



REPORT No. : XM2005003W01

TEST REPORT

APPLICANT : HATCH BABY, INC

PRODUCT NAME : Hatch Restore

MODEL NAME : Restore01

BRAND NAME : Hatch

FCC ID : 2AFYZ-RESTORE01

STANDARD(S) : 47 CFR Part 15 Subpart C

RECEIPT DATE : 2020-05-07

TEST DATE : 2020-05-11 to 2020-05-17

ISSUE DATE : 2020-05-21

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Change History		
Version	Date	Reason for change
1.0	2020-05-21	First edition



1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	HATCH BABY, INC
Applicant Address:	3525 Alameda de las Pulgas, Suite D, Menlo Park CA 94025
Manufacturer:	Xiamen Hualian Electronics Corp,. LTD.
Manufacturer Address:	No.502, Qianpu Road, Siming District, Xiamen, China

1.2. Equipment Under Test (EUT) Description

Product Name:	Hatch Restore
Serial No:	(N/A, marked #1 by test site)
Hardware Version:	30-HBW24F
Software Version:	N/A
Modulation Type:	OFDM,DSSS
Operating Frequency Range:	802.11b/g/n-20MHz: 2.412GHz - 2.462GHz 802.11n-40MHz: 2.422GHz - 2.452GHz
Channel Number:	802.11b/g/n-20MHz: 11 802.11n-40MHz: 7
Antenna Type:	PIFA Antenna
Antenna Gain:	2dBi

Note 1: The EUT is operating at 2.4GHz ISM; it supports 802.11b, 802.11g, 802.11n and they are all tested in this report.

For 802.11b/g/n-20MHz (2.4GHz band), the frequencies allocated is $F \text{ (MHz)} = 2412 + 5 * (n - 1)$ ($1 \leq n \leq 11$). The lowest, middle, highest channel numbers of the EUT used and tested in this report are separately 1 (2412MHz), 6 (2437MHz) and 11 (2462MHz).

For 802.11n-40MHz, the frequencies allocated is $F \text{ (MHz)} = 2412 + 5 * (n - 1)$ ($3 \leq n \leq 9$). The lowest, middle, highest channel numbers of the EUT used and tested in this report are separately 3 (2422MHz), 6 (2437MHz) and 9 (2452MHz).

Note 2: The EUT connected to the serial port of the computer with a serial communication cable, we use the dedicated software to control the EUT continuous transmission.

Note 3: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.



1.3. Modulation type of EUT

Modulation technology	Modulation Type	Transfer Rate (Mbps)	The Frequency Equal to the Transmission Rate of Modulation Signal
DSSS (802.11b)	DBPSK	1	1MHz
	DQPSK	2	
	CCK	5.5/ 11	1.375MHz
OFDM (802.11g)	BPSK	6 / 9	1MHz
	QPSK	12 / 18	
	16QAM	24 / 36	
	64QAM	48 / 54	
OFDM (802.11n-20MHz)	BPSK	6.5	1MHz
	QPSK	13/19.5	
	16QAM	26/39	
	64QAM	52/58.5/65	
OFDM (802.11n-40MHz)	BPSK	13.5	1MHz
	QPSK	27/40.5	
	16QAM	54/81/108	
	64QAM	121.5/135	

We only record the worst mode(black font) in the report

1.4. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C for the EUT FCC ID Certification:

No	Identity	Document Title
1	47 CFR Part 15	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Test Date	Test Engineer	Result
1	15.203	Antenna Requirement	N/A	N/A	PASS
2	15.247(b)	Output Power	May 11, 2020	Elvis Wang	PASS
3	15.247(a)	Bandwidth	May 11, 2020	Elvis Wang	PASS
4	15.247(d)	Conducted Spurious Emission and Band Edge	May 11, 2020	Elvis Wang	PASS
5	15.247(e)	Power spectral density (PSD)	May 11, 2020	Elvis Wang	PASS



6	15.247(d)	Restricted Frequency Bands	May 12, 2020	Yaming Luo	<u>PASS</u>
7	15.207	Conducted Emission	May 13, 2020	Yaming Luo	<u>PASS</u>
8	15.209, 15.247(d)	Radiated Emission	May 15, 2020	Yaming Luo	<u>PASS</u>
Note: The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.10 2013 and KDB558074 D01 v05r02.					

1.5. Environmental Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15 - 35
Relative Humidity (%):	30 -60
Atmospheric Pressure (kPa):	86-106

2. 47 CFR Part 15C Requirements

2.1. Antenna requirement

2.1.1. Applicable Standard

According to FCC 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

2.1.2. Result: Compliant

The EUT has a PIFA Antenna and max gain is 2dBi. Please refer to the EUT internal photos.

2.2. Output Power

2.2.1. Requirement

According to FCC section 15.247(b)(3), For systems using digital modulation in the 902-928 MHz,

2400-2483.5 MHz, and 5725-5850 MHz bands: The maximum peak conducted output power of the intentional radiator shall not exceed 1 Watt.

2.2.2. Test Description

The measured output power was calculated by the reading of the USB Wideband Power Sensor and calibration.

A. Test Setup:



The EUT (Equipment under the test) which is coupled to the USB Wideband Power Sensor; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

B. Equipments List:

Please refer ANNEX B(4).

2.2.3. Test Result

Duty Cycle Factor

Mode	Channel	Frequency (MHz)	T _{on} (ms)	T _(on+off) (ms)	Duty Cycle (%)	Duty Cycle Factor
802.11b	6	2437	100	100	100	0
802.11g	6	2437	100	100	100	0
802.11n-20MHz	6	2437	100	100	100	0
802.11n-40MHz	6	2437	100	100	100	0

Output Average Power

Mode	Channel	Frequency (MHz)	Output Average Power		Limit		Verdict
			dBm	W	dBm	W	
802.11 b	1	2412	13.21	0.021	30	1	PASS
	6	2437	14.06	0.025			PASS

Mode	Channel	Frequency (MHz)	Output Average Power		Limit		Verdict
			dBm	W	dBm	W	
	11	2462	12.74	0.019			PASS
802.11 g	1	2412	11.62	0.015			PASS
	6	2437	12.56	0.018			PASS
	11	2462	11.15	0.013			PASS
802.11 HT20	1	2412	11.52	0.014			PASS
	6	2437	12.39	0.017			PASS
	11	2462	11.02	0.013			PASS
802.11 HT40	3	2422	12.14	0.016			PASS
	6	2437	12.68	0.019			PASS
	9	2452	11.85	0.015			PASS

Note: The duty cycle factor has been compensated into the test result

2.3. Bandwidth

2.3.1. Requirement

According to FCC section 15.247(a) (2), Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

2.3.2. Test Description

A. Test Set:



The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

KDB558074 V05R02 Section 8.1 Option 1 was used in order to prove compliance.



B. Equipments List:

Please refer ANNEX B(4).

