



**FCC 47 CFR PART 15 SUBPART B  
ICES-003 ISSUE 4**

**TEST REPORT**

**FOR**

**802.11a/b/g/n/ac WLAN + Bluetooth PCI-E Mini Card**

**MODEL NUMBER: BCM94352HMB**

**FCC ID: QDS-BRCM1068  
IC: 4324A-BRCM1068**

**REPORT NUMBER: 12U14473-3, Revision A**

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**NVLAP LAB CODE 200065-0**

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	8/31/12	Initial Issue	F. de Anda
A	9/13/12	Update setup photos	S. Leitner

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** BROADCOM CORPORATION  
190 MATHILDA PLACE  
SUNNYVALE, CA 94086, U.S.A.

**EUT DESCRIPTION:** 802.11a/b/g/n/ac WLAN + Bluetooth PCI-E Mini Card

**MODEL:** BCM94352HMB

**SERIAL NUMBER:** 265 (P238)


**DATE TESTED:** August 13 & 29, 2012

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART B	Pass
ICES-003 ISSUE 4	Pass

UL 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 UL 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 UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL 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 UL CCS By:



FRANCISCO DE ANDA  
EMC SUPERVISOR  
UL CCS

Tested By:



VIEN TRAN  
WiSE ENGINEER  
UL CCS

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2009.

## 3. FACILITIES AND ACCREDITATION

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

UL 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:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

### 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 an 802.11a/b/g/n/ac WLAN + Bluetooth PCI-E Mini Card.

The radio module is manufactured by Broadcom.

#### GENERAL INFORMATION

Power Requirements	3.3 V DC
List of frequencies generated or used by the EUT	40 MHz

### 5.2. TEST CONFIGURATIONS

EUT Configuration	Description
Typical Configuration (representing installation inside laptop PC)	EUT connected to laptop via extender board, with minimum configuration.

### 5.3. WORST CASE MODE OF OPERATION

Mode	Description
EMC Test SW and WLAN TX	All I/O ports activated, scrolling "H" pattern on the laptop screen, TX on.

### 5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Broadcom, rev. 6.30.0.0.

The test utility software used during testing was BCM Internal, rev. 6.30.RC307.1166.

### 5.5. MODIFICATIONS

No modifications were made during testing.

## 5.6. DETAILS OF TESTED SYSTEM

### SUPPORT EQUIPMENT

SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	Test
Laptop	Lenovo	G560	CBU4473193	Con. emissions
AC Adapter	Lenovo	PA-1650-56LC	11S36001646ZZ400008KCM8	Con. emissions
Laptop	HP	DV6000	CNF6463KP7	Rad. Emissions
AC Adapter	HP	PPP009H	F3-030713834B	Rad. Emissions
Extender Board	Catalyst	MINI2EXP	BRCM 2011-05	All
Mouse	HP	M-UV96	F93A90AN13SN1PRV	All
Access Point (AP)	Cisco	AP1231G-J-K9	FHK0925J0RP	All
AC Adapter	Cisco	PSA-18U-480C	P51207891A3	All

