FCC Test Report

Report No.: AGC11034230404FE04

FCC ID	:	2AYHE-2303A
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	WiFi IP Camera
BRAND NAME	:	Reolink
MODEL NAME	:	E1 Outdoor Pro, T1 Outdoor Pro, TP4KW6
APPLICANT	:	Reolink Innovation Limited
DATE OF ISSUE	:	May 12, 2023
STANDARD(S)	:	FCC Part 15 Subpart C §15.247
REPORT VERSION	:	V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd

REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	May 12, 2023	Valid	Initial Release

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1. VERIFICATION OF CONFORMITY

Applicant	Reolink Innovation Limited
Address	FLAT/RM 705 7/F FA YUEN COMMERCIAL BUILDING 75-77 FA YUEN STREET MONG KOK KL Hong Kong
manufacturer	Reolink Innovation Limited
Address	FLAT/RM 705 7/F FA YUEN COMMERCIAL BUILDING 75-77 FA YUEN STREET MONG KOK KL Hong Kong
Factory	Shenzhen Reolink Technology Co., Ltd
Address	2-4th Floor, Building 2, Yuanling Industrial Park, ShangWu, Shiyan Street, Bao'an District, Shenzhen, China
Product Designation	WiFi IP Camera
Brand Name	Reolink
Test Model	E1 Outdoor Pro
Series Model	T1 Outdoor Pro, TP4KW6
Declaration of Difference	All the same except the model name
Date of receipt of test item	Apr. 23, 2023
Date of test	Apr. 23, 2023~May 12, 2023
Deviation	No any deviation from the test method
Condition of Test Sample	Normal
Test Result	Pass
Report Template	AGCRT-US-BGN/RF

We hereby certify that:

The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC Rules Part 15.247.

Prepared By	Bibo Zhang	
	Bibo Zhang (Project Engineer)	May 12, 2023
Reviewed By	Calvin Liu	
	Calvin Liu (Reviewer)	May 12, 2023
Approved By	Max Zhang	
	Max Zhang Authorized Officer	May 12, 2023

2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

Equipment Type	WLAN 2.4G
Frequency Band	2400MHz ~ 2483.5MHz
Operation Frequency	2412MHz ~ 2462MHz
Output Power (Average)	IEEE 802.11b:11.64dBm; IEEE 802.11g:10.49dBm; IEEE 802.11n(HT20):10.62dBm; IEEE 802.11n(HT40):10.73dBm
Output Power (Peak)	IEEE 802.11b:13.85dBm; IEEE 802.11g:17.13dBm; IEEE 802.11n(HT20):16.91dBm; IEEE 802.11n(HT40):16.25dBm
Output Power (MIMO- Average)	IEEE 802.11n(HT20):13.58dBm; IEEE 802.11n(HT40):13.61dBm
Output Power (MIMO- Peak)	IEEE 802.11n(HT20):19.86dBm; IEEE 802.11n(HT40):19.21dBm
Modulation	802.11b:(DQPSK, DBPSK,CCK)DSSS 802.11g/n:(64-QAM,16-QAM,QPSK, BPSK)OFDM
Data Rate	802.11b:1/2/5.5/11Mbps 802.11g: 6/9/12/18/24/36/48/54Mbps 802.11n: up to 300Mbps
Number of channels	11
Hardware Version	N60C05 PWR32
Software Version	V1
Antenna Designation	FPC antenna (Comply with requirements of the FCC part 15.203)
Antenna Gain	Please refer to report section 2.9 description
Number of transmit chain	2(802.11b/g/n all used two antennas,802.11n support MIMO)
Power Supply	DC 12V by adapter

2.2. TABLE OF CARRIER FREQUENCYS

For 2412-2462MHz:

11 channels are provided for 802.11b/g/n(HT20)/ax(HE20):

Channel	Frequency	Channel	Frequency	Channel	Frequency
01	2412 MHz	02	2417 MHz	03	2422 MHz
04	2427 MHz	05	2432 MHz	06	2437 MHz
07	2442 MHz	08	2447 MHz	09	2452 MHz
10	2457 MHz	11	2462 MHz		

7 channels are provided for 802.11n(HT40)/ax(HE40):

Channel	Frequency	Channel	Frequency	Channel	Frequency
01	--	02	--	03	2422 MHz
04	2427 MHz	05	2432 MHz	06	2437 MHz
07	2442 MHz	08	2447 MHz	09	2452 MHz
10	--	11	--		

2.3. IEEE 802.11N MODULATION SCHEME

MCS Index	Nss	Modulation	R	NBPSC	NCBPS		NDBPS		Data rate(Mbps)	
									800nsGI	
					20MHz	40MHz	20MHz	40MHz	20MHz	40MHz
0	1	BPSK	1/2	1	52	108	26	54	6.5	13.5
1	1	QPSK	1/2	2	104	216	52	108	13.0	27.0
2	1	QPSK	3/4	2	104	216	78	162	19.5	40.5
3	1	16-QAM	1/2	4	208	432	104	216	26.0	54.0
4	1	16-QAM	3/4	4	208	432	156	324	39.0	81.0
5	1	64-QAM	2/3	6	312	648	208	432	52.0	108.0
6	1	64-QAM	3/4	6	312	648	234	489	58.5	121.5
7	1	64-QAM	5/6	6	312	648	260	540	65.0	135.0

Symbol	Explanation
NSS	Number of spatial streams
R	Code rate
NBPSC	Number of coded bits per single carrier
NCBPS	Number of coded bits per symbol
NDBPS	Number of data bits per symbol
GI	Guard interval

2.4. RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for **FCC ID: 2AYHE-2303A** filing to comply with the FCC Part 15 requirements.

2.5. TEST METHODOLOGY

The tests were performed according to following standards:

No.	Identity	Document Title
1	FCC 47 CFR Part 2	Frequency allocations and radio treaty matters; general rules and regulations
2	FCC 47 CFR Part 15	Radio Frequency Devices
3	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
4	KDB 662911	KDB 662911 D01 Multiple Transmitter Output v02r01 Emissions Testing of Transmitters with Multiple Outputs in the Same Band (e.g., MIMO, Smart Antenna, etc)

2.6. SPECIAL ACCESSORIES

Refer to section 5.2.

2.7. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

2.8. ANTENNA REQUIREMENT

Standard Requirement
15.203 requirement: 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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi
EUT Antenna:
The non-detachable antenna inside the device cannot be replaced by the user at will. For the antenna gain, please refer to the description in Chapter 2.10 of the report.

2.9. DESCRIPTION OF AVAILABLE ANTENNAS

Antenna Type	Frequency Band (MHz)	TX Paths	Bandwidth (MHz)	Max Peak Gain (dBi)		Max Directional Gain (dBi)
				Ant 1	Ant 2	
2.4GWIFI FPC Antenna List (2.4GHz 2*2 MIMO)						
FPC Antenna	2400~2483.5	2	20, 40	3.00	3.98	6.99

Note 1: The EUT supports Cyclic Delay Diversity (CDD) technology for 802.11n/ax mode.

Note 2: The EUT supports Cyclic Delay Diversity (CDD) mode, and CDD signals are correlated.

If all antennas have the same gain, G_{ANT}, Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows.

- For power spectral density (PSD) measurements on devices:

  Array Gain = 10 log (N_{ANT}/ N_{SS}) dB = 3.01;

- For power measurements on IEEE 802.1devices:

  Array Gain = 0 dB for $N_{ANT} \leq 4$;

  Array Gain = 0 dB (i.e., no array gain) for channel widths ≥40 MHz for any N_{ANT};

  Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less, for 20 MHz channel widths with $N_{ANT} \geq 5$.

If antenna gains are not equal, Directional gain may be calculated by using the formulas applicable to equal gain antennas with G_{ANT} set equal to the gain of the antenna having the highest gain..

3. MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y ±U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

Item	Measurement Uncertainty
Uncertainty of Conducted Emission for AC Port	U_c = ±3.1 dB
Uncertainty of Radiated Emission below 1GHz	U_c = ±4.0 dB
Uncertainty of Radiated Emission above 1GHz	U_c = ±4.8 dB
Uncertainty of total RF power, conducted	U_c = ±0.8 dB
Uncertainty of RF power density, conducted	U_c = ±2.6 dB
Uncertainty of spurious emissions, conducted	U_c = ±2 %
Uncertainty of Occupied Channel Bandwidth	U_c = ±2 %

4. DESCRIPTION OF TEST MODES

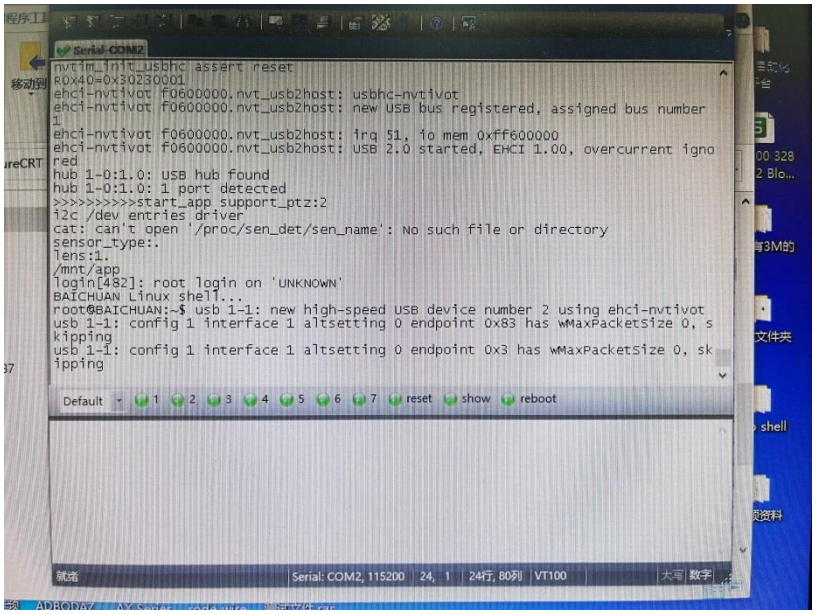
NO.	TEST MODE DESCRIPTION
1	Low channel transmitting (TX)
2	Middle channel transmitting (TX)
3	High channel transmitting (TX)

Note:
1) Transmit by 802.11b with Date rate (1/2/5.5/11)
2) Transmit by 802.11g with Date rate (6/9/12/18/24/36/48/54)
3) Transmit by 802.11n (20MHz) with Date rate (6.5/13/19.5/26/39/52/58.5/65)
4) Transmit by 802.11n (40MHz) with Date rate (13.5/27/40.5/54/81/108/121.5/135)
5) The test channel for 20MHz bandwidth system is channel 1, 6 and 11.
6) The test channel for 40MHz bandwidth system is channel 3, 6 and 9.

Note:

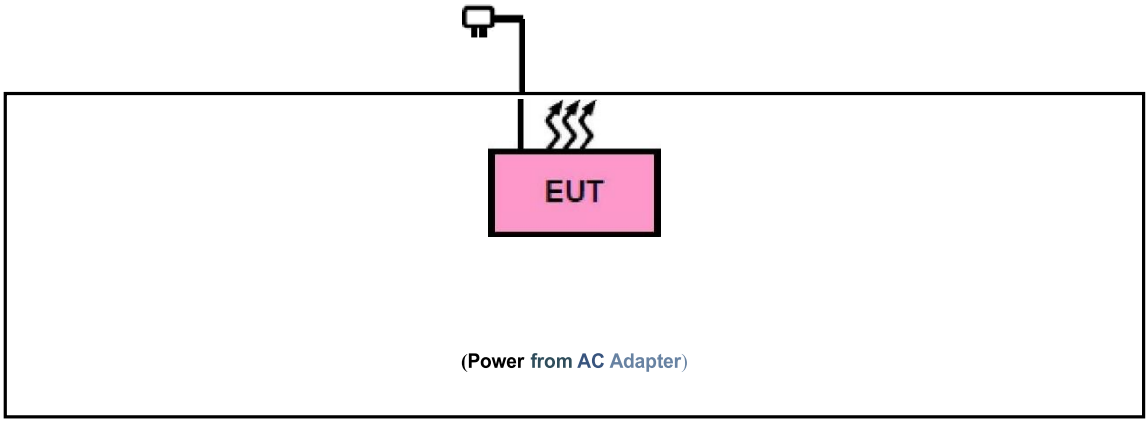
1. The EUT has been set to operate continuously on the lowest, middle and highest operation frequency Individually, and the EUT is operating at its maximum duty cycle>or equal 98%
2. All modes under which configure applicable have been tested and the worst mode test data recording in the test report, if no other mode data.

Software Setting



5. SYSTEM TEST CONFIGURATION

5.1. CONFIGURATION OF EUT SYSTEM



5.2. EQUIPMENT USED IN EUT SYSTEM

Item	Equipment	Model No.	Identifier	Note
1	WiFi IP Camera	E1 Outdoor Pro	2AYHE-2303A	EUT
2	Adapter	DCT12W120100US-B0	Input: AC 100-240V 50/60Hz, 0.3A Output: DC 12V 1A	AE

5.3. SUMMARY OF TEST RESULTS

Item	FCC Rules	Description Of Test	Result
1	§15.203&15.247(b)(4)	Antenna Equipment	Pass
2	§15.247 (b)(1)	RF Output Power	Pass
3	§15.247 (a)(1)	6 dB Bandwidth	Pass
4	§15.247 (e)	Power Spectral Density	Pass
4	§15.247 (d)	Conducted Spurious Emission	Pass
5	§15.209	Radiated Emission& Band Edge	Pass
6	§15.207	AC Power Line Conducted Emission	Pass

6. TEST FACILITY

Test Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location	1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Designation Number	CN1259
FCC Test Firm Registration Number	975832
A2LA Cert. No.	5054.02
Description	Attestation of Global Compliance(Shenzhen) Co., Ltd is accredited by A2LA

TEST EQUIPMENT OF CONDUCTED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESPI	101206	Aug. 04, 2022	Aug. 03, 2023
LISN	R&S	ESH2-Z5	100086	Jun. 08, 2022	Jun. 07, 2023
Test software	R&S	ES-K1 (Ver.V1.71)	N/A	N/A	N/A

TEST EQUIPMENT OF RADIATED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESCI	10096	Feb. 18, 2023	Feb. 17, 2024
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Aug. 04, 2022	Aug. 03, 2023
2.4GHz Filter	EM Electronics	2400-2500MHz	N/A	N/A	N/A
Attenuator	ZHINAN	E-002	N/A	Sep. 01, 2022	Aug. 31, 2023
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Oct. 31, 2021	Oct. 30, 2023
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	18051	Mar. 12, 2022	Mar. 11, 2024
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	Mar. 03, 2023	Mar. 02, 2024
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	N/A	N/A
ANTENNA	SCHWARZBECK	VULB9168	494	Jan. 05, 2023	Jan. 04, 2025
Test software	Tonscend	JS32-RE (Ver.2.5)	N/A	N/A	N/A

7. RF OUTPUT POWER MEASUREMENT

7.1 MEASUREMENT LIMITS

For DTSs employing digital modulation techniques operating in the bands 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W.

