



**FCC 47 CFR PART 15 SUBPART B
ICES-003 ISSUE 5**

TEST REPORT

FOR

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

MODEL NUMBER: BCM94352Z

FCC ID: QDS-BRCM1076

IC ID: 4324A-BRCM1076

REPORT NUMBER: 13U15029-30

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Prepared for

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NVLAP LAB CODE 200065-0

Revision History

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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: BCM94352Z

SERIAL NUMBER: P203SN0032, P205SN089

DATE TESTED: JULY 16 TO JULY 22, 2013

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART B	Pass
ICES-003 ISSUE 5	Pass

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

Tested By:



STEVE LEITNER
OPERATIONS MANAGER
UL Verification Services Inc.



GARY VICTORINE
PROJECT LEAD
UL Verification Services Inc.

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 Verification Services Inc. 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:

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

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 host laptop via extender board, with minimum configuration.

5.3. WORST CASE MODE OF OPERATION

Mode	Description
EMC Test S/W	All I/O ports activated, scrolling "H" pattern on host laptop screen; Radios off

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Broadcom Ver. 5.1.0.1400.

5.5. MODIFICATIONS

No modifications were made to the EUT during testing.

5.6. DETAILS OF TESTED SYSTEM

SUPPORT EQUIPMENT

CONDUCTED EMISSIONS

SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	S/N	FCC ID
Laptop	Hewlett-Packard	EliteBook 2730p	2CE8487ZMT	DoC
AC Adapter 1	Hewlett-Packard	384019-002	F3-08060299390H	None
PCI-E Extender Board	Broadcom	P101	SN0024	None
Mouse	Logitech	M-U0026	130HS02AXG8	Doc
Ethernet Switch	Linksys	EZXS55W	R9160K909280	DoC
AC Adapter 2	DVE	DSA-9W-09	R101123003375	DoC

RADIATED EMISSIONS

SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	S/N	FCC ID
Laptop	Hewlett-Packard	EliteBook 2730p	2CE93355SF	DoC
AC Adapter 1	Hewlett-Packard	384020-001	8498774277	None
PCI-E Extender Board*	Broadcom	Not Available	Not Available	None
Mouse	Logitech	M-U0026	130HS02AXG8	Doc
Ethernet Switch	Linksys	EZXS55W	R9160K909280	DoC
AC Adapter 2	DVE	DSA-9W-09	R101123003375	DoC

* This extender board was fully covered with copper tape, top and bottom

I/O CABLES

CONDUCTED EMISSIONS

I/O CABLE LIST						
Cable No.	Port	No. of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	3-prong	Unshielded	0.75	Laptop AC Adapter
2	DC	1	Barrel	Unshielded	1.75	Laptop AC Adapter
3	USB	1	USB	Shielded	1.8	USB Mouse
4	DC	1	Barrel	Unshielded	1.8	Eth Switch AC Adapter
5	Ethernet	1	RJ45	Unshielded	0.8	Laptop to Switch

