



REPORT No.: SZ22030287W03

TEST REPORT

APPLICANT : Thundercomm Technology Co., Ltd

PRODUCT NAME : Smart Module

MODEL NAME : C865C, C2130C, C5165C

BRAND NAME : TurboX

FCC ID : 2AOHHTURBOXC865C

STANDARD(S) : 47 CFR Part 15 Subpart C

RECEIPT DATE : 2022-03-29

TEST DATE : 2022-03-30 to 2022-04-27

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Change History		
Version	Date	Reason for change
1.0	2022-05-23	First edition



1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Thundercomm Technology Co., Ltd
Applicant Address:	Building 4, No. 99, Data Valley Middle Road,Xiantao District, Yubei District Chongqing, China
Manufacturer:	Thundercomm Technology Co., Ltd
Manufacturer Address:	Building 4, No. 99, Data Valley Middle Road,Xiantao District, Yubei District Chongqing, China

1.2. Equipment Under Test (EUT) Description

Product Name:	Smart Module	
Sample No.:	2#	
Hardware Version:	DT865_DEq_LA-IOB V03	
Software Version:	FlatBuild_Turbox-QCS8250_xx.xx_la1.0.D.userdebug	
Modulation Technology:	DSSS, OFDM	
Modulation Type:	Refer to section1.3	
Wireless Technology:	802.11b, 802.11g, 802.11n (HT20), 802.11n (HT40) 802.11ax (HEW20), 802.11ax (HEW40)	
Operating Frequency Range:	2412MHz-2462MHz	
Antenna Information:	Antenna Type:	Dipole Antenna
	Antenna Gain:	ANT0: 2.6dBi; ANT1: 2.6dBi
	Part No.:	1461531100
	Manufacturer:	MOLEX
Directional Gain:	5.61dBi _{Note 4}	

Note1: This is a variant report of original report (Report No.: SZ22030285W03, FCC ID: 2AOHHTURBOXC865CDK). Based on the similarity between before, made the following changes:

1. Remove the IO board, leaving only the RF module.
2. Modify the product name, model and FCC ID.

Except for the differences shown above, the other parts are the same as before. Also, the C865C, C2130C and C5165C differ only in the model name.

Their electrical circuit design, layout, components used and internal wiring are identical. No other changes. The changes do not affect the test results.



Note2: The EUT will not sell with the antenna.

Note 3: The EUT supports a MIMO function. Physically, the EUT provides two completed transmitters and two receivers for 802.11n, 802.11ac and 802.11ax modulation mode.

Modulation Mode:	TX Function
802.11b	1TX
802.11n	2TX
802.11ac	2TX
802.11ax	2TX

Note 4: According to KDB 662911 D01, the directional gain = $G_{ANT} + 10\log(N_{ANT})$ dBi, where G_{ANT} is the maximum antenna gain in dBi, N_{ANT} is the number of outputs.

Note 5: For conducted test item Conducted Output Power and Power Spectral Density of each modulation mode, we recorded the test result of two antennas separately, for other conducted test items both of the two antennas were tested separately, we only recorded the worst test result (ANT0) in this report.

Note 6: All radiation test items for 802.11n and 802.11 ax modulation mode operate at MIMO mode during the test. Other modulation mode operate at SISO mode, both of the two antennas were tested separately, we only recorded the worst test result(ANT0) in this report.

Note 7: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.3. Modulation Type and Data Rate of EUT

Mode	Bandwidth (MHz)	Modulation Technology	Modulation Type	Data Rate	RU Size
802.11b	20	DSSS	DBPSK	1/2/5.5/11Mbps	N/A
			DQPSK		
			CCK		
802.11g	20	OFDM	BPSK	6/9/12/18/24/36/48/54 Mbps	N/A
			QPSK		
			16QAM		
			64QAM		
802.11n	20/40 (HT20/40)	OFDM	BPSK	MCS0~MCS7	N/A
			QPSK		
			16QAM		
			64QAM		
802.11ax	20/40 (HEW20/40)	OFDMA	BPSK	MSC0~MCS11	26/52/106/242/484
			QPSK		
			16QAM		
			64QAM		
			256QAM		
			1024QAM		

Note1: The worst-case mode (bold face) in all data rates has been determined during the pre-scan, only the test data of the worst-case were recorded in this report.

1.4. The Channel Number and Frequency

Test Mode	Channel	Frequency (MHz)	Channel	Frequency (MHz)
802.11b/g/n(HT20)/ ac(VHT20)/ ax(HEW20)	1	2412	8	2447
	2	2417	9	2452
	3	2422	10	2457
	4	2427	11	2462
	5	2432		
	6	2437		
	7	2442		
Test Mode	Channel	Frequency (MHz)	Channel	Frequency (MHz)
802.11n (HT40)/ ac(VHT40) ax(HEW40)	3	2422	8	2447
	4	2427	9	2452
	5	2432		
	6	2437		
	7	2442		

Note 1: The black bold channels were selected for test.



1.5. 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	Method Determination /Remark
1	15.203	Antenna Requirement	N/A	N/A	PASS _{Note1}	No deviation
2	N/A	Duty Cycle of Test Signal	Mar. 30, 2022	Su Xiaoxian	PASS _{Note1}	No deviation
3	15.247(b)	Maximum Conducted Output Power	Apr. 27, 2022	Su Xiaoxian	PASS _{Note1}	No deviation
4	15.247(a)	Bandwidth	Apr. 15, 2022	Su Xiaoxian	PASS _{Note1}	No deviation
5	15.247(d)	Conducted Spurious Emission and Band Edge	Apr. 15, 2022	Su Xiaoxian	PASS _{Note1}	No deviation
6	15.247(e)	Power Spectral Density (PSD)	Apr. 15, 2022	Su Xiaoxian	PASS _{Note1}	No deviation
7	15.207	Conducted Emission	Apr. 27, 2022	Wu Zhaoling	PASS _{Note1}	No deviation
8	15.247(d)	Restricted Frequency Bands	Apr. 19, 2022	Lin Jiayong	PASS _{Note1}	No deviation
9	15.209, 15.247(d)	Radiated Emission	Apr. 13, 2022	Lin Jiayong	PASS _{Note1}	No deviation

Note1: The test results of these test items in this report refer to the test report (Report No.: SZ22030285W03).

Note 2: The tests were performed according to the method of measurements prescribed in ANSIC63.10-2013, KDB558074 D01 v05r02 and KDB662911 D01 v02r01.

Note 3: The path loss during the RF test is calibrated to correct the results by the offset setting in



the test equipments. The ref offset 11.5dB contains two parts that cable loss 1.5dB and Attenuator 10dB.

Note 4: Additions to, deviation, or exclusions from the method shall be judged in the "method determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table.

Note 5: When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% confidence intervals.

1.6. 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. Test Result: Compliant

Inside of the EUT has a permanently attached Dipole antenna fixed to PCB with solder. Please refer to the EUT internal photos.

2.2. Duty Cycle of Test Signal

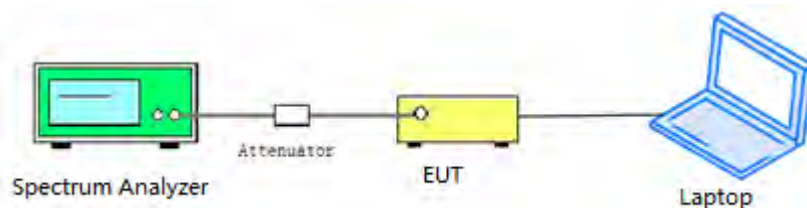
2.2.1. Requirement

Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be used to ensure that measurements are made only during transmissions at the maximum power control level. Such sweep triggering/signal gating techniques will require knowledge of the minimum transmission duration (T) over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. Sweep triggering/signal gating techniques can then be used if the measurement/sweep time of the analyzer can be set such that it does not exceed T at any time that data are being acquired (i.e., no transmitter OFF-time is to be considered).

When continuous transmission cannot be achieved and sweep triggering/signal gating cannot be implemented, alternative procedures are provided that can be used to measure the average power; however, they will require an additional measurement of the transmitter duty cycle (D). Within this subclause, the duty cycle refers to the fraction of time over which the transmitter is ON and is transmitting at its maximum power control level. The duty cycle is considered to be constant if variations are less than $\pm 2\%$; otherwise, the duty cycle is considered to be nonconstant.

2.2.2. Test Description

Test Setup:



ANSI C63.10 2013 Clause 11.6 was used in order to prove compliance.

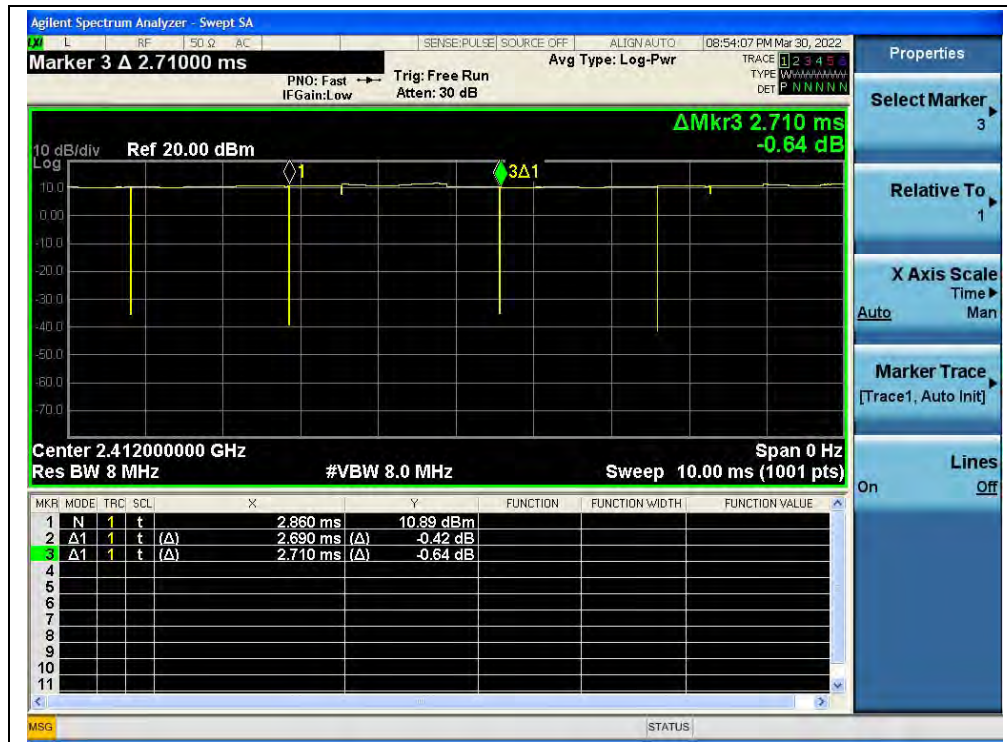


2.2.3. Test Result

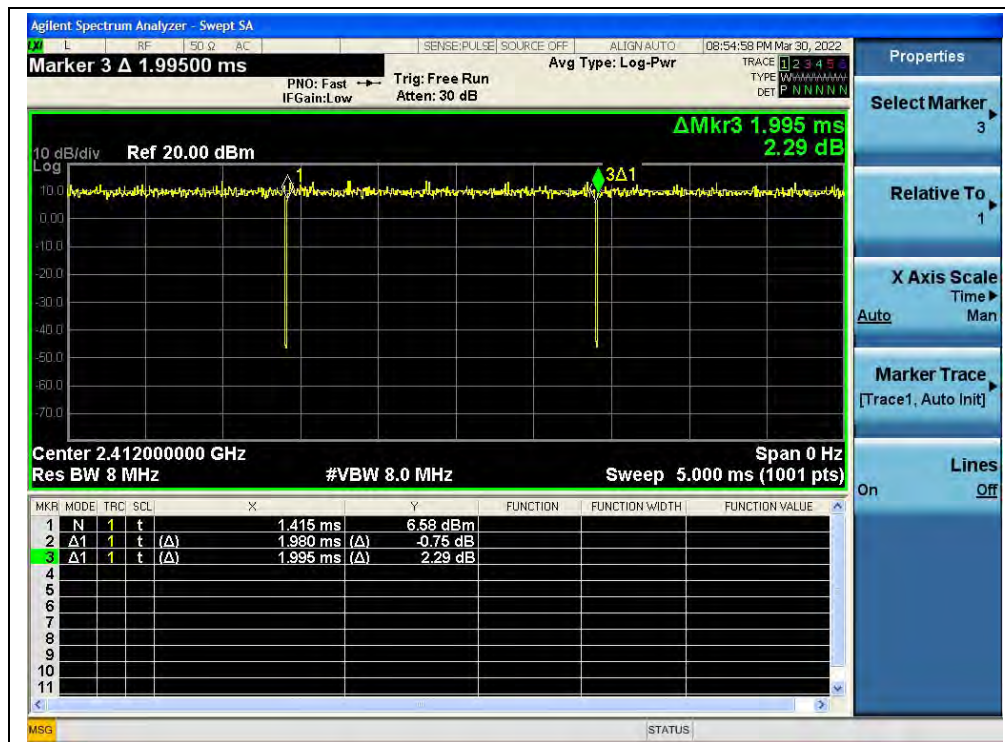
A. Test Verdict:

Test Mode	Duty Cycle (%) (D)	Duty Factor (10*lg[1/D])
802.11b	99.26	0.03
802.11g	99.25	0.03
802.11n (HT20)	100.00	0.00
802.11n (HT40)	96.32	0.16
802.11ax (HEW20)	99.63	0.02
802.11ax (HEW40)	99.63	0.02
802.11ax (HEW20) RU26	99.61	0.02
802.11ax (HEW20) RU52	99.61	0.02
802.11ax (HEW20) RU106	99.58	0.02

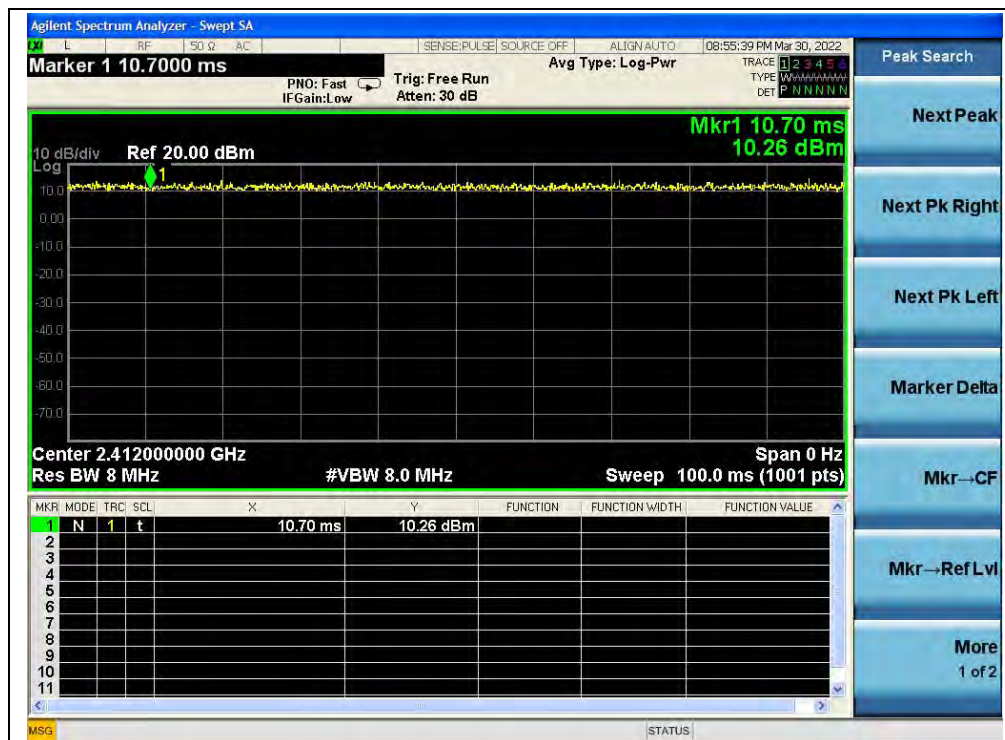
B. Test Plot:



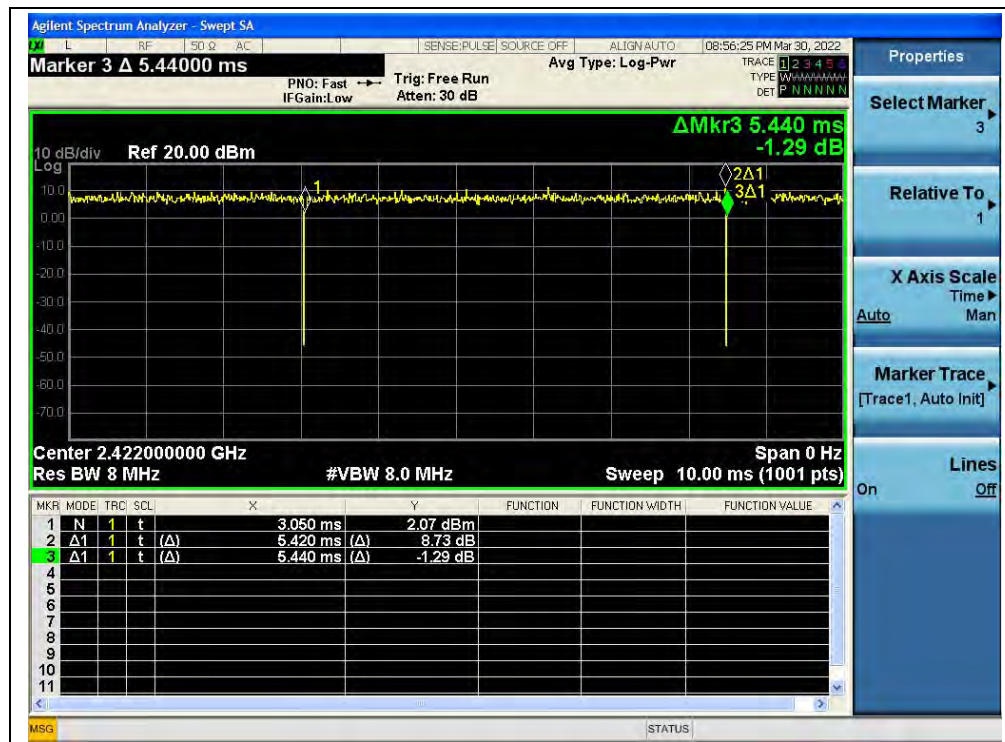
(Channel 1, 802.11b)



