FCC 47 CFR PART 15 SUBPART B

CERTIFICATION TEST REPORT

FOR

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

MODEL NUMBER: BCM94360CS2

FCC ID: QDS-BRCM1072
IC: 4324A-BRCM1072

REPORT NUMBER: 13U14796-10

ISSUE DATE: MARCH 19, 2013

Prepared for
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	03/19/13	Initial Issue	F. de Anda

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	BROADCOM CORPORATION 190 MATHILDA PLACE SUNNYVALE, CA 94086, U.S.A.
EUT DESCRIPTION:	Broadcom 802.11 a/g/n/ac WLAN + Bluetooth PCI-E Custom Combination Card
MODEL:	BCM94360CS2
SERIAL NUMBER:	C8Y2521000FC31EK
DATE TESTED:	MARCH 13 to 14, 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: Tested By:

FRANCISCO DE ANDA
WiSE OPERATIONS MANAGER
UL CCS

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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:

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

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 Air). The laptop used a mouse and headphones 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. 6.30.118.62.

The test utility software used during testing was Broadcom BlueTool, rev. 1.7.2.

5.5. MODIFICATIONS

No modifications were made during testing.

5.6. DETAILS OF TESTED SYSTEM

SUPPORT EQUIPMENT & PERIPHERALS

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**MODEL**	**Serial Number**	**FCC ID**
Laptop	Apple	Mac Book Air A1465	C02K0327AQDRV6	QDS-BRCM1052
AC Adapter	Apple	PA1450-8NSW	N/A	DoC
USB Mouse	MS	X80-7118-P1D 56180-576	4502	DoC
Headphone	Apple	N/A	N/a	N/A

