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

(Tested inside of Dell PP15S)

MODEL NUMBER: BCM94322HM8L

FCC ID: QDS-BRCM1031

IC: 4324A-BRCM1031

REPORT NUMBER: 08U11950-2, Revision B

ISSUE DATE: AUGUST 18, 2008

Prepared for

BROADCOM CORPORATION
190 MATHILDA PLACE
SUNNYVALE, CA 94086, USA

Prepared by

COMPLIANCE CERTIFICATION SERVICES
47173 BENICIA STREET
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
---	07/25/08	Initial issue	Sunny Shih
B	08/18/08	Revised MPE Section	T. Chan

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1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: 802.11ag / Draft 802.11n WLAN PCI-E MINI CARD
(Tested inside of Dell PP15S)

MODEL: BCM94322HM8L

SERIAL NUMBER: 240

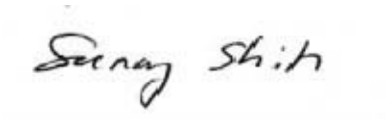
DATE TESTED: JULY 19 - 20, 2008

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:

Can Ming Chung
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 802.11ag / Draft 802.11n WLAN PCI-E Mini Card installed inside Dell PP15S portable laptop.

The radio module is manufactured by Broadcom and model number is BCM9432HM8L.

5.2. DESCRIPTION OF CLASS II CHANGE

The major changes filed under this application are:

Change #1: Adding portable platform, Dell PP15S.

Change #2: Adding co-location with BT module FCC ID: QDS-BRCM1033.

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Antenna Manufacturer	Antenna type	Model number	Max Peak gain (2.4GHz)	Max Peak gain (5GHz)
GALTRONICS	PIFA	06-7015-03 (MAIN) 06-7016-03 (AUX)	TX2 0.18dBi(H)	TX1 0.4dBi(V)
GALTRONICS	PIFA	06-7015-03 (MAIN) 06-7016-03 (AUX)	TX2 -1.84dBi(H)	TX1 0.4dBi(V)
***GALTRONICS**	**PIFA**	**06-7018-03 (MAIN)** **06-7031-03 (AUX)**	**TX2 0.66dBi(V)**	**TX2 2.48dBi(V)**
Tyco Electronics	PIFA	2023987-1(TX1) 2023987-1(TX2)	TX2 0.04dBi(H)	TX1 1.15dBi(H)
Tyco Electronics	PIFA	2023987-1(TX1) 2023986-1(TX2)	TX2 -0.98dBi(V)	TX2 0.71dBi(V)
Tyco Electronics	PIFA	2023989-1(TX1)	TX1 -1.17dBi(H)	TX2 1.24dBi(H)

***: Antenna under testing.**

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was BCMWL5, rev. 4.170

The test utility software used during testing was wl_tool, rev. 4.170. RC83.0.

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 #07U11529 and CCS Test plan.

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

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop	Dell	PP15S	21-022949000-18	DoC
AC Adapter	Dell	LA45NS0-00	OGM456-71615-7CP	N/A

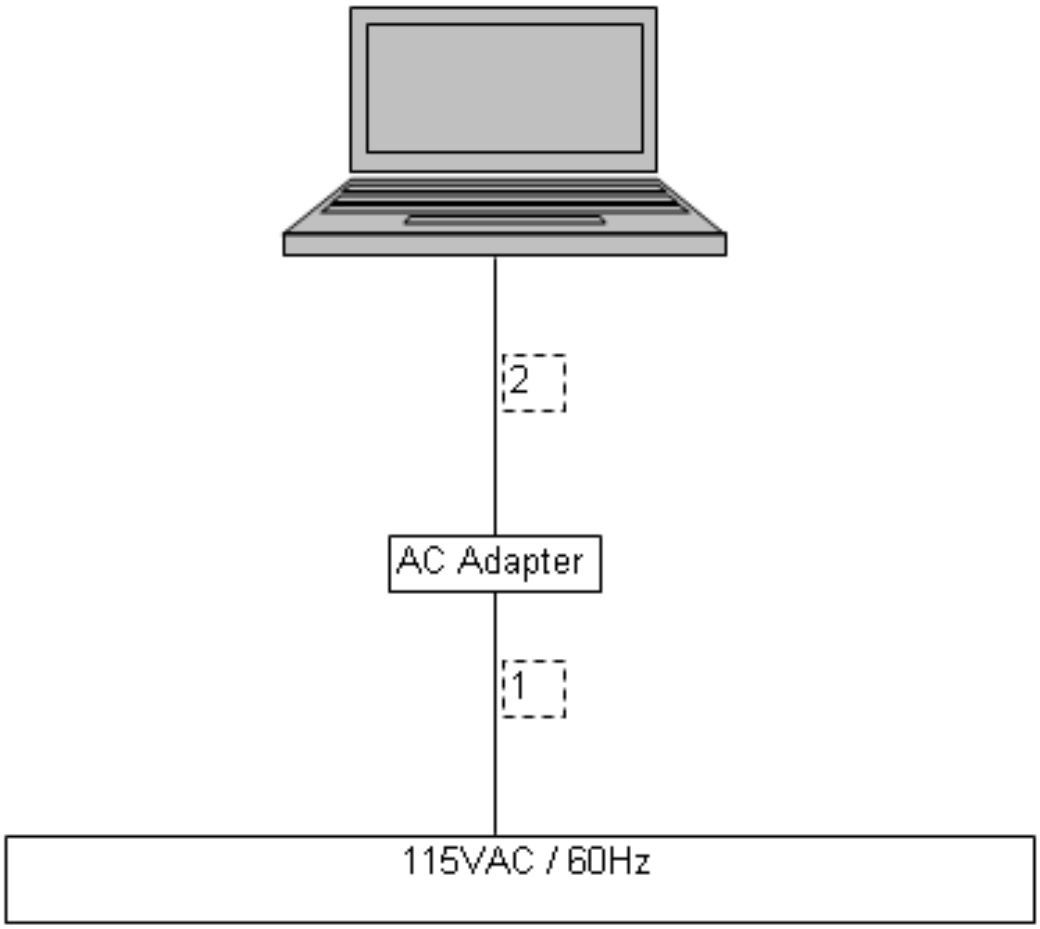
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identica Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	US115V	Unshielded	2.0m	N/A
2	DC	1	DC	Unshielded	2.0m	Ferrite on laptop's end