7.2 MEASUREMENT PROCEDURE

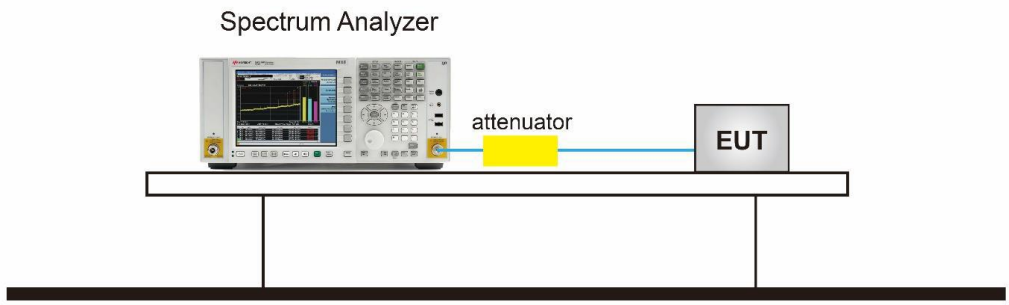
☒For peak power test:

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the RBW = 1 MHz.
3. Set the VBW ≥ [3 × RBW].
4. Set the Span ≥ [1.5 × DTS bandwidth].
5. Sweep time=Auto couple.
6. Detector function=Peak.
7. Trace Mode=Max hold.
8. Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission.
9. The indicated level is the peak output power, after any corrections for external attenuators and cables.

☒For Average power test:

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set Span to at least 1.5 times the OBW.
3. Set RBW = 1% to 5% of the OBW, not to exceed 1 MHz.
4. Set VBW≥[3×RBW].
5. Sweep Time=Auto couple.
6. Detector function=RMS (i.e., power averaging).
7. Trace average at least 100 traces in power averaging (rms) mode;
8. Determine according to the duty cycle of the equipment: when it is less than 98%, follow the steps below.
9. Add [10 log (1 / D)], where D is the duty cycle, to the measured power to compute the average power during the actual transmission times (because the measurement represents an average over both the ON and OFF times of the transmission). For example, add [10 log (1/0.25)] = 6 dB if the duty cycle is 25%.
10. Record the test results in the report.

7.3 MEASUREMENT SETUP (BLOCK DIAGRAM OF CONFIGURATION)



7.4 MEASUREMENT RESULT

Test Data of Conducted Output Power-Ant 1					
Test Mode	Test Channel (MHz)	Average Power (dBm)	Peak Power (dBm)	Limits (dBm)	Pass or Fail
802.11b	2412	11.38	13.64	≤30	Pass
	2437	11.25	13.71	≤30	Pass
	2462	**11.64**	**13.85**	≤30	Pass
802.11g	2412	9.24	16.46	≤30	Pass
	2437	10.29	16.86	≤30	Pass
	2462	**10.49**	**17.13**	≤30	Pass
802.11n20	2412	9.76	16.20	≤30	Pass
	2437	10.16	16.62	≤30	Pass
	2462	**10.62**	16.79	≤30	Pass
802.11n40	2422	10.48	15.97	≤30	Pass
	2437	10.21	16.04	≤30	Pass
	2452	10.46	16.15	≤30	Pass

Test Data of Conducted Output Power-Ant 2					
Test Mode	Test Channel (MHz)	Average Power (dBm)	Peak Power (dBm)	Limits (dBm)	Pass or Fail
802.11b	2412	11.05	13.30	≤30	Pass
	2437	11.02	13.39	≤30	Pass
	2462	11.19	13.49	≤30	Pass
802.11g	2412	9.93	16.46	≤30	Pass
	2437	10.18	16.69	≤30	Pass
	2462	10.23	16.73	≤30	Pass
802.11n20	2412	10.26	16.67	≤30	Pass
	2437	10.38	16.73	≤30	Pass
	2462	10.51	**16.91**	≤30	Pass
802.11n40	2422	10.43	16.03	≤30	Pass
	2437	**10.39**	16.11	≤30	Pass
	2452	**10.73**	**16.25**	≤30	Pass

Test Data of Conducted Output Power-MIMO					
Test Mode	Test Channel (MHz)	Average Power (dBm)	Peak Power (dBm)	Limits (dBm)	Pass or Fail
802.11n20	2412	13.03	19.45	≤30	Pass
	2437	13.28	19.69	≤30	Pass
	2462	**13.58**	**19.86**	≤30	Pass
802.11n40	2422	13.47	19.01	≤30	Pass
	2437	13.31	19.09	≤30	Pass
	2452	**13.61**	**19.21**	≤30	Pass

8. 6DB BANDWIDTH MEASUREMENT

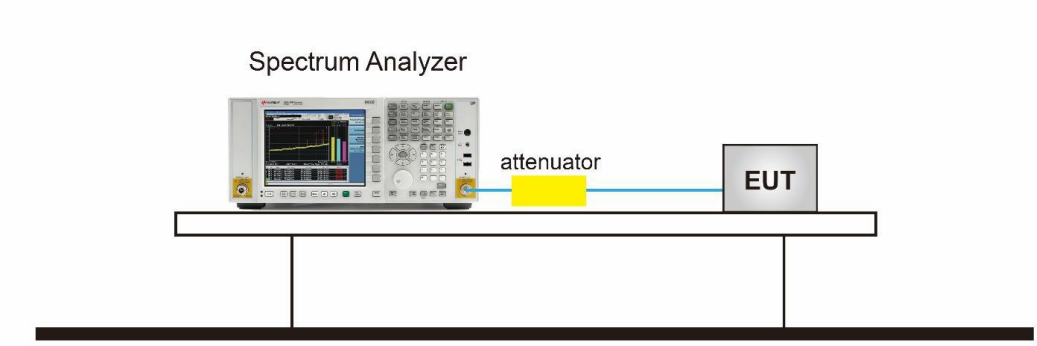
8.1 MEASUREMENT LIMITS

The minimum 6 dB bandwidth shall be 500 kHz.

8.2 MEASUREMENT PROCEDURE

1) The testing follows the ANSI C63.10 Section 6.9.3 (OBW) and 11.8.1 (6dB BW).
2) The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3) Set to the maximum power setting and enable the EUT transmit continuously.
4) For 6dB Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement.
5) For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 1-5% of the emission bandwidth and set the Video bandwidth (VBW) ≥ 3 * RBW.
6) Detector = peak
7) Trace mode = max hold.
8) Sweep = auto couple.
9) Allow the trace to stabilize.
10) Measure and record the results in the test report.

