



FCC CFR47 PART 15 SUBPART E
INDUSTRY CANADA RSS-210 ISSUE 7
CLASS II PERMISSIVE CHANGE
TEST REPORT

FOR
802.11ag/Draft 802.11n WLAN PCI-E Mini Card
(Dell Hepburn PP33L with BCM94322MH8L Inside)
MODEL NUMBER: BCM94322MH8L
FCC ID: QDS-BRCM1031
IC: 4324A-BRCM1031

REPORT NUMBER: 08U11720-5A
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Prepared for
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Revision History

Rev.	Issue Date	Revisions	Revised By
--	4-28-08	Initial Issue	Sunny Shih
A	5-12-08	<ol style="list-style-type: none">1. Updated sec. 5.2 Description of class II permissive change.2. Added Co-located MPE calculations	Sunny Shih

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1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: 802.11ag / Draft 802n WLAN PCI-E MINI CARD
(Dell Hepburn PP33L with BCM94322MH8L Inside)

MODEL: BCM94322HM8L

SERIAL NUMBER: COY7C00134

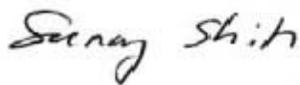
DATE TESTED: April 24-26, 2008

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart E	Pass
RSS-210 Issue 7 Annex 9 and RSS-GEN Issue 2	Pass

Compliance Certification Services, Inc. (CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All expressions of Pass/Fail in this report are opinions expressed by CCS based on interpretations of the 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 CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by 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 CCS By:



SUNNY SHIH
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:



THANH NGUYEN
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15, FCC MO&O 06-96, RSS-GEN Issue 2, and RSS-210 Issue 7.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

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. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Power Line Conducted Emission	+/- 2.3 dB
Radiated Emission	+/- 3.4 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a Broadcom 802.11ag /Draft WLAN PCI-E Mini Card inside Dell Hepburn, model PP33L.

The radio module is manufactured by Broadcom, model BCM94322HM8L.

5.2. DESCRIPTION OF CLASS II PERMISSIVE CHANGE

The major changes filed under this application are:

- Adding portable platform, model Dell PP33L.
- Add co-location of UWB+BT module FCC ID: QDS-BRCM1035

Only the Radiated Emission and AC mains line conduction tests are performed.

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The following antenna was added:

Frequency (MHz)	Antenna Manufacture	Model	Main (dBi), Tx 1	MIMO (dBi), Tx 3 (Used as Aux)	Antenna Test
5150 - 5350	Advance-Connectek, Inc (ACON)	APP8P-700045 (Main & Aux) & APP8P-700046 (MIMO)	-0.81	-0.11	<input type="checkbox"/>
	Amphenol	QT0932-11-001-R (Tx1-2) & QT0932-11-004-R (Tx3)	-1.23	-0.28	<input type="checkbox"/>
	SmartAnt	PE-080000	-0.9	2.09	<input checked="" type="checkbox"/>
5470 - 5725	Advance-Connectek, Inc (ACON)	APP8P-700045 (Main & Aux) & APP8P-700046 (MIMO)	-1.7	-1.83	<input type="checkbox"/>
	Amphenol	QT0932-11-001-R (Tx1-2) & QT0932-11-004-R (Tx3)	-1.81	-0.45	<input type="checkbox"/>
	SmartAnt	PE-080000	0.44	1.27	<input checked="" type="checkbox"/>

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was BCMWL5.SYS, rev. 4.170.75.0.

The test utility software used during testing was wl_tool, rev. 4.170 RC75.0

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case data rate for each mode is determined to be as follows, based on original test report and CCS DTS Test Plan.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	DELL	HEPBURN	COY7C00134	N/A
AC Adapter	DELL	LA90PS0-00	CN-0DF266-71615-67J-05BB	N/A

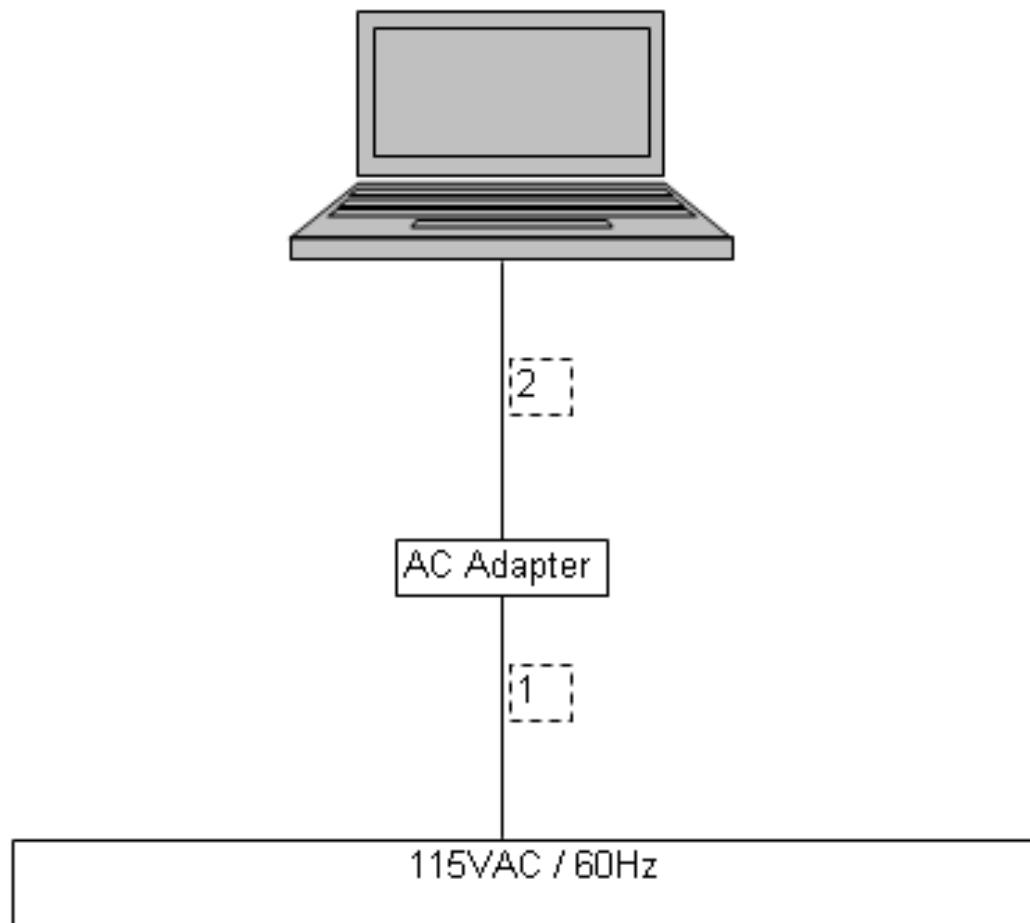
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US115V	Unshielded	2.0m	N/A
2	DC	1	DC	Unshielded	2.0m	N/A

