



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

**FOR**

**Broadcom 802.11g WLAN PCI-E Mini Card  
(Tested inside HP Laptop HSTNN-I77C)**

**MODEL NUMBER: BCM94312HMG**

**FCC ID: QDS-BRCM1030**

**IC: 4324A-BRCM1030**

**REPORT NUMBER: 09U12957-1**

**ISSUE DATE: DECEMBER 07, 2009**

*Prepared for*

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**NVLAP LAB CODE 200065-0**

Revision History

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Rev.	Issue Date	Revisions	Revised By
--	12/07/09	Initial Issue	F. Ibrahim

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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 HP Laptop HSTNN-I77C)

**MODEL:** BCM94312HMG

**SERIAL NUMBER:** 5200054160-01L1

**DATE TESTED:** DECEMBER 04, 2009

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 indications of Pass/Fail in this report are opinions expressed by CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. 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. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For CCS By:

Tested By:



FRANK IBRAHIM  
EMC SUPERVISOR  
COMPLIANCE CERTIFICATION SERVICES

CHIN PANG  
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 <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. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\text{Field Strength (dBuV/m)} = \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Preamp Gain (dB)}$$

$$36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$$

### 4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 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 tablet platforms.

The radio module is manufactured by Broadcom.

### **5.2. MAXIMUM OUTPUT POWER**

The measured output power was with  $\pm 0.5$ dBm of the original output power.

### **5.3. DESCRIPTION OF CLASS II PERMISSIVE CHANGE**

The major change filed under this application is adding tablet platforms, HP HSTNN-I77C and HSTNN-W75C.

### **5.4. DESCRIPTION OF AVAILABLE ANTENNAS**

The radio utilizes PIFA antennas, with the maximum peak gain of 1.62dBi.

### **5.5. SOFTWARE AND FIRMWARE**

The EUT driver software installed during testing was Broadcom, rev. 5.60.180.8.  
The test utility software used during testing was wl\_tool, rev. 5.60.180.8.

### **5.6. WORST-CASE CONFIGURATION AND MODE**

The EUT was installed and tested inside a HP tablet PC HSTNN-I77C. The testing with another tablet HSTNN-W75C is not required as its peak antenna gain, 0.8 dBi, is lower than what was tested in the tablet HSTNN-I77C.

Worst-case mode and channel used for 30-1000 MHz radiated emissions was the mode and channel with the highest output power.

Based on the original CCS test report 07U11426, only the worst case Radiated Emissions such as band Edge, Harmonic and TX below 1GHz are performed.

The tablet PC HSTNN-I77C was investigated under normal (mobile) and potable positions (X, Y, Z) to determine the worst case and the normal position was the worse case to test.

## 5.7. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMEN

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Tablet PC	HP	HSTNN-I77C	79816S105D	DoC
AC Adapter	HP	HSTNN-D17	WAYWUX2ARXW03K	DoC

