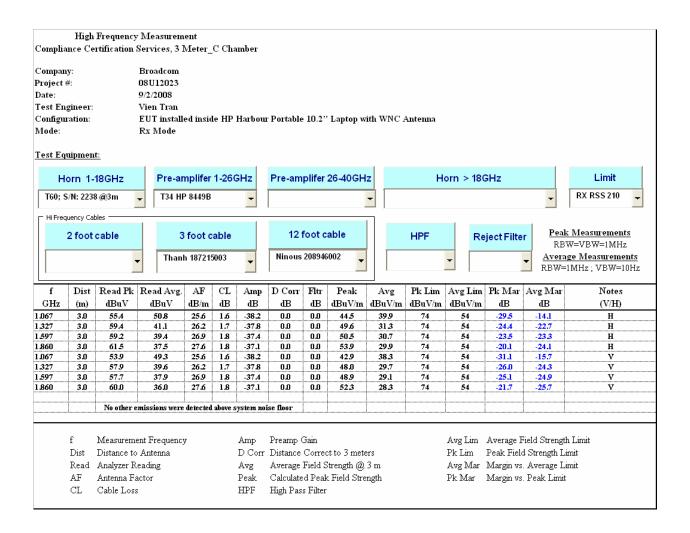




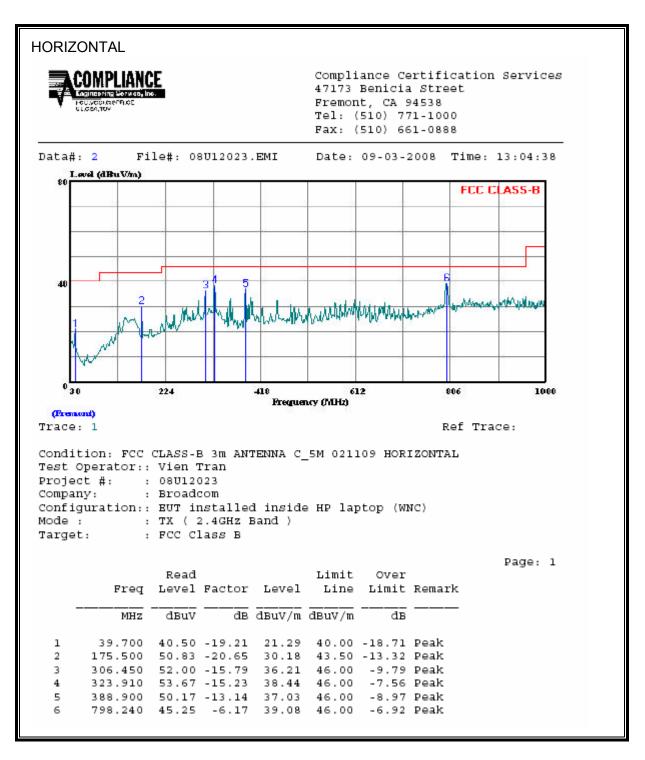
#### **HARMONICS AND SPURIOUS EMISSIONS**



#### 7.3. RECEIVER ABOVE 1 GHz

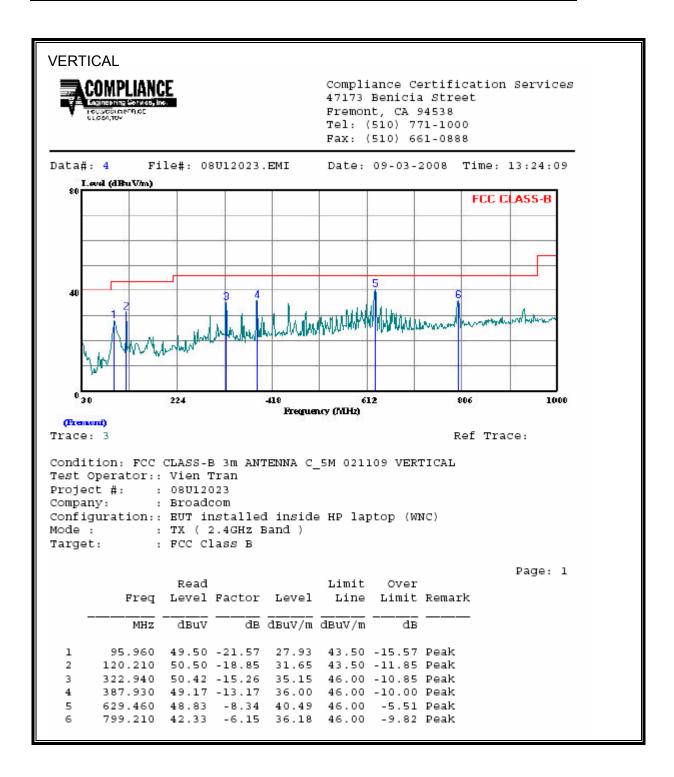


# 7.4. WORST-CASE BELOW 1 GHz SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)



DATE: SEPTEMBER 05, 2008

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



# 8. AC POWER LINE CONDUCTED EMISSIONS

#### **LIMITS**

FCC §15.207 (a)

