



**FCC 47 CFR PART 15 SUBPART C
INDUSTRY CANADA RSS-247 ISSUE 1**

CERTIFICATION TEST REPORT

FOR

APPLE TV

MODEL NUMBER: A1625

**FCC ID: BCGA1625
IC: 579C-A1625**

REPORT NUMBER: 15U20087-E3, REVISION D

ISSUE DATE: JULY 31, 2015

Prepared for
**APPLE, INC.
1 INFINITE LOOP
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	05/11/2015	Initial Issue	M. Mekuria
A	06/01/2015	Revised Section 2 and Section 7	T. Chu
B	06/17/2015	Revised report to address TCB questions, updated Section 7 KDB version	T. Chu
C	07/25/2015	Updated report per ANSI 63.10-2013 standard	E.YU
D	07/31//2015	Added IC standard	E.YU

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1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: APPLE TV

MODEL: A1625

SERIAL NUMBER: C07NW001GFM5

DATE TESTED: FEBRUARY 28 – MAY 06, 2015

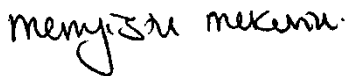
APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-247 Issue 1	Pass
INDUSTRY CANADA RSS-GEN Issue 4	Pass

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:

Tested By:



MENGISTU MEKURIA
SENIOR ENGINEER
UL VERIFICATION SERVICES INC.

ERIC YU
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 C63.10-2013, RSS-GEN Issue 4, and RSS-247 Issue 1.

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
<input type="checkbox"/> Chamber A	<input checked="" type="checkbox"/> Chamber D
<input type="checkbox"/> Chamber B	<input checked="" type="checkbox"/> Chamber E
<input type="checkbox"/> Chamber C	<input checked="" type="checkbox"/> Chamber F
	<input type="checkbox"/> Chamber G
	<input checked="" type="checkbox"/> 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:

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

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

The Apple TV device is a digital media receiver designed to play internet content onto a TV through an HDMI port. It incorporates Wi-Fi and Bluetooth radios.

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 - 2472	802.11b 1TX	22.99	199.07
2412 - 2472	802.11g	Covered by HT20 1TX	
2412 - 2472	802.11n HT20 1TX	25.55	358.92
2412 - 2472	802.11n HT20 2TX	28.51	709.58

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Band (GHz)	Antenna Gain	
	Antenna 1	Antenna 2
2.4	0.25	0.46

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was Version 7.16.170.5

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, it was determined that Y-landscape orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in Y-landscape 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

The target power for 802.11g and 802.11n HT20 1TX are the same and use the same modulation (OFDM).

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop AC/DC adapter	Lenovo	92P1160	11S92P1160Z1ZBGH798B12	NA
Laptop	Lenovo	7659	L3-AL664 08/03	NA
Dongle	N/A	N/A	HDG1409226823	NA

I/O CABLES (CONDUCTED TEST)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Antenna	1	SMA	Un-Shielded	0.2	To spectrum Analyzer
2	USB	1	USB	Shielded	1	N/A
3	AC	1	AC	Un-shielded	3	N/A

I/O CABLES (RADIATED ABOVE 1 GHZ)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	AC	Un-shielded	3	N/A

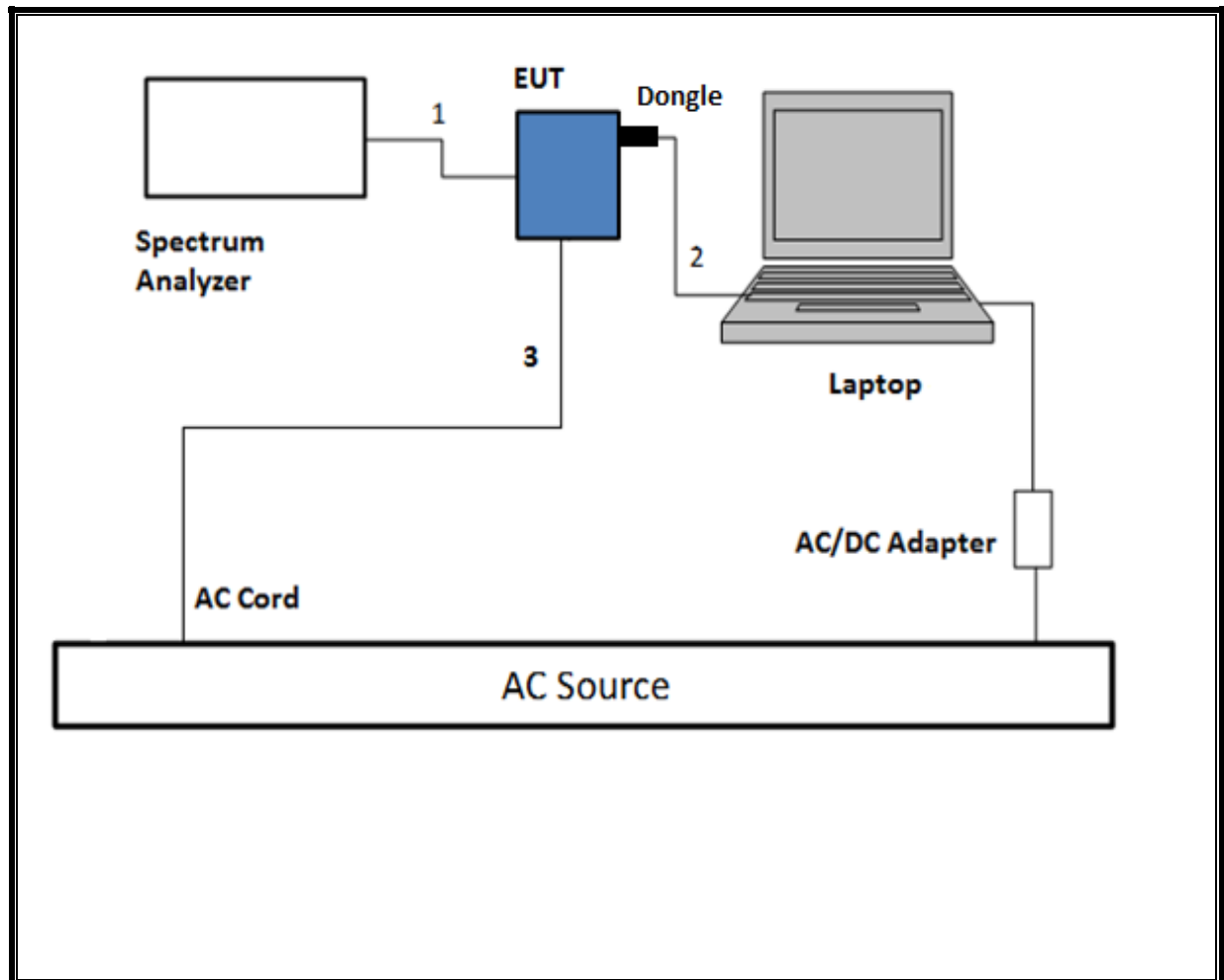
I/O CABLES (AC POWER CONDUCTED TEST AND BELOW 1 GHZ)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	AC	Un-shielded	3	N/A

TEST SETUP

The EUT was powered by AC cord. Test software exercised the radio card.

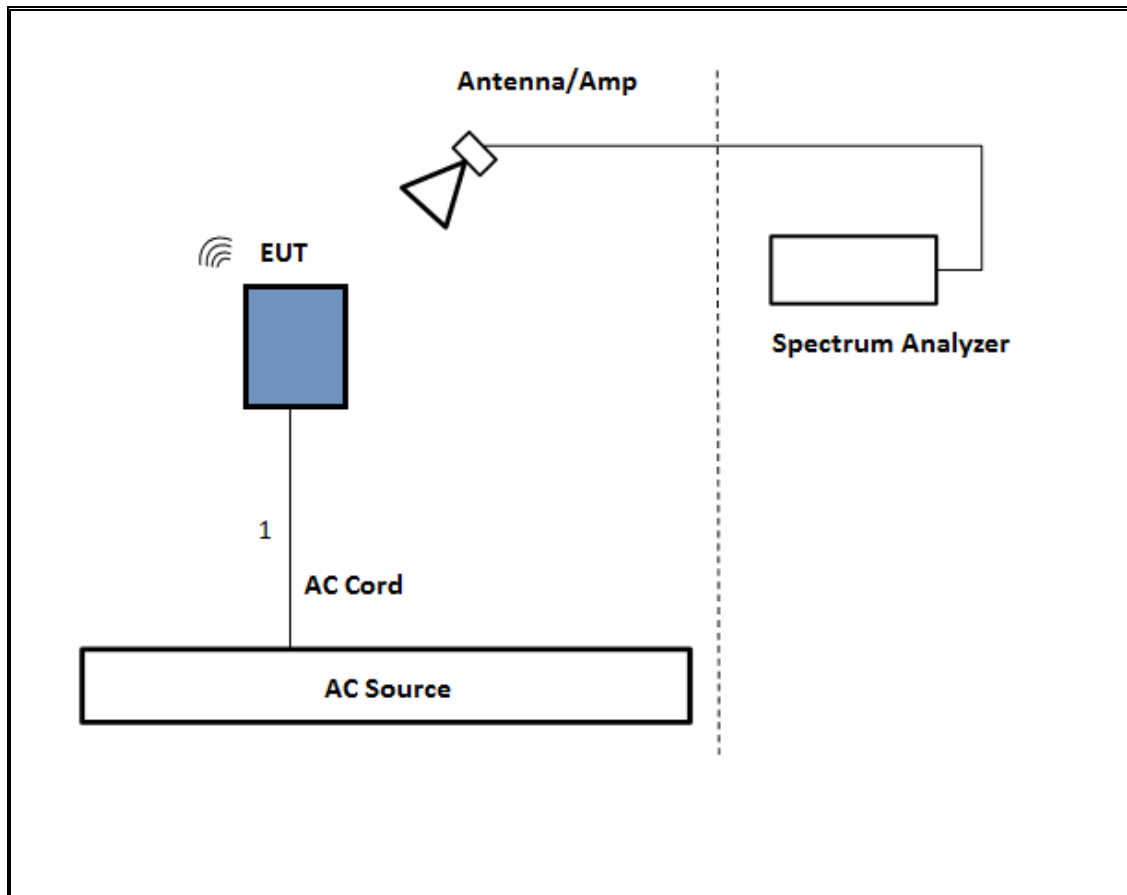
SETUP DIAGRAM



TEST SETUP- RADIATED-ABOVE 1 GHZ

The EUT was powered by AC cord. Test software exercised the EUT.

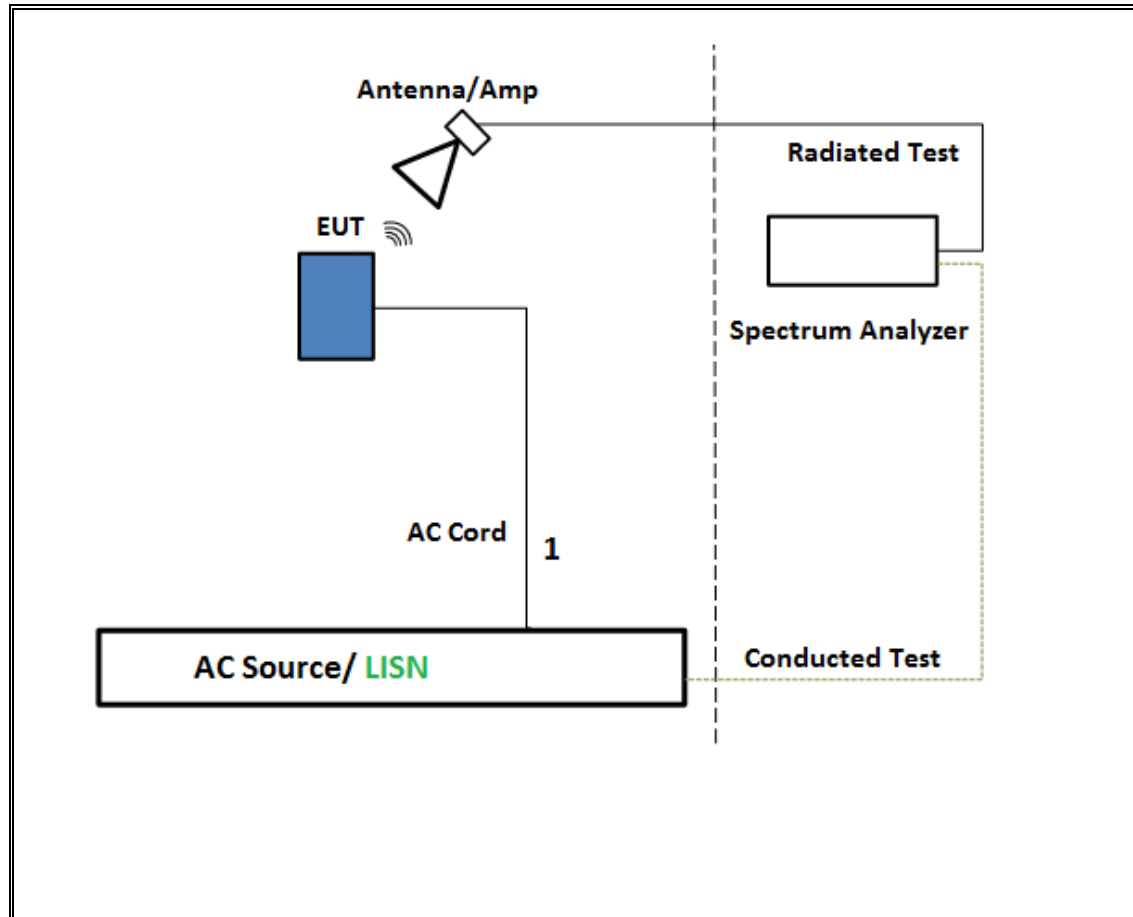
SETUP DIAGRAM



TEST SETUP- BELOW 1GHZ & AC LINE CONDUCTED TESTS

The EUT was powered by AC cord. Test software exercised the EUT.

SETUP DIAGRAM



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
Antenna, Horn 1-18GHz	ETS Lindgren	3117	00143449	2/10/2016
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	A022813-1	1/14/2016
Amplifier, 1 - 18GHz	Miteq	AFS42-00101800-25-S-42	1782158	1/26/2016
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	323561	5/28/2015
*Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent	N9030A	US51350187	5/2/2015
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	185623	6/7/2015
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent	N9030A	MY51380911	2/20/2016
Power Meter, P-series single channel	Agilent	N1911A	GB45100212	10/9/2015
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Agilent	N1921A	MY53260010	7/12/2015
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826	1049	12/17/2015
Spectrum Analyzer, 40 GHz	Agilent	8564E	3943A01643	8/6/2015
Amplifier, 1 to 26.5GHz, 23.5dB Gain minimum	Agilent	8449B	3008A01114	10/4/2015
AC Line Conducted				
EMI Test Receiver 9KHz-7GHz	Rohde & Schwarz	ESCI7	100935	9/16/2015
LISN for Conducted Emissions CISPR-16	FCC	50/250-25-2	114	1/16/2016
Power Cable, Line Conducted Emissions ANSI 63.4	UL	PG1	N/A	7/28/2015
UL SOFTWARE				
Radiated Software	UL	UL EMC	Ver 9.5, July 22, 2014	
Conducted Software	UL	UL EMC	Ver 2.2, March 31, 2015	
AC Line Conducted Software	UL	UL EMC	Ver 9.5, February 26, 2015	

*equipment was used before expiration date

7. MEASUREMENT METHODS

6 dB BW: KDB 558074 D01 v03r03, Section 8.1.

Output Power: KDB 558074 D01 v03r03, Section 9.1.2

Power Spectral Density: KDB 558074 D01 v03r03, Section 10.2.

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v03r03, Section 11.0.

Out-of-band emissions in restricted bands: KDB 558074 D01 v03r03, Section 12.1.

Band-edge: KDB 558074 D01 v03r03, Section 12.1

8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

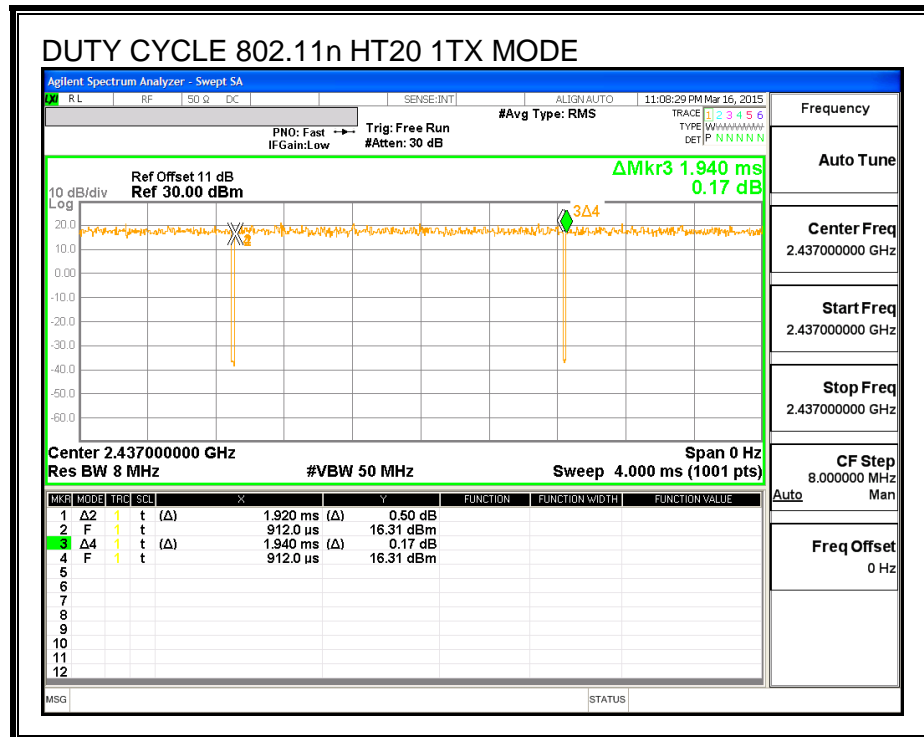
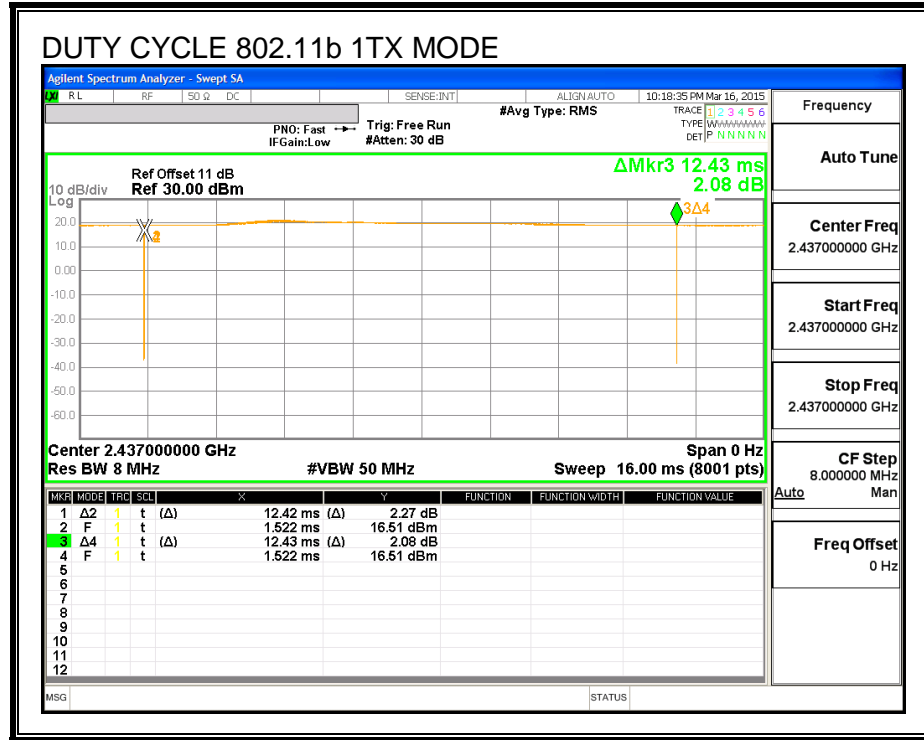
KDB 558074 Zero-Span Spectrum Analyzer Method.

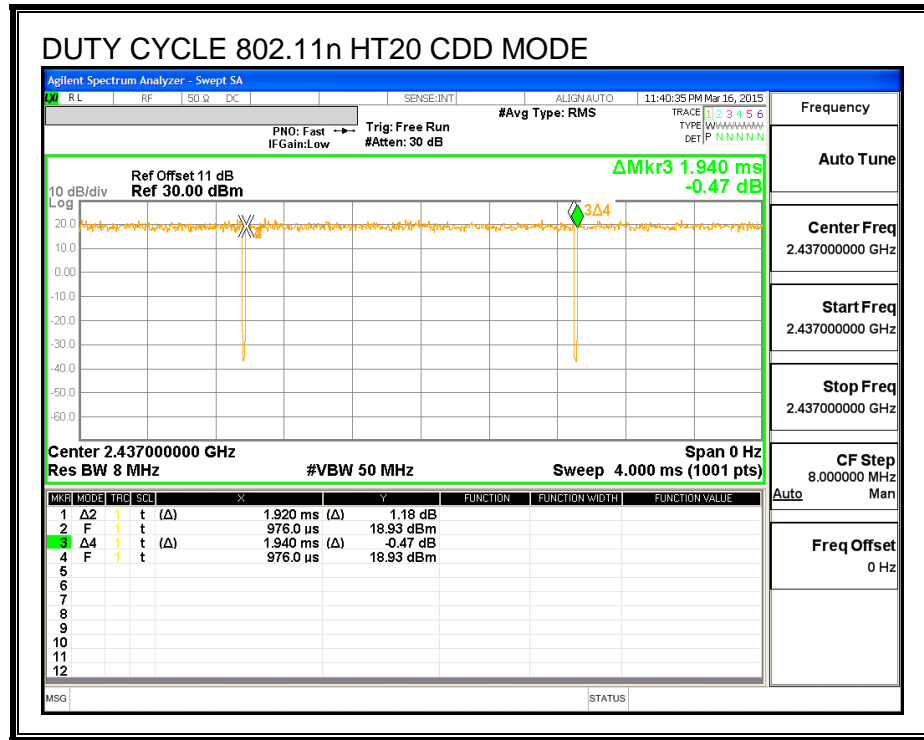
ON TIME AND DUTY CYCLE RESULTS

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	12.420	12.430	0.999	99.92%	0.00	0.010
802.11n HT20 1TX	1.920	1.940	0.990	98.97%	0.00	0.010
802.11n HT20 CDD	1.920	1.940	0.990	98.97%	0.00	0.010

DUTY CYCLE PLOTS

2.4 GHz BAND





8.2. 802.11b SISO MODE IN THE 2.4 GHz BAND

8.2.1. 6 dB BANDWIDTH

LIMITS

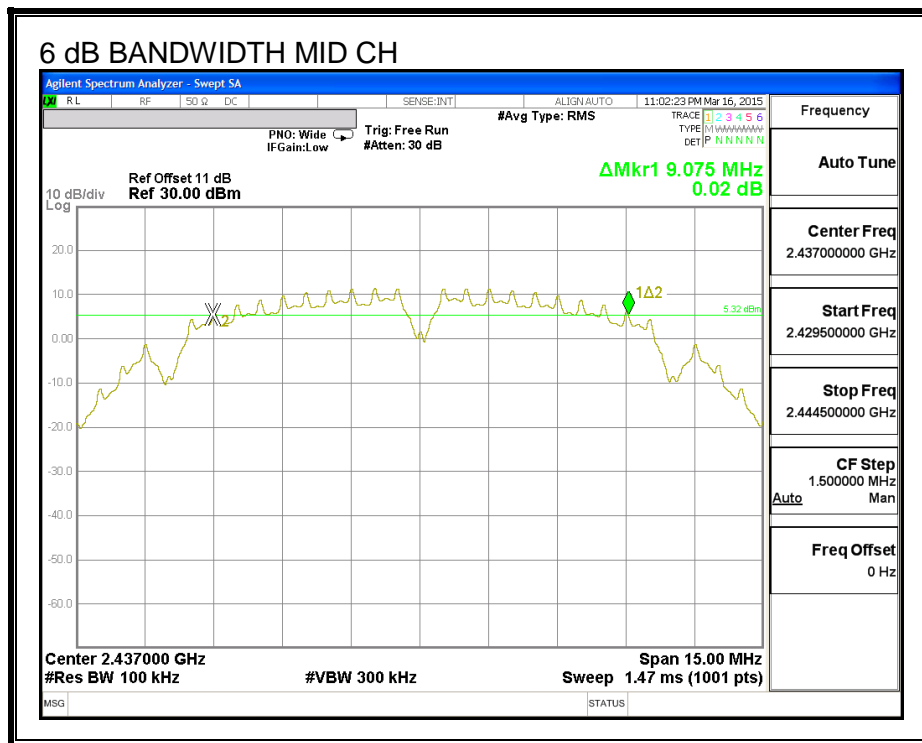
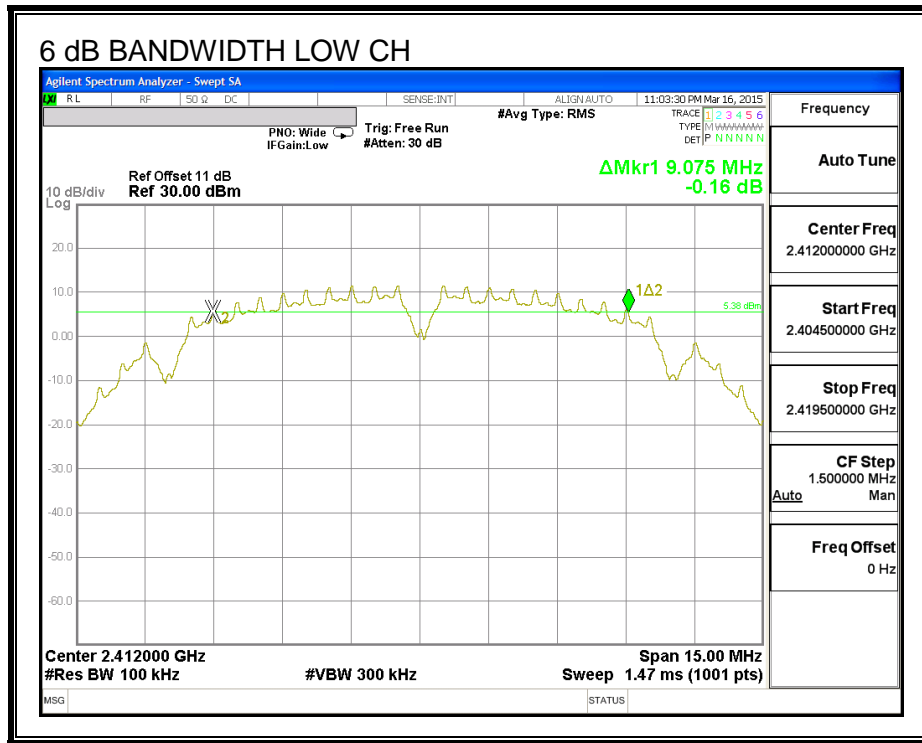
FCC §15.247 (a) (2)
IC RSS-247 (5.2) (1)

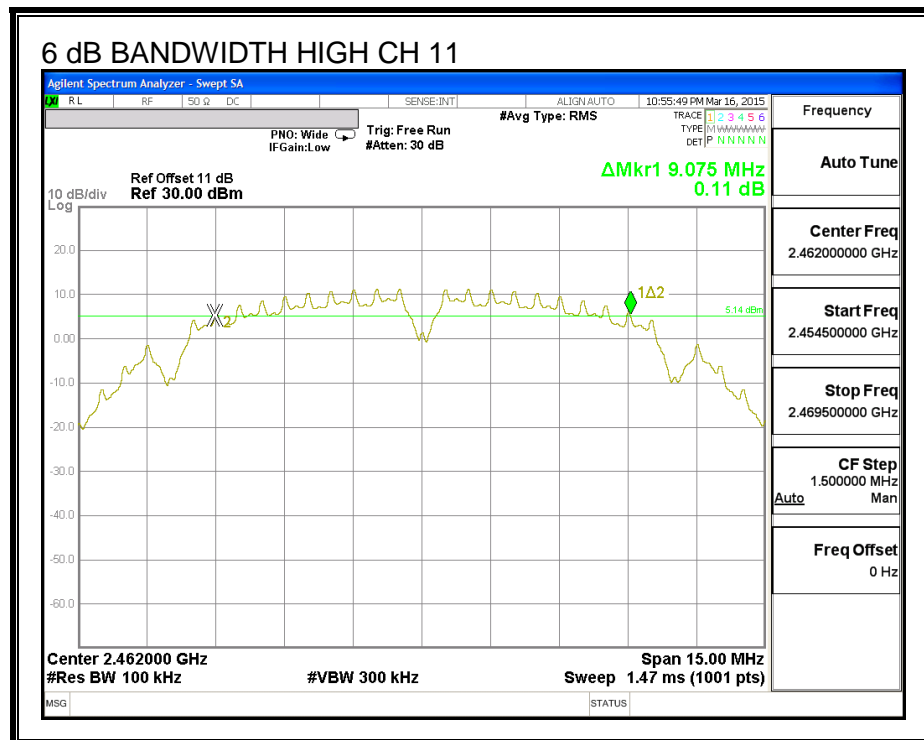
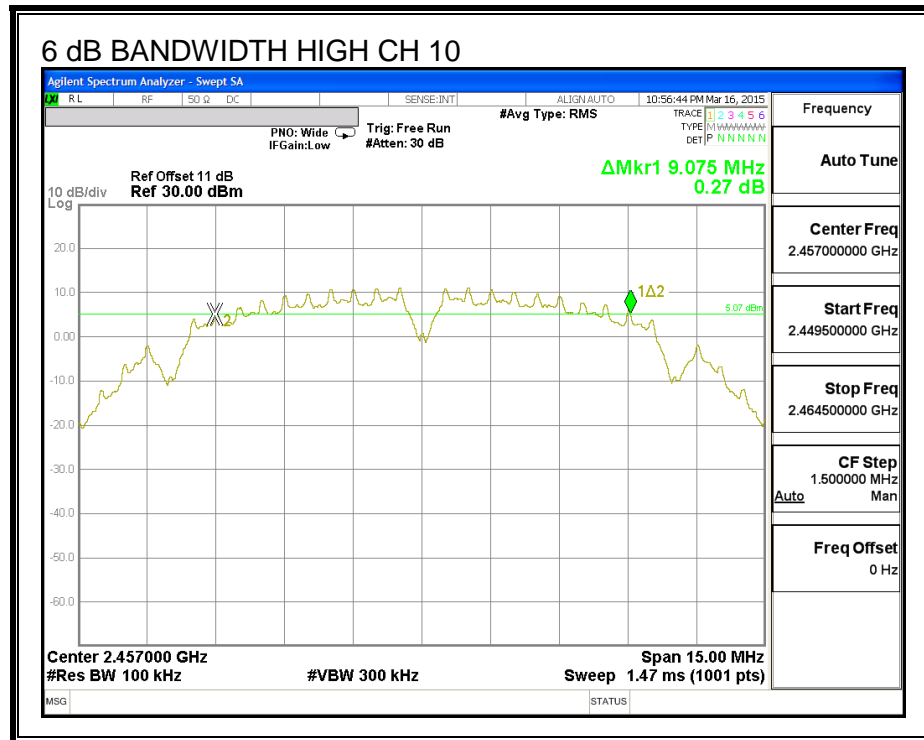
The minimum 6 dB bandwidth shall be at least 500 kHz.