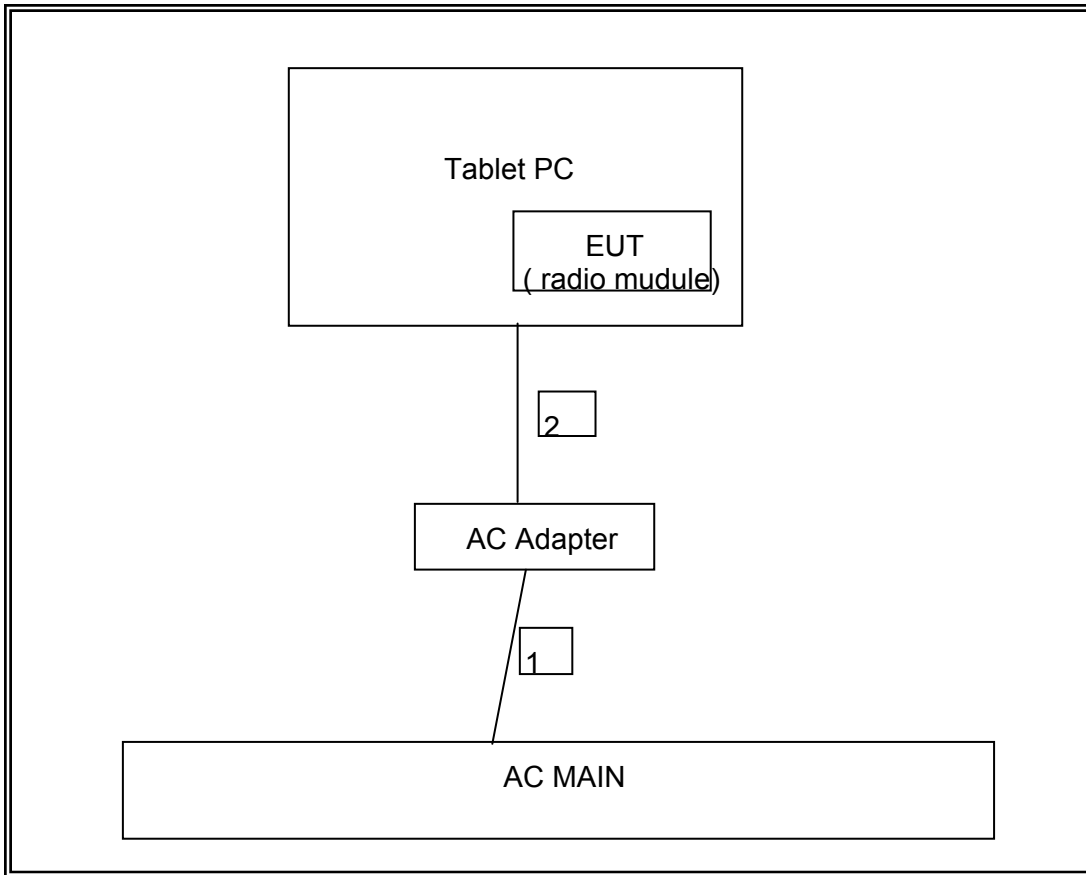
### I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US115V	Unshielded	1.5m	N/A
2	DC	1	DC	Unshielded	1.5m	N/A

### TEST SETUP

The EUT is installed inside a host tablet PC 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
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	02/04/10
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01016	01/14/10
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	12/16/09
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRM50702	N02685	CNR
Antenna, Horn, 18 GHz	EMCO	3115	C00945	01/29/10
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01179	08/24/10

