



**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**

The logo for NVLAP (National Voluntary Laboratory Accreditation Program) features the word 'NVLAP' in a bold, black, sans-serif font. The 'A' is stylized with a vertical line extending downwards. A registered trademark symbol (®) is positioned in the top right corner of the 'A'.

**NVLAP LAB CODE 200065-0**

Revision History

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

## TABLE OF CONTENTS

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

7.3.3. OUTPUT POWER .....	46
7.3.4. POWER SPECTRAL DENSITY .....	47
7.3.5. CONDUCTED SPURIOUS EMISSIONS.....	50
<b>8. RADIATED TEST RESULTS .....</b>	<b>54</b>
8.1. <i>LIMITS AND PROCEDURE</i> .....	54
8.2. <i>TRANSMITTER ABOVE 1 GHz</i> .....	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. <i>RECEIVER ABOVE 1 GHz</i> .....	64
8.3.1. FOR 20 MHz BANDWIDTH.....	64
8.3.2. FOR 40 MHz BANDWIDTH.....	65
8.4. <i>WORST-CASE BELOW 1 GHz</i> .....	66
<b>9. AC POWER LINE CONDUCTED EMISSIONS .....</b>	<b>67</b>
<b>10. MAXIMUM PERMISSIBLE EXPOSURE .....</b>	<b>71</b>
<b>11. SETUP PHOTOS .....</b>	<b>74</b>

## 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:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) +  
Cable Loss (dB) – 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

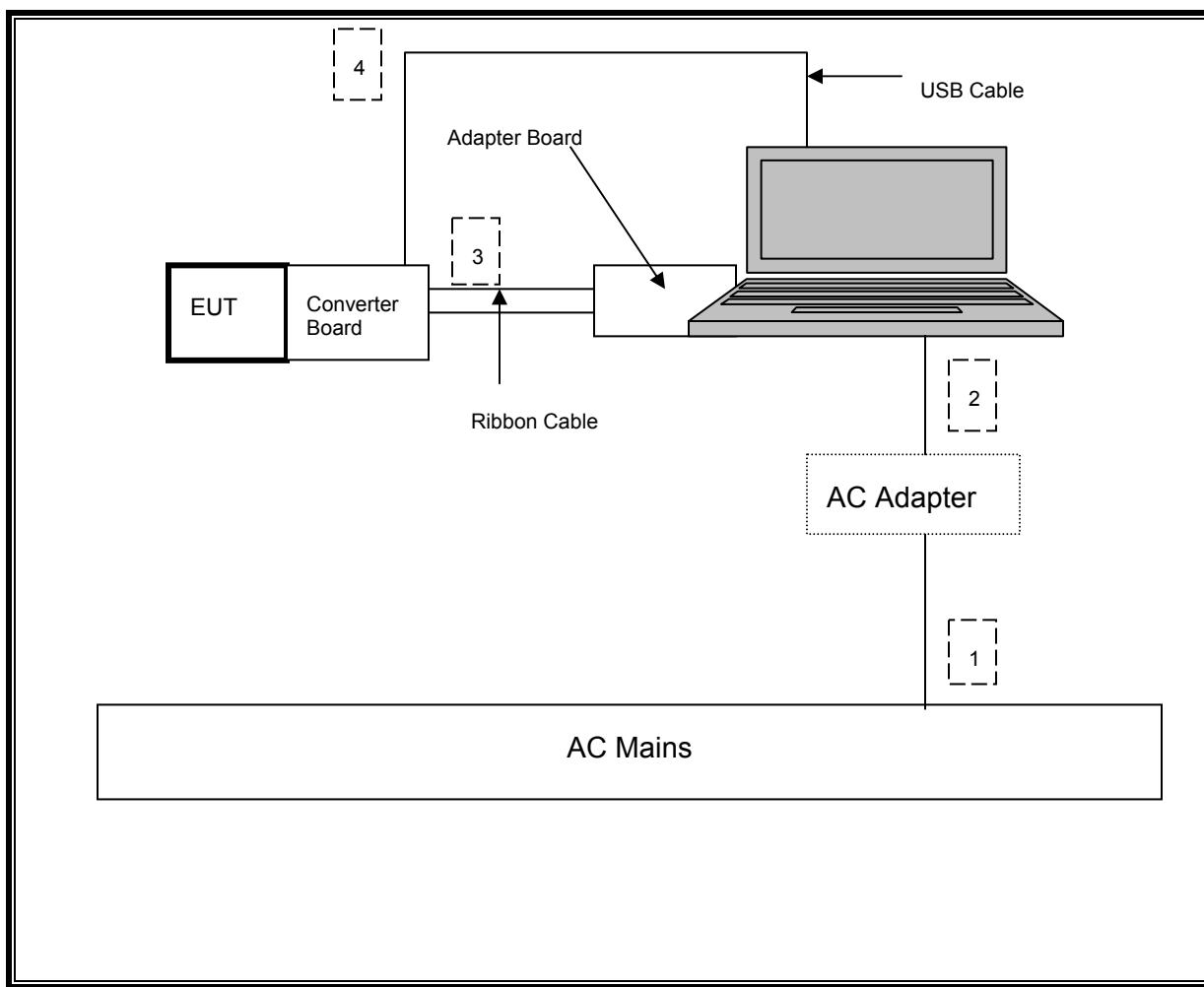
### SUPPORT EQUIPMENT

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.

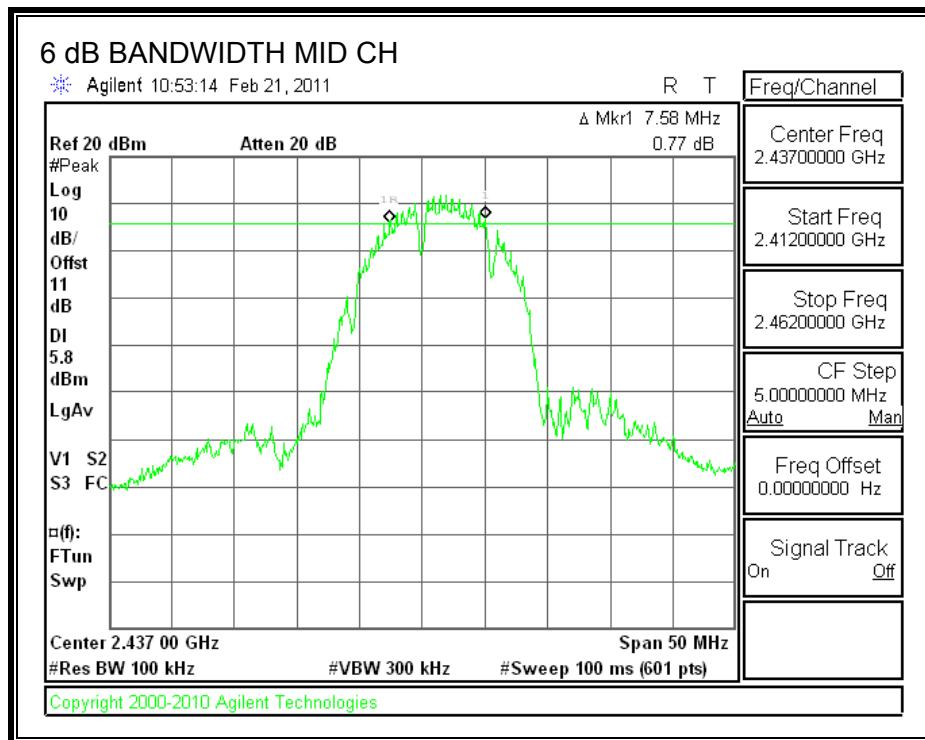
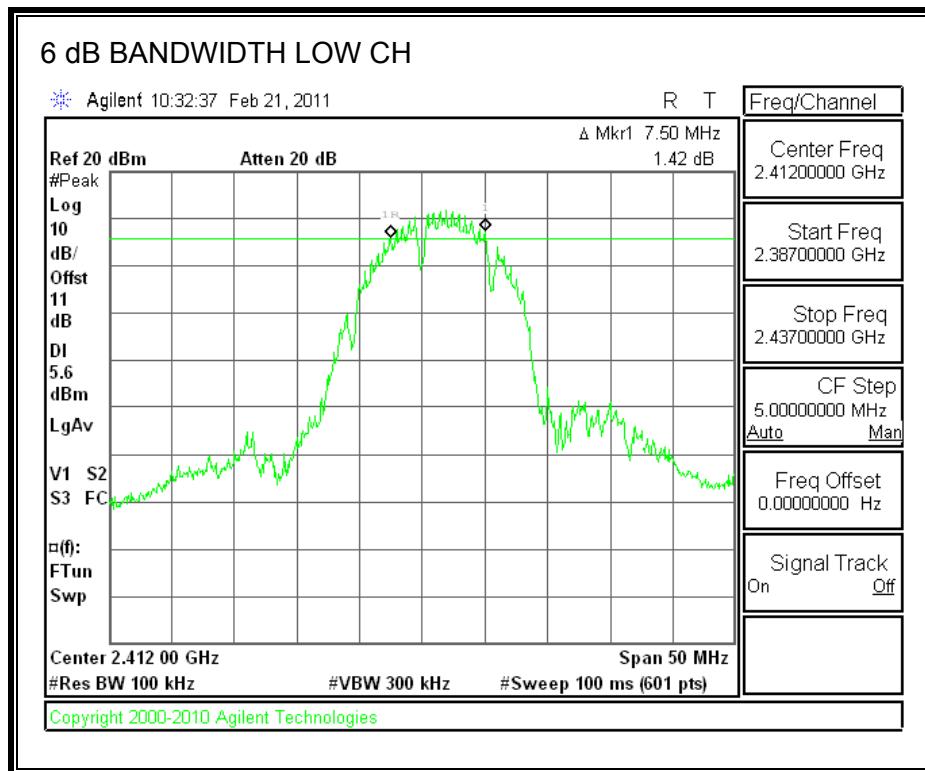
##### TEST PROCEDURE

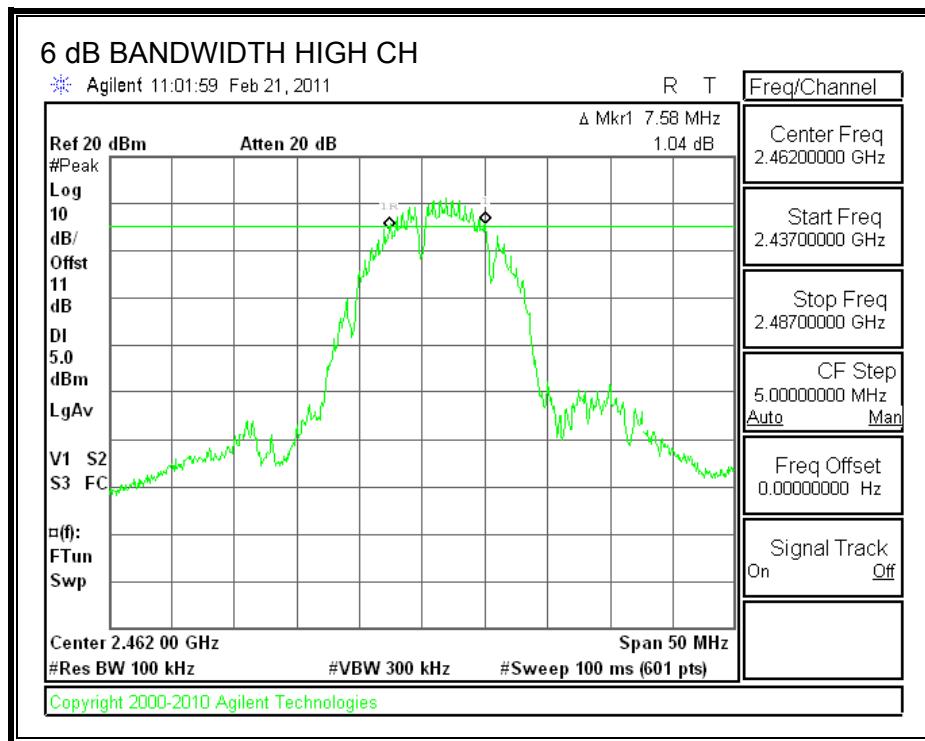
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

##### 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.

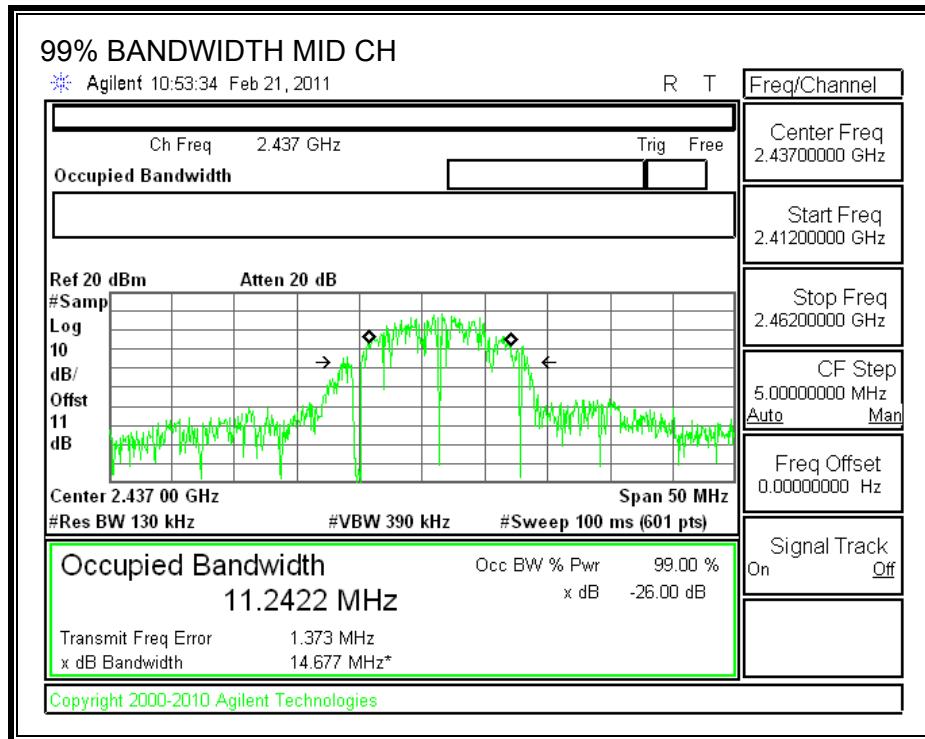
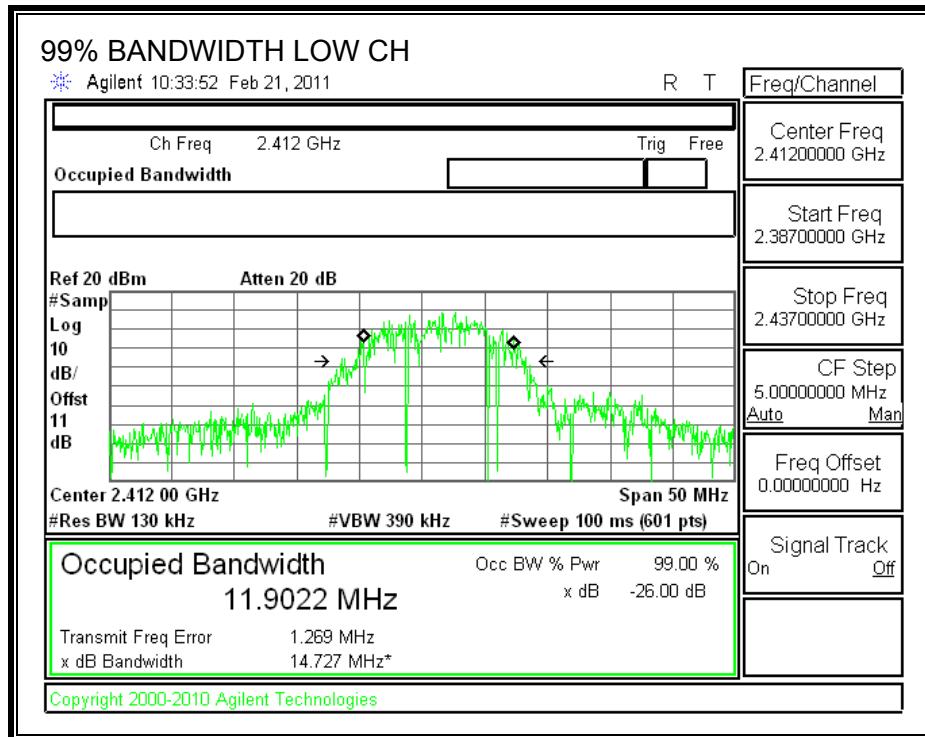
#### TEST PROCEDURE

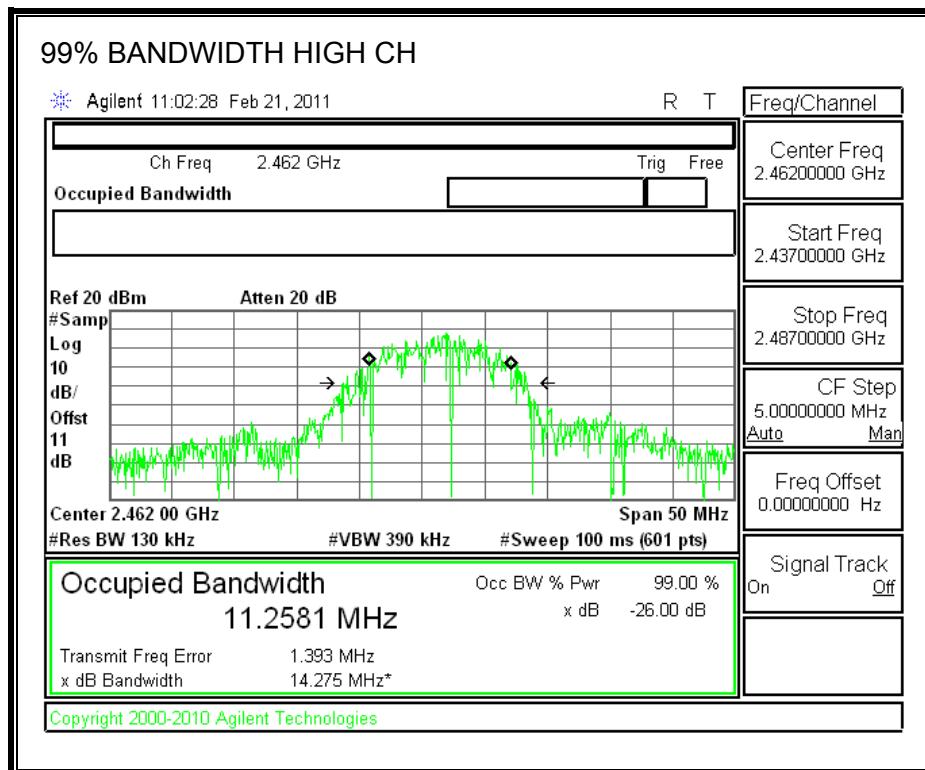
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