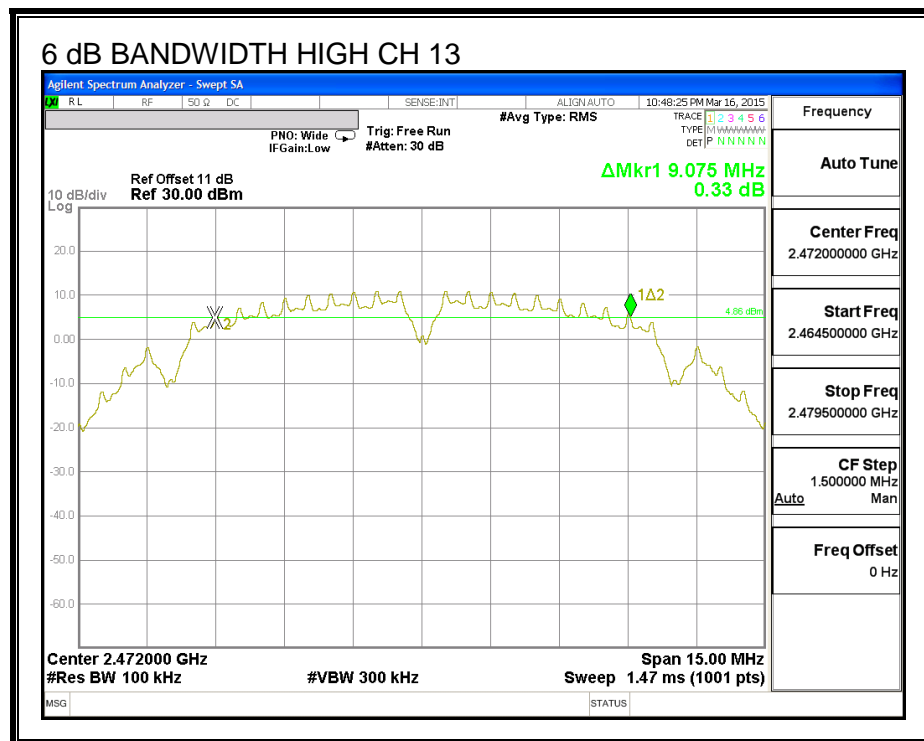
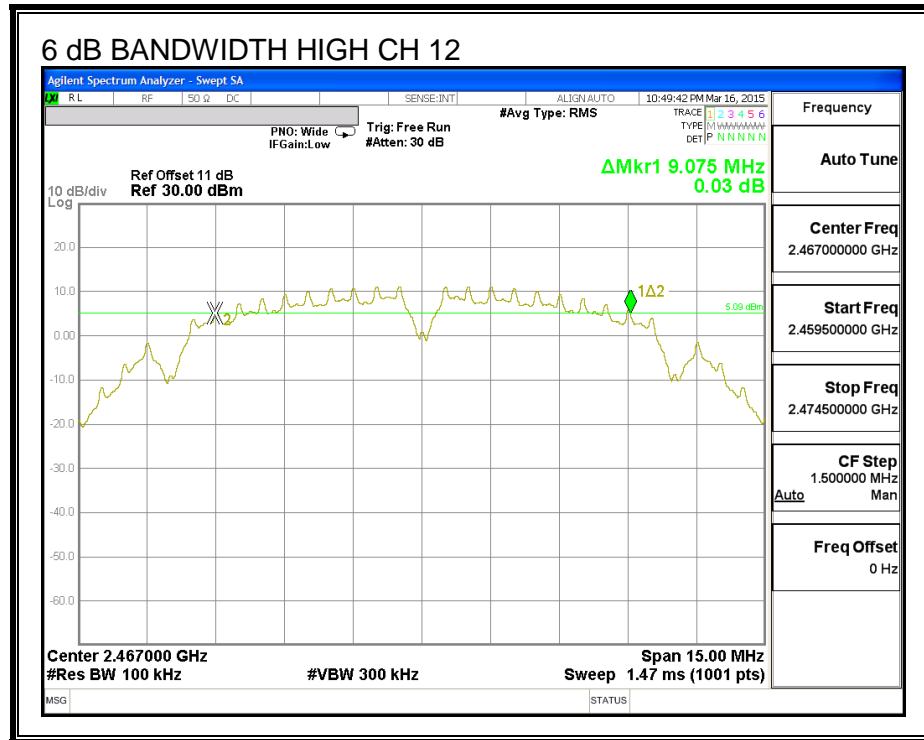
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	9.075	0.5
Mid	2437	9.075	0.5
High_10	2457	9.075	0.5
High_11	2462	9.075	0.5
High_12	2467	9.075	0.5
High_13	2472	9.075	0.5

6 dB BANDWIDTH







8.2.2. 99% BANDWIDTH

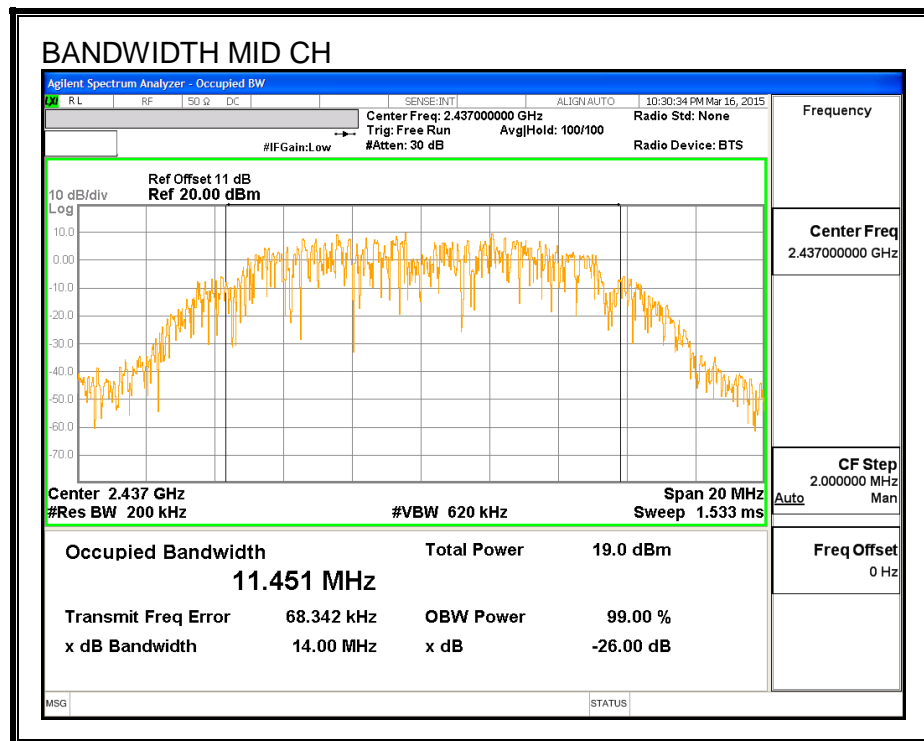
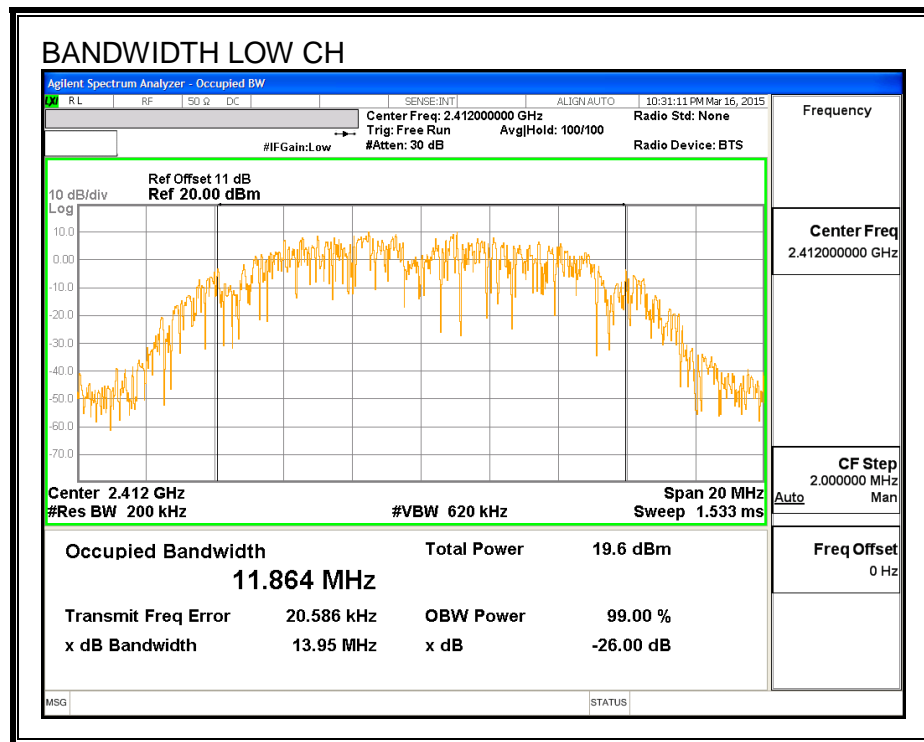
LIMITS

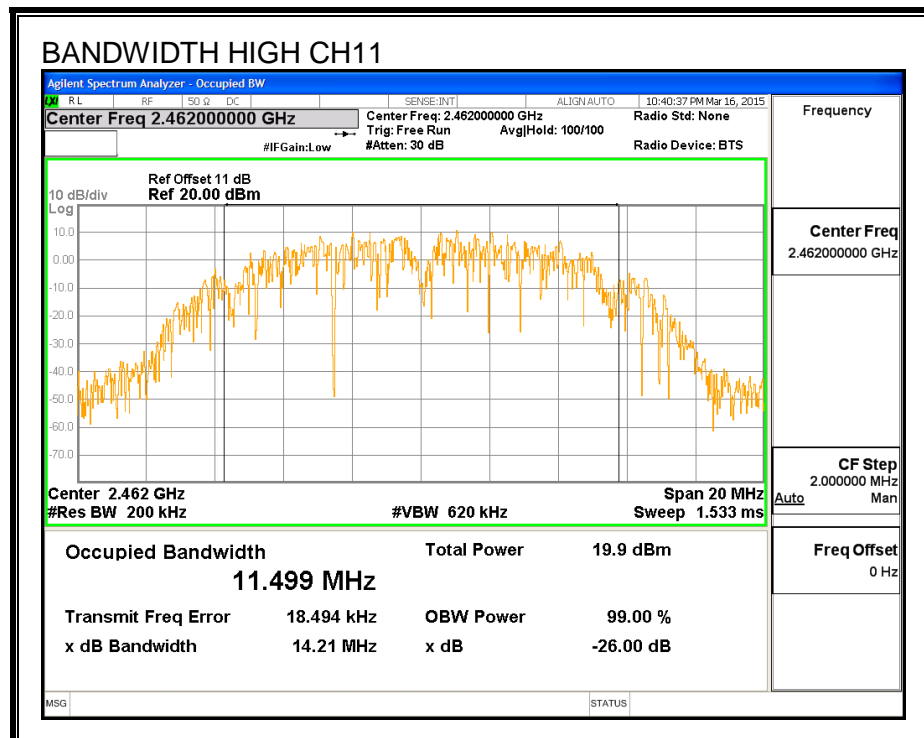
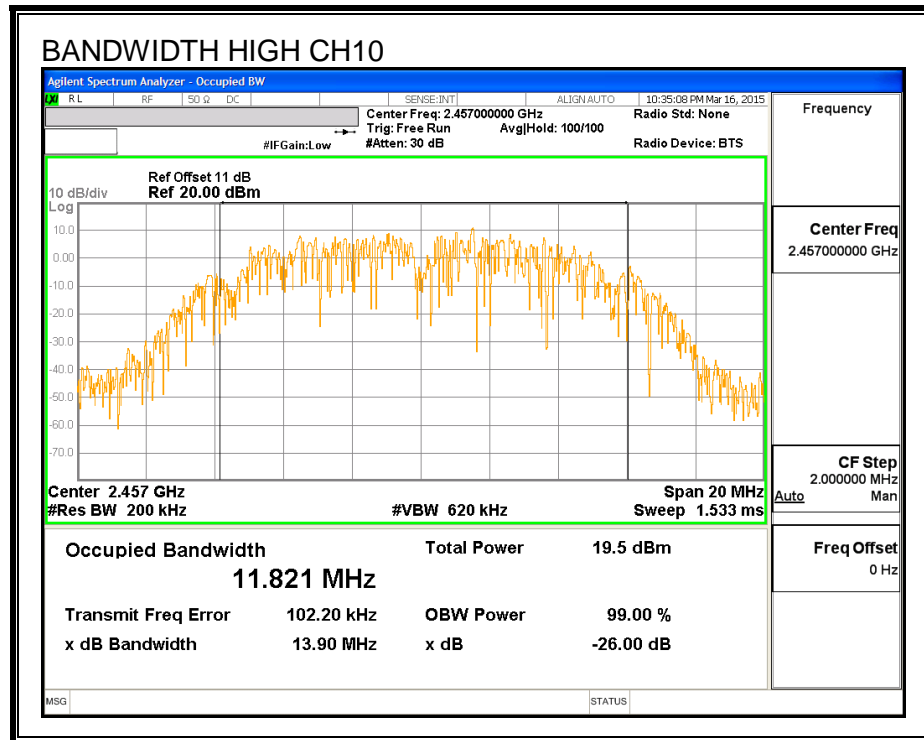
None; for reporting purposes only.

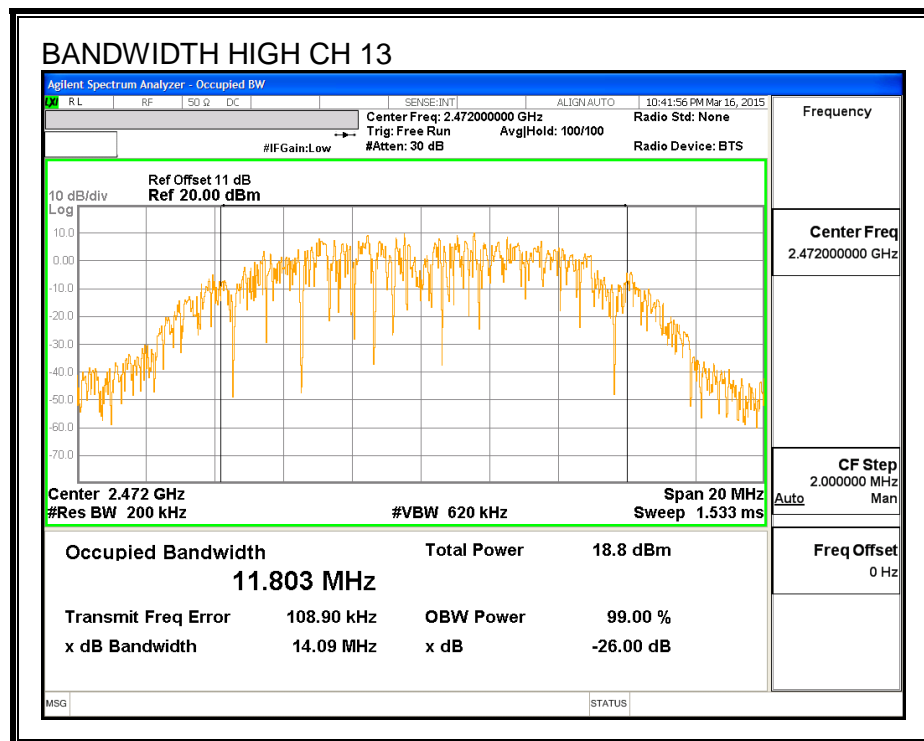
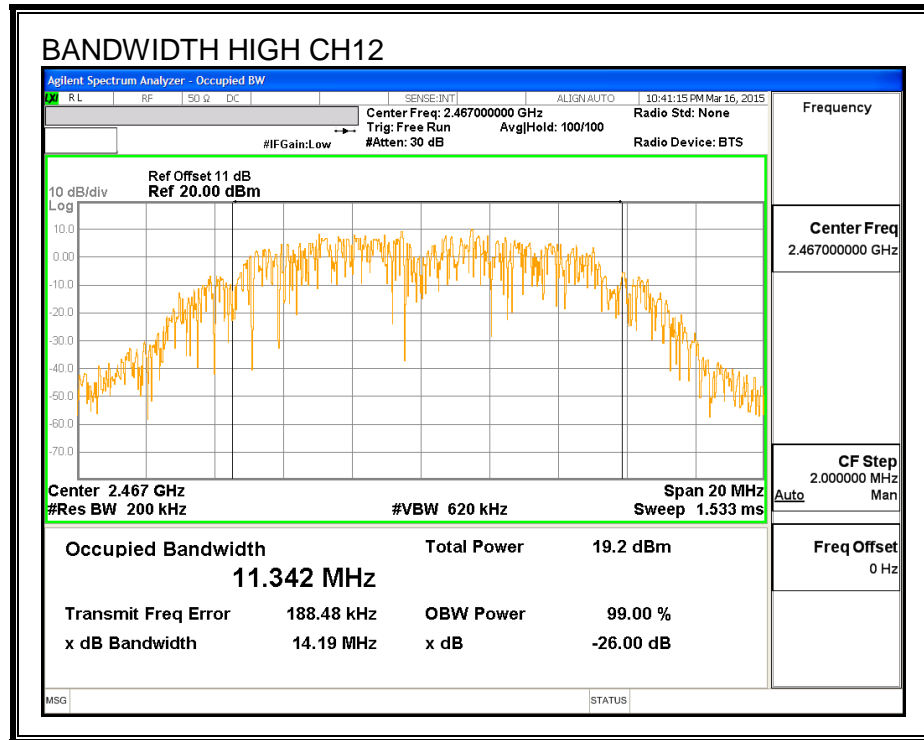
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	11.864
Mid	2437	11.451
High_10	2457	11.821
High_11	2462	11.499
High_12	2467	11.342
High_13	2472	11.803

99% BANDWIDTH







8.2.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low	2412	19.45
Mid	2437	19.50
High_10	2457	19.48
High_11	2462	18.00
High_12	2467	13.97
High_13	2472	11.00

8.2.4. OUTPUT POWER

LIMITS

FCC §15.247
IC RSS-247 (5.4) (4)

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)
Low	2412	0.46	30.00	30	36	30.00
Mid	2437	0.46	30.00	30	36	30.00
High_10	2457	0.46	30.00	30	36	30.00
High_11	2462	0.46	30.00	30	36	30.00
High_12	2467	0.46	30.00	30	36	30.00
High_13	2472	0.46	30.00	30	36	30.00

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power
--------------------	------	--

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	2412	22.94	22.94	30.00	-7.06
Mid	2437	22.99	22.99	30.00	-7.01
High_10	2457	22.95	22.95	30.00	-7.05
High_11	2462	21.78	21.78	30.00	-8.22
High_12	2467	17.54	17.54	30.00	-12.46
High_13	2472	14.68	14.68	30.00	-15.32

8.2.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247

IC RSS-247 (5.2) (2)

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 KHz band during any time interval of continuous transmissions.

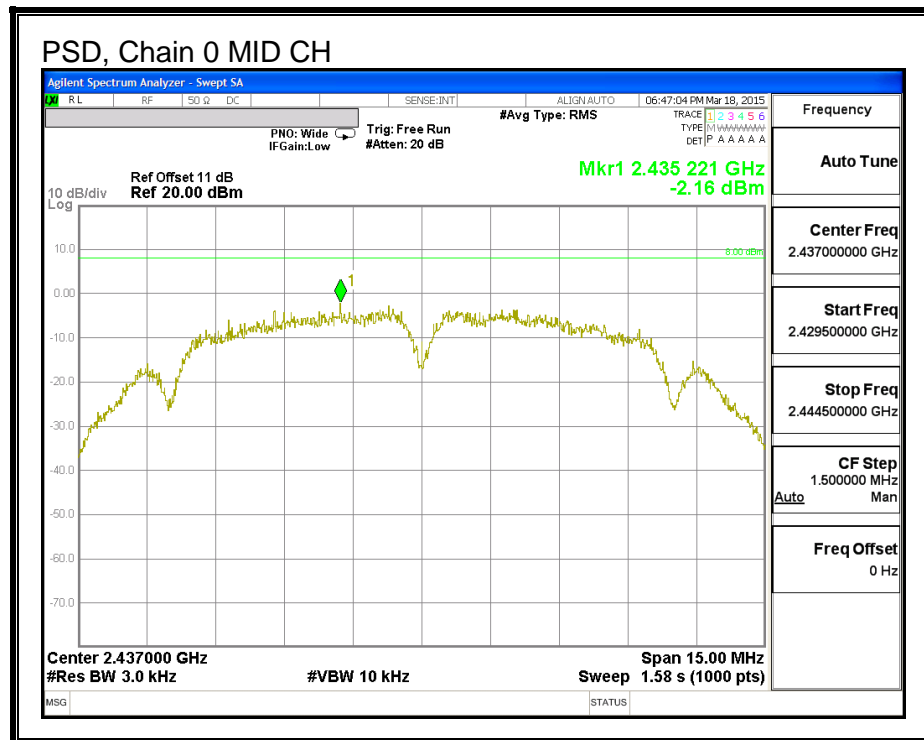
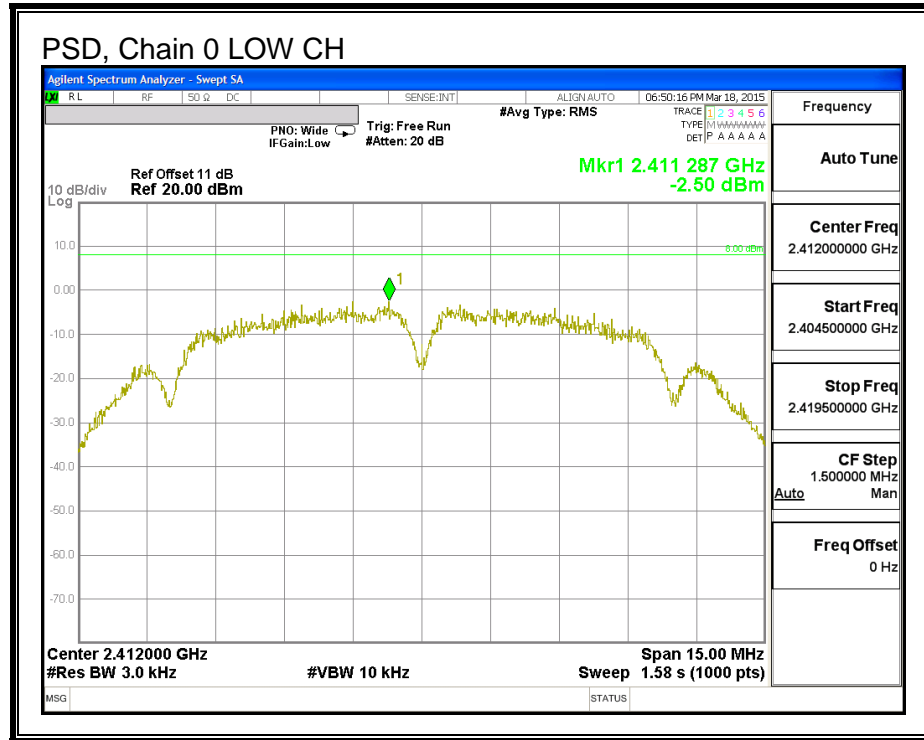
RESULTS

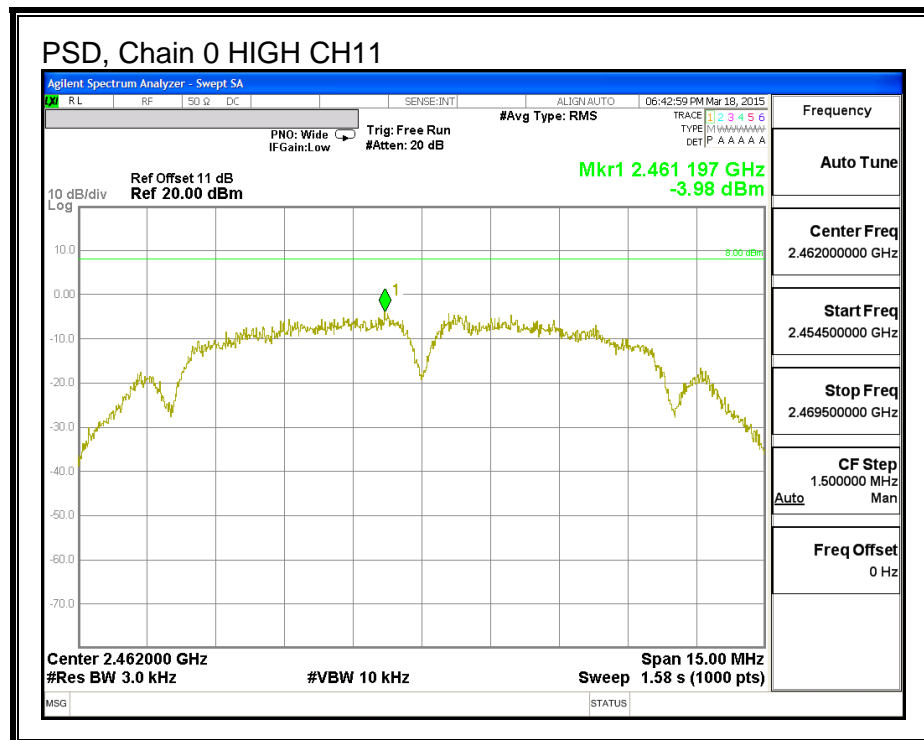
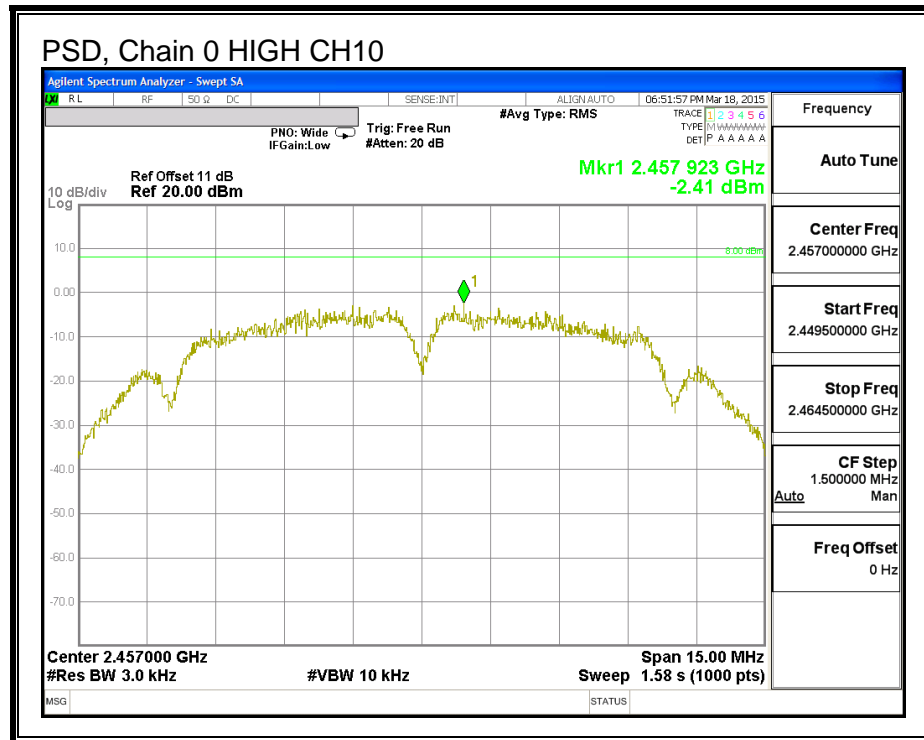
Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd PSD
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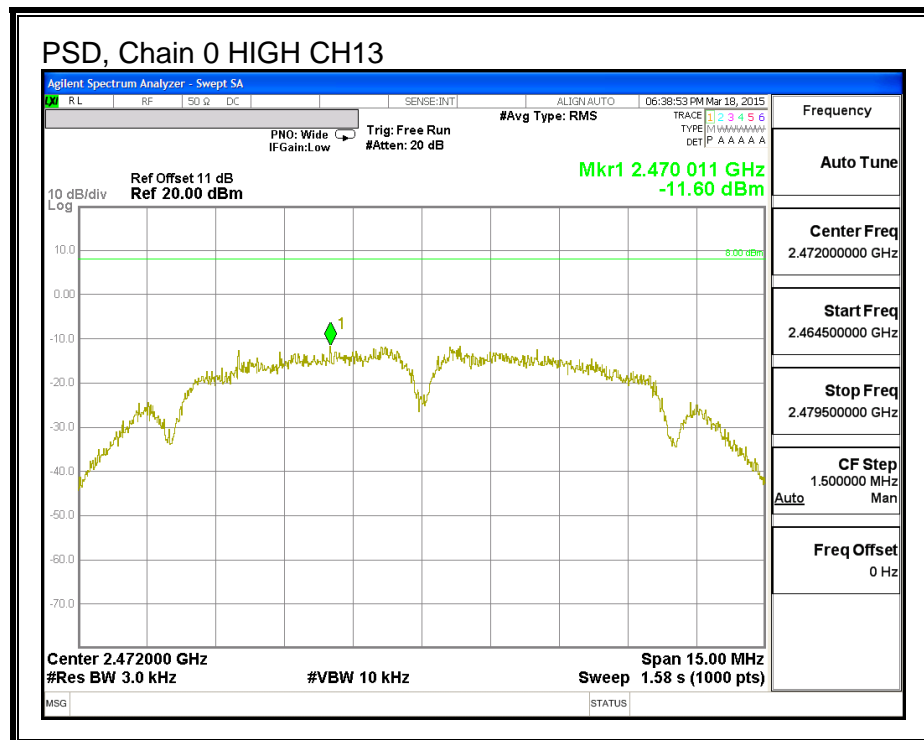
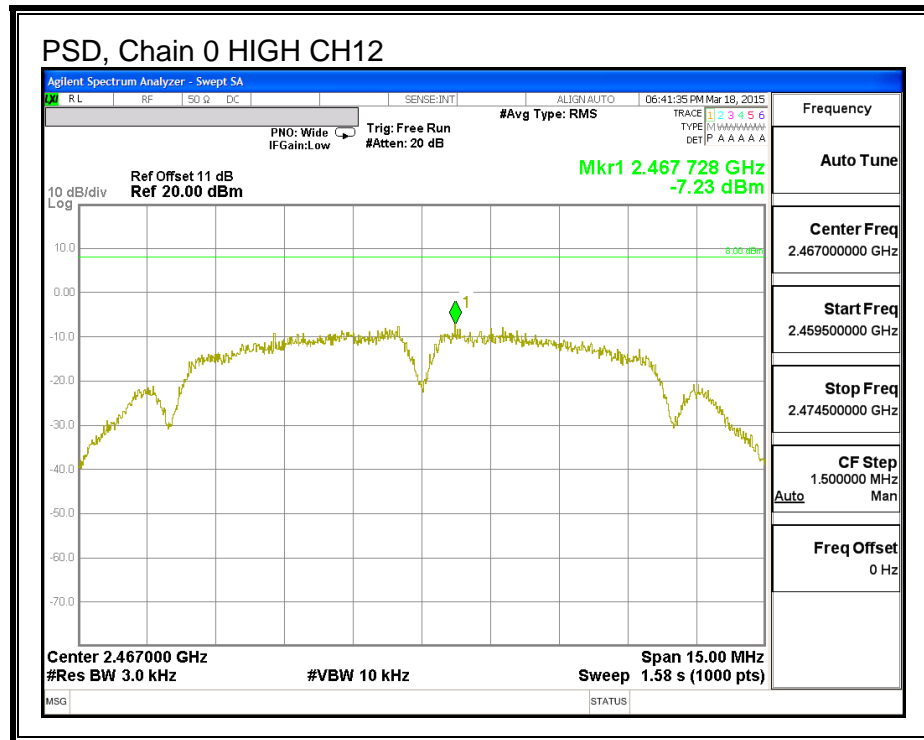
PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Total Corr'd PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-2.50	-2.50	8.0	-10.5
Mid	2437	-2.16	-2.16	8.0	-10.2
High_10	2457	-2.41	-2.41	8.0	-10.4
High_11	2462	-3.98	-3.98	8.0	-12.0
High_12	2467	-7.23	-7.23	8.0	-15.2
High_13	2472	-11.60	-11.60	8.0	-19.6

PSD, Chain 0







8.2.6. OUT-OF-BAND EMISSIONS

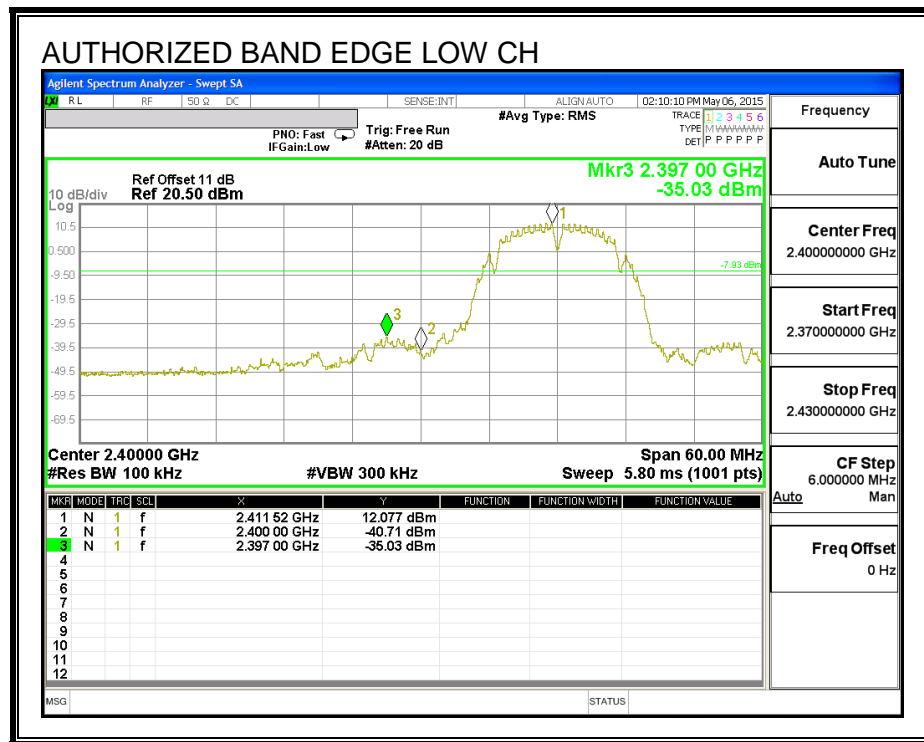
LIMITS

FCC §15.247 (d)

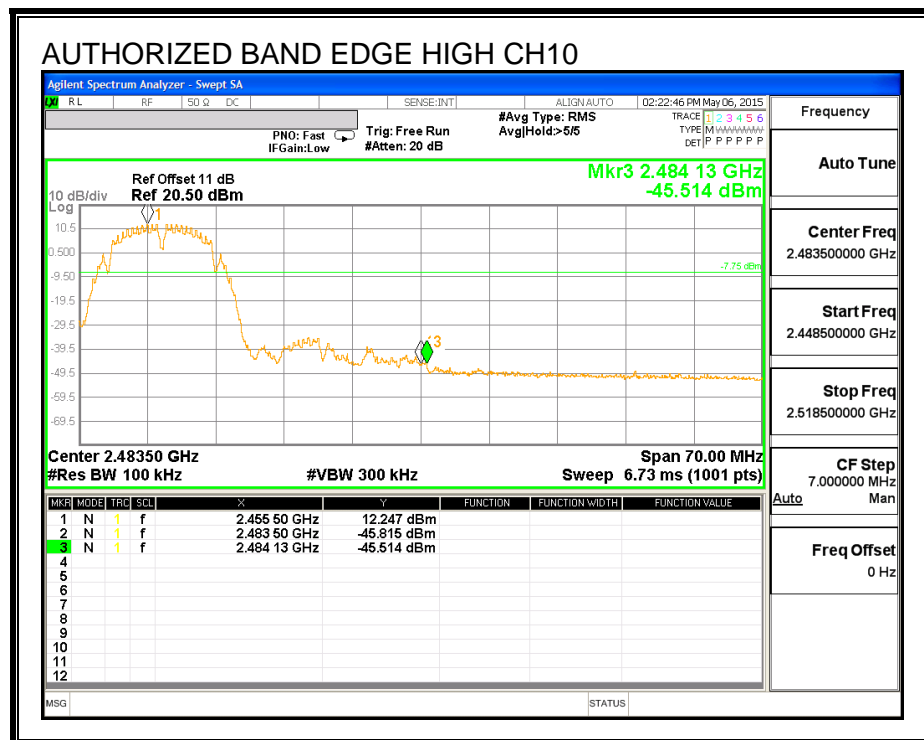
IC RSS-247 (5.5)

