FCC CFR47 PART 15 SUBPART C
CLASS II PERMISSIVE CHANGE
TEST REPORT

FOR

2.4GHz / 5GHz WLAN MINI PCI CARD

MODEL NUMBER: BCM94309MP

FCC ID: QDS-BRCM1007

REPORT NUMBER: 03U1966-1

ISSUE DATE: 6/17/2003

Prepared for
BROADCOM CORPORATION
190 MATHILDA PLACE
SUNNYVALE, CA 94086 USA

Prepared by
COMPLIANCE CERTIFICATION SERVICES
561F MONTEREY ROAD,
MORGAN HILL, CA 95037, USA
TEL: (408) 463-0885
FAX: (408) 463-0888

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1. TEST RESULT CERTIFICATION

COMPANY NAME: BROADCOM CORPORATION
190 MATHILDA PLACE
SUNNYVALE CA 94086 USA

EUT DESCRIPTION: 2.4GHz / 5GHz WLAN MINI PCI CARD

MODEL: BCM94309MP

DATE TESTED: 6/12 – 6/15/2003

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART C	NO NON-COMPLIANCE NOTED

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: This document reports conditions under which testing was conducted and results of tests performed. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document.

Note: The 2.4 GHz band is applicable to this report; the 5.2 GHz band of operation is documented in a separate report.

Approved & Released For CCS By:

MIKE HECKROTTE
CHIEF ENGINEER
COMPLIANCE CERTIFICATION SERVICES

Tested By:

NEELESH RAJ
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. DESCRIPTION OF CLASS II CHANGE

The EUT is an 802.11a/b WLAN operating in the 2400 – 2483.5 MHz band with a peak output power of 19.77 dBm (95 mW). The changes are as follows:

Add a new host computer and add two new monopole type blade antennas.

The host computer is a Dell model PP04S.

The Wistron antenna has a peak gain of 1.22 dBi and the Hitachi antenna has a peak gain of 1.7 dBi. Testing was performed on the worst-case, highest gain antenna due to the same type of antennas.

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4/1992, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

4. FACILITIES AND ACCREDITATION

4.1. FACILITIES AND EQUIPMENT

The open area test sites and conducted measurement facilities used to collect the radiated data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

4.2. TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	1300
Japan	VCCI	CISPR 22 Two OATS and one conducted Site	R-1014, R-619, C-640
Norway	NEMKO	EN50081-1, EN50081-2, EN50082-1, EN50082-2, IEC61000-6-1, IEC61000-6-2, EN50083-2, EN50091-2, EN50130-4, EN55011, EN55013, EN55014-1, EN55104, EN55015, EN61547, EN55022, EN55024, EN61000-3-2, EN61000-3-3, EN60945, EN61326-1	ELA 117
Norway	NEMKO	EN60601-1-2 and IEC 60601-1-2, the Collateral Standards for Electro-Medical Products. MDD, 93/42/EEC, AIMD 90/385/EEC	ELA-171
Taiwan	BSMI	CNS 13438	SL2-IN-E-1012
Canada	Industry Canada	RSS210 Low Power Transmitter and Receiver	IC2324 A,B,C, and F

5. CALIBRATION AND UNCERTAINTY

5.1. MEASURING INSTRUMENT CALIBRATION

The measurement instruments utilized to perform the tests documented in this report have been calibrated in accordance with the manufacturer's recommendations, and are traceable to national standards.

5.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Radiated Emission, 30 to 200 MHz	+/- 3.3 dB
Radiated Emission, 200 to 1000 MHz	+4.5 / -2.9 dB
Radiated Emission, 1000 to 2000 MHz	+4.5 / -2.9 dB
Power Line Conducted Emission	+/- 2.9 dB

Uncertainty figures are valid to a confidence level of 95%.

5.3. TEST AND MEASUREMENT EQUIPMENT

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

TEST AND MEASUREMENT EQUIPMENT LIST				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due Date
Bilog Antenna	**AR**	**LPB-25201A**	**1185**	**3/28/2004**
EMI Receiver	**HP**	**8542A**	**3942A00280**	**11/20/2003**
RF Filter Section	**HP**	**85420E**	**3705A00256**	**11/20/2003**
EMI Test Receiver	**R & S**	**ESHS 20**	**827129/006**	**7/17/2004**
LISN, 10 kHz ~ 30 MHz	**FCC**	**50/250-25-2**	**114**	**9/6/2003**
Line Filter	**Lindgren**	**LMF-3489**	**497**	**CNR**
LISN, 10 kHz ~ 30 MHz	**Solar**	**8012-50-R-24-BNC**	**837990**	**9/6/2003**
Preamplifier, 1 ~ 26 GHz	**Miteq**	**NSP10023988**	**646456**	**4/25/2004**
Antenna, Horn 1 ~ 18 GHz	**EMCO**	**3115**	**2238**	**2/4/2004**
Psa SeriesSpectrum Analyzer	**HP**	**E4440A**	**US41421507**	**5/8/2004**
2.4-2.5GHz reject filter	**Micro Tronic**	**BRM50702**	**2**	**N.C.R**

6. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Device Type	Manufacturer	Model	Serial Number	FCC ID
Laptop	**Dell**	**PP04S**	**N/A**	**DoC**
AC Adapter	**Dell**	**AA22850**	**N/A**	**N/A**

