



**FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8**

CERTIFICATION TEST REPORT

FOR

802.11b/g/n WLAN + Bluetooth Module Combo Card

MODEL NUMBER: BCM94319SDB

**FCC ID: QDS-BRCM1056
IC: 4324A- BRCM1056**

REPORT NUMBER: 11U13681-1

ISSUE DATE: FEBRUARY 23, 2011

Prepared for

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

Prepared by

**COMPLIANCE CERTIFICATION SERVICES
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888**



NVLAP LAB CODE 200065-0

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
---	02/23/2011	Initial Issue	T. Chan

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	5
2. TEST METHODOLOGY	6
3. FACILITIES AND ACCREDITATION	6
4. CALIBRATION AND UNCERTAINTY	6
4.1. <i>MEASURING INSTRUMENT CALIBRATION</i>	6
4.2. <i>SAMPLE CALCULATION</i>	6
4.3. <i>MEASUREMENT UNCERTAINTY</i>	6
5. EQUIPMENT UNDER TEST	7
5.1. <i>DESCRIPTION OF EUT</i>	7
5.2. <i>MAXIMUM OUTPUT POWER</i>	7
5.3. <i>DESCRIPTION OF AVAILABLE ANTENNAS</i>	7
5.4. <i>SOFTWARE AND FIRMWARE</i>	7
5.5. <i>NUMBER OF TRANSMIT CHAINS</i>	7
5.6. <i>WORST-CASE CONFIGURATION AND MODE</i>	8
5.7. <i>DESCRIPTION OF TEST SETUP</i>	9
6. TEST AND MEASUREMENT EQUIPMENT	11
7. ANTENNA PORT TEST RESULTS	12
7.1. <i>802.11b MODE IN THE 2.4 GHz BAND</i>	12
7.1.1. 6 dB BANDWIDTH	12
7.1.2. 99% BANDWIDTH	15
7.1.3. OUTPUT POWER	18
7.1.4. POWER SPECTRAL DENSITY	19
7.1.5. CONDUCTED SPURIOUS EMISSIONS.....	22
7.2. <i>802.11g MODE IN THE 2.4 GHz BAND</i>	26
7.2.1. 6 dB BANDWIDTH	26
7.2.2. 99% BANDWIDTH	29
7.2.3. OUTPUT POWER	32
7.2.4. POWER SPECTRAL DENSITY	33
7.2.5. CONDUCTED SPURIOUS EMISSIONS.....	36
7.3. <i>802.11n HT40 SISO MODE IN THE 2.4 GHz BAND</i>	40
7.3.1. 6 dB BANDWIDTH	40
7.3.2. 99% BANDWIDTH	43

7.3.3.	OUTPUT POWER	46
7.3.4.	POWER SPECTRAL DENSITY	47
7.3.5.	CONDUCTED SPURIOUS EMISSIONS.....	50
8.	RADIATED TEST RESULTS	54
8.1.	LIMITS AND PROCEDURE	54
8.2.	TRANSMITTER ABOVE 1 GHz	55
8.2.1.	802.11b MODE.....	55
8.2.2.	802.11g MODE.....	58
8.2.3.	802.11n HT40 SISO MODE	61
8.3.	RECEIVER ABOVE 1 GHz	64
8.3.1.	FOR 20 MHz BANDWIDTH.....	64
8.3.2.	FOR 40 MHz BANDWIDTH.....	65
8.4.	WORST-CASE BELOW 1 GHz.....	66
9.	AC POWER LINE CONDUCTED EMISSIONS	67
10.	MAXIMUM PERMISSIBLE EXPOSURE	71
11.	SETUP PHOTOS	74

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: BROADCOM CORPORATION
190 MATHILDA PLACE
SUNNYVALE, CA 94086, U.S.A.

EUT DESCRIPTION: 802.11b/g/n WLAN + Bluetooth Module Combo Card

MODEL: BCM94319SDB

SERIAL NUMBER: 336

DATE TESTED: FEBRUARY 17 to 22, 2011

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, Inc. (ULCCS) 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:



VIEN TRAN
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 3, 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:

$$\text{Field Strength (dBuV/m)} = \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Preamp Gain (dB)}$$

$$36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$$

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 802.11b/g/n WLAN + Bluetooth Module Combo Card. The radio module is manufactured by Broadcom.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11b	22.35	171.79
2412 - 2462	802.11g	26.74	472.06
2412 - 2462	802.11n HT20 SISO	Covered by testing to 11g Legacy	
2422 - 2452	802.11n HT40 SISO	24.72	296.48

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an 802.11bgn WLAN antenna, with a maximum gain of 3.9dBi.

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Broadcom, rev. 5.100.108.0.
The test utility software used during testing was wl_tool, rev. 5.100.RC108.0.

5.5. NUMBER OF TRANSMIT CHAINS

Selected measurements were performed only on the main chain for 802.11b, 11g & 11n HT40 SISO modes, with highest gain of 3.9dBi.

5.6. WORST-CASE CONFIGURATION AND MODE

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 HT40 SISO Mode (40 MHz BW operation): 13.5 Mbps (MCS 0), OFDM.

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, that was determined to be 11g mode, mid channel.

For Radiated Band Edge measurements preliminary testing showed that the worst case was horizontal polarization, so final measurements were performed with horizontal polarization.

5.7. DESCRIPTION OF TEST SETUP

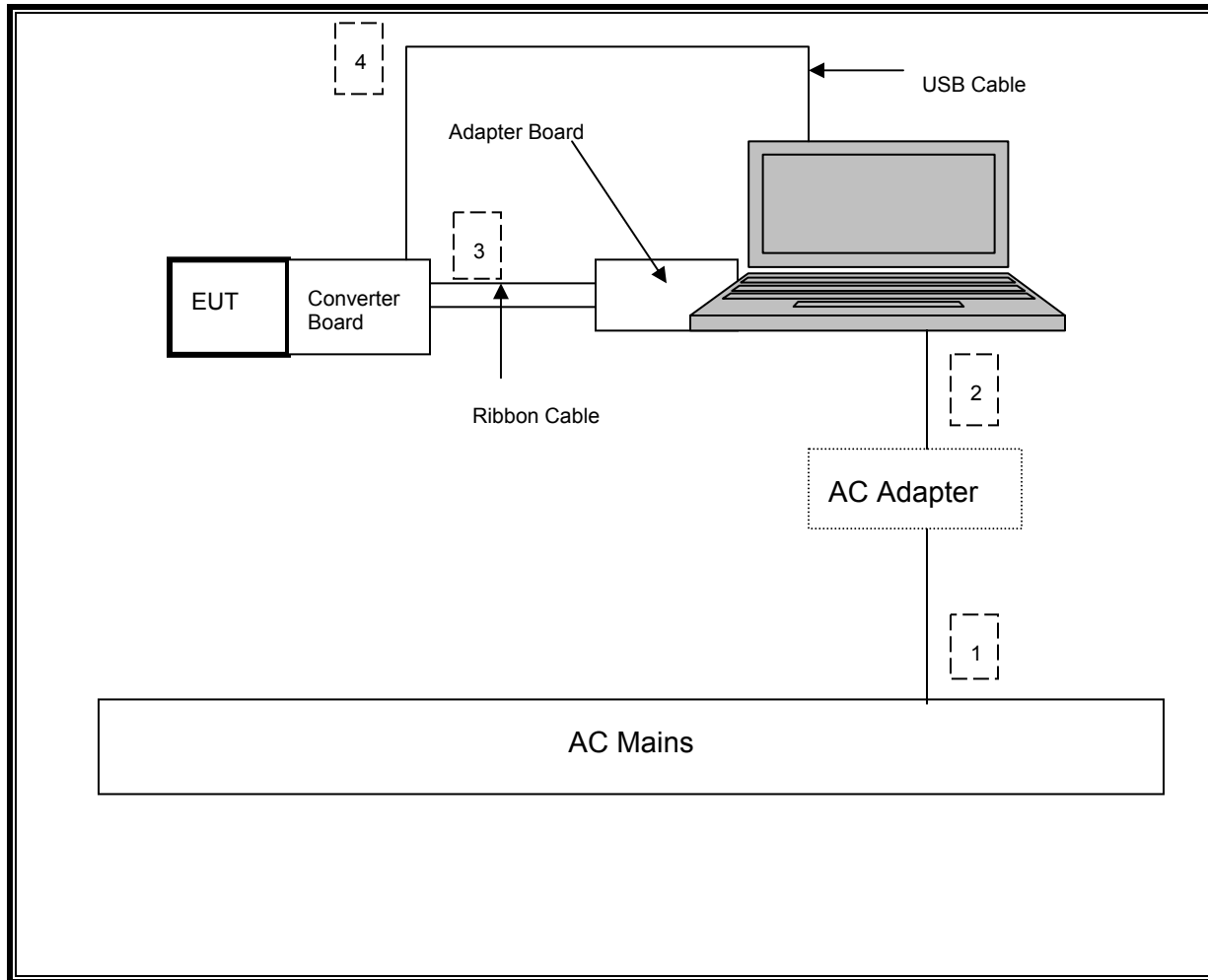
SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Dell	PP09S	N/A	DoC
AC Adapter	Dell	PA-1650-05D	CN-05U092-71615-49Q-18B8	DoC
Adapter Board	Broadcom	BCM9SDIO2CONAD	1131330	N/A
Converter Board	Broadcom	BCM94319SDB	1396825	N/A
Ribbon Cable	Precisionint	013850038014kl20	N/A	N/A
USB Cable	N/A	N/A	N/A	N/A

I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US 115V	Shielded	1.5m	NA
2	DC	1	DC	Un-shielded	1.5m	Ferrite at laptop's end
3	Ribbon Connector	1	Ribbon Connector	Un-shielded	0.20m	NA
4	USB	1	USB	Un-shielded	1.0m	NA

SETUP DIAGRAM



TEST SETUP

The EUT was tested as an external module that installed in a converter board connected to a host Laptop PC via adapter board & USB cable.

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
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00996	10/29/11
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01171	07/14/11
Antenna, Horn, 18 GHz	EMCO	3115	C00872	07/29/11
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00980	07/29/11
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00778	01/26/12
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	08/04/11
Peak Power Meter	Agilent / HP	E9327A	C00964	12/04/11
Peak Power Sensor	Agilent / HP	E4416A	C00963	12/04/11
EMI Receiver, 6.5 GHz	Agilent / HP	8546A	1963	08/19/11
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRM50702	N02685	CNR
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	05/06/12
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	05/06/11

7. ANTENNA PORT TEST RESULTS

7.1. 802.11b MODE IN THE 2.4 GHz BAND

7.1.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

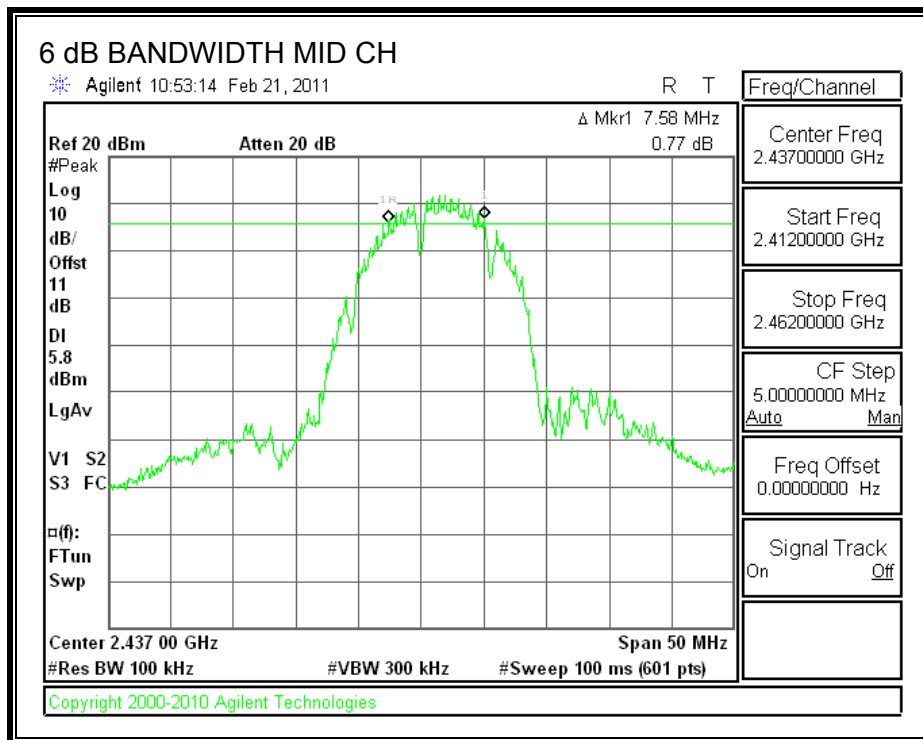
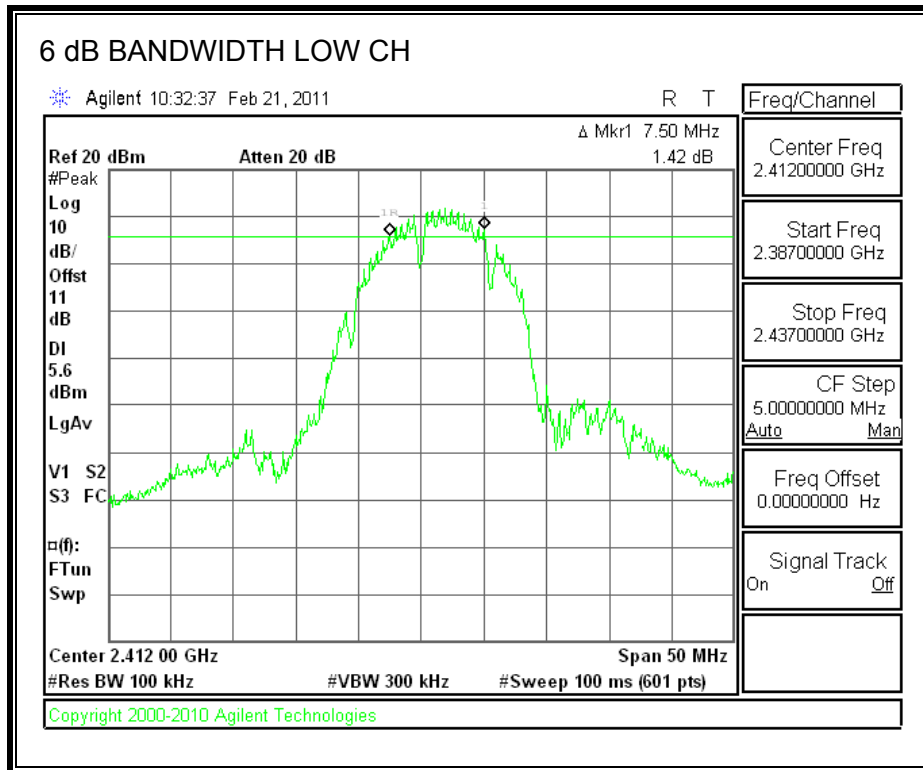
TEST PROCEDURE

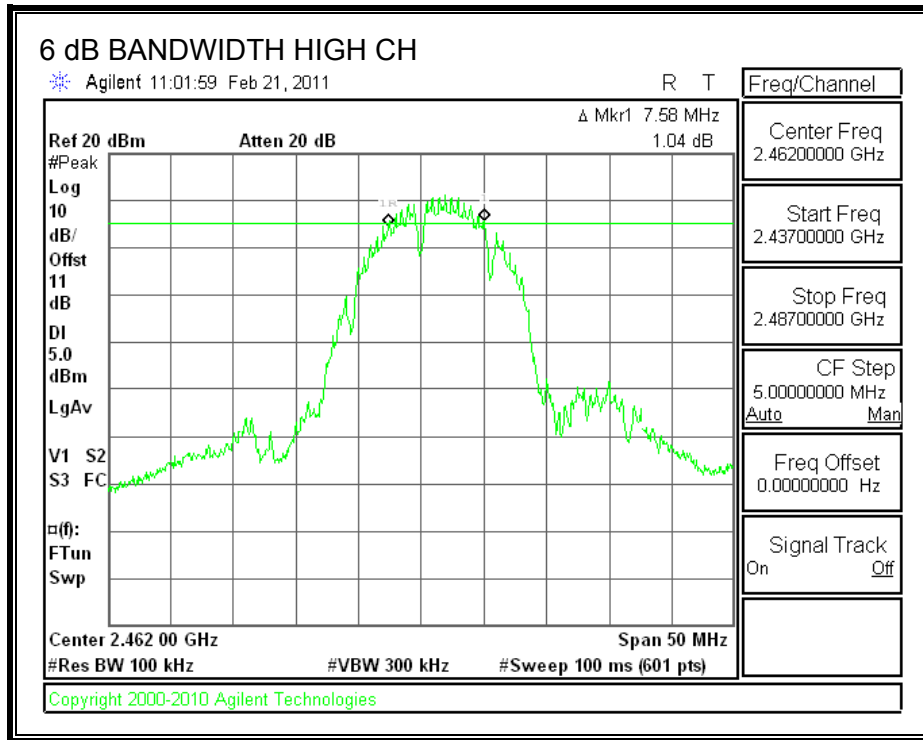
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	7.50	0.5
Middle	2437	7.58	0.5
High	2462	7.58	0.5

6 dB BANDWIDTH





7.1.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

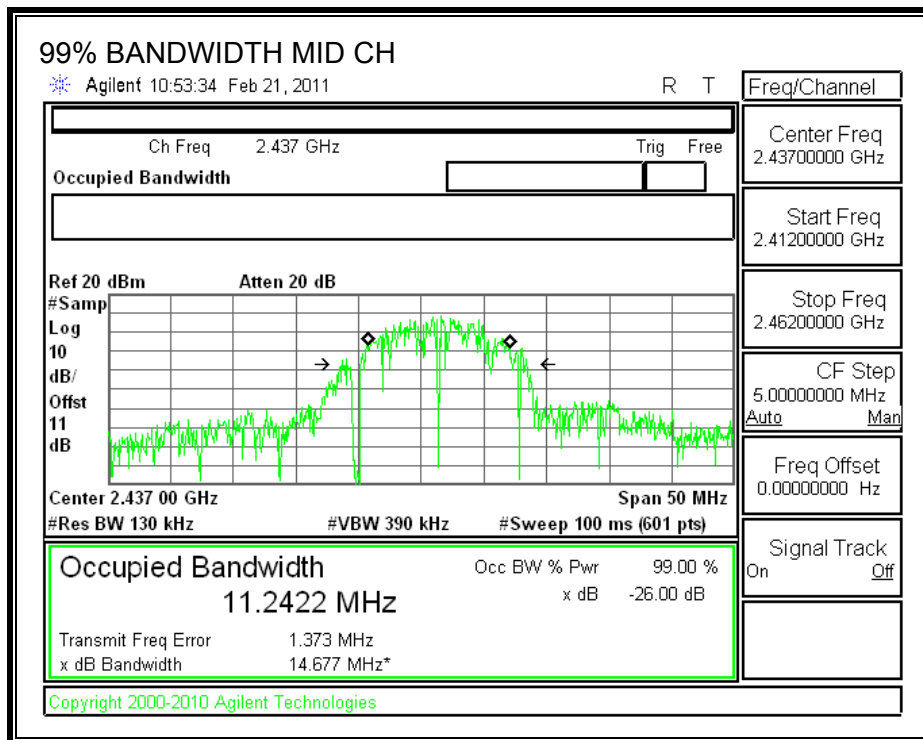
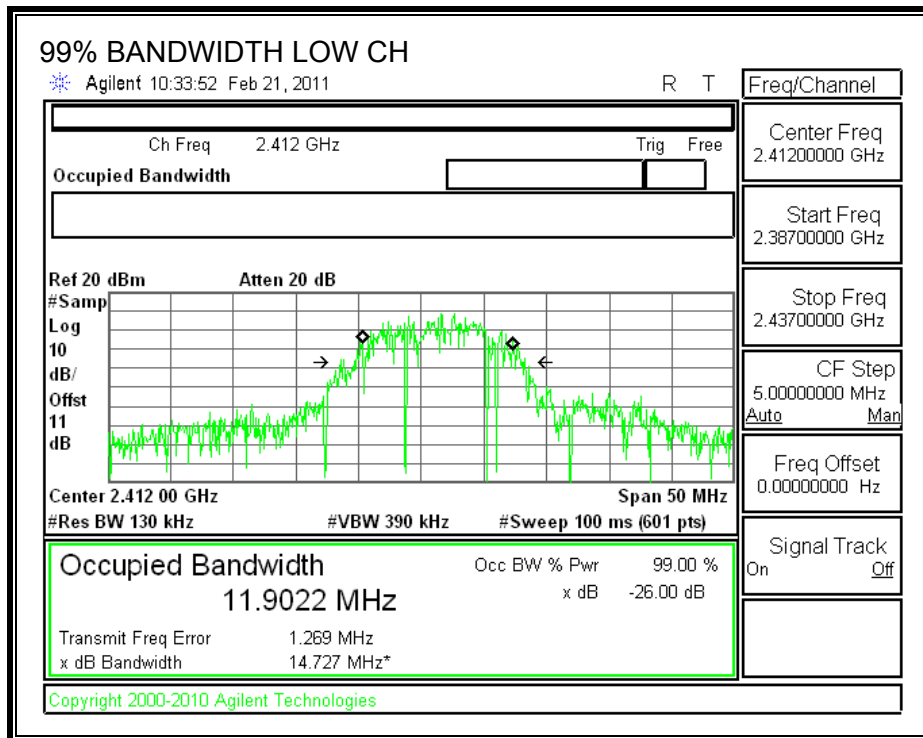
TEST PROCEDURE

