



FCC 47 CFR PART 15 SUBPART B

CERTIFICATION TEST REPORT

FOR

802.11a/g/n/ac WLAN + Bluetooth PCI-E Custom Combination Card

MODEL NUMBER: BCM94360CD

**FCC ID: QDS-BRCM1070
IC: 4324A-BRCM1070**

REPORT NUMBER: 12U14669-5

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Prepared for
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NVLAP[®]

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
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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/g/n/ac WLAN + Bluetooth PCI-E Custom Combination Card

MODEL: BCM94360CD

SERIAL NUMBER: C86243600CYF6RY0D

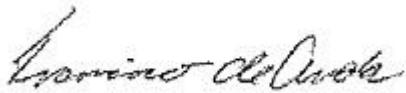
DATE TESTED: JANUARY 28, 2013

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART B	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. 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. 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 UL CCS By:



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WISE OPERATIONS MANAGER
UL CCS

Tested By:



THANH NGUYEN
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/g/n/ac 3x3 MIMO (with beam forming) WLAN + BT combo PCI-E Module.

The radio module is manufactured by Broadcom.

GENERAL INFORMATION

Power Requirements	5 Vdc
List of frequencies generated or used by the EUT	40 MHz

5.2. TEST CONFIGURATION

EUT Configuration	Description
Typical Configuration	EUT connected to a laptop computer (Mac Book Pro) via a USB port and extender card. The laptop has a mouse, Ethernet port and a Headset as minimum configuration.

5.3. MODE(S) OF OPERATION

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

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Broadcom, rev. 6.30.118.23.

The test utility software used during testing was Broadcom Bluetool, rev. 1.4.2.6.

5.5. MODIFICATIONS

No modifications were made during testing.