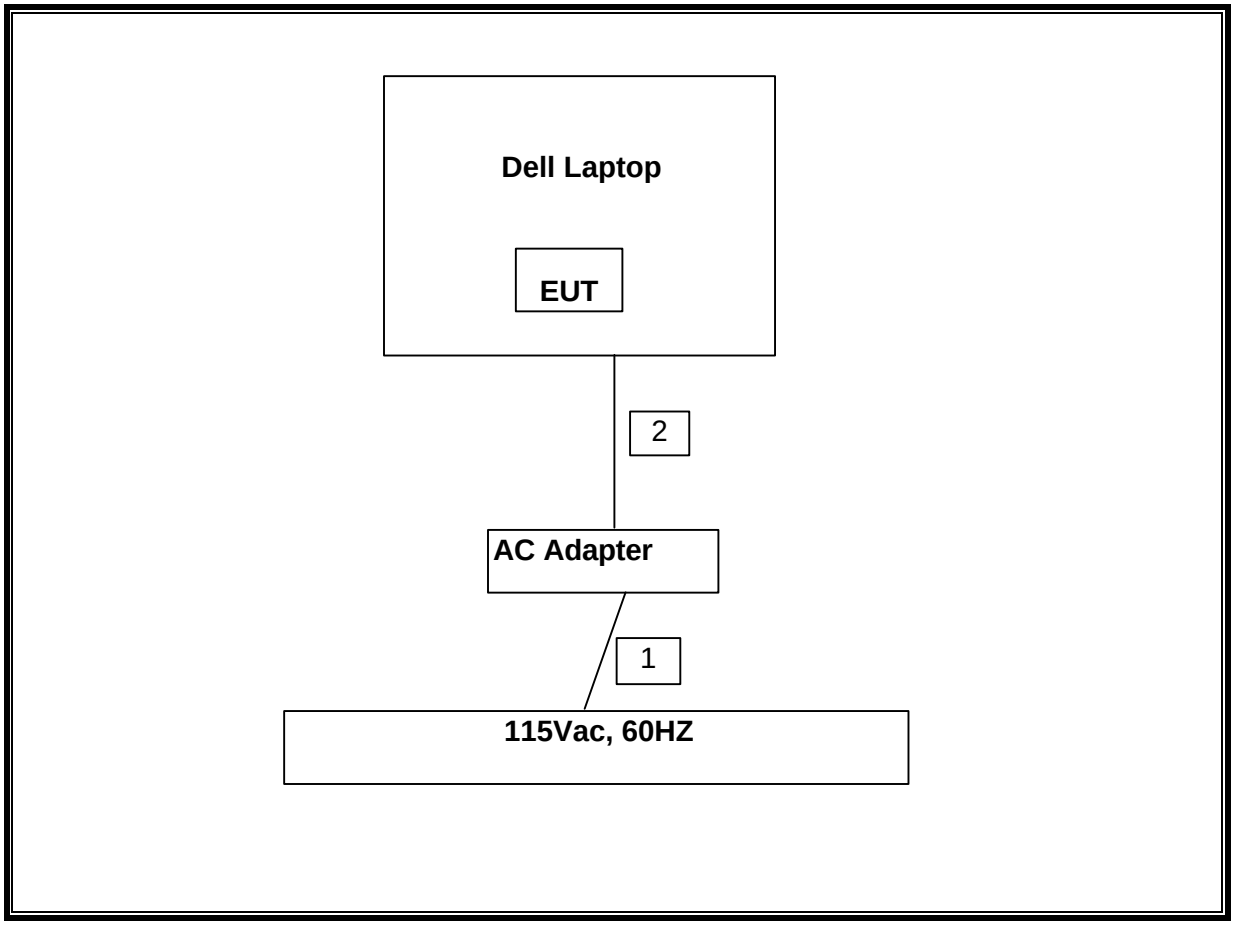
I/O CABLES

Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	**AC**	**1**	**US115**	**Unshielded**	**1.8m**	**No**
2	**DC**	**1**	**DC Jack**	**Unshielded**	**1.8m**	**No**

TEST SETUP

The EUT was installed in a host computer.

SETUP DIAGRAM



7. APPLICABLE LIMITS AND TEST RESULTS

7.1. RADIATED EMISSIONS

LIMITS

§15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2] Above 38.6

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

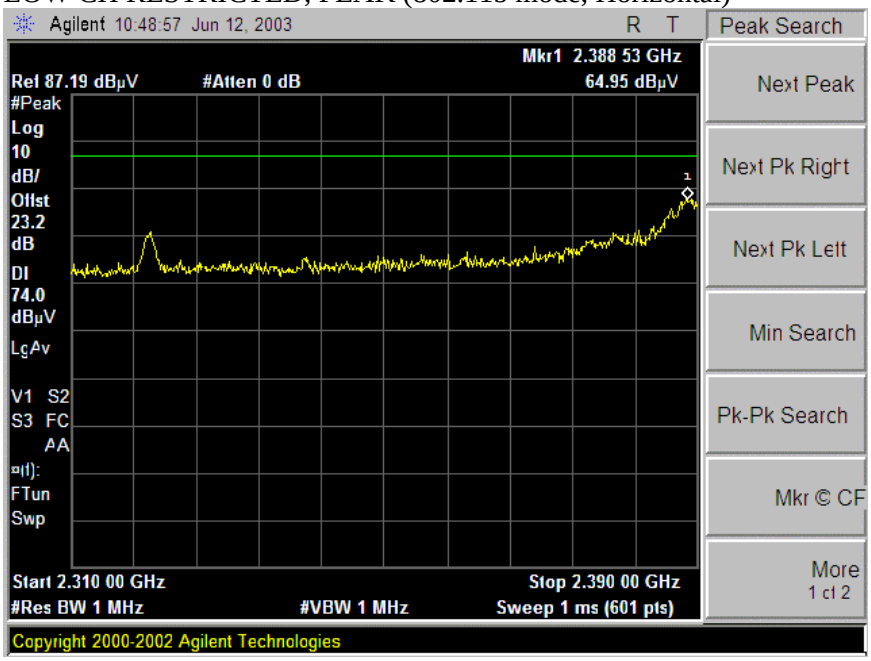
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