#### 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.

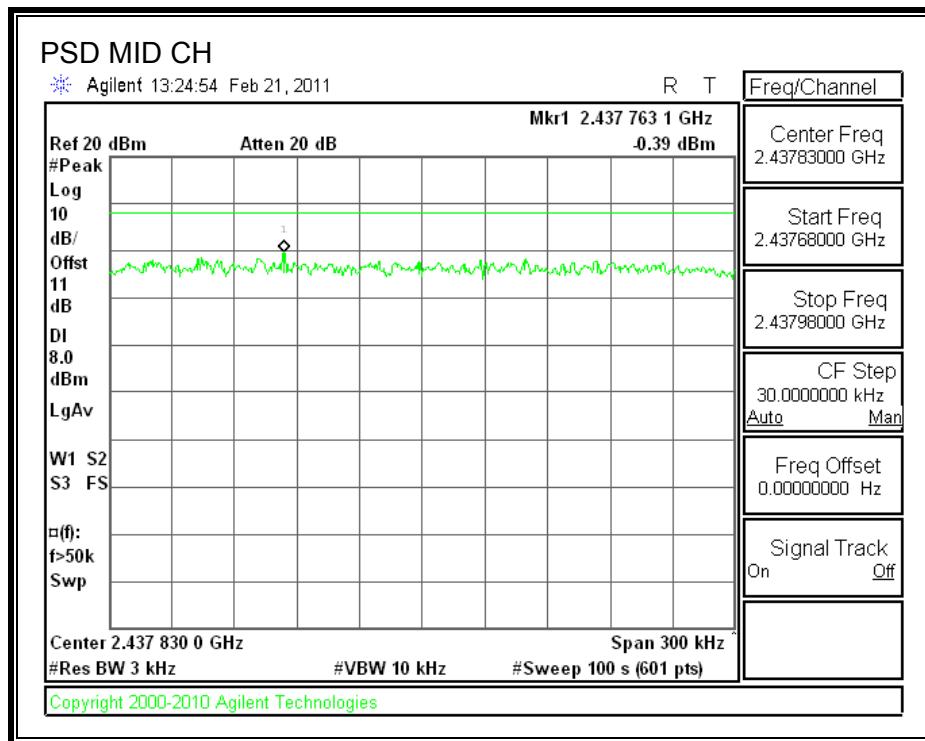
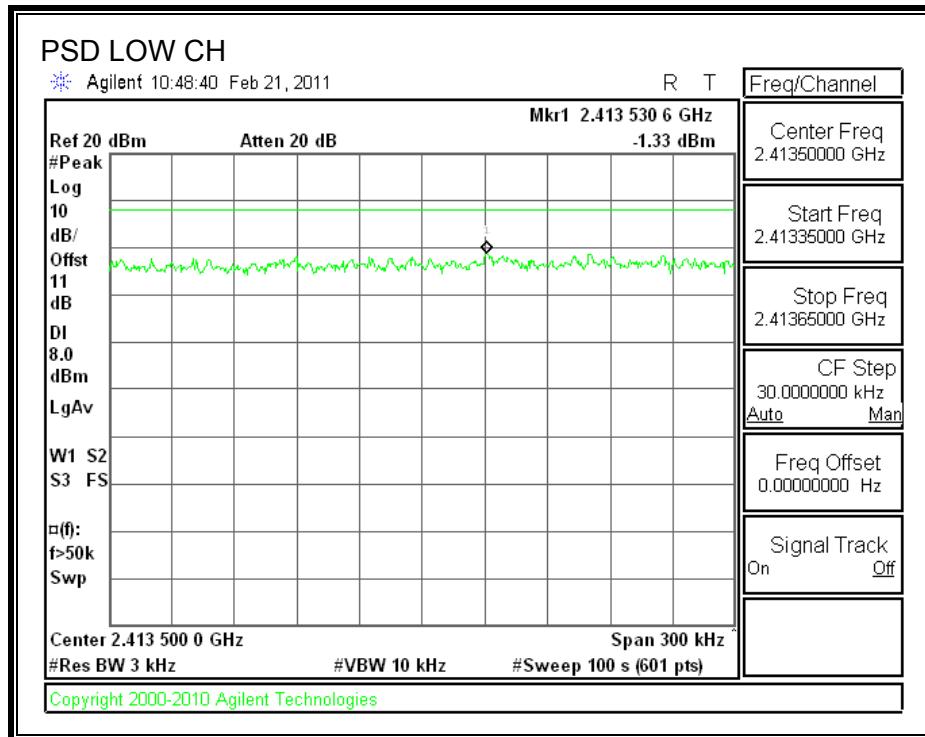
#### TEST PROCEDURE

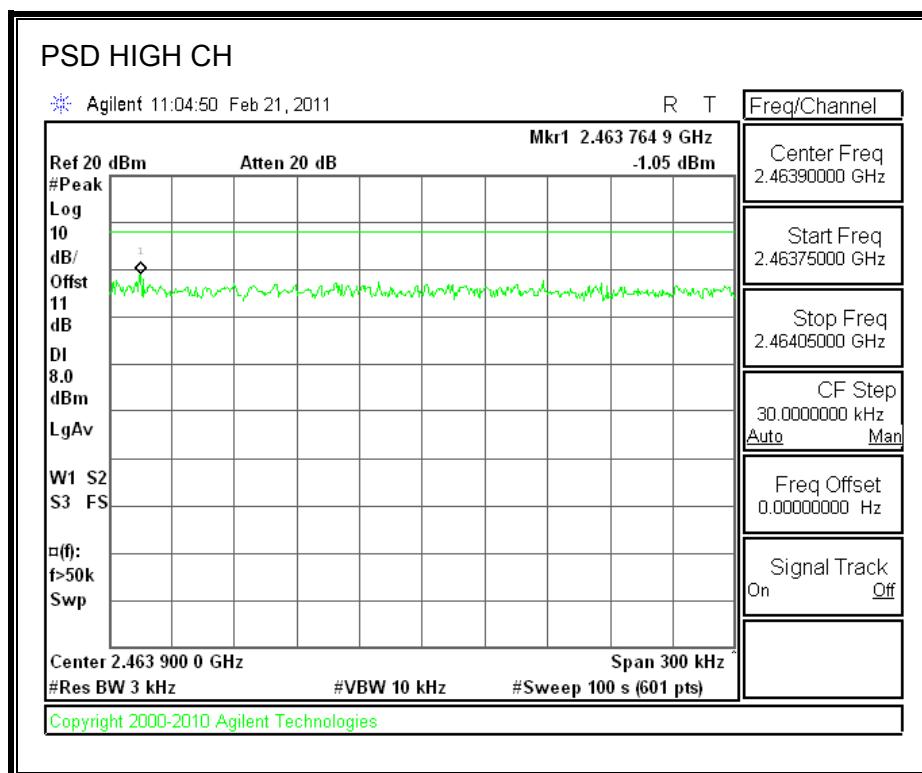
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

#### 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

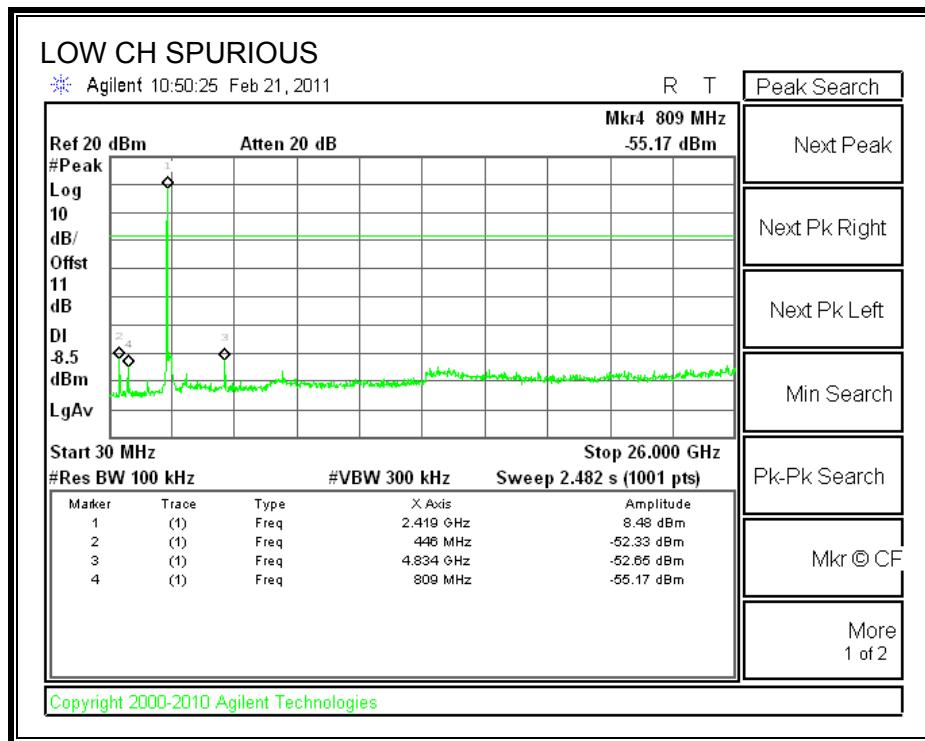
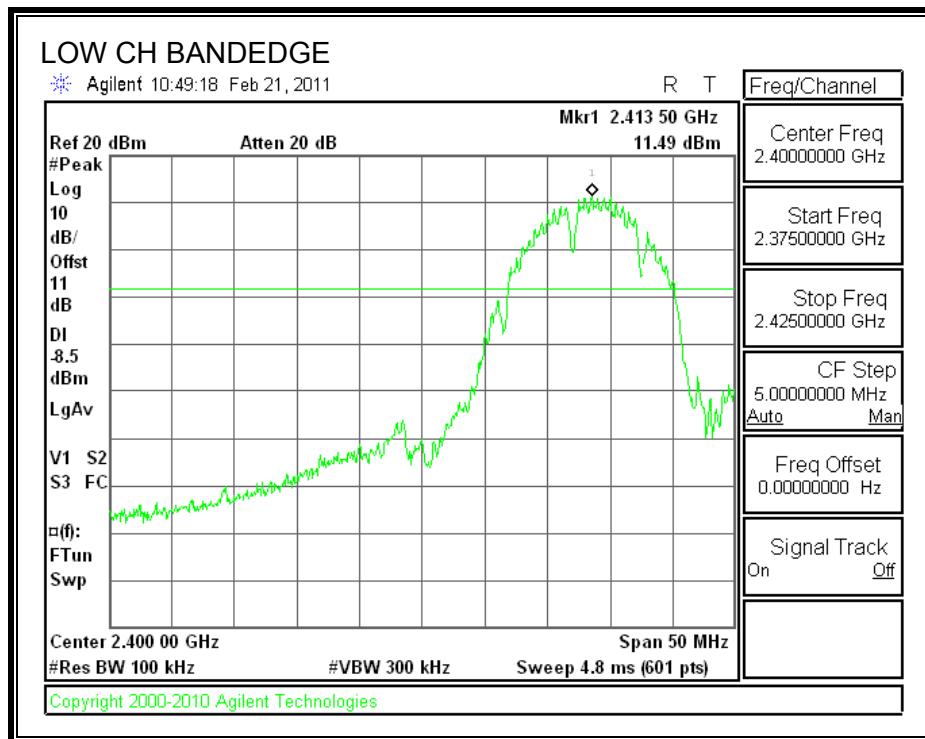
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

#### TEST PROCEDURE

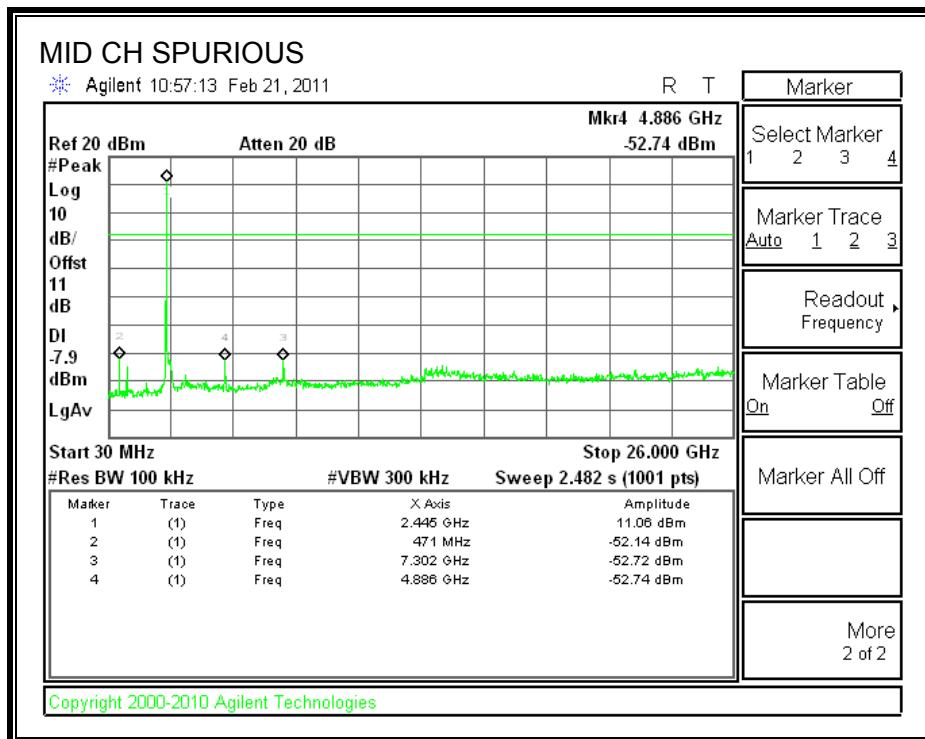
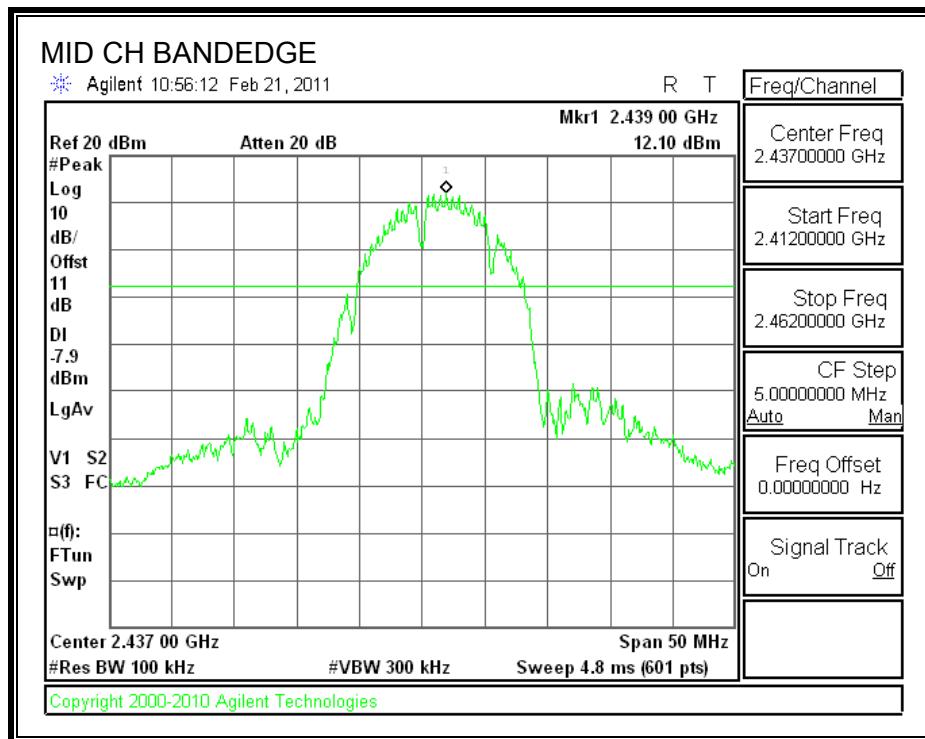
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