8.3 MEASUREMENT SETUP (BLOCK DIAGRAM OF CONFIGURATION)

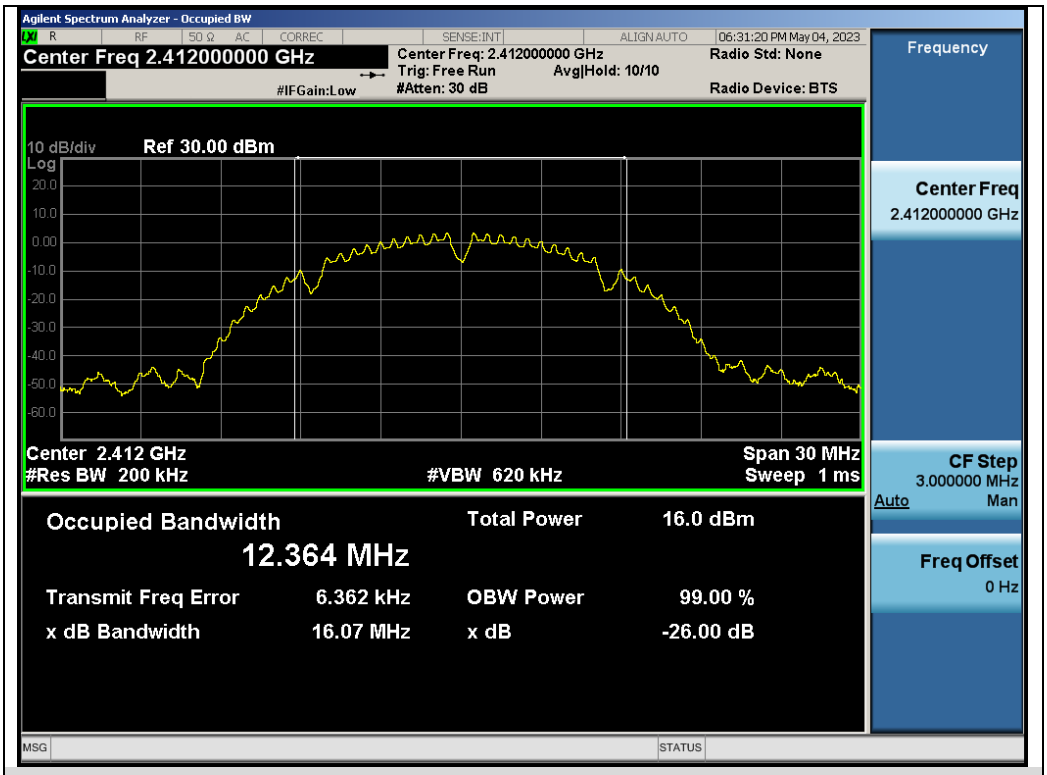


8.4 MEASUREMENT RESULTS

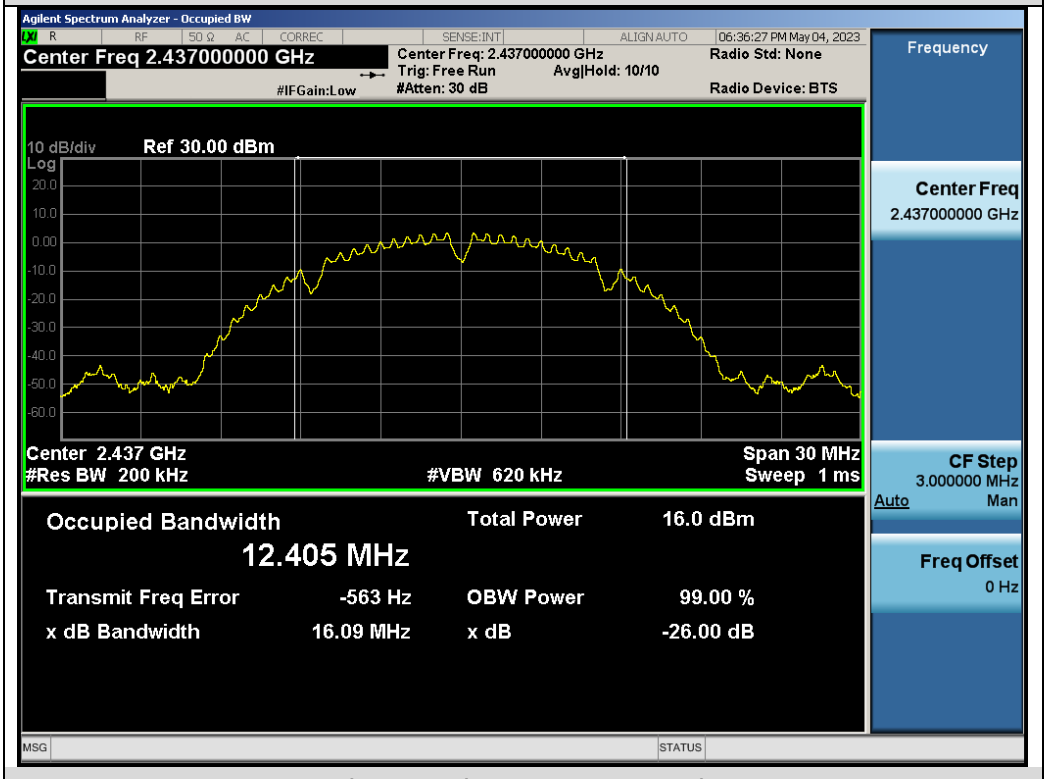
Test Data of Occupied Bandwidth and DTS Bandwidth-Ant 1					
Test Mode	Test Channel (MHz)	99% Occupied Bandwidth (MHz)	-6dB Bandwidth (MHz)	Limits (MHz)	Pass or Fail
802.11b	2412	12.364	8.068	⩾0.5	Pass
	2437	12.405	8.020	⩾0.5	Pass
	2462	12.384	8.102	⩾0.5	Pass
802.11g	2412	16.443	15.111	⩾0.5	Pass
	2437	16.976	15.134	⩾0.5	Pass
	2462	16.967	15.137	⩾0.5	Pass
802.11n20	2412	17.493	15.110	⩾0.5	Pass
	2437	17.831	15.137	⩾0.5	Pass
	2462	17.817	15.136	⩾0.5	Pass
802.11n40	2422	35.921	35.111	⩾0.5	Pass
	2437	35.933	35.093	⩾0.5	Pass
	2452	35.943	35.098	⩾0.5	Pass

Test Data of Occupied Bandwidth and DTS Bandwidth-Ant 2					
Test Mode	Test Channel (MHz)	99% Occupied Bandwidth (MHz)	-6dB Bandwidth (MHz)	Limits (MHz)	Pass or Fail
802.11b	2412	12.751	8.085	⩾0.5	Pass
	2437	12.672	8.082	⩾0.5	Pass
	2462	12.649	8.079	⩾0.5	Pass
802.11g	2412	16.445	15.113	⩾0.5	Pass
	2437	16.975	15.459	⩾0.5	Pass
	2462	16.972	15.133	⩾0.5	Pass
802.11n20	2412	17.491	15.114	⩾0.5	Pass
	2437	17.825	15.139	⩾0.5	Pass
	2462	17.824	15.130	⩾0.5	Pass
802.11n40	2422	35.926	35.099	⩾0.5	Pass
	2437	35.938	35.114	⩾0.5	Pass
	2452	35.934	35.100	⩾0.5	Pass