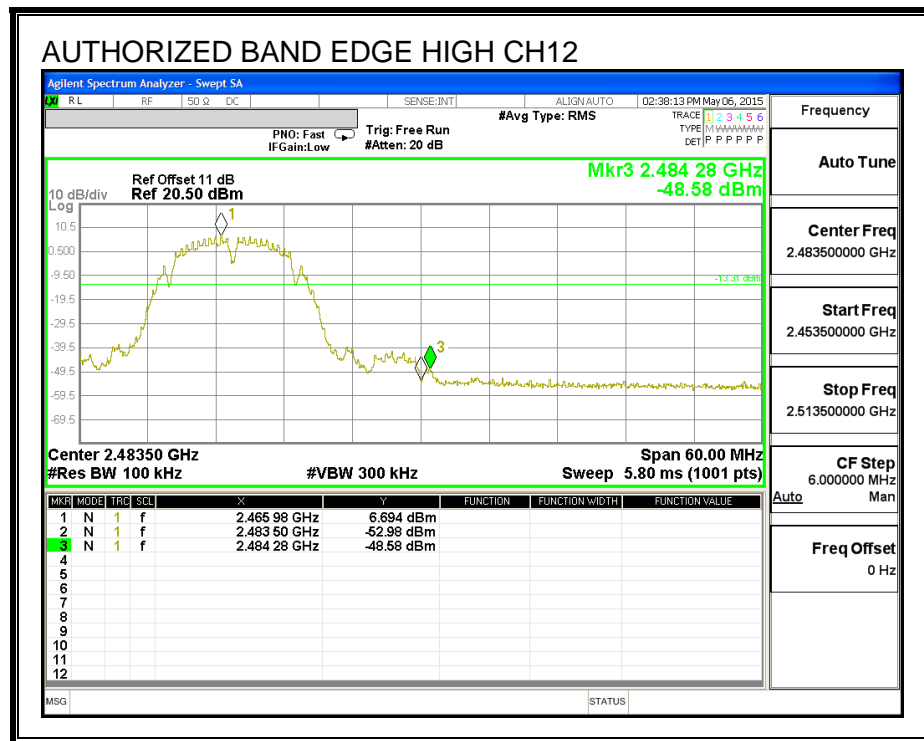
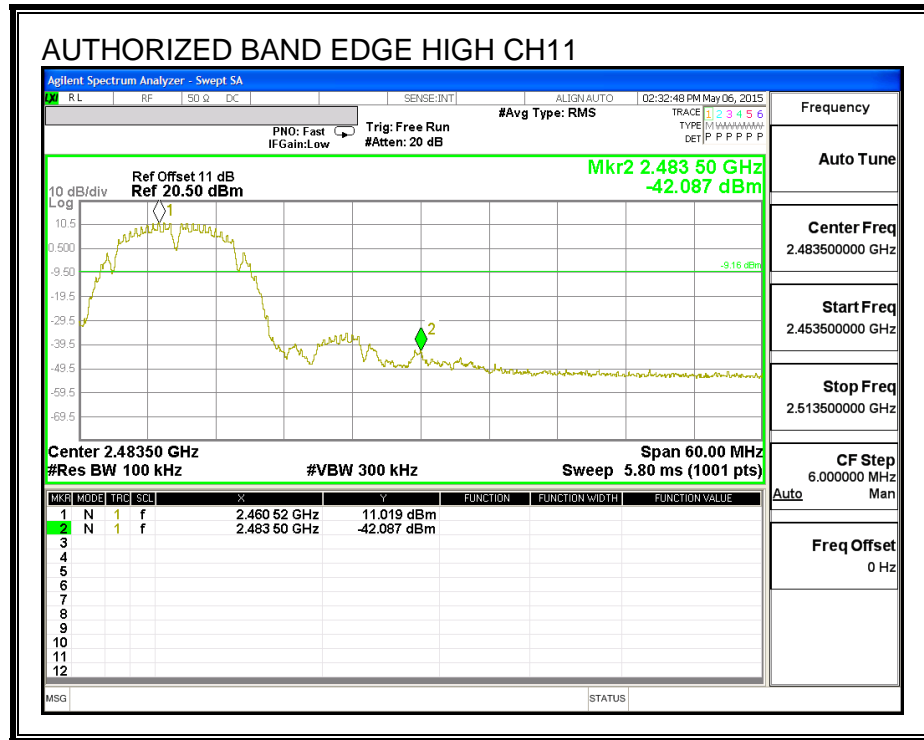
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the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

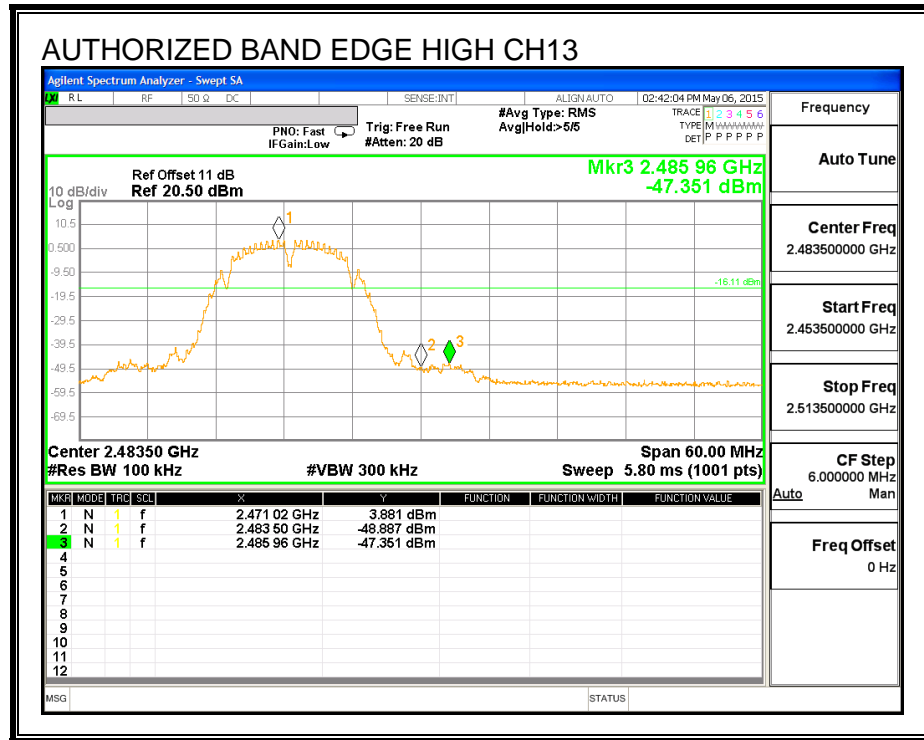
LOW CHANNEL BANDEDGE



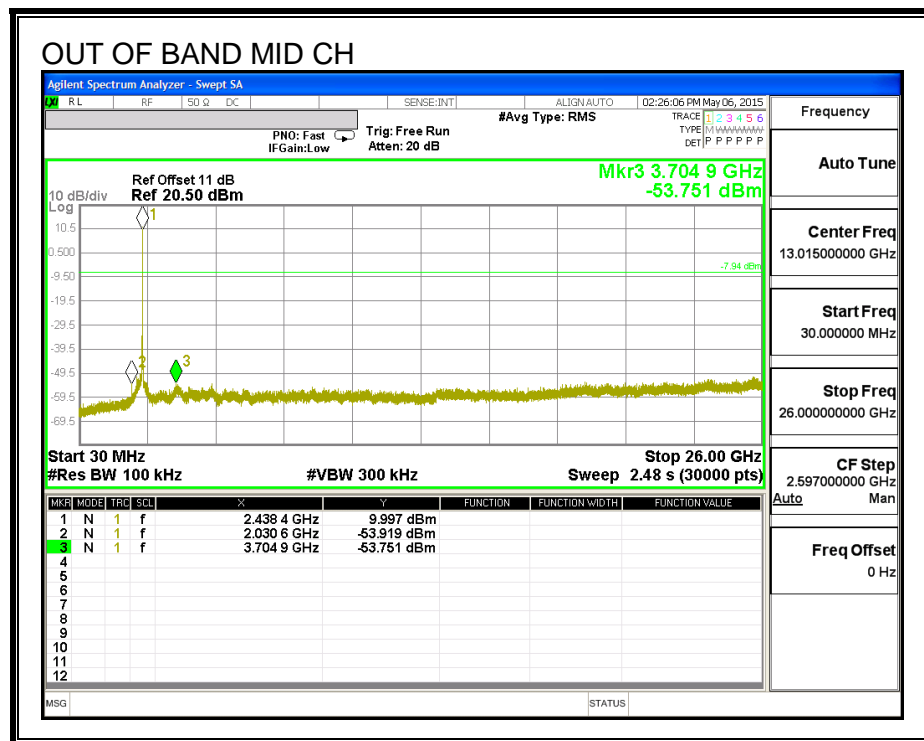
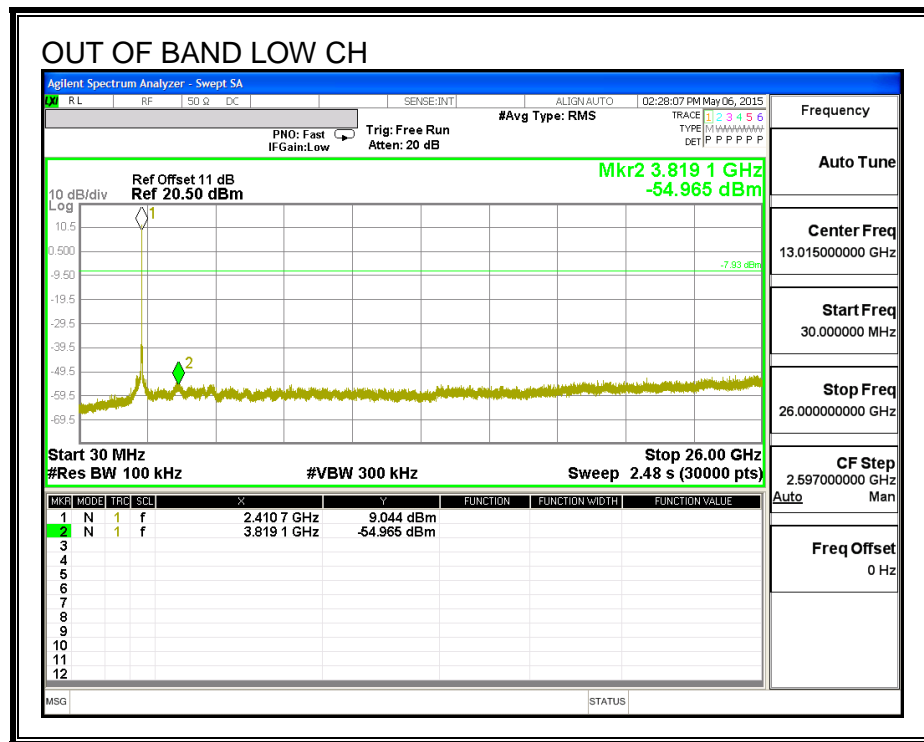
HIGH CHANNEL BANDEDGE

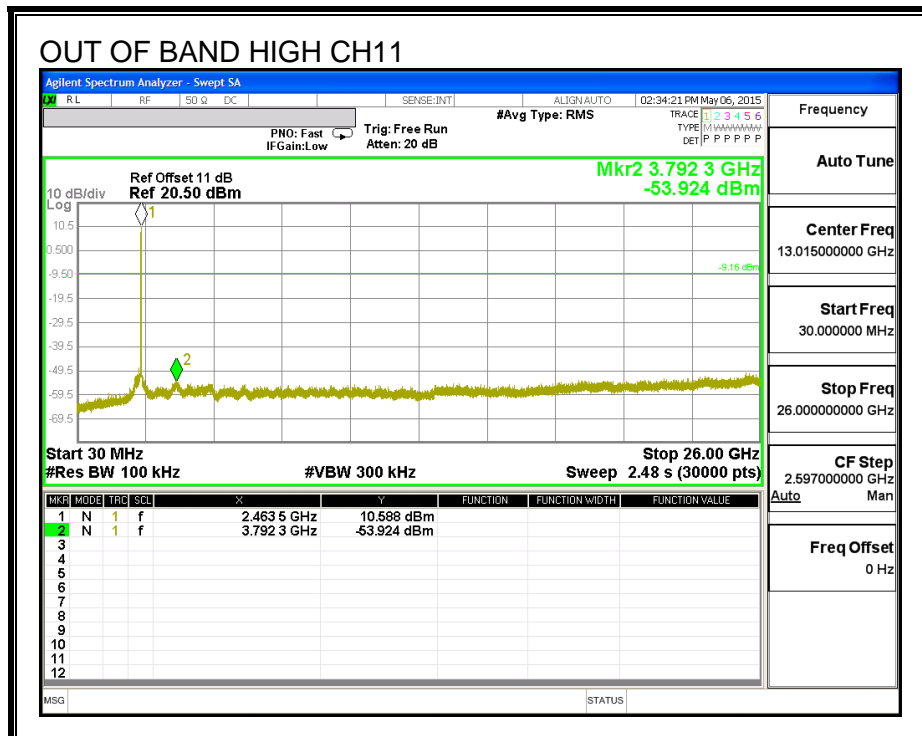
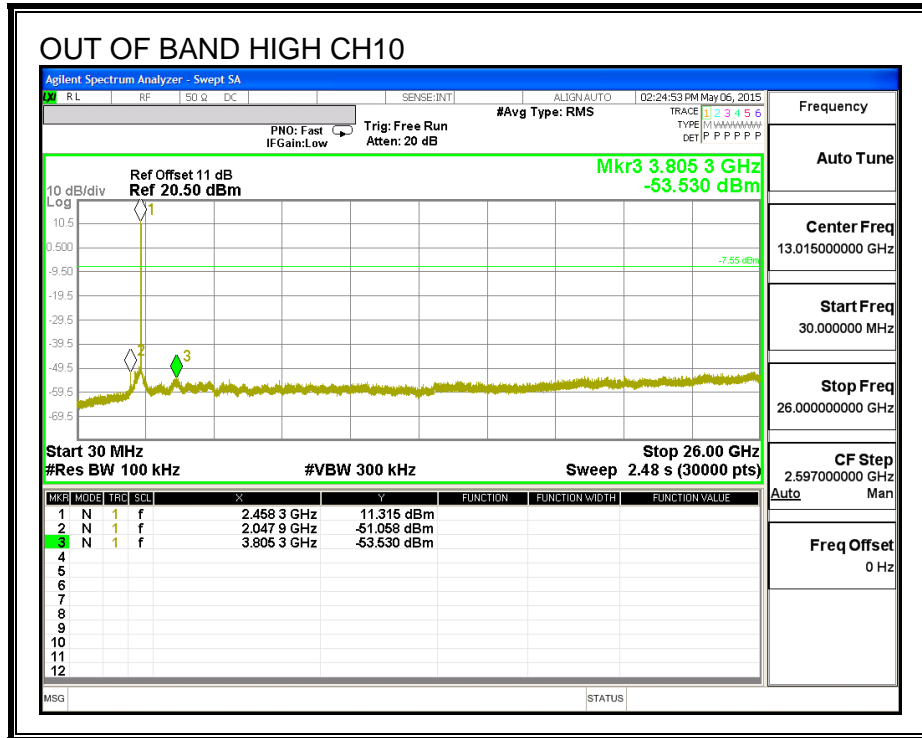


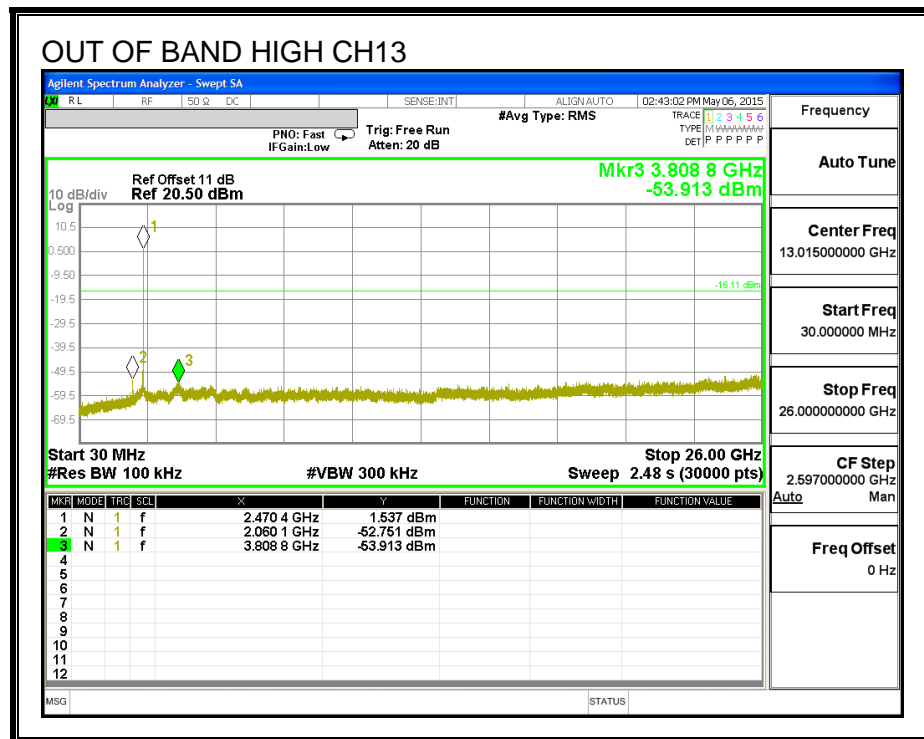
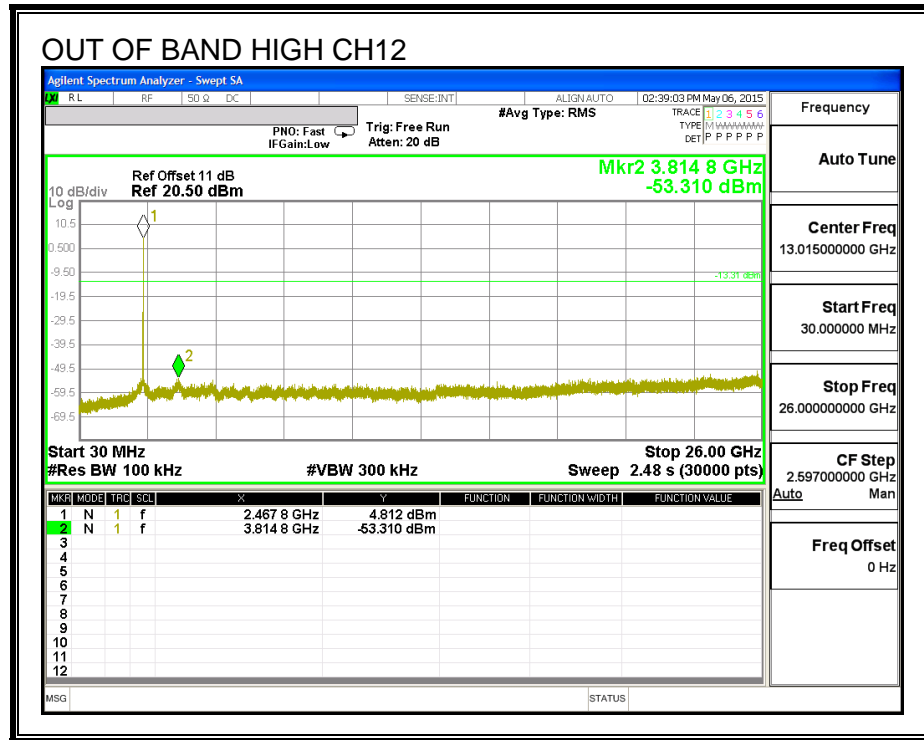




OUT-OF-BAND EMISSIONS







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

8.3.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

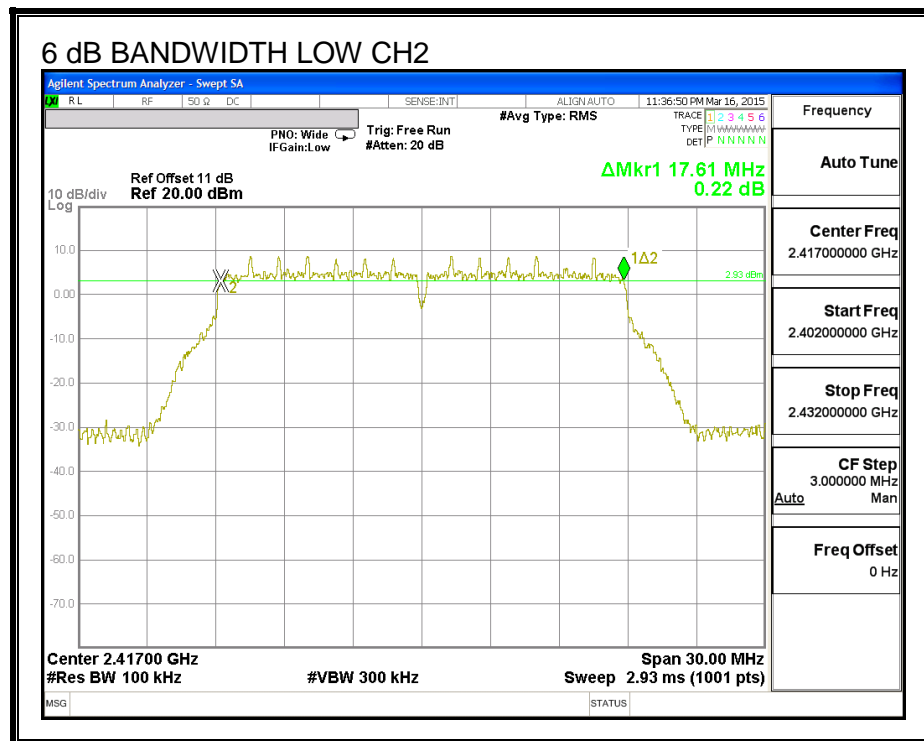
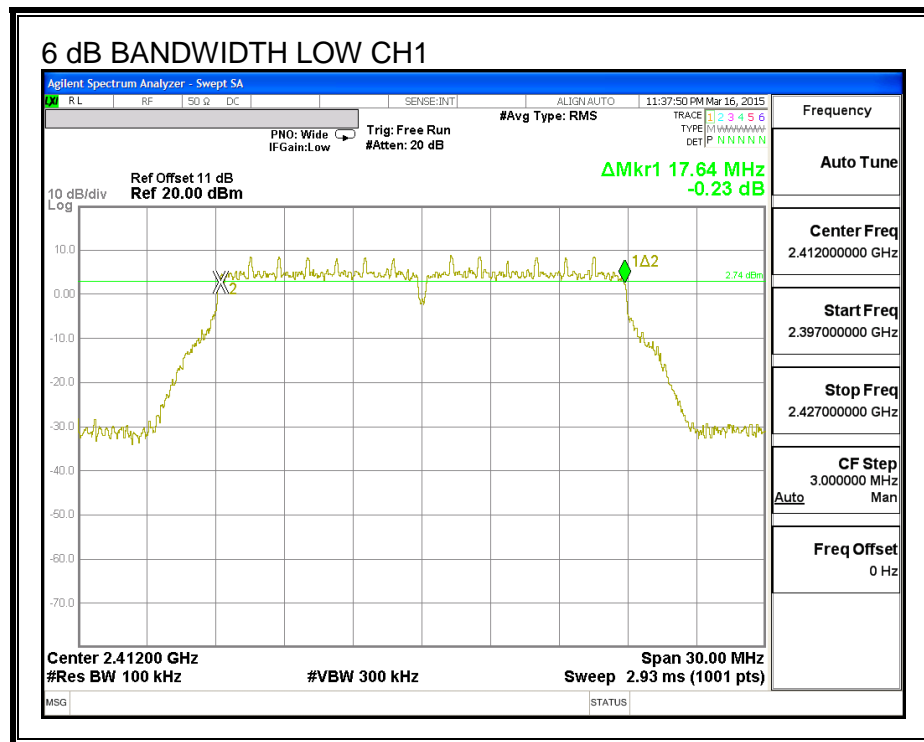
IC RSS-247 (5.2) (1)

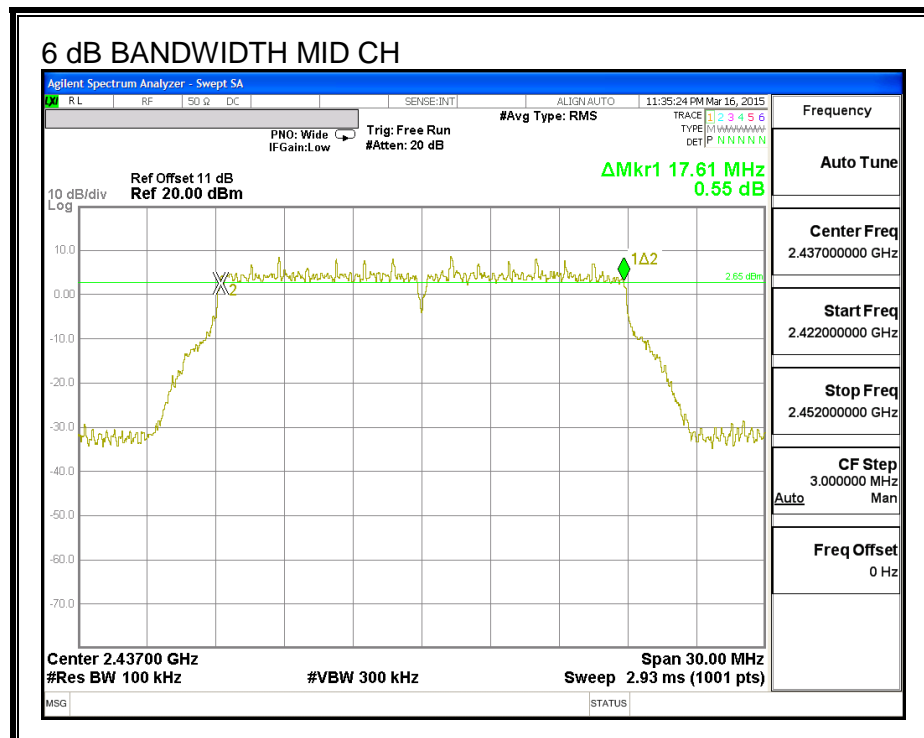
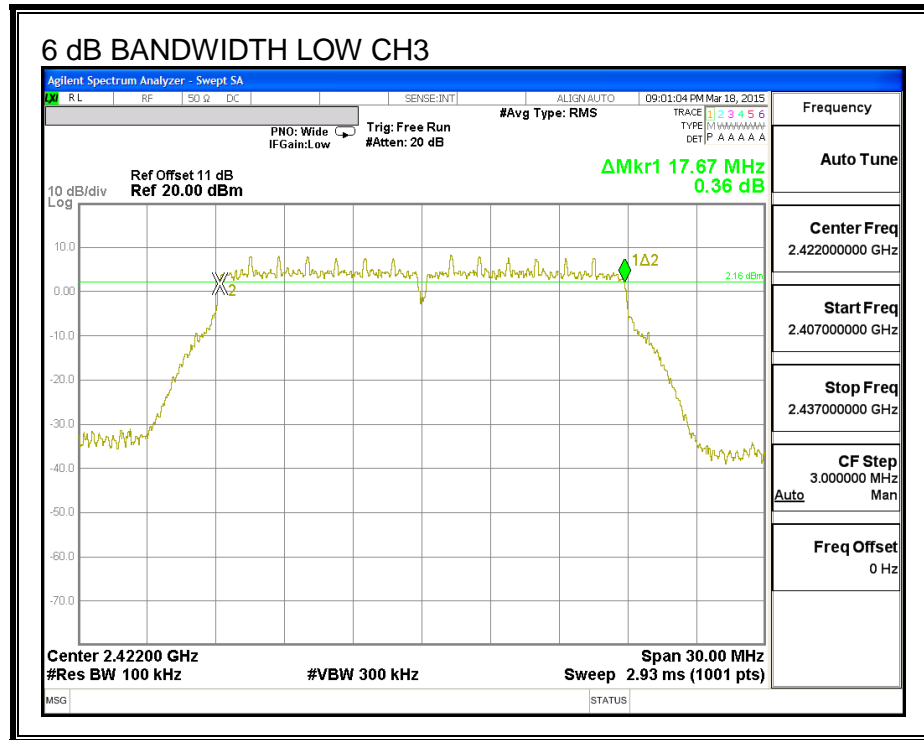
The minimum 6 dB bandwidth shall be at least 500 kHz.

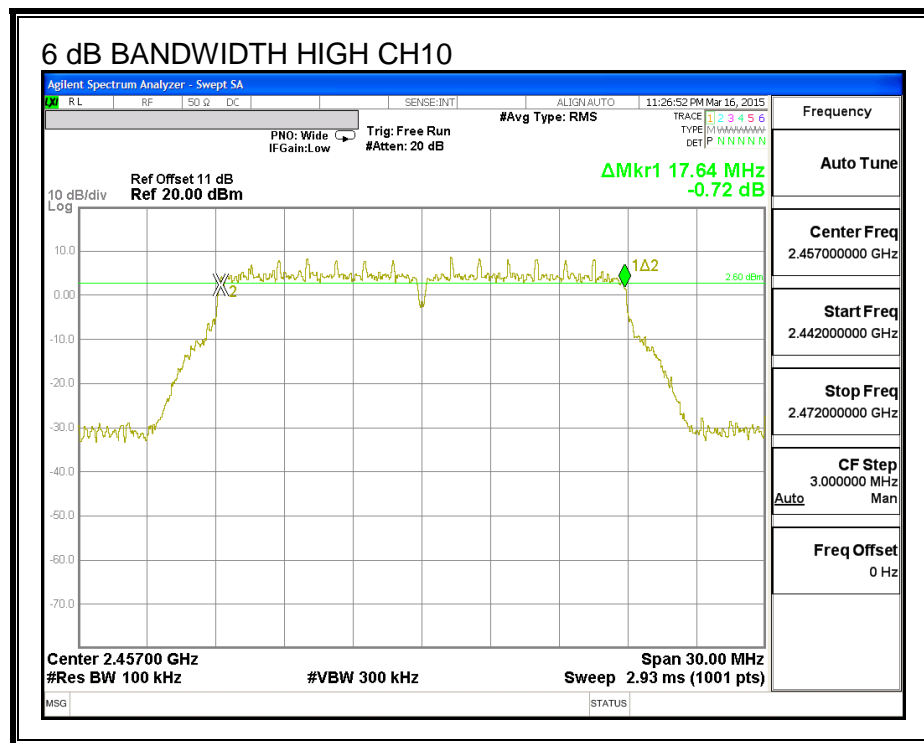
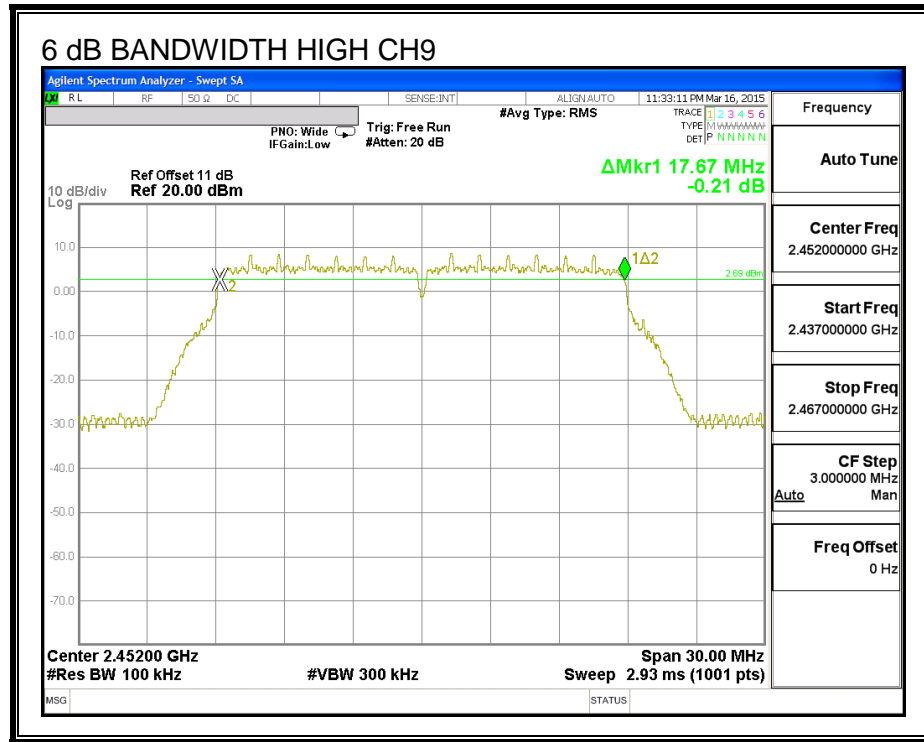
RESULTS

