



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

CERTIFICATION TEST REPORT

FOR

DUAL-BAND 802.11a/b/g/n ACCESS POINT

MODEL NUMBER: ZONEFLEX 7351

FCC ID: S9GZF7351

IC: 5912A-ZF7351

REPORT NUMBER: 12U14419-26

ISSUE DATE: DECEMBER 21, 2012

Prepared for

**RUCKUS WIRELESS, INC.
350 WEST JAVA DRIVE
SUNNYVALE, CA 94089, USA**

Prepared by

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



NVLAP LAB CODE 200065-0

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	12/21/12	Initial Issue	F. Ibrahim

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	6
2. TEST METHODOLOGY	7
3. FACILITIES AND ACCREDITATION	7
4. CALIBRATION AND UNCERTAINTY	7
4.1. <i>MEASURING INSTRUMENT CALIBRATION</i>	7
4.2. <i>SAMPLE CALCULATION</i>	7
4.3. <i>MEASUREMENT UNCERTAINTY</i>	7
5. EQUIPMENT UNDER TEST	8
5.1. <i>DESCRIPTION OF EUT</i>	8
5.2. <i>MAXIMUM OUTPUT POWER</i>	8
5.3. <i>DESCRIPTION OF AVAILABLE ANTENNAS</i>	8
5.4. <i>SOFTWARE AND FIRMWARE</i>	8
5.5. <i>WORST-CASE CONFIGURATION AND MODE</i>	9
5.6. <i>DESCRIPTION OF TEST SETUP</i>	10
6. TEST AND MEASUREMENT EQUIPMENT	12
7. MEASUREMENT METHODS	12
8. ANTENNA PORT TEST RESULTS	13
8.1. <i>802.11b MODE IN THE 2.4 GHz BAND</i>	13
8.1.1. 6 dB BANDWIDTH	13
8.1.2. 99% BANDWIDTH	17
8.1.3. AVERAGE POWER	21
8.1.4. OUTPUT POWER	22
8.1.5. PSD	27
8.1.6. OUT-OF-BAND EMISSIONS	31
8.2. <i>802.11g MODE IN THE 2.4 GHz BAND</i>	38
8.2.1. 6 dB BANDWIDTH	38
8.2.2. 99% BANDWIDTH	42
8.2.3. AVERAGE POWER	46
8.2.4. OUTPUT POWER	47
8.2.5. PSD	52
8.2.6. OUT-OF-BAND EMISSIONS	56
8.3. <i>802.11n HT20 CDD MODE IN THE 2.4 GHz BAND</i>	63
8.3.1. 6 dB BANDWIDTH	63
8.3.2. 99% BANDWIDTH	67
8.3.3. AVERAGE POWER	71
8.3.4. OUTPUT POWER	72
8.3.5. PSD	77
8.3.6. OUT-OF-BAND EMISSIONS	81

8.4. 802.11n HT20 SDM MODE IN THE 2.4 GHz BAND 90
8.4.1. 6 dB BANDWIDTH 90
8.4.2. 99% BANDWIDTH 94
8.4.3. AVERAGE POWER 98
8.4.4. OUTPUT POWER 99
8.4.5. PSD 104
8.4.6. OUT-OF-BAND EMISSIONS 108
8.5. 802.11n HT40 CDD MODE IN THE 2.4 GHz BAND 117
8.5.1. 6 dB BANDWIDTH 117
8.5.2. 99% BANDWIDTH 121
8.5.3. AVERAGE POWER 125
8.5.4. OUTPUT POWER 126
8.5.5. PSD 131
8.5.6. OUT-OF-BAND EMISSIONS 135
8.6. 802.11n HT40 SDM MODE IN THE 2.4 GHz BAND 144
8.6.1. 6 dB BANDWIDTH 144
8.6.2. 99% BANDWIDTH 148
8.6.3. AVERAGE POWER 152
8.6.4. OUTPUT POWER 153
8.6.5. PSD 158
8.6.6. OUT-OF-BAND EMISSIONS 162
8.7. 802.11a MODE IN THE 5.8 GHz BAND 170
8.7.1. 6 dB BANDWIDTH 170
8.7.2. 99% BANDWIDTH 174
8.7.3. AVERAGE POWER 178
8.7.4. OUTPUT POWER 179
8.7.5. PSD 184
8.7.6. OUT-OF-BAND EMISSIONS 188
8.8. 802.11n HT20 CDD MODE IN THE 5.8 GHz BAND 196
8.8.1. 6 dB BANDWIDTH 196
8.8.2. 99% BANDWIDTH 200
8.8.3. AVERAGE POWER 204
8.8.4. OUTPUT POWER 205
8.8.5. PSD 210
8.8.6. OUT-OF-BAND EMISSIONS 214
8.9. 802.11n HT20 SDM MODE IN THE 5.8 GHz BAND 222
8.9.1. 6 dB BANDWIDTH 222
8.9.2. 99% BANDWIDTH 226
8.9.3. AVERAGE POWER 230
8.9.4. OUTPUT POWER 231
8.9.5. PSD 236
8.9.6. OUT-OF-BAND EMISSIONS 240
8.10. 802.11n HT40 CDD MODE IN THE 5.8 GHz BAND 248
8.10.1. 6 dB BANDWIDTH 248
8.10.2. 99% BANDWIDTH 251
8.10.3. AVERAGE POWER 254
8.10.4. OUTPUT POWER 255
8.10.5. PSD 259
8.10.6. OUT-OF-BAND EMISSIONS 262

- 8.11. 802.11n HT40 SDM MODE IN THE 5.8 GHz BAND.....267
 - 8.11.1. 6 dB BANDWIDTH.....267
 - 8.11.2. 99% BANDWIDTH.....270
 - 8.11.3. AVERAGE POWER.....273
 - 8.11.4. OUTPUT POWER.....274
 - 8.11.5. PSD.....278
 - 8.11.6. OUT-OF-BAND EMISSIONS.....281
- 9. RADIATED TEST RESULTS286**
 - 9.1. LIMITS AND PROCEDURE286
 - 9.2. TRANSMITTER ABOVE 1 GHz287
 - 9.2.1. TX ABOVE 1 GHz 802.11b MODE IN THE 2.4 GHz BAND.....287
 - 9.2.2. TX ABOVE 1 GHz 802.11g MODE IN THE 2.4 GHz BAND.....292
 - 9.2.3. TX ABOVE 1 GHz 802.11n HT20 CDD MODE IN THE 2.4 GHz BAND.....297
 - 9.2.4. TX ABOVE 1 GHz 802.11n HT20 SDM MODE IN THE 2.4 GHz BAND.....302
 - 9.2.5. TX ABOVE 1 GHz 802.11n HT40 CDD MODE IN THE 2.4 GHz BAND.....307
 - 9.2.6. TX ABOVE 1 GHz 802.11n HT40 SDM MODE IN THE 2.4 GHz BAND.....312
 - 9.2.7. TX ABOVE 1 GHz 802.11a MODE IN THE 5.8 GHz BAND.....317
 - 9.2.8. TX ABOVE 1 GHz 802.11n HT20 CDD MODE IN THE 5.8 GHz BAND.....318
 - 9.2.9. TX ABOVE 1 GHz 802.11n HT20 SDM MODE IN THE 5.8 GHz BAND.....319
 - 9.2.10. TX ABOVE 1 GHz 802.11n HT40 CDD MODE IN THE 5.8 GHz BAND.....320
 - 9.2.11. TX ABOVE 1 GHz 802.11n HT40 SDM MODE IN THE 5.8 GHz BAND.....321
 - 9.3. WORST-CASE BELOW 1 GHz.....322
- 10. AC POWER LINE CONDUCTED EMISSIONS325**
- 11. SETUP PHOTOS.....329**

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: RUCKUS WIRELESS, INC.
350 WEST JAVA DRIVE
SUNNYVALE, CA 94089, USA

EUT DESCRIPTION: DUAL-BAND 802.11a/b/g/n ACCESS POINT

MODEL: ZONEFLEX 7351

SERIAL NUMBER: 301204006396

DATE TESTED: OCTOBER 01-NOVEMBER 29, 2012

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

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.

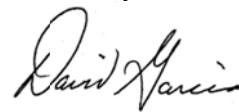
Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of this 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
WISE PROJECT LEAD
UL CCS

Tested By:



DAVID GARCIA
EMC ENGINEER
UL CCS

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2009, 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:

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

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 802.11 a/b/g/n access point designed for mounting on a desktop, wall or ceiling. The EUT is powered by an external AC adapter, Ruckus P/N 740-64190-001. The radio module is manufactured by Ruckus Wireless.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11b	25.3	338.84
2412 - 2462	802.11g	23.58	228.03
2412 - 2462	802.11n HT20	23.78	238.78
2422 - 2452	802.11n HT40	21.59	144.21
5745 - 5825	802.11a	21.61	144.88
5745 - 5825	802.11n HT20 CDD	21.12	129.42
5745 - 5825	802.11n HT20 SDM	21.36	136.77
5755 - 5795	802.11n HT40 CDD	20.69	117.22
5755 - 5795	802.11n HT40 SDM	20.66	116.41

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes the following antenna:
Proprietary dual-band PCB Omni Antenna; with a maximum peak gain of 1 dBi for 2.4GHz band, and 2 dBi for 5GHz band.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 9.3.1.5.1

The EUT driver software installed during testing was Microsoft Window Version 6.1.7601.

The test utility software used during testing was ZF7351 GD11 ART Ver. V0_9_b7_ar928xALL\ART\ bin.

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

The fundamental of the EUT was investigated in three orthogonal orientations X, Y, Z, and X orientation was determined to be the worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

Worst-case data rates as provided by the client were:

802.11b mode: 1 Mbps
802.11g mode: 6 Mbps
802.11a mode: 6 Mbps
802.11n HT20mode: MCS0 for CDD and MCS8 for SDM
802.11n HT40mode: MCS0 for CDD and MCS8 for SDM

Radiated emissions for EUT with antenna was performed and passed; therefore, antenna port spurious was not performed.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	LENOVO	IdealPad U310	804927703	PD92200BNHU
AC/DC Adapter	LENOVO	ADP40-NH B	11S36001648ZZ6002495ZB	DoC
EUT AC Adapter	RUCKUS	HK-AD-120A 100-US	1010C	DoC

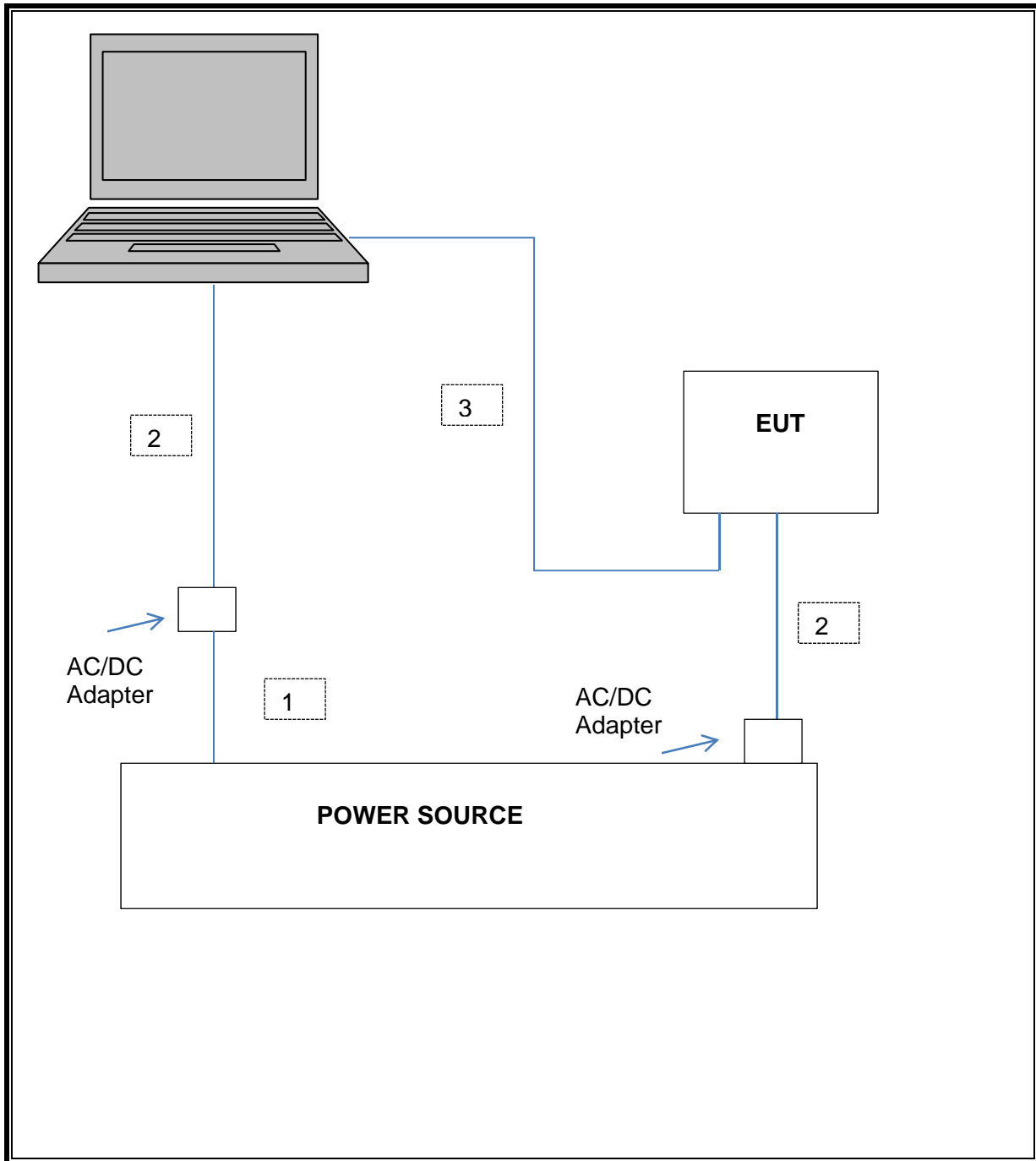
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC/DC	1	US115VAC	Unshielded	1m	N/A
2	DC	2	DC Plug	Unshielded	1.5m	N/A
3	LAN	1	RJ45	Unshielded	2m	N/A

TEST SETUP

The EUT is connected to the host laptop computer 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
3Hz-44GHz PSA	AGILENT	E4446A	C01069	12/15/12
Power Meter	AGILENT	N1991A	T299	07/27/13
Power Sensor	HP	E9323A	T230	07/27/13
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	06/13/13
Preamplifier, 1300 MHz	Agilent / HP	8447D	C01048	07/16/13
Reject Filter, 5.725-5.825 GHz	Micro-Tronics	BRC13192	N02676	CNR
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRM50702	N02685	CNR
Highpass Filter, 7.6 GHz	Micro-Tronics	HPM13195	N02682	CNR
Antenna, Horn, 18 GHz	EMCO	3115	C00783	10/25/13
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	NA	02/07/13
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00980	10/06/13
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	11/15/12
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	N02481	11/16/12
Horn Antenna, 40 GHz	ARA	MWH-2640/B	C00981	06/14/13
EMI Test Receiver	R&S	ESC17	10000741	07/02/13
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00980	08/06/13

7. MEASUREMENT METHODS

KDB 558074 Measurement Procedure AVG2 is used for power and PKAVG is used for power spectral density.

Unwanted emissions within Restricted Bands are measured using traditional radiated procedures.

8. ANTENNA PORT TEST RESULTS

8.1. 802.11b MODE IN THE 2.4 GHz BAND

8.1.1. 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.

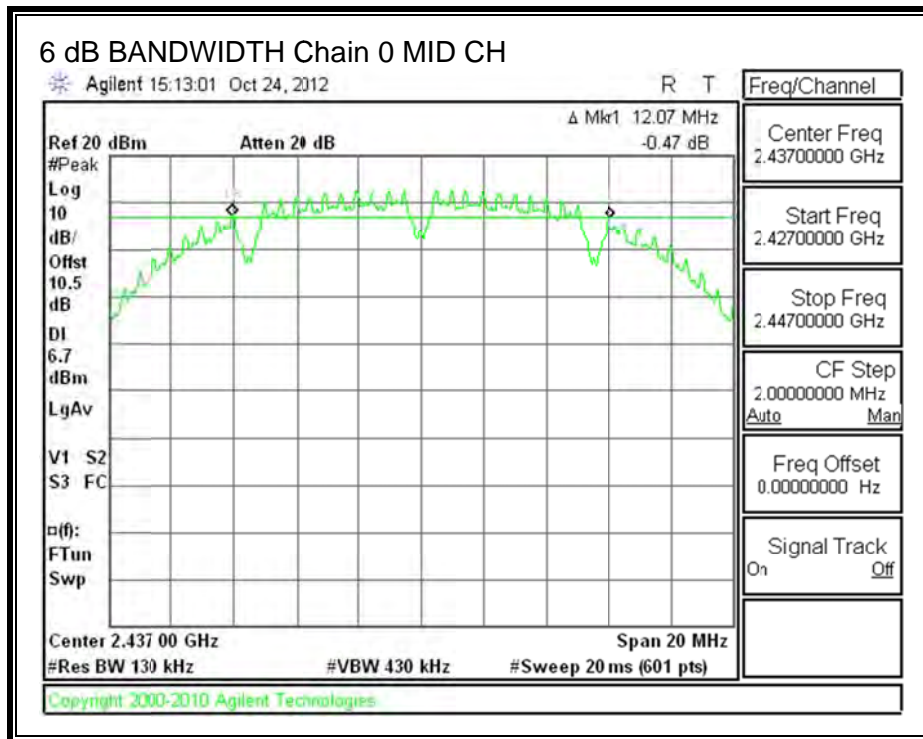
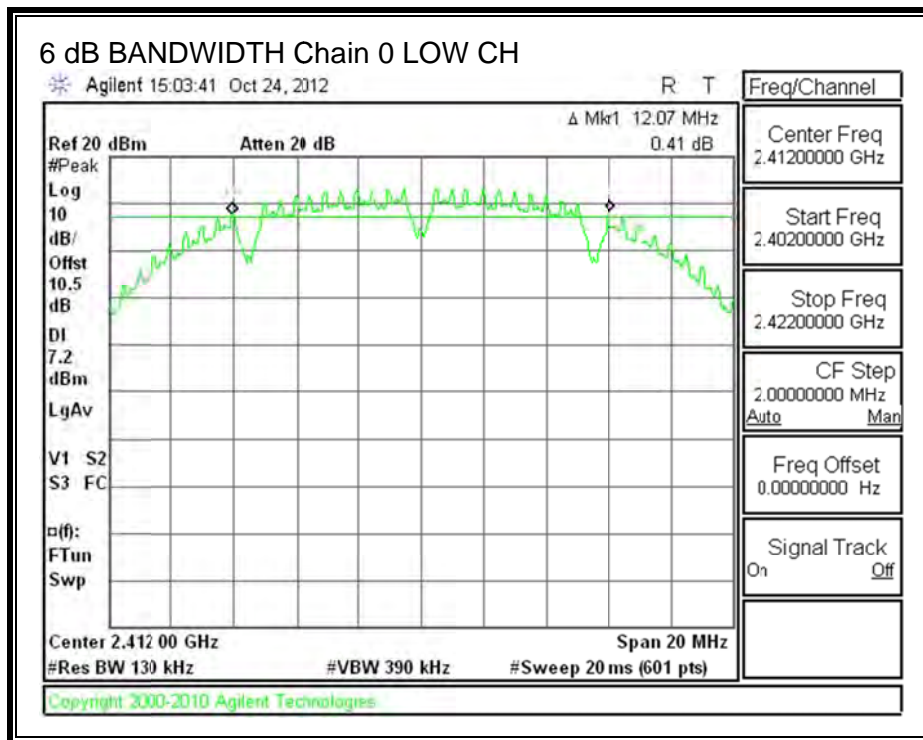
TEST PROCEDURE

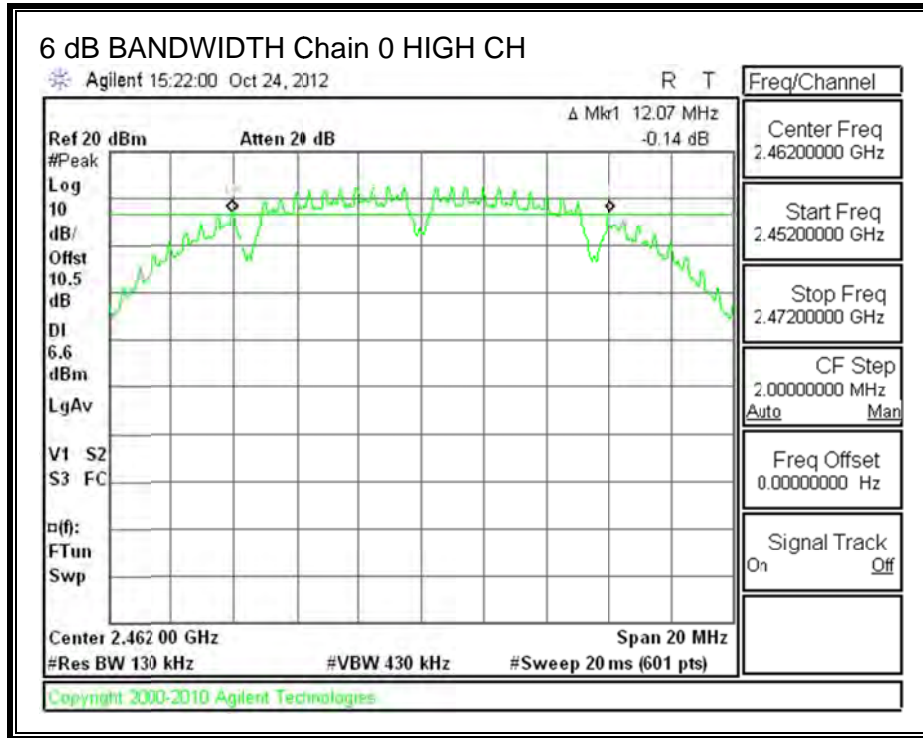
The transmitter output is connected to a spectrum analyzer with the RBW set between 1% and 5% of the EBW, the VBW $\geq 3 \times$ RBW, peak detector and max hold.

RESULTS

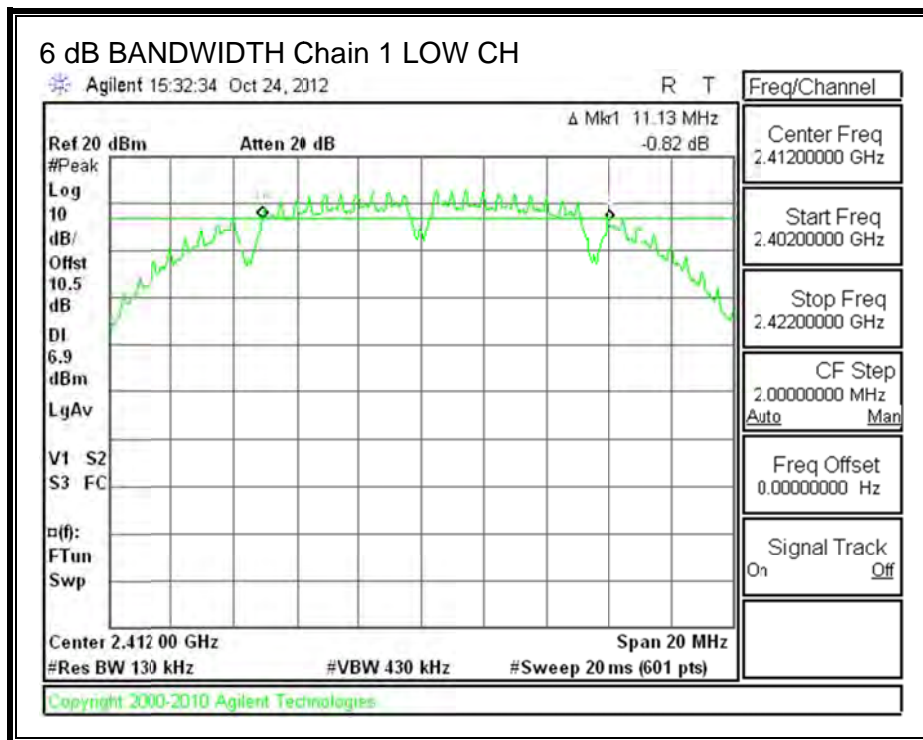
Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
Low	2412	12.07	11.13	0.5
Mid	2437	12.07	12.13	0.5
High	2462	12.07	12.07	0.5

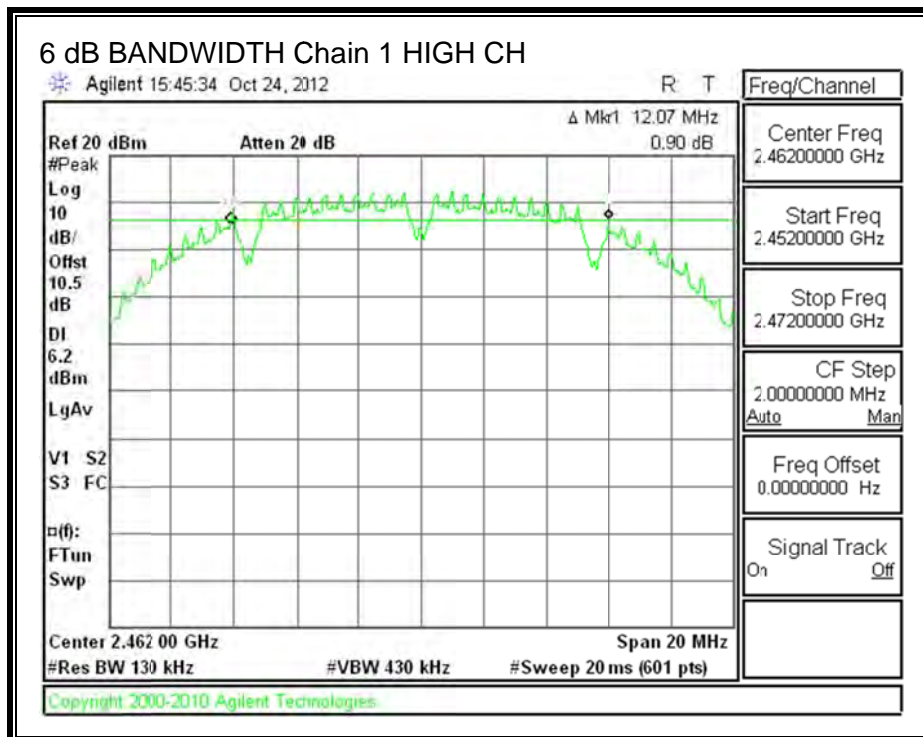
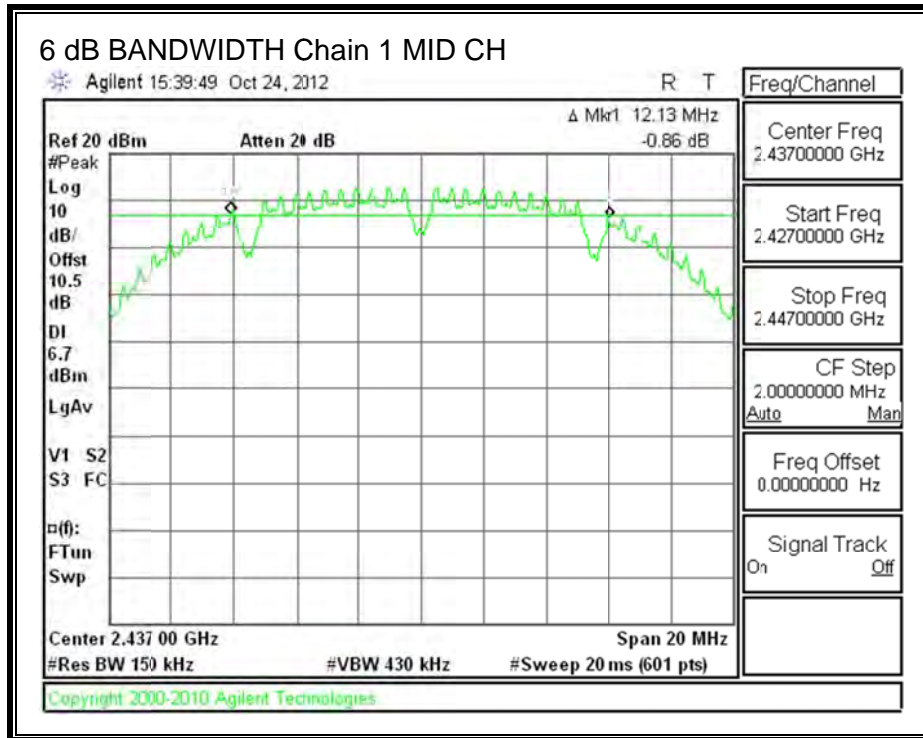
6 dB BANDWIDTH, Chain 0





6 dB BANDWIDTH, Chain 1





8.1.2. 99% BANDWIDTH

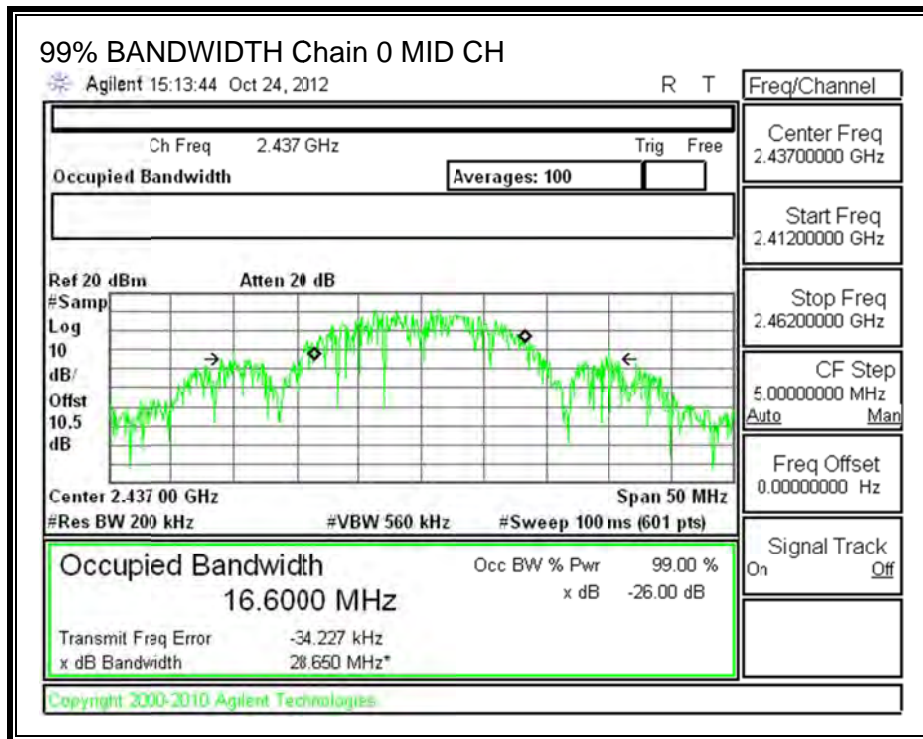
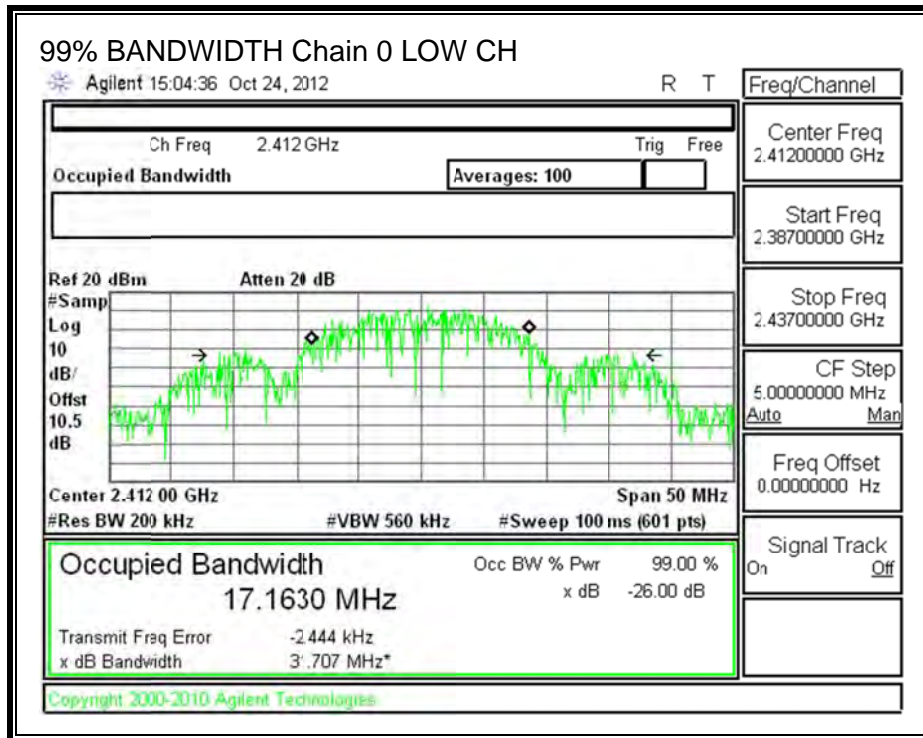
LIMITS

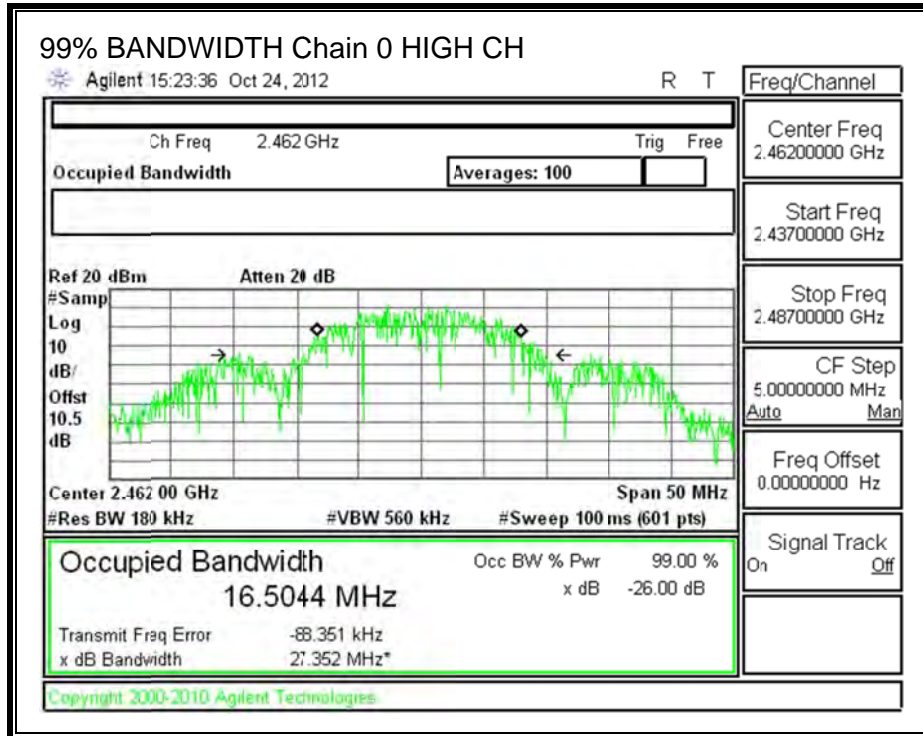
None; for reporting purposes only.