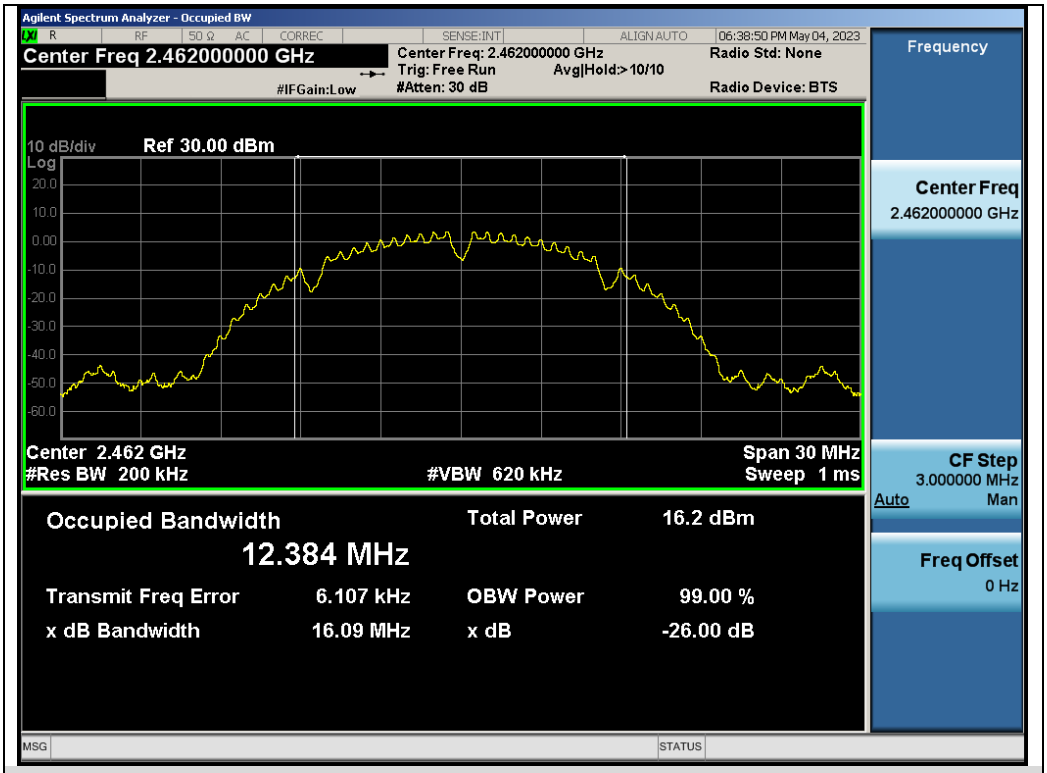
Test Graphs of Occupied Bandwidth



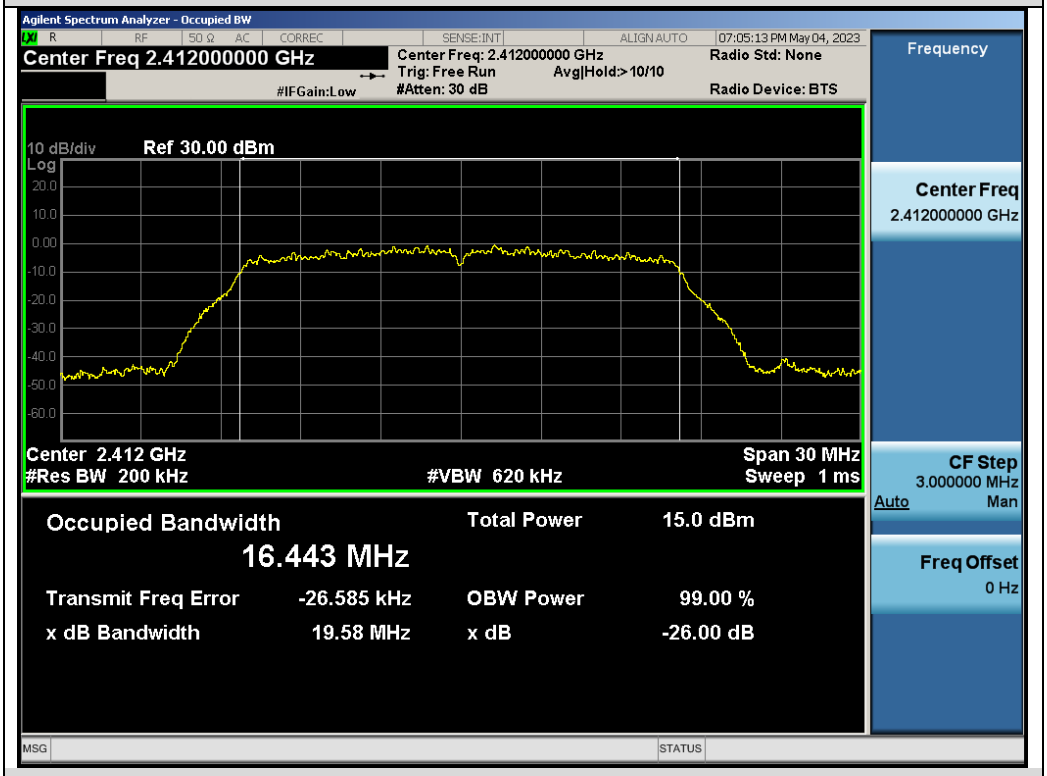
Test_Graph_802.11b_ANT1_2412_1Mbps_OBW



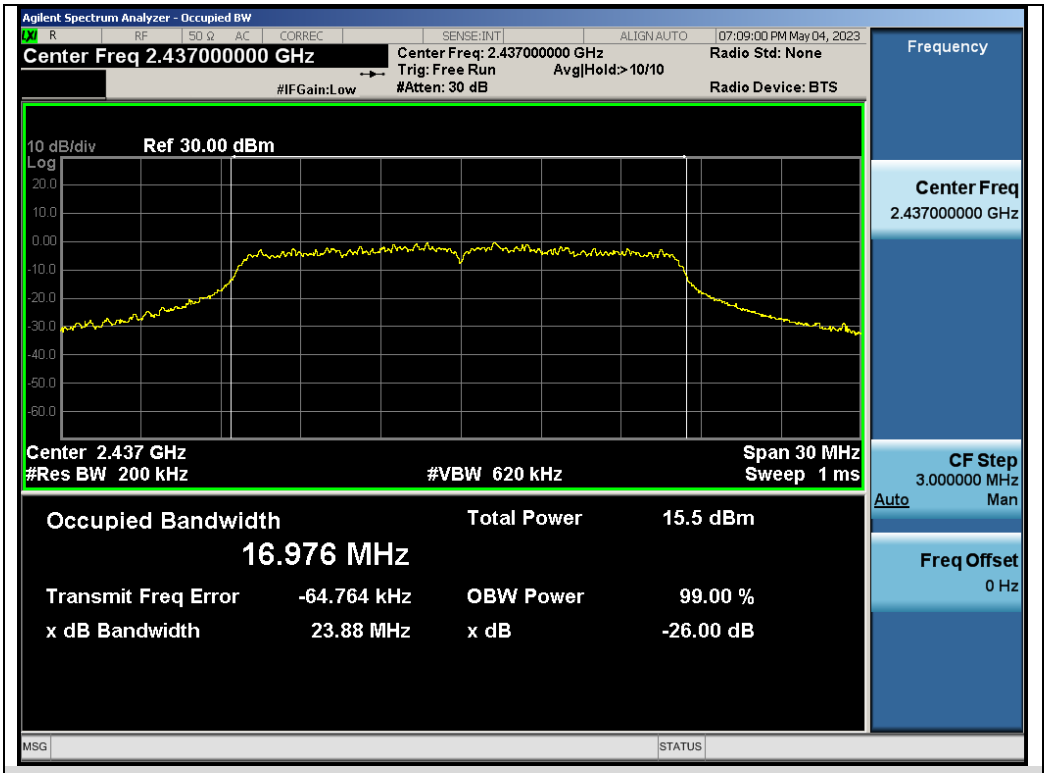
Test_Graph_802.11b_ANT1_2437_1Mbps_OBW