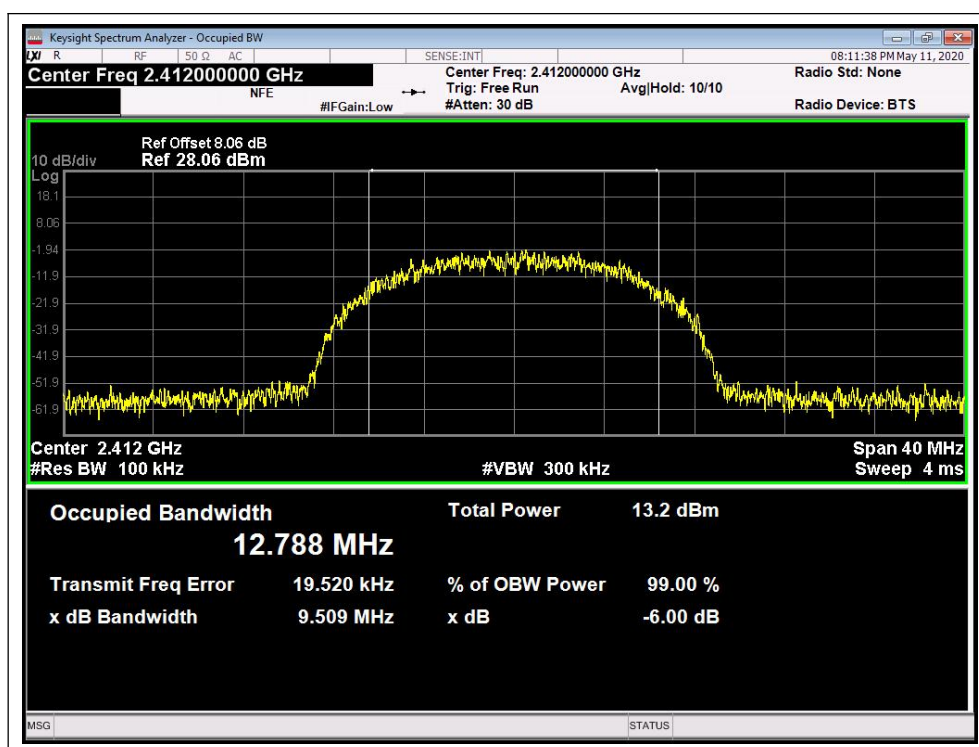
2.3.3. Test Result

802.11b Test mode

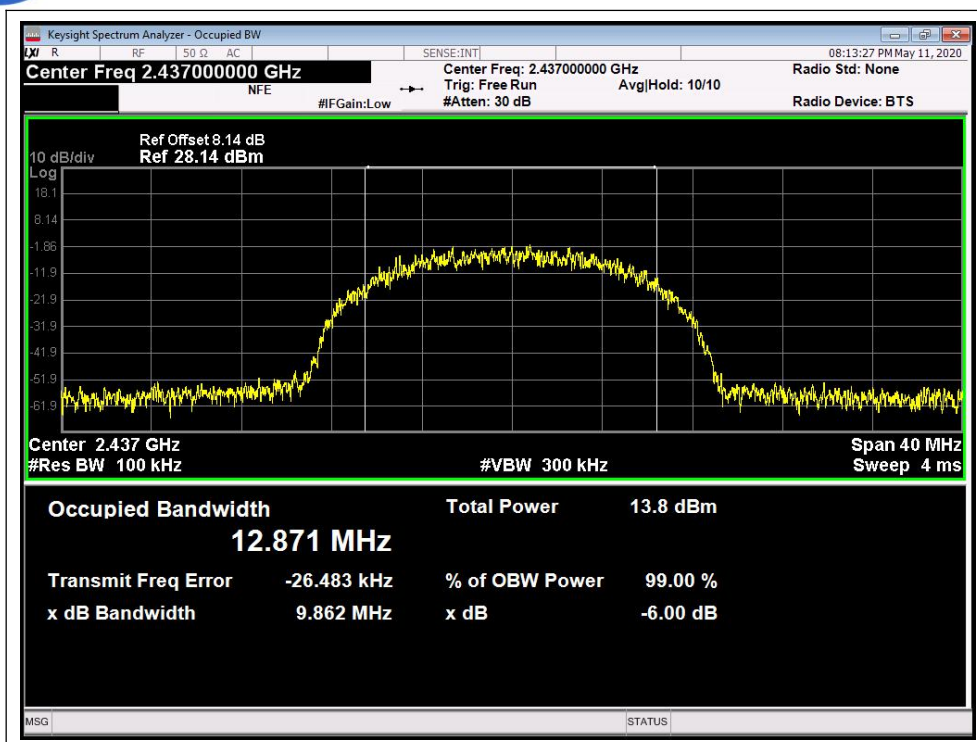
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	9.509	≥500	PASS
6	2437	9.862	≥500	PASS
11	2462	9.970	≥500	PASS

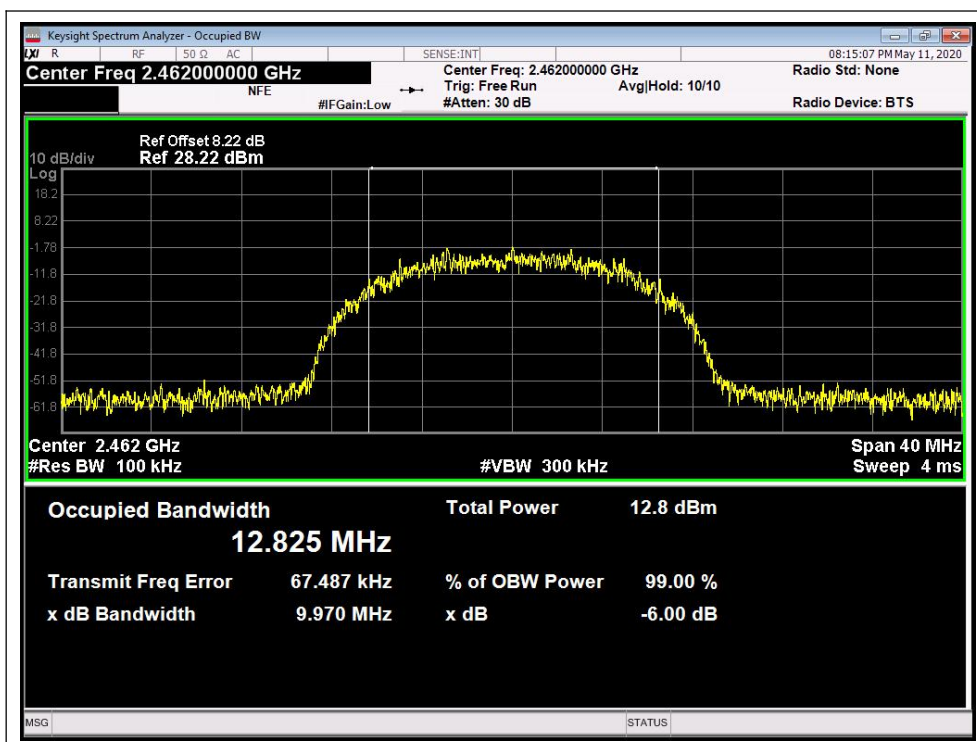
B. Test Plots



(Channel 1, 2412MHz, 802.11b)



(Channel 6, 2437 MHz, 802.11b)



(Channel 11, 2462MHz, 802.11b)

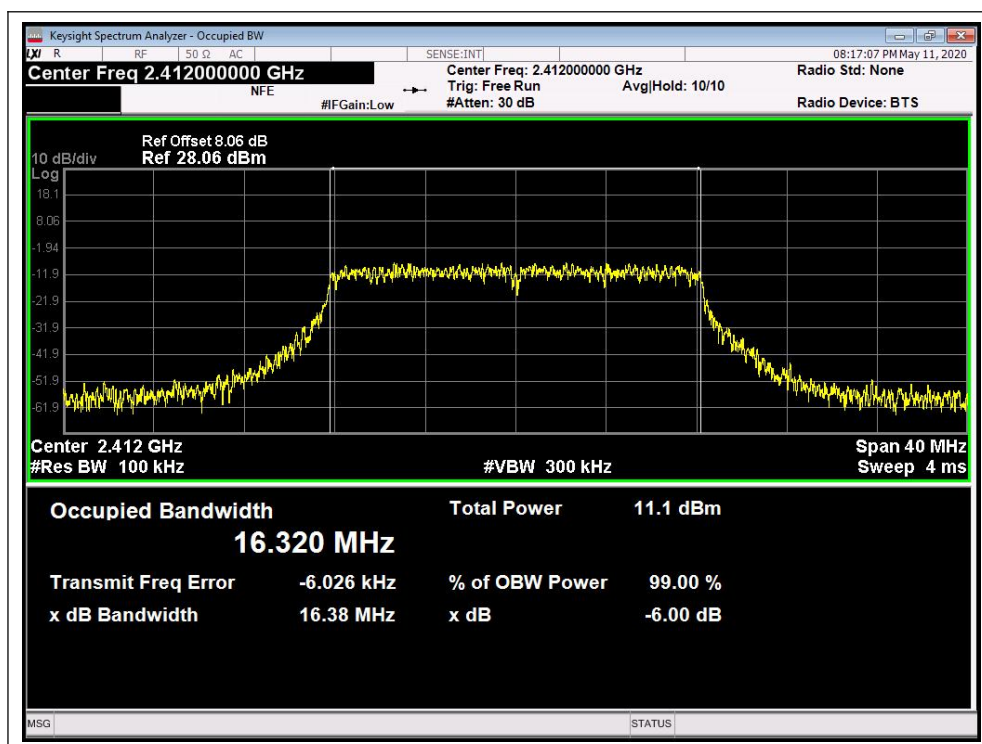


802.11g Test mode

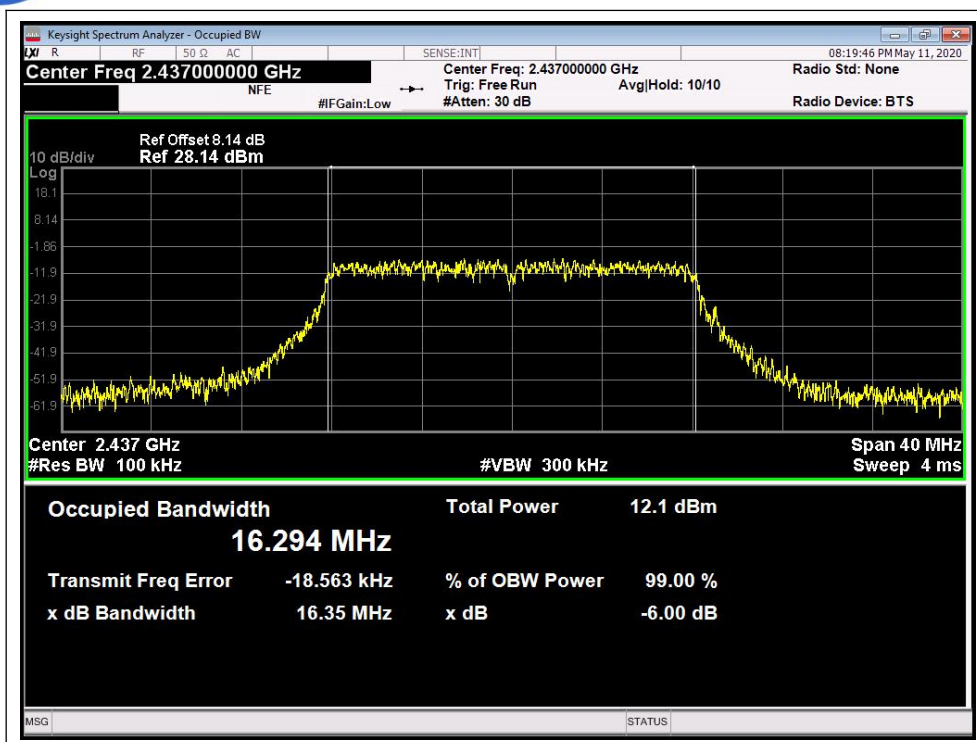
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2412	16.380	≥500	PASS
6	2437	16.350	≥500	PASS
11	2462	16.350	≥500	PASS

