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

CERTIFICATION TEST REPORT

FOR

802.11BGN 1X1 MODULE

MODEL NUMBERS:
MRF24WN0MA, MRF24WN0MB
RN1810, RN1810E
RN1811, RN1811E

FCC ID: W7O24WN0
IC: 7693A-24WN0

REPORT NUMBER: 14U19707-E1C

ISSUE DATE: AUGUST 18, 2015

Prepared for
MICROCHIP TECHNOLOGY INC.
450 HOLGER WAY
SAN JOSE, CA 95134-1368, U.S.A.

Prepared by
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	04/28/2015	Initial Issue	C. Pang
A	07/22/2015	Add Model numbers RN1810, RN1810E RN1811, RN1811E	S. Kuwatani
B	07/29/2015	Correction on Page 14 and 28	C. Pang
C	08/18/2015	Address TCB's questions	C. Pang

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: MICROCHIP TECHNOLOGY INC.
450 HOLGER WAY
SAN JOSE, CA 95134-1368, U.S.A.

EUT DESCRIPTION: 802.11BGN 1X1 MODULE

MODEL: MRF24WN0MA, MRF24WN0MB
RN1810, RN1810E
RN1811, RN1811E

SERIAL NUMBER: FAL B018

DATE TESTED: APRIL 01, 2015 TO APRIL 27, 2015

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-247 Issue 1 Annex 8	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:

CHIN PANG
WiSE PROJECT LEADER
UL VERIFICATION SERVICES INC.

Tested By:

CHRIS XIONG
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, RSS-GEN Issue 4, and RSS-247 Issue 1, and ANSI C63.10-2009 for FCC test and ANSI C63.10-2013 with deviation of measurement height of 0.8m rather than 1.5m for IC test.

3. FACILITIES AND ACCREDITATION

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:

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

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

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	± 3.52 dB
Radiated Disturbance, 30 to 1000 MHz	± 4.94 dB
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 EUT is an 802.11bgn 1x1 module.

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	14.34	27.16
2412 - 2472	802.11g	24.99	315.50
2412 - 2472	802.11n HT20 1TX	25.47	352.37
2412 - 2472	802.11n HT40 1TX	19.82	95.94

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Band (GHz)	Antenna Type	Antenna Gain
2.4	PIFA	4
	Integral	-1
	PCB	2
	Dipole	2

5.4. SOFTWARE AND FIRMWARE

The test software used during testing was ART2_LoE, rev. 2.3

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 and Z position. The following table was the results of the worst case orientation on each different antenna type based on the baseline investigation

Antenna Type	Worst-case Orientation
PIFA	Y-Landscape
Intergral	Z-Portrait
PCB	X-Flatbed
Dipole	Normal position

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

802.11b mode: 1 Mbps
802.11g mode: 6 Mbps
802.11n HT20 mode: MCS0
802.11n HT40 mode: MCS0

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Lenovo	B560	WB13861334	N/A
AC/DC Adapter	Lenovo	ADLX65NCT3A	11S36200292ZZ1003BR1EM	N/A

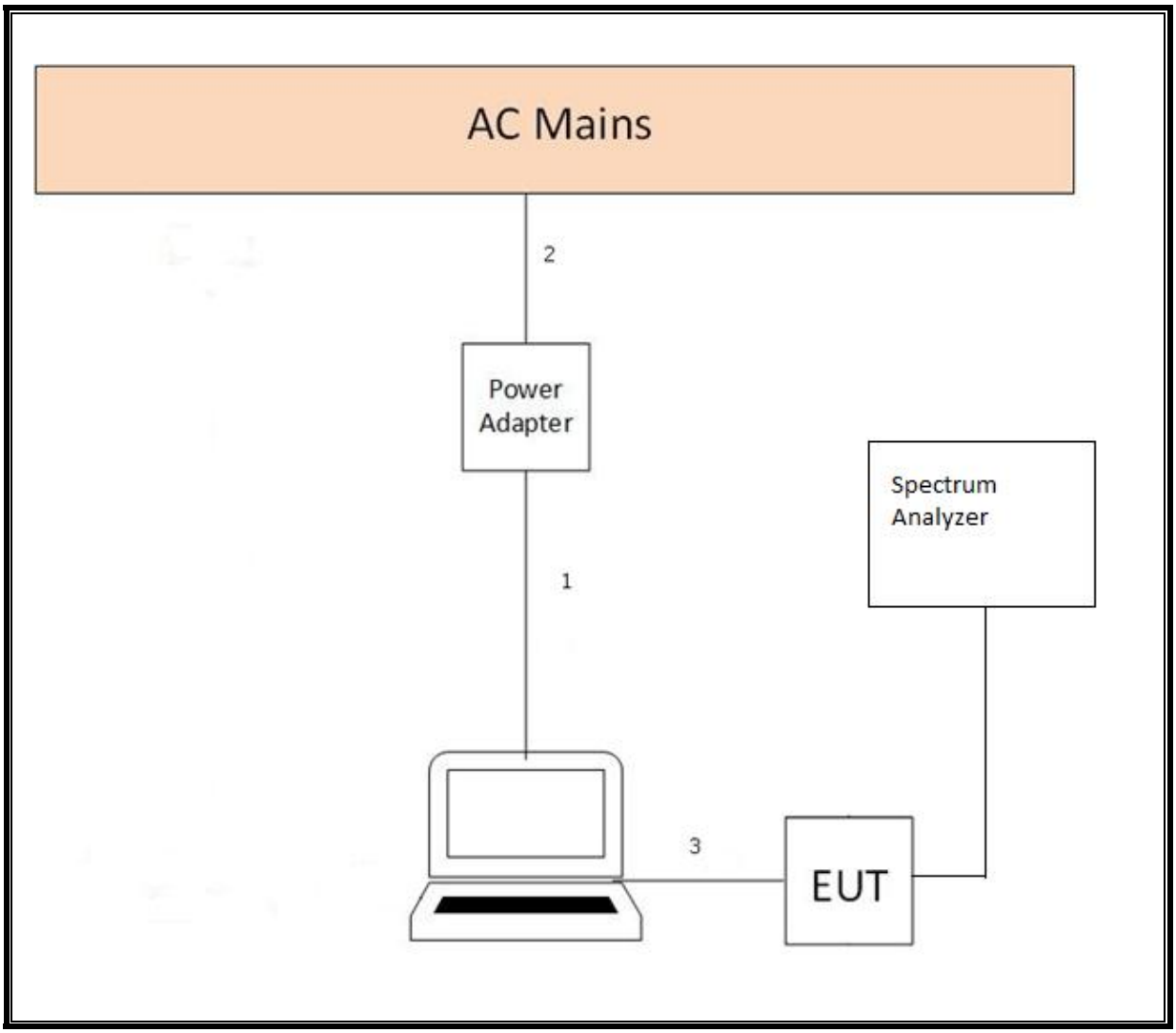
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC	1	Barrel	Unshielded	1.83	N/A
2	AC	1	3-Prong	Unshielded	1	N/A
3	USB	1	USB	Unshielded	1	N/A

TEST SETUP

The EUT was tested connected to a host Laptop via USB cable adapter and spectrum analyzer to antenna port. 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, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	A022813-1	1/14/2016
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	171202	11/1/2015
Spectrum Analyzer, PXA, 3Hz to 50GHz	Agilent	N9030A	MY52350427	9/13/2015
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
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB1	A121003	2/13/2016
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	MY53060007	9/15/2015
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Agilent	N1921A	MY53260010	7/12/2015
Power Meter, Peak	Boonton	4541	12405	7/17/2015
Power Sensor, Peak	Boonton	57006	6871	7/17/2015
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	ECSI7	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	U L	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, April 3, 2015	

7. MEASUREMENT METHODS

MEASUREMENT METHODS

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

Output Power: KDB 558074 D01 v03r02, Section 9.1.2

Power Spectral Density: KDB 558074 D01 v03r02, Section 10.2.

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 12.1.
Out-of-band emissions in restricted bands: KDB 558074 D01 v03r02, Section 12.2.

Band-edge: KDB 558074 D01 v03r02, Section 13.1.
Band-edge: KDB 558074 D01 v03r02, Section 13.3.1.
Band-edge: KDB 558074 D01 v03r02, Section 13.3.2.

LIMITS

None; for reporting purposes only.

8. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

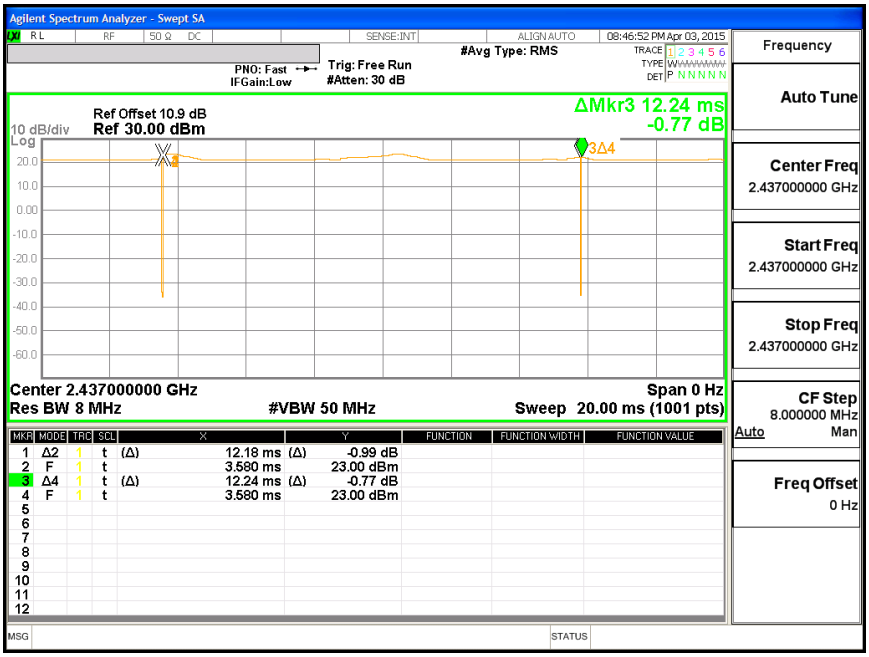
ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time T (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)
2.4GHz Band						
802.11b 1TX	12.180	12.240	0.995	99.51%	0.00	0.010
802.11g 1TX	2.022	2.082	0.971	97.12%	0.13	0.495
802.11n HT20 1TX	1.887	1.944	0.971	97.07%	0.13	0.530
802.11n HT40 1TX	0.928	0.984	0.943	94.31%	0.25	1.078

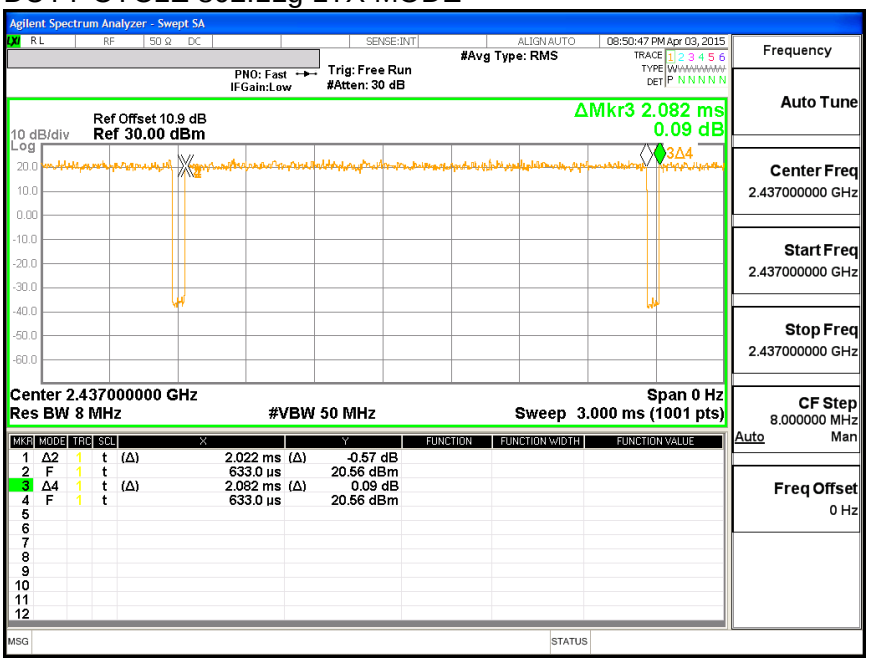
8.1. DUTY CYCLE PLOTS

2.4 GHz BAND

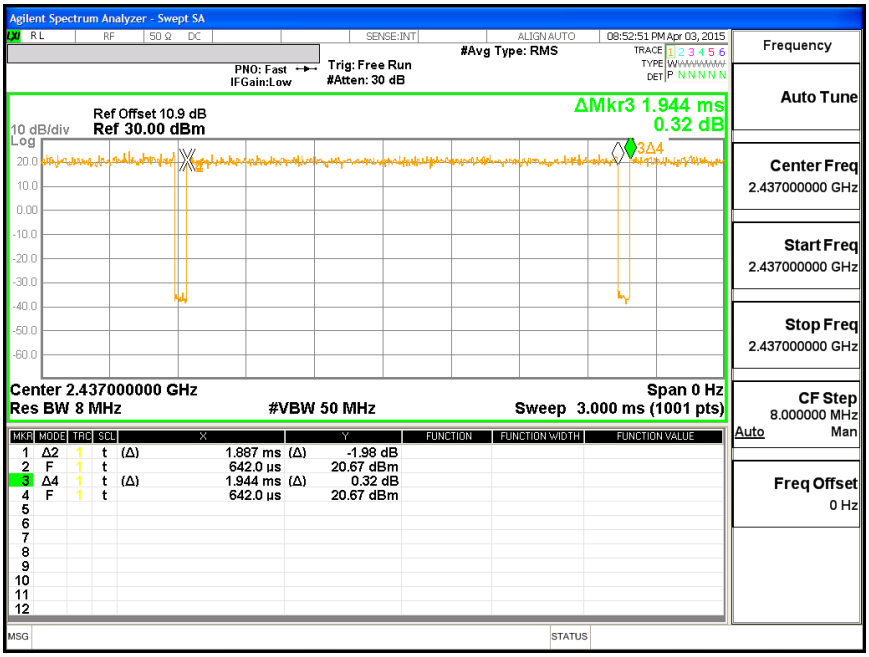
DUTY CYCLE 802.11b 1TX MODE



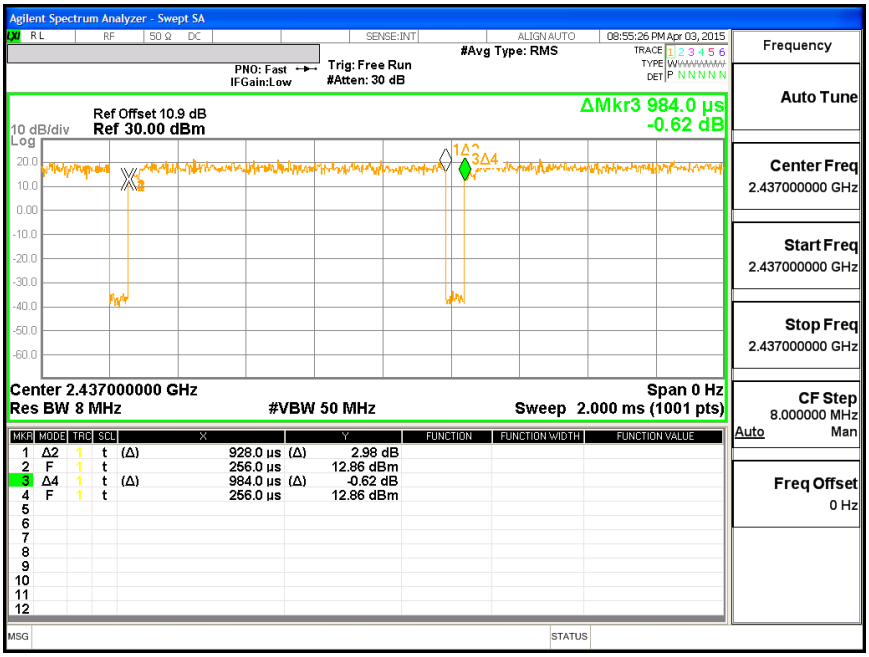
DUTY CYCLE 802.11g 1TX MODE



DUTY CYCLE 802.11n HT20 1TX MODE



DUTY CYCLE 802.11n HT40 1TX MODE



9. ANTENNA PORT TEST RESULTS

9.1. 802.11b SISO MODE IN THE 2.4 GHz BAND

9.1.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

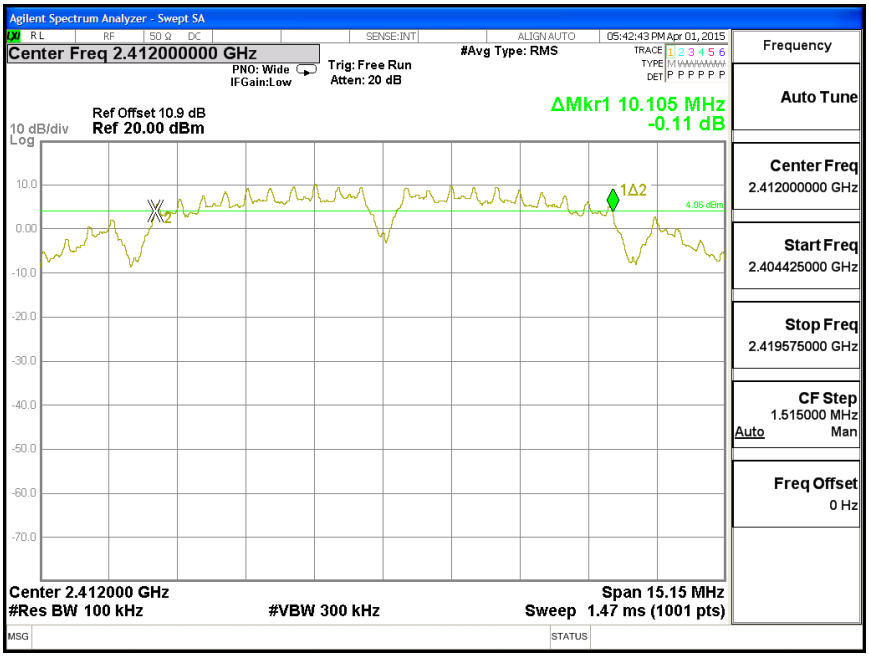
The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

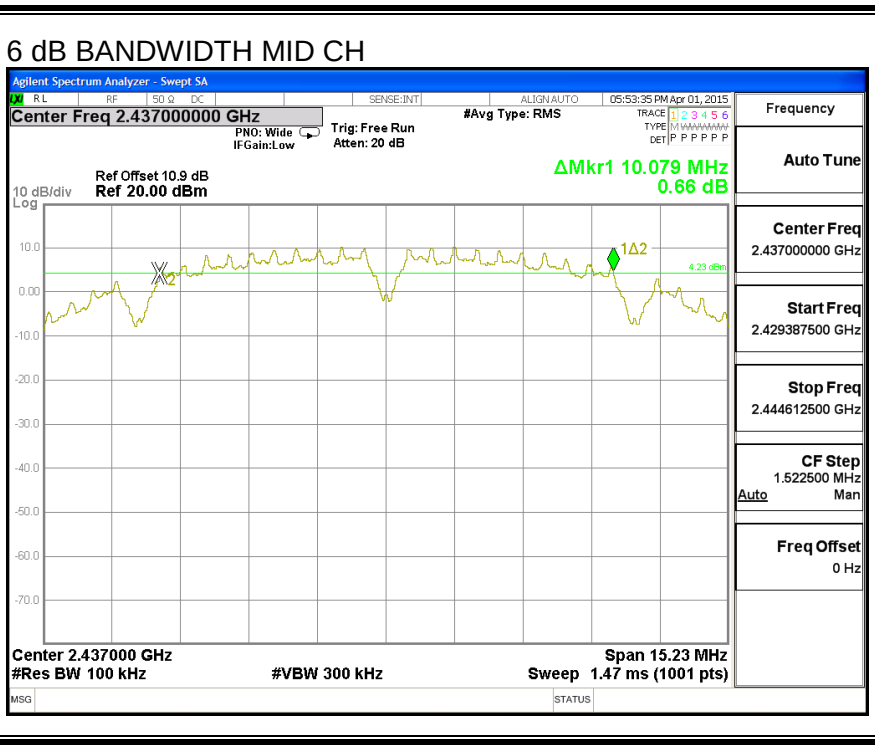
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	10.105	0.5
Mid	2437	10.079	0.5
High	2462	10.090	0.5
High	2467	10.075	0.5
High	2472	10.105	0.5

6 dB BANDWIDTH

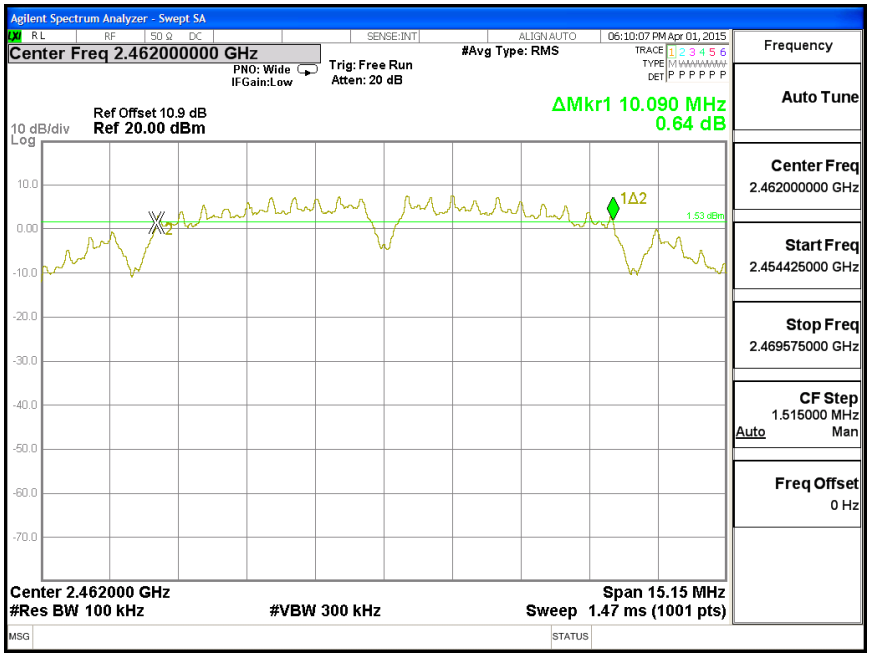
6 dB BANDWIDTH LOW CH



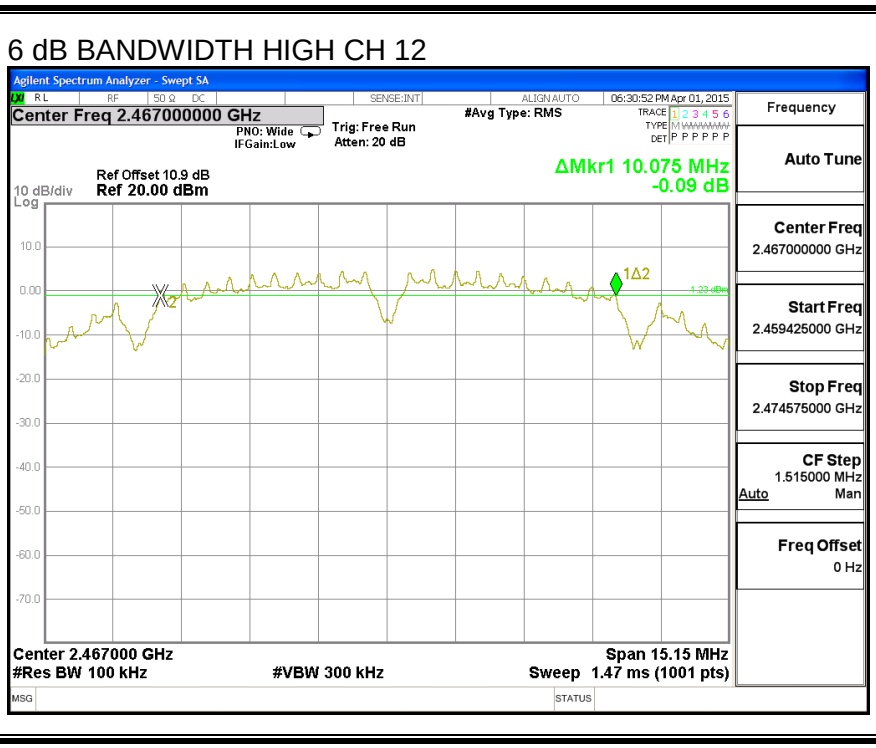
6 dB BANDWIDTH MID CH



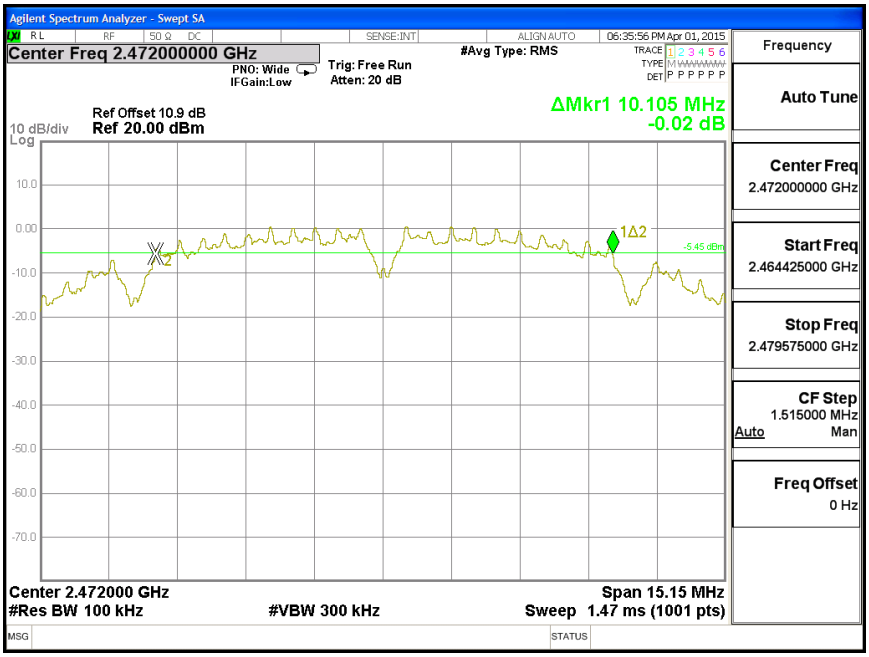
6 dB BANDWIDTH HIGH CH 11



6 dB BANDWIDTH HIGH CH 12



6 dB BANDWIDTH HIGH CH 13



9.1.2. 99% BANDWIDTH

LIMITS

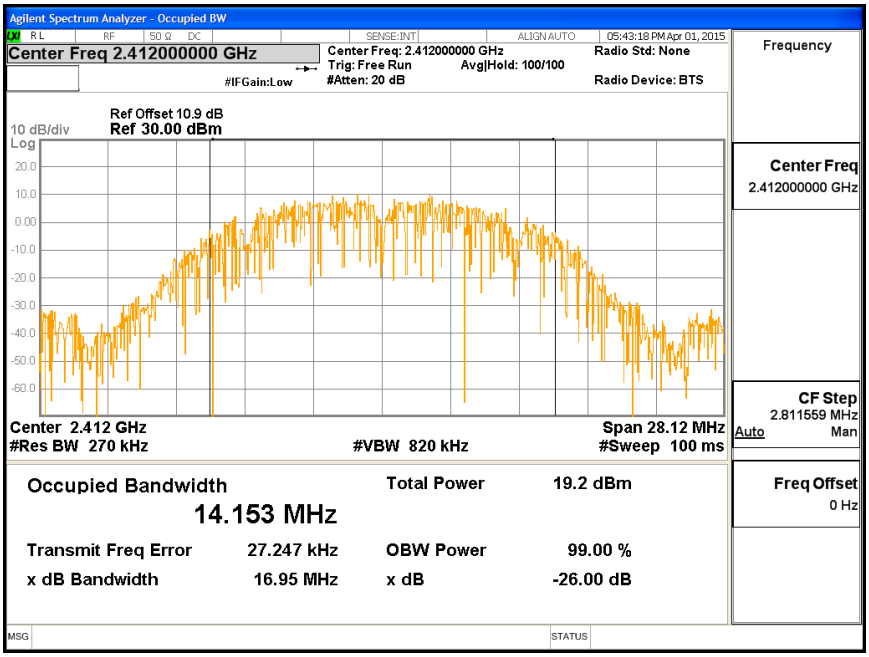
None; for reporting purposes only.

