



**FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 7**

CERTIFICATION TEST REPORT

FOR

WIRELESS N NETWORKING ADAPTOR

MODEL NUMBER: 1398

**FCC ID: C3K1398
IC: 3048A-1398**

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ISSUE DATE: AUGUST 21, 2009

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NVLAP LAB CODE 200065-0

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: MICROSOFT CORPORATION
1 MICROSOFT WAY,
REDMOND, WA 98052, U.S.A>

EUT DESCRIPTION: WIRELESS N NETWORKING ADAPTOR

MODEL: 1398

SERIAL NUMBER: 066

DATE TESTED: JULY 21 – AUGUST 10, 2009

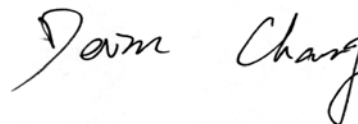
APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 7 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 2	Pass

Compliance Certification Services, Inc. (CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For CCS By:

Tested By:



THU CHAN
EMC MANAGER
COMPLIANCE CERTIFICATION SERVICES

DEVIN CHANG
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. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

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 USB 2x2 Dual Band 802.11 a/b/g/n Radio.

The radio module is manufactured by Atheros.

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	18.17	65.61
2412 - 2462	802.11g	24.43	277.33
2412 - 2462	802.11n HT20	24.78	300.61
2422 - 2452	802.11n HT40	24.81	302.69
5745 -5825	802.11a	23.49	223.36
5745 -5825	802.11n HT20	23.52	224.91
5755 - 5790	802.11n HT40	23.51	224.39

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilize a dipole antennas with maximum gain of 2 dBi from 2400 – 2483.5 MHz, 3.84 dBi from 5150 – 5250 MHz, 3.84 dBi from 5250 – 5350 MHz, 4.92 dBi from 5470 – 5725 MHz, and 3.6 dBi from 5725 - 5850 MHz.

5.4. SOFTWARE AND FIRMWARE

The test utility and driver software used during testing was Art ANWI and Devlib Revision 0.8 Build #120 Art_11n.

5.5. WORST-CASE CONFIGURATION AND MODE

The 2x2 configuration was used for 2.4GHz and 1x2 for 5GHz testing in this report.

The worst-case data rate for each mode is determined to be as follows, based on input from the manufacturer of the radio.

All emissions tests were made with following data rates:

- 802.11b mode, 20 MHz Channel Bandwidth, 1 Mb/s, CCK Modulation.
- 802.11g mode, 20 MHz Channel Bandwidth, 6 Mb/s, OFDM Modulation.
- 802.11a mode, 20 MHz Channel Bandwidth, 6 Mb/s, OFDM Modulation.
- 802.11n HT20 mode, 20 MHz Channel Bandwidth, MCS0, 6.5 Mb/s, OFDM Modulation.
- 802.11n HT40 mode, 40 MHz Channel Bandwidth, MCS0, 13.5 Mb/s, OFDM Modulation.

For radiated emissions below 1 GHz the worst-case configuration is determined to be the mode and channel with the highest output power.

Investigation that the Power Spectral Density and Conducted Spurious as measured through a combiner with both chains operating simultaneously is worst case.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
NoteBook	DELL	PP10S	CN-0C8862-48643-57L-1789	DoC
AC Adaptor	DELL	N5825	CN-0N5825-48661-575-A028	DoC

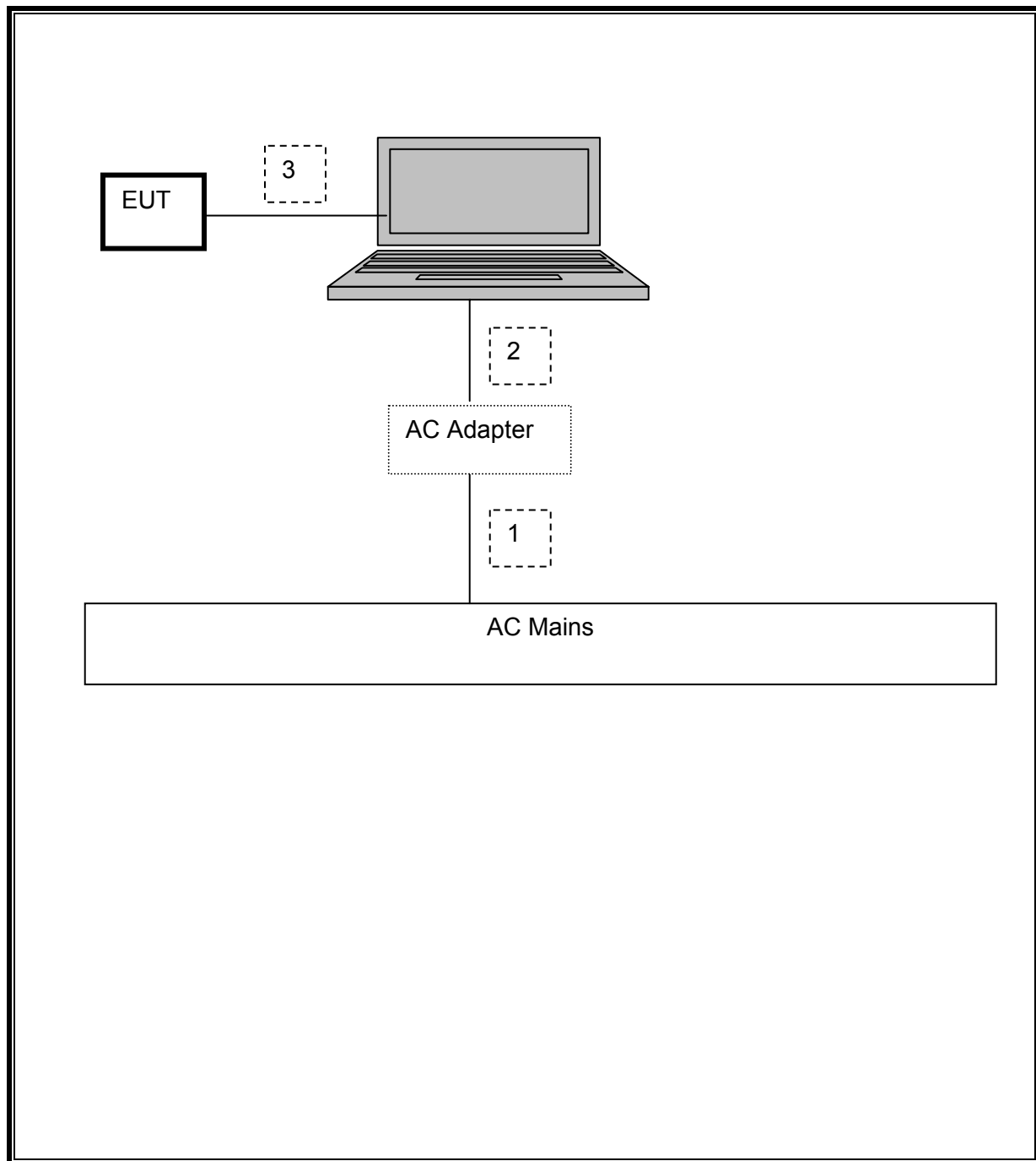
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identica Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	2	US 115V	Un-shielded	0.9 m	No
2	DC	3	DC	Un-shielded	1.8m	No
3	USB	1	USB	Un-shielded	1m	No

TEST SETUP

The EUT is connected to a host laptop computer via USB cable during the tests. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Asset	Cal Due
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	02/04/10
Antenna, Bilog, 2 GHz	Sundt Sciences	JB1	C01171	01/14/10
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	12/16/09
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01012	04/20/10
Antenna, Horn, 18 GHz	EMCO	3115	C00872	04/22/10
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	05/06/11
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	10/29/09
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	N02481	10/29/09
Peak Power Meter	Boonton	4541	N/A	01/15/10
Peak / Average Power Sensor	Boonton	57318	N/A	02/02/10
Highpass Filter, 4.0 GHz	Micro-Tronics	HPM13351	N02708	N/A
Highpass Filter, 7.6 GHz	Micro-Tronics	HPM13195	N02682	N/A

7. ANTENNA PORT TEST RESULTS

7.1. 802.11b DUAL CHAIN LEGACY 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.

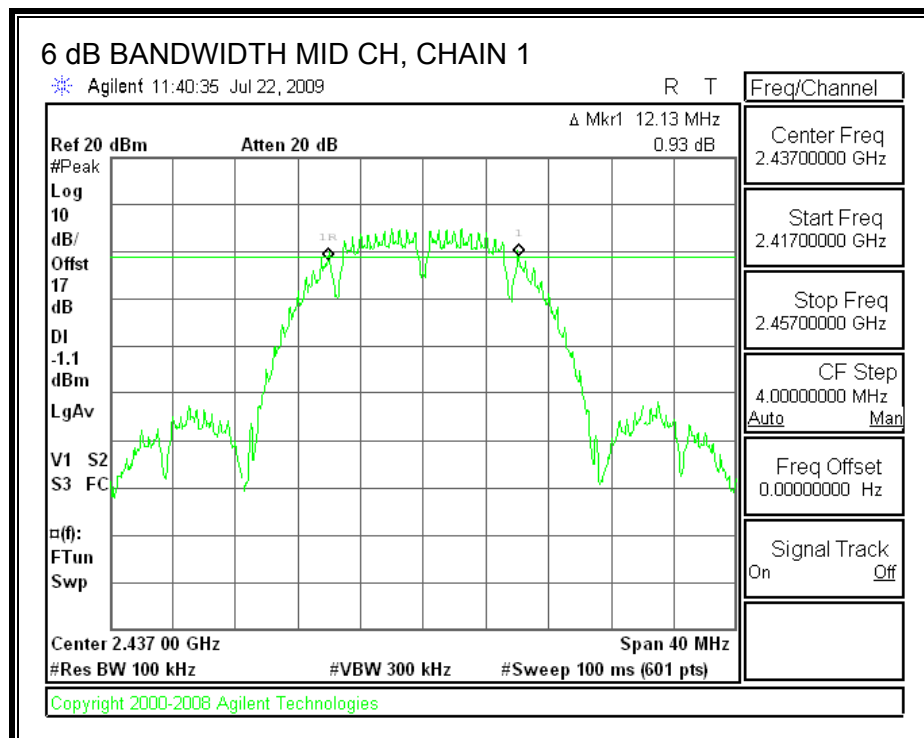
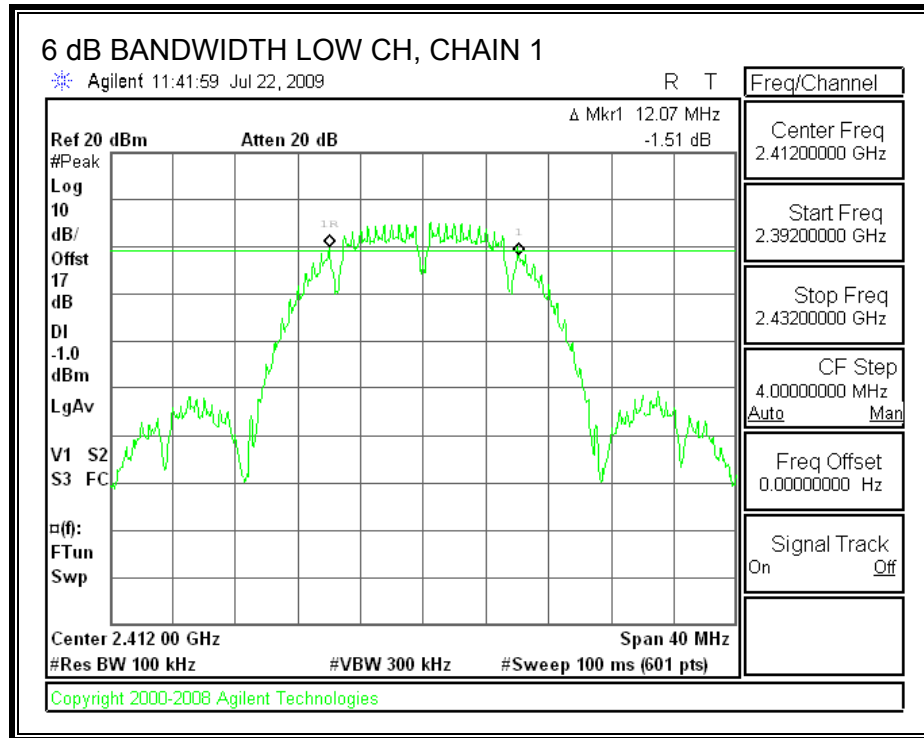
TEST PROCEDURE

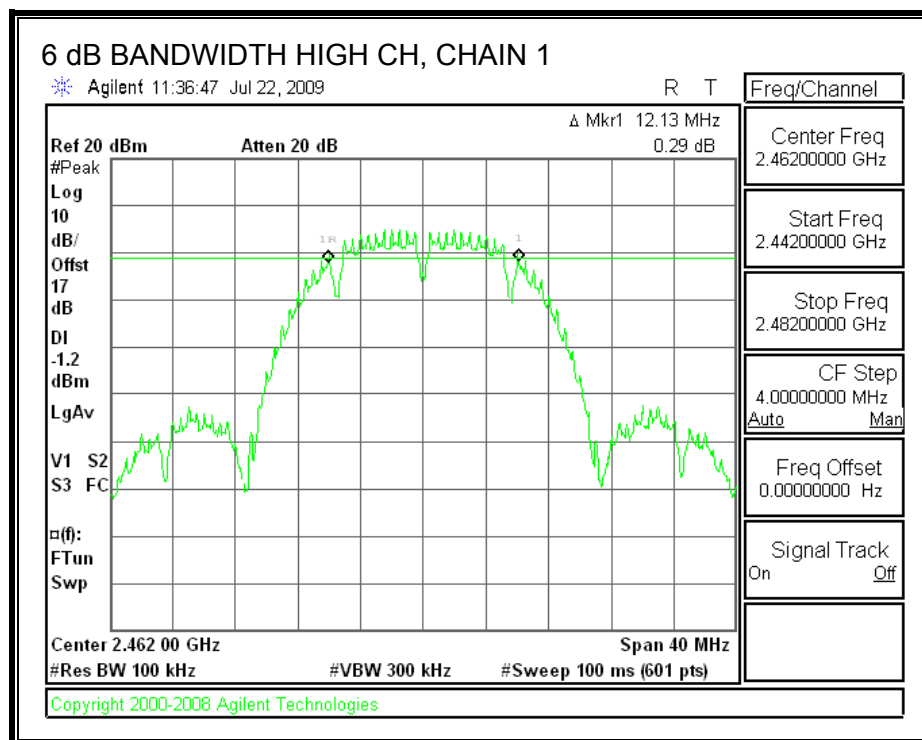
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

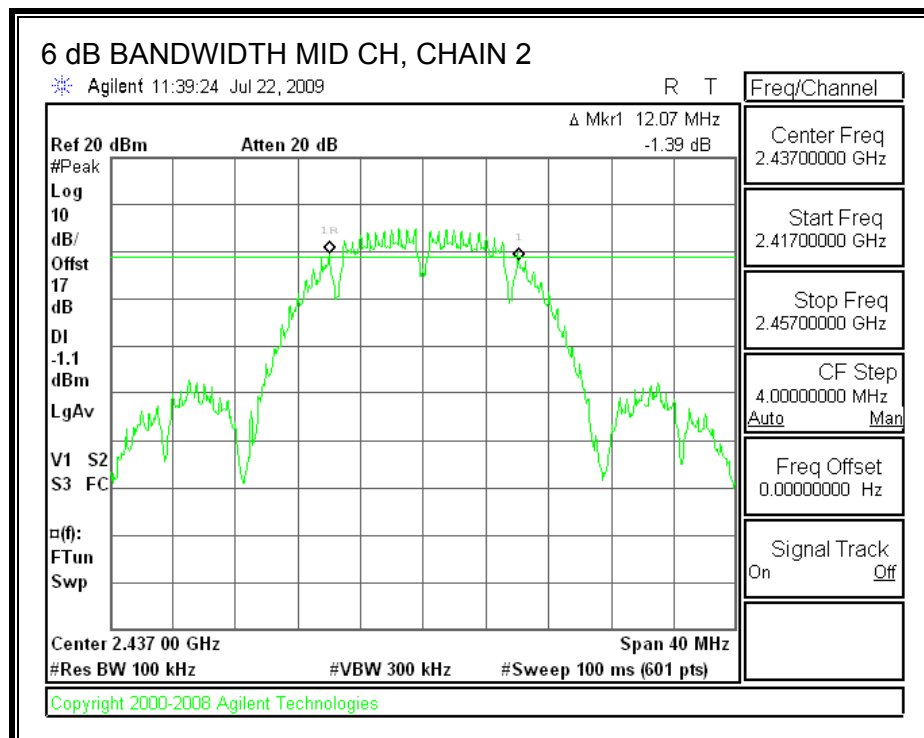
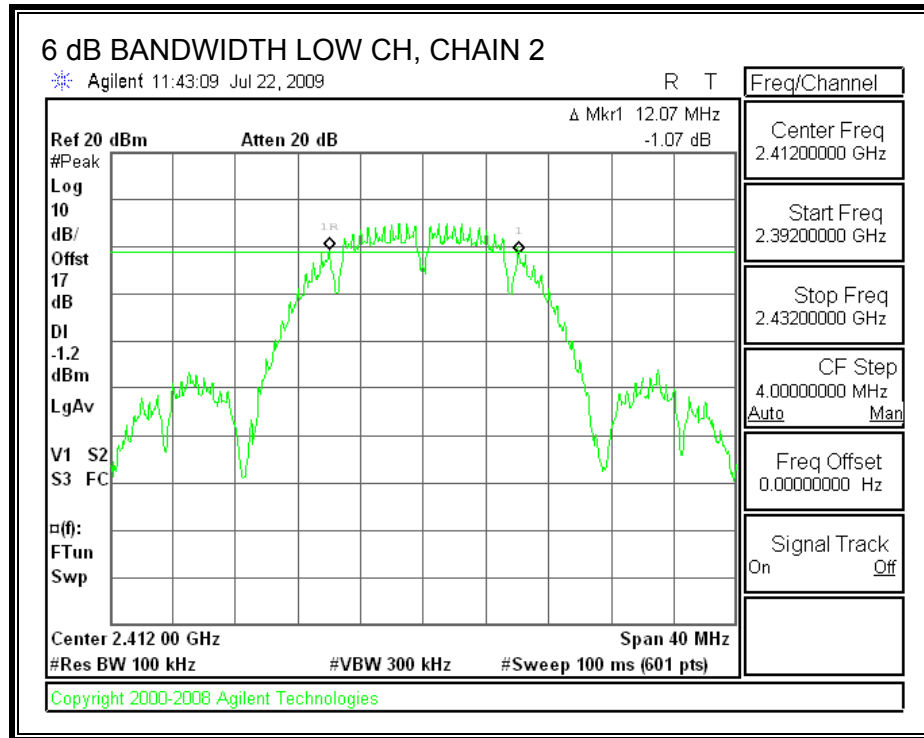
Channel	Frequency (MHz)	Chain 1 6 dB BW (MHz)	Chain 2 6 dB BW (MHz)	Minimum Limit (MHz)
Low	2412	12.07	12.07	0.5
Middle	2437	12.13	12.07	0.5
High	2462	12.13	12.00	0.5

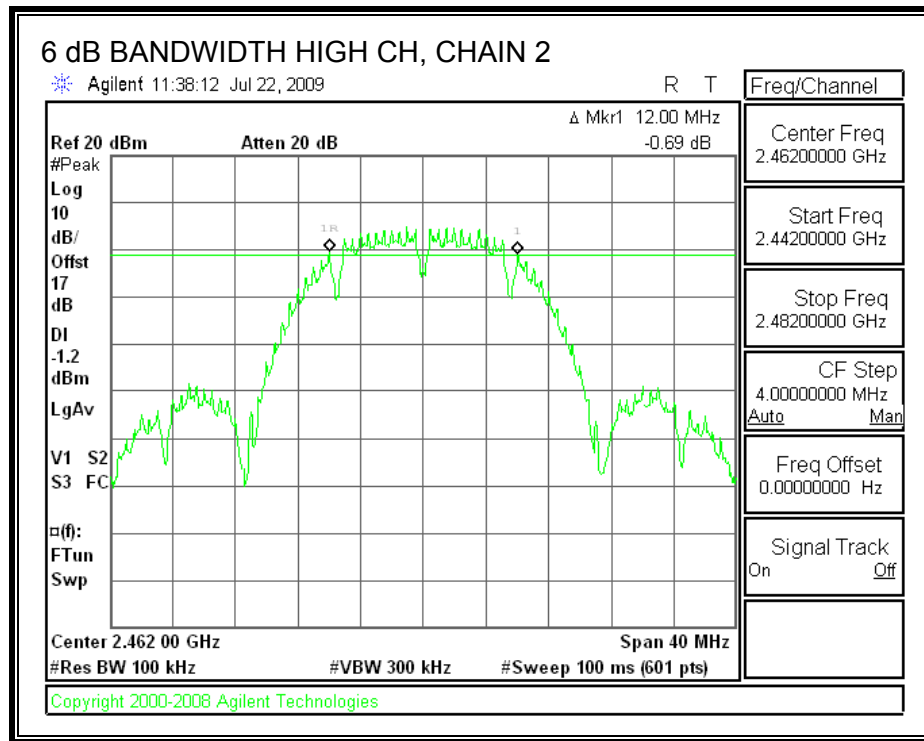
6 dB BANDWIDTH, CHAIN 1





6 dB BANDWIDTH, CHAIN 2





7.1.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

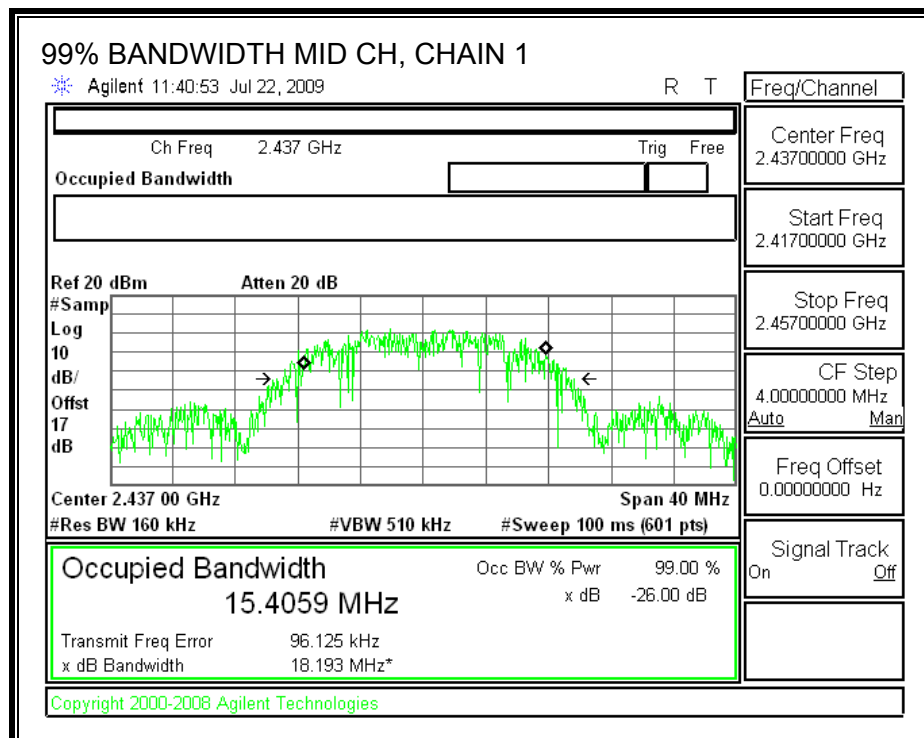
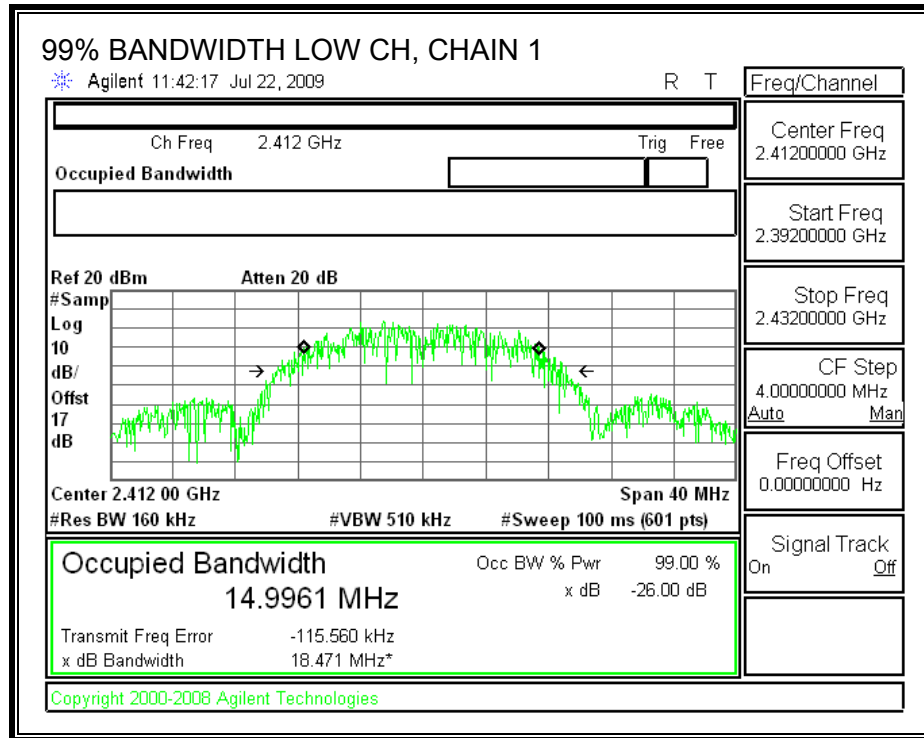
TEST PROCEDURE

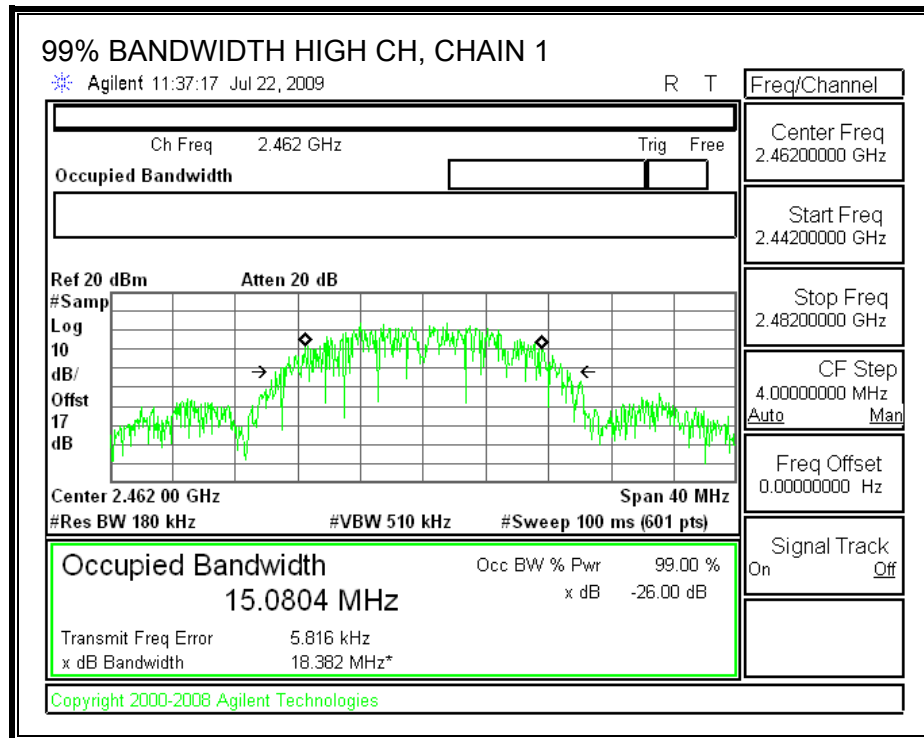
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

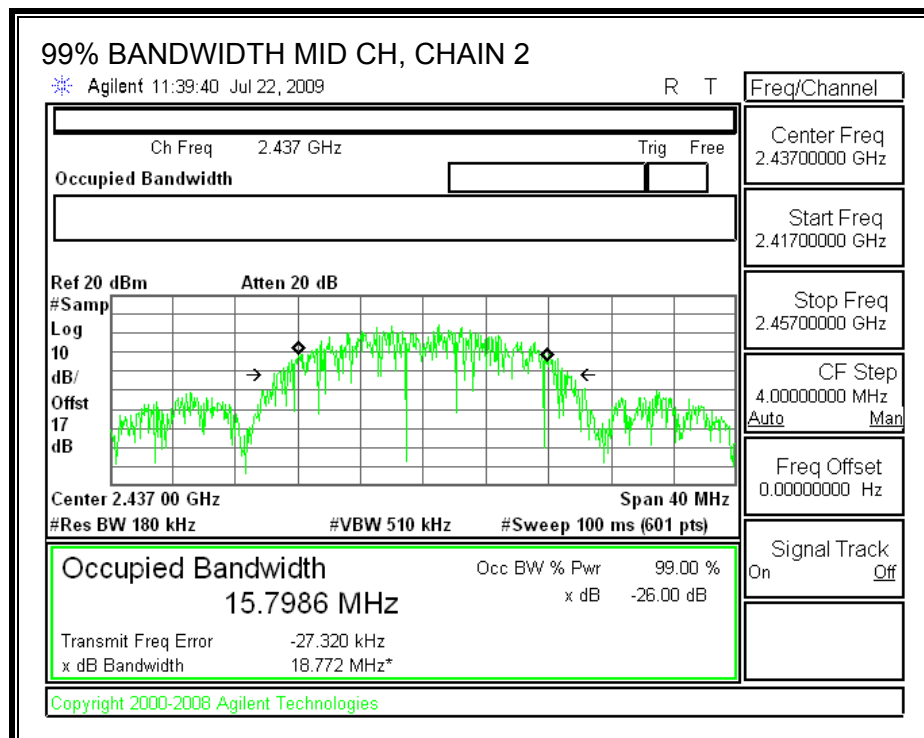
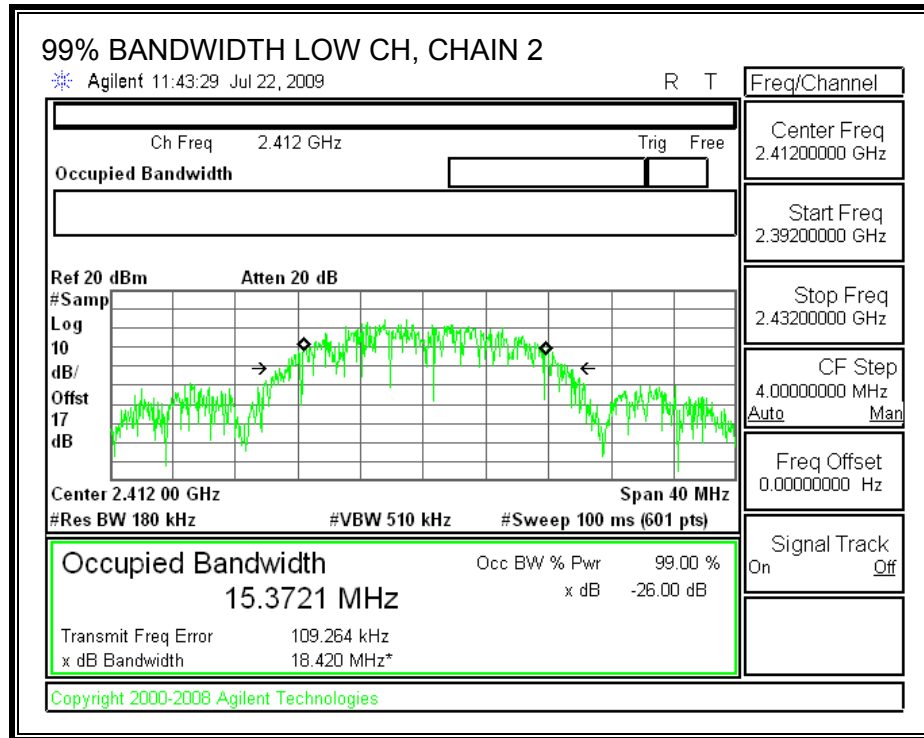
Channel	Frequency (MHz)	Chain 1 99% Bandwidth (MHz)	Chain 2 99% Bandwidth (MHz)
Low	2412	14.9961	15.3721
Middle	2437	15.4059	15.7986
High	2462	15.0804	15.2423

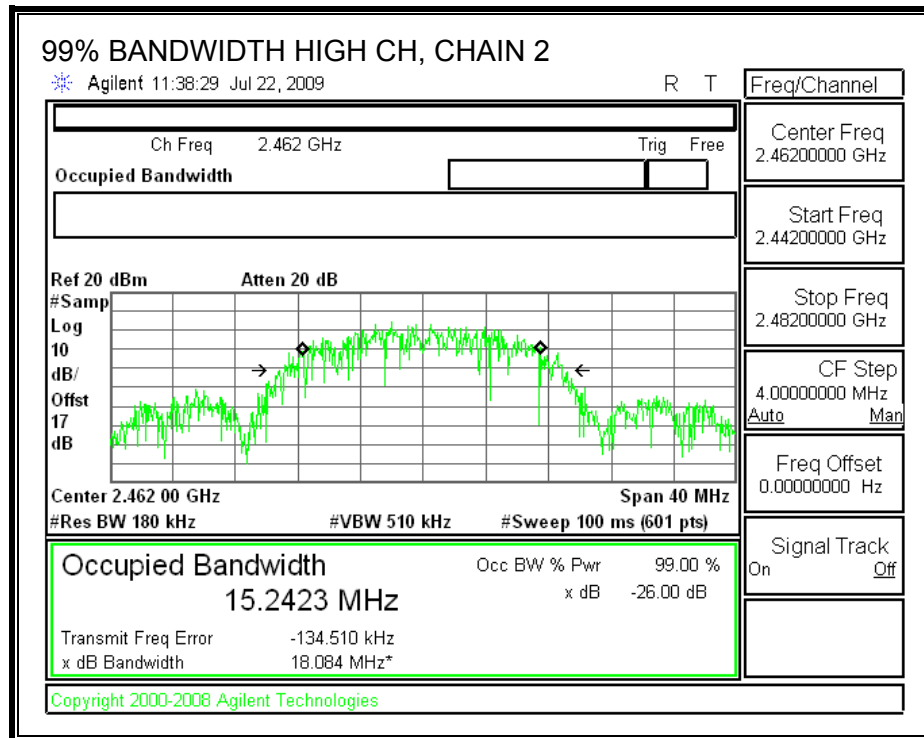
99% BANDWIDTH, CHAIN 1





99% BANDWIDTH, CHAIN 2





7.1.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

Antenna Gain (dBi)	10 Log (# Tx Chains) (dB)	Effective Legacy Gain (dBi)
2	3.01	5.01

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

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

Channel	Frequency (MHz)	Limit (dBm)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Margin (dB)
Low	2412	30.00	15.28	15.04	18.17	-11.83
Mid	2437	30.00	14.83	14.70	17.78	-12.22
High	2462	30.00	14.88	14.99	17.95	-12.05

7.1.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 17 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)
Low	2412	12.60	12.47	15.55
Middle	2437	12.19	12.10	15.16
High	2462	12.30	12.33	15.33

7.1.5. 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.

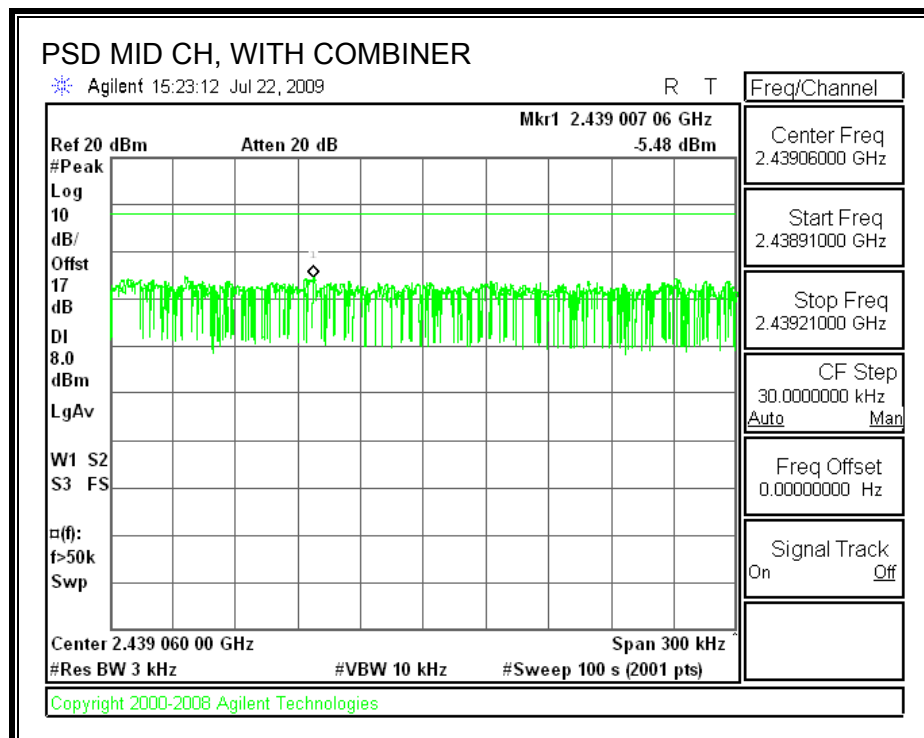
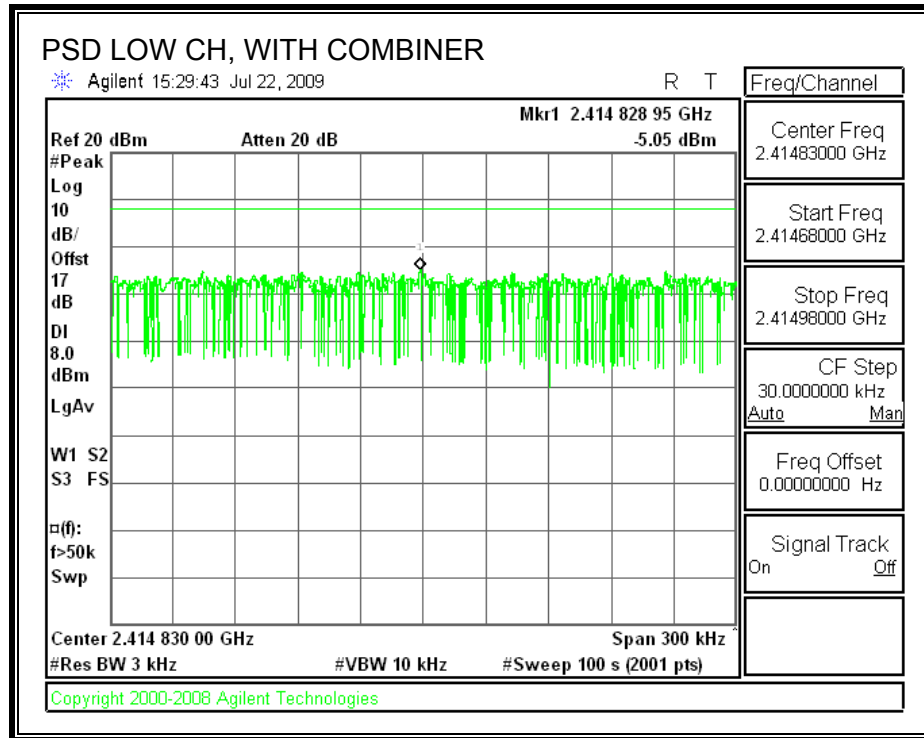
TEST PROCEDURE

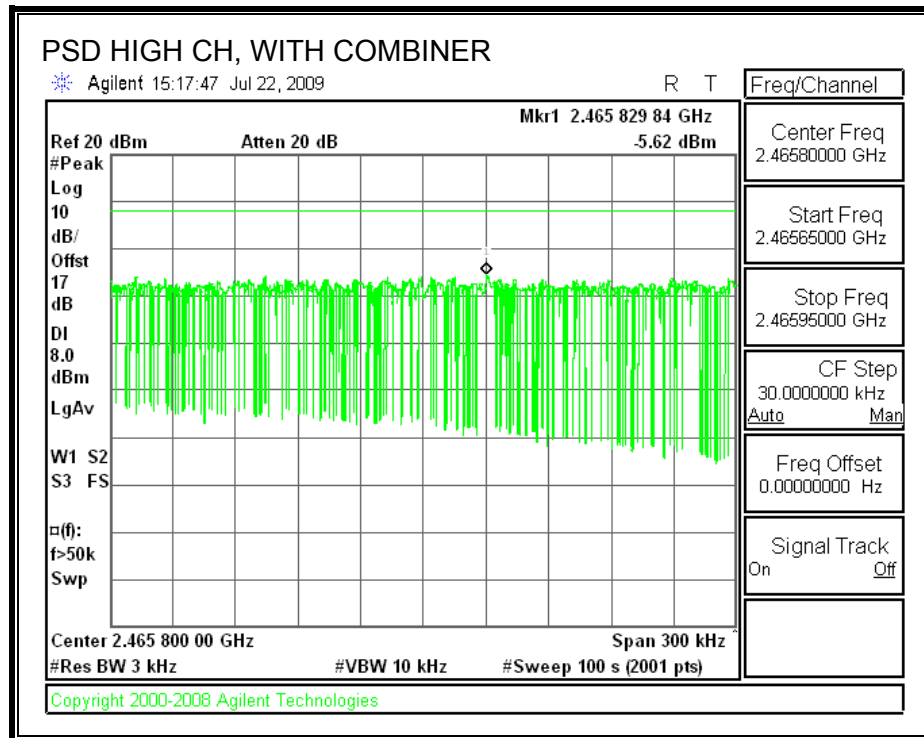
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

Channel	Frequency (MHz)	PSD with Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-5.05	8	-13.05
Middle	2437	-5.48	8	-13.48
High	2462	-5.62	8	-13.62

POWER SPECTRAL DENSITY, WITH COMBINER





7.1.6. 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.

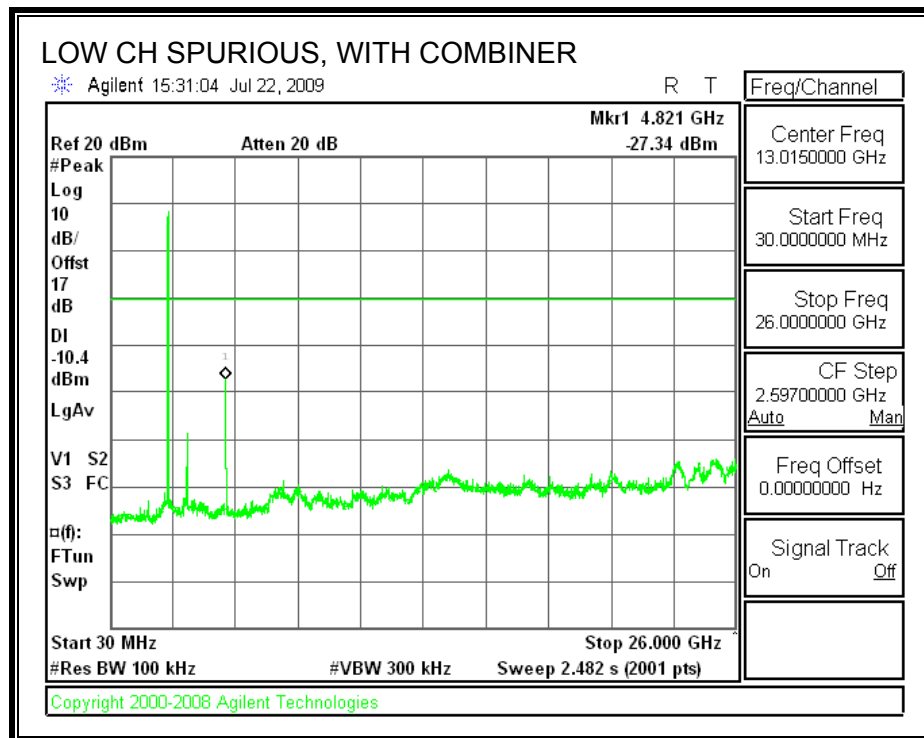
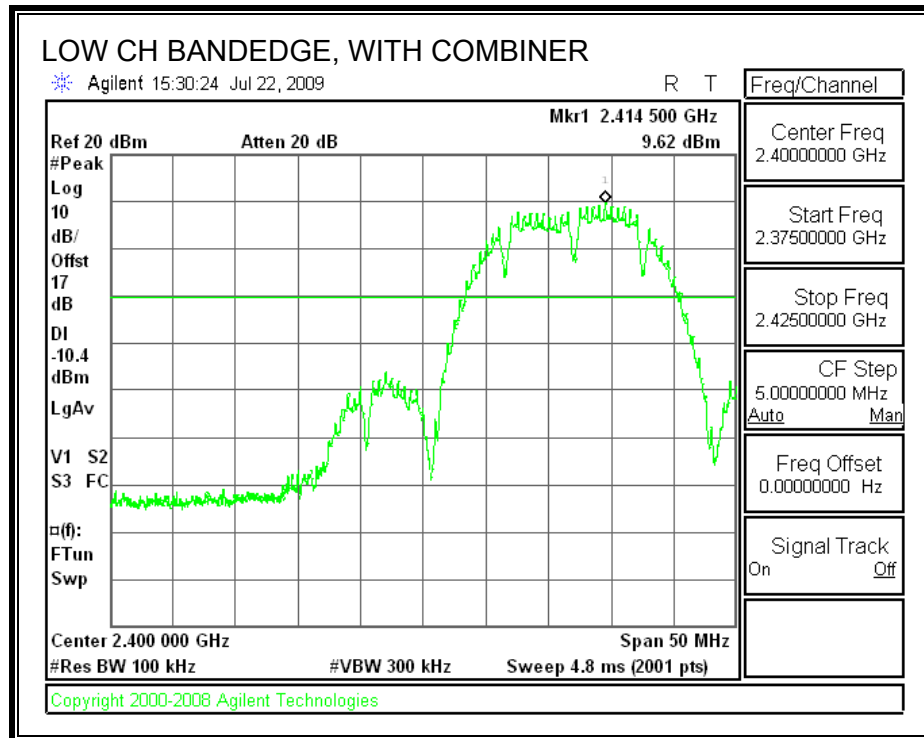
TEST PROCEDURE

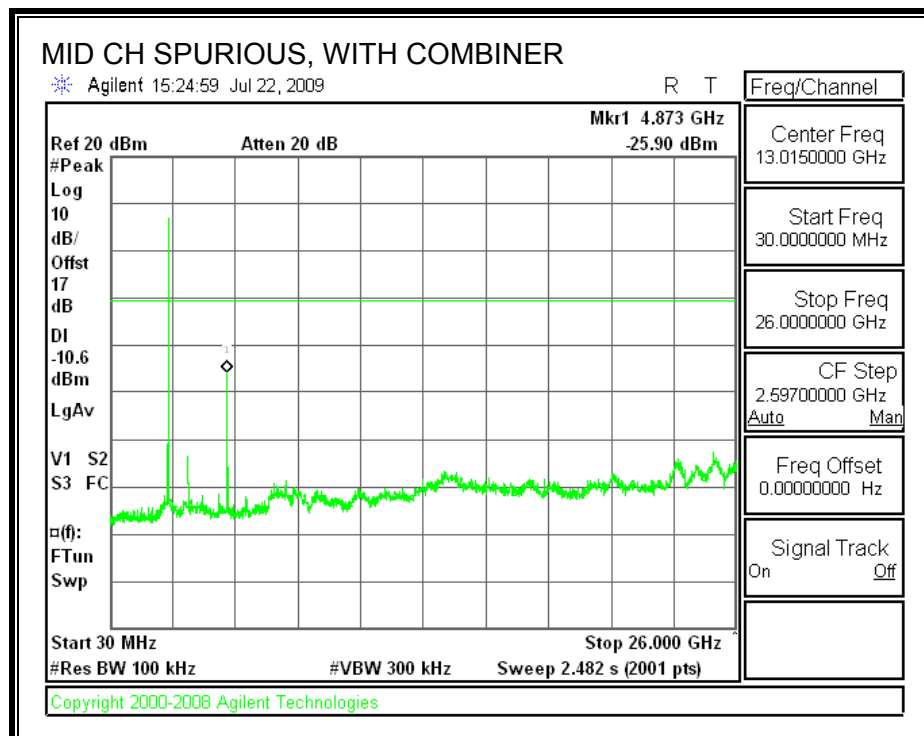
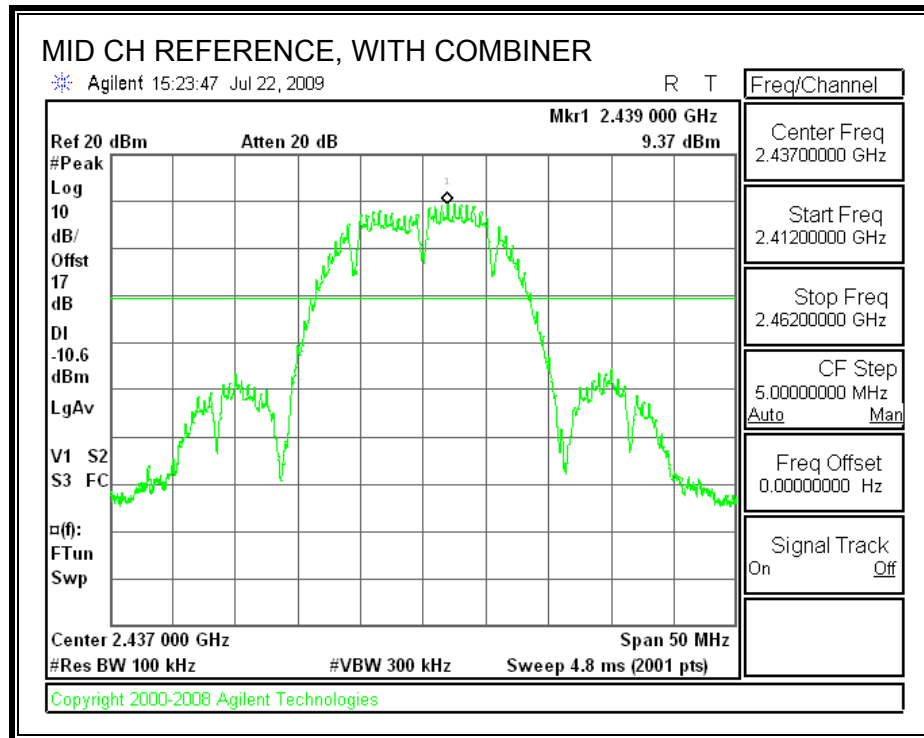
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

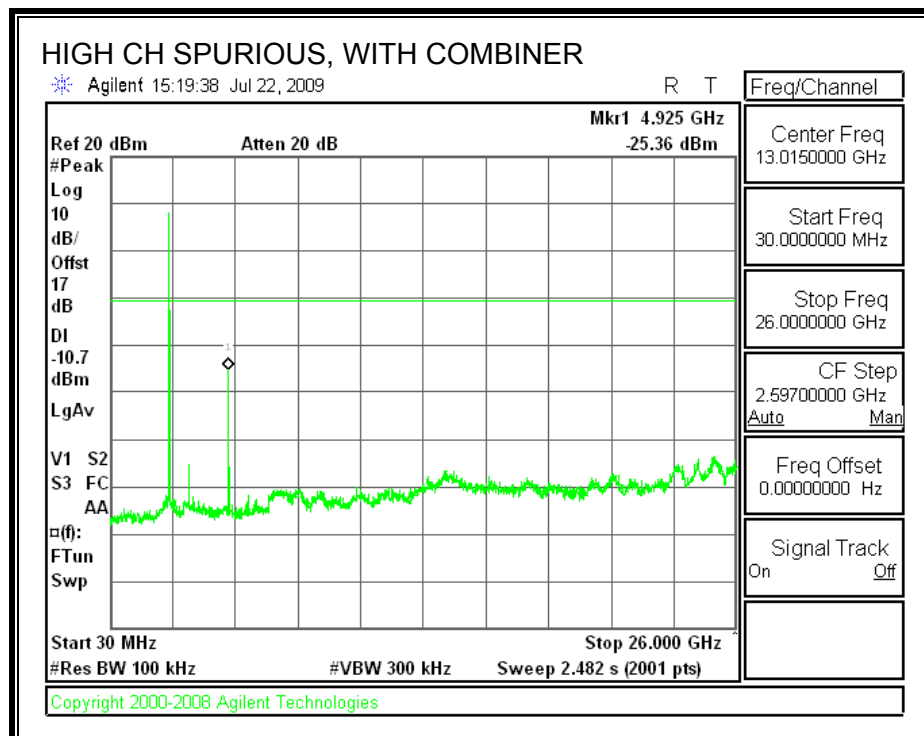
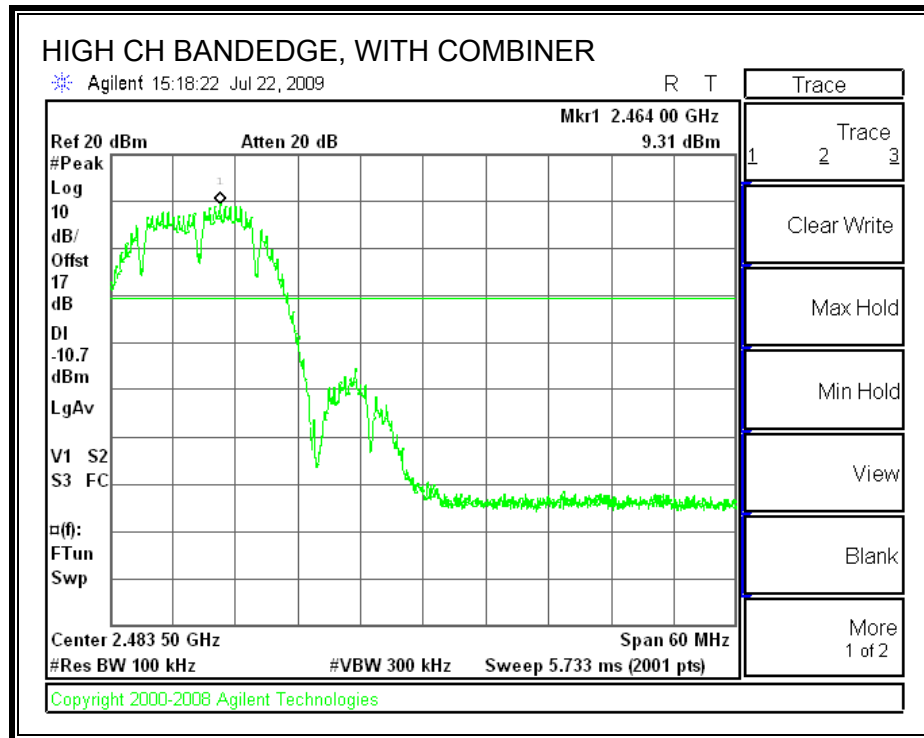
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

SPURIOUS EMISSIONS WITH COMBINER







7.2. 802.11g DUAL CHAIN LEGACY 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.