TEST SETUP

The EUT is installed in a host laptop computer during the tests. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



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	Cal Date	Cal Due
Antenna, Horn, 18 GHz	EMCO	3115	C00945	4/15/2007	7/15/2008
Bilog Antenna	Sundt Sciences	JB1	C01016	10/13/2007	10/13/2008
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	8/3/2007	9/27/2008
Preamplifier, 1300 MHz	Agilent / HP	8447D	C01064	5/9/2007	5/9/2008
EMI Receiver, 2.9 GHz	Agilent / HP	8542E	C00957	2/6/2007	6/12/2008
RF Filter Section, 2.9 GHz	Agilent / HP	85420E	C00958	2/6/2007	6/12/2008
Peak Power Meter	Agilent / HP	E4416A	C00963	2/14/2007	12/2/2008
Peak / Average Power Sensor	Agilent	E9327A	C00964	2/14/2007	12/2/2008
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	10/16/2007	1/27/2009
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	N02481	9/15/2006	9/15/2008
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	9/15/2006	9/15/2008
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01012	5/2/2006	8/7/2008

7. RADIATED TEST RESULTS

7.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

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 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 5 GHz band.

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.

7.2. TRANSMITTER ABOVE 1 GHz IN THE 5.15 – 5.25 GHz BAND

7.2.1. 802.11a MODE

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site																																	
Company: BroadCom Corporation		Project #: 08U11720		Date: April 24, 2008		Test Engineer: Thanh Nguyen		Configuration: EUT inside Dell HELBURN PP33L		Mode: Transmit a mode, 5.2GHz Lower band																							
Test Equipment:																																	
Horn 1-18GHz				Pre-amplifier 1-26GHz				Pre-amplifier 26-40GHz				Horn > 18GHz																					
T73; S/N: 6717 @3m				T145 Agilent 3008A005C																													
Hi Frequency Cables																																	
2 foot cable				3 foot cable				12 foot cable				HPF																					
				Thanh 187215003				Ninous 208946002																									
Peak Measurements RBW=VBW=1MHz																																	
Average Measurements RBW=1MHz, VBW=10Hz																																	
f GHz	Dist (m)	Read Pk dBuV	Read Avg dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)																		
CH 36, 5180 MHz																																	
15.533	3.0	44.9	33.3	38.1	5.2	-32.3	0.0	0.0	55.9	44.3	74	54	-18.1	-9.7	V																		
15.533	3.0	45.8	33.4	38.1	5.2	-32.3	0.0	0.0	56.8	44.3	74	54	-17.2	-9.7	H																		
CH 40, 5200 MHz																																	
15.600	3.0	46.2	33.0	37.9	5.2	-32.3	0.0	0.0	57.0	43.9	74	54	-17.0	-10.1	V																		
15.600	3.0	47.0	33.3	37.9	5.2	-32.3	0.0	0.0	57.8	44.2	74	54	-16.2	-9.8	H																		
CH 48, 5240 MHz																																	
15.720	3.0	46.6	33.7	37.6	5.2	-32.3	0.0	0.0	57.2	44.3	74	54	-16.8	-9.7	V																		
15.720	3.0	46.3	33.6	37.6	5.2	-32.3	0.0	0.0	56.9	44.2	74	54	-17.1	-9.8	H																		
f Measurement Frequency				Amp Preamp Gain				Avg Lim Average Field Strength Limit																									
Dist Distance to Antenna				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																												

