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

CERTIFICATION TEST REPORT

FOR

802.11n 2X2 PCIe MINICARD, add Panasonic Laptop PC CF-31

MODEL NUMBER: WL11E

FCC ID: ACJ9TGWL11E

REPORT NUMBER: 11J13902-1

ISSUE DATE: AUGUST 15, 2011

Prepared for
PANASONIC CORPORATION OF NORTH AMERICA
ONE PANASONIC WAY, 4B-8
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	08/15/11	Initial Issue	F. Ibrahim

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: PANASONIC CORPORATION OF NORTH AMERICA
ONE PANASONIC WAY, 4B-8
SECAUCUS, NEW JERSEY 07094, U.S.A.

EUT DESCRIPTION: 802.11n 2x2 PCIe MINICARD, with Panasonic Laptop PC CF-31

MODEL: WL11E

SERIAL NUMBER: Not Available

DATE TESTED: JULY 13 – 18, 2011

CHAINPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

Compliance Certification Services (UL 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 UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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

Approved & Released For UL CCS By:

FRANK IBRAHIM
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:

WILLIAM ZHUANG
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

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

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

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 802.11n 2x2 PCIe MINICARD, with Panasonic Laptop PC CF-31.

5.2. MAXIMUM OUTPUT POWER

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

Frequency Range (MHz)	Mode	Total Output Power (dBm)	Total Output Power (mW)
2412 – 2462	802.11b	23.81	240.44
2412 – 2462	802.11g	29.42	874.98
2412 – 2462	802.11n HT20	27.71	590.20
2422 – 2452	802.11n HT40	28.01	632.41

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes 3 IFA integrated antennas, with the following peak gains:

Frequency Range (MHz)	Chain 1 Peak gain dBi	Chain 2 Peak gain dBi
2.4 - 2483.5	-0.07	0.53

5.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was ART Revision 0.9 Built #34 Art_11n

5.5. WORST-CASE CONFIGURATION AND MODE

For Radiated Emissions and Power line Conducted Emissions, the channel with the highest conducted output power was selected.

Worst-case data rates as provided by the manufacturer are:
For 11b mode: 1Mbps
For 11g mode: 6Mbps
For 11n HT20 (2.4 GHz band): MCS0
For 11n HT40 (2.4 GHz band): MCS0

EUT only has one orientation (laid down on the desktop) and it was tested in that orientation.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop	PANASONIC	CF-31	1FTSA00171	DoC
AC Adapter	PANASONIC	CF-AA5713AM1	5713AM110Z12696A	DoC

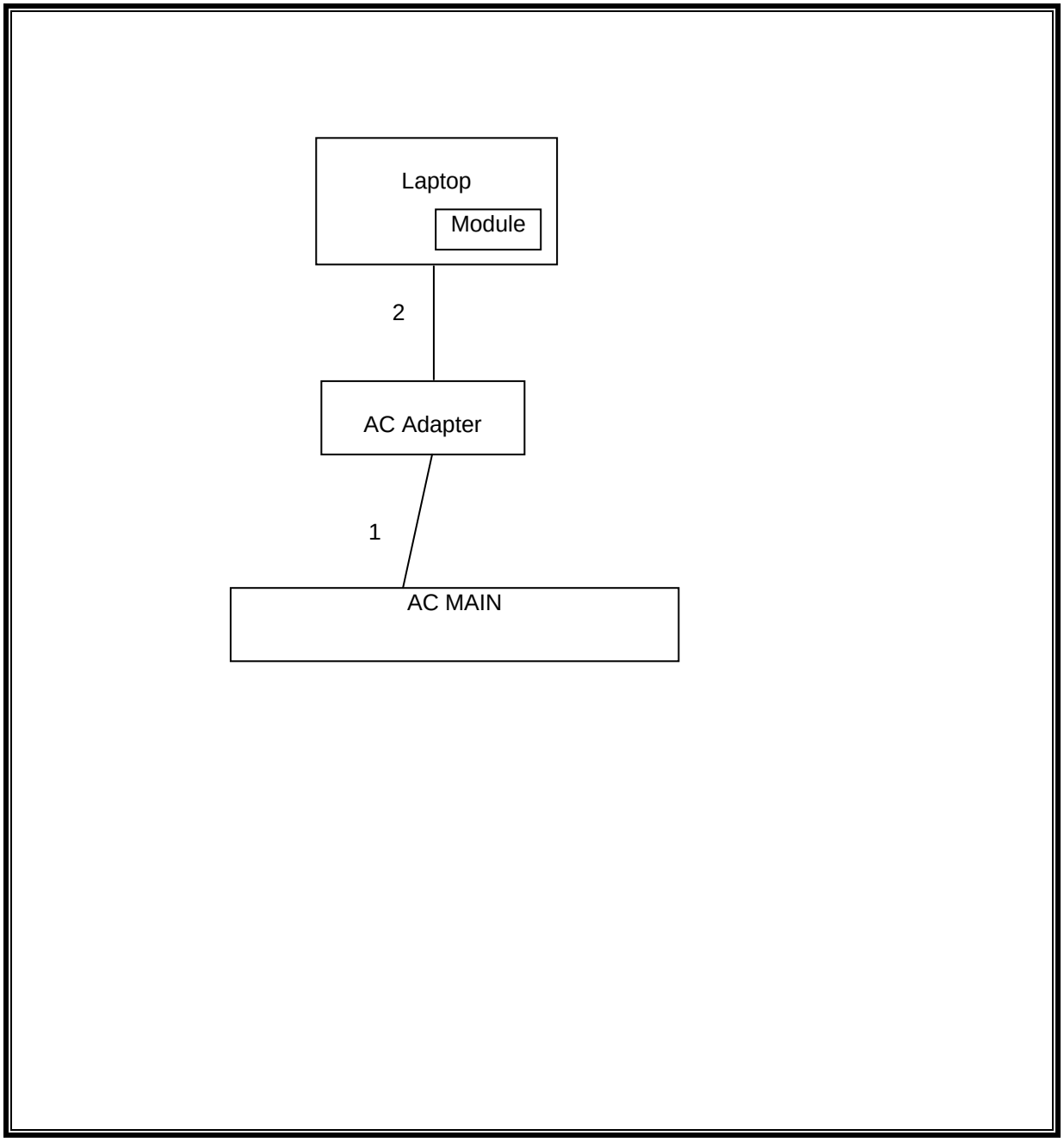
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	AC	Un-Sheilded	180 cm	N/A
2	DC	1	DC	Un-Sheilded	180 cm	N/A

TEST SETUP

The EUT is installed in a host Laptop computer during the tests. Test software exercised the radio card. Laptop computer was used to configure the EUT to continuously transmit at a specified output power or continuously receive on the channel specified in the test data. For transmit modes the worst case was evaluated.

SETUP DIAGRAM FOR RADIO 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	C01052	07/14/12
Antenna, Horn, 18 GHz	EMCO	3115	C00945	06/29/12
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	01/27/12
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01016	07/12/12
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	05/06/12
Reject Filter, 2.0-2.9 GHz	Micro-Tronics	BRM50702	N02684	CNR
High Pass Filter, 7.6 GHz	Micro-Tronics	HPM13195	N02682	CNR
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01159	05/08/12
Peak Power Meter	Boonton	4541	C01186	03/01/12
Peak Power Sensor	Boonton	57318	C01202	02/23/12
Reject Filter, 5.725-5.825 GHz	Micro-Tronics	BRC13192	N02676	CNR
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRM50702	N02685	CNR
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	11/10/11

7. ANTENNA PORT TEST RESULTS

7.1. 802.11b TWO CHAINS 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.

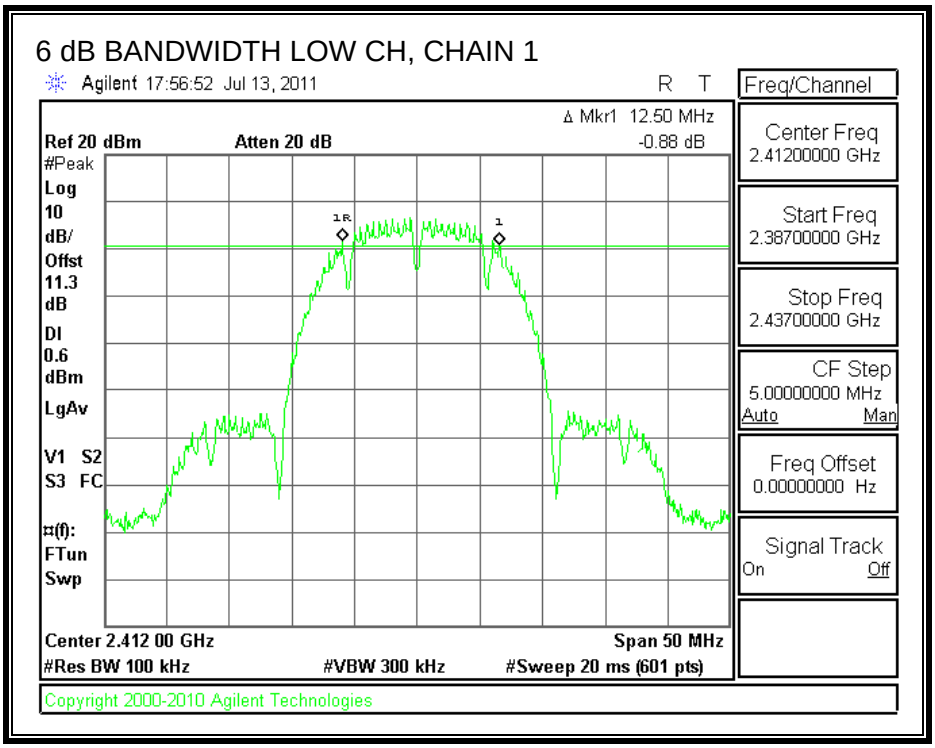
TEST PROCEDURE

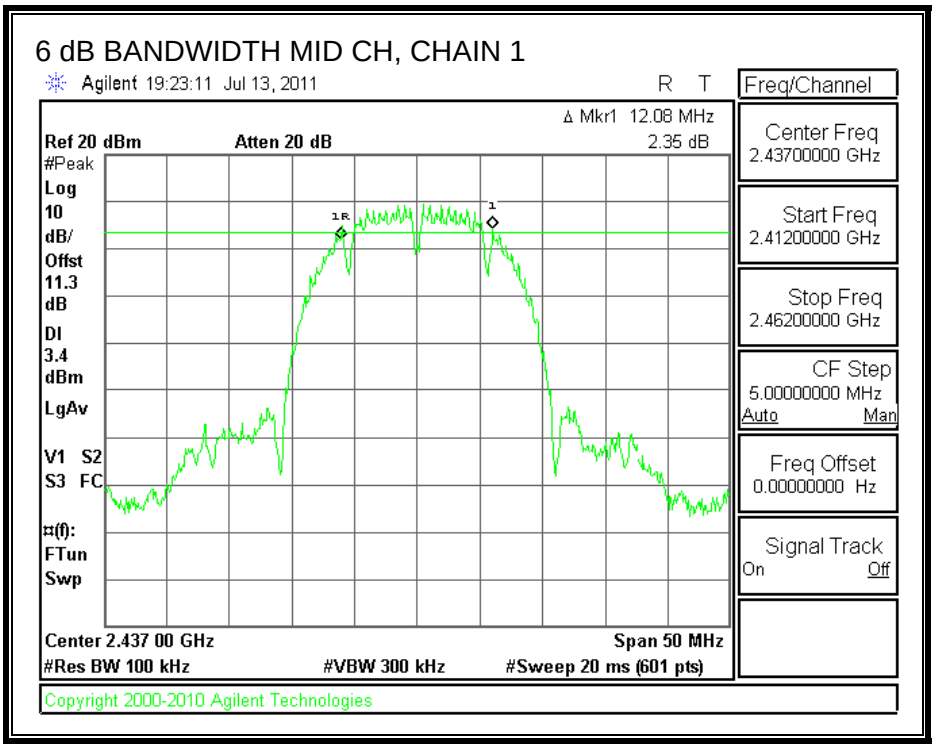
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

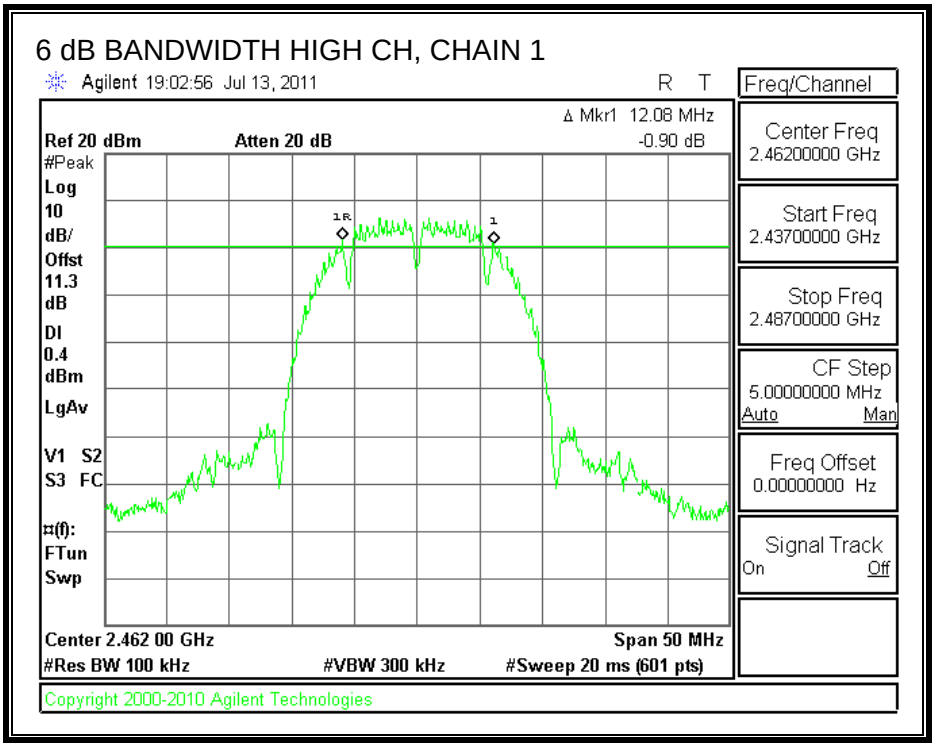
RESULTS

Channel	Frequency (MHz)	Chain 1 6 dB BW (MHz)	Chain 2 6 dB BW (MHz)	Minimum Limit (MHz)
Low	2412	12.50	12.67	0.5
Middle	2437	12.08	11.08	0.5
High	2462	12.08	11.25	0.5

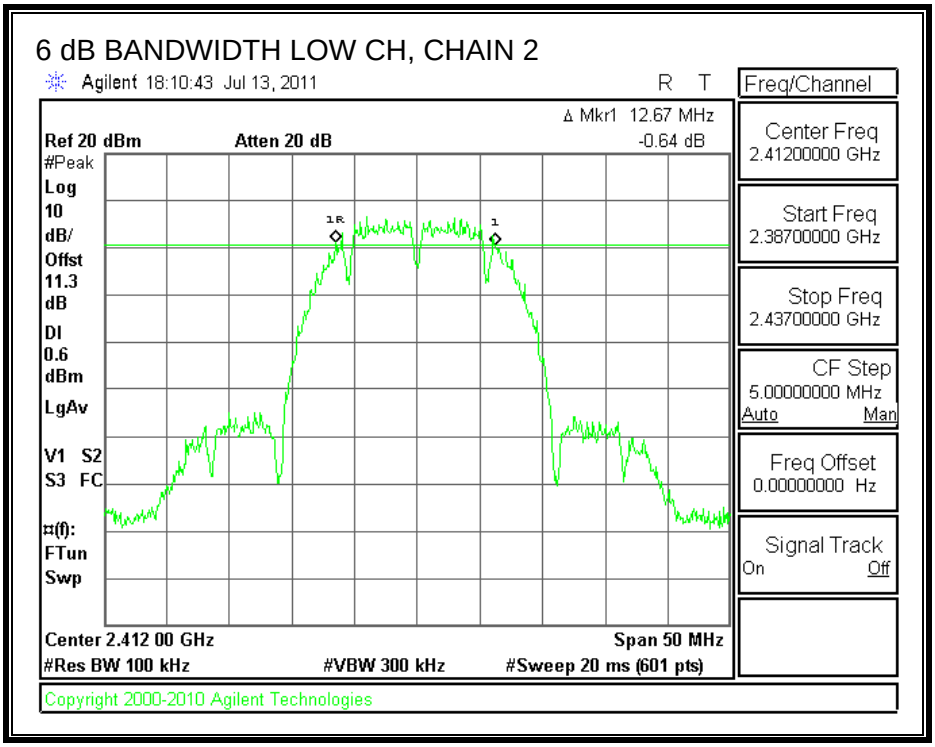
6 dB BANDWIDTH, CHAIN 1



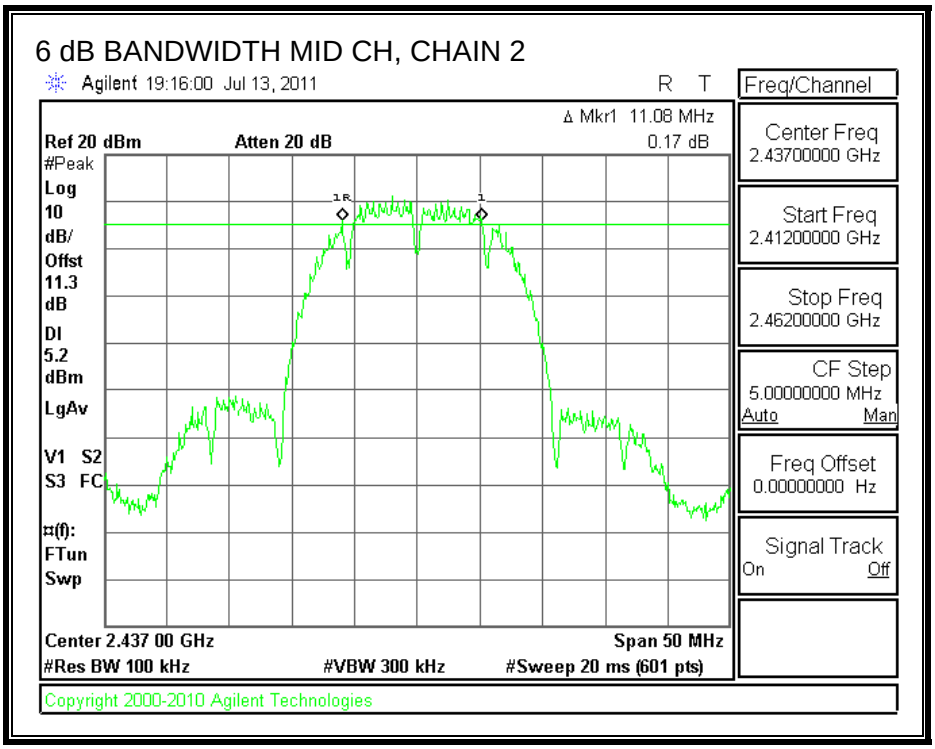




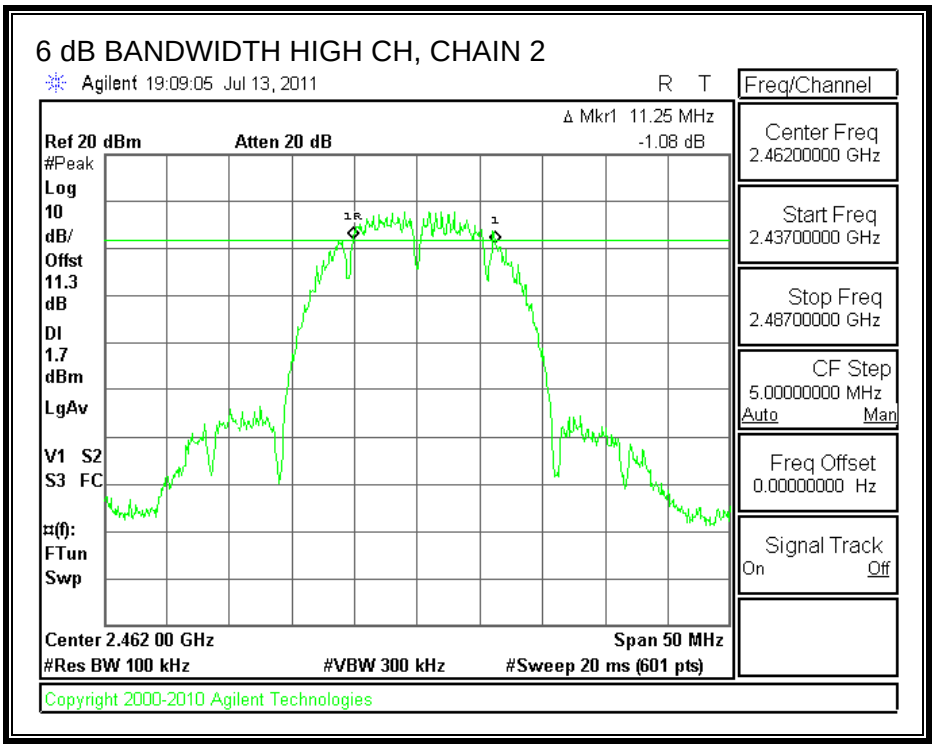
6 dB BANDWIDTH, CHAIN 2



6 dB BANDWIDTH MID CH, CHAIN 2



6 dB BANDWIDTH HIGH CH, CHAIN 2



7.1.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

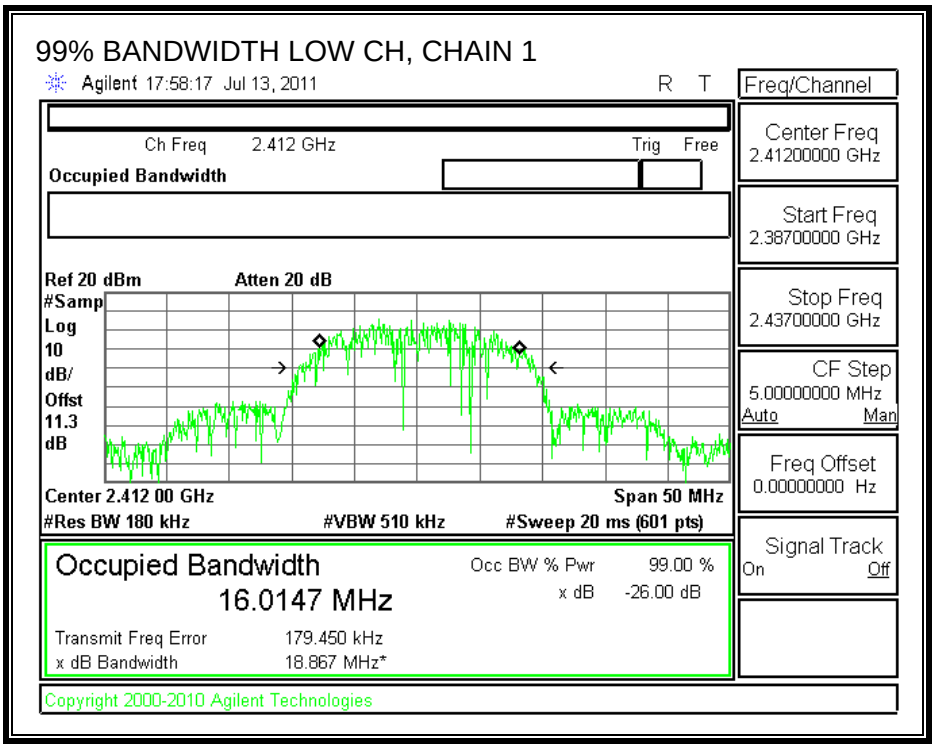
TEST PROCEDURE

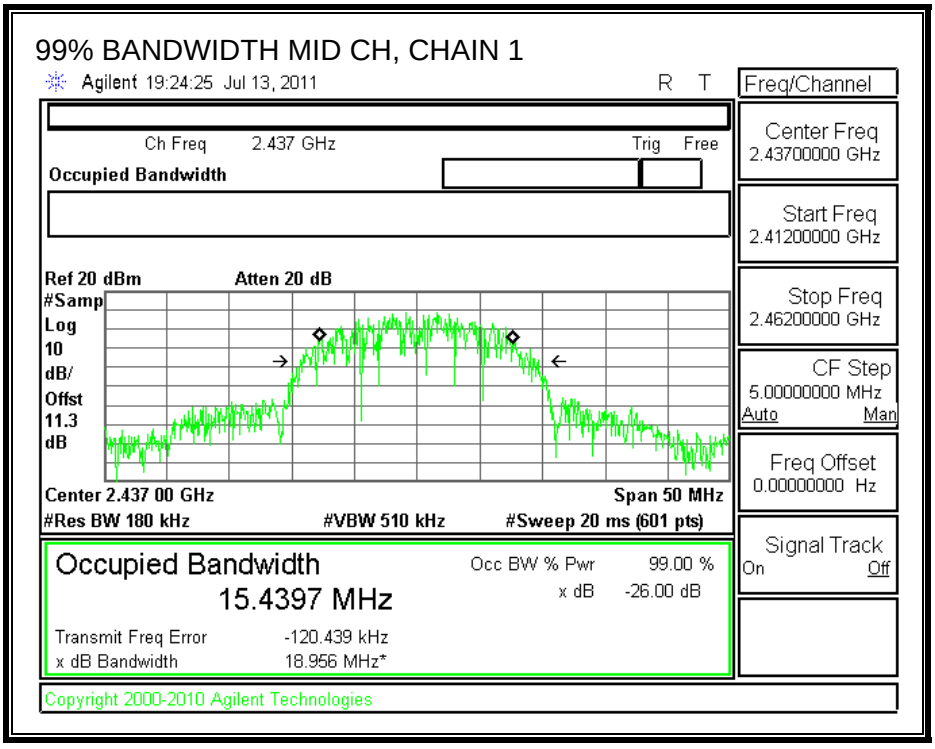
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

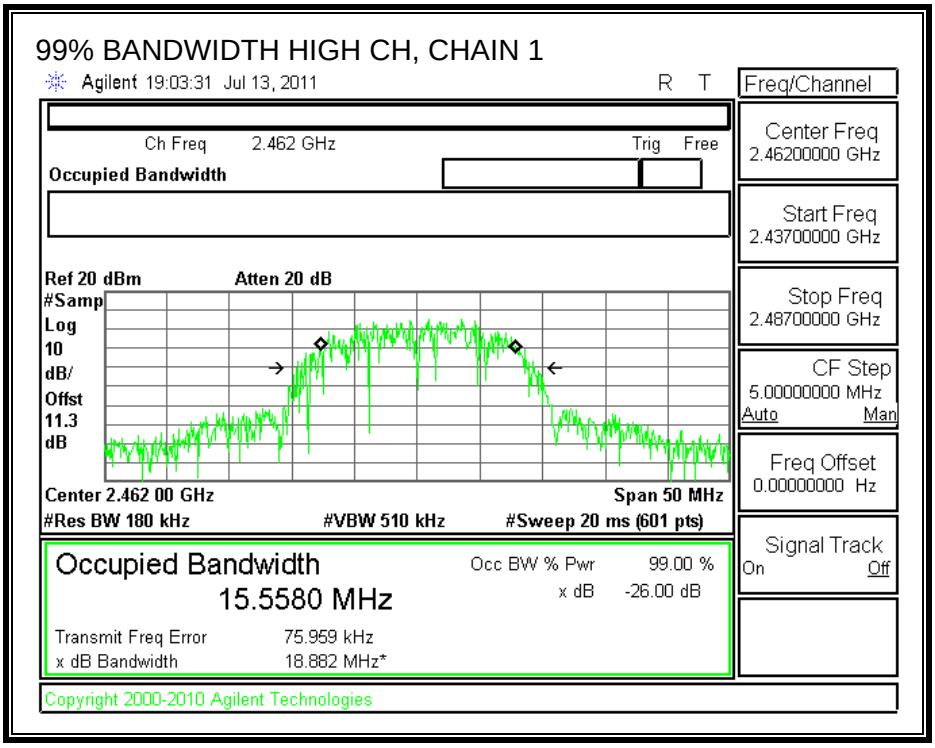
RESULTS

Channel	Frequency (MHz)	Chain 1 99% Bandwidth (MHz)	Chain 2 99% Bandwidth (MHz)
Low	2412	16.0147	15.773
Middle	2437	15.4397	16.2498
High	2462	15.558	15.5378

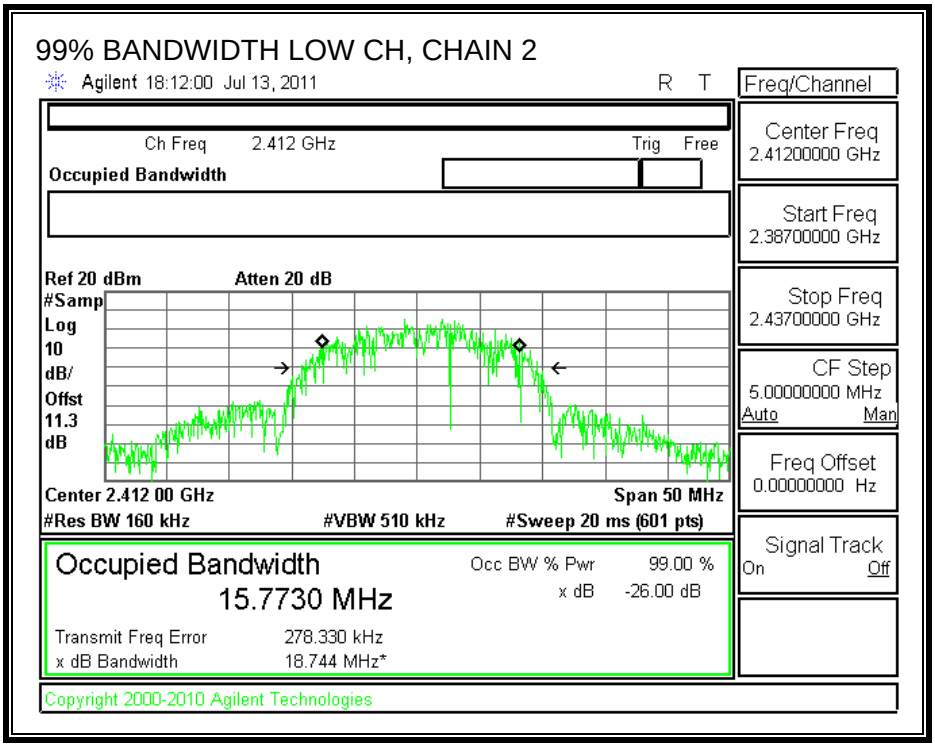
99% BANDWIDTH, CHAIN 1

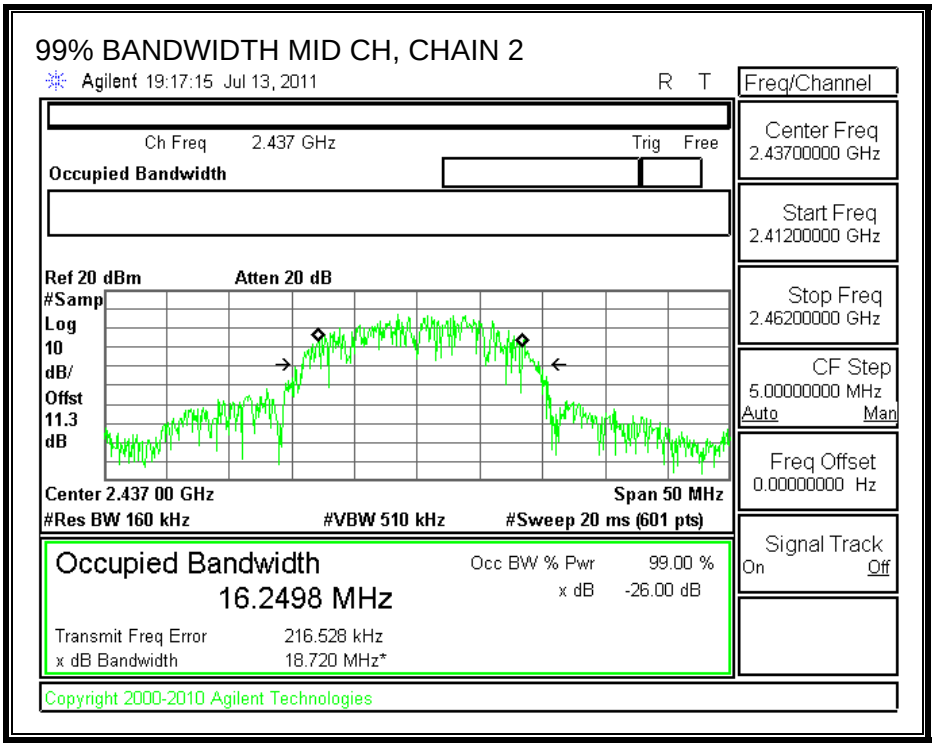


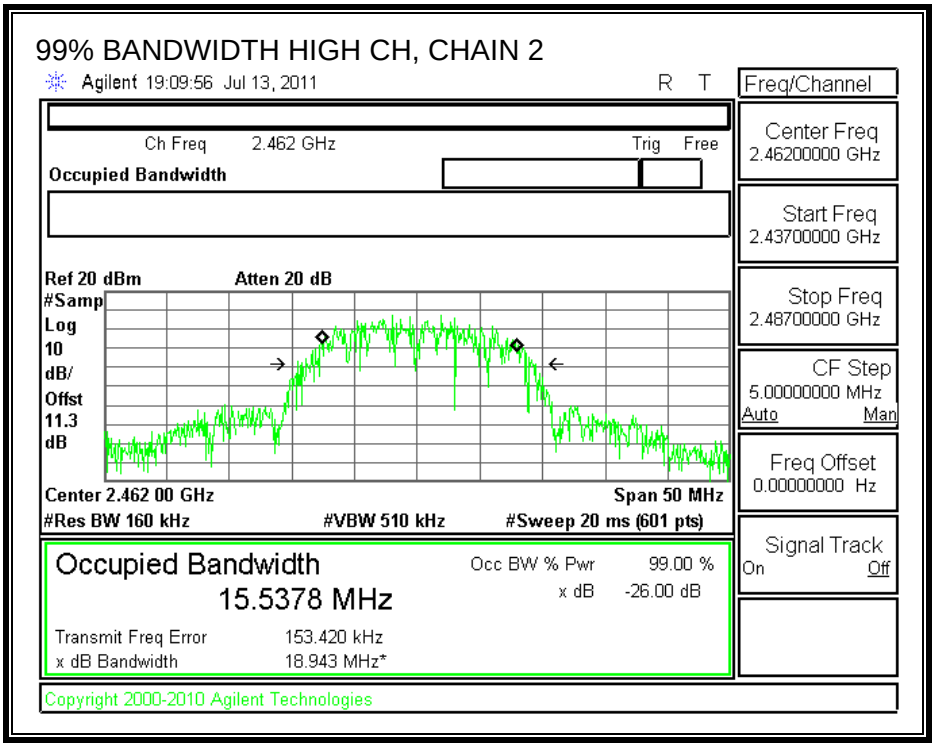




99% BANDWIDTH, CHAIN 2







7.1.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

Antenna Gain (Chain 1) (dBi)	Antenna Gain (Chain 2) (dBi)	Effective Legacy Gain (dBi)
-0.07	0.53	3.25

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

TEST PROCEDURE

Peak power is measured using a wideband peak power meter.

RESULTS

Channel	Frequency (MHz)	Chain 1 PK Power (dBm)	Chain 2 PK Power (dBm)	Attenuator + Cable Offset (dB)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	18.00	18.10	0.00	21.06	30.00	-8.94
Mid	2437	20.80	20.80	0.00	23.81	30.00	-6.19
High	2462	18.10	18.20	0.00	21.16	30.00	-8.84

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 11.3 dB (including 10 dB pad and 1.3 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	16.86	16.93	19.91
Middle	2437	20.01	20.12	23.08
High	2462	16.95	17.24	20.11

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.

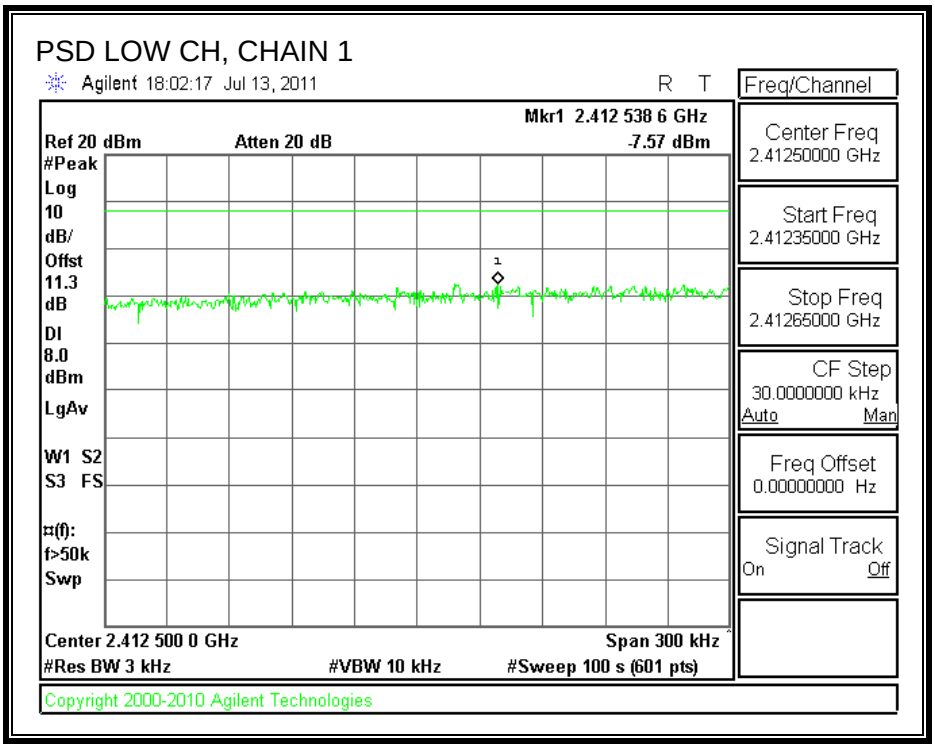
TEST PROCEDURE

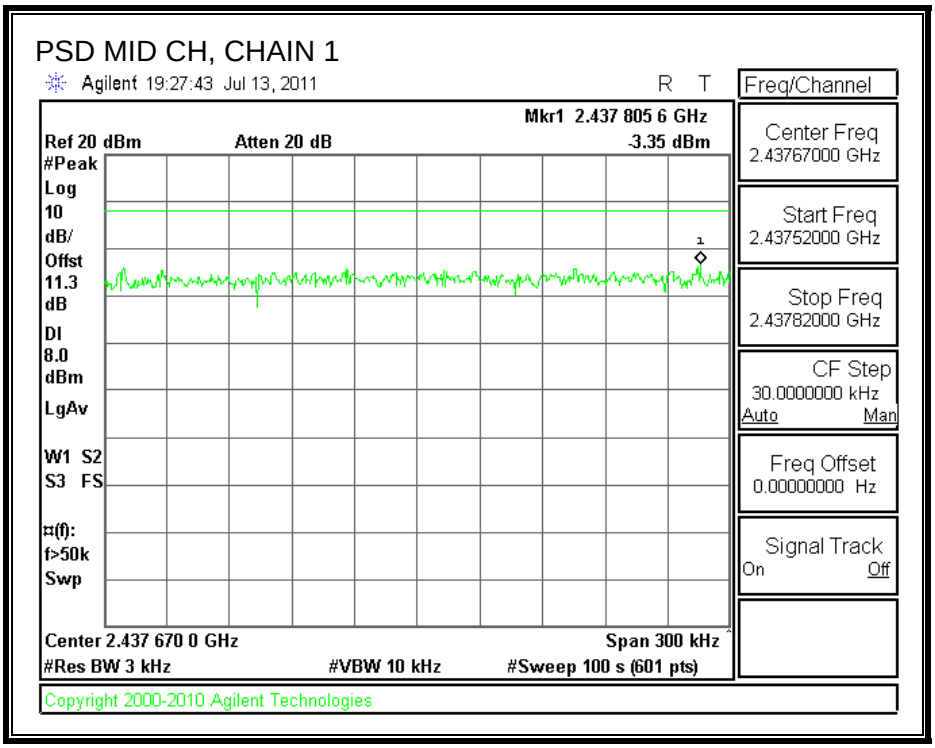
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

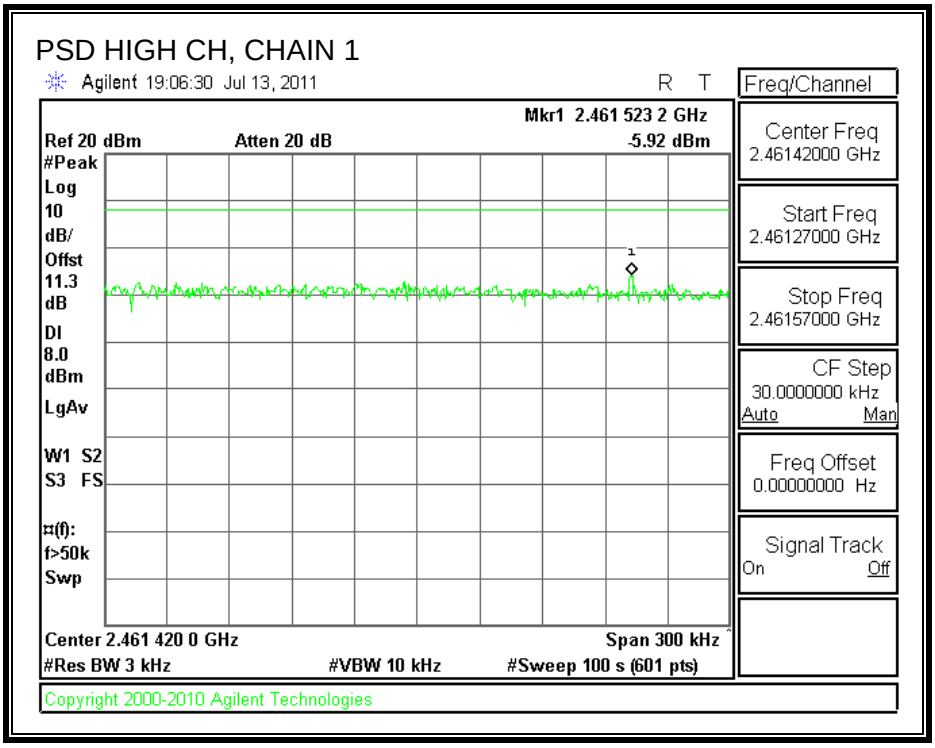
RESULTS

Channel	Frequency (MHz)	Chain 1 PSD (dBm)	Chain 2 PSD (dBm)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-7.57	-5.86	-3.62	8	-11.62
Middle	2437	-3.35	-2.36	0.18	8	-7.82
High	2462	-5.92	-5.12	-2.49	8	-10.49

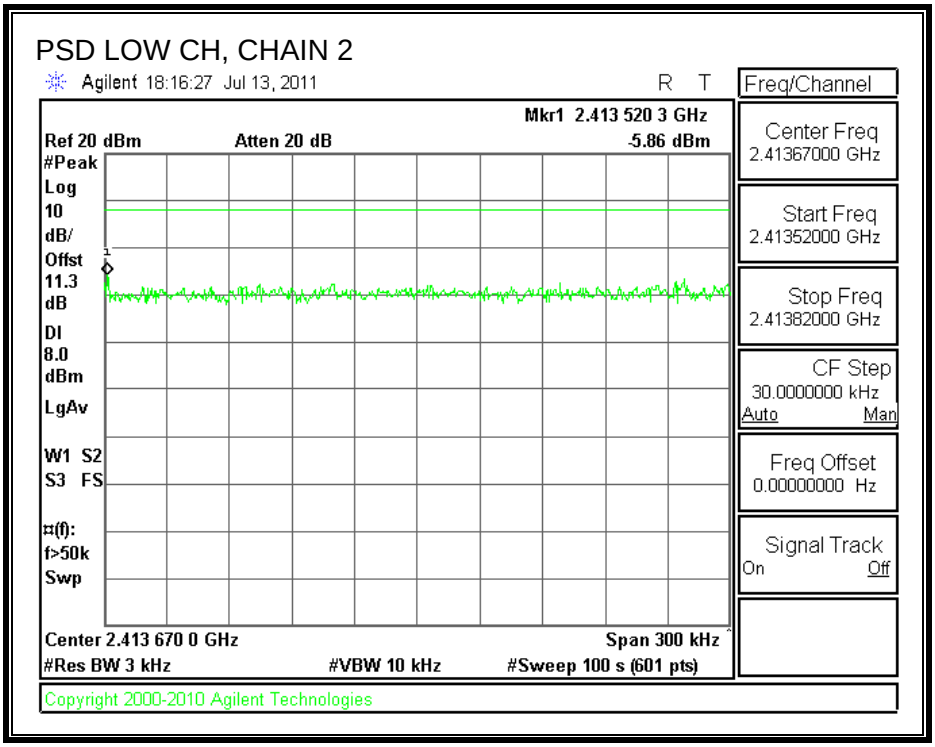
POWER SPECTRAL DENSITY, CHAIN 1



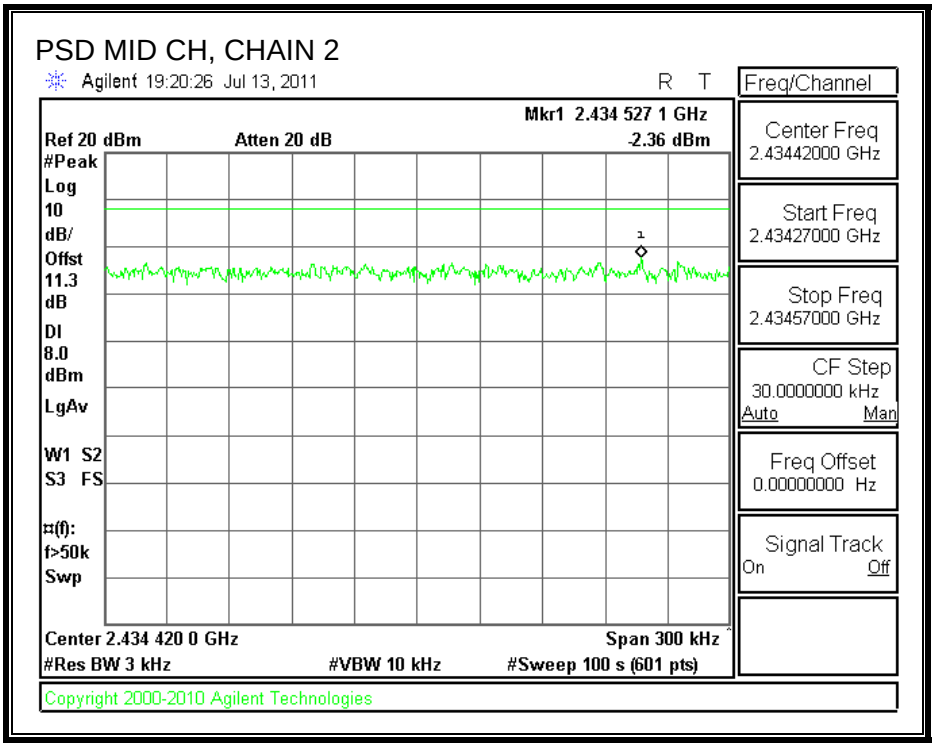




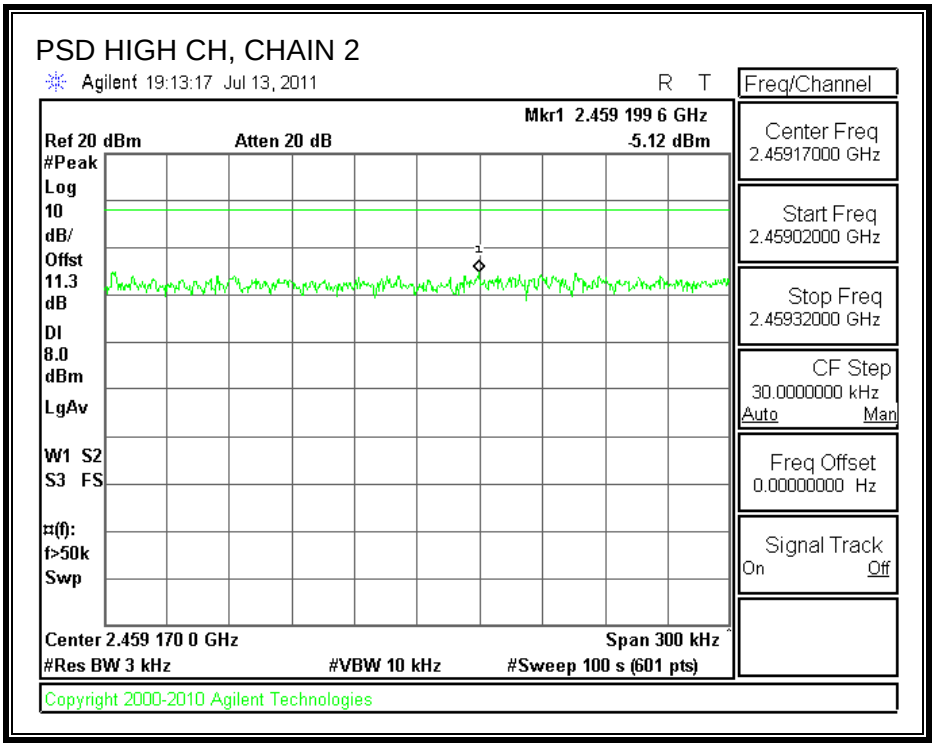
POWER SPECTRAL DENSITY, CHAIN 2



PSD MID CH, CHAIN 2



PSD HIGH CH, CHAIN 2



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.

