

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

CERTIFICATION TEST REPORT

FOR

802.11ag / Draft 802.11n WLAN + BLUETOOTH PCI-E MINICARD (Adding a higher antenna gain)

MODEL NUMBER: BCM943224PCIEBT

FCC ID: QDS-BRCM1047 IC: 4324A-BRCM1047

REPORT NUMBER: 10U13103-1, Revision A

ISSUE DATE: MARCH 25, 2010

Prepared for BROADCOM CORPORATION 190 MATHILDA PLACE SUNNYVALE, CA 94086, U.S.A.

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NVLAP LAB CODE 200065-0

leeuo

Revision History

Rev.	Date	Revisions	Revised By
	03/22/10	Initial Issue	T. Chan
A	03/25/10	Revised The Worst Case 30-1000MHz Statement To 11n HT20 Mode On Page 7; Added Explanation For The Worst Case Spurious Harmonic On Page 7 Added Note On Page 39	T. Chan

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6. 7. 7 8.	ANT 7.1.1 RAD 2.1. 8.2.1 8.2.2 8.2.3 8.2.4 8.2.5	ENNA PORT TEST RESULTS	11 11 12 12 12 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13
 6. 7. 7 8. 8 8 	ANT 7.1.1 RAD 2.1. 8.2.1 8.2.2 8.2.3 8.2.4 8.2.5 8.2.6	ENNA PORT TEST RESULTS 802.11n HT20 MODE IN THE 2.4 GHz BAND OUTPUT POWER IATED TEST RESULTS LIMITS AND PROCEDURE TRANSMITTER ABOVE 1 GHz . 802.11b MODE IN THE 2.4 GHz BAND. . 802.11g MODE IN THE 2.4 GHz BAND. . 802.11g MODE IN THE 2.4 GHz BAND. . 802.11n HT20 MODE MCS0 IN THE 2.4 GHz BAND. . 802.11n HT40 MODE SISO IN THE 2.4 GHz BAND. . 802.11n HT40 MODE MIMO MCS15 IN THE 2.4 GHz BAND. . 802.11n HT40 MODE MIMO MCS15 IN THE 2.4 GHz BAND.	11 11 12 12 12 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13
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 6. 7. 7 8. 8 9 9<td>ANT 7.1.1 RAD 7.1.1 8.2.1 8.2.2 8.2.3 8.2.4 8.2.5 8.2.6 3.3. 8.4</td><td>ENNA PORT TEST RESULTS 802.11n HT20 MODE IN THE 2.4 GHz BAND</td><td>11 11 12 12 12 12 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 30 30 34 38 39</td>	ANT 7.1.1 RAD 7.1.1 8.2.1 8.2.2 8.2.3 8.2.4 8.2.5 8.2.6 3.3. 8.4	ENNA PORT TEST RESULTS 802.11n HT20 MODE IN THE 2.4 GHz BAND	11 11 12 12 12 12 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 13 30 30 34 38 39
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1. ATTESTATION OF TEST RESULTS

	APPLICABLE STANDARI	DS TEST RESULTS
DATE TESTED:	MARCH 16 -19, 2010	
SERIAL NUMBER:	8516097JADS0B	
MODEL:	BCM943224PCIEBT	
EUT DESCRIPTION:	802.11ag / Draft 802.11n W	LAN + Bluetooth PCI-E Minicard
COMPANY NAME:	BROADCOM CORPORATIO 190 MATHILDA PLACE SUNNYVALE, CA 94086, U	

STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 7 Annex 8	Pass
INDUSTRY CANADA 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 indications of Pass/Fail in this report are opinions expressed by 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 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. 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 CCS By:

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THU CHAN EMC MANAGER COMPLIANCE CERTIFICATION SERVICES

Tested By:

VIEN TRAN EMC ENGINEER COMPLIANCE CERTIFICATION SERVICES

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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, 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 <u>http://www.ccsemc.com</u>.

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%.

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 802.11ag / Draft 802.11n WLAN + Bluetooth PCI-E Minicard. The radio module is manufactured by Broadcom.

5.2. MAXIMUM OUTPUT POWER

The test measurement passed within ± 0.5dBm of the original output power.

For MIMO HT20 MCS0 Mode at mid channel, the output power is reduced ~0.2dB as table shown below in order to pass the output power limit due to the higher antenna gain.

2400 to 2483.5 MHz Authorized Band

Frequency	Mode	Peak Power	Peak Power	Total Peak	Output Power
Range (MHz)		Chain 0 (dBm)	Chain 1 (dBm)	Power (dBm)	(mW)
2412 - 2462	802.11n 20MHz CDD	25.22	24.67	27.96	625.75

5.3. DESCRIPTION OF CLASS II PERMISSIVE CHANGE

The major change filed under this application is adding higher antenna gains as showing in section below.

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes with two different types of antenna, with the maximum gain as table below:

Antenna Type	Model	2.4GHz Peak gain (dBi)
802.11bgn WLAN Antenna	631-1355	1.66
802.11bgn WLAN Antenna	631-1333	6.77

The highest gains of each type of antennas for all legacy / SISO modes test.

	Antenna 1 (631-1355)	Antenna 2 (631-1333)
Band	• (dBi))	(dBi))
2.4 GHz	1.66	6.77

The antennas combinations for 2x2 (CCD) modes test.

Frequency Band	Antennas conbination	• Antenna 1 Gain	• Antenna 2 Gain	10^(Ant Main /10)	10^(Ant Aux/10)	10^(ant main/10)+ 10^(ant aux/10)	10*log[10^(ant main/10)+ 10^(ant aux/10)] (dBi)
2.4 GHz HT20 & HT40	Antenna 1 / Antenna 2	1.66	6.77	1.466	4.753	6.219	7.94

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5.5. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Broadcom, rev. 5.10.131.7. The test utility software used during testing was BCM Internal, rev. 5.10.RC131.7.

5.6. NUMBER OF TRANSMIT CHAINS

For legacy / SISO modes, selected measurements were performed on the Main and Auxiliary chains; however only one of these chains will be transmitting at any time. Under this report the Main chain were used as highest gain.

5.7. 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:

802.11b Mode (20 MHz BW operation): 1 Mbps, CCK.
802.11g Mode (20 MHz BW operation): 6 Mbps, OFDM.
802.11n MIMO HT20 Mode: MCS0, 6.5 Mbps, 2 Spatial Streams.
802.11n SISO HT40 Mode: MCS0, 13.5 Mbps, 2 Spatial Streams.
802.11n MIMO HT40 Mode: MCS15, 270 Mbps, 2 Spatial Streams.

Since the EUT was certified as modular approval with highest antenna; therefore only investigate on radiated band-edges, worst case of harmonic and below 1GHz.

Worst-case mode and channel used for 30-1000 MHz radiated emissions was the mode and channel with the highest output power that was determined to be 11n HT20 mode, mid channel.

For radiated spurious harmonic, from the previous testing data showed that b-mode is worstcase compared to other modes; therefore final measurement was performed only on b-mode.

All legacy/SISO modes were measured with the highest gain for each type of antenna.

All MIMO modes were measured with the highest combination of gains for each type of antenna. Note that this combination of antennas will not be implemented in the end product. This combination was selected for testing purposes only, to accommodate the highest gain of each antenna type in one single test configuration. The combined gain of this test configuration is higher than any combined gain that will be implemented in the end product.

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5.8. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST							
Description	Description Manufacturer Model Serial Number FCC ID						
Laptop PC Lenovo 4446 R8-CAC56							
AC Adapter Lenovo ADP-65-YB B 11S42T4458Z1ZF4K96V9S9 N/A							
Adapter Board	Broadcom	BCRM943224PCI	1261490	N/A			

I/O CABLES

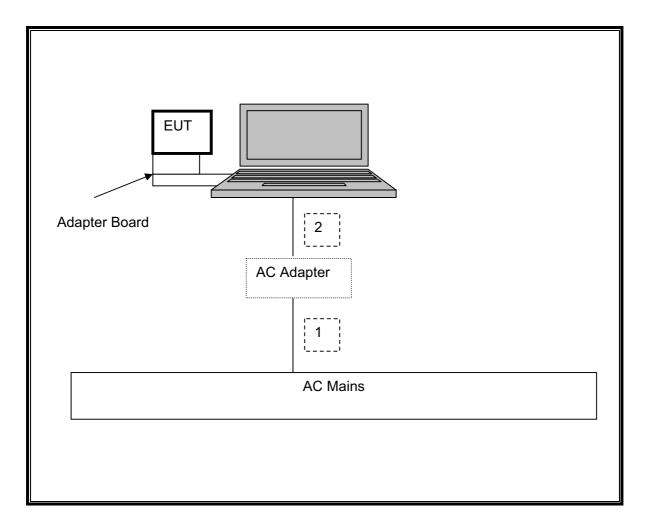
	I/O CABLE LIST									
Cable	Port	# of	Connector	Cable	Cable	Remarks				
No.		Identical Ports	Туре	Туре	Length					
1	AC	1	AC	Unshielded	1.8 m	N/A				
2	DC	1	DC	Unshielded	1.8 m	Ferrite on laptop's end				

TEST SETUP

The EUT is connected to a host laptop computer via Express card to MiniPCI-E adapter board during the test. Test software exercised the radio card.

