



# 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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# DIRECTORY

<b>1. Technical Information.....</b>	<b>4</b>
<b>1.1. Applicant and Manufacturer Information.....</b>	<b>4</b>
<b>1.2. Equipment Under Test (EUT) Description.....</b>	<b>4</b>
<b>1.3. Modulation type of EUT.....</b>	<b>5</b>
<b>1.4. Test Standards and Results.....</b>	<b>5</b>
<b>1.5. Environmental Conditions.....</b>	<b>6</b>
<b>2. 47 CFR Part 15C Requirements.....</b>	<b>6</b>
<b>2.1. Antenna requirement.....</b>	<b>6</b>
<b>2.2. Output Power.....</b>	<b>6</b>
<b>2.3. Bandwidth.....</b>	<b>8</b>
<b>2.4. Conducted Spurious Emissions and Band Edge.....</b>	<b>17</b>
<b>2.5. Power spectral density (PSD).....</b>	<b>38</b>
<b>2.6. Restricted Frequency Bands.....</b>	<b>47</b>
<b>2.7. Conducted Emission.....</b>	<b>65</b>
<b>2.8. Radiated Emission.....</b>	<b>69</b>
<b>Annex A Test Uncertainty.....</b>	<b>146</b>
<b>Annex B Testing Laboratory Information.....</b>	<b>147</b>



<b>Change History</b>		
<b>Version</b>	<b>Date</b>	<b>Reason for change</b>
1.0	2020-05-21	First edition



# 1. Technical Information

**Note:** Provide by applicant.

## 1.1. Applicant and Manufacturer Information

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

## 1.2. Equipment Under Test (EUT) Description

<b>Product Name:</b>	Hatch Restore
<b>Serial No:</b>	(N/A, marked #1 by test site)
<b>Hardware Version:</b>	30-HBW24F
<b>Software Version:</b>	N/A
<b>Modulation Type:</b>	OFDM,DSSS
<b>Operating Frequency Range:</b>	802.11b/g/n-20MHz: 2.412GHz - 2.462GHz 802.11n-40MHz: 2.422GHz - 2.452GHz
<b>Channel Number:</b>	802.11b/g/n-20MHz: 11 802.11n-40MHz: 7
<b>Antenna Type:</b>	PIFA Antenna
<b>Antenna Gain:</b>	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	<b>1</b>	1MHz
	DQPSK	2	
	CCK	5.5/ 11	1.375MHz
OFDM (802.11g)	BPSK	<b>6 / 9</b>	1MHz
	QPSK	12 / 18	
	16QAM	24 / 36	
	64QAM	48 / 54	
OFDM (802.11n-20MHz)	BPSK	<b>6.5</b>	1MHz
	QPSK	13/19.5	
	16QAM	26/39	
	64QAM	52/58.5/65	
OFDM (802.11n-40MHz)	BPSK	<b>13.5</b>	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	<b>PASS</b>
3	15.247(a)	Bandwidth	May 11, 2020	Elvis Wang	<b>PASS</b>
4	15.247(d)	Conducted Spurious Emission and Band Edge	May 11, 2020	Elvis Wang	<b>PASS</b>
5	15.247(e)	Power spectral density (PSD)	May 11, 2020	Elvis Wang	<b>PASS</b>



6	15.247(d)	Restricted Frequency Bands	May 12, 2020	Yaming Luo	<b><u>PASS</u></b>
7	15.207	Conducted Emission	May 13, 2020	Yaming Luo	<b><u>PASS</u></b>
8	15.209, 15.247(d)	Radiated Emission	May 15, 2020	Yaming Luo	<b><u>PASS</u></b>

**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 <sub>on</sub> (ms)	T <sub>(on+off)</sub> (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	<b>PASS</b>
	6	2437	14.06	0.025			<b>PASS</b>

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

**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).

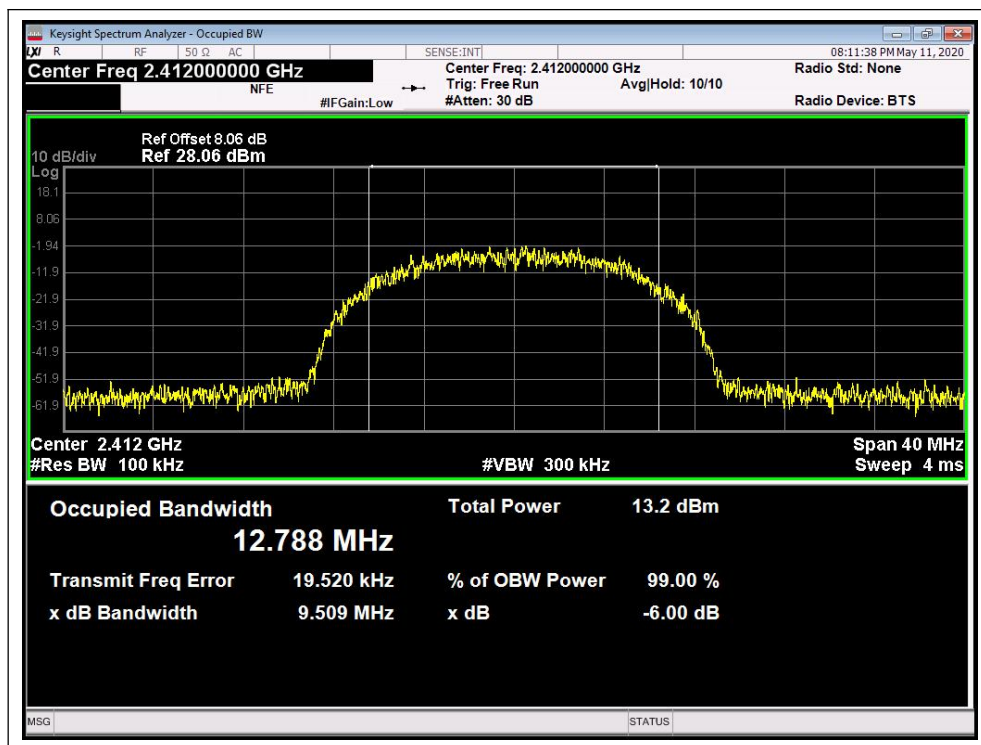
**2.3.3. Test Result**

**802.11b Test mode**

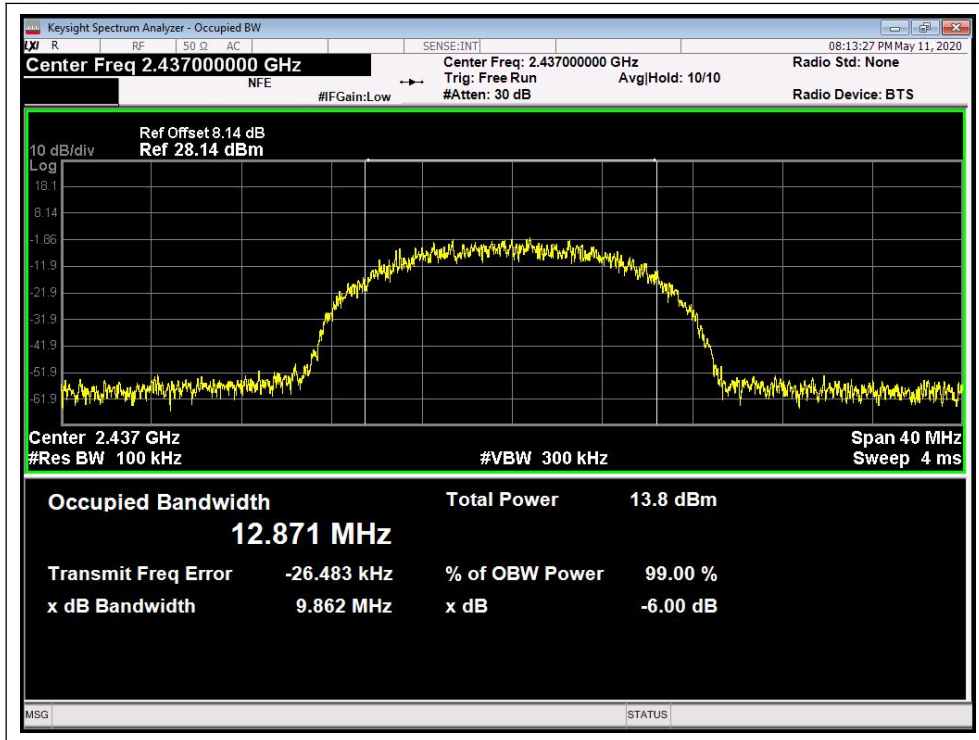
**A. Test Verdict:**

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

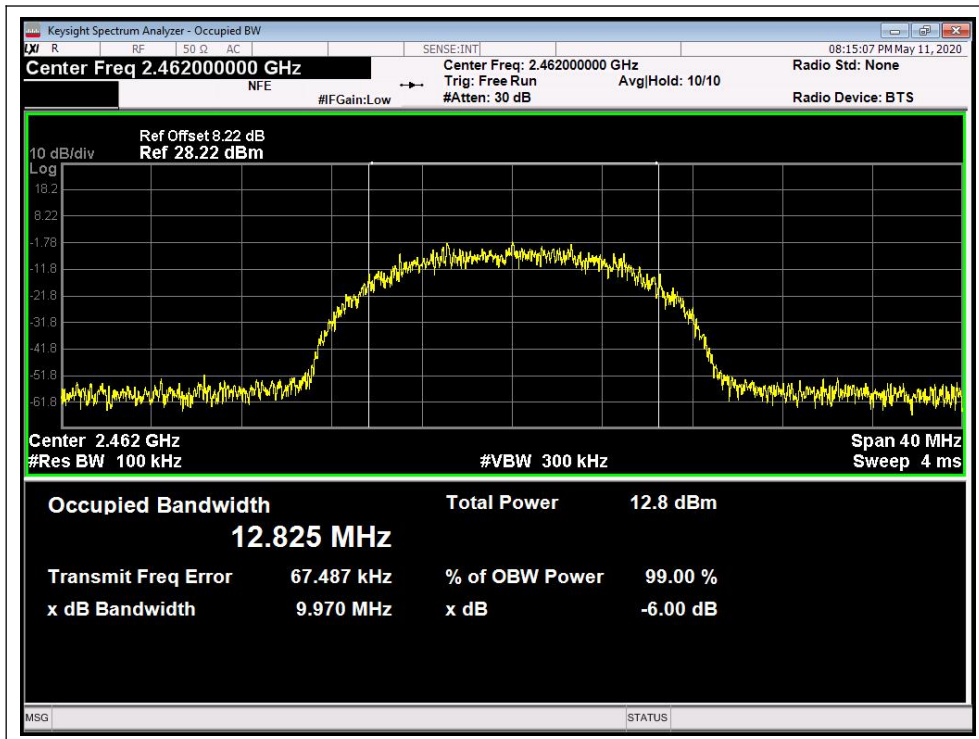
**B. Test Plots**



(Channel 1, 2412MHz, 802.11b)