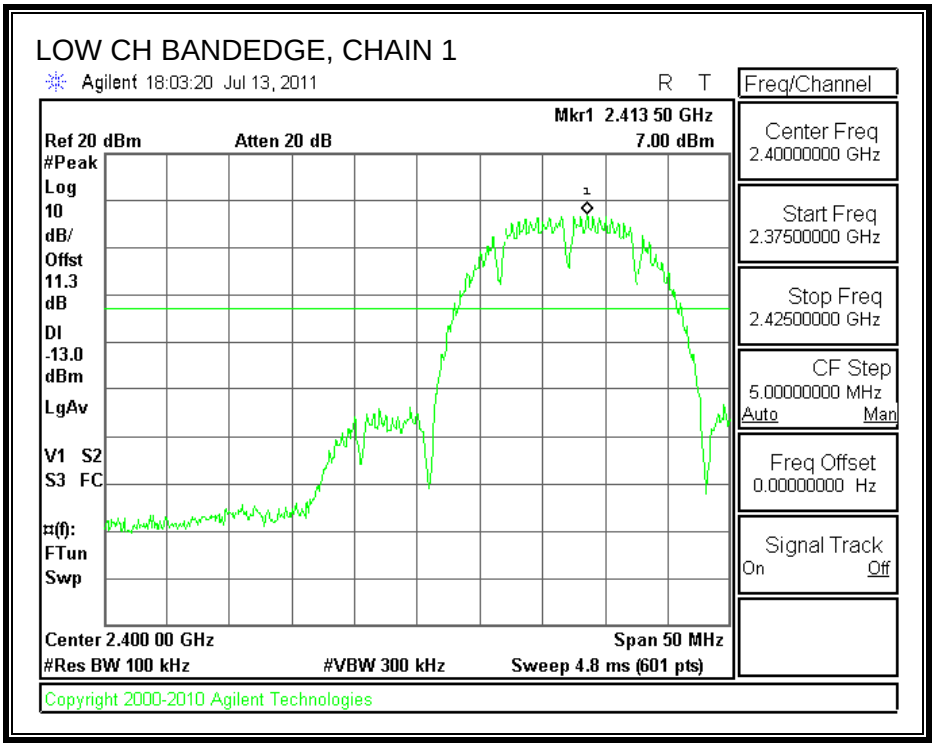
TEST PROCEDURE

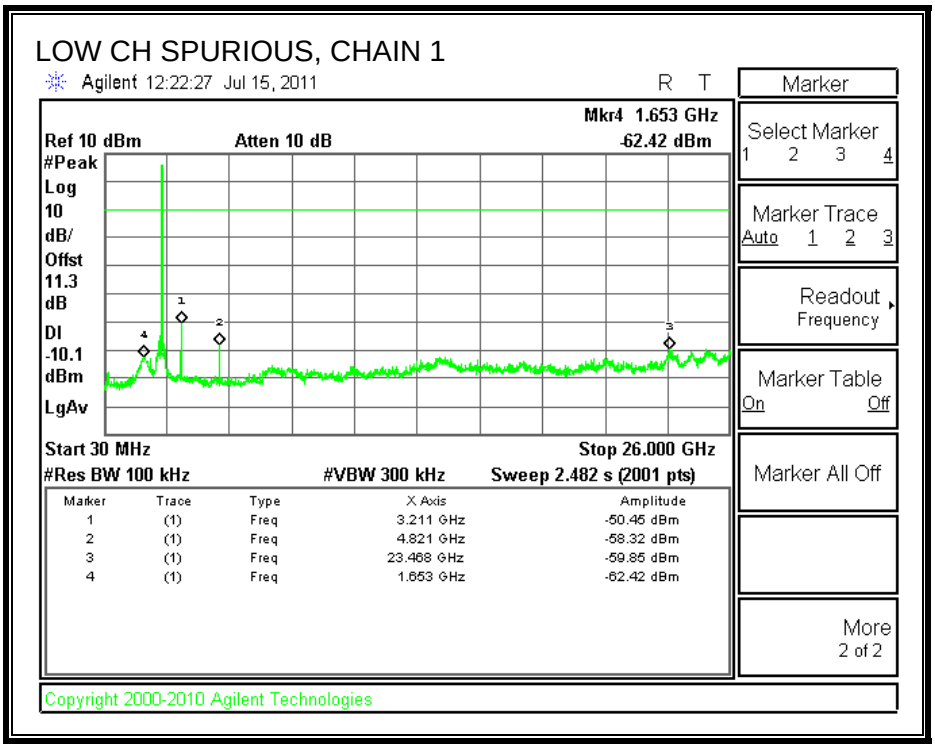
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

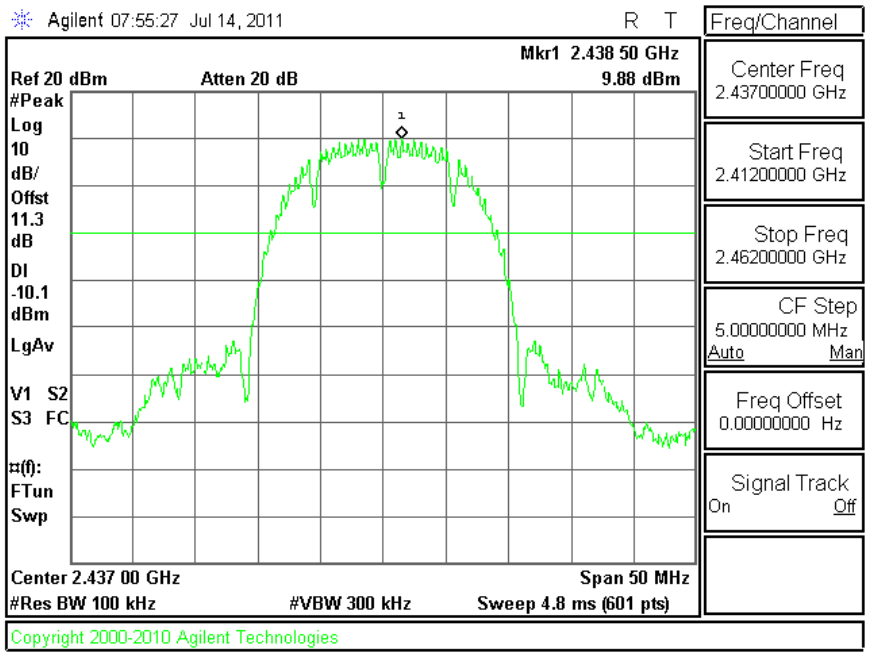
RESULTS

CHAIN 1 SPURIOUS EMISSIONS

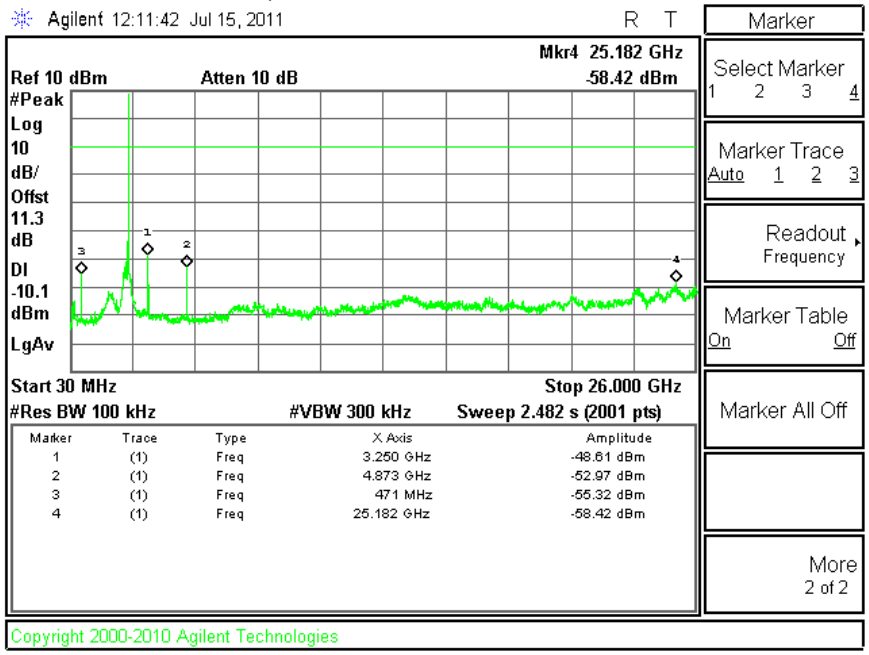




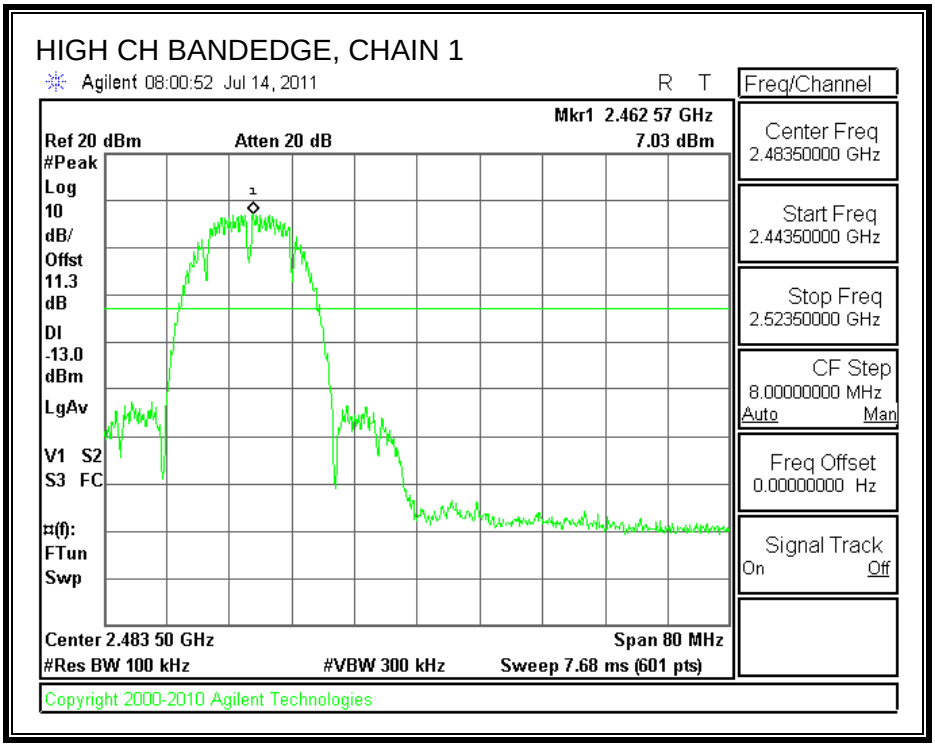
MID CH REFERENCE, CHAIN 1



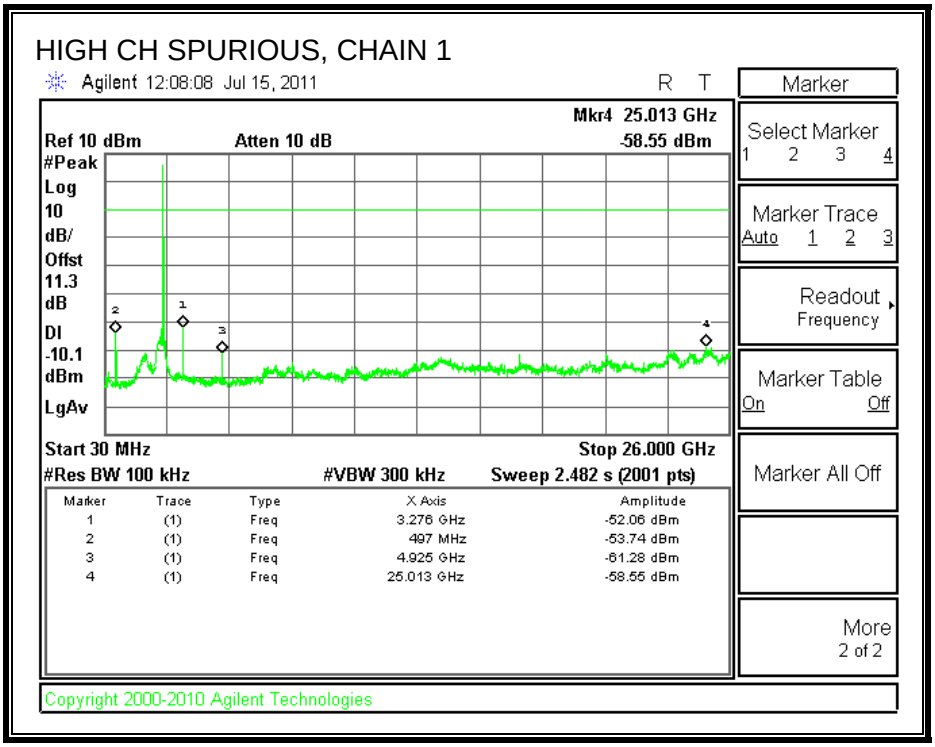
MID CH SPURIOUS, CHAIN 1



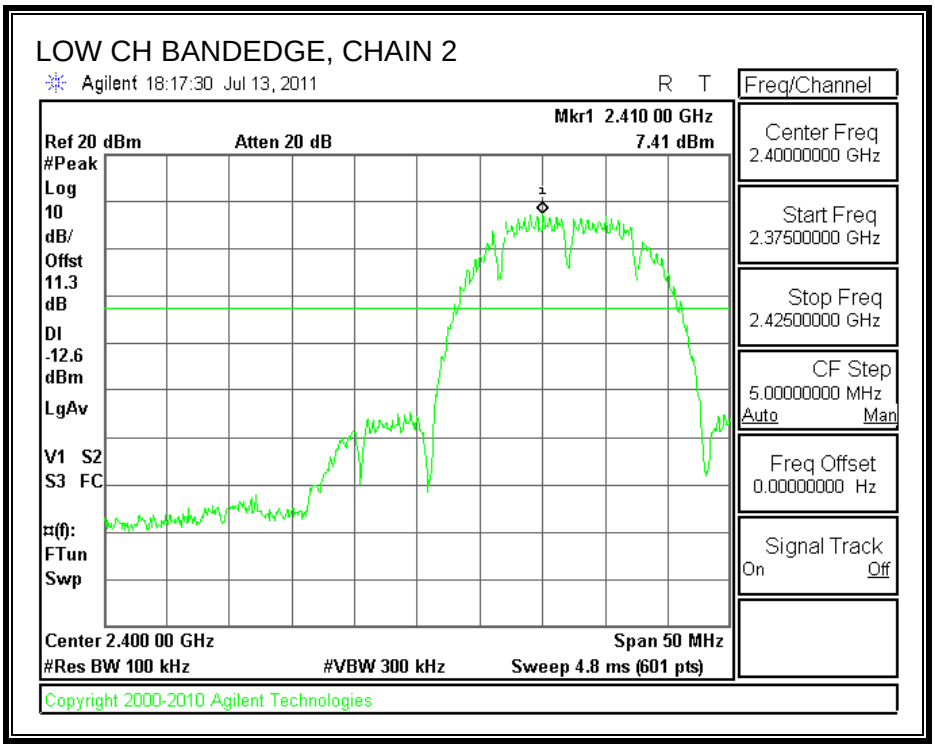
HIGH CH BANDEDGE, CHAIN 1

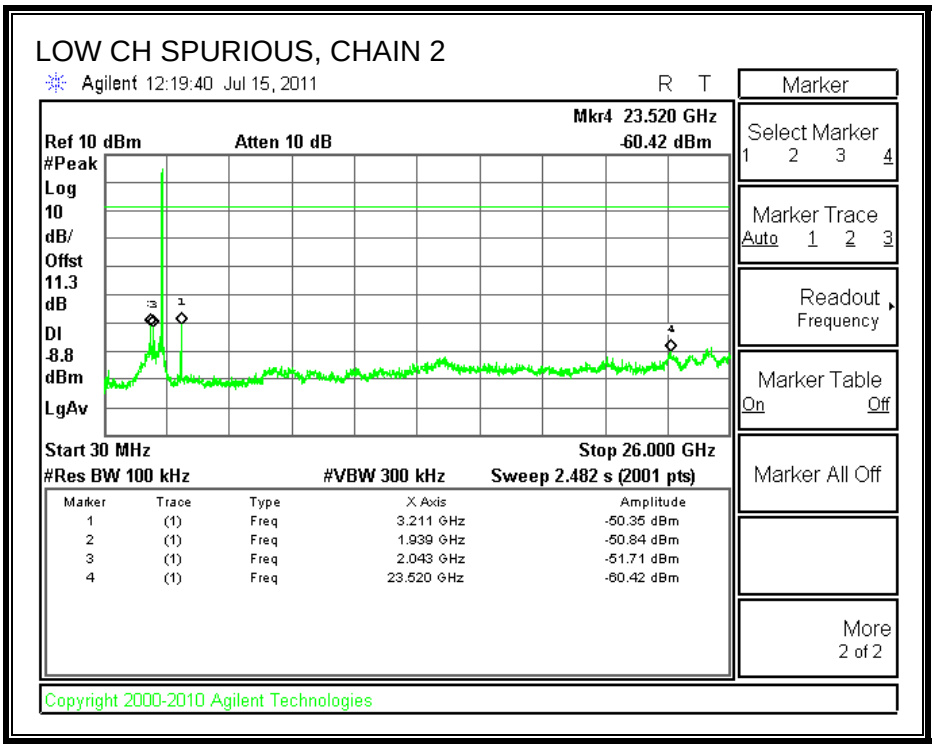


HIGH CH SPURIOUS, CHAIN 1

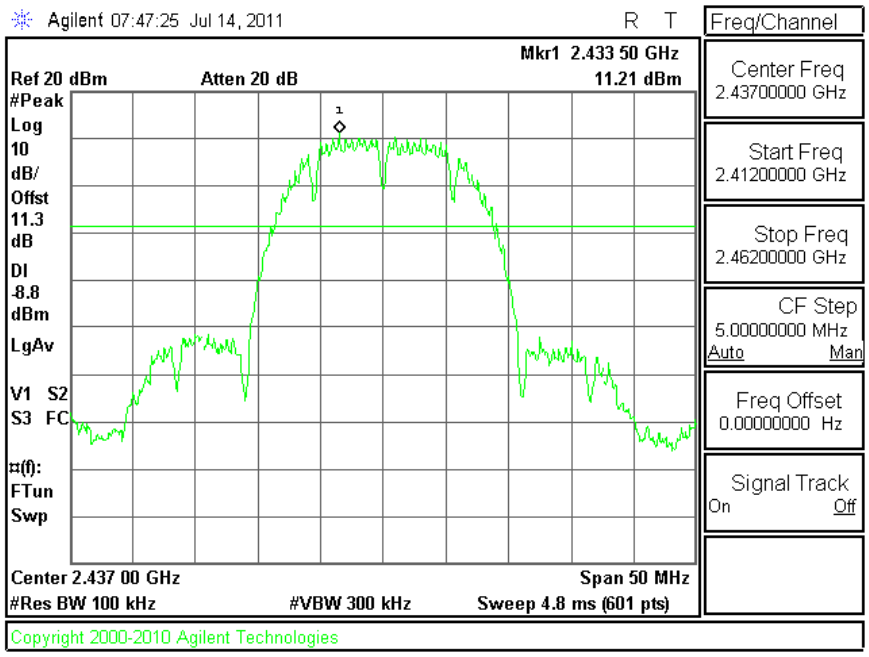


CHAIN 2 SPURIOUS EMISSIONS

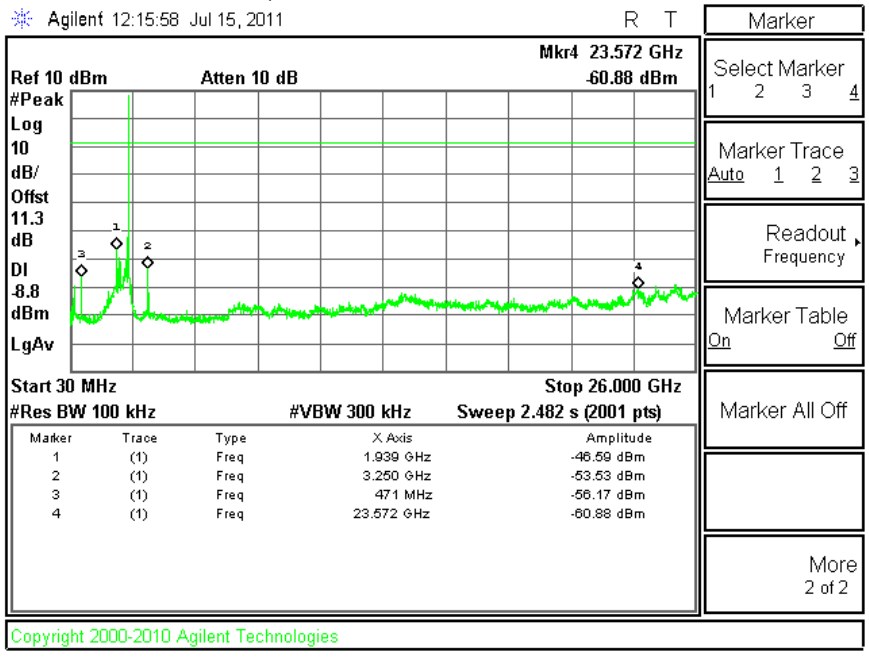




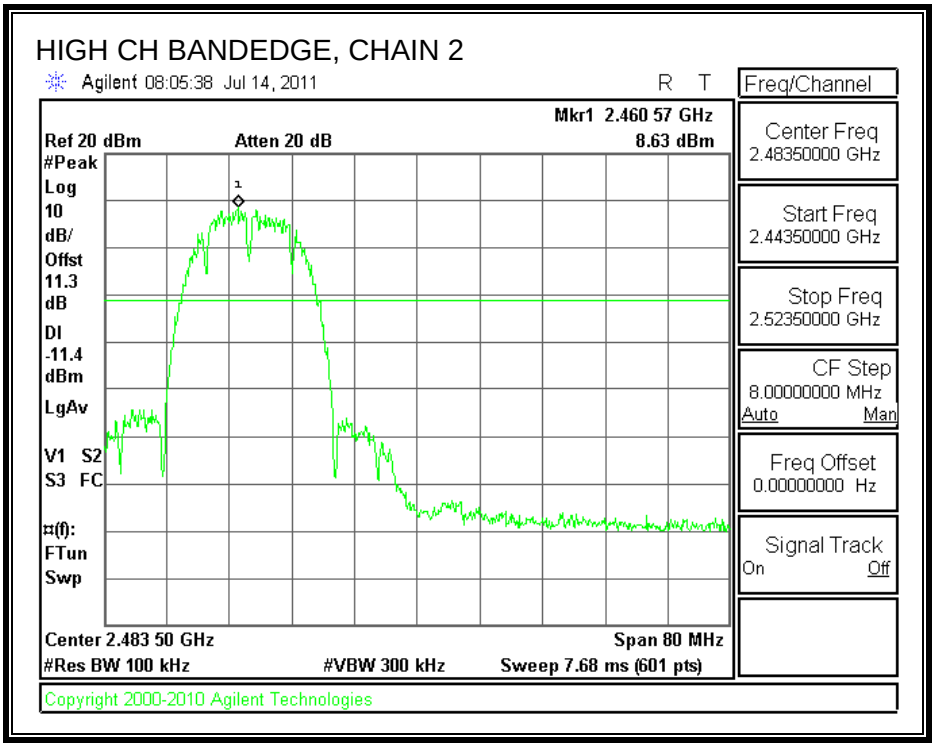
MID CH REFERENCE, CHAIN 2



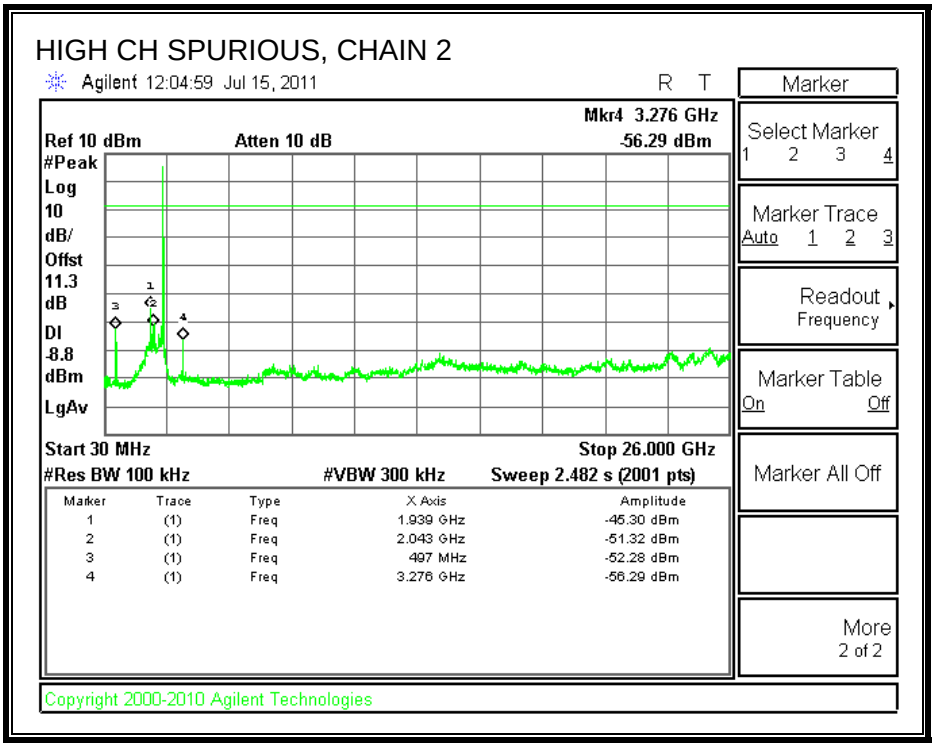
MID CH SPURIOUS, CHAIN 2



HIGH CH BANDEDGE, CHAIN 2



HIGH CH SPURIOUS, CHAIN 2



7.2. 802.11g TWO CHAINS 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.

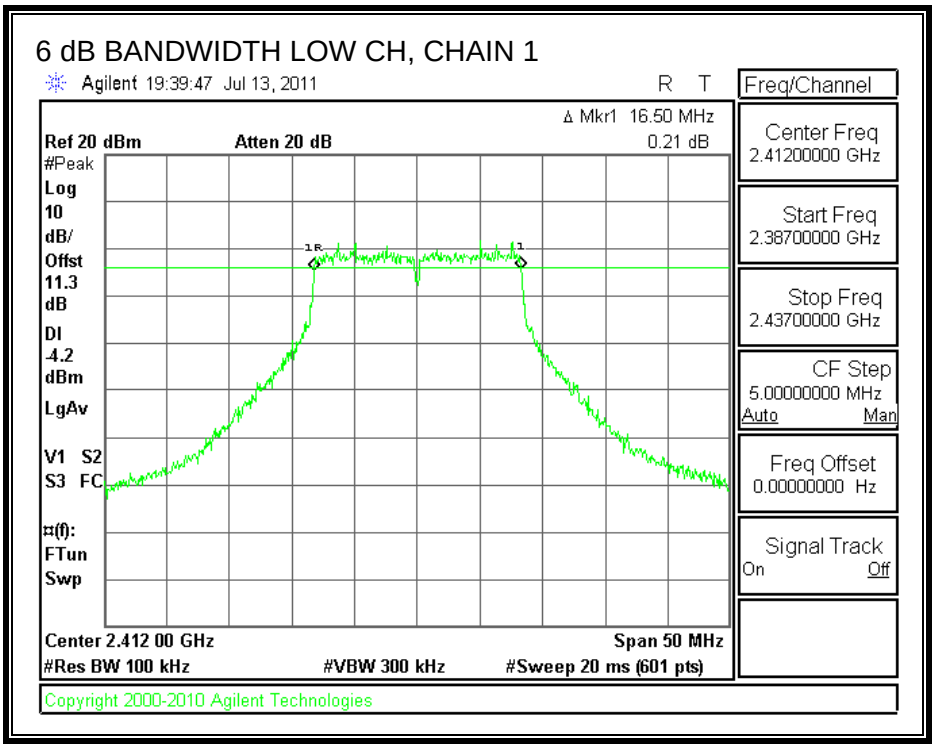
TEST PROCEDURE

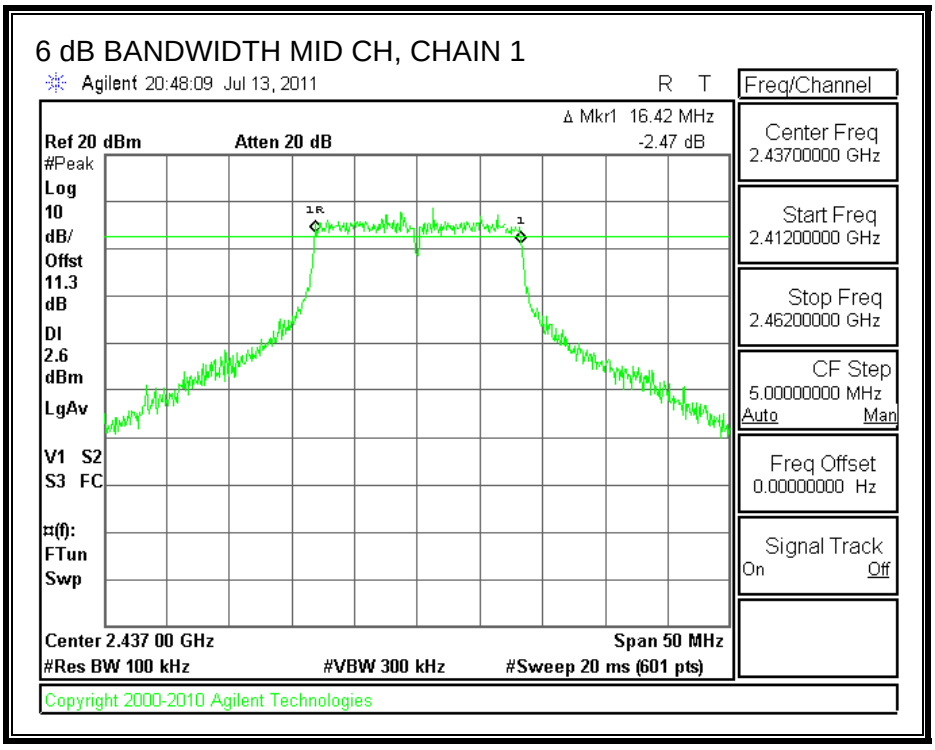
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

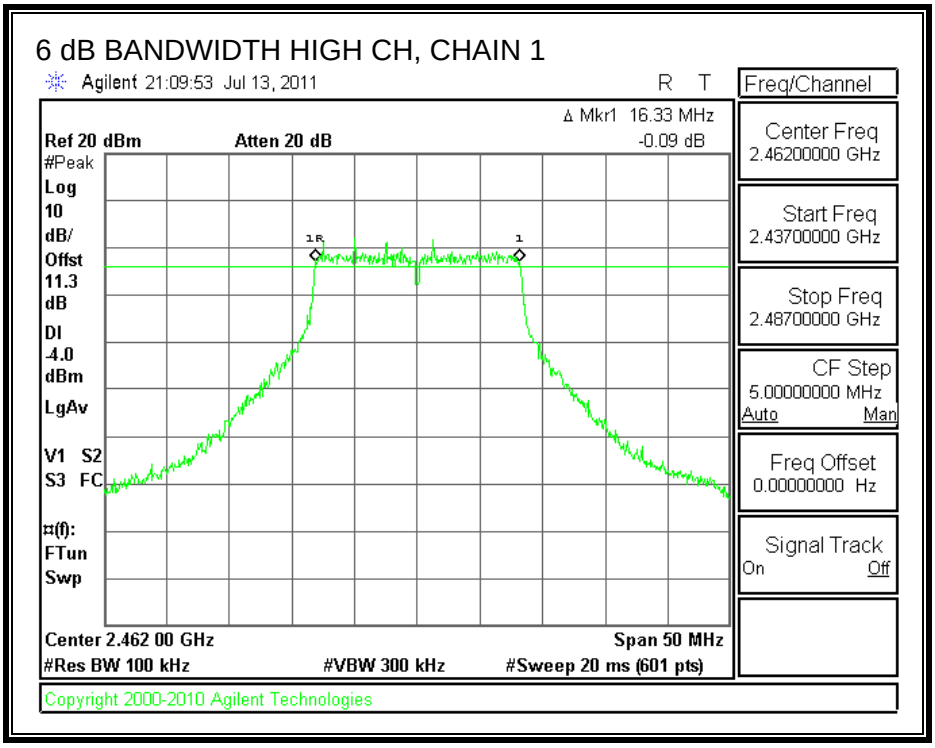
RESULTS

Channel	Frequency (MHz)	Chain 1 6 dB BW (MHz)	Chain 2 6 dB BW (MHz)	Minimum Limit (MHz)
Low	2412	16.50	16.33	0.5
Middle	2437	16.42	16.42	0.5
High	2462	16.33	16.50	0.5

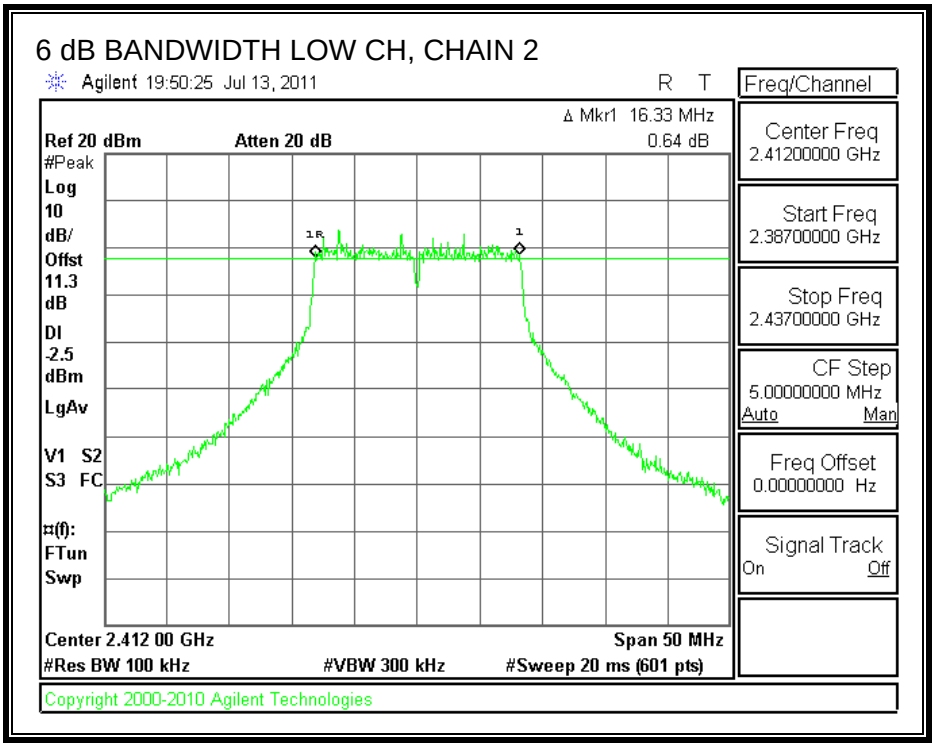
6 dB BANDWIDTH, CHAIN 1



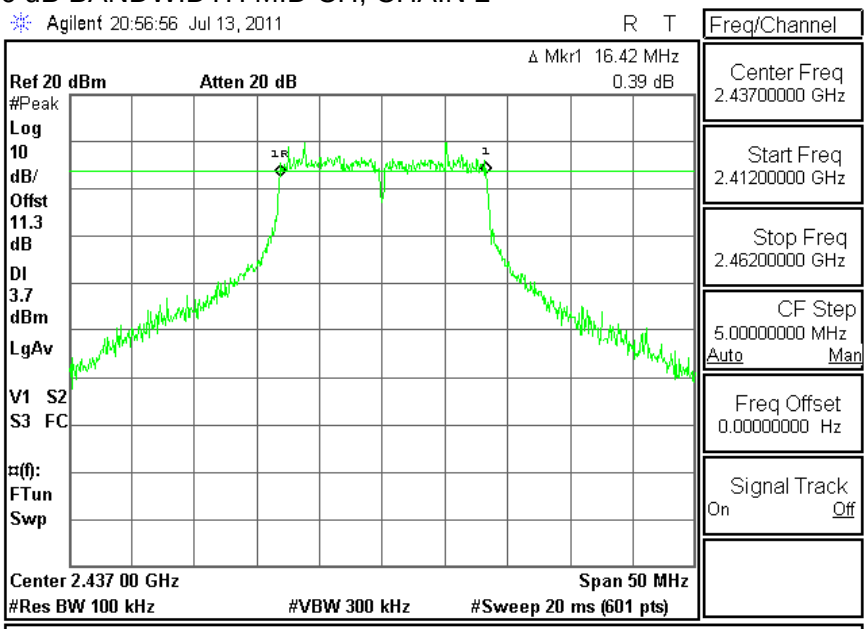




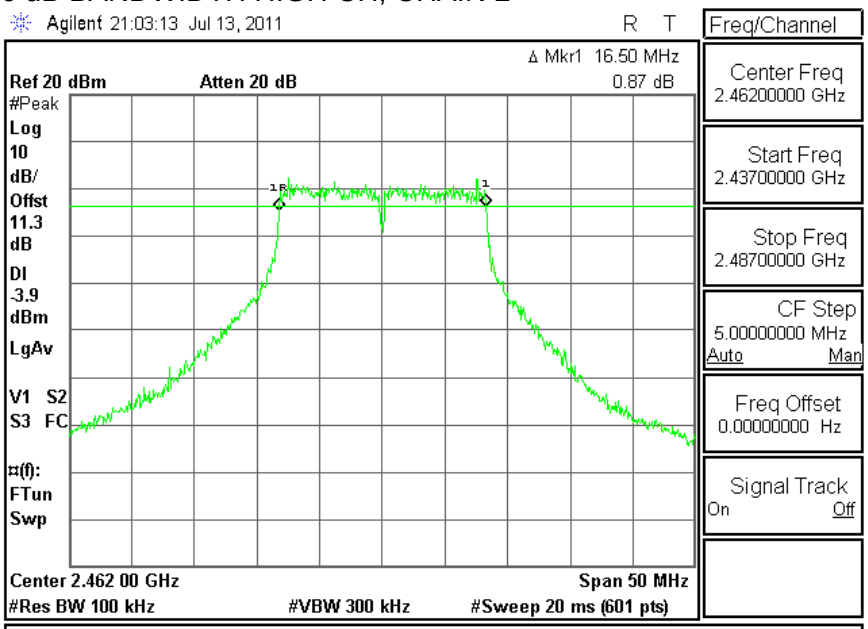
6 dB BANDWIDTH, CHAIN 2



6 dB BANDWIDTH MID CH, CHAIN 2



6 dB BANDWIDTH HIGH CH, CHAIN 2



7.2.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

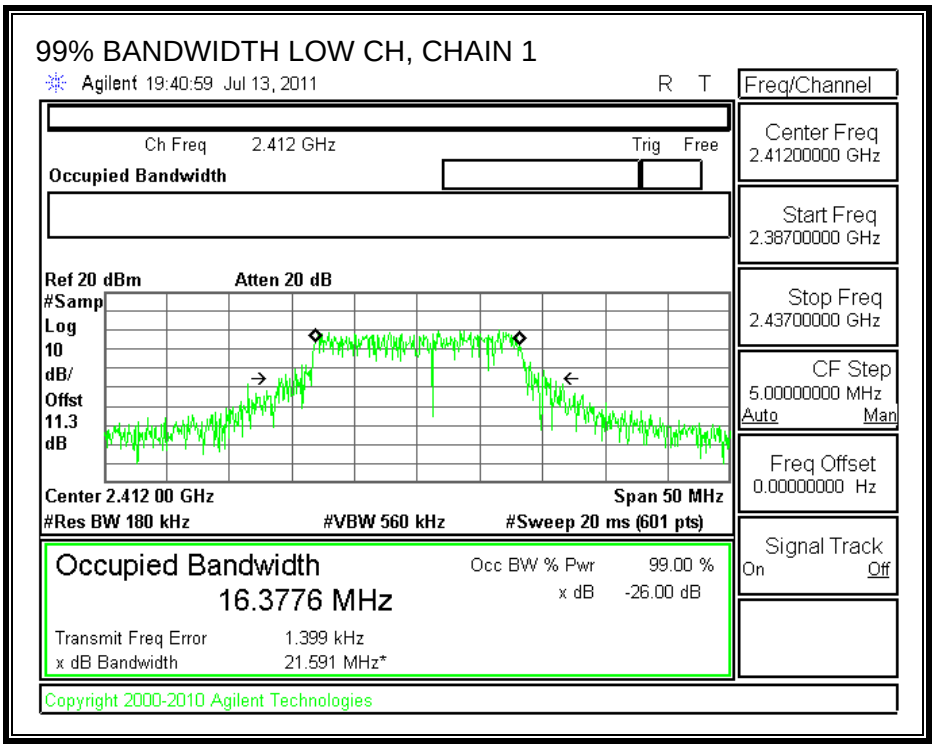
TEST PROCEDURE

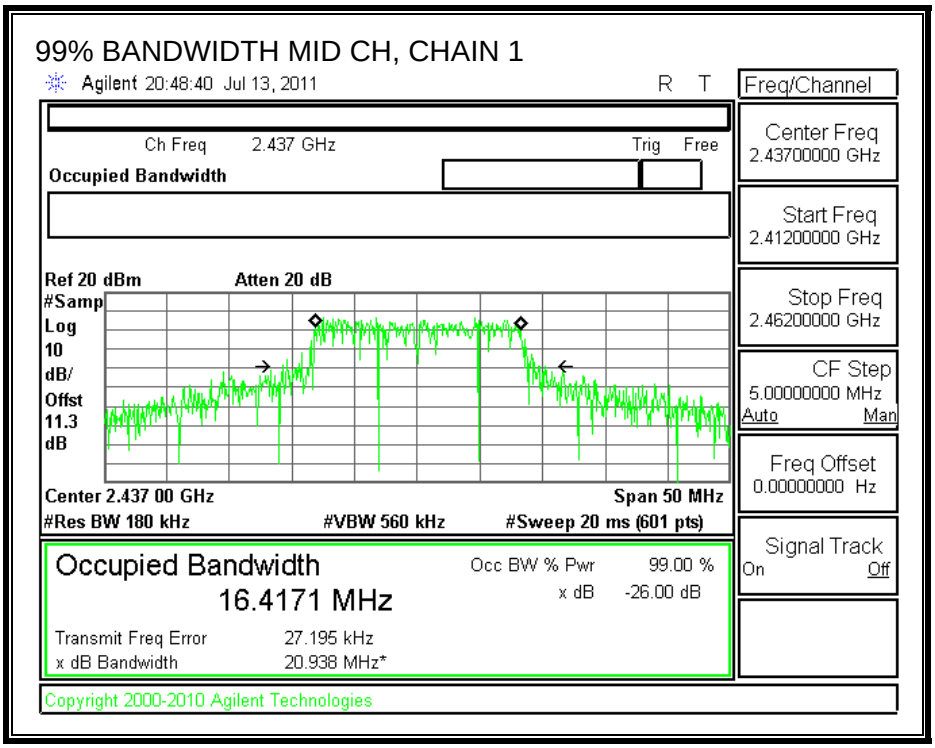
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

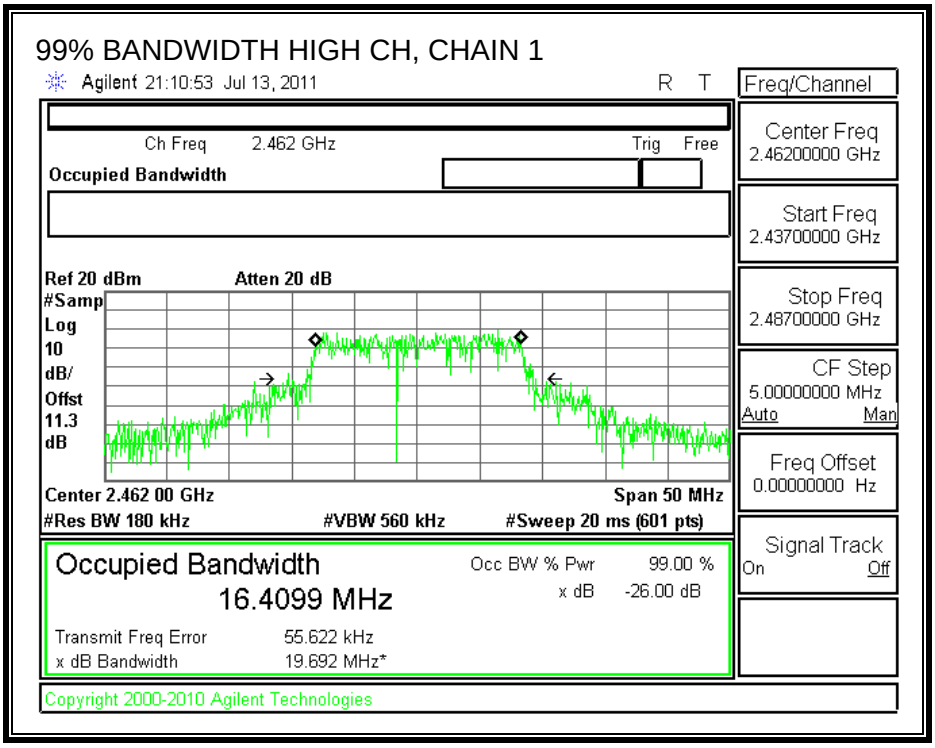
RESULTS

Channel	Frequency (MHz)	Chain 1 99% Bandwidth (MHz)	Chain 2 99% Bandwidth (MHz)
Low	2412	16.3776	16.5723
Middle	2437	16.4171	16.3348
High	2462	16.4099	16.4395

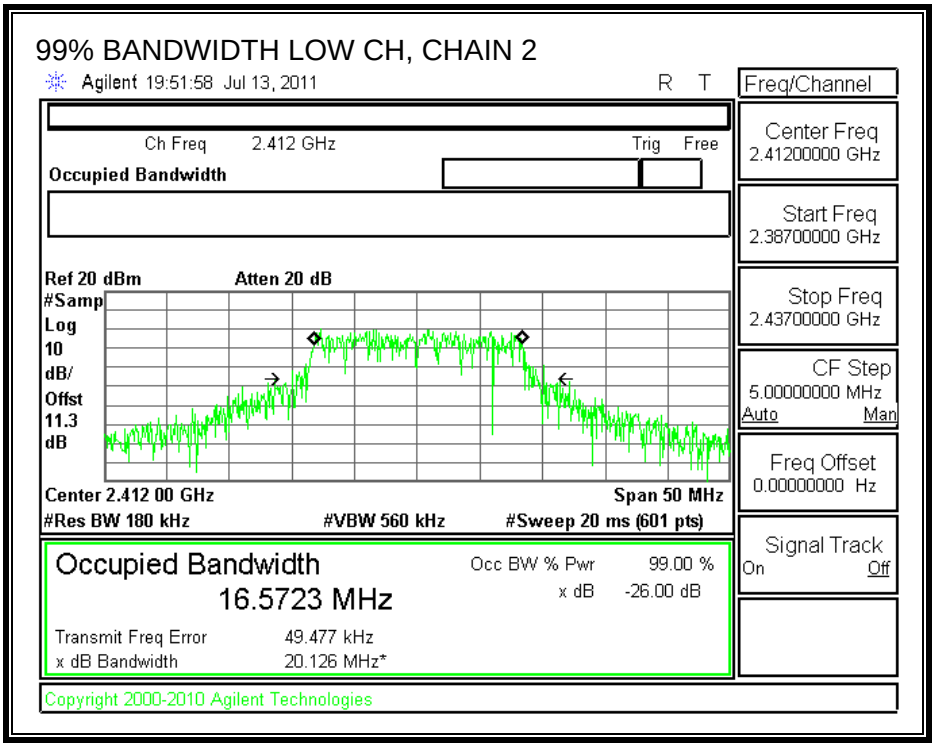
99% BANDWIDTH, CHAIN 1

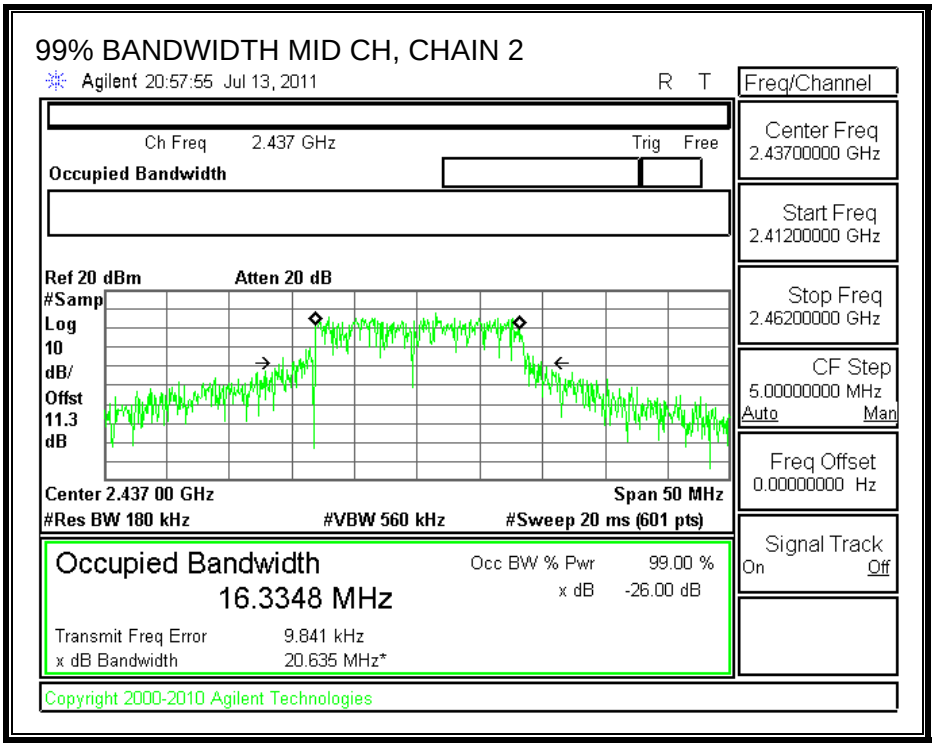


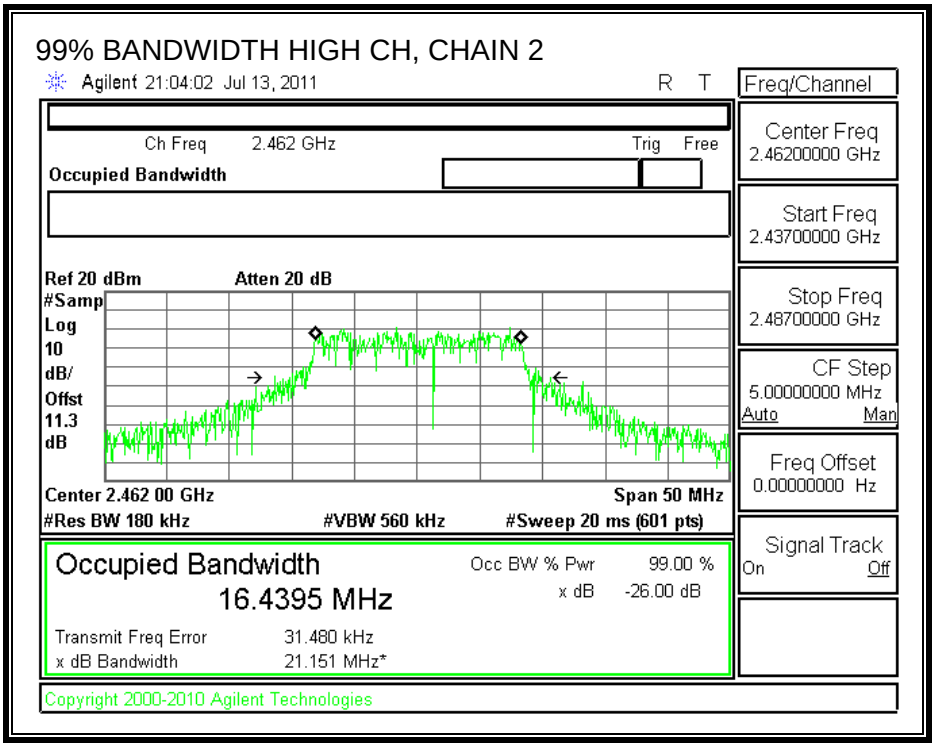




99% BANDWIDTH, CHAIN 2







7.2.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

Antenna Gain (Chain 1) (dBi)	Antenna Gain (Chain 2) (dBi)	Effective Legacy Gain (dBi)
-0.07	0.53	3.25

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

TEST PROCEDURE

Peak power is measured using a wideband peak power meter.