## 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.

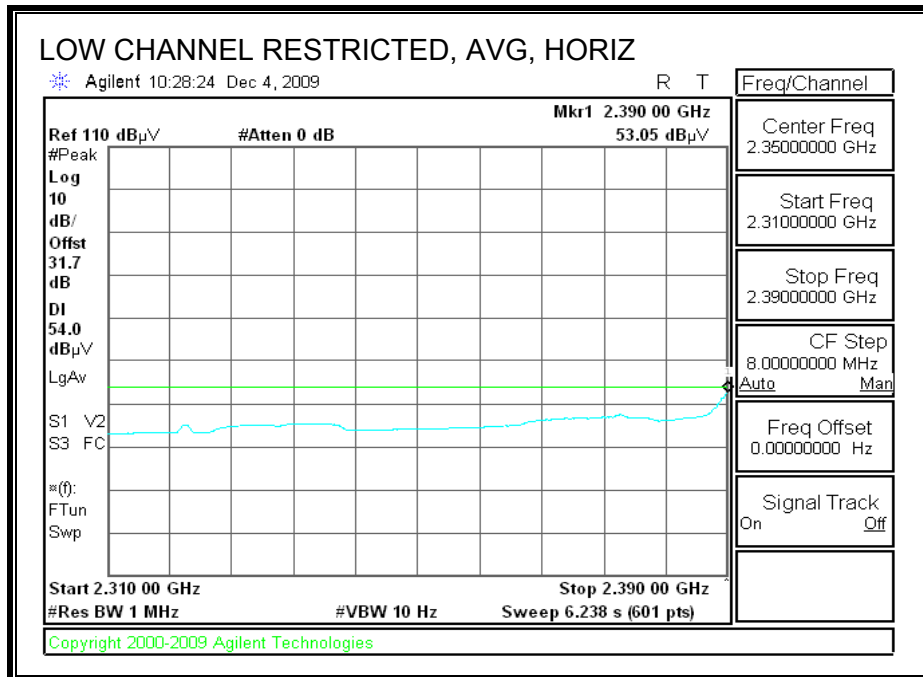
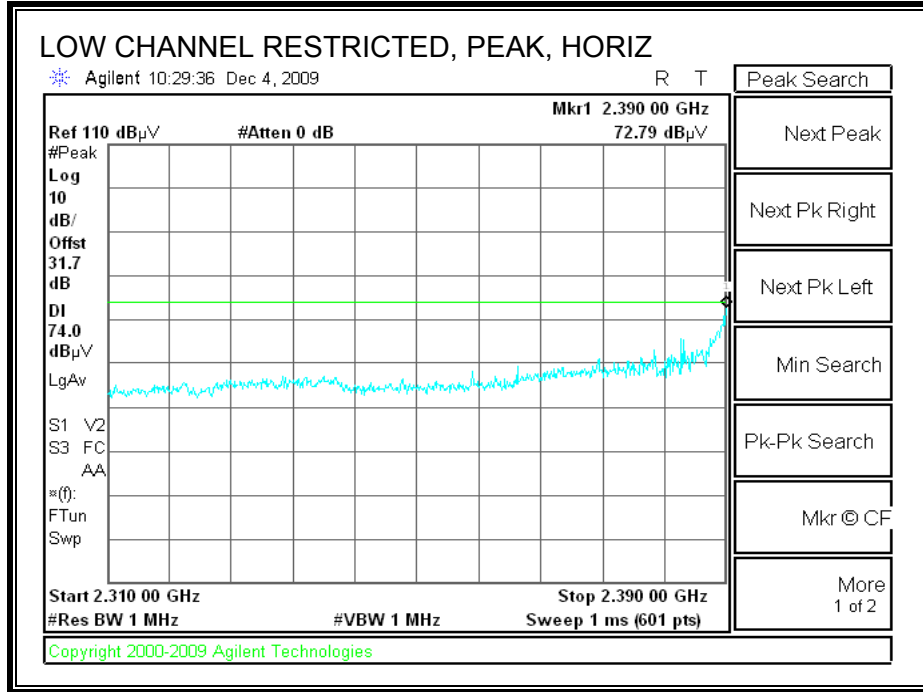
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

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.