RESULTS

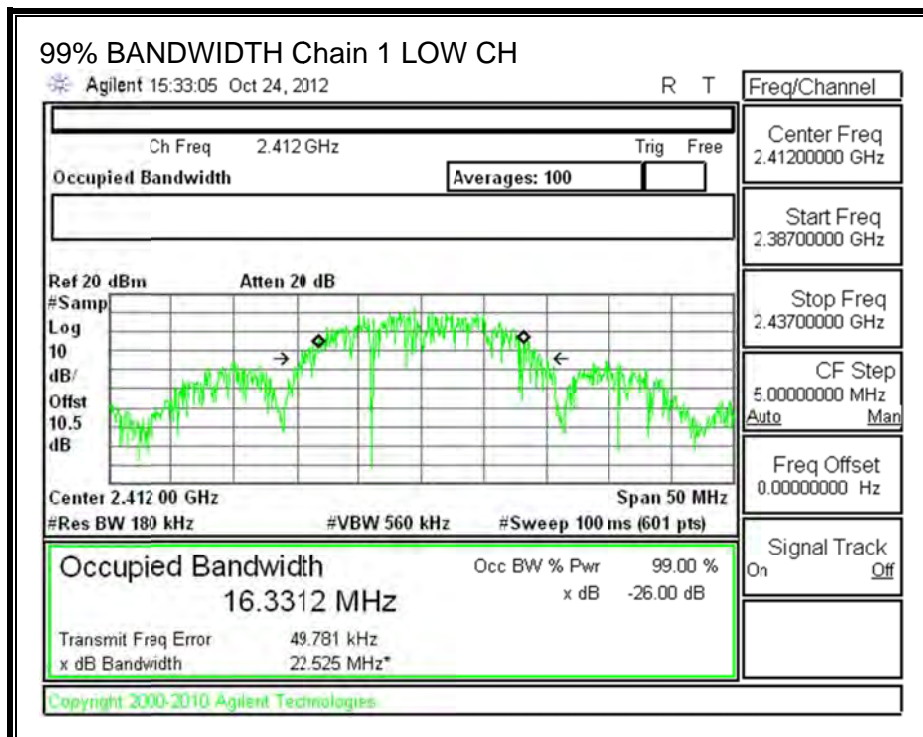
Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	2412	17.1630	16.3312
Mid	2437	16.6000	16.4041
High	2462	16.5044	16.1212

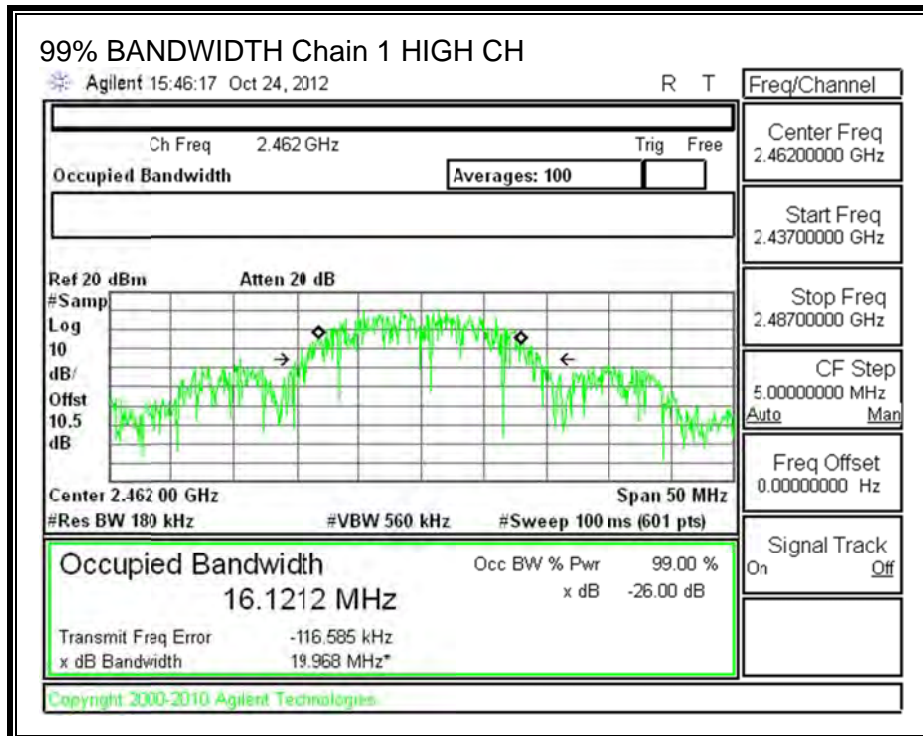
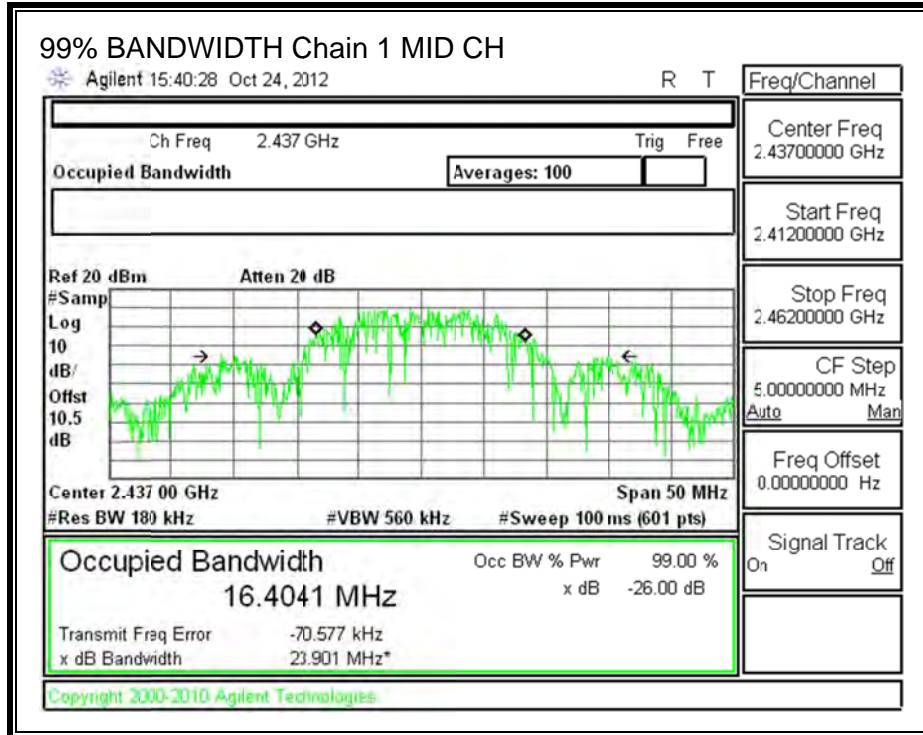
99% BANDWIDTH, Chain 0





99% BANDWIDTH, Chain 1





8.1.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.5 dB (including 10dB pad and 0.5 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	2412	20.55	19.40	23.02
Mid	2437	22.20	22.20	25.21
High	2462	22.35	22.00	25.19

8.1.4. OUTPUT POWER

LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

The TX chains are correlated and the antenna gain is the same for each chain. The directional gain is:

Antenna Gain (dBi)	10 * Log (2 chains) (dB)	Correlated Chains Directional Gain (dBi)
1.00	3.01	4.01

RESULTS

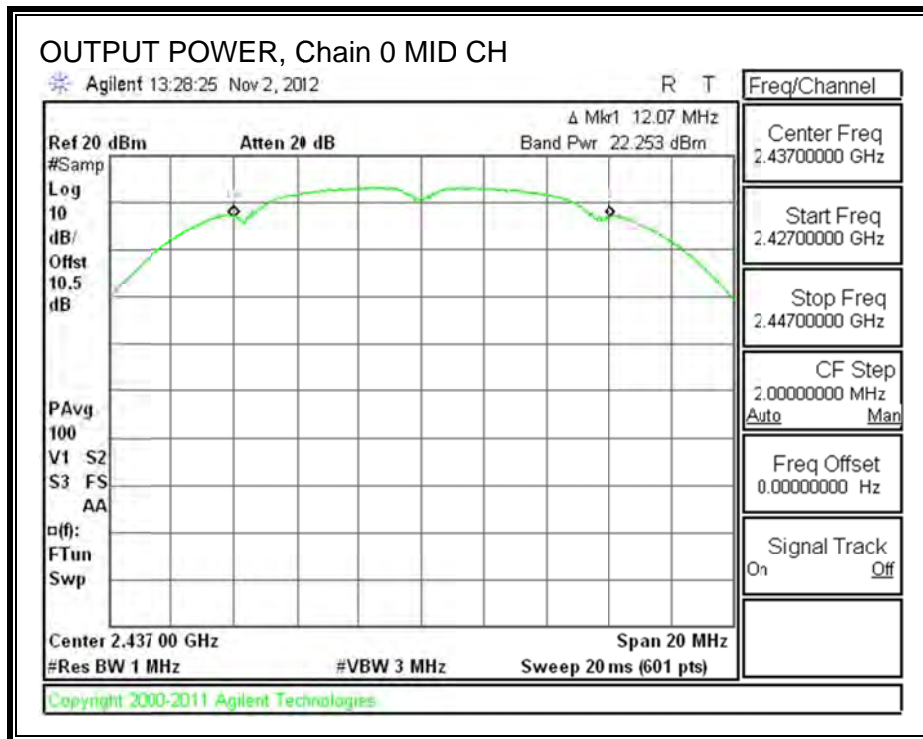
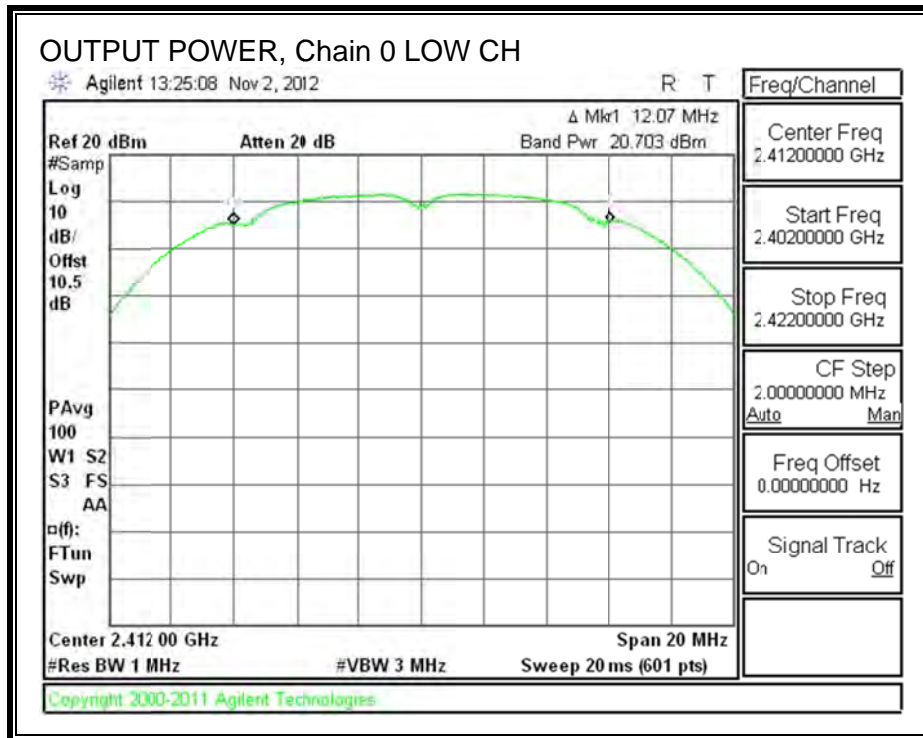
Limits

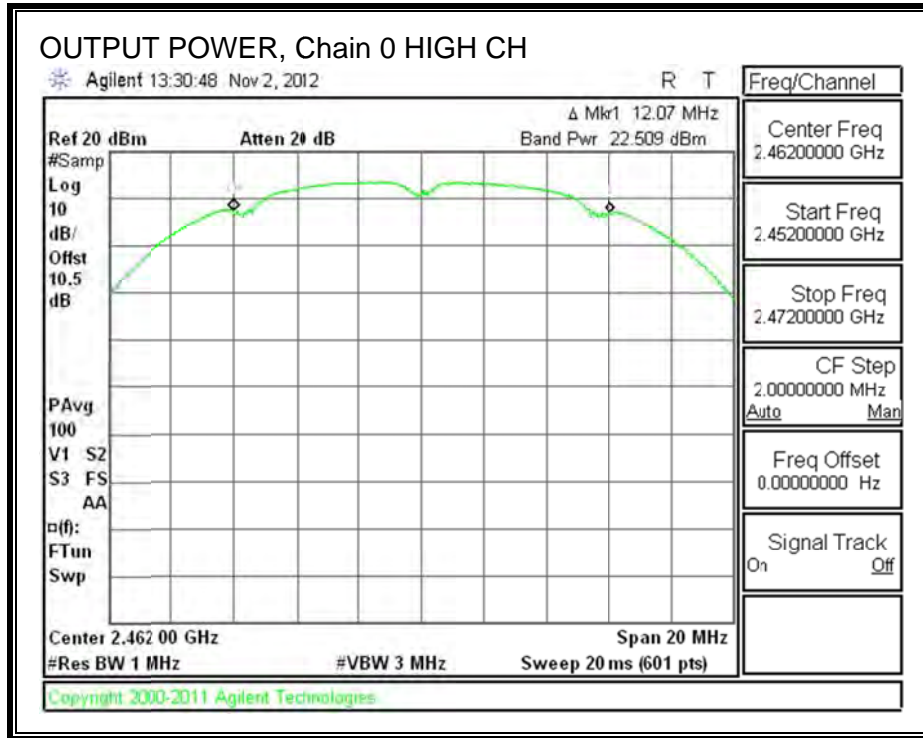
Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	4.01	30.00	30	36	30.00
Mid	2437	4.01	30.00	30	36	30.00
High	2462	4.01	30.00	30	36	30.00

Results

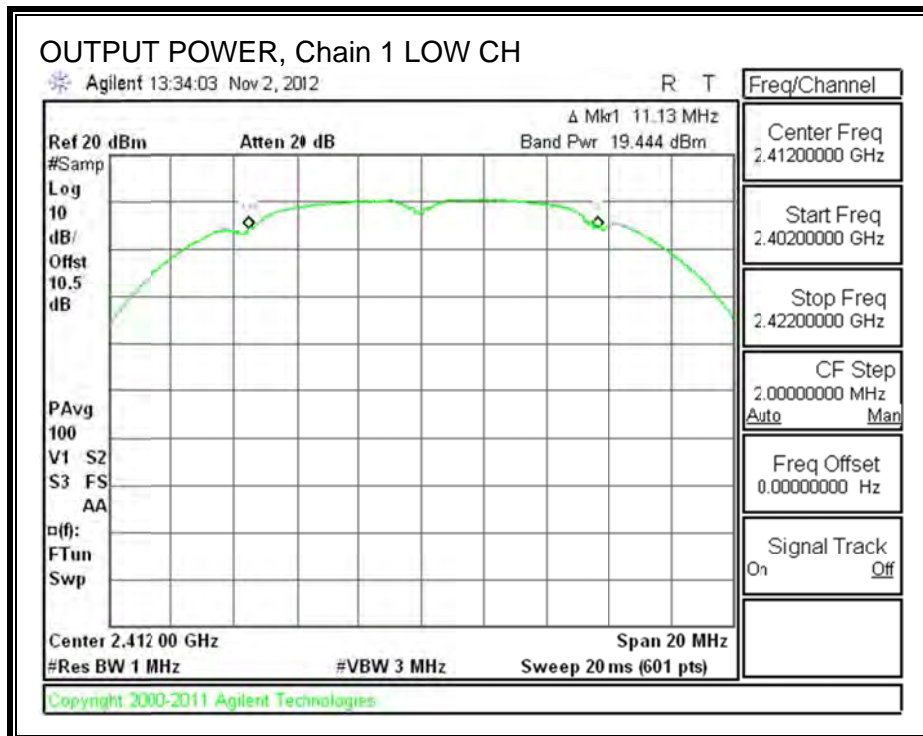
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margi (dB)
Low	2412	20.703	19.444	23.129	30.00	-6.871
Mid	2437	22.253	22.296	25.285	30.00	-4.715
High	2462	22.509	22.050	25.296	30.00	-4.704

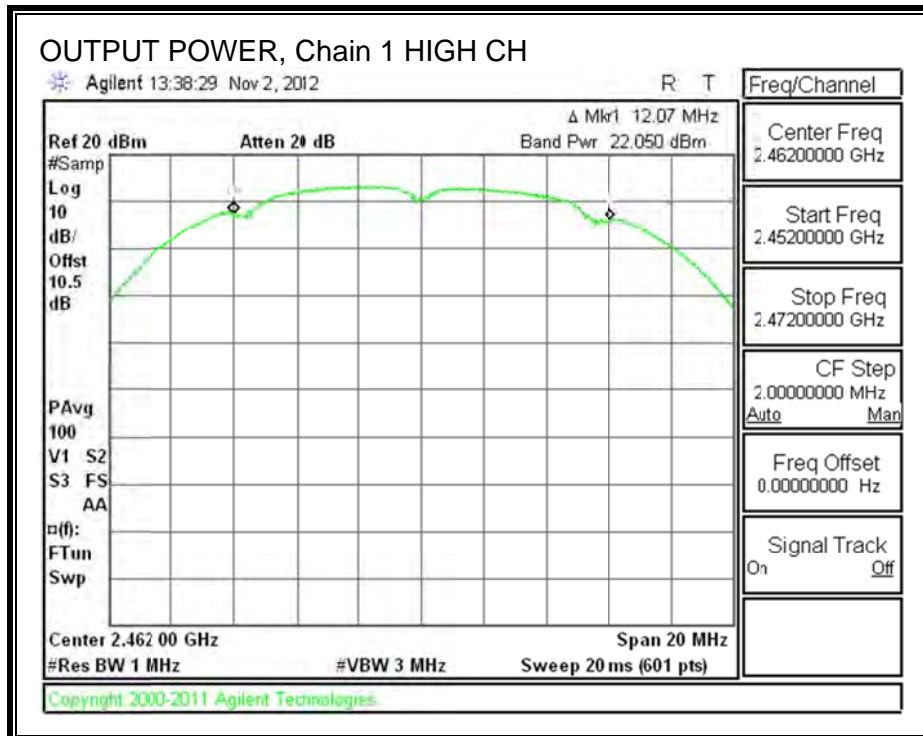
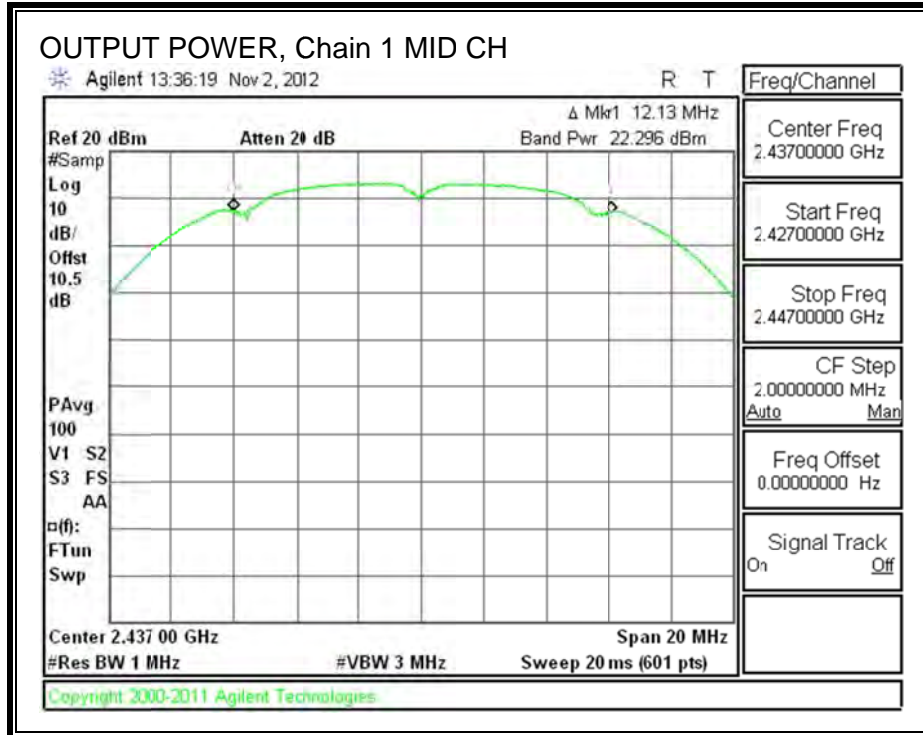
OUTPUT POWER, Chain 0





OUTPUT POWER, Chain 1





8.1.5. PSD

LIMITS

FCC §15.247

IC RSS-210 A8.2

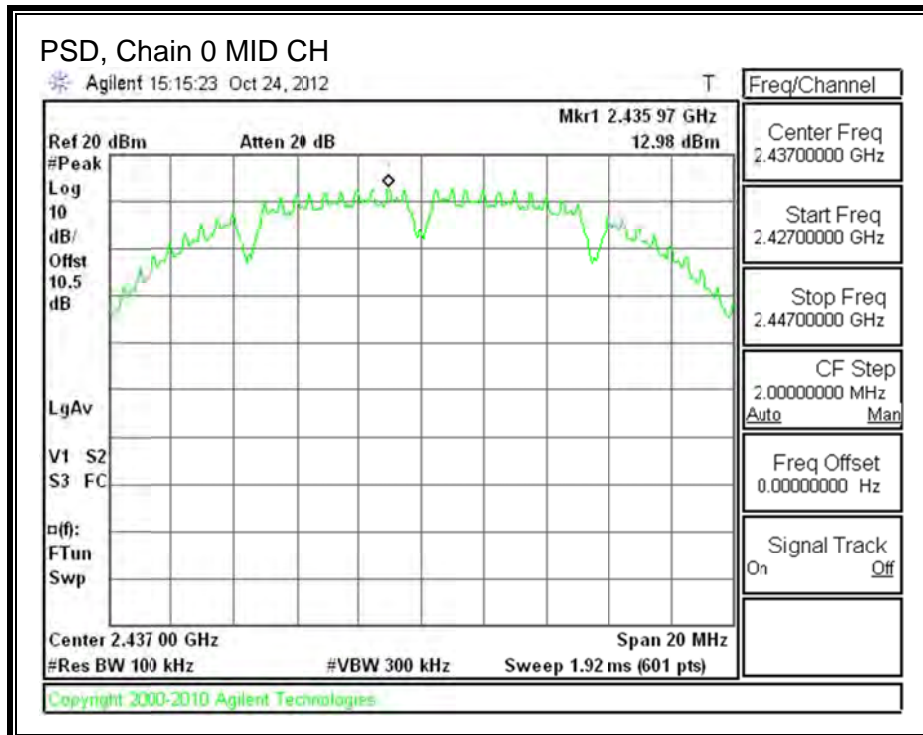
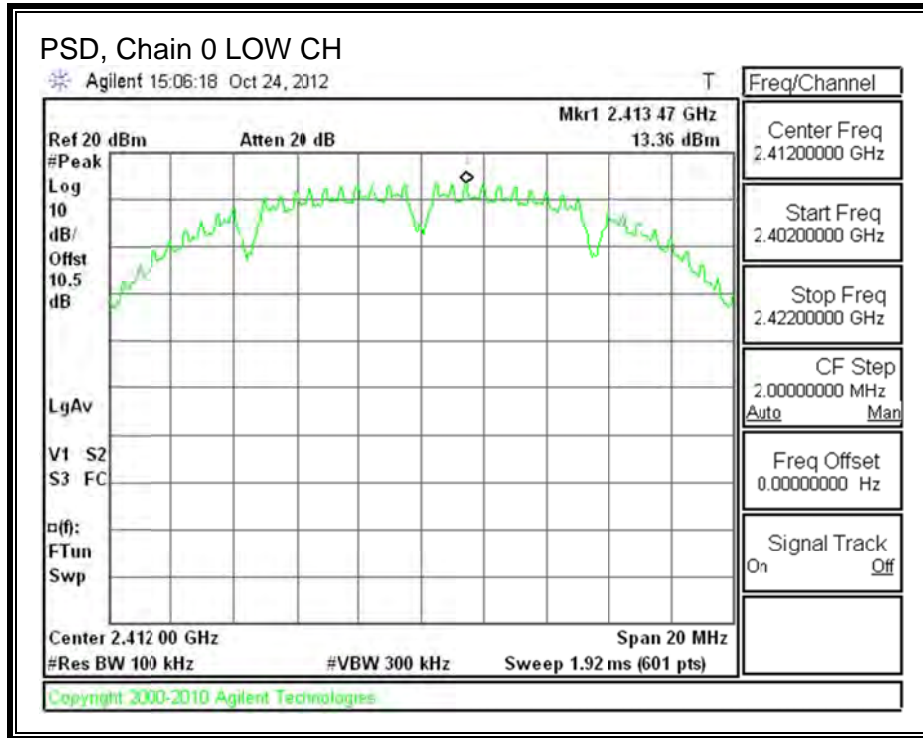
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

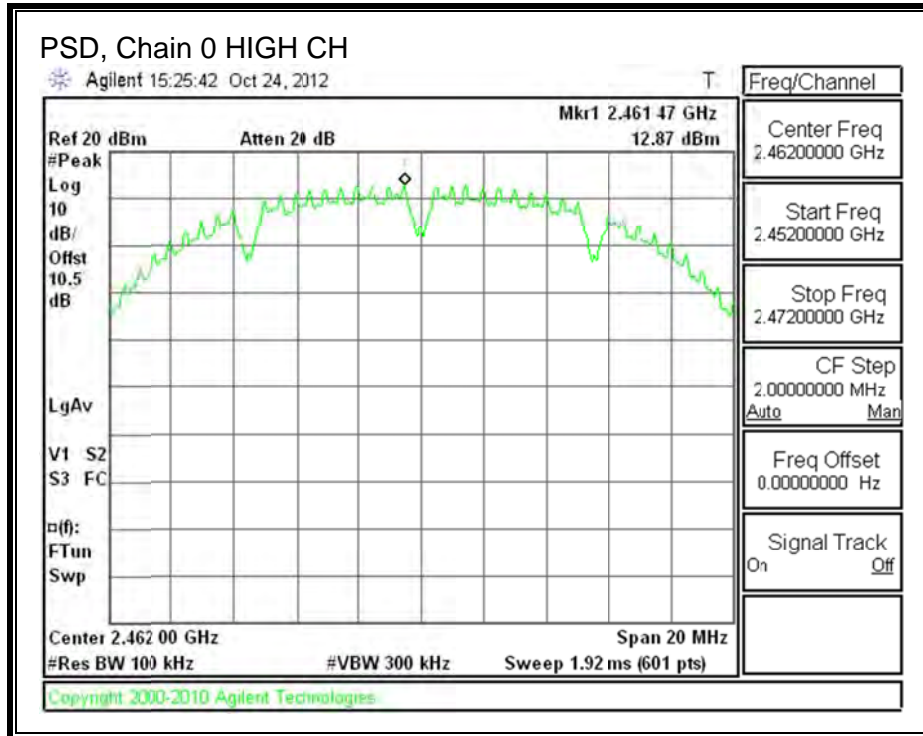
RESULTS

PSD Results

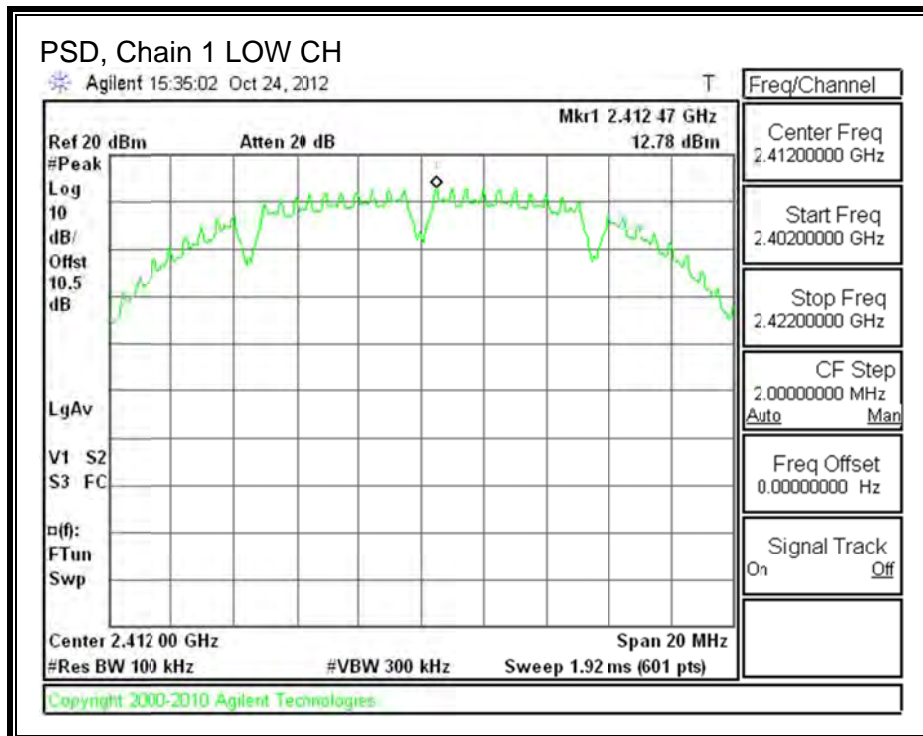
Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Chain 1 Meas (dBm)	BW Corr (dB)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	13.36	12.78	-15.2	0.89	8.0	-7.1
Mid	2437	12.98	12.36	-15.2	0.49	8.0	-7.5
High	2462	12.87	12.19	-15.2	0.35	8.0	-7.6

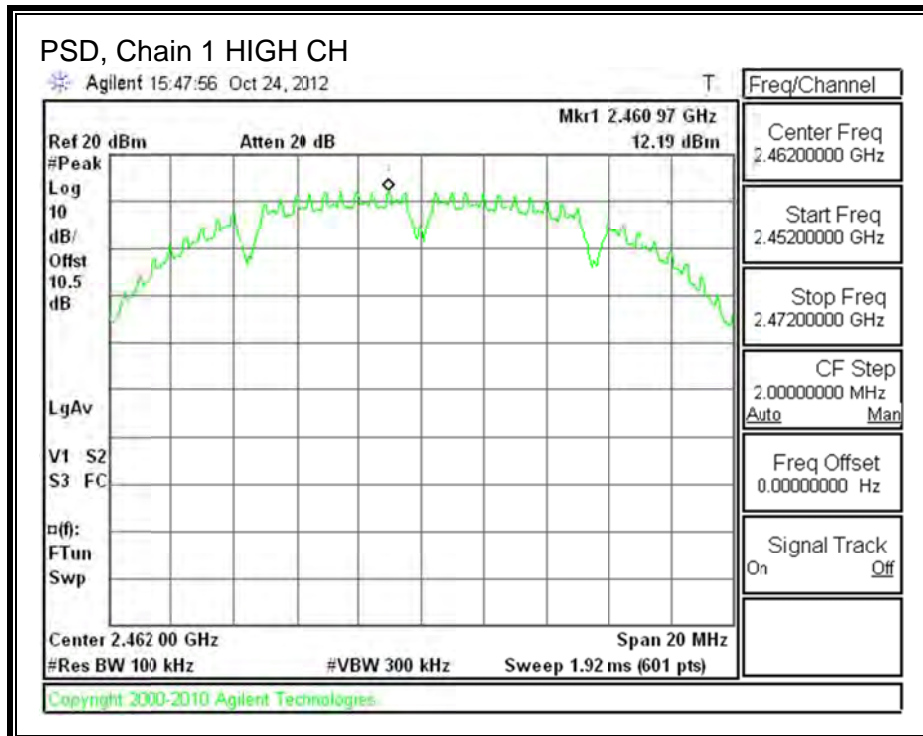
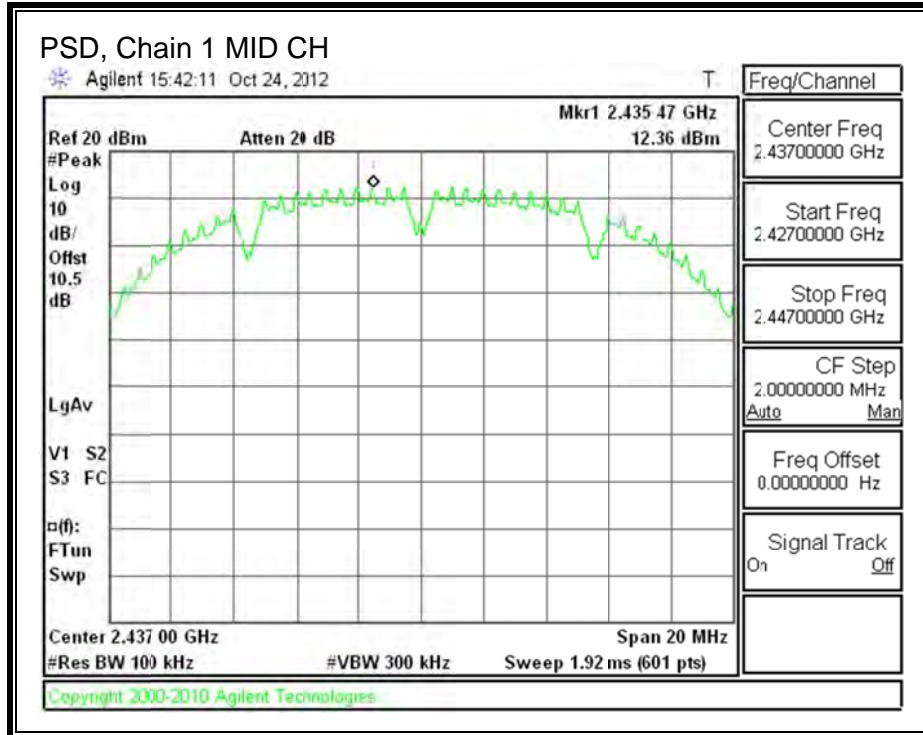
PSD, Chain 0





PSD, Chain 1





8.1.6. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

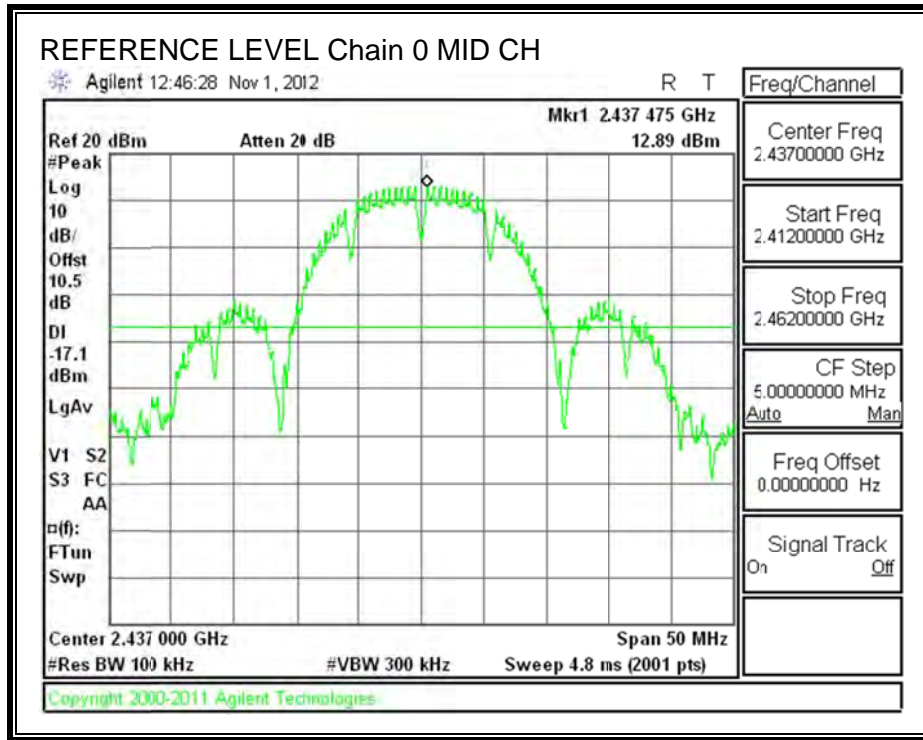
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