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 Due**
EMI Receiver, 2.9 GHz	Agilent / HP	8542E	C00957	06/12/09
RF Filter Section, 2.9 GHz	Agilent / HP	85420E	C00958	06/12/09
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	05/09/09
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	10/25/08
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	N02481	10/25/08
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	01/27/09
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01012	08/07/08
Antenna, Horn, 18 GHz	ETS	3117	C01006	04/15/09
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	08/03/08
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	10/13/08
Peak Power Meter	Agilent / HP	E4416A	C00963	12/02/08
Peak / Average Power Sensor	Agilent	E9327A	C00964	12/02/08
Antenna, Horn 26 ~ 40 GHz	ARA	MWH-2640/B	C01009	04/13/09
4.0 GHz High Pass Filter	Micro Tronics	HPM13351	N/A	N/A
2.4 - 2.5 Reject Filter	Micro Tronics	BRM50702	N/A	N/A
7.6 GHz High Pass Filter	Micro Tronics	HPM13350	N/A	N/A
5.75 - 5.8 Reject Filter	Micro Tronics	BRC13192	N/A	N/A

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, Fremont 5m Chamber

Company: Broadcom
Project #:08U11950
Date: 07/19/08
Test Engineer: Can Ming Chung
Configuration: Tx Mode
Mode: Tx 5.2 GHz_5150-5250 MHz_11a Legacy

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T120; S/N: 29310 @3m	T144 Miteq 3008A00931			FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
		A-5m Chamber	HPF_7.6GHz	

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)
LOW CHANNEL, 5180 MHz															
15.540	3.0	42.5	30.8	39.2	12.7	-34.8	0.0	0.7	60.3	48.6	74	54	-13.7	-5.4	V
15.540	3.0	43.2	31.0	39.2	12.7	-34.8	0.0	0.7	61.0	48.8	74	54	-13.0	-5.2	H
															V
MID CHANNEL, 5200 MHz															
15.600	3.0	41.5	29.8	39.0	12.7	-34.8	0.0	0.7	59.1	47.5	74	54	-14.9	-6.5	V
15.600	3.0	41.7	29.8	39.0	12.7	-34.8	0.0	0.7	59.4	47.4	74	54	-14.6	-6.6	H
															V
HI CHANNEL, 5240 MHz															
15.720	3.0	42.0	29.0	38.6	12.8	-34.7	0.0	0.7	59.4	46.4	74	54	-14.6	-7.6	V
15.720	3.0	42.1	29.5	38.6	12.8	-34.7	0.0	0.7	59.5	46.9	74	54	-14.5	-7.1	H

Rev. 4.12.7

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

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Broadcom
Project #:08U11950
Date: 07/19/08
Test Engineer: Can Ming Chung
Configuration: Tx Mode
Mode: Tx 5.3 GHz_5260-5320 MHz_11a Legacy

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T120; S/N: 29310 @3m	T144 Miteq 3008A00931			FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
		A-5m Chamber	HPF_7.6GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