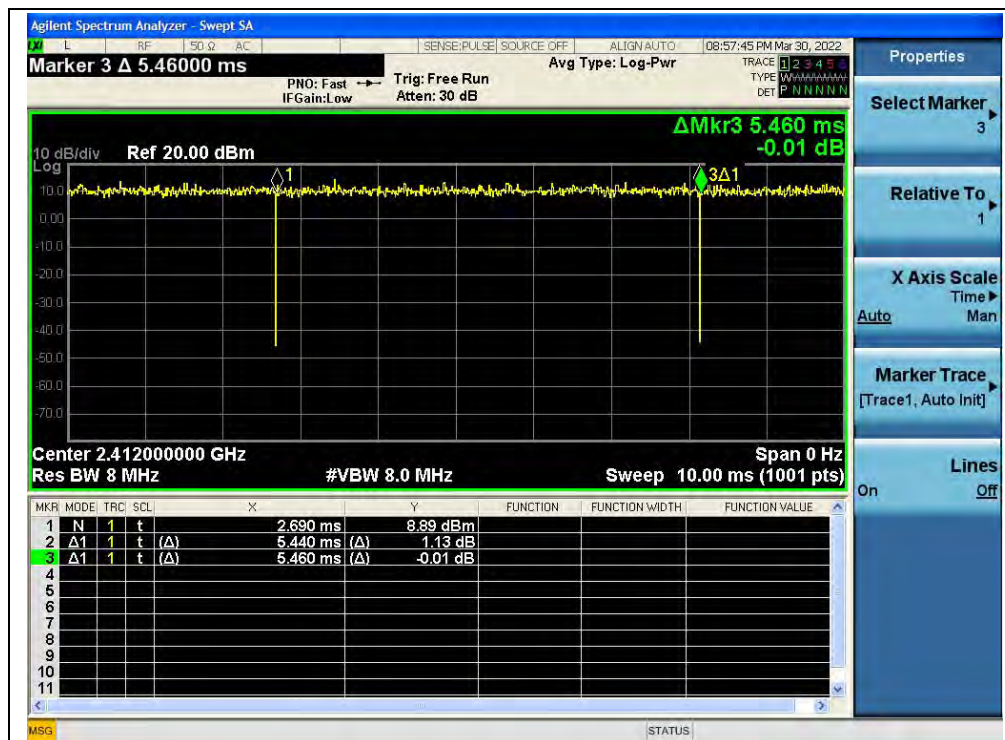
(Channel 1, 802.11g)



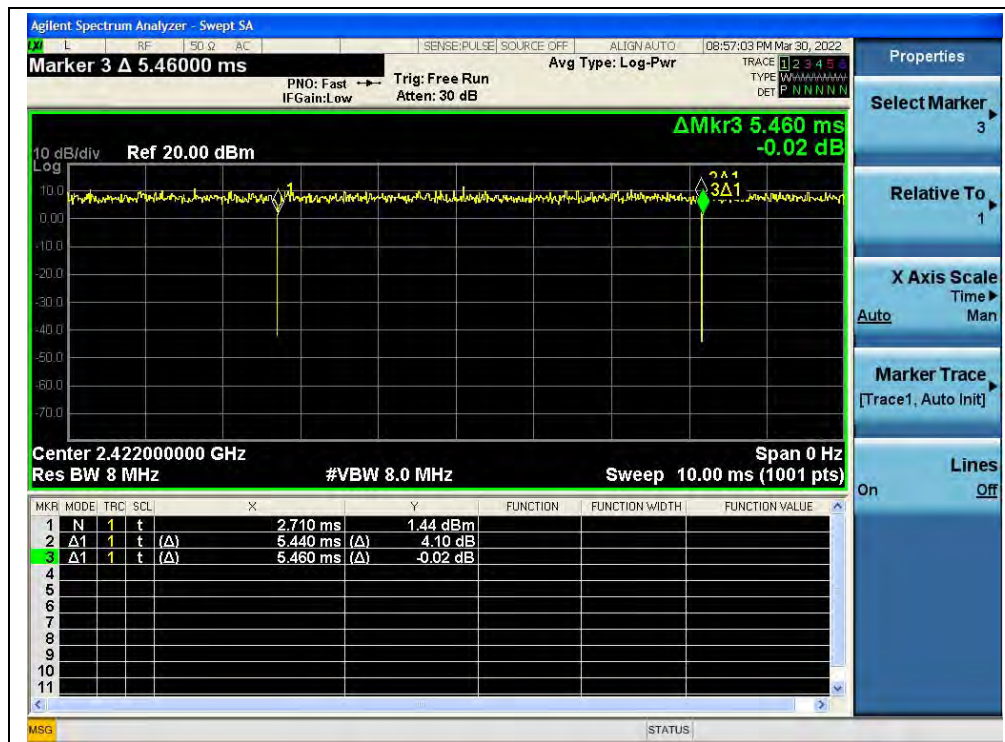
(Channel 1, 802.11n (HT20))



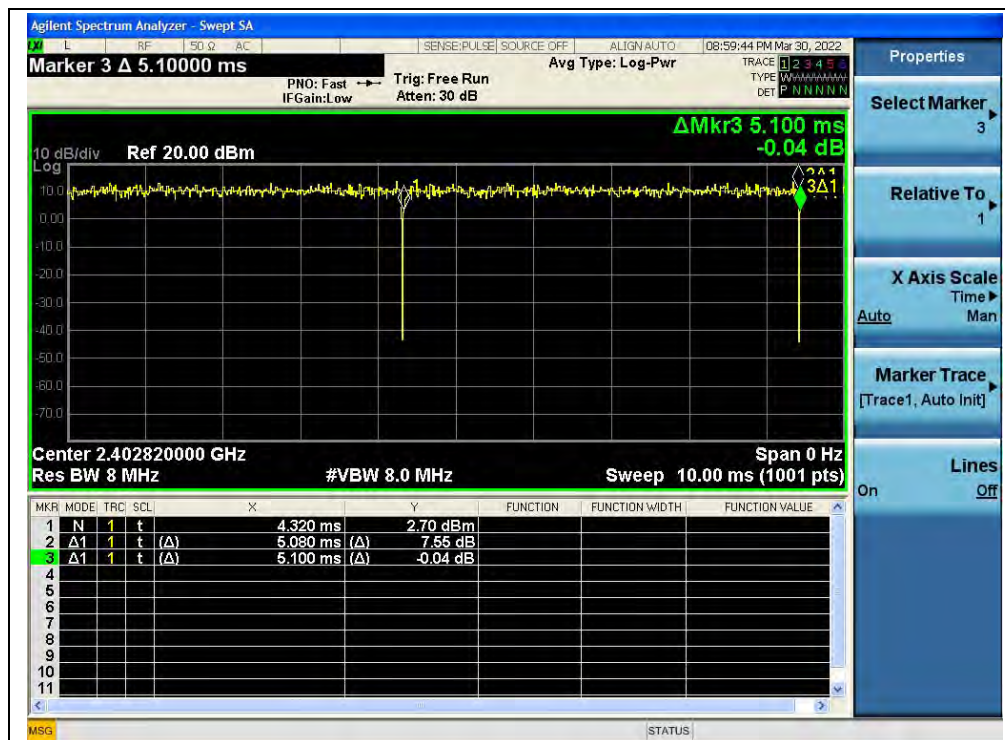
(Channel 3, 802.11n (HT40))



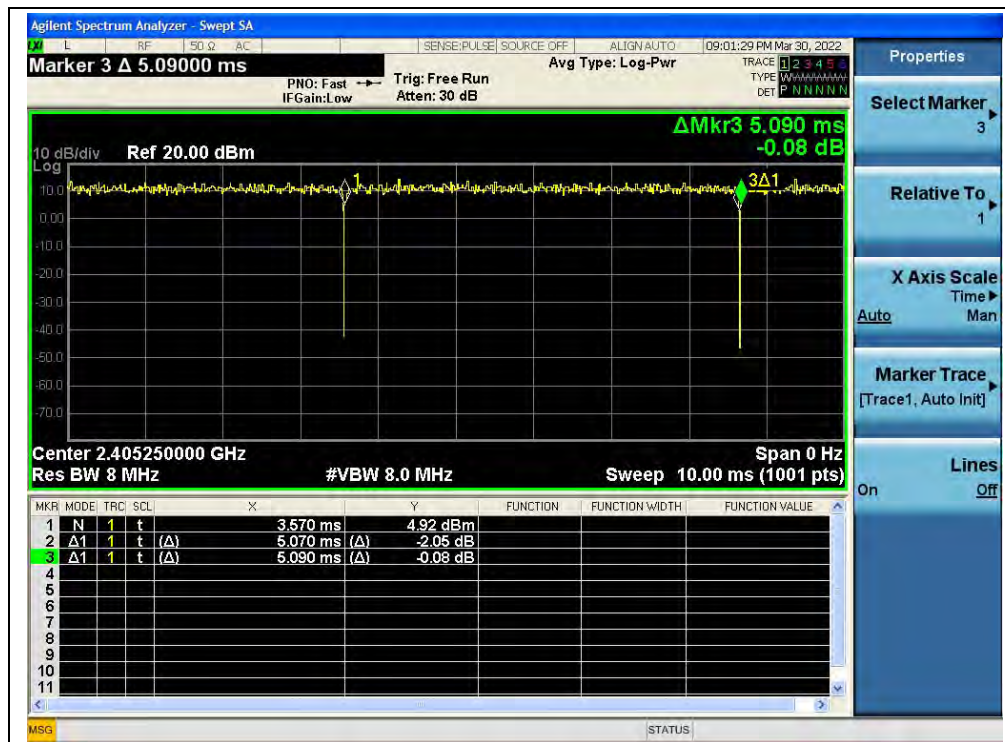
(Channel 1, 802.11ax (HEW20))



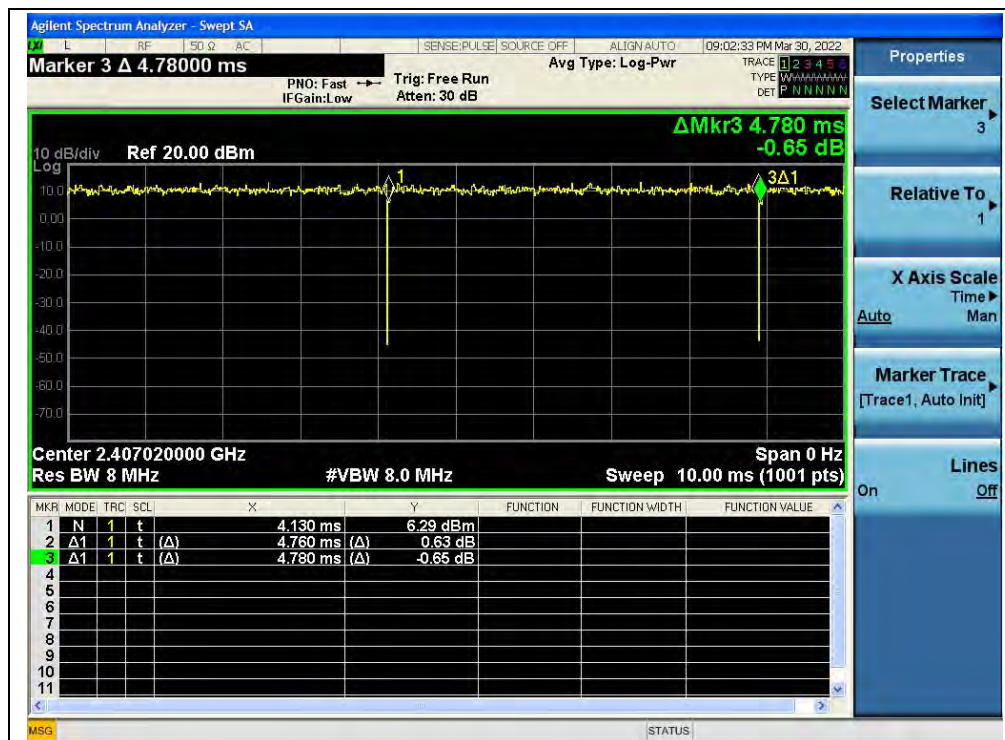
(Channel 3, 802.11ax (HEW40))



(Channel 1, 802.11ax (HEW20) RU26)



(Channel 1, 802.11ax (HEW20) RU52)



(Channel 1, 802.11ax (HEW20) RU106)

2.3. Maximum Conducted Output Power

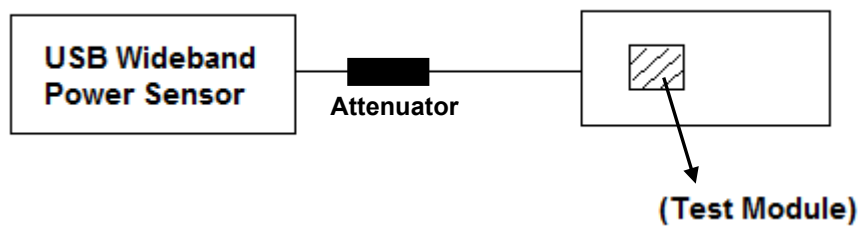
2.3.1. Requirement

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 conducted output power of the intentional radiator shall not exceed 1 Watt.

2.3.2. Test Description

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

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.

**2.3.3. Test Result****Maximum Peak Conducted Output Power****802.11b Mode**

Channel	Frequency (MHz)	Measured Peak Power				Limit		Verdict
		ANT 0		ANT 1		(dBm)		
		dBm	W	dBm	W	dBm	W	
1	2412	21.58	0.144	21.52	0.142	30	1	PASS
6	2437	21.53	0.142	21.48	0.141			PASS
11	2462	21.03	0.127	20.98	0.125			PASS

802.11g Mode

Channel	Frequency (MHz)	Measured Peak Power				Limit (dBm)		Verdict
		ANT 0		ANT 1		dBm	W	
		dBm	W	dBm	W			
1	2412	24.39	0.275	24.19	0.262	30	1	PASS
6	2437	24.33	0.271	24.24	0.265			PASS
11	2462	24.27	0.267	24.02	0.252			PASS

802.11n (HT20) Mode

Channel	Frequency (MHz)	Measured Peak Power (dBm)		Total Power (dBm)	Total Power (W)	Limit		Verdict
		ANT 0	ANT 1			dBm	W	
1	2412	23.57	23.32	26.45	0.442	30	1	PASS
6	2437	23.27	23.21	26.25	0.422			PASS
11	2462	23.19	23.06	26.14	0.411			PASS

Note: Directional gain = 2.6dBi + 10log(2) = 5.61dBi < 6dBi, so the power limit is 1W(30dBm).

802.11n (HT40) Mode

Channel	Frequency (MHz)	Measured Peak Power (dBm)		Total Power (dBm)	Total Power (W)	Limit		Verdict
		ANT 0	ANT 1			dBm	W	
3	2422	22.15	22.04	25.11	0.324	30	1	PASS
6	2437	22.23	22.16	25.21	0.332			PASS
9	2452	22.08	22.02	25.07	0.321			PASS

Note: Directional gain = 2.6dBi + 10log(2) = 5.61dBi < 6dBi, so the power limit is 1W(30dBm).

**802.11ax (HEW20) Mode**

Channel	Frequency (MHz)	Measured Peak Power (dBm)		Total Power (dBm)	Total Power (W)	Limit		Verdict
		ANT 0	ANT 1			dBm	W	
1	2412	23.36	23.24	26.31	0.428	30	1	PASS
6	2437	23.57	23.49	26.54	0.451			PASS
11	2462	23.42	23.18	26.31	0.428			PASS
Note: Directional gain = 2.6dBi +10log(2) = 5.61dBi<6dBi, so the power limit is 1W(30dBm).								

802.11ax (HEW20) RU26 Mode

Channel	Frequency (MHz)	Measured Peak Power (dBm)		Total Power (dBm)	Total Power (W)	Limit		Verdict
		ANT 0	ANT 1			dBm	W	
1	2412	24.84	24.61	27.74	0.594	30	1	PASS
6	2437	24.92	24.89	27.92	0.619			PASS
11	2462	24.86	24.68	27.78	0.600			PASS
Note: Directional gain = 2.6dBi +10log(2) = 5.61dBi<6dBi, so the power limit is 1W(30dBm).								

802.11ax (HEW20) RU52 Mode

Channel	Frequency (MHz)	Measured Peak Power (dBm)		Total Power (dBm)	Total Power (W)	Limit		Verdict
		ANT 0	ANT 1			dBm	W	
1	2412	25.50	25.29	28.41	0.693	30	1	PASS
6	2437	25.54	25.45	28.51	0.709			PASS
11	2462	25.64	25.59	28.63	0.729			PASS
Note: Directional gain = 2.6dBi +10log(2) = 5.61dBi<6dBi, so the power limit is 1W(30dBm).								

802.11ax (HEW20) RU106 Mode

Channel	Frequency (MHz)	Measured Peak Power (dBm)		Total Power (dBm)	Total Power (W)	Limit		Verdict
		ANT 0	ANT 1			dBm	W	
1	2412	25.31	25.23	28.28	0.673	30	1	PASS
6	2437	25.42	25.41	28.43	0.696			PASS
11	2462	25.11	24.94	28.03	0.636			PASS
Note: Directional gain = 2.6dBi +10log(2) = 5.61dBi<6dBi, so the power limit is 1W(30dBm).								

**802.11ax (HEW40) Mode**

Channel	Frequency (MHz)	Measured Peak Power (dBm)		Total Power (dBm)	Total Power (W)	Limit		Verdict
		ANT 0	ANT 1			dBm	W	
3	2422	23.05	23.00	26.03	0.401	30	1	PASS
6	2437	23.12	23.06	26.10	0.407			PASS
9	2452	23.24	23.15	26.20	0.417			PASS
Note: Directional gain = 2.6dBi +10log(2) = 5.61dBi<6dBi, so the power limit is 1W(30dBm).								

**Maximum Average Conducted Output Power****802.11b Mode**

Frequency (MHz)	Average Power							Limit		Verdict
	Measured		Duty Factor	Duty factor Calculated						
	ANT 0	ANT 1		ANT 0		ANT 1				
	dBm	dBm		dBm	W	dBm	W	dBm	W	
2412	19.14	19.03	0.03	19.17	0.083	19.06	0.081	30	1	PASS
2437	19.35	19.28		19.38	0.087	19.31	0.085			PASS
2462	18.84	18.75		18.87	0.077	18.78	0.076			PASS

802.11g Mode

Frequency (MHz)	Average Power							Limit		Verdict
	Measured		Duty Factor	Duty factor Calculated						
	ANT 0	ANT 1		ANT 0		ANT 1				
	dBm	dBm		dBm	W	dBm	W	dBm	W	
2412	17.88	17.81	0.03	17.91	0.062	17.84	0.061	30	1	PASS
2437	18.12	17.99		18.15	0.065	18.02	0.063			PASS
2462	17.64	17.37		17.67	0.058	17.4	0.055			PASS

802.11n (HT20) Mode

Frequency (MHz)	Average Power					Limit		Verdict
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT 0	ANT 1						
	dBm	dBm		dBm	W	dBm	W	
2412	17.55	17.35	0.00	20.45	0.111	30	1	PASS
2437	17.82	17.65		20.76	0.119			PASS
2462	17.40	17.25		20.33	0.108			PASS

Note: Directional gain = 2.6dBi + 10log(2) = 5.61dBi < 6dBi, so the power limit is 1W(30dBm).

802.11n (HT40) Mode

Frequency (MHz)	Average Power					Limit		Verdict
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT 0	ANT 1						
	dBm	dBm		dBm	W	dBm	W	
2422	16.18	16.09	0.16	19.29	0.085	30	1	PASS
2437	16.64	16.28		19.64	0.092			PASS
2452	16.29	16.00		19.29	0.085			PASS

Note: Directional gain = 2.6dBi + 10log(2) = 5.61dBi < 6dBi, so the power limit is 1W(30dBm).

**802.11ax (HEW20) Mode**

Frequency (MHz)	Average Power					Limit		Verdict
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT 0	ANT 1				dBm	W	
	dBm	dBm		dBm	W			
2412	14.84	14.59	0.02	17.78	0.060	30	1	PASS
2437	15.23	15.10		18.20	0.066			PASS
2462	15.17	14.98		18.13	0.065			PASS
Note: Directional gain = 2.6dBi +10log(2) = 5.61dBi<6dBi, so the power limit is 1W(30dBm).								