I/O CABLES

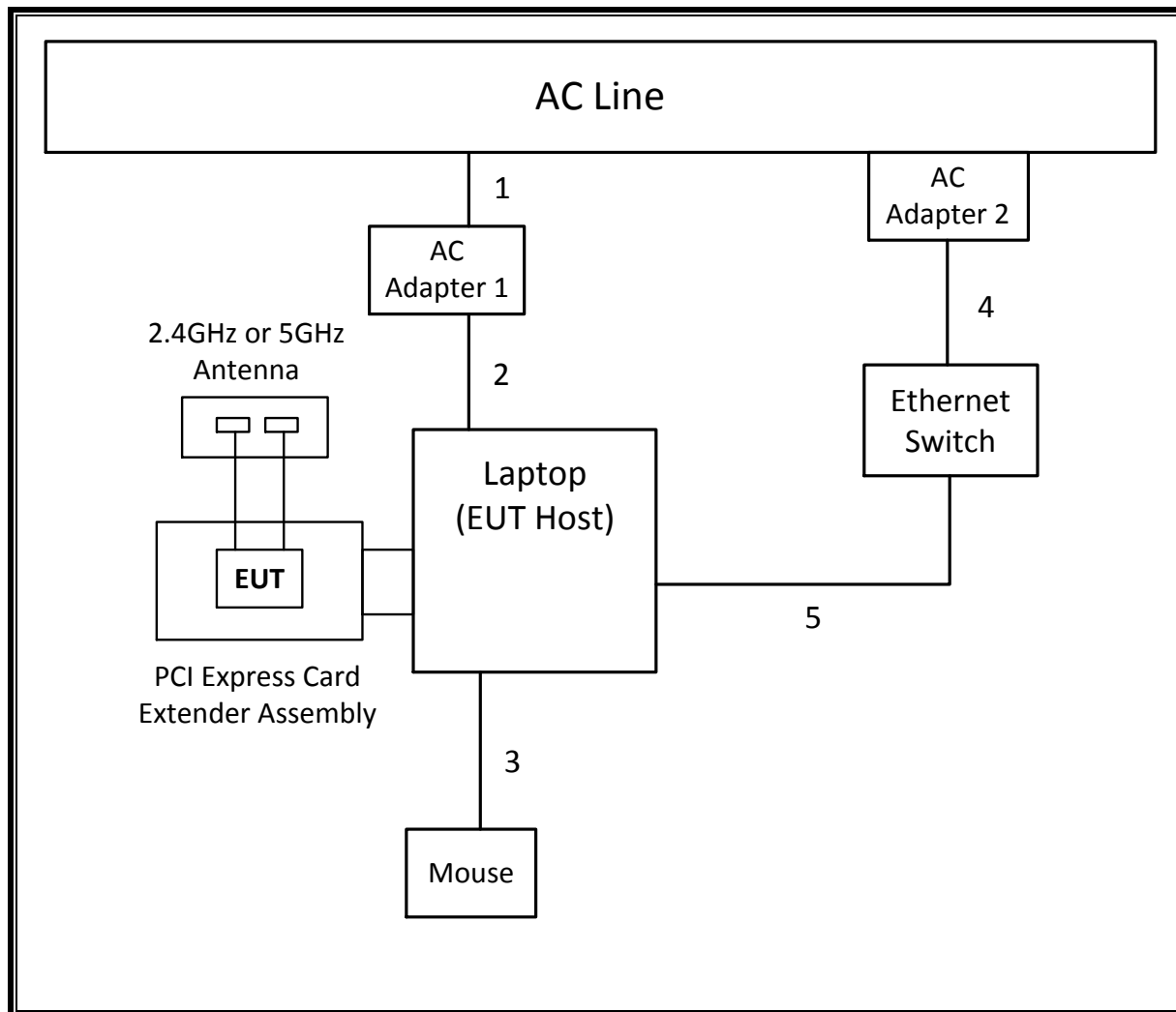
RADIATED EMISSIONS

I/O CABLE LIST						
Cable No.	Port	No. of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	3-prong	Unshielded	0.75	Laptop AC Adapter
2	DC	1	Barrel	Unshielded	1.75	Laptop AC Adapter
3	USB	1	USB	Shielded	1.8	USB Mouse
4	DC	1	Barrel	Unshielded	1.8	Eth Switch AC Adapter
5	Ethernet	1	RJ45	Unshielded	0.8	Laptop to Switch

TEST SETUP

The EUT was mounted to an extender board assembly which was installed in the ExpressCard slot of the host laptop computer during testing. Test software running scrolling "H"s exercised the host laptop computer.

SETUP DIAGRAM – RADIATED AND CONDUCTED EMISSIONS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST AND MEASUREMENT EQUIPMENT

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer, 26.5 GHz	Agilent/HP	E4440A	MY48250923	02/26/14
Preamplifier, 1300 MHz	Agilent/HP	8447D	2944A06589	01/28/14
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	A0022704	03/06/14
EMI Test Receiver	R & S	ESHS 20	827129/006	08/08/13
LISN, 10 kHz – 30 MHz	FCC	50/250-25-2	114	01/14/14
LISN, 10 kHz – 30 MHz (for support equipment)	Solar	8012-50-R-24- BNC	8379443	05/09/14

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 is 40 MHz. Therefore, the frequency range was investigated from 30 MHz to 1000 MHz.

