FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8
CLASS II PERMISSIVE CHANGE
CERTIFICATION TEST REPORT

FOR

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

MODEL NUMBER: BCM943228HMB

FCC ID: QDS-BRCM1058
IC: 4324A-BRCM1058

REPORT NUMBER: 12U14229-2, Revision A

ISSUE DATE: MARCH 27, 2012

Prepared for
BROADCOM CORPORATION
190 MATHILDA PLACE
SUNNYVALE, CA 94086, UNITED STATES

Prepared by
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	03/19/12	Initial Issue	T. Chan
A	03/26/12	Corrected Typo on Attestation page. Revised Description of Available Antenna section.	A. Zaffar

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1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: 802.11a/b/g/n WLAN + Bluetooth PCI-E Mini Card

MODEL: BCM943228HMB

SERIAL NUMBER: 74DE2B3448FE (P305)

DATE TESTED: 02/11/2012, 02/13/2012, 02/16-02/17/2012, and 02/20/2012

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

Compliance Certification Services (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. 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 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. 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 CCS By:

THU CHAN
ENGINEERING MANAGER
UL CCS

Tested By:

DAVID GARCIA
EMC ENGINEER
UL CCS

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 2, and RSS-210 Issue 8.

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

The radio module is manufactured by Broadcom.

5.2. MAXIMUM OUTPUT POWER

The measured average power values were within ± 0.5 dB of the original values. Refer to original report number "11U13795-1A FCC IC DTS WLAN Report" for exact output power values and for all antenna port results.

5.3. DESCRIPTION OF CLASS II PERMISSIVE CHANGE

The change filed under this application is the addition of an alternate monopole antenna.

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes antennas with maximum gains as a function of frequency as given in the following table:

Antenna Type	Peak Gain (dBi)					Comments
	2400-2483.5MHz	5150-5250MHz	5250-5350MHz	5470-5725MHz	5725-5850MHz	
802.11g/g/n WLAN	3.9	5.6	5.6	4.2	4.2	Original authorization
Monopole	1.21	2.15	2.06	1.62	1.36	Class 2 Permissive Change

5.5. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Broadcom, rev. 5.100.82.54.

The test utility software used during testing was BCM Internal, rev. 5.100.RC82.54

5.6. WORST-CASE CONFIGURATION AND MODE

The EUT was tested as an external module installed in a test jig board connected to a host Laptop PC.

Worst-Case data rates were utilized from preliminary testing of the Chipset, worst-case data rates used during the testing are as follows:

For 2.4GHz Band:
All final tests in the 802.11b Legacy mode were made at 1 Mb/s.
All final tests in the 802.11g Legacy mode were made at 6 Mb/s.
All final tests in the 802.11n 20MHz & 40MHz CDD mode were made at MCS0.

For 5.8GHz Band:
All final tests in the 802.11a Mode (Legacy) were made at 6 Mb/s.
All final tests in the 802.11n 20MHz & 40MHz CDD mode were made at MCS0.

Worst-case mode and channel used for 30-1000 MHz radiated and power line conducted emissions was the mode and channel with the highest output power, which was determined to be HT20 mode, mid channel.

The antennas were oriented to provide worst case radiated emissions. X, Y and Z antenna positions were tested to determine worst case emissions. The antennas in the Y position was determined to be the worst case orientation and provided the highest levels of emissions.

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop PC	Lenovo	G560	CBD6427441	DoC
AC Adapter	Lenovo	PA-1650-56LC	11S36001651ZZH0008KCMA	DoC
Mini PC Adapter	Catalyst	MINI2EXP	Suhail 02	N/A

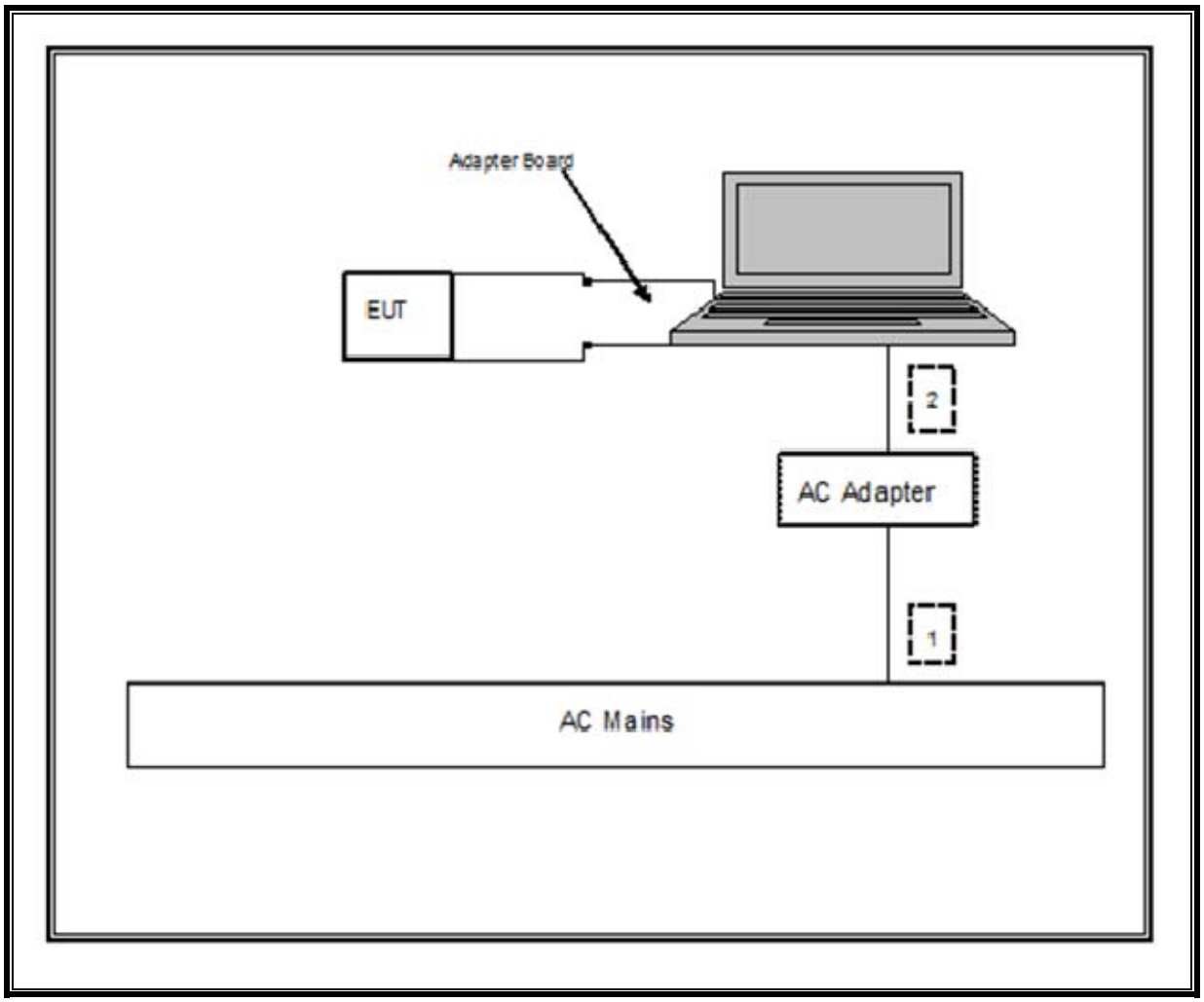
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identica Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	AC	Unshielded	1.0m	Detachable. 3C/18AWG.
2	DC	1	DC	Unshielded	1.8m	Non-detachable. Ferrite loaded at laptop end of cable.

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**
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	07/16/12
Antenna, Horn, 18 GHz	EMCO	3115	C00945	06/29/12
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00589	07/28/12
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01179	02/16/13
EMI Receiver, 6.5GHz	Agilent / HP	85462A	N/A	02/23/13
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	11/11/12
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	07/12/12
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRC13192	N02683	CNR
Reject Filter, 5.725-5.825 GHz	Micro-Tronics	BRC13192	N02677	CNR
Highpass Filter, 7.6 GHz	Micro-Tronics	HPM13195	N02601	CNR

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 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

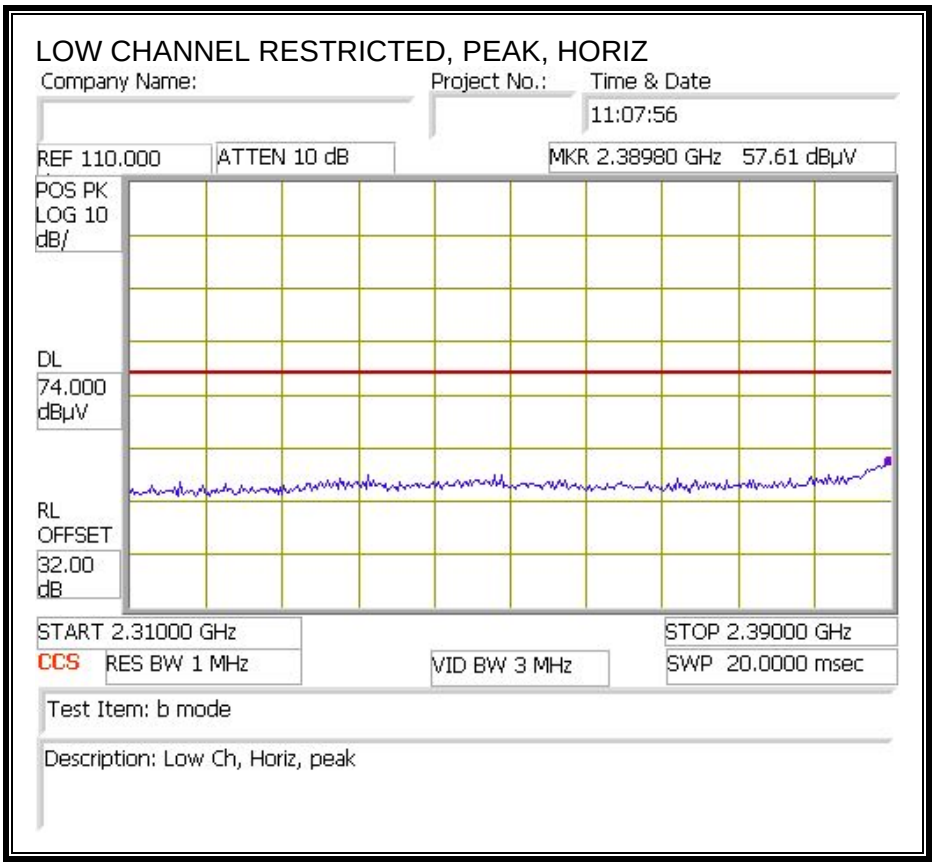
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each appplicable band.

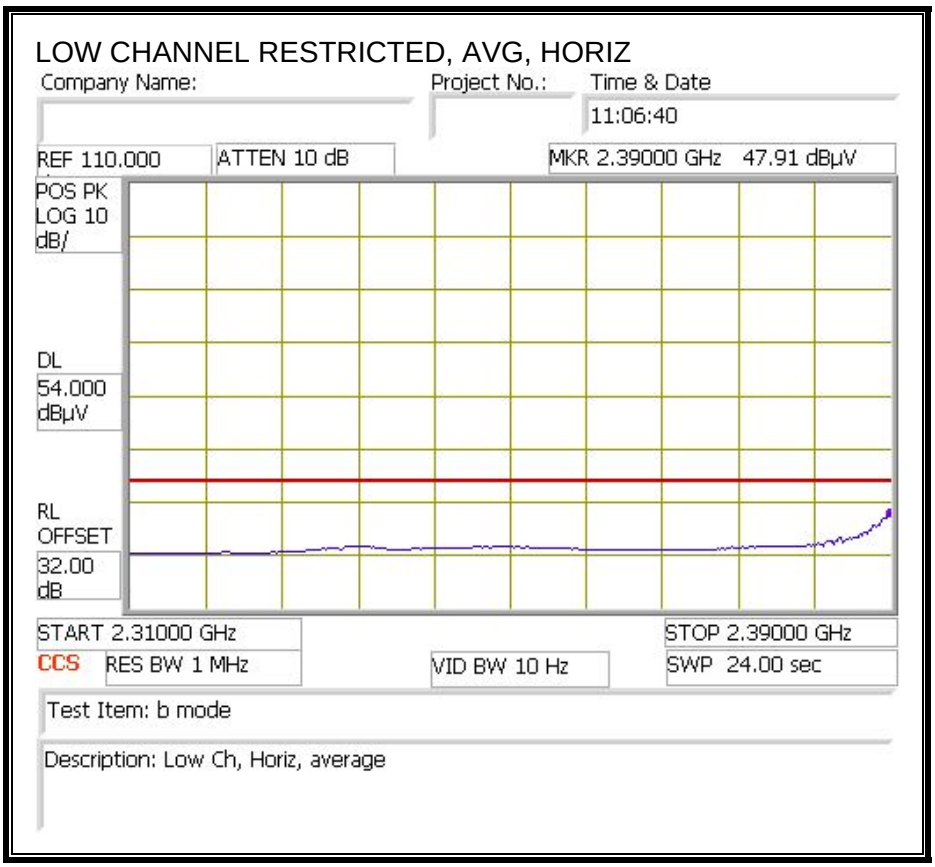
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

7.2. TRANSMITTER ABOVE 1 GHz

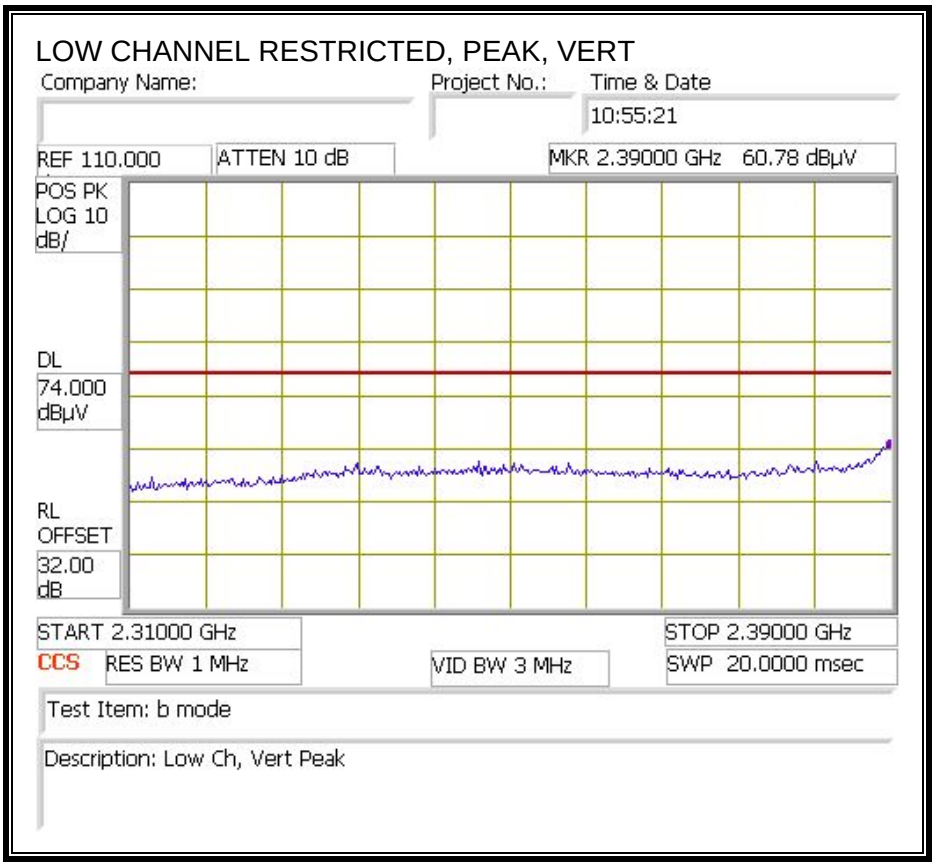
7.2.1. TX ABOVE 1 GHz FOR 802.11b 1TX MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