7.3. TRANSMITTER ABOVE 1 GHz IN THE 5.25 – 5.35 GHz BAND

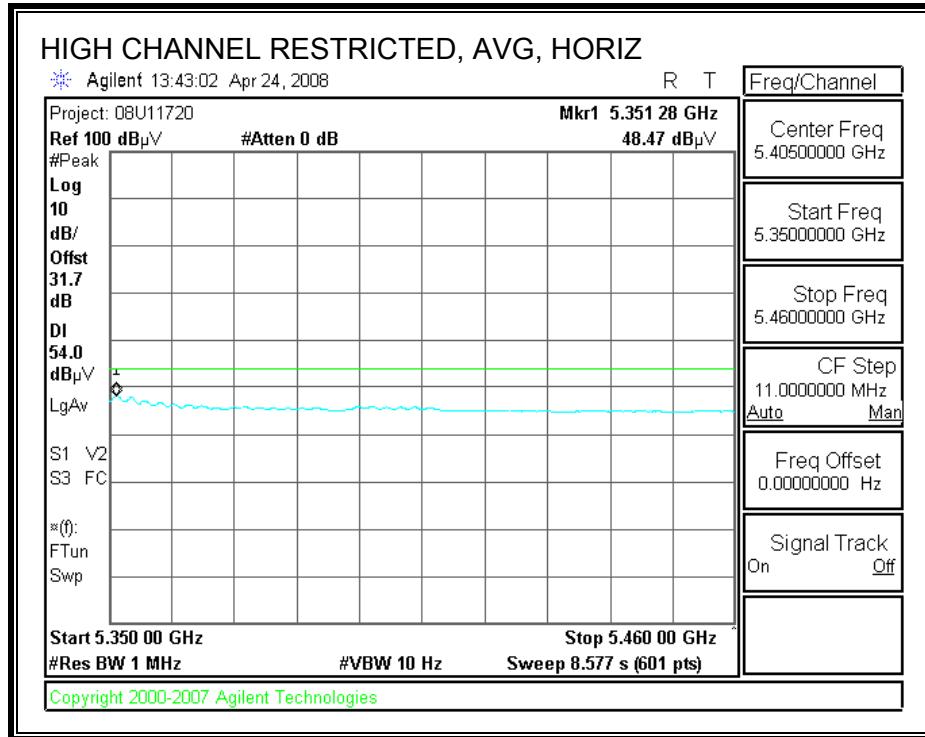
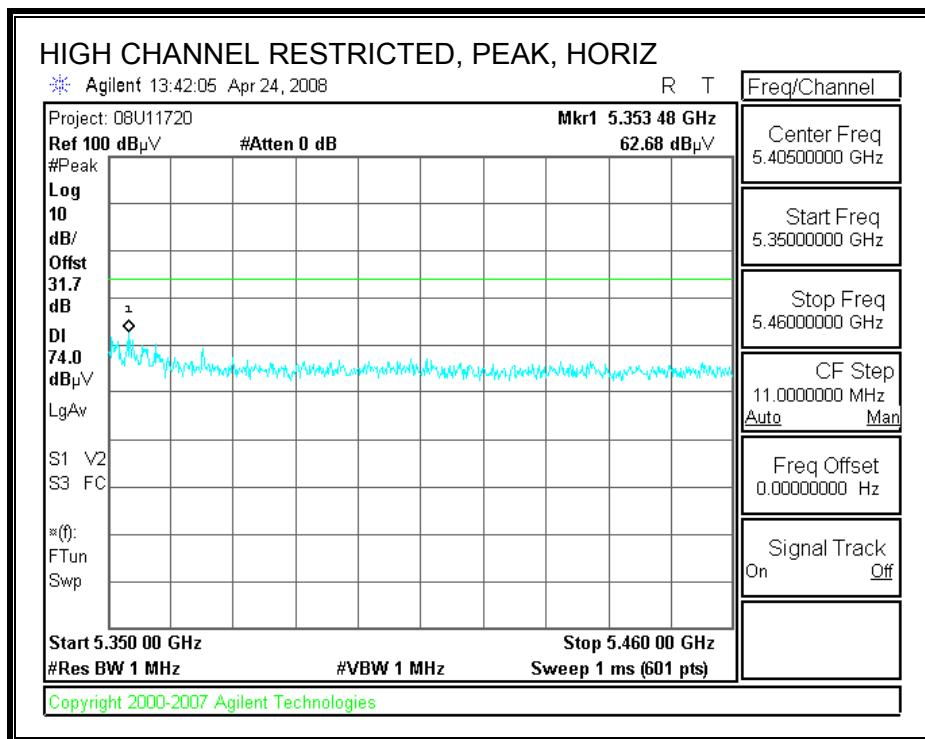
7.3.1. 802.11a MODE