RESULTS

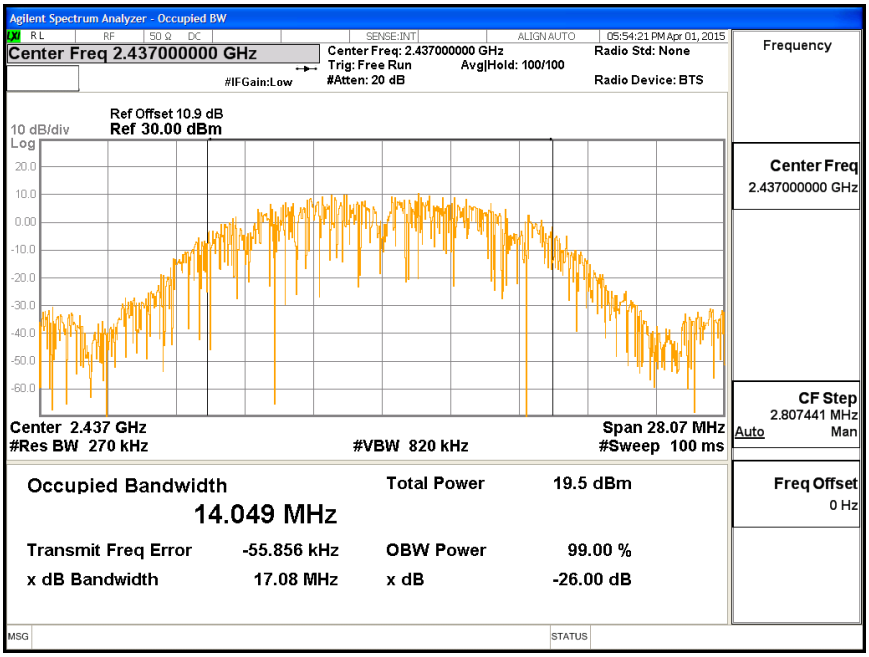
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	14.153
Mid	2437	14.049
High	2462	13.692
High	2467	14.085
High	2472	13.796

99% BANDWIDTH

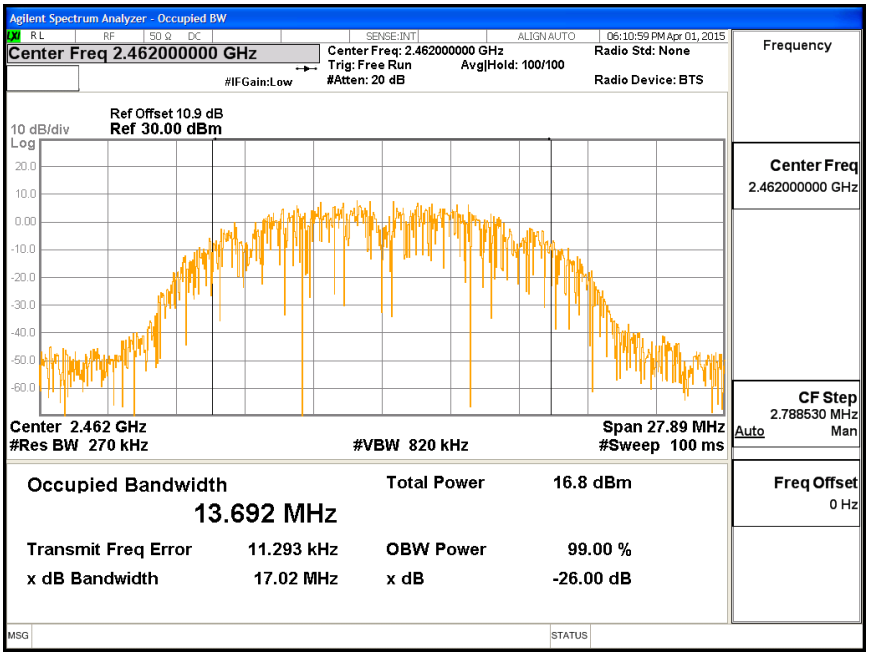
99% BANDWIDTH LOW CH



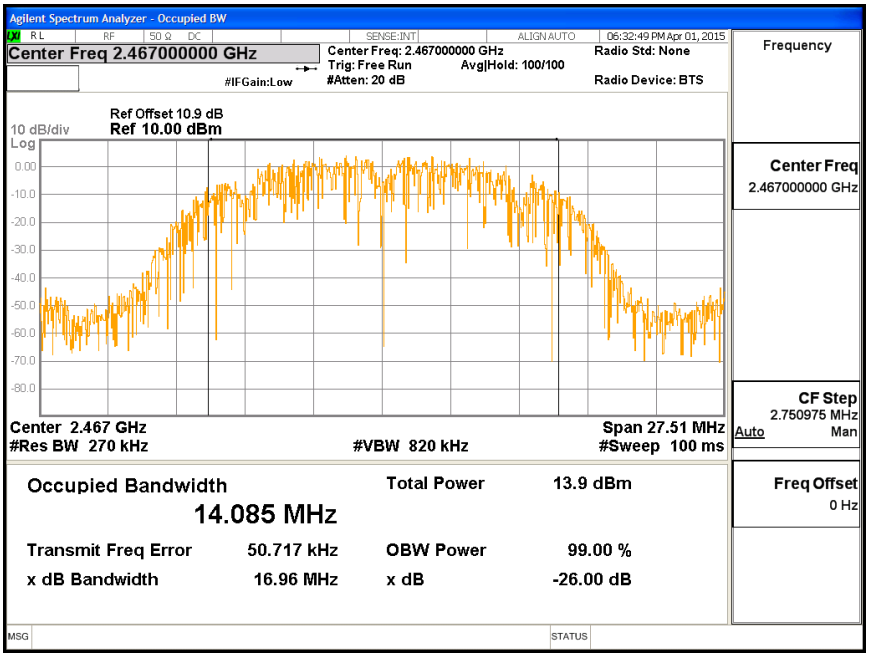
99% BANDWIDTH MID CH



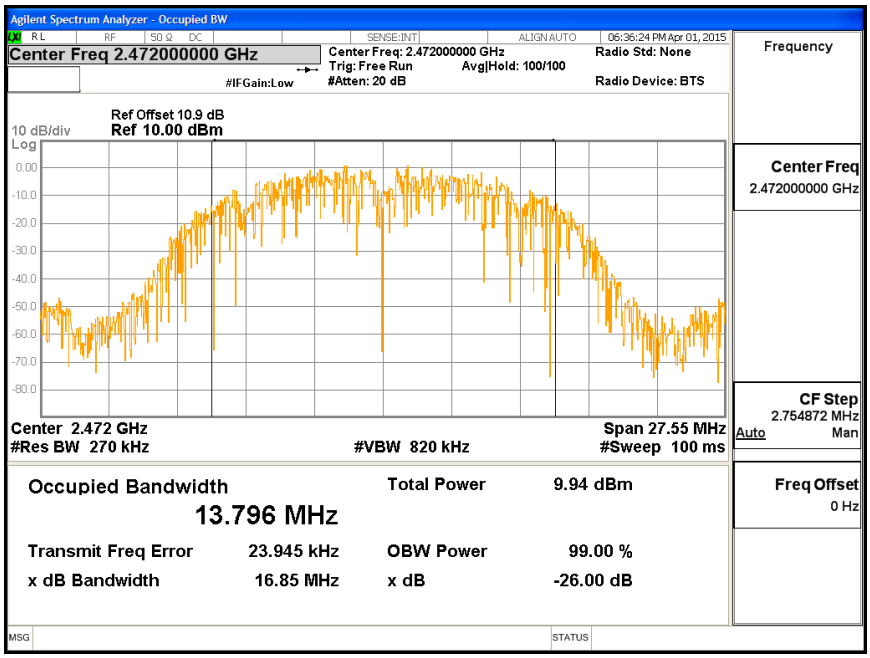
99% BANDWIDTH HIGH CH 11



99% BANDWIDTH HIGH CH 12



99% BANDWIDTH HIGH CH 13



9.1.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low	2412	11.76
Mid	2437	11.99
High	2462	10.98
High	2467	10.92
High	2472	7.56

9.1.4. 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

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	2.00	30.00	30	36	30.00
Mid	2437	2.00	30.00	30	36	30.00
High	2462	2.00	30.00	30	36	30.00
High	2467	2.00	30.00	30	36	30.00
High	2472	2.00	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	2412	14.04	14.04	30.00	-15.96
Mid	2437	14.34	14.34	30.00	-15.66
High	2462	13.31	13.31	30.00	-16.69
High	2467	13.26	13.26	30.00	-16.74
High	2472	10.34	10.34	30.00	-19.66

9.1.5. PSD

LIMITS

FCC §15.247

IC RSS-210 A8.2

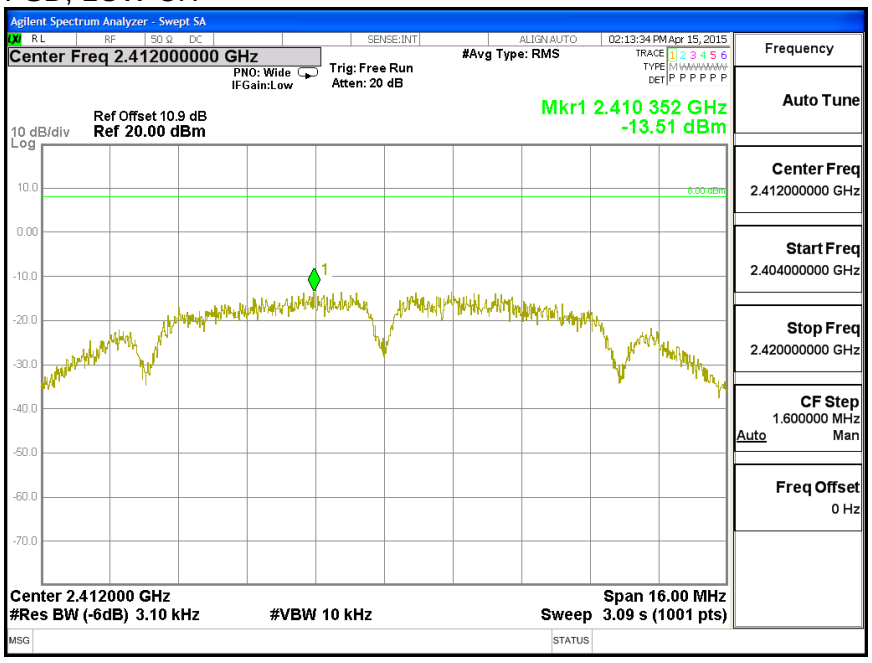
RESULTS

PSD Results

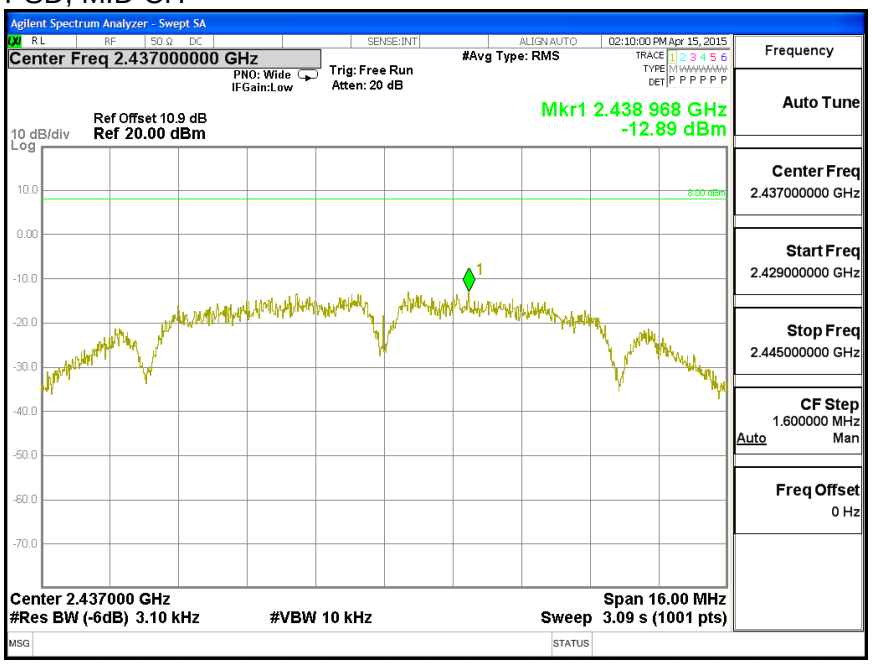
Channel	Frequency (MHz)	Meas (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-13.51	8.0	-21.5
Mid	2437	-12.89	8.0	-20.9
High	2462	-14.49	8.0	-22.5
High	2467	-13.89	8.0	-21.9
High	2472	-17.76	8.0	-25.8

PSD

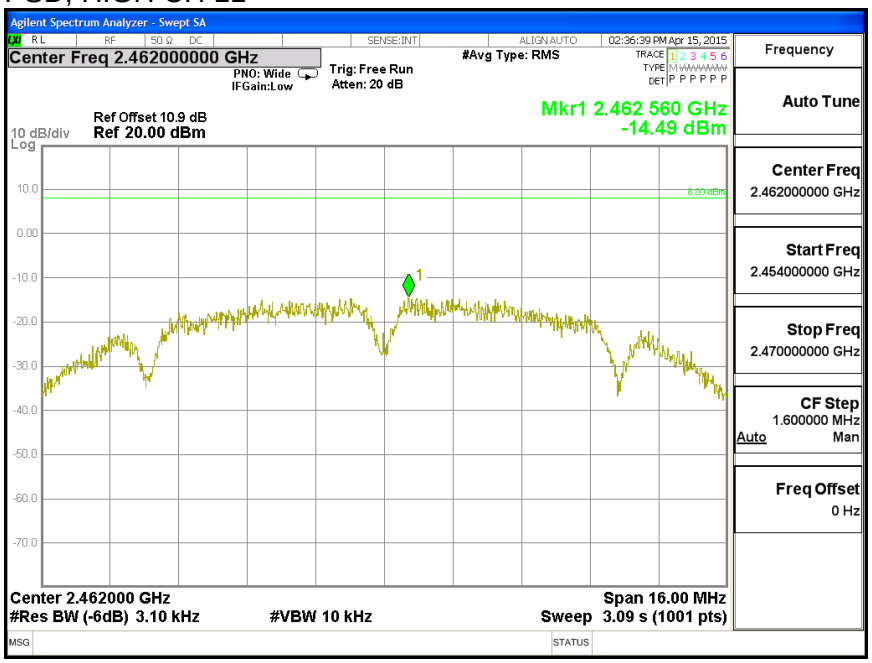
PSD, LOW CH



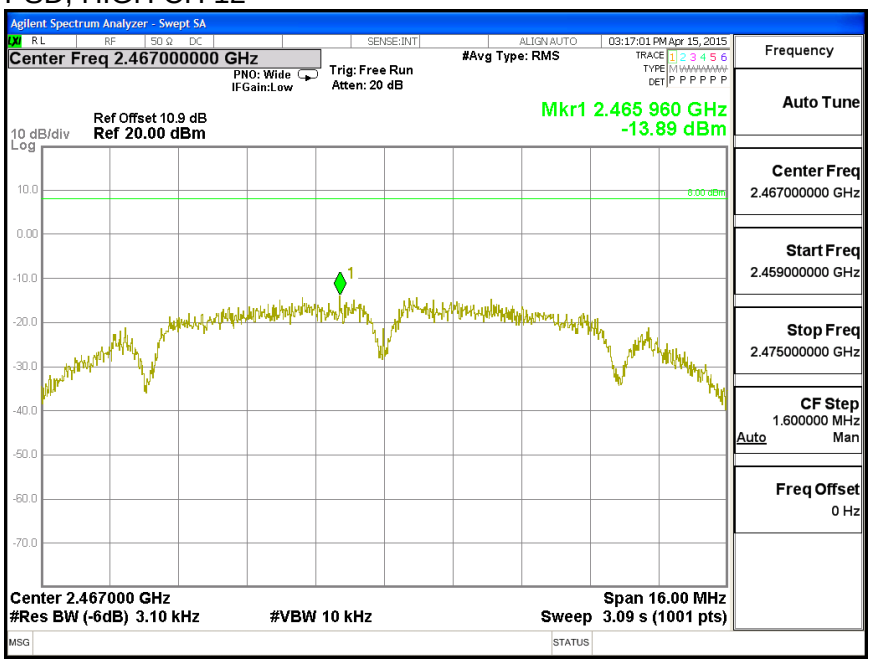
PSD, MID CH



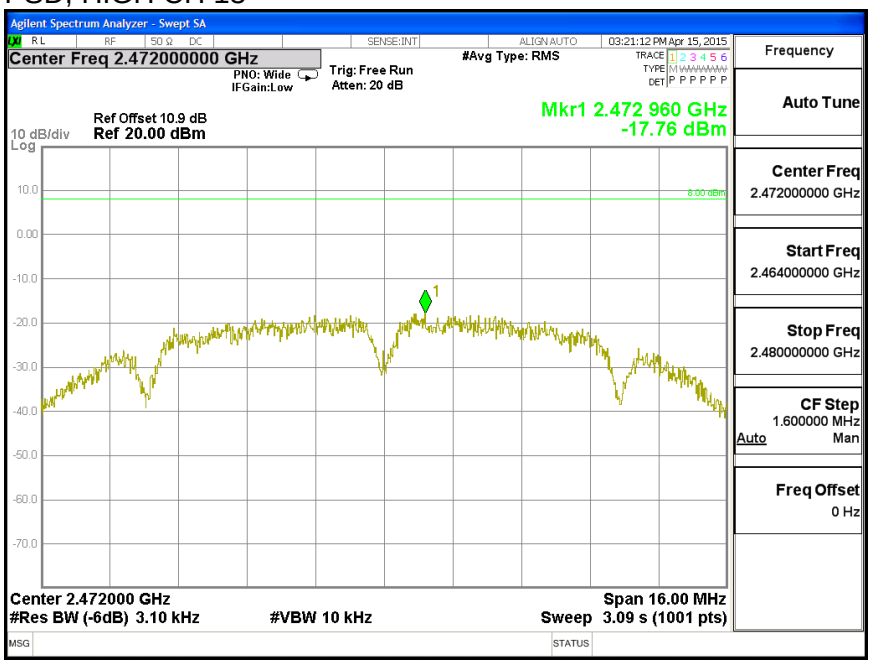
PSD, HIGH CH 11



PSD, HIGH CH 12



PSD, HIGH CH 13



9.1.6. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

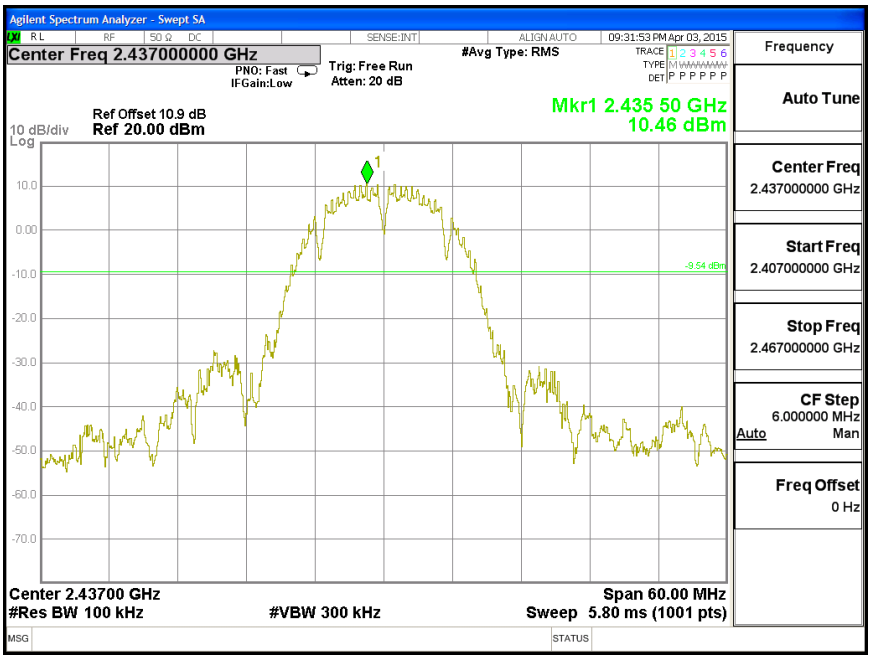
IC RSS-210 A8.5

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.