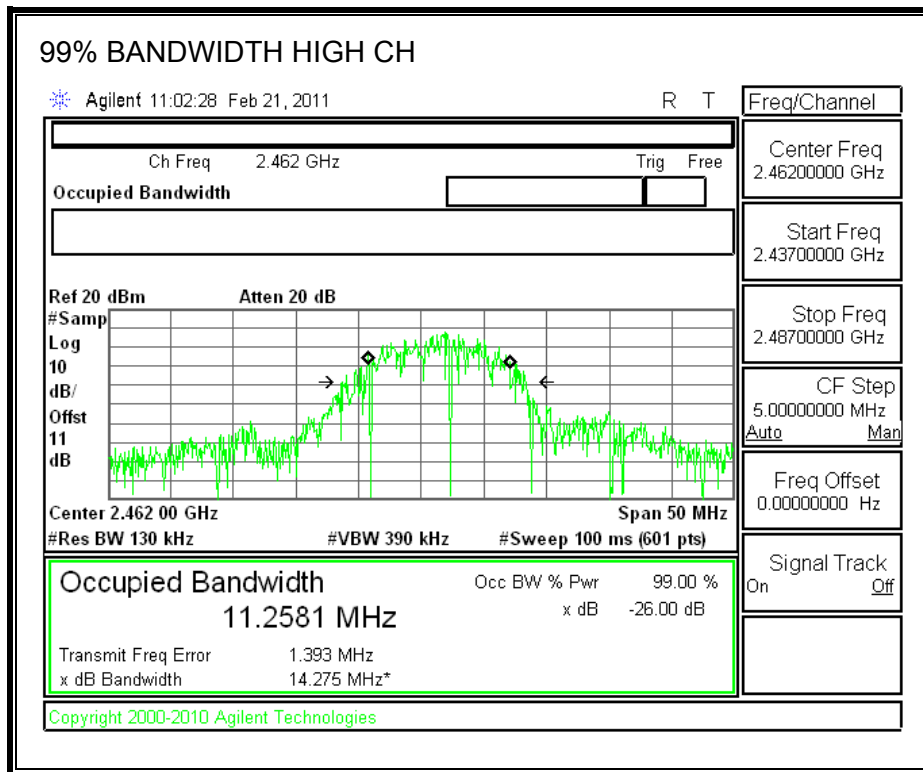
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	11.9022
Middle	2437	11.2422
High	2462	11.2581

99% BANDWIDTH





7.1.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003.

RESULTS

Channel	Frequency (MHz)	Spectrum Analyzer Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	9.40	11	20.40	30	-9.60
Middle	2437	10.36	11	21.36	30	-8.64
High	2462	11.35	11	22.35	30	-7.65

7.1.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

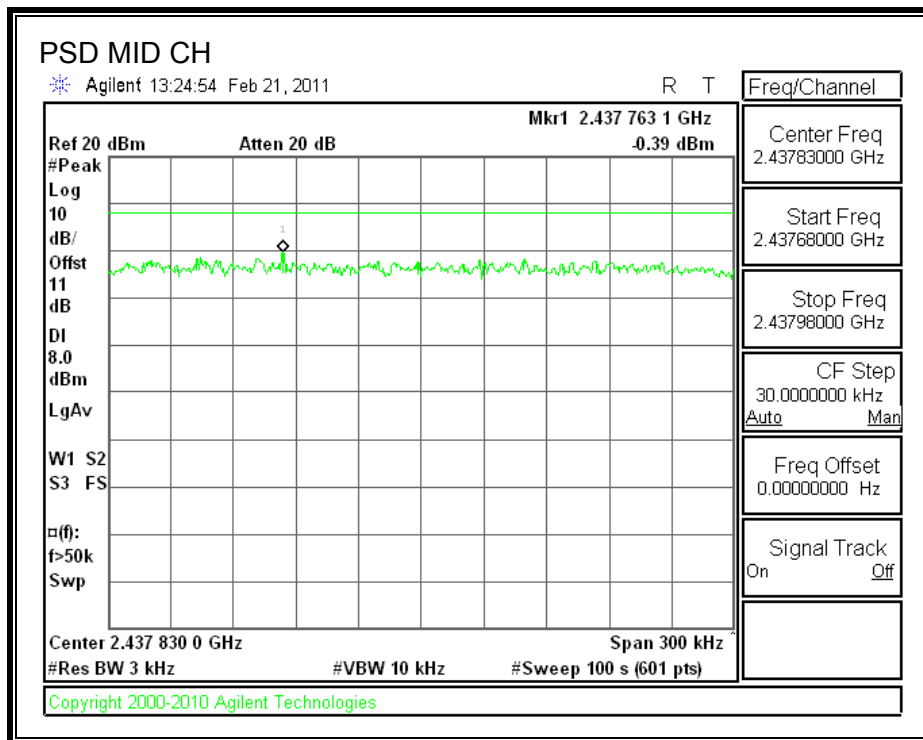
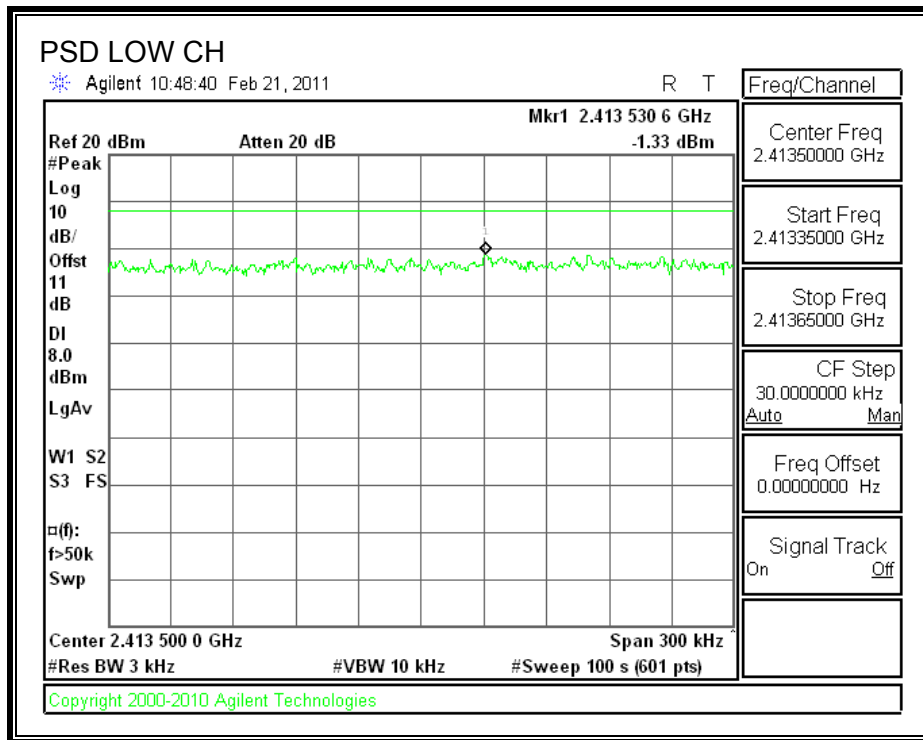
TEST PROCEDURE

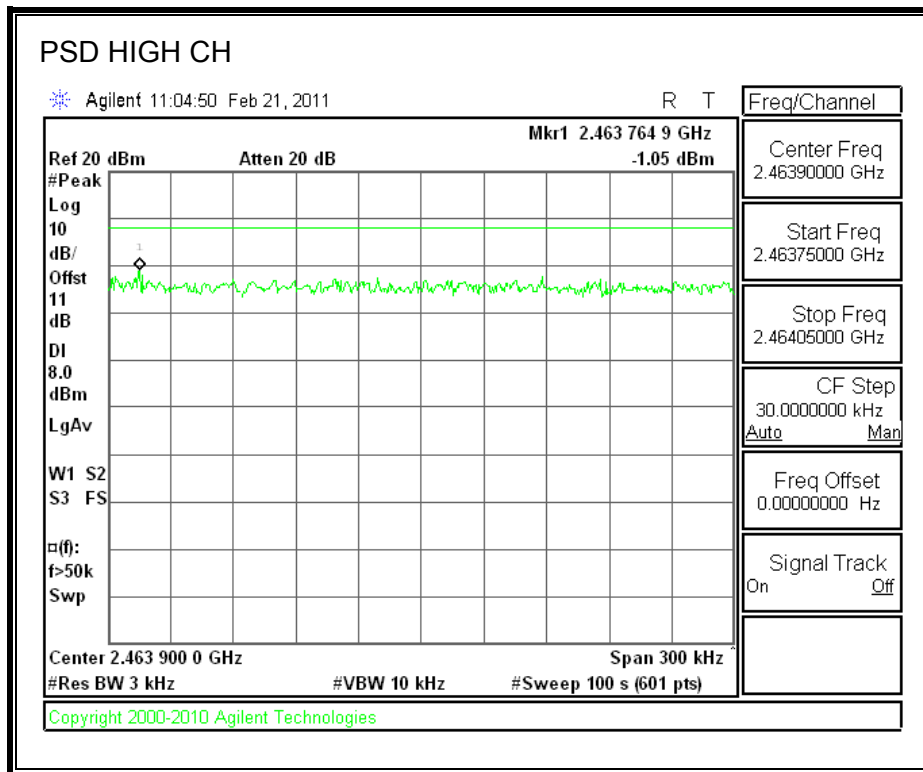
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-1.33	8	-9.33
Middle	2437	-0.39	8	-8.39
High	2462	-1.05	8	-9.05

POWER SPECTRAL DENSITY





7.1.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

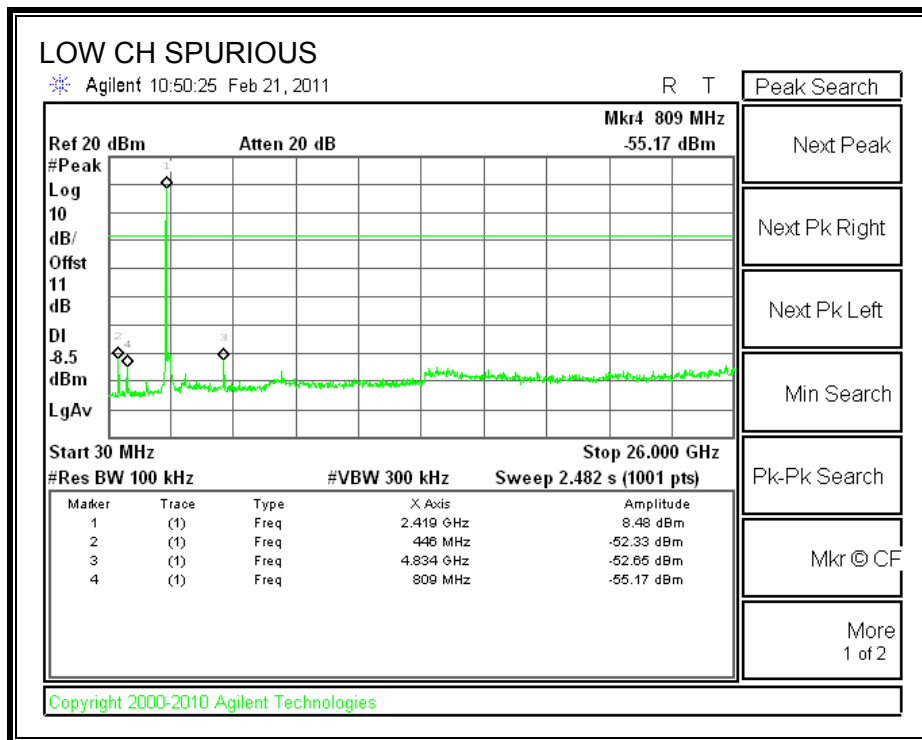
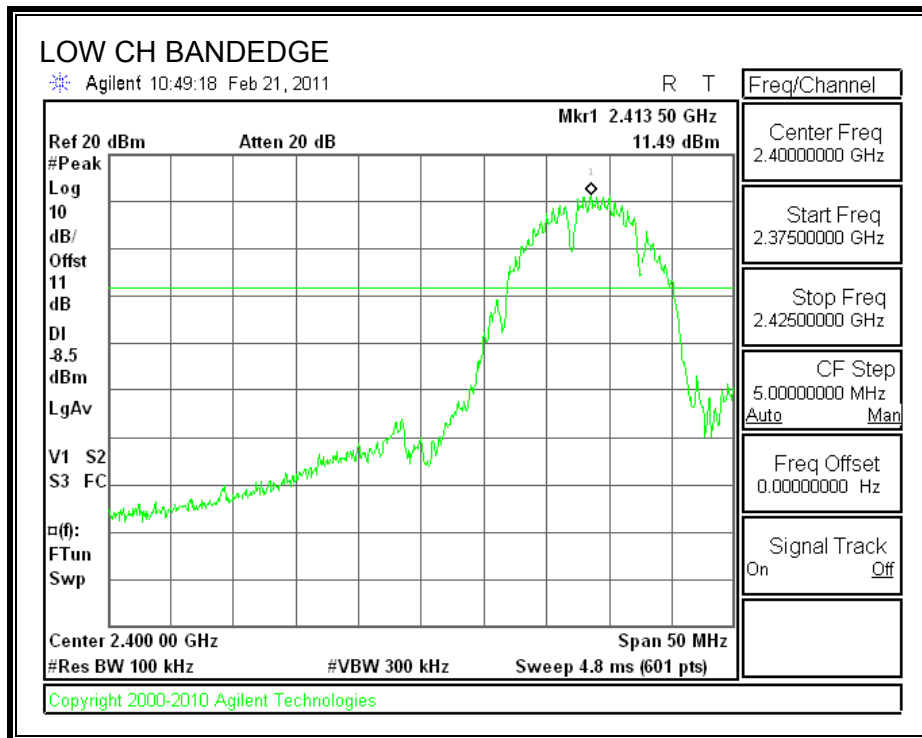
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

TEST PROCEDURE

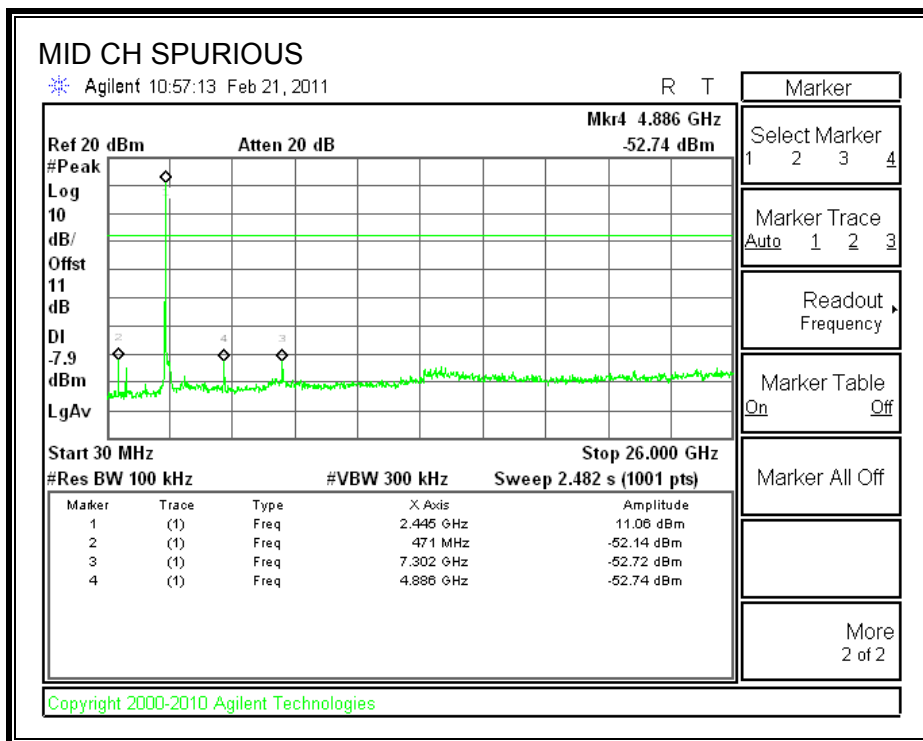
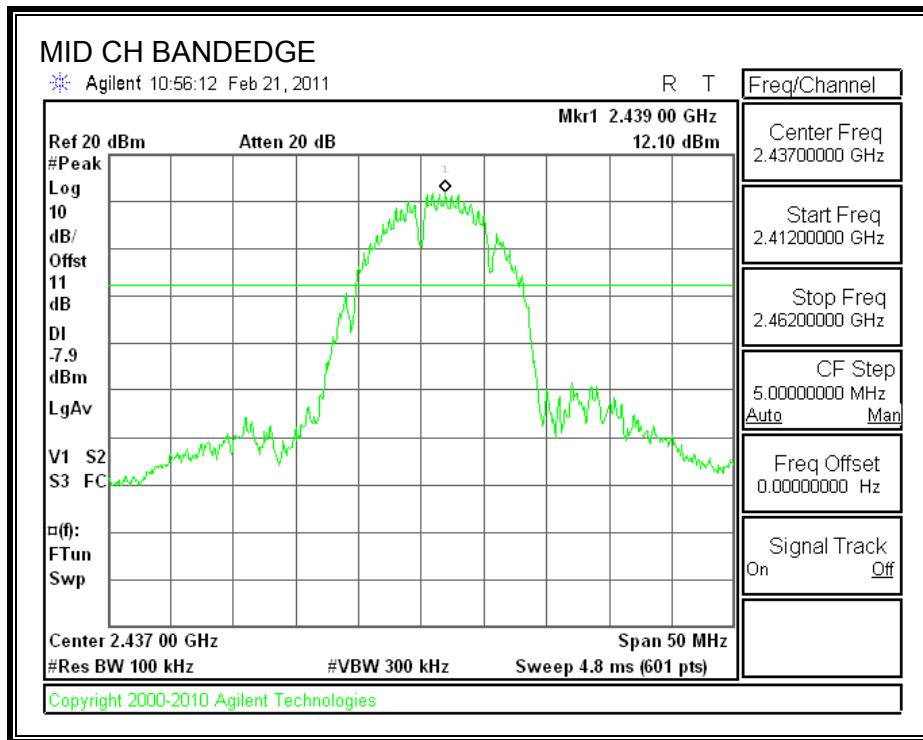
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