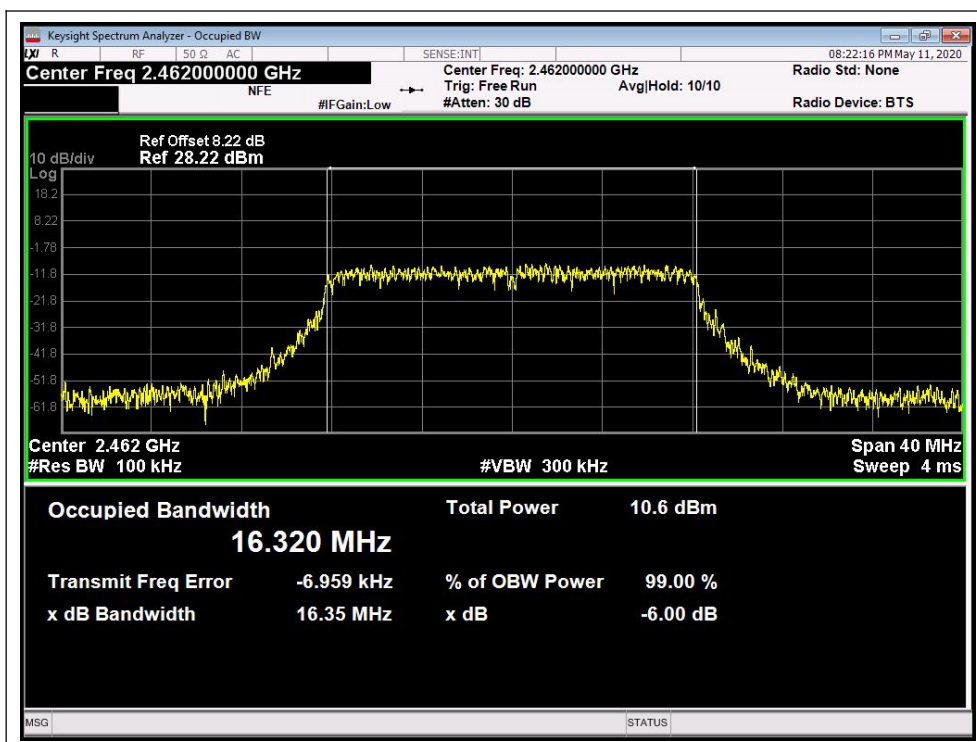
B. Test Plots:



(Channel 1, 2412MHz, 802.11g)



(Channel 6, 2437MHz, 802.11g)



(Channel 11, 2462MHz, 802.11g)

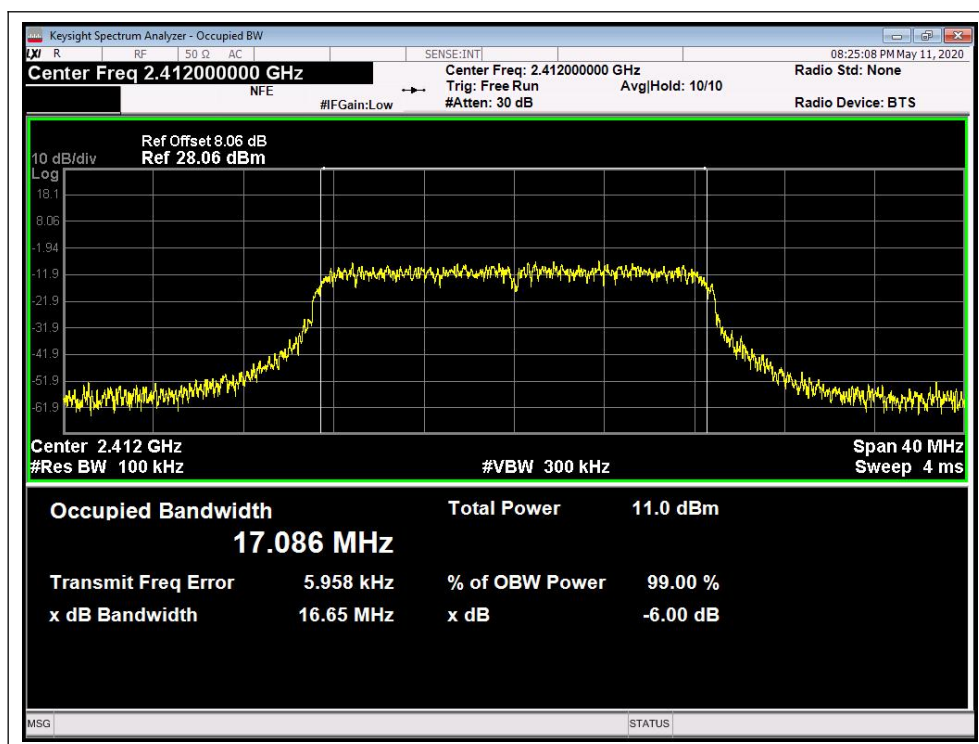


802.11n-20 Test mode

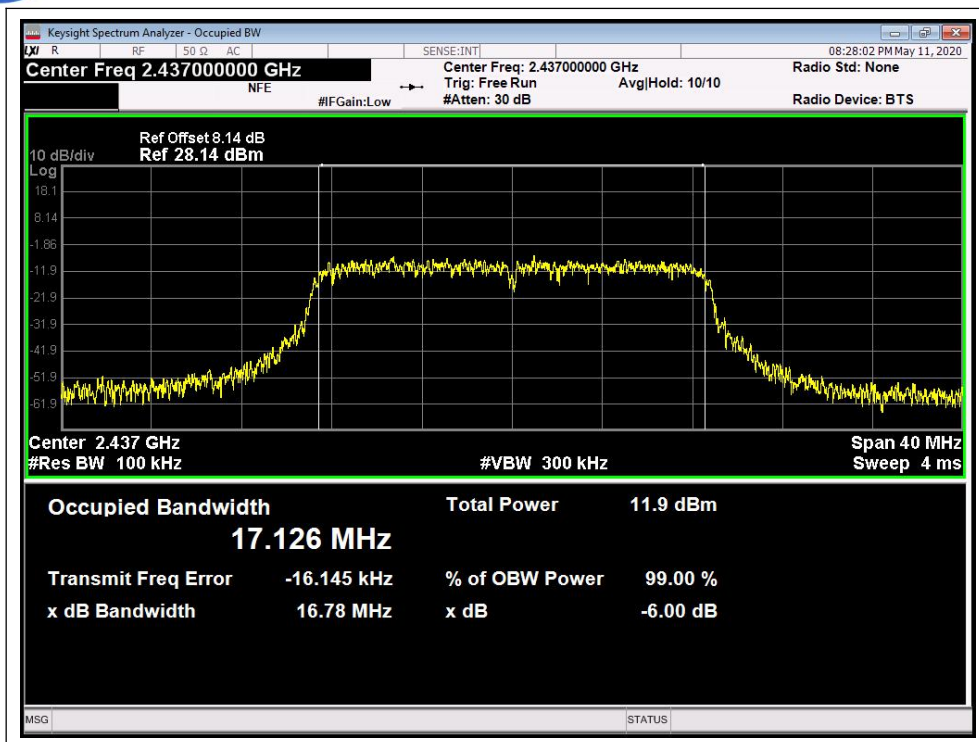
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2412	16.650	≥500	PASS
6	2437	16.780	≥500	PASS
11	2462	16.540	≥500	PASS

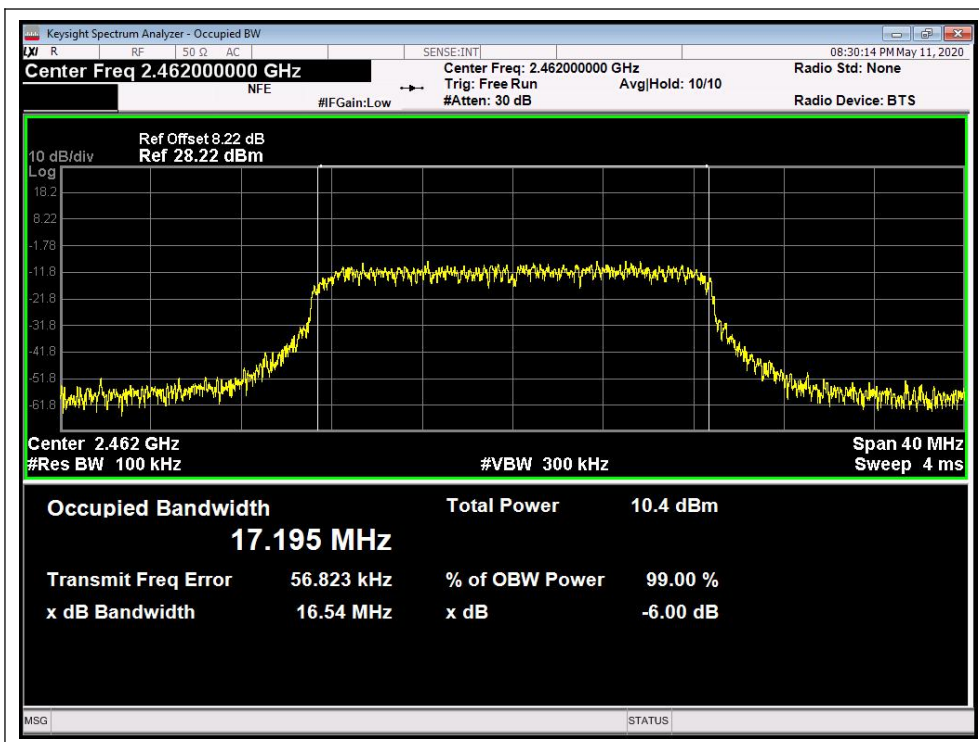
B. Test Plots:



(Channel 1, 2412MHz, 802.11n-20)



(Channel 6, 2437MHz, 802.11n-20)



(Channel 11, 2462MHz, 802.11n-20)