TEST PROCEDURE

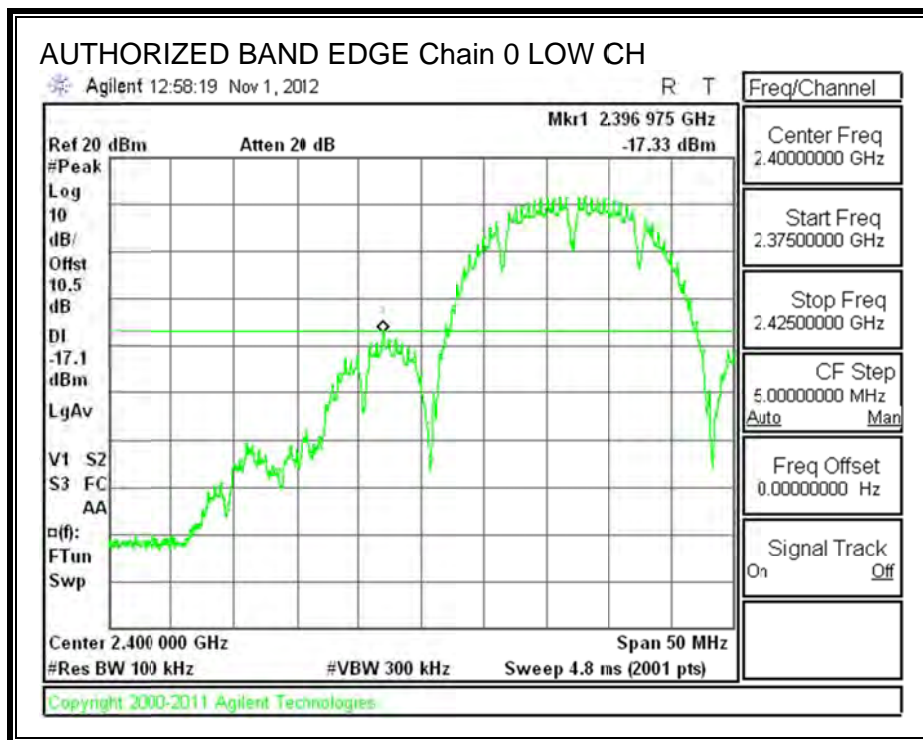
The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, bandedge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

RESULTS

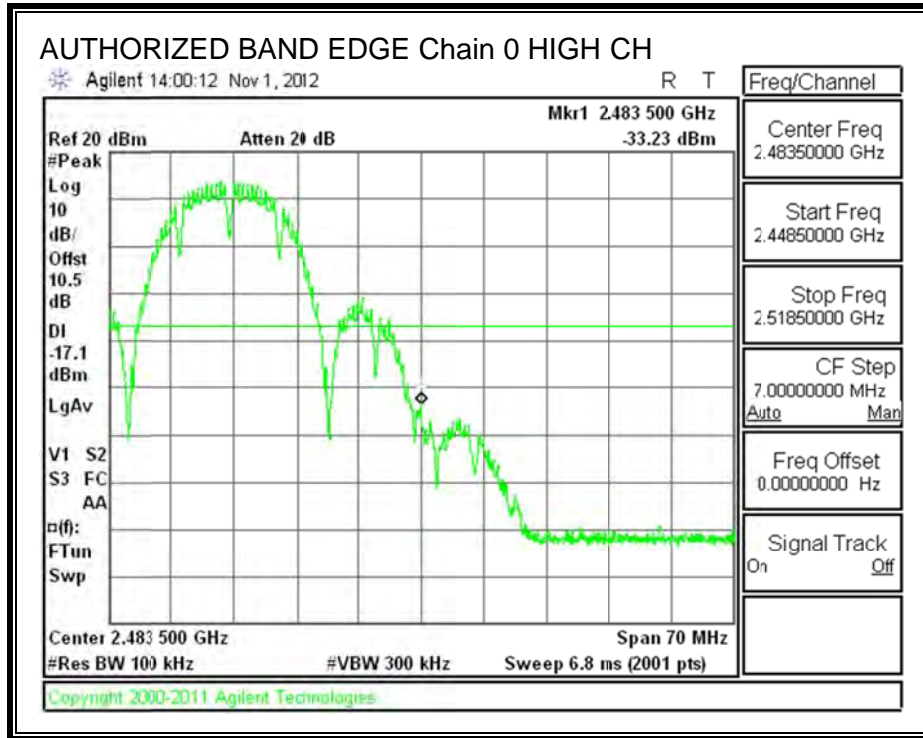
IN-BAND REFERENCE LEVEL, Chain 0



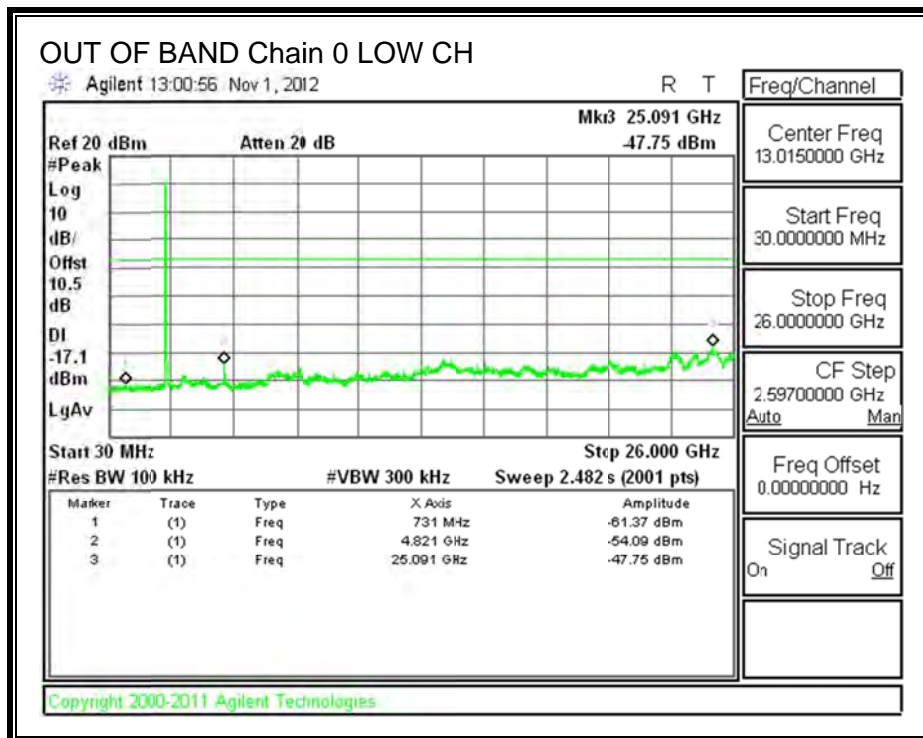
LOW CHANNEL BANDEDGE, Chain 0

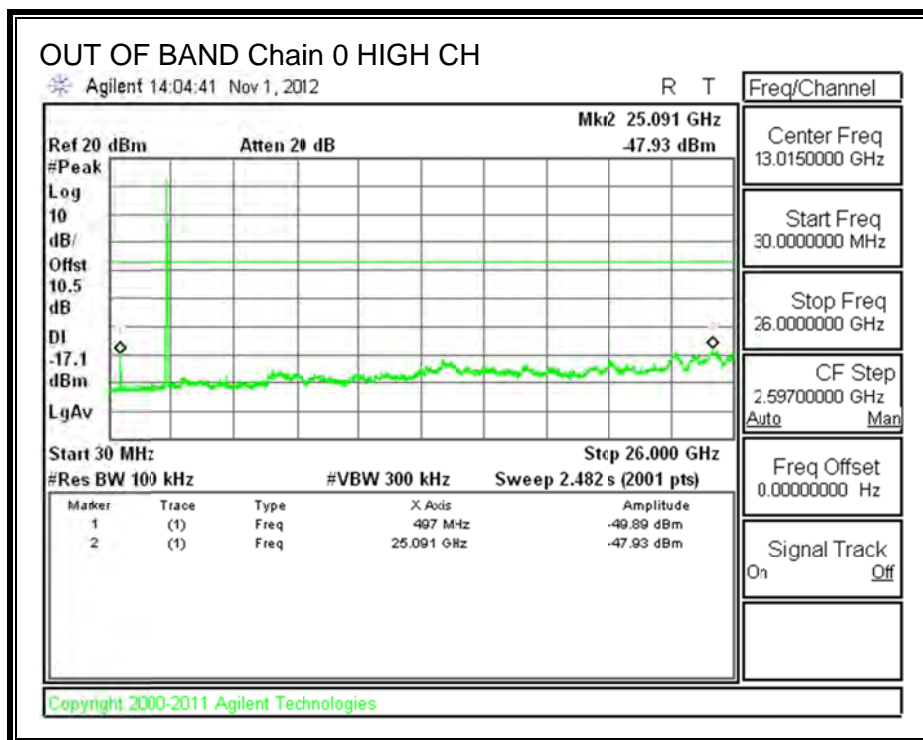
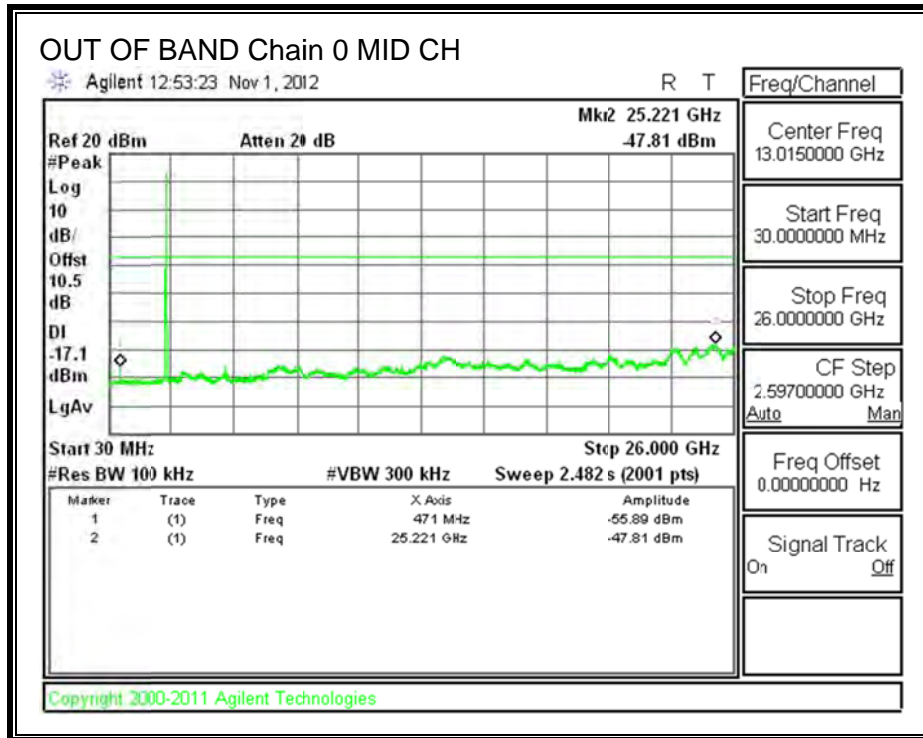


HIGH CHANNEL BANDEDGE, Chain 0

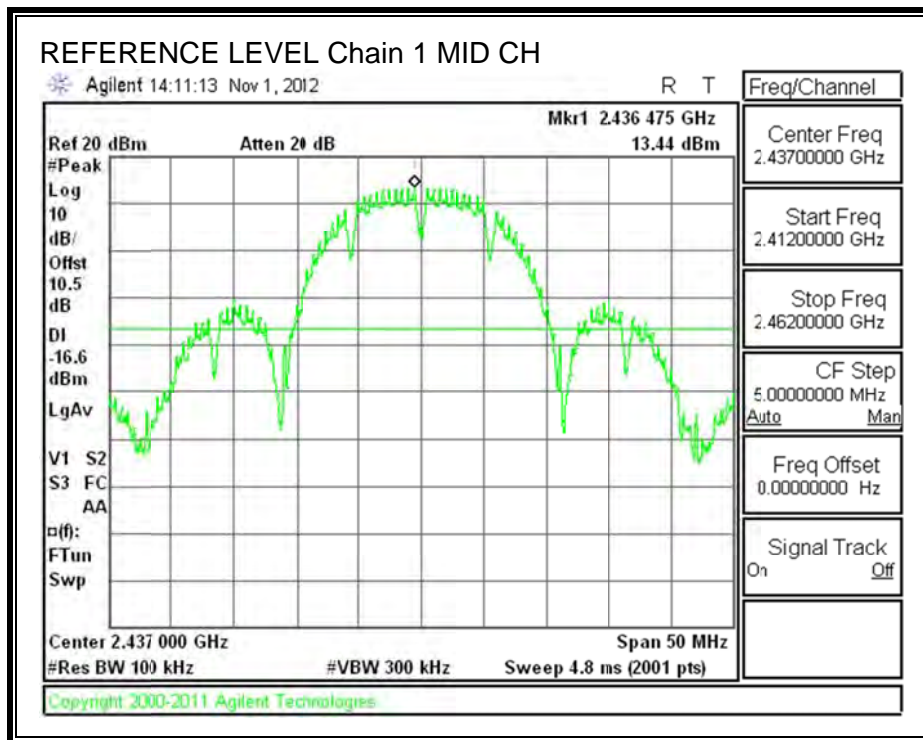


OUT-OF-BAND EMISSIONS, Chain 0

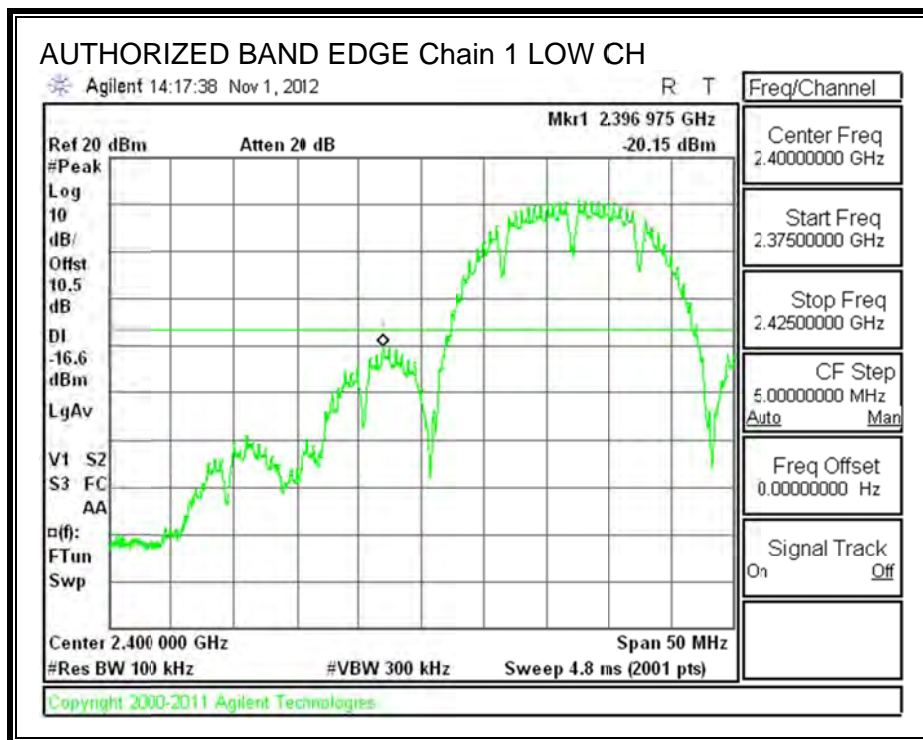




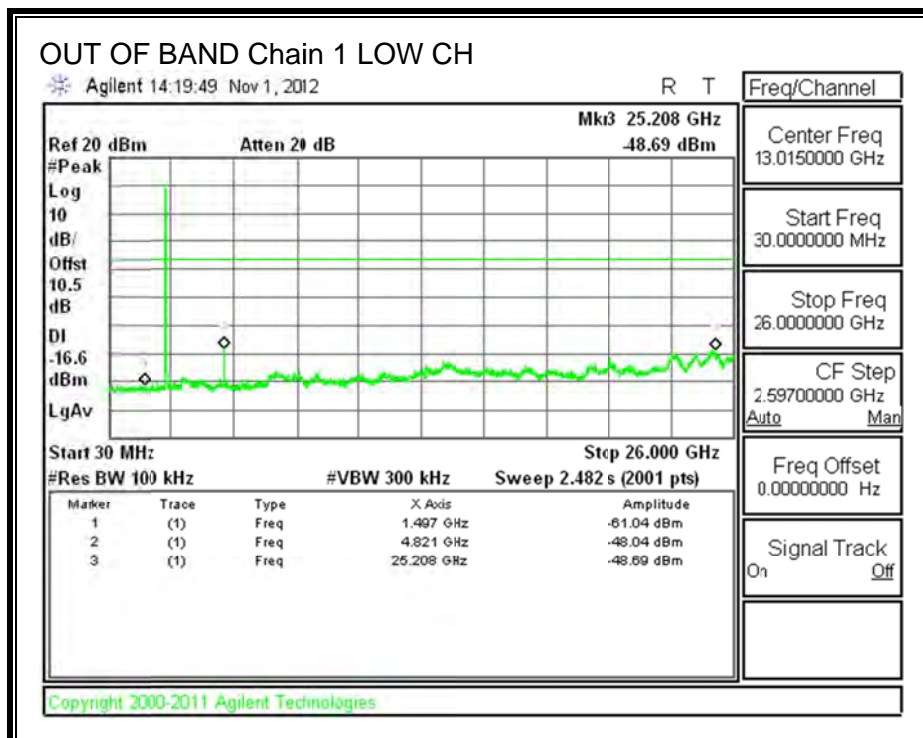
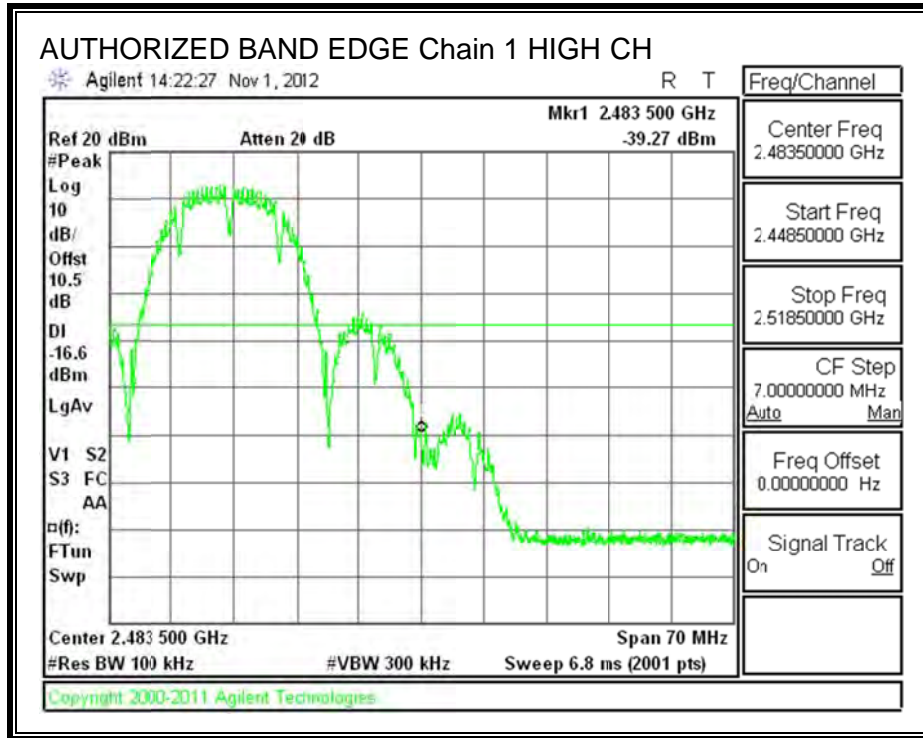
IN-BAND REFERENCE LEVEL, Chain 1

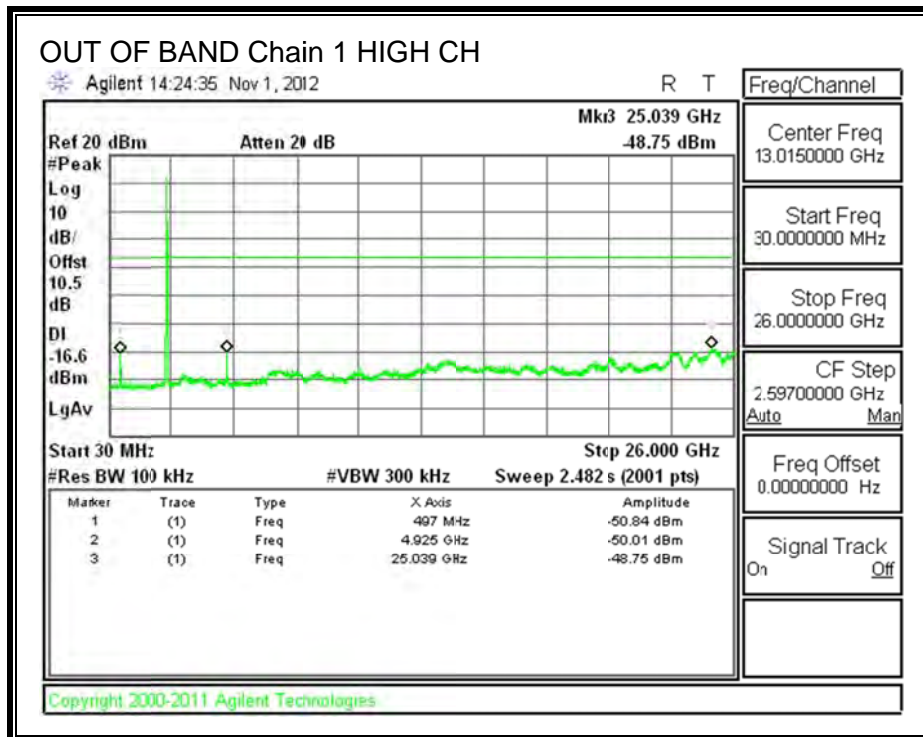
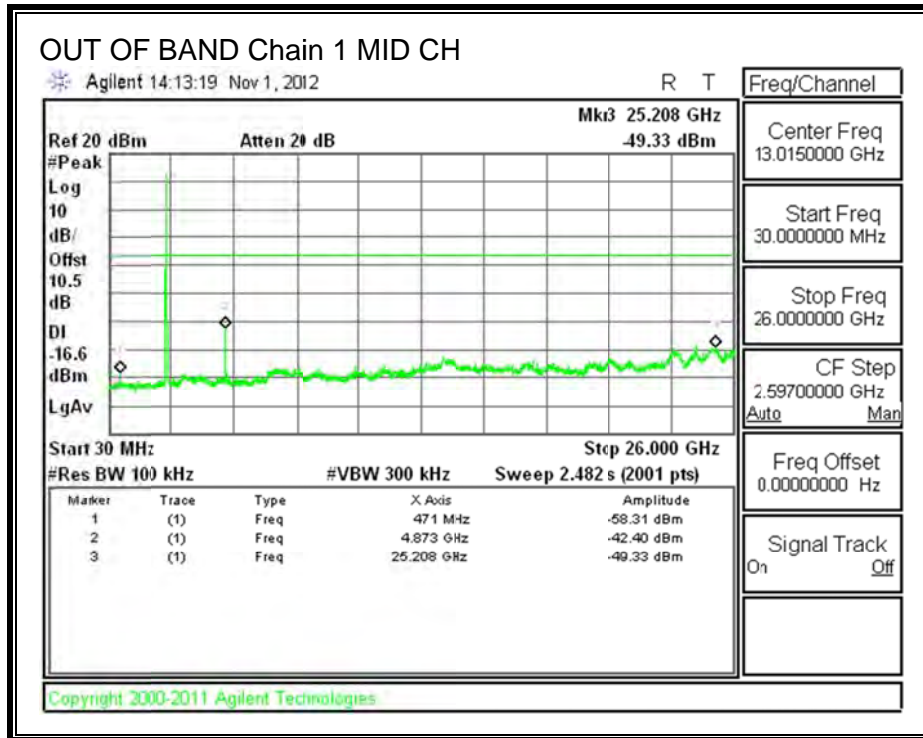


LOW CHANNEL BANDEDGE, Chain 1



HIGH CHANNEL BANDEDGE, Chain 1





8.2. 802.11g MODE IN THE 2.4 GHz BAND

8.2.1. 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.

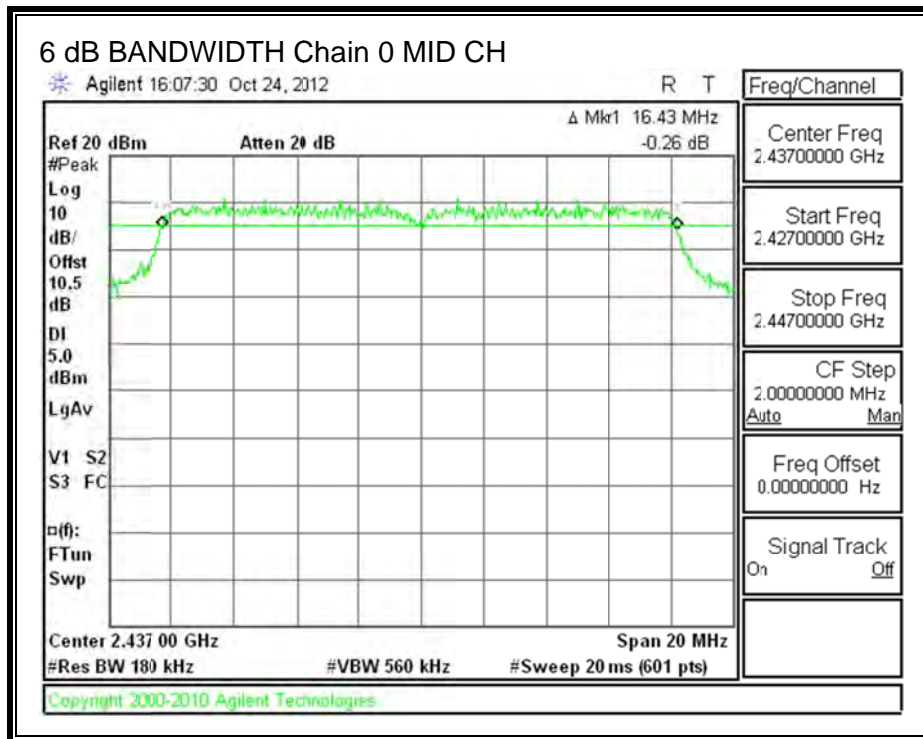
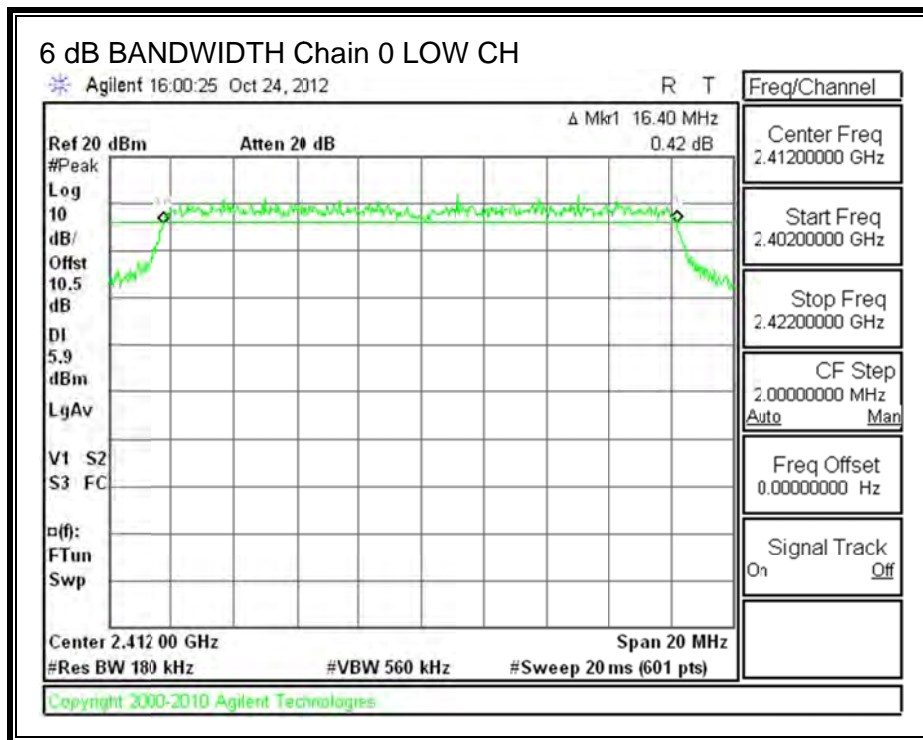
TEST PROCEDURE

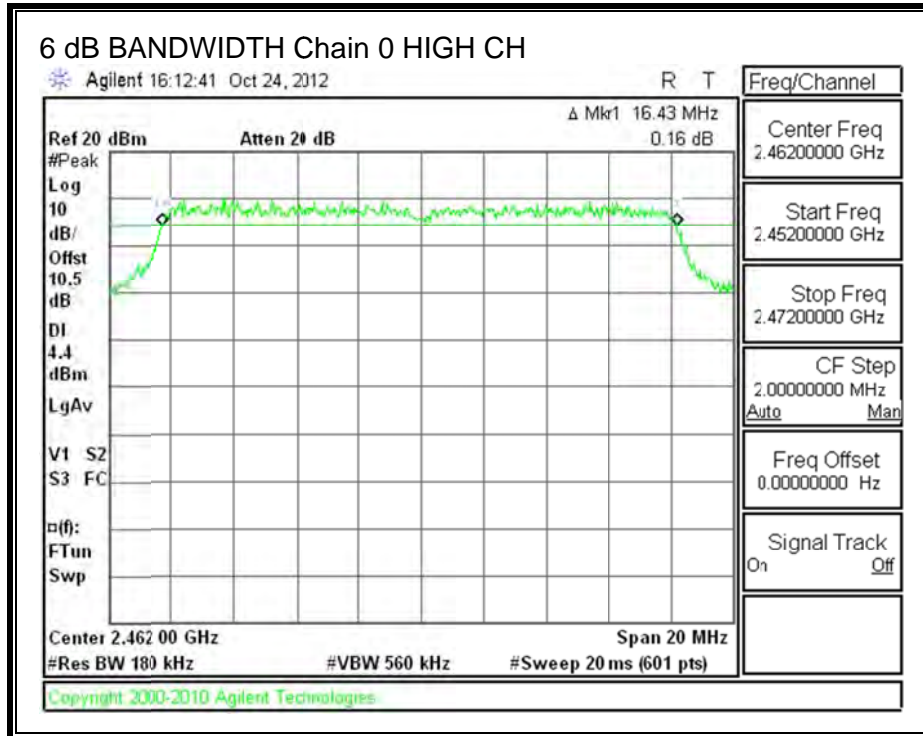
The transmitter output is connected to a spectrum analyzer with the RBW set between 1% and 5% of the EBW, the VBW $\geq 3 \times$ RBW, peak detector and max hold.