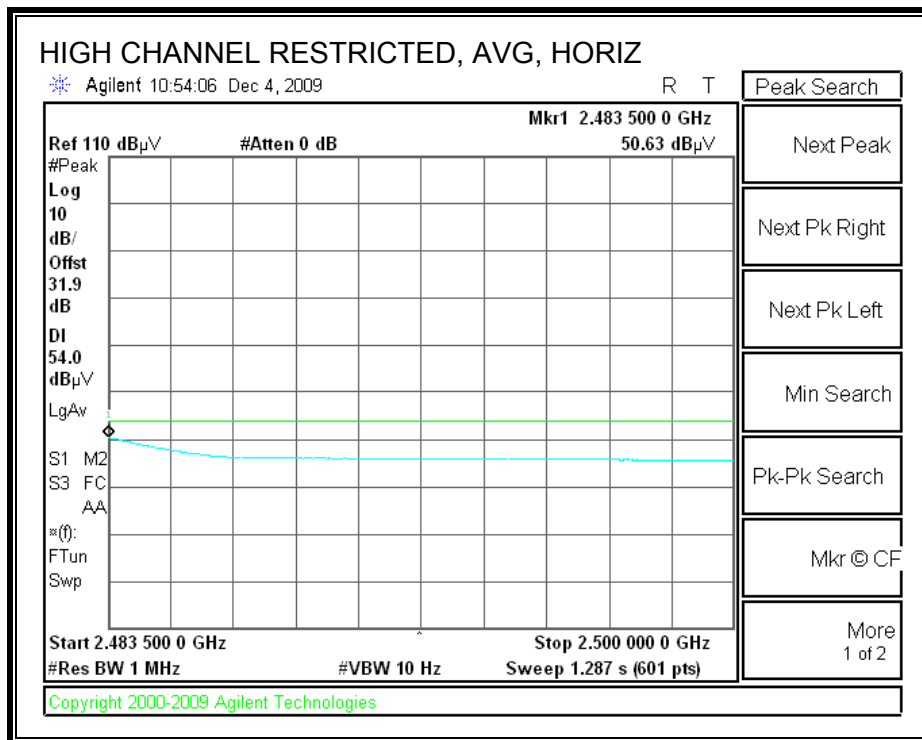
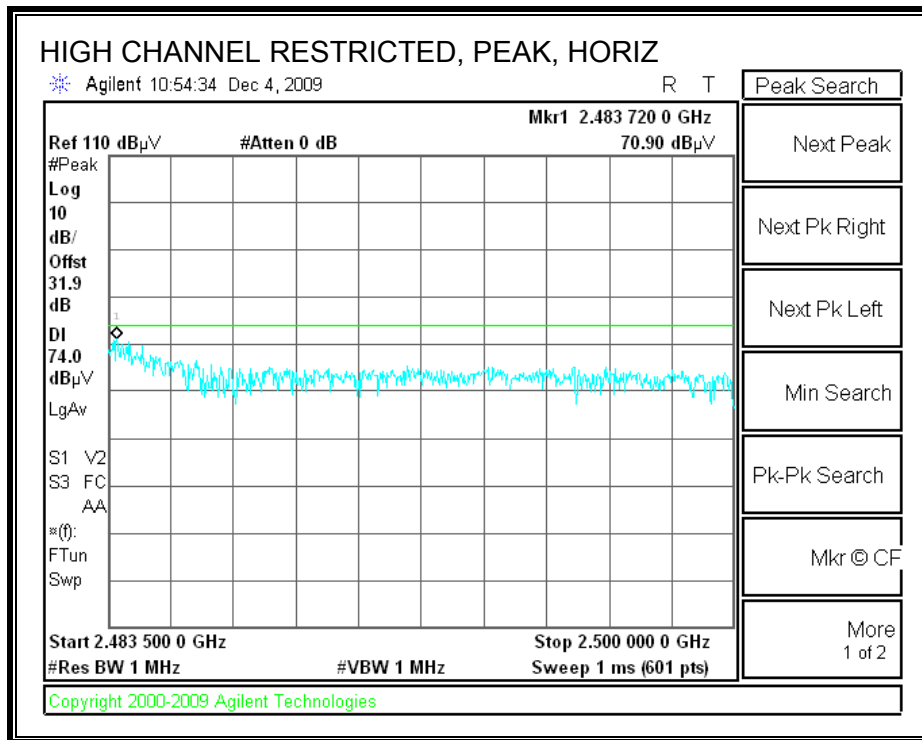
**RESULTS**