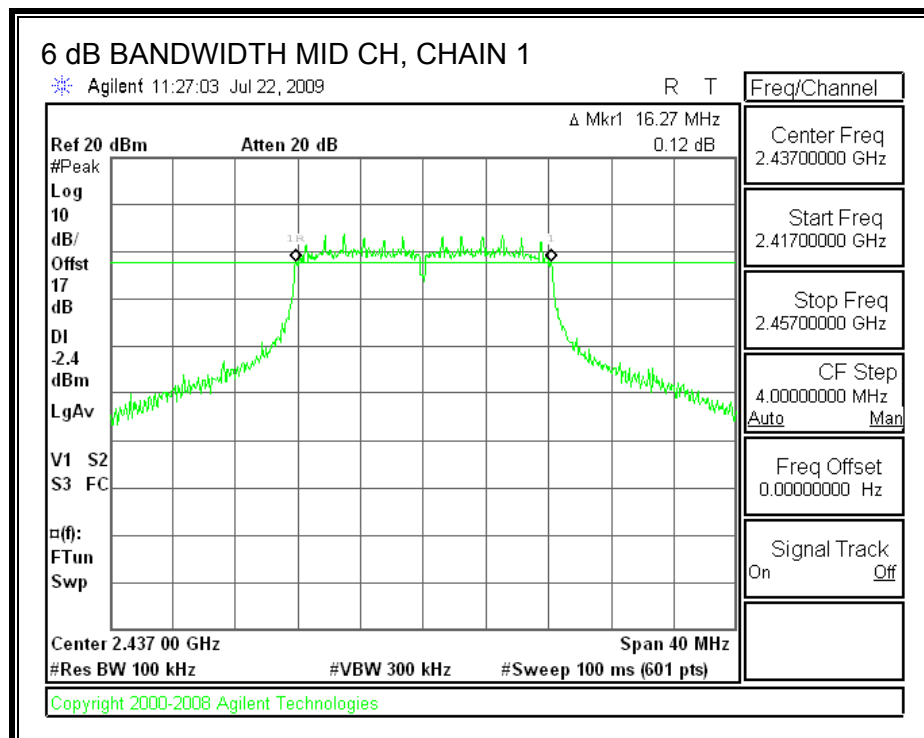
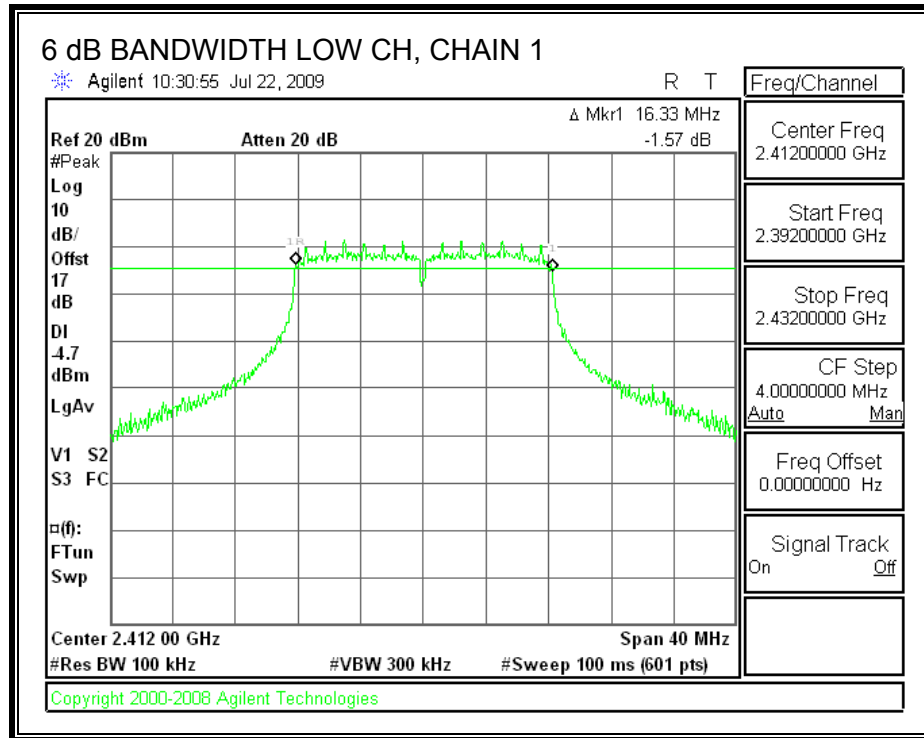
TEST PROCEDURE

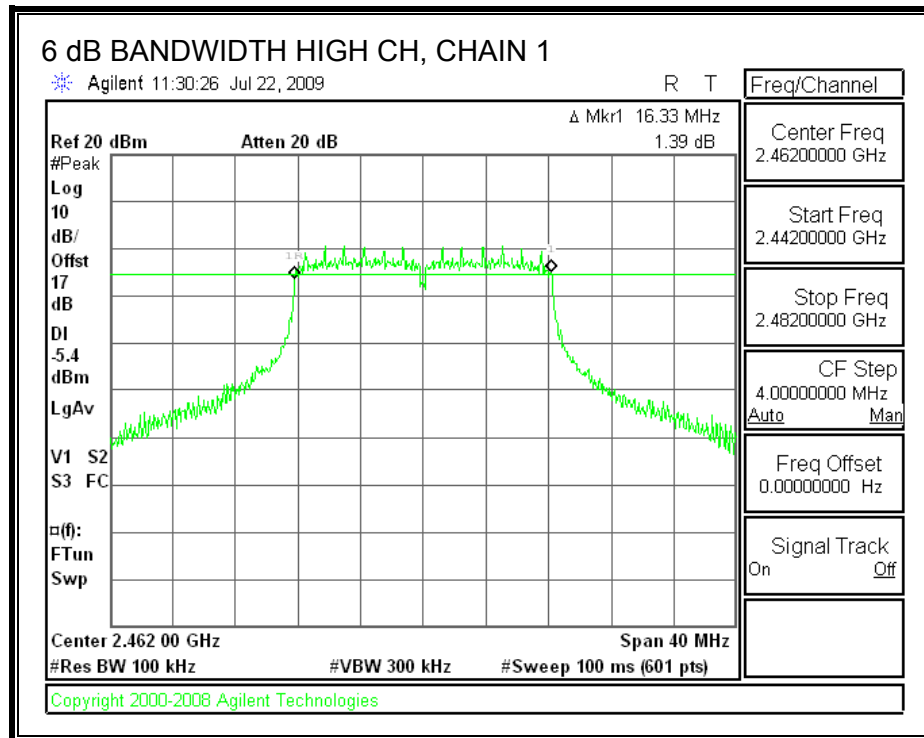
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

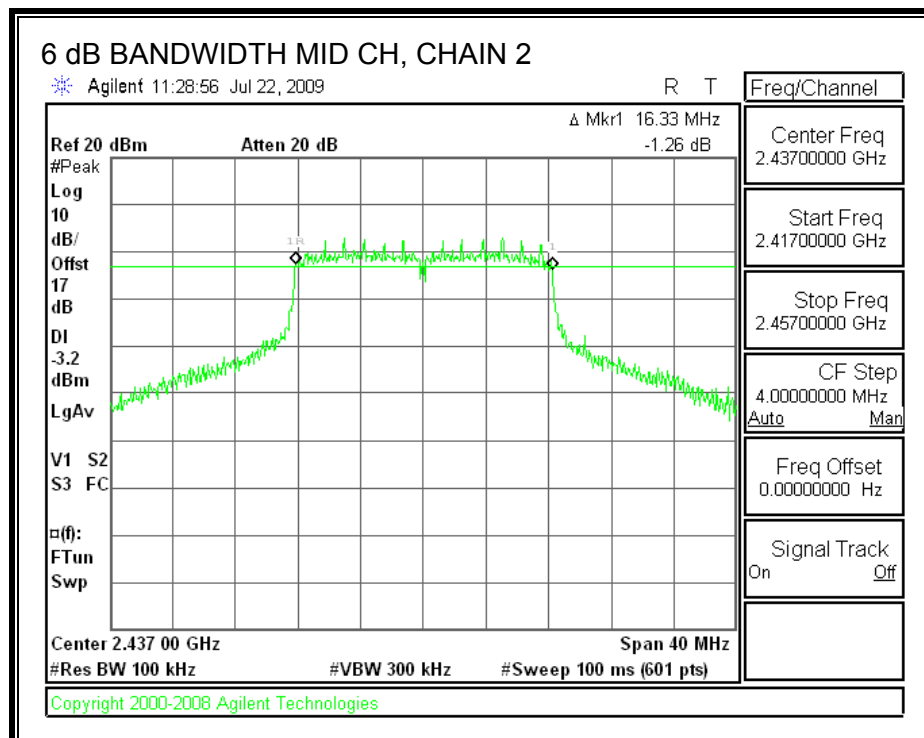
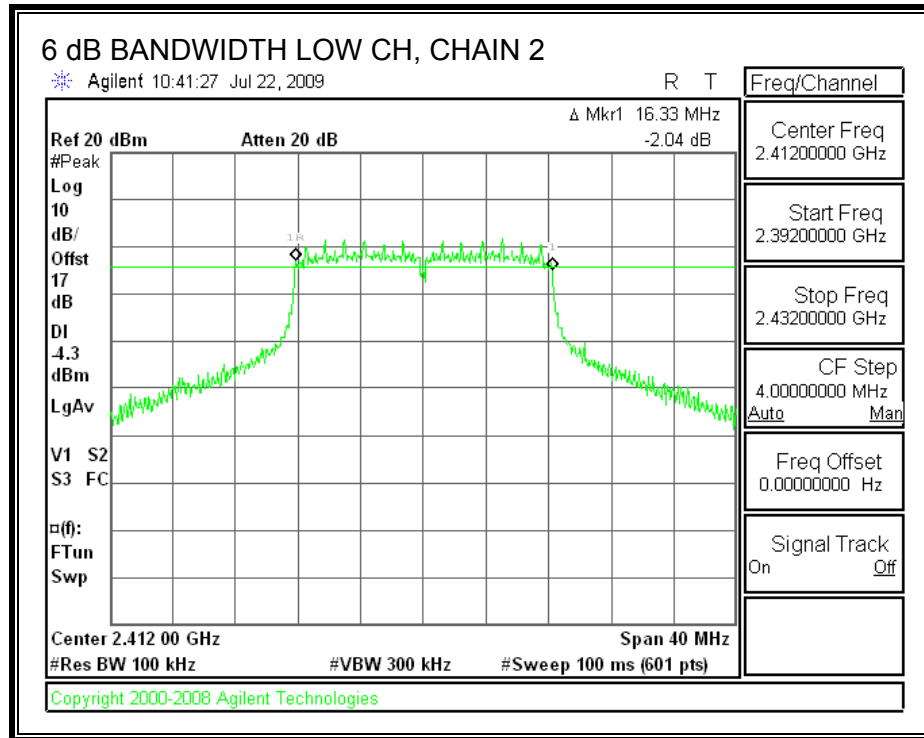
Channel	Frequency (MHz)	Chain 1 6 dB BW (MHz)	Chain 2 6 dB BW (MHz)	Minimum Limit (MHz)
Low	2412	16.33	16.33	0.5
Middle	2437	16.27	16.33	0.5
High	2462	16.33	16.33	0.5

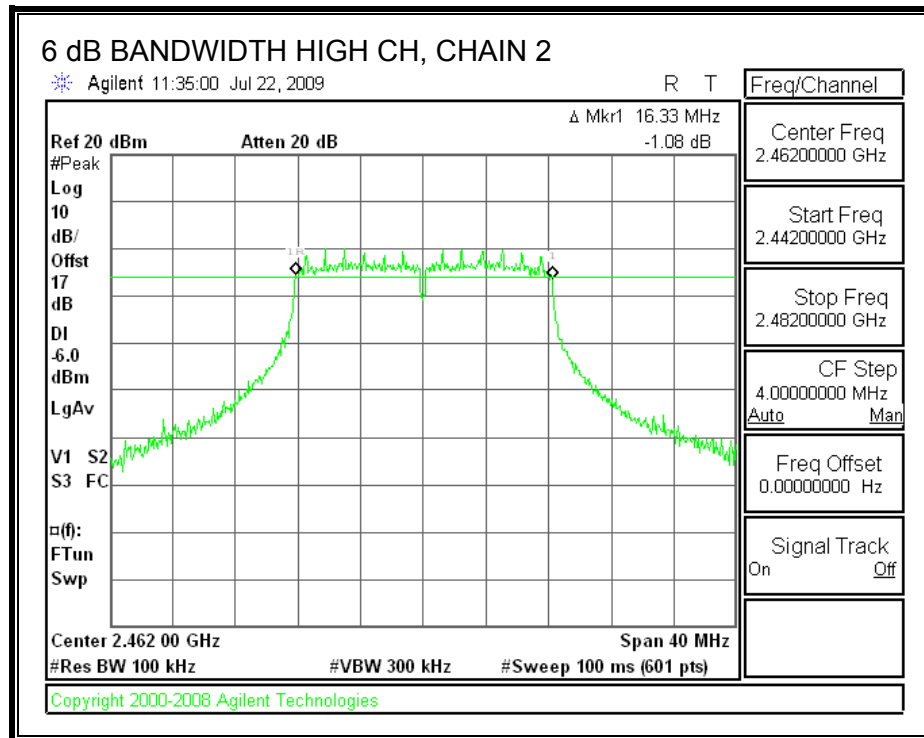
6 dB BANDWIDTH, CHAIN 1





6 dB BANDWIDTH, CHAIN 2





7.2.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

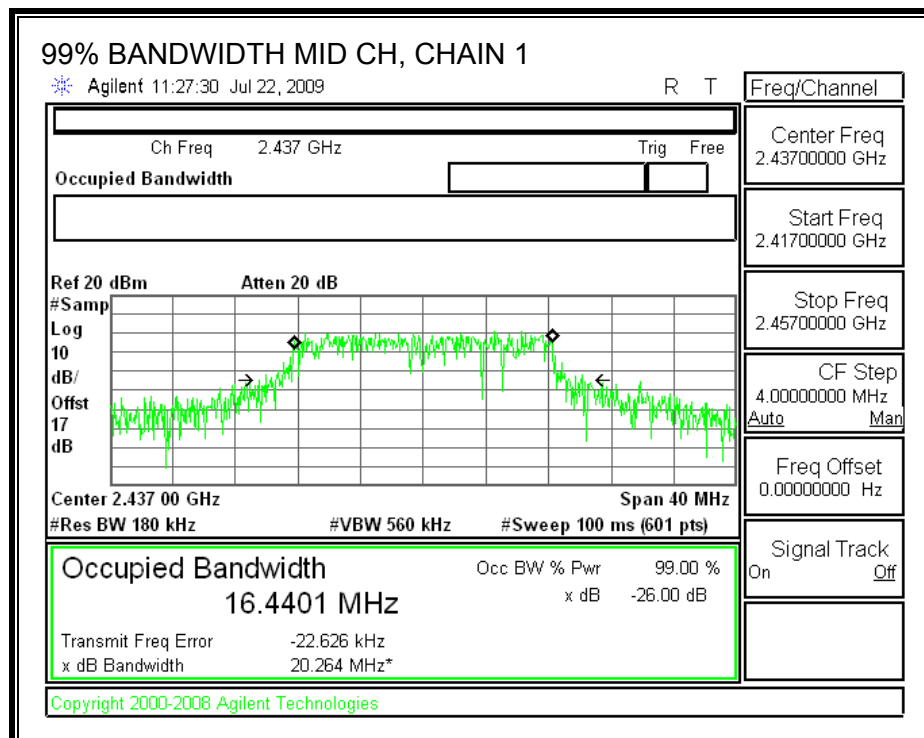
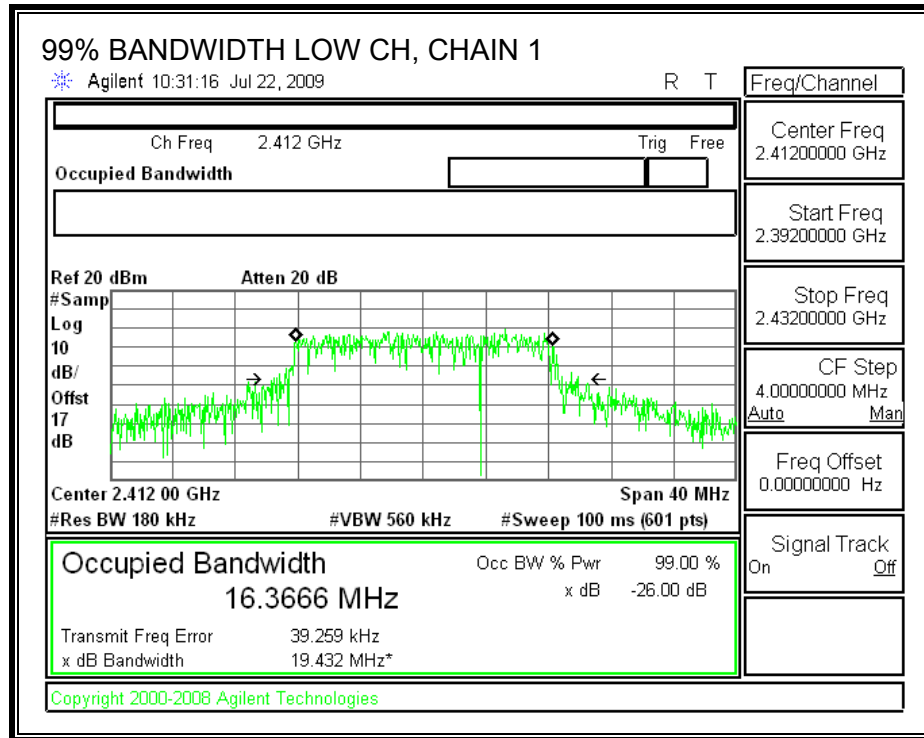
TEST PROCEDURE

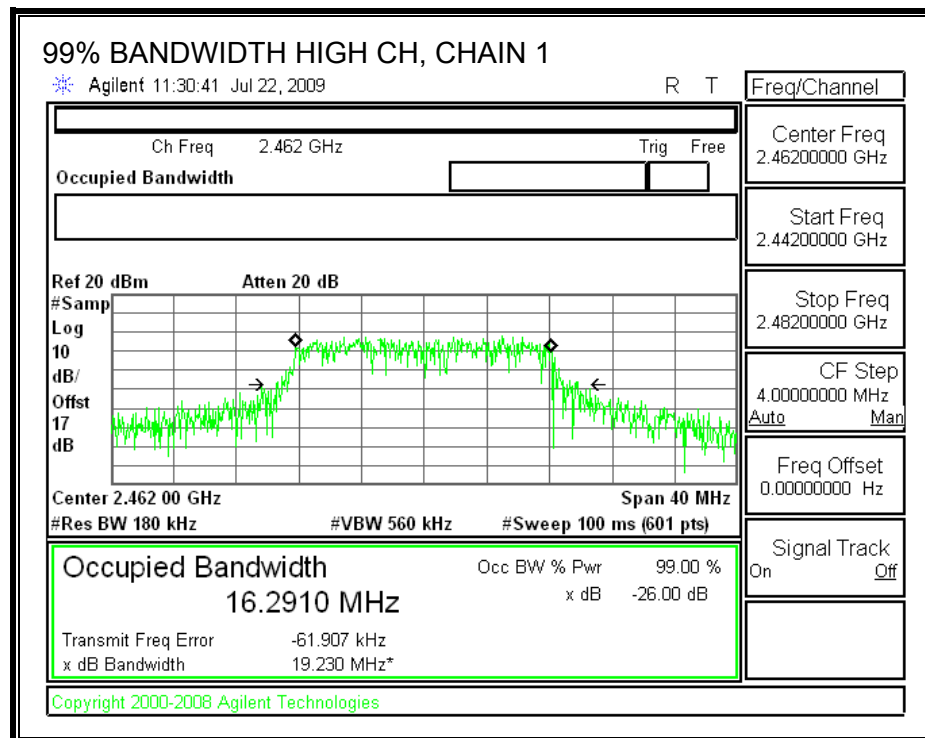
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

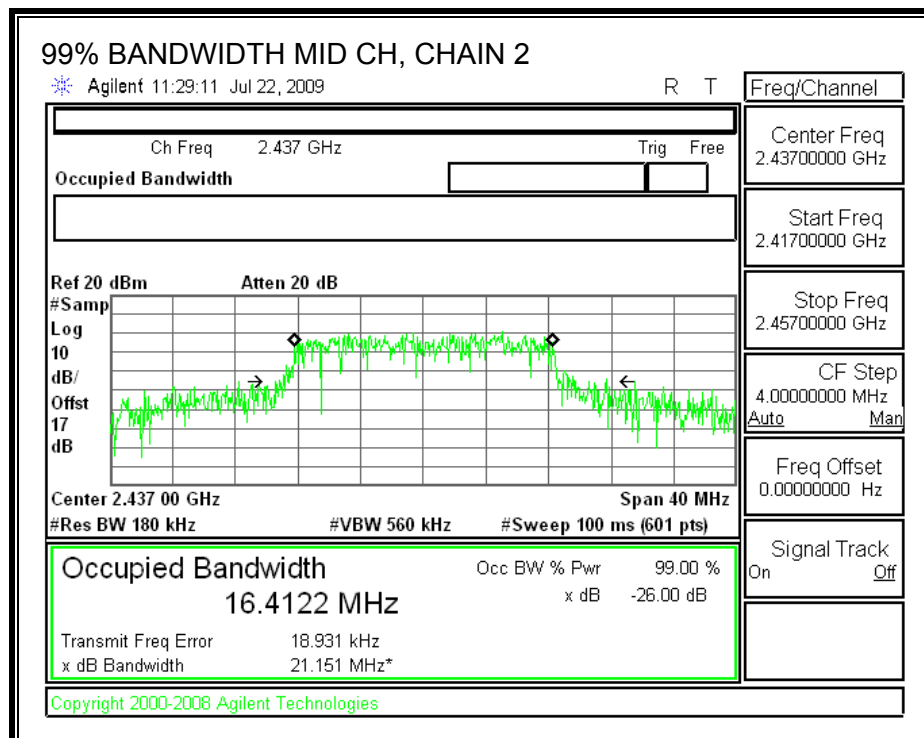
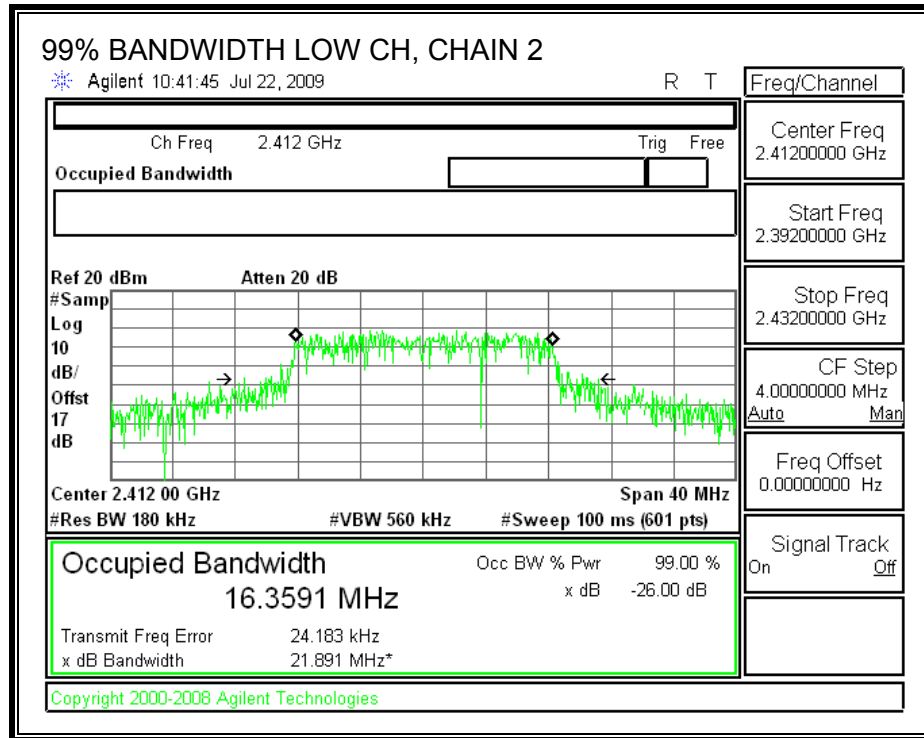
Channel	Frequency (MHz)	Chain 1 99% Bandwidth (MHz)	Chain 2 99% Bandwidth (MHz)
Low	2412	16.3666	16.3591
Middle	2437	16.4401	16.4122
High	2462	16.291	16.4414

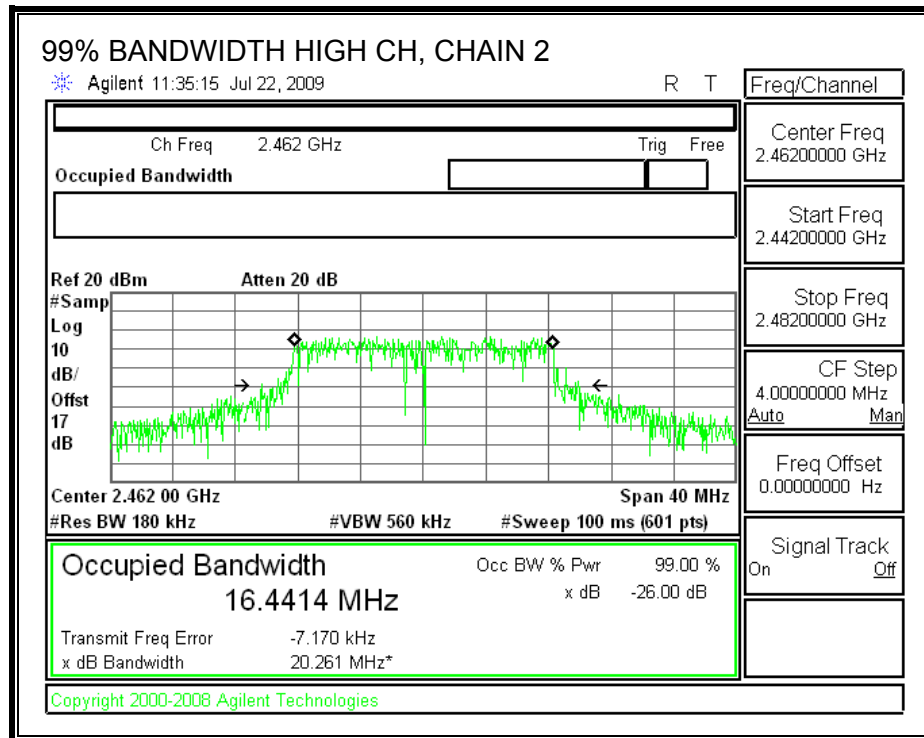
99% BANDWIDTH, CHAIN 1





99% BANDWIDTH, CHAIN 2





7.2.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

Antenna Gain (dBi)	10 Log (# Tx Chains) (dB)	Effective Legacy Gain (dBi)
2	3.01	5.01

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

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

Channel	Frequency (MHz)	Limit (dBm)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Margin (dB)
Low	2412	30.00	21.59	21.10	24.36	-5.64
Mid	2437	30.00	21.25	21.19	24.23	-5.77
High	2462	30.00	21.69	21.13	24.43	-5.57

7.2.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 17 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)
Low	2412	12.25	12.47	15.37
Middle	2437	12.01	12.29	15.16
High	2462	12.31	12.43	15.38

7.2.5. 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.

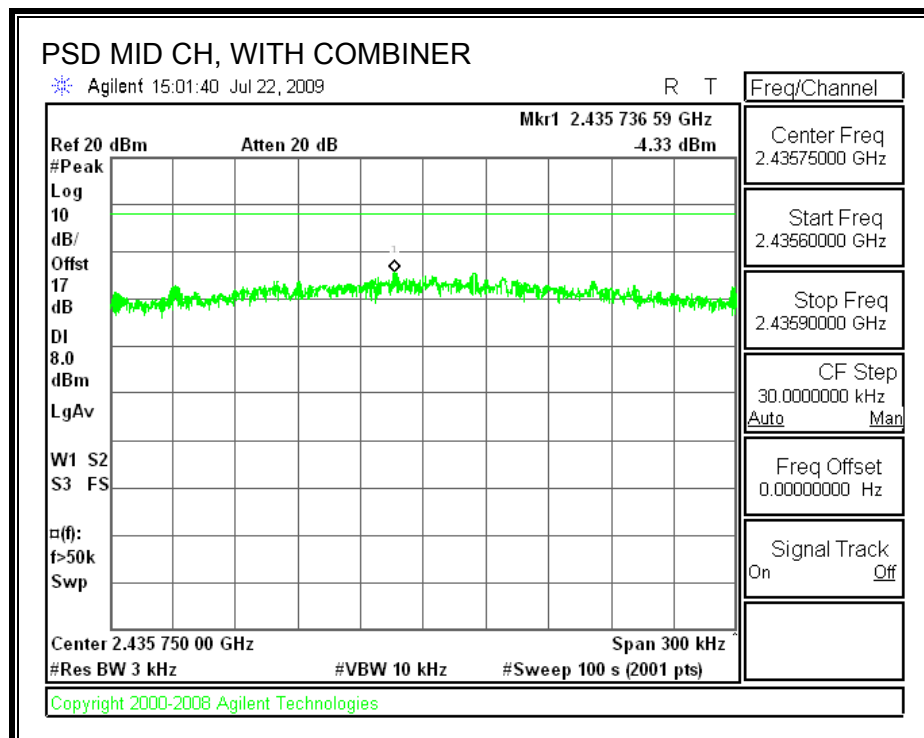
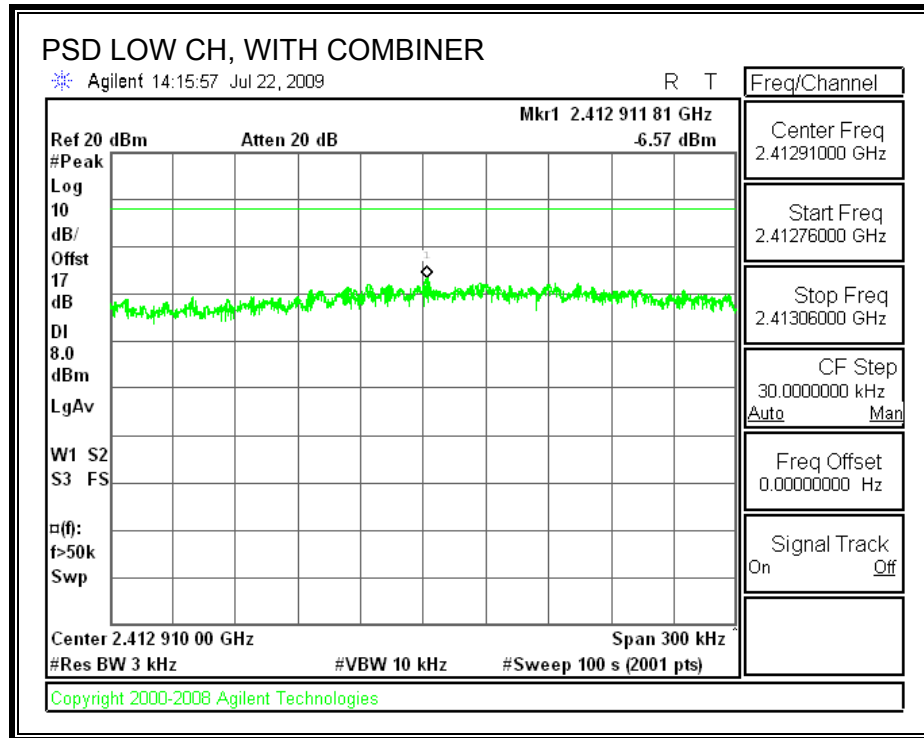
TEST PROCEDURE

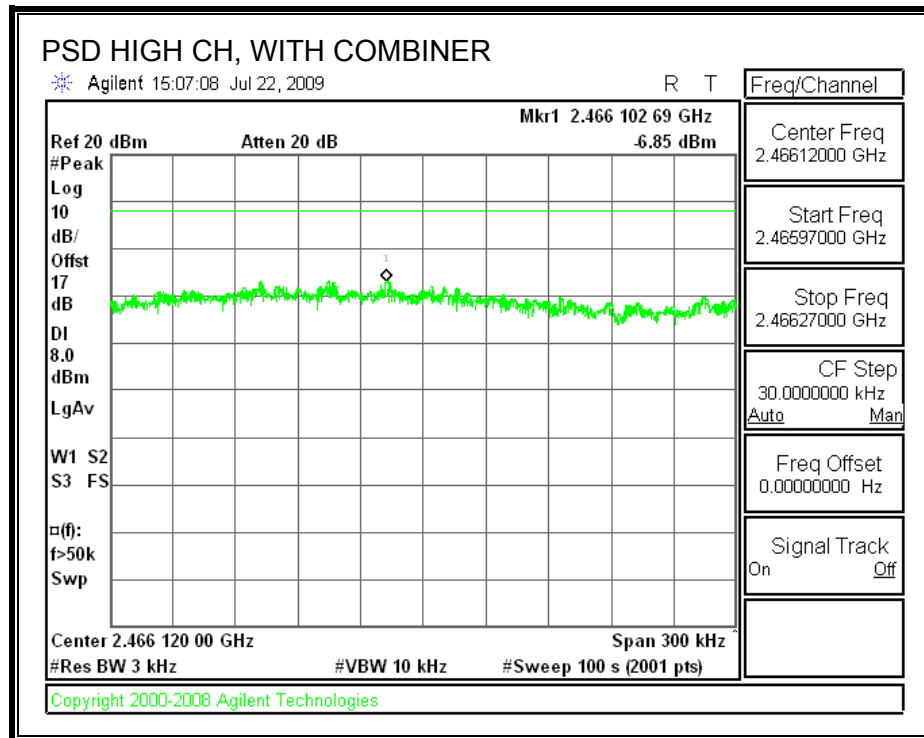
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

Channel	Frequency (MHz)	PSD with Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-6.57	8	-14.57
Middle	2437	-4.33	8	-12.33
High	2462	-6.85	8	-14.85

POWER SPECTRAL DENSITY, WITH COMBINER





7.2.6. 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.

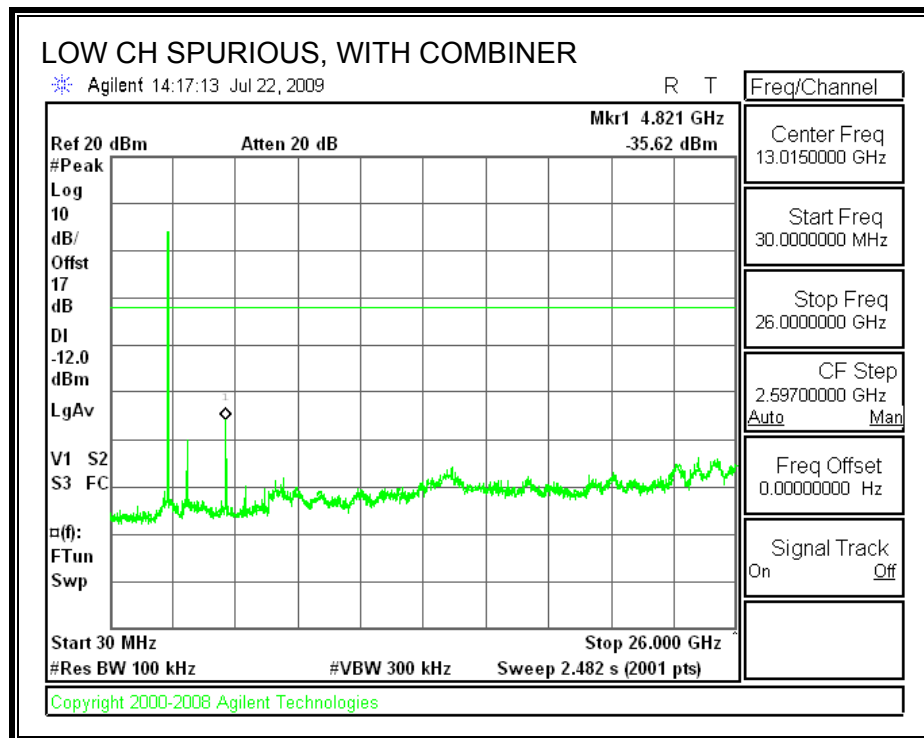
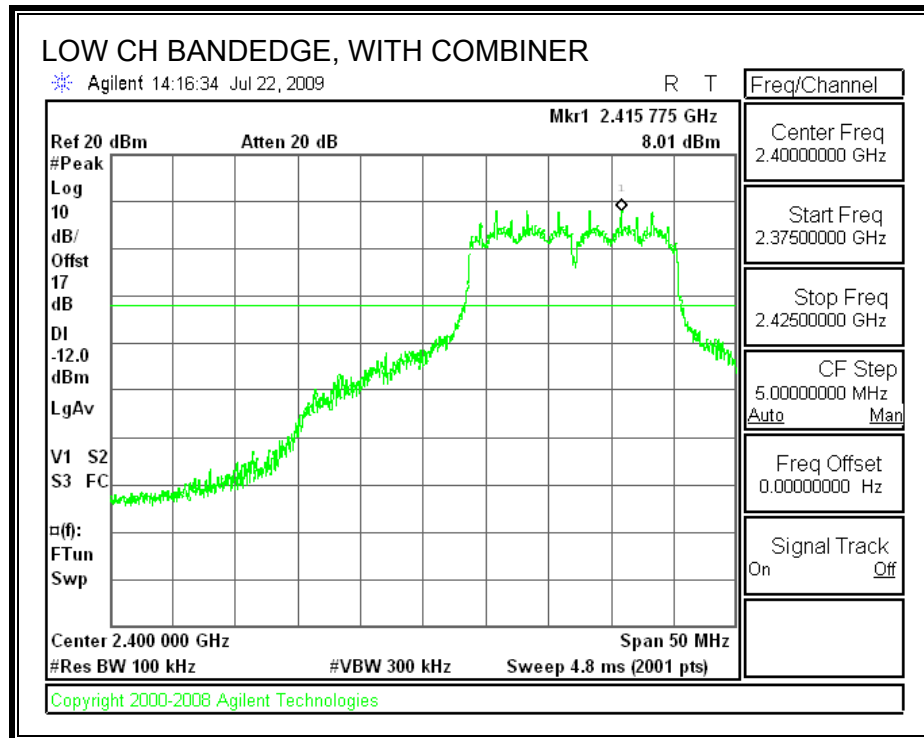
TEST PROCEDURE

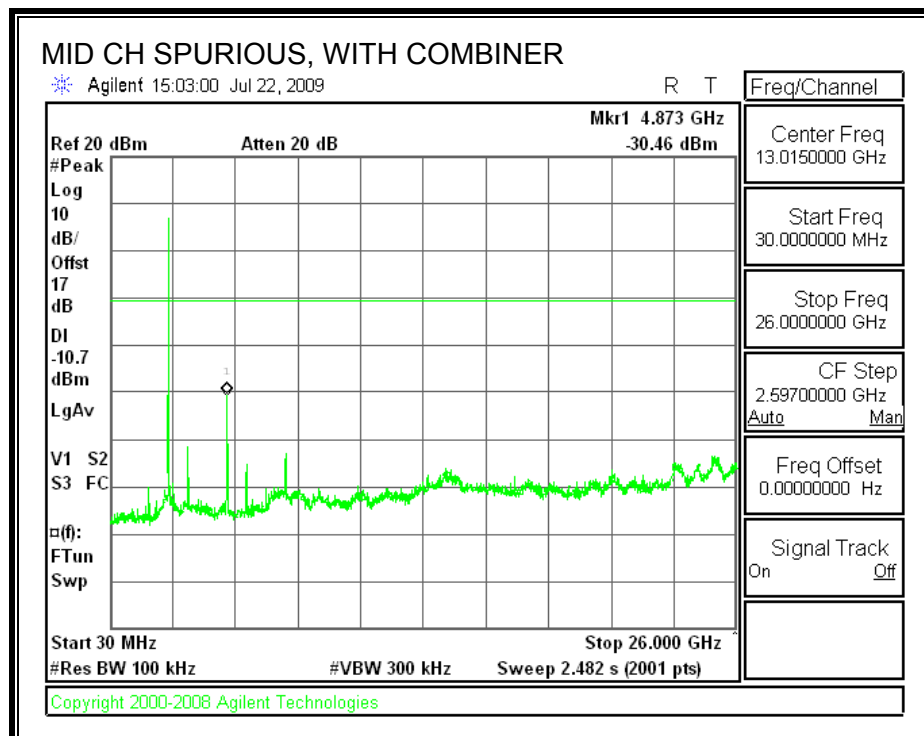
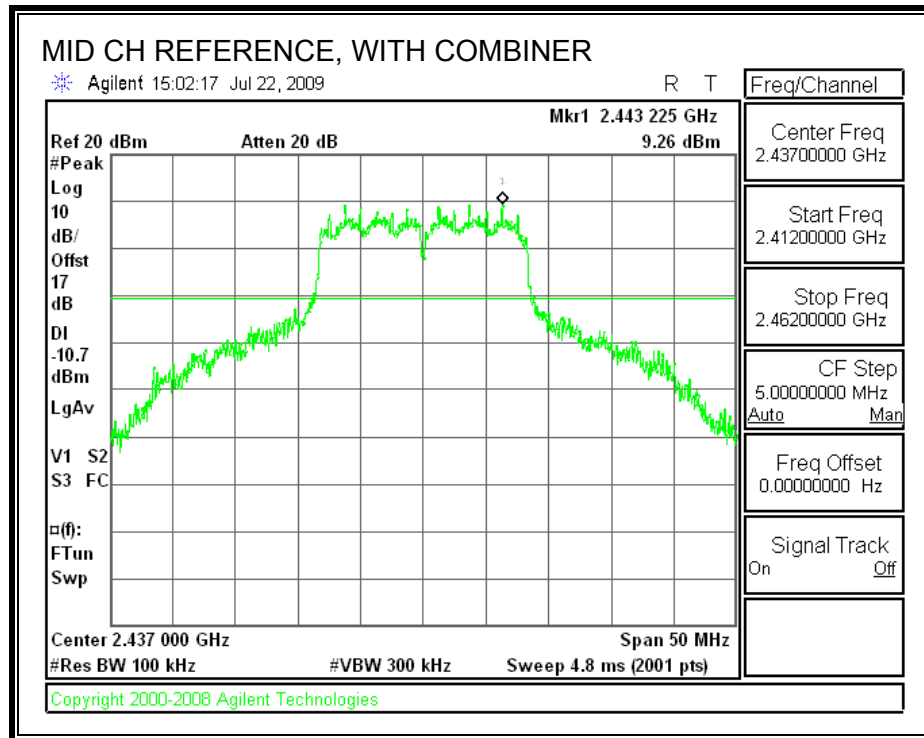
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

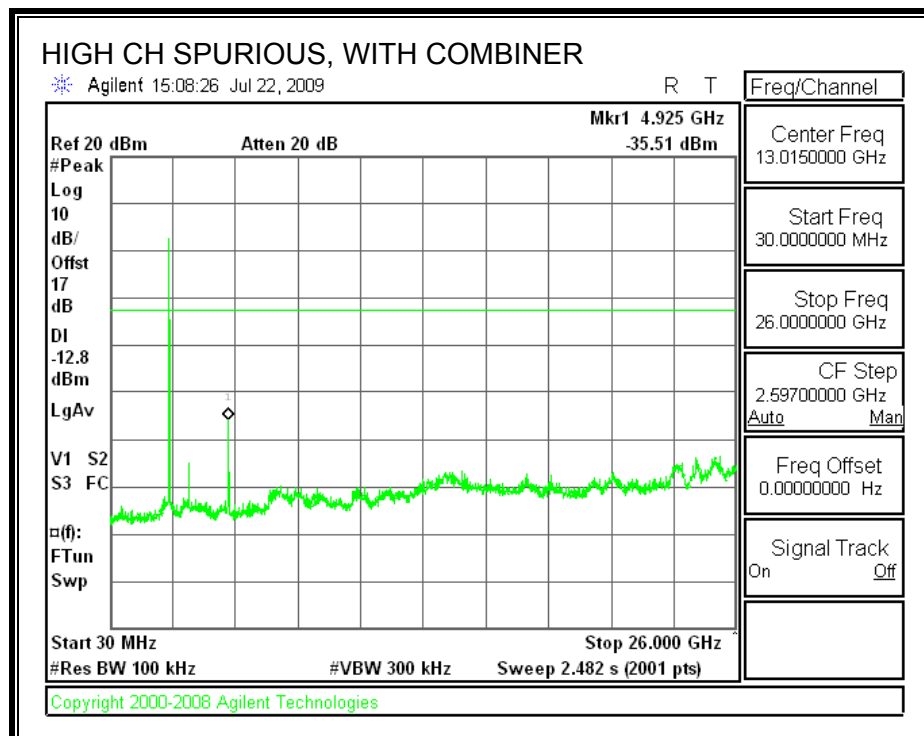
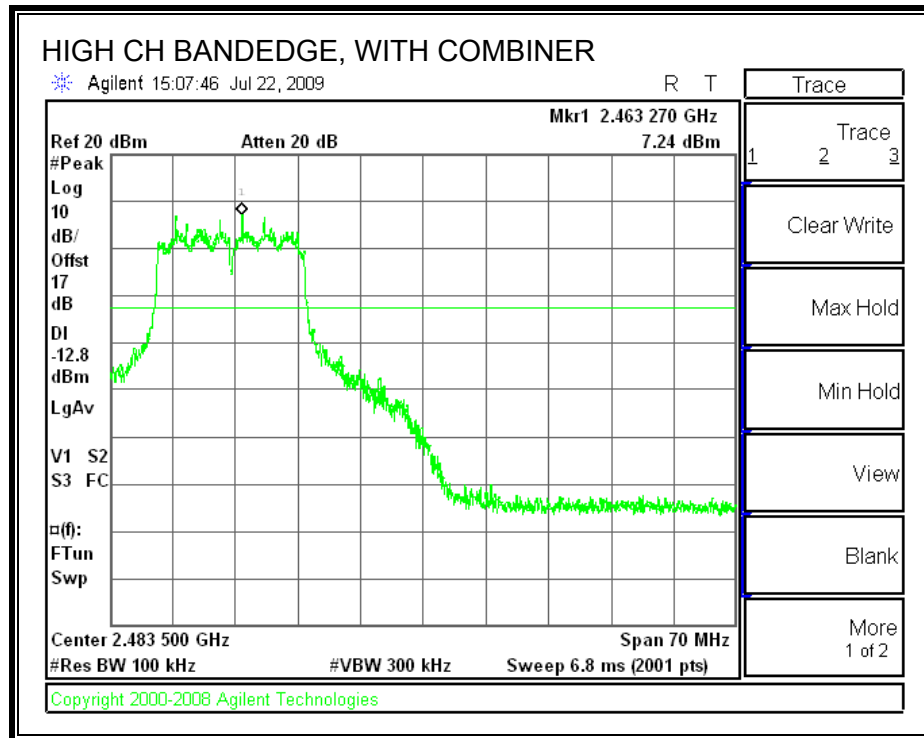
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

SPURIOUS EMISSIONS WITH COMBINER







7.3. 802.11n HT20 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.