(Channel 6, 2437 MHz, 802.11b)



(Channel 11, 2462MHz, 802.11b)

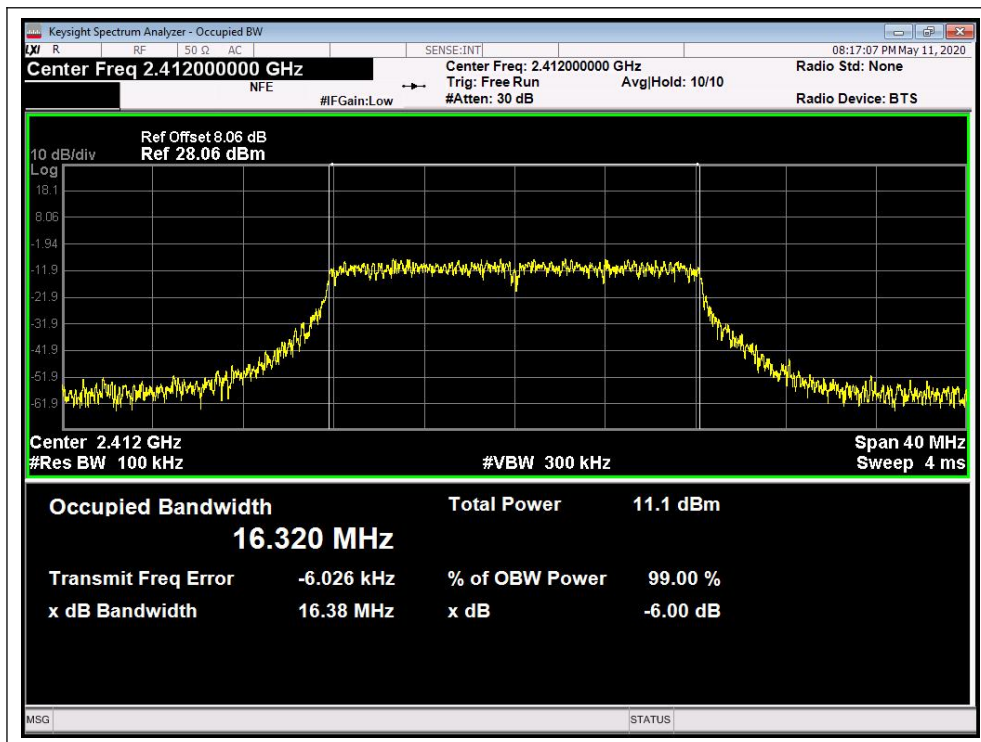


**802.11g Test mode**

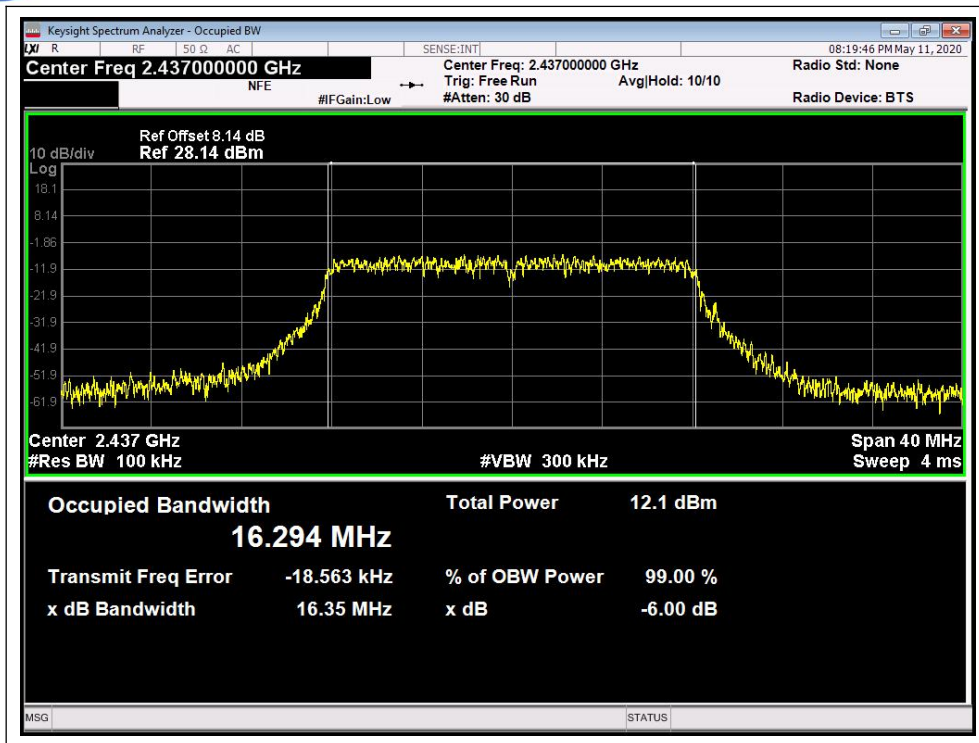
**A. Test Verdict:**

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

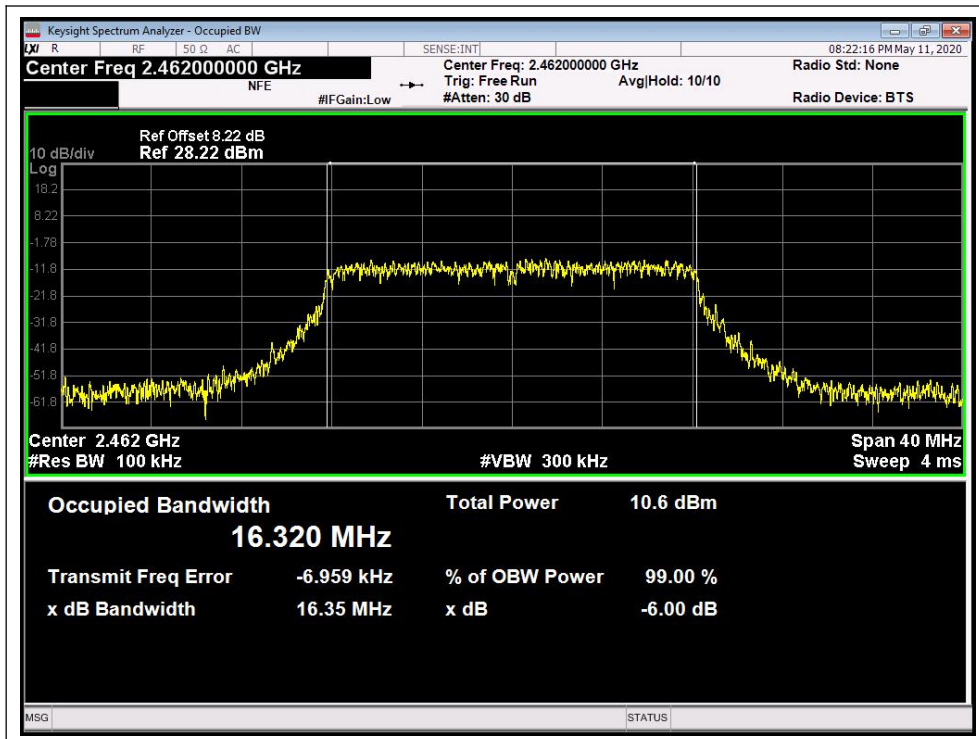
**B. Test Plots:**



(Channel 1, 2412MHz, 802.11g)



(Channel 6, 2437MHz, 802.11g)



(Channel 11, 2462MHz, 802.11g)