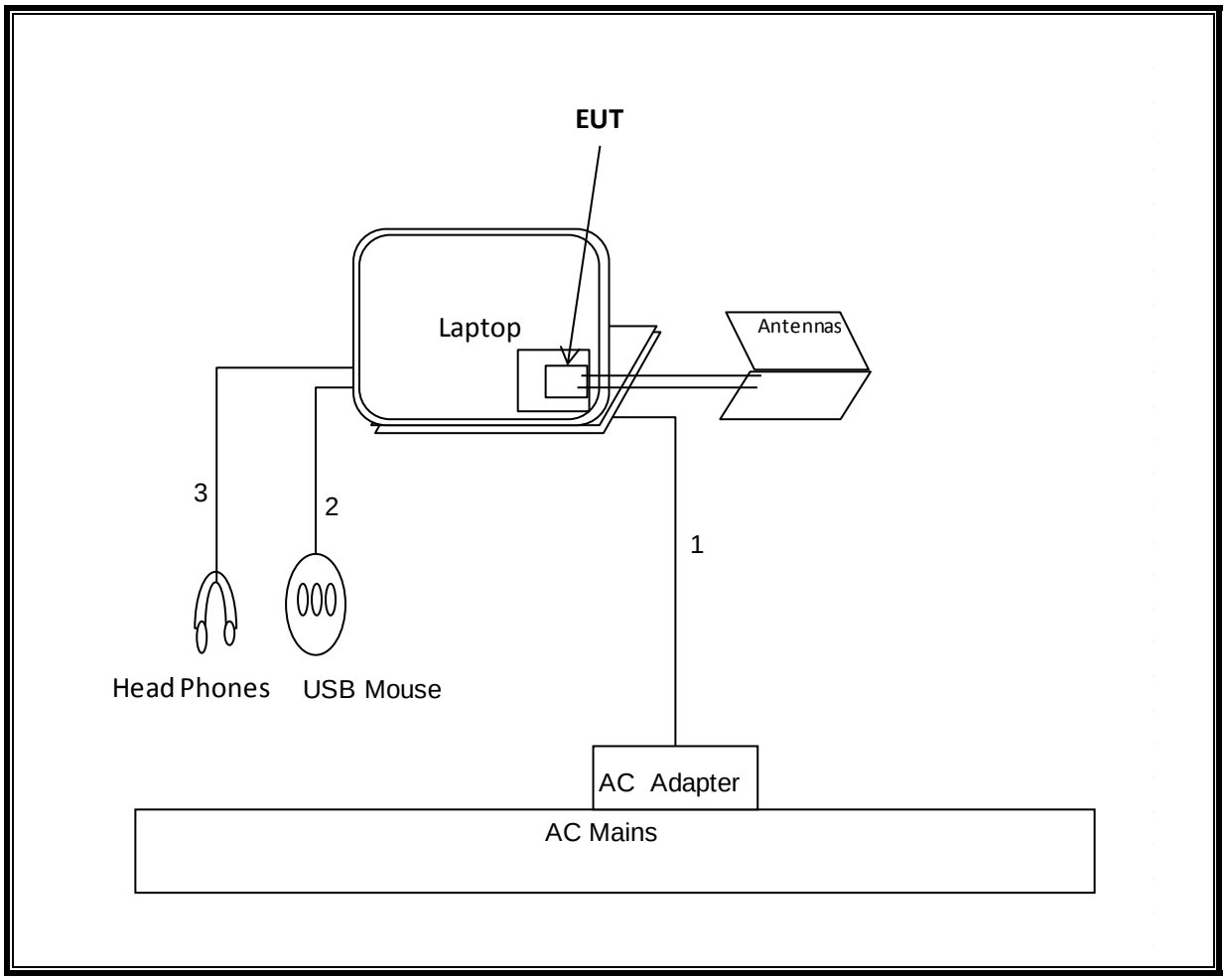
I/O CABLES

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	1.8 m	AC adapter out
3	USB Mouse	1	USB	Shielded	1.8 m	Mouse
4	Headphone	1	Mini jack	Shielded	1 m	Headphone

TEST SETUP

The EUT was installed in the laptop computer that was set up in a minimum configuration with a USB mouse and headphones. 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	08/14/13
Preamplifier,1300 MHz	Agilent / HP	8447D	2944A06589	02/21/14
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	04/07/13
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.