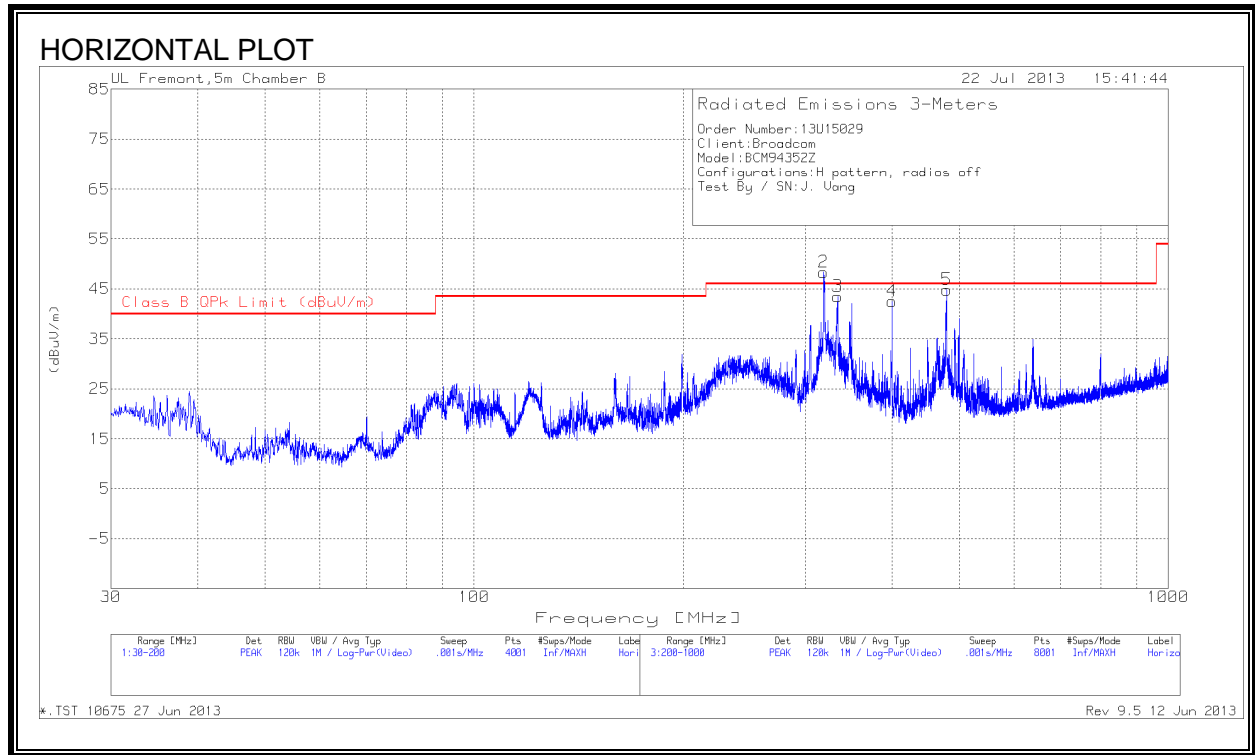
LIMIT

§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:

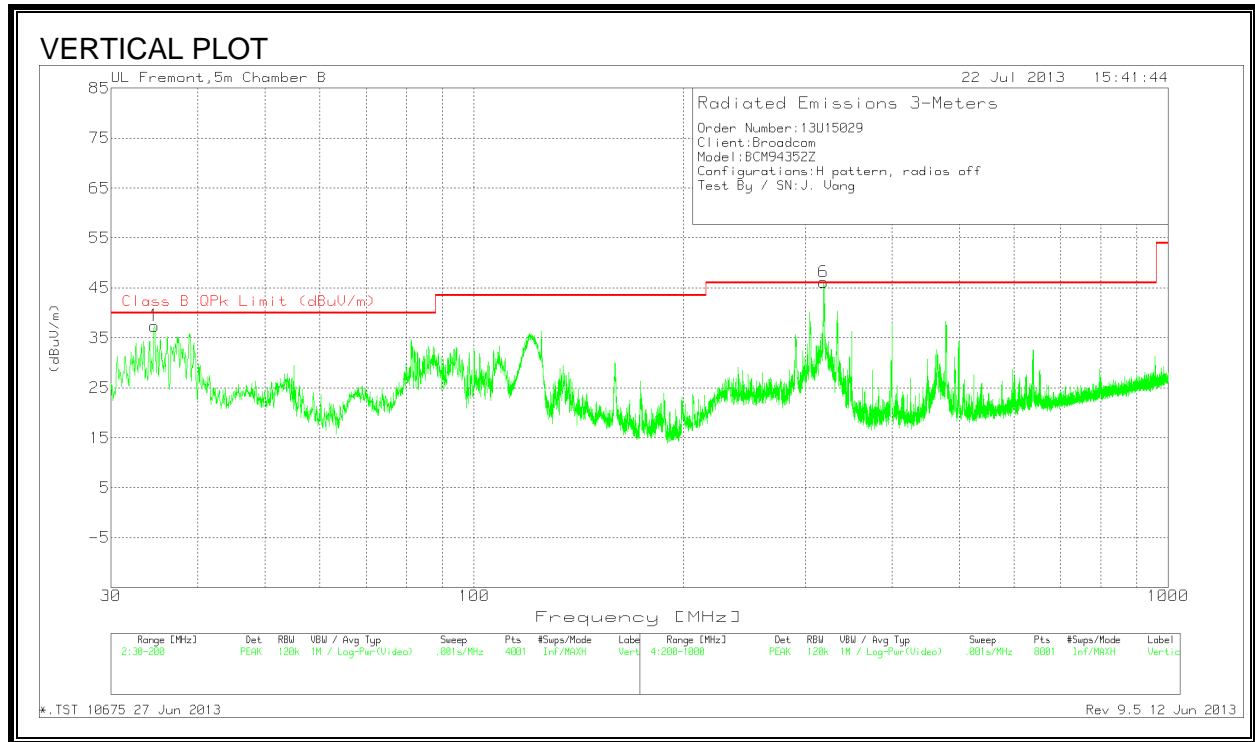
Limits for radiated disturbance of Class B ITE at measuring distance of 3 m	
Frequency range (MHz)	Quasi-peak limits (dB μ V/m)
30 to 88	40
88 to 216	43.5
216 to 960	46
Above 960 MHz	54
Note: The lower limit shall apply at the transition frequency.	