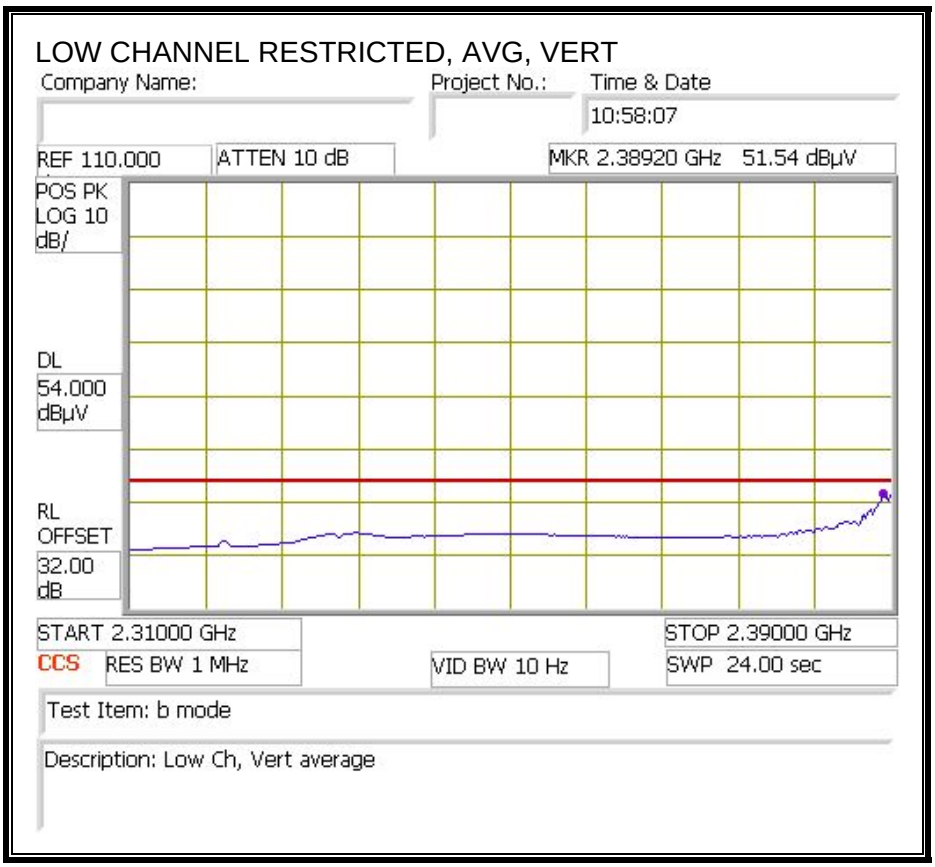




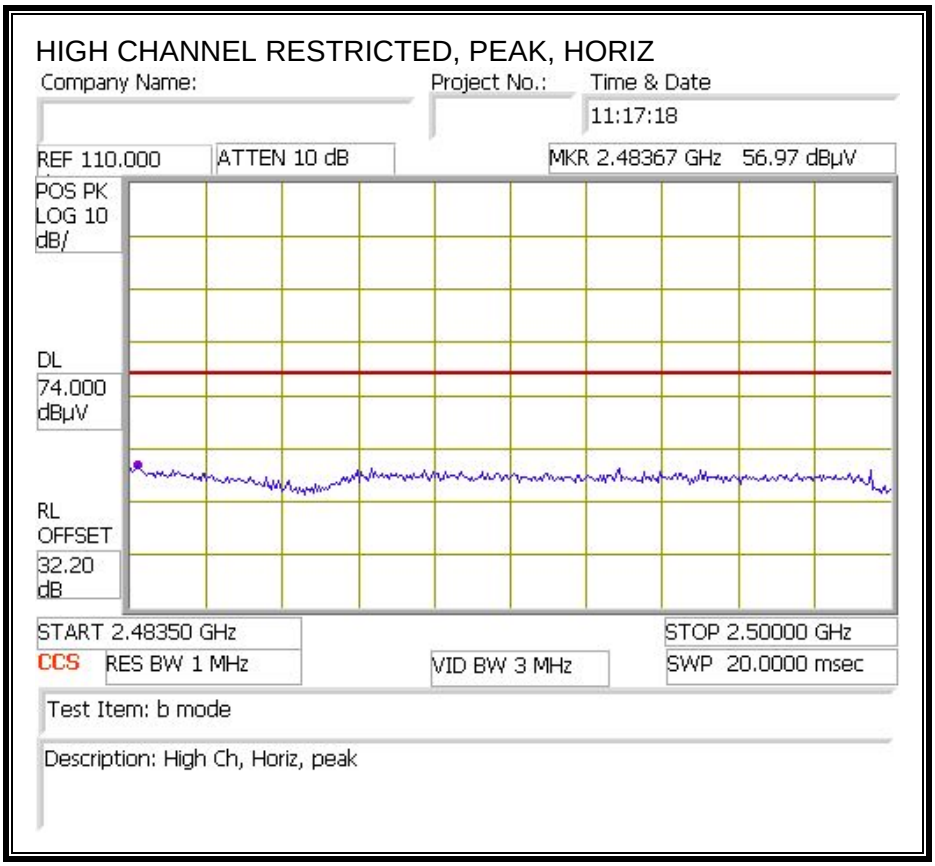
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

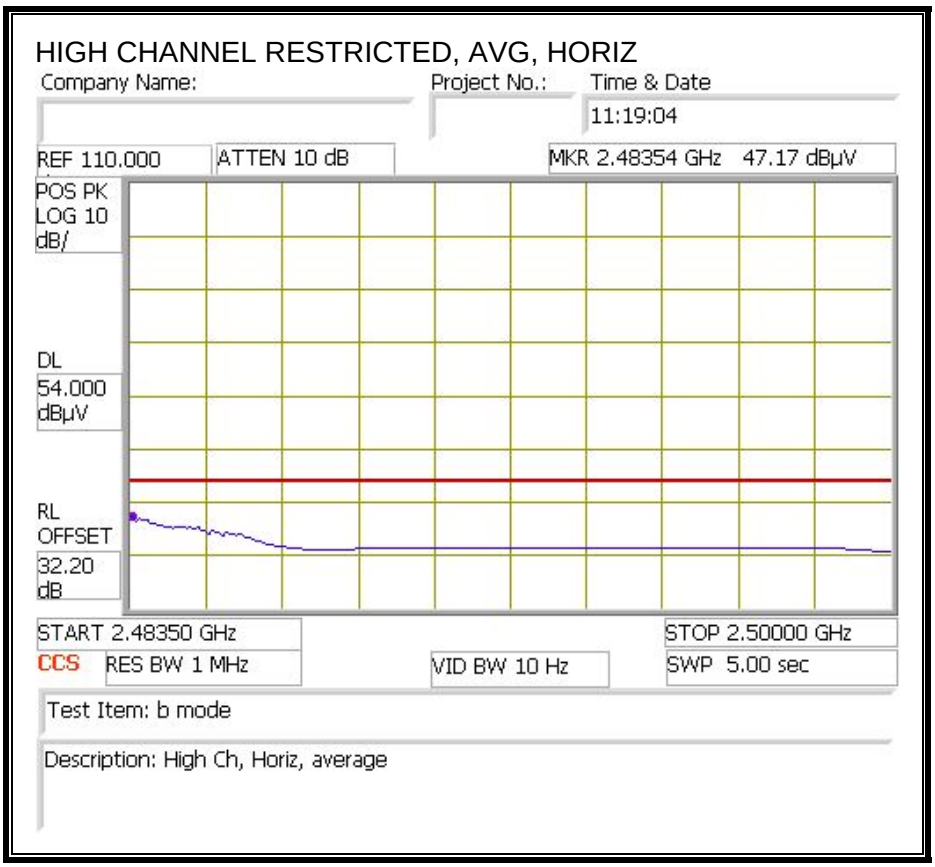


LOW CHANNEL RESTRICTED, AVG, VERT

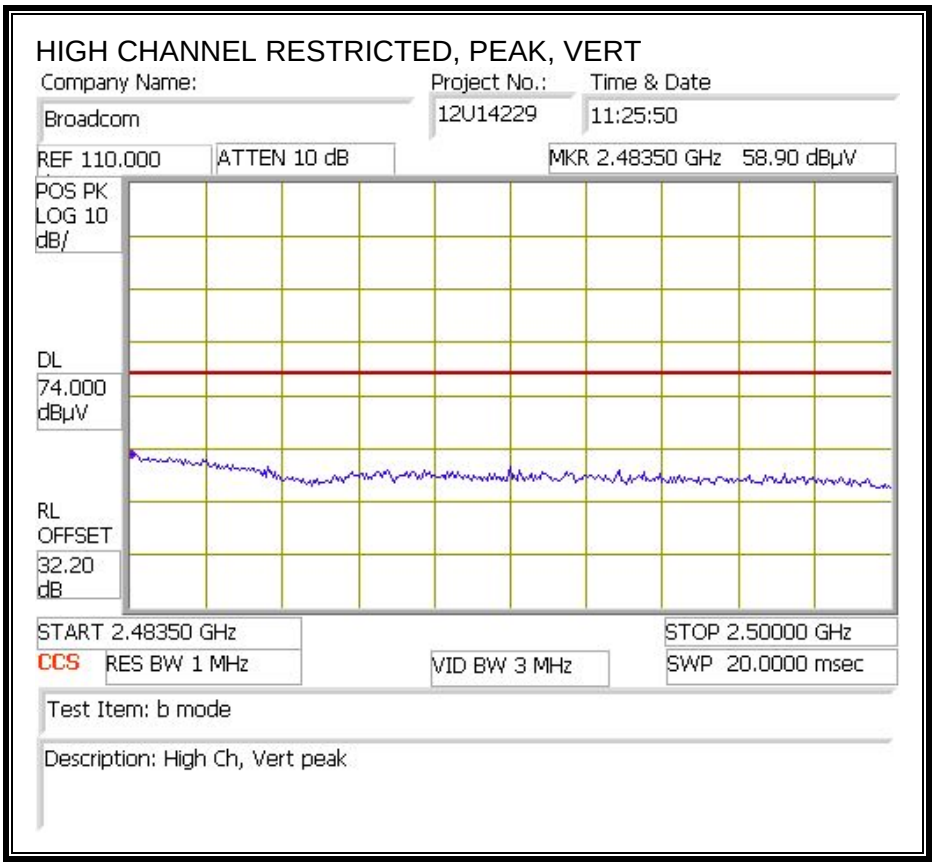


RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

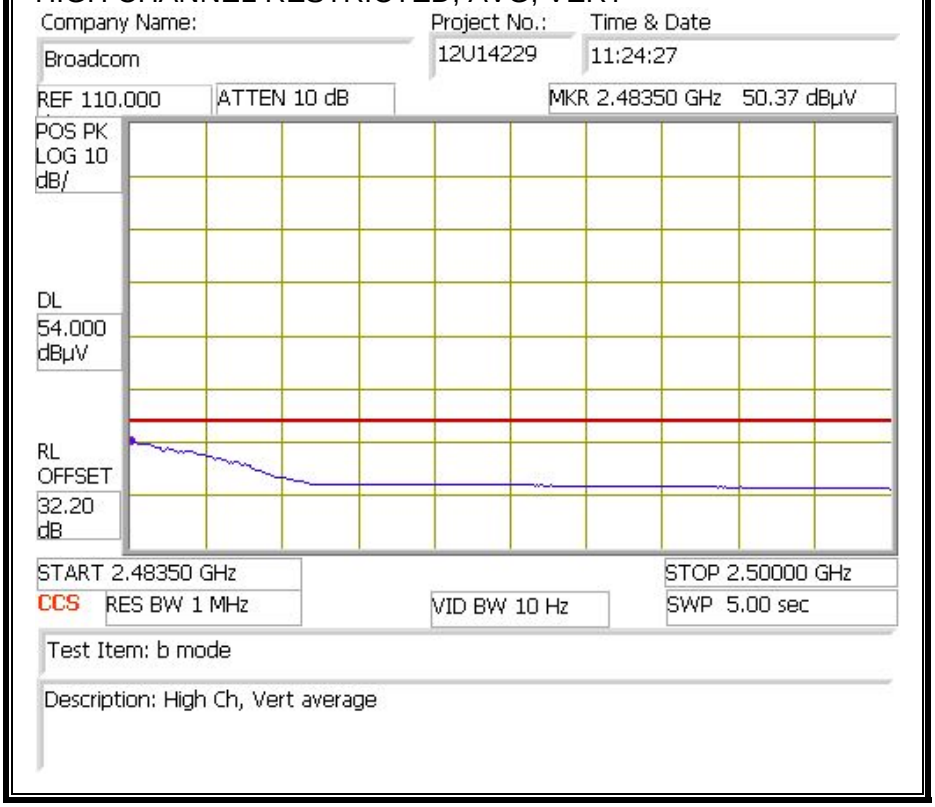




RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HIGH CHANNEL RESTRICTED, AVG, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber B

Test Engr: Chin Pang
Date: 02/11/12
Project #: 12U14229
Company: Broadcom
Test Target: FCC 15.247
Mode Oper: TX, b mode