802.11ax (HEW20) RU26 Mode

Frequency (MHz)	Average Power					Limit		Verdict
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT 0	ANT 1				dBm	W	
	dBm	dBm		dBm	W			
2412	15.92	15.63	0.02	18.81	0.076	30	1	PASS
2437	16.35	16.09		19.24	0.084			PASS
2462	16.31	16.02		19.19	0.083			PASS
Note: Directional gain = 2.6dBi +10log(2) = 5.61dBi<6dBi, so the power limit is 1W(30dBm).								

802.11ax (HEW20) RU52 Mode

Frequency (MHz)	Average Power					Limit		Verdict
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT 0	ANT 1				dBm	W	
	dBm	dBm		dBm	W			
2412	15.98	15.85	0.02	18.92	0.078	30	1	PASS
2437	16.40	16.35		19.40	0.087			PASS
2462	16.37	16.15		19.29	0.085			PASS
Note: Directional gain = 2.6dBi +10log(2) = 5.61dBi<6dBi, so the power limit is 1W(30dBm).								

**802.11ax (HEW20) RU106 Mode**

Frequency (MHz)	Average Power					Limit		Verdict
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT 0	ANT 1						
	dBm	dBm		dBm	W	dBm	W	
2412	16.18	15.96	0.02	19.08	0.081	30	1	PASS
2437	16.41	16.15		19.29	0.085			PASS
2462	16.20	15.91		19.08	0.081			PASS
Note: Directional gain = 2.6dBi +10log(2) = 5.61dBi<6dBi, so the power limit is 1W(30dBm).								

802.11ax (HEW40) Mode

Frequency (MHz)	Average Power					Limit		Verdict
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT 0	ANT 1						
	dBm	dBm		dBm	W	dBm	W	
2422	14.18	14.03	0.02	17.16	0.052	30	1	PASS
2437	14.06	13.97		17.08	0.051			PASS
2452	14.25	14.11		17.24	0.053			PASS
Note: Directional gain = 2.6dBi +10log(2) = 5.61dBi<6dBi, so the power limit is 1W(30dBm).								

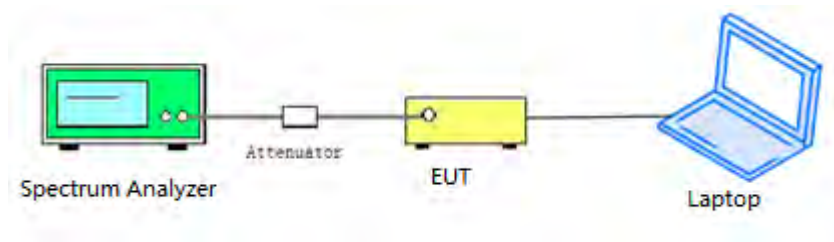
2.4. Bandwidth

2.4.1. 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.

2.4.2. Test Description

Test Setup:



The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50 Ohm; 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.

2.4.3. Test Procedure

KDB 558074 Section 8.2 was used in order to prove compliance.



2.4.4. Test Result

802.11b Mode

A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	8.085	≥500	PASS
6	2437	7.142	≥500	PASS
11	2462	8.126	≥500	PASS

B.Test Plot:



(Channel 1, 802.11b)



(Channel 6, 802.11b)



(Channel 11, 802.11b)



802.11g Mode

A.Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	16.28	≥500	PASS
6	2437	16.06	≥500	PASS
11	2462	16.32	≥500	PASS

B.Test Plot:



(Channel 1, 802.11g)



(Channel 6, 802.11g)



(Channel 11, 802.11g)

**802.11n (HT20) Mode****A.Test Verdict:**

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	17.14	≥500	PASS
6	2437	16.91	≥500	PASS
11	2462	17.54	≥500	PASS

B.Test Plot:

(Channel 1, 802.11n (HT20))



(Channel 6, 802.11n (HT20))



(Channel 11, 802.11n (HT20))



A.Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
3	2422	36.30	≥500	PASS
6	2437	36.35	≥500	PASS
9	2452	36.38	≥500	PASS

Agilent Spectrum Analyzer - Occupied BW

12 RF 50.0 AC SENSE:PULSE SOURCE:OFF ALIGN:AUTO 11:26:35 AM Apr 15, 2022

Center Freq 2.422000000 GHz Center Freq: 2.422000000 GHz Radio Std: None
 Trig: Free Run Avg/Hold: >10/10
 #IFGain: Low #Atten: 10 dB Radio Device: BTS

10 dB/div Ref 30.00 dBm

Center 2.422 GHz Span 60 MHz
 #Res BW 100 kHz #VBW 300 kHz Sweep 7.467 ms

Occupied Bandwidth		Total Power	
35.956 MHz		23.3 dBm	
Transmit Freq Error	51.317 kHz	OBW Power	99.00 %
x dB Bandwidth	36.30 MHz	x dB	-6.00 dB

MSG STATUS

Meas Setup

Avg/Hold Num 10 On
 Avg Mode Exp Repeat

OBW Power 99.00 %

x dB -5.00 dB

More 1 of 2

(Channel 3, 802.11n (HT40))



(Channel 6, 802.11n (HT40))



(Channel 9, 802.11n (HT40))

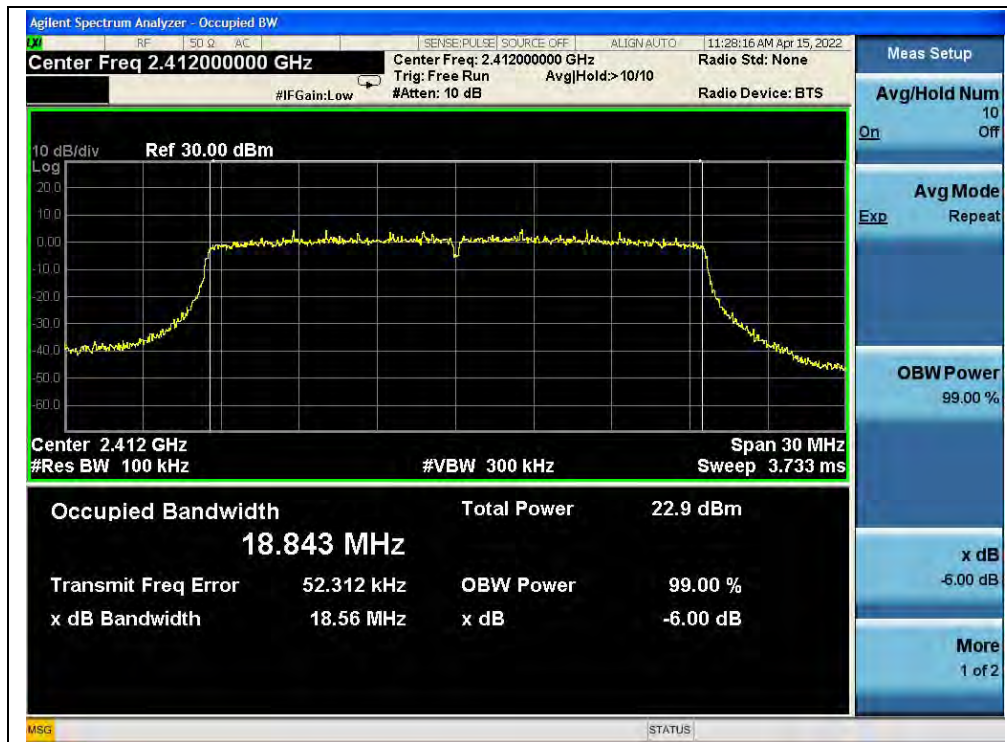


802.11ax (HEW20) Mode

A.Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	18.56	≥500	PASS
6	2437	18.25	≥500	PASS
11	2462	18.07	≥500	PASS

B.Test Plot:



(Channel 3, 802.11ax (HEW20))



(Channel 6, 802.11ax (HEW20))



(Channel 9, 802.11ax (HEW20))

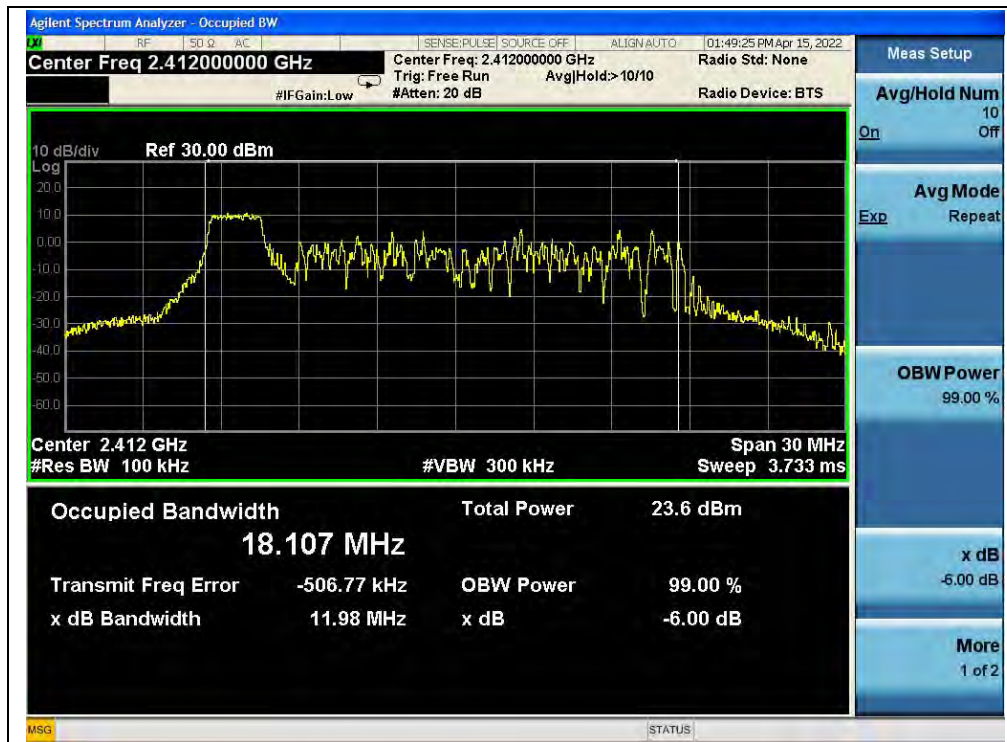


802.11ax (HEW20) RU26 Mode

A.Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	11.98	≥500	PASS
6	2437	2.065	≥500	PASS
11	2462	2.089	≥500	PASS

B.Test Plot:



(Channel 3, 802.11ax (HEW20) RU26)



(Channel 6, 802.11ax (HEW20) RU26)



(Channel 9, 802.11ax (HEW20) RU26)



802.11ax (HEW20)(RU52) Mode

A.Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	15.83	≥500	PASS
6	2437	17.06	≥500	PASS
11	2462	14.52	≥500	PASS

B.Test Plot:



(Channel 3, 802.11ax (HEW20) RU52)



(Channel 6, 802.11ax (HEW20) RU52)



(Channel 9, 802.11ax (HEW20) RU52)



802.11ax (HEW20) RU106 Mode

A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	18.05	≥500	PASS
6	2437	17.14	≥500	PASS
11	2462	17.13	≥500	PASS

B.Test Plot:



(Channel 3, 802.11ax (HEW20) RU106)



(Channel 6, 802.11ax (HEW20) RU106)



(Channel 9, 802.11ax (HEW20) RU106)

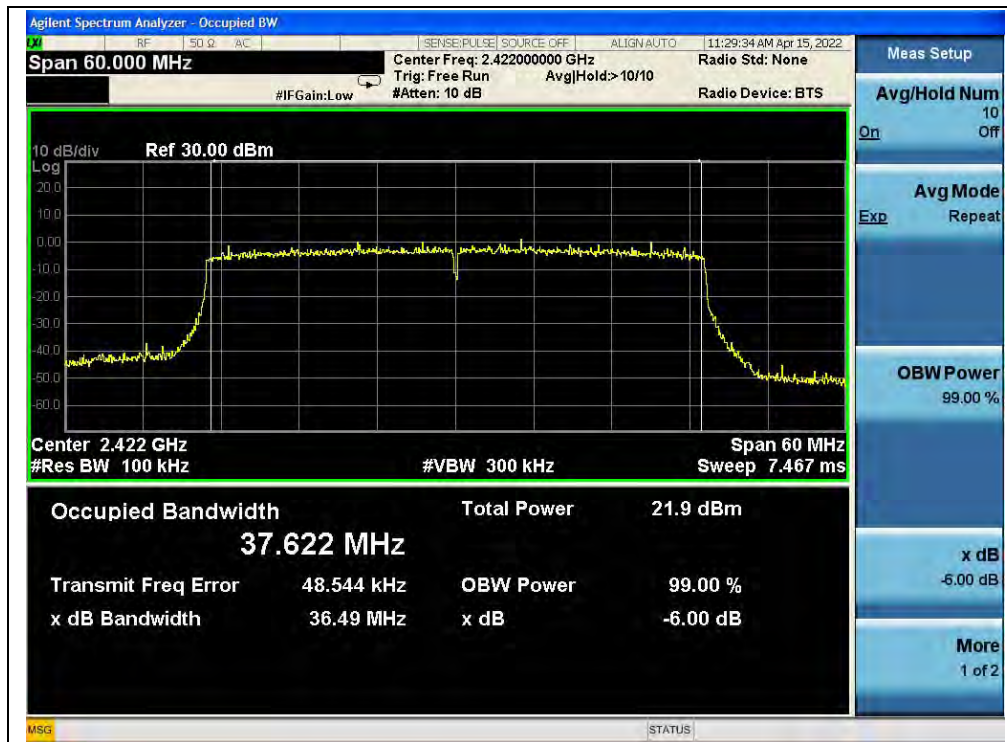


802.11ax (HEW40) Mode

A.Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
3	2422	36.49	≥500	PASS
6	2437	37.91	≥500	PASS
9	2452	36.83	≥500	PASS

B.Test Plot:



(Channel 3, 802.11ax (HEW40))



(Channel 6, 802.11ax (HEW40))



(Channel 9, 802.11ax (HEW40))

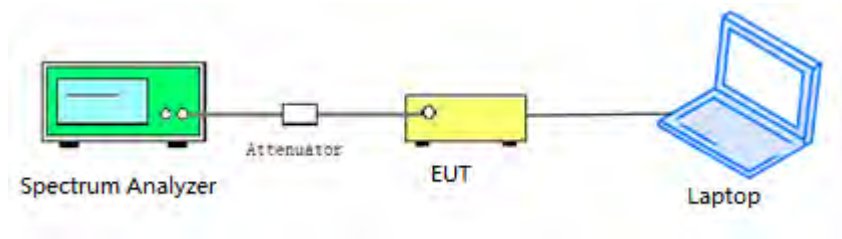
2.5. Conducted Spurious Emissions and Band Edge

2.5.1. 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.

2.5.2. Test Description

Test Setup:



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.

2.5.3. Test Procedure

KDB 558074 Section 8.5 and 8.7 was used in order to prove compliance.



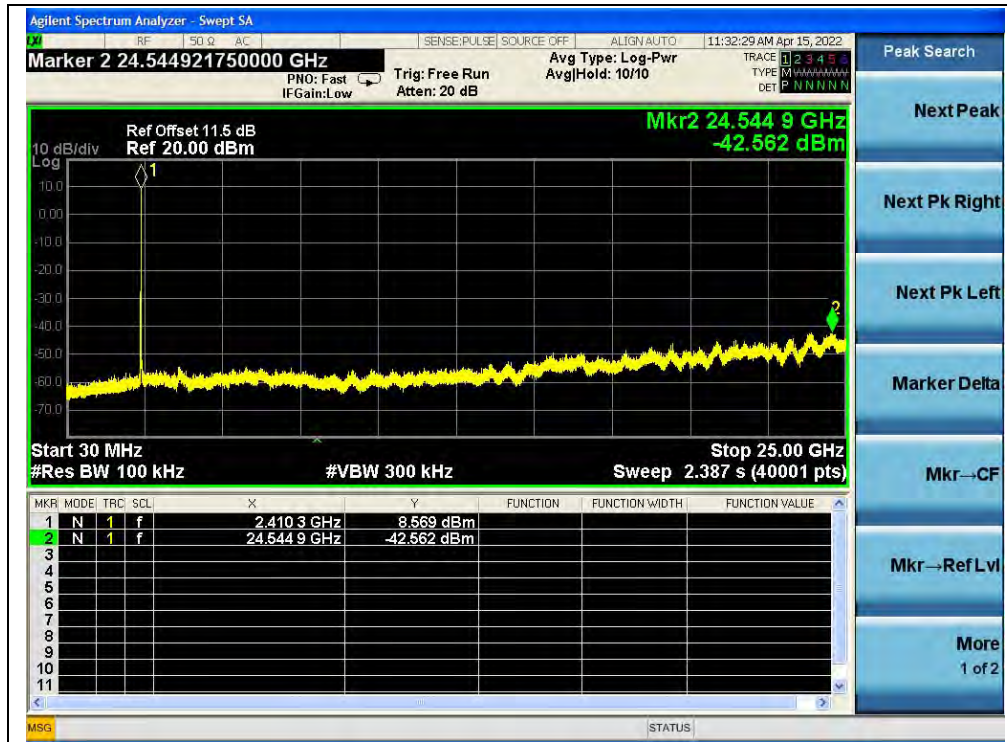
2.5.4. Test Result

802.11b Mode

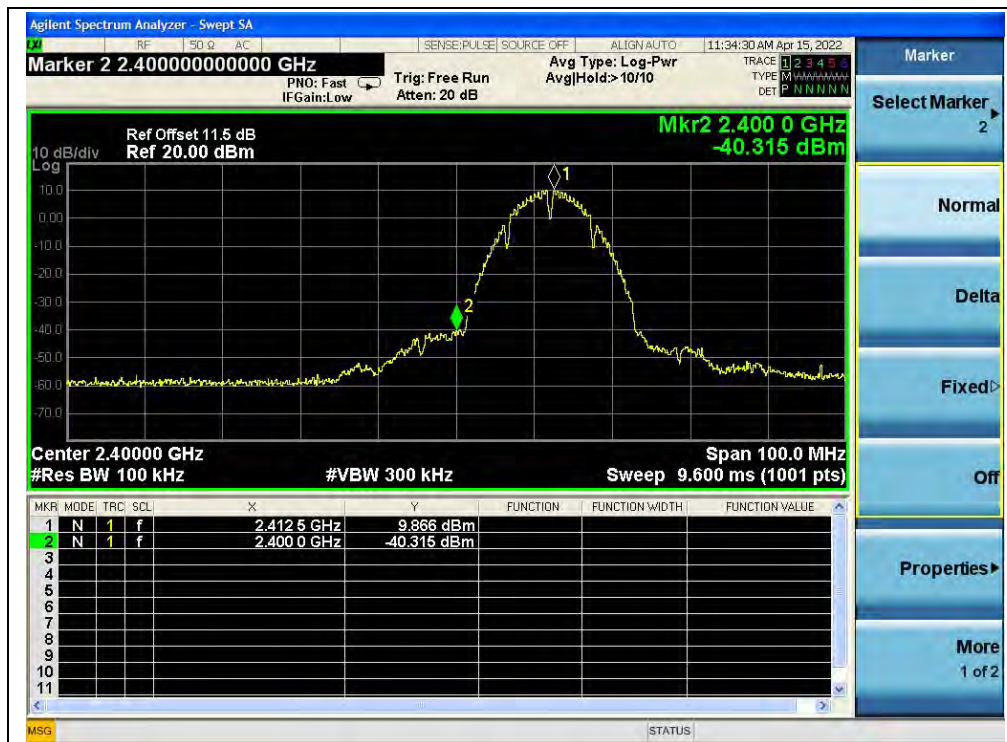
A.Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-42.56	8.57	-11.43	PASS
6	2437	-42.82	9.70	-10.30	PASS
11	2462	-42.55	10.07	-9.93	PASS

