



FCC 47 CFR PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

PORTABLE COMPUTER

MODEL NUMBER: A1534

FCC ID: BCGA1534

REPORT NUMBER: 14U18574-E3, VERSION B

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Prepared for
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	01/23/15	Initial Issue	F. de Anda
B	02/11/15	Revised report to address TCB's questions	T. Chu

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: APPLE
1 INFINITE LOOP
CUPERTINO, CA 95014, U.S.A.

EUT DESCRIPTION: PORTABLE COMPUTER

MODEL: A1534

SERIAL NUMBER: C02N9002G17D (CONDUCTED), C02N900KG17D (RADIATED)

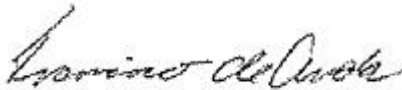
DATE TESTED: SEPTEMBER 22 TO OCTOBER 10, 2014

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass

UL Verification Services Inc. 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 Verification Services Inc. 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 Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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 Verification Services Inc. By:



Francisco DeAnda
PROJECT LEAD
UL Verification Services Inc.

Tested By:



Francisco Guarnero
EMC ENGINEER
UL Verification Services Inc.

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.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA. The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street
☐ Chamber A	☒ Chamber D
☐ Chamber B	☒ Chamber E
☐ Chamber C	☐ Chamber F
	☒ Chamber G
	☐ Chamber H

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through H are covered under Industry Canada company address code 2324B with site numbers 2324B-1 through 2324B-8, respectively

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2000650.htm>.

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:

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

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
Radiated Disturbance, 1 to 6 GHz	± 3.86 dB
Radiated Disturbance, 6 to 18 GHz	± 4.23 dB
Radiated Disturbance, 18 to 26 GHz	± 5.30 dB
Radiated Disturbance, 26 to 40 GHz	± 5.23 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

Laptop Device with Bluetooth and WLAN Radios (AC 80 MHZ Beam-Forming)

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

Frequency Range (MHz)	Mode	Output (dBm)	Output Power (mW)	Covered Modes
2412 - 2472	802.11b, 1TX	19.50	89.13	
2412 - 2472	802.11b, 2TX CDD	22.50	177.83	
2412 - 2472	802.11g, 1TX	18.99	79.25	802.11n HT20 1TX 802.11ac VHT20 1TX
2412 - 2472	802.11n HT20 2TX CDD	21.98	157.76	802.11g 2TX CDD 802.11n HT20 2TX STBC/SDM 802.11ac VHT20 2TX
2412 - 2472	802.11ac VHT20 2TX BF	22.01	158.85	802.11g 2TX BF 802.11n HT20 2TX BF

Note: "Covered Modes" are test reduction modes. The output powers on the "Covered Modes" are equal to or less than the mode referenced.

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an inverted-F Antenna (IFA), with a maximum gain as below table:

Frequency Band (GHz)	Antenna Gain (dBi)	
	Chain 0	Chain 1
2.4	2.24	3.40

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 7.15.147

The test utility software used during testing was 7.15 RC147

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.

For 1TX modes, either Chain 0 or Chain 1 can transmit and both chains have the same power; Only Chain 1 data are representative of the worst case due to Chain 1 has a higher antenna gain.

All radiated testing was performed with the EUT in normal use orientation.

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

802.11b mode: 1 Mbps

802.11g mode: 6 Mbps

802.11n HT20mode: MCS0

802.11ac VHT20mode: MCS0

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC/ DC Adapter	Apple Inc.	A1540	C4H433700AZFPWW1E	N/A
Earphone	Apple Inc.	N/A	N/A	N/A

I/O CABLES (CONDUCTED TEST)

Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Antenna	2	SMA	Un-Shielded	0.2	To Spectrum Analyzer
2	DC	1	Lightning	Un-Shielded	2	NA

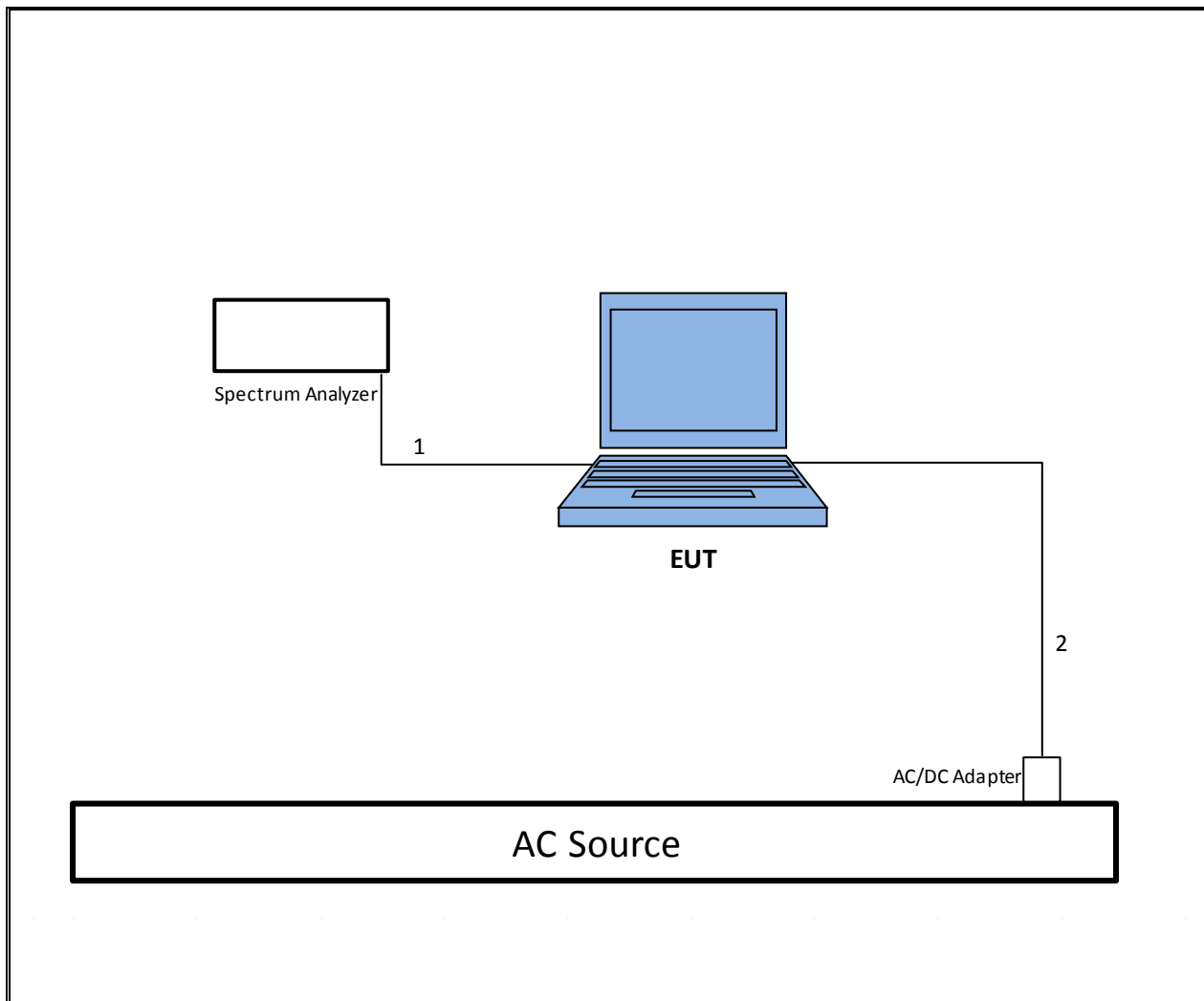
I/O CABLES (RADIATED AND AC POWER CONDUCTED TEST)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
2	DC	1	Lightning	Un-Shielded	2	NA
3	Audio	1	Jack	Un-Shielded	0.5	NA

TEST SETUP- (CONDUCTED TEST)

The EUT was tested connected to spectrum analyzer via antenna port. Test software exercised the EUT.

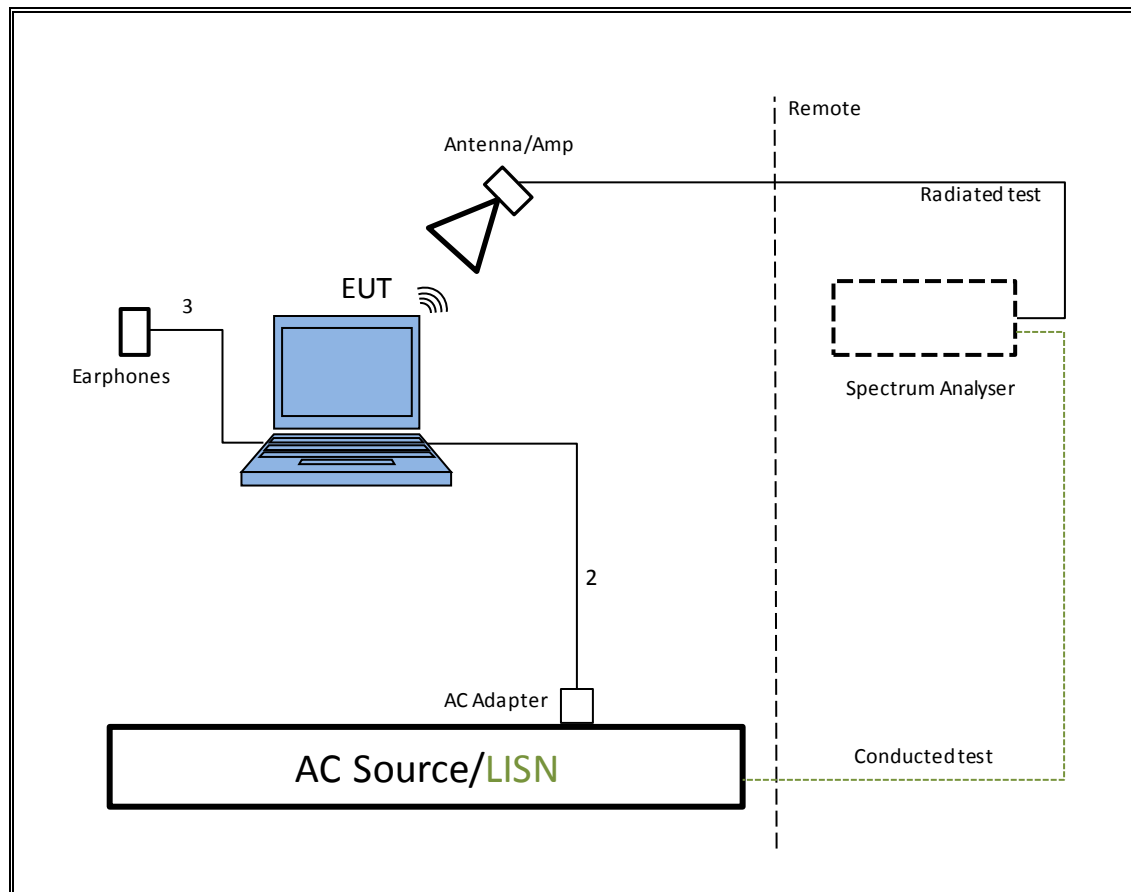
SETUP DIAGRAM



TEST SETUP- RADIATED & AC LINE CONDUCTED TESTS

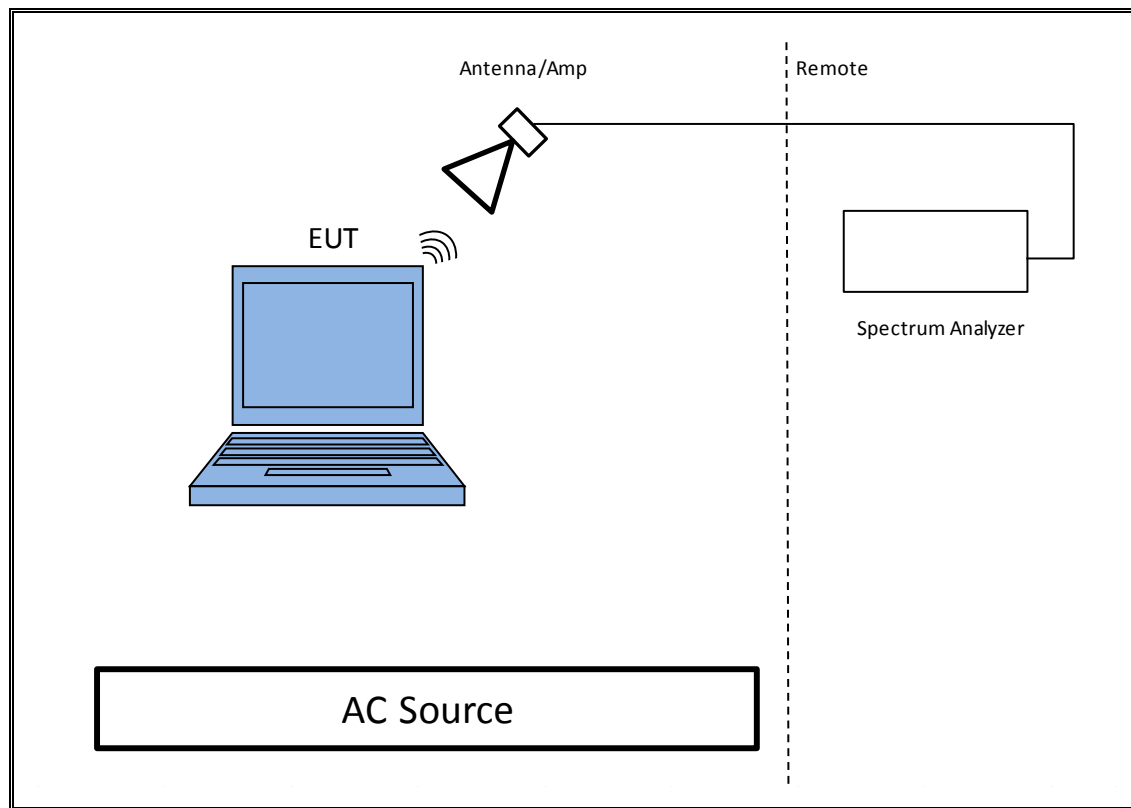
The EUT's test software exercised the radio card.

SETUP DIAGRAM



TEST SETUP- RADIATED ABOVE 1 GHz

The EUT's test software exercised the radio card.



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	T Number	Cal Due
PXA Signal Analyzer	Agilent	N9030A	T342	06/25/15
PXA Signal Analyzer	Agilent	N9030A	T341	02/12/15
Power Meter	Agilent	N1911A	T382	04/09/15
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T862	04/14/15
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T120	03/26/15
Antenna, Hybrid 30MHz to 2GHz	Sunol Sciences	JB3	T899	05/14/15
Antenna, Hybrid 30MHz to 2GHz	Sunol Sciences	JB1	T122	04/22/15
PXA Signal Analyzer 3Hz to 44GHz	Agilent	N9030A	T905	05/17/15
Amplifier, 10KHz to 1GHz	Sonoma	310N	T834	06/05/15
Amplifier, 10KHz to 1GHz	Sonoma	310N	T173	12/30/14
Amplifier, 1 to 18GHz	Miteq	AFS42-00101	T491	06/05/15
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T742	01/20/15
PXA Signal Analyzer 3Hz to 44GHz	Agilent	N9030A	T341	02/12/15
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T120	03/20/15
Antenna, Hybrid 30MHz to 2GHz	Sunol Sciences	JB1	T122	04/22/15
Amplifier, 1 to 18GHz	Miteq	AFS42-00101	T742	01/20/15
Amplifier, 10KHz to 1GHz	Sonoma	310N	T173	12/30/14
EMI Test Receiver, 9 kHz-7 GHz	R & S	ESCI 7	T284	09/16/15
LISN, 30 MHz	FCC	LISN-50/250-25-2	T24	01/17/15
Amplifier, 1 to 26.5 Ghz	Agilent	8449B	T404	03/25/15
Antenna Horn 18 to 26.5 Ghz	ARA	MWH-1826/B	T89	11/26/14

7. MEASUREMENT METHODS

6 dB BW: KDB 558074 D01 v03r02, Section 8.1.

Output Power: KDB 558074 D01 v03r02, Section 9.2.3.1

Power Spectral Density: KDB 558074 D01 v03r02, Section 10.3.

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v03r02, Section 11.0.

Out-of-band emissions in restricted bands: KDB 558074 D01 v03r02, Section 12.0

Band-edge: KDB 558074 D01 v03r02, Section 13.3.2.

8. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

LIMITS

None; for reporting purposes only.

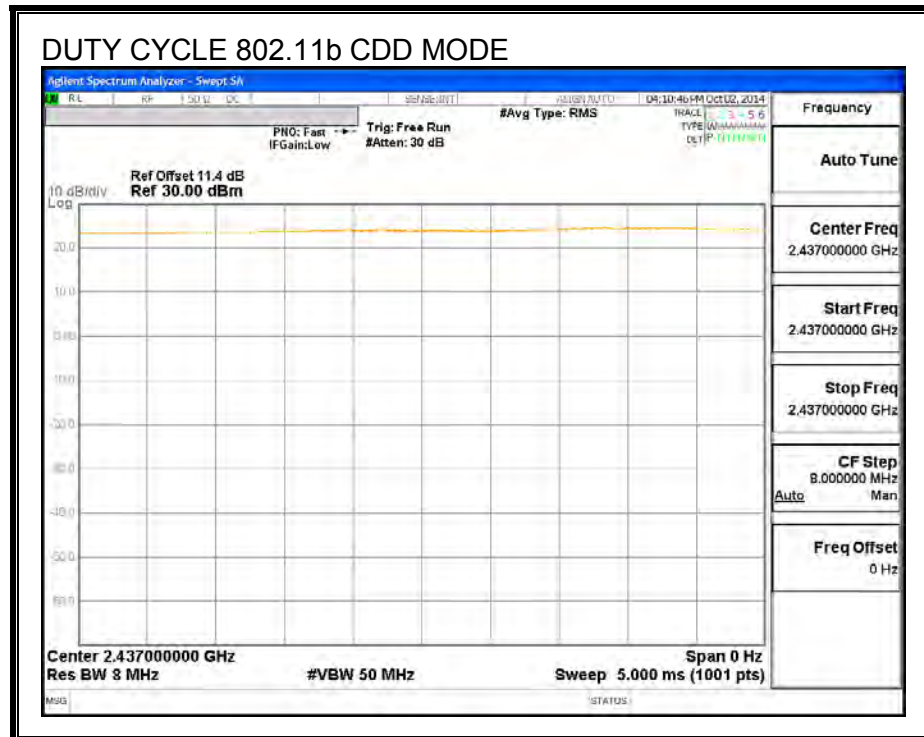
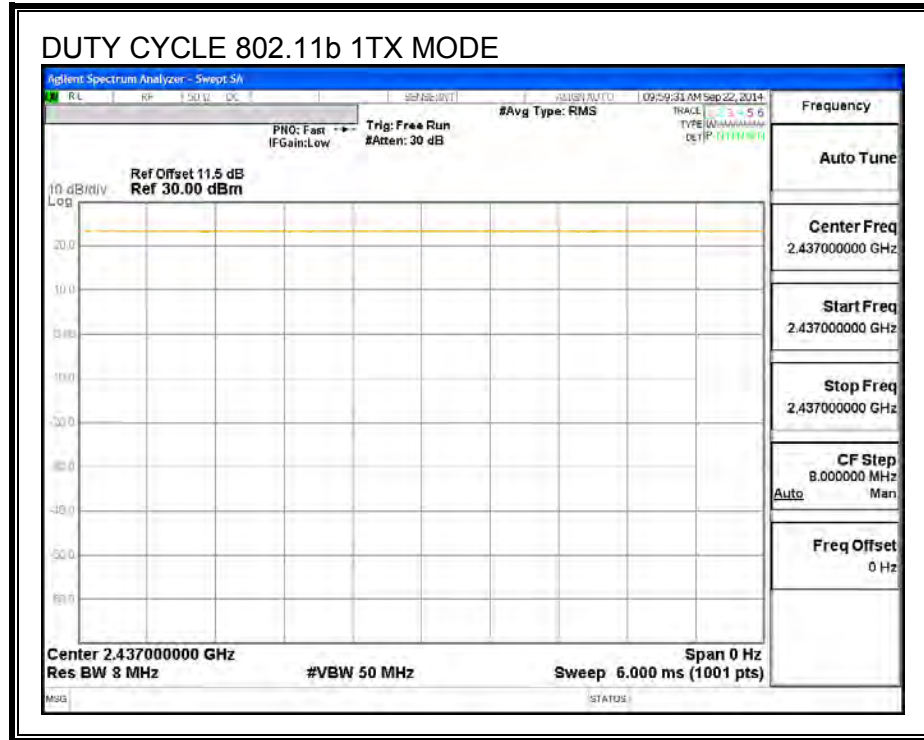
PROCEDURE

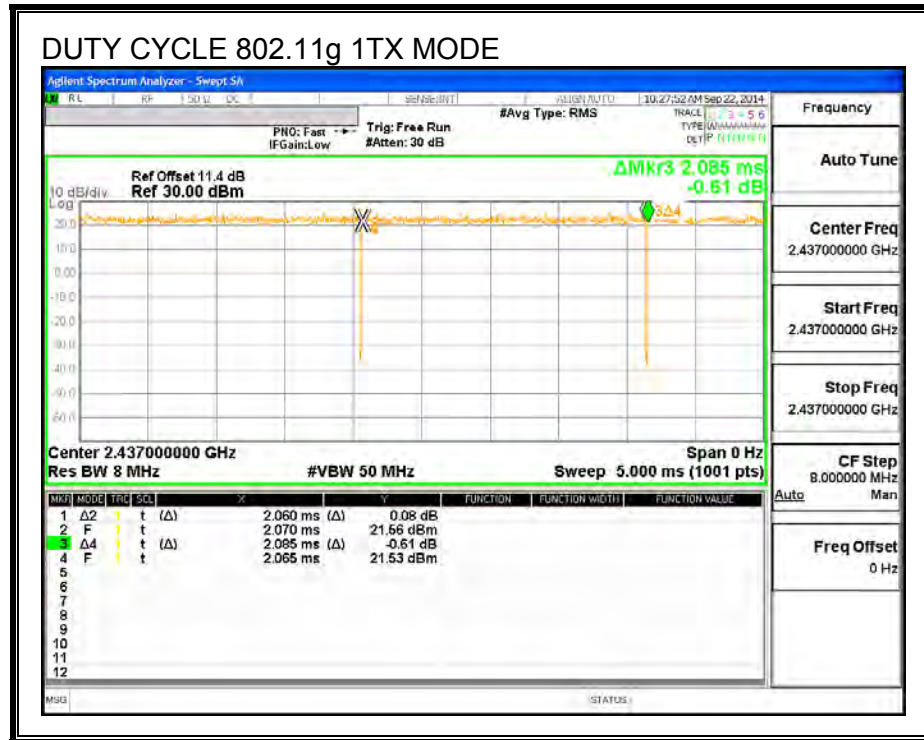
KDB 558074 Zero-Span Spectrum Analyzer Method.

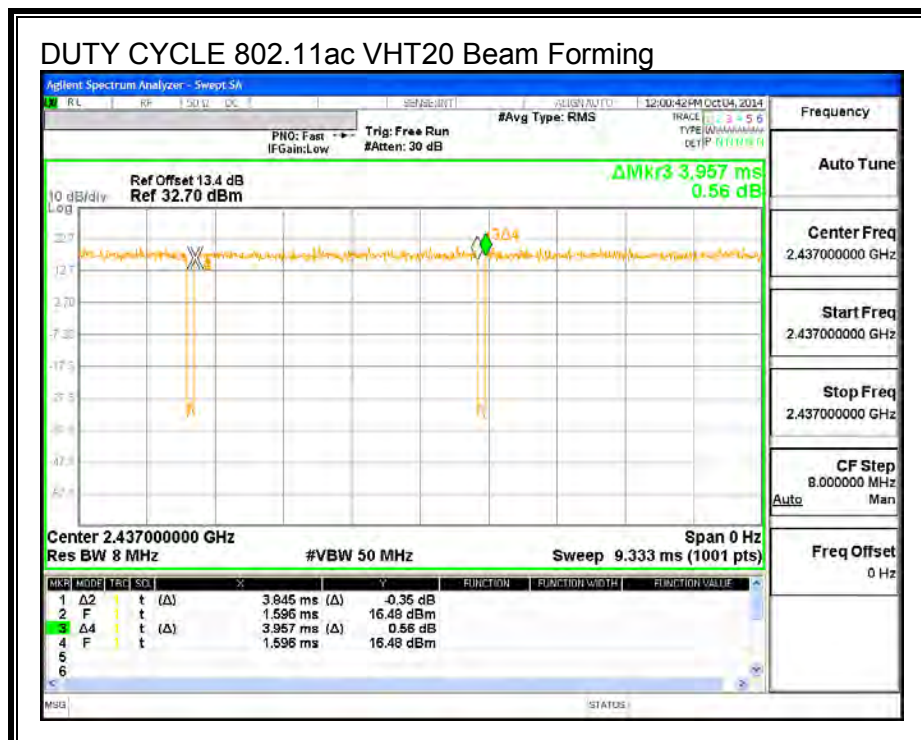
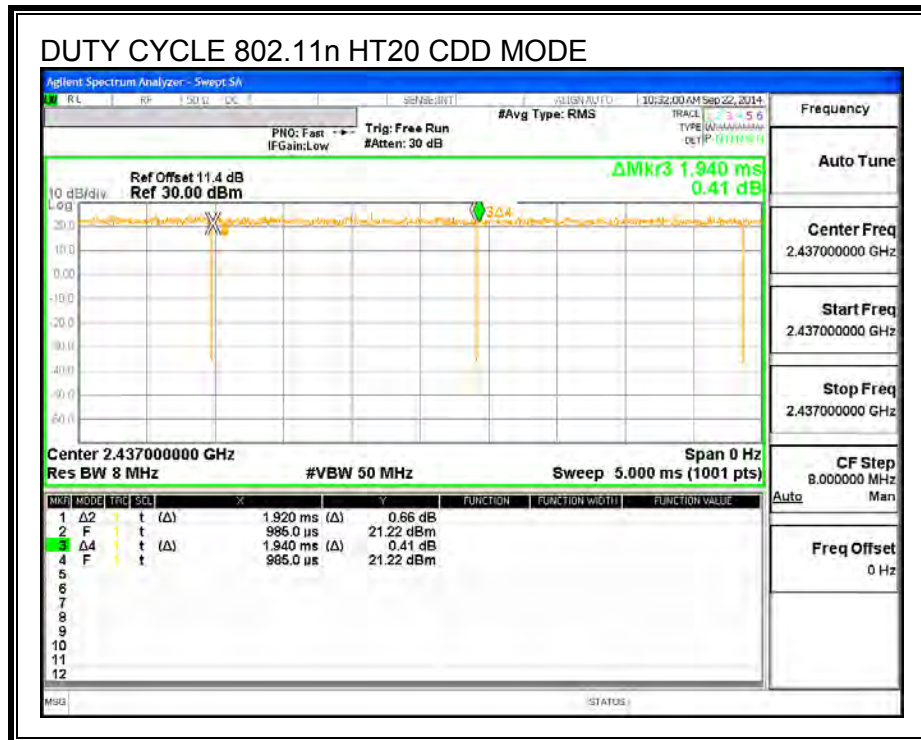
8.1. ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
2.4GHz Band						
802.11b 1TX	1.000	1.000	1.000	100.00%	0.00	0.010
802.11b CDD	1.000	1.000	1.000	100.00%	0.00	0.010
802.11g 1TX	2.060	2.085	0.988	98.80%	0.00	0.010
802.11n HT20 CDD	1.920	1.940	0.990	98.97%	0.00	0.010
802.11ac VHT20 Beam Forming	3.845	3.957	0.972	97.17%	0.12	0.260

8.2. DUTY CYCLE PLOTS







9. ANTENNA PORT TEST RESULTS

9.1. 802.11b 1Tx MODE IN THE 2.4 GHz BAND

9.1.1. 6 dB BANDWIDTH

LIMITS

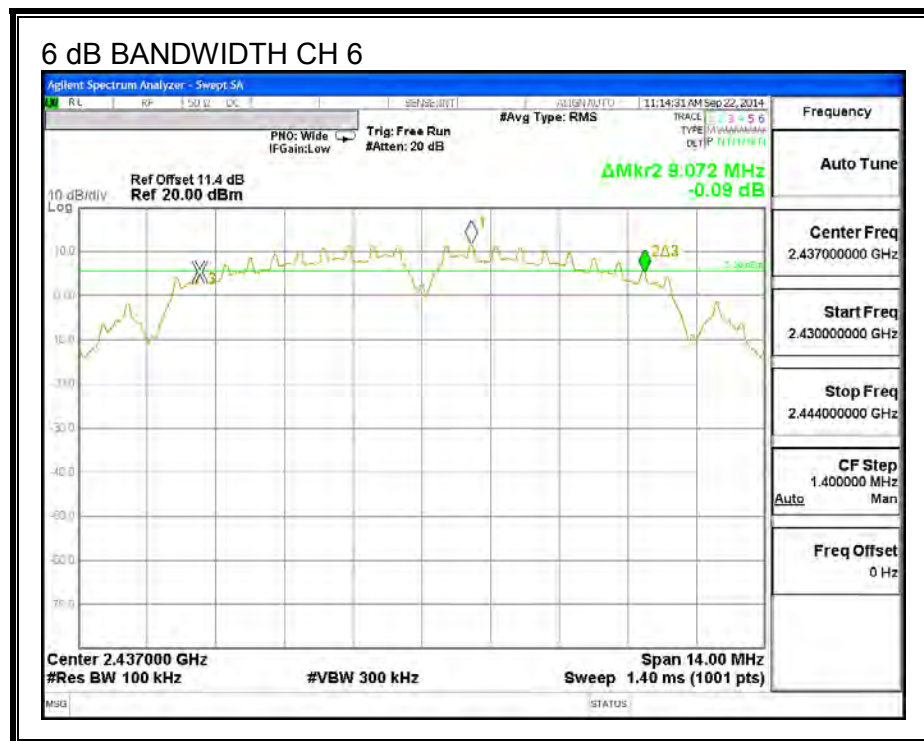
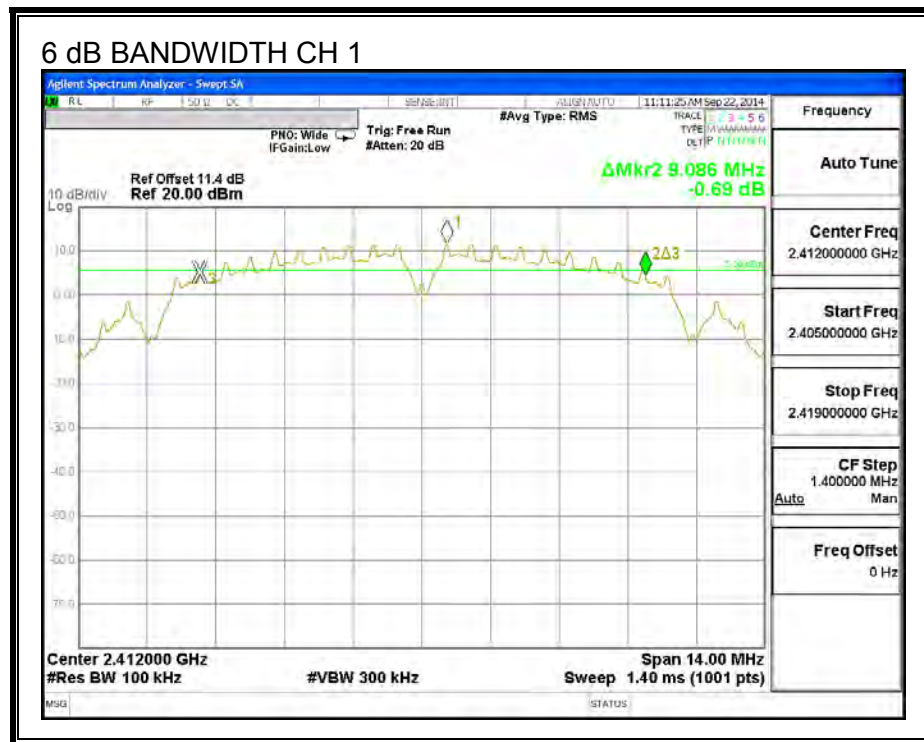
FCC §15.247 (a) (2)

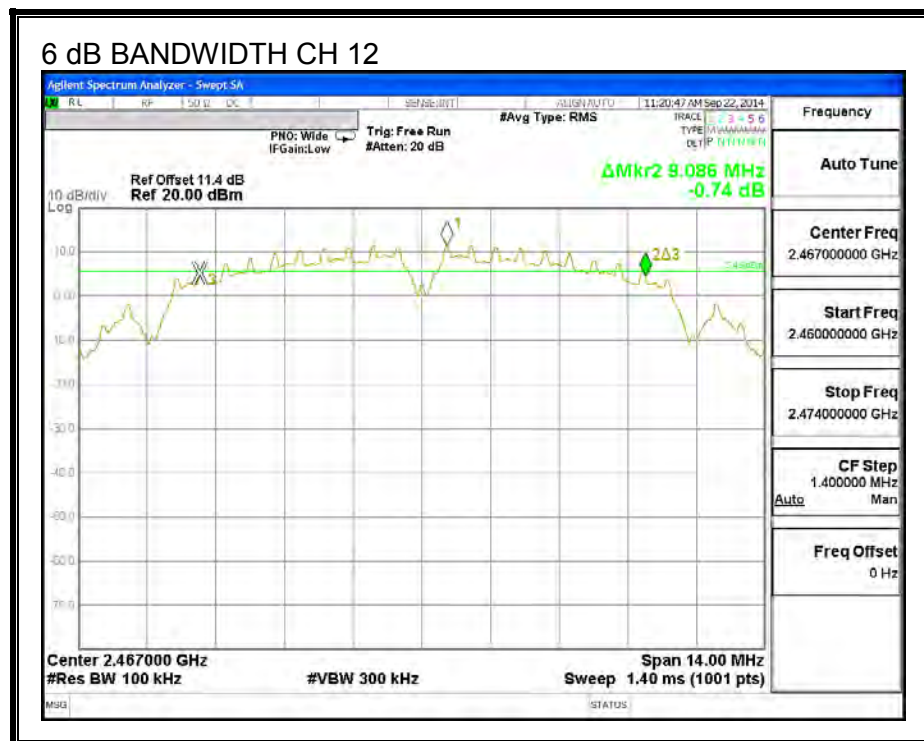
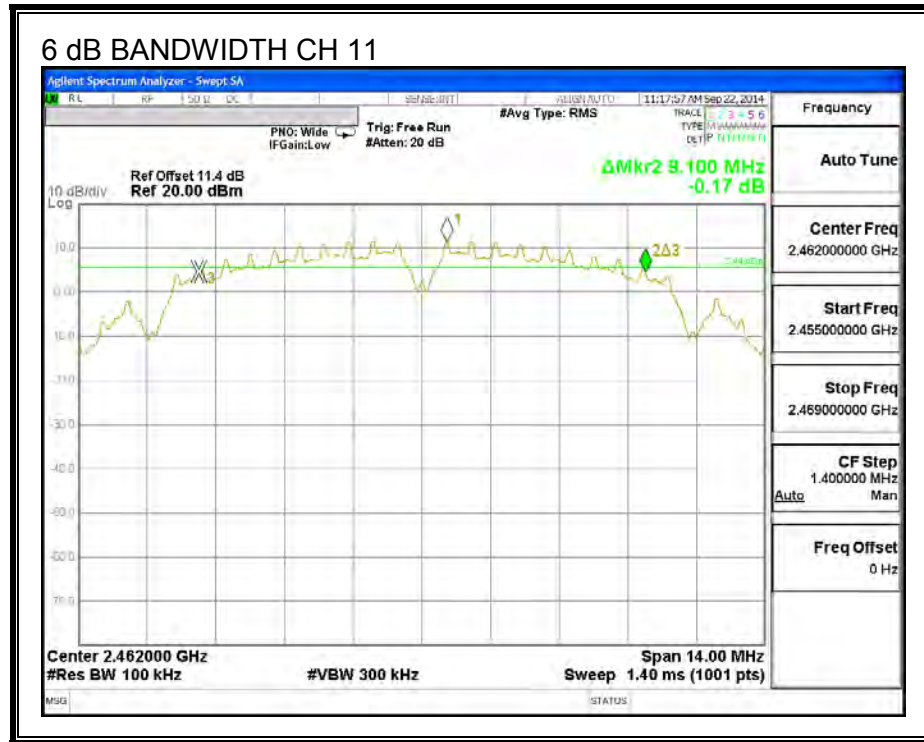
The minimum 6 dB bandwidth shall be at least 500 kHz.