RESULTS

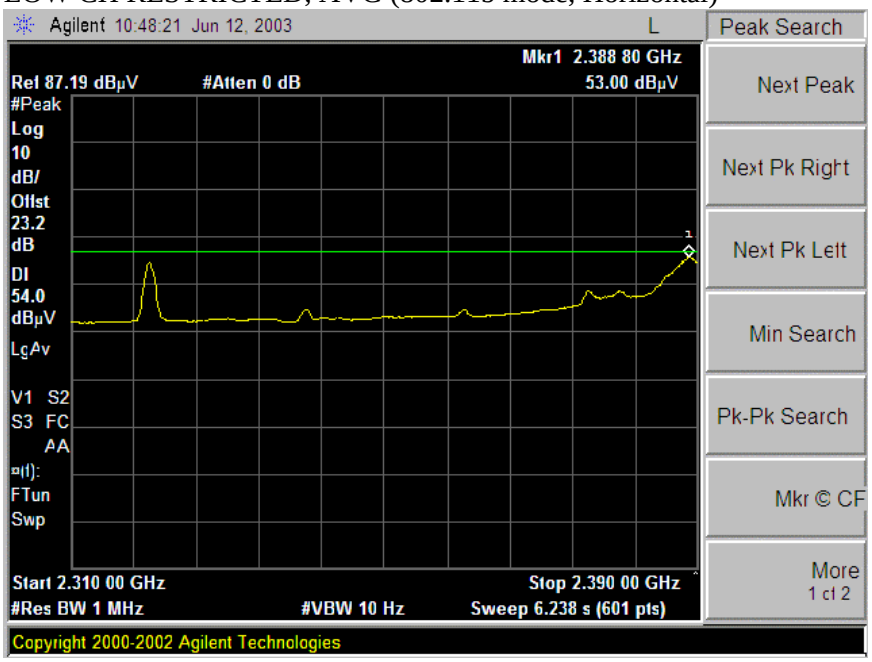
No non-compliance noted:

RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11b mode, Horizontal)

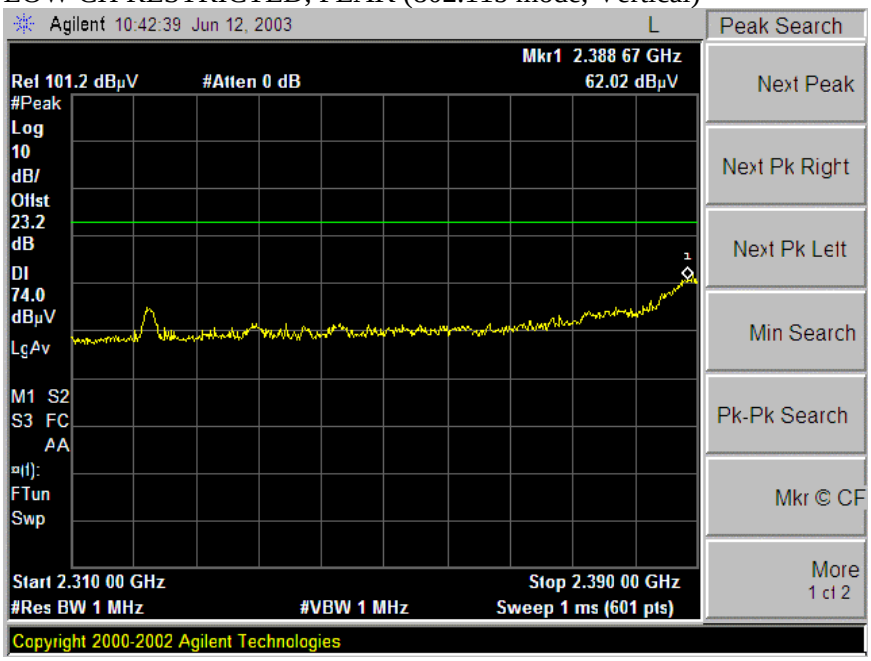


LOW CH RESTRICTED, AVG (802.11b mode, Horizontal)

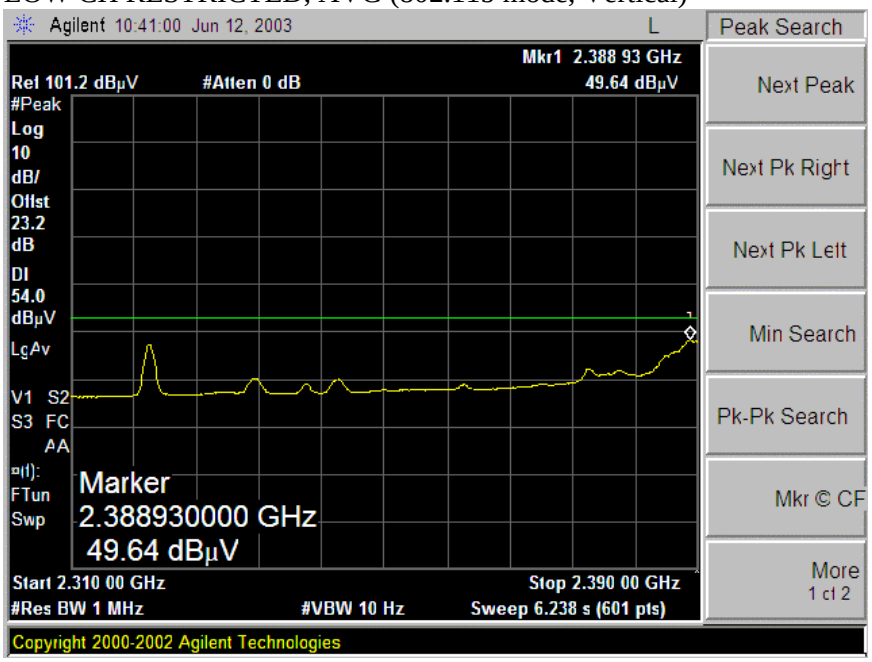


RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11b mode, Vertical)