RESULTS

Channel	Frequency (MHz)	Chain 1 PK Power (dBm)	Chain 2 PK Power (dBm)	Attenuator + Cable Offset (dB)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	22.60	22.80	0.00	25.71	30.00	-4.29
Mid	2437	26.10	26.70	0.00	29.42	30.00	-0.58
High	2462	22.50	22.60	0.00	25.56	30.00	-4.44

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 11.3 dB (including 10 dB pad and 1.3 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	13.65	14.04	16.86
Middle	2437	20.21	20.31	23.27
High	2462	13.67	13.96	16.83

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.

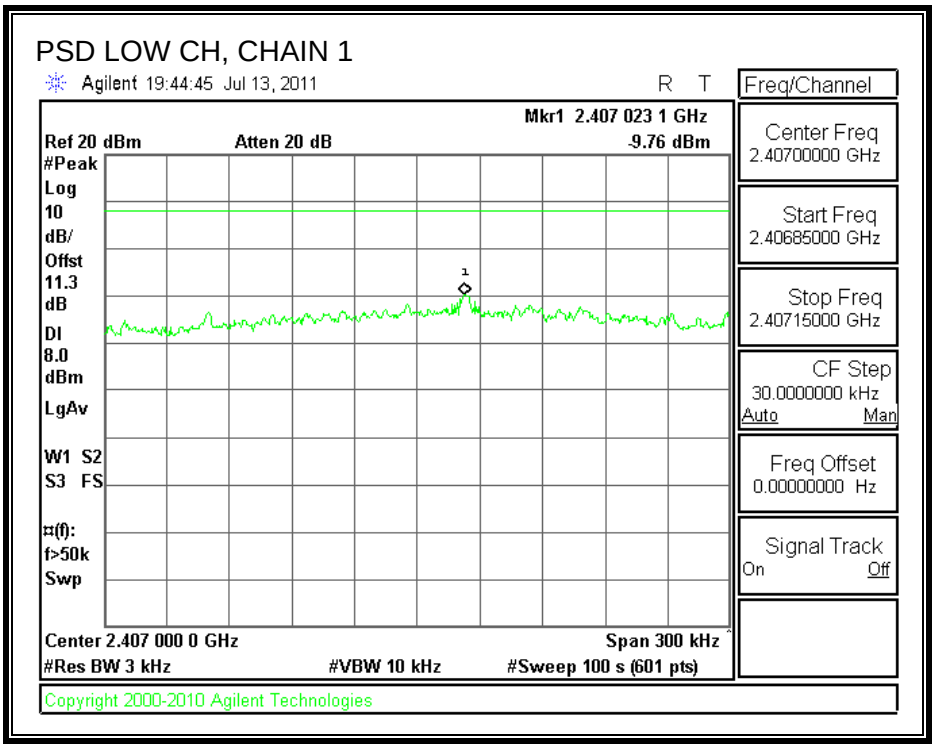
TEST PROCEDURE

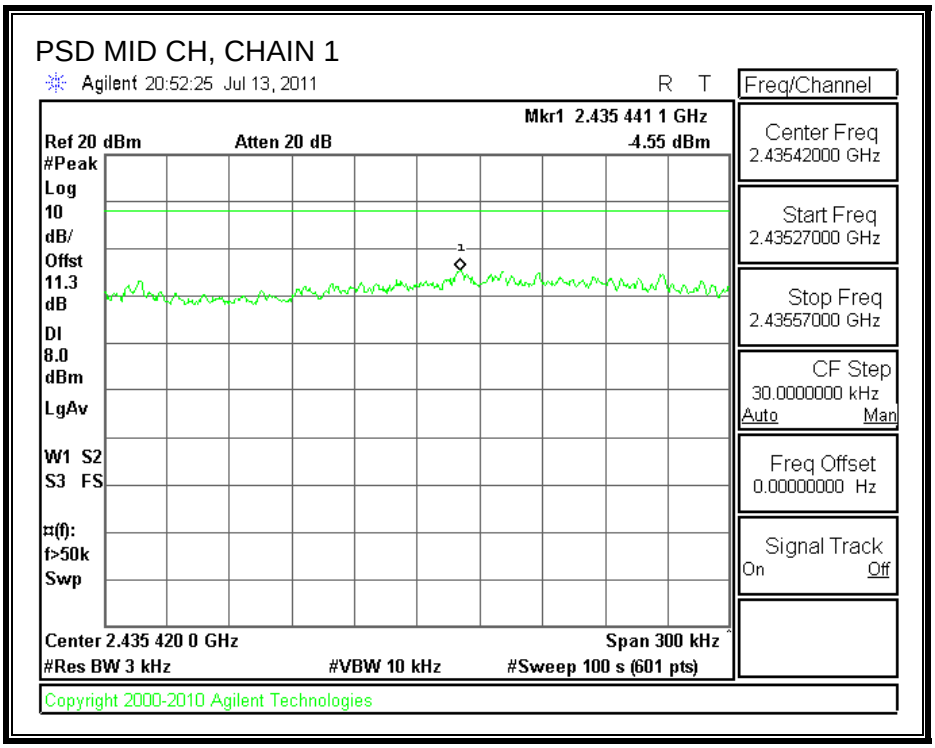
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

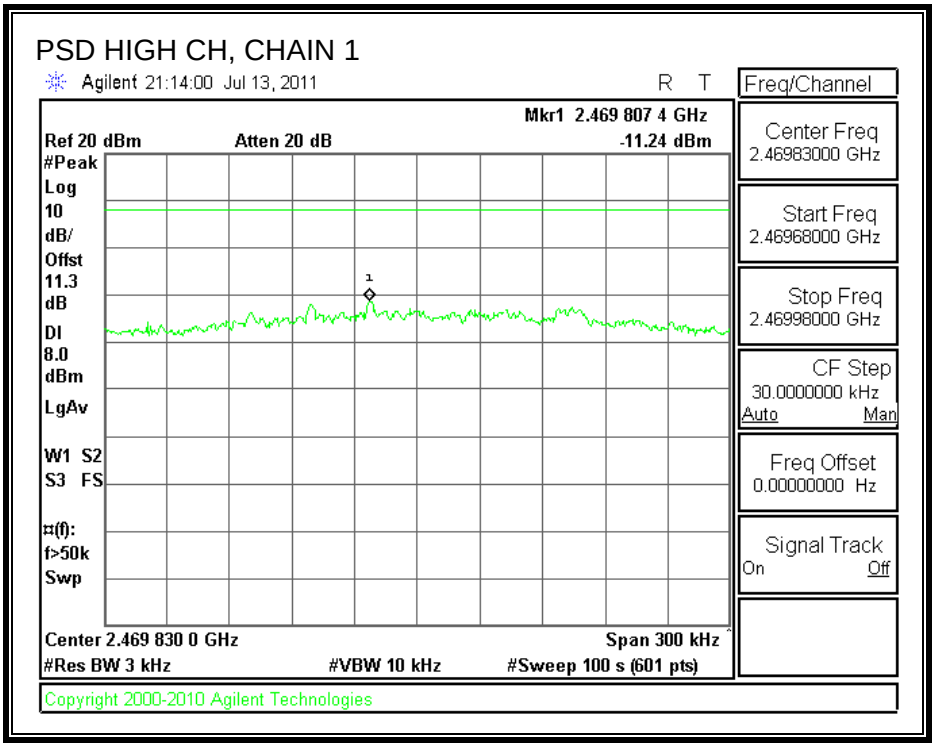
RESULTS

Channel	Frequency (MHz)	Chain 1 PSD (dBm)	Chain 2 PSD (dBm)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-9.76	-9.78	-6.76	8	-14.76
Middle	2437	-4.55	-4.30	-1.41	8	-9.41
High	2462	-11.24	-8.73	-6.80	8	-14.80

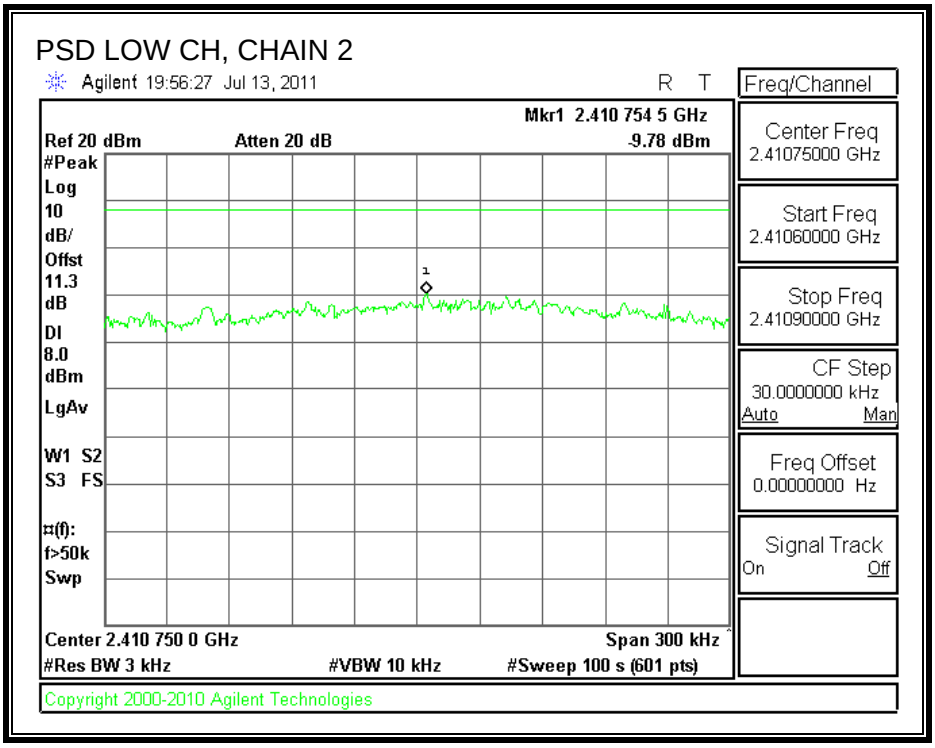
POWER SPECTRAL DENSITY, CHAIN 1

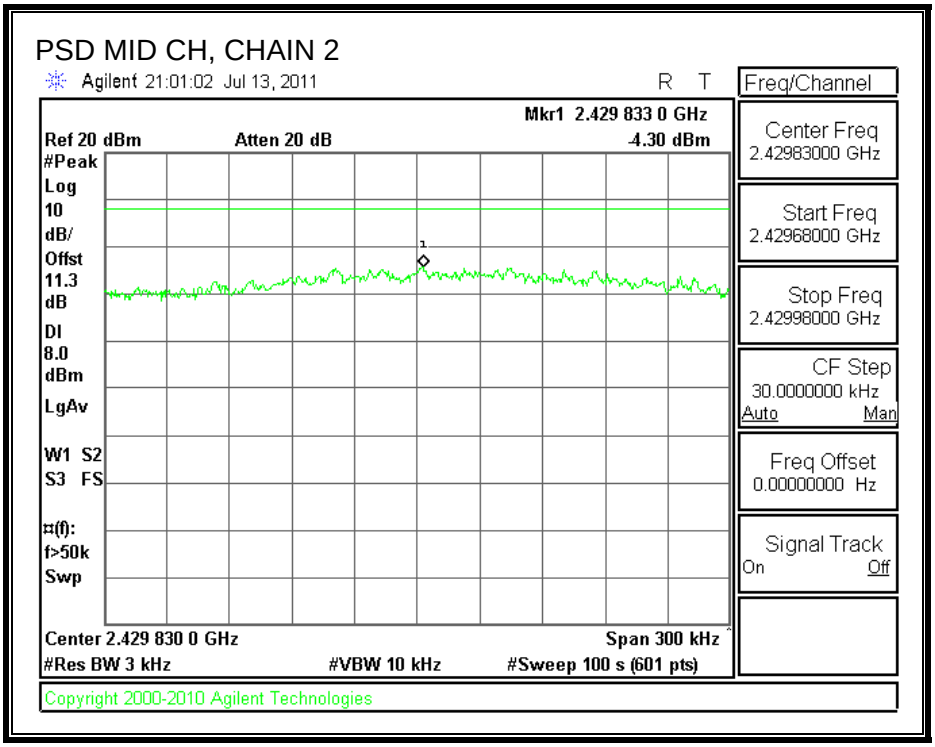


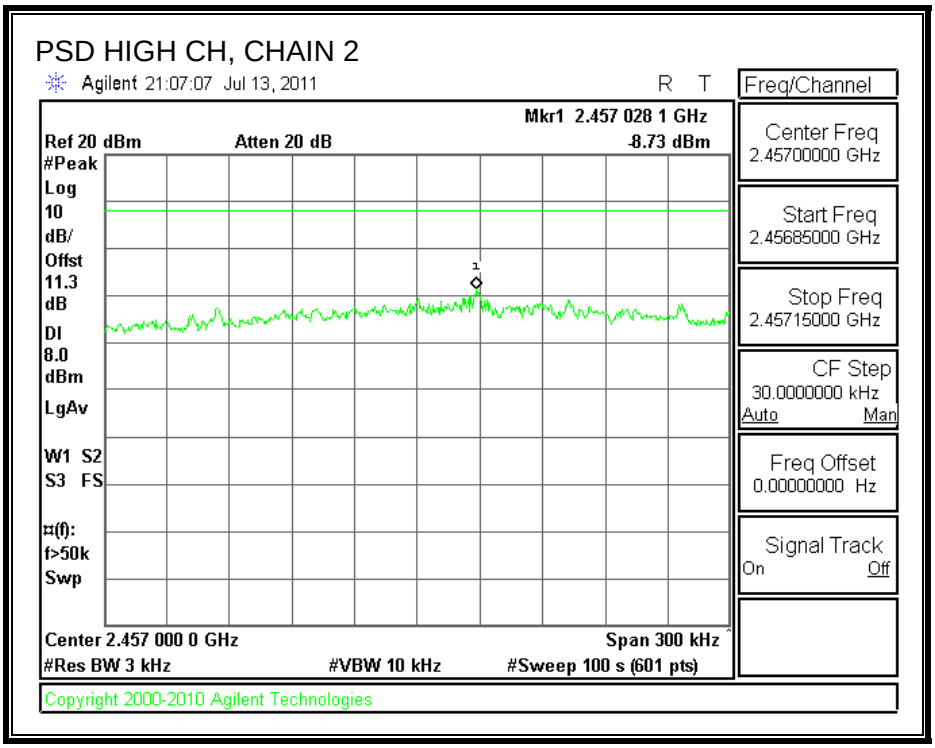




POWER SPECTRAL DENSITY, CHAIN 2







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.

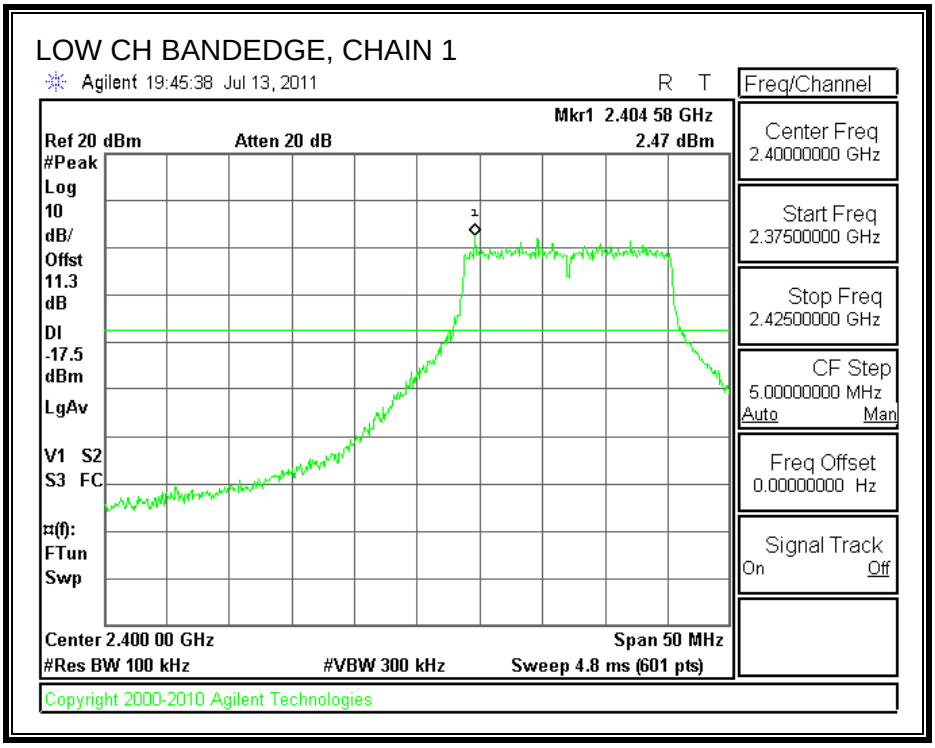
TEST PROCEDURE

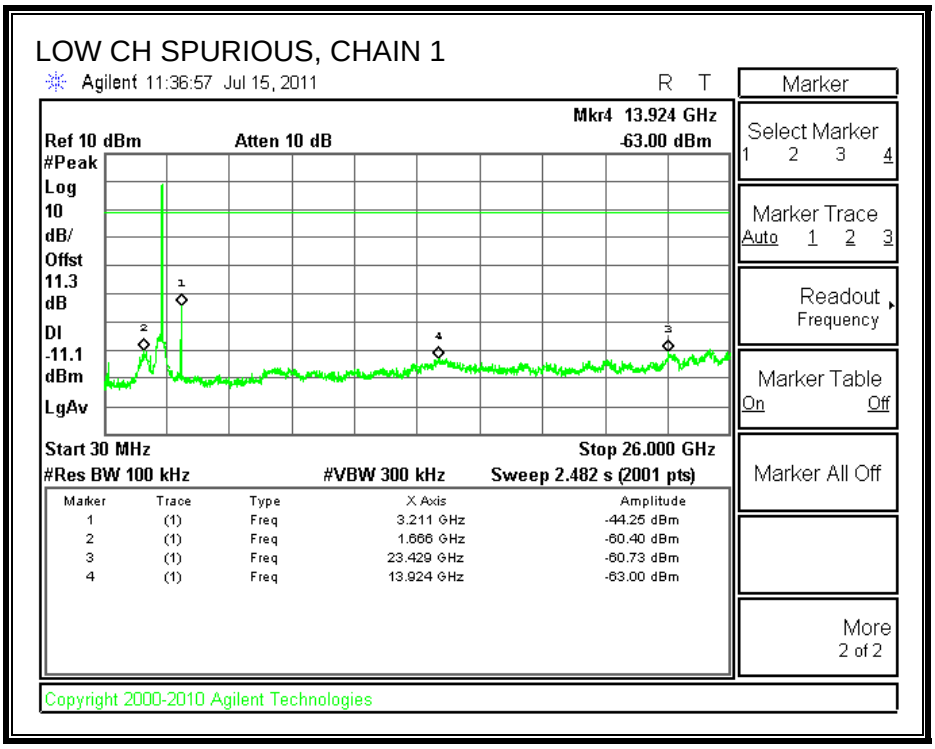
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

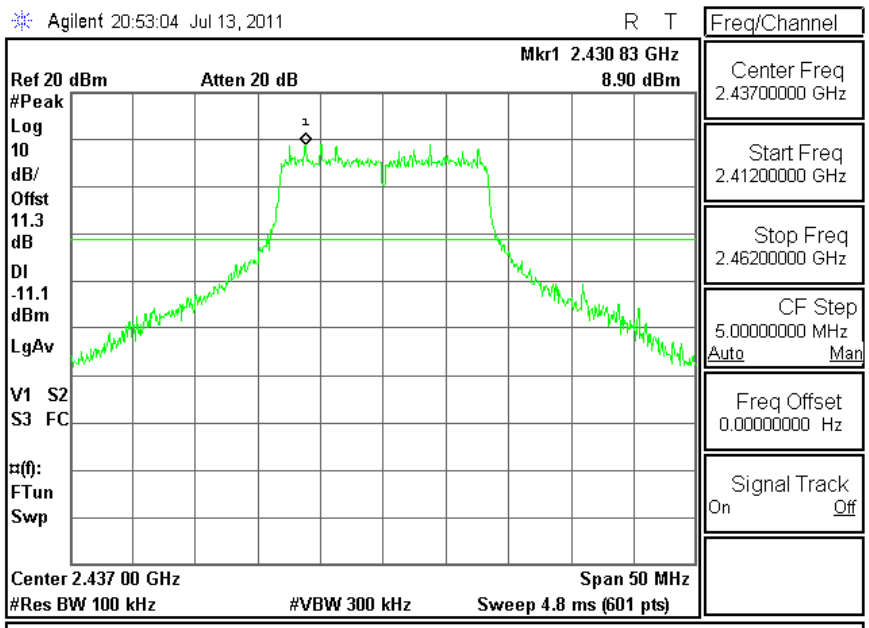
RESULTS

CHAIN 1 SPURIOUS EMISSIONS

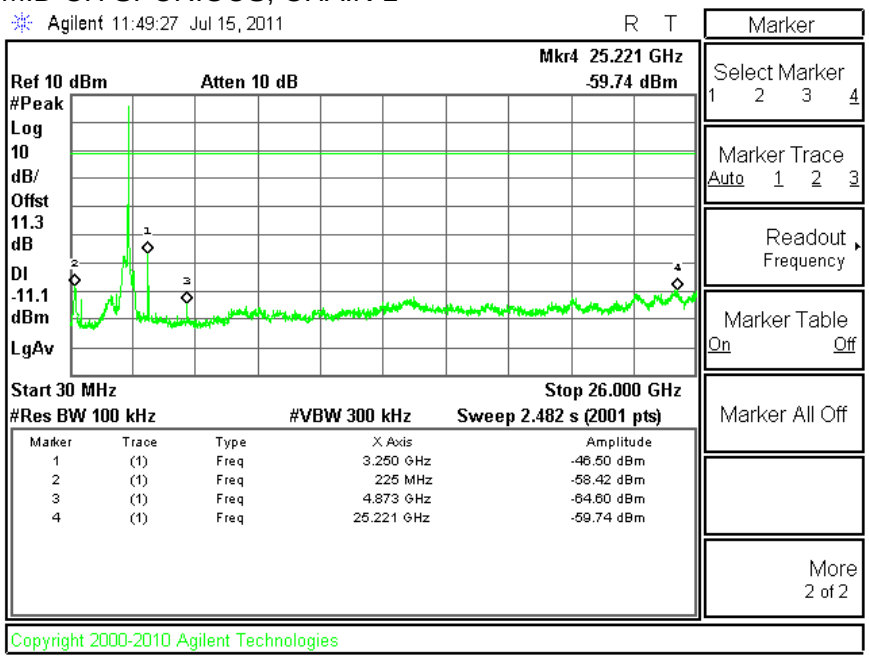


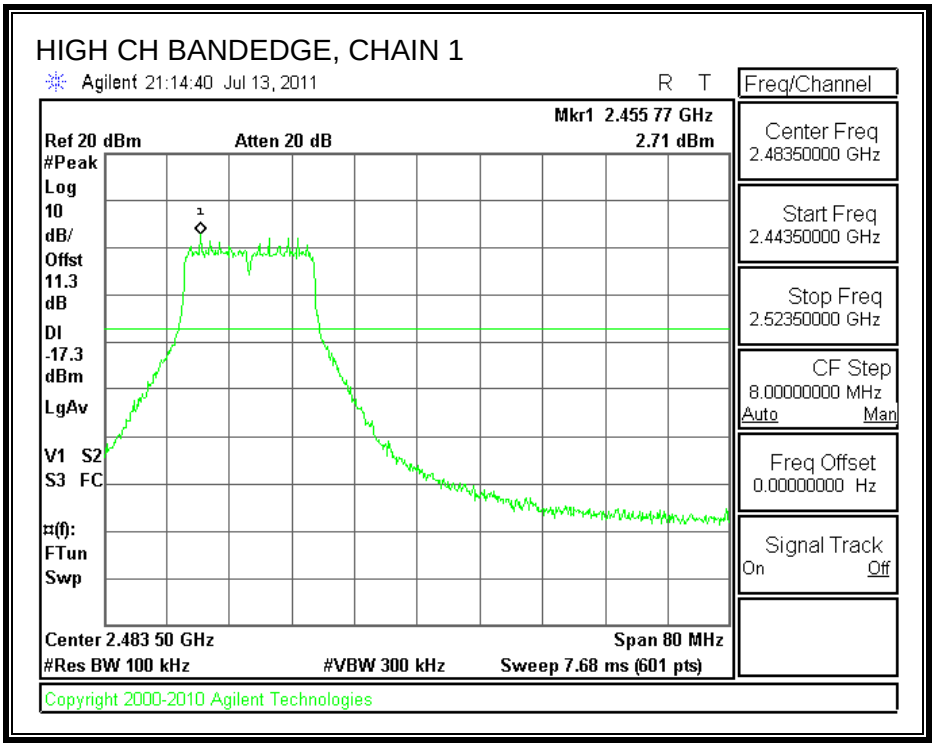


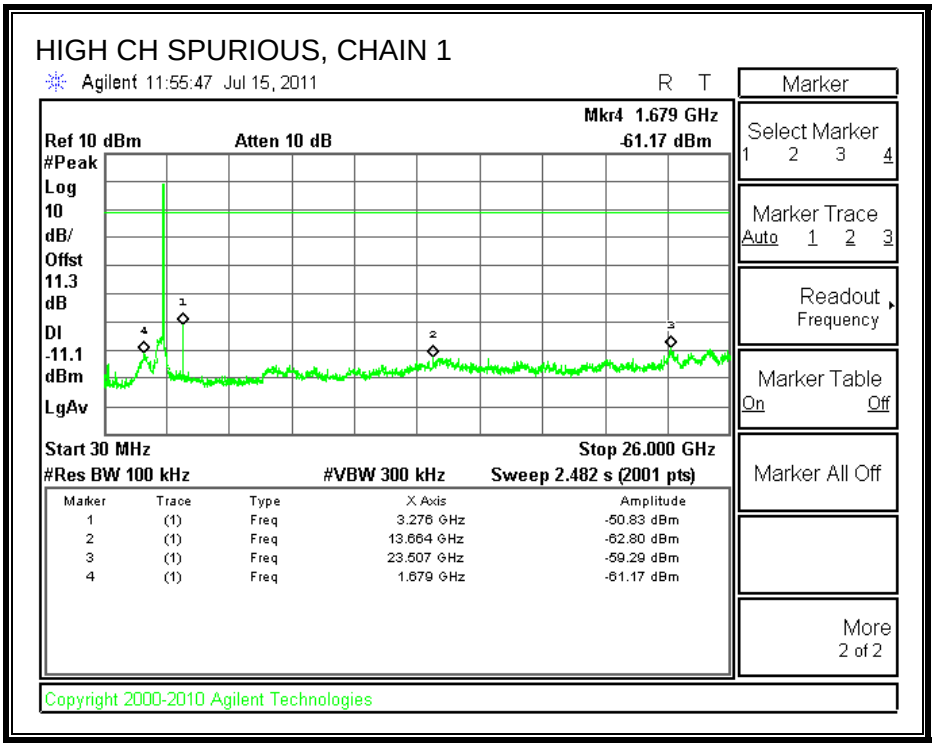
MID CH REFERENCE, CHAIN 1



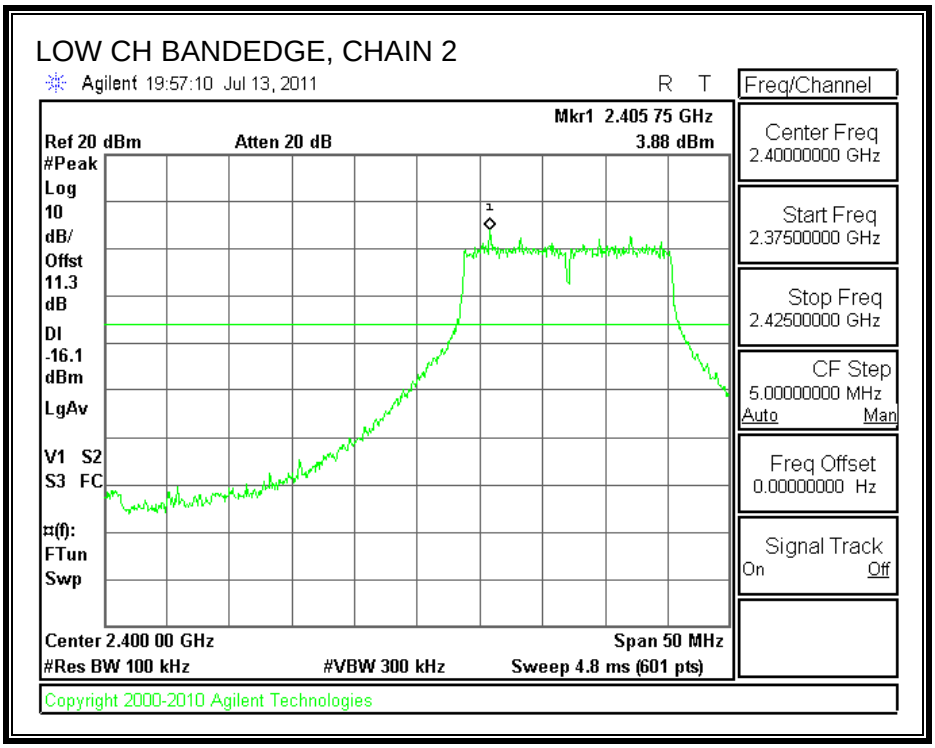
MID CH SPURIOUS, CHAIN 1

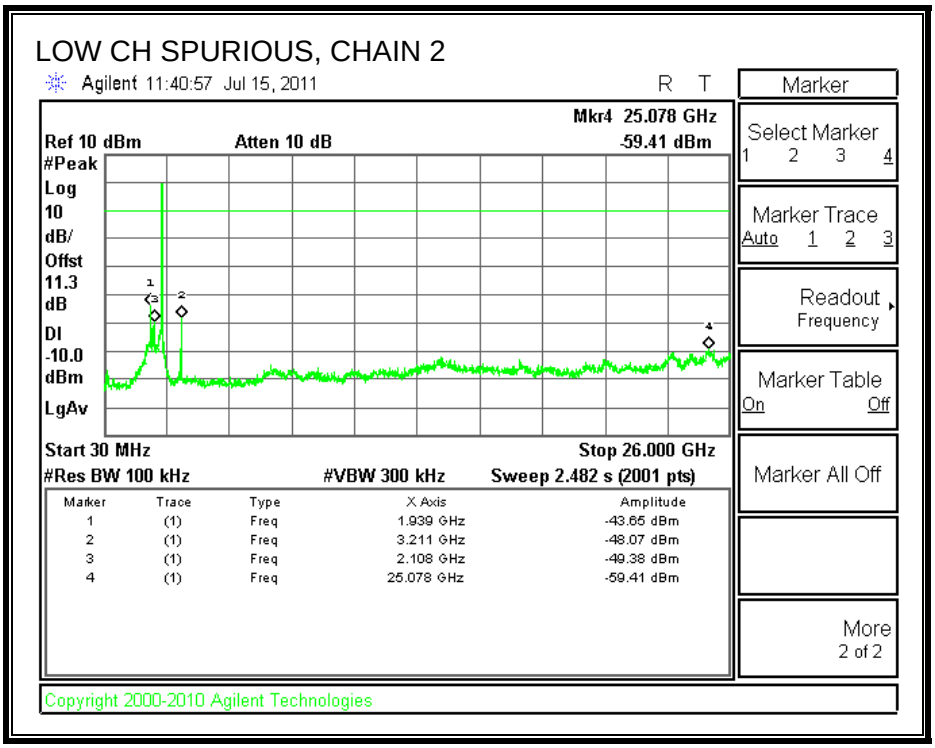




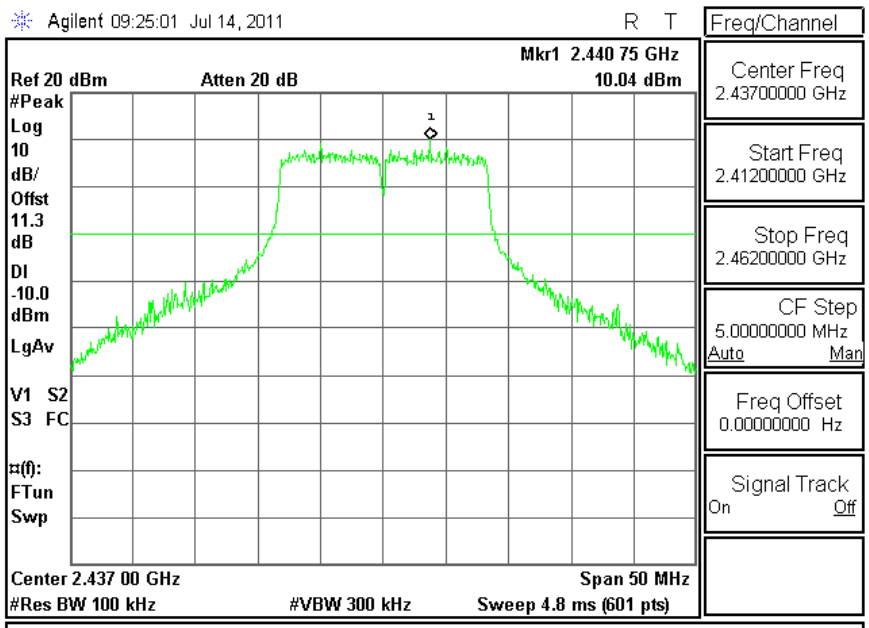


CHAIN 2 SPURIOUS EMISSIONS

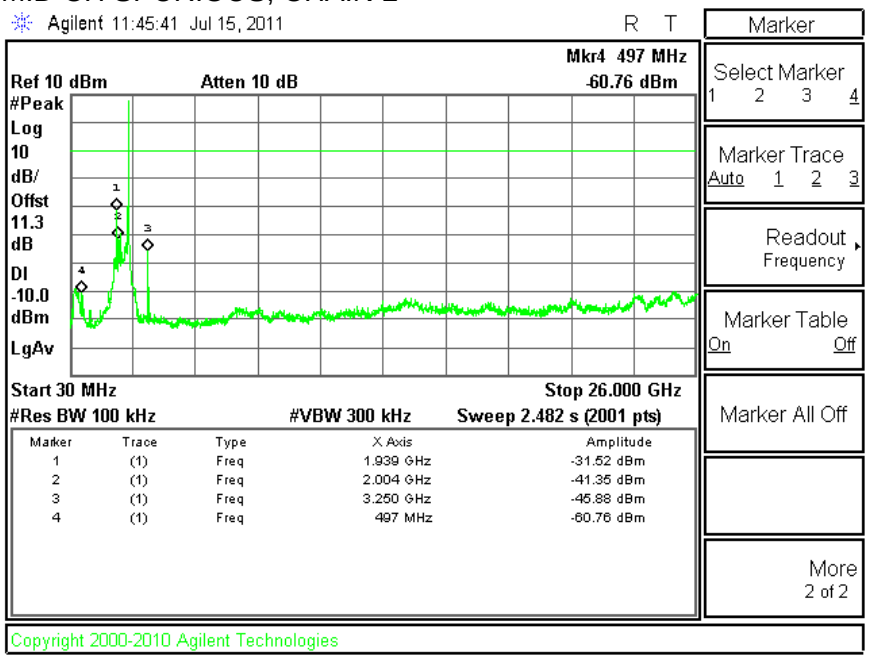




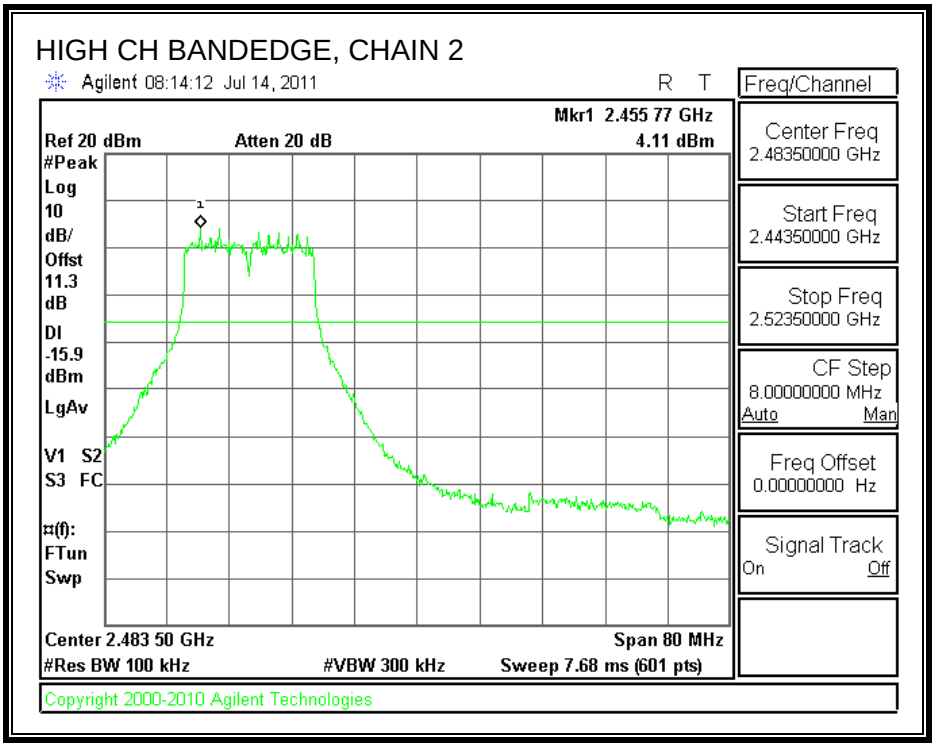
MID CH REFERENCE, CHAIN 2



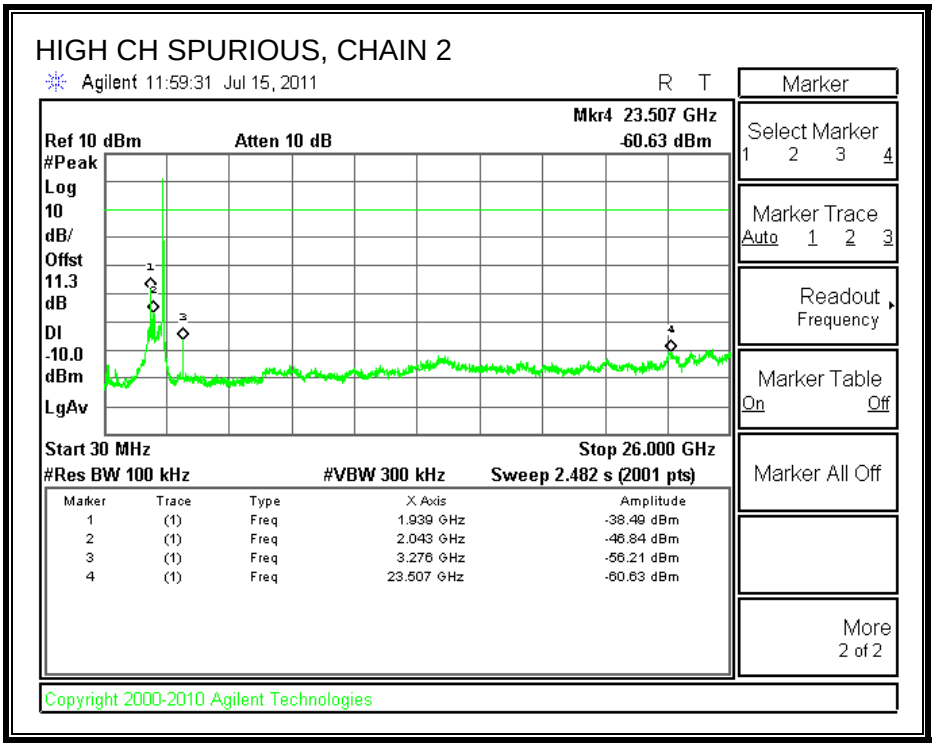
MID CH SPURIOUS, CHAIN 2



HIGH CH BANDEDGE, CHAIN 2



HIGH CH SPURIOUS, CHAIN 2



7.3. 802.11n TWO CHAINS 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.