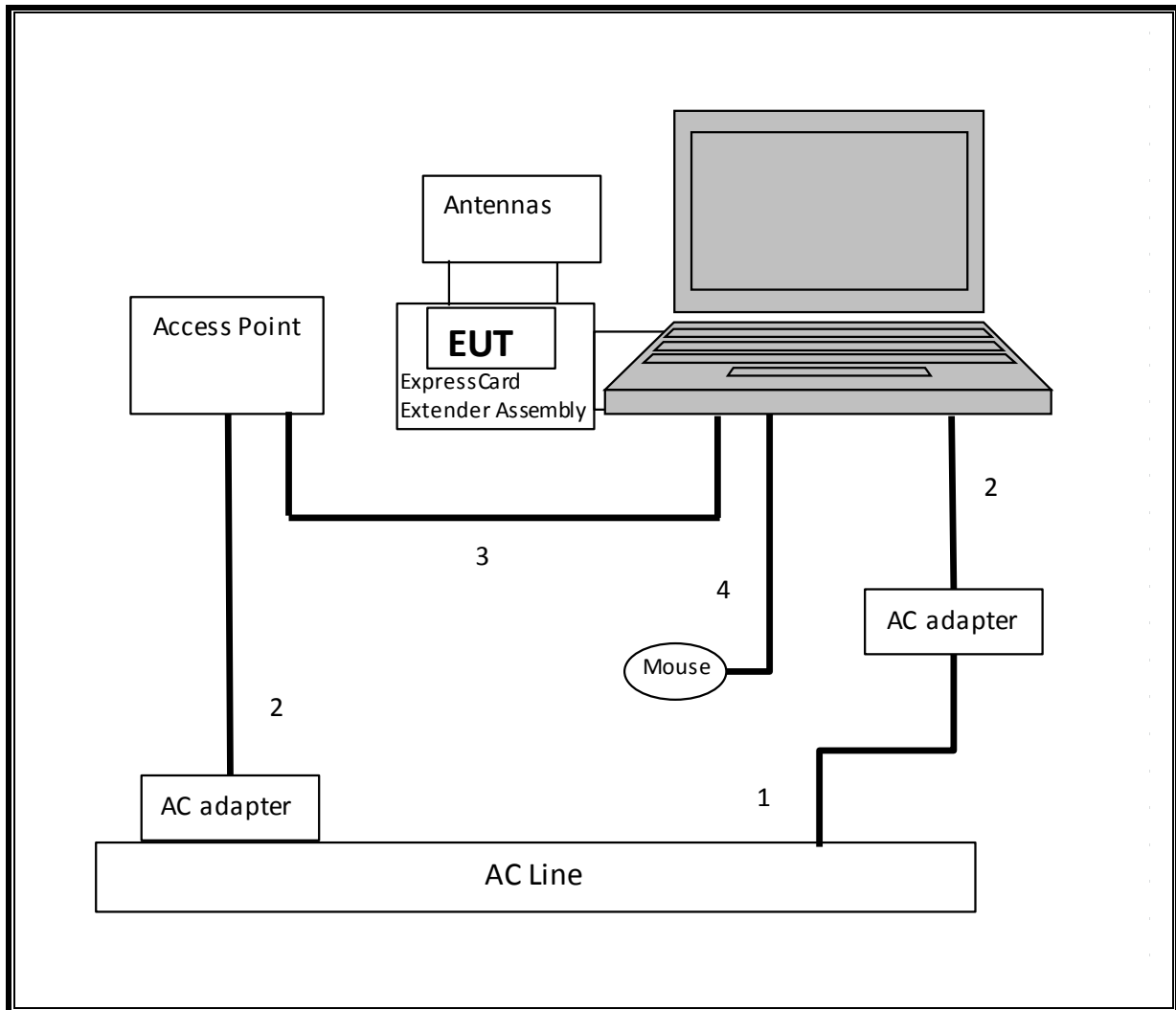
### I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	2	2-prong	Unshielded	1.5 m	NA
2	DC	1	Barrel	Unshielded	1.5 m	Ferrite at AP end
3	DC	1	Barrel	Unshielded	1.5 m	Laptop
4	Ethernet	1	RJ45	Unshielded	2 m	AP
5	USB	1	USB	Shielded	2 m	USB Mouse

### TEST SETUP

The EUT was mounted to an extender board assembly which was installed in the ExpressCard slot of a host laptop computer during the tests. 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
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00558	11/11/12
BiLog Antenna	Sunol	JB1	C01171	01/26/13
Spectrum Analyzer	Agilent / HP	E4446A	C01012	09/02/12
LISN	FCC	50/250-25-2	C00626	12/13/12
LISN	Solar	8012-50-R-24-BNC	N02486	03/07/13
Test receiver	R&S	ESHS 20	N02396	08/19/13

## 7. APPLICABLE LIMITS AND TEST RESULTS

### 7.1. RADIATED EMISSIONS

#### TEST PROCEDURE

ANSI C63.4

The highest clock frequency generated or used in the EUT (except for the intended fundamental) was 20 MHz; therefore the frequency range was investigated from 30 MHz to 1000 MHz.