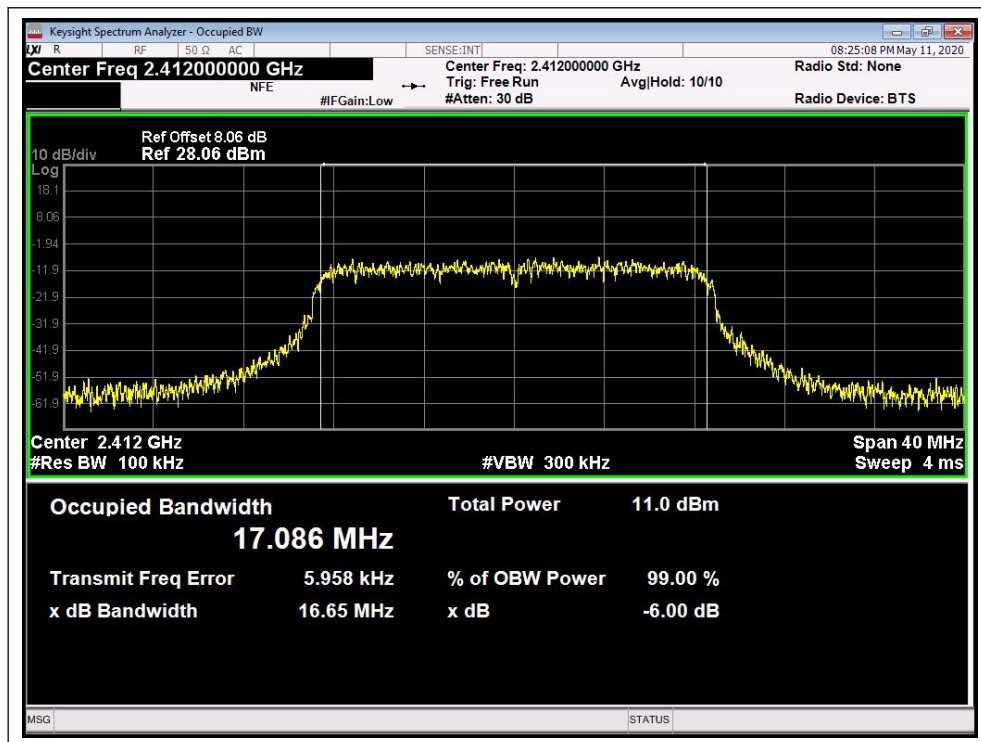


**802.11n-20 Test mode**

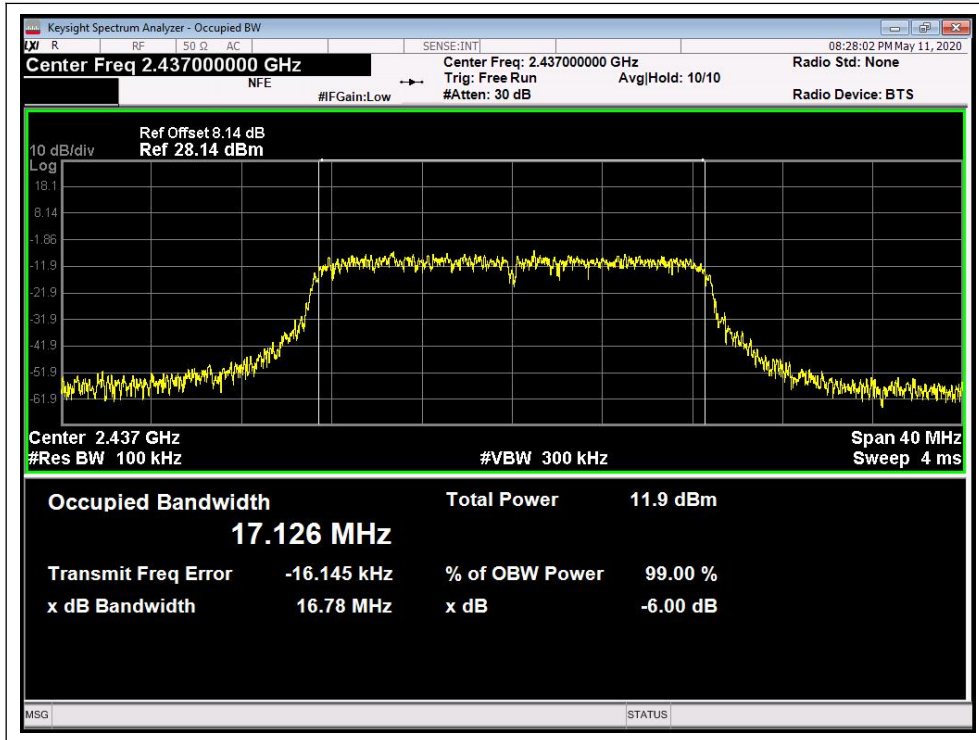
**A. Test Verdict:**

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

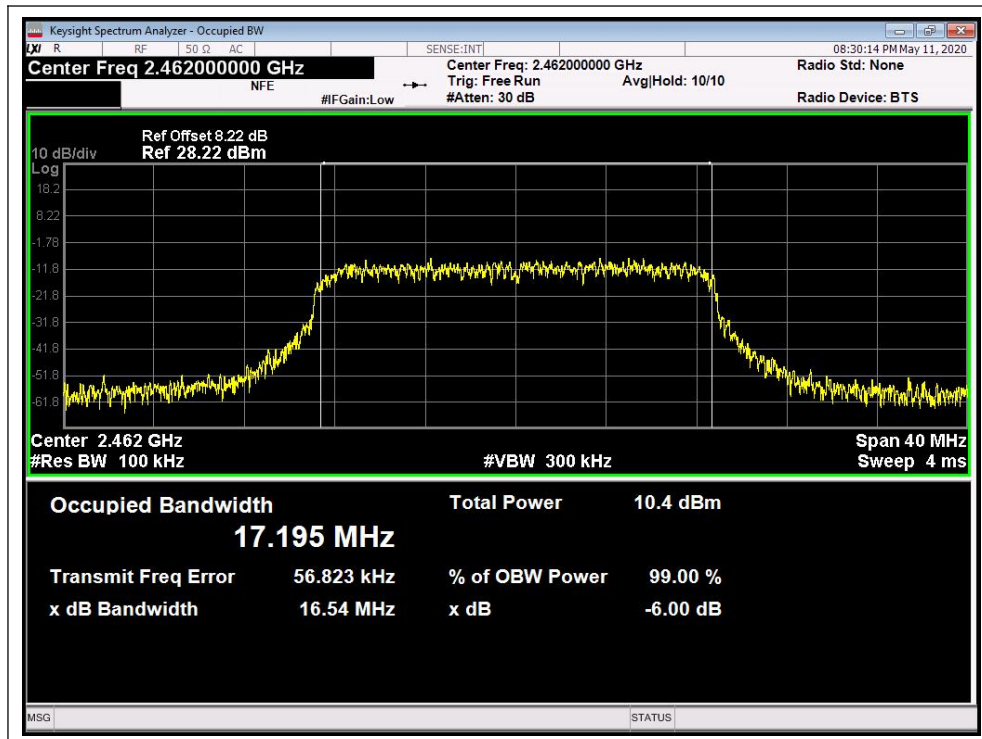
**B. Test Plots:**



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



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



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

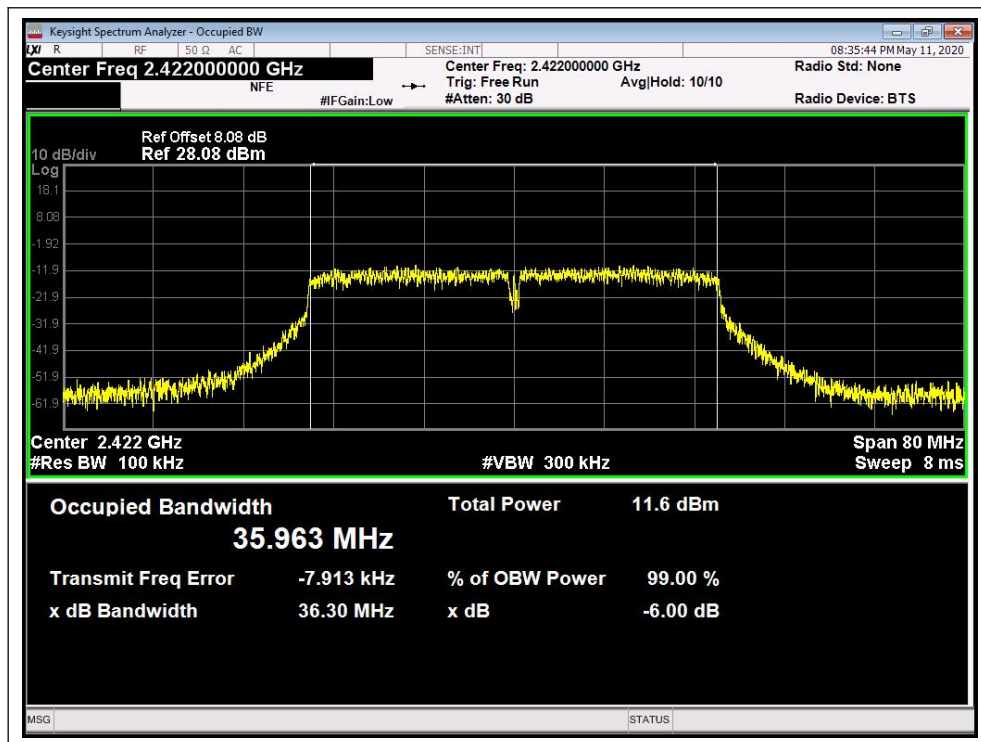