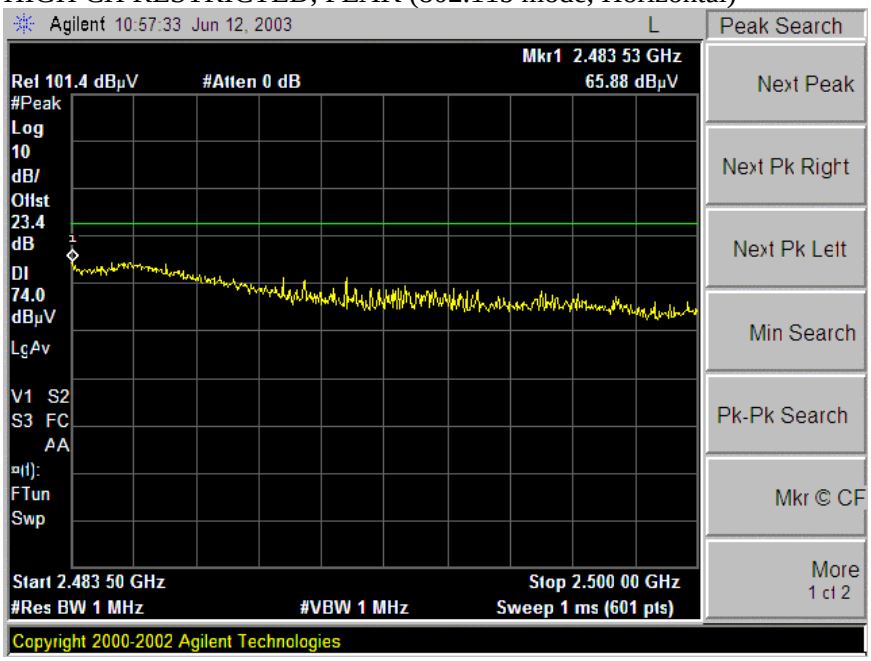


LOW CH RESTRICTED, AVG (802.11b mode, Vertical)

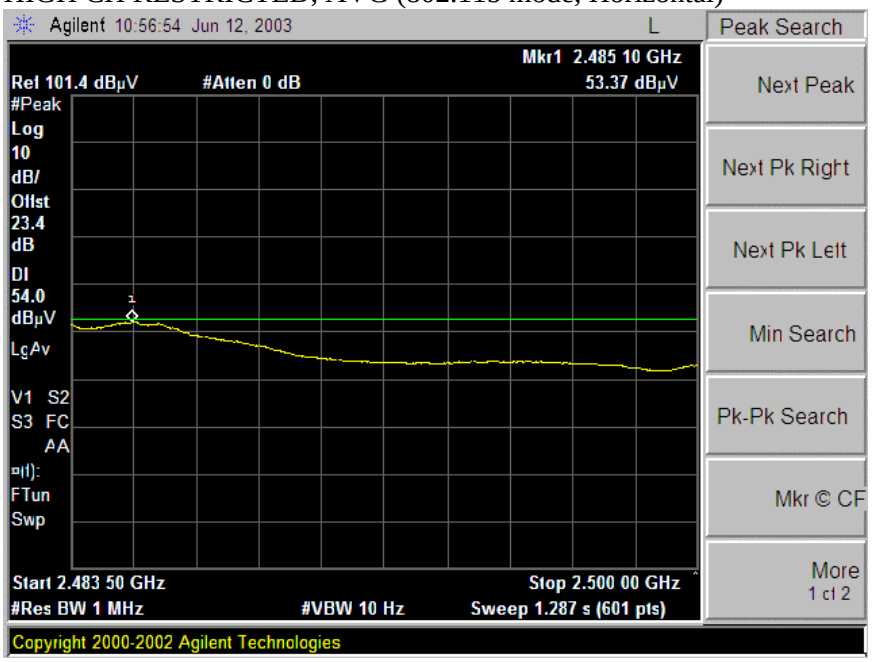


RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11b mode, Horizontal)