HARMONICS AND SPURIOUS EMISSIONS

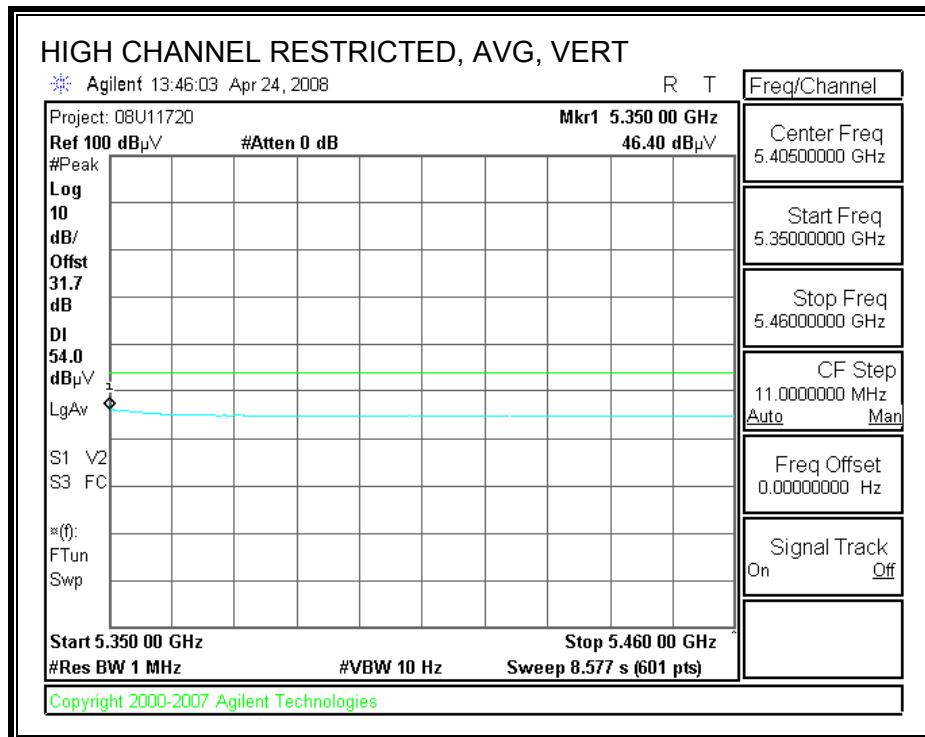
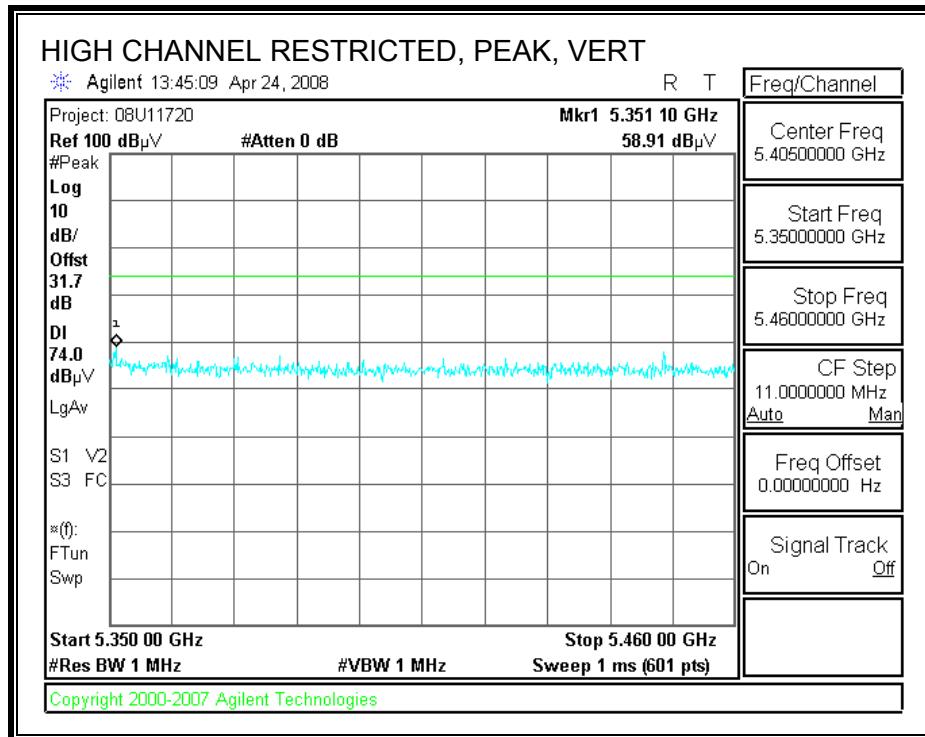
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Company: BroadCom Corporation Project #: 08U11720 Date: April 24, 2008 Test Engineer: Thanh Nguyen Configuration: EUT inside Dell HELBURN PP33L Mode: Transmit a mode, 5.2GHz Upper band																	
<u>Test Equipment:</u>																	
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit					
T73; S/N: 6717 @3m			T145 Agilent 3008A005C									FCC 15.205					
Hi Frequency Cables																	
2 foot cable			3 foot cable			12 foot cable			HPF			Reject Filter			Peak Measurements RBW=VBW=1MHz		
Thanh 187215003			Ninous 208946002												Average Measurements RBW=1MHz ; VBW=10Hz		
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuVm	Avg dBuVm	Pk Lim dBuVm	Avg Lim dBuVm	Pk Mar dB	Avg Mar dB	Notes (V/H)		
CH 52,5260 MHz																	
15.533	3.0	45.8	33.2	38.1	5.2	-32.3	0.0	0.0	56.8	44.1	74	54	-17.2	.99	V		
15.533	3.0	46.8	33.7	38.1	5.2	-32.3	0.0	0.0	57.7	44.6	74	54	-16.3	.94	H		
CH 60,5300 MHz																	
15.900	3.0	46.0	33.3	37.2	5.3	-32.2	0.0	0.0	56.3	43.5	74	54	-17.7	-10.5	V		
15.900	3.0	45.7	33.2	37.2	5.3	-32.2	0.0	0.0	56.0	43.5	74	54	-18.0	-10.5	H		
CH 64,5320 MHz																	
15.960	3.0	46.4	33.5	37.1	5.3	-32.2	0.0	0.0	56.6	43.6	74	54	-17.4	-10.4	V		
15.960	3.0	45.9	33.4	37.1	5.3	-32.2	0.0	0.0	56.1	43.6	74	54	-17.9	-10.4	H		
f Measurement Frequency Dist Distance to Antenna Read Analyzer Reading AF Antenna Factor CL Cable Loss								Amp Preamp Gain D Corr Distance Correct to 3 meters Avg Average Field Strength @ 3 m Peak Calculated Peak Field Strength HPF High Pass Filter								Avg Lim Average Field Strength Limit Pk Lim Peak Field Strength Limit Avg Mar Margin vs. Average Limit Pk Mar Margin vs. Peak Limit	