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SETUP DIAGRAM



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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 Test Receiver, 30 MHz	R&S	ESHS 20	N02396	02/06/11				
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	01/05/11				
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	01/14/11				
Antenna, Horn, 18 GHz	EMCO	3115	C00945	04/22/10				
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00589	11/28/11				
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	03/31/10				
Preamplifier, 1-26GHz	Agilent / HP	8449B	C01052	07/05/11				
Peak Power Meter	Boonton	4541	C01186	02/26/11				
Peak Power Sensor	Boonton	4541	C01189	02/23/11				
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	10/29/10				

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7. ANTENNA PORT TEST RESULTS

7.1. 802.11n HT20 MODE IN THE 2.4 GHz BAND

7.1.1. OUTPUT POWER

<u>LIMITS</u>

FCC §15.247 (b)

IC RSS-210 A8.4

The highest combination of antenna gains is equal to 7.94dBi, therefore the limit is 28.06dBm.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency	Limit	Chain 1	Chain 2	Total	Margin
			Power	Power	Power	
				(al Dura)		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)

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8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

<u>LIMITS</u>

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.

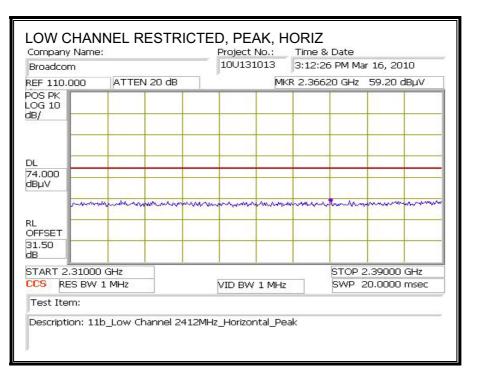
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

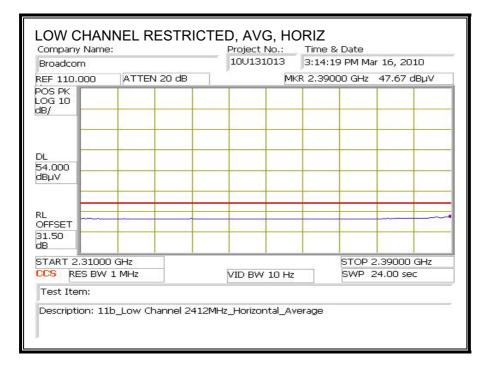
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8.2. TRANSMITTER ABOVE 1 GHz

8.2.1. 802.11b MODE IN THE 2.4 GHz BAND

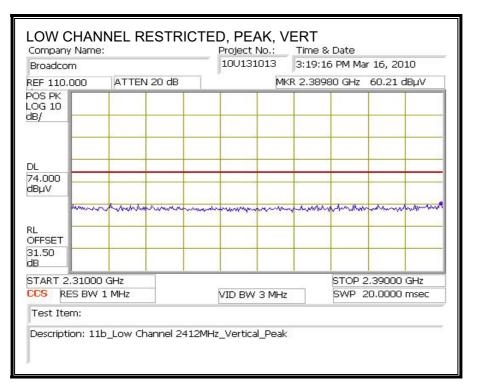
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

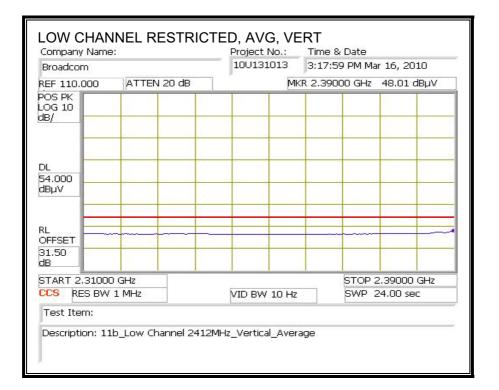




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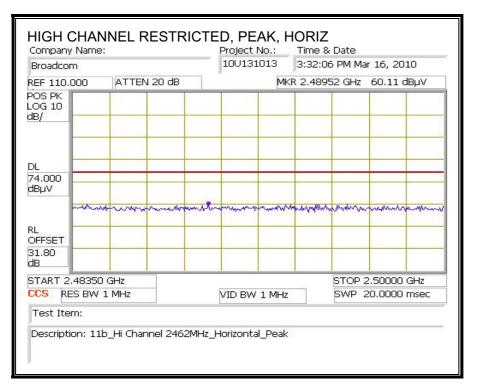
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

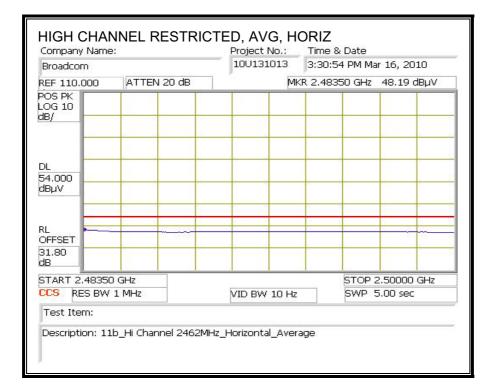




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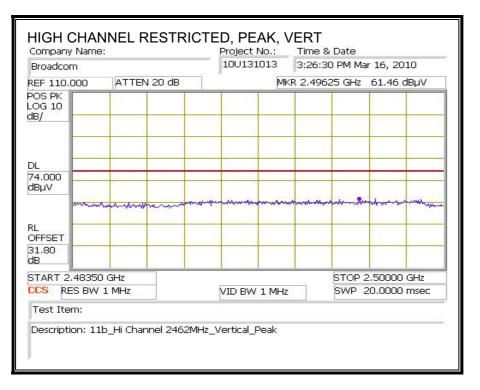
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

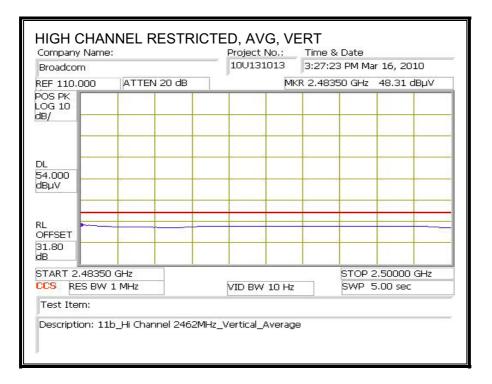




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RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





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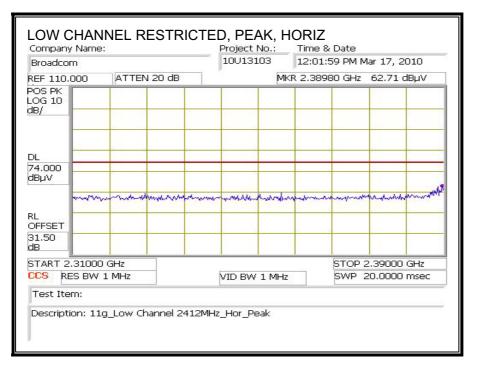
HARMONICS AND SPURIOUS EMISSIONS