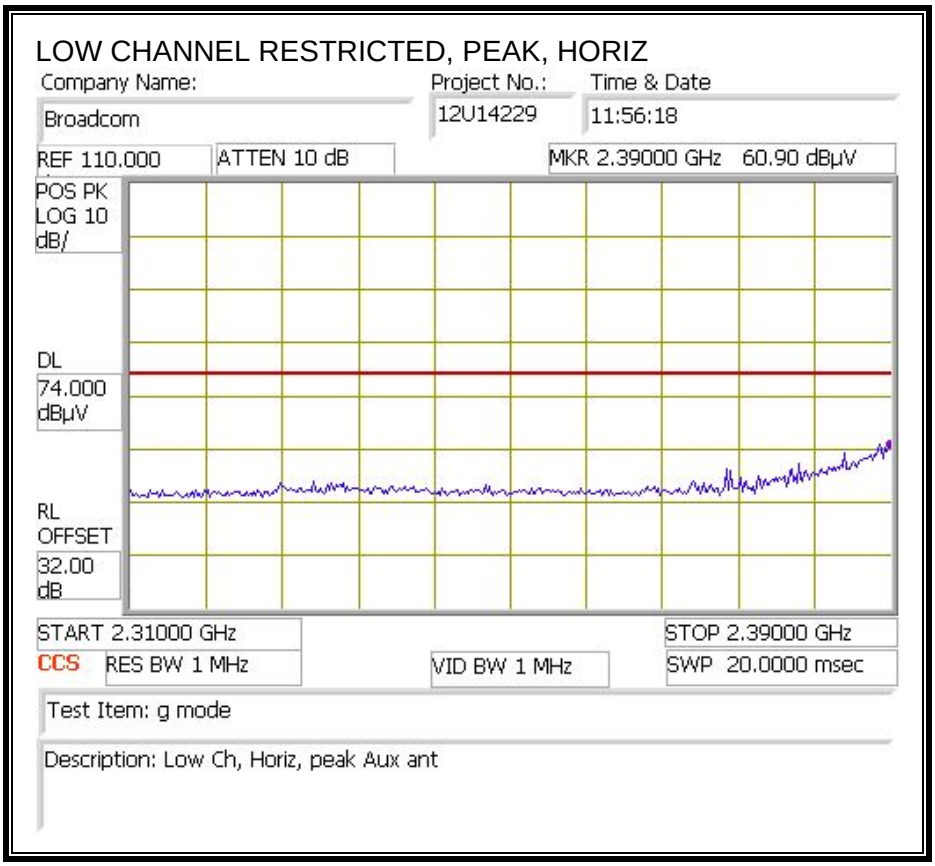
f	Measurement Frequency	Amp	Preamp Gain		Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m		Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength		Margin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

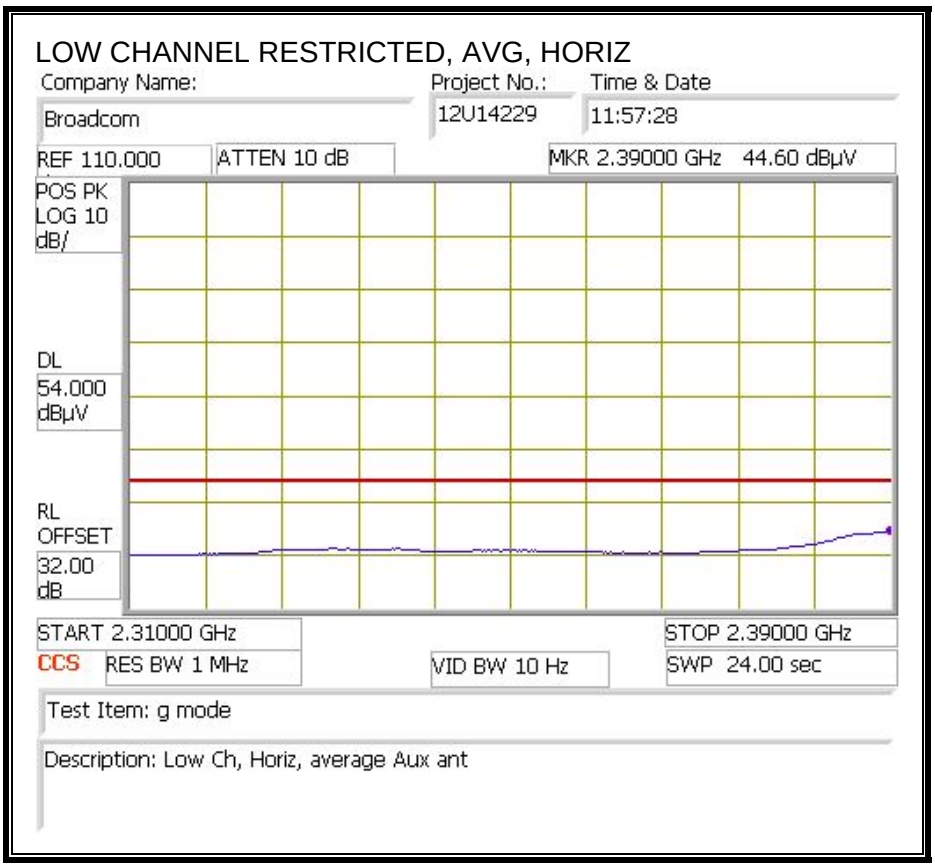
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Ch, 2412MHz													
4.824	3.0	42.8	33.2	5.8	-34.8	0.0	0.0	46.9	74.0	-27.1	H	P	
4.824	3.0	38.4	33.2	5.8	-34.8	0.0	0.0	42.6	54.0	-11.4	H	A	
4.824	3.0	46.6	33.2	5.8	-34.8	0.0	0.0	50.7	74.0	-23.3	V	P	
4.824	3.0	43.5	33.2	5.8	-34.8	0.0	0.0	47.6	54.0	-6.4	V	A	
Mid Ch, 2437MHZ													
4.874	3.0	38.2	33.2	5.8	-34.9	0.0	0.0	42.4	74.0	-31.6	H	P	
4.874	3.0	28.9	33.2	5.8	-34.9	0.0	0.0	33.2	54.0	-20.8	H	A	
7.311	3.0	38.5	36.2	7.3	-34.7	0.0	0.0	47.3	74.0	-26.7	H	P	
7.311	3.0	27.5	36.2	7.3	-34.7	0.0	0.0	36.3	54.0	-17.7	H	A	
4.874	3.0	41.7	33.2	5.8	-34.9	0.0	0.0	45.9	74.0	-28.1	V	P	
4.874	3.0	36.2	33.2	5.8	-34.9	0.0	0.0	40.4	54.0	-13.6	V	A	
7.311	3.0	43.7	36.2	7.3	-34.7	0.0	0.0	52.5	74.0	-21.5	V	P	
7.311	3.0	39.0	36.2	7.3	-34.7	0.0	0.0	47.8	54.0	-6.2	V	A	
High Ch, 2462MHz													
4.924	3.0	41.9	33.3	5.9	-34.9	0.0	0.0	46.2	74.0	-27.8	H	P	
4.924	3.0	36.2	33.3	5.9	-34.9	0.0	0.0	40.5	54.0	-13.5	H	A	
7.386	3.0	38.7	36.3	7.3	-34.6	0.0	0.0	47.6	74.0	-26.4	H	P	
7.386	3.0	24.9	36.3	7.3	-34.6	0.0	0.0	33.9	54.0	-20.1	H	A	
4.924	3.0	44.3	33.3	5.9	-34.9	0.0	0.0	48.6	74.0	-25.4	V	P	
4.924	3.0	37.2	33.3	5.9	-34.9	0.0	0.0	41.5	54.0	-12.5	V	A	
7.386	3.0	47.1	36.3	7.3	-34.6	0.0	0.0	56.0	74.0	-18.0	V	P	
7.386	3.0	41.1	36.3	7.3	-34.6	0.0	0.0	50.0	54.0	-4.0	V	A	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

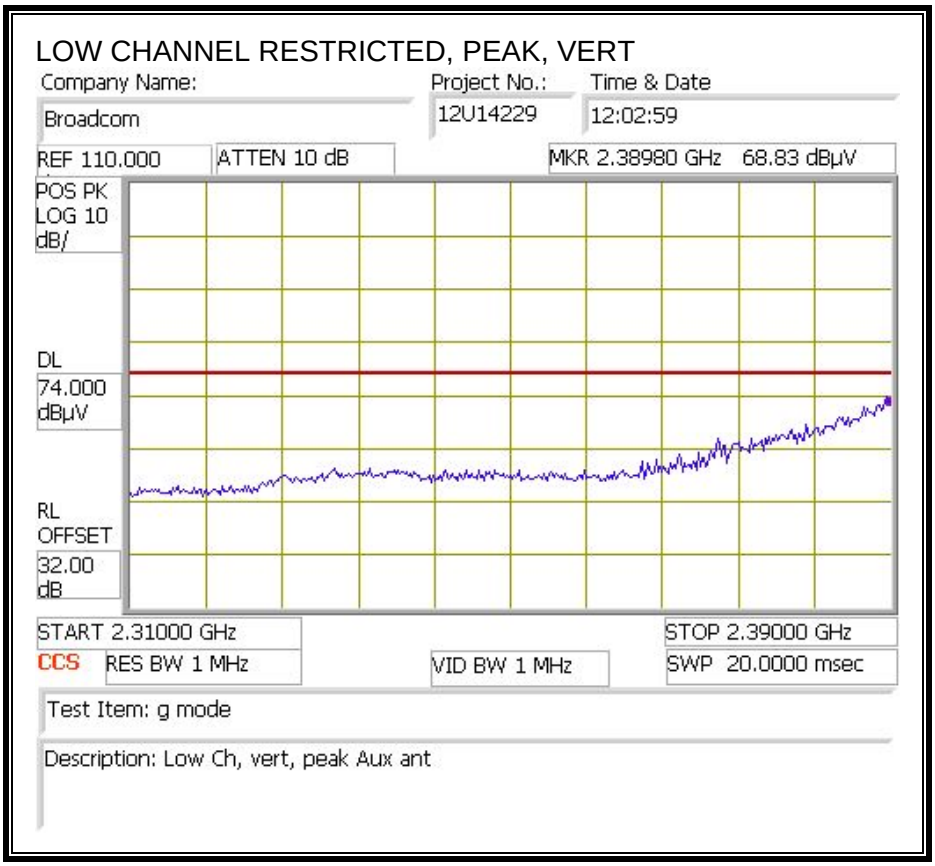
7.2.2. TX ABOVE 1 GHz FOR 802.11g 1TX MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

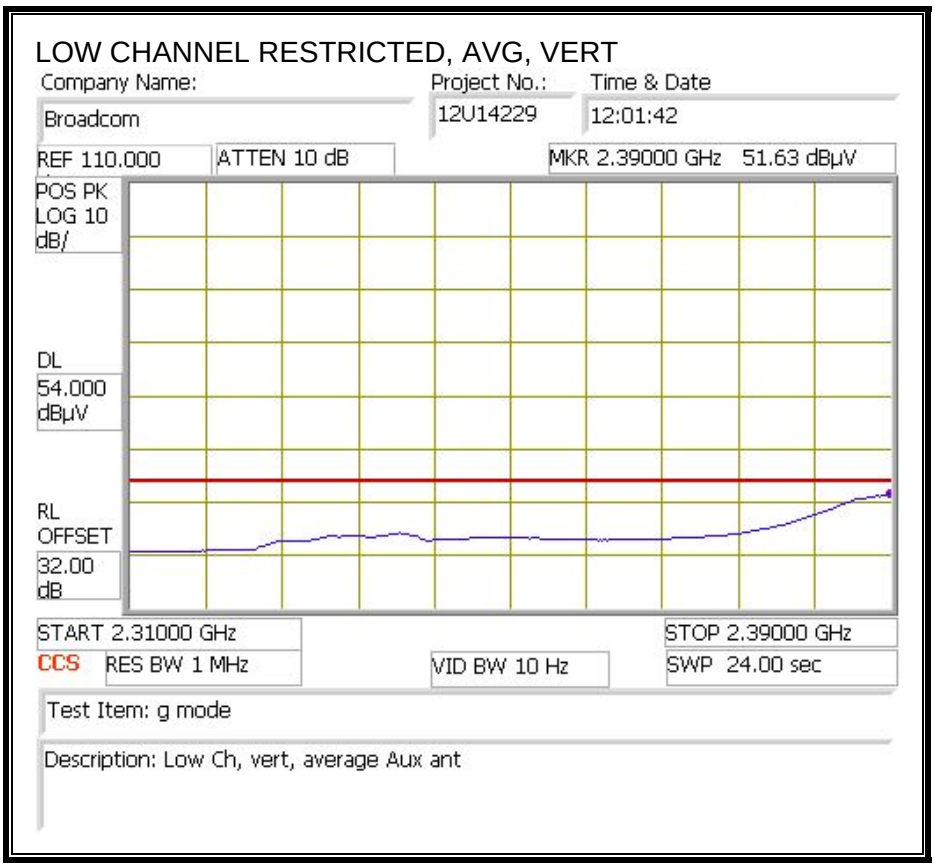




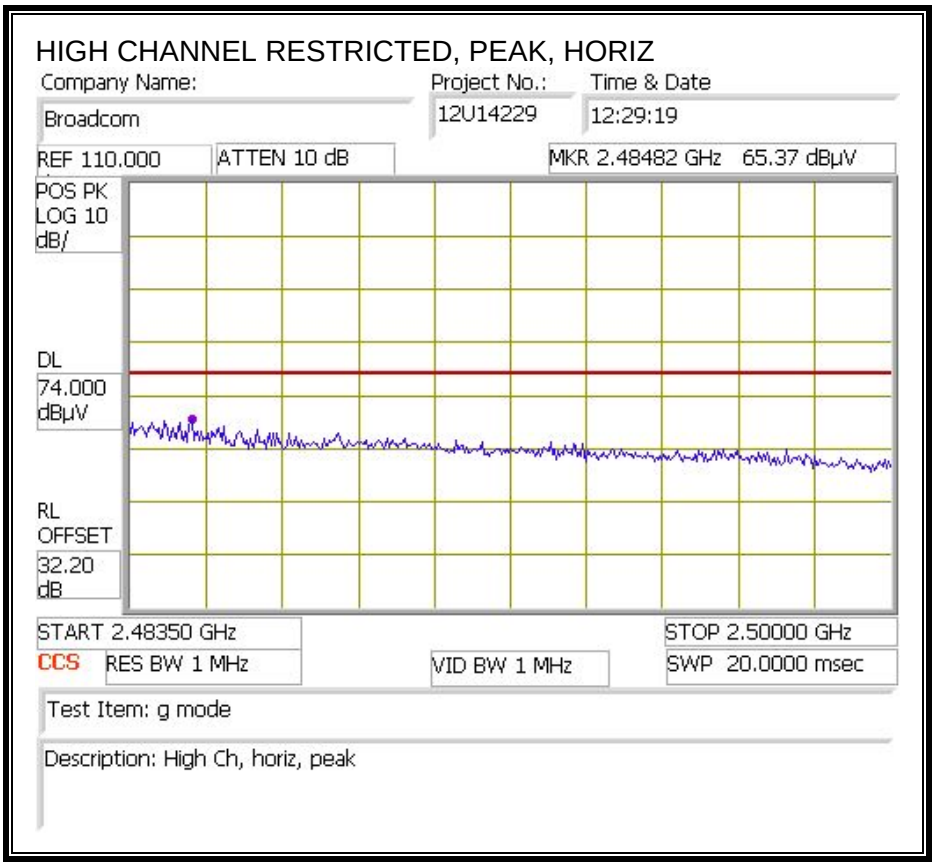
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