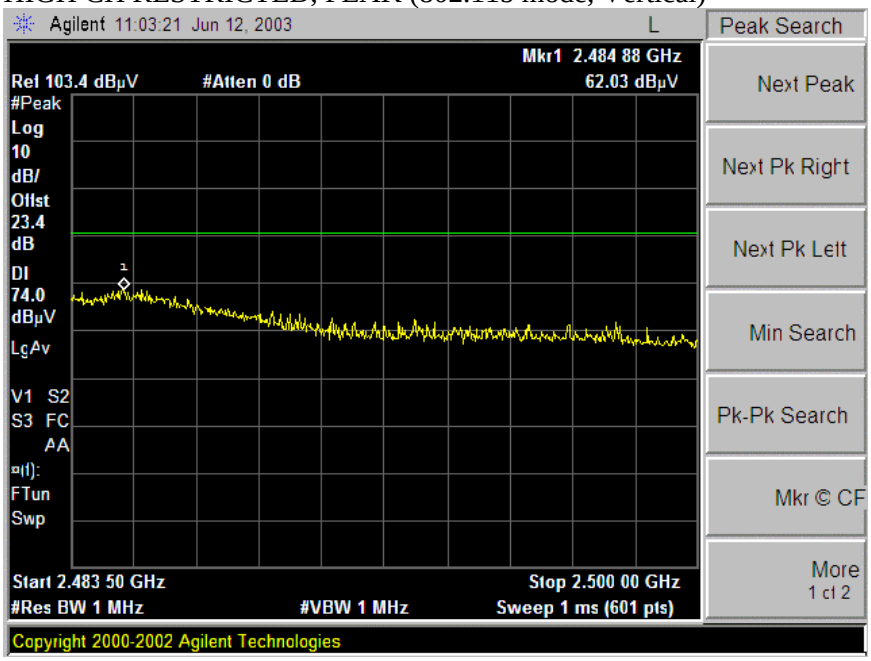


HIGH CH RESTRICTED, AVG (802.11b mode, Horizontal)

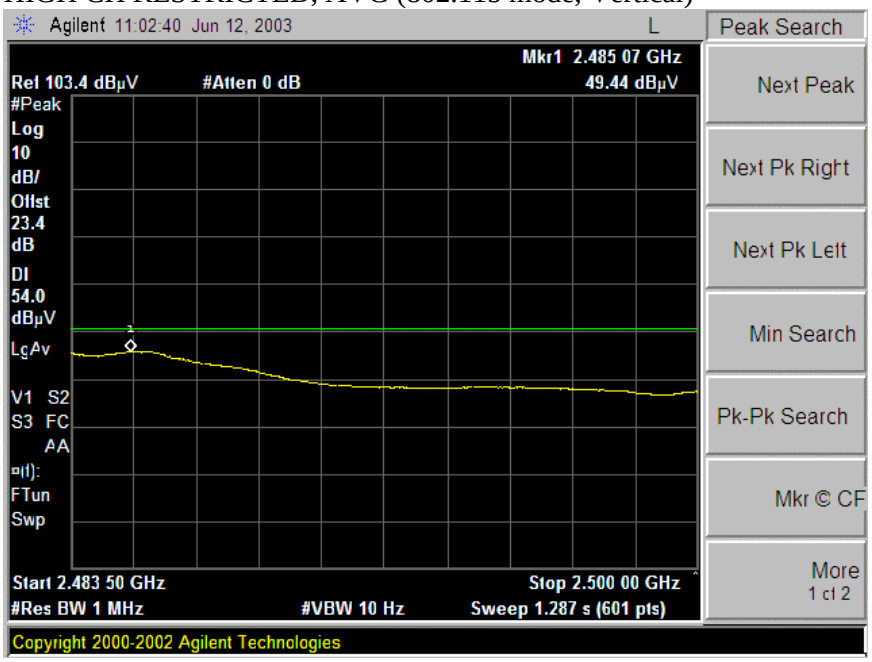


RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11b mode, Vertical)



HIGH CH RESTRICTED, AVG (802.11b mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS b-MODE

06/17/03 **High Frequency Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: Thanh Nguyen
Project #: 03U1966-1
Company: BROADCOM Corporation
EUT Descrip.: 2.4GHz/5.8GHz WLAN MiniPCI Card (FCC ID QDS-BRCM1007)
EUT M/N: BCM94309MP
Test Target: FCC 15.247
Mode Oper:Tx b-mode

Test Equipment:

EMCO Horn 1-18GHz	Pre-amplifer 1-26GHz	Spectrum Analyzer	Horn > 18GHz
T59; S/N: 3245 @3m	T63 Miteq 646456	HP 8593EM Analyzer	

Hi Frequency Cables
☐ (2 ft) ☑ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☑ (12 ft)

Peak Measurements:
1 MHz Resolution Bandwidth
1MHz Video Bandwidth

Average Measurements:
1 MHz Resolution Bandwidth
10Hz Video Bandwidth

f GHz	Dist feet	Read Pk dBuV	Read Avg dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
Channel 1, 2.412GHZ															
Harmonics															
4.824	9.8	45.6	34.6	33.1	3.1	-35.3	0.0	1.0	47.5	36.4	74.0	54.0	-26.5	-17.6	Noise Floor
Channel 6, 2.437GHZ															
Harmonisc															
4.874	9.8	45.3	34.3	33.1	3.2	-35.3	0.0	1.0	47.3	36.2	74.0	54.0	-26.7	-17.8	Noise Floor
Channel 11, 2.462GHZ															
Harmonics															
4.924	9.8	47.1	34.9	33.1	3.2	-35.3	0.0	1.0	49.0	36.9	74.0	54.0	-25.0	-17.1	Noise Floor
other spurious emissions were detected in the restricted bands															

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenn	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)

COMPLIANCE Engineering Services, Inc.
FCC,VCCI,CISPR,CE
UL,CSA,TUV

561F Monterey Road
Morgan Hill, CA 95037, U.S.A.
Tel: (408) 463-0885
Fax:(408) 463-0888