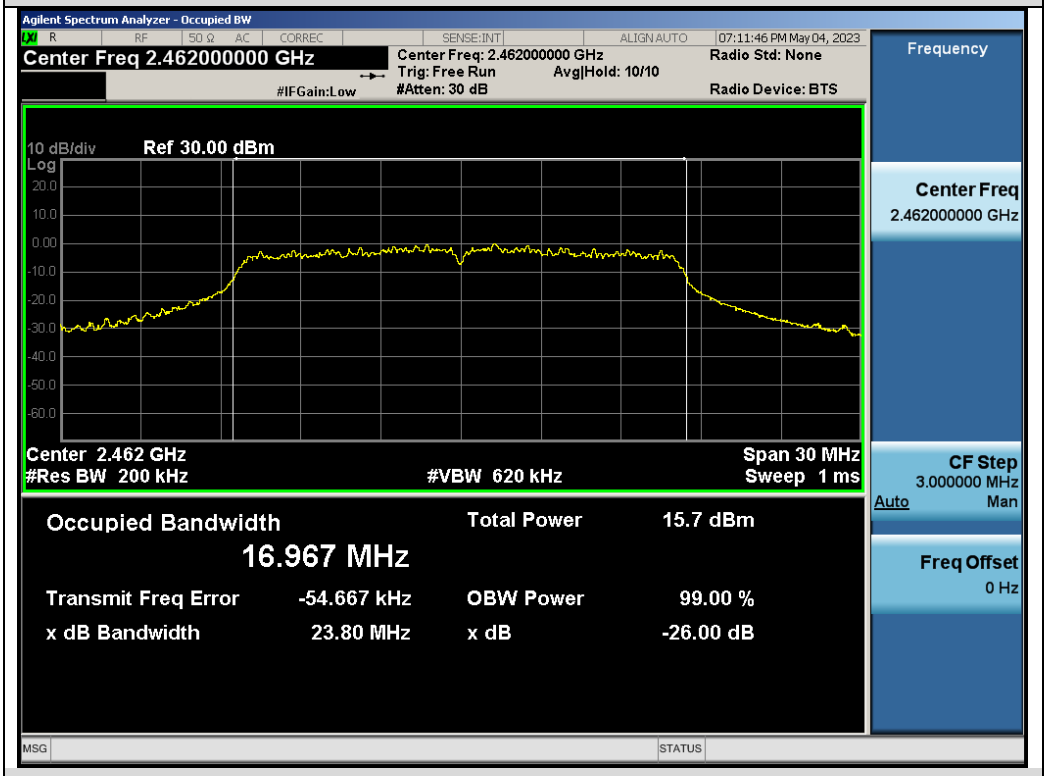
Test_Graph_802.11b_ANT1_2462_1Mbps_OBW



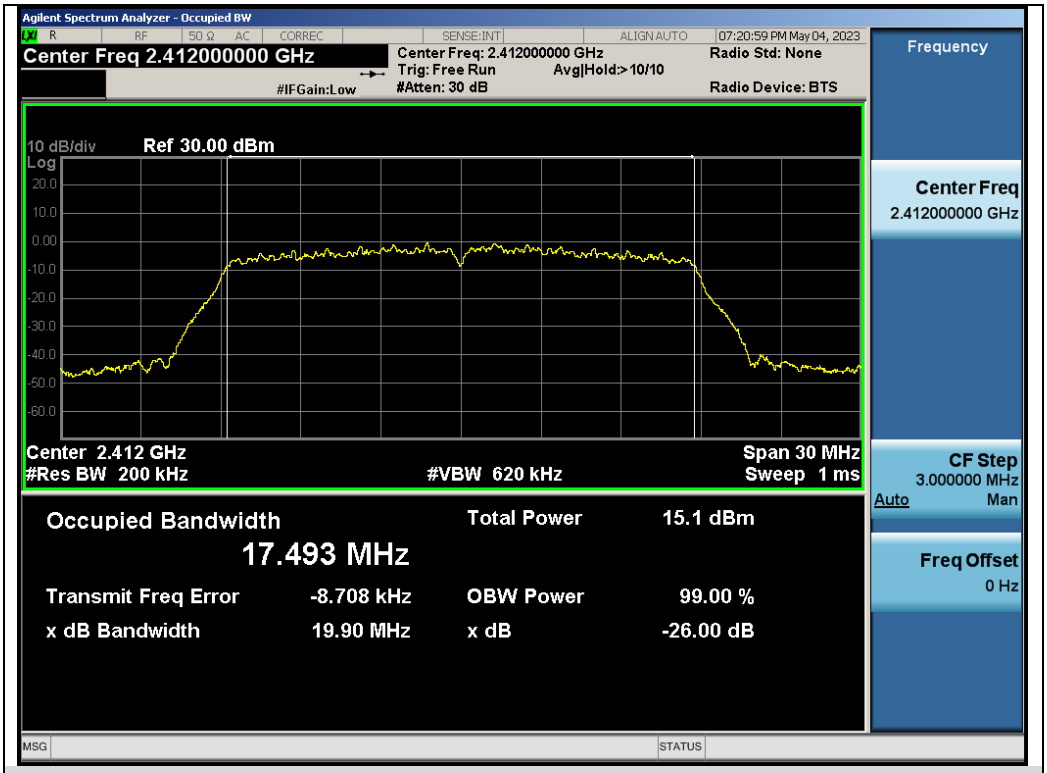
Test_Graph_802.11g_ANT1_2412_6Mbps_OBW



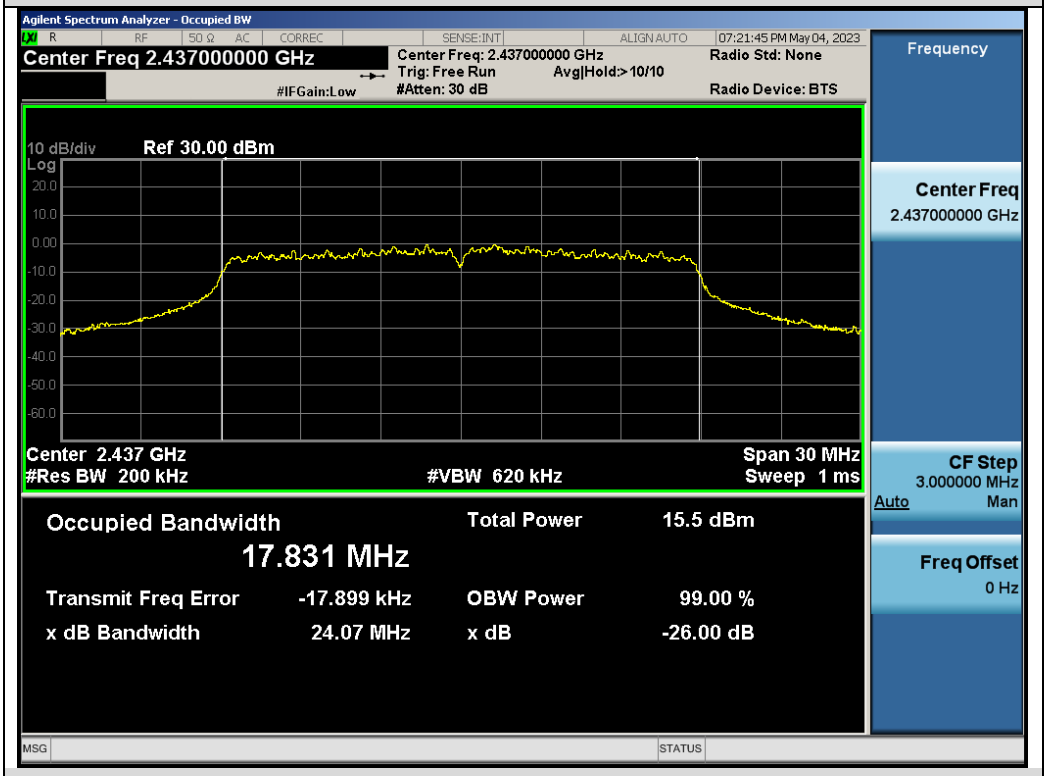
Test_Graph_802.11g_ANT1_2437_6Mbps_OBW



