FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 7
CERTIFICATION TEST REPORT

FOR

BROADCOM 802.11g WLAN PCI-E MINI CARD

MODEL NUMBER: BCM94312HMG

FCC ID: QDS-BRCM1030

IC: 4324A-BRCM1030

REPORT NUMBER: 07U11426-1, REVISION A

ISSUE DATE: NOVEMBER 15, 2007

Prepared for

BROADCOM CORPORATION

190 MATHILDA PLACE

SUNNYVALE, CA 94086, USA

Prepared by

COMPLIANCE CERTIFICATION SERVICES

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	11/12/07	Initial Issue	Hsin Fu Shih
A	11/15/07	Modified EUT name and corrected IC # on cover	T. Hong

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1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: BROADCOM 802.11g WLAN PCI-E MINI CARD

MODEL: BCM94312HMG

SERIAL NUMBER: 200-116263-0000G B

DATE TESTED: NOVEMBER 05 - 12, 2007

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C and Subpart E	No Non-Compliance Noted
RSS-210 Issue 7 Annex 8 and RSS-GEN Issue 2	No Non-Compliance Noted

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. 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 Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

Hsin-Fu Shih

HSIN FU SHIH
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:

VIEN TRAN
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 2, and RSS-210 Issue 7.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 200 MHz	+/- 3.3 dB
Radiated Emission, 200 to 1000 MHz	+4.5 / -2.9 dB
Radiated Emission, 1000 to 2000 MHz	+4.5 / -2.9 dB
Power Line Conducted Emission	+/- 2.9 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 802.11g WLAN Transceiver card manufactured by Broadcom.
Model number is BCM94312HMG.

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	22.28	169.04
2412 - 2462	802.11g	23.05	201.84

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a stamped metal antenna (Hitachi, HMT05/HFT17-DL07), with a maximum gain of 3.9 dBi.

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was BCMWL5, rev. 4.170.20.2.

The test utility software used during testing was wl_tool, rev. 4.150 RC27.0.

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power.

5.6. CHANNELS AND TEST ITEMS

	CHANNELS & TEST ITEMS			
11b	**Bandedge**	**PSD**	**Ch. Power**	**Cond./Rad.**
CH1	*	*	*	**
CH6	**N/A**	*	*	**
CH11	*	*	*	**
11g	**Bandedge**	**PSD**	**Ch. Power**	**Cond./Rad.**
CH1	*	*	*	**
CH2	*	*	*	**N/A**
CH6	**N/A**	*	*	**
CH10	*	*	*	**N/A**
CH11	*	*	*	**
NOTE:				
	* : Base on Band Edge power setting			
	** : Set to highest output power			

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop PC	Dell	Inspiron 0000	TD429	DOC
AC Adapter	Dell	ADP-60NH B	MOW00528000191	DOC

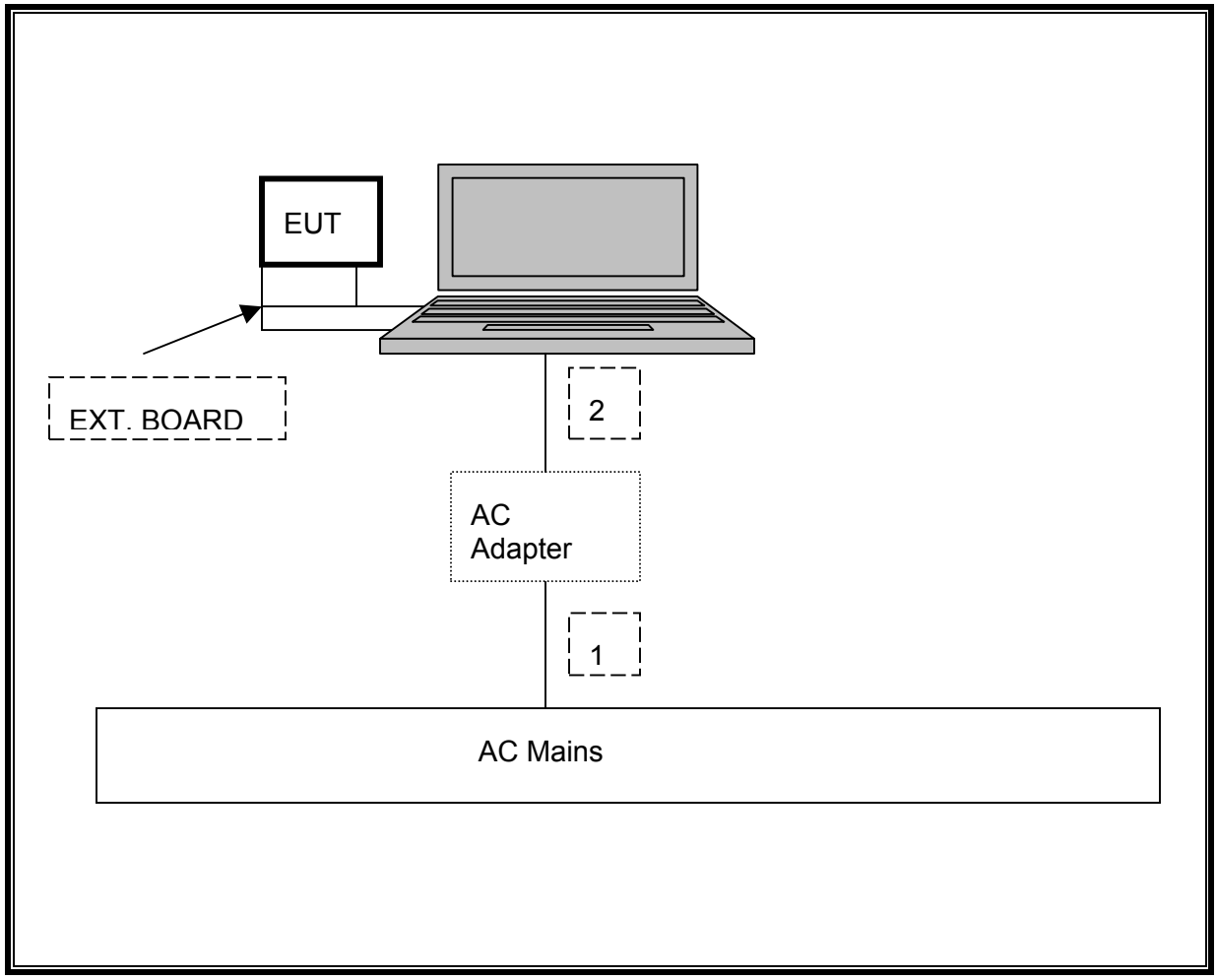
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identic Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	AC	Unshielded	1.2 m	N/A
2	DC	1	DC	Unshielded	1.2 m	N/A

TEST SETUP

The EUT is installed in a host laptop computer via Express card to MiniPCI-E adapter boards during the tests. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST					
Description	**Manufacturer**	**Model**	**Asset**	**Cal Date**	**Cal Due**
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01012	05/02/06	08/07/08
Antenna, Horn, 18 GHz	ETS	3117	C01006	04/15/07	4/15/08
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	08/03/07	8/3/08
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	10/13/07	10/13/08
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	09/15/06	9/15/08
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	N02481	09/15/07	9/15/08
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	10/16/06	1/27/08
Peak power Meter	Agilent / HP	E4416A	Broadcom	N/A	N/A
Highpass Filter, 4.0 GHz	Micro-Tronics	HPM13351	N02709	CNR	CNR
Power Sensor	Agilent / HP	E9323A	Broadcom	CNR	CNR

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

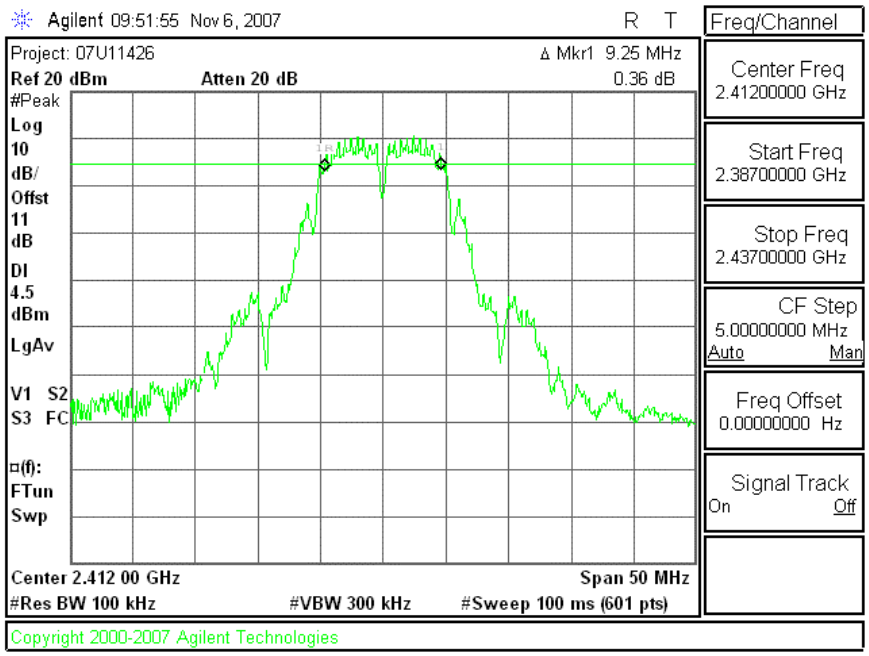
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

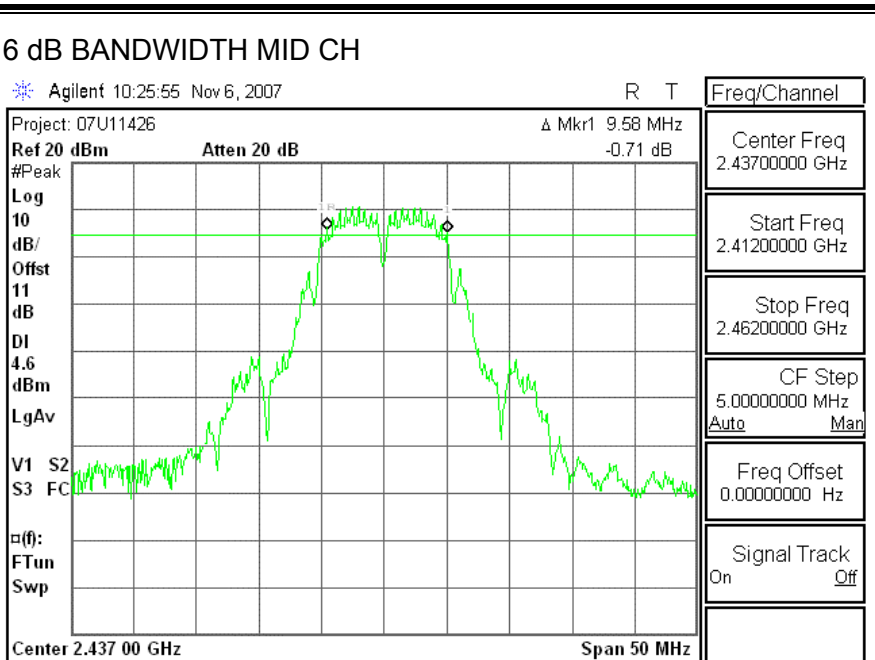
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	9.25	0.5
Middle	2437	9.58	0.5
High	2462	9.58	0.5

6 dB BANDWIDTH

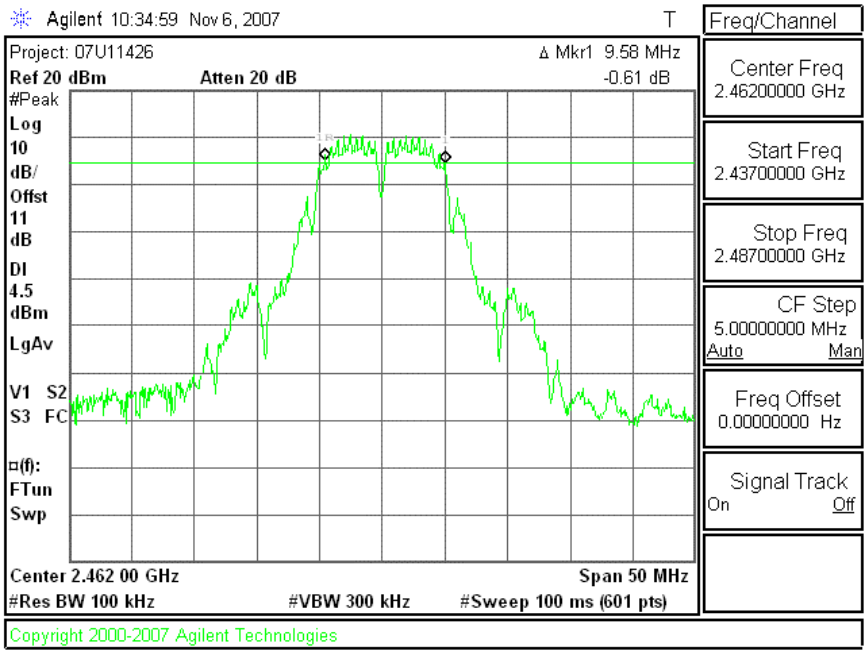
6 dB BANDWIDTH LOW CH



6 dB BANDWIDTH MID CH



6 dB BANDWIDTH HIGH CH



7.1.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

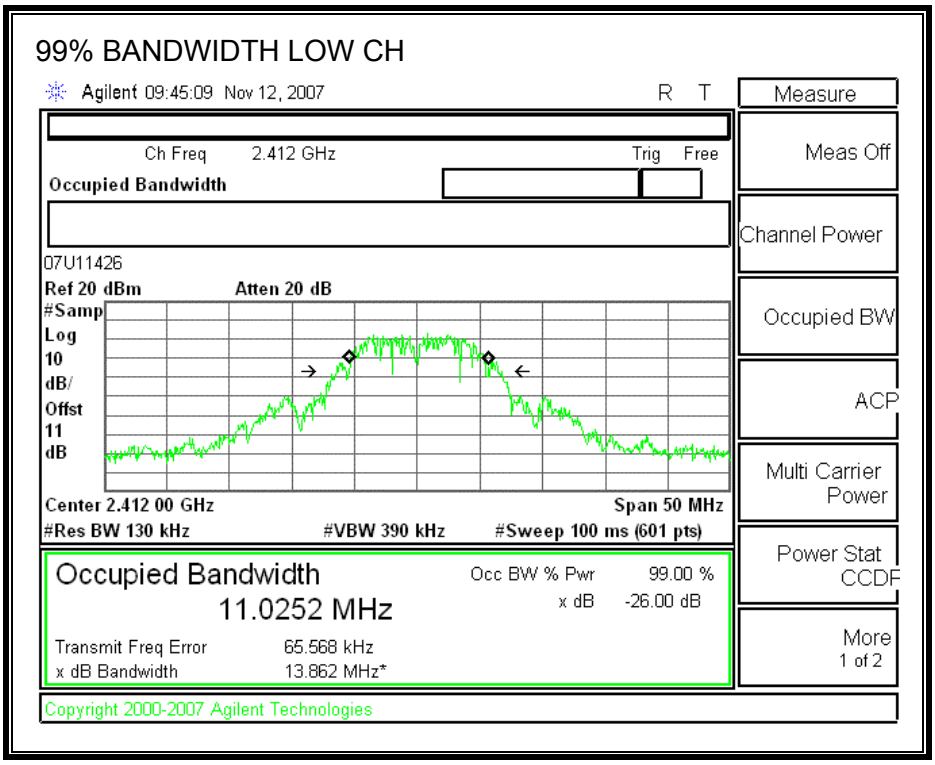
TEST PROCEDURE

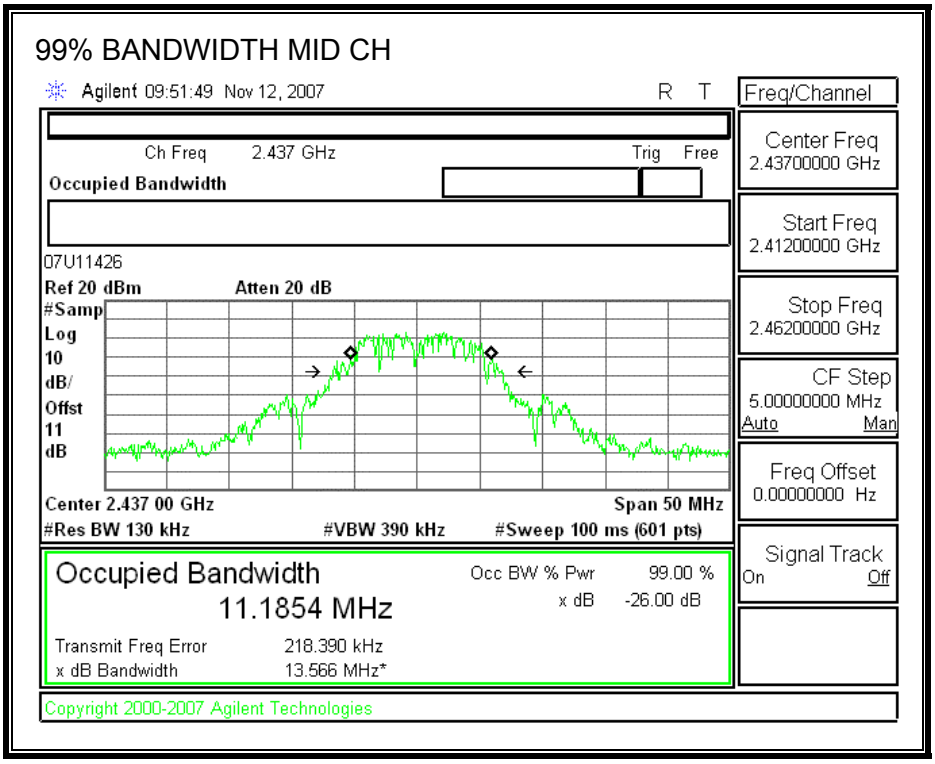
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

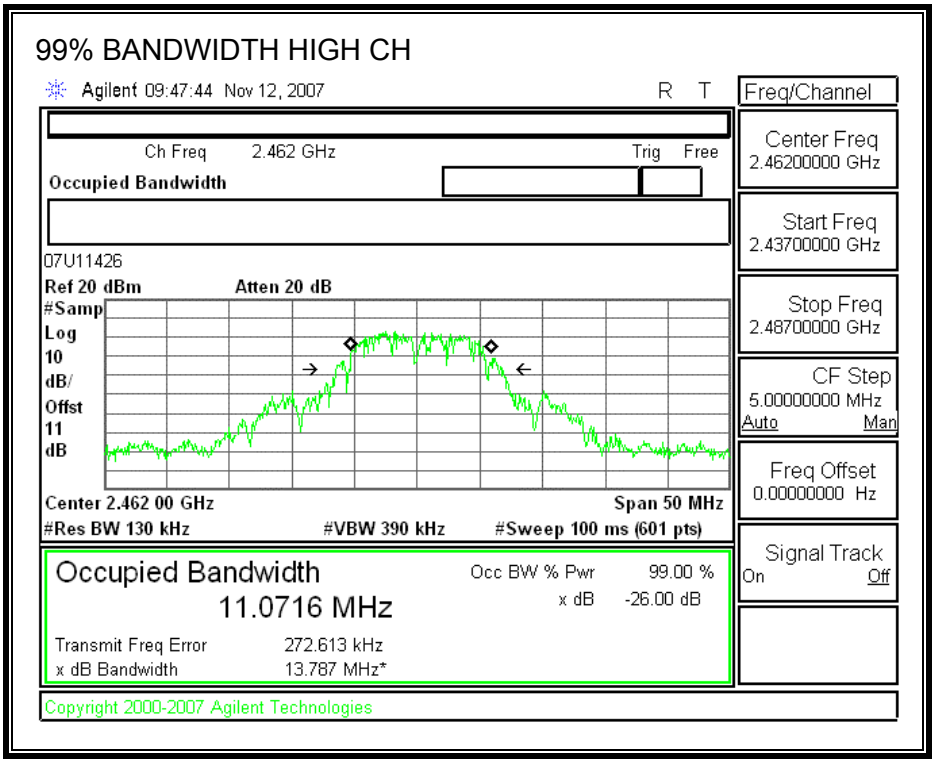
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	11.0252
Middle	2437	11.1854
High	2462	11.0716

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

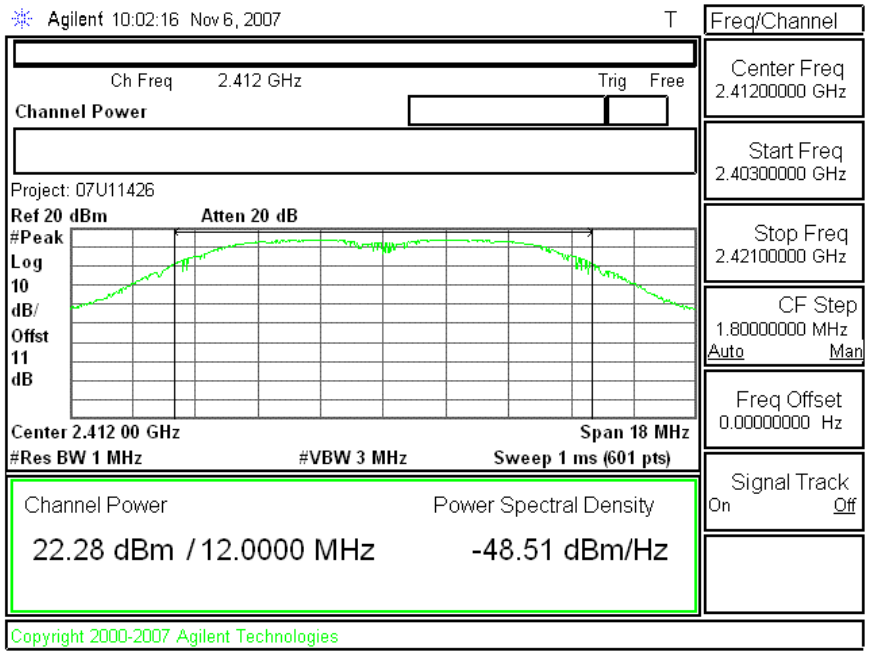
Peak power is measured using the spectrum analyzer's internal channel power integration function. Power is integrated over a bandwidth greater than or equal to the 99% bandwidth.