**802.11n-40 Test mode**

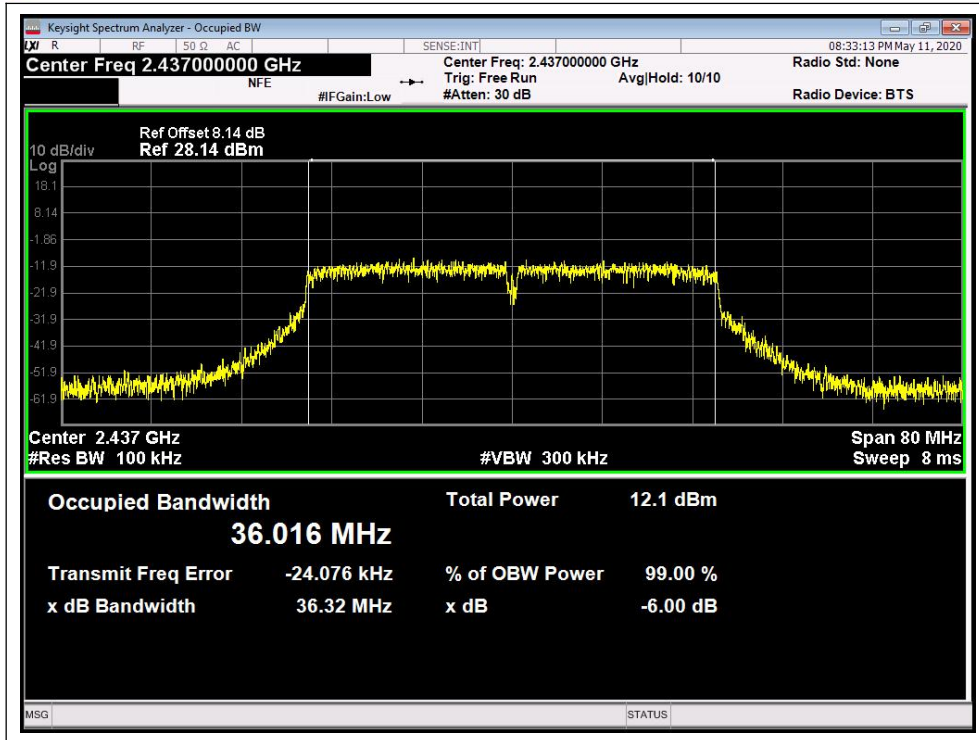
**A. Test Verdict:**

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

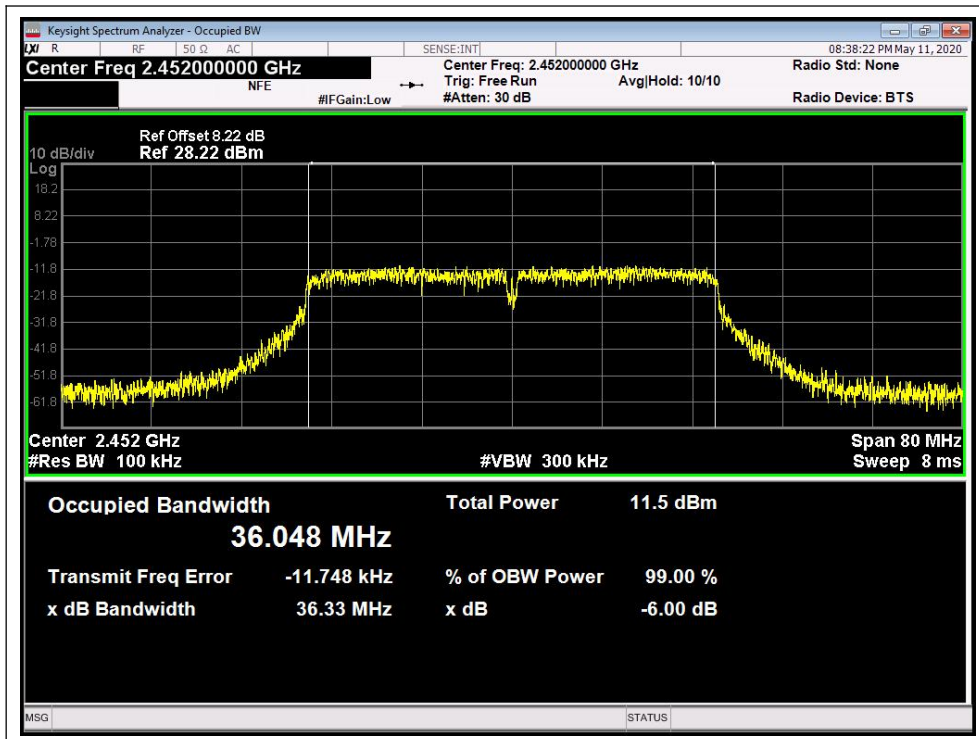
**B. Test Plots:**



(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.

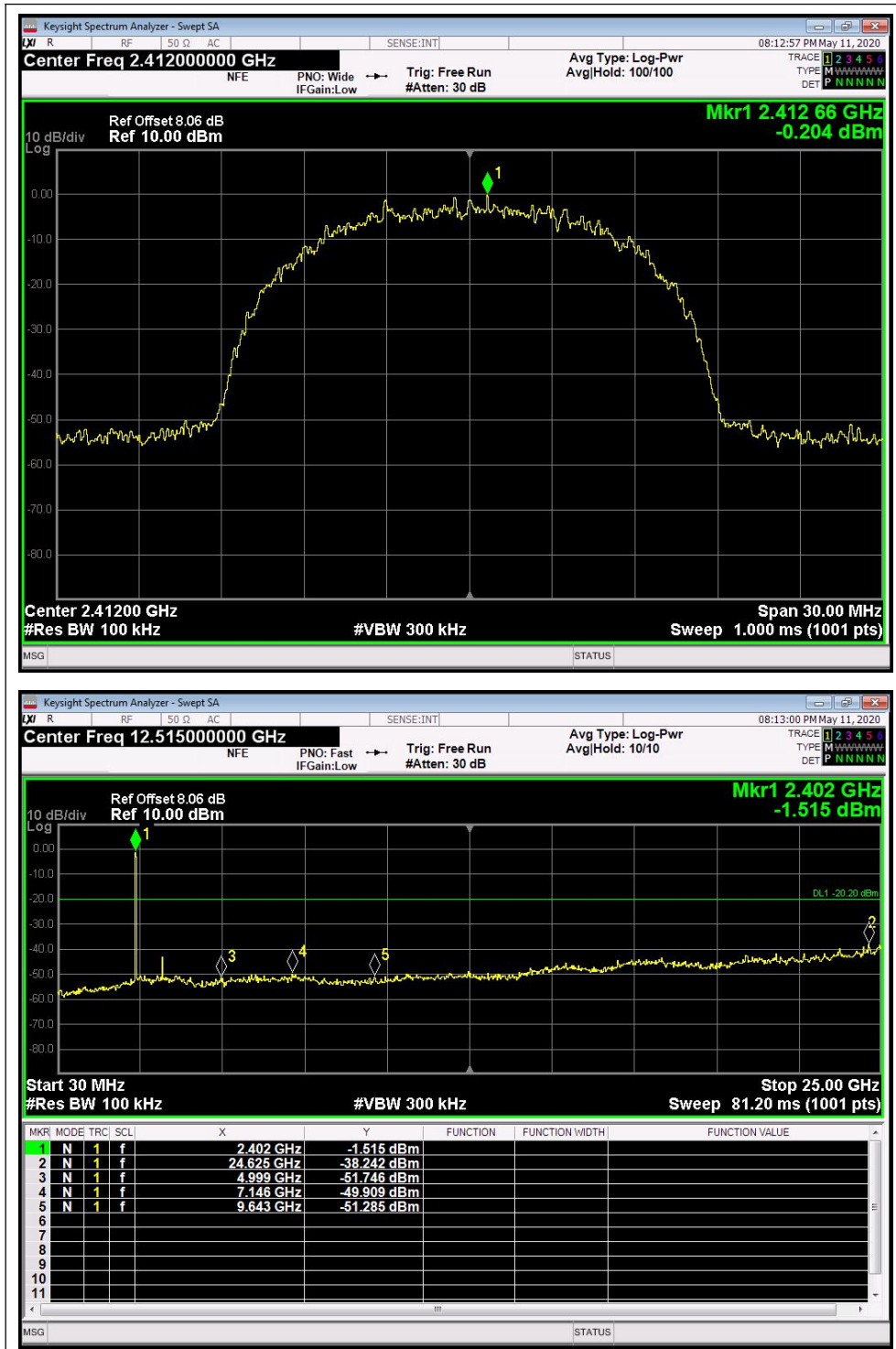
KDB 558074 D01 v05r02 Section 11.0 was used in order to prove compliance.

#### B. Equipments List:

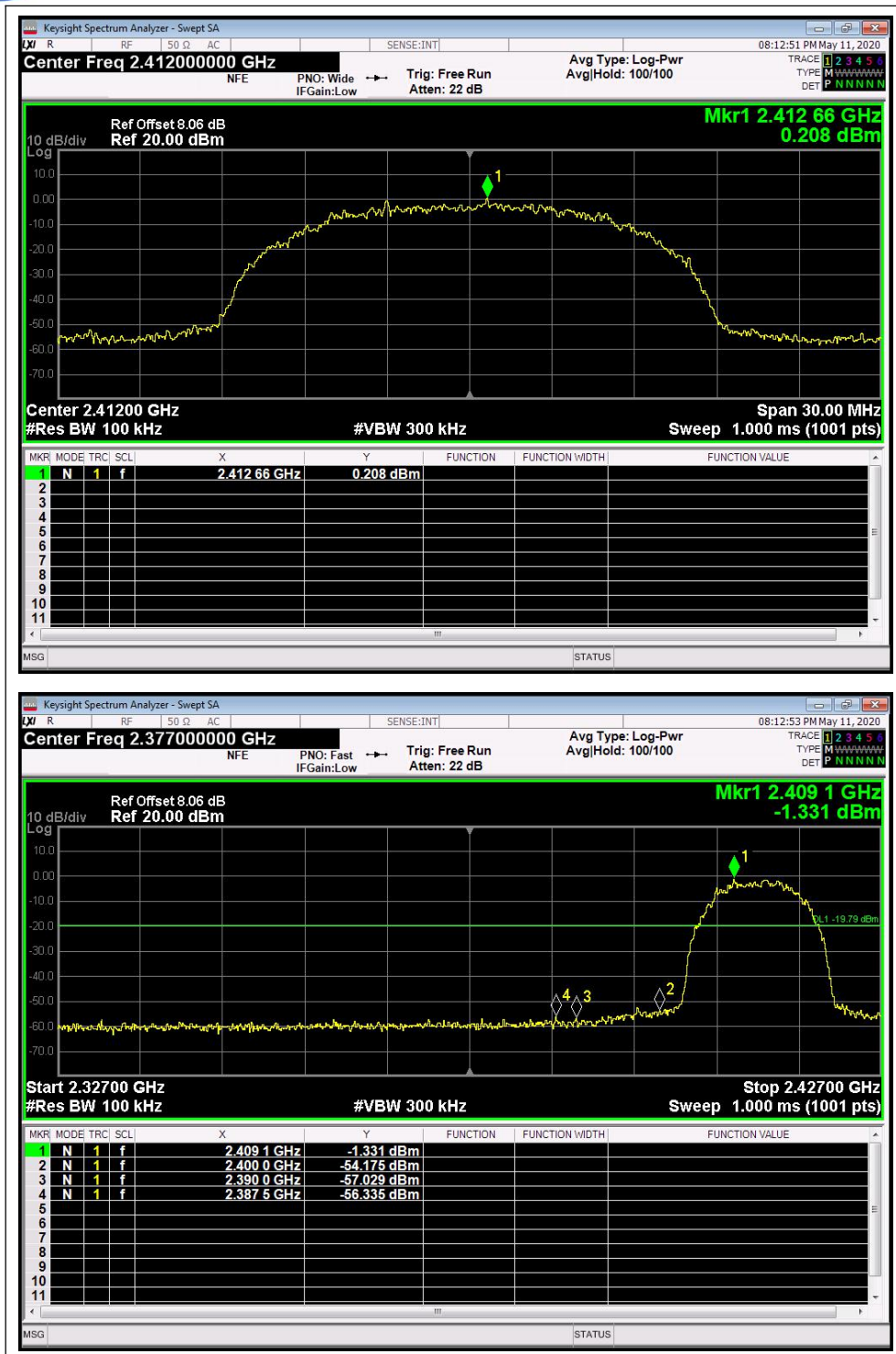
Please refer ANNEX B(4).