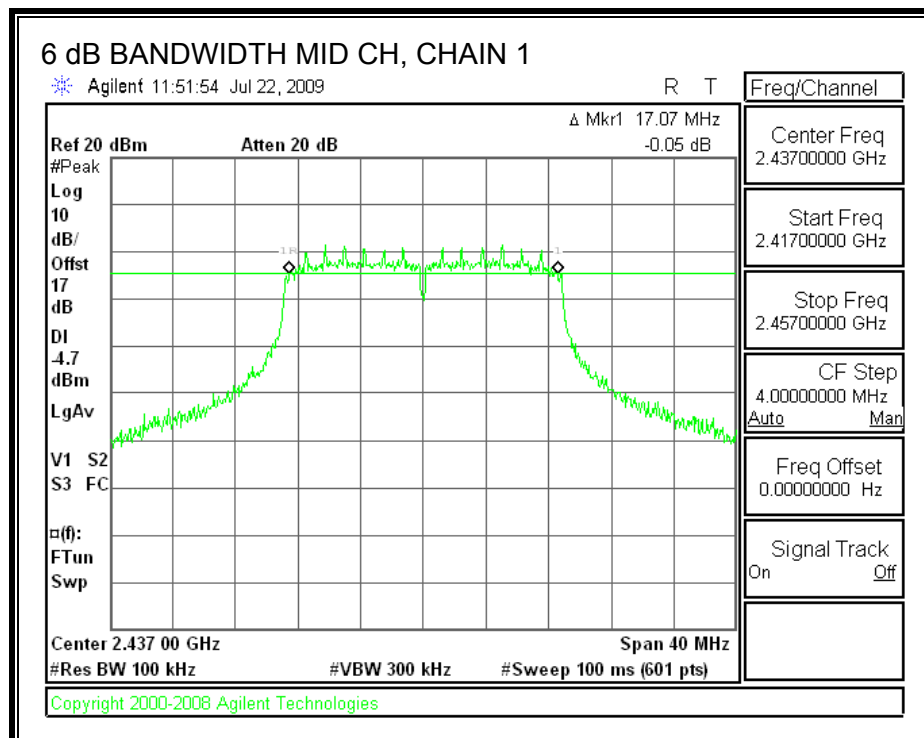
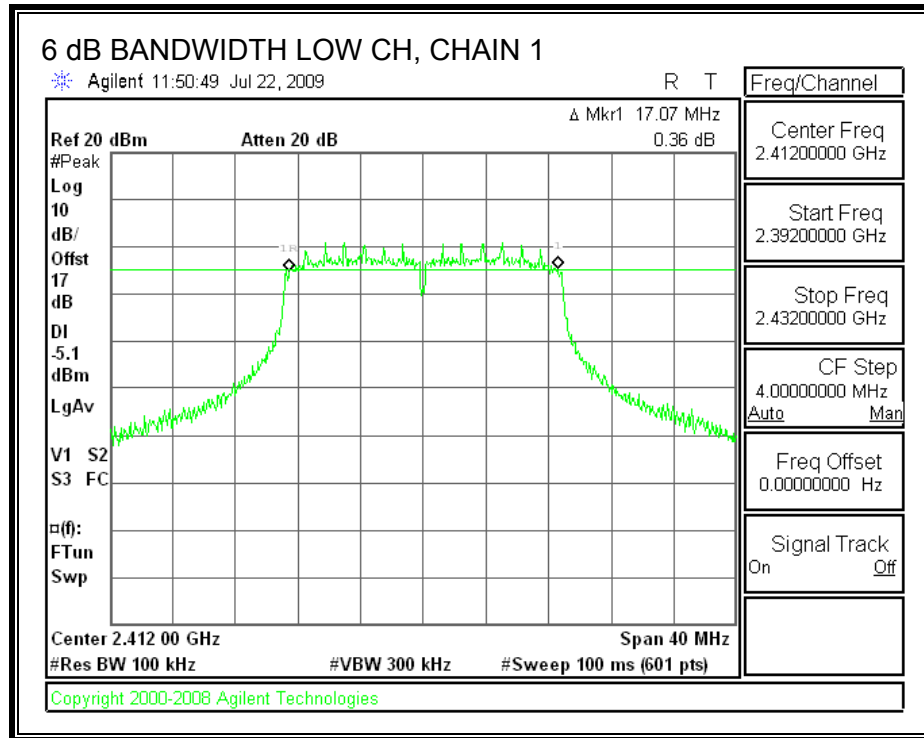
TEST PROCEDURE

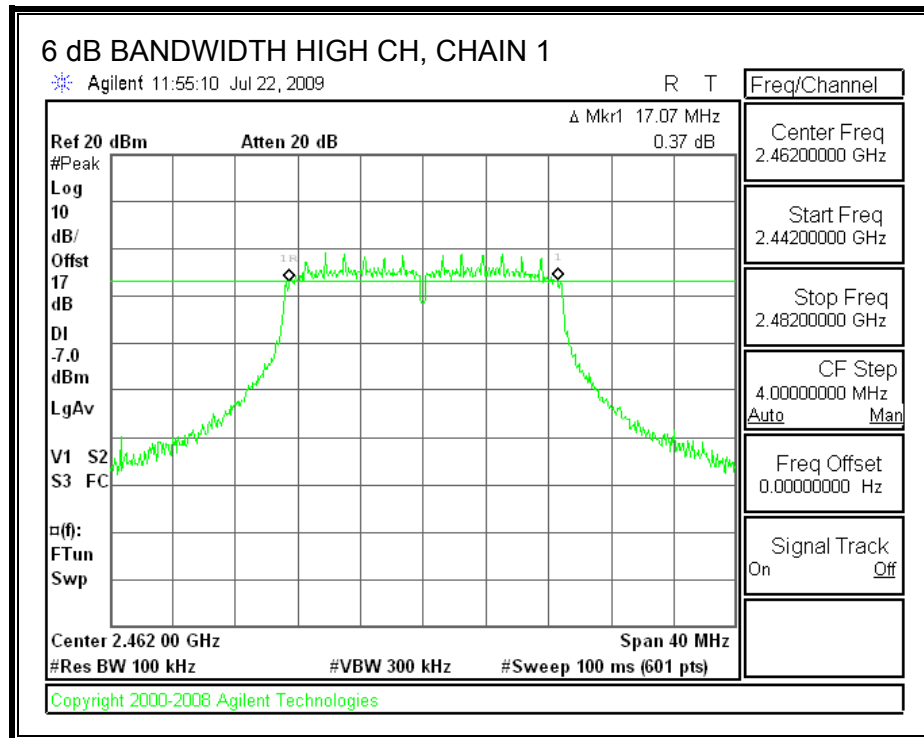
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

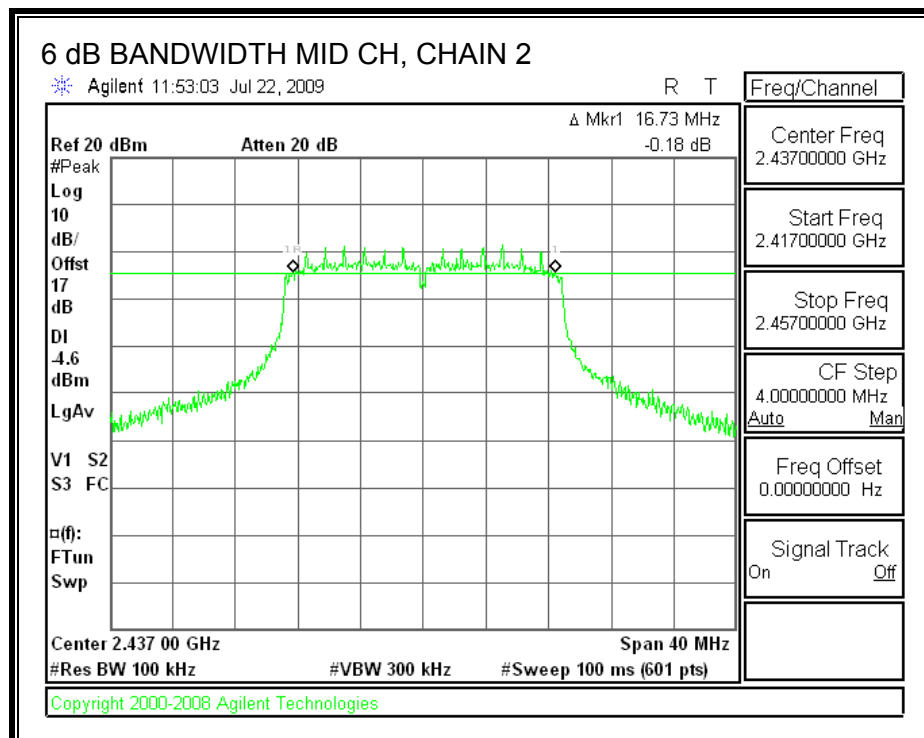
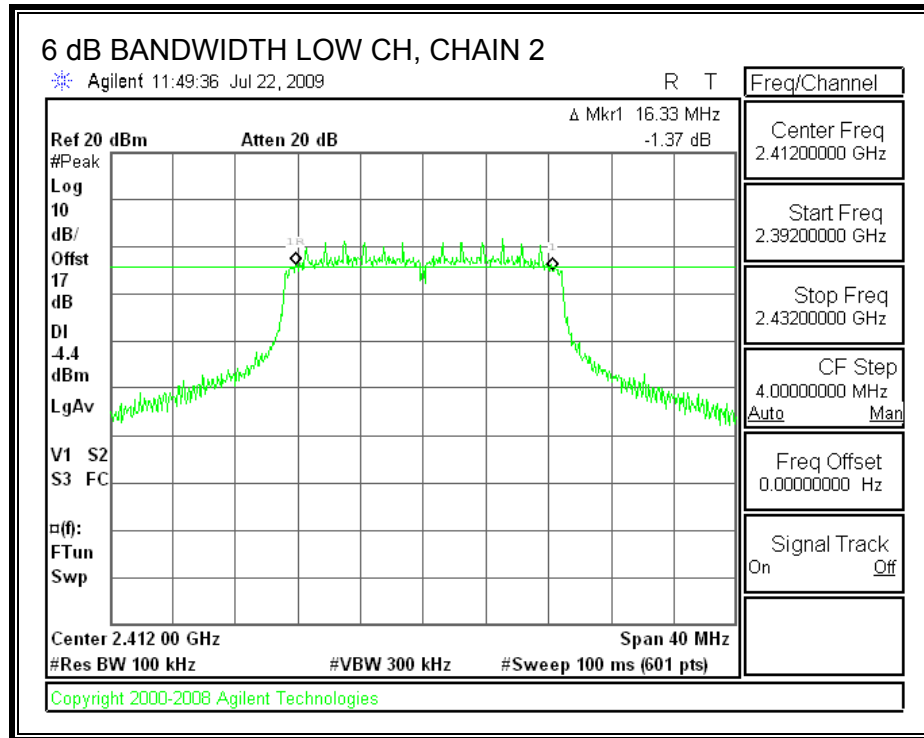
Channel	Frequency (MHz)	Chain 1 6 dB BW (MHz)	Chain 2 6 dB BW (MHz)	Minimum Limit (MHz)
Low	2412	17.07	16.33	0.5
Middle	2437	17.07	16.73	0.5
High	2462	17.07	17.27	0.5

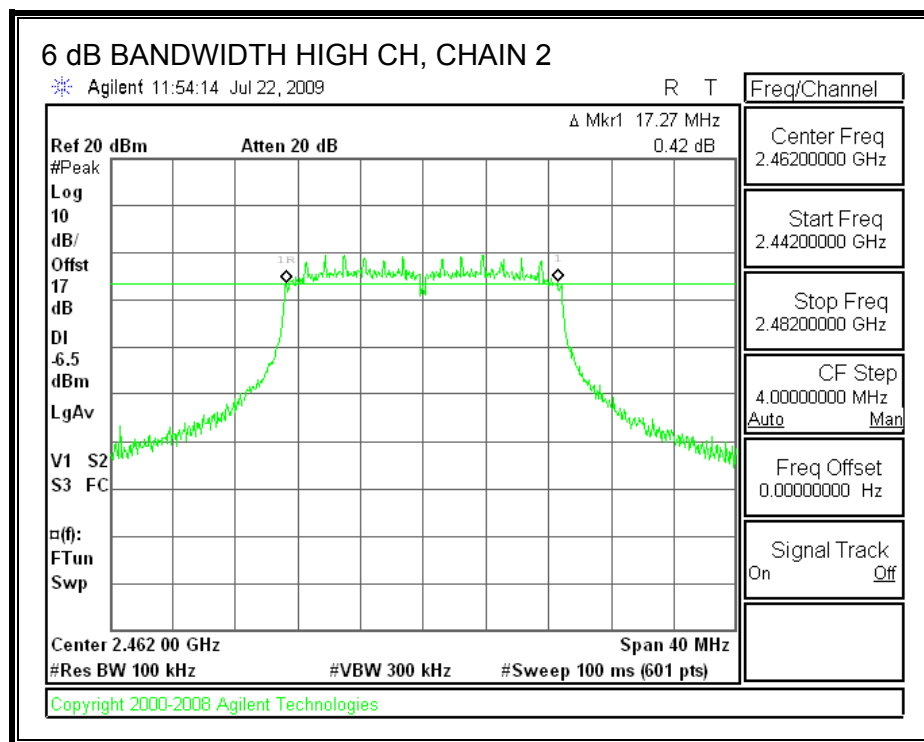
6 dB BANDWIDTH, CHAIN 1





6 dB BANDWIDTH, CHAIN 2





7.3.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

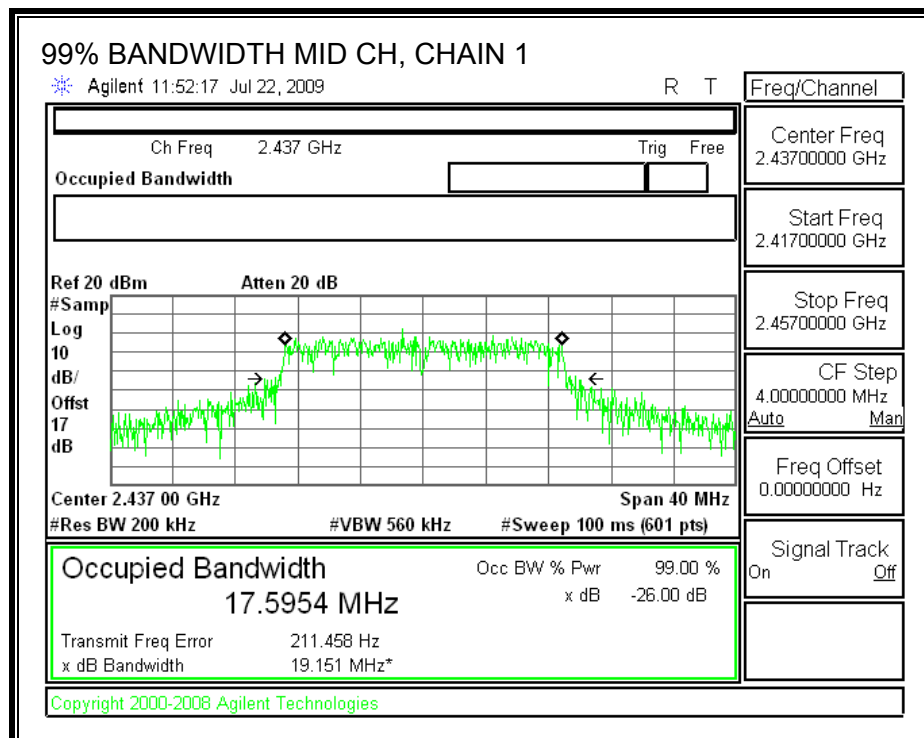
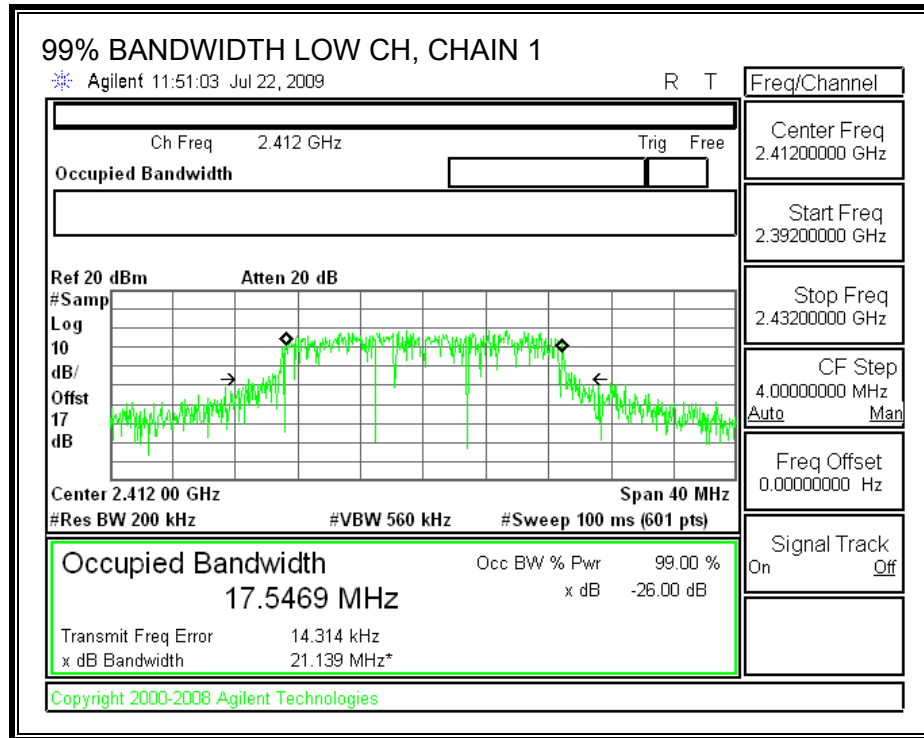
TEST PROCEDURE

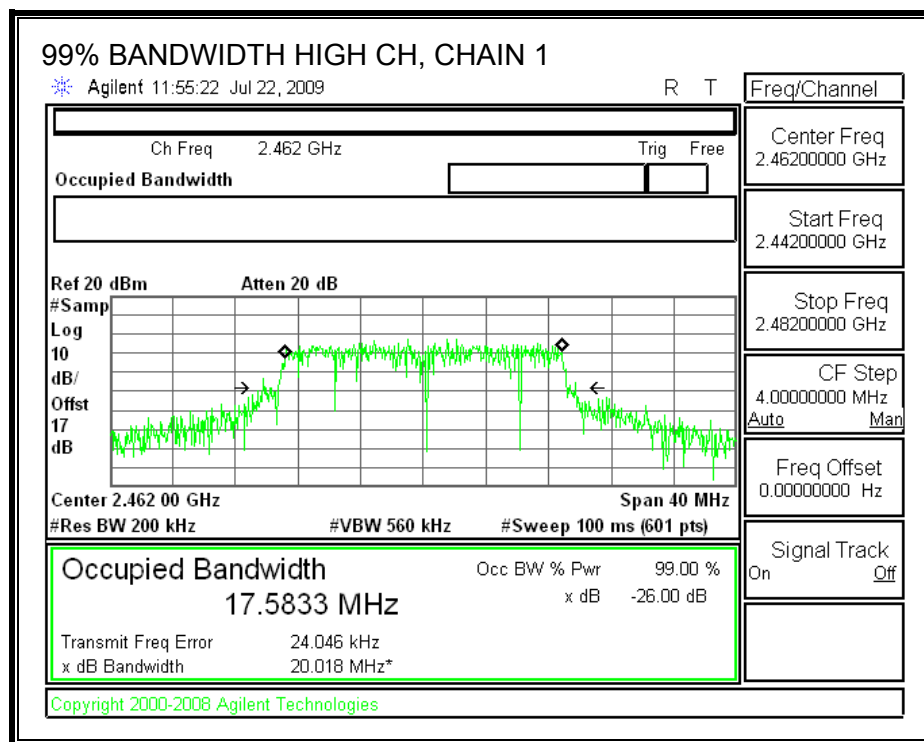
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

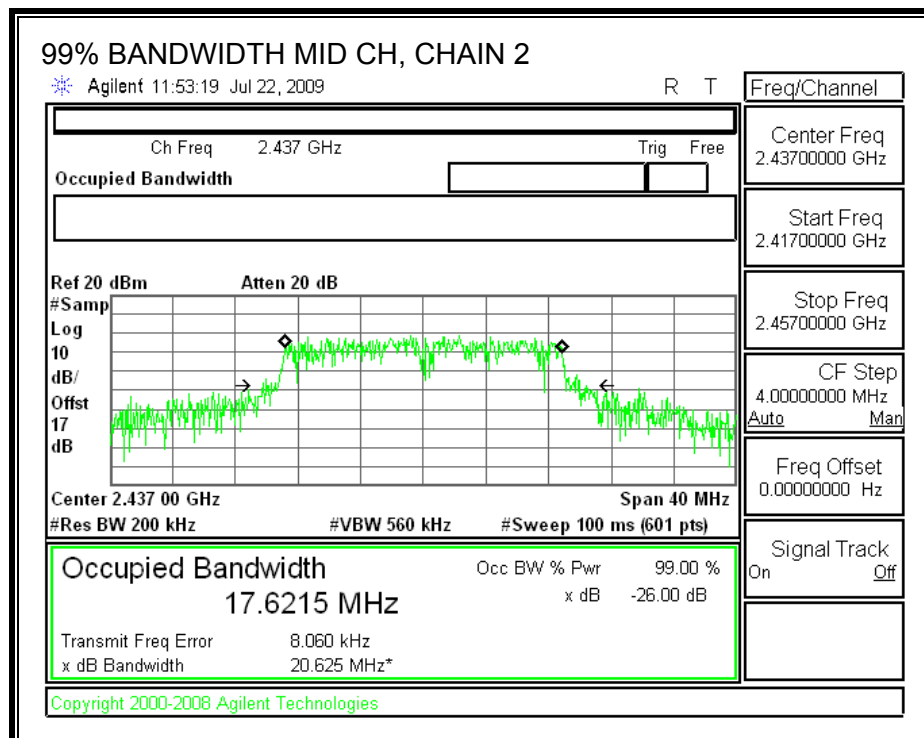
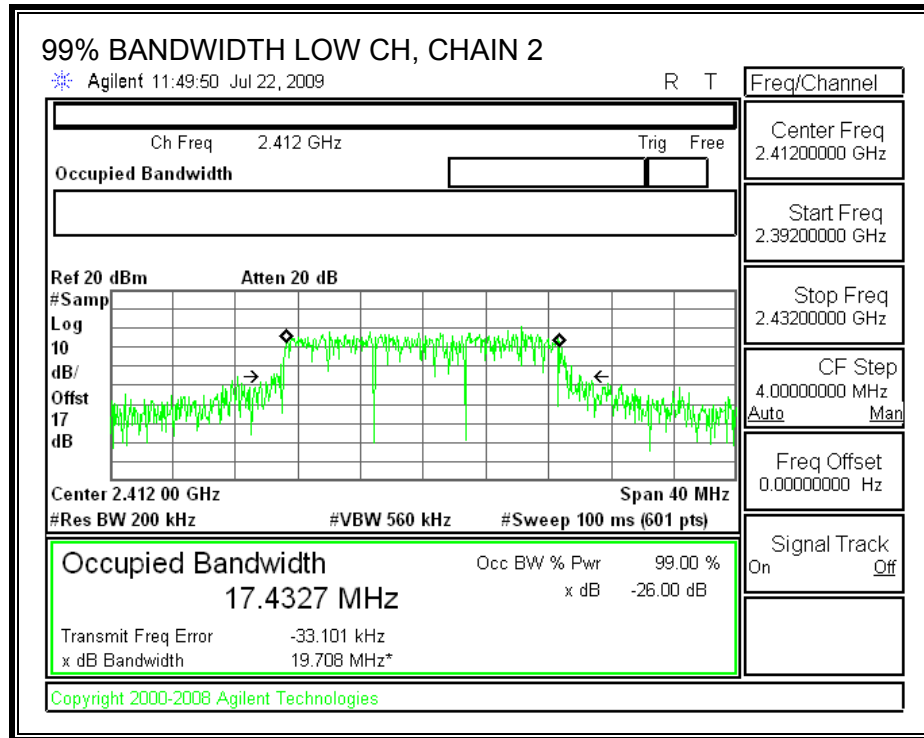
Channel	Frequency (MHz)	Chain 1 99% Bandwidth (MHz)	Chain 2 99% Bandwidth (MHz)
Low	2412	17.5469	17.4327
Middle	2437	17.5954	17.6215
High	2462	17.5833	17.5486

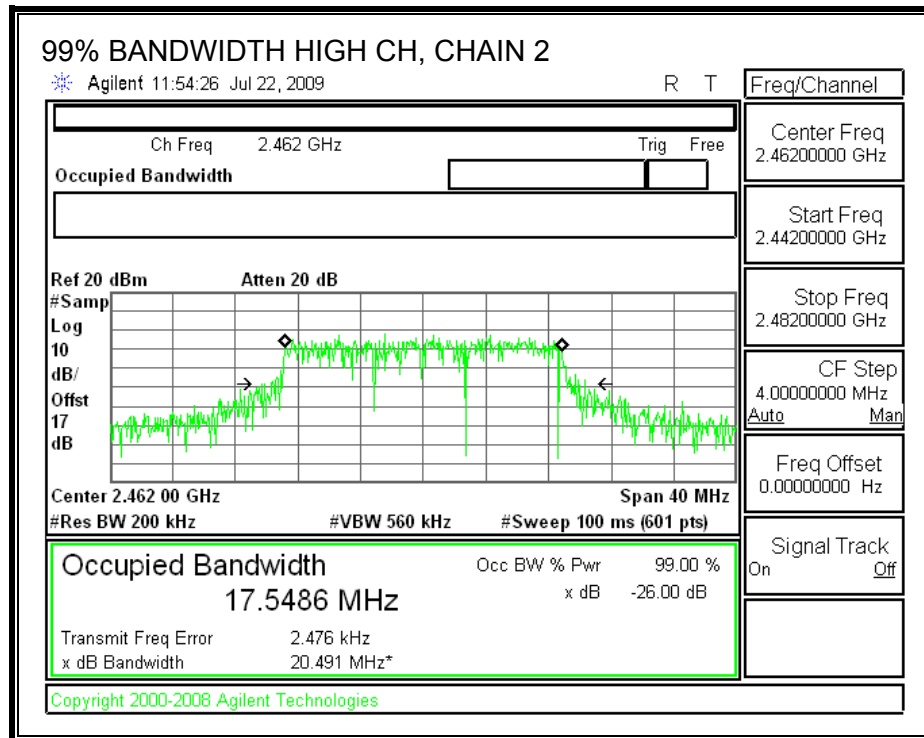
99% BANDWIDTH, CHAIN 1





99% BANDWIDTH, CHAIN 2





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

The transmitter output is connected to a power meter.

RESULTS

Channel	Frequency (MHz)	Limit (dBm)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Margin (dB)
Low	2412	30.00	21.51	21.43	24.48	-5.52
Mid	2437	30.00	21.53	21.14	24.35	-5.65
High	2462	30.00	21.88	21.65	24.78	-5.22

7.3.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 17 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)
Low	2412	12.19	12.47	15.34
Middle	2437	12.00	12.29	15.16
High	2462	12.15	12.30	15.24

7.3.5. 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.

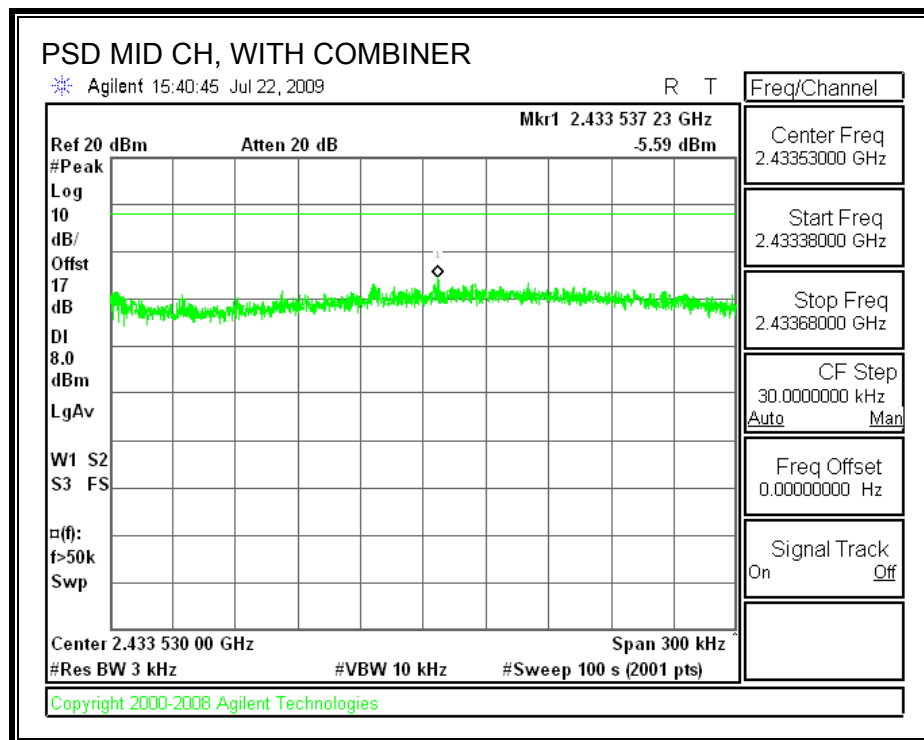
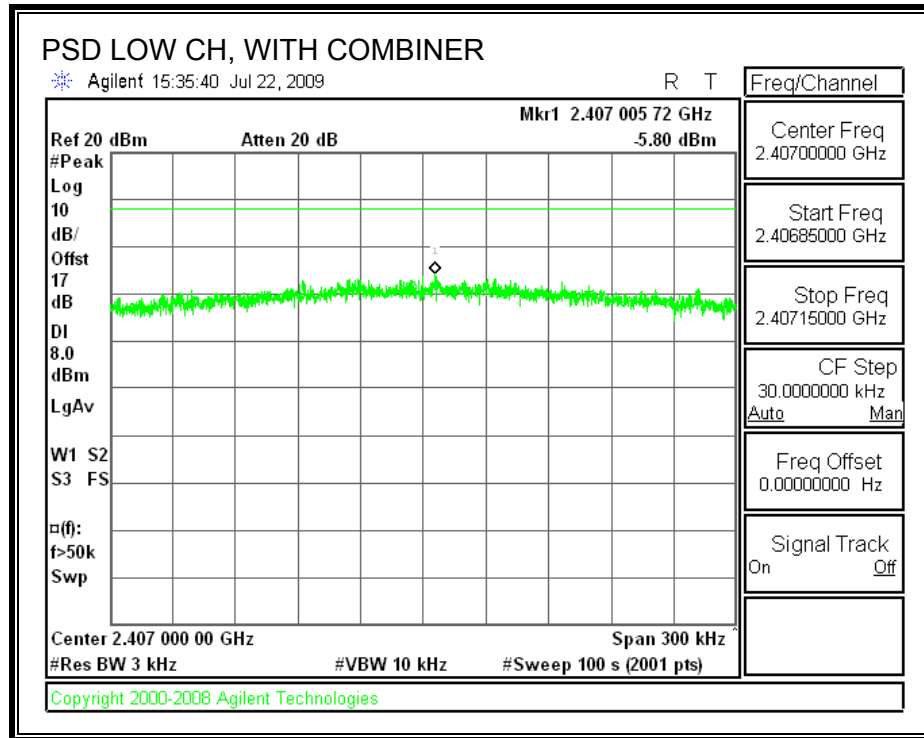
TEST PROCEDURE

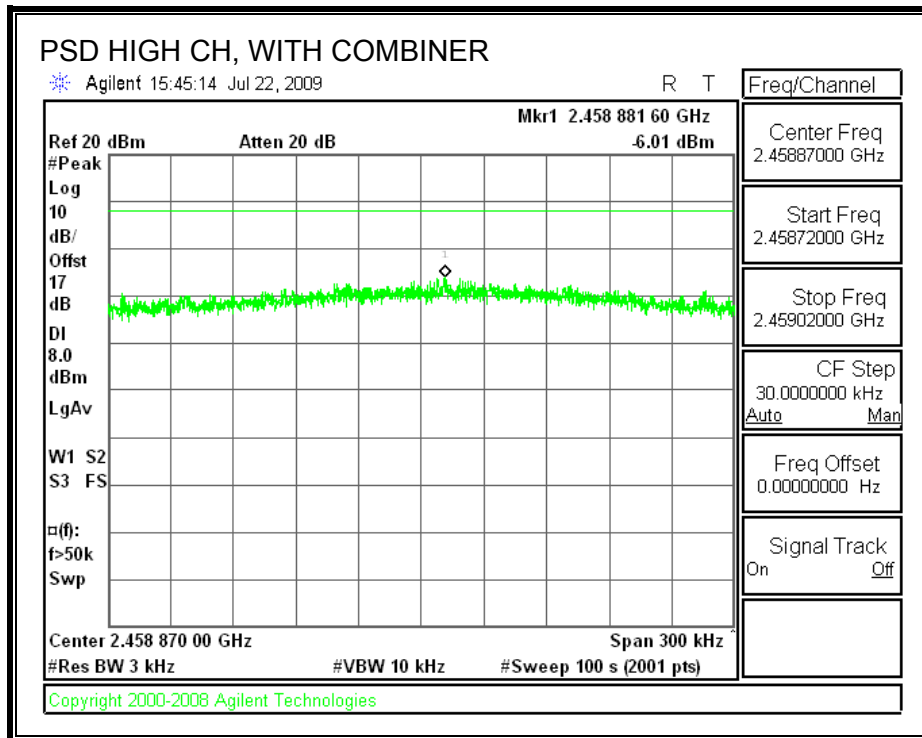
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

Channel	Frequency (MHz)	PSD with Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-5.80	8	-13.80
Middle	2437	-5.59	8	-13.59
High	2462	-6.01	8	-14.01

POWER SPECTRAL DENSITY, WITH COMBINER





7.3.6. 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.

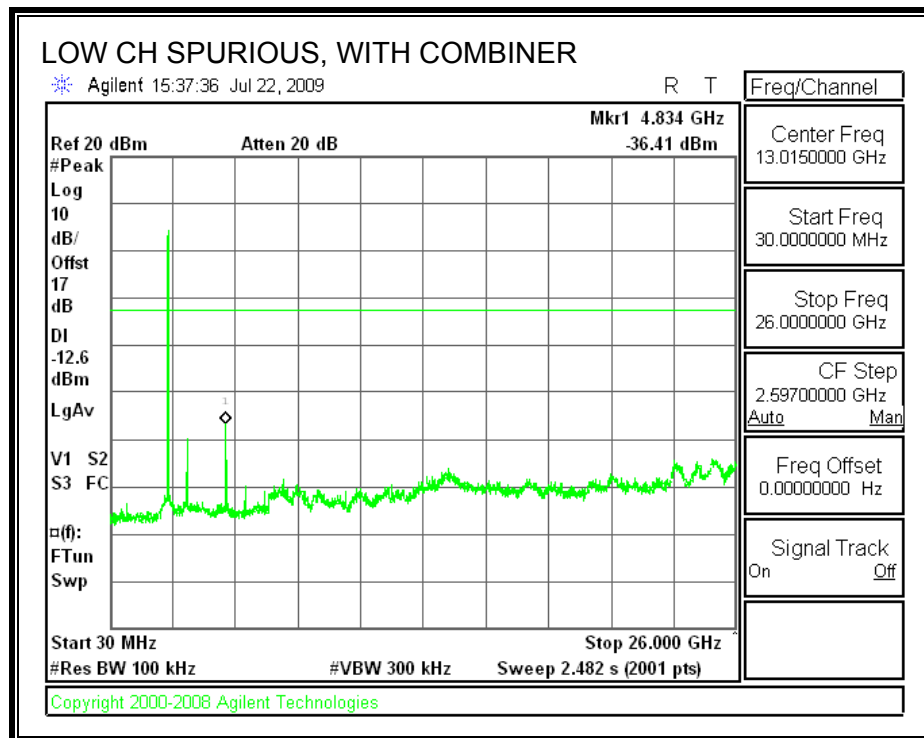
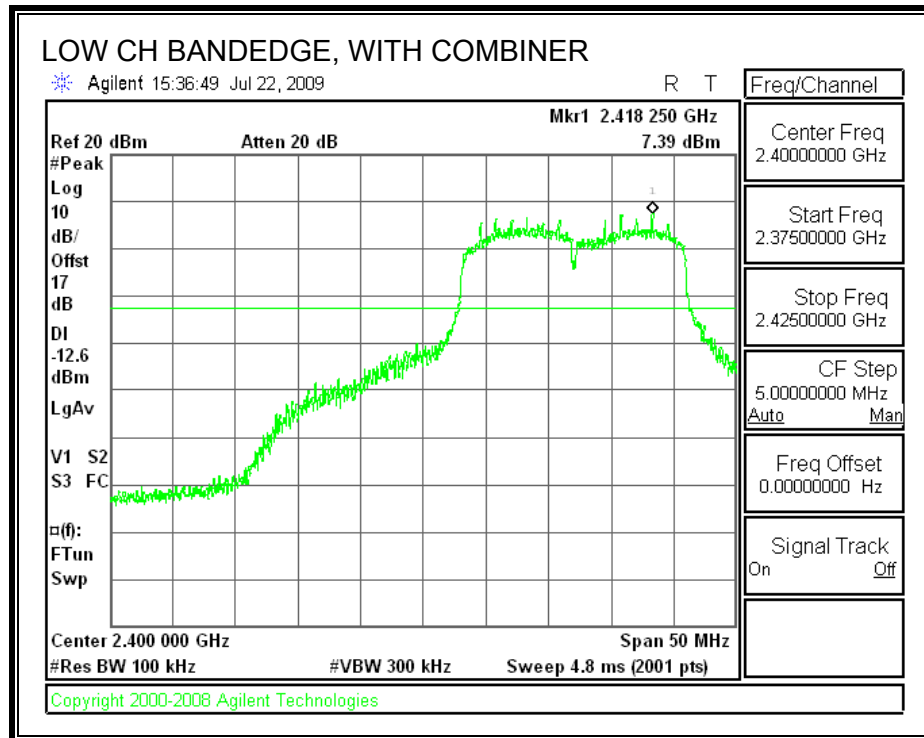
TEST PROCEDURE

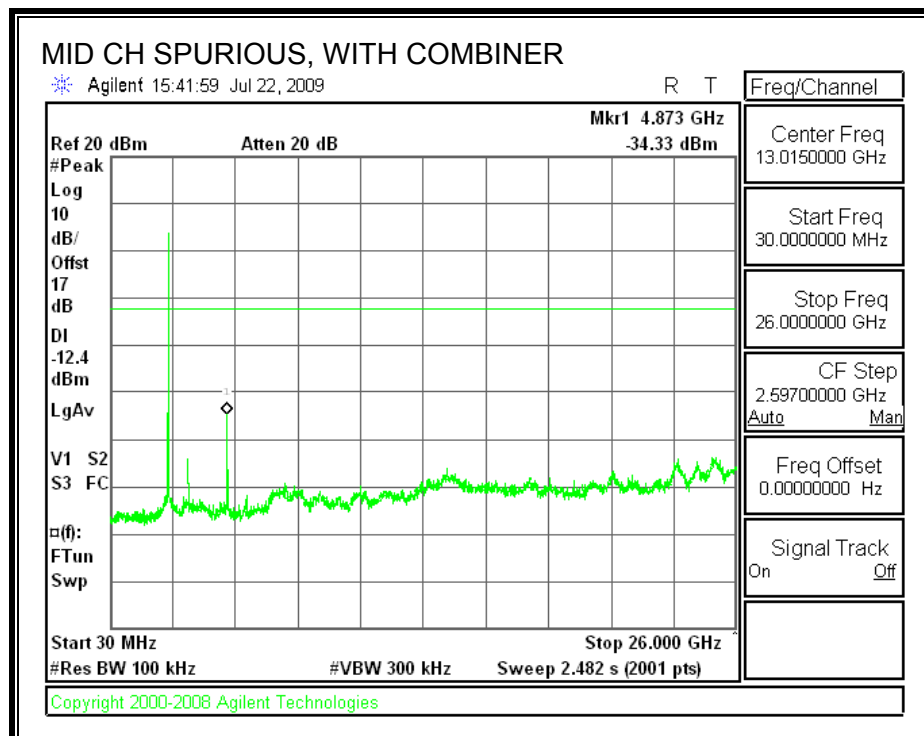
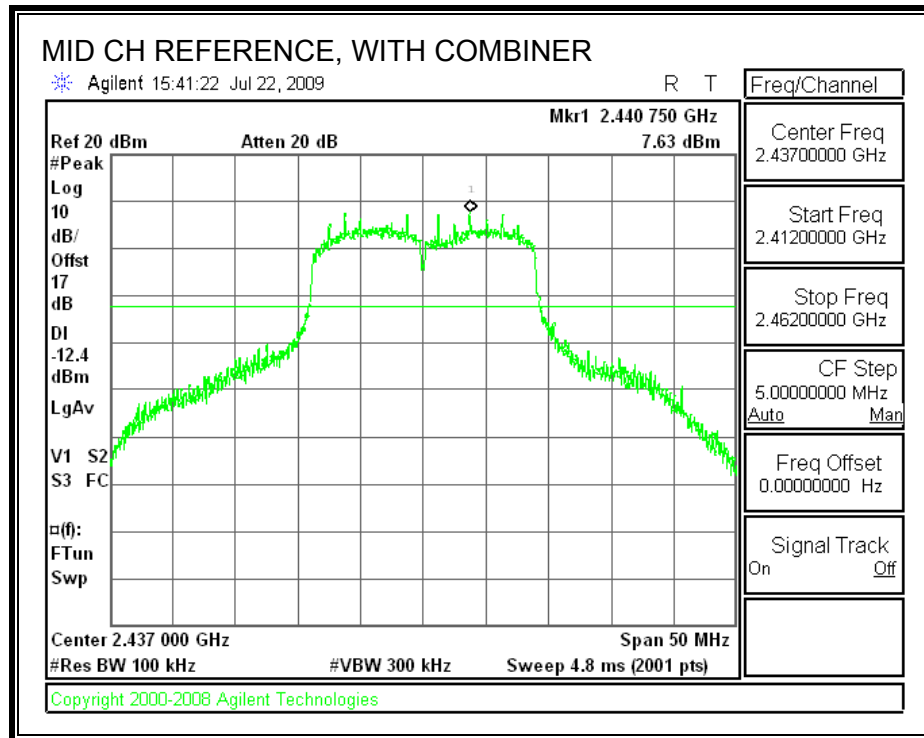
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

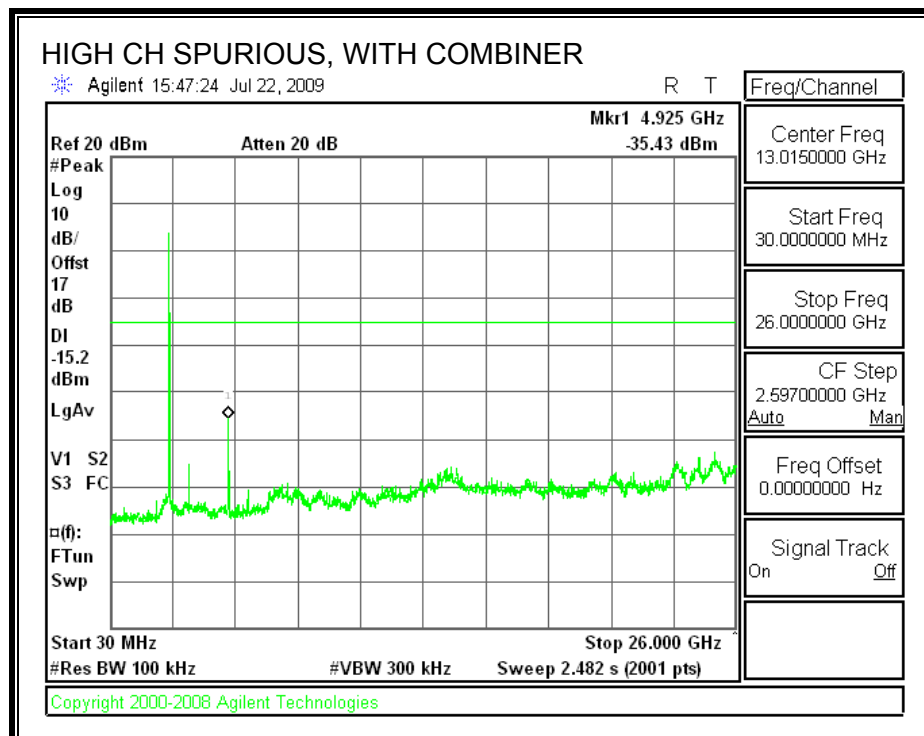
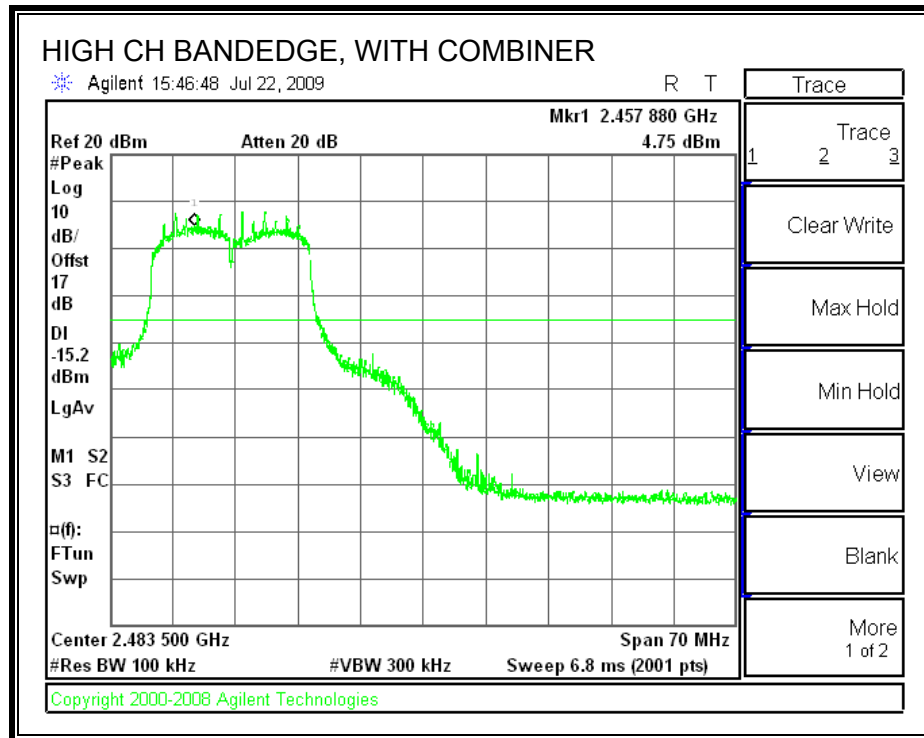
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

SPURIOUS EMISSIONS WITH COMBINER







7.4. 802.11n HT40 MODE IN THE 2.4 GHz BAND

7.4.1. 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.