5.6. DETAILS OF TESTED SYSTEM

SUPPORT EQUIPMENT & PERIPHERALS

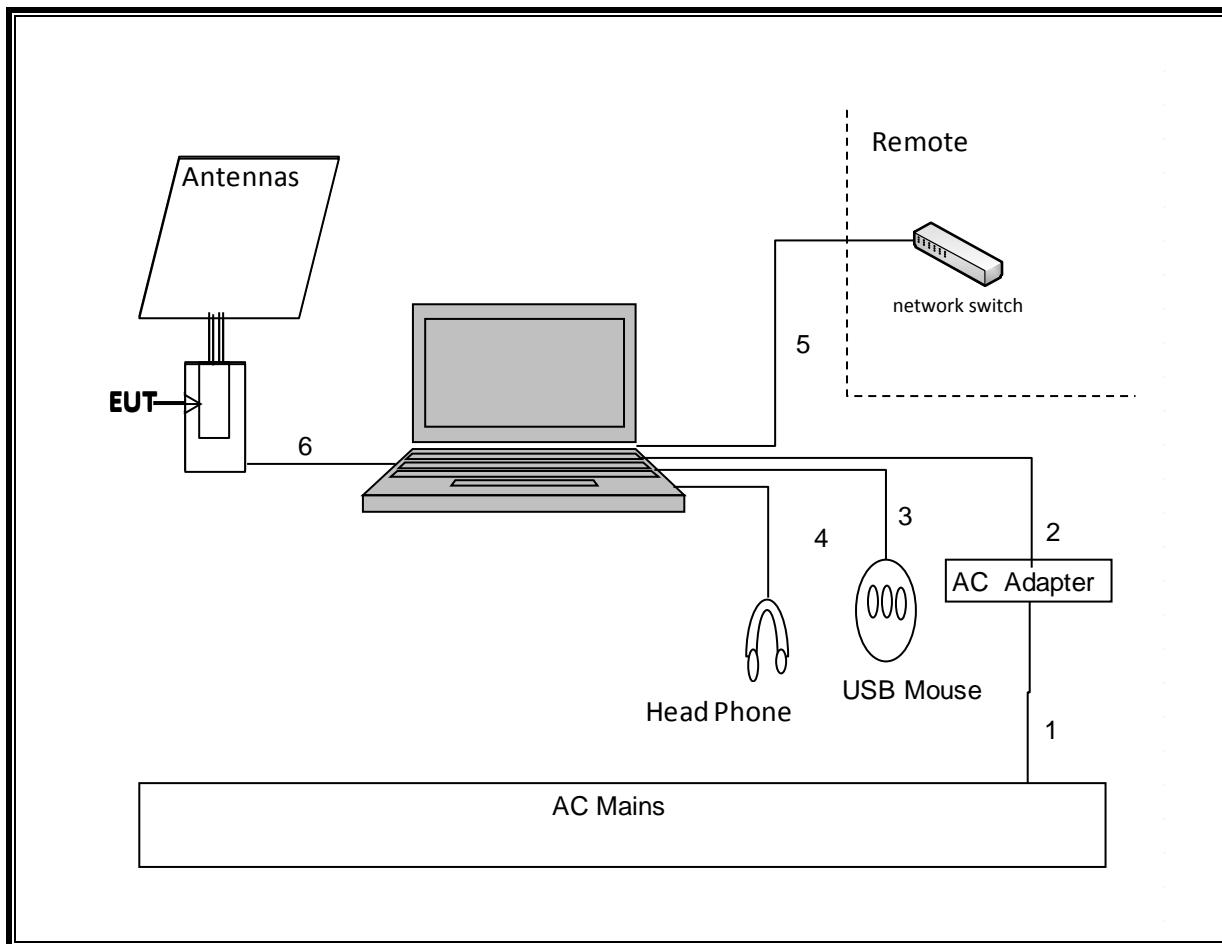
PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	F8GSDR	Serial Number	FCC ID
Laptop	Apple	Mac Book Air A1465	C02JF8GSDRV6	DoC
AC Adapter	Lite-On	PA1450-8 NSW25804	C0623350GF4F6V7AR	N/A
USB Mouse	Microsoft	X80-7118-P1D 56180-576	4502	N/A
Headphone	N/A	N/A	N/A	N/A
Extender card	IBEC	X29T	151447	N/A

I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	3 Prong	Unshielded	1.5 m	AC adapter
2	DC	1	MagSafe	Unshielded	1.5 m	AC adapter out
3	USB Mouse	1	USB	Shielded	1.0 m	Mouse
4	Headphone	1	Mini jack	Shielded	1.2 m	Headphone
5	Ethernet	1	RJ45	Unshielded	1.2 m	To the remote HUB
6	USB	1	USB	Shielded	0.8 m	To extender card

TEST SETUP

The EUT was connected to a laptop computer that was set up in a minimum configuration with a USB mouse, Ethernet and headset. External antennas were used. Test software exercised video and peripherals. Radio was not transmitting.

TEST 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, Bilog, 2 GHz	Sunol Sciences	JB1	A121003	03/23/13
Preamplifier, 1300 MHz	Agilent / HP	8447D	2944A06589	01/16/14
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	MY48250925	11/21/13
LISN, 30 MHz	FCC	LISN-50/250-25-2	114	12/13/13
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	837990	03/07/13
EMI Test Receiver, 30 MHz	R & S	ESHS 20	827129/006	08/18/13