RESULTS

RADIATED EMISSIONS 30 TO 1000 MHz (HORIZONTAL)



RADIATED EMISSIONS 30 TO 1000 MHz (VERTICAL)



TRACE MARKERS

HORIZONTAL AND VERTICAL DATA

Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp/Cbl/Filtr /Pad (dB)	Corrected Reading (dBuV/m)	Class B QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
34.636	43.27	QP	17.5	-28.8	31.97	40	-8.03	206	208	V
319.5939	51.85	QP	13.8	-25.9	39.75	46	-6.27	128	372	H
332.9617	42.66	QP	13.9	-25.9	30.66	46	-15.36	0	165	H
400.0003	44.34	QP	15.5	-26.1	33.74	46	-12.28	180	234	H
478.8901	45.1	QP	17.7	-25.9	36.9	46	-9.12	43	233	H
319.6405	47.83	QP	13.8	-25.9	35.73	46	-10.29	299	255	V

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 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.

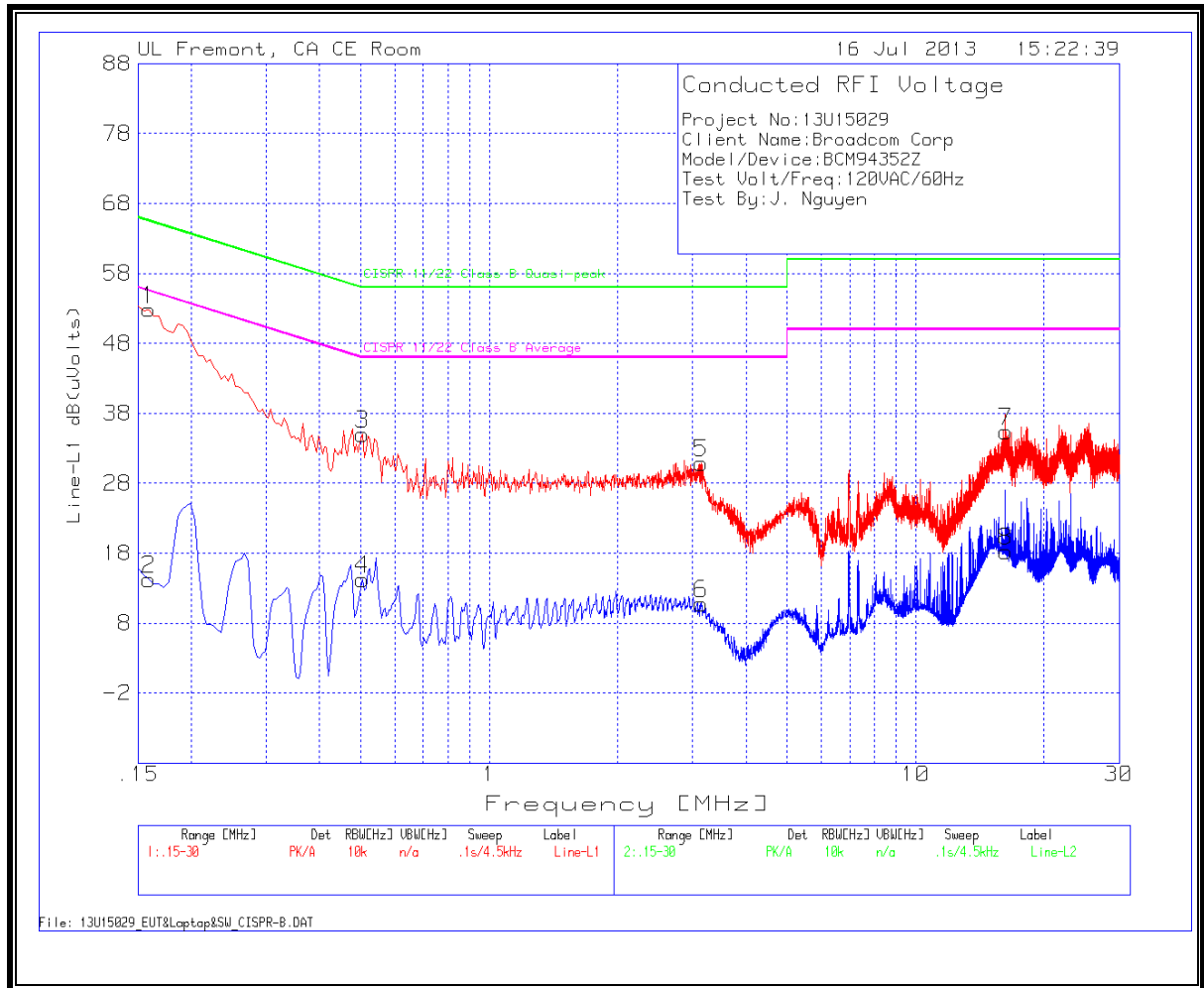
Frequency range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Notes: 1. The lower limit shall apply at the transition frequencies 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

RESULTS

WORST EMISSIONS

Project No: 13U15029									
Client Name: Broadcom Corp									
Model/Device: BCM94352Z									
Test Volt/Freq: 120VAC/60Hz									