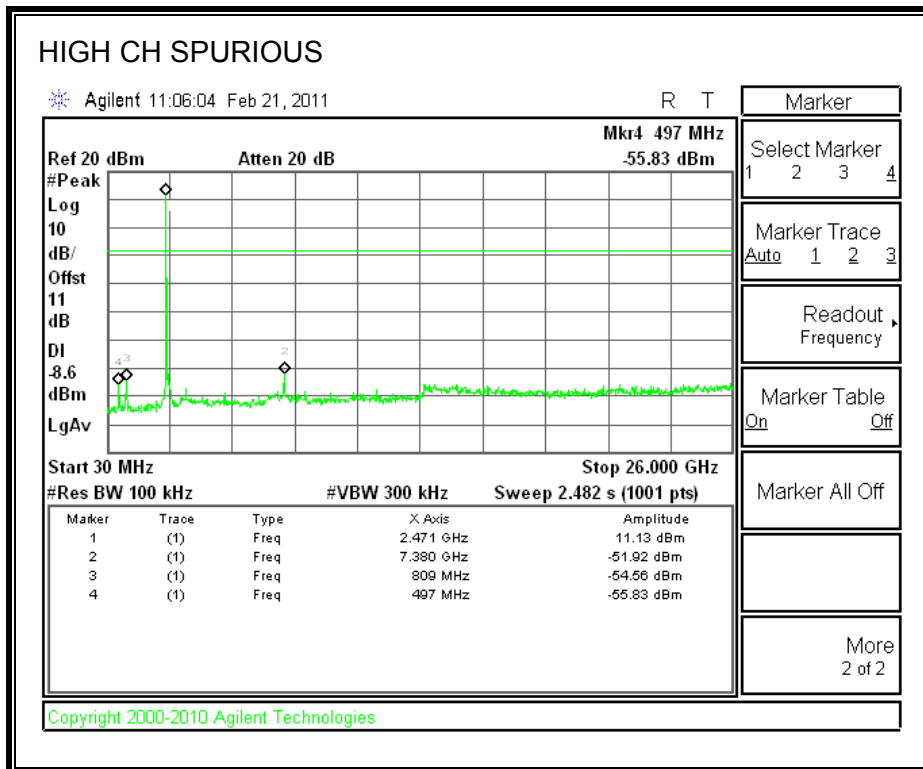
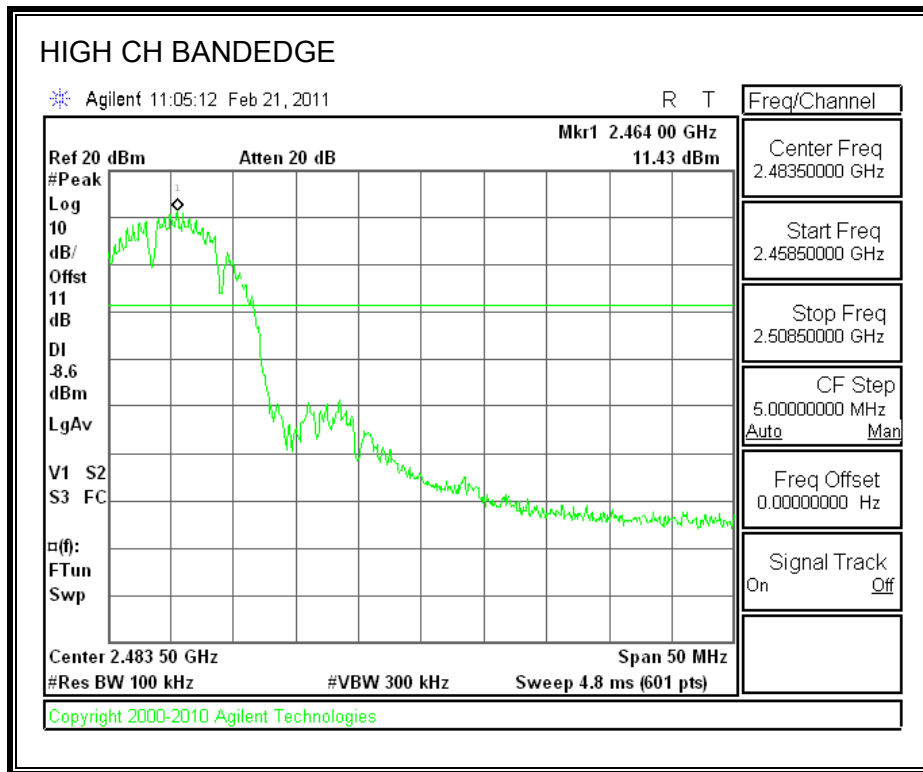
SPURIOUS EMISSIONS, LOW CHANNEL



SPURIOUS EMISSIONS, MID CHAN



SPURIOUS EMISSIONS, HIGH CHANNEL



7.2. 802.11g MODE IN THE 2.4 GHz BAND

7.2.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

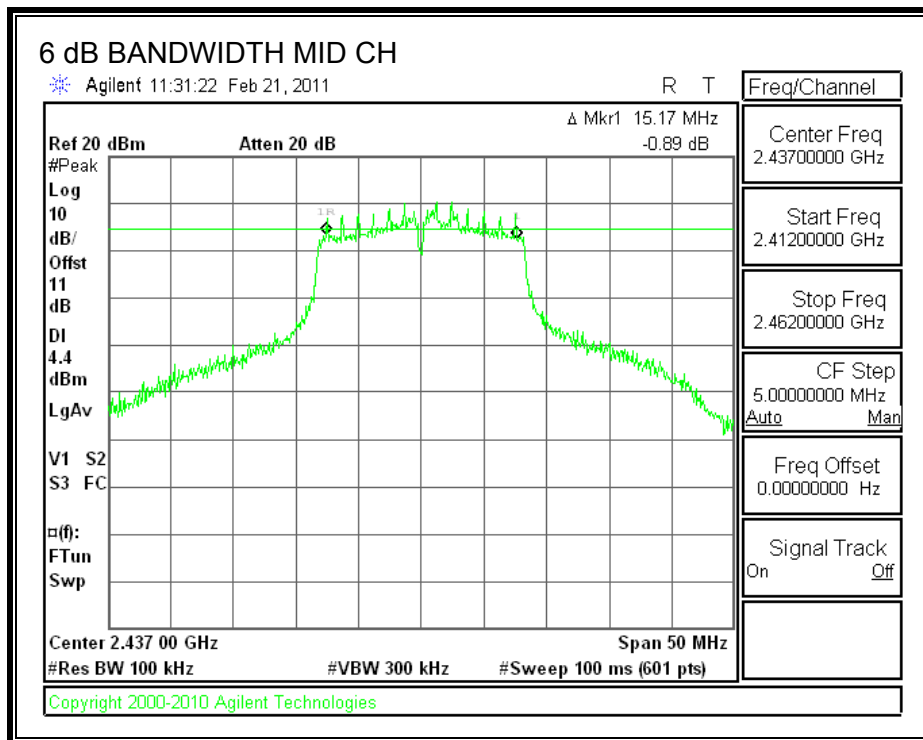
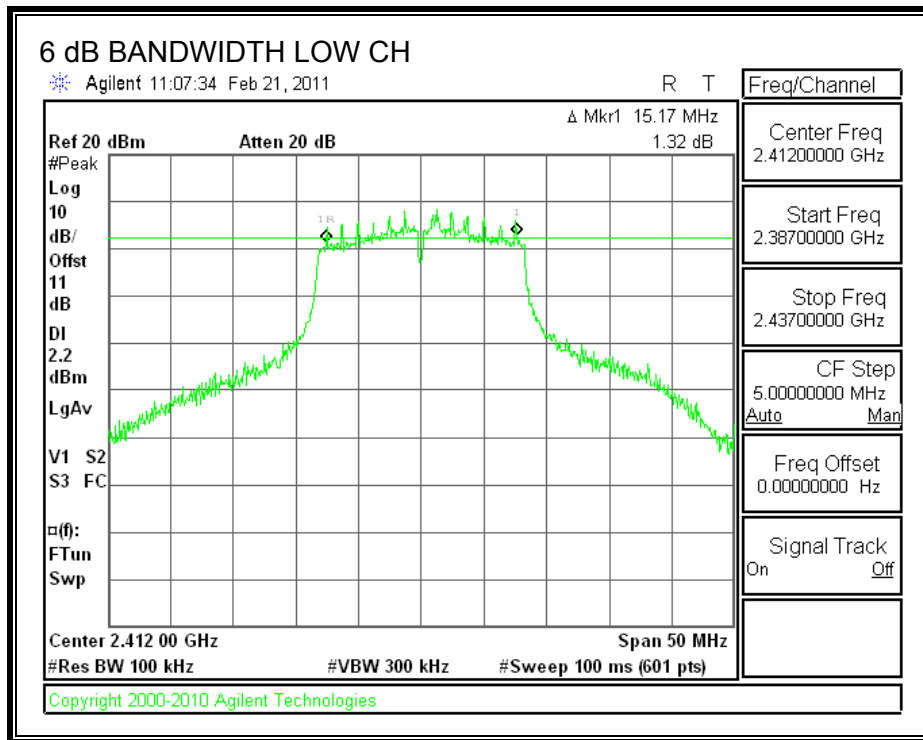
TEST PROCEDURE

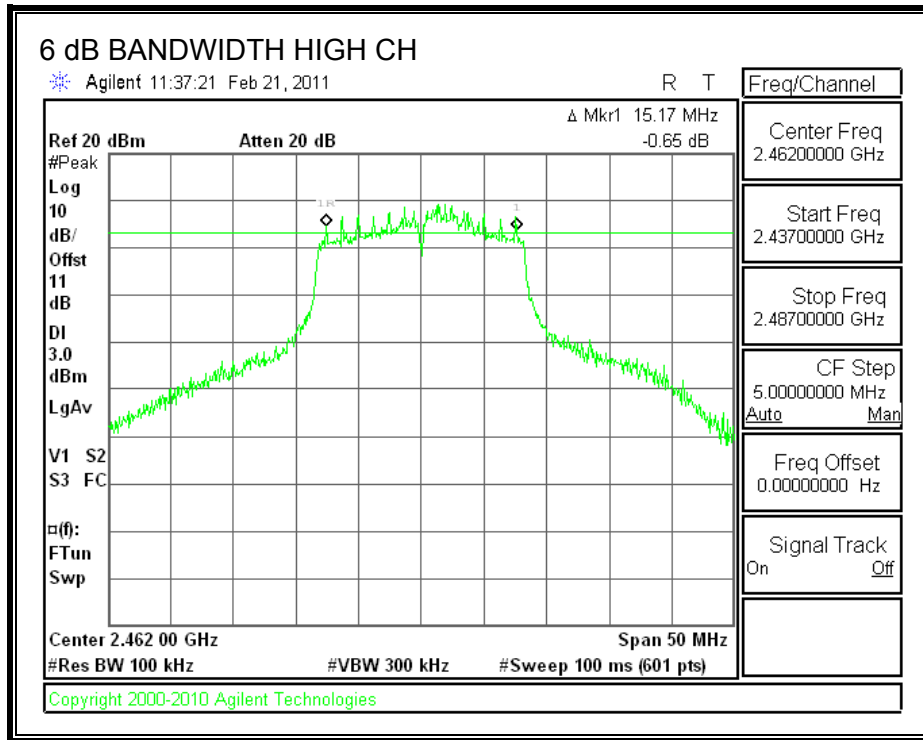
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	15.17	0.5
Middle	2437	15.17	0.5
High	2462	15.17	0.5

6 dB BANDWIDTH





7.2.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

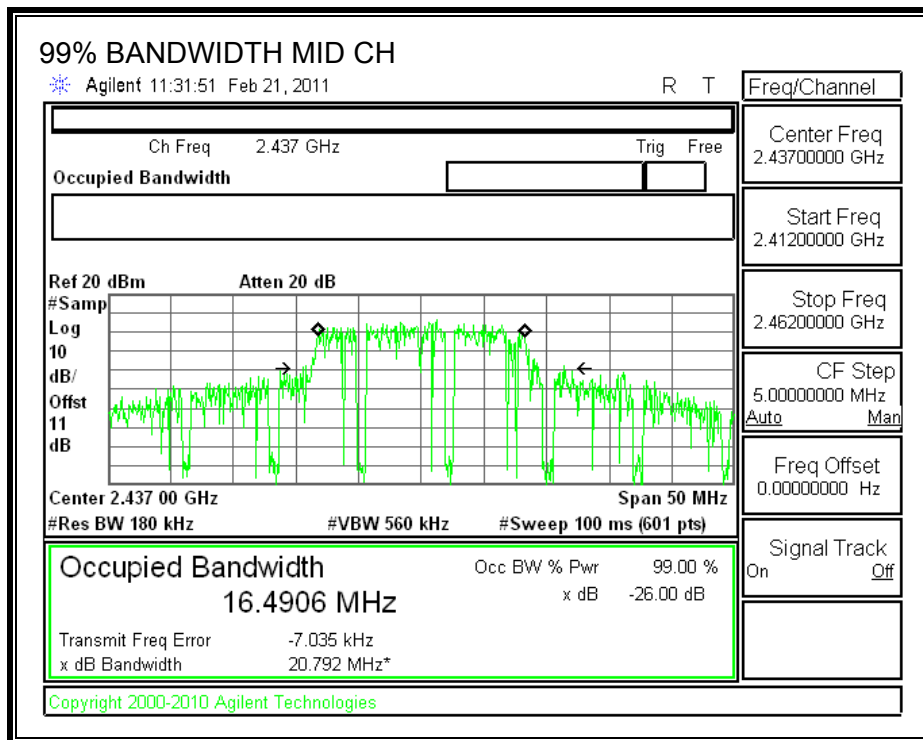
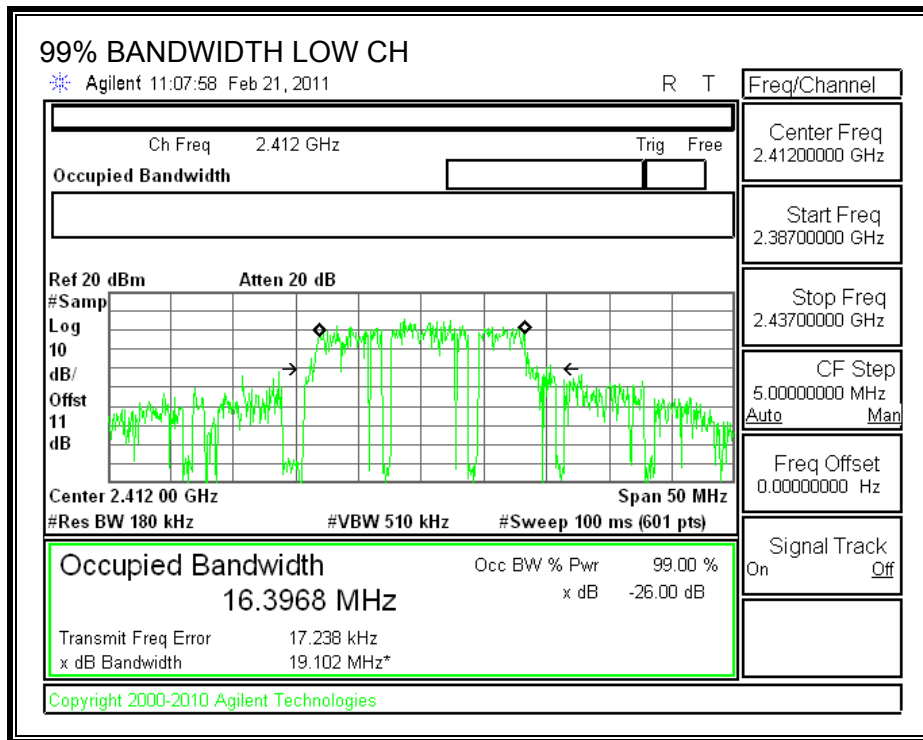
TEST PROCEDURE

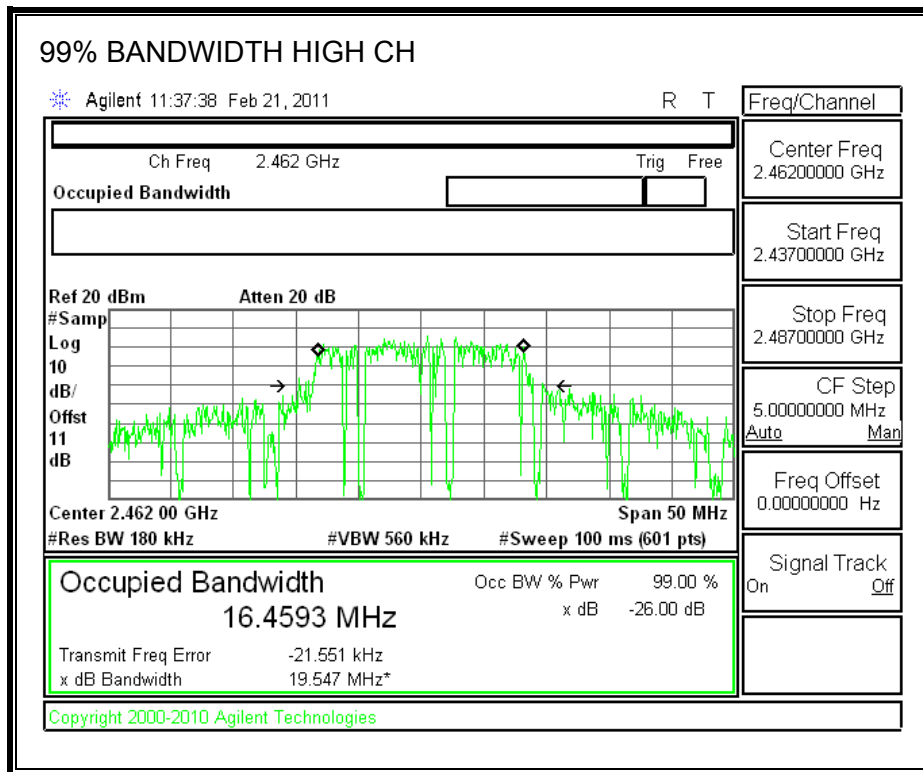
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.3968
Middle	2437	16.4906
High	2462	16.4593

99% BANDWIDTH





7.2.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003.

RESULTS

Channel	Frequency (MHz)	Spectrum Analyzer Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	11.66	11	22.66	30	-7.34
Middle	2437	15.74	11	26.74	30	-3.26
High	2462	11.90	11	22.90	30	-7.10

7.2.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

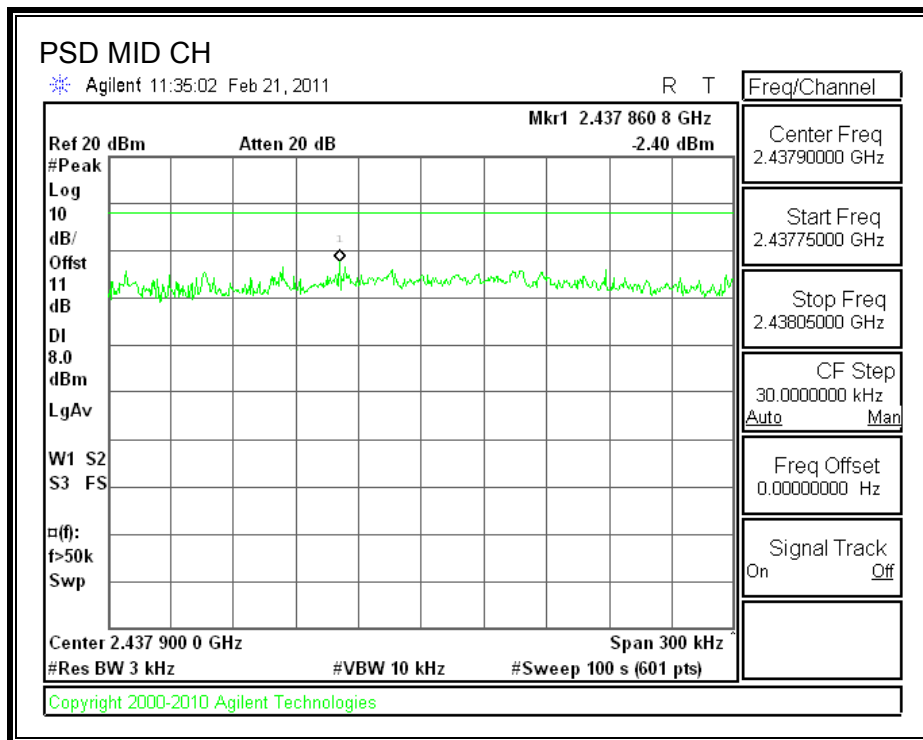
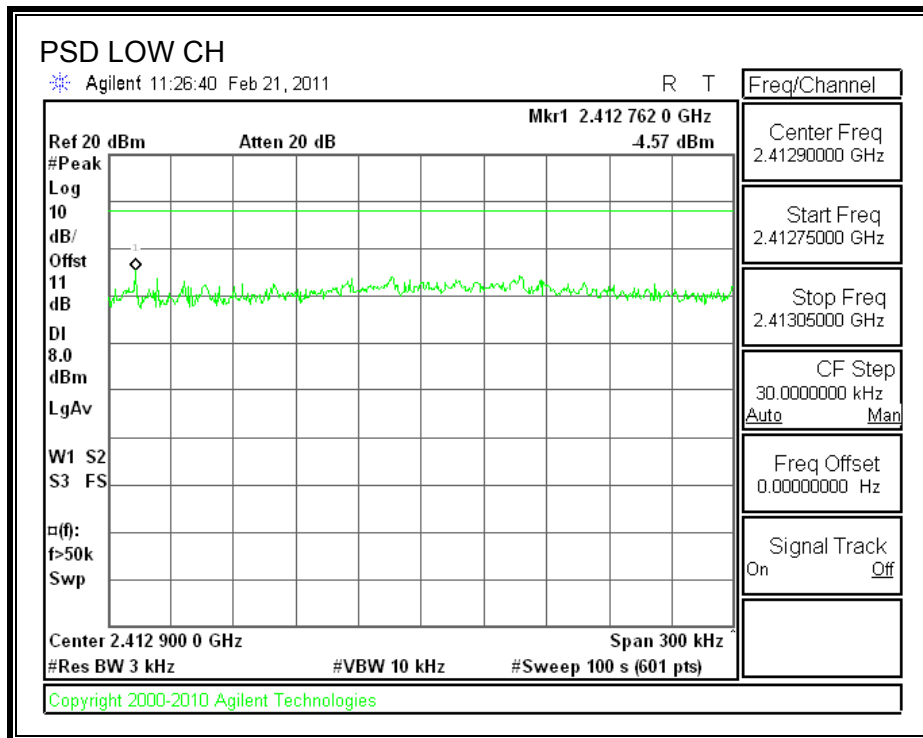
TEST PROCEDURE