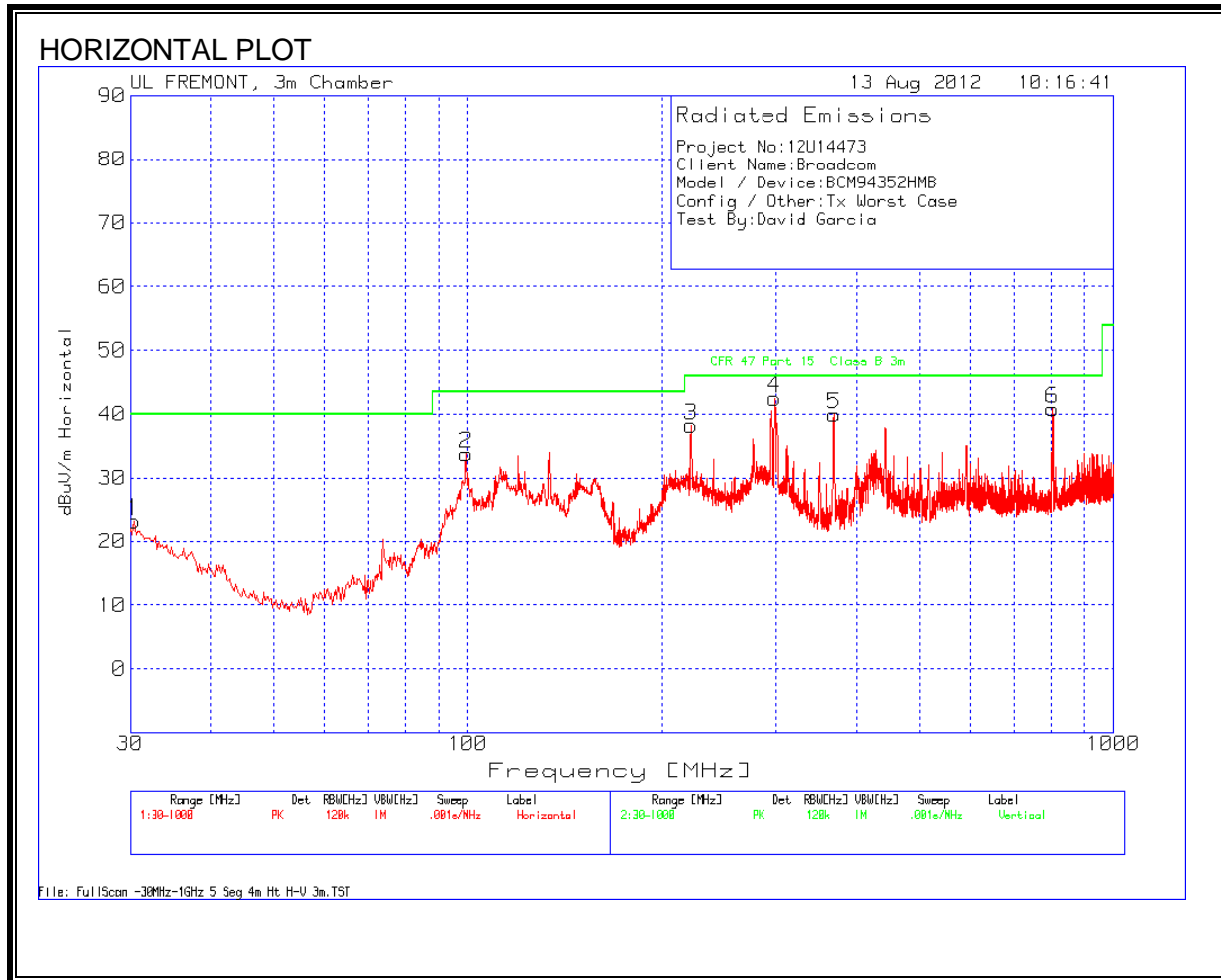
#### LIMIT

§15.109 (a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

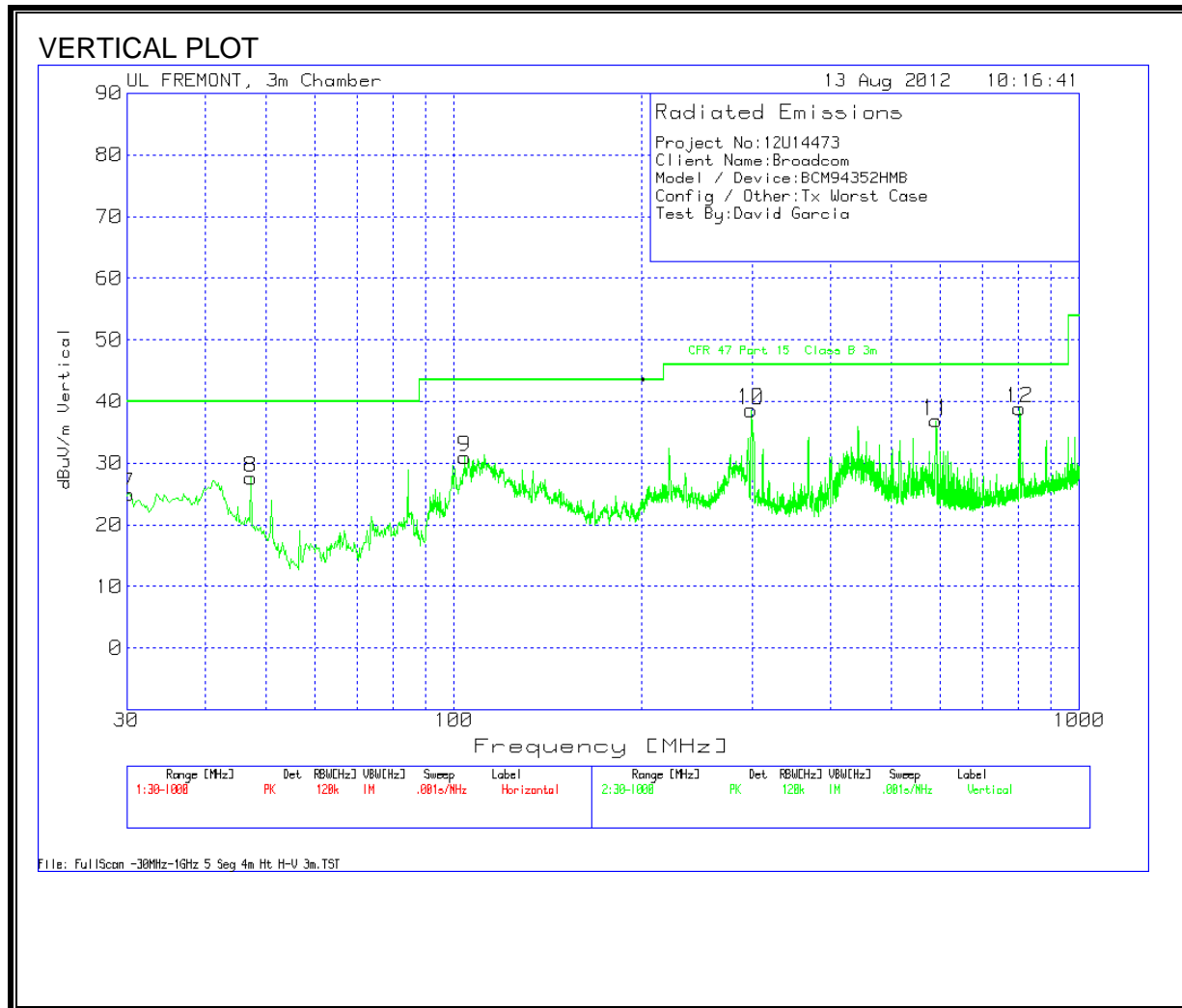
Limits for radiated disturbance of Class B ITE at measuring distance of 3 m	
Frequency range (MHz)	Quasi-peak limits (dB $\mu$ V/m)
30 to 88	40
88 to 216	43.5
216 to 960	46
Above 960 MHz	54

Note: The lower limit shall apply at the transition frequency.