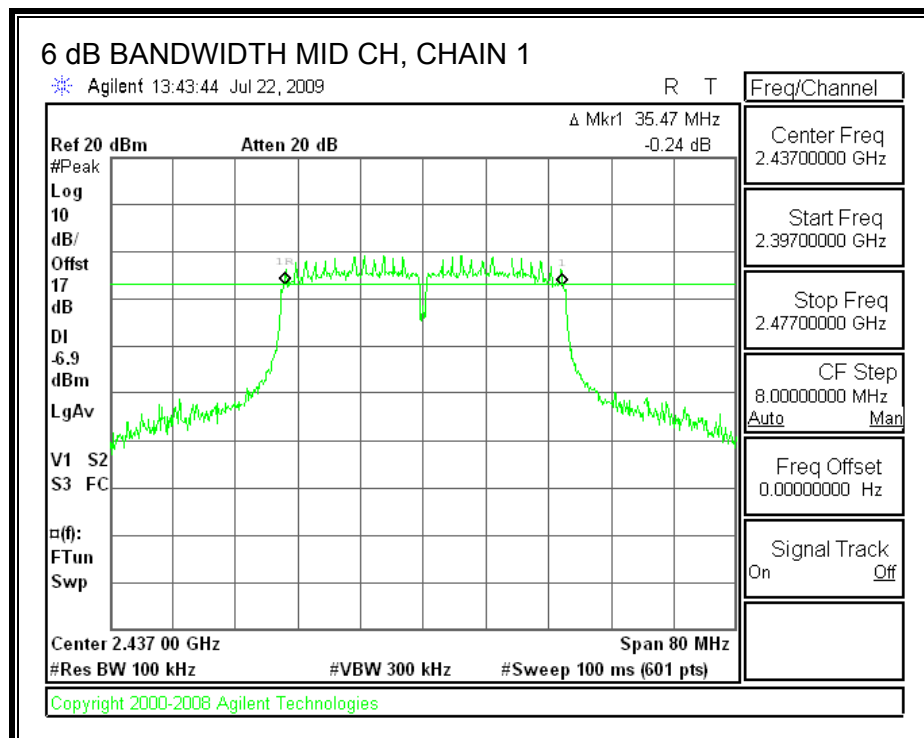
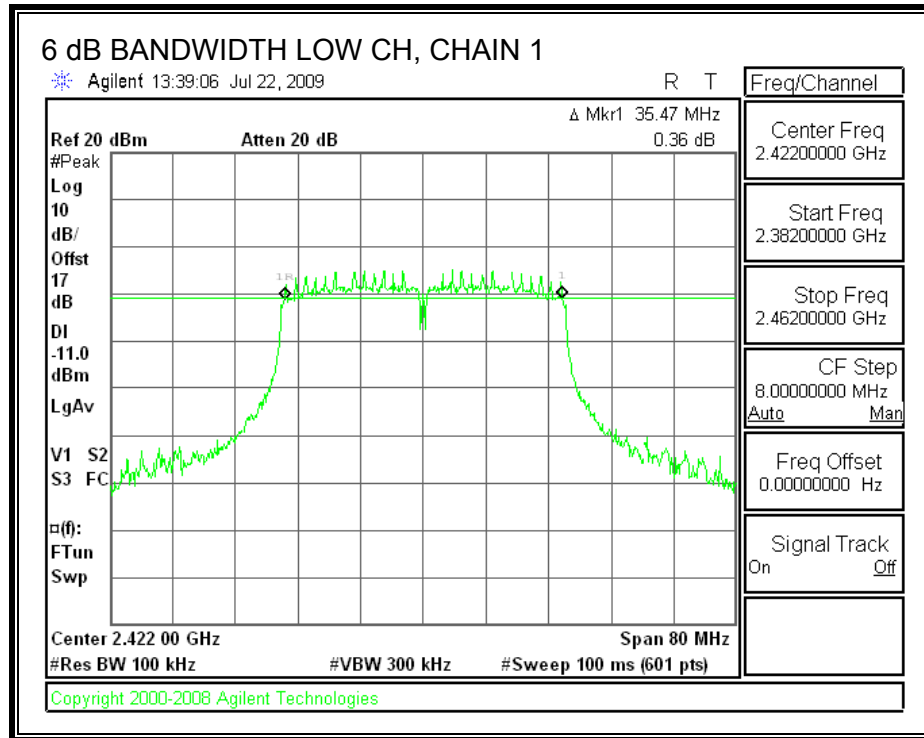
TEST PROCEDURE

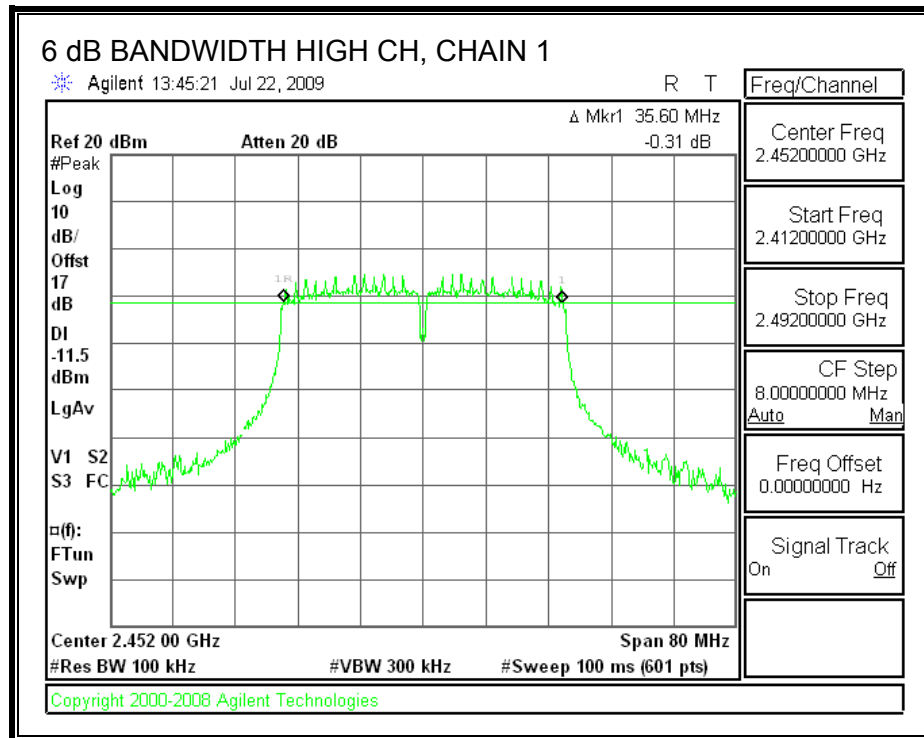
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

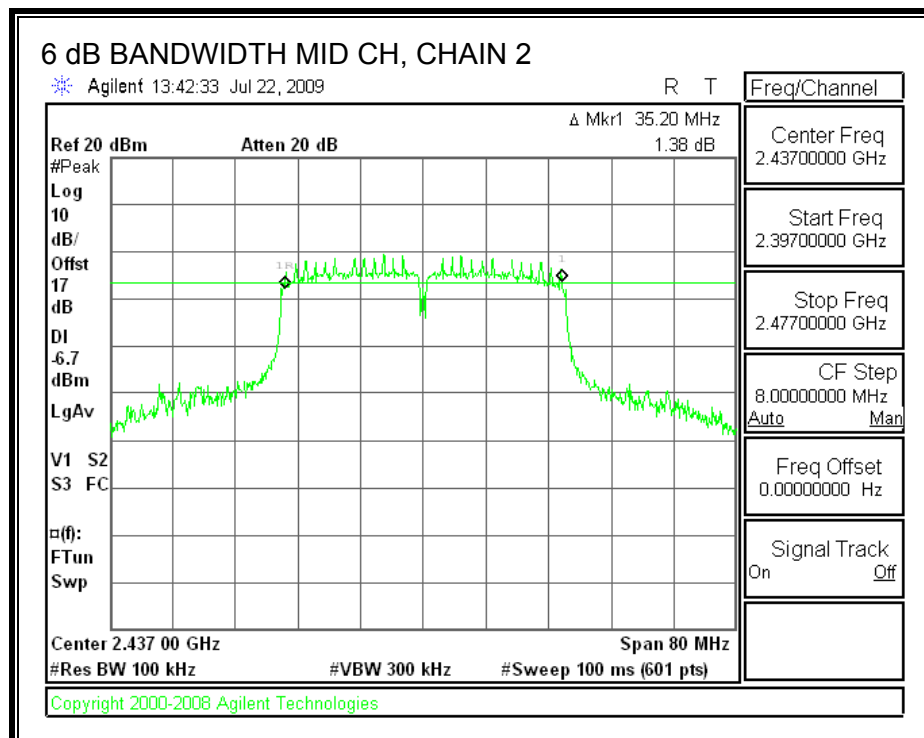
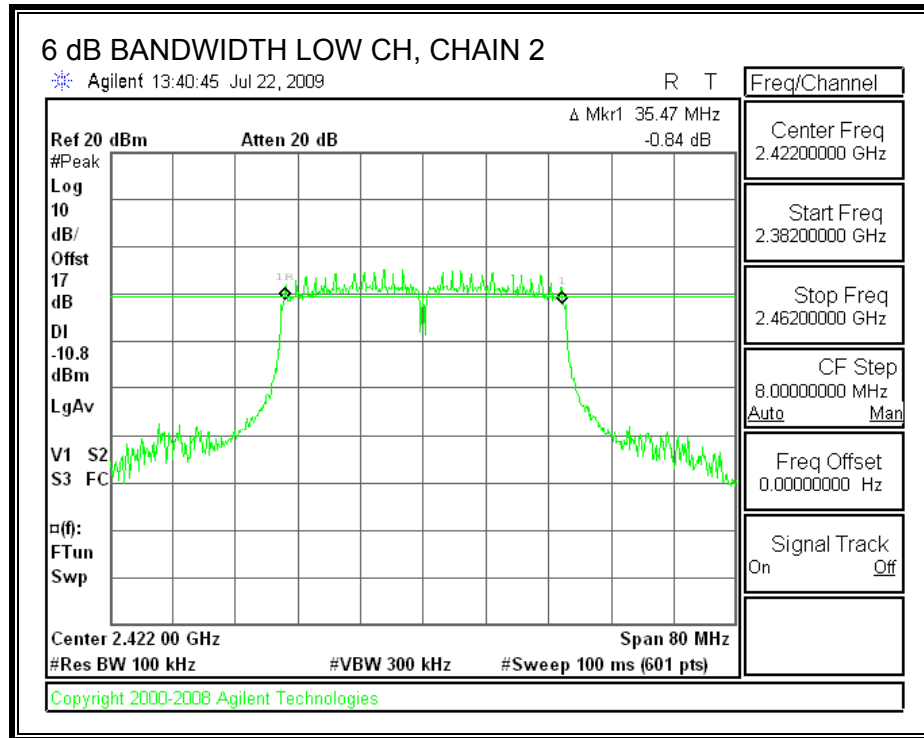
Channel	Frequency (MHz)	Chain 1 6 dB BW (MHz)	Chain 2 6 dB BW (MHz)	Minimum Limit (MHz)
Low	2422	35.47	35.47	0.5
Middle	2437	35.47	35.20	0.5
High	2452	35.60	35.33	0.5

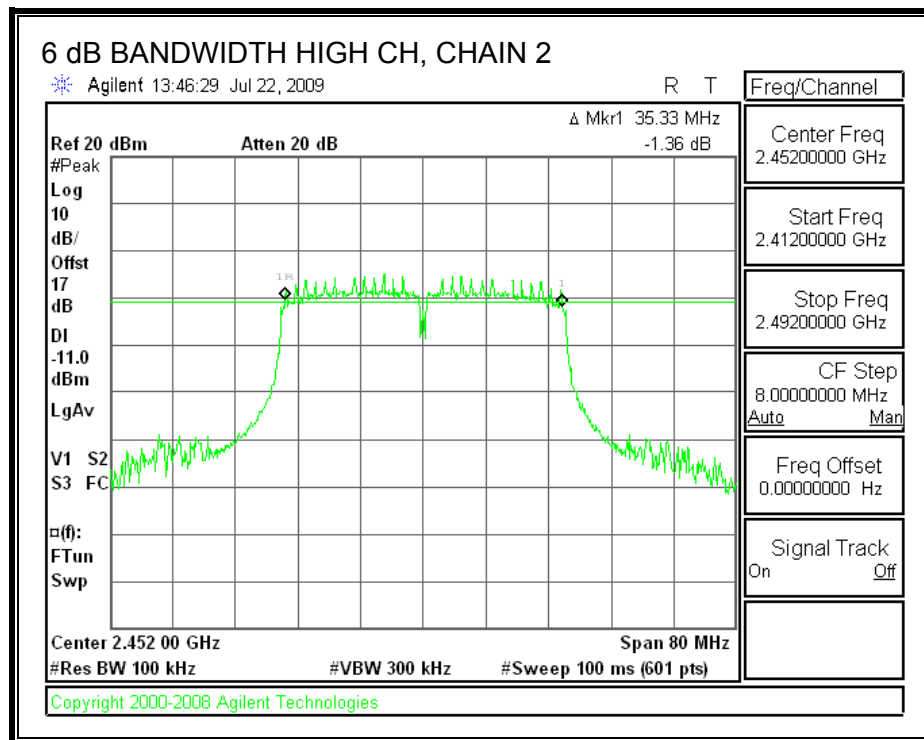
6 dB BANDWIDTH, CHAIN 1





6 dB BANDWIDTH, CHAIN 2





7.4.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

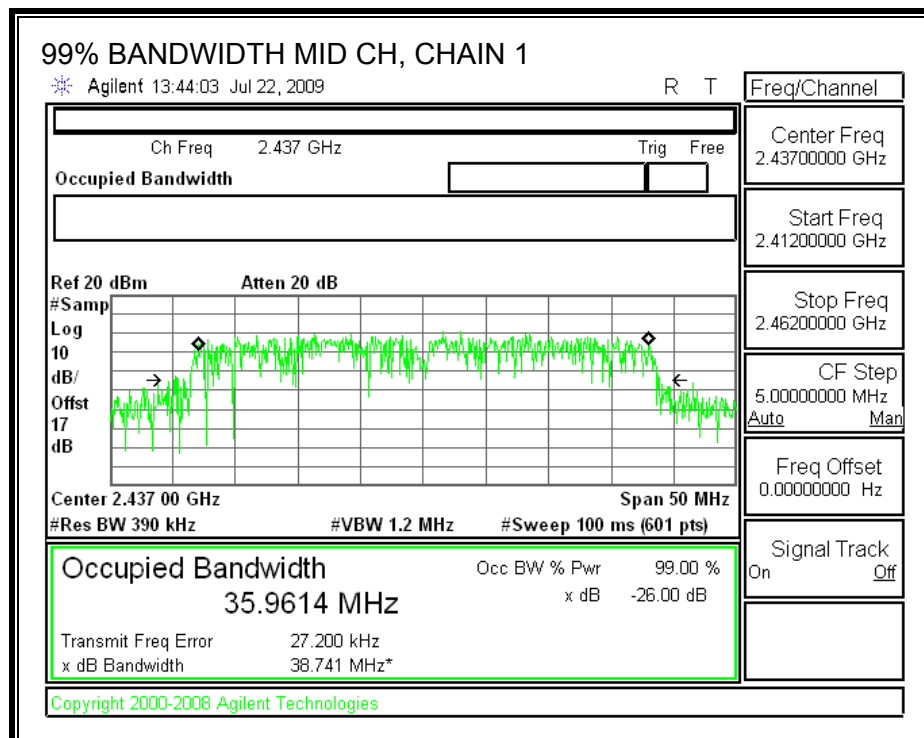
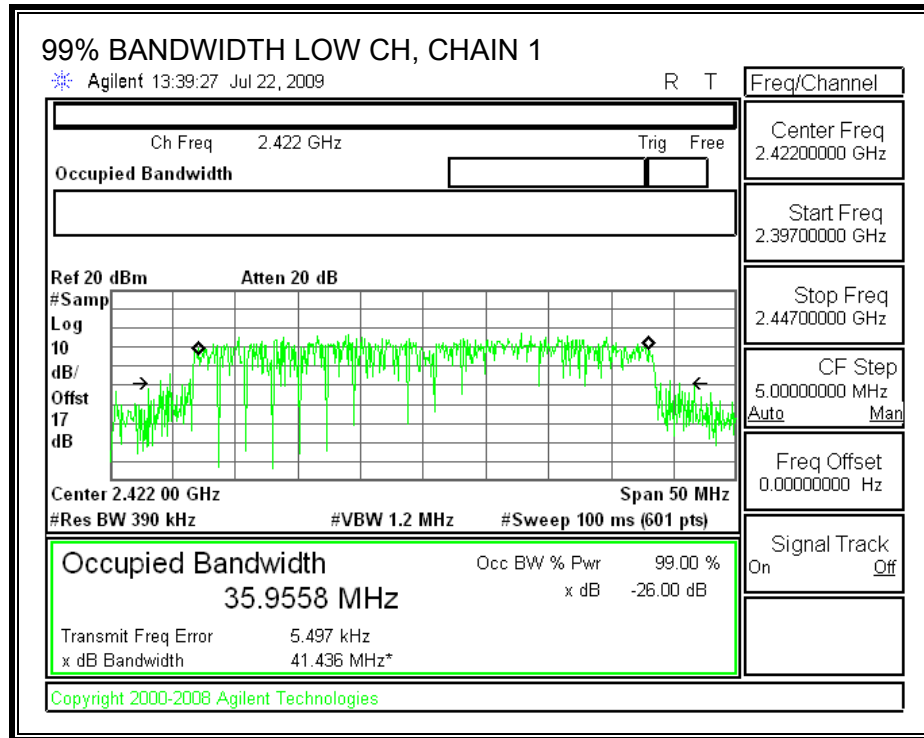
TEST PROCEDURE

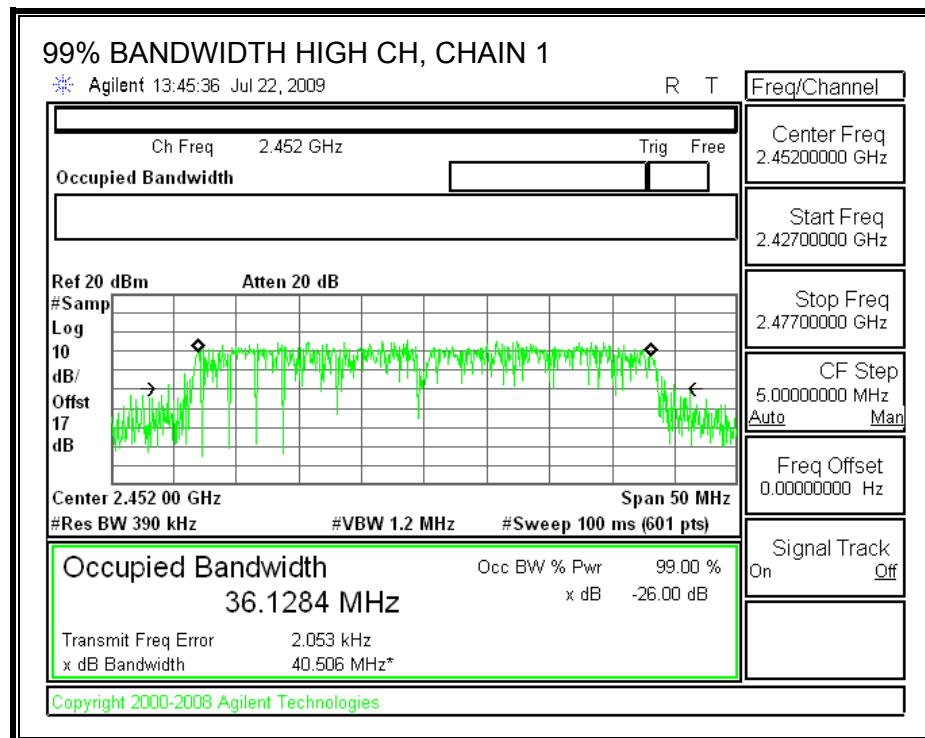
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

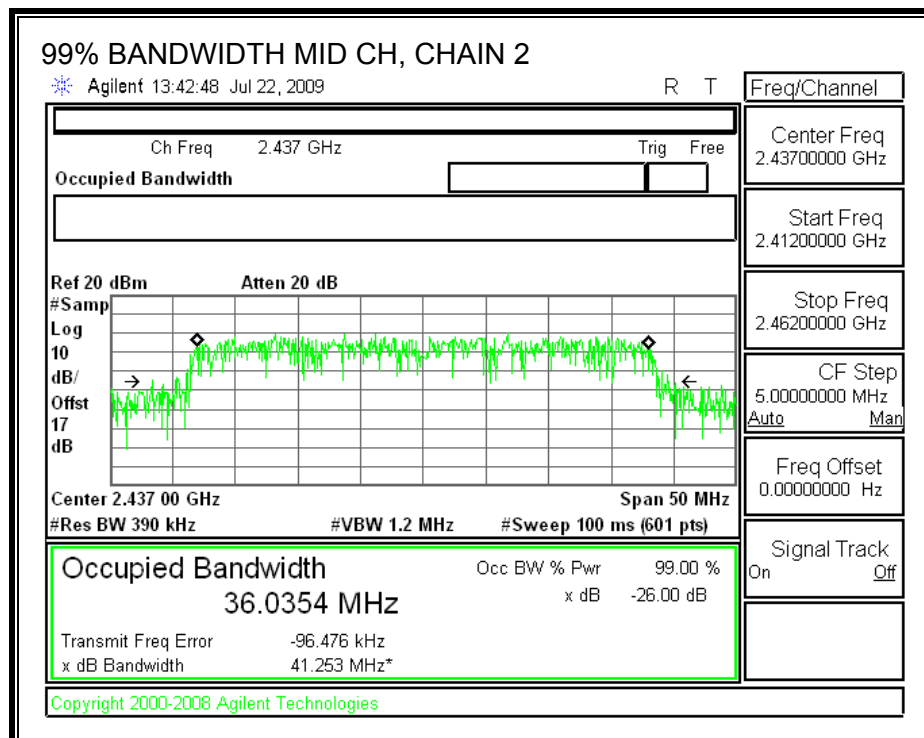
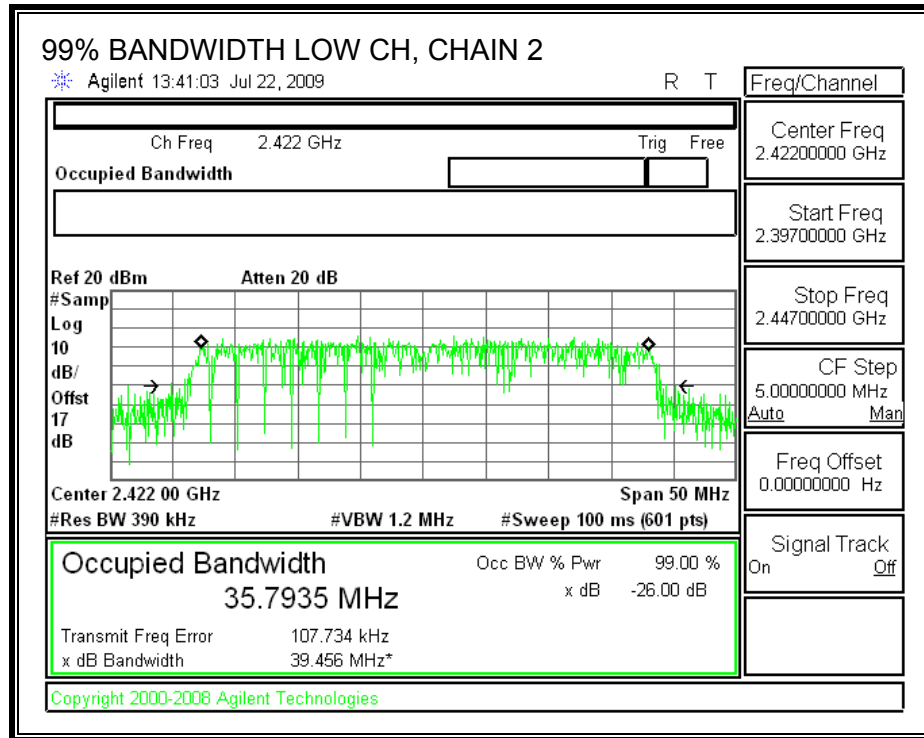
Channel	Frequency (MHz)	Chain 1 99% Bandwidth (MHz)	Chain 2 99% Bandwidth (MHz)
Low	2422	35.9558	35.7935
Middle	2437	35.9614	36.0354
High	2452	36.1284	35.7192

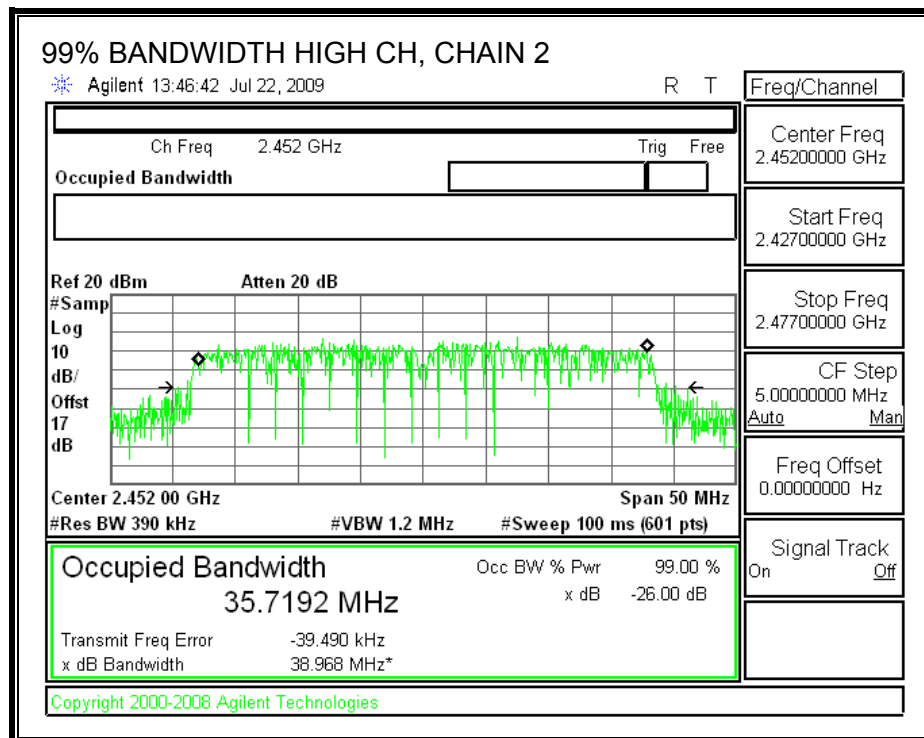
99% BANDWIDTH, CHAIN 1





99% BANDWIDTH, CHAIN 2





7.4.3. 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

The transmitter output is connected to a power meter.

RESULTS

Channel	Frequency (MHz)	Limit (dBm)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Margin (dB)
Low	2422	30.00	20.73	20.53	23.64	-6.36
Mid	2437	30.00	22.00	21.60	24.81	-5.19
High	2452	30.00	20.90	20.67	23.80	-6.20

7.4.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 17 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)
Low	2422	10.18	10.39	13.30
Middle	2437	12.20	12.26	15.24
High	2452	10.48	10.50	13.50

7.4.5. 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.

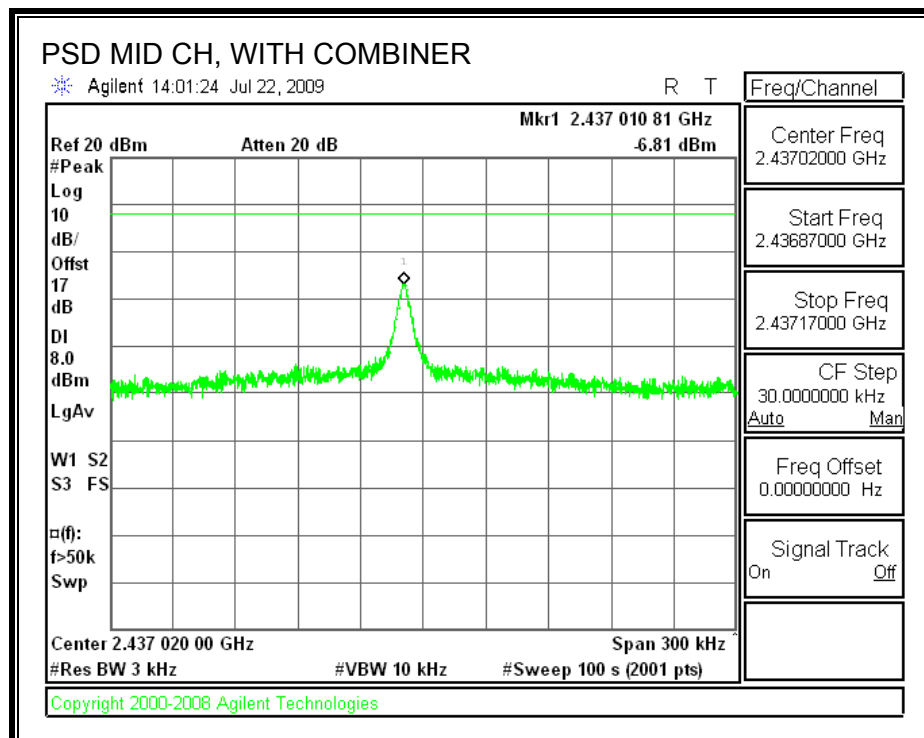
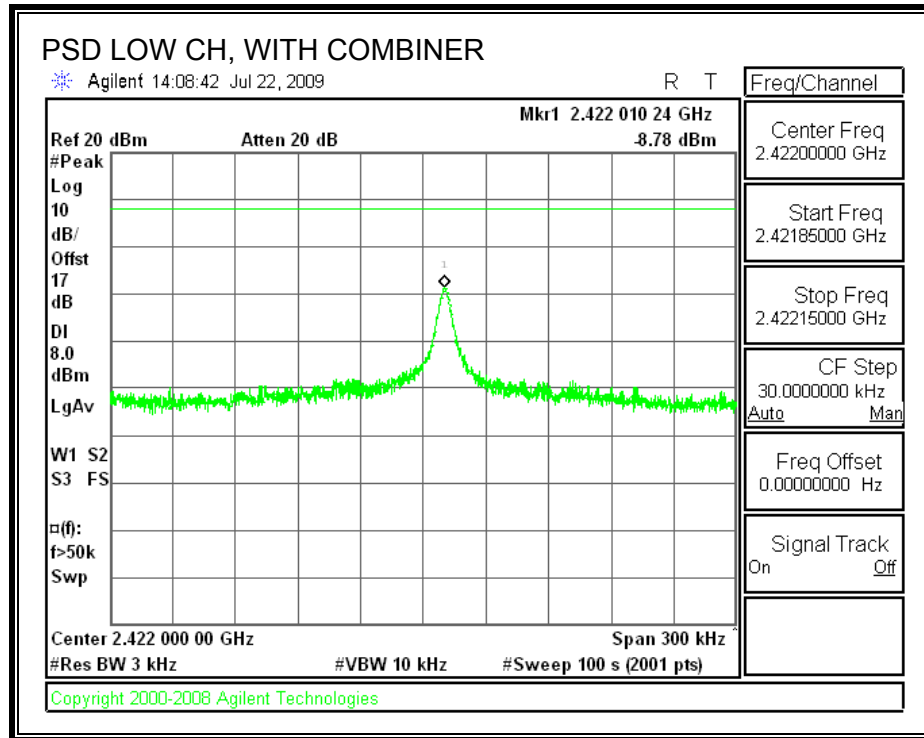
TEST PROCEDURE

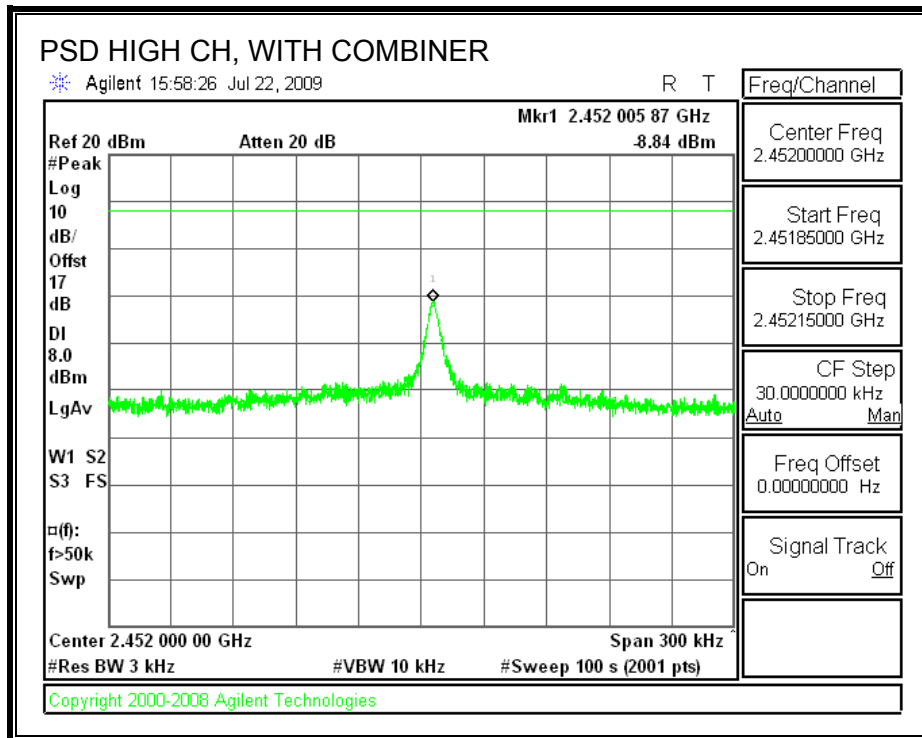
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

Channel	Frequency (MHz)	PSD with Combiner (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-8.78	8	-16.78
Middle	2437	-6.81	8	-14.81
High	2452	-8.84	8	-16.84

POWER SPECTRAL DENSITY, WITH COMBINER





7.4.6. 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.

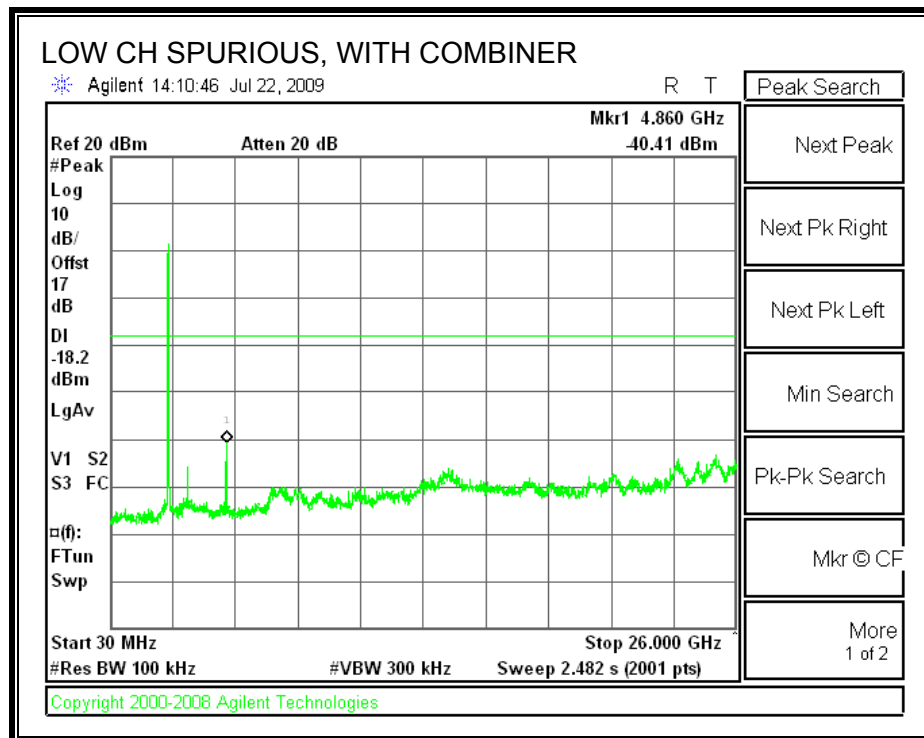
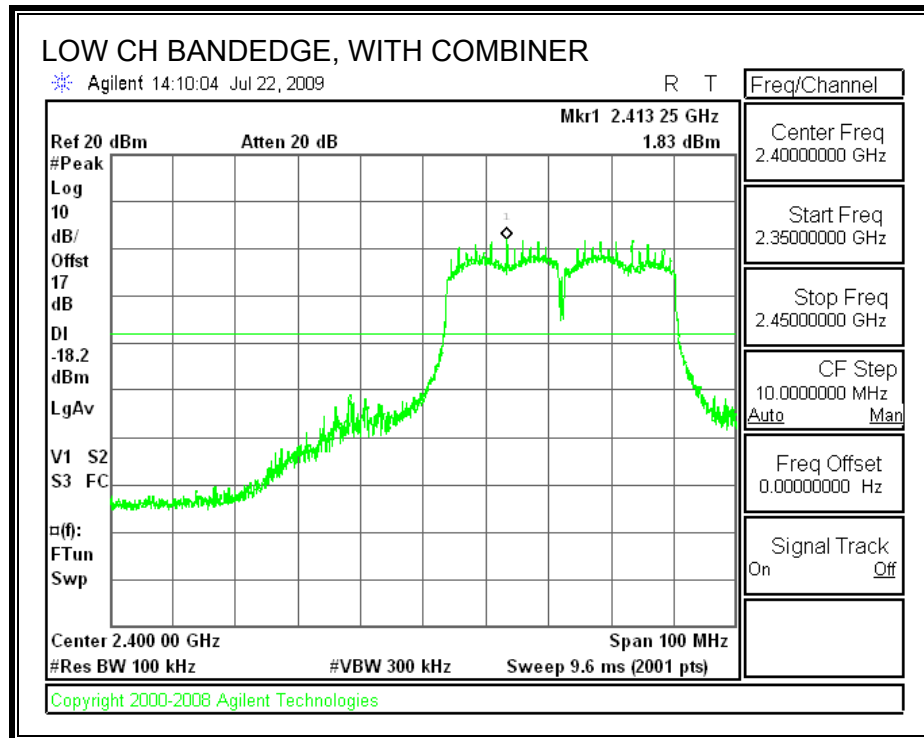
TEST PROCEDURE

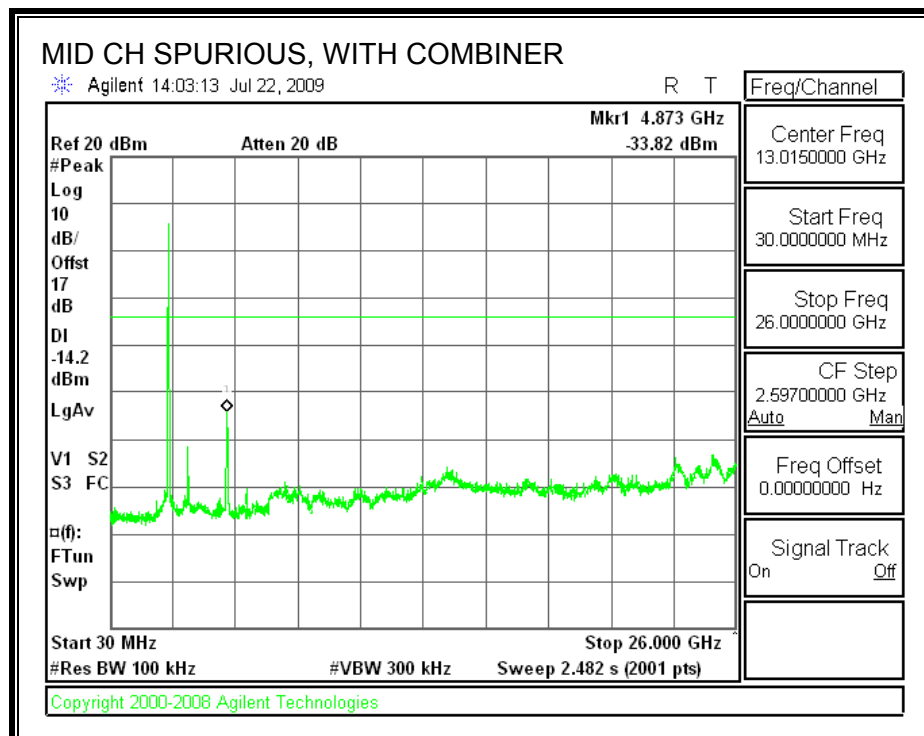
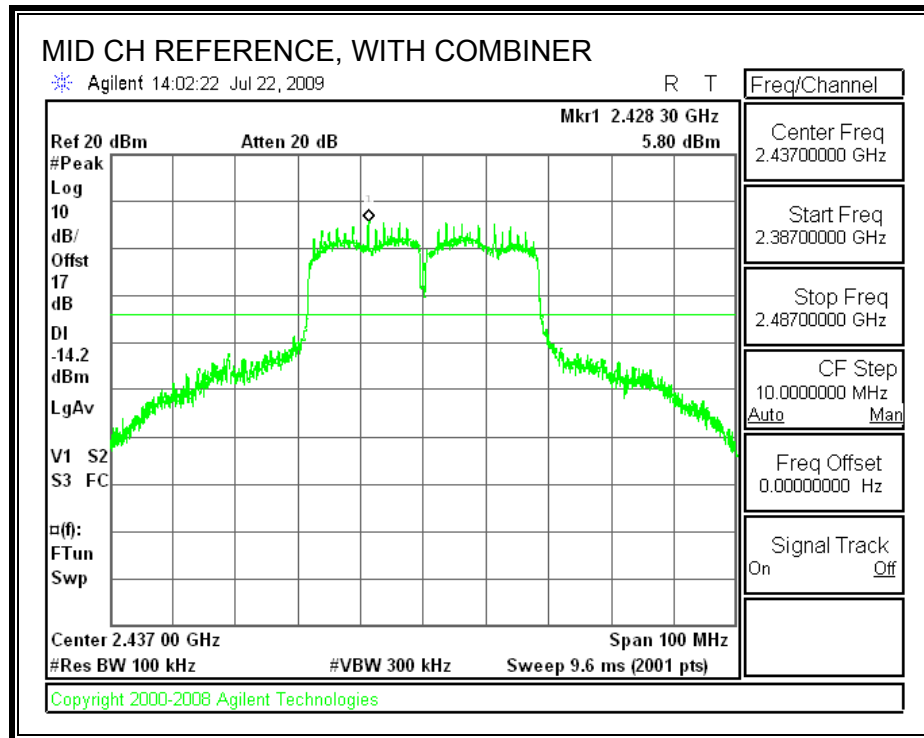
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

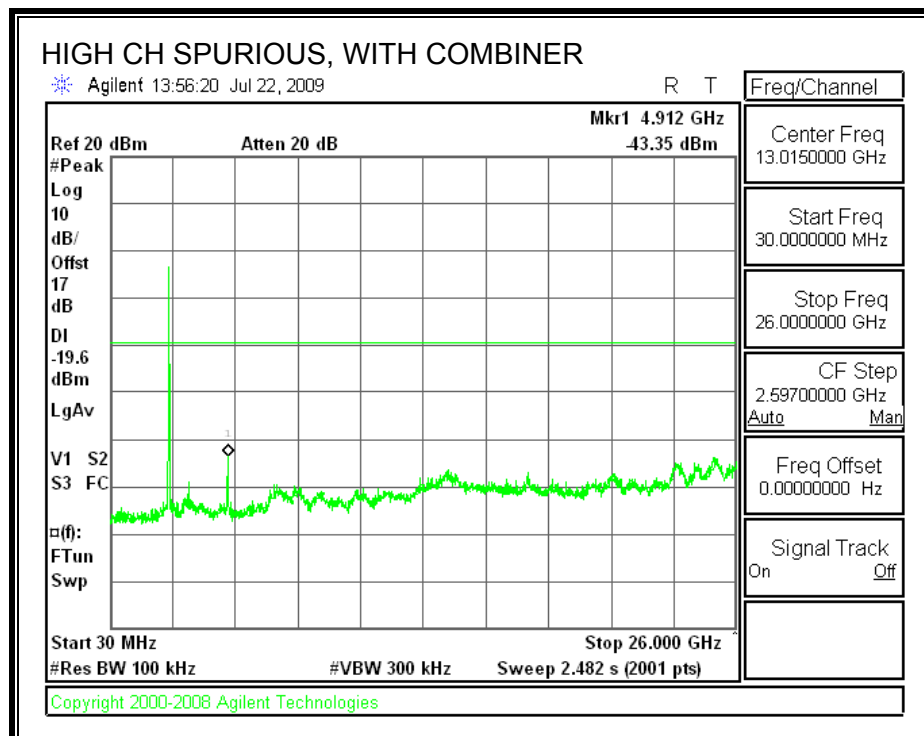
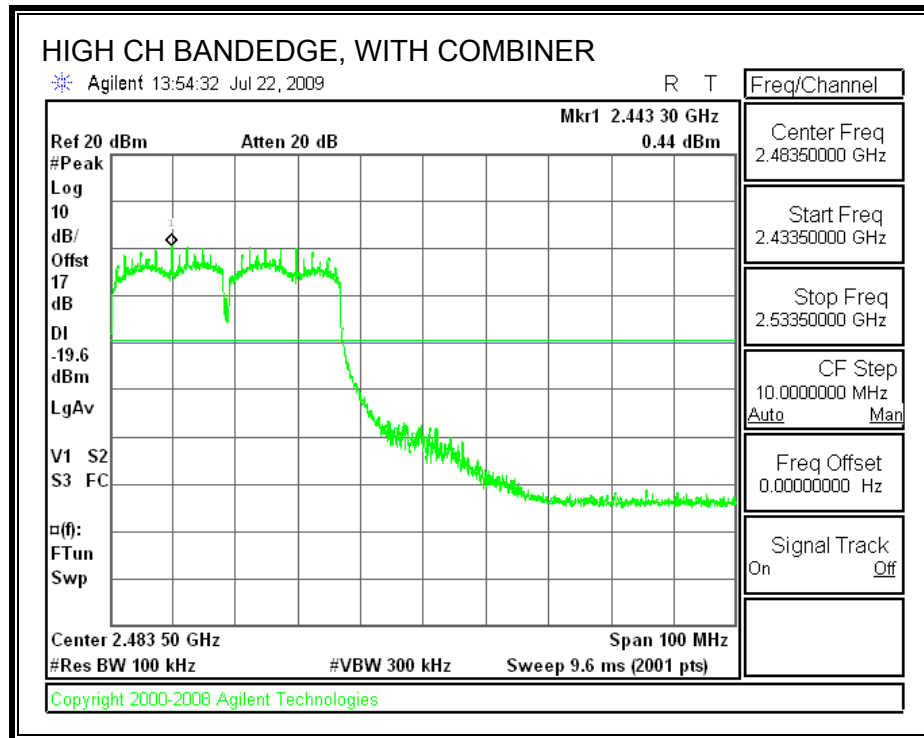
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

SPURIOUS EMISSIONS WITH COMBINER







7.5. 802.11a MODE IN THE 5.8 GHz BAND

7.5.1. 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.