APPLICABLE LIMITS AND TEST RESULTS

6.1. RADIATED EMISSIONS

TEST PROCEDURE

ANSI C63.4

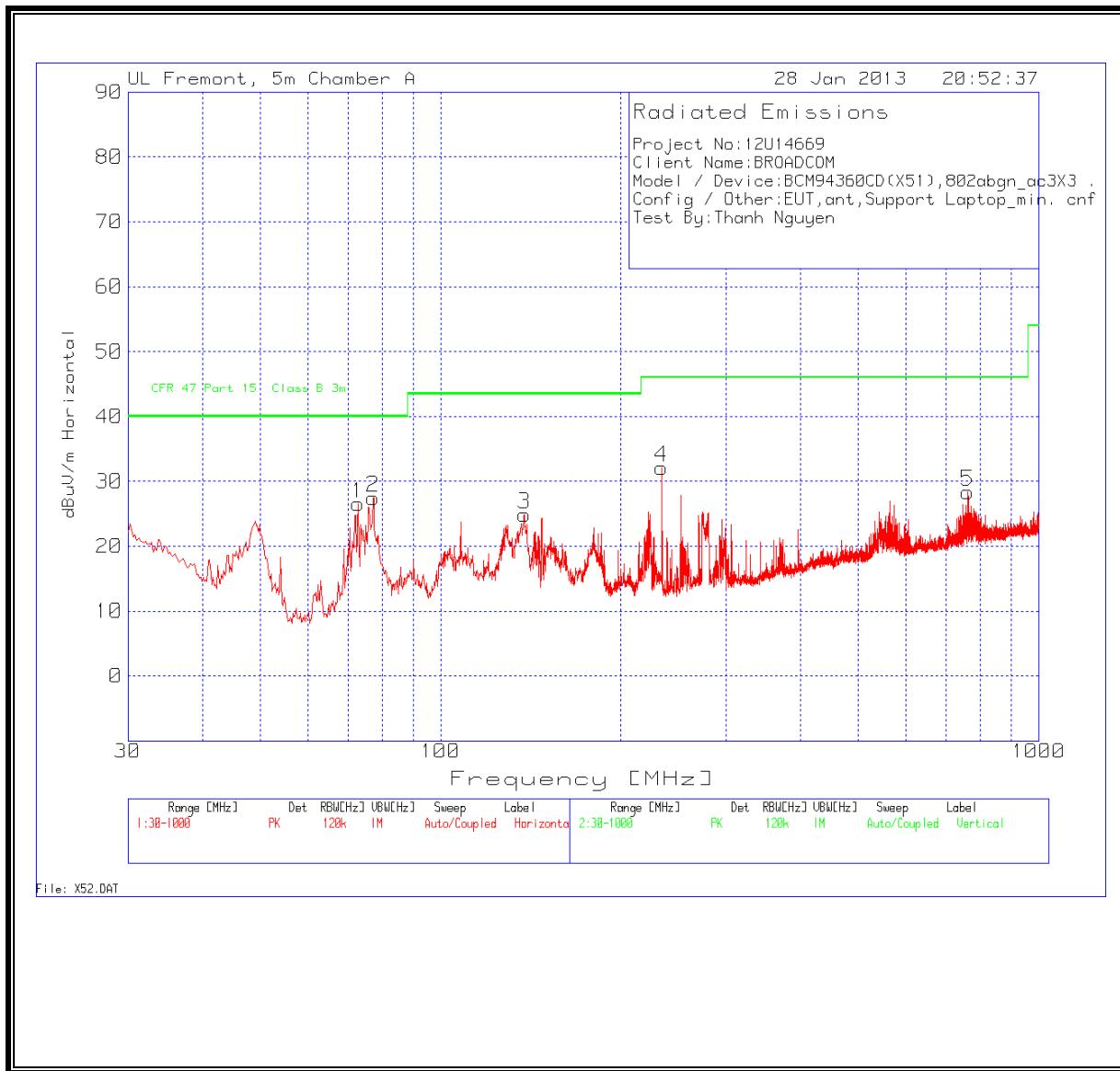
The highest clock frequency generated or used in the EUT for the digital portion was 40 MHz; therefore the frequency range was investigated from 30 MHz to 1000 MHz.