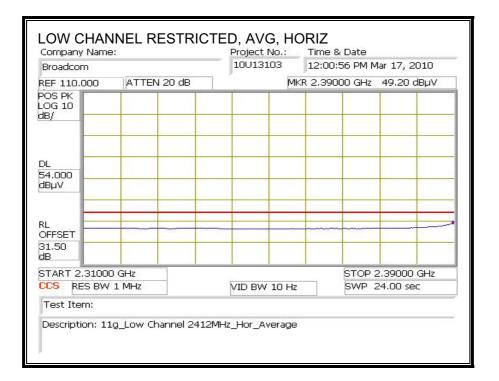
-		Measurer lification		s, Fre:	mont 31	n Chambo	er						
Fest Engi		Vien Tra											
Date:	•	03/18/10											
Project #		10U1310											
Company		Broadco											
				07 11	- WIT &I	N + Bluet	ath I	CTEM:	ni Card				
EUT M/N:	-	BCM943			1 11 14 14	t + Diaen	00 UL 1		in Caru				
Fest Targ		FCC CL		DI									
Mode Op		Tx 2.4GI											
noue op		14 2.101	II DUI	•									
	f	Measurer	nent Fred	puency	Amp	Preamp (Gain			Average	Field Stren	gth Limit	
	Dist	Distance	to Anter	una -	D Corr	Distance	Correc	rt to 3 me	eters	-	ld Strength	-	
	Read	Analyzer			Avg	Average I					s. Average		
	AF	Antenna	~		Peak	Calculate			,	-	s. Peak Lii		
	CL	Cable Lo:	55		HPF	High Pass			-	-			
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr.	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Cha	:		- w/m	<u></u>	<u>. uo</u>		шD	ana v/m	ana ww	_ uD	v/H	riniQr	
1.824	3.0	40.4	32.7	5.8	-34.8	0.0	0.0	44.0	74.0	-30.0	v	Р	
1.824	3.0	34.7	32.7	5.8	-34.8	0.0	0.0	38.3	54.0	-15.7	v	Ā	
12.060	3.0	35.2	38.5	9.8	-32.5	0.0	0.0	51.0	74.0	-23.0	v	P	
12.060	3.0	25.2	38.5	9.8	-32.5	0.0	0.0	41.0	54.0	-13.0	V	A	
1.824	3.0	42.0	32.7	5.8	-34.8	0.0	0.0	45.7	74.0	- 28.3	Н	P	
1.824	3.0	36.2	32.7	5.8	-34.8	0.0	0.0	39.8	54.0	-14.2	H	A	
12.060	3.0	35.3	38.5	9.8	-32.5	0.0	0.0	51.1	74.0	-22.9	H	Р	
12.060	3.0	25.0	38.5	9.8	-32.5	0.0	0.0	40.8	54.0	-13.2	H	A	
Mid Cha		v	~ ~				~ ~ ~					_	
4.874	3.0 3.0	42.9	32.7 32.7	5.8 5.8	-34.8 -34.8	0.0	0.0	46.6 42.5	74.0 54.0	-27.4	V	Р	
4.874 7.311	3.0	38.8 43.5	32.7	5.8 7.3	-34.8	0.0 0.0	0.0 0.0	42.5	54.0 74.0	-11.5 -21.8	v v	A P	
7.311	3.0	43.5	35.5	7.3	-34.1	0.0	0.0	46.1	74.0 54.0	-21.0	v	P A	
12.185	3.0	35.1	38.5	9.8	-32.5	0.0	0.0	50.9	54.0 74.0	-23.1	v	P	
12.185	3.0	25.5	38.5	9.8	-32.5	0.0	0.0	41.3	54.0	-12.7	v	Å	
1.874	3.0	41.8	32.7	5.8	-34.8	0.0	0.0	45.5	74.0	-28.5	H	P	
4.874	3.0	37.7	32.7	5.8	-34.8	0.0	0.0	41.4	54.0	-12.6	H	A	
7.311	3.0	40.5	35.5	7.3	-34.1	0.0	0.0	49.1	74.0	-24.9	H	P	
7.311	3.0	33.5	35.5	7.3	-34.1	0.0	0.0	42.1	54.0	-11.9	H	A	
12.185	3.0	35.0	38.5	9.8	-32.5	0.0	0.0	50.8	74.0	-23.2	H	Р	
12.185	3.0	24.1	38.5	9.8	-32.5	0.0	0.0	40.0	54.0	-14.0	H	A	
High Ch		v	20.7	50	240		0.0	46.0	740		τ	n	
1.924 1.924	3.0	43.0 38.6	32.7 32.7	5.9 5.9	-34.8 -34.8	0.0 0.0	0.0	46.8	74.0 54.0	-27.2 -11.6	v v	P A	
1.924 7.386	3.0	38.0 43.6	35.6	7.3	-34.0	0.0	0.0	42.4 52.3	54.0 74.0	-11.0 -21.7	v	P	
.386	3.0	37.5	35.6	7.3	-34.1	0.0	0.0	46.3	54.0	-7.7	v	A	
2.310	3.0	33.9	38.5	9,9	-32.5	0.0	0.0	49.8	74.0	-24.2	v	P	
2.310	3.0	23.0	38.5	9,9	-32.5	0.0	0.0	38.9	54.0	-15.1	v	Ā	
1.924	3.0	43.3	32.7	5.9	-34.8	0.0	0.0	47.1	74.0	-26.9	H	P	
1.924	3.0	39.2	32.7	5.9	-34.8	0.0	0.0	43.0	54.0	- 11.0	H	A	
7.386	3.0	40.3	35.6	7.3	-34.1	0.0	0.0	49.1	74.0	-24.9	H	P	
7.386	3.0	33.7	35.6	7.3	-34.1	0.0	0.0	42.5	54.0	-11.5	H	A	
	3.0	34.0	38.5	9.9	-32.5	0.0	0.0	49.9	74.0	-24.1	H	Р	
12.310 12.310	3.0	22.4	38.5	9,9	-32.5	0.0	0.0	38.3	54.0	-15.7	н	A	

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8.2.2. 802.11g MODE IN THE 2.4 GHz BAND

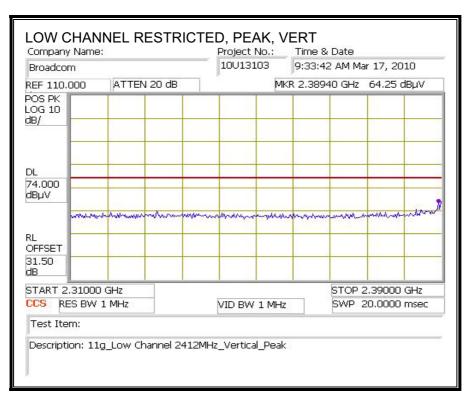
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

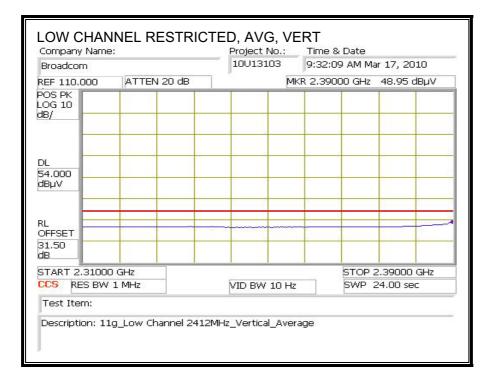




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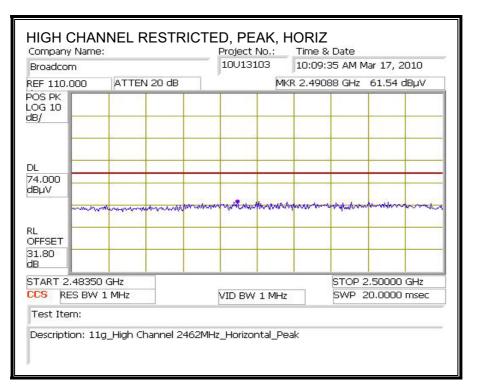
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

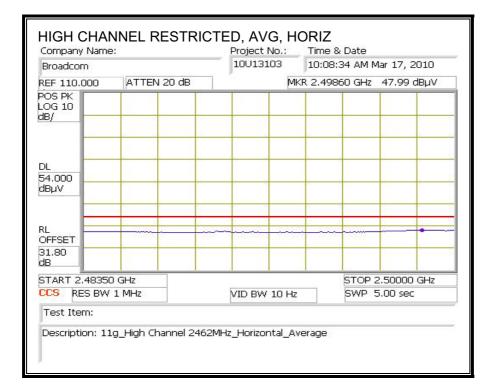




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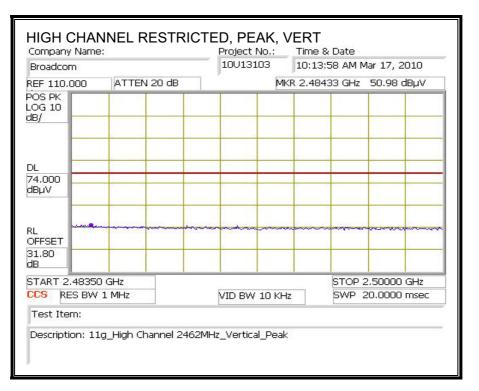
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

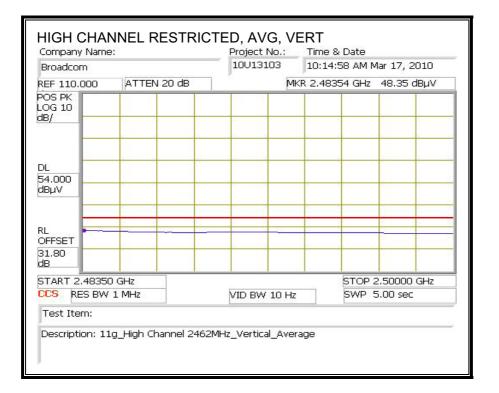




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RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



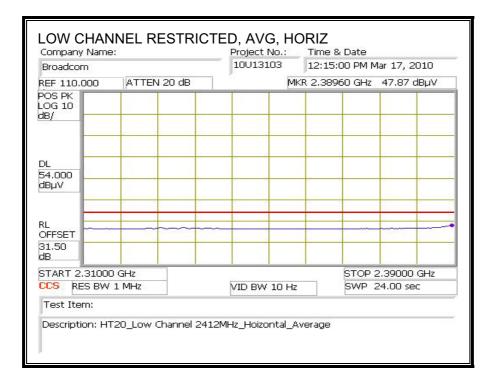


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8.2.3. 802.11n HT20 MODE MCS0 IN THE 2.4 GHz BAND

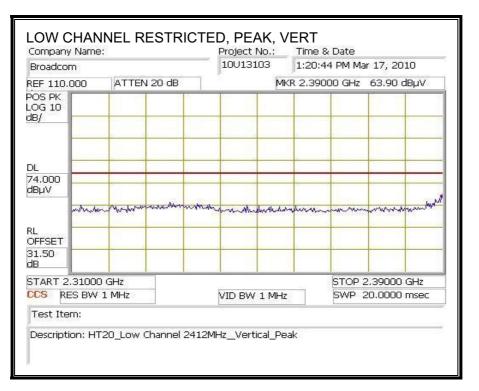
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

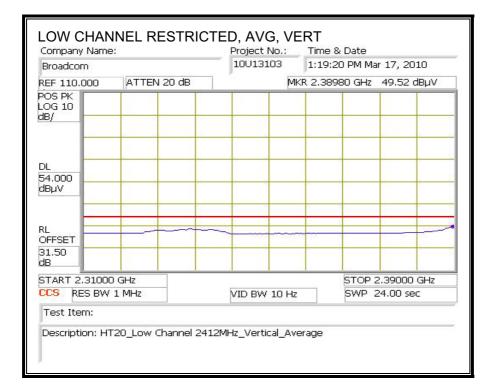
LOW CHANNEL RESTRICTED, PEAK, HORIZ Company Name: Project No.: Time & Date 10U13103 12:13:40 PM Mar 17, 2010 Broadcom MKR 2.38980 GHz 61.95 dBµV REF 110.000 ATTEN 20 dB POS PK LOG 10 dB/ DL 74.000 dBuV man and many many many many mound min RL OFFSET 31.50 dB START 2,31000 GHz STOP 2.39000 GHz SWP 20.0000 msec CCS RES BW 1 MHz VID BW 1 MHz Test Item: Description: HT20_Low Channel 2412MHz_Hoizontal_Peak