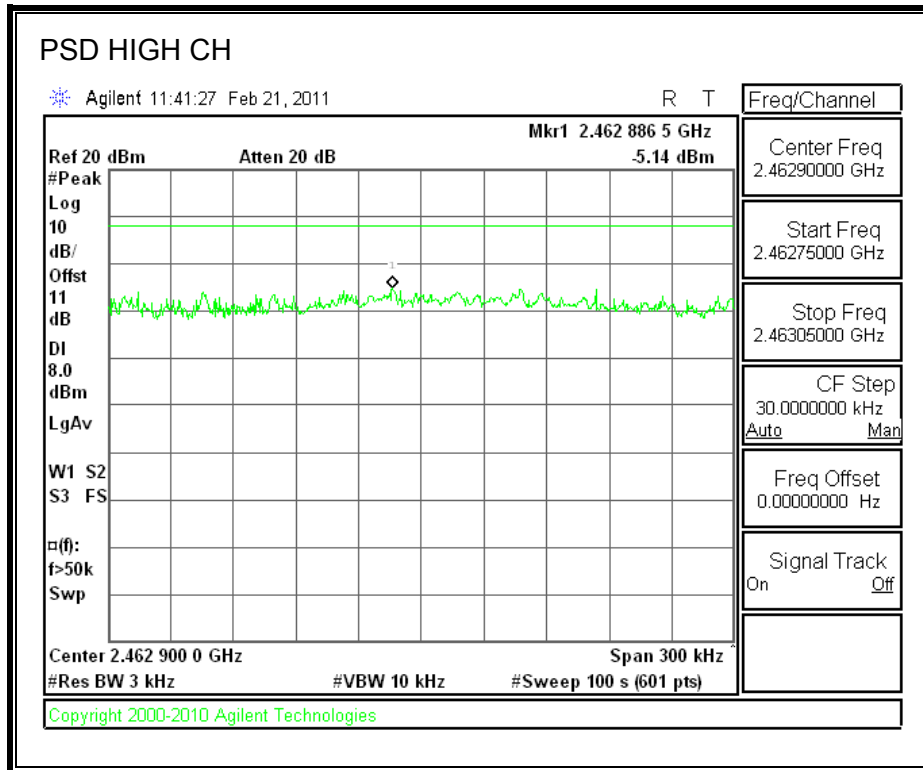
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-4.57	8	-12.57
Middle	2437	-2.40	8	-10.40
High	2462	-5.14	8	-13.14

POWER SPECTRAL DENSITY





7.2.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

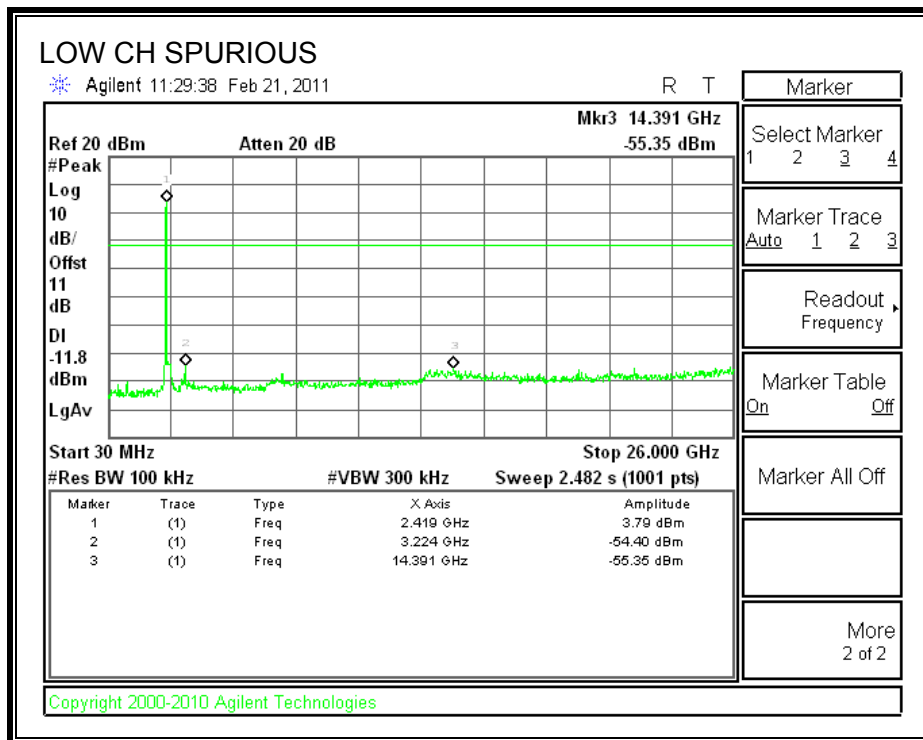
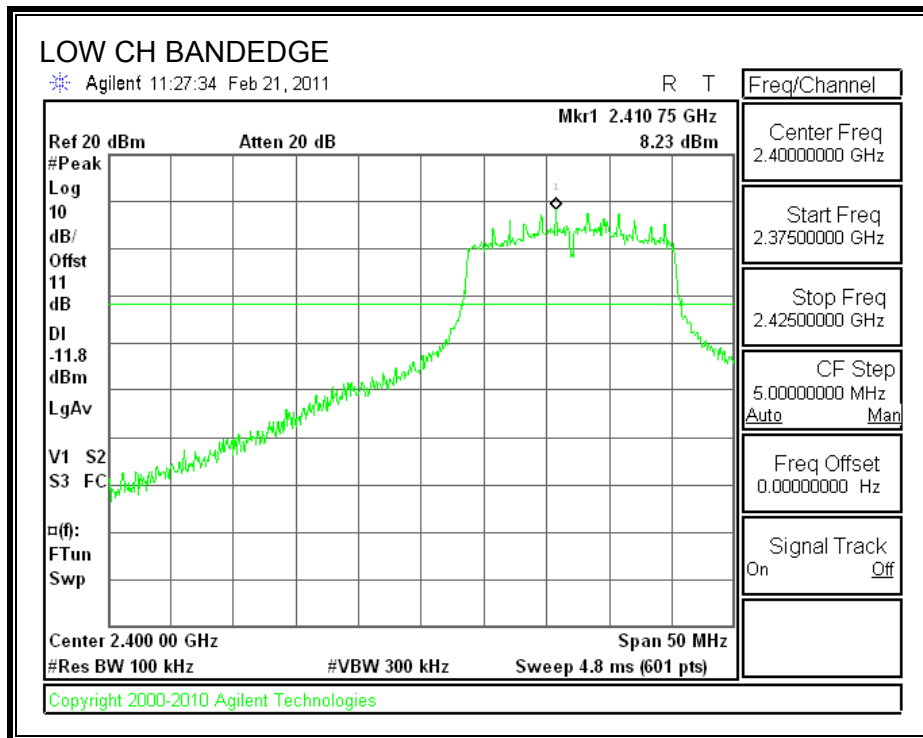
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

TEST PROCEDURE

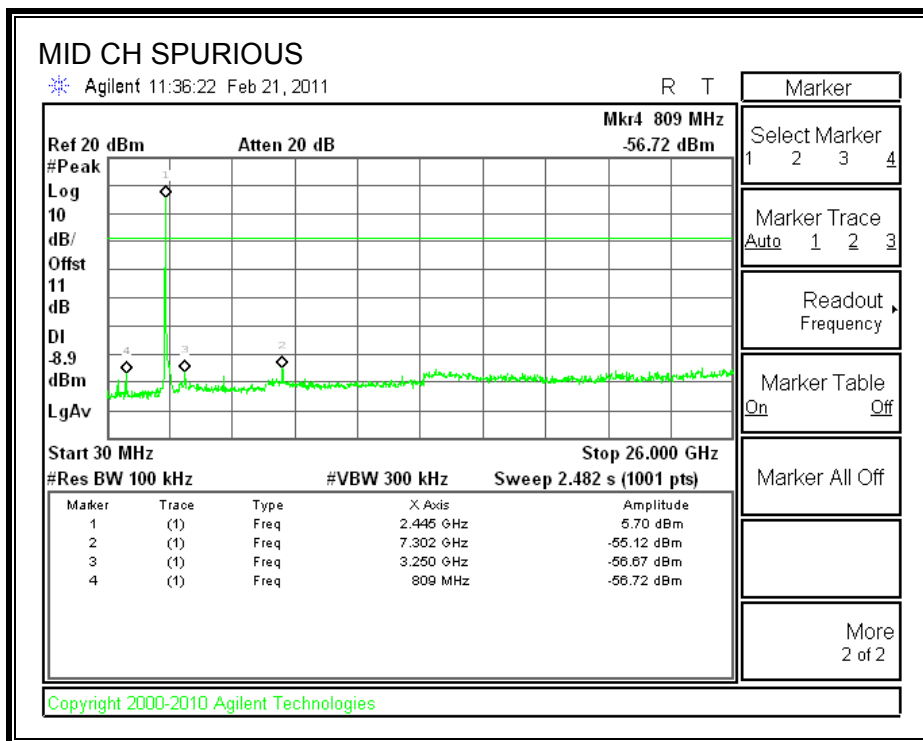
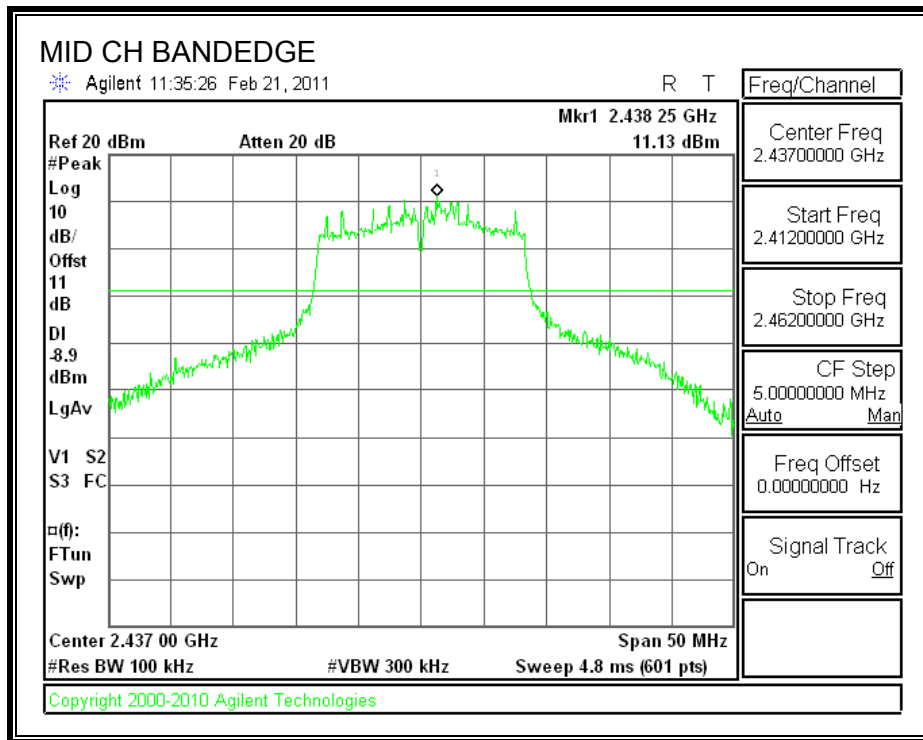
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

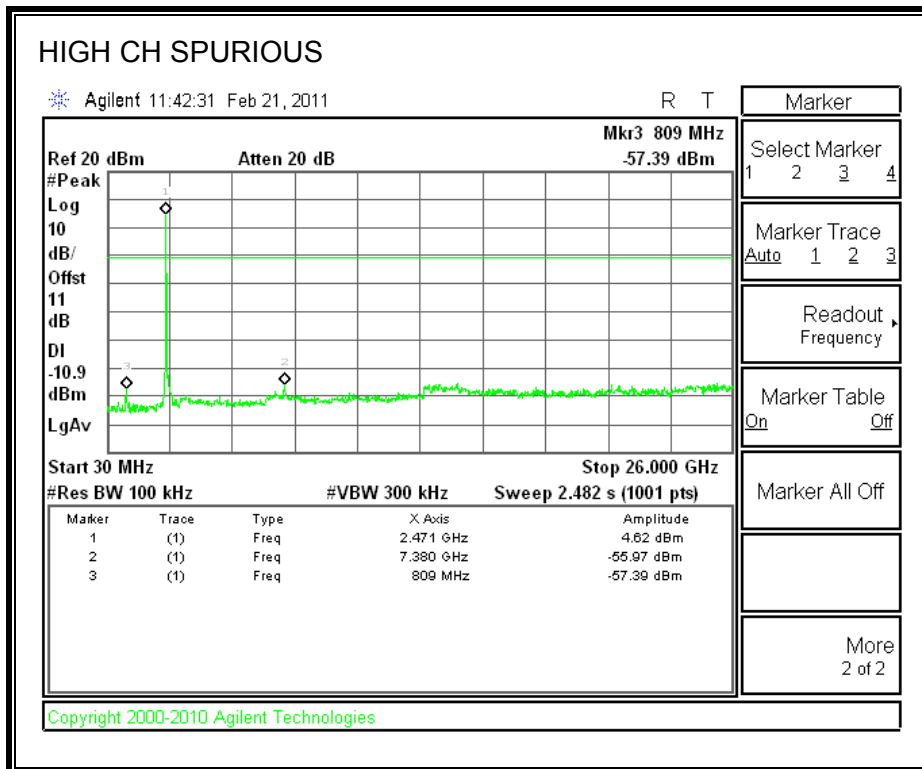
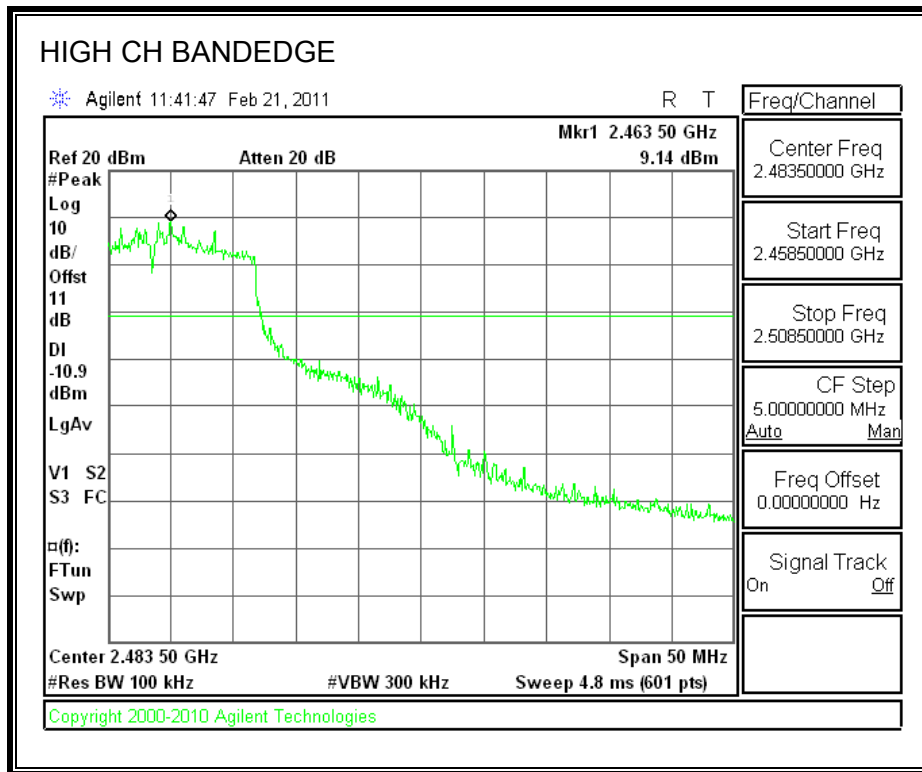
SPURIOUS EMISSIONS, LOW CHANNEL



SPURIOUS EMISSIONS, MID CHAN



SPURIOUS EMISSIONS, HIGH CHANNEL



7.3. 802.11n HT40 SISO MODE IN THE 2.4 GHz BAND

7.3.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

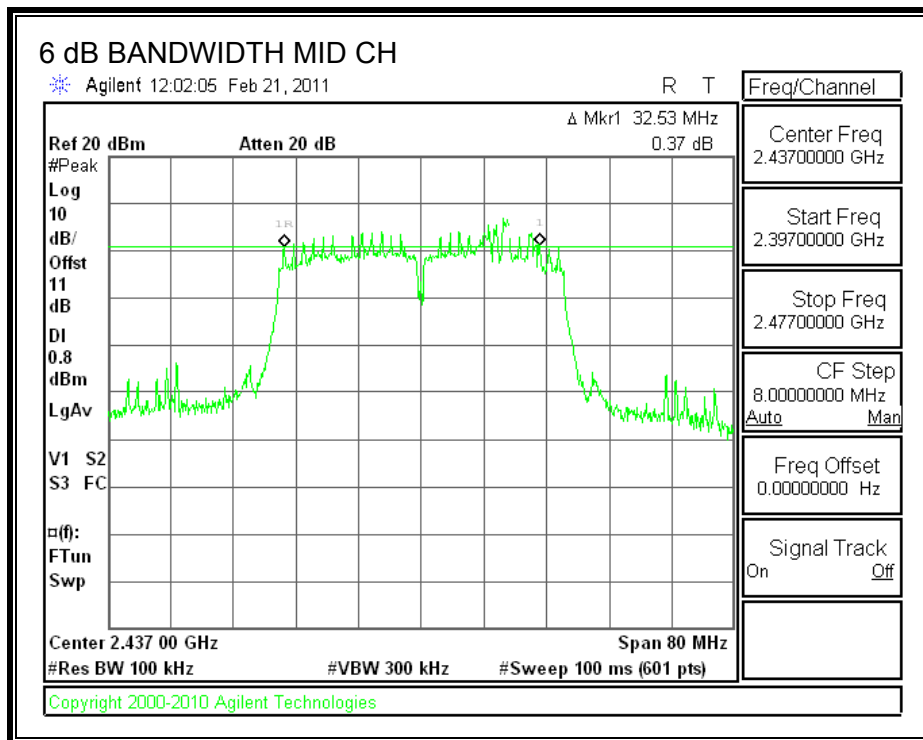
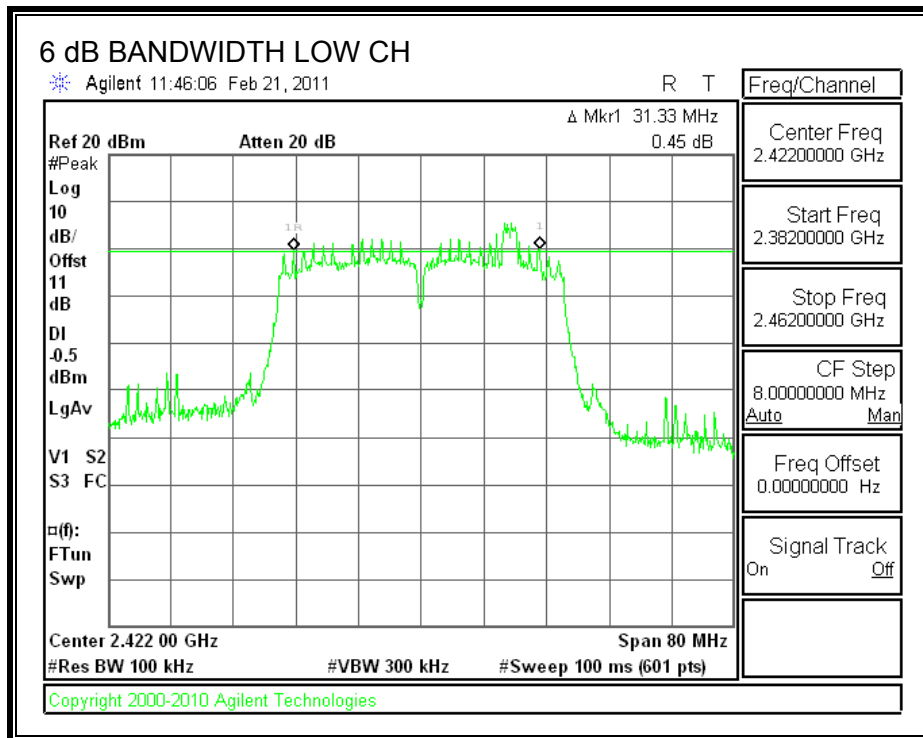
TEST PROCEDURE