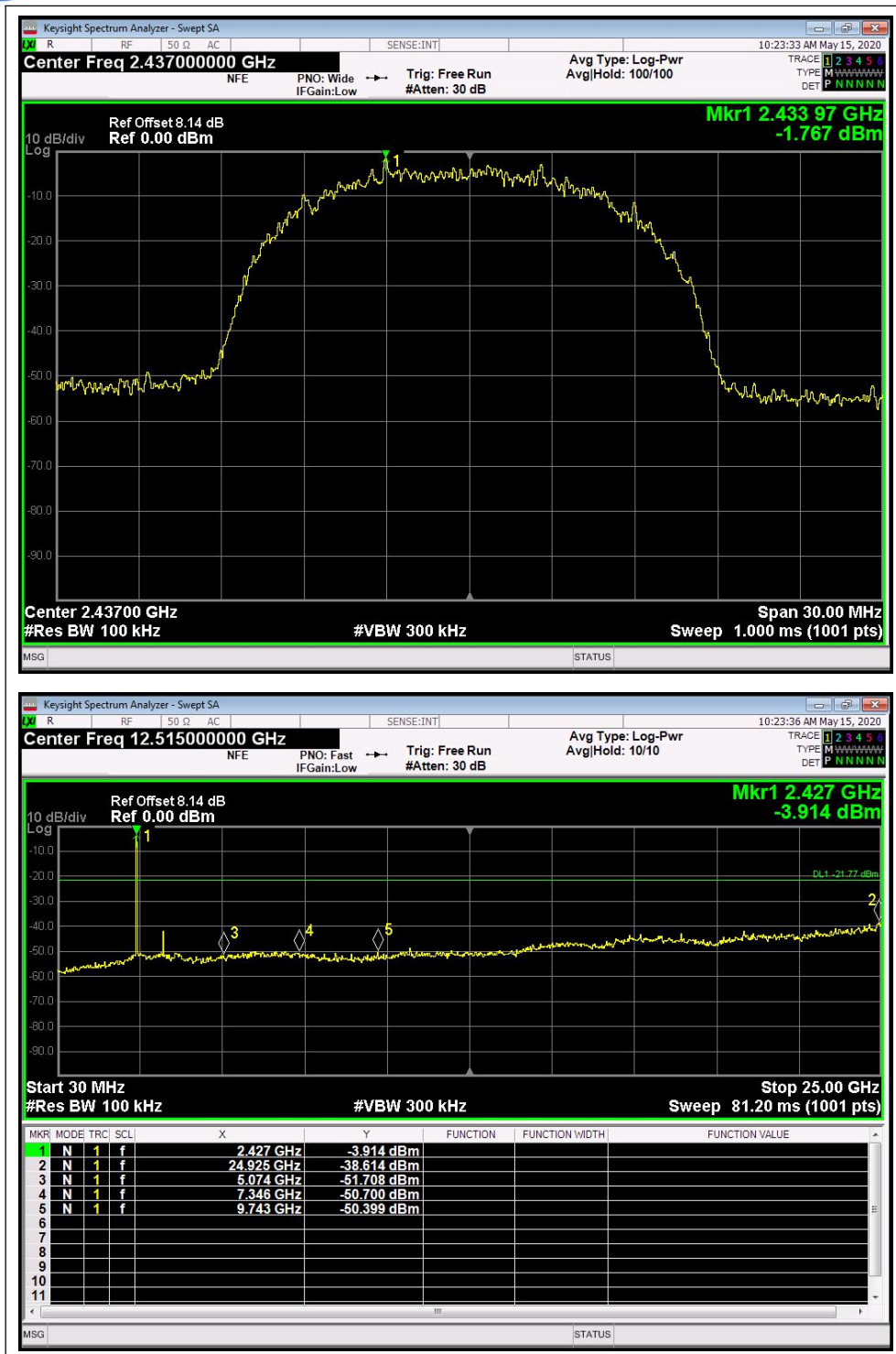
2.4.3. Test Result



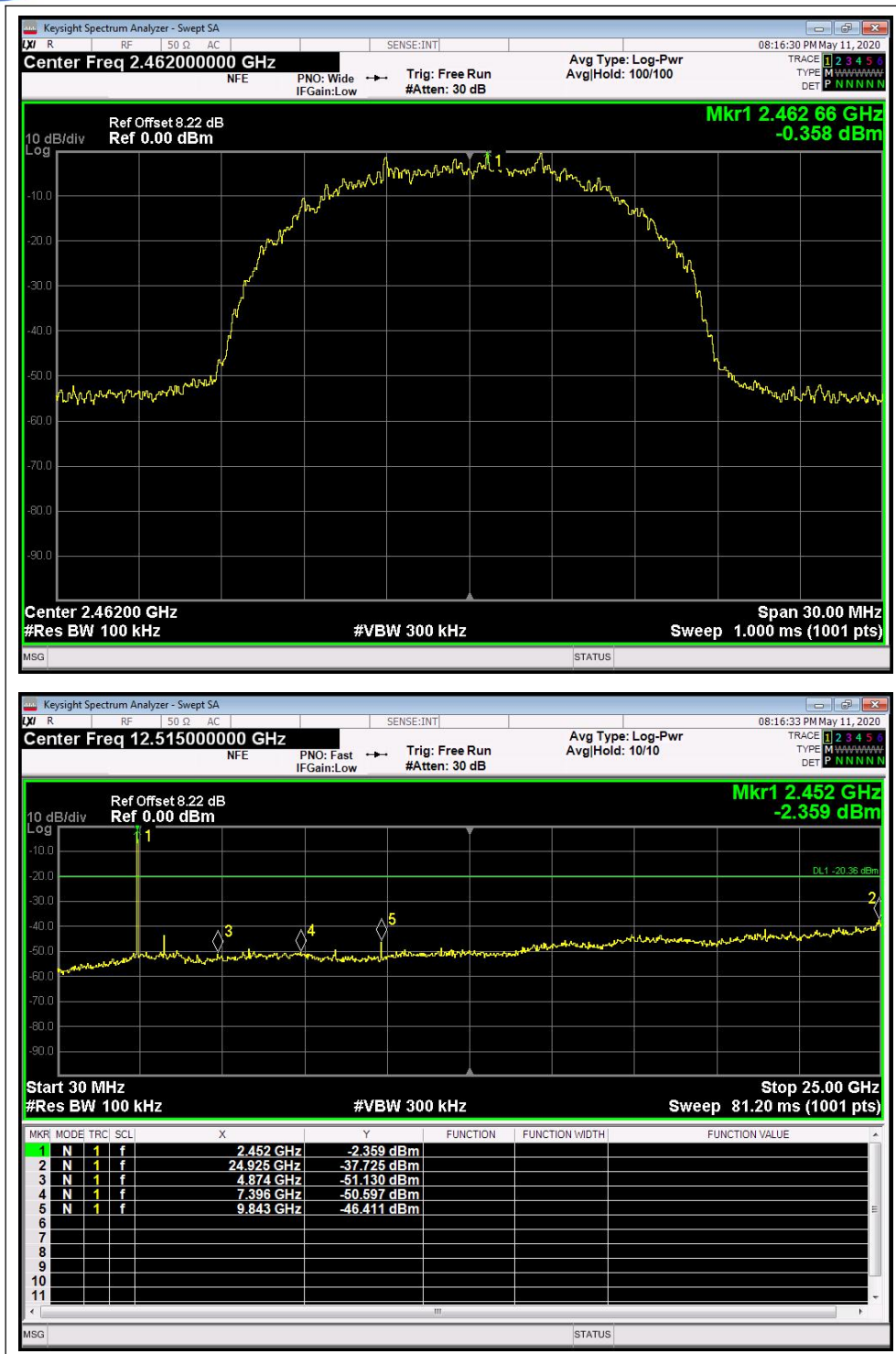
(802.11 b, Channel = 1, 30MHz to 25GHz)