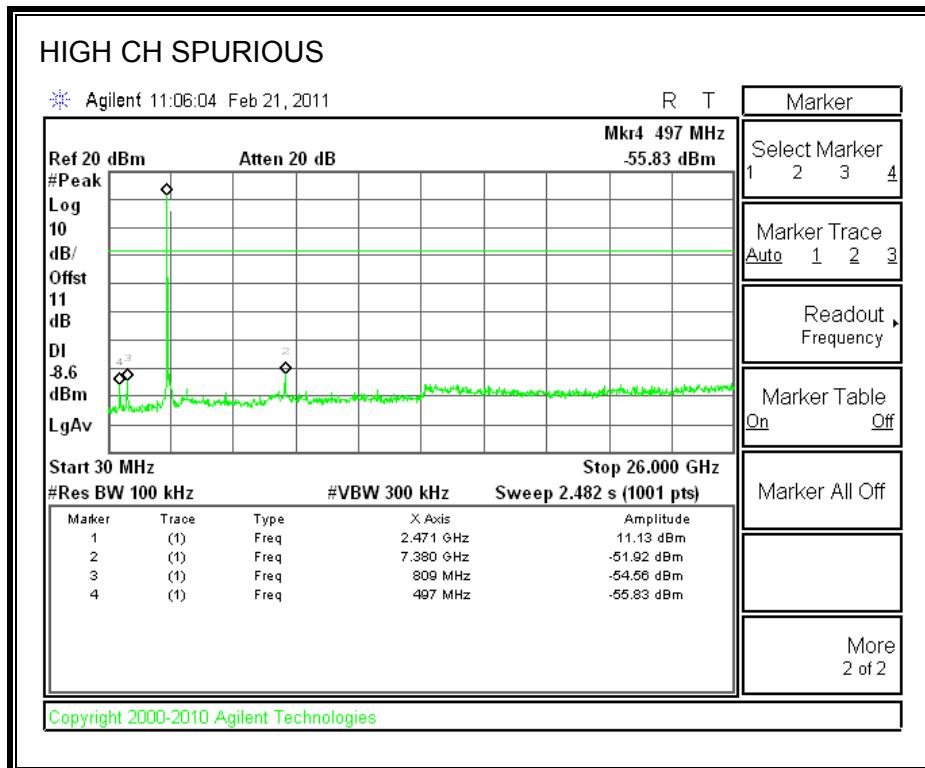
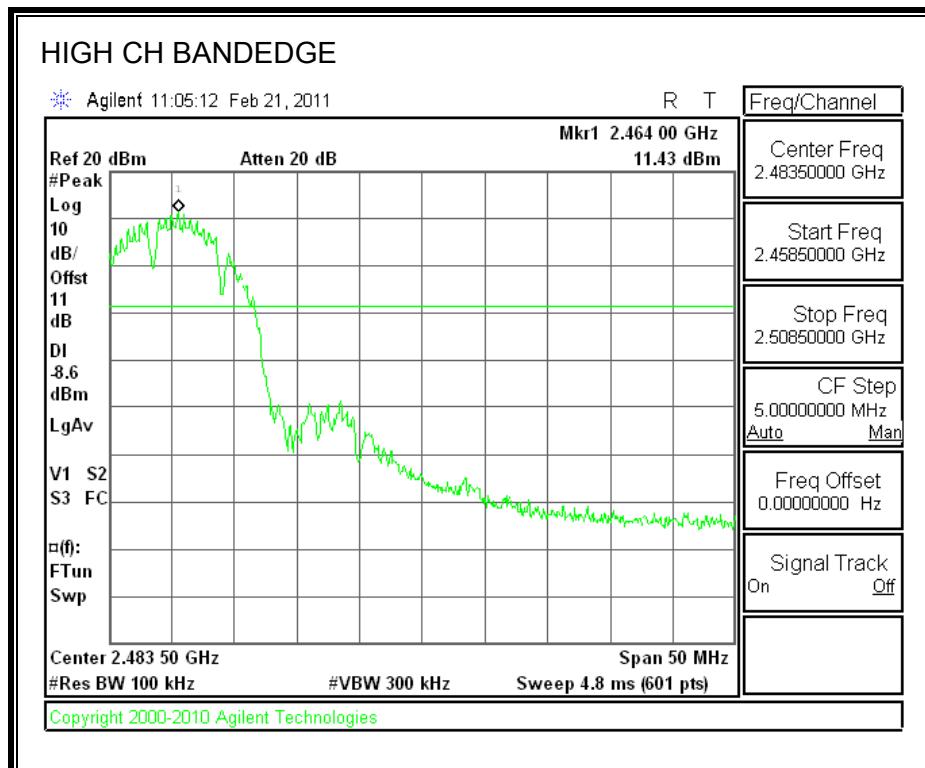
**SPURIOUS EMISSIONS, LOW CHANNEL**



**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.

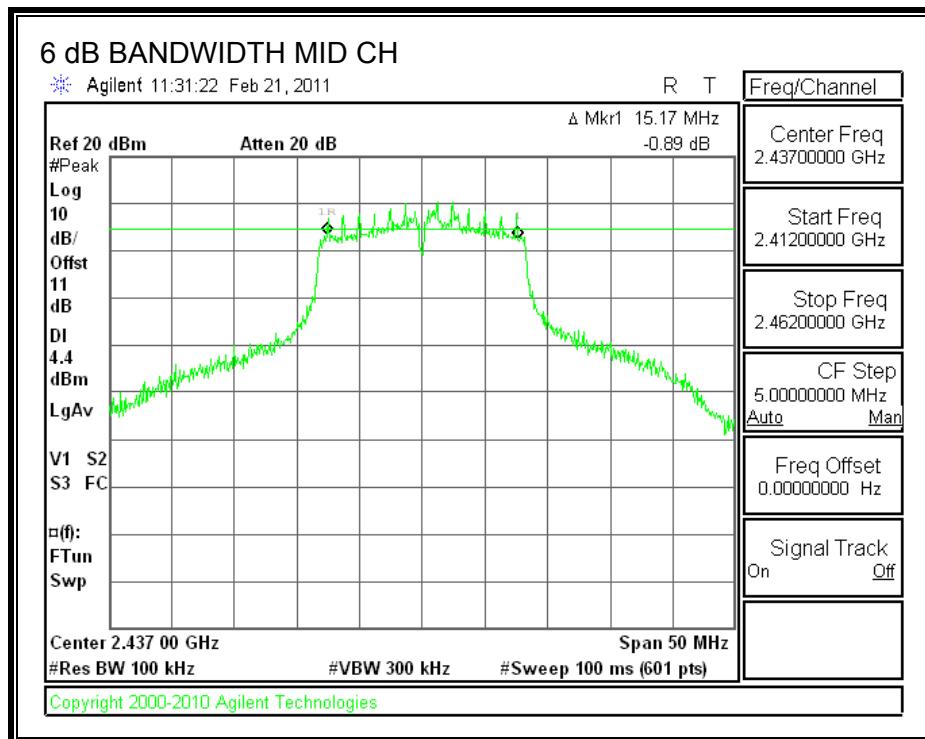
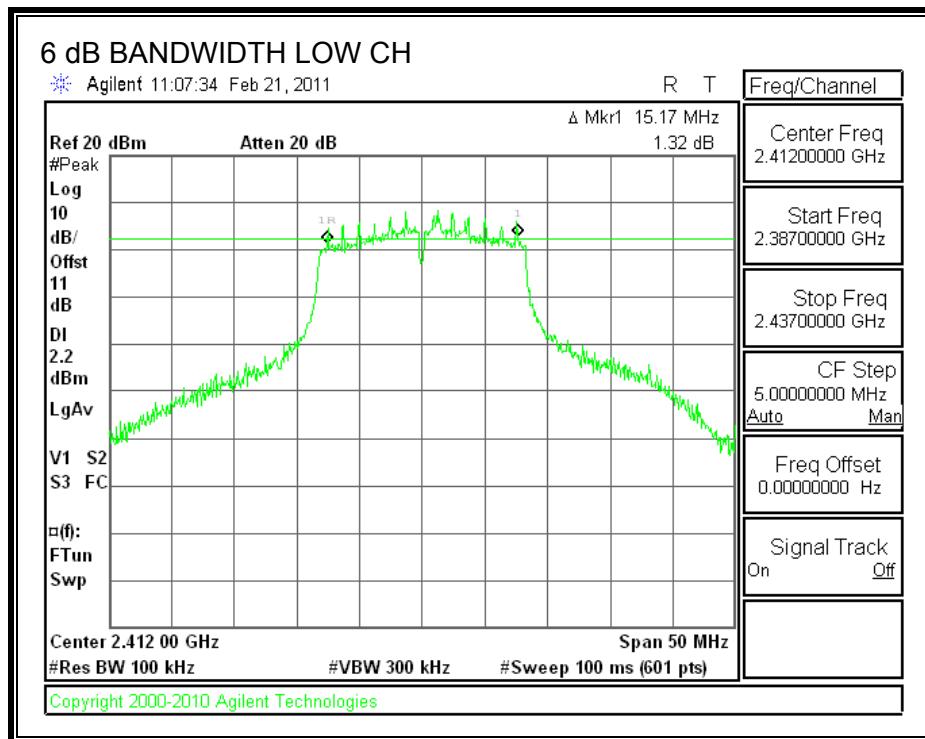
#### TEST PROCEDURE

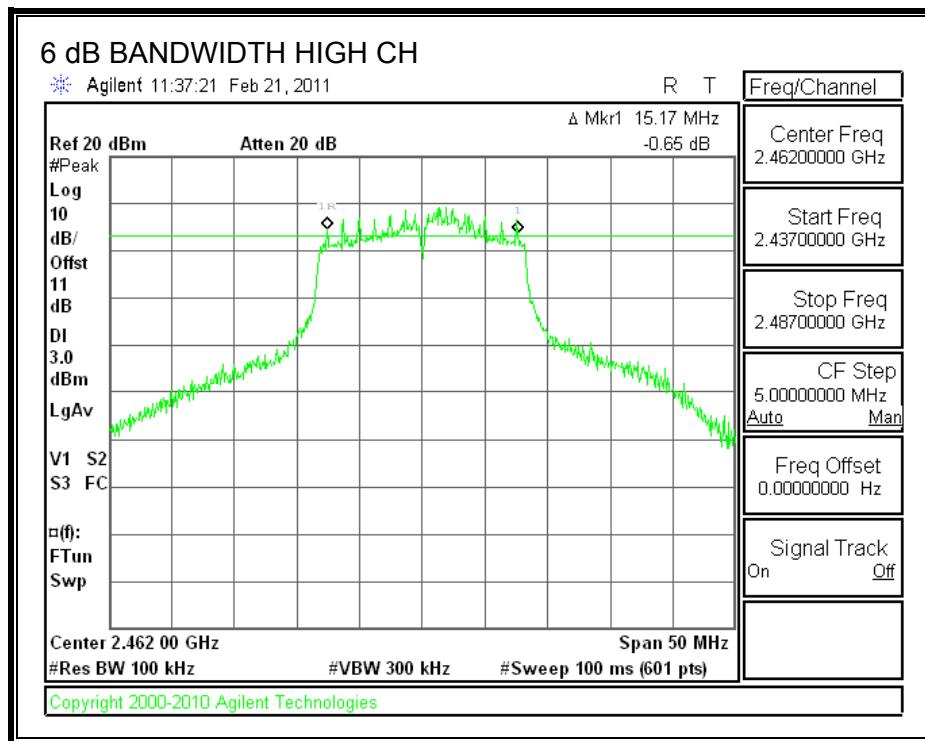
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

#### 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.

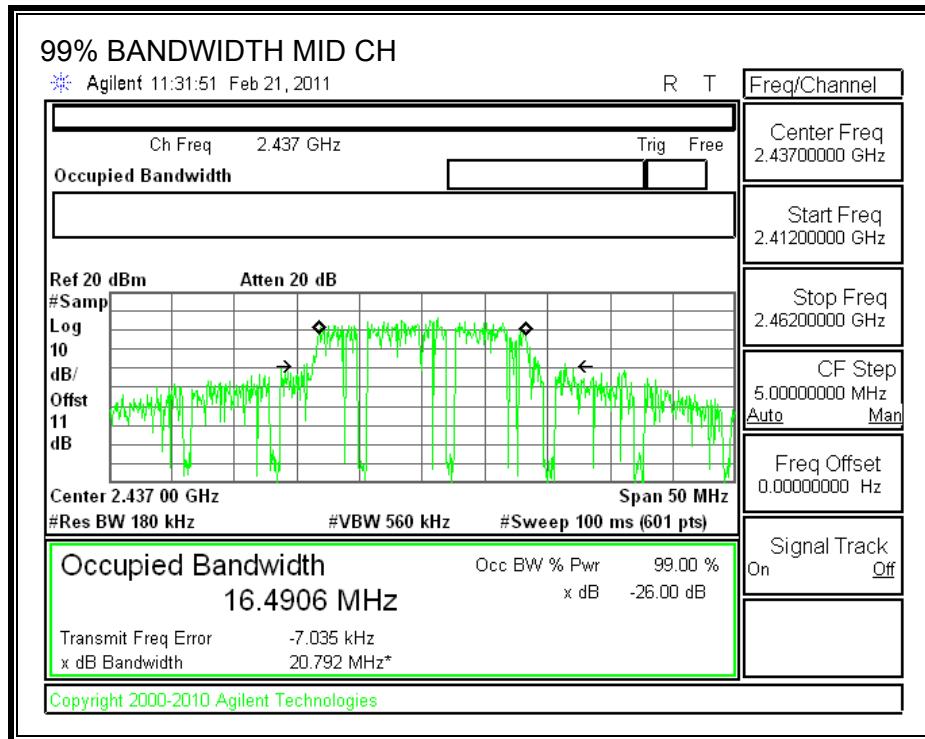
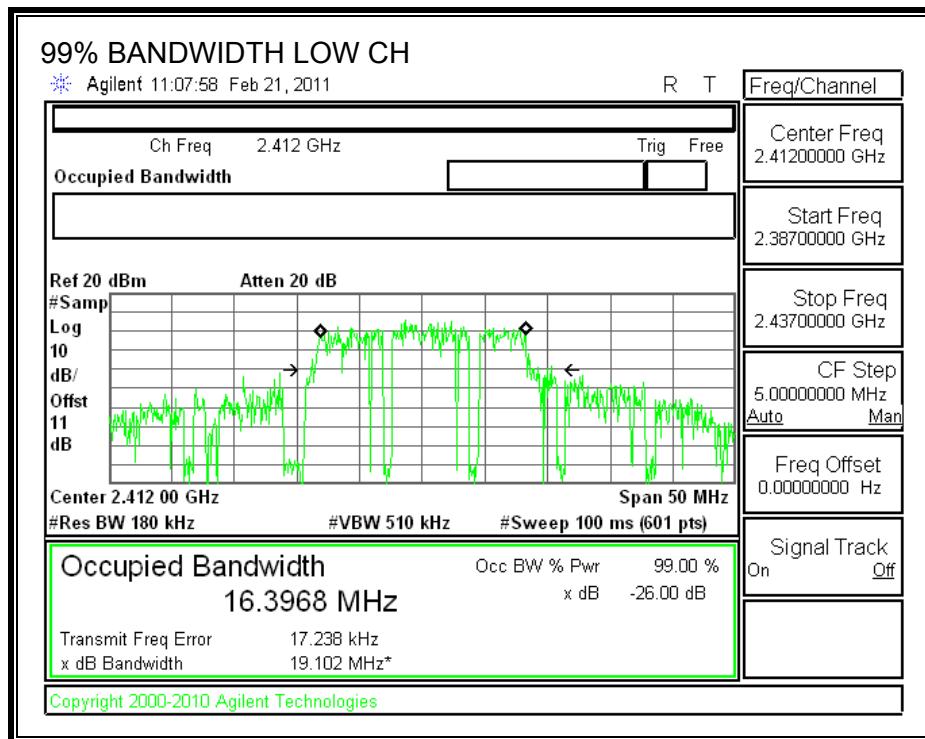
#### TEST PROCEDURE

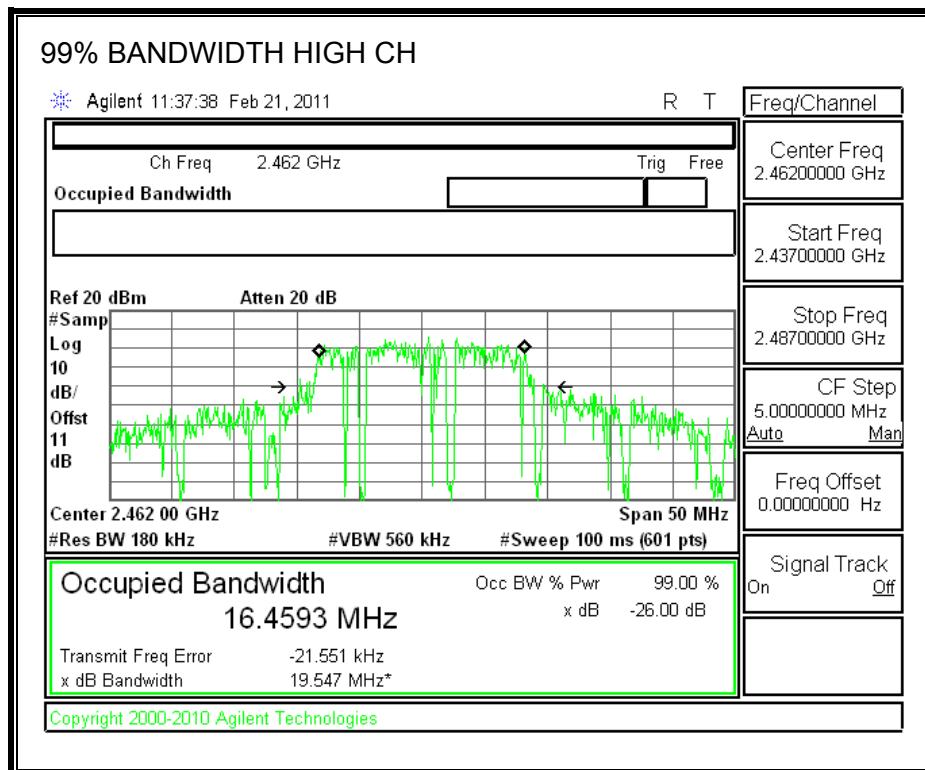
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

#### 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.

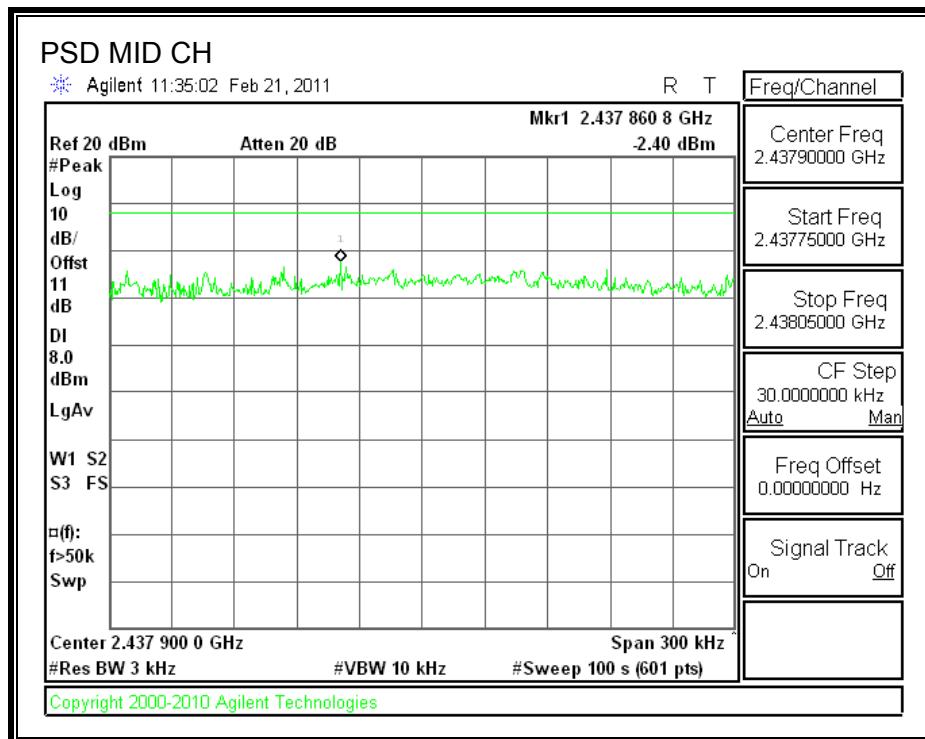
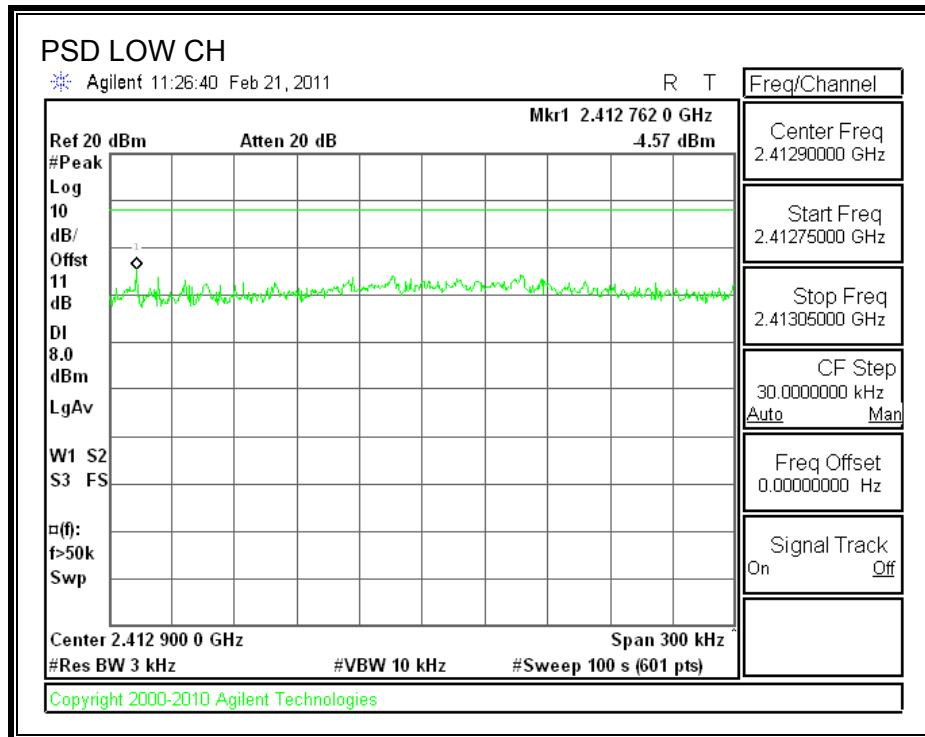
### TEST PROCEDURE