7.3.2. 802.11n HT40 MODE

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



7.4. TRANSMITTER ABOVE 1 GHz IN THE 5.47 – 5.725 GHz BAND

7.4.1. 802.11a MODE

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site																																																																																																																																																																																																									
<p>Company: BroadCom Corporation Project #: 08U11720 Date: April 24, 2008 Test Engineer: Thanh Nguyen Configuration: EUT inside Dell HELBURN PP33L Mode: Transmit a mode, 5.5GHz band</p> <p><u>Test Equipment:</u></p> <table border="1"> <tr> <td>Horn 1-18GHz</td> <td>Pre-amplifier 1-26GHz</td> <td>Pre-amplifier 26-40GHz</td> <td colspan="4">Horn > 18GHz</td> <td>Limit</td> </tr> <tr> <td>T73; S/N: 6717 @3m</td> <td>T145 Agilent 3008A005C</td> <td></td> <td colspan="4"></td> <td>FCC 15.205</td> </tr> <tr> <td colspan="15">Hi Frequency Cables</td> </tr> <tr> <td>2 foot cable</td> <td>3 foot cable</td> <td>12 foot cable</td> <td>HPF</td> <td>Reject Filter</td> <td colspan="9"> <u>Peak Measurements</u> RBW=VBW=1MHz <u>Average Measurements</u> RBW=1MHz; VBW=10Hz </td> </tr> <tr> <td>f GHz</td> <td>Dist (m)</td> <td>Read Pk dBuV</td> <td>Read Avg. dBuV</td> <td>AF dB/m</td> <td>CL dB</td> <td>Amp dB</td> <td>D Corr dB</td> <td>Fltr dB</td> <td>Peak dBuVm</td> <td>Avg dBuVm</td> <td>Pk Lim dBuVm</td> <td>Avg Lim dBuVm</td> <td>Pk Mar dB</td> <td>Avg Mar dB</td> <td>Notes (V/H)</td> </tr> </table> <p>CH 100, 5500 MHz</p> <table border="1"> <tr> <td>11.000</td> <td>3.0</td> <td>45.2</td> <td>31.4</td> <td>37.2</td> <td>3.9</td> <td>-33.8</td> <td>0.0</td> <td>0.0</td> <td>52.6</td> <td>38.7</td> <td>74</td> <td>54</td> <td>-21.4</td> <td>-15.3</td> <td>V</td> </tr> <tr> <td>11.000</td> <td>3.0</td> <td>44.6</td> <td>31.7</td> <td>37.2</td> <td>3.9</td> <td>-33.8</td> <td>0.0</td> <td>0.0</td> <td>52.0</td> <td>39.0</td> <td>74</td> <td>54</td> <td>-22.0</td> <td>-15.0</td> <td>H</td> </tr> </table> <p>CH 120, 5600 MHz</p> <table border="1"> <tr> <td>11.200</td> <td>3.0</td> <td>43.7</td> <td>31.4</td> <td>37.3</td> <td>3.9</td> <td>-33.5</td> <td>0.0</td> <td>0.0</td> <td>51.4</td> <td>39.1</td> <td>74</td> <td>54</td> <td>-22.6</td> <td>-14.9</td> <td>V</td> </tr> <tr> <td>11.200</td> <td>3.0</td> <td>44.6</td> <td>31.3</td> <td>37.3</td> <td>3.9</td> <td>-33.5</td> <td>0.0</td> <td>0.0</td> <td>52.3</td> <td>39.0</td> <td>74</td> <td>54</td> <td>-21.7</td> <td>-15.0</td> <td>H</td> </tr> </table> <p>CH 140, 5700 MHz</p> <table border="1"> <tr> <td>11.400</td> <td>3.0</td> <td>44.1</td> <td>31.3</td> <td>37.4</td> <td>3.9</td> <td>-33.2</td> <td>0.0</td> <td>0.0</td> <td>52.3</td> <td>39.5</td> <td>74</td> <td>54</td> <td>-21.7</td> <td>-14.5</td> <td>V</td> </tr> <tr> <td>11.400</td> <td>3.0</td> <td>43.7</td> <td>31.3</td> <td>37.4</td> <td>3.9</td> <td>-33.2</td> <td>0.0</td> <td>0.0</td> <td>51.8</td> <td>39.4</td> <td>74</td> <td>54</td> <td>-22.2</td> <td>-14.6</td> <td>H</td> </tr> </table> <p>Legend:</p> <table border="0"> <tr> <td>f</td> <td>Measurement Frequency</td> <td>Amp</td> <td>Preamp Gain</td> <td>Avg Lim</td> <td>Average Field Strength Limit</td> </tr> <tr> <td>Dist</td> <td>Distance to Antenna</td> <td>D Corr</td> <td>Distance Correct to 3 meters</td> <td>Pk Lim</td> <td>Peak Field Strength Limit</td> </tr> <tr> <td>Read</td> <td>Analyzer Reading</td> <td>Avg</td> <td>Average Field Strength @ 3 m</td> <td>Avg Mar</td> <td>Margin vs. Average Limit</td> </tr> <tr> <td>AF</td> <td>Antenna Factor</td> <td>Peak</td> <td>Calculated Peak Field Strength</td> <td>Pk Mar</td> <td>Margin vs. Peak Limit</td> </tr> <tr> <td>CL</td> <td>Cable Loss</td> <td>HPF</td> <td>High Pass Filter</td> <td></td> <td></td> </tr> </table>															Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz				Limit	T73; S/N: 6717 @3m	T145 Agilent 3008A005C						FCC 15.205	Hi Frequency Cables															2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter	<u>Peak Measurements</u> RBW=VBW=1MHz <u>Average Measurements</u> RBW=1MHz; VBW=10Hz									f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuVm	Avg dBuVm	Pk Lim dBuVm	Avg Lim dBuVm	Pk Mar dB	Avg Mar dB	Notes (V/H)	11.000	3.0	45.2	31.4	37.2	3.9	-33.8	0.0	0.0	52.6	38.7	74	54	-21.4	-15.3	V	11.000	3.0	44.6	31.7	37.2	3.9	-33.8	0.0	0.0	52.0	39.0	74	54	-22.0	-15.0	H	11.200	3.0	43.7	31.4	37.3	3.9	-33.5	0.0	0.0	51.4	39.1	74	54	-22.6	-14.9	V	11.200	3.0	44.6	31.3	37.3	3.9	-33.5	0.0	0.0	52.3	39.0	74	54	-21.7	-15.0	H	11.400	3.0	44.1	31.3	37.4	3.9	-33.2	0.0	0.0	52.3	39.5	74	54	-21.7	-14.5	V	11.400	3.0	43.7	31.3	37.4	3.9	-33.2	0.0	0.0	51.8	39.4	74	54	-22.2	-14.6	H	f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit	Dist	Distance to Antenna	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		
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7.5. RECEIVER ABOVE 1 GHz