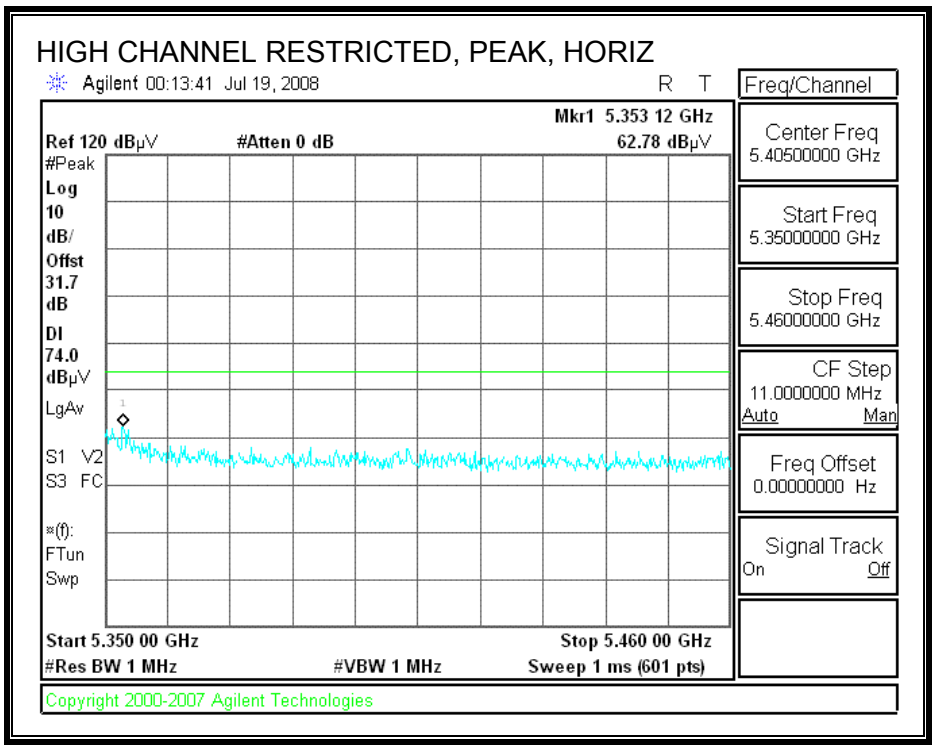
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
LOW CHANNEL, 5260 MHz															
15.780	3.0	41.5	28.9	38.4	12.8	-34.6	0.0	0.7	58.8	46.2	74	54	-15.2	-7.8	V
15.780	3.0	41.2	29.8	38.4	12.8	-34.6	0.0	0.7	58.5	47.1	74	54	-15.5	-6.9	H
															V
MID CHANNEL, 5300 MHz															
15.900	3.0	42.6	29.0	38.0	12.8	-34.6	0.0	0.7	59.6	46.0	74	54	-14.4	-8.0	V
15.900	3.0	43.0	29.1	38.0	12.8	-34.6	0.0	0.7	60.0	46.1	74	54	-14.0	-7.9	H
															V
HI CHANNEL, 5320 MHz															
15.960	3.0	41.5	28.9	37.8	12.8	-34.5	0.0	0.7	58.4	45.7	74	54	-15.6	-8.3	V
15.960	3.0	41.8	28.9	37.8	12.8	-34.5	0.0	0.7	58.7	45.8	74	54	-15.3	-8.2	H