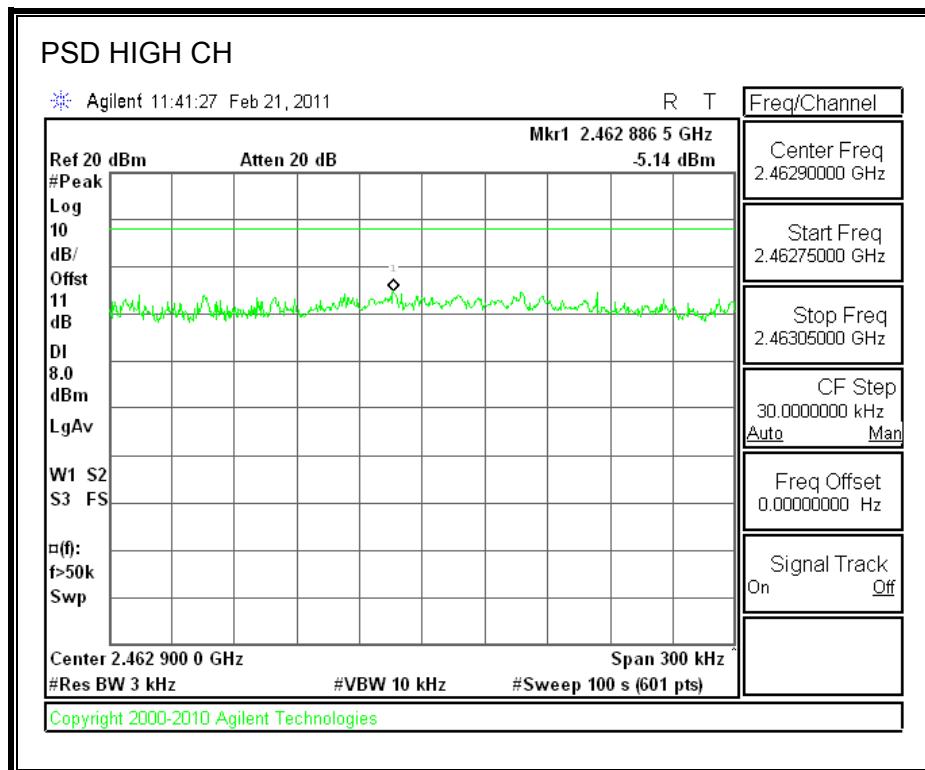
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

### 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

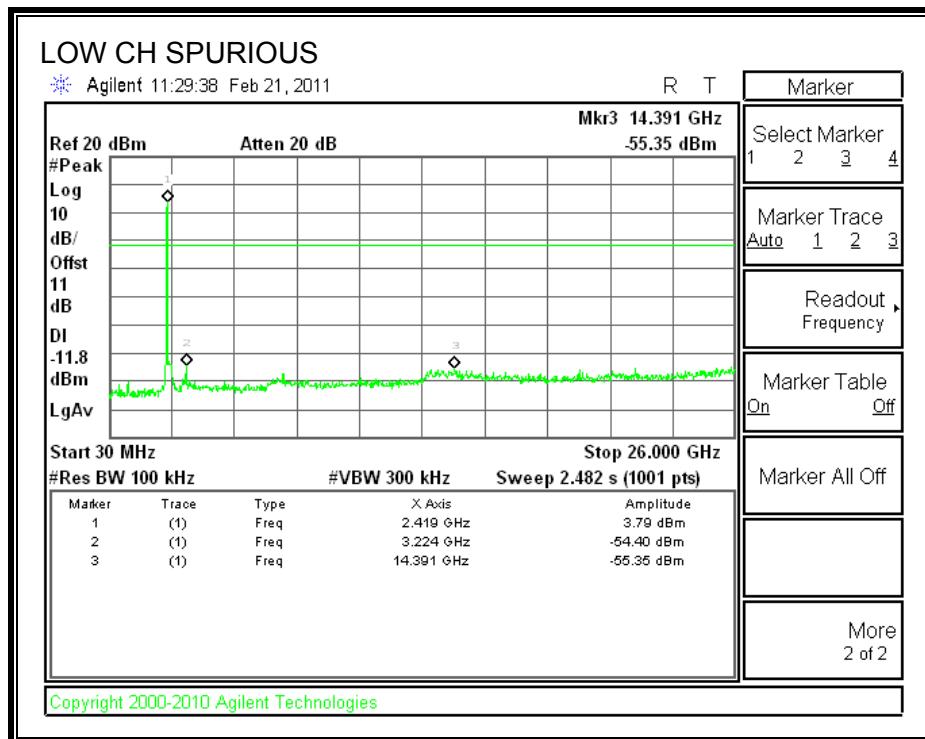
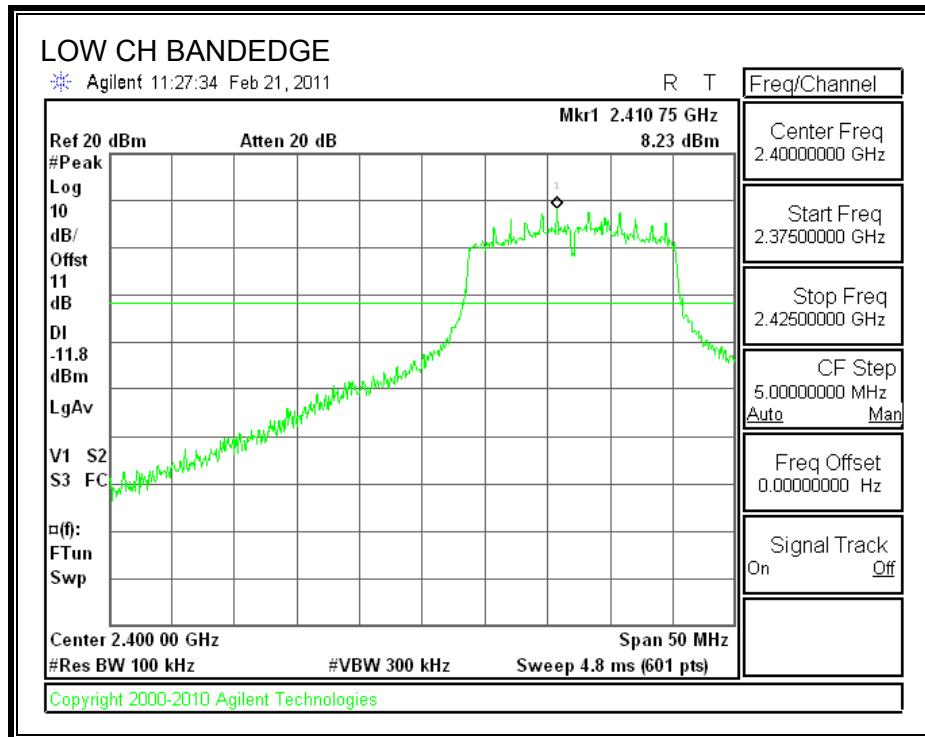
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

### TEST PROCEDURE

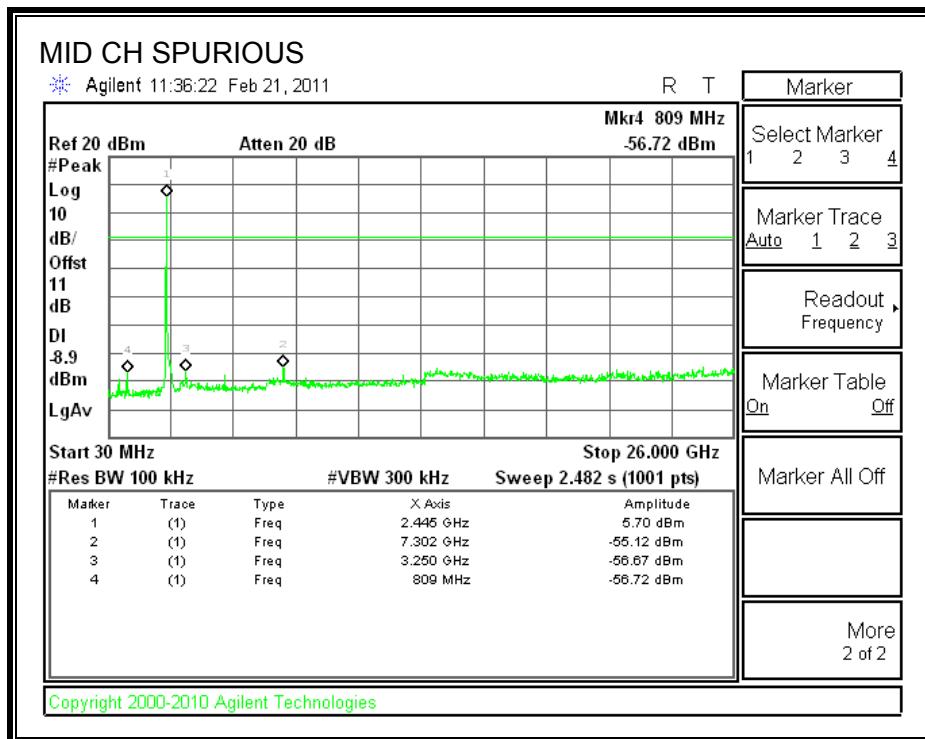
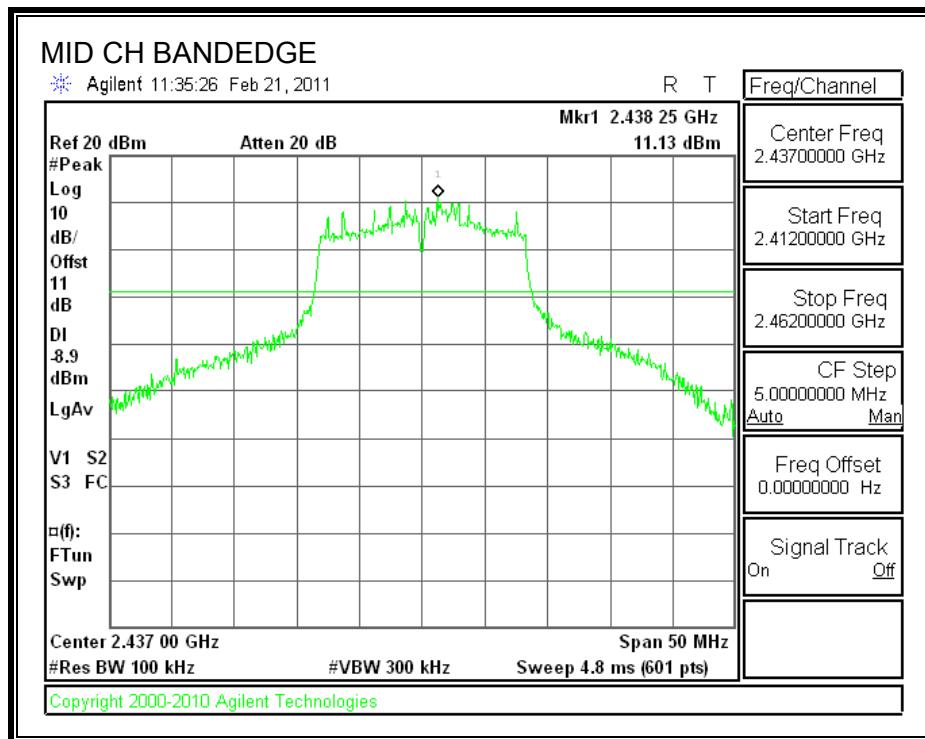
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

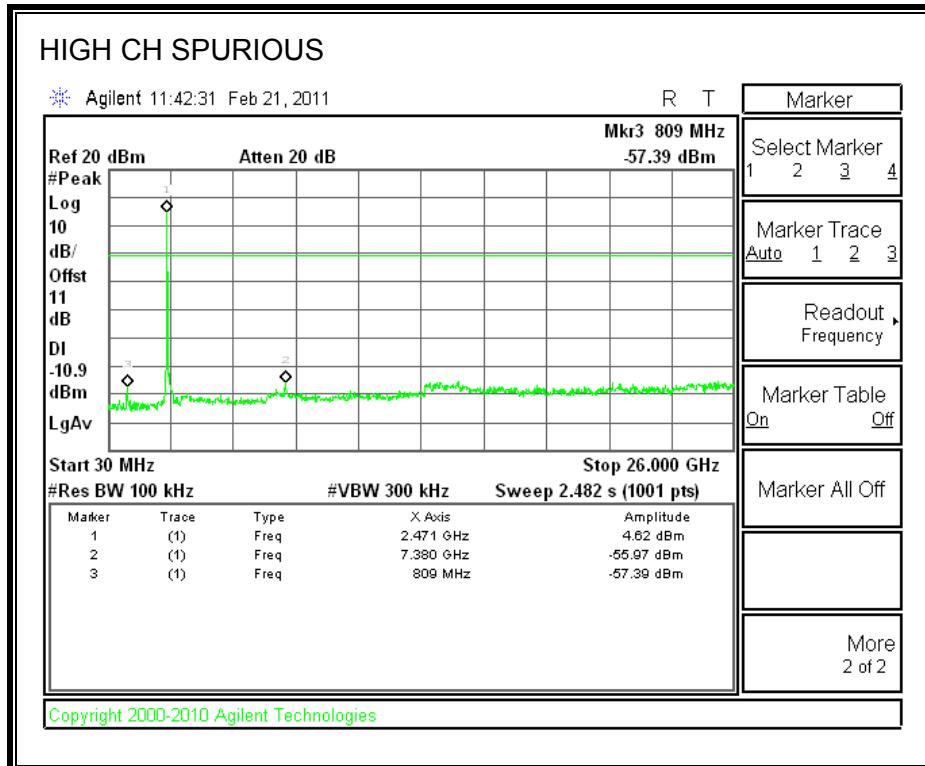
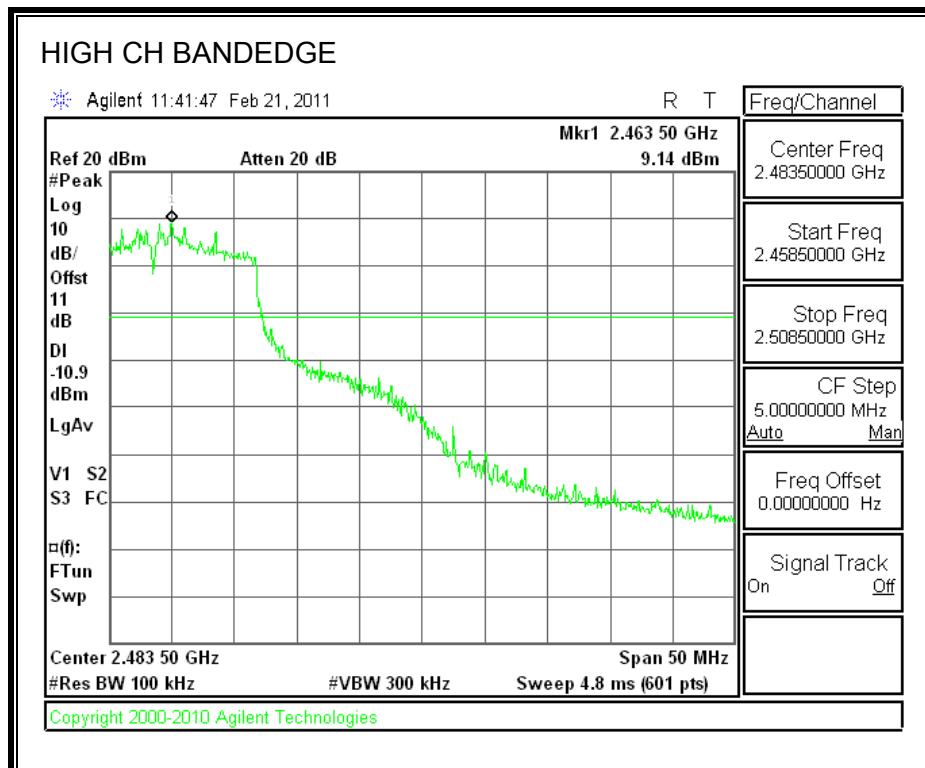
## SPURIOUS EMISSIONS, LOW CHANNEL