RESULTS

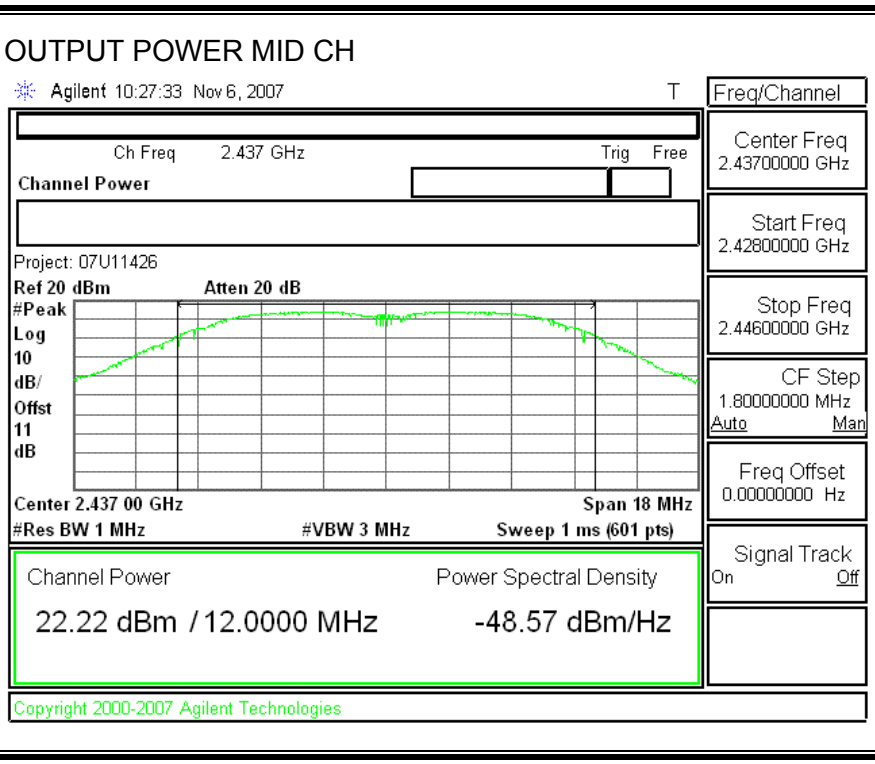
Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	22.28	30	-7.72
Middle	2437	22.22	30	-7.78
High	2462	22.11	30	-7.89

OUTPUT POWER

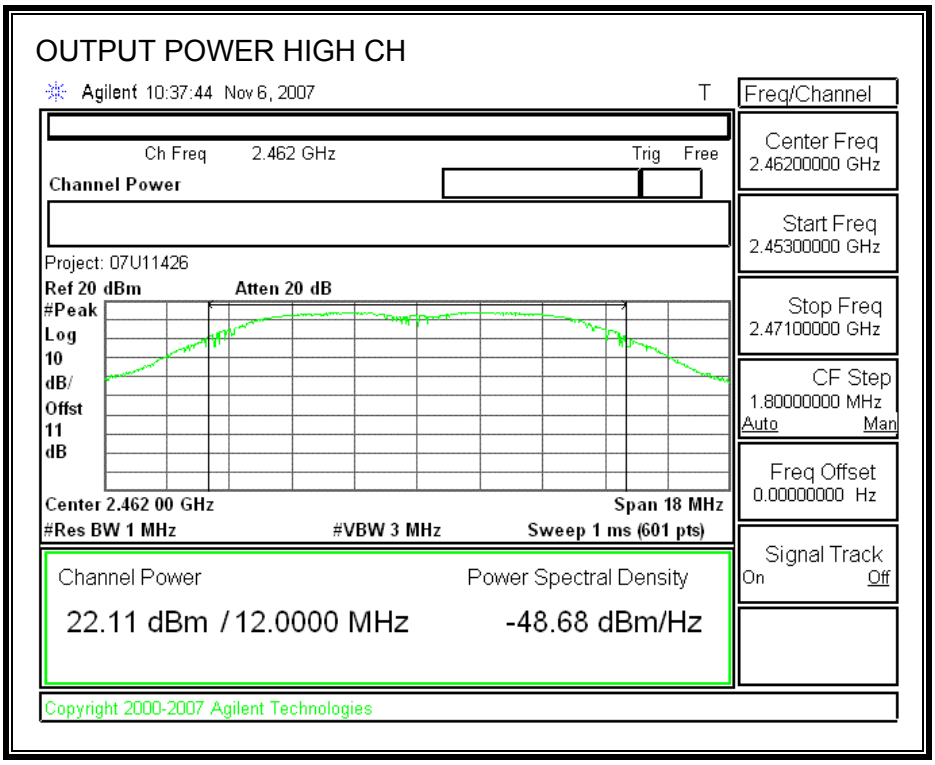
OUTPUT POWER LOW CH



OUTPUT POWER MID CH



OUTPUT POWER HIGH CH



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

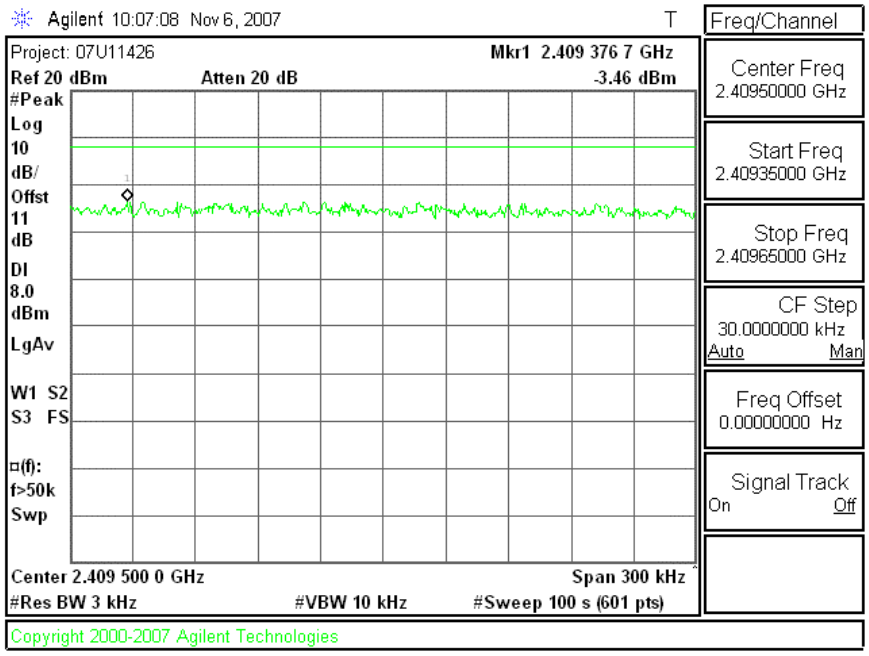
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

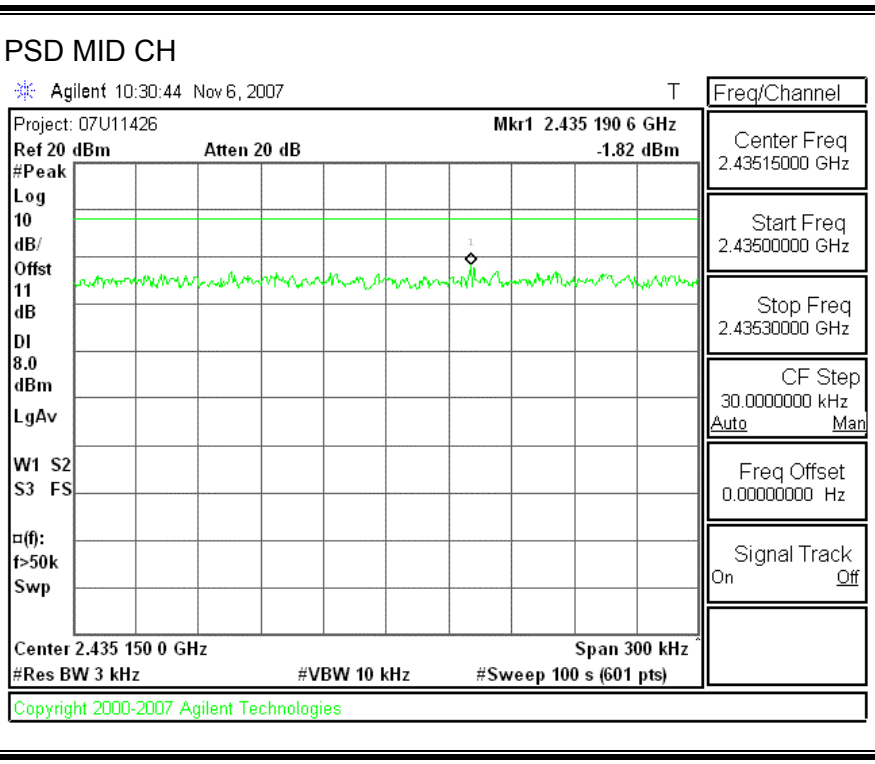
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-3.46	8	-11.46
Middle	2437	-1.82	8	-9.82
High	2462	-2.61	8	-10.61

POWER SPECTRAL DENSITY

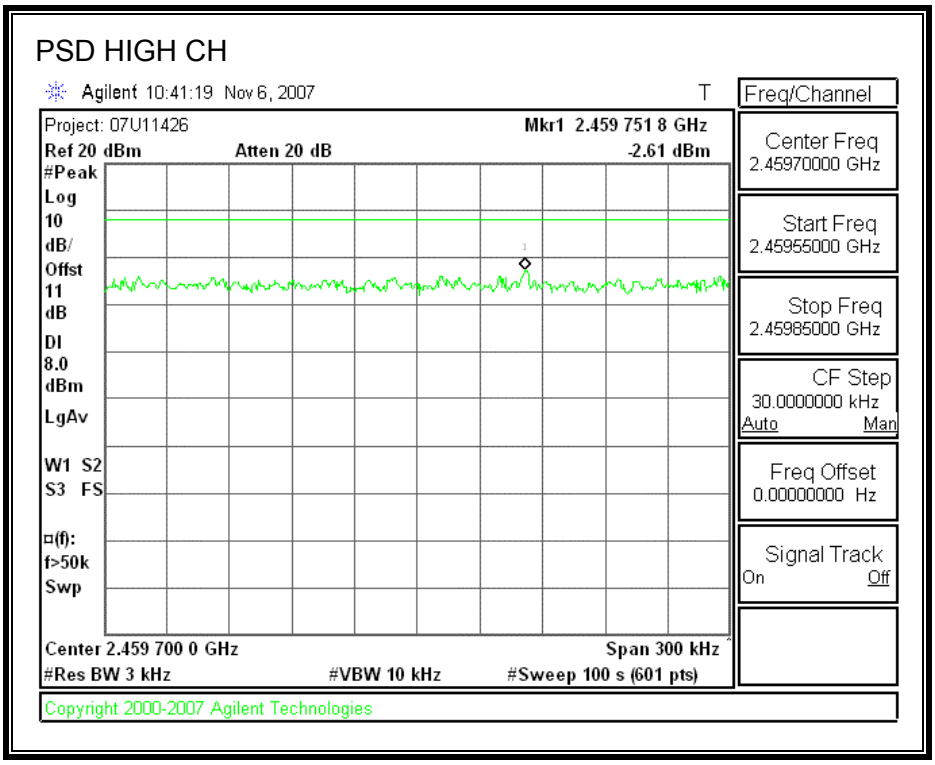
PSD LOW CH



PSD MID CH



PSD HIGH CH



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.

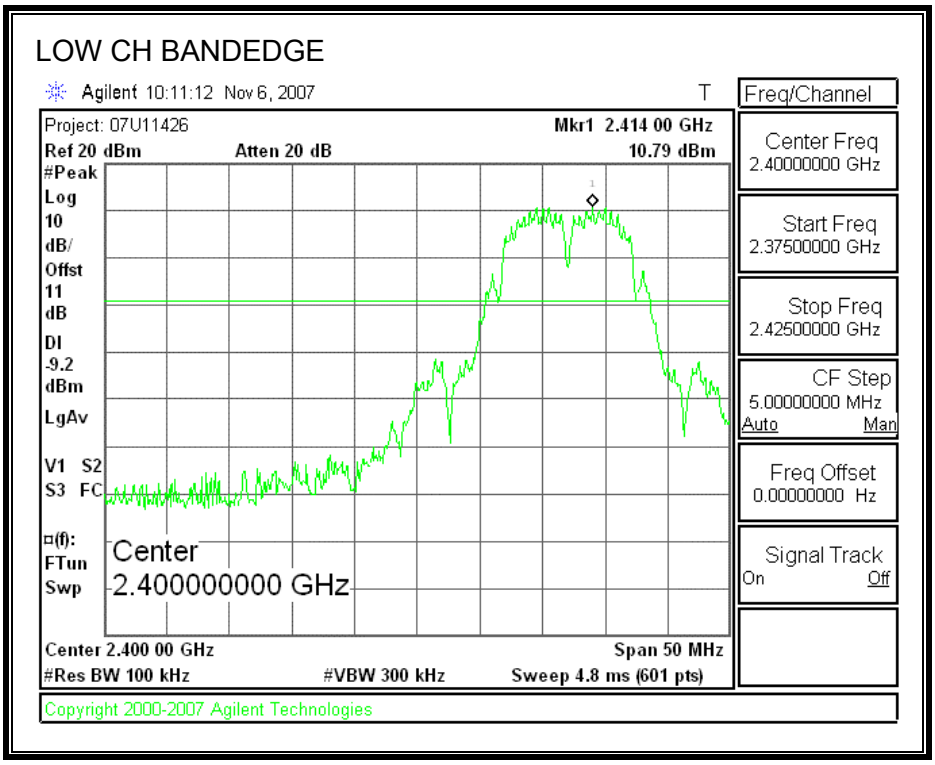
TEST PROCEDURE

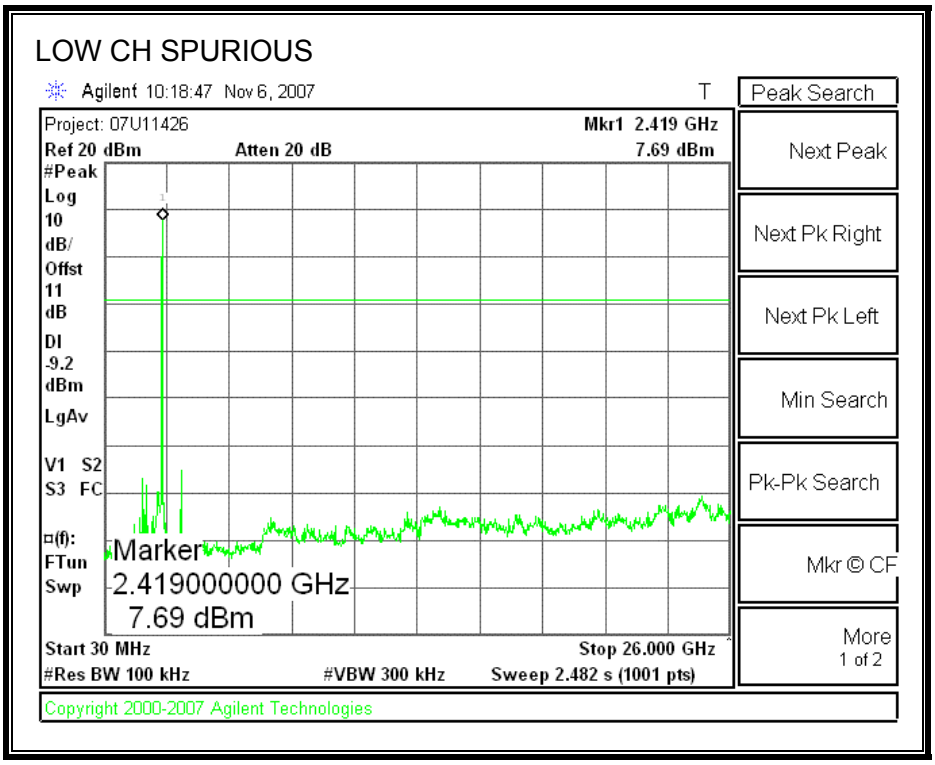
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