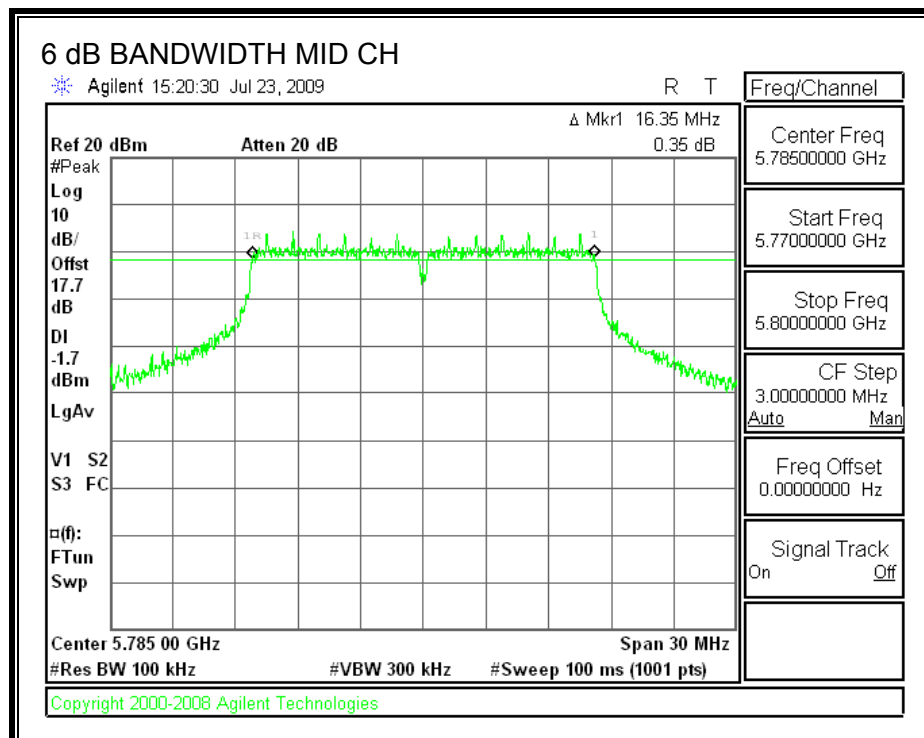
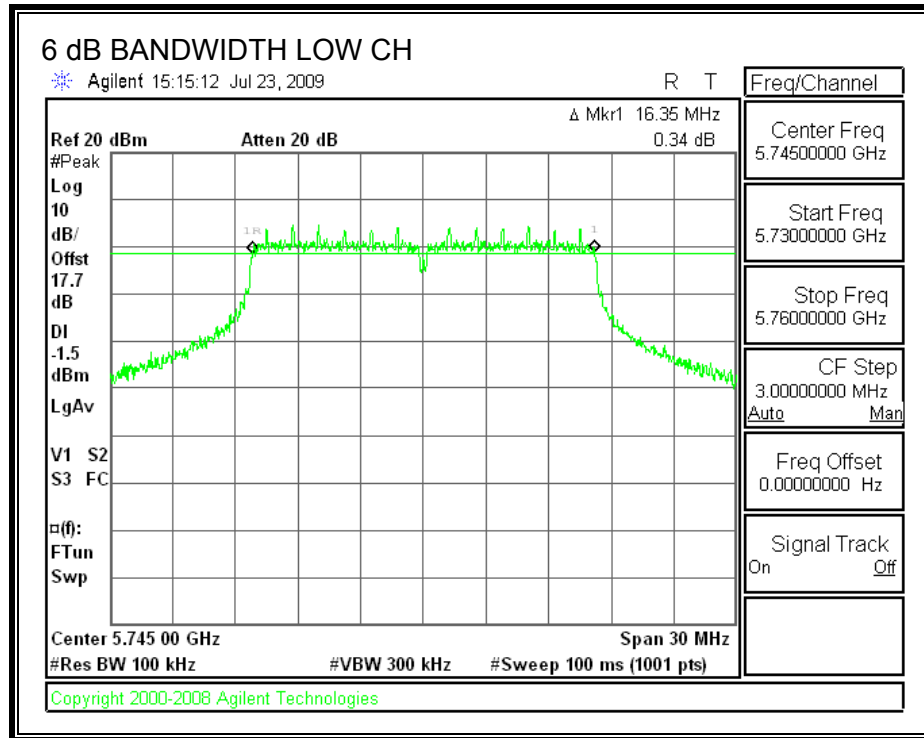
TEST PROCEDURE

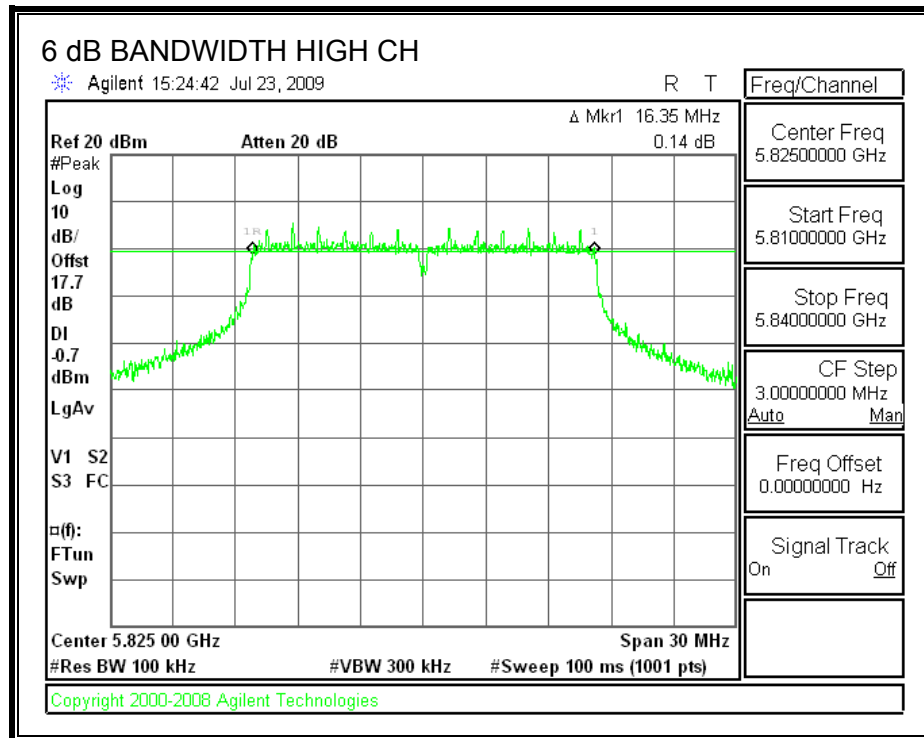
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	5745	16.35	0.5
Middle	5785	16.35	0.5
High	5825	16.35	0.5

6 dB BANDWIDTH





7.5.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

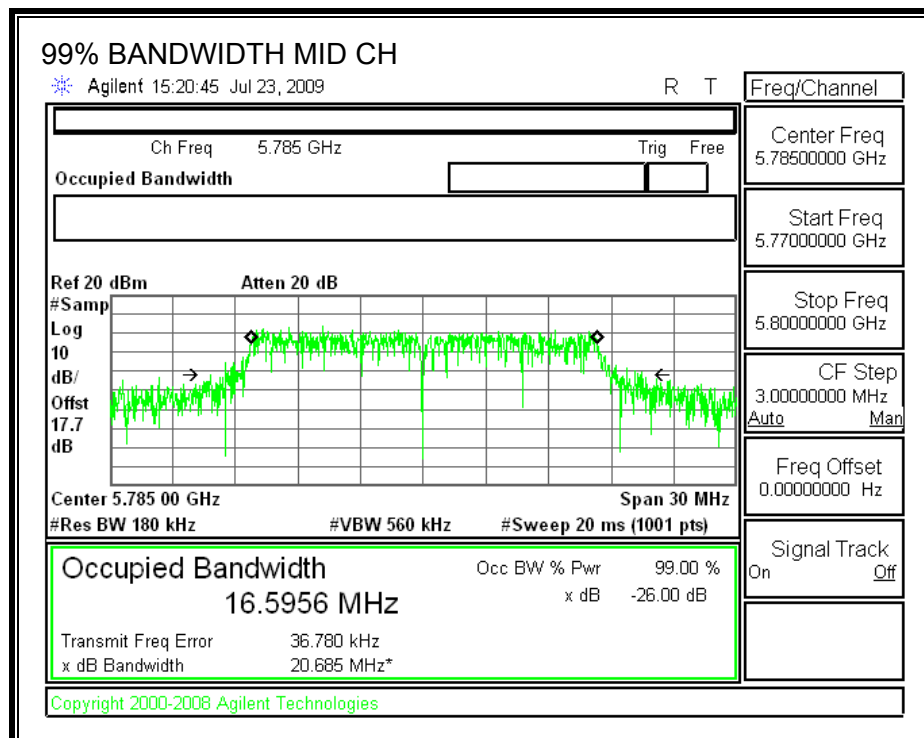
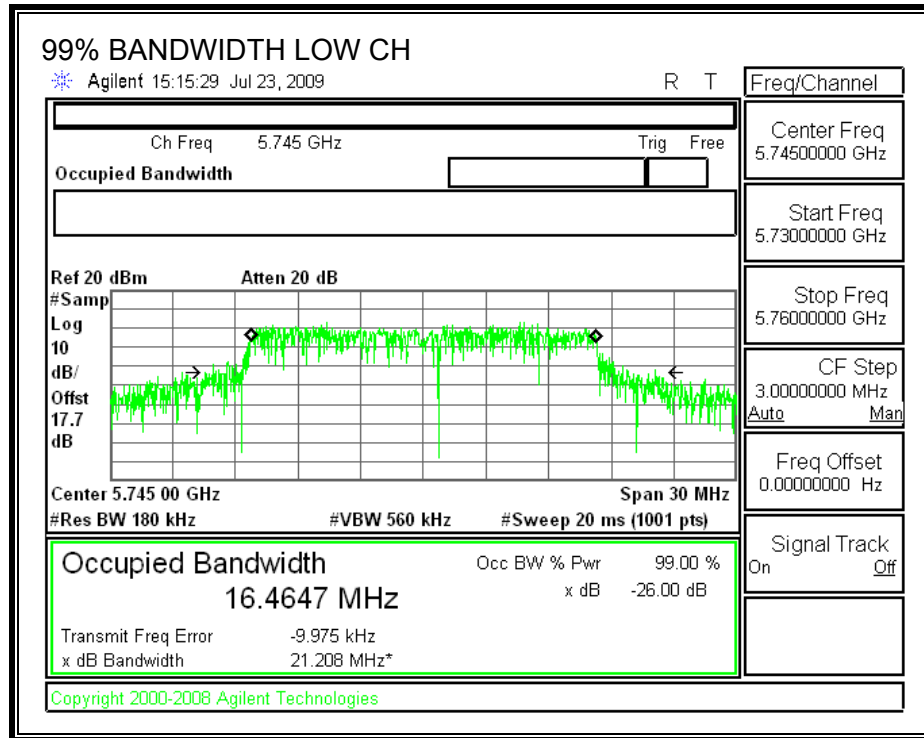
TEST PROCEDURE

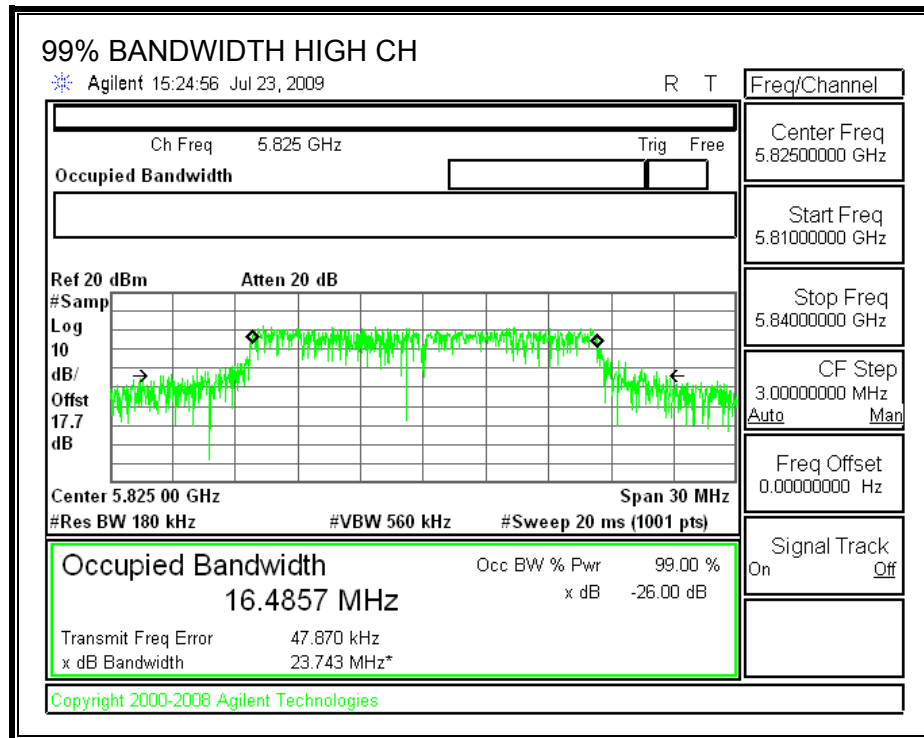
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5745	16.4647
Middle	5785	16.5956
High	5825	16.4857

99% BANDWIDTH





7.5.3. 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

The transmitter output is connected to a power meter.

RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	5745	23.40	30	-6.60
Middle	5785	23.49	30	-6.51
High	5825	23.40	30	-6.60

7.5.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 17.7 dB (including 16 dB pad and 1.7 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	5745	17.41
Middle	5785	17.32
High	5825	17.02

7.5.5. 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.

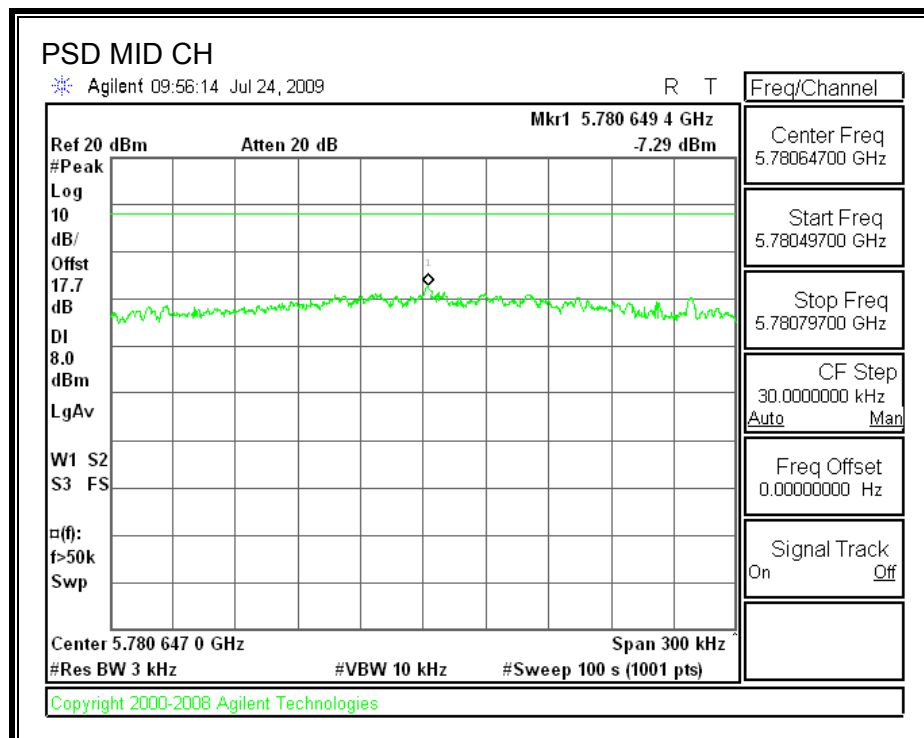
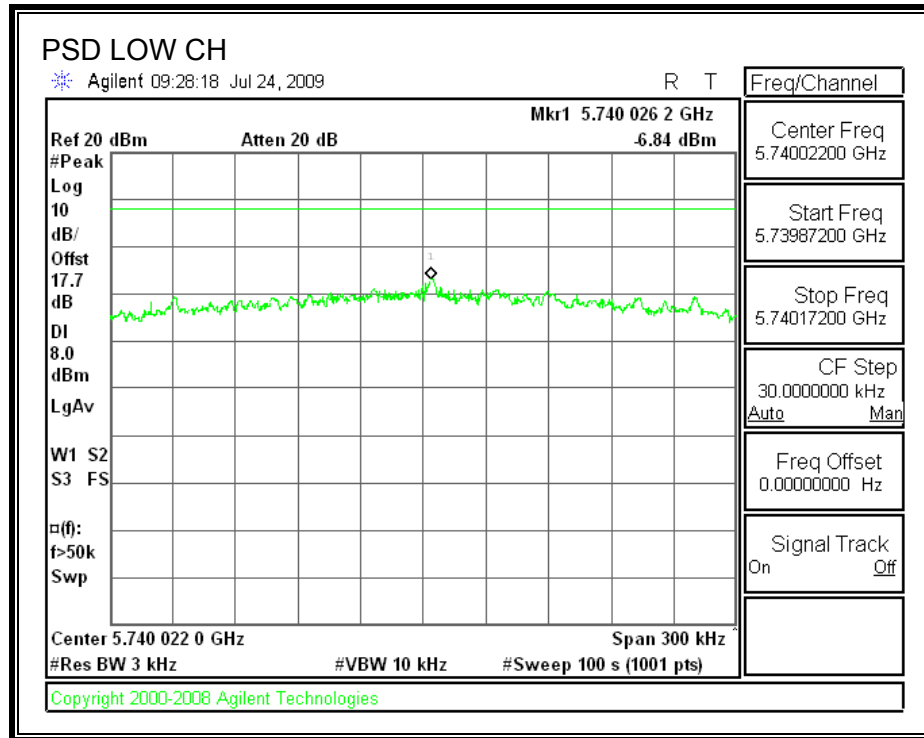
TEST PROCEDURE

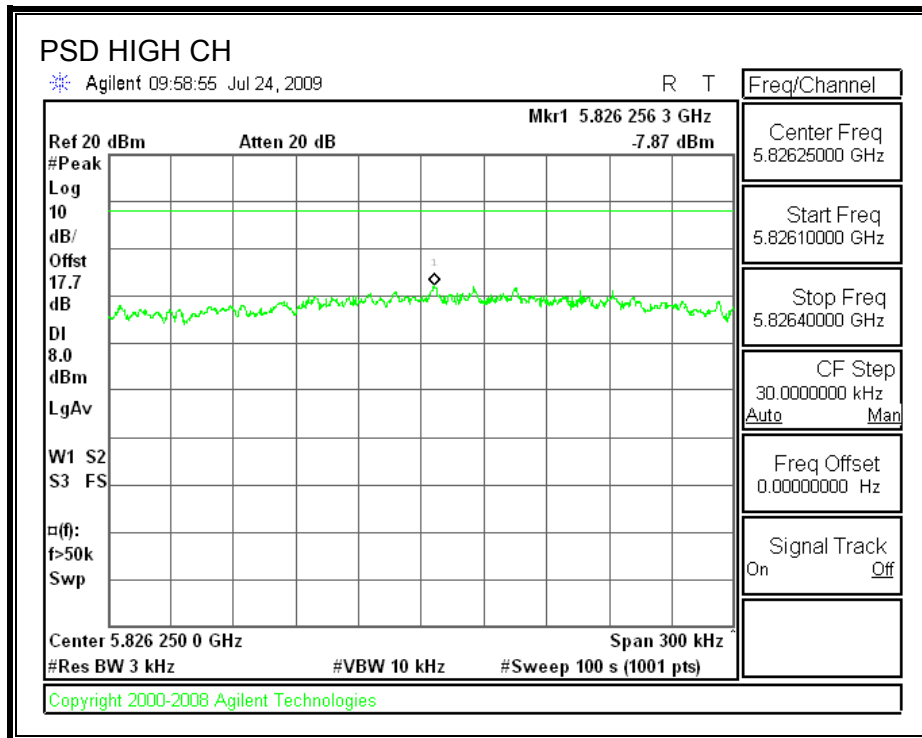
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5745	-6.84	8	-14.84
Middle	5785	-7.29	8	-15.29
High	5825	-7.87	8	-15.87

POWER SPECTRAL DENSITY





7.5.6. 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.

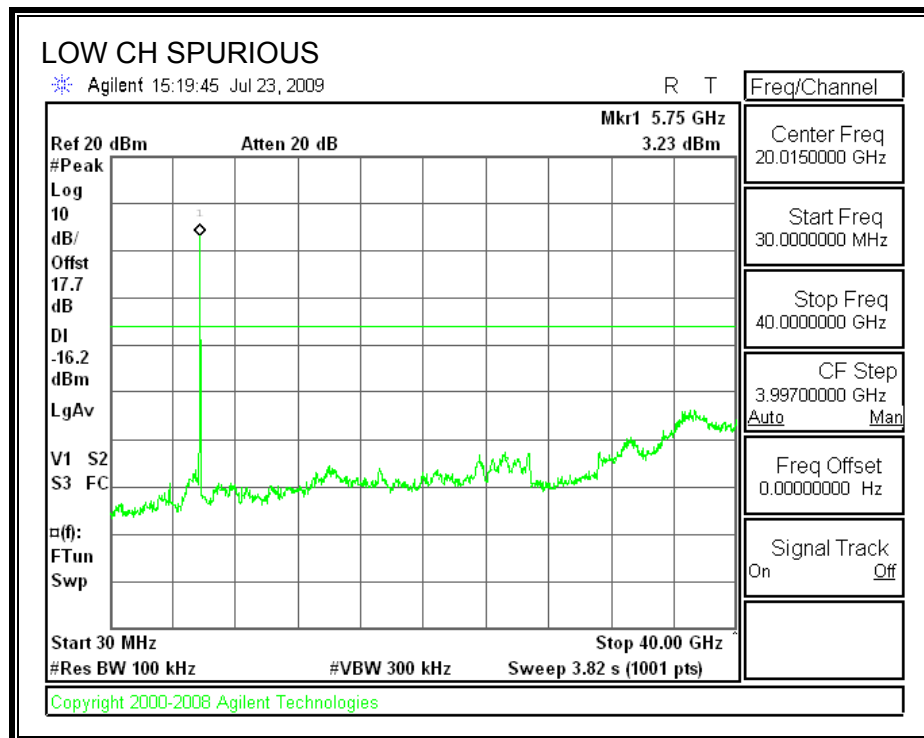
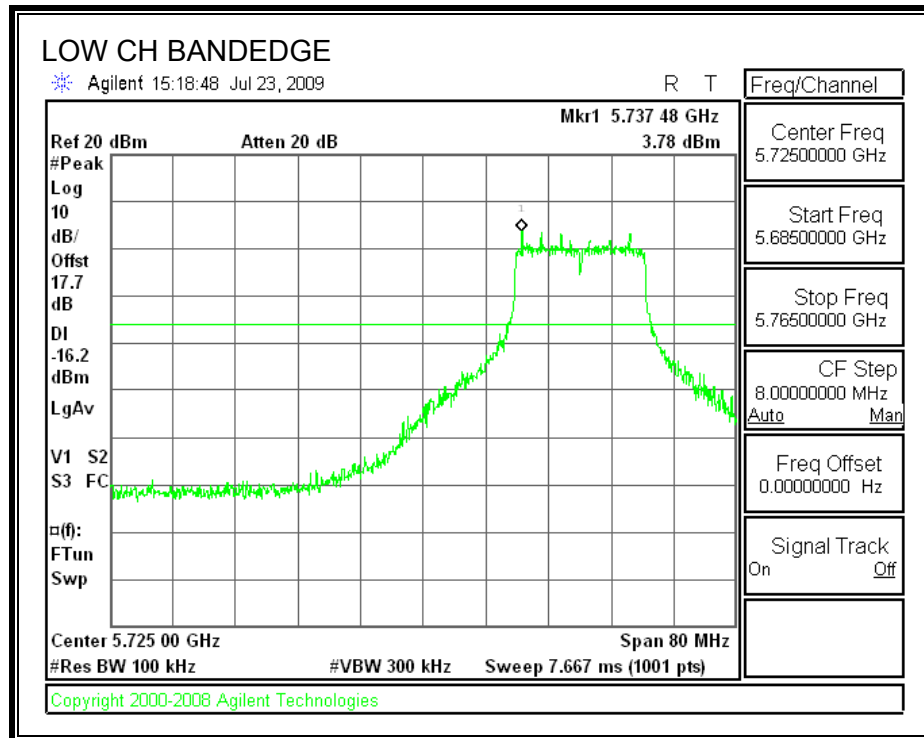
TEST PROCEDURE

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.

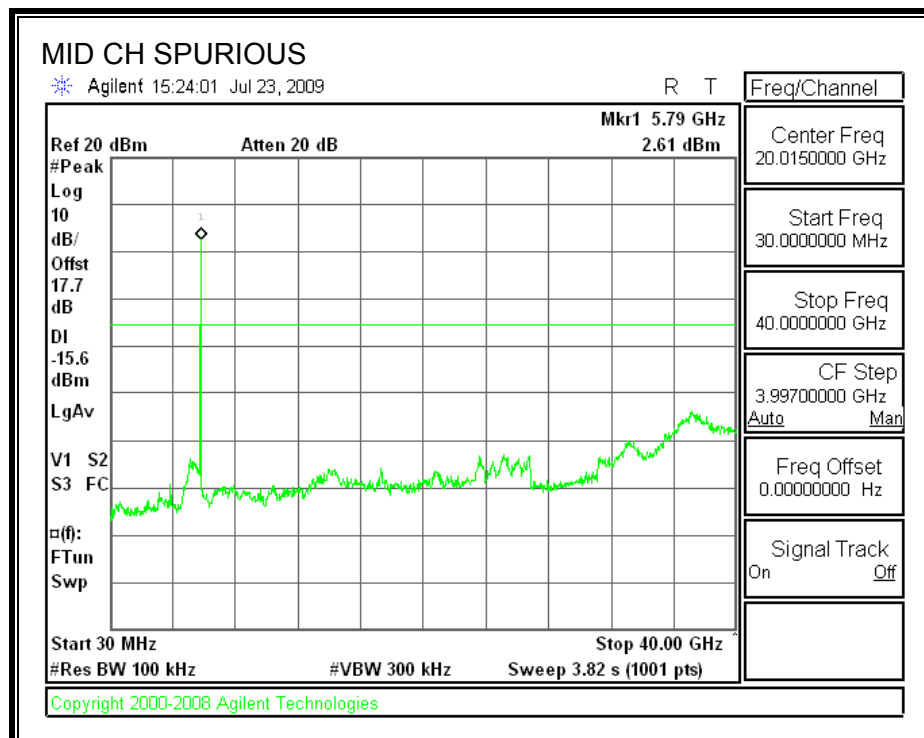
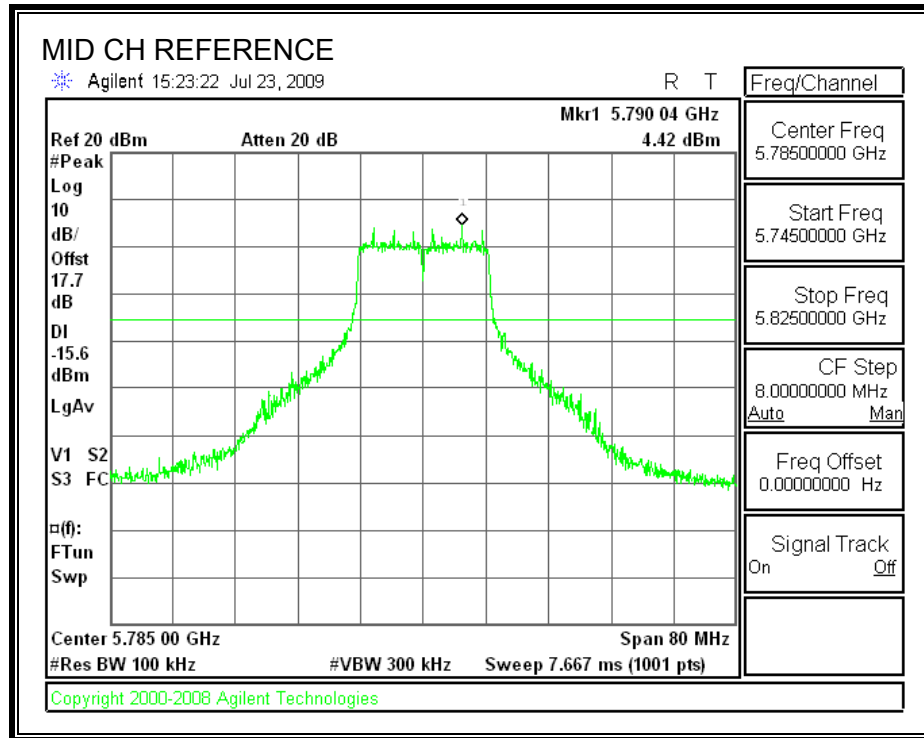
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

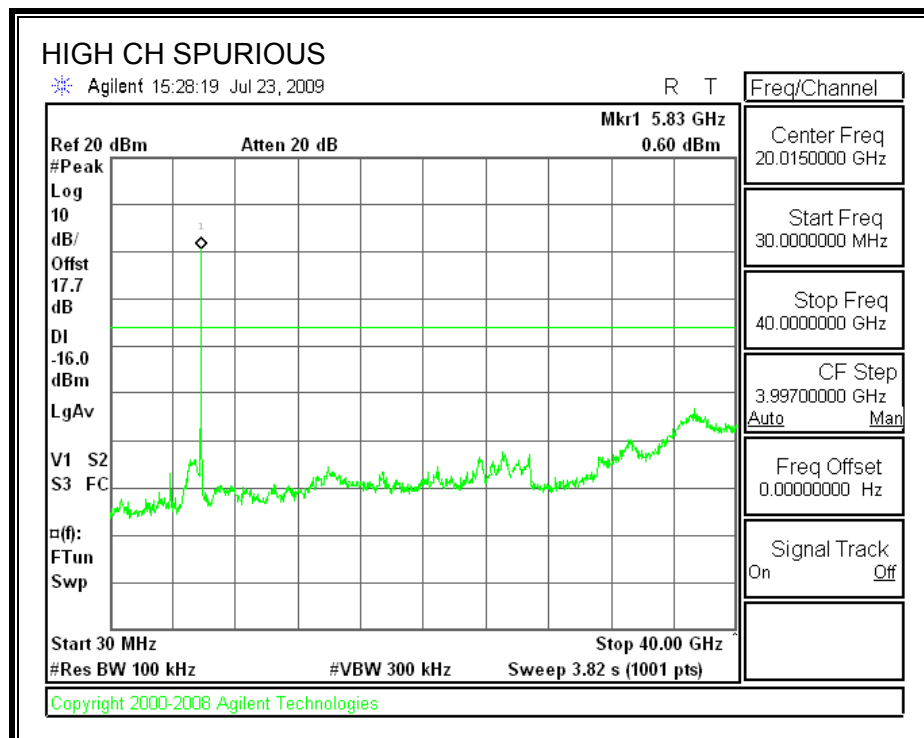
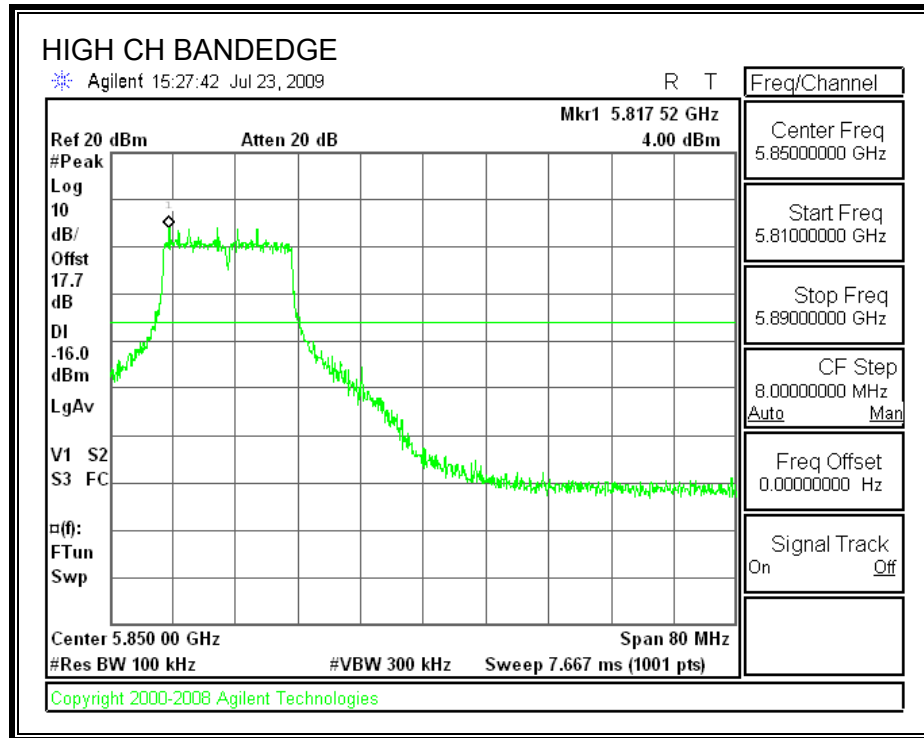
SPURIOUS EMISSIONS, LOW CHANNEL



SPURIOUS EMISSIONS, MID CHANNEL



SPURIOUS EMISSIONS, HIGH CHANNEL



7.6. 802.11n HT20 MODE IN THE 5.8 GHz BAND

7.6.1. 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.

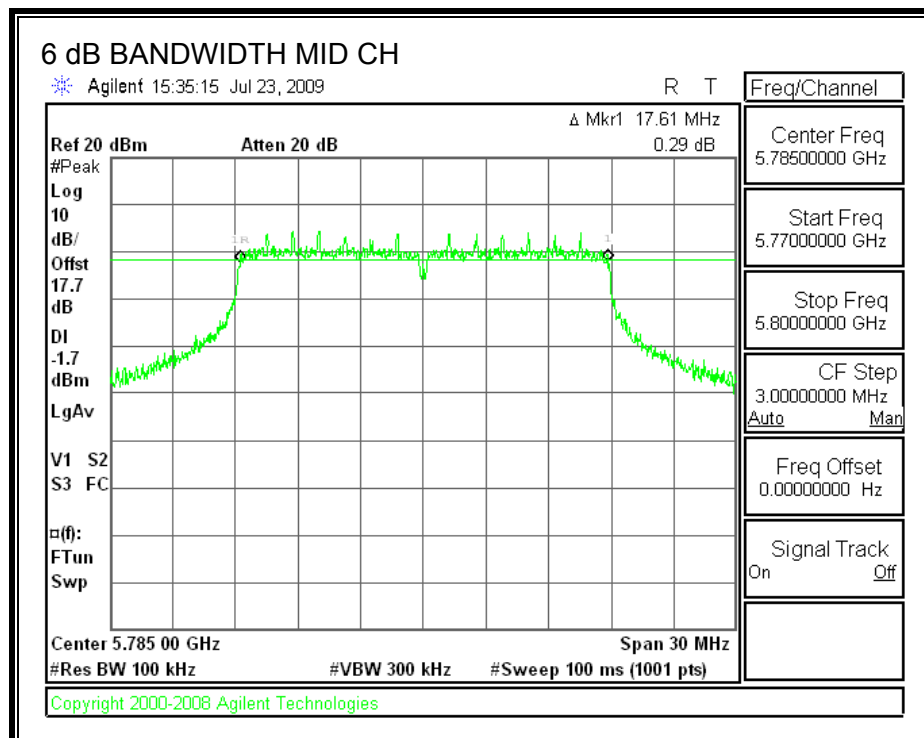
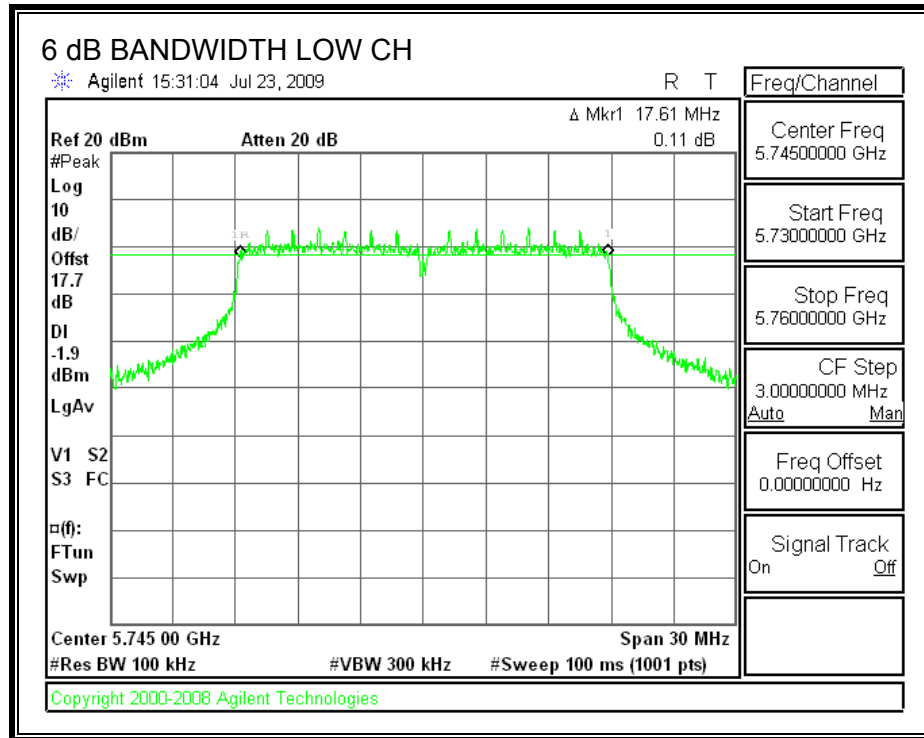
TEST PROCEDURE

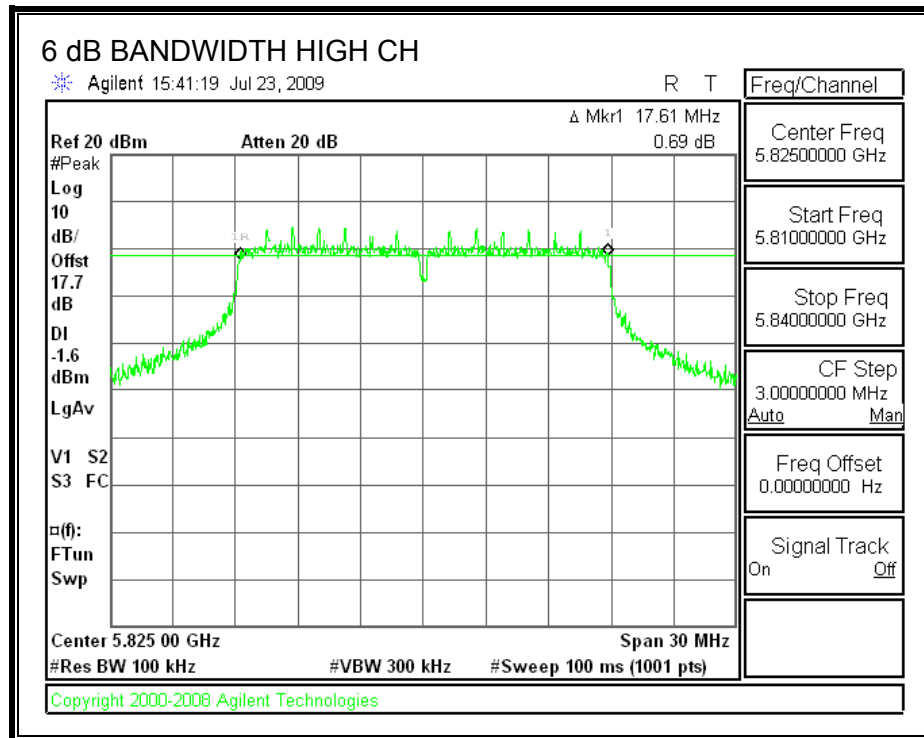
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	5745	17.61	0.5
Middle	5785	17.61	0.5
High	5825	17.61	0.5

6 dB BANDWIDTH





7.6.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

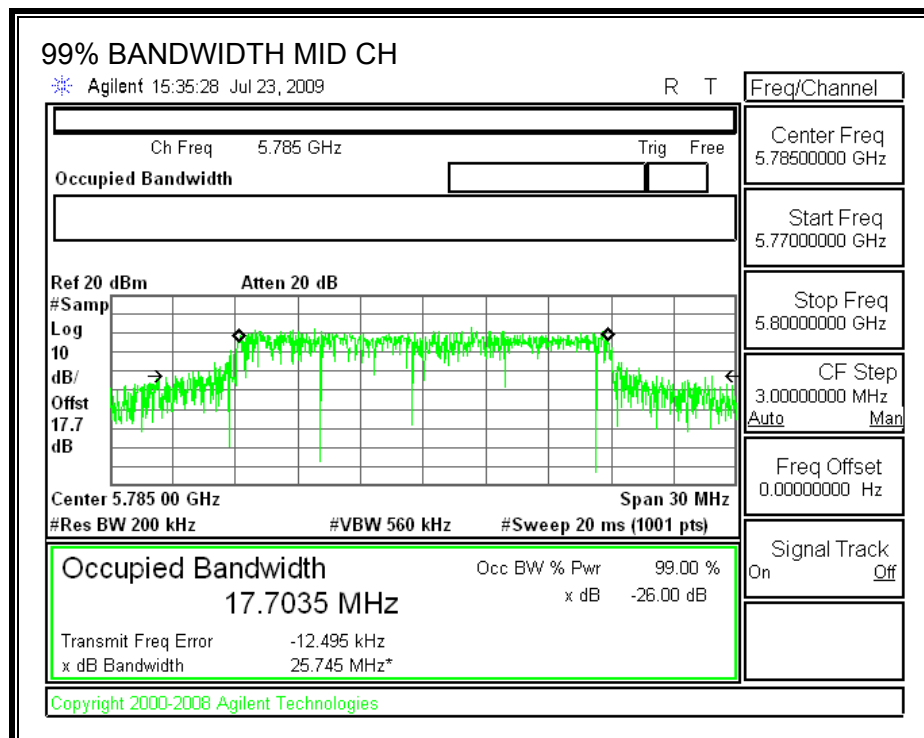
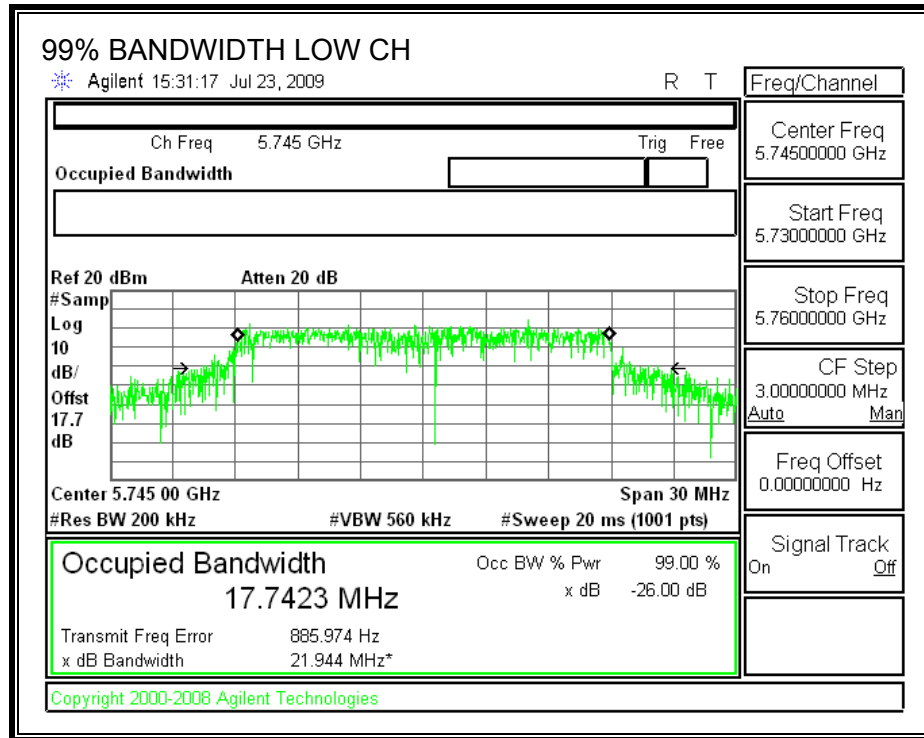
TEST PROCEDURE

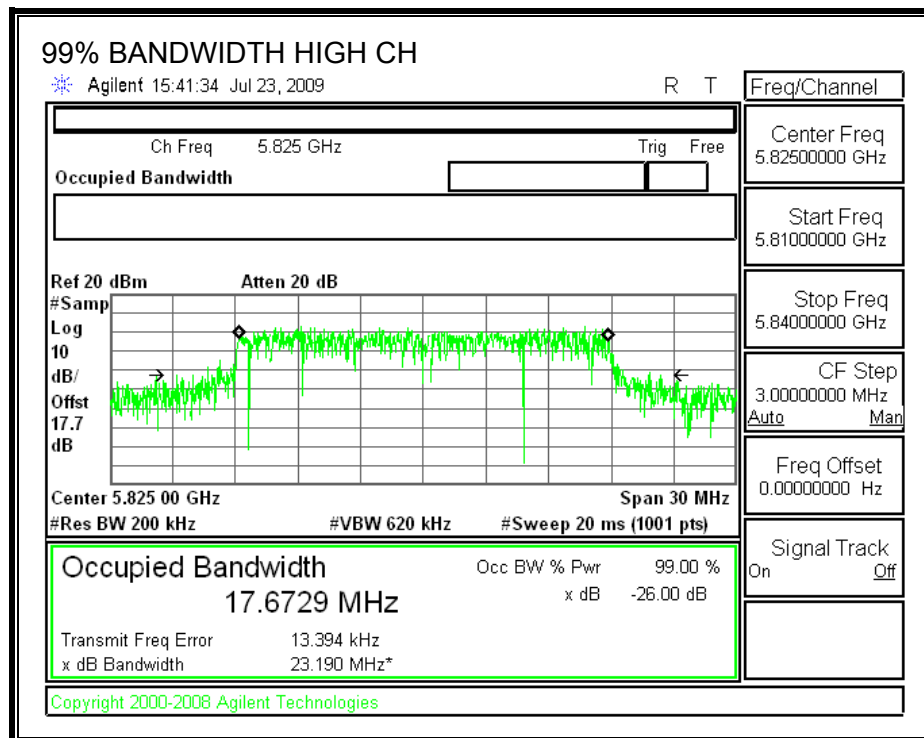
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5745	17.7423
Middle	5785	17.7035
High	5825	17.6729

99% BANDWIDTH





7.6.3. 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

The transmitter output is connected to a power meter.

RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	5745	23.42	30	-6.58
Middle	5785	23.52	30	-6.48
High	5825	23.51	30	-6.49

7.6.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 17.7 dB (including 16 dB pad and 1.7 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	5745	17.50
Middle	5785	17.34
High	5825	16.99

7.6.5. 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.