RESULTS

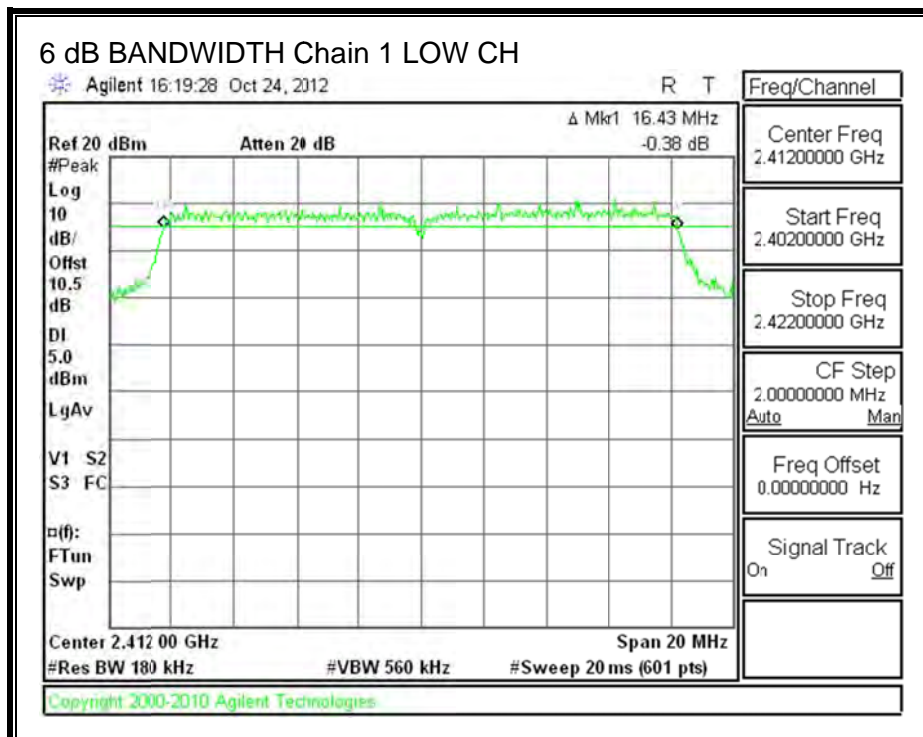
Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
Low	2412	16.40	16.43	0.5
Mid	2437	16.43	16.43	0.5
High	2462	16.43	16.47	0.5

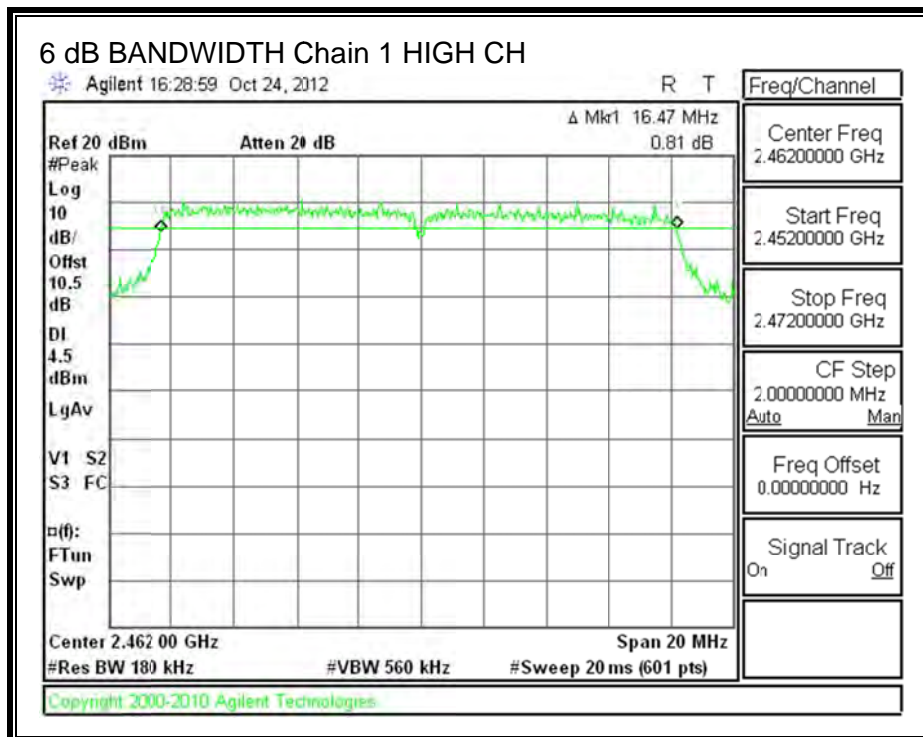
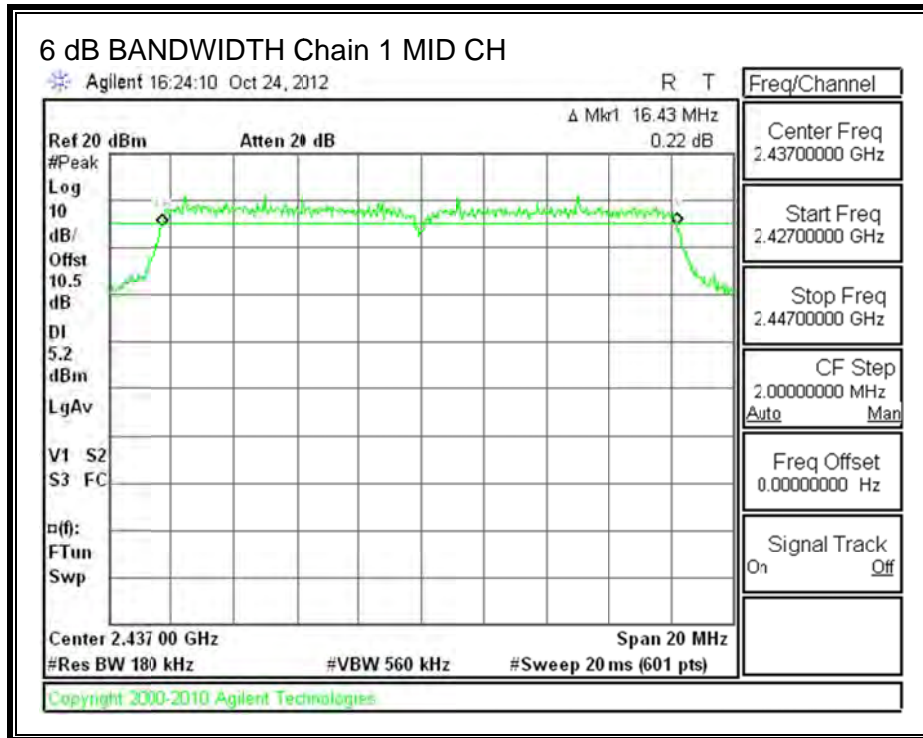
6 dB BANDWIDTH, Chain 0





6 dB BANDWIDTH, Chain 1





8.2.2. 99% BANDWIDTH

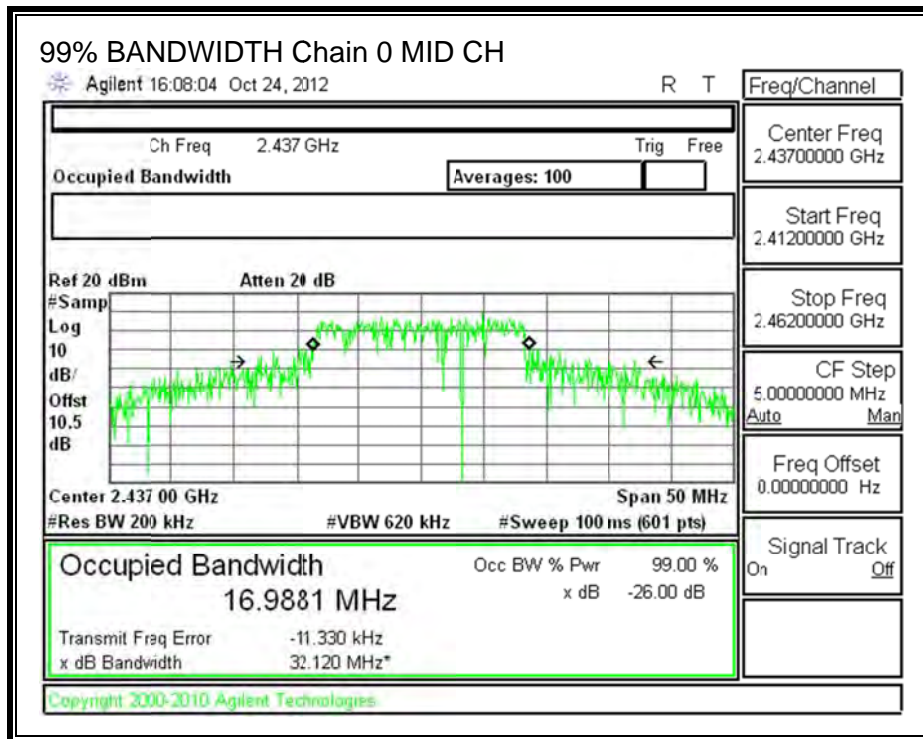
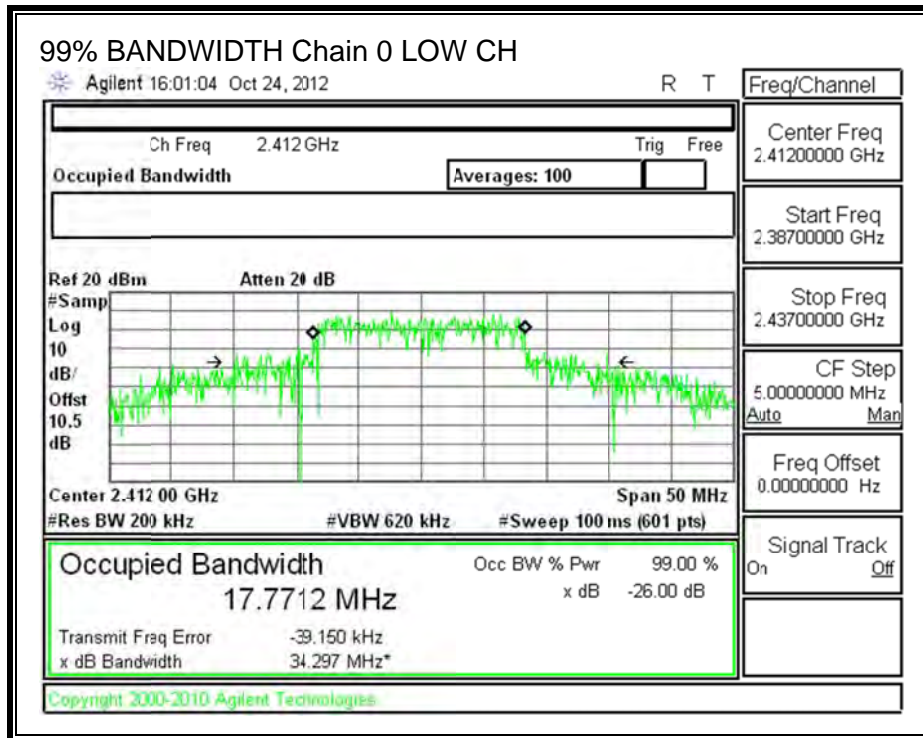
LIMITS

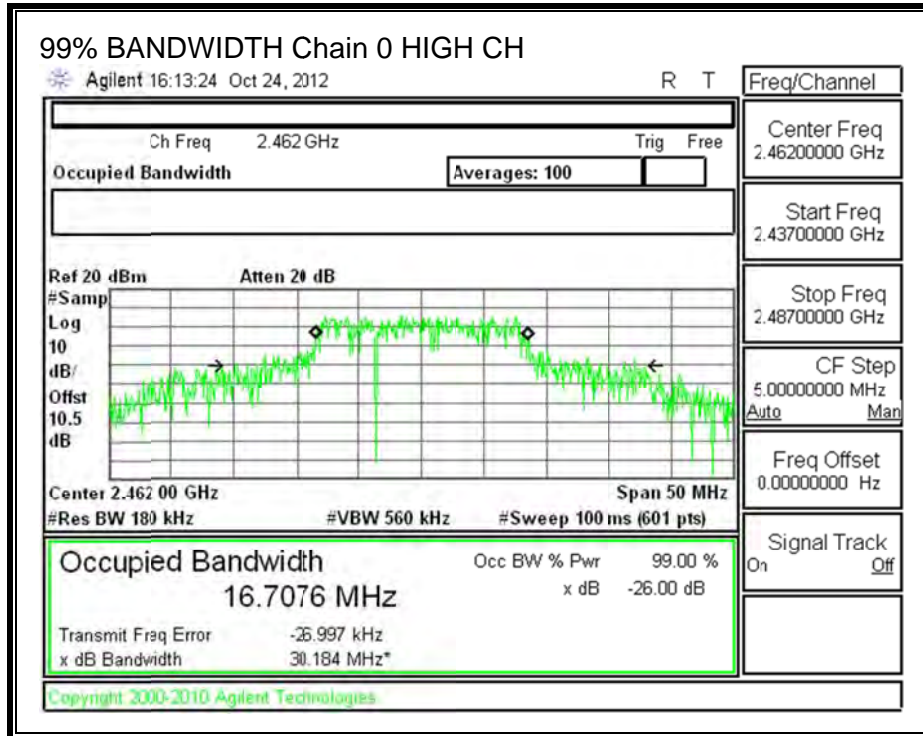
None; for reporting purposes only.

RESULTS

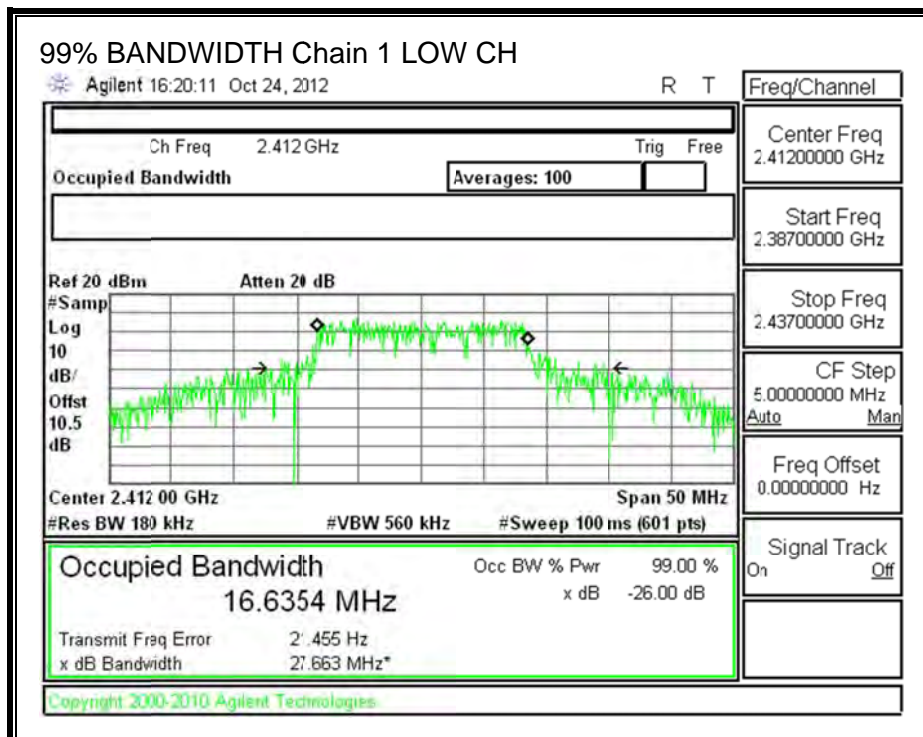
Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	2412	17.7712	16.6354
Mid	2437	16.9881	16.7167
High	2462	16.7076	16.6038

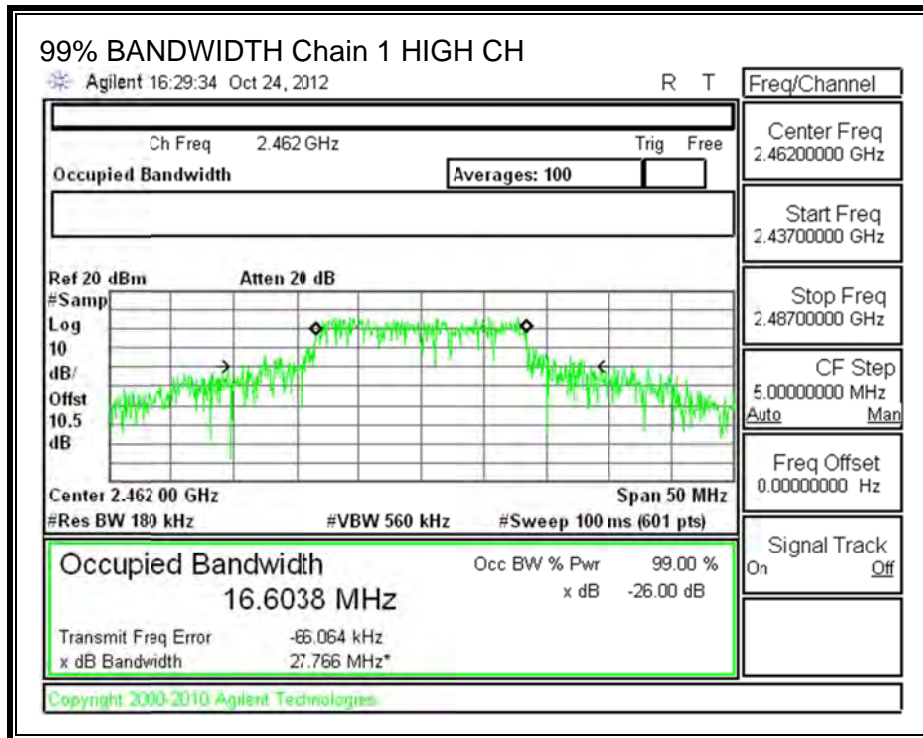
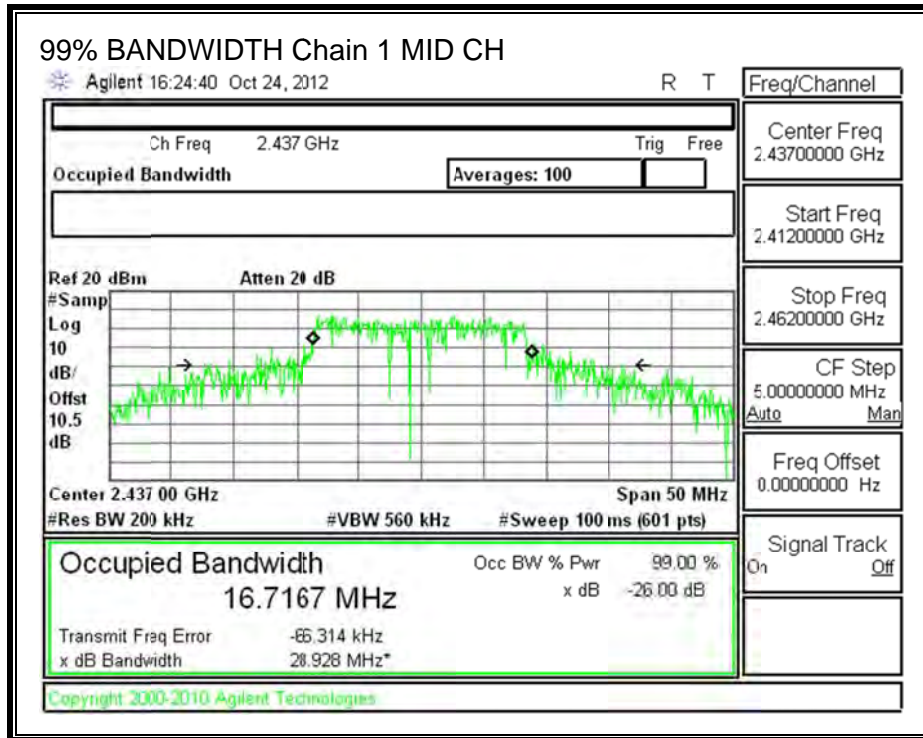
99% BANDWIDTH, Chain 0





99% BANDWIDTH, Chain 1





8.2.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.5 dB (including 10 dB pad and 0.5 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	2412	18.06	17.10	20.62
Mid	2437	20.50	20.45	23.49
High	2462	20.15	20.35	23.26

8.2.4. OUTPUT POWER

LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

The TX chains are correlated and the antenna gain is the same for each chain. The directional gain is:

Antenna Gain (dBi)	10 * Log (2 chains) (dB)	Correlated Chains Directional Gain (dBi)
1.00	3.01	4.01

RESULTS

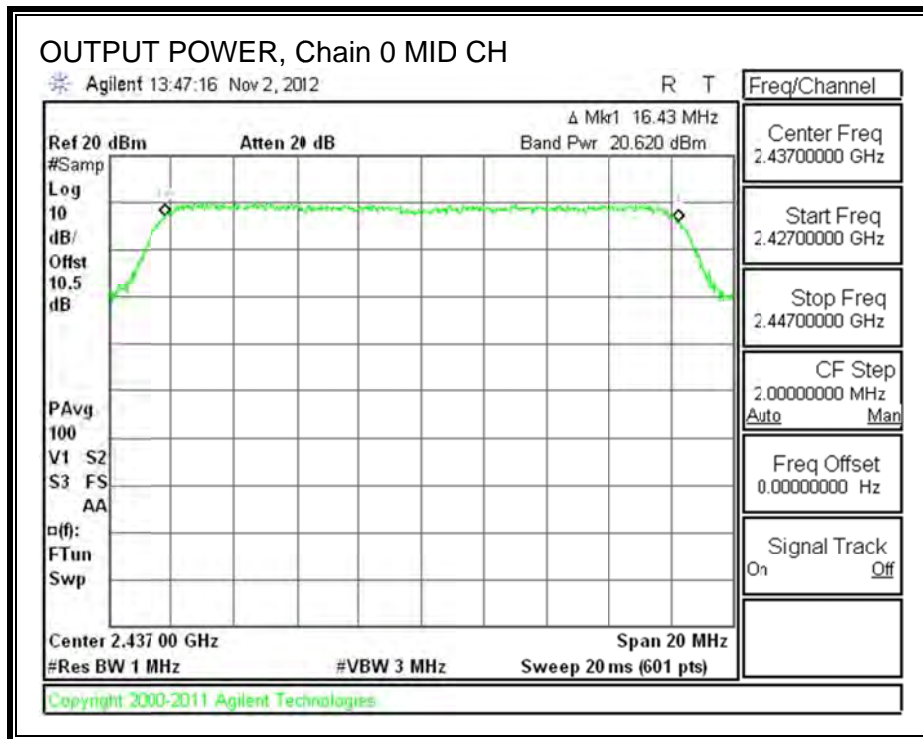
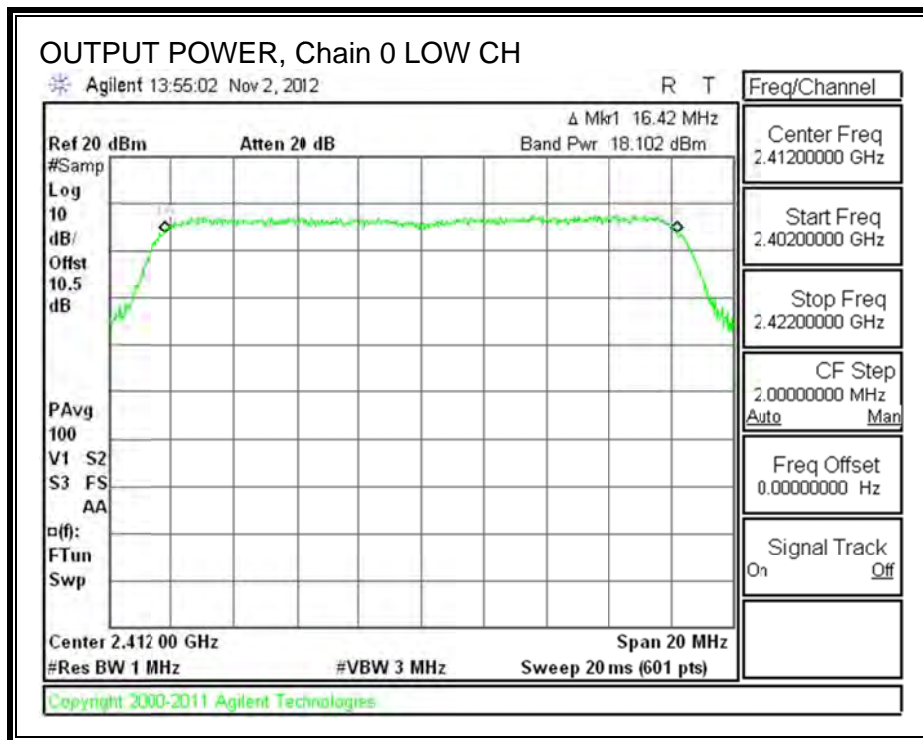
Limits

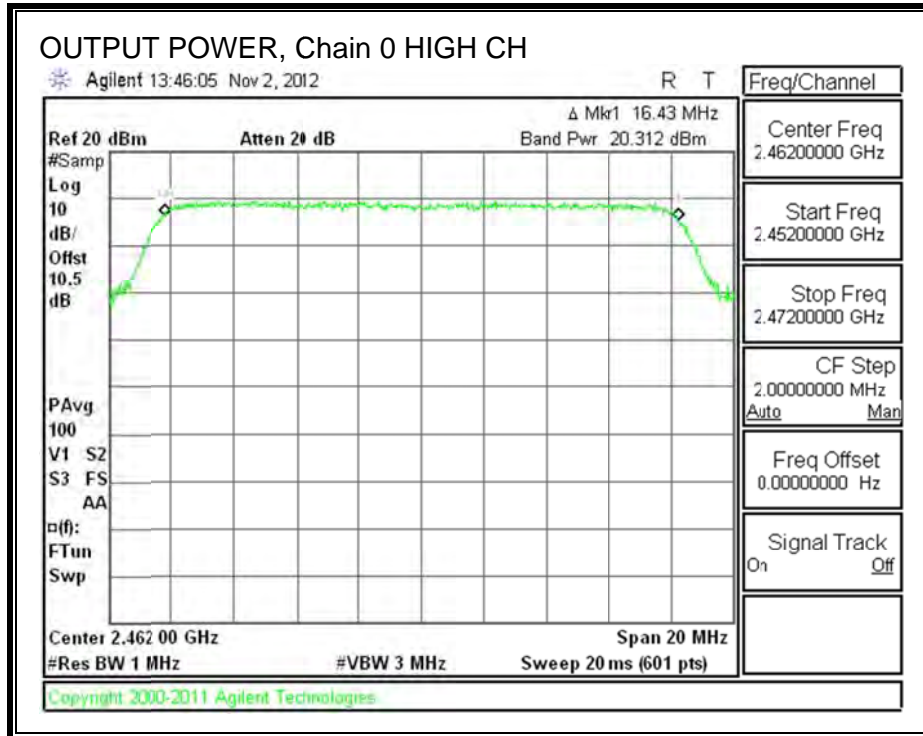
Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	1.00	30.00	30	36	30.00
Mid	2437	1.00	30.00	30	36	30.00
High	2462	1.00	30.00	30	36	30.00

Results

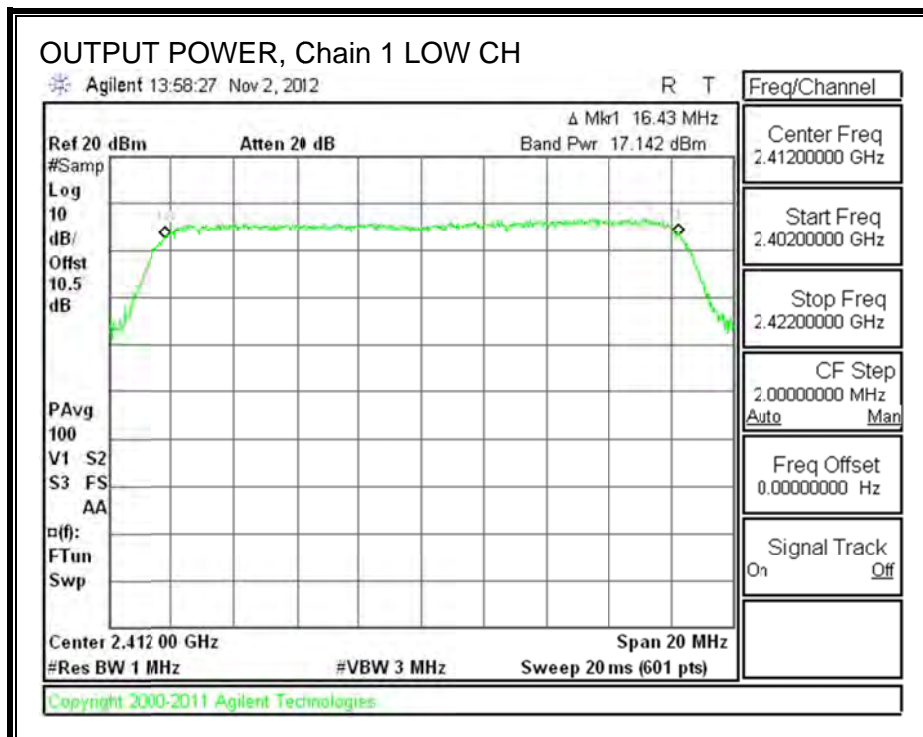
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margi (dB)
Low	2412	18.102	17.142	20.659	30.00	-9.341
Mid	2437	20.620	20.510	23.576	30.00	-6.424
High	2462	20.312	20.401	23.367	30.00	-6.633

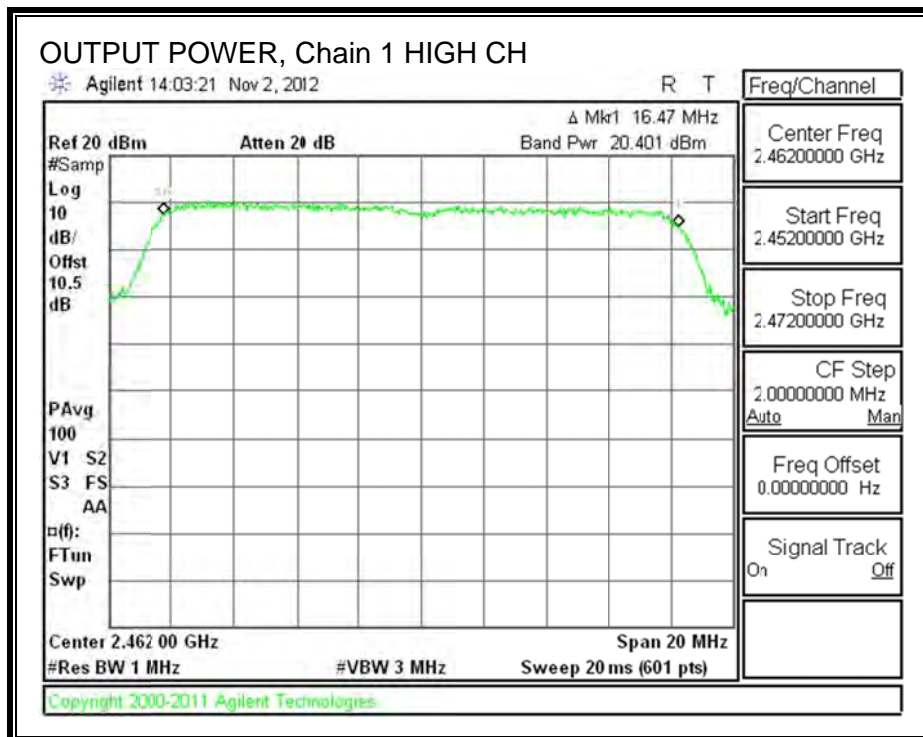
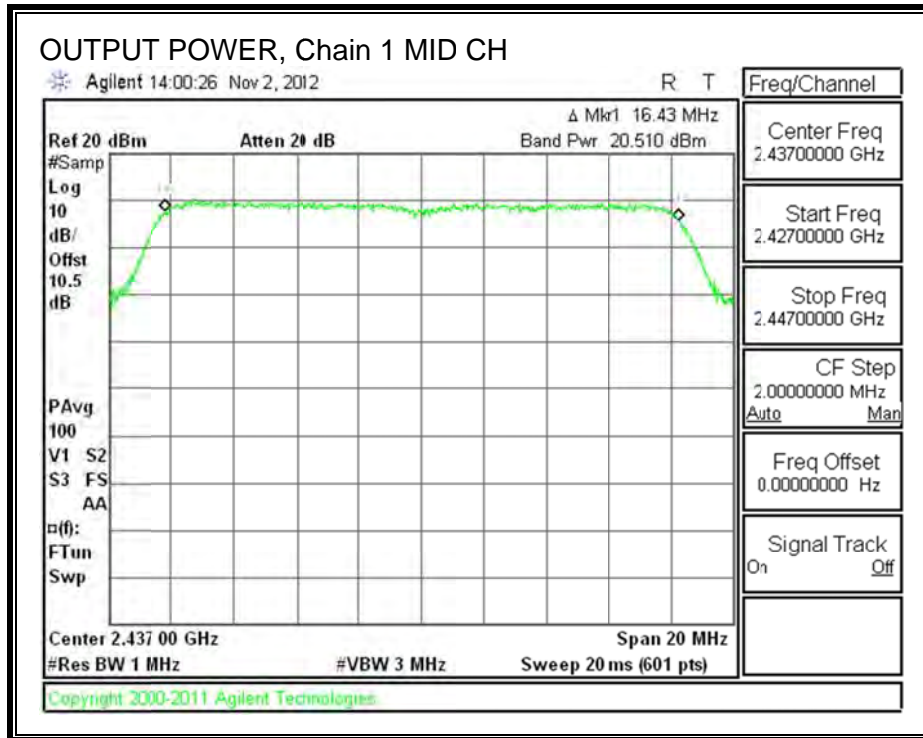
OUTPUT POWER, Chain 0





OUTPUT POWER, Chain 1





8.2.5. PSD

LIMITS

FCC §15.247

IC RSS-210 A8.2

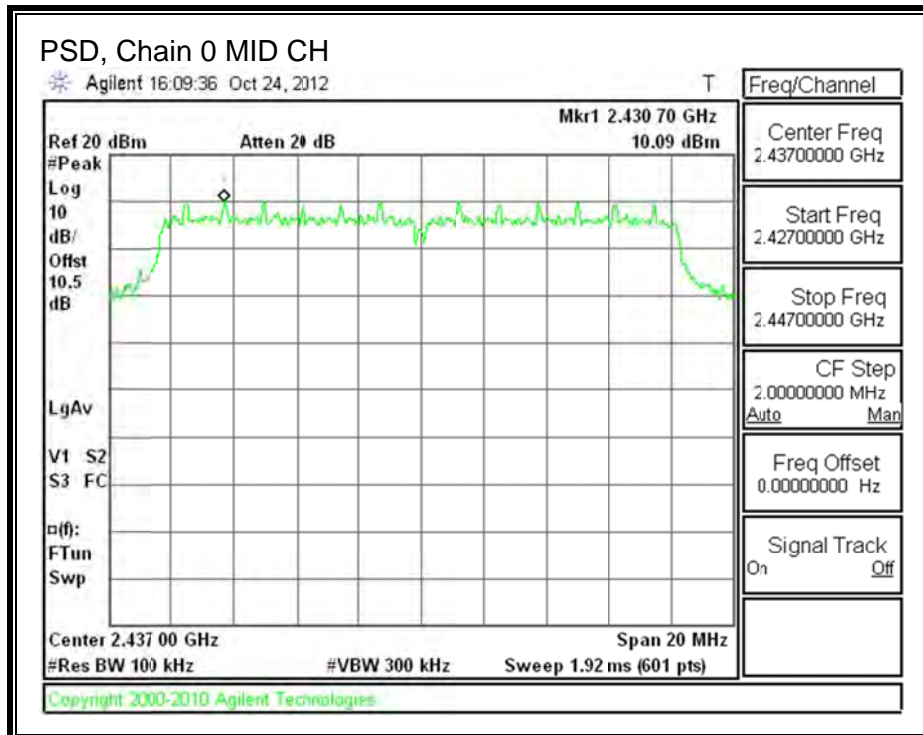
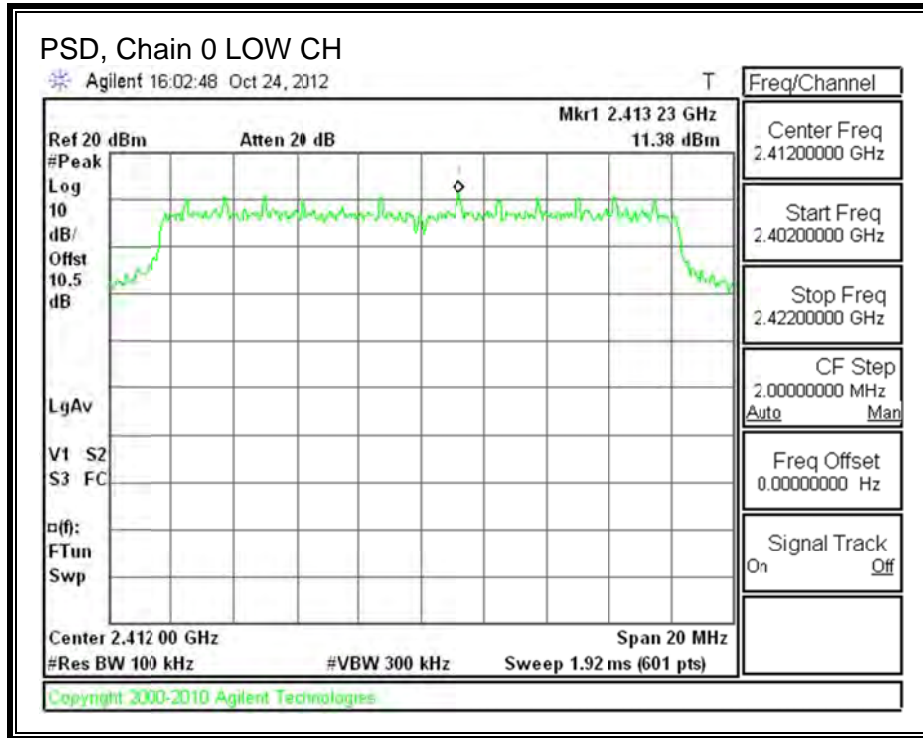
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