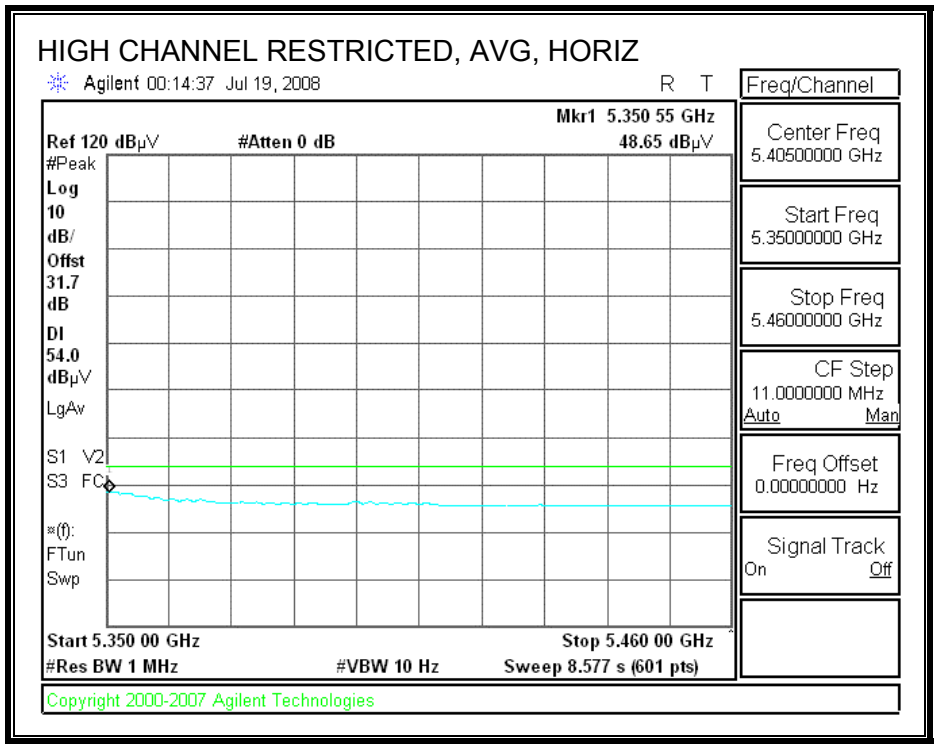
Rev. 4.12.7

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		

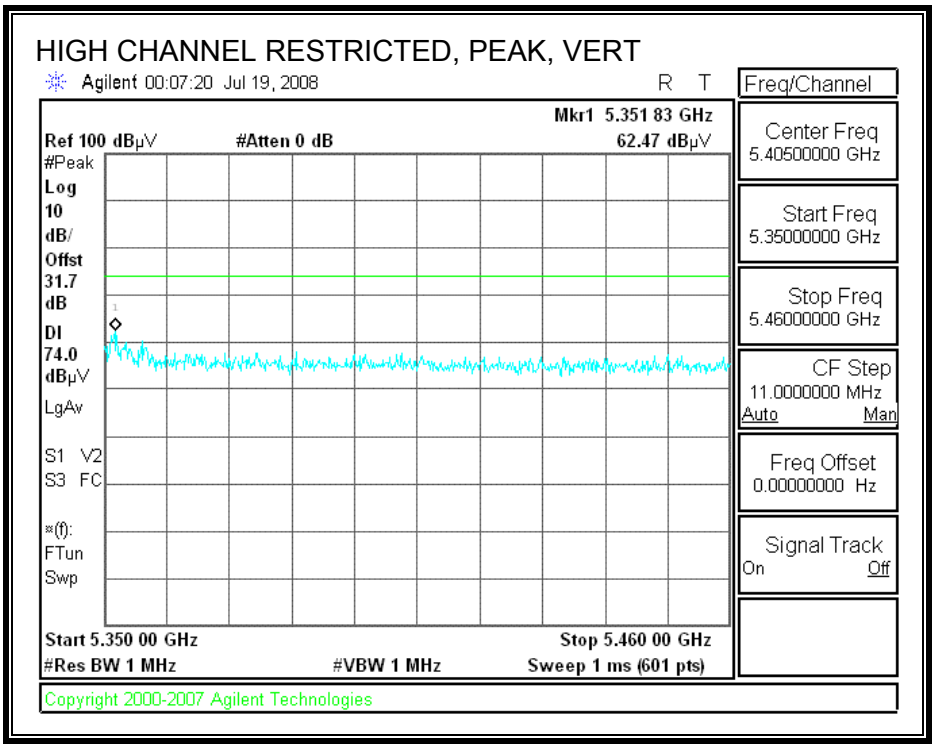
7.3.2. 802.11n HT40 MODE

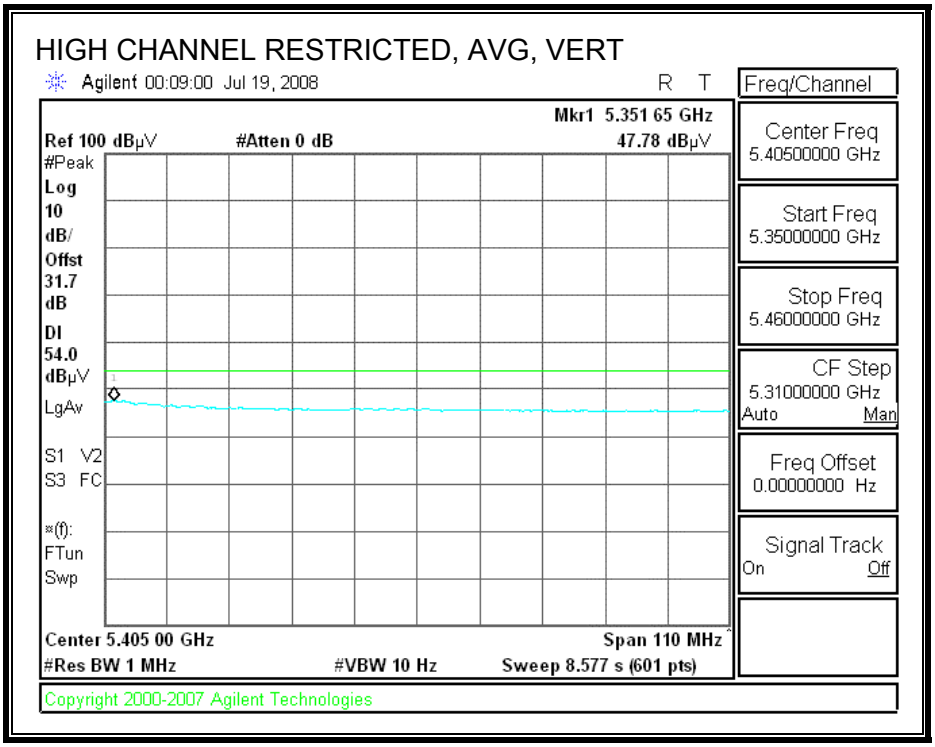
RESTRICTED BANDEDGE (HIGH CHANNEL 62, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL 62, 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, Fremont 5m Chamber

Company: Broadcom
Project #:08U11950
Date: 07/19/08
Test Engineer: Can Ming Chung
Configuration: Tx Mode
Mode: Tx 5.47-5.725 GHz Band_11a Legacy

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T120; S/N: 29310 @3m	T144 Miteq 3008A00931		T125; ARA 18-26GHz; S/N:1007	FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
		A-5m Chamber	HPF_7.6GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