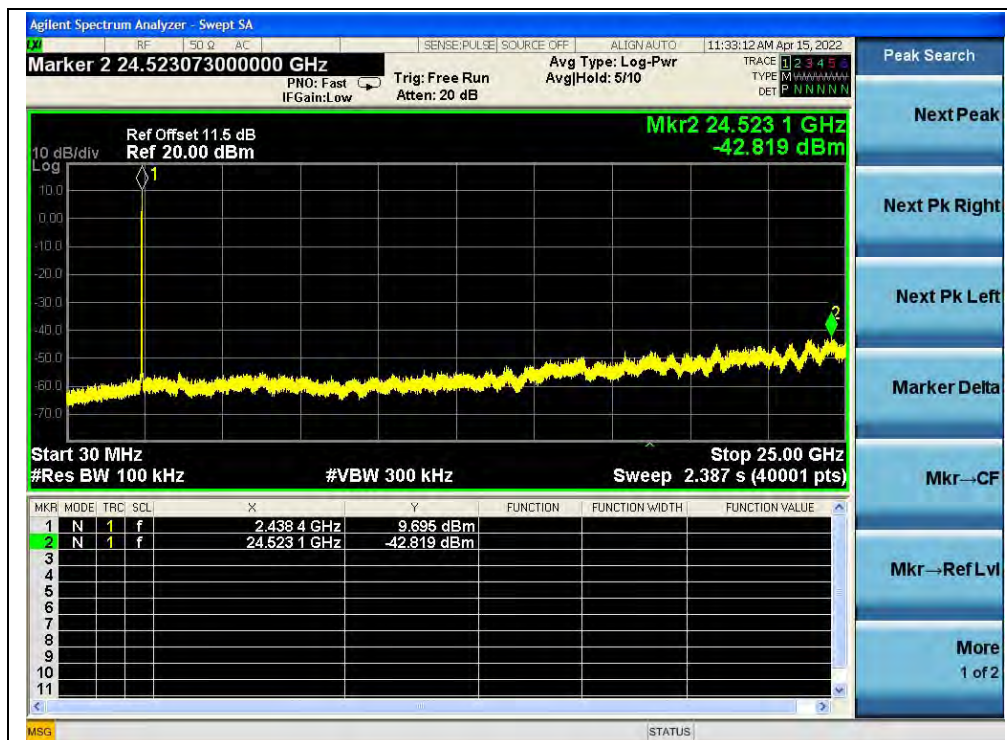
B.Test Plot:



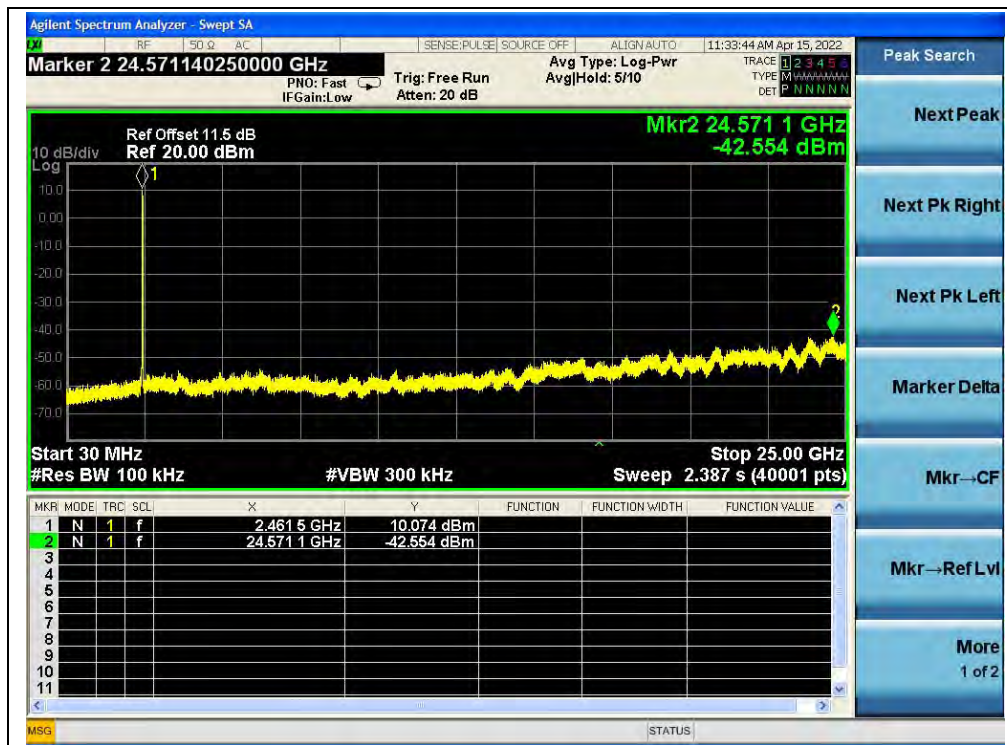
(30MHz to 25GHz, Channel 1, 802.11b)



(Band Edge, Channel 1, 802.11b)



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



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



(Band Edge, Channel 11, 802.11b)

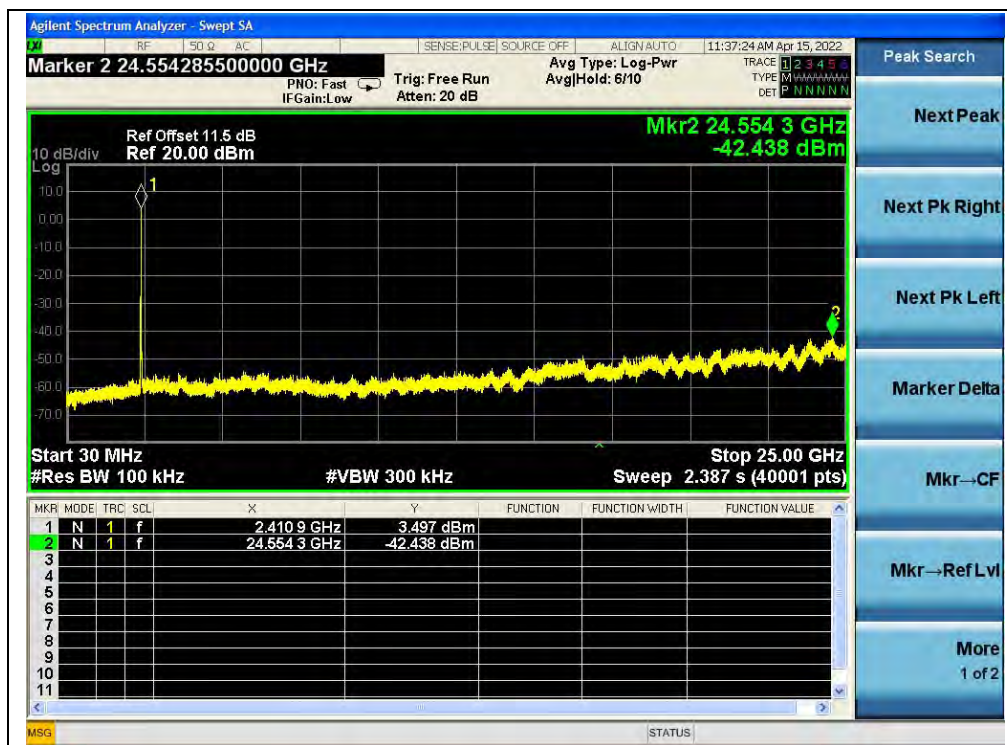


802.11g Mode

A.Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-42.44	3.50	-16.50	PASS
6	2437	-42.42	3.94	-16.06	PASS
11	2462	-41.90	3.45	-16.55	PASS

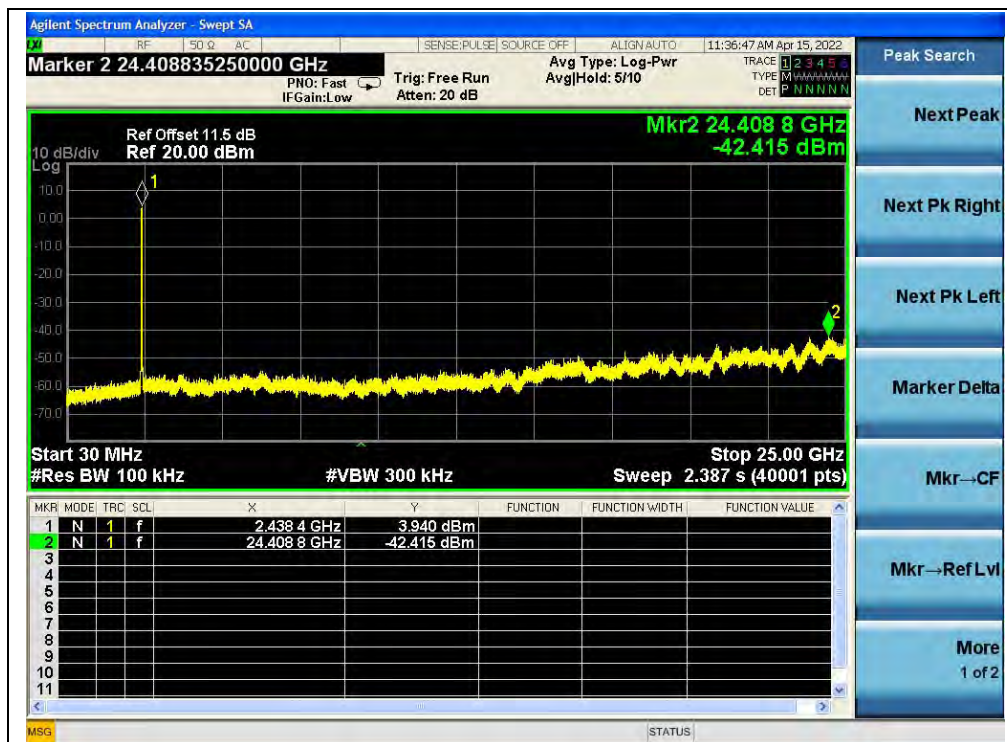
B.Test Plot:



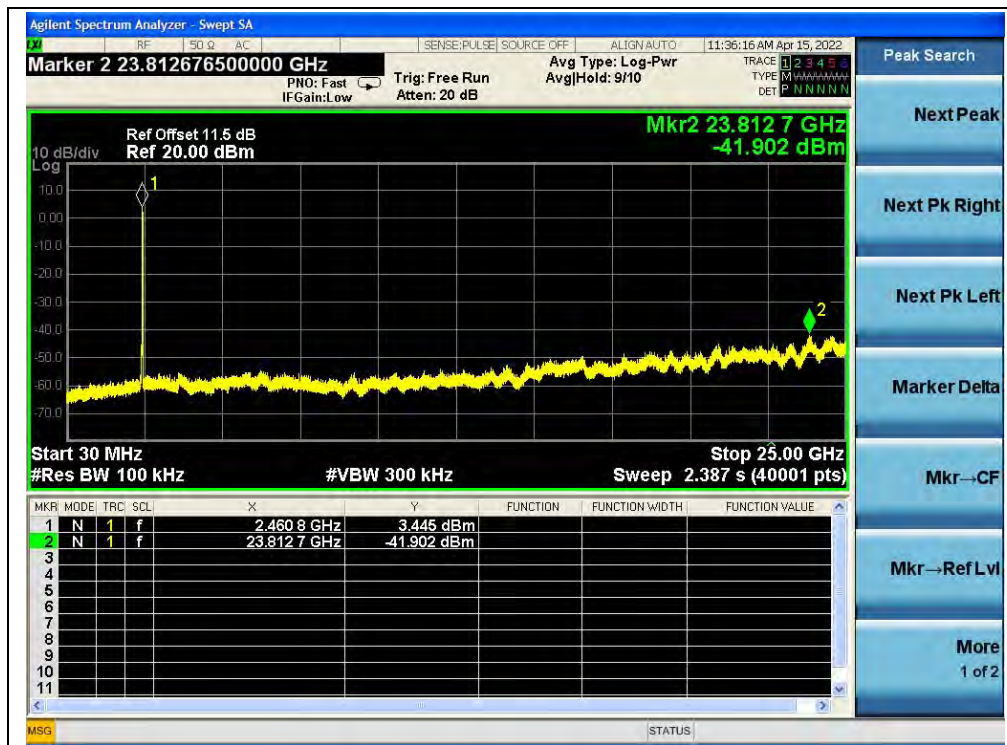
(30MHz to 25GHz, Channel 1, 802.11g)



(Band Edge, Channel 1, 802.11g)



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



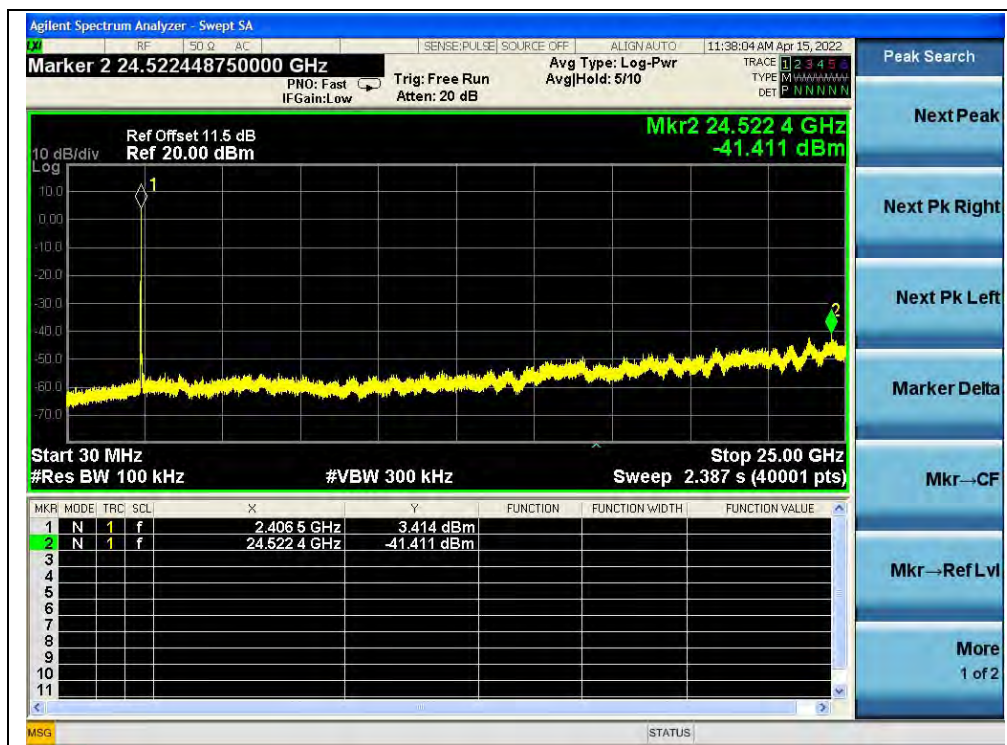
(30MHz to 25GHz, Channel 11, 802.11g)



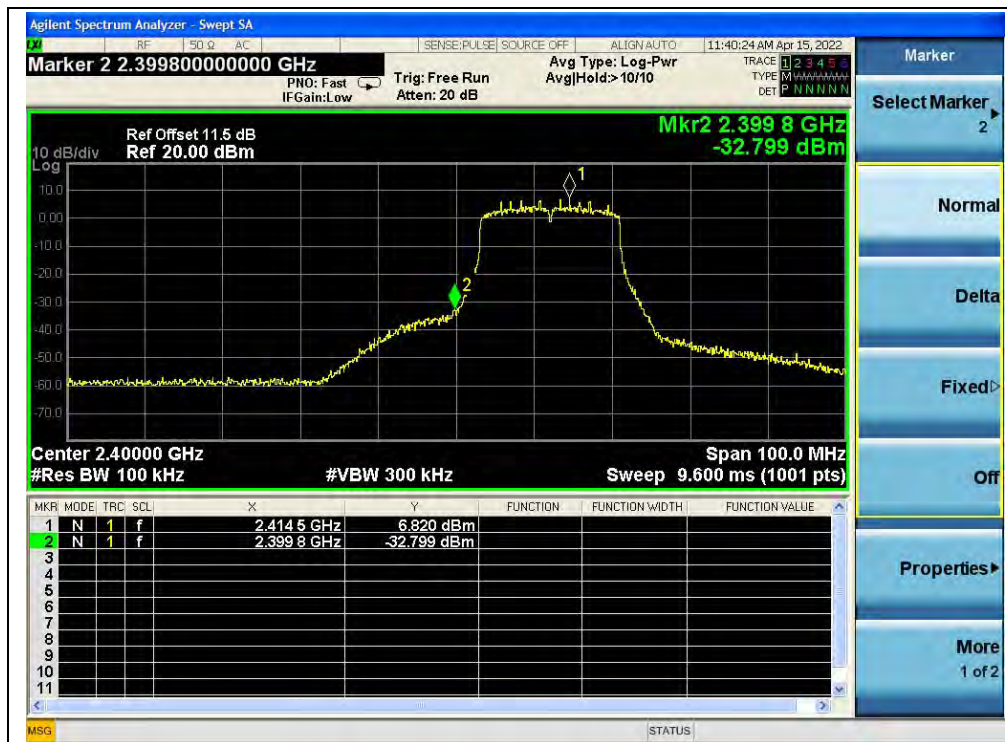
(Band Edge, Channel 11, 802.11g)