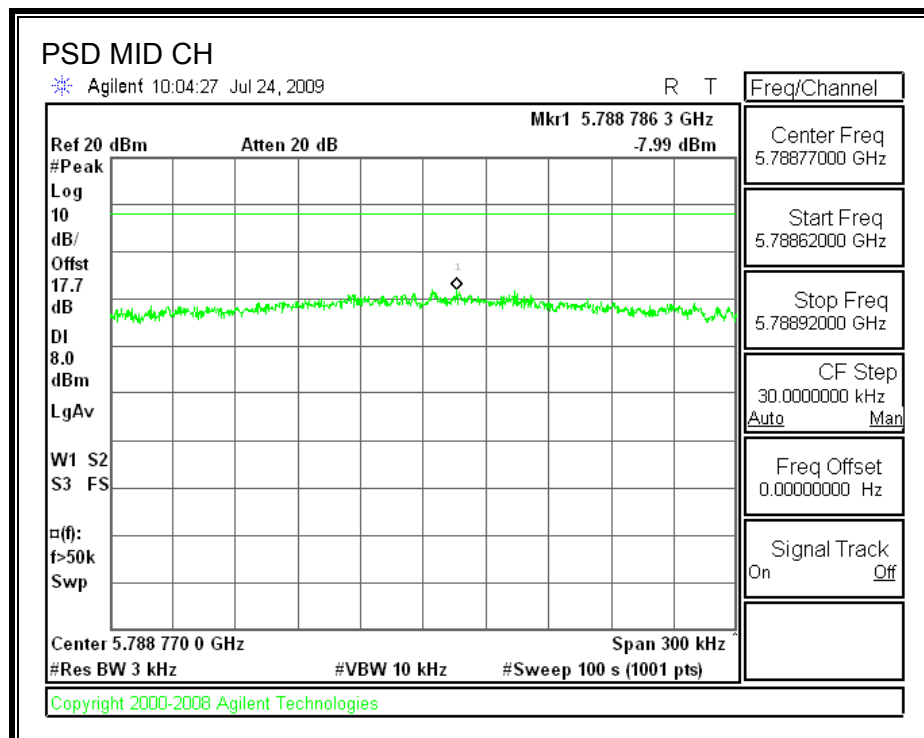
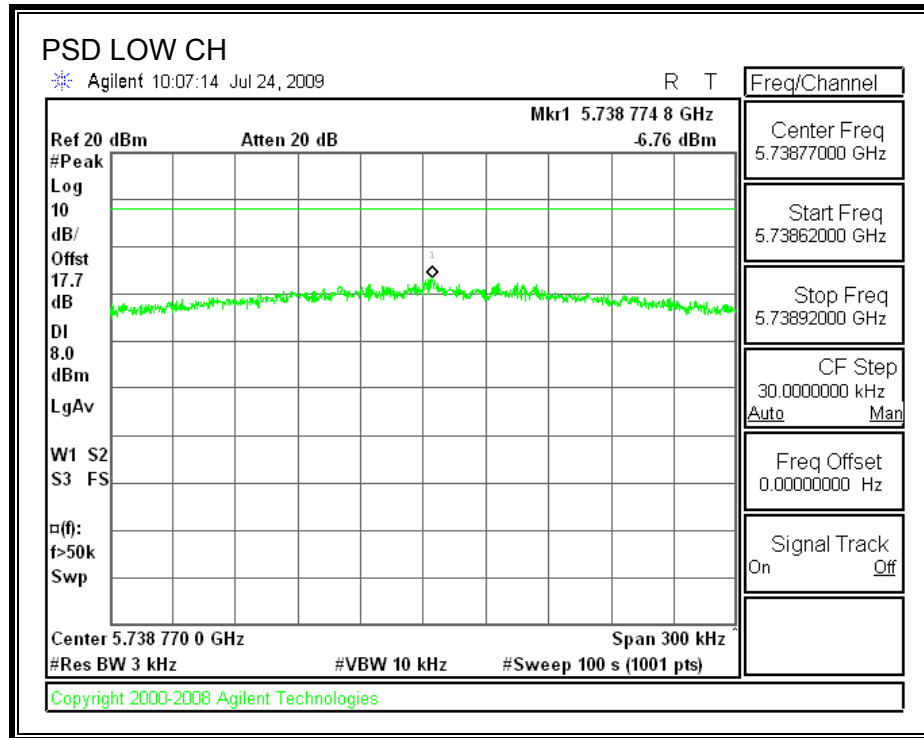
TEST PROCEDURE

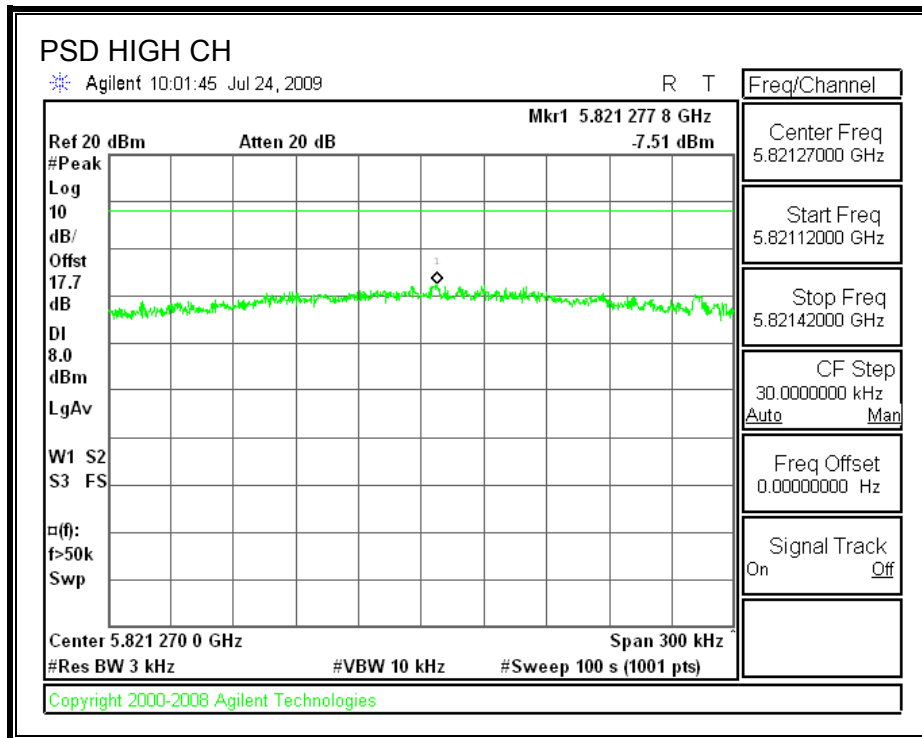
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5745	-6.76	8	-14.76
Middle	5785	-7.99	8	-15.99
High	5825	-7.51	8	-15.51

POWER SPECTRAL DENSITY





7.6.6. 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.

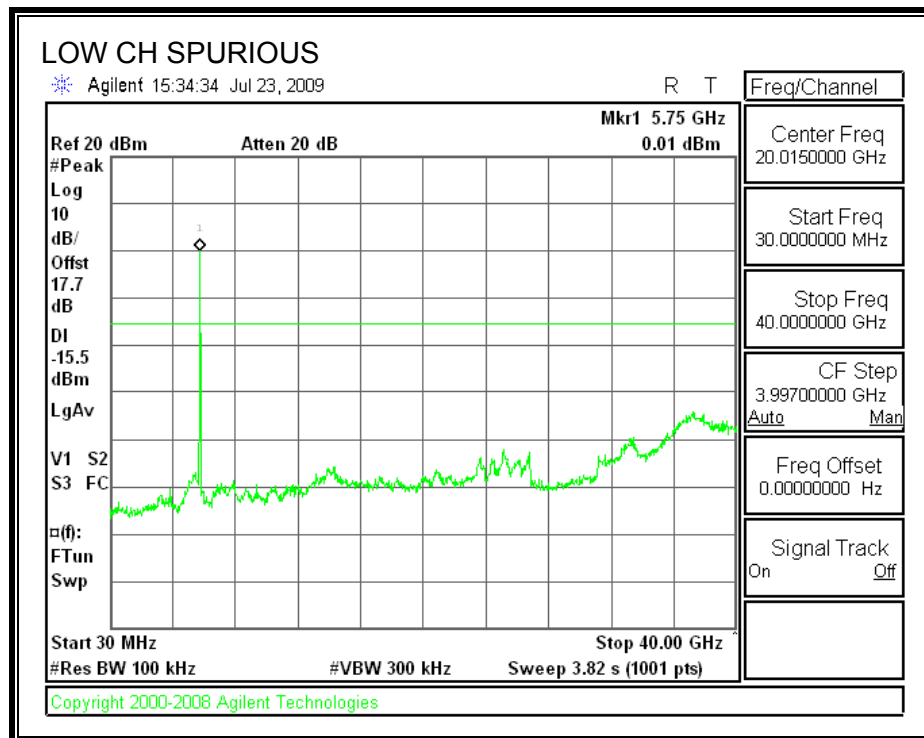
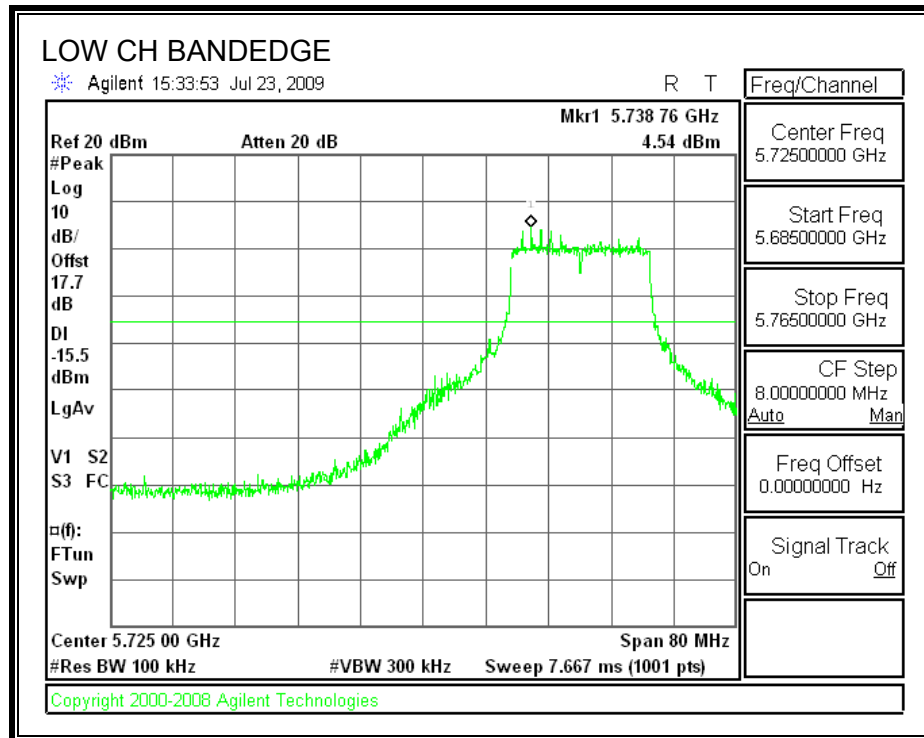
TEST PROCEDURE

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.

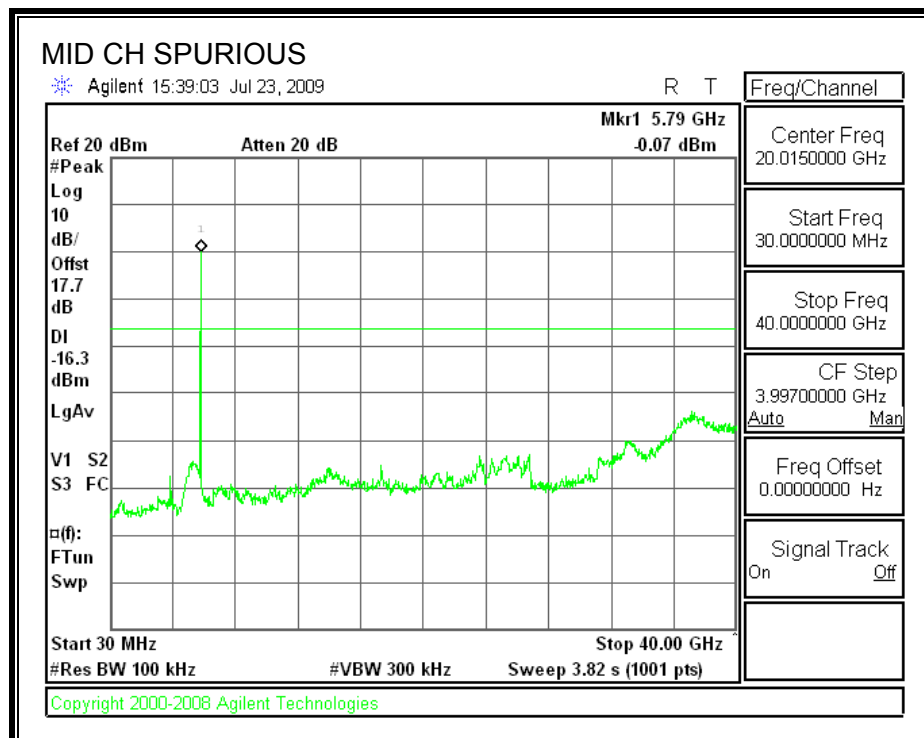
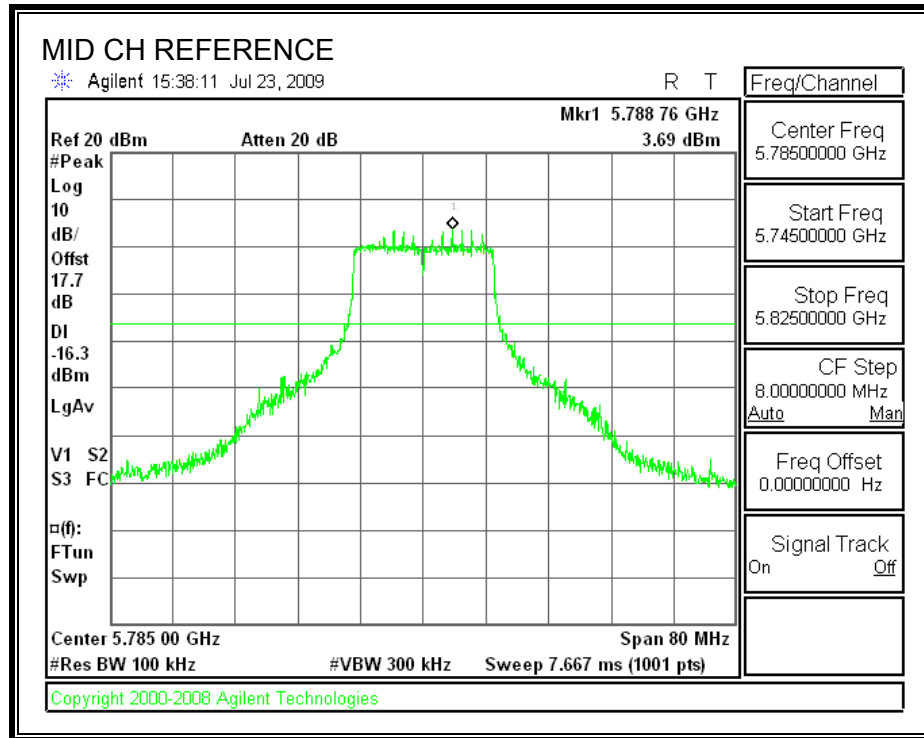
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

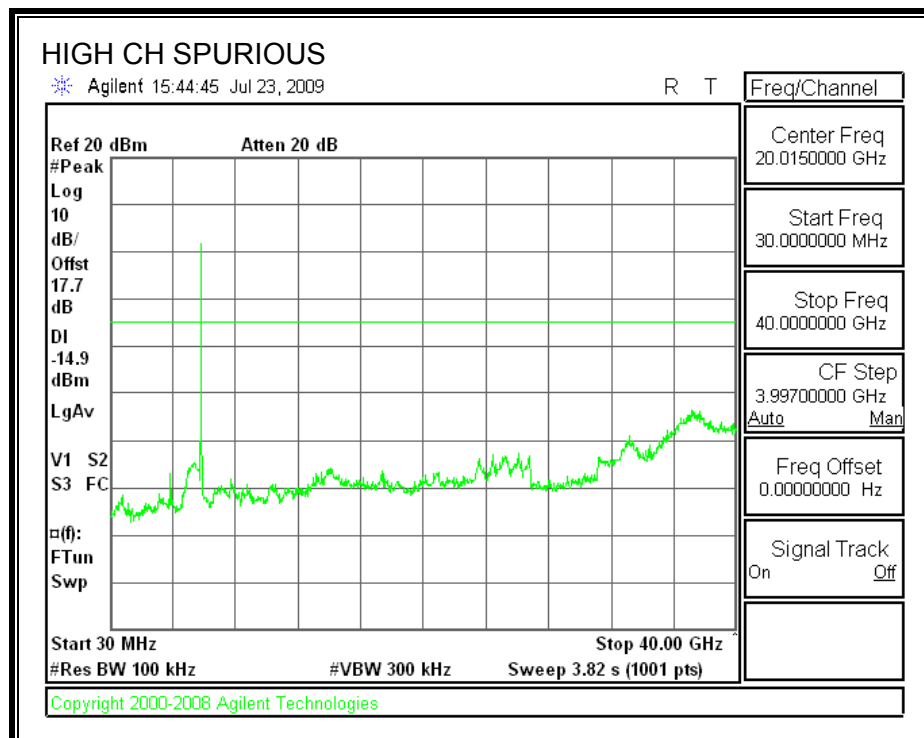
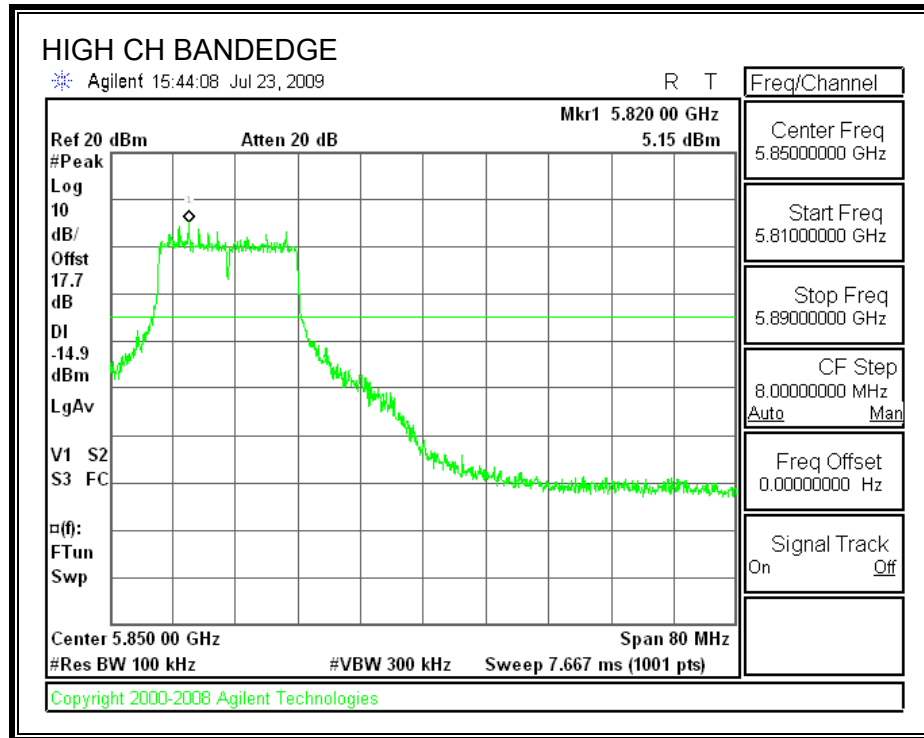
SPURIOUS EMISSIONS, LOW CHANNEL



SPURIOUS EMISSIONS, MID CHANNEL



SPURIOUS EMISSIONS, HIGH CHANNEL



7.7. 802.11n HT40 MODE IN THE 5.8 GHz BAND

7.7.1. 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.

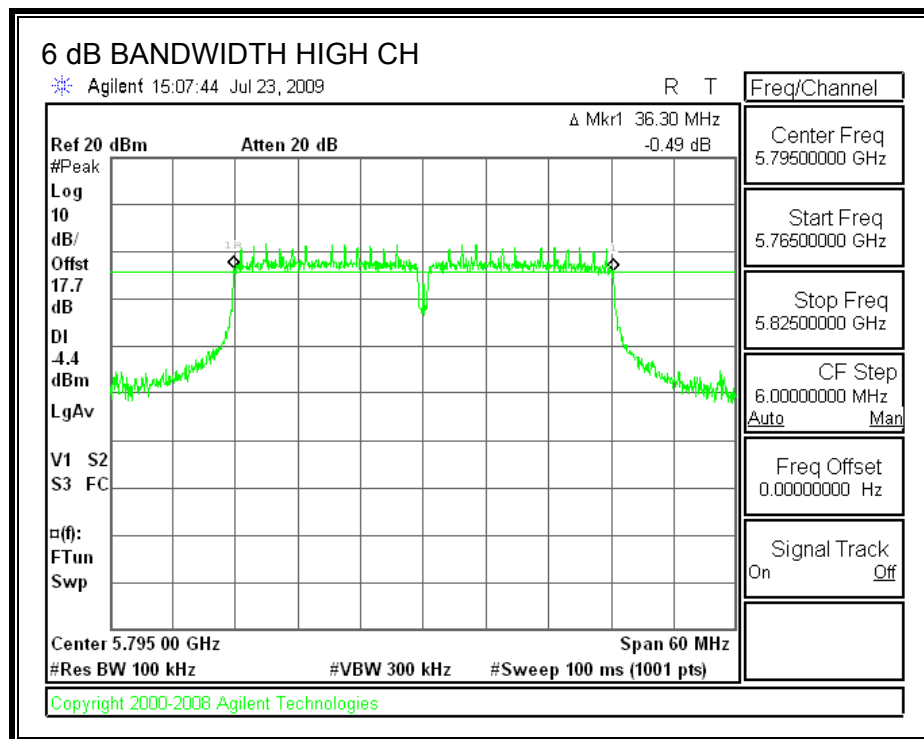
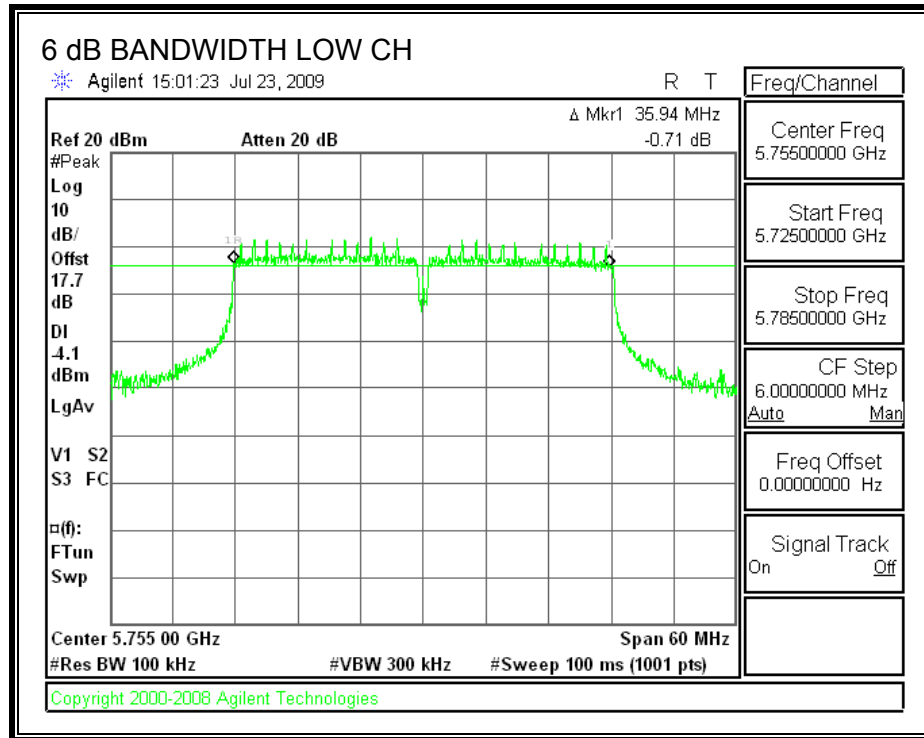
TEST PROCEDURE

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	5755	35.94	0.5
High	5795	36.30	0.5

6 dB BANDWIDTH



7.7.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

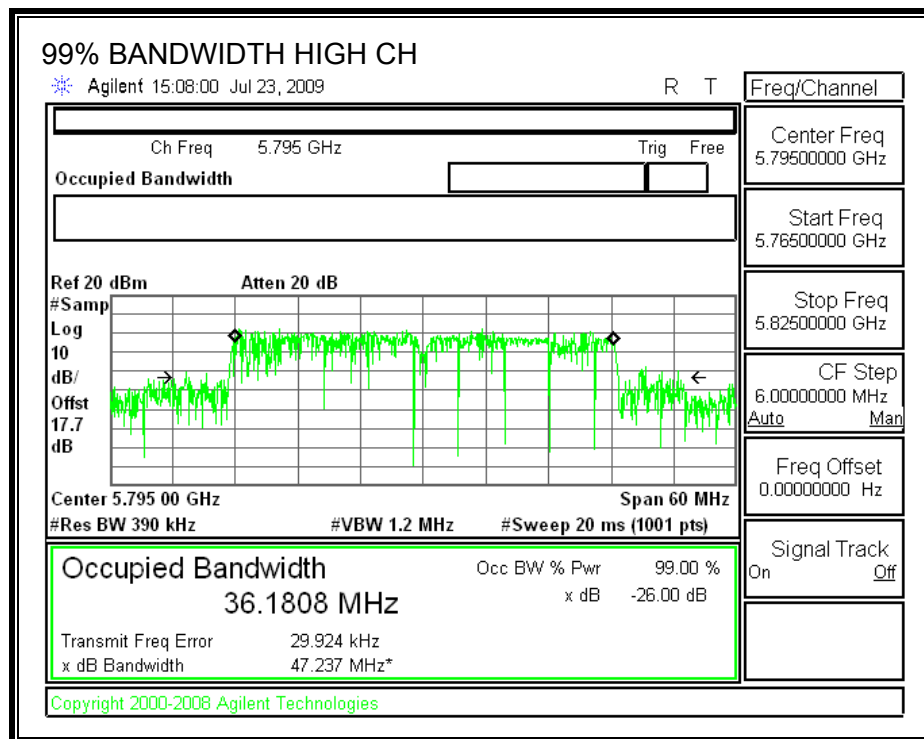
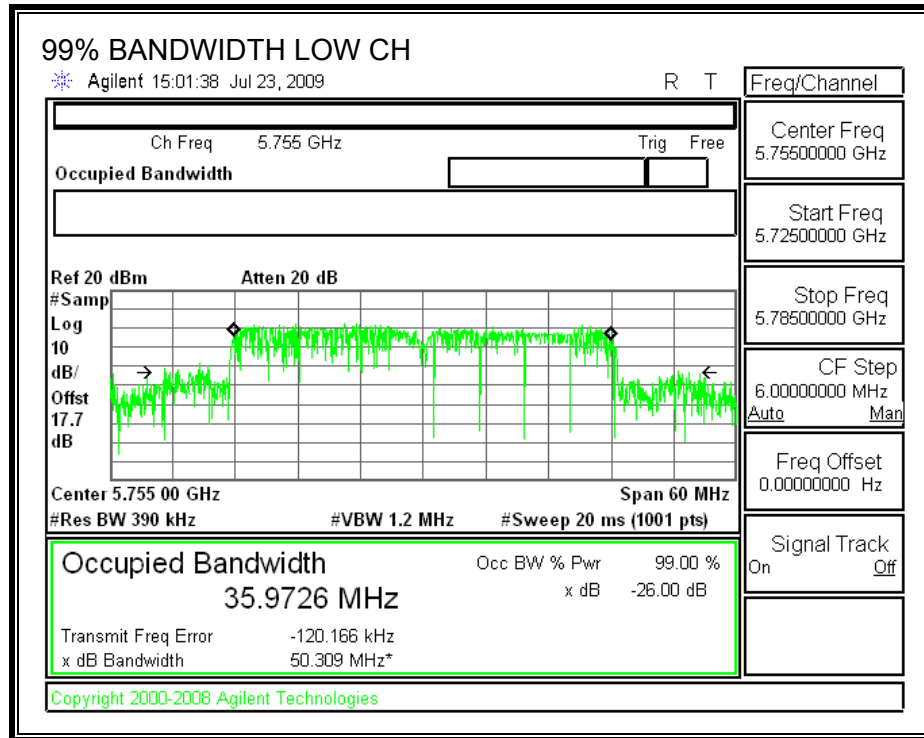
TEST PROCEDURE

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	5755	35.9726
High	5795	36.1808

99% BANDWIDTH



7.7.3. 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

The transmitter output is connected to a power meter.

RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	5755	23.45	30	-6.55
High	5795	23.51	30	-6.49

7.7.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 17.7 dB (including 16 dB pad and 1.7 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	5755	17.25
High	5795	17.09

7.7.5. 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.

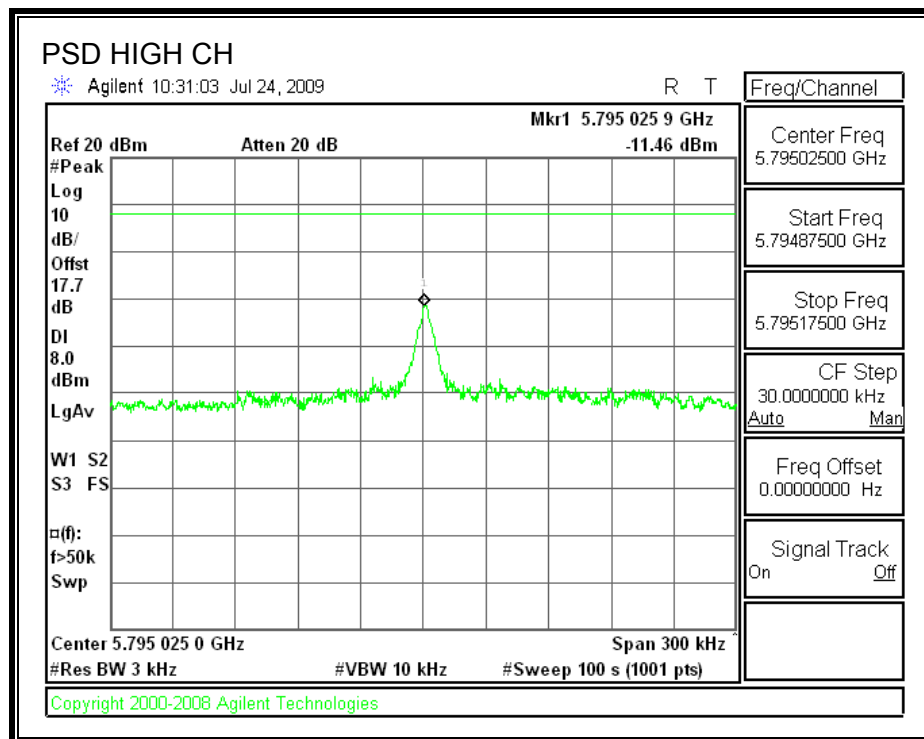
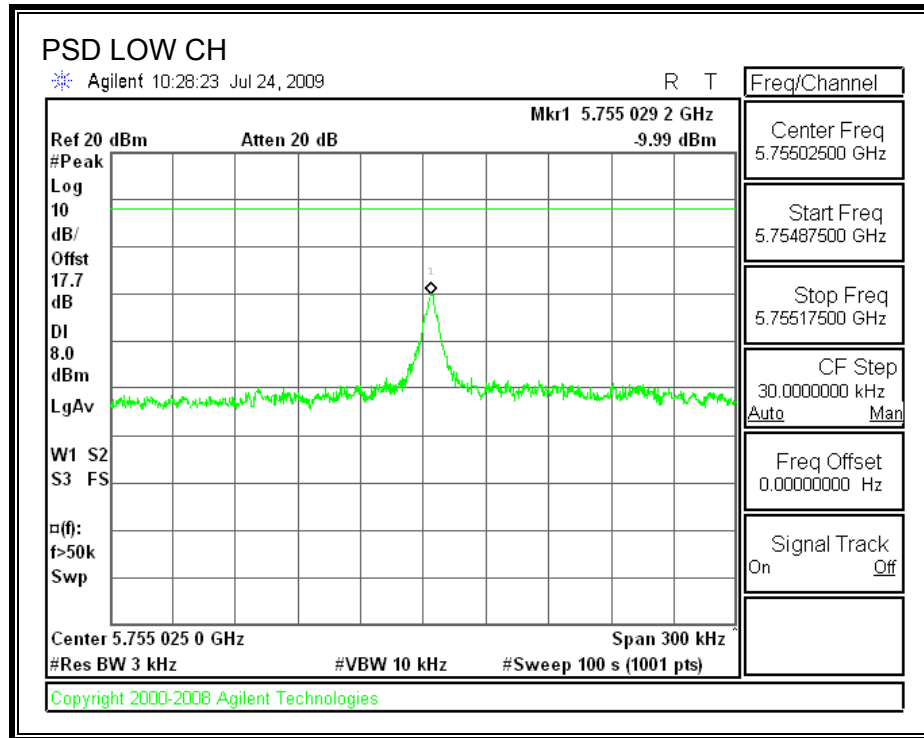
TEST PROCEDURE

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	5755	-9.99	8	-17.99
High	5795	-11.46	8	-19.46

POWER SPECTRAL DENSITY



7.7.6. 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.

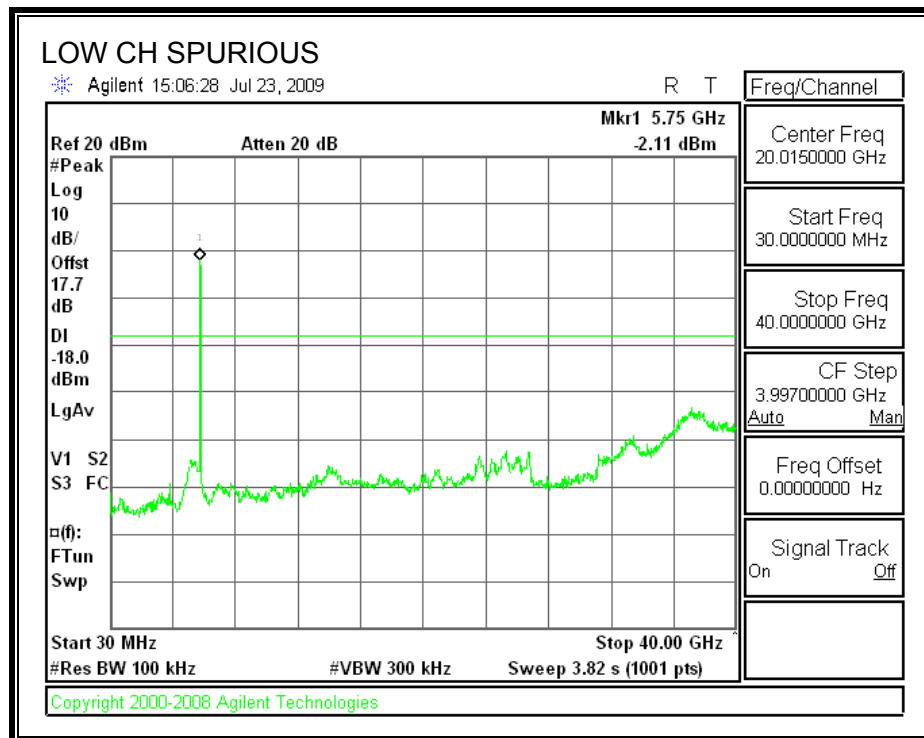
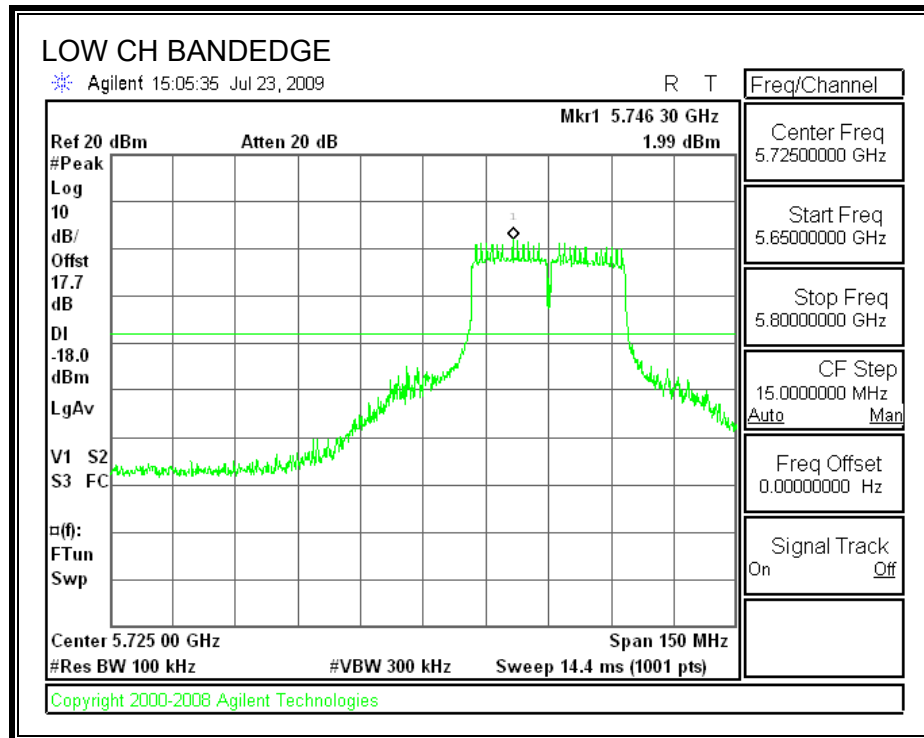
TEST PROCEDURE

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.

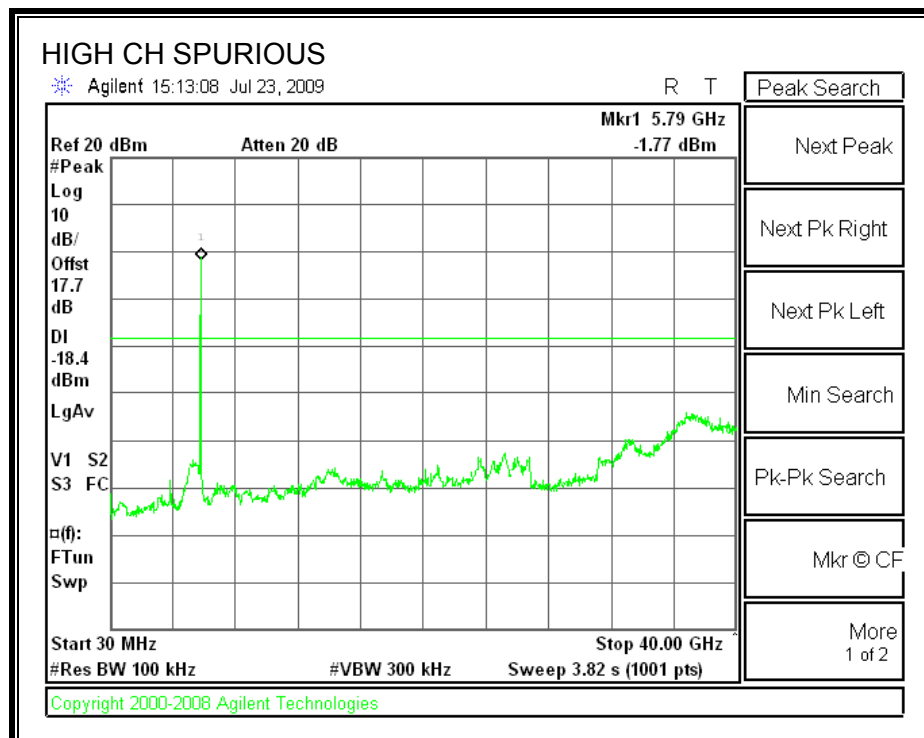
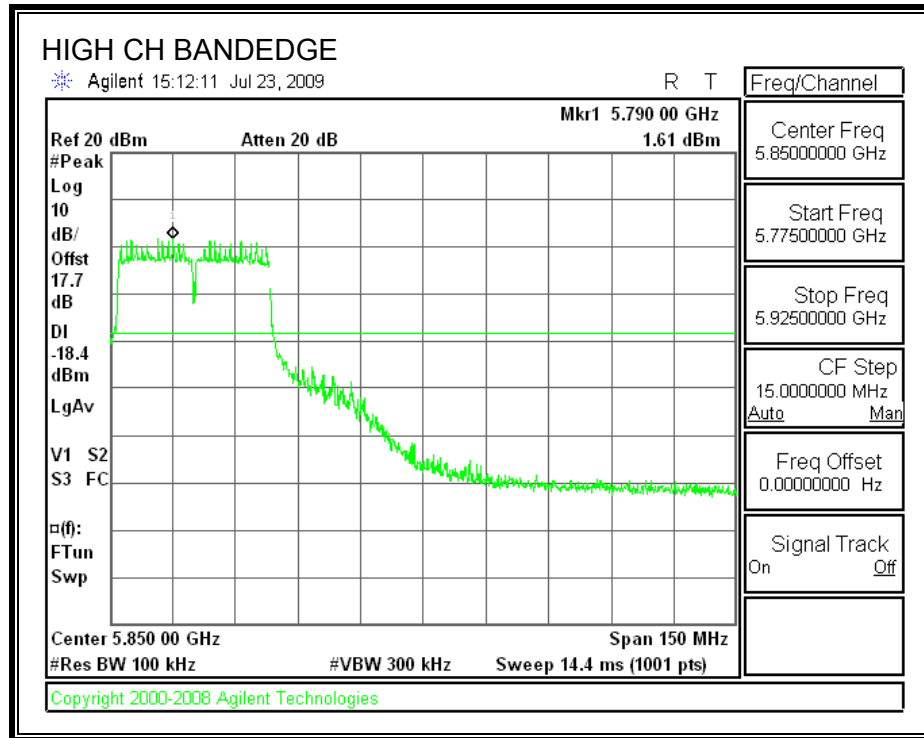
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL



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.

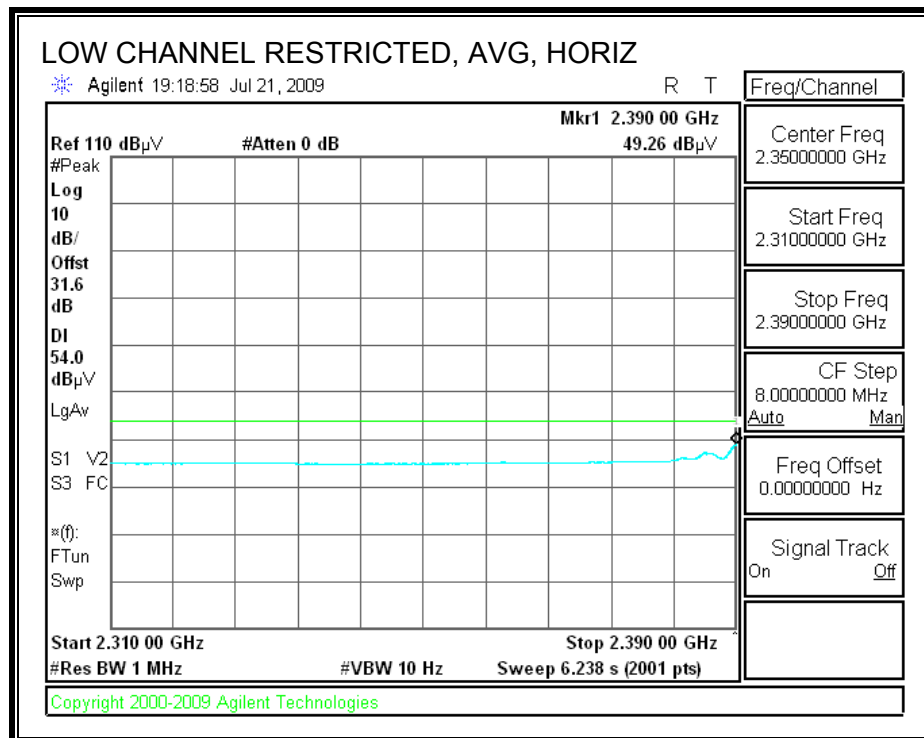
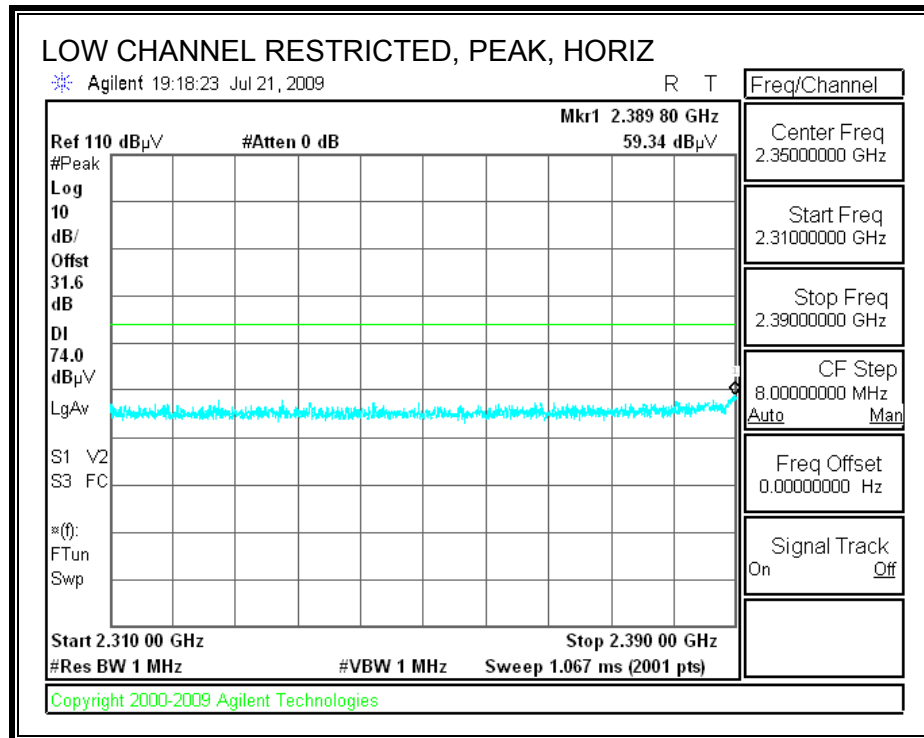
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

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

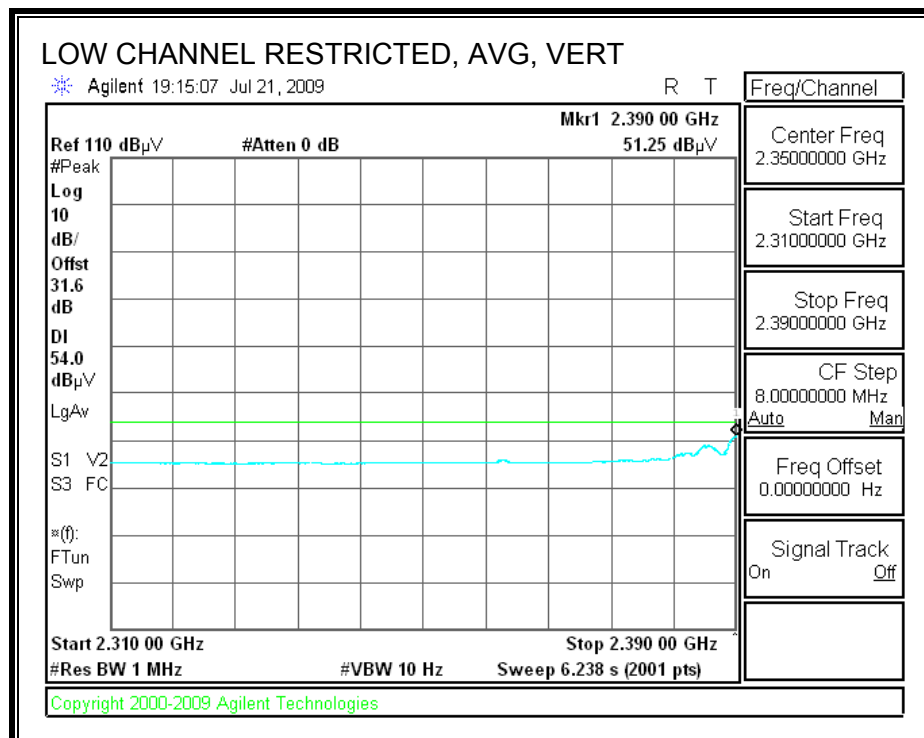
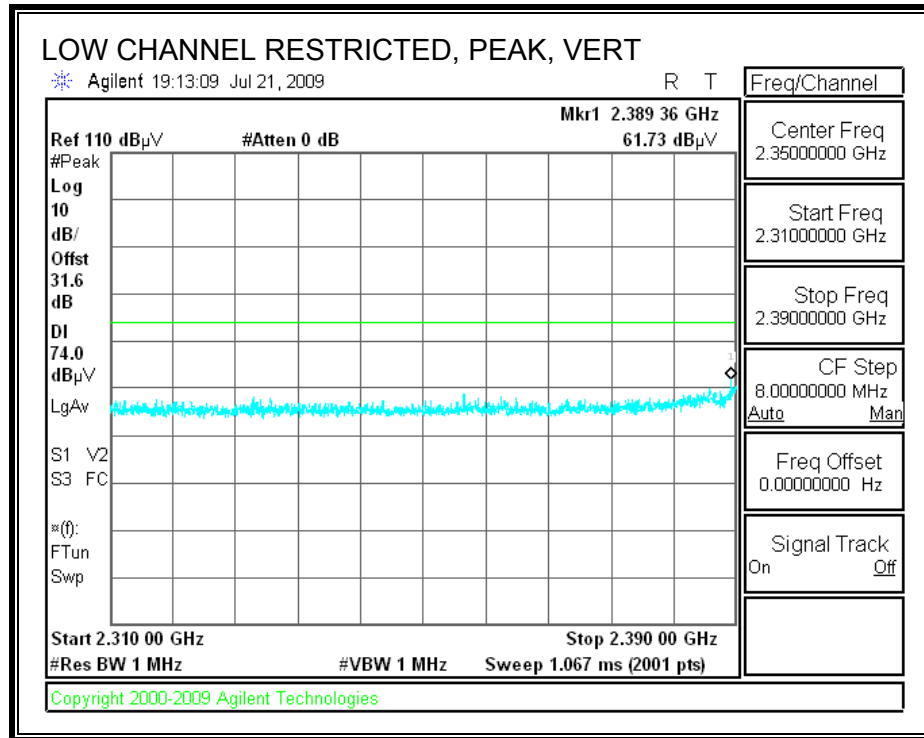
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