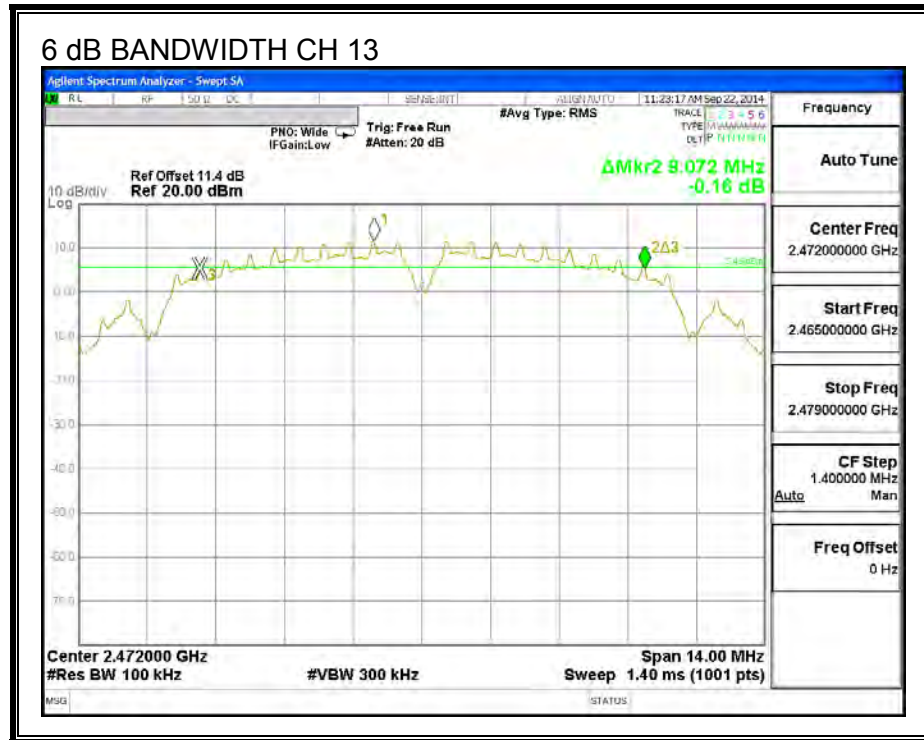
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
1	2412	9.086	0.5
6	2437	9.072	0.5
11	2462	9.100	0.5
12	2467	9.086	0.5
13	2472	9.072	0.5

6 dB BANDWIDTH







9.1.2. 99% BANDWIDTH

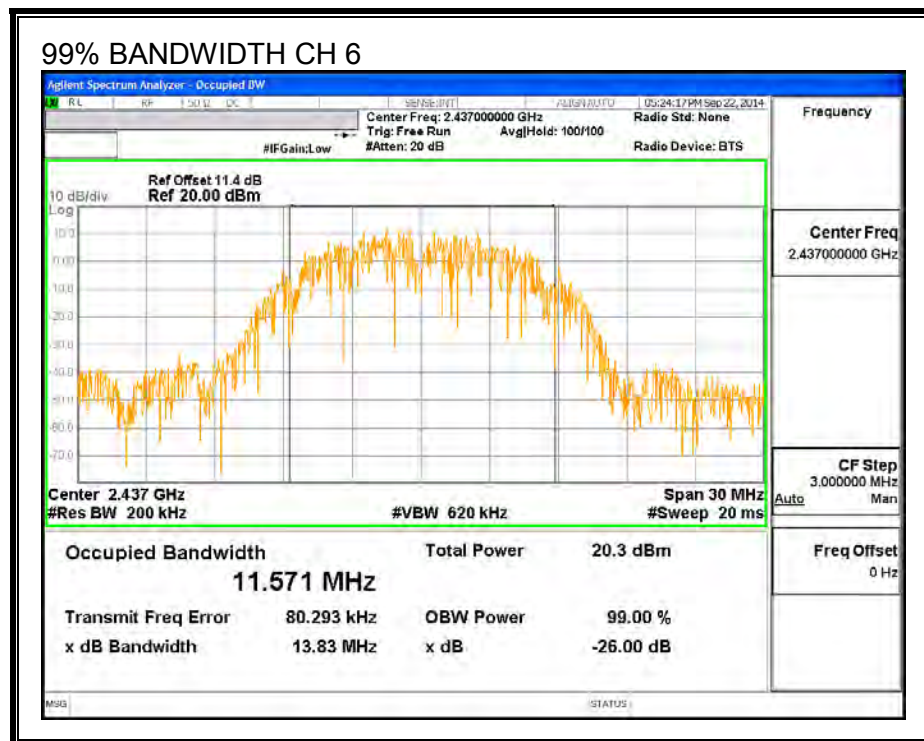
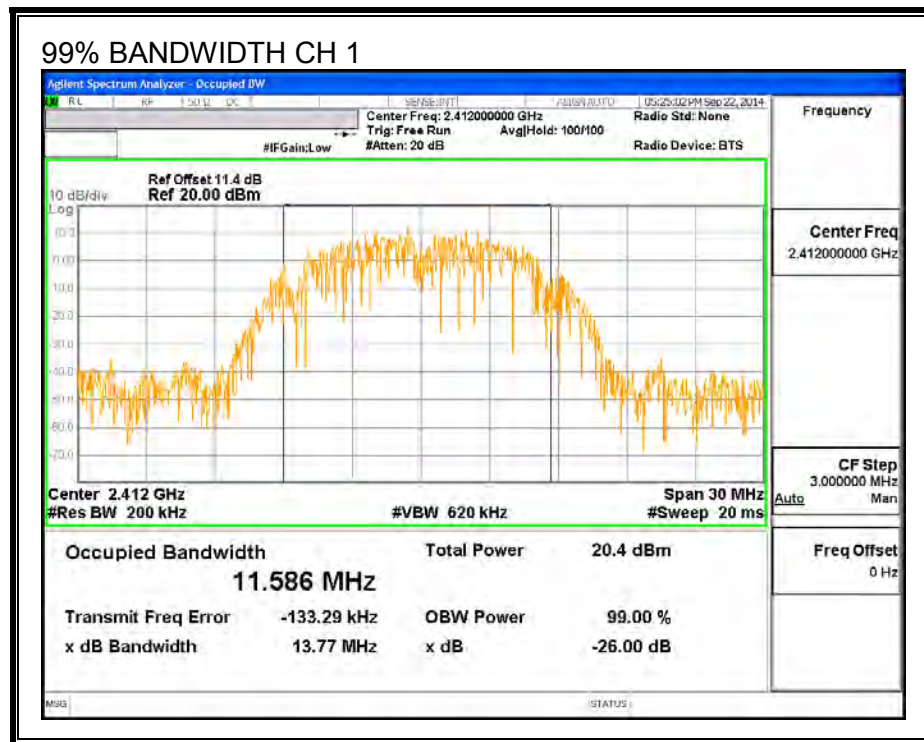
LIMITS

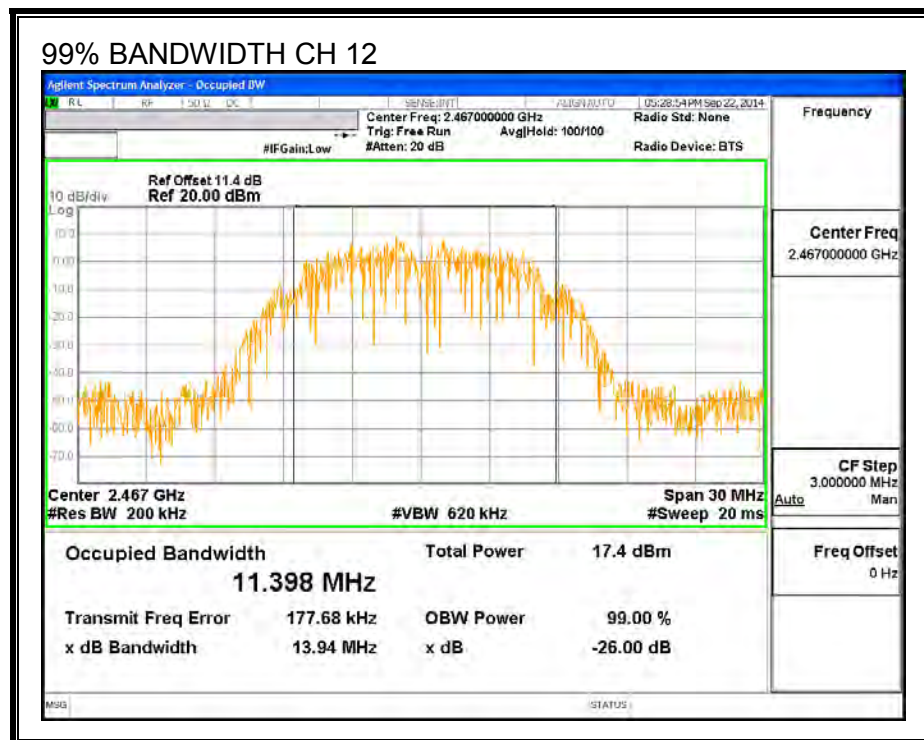
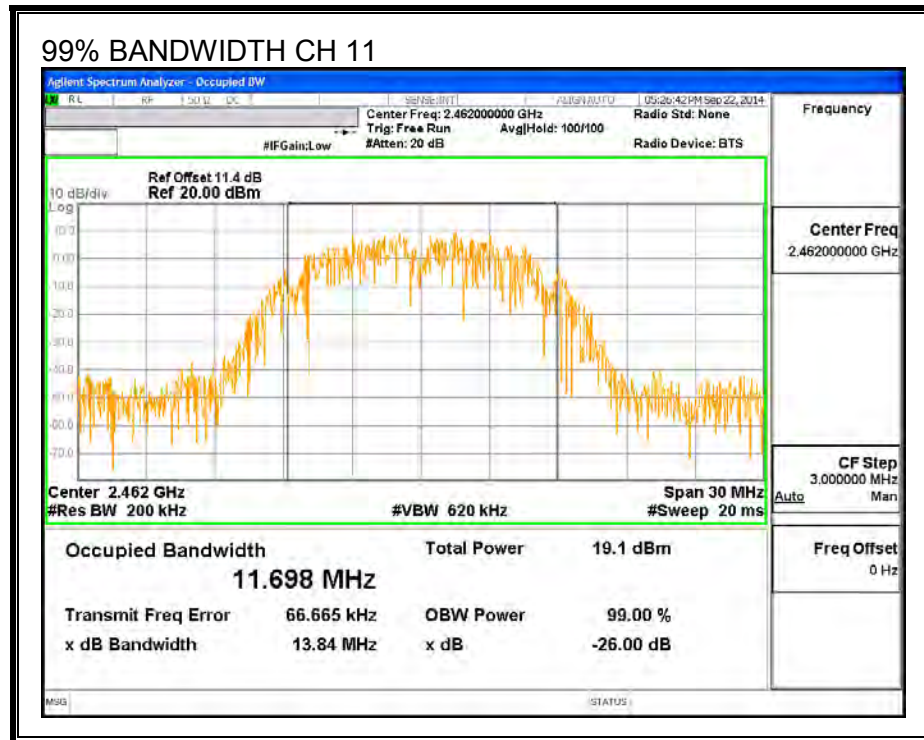
None; for reporting purposes only.

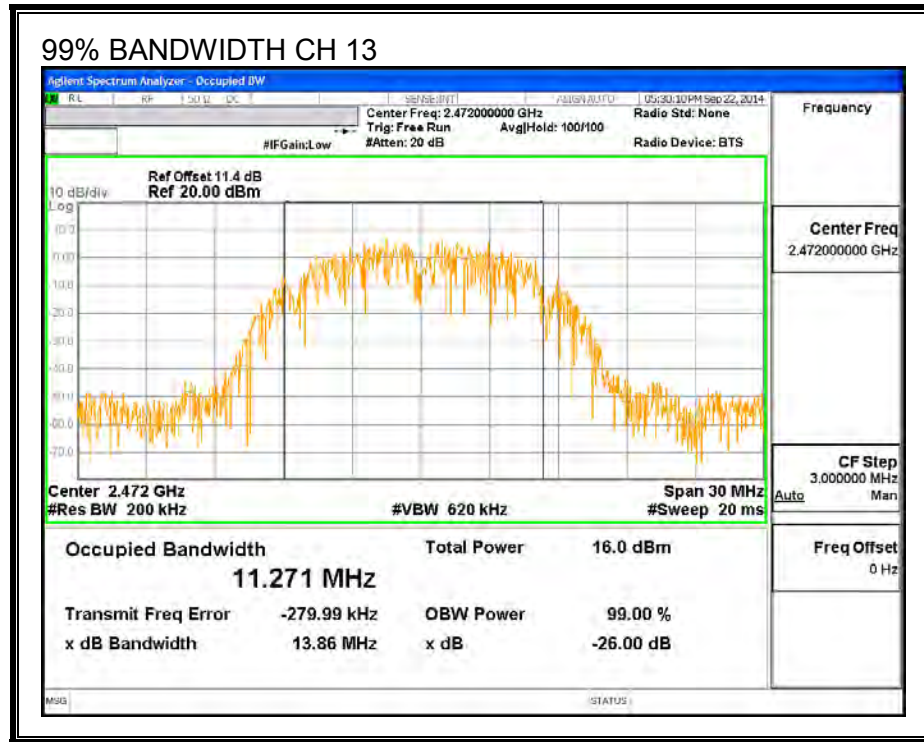
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
1	2412	11.586
6	2437	11.571
11	2462	11.698
12	2467	11.398
13	2472	11.271

99% BANDWIDTH







9.1.3. OUTPUT POWER

LIMITS

FCC §15.247

For systems using digital modulation in the 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

There is only one transmitter output therefore 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)
1	2412	3.40	30.00	30	36	30.00
6	2437	3.40	30.00	30	36	30.00
11	2462	3.40	30.00	30	36	30.00
12	2467	3.40	30.00	30	36	30.00
13	2472	3.40	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
1	2412	19.48	19.48	30.00	-10.52
6	2437	19.50	19.50	30.00	-10.50
11	2462	19.47	19.47	30.00	-10.53
12	2467	17.49	17.49	30.00	-12.51
13	2472	15.00	15.00	30.00	-15.00

9.1.4. PSD

LIMITS

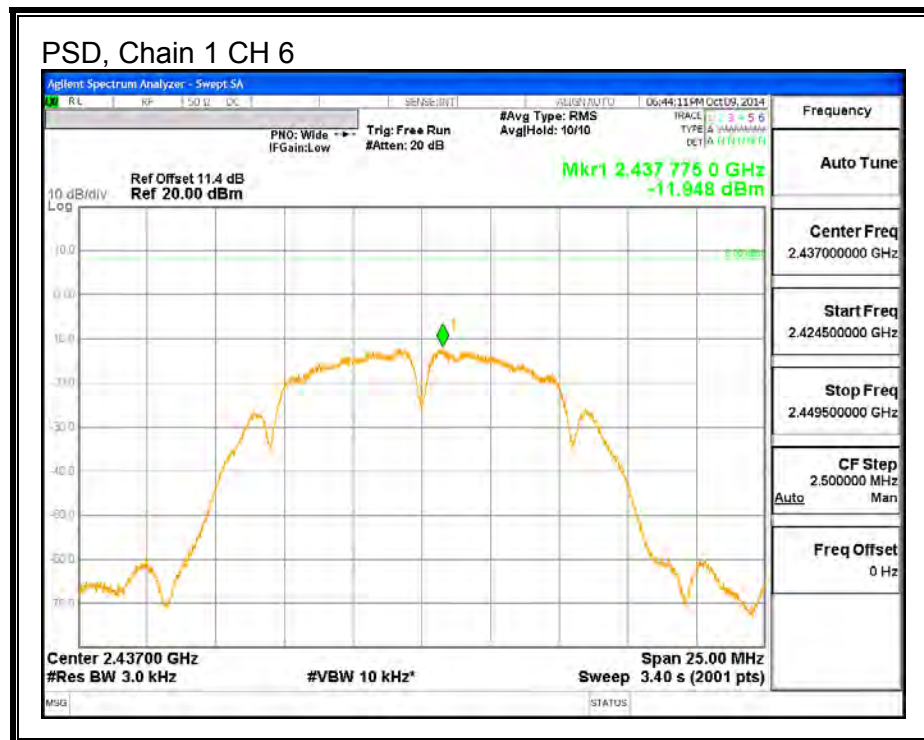
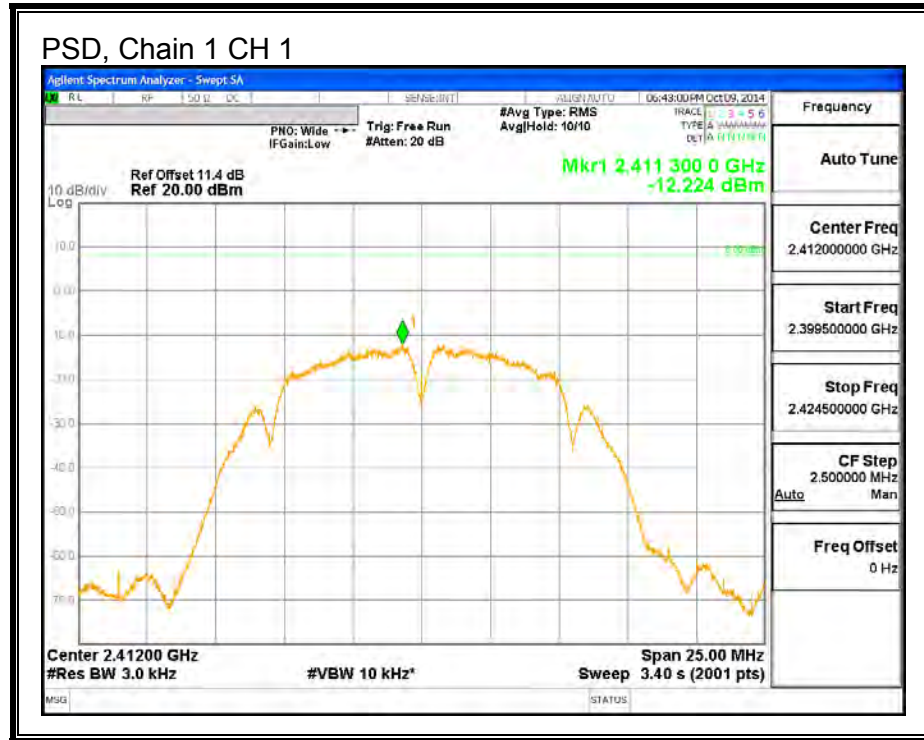
FCC §15.247

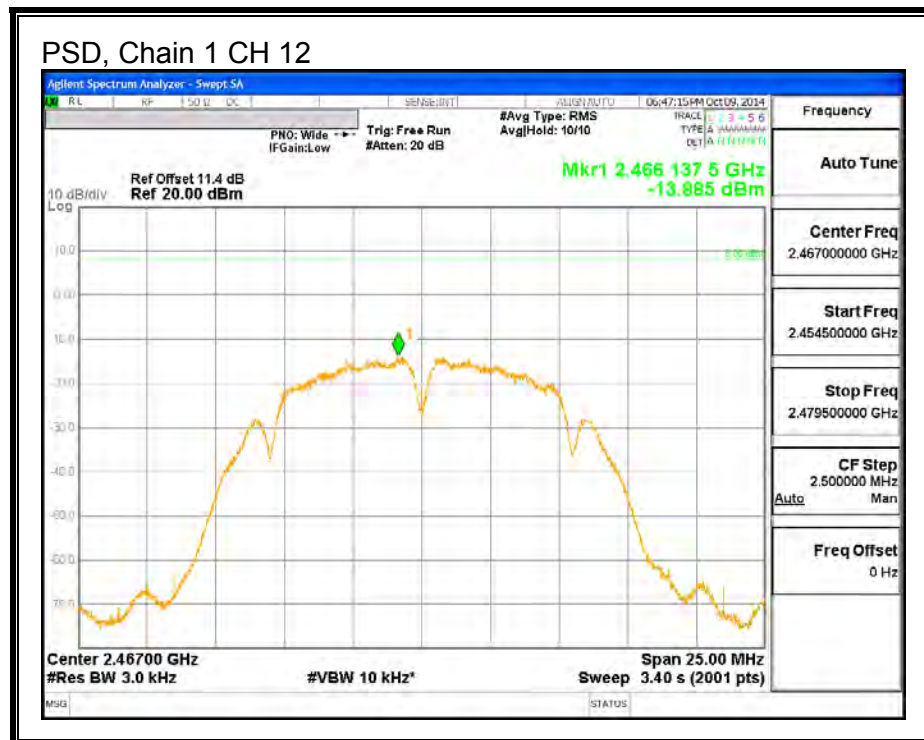
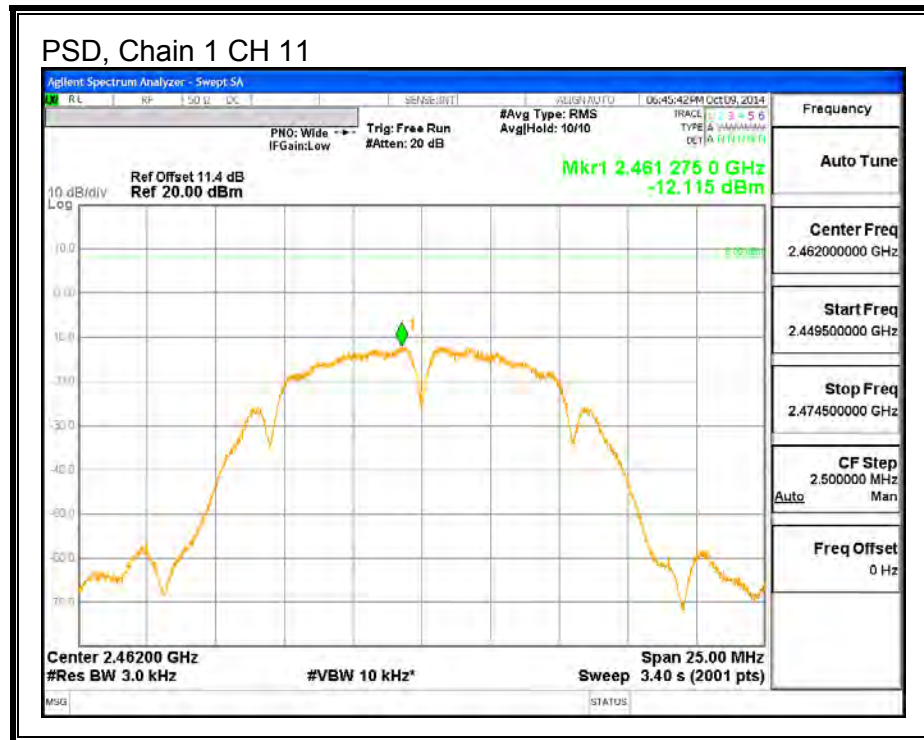
RESULTS

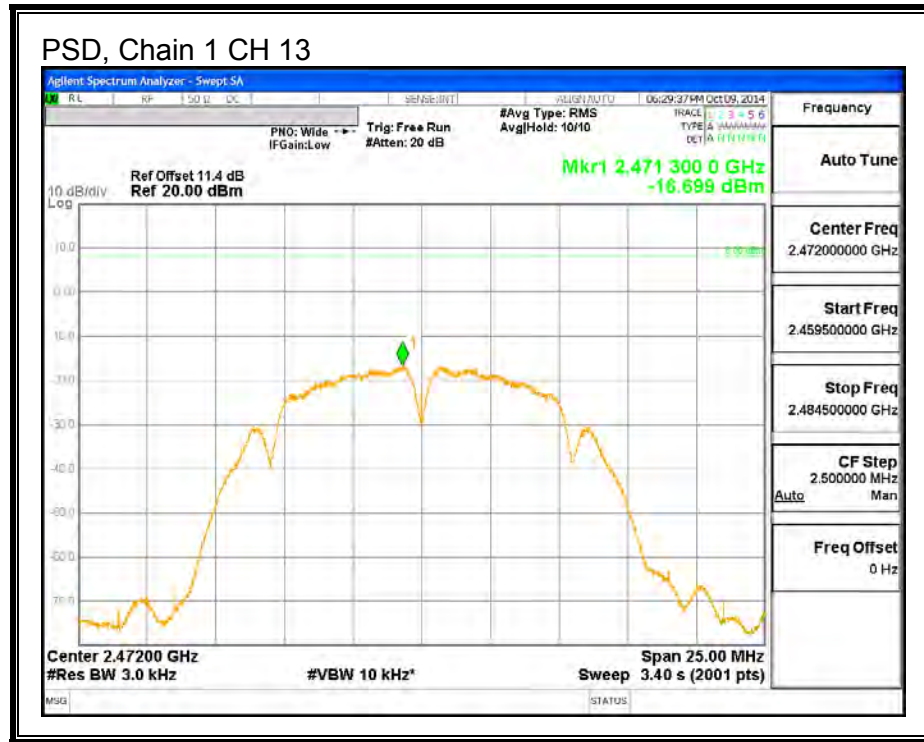
PSD Results

Channel	Frequency (MHz)	Chain 1 Meas (dBm)	Limit (dBm)	Margin (dB)
1	2412	-12.224	8.0	-20.2
6	2437	-11.948	8.0	-19.9
11	2462	-12.115	8.0	-20.1
12	2467	-13.885	8.0	-21.9
13	2472	-16.699	8.0	-24.7

PSD,







9.1.5. OUT-OF-BAND EMISSIONS

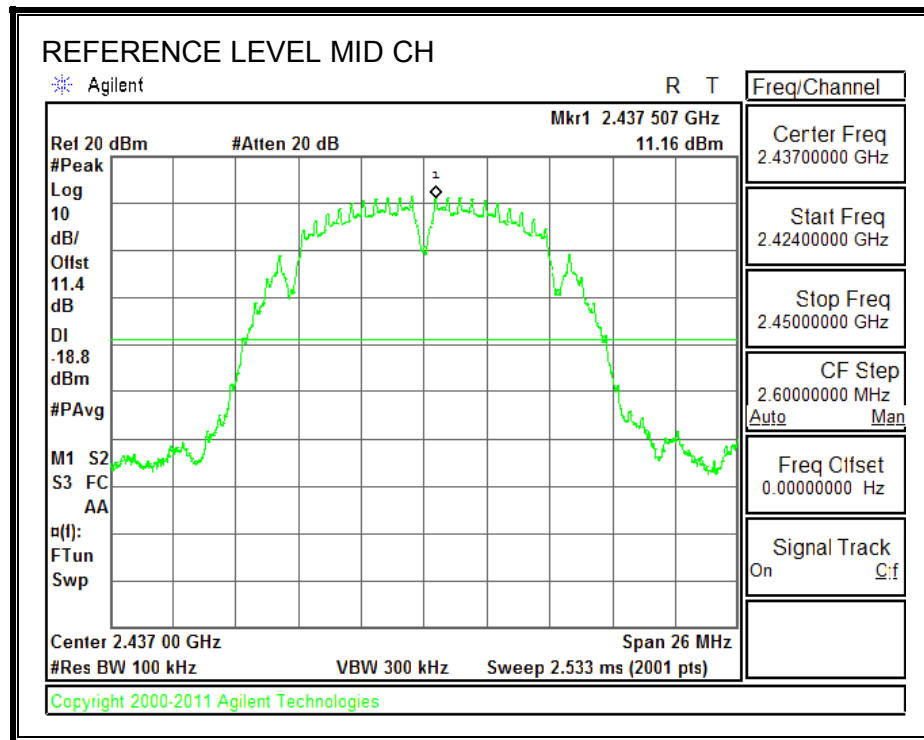
LIMITS

FCC §15.247 (d)

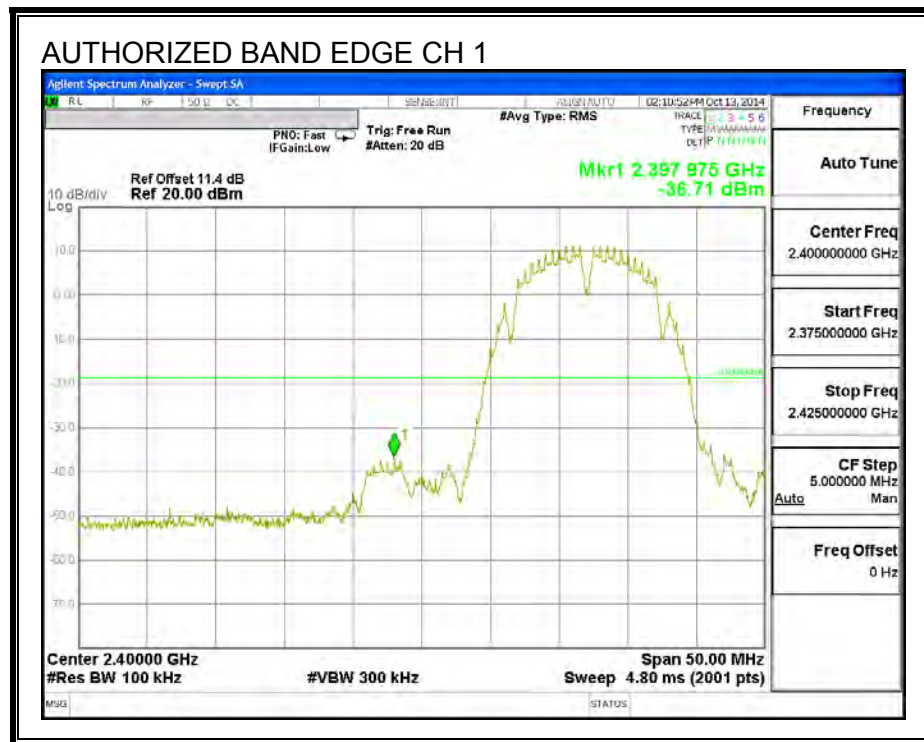
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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.