RESULTS

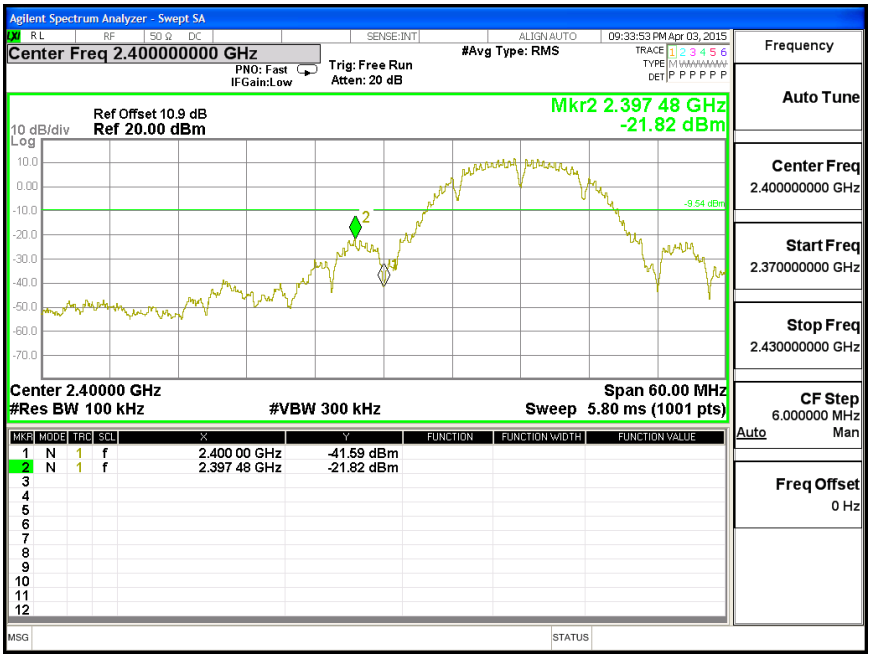
IN-BAND REFERENCE LEVEL

REFERENCE LEVEL MID CH



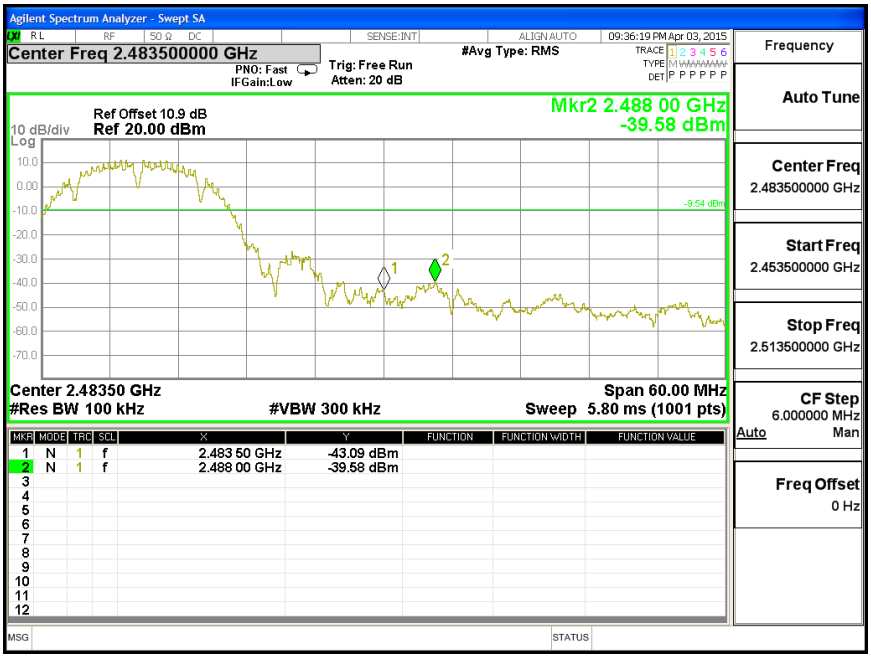
LOW CHANNEL BANDEDGE

AUTHORIZED BAND EDGE LOW CH



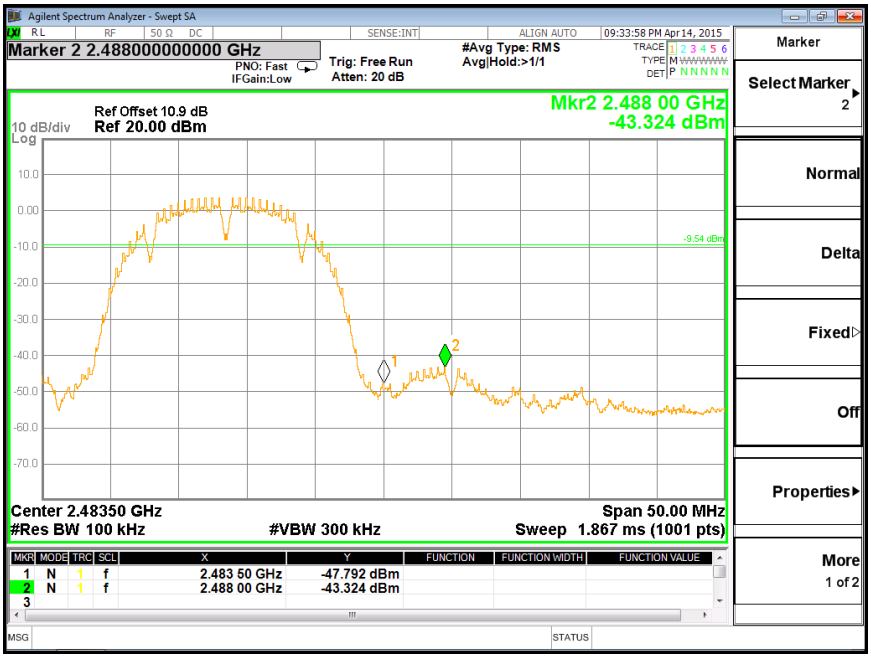
HIGH CHANNEL 11 BANDEDGE

AUTHORIZED BAND EDGE HIGH CH 11



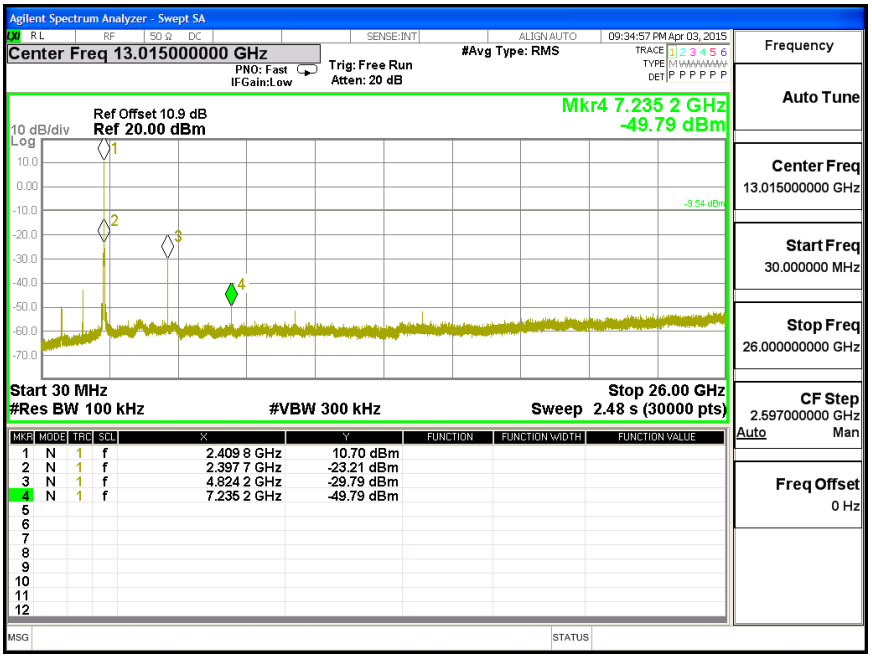
HIGH CHANNEL 13 BANDEDGE

AUTHORIZED BAND EDGE HIGH CH 13

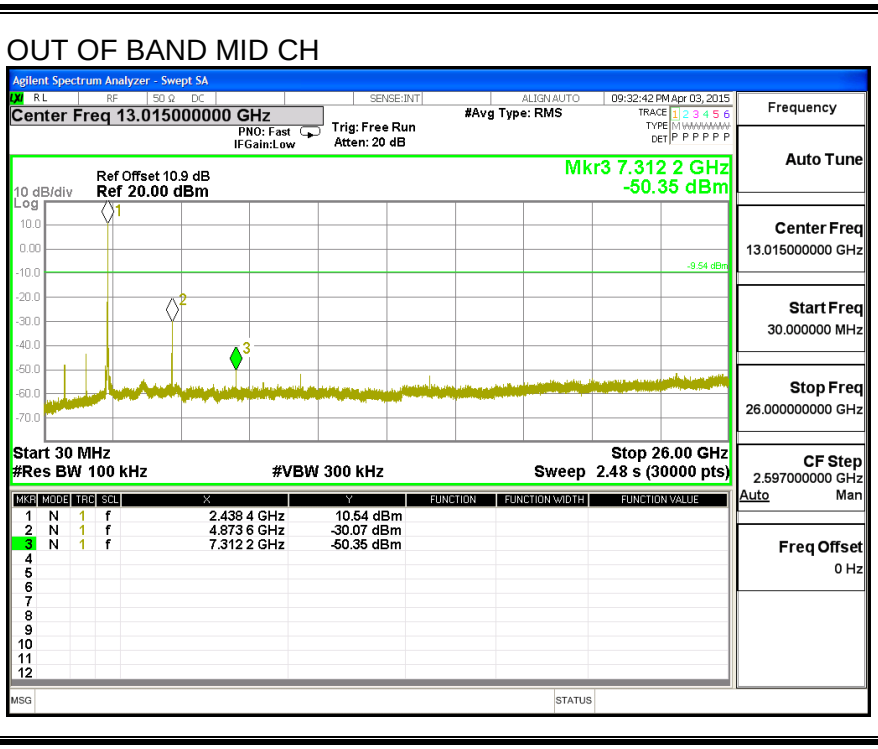


OUT-OF-BAND EMISSIONS

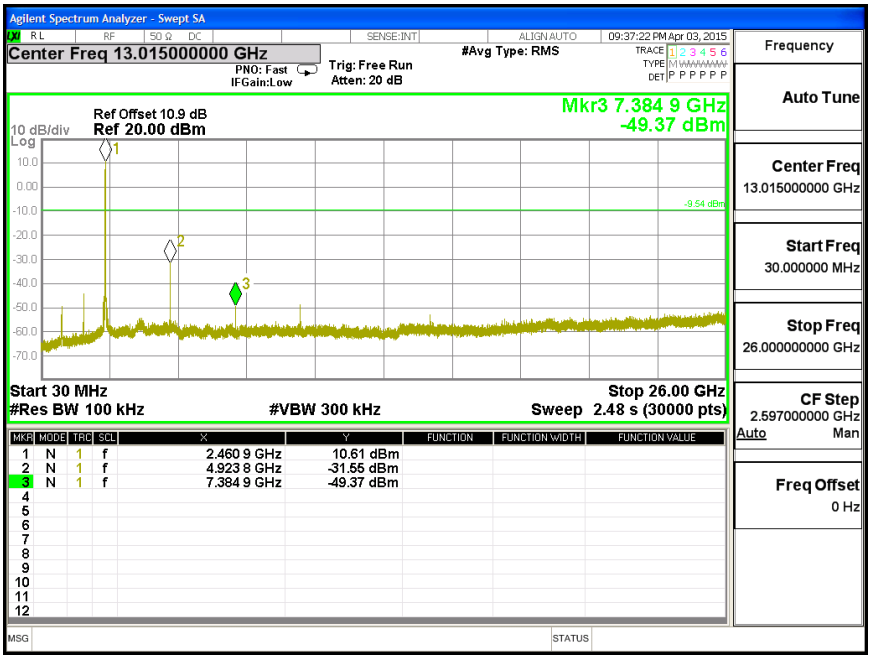
OUT OF BAND LOW CH



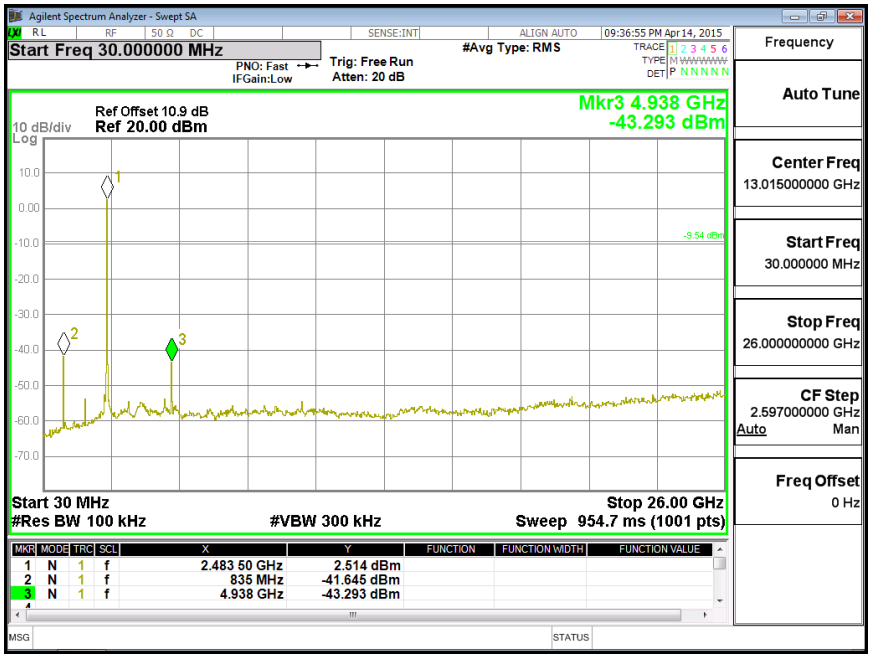
OUT OF BAND MID CH



OUT OF BAND HIGH CH 11



OUT OF BAND HIGH CH 13



9.2. 802.11g SISO MODE IN THE 2.4 GHz BAND

9.2.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

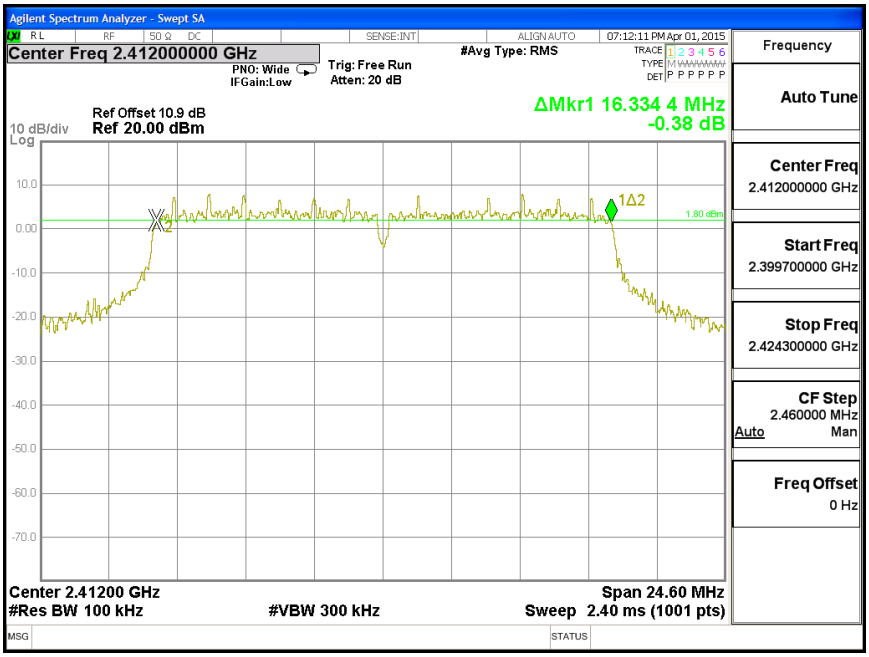
The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

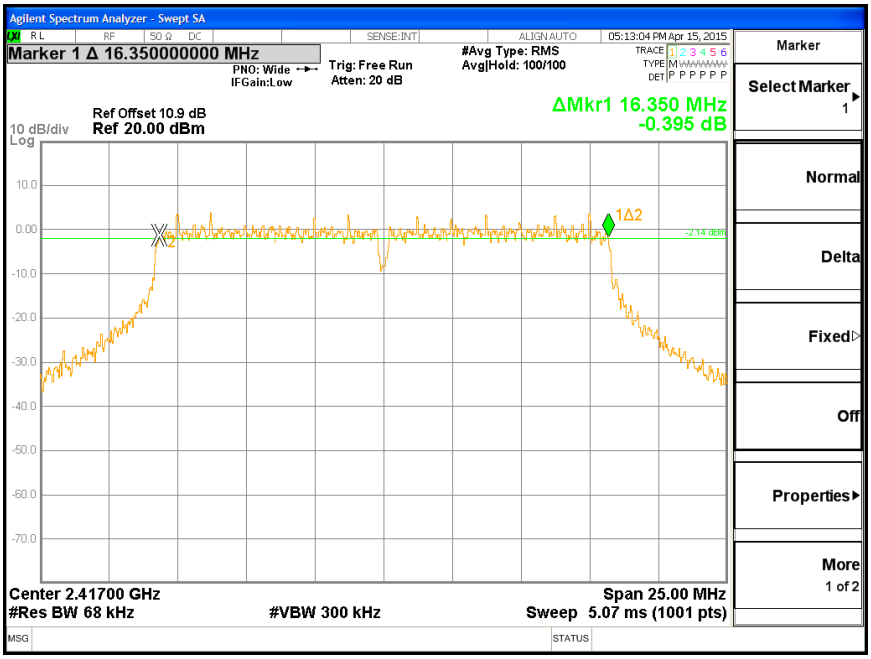
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	16.334	0.5
Low	2417	16.350	0.5
Mid	2437	16.334	0.5
High	2457	16.375	0.5
High	2462	16.358	0.5
High	2467	16.334	0.5
High	2472	16.334	0.5

6 dB BANDWIDTH

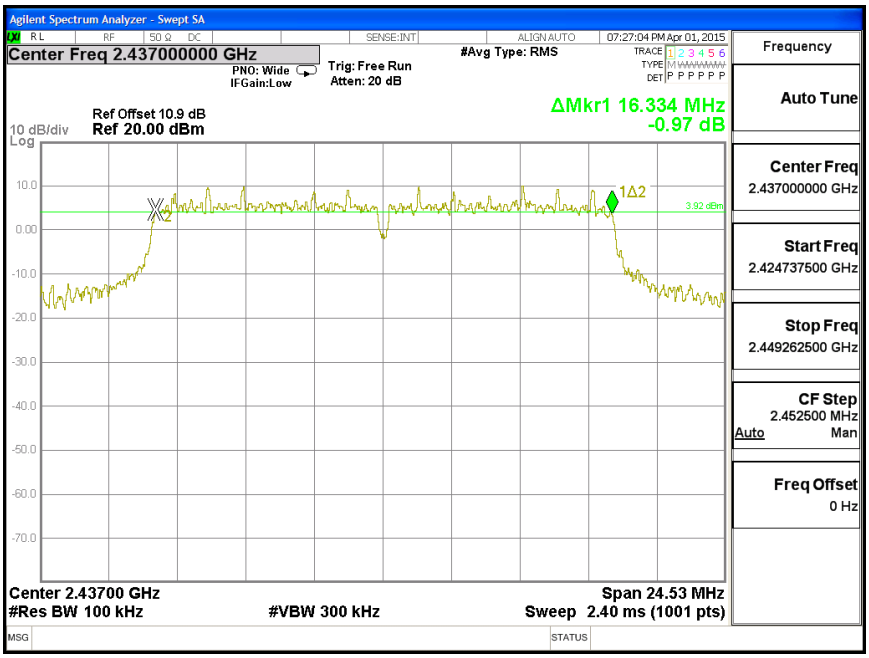
6 dB BANDWIDTH LOW CH 1



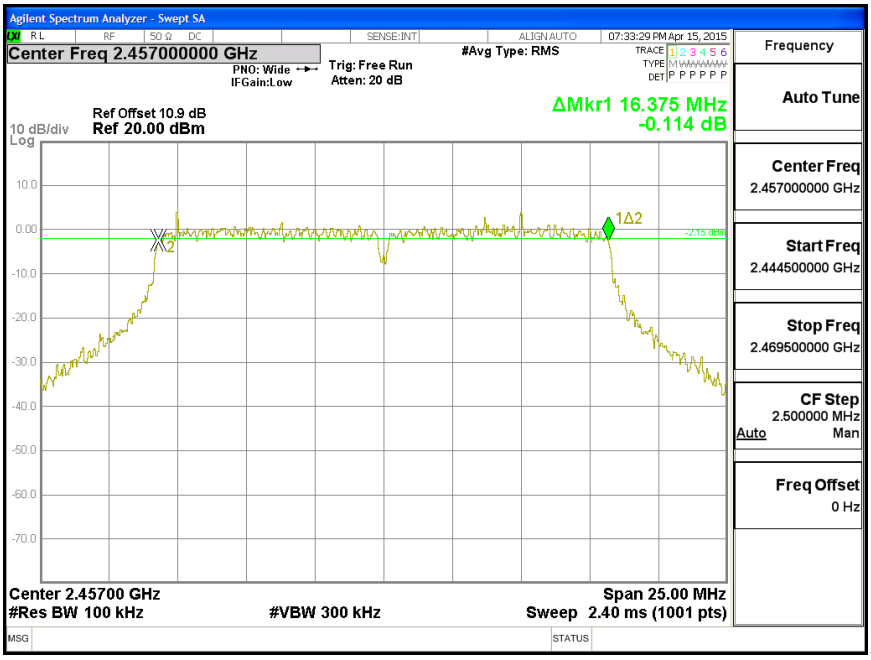
6 dB BANDWIDTH LOW CH 2



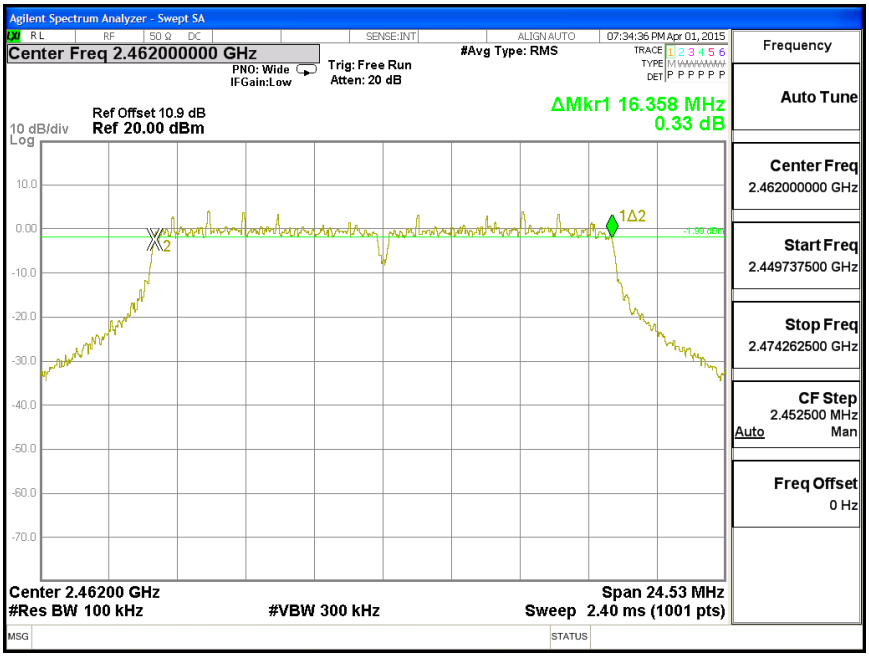
6 dB BANDWIDTH MID CH



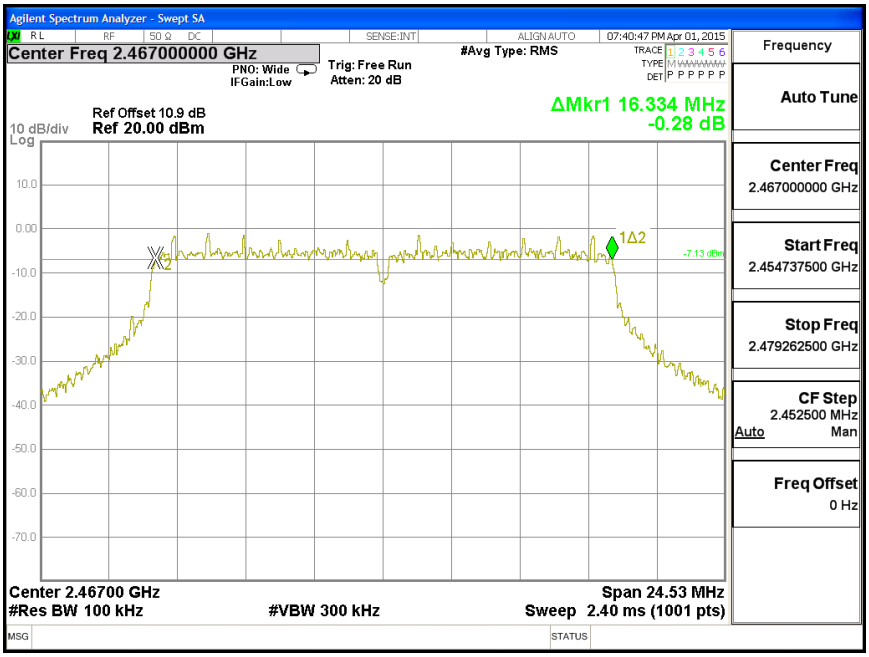
6 dB BANDWIDTH HIGH CH 10



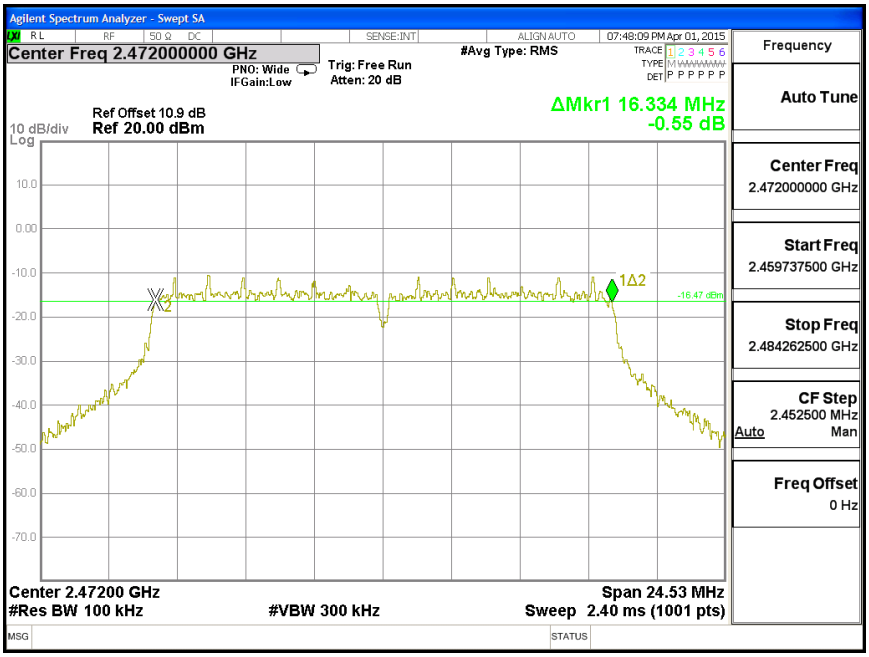
6 dB BANDWIDTH HIGH CH 11



6 dB BANDWIDTH HIGH CH 12



6 dB BANDWIDTH HIGH CH 13



9.2.2. 99% BANDWIDTH

LIMITS

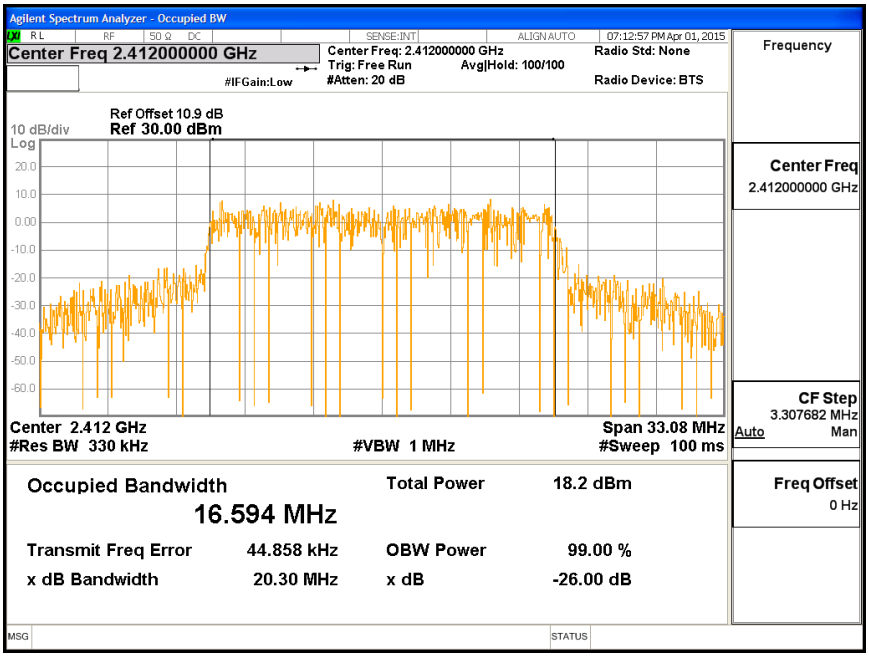
None; for reporting purposes only.