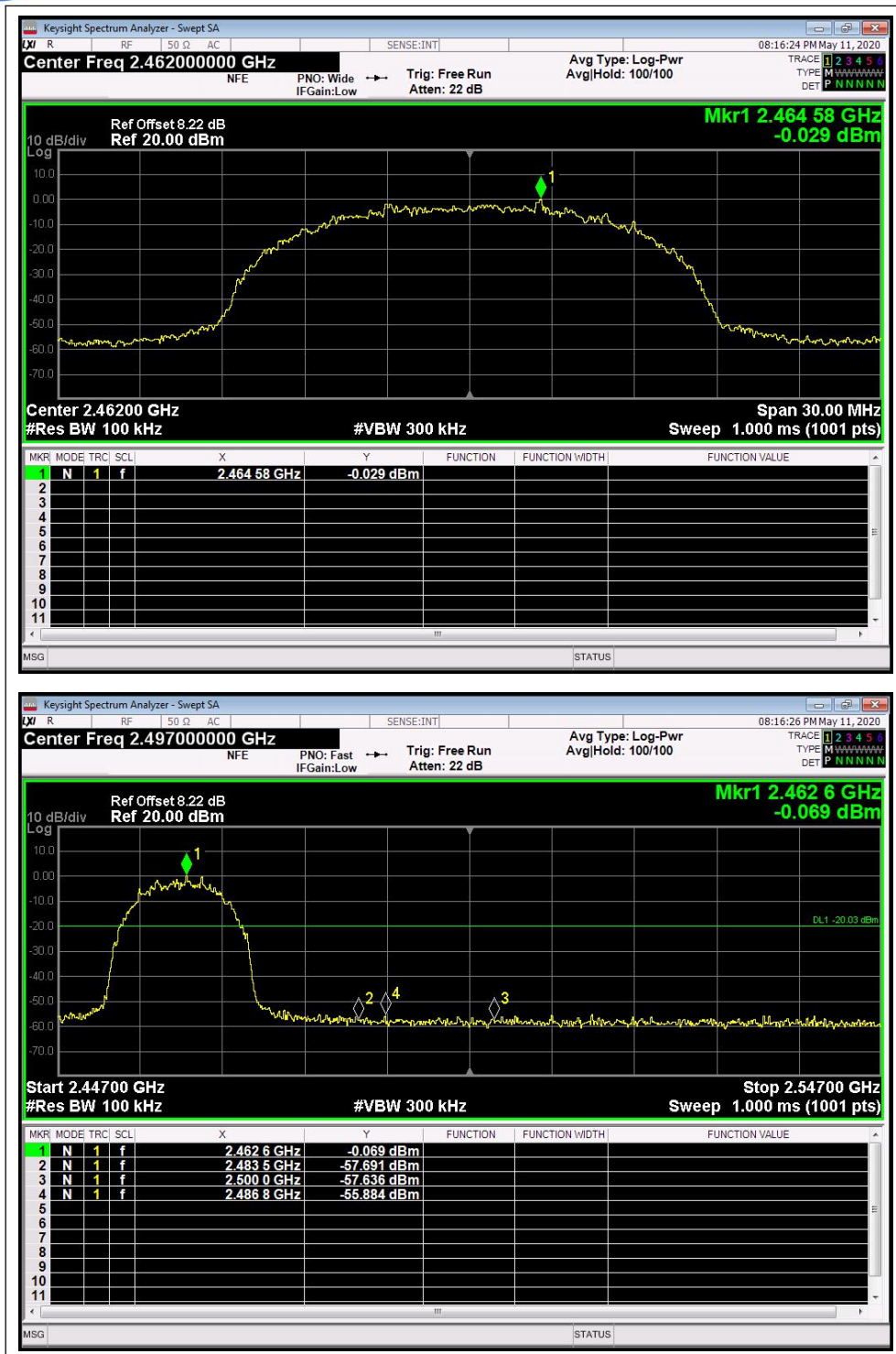
(802.11 b, Band Edge @ Channel = 1)



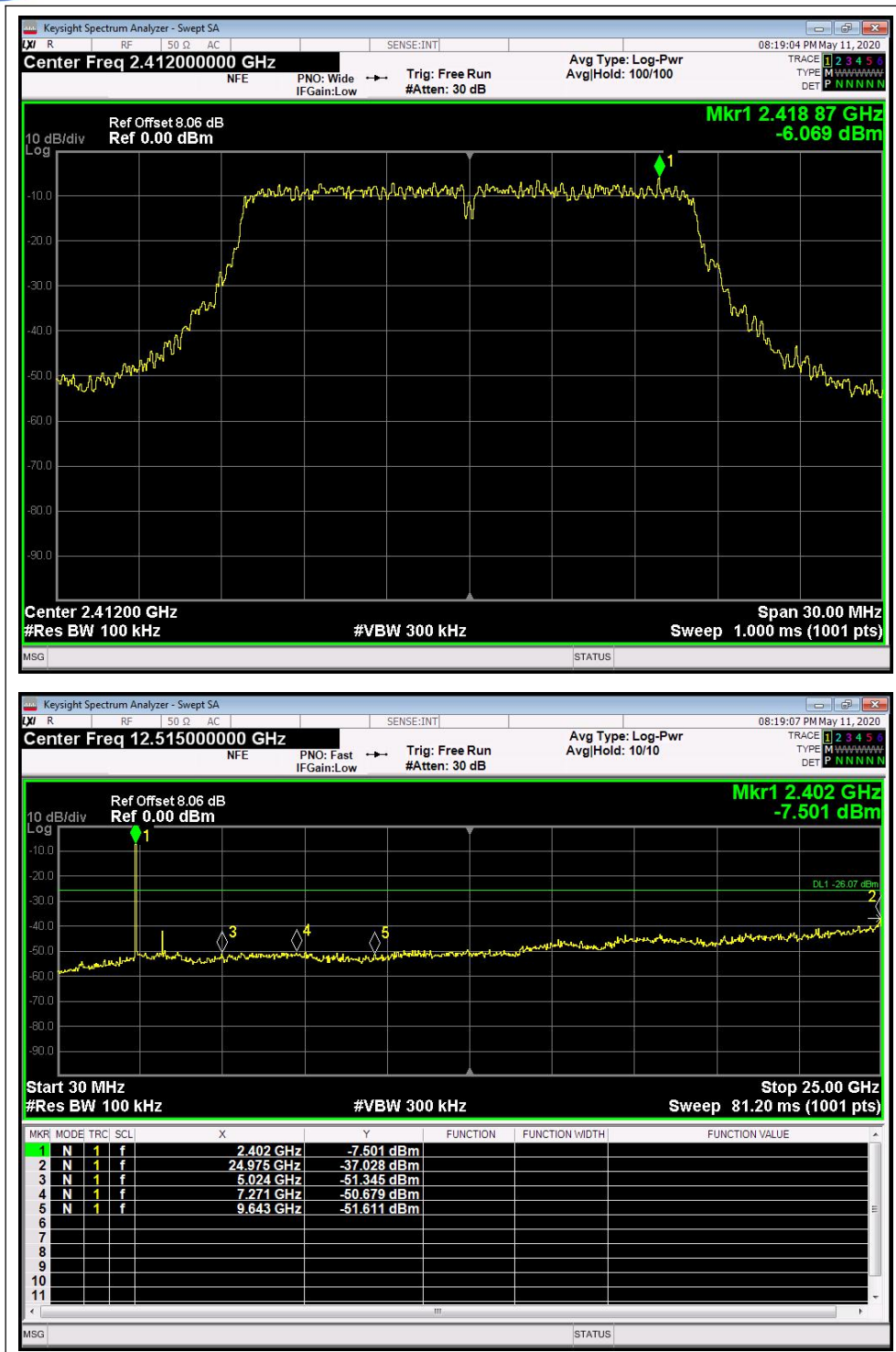
(802.11 b, Channel = 6, 30MHz to 25GHz)



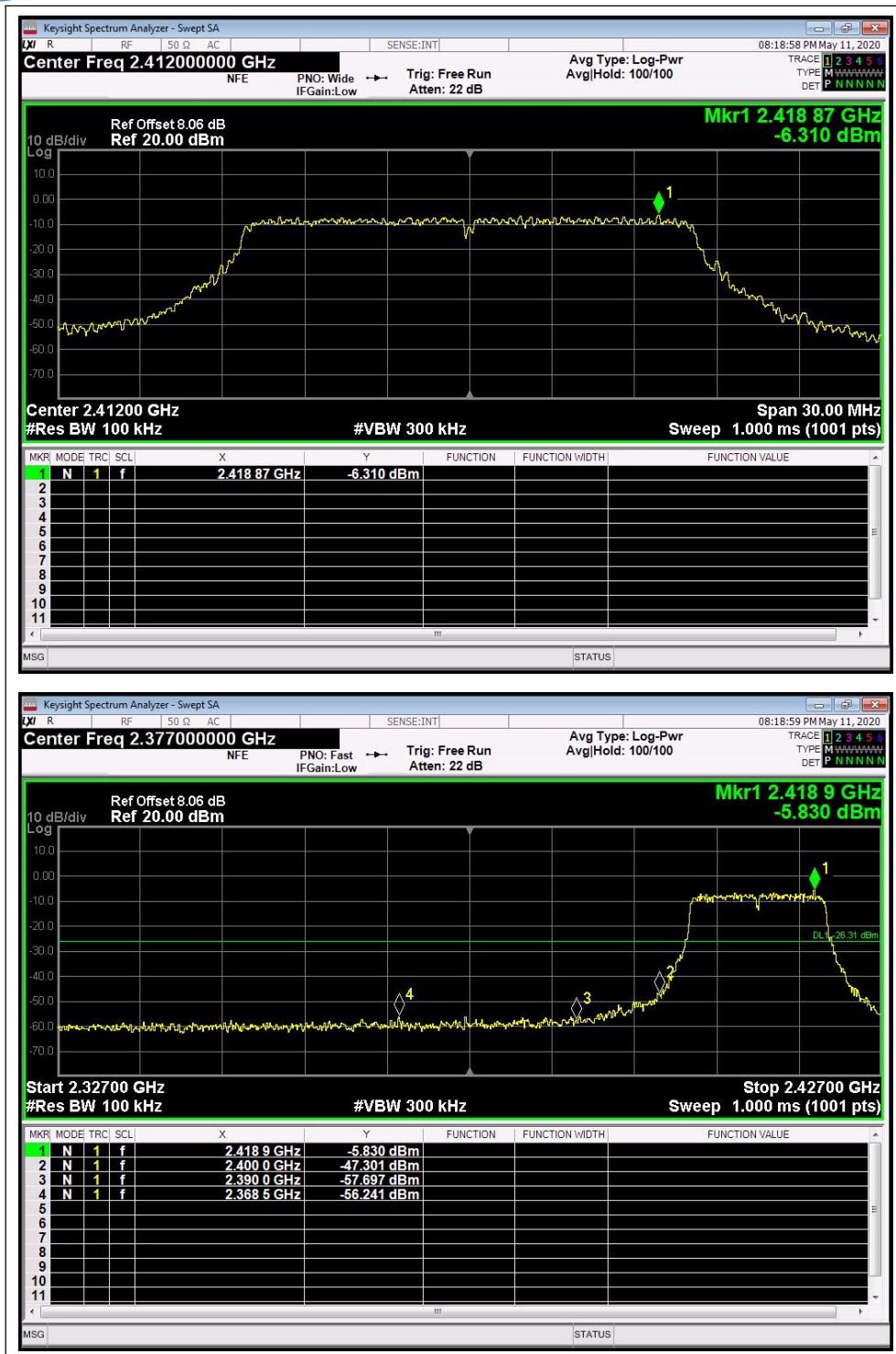
(802.11 b, Channel = 11, 30MHz to 25GHz)