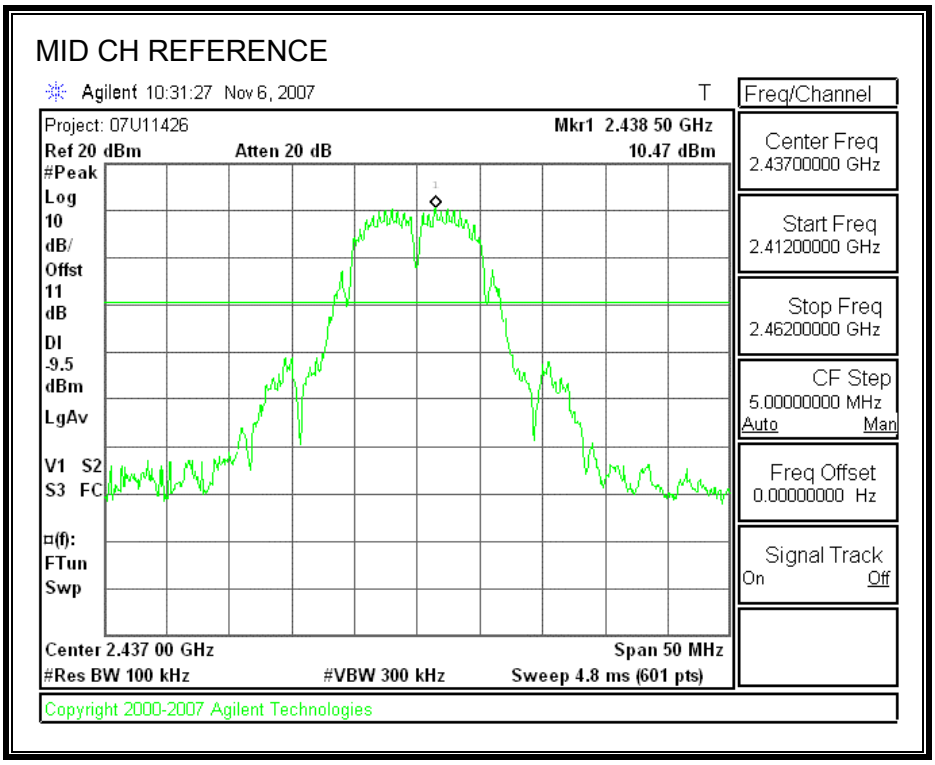
RESULTS

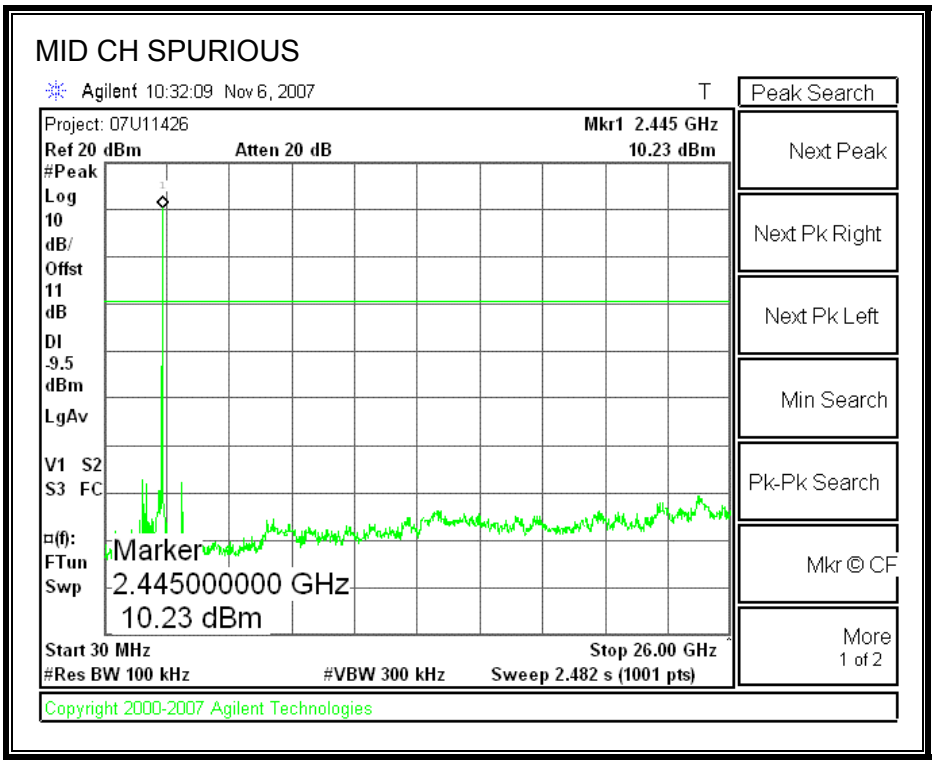
SPURIOUS EMISSIONS, LOW CHANNEL





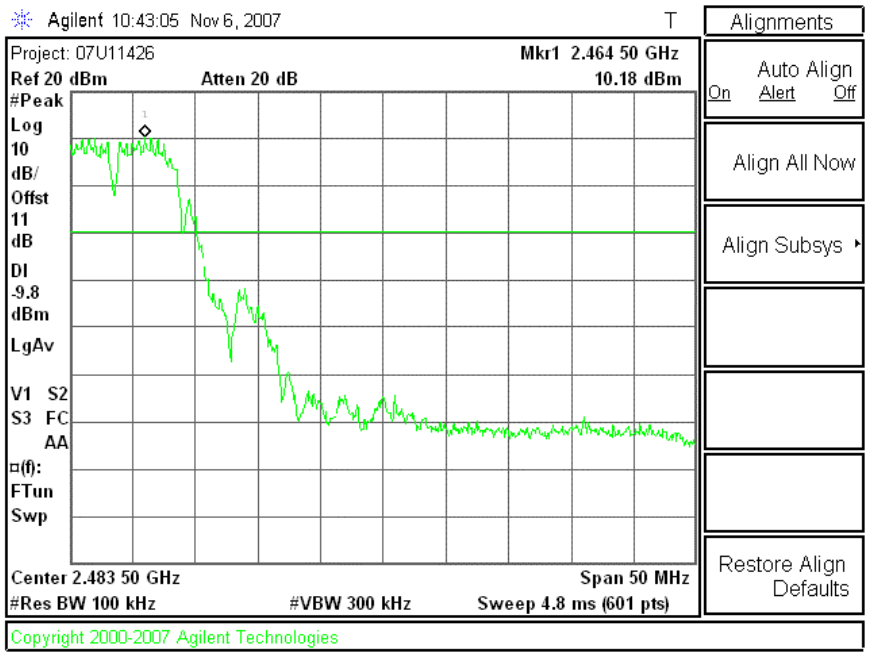
SPURIOUS EMISSIONS, MID CHANNEL



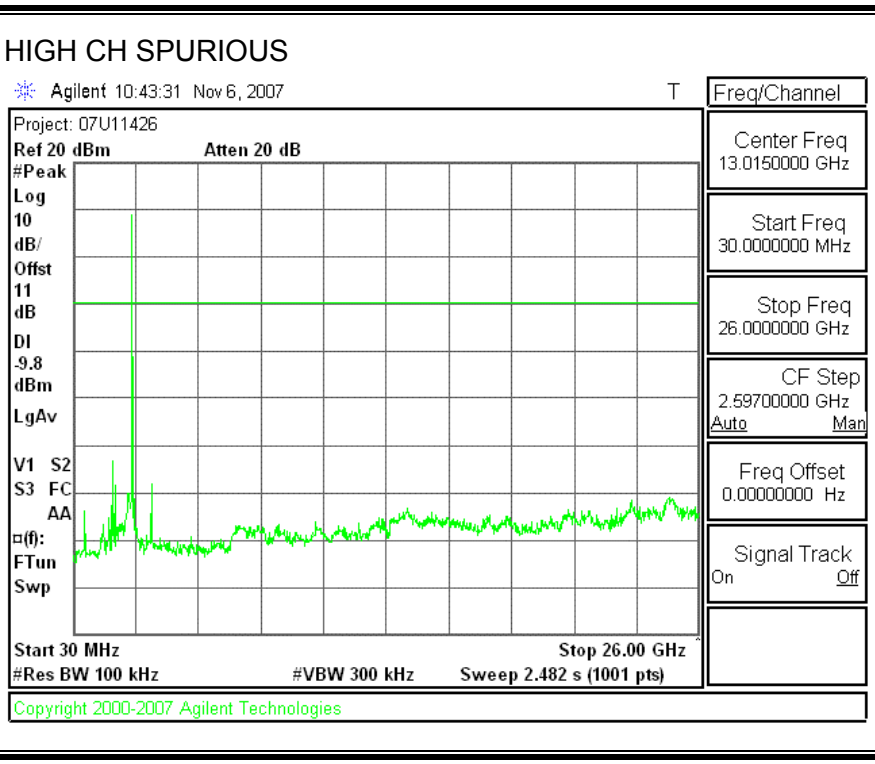


SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CH BANDEDGE



HIGH CH SPURIOUS



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.

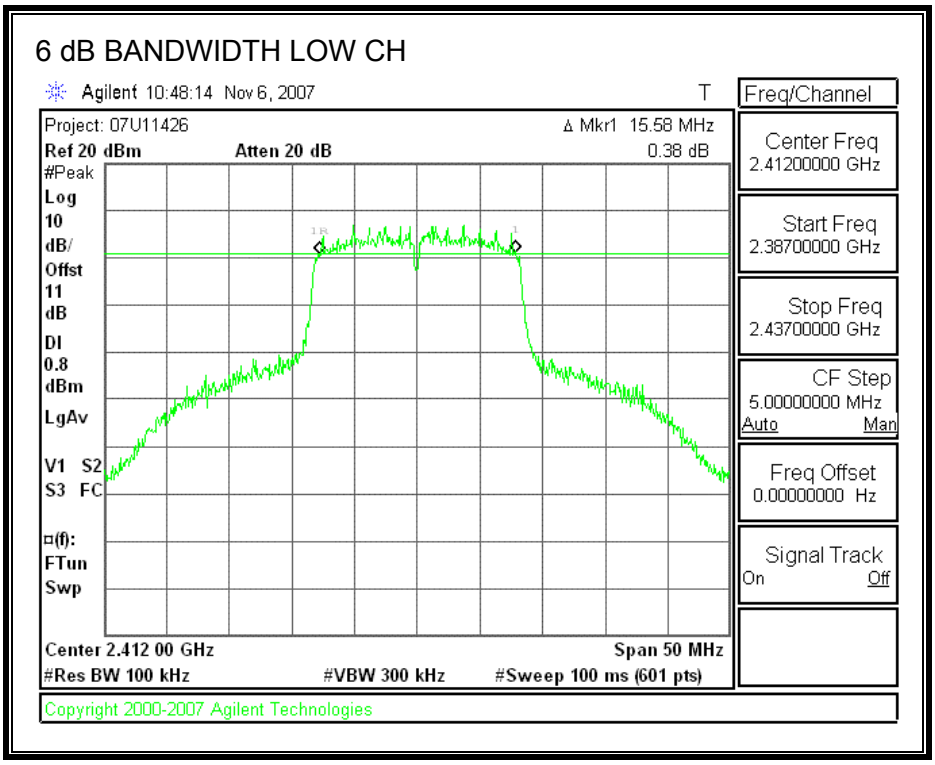
TEST PROCEDURE

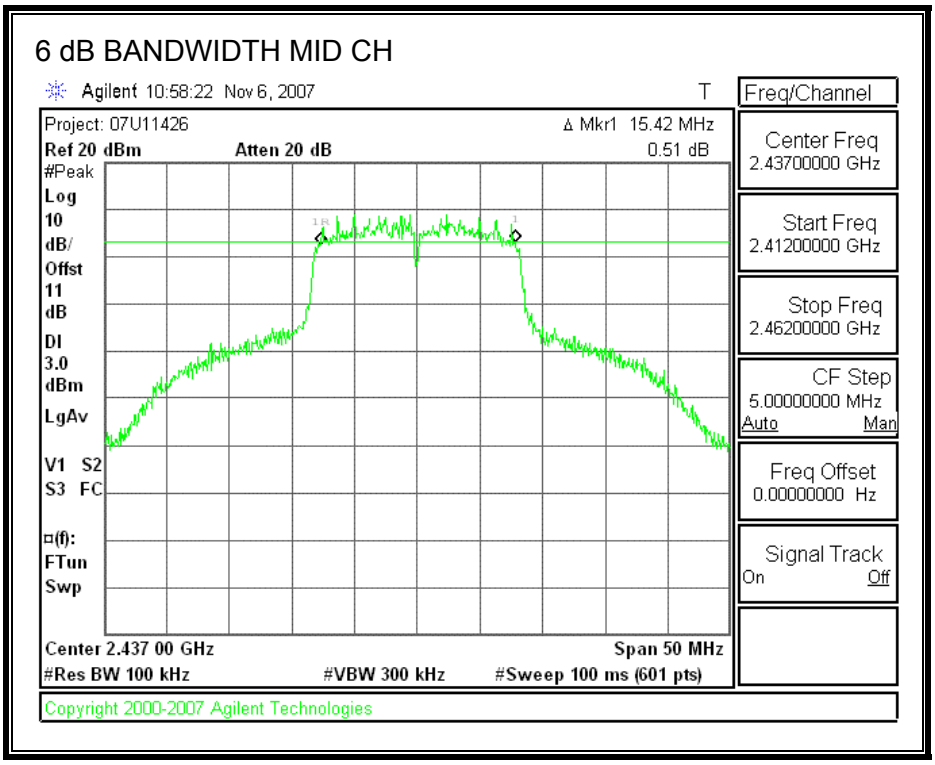
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

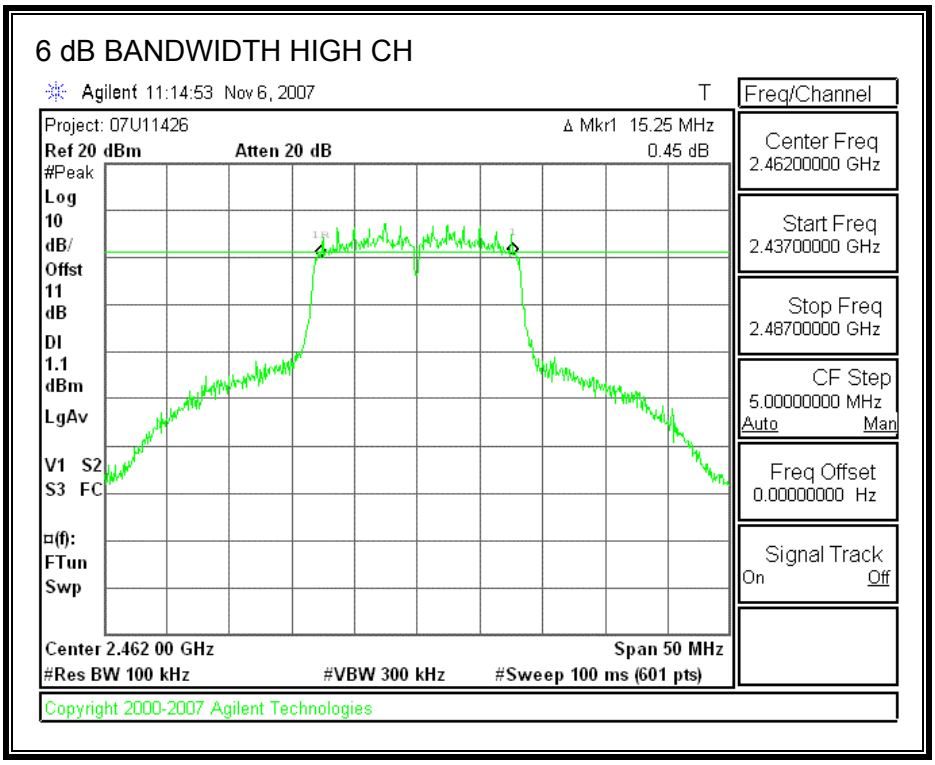
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	15.58	0.5
Middle	2437	15.42	0.5
High	2462	15.25	0.5

6 dB BANDWIDTH





6 dB BANDWIDTH HIGH CH



7.2.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

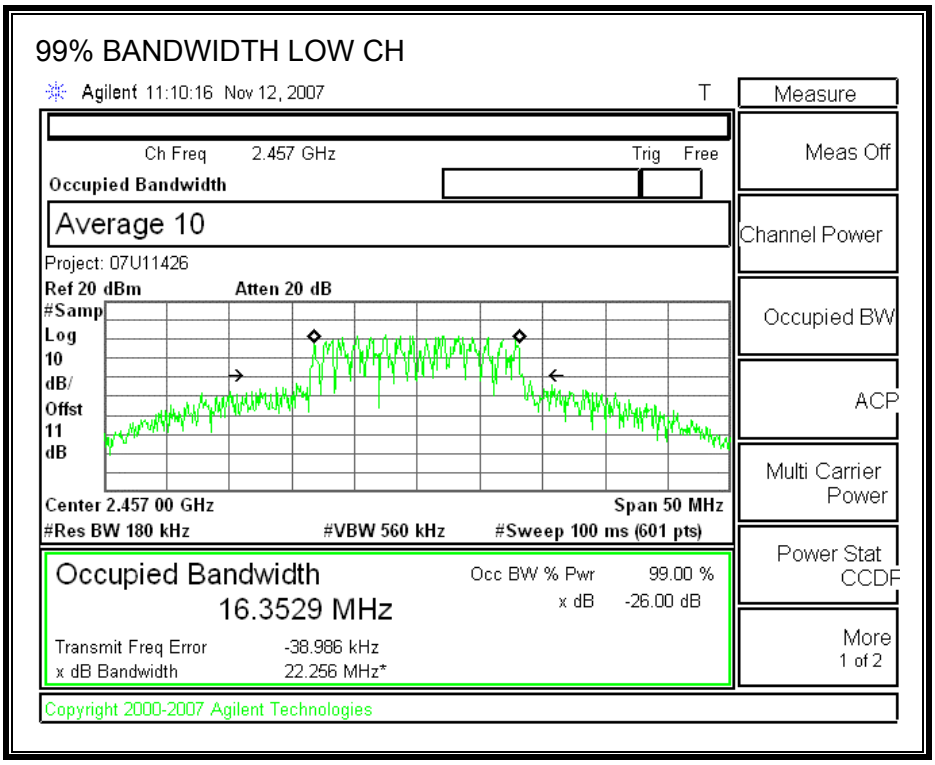
TEST PROCEDURE

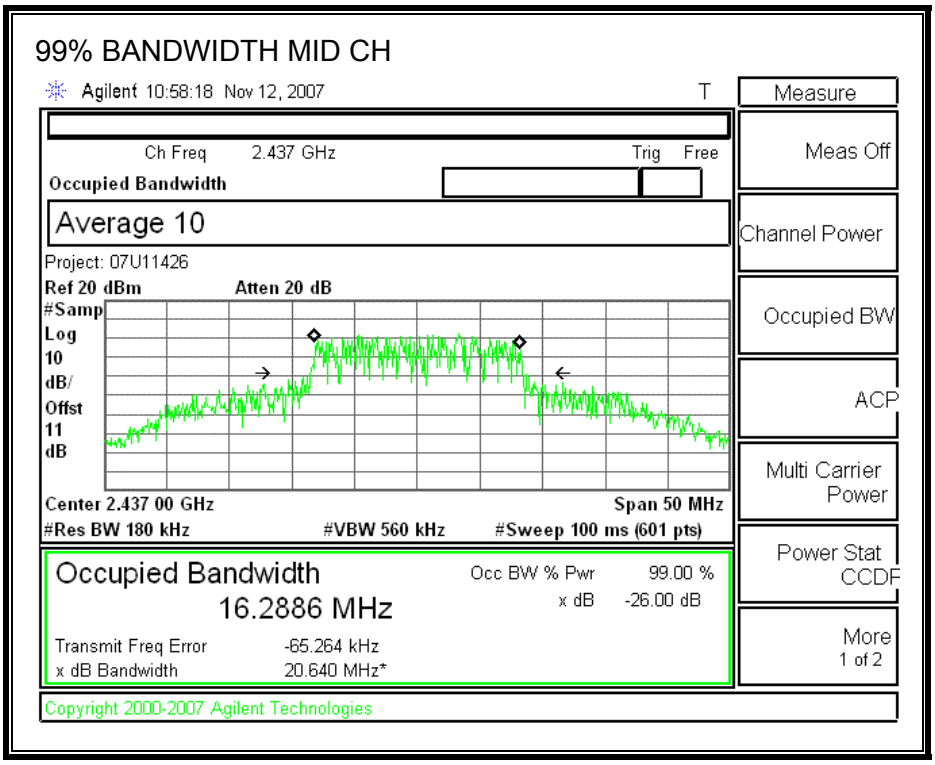
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

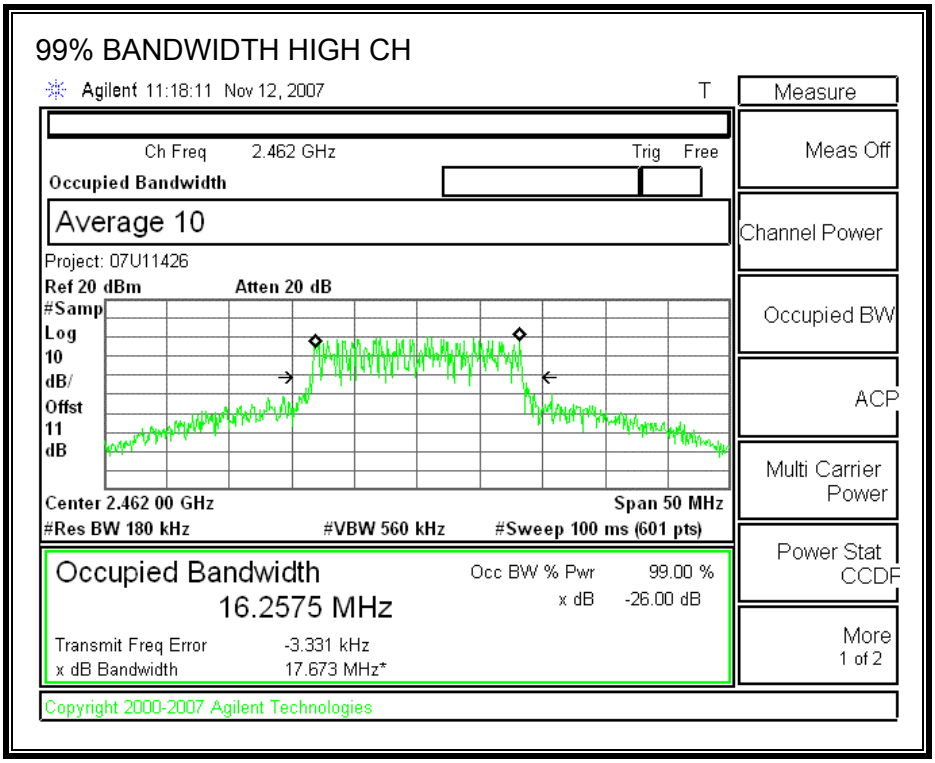
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.3529
Middle	2437	16.2886
High	2462	16.2575

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.