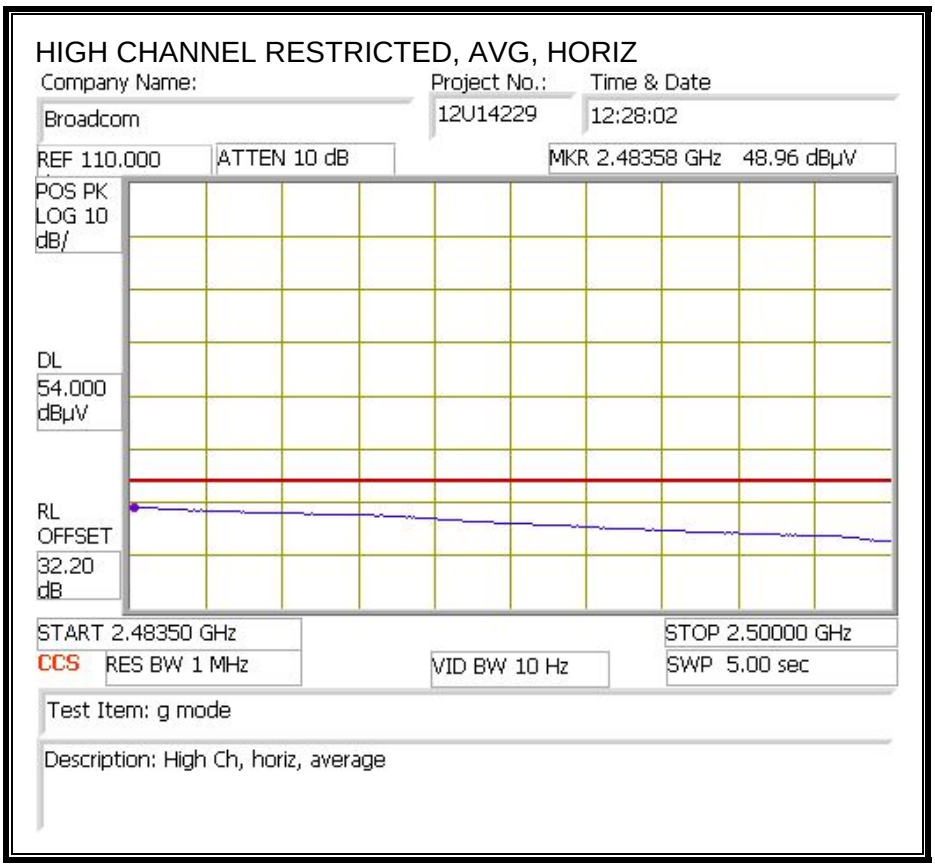


LOW CHANNEL RESTRICTED, AVG, VERT

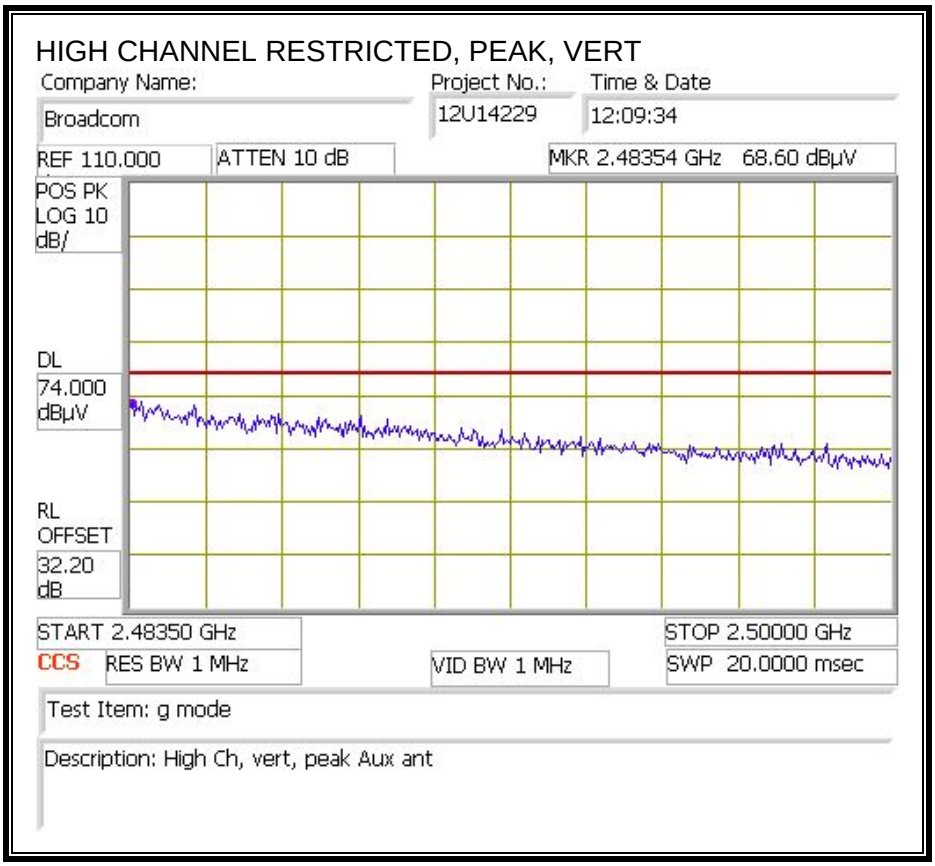


RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

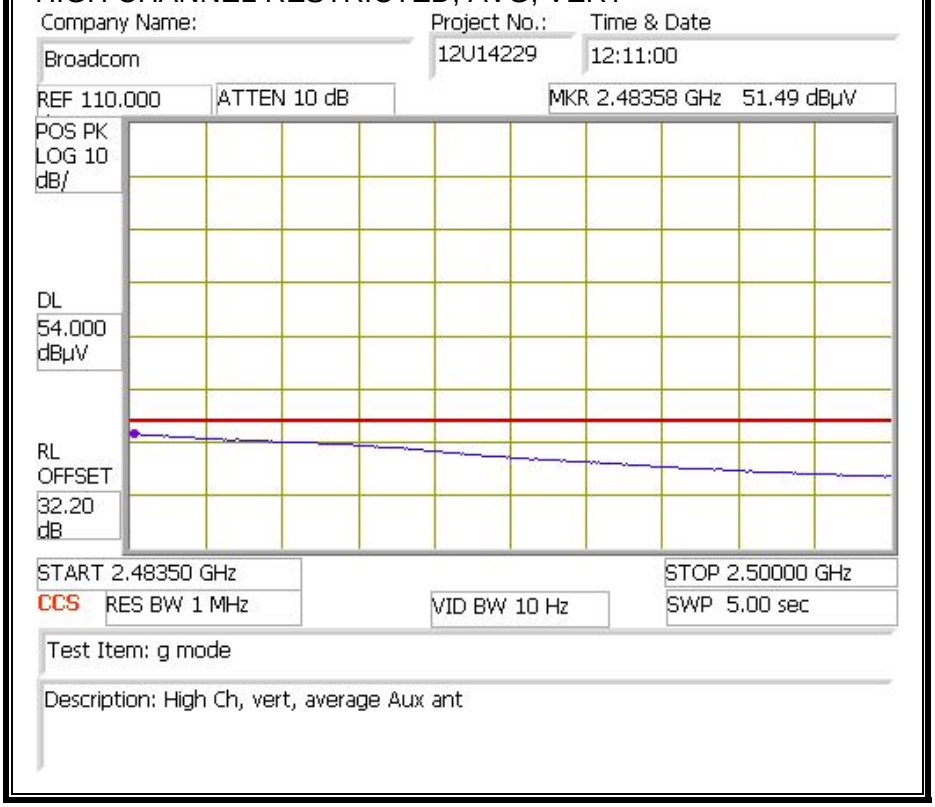




RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HIGH CHANNEL RESTRICTED, AVG, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber A

Test Engr: David Garcia
Date: 02/16/12
Project #: 12U14229
Company: Broadcom
Test Target: FCC 15.247
Mode Oper: 11g

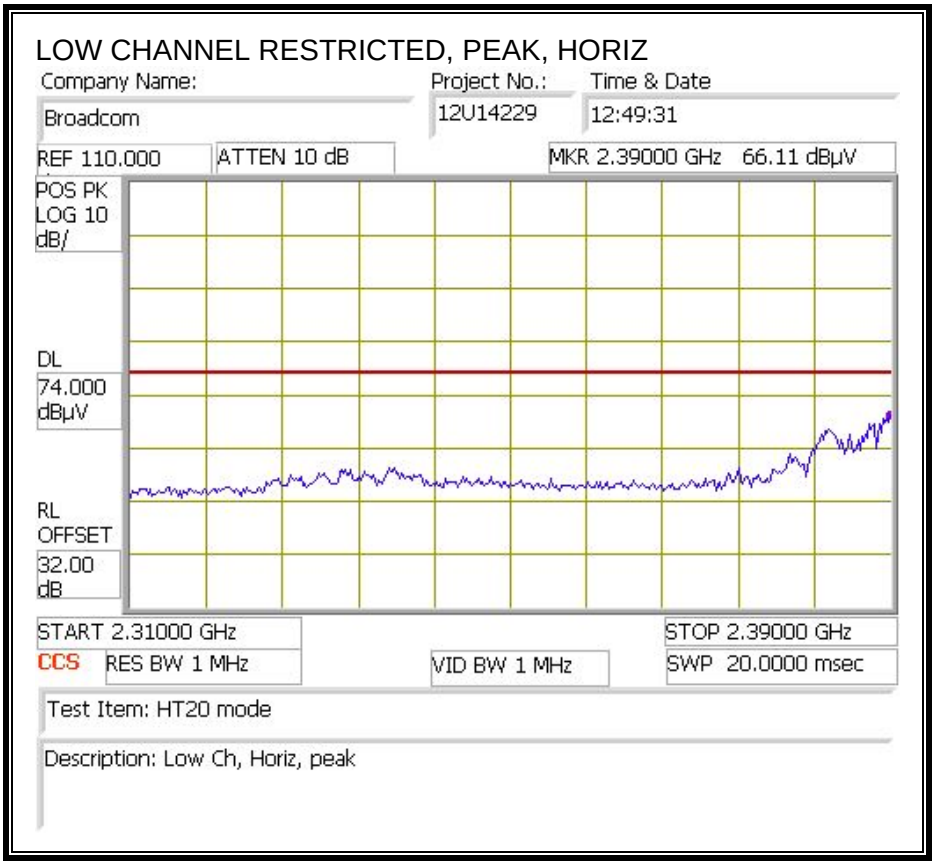
f	Measurement Frequency	Amp	Preamp Gain		Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m		Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength		Margin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

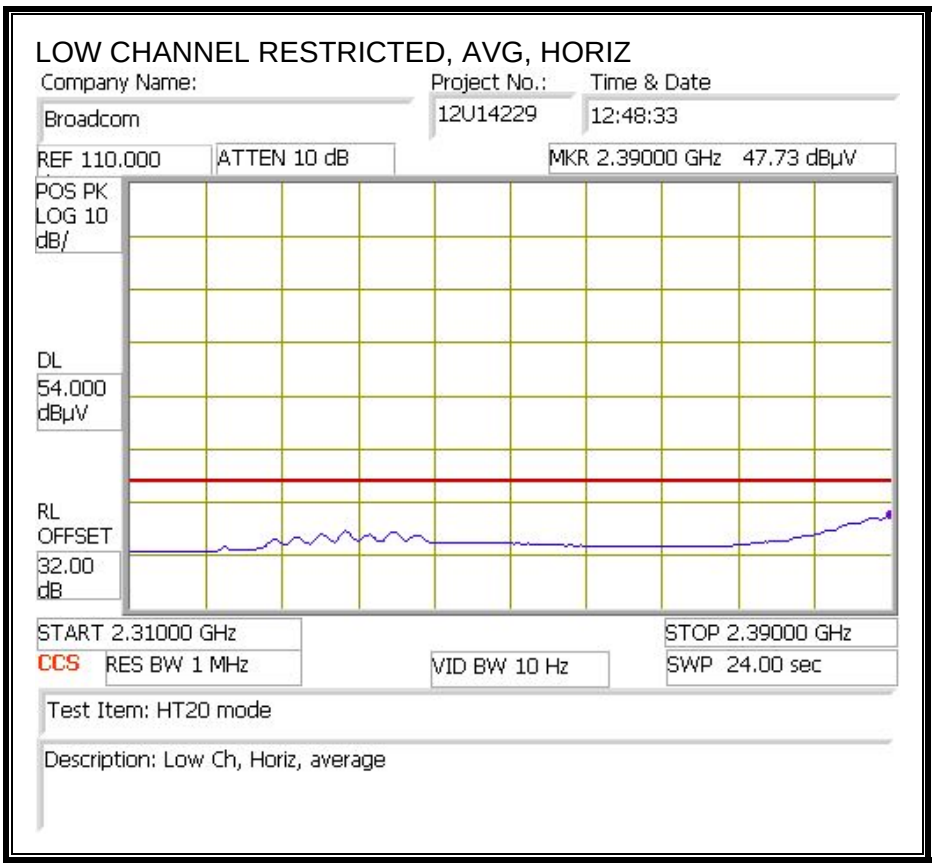
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Channel: 2412 MHz													
4.824	3.0	41.1	33.1	6.8	-34.8	0.0	0.0	46.2	74.0	-27.8	H	P	
4.824	3.0	26.0	33.1	6.8	-34.8	0.0	0.0	31.1	54.0	-22.9	H	A	
4.824	3.0	45.1	33.1	6.8	-34.8	0.0	0.0	50.1	74.0	-23.9	V	P	
4.824	3.0	31.2	33.1	6.8	-34.8	0.0	0.0	36.3	54.0	-17.7	V	A	
Mid Channel: 2437 MHz													
4.874	3.0	43.5	33.2	6.8	-34.8	0.0	0.0	48.7	74.0	-25.3	H	P	
4.874	3.0	29.6	33.2	6.8	-34.8	0.0	0.0	34.8	54.0	-19.2	H	A	
7.311	3.0	41.2	36.3	9.1	-34.1	0.0	0.0	52.5	74.0	-21.5	H	P	
7.311	3.0	26.5	36.3	9.1	-34.1	0.0	0.0	37.8	54.0	-16.3	H	A	
4.874	3.0	47.7	33.2	6.8	-34.8	0.0	0.0	52.8	74.0	-21.2	V	P	
4.874	3.0	32.6	33.2	6.8	-34.8	0.0	0.0	37.8	54.0	-16.2	V	A	
7.311	3.0	49.2	36.3	9.1	-34.1	0.0	0.0	60.4	74.0	-13.6	V	P	
7.311	3.0	34.6	36.3	9.1	-34.1	0.0	0.0	45.9	54.0	-8.1	V	A	
High Channel: 2462 MHz													
4.924	3.0	36.4	33.2	6.8	-34.8	0.0	0.0	41.6	74.0	-32.4	H	P	
4.924	3.0	24.2	33.2	6.8	-34.8	0.0	0.0	29.4	54.0	-24.6	H	A	
7.386	3.0	35.8	36.4	9.1	-34.1	0.0	0.0	47.2	74.0	-26.8	H	P	
7.386	3.0	22.8	36.4	9.1	-34.1	0.0	0.0	34.2	54.0	-19.8	H	A	
4.924	3.0	39.0	33.2	6.8	-34.8	0.0	0.0	44.2	74.0	-29.8	V	P	
4.924	3.0	26.6	33.2	6.8	-34.8	0.0	0.0	31.8	54.0	-22.2	V	A	
7.386	3.0	44.3	36.4	9.1	-34.1	0.0	0.0	55.7	74.0	-18.3	V	P	
7.386	3.0	29.0	36.4	9.1	-34.1	0.0	0.0	40.4	54.0	-13.6	V	A	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