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



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



**WORST EMISSIONS**

<b>Project No:12U14473</b>									
<b>Client Name:Broadcom</b>									
<b>Model / Device:BCM94352HMB</b>									
<b>Config / Other:Tx Worst Case</b>									
<b>Test By:David Garcia</b>									
Test Frequency Mhz	Meter Reading dB(μV)	Detector	Amp Path dB	Antenna T185 dB	dBμV/m	Class B 3m dB(μV/m)	Margin dB	Height cm	Polarity
<b>Horizontal</b>									
30.3877	29.74	PK	-27.5	20.9	23.14	40.0	-16.86	400	Horz
99.5903	50.90	PK	-26.8	9.7	33.80	43.5	-9.70	201	Horz
221.3249	53.16	PK	-25.7	10.8	38.26	46.0	-7.74	100	Horz
298.8629	54.43	PK	-25.2	13.3	42.53	46.0	-3.47	100	Horz
369.0348	50.46	PK	-25.5	15.0	39.96	46.0	-6.04	100	Horz
803.2474	44.23	PK	-24.6	21.2	40.83	46.0	-5.17	100	Horz
<b>Vertical</b>									
30.1938	31.40	PK	-27.5	21.1	25.00	40.0	-15.00	101	Vert
47.446	45.97	PK	-27.3	9.0	27.67	40.0	-12.33	101	Vert
104.2426	46.67	PK	-26.8	11.1	30.97	43.5	-12.53	101	Vert
298.8629	50.54	PK	-25.2	13.3	38.64	46.0	-7.36	200	Vert
590.5995	44.22	PK	-25.7	18.4	36.92	46.0	-9.08	101	Vert
803.4412	42.30	PK	-24.6	21.2	38.90	46.0	-7.10	101	Vert
PK - Peak detector									
QP - Quasi-Peak detector									

## 7.2. AC MAINS LINE CONDUCTED EMISSIONS

### TEST PROCEDURE

ANSI C63.4

### LIMIT

§15.107 (a) Except for Class A digital devices, for equipment 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  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency range (MHz)	Limits (dB $\mu$ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