RESULTS

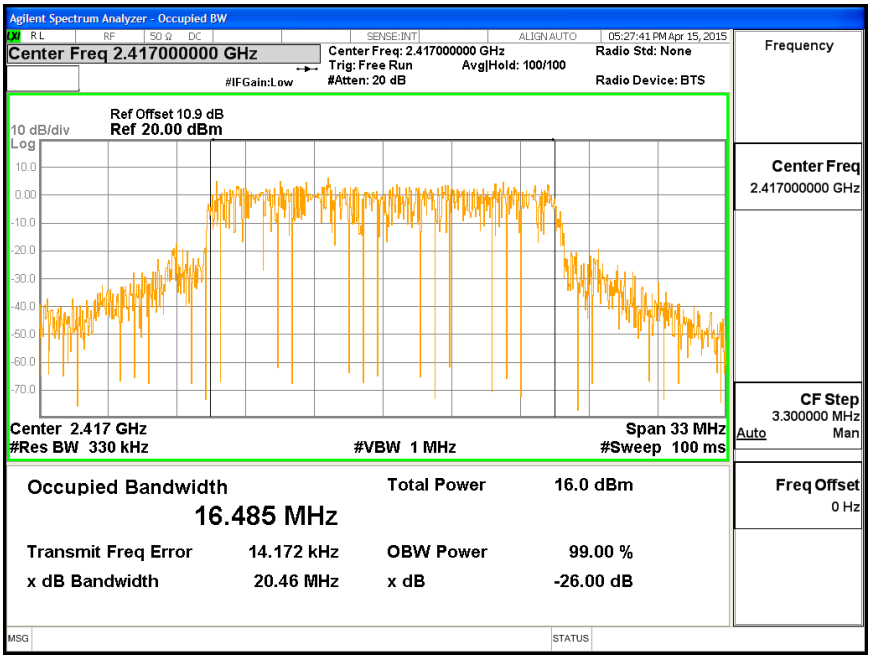
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.594
Low	2417	16.485
Mid	2437	16.653
High	2457	16.501
High	2462	16.466
High	2467	16.493
High	2472	16.481

99% BANDWIDTH

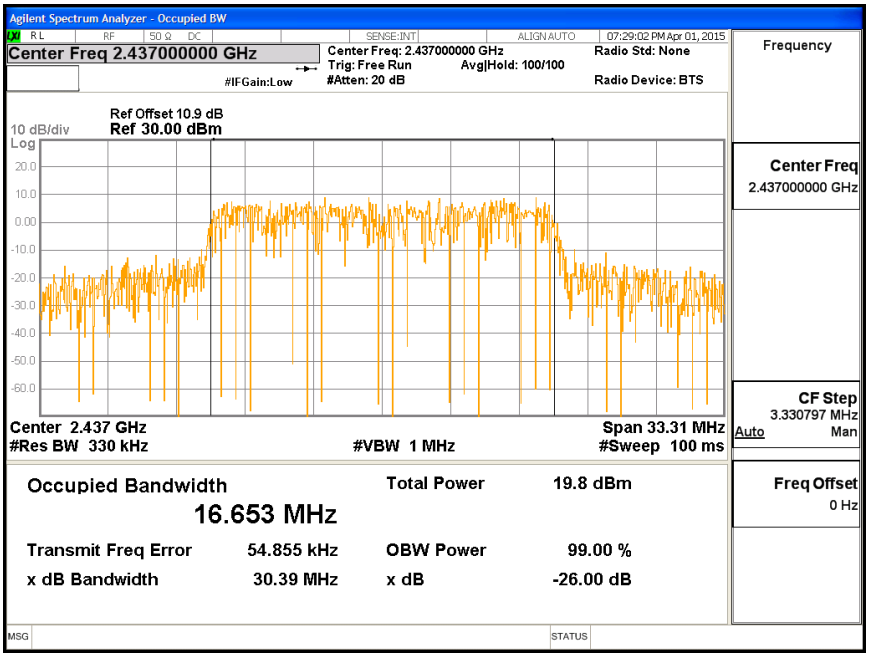
99% BANDWIDTH LOW CH01



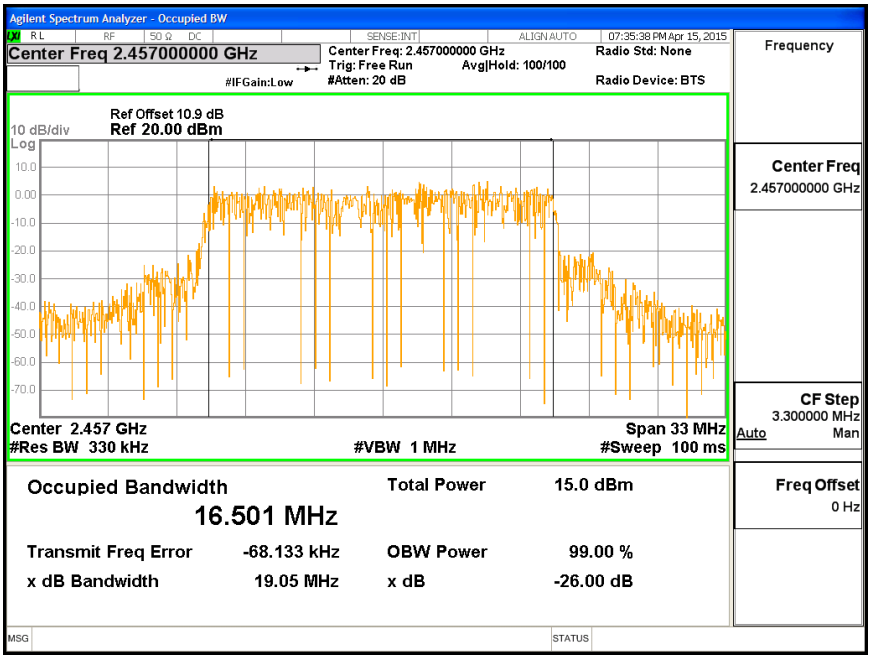
99% BANDWIDTH LOW CH0 2



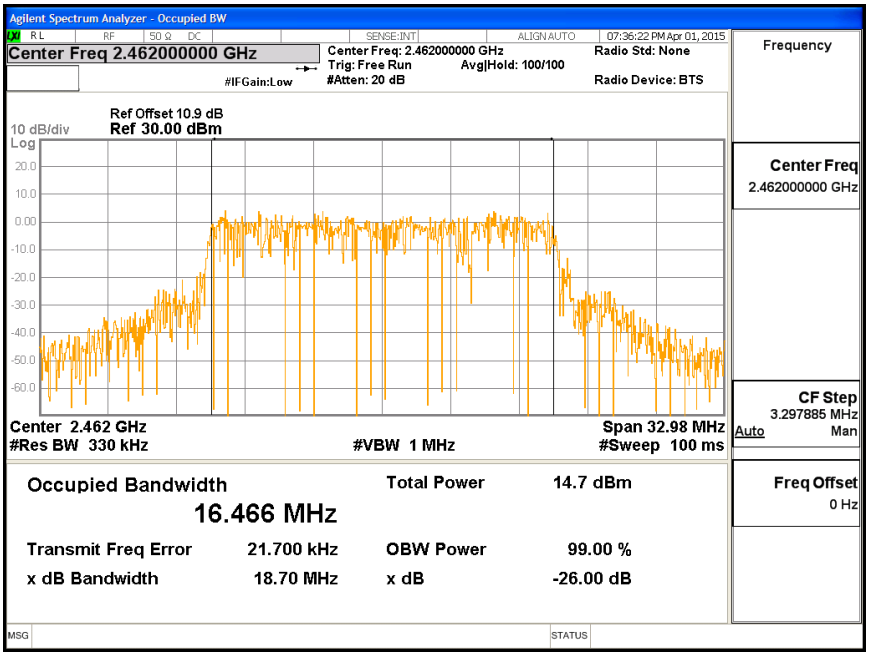
99% BANDWIDTH MID CH



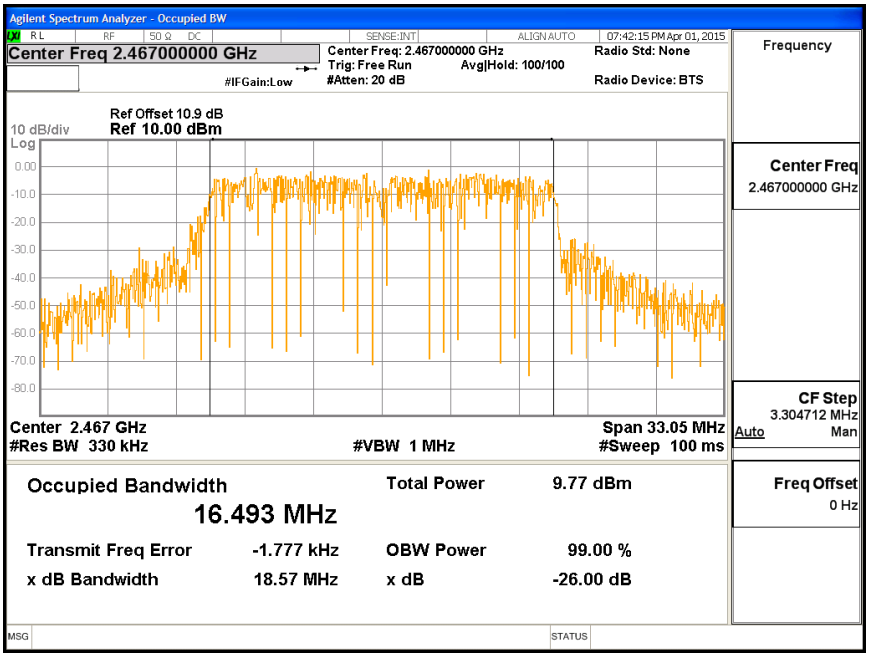
99% BANDWIDTH MID CH 10



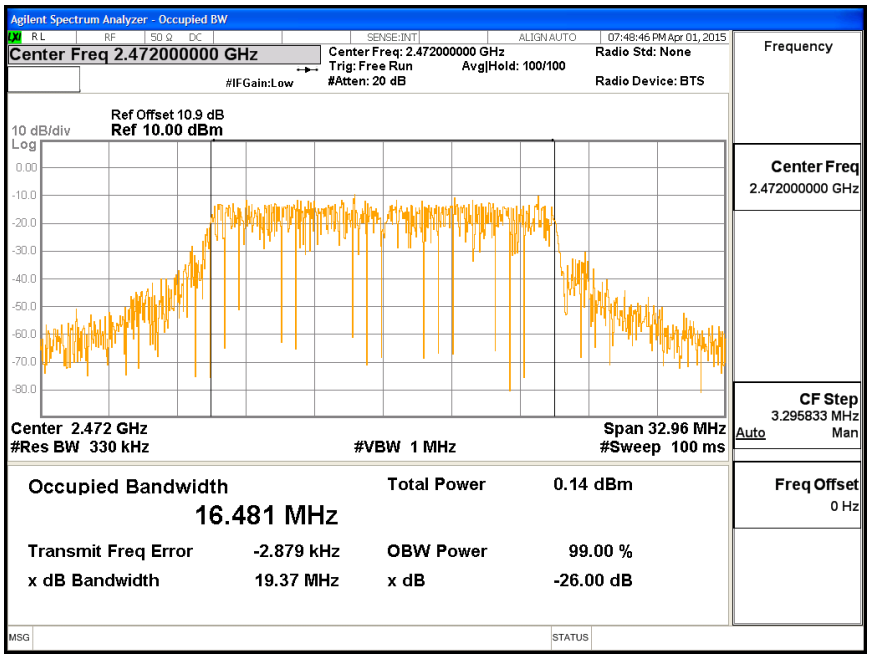
99% BANDWIDTH HIGH CH 11



99% BANDWIDTH HIGH CH 12



99% BANDWIDTH HIGH CH 13



9.2.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low	2412	11.48
Low	2417	15.87
Mid	2437	16.90
High	2457	14.95
High	2462	11.30
High	2467	7.96
High	2472	-0.97

9.2.4. 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

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

RESULTS

	(MHz)	(dBi)	Limit (dBm)	Limit (dBm)	Limit (dBm)	(dBm)
Low	2412	2.00	30.00	30	36	30.00
Low	2417	2.00	30.00	30	36	30.00
Mid	2437	2.00	30.00	30	36	30.00
High	2457	2.00	30.00	30	36	30.00
High	2462	2.00	30.00	30	36	30.00
High	2467	2.00	30.00	30	36	30.00
High	2472	2.00	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	2412	19.47	19.47	30.00	-10.53
Low	2417	22.78	22.78	30.00	-7.22
Mid	2437	24.99	24.99	30.00	-5.01
High	2457	22.24	22.24	30.00	-7.76
High	2462	19.31	19.31	30.00	-10.69
High	2467	16.00	16.00	30.00	-14.00
High	2472	7.15	7.15	30.00	-22.85

9.2.5. PSD

LIMITS

FCC §15.247

IC RSS-210 A8.2

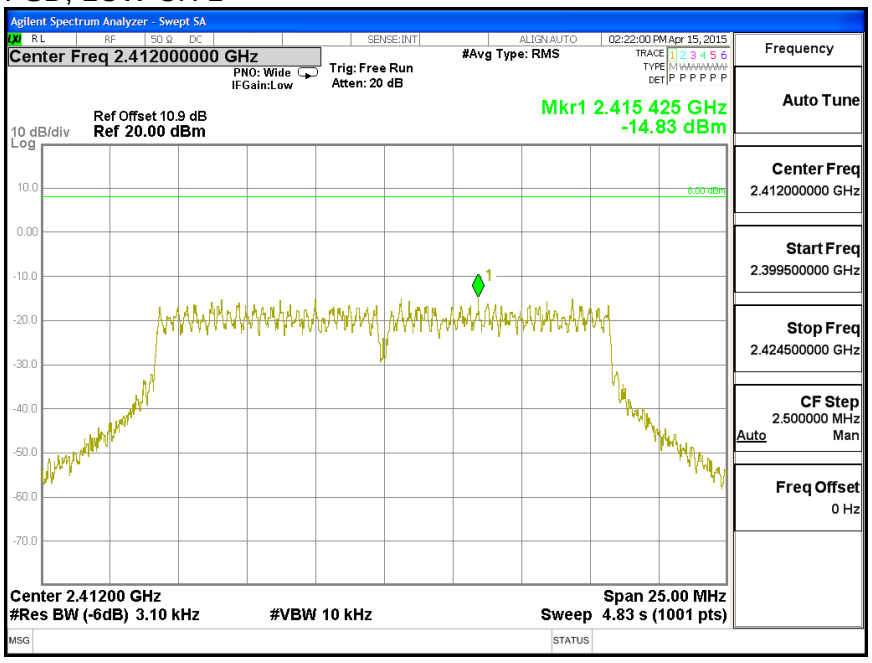
RESULTS

PSD Results

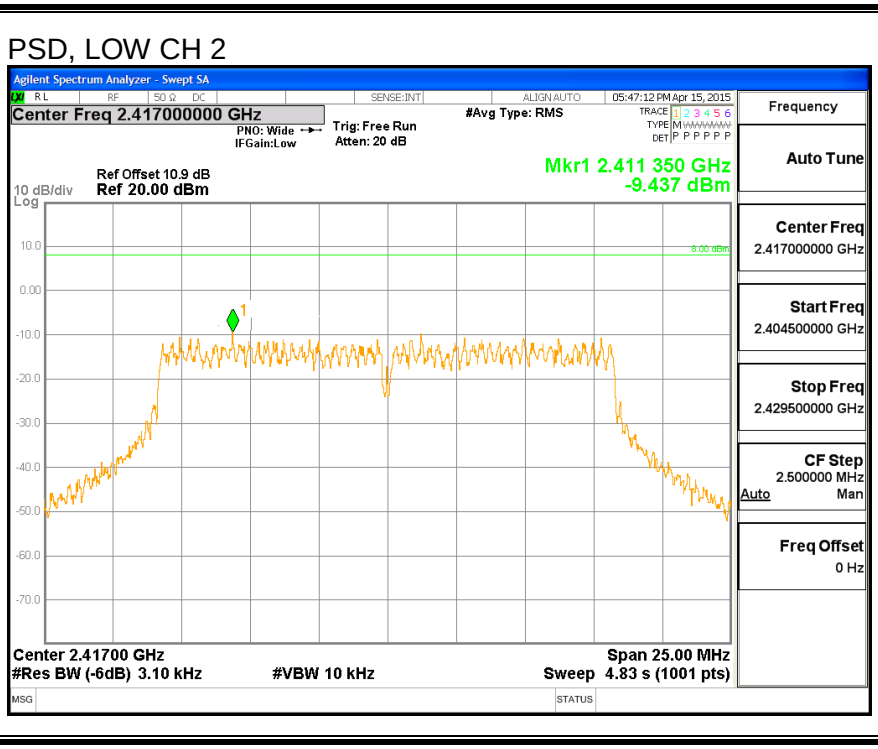
Channel	Frequency (MHz)	Meas (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-14.83	8.0	-22.8
Low	2417	-9.44	8.0	-17.4
Mid	2437	-9.74	8.0	-17.7
High	2457	-9.55	8.0	-17.6
High	2462	-14.72	8.0	-22.7
High	2467	-18.02	8.0	-26.0
High	2472	-25.60	8.0	-33.6

PSD

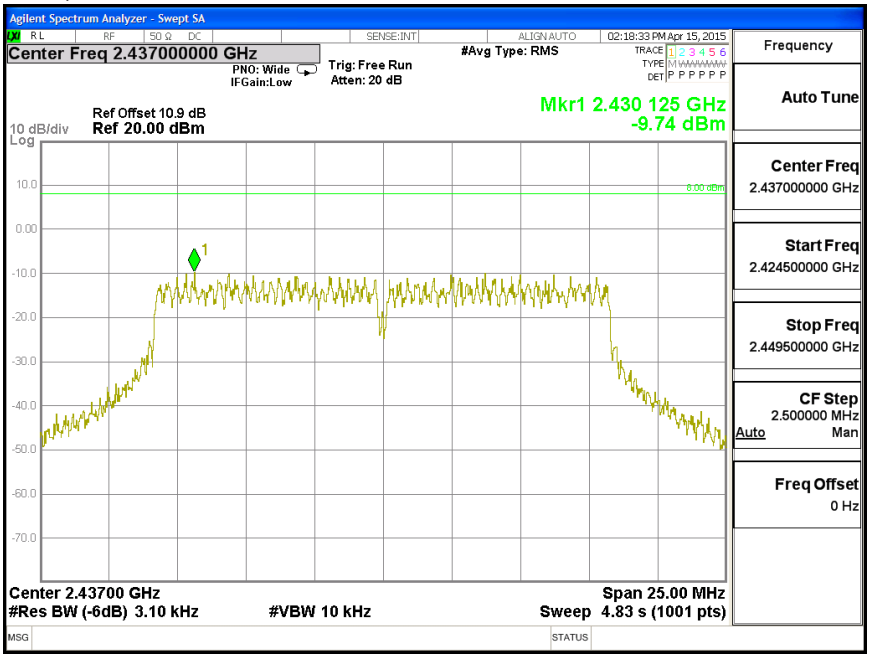
PSD, LOW CH 1



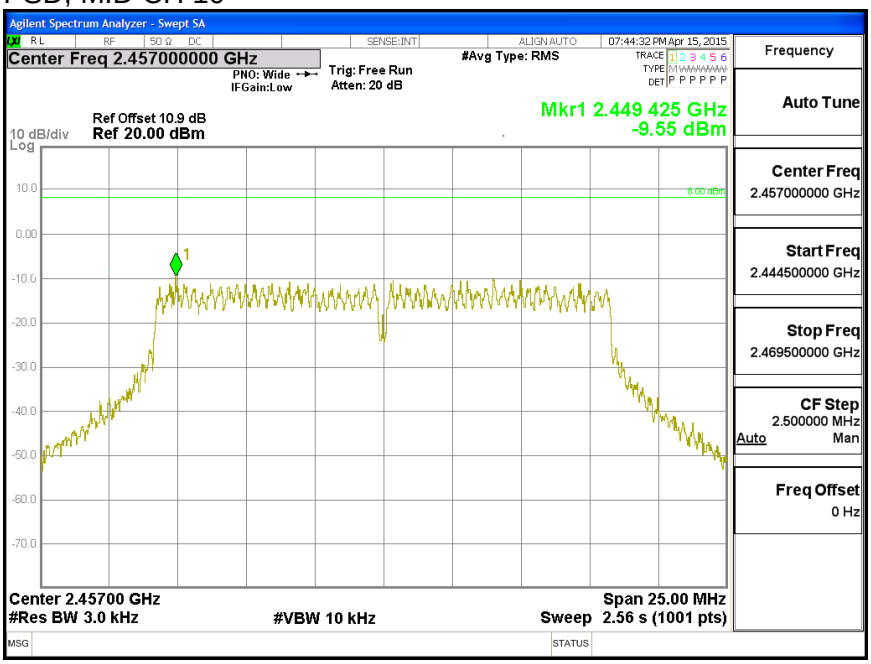
PSD, LOW CH 2



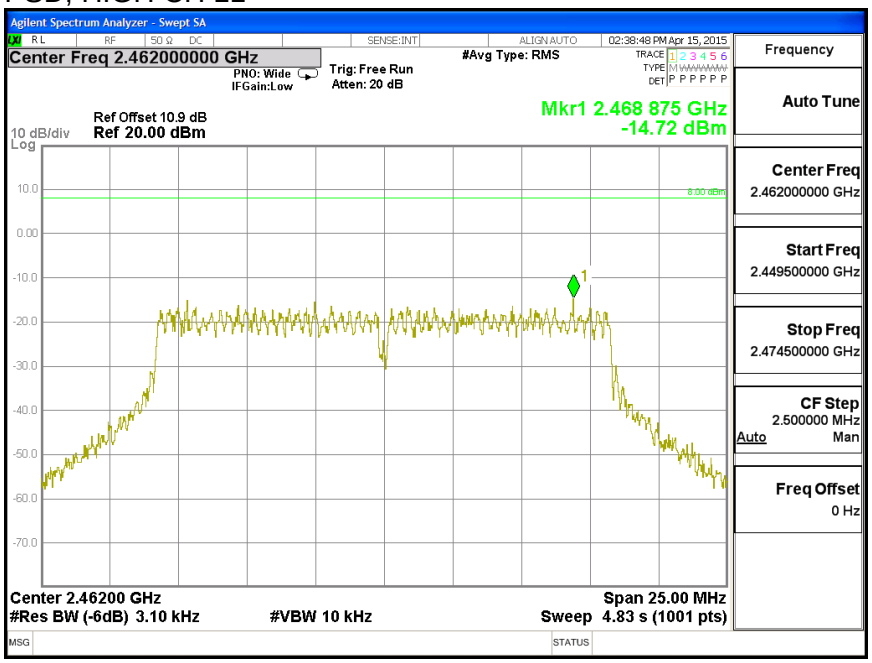
PSD, MID CH



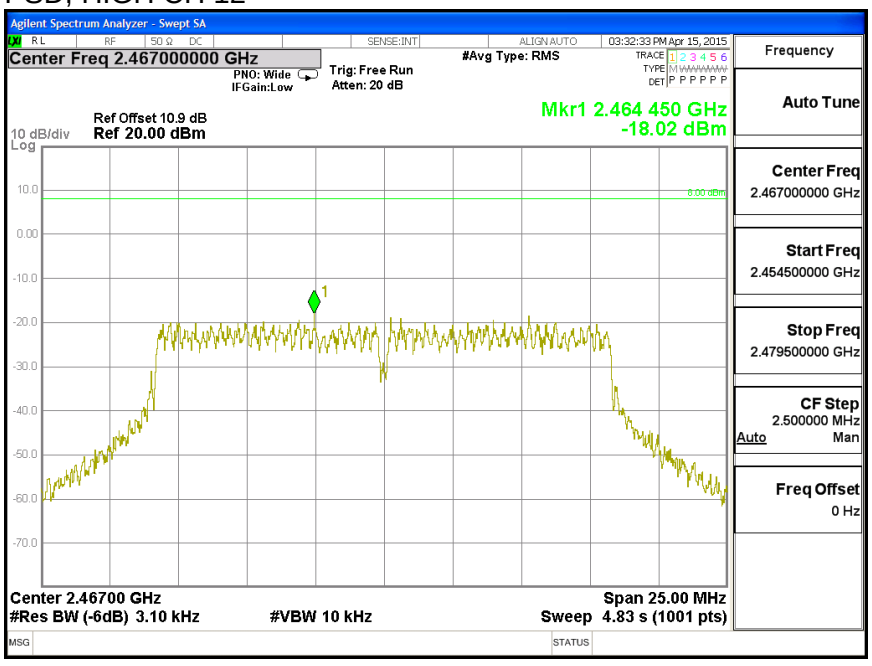
PSD, MID CH 10



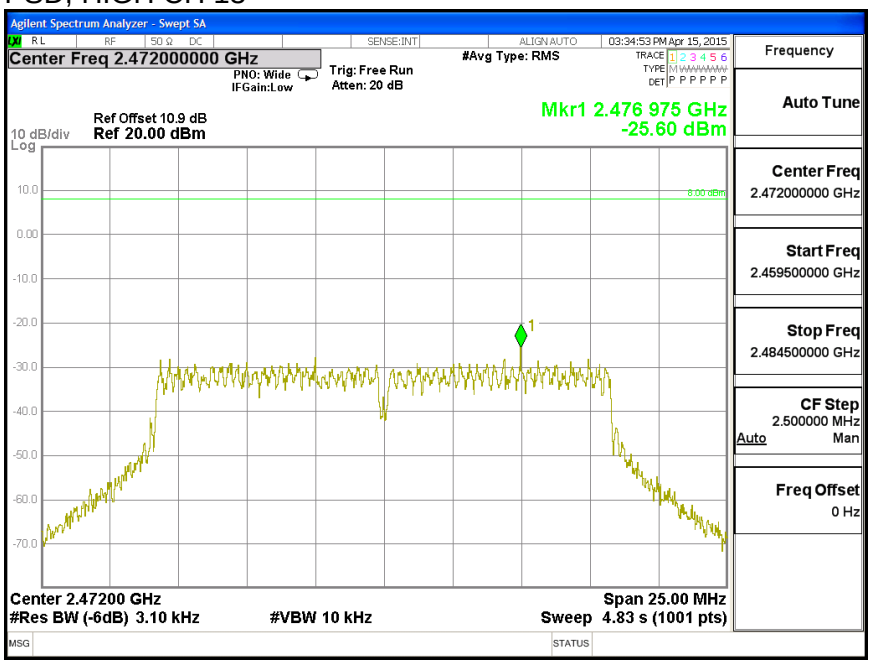
PSD, HIGH CH 11



PSD, HIGH CH 12



PSD, HIGH CH 13



9.2.6. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

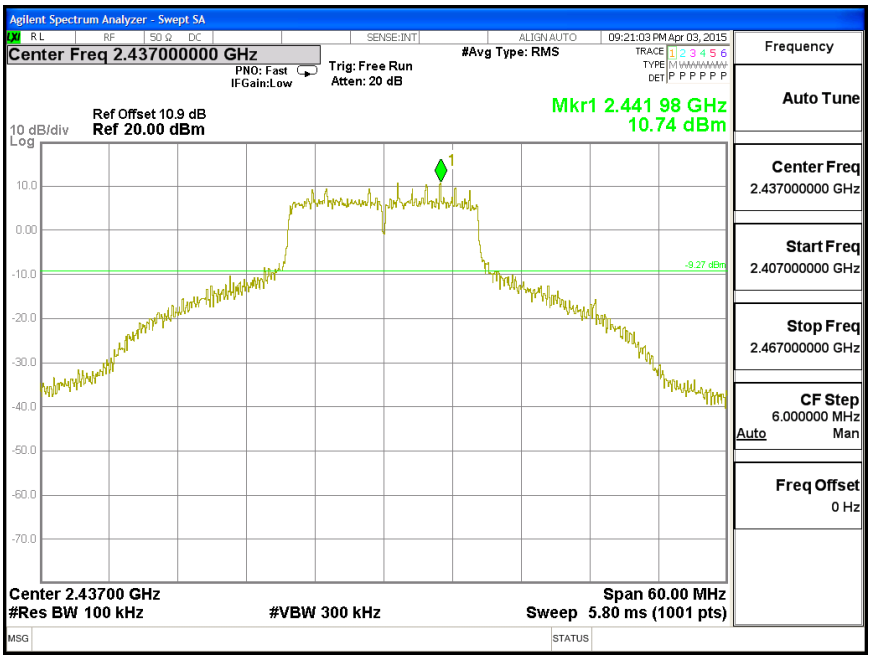
IC RSS-210 A8.5

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.