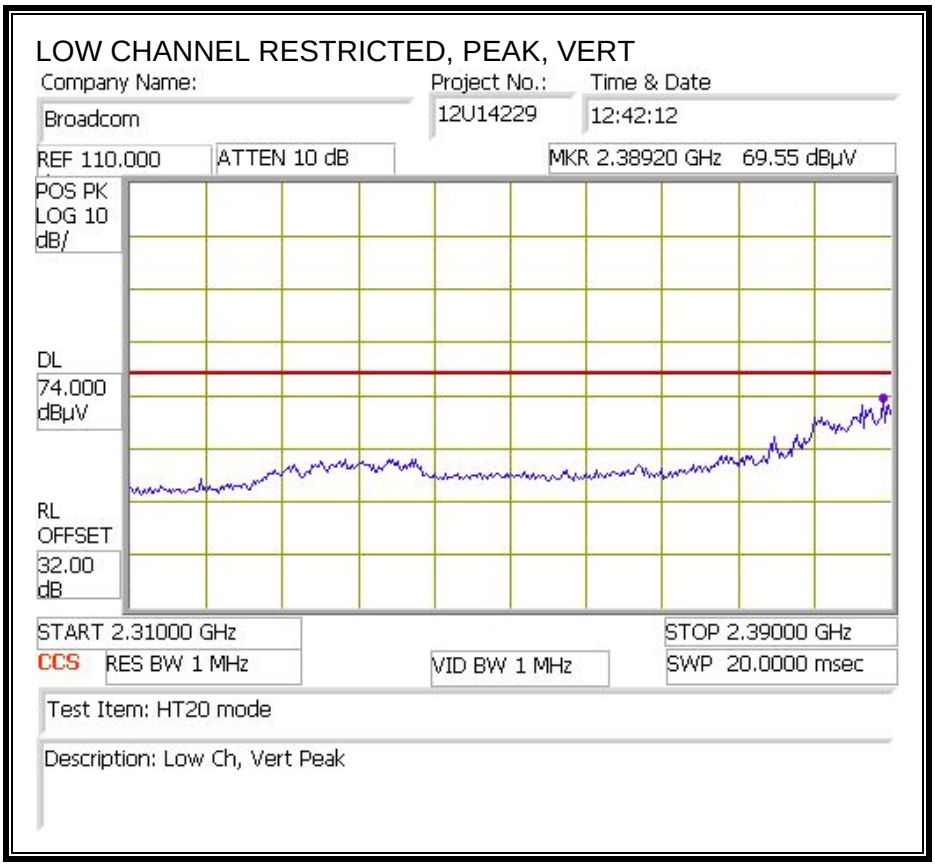
7.2.3. TX ABOVE 1 GHz FOR 802.11n HT20 2TX MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

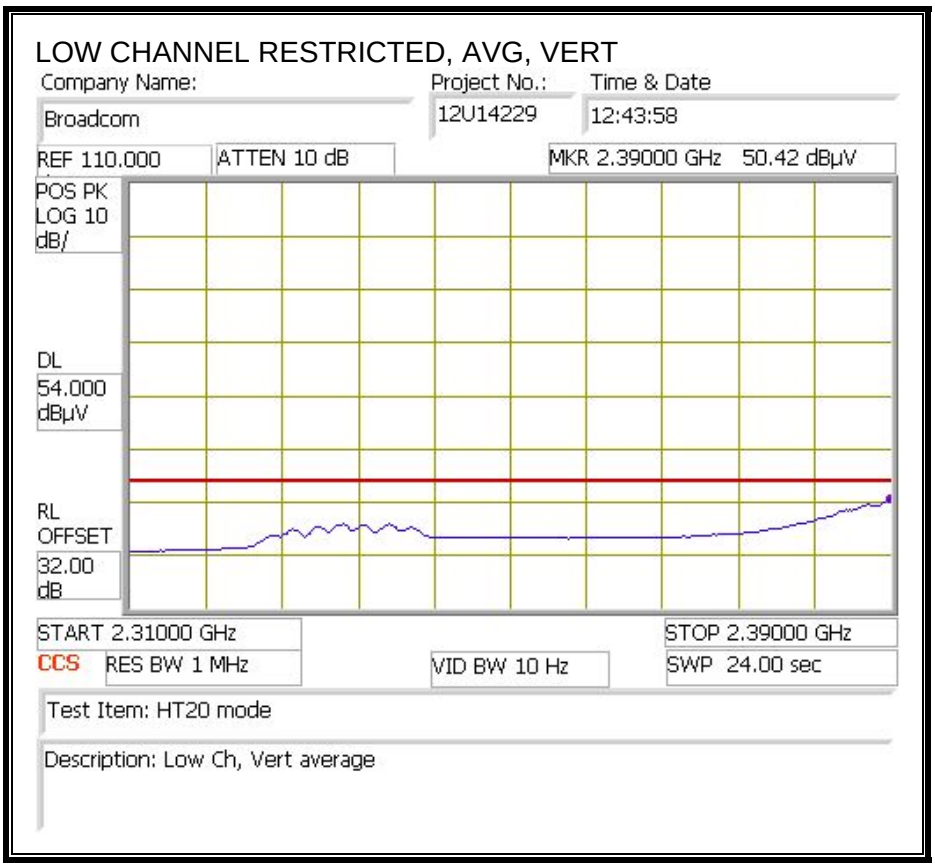




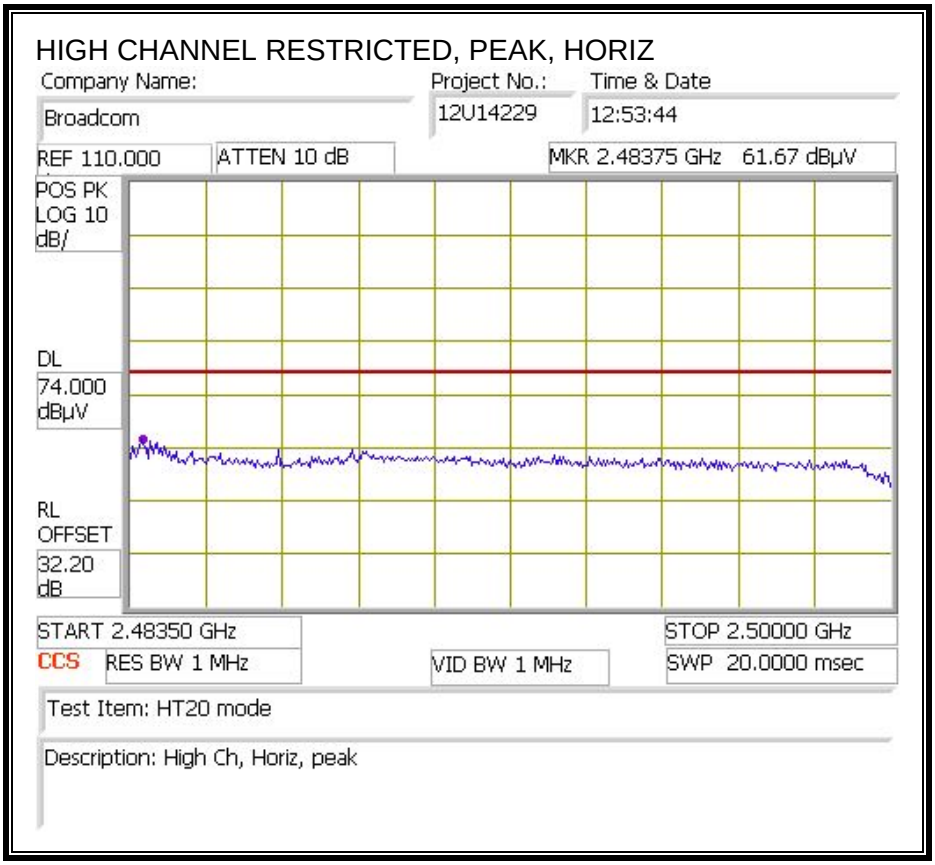
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



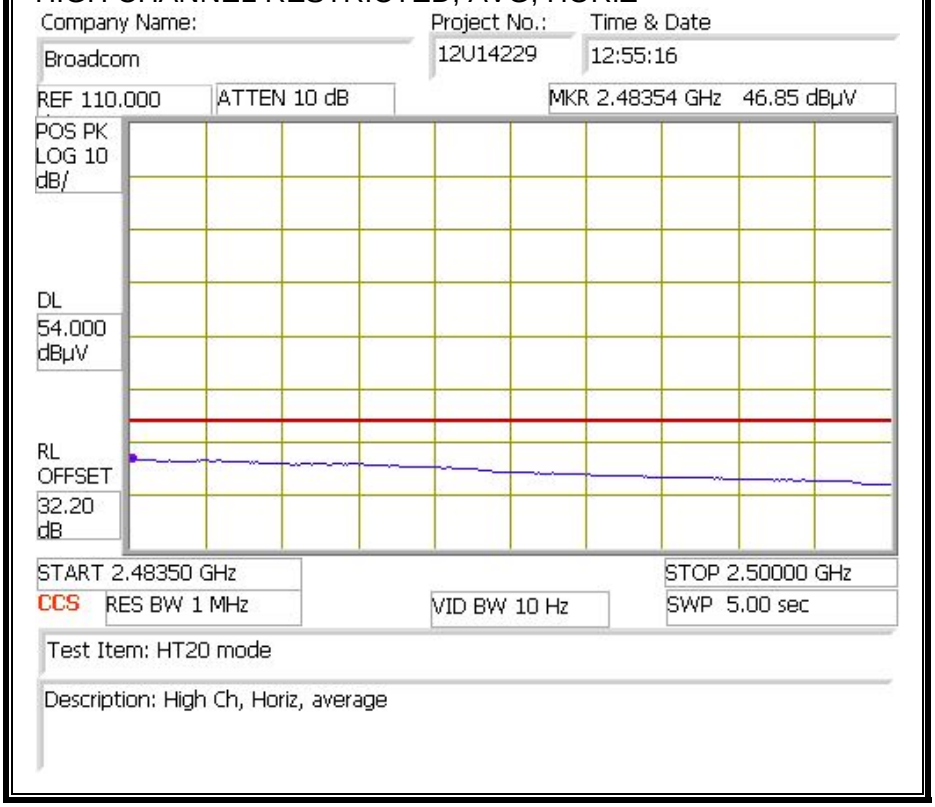
LOW CHANNEL RESTRICTED, AVG, VERT



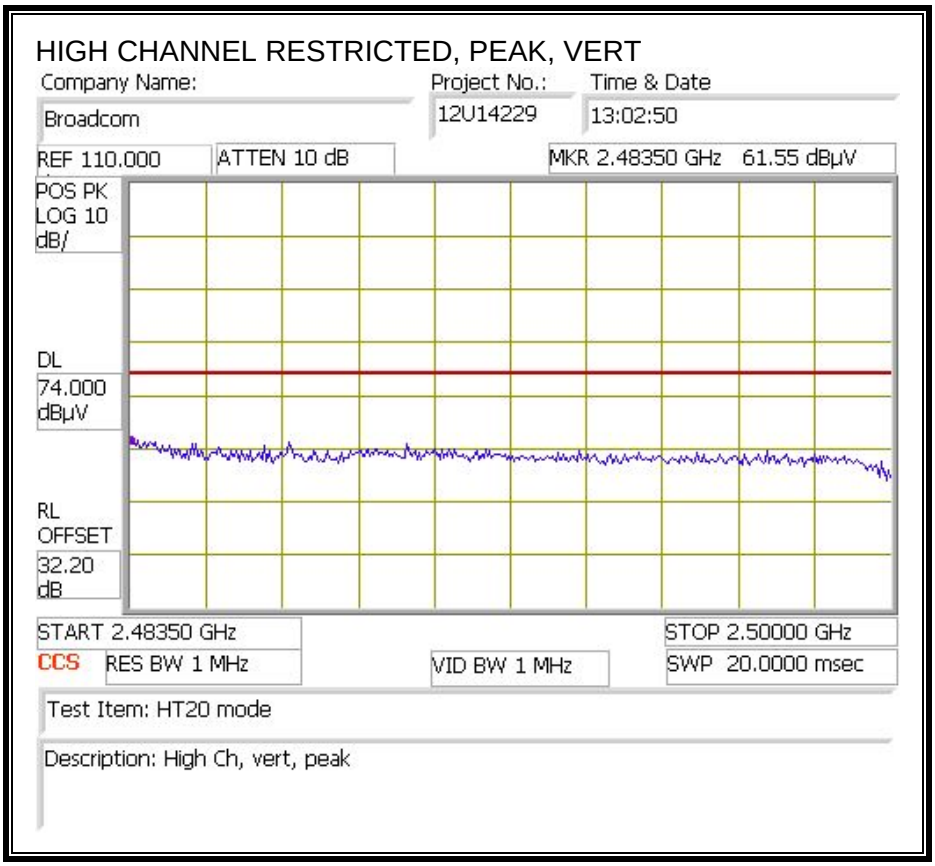
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