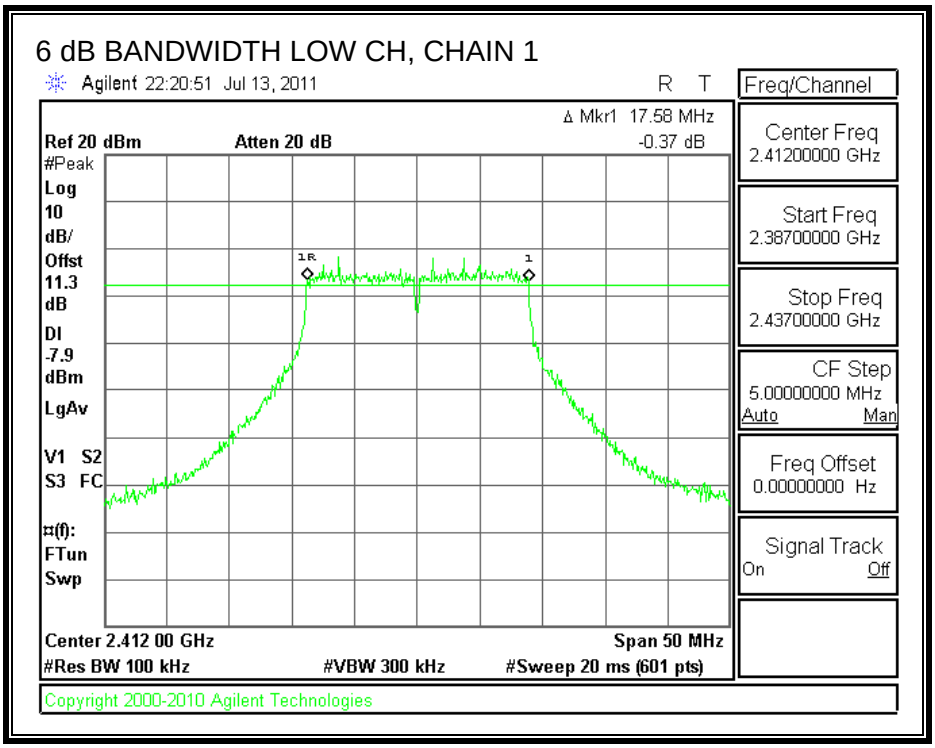
TEST PROCEDURE

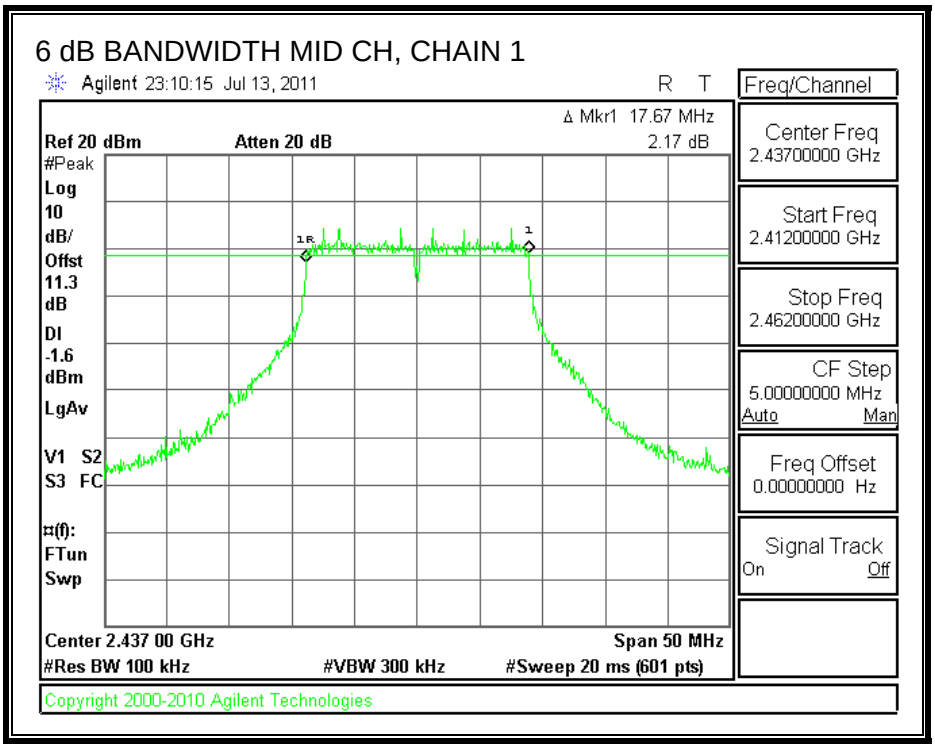
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

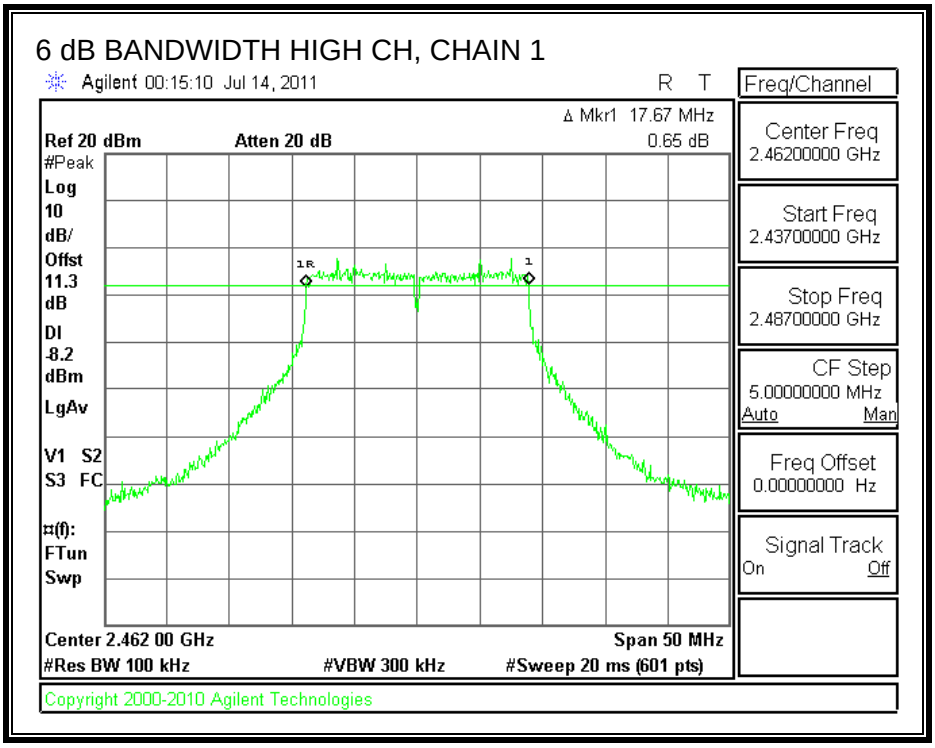
RESULTS

Channel	Frequency (MHz)	Chain 1 6 dB BW (MHz)	Chain 2 6 dB BW (MHz)	Minimum Limit (MHz)
Low	2412	17.58	17.67	0.5
Middle	2437	17.67	17.58	0.5
High	2462	17.67	17.67	0.5

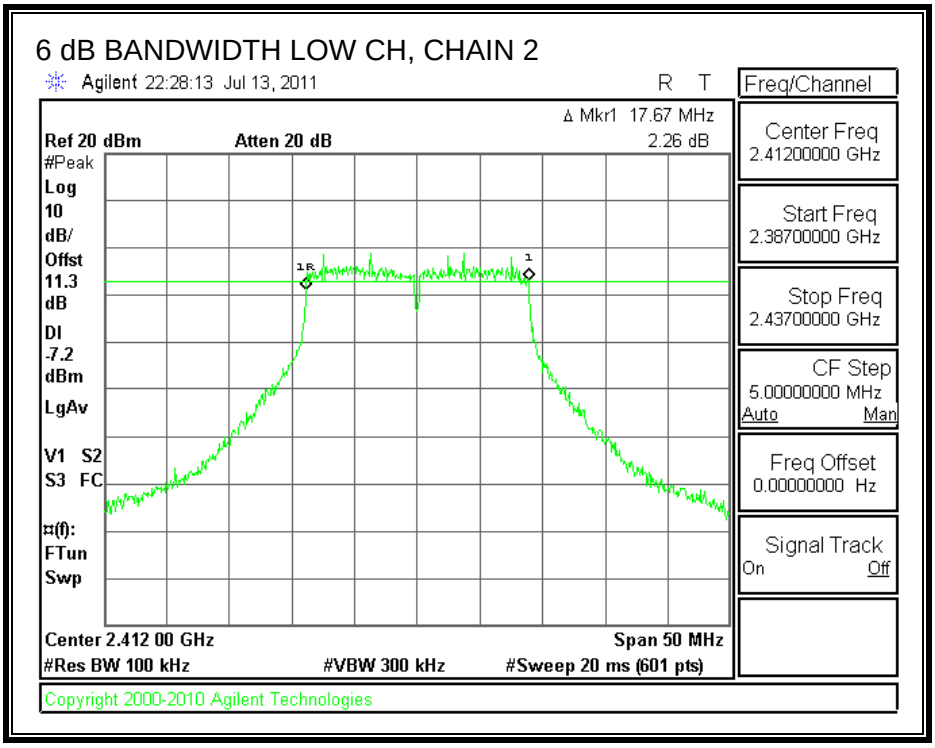
6 dB BANDWIDTH, CHAIN 1



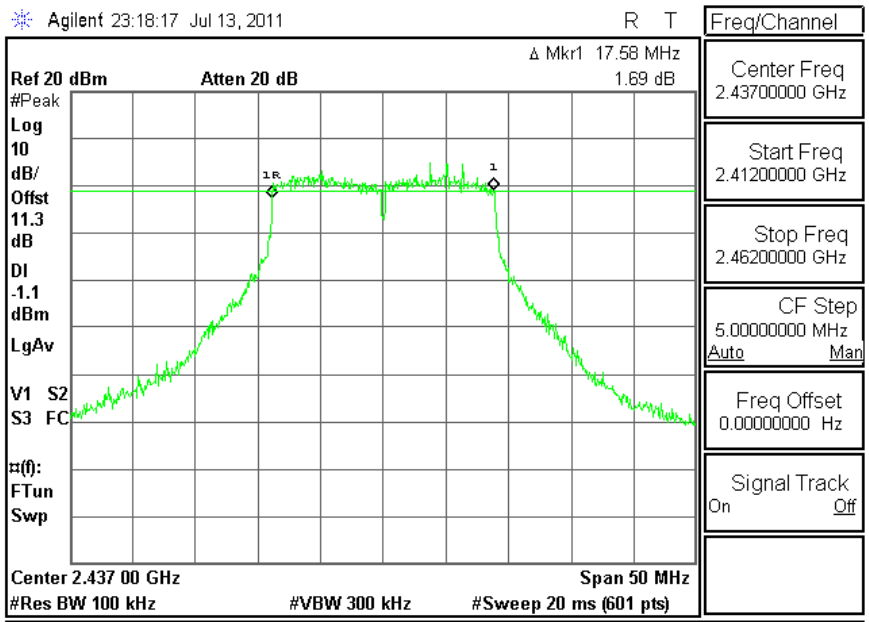




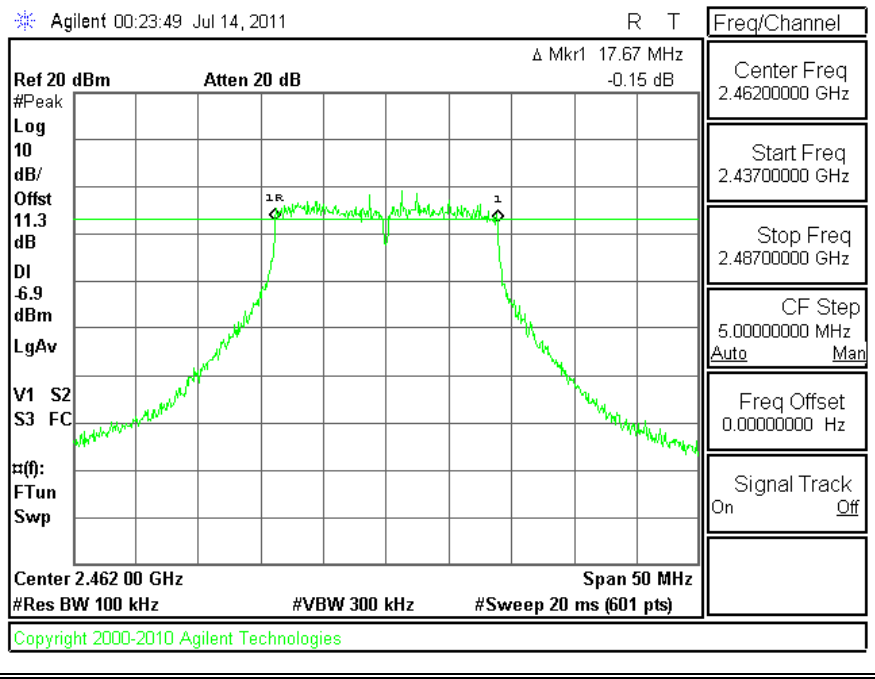
6 dB BANDWIDTH, CHAIN 2



6 dB BANDWIDTH MID CH, CHAIN 2



6 dB BANDWIDTH HIGH CH, CHAIN 2



7.3.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

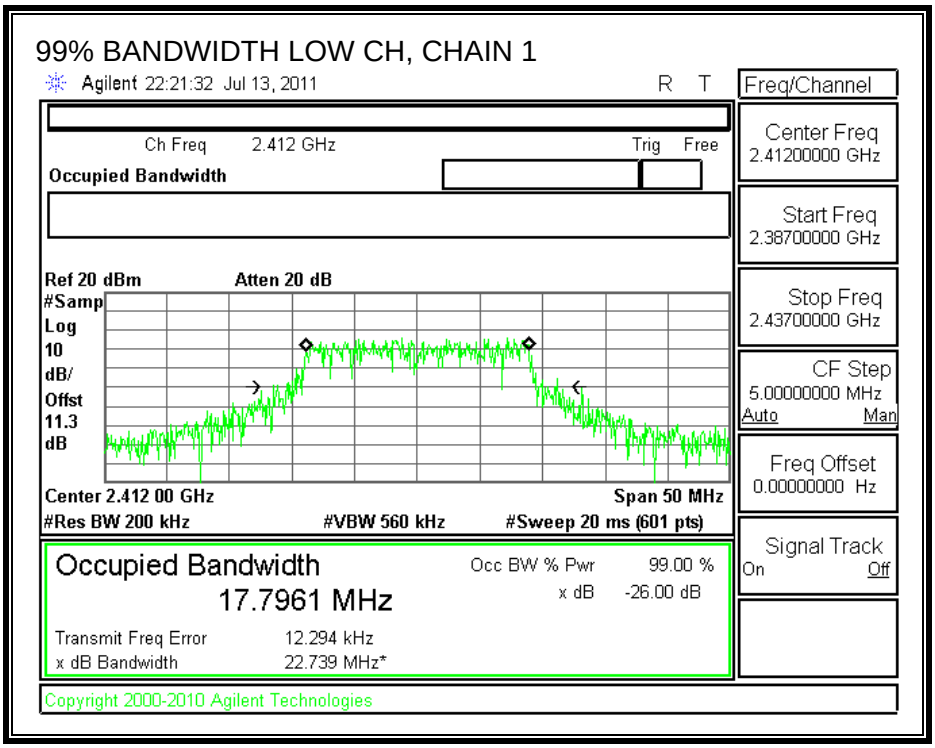
TEST PROCEDURE

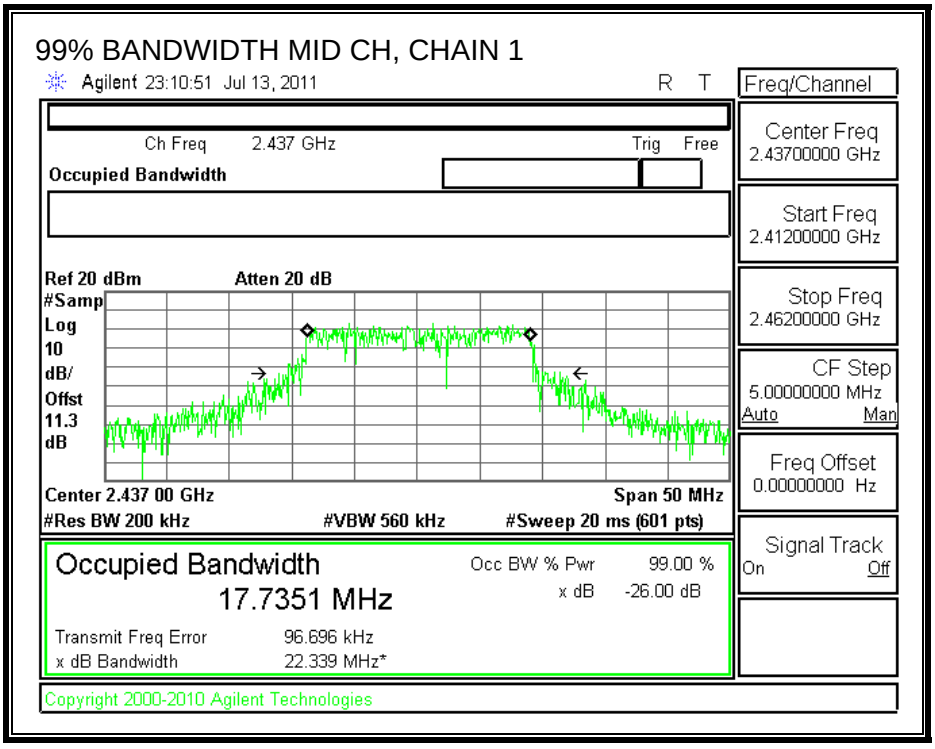
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

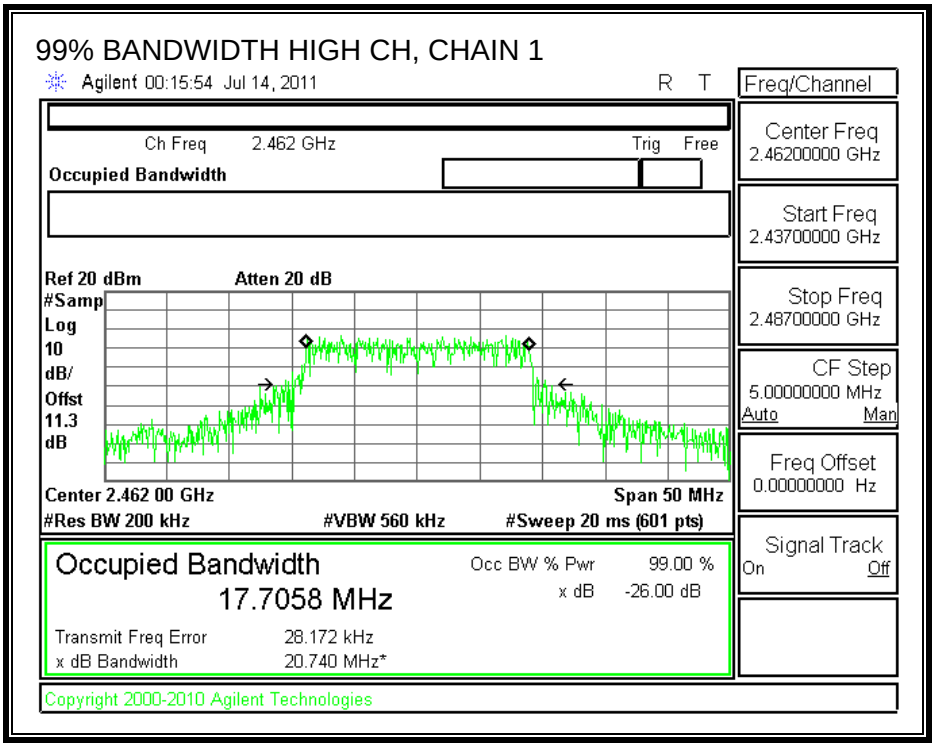
RESULTS

Channel	Frequency (MHz)	Chain 1 99% Bandwidth (MHz)	Chain 2 99% Bandwidth (MHz)
Low	2412	17.7961	17.7326
Middle	2437	17.7351	17.7157
High	2462	17.7058	17.7152

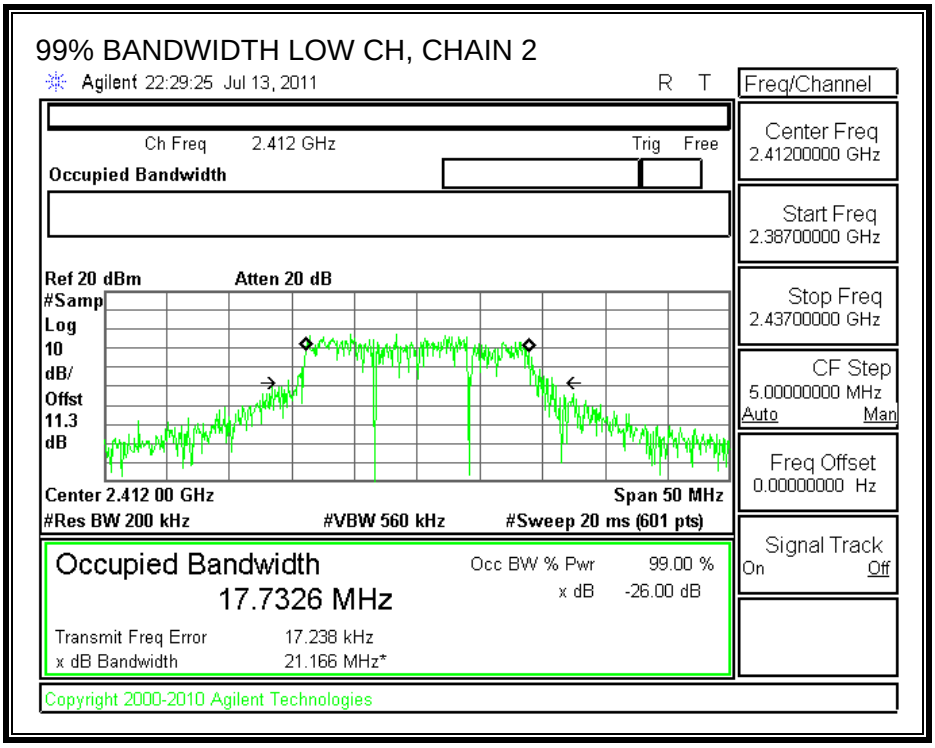
99% BANDWIDTH, CHAIN 1

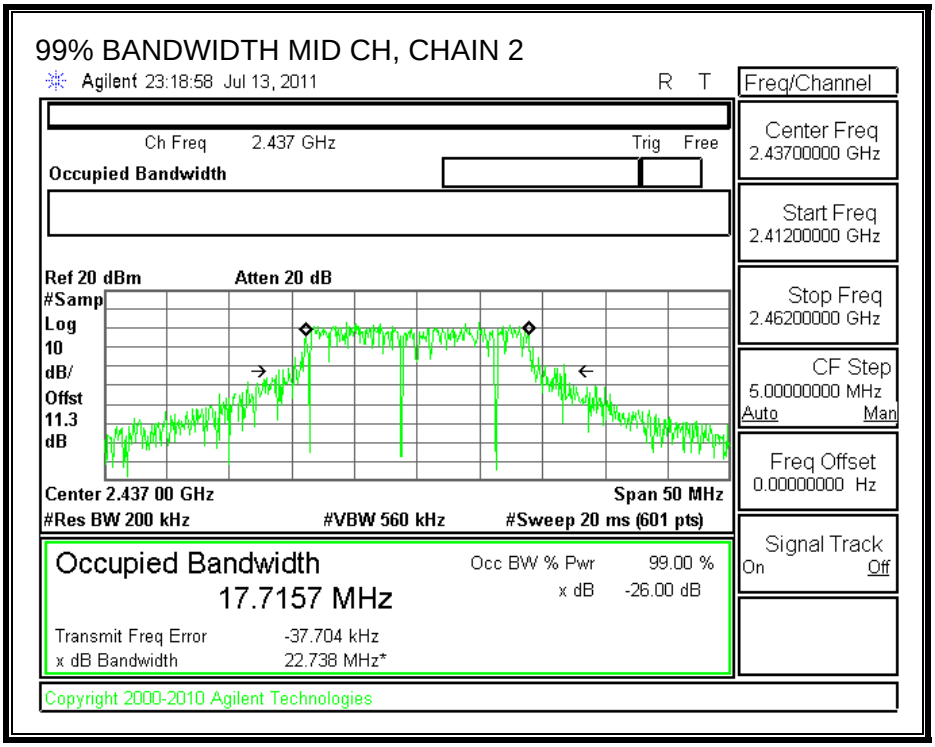


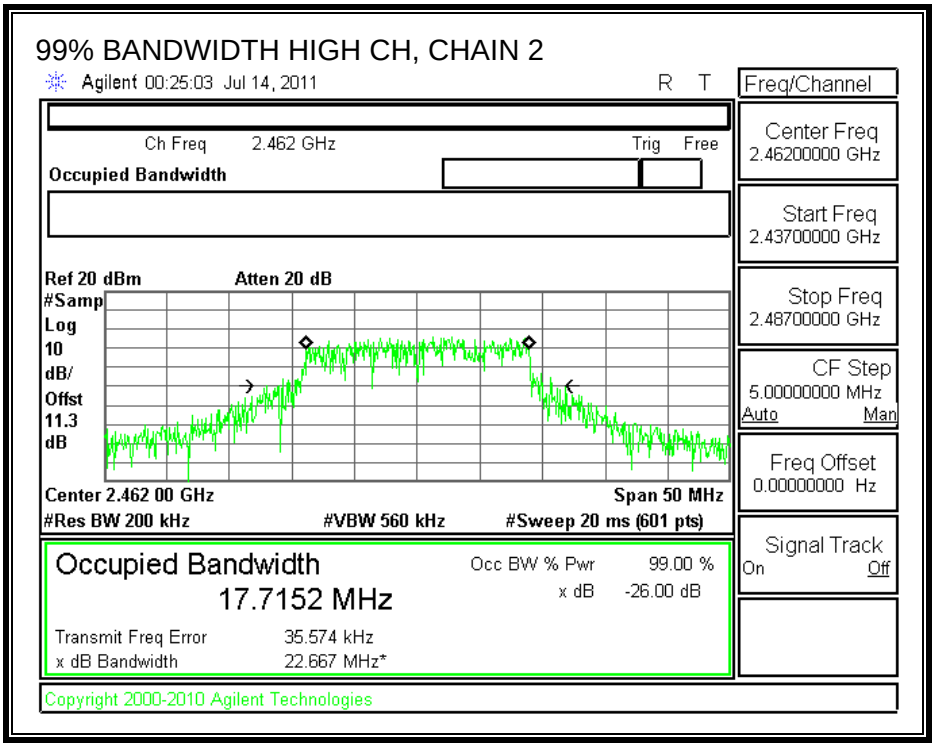




99% BANDWIDTH, CHAIN 2







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

Peak power is measured using a wideband peak power meter.

RESULTS

Channel	Frequency (MHz)	Chain 1 PK Power (dBm)	Chain 2 PK Power (dBm)	Attenuator + Cable Offset (dB)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	19.10	19.70	0.00	22.42	30.00	-7.58
Mid	2437	24.80	24.60	0.00	27.71	30.00	-2.29
High	2462	19.10	19.30	0.00	22.21	30.00	-7.79

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 11.3 dB (including 10 dB pad and 1.3 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	10.03	10.21	13.13
Middle	2437	16.12	15.85	19.00
High	2462	9.86	10.23	13.06

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.

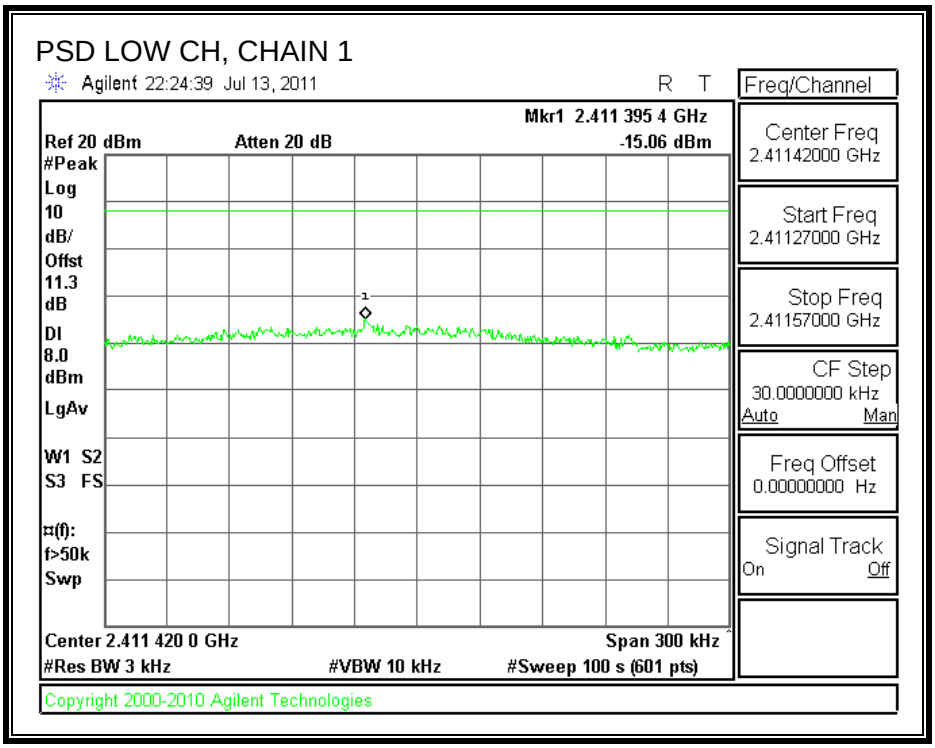
TEST PROCEDURE

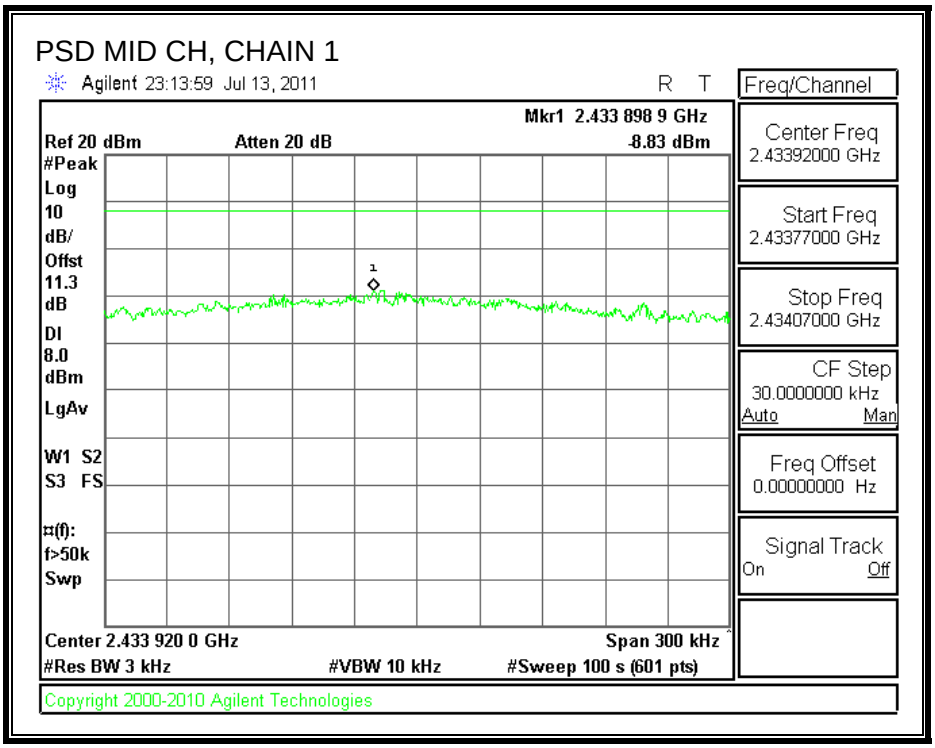
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

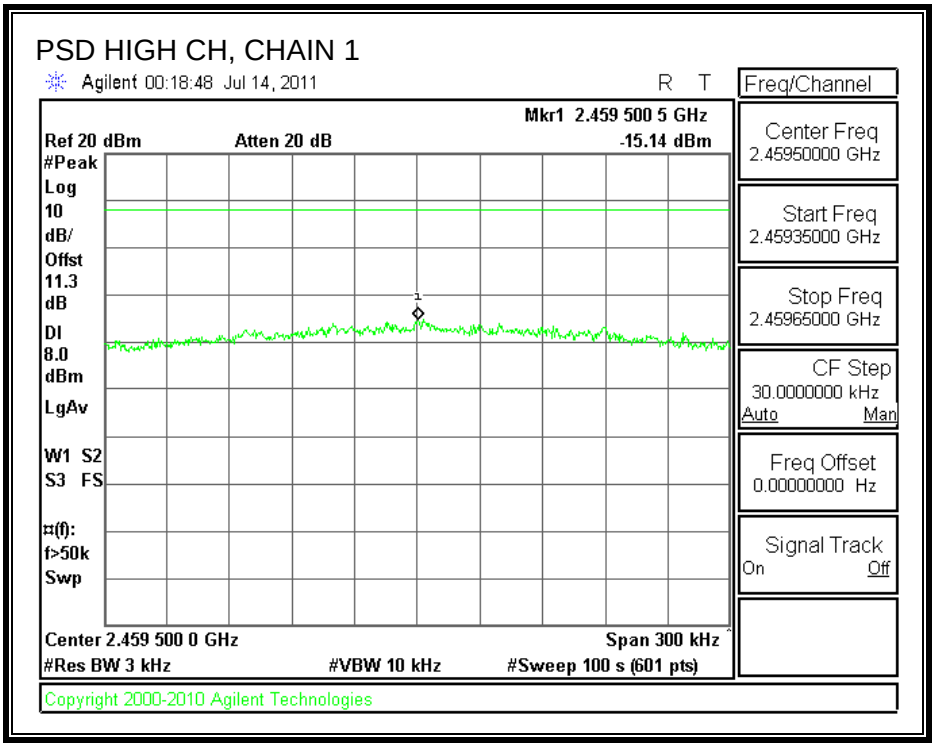
RESULTS

Channel	Frequency (MHz)	Chain 1 PSD (dBm)	Chain 2 PSD (dBm)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-15.06	-14.57	-11.80	8	-19.80
Middle	2437	-8.83	-7.54	-5.13	8	-13.13
High	2462	-15.14	-13.02	-10.94	8	-18.94

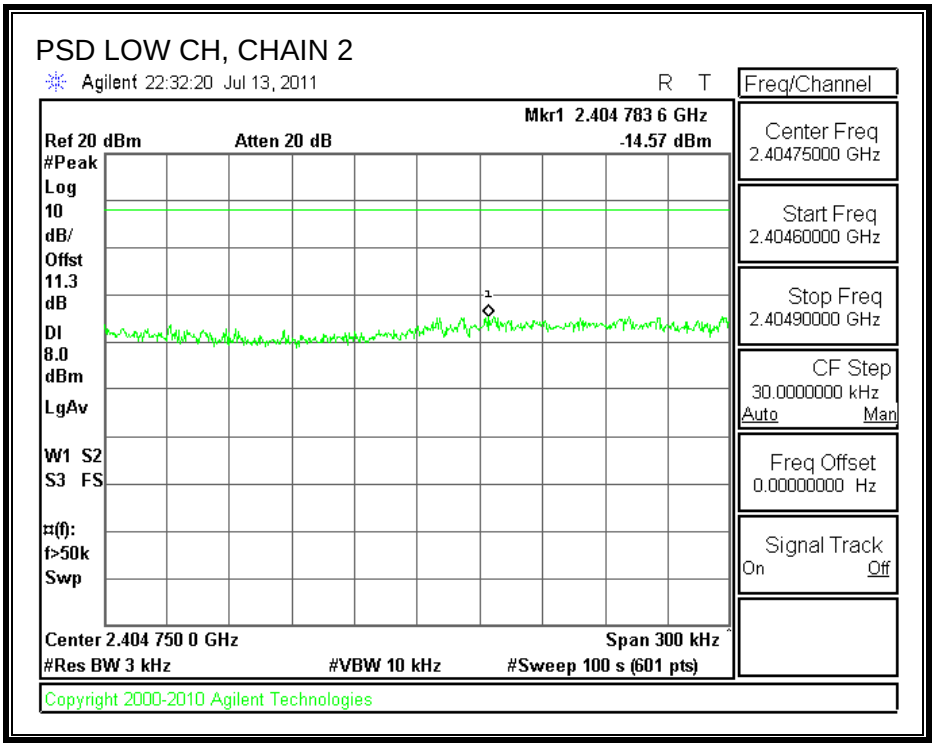
POWER SPECTRAL DENSITY, CHAIN 1



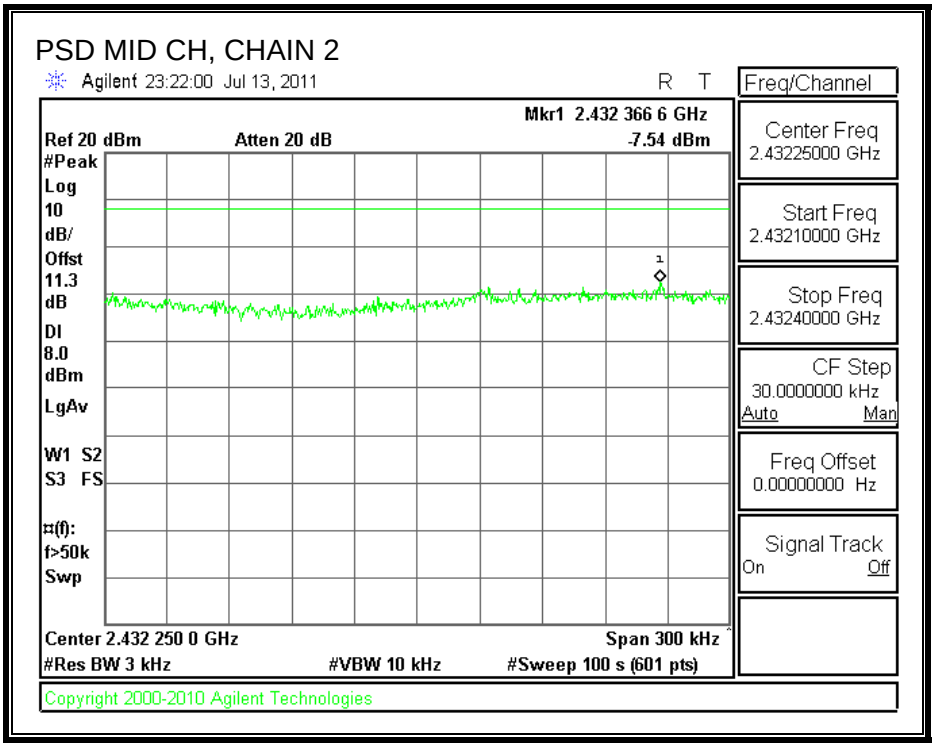




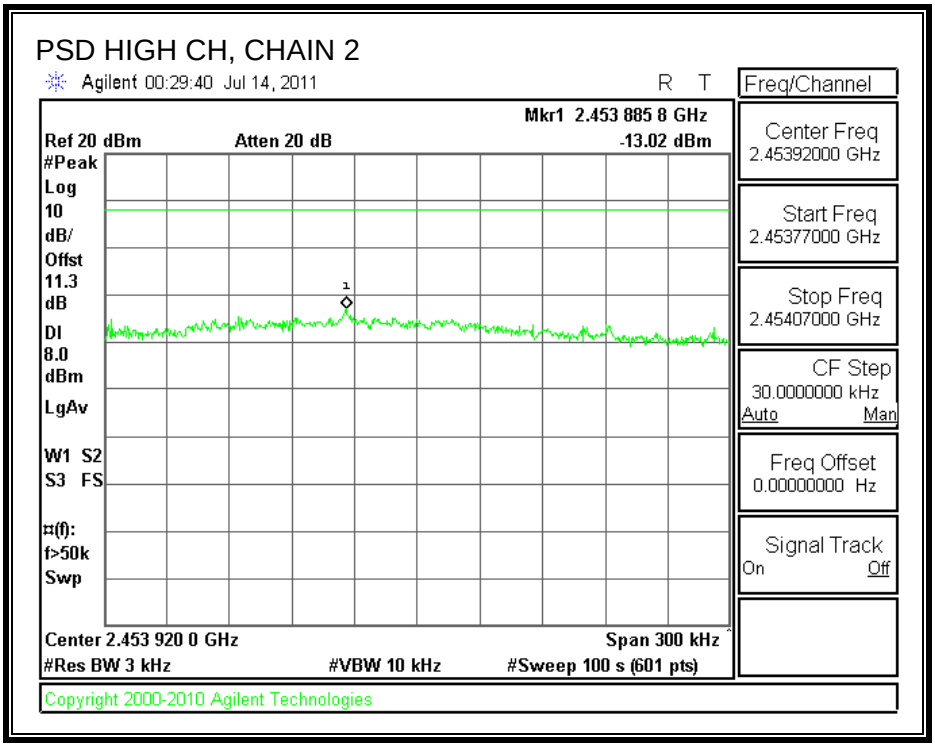
POWER SPECTRAL DENSITY, CHAIN 2



PSD MID CH, CHAIN 2



PSD HIGH CH, CHAIN 2



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.

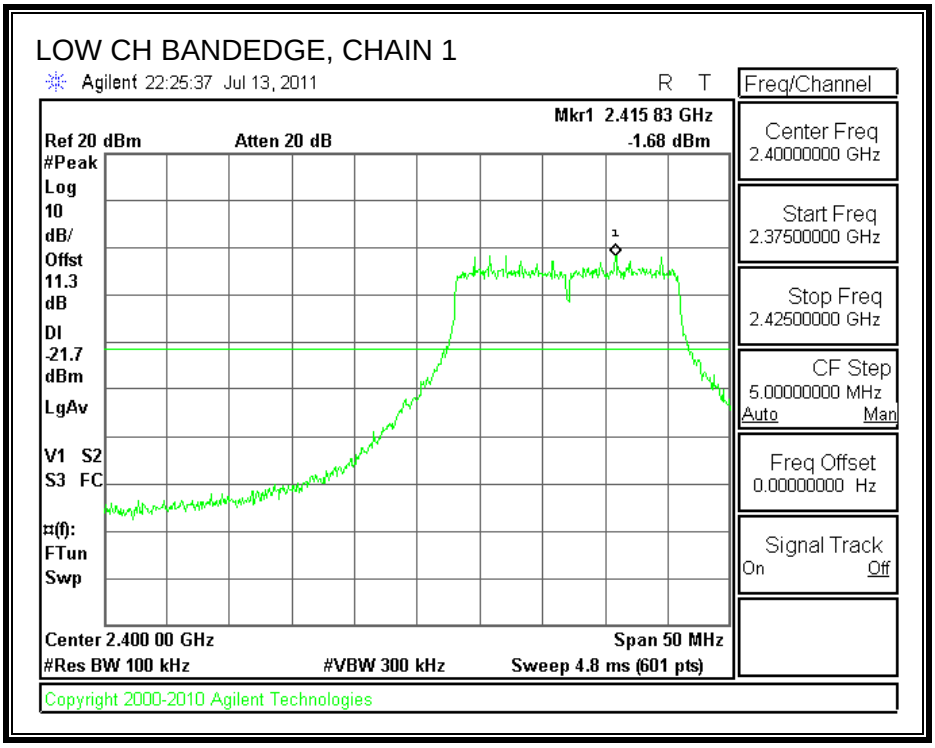
TEST PROCEDURE

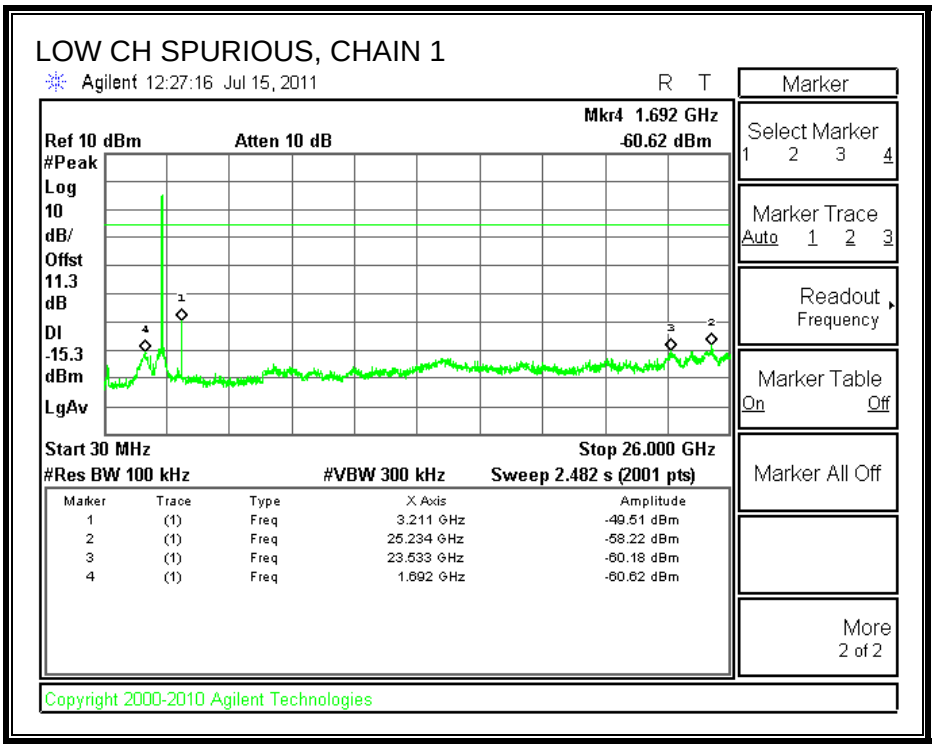
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