RESULTS

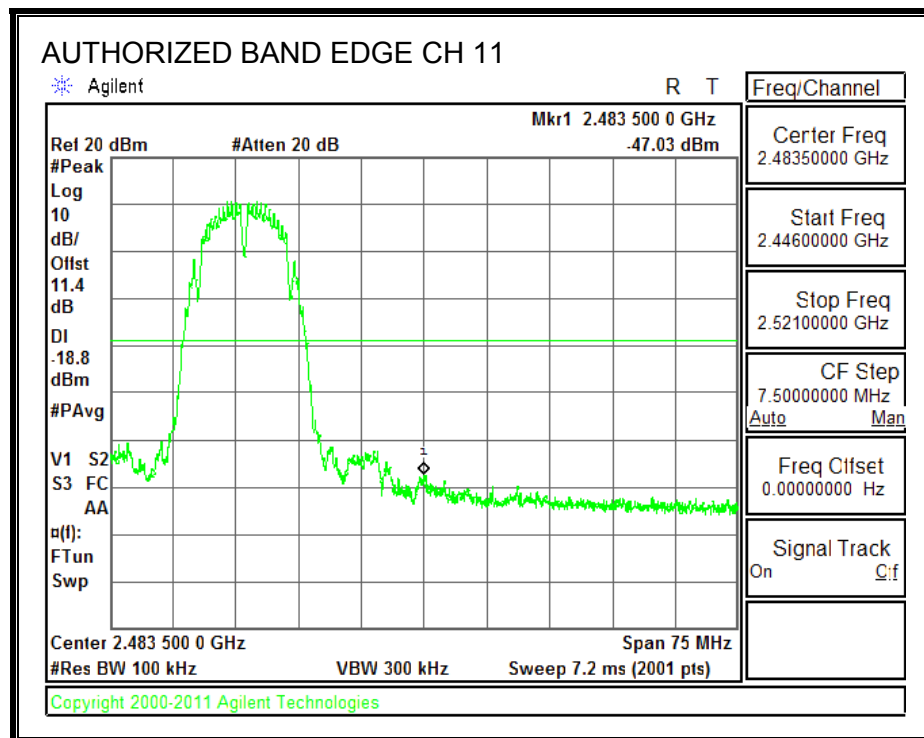
IN-BAND REFERENCE LEVEL

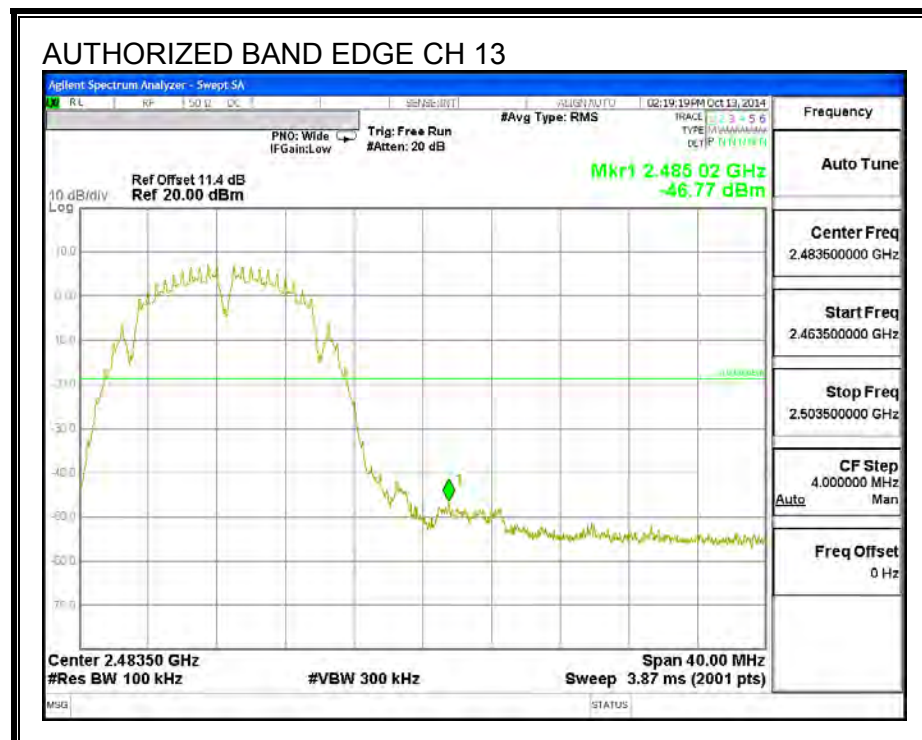
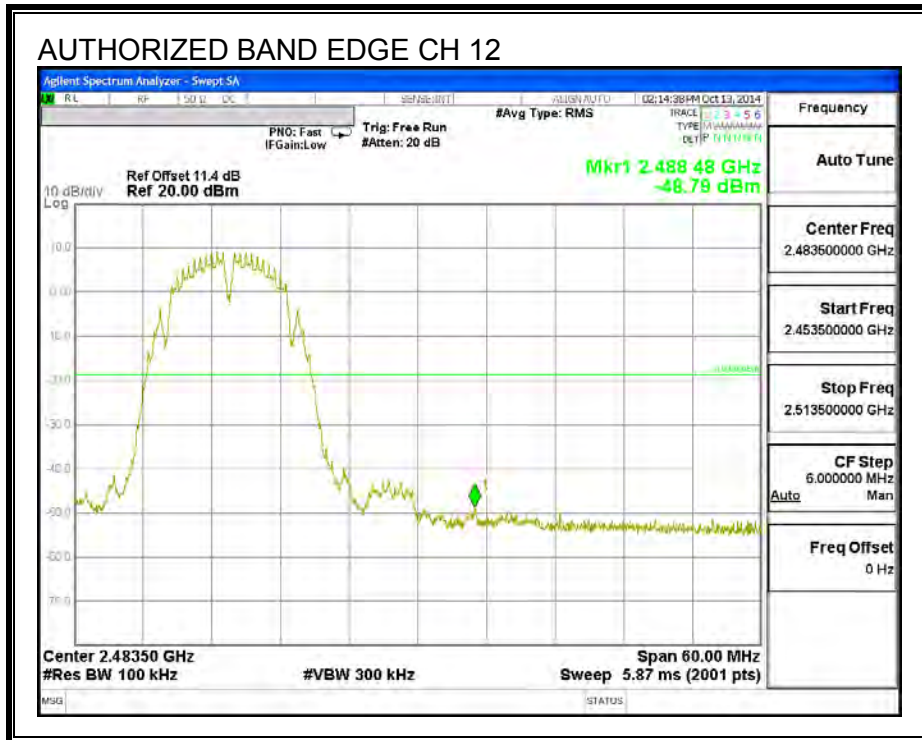


LOW CHANNEL BANDEDGE

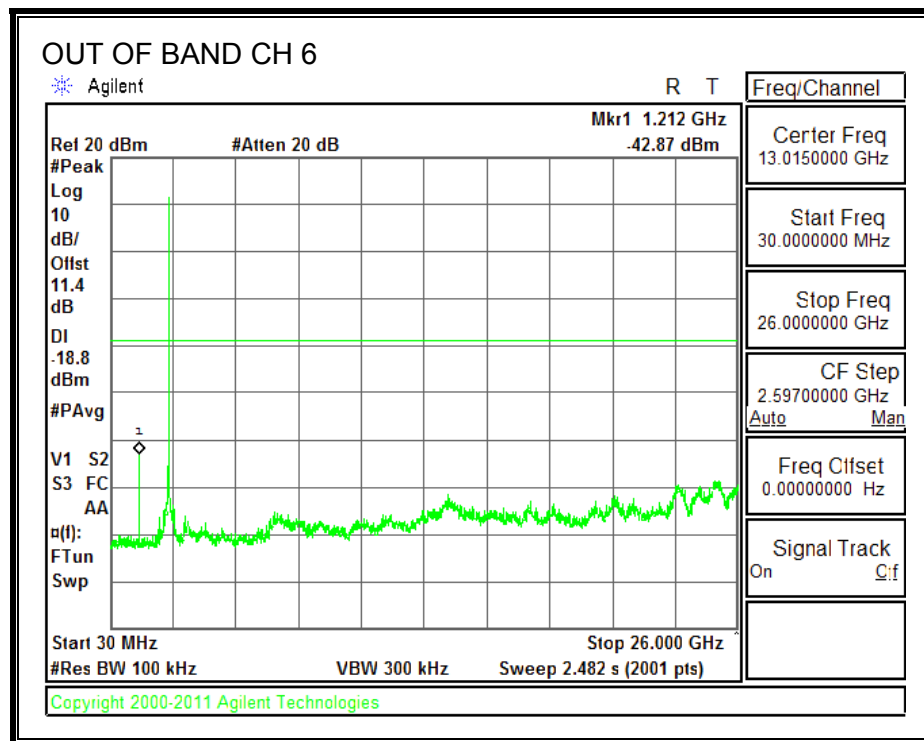
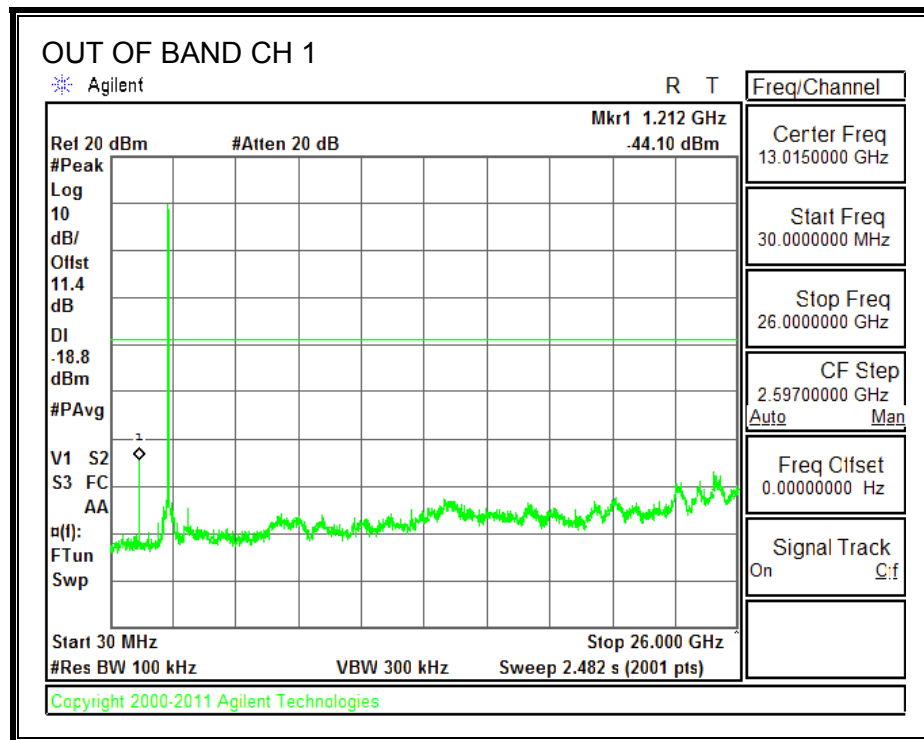


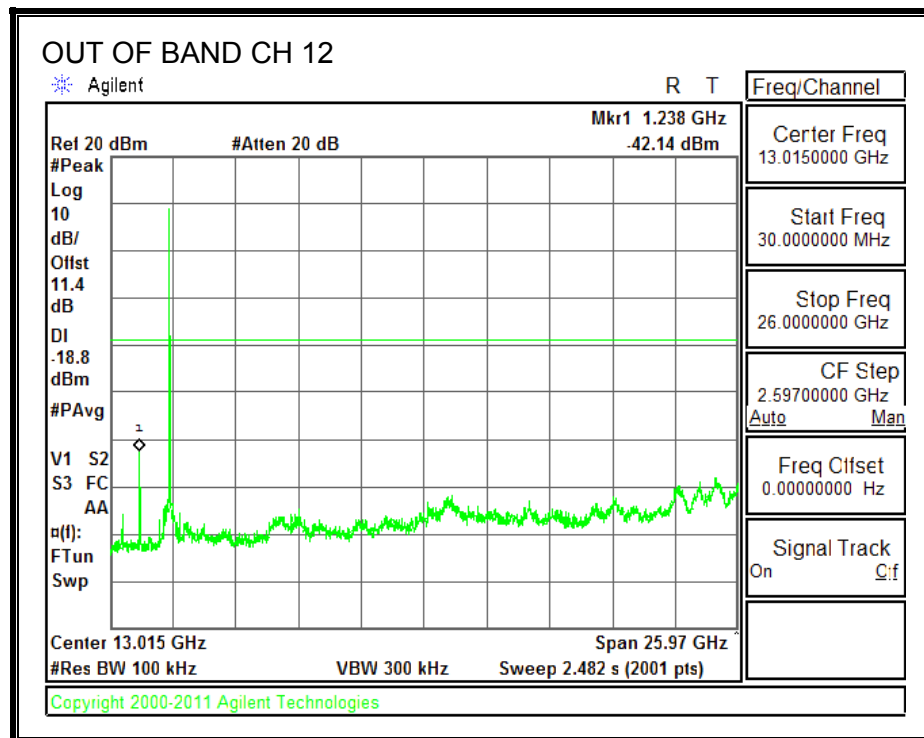
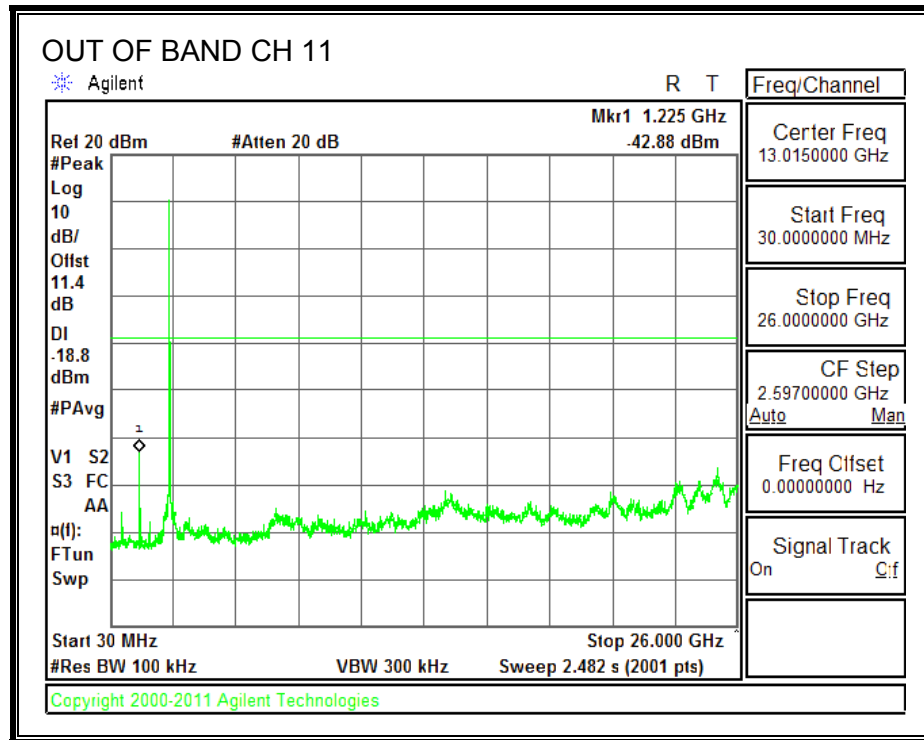
HIGH CHANNEL BANDEDGE

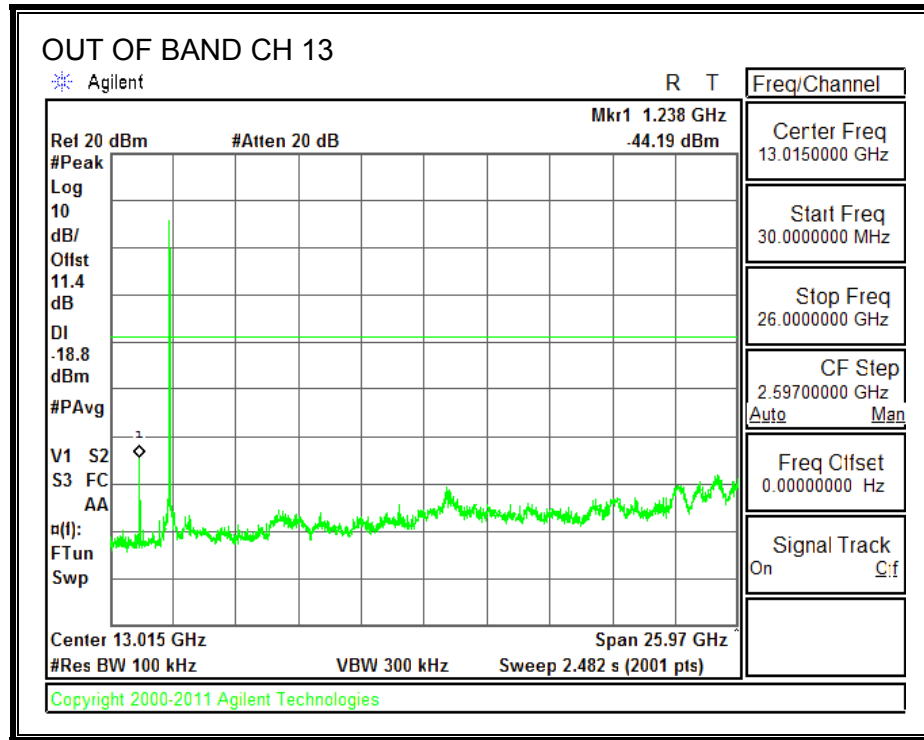




OUT-OF-BAND EMISSIONS







9.2. 802.11b 2Tx CDD MODE IN THE 2.4 GHz BAND

9.2.1. 6 dB BANDWIDTH

LIMITS

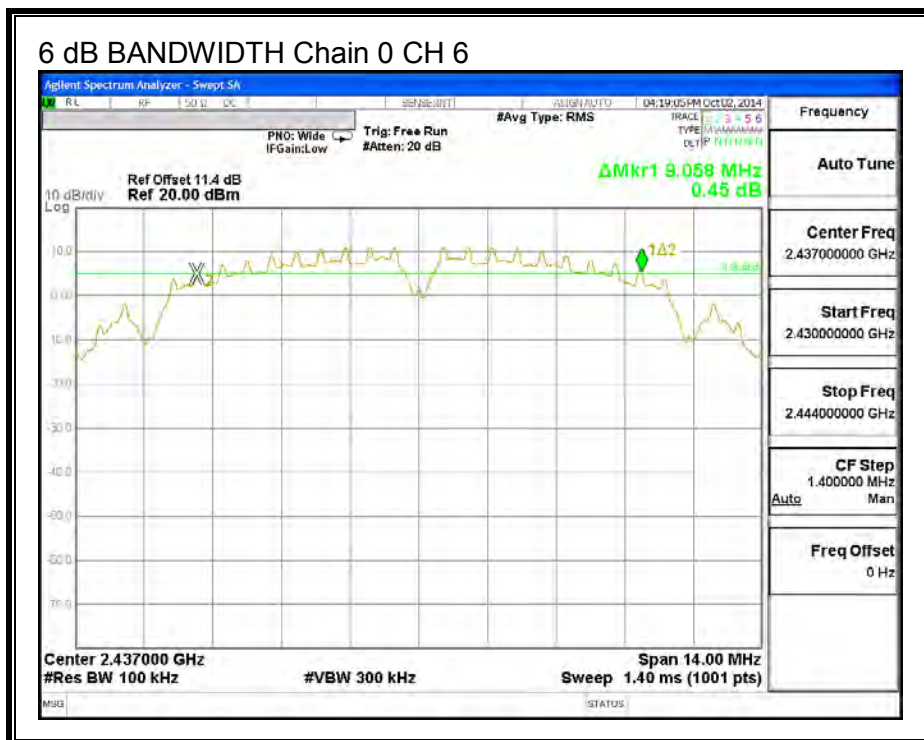
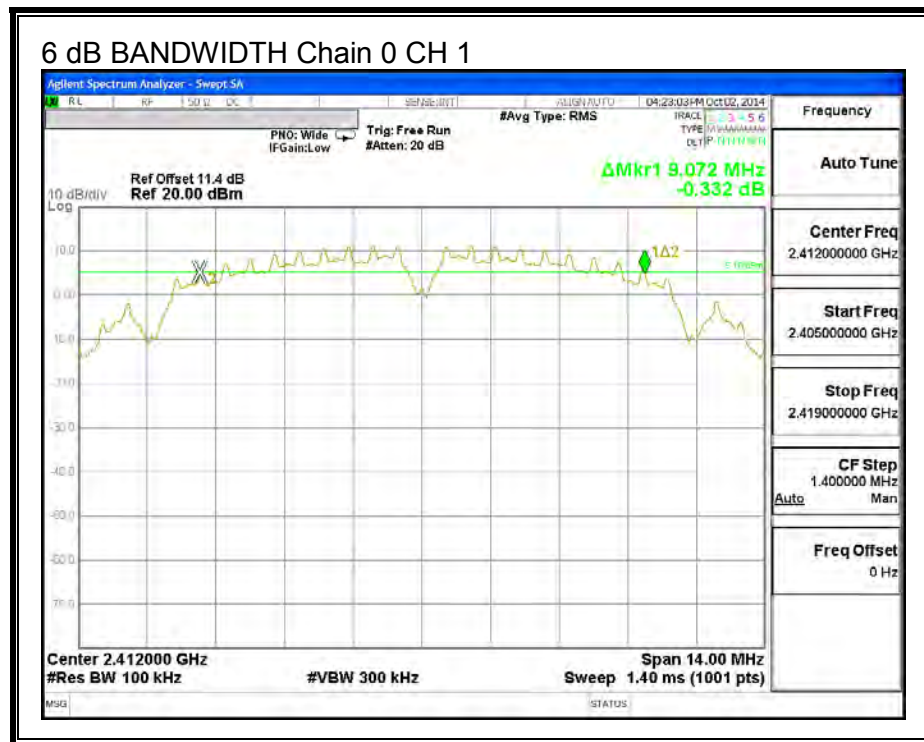
FCC §15.247 (a) (2)

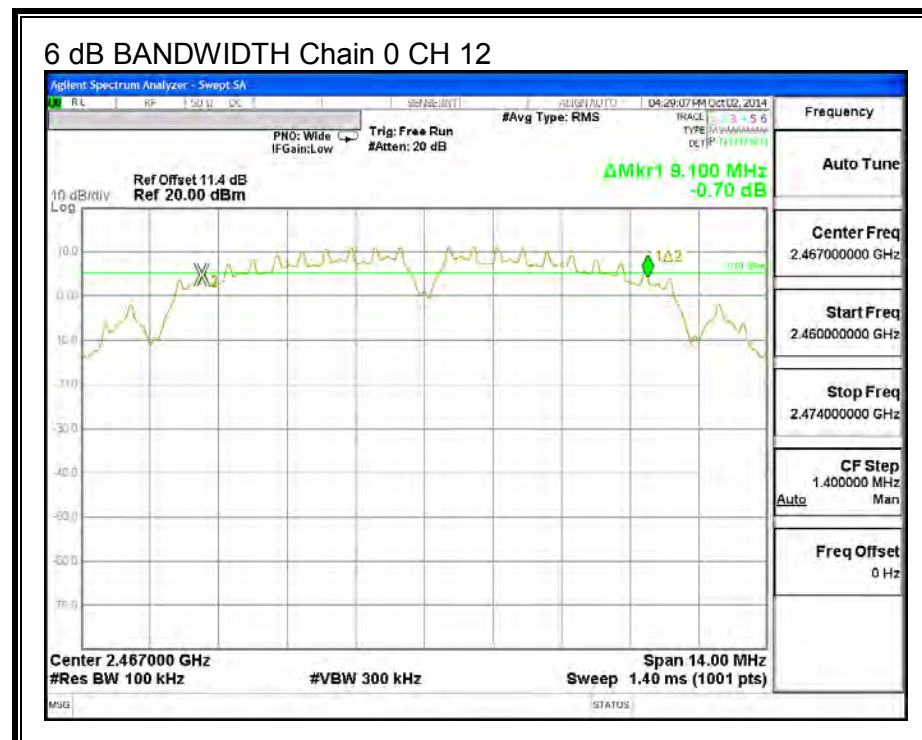
The minimum 6 dB bandwidth shall be at least 500 kHz.

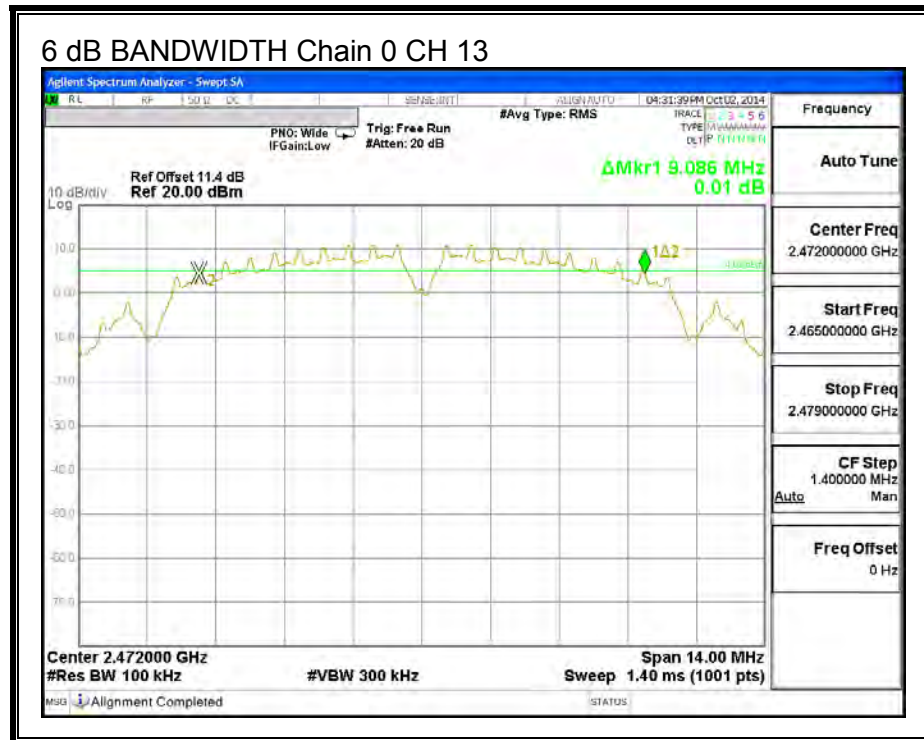
RESULTS

Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
1	2412	9.072	9.100	0.5
6	2437	9.058	9.100	0.5
11	2462	9.072	9.128	0.5
12	2467	9.100	9.100	0.5
13	2472	9.086	9.100	0.5

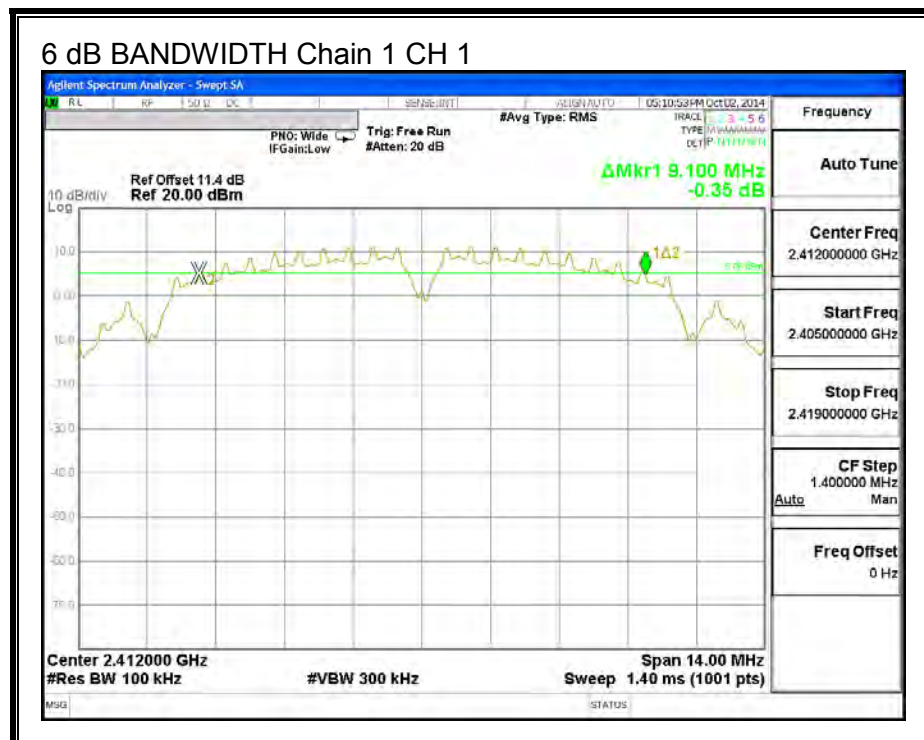
6 dB BANDWIDTH, Chain 0

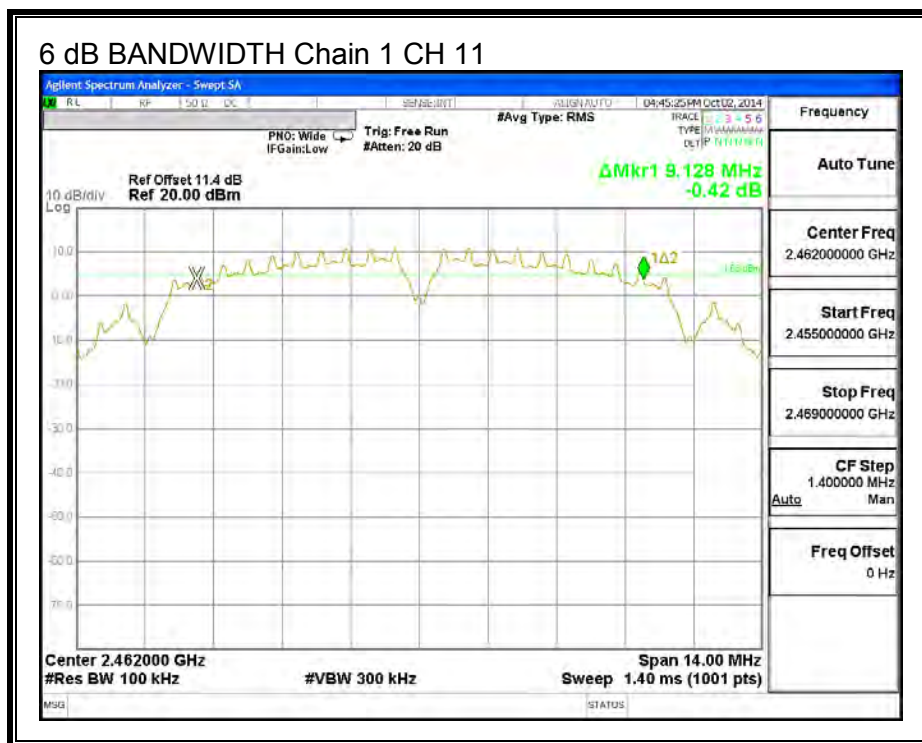


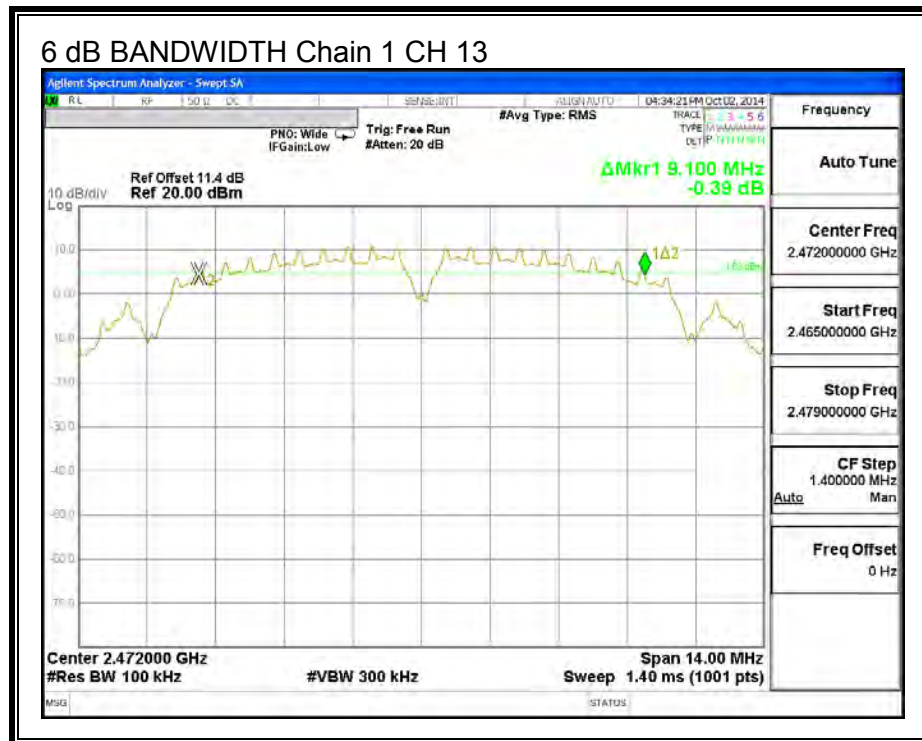
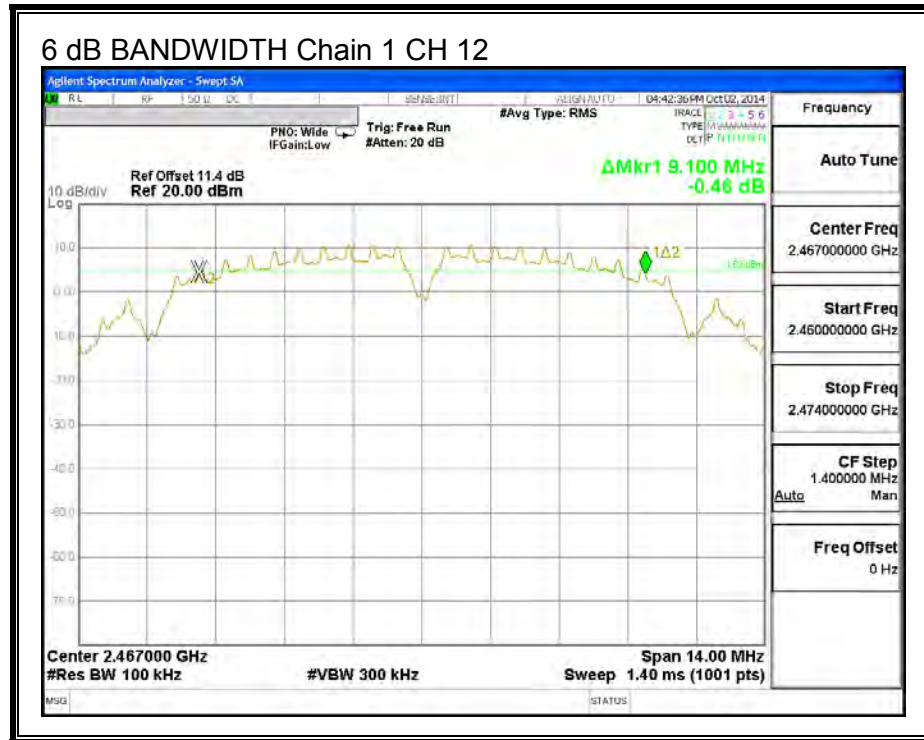