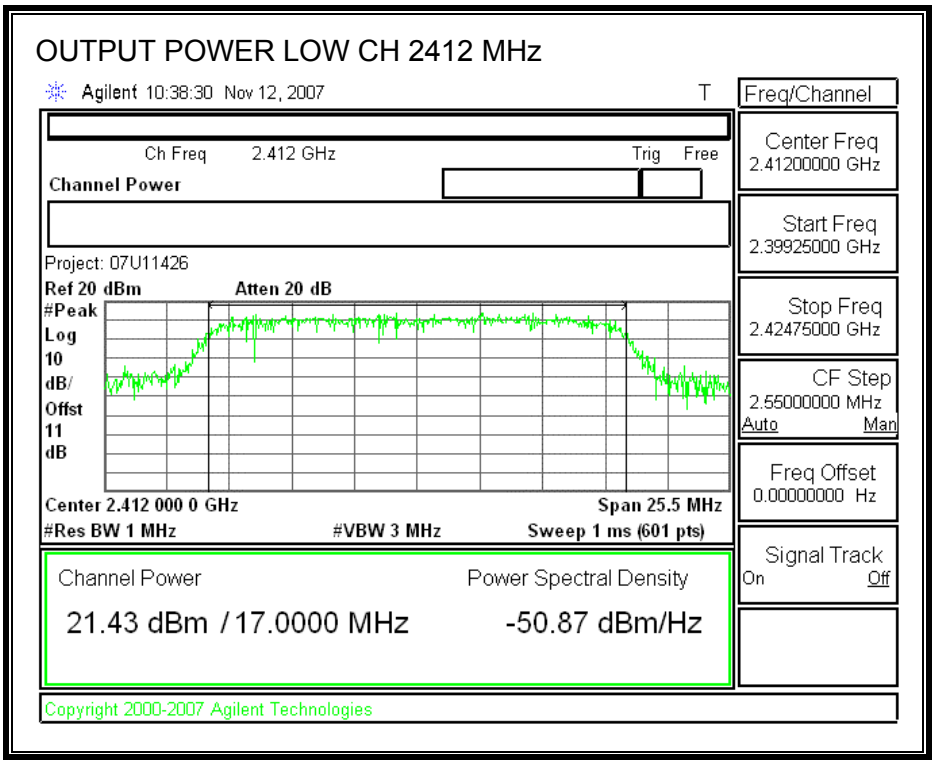
TEST PROCEDURE

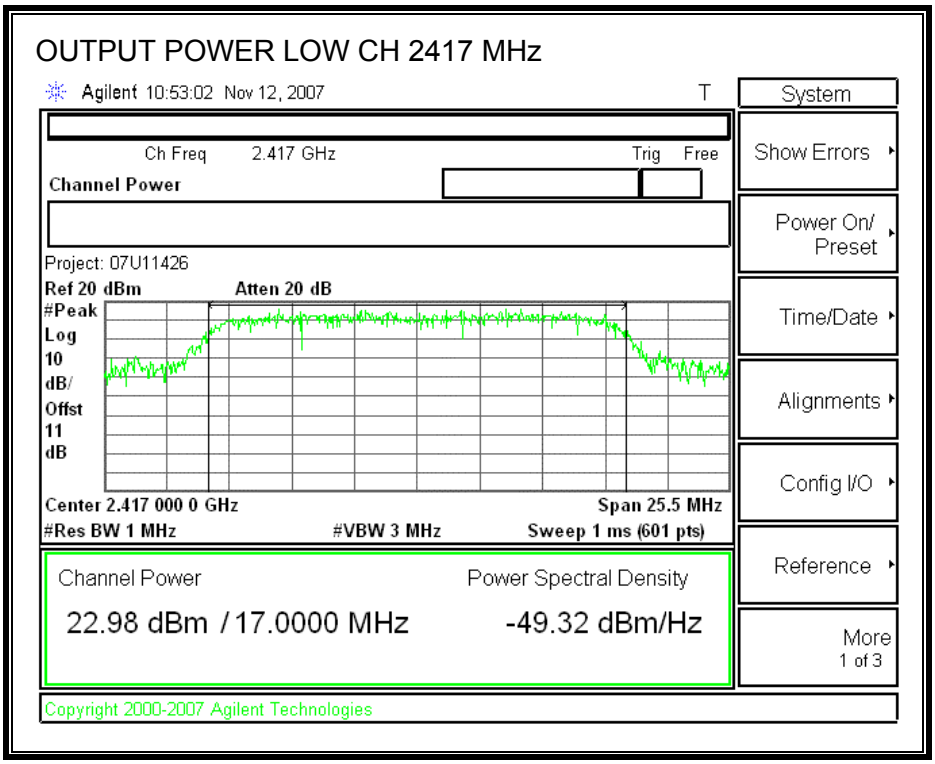
Peak power is measured using the spectrum analyzer's internal channel power integration function. Power is integrated over a bandwidth greater than or equal to the 99% bandwidth.

RESULTS

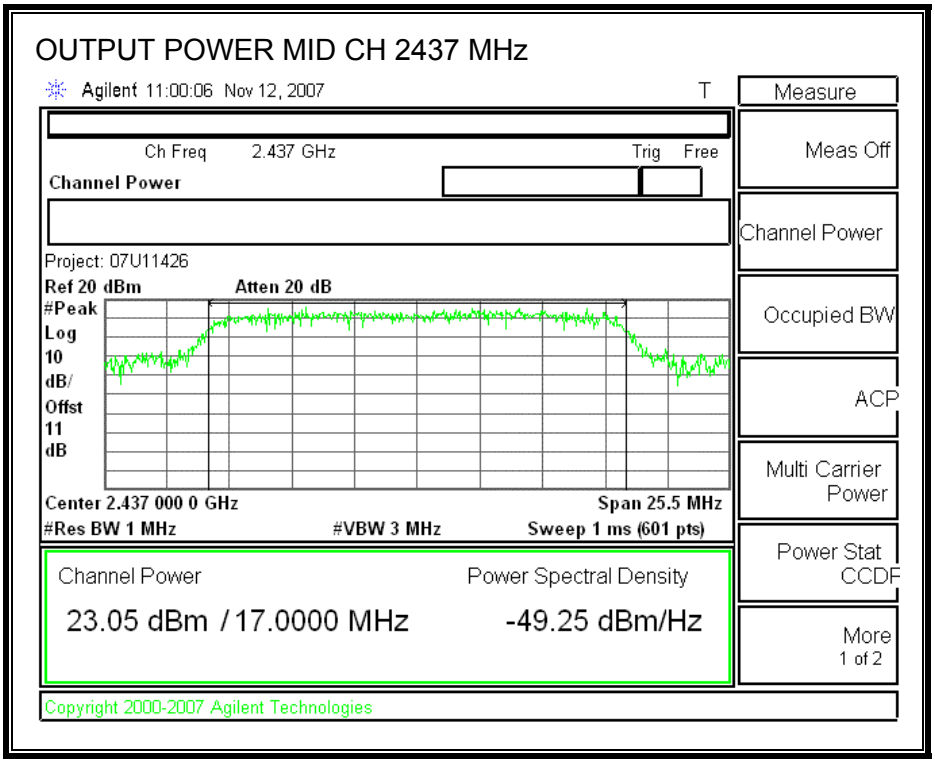
Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	21.34	30	-8.66
Low	2417	22.98	30	-7.02
Middle	2437	23.05	30	-6.95
High	2457	23.02	30	-6.98
High	2462	20.89	30	-9.11

OUTPUT POWER

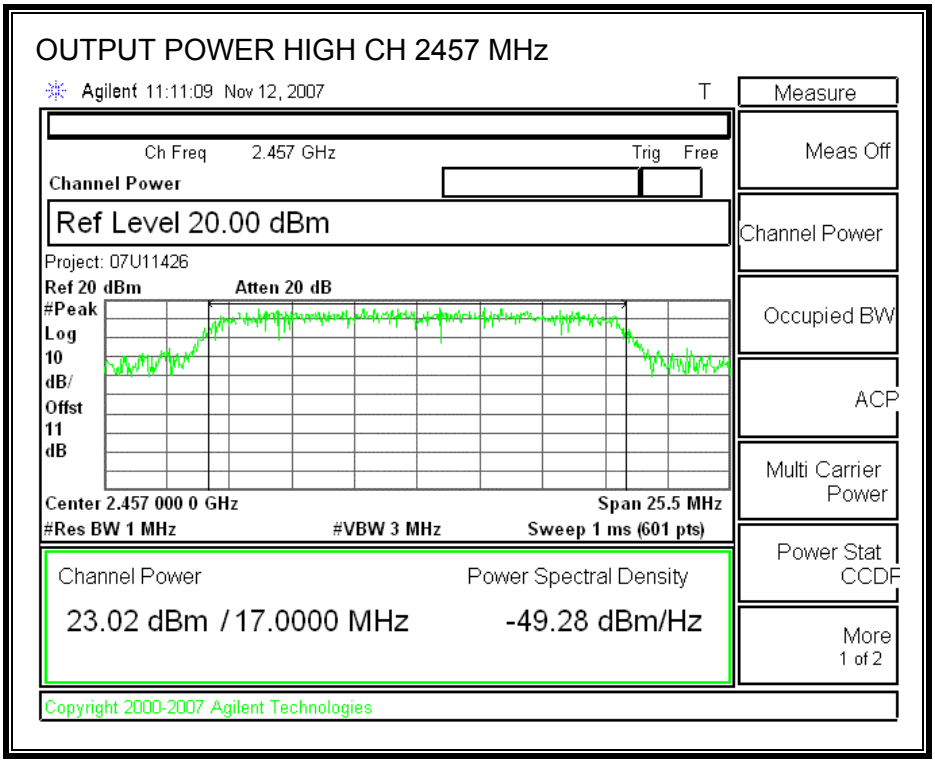


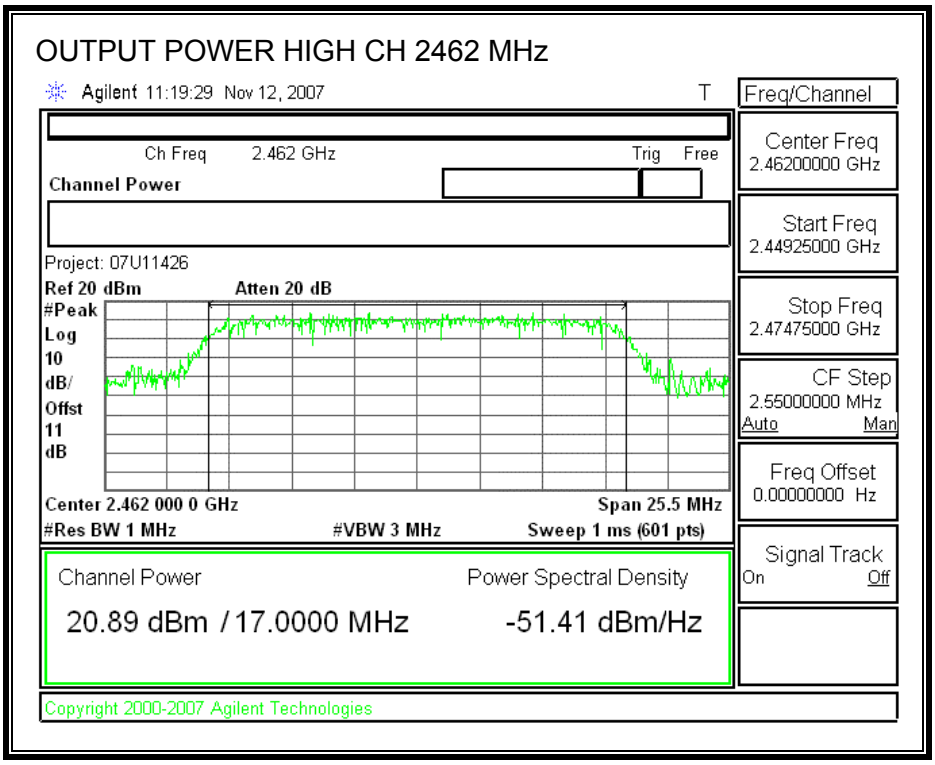


OUTPUT POWER MID CH 2437 MHz



OUTPUT POWER HIGH CH 2457 MHz





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

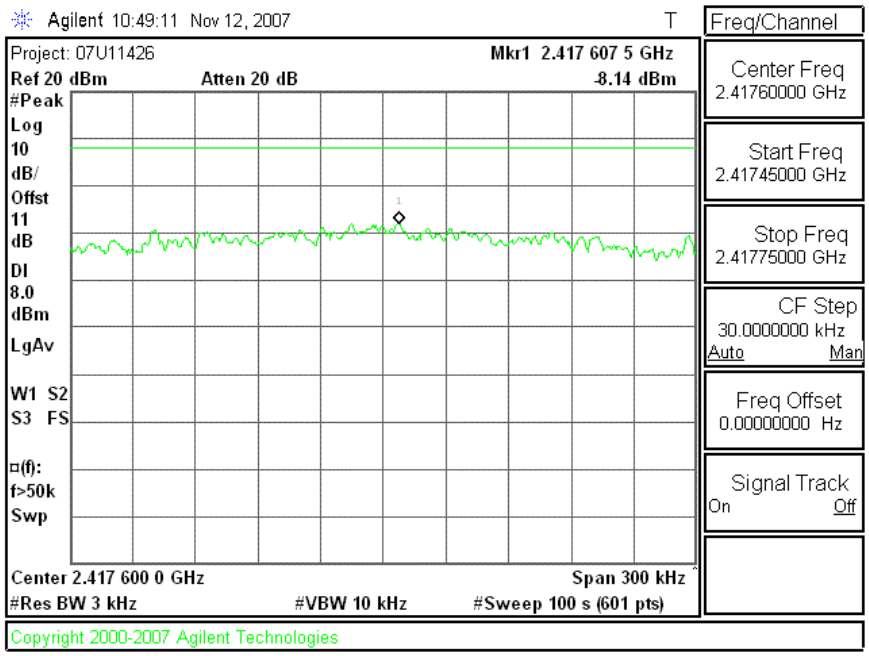
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

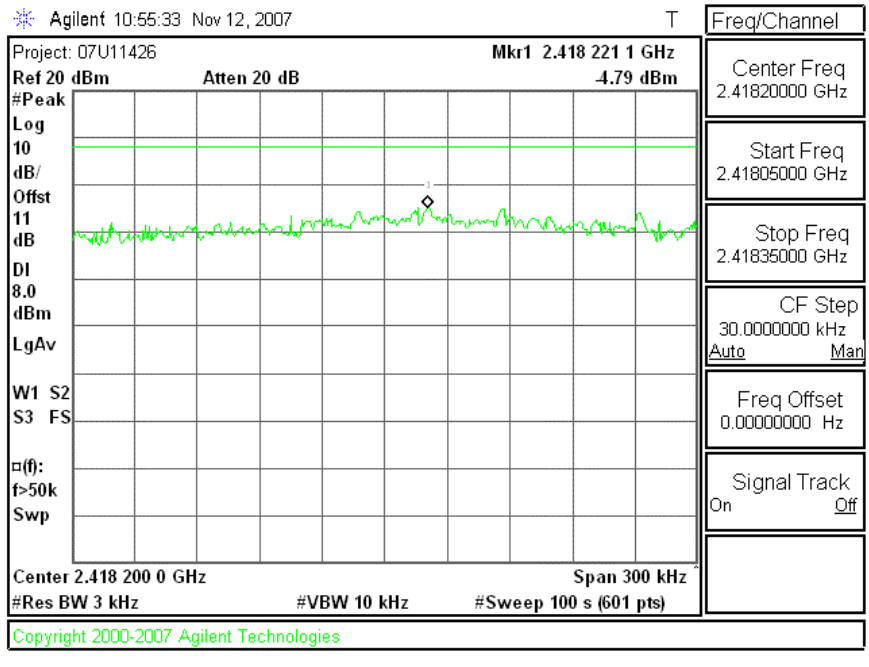
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-8.14	8	-16.14
Low	2417	-4.79	8	-12.79
Middle	2437	-5.22	8	-13.22
High	2457	-5.42	8	-13.42
High	2462	-6.94	8	-14.94

POWER SPECTRAL DENSITY

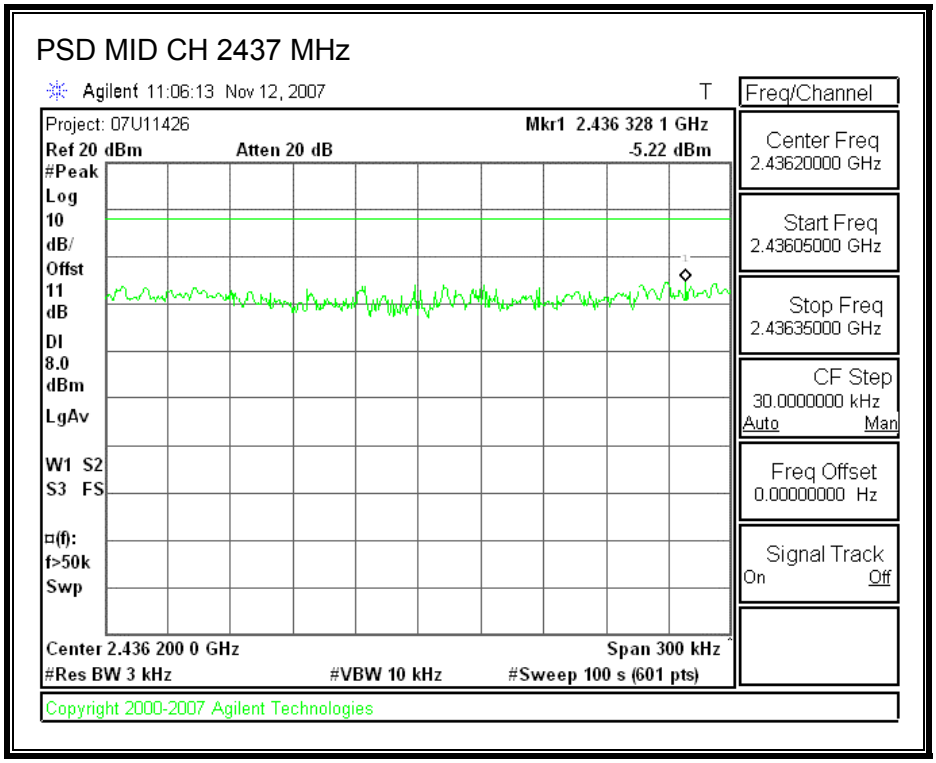
PSD LOW CH 2412 MHz



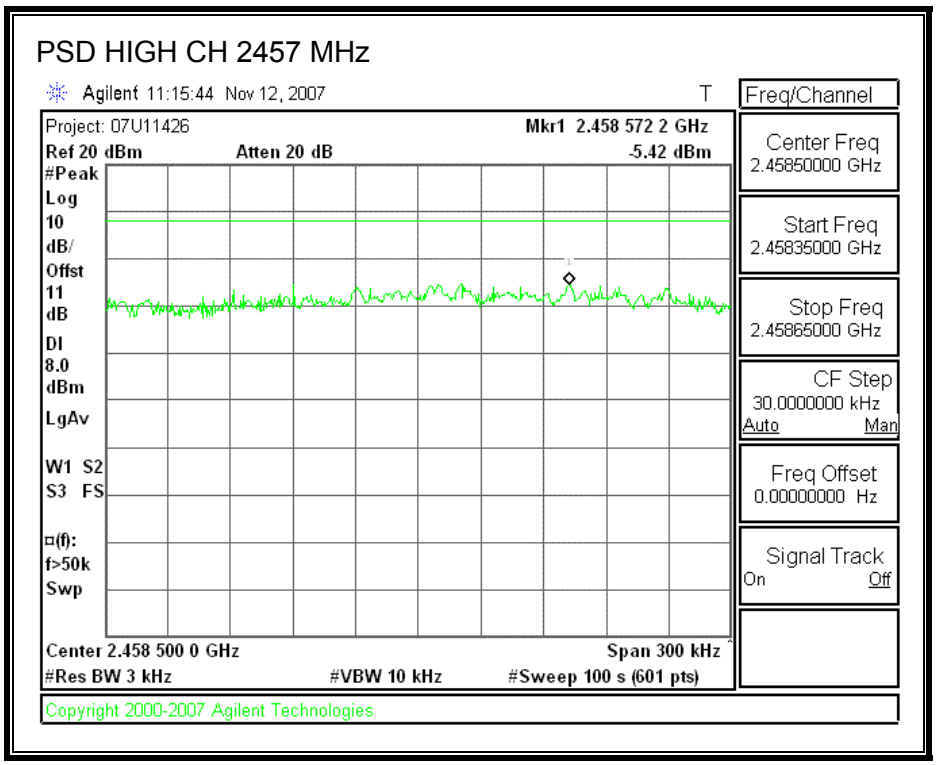
PSD LOW CH 2417 MHz



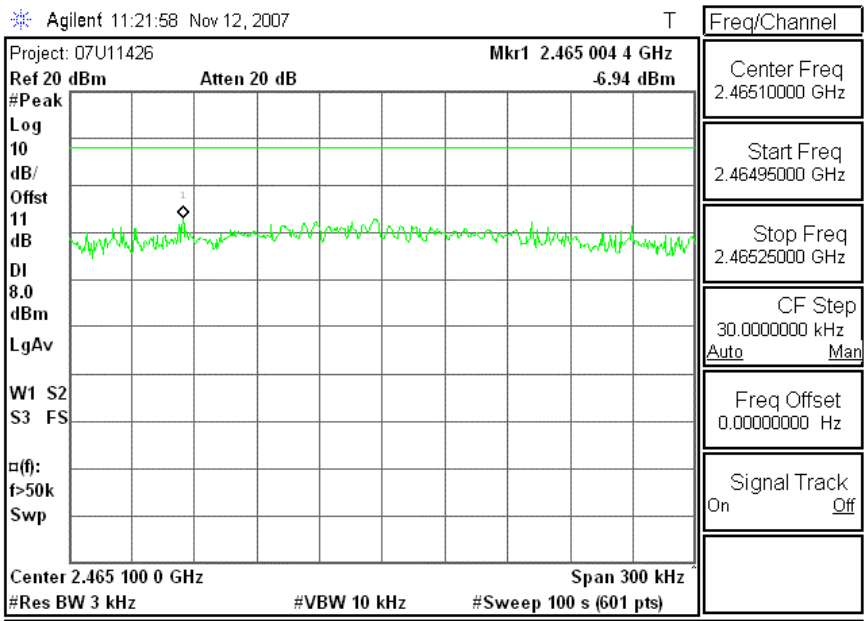
PSD MID CH 2437 MHz



PSD HIGH CH 2457 MHz



PSD HIGH CH 2462 MHz



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.