RSS-Gen 7.2.2

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**

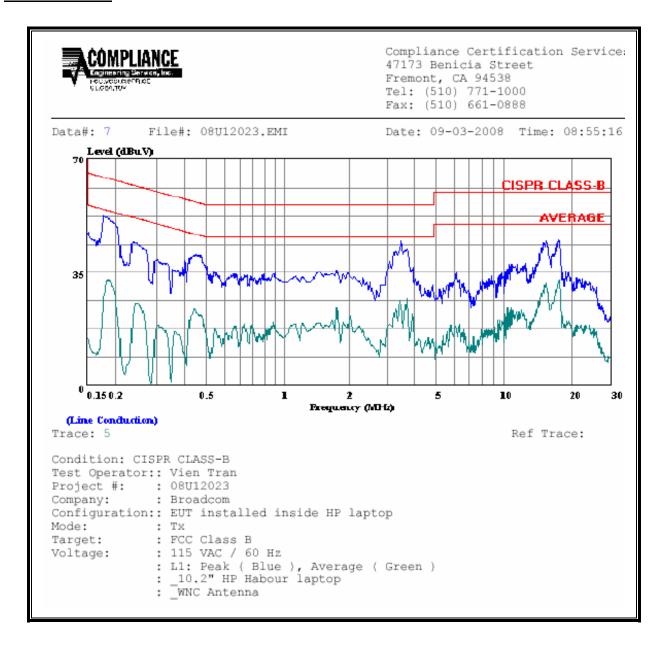
**ANSI C63.4** 

#### **RESULTS**

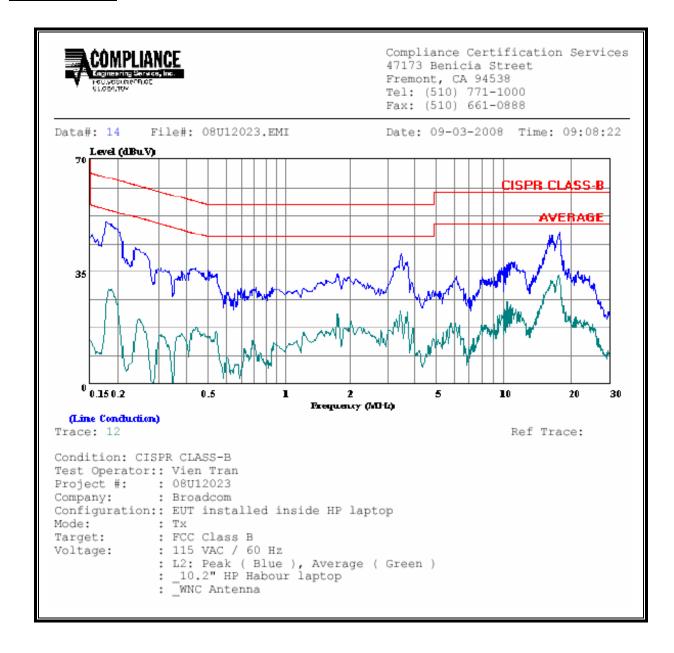
#### **6 WORST EMISSIONS**

	CONDUCTED EMISSIONS DATA (115VAC 60Hz)								
Freq.	Reading			Closs	Limit	FCC_B	Marg	in	Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV(dB)	L1/L2
0.18	52.61		32.56	0.00	64.63	54.63	-12.02	-22.07	L1
3.58	44.87		26.97	0.00	56.00	46.00	-11.13	-19.03	L1
17.85	45.05		32.60	0.00	60.00	50.00	-14.95	-17.40	L1
0.18	50.51		29.54	0.00	64.63	54.63	-14.12	-25.09	L2
3.58	40.17		22.67	0.00	56.00	46.00	-15.83	-23.33	L2
17.85	47.67		33.58	0.00	60.00	50.00	-12.33	-16.42	L2
6 Worst l	6 Worst Data								

#### **LINE 1 RESULTS**



#### **LINE 2 RESULTS**



IC: 4324A-BRCM1030