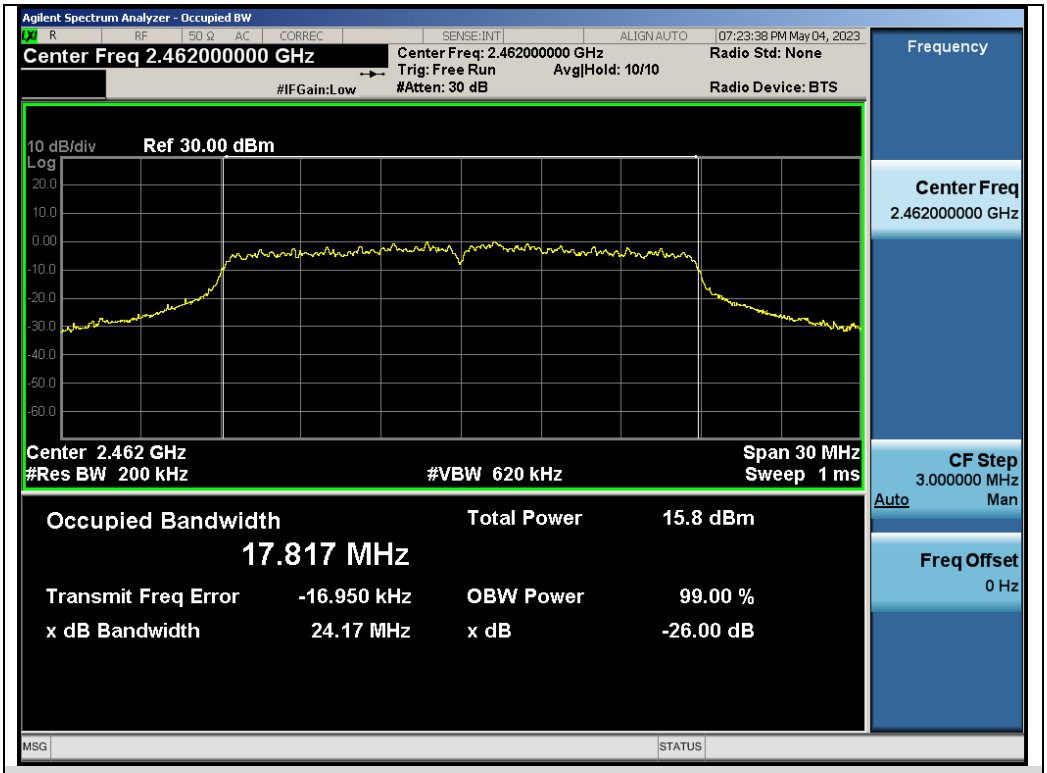
Test_Graph_802.11g_ANT1_2462_6Mbps_OBW



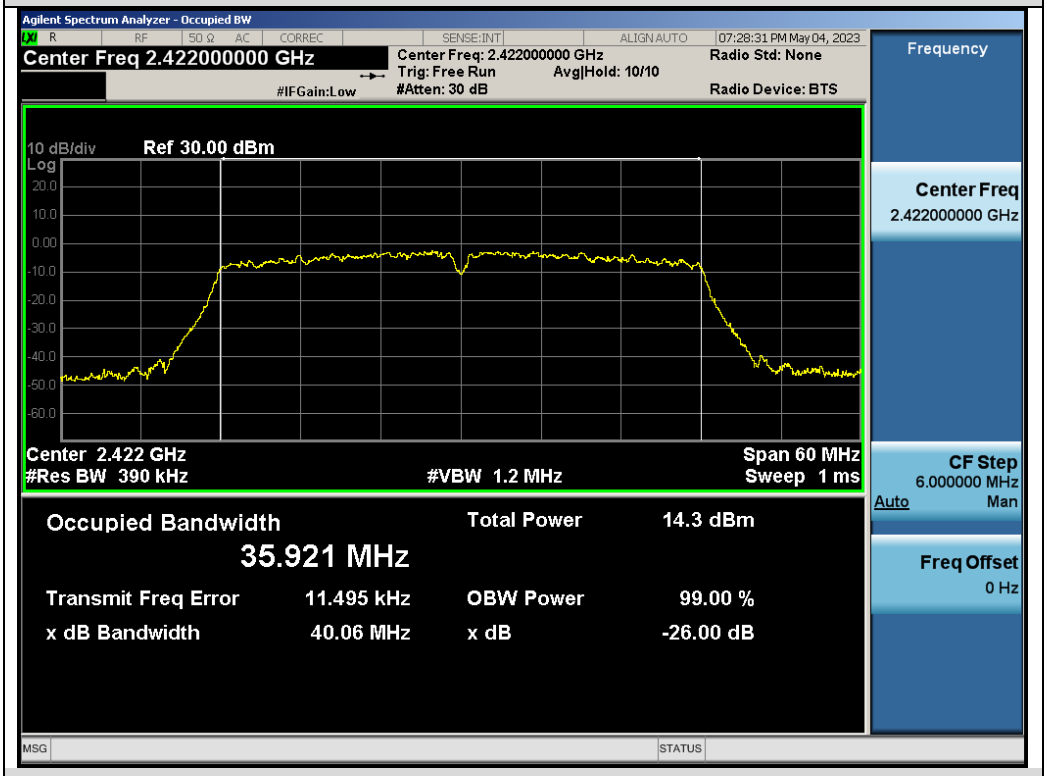
Test_Graph_802.11n20_ANT1_2412_MCS0_OBW



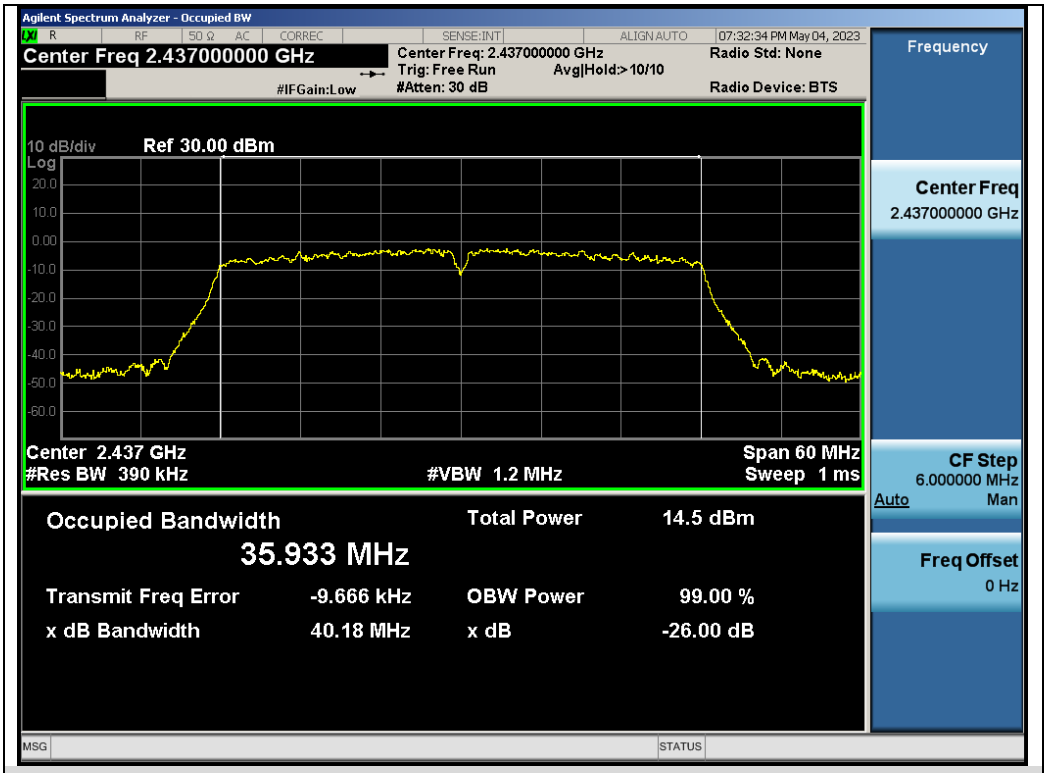
Test_Graph_802.11n20_ANT1_2437_MCS0_OBW