**802.11n (HT20) Mode****A.Test Verdict:**

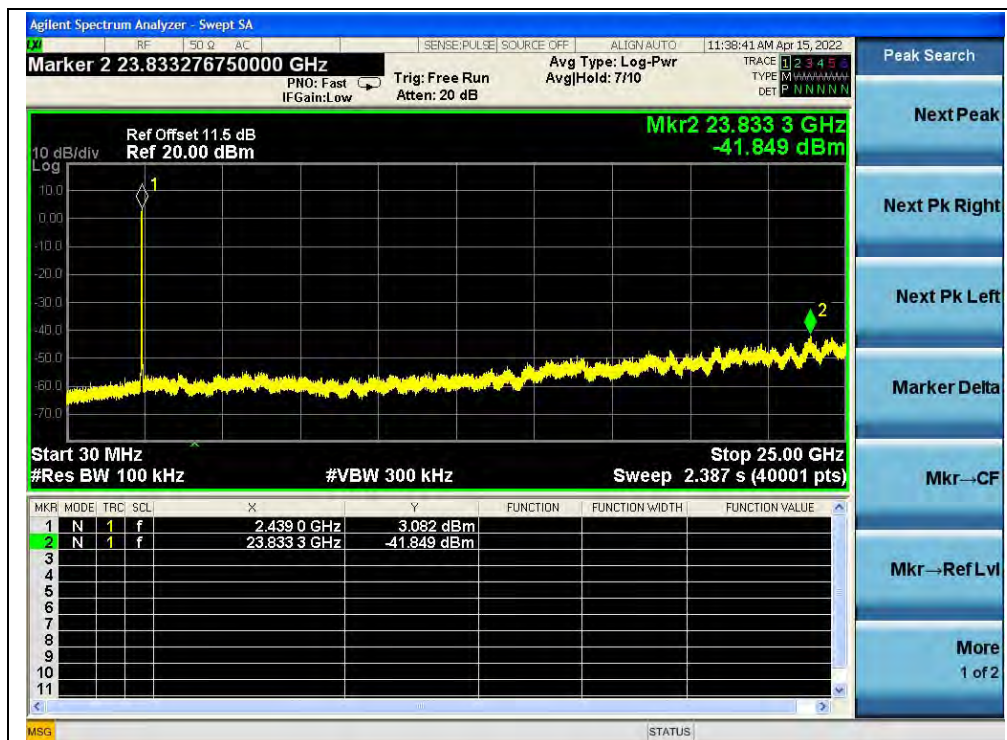
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-41.41	3.41	-16.59	PASS
6	2437	-41.85	3.08	-16.92	PASS
11	2462	-42.45	3.00	-17.00	PASS

B.Test Plot:

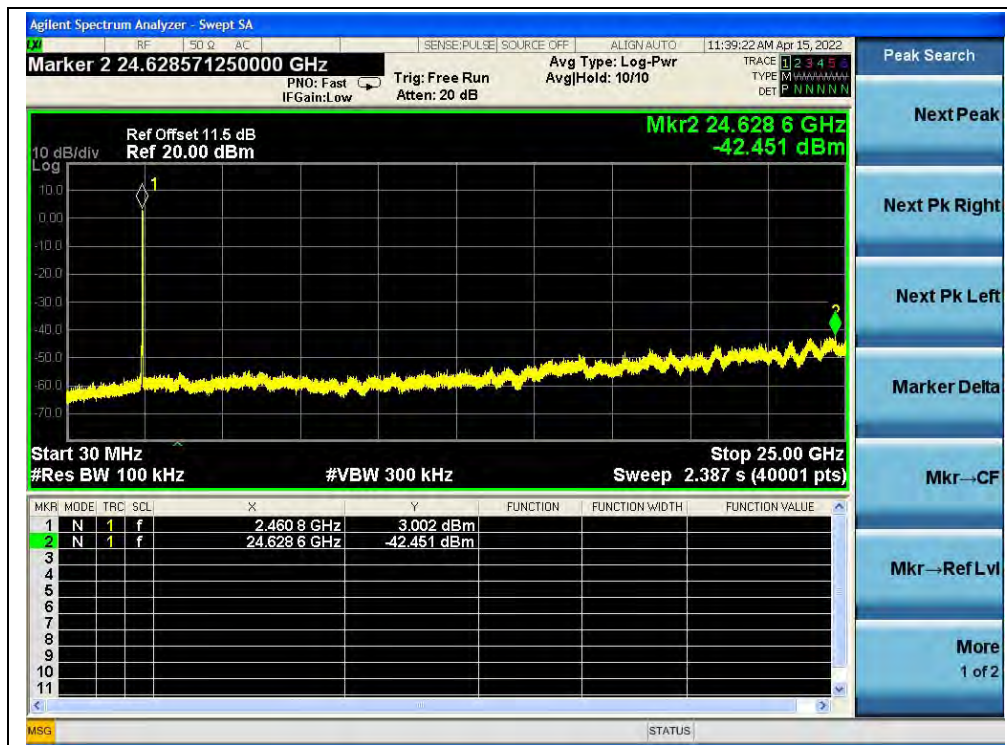
(30MHz to 25GHz, Channel 1, 802.11n (HT20))



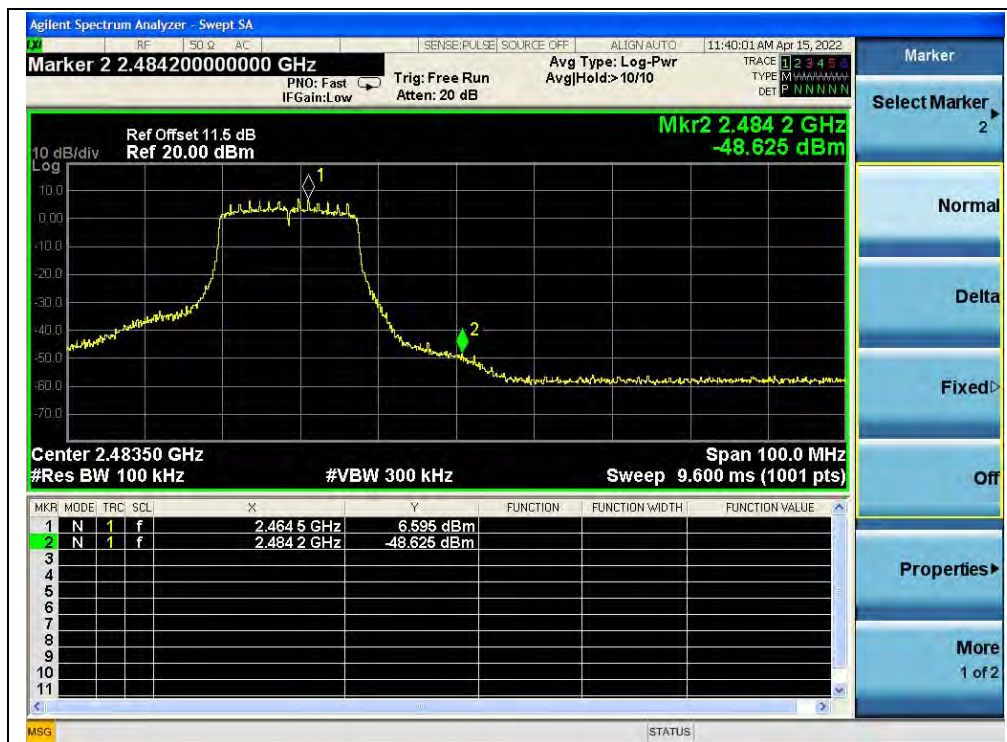
(Band Edge, Channel 1, 802.11n (HT20))



(30MHz to 25GHz, Channel 6, 802.11n (HT20))



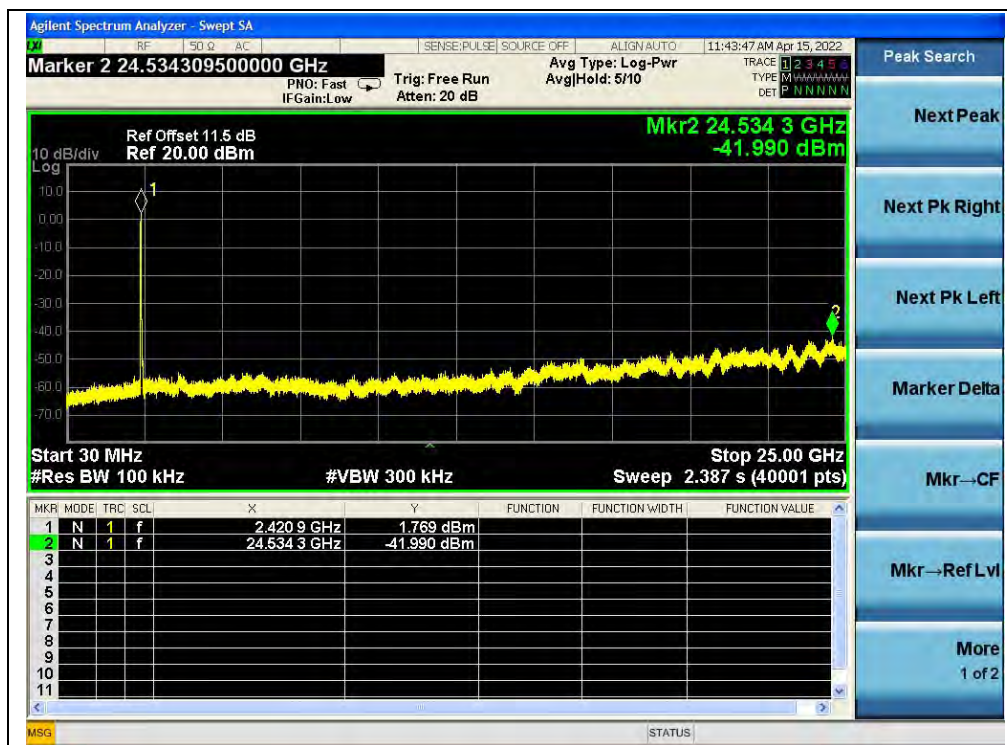
(30MHz to 25GHz, Channel 11, 802.11n (HT20))



(Band Edge, Channel 11, 802.11n (HT20))

**802.11n (HT40) Mode****A.Test Verdict:**

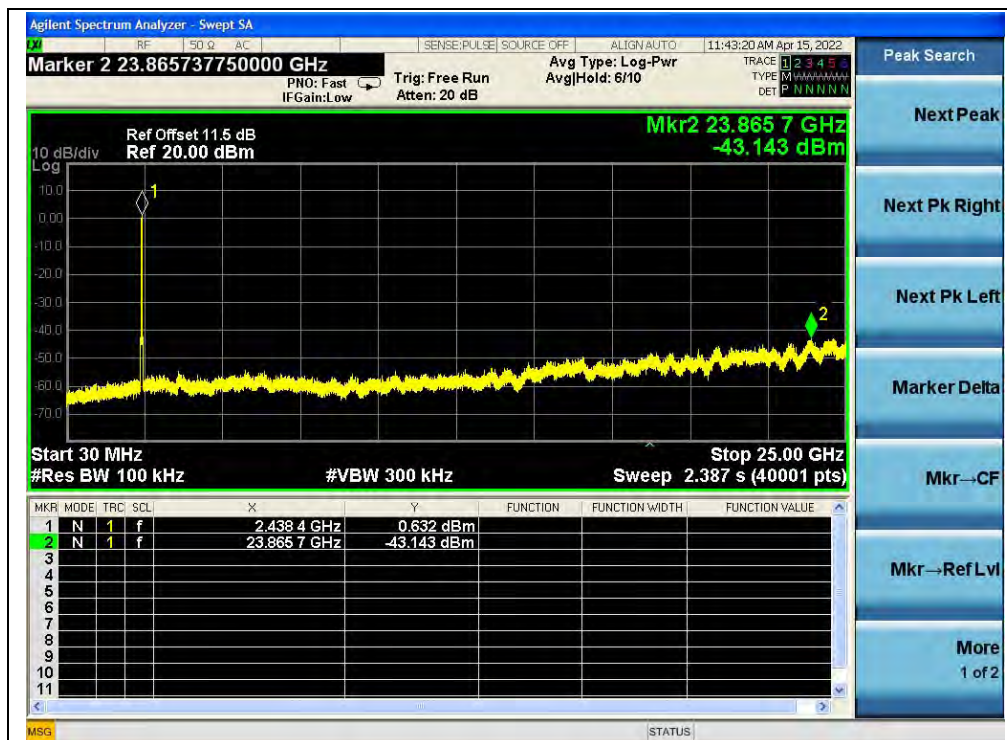
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
3	2422	-41.99	1.77	-18.23	PASS
6	2437	-43.14	0.63	-19.37	PASS
9	2452	-42.31	2.61	-17.39	PASS

B.Test Plot:

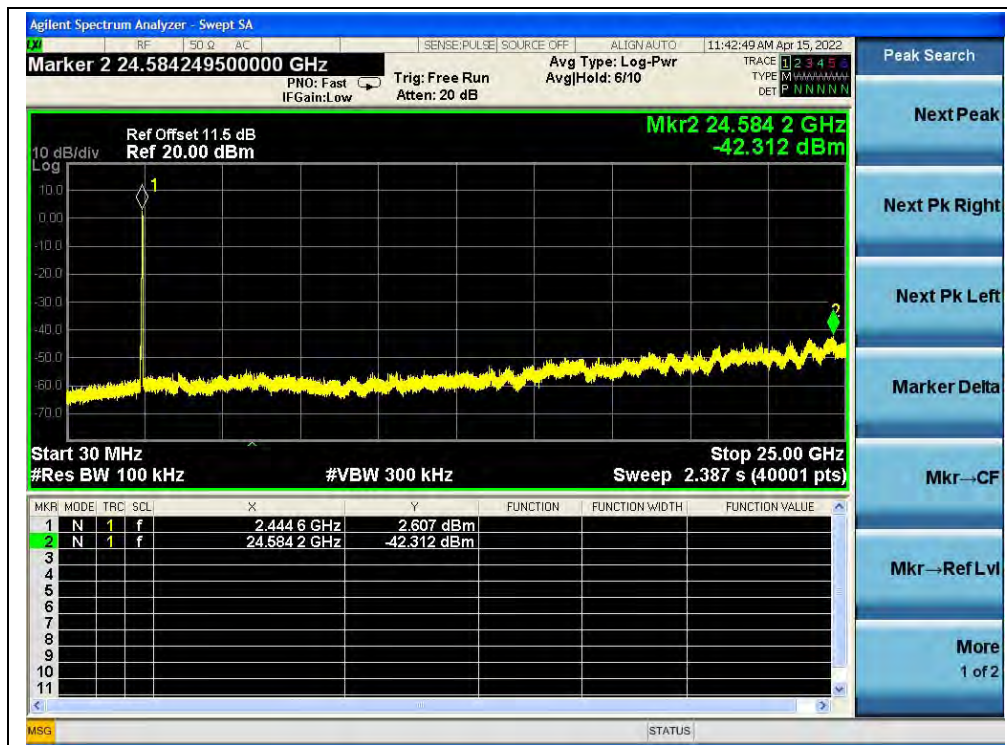
(30MHz to 25GHz, Channel 3, 802.11n (HT40))



(Band Edge, Channel 3, 802.11n (HT40))



(30MHz to 25GHz, Channel 6, 802.11n (HT40))



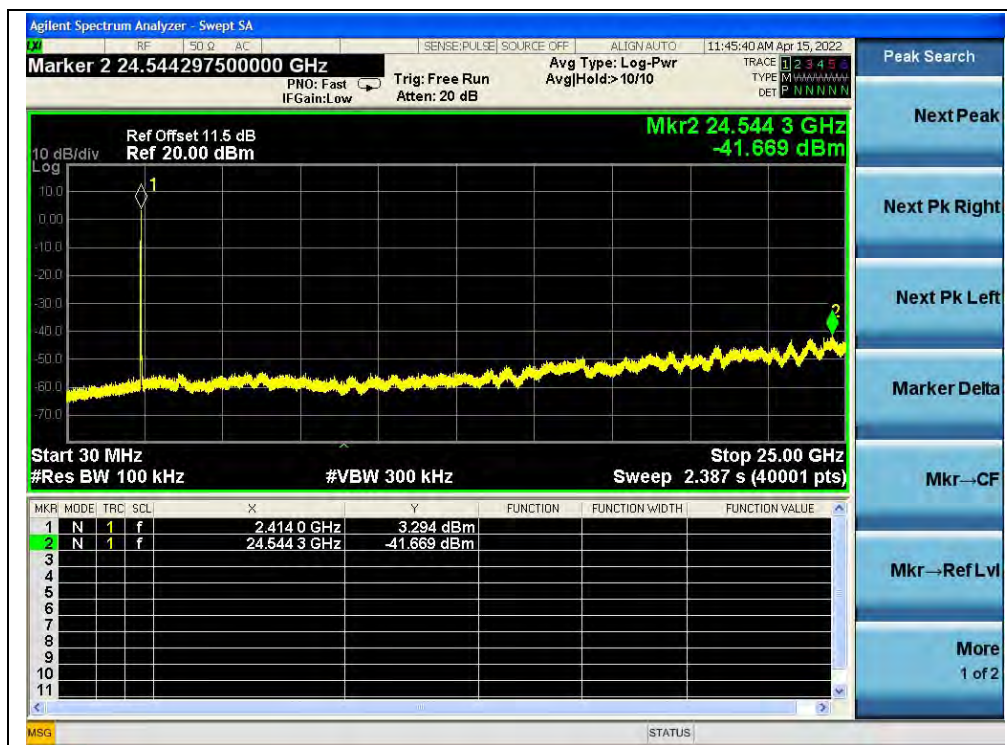
(30MHz to 25GHz, Channel 9, 802.11n (HT40))



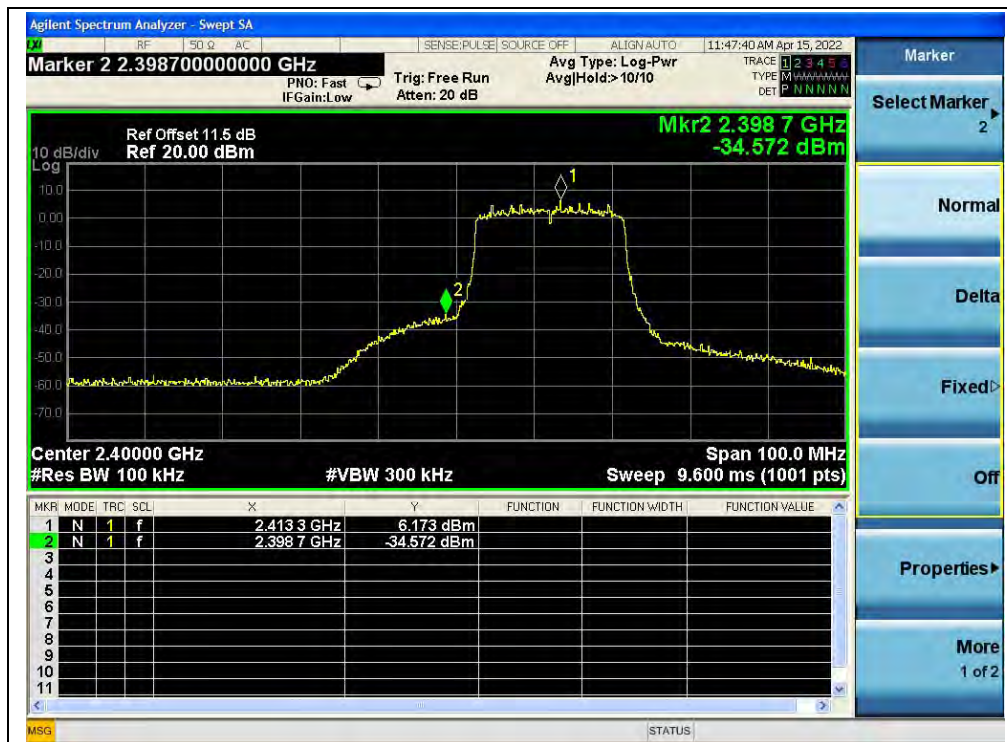
(Band Edge, Channel 11, 802.11n (HT40))