**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.

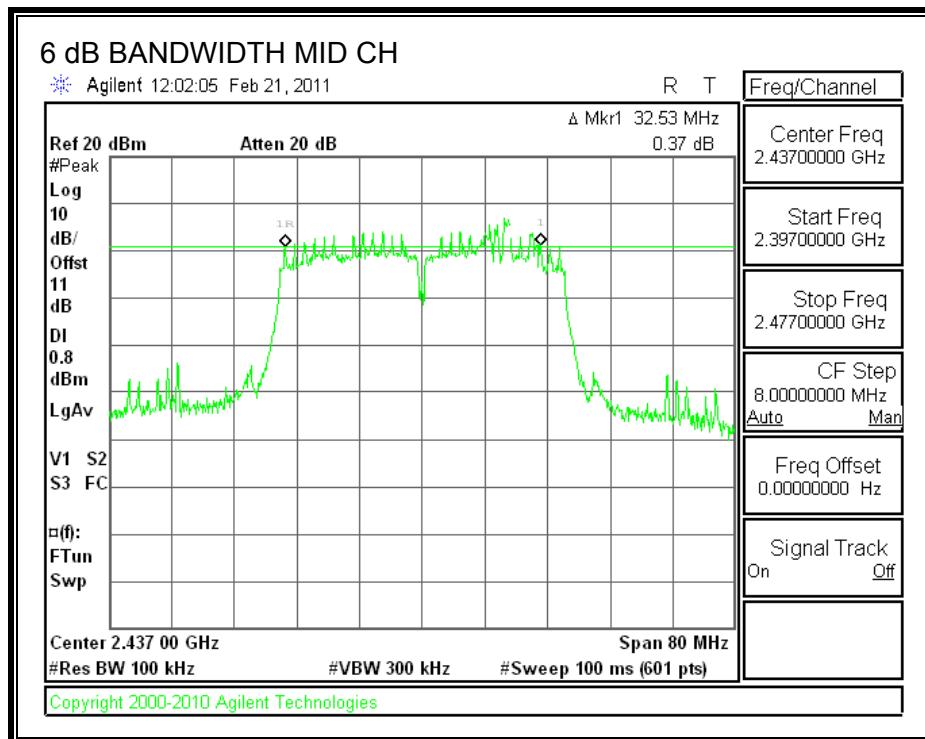
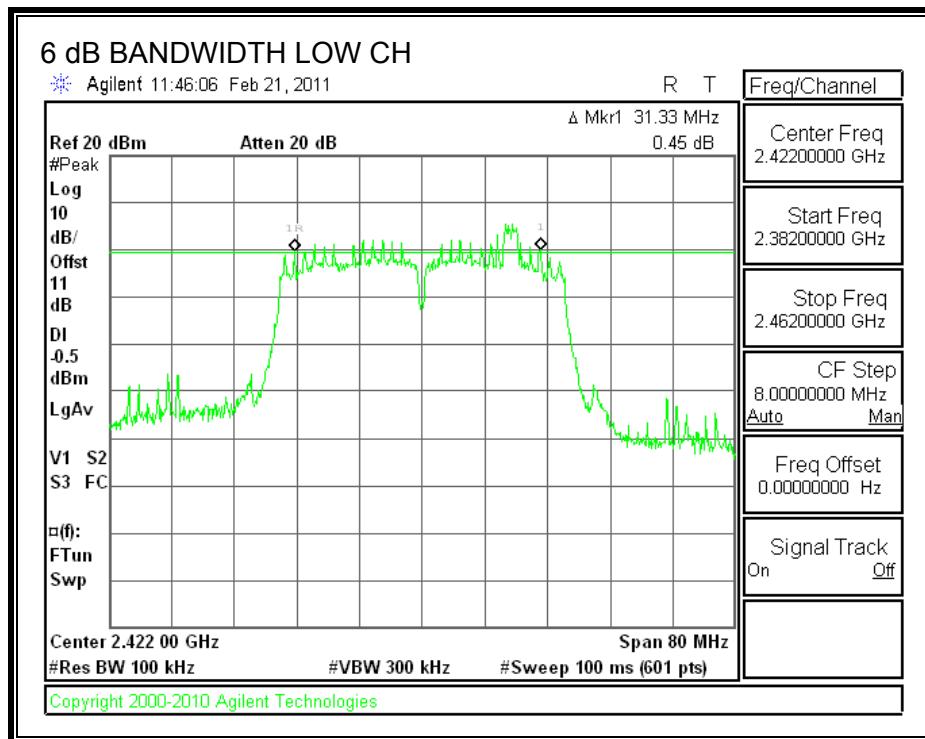
##### TEST PROCEDURE

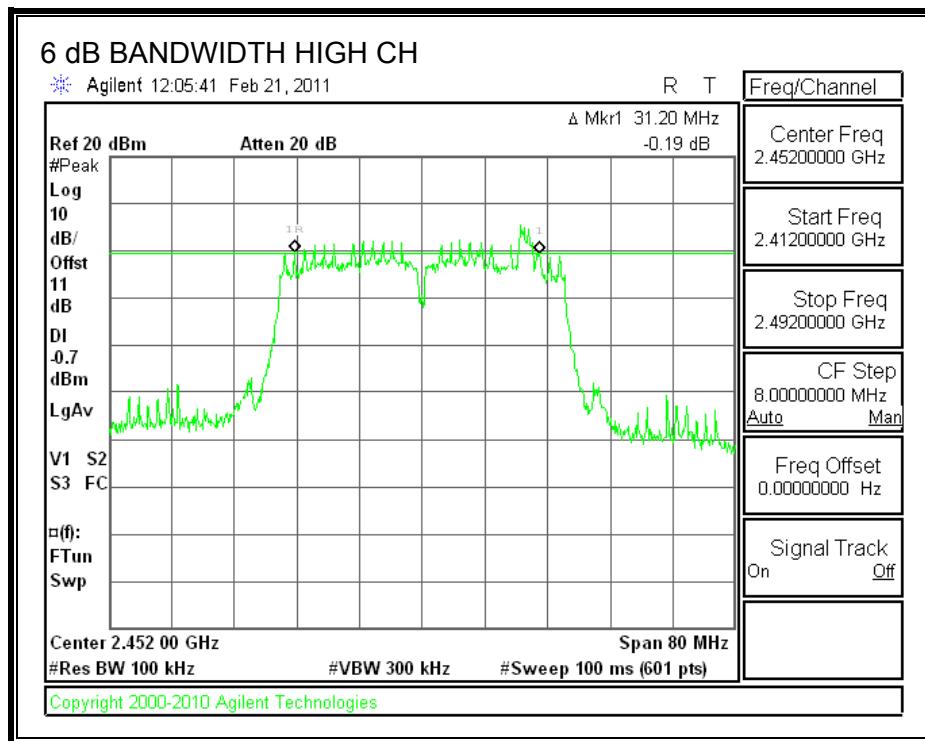
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

##### 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.

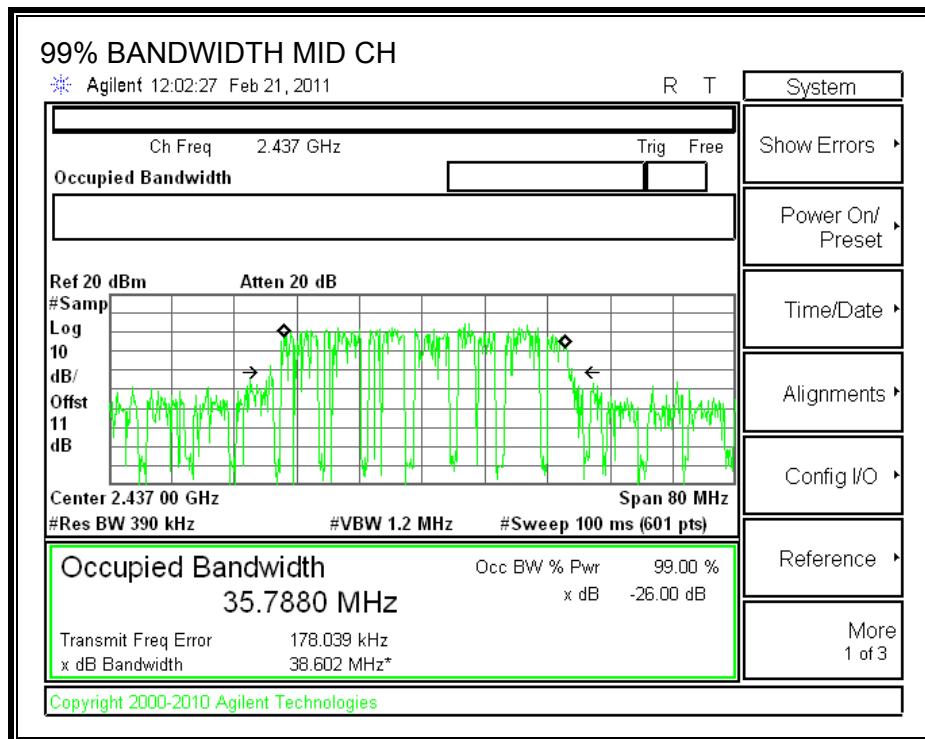
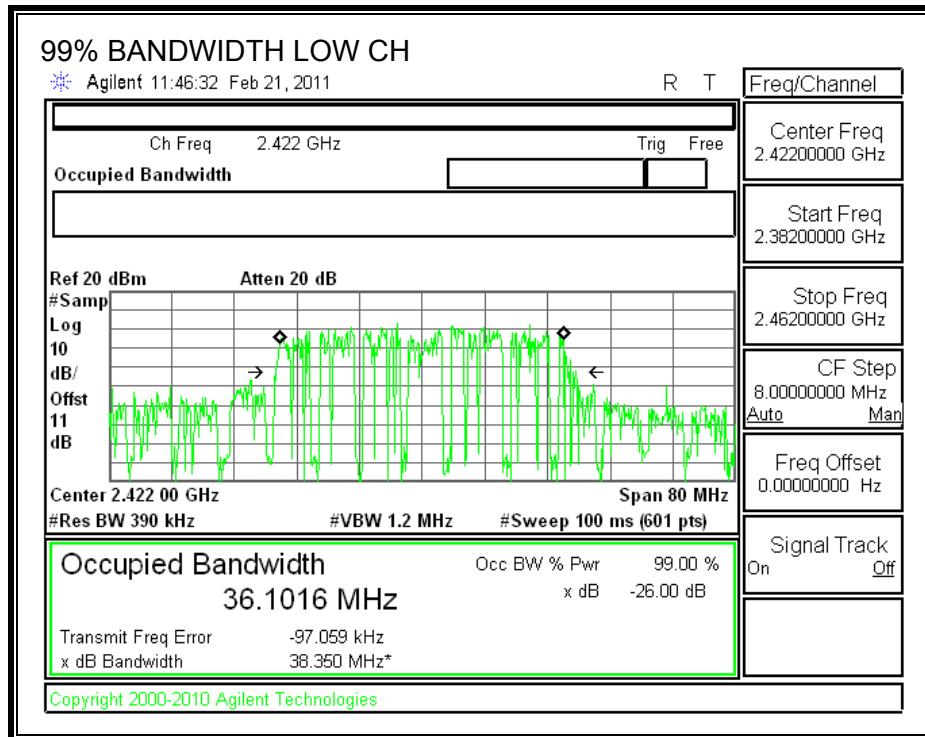
#### TEST PROCEDURE

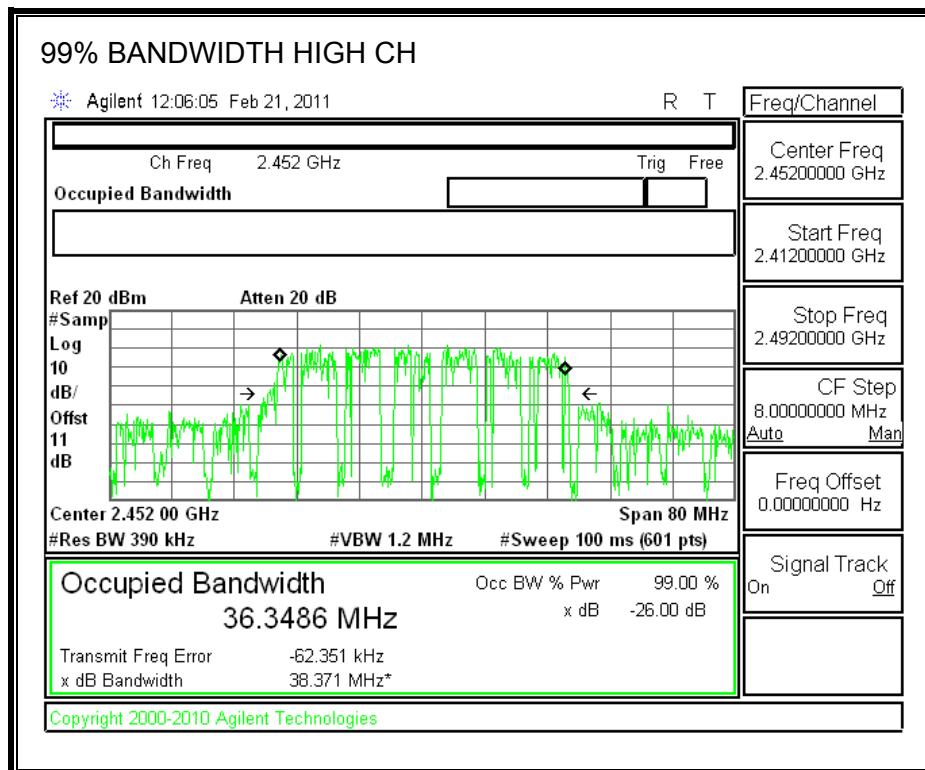
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

#### 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.

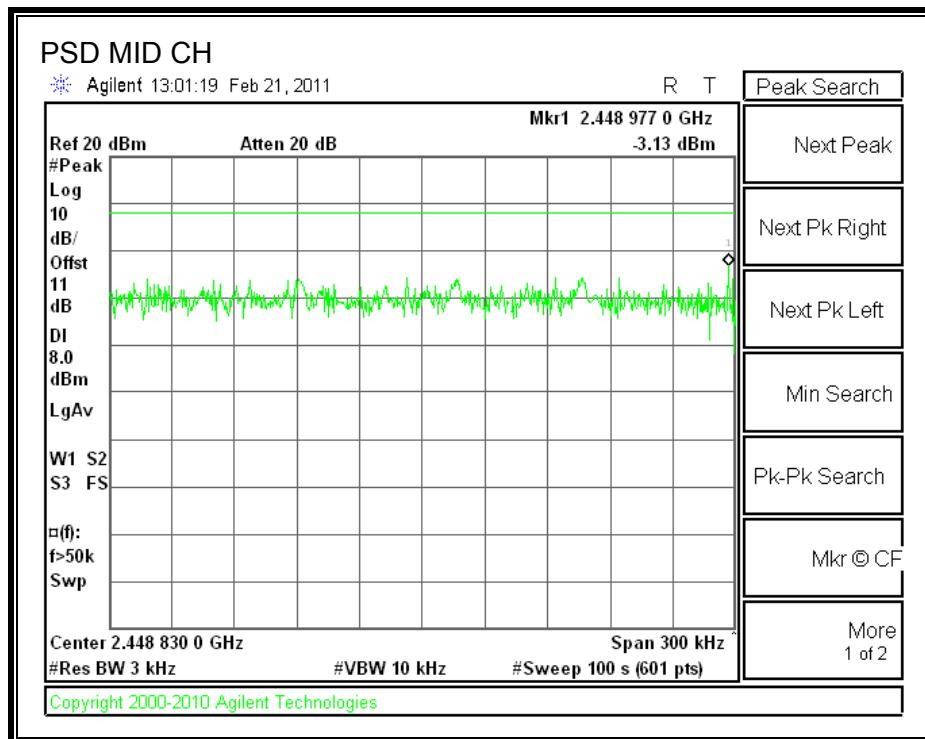
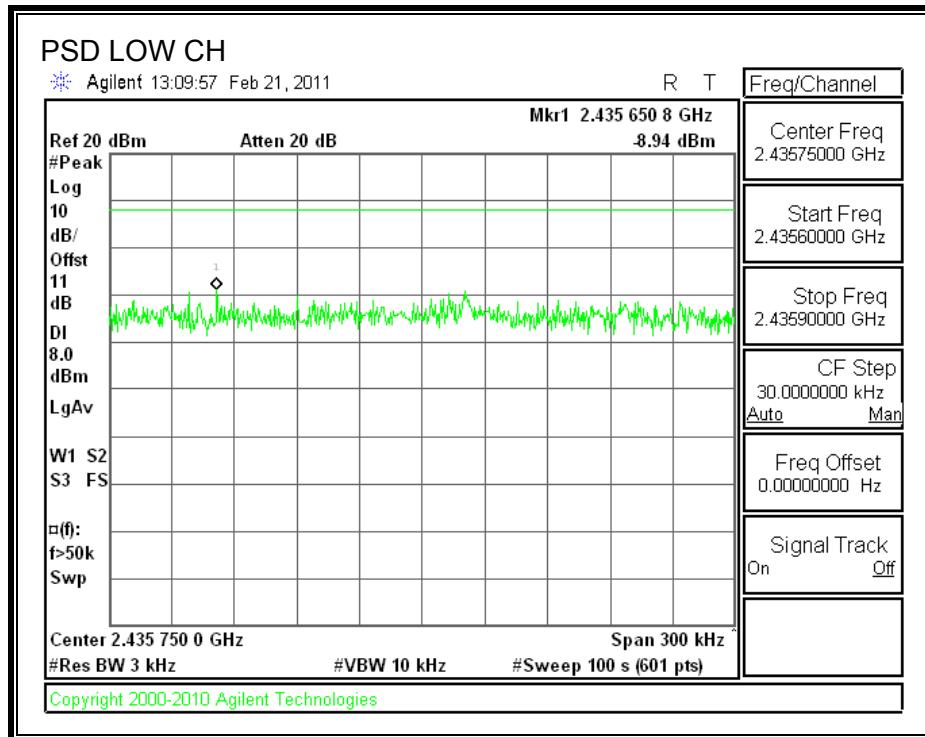
#### TEST PROCEDURE