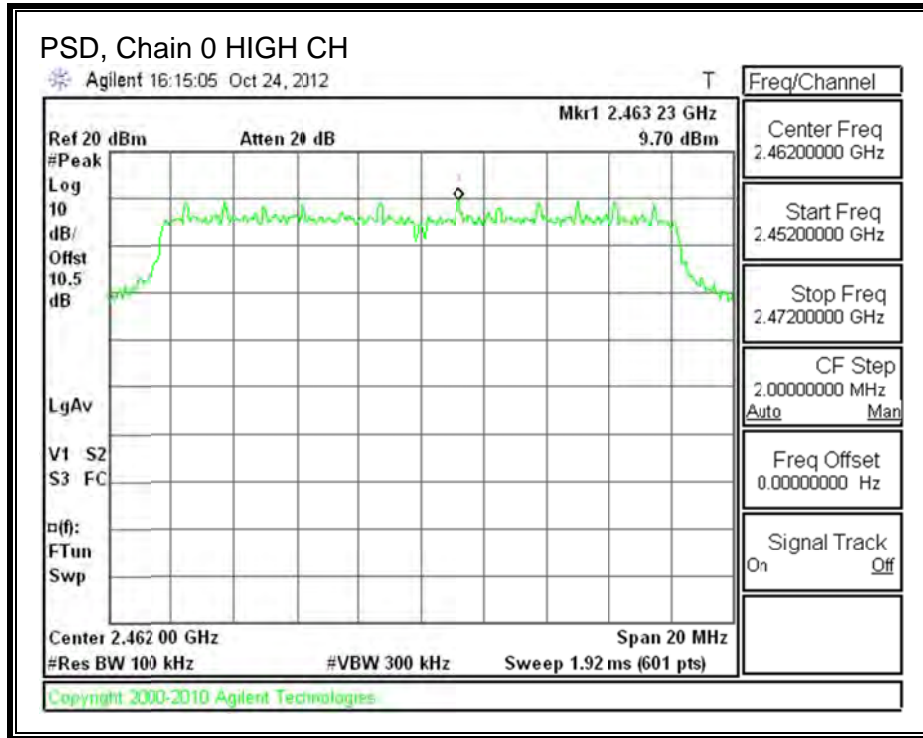
RESULTS

PSD Results

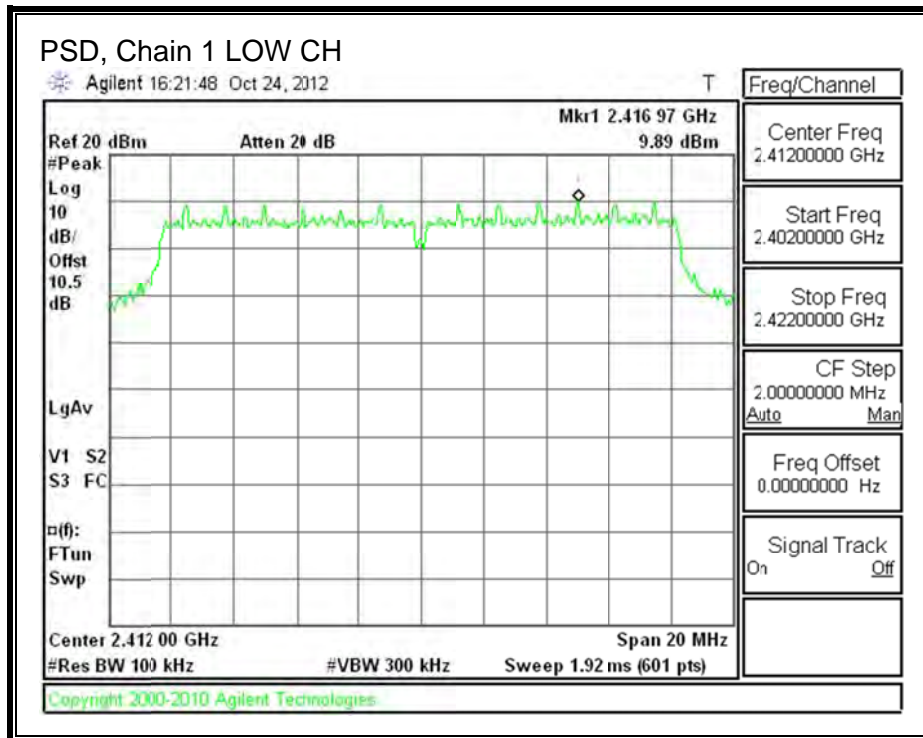
Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Chain 1 Meas (dBm)	BW Corr (dB)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	11.38	9.89	-15.2	-1.49	8.0	-9.5
Mid	2437	10.09	10.41	-15.2	-1.94	8.0	-9.9
High	2462	9.70	10.53	-15.2	-2.05	8.0	-10.1

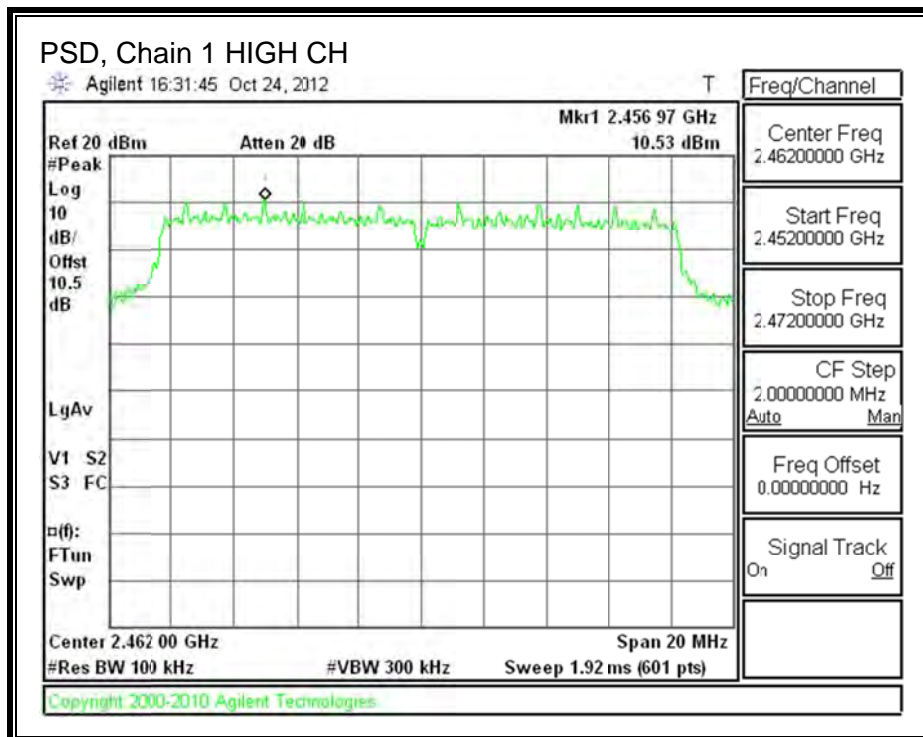
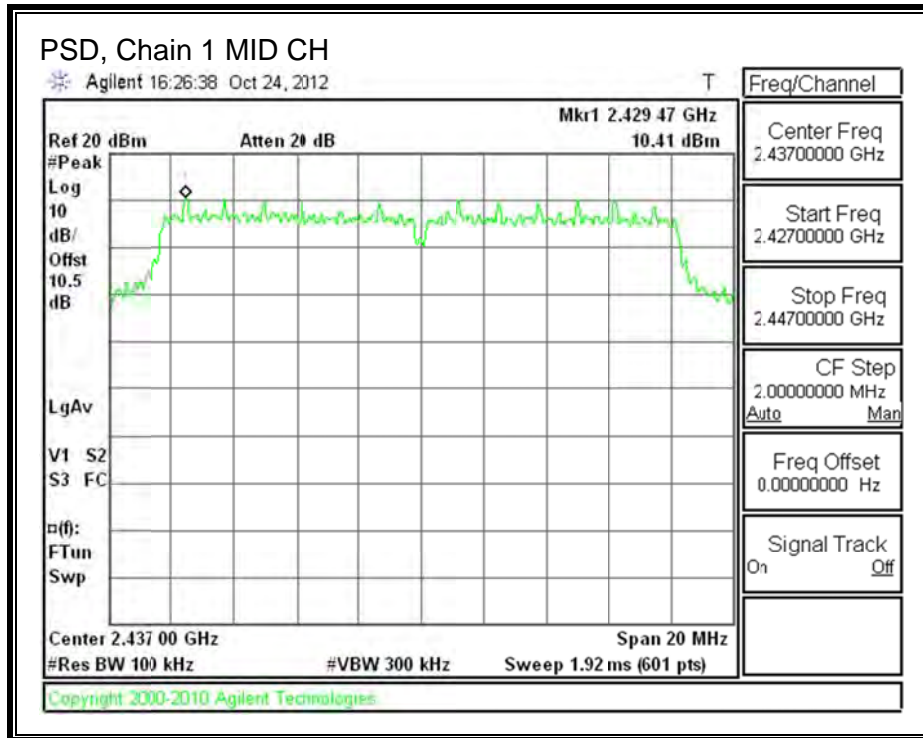
PSD, Chain 0





PSD, Chain 1





8.2.6. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

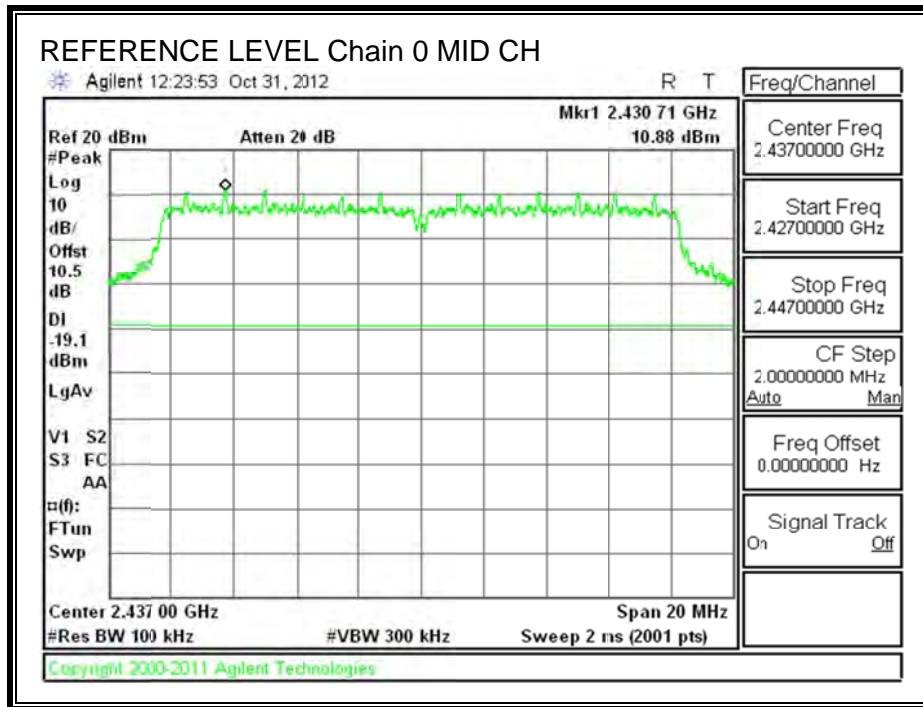
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

TEST PROCEDURE

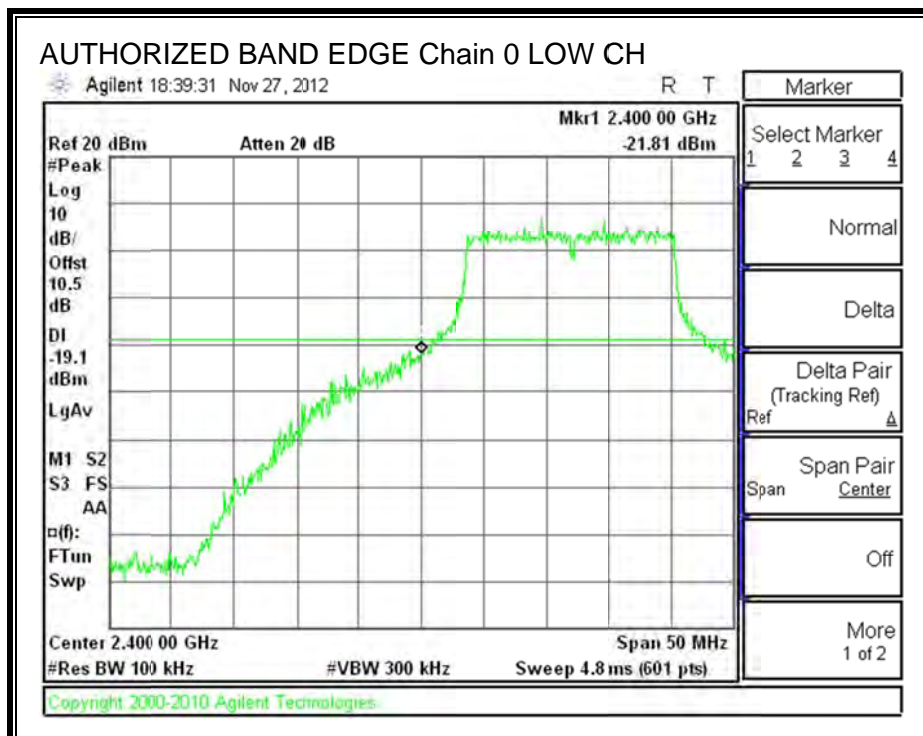
The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, bandedge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

RESULTS

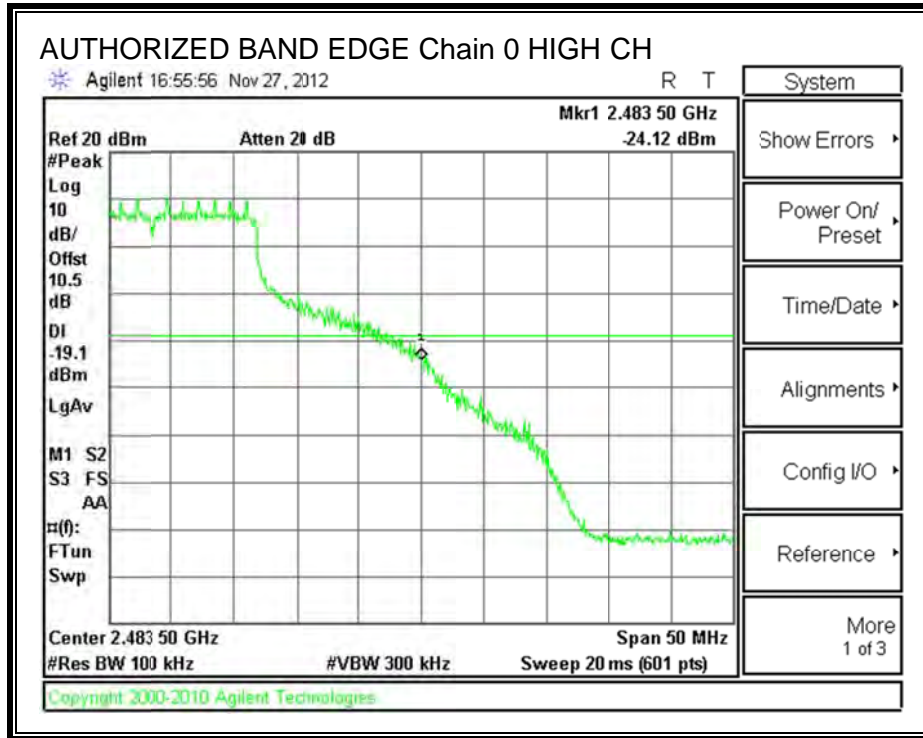
IN-BAND REFERENCE LEVEL, Chain 0



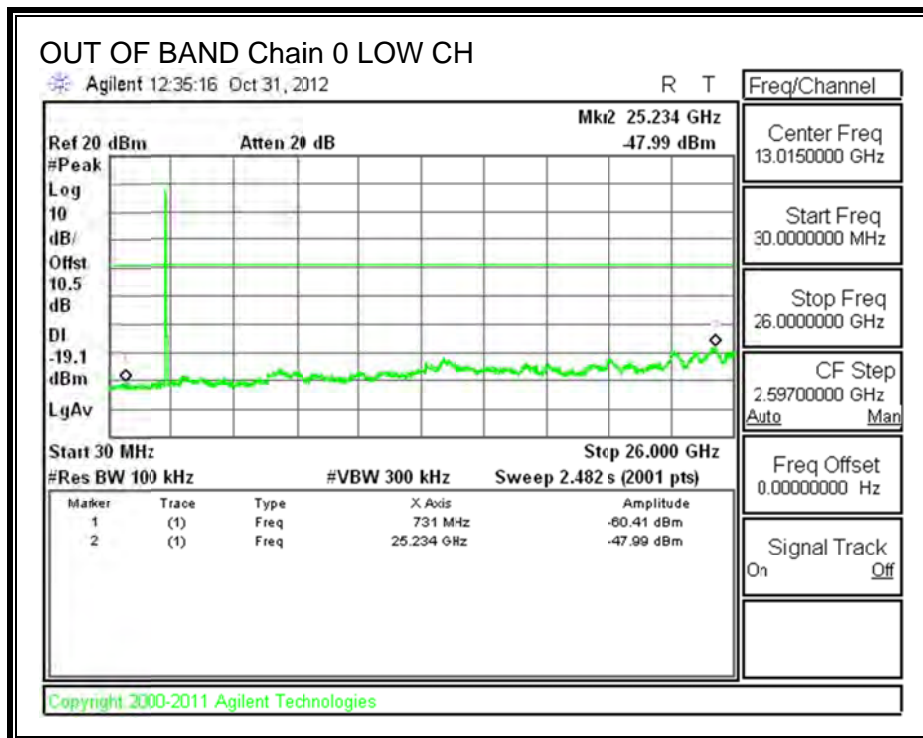
LOW CHANNEL BANDEDGE, Chain 0

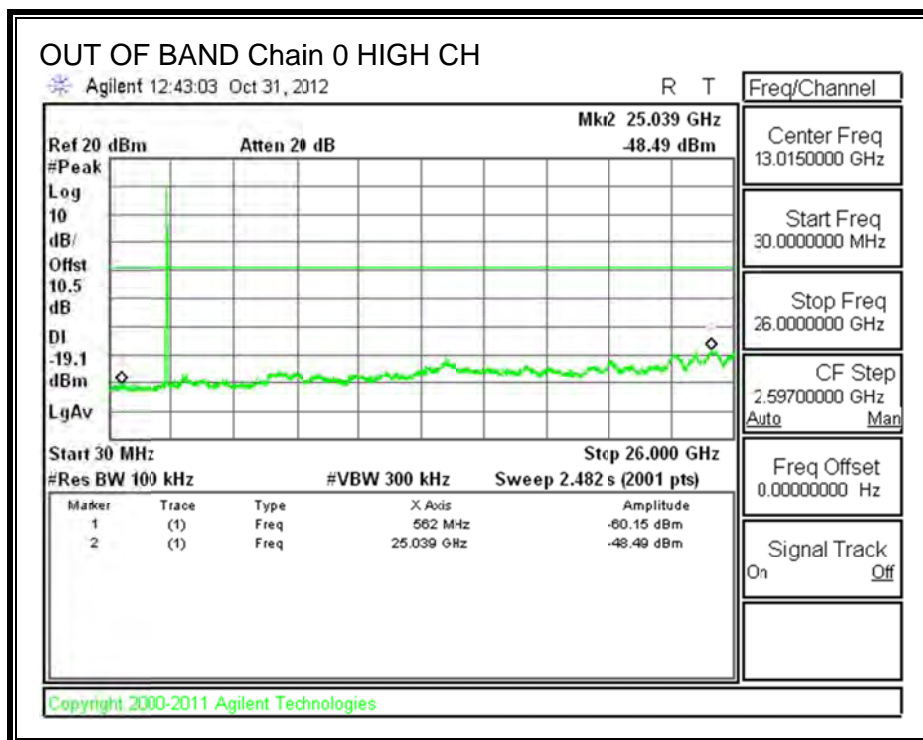
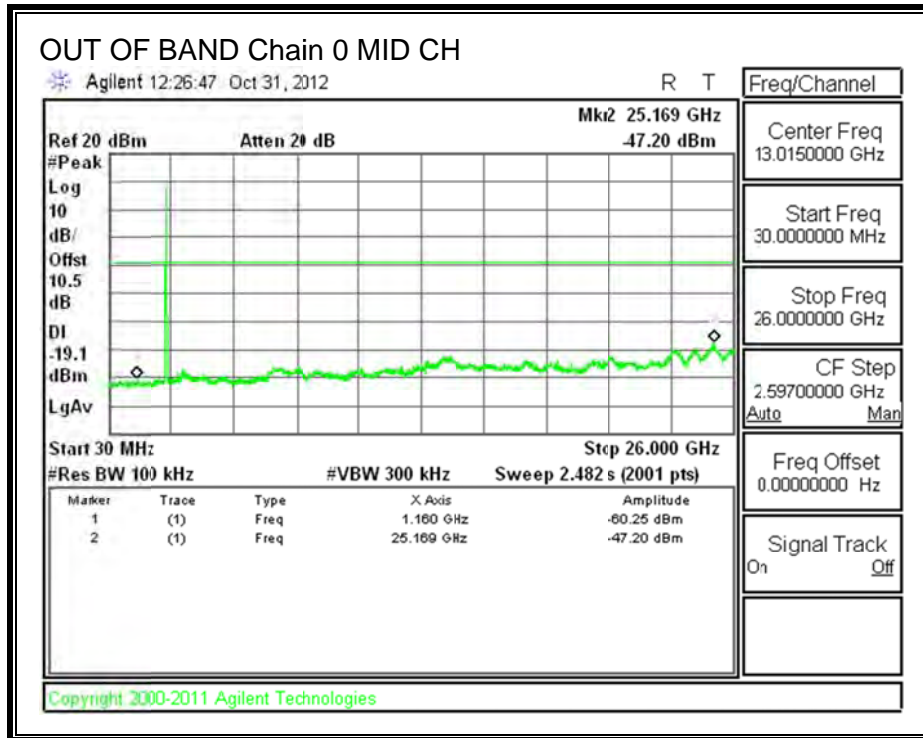


HIGH CHANNEL BANDEDGE, Chain 0

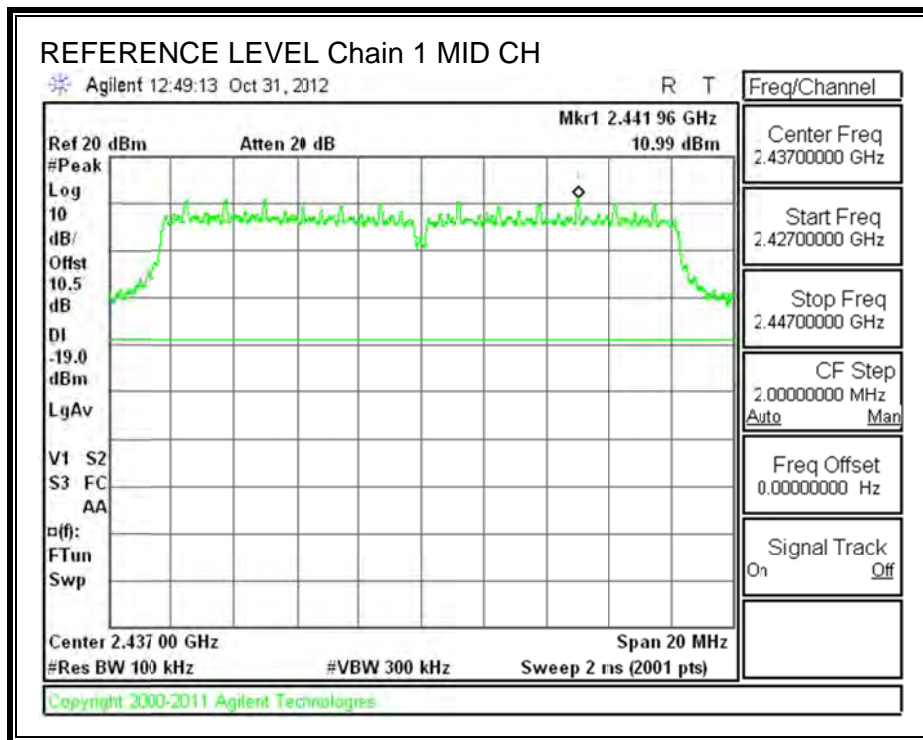


OUT-OF-BAND EMISSIONS, Chain 0

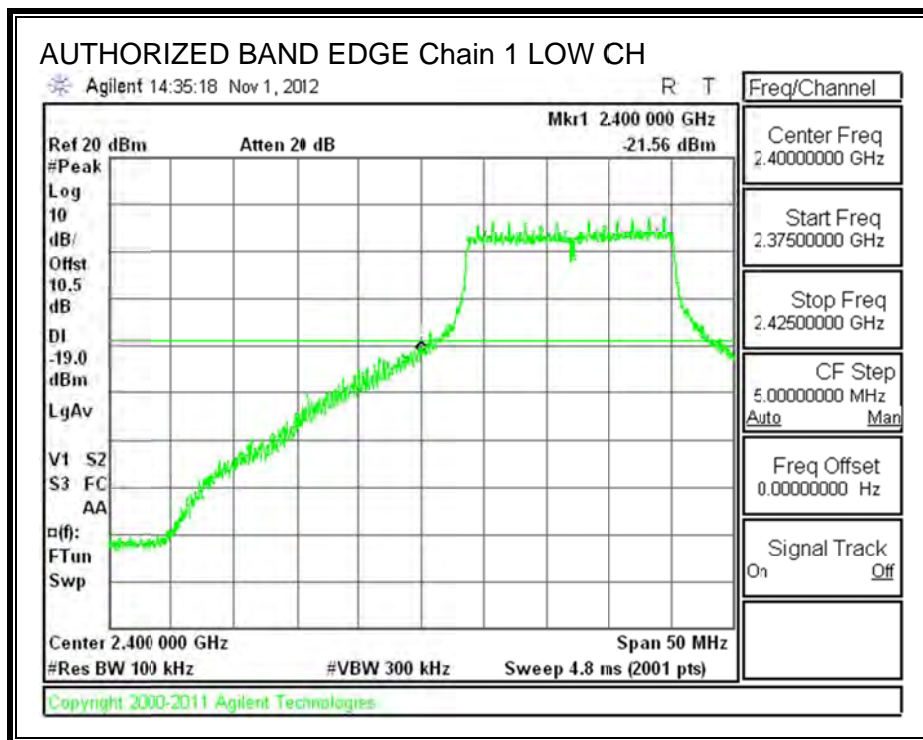




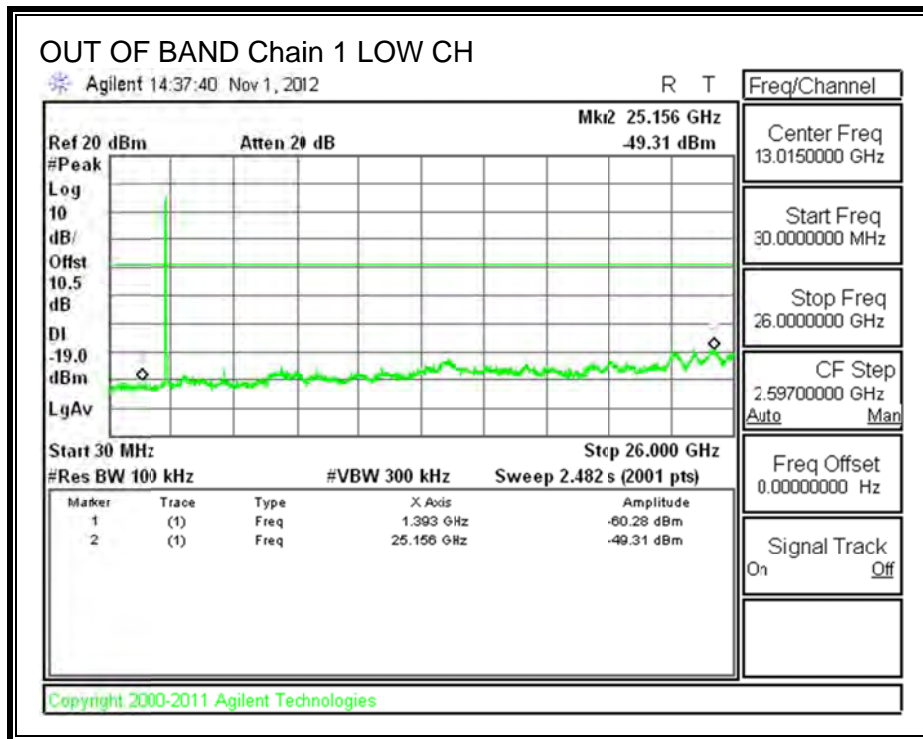
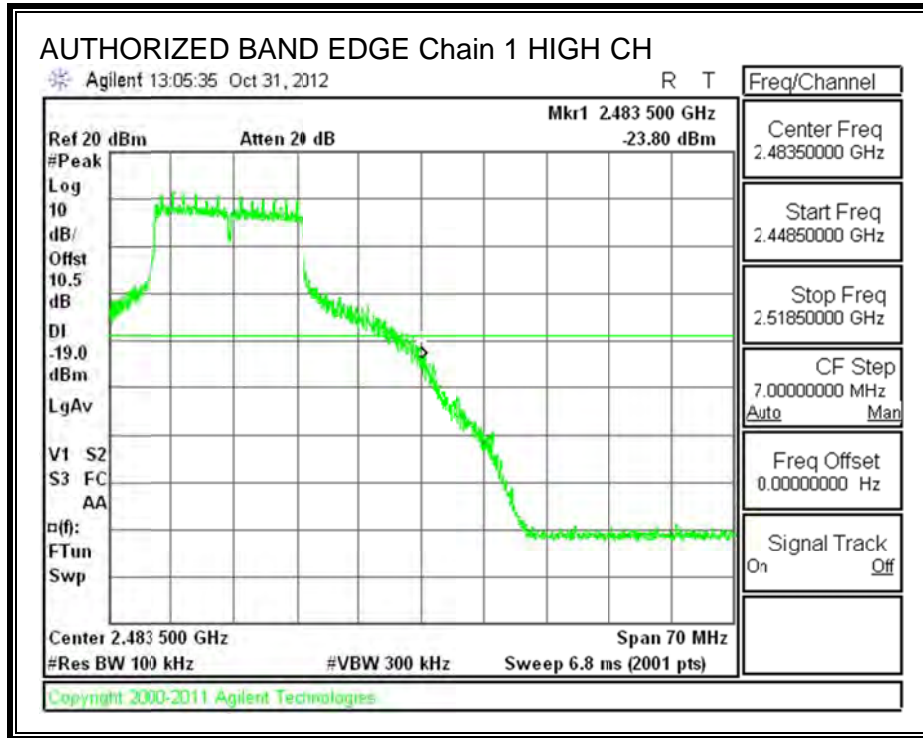
IN-BAND REFERENCE LEVEL, Chain 1

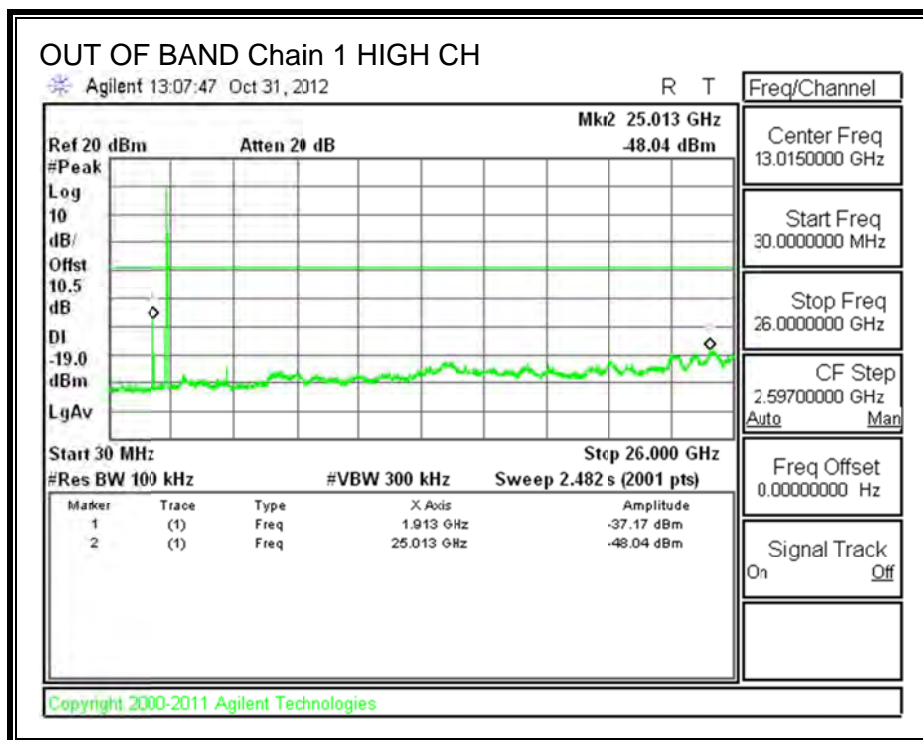
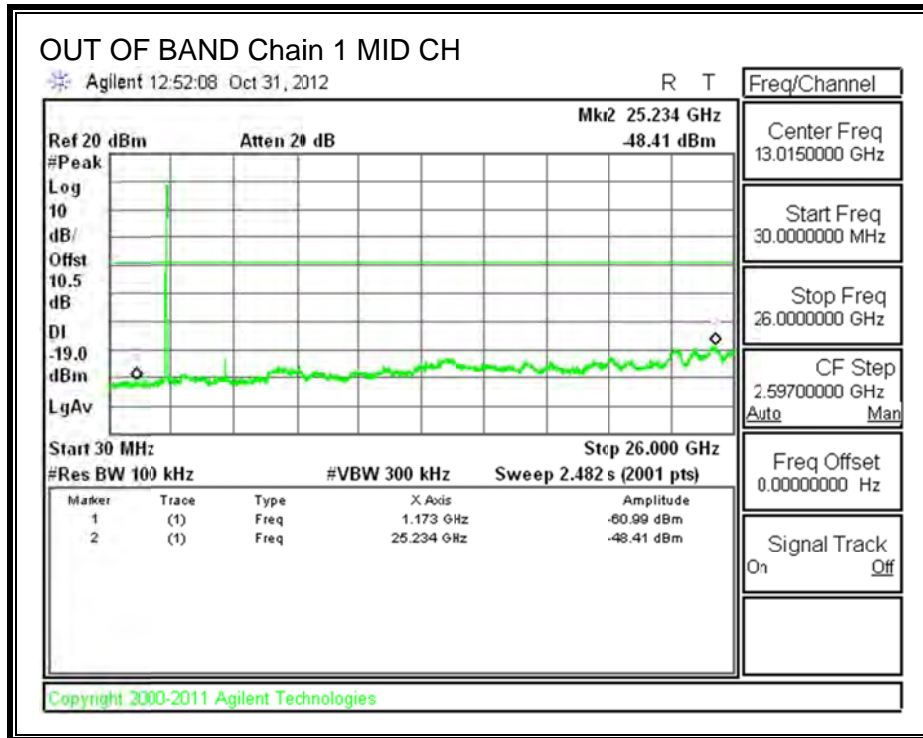


LOW CHANNEL BANDEDGE, Chain 1



HIGH CHANNEL BANDEDGE, Chain 1





8.3. 802.11n HT20 CDD MODE IN THE 2.4 GHz BAND

8.3.1. 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.