6 dB BANDWIDTH, Chain 1







9.2.2. 99% BANDWIDTH

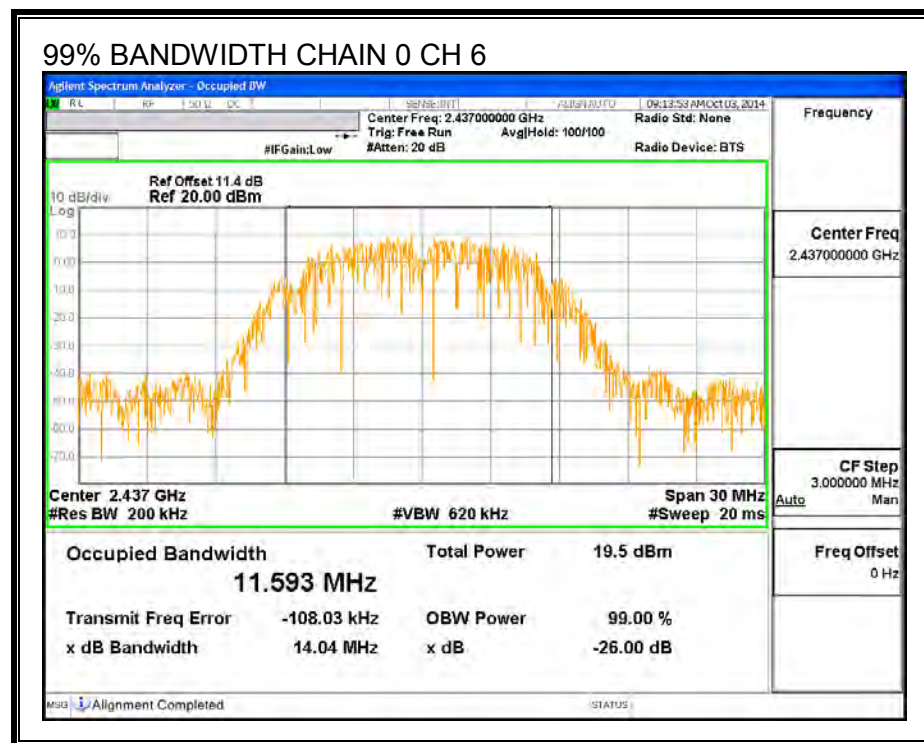
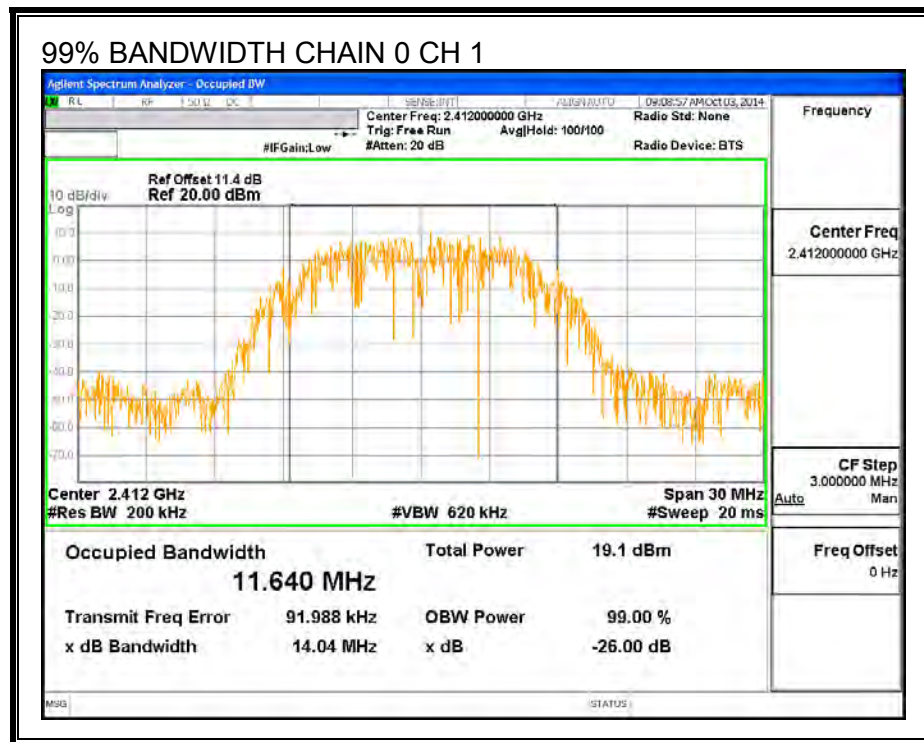
LIMITS

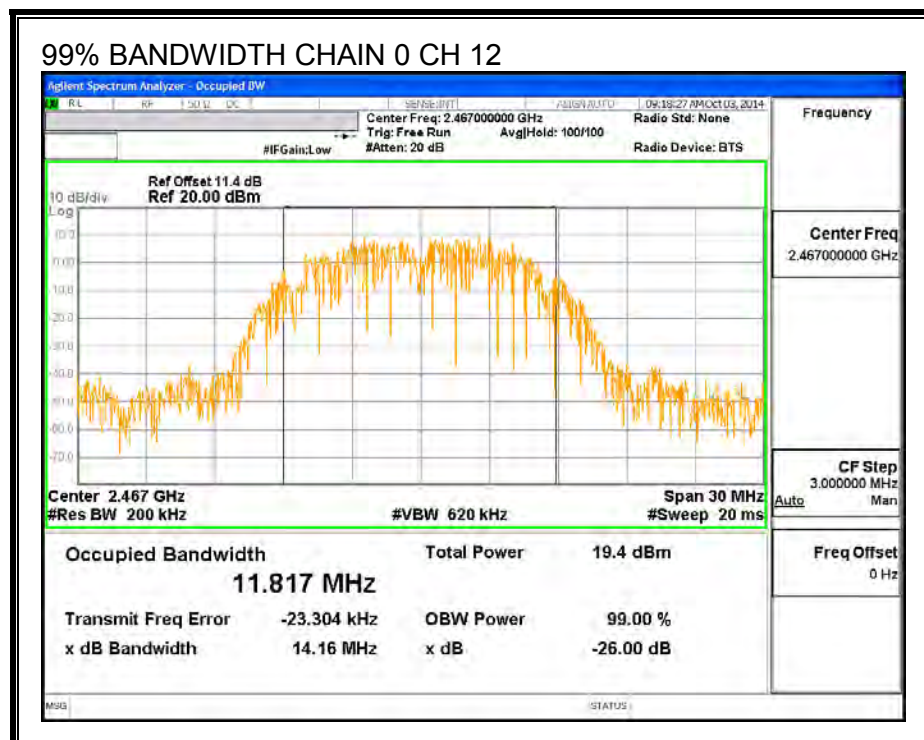
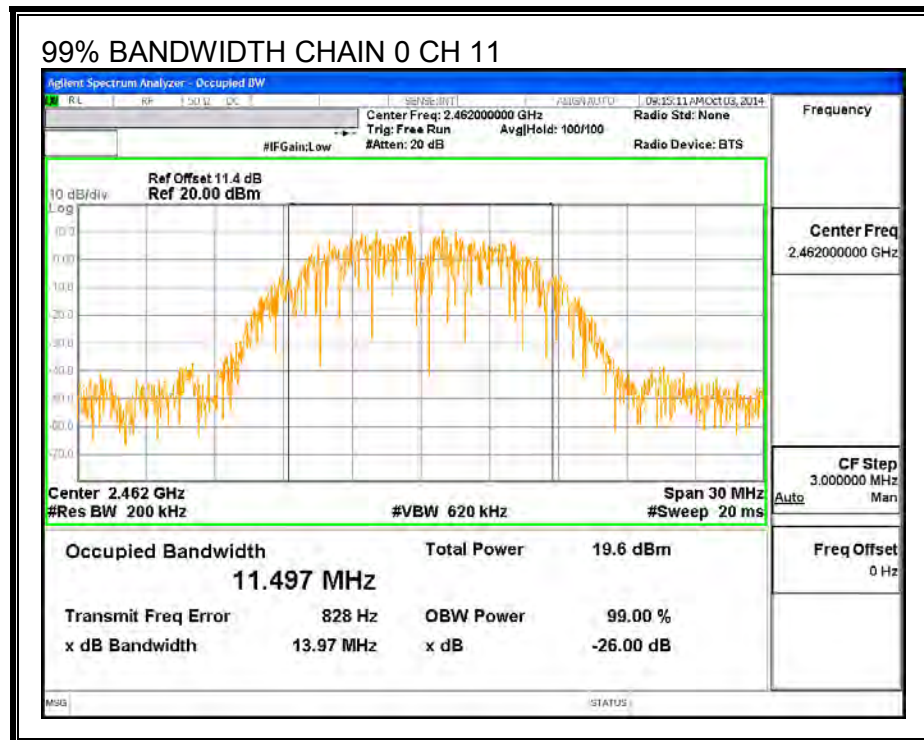
None; for reporting purposes only.

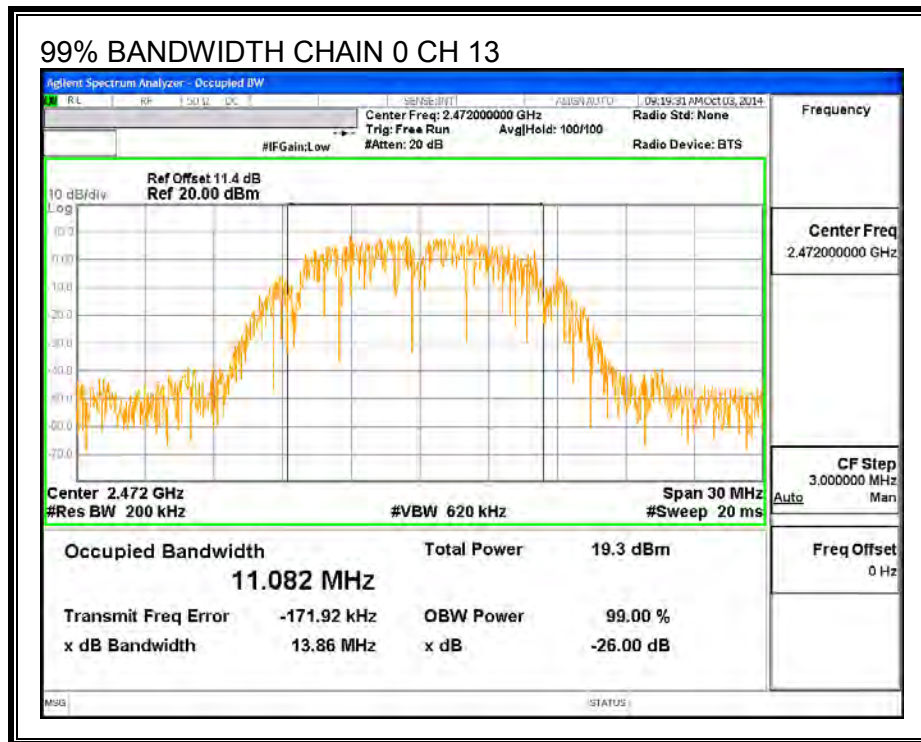
RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
1	2412	11.640	11.698
6	2437	11.593	11.565
11	2462	11.497	11.203
12	2467	11.817	11.533
13	2472	11.082	11.249

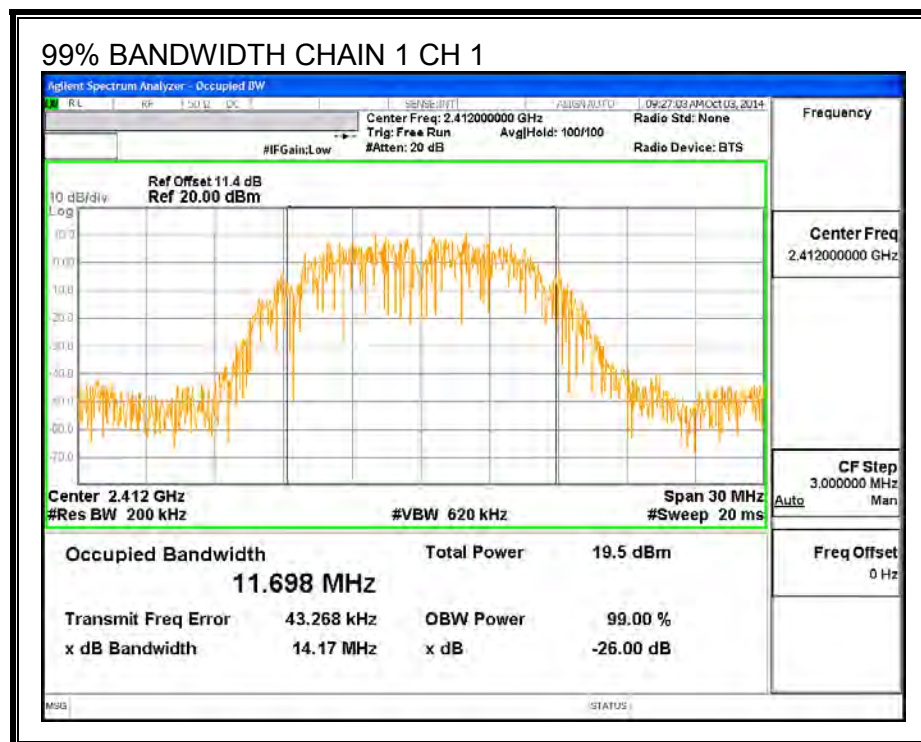
99% BANDWIDTH, CHAIN 0

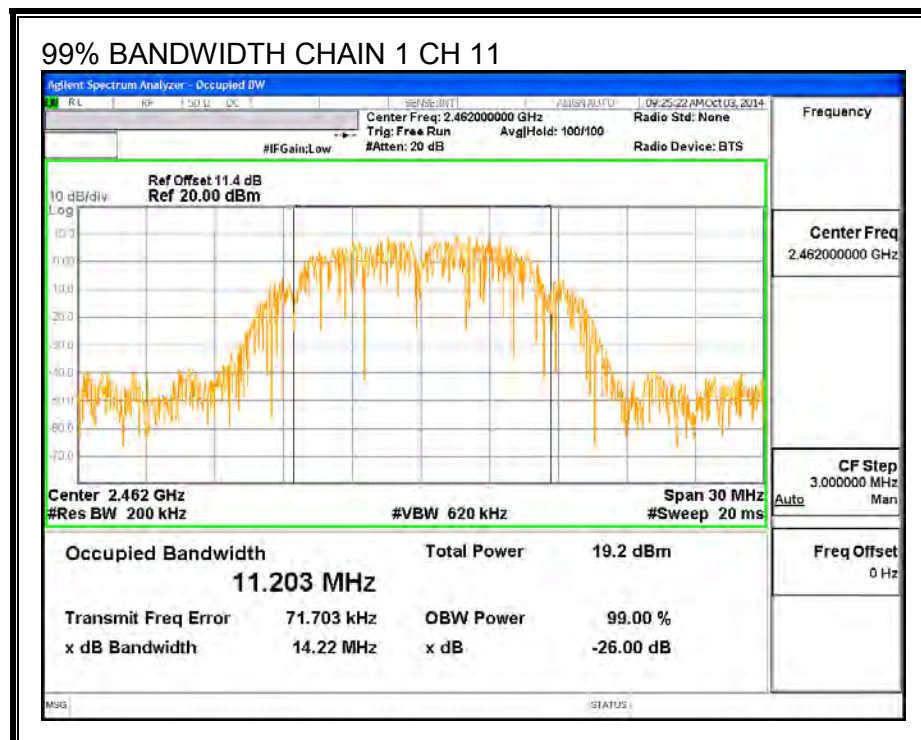
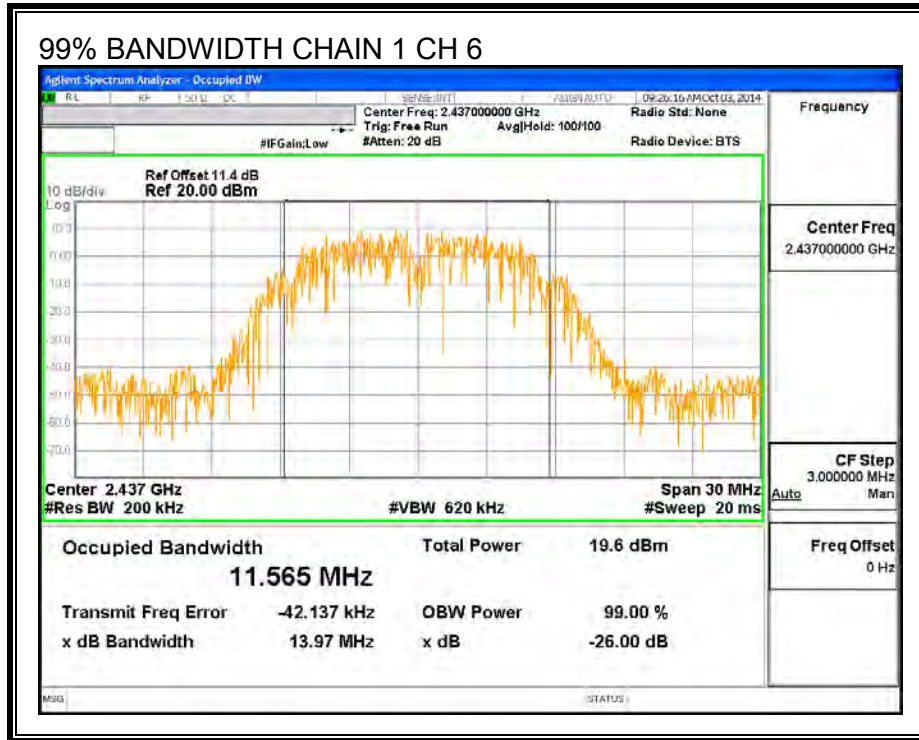




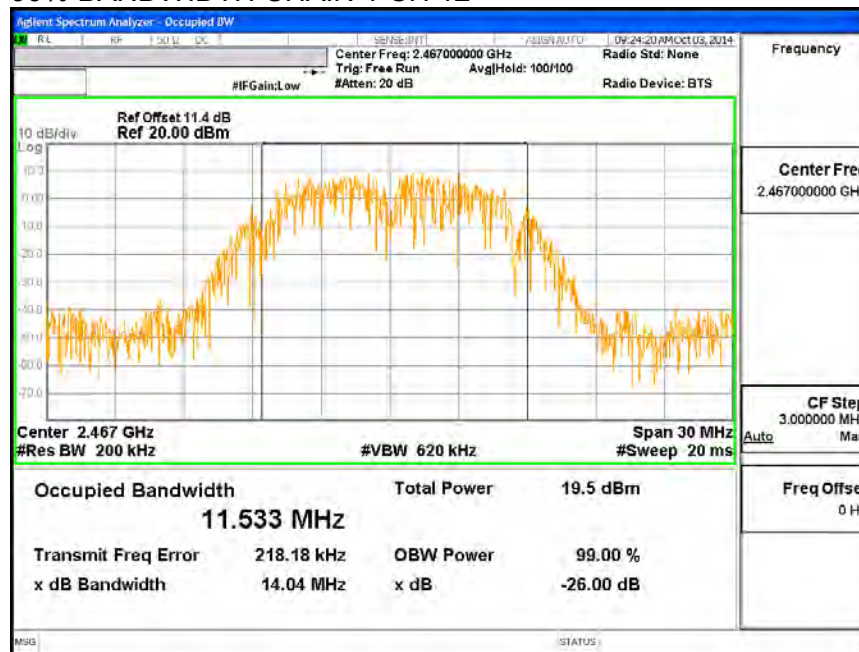


99% BANDWIDTH, CHAIN 1

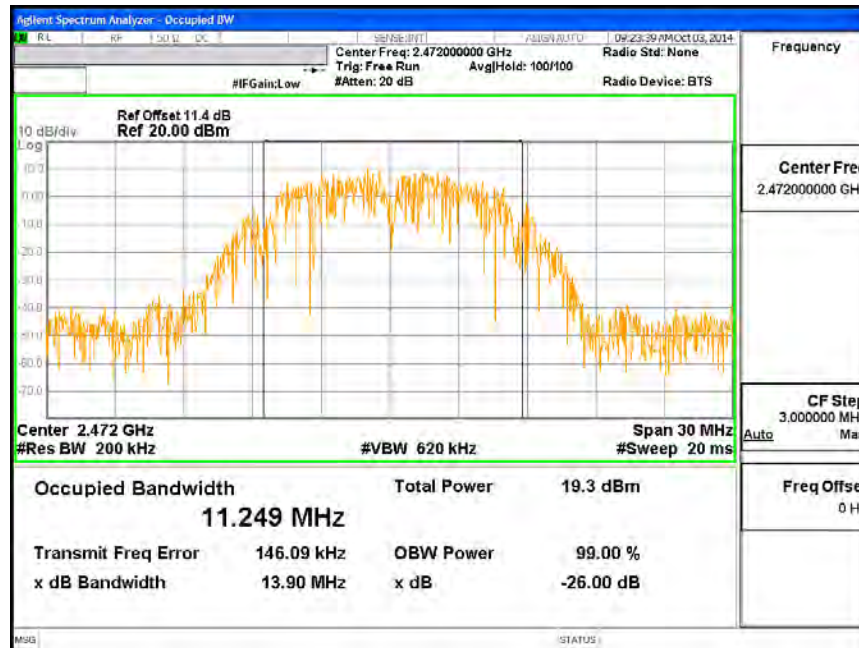




99% BANDWIDTH CHAIN 1 CH 12



99% BANDWIDTH CHAIN 1 CH 13



9.2.3. OUTPUT POWER

LIMITS

FCC §15.247

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 unequal among the chains. The directional gain is:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
2.24	3.40	2.86

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
1	2412.0	2.86	30.00	30.00	36.00	30.00
6	2437.0	2.86	30.00	30.00	36.00	30.00
11	2462.0	2.86	30.00	30.00	36.00	30.00
12	2467.0	2.86	30.00	30.00	36.00	30.00
13	2472.0	2.86	30.00	30.00	36.00	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)
1	2412.0	19.49	19.40	22.46	30.00	-7.54
6	2437.0	19.50	19.48	22.50	30.00	-7.50
11	2462.0	18.00	17.98	21.00	30.00	-9.00
12	2467.0	15.50	15.49	18.51	30.00	-11.49
13	2472.0	13.00	12.88	15.95	30.00	-14.05

9.2.4. PSD

LIMITS

FCC §15.247

DIRECTIONAL ANTENNA GAIN

The TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

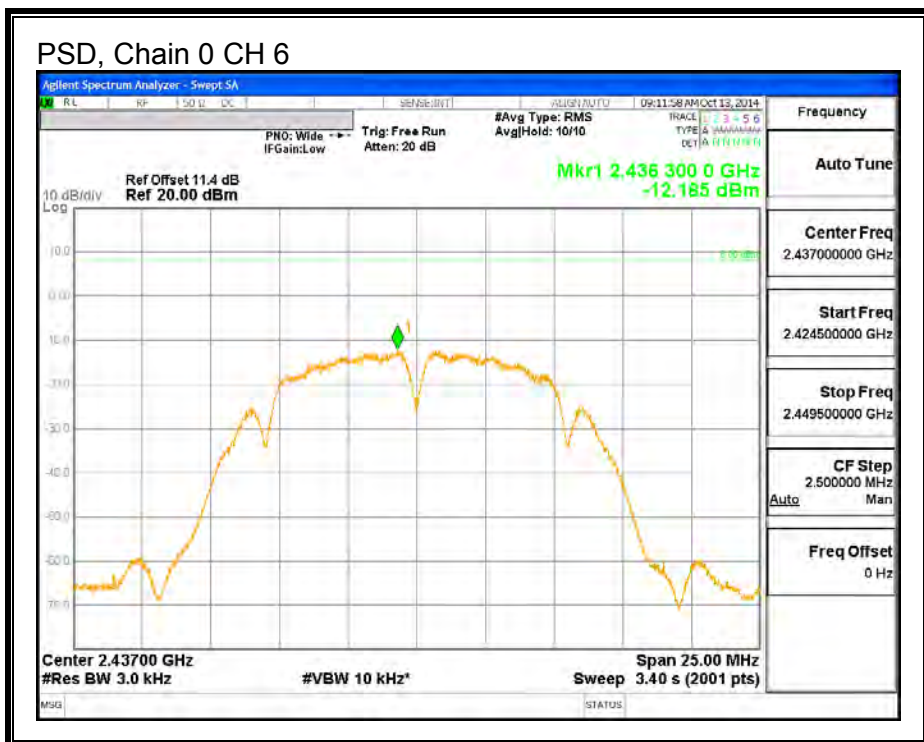
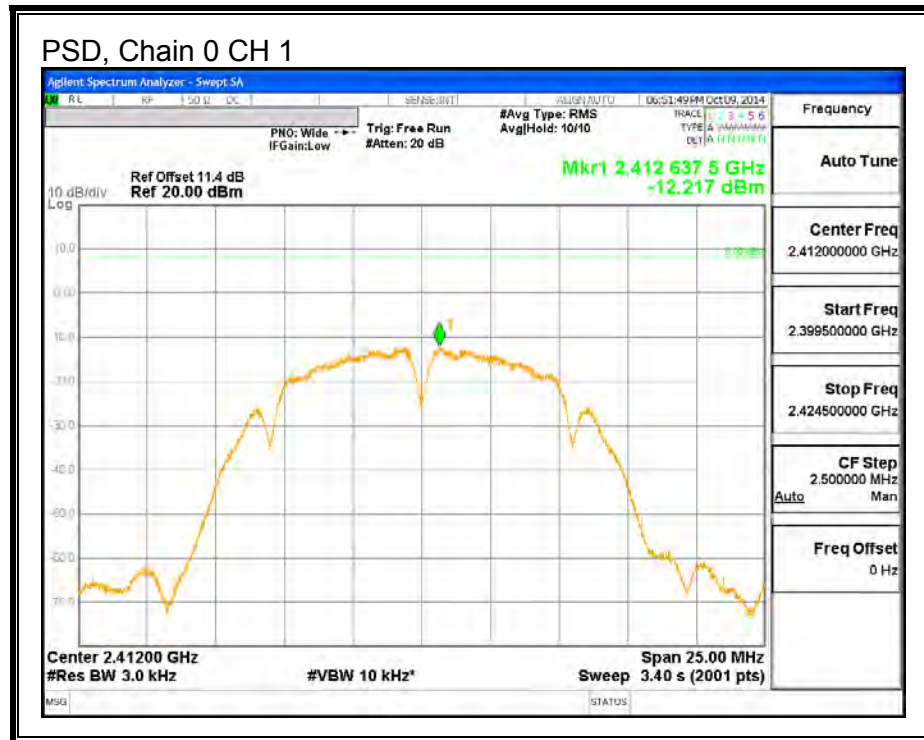
Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
2.24	3.40	5.85

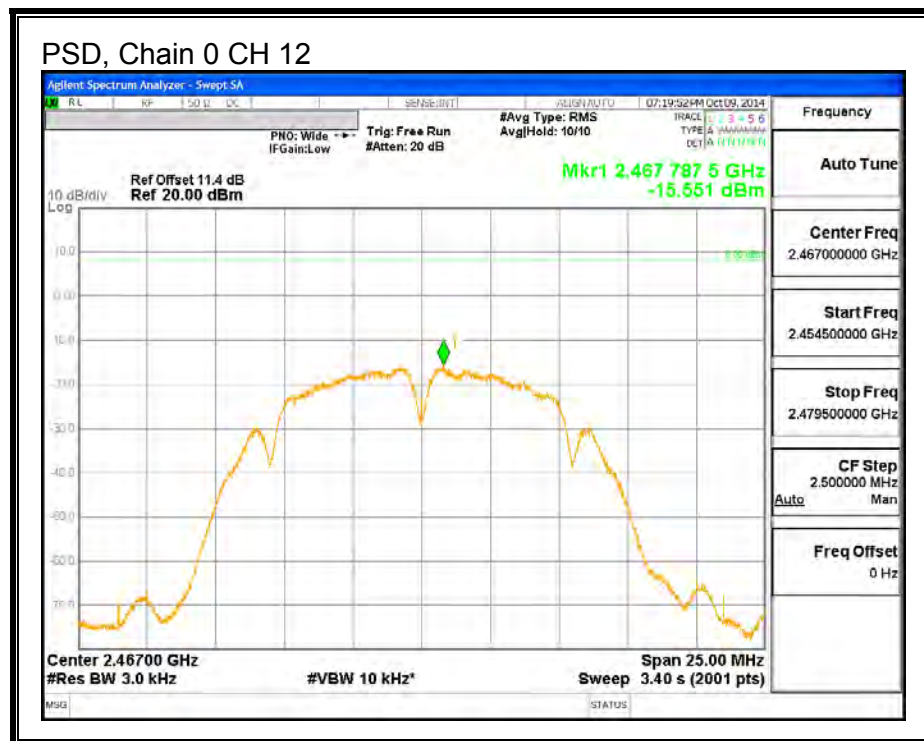
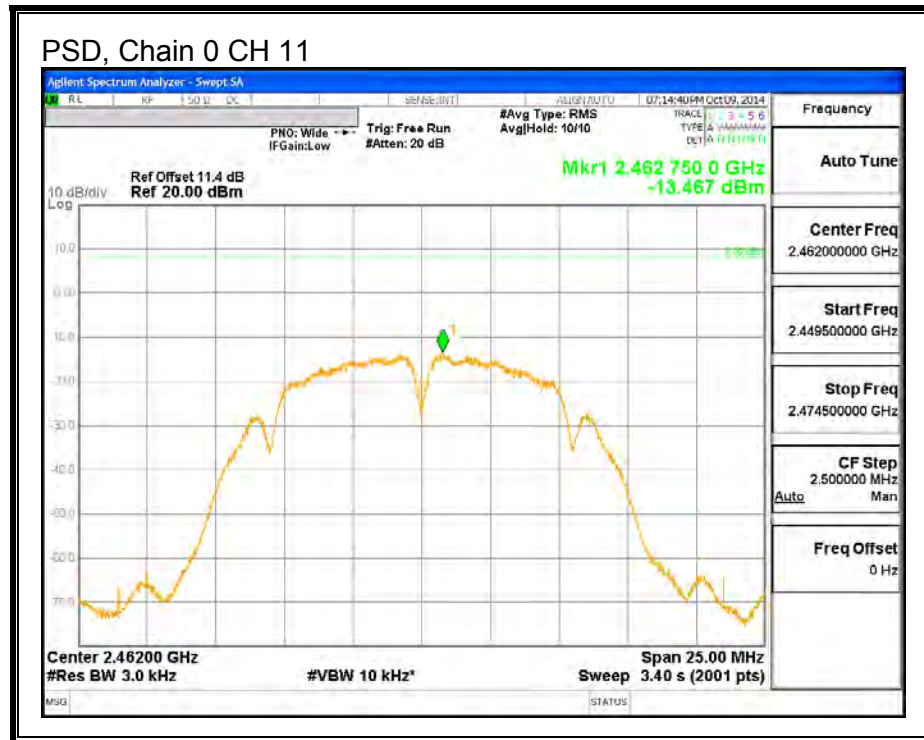
RESULTS

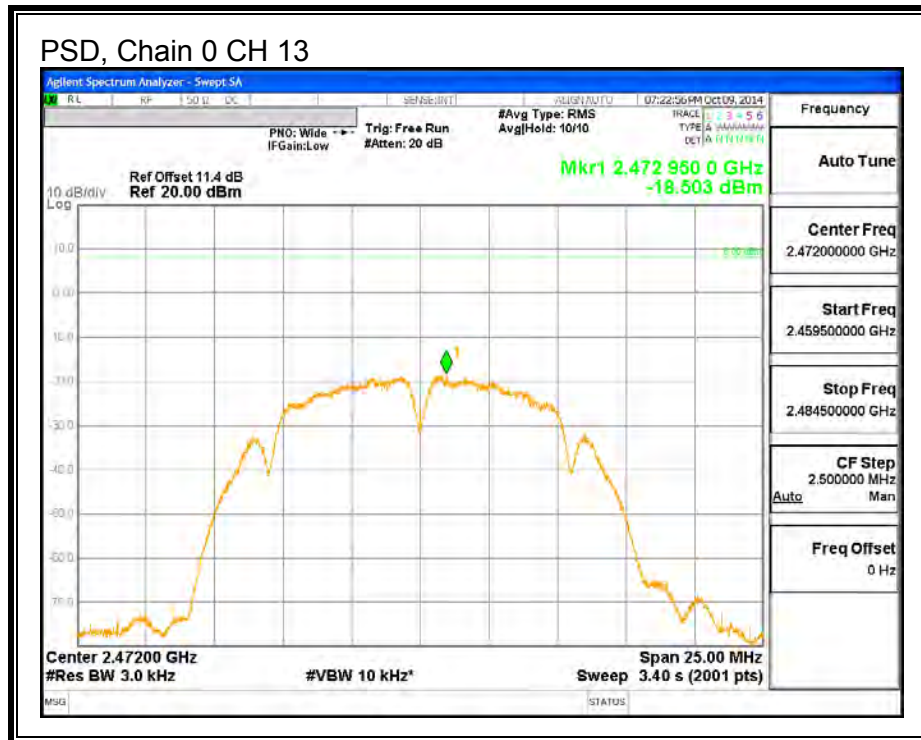
PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Chain 1 Meas (dBm)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
1	2412	-12.217	-11.837	-9.01	8.0	-17.0
6	2437	-12.185	-11.813	-8.98	8.0	-17.0
11	2462	-13.467	-13.795	-10.62	8.0	-18.6
12	2467	-15.551	-16.382	-12.94	8.0	-20.9
13	2472	-18.503	-18.819	-15.65	8.0	-23.6