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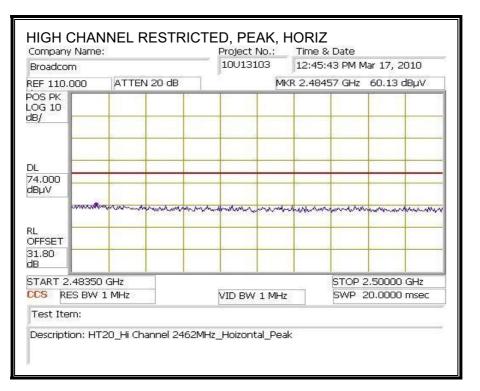
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

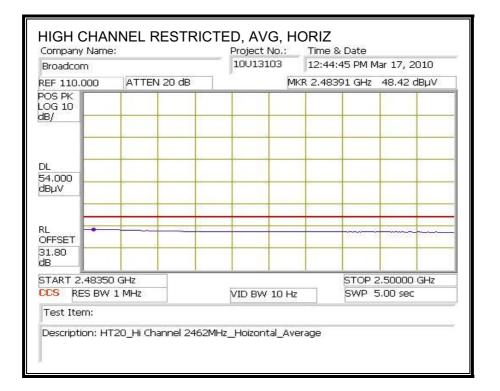




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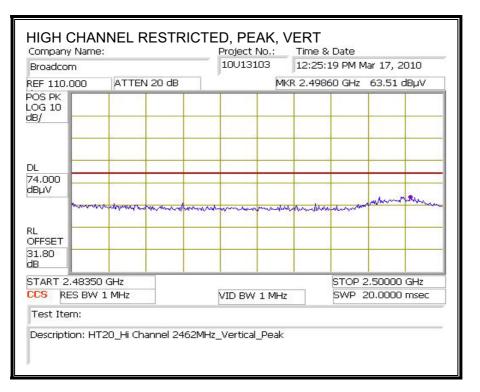
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

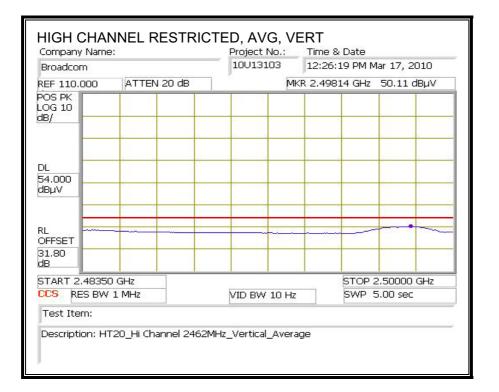




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RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



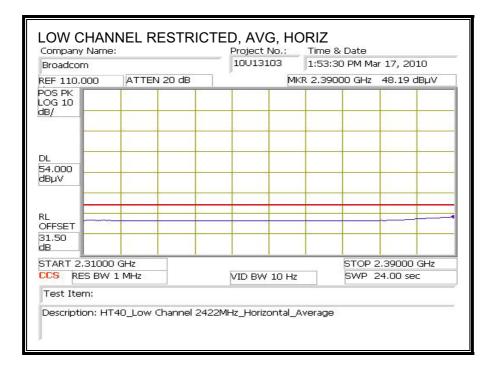


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8.2.4. 802.11n HT40 MODE SISO IN THE 2.4 GHz BAND

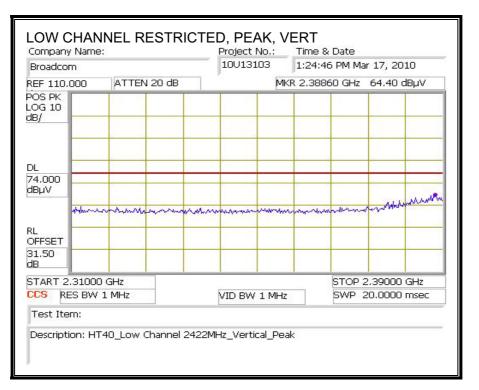
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

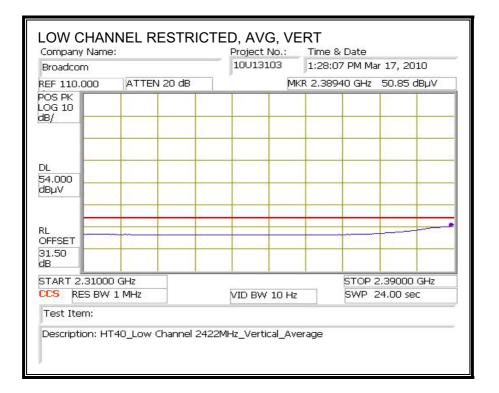
LOW CHANNEL RESTRICTED, PEAK, HORIZ Company Name: Project No.: Time & Date 10013103 1:54:27 PM Mar 17, 2010 Broadcom REF 110.000 ATTEN 20 dB MKR 2.38620 GHz 60.68 dBµV POS PK LOG 10 dB/ DL 74.000 dBµV momente annum Mannen have RI OFFSET 31.50 dB START 2.31000 GHz STOP 2.39000 GHz CCS RES BW 1 MHz SWP 20.0000 msec VID BW 1 MHz Test Item: Description: HT40_Low Channel 2422MHz_Horizontal_Peak



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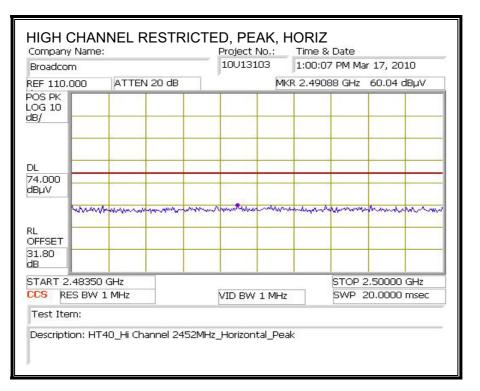
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

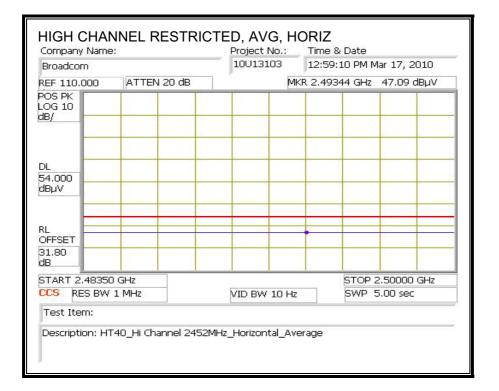




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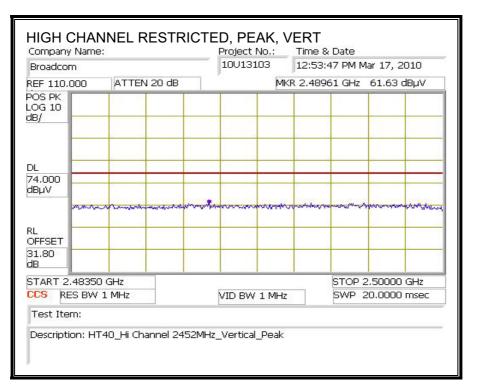
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

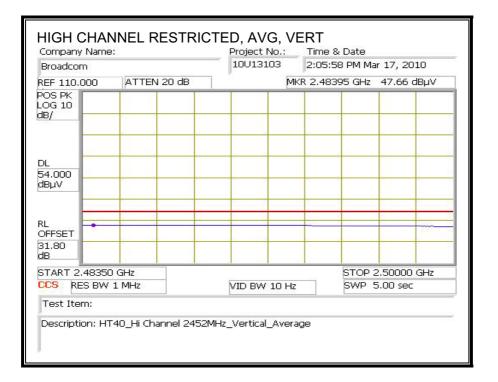




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RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



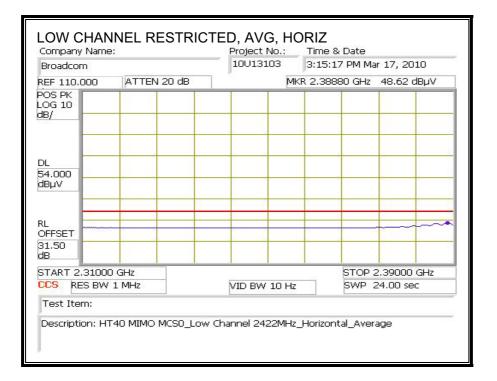


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8.2.5. 802.11n HT40 MODE MIMO MCS0 IN THE 2.4 GHz BAND

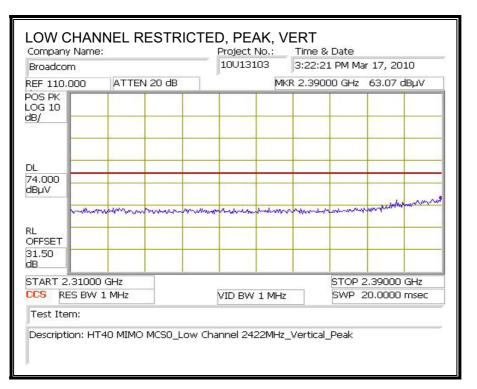
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