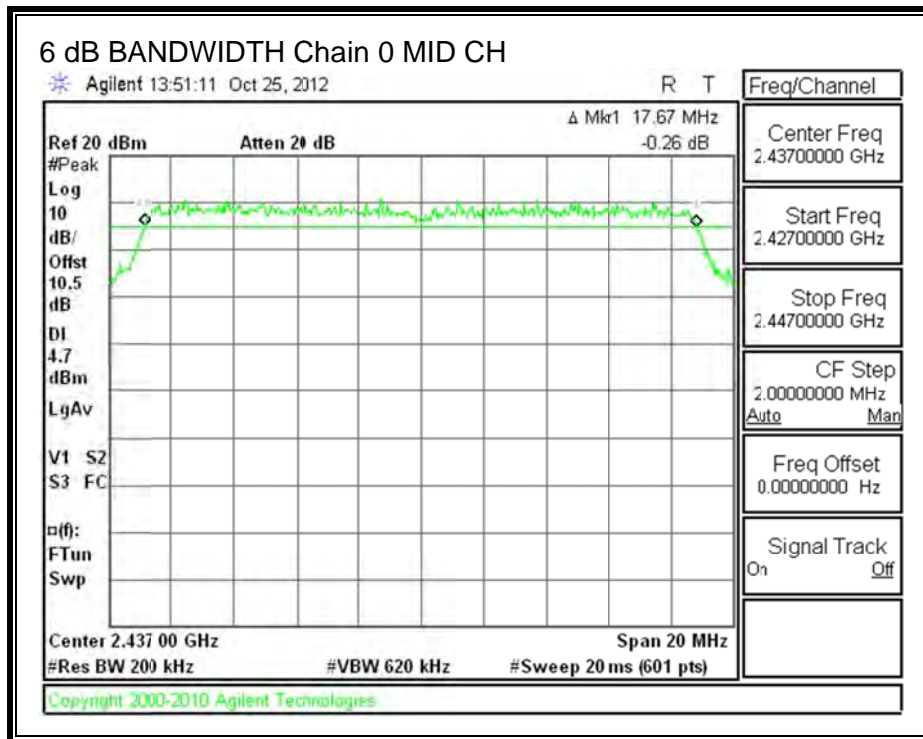
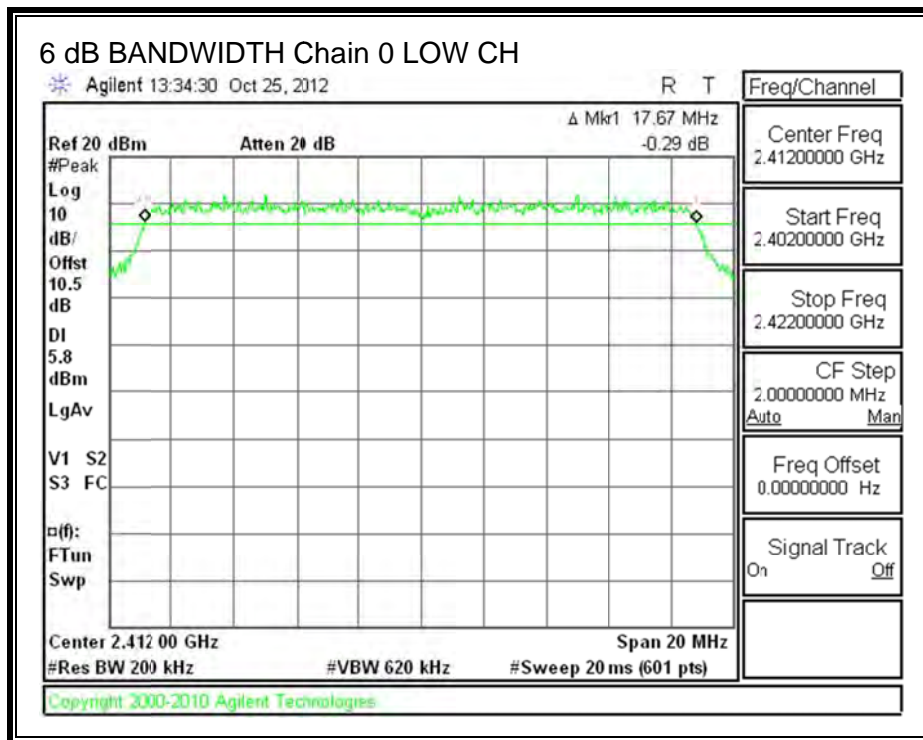
TEST PROCEDURE

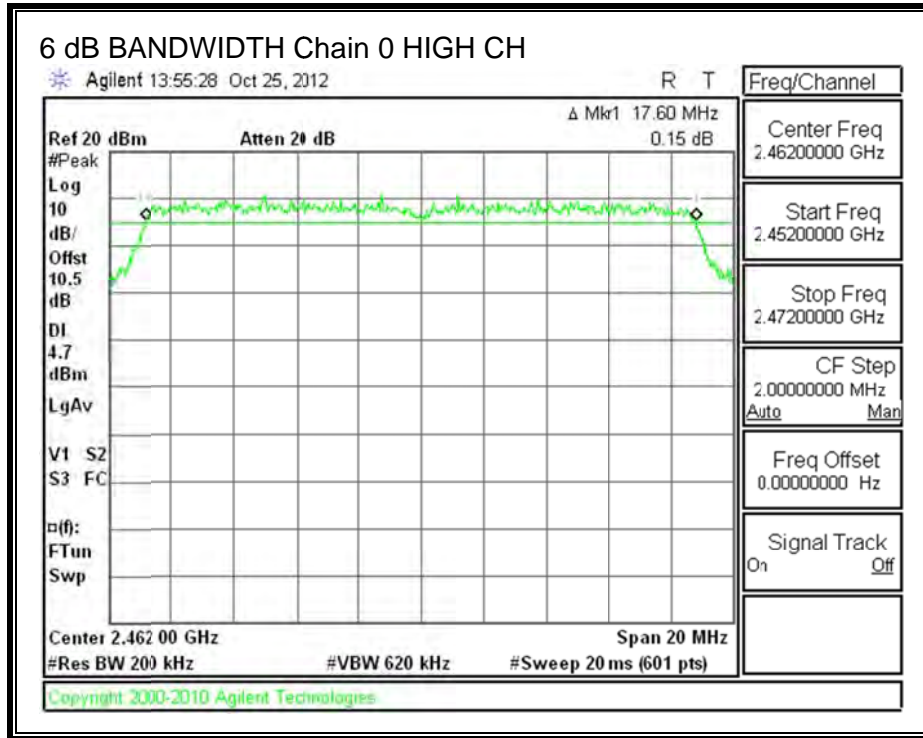
The transmitter output is connected to a spectrum analyzer with the RBW set between 1% and 5% of the EBW, the VBW $\geq 3 \times$ RBW, peak detector and max hold.

RESULTS

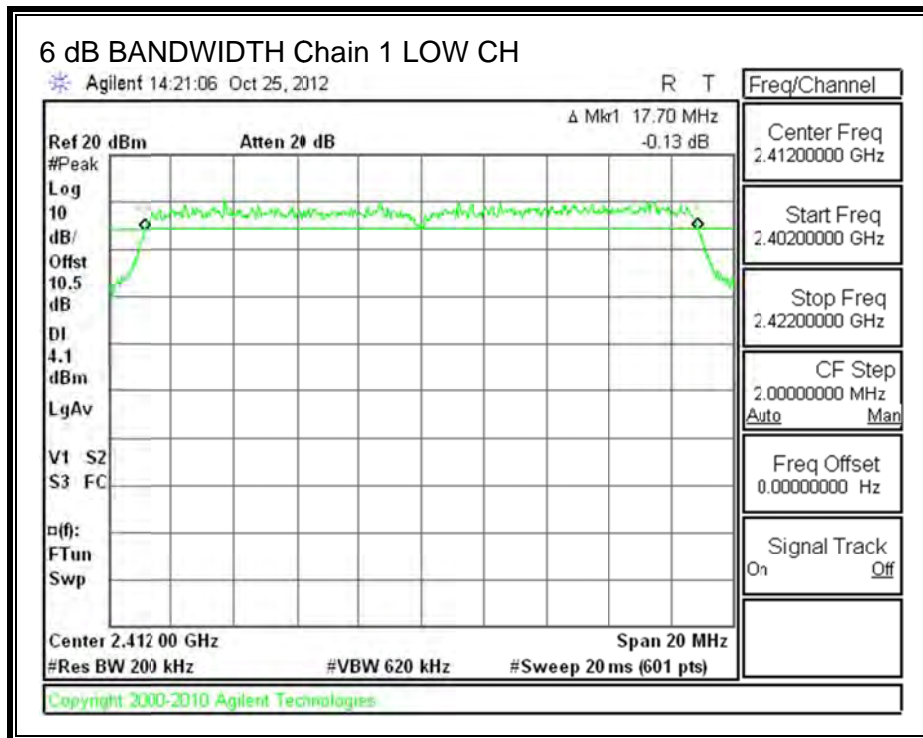
Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
Low	2412	17.67	17.70	0.5
Mid	2437	17.67	17.63	0.5
High	2462	17.60	17.60	0.5

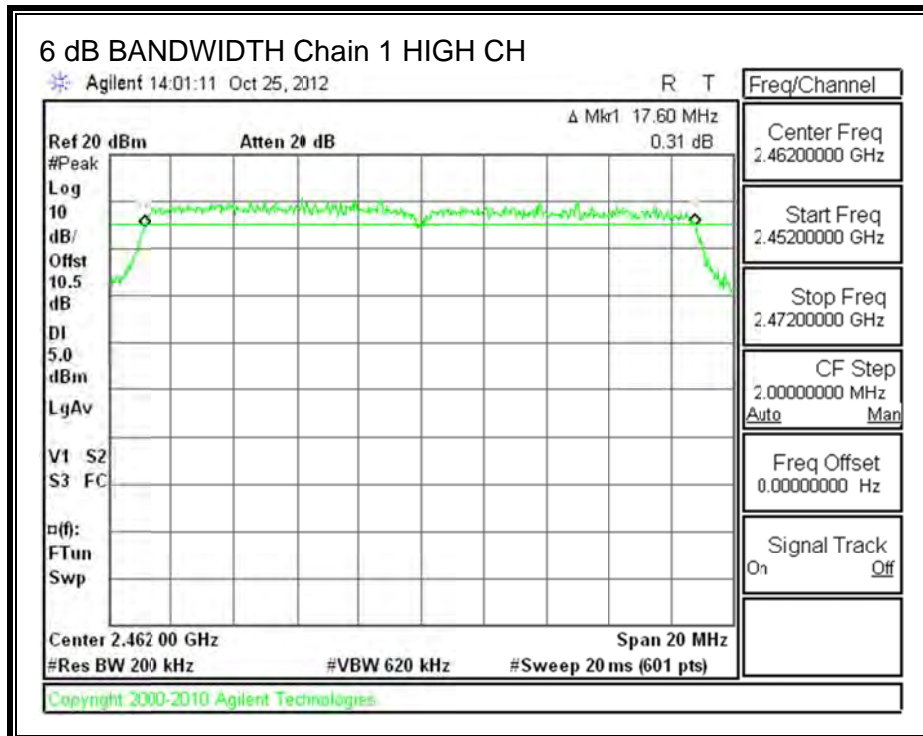
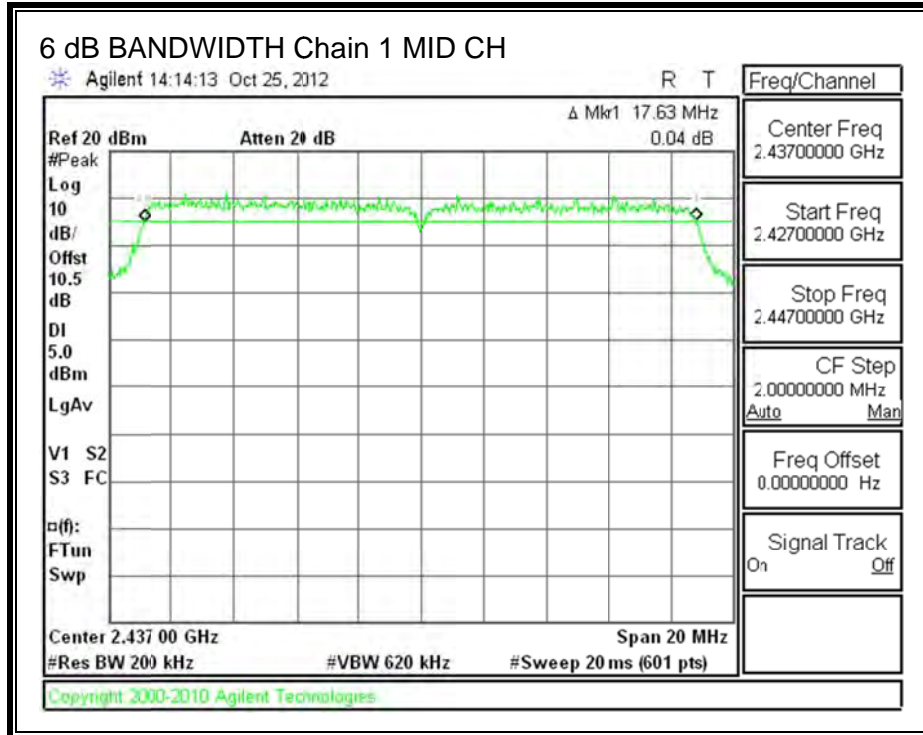
6 dB BANDWIDTH, Chain 0





6 dB BANDWIDTH, Chain 1





8.3.2. 99% BANDWIDTH

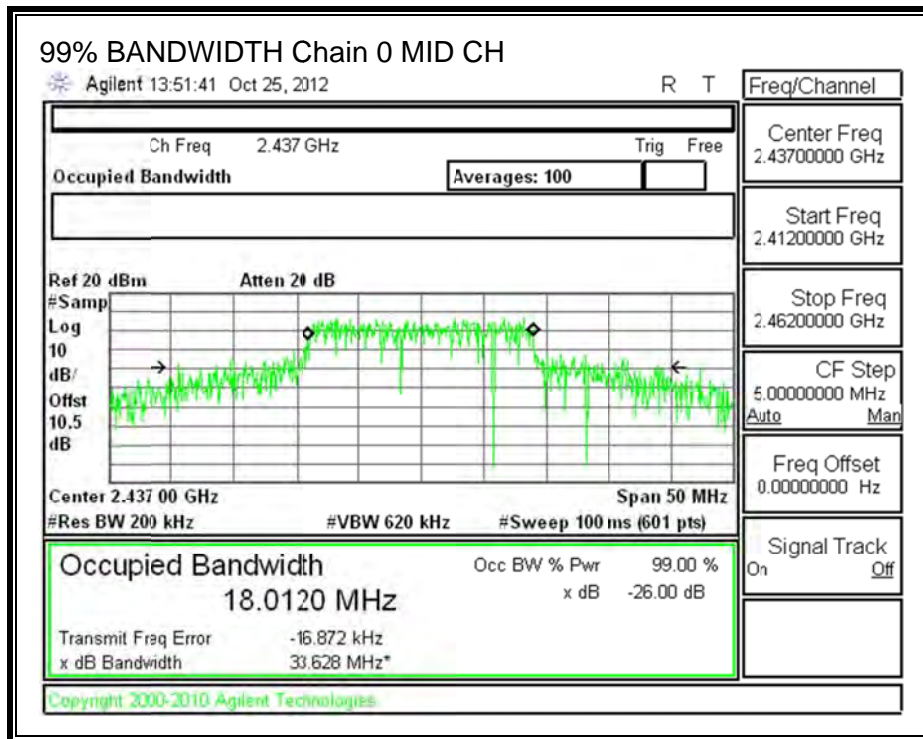
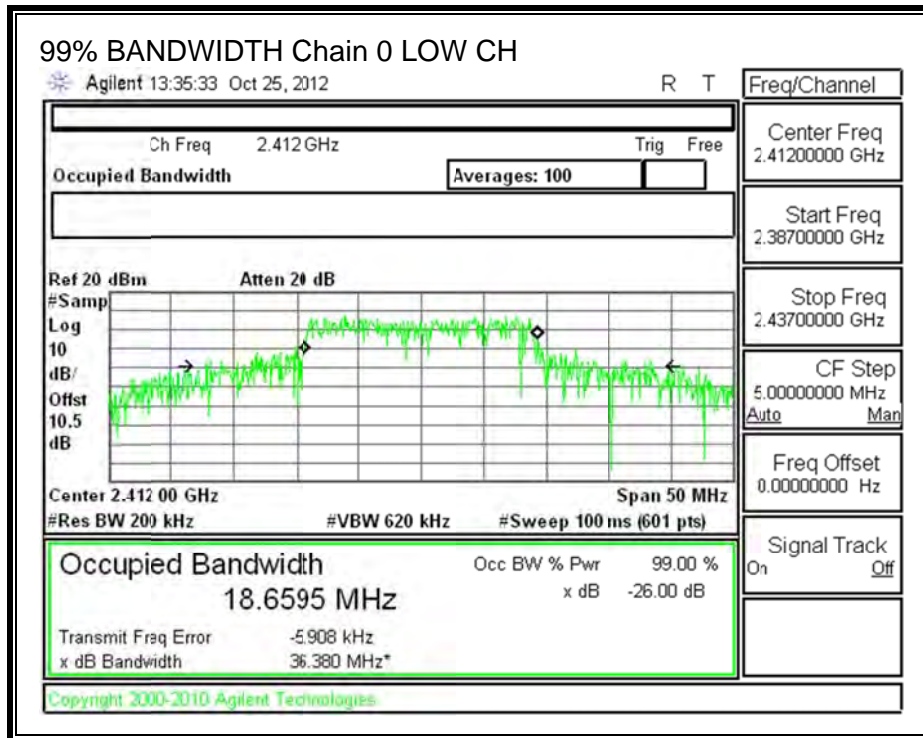
LIMITS

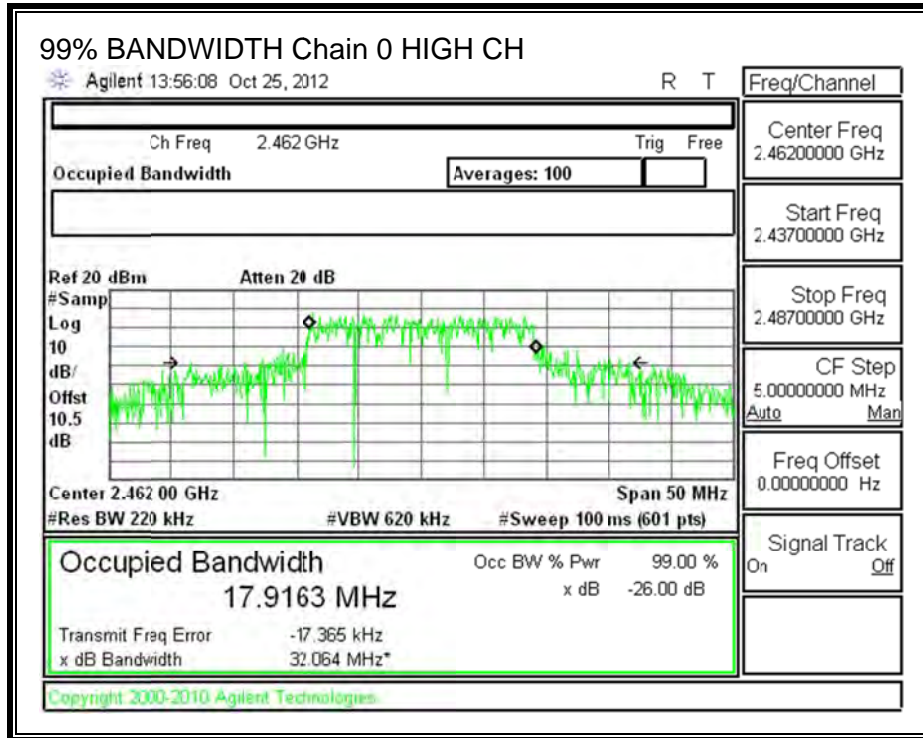
None; for reporting purposes only.

RESULTS

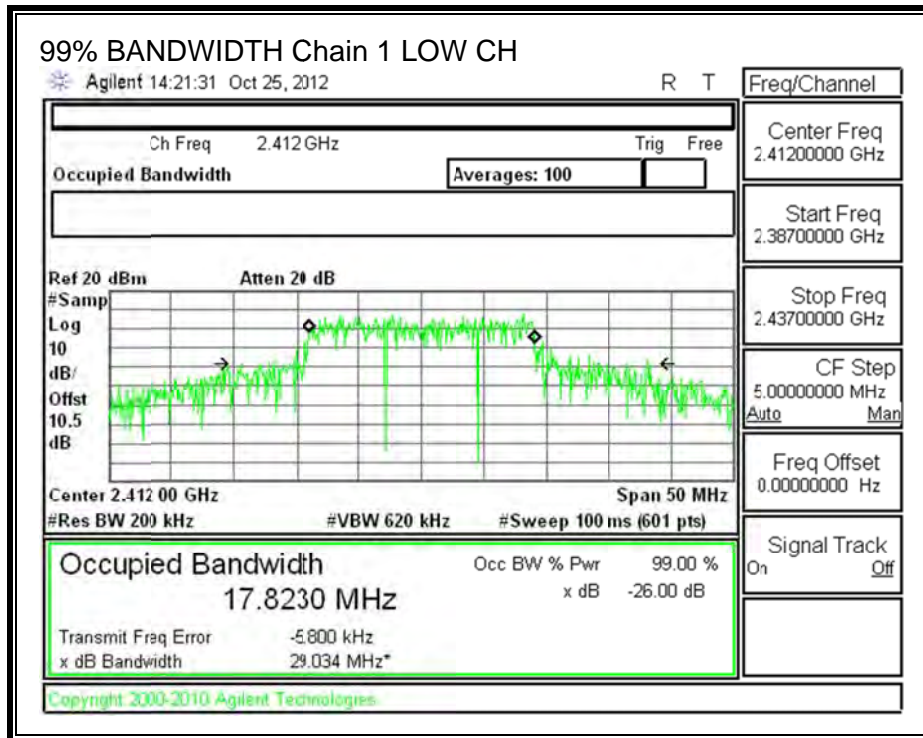
Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	2412	18.6595	17.8230
Mid	2437	18.0120	17.8566
High	2462	17.9163	17.7768

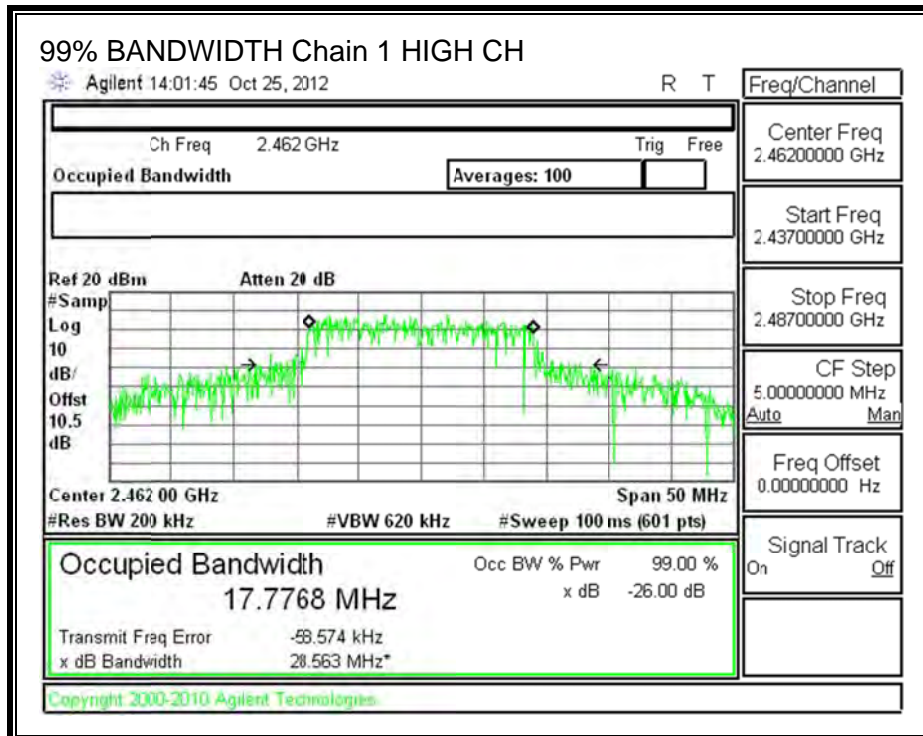
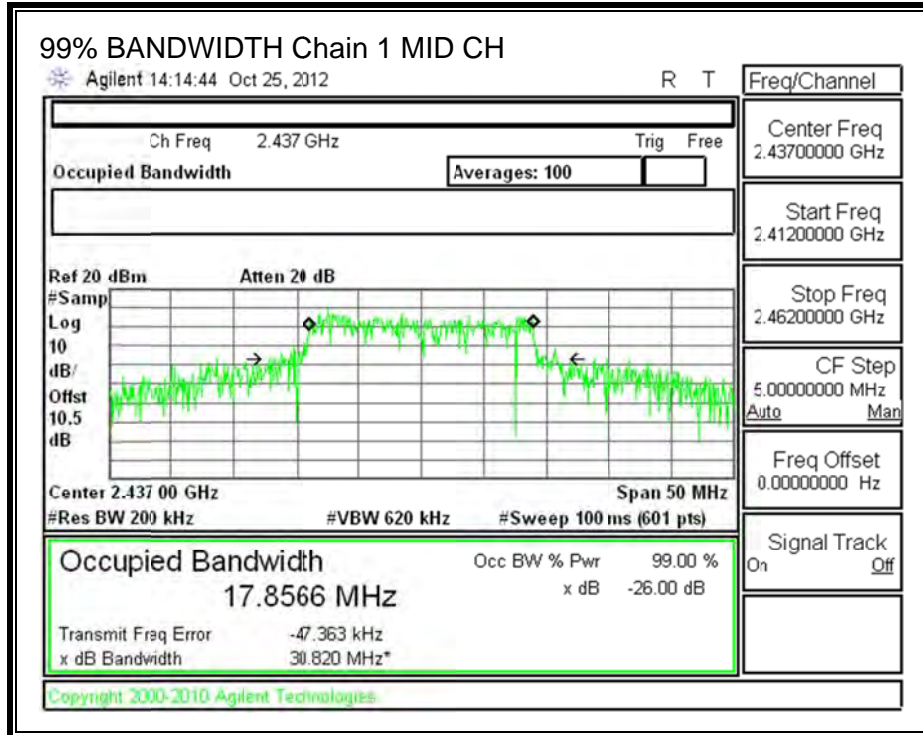
99% BANDWIDTH, Chain 0





99% BANDWIDTH, Chain 1





8.3.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.5 dB (including 10 dB pad and 0.5 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	2412	18.52	17.30	20.96
Mid	2437	20.75	20.65	23.71
High	2462	20.50	20.60	23.56

8.3.4. OUTPUT POWER

LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

The TX chains are correlated and the antenna gain is the same for each chain. The directional gain is:

Antenna Gain (dBi)	10 * Log (2 chains) (dB)	Correlated Chains Directional Gain (dBi)
1.00	3.01	4.01

RESULTS

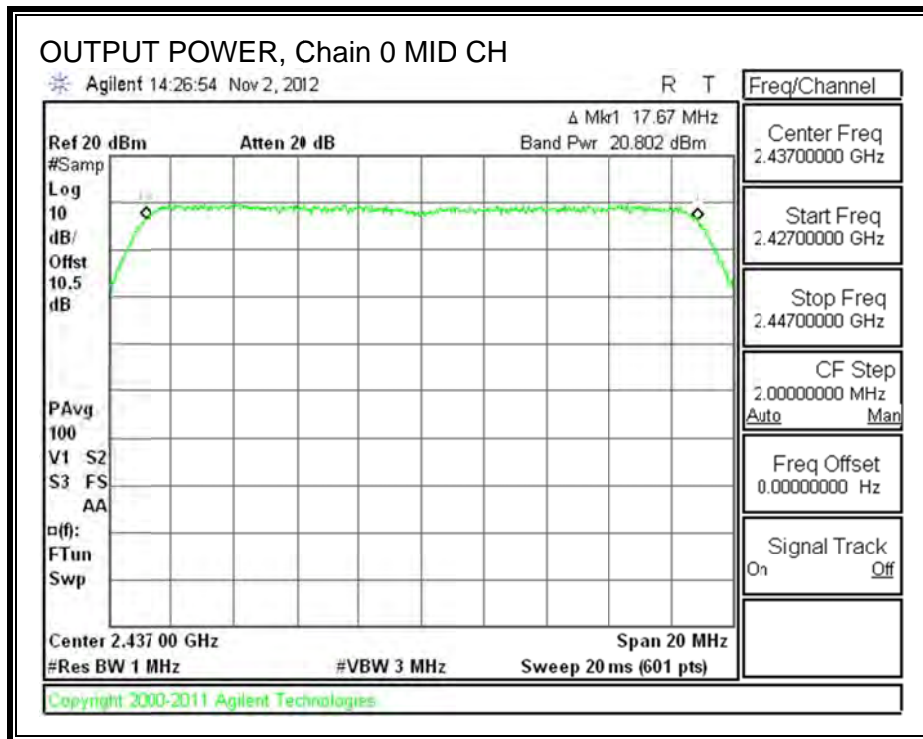
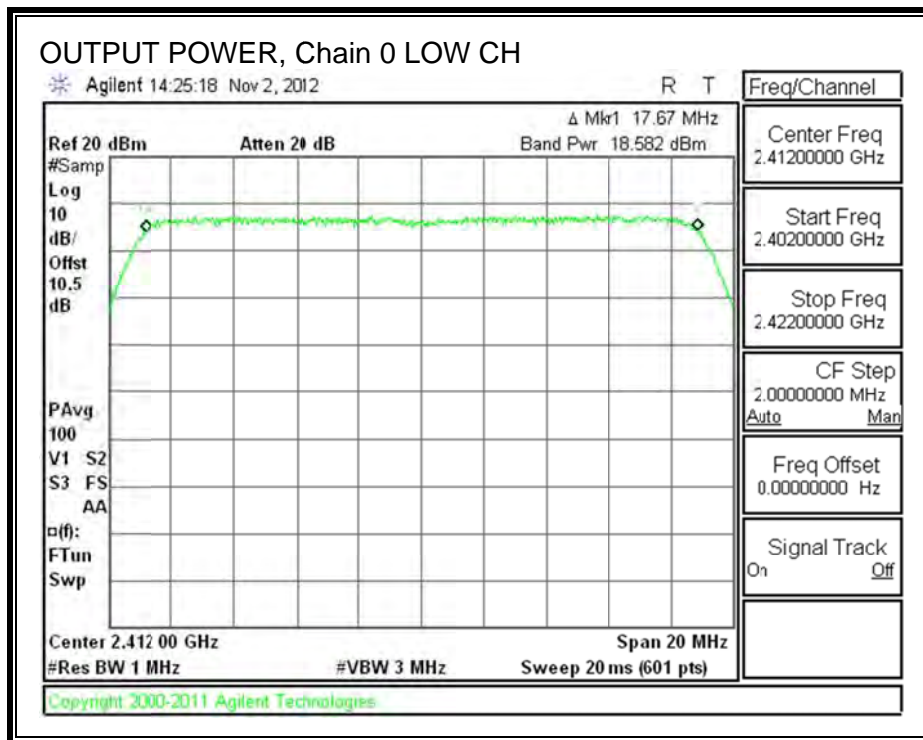
Limits

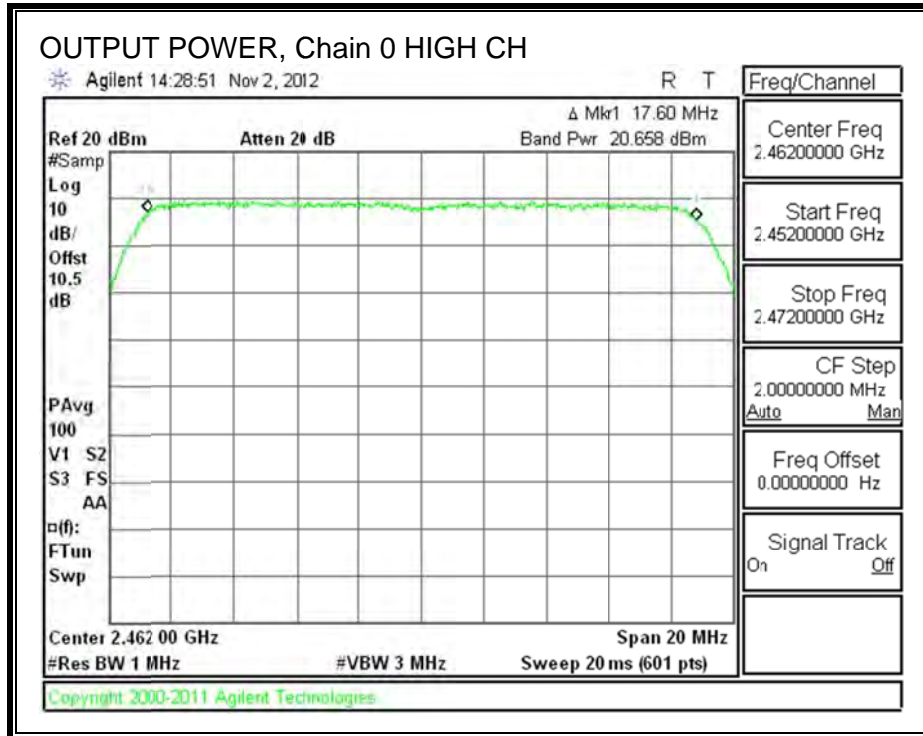
Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	4.01	30.00	30	36	30.00
Mid	2437	4.01	30.00	30	36	30.00
High	2462	4.01	30.00	30	36	30.00

Results

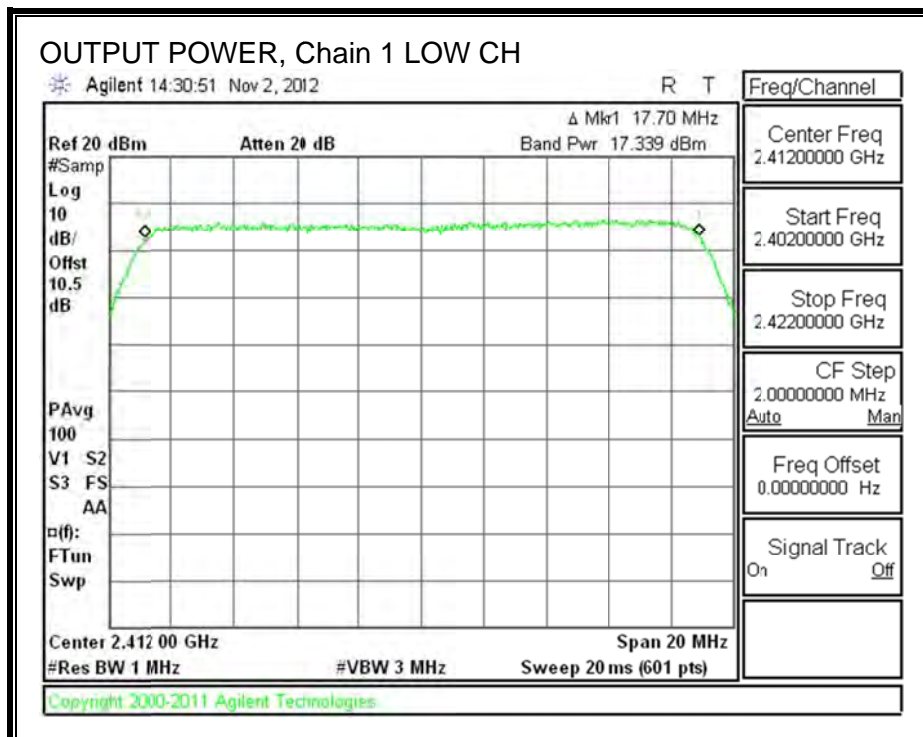
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margi (dB)
Low	2412	18.582	17.339	21.015	30.00	-8.985
Mid	2437	20.802	20.745	23.784	30.00	-6.216
High	2462	20.658	20.631	23.655	30.00	-6.345