RESULTS

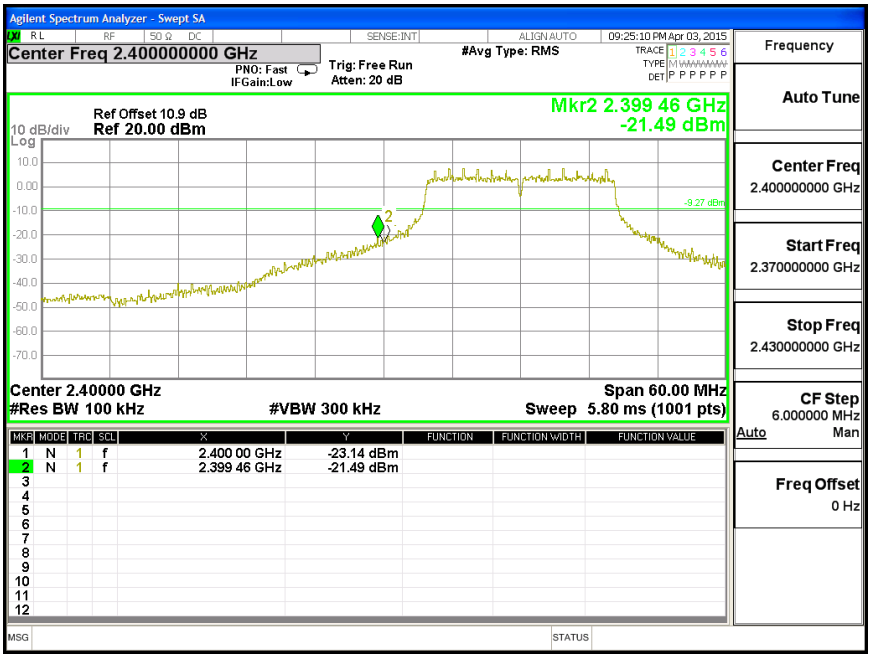
IN-BAND REFERENCE LEVEL

REFERENCE LEVEL MID CH



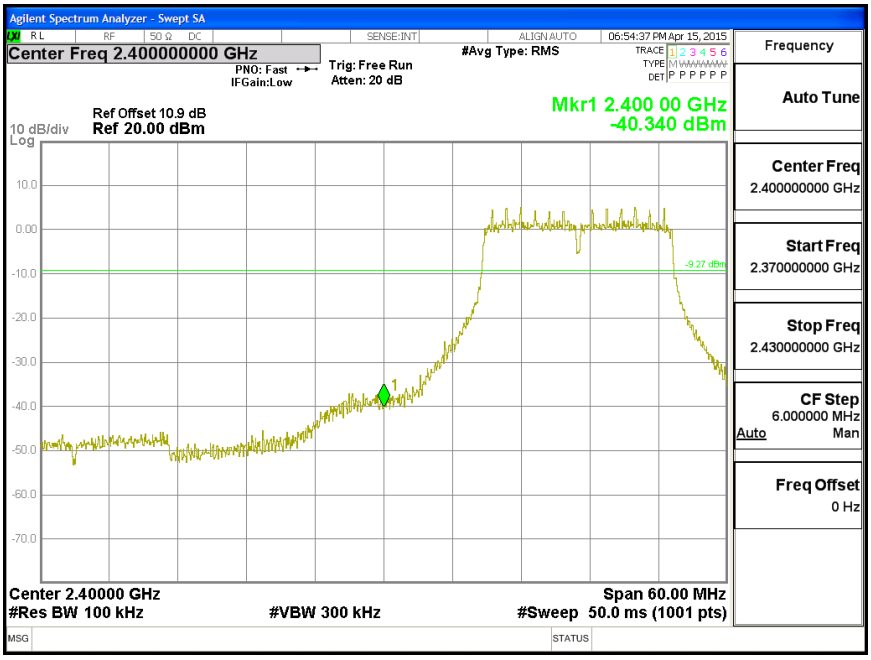
LOW CHANNEL 1 BANDEDGE

AUTHORIZED BAND EDGE LOW CH 1



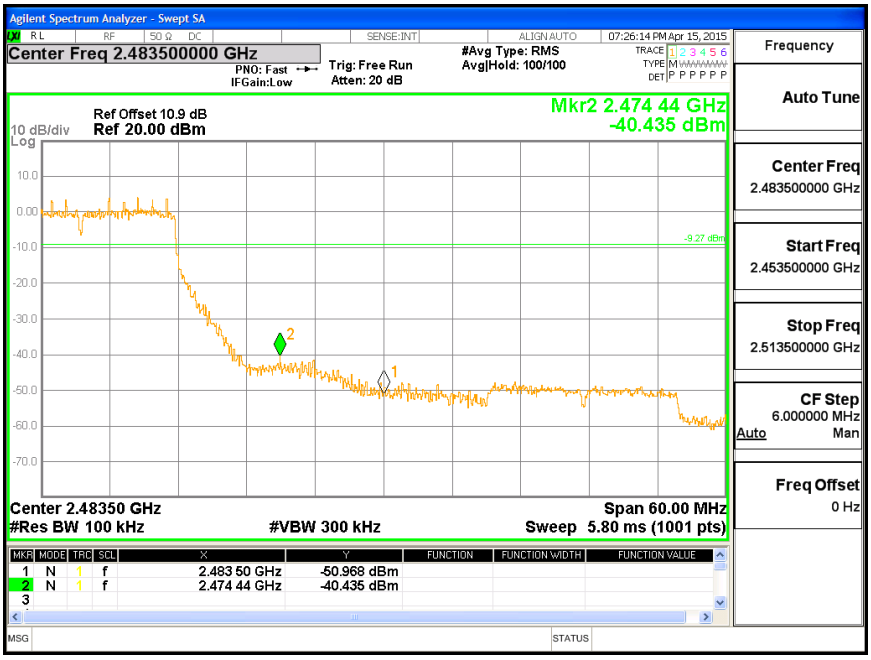
LOW CHANNEL 2 BANDEDGE

AUTHORIZED BAND EDGE LOW CH 2



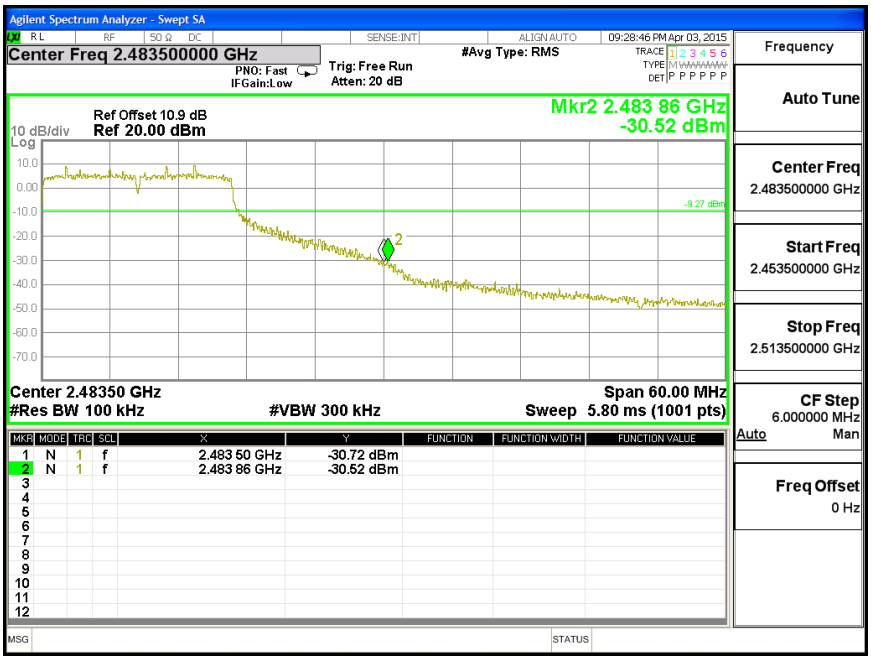
HIGH CHANNEL 10 BANDEDGE

AUTHORIZED BAND EDGE HIGH CH 10



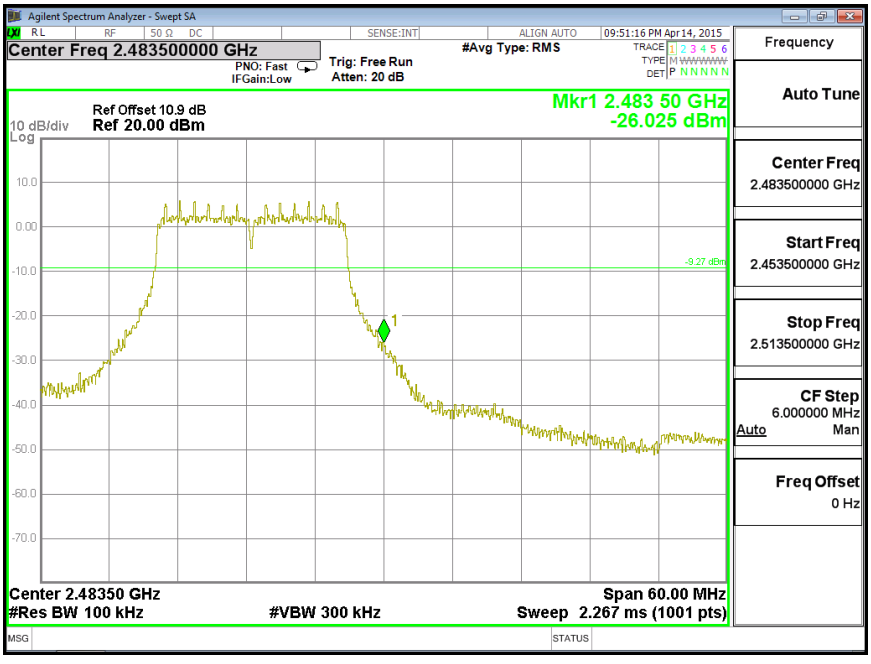
HIGH CHANNEL 11 BANDEDGE

AUTHORIZED BAND EDGE HIGH CH 11



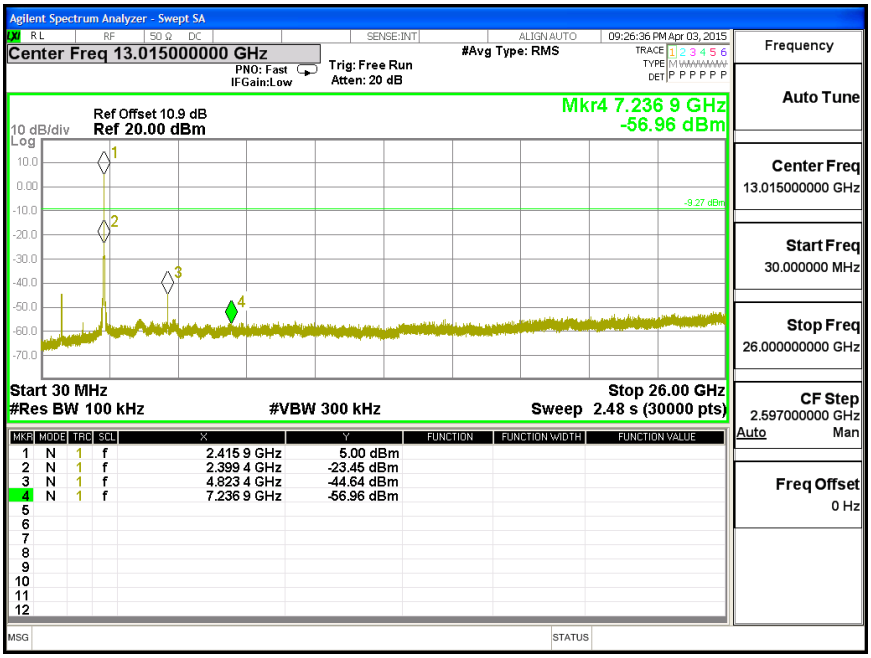
HIGH CHANNEL 13 BANDEDGE

AUTHORIZED BAND EDGE HIGH CH 13

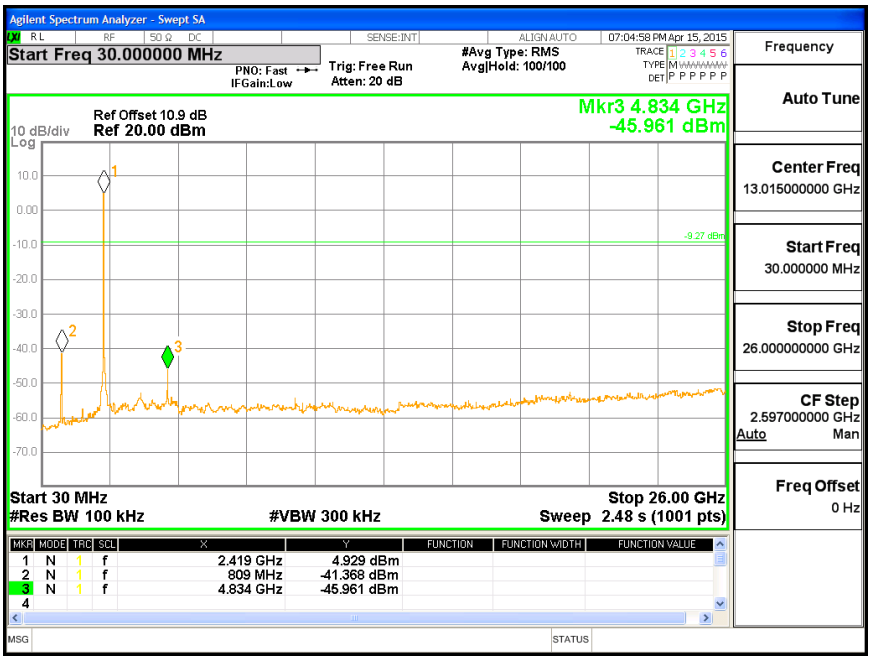


OUT-OF-BAND EMISSIONS

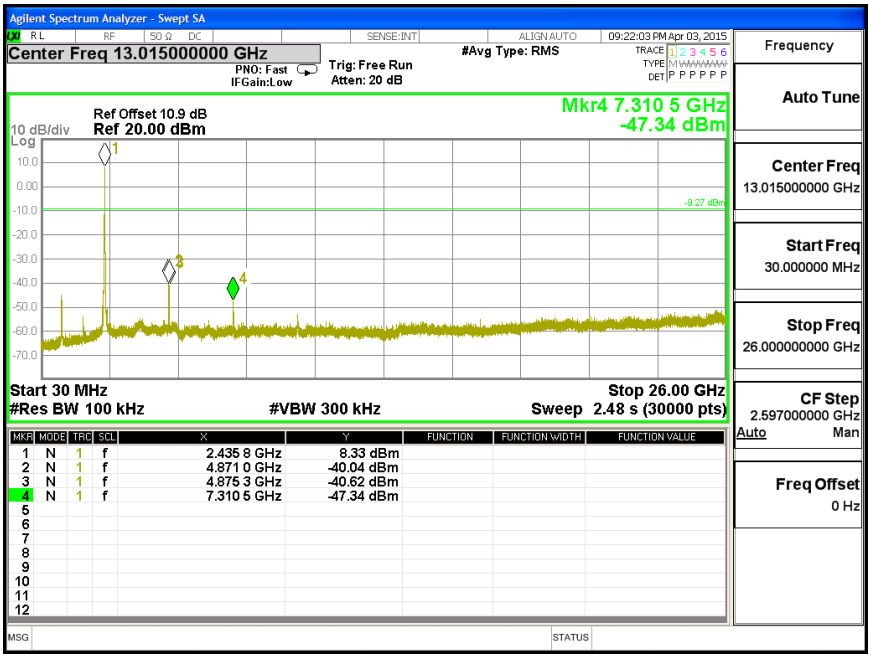
OUT OF BAND LOW CH 1



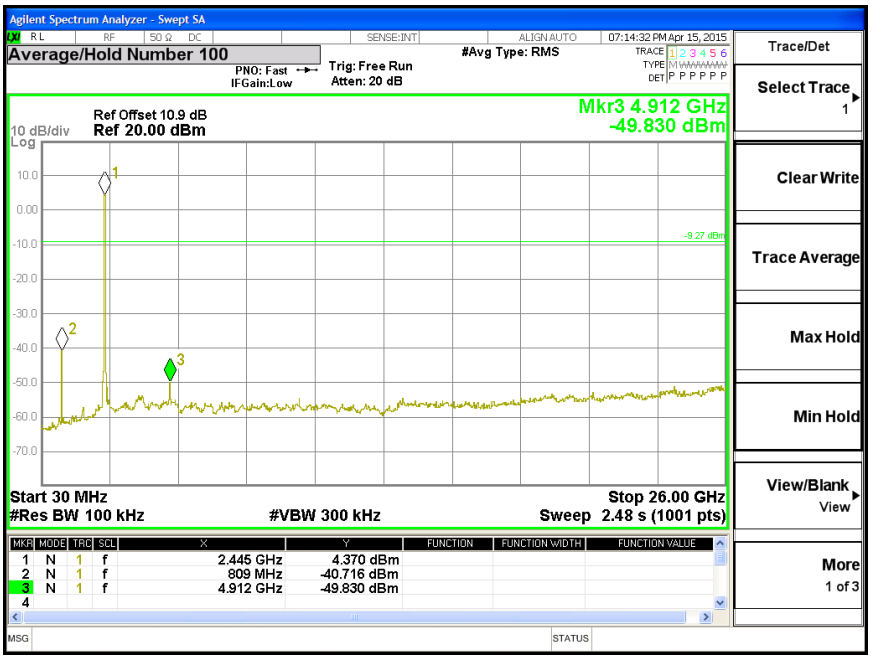
OUT OF BAND LOW CH 2



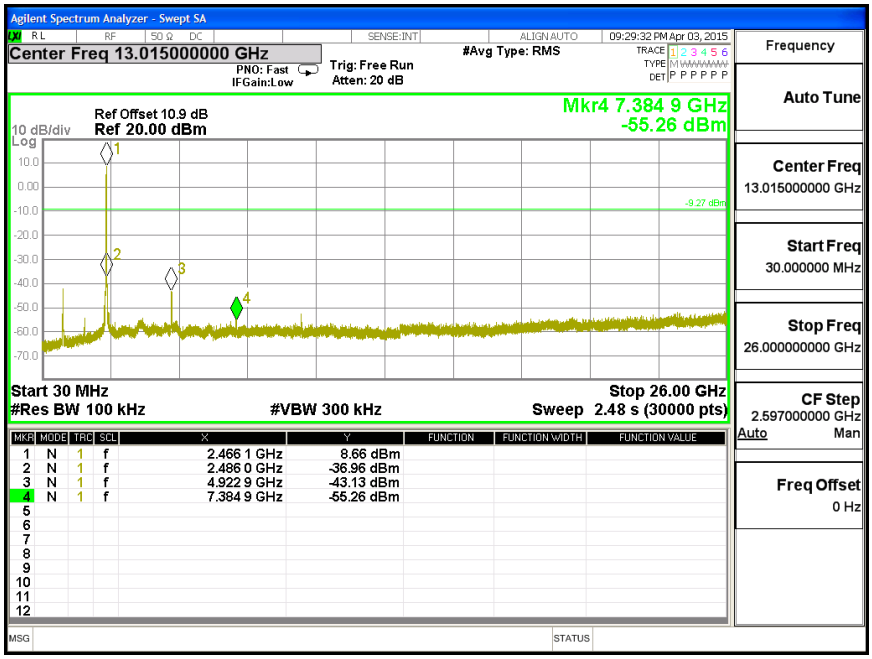
OUT OF BAND MID CH



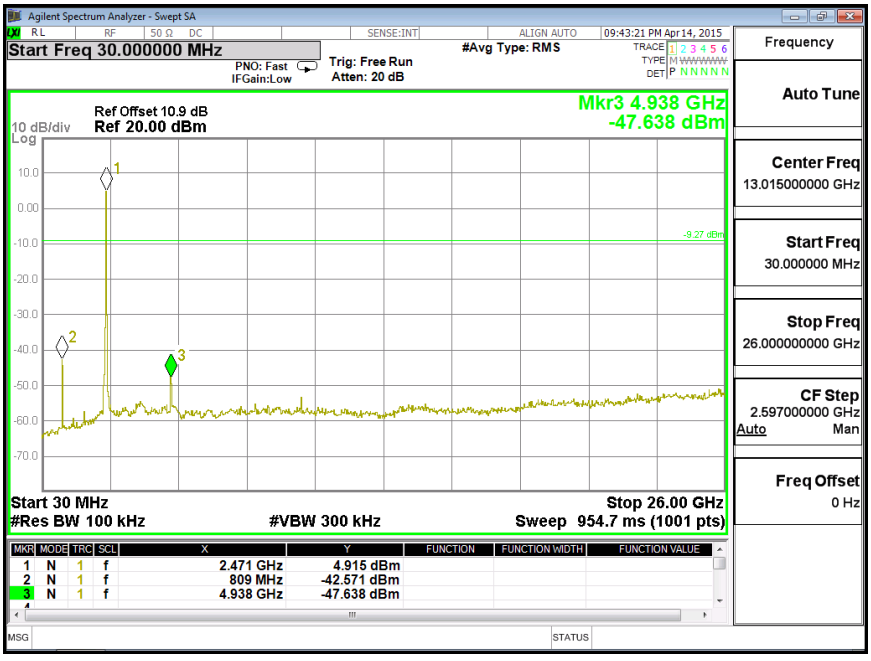
OUT OF BAND HI CH 10



OUT OF BAND HIGH CH 11



OUT OF BAND HIGH CH 13



9.3. 802.11n HT20 SISO MODE IN THE 2.4 GHz BAND

9.3.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

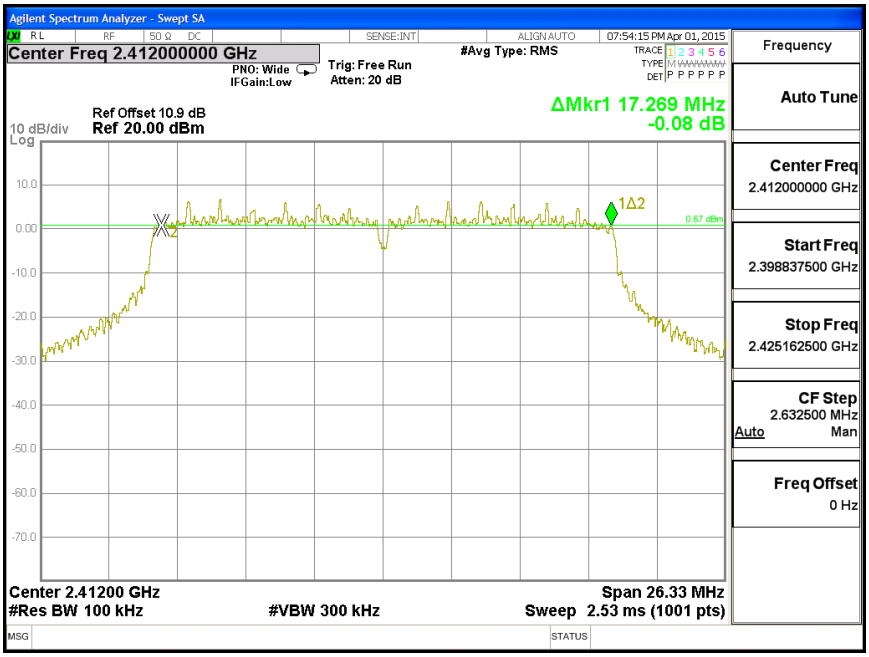
The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

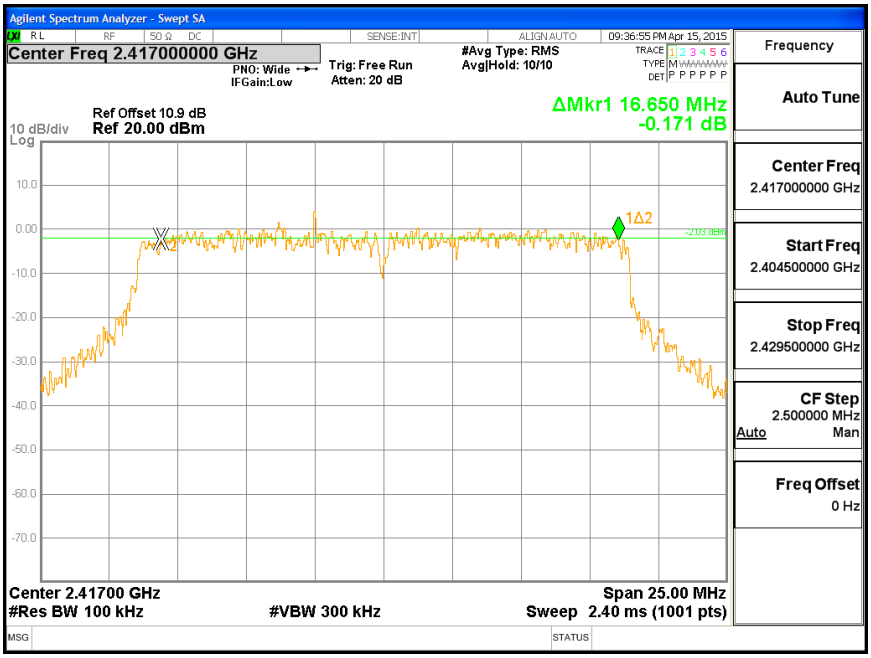
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	17.269	0.5
Low	2417	16.650	0.5
Mid	2437	17.296	0.5
High	2457	17.475	0.5
High	2462	17.310	0.5
High	2467	17.542	0.5
High	2472	17.283	0.5