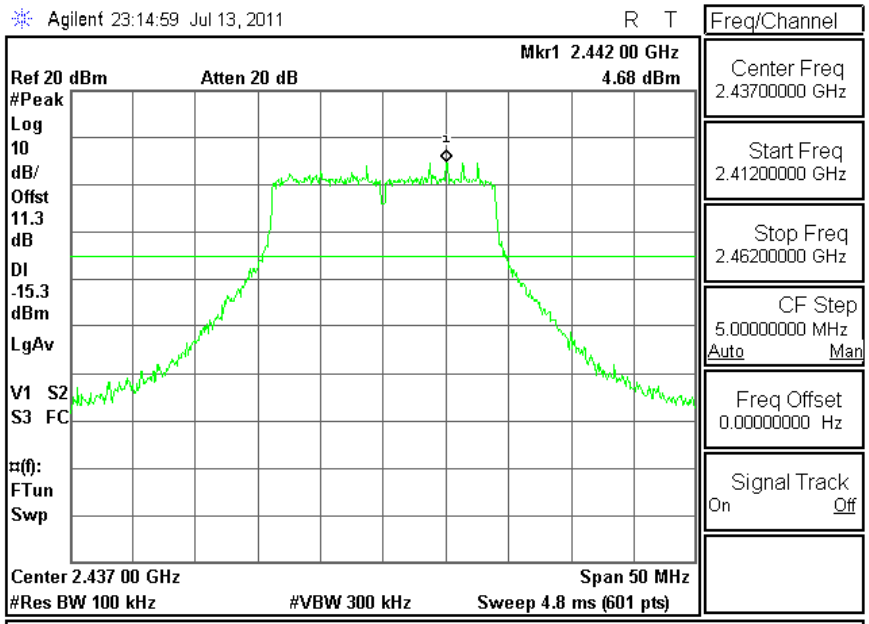
RESULTS

CHAIN 1 SPURIOUS EMISSIONS

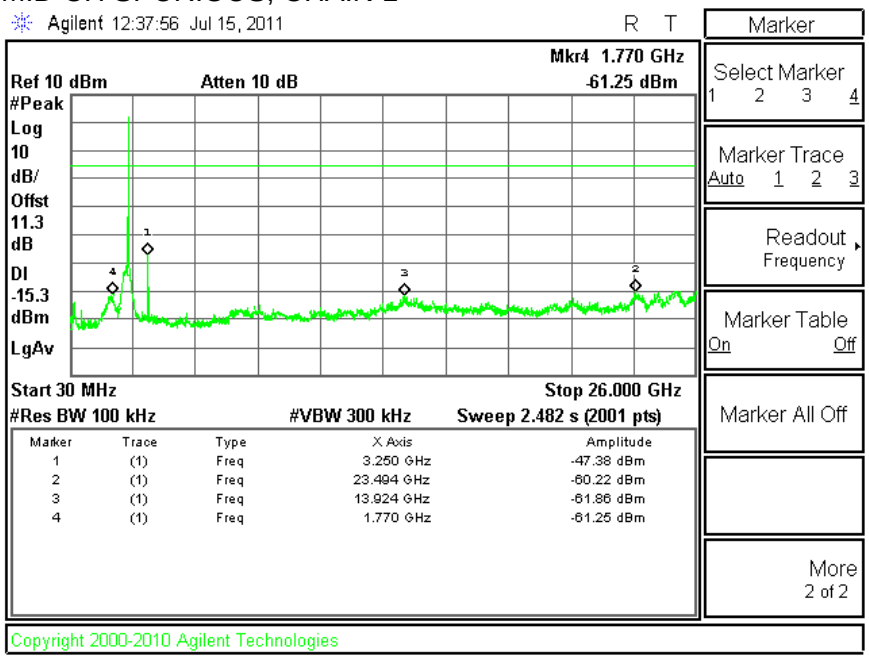




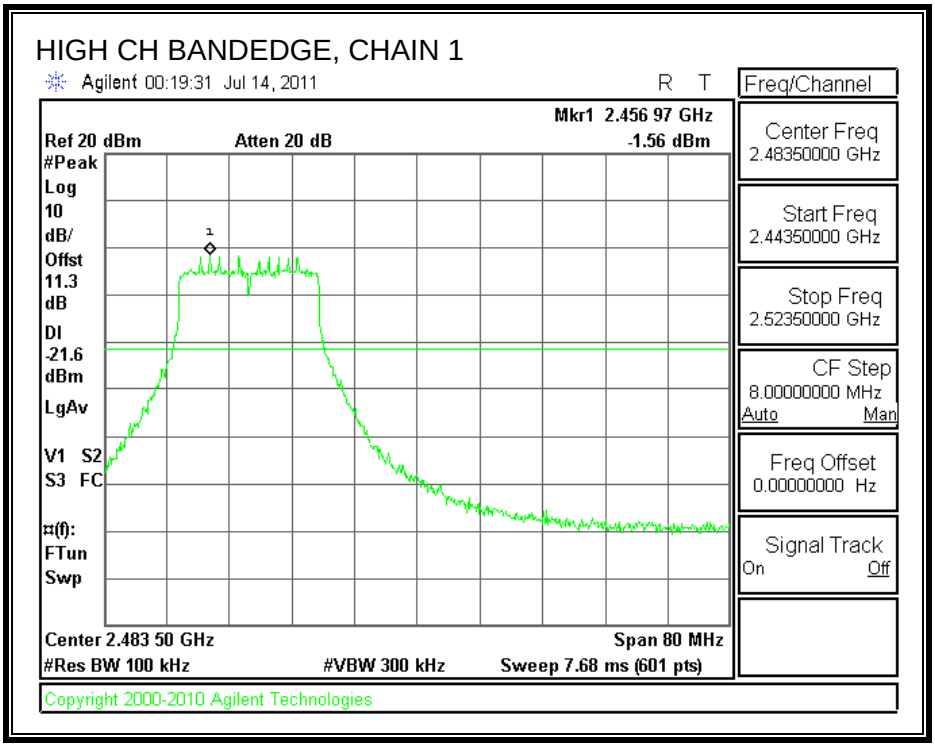
MID CH REFERENCE, CHAIN 1



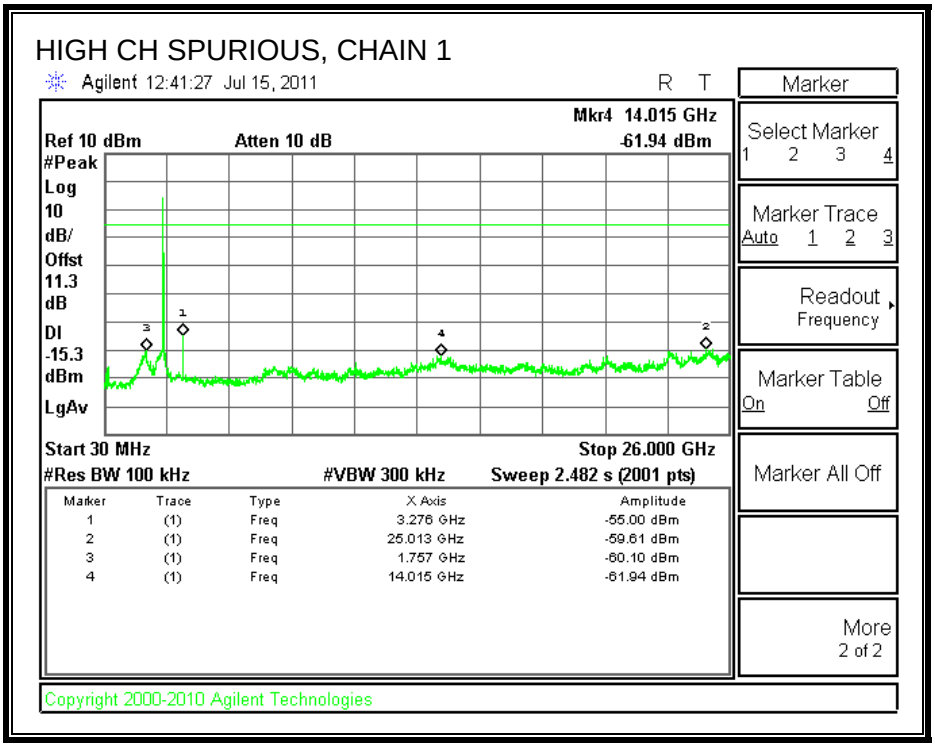
MID CH SPURIOUS, CHAIN 1



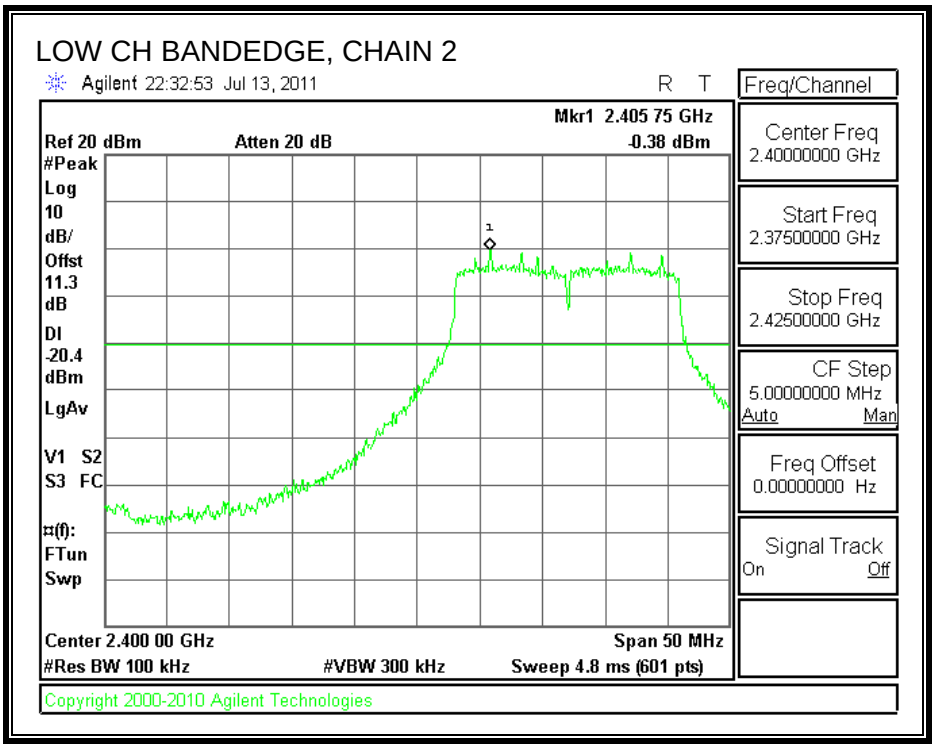
HIGH CH BANDEDGE, CHAIN 1

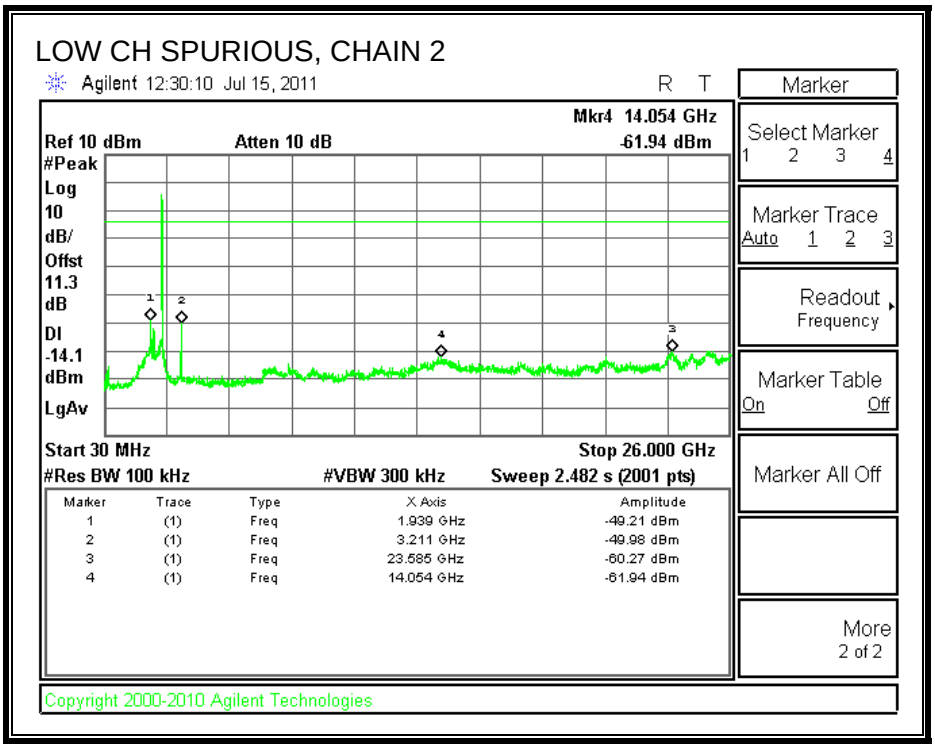


HIGH CH SPURIOUS, CHAIN 1

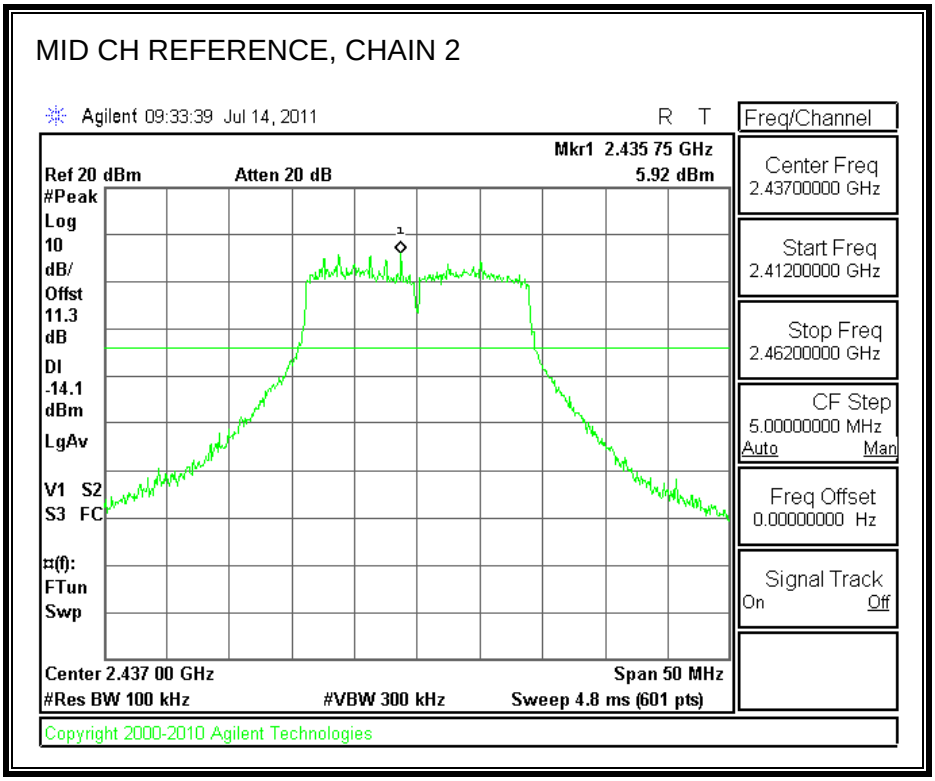


CHAIN 2 SPURIOUS EMISSIONS

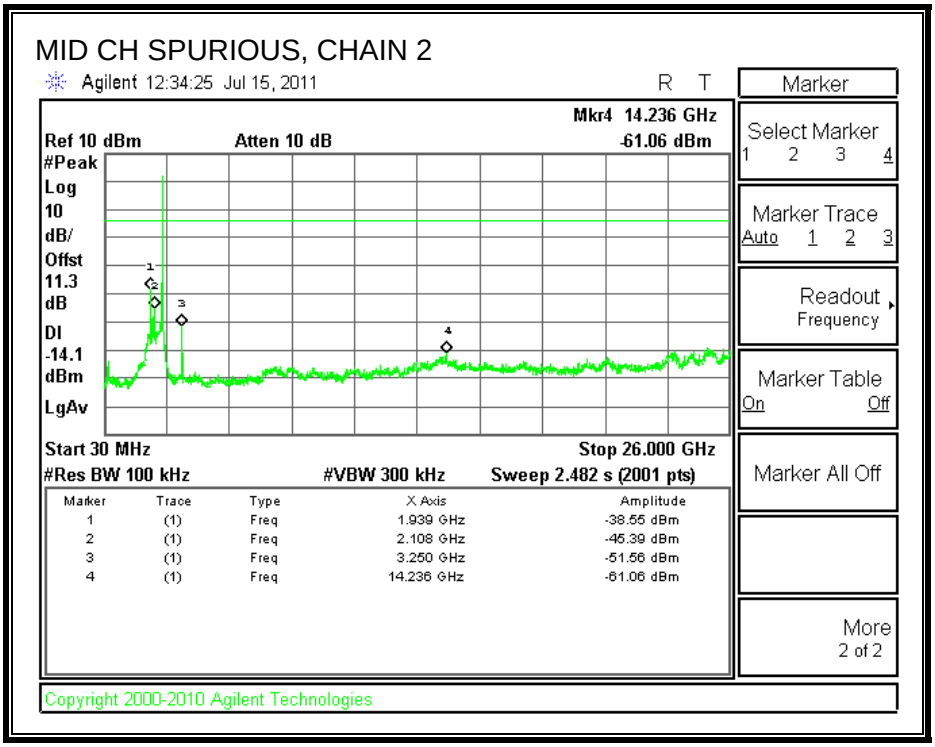




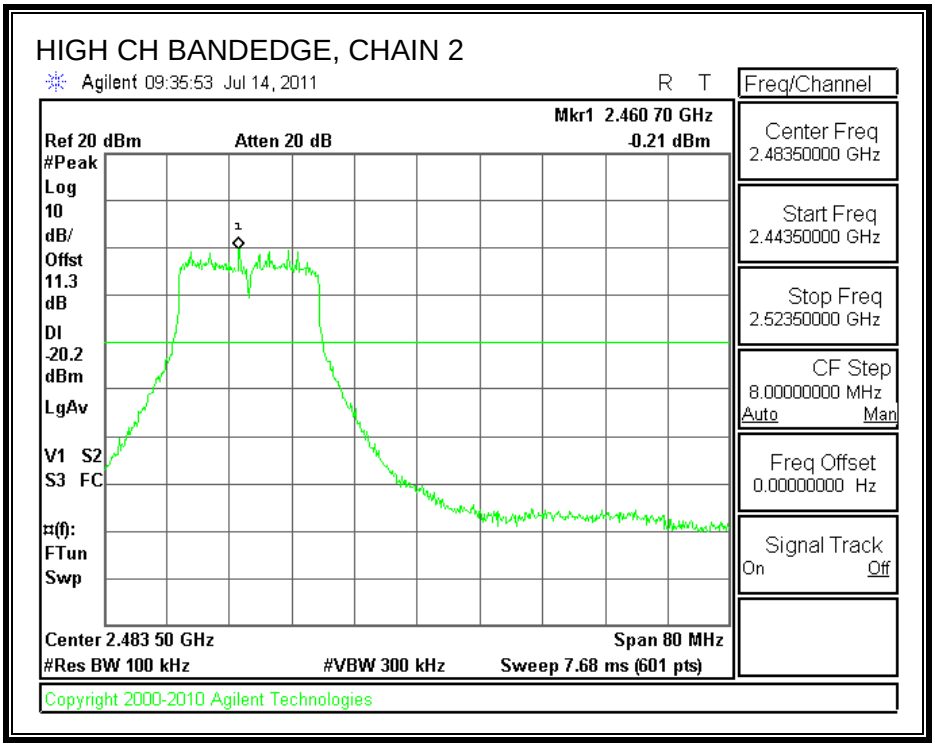
MID CH REFERENCE, CHAIN 2



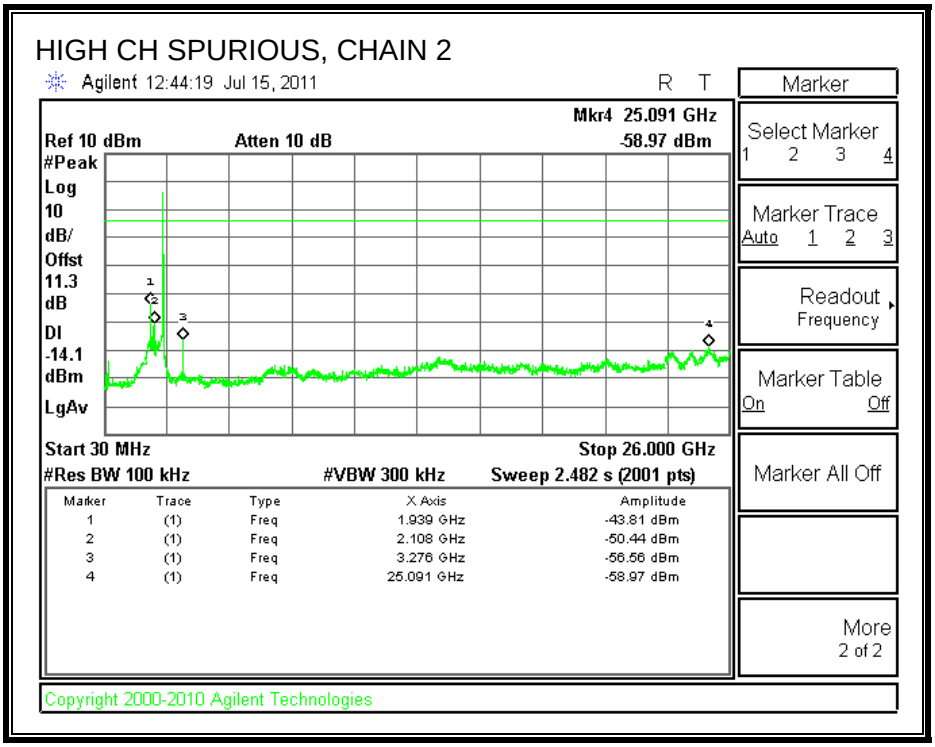
MID CH SPURIOUS, CHAIN 2



HIGH CH BANDEDGE, CHAIN 2



HIGH CH SPURIOUS, CHAIN 2



7.4. 802.11n TWO CHAINS 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.

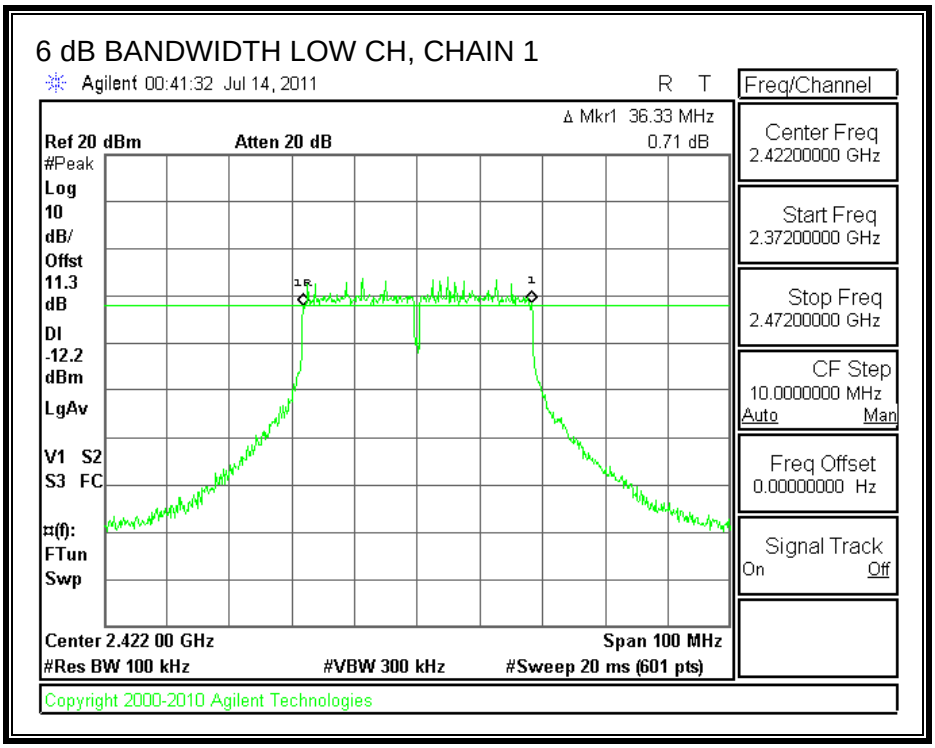
TEST PROCEDURE

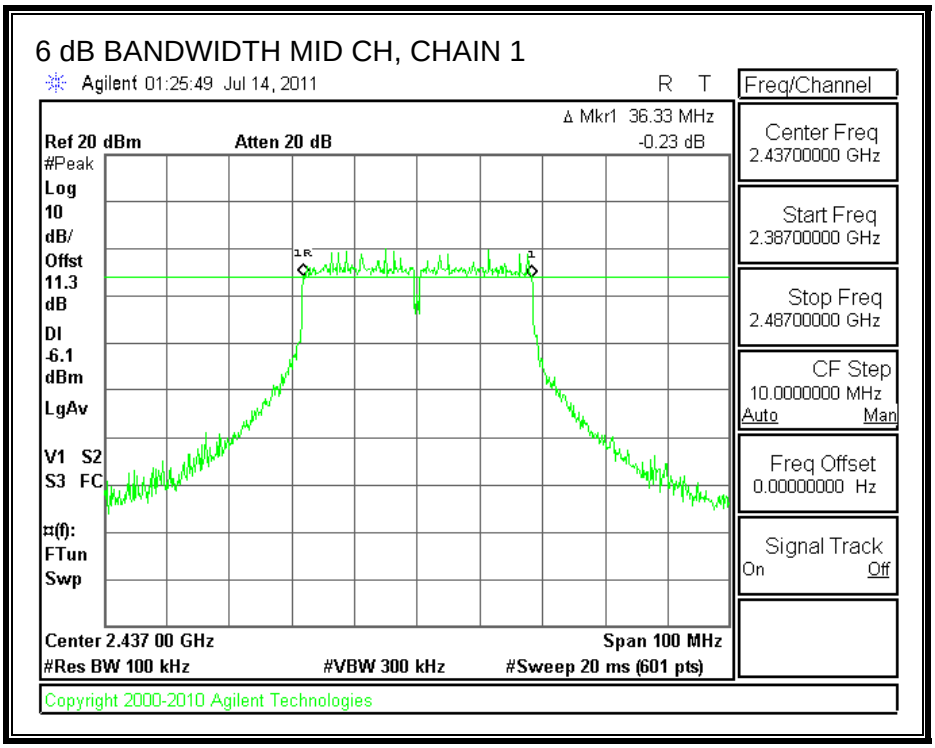
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

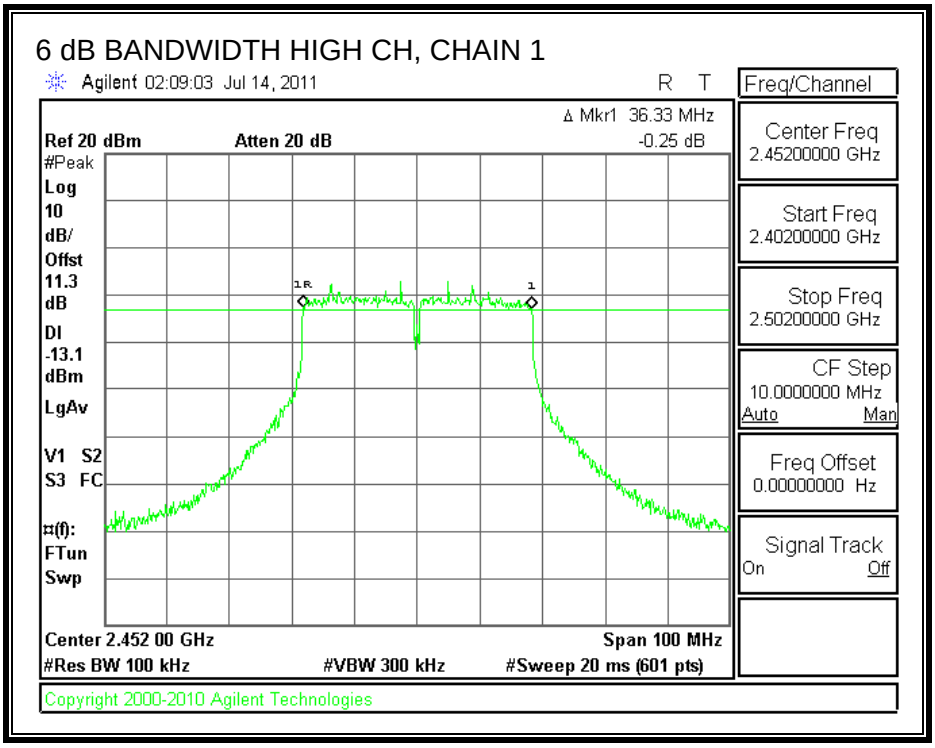
RESULTS

Channel	Frequency (MHz)	Chain 1 6 dB BW (MHz)	Chain 2 6 dB BW (MHz)	Minimum Limit (MHz)
Low	2422	36.33	35.67	0.5
Middle	2437	36.33	35.83	0.5
High	2452	36.33	35.17	0.5

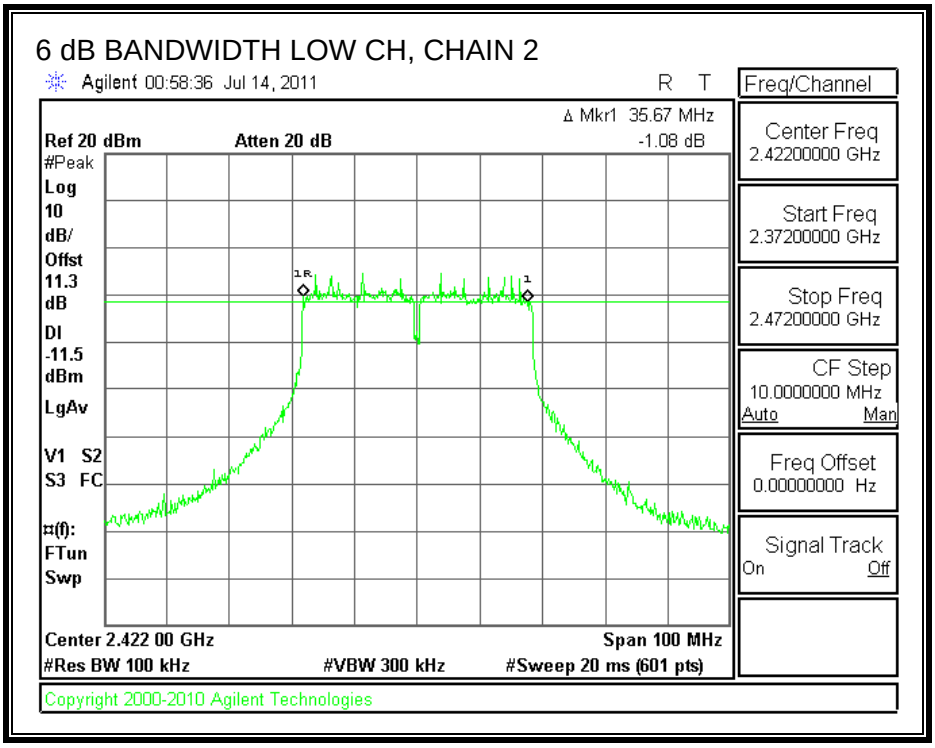
6 dB BANDWIDTH, CHAIN 1



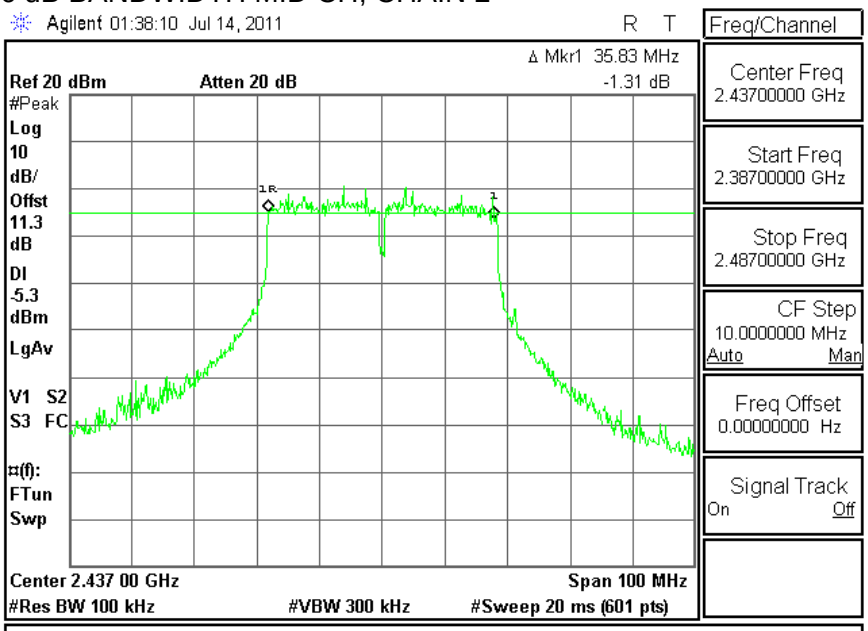




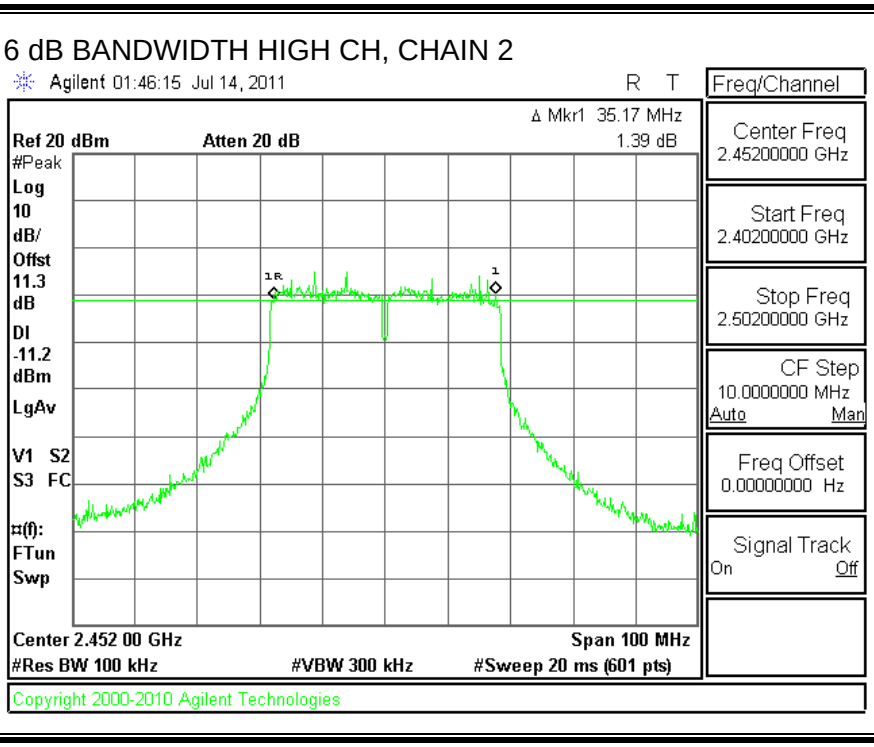
6 dB BANDWIDTH, CHAIN 2



6 dB BANDWIDTH MID CH, CHAIN 2



6 dB BANDWIDTH HIGH CH, CHAIN 2



7.4.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

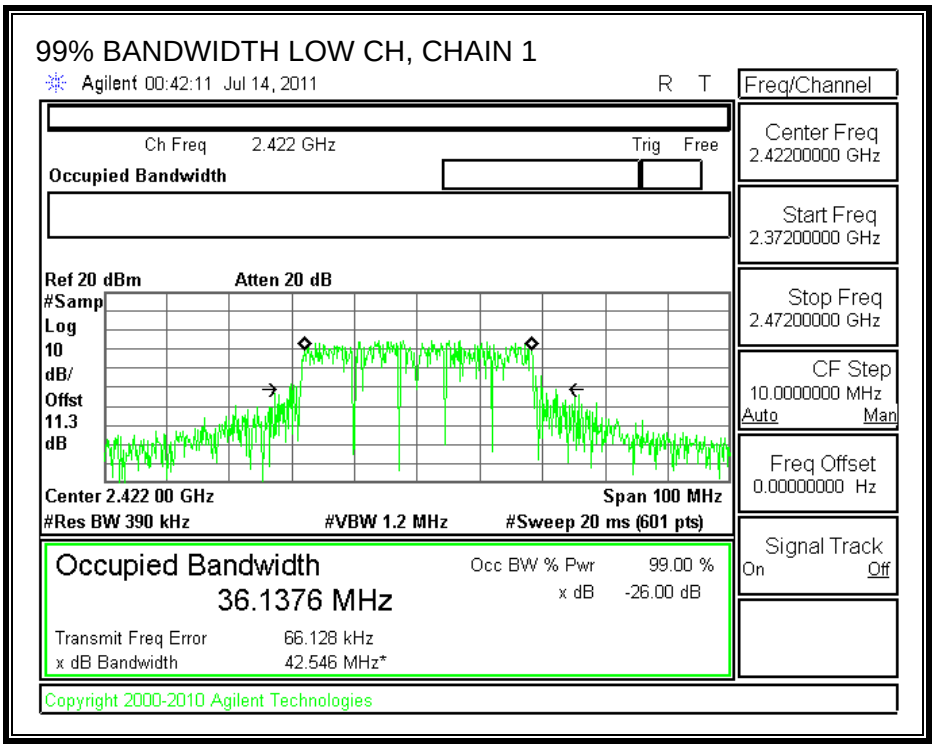
TEST PROCEDURE

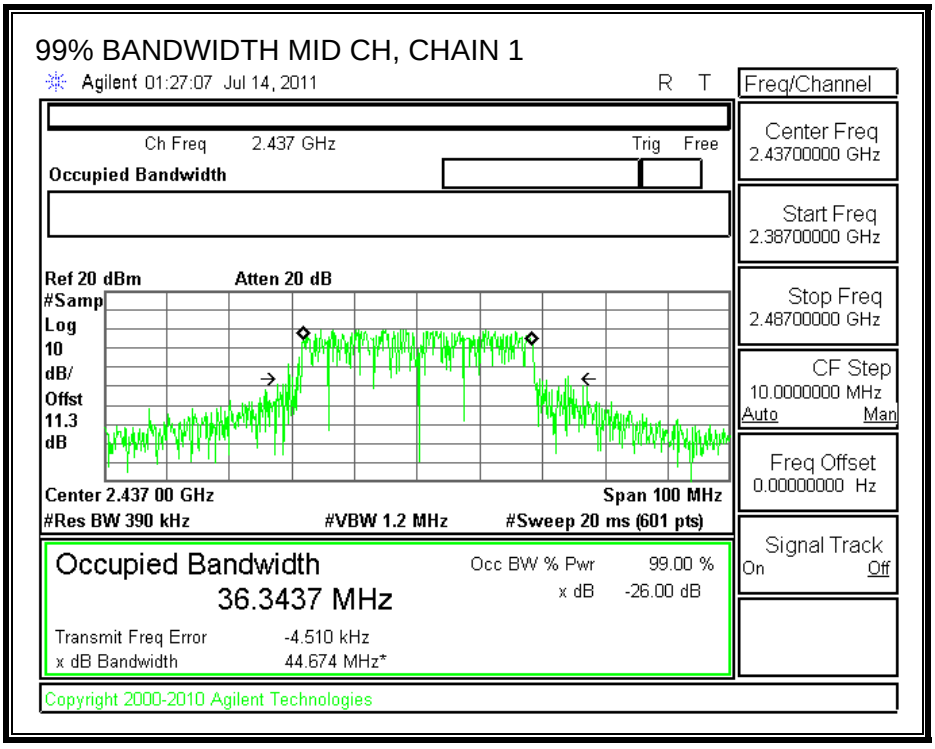
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

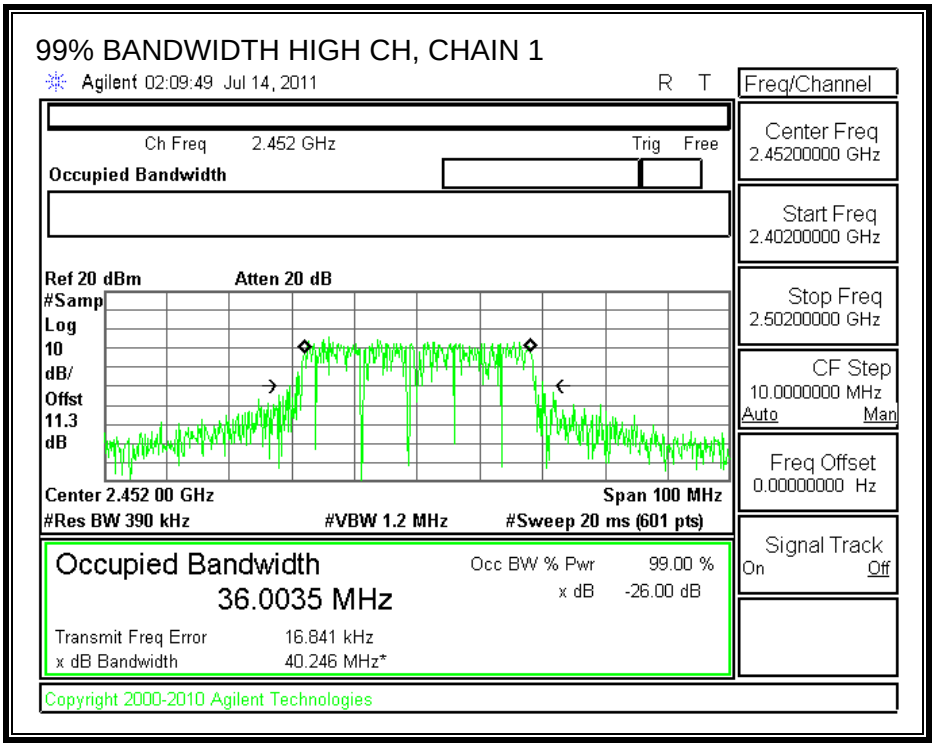
RESULTS

Channel	Frequency (MHz)	Chain 1 99% Bandwidth (MHz)	Chain 2 99% Bandwidth (MHz)
Low	2422	36.1376	35.9974
Middle	2437	36.3437	36.2763
High	2452	36.0035	36.1403

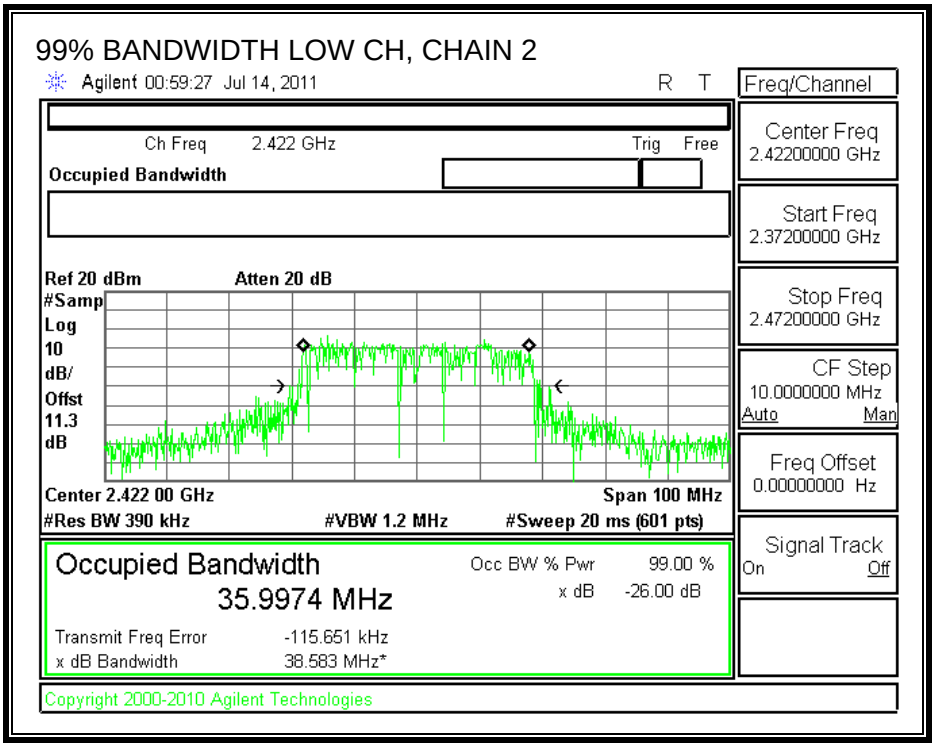
99% BANDWIDTH, CHAIN 1

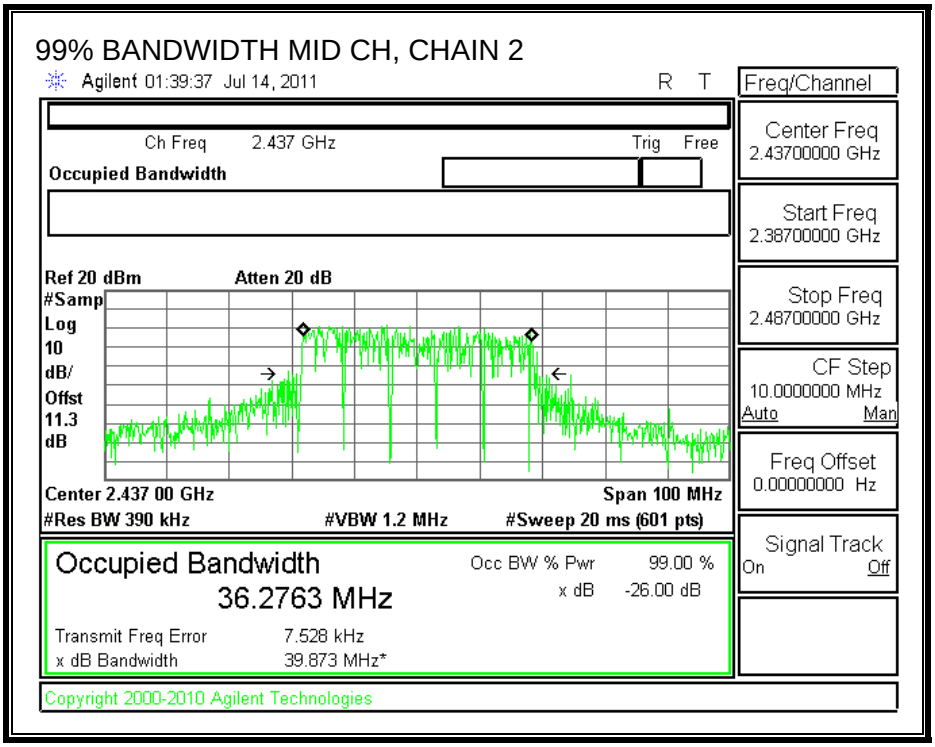


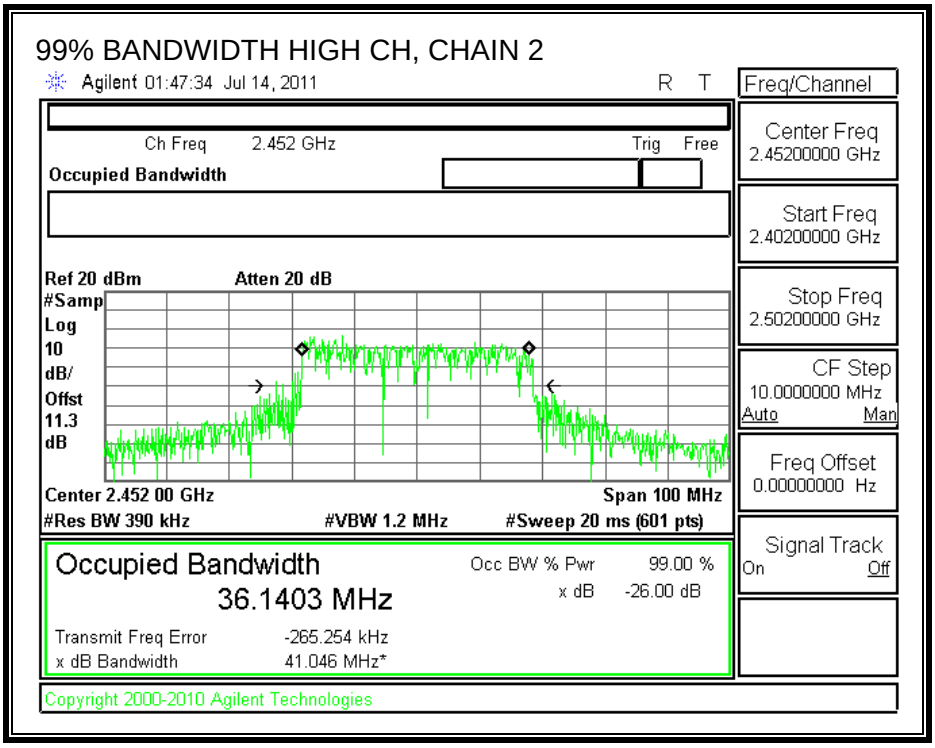




99% BANDWIDTH, CHAIN 2







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

Peak power is measured using a wideband peak power meter.

RESULTS

Channel	Frequency (MHz)	Chain 1 PK Power (dBm)	Chain 2 PK Power (dBm)	Attenuator + Cable Offset (dB)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	2422	19.10	19.20	0.00	22.16	30.00	-7.84
Mid	2437	24.80	25.20	0.00	28.01	30.00	-1.99
High	2452	18.70	19.30	0.00	22.02	30.00	-7.98

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 11.3 dB (including 10 dB pad and 1.3 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	8.23	8.02	11.14
Middle	2437	14.42	14.35	17.40
High	2452	7.68	8.06	10.88

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.