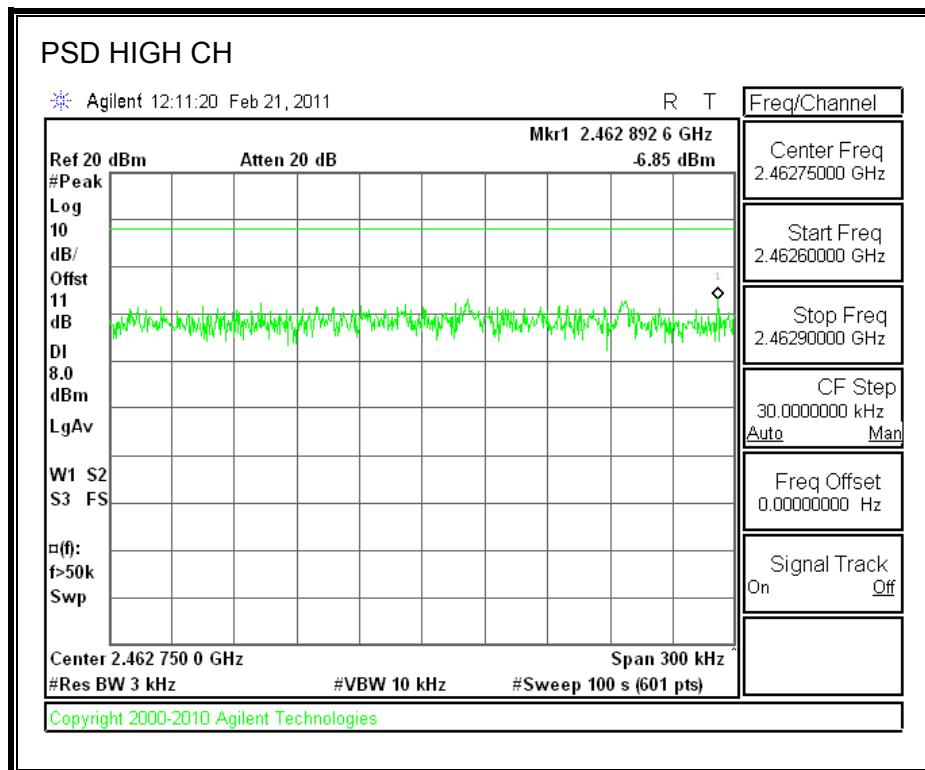
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

#### 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

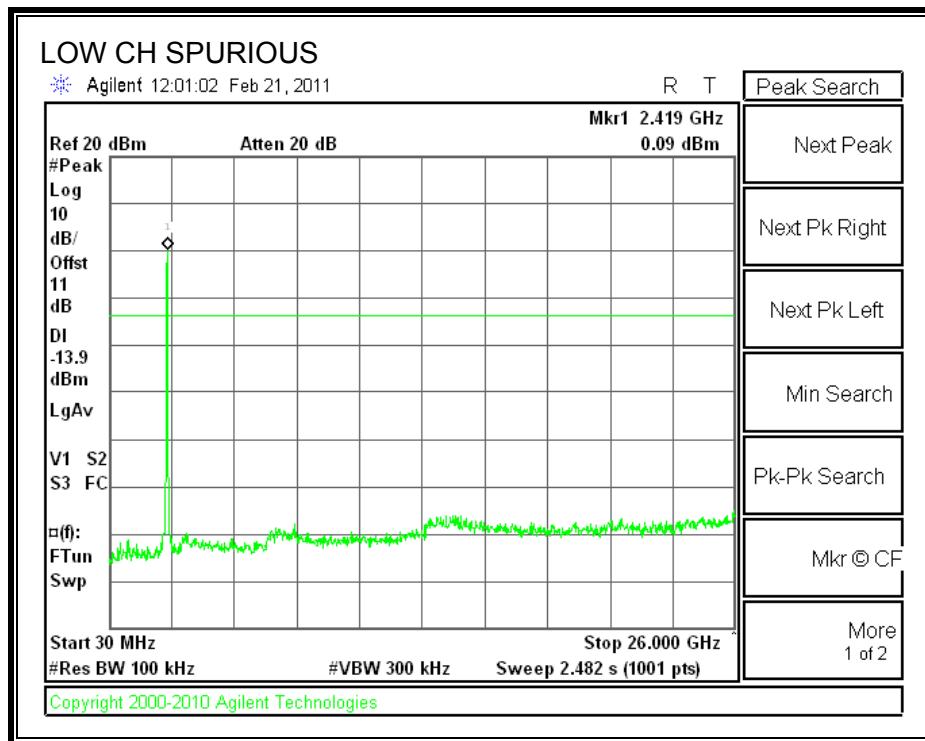
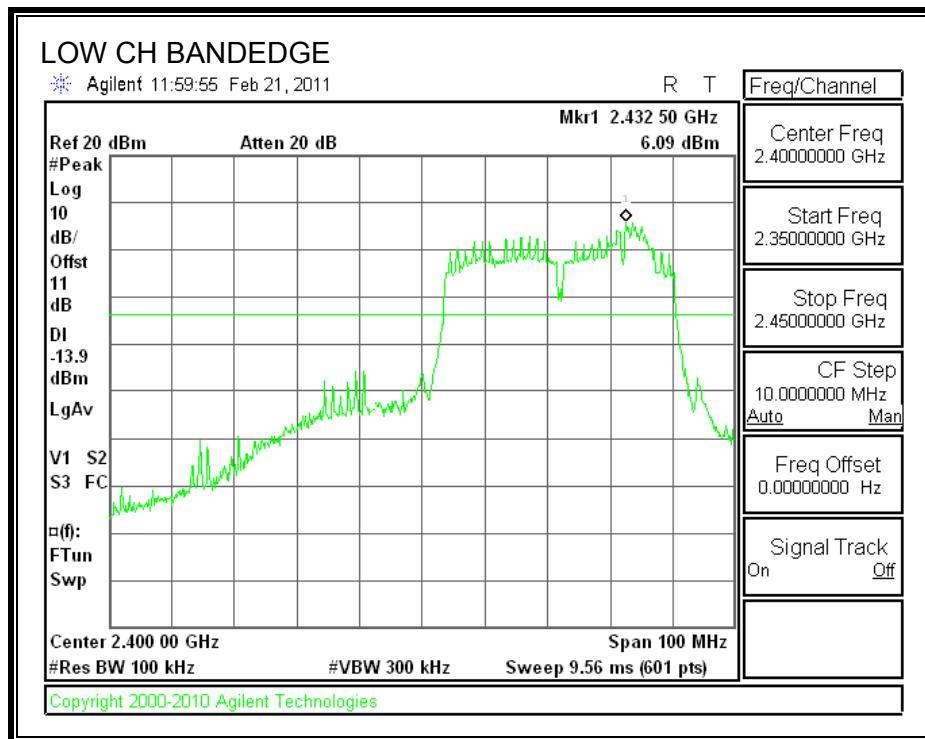
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

#### TEST PROCEDURE

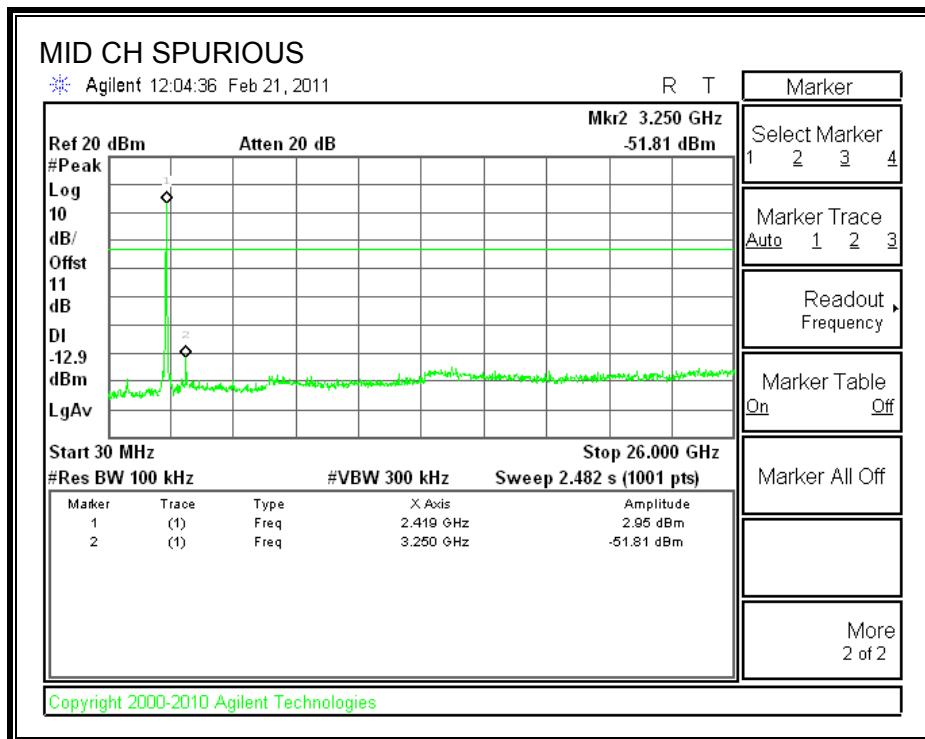
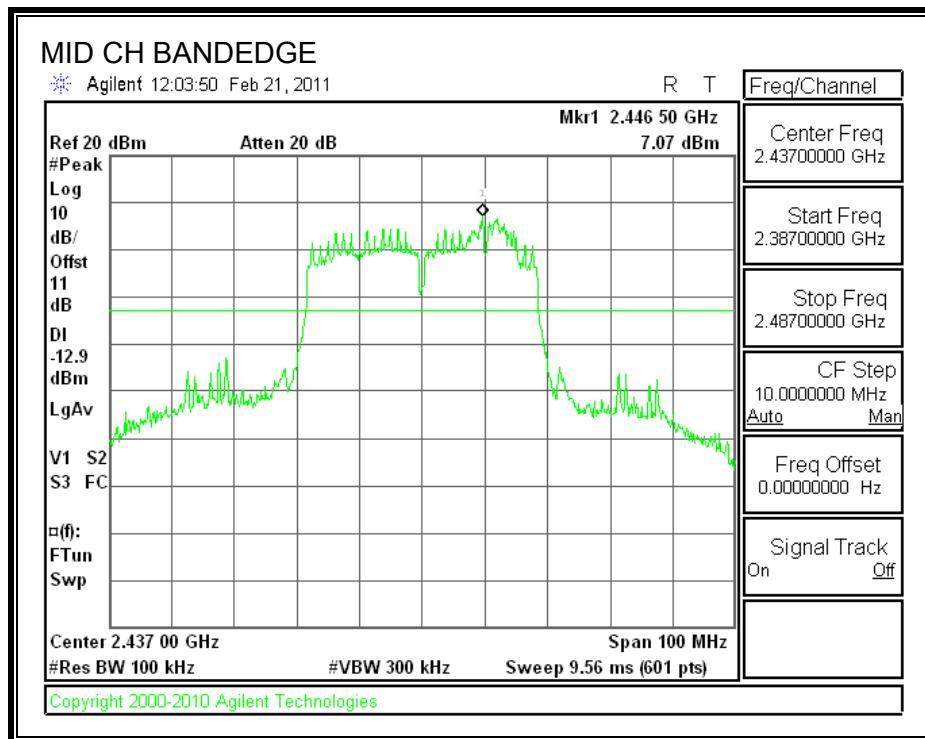
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

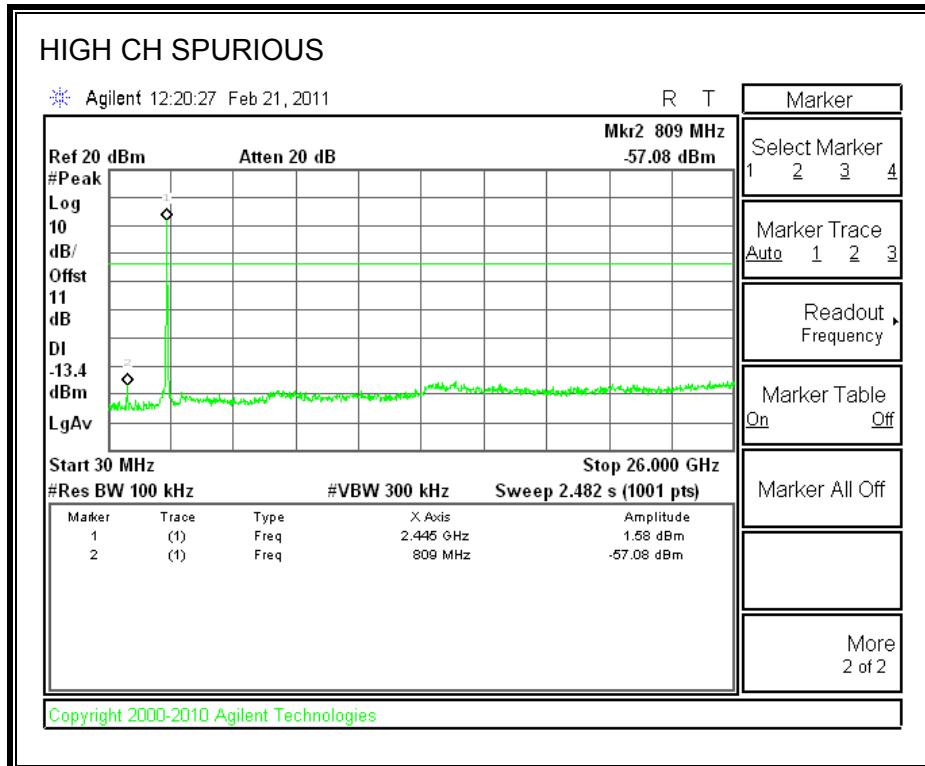
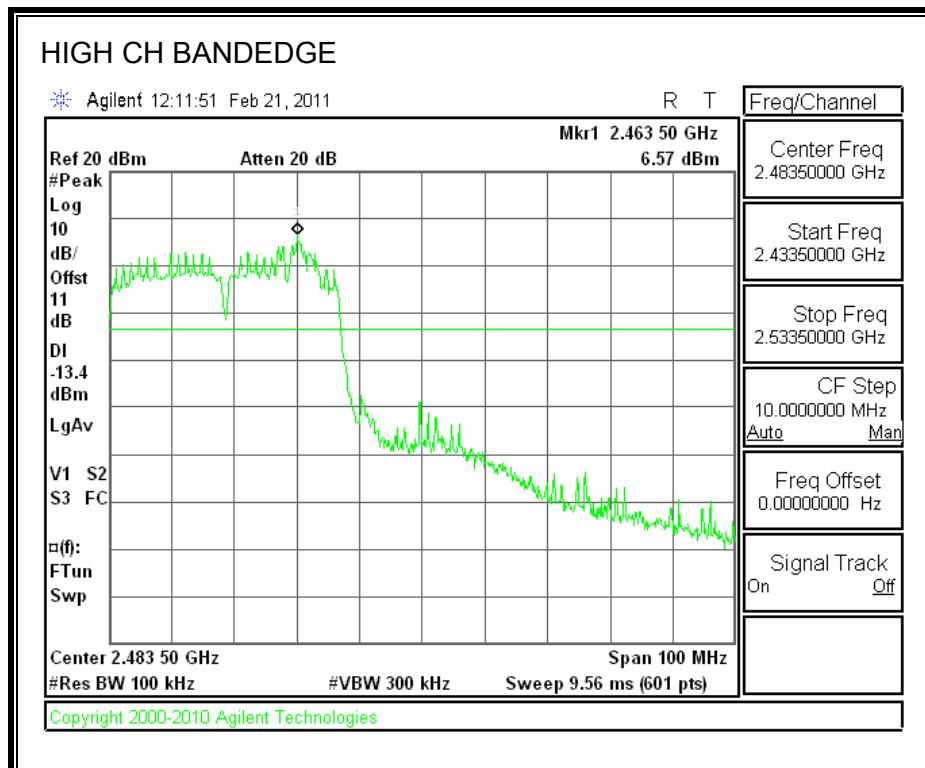
**SPURIOUS EMISSIONS, LOW CHANNEL**



**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.

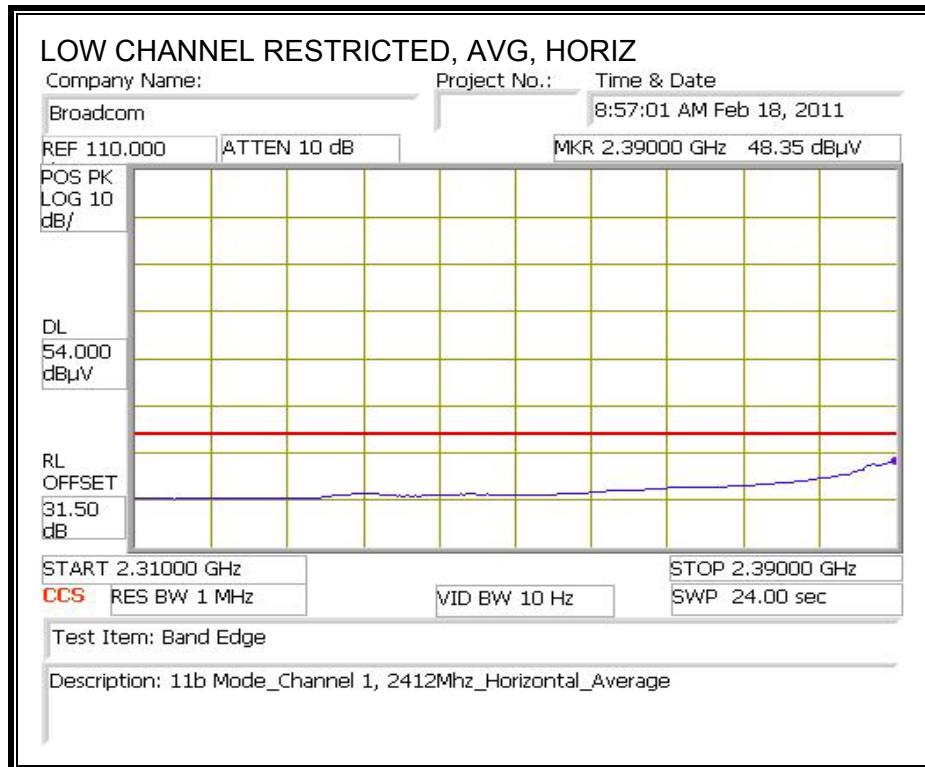
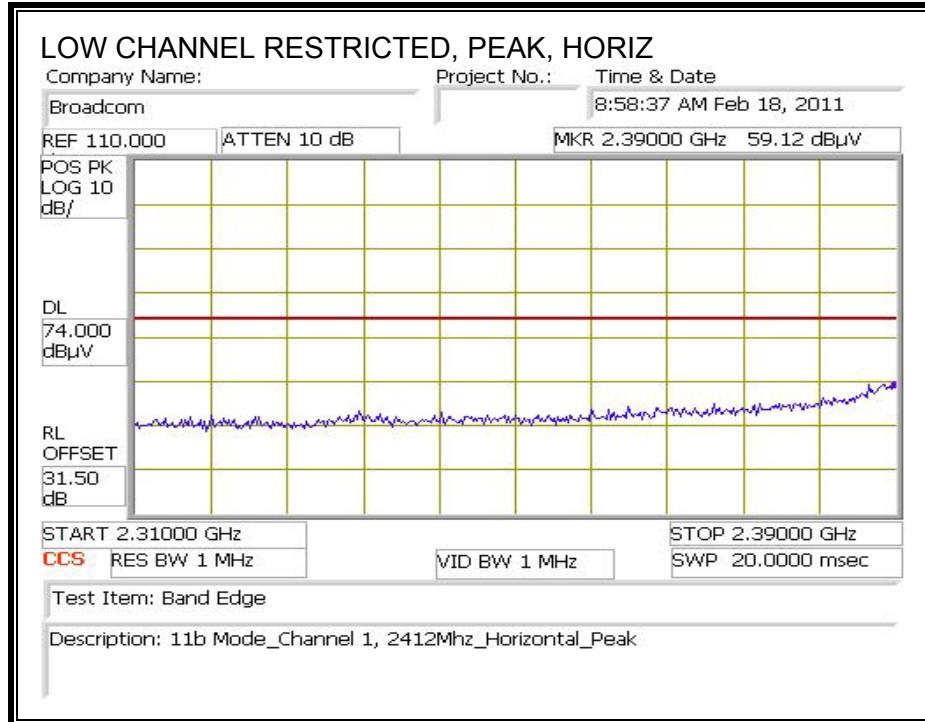
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