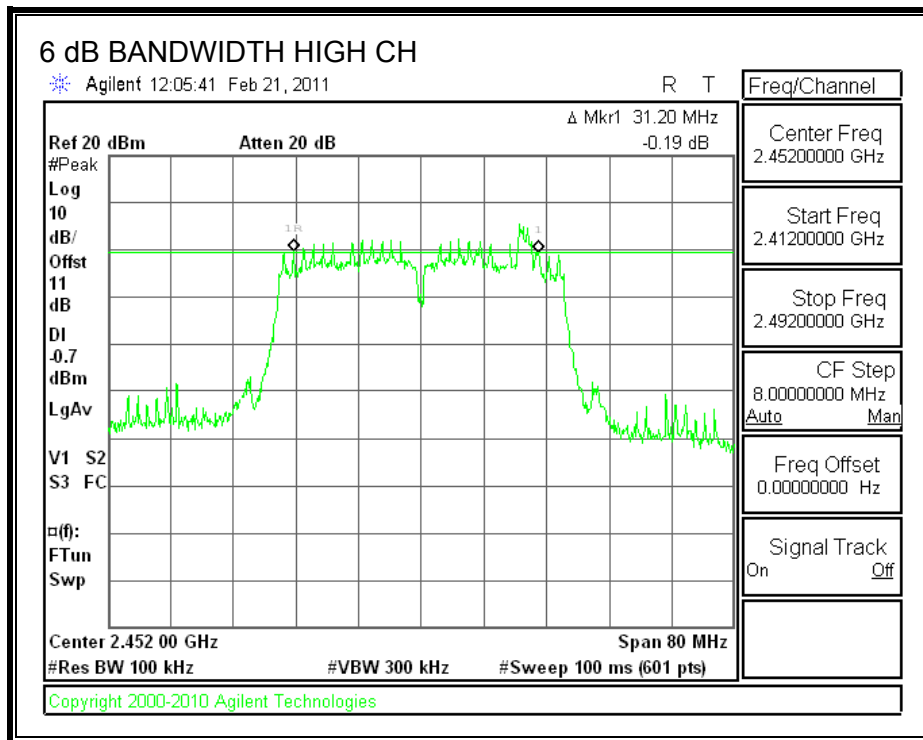
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2422	31.33	0.5
Middle	2437	32.53	0.5
High	2452	31.20	0.5

6 dB BANDWIDTH





7.3.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

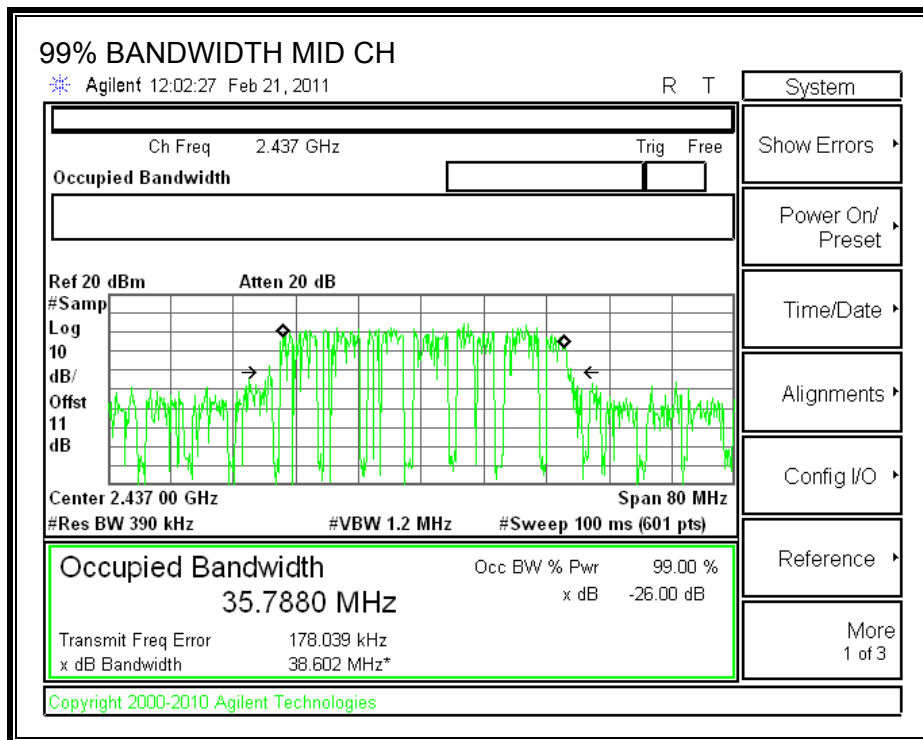
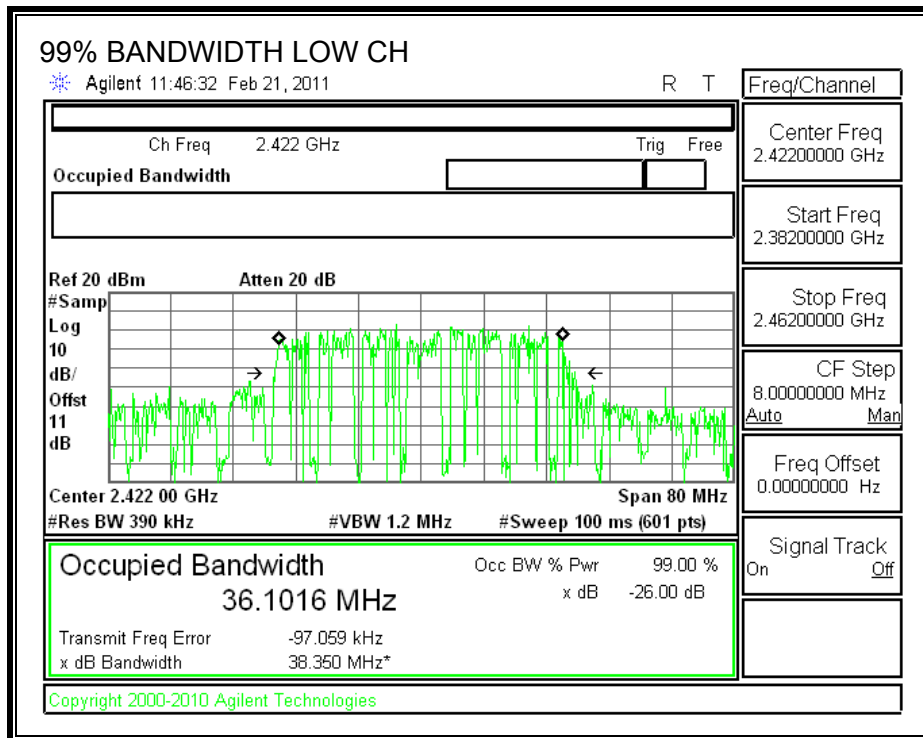
TEST PROCEDURE

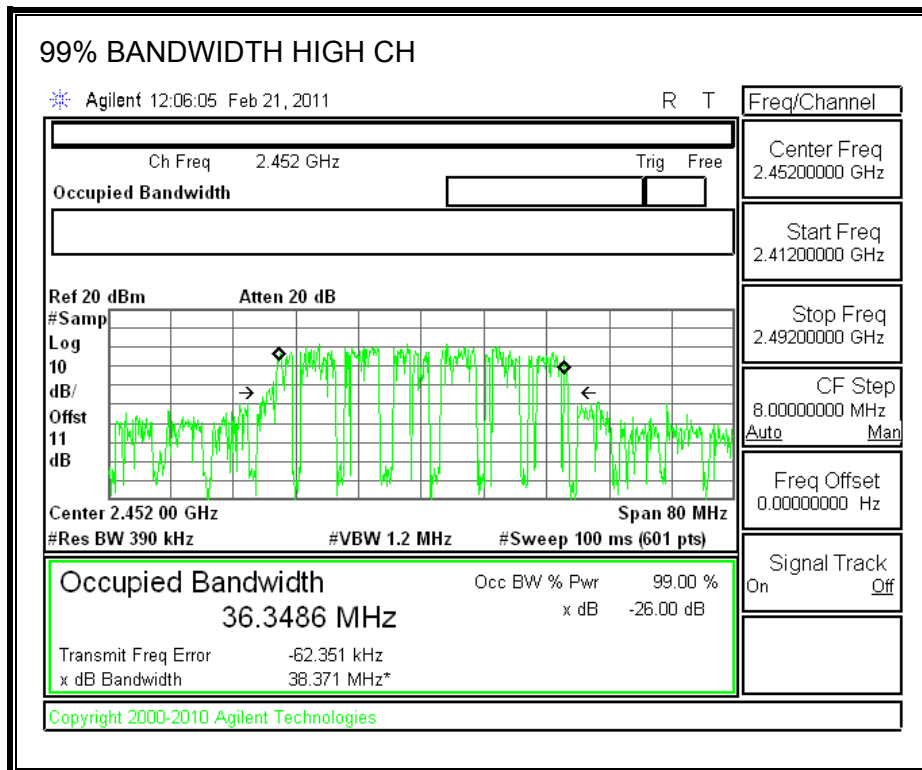
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2422	36.1016
Middle	2437	35.7880
High	2452	36.3486

99% BANDWIDTH





7.3.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003.

RESULTS

Channel	Frequency (MHz)	Spectrum Analyzer Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2422	7.28	11	18.28	30	-11.72
Middle	2437	13.72	11	24.72	30	-5.28
High	2452	9.24	11	20.24	30	-9.76

7.3.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

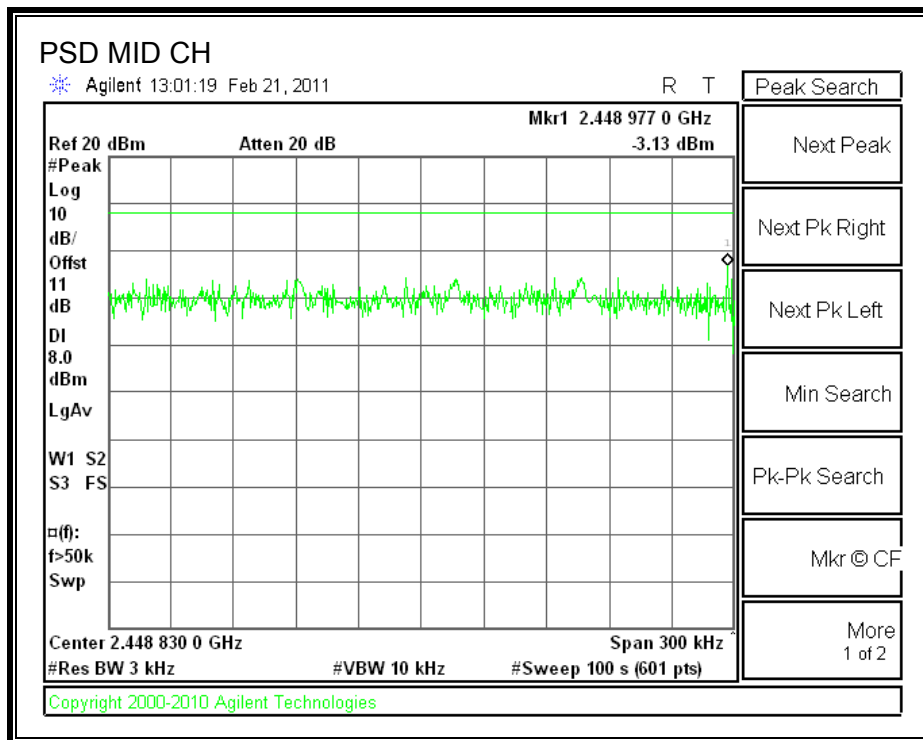
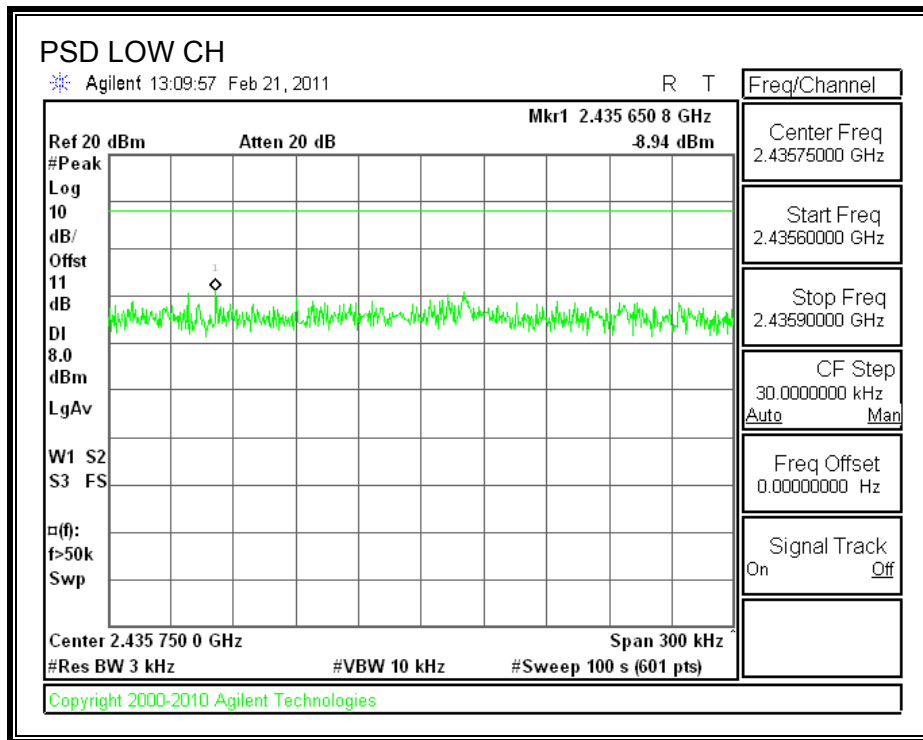
TEST PROCEDURE

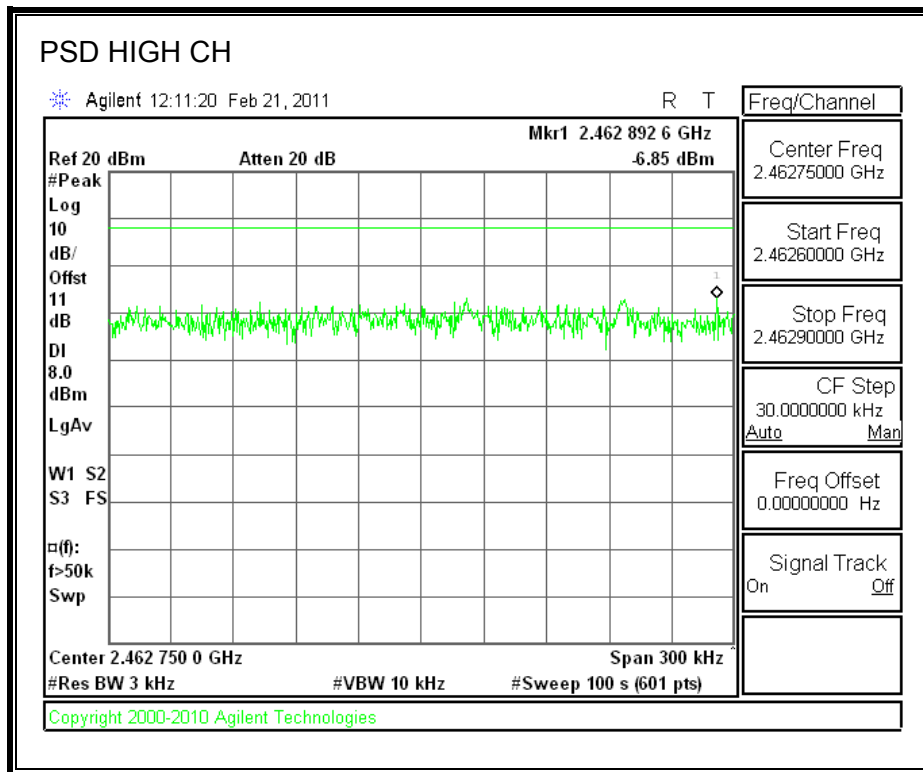
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2422	-8.94	8	-16.94
Middle	2437	-3.13	8	-11.13
High	2452	-6.85	8	-14.85

POWER SPECTRAL DENSITY





7.3.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

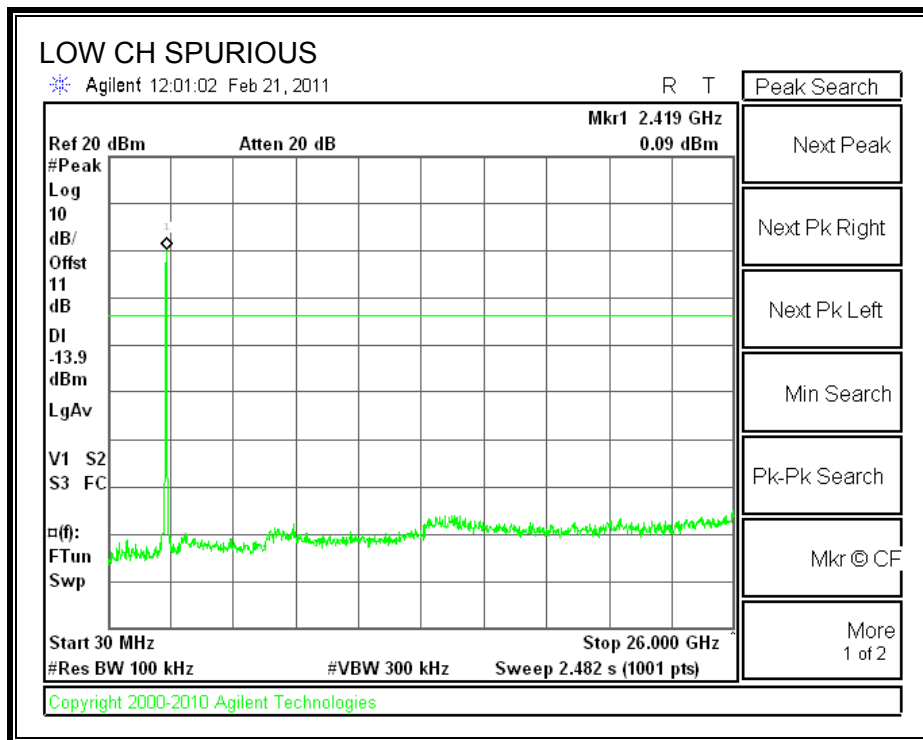
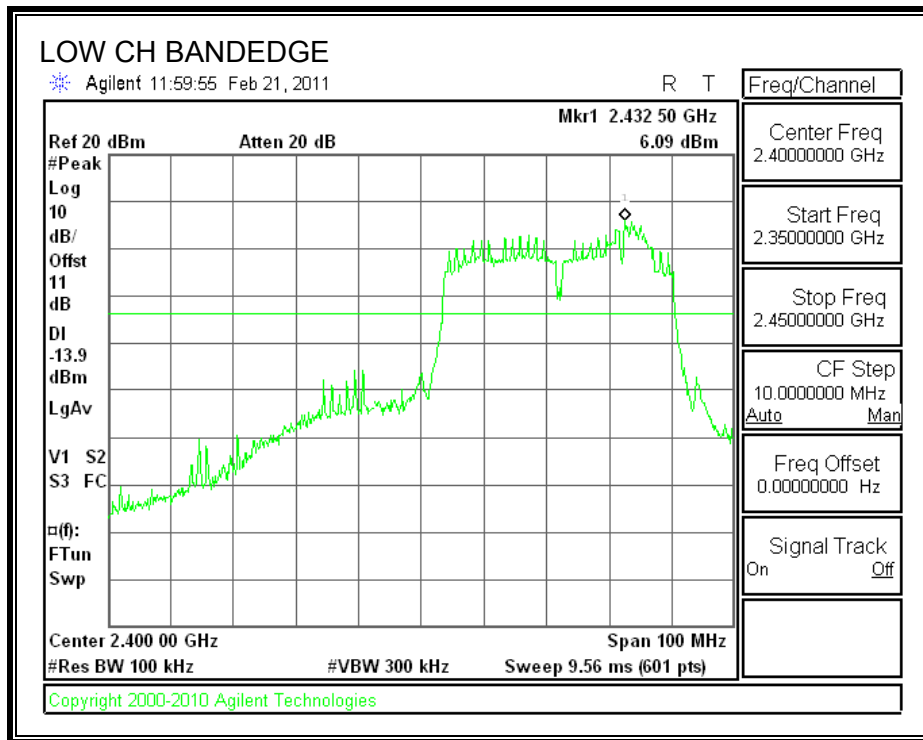
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