**7.2. TRANSMITTER ABOVE 1 GHz**  
**7.2.1. 802.11g MODE**

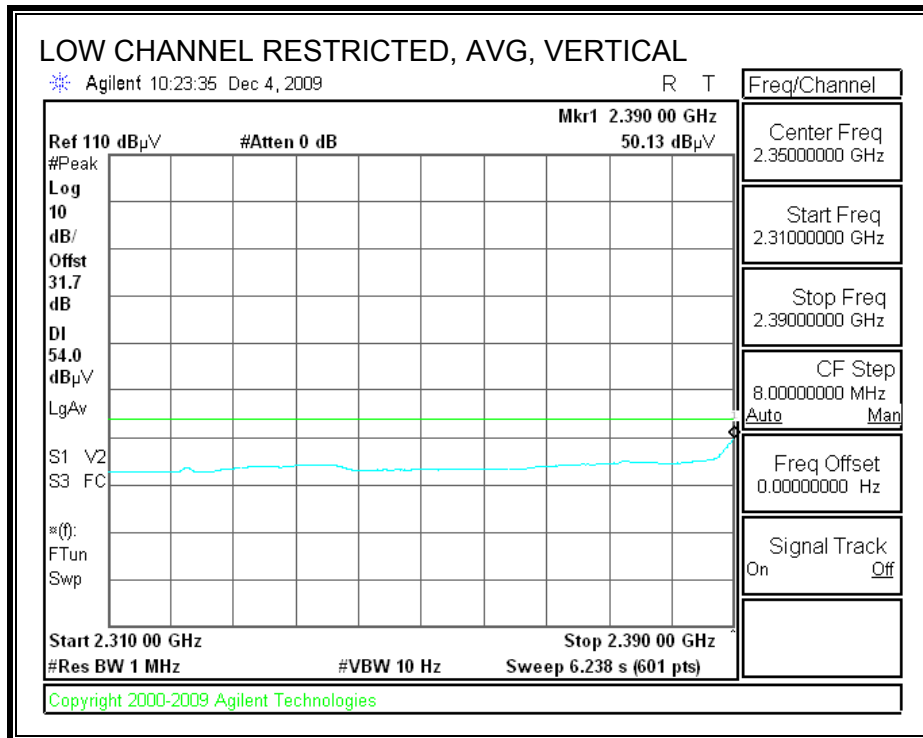
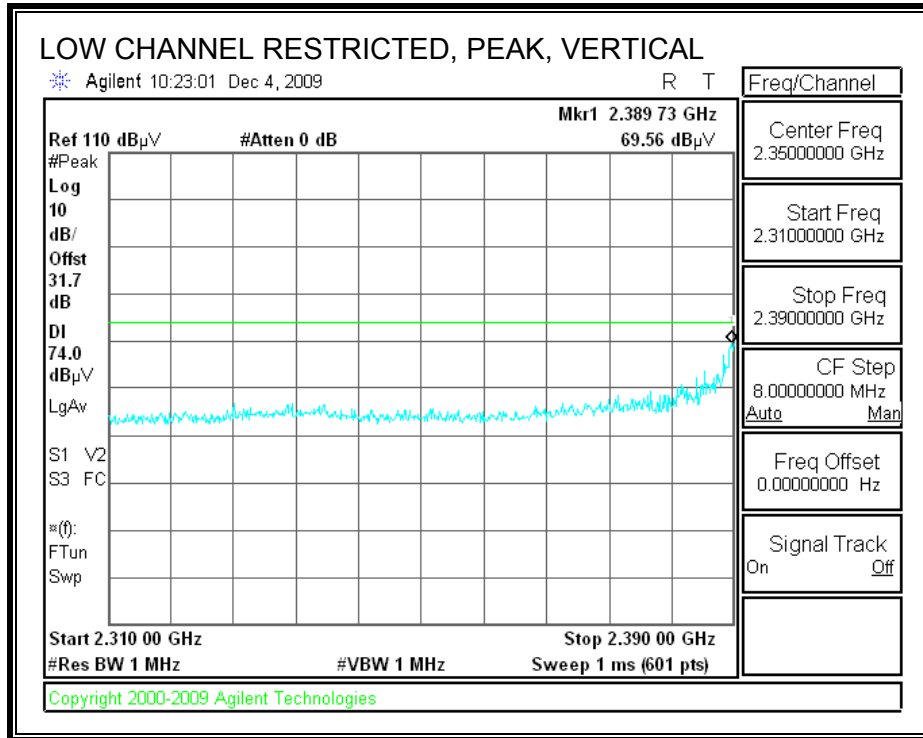
**RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)**