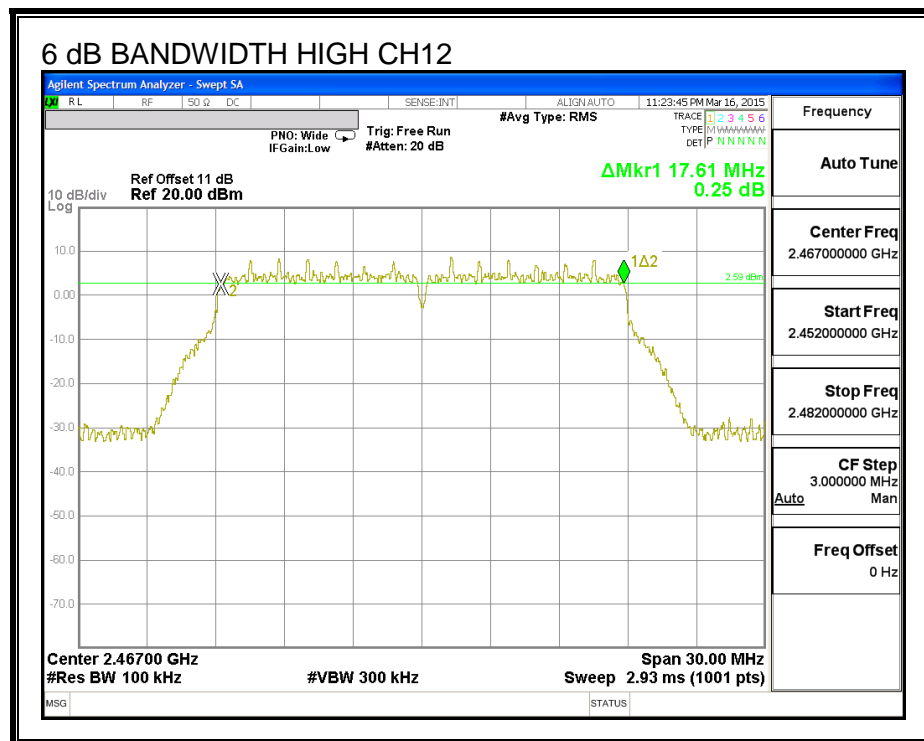
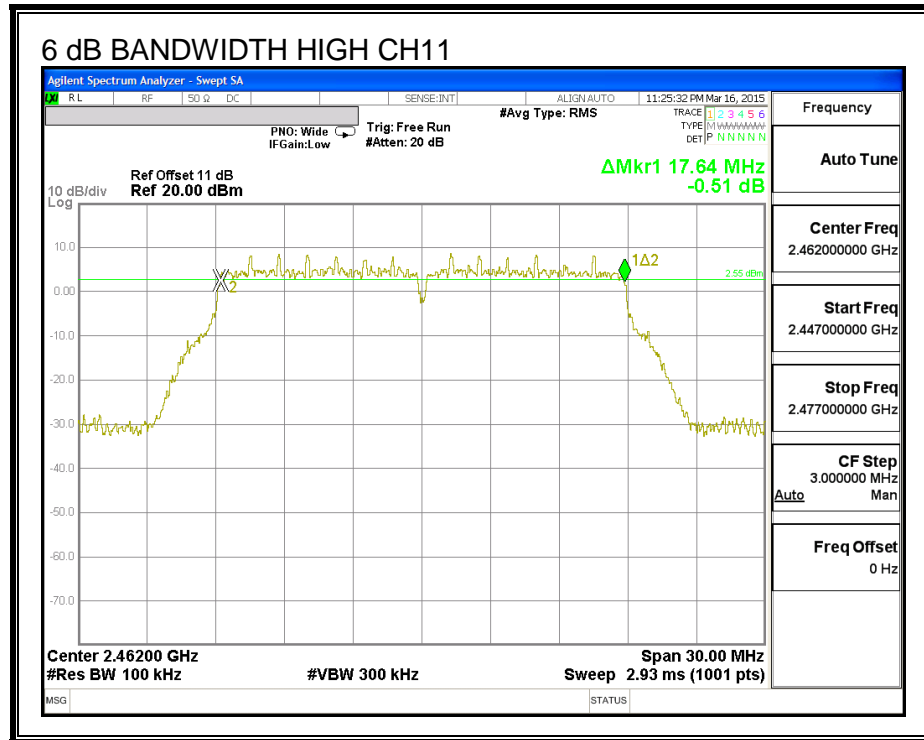
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low_1	2412	17.64	0.5
Low_2	2417	17.61	0.5
Low_3	2422	17.67	0.5
Mid	2437	17.61	0.5
High_9	2452	17.67	0.5
High_10	2457	17.64	0.5
High_11	2462	17.64	0.5
High_12	2467	17.61	0.5
High_13	2472	17.64	0.5

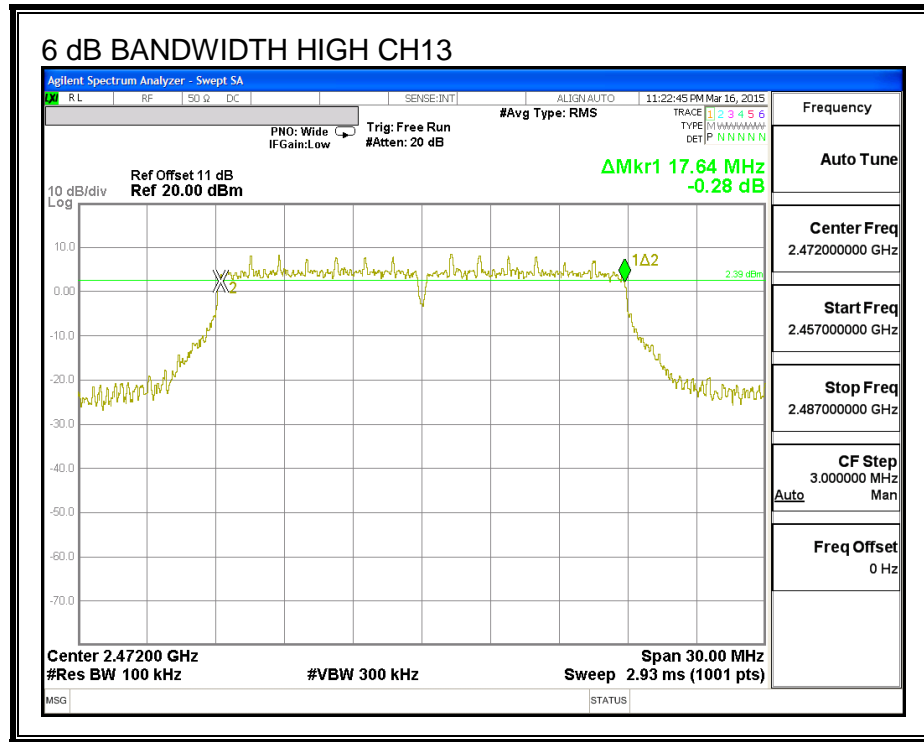
6 dB BANDWIDTH











8.3.2. 99% BANDWIDTH

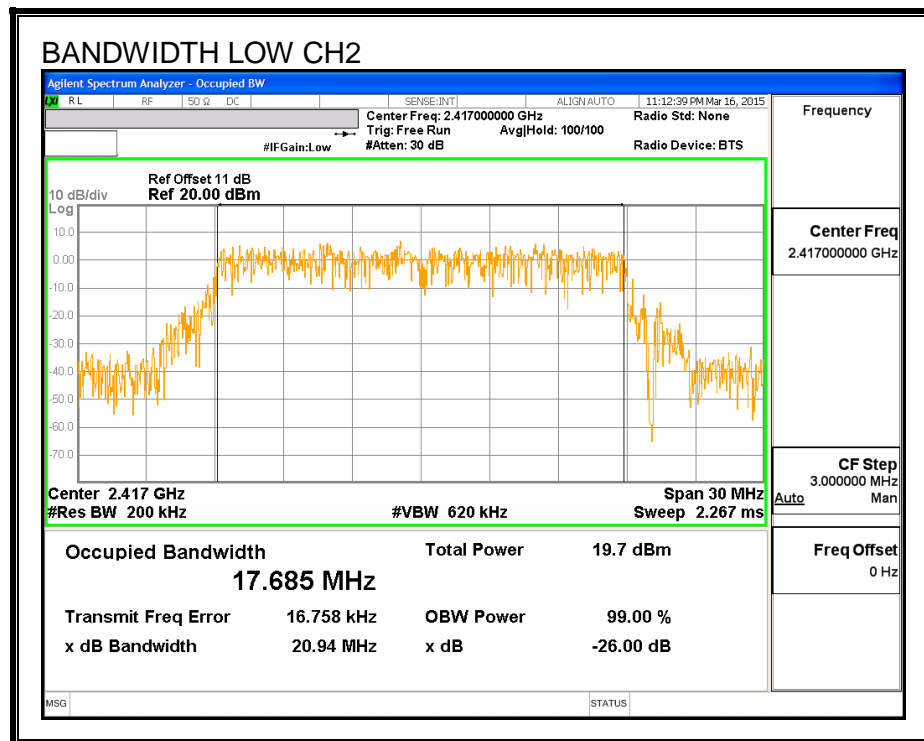
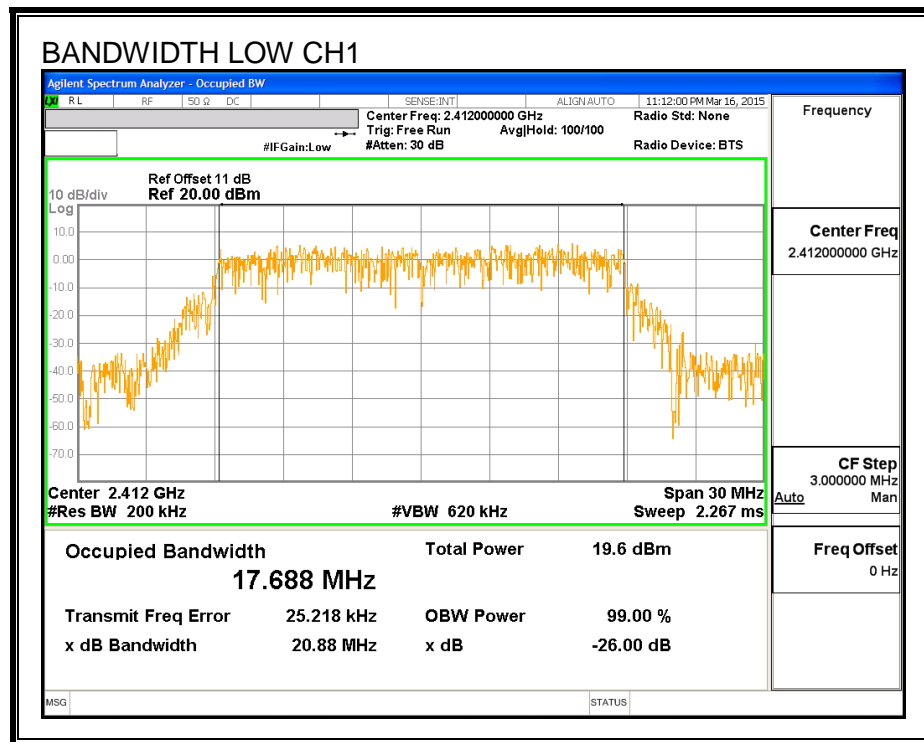
LIMITS

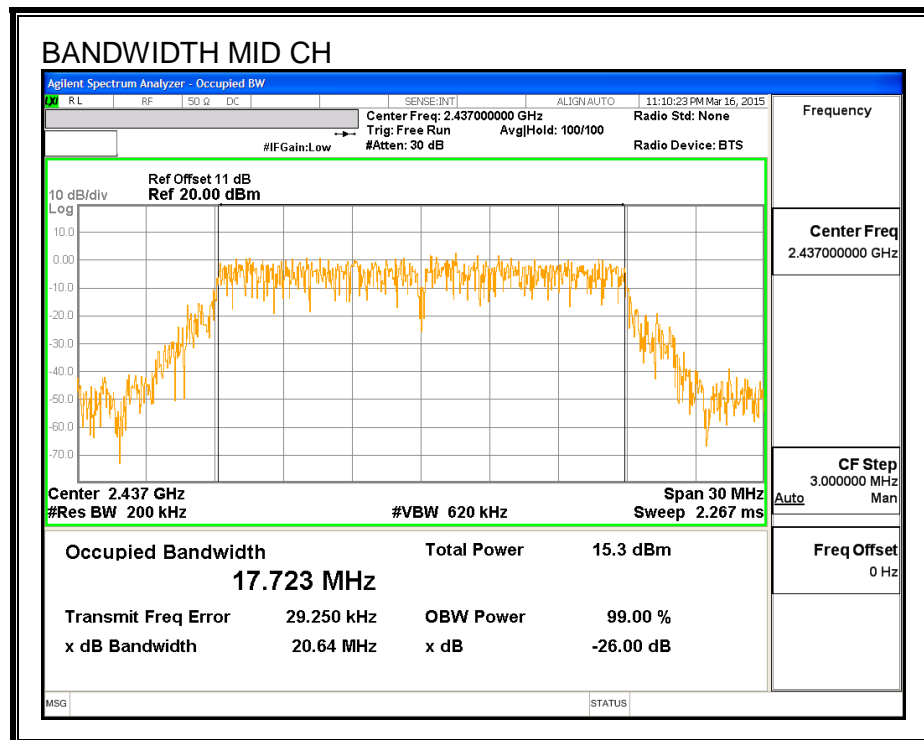
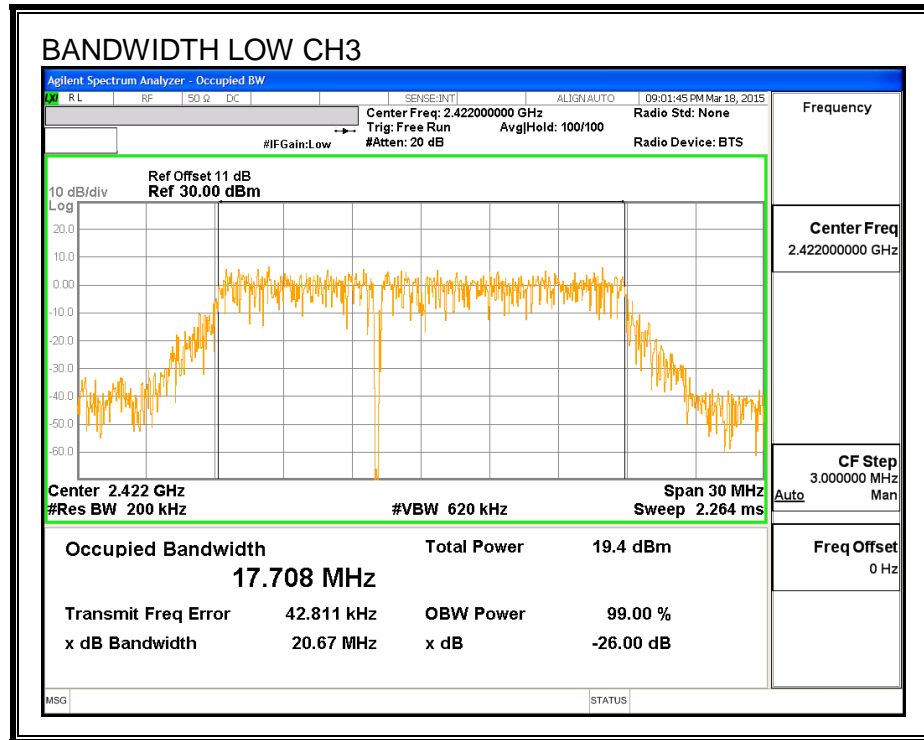
None; for reporting purposes only.

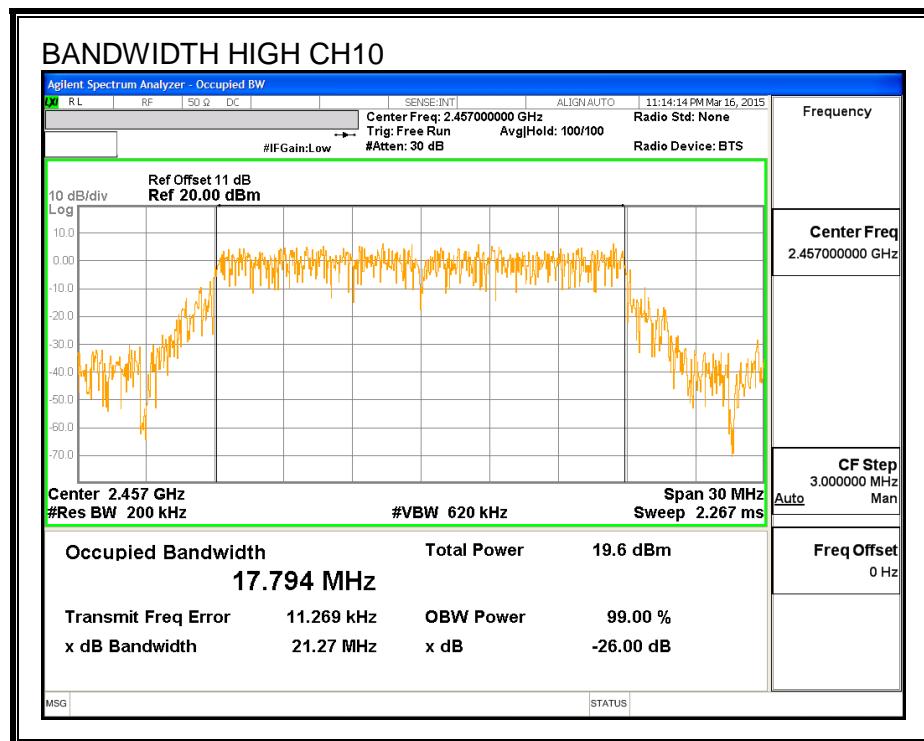
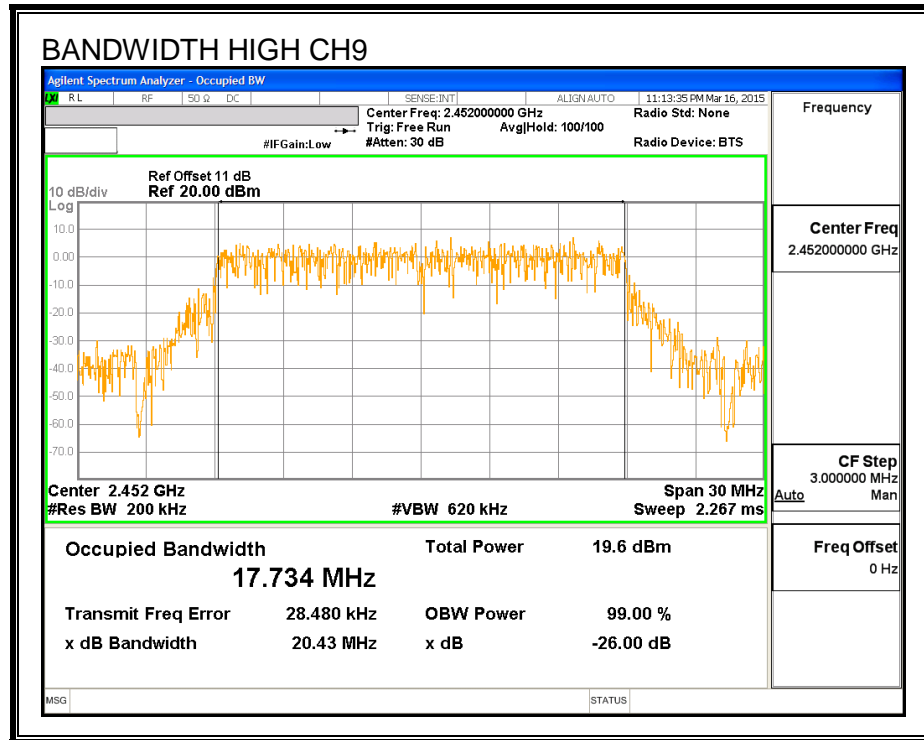
RESULTS

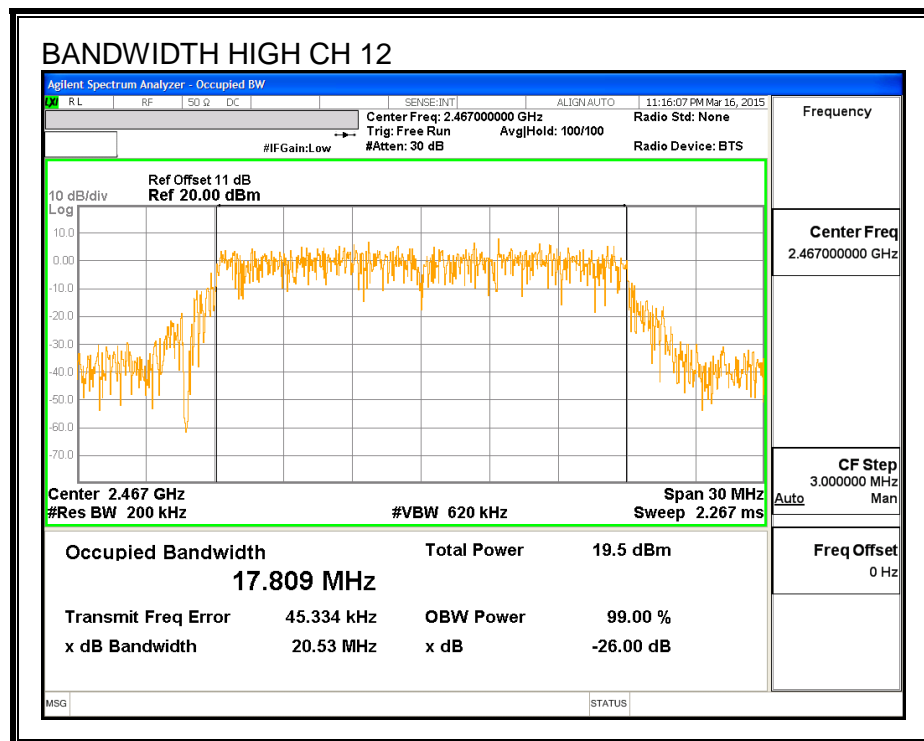
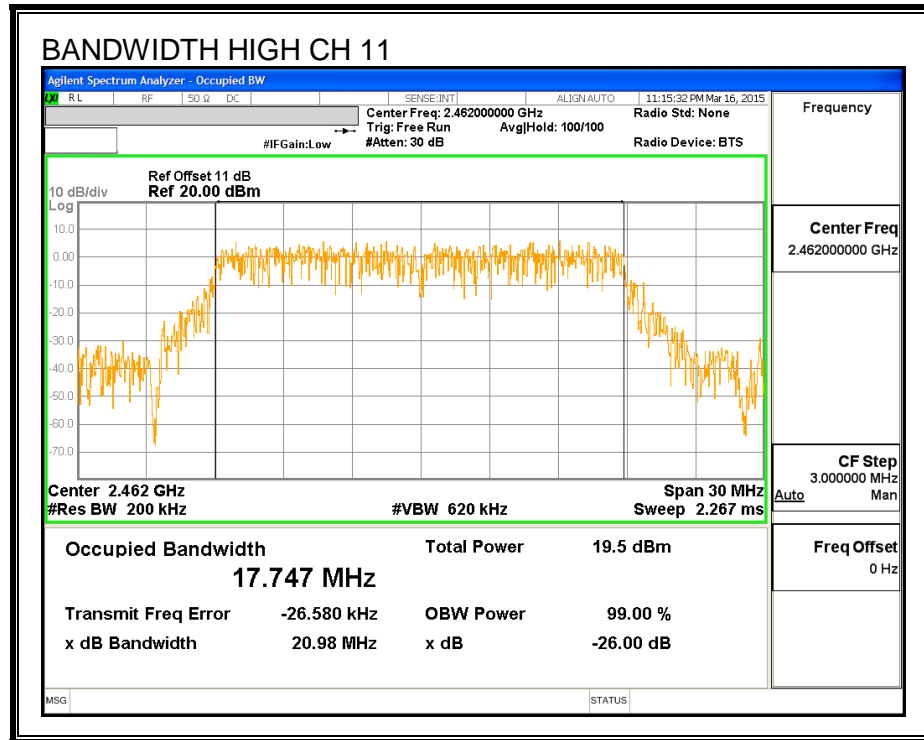
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low_1	2412	17.688
Low_2	2417	17.685
Low_3	2422	17.708
Mid	2437	17.723
High_9	2452	17.734
High_10	2457	17.794
High_11	2462	17.747
High_12	2467	17.809
High_13	2472	17.646

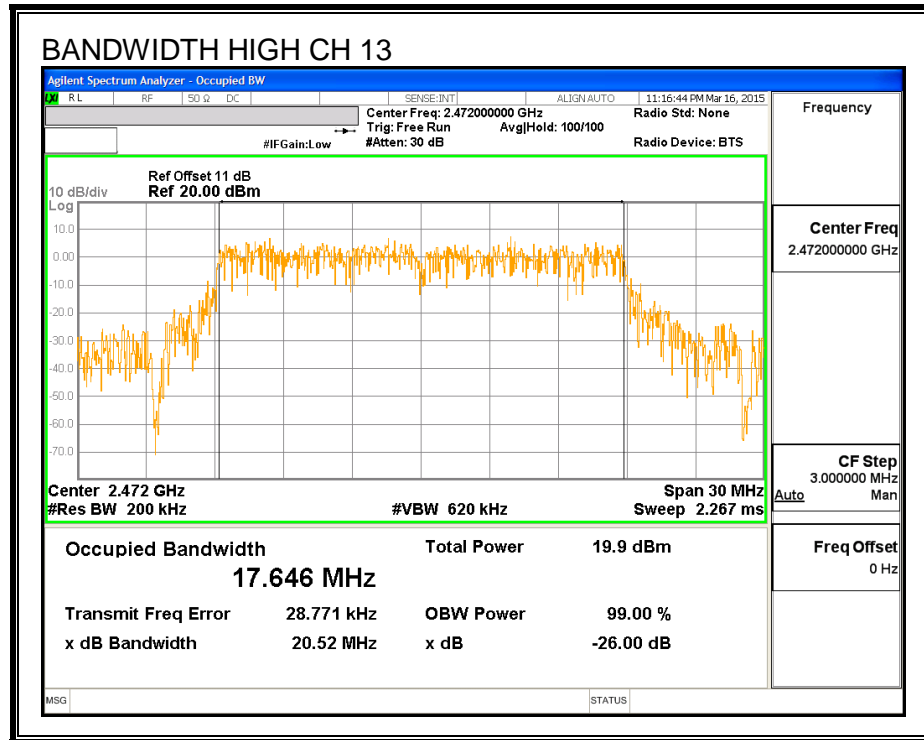
99% BANDWIDTH











8.3.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low_1	2412	13.00
Low_2	2417	16.50
Low_3	2422	18.46
Mid	2437	18.50
High_9	2452	18.46
High_10	2457	15.00
High_11	2462	10.92
High_12	2467	8.48
High_13	2472	0.00

8.3.4. OUTPUT POWER

LIMITS

FCC §15.247

IC RSS-247 (5.4) (4)

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)
Low_1	2412	0.46	30.00	30	36	30.00
Low_2	2417	0.46	30.00	30	36	30.00
Low_3	2422	0.46	30.00	30	36	30.00
Mid	2437	0.46	30.00	30	36	30.00
High_9	2452	0.46	30.00	30	36	30.00
High_10	2457	0.46	30.00	30	36	30.00
High_11	2462	0.46	30.00	30	36	30.00
High_12	2467	0.46	30.00	30	36	30.00
High_13	2472	0.46	30.00	30	36	30.00

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power
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Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low_1	2412	19.93	19.93	30.00	-10.07
Low_2	2417	23.55	23.55	30.00	-6.45
Low_3	2422	25.49	25.49	30.00	-4.51
Mid	2437	25.55	25.55	30.00	-4.45
High_9	2452	25.42	25.42	30.00	-4.58
High_10	2457	22.03	22.03	30.00	-7.97
High_11	2462	17.98	17.98	30.00	-12.02
High_12	2467	15.54	15.54	30.00	-14.46
High_13	2472	8.02	8.02	30.00	-21.98

8.3.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247

IC RSS-247 (5.2) (2)

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 KHz band during any time interval of continuous transmissions

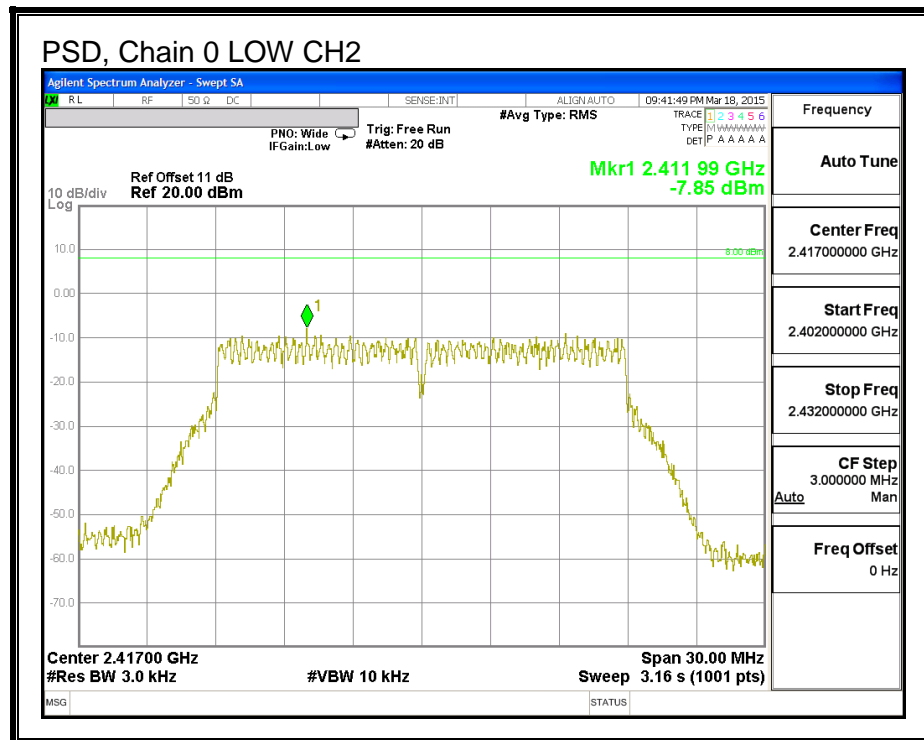
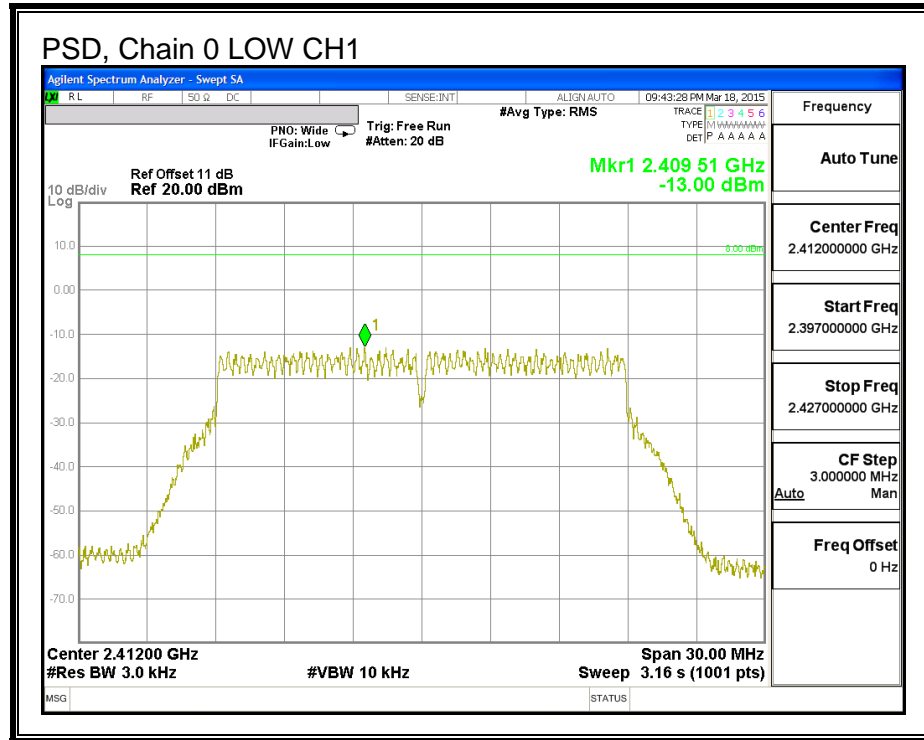
RESULTS

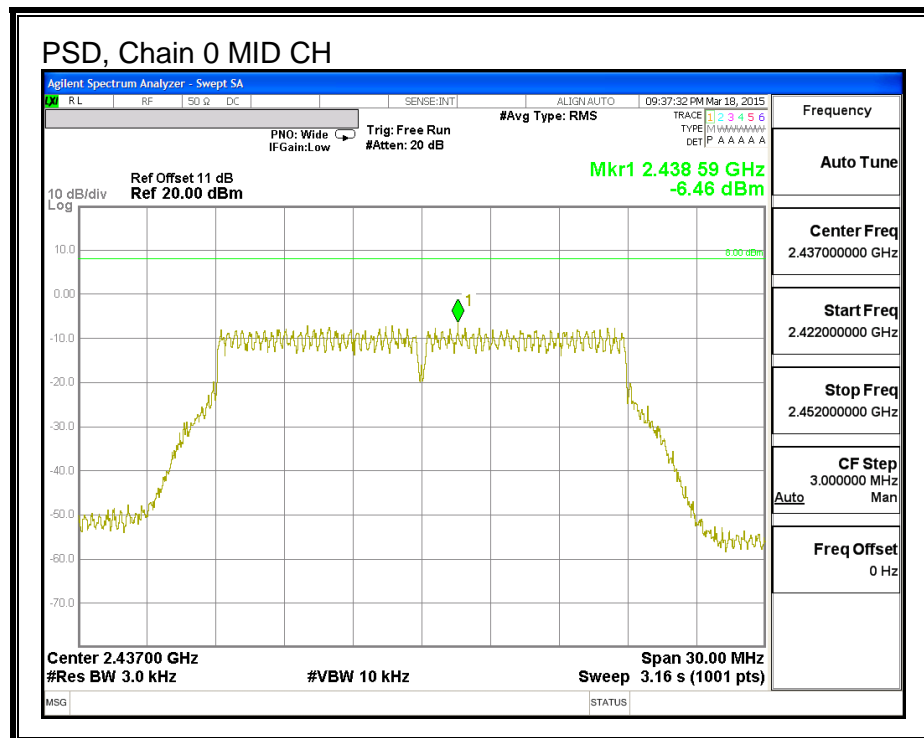
Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd PSD
---------------------------	------	---