TEST PROCEDURE

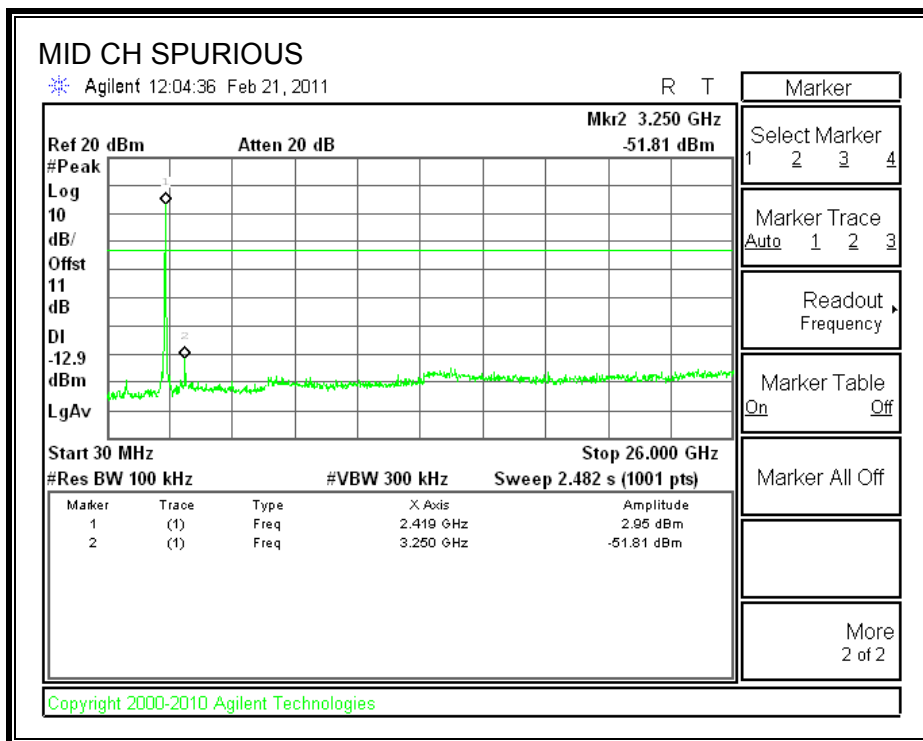
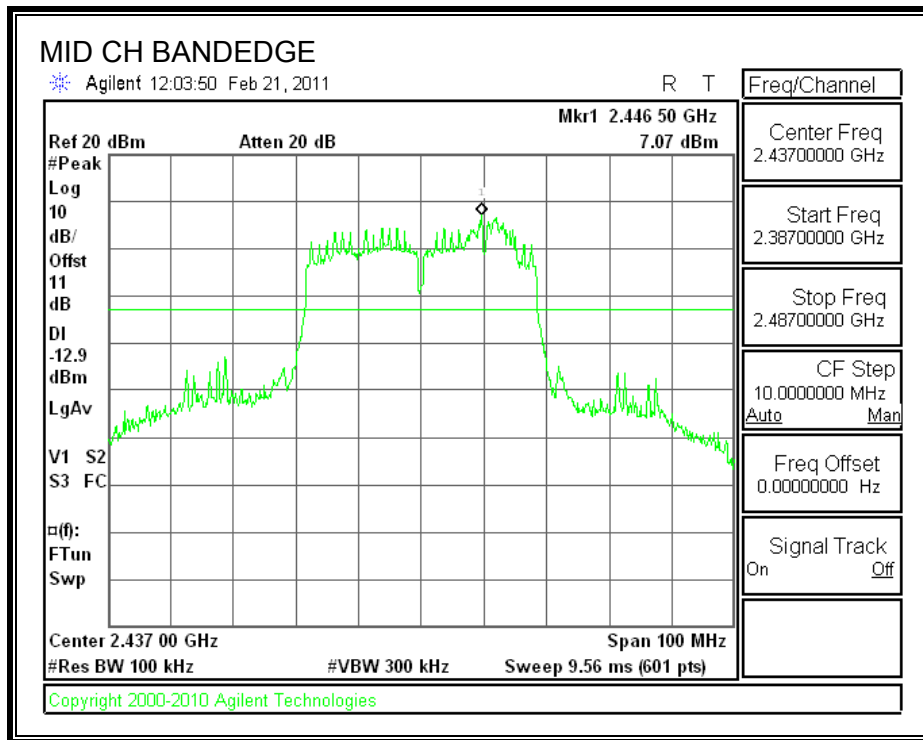
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

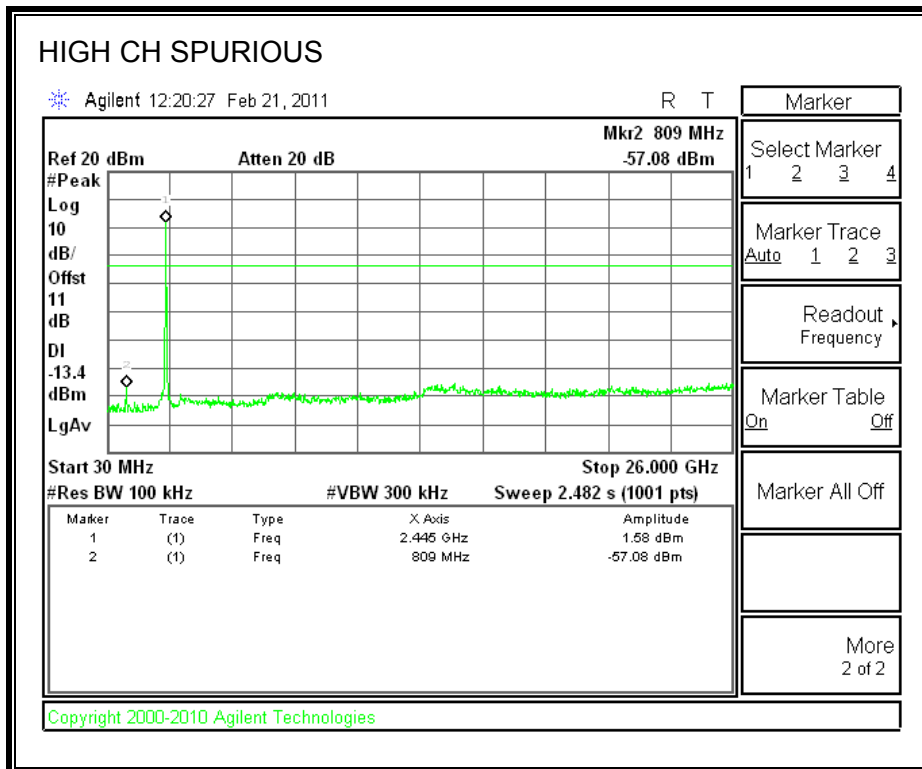
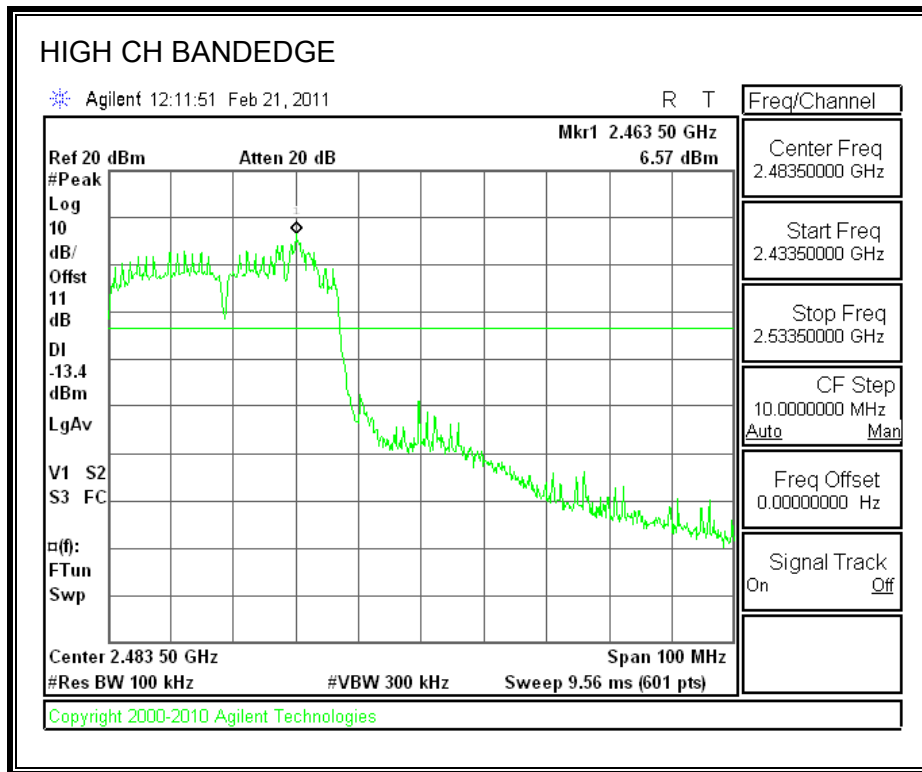
SPURIOUS EMISSIONS, LOW CHANNEL



SPURIOUS EMISSIONS, MID CHAN



SPURIOUS EMISSIONS, HIGH CHANNEL



8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

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, and 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.

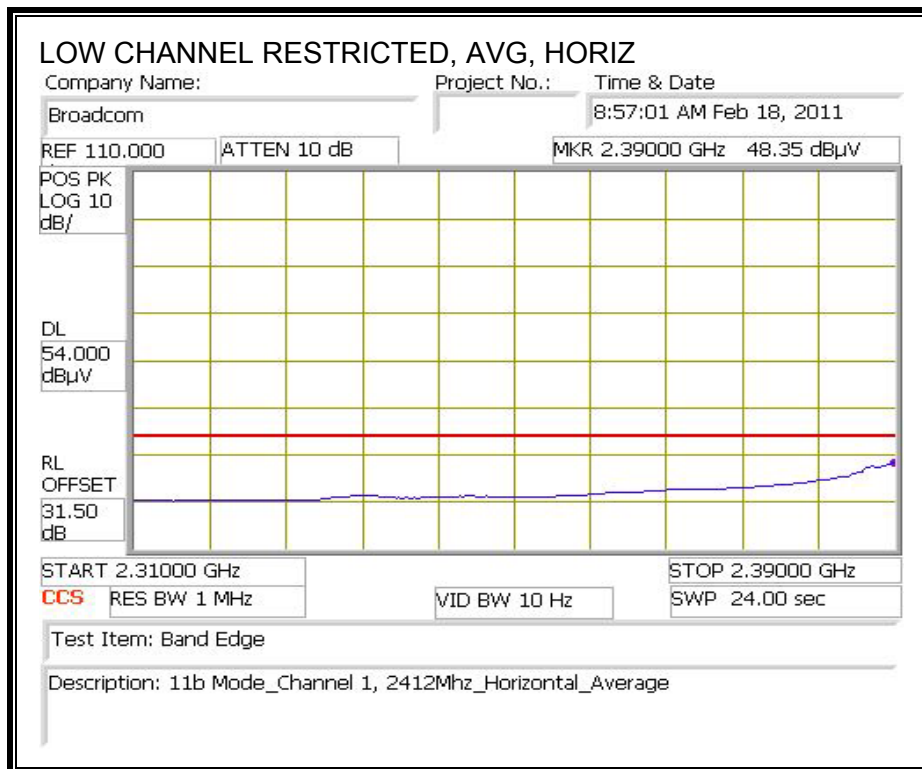
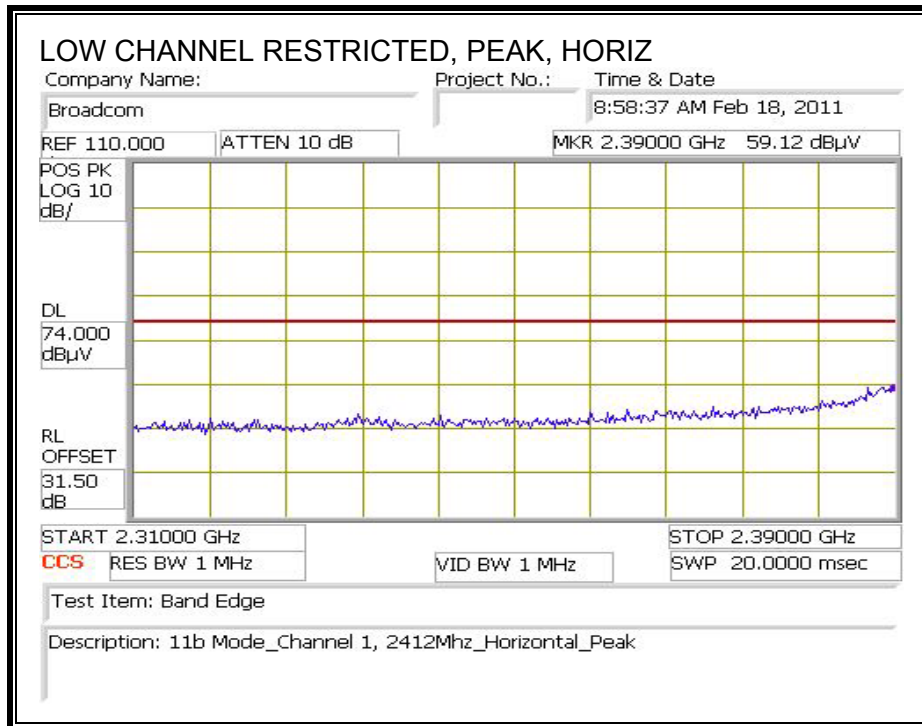
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

RESULTS

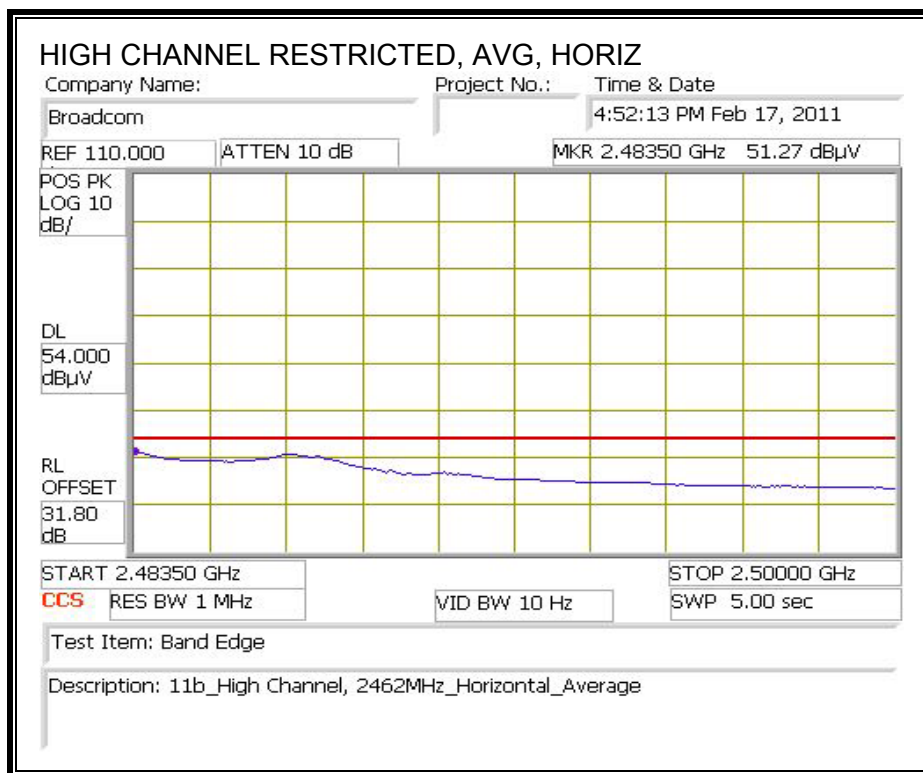
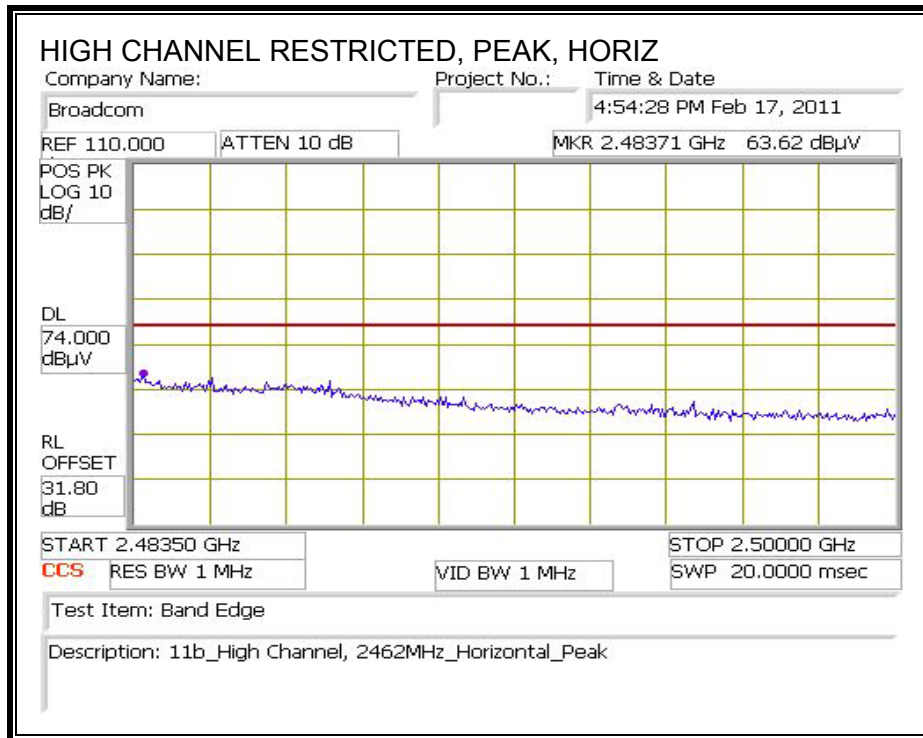
8.2. TRANSMITTER ABOVE 1 GHz