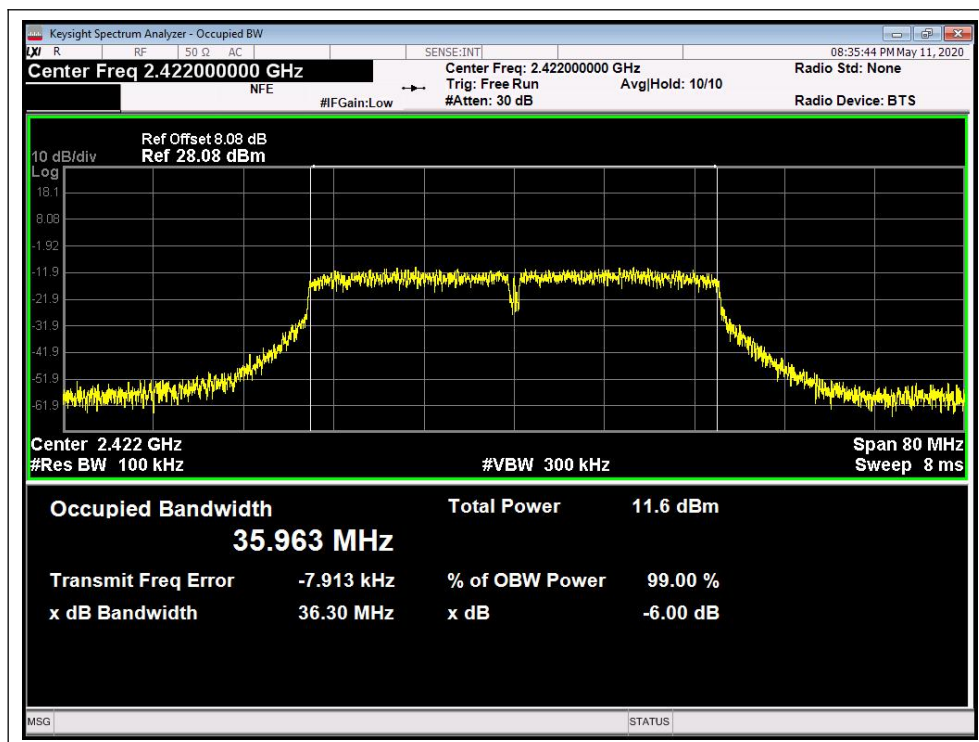


802.11n-40 Test mode

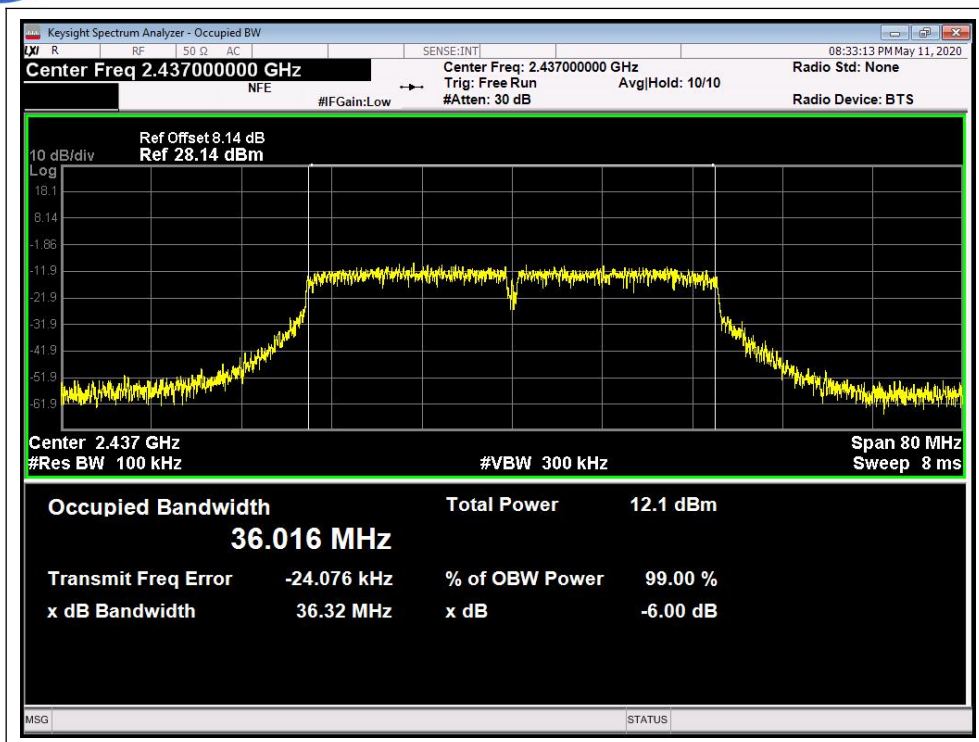
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
3	2422	36.300	≥500	PASS
6	2437	36.320	≥500	PASS
9	2452	36.330	≥500	PASS

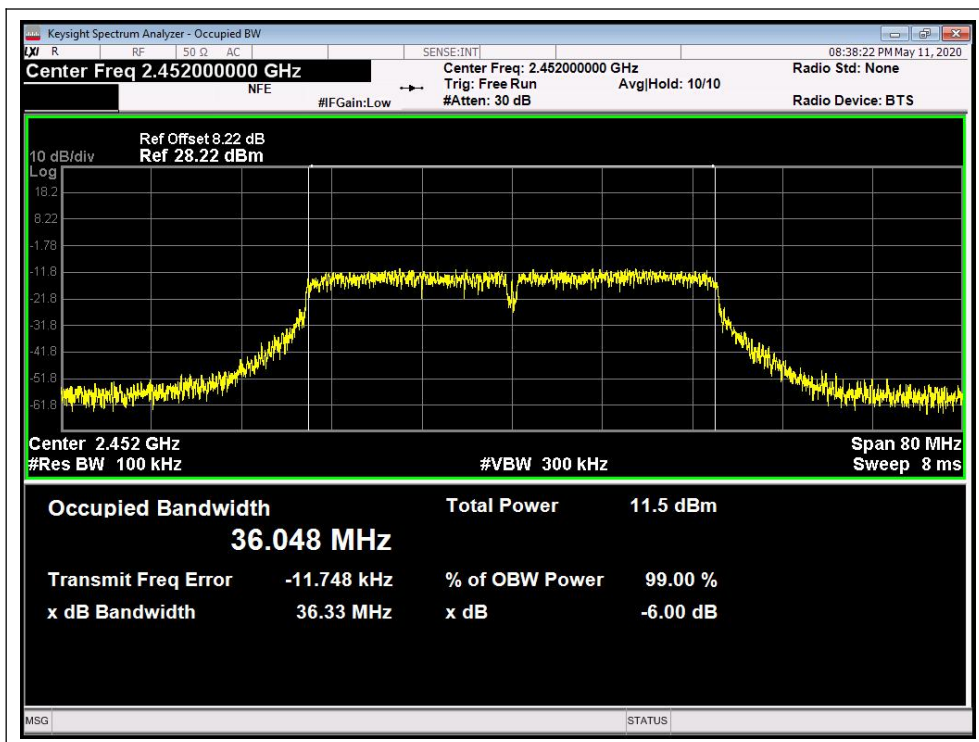
B. Test Plots:



(Channel 3, 2422Mz, 802.11n-40)



(Channel 6, 2437MHz, 802.11n-40)



(Channel 9, 2452MHz, 802.11n-40)

2.4. Conducted Spurious Emissions and Band Edge

2.4.1. Requirement

According to FCC section 15.247(c), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

2.4.2. Test Description

A. Test Set:



The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

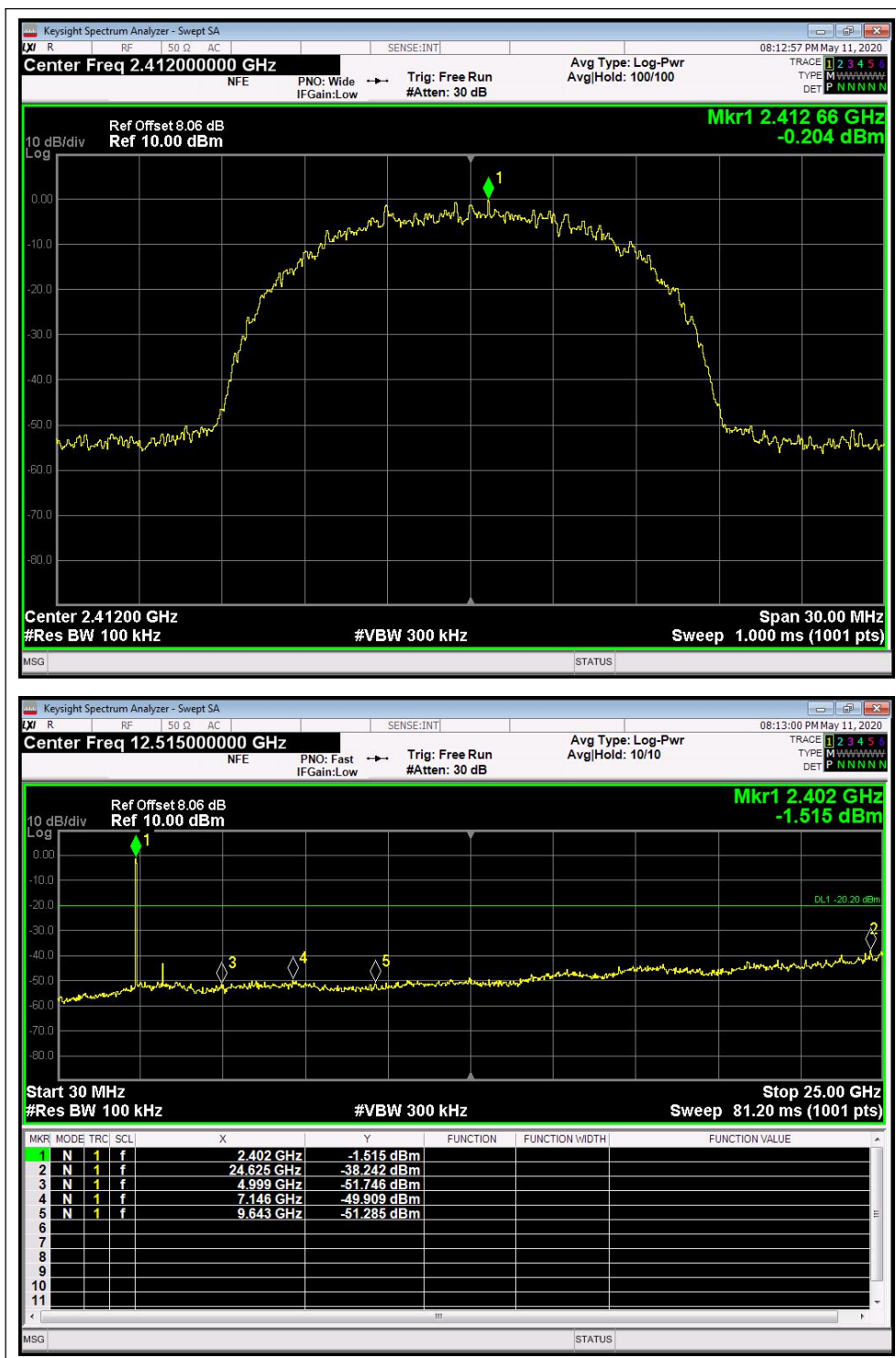
KDB 558074 D01 v05r02 Section 11.0 was used in order to prove compliance.