8.2. TRANSMITTER ABOVE 1 GHz

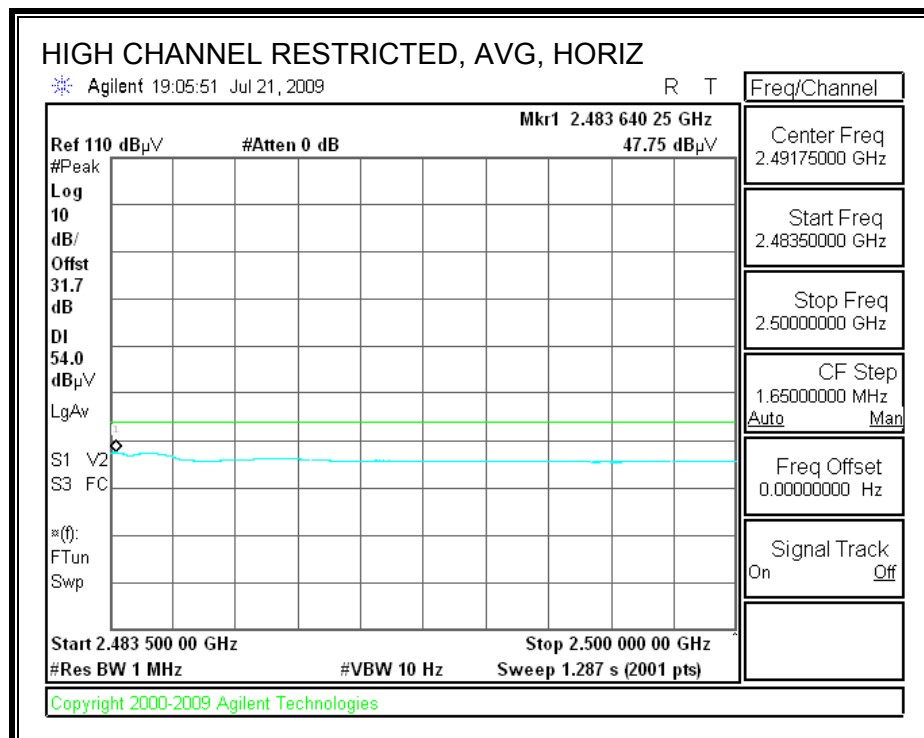
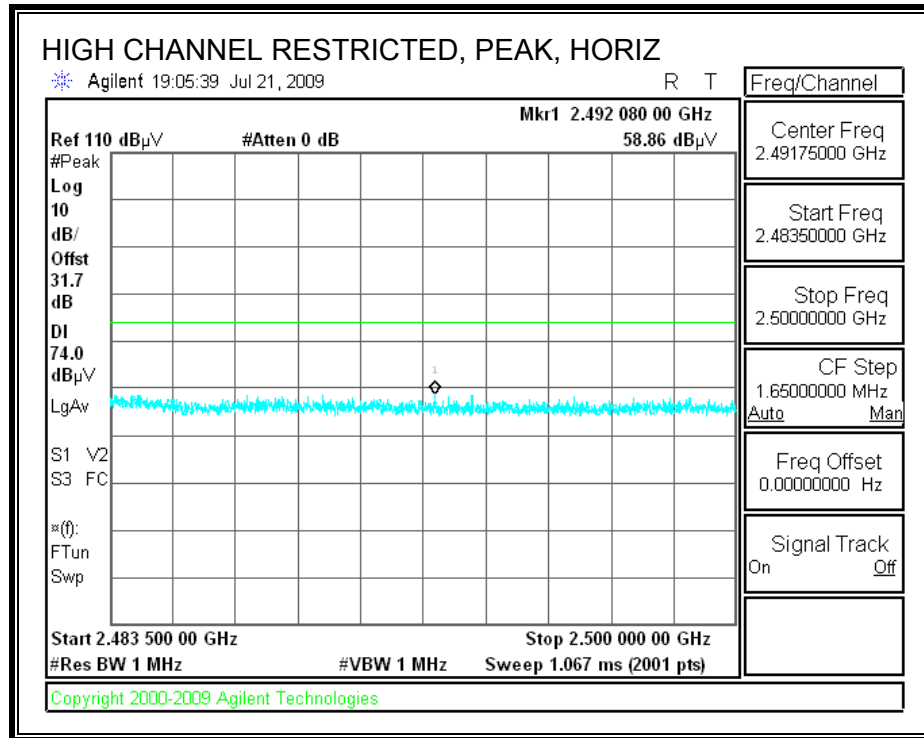
8.2.1. TRANSMITTER ABOVE 1 GHz FOR 802.11b IN THE 2.4 GHz BAND RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



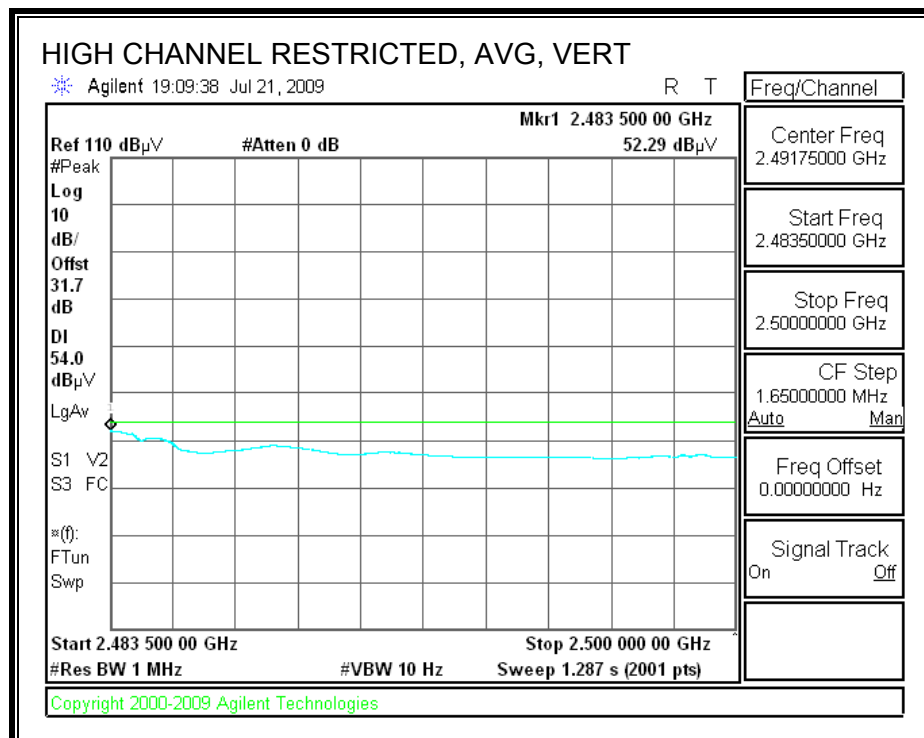
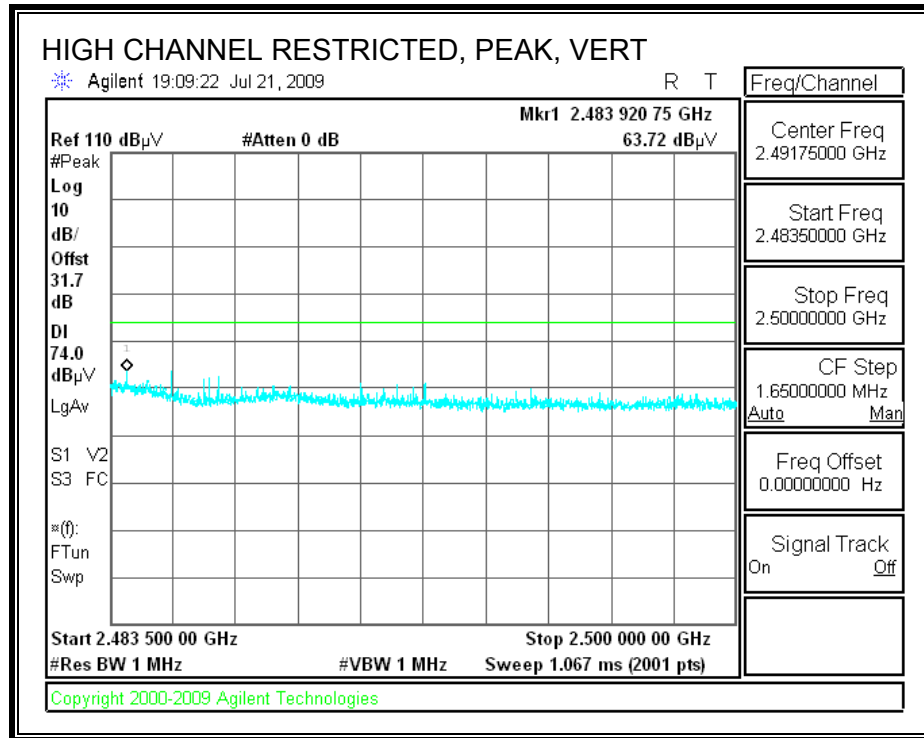
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber

Test Engr: Devin Chang
Date: 08/03/09
Project #: 09U12610
Company: Microsoft
EUT M/N: Omni N
Test Target: Harmonic
Mode Oper: Tx_b mode

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

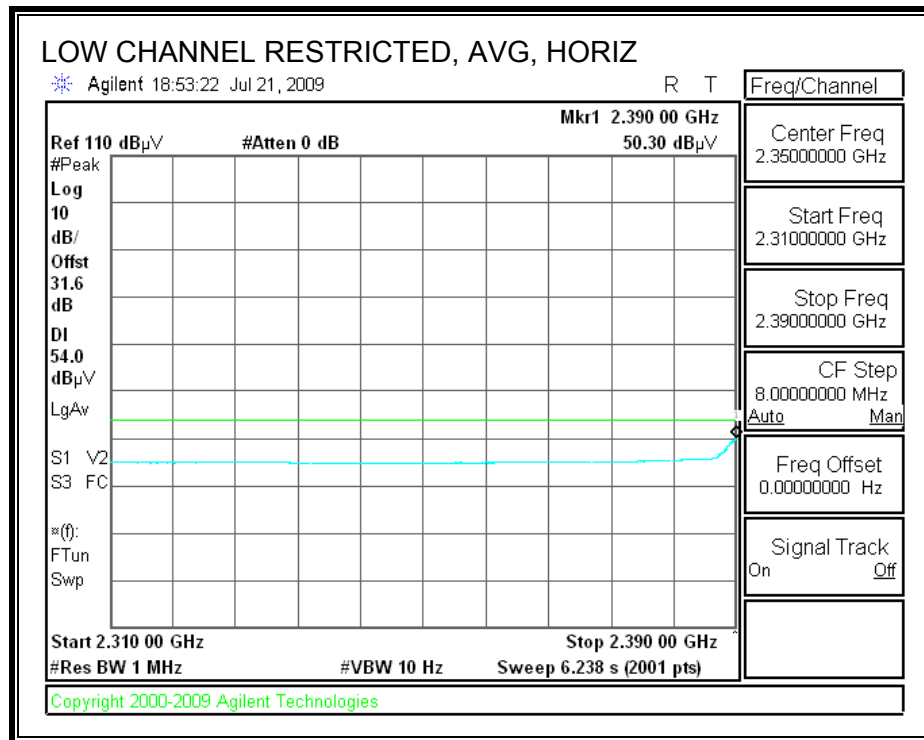
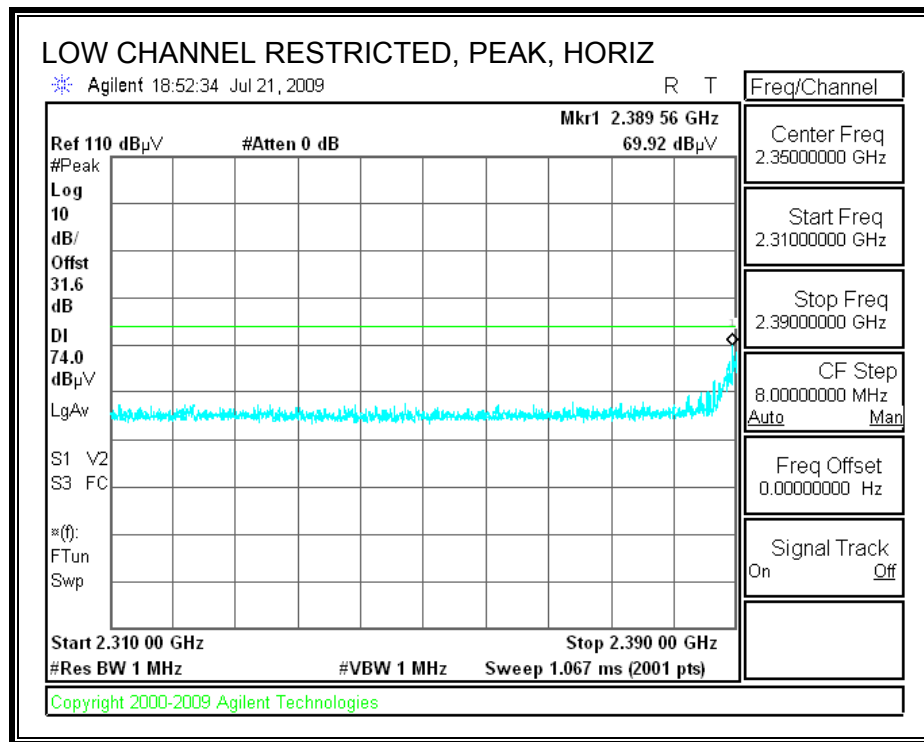
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
2412MHz													
4.824	3.0	41.6	32.8	5.8	-34.8	0.0	0.6	45.9	74.0	-28.1	H	P	
4.824	3.0	37.2	32.8	5.8	-34.8	0.0	0.6	41.5	54.0	-12.5	H	A	
4.824	3.0	42.2	32.8	5.8	-34.8	0.0	0.6	46.5	74.0	-27.5	V	P	
4.824	3.0	37.8	32.8	5.8	-34.8	0.0	0.6	42.2	54.0	-11.8	V	A	
2437MHz													
4.874	3.0	43.1	32.8	5.8	-34.9	0.0	0.6	47.5	74.0	-26.5	V	P	
4.874	3.0	38.6	32.8	5.8	-34.9	0.0	0.6	43.0	54.0	-11.0	V	A	
7.311	3.0	41.8	35.2	7.3	-34.7	0.0	0.6	50.3	74.0	-23.7	V	P	
7.311	3.0	33.0	35.2	7.3	-34.7	0.0	0.6	41.5	54.0	-12.5	V	A	
4.874	3.0	41.0	32.8	5.8	-34.9	0.0	0.6	45.4	74.0	-28.6	H	P	
4.874	3.0	34.9	32.8	5.8	-34.9	0.0	0.6	39.3	54.0	-14.7	H	A	
7.311	3.0	37.4	35.2	7.3	-34.7	0.0	0.6	45.8	74.0	-28.2	H	P	
7.311	3.0	25.2	35.2	7.3	-34.7	0.0	0.6	33.6	54.0	-20.4	H	A	
2462MHz													
4.924	3.0	43.8	32.8	5.9	-34.9	0.0	0.6	48.3	74.0	-25.7	V	P	
4.924	3.0	39.1	32.8	5.9	-34.9	0.0	0.6	43.6	54.0	-10.4	V	A	
7.386	3.0	39.9	35.3	7.3	-34.6	0.0	0.6	48.5	74.0	-25.5	V	P	
7.386	3.0	31.2	35.3	7.3	-34.6	0.0	0.6	39.8	54.0	-14.2	V	A	
4.924	3.0	40.6	32.8	5.9	-34.9	0.0	0.6	45.1	74.0	-28.9	H	P	
4.924	3.0	34.4	32.8	5.9	-34.9	0.0	0.6	38.9	54.0	-15.1	H	A	
7.386	3.0	37.5	35.3	7.3	-34.6	0.0	0.6	46.1	74.0	-27.9	H	P	
7.386	3.0	26.2	35.3	7.3	-34.6	0.0	0.6	34.8	54.0	-19.2	H	A	

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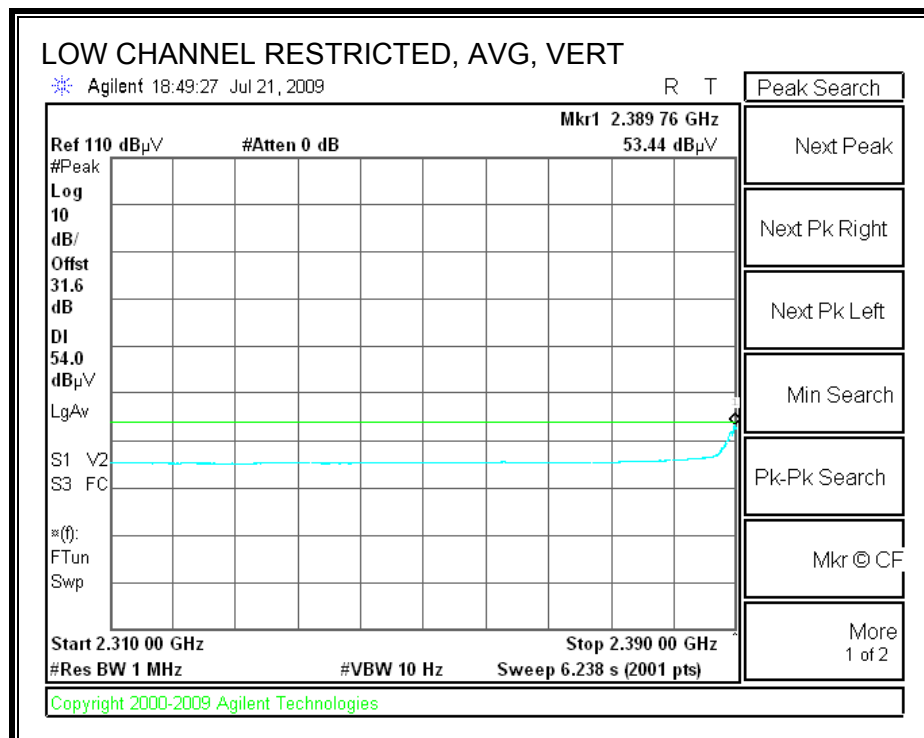
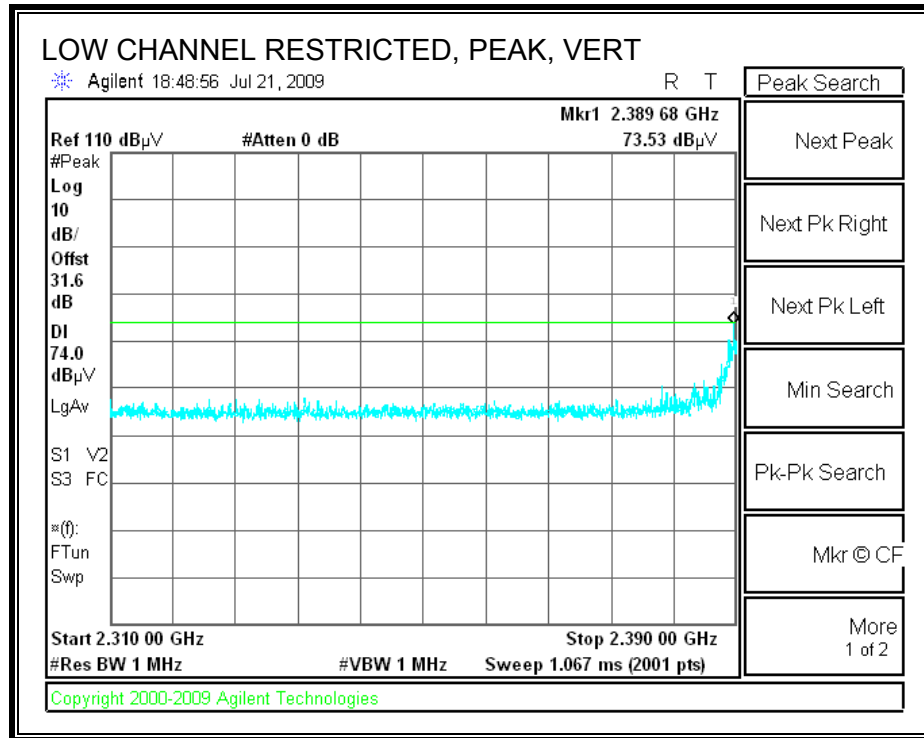
Note: No other emissions were detected above the system noise floor.

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

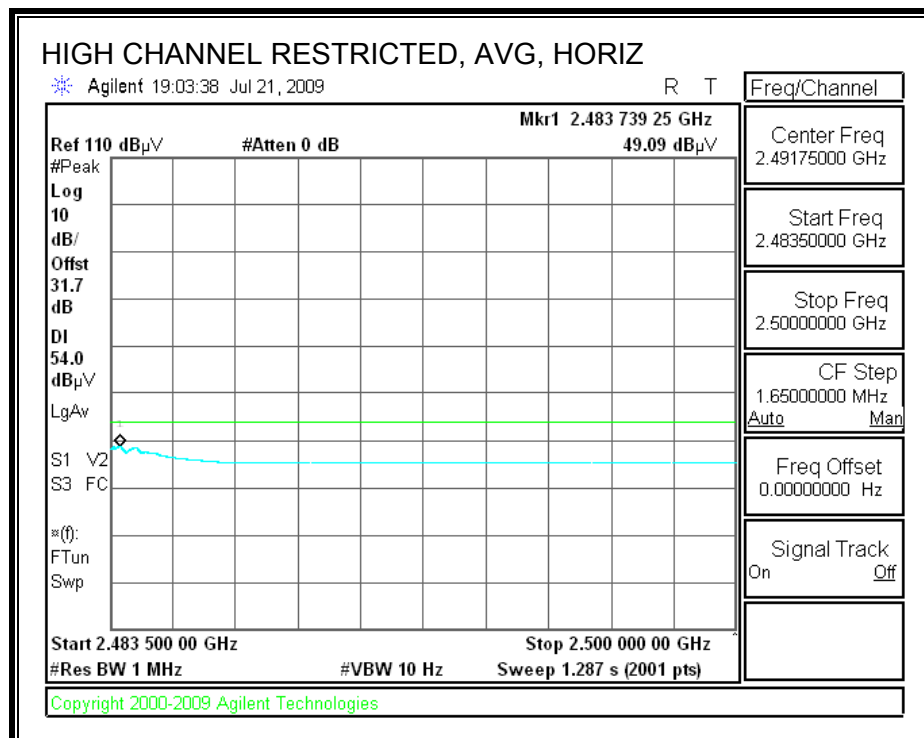
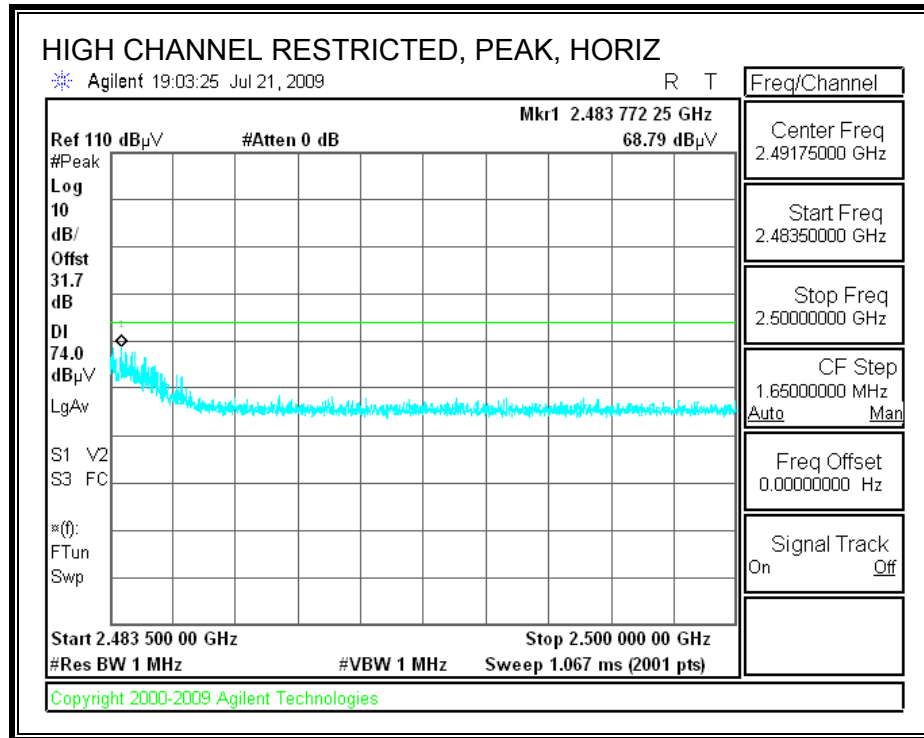
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



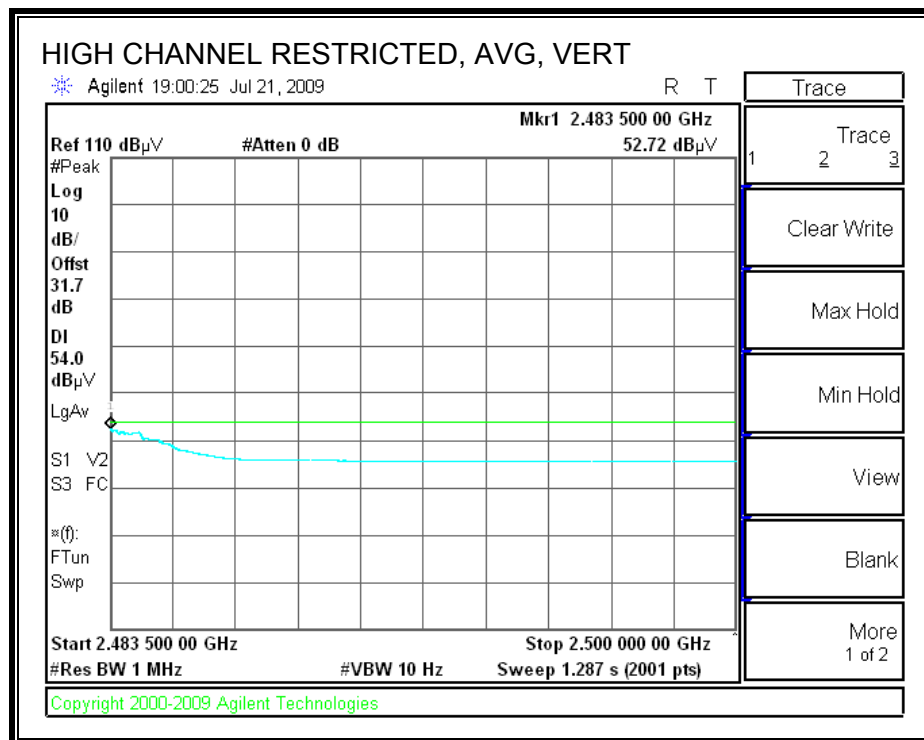
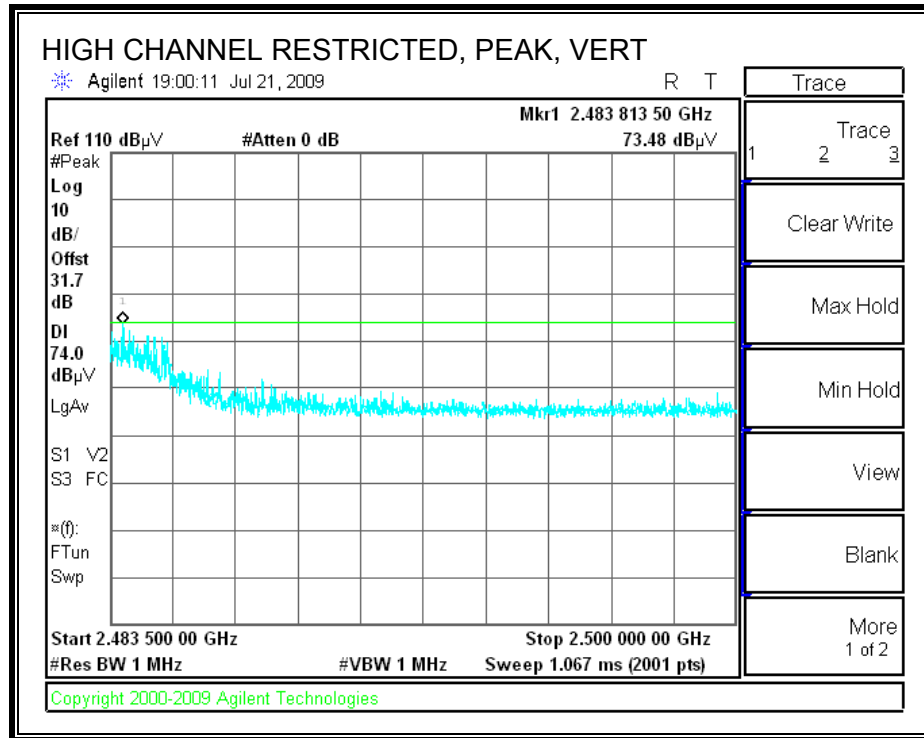
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber

Test Engr: Devin Chang
Date: 08/03/09
Project #: 09U12610
Company: Microsoft
EUT M/N: Omni N
Test Target: Harmonic
Mode Oper: Tx_g 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	

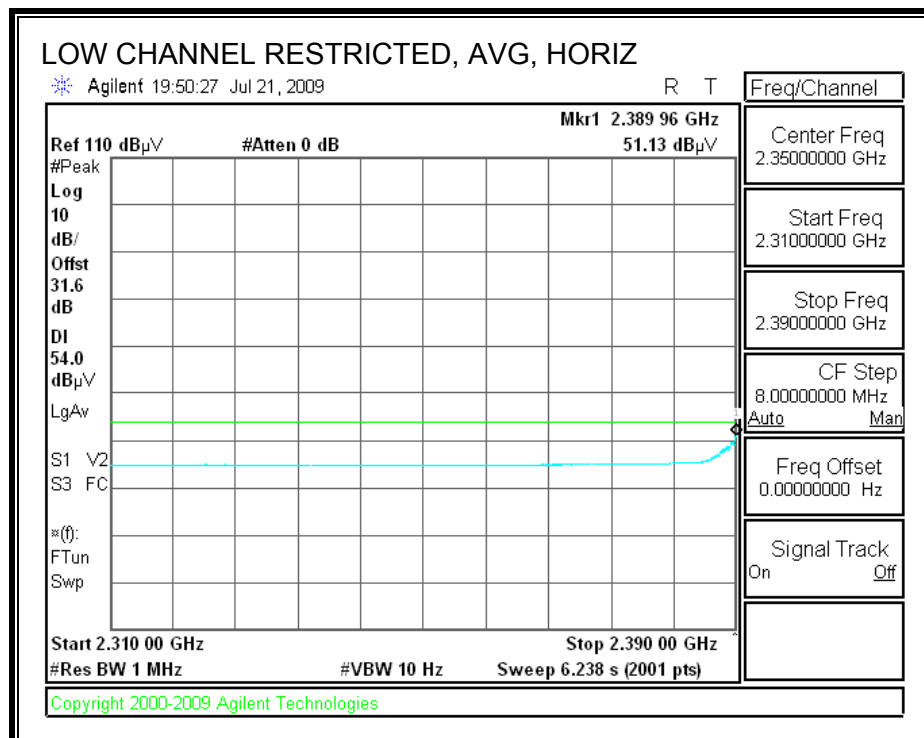
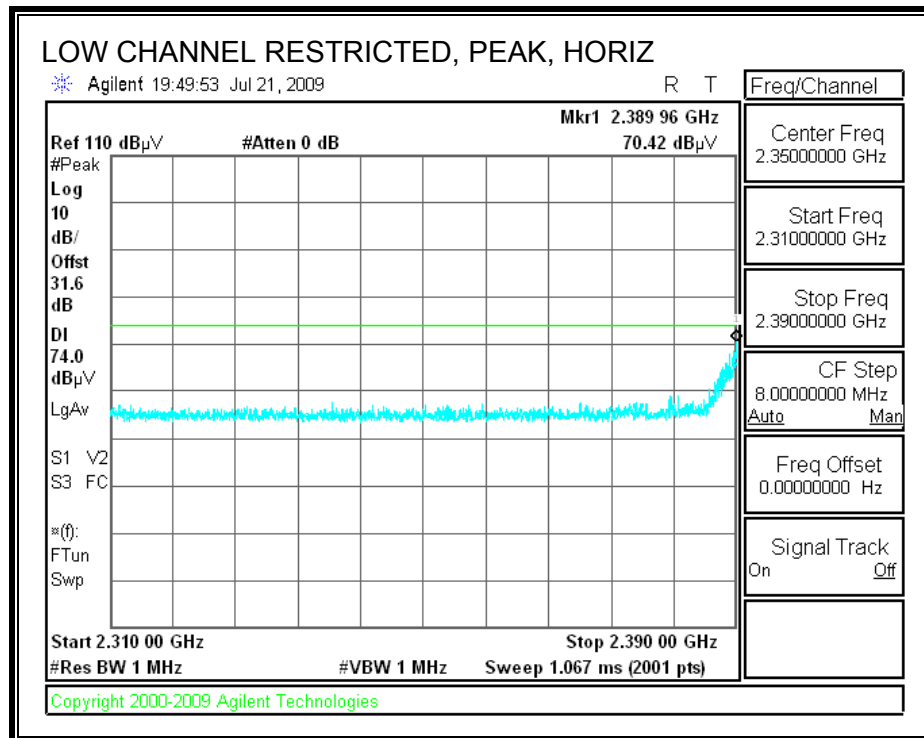
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
2412MHz													
4.824	3.0	46.8	32.8	5.8	-36.5	0.0	0.0	48.9	74.0	-25.1	V	P	
4.824	3.0	31.9	32.8	5.8	-36.5	0.0	0.0	34.0	54.0	-20.0	V	A	
4.824	3.0	44.9	32.8	5.8	-36.5	0.0	0.0	47.0	74.0	-27.0	H	P	
4.824	3.0	30.0	32.8	5.8	-36.5	0.0	0.0	32.1	54.0	-21.9	H	A	
2437MHz													
4.874	3.0	51.4	32.8	5.8	-36.5	0.0	0.0	53.6	74.0	-20.4	V	P	
4.874	3.0	35.6	32.8	5.8	-36.5	0.0	0.0	37.8	54.0	-16.2	V	A	
7.311	3.0	54.0	35.2	7.3	-36.2	0.0	0.0	60.3	74.0	-13.7	V	P	
7.311	3.0	35.7	35.2	7.3	-36.2	0.0	0.0	41.9	54.0	-12.1	V	A	
4.874	3.0	44.3	32.8	5.8	-36.5	0.0	0.0	46.5	74.0	-27.5	H	P	
4.874	3.0	30.8	32.8	5.8	-36.5	0.0	0.0	33.0	54.0	-21.1	H	A	
7.311	3.0	44.1	35.2	7.3	-36.2	0.0	0.0	50.4	74.0	-23.6	H	P	
7.311	3.0	28.6	35.2	7.3	-36.2	0.0	0.0	34.8	54.0	-19.2	H	A	
2462MHz													
4.924	3.0	54.0	32.8	5.9	-36.5	0.0	0.0	56.2	74.0	-17.8	V	P	
4.924	3.0	39.2	32.8	5.9	-36.5	0.0	0.0	41.4	54.0	-12.6	V	A	
7.386	3.0	55.5	35.3	7.3	-36.2	0.0	0.0	61.9	74.0	-12.1	V	P	
7.386	3.0	37.3	35.3	7.3	-36.2	0.0	0.0	43.7	54.0	-10.3	V	A	
4.924	3.0	47.7	32.8	5.9	-36.5	0.0	0.0	49.9	74.0	-24.1	H	P	
4.924	3.0	33.1	32.8	5.9	-36.5	0.0	0.0	35.3	54.0	-18.7	H	A	
7.386	3.0	46.7	35.3	7.3	-36.2	0.0	0.0	53.1	74.0	-20.9	H	P	
7.386	3.0	29.0	35.3	7.3	-36.2	0.0	0.0	35.4	54.0	-18.6	H	A	

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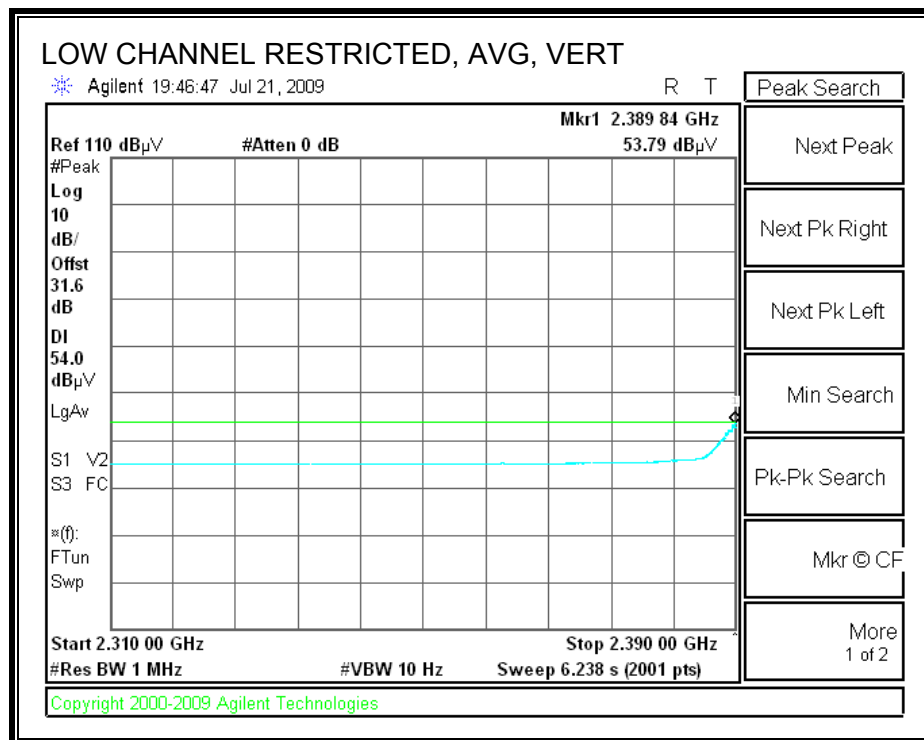
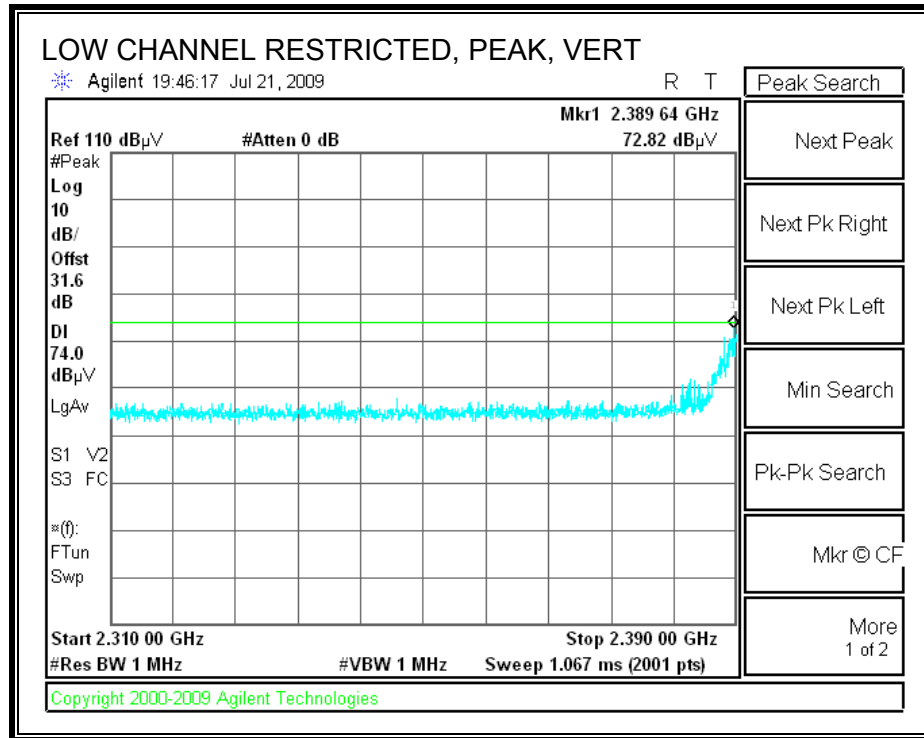
Note: No other emissions were detected above the system noise floor.

8.2.3. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT20 IN THE 2.4 GHz BAND

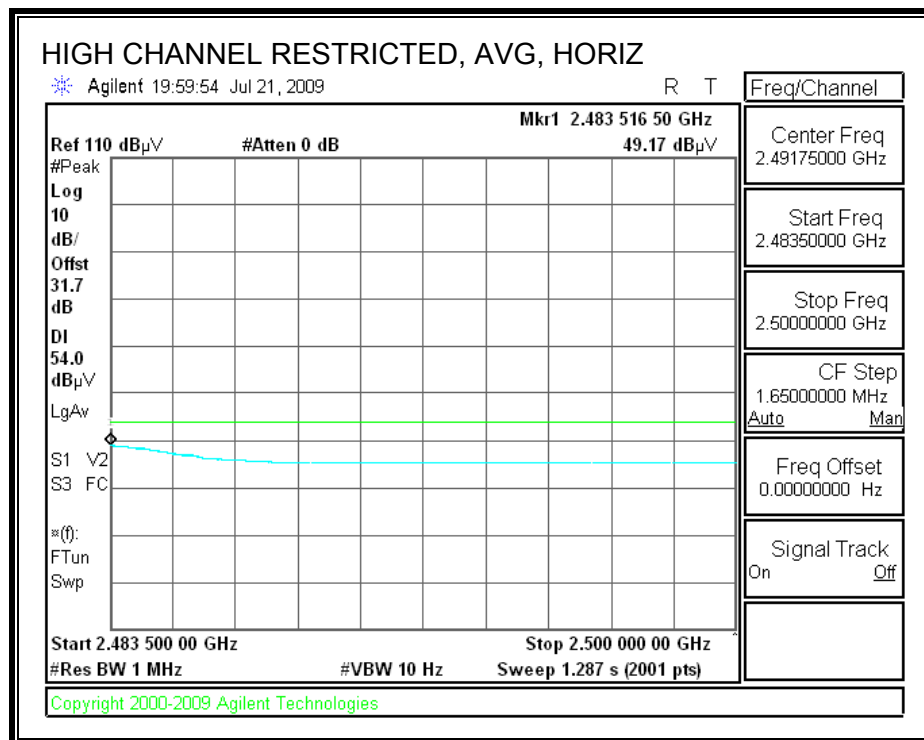
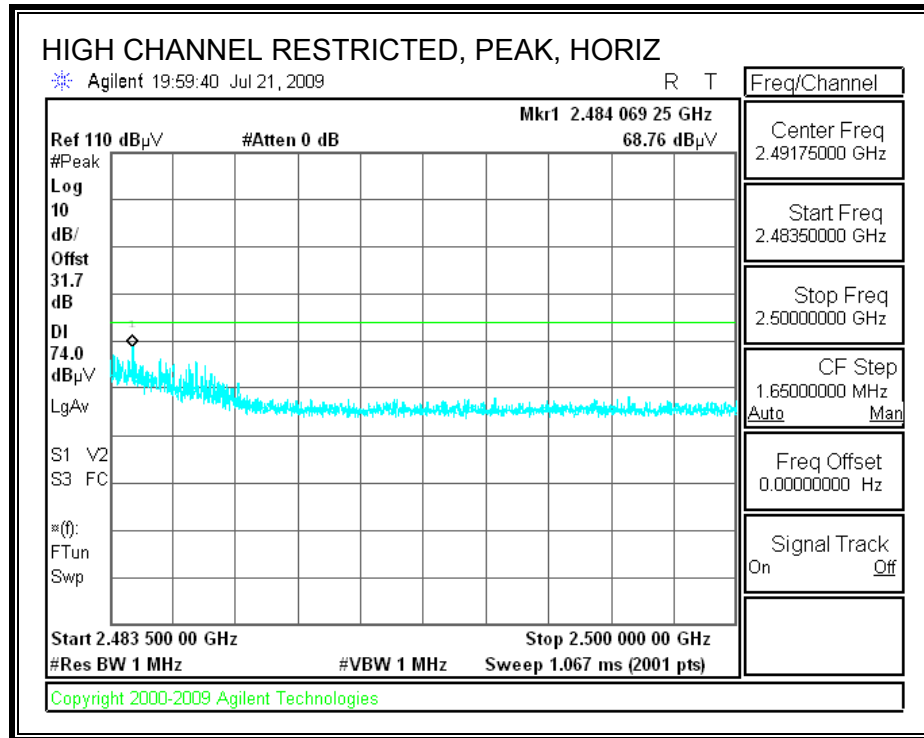
RESTRICTED BANEDGE (LOW CHANNEL, HORIZONTAL)



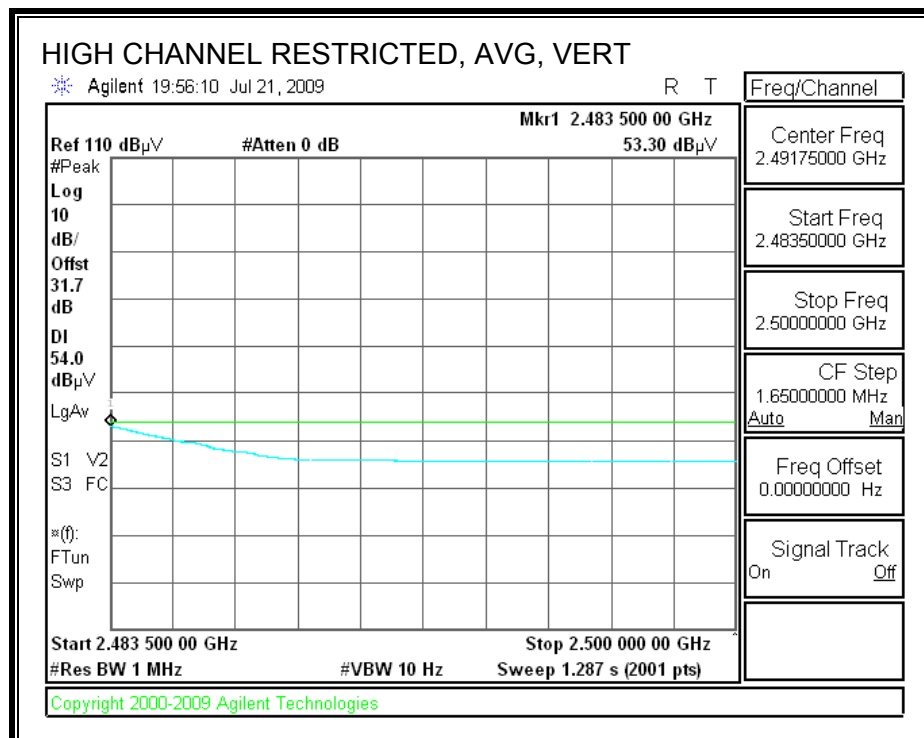
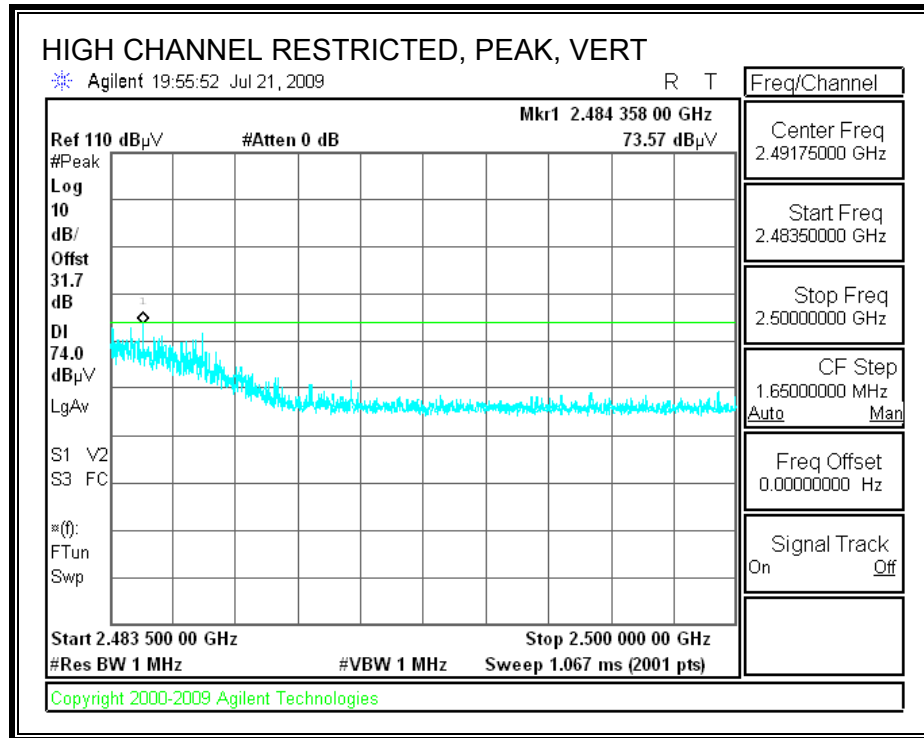
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber

Test Engr: Devin Chang
Date: 08/03/09
Project #: 09U12610
Company: Microsoft
EUT M/N: Omni N
Test Target: Harmonic
Mode Oper: Tx_HT20