8.2.1. 802.11b MODE

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



HARMONICS AND SPURIOUS EMISSIONS

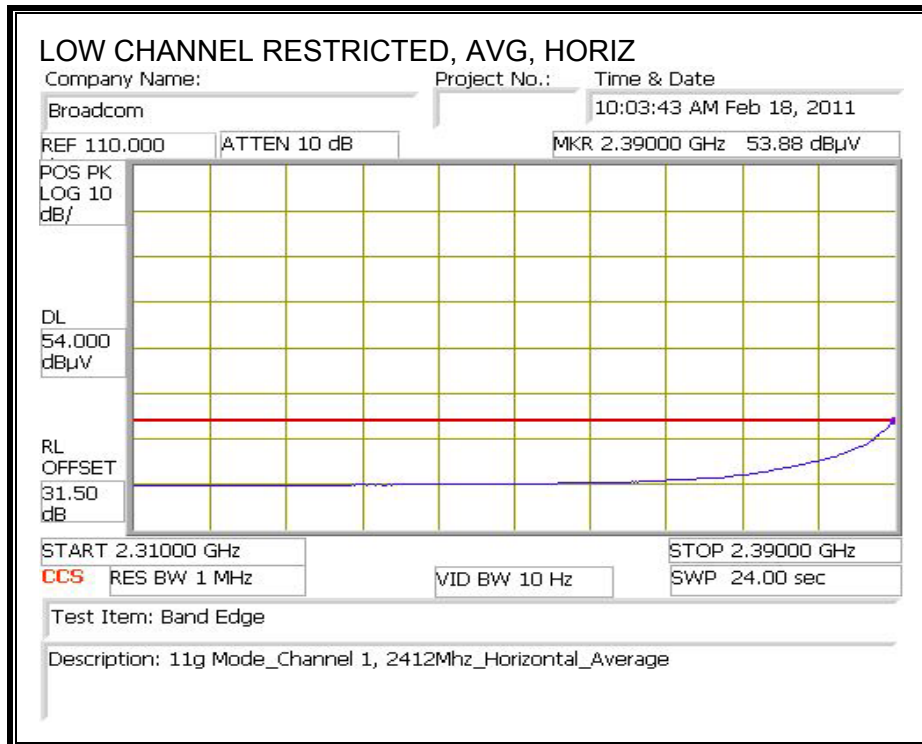
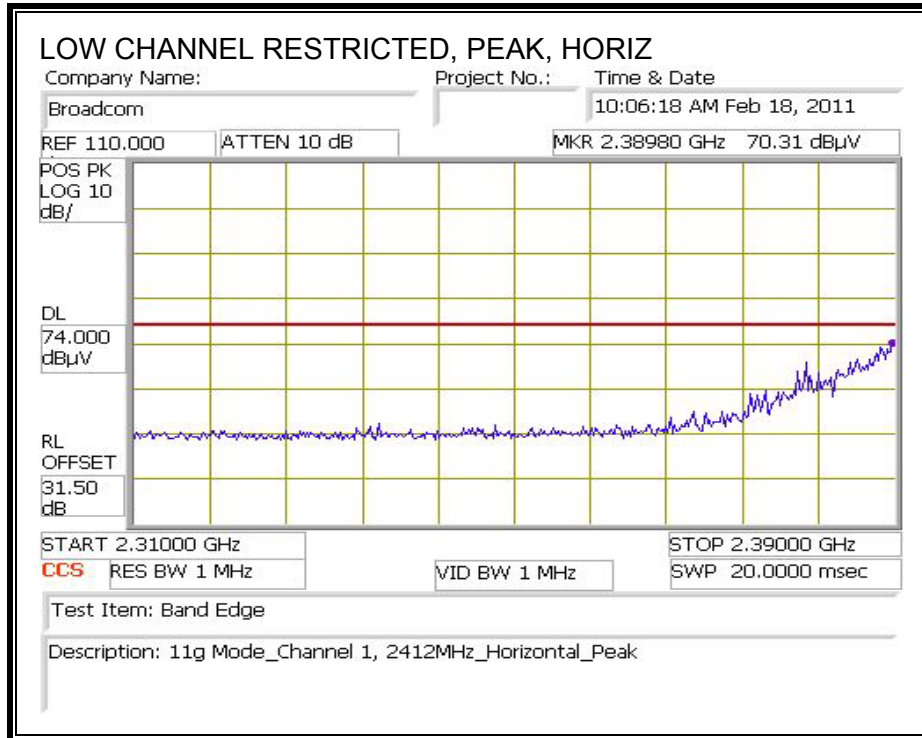
High Frequency Measurement													
Compliance Certification Services, Fremont 3m Chamber													
Test Engr:		Vien Tran											
Date:		02/17/11											
Project #:		11U13681											
Company:		Broadcom											
Test Target:		FCC B											
Mode Oper:		Tx 11b Mode											
f	Measurement 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	Dist	Read	AF	CL	Amp	D Corr	Filtr	Corr.	Limit	Margin	Ant. Pol.	Det.	Notes
GHz	(m)	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dB	V/H	P/A/QP	
LOW CHANNEL, 2412MHz													
4.824	3.0	48.3	32.7	5.8	-34.8	0.0	0.0	51.9	74.0	-22.1	V	P	
4.824	3.0	45.6	32.7	5.8	-34.8	0.0	0.0	49.2	54.0	-4.8	V	A	
4.824	3.0	49.4	32.7	5.8	-34.8	0.0	0.0	53.0	74.0	-21.0	H	P	
4.824	3.0	45.5	32.7	5.8	-34.8	0.0	0.0	49.1	54.0	-4.9	H	A	
MID CHANNEL, 2437MHz													
4.874	3.0	48.2	32.7	5.8	-34.8	0.0	0.0	51.9	74.0	-22.1	V	P	
4.874	3.0	45.2	32.7	5.8	-34.8	0.0	0.0	48.9	54.0	-5.1	V	A	
7.311	3.0	40.0	35.5	7.3	-34.1	0.0	0.0	48.6	74.0	-25.4	V	P	
7.311	3.0	33.0	35.5	7.3	-34.1	0.0	0.0	41.6	54.0	-12.4	V	A	
4.874	3.0	46.0	32.7	5.8	-34.8	0.0	0.0	49.7	74.0	-24.3	H	P	
4.874	3.0	41.9	32.7	5.8	-34.8	0.0	0.0	45.6	54.0	-8.4	H	A	
7.311	3.0	42.4	35.5	7.3	-34.1	0.0	0.0	51.0	74.0	-23.0	H	P	
7.311	3.0	36.9	35.5	7.3	-34.1	0.0	0.0	45.6	54.0	-8.4	H	A	
HIGH CHANNEL, 2462MHz													
4.924	3.0	42.4	32.7	5.9	-34.8	0.0	0.0	46.2	74.0	-27.8	V	P	
4.924	3.0	36.8	32.7	5.9	-34.8	0.0	0.0	40.6	54.0	-13.4	V	A	
7.386	3.0	41.4	35.6	7.3	-34.1	0.0	0.0	50.1	74.0	-23.9	V	P	
7.386	3.0	34.9	35.6	7.3	-34.1	0.0	0.0	43.7	54.0	-10.3	V	A	
4.924	3.0	41.1	32.7	5.9	-34.8	0.0	0.0	44.9	74.0	-29.1	H	P	
4.924	3.0	36.4	32.7	5.9	-34.8	0.0	0.0	40.2	54.0	-13.8	H	A	
7.386	3.0	43.6	35.6	7.3	-34.1	0.0	0.0	52.4	74.0	-21.6	H	P	
7.386	3.0	36.5	35.6	7.3	-34.1	0.0	0.0	45.3	54.0	-8.7	H	A	

Rev. 4.1.2.7

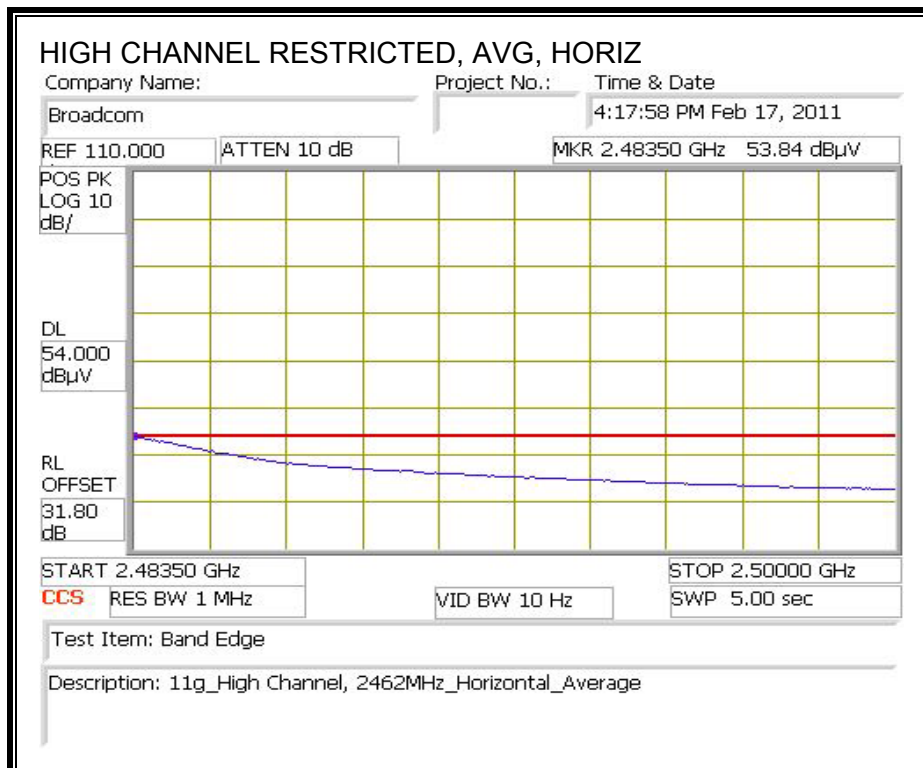
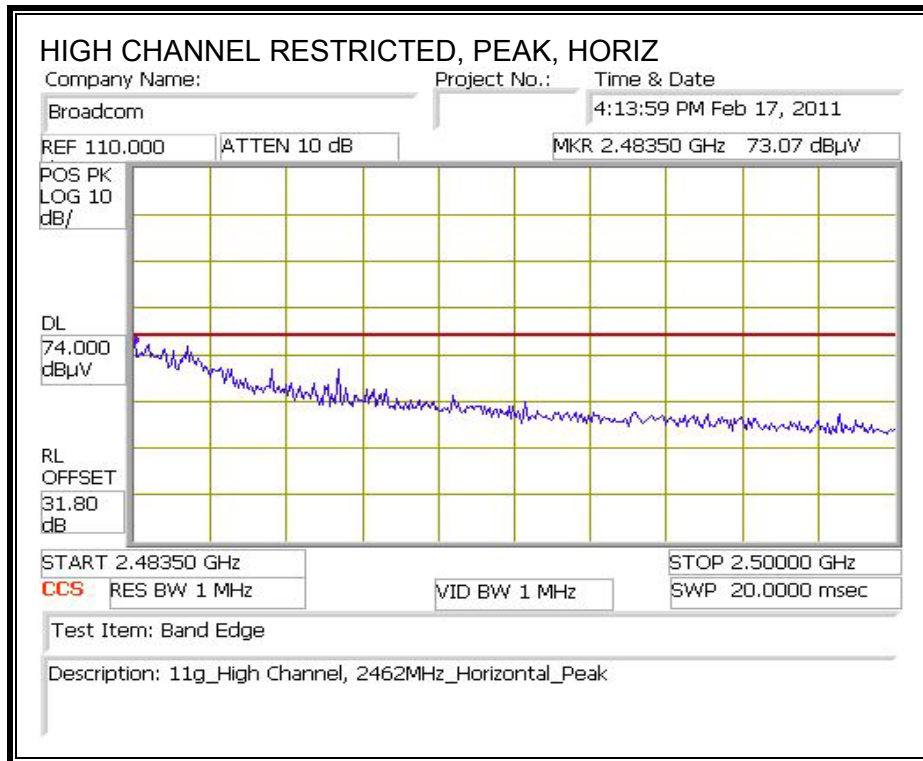
Note: No other emissions were detected above the system noise floor.

8.2.2. 802.11g MODE

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

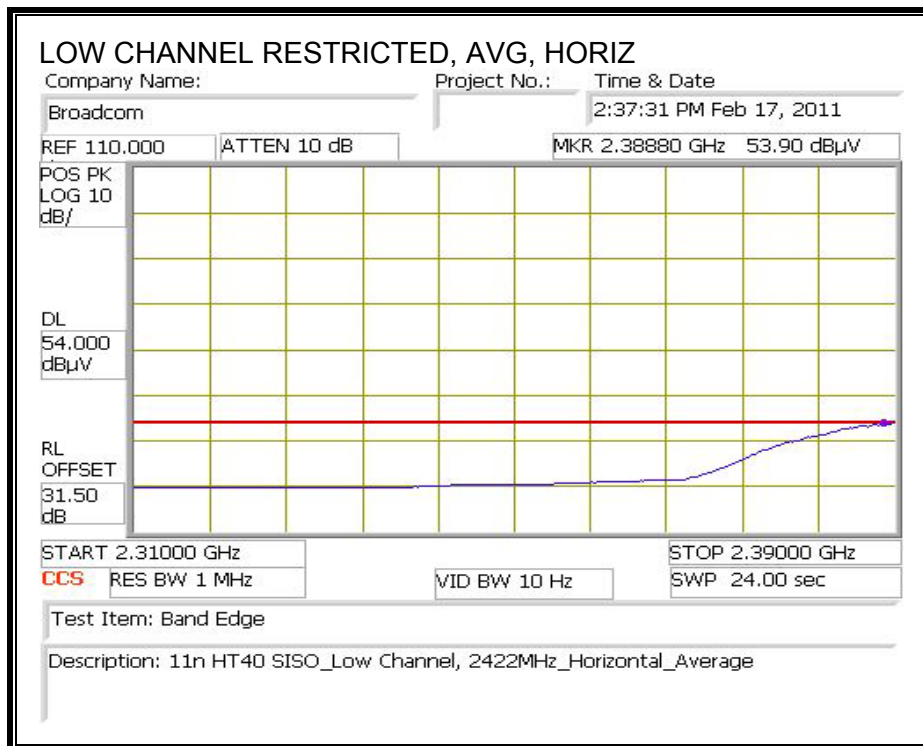
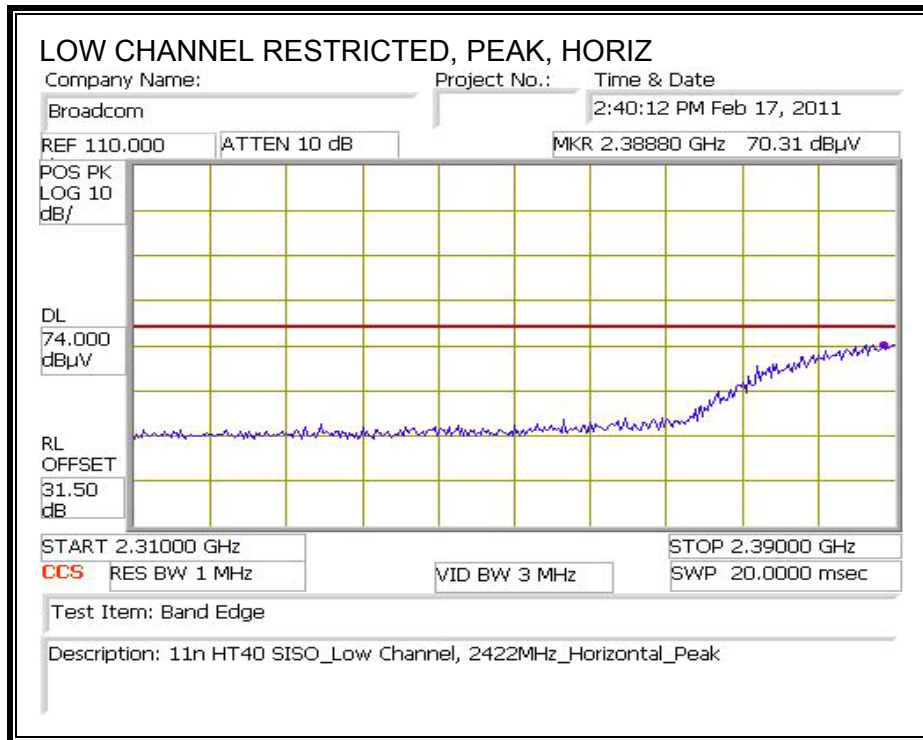


HARMONICS AND SPURIOUS EMISSIONS

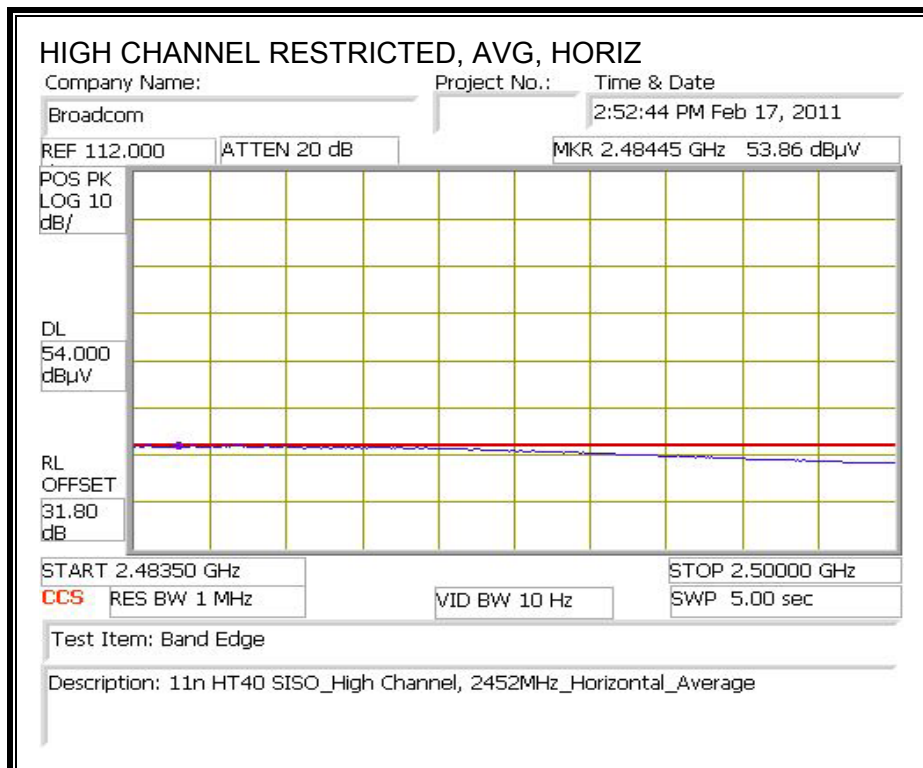
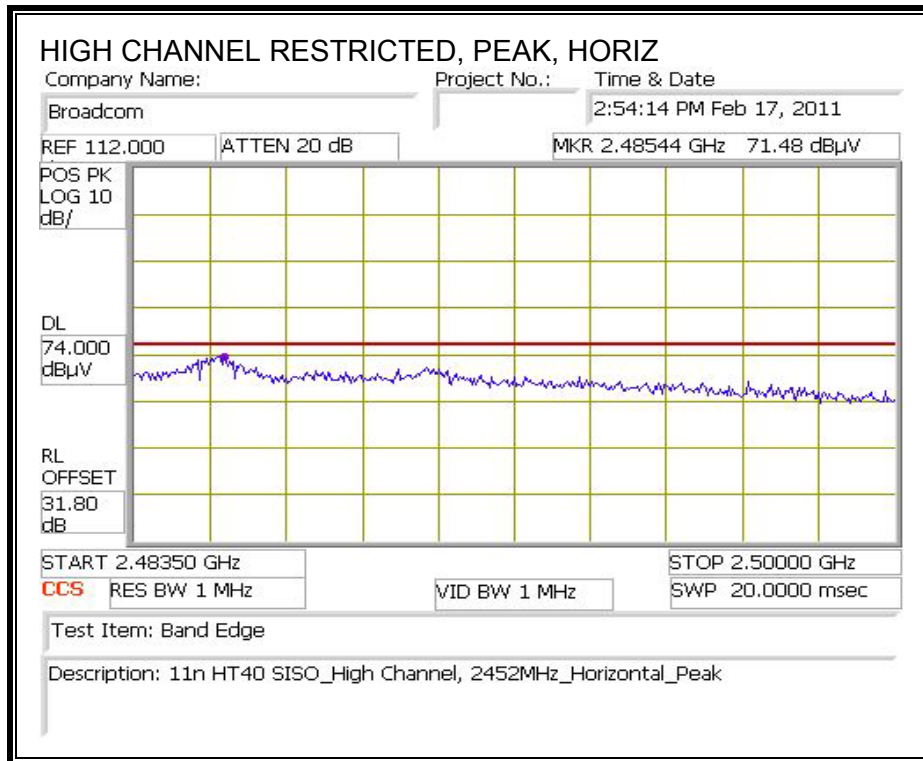
High Frequency Measurement													
Compliance Certification Services, Fremont 3m Chamber													
Test Engr:		Vien Tran											
Date:		02/17/11											
Project #:		11U13681											
Company:		Broadcom											
Test Target:		FCC B											
Mode Oper:		Tx 11g Mode											
f	Measurement 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	Dist	Read	AF	CL	Amp	D Corr	Fltr	Corr.	Limit	Margin	Ant. Pol.	Det.	Notes
GHz	(m)	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dB	V/H	P/A/QP	
LOW CHANNEL, 2412MHz													
4.824	3.0	45.8	32.7	5.8	-34.8	0.0	0.0	49.5	74.0	-24.5	V	P	
4.824	3.0	31.8	32.7	5.8	-34.8	0.0	0.0	35.4	54.0	-18.6	V	A	
4.824	3.0	42.2	32.7	5.8	-34.8	0.0	0.0	45.9	74.0	-28.1	H	P	
4.824	3.0	27.9	32.7	5.8	-34.8	0.0	0.0	31.6	54.0	-22.4	H	A	
MID CHANNEL, 2437MHz													
4.874	3.0	45.4	32.7	5.8	-34.8	0.0	0.0	49.2	74.0	-24.8	V	P	
4.874	3.0	32.4	32.7	5.8	-34.8	0.0	0.0	36.1	54.0	-17.9	V	A	
7.311	3.0	49.6	35.5	7.3	-34.1	0.0	0.0	58.2	74.0	-15.8	V	P	
7.311	3.0	32.1	35.5	7.3	-34.1	0.0	0.0	40.7	54.0	-13.3	V	A	
4.874	3.0	46.8	32.7	5.8	-34.8	0.0	0.0	50.5	74.0	-23.5	H	P	
4.874	3.0	34.0	32.7	5.8	-34.8	0.0	0.0	37.8	54.0	-16.2	H	A	
7.311	3.0	49.9	35.5	7.3	-34.1	0.0	0.0	58.5	74.0	-15.5	H	P	
7.311	3.0	30.5	35.5	7.3	-34.1	0.0	0.0	39.2	54.0	-14.8	H	A	
HIGH CHANNEL, 2462MHz													
4.924	3.0	43.3	32.7	5.9	-34.8	0.0	0.0	47.1	74.0	-26.9	V	P	
4.924	3.0	28.4	32.7	5.9	-34.8	0.0	0.0	32.2	54.0	-21.8	V	A	
7.386	3.0	46.7	35.6	7.3	-34.1	0.0	0.0	55.5	74.0	-18.5	V	P	
7.386	3.0	31.5	35.6	7.3	-34.1	0.0	0.0	40.3	54.0	-13.7	V	A	
4.924	3.0	39.9	32.7	5.9	-34.8	0.0	0.0	43.7	74.0	-30.3	H	P	
4.924	3.0	27.0	32.7	5.9	-34.8	0.0	0.0	30.8	54.0	-23.2	H	A	
7.386	3.0	40.0	35.6	7.3	-34.1	0.0	0.0	48.8	74.0	-25.2	H	P	
7.386	3.0	26.6	35.6	7.3	-34.1	0.0	0.0	35.3	54.0	-18.7	H	A	
Rev. 4.1.2.7													
Note: No other emissions were detected above the system noise floor.													