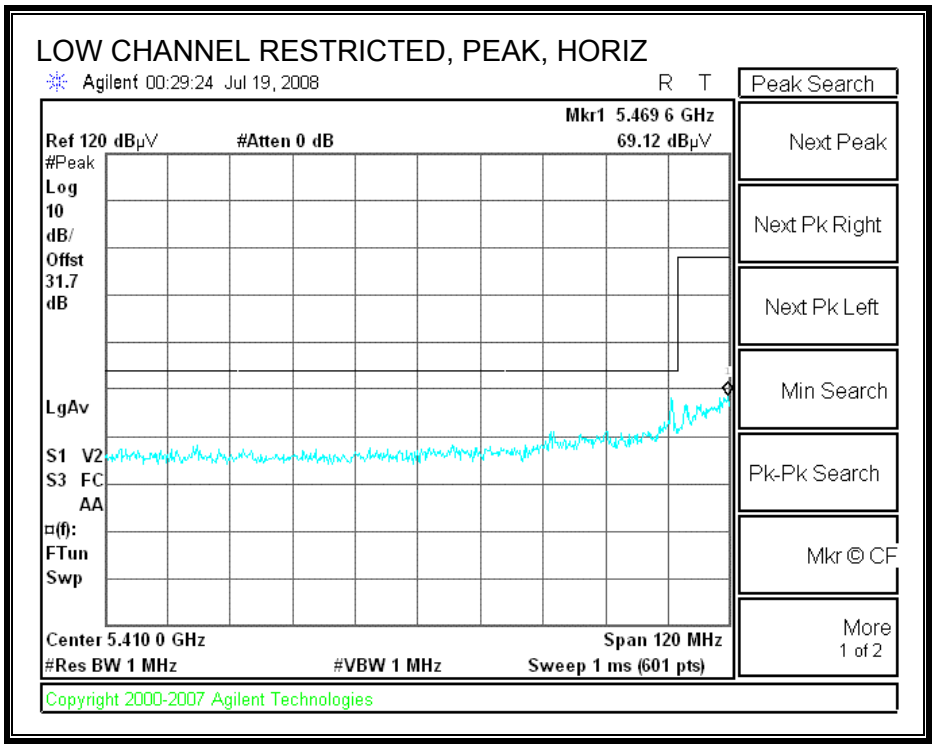
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
LOW CHANNEL, 5500 MHz															
11.000	3.0	41.9	29.0	36.3	11.1	-36.3	0.0	0.7	53.8	40.8	74	54	-20.2	-13.2	V
11.000	3.0	40.9	28.6	36.3	11.1	-36.3	0.0	0.7	52.8	40.5	74	54	-21.2	-13.5	H
															V
MID CHANNEL, 5600 MHz															
11.200	3.0	41.5	29.0	36.4	11.3	-36.1	0.0	0.7	53.8	41.2	74	54	-20.2	-12.8	V
11.200	3.0	41.1	29.3	36.4	11.3	-36.1	0.0	0.7	53.4	41.6	74	54	-20.6	-12.4	H
															V
HI CHANNEL, 5700 MHz															
11.400	3.0	40.9	28.7	36.4	11.5	-35.9	0.0	0.7	53.6	41.4	74	54	-20.4	-12.6	V
11.400	3.0	41.7	28.7	36.4	11.5	-35.9	0.0	0.7	54.4	41.4	74	54	-19.6	-12.6	H