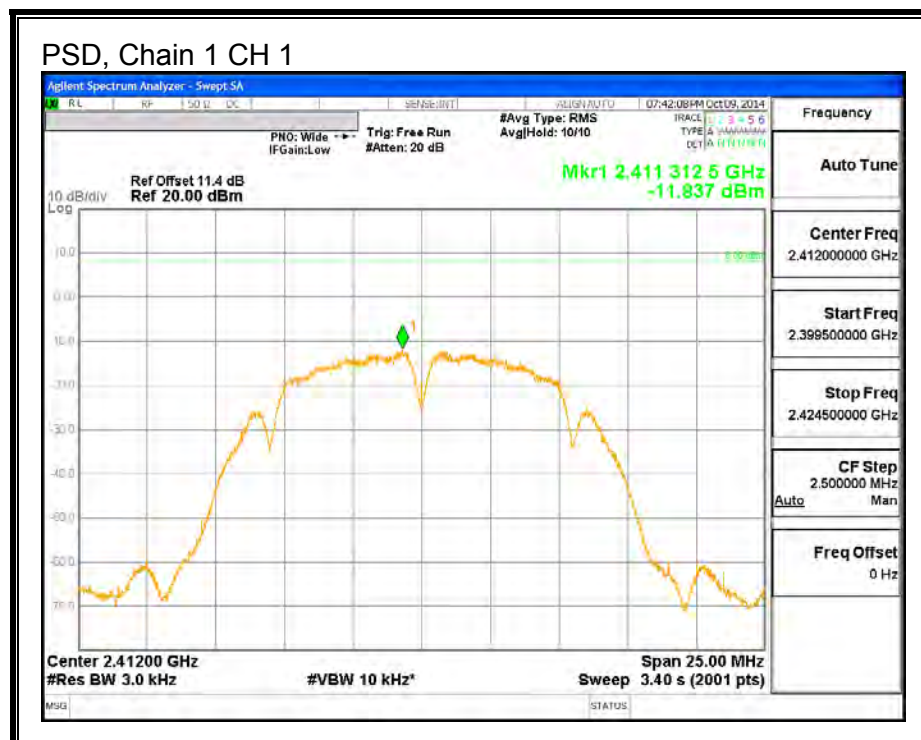
PSD

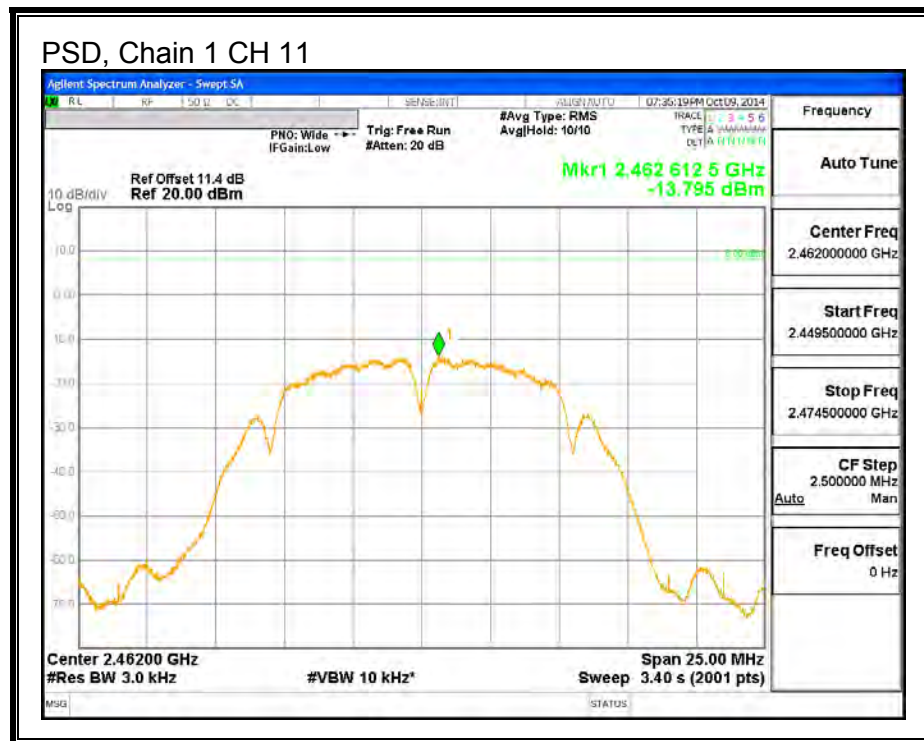
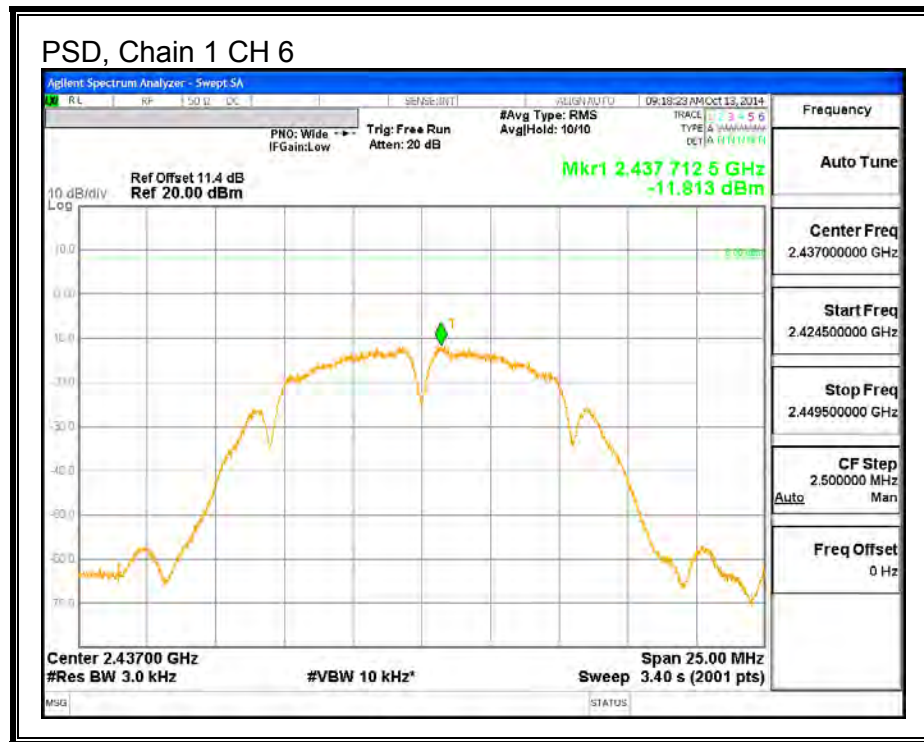


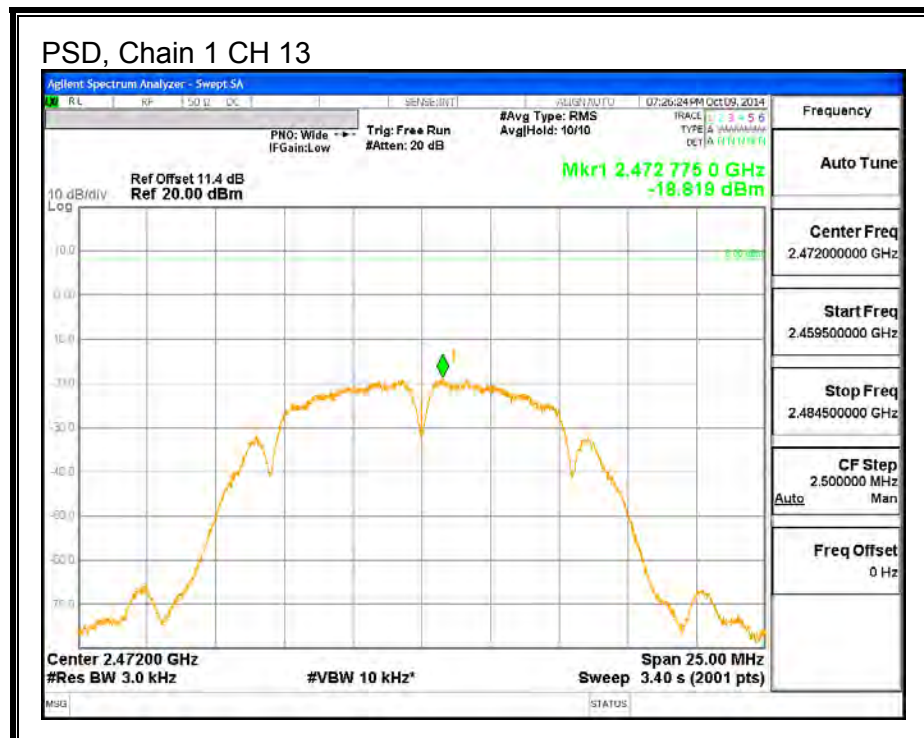
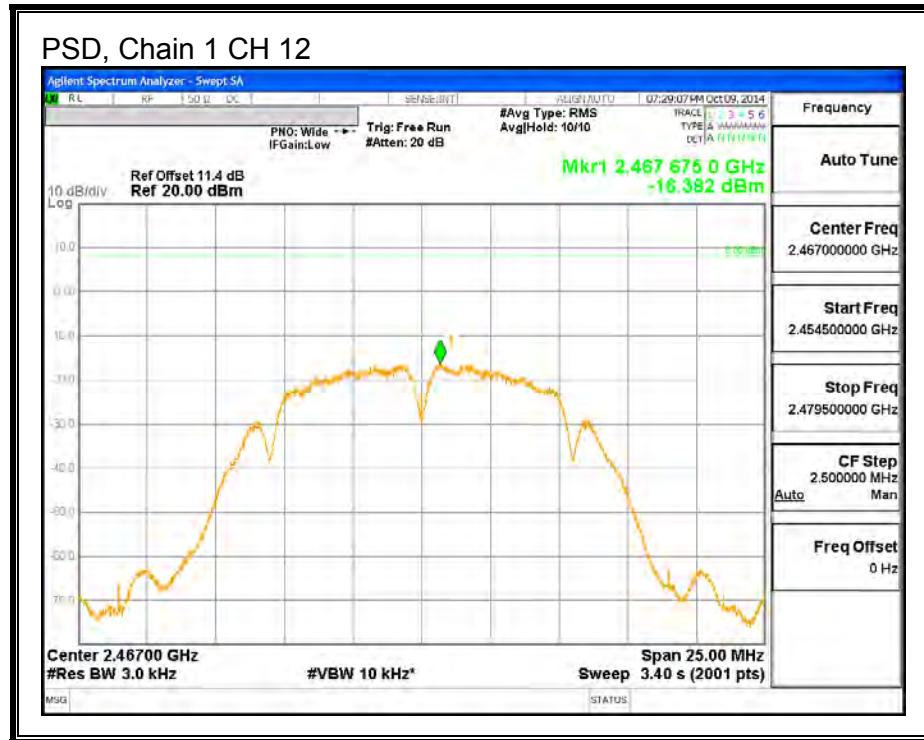




PSD, Chain 1







9.2.5. OUT-OF-BAND EMISSIONS

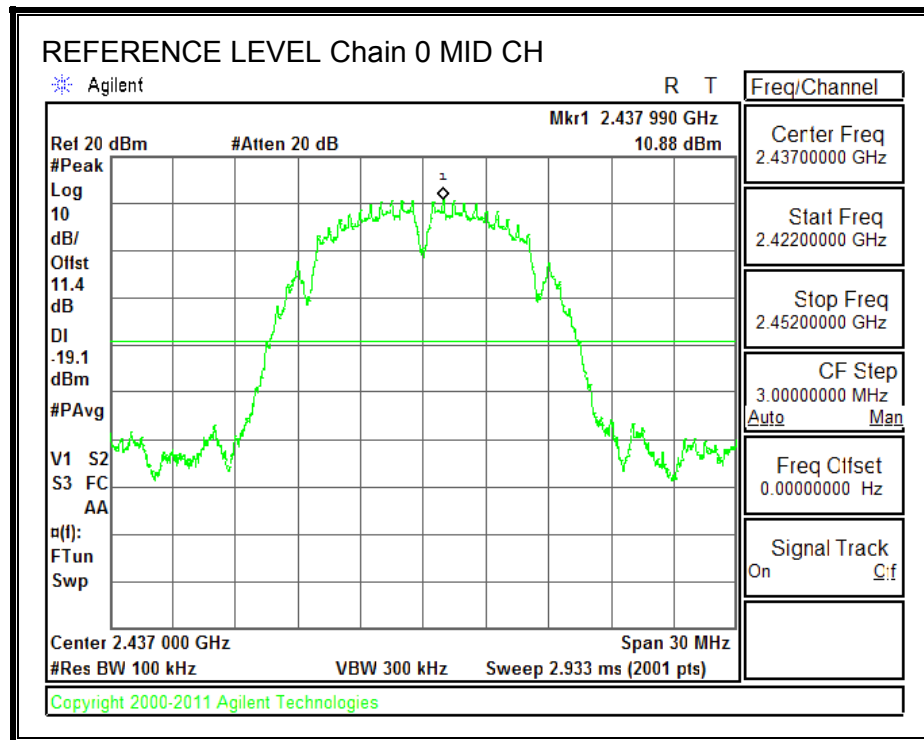
LIMITS

FCC §15.247 (d)

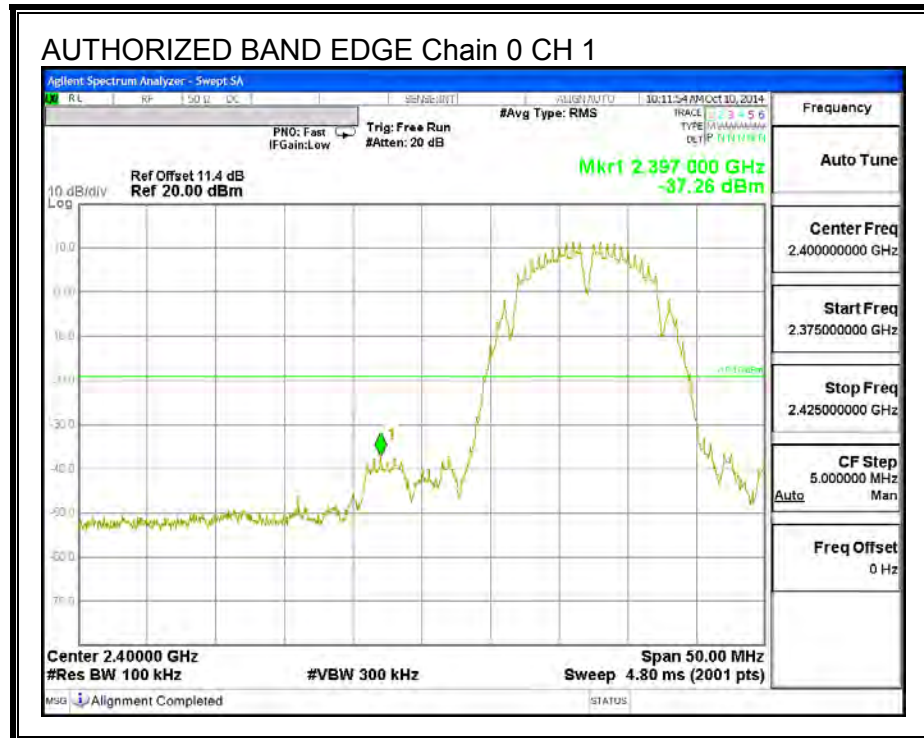
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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.

RESULTS

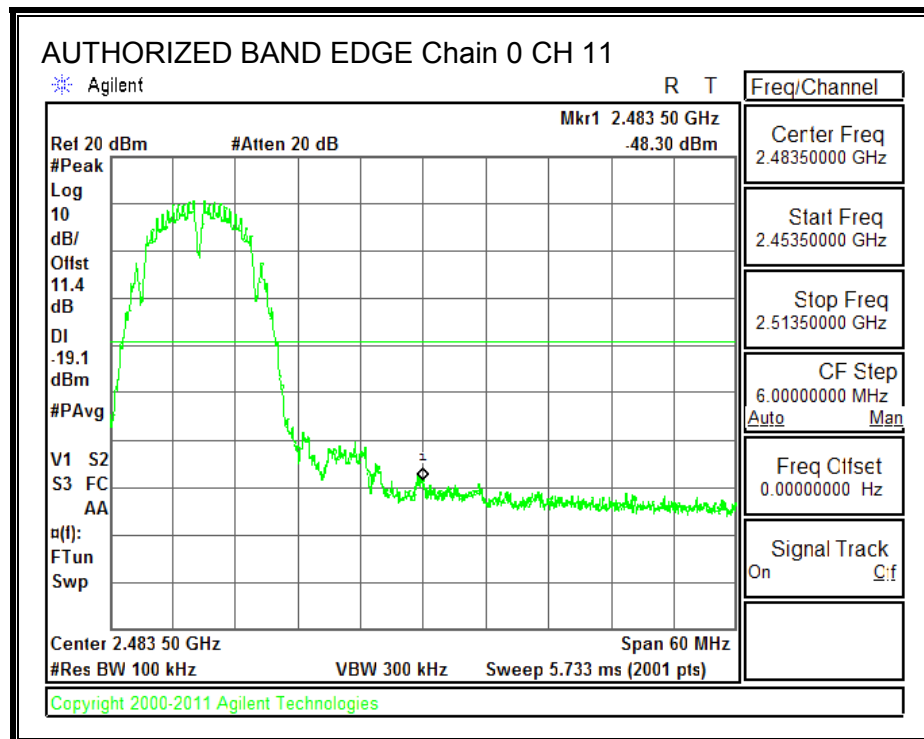
IN-BAND REFERENCE LEVEL, Chain 0

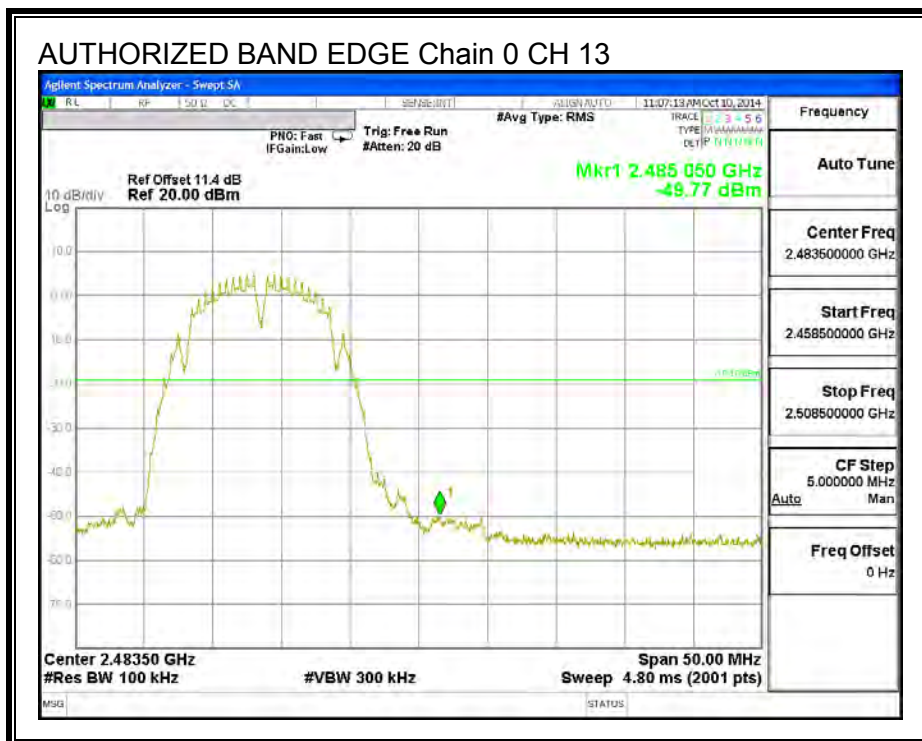
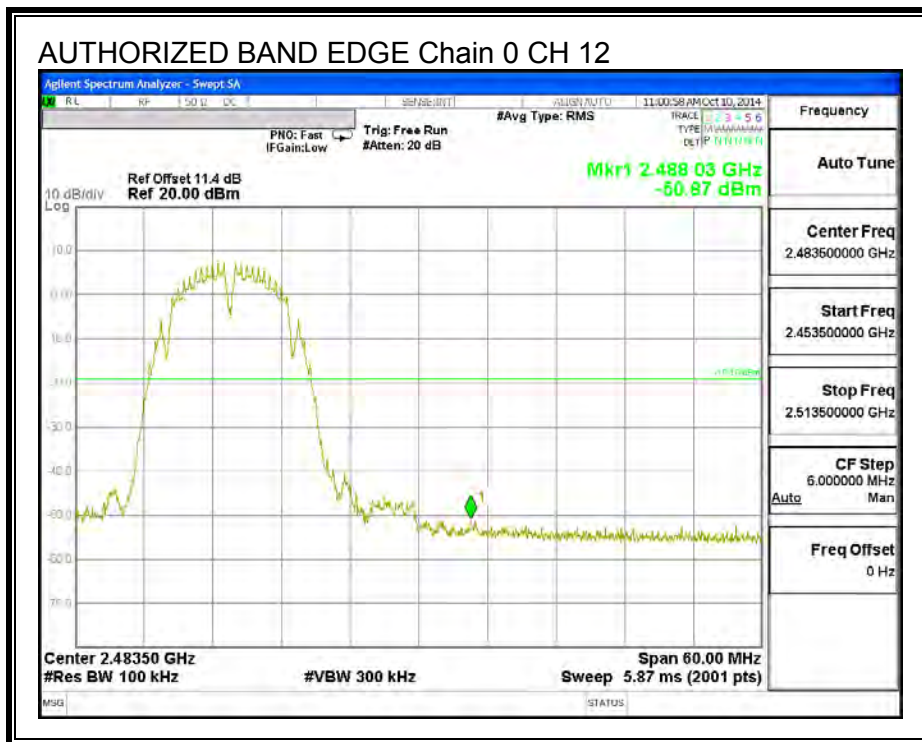


LOW CHANNEL BANDEDGE, Chain 0

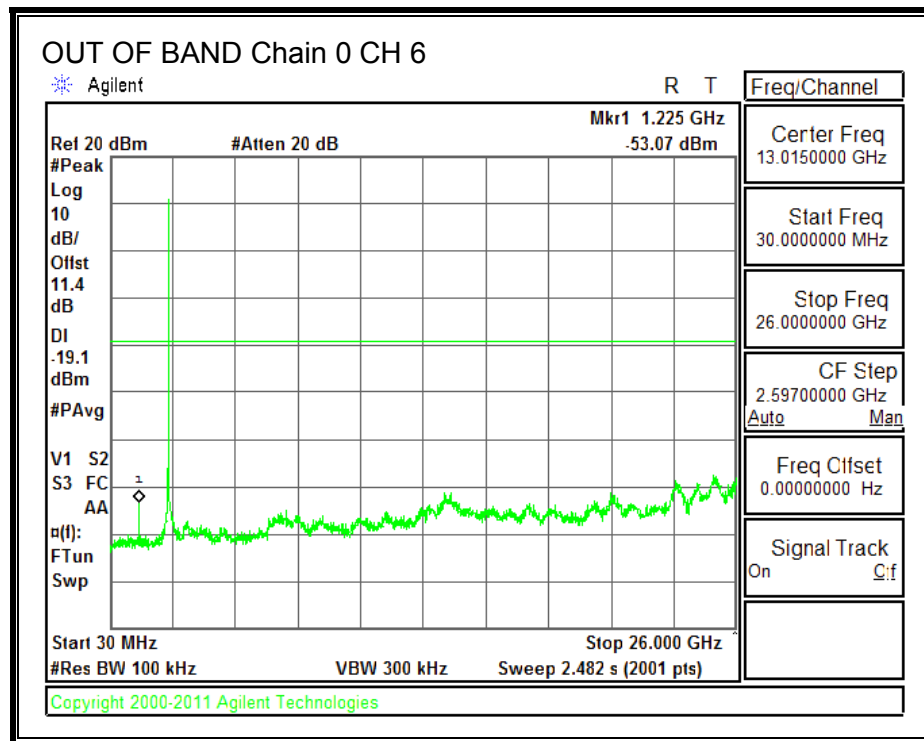
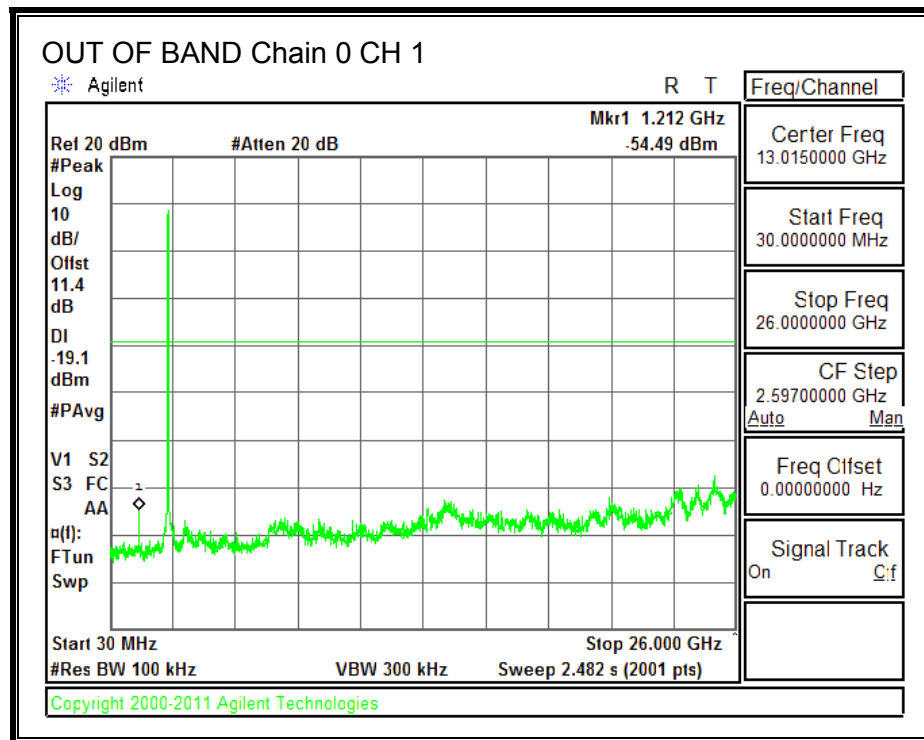


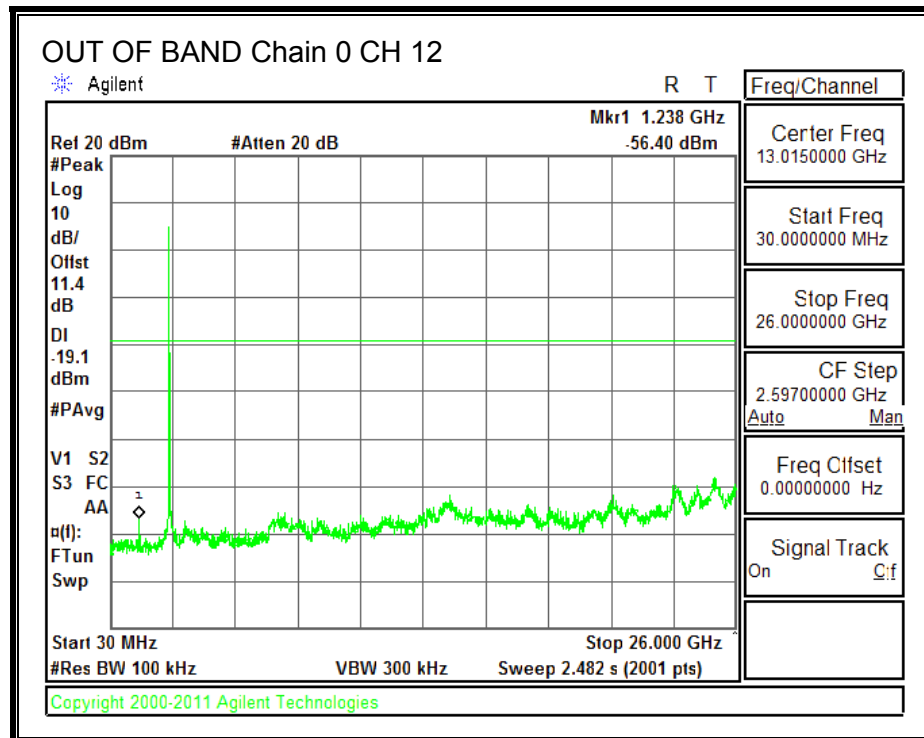
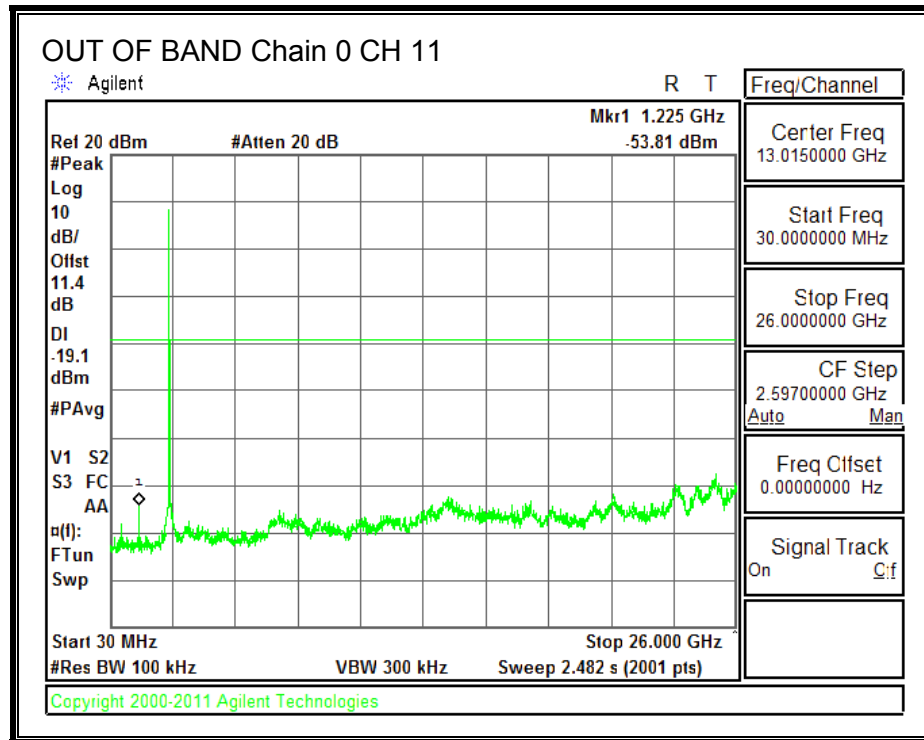
HIGH CHANNEL BANDEDGE, Chain 0