(802.11 b, Band Edge @ Channel = 11)

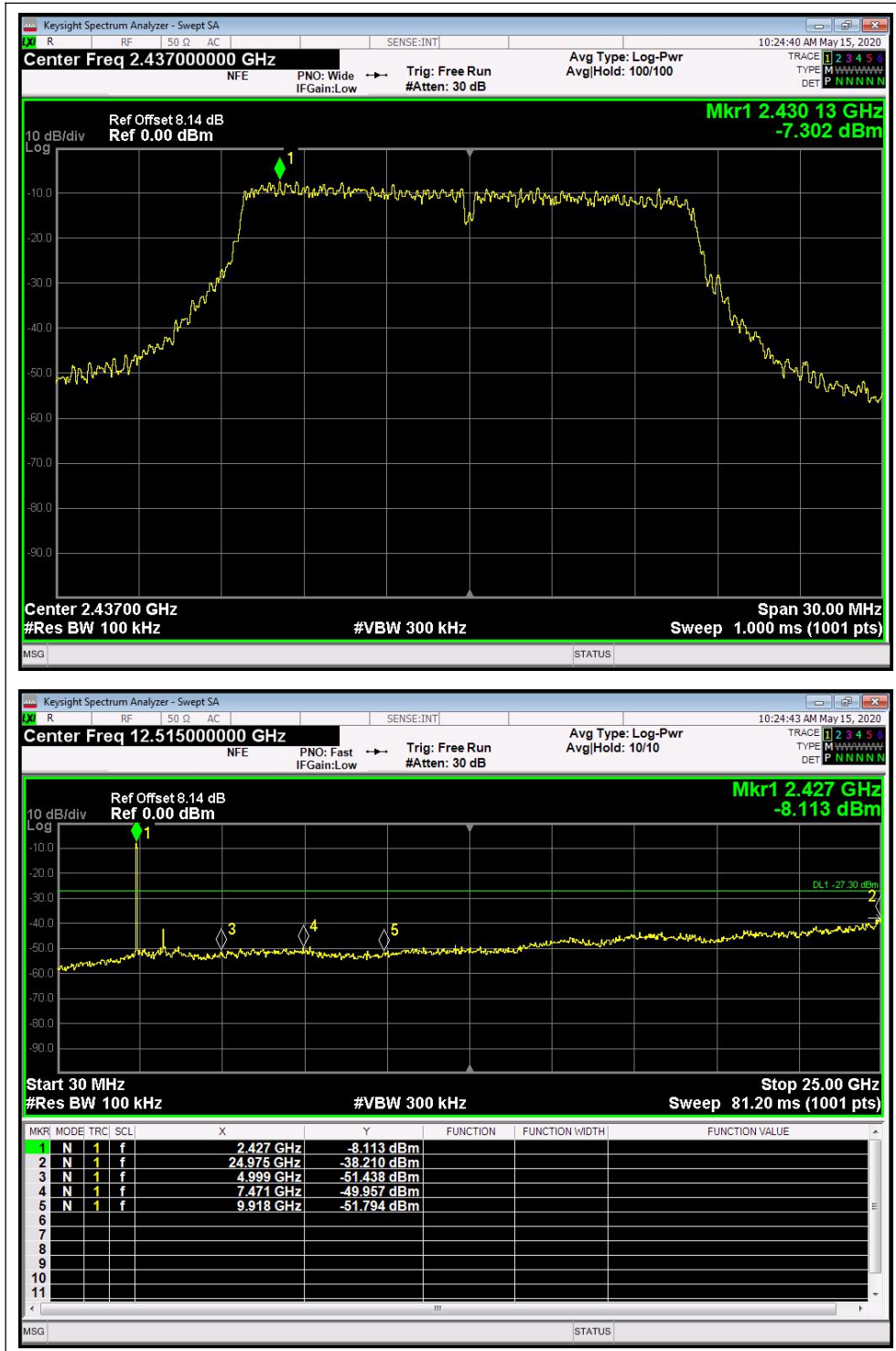


(802.11 g, Channel = 1, 30MHz to 25GHz)

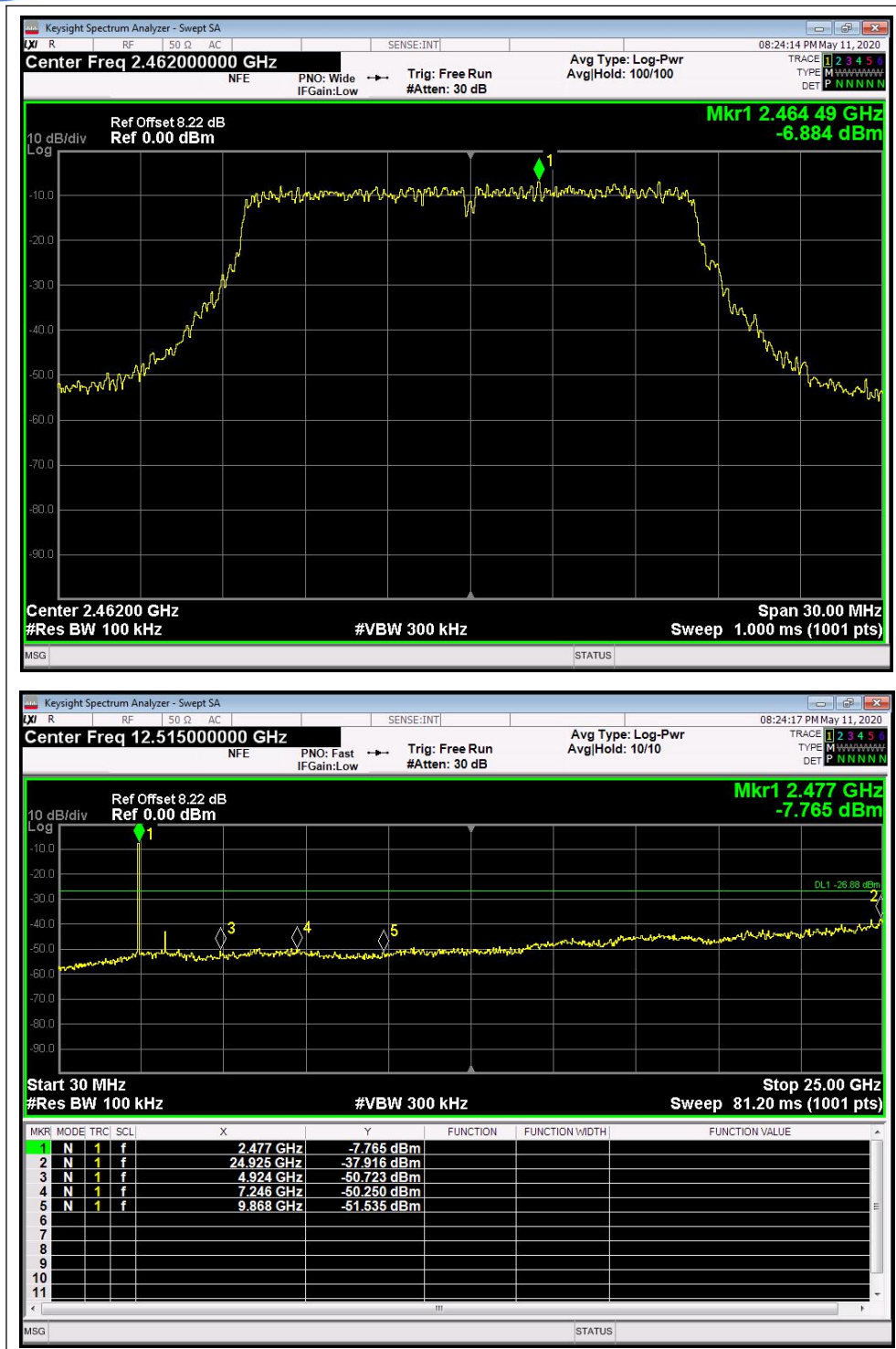


(802.11 g, Band Edge @ Channel = 1)

