FCC CFR47 PART 15 SUBPART B

VERIFICATION TEST REPORT
DECLARATION OF CONFORMITY TEST REPORT

FOR

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

MODEL NUMBER: BCM94331PCIEBT3A

REPORT NUMBER: 11U13734-3

ISSUE DATE: APRIL 27, 2011

Prepared for

BROADCOM CORPORATION
190 MATHILDA PLACE
SUNNYVALE, CA 94086, U.S.A.

Prepared by

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	04/27/11	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:	802.11a/g/n WLAN + Bluetooth PCI-E Custom Combination Card
MODEL:	BCM94331PCIEBT3A
SERIAL NUMBER:	C961095004UDJY01W
DATE TESTED:	MARCH 17 & APRIL 19, 2011

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART B	Pass

Compliance Certification Services (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:

THU CHAN
ENGINEERING MANAGER
UL CCS

Tested By:

VIEN TRAN
EMC 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:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 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 an 802.11a/g/n WLAN + Bluetooth PCI-E Custom Combination Card.

The radio module is manufactured by Broadcom.

GENERAL INFORMATION

Power Requirements	100-240 VAC / 50-60 Hz
List of frequencies generated or used by the EUT	20 MHz

5.1. PRELIMINARY TEST CONFIGURATIONS

The following configuration was investigated during testing:

EUT Configuration	Description
Typical Configuration	EUT connected to laptop via extended board with minimum configuration such as printer, USB mouse.

5.1. MODE(s) OF OPERATION

Mode	Description
EMC Test & TX	All I/O ports activate with H' patterns scrolling on the screen display with TX on.

5.1. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Broadcom, rev. 5.100.98.29.

The test utility software used during testing was BCM Internal, rev. 5.100.RC98.29.

5.2. MODIFICATIONS

No modifications were made during testing.

5.3. DETAILS OF TESTED SYSTEM

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Lenovo	G560	CPU4495728	DoC
AC Adapter	Lenovo	ADP-65KH B	11S36001646ZZ1000AD9WJ	DoC
Adapter Board	Catalyst	MINI2EXP	BRCM 02	N/A
Adapter Board	Broadcom	BCM94331PCIBT4HAD	1385233	N/A
Mouse	HP	5184-1244	LZE01650057	N/A
Printer	HP	7850	MY56K1304B	DoC

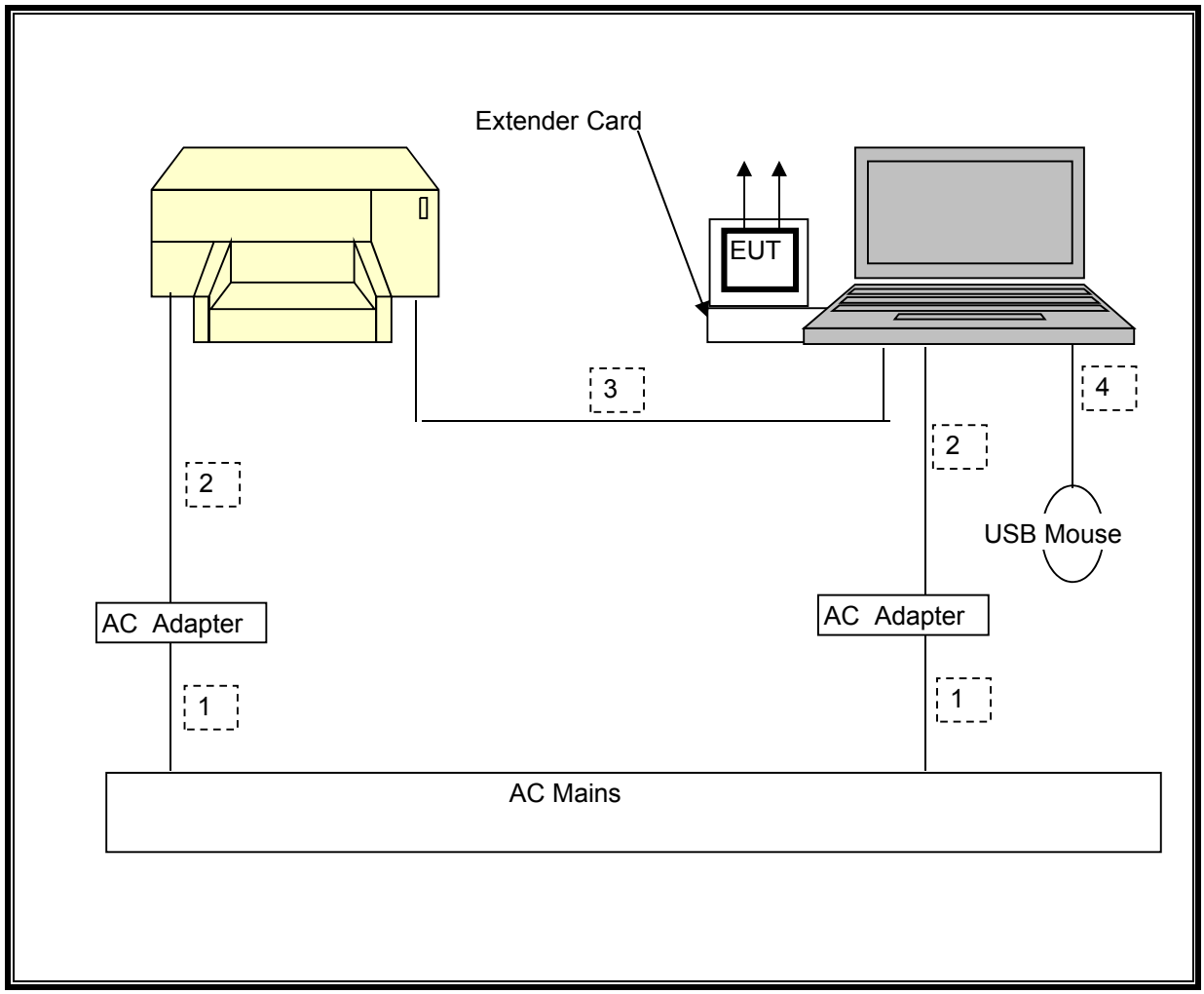
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	US 115V	Shielded	1.5m	NA
2	DC	1	DC	Un-shielded	1.5m	Ferrite at laptop's end
3	USB	1	Printer	Un-shielded	2.0m	Bundle
4	USB	1	USB	Un-shielded	2.0m	USB Mouse