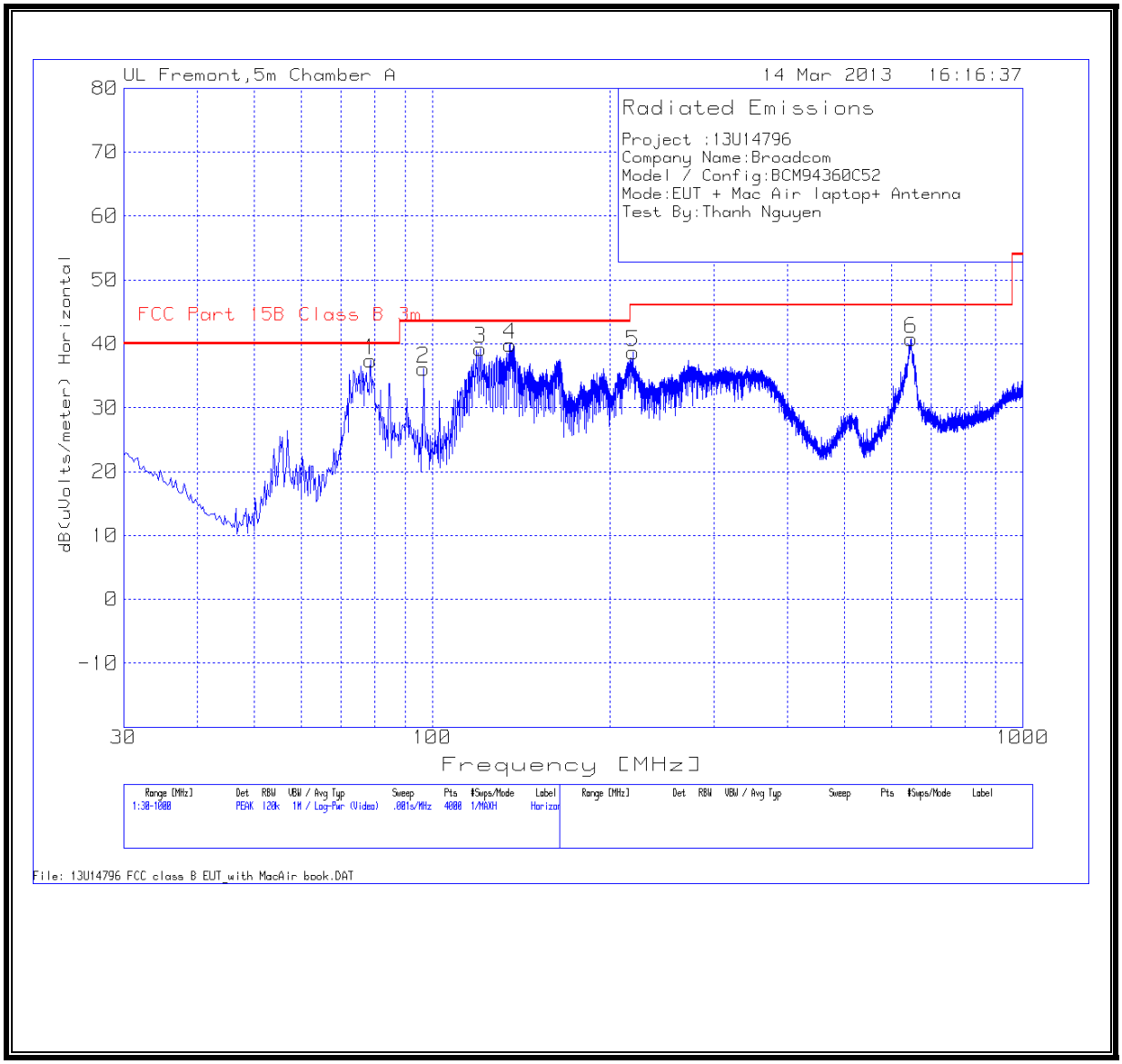
LIMIT

§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:

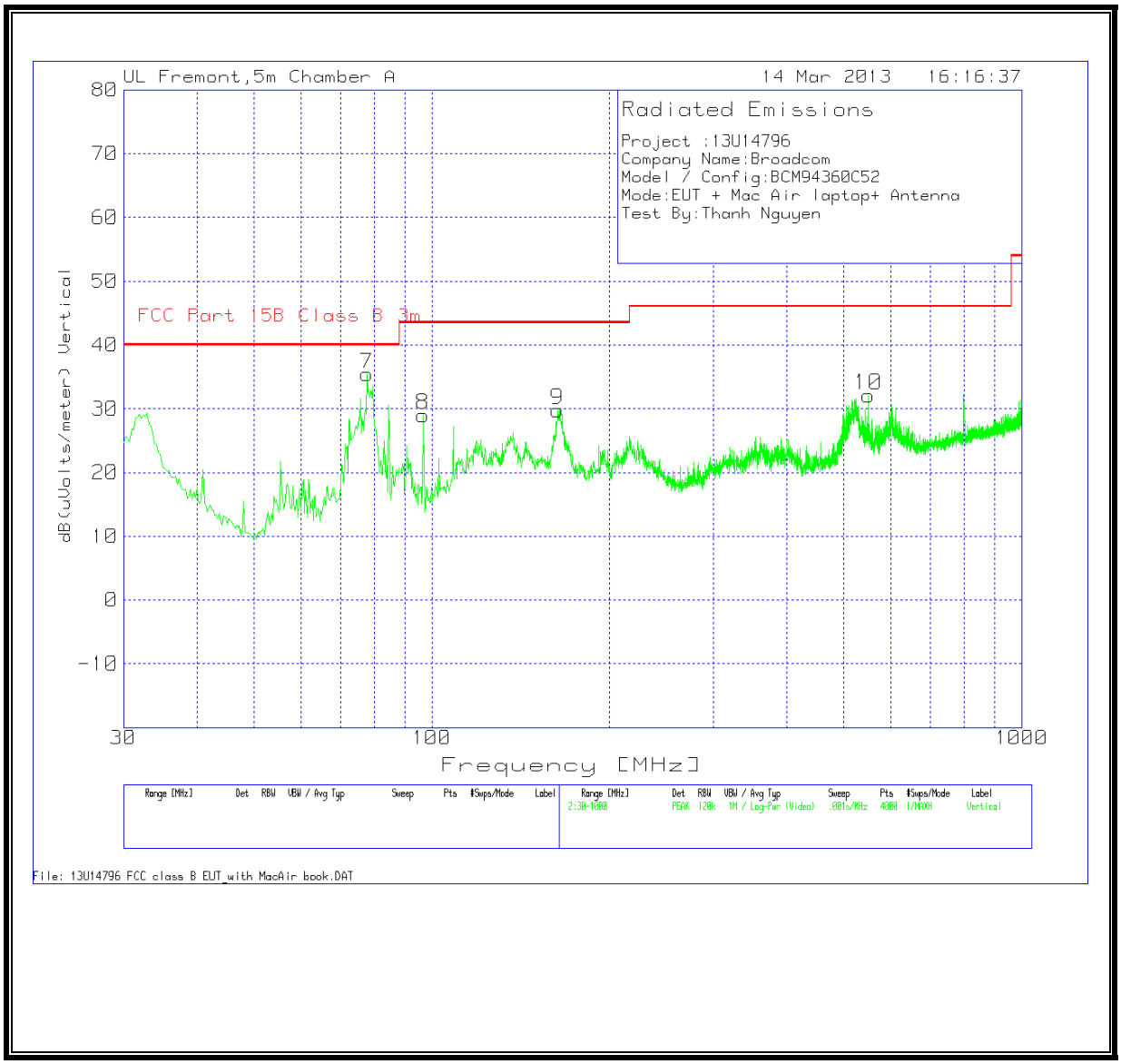
Limits for radiated disturbance of Class B ITE at measuring distance of 3 m	
Frequency range (MHz)	Quasi-peak limits (dBµV/m)
30 to 88	40
88 to 216	43.5
216 to 960	46
Above 960 MHz	54
Note: The lower limit shall apply at the transition frequency.	