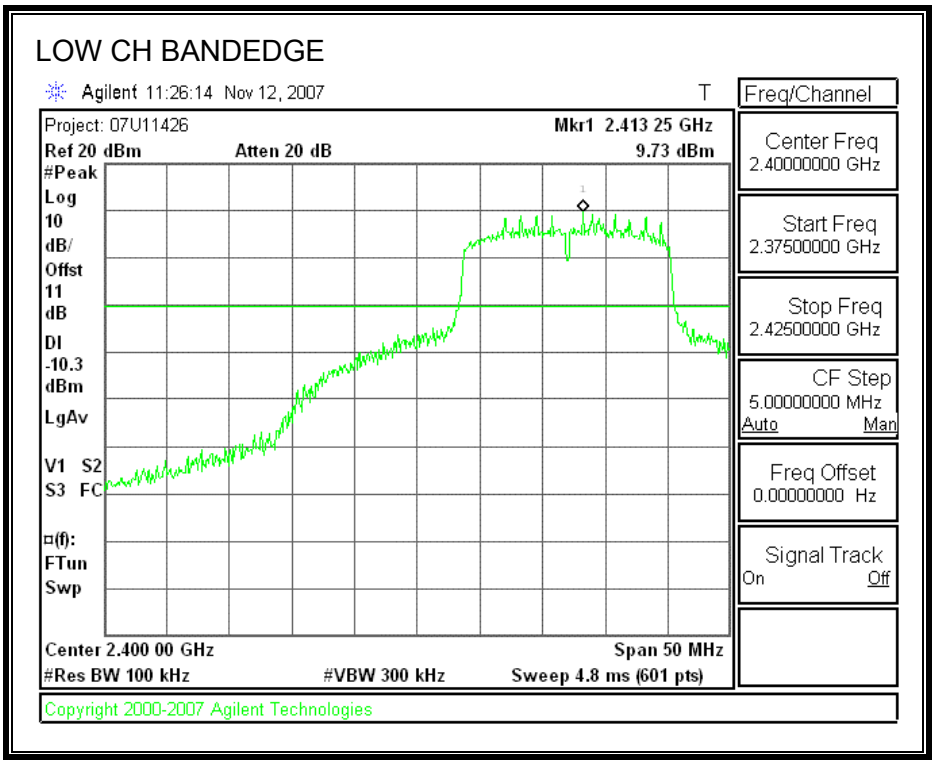
TEST PROCEDURE

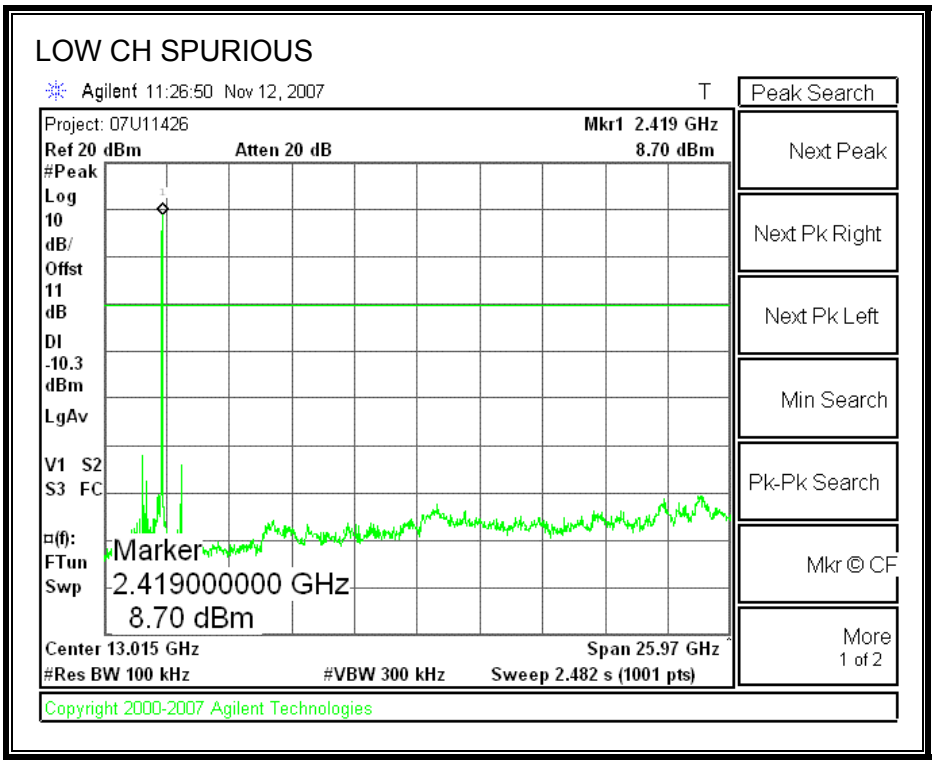
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

RESULTS

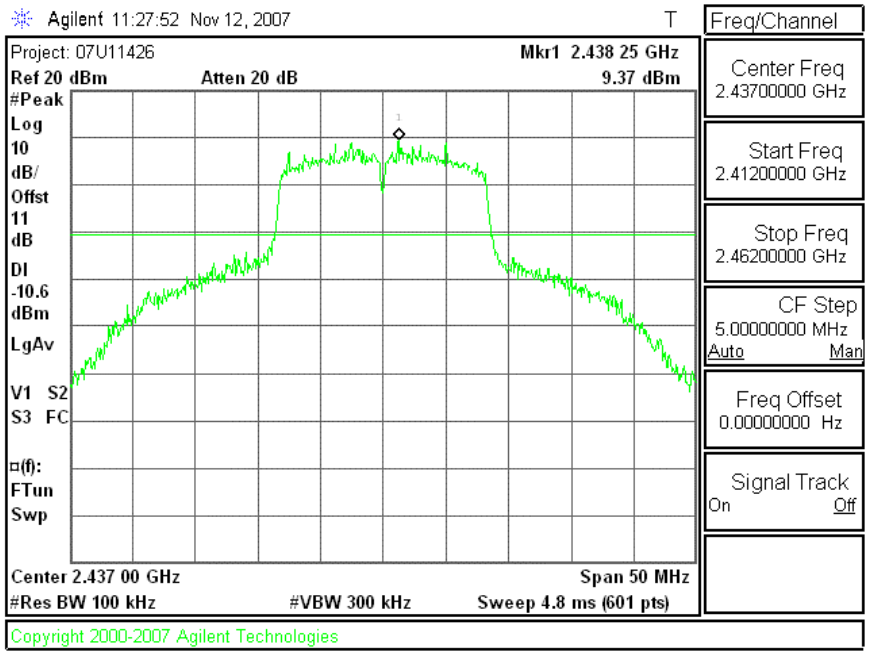
SPURIOUS EMISSIONS, LOW CHANNEL



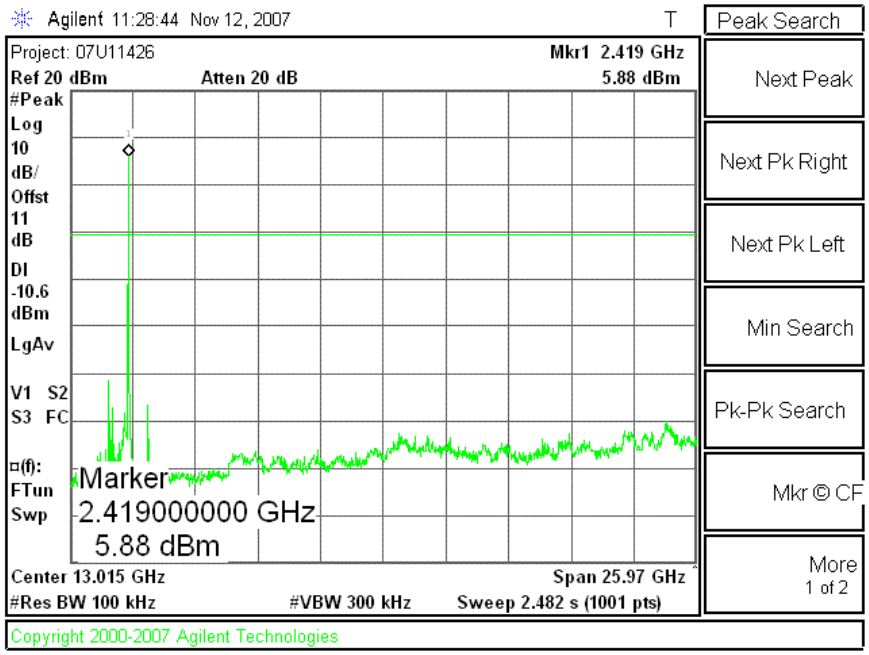


SPURIOUS EMISSIONS, MID CHANNEL

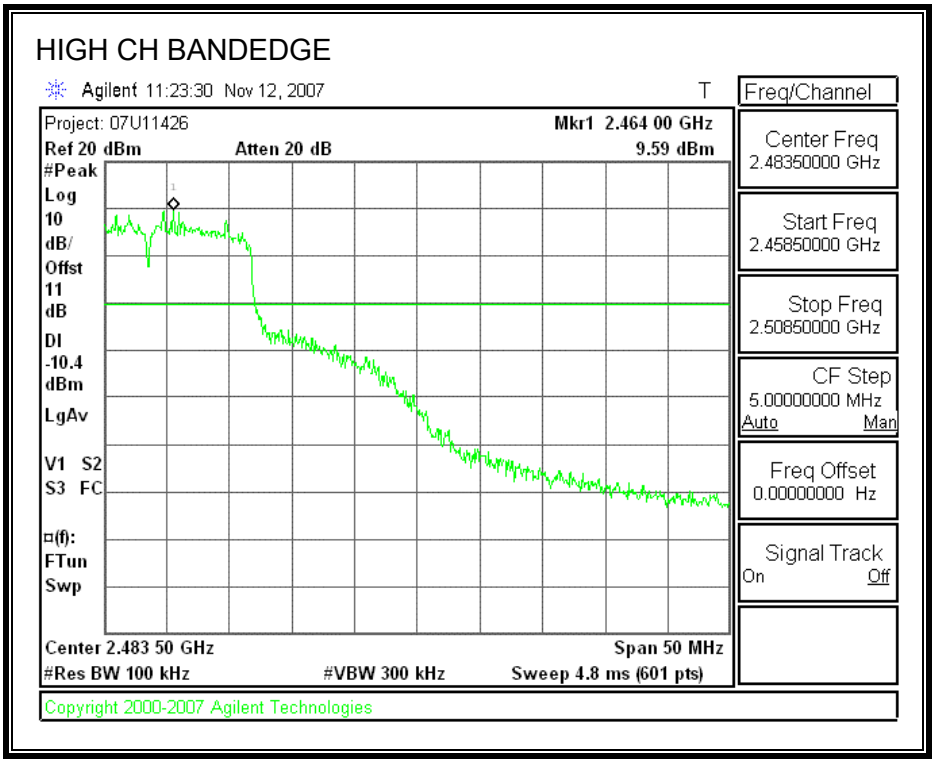
MID CH REFERENCE

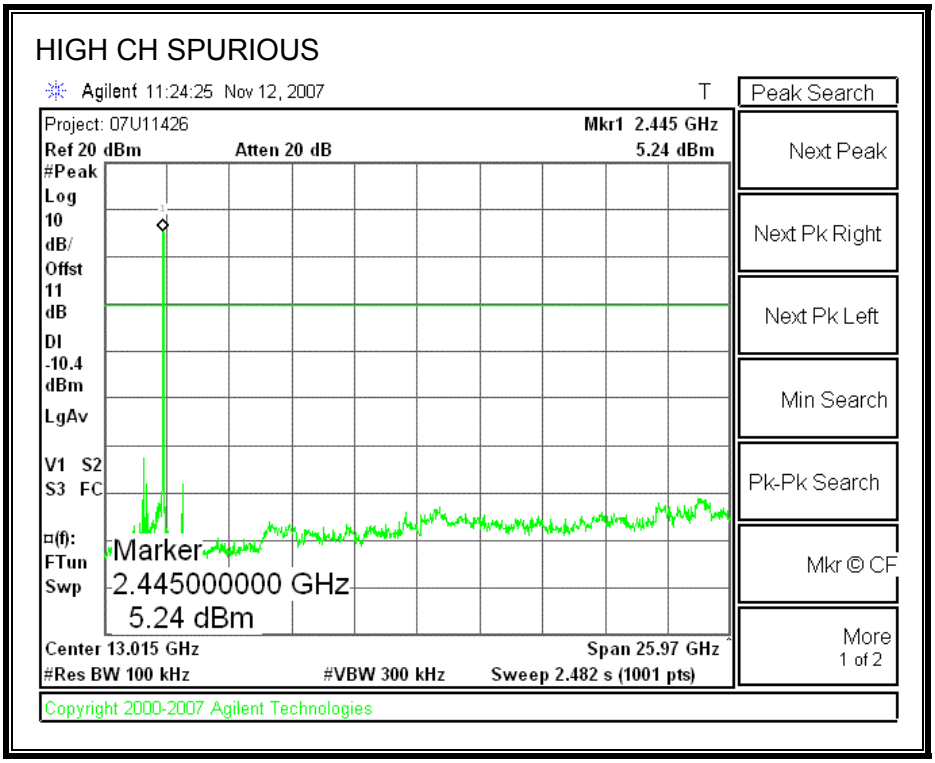


MID CH SPURIOUS



SPURIOUS EMISSIONS, HIGH CHANNEL





8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

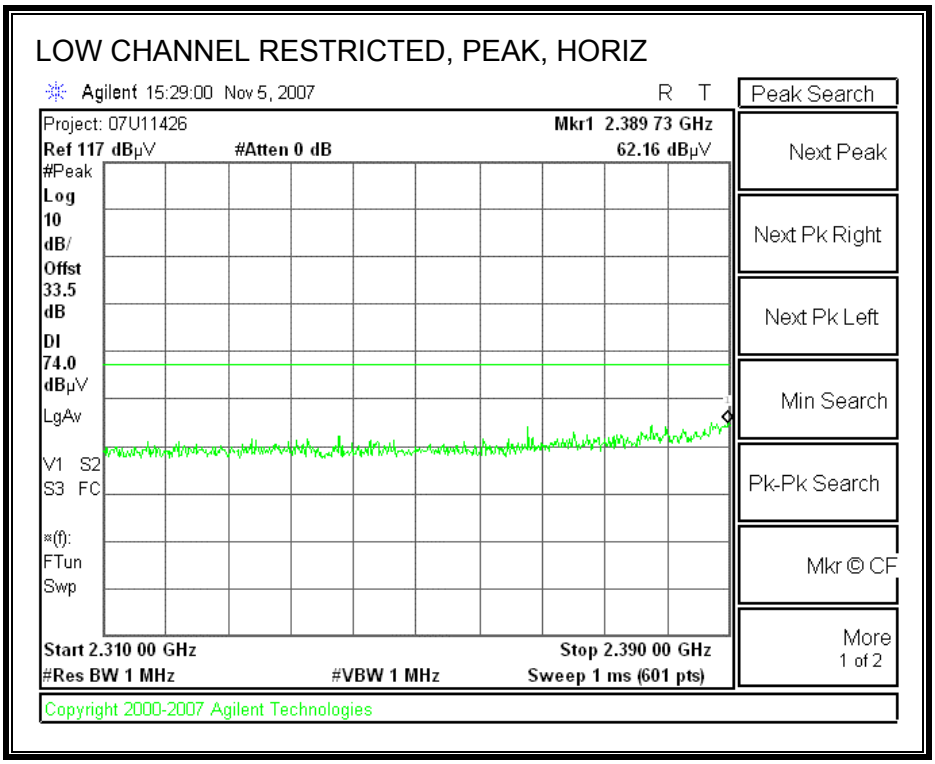
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The 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.