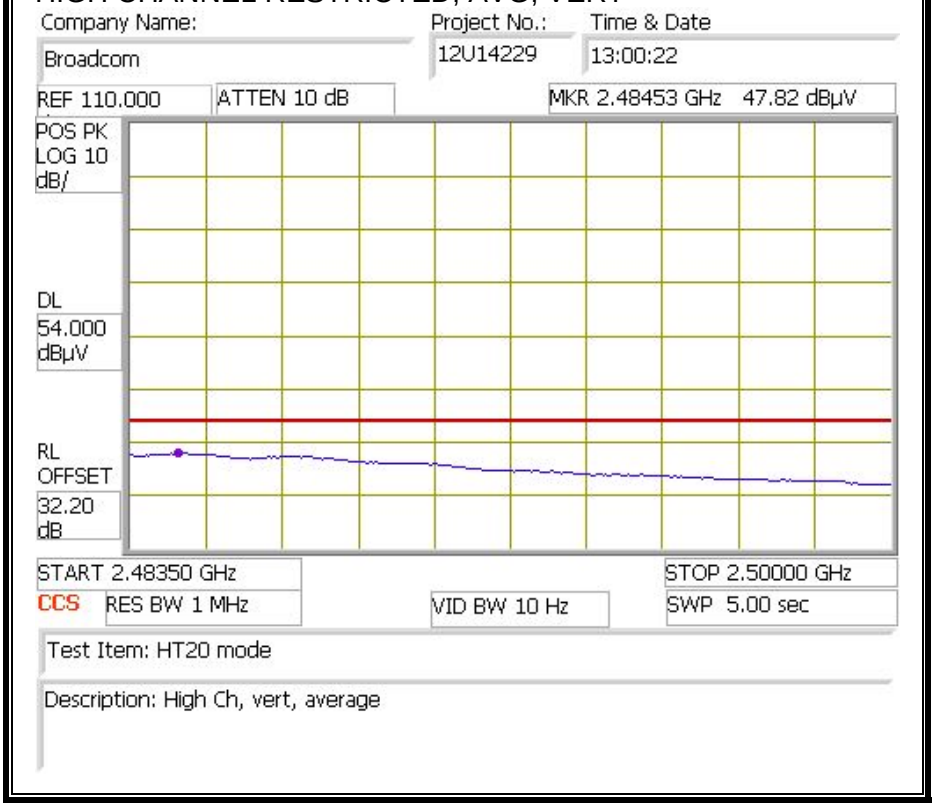
HIGH CHANNEL RESTRICTED, AVG, HORIZ



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HIGH CHANNEL RESTRICTED, AVG, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: David Garcia
Date: 02/16/12
Project #: 12U14229
Company: Broadcom
Test Target: FCC 15.247
Mode Oper: 2.4GHz HT20 MIMO

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

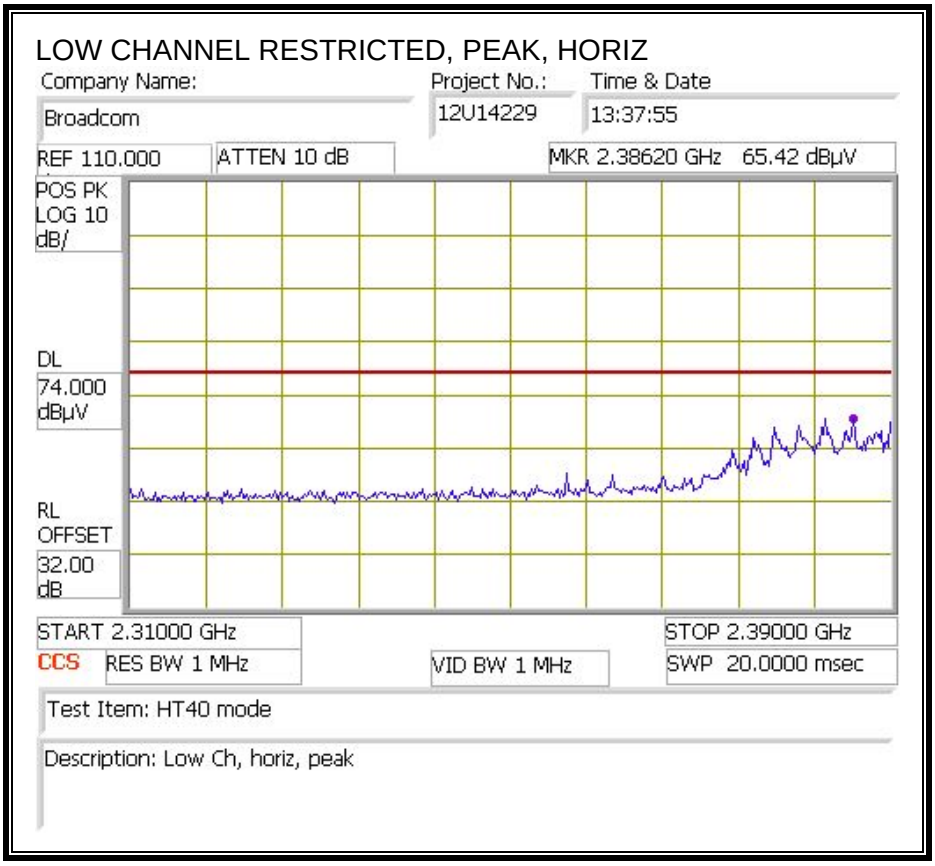
Average Field Strength Limit
Peak Field Strength Limit
Margin vs. Average Limit
Margin vs. Peak Limit

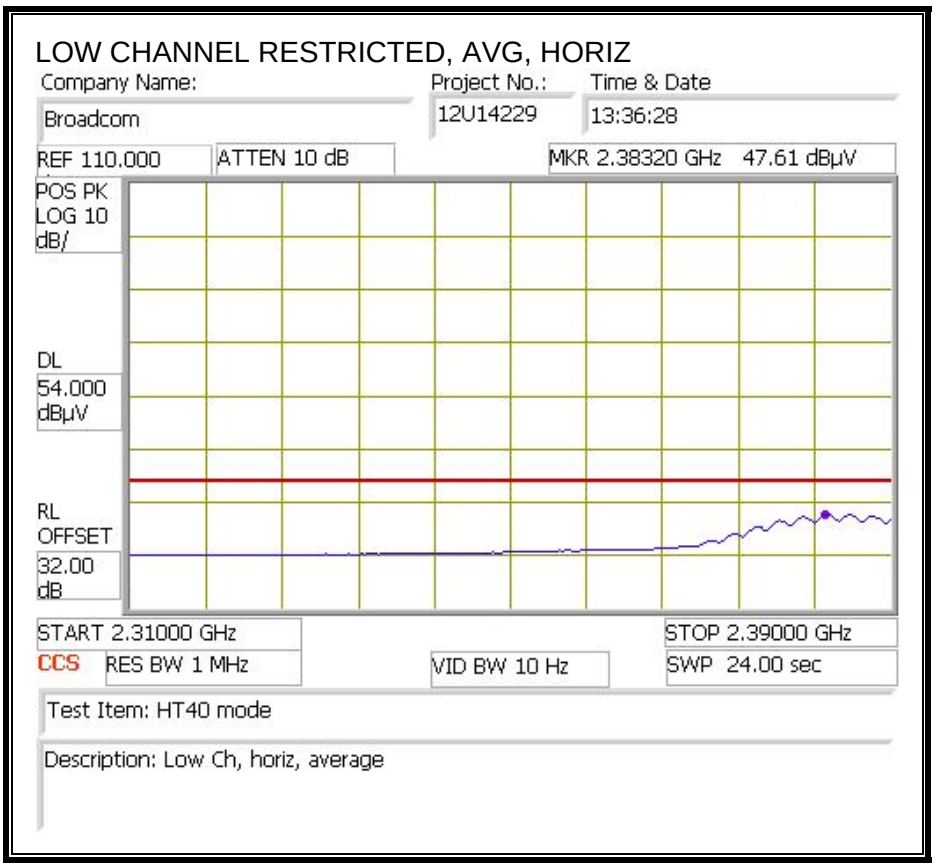
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Channel: 2412 MHz													
4.824	3.0	49.9	33.1	6.8	-34.8	0.0	0.0	55.0	74.0	-19.0	H	P	
4.824	3.0	34.7	33.1	6.8	-34.8	0.0	0.0	39.8	54.0	-14.2	H	A	
4.824	3.0	54.1	33.1	6.8	-34.8	0.0	0.0	59.2	74.0	-14.8	V	P	
4.824	3.0	39.4	33.1	6.8	-34.8	0.0	0.0	44.4	54.0	-9.6	V	A	
Mid Channel: 2437 MHz													
4.874	3.0	55.9	33.2	6.8	-34.8	0.0	0.0	61.0	74.0	-13.0	H	P	
4.874	3.0	42.2	33.2	6.8	-34.8	0.0	0.0	47.4	54.0	-6.6	H	A	
7.311	3.0	40.8	36.3	9.1	-34.1	0.0	0.0	52.1	74.0	-21.9	H	P	
7.311	3.0	27.7	36.3	9.1	-34.1	0.0	0.0	39.0	54.0	-15.0	H	A	
4.874	3.0	58.7	33.2	6.8	-34.8	0.0	0.0	63.8	74.0	-10.2	V	P	
4.874	3.0	45.0	33.2	6.8	-34.8	0.0	0.0	50.1	54.0	-3.9	V	A	
7.311	3.0	47.4	36.3	9.1	-34.1	0.0	0.0	58.7	74.0	-15.3	V	P	
7.311	3.0	34.3	36.3	9.1	-34.1	0.0	0.0	45.6	54.0	-8.4	V	A	
High Channel: 2462 MHz													
4.924	3.0	49.2	33.2	6.8	-34.8	0.0	0.0	54.4	74.0	-19.6	H	P	
4.924	3.0	34.0	33.2	6.8	-34.8	0.0	0.0	39.2	54.0	-14.8	H	A	
7.386	3.0	34.8	36.4	9.1	-34.1	0.0	0.0	46.2	74.0	-27.8	H	P	
7.386	3.0	22.6	36.4	9.1	-34.1	0.0	0.0	34.0	54.0	-20.0	H	A	
4.924	3.0	50.0	33.2	6.8	-34.8	0.0	0.0	55.2	74.0	-18.8	V	P	
4.924	3.0	35.9	33.2	6.8	-34.8	0.0	0.0	41.1	54.0	-12.9	V	A	
7.386	3.0	37.5	36.4	9.1	-34.1	0.0	0.0	48.9	74.0	-25.1	V	P	
7.386	3.0	23.9	36.4	9.1	-34.1	0.0	0.0	35.3	54.0	-18.7	V	A	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

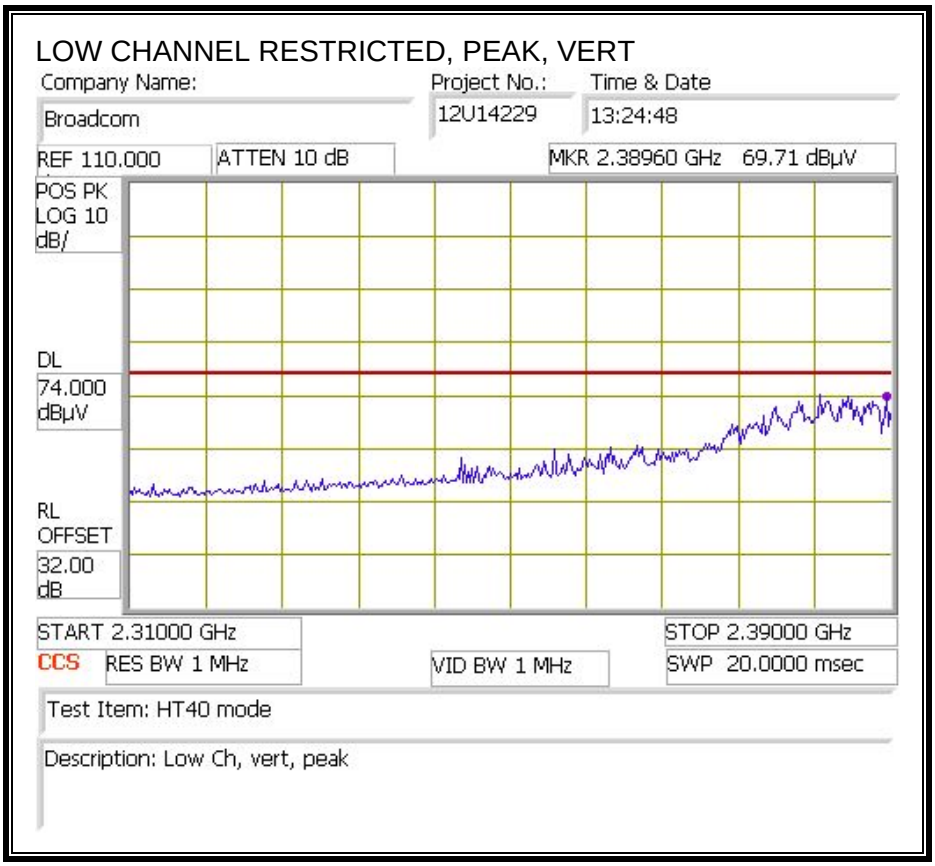
7.2.4. TX ABOVE 1 GHz FOR 802.11n HT40 2TX MODE IN THE 2.4 GHz BAND

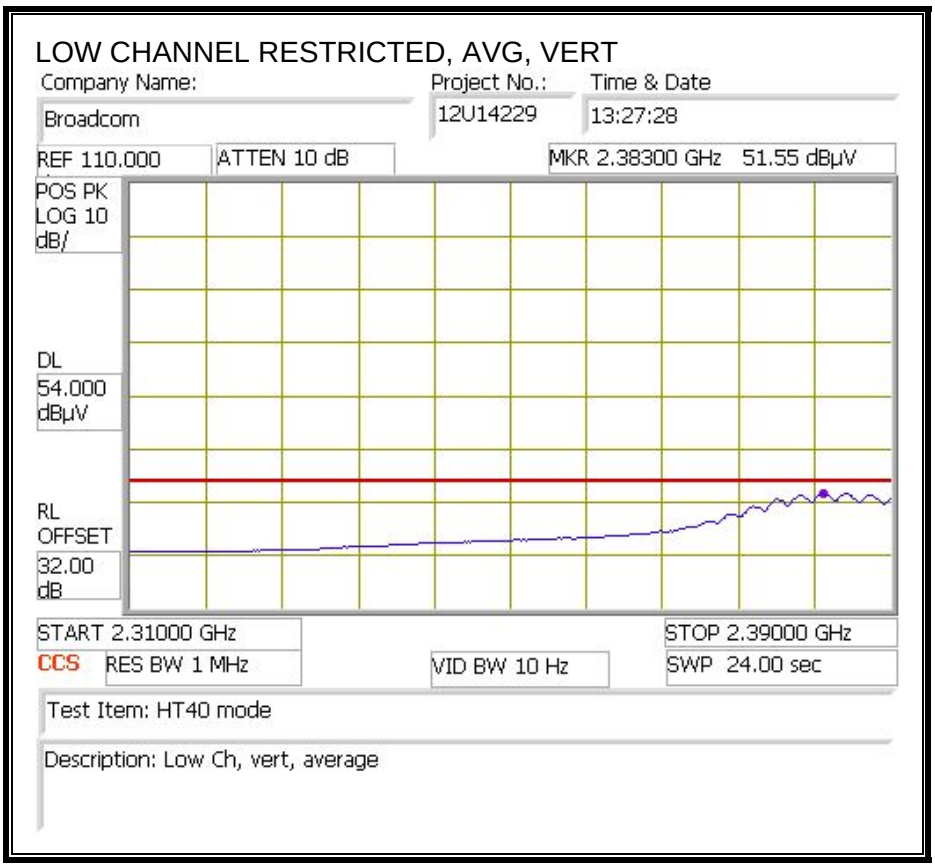
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