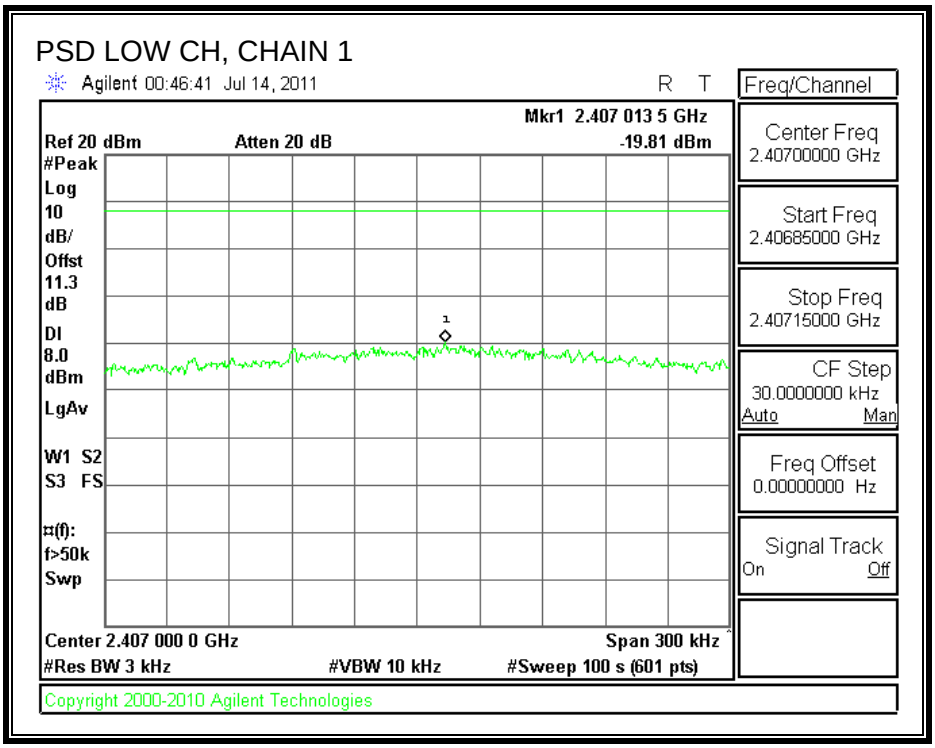
TEST PROCEDURE

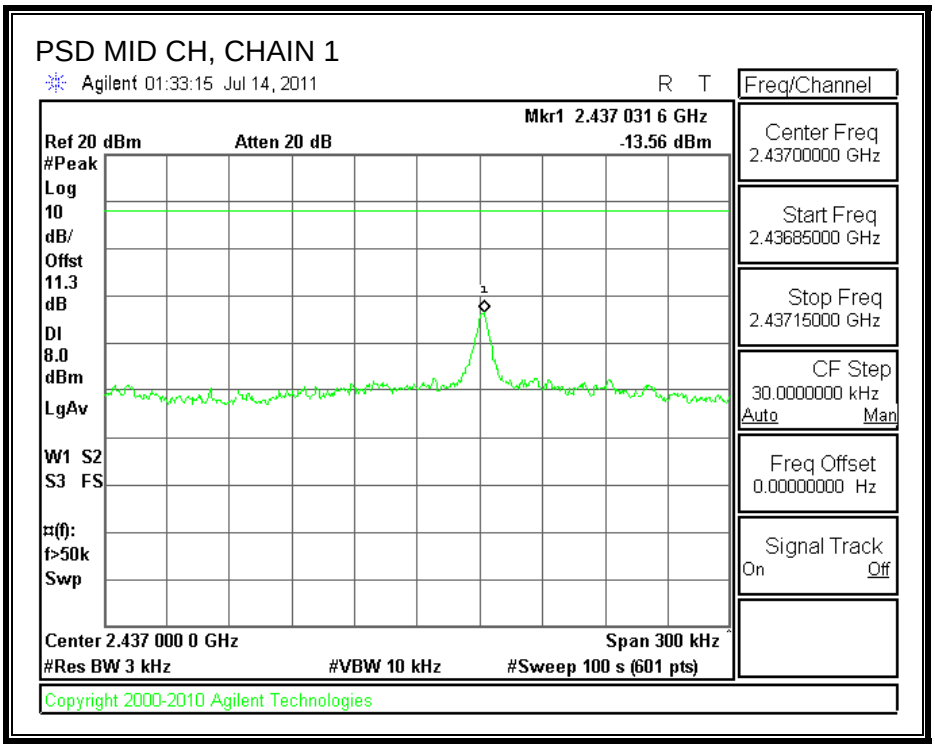
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

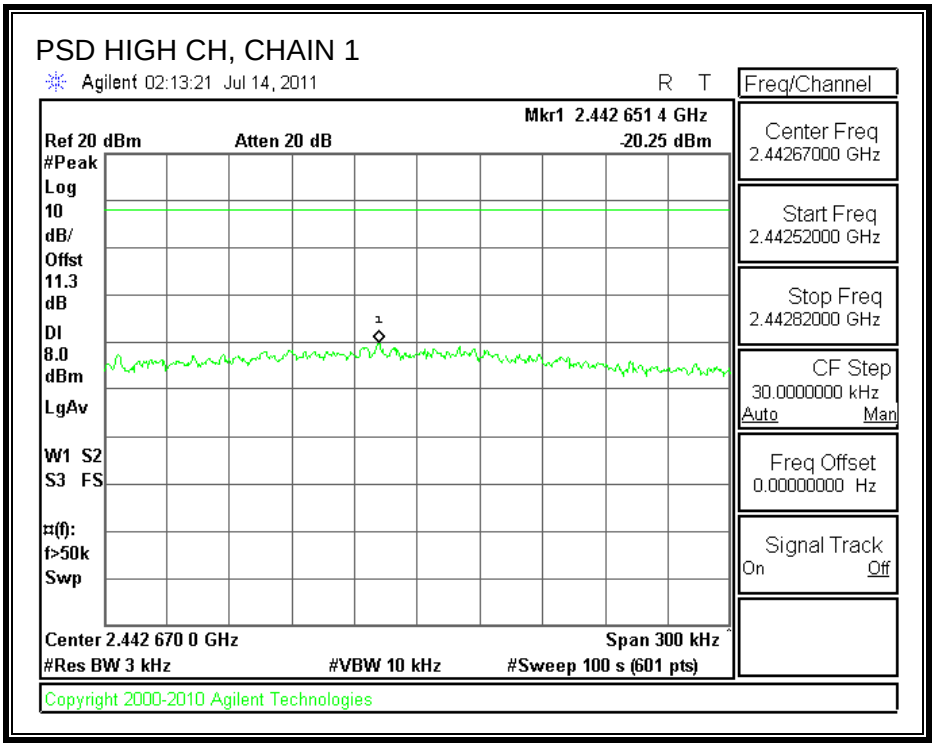
RESULTS:

Channel	Frequency (MHz)	Chain 1 PSD (dBm)	Chain 2 PSD (dBm)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2422	-19.81	-17.73	-15.64	8	-23.64
Middle	2437	-13.56	-13.00	-10.26	8	-18.26
High	2452	-20.25	-17.69	-15.77	8	-23.77

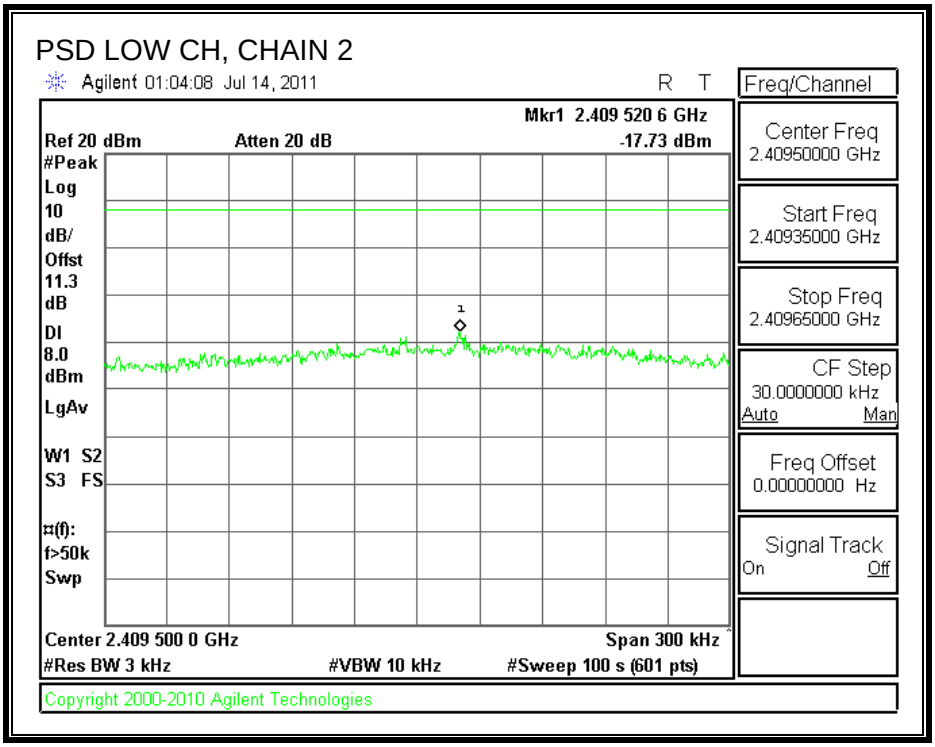
POWER SPECTRAL DENSITY, CHAIN 1



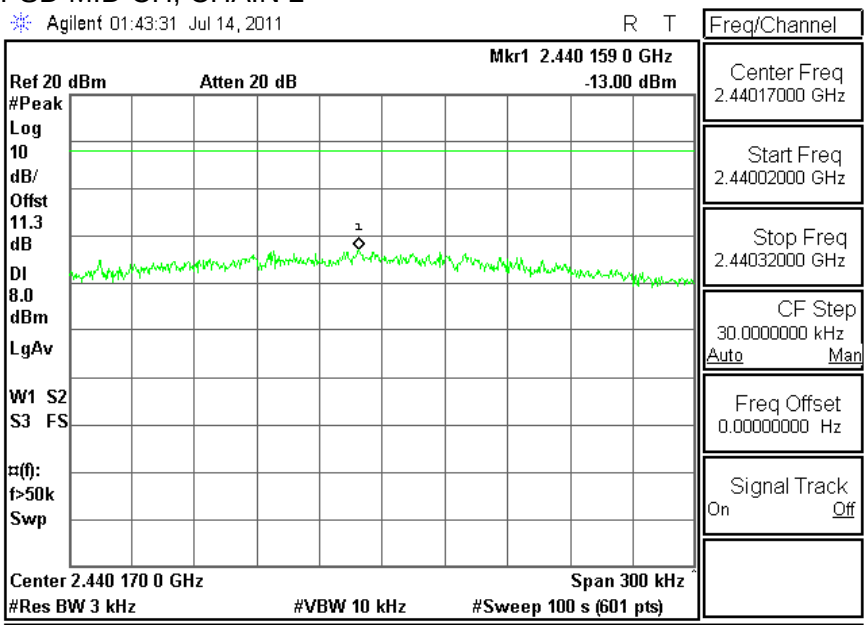




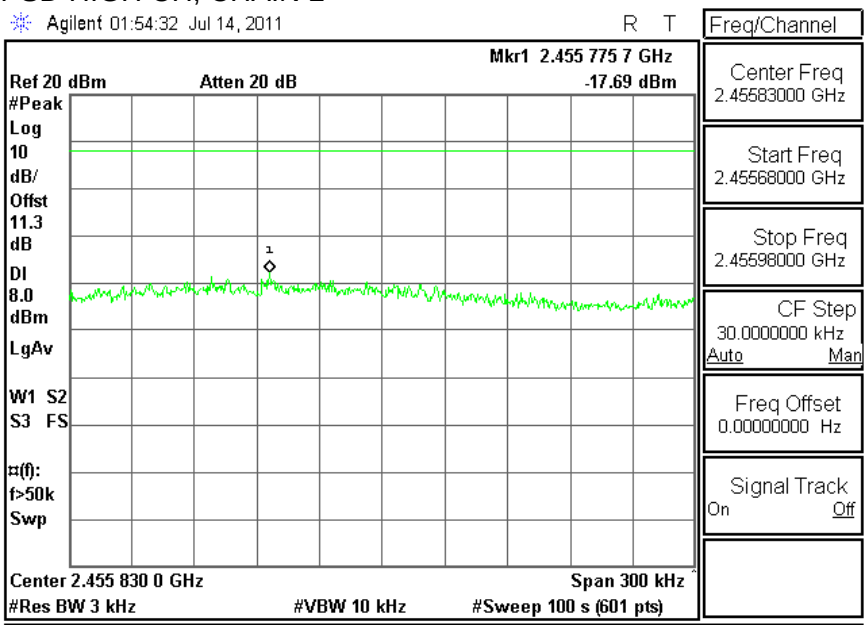
POWER SPECTRAL DENSITY, CHAIN 2



PSD MID CH, CHAIN 2



PSD HIGH CH, CHAIN 2



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.

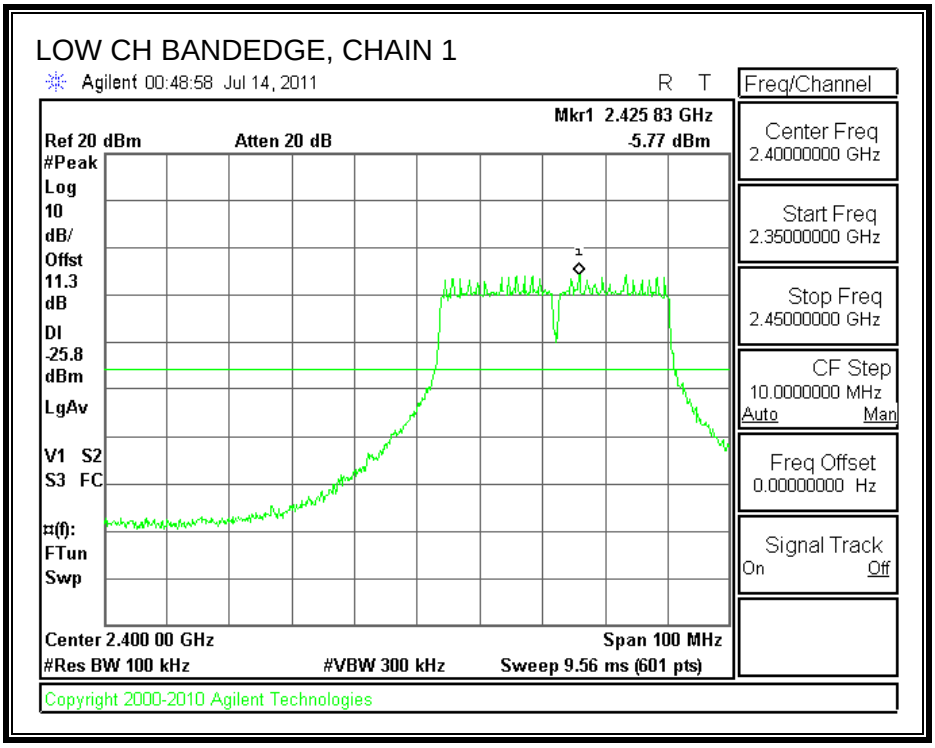
TEST PROCEDURE

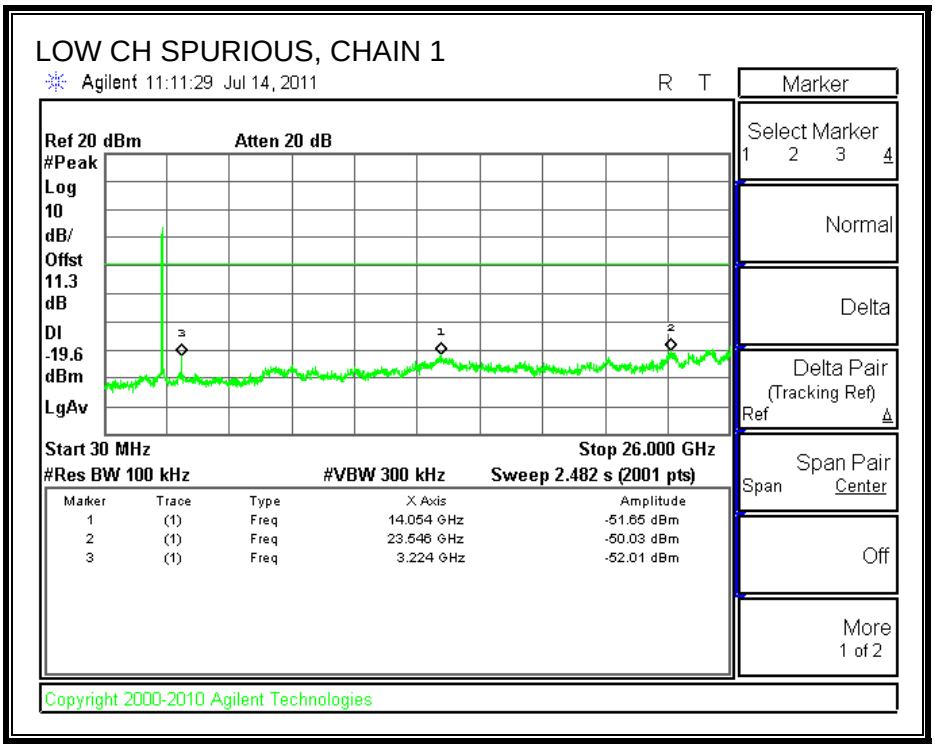
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

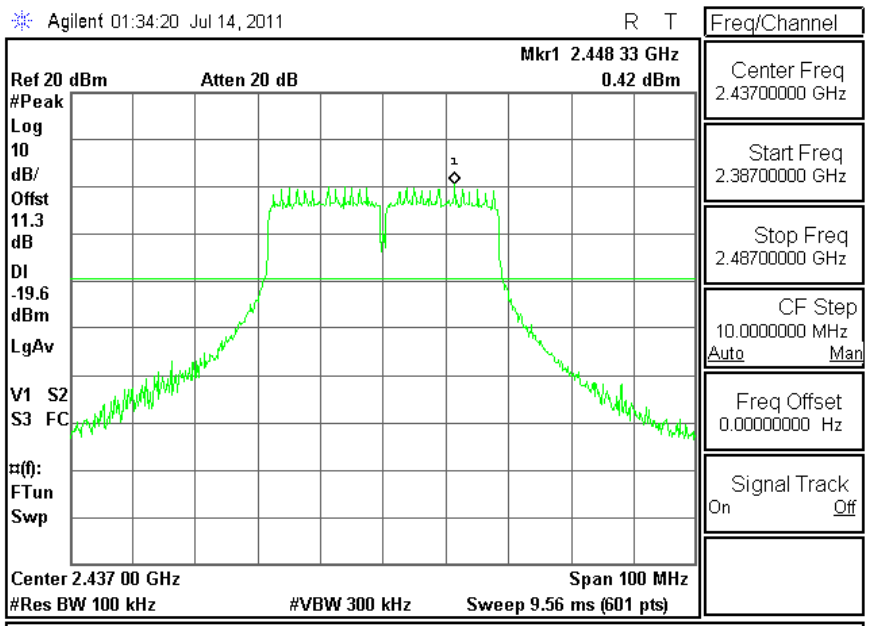
RESULTS

CHAIN 2 SPURIOUS EMISSIONS

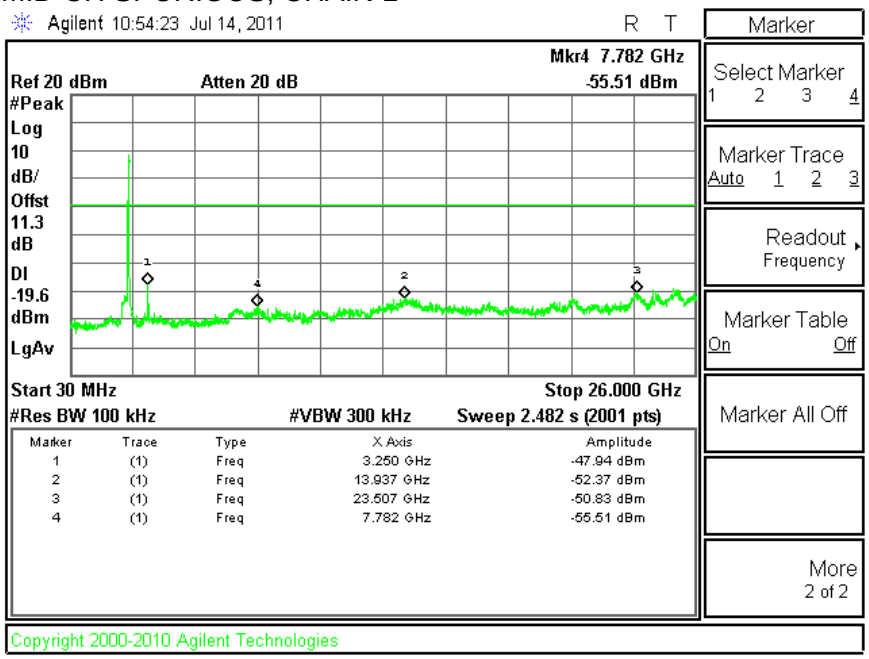




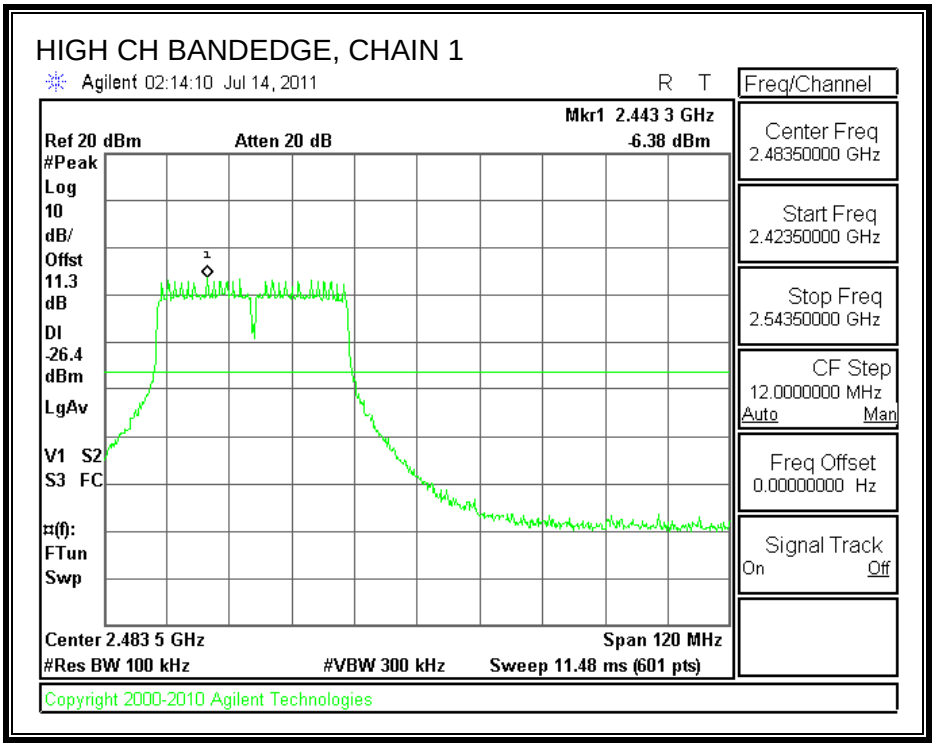
MID CH REFERENCE, CHAIN 1



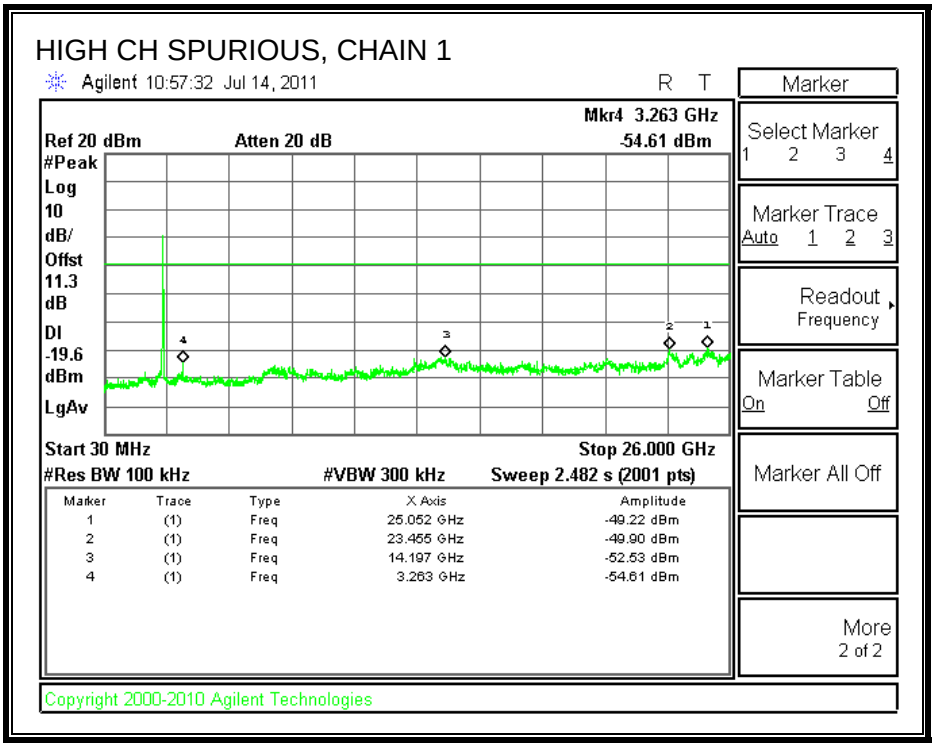
MID CH SPURIOUS, CHAIN 1



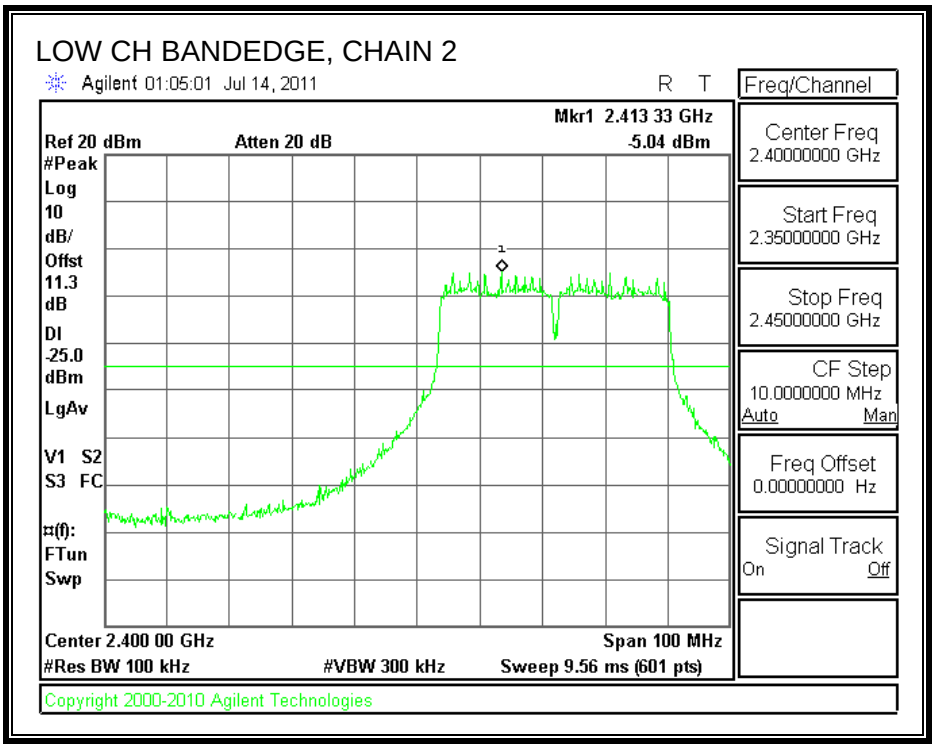
HIGH CH BANDEDGE, CHAIN 1

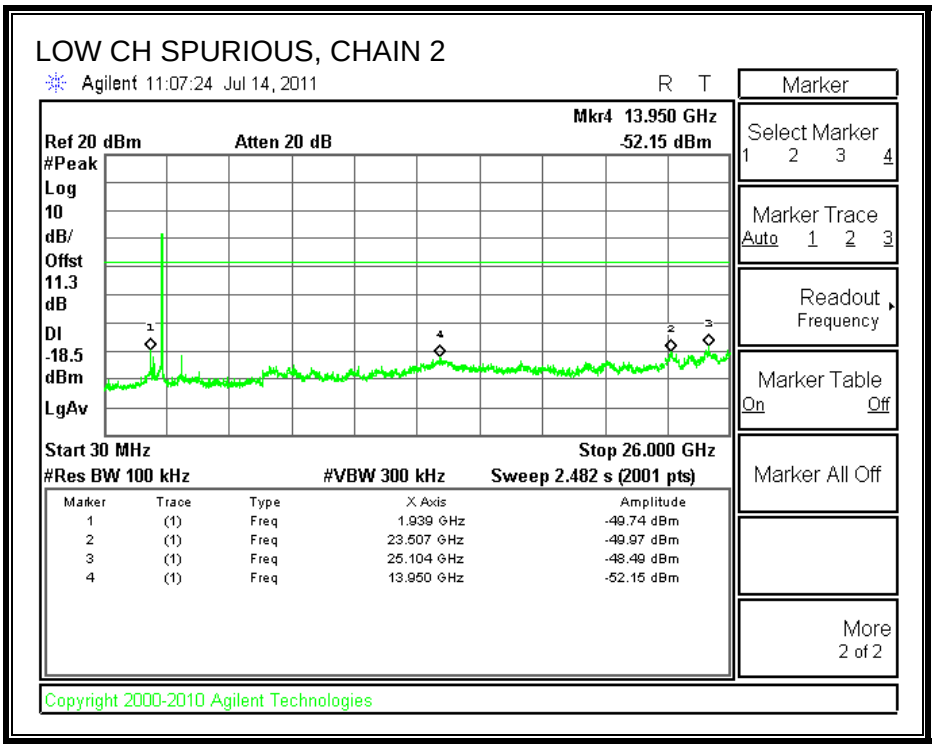


HIGH CH SPURIOUS, CHAIN 1

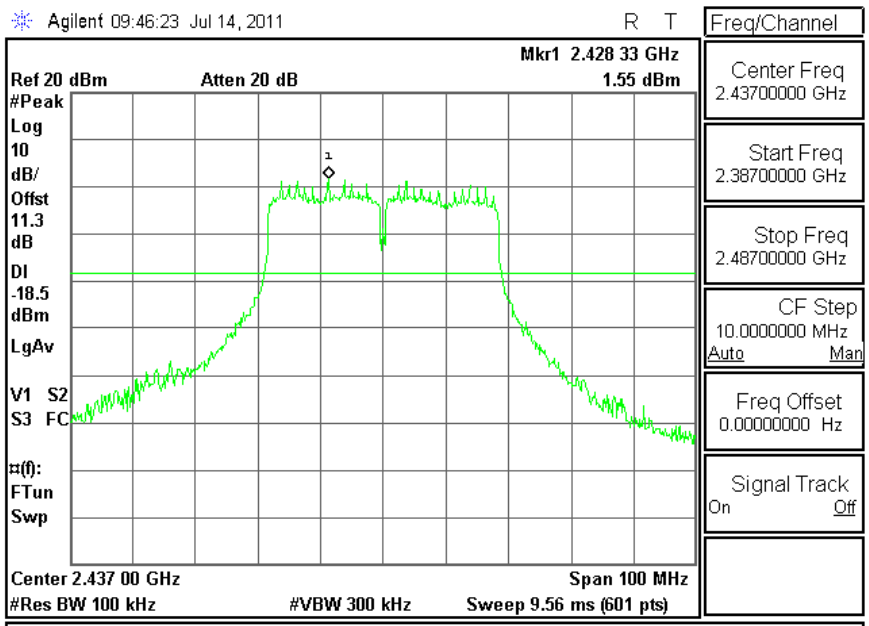


CHAIN 2 SPURIOUS EMISSIONS

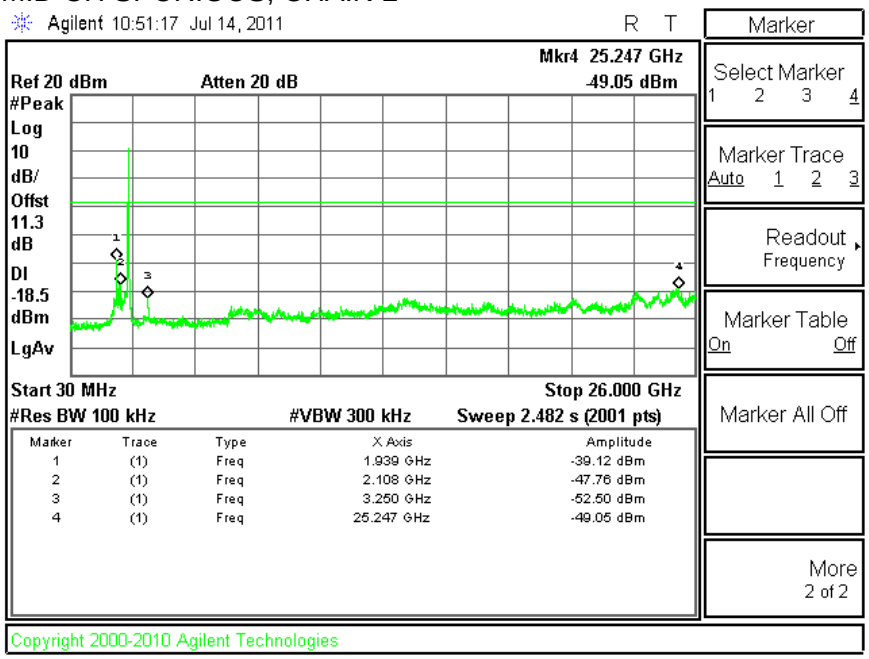




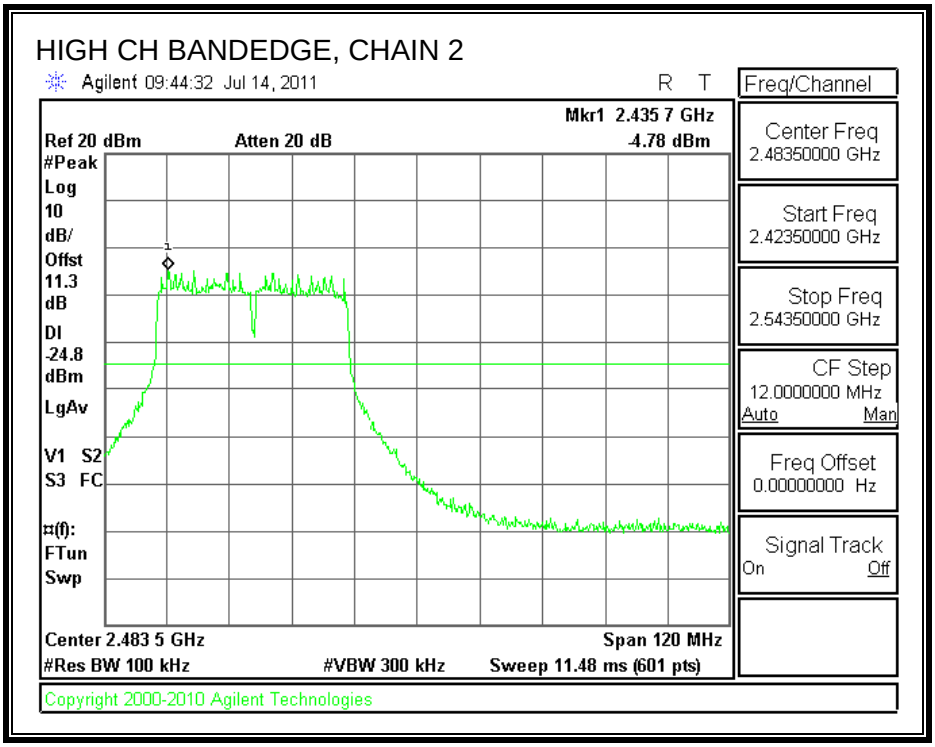
MID CH REFERENCE, CHAIN 2



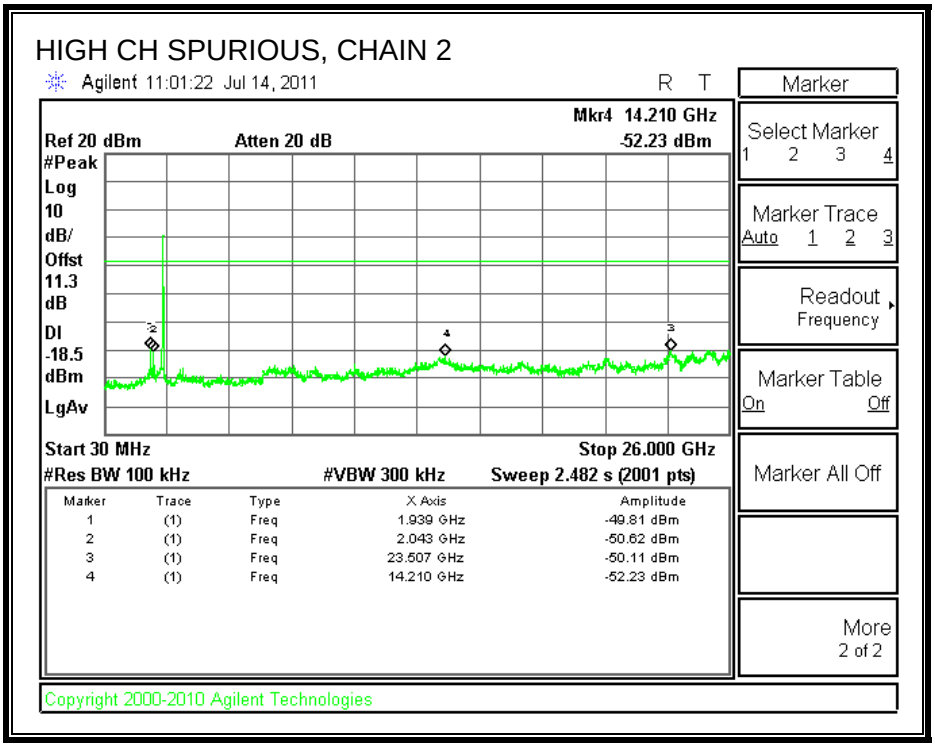
MID CH SPURIOUS, CHAIN 2



HIGH CH BANDEDGE, CHAIN 2



HIGH CH SPURIOUS, CHAIN 2



8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

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

TEST PROCEDURE

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

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

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

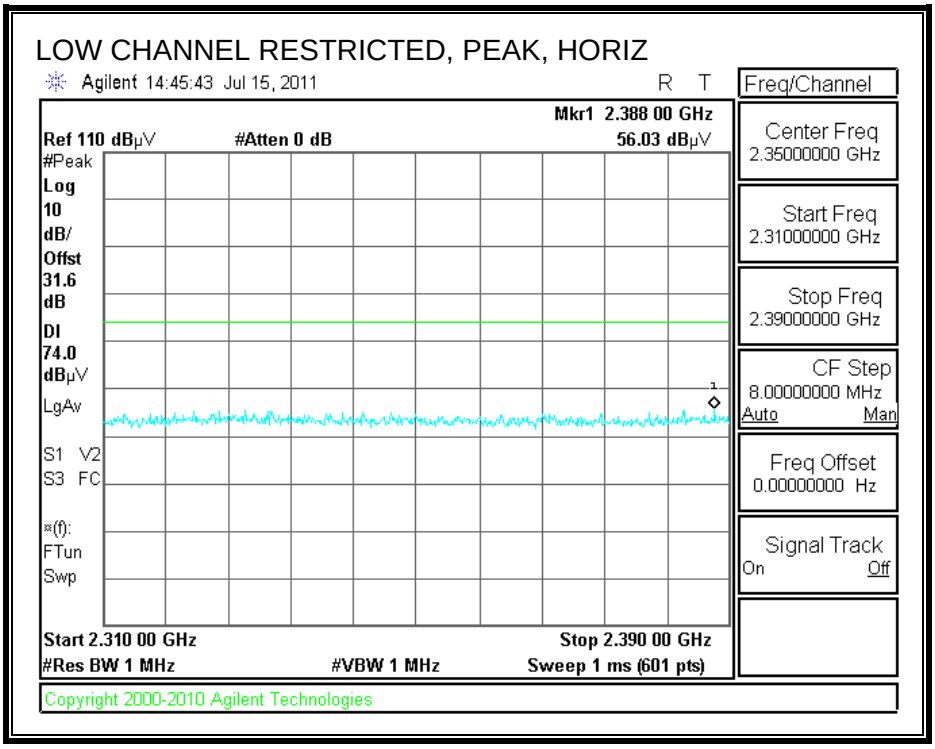
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

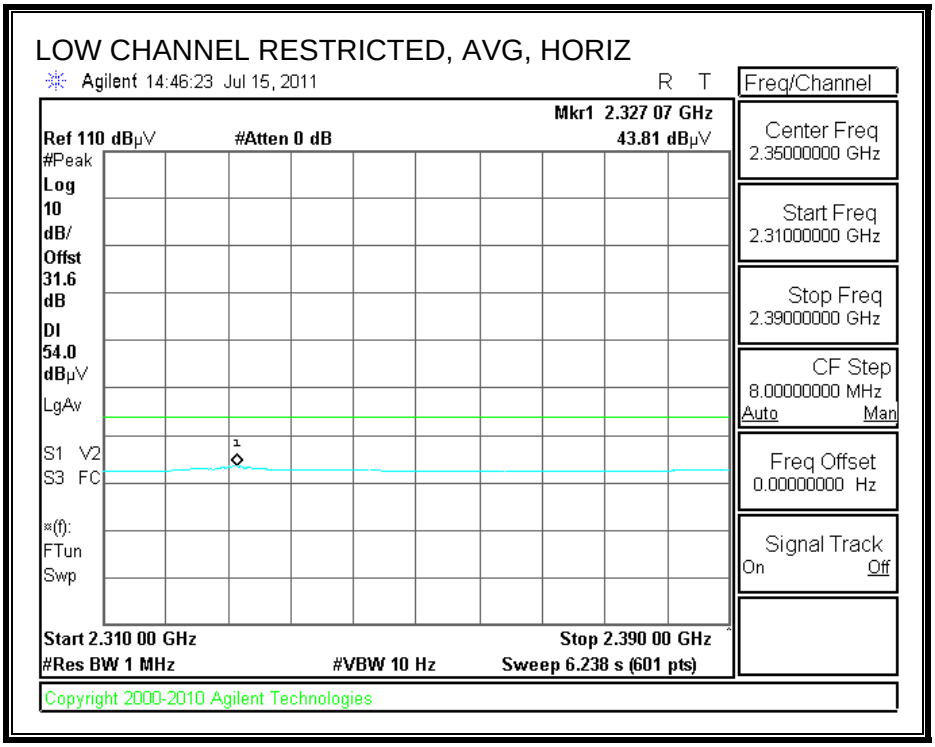
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

8.2. TRANSMITTER ABOVE 1 GHz

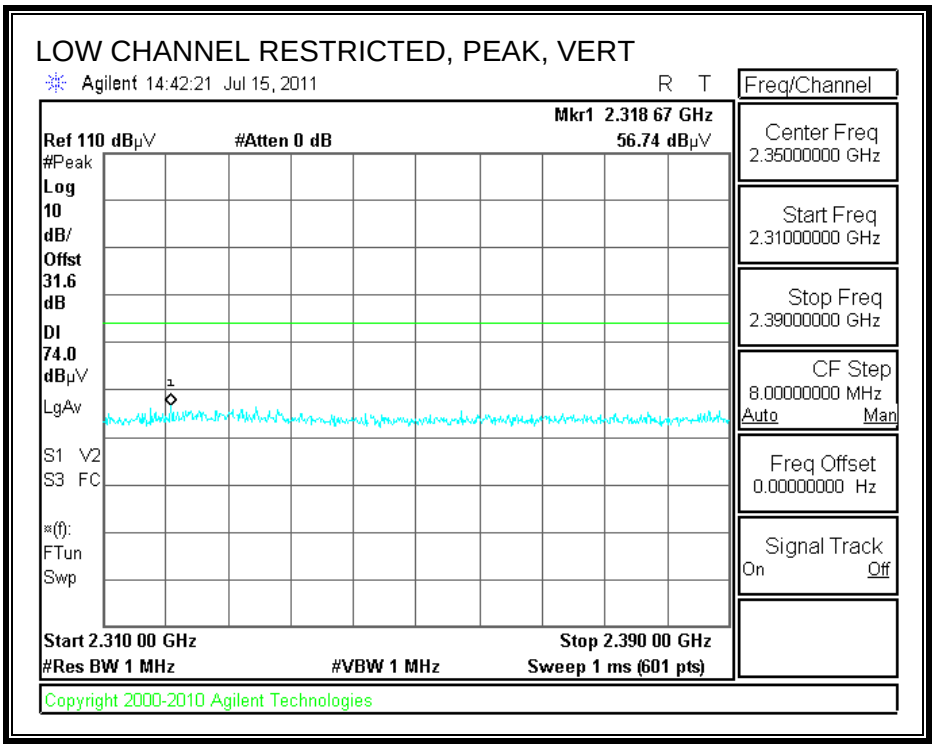
8.2.1. TX ABOVE 1 GHz FOR 802.11b MODE IN THE 2.4 GHz BAND

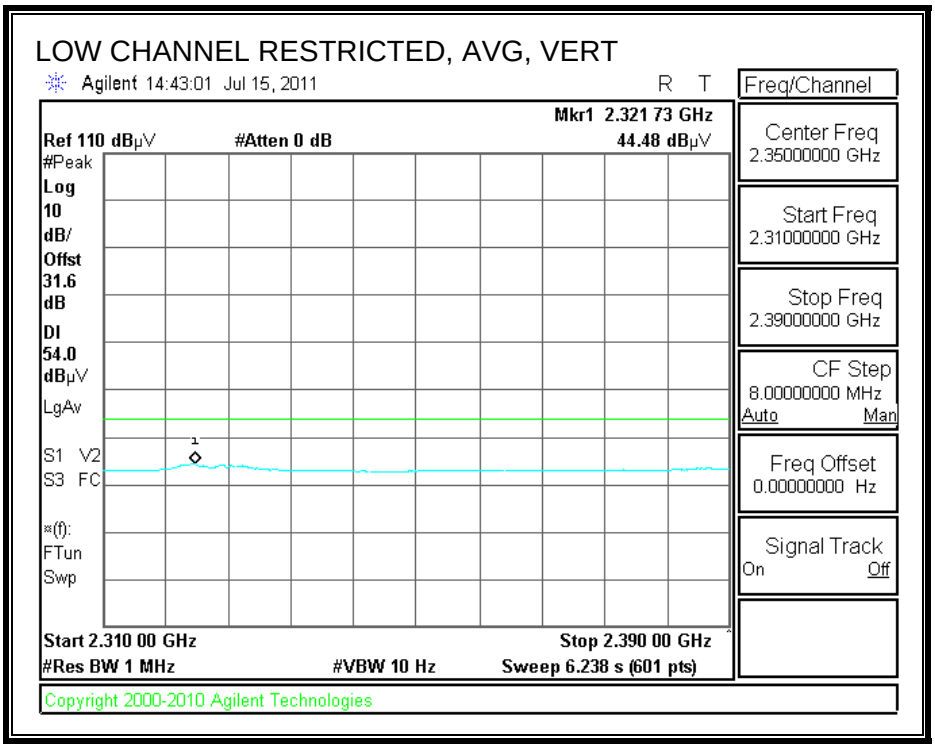
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