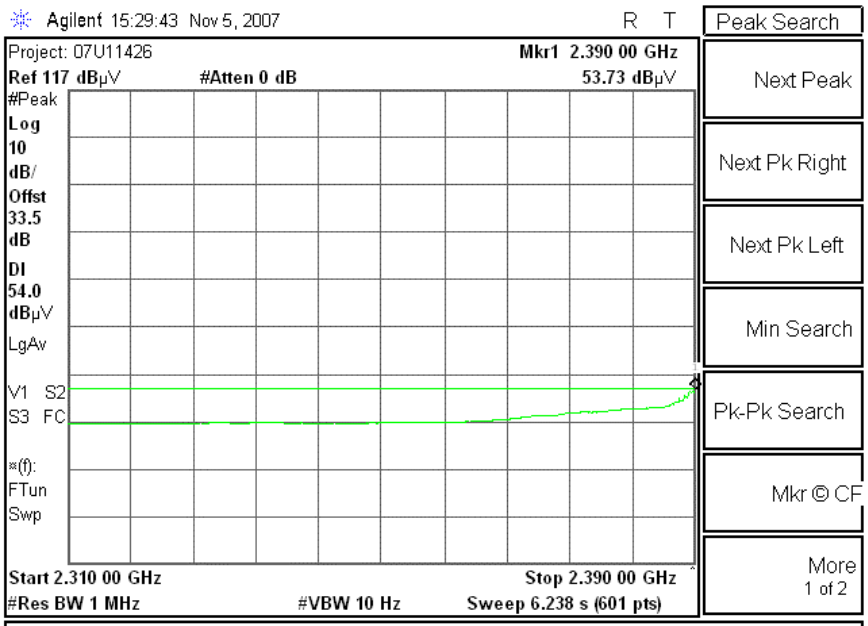
8.1.1. TRANSMITTER ABOVE 1 GHz FOR 802.11b MODE IN THE 2.4 GHz BAND

CH1, 2412 MHz

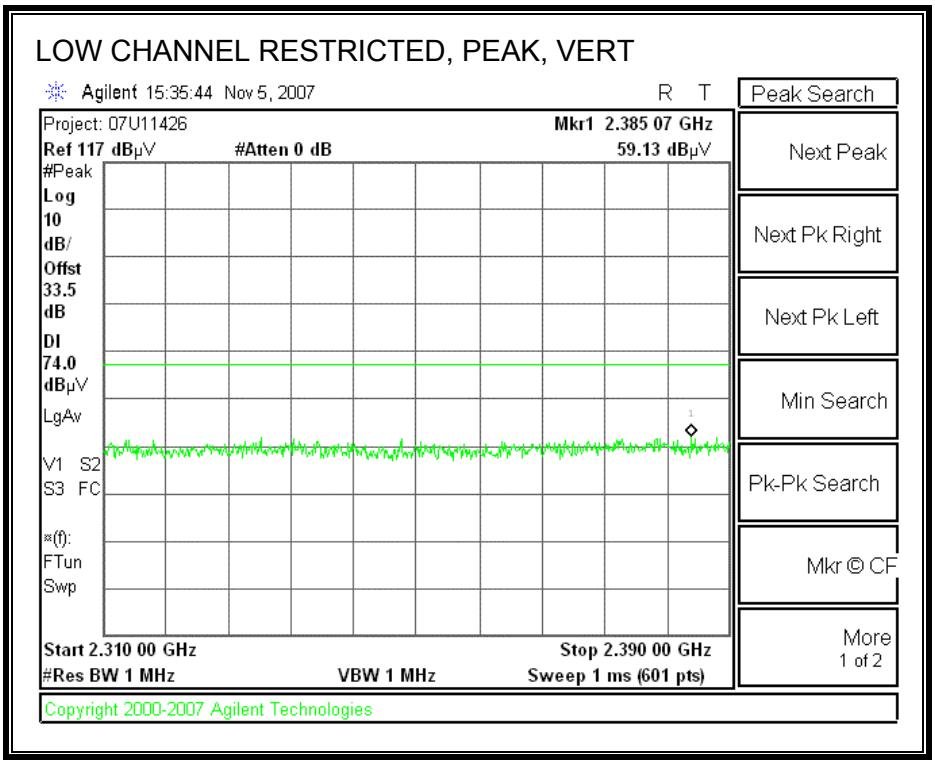
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

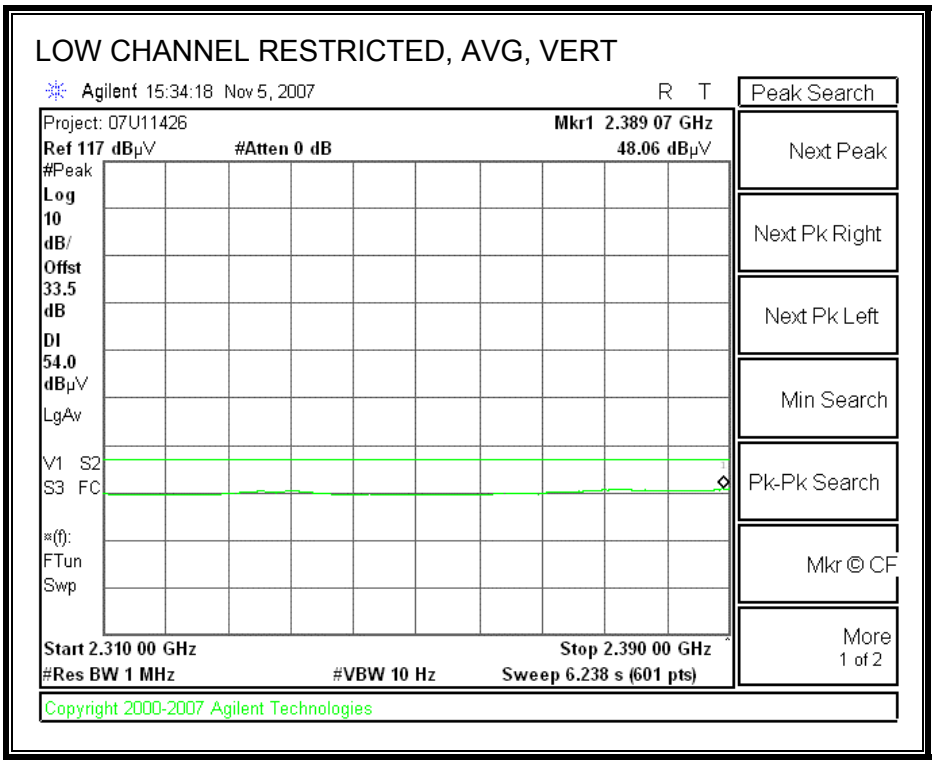


LOW CHANNEL RESTRICTED, AVG, HORIZ



RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

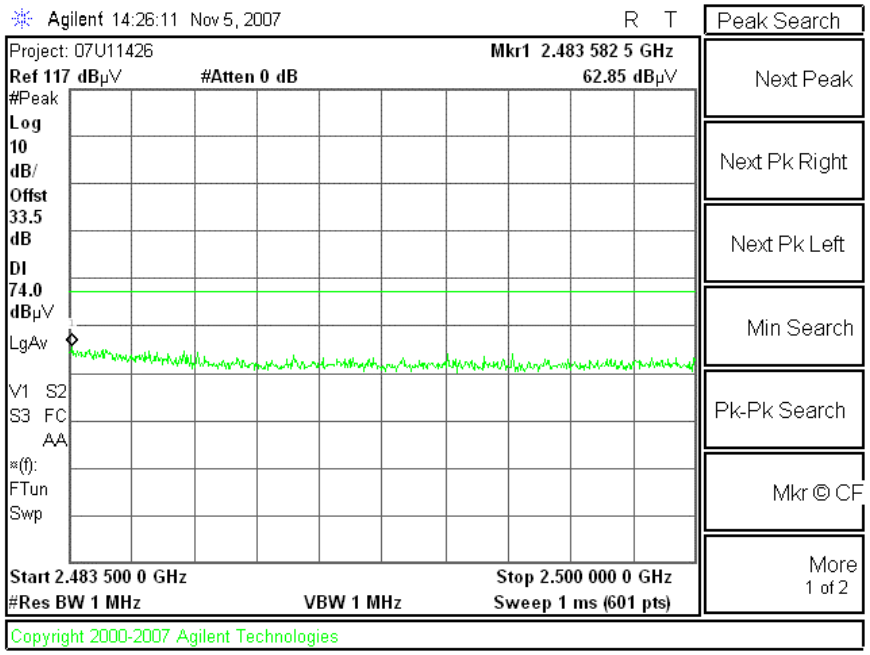




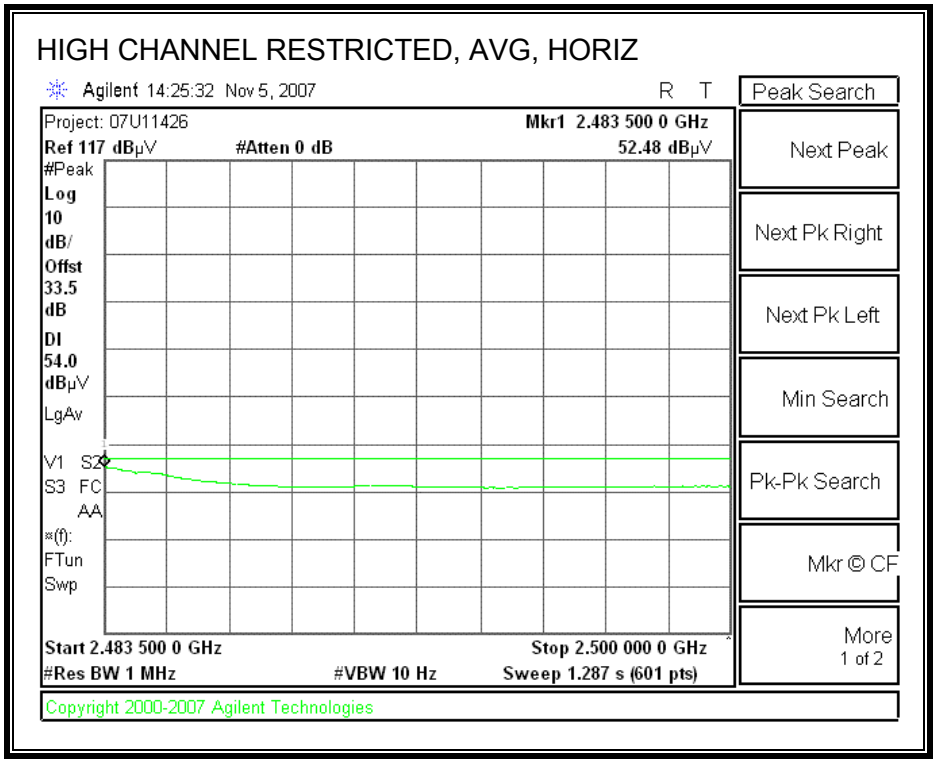
CH11, 2462 MHz

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

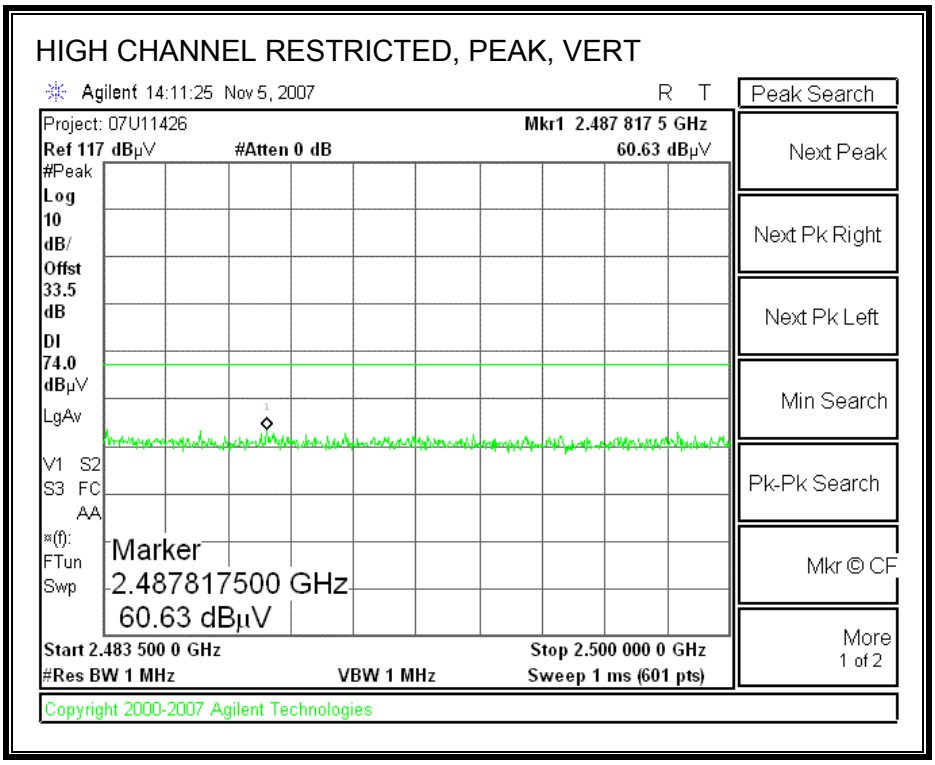
HIGH CHANNEL RESTRICTED, PEAK, HORIZ

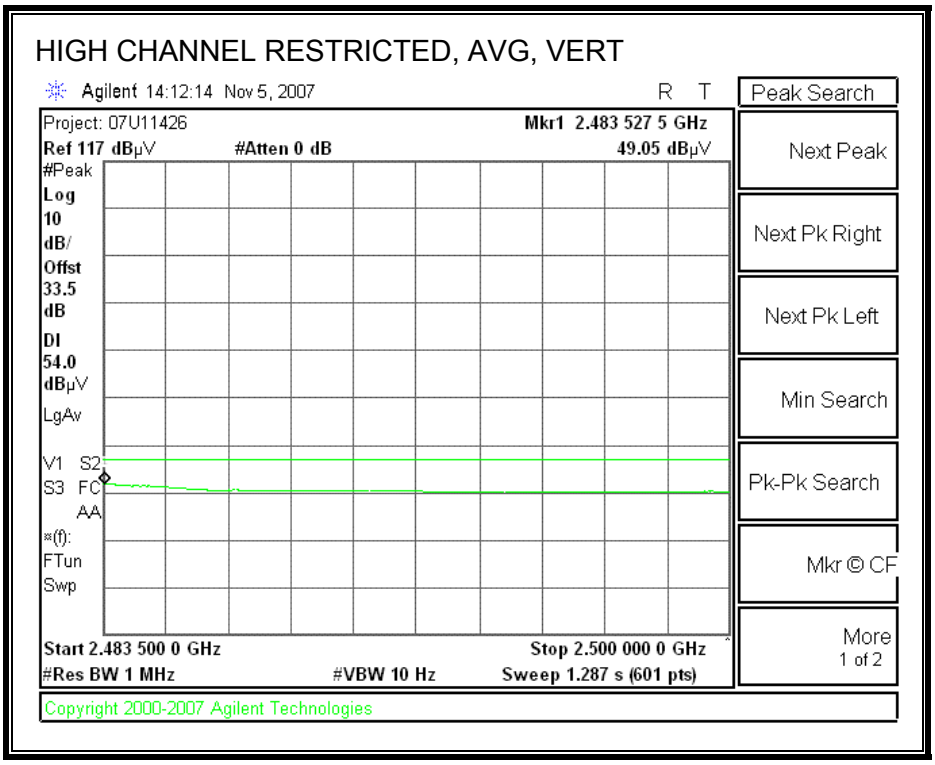


HIGH CHANNEL RESTRICTED, AVG, HORIZ



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Company: Broadcom
Project #: 07U11426
Date: 11/05/07
Test Engineer: Vien Tran
Configuration: EUT on extended card
Mode: Tx 11b

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T119; S/N: 29301 @3m	T34 HP 8449B			FCC 15.205

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
	Gordon 177080004	Chin 200354001	HPF_4.0GHz	

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
LOW CH, 2412 MHz															
4.824	3.0	45.2	35.5	33.7	3.5	-34.8	0.0	0.6	48.1	38.4	74	54	-25.9	-15.6	V
4.824	3.0	47.2	38.9	33.7	3.5	-34.8	0.0	0.6	50.1	41.8	74	54	-23.9	-12.2	H
MID CH, 2437 MHz															
4.874	3.0	48.6	43.6	33.7	3.5	-34.8	0.0	0.6	51.6	46.6	74	54	-22.4	-7.4	V
7.311	3.0	46.5	37.1	35.2	4.1	-34.1	0.0	0.6	52.2	42.8	74	54	-21.8	-11.2	V
4.874	3.0	47.8	41.6	33.7	3.5	-34.8	0.0	0.6	50.8	44.6	74	54	-23.2	-9.4	H
7.311	3.0	46.7	37.2	35.2	4.1	-34.1	0.0	0.6	52.5	43.0	74	54	-21.5	-11.0	H
HI CH, 2462 MHz															
4.924	3.0	49.8	44.3	33.8	3.5	-34.8	0.0	0.6	52.8	47.4	74	54	-21.2	-6.6	V
7.386	3.0	45.2	33.6	35.2	4.1	-34.1	0.0	0.6	51.0	39.4	74	54	-23.0	-14.6	V
4.924	3.0	45.7	38.2	33.8	3.5	-34.8	0.0	0.6	48.8	41.3	74	54	-25.2	-12.7	H
7.386	3.0	45.6	35.5	35.2	4.1	-34.1	0.0	0.6	51.4	41.4	74	54	-22.6	-12.6	H

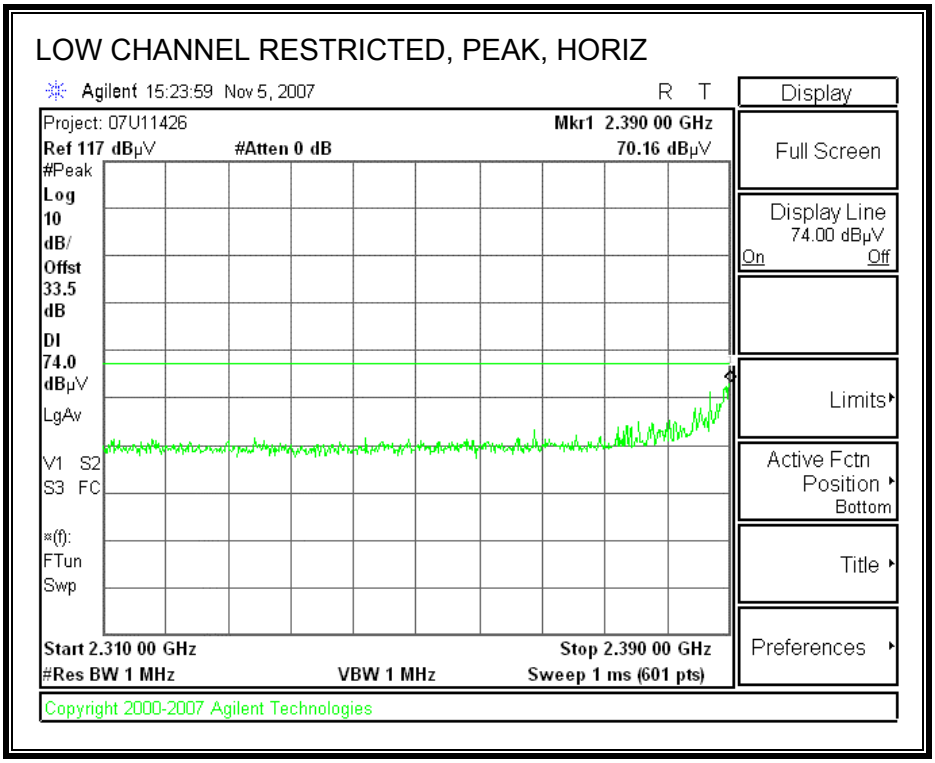
Rev. 5.1.6

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		

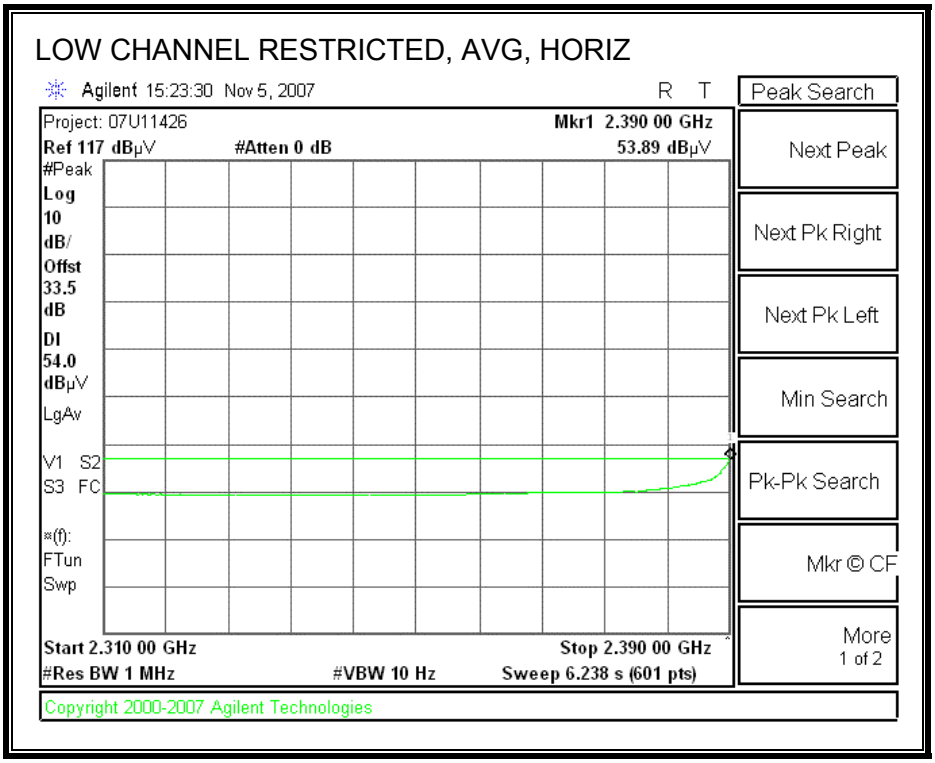
8.1.2. TRANSMITTER ABOVE 1 GHz FOR 802.11g MODE IN THE 2.4 GHz BAND