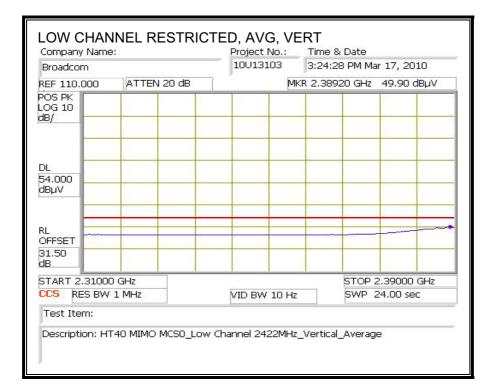
LOW CHANNEL RESTRICTED, PEAK, HORIZ Company Name: Project No.: Time & Date 10U13103 3:16:04 PM Mar 17, 2010 Broadcom MKR 2.38700 GHz 60.09 dBµV REF 110.000 ATTEN 20 dB POS PK LOG 10 dB/ DL 74.000 dBµV manun man munim monde render m RL OFFSET 31.50 dB START 2,31000 GHz STOP 2.39000 GHz SWP 20.0000 msec CCS RES BW 1 MHz VID BW 1 MHz Test Item: Description: HT40 MIMO MCS0_Low Channel 2422MHz_Horizontal_Pk



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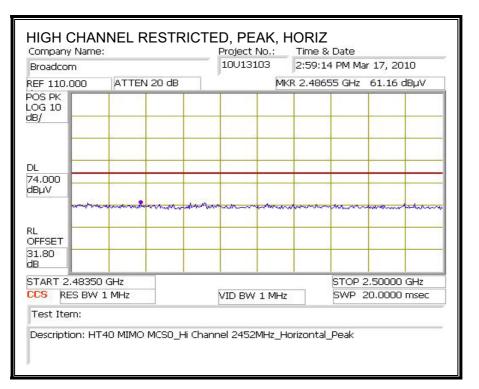
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

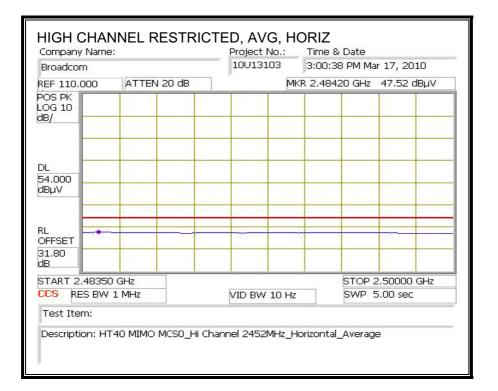




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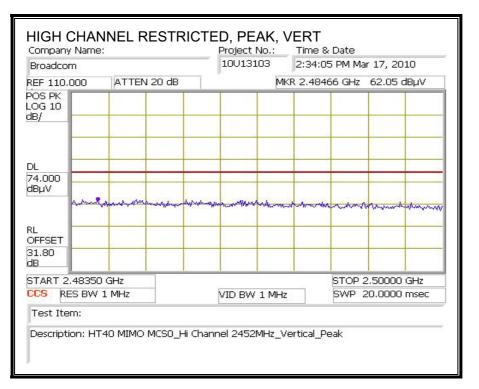
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

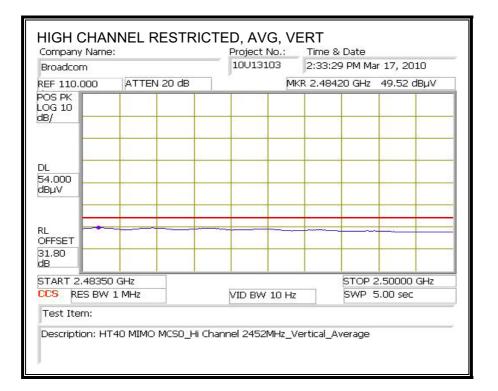




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RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



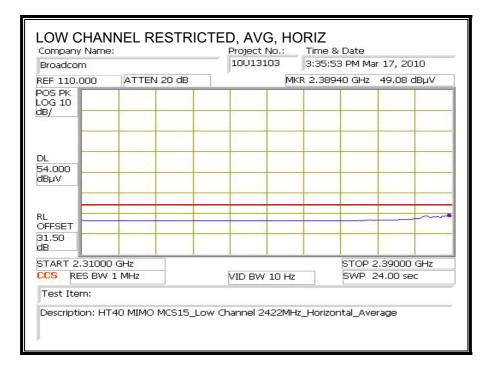


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8.2.6. 802.11n HT40 MODE MIMO MCS15 IN THE 2.4 GHz BAND

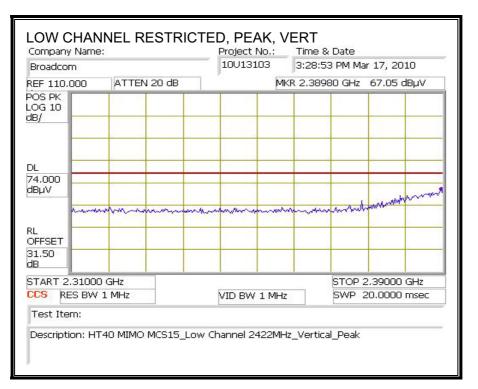
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

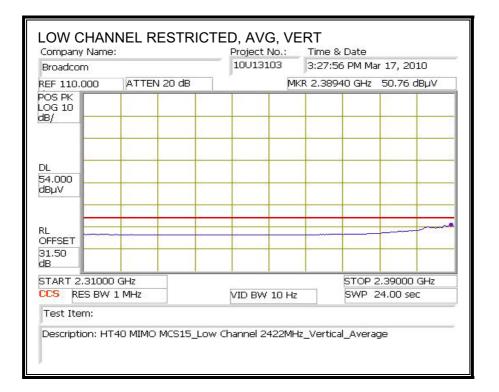
LOW CHANNEL RESTRICTED, PEAK, HORIZ Company Name: Project No.: Time & Date 10U13103 3:33:31 PM Mar 17, 2010 Broadcom MKR 2.38680 GHz 64.47 dBµV REF 110.000 ATTEN 20 dB POS PK LOG 10 dB/ DL 74.000 dBµV 2de Munhamman manger and have mouturement m. M. h. And RL OFFSET 31.50 dB START 2,31000 GHz STOP 2.39000 GHz SWP 20.0000 msec CCS RES BW 1 MHz VID BW 1 MHz Test Item: Description: HT40 MIMO MCS15_Low Channel 2422MHz_Horizontal_Peak



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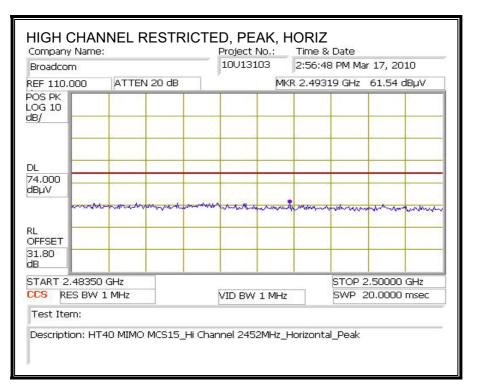
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

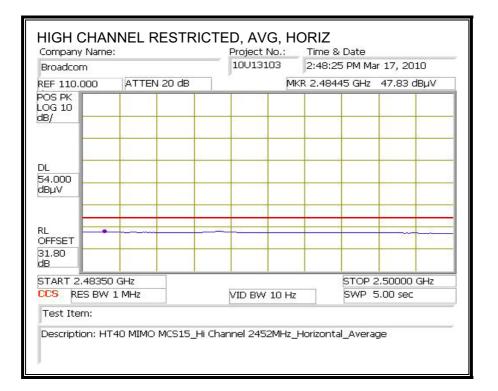




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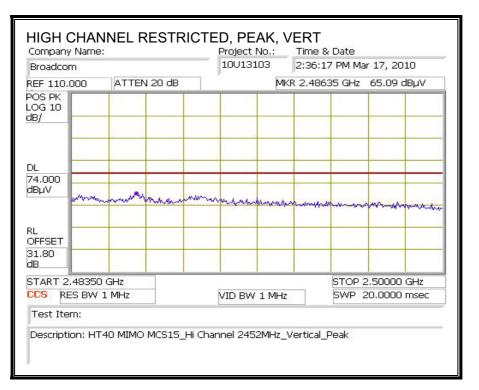
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

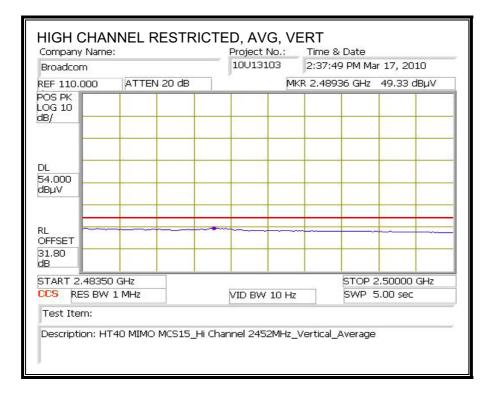




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RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