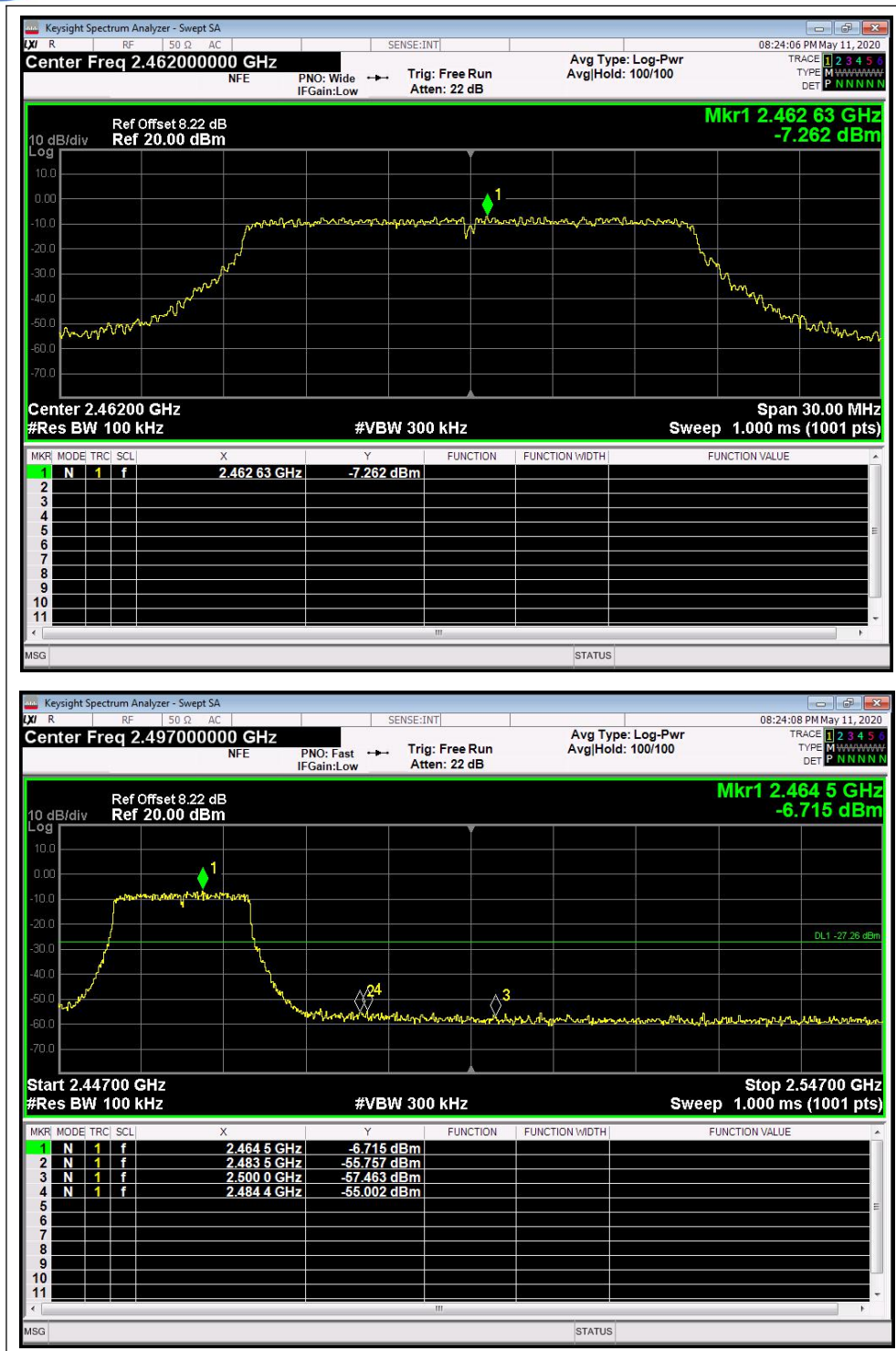




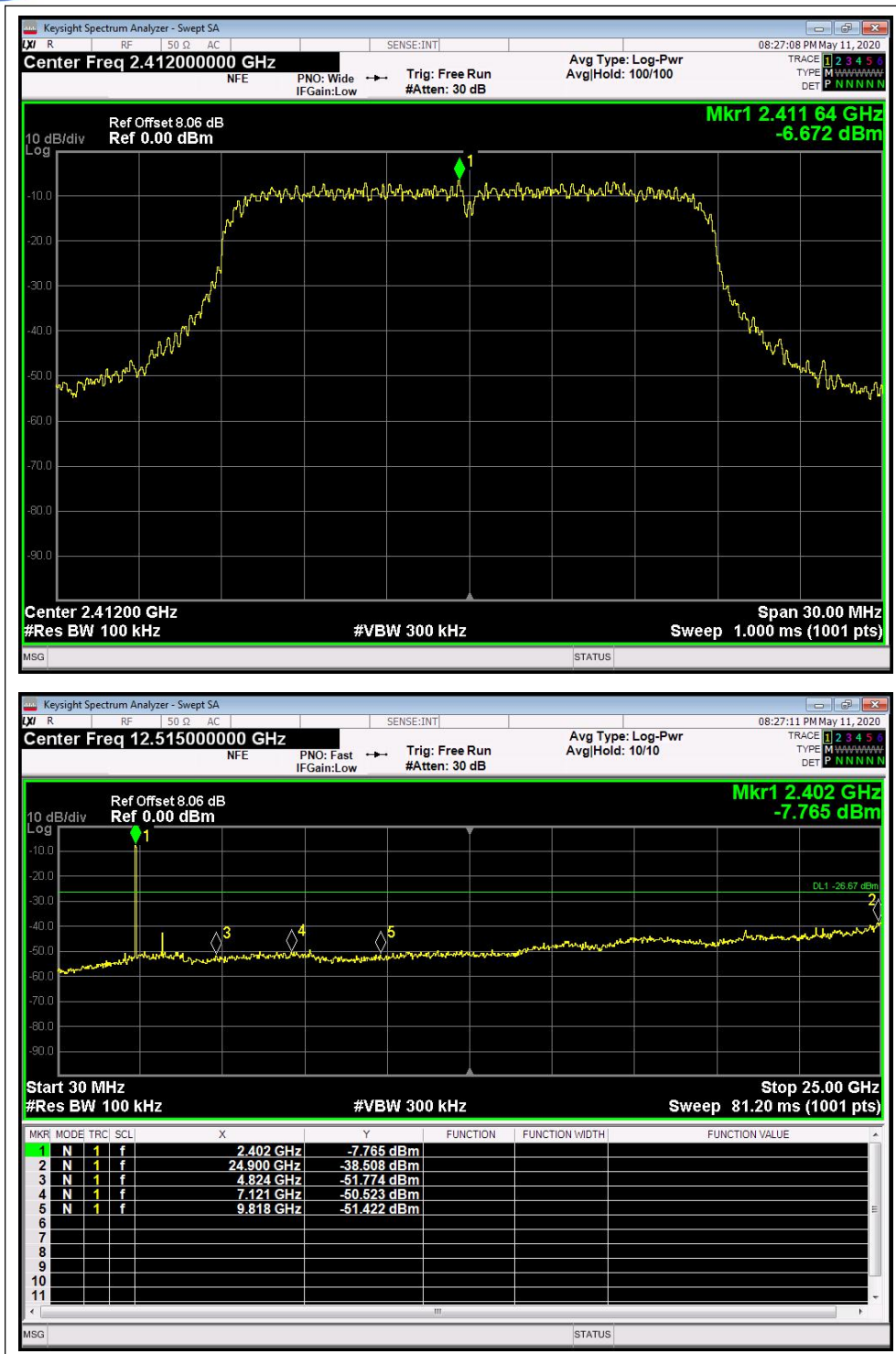
(802.11 g, Channel = 6, 30MHz to 25GHz)



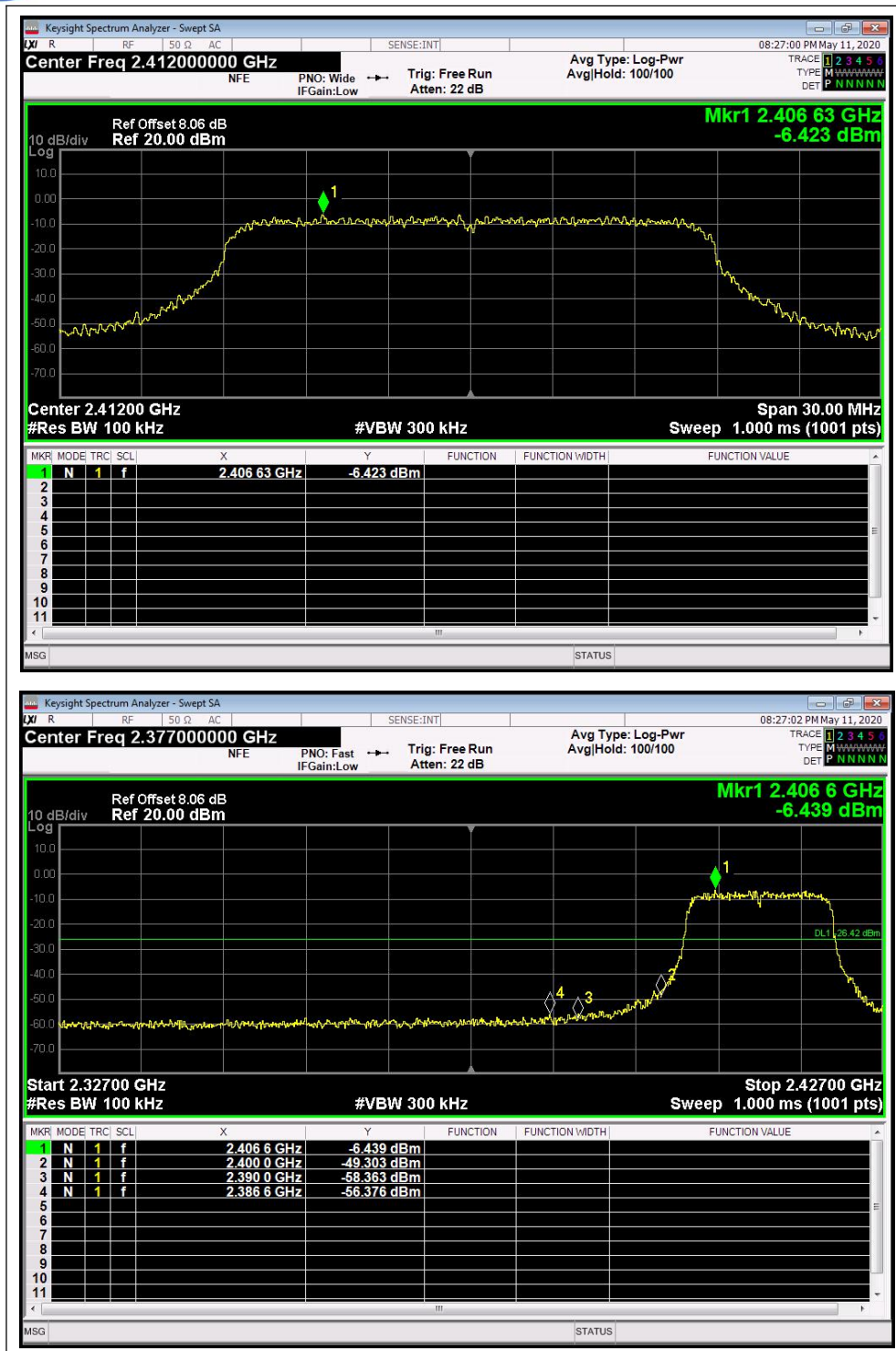
(802.11 g, Channel = 11, 30MHz to 25GHz)



(802.11 g, Band Edge @ Channel = 11)



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



(802.11 HT20, Band Edge @ Channel = 1)