CH1, 2412 MHz

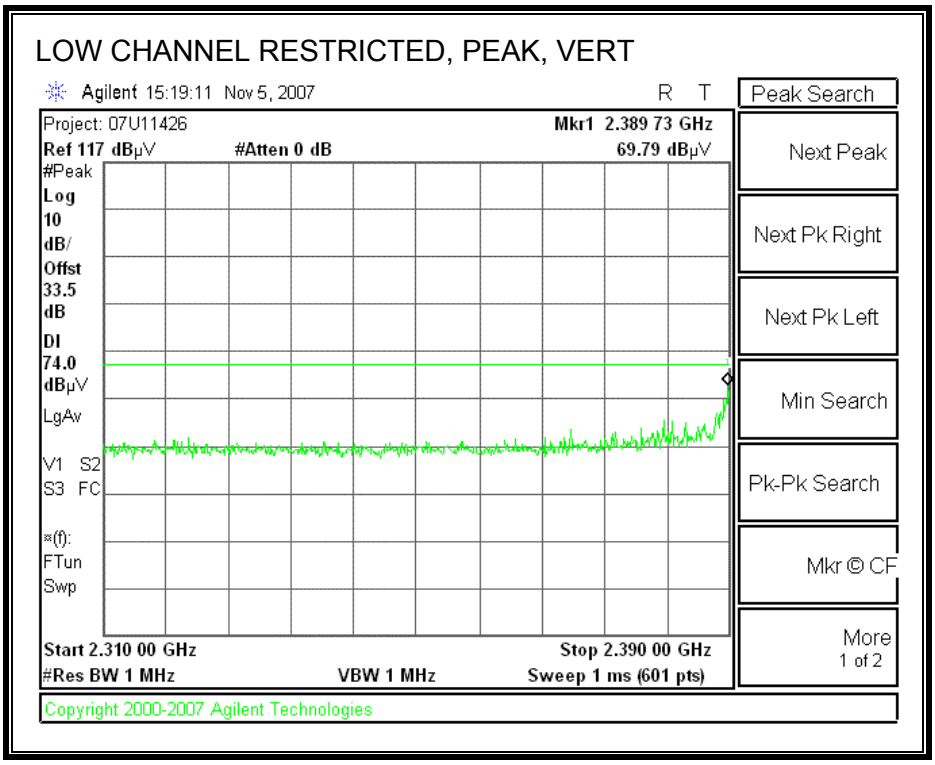
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

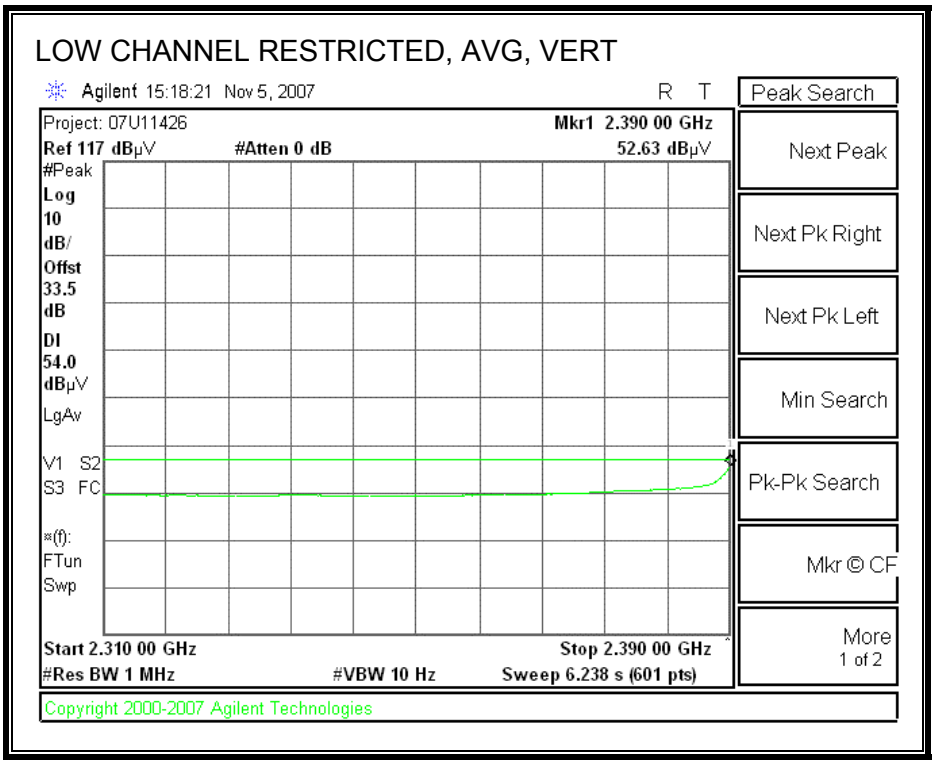


LOW CHANNEL RESTRICTED, AVG, HORIZ



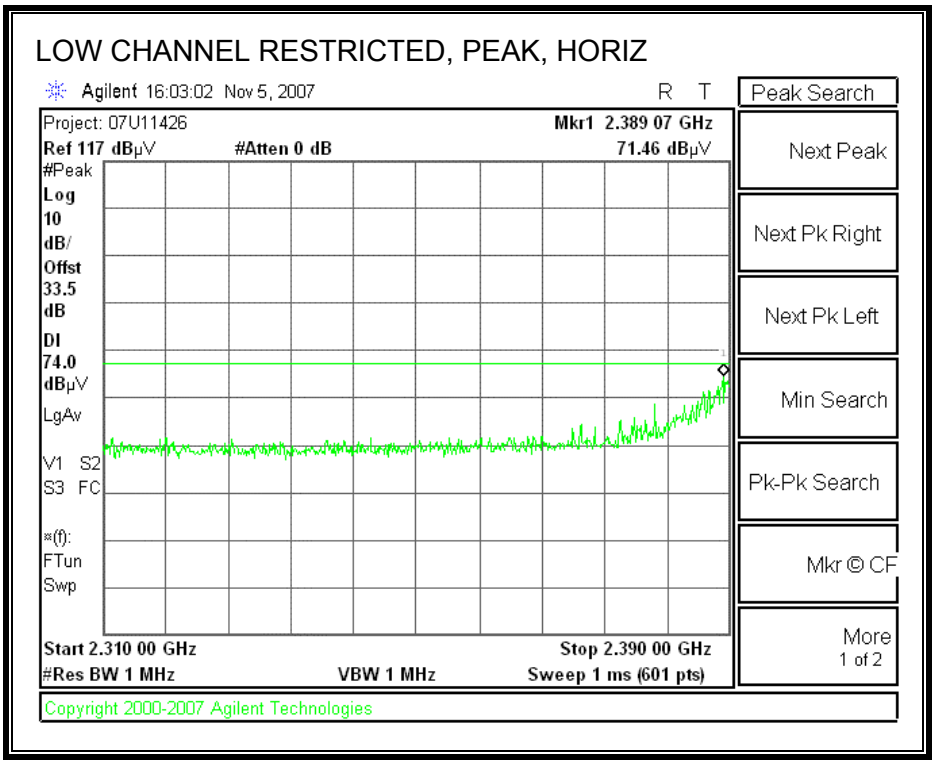
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

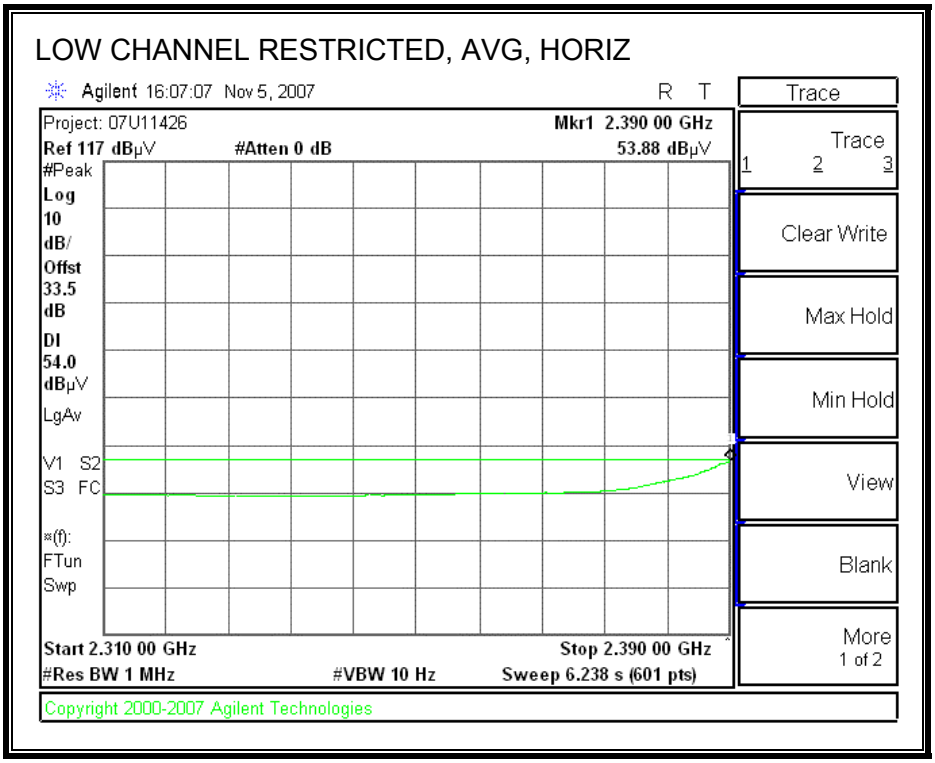




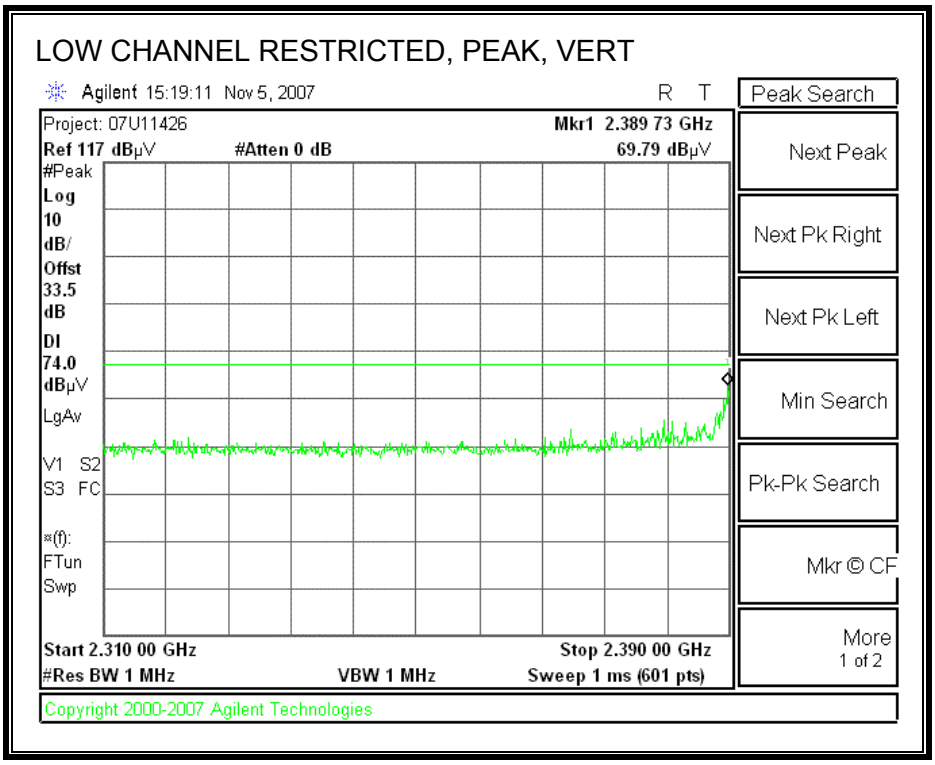
CH2, 2417 MHz

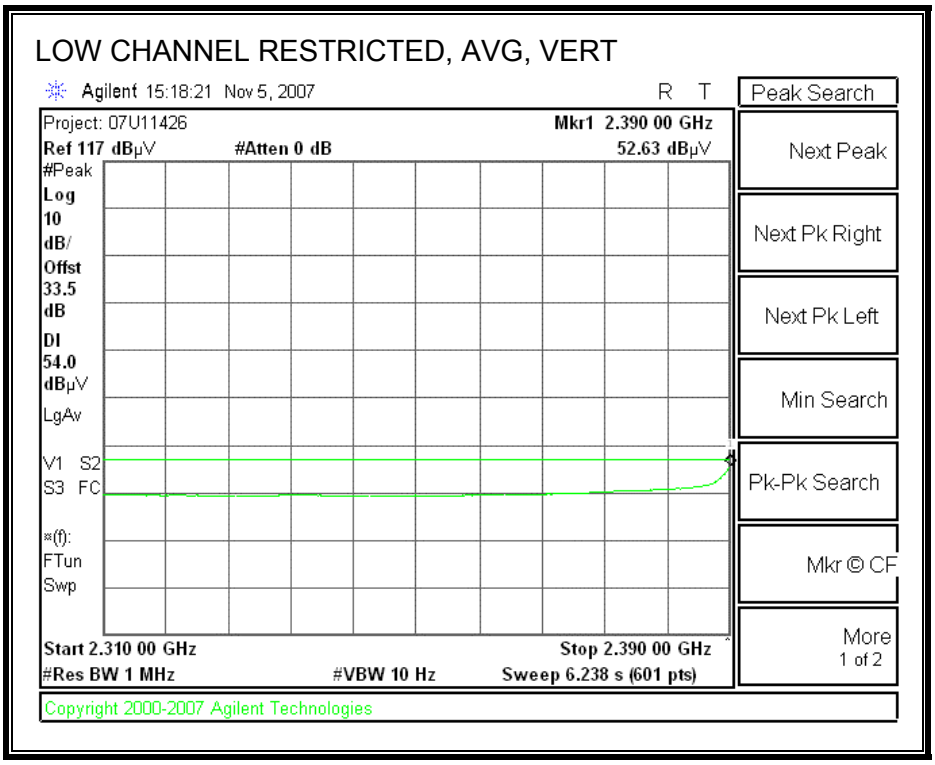
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