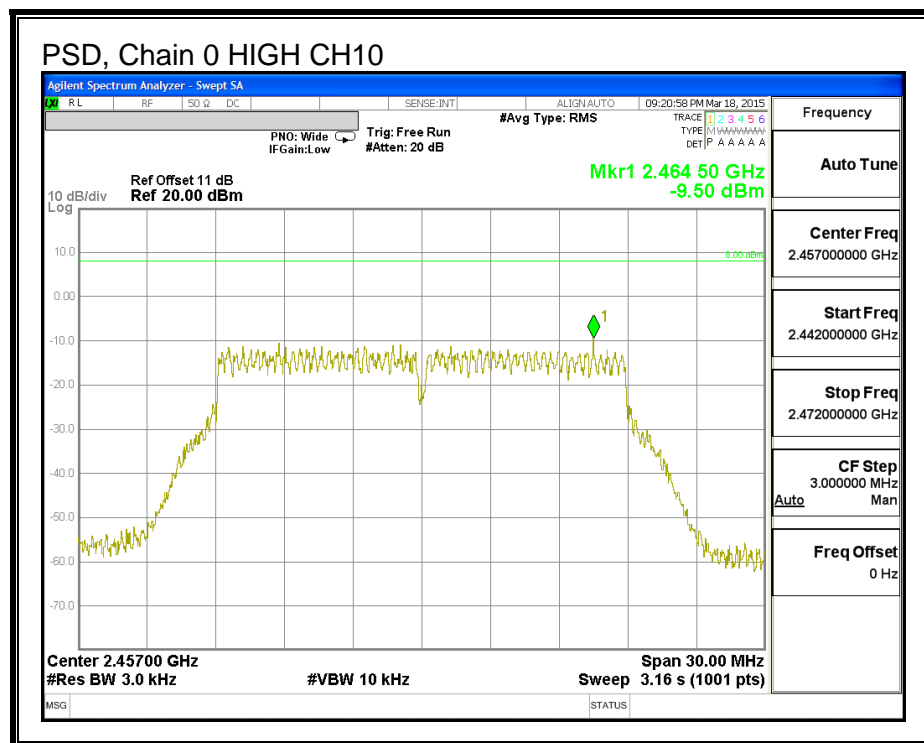
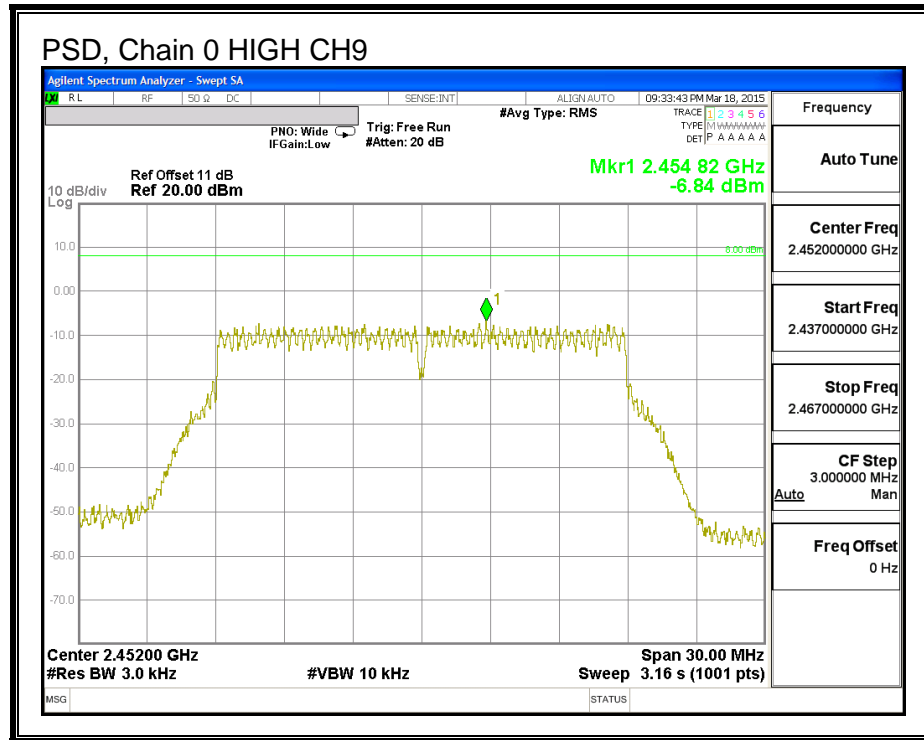
PSD Results

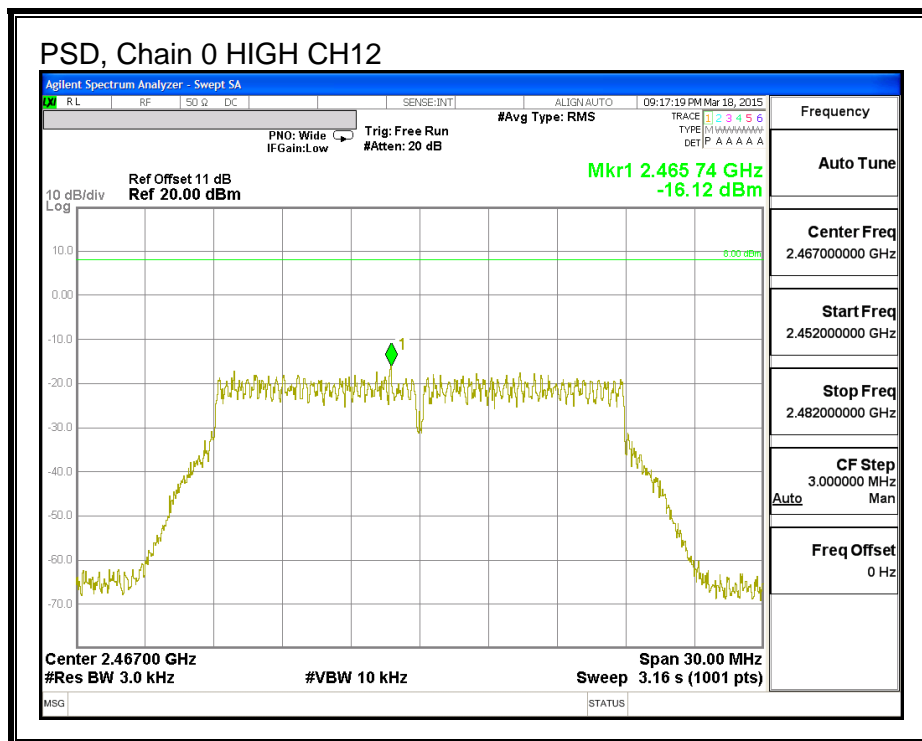
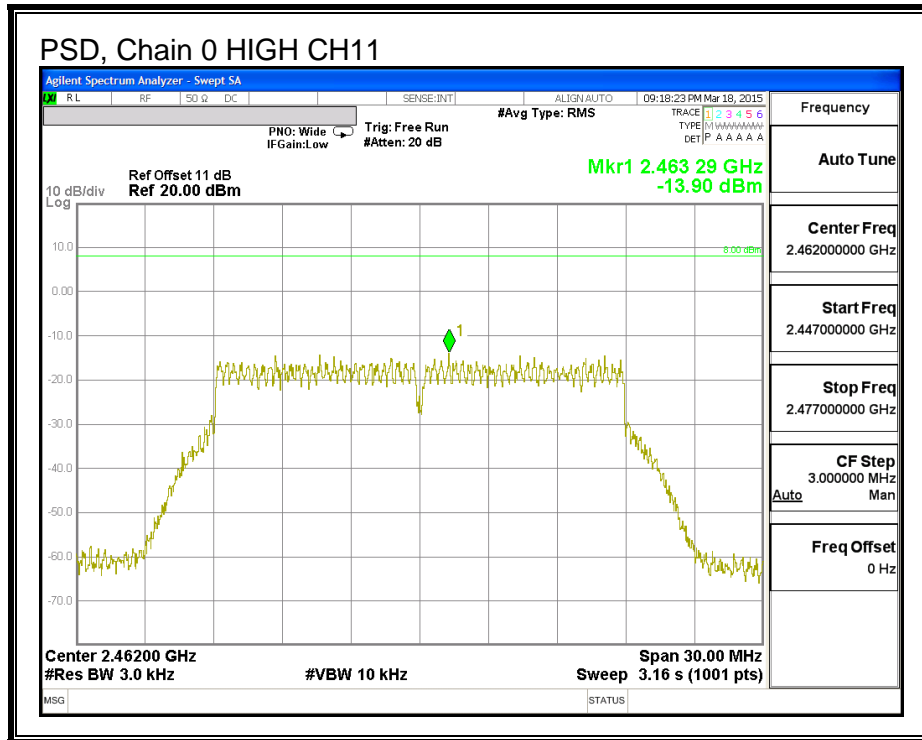
Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Total Corr'd PSD (dBm)	Limit (dBm)	Margin (dB)
Low_1	2412	-13.00	-13.00	8.0	-21.0
Low_2	2417	-7.85	-7.85	8.0	-15.9
Low_3	2422	-6.78	-6.78	8.0	-14.8
Mid	2437	-6.46	-6.46	8.0	-14.5
High_9	2452	-6.84	-6.84	8.0	-14.8
High_10	2457	-9.50	-9.50	8.0	-17.5
High_11	2462	-13.90	-13.90	8.0	-21.9
High_12	2467	-16.12	-16.12	8.0	-24.1
High_13	2472	-25.14	-25.14	8.0	-33.1

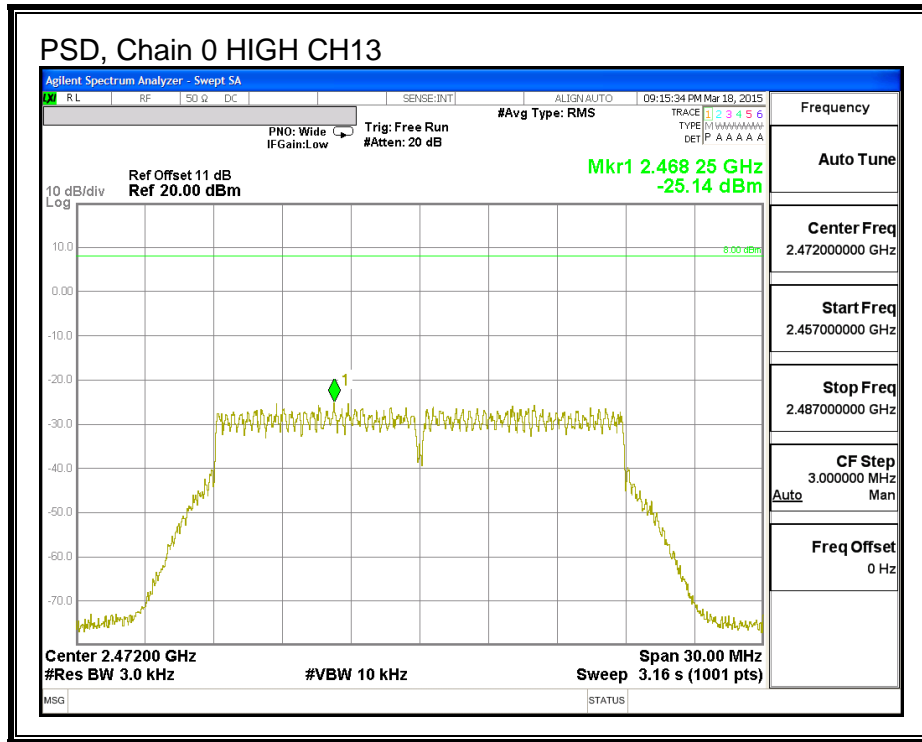
PSD, Chain 0











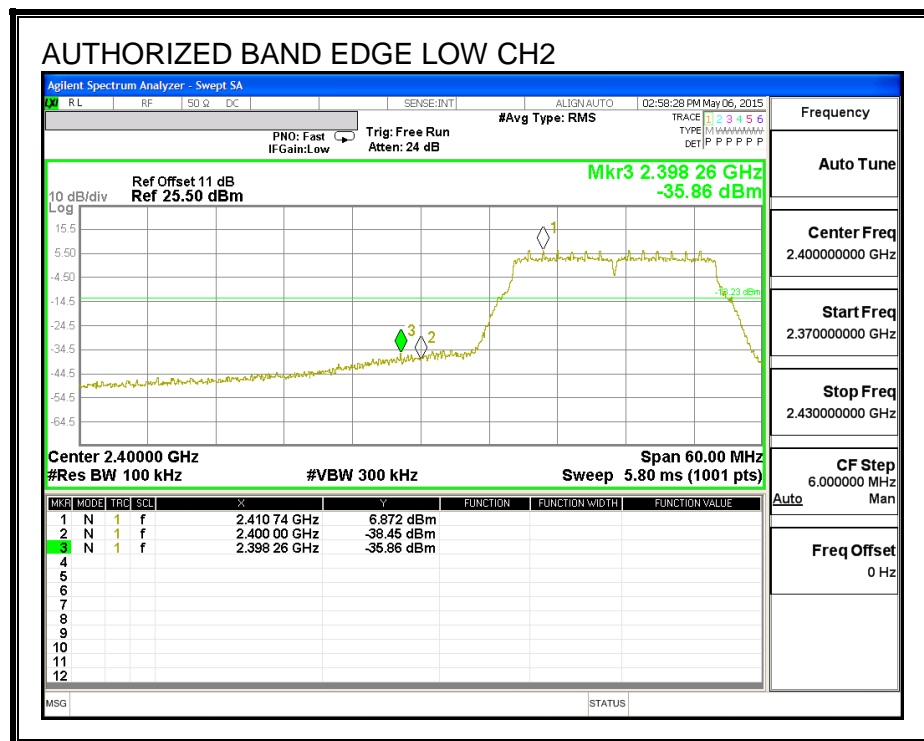
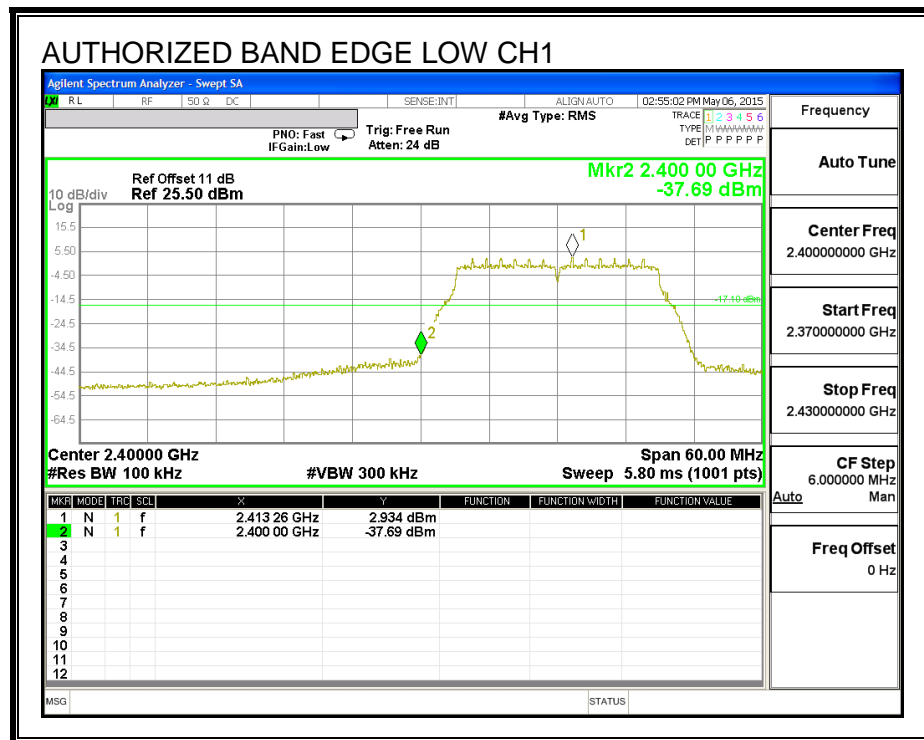
8.3.6. OUT-OF-BAND EMISSIONS

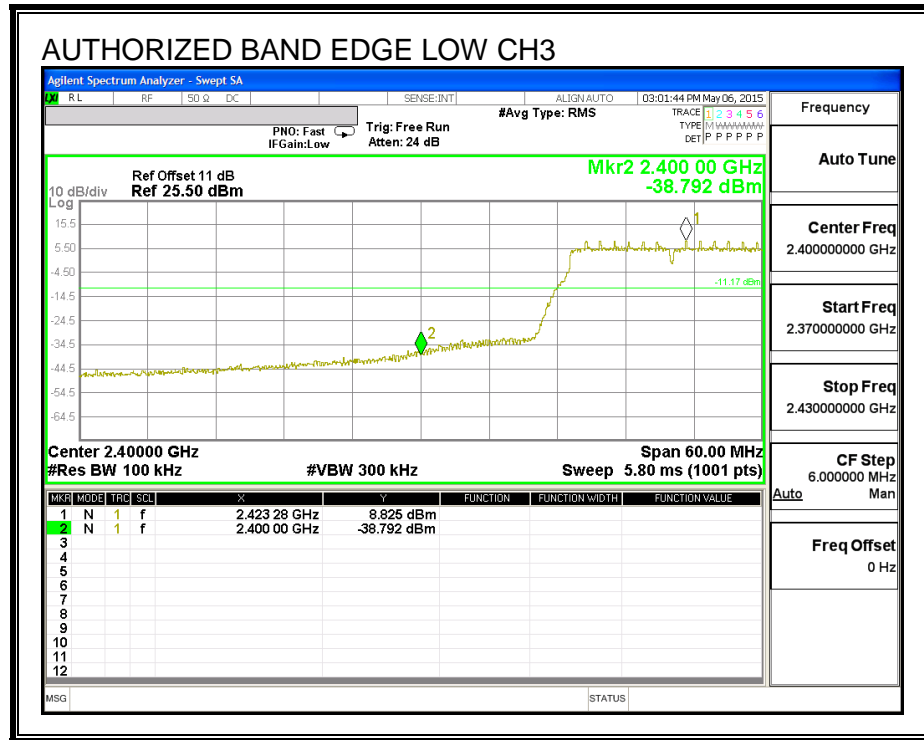
LIMITS

FCC §15.247 (d)

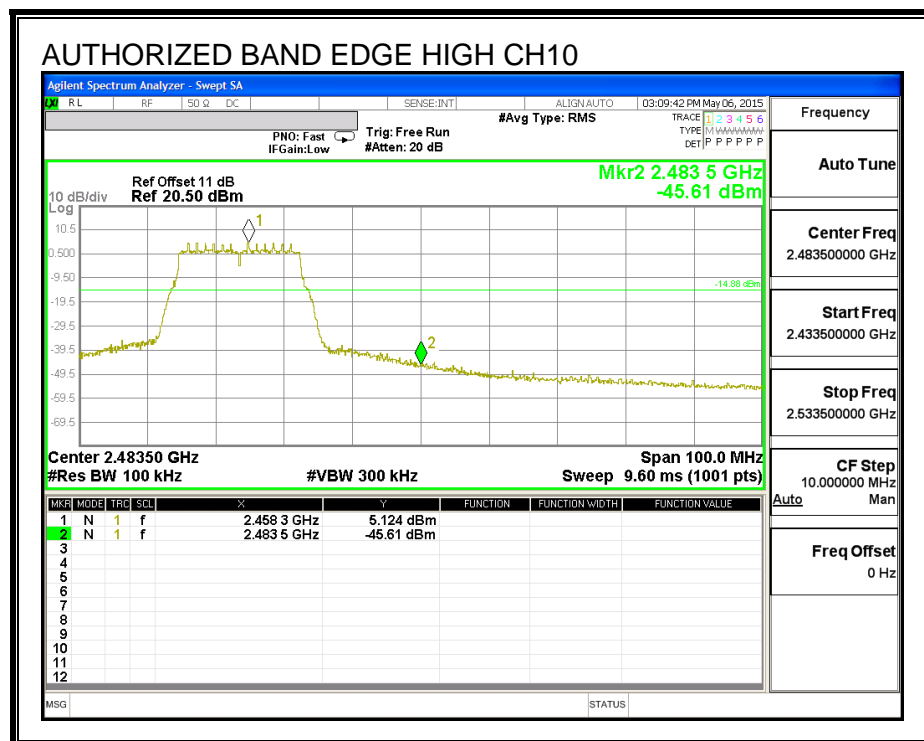
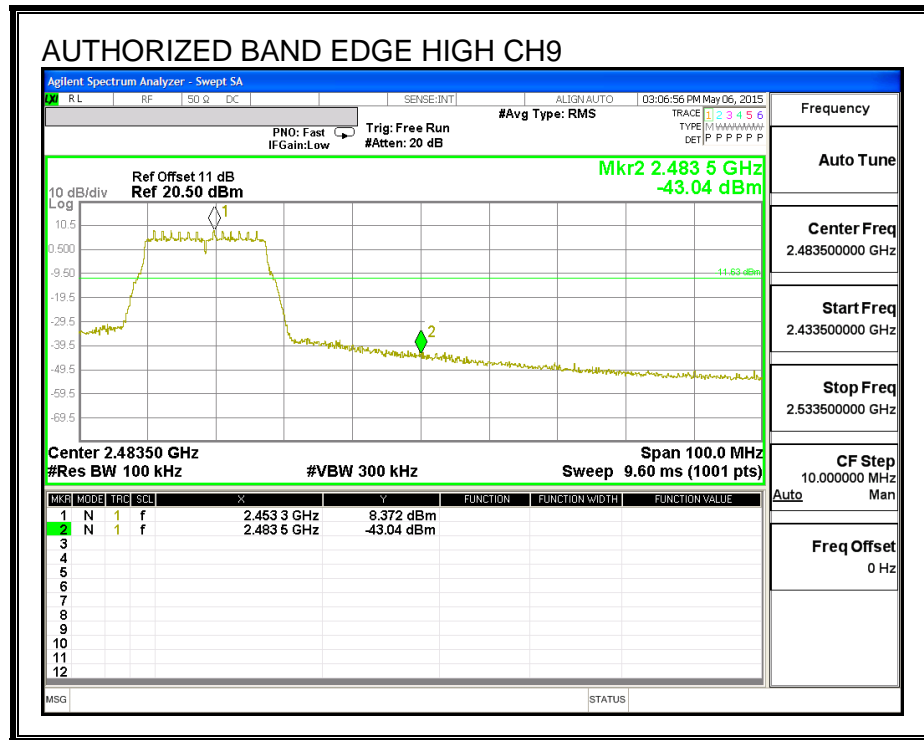
IC RSS-247 (5.5)

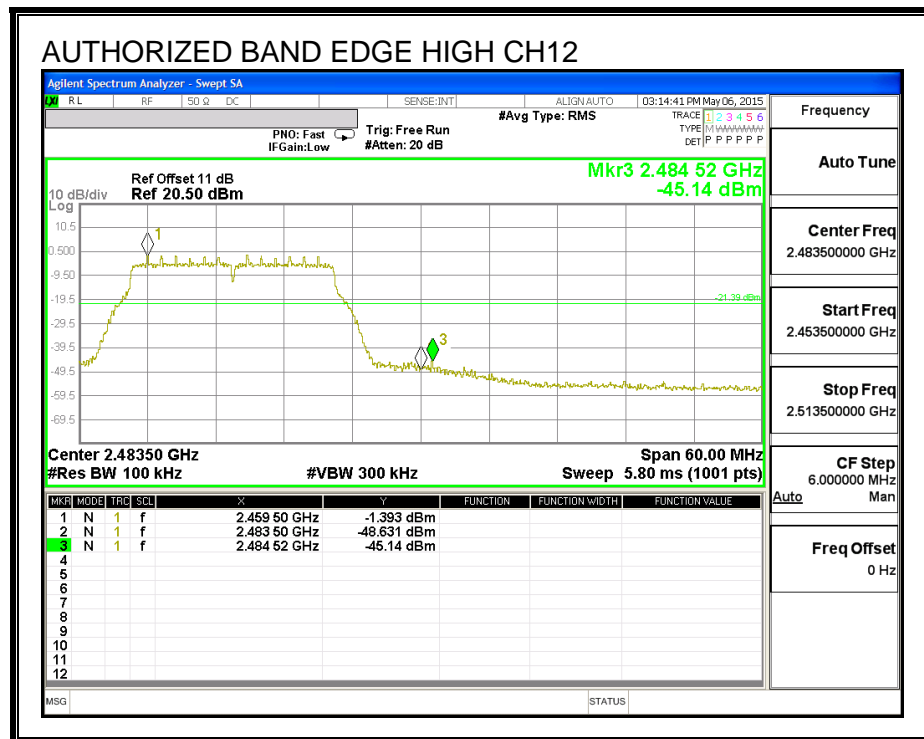
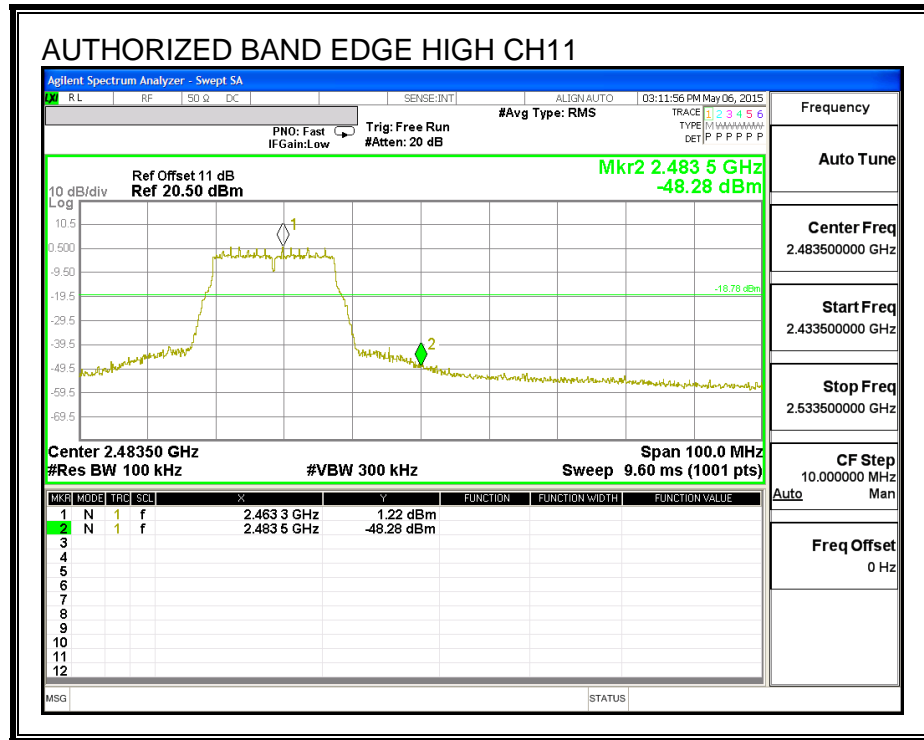
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the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





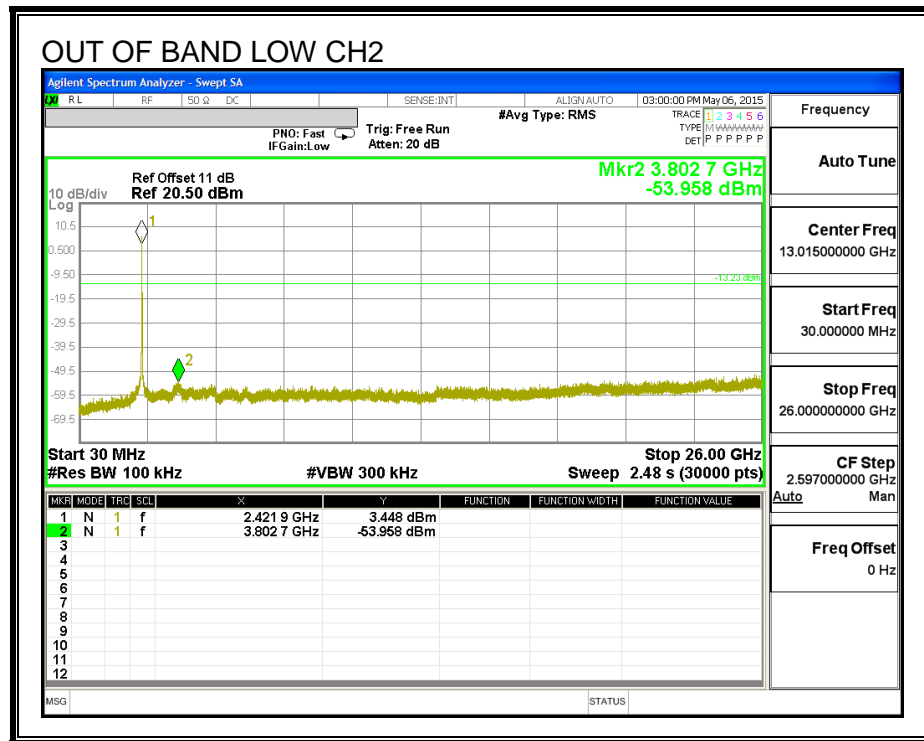
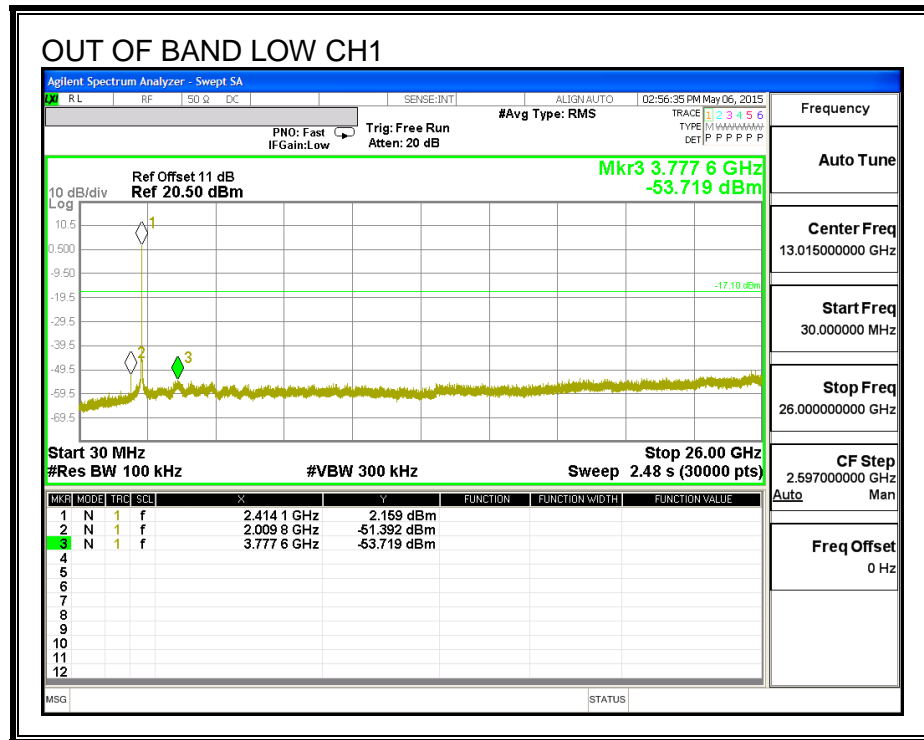
HIGH CHANNEL BANDEDGE

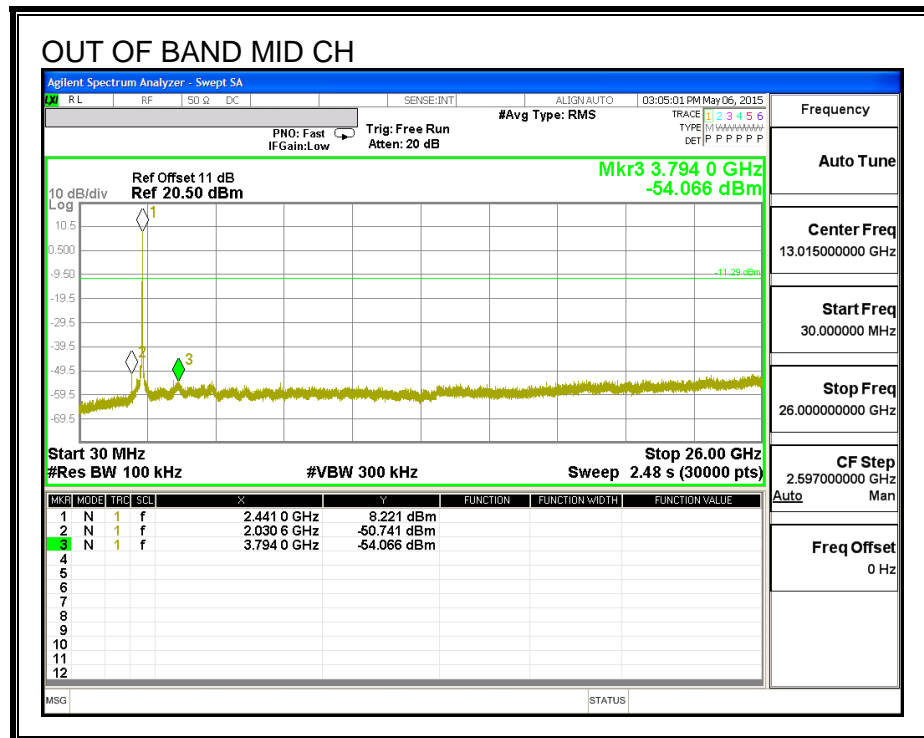
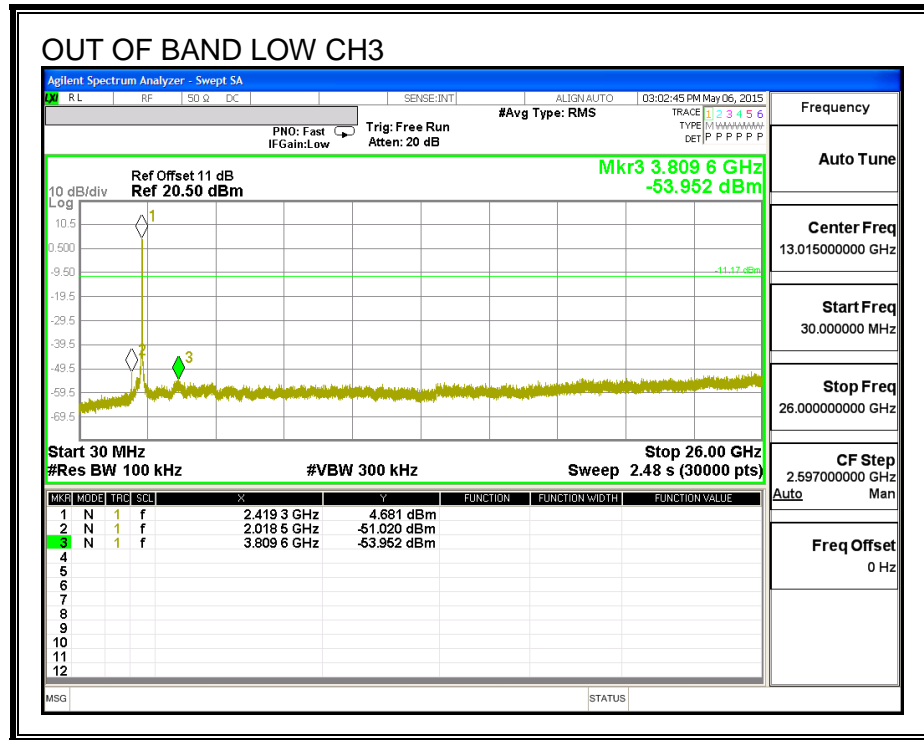