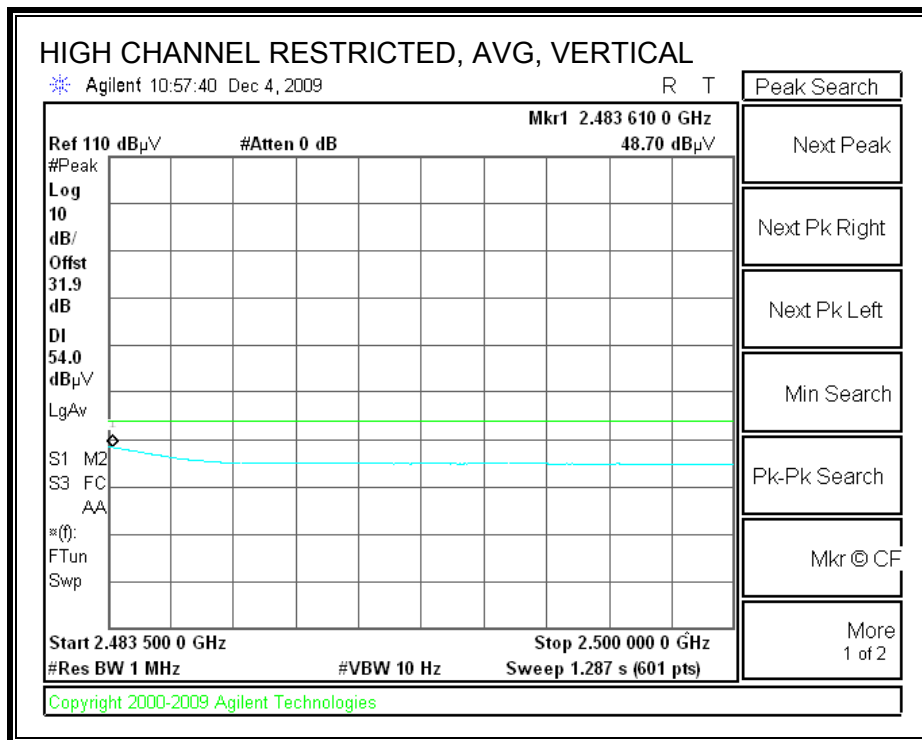
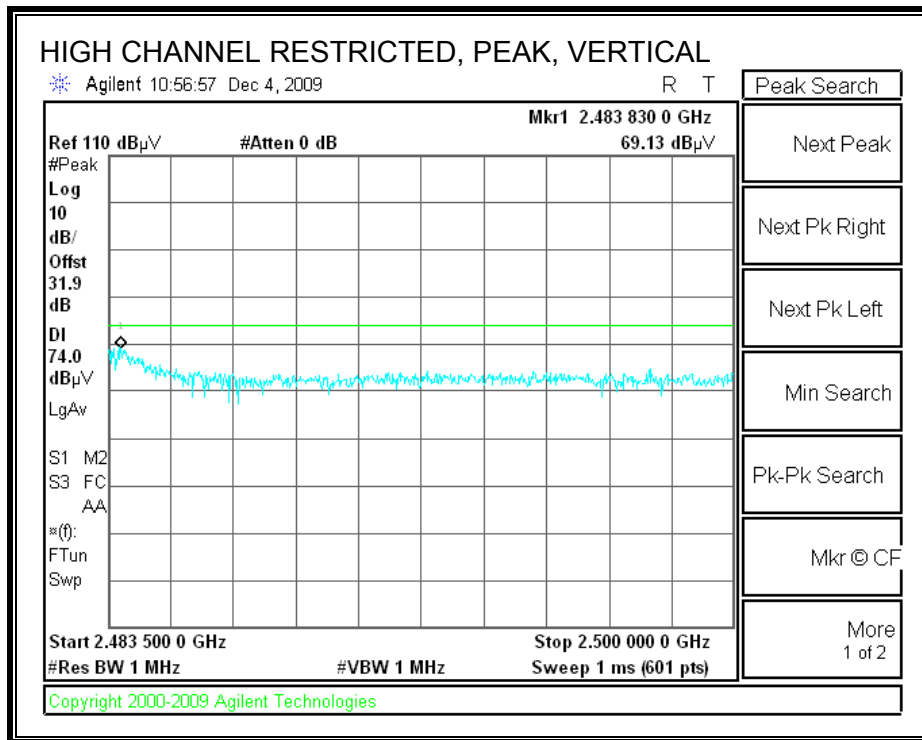
**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**



**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL**



**RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL**



**HARMONICS AND SPURIOUS EMISSIONS**

**High Frequency Measurement**  
 Compliance Certification Services, Fremont 5m Chamber

Company: Broadcom  
 Project #: 09U12957  
 Date: 12/4/09  
 Test Engineer: Chun Pang  
 Configuration: EUT only  
 Mode: TX, g mode

Test Equipment:

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T144 Miteq 3008A00931			FCC 15.205