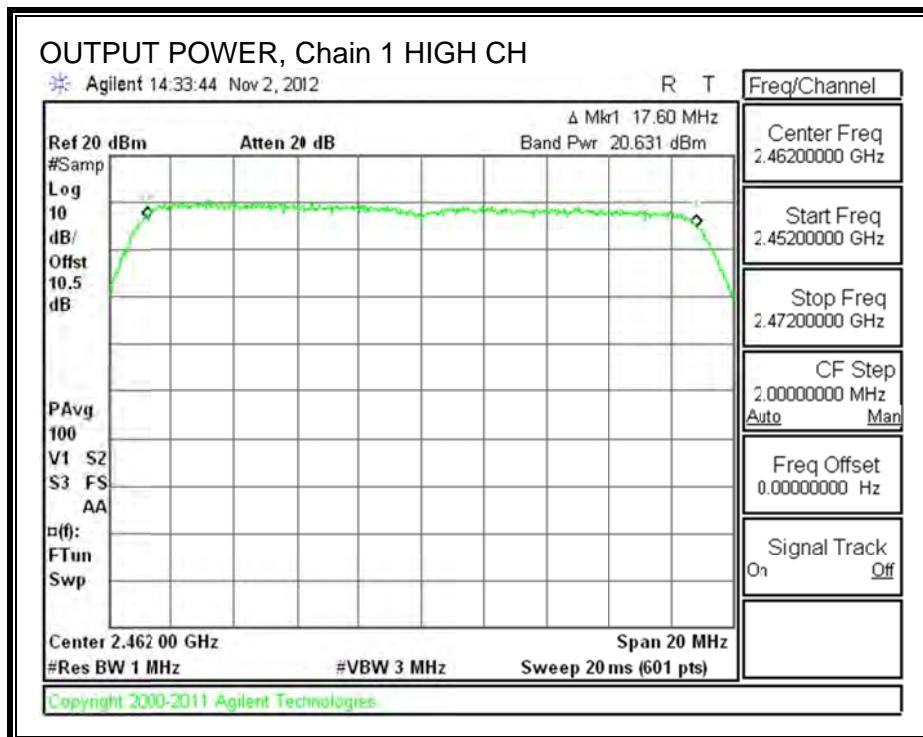
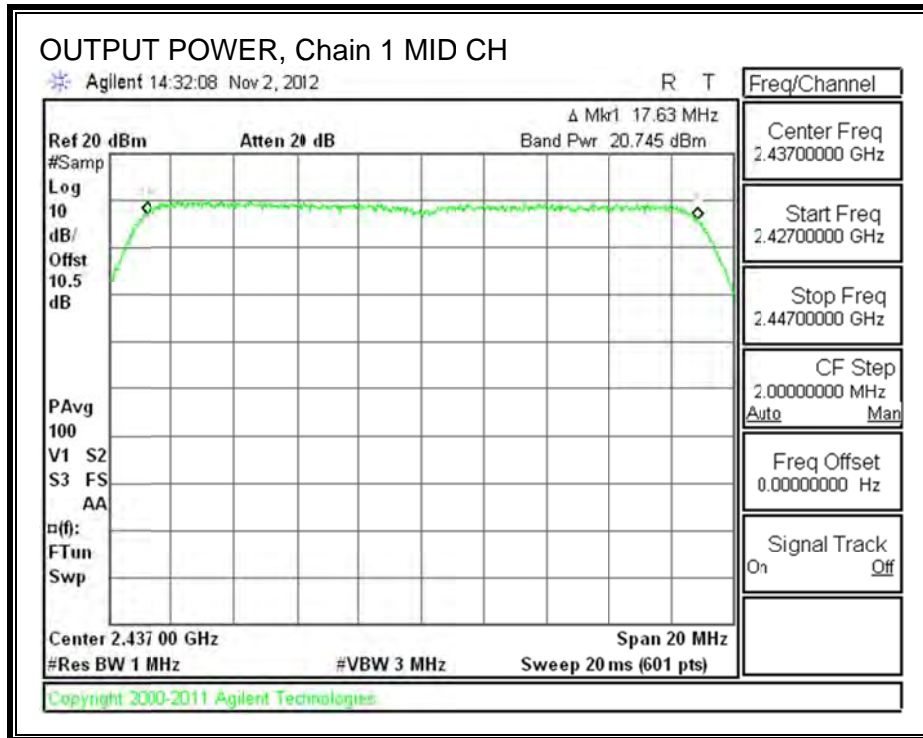
OUTPUT POWER, Chain 0





OUTPUT POWER, Chain 1





8.3.5. PSD

LIMITS

FCC §15.247

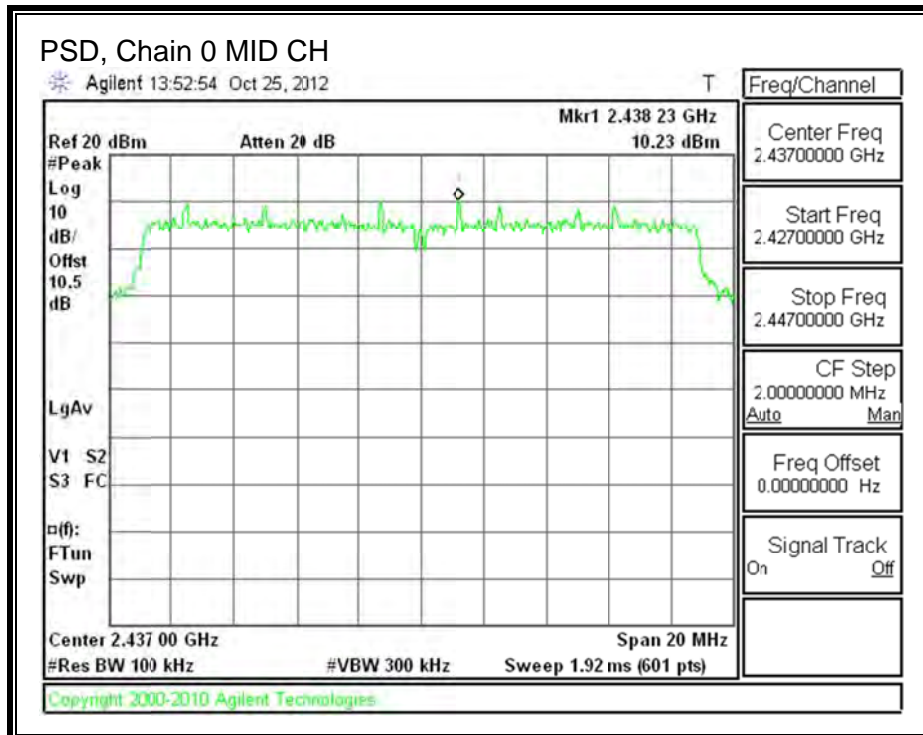
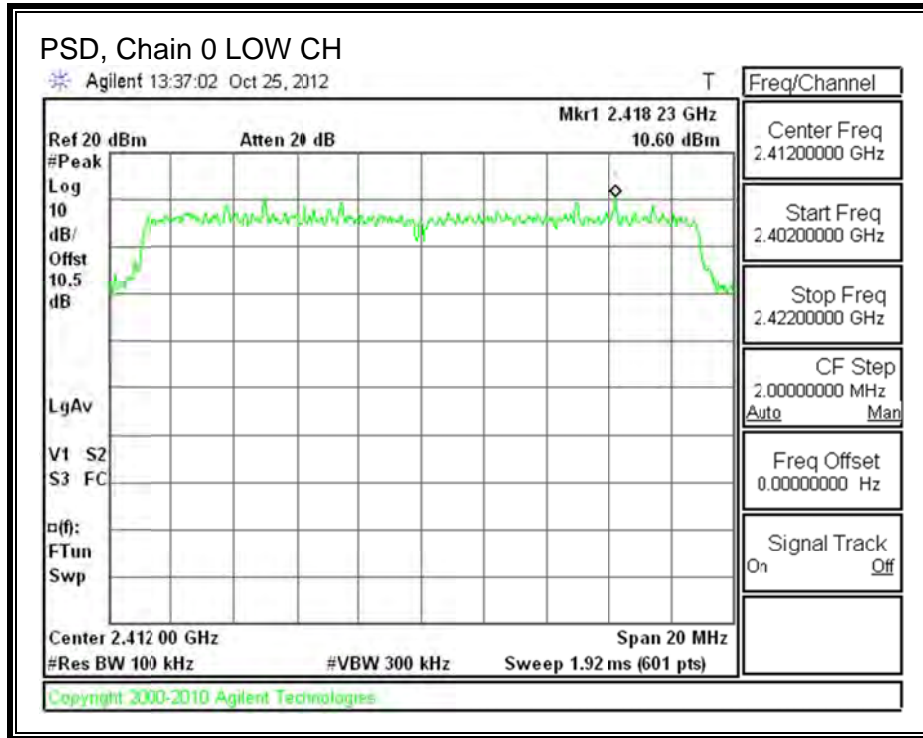
IC RSS-210 A8.2

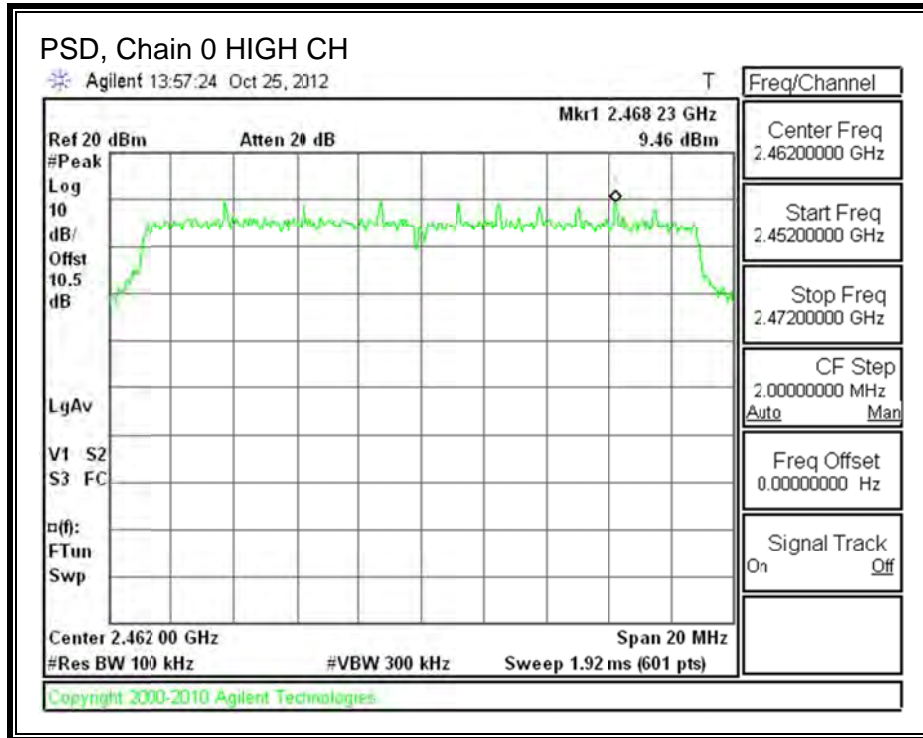
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RESULTS

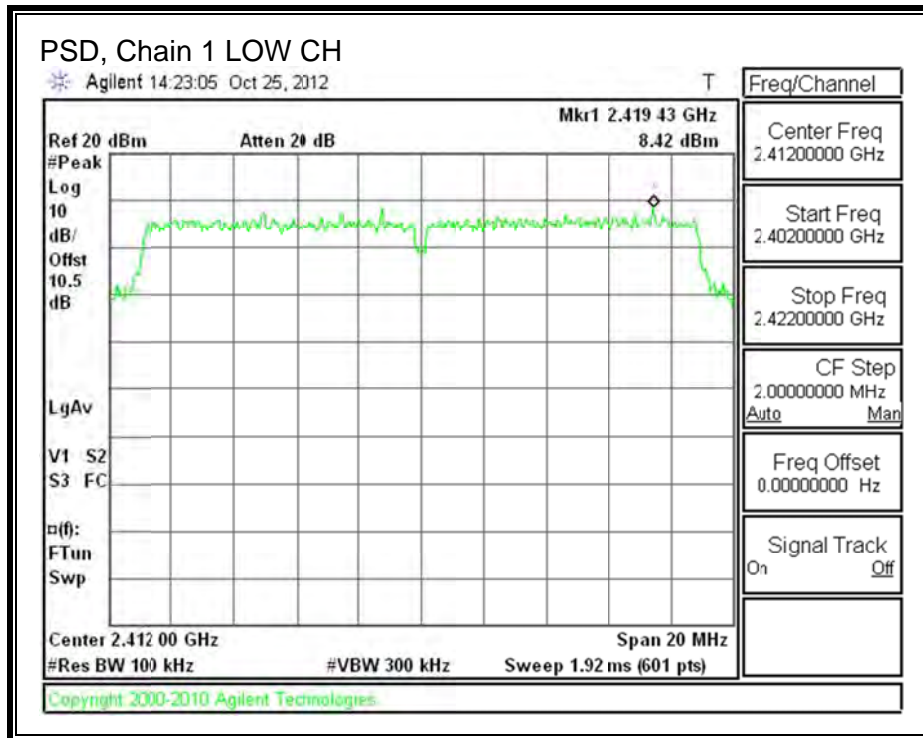
Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Chain 1 Meas (dBm)	BW Corr (dB)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	10.60	8.42	-15.2	-2.54	8.0	-10.5
Mid	2437	10.23	10.09	-15.2	-2.03	8.0	-10.0
High	2462	9.46	9.56	-15.2	-2.68	8.0	-10.7

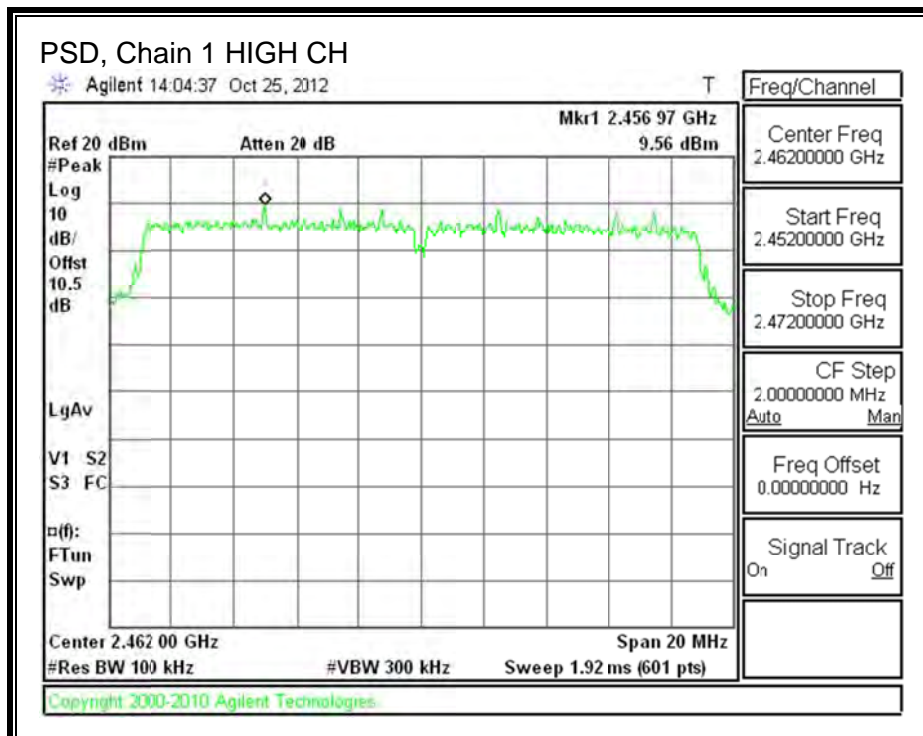
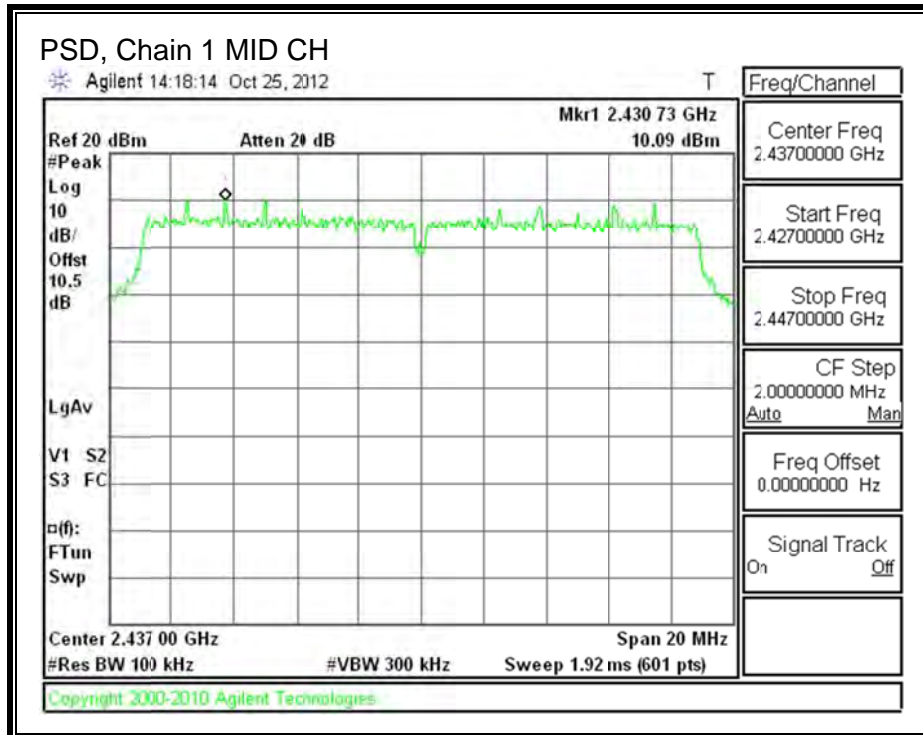
PSD, Chain 0





PSD, Chain 1





8.3.6. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

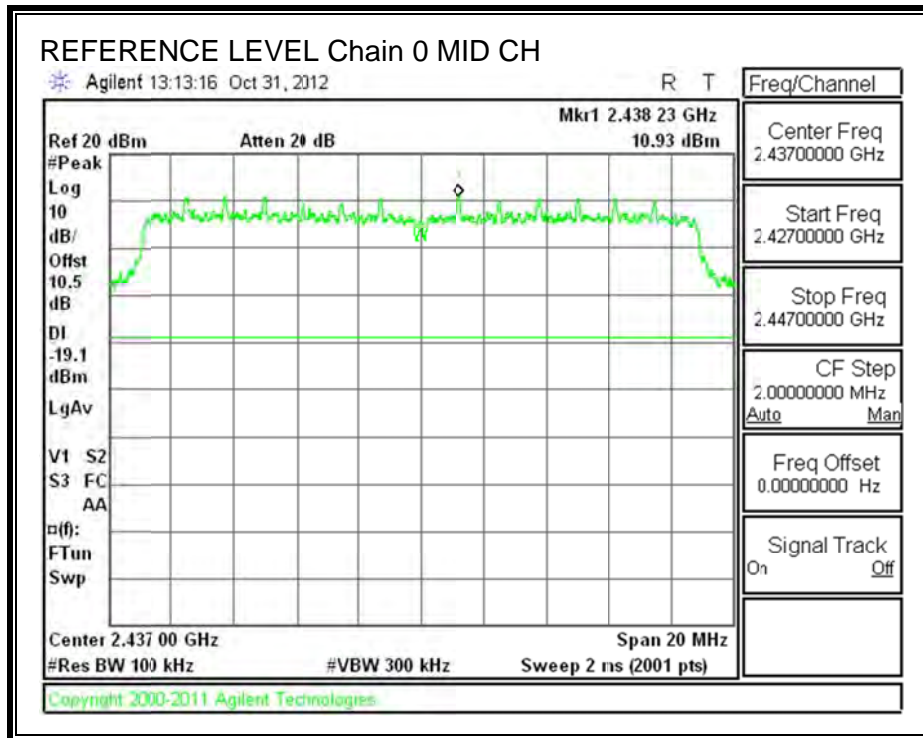
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

TEST PROCEDURE

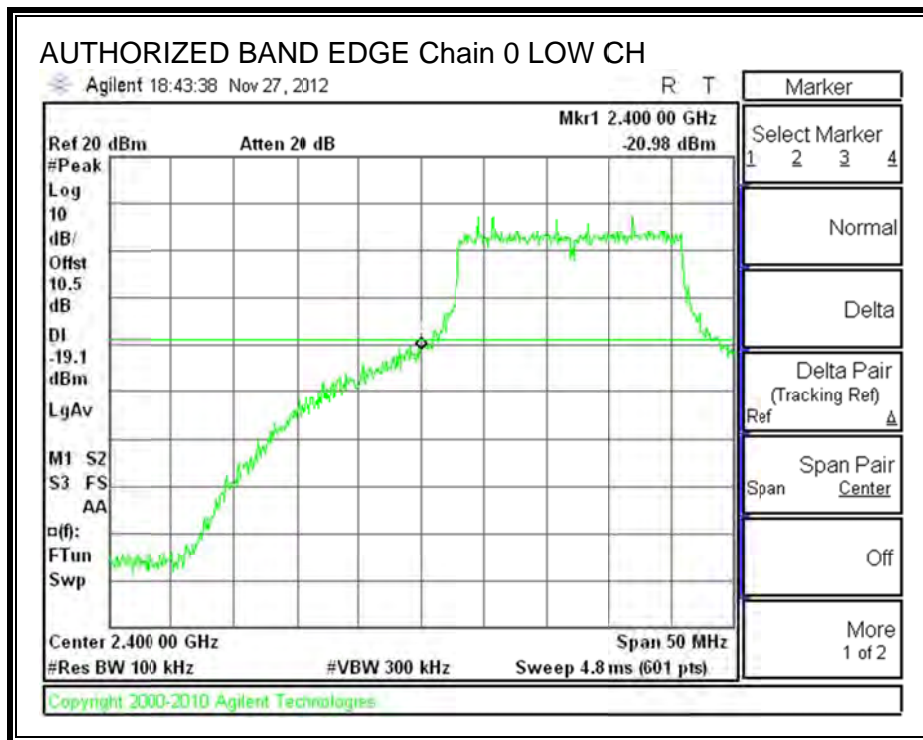
The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, bandedge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

RESULTS

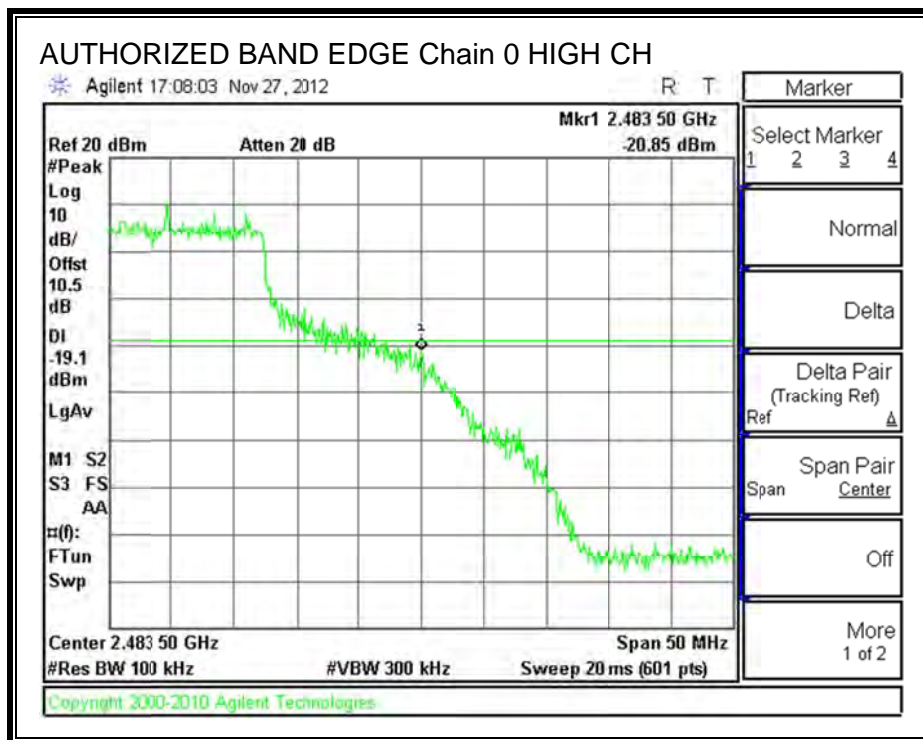
IN-BAND REFERENCE LEVEL, Chain 0



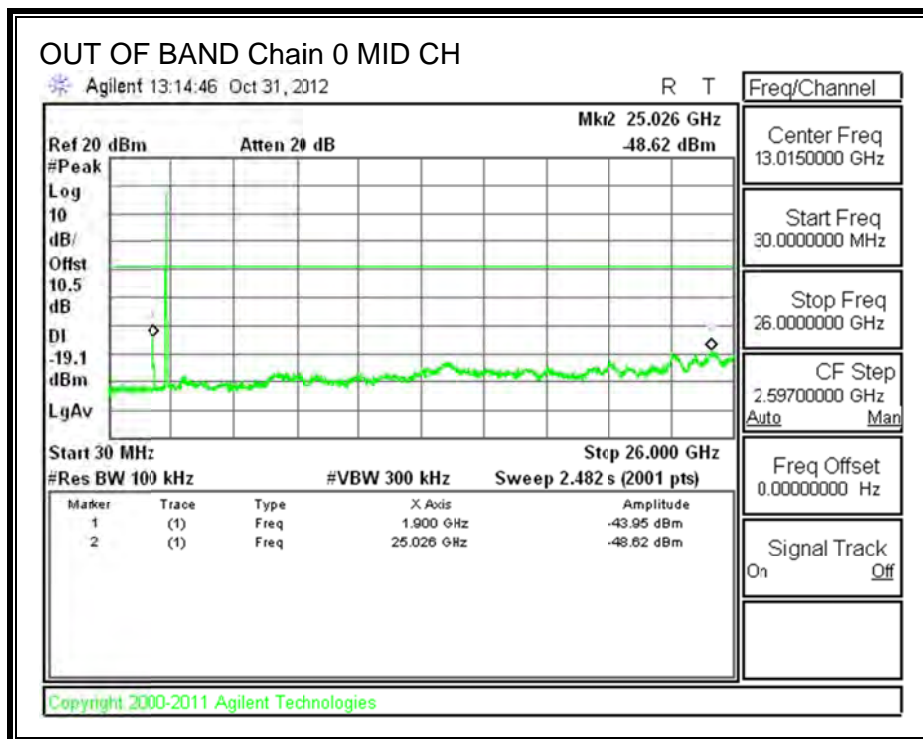
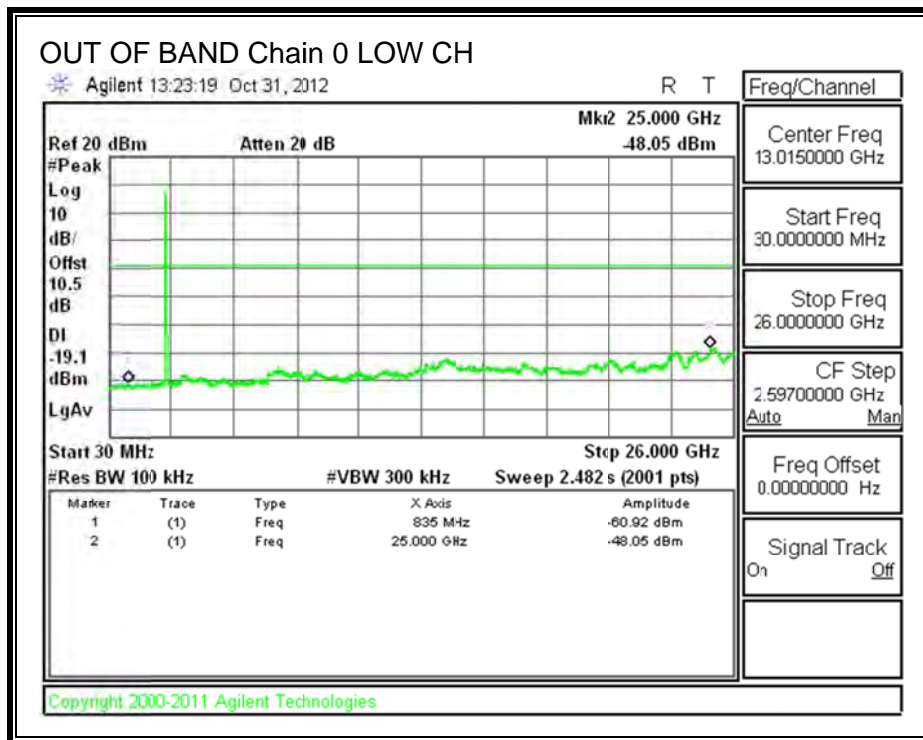
LOW CHANNEL BANDEDGE, Chain 0