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8.3. RECEIVER ABOVE 1 GHz

$\begin{array}{cccccccccccccccccccccccccccccccccccc$	~		y Measure													
Date: 03/18/10 Project #: 10U13103 Company: Broadcon EUT Description: 802.22 ag/Draft 802.11n WLAN + Binetooth PCI-E Mini Card EUT Description: 802.22 ag/Draft 802.11n WLAN + Binetooth PCI-E Mini Card EUT Description: 802.22 ag/Draft 802.11n WLAN + Binetooth PCI-E Mini Card EUT Mr: BC/M94322PCTEBT Test Target: FCC Class B Mode Oper: Rx 2.4GHz Band (No significant change from the readings between 20MHz & 40MHz Bandwidth) Test Equipment: Horn 1-18GHz Pre-amplifer 1-26GHz Pre-amplifer 26-40GHz Horn > 18GHz Imit RX RSS 210 160: SN: 2238 @3m 1734 HP 84498 Pre-amplifer 26-40GHz Pre-amplifer 28-807500 Pre-a	Complia	ince Ce	rtification	Services, Fr	emont	3m Ch	amber									
Project #:IOUI3103 Company:FroadcomCUTD pescription:S02 22 gD raft 802. I.In WLAN + Binetooth PCI-E Mini CardEUT Description:S02 22 gD raft 802. I.In WLAN + Binetooth PCI-E Mini CardEUT MN:BCM4322PCTEBTTest Target:FCC Chass BMode Oper:Rx 2.4 GHz Band (No significant change from the readings between 20MHz & 40MHz Bandwidth)Test Target:FCC Chass BMode Oper:Rx 2.4 GHz Band (No significant change from the readings between 20MHz & 40MHz Bandwidth)Test Equipment:100 (Sin: 2238 @3m , Tat HP 84498 , Tat HP 844	Test Eng	व्राः		Vien Tran												
Company: Broadcom EUT Description: 802.22 agDraft 802.11n WLAN + Bluetooth PCI-E Mini Card EUT M/N: BCM94322PCTEBT Test Target: ECC Class B Mode Oper: Rx 2.4GHz Band (No significant change from the readings between 20MHz & 40MHz Bandwidth) Test Equipment: Horn 1-18GHz Pre-amplifer 1-26GHz Pre-amplifer 26-40GHz Horn > 18GHz Limit 150: S/N: 2238 @3m T34 HP 84498 20' cable 22807500 12' cable 22807600 20' cable 22807500 Pre-amplifer 26-40GHz HOFF Reject Filter Peak Measurements RBW=/BW-/BHz 11/1 requency Cables 12' cable 22807600 20' cable 22807500 12' cable 22807600 20' cable 22807500 Pk Lim Avg Lim Pk Mar Avg Mar Notes (HJM BUV/n dBuV/n dB	Date:			03/18/10												
EUT Description:802.22 ag Draft 802.11n WLAN + Ellectooth PCI-E Mini CardEUT MAN:BCM 24322PCIEETTest Target:FCC Class BMode Oper:Rx 2.4GHz Band (No significant change from the readings between 20MHz & 40MHz Bandwidth)Test Target:Pre-amplifer 1-26GHzPre-amplifer 26-40GHzHorn > 18GHzLimitMore 1-18GHzPre-amplifer 1-26GHzPre-amplifer 26-40GHzHorn > 18GHzLimitTest Target:Pre-amplifer 1-26GHzPre-amplifer 26-40GHzHorn > 18GHzLimitTime to solve 2280770012' cable 2280760020' cable 22807500Peak Measurements RBW=1MHz Arenge Measurements 	Project #	#:		10U13103												
EUT M.N:BCM94322PCTEBTTest Target:FCC Class BMode Oper:Rx 2.4GHz Band (No significant change from the readings between 20MHz & 40MHz Bandwidth)Test Fquipment:Horn 1-18GHzPre-amplifer 1-26GHzPre-amplifer 26-40GHzHorn > 18GHzLimitT60: S/N: 2238 @3mT34 HP 8449BQo' cable 22807500Pre-amplifer 26-40GHzHorn > 18GHzLimitMode Coper:T34 HP 8449BQo' cable 22807500Qo' cable 22807500HPFReject FilterPeak Measurements RBW=VBW=1MHz3' cable 2280770012' cable 22807600Qo' cable 22807500Qo' cable 22807500Pk LimAvg LimPk MarAvg MarNotes RBW=1MHz, VBW=10HzfDistRead PkRead AvgAFCLAmpD CorrFitrPeakAvgPk LimAvg LimPk MarAvg MarNotes RBW=1MHz, VBW=10HzfMeasurement FrequencyAFCLAmpD corrFitrPeakAvg LimAverage Field Strength LimitPh Lim10973.053.239.926.12.937.60.046.631.97454-27.2-21.6VI1973.053.239.926.12.937.60.046.631.97454-29.3-22.6HIn distance to AntennaD CorrD CorrFitrPeakAvg LimAverage Field Strength LimitPreamp GainAre		•		Broadcom												
Test Target:FCC Class BMode Oper:Rx 2.4GHz Band (No significant change from the readings between 20MHz & 40MHz Bandwidth)Test Equipment:Horn 1-18GHzPre-amplifer 1-26GHzPre-amplifer 26-40GHzHorn > 18GHzLimitTöi: S/N: 2238 (#3m)T34 HP 84498Pre-amplifer 26-40GHzHorn > 18GHzLimitIf Frequency Cables20' cable 2280750020' cable 22807500Pre-amplifer 20' cable 22807500Pre-amplifer 20' cable 22807500Pre-amplifer 20' cable 2280750012' cable 2280770012' cable 2280760020' cable 22807500Pre-amplifer 20' cable 22807500Pre-amplifer 20' cable 22807500Pre-amplifer 20' cable 228075001DistRead AvgAFCLAmpD CorrFInPeakAvgMinAvg LimAvg MarNotesGHzImage: Image free data data data data data data data da	EUT De:	scriptic	on:	802.22 ag/D	raft 80	2.11n \	WLAN ·	+ Bluetoc	oth PC	I-E Mini (Card					
Mode Oper:Rx 2.4GHz Band (No significant change from the readings between 20MHz & 40MHz Bandwidth)Test Equipment:Horn 1-18GHzPre-amplifer 1-26GHzPre-amplifer 26-40GHzHorn > 18GHzLimitTo; S.N: 2238 @3mT34 HP 8449BQ' cable 22807500Pre-amplifer 26-40GHzHorn > 18GHzLimitWeight CablesQ' cable 2280770012' cable 2280760020' cable 22807500HPFReject FilterPeak Measurements RBW=1MHzTo bistRead Pix Read AvgAFCLAmpD CorrFiltPeakAvgPk LimAvg LimPk MarAvg MarNotes RBW=10HzTo bistRead Pix Read AvgAFCLAmpD CorrFiltPeakAvgPk LimAvg LimPk MarNotes RBW=10HzTo bistRead Pix Read AvgAFCLAmpD CorrFiltPeakAvgPk LimAvg LimPk MarNotes RBW=10HzTo bistRead Pix Read AvgAFCLAmpD CorrFiltPeakAvgPk LimAvg LimPk MarAvg MarNotes RBW=10HzTo bistDistDistance to AntennaDistDistance to AntennaDistDistance to AntennaArgArgArgMargin vs. Peak LimitPeak Field Strength Limit Pk MarPeak Field Strength Limit Pk MarPeak Margin vs. Peak LimitfMeasurement Frequency ArgArgArgArgArgArg Mar Margin vs. Peak LimitPk MarMargin vs. Peak Limit </th <th></th> <th></th> <th></th> <th></th> <th></th> <th>βT</th> <th></th>						βT										
Test Equipment: Horn 1-18GHz Pre-amplifer 1-26 GHz Pre-amplifer 26-40 GHz Horn > 18 GHz Limit T60; S/N: 2238 @03m T34 HP 8449B 20' cable 22807500 Pre-amplifer 26-40 GHz Horn > 18 GHz Limit # Frequency Cables 12' cable 22807600 20' cable 22807500 20' cable 22807500 HPF Reject Filter Peak Measurements RBW=VBW=1MHz Average Measurements 20' cable 22807500 20' cable 22807500 0''' Pk Lim Average Measurements RBW=1MHz; VBW=10Hz f Dist Read Pk Read Avg AF CL Amp D Corr Flt Peak Avg Pk Lim Avg Mar Notes GHz (m) dBuV dB dB dB dB dB dB dB V'' H''' Average Measurements 1497 3.0 57.1 42.7 2.1 2.6 38.0 0.0 46.8 32.0 74 54 -27.7 -22.0 H 1497 3.0 55.6 42.3 25.1 2.6 38.0 0.0 46.3 32.0 74 5		~			_											
Horn 1-18GHz Pre-amplifer 1-26GHz Pre-amplifer 26-40GHz Horn > 18GHz Limit T60; S/N: 2238 @3m T34 HP 8449B 20' cable 22807500 RX RSS 210 RX RSS 210 If Frequency Cables 12' cable 22807600 20' cable 22807500 Pre-amplifer 26-40GHz HPF Reject Filter Peak Measurements RBW=VBW=1MHz Average Measurements 12' cable 22807600 20' cable 22807500 0 Pk Lim Avg Pk Lim Avg Mar Notes f Dist Read Pk Read Avg AF CL Amp D Corr Flt Peak Avg Pk Lim Avg Lim Pk Mar Avg Mar Notes GHz (m) dBuV dBn dB dB dB dB U/m dBuV/m dBuV/m MB V/H 1197 3.0 56.6 42.3 25.1 2.6 38.0 0.0 46.3 32.0 74 54 -27.2 2.1.6 V 1197 3.0 56.6 42.3 2.5.1 2.6 38.0 0.0<	Mode O	per:		Rx 2.4GHz	Band (No sig	nificant	change f	rom tl	ıe reading	s between	20MHz 8	2 40MHz I	Bandwidth	i)	
Too: S/N: 2238 @3m T34 HP 8449B RX RSS 210 Too: S/N: 2238 @3m T34 HP 8449B RX RSS 210 If Frequency Cables 3' cable 22807700 12' cable 22807600 20' cable 22807500 3' cable 22807700 12' cable 22807600 20' cable 22807500 12' cable 22807700 IPF Mar Avg Mar Mag Mar Motes G Gain dia dia dia dia V/m	<u>Test Equ</u>	uipmen	. <u>t:</u>													
H Frequency Cables 12' cable 22807600 20' cable 22807500 HPF Reject Filter Peak Measurements RBW=VBW=1MHz 3' cable 22807700 12' cable 22807600 20' cable 22807500 12' cable 22807600 Pi cable 22807500 Pi cable 22807500 Pi cable 22807600 Pi cable 22807500 Pi cable 22807600 Pi cable 22807500 Pi cable 22807600 Pi cable 22807500 Pi cable 228075	Ho	orn 1-	18GHz	Pre-an	nplifer	1-260	SHz	Pre-am	plifer	26-40GH	z	H	orn > 180	GHz		
3' cable 22807700 12' cable 22807600 20' cable 22807500 Peak Measurements RBW=1MHz 3' cable 22807700 12' cable 22807600 20' cable 22807500 3' cable 22807700 12' cable 22807600 Peak Measurements RBW=1MHz 12' cable 22807600 20' cable 22807500 12' cable 22807600 Peak Measurements RBW=1MHz Average Measurements RBW=1MHz Voide 22807500 10' cable 22807500 Peak Marge Measurements RBW=1MHz Verage Measurements RBW=10Hz GHz (m) dBa dy Measurements RBW-1MHz Verage Measurements RBW=10Hz GHz (m) dBa dy Measurements RBW-1MHz Verage Measurements RBW=10Hz 1007 Bab dB dBu/m dB dBu/m dBu/m dBu/m dBu/m dBu/m dBu/m dBu/m dBu/m dBu/m dB Weight Circle Average Measurements RBW=1MHz 1007 State Call and Pix Mar Average Measurements RBW-1MHz Verage Measurements 	T60; S	5/N: 223	8 @3m	- T34 HF	, 8449B		-				-				-	RX RSS 210 .