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter	Peak Measurements RBW=VBW=1MHz
3' cable 22807700	12' cable 22807600	20' cable 22807500		R_001	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	Filt dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
<b>Low Ch, 2412MHz</b>															
4.824	3.0	42.0	31.0	33.0	5.8	-36.5	0.0	0.0	44.4	33.4	74	54	-29.6	-20.6	Y
4.824	3.0	44.6	32.5	33.0	5.8	-36.5	0.0	0.0	47.0	34.9	74	54	-27.0	-19.1	H
<b>Mid Ch, 2437MHz</b>															
4.874	3.0	41.6	30.5	33.1	5.8	-36.5	0.0	0.0	44.1	33.0	74	54	-29.9	-21.0	Y
7.311	3.0	42.5	29.6	35.3	7.3	-36.2	0.0	0.0	48.8	35.9	74	54	-25.2	-18.1	V
4.874	3.0	43.2	30.0	33.1	5.8	-36.5	0.0	0.0	45.7	32.5	74	54	-28.3	-21.5	H
7.311	3.0	42.4	29.8	35.3	7.3	-36.2	0.0	0.0	48.7	36.1	74	54	-25.3	-17.9	H
<b>High Ch, 2462MHz</b>															
4.924	3.0	42.0	29.3	33.1	5.9	-36.5	0.0	0.0	44.6	31.9	74	54	-29.4	-22.1	V
7.386	3.0	41.0	28.3	35.4	7.3	-36.2	0.0	0.0	47.5	34.8	74	54	-26.5	-19.2	V
4.924	3.0	41.5	28.7	33.1	5.9	-36.5	0.0	0.0	44.1	31.3	74	54	-29.9	-22.7	H
7.386	3.0	41.0	28.0	35.4	7.3	-36.2	0.0	0.0	47.5	34.5	74	54	-26.5	-19.5	H

Rev. 11.10.08

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. WORST-CASE BELOW 1 GHz**  
**SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE )**

DATA													
30-1000MHz Frequency Measurement													
Compliance Certification Services, Fremont 5m Chamber													
Test Engr:		Chin Pang											
Date:		12/04/09											
Project #:		09U12957											
Company:		Broadcom											
EUT Description:		802.11g Wlan PCI-e Minivard, adding portable tablet, HSTNN-177C											
EUT M/N:		BCM94312HMG											
Test Target:		FCC 15B											
Mode Oper:		TX ( Worst Case )											
f	Measurement Frequency	Amp	Preamp Gain	Margin	Margin vs. Limit								
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters										
Read	Analyzer Reading	Filter	Filter Insert Loss										
AF	Antenna Factor	Corr.	Calculated Field Strength										
CL	Cable Loss	Limit	Field Strength Limit										
f	Dist	Read	AF	CL	Amp	D Corr	Filter	Corr.	Limit	Margin	Ant. Pol.	Det.	Notes
MHz	(m)	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dB	V/H	P/A/QP	
<b>horiz</b>													
144.005	3.0	49.3	13.0	1.1	28.3	0.0	0.0	35.1	43.5	-8.4	H	P	
240.009	3.0	50.4	11.8	1.3	28.2	0.0	0.0	35.4	46.0	-10.6	H	P	
355.453	3.0	43.3	14.2	1.7	28.1	0.0	0.0	31.1	46.0	-14.9	H	P	
528.021	3.0	42.0	17.2	2.1	27.7	0.0	0.0	33.6	46.0	-12.4	H	P	
742.829	3.0	42.9	20.2	2.5	27.3	0.0	0.0	38.3	46.0	-7.7	H	P	
912.036	3.0	42.9	21.9	2.8	27.8	0.0	0.0	39.8	46.0	-6.2	H	P	
933.157	3.0	40.7	22.1	2.9	27.8	0.0	0.0	37.8	46.0	-8.2	H	P	
44.041	3.0	53.0	11.4	0.6	28.4	0.0	0.0	36.6	40.0	-3.4	V	P	
44.041	3.0	45.8	11.4	0.6	28.4	0.0	0.0	29.4	40.0	-10.6	V	QP	
193.807	3.0	46.1	11.6	1.2	28.2	0.0	0.0	30.7	43.5	-12.8	V	P	
240.009	3.0	46.4	11.8	1.3	28.2	0.0	0.0	31.4	46.0	-14.6	V	P	
528.021	3.0	46.1	17.2	2.1	27.7	0.0	0.0	37.6	46.0	-8.4	V	P	
624.024	3.0	42.1	18.7	2.3	27.4	0.0	0.0	35.6	46.0	-10.4	V	P	
912.036	3.0	41.0	21.9	2.8	27.8	0.0	0.0	38.0	46.0	-8.0	V	P	