TEST SETUP

The EUT is attached to a jig board which is installed in the PCMCI slot of a host laptop computer during the tests. Test software exercised the radio card.

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**	**Asset Number**	**Cal Due**
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01178	08/30/11
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01016	07/12/11
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	01/27/12
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	11/10/11
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	06/05/11

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 for the digital portion is 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 (dBµV/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.	

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

HORIZONTAL & VERTICAL DATA

30 - 1000 MHz Measurement
Compliance Certification Services, Fremont_ Chamber B

Test Engr:	**Vien Tran**
Date:	**04/19/11**
Project #:	**11U13734**
Company:	**Broadcom**
Test Target:	**FCC Part 15 B**
Mode Oper:	**Tx Worst-Case**

30 - 1000MHz - HORIZONTAL

Test Frequency	Meter Reading	Detector	Chamber 5B Below 1GHz Cable.TX [dB]	T10 Below 1 GHz PreAmp. TXT [dB]	T130 Bilog Factors. TXT [dB]	dB[uVolts/ meter]	CFR 47 Part 15 Class B 3m	Margin	Height [cm]	Polarity
215.7229	54.84	QP	2	-28.9	11.9	37.6	43.5	-5.90	200	Horz
266.3558	53.00	PK	2.3	-28.7	12.3	38.9	46	-7.10	100	Horz
296.7355	54.97	QP	2.4	-28.5	13.2	39.8	46	-6.20	100	Horz
499.8001	57.73	QP	3.1	-29.4	16.8	41.40	46	-4.60	200	Horz
896.0693	51.73	QP	4.1	-28.6	21.5	41.73	46	-4.27	100	Horz
952.8314	50.17	QP	4.3	-28.4	22.1	41.02	46	-4.98	100	Horz
995.2032	52.87	QP	4.5	-28.2	22.5	47.9	54	-6.10	100	Horz

30 - 1000MHz - VERTICAL

Test Frequency	Meter Reading	Detector	Chamber 5B Below 1GHz Cable.TX [dB]	T10 Below 1 GHz PreAmp. TXT [dB]	T130 Bilog Factors. TXT [dB]	dB[uVolts/ meter]	CFR 47 Part 15 Class B 3m	Margin	Height [cm]	Polarity
30.8496	40.61	PK	0.9	-29.5	20	32.01	40	-7.99	109	Vert
200.00	50.43	PK	2	-28.9	12	35.53	43.5	-7.97	200	Vert
497.9347	54.53	QP	3.1	-29.4	16.8	41.12	46	-4.88	100	Vert
715.1233	45.42	PK	3.7	-29.2	19.5	39.42	46	-6.58	100	Vert
896.0693	43.41	PK	4.1	-28.6	21.5	40.41	46	-5.59	100	Vert
996.8021	44.48	PK	4.5	-28.2	22.6	43.38	54	-10.62	100	Vert

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear Average detector
LgAv - Log Average detector
Av - Average detector
CAV - CISPR Average detector
RMS - RMS detection
CRMS - CISPR RMS detection
File: RE 30-1000 MHz 3m FCC Class B Full Scan.TST

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 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 band edges.