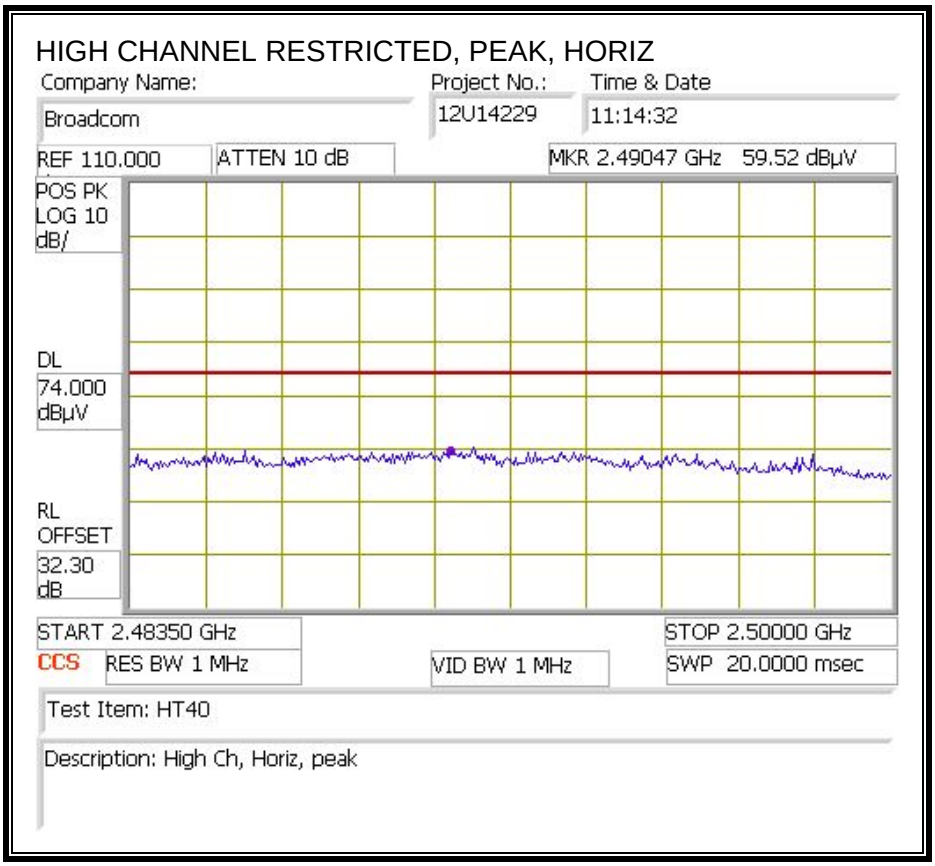


RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

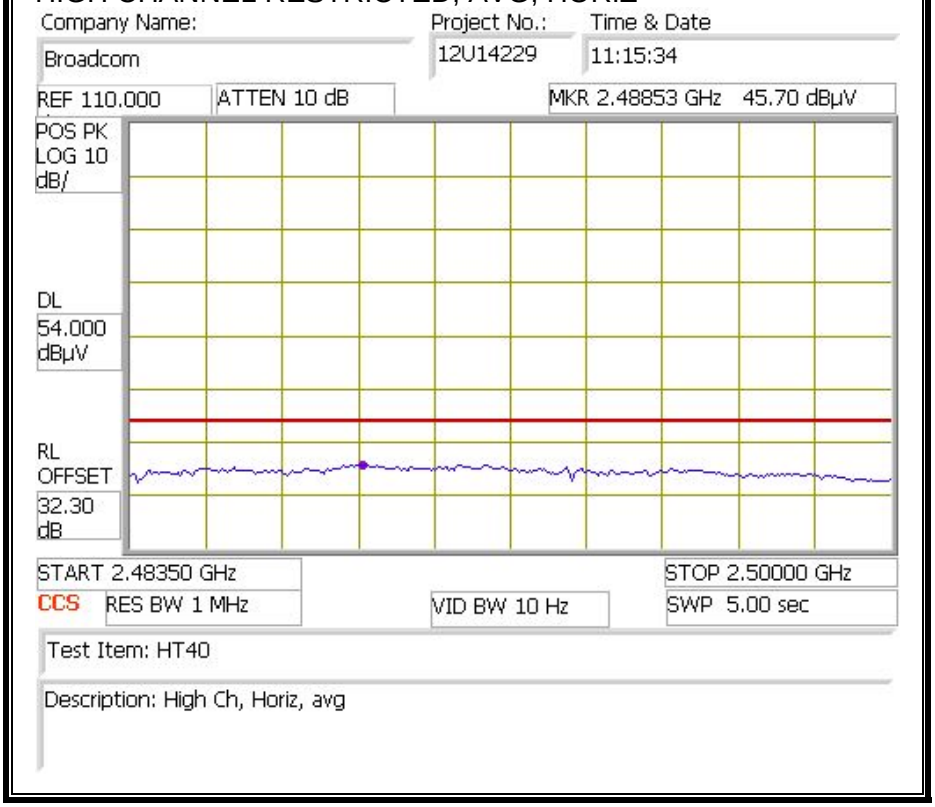




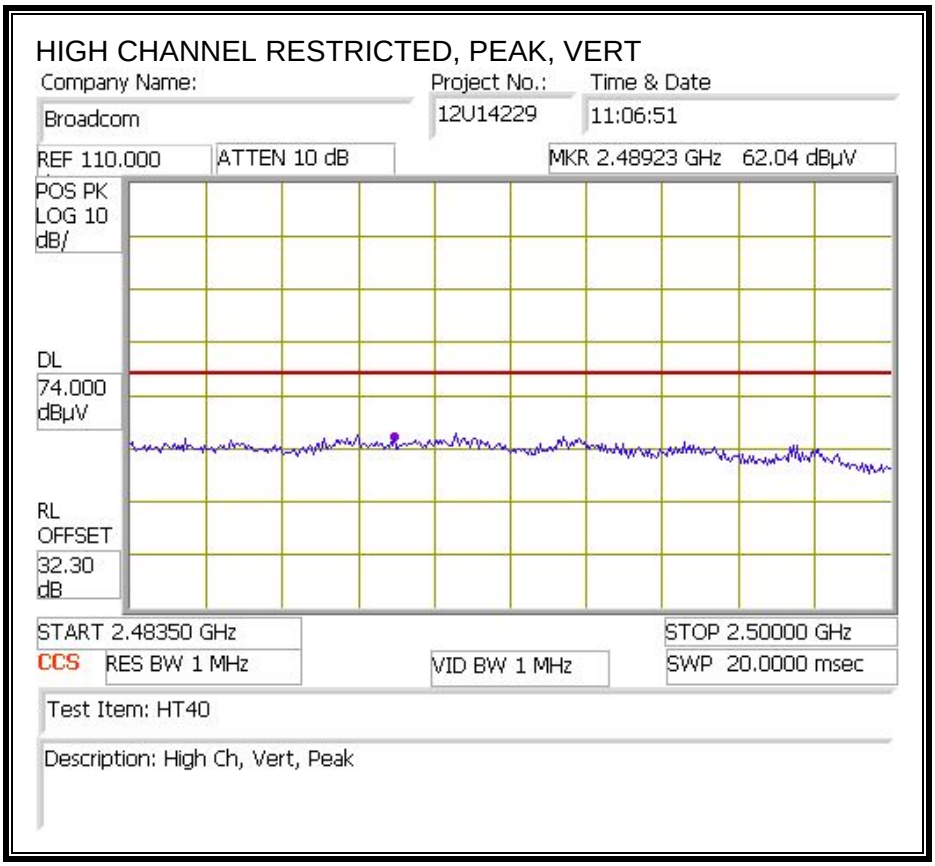
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



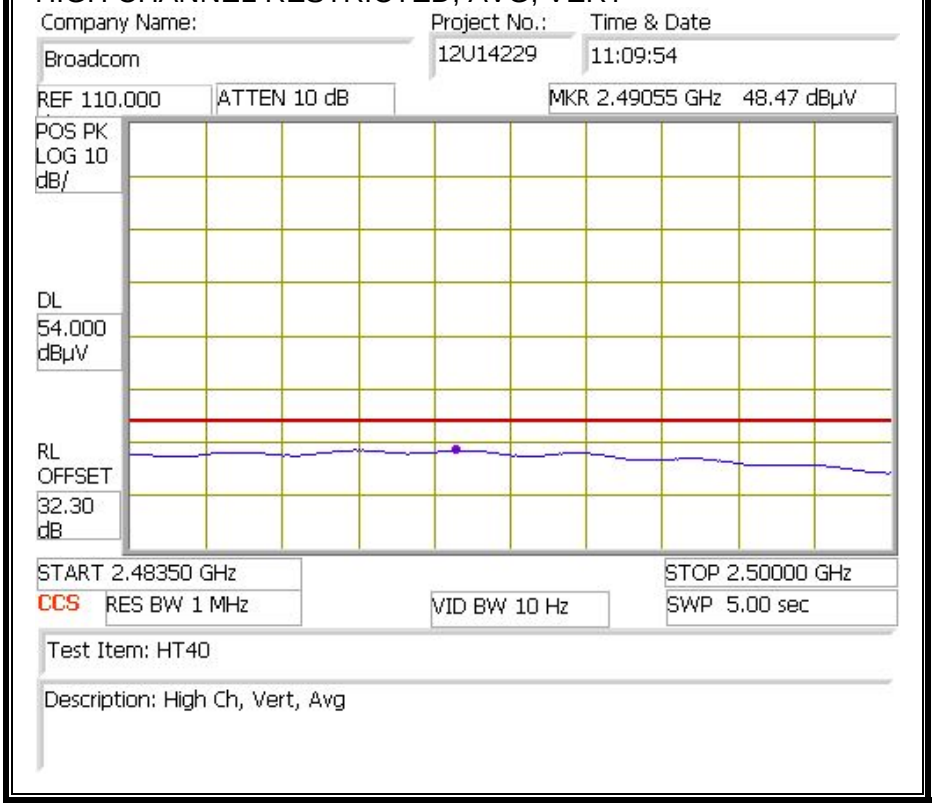
HIGH CHANNEL RESTRICTED, AVG, HORIZ



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HIGH CHANNEL RESTRICTED, AVG, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: David Garcia
Date: 02/16/12
Project #: 12U14229
Company: Broadcom
Test Target: FCC 15.205
Mode Oper: 2.4GHz HT40 MIMO

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

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Channel: 2422 MHz													
4.844	3.0	44.3	33.1	6.8	-34.8	0.0	0.0	49.4	74.0	-24.6	H	P	
4.844	3.0	29.7	33.1	6.8	-34.8	0.0	0.0	34.8	54.0	-19.2	H	A	
7.266	3.0	35.3	36.2	9.1	-34.1	0.0	0.0	46.5	74.0	-27.5	H	P	
7.266	3.0	23.0	36.2	9.1	-34.1	0.0	0.0	34.2	54.0	-19.8	H	A	
4.844	3.0	46.5	33.1	6.8	-34.8	0.0	0.0	51.6	74.0	-22.4	V	P	
4.844	3.0	31.4	33.1	6.8	-34.8	0.0	0.0	36.4	54.0	-17.6	V	A	
7.266	3.0	35.5	36.2	9.1	-34.1	0.0	0.0	46.7	74.0	-27.3	V	P	
7.266	3.0	23.3	36.2	9.1	-34.1	0.0	0.0	34.5	54.0	-19.5	V	A	
Mid Channel: 2437 MHz													
4.874	3.0	46.8	33.2	6.8	-34.8	0.0	0.0	51.9	74.0	-22.1	H	P	
4.874	3.0	32.8	33.2	6.8	-34.8	0.0	0.0	37.9	54.0	-16.1	H	A	
7.311	3.0	36.0	36.3	9.1	-34.1	0.0	0.0	47.3	74.0	-26.7	H	P	
7.311	3.0	23.1	36.3	9.1	-34.1	0.0	0.0	34.4	54.0	-19.6	H	A	
4.874	3.0	45.9	33.2	6.8	-34.8	0.0	0.0	51.0	74.0	-23.0	V	P	
4.874	3.0	31.7	33.2	6.8	-34.8	0.0	0.0	36.8	54.0	-17.2	V	A	
7.311	3.0	36.5	36.3	9.1	-34.1	0.0	0.0	47.8	74.0	-26.2	V	P	
7.311	3.0	23.6	36.3	9.1	-34.1	0.0	0.0	34.9	54.0	-19.1	V	A	
High Channel: 2452 MHz													
4.904	3.0	41.4	33.2	6.8	-34.8	0.0	0.0	46.6	74.0	-27.4	H	P	
4.904	3.0	28.2	33.2	6.8	-34.8	0.0	0.0	33.4	54.0	-20.6	H	A	
7.356	3.0	36.7	36.4	9.1	-34.1	0.0	0.0	48.1	74.0	-25.9	H	P	
7.356	3.0	22.8	36.4	9.1	-34.1	0.0	0.0	34.2	54.0	-19.8	H	A	
4.904	3.0	43.3	33.2	6.8	-34.8	0.0	0.0	48.4	74.0	-25.6	V	P	
4.904	3.0	29.3	33.2	6.8	-34.8	0.0	0.0	34.5	54.0	-19.5	V	A	
7.356	3.0	35.2	36.4	9.1	-34.1	0.0	0.0	46.6	74.0	-27.4	V	P	
7.356	3.0	22.8	36.4	9.1	-34.1	0.0	0.0	34.2	54.0	-19.8	V	A	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

7.2.5. TRANSMITTER ABOVE 1 GHz FOR 802.11a MODE IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber A

Test Engr: Dennis Huang
Date: 02/17/12
Project #: 12U14229
Company: BroadCom
Test Target: FCC 15.247
Mode Oper: 802.11a Tx

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

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
Low Channel - 5745MHz															
11.490	3.0	45.0	38.8	9.5	-35.9	0.0	0.7	58.1	74.0	-15.9	V	P	152.5	30.8	
11.490	3.0	35.1	38.8	9.5	-35.9	0.0	0.7	48.3	54.0	-5.7	V	A	152.5	30.8	
11.490	3.0	39.9	38.8	9.5	-35.9	0.0	0.7	53.1	74.0	-20.9	H	P	152.2	1.7	
11.490	3.0	30.4	38.8	9.5	-35.9	0.0	0.7	43.5	54.0	-10.5	H	A	152.2	1.7	
Mid Channel - 5785MHz															
11.570	3.0	41.8	38.9	9.5	-35.8	0.0	0.7	55.1	74.0	-18.9	V	P	129.3	221.6	
11.570	3.0	32.1	38.9	9.5	-35.8	0.0	0.7	45.4	54.0	-8.6	V	A	129.3	221.6	
11.570	3.0	41.6	38.9	9.5	-35.8	0.0	0.7	55.0	74.0	-19.0	H	P	152.1	2.1	
11.570	3.0	31.0	38.9	9.5	-35.8	0.0	0.7	44.3	54.0	-9.7	H	A	152.1	2.1	
High Channel - 5825MHz															
11.650	3.0	41.3	39.0	9.6	-35.7	0.0	0.7	54.8	74.0	-19.2	V	P	197.5	56.8	
11.650	3.0	31.1	39.0	9.6	-35.7	0.0	0.7	44.6	54.0	-9.4	V	A	197.5	56.8	
11.650	3.0	37.4	39.0	9.6	-35.7	0.0	0.7	50.9	74.0	-23.1	H	P	185.2	7.8	
11.650	3.0	28.0	39.0	9.6	-35.7	0.0	0.7	41.5	54.0	-12.5	H	A	185.2	7.8	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