B. Equipments List:

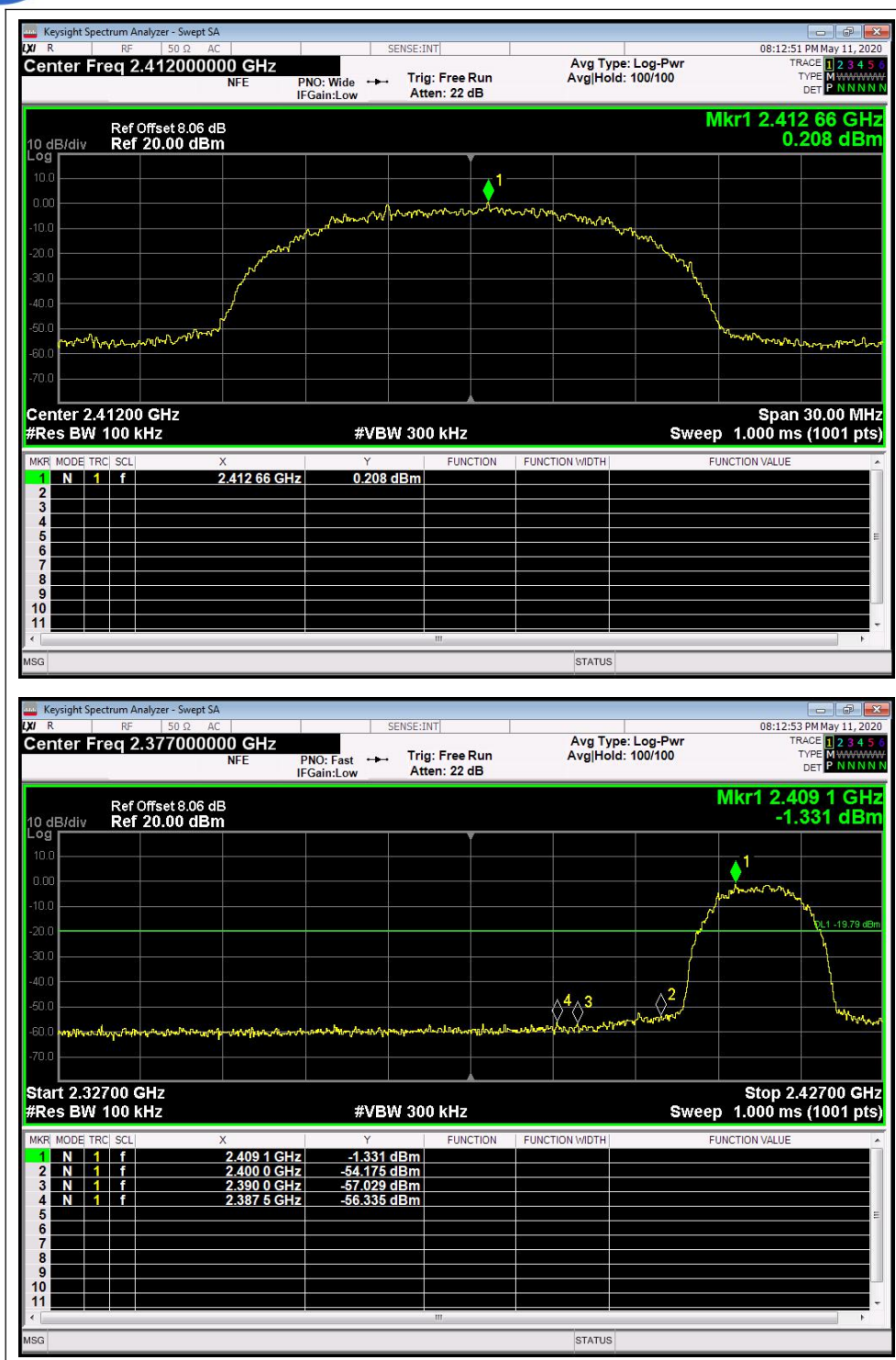
Please refer ANNEX B(4).