Frequency range (MHz)	Limits (dBμV)	
	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

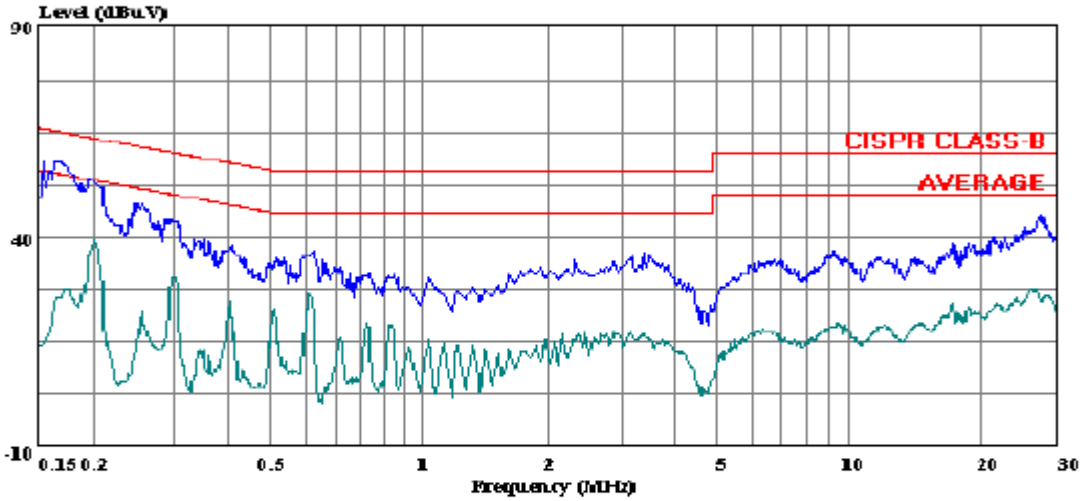
6 WORST EMISSIONS

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
0.17	57.95	--	27.53	0.00	65.16	55.16	-7.21	-27.63	L1
0.20	53.71	--	38.66	0.00	63.82	53.82	-10.11	-15.16	L1
27.13	44.27	--	27.47	0.00	60.00	50.00	-15.73	-22.53	L1
0.15	57.16	--	26.23	0.00	65.84	55.84	-8.68	-29.61	L2
0.23	47.98	--	38.74	0.00	62.38	52.38	-14.40	-13.64	L2
27.13	43.00	--	26.62	0.00	60.00	50.00	-17.00	-23.38	L2
6 Worst Data									

LINE 1 RESULTS

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 7 File#: AC Line Conduction_3x3 (x28).EMI
Date: 03-17-2011 Time: 13:55:28



Trace: 5 Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Vien Tran
Project # : 11U13734
Company : Broadcom
Configuration : EUT with Laptop
EUT Description: 802.11agn MIMO WLAN+Bluetooth Combo
Mode : Tx Worst-case
Target : FCC Class B
Voltage : 115V / 60Hz
: L1: Blue (Peak), Green (Average)

LINE 2 RESULTS

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

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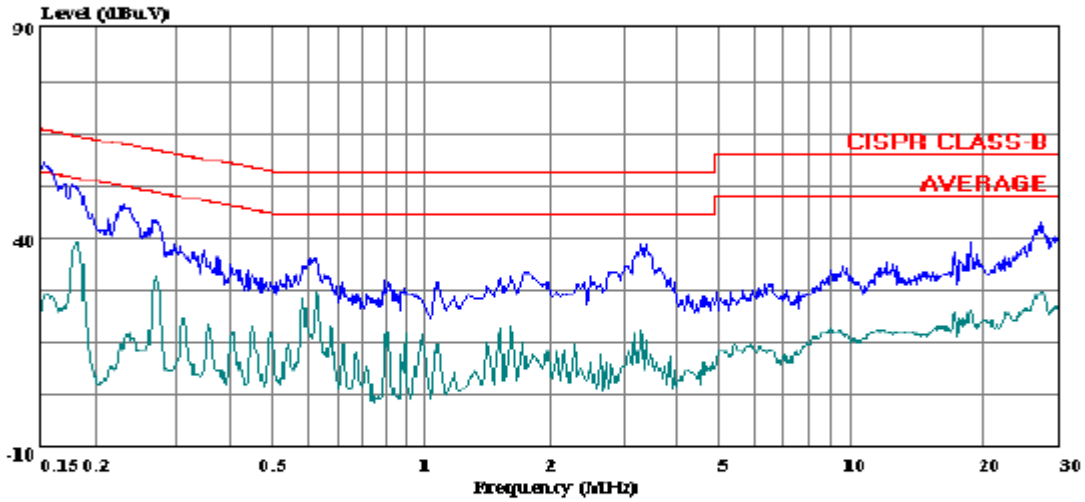

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Condition: CISPR CLASS-B
Test Operator : Vien Tran
Project # : 11U13734
Company : Broadcom
Configuration : EUT with Laptop
EUT Description: 802.11agn MIMO WLAN + Bluetooth Combo
Mode : Tx Worst-Case
Target : FCC Class B
Voltage : 115V / 60Hz
: L2: Blue (Peak), Green (Average)