**802.11ax (HEW20) Mode****A.Test Verdict:**

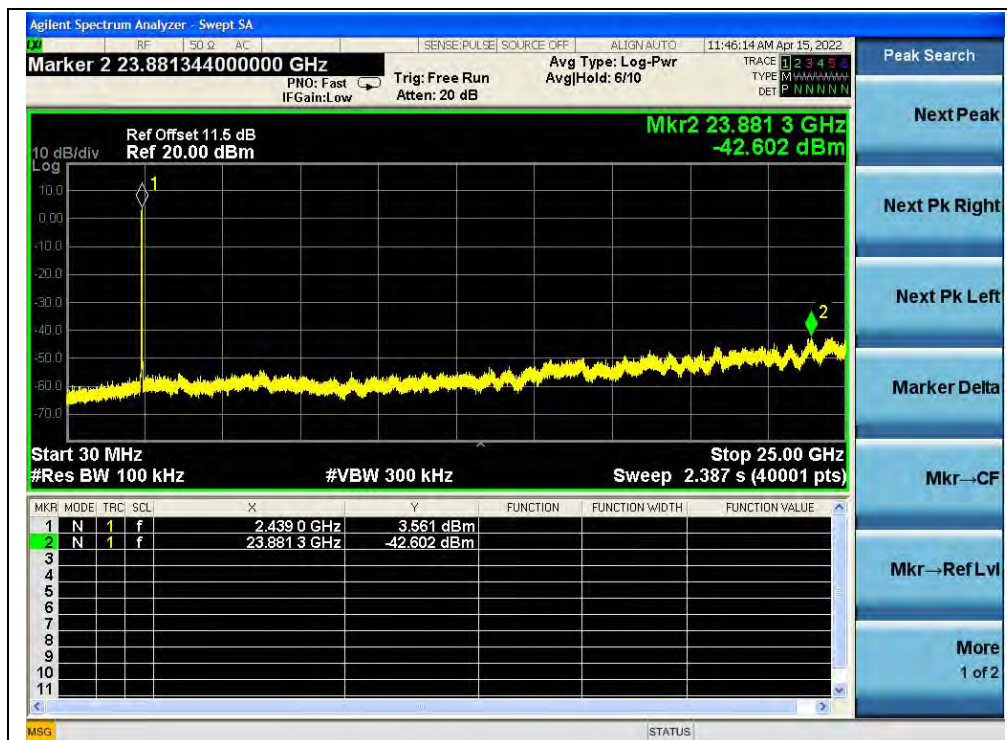
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-41.67	3.29	-16.71	PASS
6	2437	-42.60	3.56	-16.44	PASS
11	2462	-42.69	2.63	-17.37	PASS

B.Test Plot:

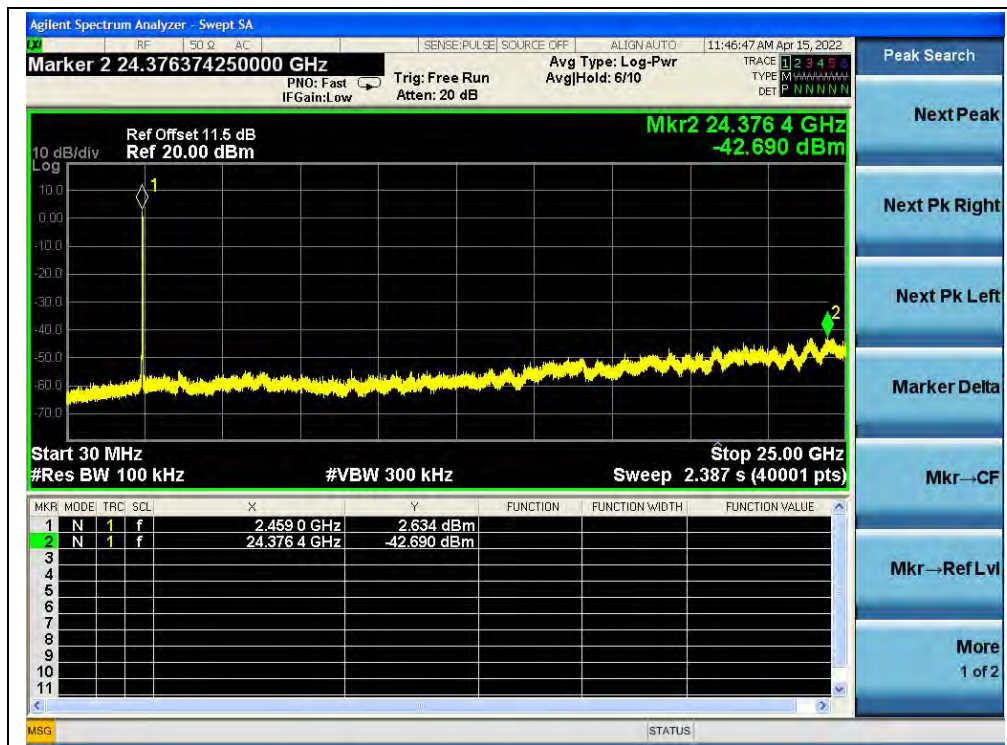
(30MHz to 25GHz, Channel 1, 802.11ax (HEW20))



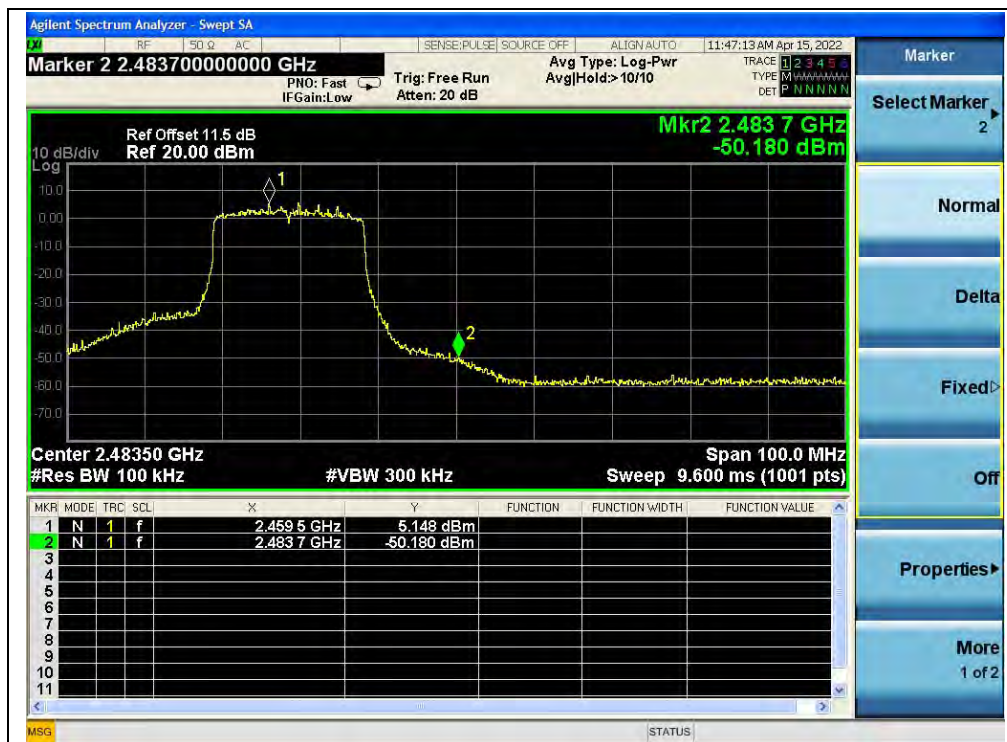
(Band Edge, Channel 1, 802.11ax (HEW20))



(30MHz to 25GHz, Channel 6, 802.11ax (HEW20))



(30MHz to 25GHz, Channel 11, 802.11ax (HEW20))



(Band Edge, Channel 11, 802.11ax (HEW20))

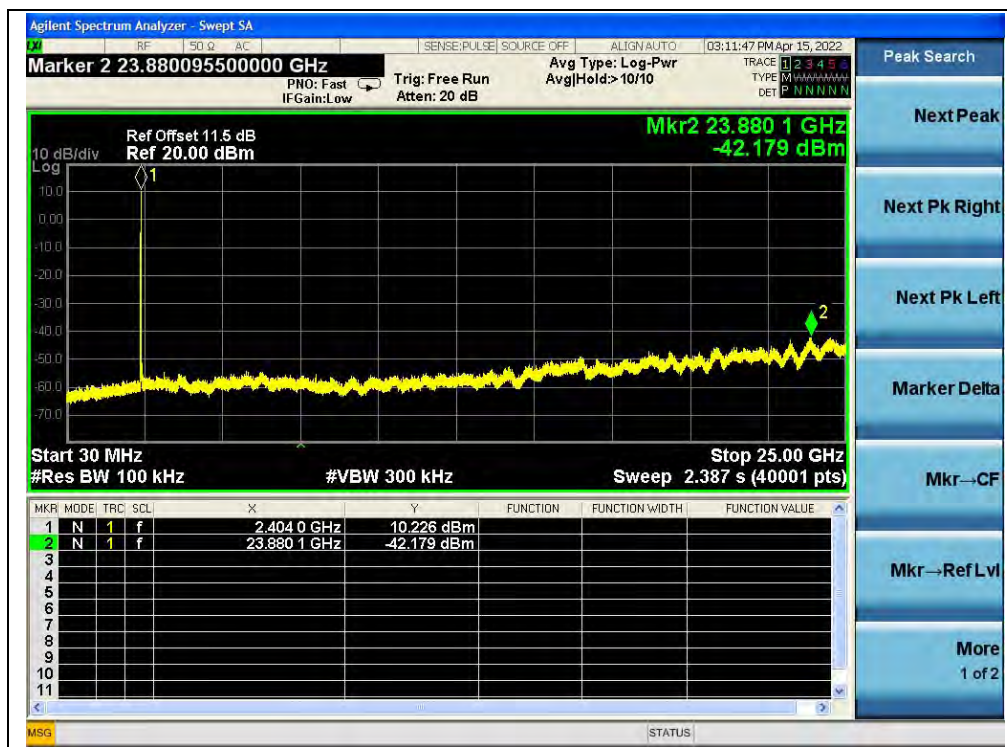


802.11ax (HEW20) RU26 Mode

A.Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-45.18	10.23	-9.77	PASS
6	2437	-41.75	10.24	-9.76	PASS
11	2462	-41.52	11.39	-8.61	PASS

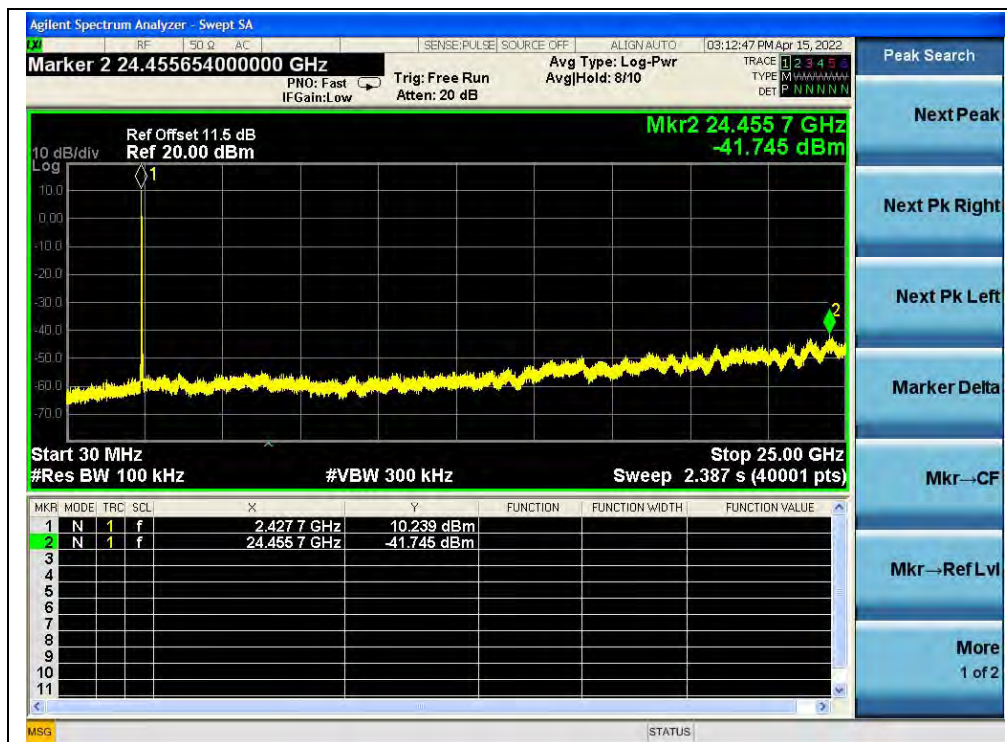
B.Test Plot:



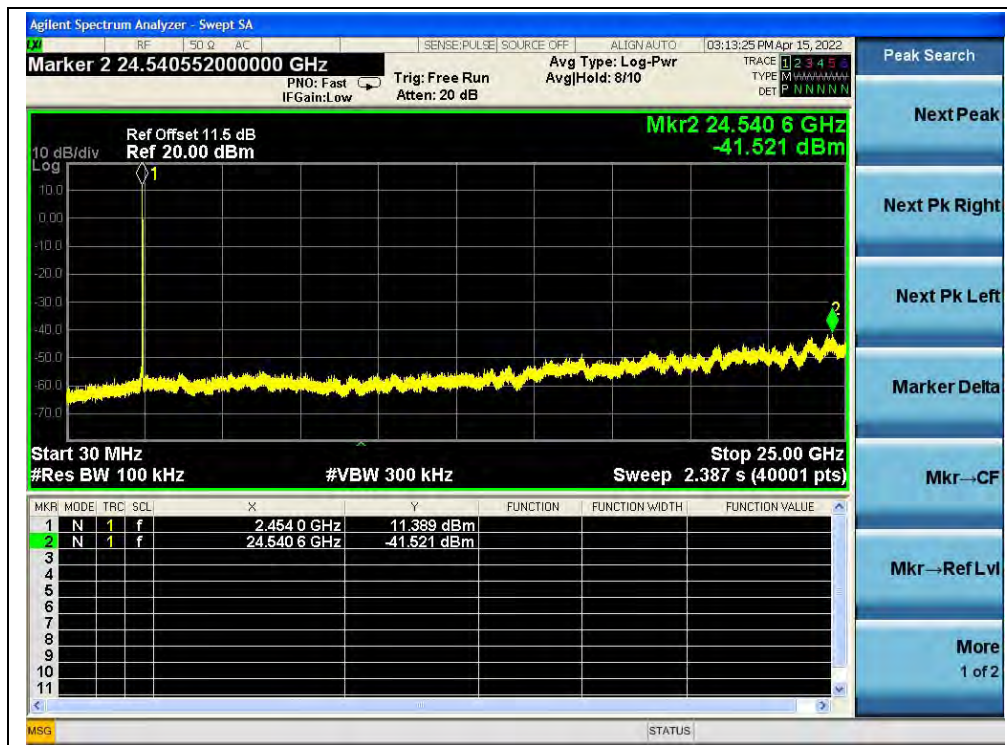
(30MHz to 25GHz, Channel 1, 802.11ax (HEW20) RU26)



(Band Edge, Channel 1, 802.11ax (HEW20) RU26)



(30MHz to 25GHz, Channel 6, 802.11ax (HEW20) RU26)



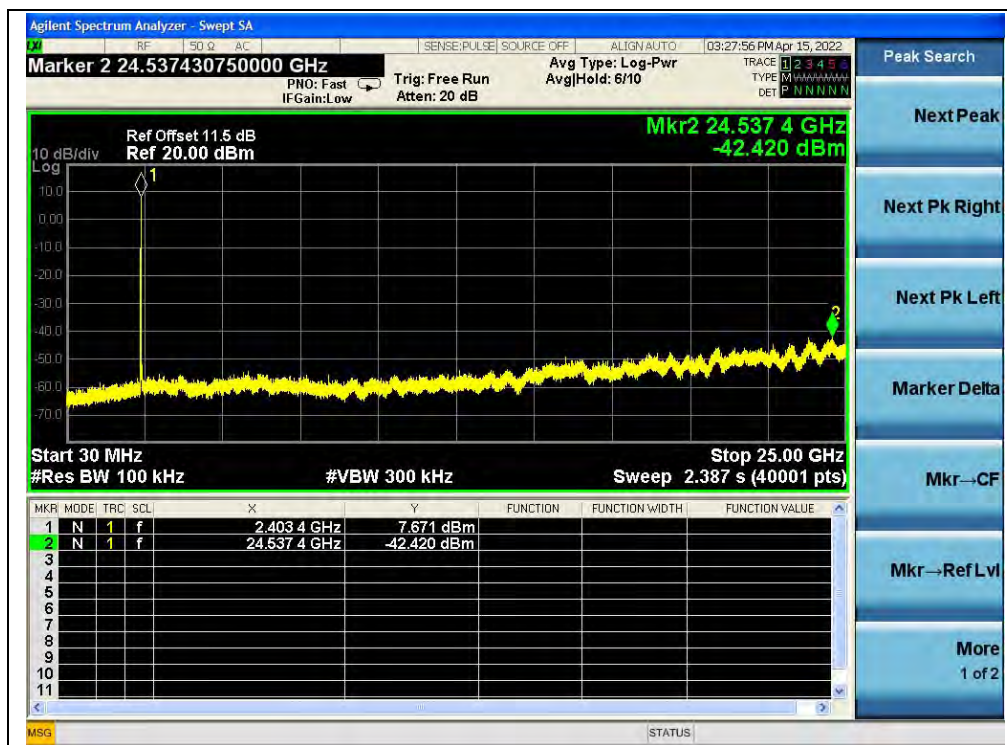
(30MHz to 25GHz, Channel 11, 802.11ax (HEW20) RU26)



(Band Edge, Channel 11, 802.11ax (HEW20) RU26)

**802.11ax (HEW20) RU52 Mode****A.Test Verdict:**

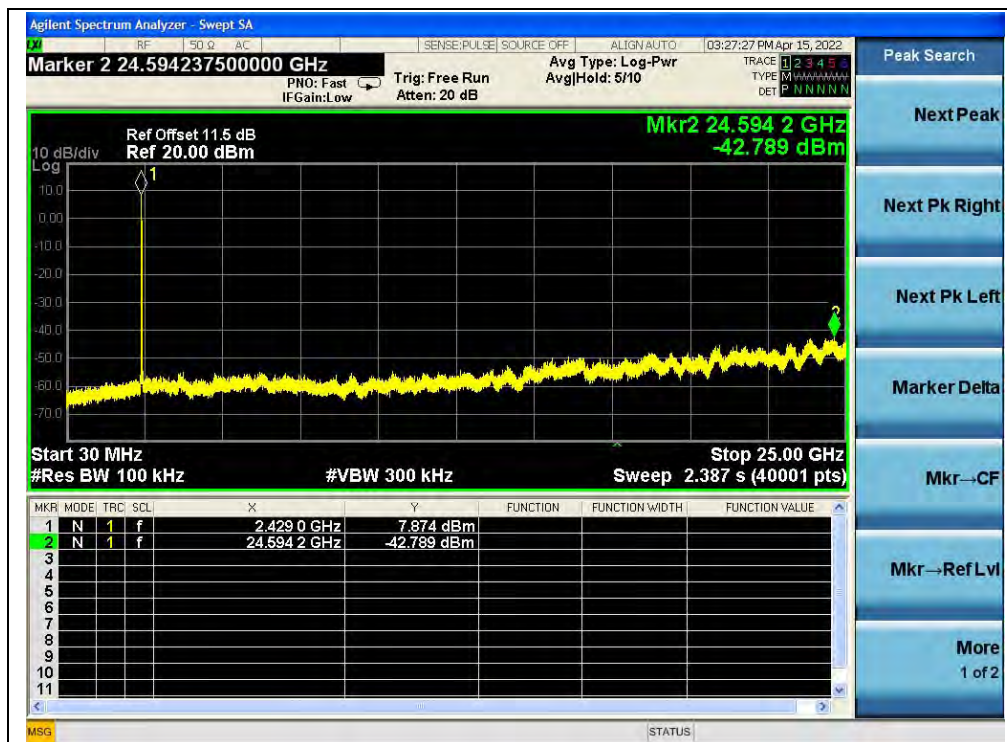
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-42.42	7.67	-12.33	PASS
6	2437	-42.79	7.87	-12.13	PASS
11	2462	-42.31	8.49	-11.51	PASS