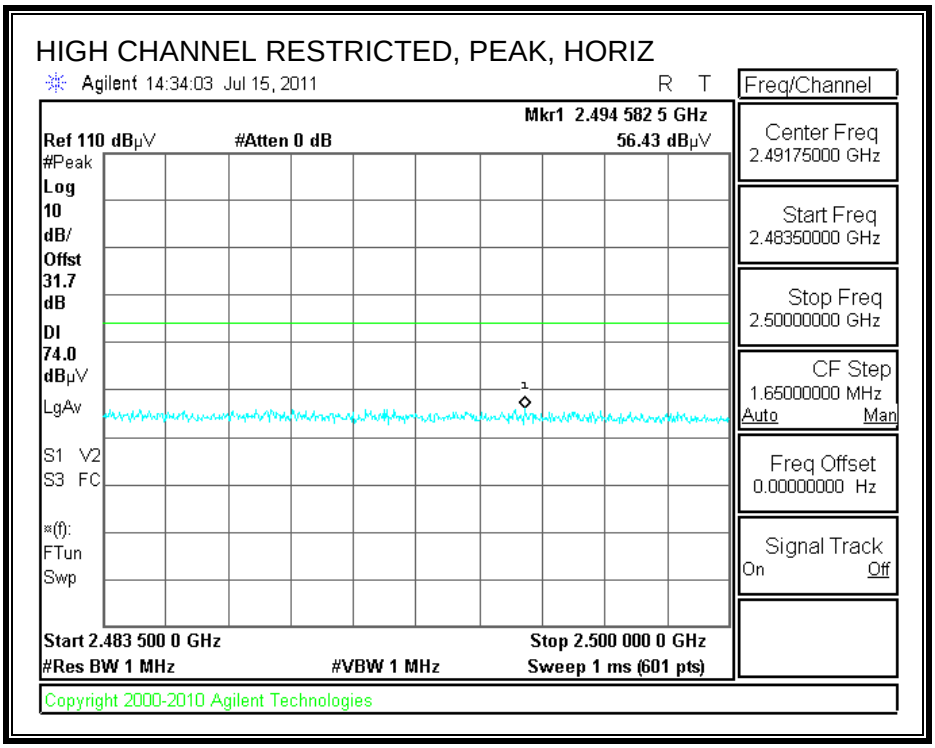


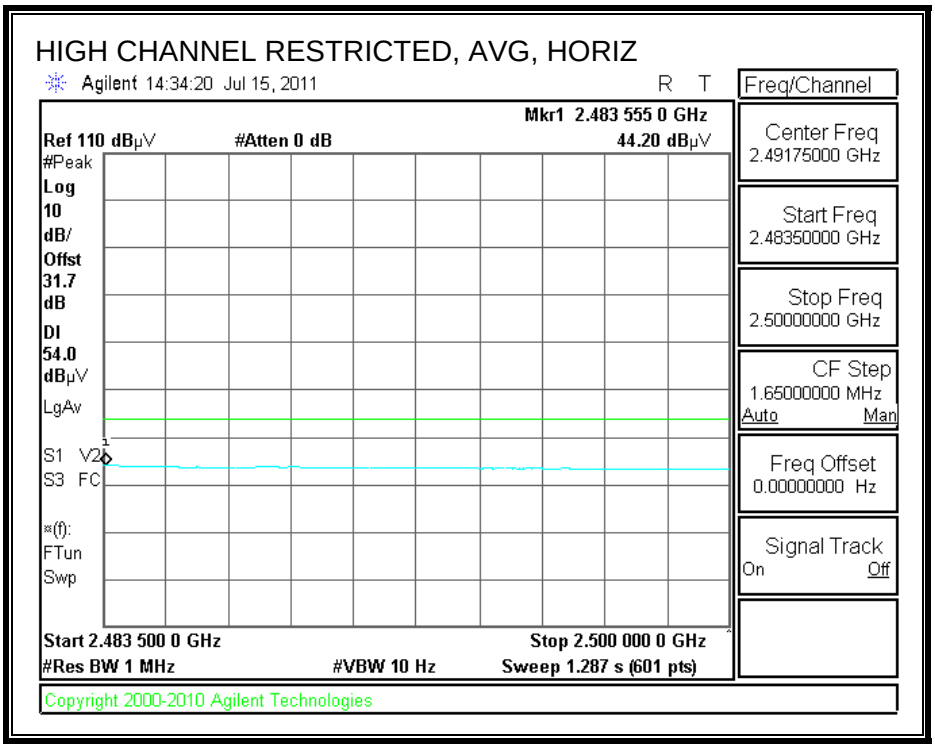
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



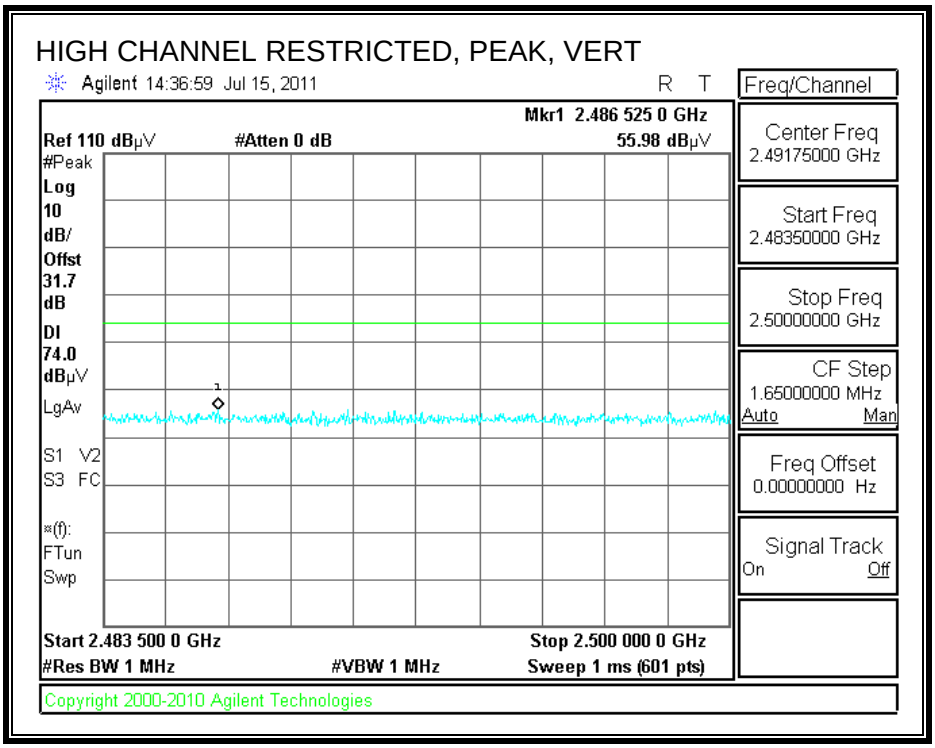


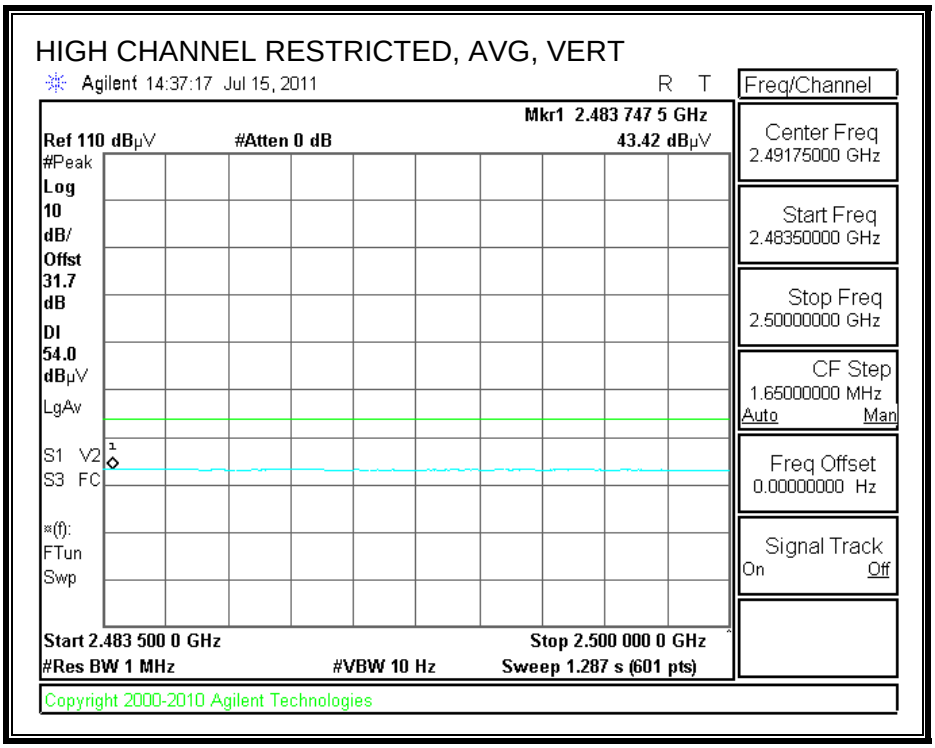
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: William Zhuang
Date: 07/18/11
Project #: 11J13902
Company: Panasonic
Test Target: FCC 15.247
Mode Oper: Tx On, b Mode

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

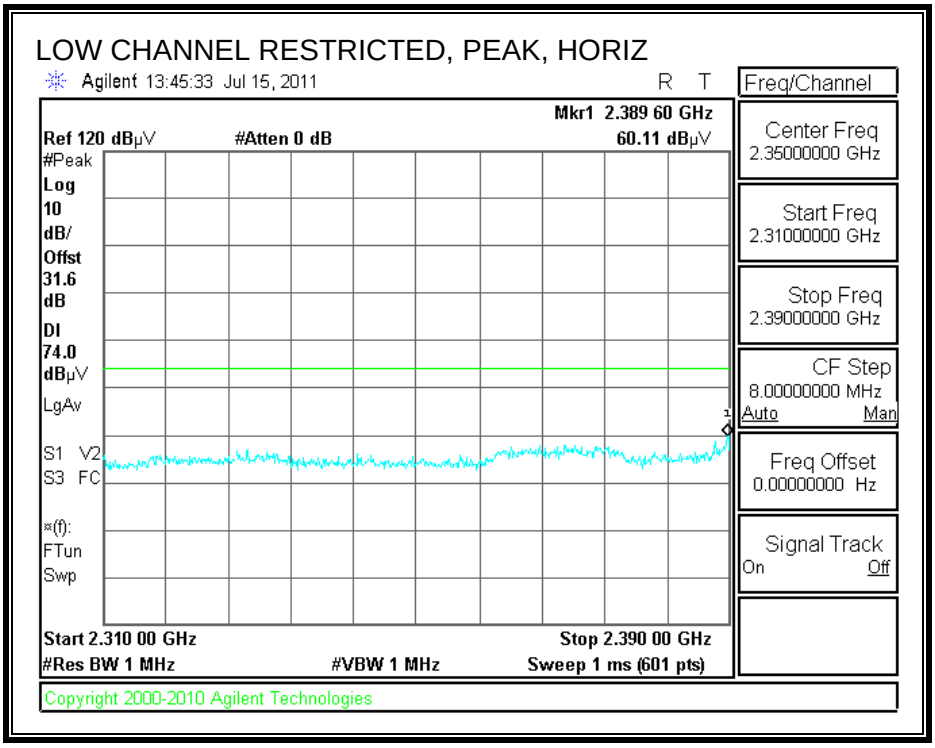
Average Field Strength Limit
Peak Field Strength Limit
Margin vs. Average Limit
Margin vs. Peak Limit

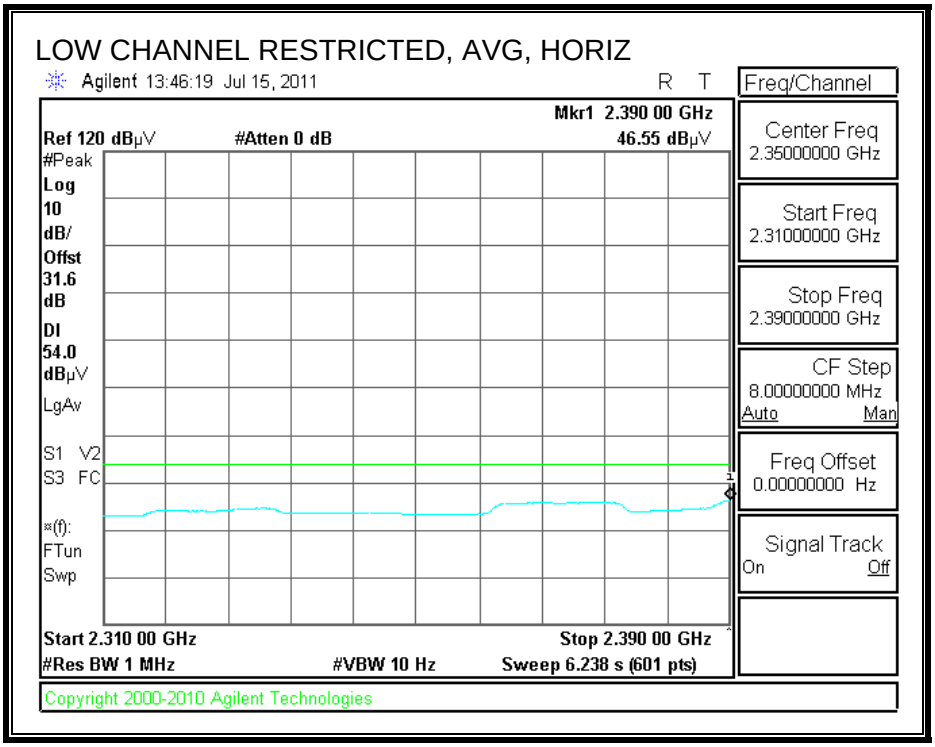
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
Low Ch. 2412 MHz															
4.824	3.0	41.0	32.7	5.8	-34.8	0.0	0.0	44.7	74.0	-29.3	V	P	101.0	354.0	
4.824	3.0	37.1	32.7	5.8	-34.8	0.0	0.0	40.7	54.0	-13.3	V	A	101.0	354.0	
4.824	3.0	40.7	32.7	5.8	-34.8	0.0	0.0	44.3	74.0	-29.7	H	P	123.0	101.0	
4.824	3.0	35.9	32.7	5.8	-34.8	0.0	0.0	39.5	54.0	-14.5	H	A	123.0	101.0	
Mid Ch. 2437 MHz															
4.874	3.0	46.3	32.7	5.8	-34.8	0.0	0.0	50.0	74.0	-24.0	H	P	158.0	90.0	
4.874	3.0	44.1	32.7	5.8	-34.8	0.0	0.0	47.8	54.0	-6.2	H	A	158.0	90.0	
4.874	3.0	47.0	32.7	5.8	-34.8	0.0	0.0	50.7	74.0	-23.3	V	P	99.0	355.0	
4.874	3.0	44.3	32.7	5.8	-34.8	0.0	0.0	48.0	54.0	-6.0	V	A	99.0	355.0	
7.311	3.0	37.4	35.5	7.3	-34.1	0.0	0.0	46.1	74.0	-27.9	V	P	167.0	104.0	
7.311	3.0	27.0	35.5	7.3	-34.1	0.0	0.0	35.6	54.0	-18.4	V	A	167.0	104.0	
7.311	3.0	36.3	35.5	7.3	-34.1	0.0	0.0	44.9	74.0	-29.1	H	P	150.0	124.0	
7.311	3.0	25.5	35.5	7.3	-34.1	0.0	0.0	34.1	54.0	-19.9	H	A	150.0	124.0	
High Ch. 2462 MHz															
4.924	3.0	40.1	32.7	5.9	-34.8	0.0	0.0	43.9	74.0	-30.1	H	P	152.0	103.0	
4.924	3.0	34.2	32.7	5.9	-34.8	0.0	0.0	38.0	54.0	-16.0	H	A	152.0	103.0	
4.924	3.0	37.2	32.7	5.9	-34.8	0.0	0.0	41.0	74.0	-33.0	V	P	98.0	274.0	
4.924	3.0	29.5	32.7	5.9	-34.8	0.0	0.0	33.3	54.0	-20.7	V	A	98.0	274.0	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

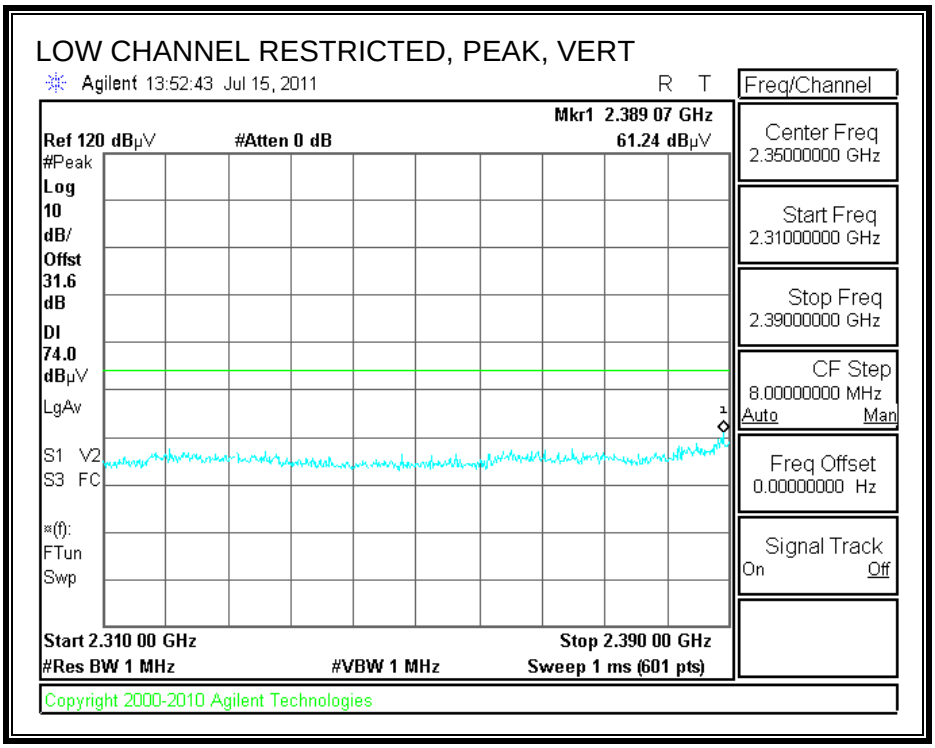
8.2.2. TX ABOVE 1 GHz FOR 802.11g MODE IN THE 2.4 GHz BAND

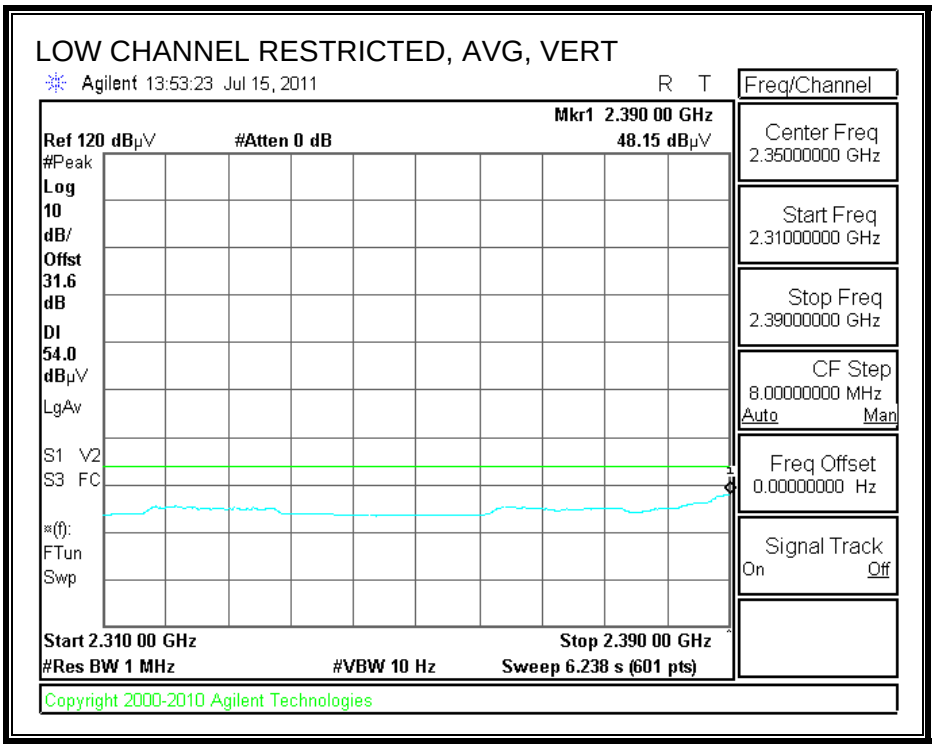
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



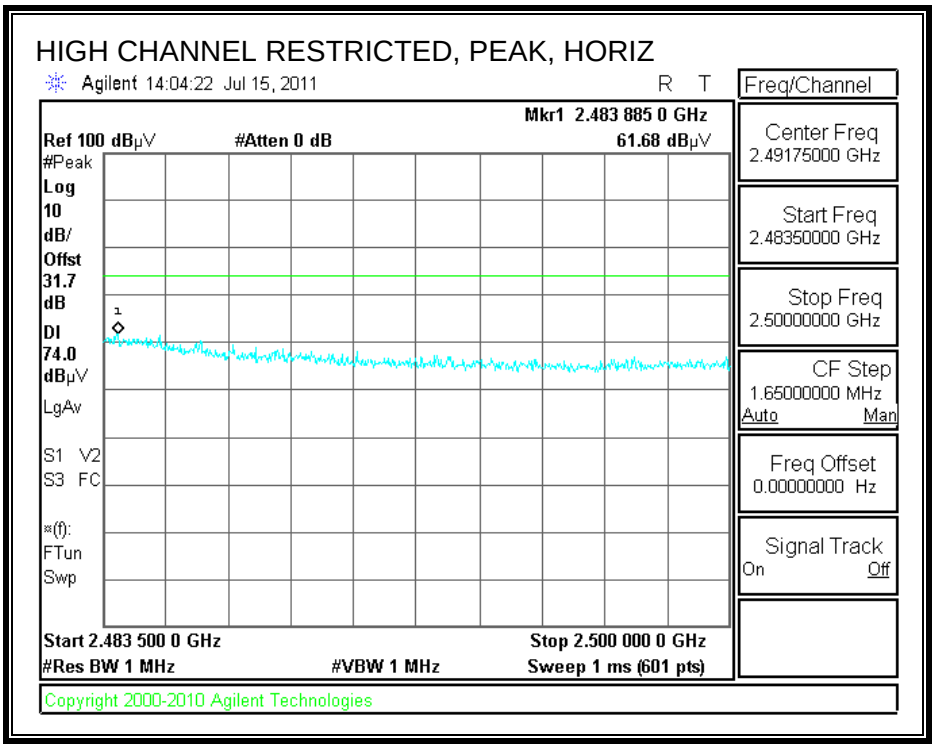


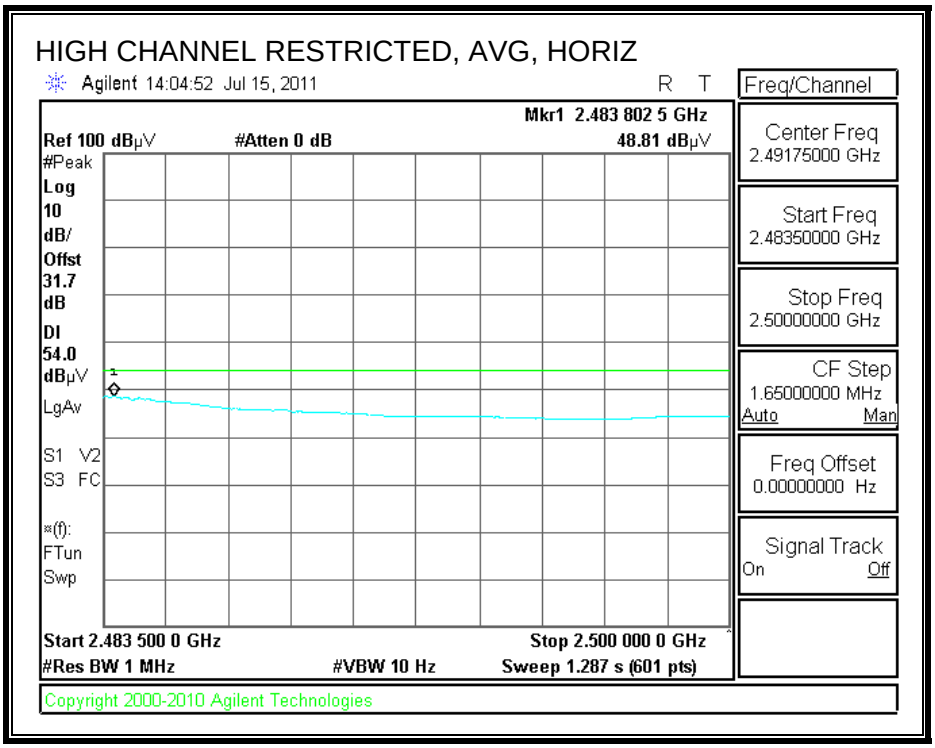
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



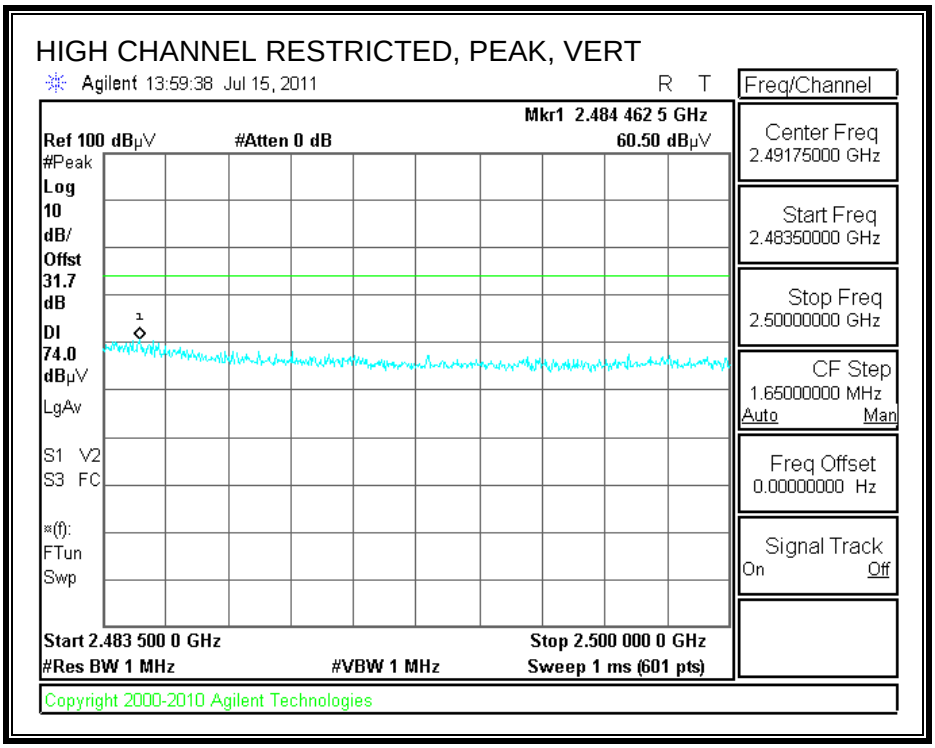


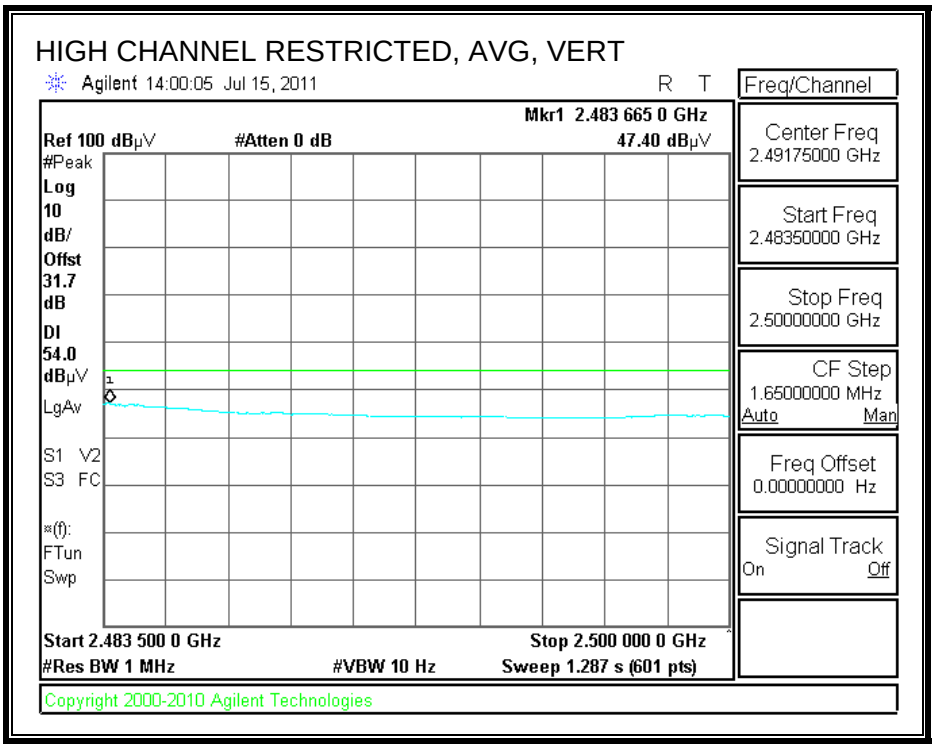
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: William Zhuang
Date: 07/18/11
Project #: 11J13902
Company: Panasonic
Test Target: FCC 15.247
Mode Oper: Tx On, g Mode

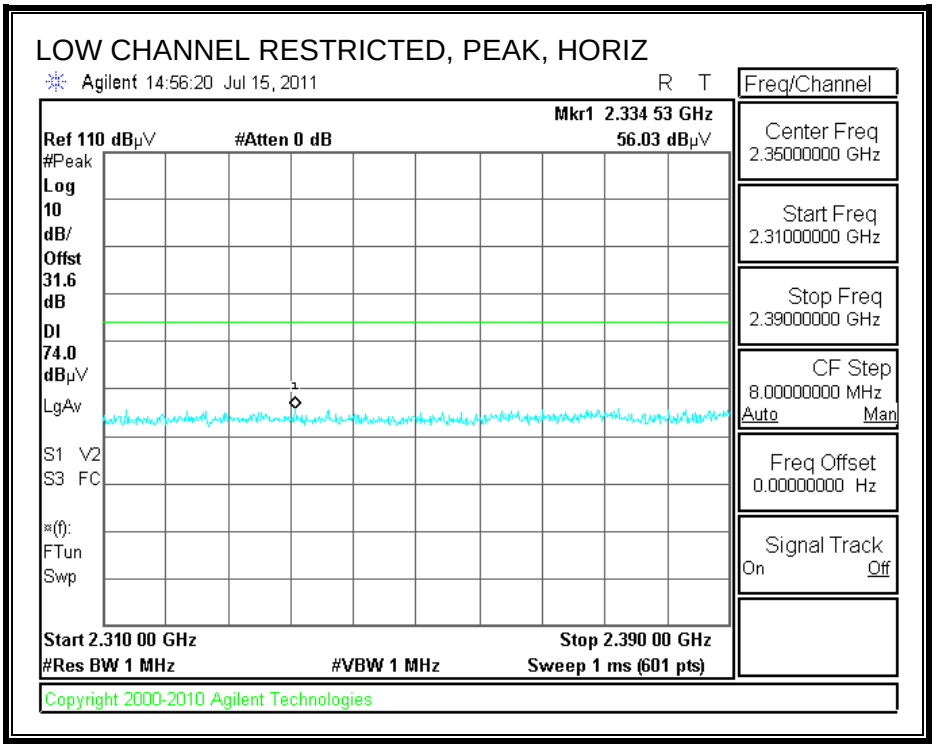
f	Measurement Frequency	Amp	Preamp Gain		Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m		Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength		Margin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

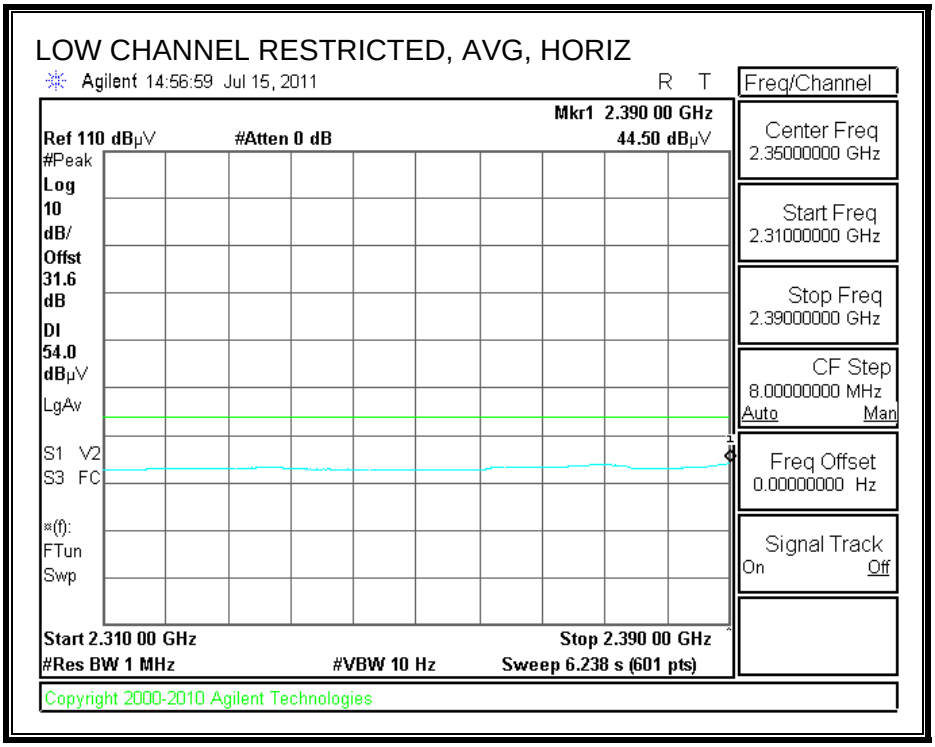
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
Low Ch. 2412 MHz															
4.824	3.0	36.5	32.7	5.8	-34.8	0.0	0.0	40.2	74.0	-33.8	V	P	178.0	162.0	
4.824	3.0	24.1	32.7	5.8	-34.8	0.0	0.0	27.7	54.0	-26.3	V	A	178.0	162.0	
4.824	3.0	37.7	32.7	5.8	-34.8	0.0	0.0	41.4	74.0	-32.6	H	P	129.0	102.0	
4.824	3.0	25.2	32.7	5.8	-34.8	0.0	0.0	28.8	54.0	-25.2	H	A	129.0	102.0	
Mid Ch. 2437 MHz															
4.874	3.0	38.2	32.7	5.8	-34.8	0.0	0.0	41.9	74.0	-32.1	H	P	98.0	101.0	
4.874	3.0	26.2	32.7	5.8	-34.8	0.0	0.0	29.9	54.0	-24.1	H	A	98.0	101.0	
4.874	3.0	45.7	32.7	5.8	-34.8	0.0	0.0	49.4	74.0	-24.6	V	P	98.0	358.0	
4.874	3.0	33.3	32.7	5.8	-34.8	0.0	0.0	37.0	54.0	-17.0	V	A	98.0	358.0	
7.311	3.0	38.6	35.5	7.3	-34.1	0.0	0.0	47.2	74.0	-26.8	H	P	117.0	359.0	
7.311	3.0	24.6	35.5	7.3	-34.1	0.0	0.0	33.2	54.0	-20.8	H	A	117.0	359.0	
7.311	3.0	42.9	35.5	7.3	-34.1	0.0	0.0	51.6	74.0	-22.4	V	P	140.0	92.0	
7.311	3.0	27.2	35.5	7.3	-34.1	0.0	0.0	35.8	54.0	-18.2	V	A	140.0	92.0	
High Ch. 2462 MHz															
4.924	3.0	37.0	32.7	5.9	-34.8	0.0	0.0	40.8	74.0	-33.2	V	P	161.0	60.0	
4.924	3.0	23.6	32.7	5.9	-34.8	0.0	0.0	27.4	54.0	-26.6	V	A	161.0	60.0	
4.924	3.0	36.0	32.7	5.9	-34.8	0.0	0.0	39.8	74.0	-34.2	H	P	157.0	126.0	
4.924	3.0	23.6	32.7	5.9	-34.8	0.0	0.0	27.4	54.0	-26.6	H	A	157.0	126.0	
7.386	3.0	35.5	35.6	7.3	-34.1	0.0	0.0	44.3	74.0	-29.7	H	P	139.0	226.0	
7.386	3.0	23.2	35.6	7.3	-34.1	0.0	0.0	32.0	54.0	-22.0	H	A	139.0	226.0	
7.386	3.0	35.1	35.6	7.3	-34.1	0.0	0.0	43.9	74.0	-30.1	V	P	98.0	264.0	
7.386	3.0	23.2	35.6	7.3	-34.1	0.0	0.0	32.0	54.0	-22.0	V	A	98.0	264.0	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

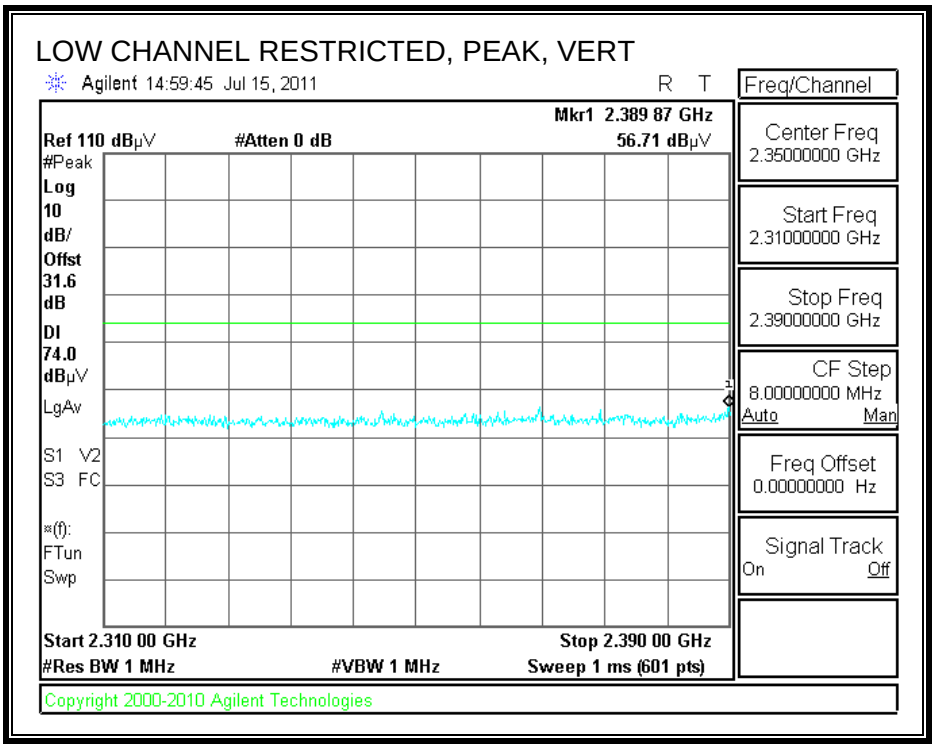
8.2.3. TX ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE 2.4 GHz BAND

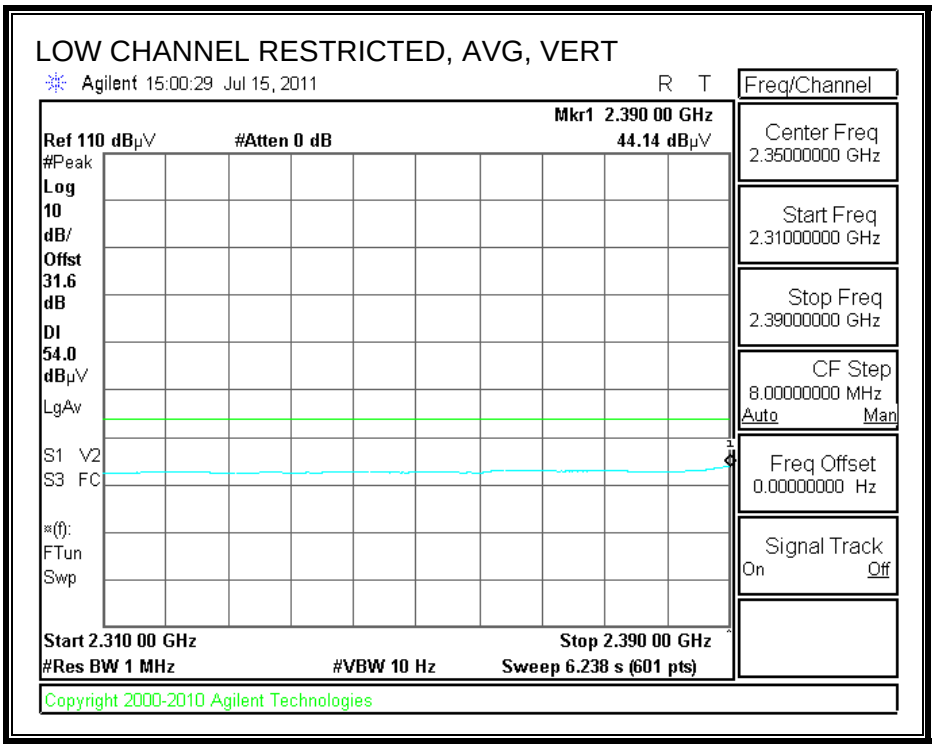
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



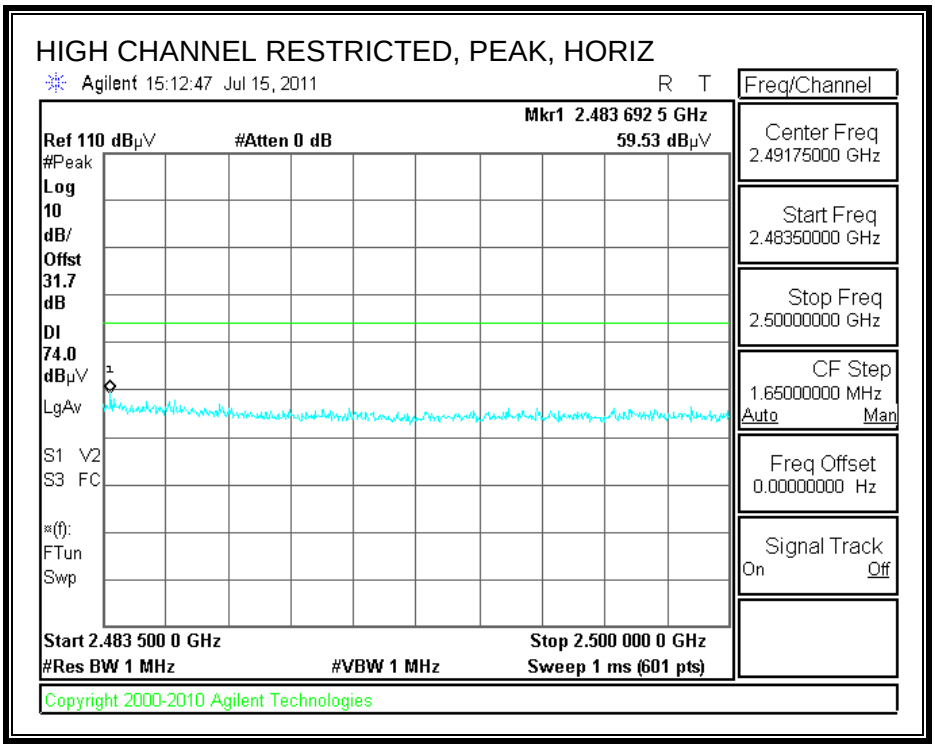


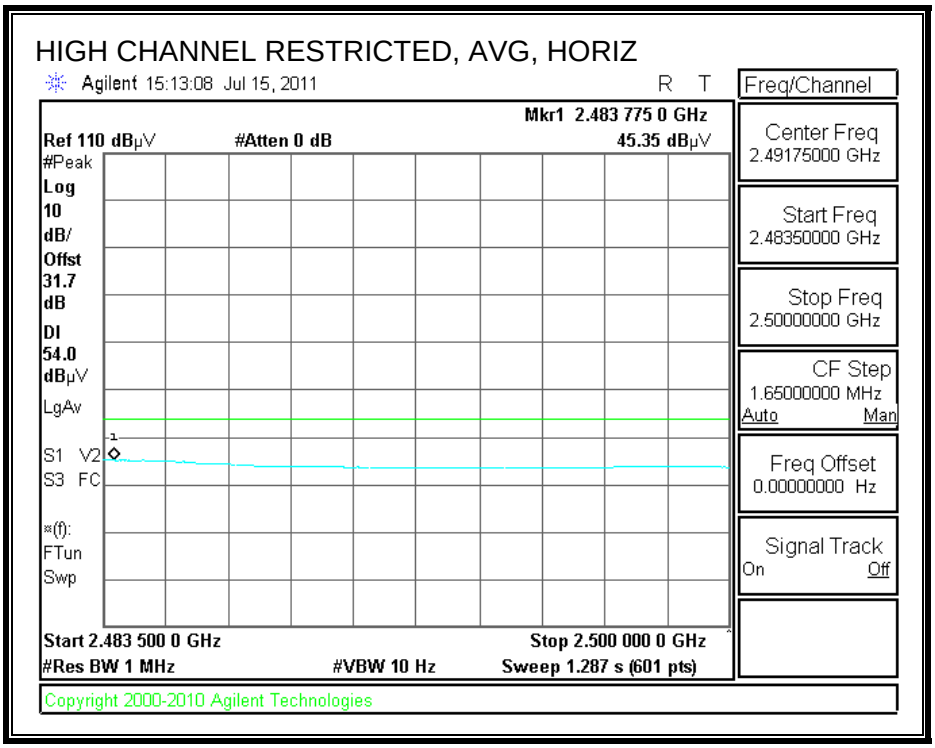
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



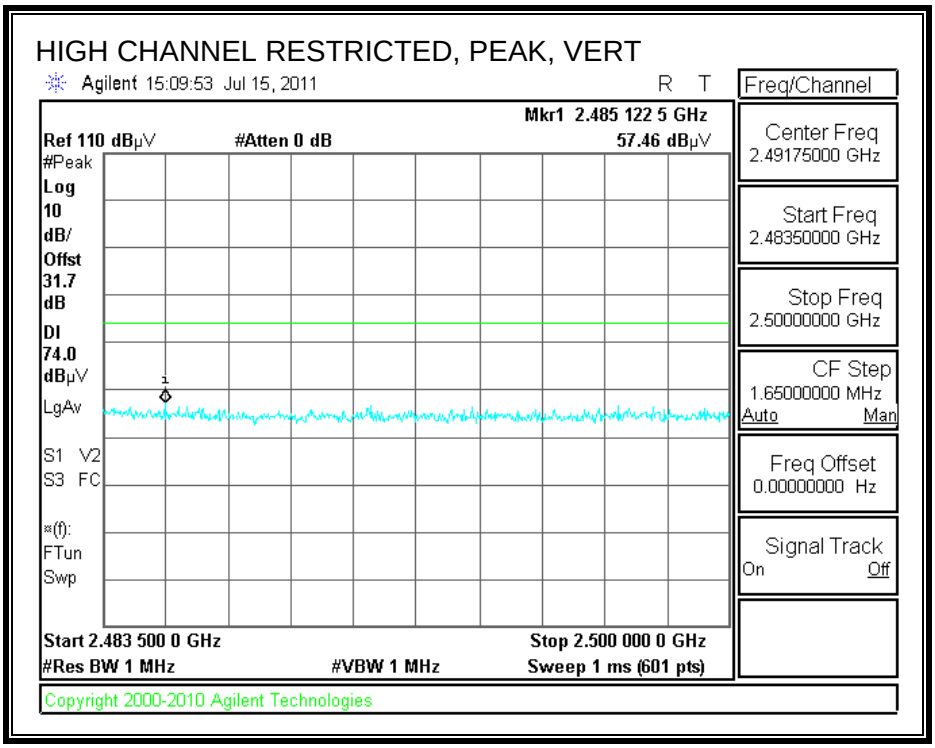


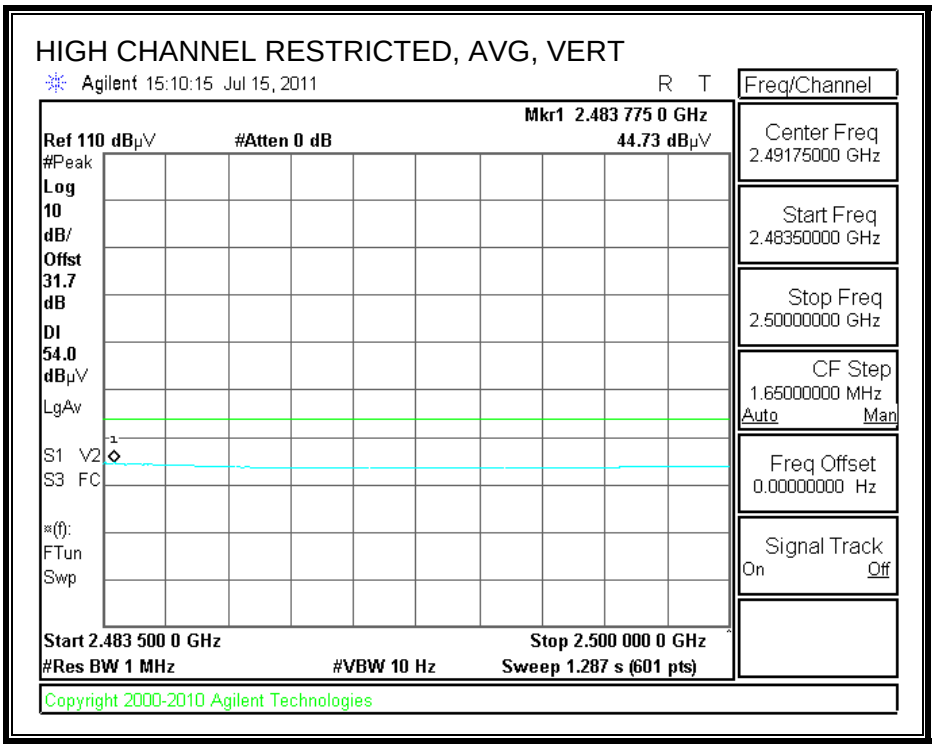
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: William Zhuang
Date: 07/18/11
Project #: 11J13902
Company: Panasonic
Test Target: FCC 15.247
Mode Oper: Tx On, HT20 Mode