High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site															
Company: BroadCom Corporation Project #: 08U11720 Date: April 25, 2008 Test Engineer: Thanh Nguyen Configuration: EUT inside Dell HELBURN PP33L Mode: Receive															
Test Equipment:															
Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz		Limit							
T73; S/N: 6717 @3m		T145 Agilent 3008A005C						RX RSS 210							
Hi Frequency Cables															
2 foot cable		3 foot cable		12 foot cable		HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz, VBW=10Hz					
Thanh 187215003		Ninous 208946002													
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Mid CH HT20															
1.063	3.0	51.2	38.2	24.0	1.6	-36.1	0.0	0.0	40.7	27.7	74	54	-33.3	-26.3	H
1.960	3.0	50.9	38.3	27.3	1.9	-35.4	0.0	0.0	44.6	32.0	74	54	-29.4	-22.0	H
3.000	3.0	47.8	34.9	30.0	2.1	-35.2	0.0	0.0	44.7	31.7	74	54	-29.3	-22.3	H
1.828	3.0	50.6	38.6	26.8	1.8	-35.5	0.0	0.0	43.7	31.7	74	54	-30.3	-22.3	V
2.557	3.0	50.5	38.4	28.7	2.0	-35.1	0.0	0.0	46.1	34.0	74	54	-27.9	-20.0	V
f Measurement Frequency Dist Distance to Antenna Read Analyzer Reading AF Antenna Factor CL Cable Loss					Amp Preamp Gain D Corr Distance Correct to 3 meters Avg Average Field Strength @ 3 m Peak Calculated Peak Field Strength HPF High Pass Filter					Avg Lim Average Field Strength Limit Pk Lim Peak Field Strength Limit Avg Mar Margin vs. Average Limit Pk Mar Margin vs. Peak Limit					

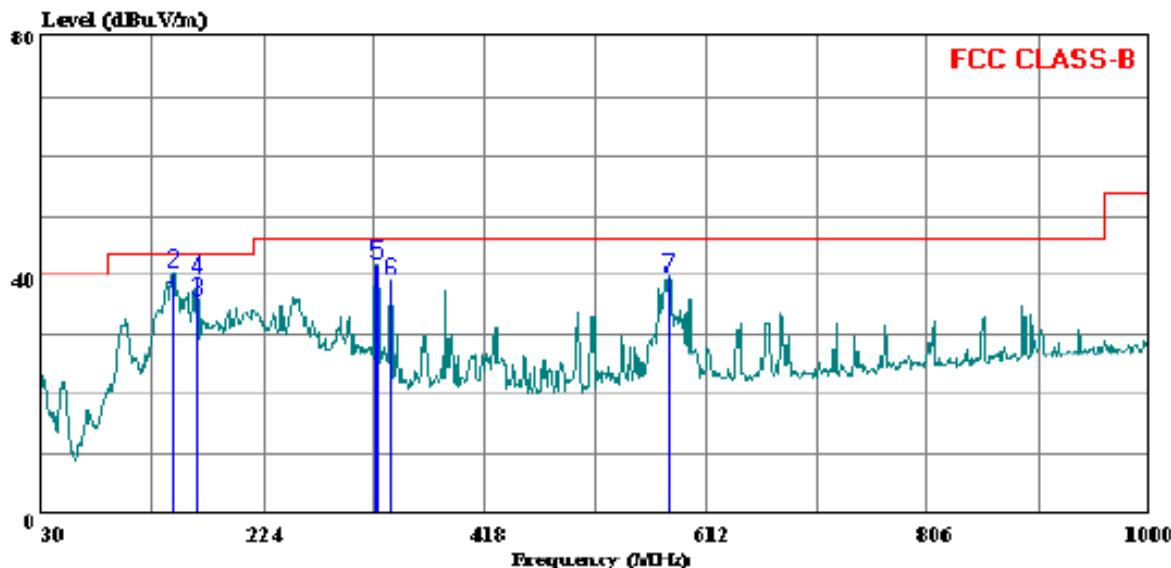
7.6. WORST-CASE BELOW 1 GHz

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



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

Data#: 20 File#: 08U11720_Hepburn.EMI Date: 04-26-2008 Time: 14:59:13



Trace: 17

Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator::: Thanh Nguyen
Project #: : 08U11720
Company: : Broadcom
Configuration::: EUT inside Hepburn laptop
Mode : : Transmit 5GHz band ,worst case
Target: : FCC Class B

Page: 1

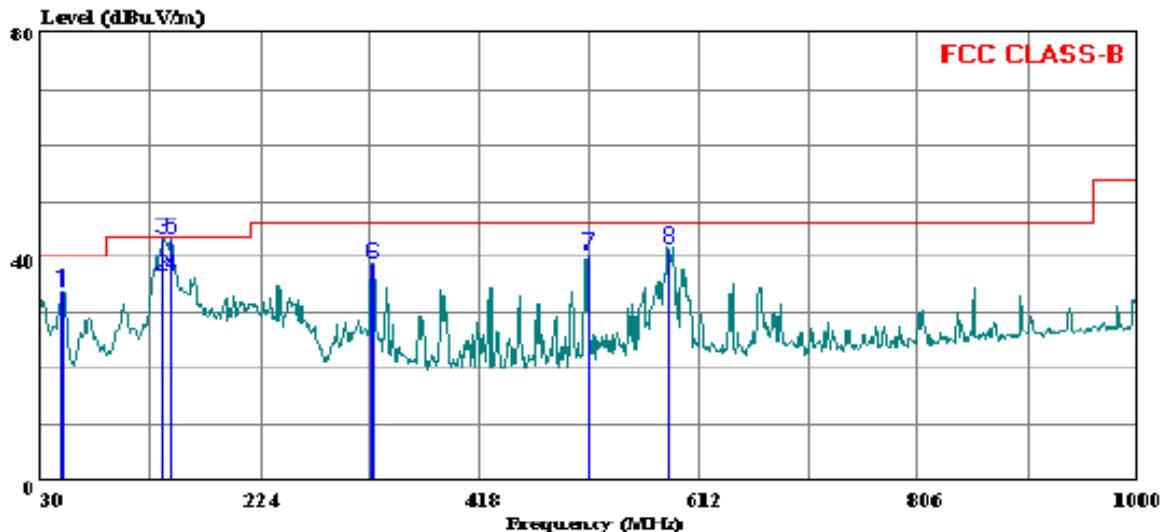
Freq	Read		Limit	Over	Remark	
	Level	Factor				
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB
1	145.430	52.46	-17.09	35.37	43.50	-8.13 QP
2	145.430	57.52	-17.02	40.49	43.50	-3.01 Peak
3	165.800	53.65	-17.93	35.72	43.50	-7.78 QP
4	165.800	57.50	-17.93	39.57	43.50	-3.93 Peak
5	323.910	57.17	-15.16	42.01	46.00	-3.99 Peak
6	336.520	53.83	-14.86	38.97	46.00	-7.03 Peak
7	578.050	50.00	-10.12	39.88	46.00	-6.12 Peak