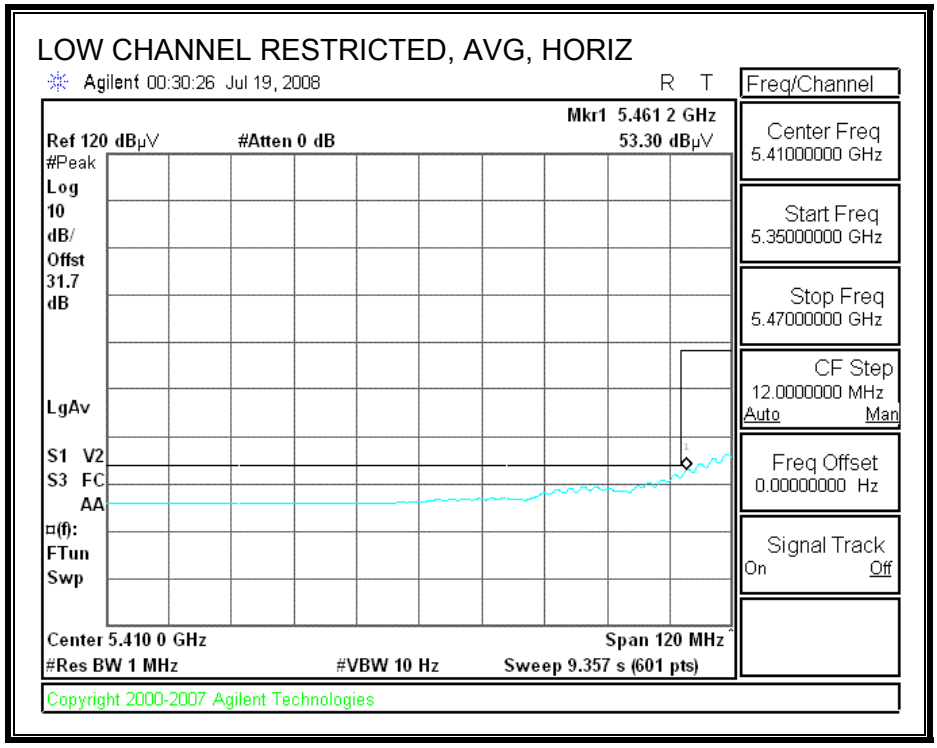
Rev. 4.12.7

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		

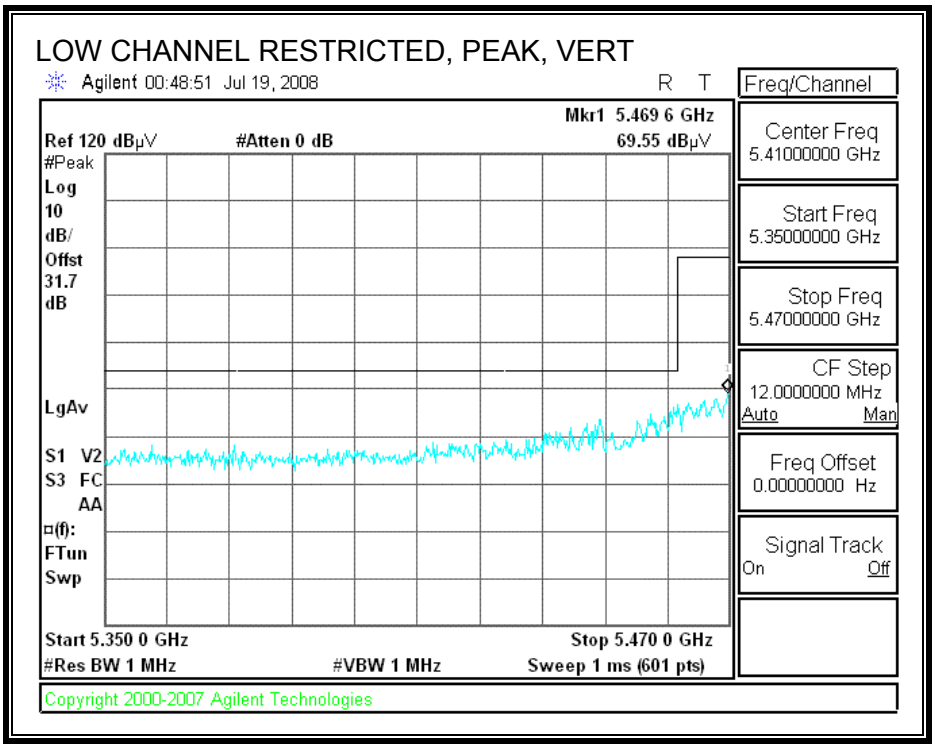
7.4.2. 802.11n HT40 MODE

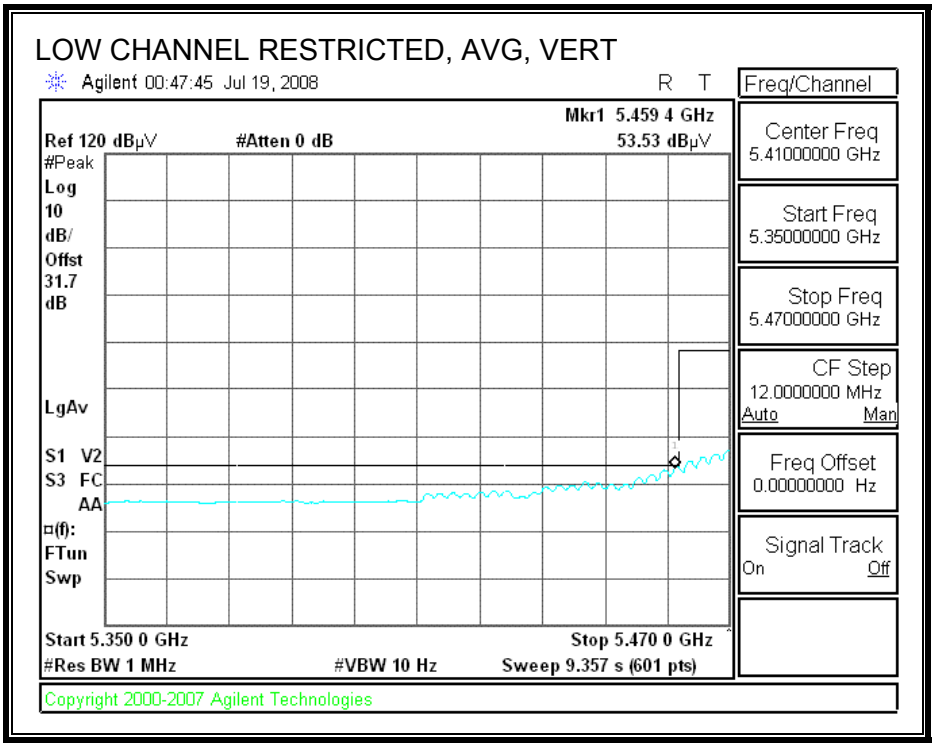
RESTRICTED BANDEDGE (LOW CHANNEL 102, HORIZONTAL)





RESTRICTED BANDEDGE (LOW CHANNEL 102, VERTICAL)





7.5. RECEIVER ABOVE 1 GHz

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Broadcom
Project #:08U11950
Date: 07/19/08
Test Engineer: Can Ming Chung
Configuration: Rx Mode
Mode: Rx 2.4 GHz_HT 20

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T120; S/N: 29310 @3m	T144 Miteq 3008A00931			RX RSS 210

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
		A-5m Chamber		

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)
5.990	3.0	39.2	28.7	33.8	7.6	-36.3	0.0	0.0	44.4	33.9	74	54	-29.6	-20.1	H
7.320	3.0	41.0	30.7	34.1	8.4	-36.2	0.0	0.0	47.4	37.0	74	54	-26.6	-17.0	H
5.670	3.0	38.5	28.5	33.1	7.5	-36.5	0.0	0.0	42.6	32.6	74	54	-31.4	-21.4	V
7.360	3.0	40.6	27.8	34.1	8.4	-36.2	0.0	0.0	46.9	34.1	74	54	-27.1	-19.9	V