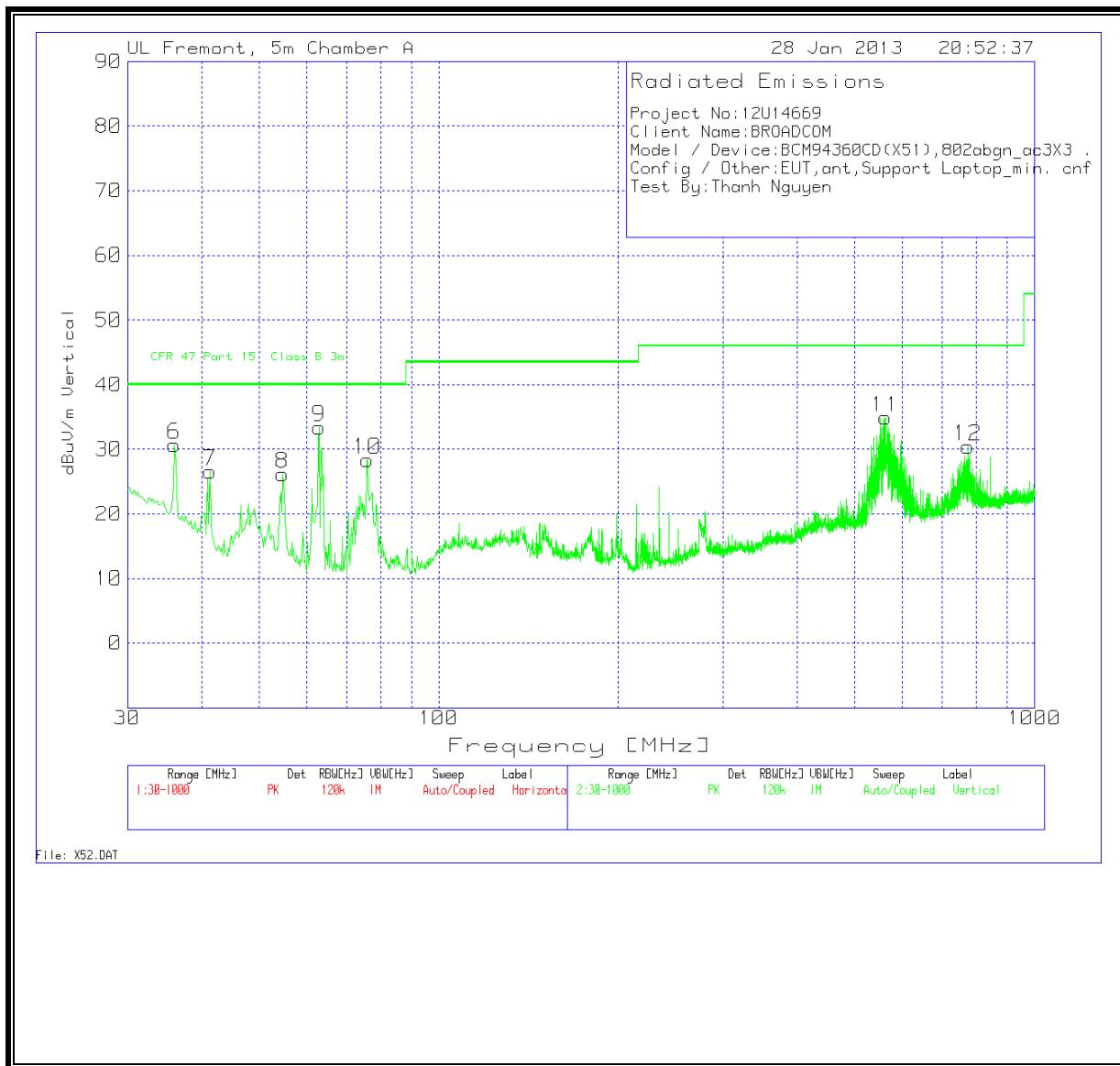
LIMIT

§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 μ 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.