B.Test Plot:

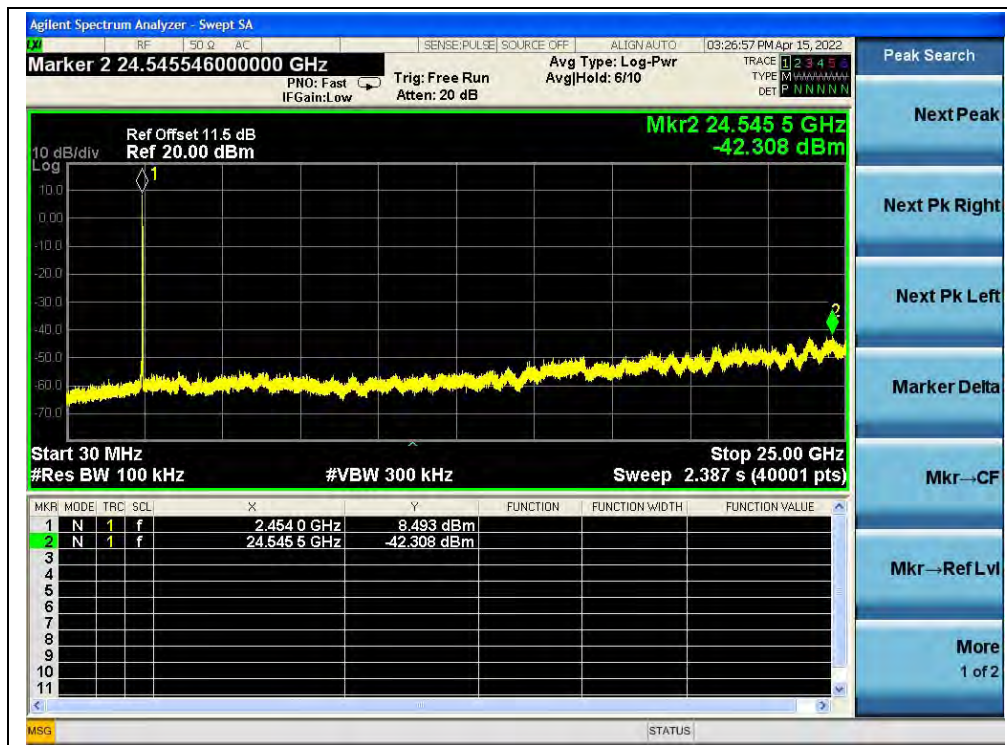
(30MHz to 25GHz, Channel 1, 802.11ax (HEW20) RU52)



(Band Edge, Channel 1, 802.11ax (HEW20) RU52)



(30MHz to 25GHz, Channel 6, 802.11ax (HEW20) RU52)



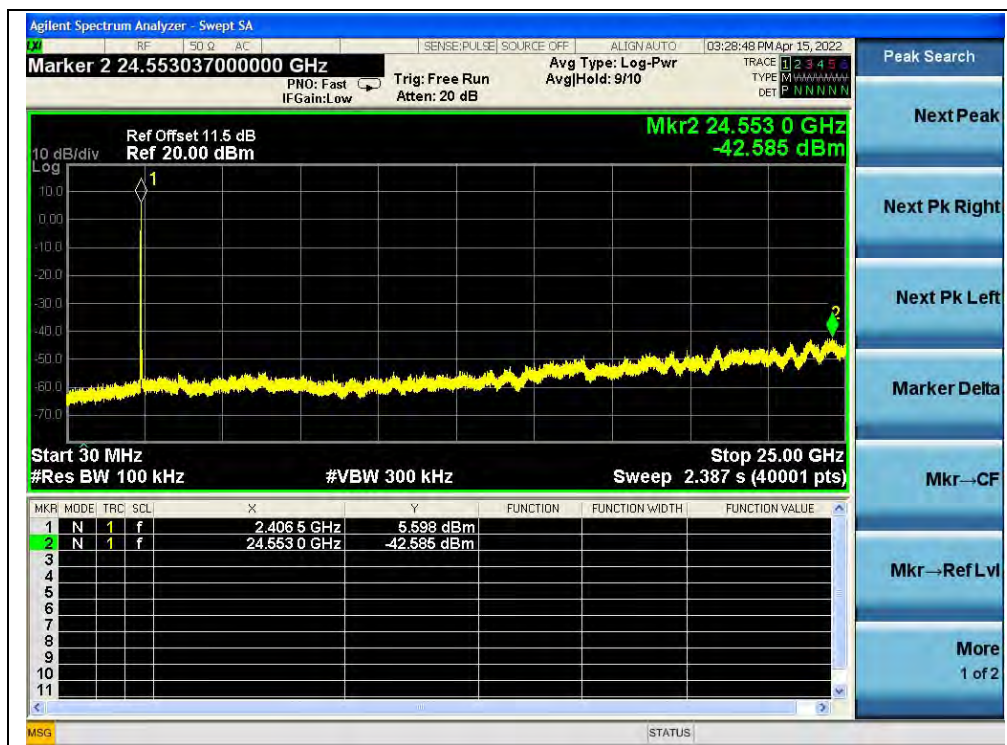
(30MHz to 25GHz, Channel 11, 802.11ax (HEW20) RU52)



(Band Edge, Channel 11, 802.11ax (HEW20) RU52)

**802.11ax (HEW20) RU106 Mode****A.Test Verdict:**

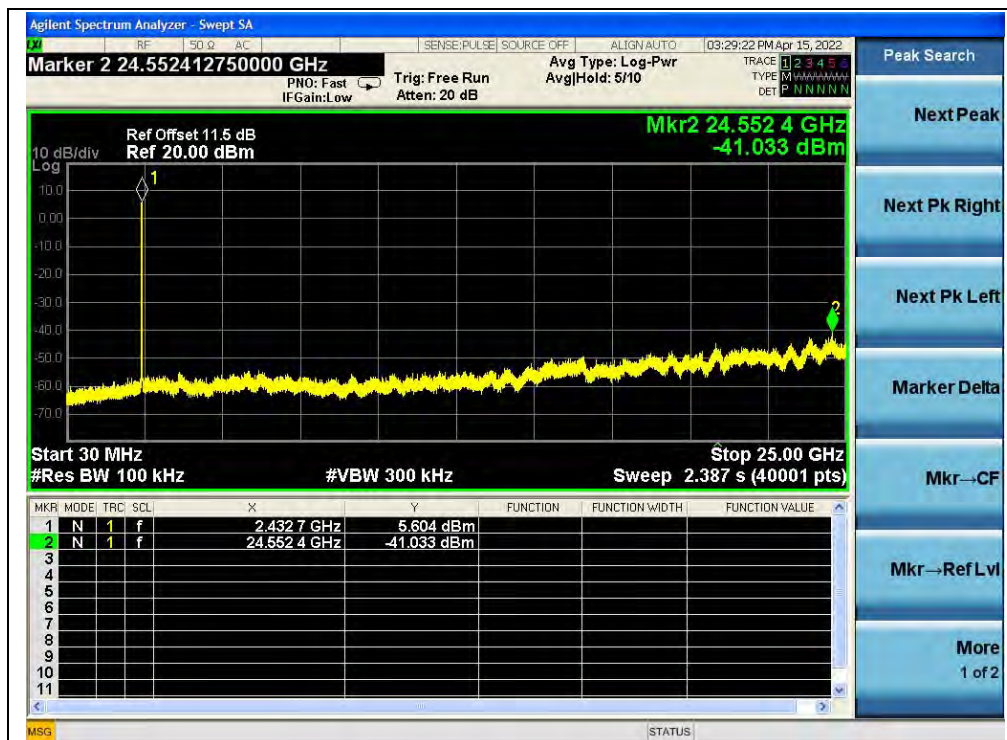
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-42.59	5.60	-14.40	PASS
6	2437	-41.03	5.60	-14.40	PASS
11	2462	-42.42	5.67	-14.33	PASS

B.Test Plot:

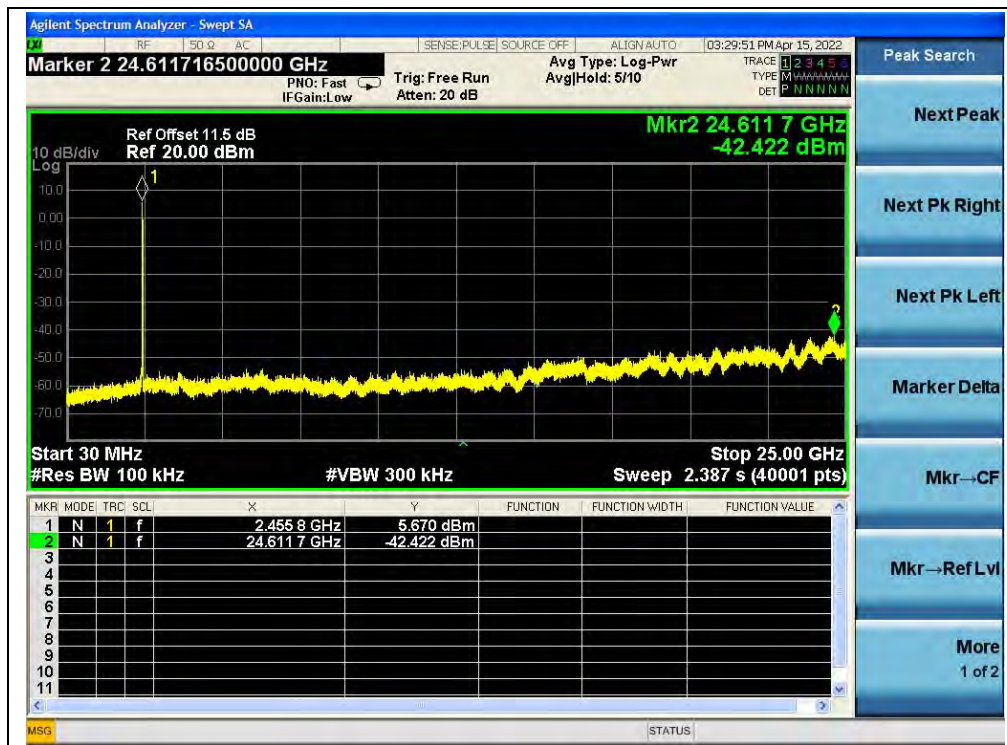
(30MHz to 25GHz, Channel 1, 802.11ax (HEW20) RU106)



(Band Edge, Channel 1, 802.11ax (HEW20) RU106)



(30MHz to 25GHz, Channel 6, 802.11ax (HEW20) RU106)



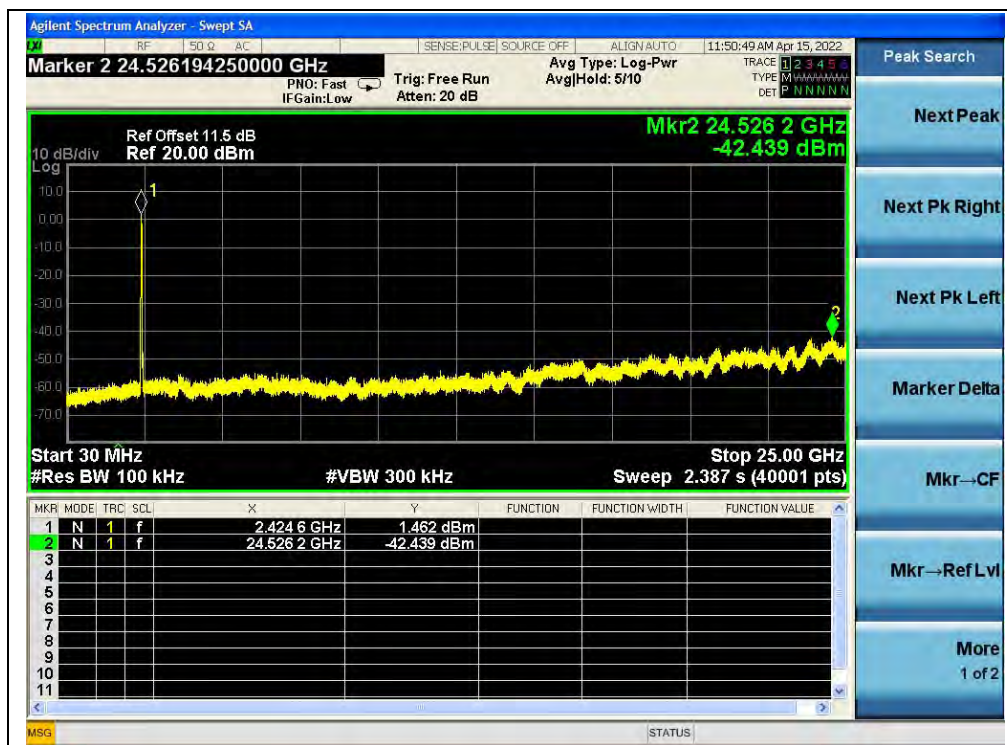
(30MHz to 25GHz, Channel 11, 802.11ax (HEW20) RU106)



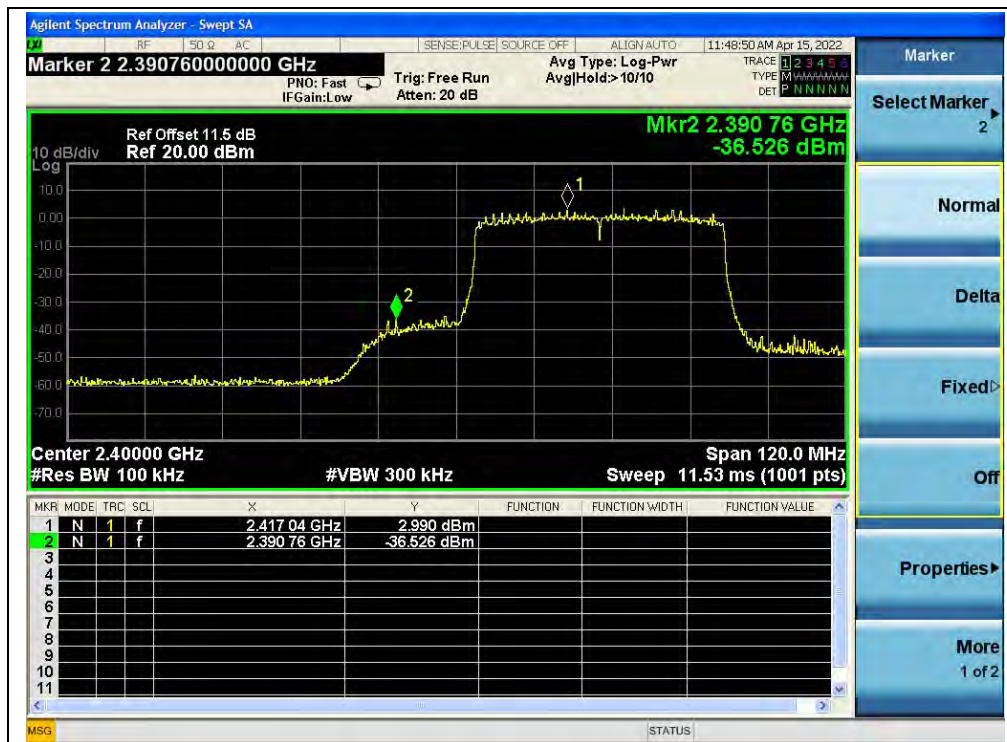
(Band Edge, Channel 11, 802.11ax (HEW20) RU106)

**802.11ax (HEW40) Mode****A.Test Verdict:**

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
3	2422	-42.44	1.46	-18.54	PASS
6	2437	-42.91	1.51	-18.49	PASS
9	2452	-43.12	0.99	-19.01	PASS

B.Test Plot:

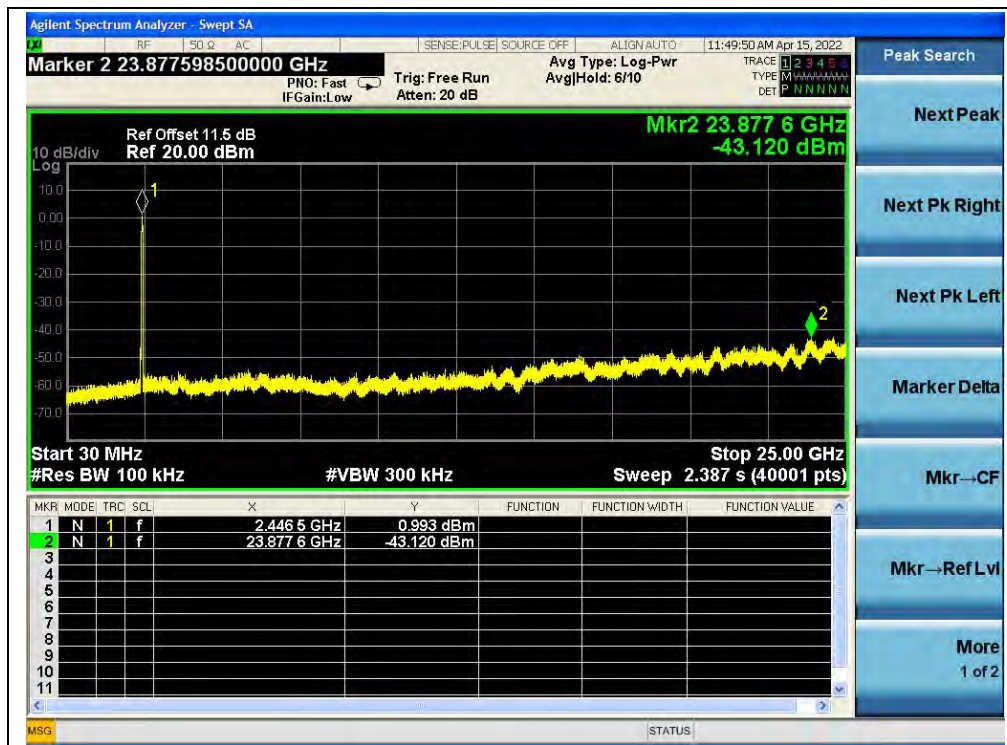
(30MHz to 25GHz, Channel 3, 802.11ax (HEW40))



(Band Edge, Channel 3, 802.11ax (HEW40))



(30MHz to 25GHz, Channel 6, 802.11ax (HEW40))



(30MHz to 25GHz, Channel 9, 802.11ax (HEW40))



(Band Edge, Channel 11, 802.11ax (HEW40))

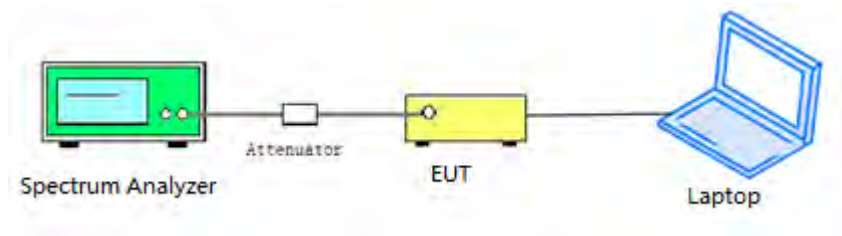
2.6. Power Spectral Density

2.6.1. Requirement

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

2.6.2. Test Description

Test Setup:



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.