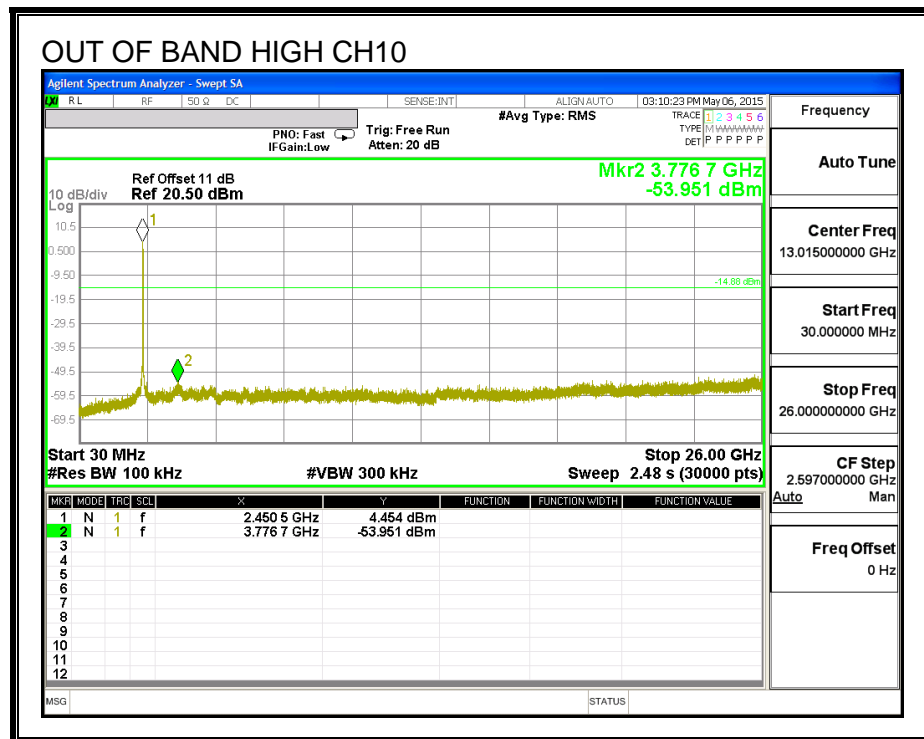
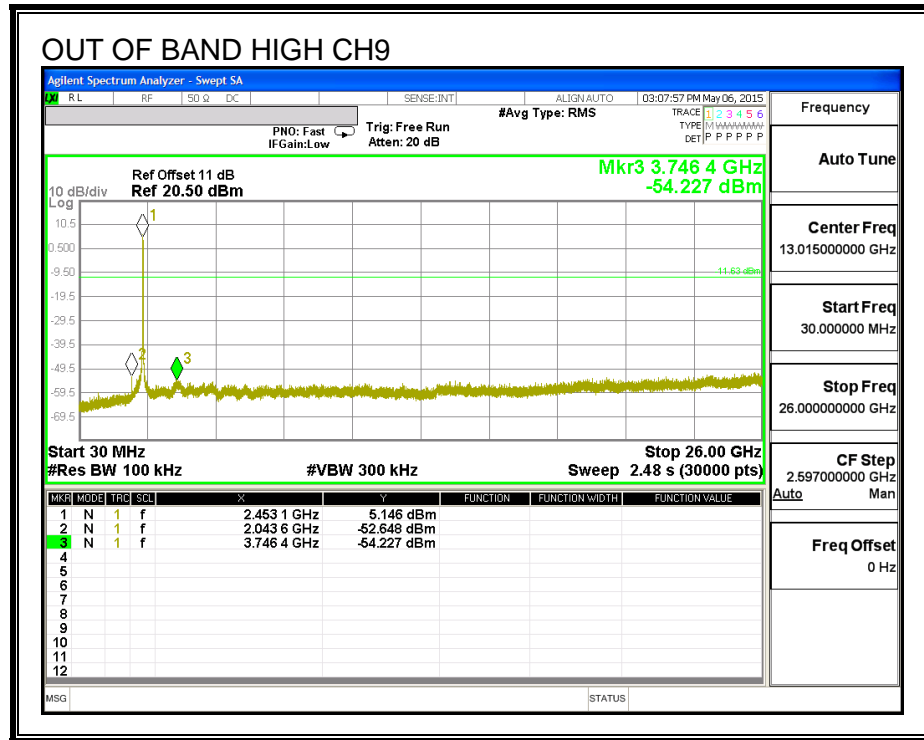


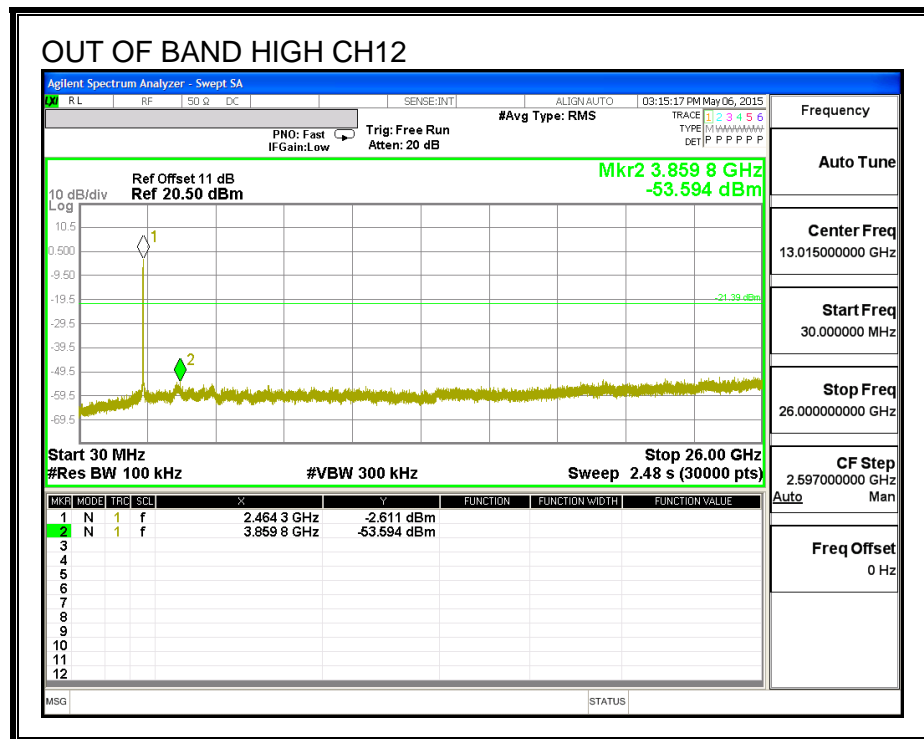
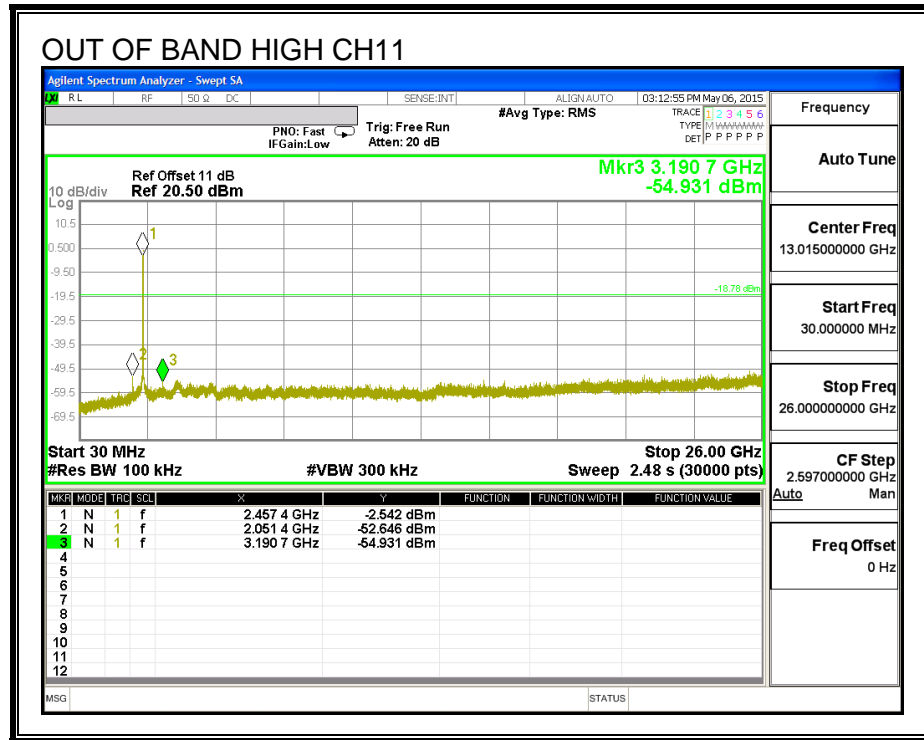


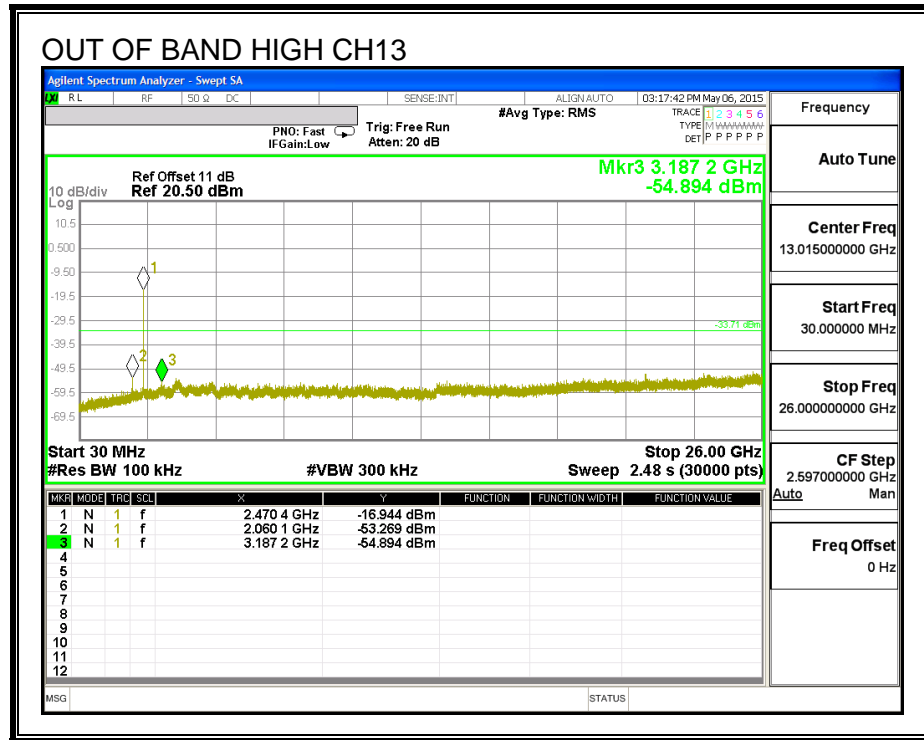
OUT-OF-BAND EMISSIONS











8.4. 802.11n HT20 2TX CDD MODE IN THE 2.4 GHz BAND

8.4.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

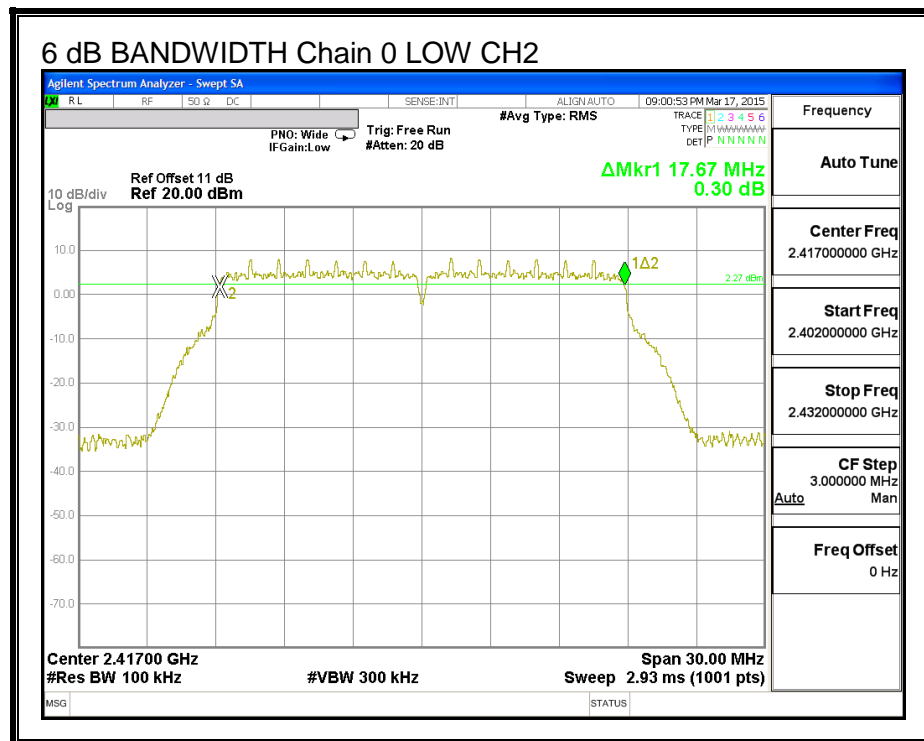
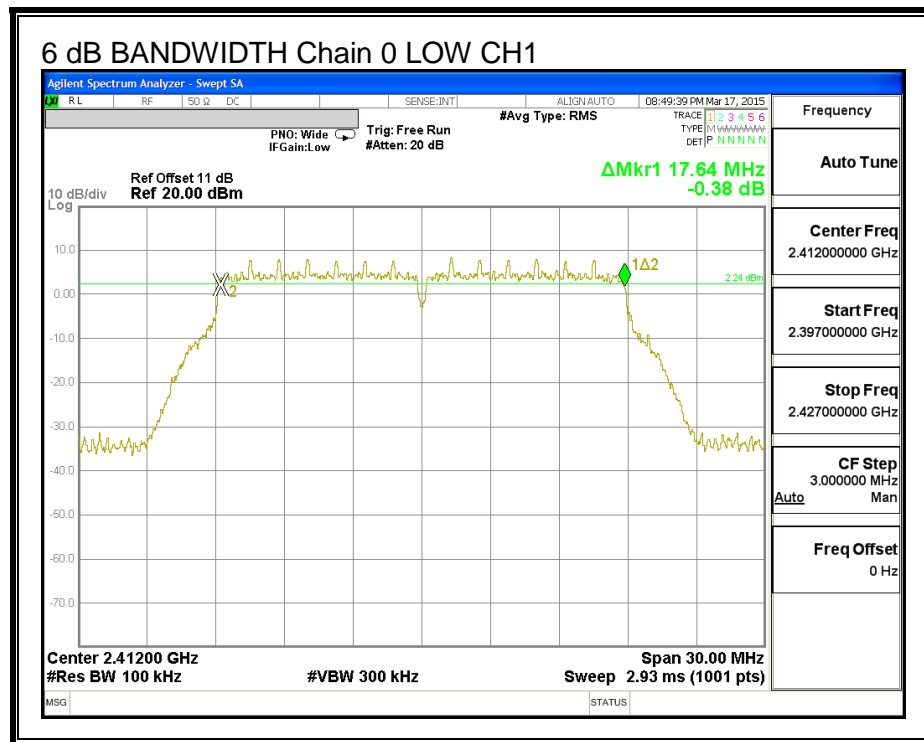
IC RSS-247 (5.2) (1)

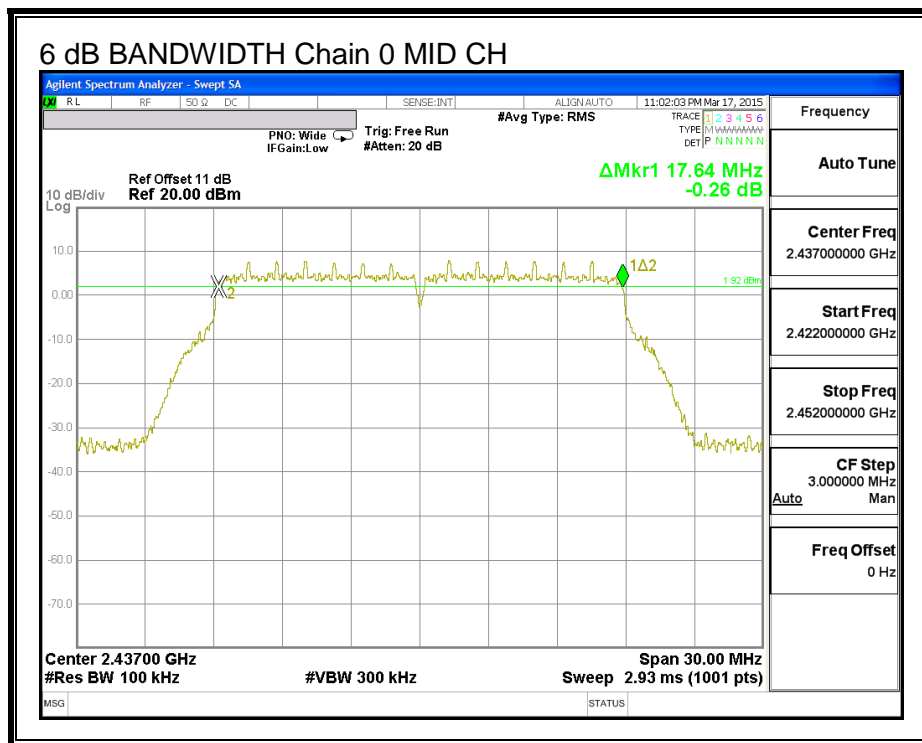
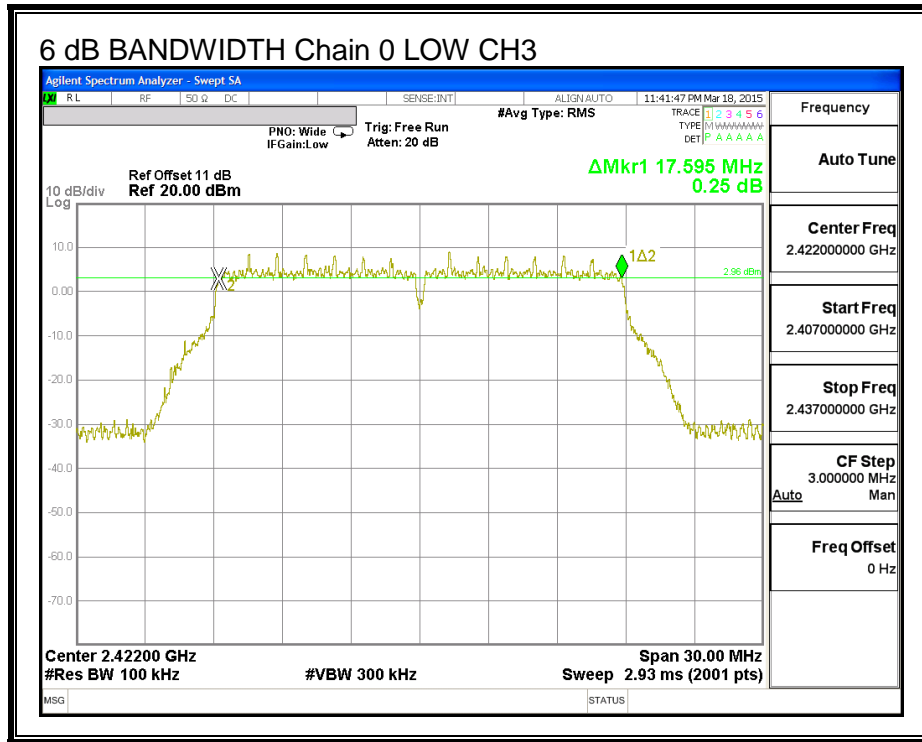
The minimum 6 dB bandwidth shall be at least 500 kHz.

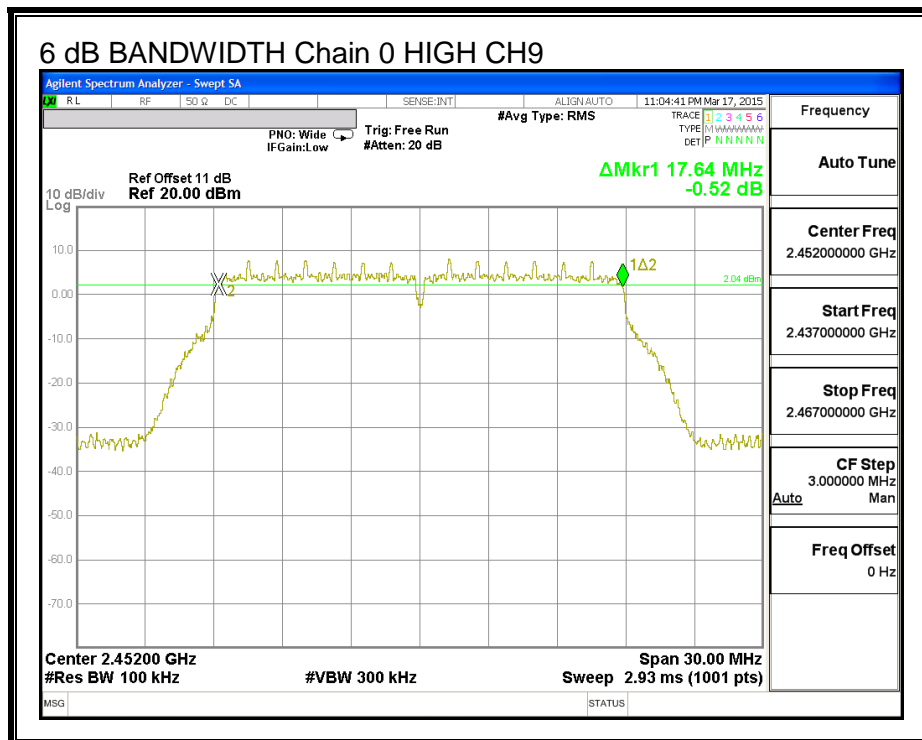
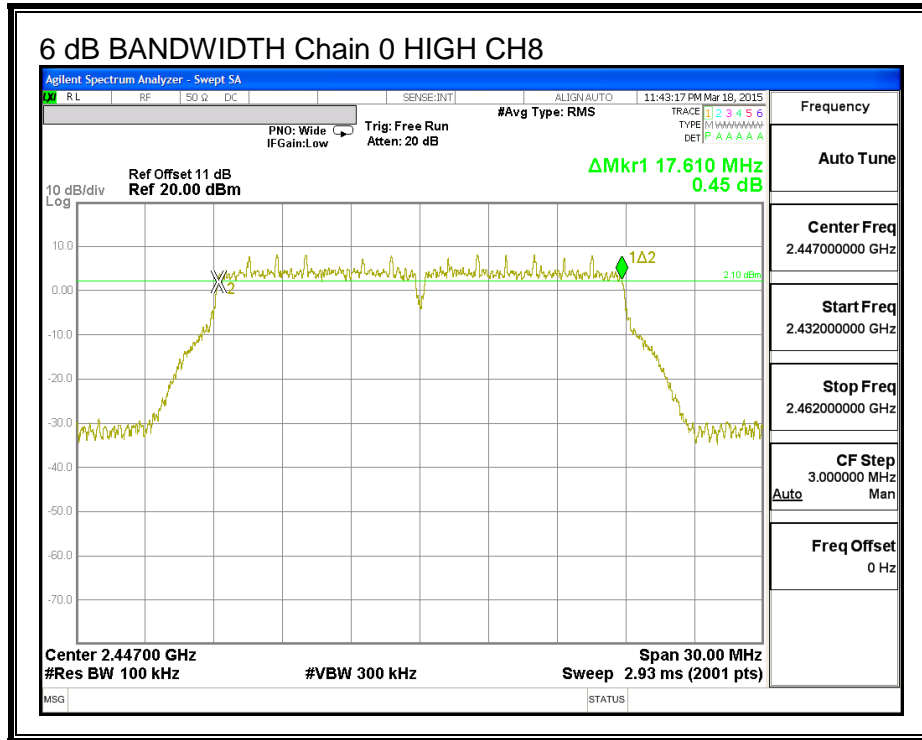
RESULTS

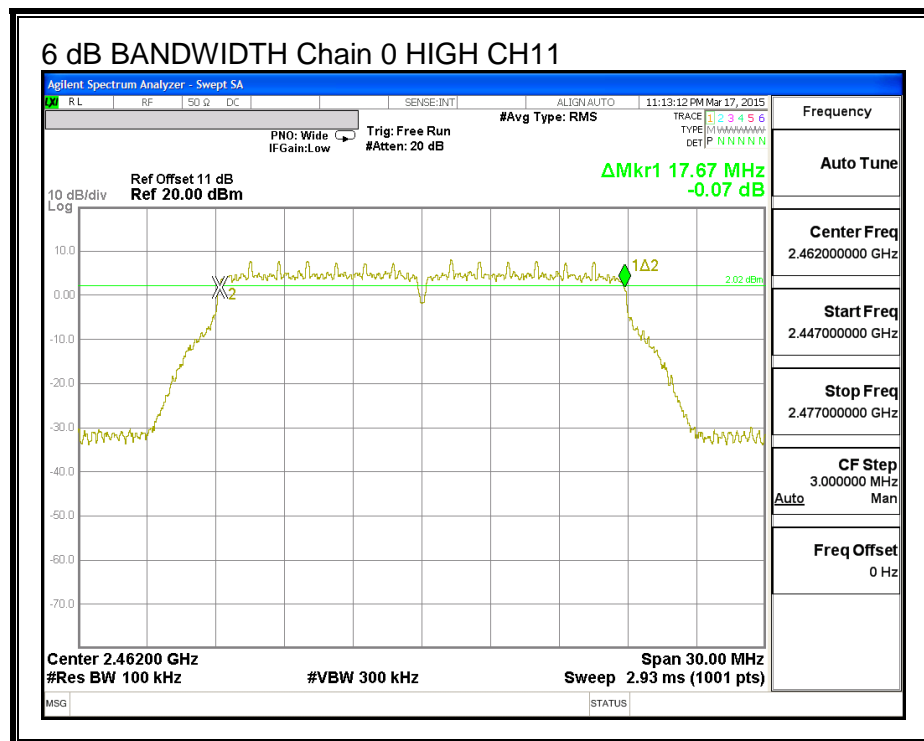
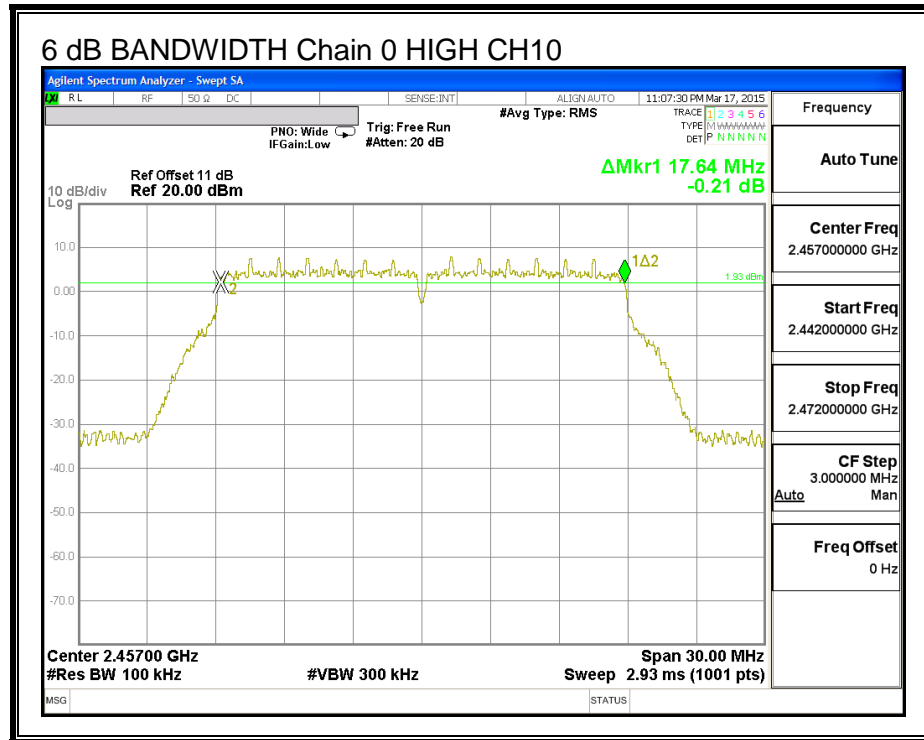
Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
Low_1	2412	17.64	17.67	0.5
Low_2	2417	17.67	17.67	0.5
Low_3	2422	17.60	17.66	0.5
Mid	2437	17.64	17.67	0.5
High_8	2447	17.61	17.66	0.5
High_9	2452	17.64	17.70	0.5
High_10	2457	17.64	17.67	0.5
High_11	2462	17.67	17.70	0.5
High_12	2467	17.61	17.70	0.5
High_13	2472	17.64	17.70	0.5

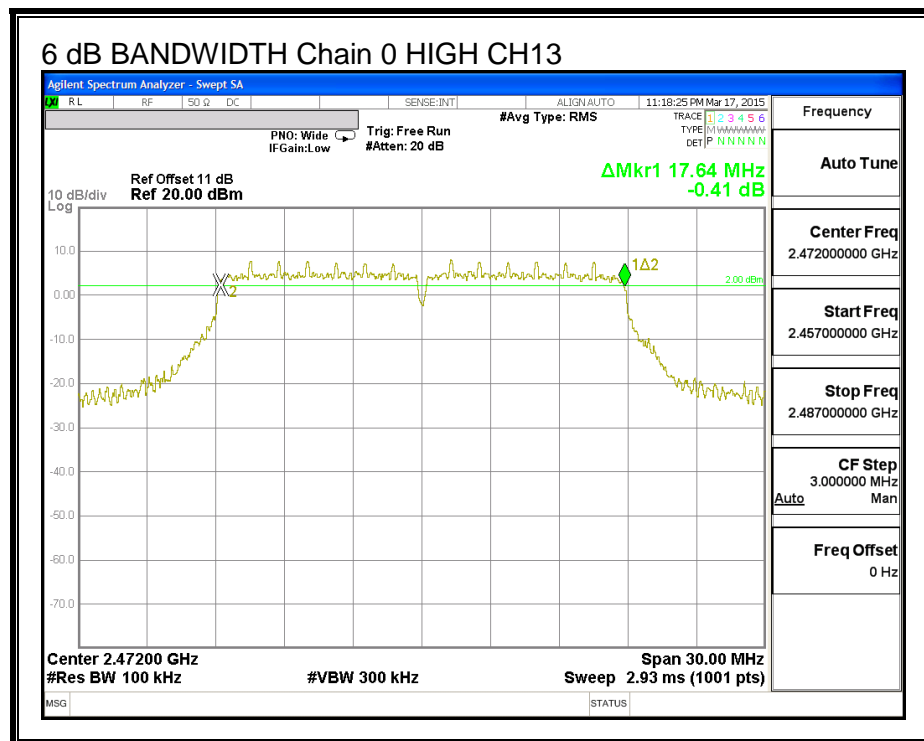
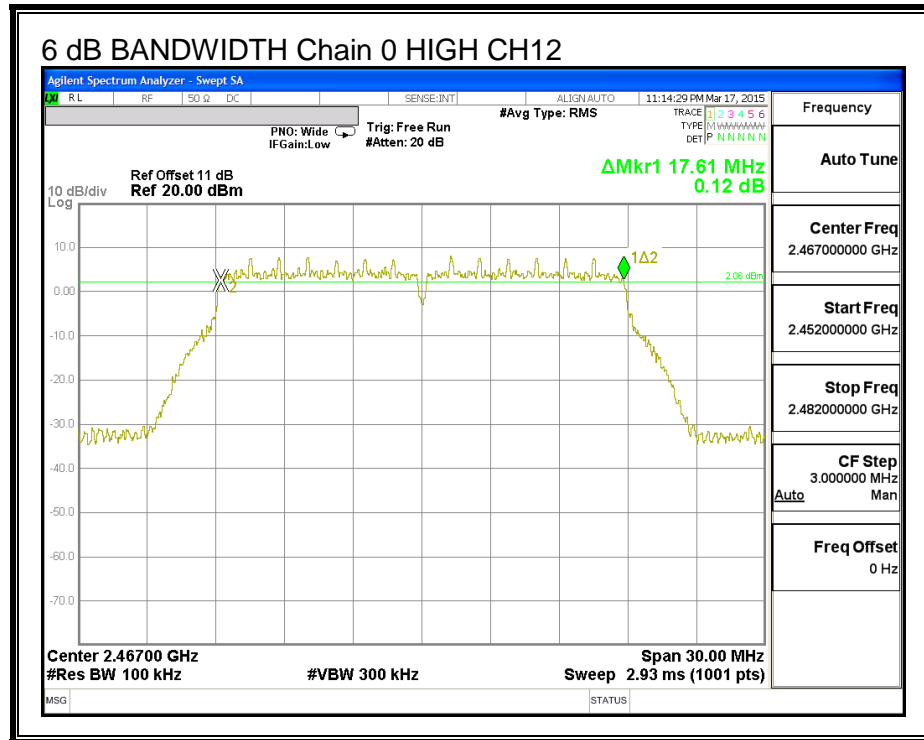
6 dB BANDWIDTH, Chain 0