RESULTS**RADIATED EMISSIONS 30 TO 1000 MHz - HORIZONTAL**

RADIATED EMISSIONS 30 TO 1000 MHz - VERTICAL

WORST EMISSIONS**HORIZONTAL AND VERTICAL DATA**

Project No:12U14669											
Client Name:BROADCOM											
Model / Device:BCM94360CD(X51),802abgn_ac3X3 .											
Config / Other:EUT,ant,Support Laptop_min.cnf											
Test By:Thanh Nguyen											
Marker No.	Test Frequency MHz	Meter Reading dB μ V	Detector	Antenna Factor dB	Amp Factor dB	Corrected dB μ V/m	CFR 47 Part 15 Class B 3m	Margin dB	Height cm	Polarity	
Horizontal 30 - 1000MHz											
1	72.8397	46.61	PK	8.1	-28.2	26.51	40	-13.49	400	Horz	
2	77.2012	47.7	PK	7.9	-28.1	27.5	40	-12.5	400	Horz	
3	137.9716	40.04	PK	12.9	-28	24.94	43.5	-18.56	300	Horz	
4	234.3126	48.82	PK	11.2	-27.9	32.12	46	-13.88	100	Horz	
5	761.1831	34.53	PK	20.8	-27	28.33	46	-17.67	100	Horz	
Vertical 30 - 1000MHz											
6	36.0092	41.99	PK	16.9	-28.2	30.69	40	-9.31	100	Vert	
7	41.243	41.71	PK	13.1	-28.2	26.61	40	-13.39	300	Vert	
8	54.6183	47.24	PK	7.2	-28.2	26.24	40	-13.76	100	Vert	
9	62.9536	54.03	PK	7.6	-28.2	33.43	40	-6.57	200	Vert	
10	75.9412	48.55	PK	8	-28.2	28.35	40	-11.65	100	Vert	
11	562.6859	43.79	PK	18.4	-27.3	34.89	46	-11.11	100	Vert	
12	774.3645	36.55	PK	20.9	-27	30.45	46	-15.55	100	Vert	
PK - Peak detector											
QP - Quasi-Peak detector											