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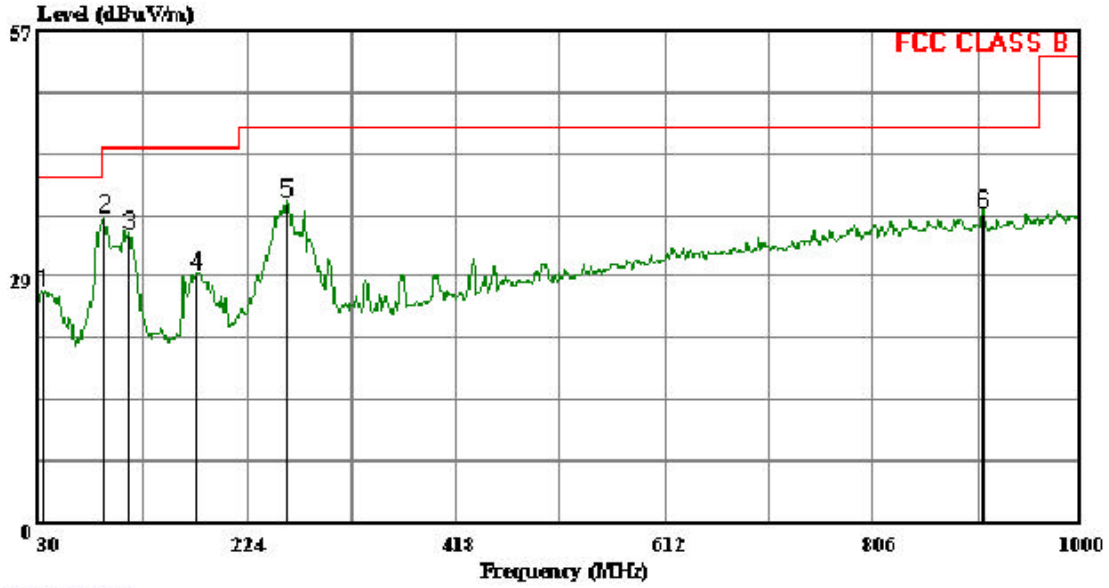

(Audix ATC)

Trace: 1 Ref Trace:

Condition: FCC CLASS B 3m CHAMBER 030306 1185 HORIZONTAL
Company : BroadCom Corporation
EUT Description : 2.4GHz/ 5.8GHz WLAN MiniPCI card
Model Number : BCM94309MP
Test Configurtion: EUT
Test Target : FCC Class B
Mode of Operation: Tx worst case
Project No : 03U1966-1
Tester : Thanh Nguyen

Page: 1

	Freq	Read Level	Probe Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	34.850	9.04	16.94	0.60	0.00	26.58	40.00	-13.42	Peak
2	90.140	26.35	8.03	0.91	0.00	35.29	43.50	-8.21	Peak
3	113.420	22.36	10.04	1.02	0.00	33.42	43.50	-10.08	Peak
4	176.470	18.46	8.84	1.30	0.00	28.60	43.50	-14.90	Peak
5	260.860	23.72	11.82	1.59	0.00	37.13	46.00	-8.87	Peak
6	907.850	11.91	20.64	3.23	0.00	35.78	46.00	-10.22	Peak

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)

COMPLIANCE Engineering Services, Inc.
FCC,VCCI,CISPR,CE
UL,CSA,TUV

561F Monterey Road
Morgan Hill, CA 95037, U.S.A.
Tel: (408) 463-0885
Fax:(408) 463-0888

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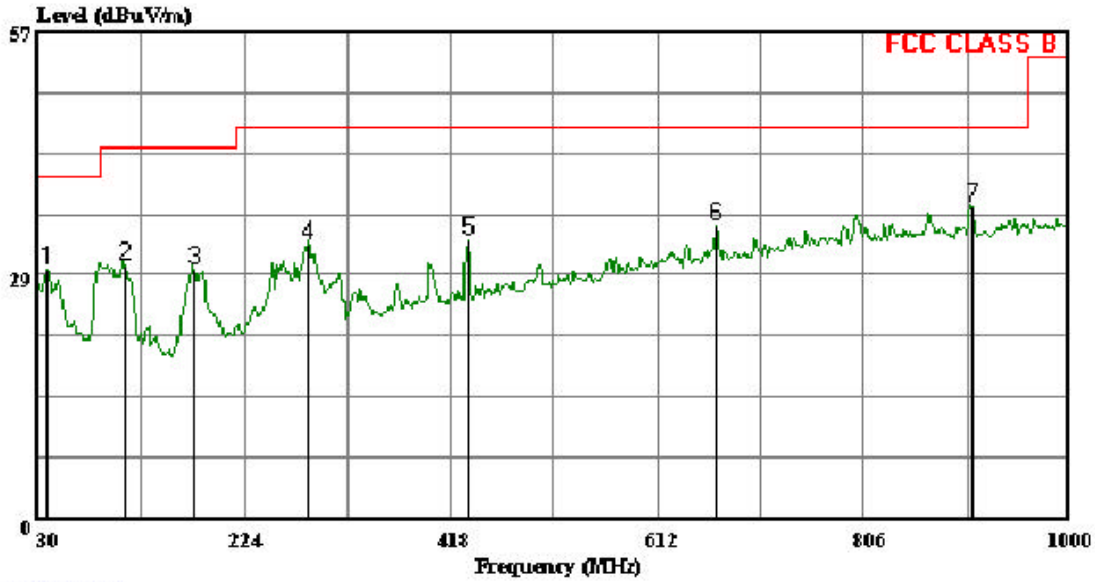

(Audix ATC)

Trace: 3 Ref Trace:

Condition: FCC CLASS B 3m CHAMBER 030306 1185 VERTICAL
Company : BroadCom Corporation
EUT Description : 2.4GHz/ 5.8GHz WLAN MiniPCI card
Model Number : BCM94309MP
Test Configurtion: EUT
Test Target : FCC Class B
Mode of Operation: Tx worst case
Project No : 03U1966-1
Tester : Thanh Nguyen