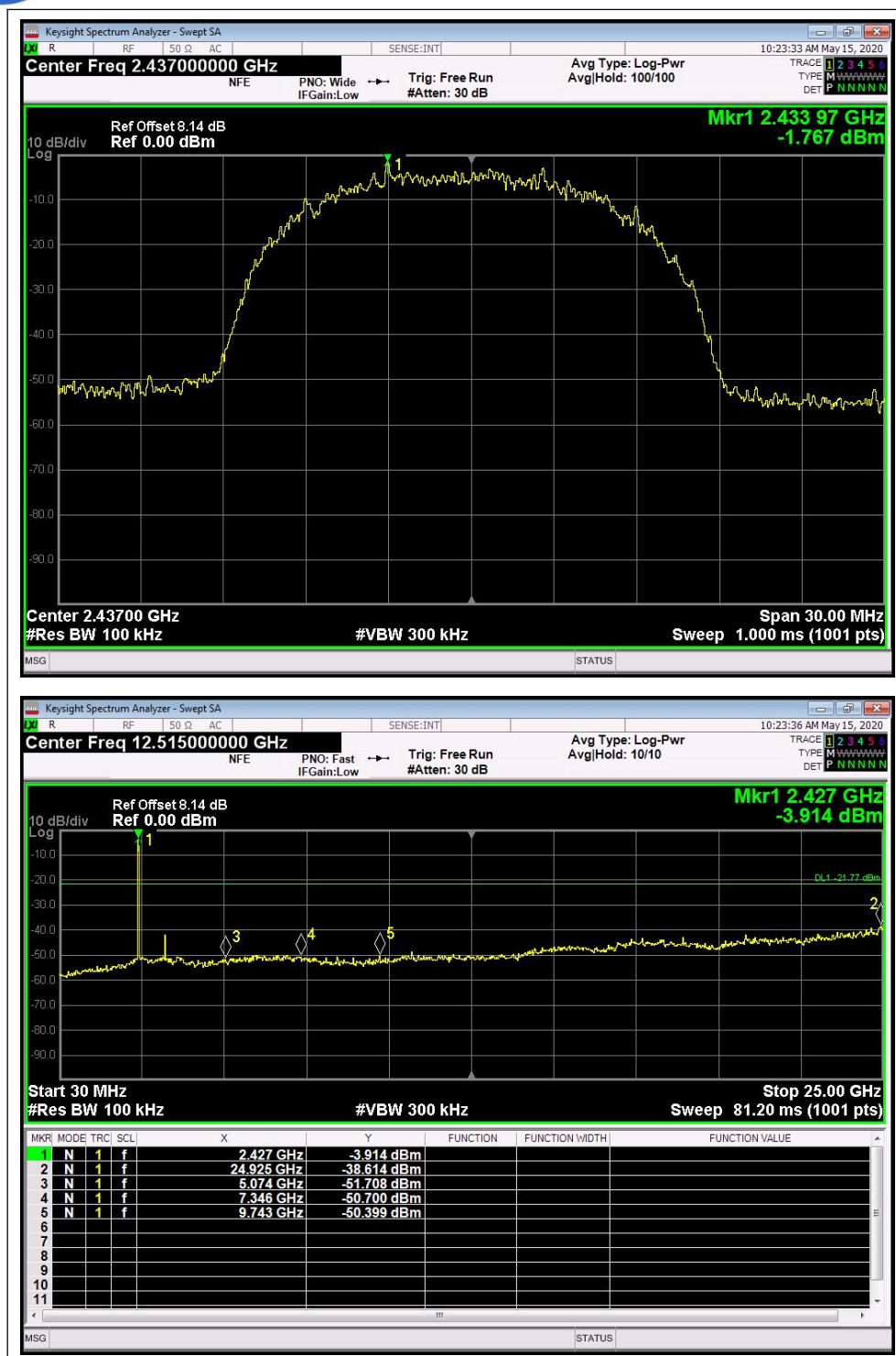
2.4.3. Test Result



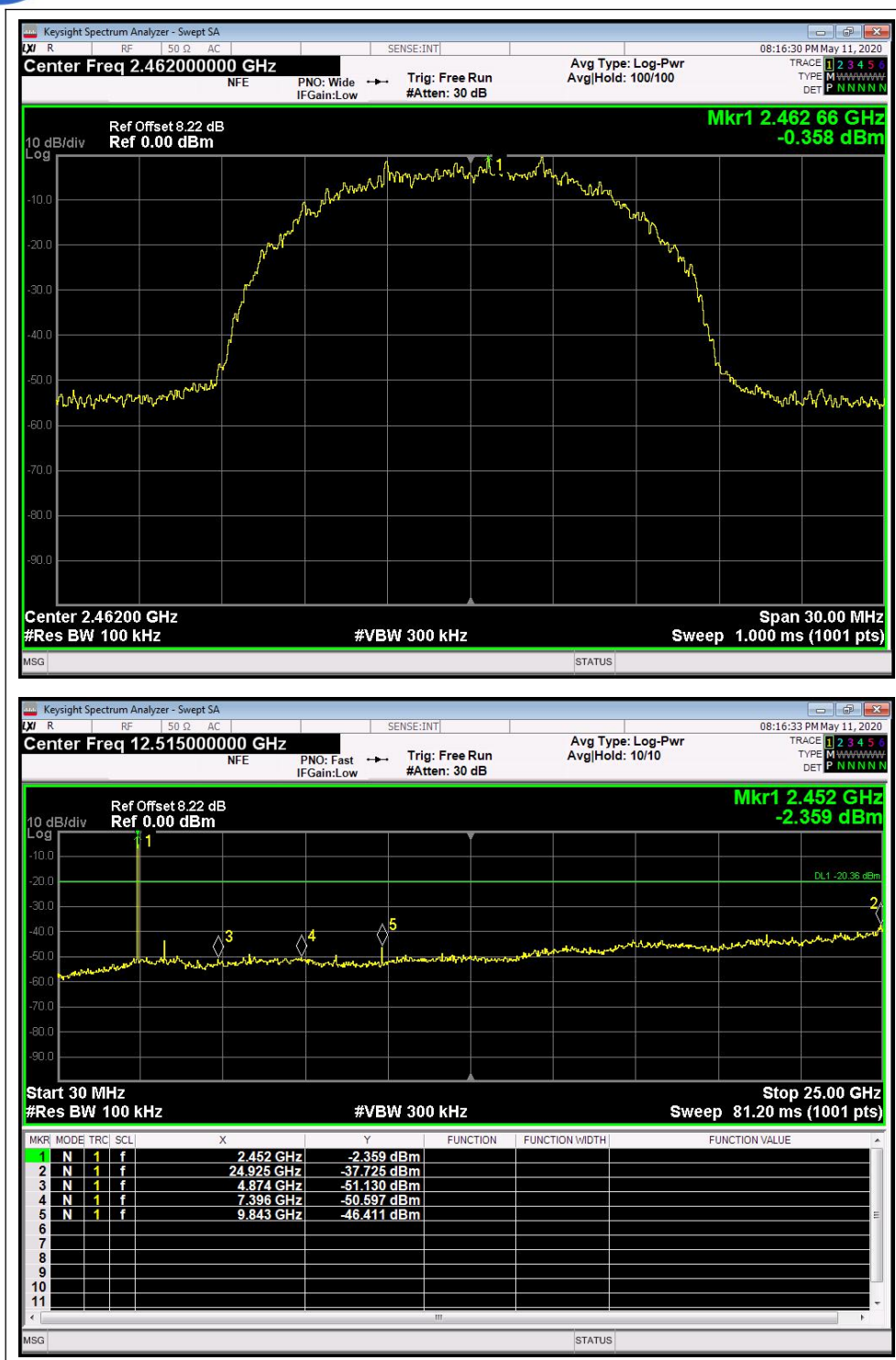
(802.11 b, Channel = 1, 30MHz to 25GHz)



(802.11 b, Band Edge @ Channel = 1)



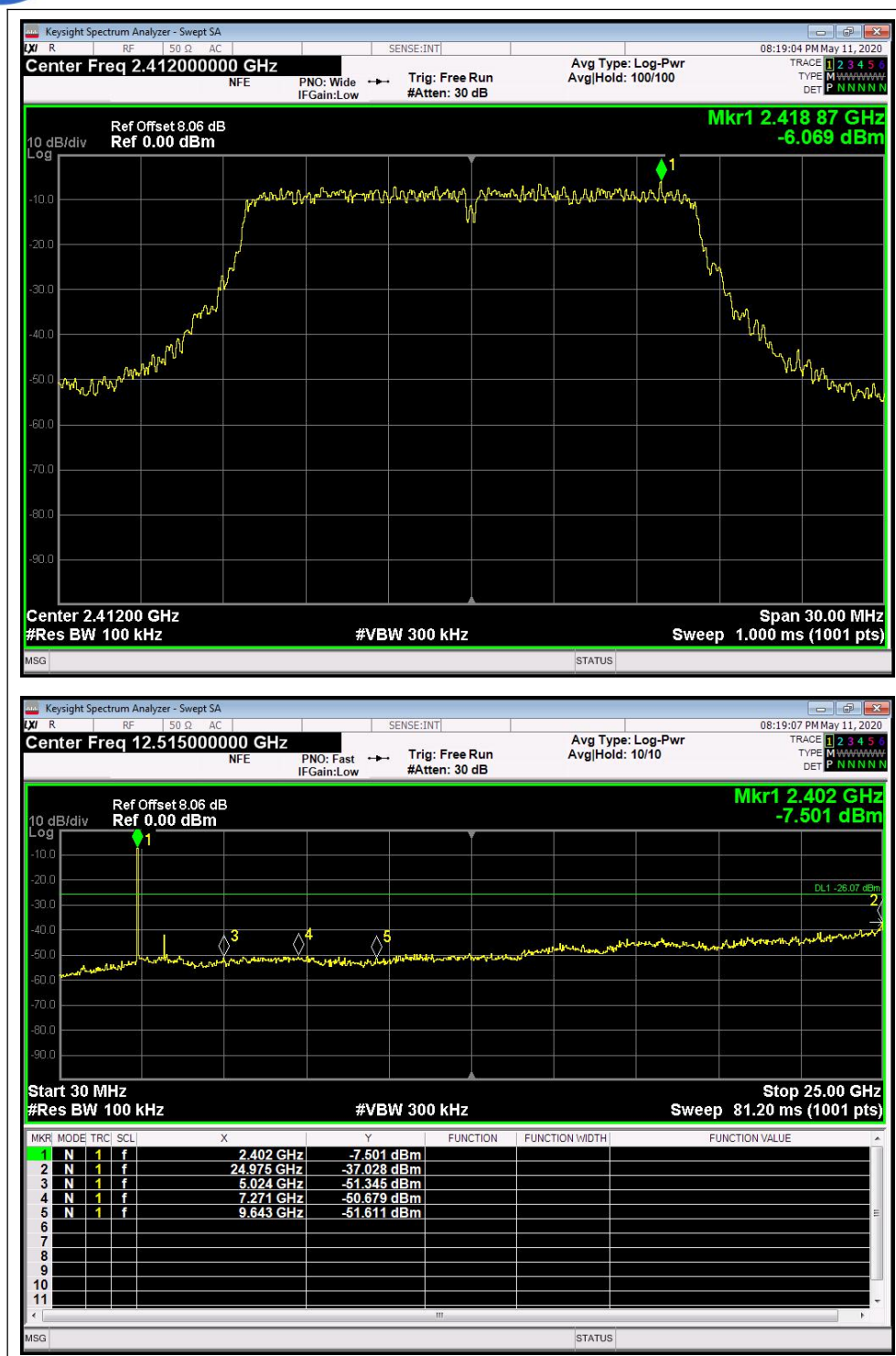
(802.11 b, Channel = 6, 30MHz to 25GHz)



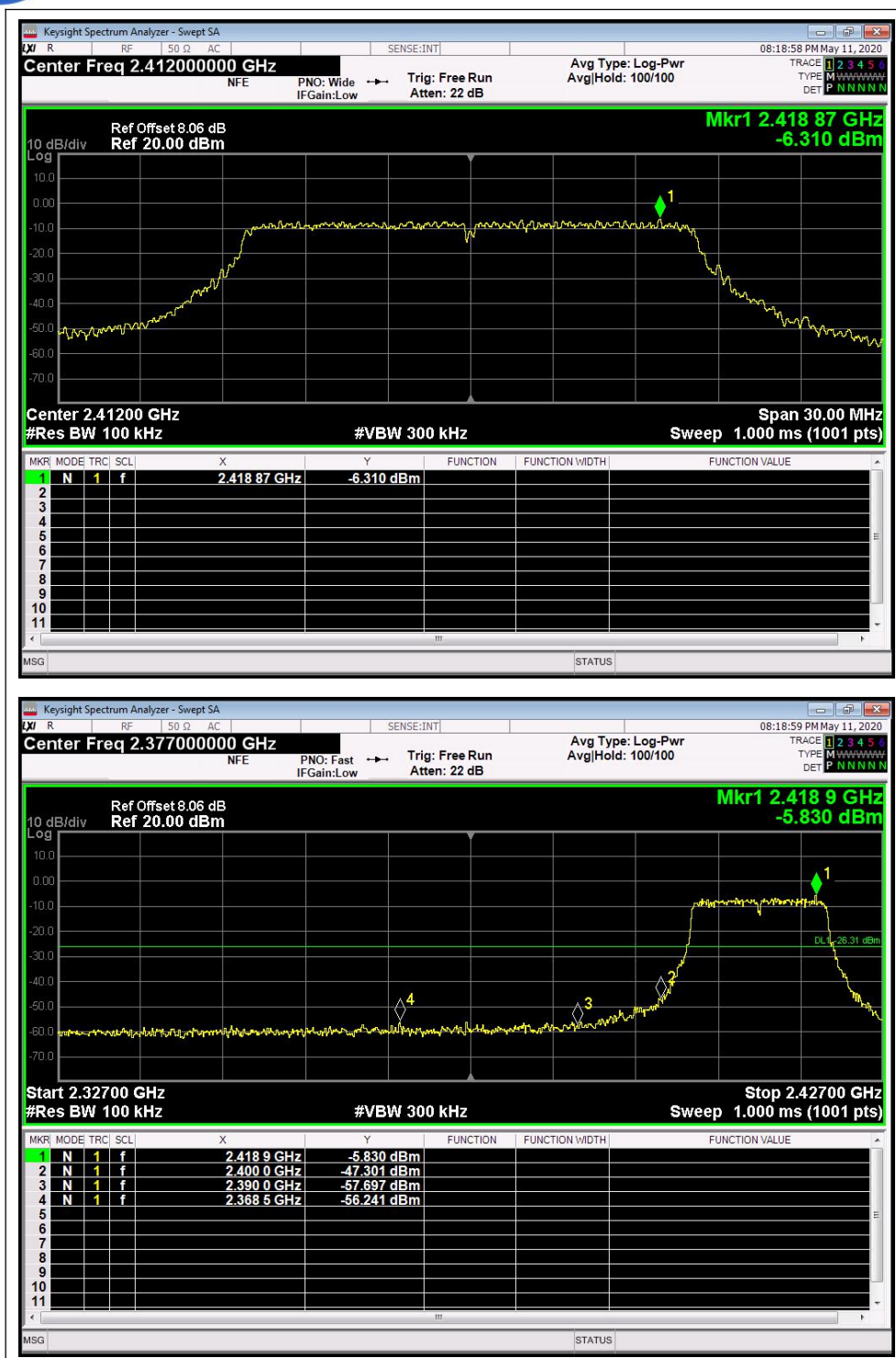
(802.11 b, Channel = 11, 30MHz to 25GHz)