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



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

Data#: 16 File#: 08U11720_Hepburn.EMI Date: 04-26-2008 Time: 14:47:48



Trace: 13

Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator::: Thanh Nguyen
Project #: : 08U11720
Company: : Broadcom
Configuration::: EUT inside Hepburn laptop
Mode : : Transmit 5GHz band ,worst case
Target: : FCC Class B

Page: 1

Freq	Read		Limit	Over	Remark	
	Level	Factor				
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	49.400	55.83	-21.75	34.08	40.00	-5.92 Peak
2	137.670	53.50	-16.76	36.74	43.50	-6.76 QP
3	137.670	60.17	-16.73	43.43	43.50	-0.07 Peak
4	144.460	53.85	-17.02	36.83	43.50	-6.67 QP
5	144.460	60.17	-17.02	43.14	43.50	-0.36 Peak
6	323.910	54.00	-15.16	38.84	46.00	-7.16 Peak
7	513.060	51.50	-11.11	40.39	46.00	-5.61 Peak
8	584.840	51.75	-10.08	41.67	46.00	-4.33 Peak

8. MAXIMUM PERMISSIBLE EXPOSURE

FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842f	4.89f	*(900f ²)	6
30–300	61.4	0.163	1.0	6
300–1500	.....	.....	f/300	6
1500–100,000	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824f	2.19f	*(180f ²)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500	.....	.....	f/1500	30
1500–100,000	.....	.....	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

IC RULES

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

Table 5

Exposure Limits for Persons Not Classed As RF and Microwave Exposed Workers (Including the General Public)

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m ²)	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	280/ <i>f</i>	2.19/ <i>f</i>		6
10–30	28	2.19/ <i>f</i>		6
30–300	28	0.073	2*	6
300–1 500	1.585 <i>f</i> ^{0.5}	0.0042 <i>f</i> ^{0.5}	<i>f</i> /150	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	616 000/ <i>f</i> ^{1.2}
150 000–300 000	0.158 <i>f</i> ^{0.5}	4.21 × 10 ⁻⁴ <i>f</i> ^{0.5}	6.67 × 10 ⁻⁵ <i>f</i>	616 000/ <i>f</i> ^{1.2}

* Power density limit is applicable at frequencies greater than 100 MHz.

Notes: 1. Frequency, *f*, is in MHz.
2. A power density of 10 W/m² is equivalent to 1 mW/cm².
3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

CALCULATIONS

Given

$$E = \sqrt{(30 * P * G) / d}$$

and

$$S = E^2 / 3770$$

where

E = Field Strength in Volts/meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power Density in milliwatts/square centimeter

Combining equations, rearranging the terms to express the distance as a function of the remaining variables, changing to units of Power to mW and Distance to cm, and substituting the logarithmic form of power and gain yields:

$$d = 0.282 * 10^{((P + G) / 20) / \sqrt{S}}$$

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW/cm²

Rearranging terms to calculate the power density at a specific distance yields

$$S = 0.0795 * 10^{((P + G) / 10) / (d^2)}$$

The power density in units of mW/cm² is converted to units of W/m² by multiplying by a factor of 10.

CO-LOCATED MPE CALCULATIONS for Mobile configuration

For multiple colocated transmitters operating simultaneously the total power density can be calculated by summing the Power * Gain product (in linear units) of each transmitter.

yields

$$d = 0.282 * \sqrt{((P1 * G1) + (P2 * G2) + \dots + (Pn * Gn)) / S}$$

where

d = distance in cm

Px = Power of transmitter x in mW

Gx = Numeric gain of antenna x

S = Power Density in mW/cm²

In the table below, Power and Gain are entered in units of dBm and dBi respectively, then converted to their linear forms for the purpose of the calculations.

LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm²

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m²

RESULTS

Please see next page

RESULTS

(MPE distance equals 20 cm)

Mode	Band	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)	FCC Power Density (mW/cm^2)	IC Power Density (W/m^2)
Bluetooth	2.4 GHz	0.70	3.15			
WLAN	5.2 GHz	15.30	2.09			
Combined				20.0	0.01	0.11

Mode	Band	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)	FCC Power Density (mW/cm^2)	IC Power Density (W/m^2)
Bluetooth	2.4 GHz	0.70	3.15			
WLAN	5.3 GHz	18.70	2.09			
Combined				20.0	0.02	0.24

Mode	Band	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)	FCC Power Density (mW/cm^2)	IC Power Density (W/m^2)
Bluetooth	2.4 GHz	0.70	3.15			
WLAN	5.6 GHz	20.70	1.27			
Combined				20.0	0.03	0.32

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

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 receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