RESULTS

RADIATED EMISSIONS 30 TO 1000 MHz - HORIZONTAL



RADIATED EMISSIONS 30 TO 1000 MHz - VERTICAL



WORST EMISSIONS

HORIZONTAL AND VERTICAL DATA

Project : 13U14796
Company Name:Broadcom
Model / Config: BCM94360CS2
Mode: EUT + Mac Air laptop+ Antenna+MS+HP
Test By: Thanh Nguyen

Marker No.	Test Frequency MHz	Meter Reading dB(µV/m)	Detector	T185 Antenna Factor	Gain / loss Factor	Corrected dB(µV/m)	FCC Part 15B Class B 3m Limit	Margin dB	Height cm	Polarity
Horizontal 30 - 1000MHz										
1	78.706	51.79	QP	7.8	-27.2	32.39	40	-7.61	169	Horz
2	96.6375	54.09	PK	9.1	-27.1	36.09	43.5	-7.41	300	Horz
3	120.8693	51.98	PK	14	-26.8	39.18	43.5	-4.32	300	Horz
4	135.6508	53.19	PK	13.5	-26.8	39.89	43.5	-3.61	200	Horz
5	218.7659	54.26	PK	10.7	-26.2	38.76	46	-7.24	100	Horz
6	647.9116	44.22	PK	19.8	-23.2	40.82	46	-5.18	100	Horz
Vertical 30 - 1000MHz										
7	77.7367	54.91	PK	7.8	-27.3	35.41	40	-4.59	400	Vert
8	96.6375	46.96	PK	9.1	-27.1	28.96	43.5	-14.54	100	Vert
9	163.5174	44.38	PK	11.9	-26.5	29.78	43.5	-13.72	200	Vert
10	549.5304	38.09	PK	18.2	-24.2	32.09	46	-13.91	100	Vert