2.6.3. Test Procedure

KDB 558074 Section 8.4 was used in order to prove compliance.



2.6.4. Test Result

802.11b Mode

A.Test Verdict:

Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)		Limit (dBm/3kHz)	Verdict
		ANT 0	ANT 1		
1	2412	-3.19	-4.14	8	PASS
6	2437	-4.15	-2.56	8	PASS
11	2462	-3.54	-4.82	8	PASS

B.Test Plot:



(Channel 1, 802.11b, ANT 0)



(Channel 6, 802.11b, ANT 0)



(Channel 11, 802.11b, ANT 0)



(Channel 1, 802.11b, ANT 1)



(Channel 6, 802.11b, ANT 1)



(Channel 11, 802.11b, ANT 1)

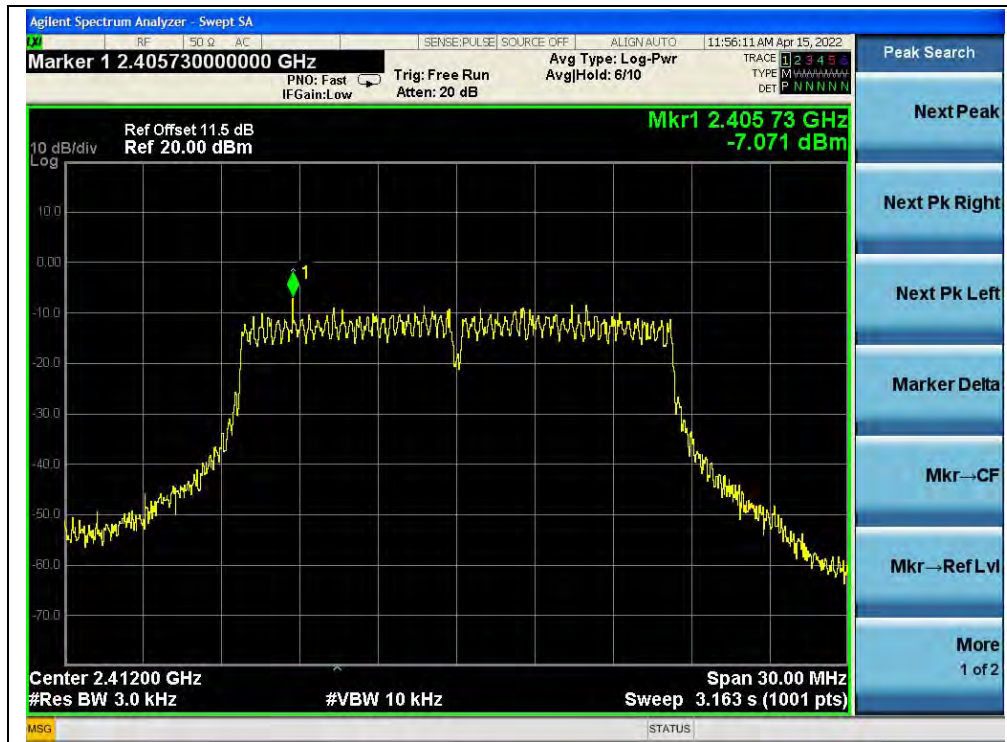


802.11g Mode

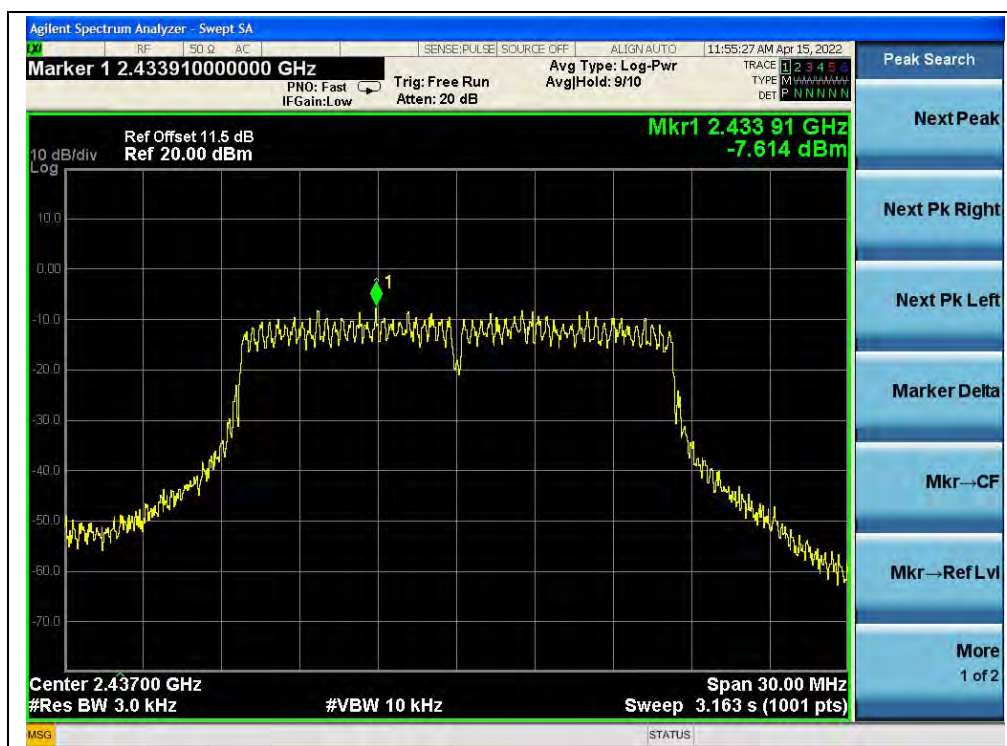
A.Test Verdict:

Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)		Limit (dBm/3kHz)	Verdict
		ANT 0	ANT 1		
1	2412	-7.07	-9.18	8	PASS
6	2437	-7.61	-8.07	8	PASS
11	2462	-9.11	-9.09	8	PASS

B.Test Plot:



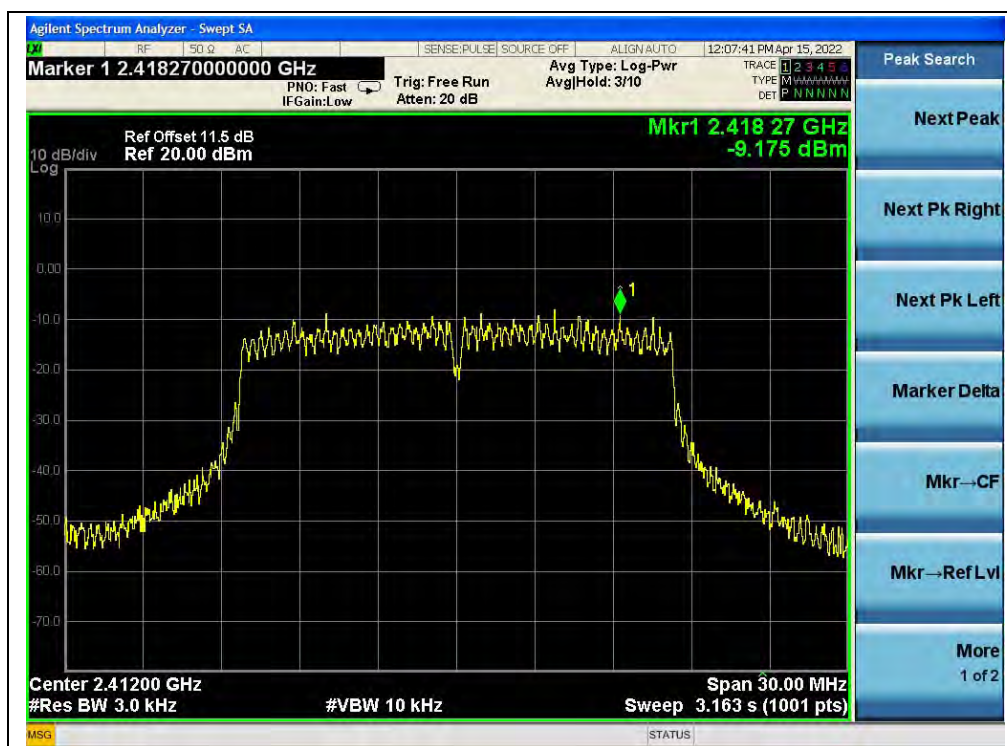
(Channel 1, 802.11g, ANT 0)



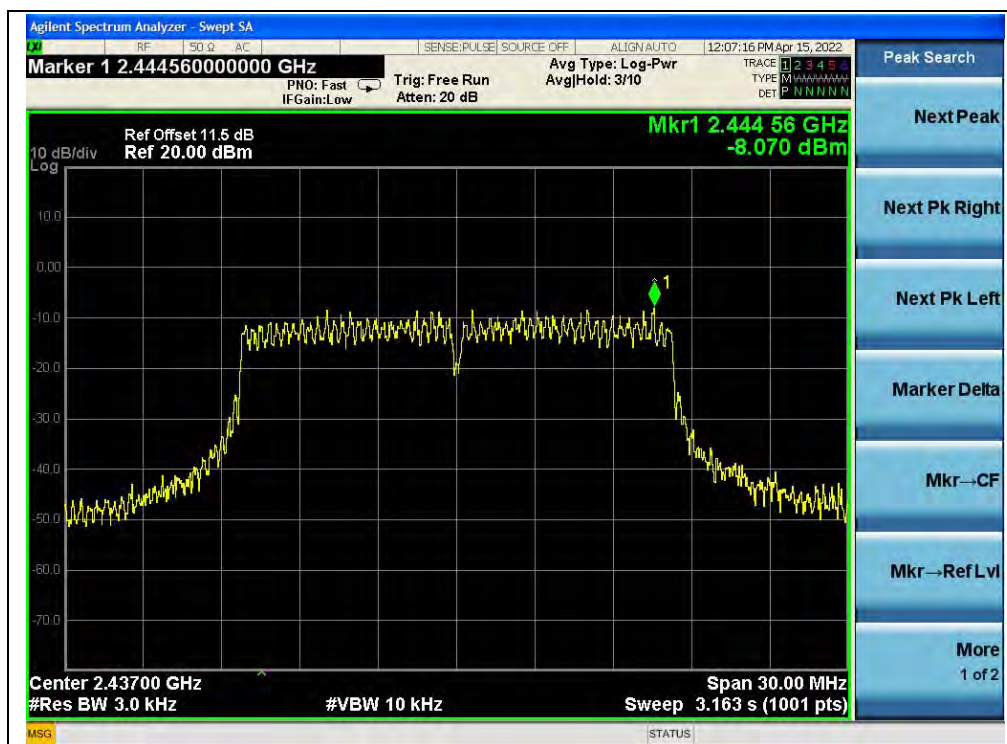
(Channel 6, 802.11g, ANT 0)



(Channel 11, 802.11g, ANT 0)



(Channel 1, 802.11g, ANT 1)



(Channel 6, 802.11g, ANT 1)



(Channel 11, 802.11g, ANT 1)



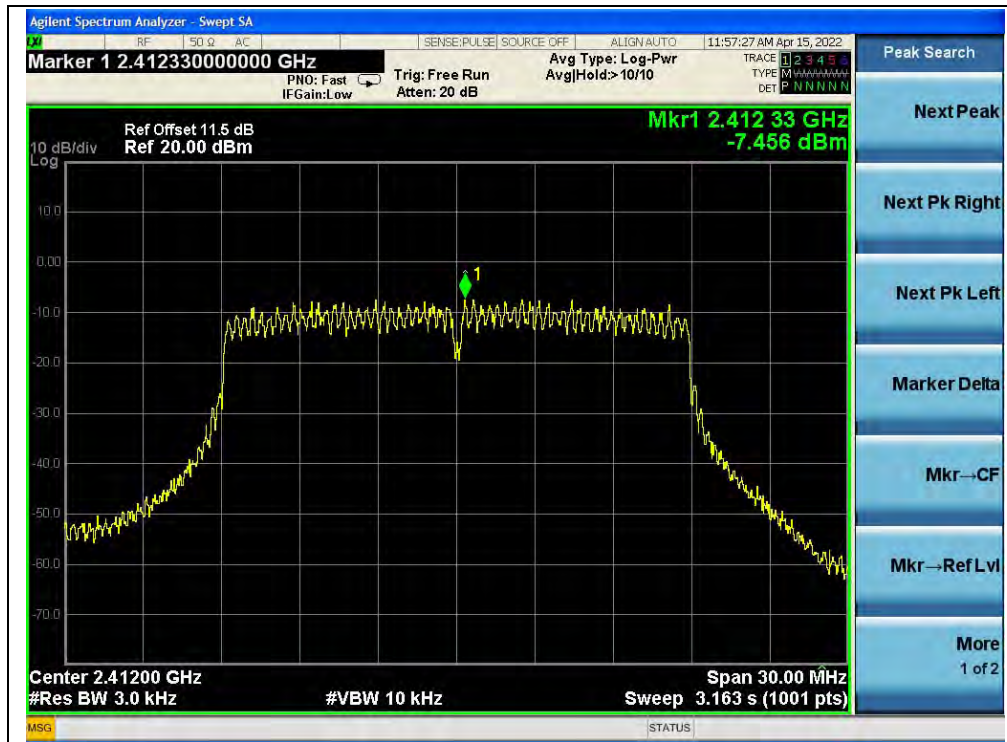
802.11n (HT20) Mode

A.Test Verdict:

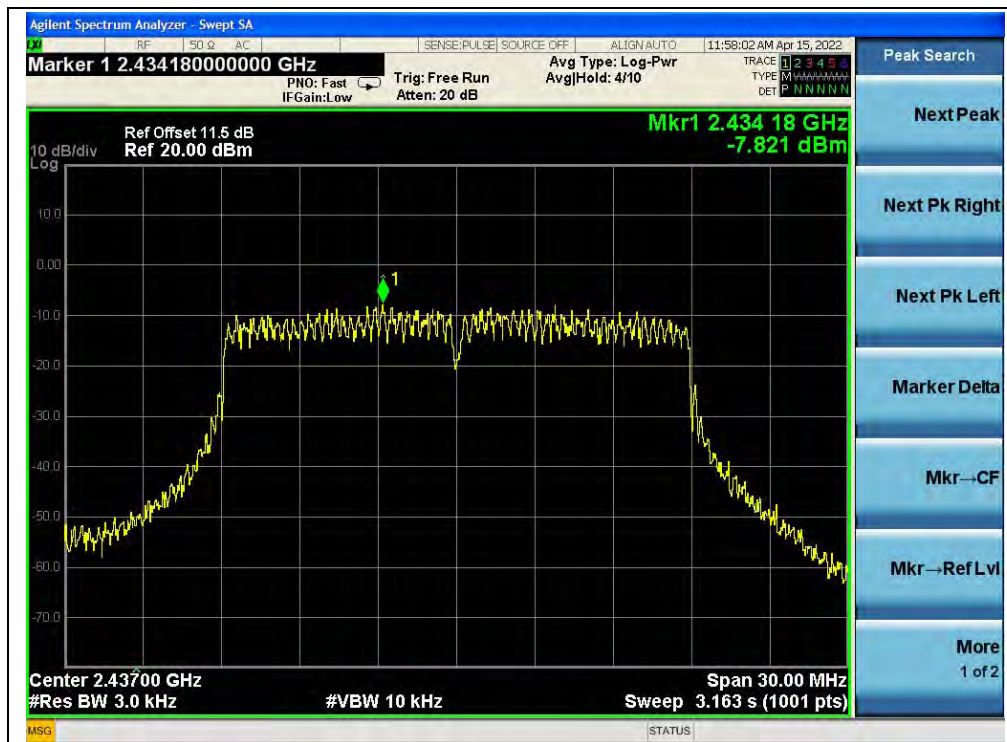
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)		Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
		ANT 0	ANT 1			
1	2412	-7.46	-7.90	-4.66	8	PASS
6	2437	-7.82	-6.17	-3.91	8	PASS
11	2462	-7.24	-8.19	-4.68	8	PASS

Note: Directional gain = $2.6\text{dBi} + 10\log(2) = 5.61\text{dBi} < 6\text{dBi}$, so the power density limit is 8 dBm/3kHz.

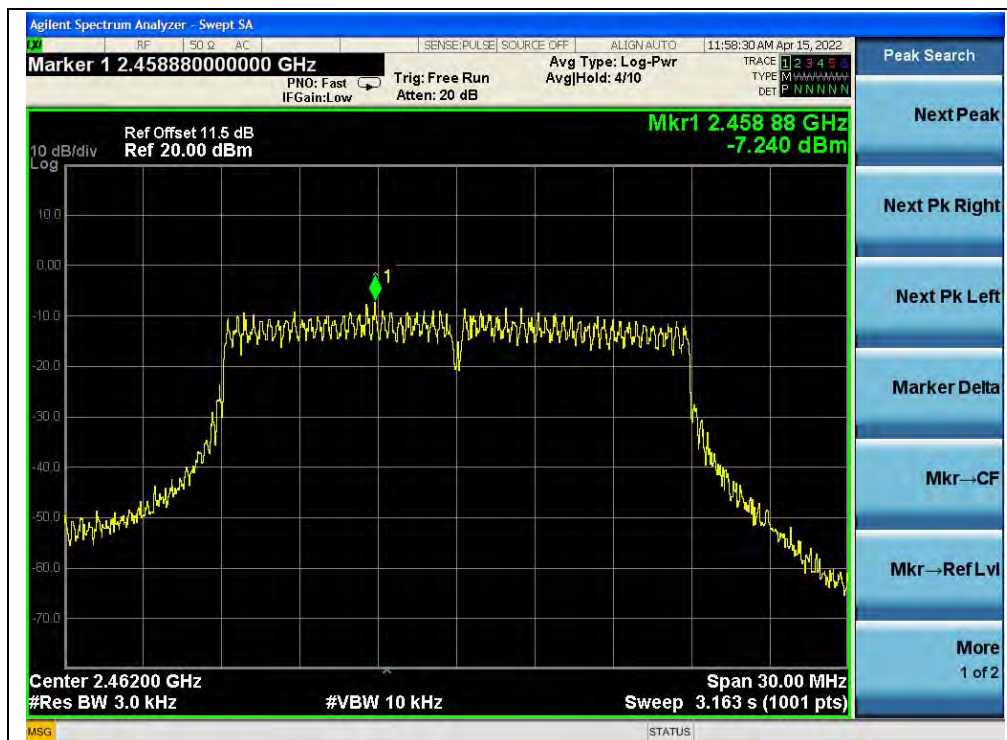
B.Test Plot:



(Channel 1, 802.11n (HT20), ANT 0)



(Channel 6, 802.11n (HT20), ANT 0)



(Channel 11, 802.11n (HT20), ANT 0)