Test By: J. Nguyen									
Test Frequency	Meter Reading	Detector	T24 IL L1.TXT (dB)	LC Cables 1&3.TXT (dB)	dBuVolts	CISPR 11/22 Class B Quasi-peak Limit	Margin	CISPR 11/22 Class B Average Limit	Margin
Line-L1 0.15 - 30MHz									
0.159	52.76	PK	0.1	0	52.86	65.5	-12.64	-	-
0.159	14.16	Av	0.1	0	14.26	-	-	55.5	-41.24
0.5055	34.94	PK	0.1	0	35.04	56	-20.96	-	-
0.5055	14.19	Av	0.1	0	14.29	-	-	46	-31.71
3.147	30.66	PK	0.1	0.1	30.86	56	-25.14	-	-
3.147	10.62	Av	0.1	0.1	10.82	-	-	46	-35.18
16.3095	34.97	PK	0.2	0.2	35.37	60	-24.63	-	-
16.3095	17.84	Av	0.2	0.2	18.24	-	-	50	-31.76
Line-L2 0.15 - 30MHz									
0.15	52.79	PK	0.1	0	52.89	66	-13.11	-	-
0.15	14.82	Av	0.1	0	14.92	-	-	56	-41.08
0.546	38.62	PK	0.1	0	38.72	56	-17.28	-	-
0.546	17.6	Av	0.1	0	17.7	-	-	46	-28.3
16.2915	32.59	PK	0.2	0.2	32.99	60	-27.01	-	-
16.2915	14.27	Av	0.2	0.2	14.67	-	-	50	-35.33
22.029	35.52	PK	0.3	0.2	36.02	60	-23.98	-	-
22.029	20.83	Av	0.3	0.2	21.33	-	-	50	-28.67
25.53	36.7	PK	0.5	0.3	37.5	60	-22.5	-	-
25.53	18.62	Av	0.5	0.3	19.42	-	-	50	-30.58
PK - Peak detector									
QP - Quasi-Peak detector									

LINE 1 RESULTS



LINE 2 RESULTS