6 dB BANDWIDTH

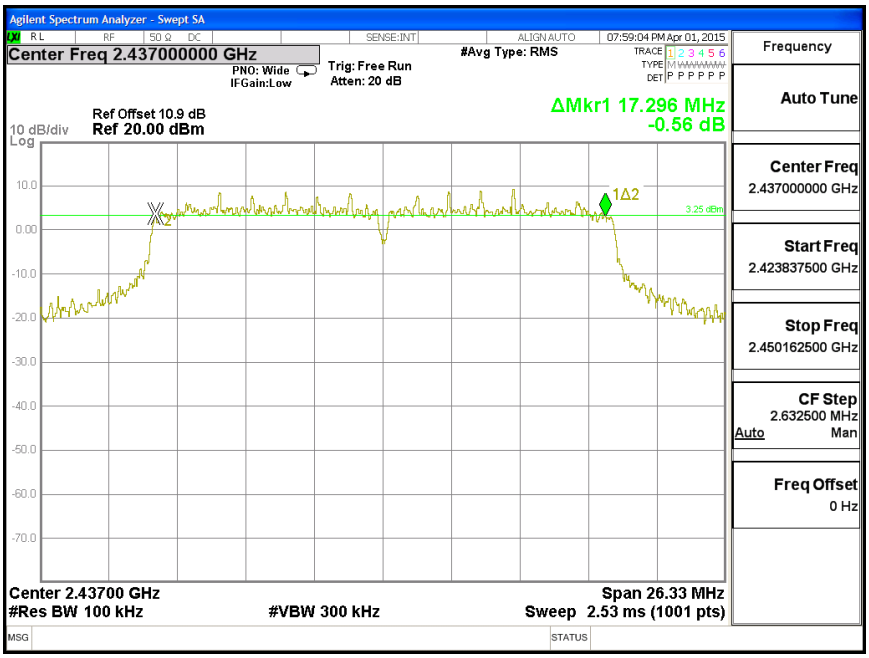
6 dB BANDWIDTH LOW CH 1



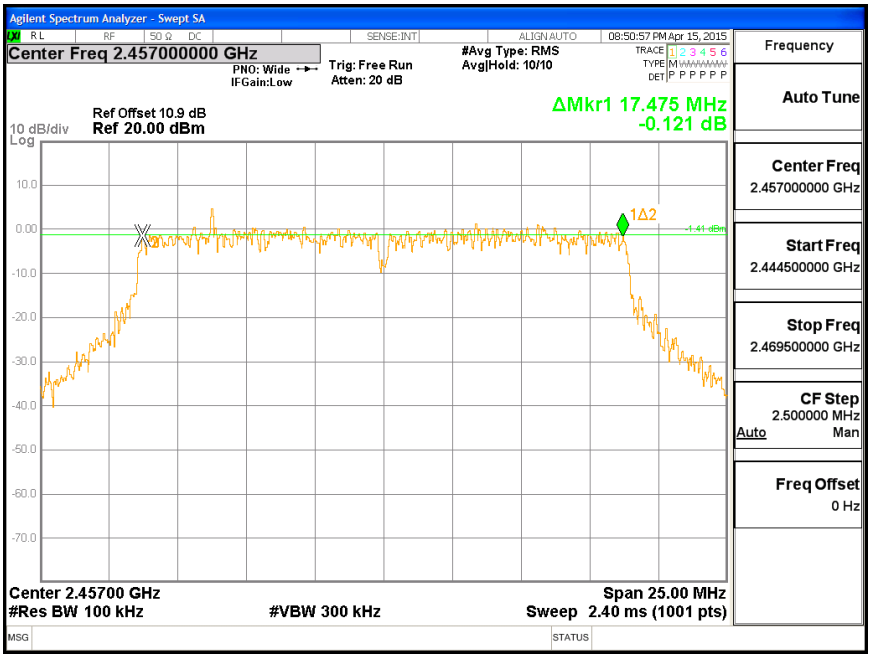
6 dB BANDWIDTH LOW CH 2



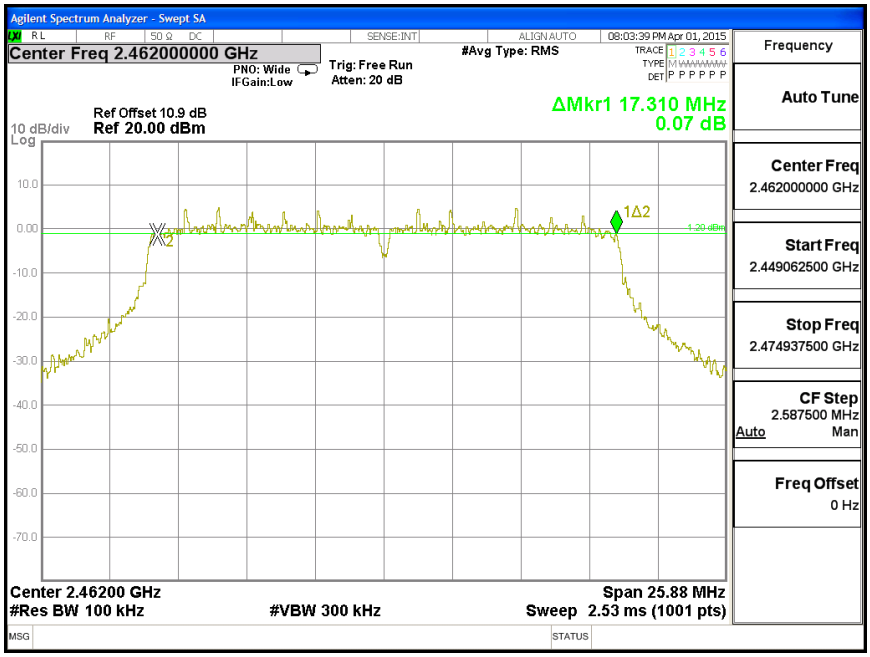
6 dB BANDWIDTH MID CH



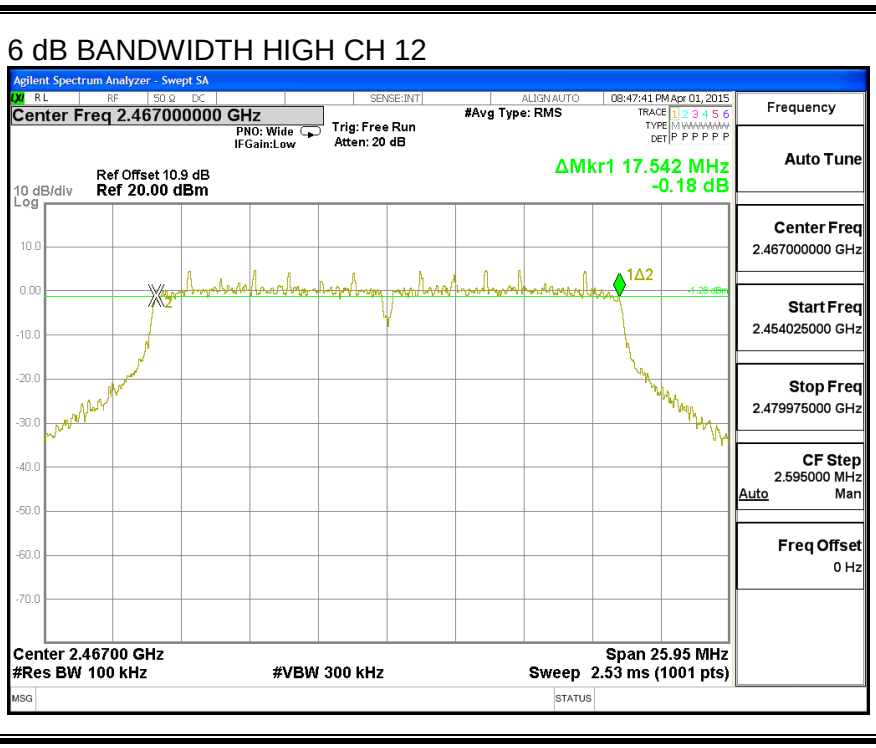
6 dB BANDWIDTH HIGH CH 10



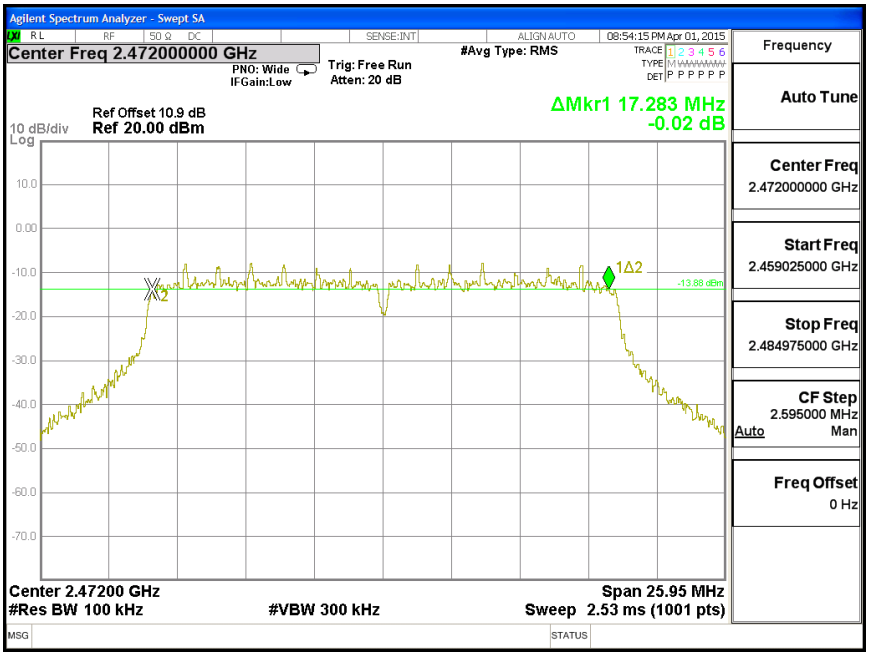
6 dB BANDWIDTH HIGH CH 11



6 dB BANDWIDTH HIGH CH 12



6 dB BANDWIDTH HIGH CH 13



9.3.2. 99% BANDWIDTH

LIMITS

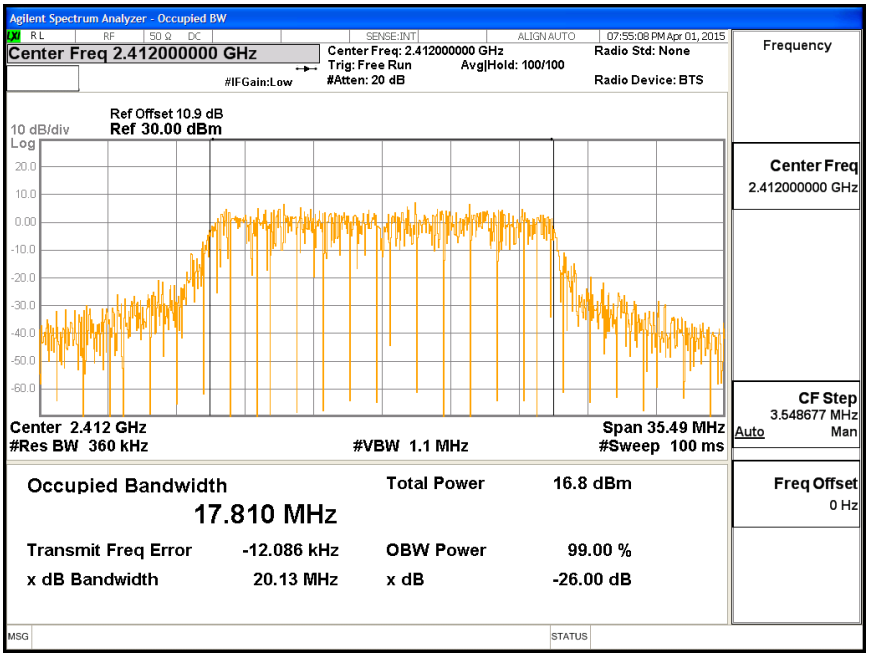
None; for reporting purposes only.

RESULTS

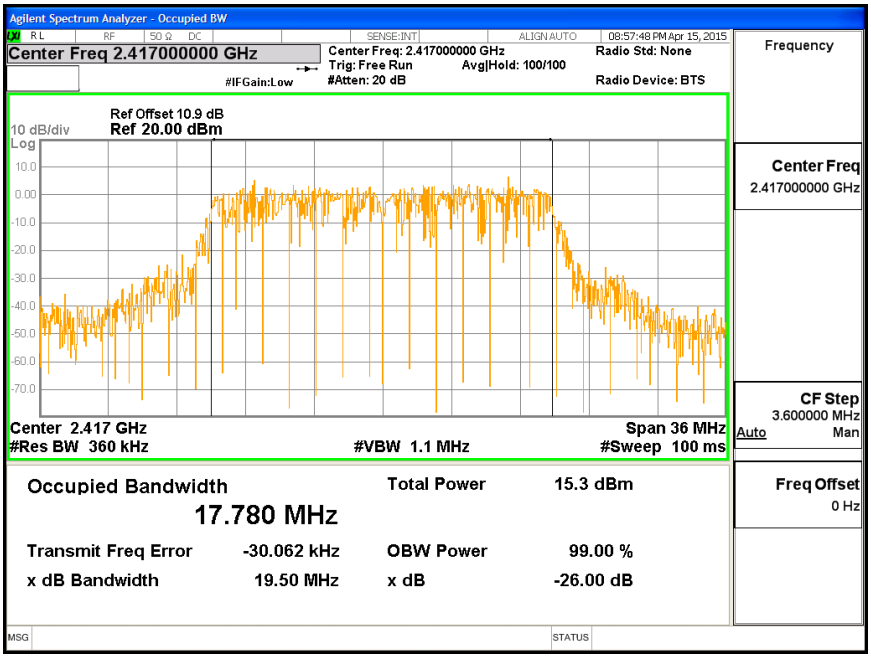
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	17.810
Low	2417	17.780
Mid	2437	17.795
High	2457	17.836
High	2462	17.807
High	2467	17.750
High	2472	17.758

99% BANDWIDTH

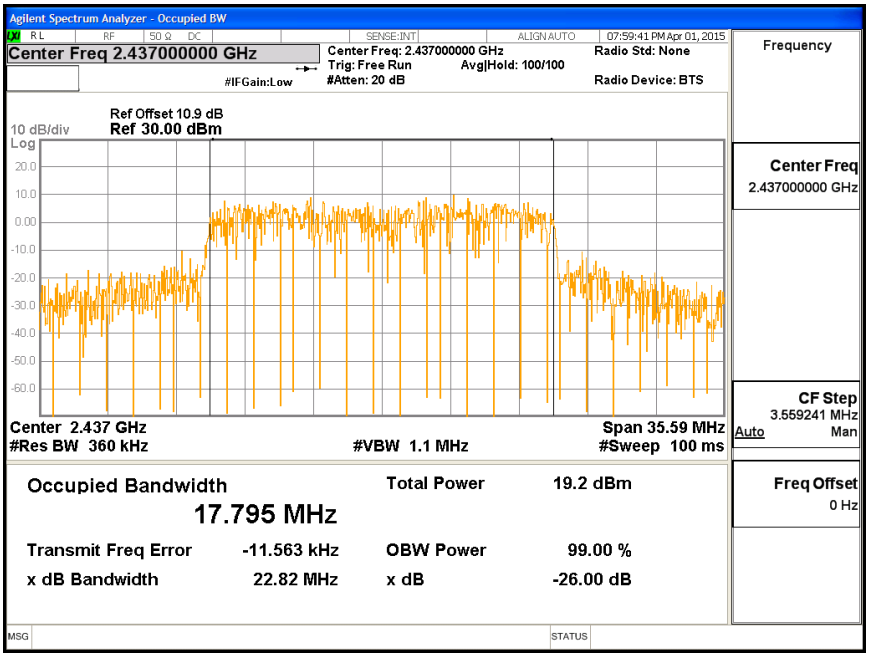
99% BANDWIDTH LOW CH 1



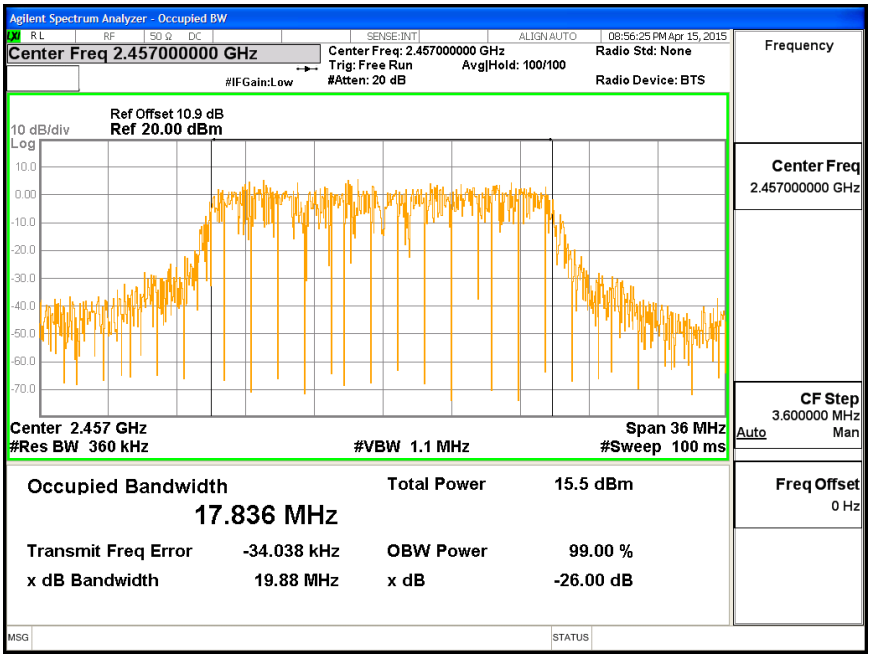
99% BANDWIDTH LOW CH 2



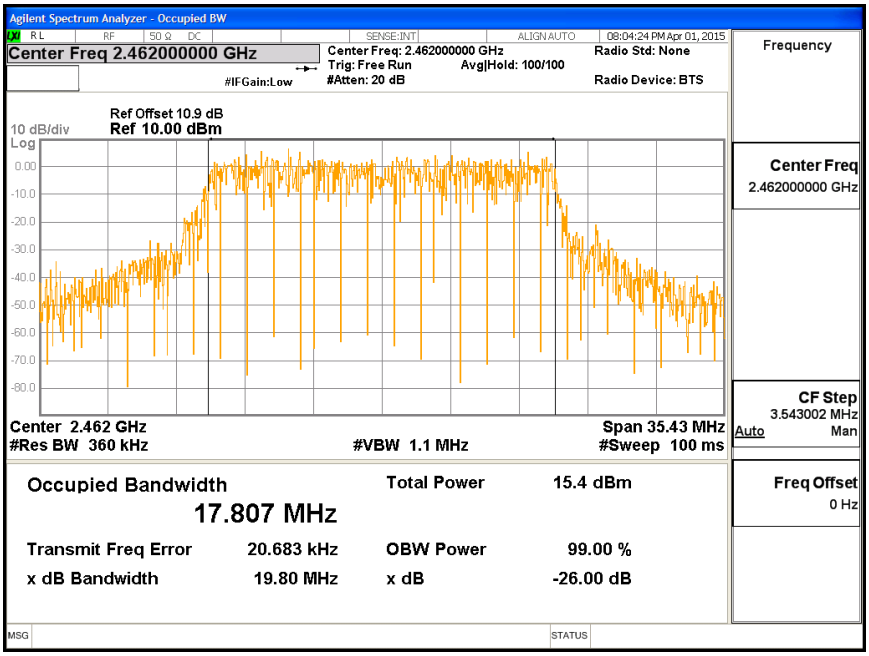
99% BANDWIDTH MID CH



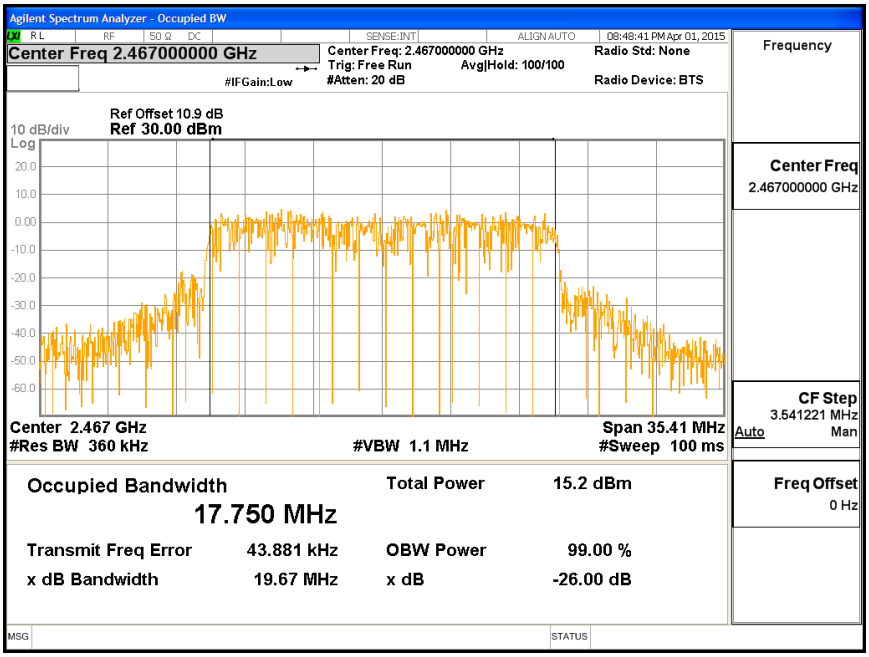
99% BANDWIDTH HIGH CH10



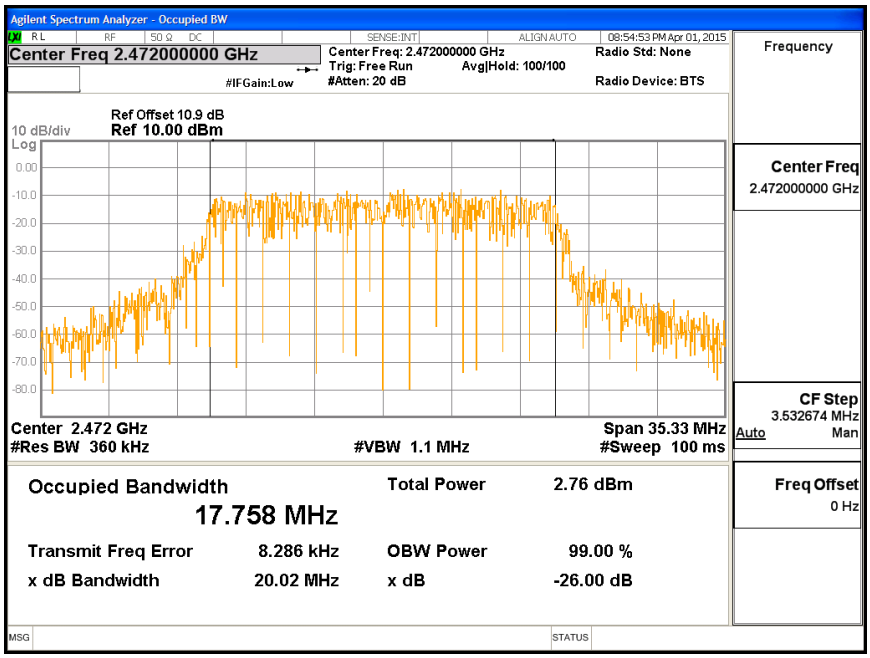
99% BANDWIDTH HIGH CH 11



99% BANDWIDTH HIGH CH 12



99% BANDWIDTH HIGH CH 13



9.3.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low	2412	12.38
Low	2417	15.27
Mid	2437	16.31
High	2457	15.57
High	2462	12.12
High	2467	8.91
High	2472	-1.31

9.3.4. 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

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	2.00	30.00	30	36	30.00
Low	2412	2.00	30.00	30	36	30.00
Mid	2437	2.00	30.00	30	36	30.00
High	2457	2.00	30.00	30	36	30.00
High	2462	2.00	30.00	30	36	30.00
High	2467	2.00	30.00	30	36	30.00
High	2472	2.00	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	2412	20.49	20.49	30.00	-9.51
Low	2417	22.57	22.57	30.00	-7.43
Mid	2437	27.39	24.47	30.00	-5.53
High	2457	24.85	25.47	30.00	-4.53
High	2462	23.33	20.27	30.00	-9.73
High	2467	23.34	17.07	30.00	-12.93
High	2472	10.84	7.04	30.00	-22.96

9.3.5. PSD

LIMITS

FCC §15.247

IC RSS-210 A8.2

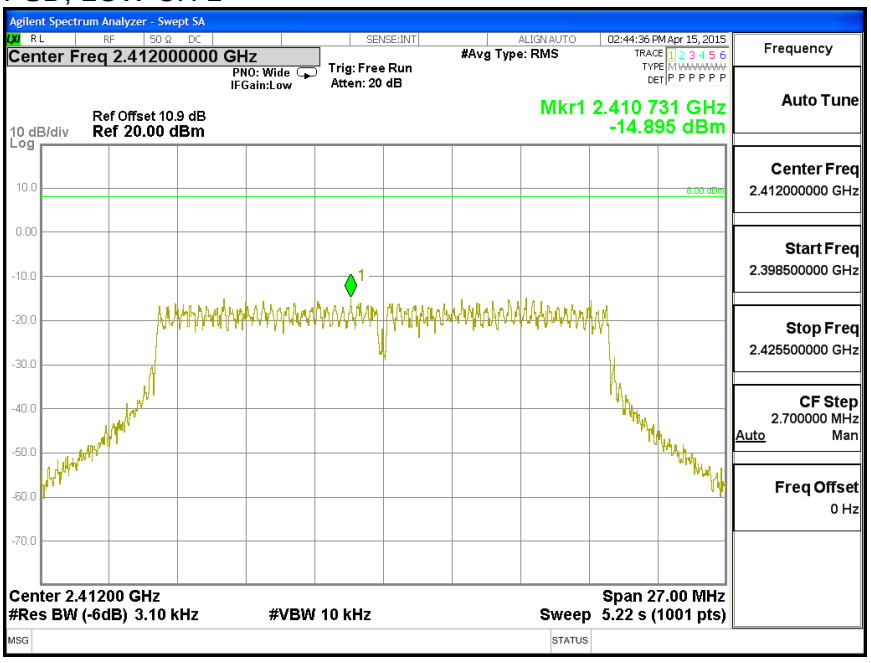
RESULTS

PSD Results

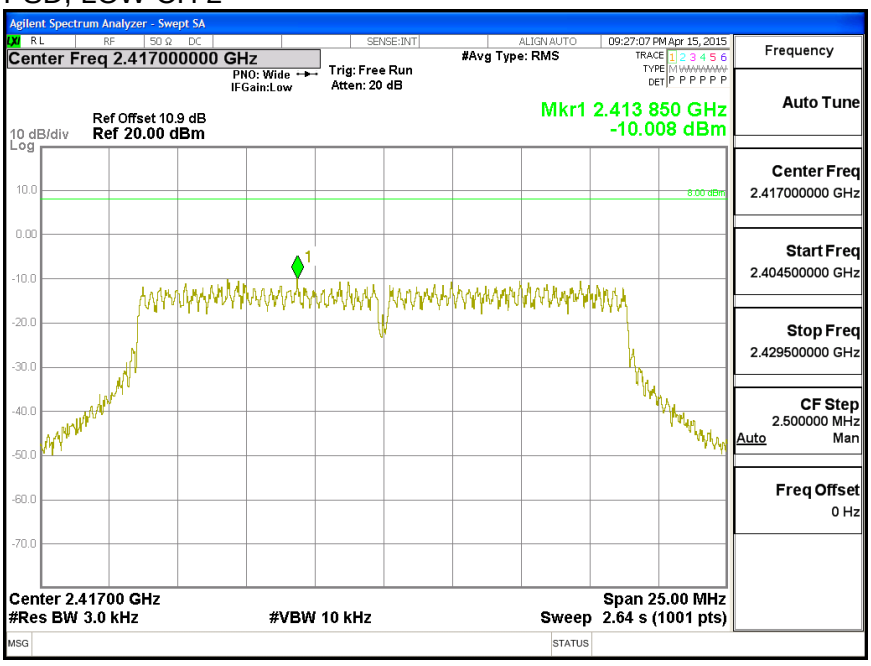
Channel	Frequency (MHz)	Meas (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-14.90	8.0	-22.9
Low	2417	-10.01	8.0	-18.0
Mid	2437	-9.74	8.0	-17.7
High	2457	-8.57	8.0	-16.6
High	2462	-14.54	8.0	-22.5
High	2467	-17.14	8.0	-25.1
High	2472	-28.36	8.0	-36.4