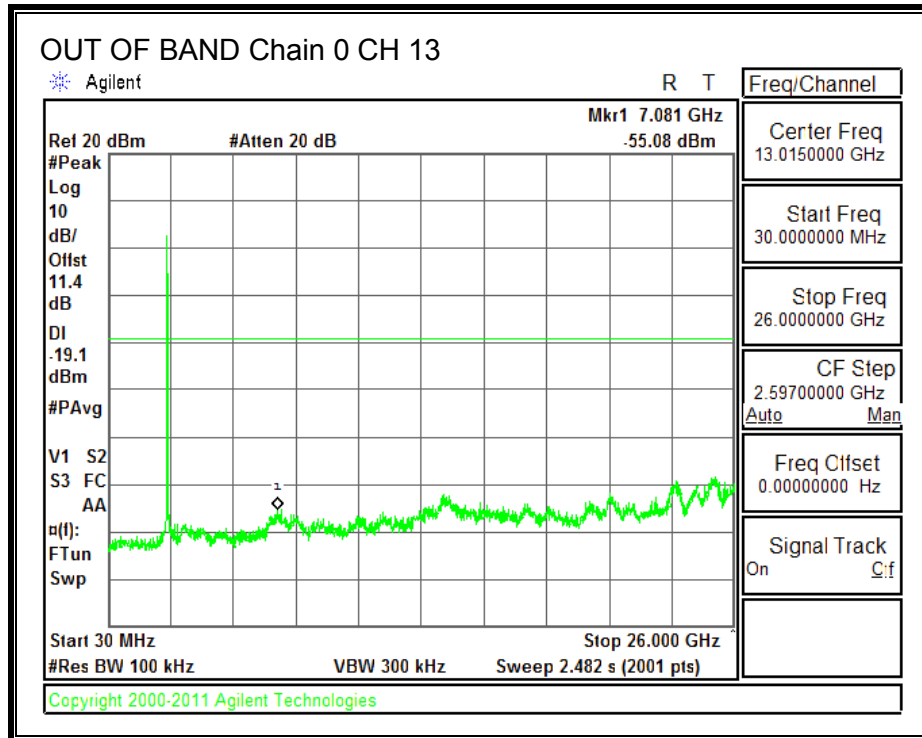




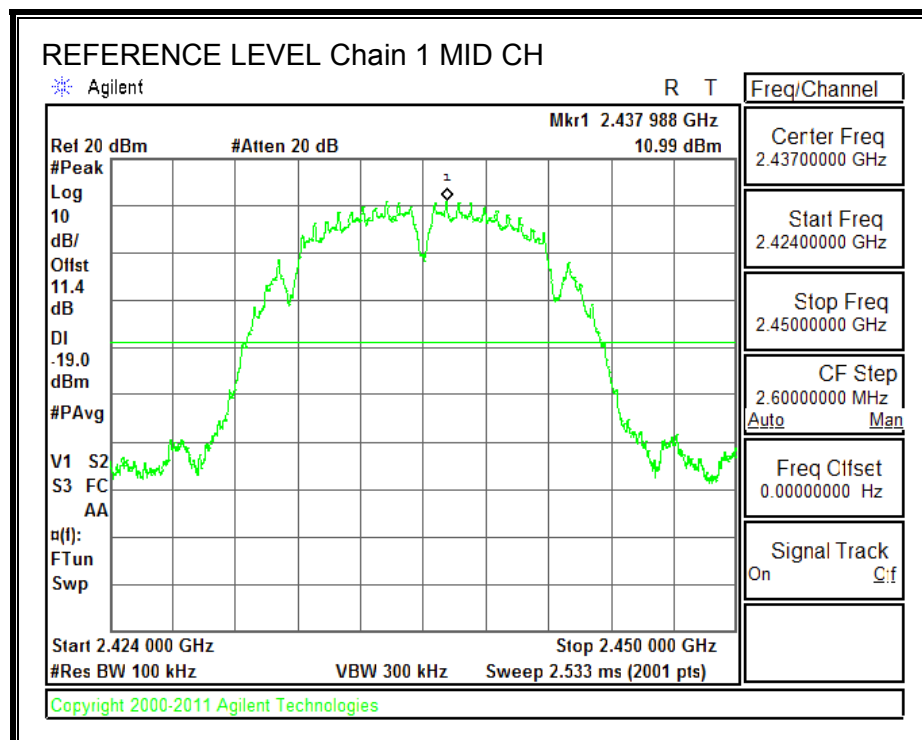
OUT-OF-BAND EMISSIONS, Chain 0



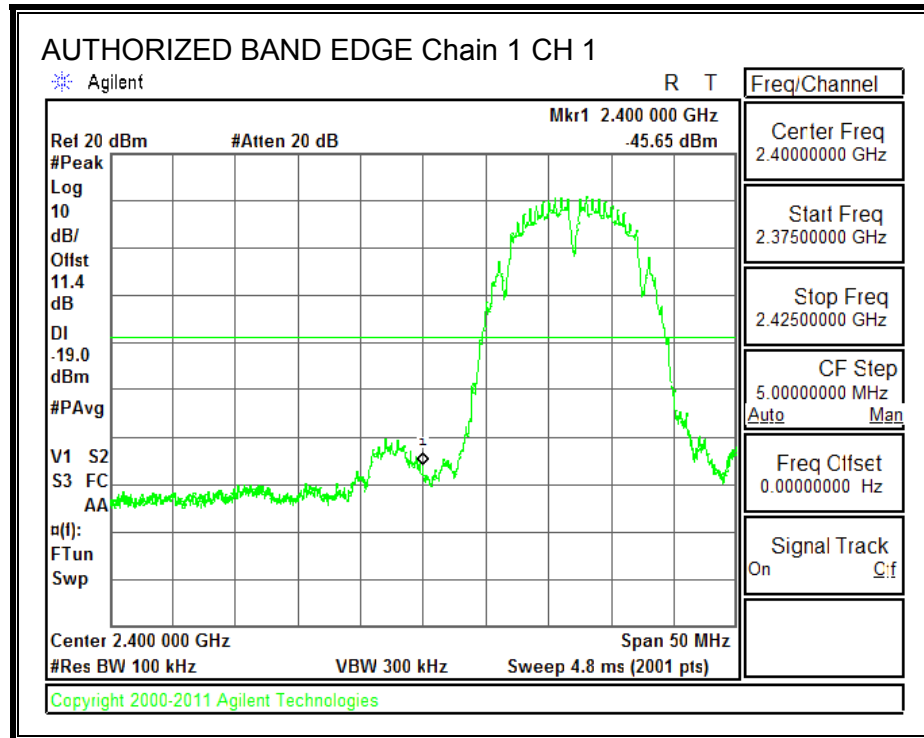




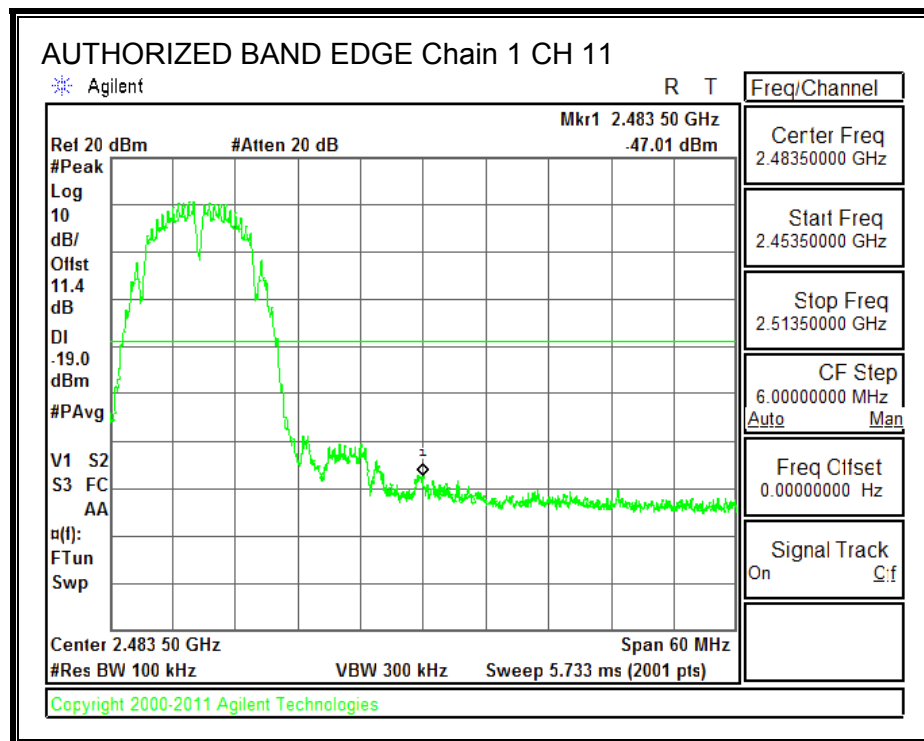
IN-BAND REFERENCE LEVEL, Chain 1

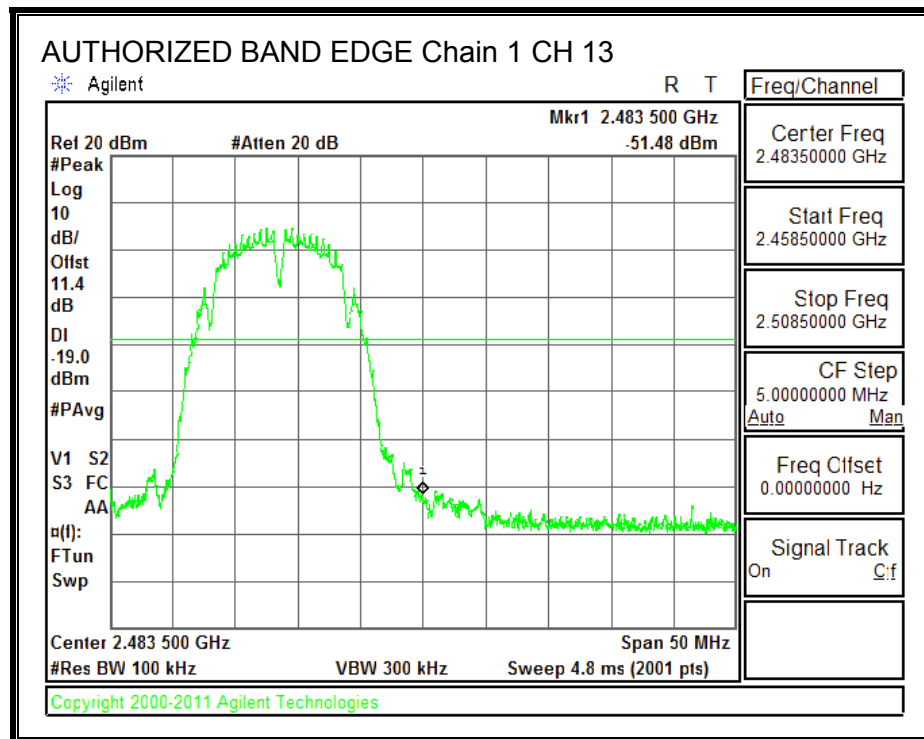
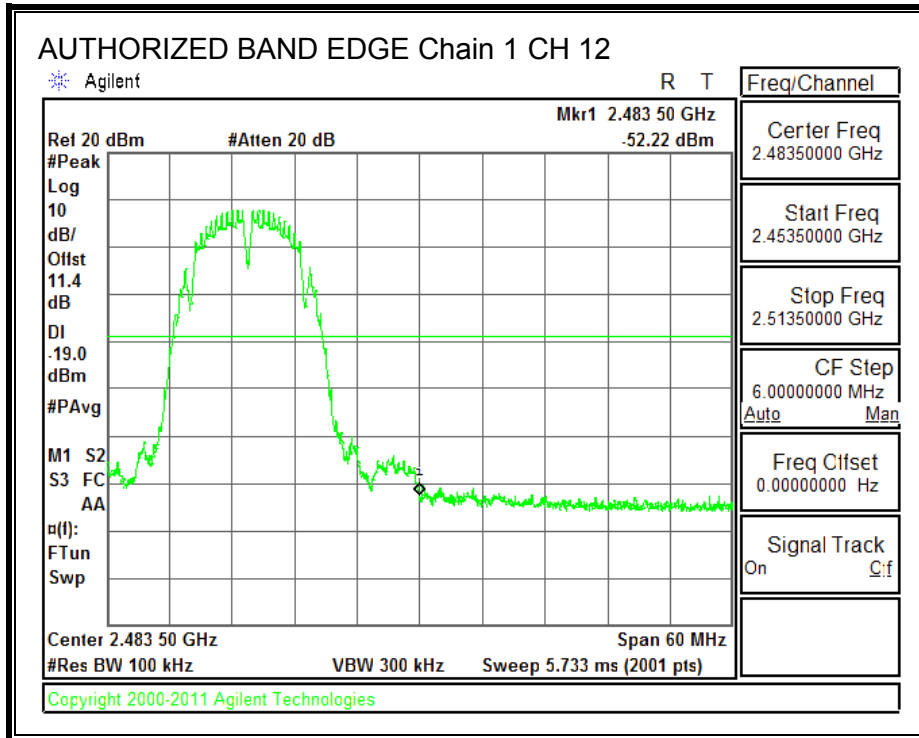


LOW CHANNEL BANDEDGE, Chain 1

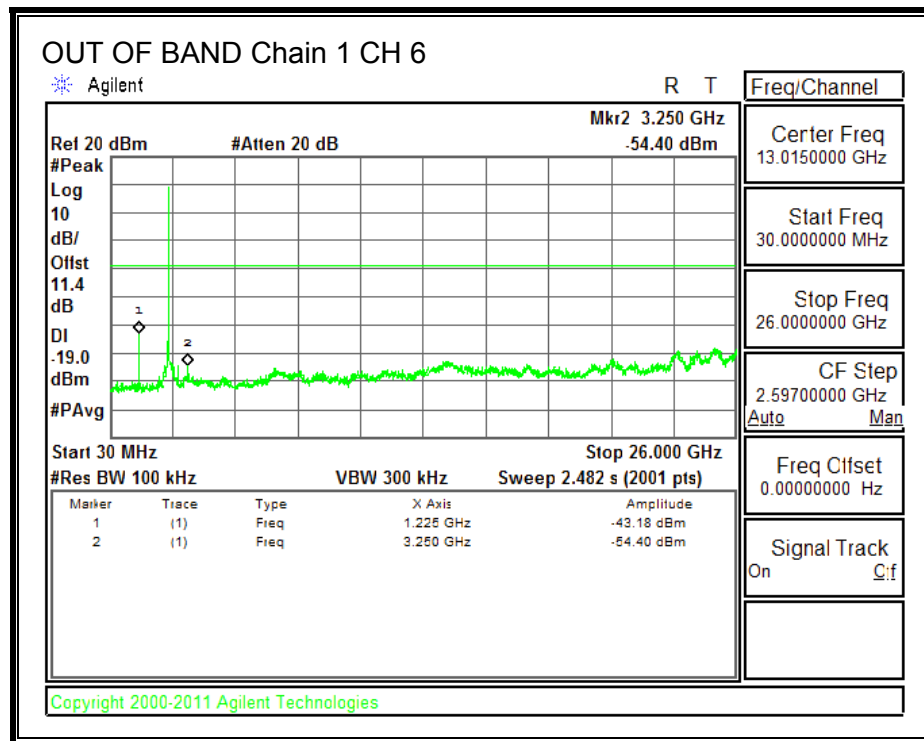
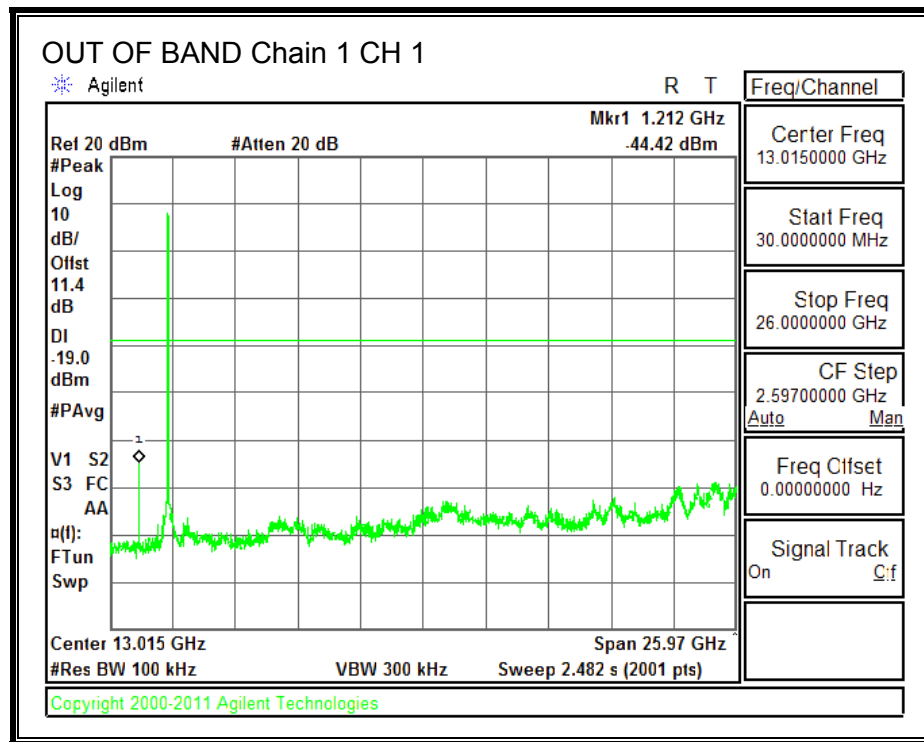


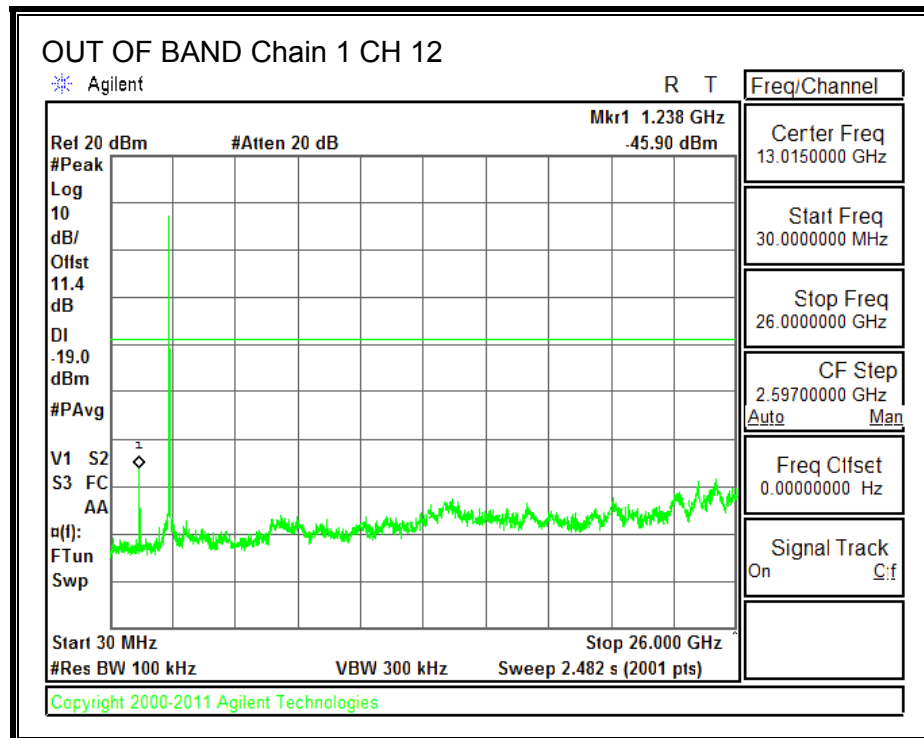
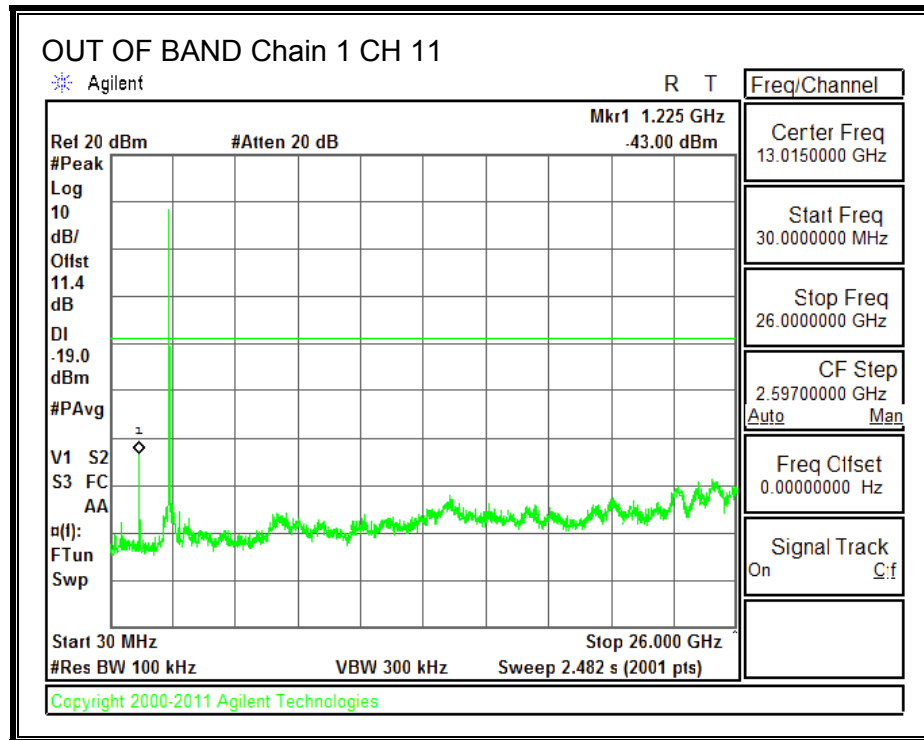
HIGH CHANNEL BANDEDGE, Chain 1

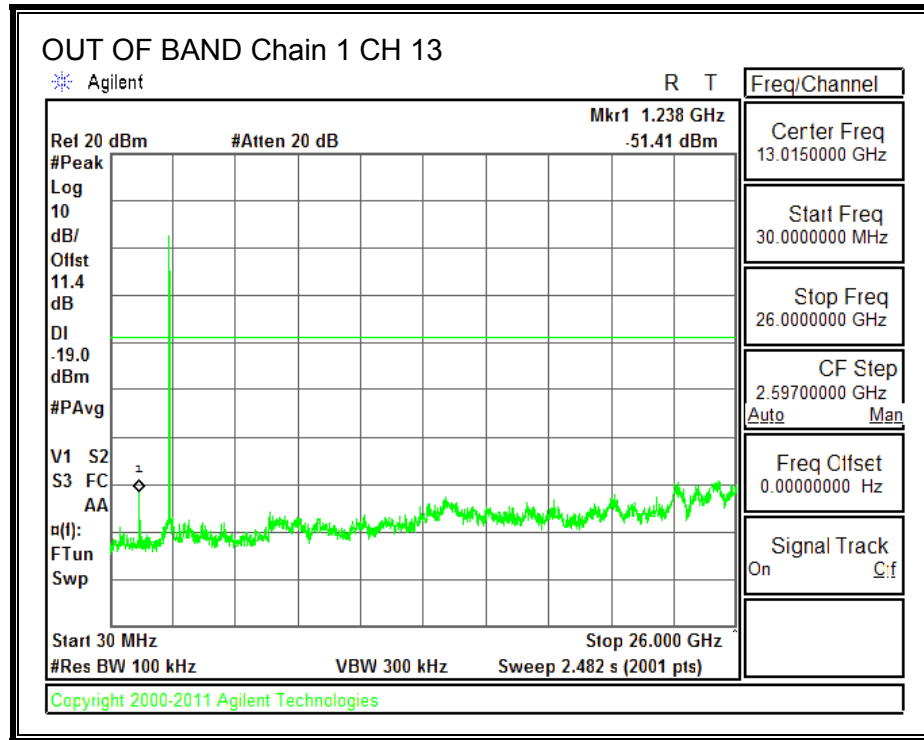




OUT-OF-BAND EMISSIONS, Chain 1







9.3. 802.11g 1Tx MODE IN THE 2.4 GHz BAND

9.3.1. 6 dB BANDWIDTH

LIMITS

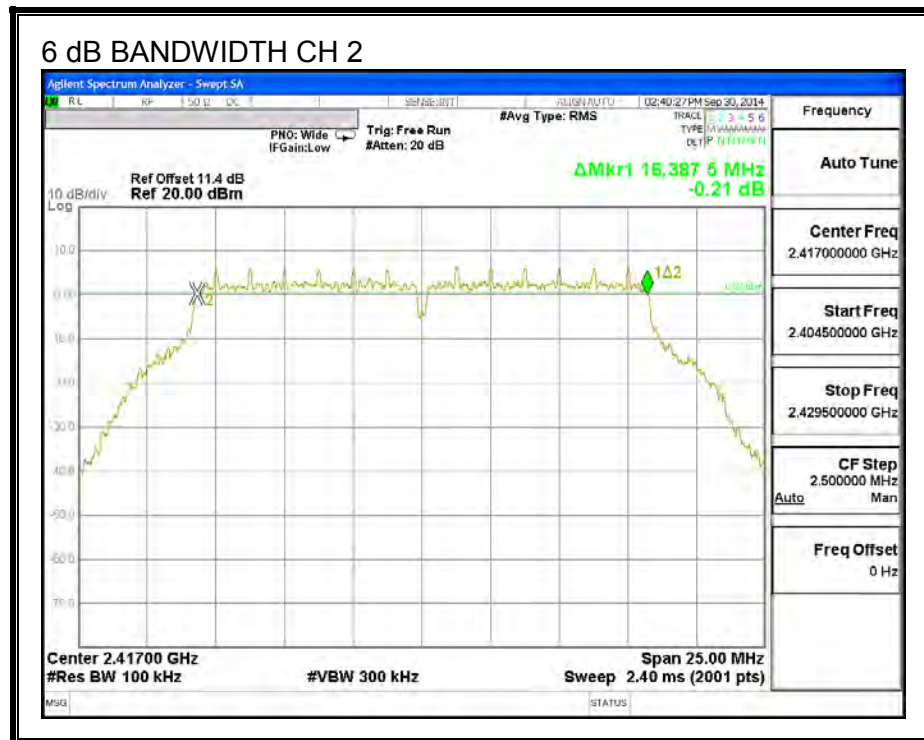
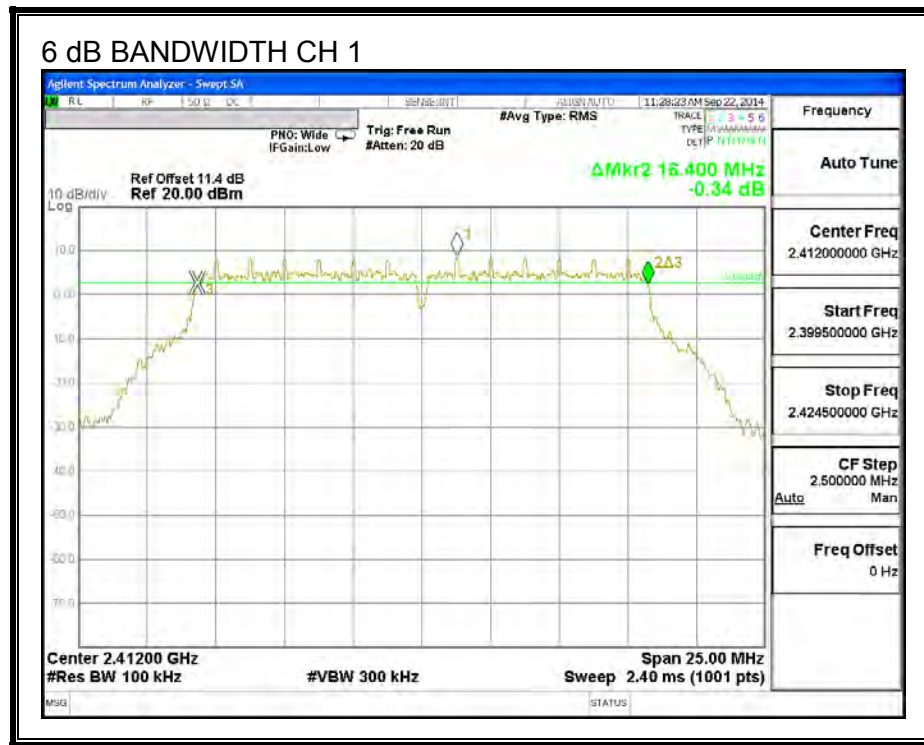
FCC §15.247 (a) (2)

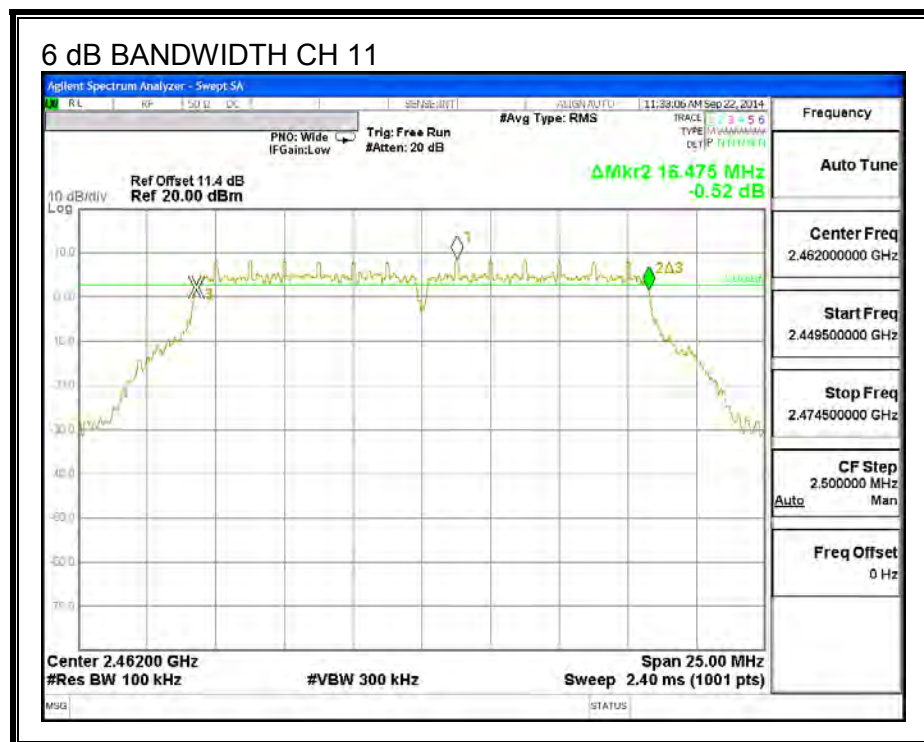
The minimum 6 dB bandwidth shall be at least 500 kHz.