Rev. 4.12.7

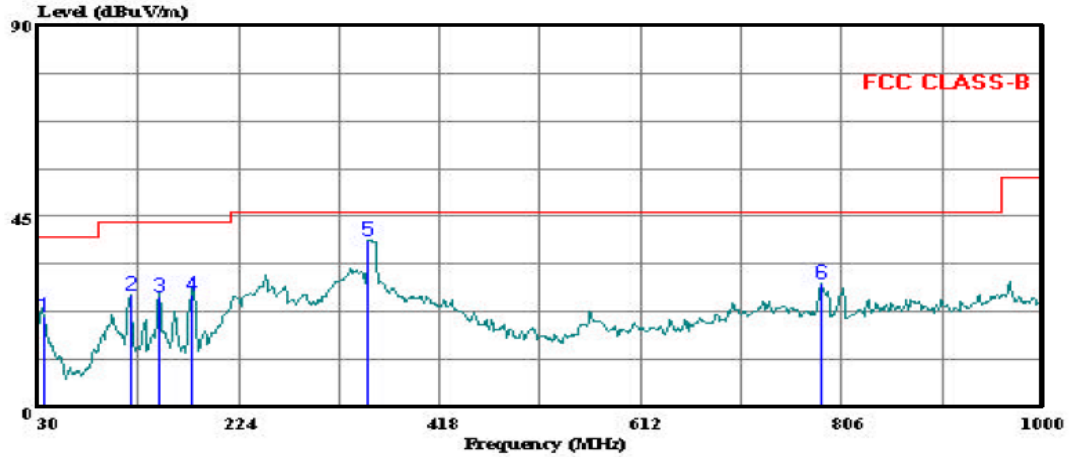
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field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

7.6. 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#: 12 File#: 08u11950.emi Date: 07-19-2008 Time: 18:11:13



Trace: 11 Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator:: Can Ming Chung
Project #: : 08U11950
Company: : Broadcom
Configuration:: EUT install in laptop
Mode : : TX worst case A mode-Mid Ch
Target: : FCC Class B

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	35.820	37.03	-15.69	21.34	40.00	-18.66	Peak
2	119.240	43.51	-17.15	26.36	43.50	-17.14	Peak
3	147.370	44.37	-18.09	26.27	43.50	-17.23	Peak
4	178.410	45.38	-18.82	26.56	43.50	-16.94	Peak
5	349.130	53.31	-14.12	39.19	46.00	-6.81	Peak
6	785.630	33.97	-4.87	29.10	46.00	-16.90	Peak

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

Compliance Certification Services
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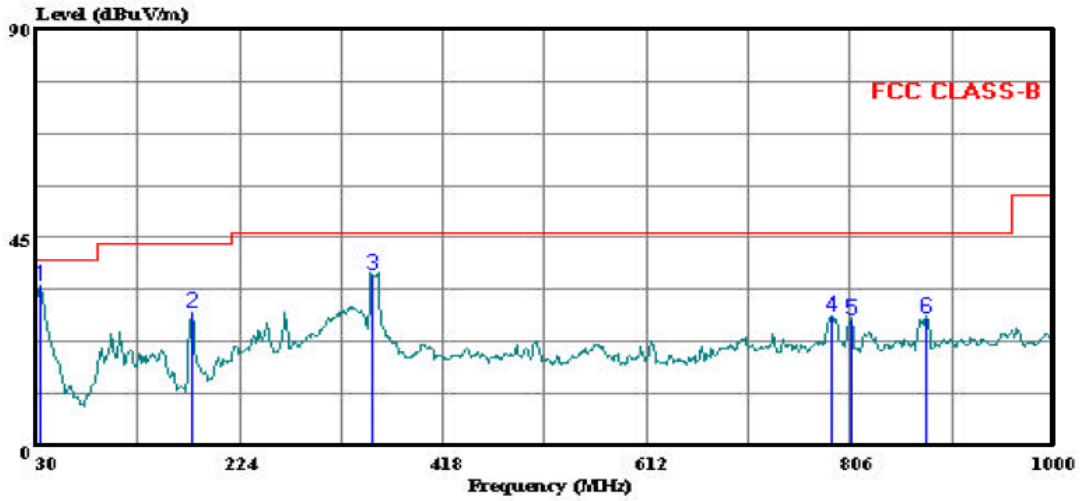
Data#: 14 File#: 08u11950.emi Date: 07-19-2008 Time: 18:19:08



Trace: 13 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator:: Can Ming Chung
Project #: : 08U11950
Company: : Broadcom
Configuration:: EUT install in laptop
Mode : : TX worst case A mode-Mid Ch
Target: : FCC Class B

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	33.880	49.65	-14.91	34.74	40.00	-5.26	Peak
2	179.380	47.50	-18.77	28.73	43.50	-14.77	Peak
3	351.070	50.97	-14.07	36.89	46.00	-9.11	Peak
4	788.540	32.88	-4.81	28.07	46.00	-17.93	Peak
5	806.970	31.75	-4.47	27.28	46.00	-18.72	Peak
6	878.750	30.32	-2.79	27.53	46.00	-18.47	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	1842/f	4.89/f	*($900/f^2$)	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	824/f	2.19/f	*($180/f^2$)	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	$280/f$	$2.19/f$		6
10–30	28	$2.19/f$		6
30–300	28	0.073	2*	6
300–1 500	$1.585f^{0.5}$	$0.0042f^{0.5}$	$f/150$	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	$616\,000/f^{1.2}$
150 000–300 000	$0.158f^{0.5}$	$4.21 \times 10^{-4}f^{0.5}$	$6.67 \times 10^{-5}f$	$616\,000/f^{1.2}$

* 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/m^2 is equivalent to 1 mW/cm^2.
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/cm^2

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/cm^2 is converted to units of W/m^2 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

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

where

d = distance in cm
Px = Power of transmitter x in mW
Gx = Numeric gain of antenna x
S = Power Density in mW/cm^2

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/cm^2
From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m^2

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	6.07	3.50			
WLAN	5.5 GHz	21.87	2.48			
Combined				20.0	0.06	0.56