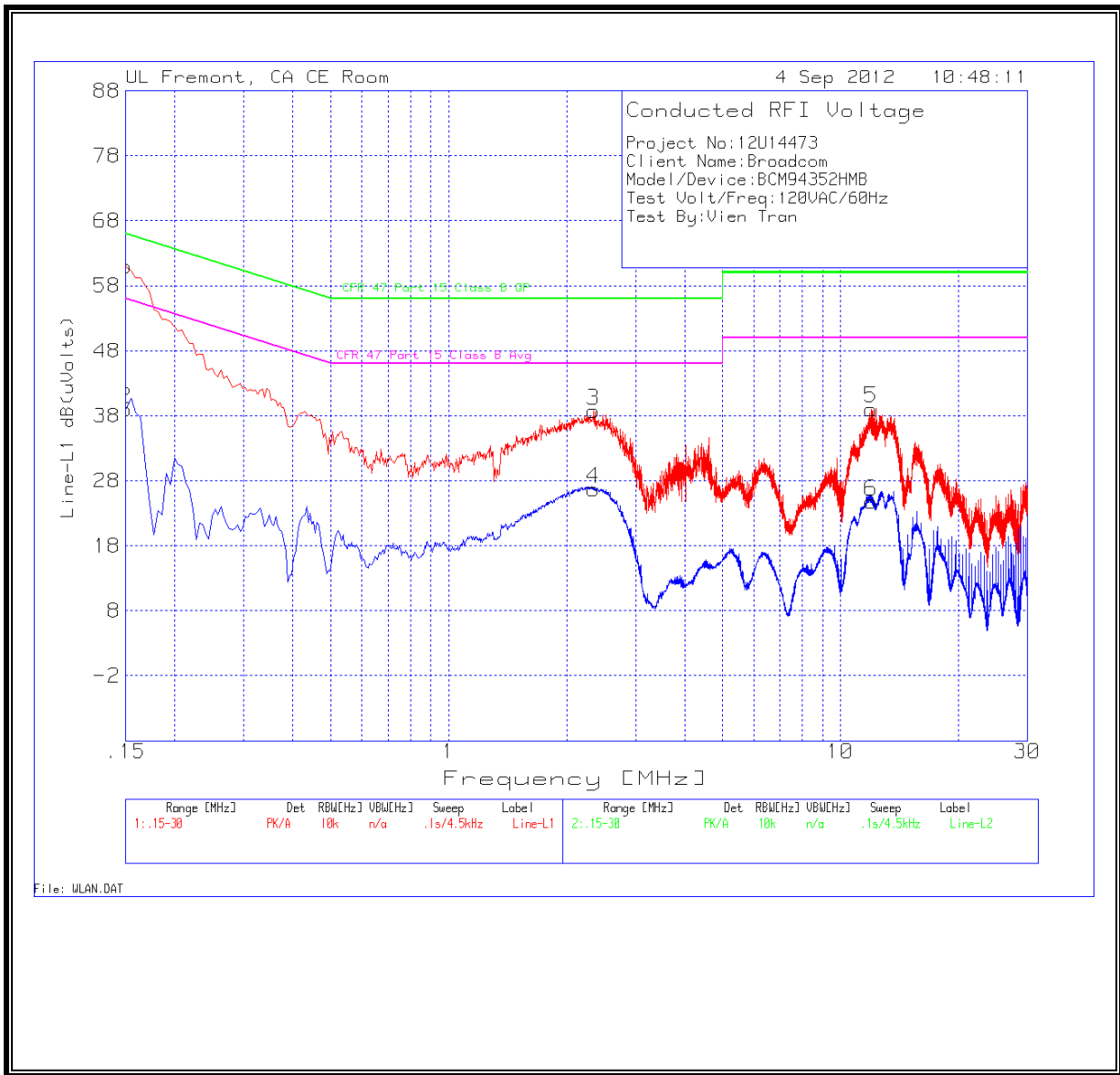
Notes:  
1. The lower limit shall apply at the transition frequencies  
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

**RESULTS**

**WORST EMISSIONS**

Project No:12U14473									
Client Name:Broadcom									
Model/Device:BCM94352HMB									
Test Volt/Freq:120VAC/60Hz									
Test By:Vien Tran									
Frequency MHz	Reading dB(µV)	Detector	T24 LISN dB	Cables dB	Corrected dB(µV)	Class B QP Limit dB(µV)	QP Margin dB	Class B Av Limit dB(µV)	Av Margin dB
<b>Line-L1 .15 - 30MHz</b>									
0.15	60.88	PK	0.1	0	60.98	66	-5.02	-	-
0.15	38.86	Av	0.1	0	38.96	-	-	56	-17.04
2.3415	38.6	PK	0.1	0.1	38.8	56	-17.2	-	-
2.3415	26.55	Av	0.1	0.1	26.75	-	-	46	-19.25
12.003	38.67	PK	0.2	0.2	39.07	60	-20.93	-	-
12.003	24.42	Av	0.2	0.2	24.82	-	-	50	-25.18
<b>Line-L2 .15 - 30MHz</b>									
0.15	59.32	PK	0.1	0	59.42	66	-6.58	-	-
0.15	37.04	Av	0.1	0	37.14	-	-	56	-18.86
2.679	38.52	PK	0.1	0.1	38.72	56	-17.28	-	-
2.679	25.94	Av	0.1	0.1	26.14	-	-	46	-19.86
12.1155	37.77	PK	0.2	0.2	38.17	60	-21.83	-	-
12.1155	21.56	Av	0.2	0.2	21.96	-	-	50	-28.04
PK - Peak detector									
QP - Quasi-Peak detector									
Av - Average detector									
Text File: WLAN.TXT									
File: WLAN.DAT									

**LINE 1 RESULTS**





**LINE 2 RESULTS**