#### RESULTS

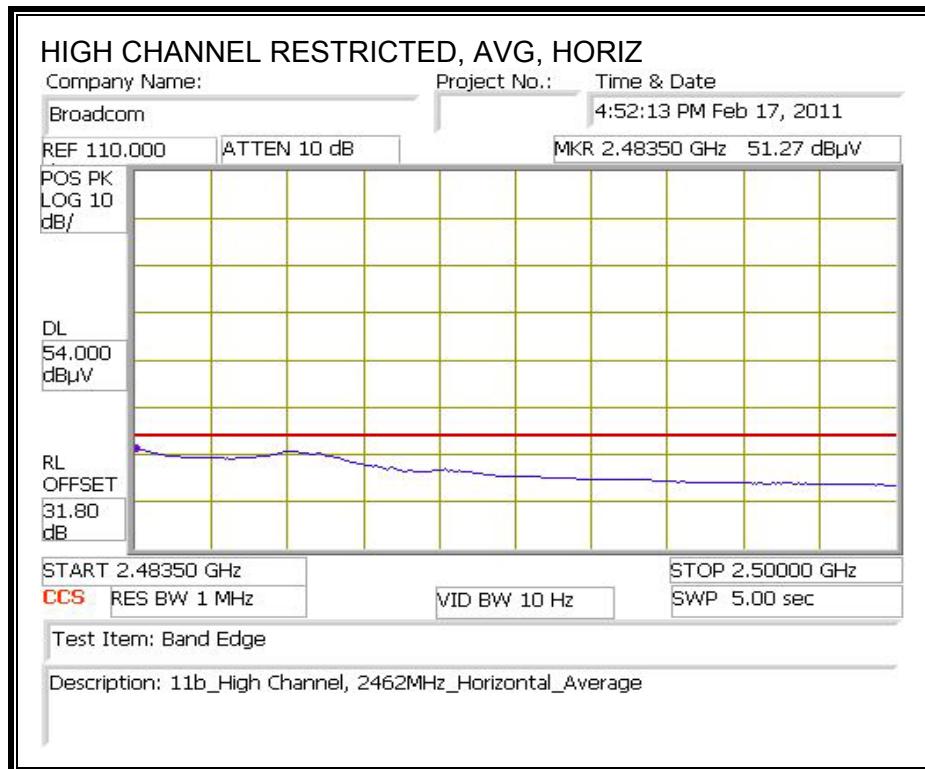
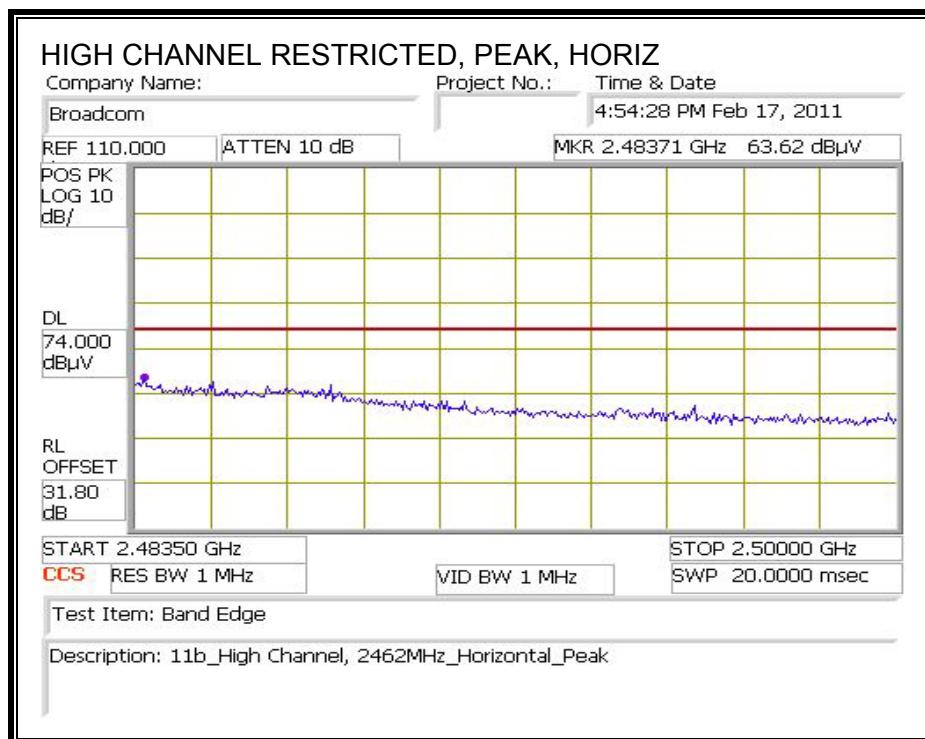
## 8.2. TRANSMITTER ABOVE 1 GHz

### 8.2.1. 802.11b MODE

#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**

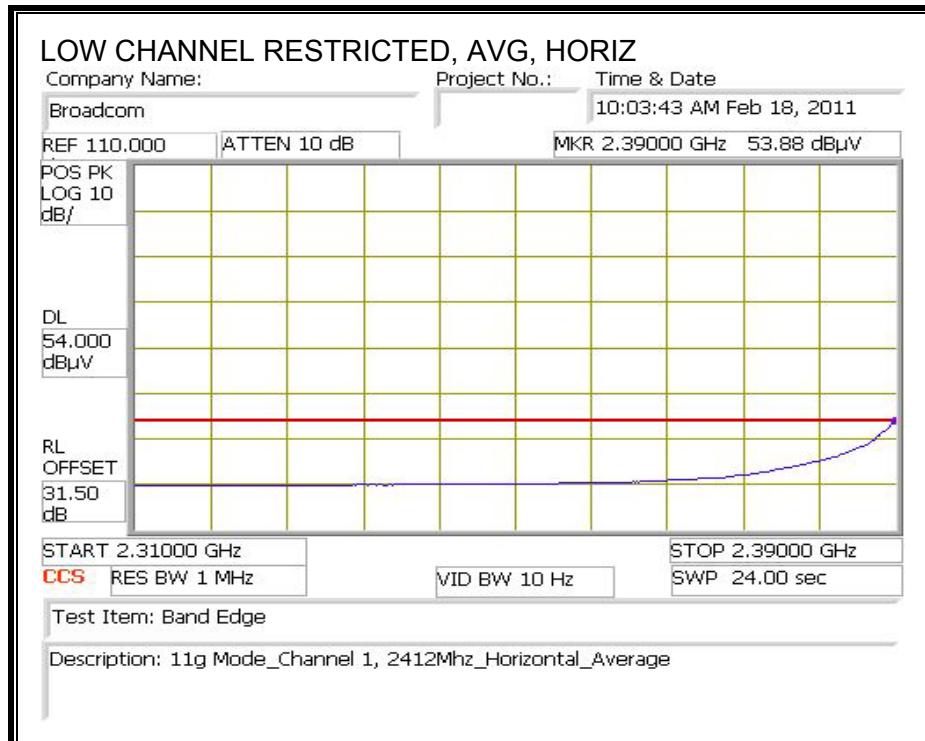
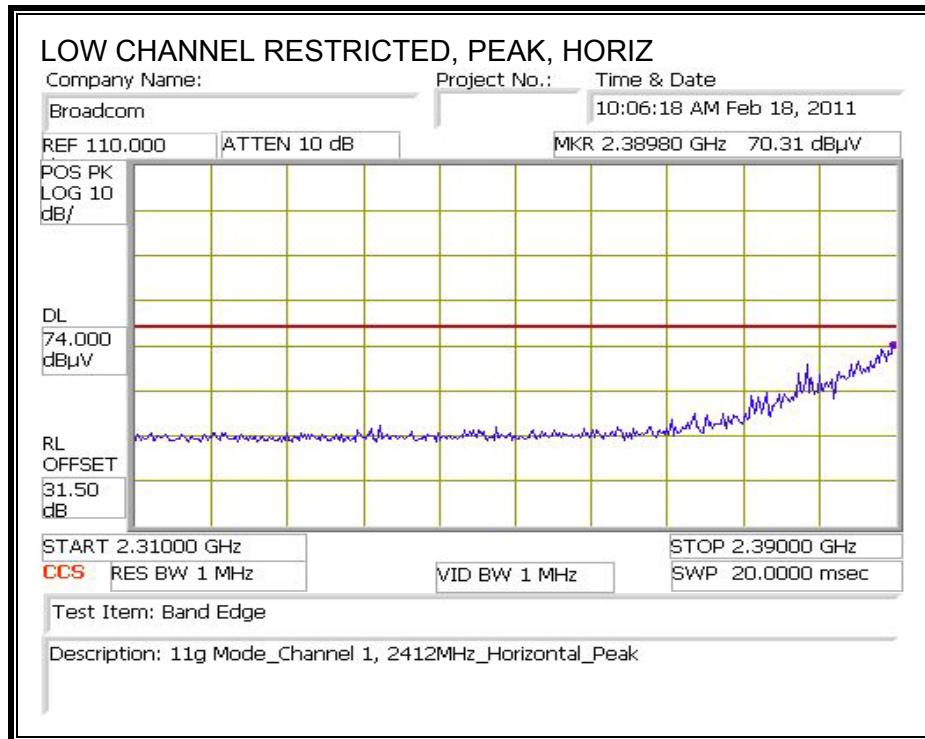


## HARMONICS AND SPURIOUS EMISSIONS

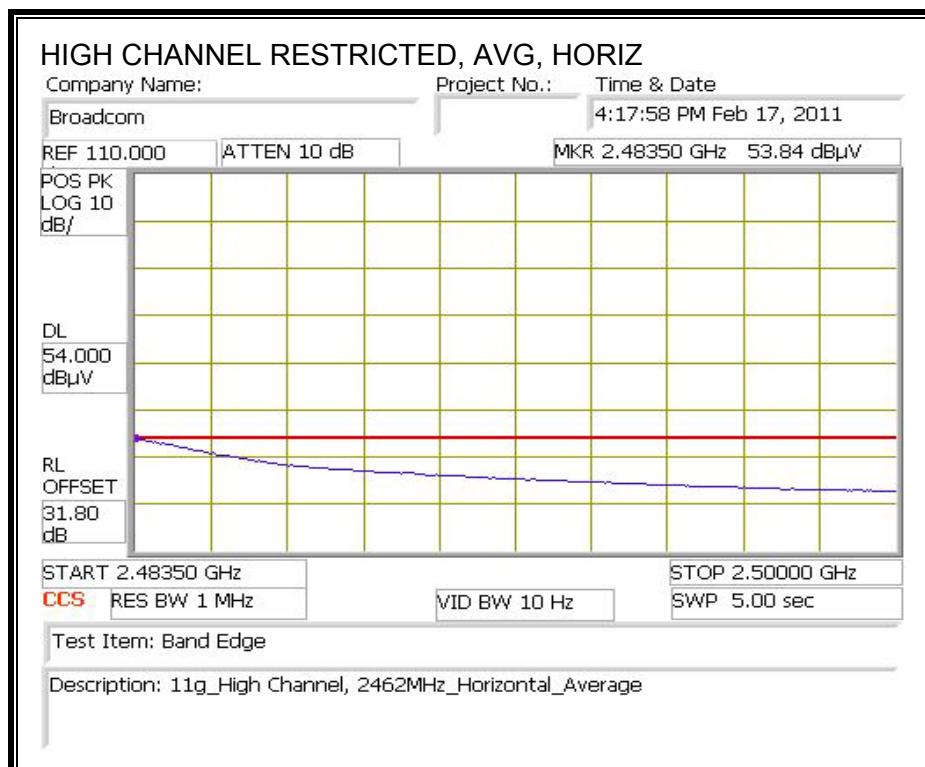
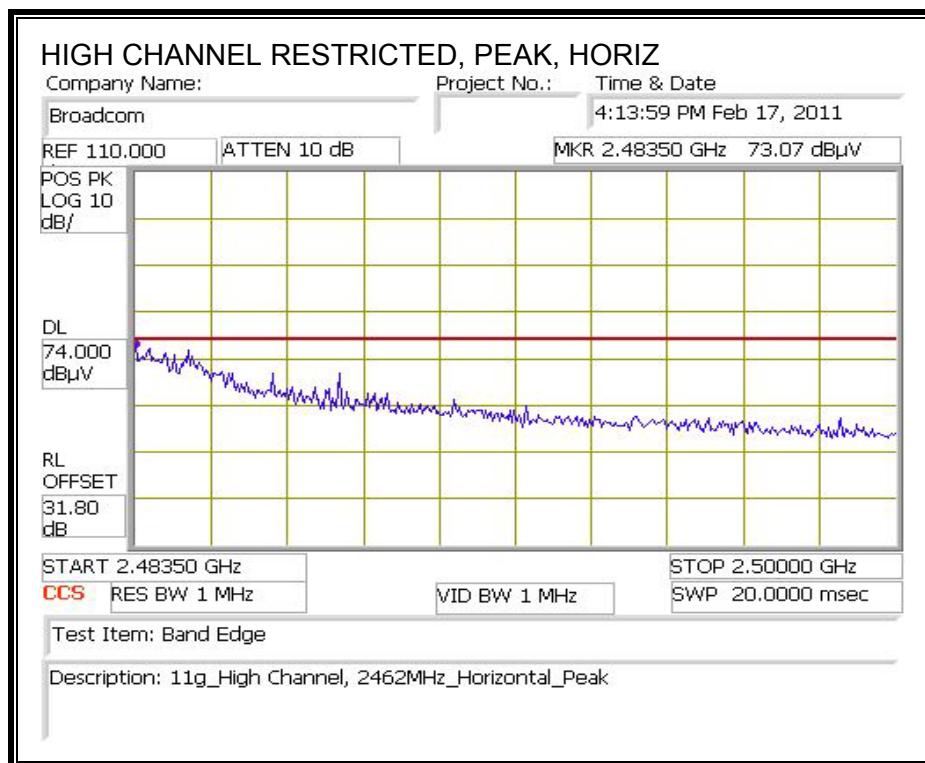
<b>High Frequency Measurement</b> <b>Compliance Certification Services, Fremont 3m Chamber</b>													
Test Engr:	Vien Tran												
Date:	02/17/11												
Project #:	11U13681												
Company:	Broadcom												
Test Target:	FCC B												
Mode Oper:	Tx 1lb Mode												
f	Measurement Frequency	Amp	Preamp Gain										Average Field Strength Limit
Dist	Distance to Antenna	D	Corr	Distance Correct to 3 meters									Peak Field Strength Limit
Read	Analyzer Reading	Avg		Average Field Strength @ 3 m									Margin vs. Average Limit
AF	Antenna Factor	Peak		Calculated Peak Field Strength									Margin vs. Peak Limit
CL	Cable Loss	HPF		High Pass Filter									
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>LOW CHANNEL, 2412MHZ</b>													
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	
<b>MID CHANNEL, 2437MHz</b>													
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	
<b>HIGH CHANNEL, 2462MHz</b>													
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	