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.	Reading			Closs	Limit	FCC_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.20	54.83	--	46.11	0.00	63.61	53.61	-8.78	-7.50	L1
0.60	46.38	--	35.40	0.00	56.00	46.00	-9.62	-10.60	L1
4.55	42.99	--	20.63	0.00	56.00	46.00	-13.01	-25.37	L1
0.20	51.94	--	42.94	0.00	63.61	53.61	-11.67	-10.67	L2
0.68	43.03	--	27.21	0.00	56.00	46.00	-12.97	-18.79	L2
12.99	41.22	--	24.57	0.00	60.00	50.00	-18.78	-25.43	L2
6 Worst Data									

LINE 1 RESULTS

Compliance Certification Services
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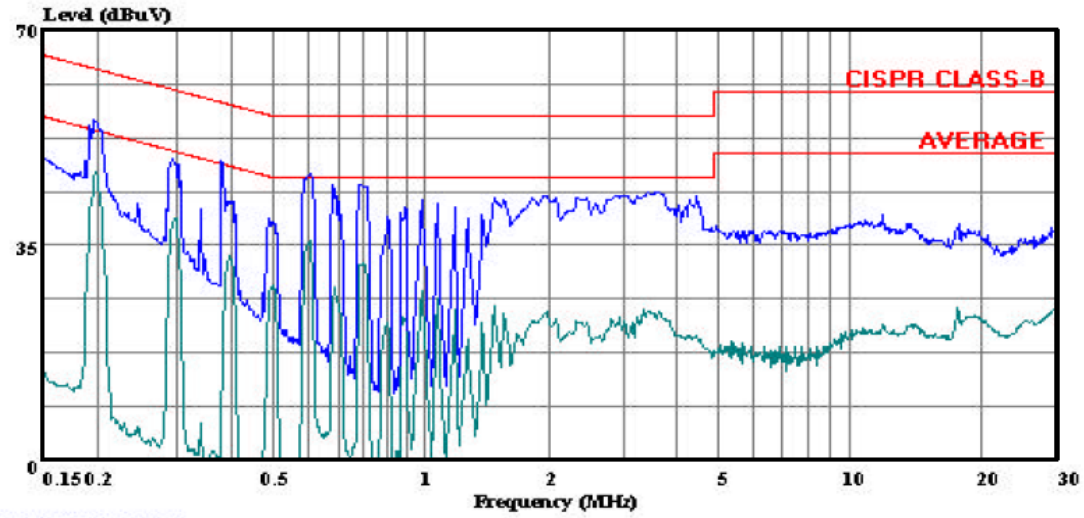
Data#: 14 File#: 08U11950.EMI Date: 07-19-2008 Time: 18:36:19



(Line Conduction)

Trace: 12 Ref Trace:

Condition: CISPR CLASS-B
Test Operator:: Can Ming Chung
Project #: : 08U11950
Company: : Broadcom
Configuration:: EUT inside Laptop
Mode: : TX Worst case
Target: : CISPR B
Voltage: : 115VAC / 60Hz
: L1: Peak (Blue); Average (Green)

LINE 2 RESULTS

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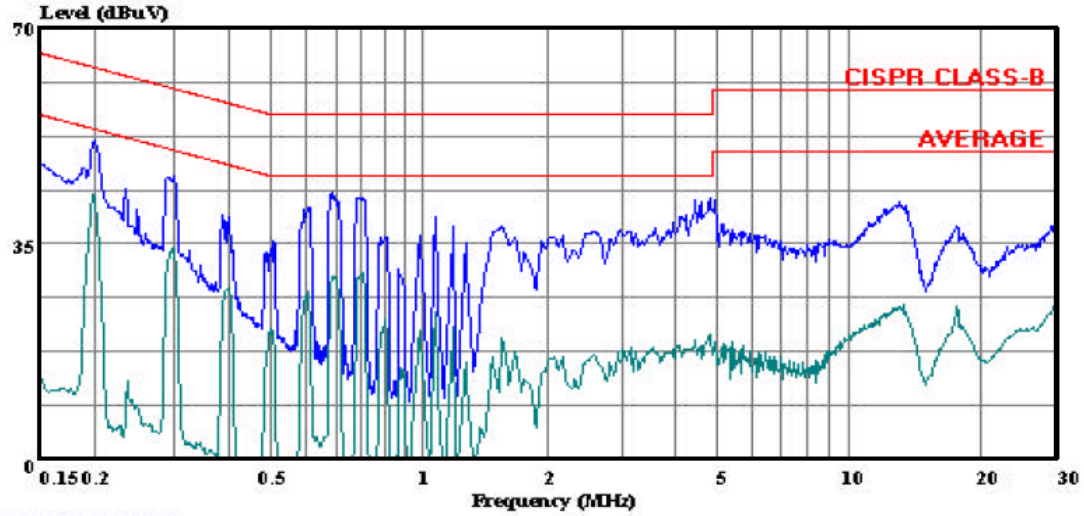
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 21 File#: 08U11950.EMI Date: 07-19-2008 Time: 18:45:50



(Line Conduction)

Trace: 19 Ref Trace:

Condition: CISPR CLASS-B
Test Operator:: Can Ming Chung
Project #: : 08U11950
Company: : Broadcom
Configuration:: EUT inside Laptop
Mode: : TX Worst case
Target: : CISPR B
Voltage: : 115VAC / 60Hz
: L2: Peak (Blue); Average (Green)