PSD

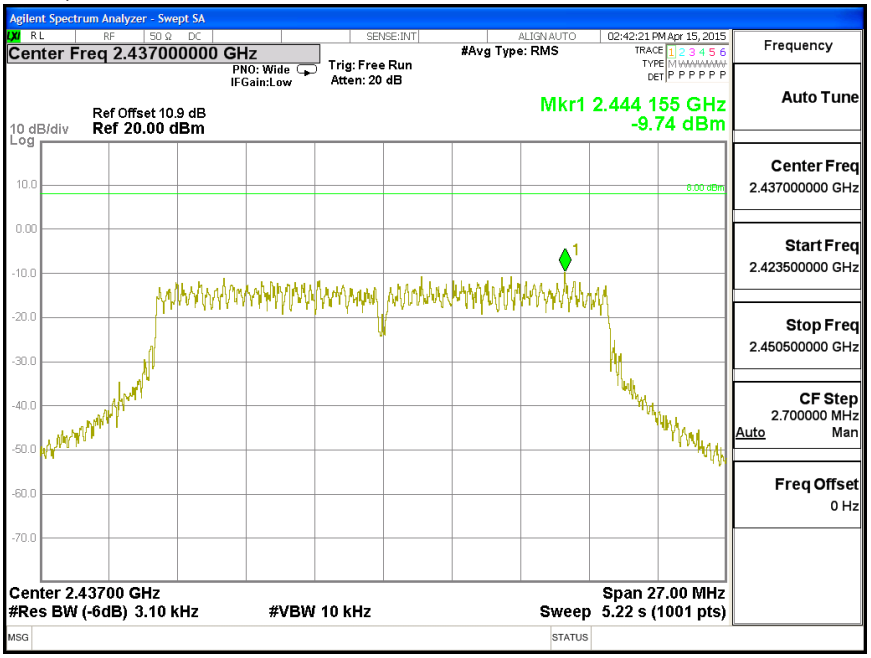
PSD, LOW CH 1



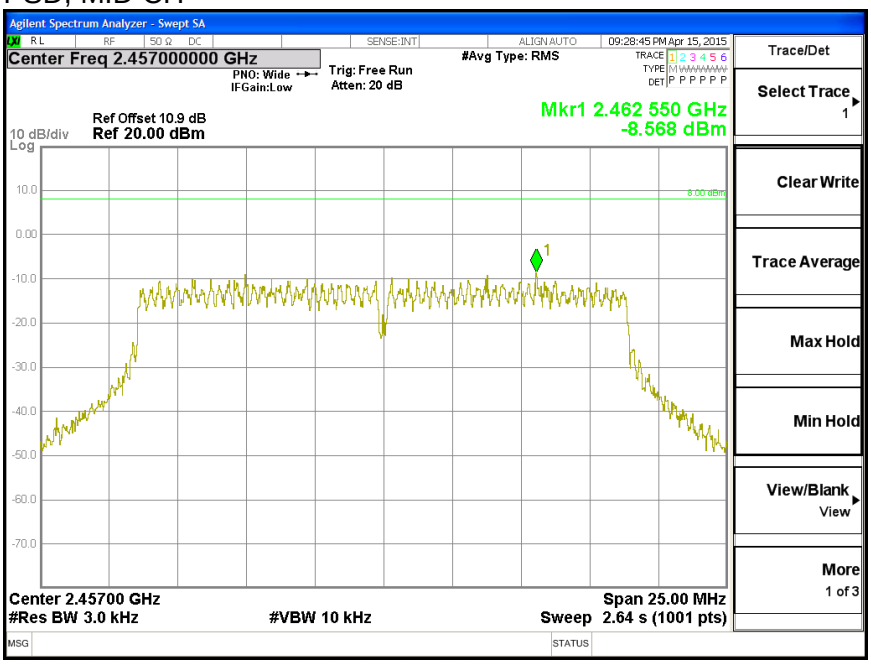
PSD, LOW CH 2



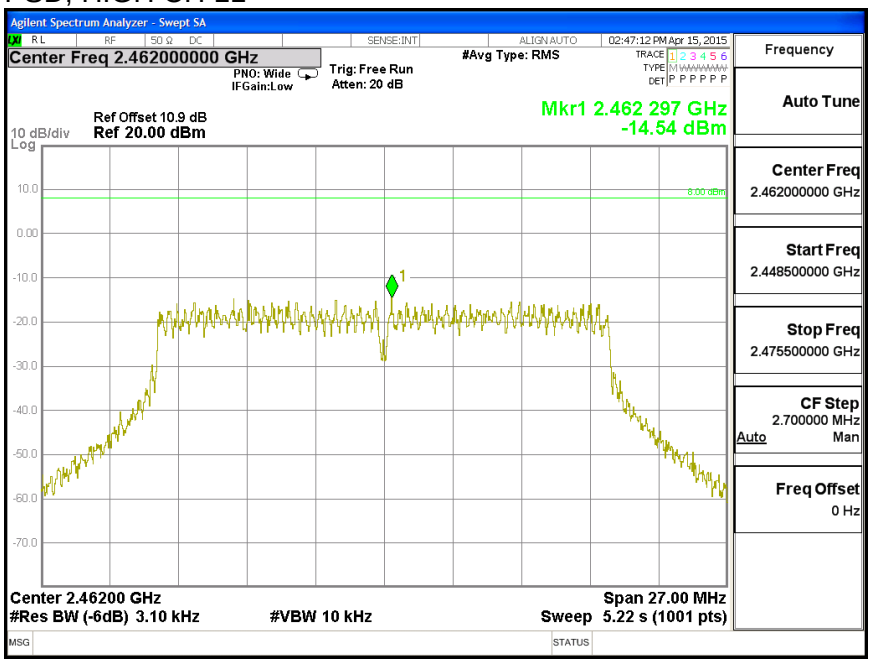
PSD, MID CH



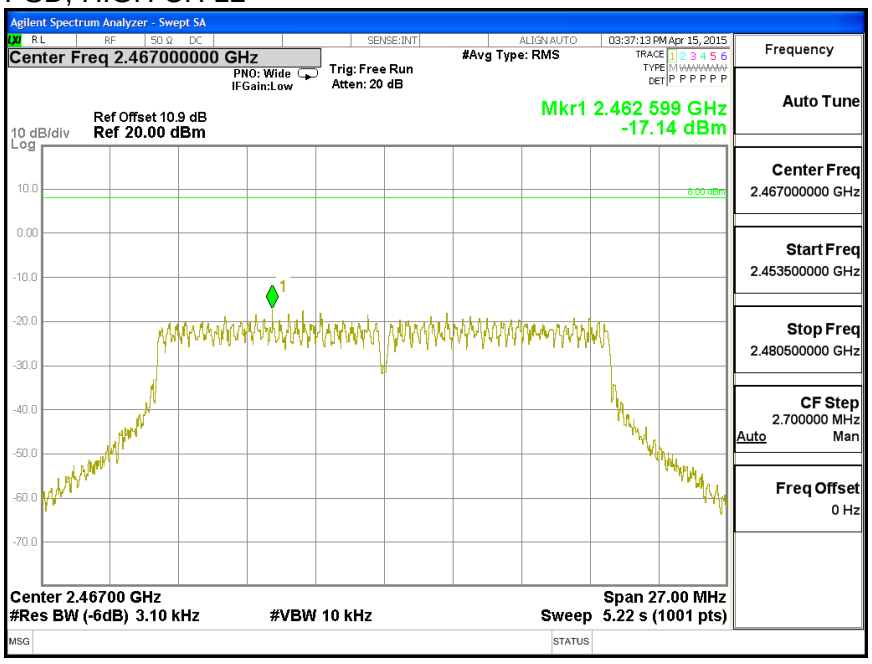
PSD, MID CH



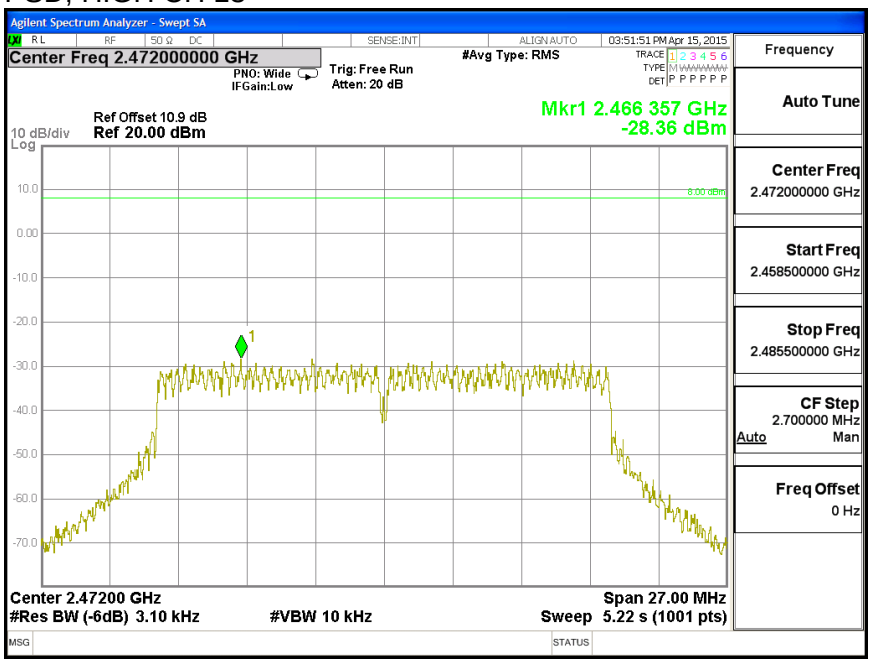
PSD, HIGH CH 11



PSD, HIGH CH 12



PSD, HIGH CH 13



9.3.6. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

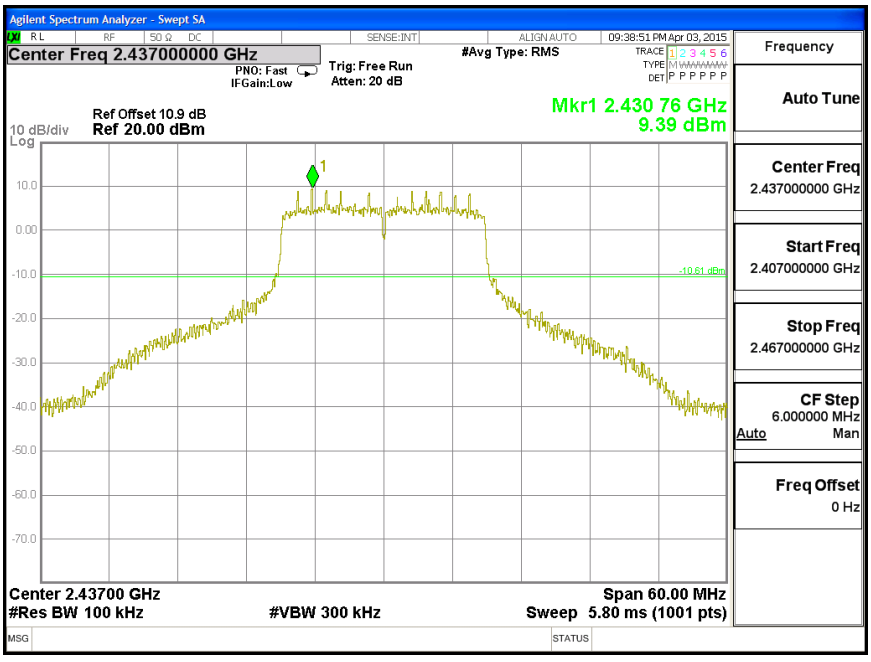
IC RSS-210 A8.5

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.