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	

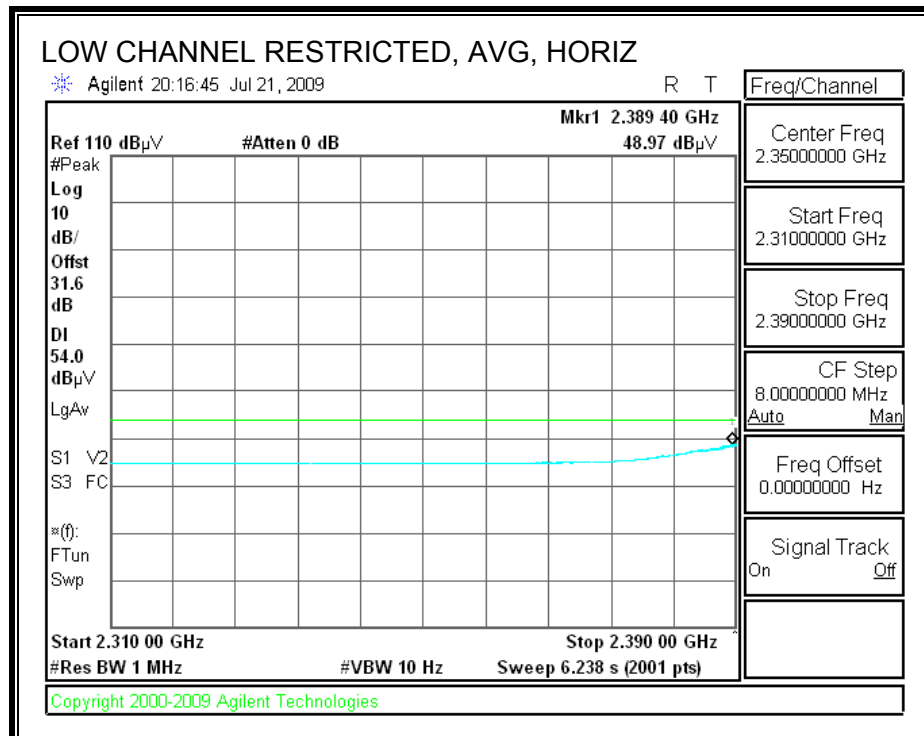
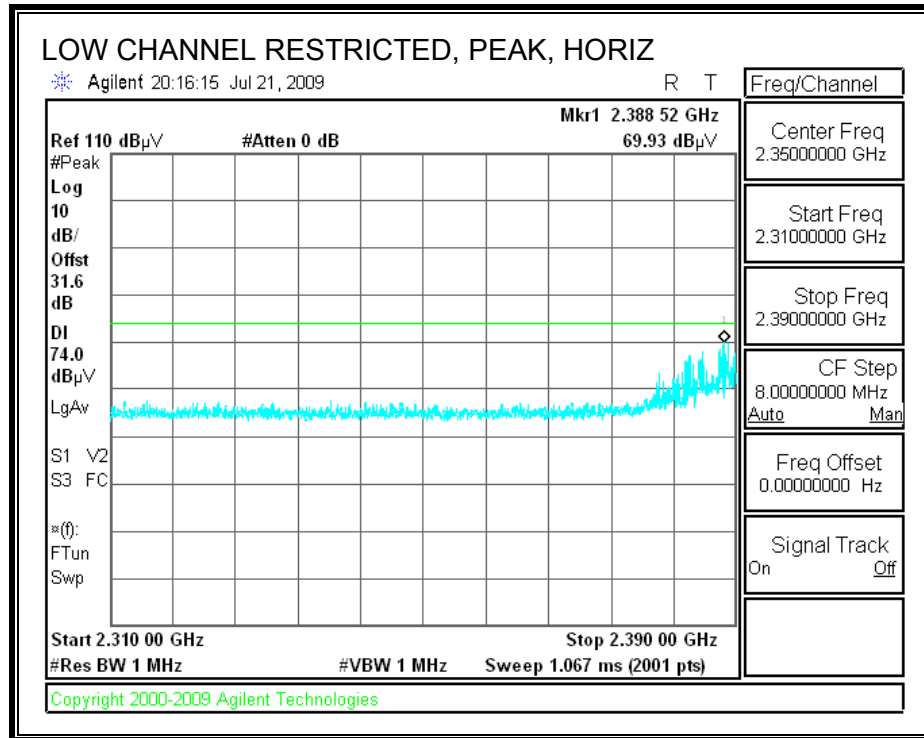
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
2412MHz													
4.824	3.0	47.7	32.8	5.8	-36.5	0.0	0.0	49.8	74.0	-24.2	V	P	
4.824	3.0	32.2	32.8	5.8	-36.5	0.0	0.0	34.3	54.0	-19.7	V	A	
4.824	3.0	43.6	32.8	5.8	-36.5	0.0	0.0	45.7	74.0	-28.3	H	P	
4.824	3.0	29.9	32.8	5.8	-36.5	0.0	0.0	31.9	54.0	-22.1	H	A	
2437MHz													
4.874	3.0	49.5	32.8	5.8	-36.5	0.0	0.0	51.7	74.0	-22.3	V	P	
4.874	3.0	33.6	32.8	5.8	-36.5	0.0	0.0	35.8	54.0	-18.2	V	A	
7.311	3.0	53.5	35.2	7.3	-36.2	0.0	0.0	59.7	74.0	-14.3	V	P	
7.311	3.0	35.9	35.2	7.3	-36.2	0.0	0.0	42.2	54.0	-11.8	V	A	
4.874	3.0	46.0	32.8	5.8	-36.5	0.0	0.0	48.2	74.0	-25.8	H	P	
4.874	3.0	30.6	32.8	5.8	-36.5	0.0	0.0	32.8	54.0	-21.2	H	A	
7.311	3.0	42.7	35.2	7.3	-36.2	0.0	0.0	48.9	74.0	-25.1	H	P	
7.311	3.0	27.6	35.2	7.3	-36.2	0.0	0.0	33.8	54.0	-20.2	H	A	
2462MHz													
4.924	3.0	54.3	32.8	5.9	-36.5	0.0	0.0	56.6	74.0	-17.4	V	P	
4.924	3.0	39.4	32.8	5.9	-36.5	0.0	0.0	41.6	54.0	-12.4	V	A	
7.386	3.0	56.2	35.3	7.3	-36.2	0.0	0.0	62.6	74.0	-11.4	V	P	
7.386	3.0	37.2	35.3	7.3	-36.2	0.0	0.0	43.6	54.0	-10.4	V	A	
4.924	3.0	48.1	32.8	5.9	-36.5	0.0	0.0	50.3	74.0	-23.7	H	P	
4.924	3.0	33.4	32.8	5.9	-36.5	0.0	0.0	35.6	54.0	-18.4	H	A	
7.386	3.0	46.9	35.3	7.3	-36.2	0.0	0.0	53.2	74.0	-20.8	H	P	
7.386	3.0	29.3	35.3	7.3	-36.2	0.0	0.0	35.7	54.0	-18.4	H	A	

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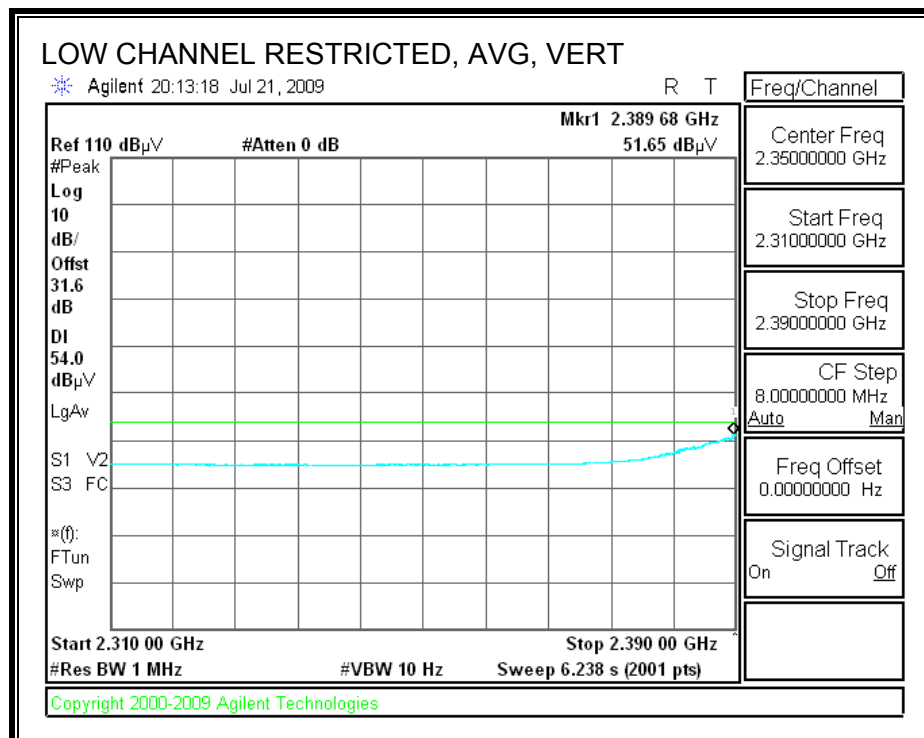
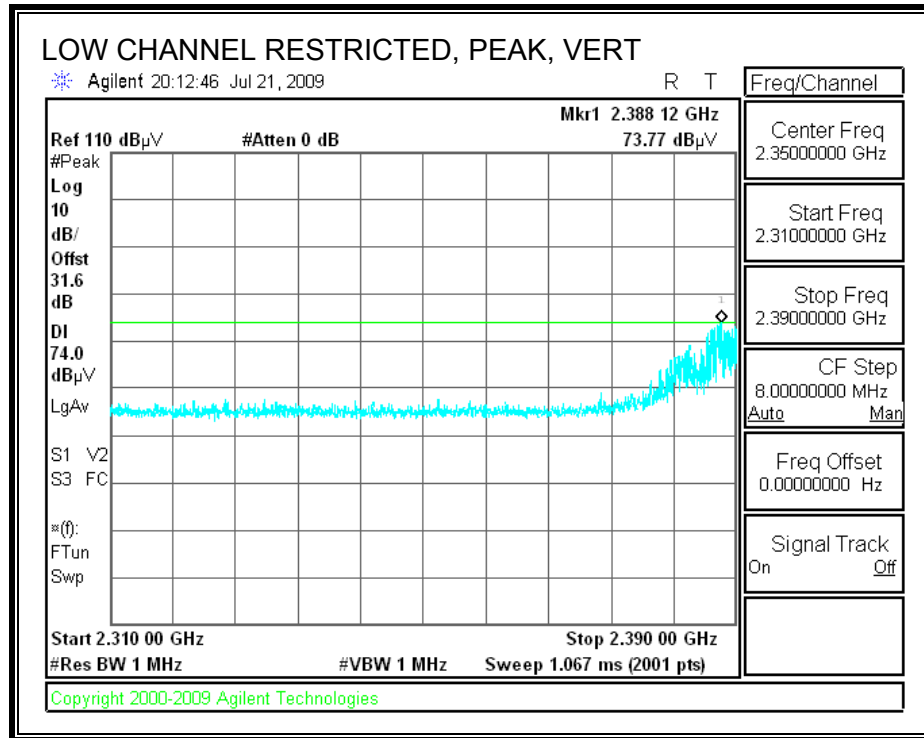
Note: No other emissions were detected above the system noise floor.

8.2.4. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT40 IN THE 2.4 GHz BAND

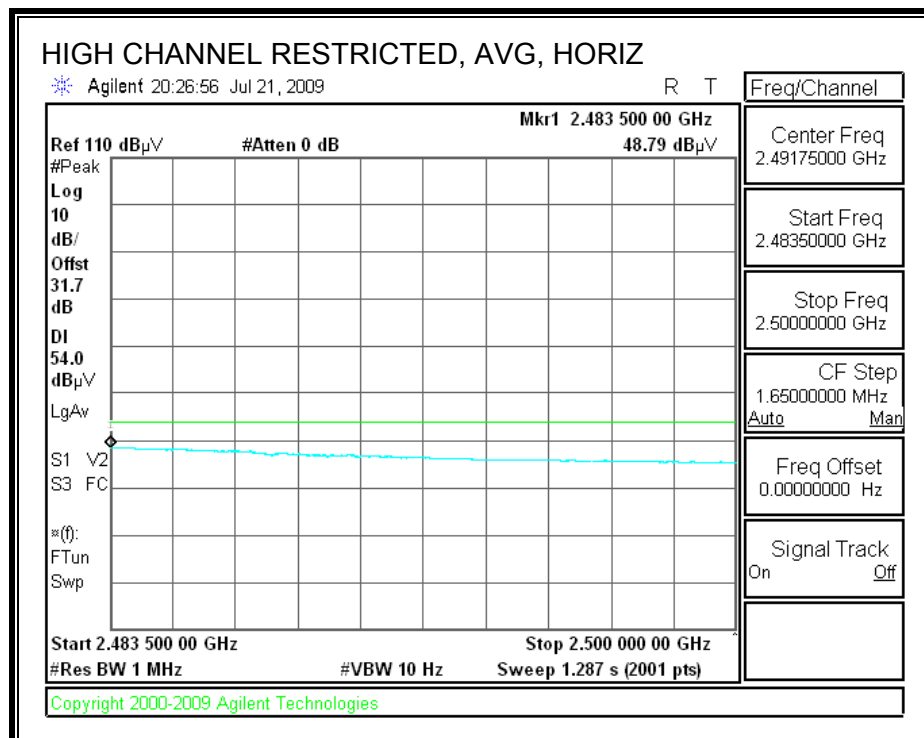
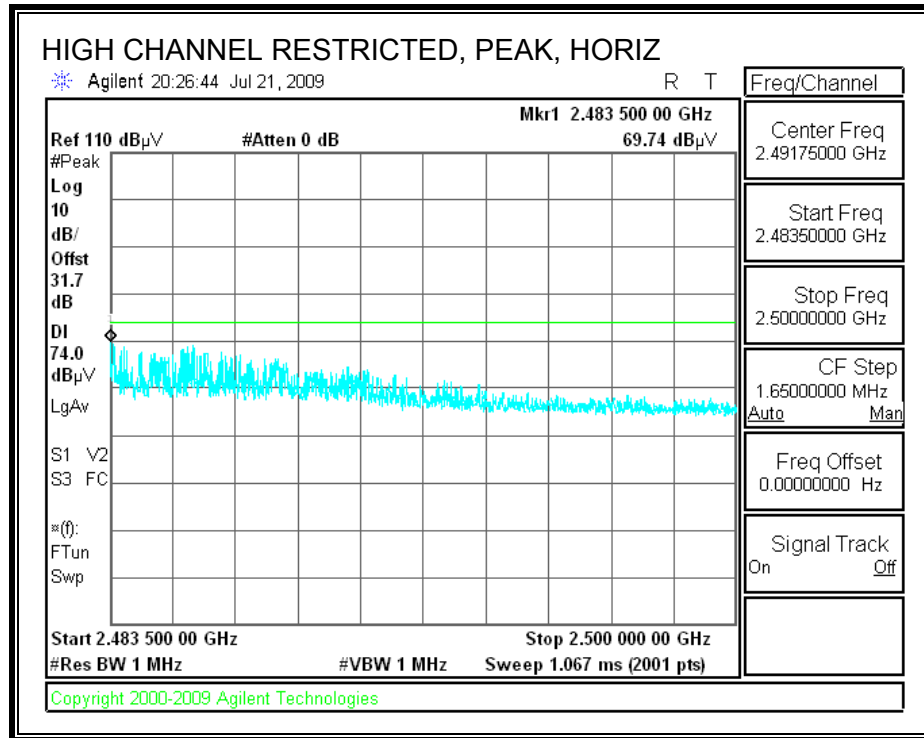
RESTRICTED BANEDGE (LOW CHANNEL, HORIZONTAL)



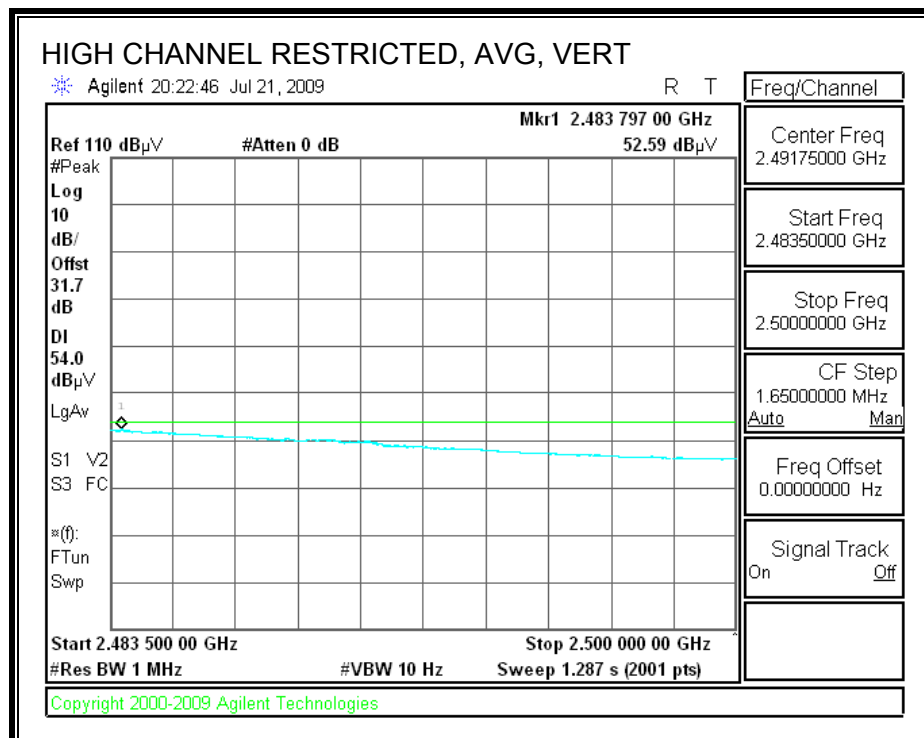
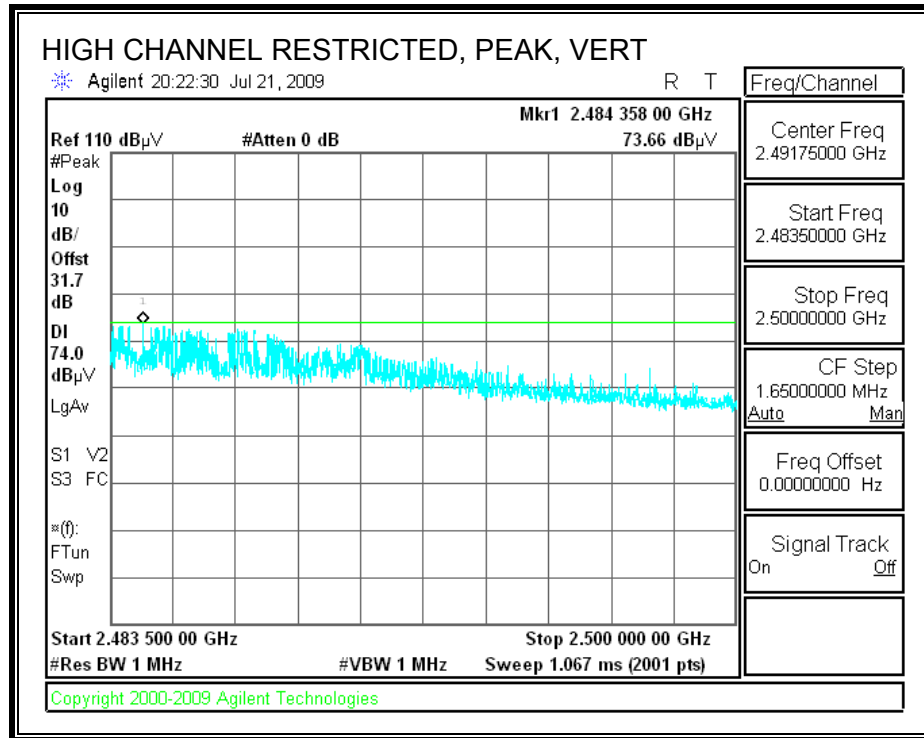
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Devin Chang
Date: 08/03/09
Project #: 09U12610
Company: Microsoft
EUT M/N: Omni N
Test Target: Harmonic
Mode Oper: Tx_HT40

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
2422MHz													
4.844	3.0	46.7	32.8	5.8	-36.5	0.0	0.0	48.8	74.0	-25.2	V	P	
4.844	3.0	32.2	32.8	5.8	-36.5	0.0	0.0	34.3	54.0	-19.7	V	A	
7.266	3.0	53.9	35.1	7.2	-36.2	0.0	0.0	60.1	74.0	-13.9	V	P	
7.266	3.0	37.1	35.1	7.2	-36.2	0.0	0.0	43.2	54.0	-10.8	V	A	
4.844	3.0	42.8	32.8	5.8	-36.5	0.0	0.0	44.9	74.0	-29.1	H	P	
4.844	3.0	28.6	32.8	5.8	-36.5	0.0	0.0	30.7	54.0	-23.3	H	A	
7.266	3.0	42.7	35.1	7.2	-36.2	0.0	0.0	48.9	74.0	-25.1	H	P	
7.266	3.0	27.9	35.1	7.2	-36.2	0.0	0.0	34.0	54.0	-20.0	H	A	
2437MHz													
4.874	3.0	48.0	32.8	5.8	-36.5	0.0	0.0	50.2	74.0	-23.8	V	P	
4.874	3.0	32.7	32.8	5.8	-36.5	0.0	0.0	34.9	54.0	-19.1	V	A	
7.311	3.0	50.4	35.2	7.3	-36.2	0.0	0.0	56.6	74.0	-17.4	V	P	
7.311	3.0	33.2	35.2	7.3	-36.2	0.0	0.0	39.5	54.0	-14.5	V	A	
4.874	3.0	43.4	32.8	5.8	-36.5	0.0	0.0	45.6	74.0	-28.4	H	P	
4.874	3.0	29.3	32.8	5.8	-36.5	0.0	0.0	31.5	54.0	-22.5	H	A	
7.311	3.0	45.1	35.2	7.3	-36.2	0.0	0.0	51.4	74.0	-22.6	H	P	
7.311	3.0	29.1	35.2	7.3	-36.2	0.0	0.0	35.3	54.0	-18.7	H	A	
2452MHz													
4.904	3.0	51.6	32.8	5.9	-36.5	0.0	0.0	53.8	74.0	-20.2	V	P	
4.904	3.0	36.8	32.8	5.9	-36.5	0.0	0.0	39.1	54.0	-14.9	V	A	
7.356	3.0	53.5	35.3	7.3	-36.2	0.0	0.0	59.8	74.0	-14.2	V	P	
7.356	3.0	36.8	35.3	7.3	-36.2	0.0	0.0	43.1	54.0	-10.9	V	A	
4.904	3.0	46.7	32.8	5.9	-36.5	0.0	0.0	49.0	74.0	-25.0	H	P	
4.904	3.0	32.1	32.8	5.9	-36.5	0.0	0.0	34.3	54.0	-19.7	H	A	
7.356	3.0	45.4	35.3	7.3	-36.2	0.0	0.0	51.7	74.0	-22.3	H	P	
7.356	3.0	29.2	35.3	7.3	-36.2	0.0	0.0	35.5	54.0	-18.5	H	A	

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

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

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Test Engr: Devin Chang
Date: 07/25/09
Project #: 09U12610
Company: Microsoft
EUT M/N: Omni N
Test Target: Harmonic
Mode Oper: Tx_a 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
5745MHz													
11.490	3.0	43.9	38.1	9.5	-35.9	0.0	0.0	55.6	74.0	-18.4	V	P	
11.490	3.0	28.4	38.1	9.5	-35.9	0.0	0.0	40.1	54.0	-13.9	V	A	
11.490	3.0	45.1	38.1	9.5	-35.9	0.0	0.0	56.8	74.0	-17.2	H	P	
11.490	3.0	29.2	38.1	9.5	-35.9	0.0	0.0	40.9	54.0	-13.1	H	A	
5785MHz													
11.570	3.0	41.5	38.1	9.5	-35.8	0.0	0.0	53.4	74.0	-20.6	V	P	
11.570	3.0	28.0	38.1	9.5	-35.8	0.0	0.0	39.9	54.0	-14.1	V	A	
11.570	3.0	42.0	38.1	9.5	-35.8	0.0	0.0	53.9	74.0	-20.1	H	P	
11.570	3.0	28.7	38.1	9.5	-35.8	0.0	0.0	40.6	54.0	-13.4	H	A	
5825MHz													
11.650	3.0	46.2	38.2	9.6	-35.7	0.0	0.0	58.2	74.0	-15.8	V	P	
11.650	3.0	32.9	38.2	9.6	-35.7	0.0	0.0	44.9	54.0	-9.1	V	A	
11.650	3.0	48.0	38.2	9.6	-35.7	0.0	0.0	60.0	74.0	-14.0	H	P	
11.650	3.0	34.9	38.2	9.6	-35.7	0.0	0.0	47.0	54.0	-7.0	H	A	

Rev. 4.1.2.7

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

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

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber

Test Engr: Devin Chang
Date: 07/25/09
Project #: 09U12610
Company: Microsoft
EUT M/N: Omni N
Test Target: Harmonic
Mode Oper: Tx_HT20

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
5745MHz													
11.490	3.0	42.7	38.1	9.5	-35.9	0.0	0.0	54.4	74.0	-19.6	V	P	
11.490	3.0	28.0	38.1	9.5	-35.9	0.0	0.0	39.7	54.0	-14.3	V	A	
11.490	3.0	42.1	38.1	9.5	-35.9	0.0	0.0	53.8	74.0	-20.2	H	P	
11.490	3.0	28.0	38.1	9.5	-35.9	0.0	0.0	39.7	54.0	-14.3	H	A	
5785MHz													
11.570	3.0	41.7	38.1	9.5	-35.8	0.0	0.0	53.5	74.0	-20.5	V	P	
11.570	3.0	26.9	38.1	9.5	-35.8	0.0	0.0	38.7	54.0	-15.3	V	A	
11.570	3.0	42.5	38.1	9.5	-35.8	0.0	0.0	54.4	74.0	-19.6	H	P	
11.570	3.0	28.9	38.1	9.5	-35.8	0.0	0.0	40.8	54.0	-13.2	H	A	
5825MHz													
11.650	3.0	45.5	38.2	9.6	-35.7	0.0	0.0	57.6	74.0	-16.4	V	P	
11.650	3.0	32.5	38.2	9.6	-35.7	0.0	0.0	44.6	54.0	-9.4	V	A	
11.650	3.0	47.6	38.2	9.6	-35.7	0.0	0.0	59.7	74.0	-14.3	H	P	
11.650	3.0	34.3	38.2	9.6	-35.7	0.0	0.0	46.3	54.0	-7.7	H	A	

Rev. 4.1.2.7

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

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

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber

Test Engr: Devin Chang
Date: 07/25/09
Project #: 09U12610
Company: Microsoft
EUT M/N: Omni N
Test Target: Harmonic
Mode Oper: Tx_HT40

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
5755MHz													
11.510	3.0	43.5	38.1	9.5	-35.8	0.0	0.0	55.2	74.0	-18.8	V	P	
11.510	3.0	30.5	38.1	9.5	-35.8	0.0	0.0	42.3	54.0	-11.7	V	A	
11.510	3.0	42.8	38.1	9.5	-35.8	0.0	0.0	54.6	74.0	-19.4	H	P	
11.510	3.0	29.8	38.1	9.5	-35.8	0.0	0.0	41.5	54.0	-12.5	H	A	
5795MHz													
11.590	3.0	43.0	38.2	9.5	-35.8	0.0	0.0	54.9	74.0	-19.1	V	P	
11.590	3.0	29.9	38.2	9.5	-35.8	0.0	0.0	41.8	54.0	-12.2	V	A	
11.590	3.0	44.0	38.2	9.5	-35.8	0.0	0.0	55.9	74.0	-18.1	H	P	
11.590	3.0	31.1	38.2	9.5	-35.8	0.0	0.0	43.0	54.0	-11.0	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. RECEIVER FOR 20 MHz BANDWIDTH IN THE 2.4 GHz BAND

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber													
Test Engr:		Devin Chang											
Date:		08/01/09											
Project #:		09U12610											
Company:		Microsoft											
EUT M/N:		Omni N											
Test Target:		Harmonic											
Mode Oper:		2.4GHz Rx 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
1.325	3.0	59.8	25.6	2.7	-39.0	0.0	0.0	49.1	74.0	-24.9	V	P	
1.325	3.0	42.2	25.6	2.7	-39.0	0.0	0.0	31.4	54.0	-22.6	V	A	
1.663	3.0	56.4	26.7	3.1	-38.5	0.0	0.0	47.7	74.0	-26.3	V	P	
1.663	3.0	37.8	26.7	3.1	-38.5	0.0	0.0	29.1	54.0	-24.9	V	A	
1.325	3.0	58.2	25.6	2.7	-39.0	0.0	0.0	47.5	74.0	-26.5	H	P	
1.325	3.0	41.0	25.6	2.7	-39.0	0.0	0.0	30.2	54.0	-23.8	H	A	
1.663	3.0	57.4	26.7	3.1	-38.5	0.0	0.0	48.7	74.0	-25.3	H	P	
1.663	3.0	41.9	26.7	3.1	-38.5	0.0	0.0	33.1	54.0	-20.9	H	A	

Rev. 4.1.2.7

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

8.3.2. RECEIVER FOR 40 MHz BANDWIDTH IN THE 2.4 GHz BAND

High Frequency Measurement													
Compliance Certification Services, Fremont 5m Chamber													
Test Engr:		Devin Chang											
Date:		08/01/09											
Project #:		09U12610											
Company:		Microsoft											
EUT M/N:		Omni N											
Test Target:		Harmonic											
Mode Oper:		2.4GHz Rx 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
1.325	3.0	58.3	25.6	2.7	-39.0	0.0	0.0	47.6	74.0	-26.4	V	P	
1.325	3.0	43.5	25.6	2.7	-39.0	0.0	0.0	32.8	54.0	-21.2	V	A	
1.663	3.0	55.8	26.7	3.1	-38.5	0.0	0.0	47.0	74.0	-27.0	V	P	
1.663	3.0	38.6	26.7	3.1	-38.5	0.0	0.0	29.8	54.0	-24.2	V	A	
1.325	3.0	59.1	25.6	2.7	-39.0	0.0	0.0	48.4	74.0	-25.6	H	P	
1.325	3.0	42.6	25.6	2.7	-39.0	0.0	0.0	31.9	54.0	-22.1	H	A	
1.663	3.0	57.6	26.7	3.1	-38.5	0.0	0.0	48.8	74.0	-25.2	H	P	
1.663	3.0	43.0	26.7	3.1	-38.5	0.0	0.0	34.2	54.0	-19.8	H	A	

Rev. 4.1.2.7

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

8.3.3. RECEIVER FOR 20 MHz BANDWIDTH IN THE 5.8 GHz BAND

High Frequency Measurement													
Compliance Certification Services, Fremont 5m Chamber													
Test Engr:		Devin Chang											
Date:		08/01/09											
Project #:		09U12610											
Company:		Microsoft											
EUT M/N:		Omni N											
Test Target:		Harmonic											
Mode Oper:		5GHz_Rx 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
1.325	3.0	60.7	25.6	2.7	-39.0	0.0	0.0	49.9	74.0	-24.1	V	P	
1.325	3.0	42.6	25.6	2.7	-39.0	0.0	0.0	31.8	54.0	-22.2	V	A	
1.663	3.0	53.0	26.7	3.1	-38.5	0.0	0.0	44.2	74.0	-29.8	V	P	
1.663	3.0	40.6	26.7	3.1	-38.5	0.0	0.0	31.8	54.0	-22.2	V	A	
1.325	3.0	54.8	25.6	2.7	-39.0	0.0	0.0	44.1	74.0	-29.9	H	P	
1.325	3.0	38.9	25.6	2.7	-39.0	0.0	0.0	28.2	54.0	-25.9	H	A	
1.663	3.0	58.2	26.7	3.1	-38.5	0.0	0.0	49.5	74.0	-24.5	H	P	
1.663	3.0	42.1	26.7	3.1	-38.5	0.0	0.0	33.4	54.0	-20.6	H	A	

Rev. 4.1.2.7

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

8.3.4. RECEIVER FOR 40 MHz BANDWIDTH IN THE 5.8 GHz BAND

High Frequency Measurement													
Compliance Certification Services, Fremont 5m Chamber													
Test Engr:		Devin Chang											
Date:		08/01/09											
Project #:		09U12610											
Company:		Microsoft											
EUT M/N:		Omni N											
Test Target:		Harmonic											
Mode Oper:		5GHz_Rx 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										

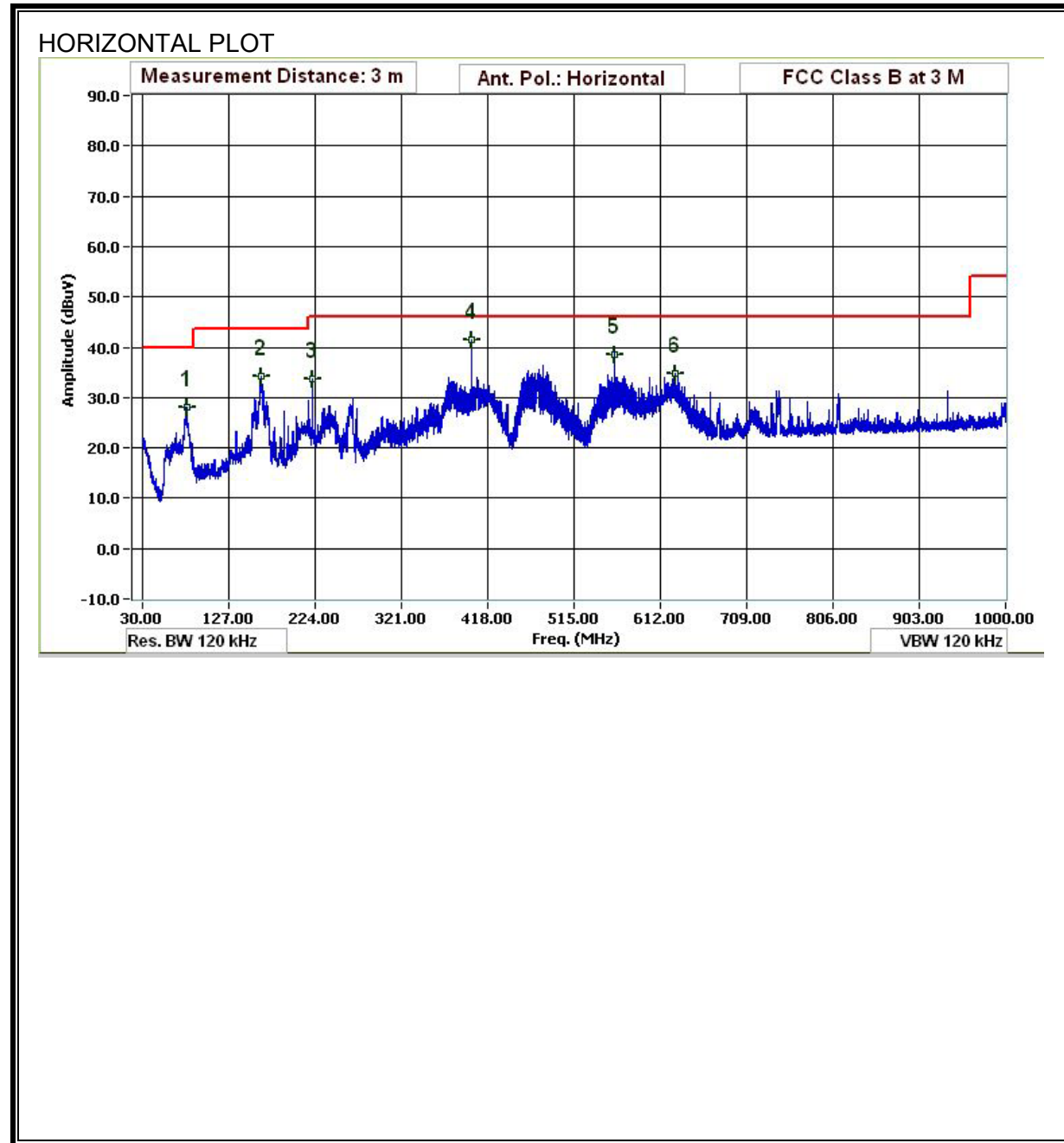
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
1.325	3.0	59.6	25.6	2.7	-39.0	0.0	0.0	48.9	74.0	-25.1	V	P	
1.325	3.0	43.6	25.6	2.7	-39.0	0.0	0.0	32.9	54.0	-21.1	V	A	
1.663	3.0	54.5	26.7	3.1	-38.5	0.0	0.0	45.7	74.0	-28.3	V	P	
1.663	3.0	41.0	26.7	3.1	-38.5	0.0	0.0	32.2	54.0	-21.8	V	A	
1.325	3.0	55.2	25.6	2.7	-39.0	0.0	0.0	44.5	74.0	-29.5	H	P	
1.325	3.0	39.0	25.6	2.7	-39.0	0.0	0.0	28.3	54.0	-25.7	H	A	
1.663	3.0	58.6	26.7	3.1	-38.5	0.0	0.0	49.8	74.0	-24.2	H	P	
1.663	3.0	43.1	26.7	3.1	-38.5	0.0	0.0	34.3	54.0	-19.7	H	A	

Rev. 4.1.2.7

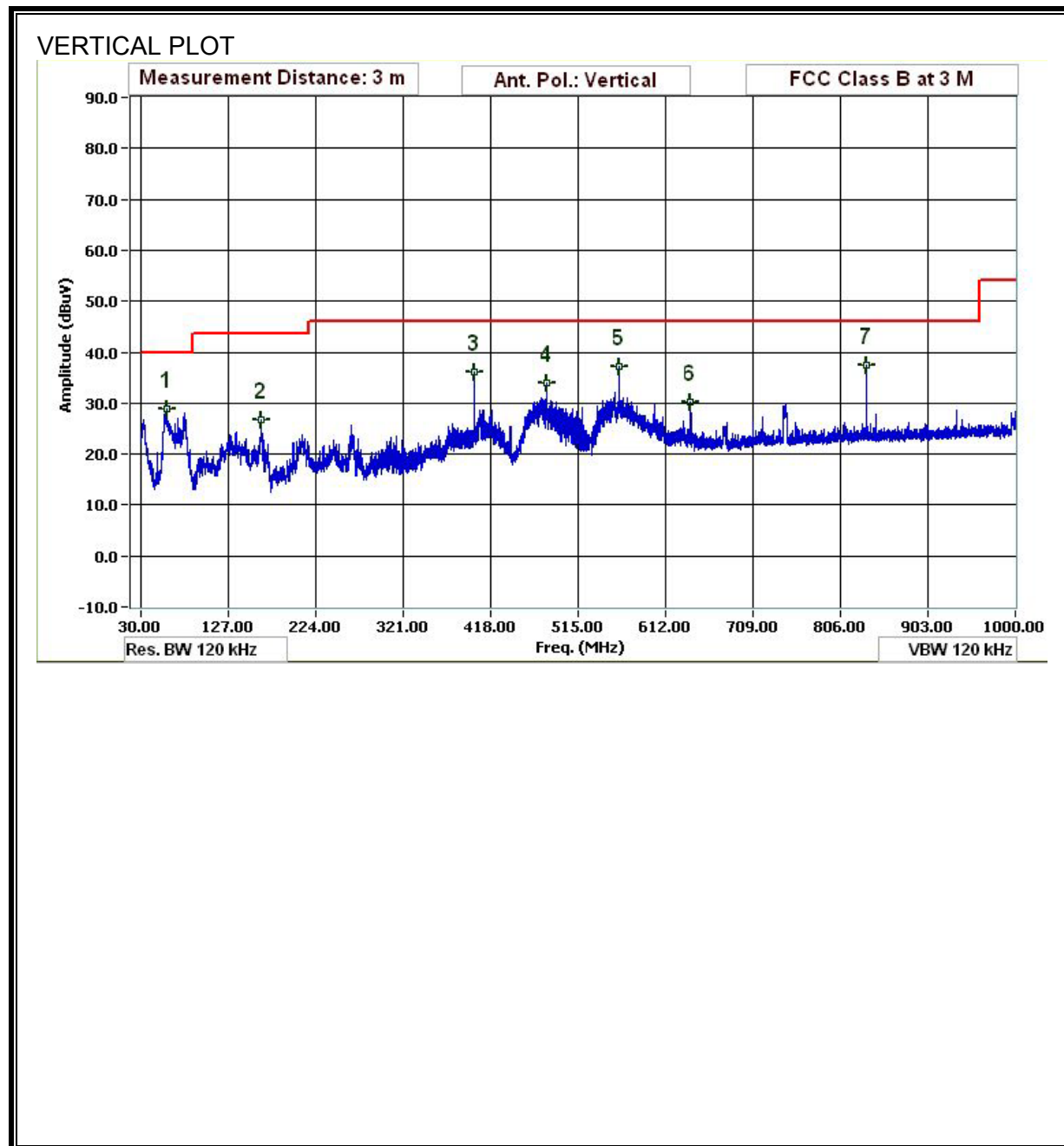
Note: No other emissions were detected above the system noise floor.

8.4. WORST-CASE BELOW 1 GHz

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



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



30-1000MHz Frequency Measurement														
Compliance Certification Services, Fremont 5m Chamber														
Test Engr:		Devin Chang												
Date:		07/31/09												
Project #:		09U12610												
Company:		Microsoft												
EUT M/N:		Omni N												
Test Target:		Harmonic												
Mode Oper:		Tx_b mode												
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	Filter dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes	
58.321	3.0	48.7	8.0	0.7	28.4	0.0	0.0	29.0	40.0	-11.0	V	EP		
163.446	3.0	42.6	11.4	1.1	28.2	0.0	0.0	26.8	43.5	-16.7	V	EP		
399.975	3.0	47.5	14.9	1.8	28.1	0.0	0.0	36.1	46.0	-9.9	V	EP		
480.019	3.0	43.5	16.4	2.0	27.9	0.0	0.0	34.0	46.0	-12.0	V	EP		
560.062	3.0	45.0	17.7	2.2	27.6	0.0	0.0	37.3	46.0	-8.7	V	EP		
639.985	3.0	36.4	18.9	2.3	27.4	0.0	0.0	30.2	46.0	-15.8	V	EP		
834.873	3.0	41.1	21.3	2.7	27.6	0.0	0.0	37.5	46.0	-8.5	V	EP		
79.322	3.0	48.3	7.4	0.8	28.3	0.0	0.0	28.1	40.0	-11.9	H	EP		
163.205	3.0	49.9	11.4	1.1	28.2	0.0	0.0	34.2	43.5	-9.3	H	EP		
221.168	3.0	48.7	11.9	1.3	28.2	0.0	0.0	33.7	46.0	-12.3	H	EP		
399.975	3.0	52.7	14.9	1.8	28.1	0.0	0.0	41.4	46.0	-4.6	H	EP		
560.062	3.0	46.4	17.7	2.2	27.6	0.0	0.0	38.6	46.0	-7.4	H	EP		
629.305	3.0	41.1	18.8	2.3	27.4	0.0	0.0	34.7	46.0	-11.3	H	EP		

Rev. 1.27.09

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

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

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

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

ANSI C63.4

RESULTS

6 WORST EMISSIONS

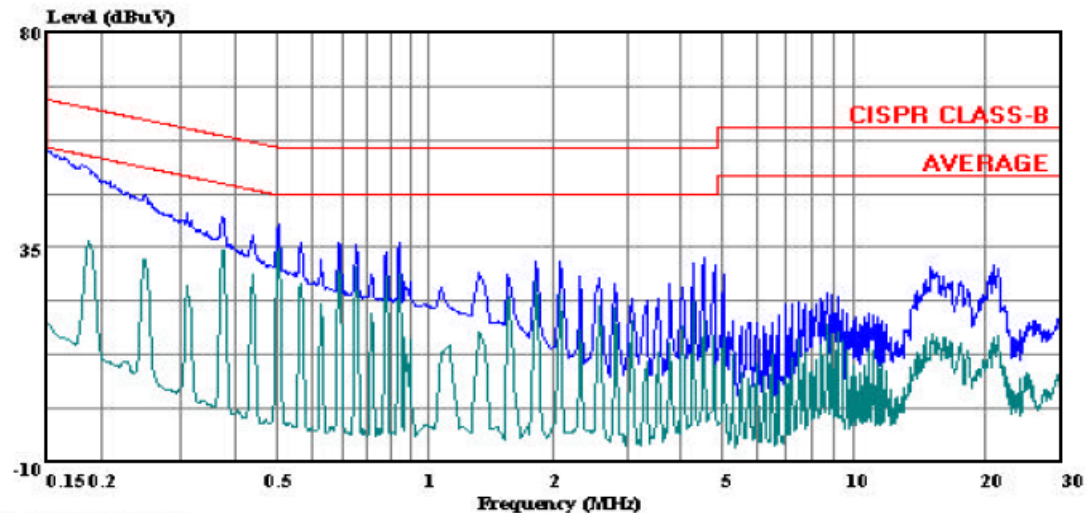
CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	FCC_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.19	51.45	--	36.26	0.00	64.17	54.17	-12.72	-17.91	L1
0.38	41.40	--	3.40	0.00	58.35	48.35	-16.95	-44.95	L1
0.50	39.91	--	36.03	0.00	56.02	46.02	-16.11	-9.99	L1
0.19	52.28	--	35.83	0.00	64.17	54.17	-11.89	-18.34	L2
0.50	37.89	--	34.48	0.00	56.02	46.02	-18.13	-11.54	L2
0.94	35.12	--	33.02	0.00	56.00	46.00	-20.88	-12.98	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#: 14 File#: 09U12610.EMI Date: 08-01-2009 Time: 10:41:49



(Line Conduction)

Trace: 12

Ref Trace:

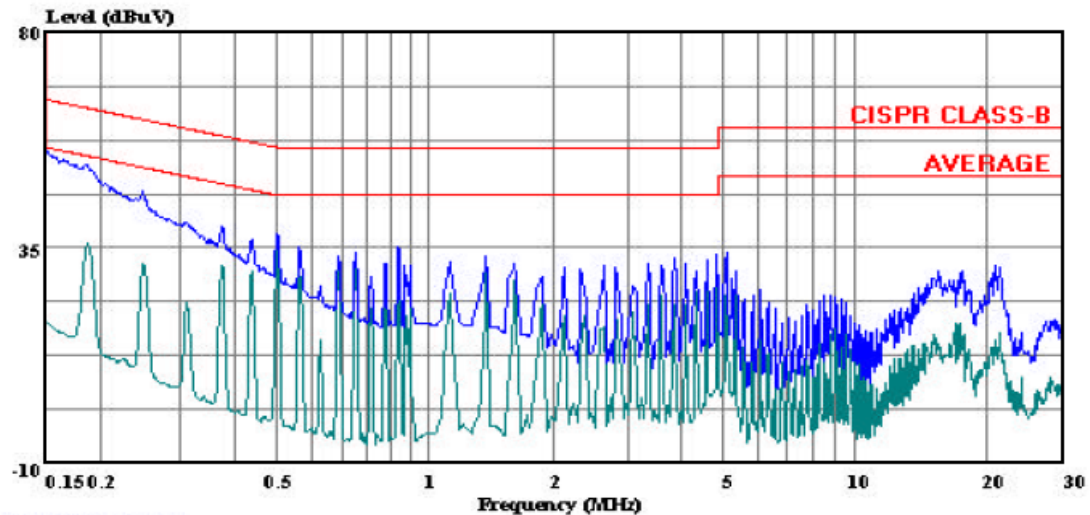
Condition: CISPR CLASS-B
Test Operator: : Devin Chang
Project #: : 09U12610
Company: : Microsoft
EUT Description: : EUT with Laptop
Mode: : Tx mode
Target: : FCC Class B
Voltage: : 115VAC/60Hz
: L1: Peak (Blue) , Average (Green)

LINE 2 RESULTS



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

Data#: 7 File#: 09U12610.EMI Date: 08-01-2009 Time: 10:19:13



(Line Conduction)

Trace: 5

Ref Trace:

Condition: CISPR CLASS-B
Test Operator: : Devin Chang
Project #: : 09U12610
Company: : Microsoft
EUT Description: : EUT with Laptop
Mode: : Tx mode
Target: : FCC Class B
Voltage: : 115VAC/60Hz
: L2: Peak (Blue) , Average (Green)

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	1.585 $f^{0.5}$	0.0042 $f^{0.5}$	$f/150$	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	616 000 / $f^{1.2}$
150 000–300 000	0.158 $f^{0.5}$	4.21 x 10 ⁻⁴ $f^{0.5}$	6.67 x 10 ⁻⁵ f	616 000 / $f^{1.2}$

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

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

EQUATIONS

Power density is given by:

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

where

S = Power density in W/m²

EIRP = Equivalent Isotropic Radiated Power in W

D = Separation distance in m

Power density in units of W/m² is converted to units of mW/cm² by dividing by 10.

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

LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm²

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m²

RESULTS

Band	Mode	Separation Distance (m)	Output Power (dBm)	Antenna Gain (dBi)	IC Power Density (W/m^2)	FCC Power Density (mW/cm^2)
2.4 GHz	b mode	0.20	18.17	5.01	0.41	0.041
2.4 GHz	g mode	0.20	24.43	5.01	1.75	0.175
2.4 GHz	HT20	0.20	24.78	2.00	0.95	0.095
2.4 GHz	HT40	0.20	24.81	2.00	0.95	0.095
5 GHz	a mode	0.20	23.49	3.60	1.02	0.102
5 GHz	HT20	0.20	23.52	3.60	1.03	0.103
5 GHz	HT40	0.20	23.51	3.60	1.02	0.102