PK - Peak detector
QP - Quasi-Peak detector

6.2. AC MAINS LINE CONDUCTED EMISSIONS

TEST PROCEDURE

ANSI C63.4

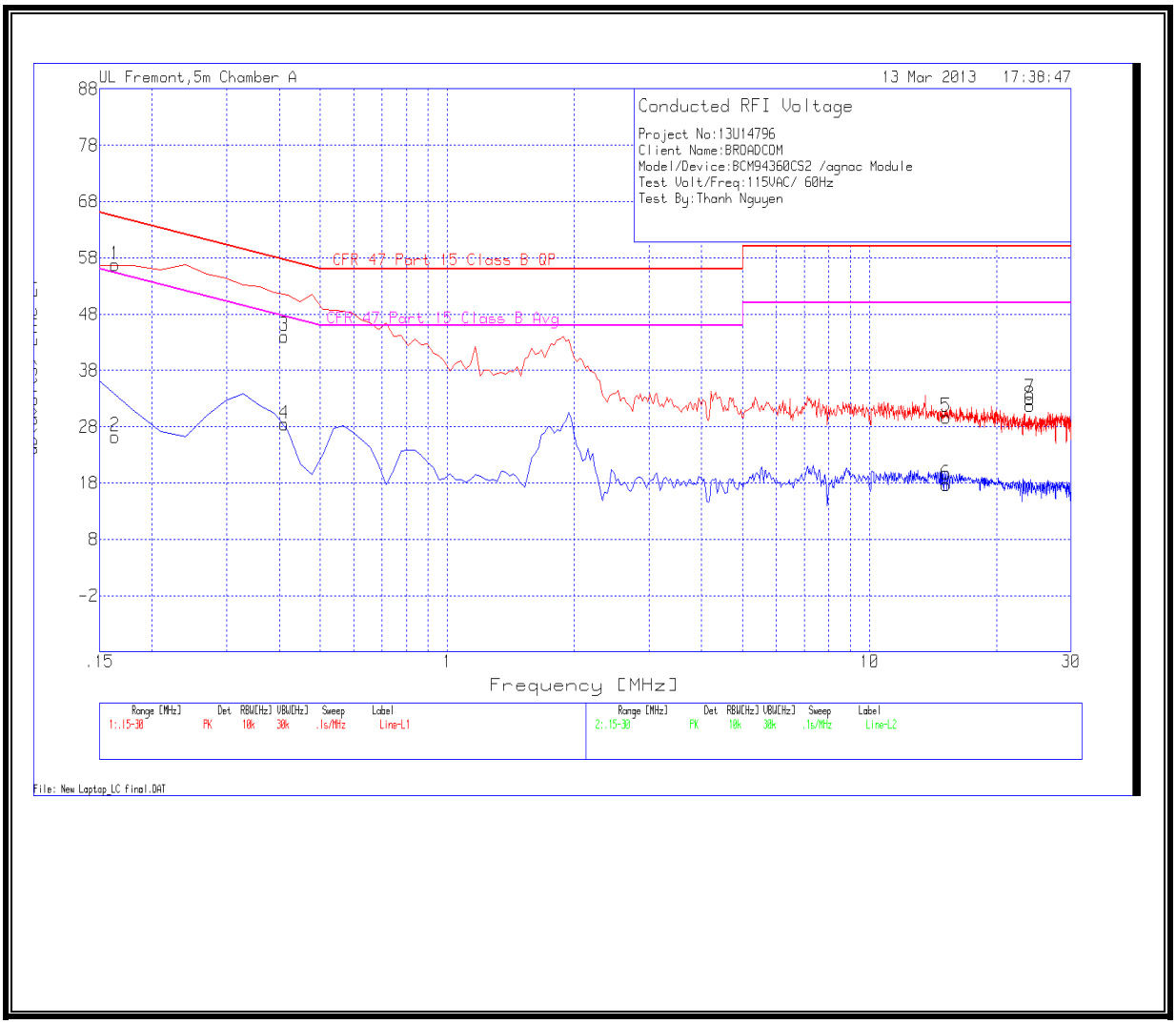
LIMIT

§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 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.