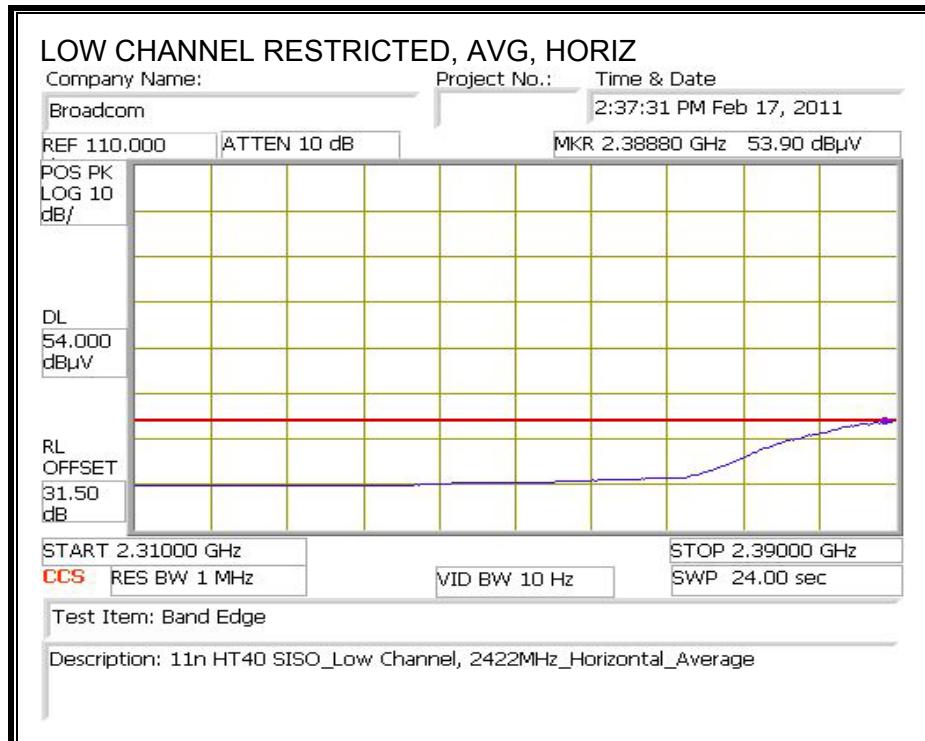
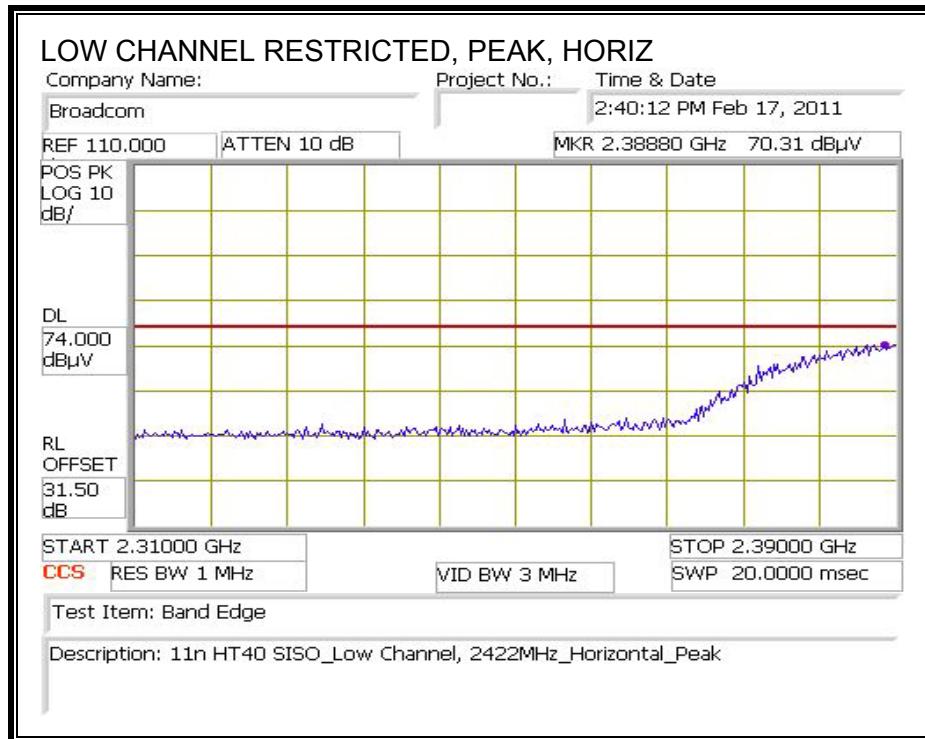
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>LOW CHANNEL, 2412MHz</b>													
4.824	3.0	45.8	32.7	5.8	-34.8	0.0	0.0	49.5	74.0	-24.5	V	P	
4.824	3.0	31.8	32.7	5.8	-34.8	0.0	0.0	35.4	54.0	-18.6	V	A	
4.824	3.0	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	
<b>MID CHANNEL, 2437MHz</b>													
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	
<b>HIGH CHANNEL, 2462MHz</b>													
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

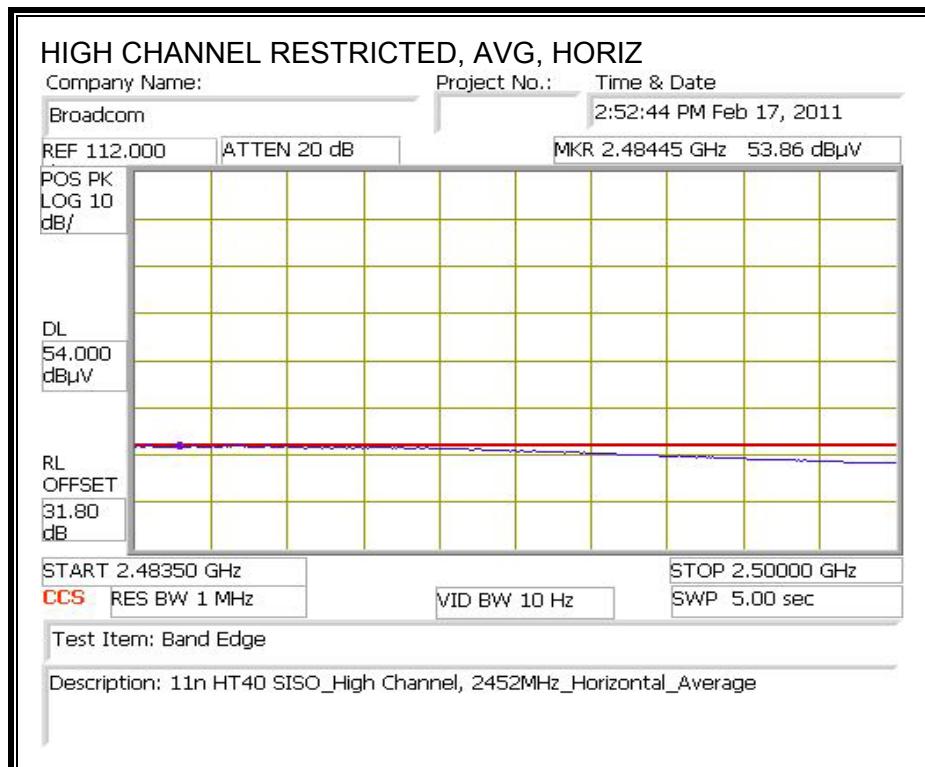
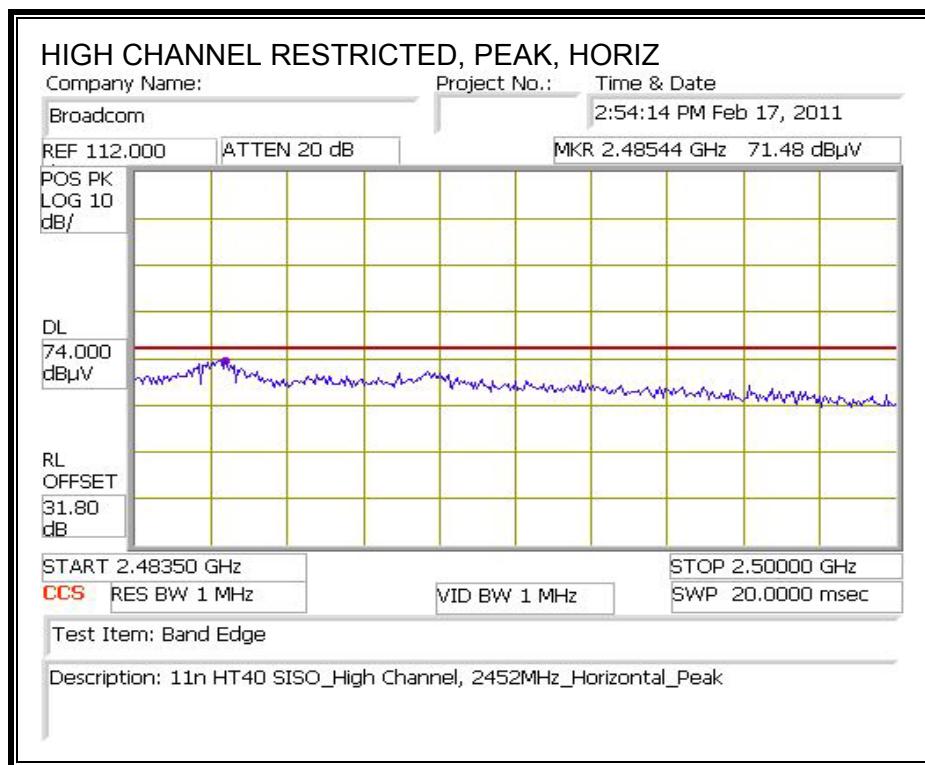
Note: No other emissions were detected above the system noise floor.

### 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 GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>LOW CHANNEL, 2422MHz</b>													
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	
<b>MID CHANNEL, 2437MHz</b>													
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	
<b>HIGH CHANNEL, 2452MHz</b>													
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													
<b>Test Equipment:</b>																							
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 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 dBm	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)								
1.063	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								
<b>Definitions:</b>																							
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																																											
<u>Test Equipment:</u>																																												
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 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	Fltr dBuV/m	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																													
<table> <tr> <td>f</td> <td>Measurement Frequency</td> <td>Amp</td> <td>Preamp Gain</td> <td>Avg Lim</td> <td>Average Field Strength Limit</td> </tr> <tr> <td>Dist</td> <td>Distance to Antenna</td> <td>D Corr</td> <td>Distance Correct to 3 meters</td> <td>Pk Lim</td> <td>Peak Field Strength Limit</td> </tr> <tr> <td>Read</td> <td>Analyzer Reading</td> <td>Avg</td> <td>Average Field Strength @ 3 m</td> <td>Avg Mar</td> <td>Margin vs. Average Limit</td> </tr> <tr> <td>AF</td> <td>Antenna Factor</td> <td>Peak</td> <td>Calculated Peak Field Strength</td> <td>Pk Mar</td> <td>Margin vs. Peak Limit</td> </tr> <tr> <td>CL</td> <td>Cable Loss</td> <td>HPF</td> <td>High Pass Filter</td> <td></td> <td></td> </tr> </table>															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		
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
<b>Vertical</b>													
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	
<b>Horizontal</b>													
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

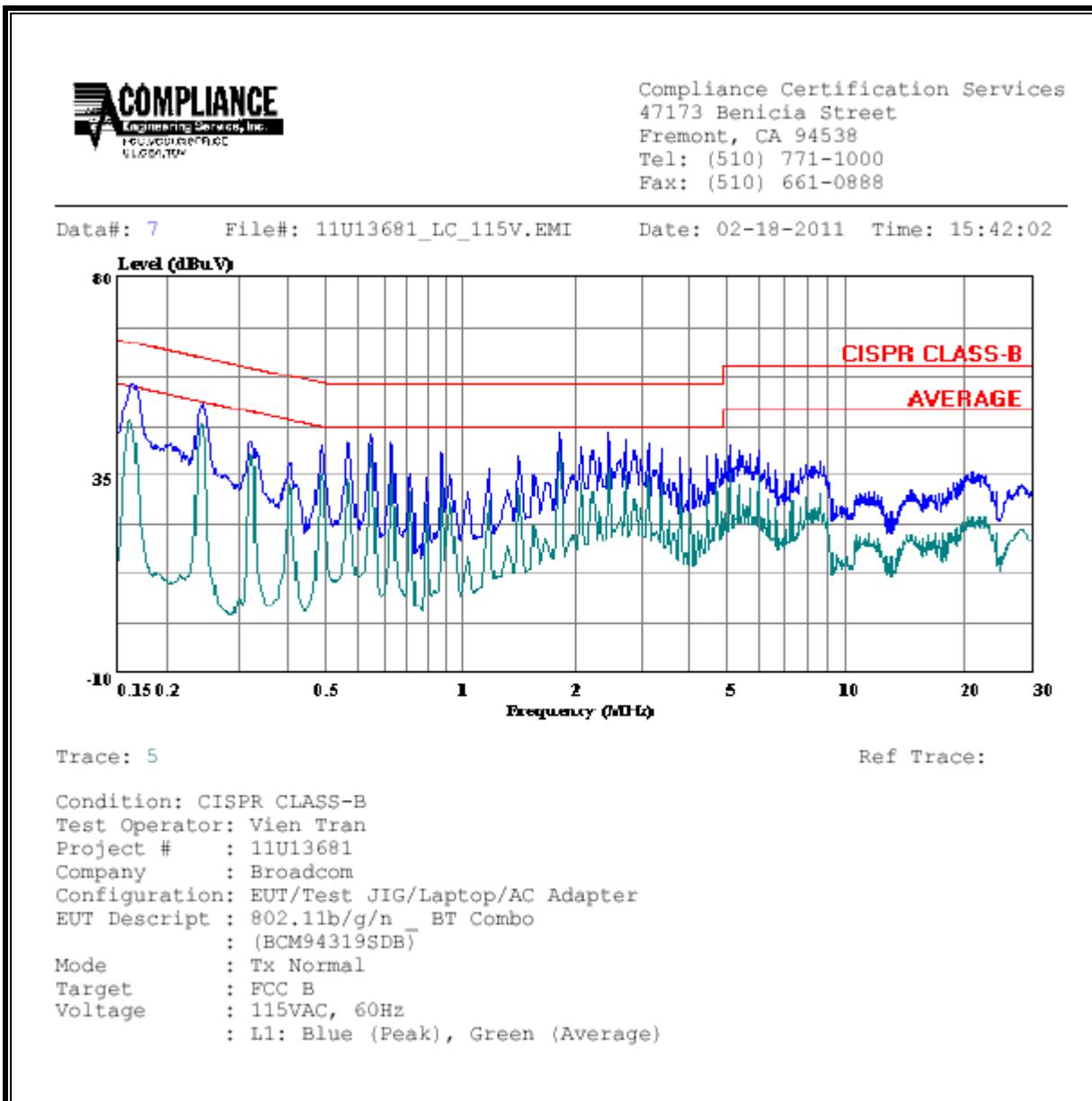
ANSI C63.4

### RESULTS

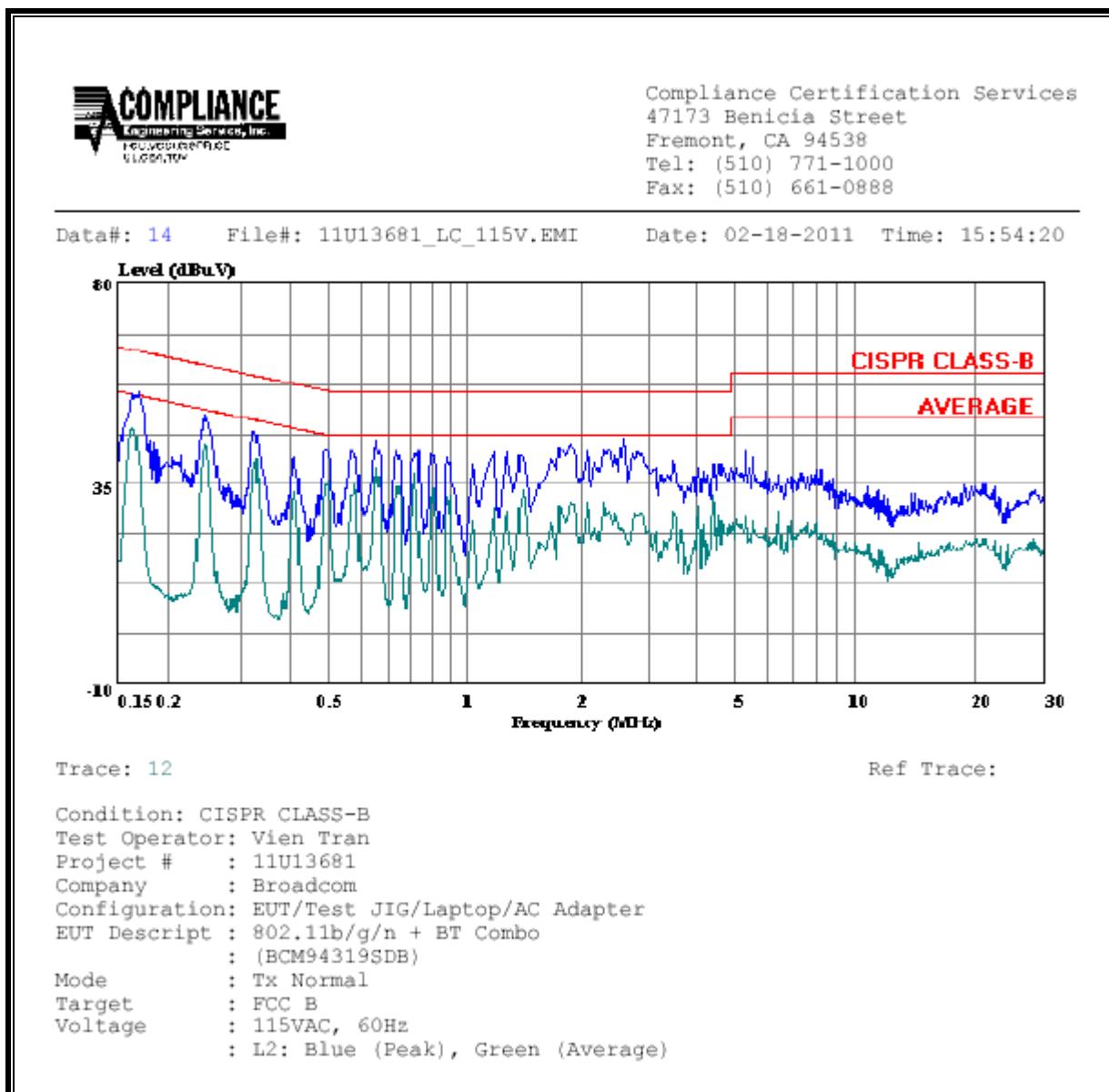
## **6 WORST EMISSIONS**

CONDUCTED EMISSIONS DATA (115VAC 60Hz)										
Freq. (MHz)	Reading			Closs (dB)	Limit	FCC_B		Margin		Remark
	PK (dBuV)	QP (dBuV)	AV (dBuV)			QP	AV	QP (dB)	AV (dB)	
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 <sup>2</sup> )	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0 .....	614	1.63	*(100)	6
3.0–30 .....	1842f	4.89f	*(900f <sup>2</sup> )	6
30–300 .....	61.4	0.163	1.0	6
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34 .....	614	1.63	*(100)	30
1.34–30 .....	824f	2.19f	*(180f <sup>2</sup> )	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 <sup>2</sup> )	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 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 <sup>2</sup> )	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	280/f	2.19/f		6
10–30	28	2.19/f		6
30–300	28	0.073	2*	6
300–1 500	$1.585f^{0.5}$	$0.0042f^{0.5}$	$f/150$	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	$616\,000/f^{1.2}$
150 000–300 000	$0.158f^{0.5}$	$4.21 \times 10^{-4}f^{0.5}$	$6.67 \times 10^{-5}f$	$616\,000/f^{1.2}$

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

**Notes:**

1. Frequency,  $f$ , is in MHz.
2. A power density of 10 W/m<sup>2</sup> is equivalent to 1 mW/cm<sup>2</sup>.
3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla ( $\mu$ T) or 12.57 milligauss (mG).

## EQUATIONS

Power density is given by:

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

where

S = Power density in W/m<sup>2</sup>

EIRP = Equivalent Isotropic Radiated Power in W

D = Separation distance in m

Power density in units of W/m<sup>2</sup> is converted to units of mW/cm<sup>2</sup> by dividing by 10.

Distance is given by:

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

where

D = Separation distance in m

EIRP = Equivalent Isotropic Radiated Power in W

S = Power density in W/m<sup>2</sup>

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/cm<sup>2</sup>

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m<sup>2</sup>

## RESULTS

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