6.2. AC MAINS LINE CONDUCTED EMISSIONS

TEST PROCEDURE

ANSI C63.4

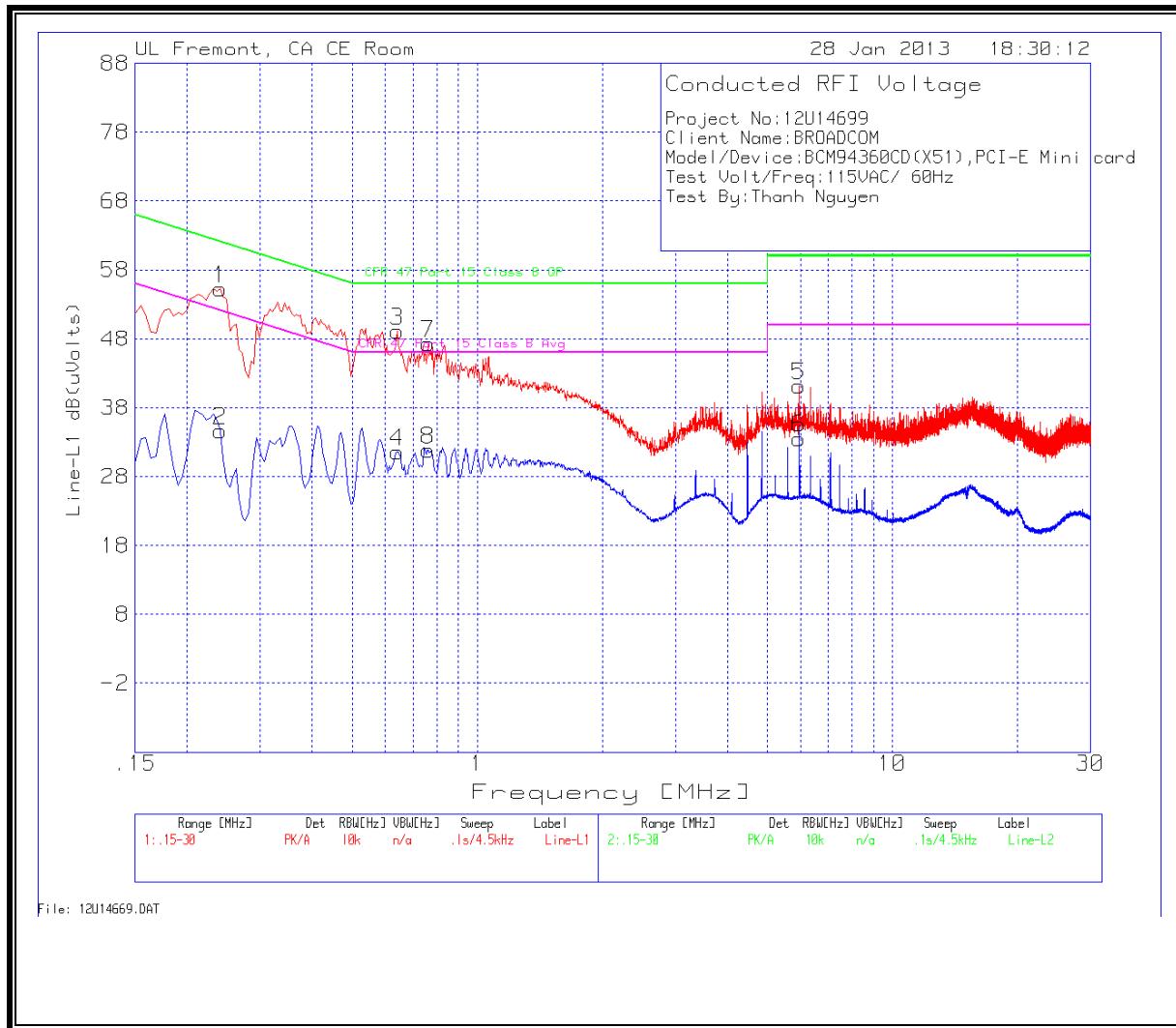
LIMIT

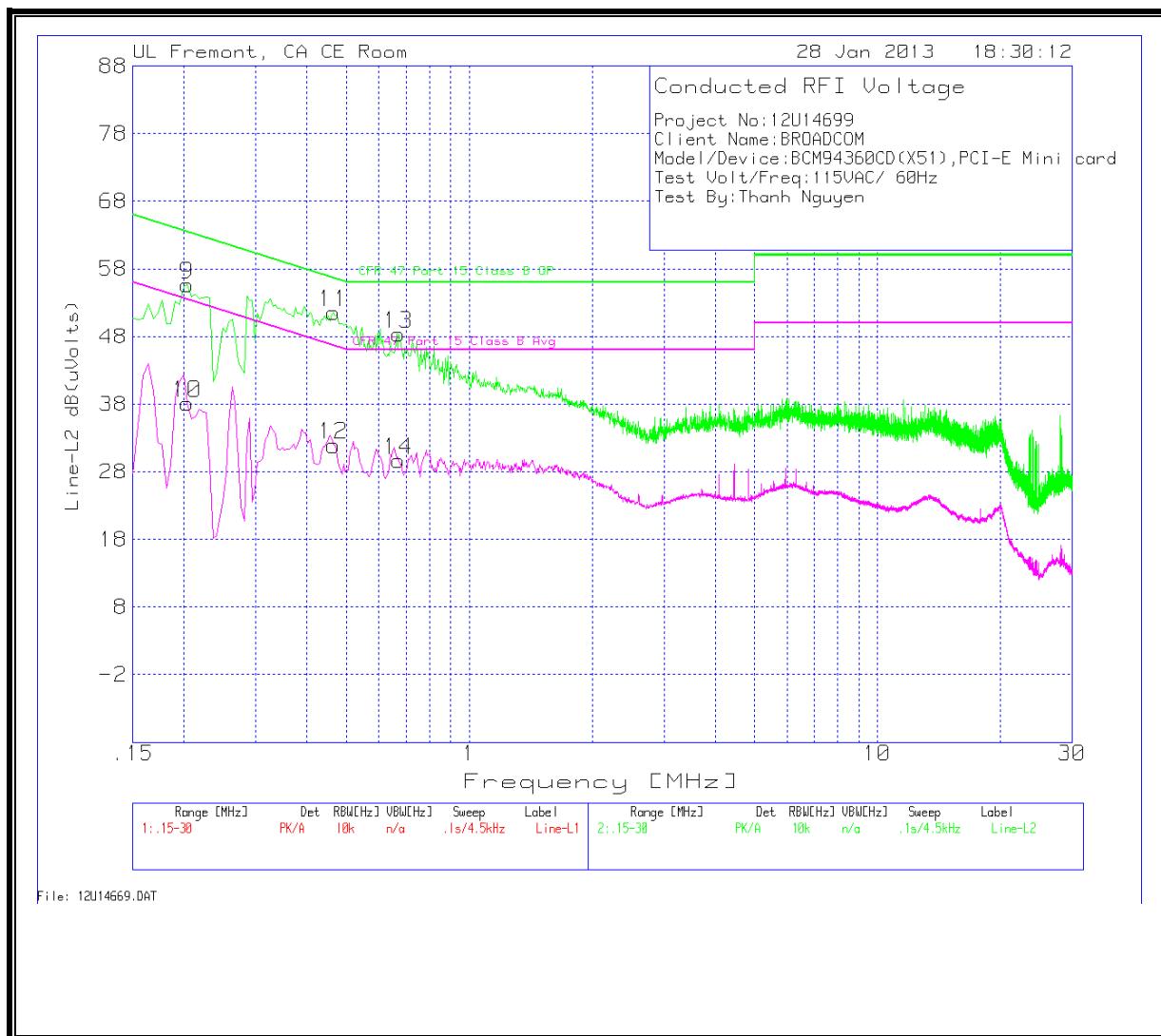
§15.107 (a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ 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 μ 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**LINE 1 RESULTS**

LINE 2 RESULTS

WORST EMISSIONS**HORIZONTAL AND VERTICAL DATA**

Project No:12U14699									
Client Name:BROADCOM									
Model/Device:BCM94360CD(X51),PCI-E Mini card									
Test Volt/Freq:115VAC/ 60Hz									
Test By:Thanh Nguyen									
Test Frequency MHz	Meter Reading dB μ V	Detector	LISN dB	Cables Loss dB	Corrected dB μ V	CFR 47 Part 15 Class B QP	Margin dB	CFR 47 Part 15 Class B Avg	Margin dB