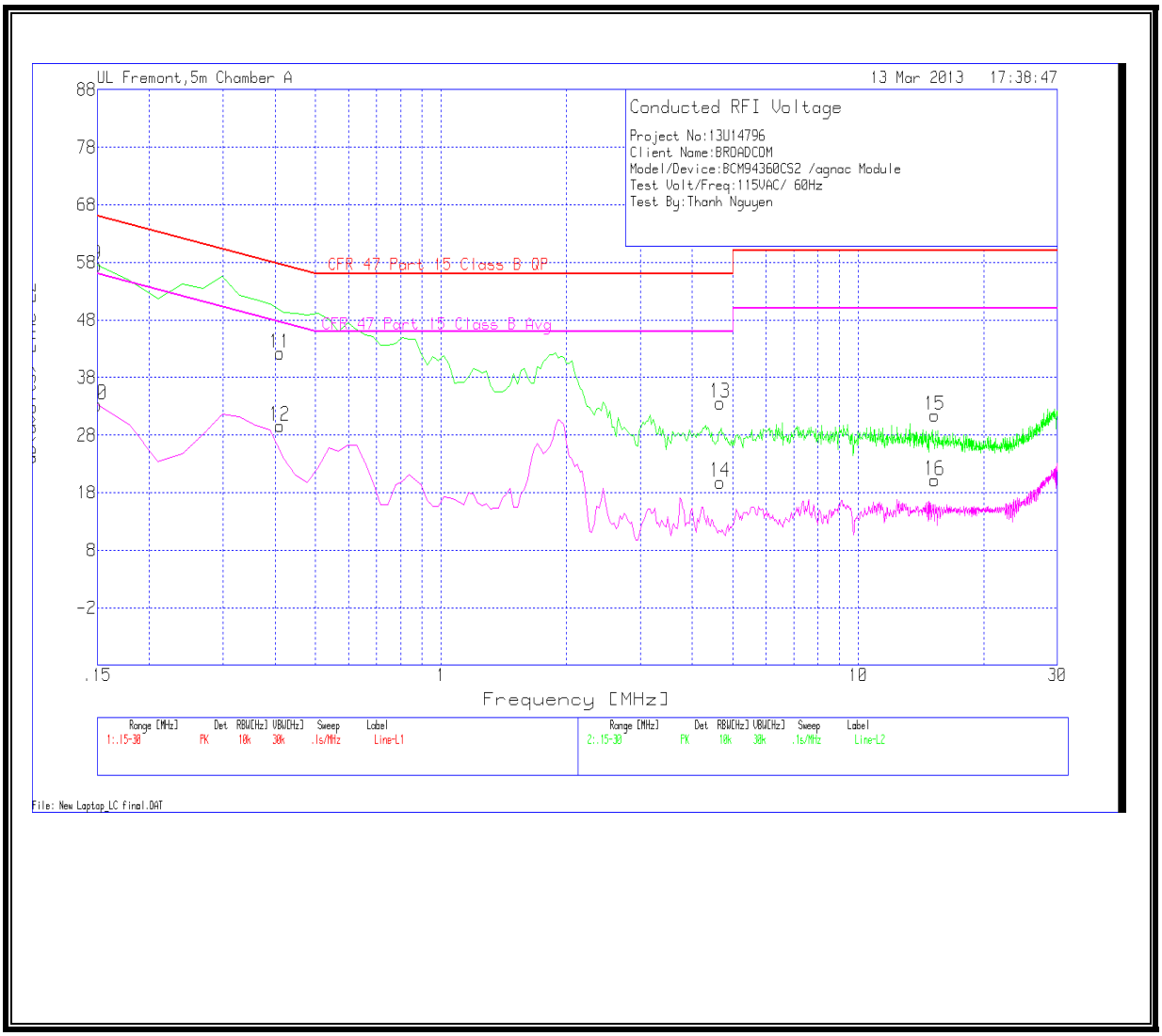
Frequency range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Notes: 1. The lower limit shall apply at the transition frequencies 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

RESULTS

LINE 1 RESULTS



LINE 2 RESULTS



WORST EMISSIONS

SUMMARY DATA

Project No:13U14796
Client Name:BROADCOM
Model/Device:BCM94360CS2 /agnac Module
Test Volt/Freq:115VAC/ 60Hz
Test By:Thanh Nguyen

Test Frequency MHz	Meter Reading dBµV	Detector	LISN dB	Cable Loss dB	Corrected dBµV	FCC Part 15B QP Limit	Margin dB	FCC Part 15B Avg Limit	Margin dB
Line-L1 .15 - 30MHz									
0.1635	56.64	PK	0.1	0	56.74	65.3	-8.56	-	-
0.1635	26.19	Av	0.1	0	26.29	-	-	55.3	-29.01
0.411	43.96	PK	0.1	0	44.06	57.6	-13.54	-	-
0.411	28.36	Av	0.1	0	28.46	-	-	47.6	-19.14
15.1755	29.3	PK	0.2	0.2	29.7	60	-30.3	-	-
15.1755	17.32	Av	0.2	0.2	17.72	-	-	50	-32.28
23.973	32.4	PK	0.4	0.2	33	60	-27	-	-
23.973	31.2	Av	0.4	0.2	31.8	-	-	50	-18.2
Line-L2 .15 - 30MHz									
0.15	57.47	PK	0.1	0	57.57	66	-8.43	-	-
0.15	33.22	Av	0.1	0	33.32	-	-	56	-22.68
0.411	42.12	PK	0.1	0	42.22	57.6	-15.38	-	-
0.411	29.51	Av	0.1	0	29.61	-	-	47.6	-17.99
4.6635	33.41	PK	0.1	0.1	33.61	56	-22.39	-	-
4.6635	19.66	Av	0.1	0.1	19.86	-	-	46	-26.14
15.2295	31.04	PK	0.2	0.2	31.44	60	-28.56	-	-
15.2295	19.78	Av	0.2	0.2	20.18	-	-	50	-29.82

PK - Peak detector
Av - Average detector