RESULTS

6 WORST EMISSIONS

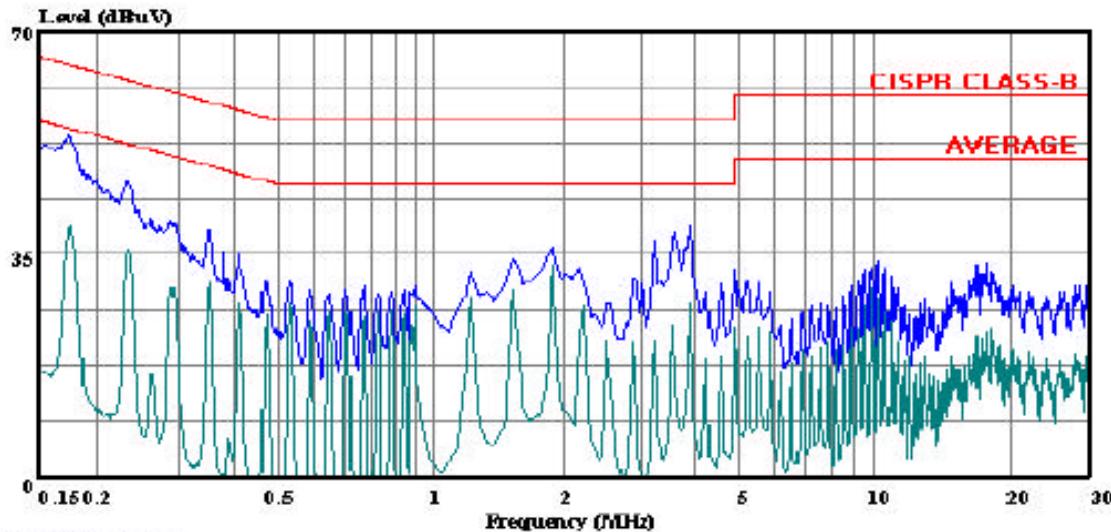
CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq. (MHz)	Reading			Closs (dB)	Limit QP	EN_B AV	Margin		Remark
	PK (dBuV)	QP (dBuV)	AV (dBuV)				QP (dB)	AV (dB)	
0.17	53.62	--	39.31	0.00	64.77	54.77	-11.15	-15.46	L1
1.99	35.99	--	33.47	0.00	56.00	46.00	-20.01	-12.53	L1
4.01	39.27	--	27.24	0.00	56.00	46.00	-16.73	-18.76	L1
0.17	53.04	--	40.13	0.00	64.82	54.82	-11.78	-14.69	L2
2.33	36.19	--	24.66	0.00	56.00	46.00	-19.81	-21.34	L2
4.01	42.46	--	23.22	0.00	56.00	46.00	-13.54	-22.78	L2
6 Worst Data									

LINE 1 RESULTS



Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
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Data#: 7 File#: LC.EMI Date: 04-25-2008 Time: 13:21:18



(Line Conduction)
Trace: 5 Ref Trace:

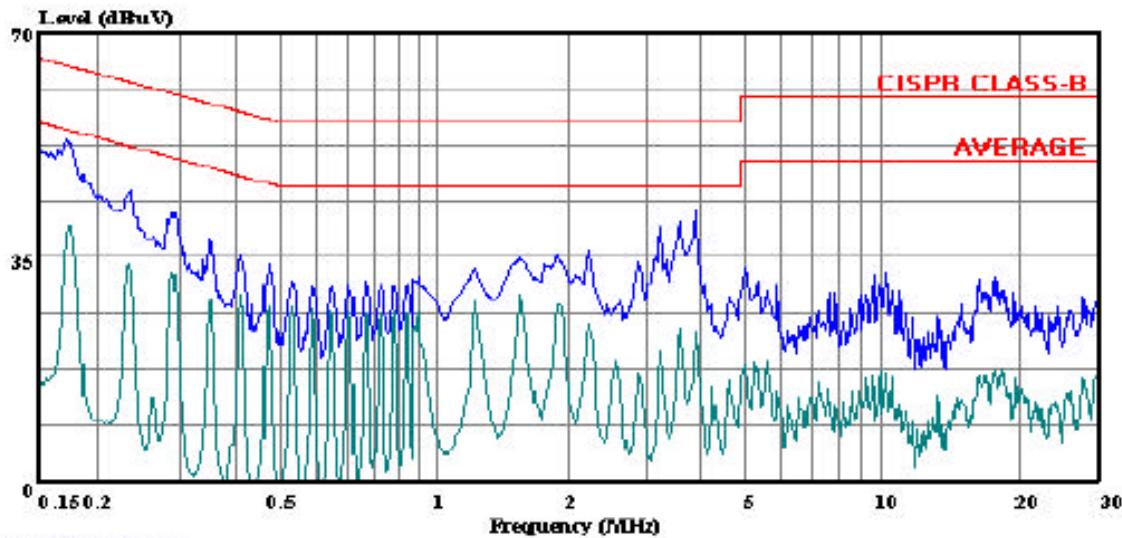
Condition: CISPR CLASS-B
Test Operator:: Thanh Nguyen
Project #: : 0811720
Company: : BroadCom Corporation
Configuration:: EUT inside Dell Hepburn laptop
Mode: : TX worst case
Target: : FCC Class B
Voltage: : 115VAC / 60Hz
: Line 1: Peak (Blue); Average (Green)

LINE 2 RESULTS



Compliance Certification Services
47173 Benicia Street
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Data#: 21 File#: LC.EMI Date: 04-25-2008 Time: 13:55:55



(Line Conduction)
Trace: 19 Ref Trace:

Condition: CISPR CLASS-B
Test Operator:: Thanh Nguyen
Project #: : 0811720
Company: : BroadCom Cotporation
Configuration:: EUT inside Dell Hepburn laptop
Mode: : TX worst case
Target: : FCC Class B
Voltage: : 115VAC / 60Hz
: Line 2: Peak (Blue); Average (Green)