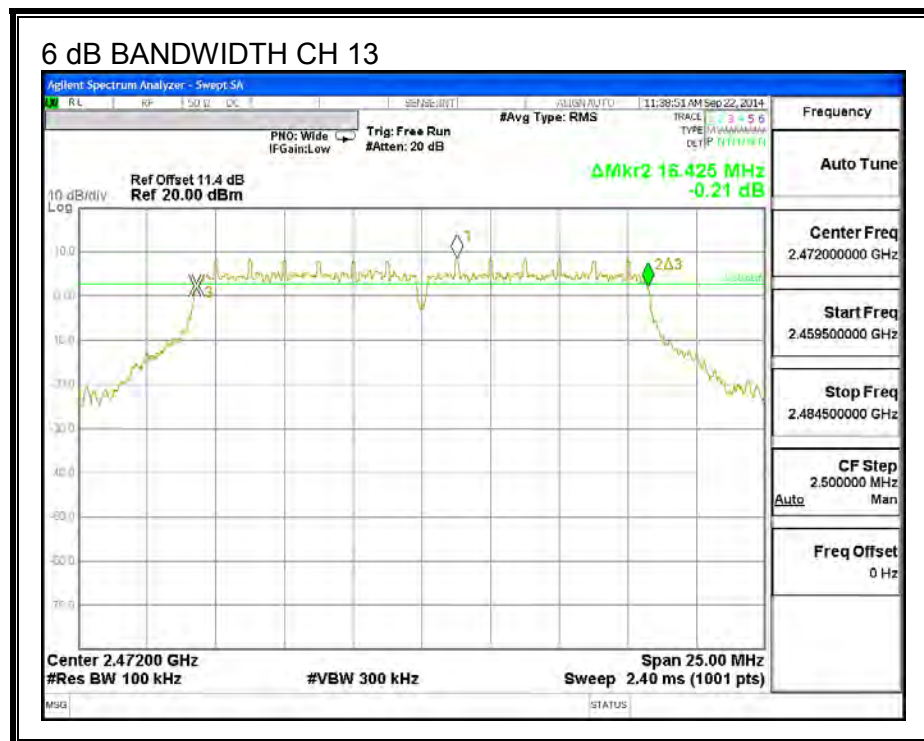
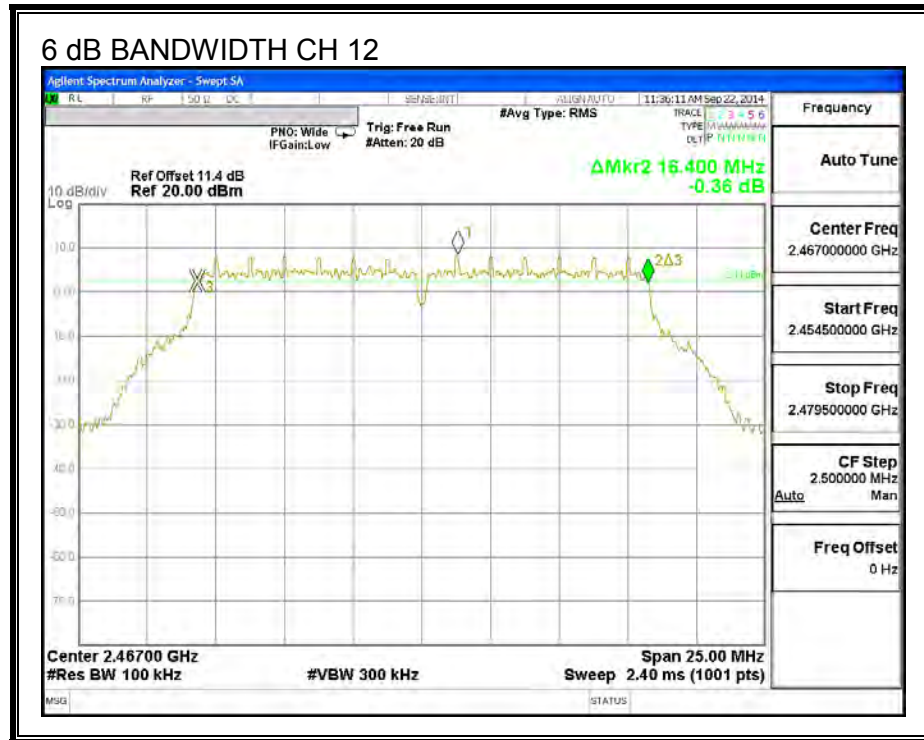
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
1	2412	16.400	0.5
2	2417	16.387	0.5
6	2437	16.450	0.5
11	2462	16.475	0.5
12	2467	16.400	0.5
13	2472	16.425	0.5

6 dB BANDWIDTH







9.3.2. 99% BANDWIDTH

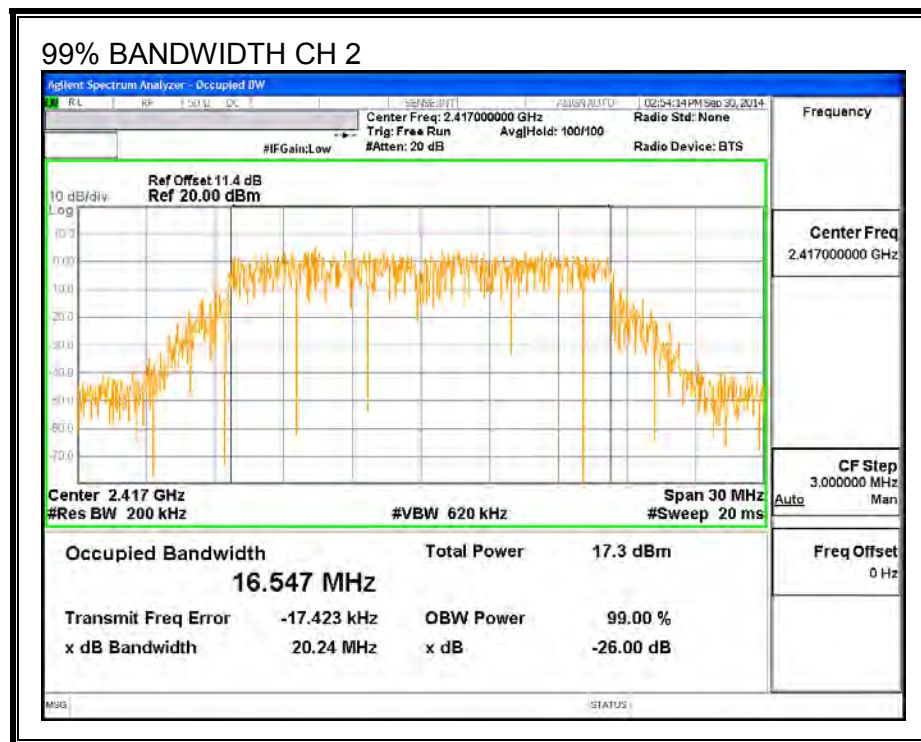
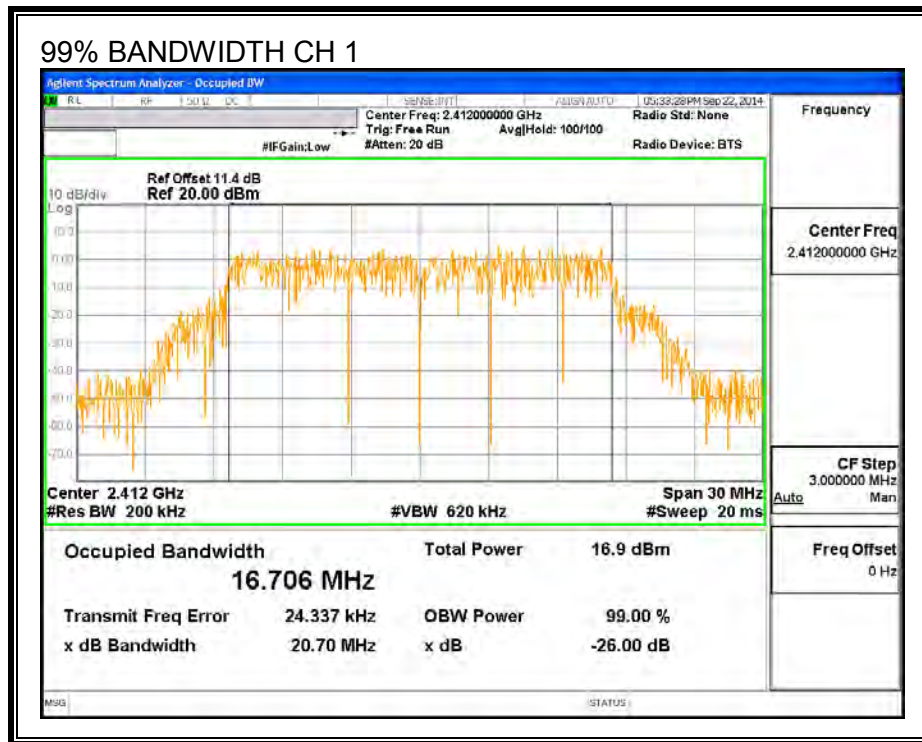
LIMITS

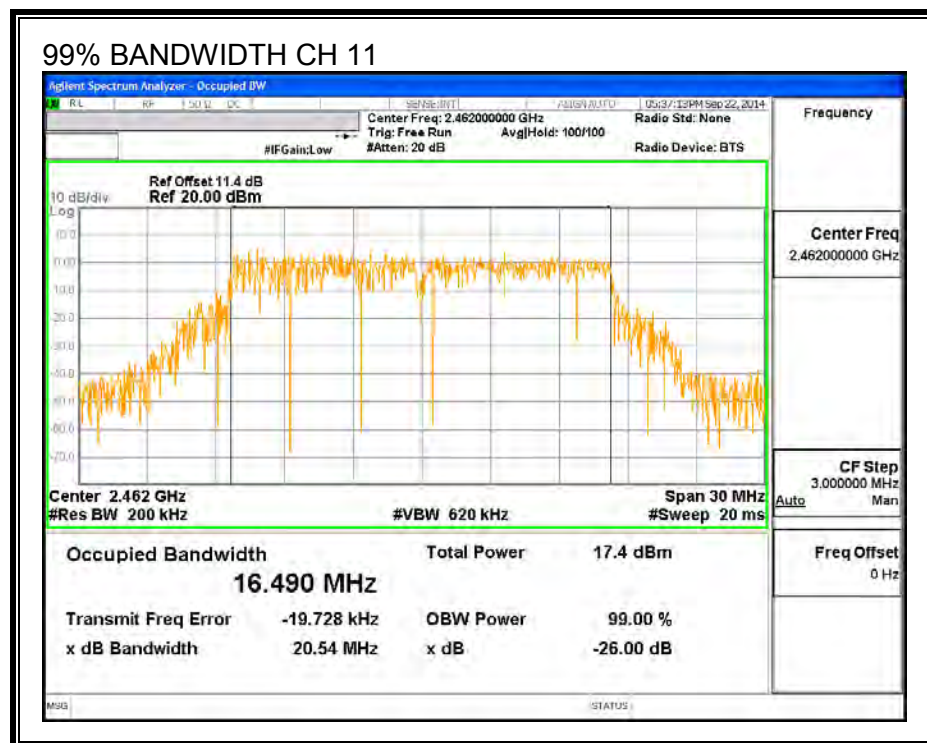
None; for reporting purposes only.

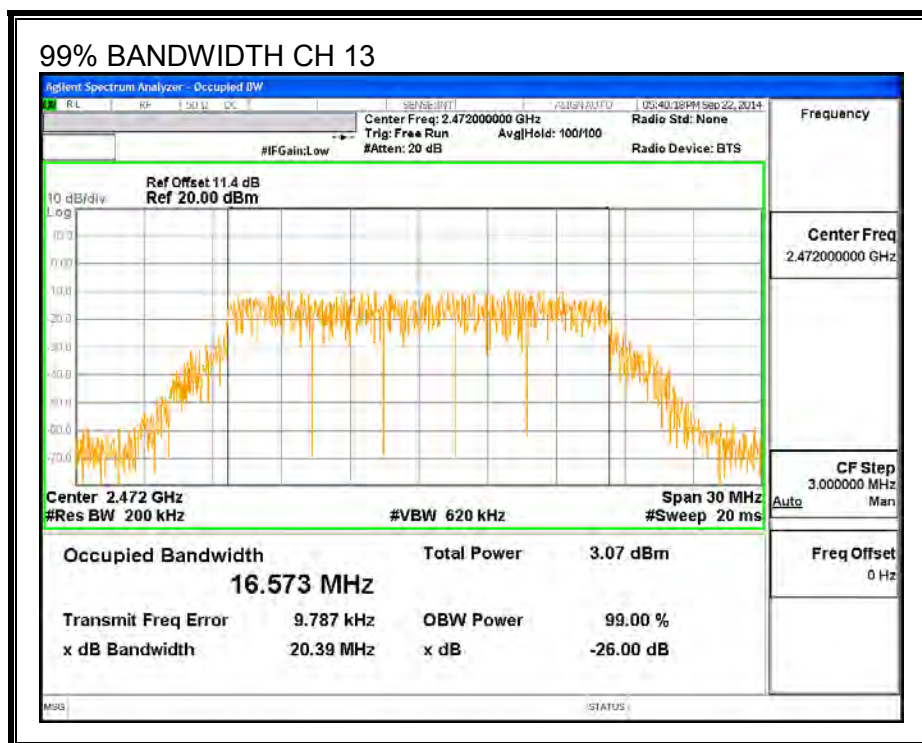
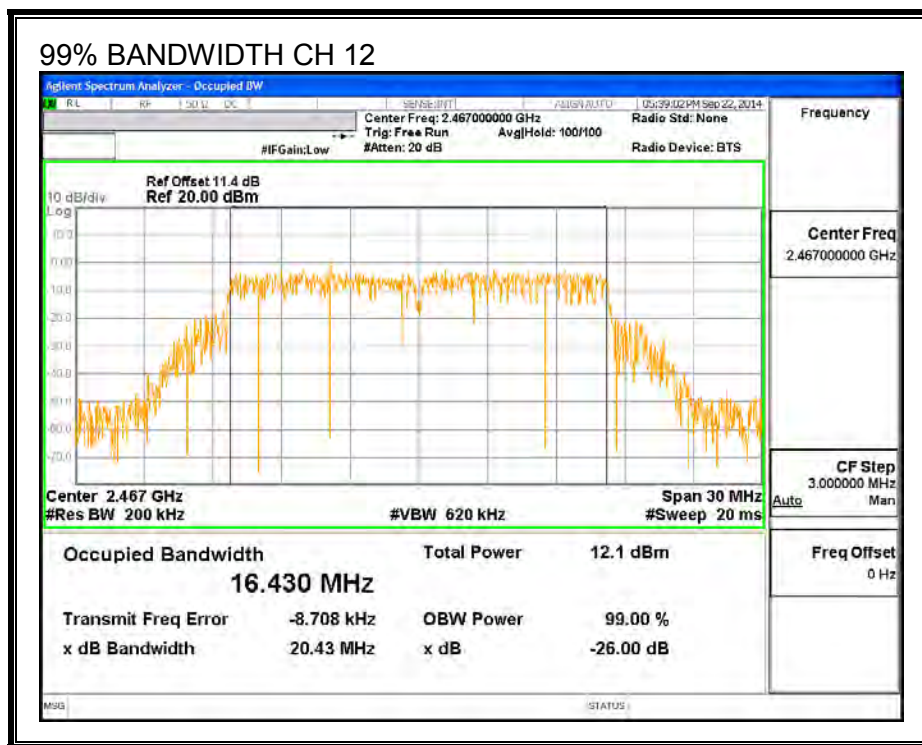
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
1	2412	16.706
2	2417	16.574
6	2437	16.587
11	2462	16.490
12	2467	16.430
13	2472	16.573

99% BANDWIDTH







9.3.3. OUTPUT POWER

LIMITS

FCC §15.247

For systems using digital modulation in the 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

There is only one transmitter output therefore 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)
1	2412	3.40	30.00	30	36	30.00
2	2417	3.40	30.00	30	36	30.00
6	2437	3.40	30.00	30	36	30.00
11	2462	3.40	30.00	30	36	30.00
12	2467	3.40	30.00	30	36	30.00
13	2472	3.40	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
1	2412	15.49	15.49	30.00	-14.51
2	2417	17.50	17.50	30.00	-12.50
6	2437	18.99	18.99	30.00	-11.01
11	2462	16.90	16.90	30.00	-13.10
12	2467	14.00	14.00	30.00	-16.00
13	2472	4.92	4.92	30.00	-25.08

9.3.4. PSD

LIMITS

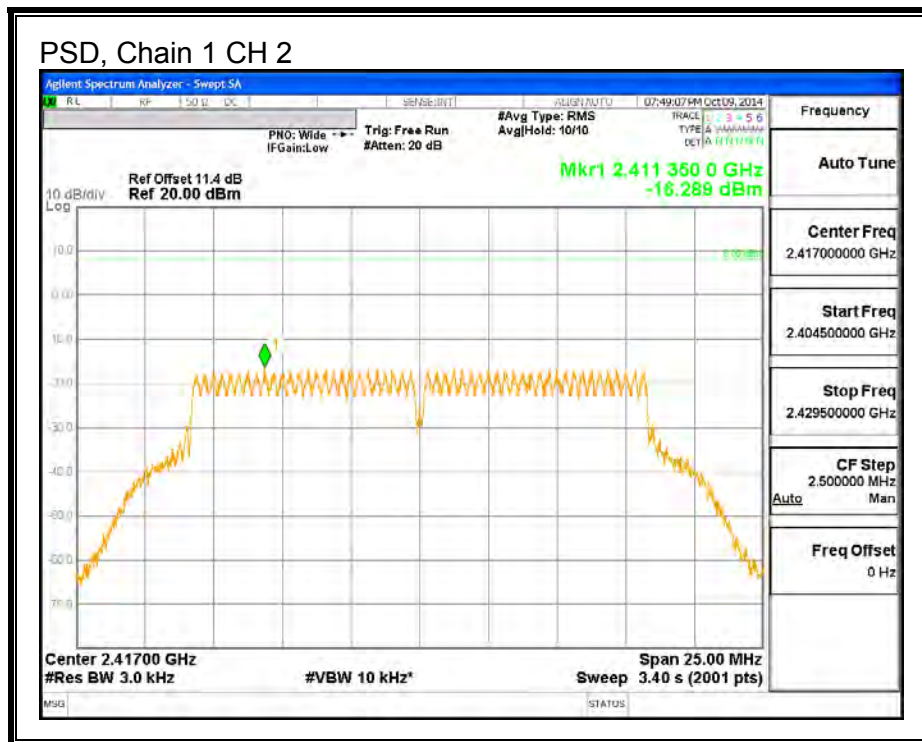
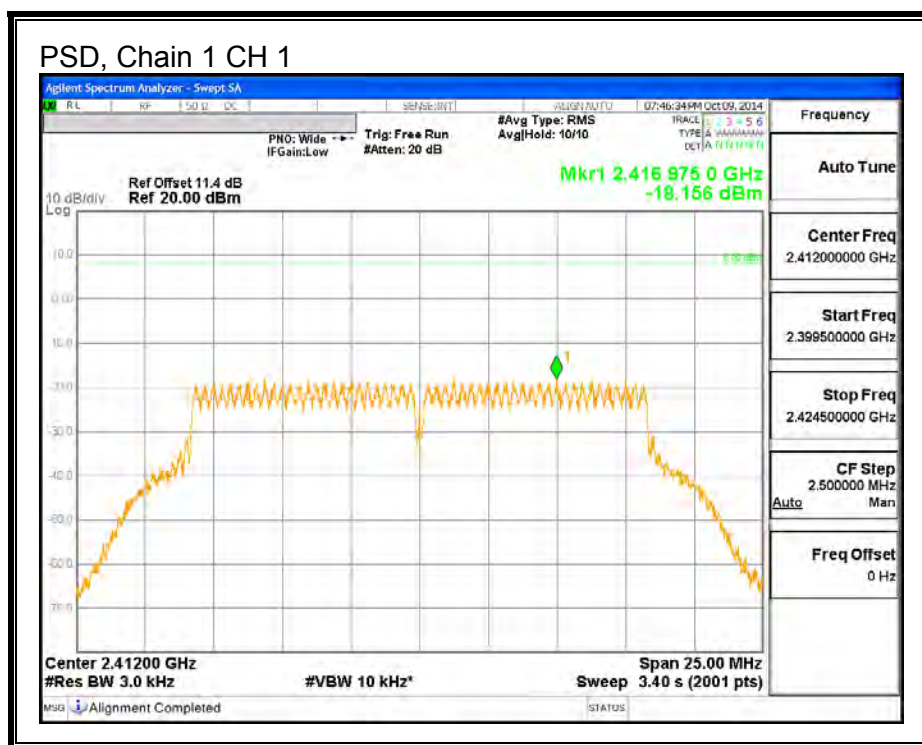
FCC §15.247

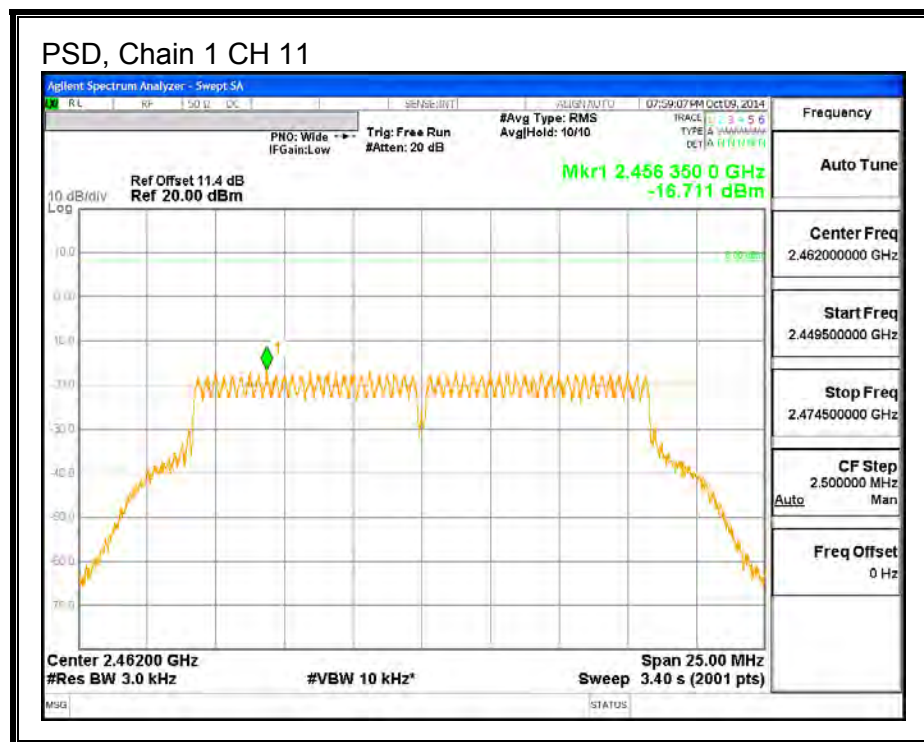
RESULTS

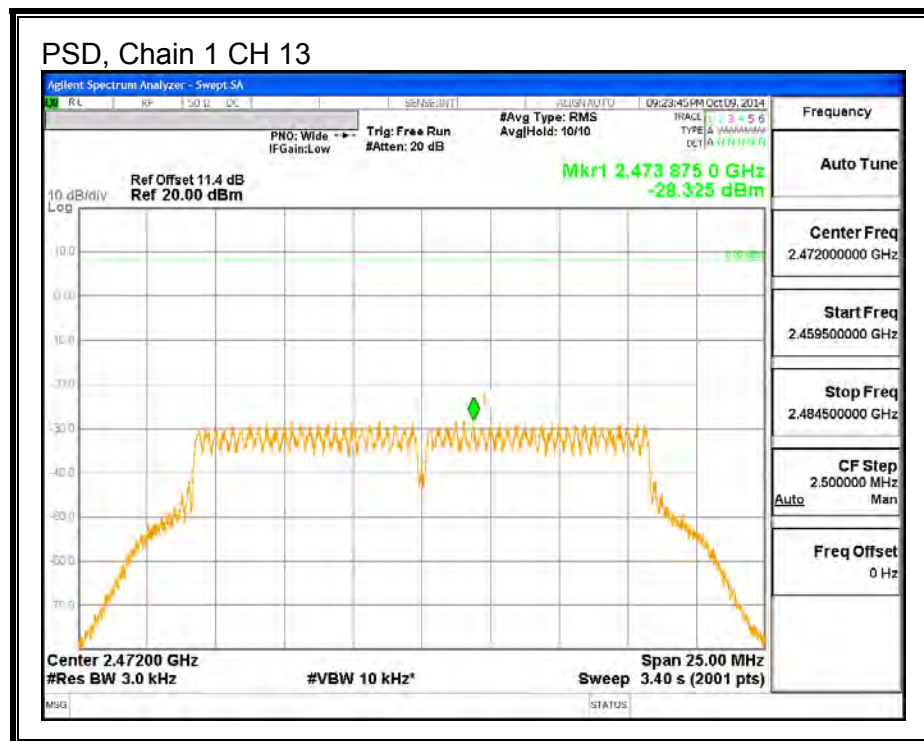
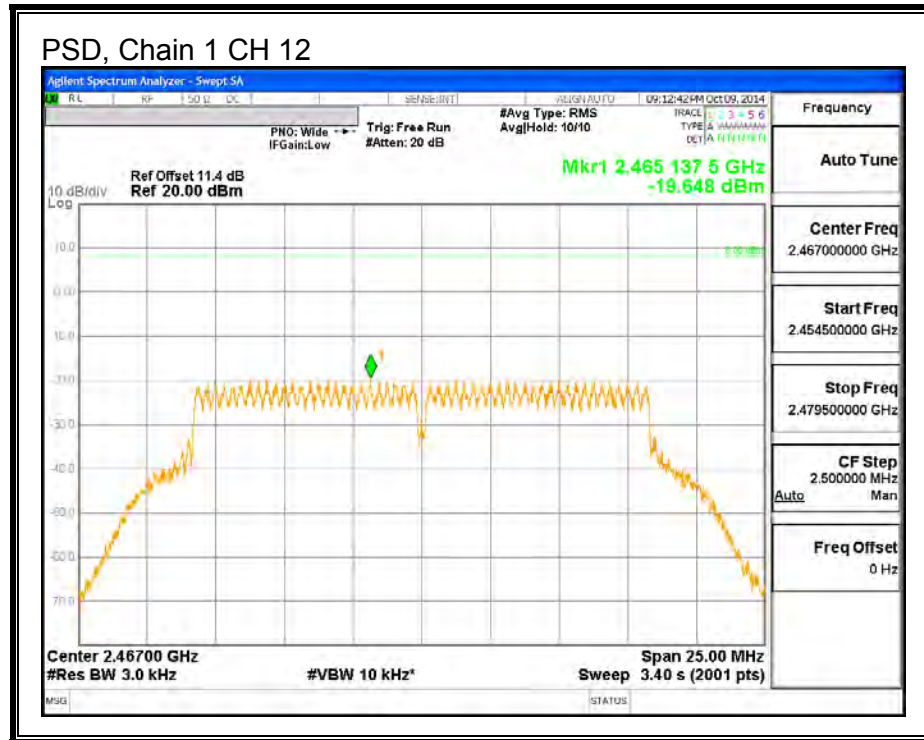
PSD Results

Channel	Frequency (MHz)	Chain 1 Meas (dBm)	Limit (dBm)	Margin (dB)
1	2412	-18.156	8.0	-26.2
2	2417	-16.289	8.0	-24.3
6	2437	-13.689	8.0	-21.7
11	2462	-16.711	8.0	-24.7
12	2467	-19.648	8.0	-27.6
13	2472	-28.325	8.0	-36.3

PSD, Chain 1







9.3.5. OUT-OF-BAND EMISSIONS

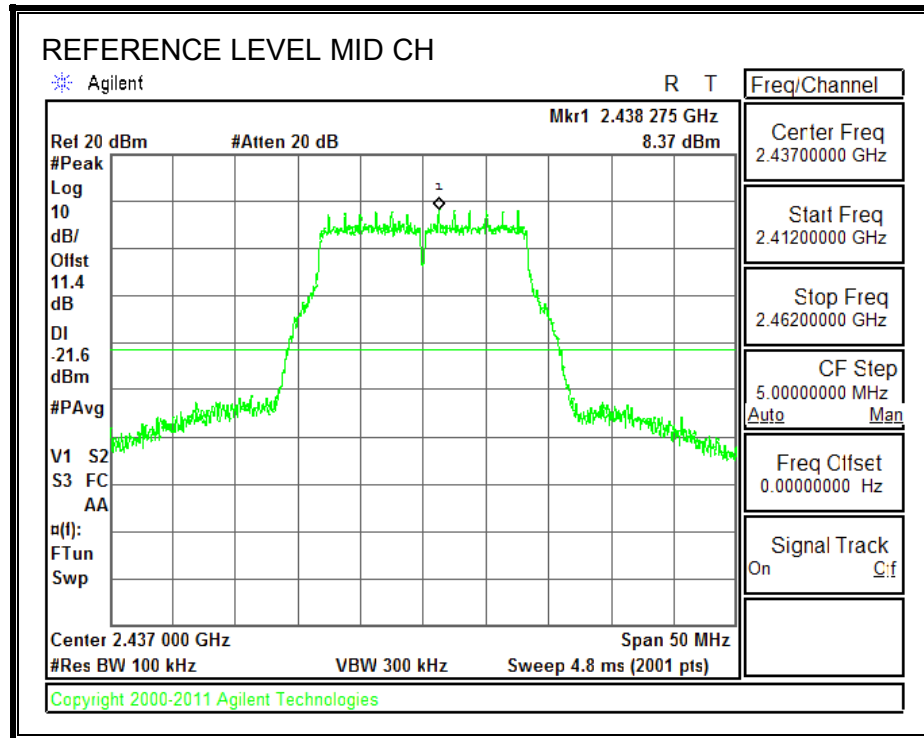
LIMITS

FCC §15.247 (d)

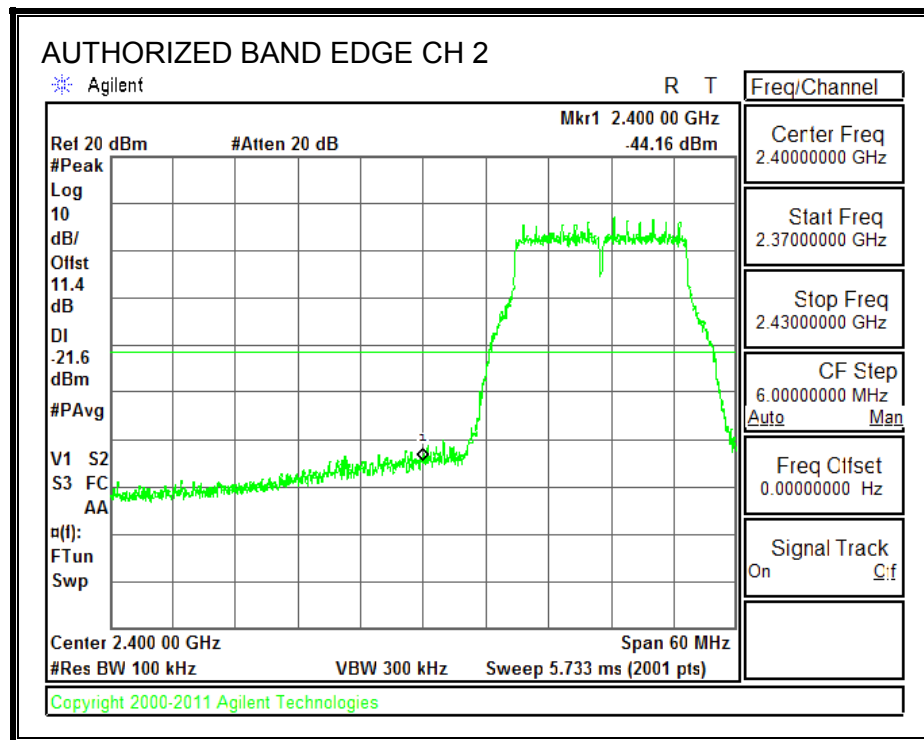
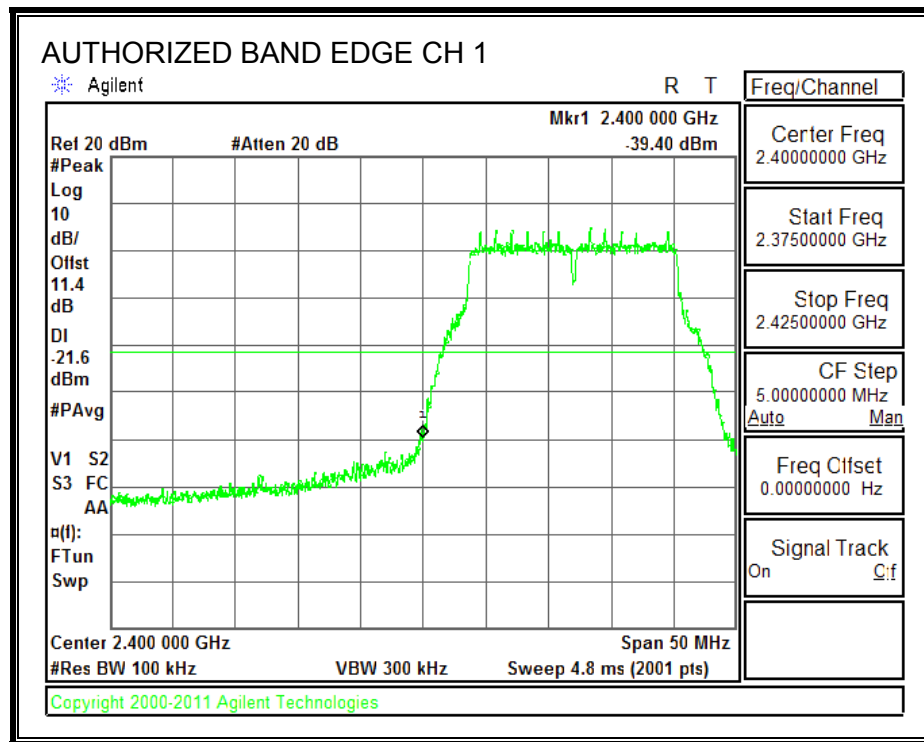
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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.