Page: 1

	Freq	Read Level	Probe Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	38.730	11.94	16.64	0.59	0.00	29.17	40.00	-10.83	Peak
2	111.480	18.84	9.88	1.00	0.00	29.72	43.50	-13.78	Peak
3	176.470	18.90	8.84	1.30	0.00	29.04	43.50	-14.47	Peak
4	283.170	18.57	11.96	1.66	0.00	32.20	46.00	-13.80	Peak
5	434.490	15.14	15.23	2.12	0.00	32.49	46.00	-13.51	Peak
6	667.290	13.41	18.29	2.70	0.00	34.40	46.00	-11.60	Peak
7	906.880	12.59	20.63	3.23	0.00	36.45	46.00	-9.55	Peak

7.2. POWERLINE CONDUCTED EMISSIONS

LIMIT

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator 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 boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The resolution bandwidth is set to 9 kHz for both peak detection and quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

No non-compliance noted:

6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.16	51.87	--	41.09	0.00	64.31	54.31	-16.04	-13.22	L1
0.64	39.74	--	32.60	0.00	56.00	46.00	-16.26	-13.40	L1
14.06	38.48	--	31.29	0.00	60.00	50.00	-21.52	-18.71	L1
0.16	48.00	--	41.77	0.00	64.29	54.29	-16.29	-12.52	L2
0.64	40.58	--	33.17	0.00	56.00	46.00	-15.42	-12.83	L2
14.06	39.12	--	32.36	0.00	60.00	50.00	-20.88	-17.64	L2
6 Worst Data									

LINE 1 AND LINE 2 RESULTS

COMPLIANCE Engineering Services, Inc.
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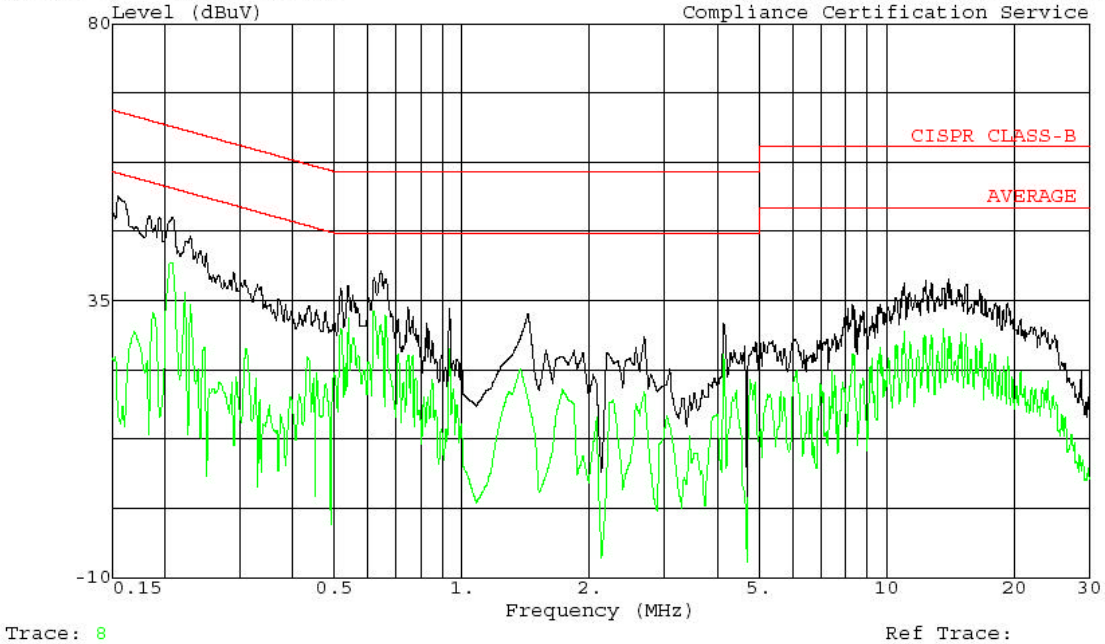
Tel: (408) 463-0885
Fax: (408) 463-0888



Trace: 8 Ref Trace:
Project # : 03U1966-1 - L1
Test Engineer : VIEN TRAN
Company : BROADCOM
EUT : 2.4GHz/5.8GHz WLAN MINI PCI CARD
Model : BCM94309MP
Configuration : EUT
Target of Test: FCC CLASS B
: L1: Peak (Black), Average (Green)
: 115Vac, 60Hz

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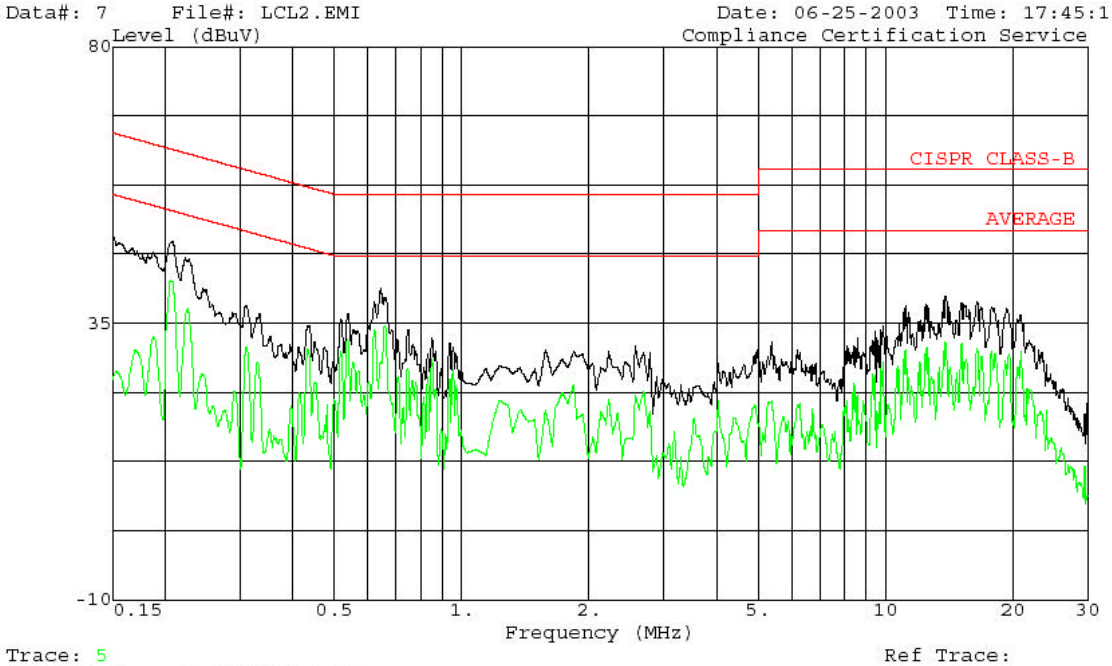