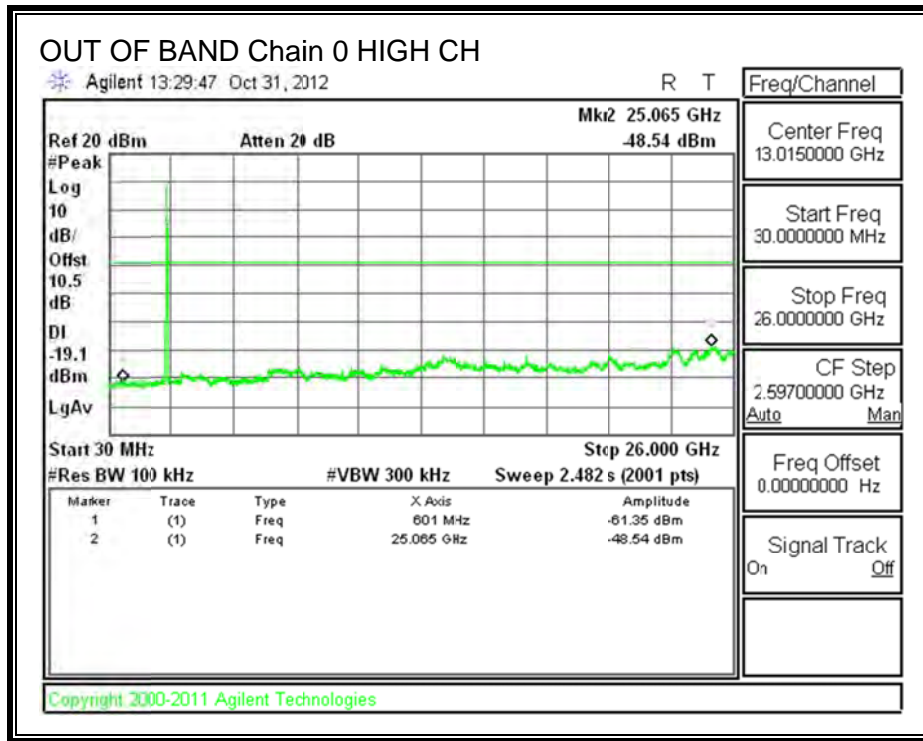


HIGH CHANNEL BANDEDGE, Chain 0

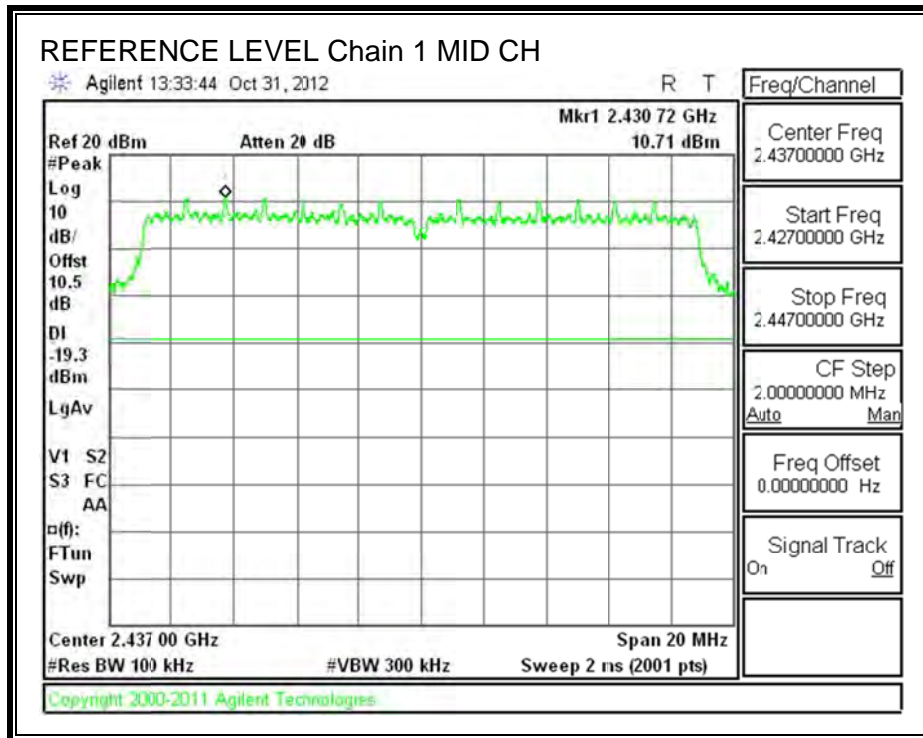


OUT-OF-BAND EMISSIONS, Chain 0

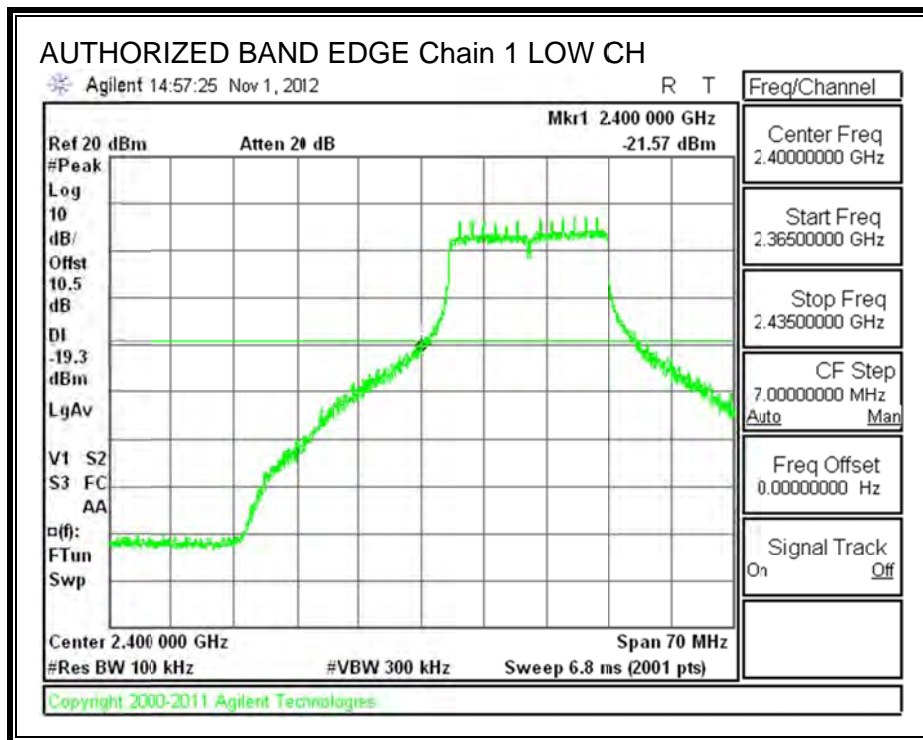




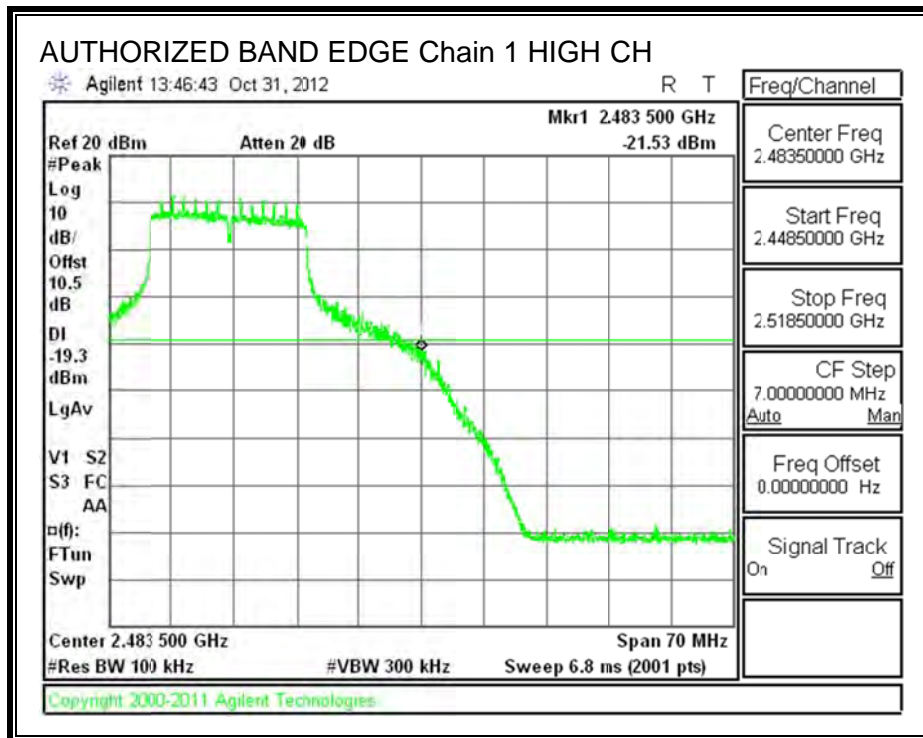
IN-BAND REFERENCE LEVEL, Chain 1

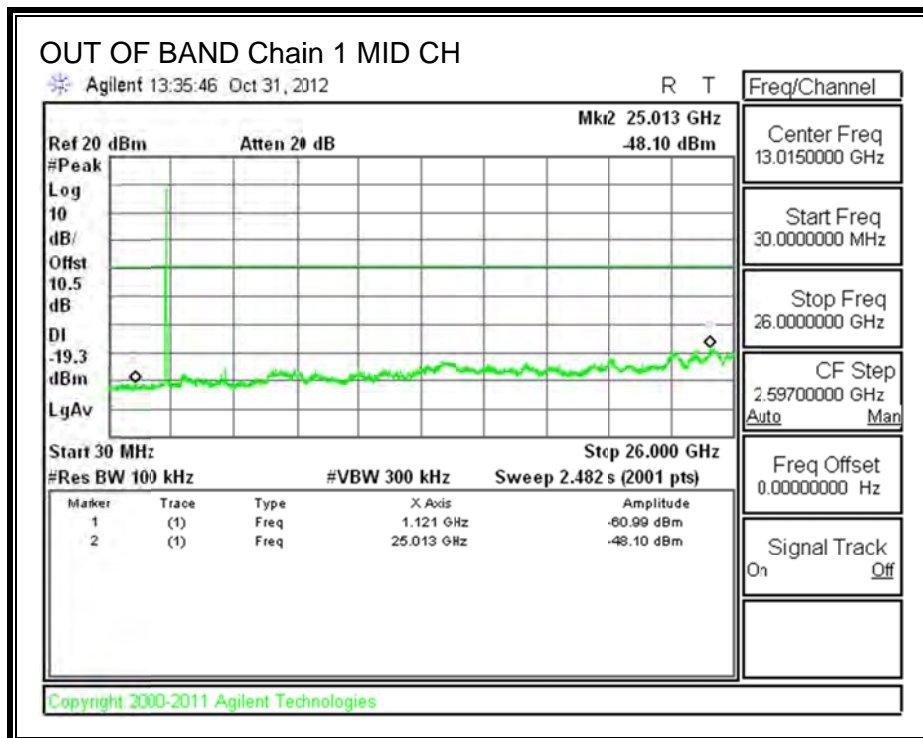
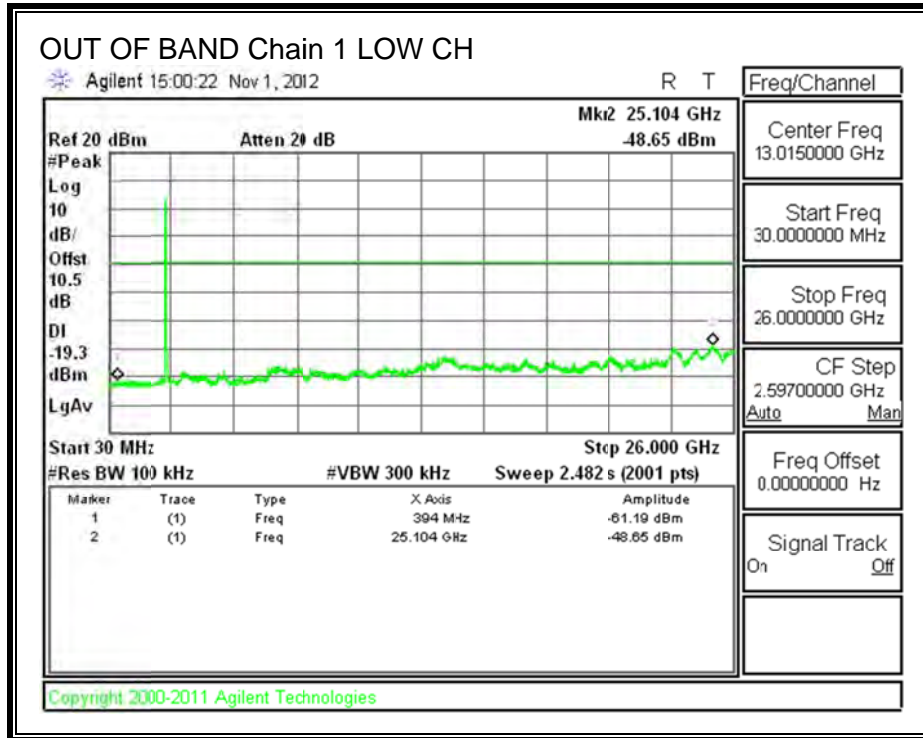


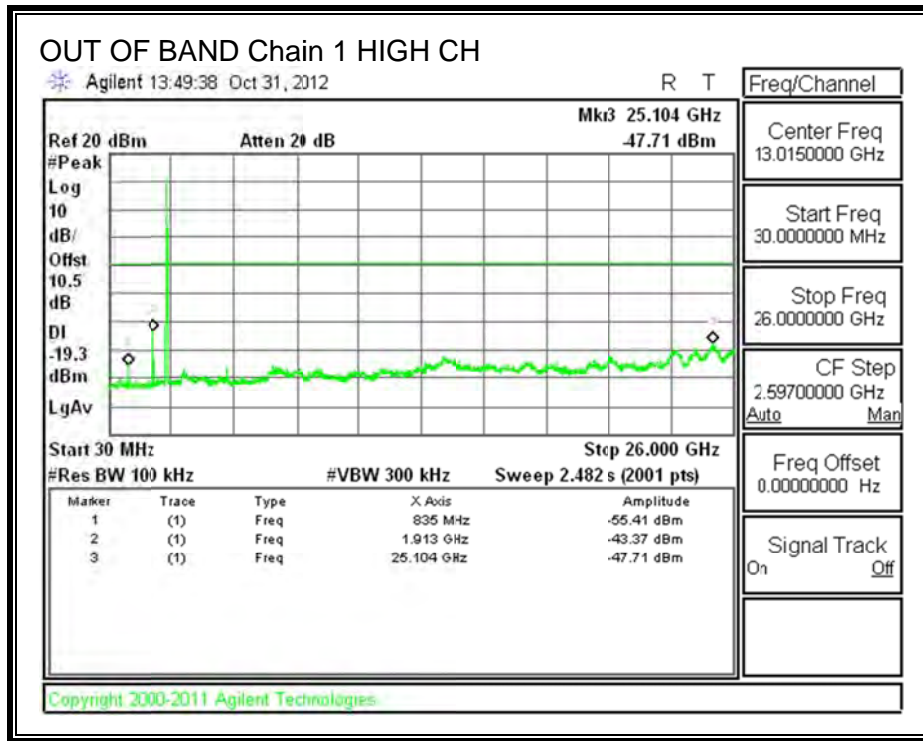
LOW CHANNEL BANDEDGE, Chain 1



HIGH CHANNEL BANDEDGE, Chain 1







8.4. 802.11n HT20 SDM MODE IN THE 2.4 GHz BAND

8.4.1. 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.

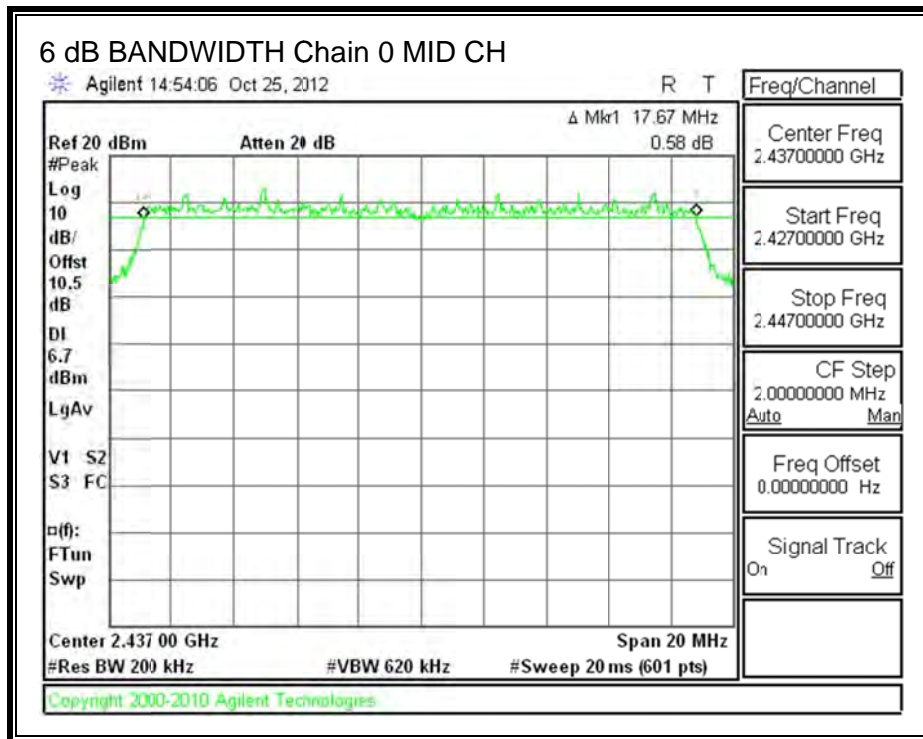
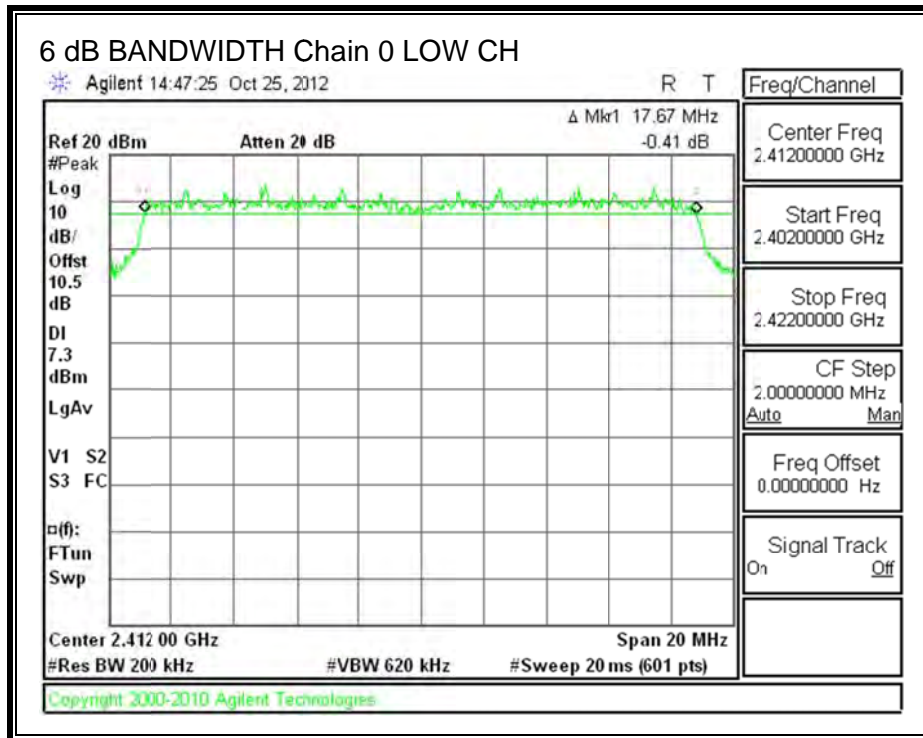
TEST PROCEDURE

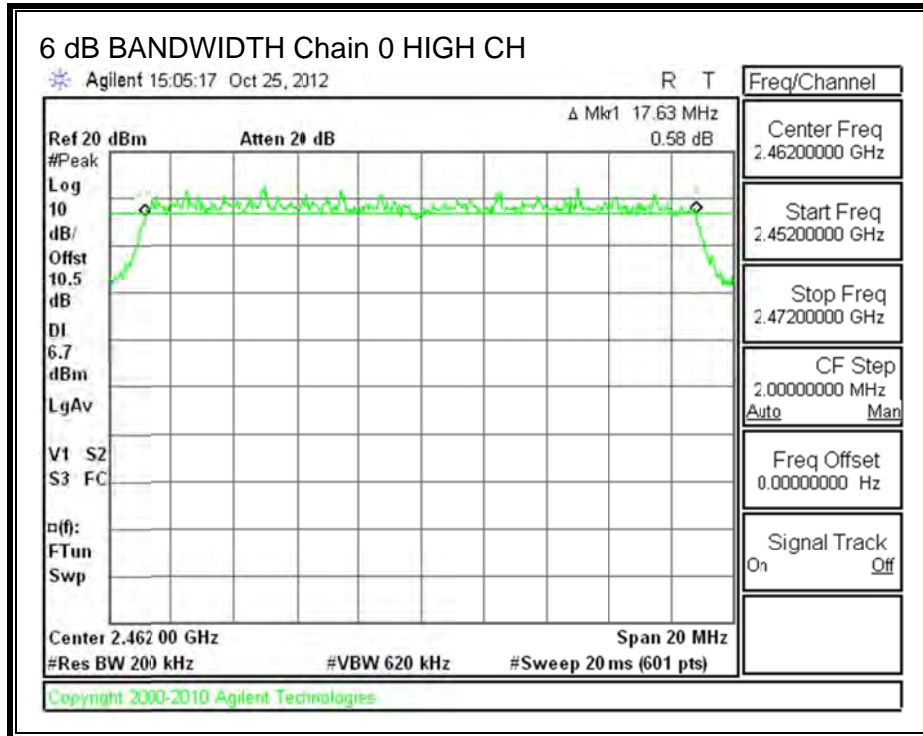
The transmitter output is connected to a spectrum analyzer with the RBW set between 1% and 5% of the EBW, the VBW $\geq 3 \times$ RBW, peak detector and max hold.

RESULTS

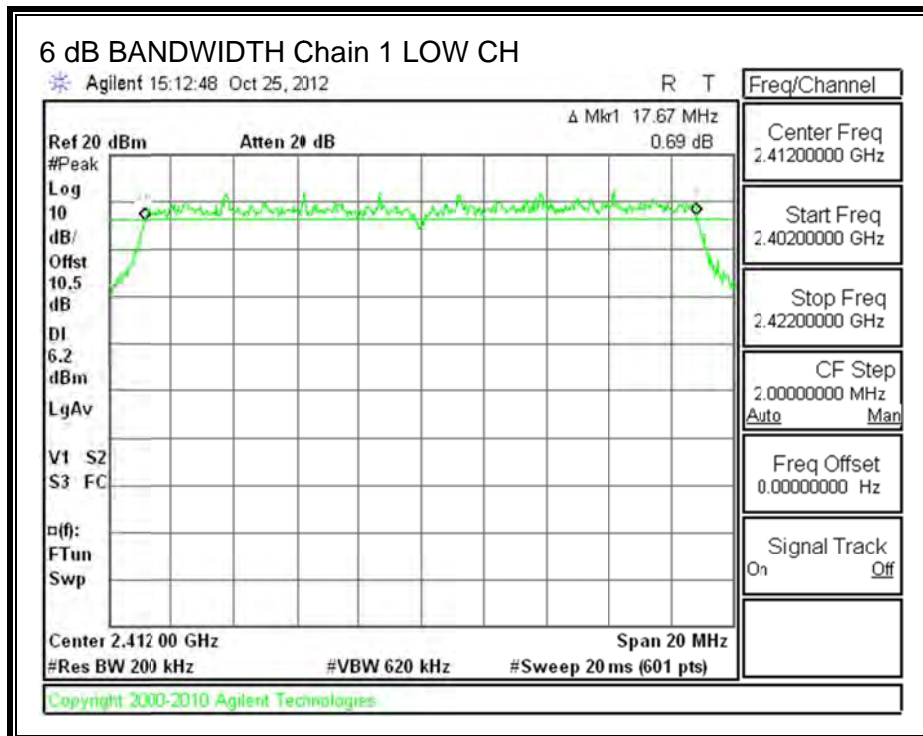
Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
Low	2412	17.67	17.67	0.5
Mid	2437	17.67	17.67	0.5
High	2462	17.63	17.60	0.5

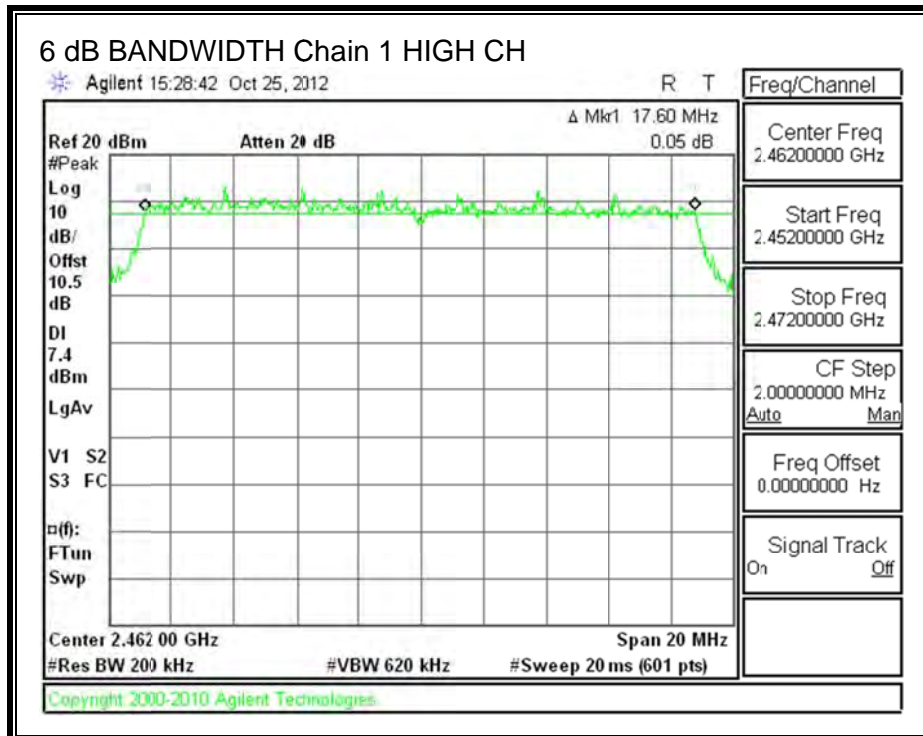
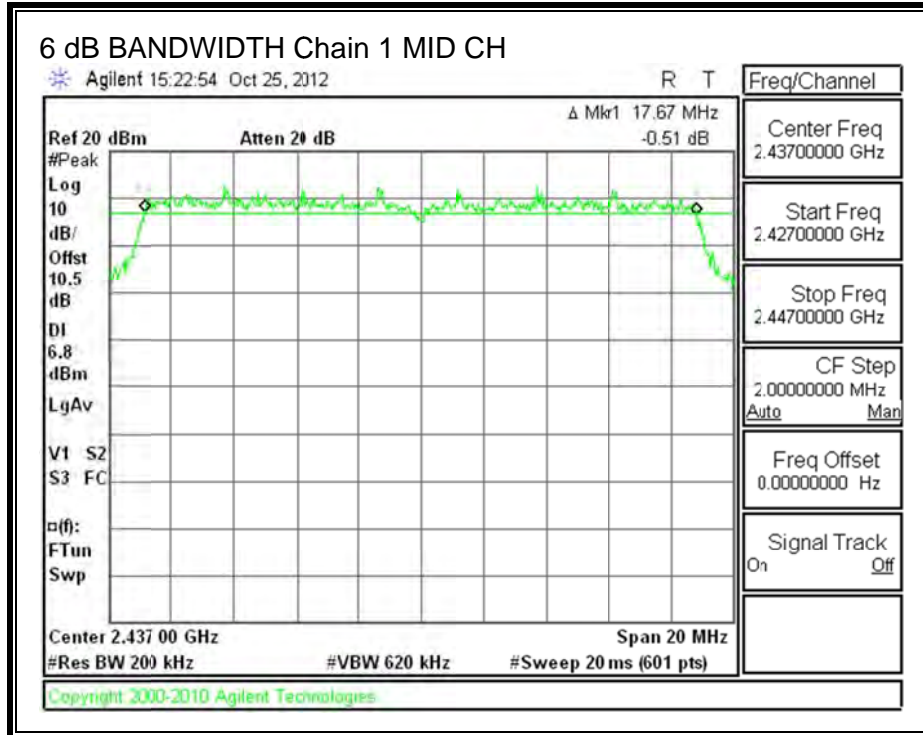
6 dB BANDWIDTH, Chain 0





6 dB BANDWIDTH, Chain 1





8.4.2. 99% BANDWIDTH

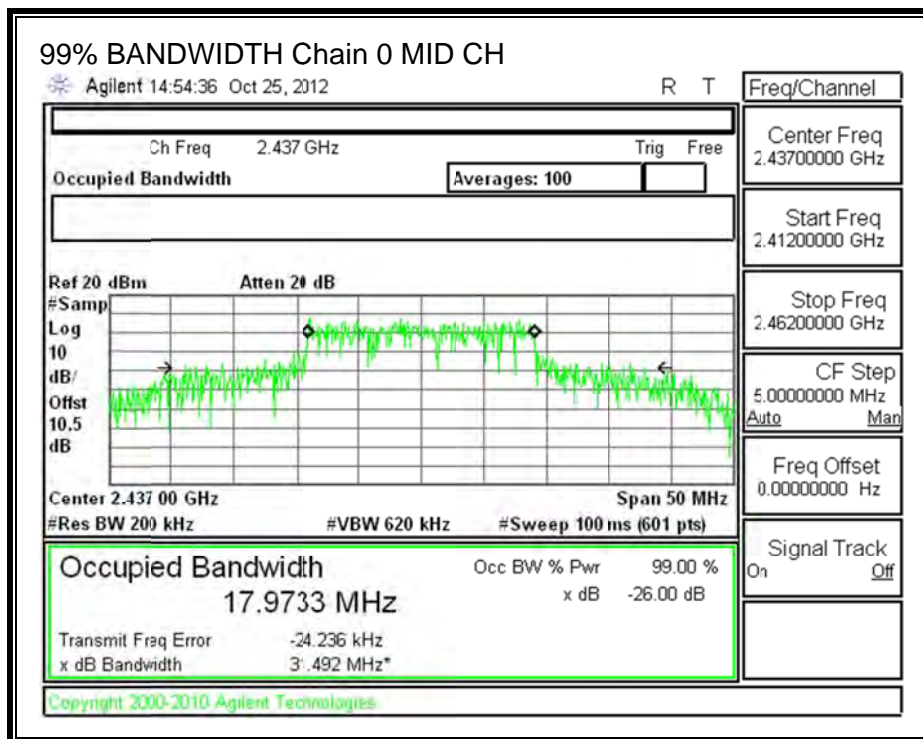
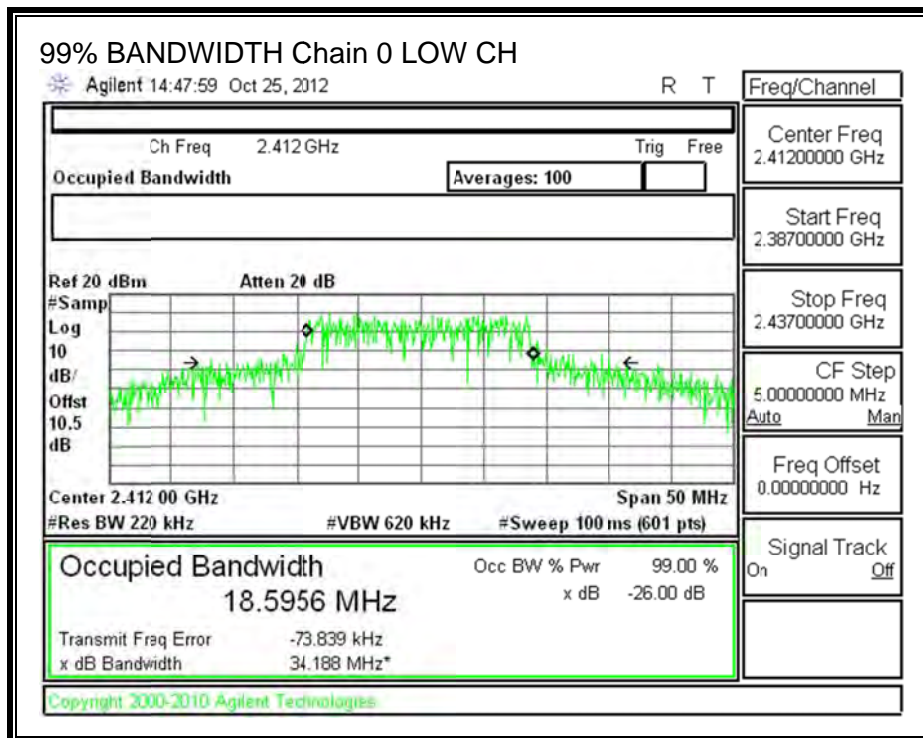
LIMITS

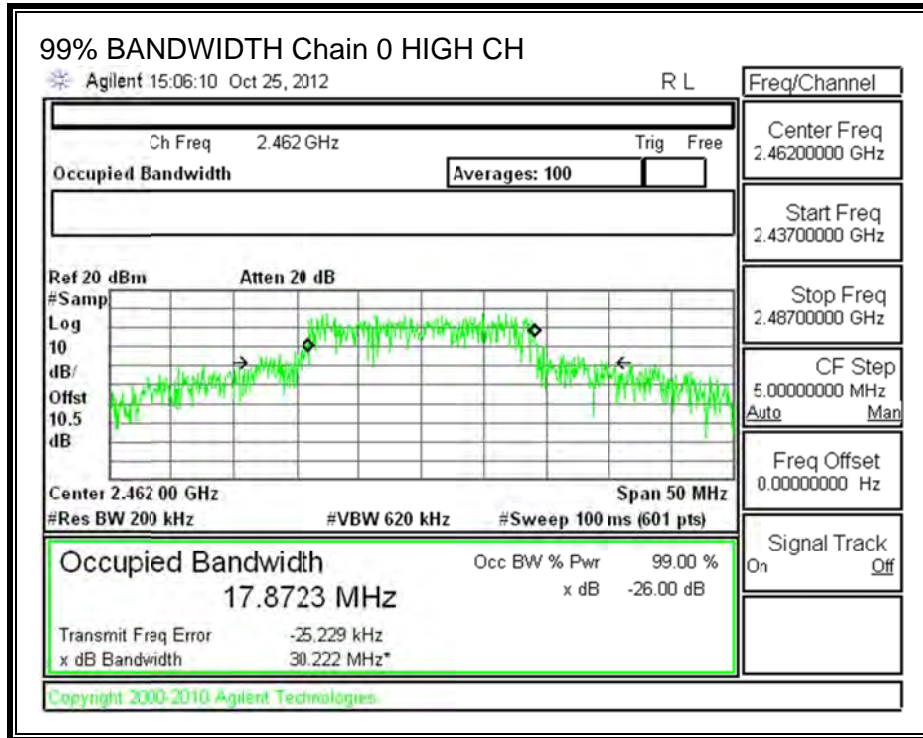
None; for reporting purposes only.

RESULTS

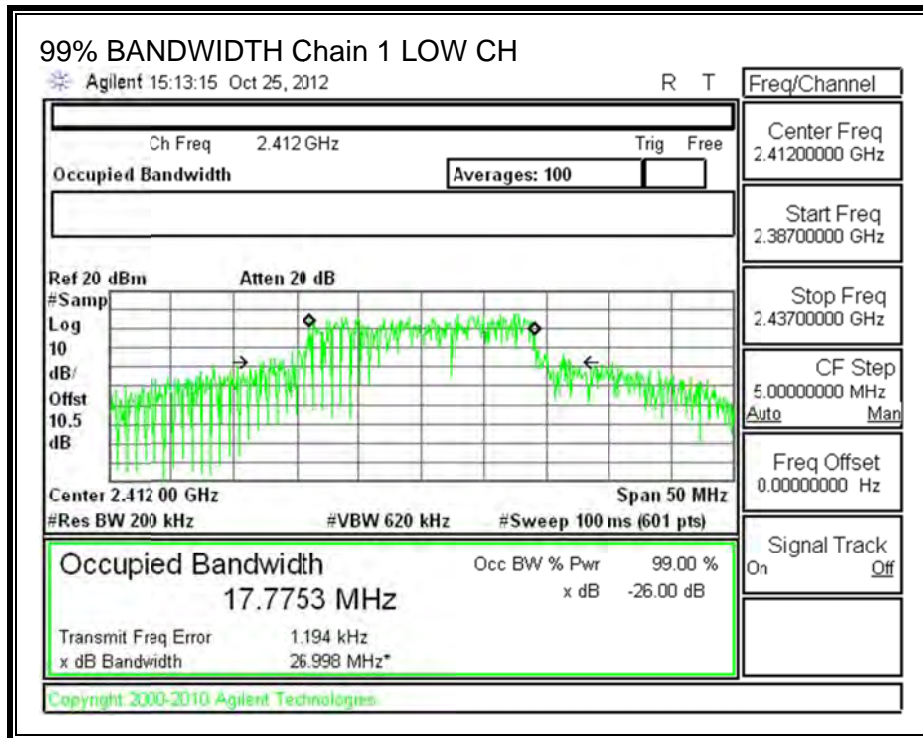
Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	2412	18.5956	17.7753
Mid	2437	17.9733	17.8127
High	2462	17.8723	17.7601

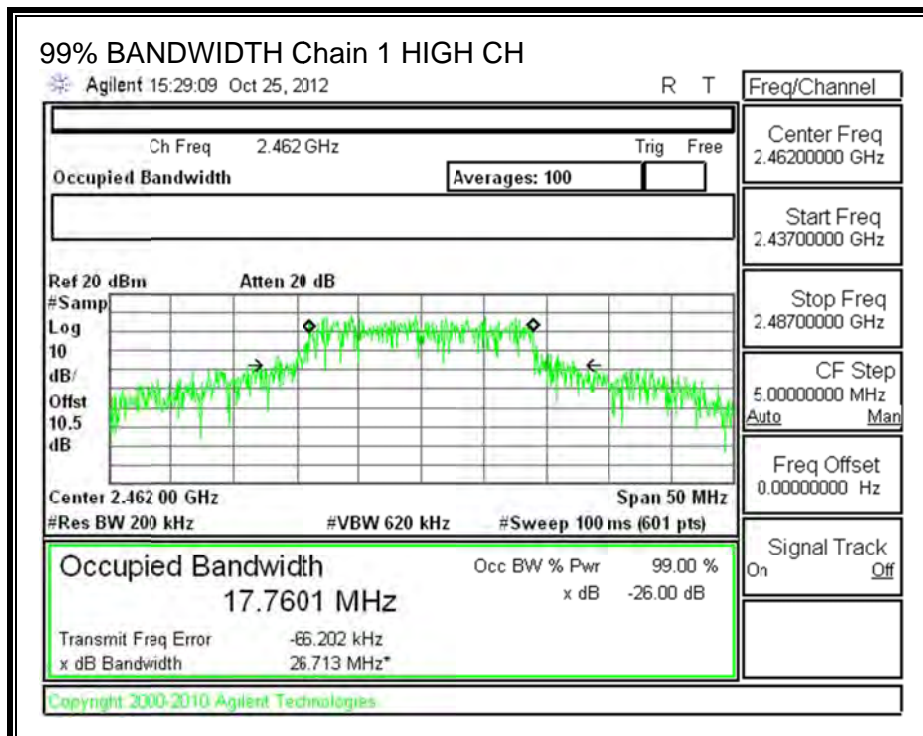
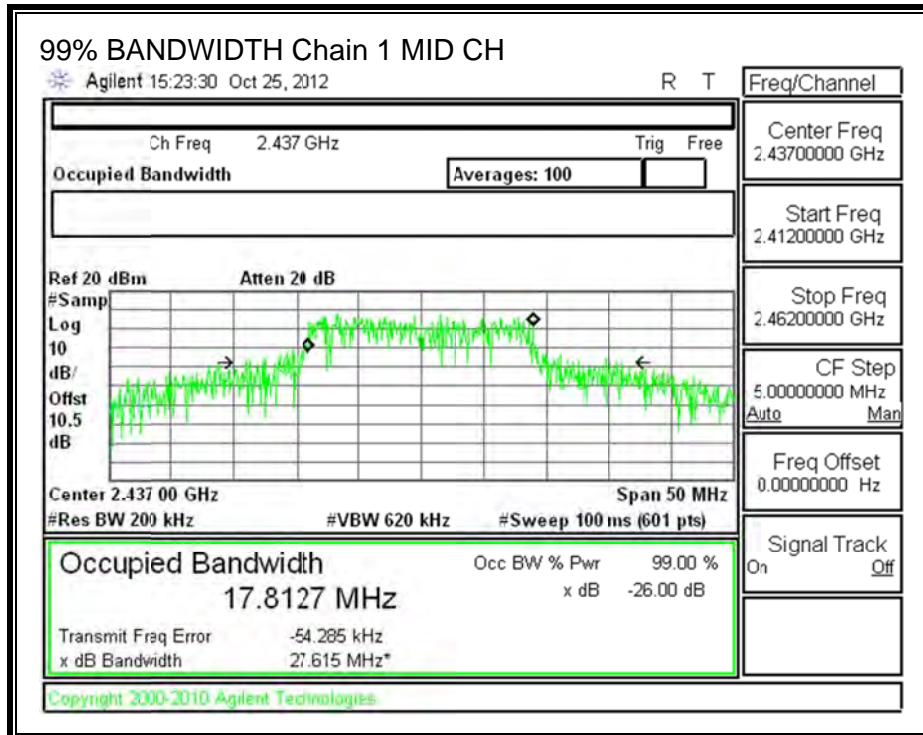
99% BANDWIDTH, Chain 0





99% BANDWIDTH, Chain 1





8.4.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.5 dB (including 10 dB pad and 0.5 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	2412	17.80	15.90	19.96
Mid	2437	20.00	16.20	21.51
High	2462	19.90	16.25	21.46

8.4.4. OUTPUT POWER

LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

The TX chains are uncorrelated and the antenna gain is the same for each chain. The directional gain is equal to the antenna gain.

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	1.00	30.00	30	36	30.00
Mid	2437	1.00	30.00	30	36	30.00
High	2462	1.00	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	2412	17.822	15.868	19.964	30.00	-10.036
Mid	2437	20.088	16.246	21.589	30.00	-8.411
High	2462	19.913	16.292	21.480	30.00	-8.520