Image: Construction of the call of	Hi Frequ	juency Ca'	bles ——		-											
f Dist Read Avg. AF CL Amp D Corr Fitr Peak Avg Pk Lim Avg Lim Pk Mar Avg Mar Notes GHz (m) dBuV dBnV dBra dB dB dB dB dB dBuV/m dBuV/m dBuV/m dBuV/m dBuV/m dB dB (V/H) 1.197 3.0 57.1 42.7 25.1 2.6 -38.0 0.0 46.8 32.4 74 54 -27.2 -21.6 V 1.197 3.0 56.6 42.3 25.1 2.6 -38.0 0.0 46.3 32.0 74 54 -27.2 -21.6 V 1.197 3.0 56.6 42.3 25.1 2.6 -38.0 0.0 46.3 32.0 74 54 -29.3 -22.6 H 1.497 3.0 53.2 39.9 26.1 2.9 -37.6 0.0 44.7 31.4 74																
GHz (m) dBuV dBuV dB/m dB dB dB dB dB dBuV/m dBuV/m dBuV/m dB dB (V/H) 1.197 3.0 57.1 42.7 25.1 2.6 -38.0 0.0 46.8 32.4 74 54 -27.2 -21.6 V 1.497 3.0 57.1 40.4 26.1 2.9 -37.6 0.0 46.5 31.9 74 54 -27.2 -21.6 V 1.197 3.0 56.6 42.3 25.1 2.6 -38.0 0.0 46.3 32.0 74 54 -27.7 -22.0 H 1.497 3.0 53.2 39.9 26.1 2.9 -37.6 0.0 44.7 31.4 74 54 -29.3 -22.6 H No other emissions were detected above system noise floor No other emissions were detected above system noise floor String to fan analyzer Reading Arg	3' c	able 2	2807700	12' c	able 2	28076	00	20' cal	ble 22	807500		HPF	Re	ject Filte		
GHz (m) dBuV dBuV dB/m dB dB dB dB dB dB dB dB dB/m dB dB dB dB/m dB dB dB dB/m dB dB dB dB/m dB dB dB/m dB dB dB/m dB dB (V/H) 1.197 3.0 57.1 42.7 25.1 2.6 -38.0 0.0 46.8 32.4 74 54 -27.2 -21.6 V 1.497 3.0 56.6 42.3 25.1 2.6 -38.0 0.0 46.3 32.0 74 54 -27.7 -22.0 H 1.497 3.0 53.2 39.9 26.1 2.9 -37.6 0.0 44.7 31.4 74 54 -27.7 -22.0 H 1.497 3.0 53.2 39.9 26.1 2.9 -37.6 0.0 44.7 31.4 74 54							00 •					HPF	Re	iject Filte	RB1 Avera	W=VBW=1MHz ge Measurements
1.497 3.0 54.1 40.4 26.1 2.9 -37.6 0.0 45.6 31.9 74 54 -28.4 -22.1 V 1.197 3.0 56.6 42.3 25.1 2.6 -38.0 0.0 46.3 32.0 74 54 -28.4 -22.1 V 1.497 3.0 53.2 39.9 26.1 2.9 -37.6 0.0 46.3 32.0 74 54 -27.7 -22.0 H No other emissions were detected above system noise floor 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	3' ca	able 228	807700	• 12' ca	ıble 228	07600	•	20' cab	le 2280)7500	Avg				RBV Avera RBW=	W=VBW=1MHz ge Measurements 1MHz ; VBW=10H;
1.197 3.0 56.6 42.3 25.1 2.6 -38.0 0.0 46.3 32.0 74 54 -27.7 -22.0 H 1.497 3.0 53.2 39.9 26.1 2.9 -37.6 0.0 44.7 31.4 74 54 -27.7 -22.0 H No other emissions were detected above system noise floor 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	3' ca	able 228 Dist	807700 Read Pk	 12' ca Read Avg. 	ble 228 AF	07600 CL	• Amp	20' cab D Corr	le 2280 Fltr	Peak		Pk Lim	• Avg Lim	Pk Mar	RBV Avera RBW= Avg Mar	W=VBW=1MHz ge Measurements 1MHz ; VBW=10H: Notes
1.497 3.0 53.2 39.9 26.1 2.9 -37.6 0.0 44.7 31.4 74 54 -29.3 -22.6 H No other emissions were detected above system noise floor f Measurement Frequency Dist 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	3' ca f GHz	able 228 Dist (m) 3.0	B07700 Read Pk dBuV	The ad Avg. dBuV	ble 228 AF dB/m	07600 CL dB 2.6	• Amp dB -38.0	20' cab D Corr	le 2280 Fltr dB	Peak dBuV/m	dBuV/m	Pk Lim dBuV/m	• Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB -21.6	W=VBW=1MHz ge Measurements 1MHz ; VBW=10H: Notes (V/H) V
No other emissions were detected above system noise floor 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	f GHz 1.197 1.497	able 228 Dist (m) 3.0 3.0	807700 Read Pk dBuV 57.1 54.1	 12' ca Read Avg. dBuV 42.7 40.4 	AF dB/m 25.1 26.1	07600 CL dB 2.6 2.9	• Amp dB -38.0 -37.6	20' cab D Corr	le 2280 Fltr dB 0.0 0.0	7500 Peak dBuV/m 46.8 45.6	dBuV/m 32.4 31.9	Pk Lim dBuV/m 74 74	Vy Lim dBuV/m 54 54	Pk Mar dB -27.2 -28.4	Avg Mar dB -21.6 -22.1	W=VBW=1MHz ge Measurements 1MHz ; VBW=10H: Notes (V/H) V V
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	f GHz 1.197 1.497 1.197	able 228 Dist (m) 3.0 3.0 3.0	807700 Read Pk dBuV 57.1 54.1 56.6	 12' ca Read Avg. dBuV 42.7 40.4 42.3 	AF dB/m 25.1 26.1 25.1	07600 CL dB 2.6 2.9 2.6	 Amp dB -38.0 -37.6 -38.0 	20' cab D Corr	le 2280 Fltr dB 0.0 0.0	7500 Peak dBuV/m 468 45.6 46.3	dBuV/m 32.4 31.9 32.0	Pk Lim dBuV/m 74 74 74 74	• Avg Lim dBuV/m 54 54 54	Pk Mar dB -27.2 -28.4 -27.7	Avg Mar dB -21.6 -22.0	W=VBW=1MHz ge Measurements 1MHz ; VBW=10H: Notes (V/H) V V H H
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	f GHz 1.197 1.497 1.197	able 228 Dist (m) 3.0 3.0 3.0	Read Pk dBuV 57.1 54.1 56.6 53.2	 Read Avg. dBuV 42.7 40.4 42.3 39.9 	AF dB/m 25.1 26.1 25.1 26.1	07600 CL dB 2.6 2.9 2.6 2.9	 Amp dB -38.0 -37.6 -38.0 -37.6 	20' cab D Corr dB	le 2280 Fltr dB 0.0 0.0	7500 Peak dBuV/m 468 45.6 46.3	dBuV/m 32.4 31.9 32.0	Pk Lim dBuV/m 74 74 74 74	• Avg Lim dBuV/m 54 54 54	Pk Mar dB -27.2 -28.4 -27.7	Avg Mar dB -21.6 -22.0	W=VBW=1MHz ge Measurements 1MHz ; VBW=10H: Notes (V/H) V V H H
AF Antenna Factor Peak Calculated Peak Field Strength Pk Mar Margin vs. Peak Limit	3' ca f GHz 1.197 1.497 1.197 1.497	able 228 Dist (m) 3.0 3.0 3.0 3.0	Read Pk dBuV 57.1 54.1 56.6 53.2 No other em	Read Avg. dBuV 42.7 40.4 42.3 39.9 tissions were de	AF dB/m 25.1 26.1 25.1 26.1 26.1	07600 CL dB 2.6 2.9 2.6 2.9 bove sys	Amp dB -38.0 -37.6 -38.0 -37.6 tem noise	20' cab D Corr dB	le 2280 Fltr dB 0.0 0.0 0.0	7500 Peak dBuV/m 468 45.6 46.3	dBuV/m 32.4 31.9 32.0	Pk Lim dBuV/m 74 74 74 74	• Avg Lim dBuV/m 54 54 54 54 54 54	Pk Mar dB -27.2 -28.4 -27.7 -29.3	Avera RBW=2 Avg Mar dB -216 -22.1 -22.0 -22.6	W=VBW=1MHz ge Measurements 1MHz ; VBW=10H: Notes (V/H) V V H H H
	f GHz 1.197 1.497 1.497 1.497	able 228 Dist (m) 3.0 3.0 3.0 f Dist	807700 Read Pk dBuV 57.1 54.1 56.6 53.2 No other em Distance to	Read Avg. dBuV 42.7 40.4 42.3 39.9 tissions were de	AF dB/m 25.1 26.1 25.1 26.1 26.1	07600 CL dB 2.6 2.9 2.6 2.9 bove sys	Amp dB -38.0 -37.6 -38.0 -37.6 tem noise Amp	20' cab D Corr dB floor Preamp (Distance	Fltr dB 0.0 0.0 0.0 0.0 Correct	Peak dBuV/m 46.8 45.6 46.3 44.7	dBuV/m 32.4 31.9 32.0 31.4	Pk Lim dBuV/m 74 74 74 74 74	Avg Lim dBuV/m 54 54 54 54 54 8 Vg Lim Pk Lim	Pk Mar dB -27.2 -28.4 -27.7 -29.3 Average F Peak Field	Avg Mar dB -21.6 -22.1 -22.0 -22.6 -22.6 -22.6	W=VBW=1MHz <u>ge Measurements</u> 1MHz ; VBW=10H2 Notes (V/H) V V H H h Limit imit
CL Cable Loss HPF High Pass Filter	f GHz 1.197 1.497 1.497	f f Dist (m) 3.0 3.0 3.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1	Read Pk dBuV 57.1 56.6 53.2 No other em Distance to Analyzer R	12' ca Read Avg. dBuV 42.7 42.3 39.9 dBuV 42.3 ag. ag. dBuV 42.3 ag. ag. dBuV 42.3 ag. ag. ag. ag. ag. ag. ag. ag.	AF dB/m 25.1 26.1 25.1 26.1 26.1	07600 CL dB 2.6 2.9 2.6 2.9 bove sys	Amp dB -38.0 -37.6 -38.0 -37.6 -37.6 tem noise Amp D Corr Avg	20' cab D Corr dB effoor Preamp (Distance Average	Fltr dB 0.0 0.0 0.0 0.0 Gain Correct Field S	Peak dBuV/m 46.8 45.6 46.3 44.7 ct to 3 metr Strength @	dBuV/m 32.4 31.9 32.0 31.4 ers 3 m	Pk Lim dBuV/m 74 74 74 74	Avg Lim dBuV/m 54 54 54 54 54 54 54 54	Pk Mar dB -27.2 -28.4 -27.7 -29.3 Average F Peak Field Margin vs	Averation Alexandric A	W=VBW=1MHz <u>ge Measurements</u> 1MHz ; VBW=10H: <u>Notes</u> <u>(V/H)</u> <u>V</u> <u>V</u> <u>H</u> <u>H</u> h Limit imit
	3' ca f GHz 1.197 1.497 1.497 1.497	f Dist (m) 3.0 3.0 3.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1	Read Pk dBuV 57.1 54.6 53.2 No other em Distance to Analyzer R Antenna Fa	Read Avg. dBuV 42.7 40.4 42.3 39.9 dissions were de ent Frequency Antenna teading actor	AF dB/m 25.1 26.1 25.1 26.1 26.1	07600 CL dB 2.6 2.9 2.6 2.9 hove sys	Amp dB -38.0 -37.6 -38.0 -37.6 tem noise D Corr Avg Peak	20' cab D Corr dB 9 floor Preamp (Distance Average Calculate	Fltr dB 0.0 0.0 0.0 Gain Correct Field State	Peak dBuV/m 46.8 45.6 46.3 44.7 ct to 3 mete Strength @ c Field Stre	dBuV/m 32.4 31.9 32.0 31.4 ers 3 m	Pk Lim dBuV/m 74 74 74 74	Avg Lim dBuV/m 54 54 54 54 54 54 54 54	Pk Mar dB -27.2 -28.4 -27.7 -29.3 Average F Peak Field Margin vs	Averation Alexandric A	W=VBW=1MHz <u>ge Measurements</u> 1MHz ; VBW=10H: <u>Notes</u> <u>(V/H)</u> <u>V</u> <u>V</u> <u>H</u> <u>H</u> h Limit imit