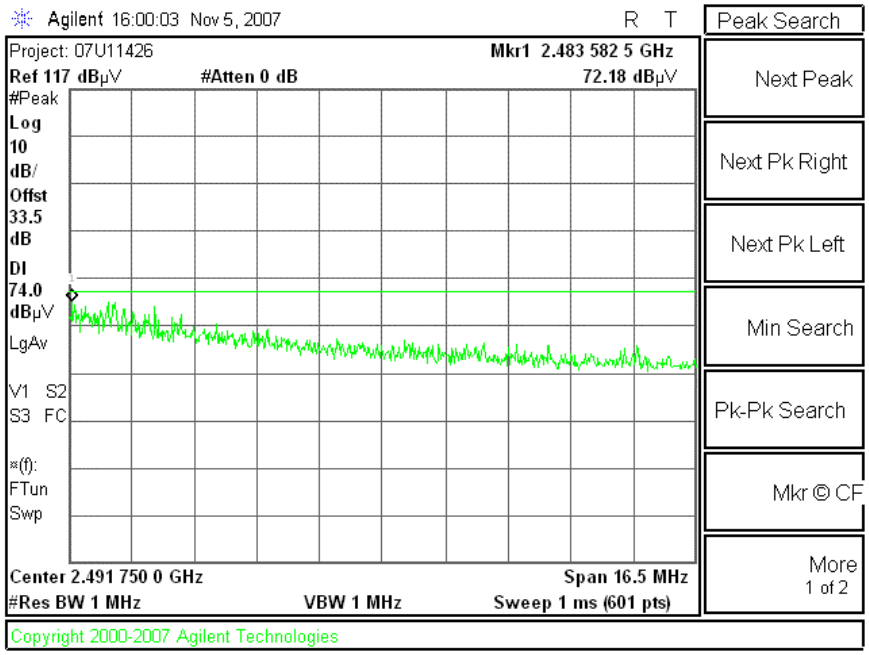




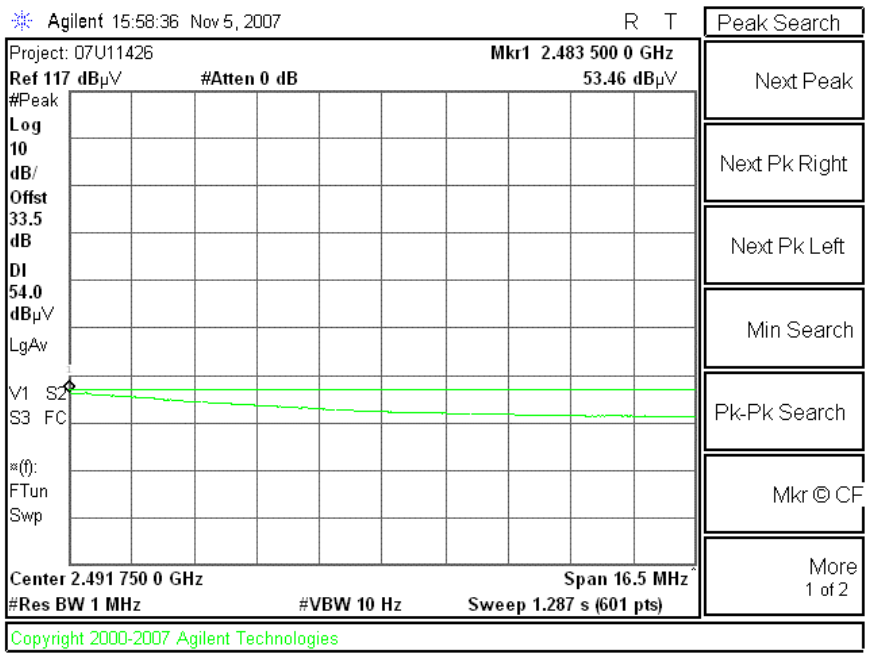
CH10, 2457 MHz

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

HIGH CHANNEL RESTRICTED, PEAK, HORIZ

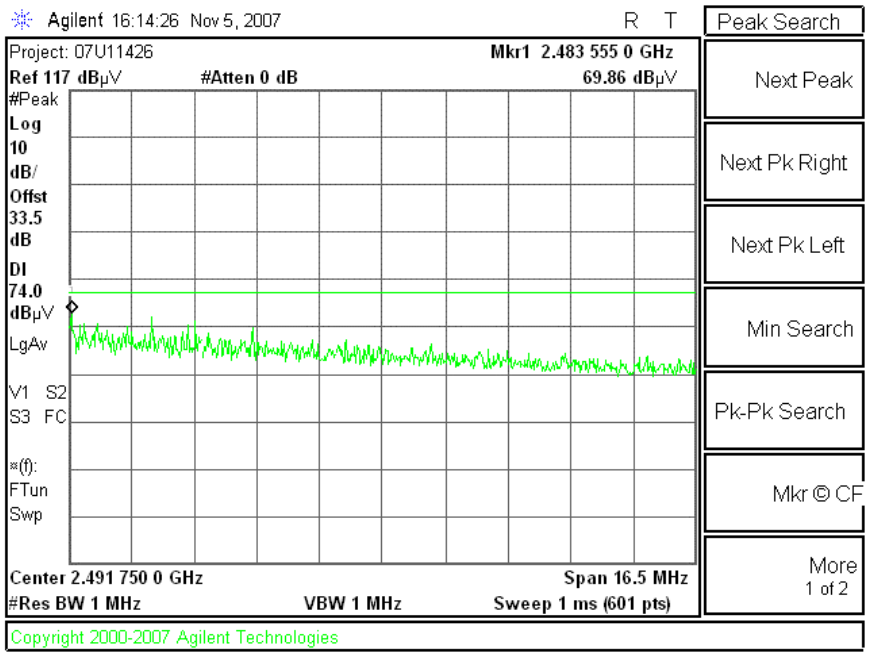


HIGH CHANNEL RESTRICTED, AVG, HORIZ

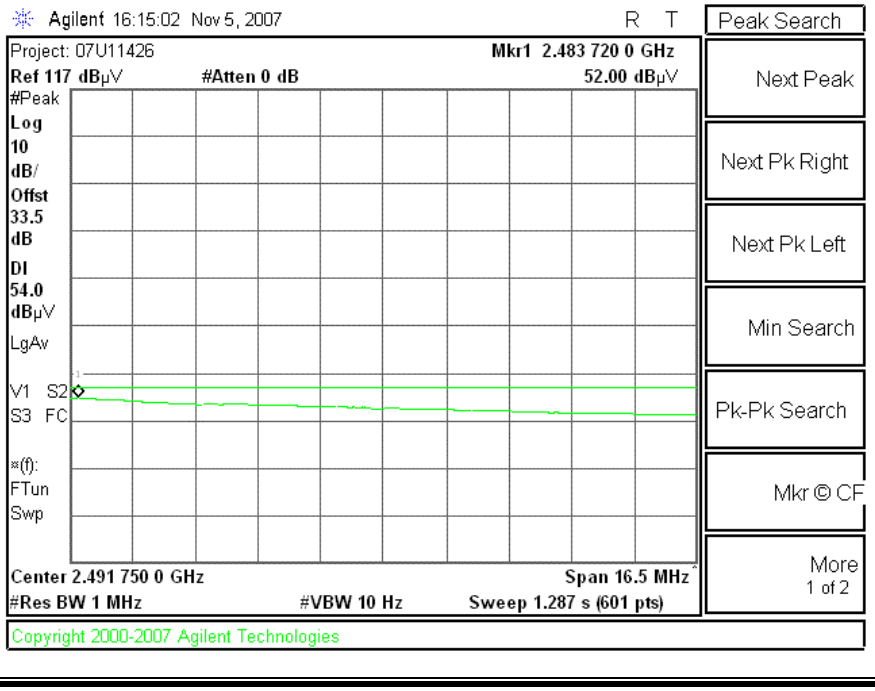


RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

HIGH CHANNEL RESTRICTED, PEAK, VERT



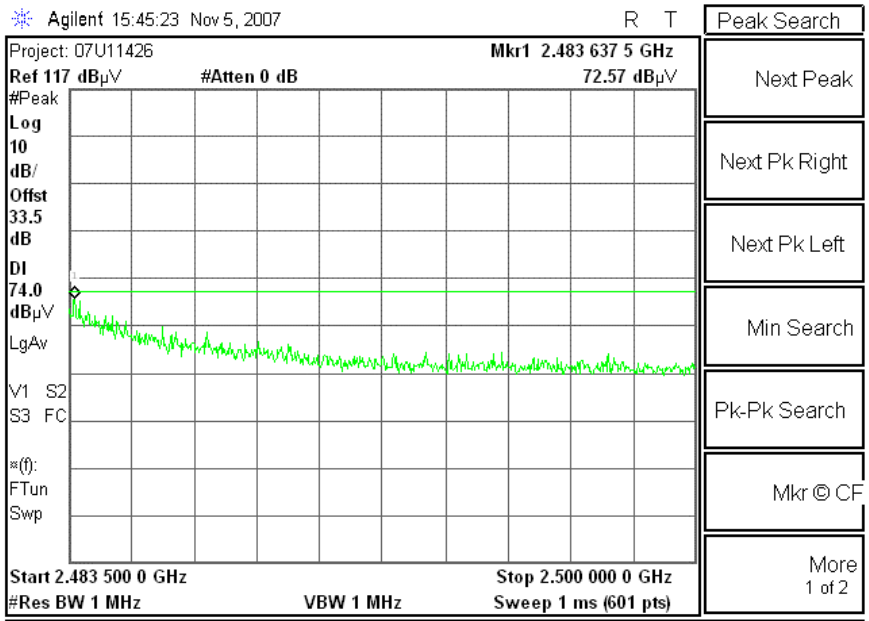
HIGH CHANNEL RESTRICTED, AVG, VERT



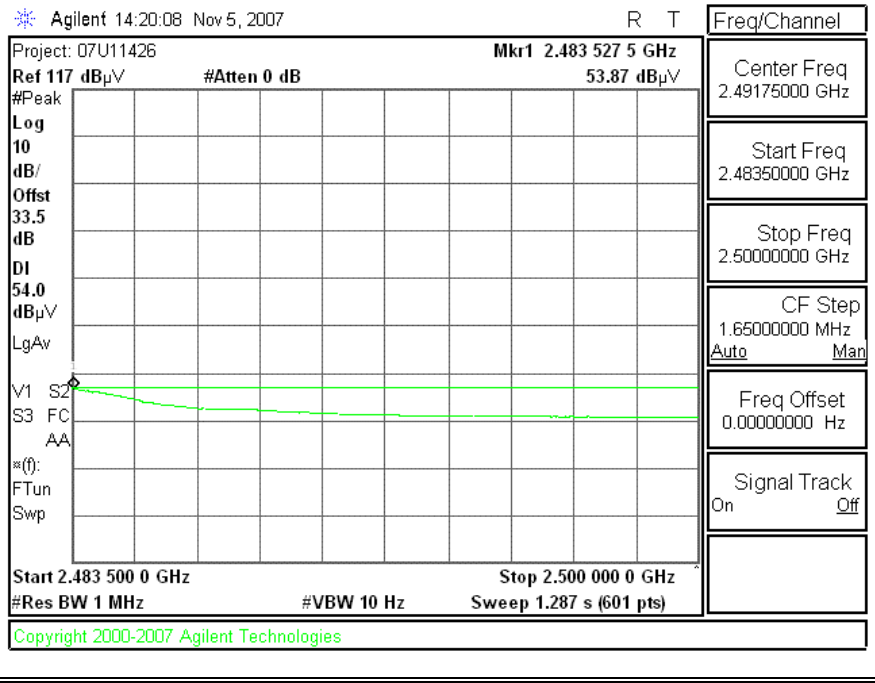
CH11, 2462 MHz

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

HIGH CHANNEL RESTRICTED, PEAK, HORIZ

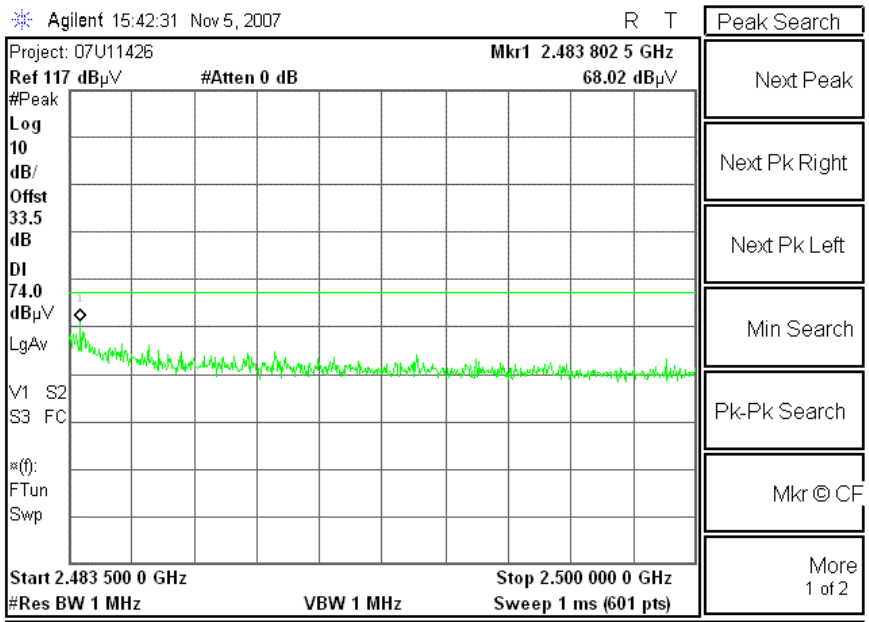


HIGH CHANNEL RESTRICTED, AVG, HORIZ

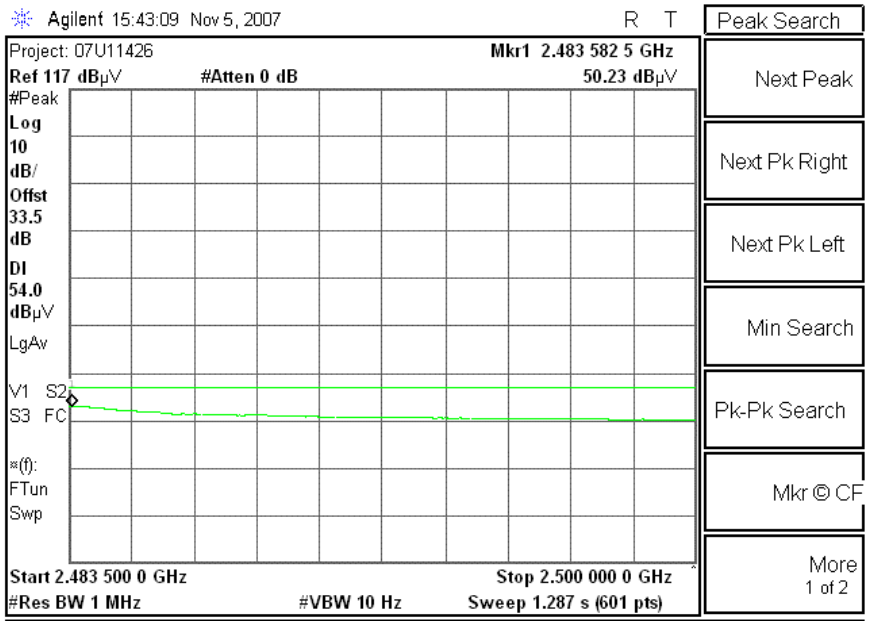


RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

HIGH CHANNEL RESTRICTED, PEAK, VERT



HIGH CHANNEL RESTRICTED, AVG, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Company: Broadcom
Project #: 07U11426
Date: 11/05/07
Test Engineer: Vien Tran
Configuration: EUT on extended card
Mode: Tx 11g

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T119; S/N: 29301 @3m	T34 HP 8449B			FCC 15.205

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
	Gordon 177080004	Chin 200354001	HPF_4.0GHz	

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
LOW CH, 2412 MHz															
4.824	3.0	50.8	35.5	33.7	3.5	-34.8	0.0	0.6	53.7	38.4	74	54	-20.3	-15.6	V
4.824	3.0	47.1	33.1	33.7	3.5	-34.8	0.0	0.6	50.0	36.0	74	54	-24.0	-18.0	H
MID CH, 2437 MHz															
4.874	3.0	51.4	36.2	33.7	3.5	-34.8	0.0	0.6	54.4	39.2	74	54	-19.6	-14.8	V
7.311	3.0	45.7	33.1	35.2	4.1	-34.1	0.0	0.6	51.4	38.8	74	54	-22.6	-15.2	V
4.874	3.0	46.7	33.4	33.7	3.5	-34.8	0.0	0.6	49.7	36.4	74	54	-24.3	-17.6	H
7.311	3.0	48.6	35.7	35.2	4.1	-34.1	0.0	0.6	54.4	41.4	74	54	-19.6	-12.6	H
HI CH, 2462 MHz															
4.924	3.0	51.7	36.8	33.8	3.5	-34.8	0.0	0.6	54.8	39.9	74	54	-19.2	-14.1	V
4.924	3.0	47.2	33.6	33.8	3.5	-34.8	0.0	0.6	50.3	36.7	74	54	-23.7	-17.3	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		

8.2. RECEIVER ABOVE 1 GHz

8.2.1. RECEIVER ABOVE 1 GHz 802.11 b MODE IN THE 2.4 GHz BAND

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Broadcom
Project #: 07U11426
Date: 11/5/2007
Test Engineer: Mengistu Mekuria
Configuration: EUT, Extention Card, and Laptop
Mode: Rx b mode

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T120; S/N: 29310 @3m	T145 Agilent 3008A005(			RX RSS 210

Hi Frequency Cables

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

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.036	3.0	49.0	34.3	28.0	3.3	-36.1	0.0	0.0	44.1	29.4	74	54	-29.9	-24.6	V
2.485	3.0	57.2	34.3	31.8	5.1	-35.1	0.0	0.0	59.0	36.1	74	54	-15.0	-17.9	V
1.045	3.0	51.0	35.9	28.0	3.3	-36.1	0.0	0.0	46.2	31.1	74	54	-27.8	-22.9	H
1.300	3.0	50.3	35.2	29.0	3.6	-35.9	0.0	0.0	47.0	31.9	74	54	-27.0	-22.1	H
1.600	3.0	50.1	34.8	30.1	4.0	-35.7	0.0	0.0	48.5	33.2	74	54	-25.5	-20.8	H
2.485	3.0	54.5	33.3	31.8	5.1	-35.1	0.0	0.0	56.2	35.1	74	54	-17.8	-18.9	H

Rev. 4.12.7

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

8.2.2. RECEIVER ABOVE 1 GHz 802.11g MODE IN THE 2.4 GHz BAND

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Broadcom
Project #: 07U11426
Date: 11/5/2007
Test Engineer: Mengistu Mekuria
Configuration: EUT, Extention Card, and Laptop
Mode: Rx g mode

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T120; S/N: 29310 @3m	T145 Agilent 3008A005(			RX RSS 210

Hi Frequency Cables

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

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.036	3.0	51.6	34.8	28.0	3.3	-36.1	0.0	0.0	46.7	30.0	74	54	-27.3	-24.0	V
2.485	3.0	57.4	34.3	31.8	5.1	-35.1	0.0	0.0	59.1	36.1	74	54	-14.9	-17.9	V
1.090	3.0	52.1	39.4	28.2	3.3	-36.1	0.0	0.0	47.5	34.9	74	54	-26.5	-19.1	H
1.195	3.0	50.4	36.2	28.6	3.5	-36.0	0.0	0.0	46.4	32.2	74	54	-27.6	-21.8	H
1.600	3.0	48.6	34.2	30.1	4.0	-35.7	0.0	0.0	47.0	32.6	74	54	-27.0	-21.4	H
2.485	3.0	54.9	33.4	31.8	5.1	-35.1	0.0	0.0	56.7	35.2	74	54	-17.3	-18.8	H

Rev. 4.12.7

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

8.3. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT & DATA

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 37 File#: 07U11426_EMI.EMI Date: 11-07-2007 Time: 00:41:21

Condition: FCC CLASS-B HORIZONTAL
Test Operator:: Mengistu Mekuria
Project #: : 07U11426
Company: : Broadcom
Configuration:: EUT, Extention Card, and Laptop
Mode : : Tx Worst Case
Target: : FCC Class B

Page: 1

	Freq	Level	Limit Line	Over Limit	Remark
	MHz	dBuV/m	dBuV/m	dB	
1	402.480	35.81	46.00	-10.19	Peak
2	417.030	35.64	46.00	-10.36	Peak
3	555.740	32.04	46.00	-13.96	Peak
4	722.580	36.99	46.00	-9.01	Peak

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

VERTICAL PLOT & DATA

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 38 File#: 07U11426_EMI.EMI Date: 11-07-2007 Time: 00:45:49

Condition: FCC CLASS-B VERTICAL
Test Operator:: Mengistu Mekuria
Project #: : 07U11426
Company: : Broadcom
Configuration:: EUT, Extention Card, and Laptop
Mode : : Tx Worst Case
Target: : FCC Class B

Page: 1

	Freq	Level	Limit Line	Over Limit	Remark
	MHz	dBuV/m	dBuV/m	dB	
1	101.780	35.91	43.50	-7.59	Peak
2	279.290	32.13	46.00	-13.87	Peak
3	367.560	33.29	46.00	-12.71	Peak
4	383.080	33.21	46.00	-12.79	Peak
5	450.980	37.58	46.00	-8.42	Peak
6	698.330	38.27	46.00	-7.73	Peak

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

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

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

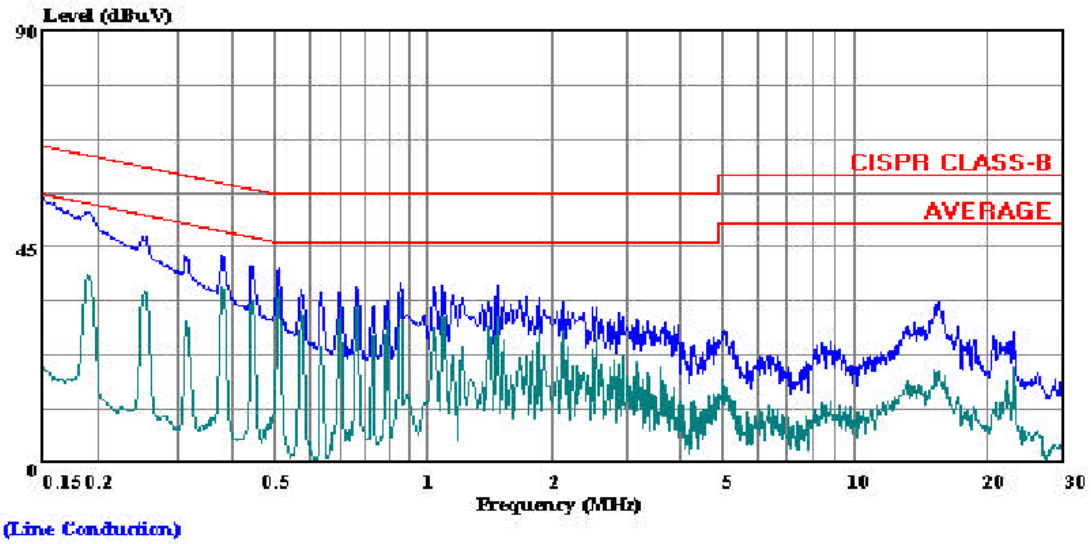
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.38	43.19	--	--	0.00	58.30	48.30	-15.11	-5.11	L1
0.51	40.35	--	--	0.00	56.00	46.00	-15.65	-5.65	L1
0.95	37.57	--	--	0.00	56.00	46.00	-18.43	-8.43	L1
0.38	42.89	--	--	0.00	58.30	48.30	-15.41	-5.41	L2
0.51	40.55	--	--	0.00	56.00	46.00	-15.45	-5.45	L2
0.95	38.45	--	--	0.00	56.00	46.00	-17.55	-7.55	L2
6 Worst Data									

LINE 1 RESULTS

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 7 File#: 07U11426 LC.EMI Date: 11-05-2007 Time: 22:03:04



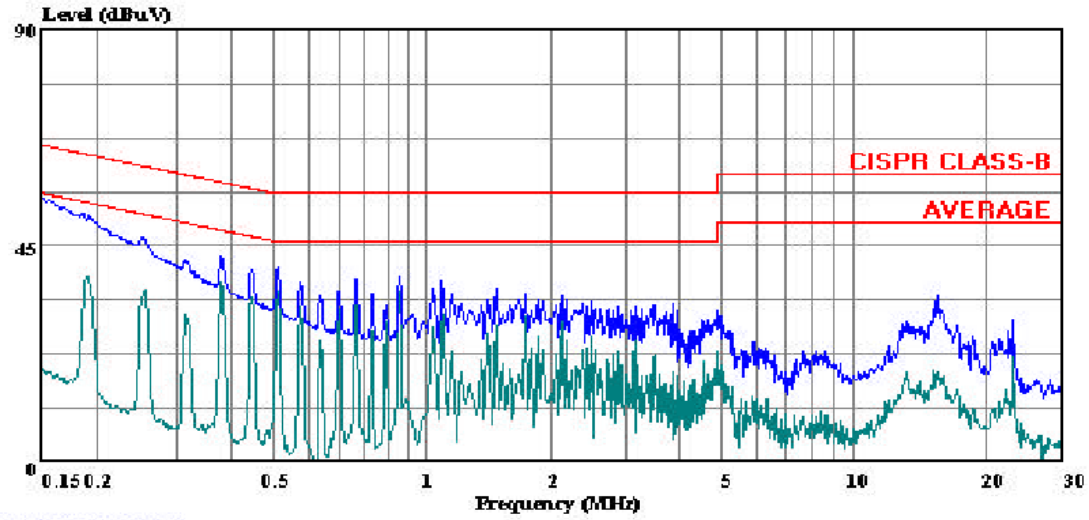
Trace: 5 Ref Trace:

Condition: CISPR CLASS-B
Test Operator:: Mengistu Mekuria
Project #: : 07U11426
Company: : Broadcom
Configuration:: EUT, Extention Card, and Laptop
Mode: : Tx mode (Worst Case)
Target: : FCC Class B
Voltage: : 115VAC/60Hz
: L1: Peak (Blue); Green (Average)

LINE 2 RESULTS

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 14 File#: 07U11426 LC.EMI Date: 11-05-2007 Time: 22:15:26



(Line Conduction)

Trace: 12 Ref Trace:

Condition: CISPR CLASS-B
Test Operator:: Mengistu Mekuria
Project #: : 07U11426
Company: : Broadcom
Configuration:: EUT, Extention Card, and Laptop
Mode: : Tx mode (Worst Case)
Target: : FCC Class B
Voltage: : 115VAC/60Hz
: L2: Peak (Blue); Green (Average)

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

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

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

f = frequency in MHz
* = Plane-wave equivalent power density

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

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

IC RULES

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

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

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

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

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

CALCULATIONS

Given

$E = \sqrt{(30 * P * G)} / d$

and

$S = E ^ 2 / 3770$

where

E = Field Strength in Volts/meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power Density in milliwatts/square centimeter

Combining equations, rearranging the terms to express the distance as a function of the remaining variables, changing to units of Power to mW and Distance to cm, and substituting the logarithmic form of power and gain yields:

$d = 0.282 * 10 ^ ((P + G) / 20) / \sqrt{S}$

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW/cm^2

Rearranging terms to calculate the power density at a specific distance yields

$S = 0.0795 * 10 ^ ((P + G) / 10) / (d^2)$

The power density in units of mW/cm^2 is converted to units of W/m^2 by multiplying by a factor of 10.

LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm^2

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

RESULTS

(MPE distance equals 20 cm)

Mode	Band	MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	FCC Power Density (mW/cm^2)	IC Power Density (W/m^2)
WLAN	2.4 GHz	20.0	23.05	3.90	0.10	0.98

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.