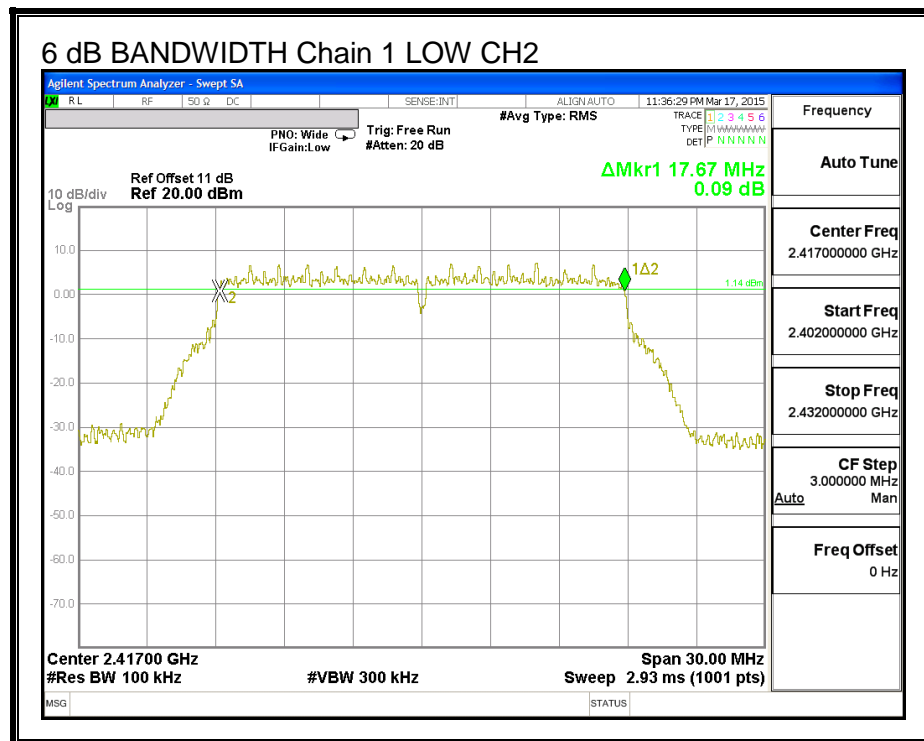
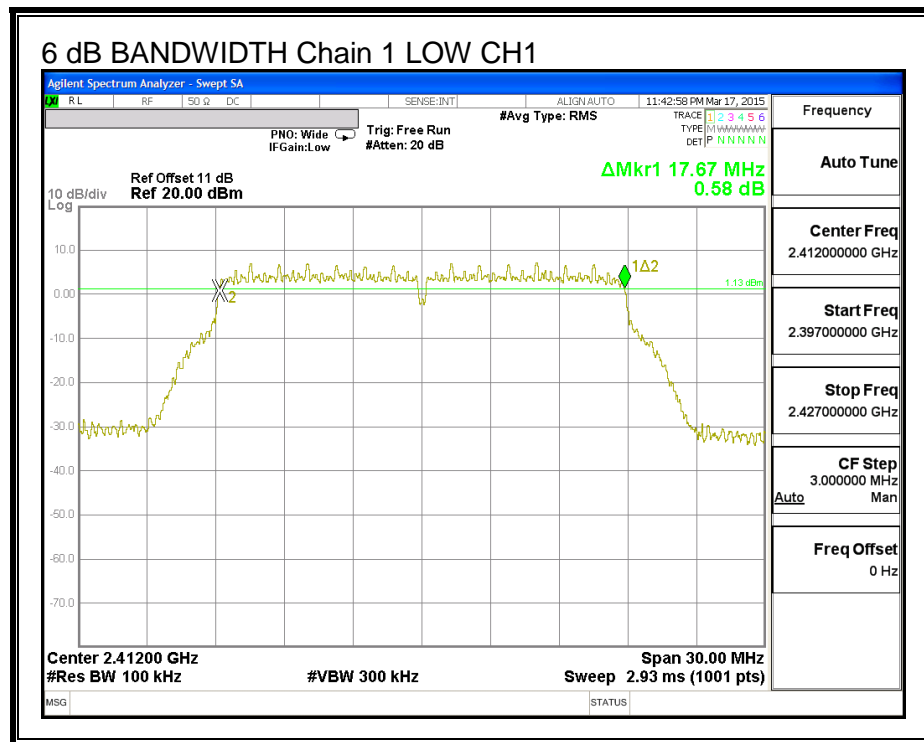


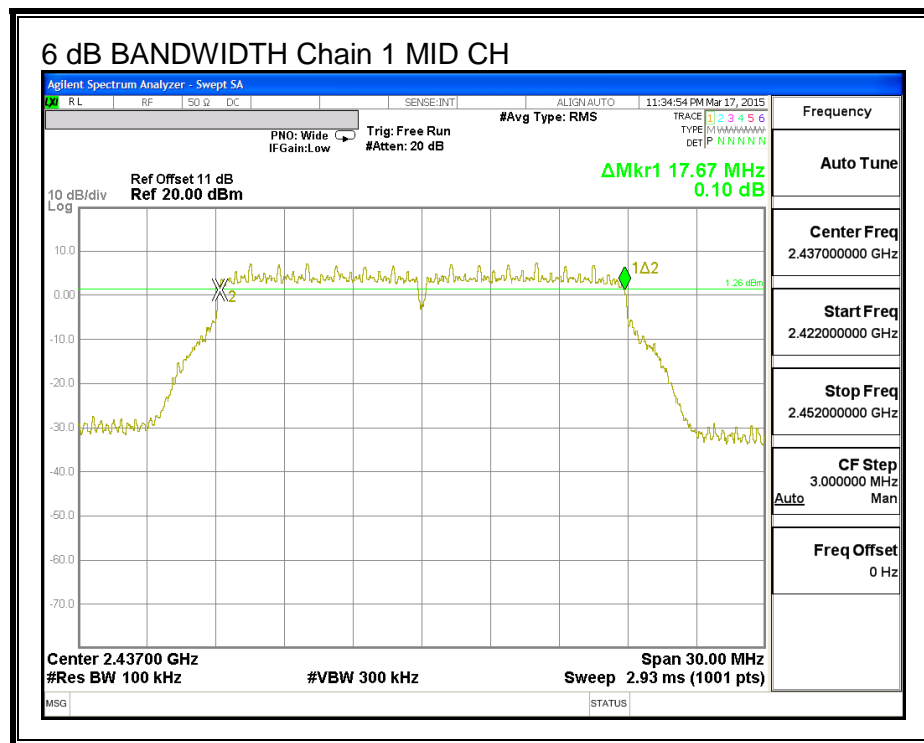
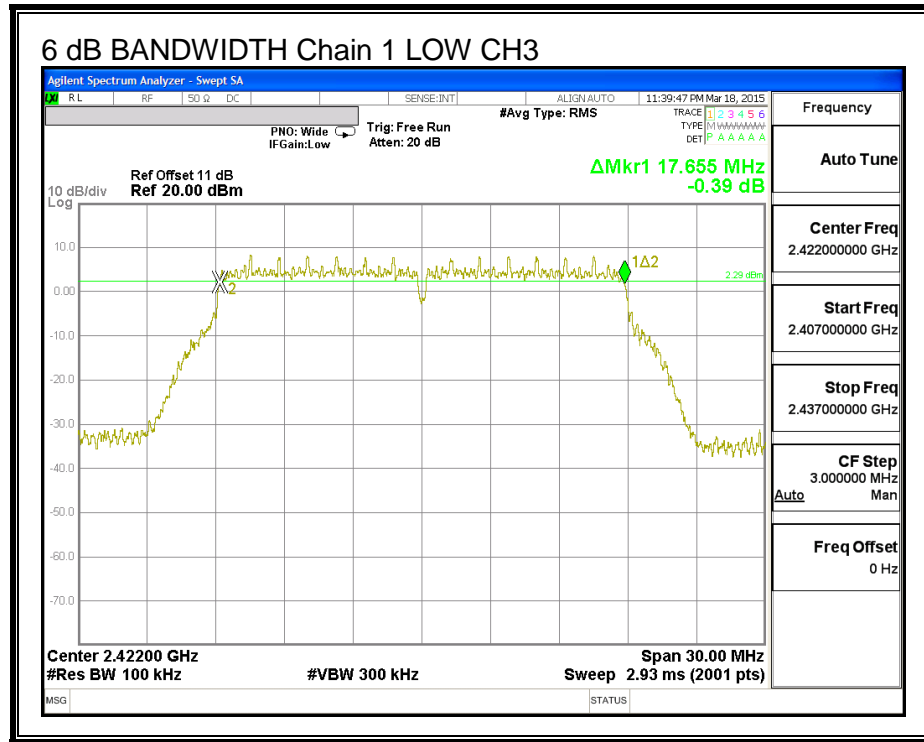


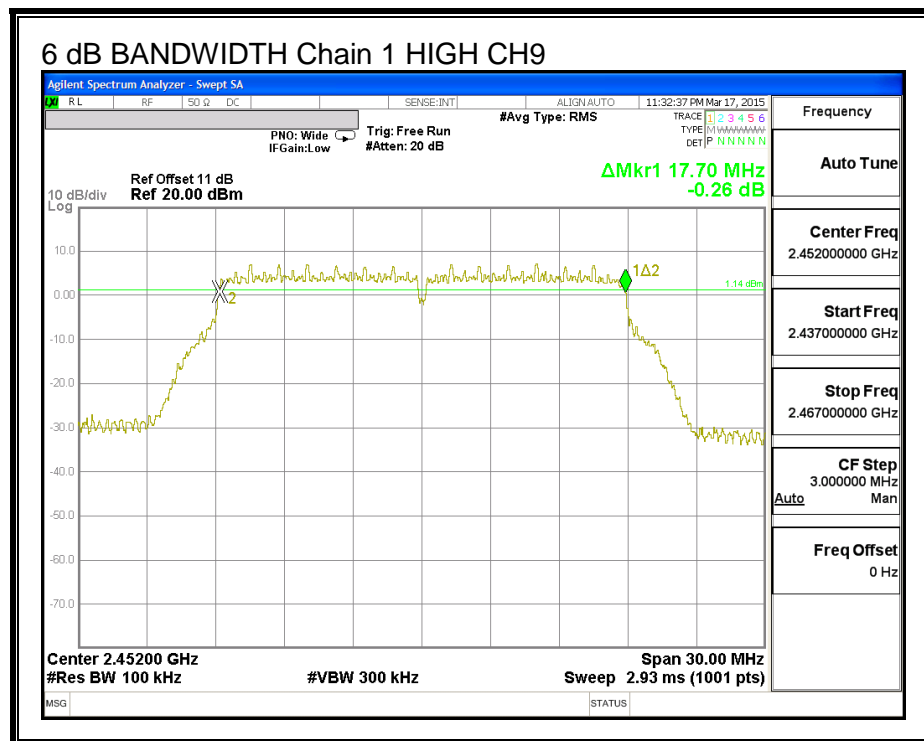
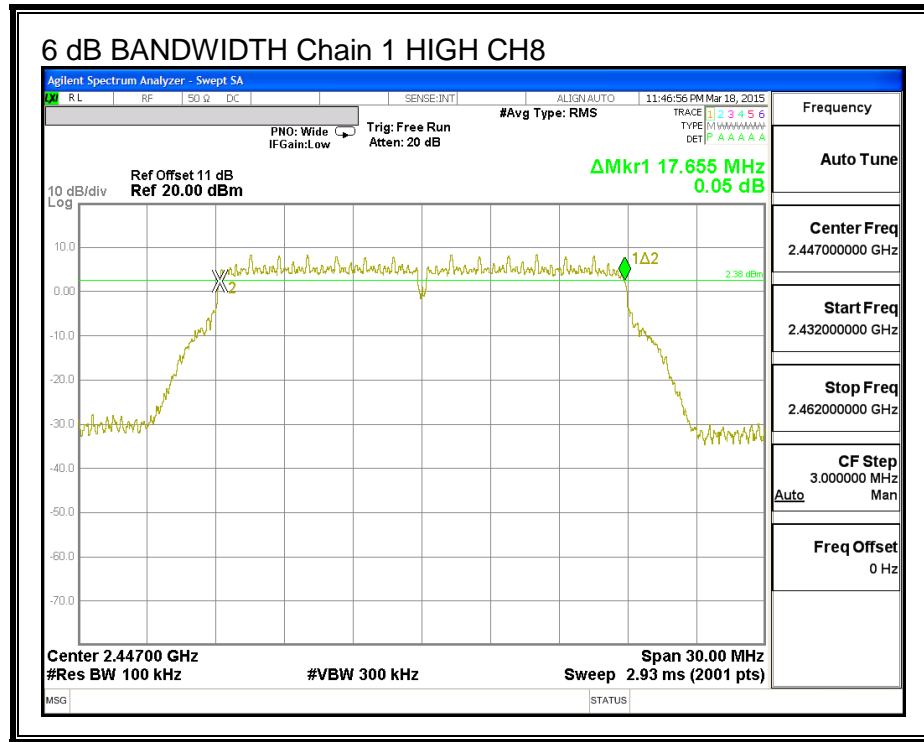


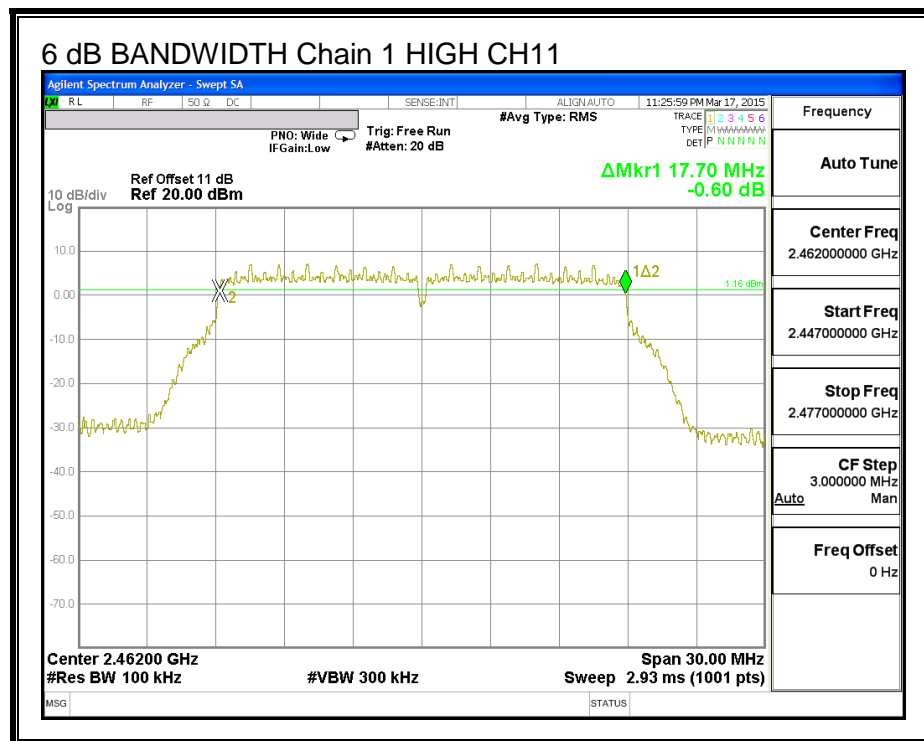
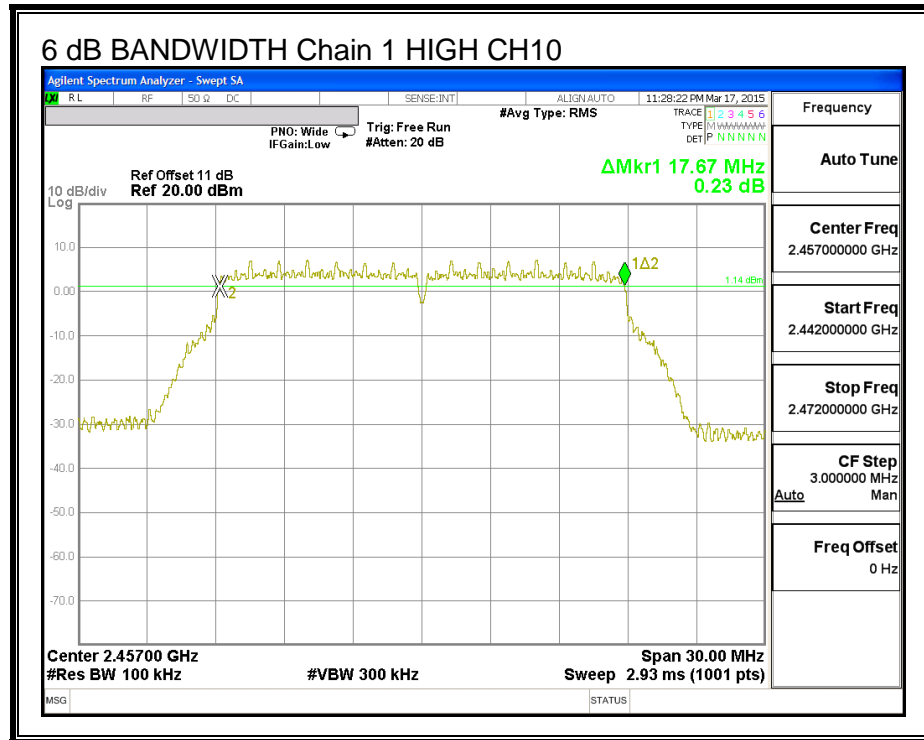


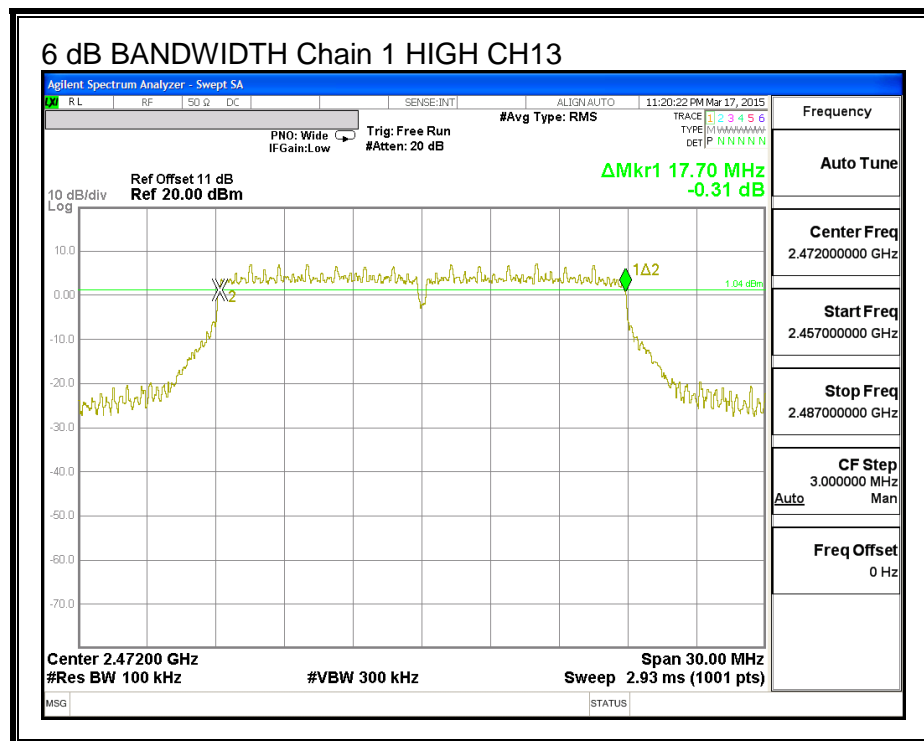
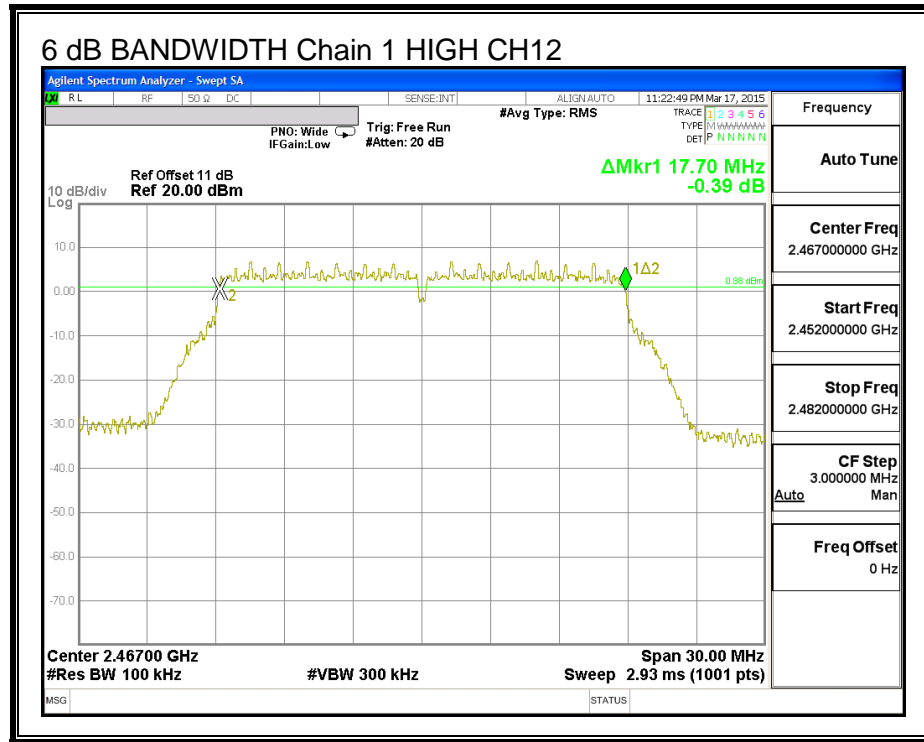
6 dB BANDWIDTH, Chain 1











8.4.2. 99% BANDWIDTH

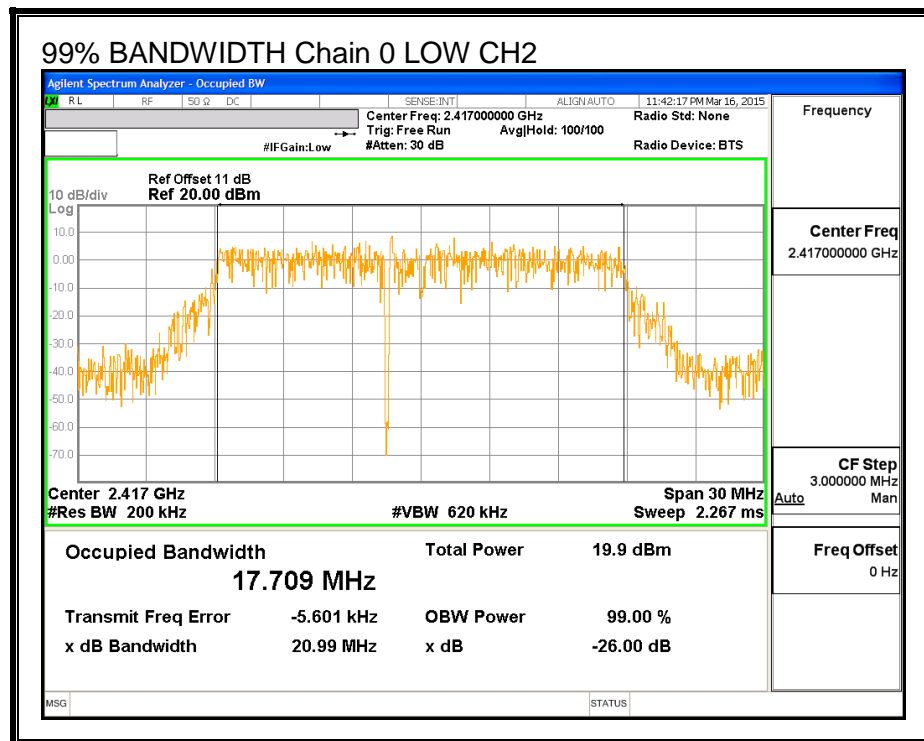
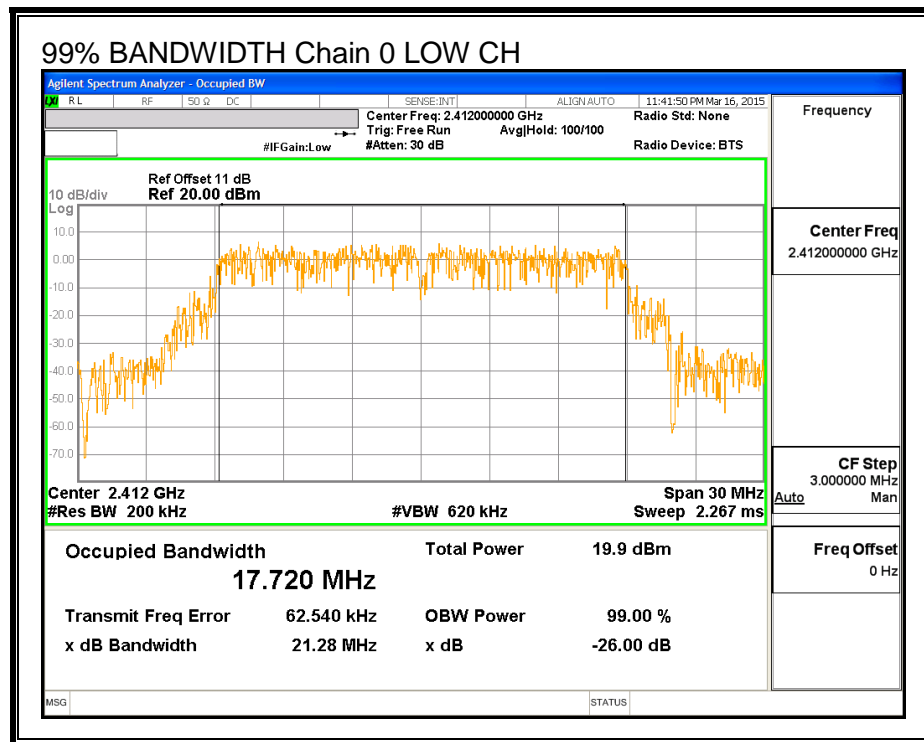
LIMITS

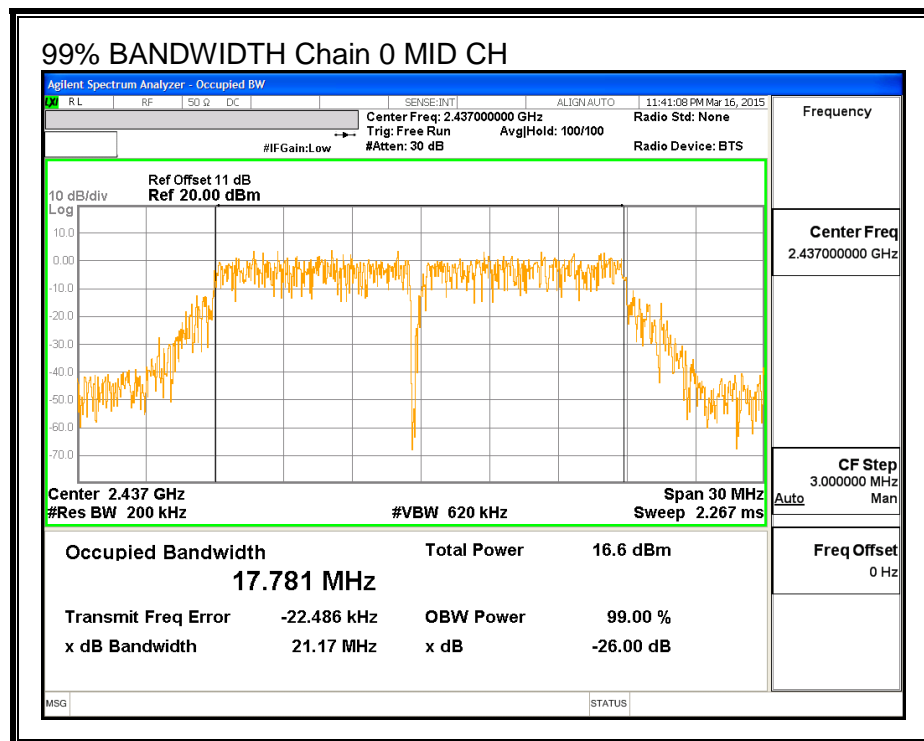
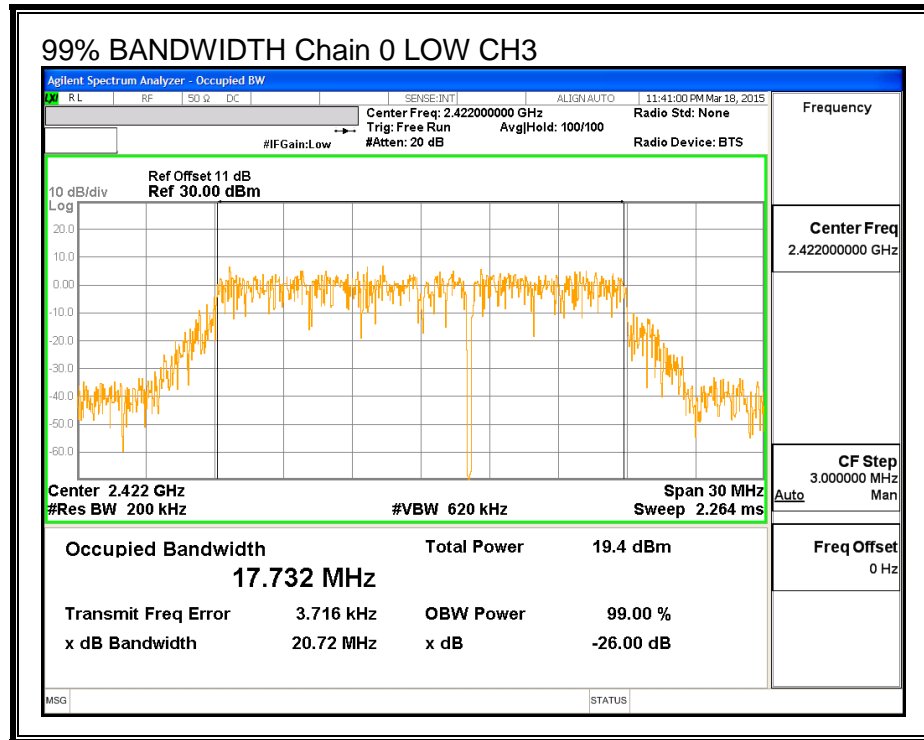
None; for reporting purposes only.