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

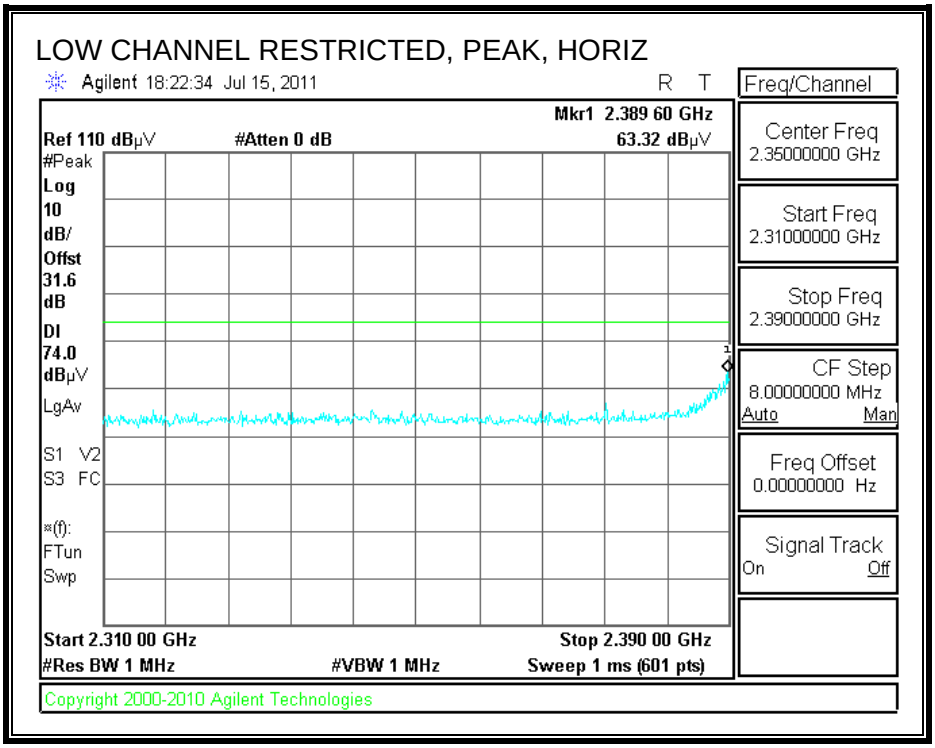
Average Field Strength Limit
Peak Field Strength Limit
Margin vs. Average Limit
Margin vs. Peak Limit

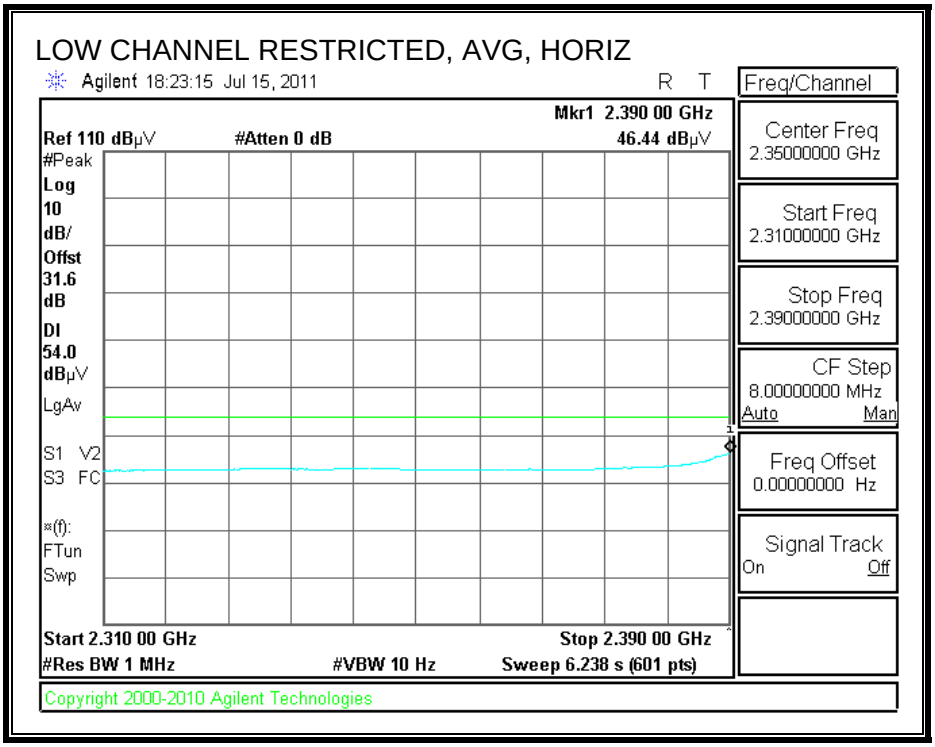
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
Low Ch, 2412 MHz, Power setting: 11.0 dBm															
4.824	3.0	36.8	32.7	5.8	-34.8	0.0	0.0	40.5	74.0	-33.5	V	P	190.0	307.0	
4.824	3.0	23.9	32.7	5.8	-34.8	0.0	0.0	27.5	54.0	-26.5	V	A	190.0	307.0	
4.824	3.0	36.8	32.7	5.8	-34.8	0.0	0.0	40.5	74.0	-33.5	H	P	103.0	234.0	
4.824	3.0	23.9	32.7	5.8	-34.8	0.0	0.0	27.6	54.0	-26.4	H	A	103.0	234.0	
Mid Ch, 2437 MHz, Power setting: 16.5 dBm															
4.874	3.0	38.8	32.7	5.8	-34.8	0.0	0.0	42.6	74.0	-31.4	H	P	170.0	91.0	
4.874	3.0	26.9	32.7	5.8	-34.8	0.0	0.0	30.7	54.0	-23.3	H	A	170.0	91.0	
4.874	3.0	39.7	32.7	5.8	-34.8	0.0	0.0	43.4	74.0	-30.6	V	P	98.0	11.0	
4.874	3.0	27.1	32.7	5.8	-34.8	0.0	0.0	30.9	54.0	-23.1	V	A	98.0	11.0	
7.311	3.0	36.1	35.5	7.3	-34.1	0.0	0.0	44.7	74.0	-29.3	V	P	132.0	275.0	
7.311	3.0	23.1	35.5	7.3	-34.1	0.0	0.0	31.7	54.0	-22.3	V	A	132.0	275.0	
7.311	3.0	35.5	35.5	7.3	-34.1	0.0	0.0	44.1	74.0	-29.9	H	P	136.0	3.0	
7.311	3.0	23.2	35.5	7.3	-34.1	0.0	0.0	31.8	54.0	-22.2	H	A	136.0	3.0	
High Ch, 2462 MHz, Power setting: 11.0 dBm															
4.924	3.0	36.3	32.7	5.9	-34.8	0.0	0.0	40.1	74.0	-33.9	H	P	121.0	49.0	
4.924	3.0	23.7	32.7	5.9	-34.8	0.0	0.0	27.5	54.0	-26.5	H	A	121.0	49.0	
4.924	3.0	35.6	32.7	5.9	-34.8	0.0	0.0	39.4	74.0	-34.6	V	P	109.0	2.0	
4.924	3.0	23.7	32.7	5.9	-34.8	0.0	0.0	27.5	54.0	-26.5	V	A	109.0	2.0	
7.386	3.0	35.5	35.6	7.3	-34.1	0.0	0.0	44.3	74.0	-29.7	V	P	187.0	206.0	
7.386	3.0	23.4	35.6	7.3	-34.1	0.0	0.0	32.1	54.0	-21.9	V	A	187.0	206.0	
7.386	3.0	35.6	35.6	7.3	-34.1	0.0	0.0	44.4	74.0	-29.6	H	P	155.0	172.0	
7.386	3.0	23.3	35.6	7.3	-34.1	0.0	0.0	32.1	54.0	-21.9	H	A	155.0	172.0	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

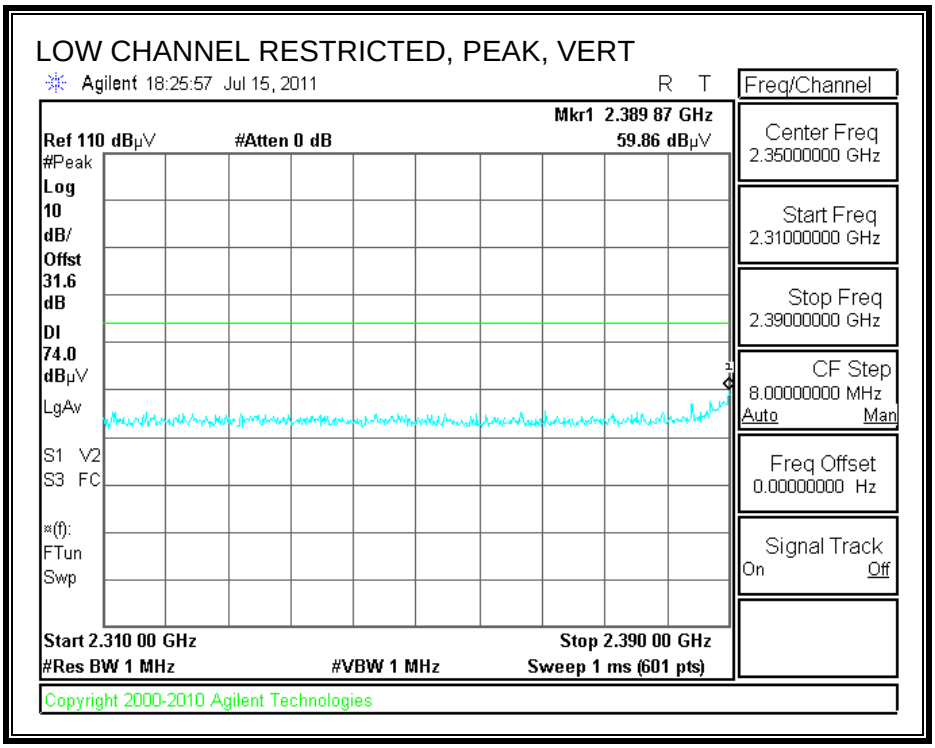
8.2.4. TX ABOVE 1 GHz FOR 802.11n HT40 MODE IN THE 2.4 GHz BAND

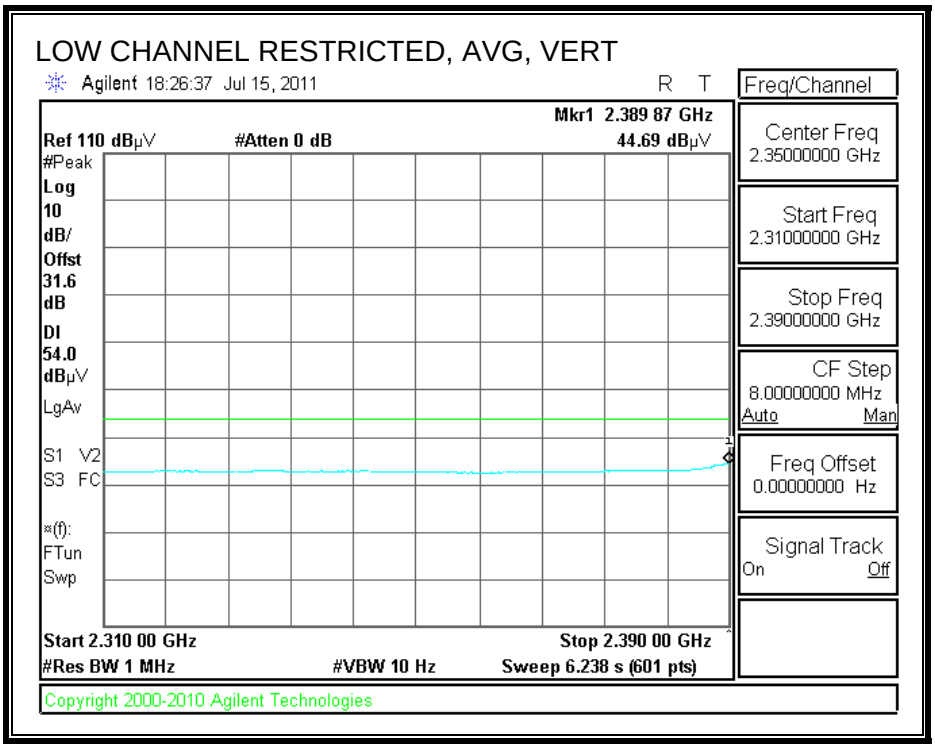
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



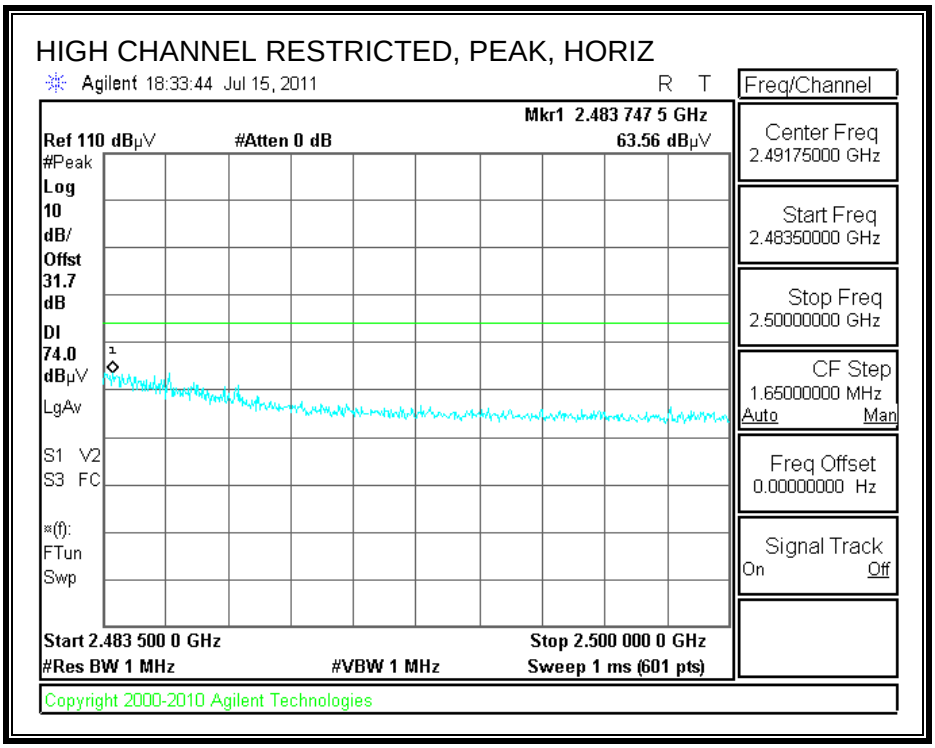


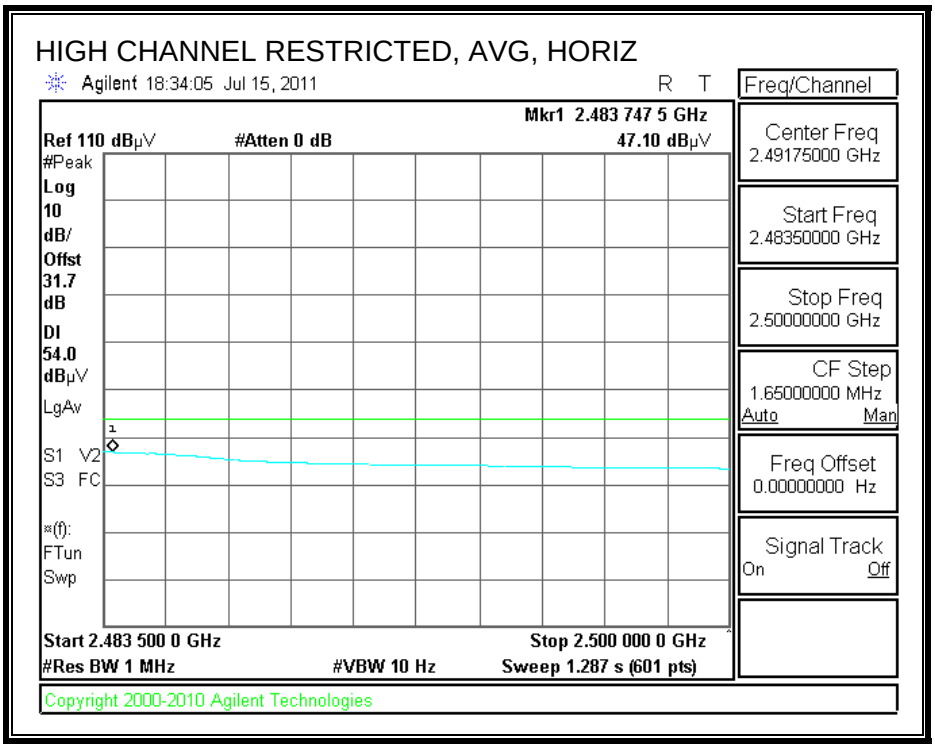
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



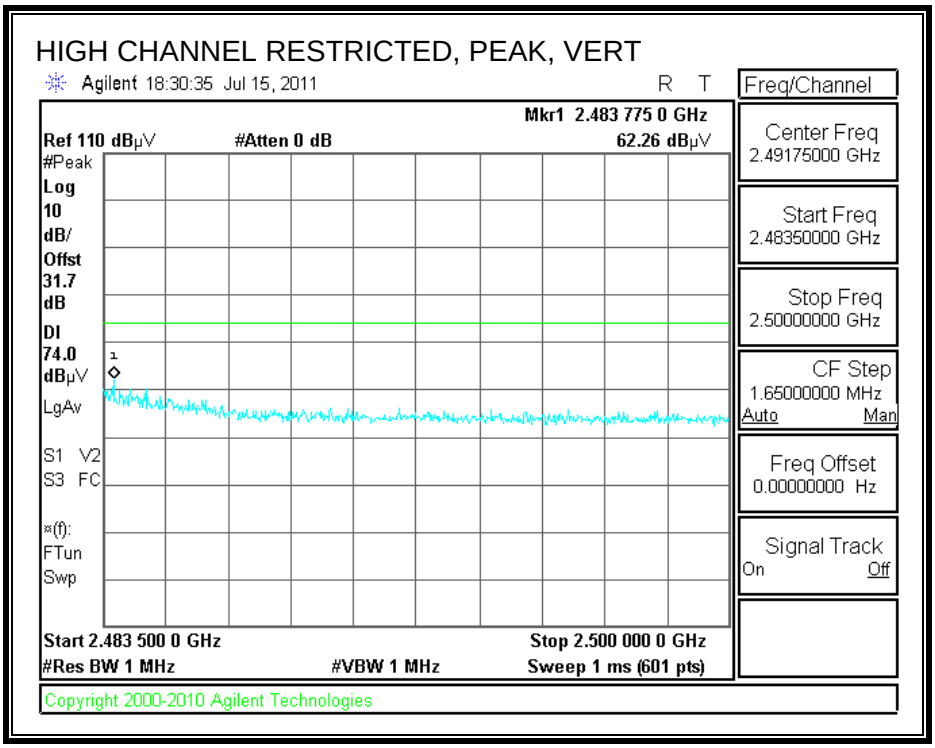


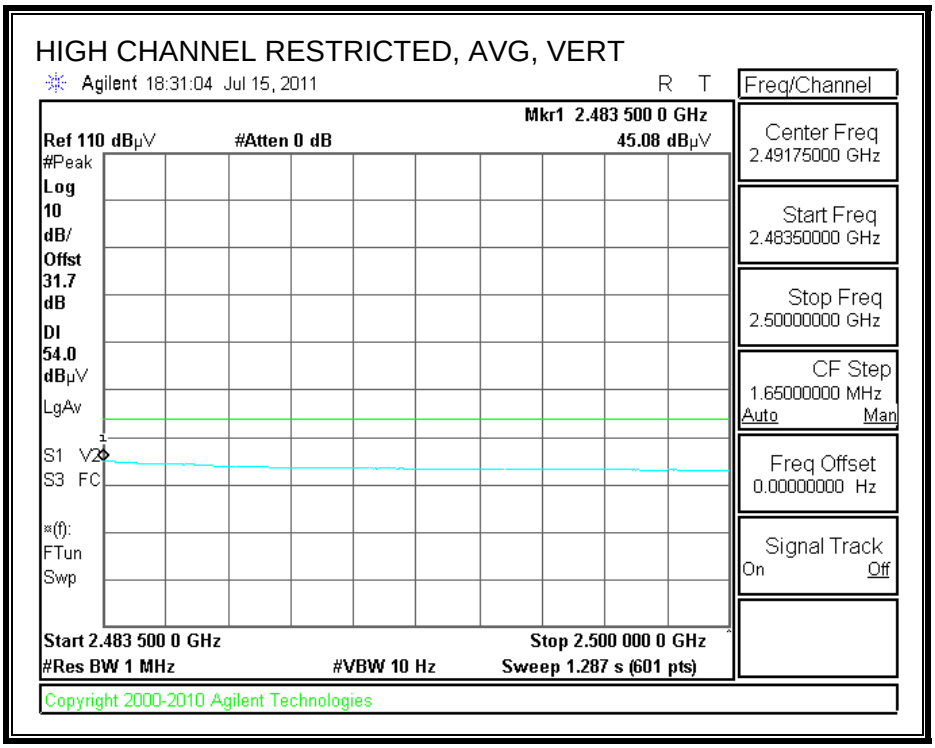
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Doug Anderson
Date: 07/18/11
Project #: 11J13902
Company: Panasonic
Test Target: FCC 15.247
Mode Oper: Tx On, HT40 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	Ant.High cm	Table Angle Degree	Notes
Low Channel: 2422MHz; Power Setting 9.0															
4.844	3.0	37.4	32.7	5.8	-34.8	0.0	0.0	41.0	74.0	-33.0	V	P	101.0	271.0	
4.844	3.0	23.9	32.7	5.8	-34.8	0.0	0.0	27.6	54.0	-26.4	V	A	101.0	271.0	
7.266	3.0	35.1	35.4	7.2	-34.1	0.0	0.0	43.6	74.0	-30.4	V	P	130.0	150.0	
7.266	3.0	23.0	35.4	7.2	-34.1	0.0	0.0	31.6	54.0	-22.4	V	A	130.0	150.0	
4.844	3.0	36.2	32.7	5.8	-34.8	0.0	0.0	39.9	74.0	-34.1	H	P	103.0	103.0	
4.844	3.0	23.9	32.7	5.8	-34.8	0.0	0.0	27.6	54.0	-26.4	H	A	103.0	103.0	
7.266	3.0	34.9	35.4	7.2	-34.1	0.0	0.0	43.4	74.0	-30.6	H	P	177.0	202.0	
7.266	3.0	23.0	35.4	7.2	-34.1	0.0	0.0	31.5	54.0	-22.5	H	A	177.0	202.0	
Mid Channel: 2427MHz; Power Setting 14.5															
4.874	3.0	36.5	32.7	5.8	-34.8	0.0	0.0	40.2	74.0	-33.8	V	P	98.0	95.0	
4.874	3.0	24.1	32.7	5.8	-34.8	0.0	0.0	27.8	54.0	-26.2	V	A	98.0	95.0	
7.311	3.0	35.8	35.5	7.3	-34.1	0.0	0.0	44.4	74.0	-29.6	V	P	156.0	94.0	
7.311	3.0	23.1	35.5	7.3	-34.1	0.0	0.0	31.8	54.0	-22.2	V	A	156.0	94.0	
4.874	3.0	36.7	32.7	5.8	-34.8	0.0	0.0	40.4	74.0	-33.6	H	P	124.0	350.0	
4.874	3.0	24.1	32.7	5.8	-34.8	0.0	0.0	27.8	54.0	-26.2	H	A	124.0	350.0	
7.311	3.0	35.9	35.5	7.3	-34.1	0.0	0.0	44.5	74.0	-29.5	H	P	185.0	147.0	
7.311	3.0	23.1	35.5	7.3	-34.1	0.0	0.0	31.7	54.0	-22.3	H	A	185.0	147.0	
High Channel: 2452MHz; Power Setting 9.0															
4.904	3.0	35.9	32.7	5.9	-34.8	0.0	0.0	39.7	74.0	-34.3	V	P	155.0	86.0	
4.904	3.0	23.9	32.7	5.9	-34.8	0.0	0.0	27.7	54.0	-26.3	V	A	155.0	86.0	
7.356	3.0	36.4	35.5	7.3	-34.1	0.0	0.0	45.1	74.0	-28.9	V	P	193.0	131.0	
7.356	3.0	23.3	35.5	7.3	-34.1	0.0	0.0	32.0	54.0	-22.0	V	A	193.0	131.0	
4.904	3.0	35.9	32.7	5.9	-34.8	0.0	0.0	39.7	74.0	-34.3	H	P	98.0	249.0	
4.904	3.0	23.9	32.7	5.9	-34.8	0.0	0.0	27.7	54.0	-26.3	H	A	98.0	249.0	
7.356	3.0	35.6	35.5	7.3	-34.1	0.0	0.0	44.3	74.0	-29.7	H	P	173.0	69.0	
7.356	3.0	23.3	35.5	7.3	-34.1	0.0	0.0	32.0	54.0	-22.0	H	A	173.0	69.0	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

8.3. RECEIVER ABOVE 1 GHz

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Project #: 11J13902
Date: 7/18/2011
Test Engineer: William Zhuang
Configuration: EUT in Laptop PC
Mode: RX mode, g Mode Mid Ch. Worst case

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B			RX RSS 210

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500		

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.147	3.0	57.2	44.6	25.0	2.5	-38.1	0.0	0.0	46.7	34.0	74	54	-27.3	-20.0	V
1.500	3.0	51.4	42.3	26.1	2.9	-37.6	0.0	0.0	43.0	33.8	74	54	-31.0	-20.2	V
1.593	3.0	53.8	33.1	26.4	3.0	-37.4	0.0	0.0	45.8	25.1	74	54	-28.2	-28.9	V
1.120	3.0	49.5	33.5	24.9	2.5	-38.1	0.0	0.0	38.8	22.8	74	54	-35.2	-31.2	H
1.193	3.0	51.1	34.1	25.1	2.6	-38.0	0.0	0.0	40.8	23.8	74	54	-33.2	-30.2	H
1.593	3.0	55.7	32.8	26.4	3.0	-37.4	0.0	0.0	47.7	24.9	74	54	-26.3	-29.1	H

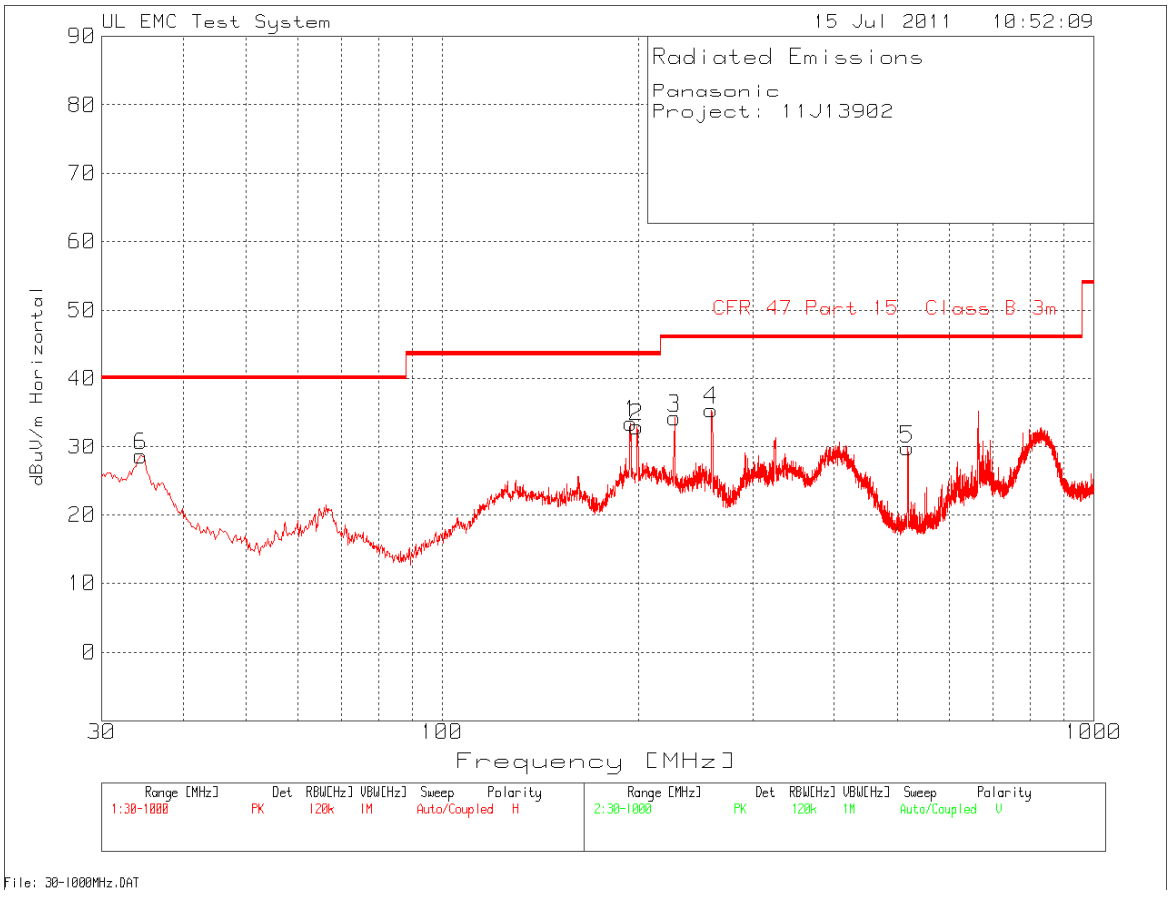
Rev. 07.22.09

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

8.4. RADIATED BELOW 1 GHz

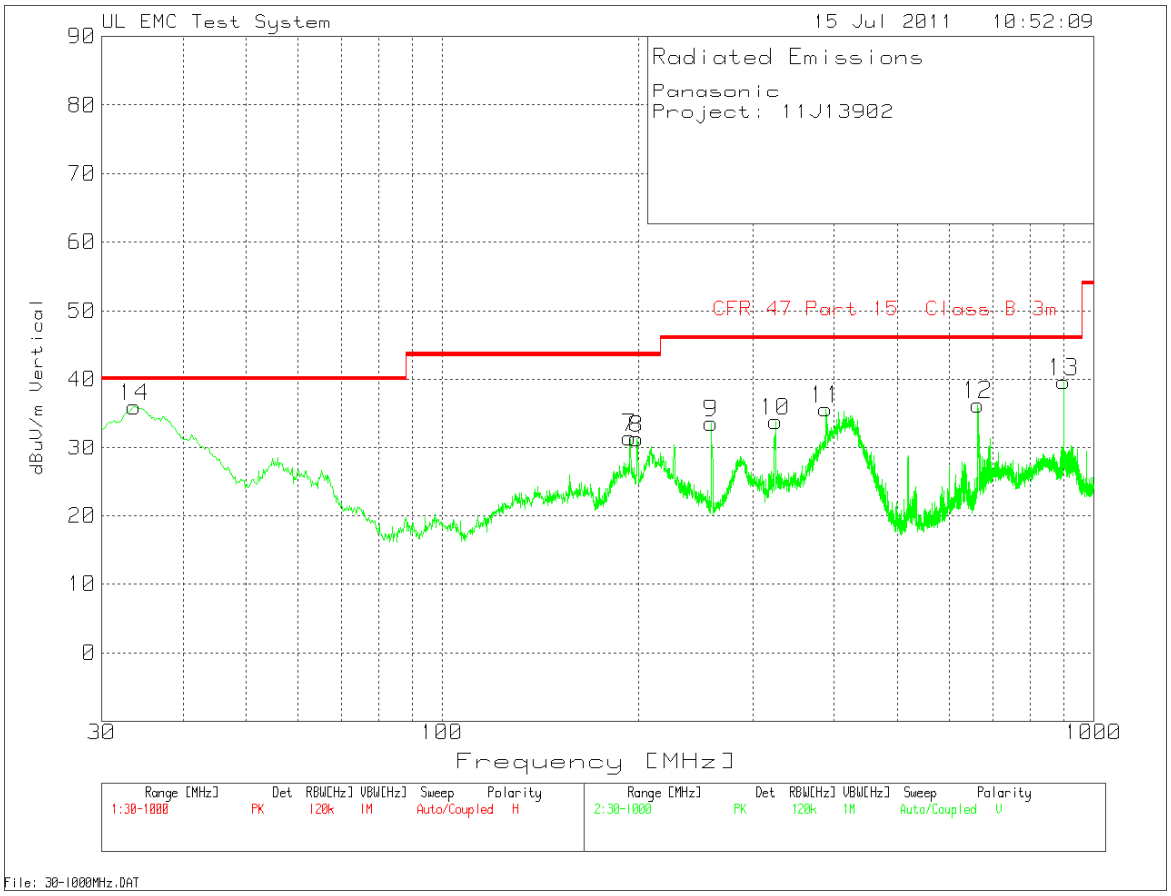
SPURIOUS EMISSIONS 30 TO 1000 MHz (HORIZONTAL)

HORIZONTAL PLOT



SPURIOUS EMISSIONS 30 TO 1000 MHz (VERTICAL)

VERTICAL PLOT



TABULATED DATA

Panasonic
Project: 11J13902

Horizontal 30 - 1000MHz

Test Frequency	Meter Reading	Detector	3m below 1GHz Cable.TXT [dB]	3m T15 PreAmp below 1GHz.TXT [dB]	3m Bilog T185 below 1GHz.TXT [dB]	dBuV/m	CFR 47 Part 15 Class B 3m	Margin	Height [cm]	Polarity
194.7682	48.21	PK	1.4	-27.7	11.6	33.51	43.5	-9.99	99	Horz
199.0328	47.35	PK	1.4	-27.7	11.9	32.95	43.5	-10.55	99	Horz
227.3341	48.35	PK	1.5	-27.5	11.9	34.25	46	-11.75	99	Horz
258.9309	49.11	PK	1.6	-27.4	12.1	35.41	46	-10.59	99	Horz
517.7138	38.85	PK	2.3	-28.5	17.1	29.75	46	-16.25	176	Horz
34.4584	38.53	PK	0.6	-28.3	17.8	28.63	40	-11.37	251	Horz

Vertical 30 - 1000MHz

Test Frequency	Meter Reading	Detector	3m below 1GHz Cable.TXT [dB]	3m T15 PreAmp below 1GHz.TXT [dB]	3m Bilog T185 below 1GHz.TXT [dB]	dBuV/m	CFR 47 Part 15 Class B 3m	Margin	Height [cm]	Polarity
193.9928	46.34	PK	1.4	-27.7	11.5	31.54	43.5	-11.96	176	Vert
199.0328	45.77	PK	1.4	-27.7	11.9	31.37	43.5	-12.13	101	Vert
258.9309	47.36	PK	1.6	-27.4	12.1	33.66	46	-12.34	176	Vert
324.8381	45.52	PK	1.9	-27.4	13.9	33.92	46	-12.08	176	Vert
388.2254	46.58	PK	2.1	-27.8	14.8	35.68	46	-10.32	101	Vert
664.2606	43.23	PK	2.7	-28.4	18.8	36.33	46	-9.67	101	Vert
900.1699	42.07	PK	3.2	-27.7	22.1	39.67	46	-6.33	101	Vert
33.6831	45.54	PK	0.6	-28.3	18.2	36.04	40	-3.96	101	Vert

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear Average detector
LgAv - Log Average detector
Av - Average detector
CAV - CISPR Average detector
RMS - RMS detection
CRMS - CISPR RMS detection
Text File: 30-1000MHz.TXT
File: 30-1000MHz.DAT

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

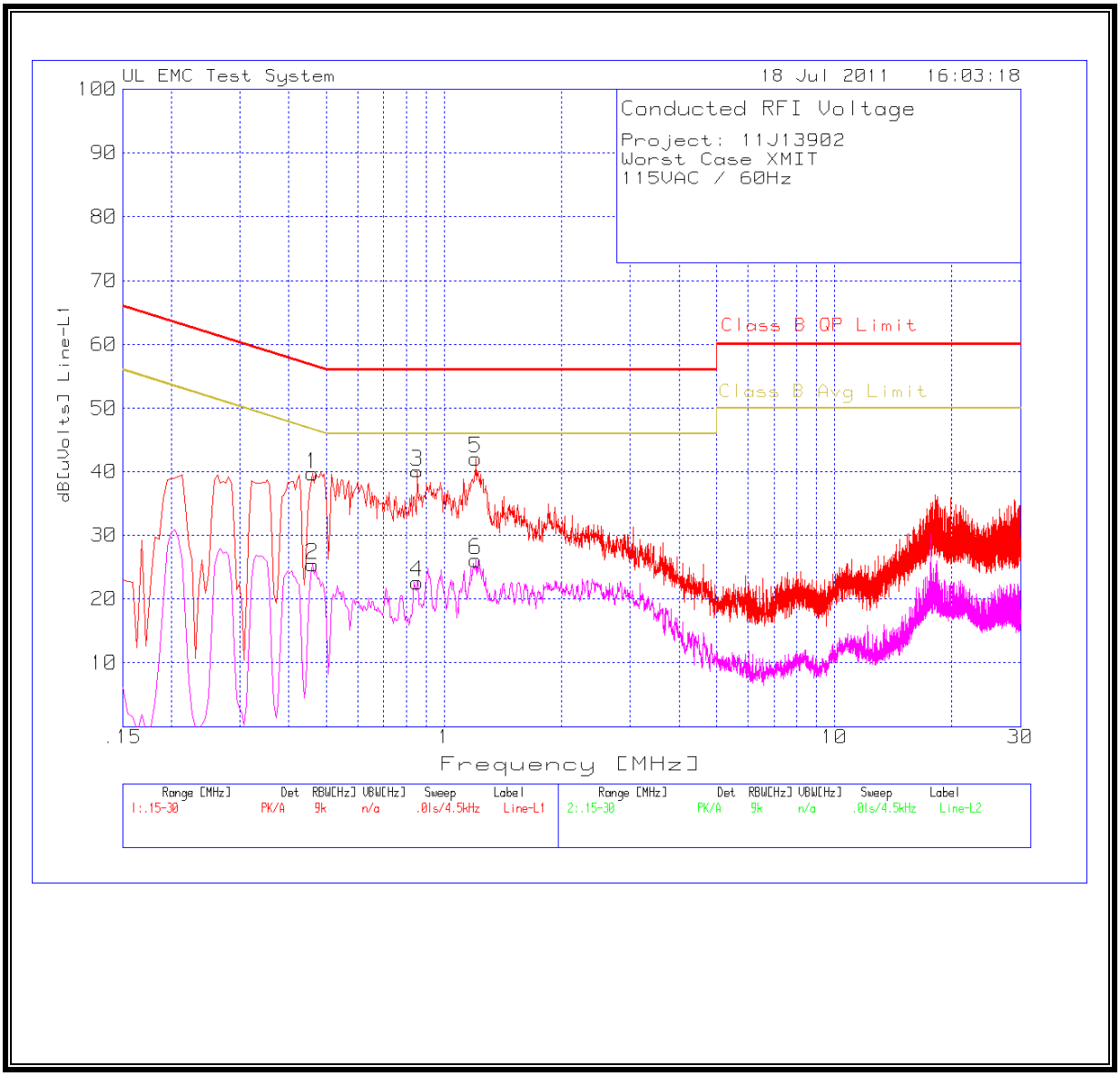
ANSI C63.4

RESULTS

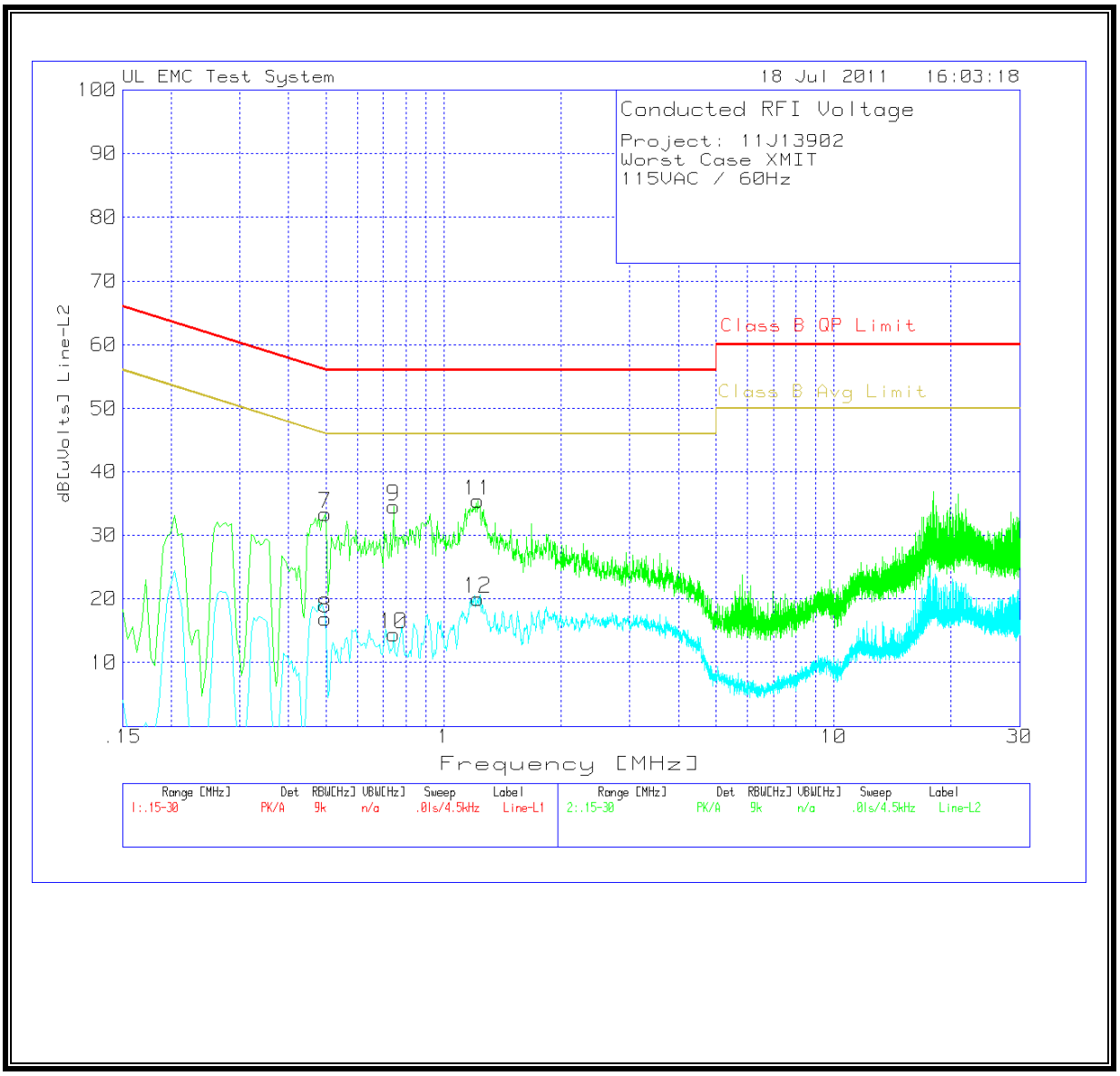
6 WORST EMISSIONS

Project: 11J13902									
Worst Case XMIT									
115VAC / 60Hz									
Line-L1 .15 - 30MHz									
Test Freq. (MHz)	Meter Reading	Detector	LISN [dB]	Conducted Emission Cable [dB]	Correct Reading (dBuVolts)	Class B Quasi-peak Limit	Quasi-Peak Margin	Class B Average Limit	Average Margin
0.4605	39.72	PK	0	0	39.72	56.7	-16.98	--	--
0.4605	25.38	Av	0	0	25.38	--	--	46.7	-21.32
0.852	40.13	PK	0	0	40.13	56	-15.87	--	--
0.852	22.56	Av	0	0	22.56	--	--	46	-23.44
1.2075	42.09	PK	0	0	42.09	56	-13.91	--	--
1.2075	26.08	Av	0	0	26.08	--	--	46	-19.92
Line-L2 .15 - 30MHz									
Test Freq. (MHz)	Meter Reading	Detector	LISN [dB]	Conducted Emission Cable [dB]	Correct Reading (dBuVolts)	Class B Quasi-peak Limit	Quasi-Peak Margin	Class B Average	Average Margin
0.4965	33.35	PK	0	0	33.35	56.1	-22.75	--	--
0.4965	16.93	Av	0	0	16.93	--	--	46.1	-29.17
0.744	34.49	PK	0	0	34.49	56	-21.51	--	--
0.744	14.46	Av	0	0	14.46	--	--	46	-31.54
1.221	35.35	PK	0	0	35.35	56	-20.65	--	--
1.221	20.07	Av	0	0	20.07	--	--	46	-25.93
PK - Peak detector									
QP - Quasi-Peak detector									
LnAv - Linear Average detector									
LgAv - Log Average detector									
Av - Average detector									
CAV - CISPR Average detector									
RMS - RMS detection									
CRMS - CISPR RMS detection									
Text File: 11J13902LC_115.TXT									

LINE 1 RESULTS



LINE 2 RESULTS



10. MAXIMUM PERMISSIBLE EXPOSURE

FCC RULES

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

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

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

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

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

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

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

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

IC RULES

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

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

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

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

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

EQUATIONS

Power density is given by:

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

where

S = Power density in W/m^2
EIRP = Equivalent Isotropic Radiated Power in W
D = Separation distance in m

Power density in units of W/m^2 is converted to units of mWc/m^2 by dividing by 10.

Distance is given by:

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

where

D = Separation distance in m
EIRP = Equivalent Isotropic Radiated Power in W
S = Power density in W/m^2

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

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

where

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

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

LIMITS

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

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

RESULTS

Multiple chain or colocated transmitters									
Band	**Mode**	**Chain for MIMO**	**Separation Distance (m)**	**Output AV Power (dBm)**	**Antenna Gain (dBi)**	**EIRP (dBm)**	**EIRP (W)**	**IC Power Density (W/m^2)**	**FCC Power Density (mW/cm^2)**
2.4 GHz	WLAN	1		20.21	-0.07	20.14	0.10		
2.4 GHz	WLAN	2		20.31	0.53	20.84	0.12		
2.4 GHz	BT	N/A		13.00	3.50	16.50	0.04		
Combined			0.20				0.22	0.45	0.045