8.2.3. 802.11n HT40 SISO MODE

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement													
Compliance Certification Services, Fremont 3m Chamber													
Test Engr:		Vien Tran											
Date:		02/17/11											
Project #:		11U13681											
Company:		Broadcom											
Test Target:		FCC B											
Mode Oper:		Tx 11n HT40 SISO 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	Dist	Read	AF	CL	Amp	D Corr	Fltr	Corr.	Limit	Margin	Ant. Pol.	Det.	Notes
GHz	(m)	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dB	V/H	P/A/QP	
LOW CHANNEL, 2422MHz													
4.844	3.0	36.5	32.7	5.8	-34.8	0.0	0.0	40.1	74.0	-33.9	V	P	
4.844	3.0	24.2	32.7	5.8	-34.8	0.0	0.0	27.8	54.0	-26.2	V	A	
4.844	3.0	37.4	32.7	5.8	-34.8	0.0	0.0	41.0	74.0	-33.0	H	P	
4.844	3.0	24.4	32.7	5.8	-34.8	0.0	0.0	28.0	54.0	-26.0	H	A	
MID CHANNEL, 2437MHz													
4.874	3.0	41.5	32.7	5.8	-34.8	0.0	0.0	45.2	74.0	-28.8	V	P	
4.874	3.0	26.8	32.7	5.8	-34.8	0.0	0.0	30.6	54.0	-23.4	V	A	
7.311	3.0	38.3	35.5	7.3	-34.1	0.0	0.0	46.9	74.0	-27.1	V	P	
7.311	3.0	25.3	35.5	7.3	-34.1	0.0	0.0	33.9	54.0	-20.1	V	A	
4.874	3.0	39.5	32.7	5.8	-34.8	0.0	0.0	43.2	74.0	-30.8	H	P	
4.874	3.0	26.0	32.7	5.8	-34.8	0.0	0.0	29.7	54.0	-24.3	H	A	
7.311	3.0	38.1	35.5	7.3	-34.1	0.0	0.0	46.7	74.0	-27.3	H	P	
7.311	3.0	24.9	35.5	7.3	-34.1	0.0	0.0	33.5	54.0	-20.5	H	A	
HIGH CHANNEL, 2452MHz													
4.904	3.0	36.3	32.7	5.9	-34.8	0.0	0.0	40.0	74.0	-34.0	V	P	
4.904	3.0	24.0	32.7	5.9	-34.8	0.0	0.0	27.8	54.0	-26.2	V	A	
7.356	3.0	35.8	35.5	7.3	-34.1	0.0	0.0	44.5	74.0	-29.5	V	P	
7.356	3.0	23.4	35.5	7.3	-34.1	0.0	0.0	32.2	54.0	-21.8	V	A	
4.904	3.0	36.2	32.7	5.9	-34.8	0.0	0.0	39.9	74.0	-34.1	H	P	
4.904	3.0	23.3	32.7	5.9	-34.8	0.0	0.0	27.1	54.0	-26.9	H	A	
7.356	3.0	37.8	35.5	7.3	-34.1	0.0	0.0	46.5	74.0	-27.5	H	P	
7.356	3.0	24.5	35.5	7.3	-34.1	0.0	0.0	33.2	54.0	-20.8	H	A	
Rev. 4.1.2.7													
Note: No other emissions were detected above the system noise floor.													

8.3. RECEIVER ABOVE 1 GHz

8.3.1. FOR 20 MHz BANDWIDTH

High Frequency Measurement
 Compliance Certification Services, Fremont 3m Chamber

Company: Broadcom
 Project #: 11U13681
 Date: 2/18/2011
 Test Engineer: Vien Tran
 Configuration: EUT / Test JIG / Laptop
 Mode: Rx in 20MHz Bandwidth

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B			FCC 15.209

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter	Peak Measurements RBW=VBW=1MHz
3' cable 22807700	12' cable 22807600	20' cable 22807500			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	Fitr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.063	3.0	55.2	41.3	24.7	2.4	-38.2	0.0	0.0	44.1	30.2	74	54	-29.9	-23.8	V
1.247	3.0	57.9	42.8	25.3	2.7	-37.9	0.0	0.0	47.9	32.8	74	54	-26.1	-21.2	V
1.600	3.0	63.8	40.9	26.5	3.0	-37.4	0.0	0.0	55.9	33.0	74	54	-18.1	-21.0	V
2.497	3.0	55.6	37.8	28.3	3.9	-36.3	0.0	0.0	51.6	33.8	74	54	-22.4	-20.2	V
1.063	3.0	56.6	37.2	24.7	2.4	-38.2	0.0	0.0	45.5	26.1	74	54	-28.5	-27.9	H
1.247	3.0	52.9	38.3	25.3	2.7	-37.9	0.0	0.0	42.9	28.3	74	54	-31.1	-25.7	H
1.600	3.0	58.3	36.3	26.5	3.0	-37.4	0.0	0.0	50.4	28.4	74	54	-23.6	-25.6	H
2.497	3.0	52.8	36.5	28.3	3.9	-36.3	0.0	0.0	48.8	32.5	74	54	-25.2	-21.5	H

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

8.3.2. FOR 40 MHZ BANDWIDTH

High Frequency Measurement
 Compliance Certification Services, Fremont 3m Chamber

Company: Broadcom
 Project #: 11U13681
 Date: 2/18/2011
 Test Engineer: Vien Tran
 Configuration: EUT / Test JIG / Laptop
 Mode: Rx in 40MHz Bandwidth

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B			FCC 15.209

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter	Peak Measurements RBW=VBW=1MHz
3' cable 22807700	12' cable 22807600	20' cable 22807500			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	Fldr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.063	3.0	55.8	36.6	24.7	2.4	-38.2	0.0	0.0	44.7	25.5	74	54	-29.3	-28.5	V
1.247	3.0	56.8	40.8	25.3	2.7	-37.9	0.0	0.0	46.8	30.8	74	54	-27.2	-23.2	V
1.600	3.0	61.1	36.5	26.5	3.0	-37.4	0.0	0.0	53.2	28.6	74	54	-20.8	-25.4	V
2.497	3.0	54.5	33.4	28.3	3.9	-36.3	0.0	0.0	50.5	29.4	74	54	-23.5	-24.6	V
1.063	3.0	55.6	35.7	24.7	2.4	-38.2	0.0	0.0	44.5	24.6	74	54	-29.5	-29.4	H
1.247	3.0	54.8	36.8	25.3	2.7	-37.9	0.0	0.0	44.8	26.8	74	54	-29.2	-27.2	H
1.600	3.0	58.2	36.9	26.5	3.0	-37.4	0.0	0.0	50.3	29.0	74	54	-23.7	-25.0	H
2.497	3.0	50.8	32.2	28.3	3.9	-36.3	0.0	0.0	46.8	28.2	74	54	-27.2	-25.8	H

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

8.4. WORST-CASE BELOW 1 GHz

HORIZONTAL & VERTICAL DATA

30-1000MHz Frequency Measurement
 Compliance Certification Services, Fremont 5m Chamber

Test Engr: Vien Tran
 Date: 02/22/11
 Project #: 11U13681
 Company: Broadcom
 Test Target: FCC B
 Mode Oper: Tx Normal

f Measurement Frequency Amp Preamp Gain Margin Margin vs. Limit
 Dist Distance to Antenna D Corr Distance Correct to 3 meters
 Read Analyzer Reading Filter Filter Insert Loss
 AF Antenna Factor Corr. Calculated Field Strength
 CL Cable Loss Limit Field Strength Limit

f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Pad dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol V/H	Det. P/A/QP	Notes
Vertical													
249.729	3.0	55.4	11.8	1.4	28.2	0.0	0.0	40.4	46.0	-5.6	V	P	
316.452	3.0	53.3	13.7	1.6	28.1	0.0	0.0	40.4	46.0	-5.6	V	P	
416.296	3.0	45.8	15.2	1.8	28.1	0.0	0.0	34.8	46.0	-11.2	V	P	
449.657	3.0	46.6	15.8	1.9	28.0	0.0	0.0	36.4	46.0	-9.6	V	P	
482.899	3.0	46.7	16.4	2.0	27.9	0.0	0.0	37.2	46.0	-8.8	V	P	
532.821	3.0	45.2	17.3	2.1	27.7	0.0	0.0	36.8	46.0	-9.2	V	P	
580.943	3.0	46.4	18.1	2.2	27.6	0.0	0.0	39.1	46.0	-6.9	V	P	
614.064	3.0	45.4	18.6	2.3	27.5	0.0	0.0	38.7	46.0	-7.3	V	P	
647.305	3.0	43.1	19.0	2.3	27.4	0.0	0.0	37.1	46.0	-8.9	V	P	
680.427	3.0	44.0	19.4	2.4	27.3	0.0	0.0	38.5	46.0	-7.5	V	P	
713.908	3.0	42.7	19.8	2.5	27.2	0.0	0.0	37.8	46.0	-8.2	V	P	
746.79	3.0	41.5	20.2	2.5	27.3	0.0	0.0	36.9	46.0	-9.1	V	P	
813.392	3.0	41.9	21.1	2.7	27.5	0.0	0.0	38.1	46.0	-7.9	V	P	
849.394	3.0	40.8	21.4	2.7	27.6	0.0	0.0	37.3	46.0	-8.7	V	P	
Horizontal													
49.921	3.0	52.0	8.4	0.6	28.4	0.0	0.0	32.6	40.0	-7.4	H	P	
336.013	3.0	51.2	14.0	1.6	28.1	0.0	0.0	38.7	46.0	-7.3	H	P	
349.693	3.0	51.6	14.2	1.7	28.1	0.0	0.0	39.4	46.0	-6.6	H	P	
365.174	3.0	53.1	14.4	1.7	28.1	0.0	0.0	41.1	46.0	-4.9	H	P	
382.935	3.0	52.6	14.7	1.8	28.1	0.0	0.0	40.9	46.0	-5.1	H	P	
416.416	3.0	48.6	15.2	1.8	28.1	0.0	0.0	37.6	46.0	-8.4	H	P	
616.104	3.0	46.5	18.6	2.3	27.5	0.0	0.0	39.9	46.0	-6.1	H	P	
713.668	3.0	46.9	19.8	2.5	27.2	0.0	0.0	42.0	46.0	-4.0	H	P	
749.43	3.0	46.5	20.3	2.5	27.3	0.0	0.0	42.0	46.0	-4.0	H	P	
816.152	3.0	43.3	21.1	2.7	27.5	0.0	0.0	39.6	46.0	-6.4	H	P	

Rev. 1.27.09

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

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

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

*Decreases with the logarithm of the frequency.

TEST PROCEDURE

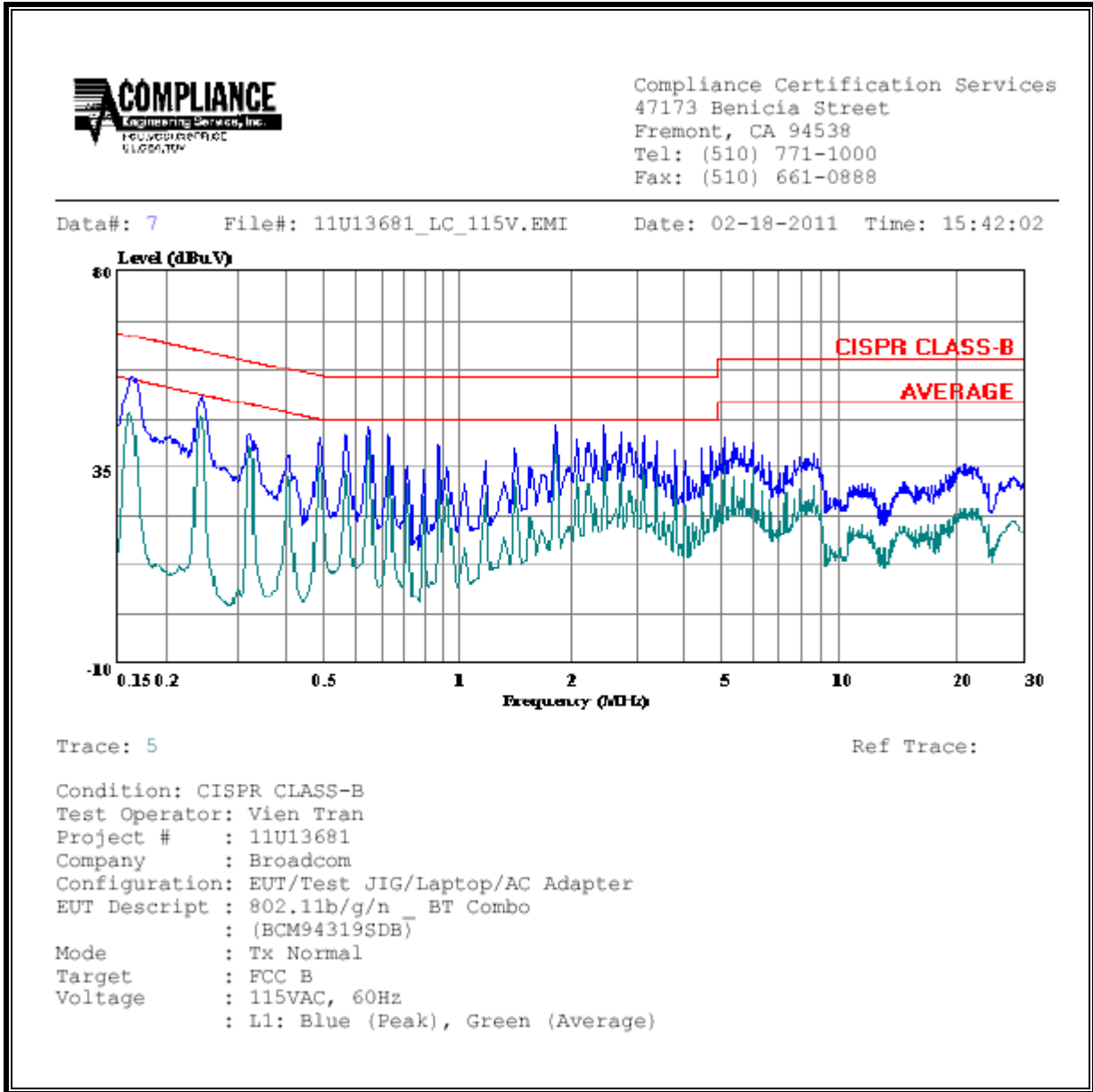
ANSI C63.4

RESULTS

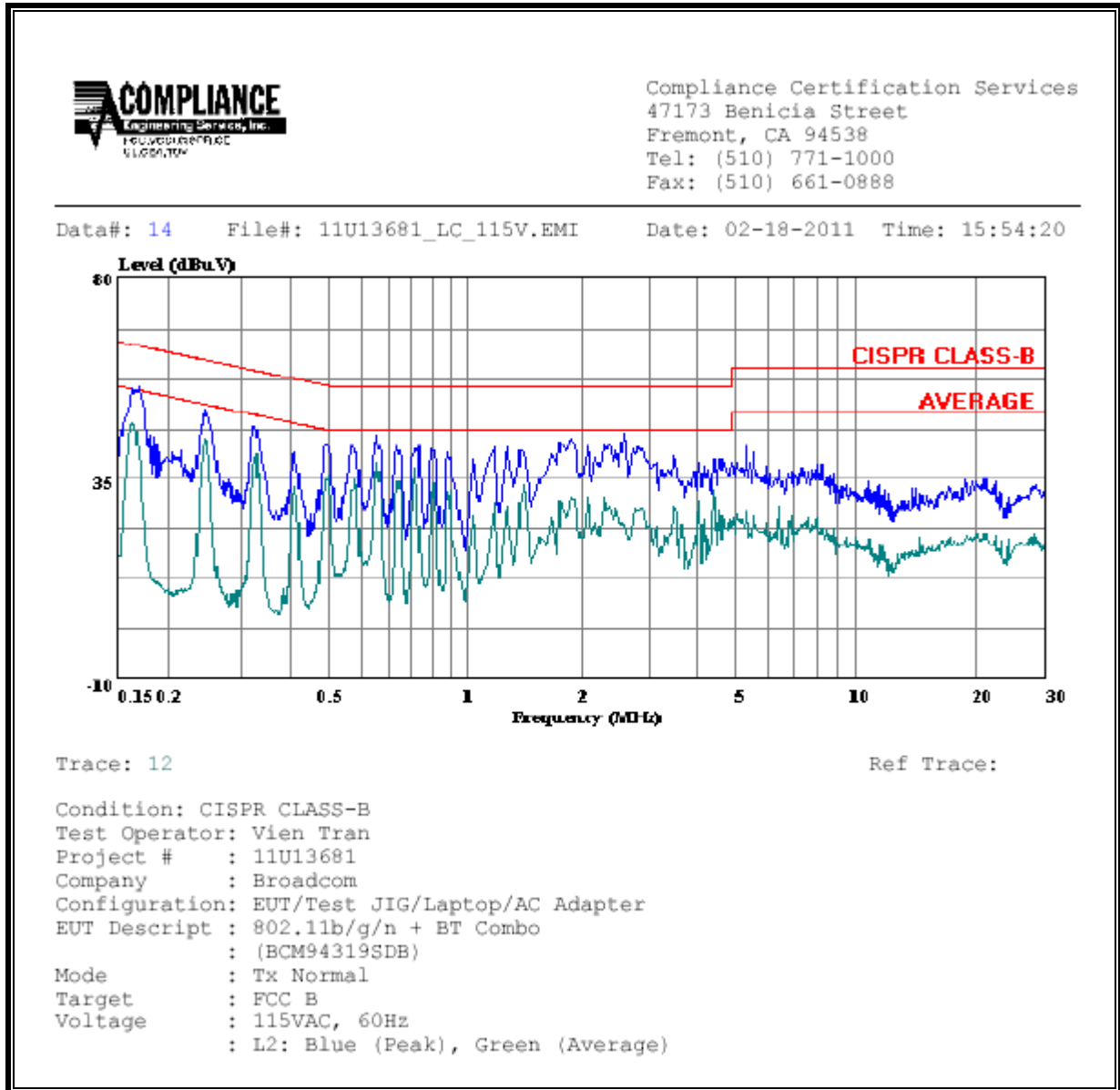
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Class	Limit	FCC_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.17	55.84	--	47.40	0.00	65.21	55.21	-9.37	-7.81	L1
0.24	51.60	--	46.76	0.00	61.96	51.96	-10.36	-5.20	L1
1.93	44.95	--	43.19	0.00	56.00	46.00	-11.05	-2.81	L1
0.17	54.27	--	47.19	0.00	65.21	55.21	-10.94	-8.02	L2
0.24	50.59	--	44.02	0.00	61.96	51.96	-11.37	-7.94	L2
0.65	45.04	--	38.58	0.00	56.00	46.00	-10.96	-7.42	L2
6 Worst Data									

LINE 1 RESULTS



LINE 2 RESULTS



10. MAXIMUM PERMISSIBLE EXPOSURE

FCC RULES

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

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

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

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

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

f = frequency in MHz

* = Plane-wave equivalent power density

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

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

Table 5
Exposure Limits for Persons Not Classed As RF and Microwave Ex-
posed Workers (Including the General Public)

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

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

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

EQUATIONS

Power density is given by:

$$S = \text{EIRP} / (4 * \text{Pi} * \text{D}^2)$$

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:

$$D = \text{SQRT} (\text{EIRP} / (4 * \text{Pi} * S))$$

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.

$$\text{Total EIRP} = (P1 * G1) + (P2 * G2) + \dots + (Pn * Gn)$$

where

- Px = Power of transmitter x
- Gx = 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.

LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm²
From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m²

RESULTS

Band	Mode	Separation Distance (m)	Output Power (dBm)	Antenna Gain (dBi)	IC Power Density (W/m ²)	FCC Power Density (mW/cm ²)
2.4 GHz	WLAN	0.20	26.74	3.90	2.31	0.231