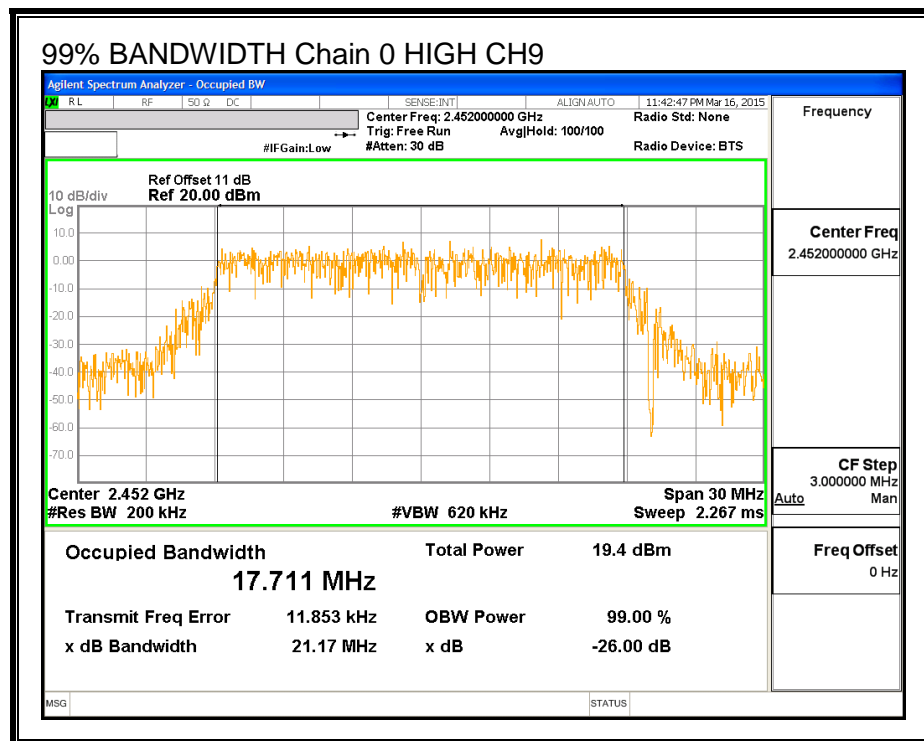
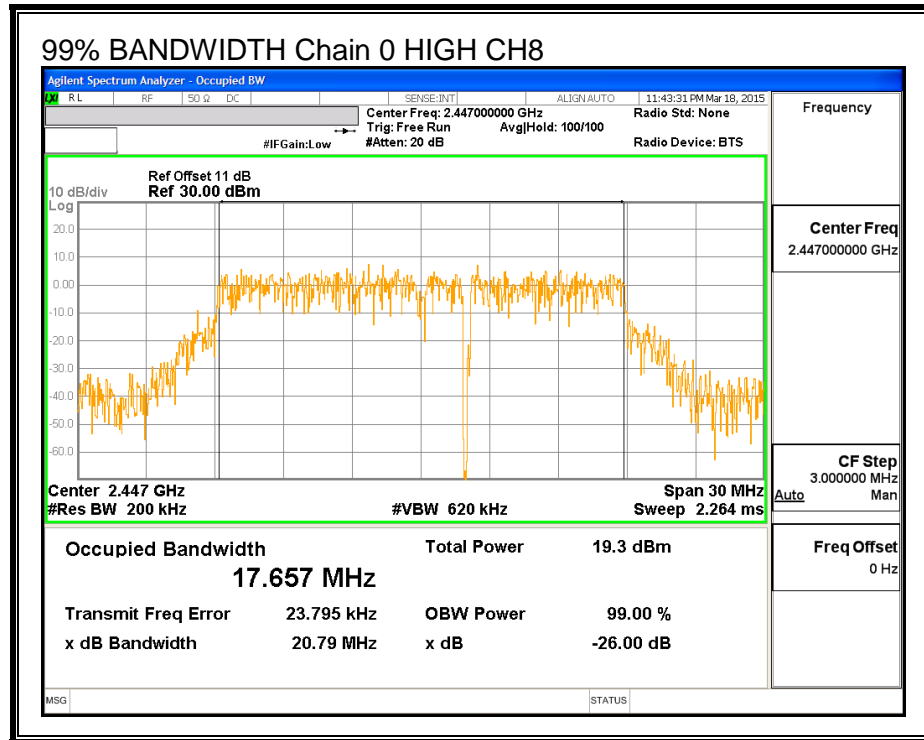
RESULTS

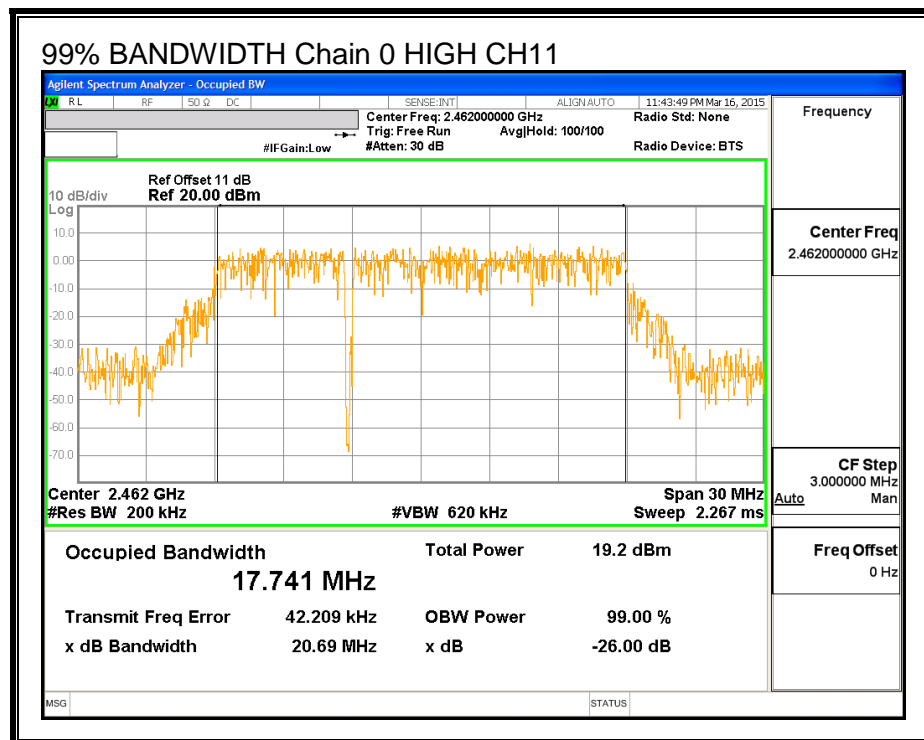
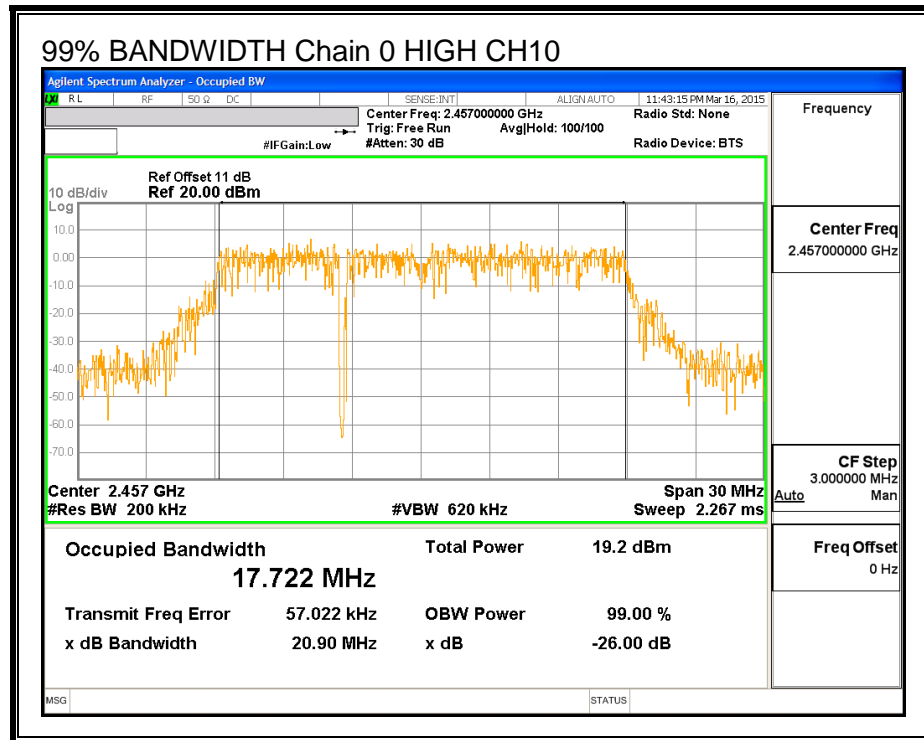
Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low_1	2412	17.720	17.743
Low_2	2417	17.709	17.724
Low_3	2422	17.732	17.793
Mid	2437	17.781	17.789
High_8	2447	17.657	17.686
High_9	2452	17.711	17.735
High_10	2457	17.722	17.725
High_11	2462	17.741	17.690
High_12	2467	17.672	17.673
High_13	2472	17.716	17.790

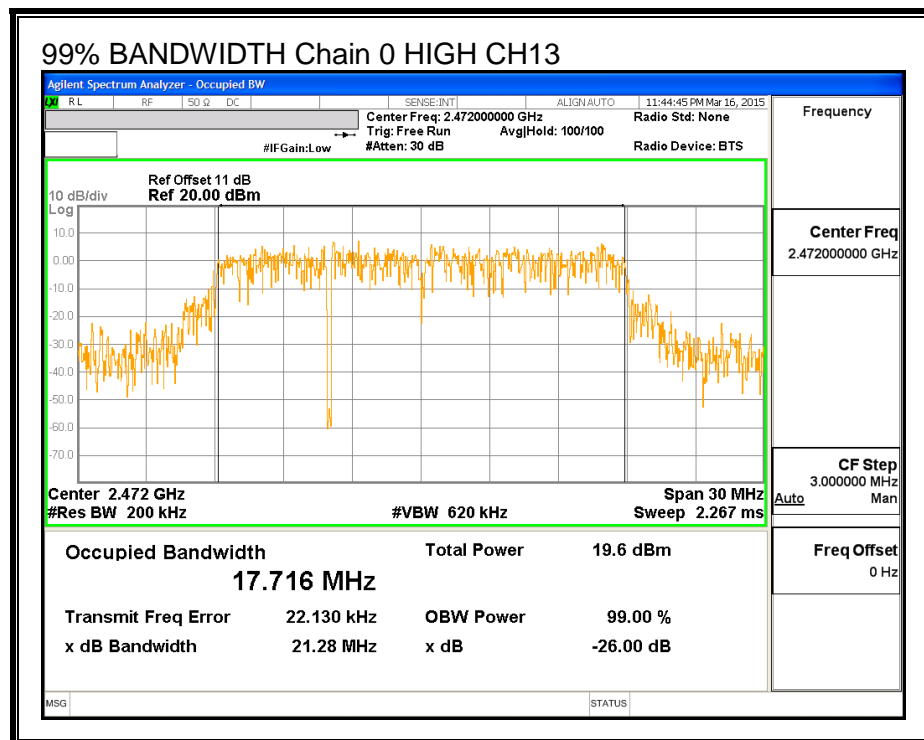
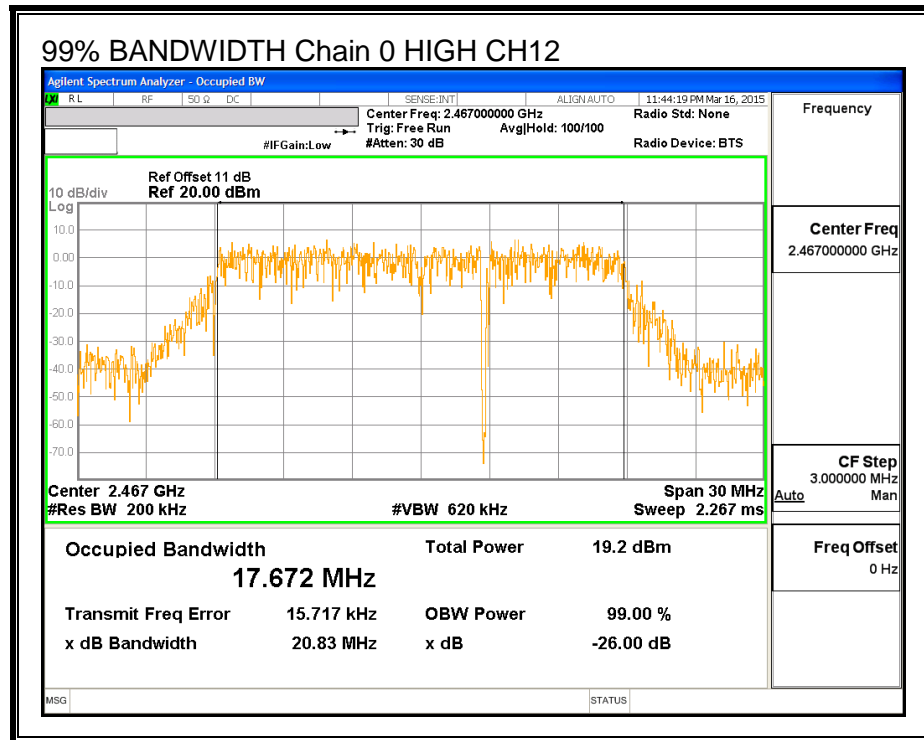
99% BANDWIDTH, Chain 0



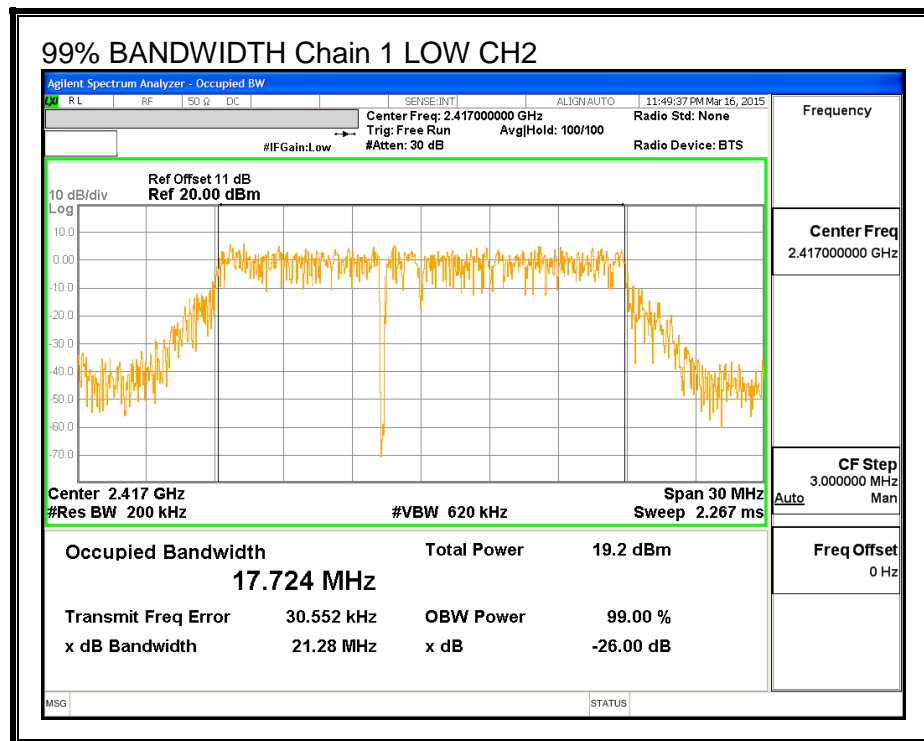
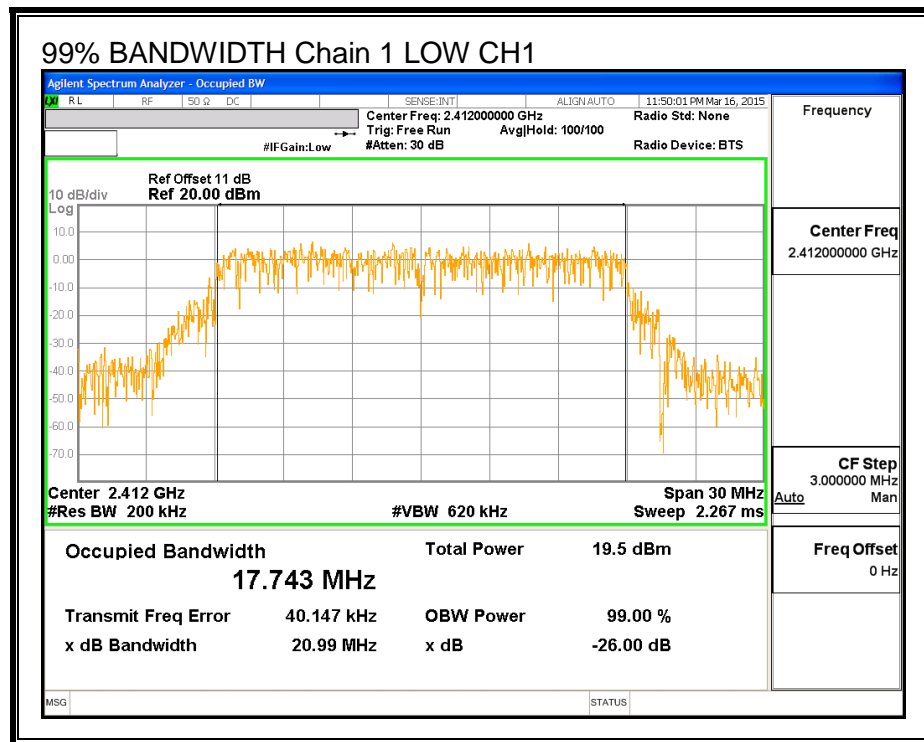


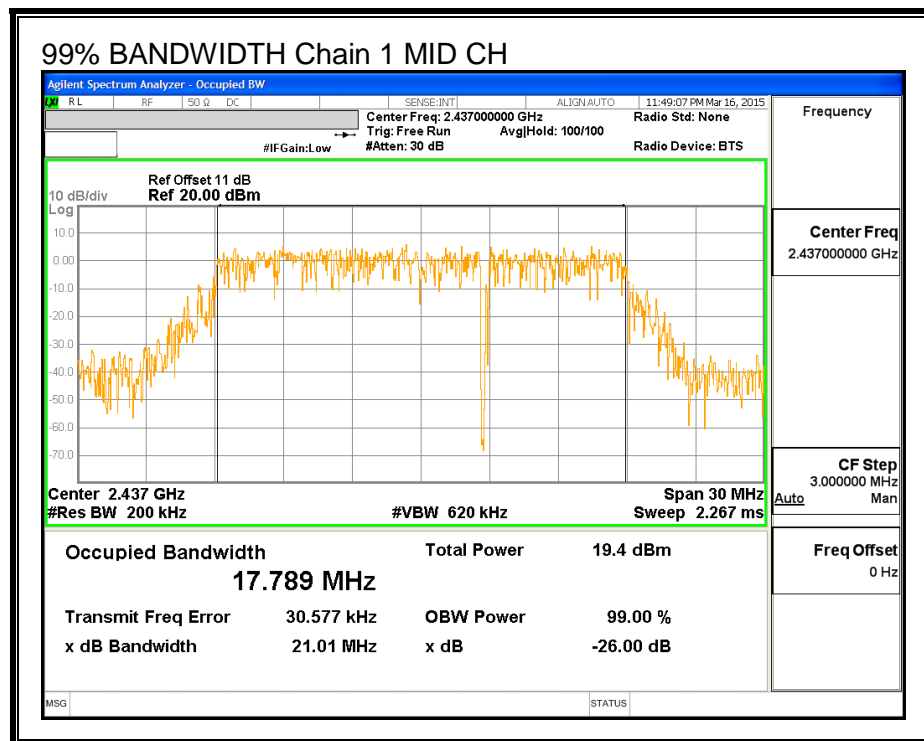
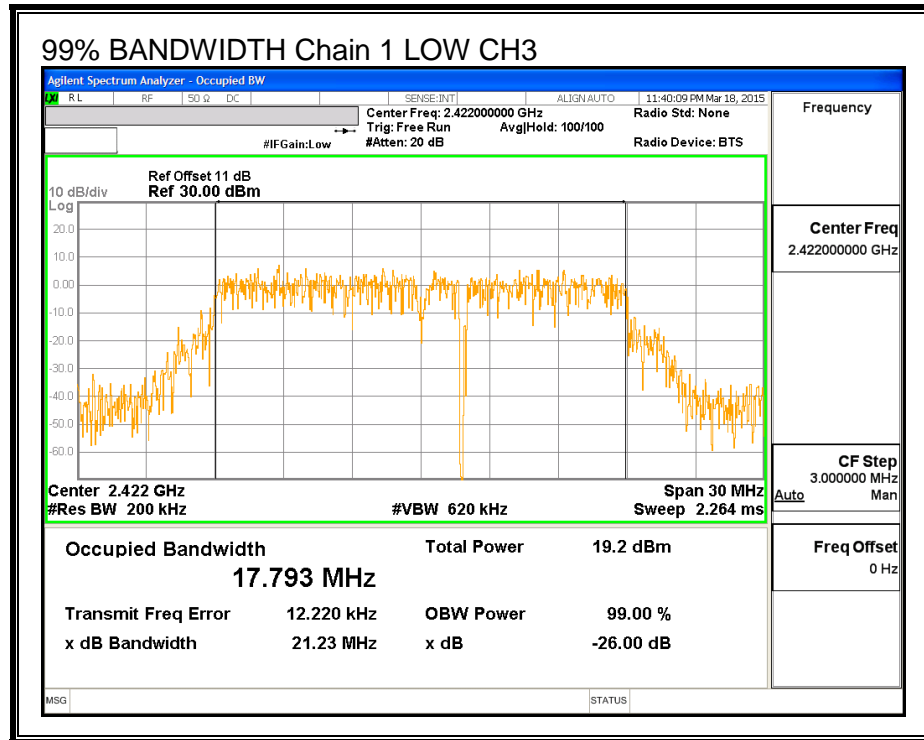


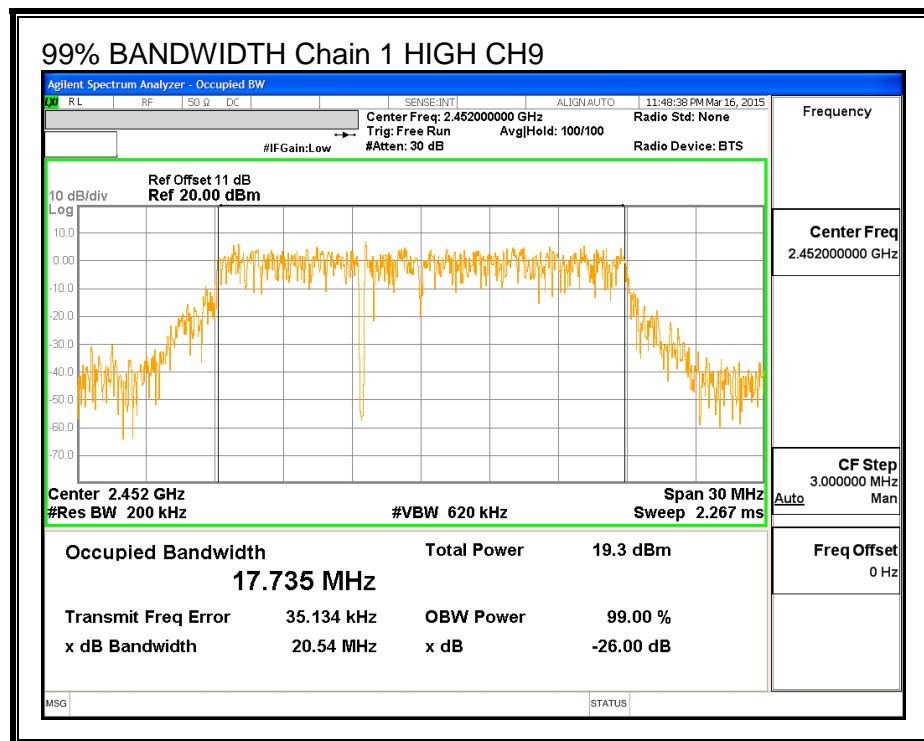
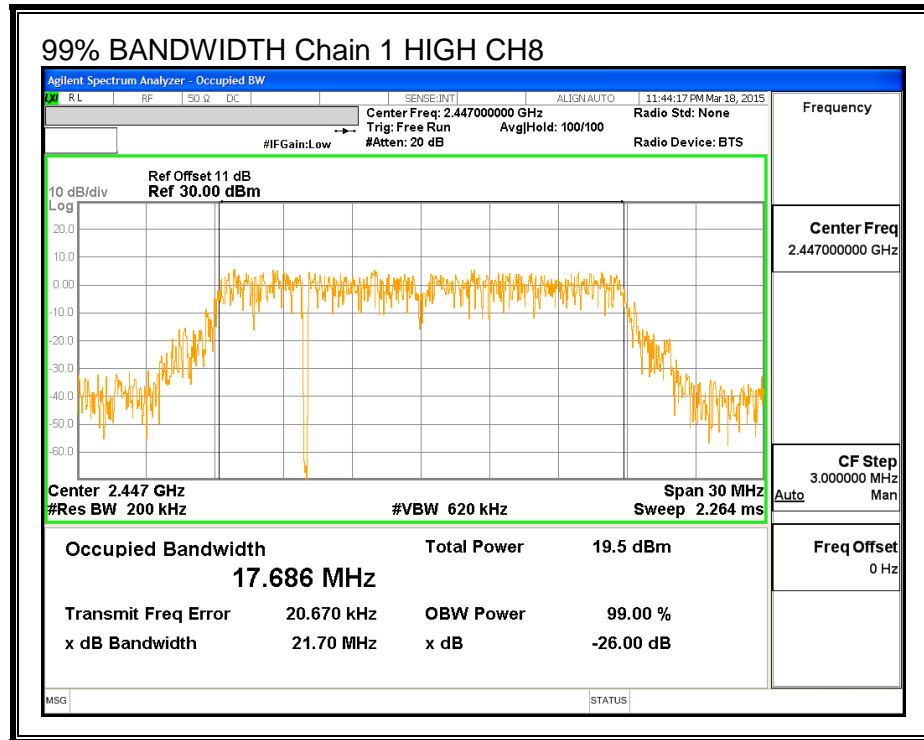


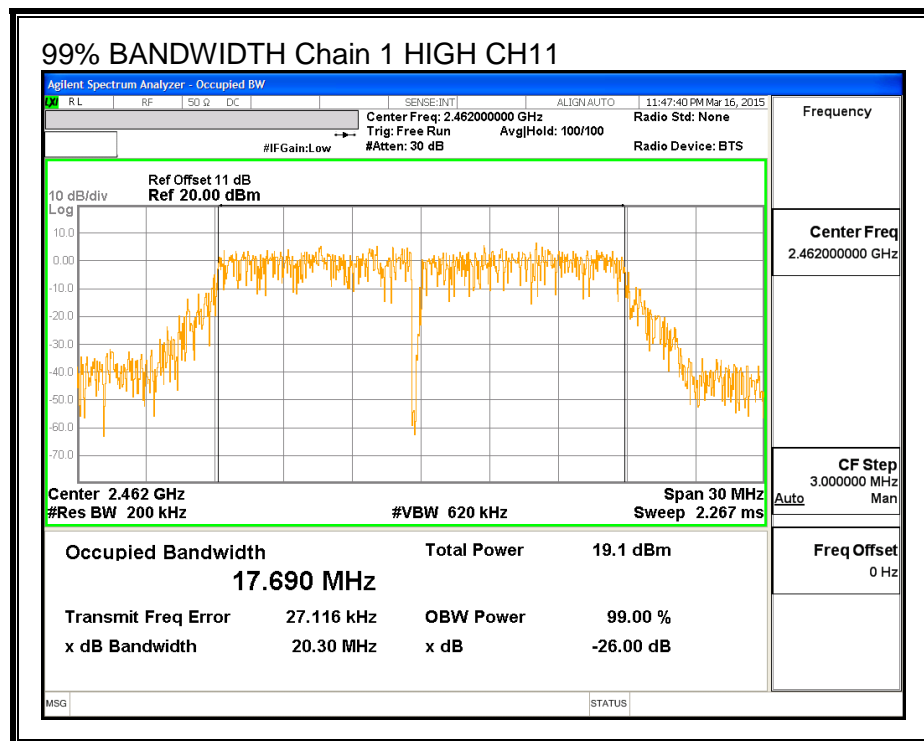
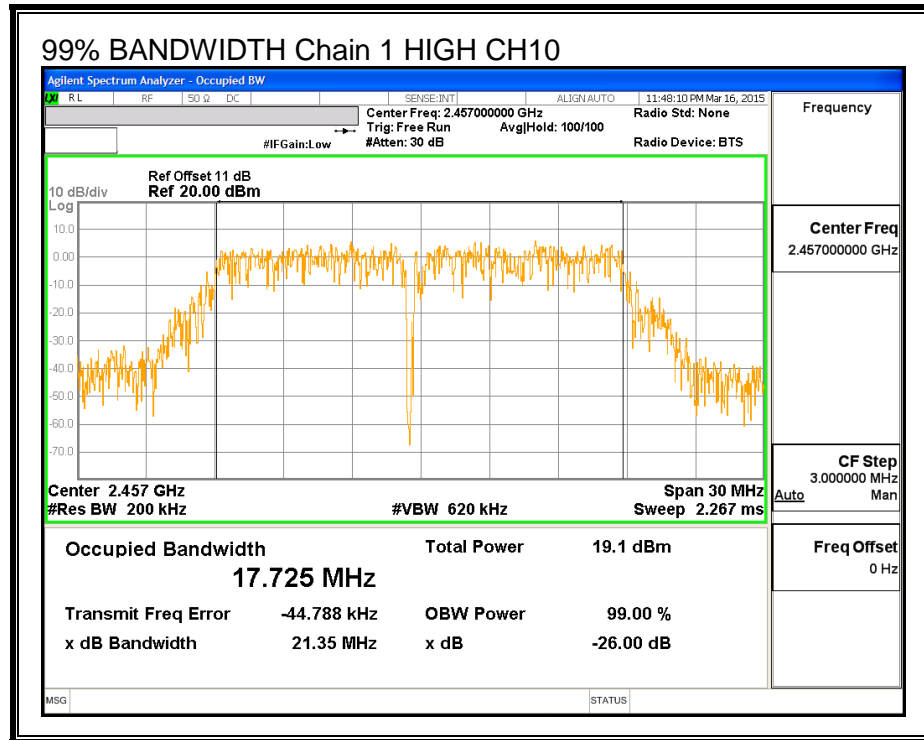


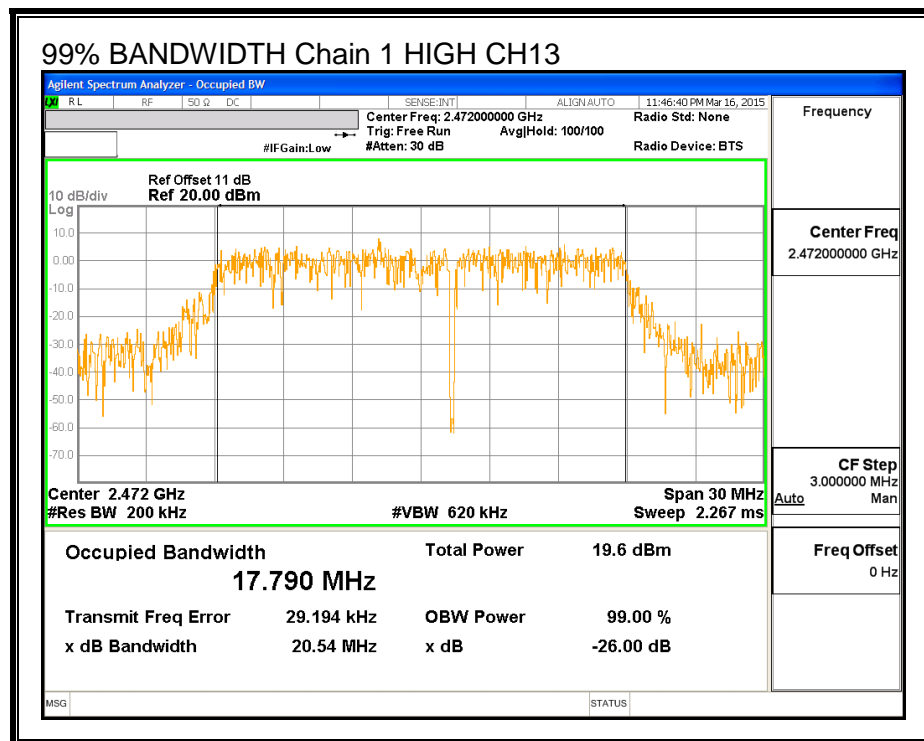
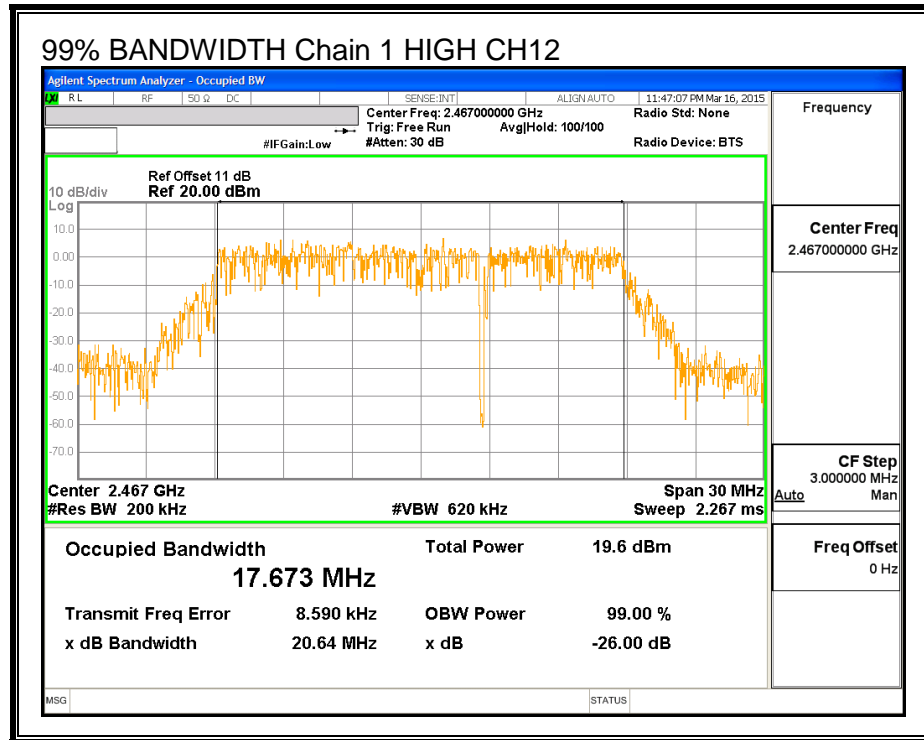
99% BANDWIDTH, Chain 1











8.4.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low_1	2412	11.50	11.43	14.48
Low_2	2417	15.50	15.49	18.51
Low_3	2422	18.47	18.45	21.47
Mid	2437	18.50	18.49	21.51
High_8	2447	18.48	18.49	21.50
High_9	2452	16.00	15.99	19.01
High_10	2457	13.98	13.98	16.99
High_11	2462	10.00	9.98	13.00
High_12	2467	8.00	7.98	11.00
High_13	2472	0.00	0.00	3.01

8.4.4. OUTPUT POWER

LIMITS

FCC §15.247

IC RSS-247 (5.4) (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 unequal among the chains. The directional gain is:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
0.25	0.46	0.36

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low_1	2412	0.36	30.00	30	36	30.00
Low_2	2417	0.36	30.00	30	36	30.00
Low_3	2422	0.36	30.00	30	36	30.00
Mid	2437	0.36	30.00	30	36	30.00
High_8	2447	0.36	30.00	30	36	30.00
High_9	2452	0.36	30.00	30	36	30.00
High_10	2457	0.36	30.00	30	36	30.00
High_11	2462	0.36	30.00	30	36	30.00
High_12	2467	0.36	30.00	30	36	30.00
High_13	2472	0.36	30.00	30	36	30.00

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power
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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_1	2412	18.44	18.45	21.46	30.00	-8.54
Low_2	2417	22.41	22.43	25.43	30.00	-4.57
Low_3	2422	25.47	25.48	28.49	30.00	-1.51
Mid	2437	25.49	25.51	28.51	30.00	-1.49
High_8	2447	25.46	25.47	28.48	30.00	-1.52
High_9	2452	22.98	23.01	26.01	30.00	-3.99
High_10	2457	20.99	21.02	24.02	30.00	-5.98
High_11	2462	17.01	17.02	20.03	30.00	-9.97
High_12	2467	15.02	14.98	18.01	30.00	-11.99
High_13	2472	8.60	8.52	11.57	30.00	-18.43

8.4.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247

IC RSS-247 (5.2) (2)

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 KHz band during any time interval of continuous transmissions.

RESULTS

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd PSD
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PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Chain 1 Meas (dBm)	Total Corr'd PSD (dBm)	Limit (dBm)	Margin (dB)
Low_1	2412	-13.61	-13.45	-10.52	8.0	-18.5
Low_2	2417	-10.43	-10.06	-7.23	8.0	-15.2
Low_3	2422	-6.94	-7.07	-3.99	8.0	-12.0
Mid	2437	-6.91	-7.04	-3.96	8.0	-12.0
High_8	2447	-7.12	-7.16	-4.13	8.0	-12.1
High_9	2452	-9.82	-9.52	-6.66	8.0	-14.7
High_10	2457	-11.69	-11.42	-8.54	8.0	-16.5
High_11	2462	-15.01	-14.89	-11.94	8.0	-19.9
High_12	2467	-16.10	-16.14	-13.11	8.0	-21.1
High_13	2472	-25.54	-24.43	-21.94	8.0	-29.9