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8.4. WORST-CASE BELOW 1 GHz

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

Company: SUT Descrig SUT M/N: Gest Target Mode Oper		Vien Trai 03/18/10 10U13103 Broadcon 802.22ag/ BCM9432 FCC Clai Tx 2.4GH	3 n /Draft 80 22PCIEB ss B		WLAN +	Bluetoot	h PCI-E	Mini Cari	I				
	f Dist Read AF CL	Measurem Distance t Analyzer I Antenna F Cable Loss	o Antenn Reading Factor		Amp D Corr Filter Corr. Limit	Filter Ins Calculate	Correct ert Loss d Field S	-		Margin	Margin vs.	Limit	
f	Dist	Read	AF	CL	Amp	Field Stre	-	Corr.	Limit	Margin	Ant. Pol.	Det	Notes
MHz	(m)	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dB	V/H	P/A/QP	
Iorizontal													
184.446	3.0	51.9	11.0	1.1	27.5	0.0	0.0	36.5	43.5	-7 .0	H	Р	
76.610	3.0	54.7	12.7	1.4	27.4	0.0	0.0	41.4	46.0	- 4.6	H	Р	
68.894	3.0	52.3	14.5	1.7	27.8	0.0	0.0	40.7	46.0	-5.4	H	Р	
114.976	3.0	48.9	15.3	1.8	28.1	0.0	0.0	37.9	46.0	- 8.1	H	Р	
132.017	3.0	49.4	15.6	1.8	28.2	0.0	0.0	38.6	46.0	-7.4	H		
36.553	3.0	40.3	21.3	2.6	28.1	0.0	0.0	36.1	46.0	- 9.9	H	Р	
Vertical		ļ		_		Ļ					Ļ		
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		52.9	15.0	1.7	28.0	0.0	0.0	41.7	46.0	-4.3	V	Р	
68.894 14.976 132.017 136.553	3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	52.3 48.9 49.4 40.3 50.9 44.5 48.2 53.2 51.3 52.9	14.5 15.3 15.6 21.3 12.9 11.0 11.4 13.5 13.8 15.0	1.7 1.8 1.8 2.6 1.0 1.1 1.1 1.1 1.5 1.5 1.7	27.8 28.1 28.2 28.1 27.9 27.5 27.4 27.4 27.4 27.5 28.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	40.7 37.9 38.6 36.1 36.9 29.2 33.3 40.8 39.1 41.7	46.0 46.0 46.0	-5.4 -8.1 -7.4	H H H	P P P	

<u>Note:</u> Observed and there was no significant change between b-mode and HT20 mode for 30 - 1000MHz scan.

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9. 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.

			. ,	
Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	Averaging time (minutes)
(A) Lim	its for Occupational	/Controlled Exposu	res	
0.3–3.0 3.0–30 30–300 300–1500 1500–100,000	614 1842/f 61.4	1.63 4.89/f 0.163	*(100) *(900/f²) 1.0 f/300 5	6 6 6 8
(B) Limits	for General Populati	on/Uncontrolled Ex	posure	
0.3–1.34 1.34–30	614 824 <i>/</i> f	1.63 2.19/f	*(100) *(180/f ²)	30 30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

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/cm²)	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 occu-tional controlled exposure also apply in situations when an individual is transient through a location where occu-tional controlled exposure also apply in situations when an individual is transient through a location where occu-tional controlled exposure also apply in situations of the exposure and can exercise control over their exposure.

pational/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 ex-posed, 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.

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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/ <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}	0.0042f ^{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	0.158 <i>f</i> ^{0.5}	4.21 x 10 ⁻⁴ f ^{0.5}	6.67 x 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/m² is equivalent to 1 mW/cm².
- A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

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EQUATIONS

Power density is given by:

S = EIRP / (4 * Pi * D^2)

where

S = Power density in W/m² EIRP = Equivalent Isotropic Radiated Power in W D = Separation distance in m

Power density in units of W/m² is converted to units of mWc/m² by dividing by 10.

Distance is given by:

D = SQRT (EIRP / (4 * Pi * S))

where

D = Separation distance in m EIRP = Equivalent Isotropic Radiated Power in W S = Power density in W/m²

For multiple colocated transmitters operating simultaneously in frequency bands where the limit is identical, the total power density is calculated using the total EIRP obtained by summing the Power * Gain product (in linear units) of each transmitter.

Total EIRP = (P1 * G1) + (P2 * G2) + ... + (Pn * Pn)

where

Px = Power of transmitter xGx = Numeric gain of antenna x

In the table(s) below, Power and Gain are entered in units of dBm and dBi respectively and conversions to linear forms are used for the calculations.

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<u>LIMITS</u>

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

Band	Mode	Separation	Output	Antenna	IC Power	FCC Power
		Distance	Power	Gain	Density	Density
(MHz)		(m)	(dBm)	(dBi)	(W/m^2)	(mW/cm^2)
2412 - 2462	g-mode Legacy	0.20	25.58	6.77	3.42	0.342
2412 - 2462	HT20	0.20	27.96	7.94	7.74	0.774
2422 - 2452	HT40 SISO	0.20	24.16	6.77	2.47	0.247
2422 - 2452	HT40	0.20	26.50	7.94	5.53	0.553

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