RESULTS

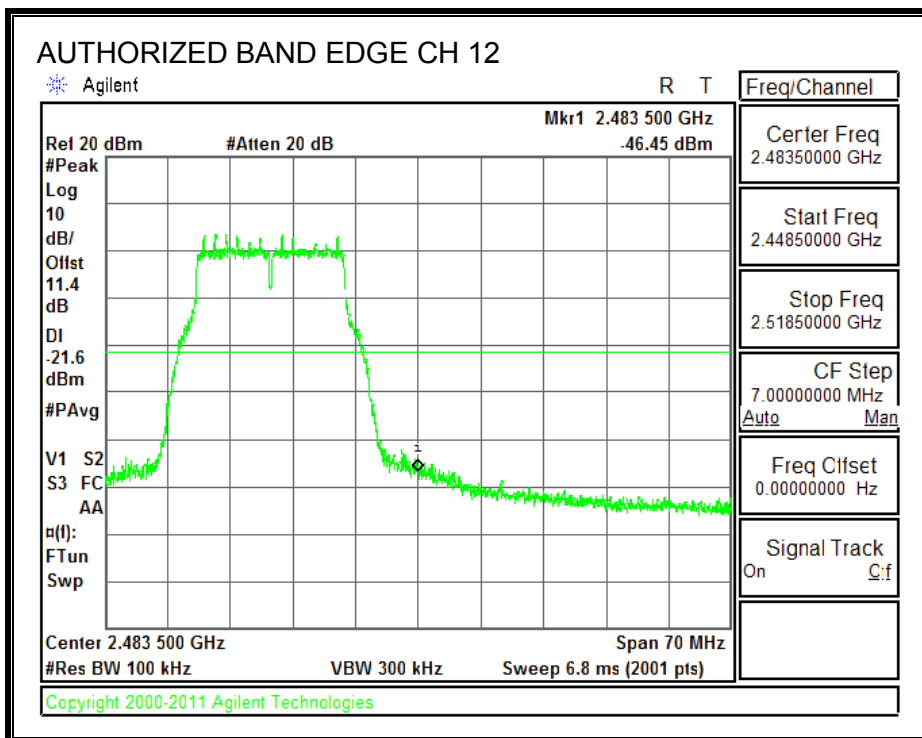
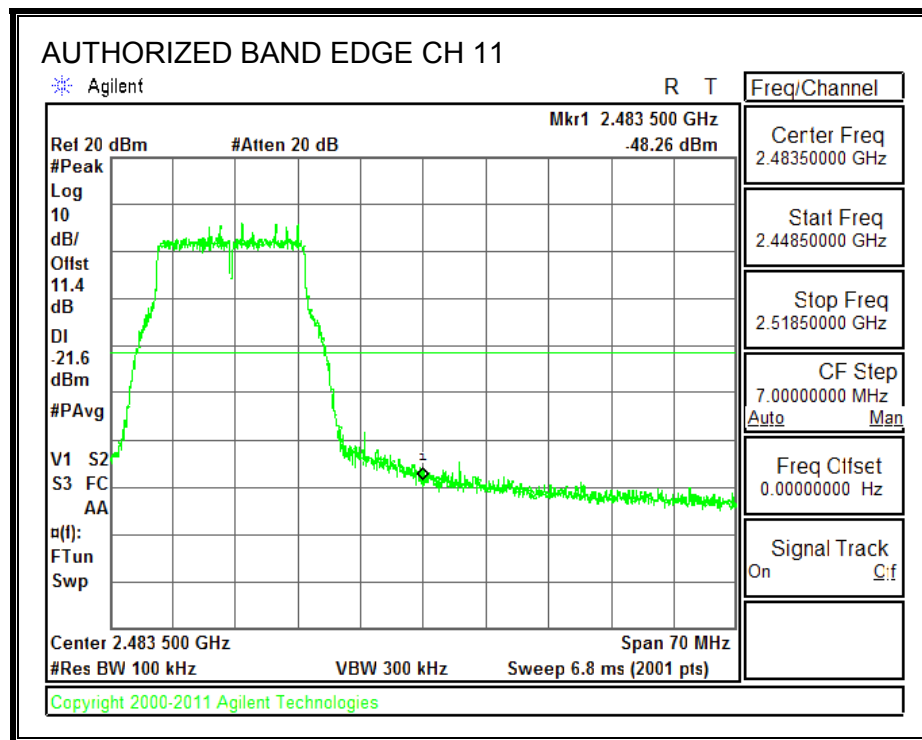
IN-BAND REFERENCE LEVEL

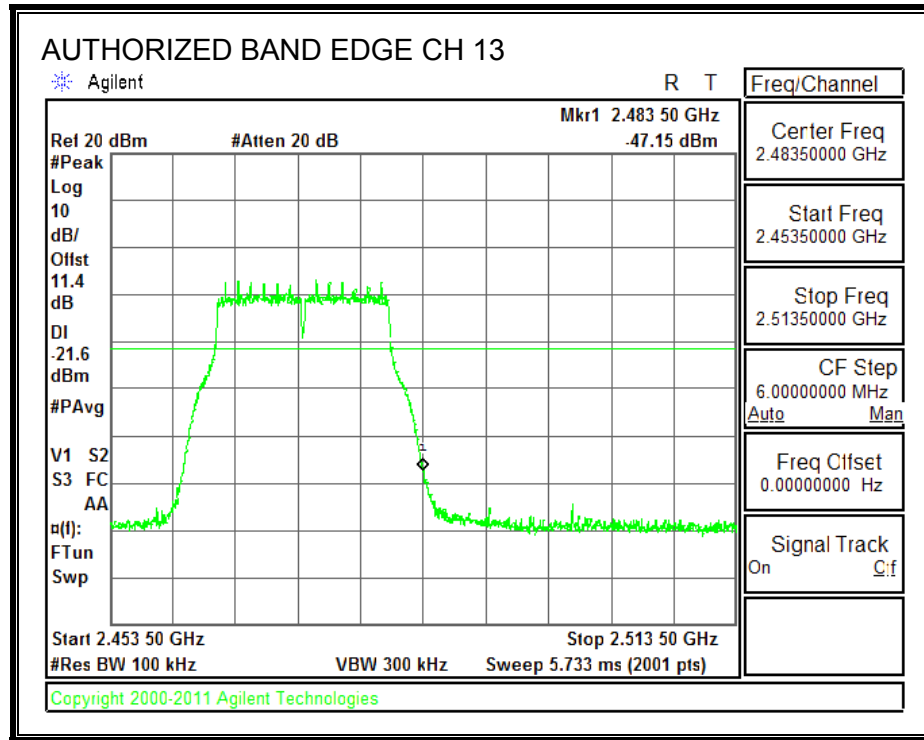


LOW CHANNEL BANDEDGE

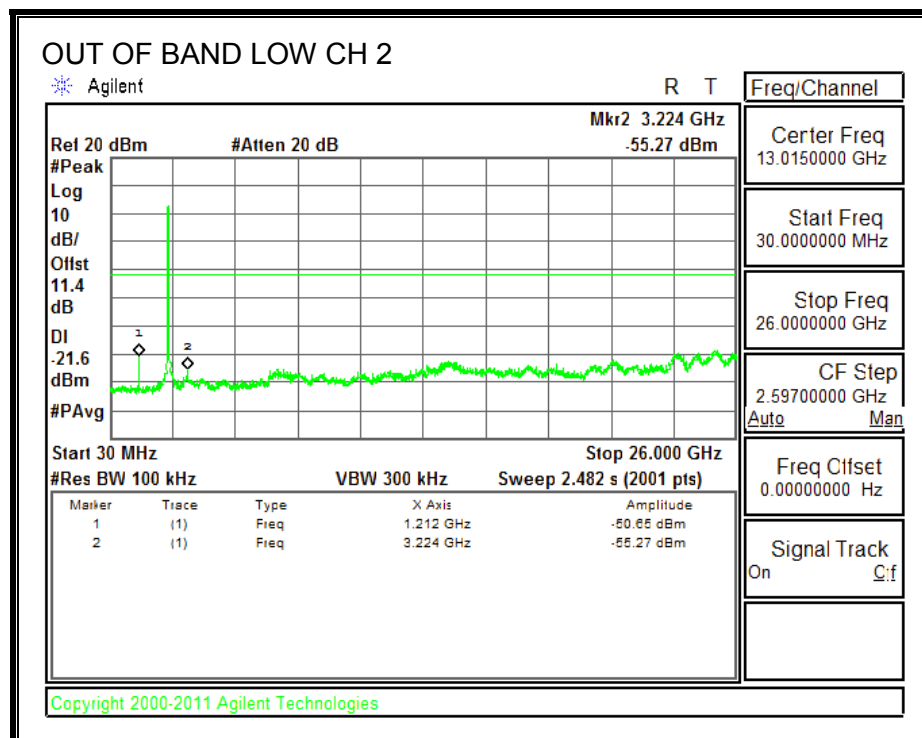
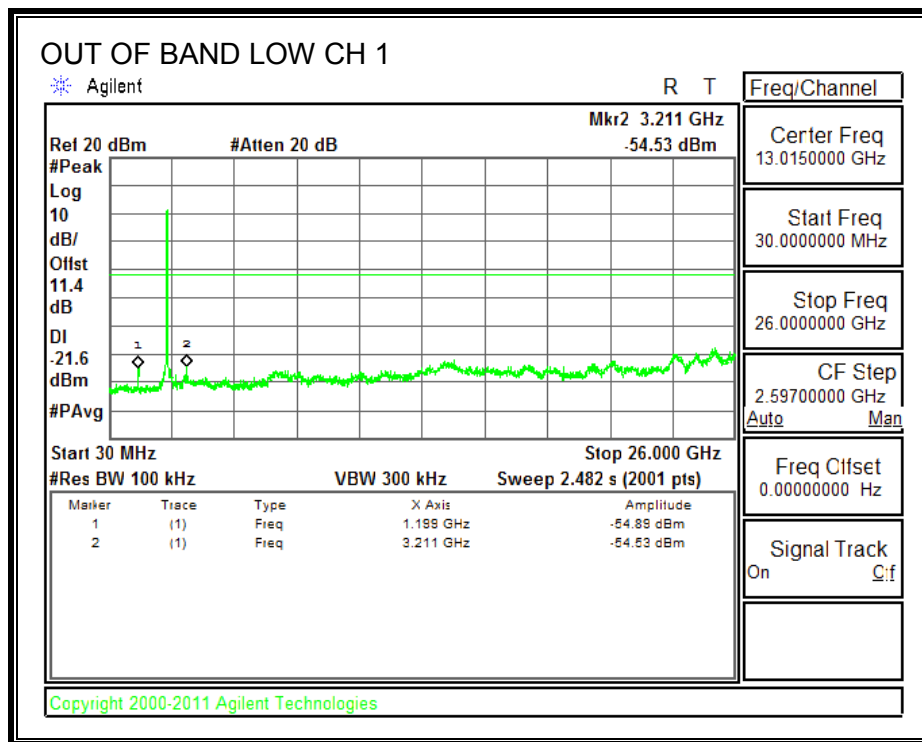


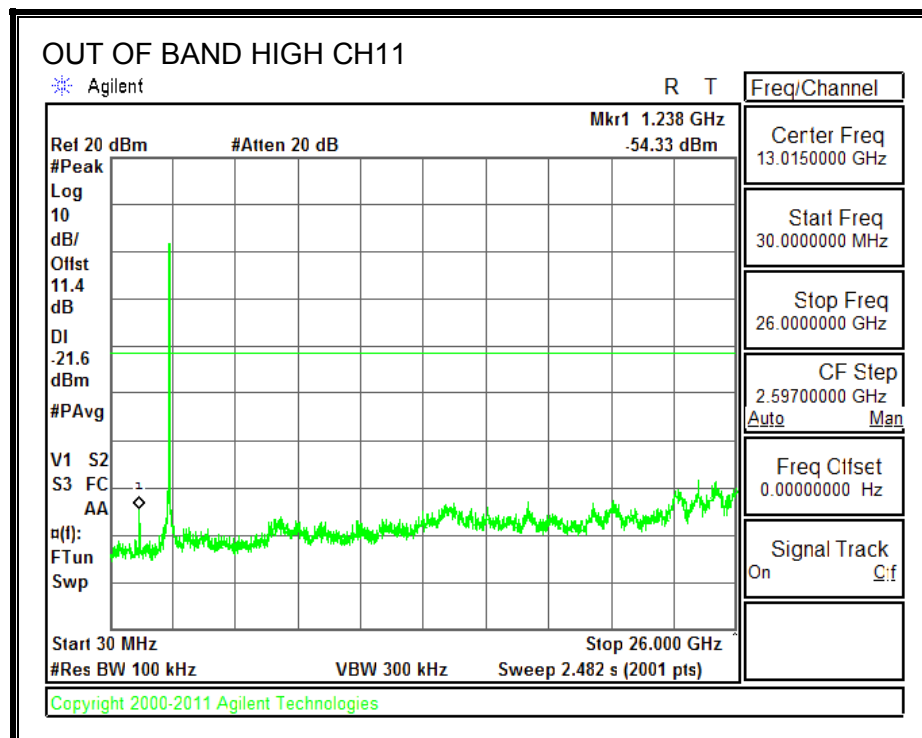
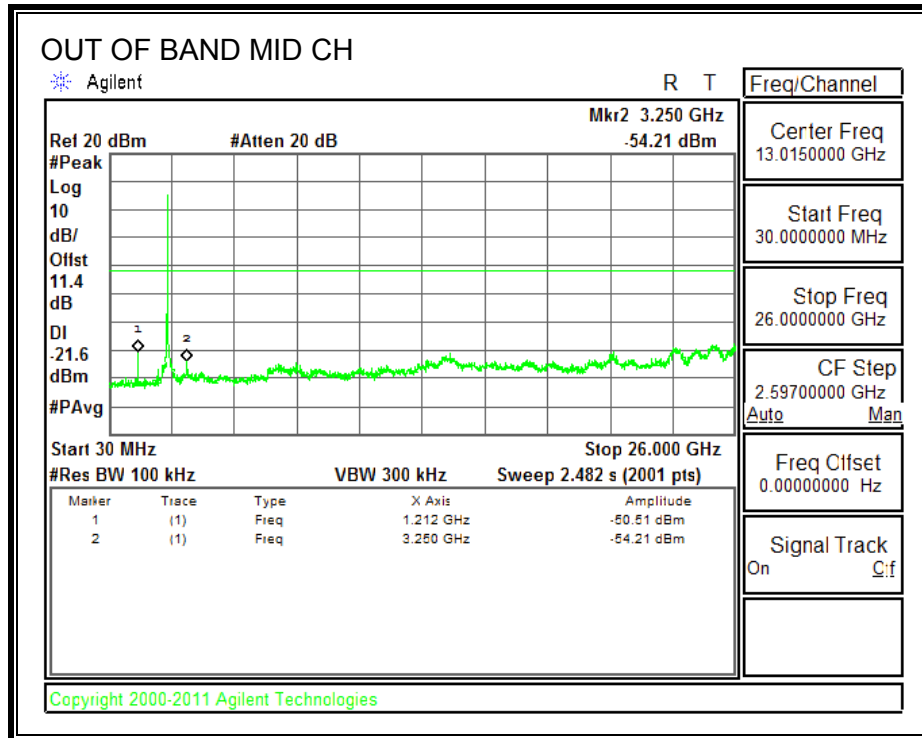
HIGH CHANNEL BANDEDGE

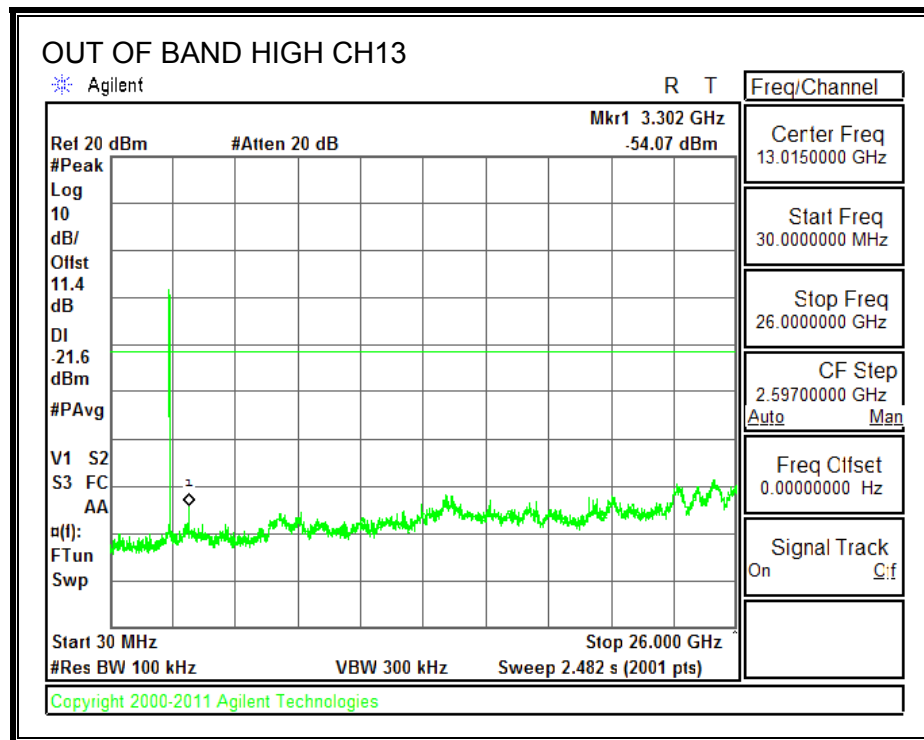
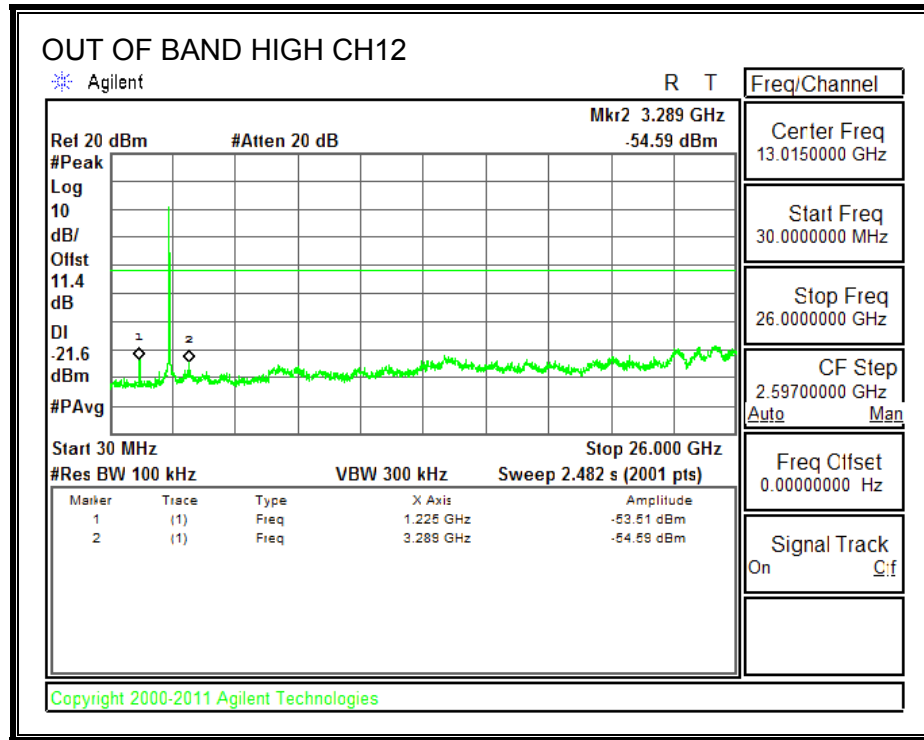




OUT-OF-BAND EMISSIONS







9.4. 802.11n HT20 2Tx CDD MODE IN THE 2.4 GHz BAND

9.4.1. 6 dB BANDWIDTH

LIMITS

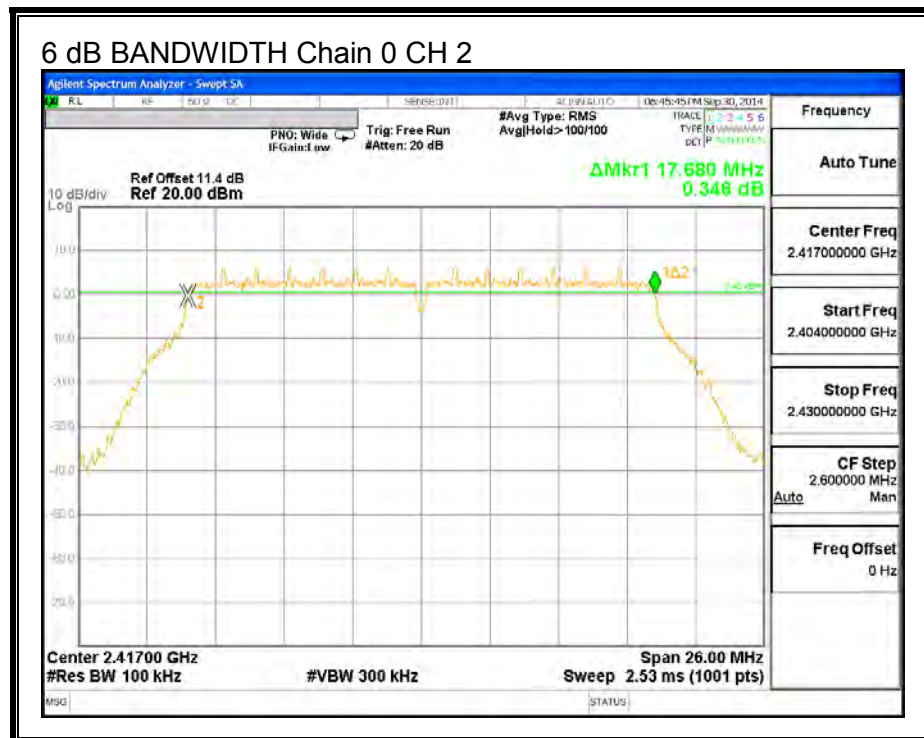
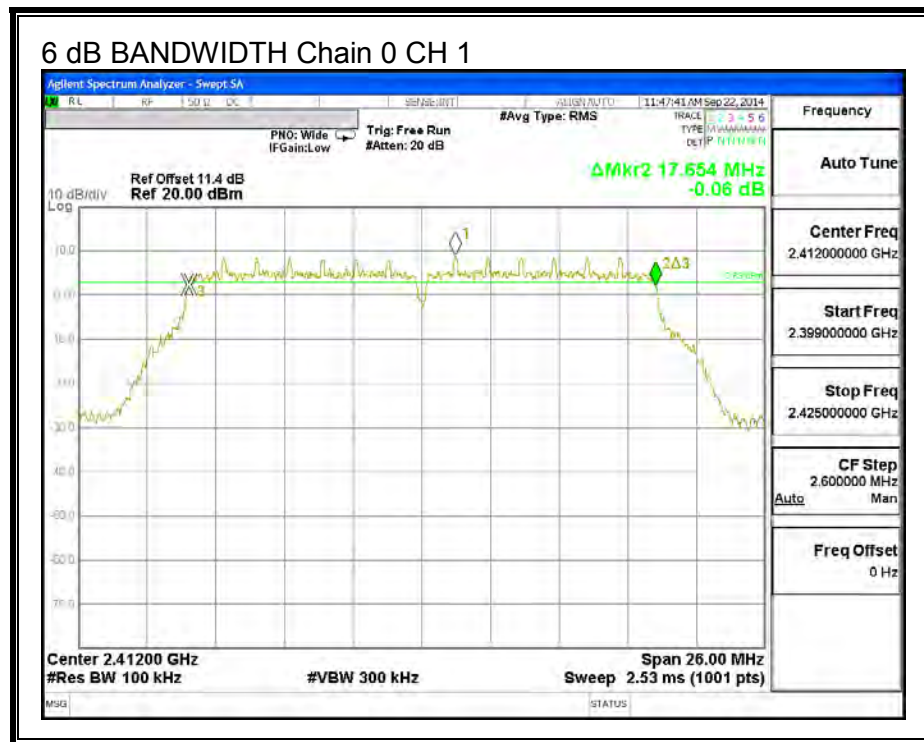
FCC §15.247 (a) (2)

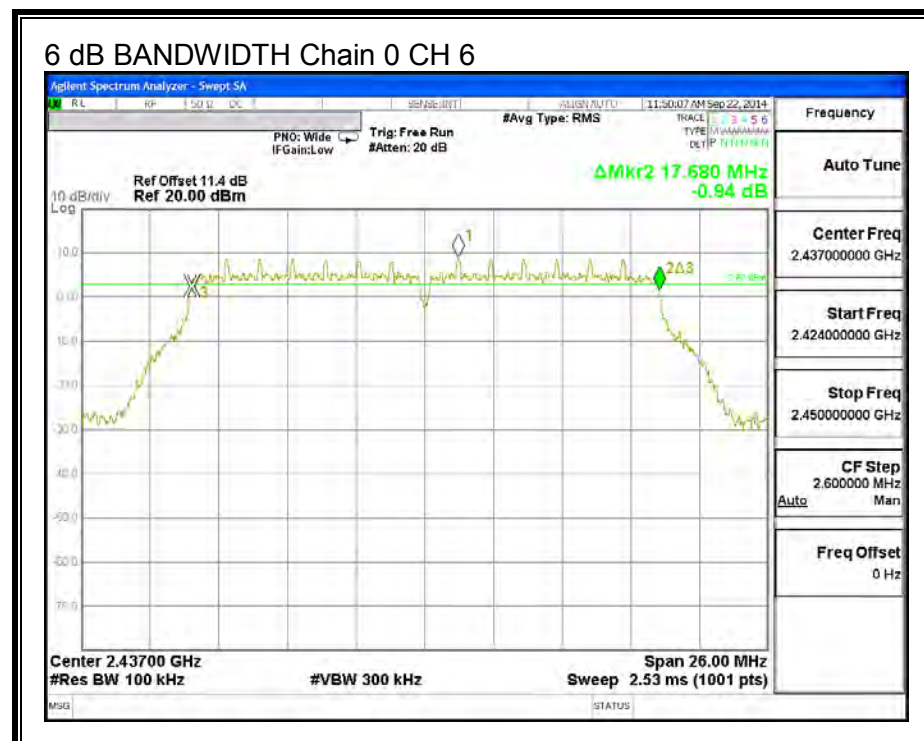
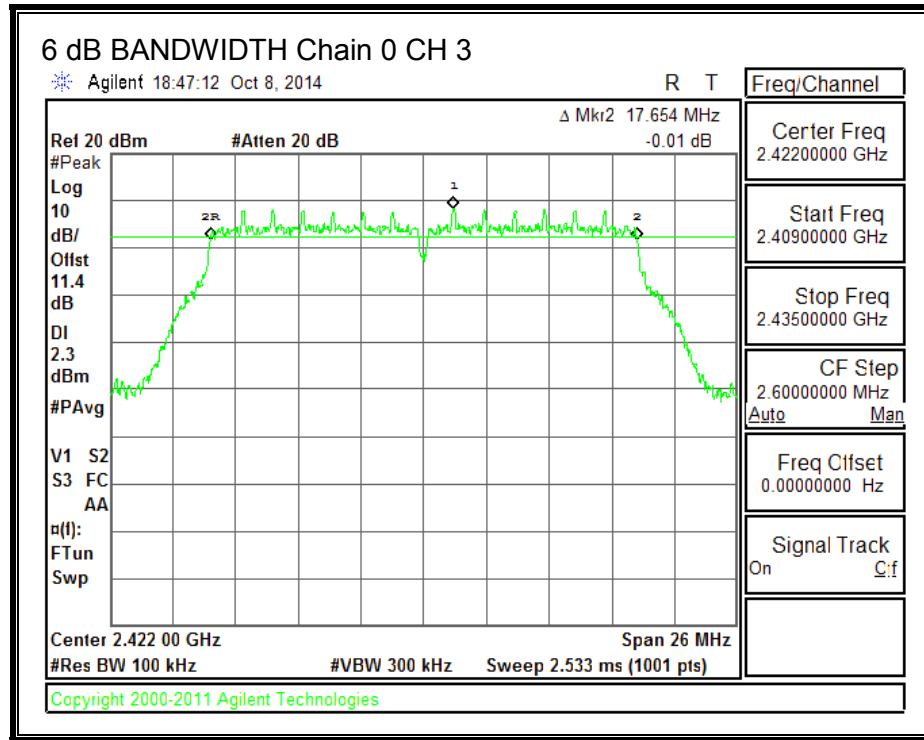
The minimum 6 dB bandwidth shall be at least 500 kHz.

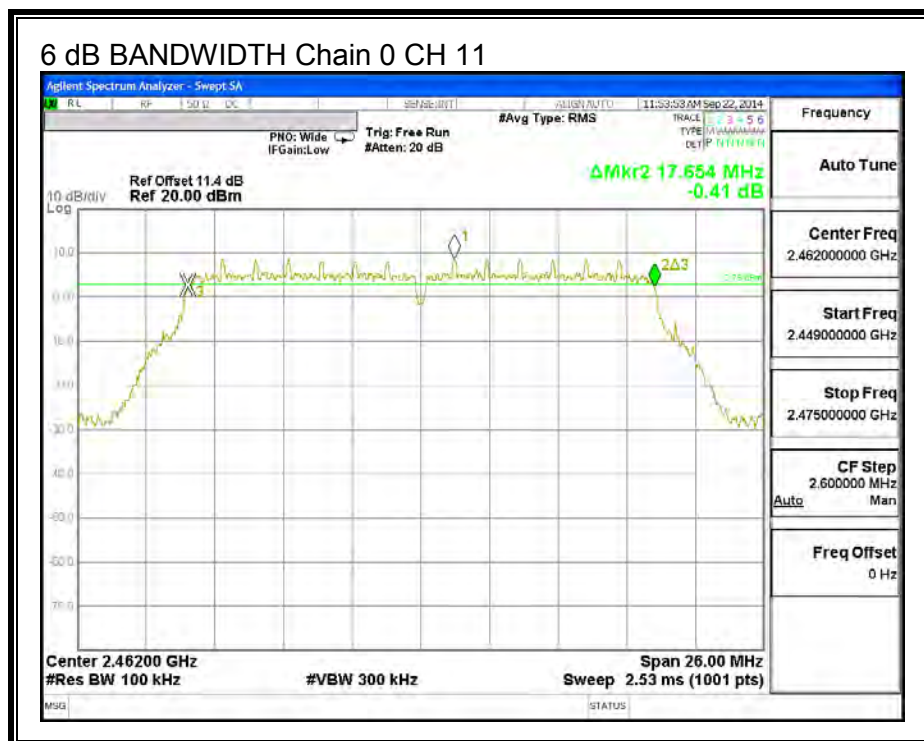
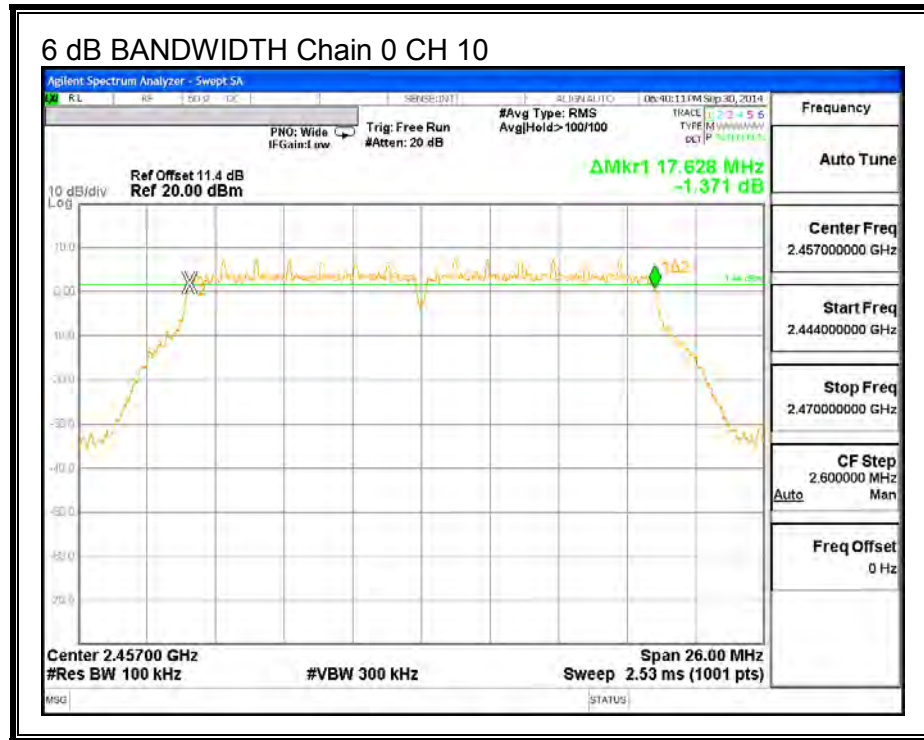
RESULTS

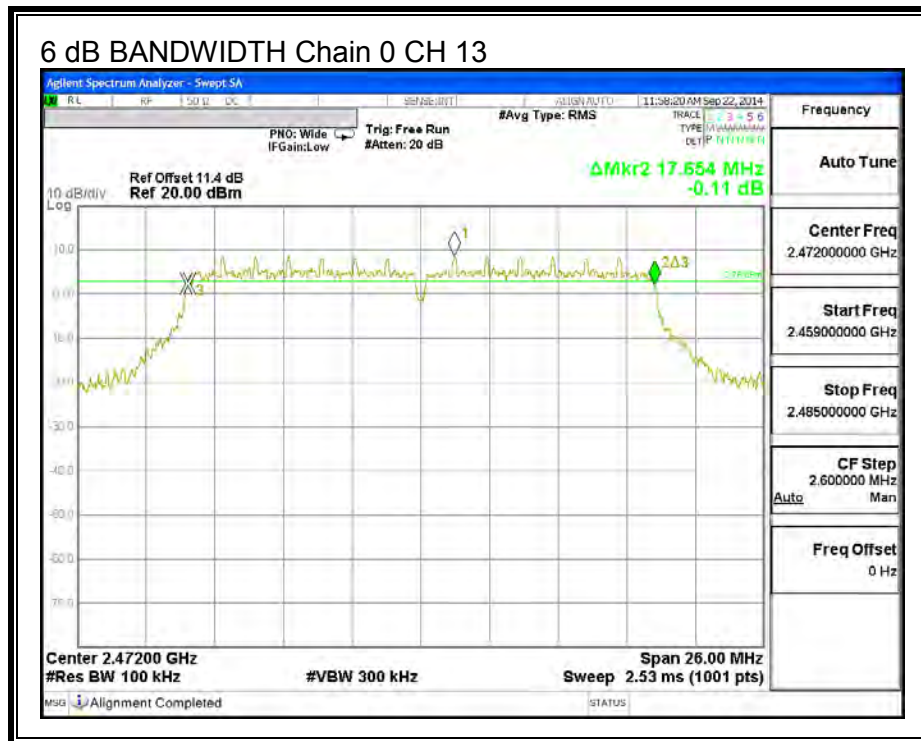
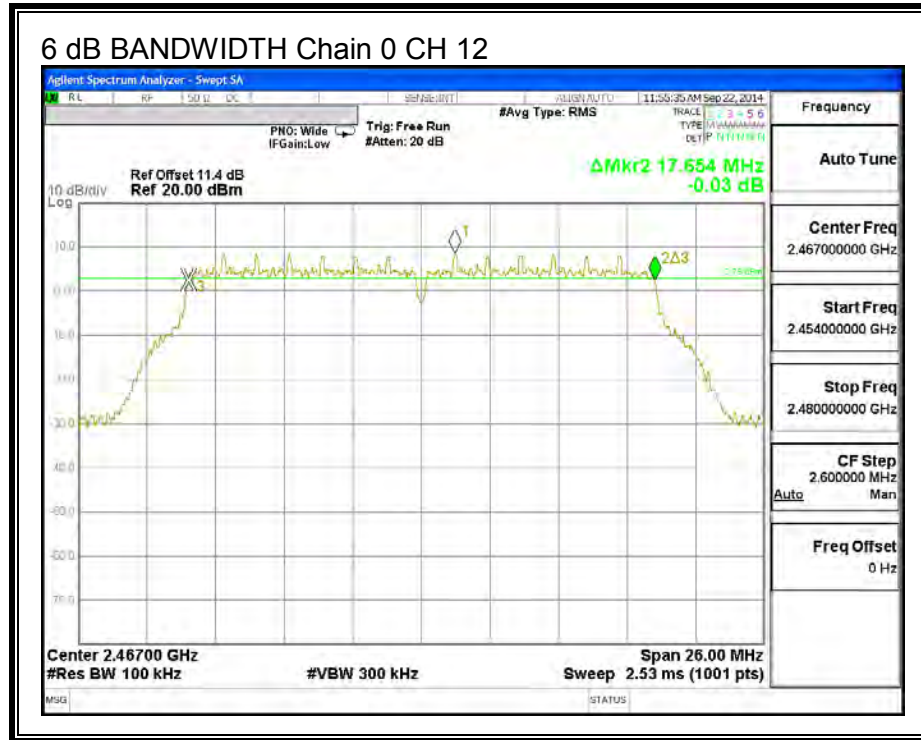
Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
1	2412	17.654	17.680	0.5
2	2417	17.680	17.654	0.5
3	2422	17.654	17.680	0.5
6	2437	17.680	17.654	0.5
10	2457	17.628	17.654	0.5
11	2462	17.654	17.706	0.5
12	2467	17.654	17.680	0.5
13	2472	17.654	17.654	0.5

6 dB BANDWIDTH, Chain 0









6 dB BANDWIDTH, Chain 1