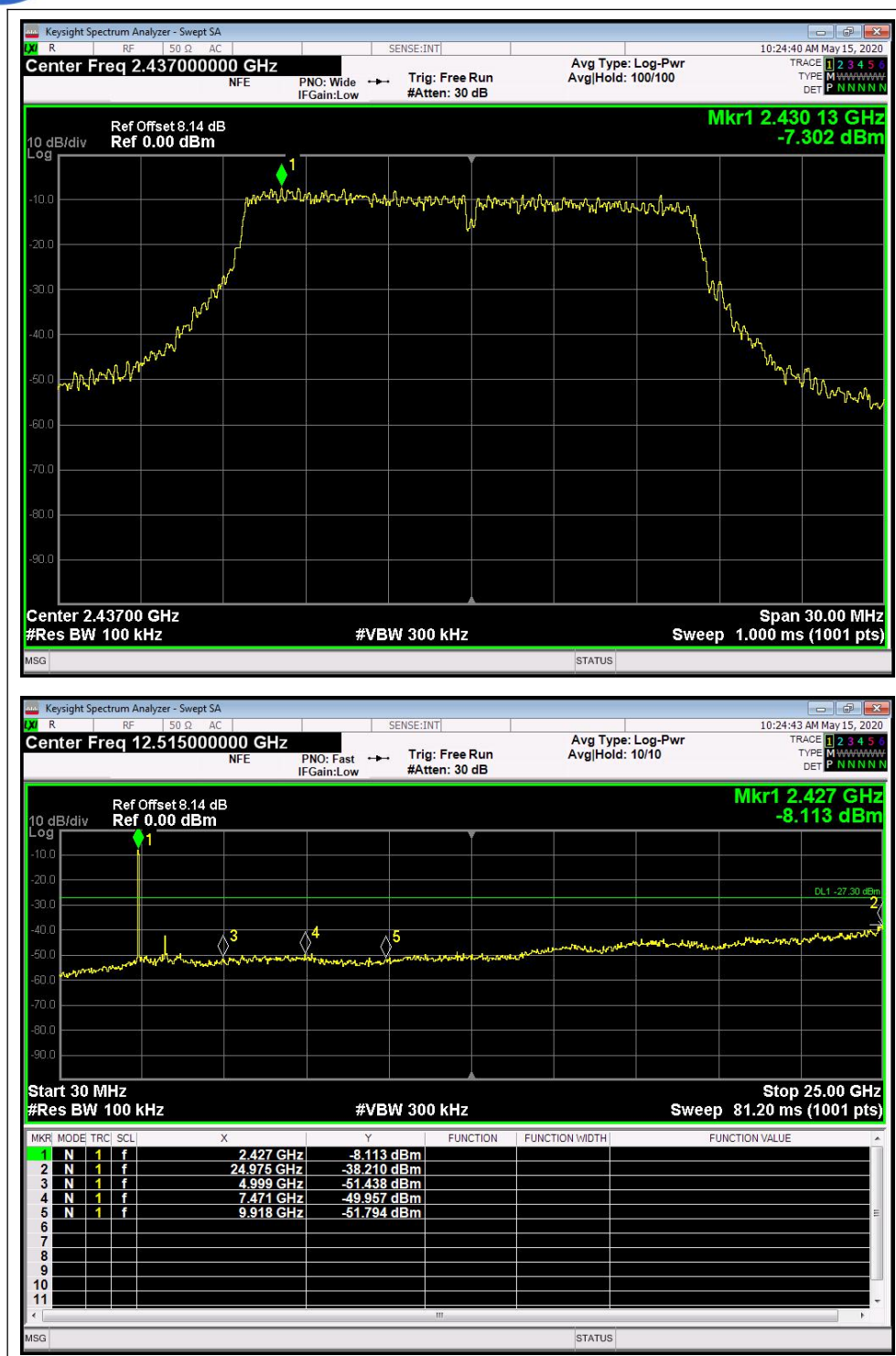
(802.11 b, Band Edge @ Channel = 11)



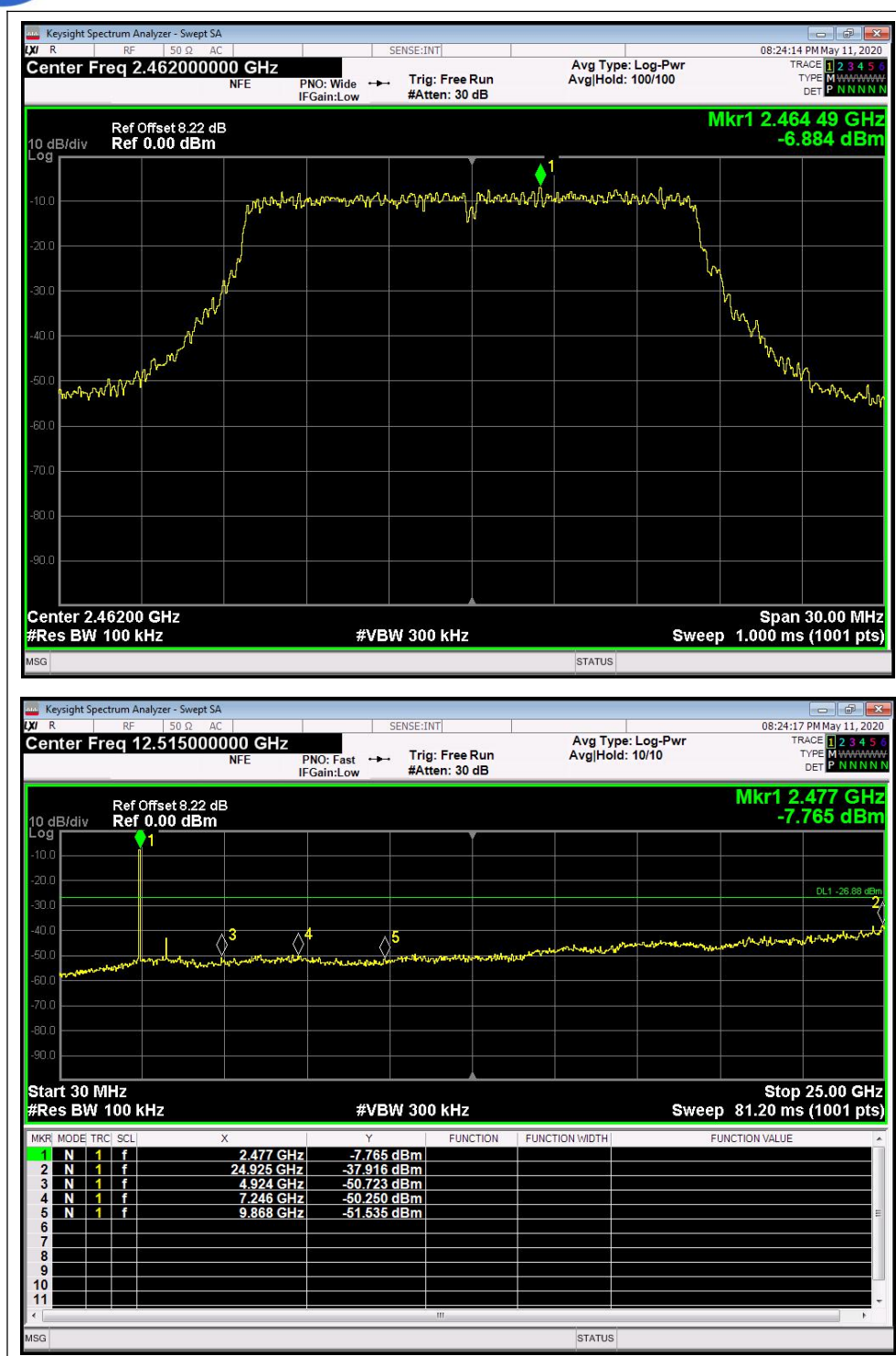
(802.11 g, Channel = 1, 30MHz to 25GHz)



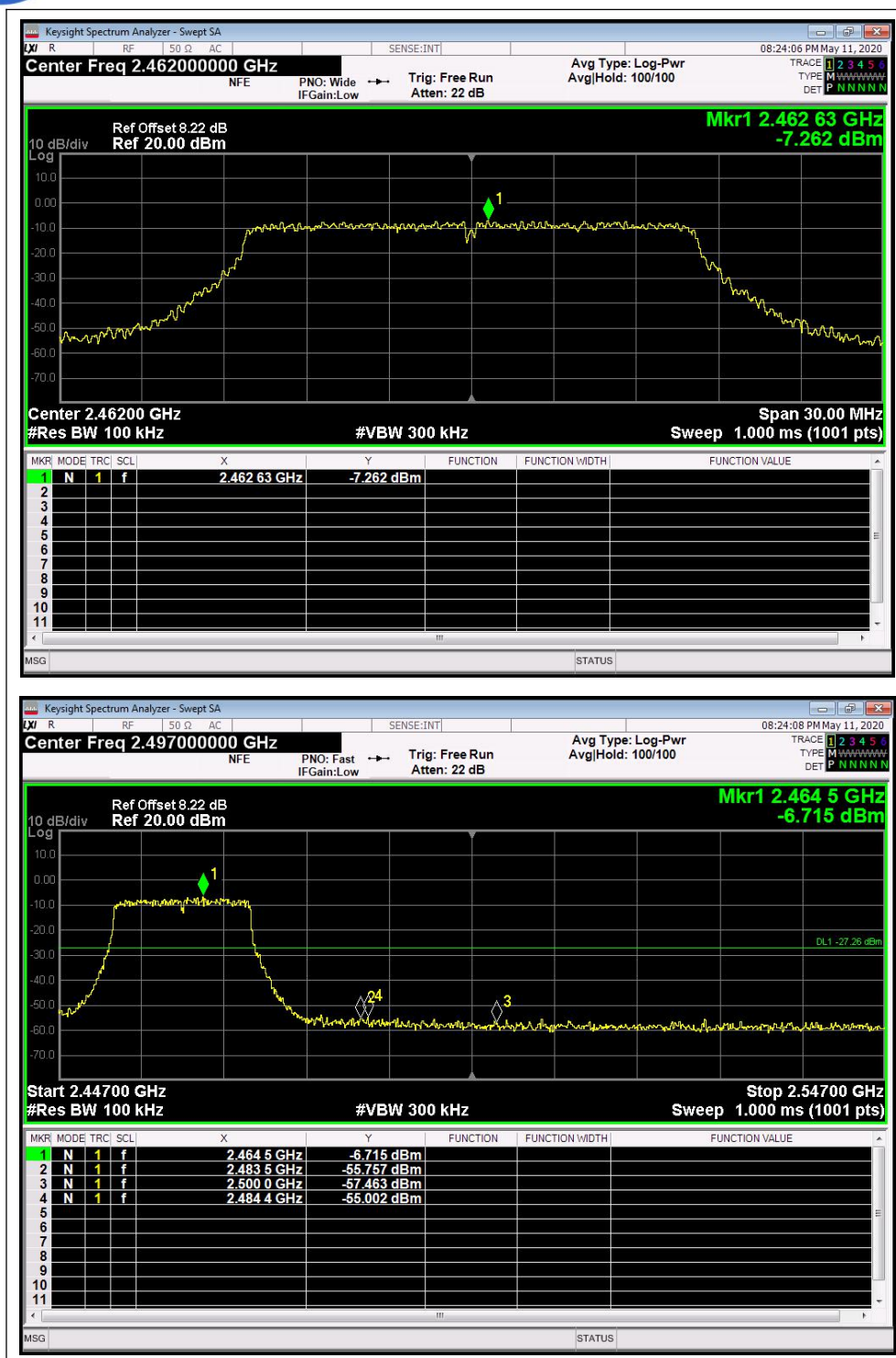
(802.11 g, Band Edge @ Channel = 1)