7.2.6. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber A

Test Engr: Dennis Huang
Date: 02/17/12
Project #: 12U14229
Company: BroadCom
Test Target: FCC 15.247
Mode Oper: 802.11n HT20 Tx

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

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
Low Channel - 5745MHz															
11.490	3.0	46.8	38.8	9.5	-35.9	0.0	0.7	60.0	74.0	-14.0	V	P	139.1	60.4	
11.490	3.0	37.5	38.8	9.5	-35.9	0.0	0.7	50.6	54.0	-3.4	V	A	139.1	60.4	
11.490	3.0	39.1	38.8	9.5	-35.9	0.0	0.7	52.3	74.0	-21.7	H	P	178.4	9.2	
11.490	3.0	28.5	38.8	9.5	-35.9	0.0	0.7	41.7	54.0	-12.3	H	A	178.4	9.2	
Mid Channel - 5785MHz															
11.570	3.0	47.2	38.9	9.5	-35.8	0.0	0.7	60.5	74.0	-13.5	V	P	132.0	60.9	
11.570	3.0	33.4	38.9	9.5	-35.8	0.0	0.7	46.7	54.0	-7.3	V	A	132.0	60.9	
11.570	3.0	39.1	38.9	9.5	-35.8	0.0	0.7	52.4	74.0	-21.6	H	P	174.8	4.5	
11.570	3.0	29.5	38.9	9.5	-35.8	0.0	0.7	42.8	54.0	-11.2	H	A	174.8	4.5	
High Channel - 5825MHz															
11.650	3.0	43.7	39.0	9.6	-35.7	0.0	0.7	57.2	74.0	-16.8	V	P	143.7	86.2	
11.650	3.0	33.7	39.0	9.6	-35.7	0.0	0.7	47.3	54.0	-6.7	V	A	143.7	86.2	
11.650	3.0	39.5	39.0	9.6	-35.7	0.0	0.7	53.0	74.0	-21.0	H	P	101.0	6.5	
11.650	3.0	28.2	39.0	9.6	-35.7	0.0	0.7	41.7	54.0	-12.3	H	A	101.0	6.5	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

7.2.7. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT40 MODE IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber A

Test Engr: Dennis Huang
Date: 02/17/12
Project #: 12U14229
Company: BroadCom
Test Target: FCC 15.205
Mode Oper: 802.11n HT40 Tx

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

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
Low Channel - 5755MHz															
11.510	3.0	43.7	38.8	9.5	-35.8	0.0	0.7	57.0	74.0	-17.0	V	P	139.1	60.2	
11.510	3.0	33.8	38.8	9.5	-35.8	0.0	0.7	47.0	54.0	-7.0	V	A	139.1	60.2	
11.510	3.0	36.4	38.8	9.5	-35.8	0.0	0.7	49.6	74.0	-24.4	H	P	148.0	18.4	
11.510	3.0	27.4	38.8	9.5	-35.8	0.0	0.7	40.6	54.0	-13.4	H	A	148.0	18.4	
High Channel - 5795MHz															
11.590	3.0	38.9	38.9	9.5	-35.8	0.0	0.7	52.3	74.0	-21.7	V	P	100.0	86.4	
11.590	3.0	29.5	38.9	9.5	-35.8	0.0	0.7	-879.6	54.0	-933.6	V	A	100.0	86.4	
11.590	3.0	36.6	38.9	9.5	-35.8	0.0	0.7	50.0	74.0	-24.0	H	P	134.4	64.6	
11.590	3.0	27.3	38.9	9.5	-35.8	0.0	0.7	40.6	54.0	-13.4	H	A	134.4	64.6	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

7.3. RECEIVER ABOVE 1 GHz

7.3.1. RECEIVER ABOVE 1 GHz FOR 20 MHz BANDWIDTH

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber-A

Company: BroadCom
Project #: 12U14229
Date: 2/17/2012
Test Engineer: Dennis Huang
Configuration: EUT with Support Laptop PC
Mode: Rx HT20

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T144 Miteq 3008A00931			RX RSS 210

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500		

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)
1.245	3.0	69.5	40.9	24.7	3.0	-38.5	0.0	0.0	58.8	30.2	74	54	-15.2	-23.8	V
1.250	3.0	63.1	36.5	24.8	3.0	-38.5	0.0	0.0	52.4	25.8	74	54	-21.6	-28.2	H
2.492	3.0	61.4	37.2	28.9	4.4	-36.9	0.0	0.0	57.8	33.6	74	54	-16.2	-20.4	V
2.492	3.0	60.7	37.9	28.9	4.4	-36.9	0.0	0.0	57.1	34.3	74	54	-16.9	-19.7	H

Rev. 07.08.11

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. RECEIVER ABOVE 1 GHz FOR 40 MHz BANDWIDTH

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber-A

Company: BroadCom
Project #: 12U14229
Date: 2/17/2012
Test Engineer: Dennis Huang
Configuration: EUT with Support Laptop PC
Mode: Rx HT40

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T144 Miteq 3008A00931			RX RSS 210

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500		

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)
1.245	3.0	70.5	40.9	24.7	3.0	-38.5	0.0	0.0	59.8	30.2	74	54	-14.2	-23.8	V
1.250	3.0	64.0	37.1	24.8	3.0	-38.5	0.0	0.0	53.3	26.4	74	54	-20.7	-27.6	H
2.492	3.0	62.1	38.4	28.9	4.4	-36.9	0.0	0.0	58.6	34.8	74	54	-15.4	-19.2	V
2.492	3.0	61.4	38.0	28.9	4.4	-36.9	0.0	0.0	57.9	34.4	74	54	-16.1	-19.6	H

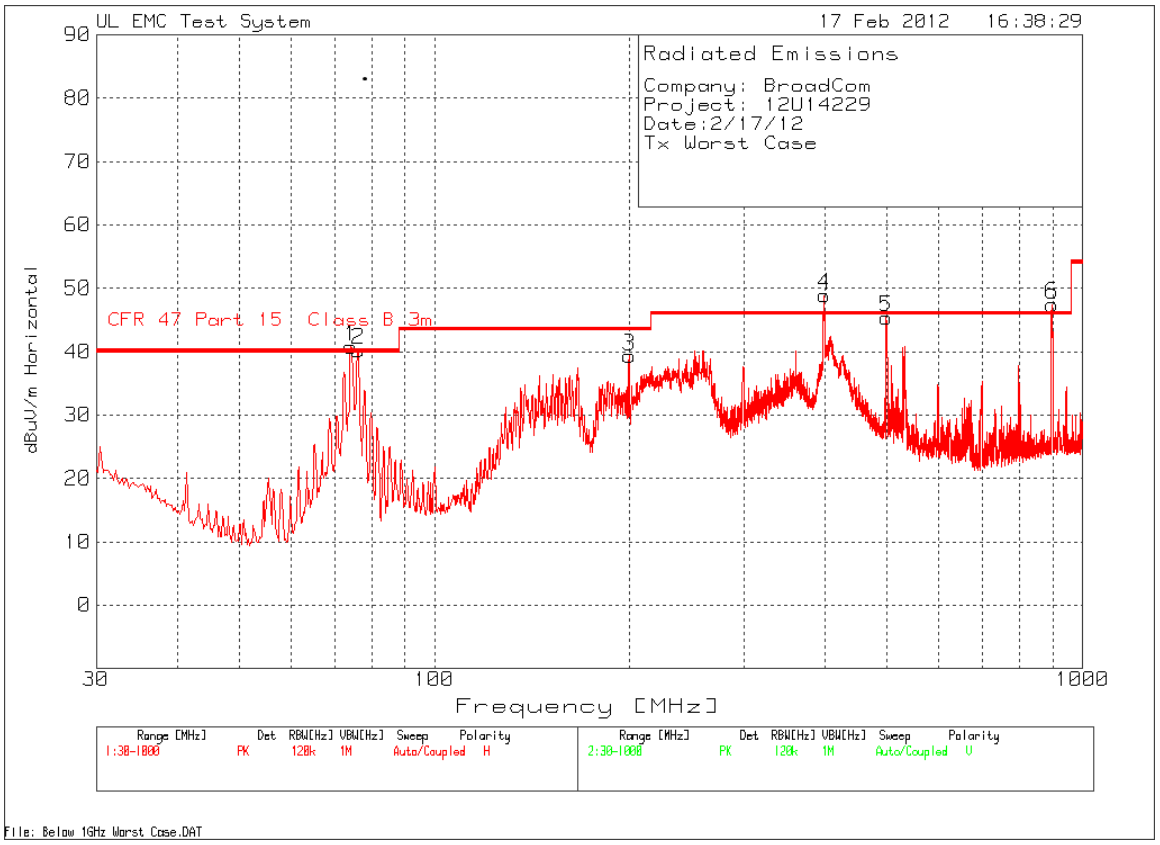
Rev. 07.08.11

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. WORST-CASE BELOW 1 GHz

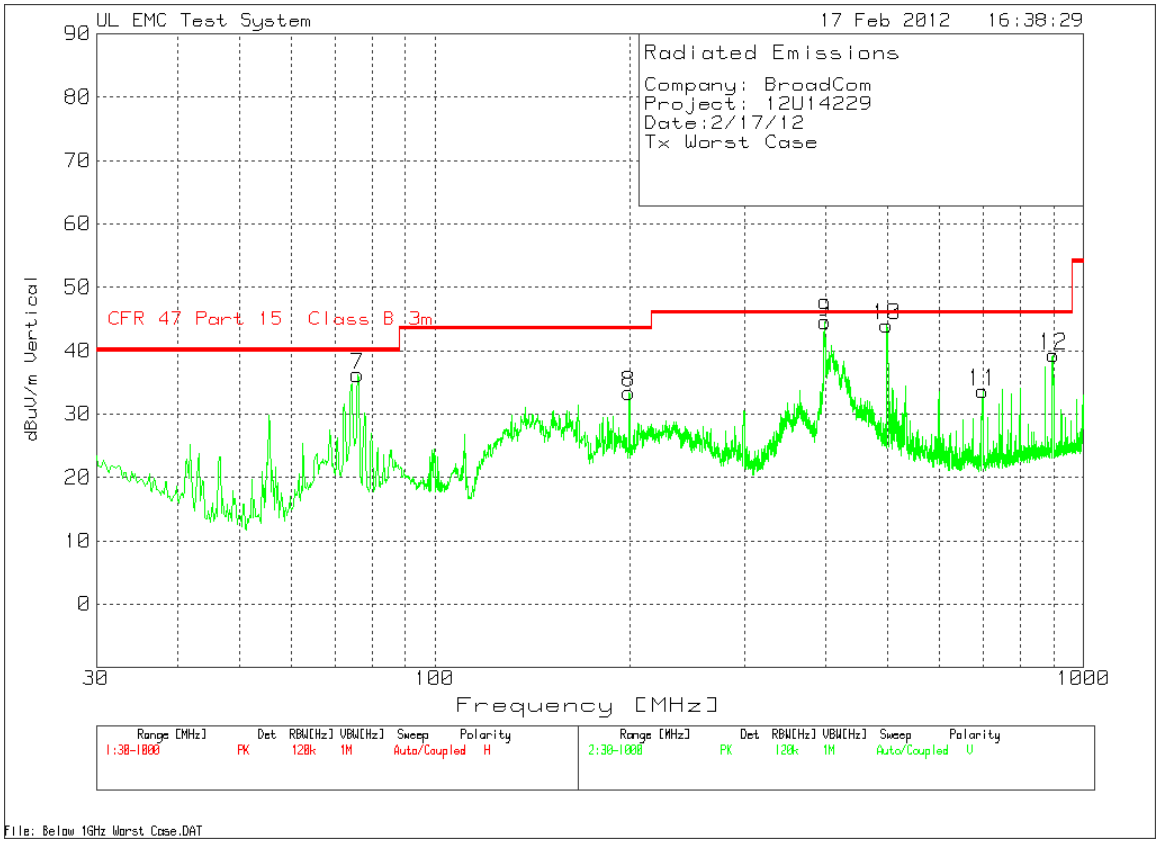
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



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

VERTICAL PLOT



HORIZONTAL & VERTICAL DATA

Company:	Broadcom
Project:	12U14229
Date:	2/17/2012
Mode	Tx Worst Case
Test Engineer:	Dennis Huang
Range 1 30 - 1000MHz	

Test Frequency	Meter Reading	Detector	25MHz-1GHz ChmbrA Amplified.TX [dB]	5m A T122 Bilog below 1GHz.TXT [dB]	dBuV/m	CFR 47 Part 15 Class B 3m	Margin	Height [cm]	Polarity
74.1966	60.21	PK	-27.1	7.7	40.81	40	0.81	200	Horz
74.095	59.3	QP	-27.1	7.7	39.9	40	-0.1	201	Horz
76.1351	59.75	PK	-27.1	7.6	40.25	40	0.25	200	Horz
75.992	59.4	QP	-27.1	7.6	39.9	40	-0.1	201	Horz
199.8082	53.51	PK	-26.2	12	39.31	43.5	-4.19	100	Horz
399.6623	59.29	PK	-25.3	14.9	48.89	46	2.89	100	Horz
399.725	55.36	QP	-25.3	14.9	44.96	46	-1.04	101	Horz
497.9416	53.61	PK	-24.9	16.7	45.41	46	-0.59	200	Horz
899.3945	48.94	PK	-23.4	21.9	47.44	46	1.44	100	Horz
899.394	46.11	QP	-23.4	21.9	44.61	46	-1.39	101	Horz
75.9412	55.74	PK	-27.1	7.6	36.24	40	-3.76	400	Vert
199.0328	47.68	PK	-26.2	11.9	33.38	43.5	-10.12	200	Vert
399.6623	55.01	PK	-25.3	14.9	44.61	46	-1.39	100	Vert
497.7478	52.21	PK	-24.9	16.7	44.01	46	-1.99	100	Vert
699.5404	37.32	PK	-23.3	19.6	33.62	46	-12.38	200	Vert
899.5883	40.8	PK	-23.4	21.9	39.3	46	-6.7	100	Vert