Trace: 5 Ref Trace:
Project # : 03U1966-1 L2
Test Engineer : VIEN TRAN
Company : BROADCOM
EUT : 2.4GHz/5.8GHz WLAN MINI PCI CARD
Model : BCM94309MP
Configuration : EUT
Target of Test: FCC CLASS B
: L2: Peak (Black), Average (Green)
: 115Vac, 60Hz

8. SETUP PHOTOS

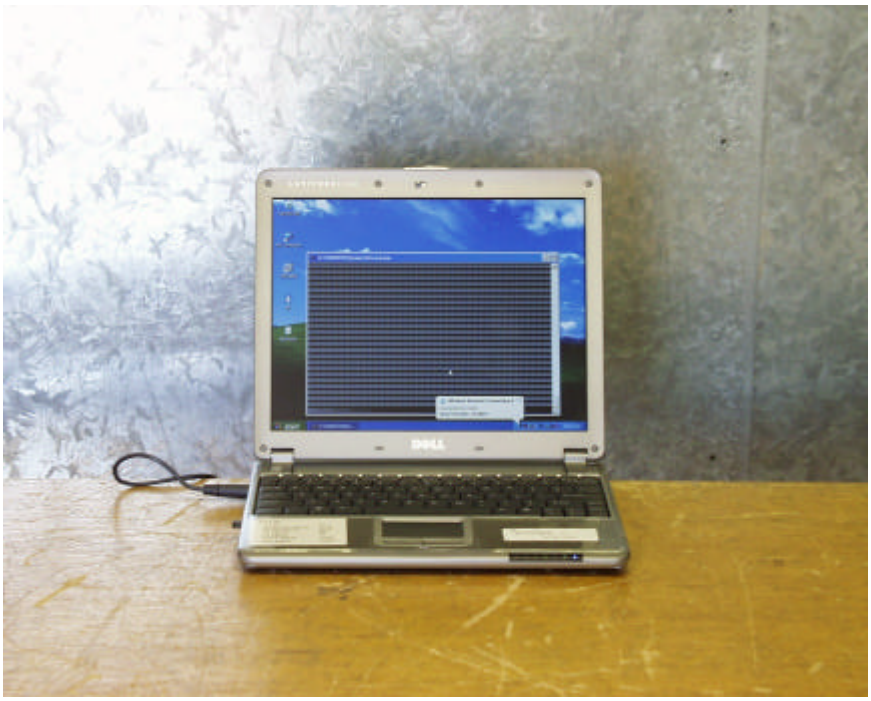
RADIATED RF MEASUREMENT SETUP

RADIATED FRONT PHOTO

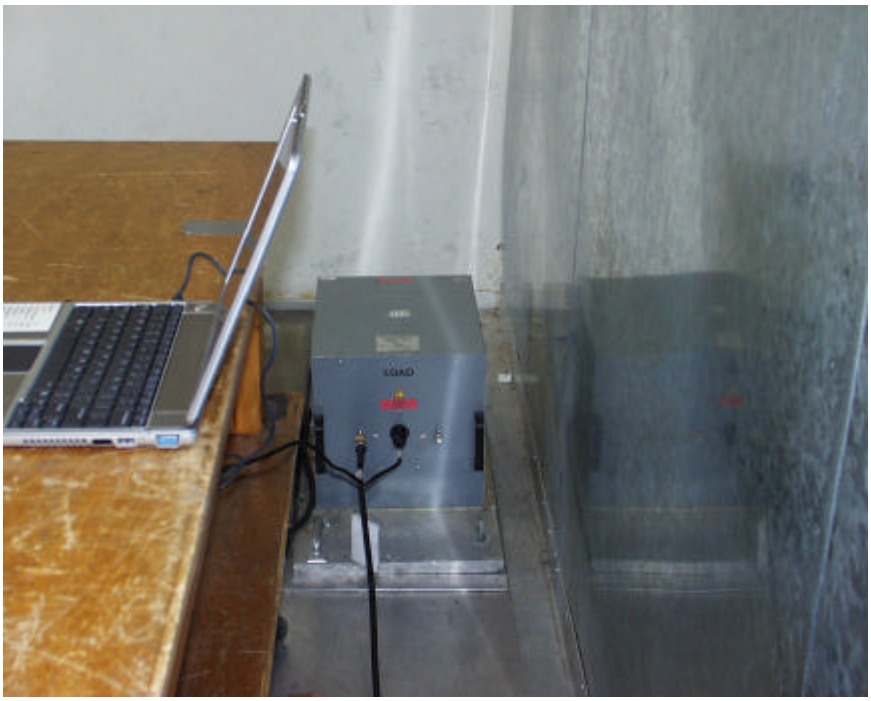
RADIATED BACK PHOTO

POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP

LINE CONDUCTED FRONT PHOTO



LINE CONDUCTED BACK PHOTO



END OF REPORT