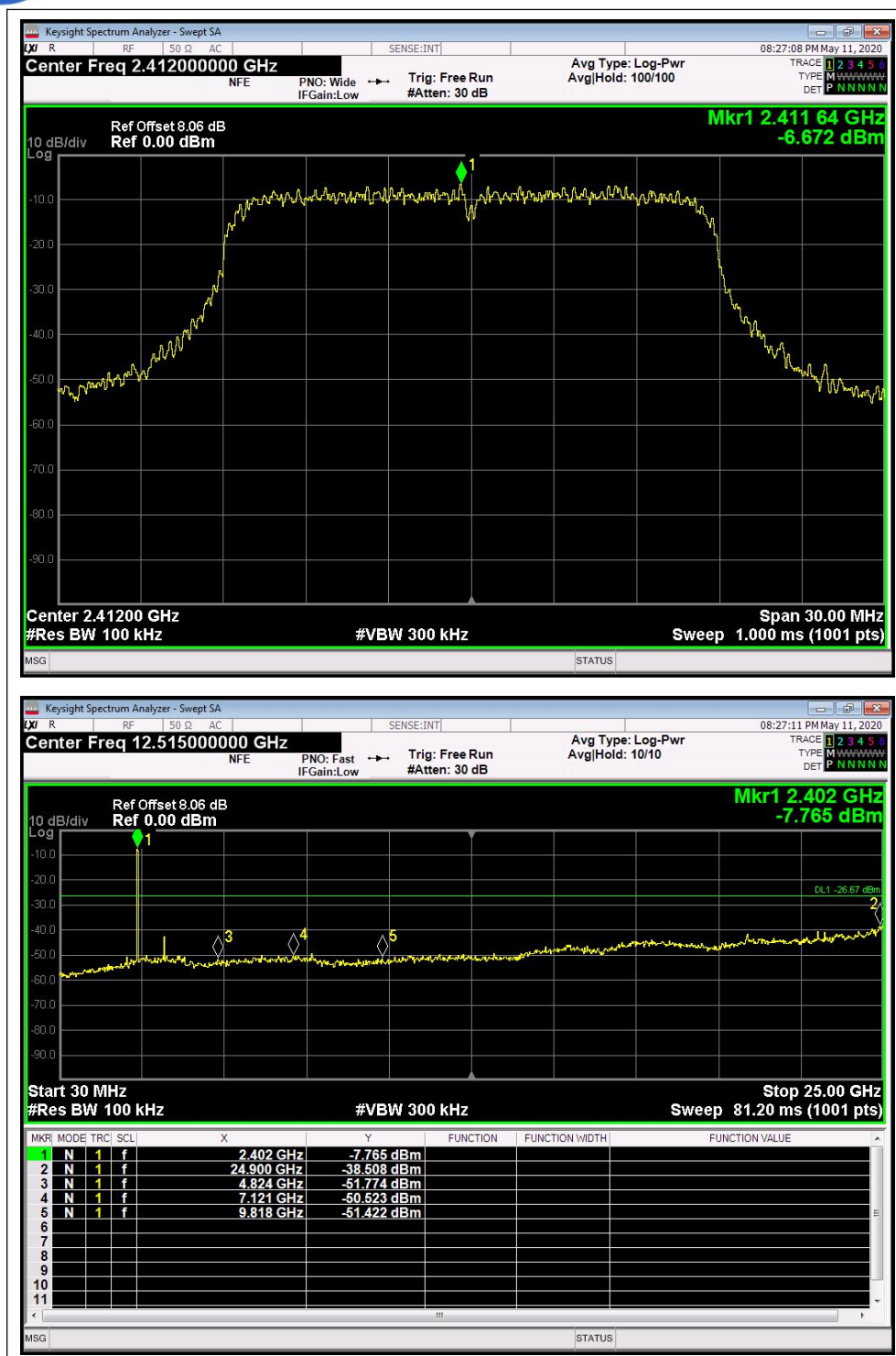
(802.11 g, Channel = 6, 30MHz to 25GHz)



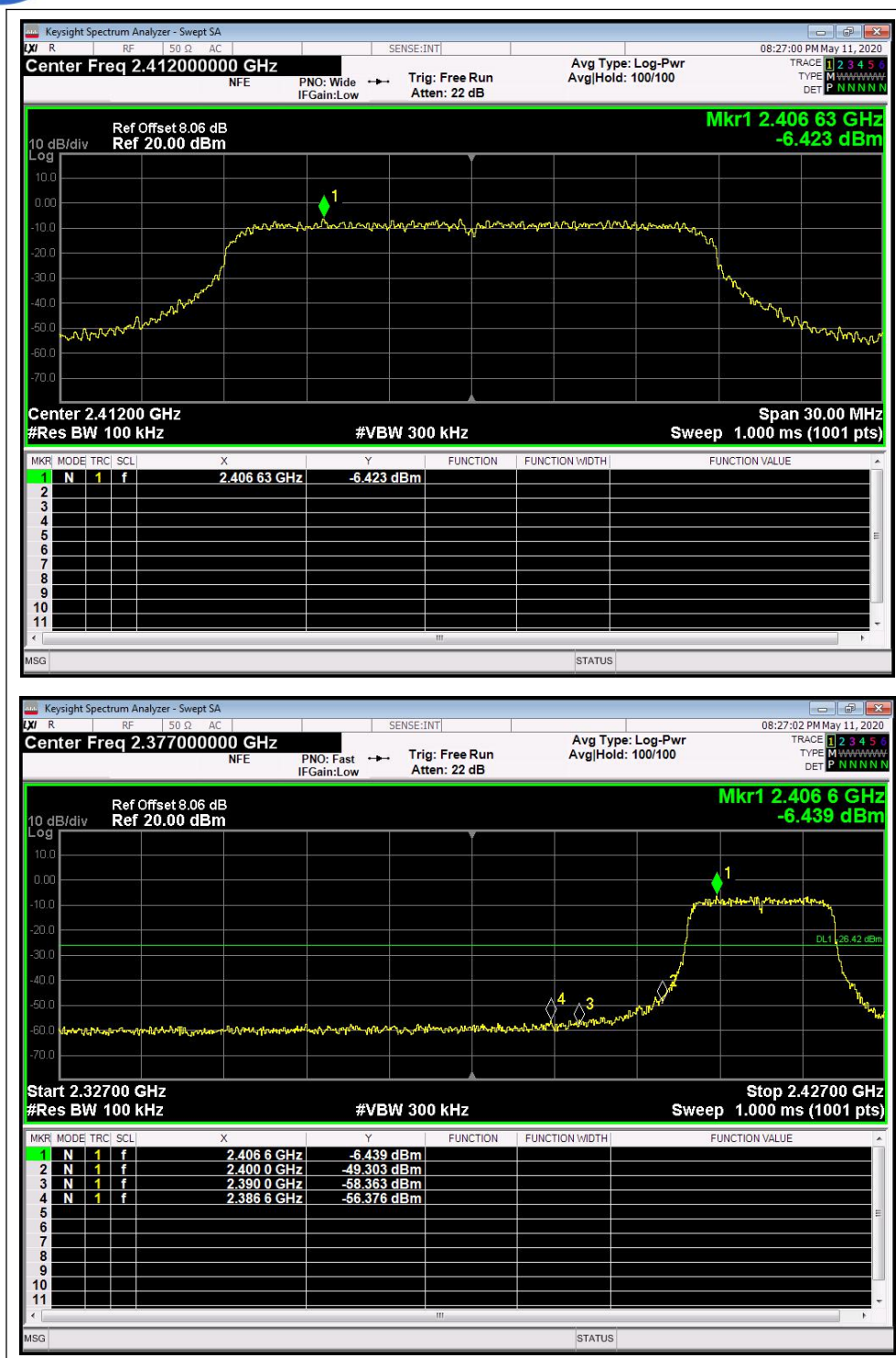
(802.11 g, Channel = 11, 30MHz to 25GHz)



(802.11 g, Band Edge @ Channel = 11)



(802.11 HT20, Channel = 1, 30MHz to 25GHz)



(802.11 HT20, Band Edge @ Channel = 1)