Line-L1 .15 - 30MHz									
0.24	55.2	PK	0.1	0	55.3	62.1	-6.8	-	-
0.24	34.56	Av	0.1	0	34.66	-	-	52.1	-17.44
0.6405	49.01	PK	0.1	0	49.11	56	-6.89	-	-
0.6405	31.47	Av	0.1	0	31.57	-	-	46	-14.43
5.96625	41.01	PK	0.1	0.1	41.21	60	-18.79	-	-
5.96625	33.37	Av	0.1	0.1	33.57	-	-	50	-16.43
0.762	47.26	PK	0.1	0	47.36	56	-8.64	-	-
0.762	31.77	Av	0.1	0	31.87	-	-	46	-14.13
Line-L2 .15 - 30MHz									
0.204	55.52	PK	0.1	0	55.62	63.4	-7.78	-	-
0.204	38.06	Av	0.1	0	38.16	-	-	53.4	-15.24
0.465	51.43	PK	0.1	0	51.53	56.6	-5.07	-	-
0.465	31.81	Av	0.1	0	31.91	-	-	46.6	-14.69
0.672	48.21	PK	0.1	0	48.31	56	-7.69	-	-
0.672	29.6	Av	0.1	0	29.7	-	-	46	-16.3
PK - Peak detector									
AV - Average detector									