RESULTS

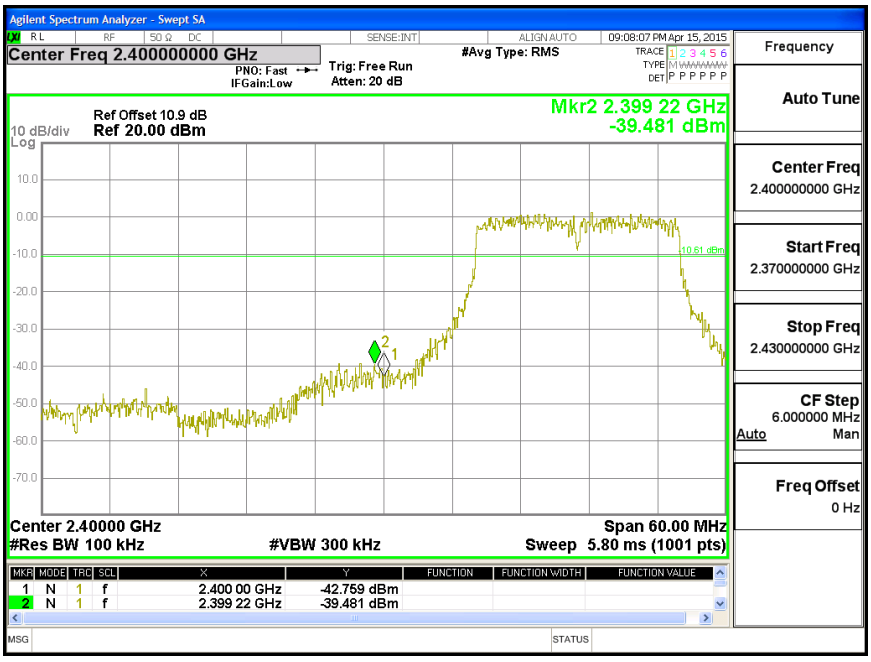
IN-BAND REFERENCE LEVEL

REFERENCE LEVEL MID CH



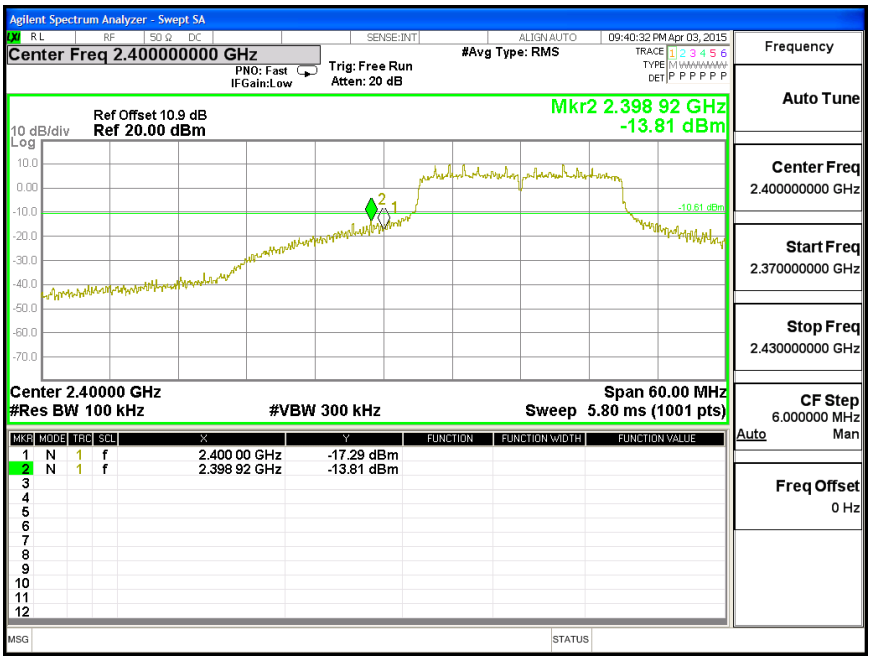
AUTHORIZED BAND EDGE LOW CH 1

AUTHORIZED BAND EDGE LOW CH 2



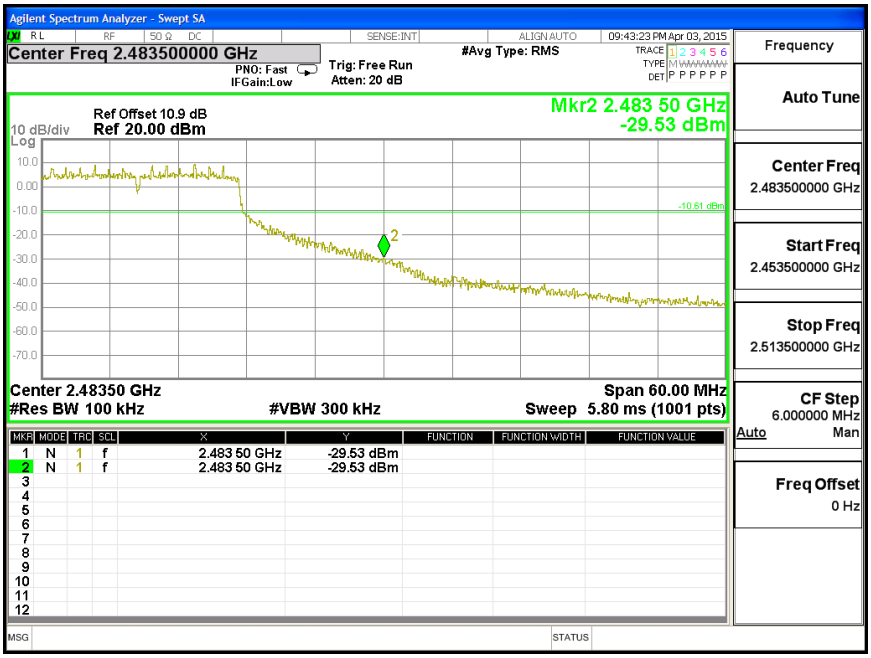
LOW CHANNEL BANDEDGE

AUTHORIZED BAND EDGE HIGH CH 10

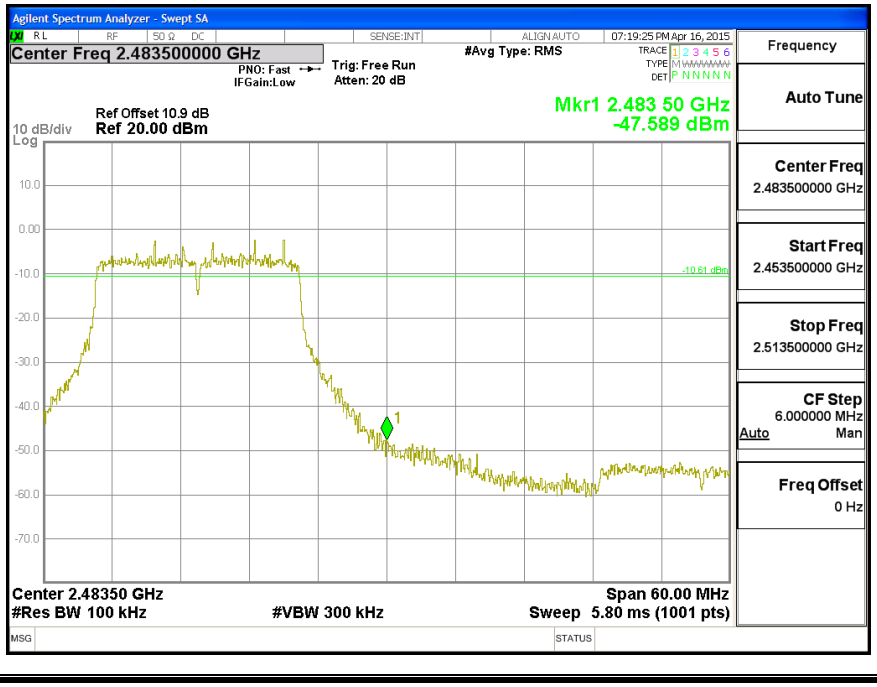


HIGH CHANNEL 11 BANDEDGE

AUTHORIZED BAND EDGE HIGH CH 11

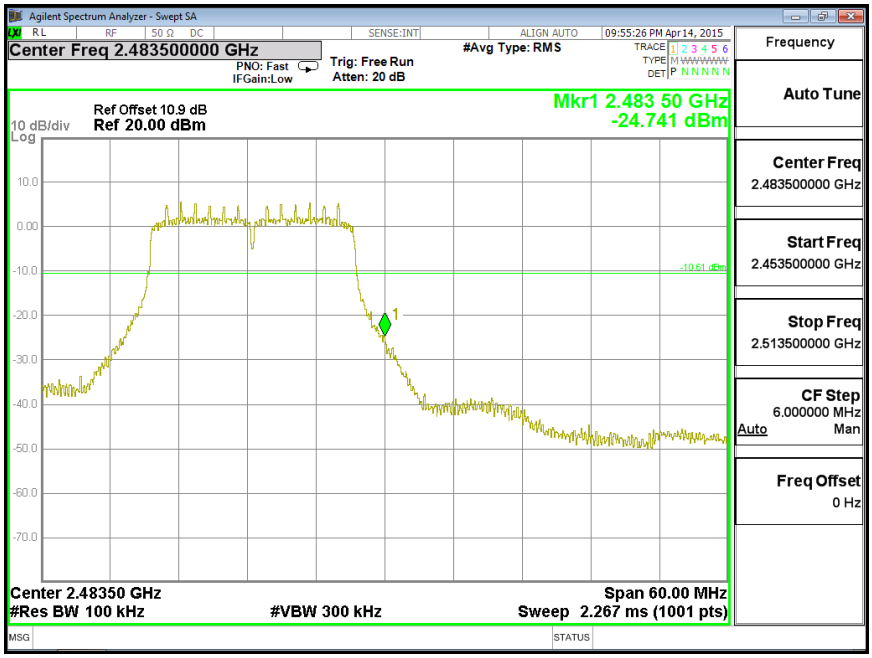


AUTHORIZED BAND EDGE HIGH CH 12



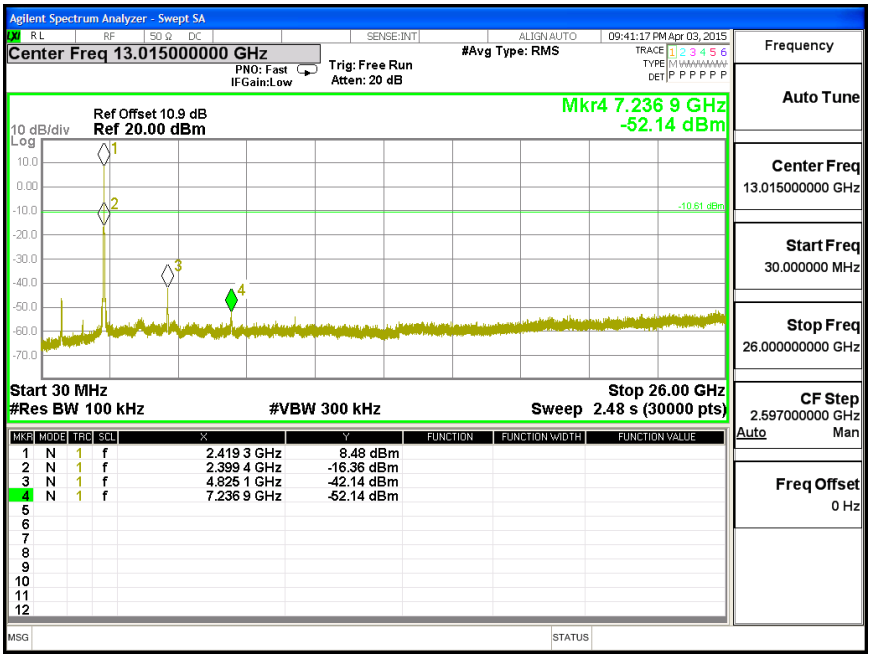
HIGH CHANNEL 13 BANDEDGE

AUTHORIZED BAND EDGE HIGH CH 13

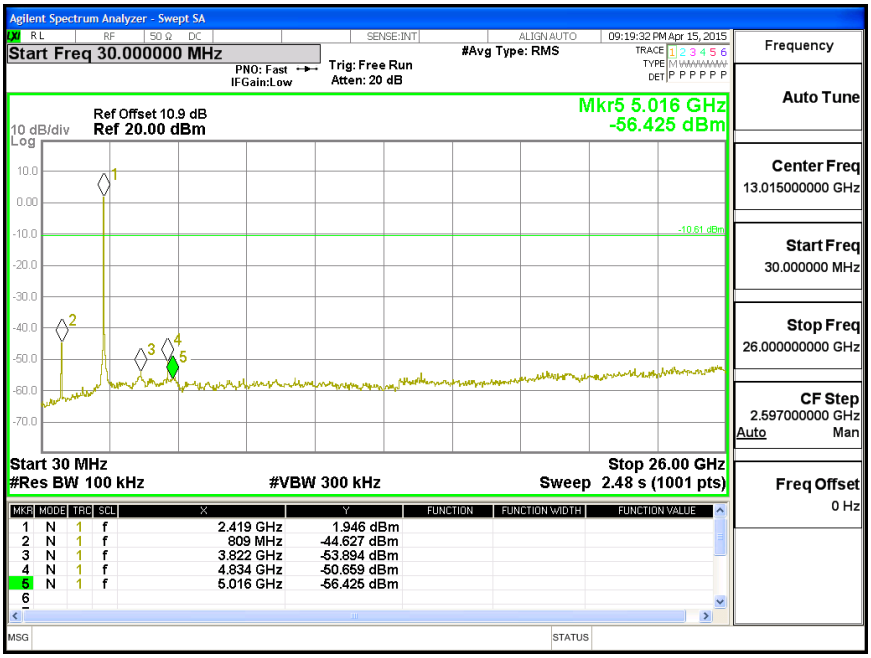


OUT-OF-BAND EMISSIONS

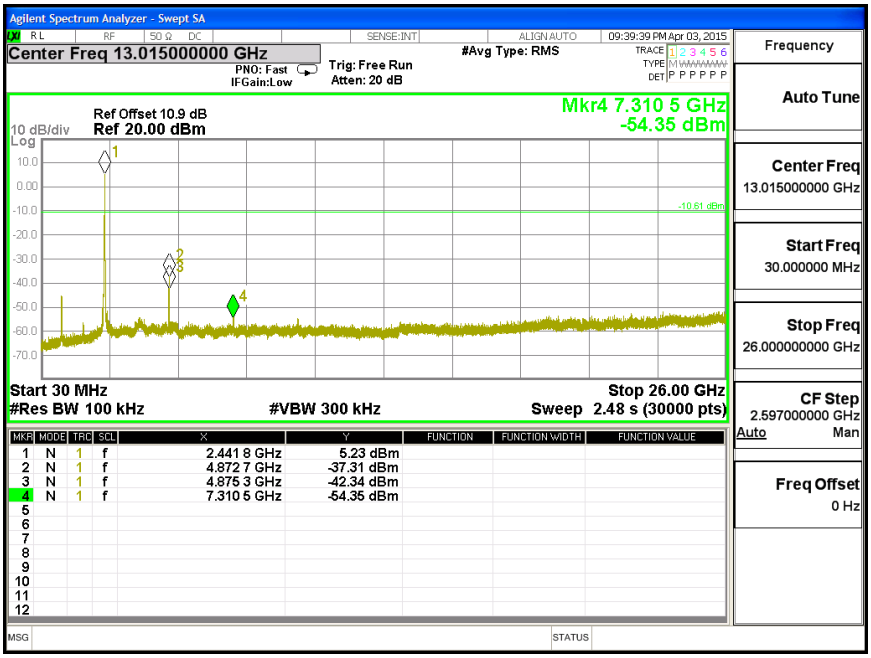
OUT OF BAND LOW CH 1



OUT OF BAND LOW CH 2

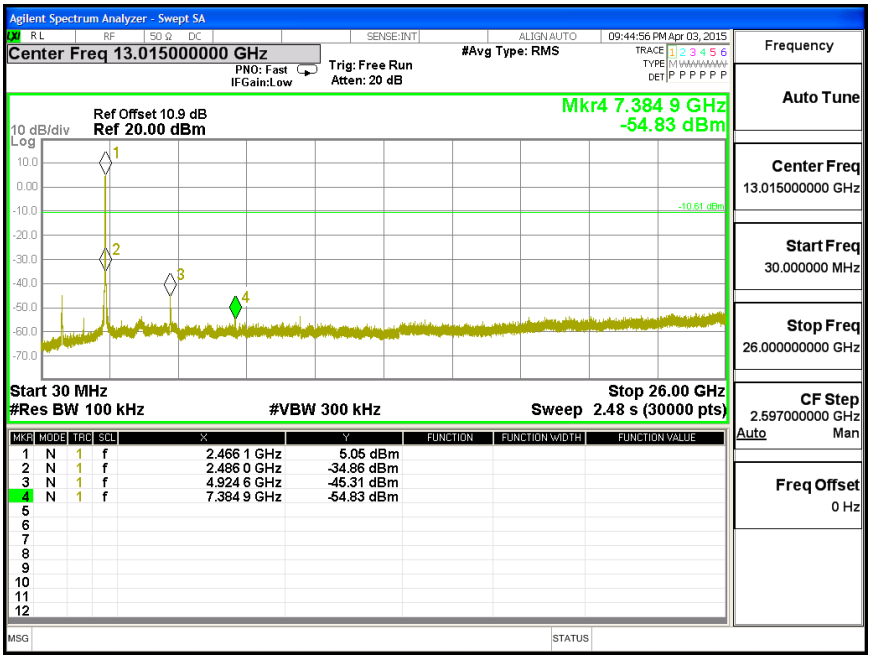


OUT OF BAND MID CH

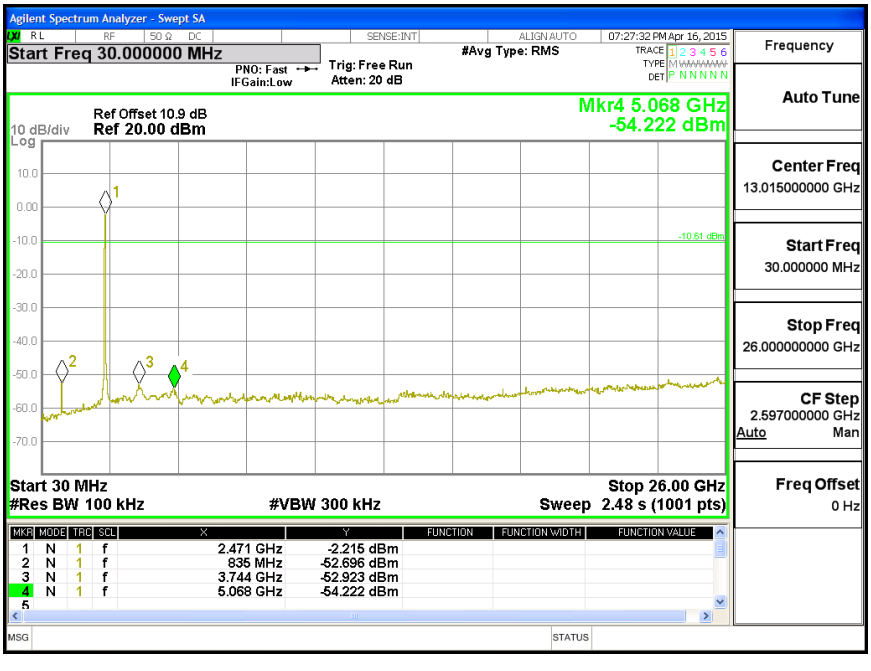


OUT OF BAND HIGH CH 10

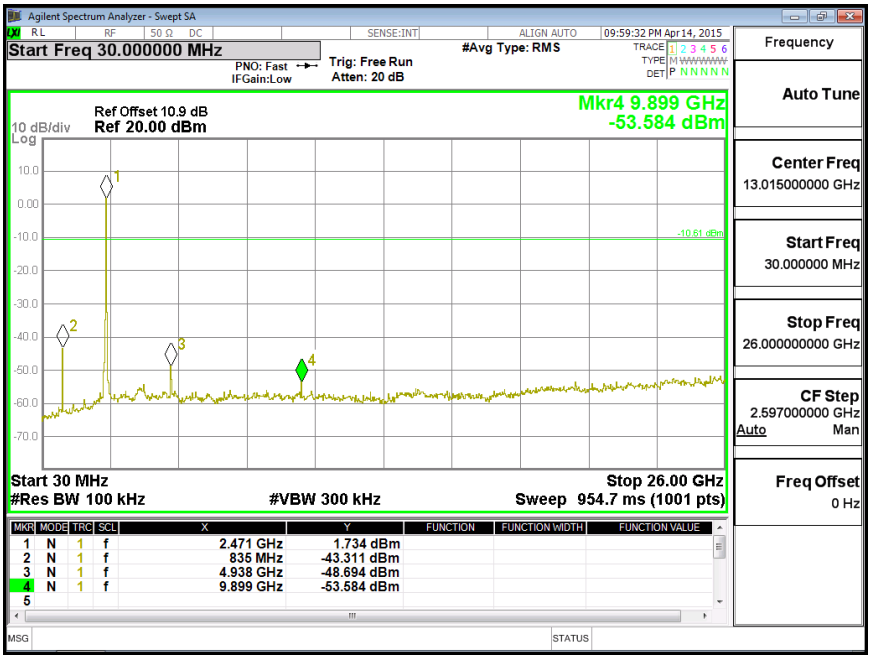
OUT OF BAND HIGH CH 11



OUT OF BAND HIGH CH 12



OUT OF BAND HIGH CH 13



9.4. 802.11n HT40 SISO MODE IN THE 2.4 GHz BAND

9.4.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

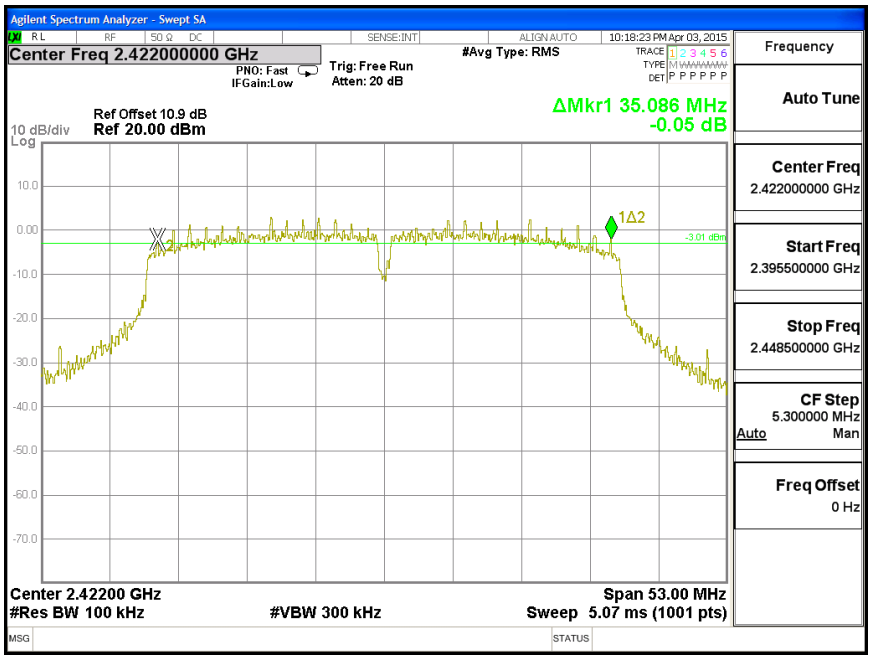
The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

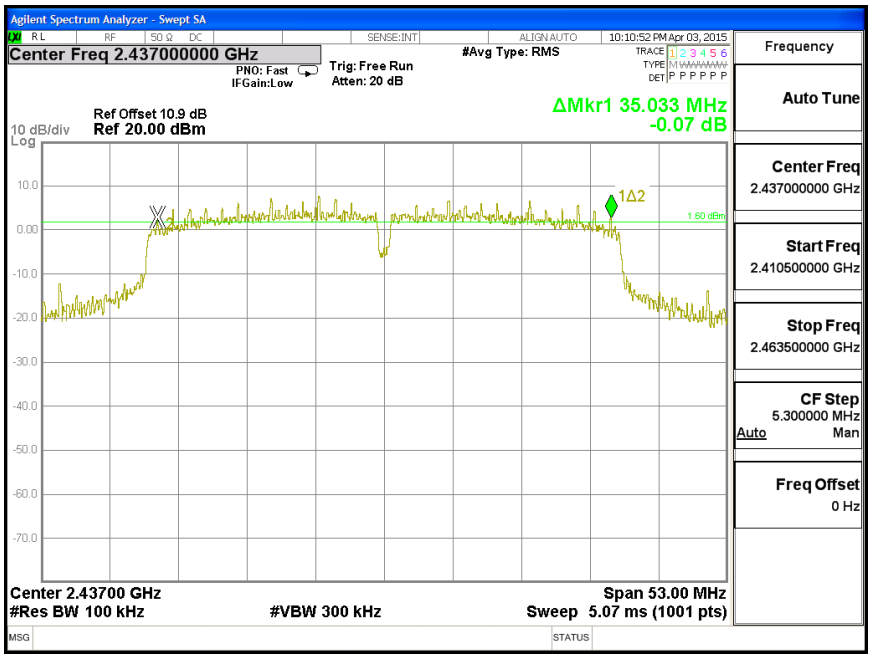
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2422	36.086	0.5
Mid	2437	35.033	0.5
High	2442	35.139	0.5
High	2447	35.088	0.5
High	2452	35.086	0.5

6 dB BANDWIDTH

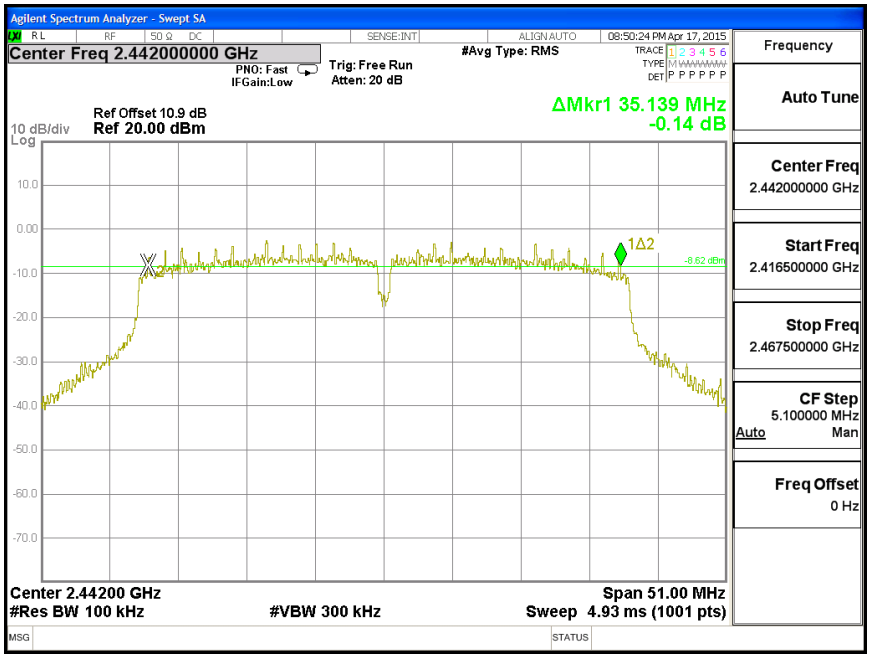
6 dB BANDWIDTH LOW CH



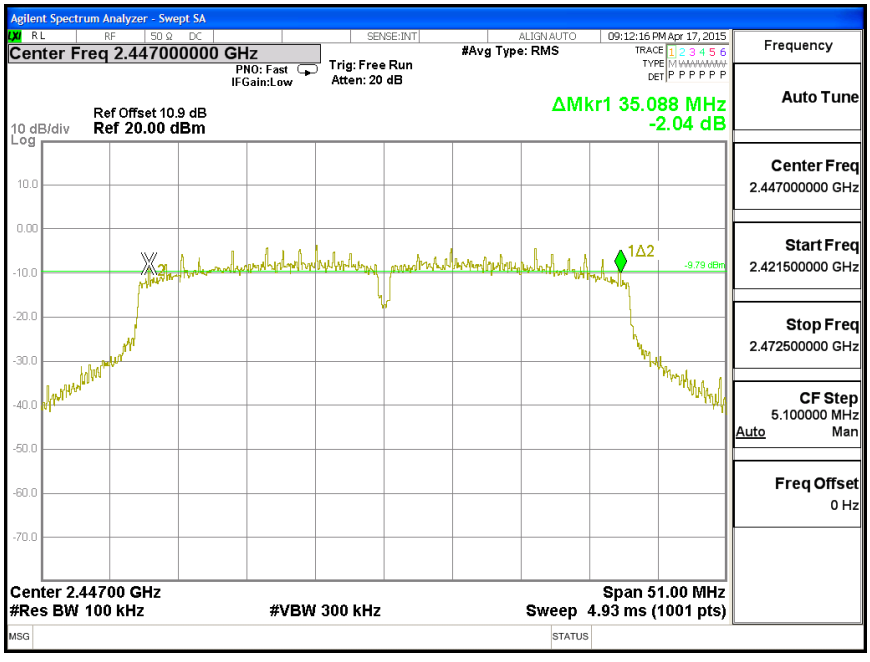
6 dB BANDWIDTH MID CH



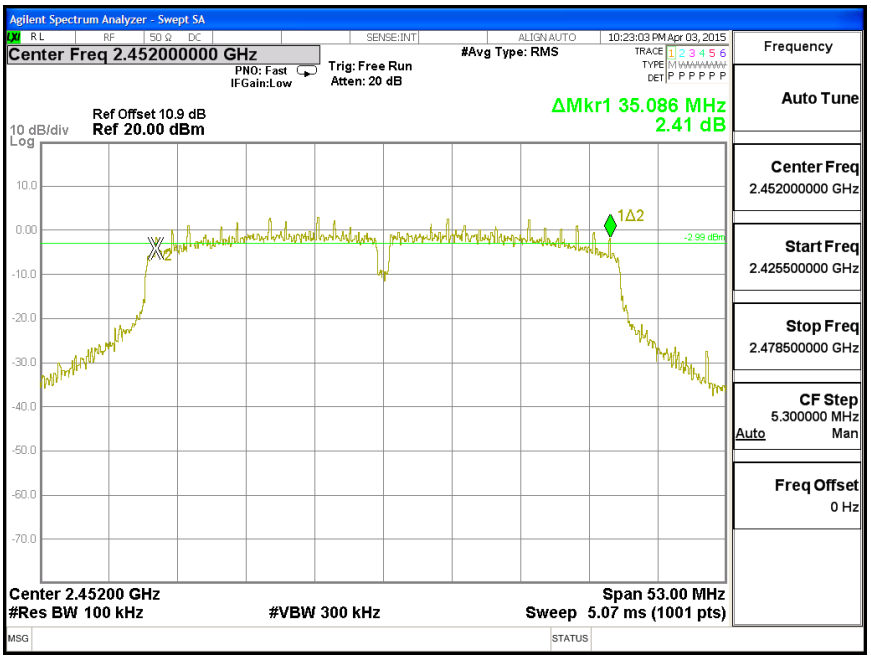
6 dB BANDWIDTH HIGH CH 7



6 dB BANDWIDTH HIGH CH 8



6 dB BANDWIDTH HIGH CH 9



9.4.2. 99% BANDWIDTH

LIMITS

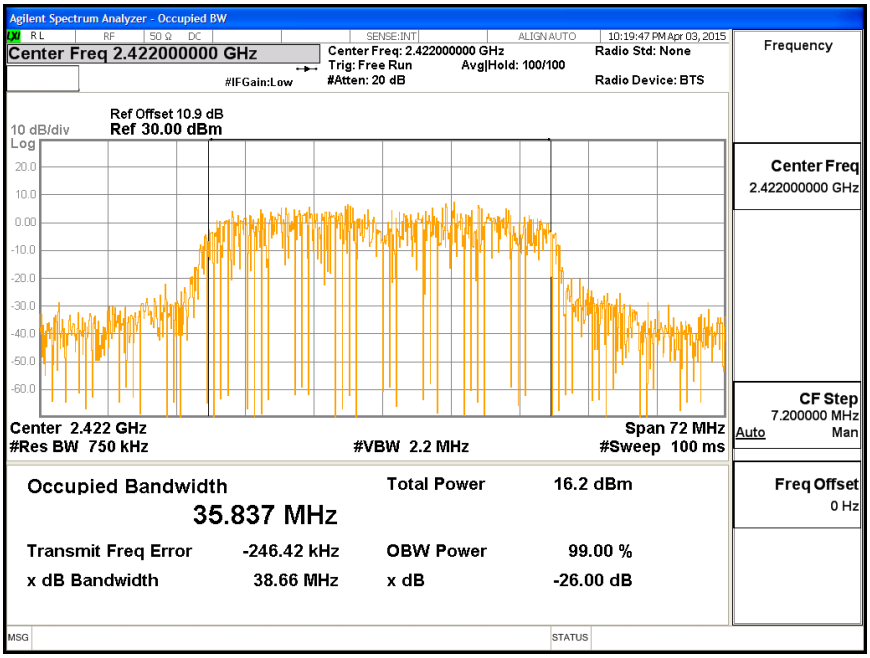
None; for reporting purposes only.

RESULTS

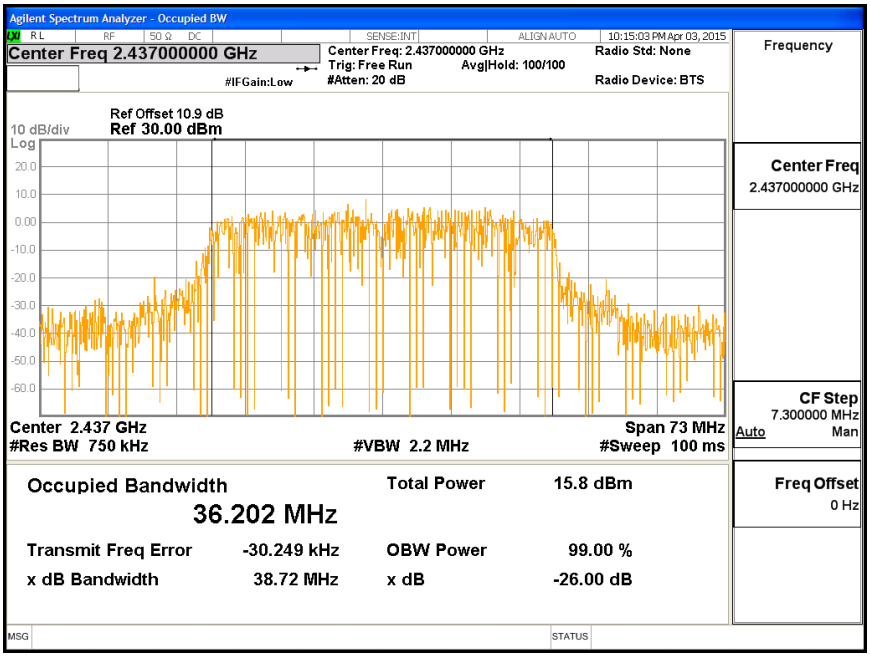
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2422	35.837
Mid	2437	36.202
High	2442	35.905
High	2447	36.220
High	2452	36.077

99% BANDWIDTH

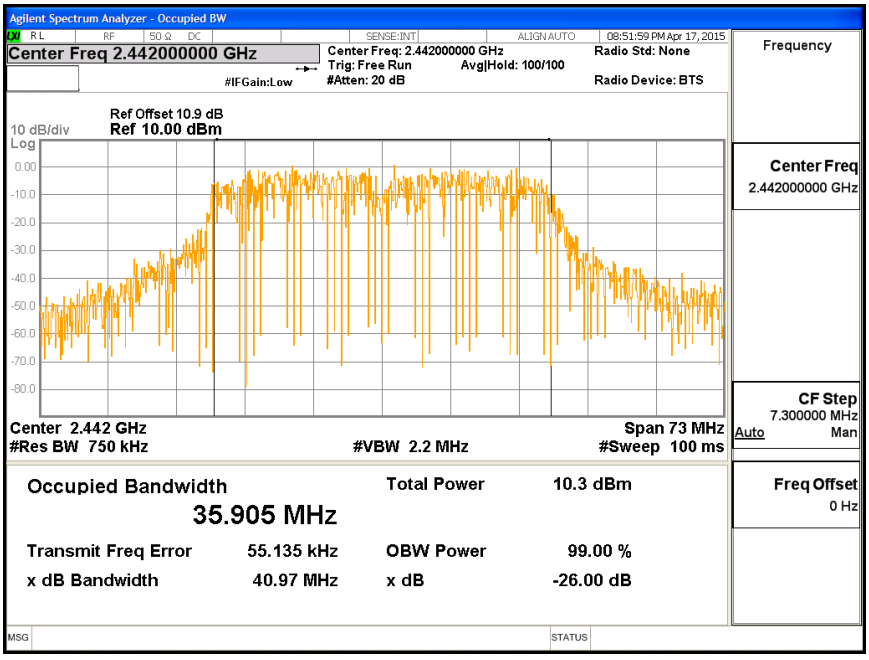
99% BANDWIDTH LOW CH



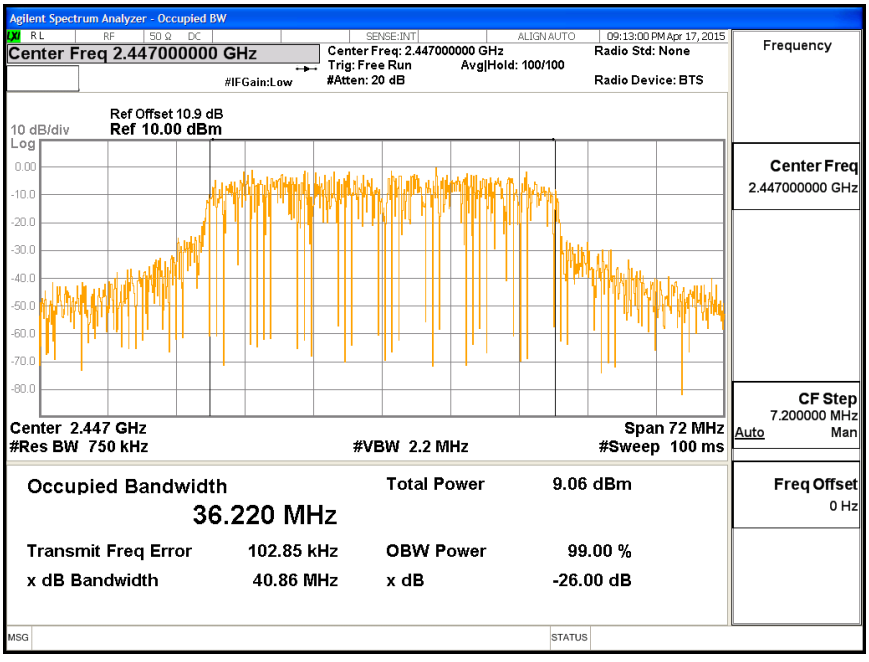
99% BANDWIDTH MID CH



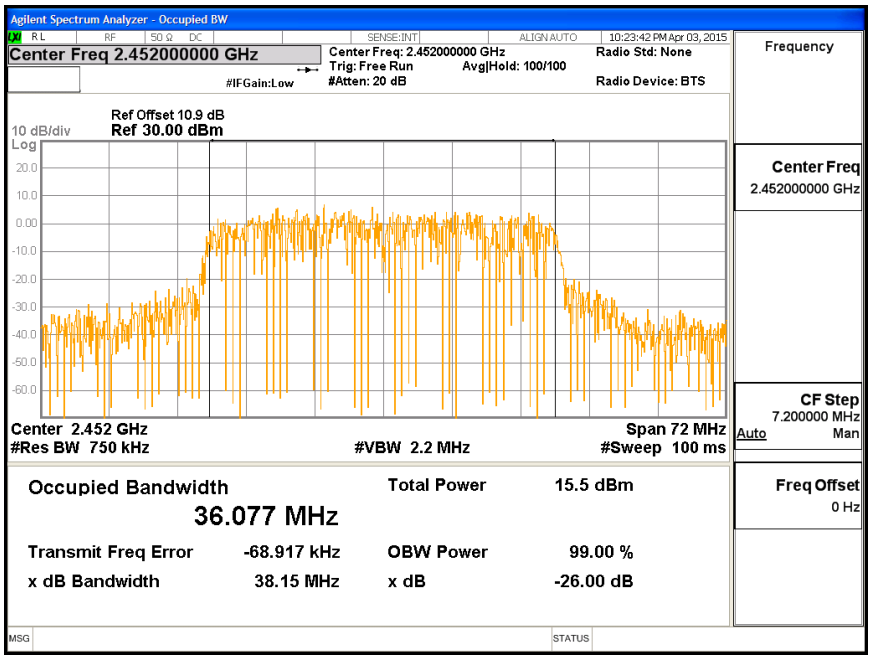
99% BANDWIDTH HIGH CH 7



99% BANDWIDTH HIGH CH 8



99% BANDWIDTH HIGH CH 9



9.4.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low	2422	10.43
Mid	2437	12.45
High	2442	10.28
High	2447	8.90
High	2452	6.89

9.4.4. 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

There is only one transmitter output therefore the directional gain is equal to the antenna gain.