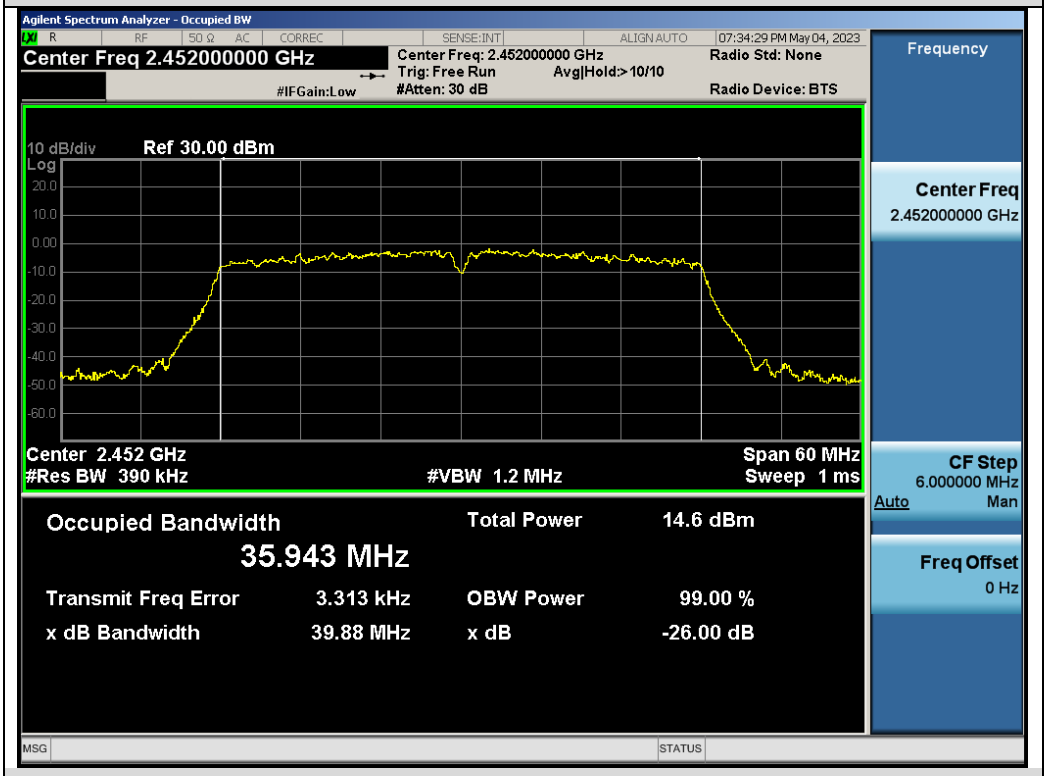
Test_Graph_802.11n20_ANT1_2462_MCS0_OBW



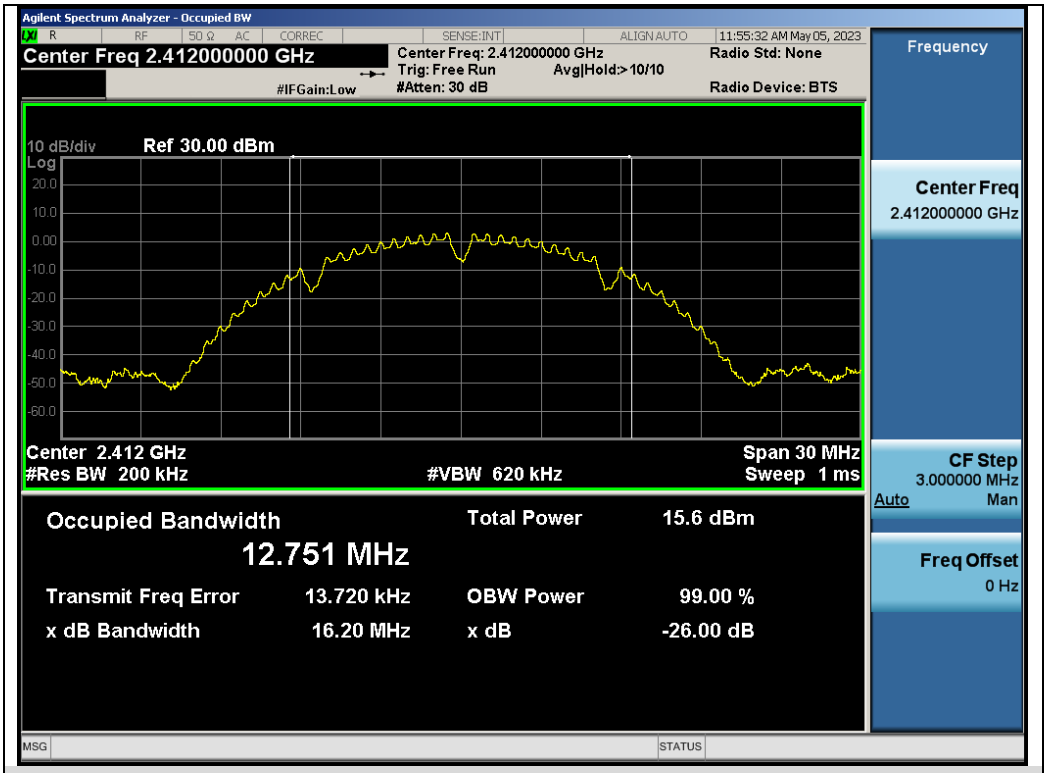
Test_Graph_802.11n40_ANT1_2422_MCS0_OBW



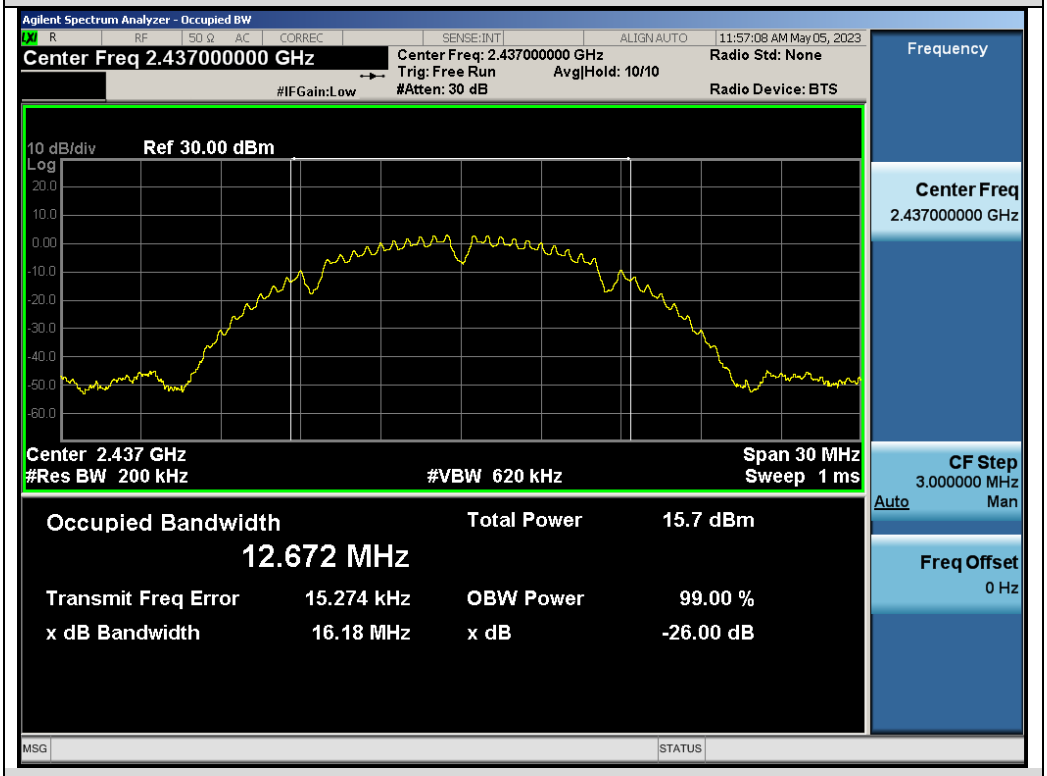
Test_Graph_802.11n40_ANT1_2437_MCS0_OBW



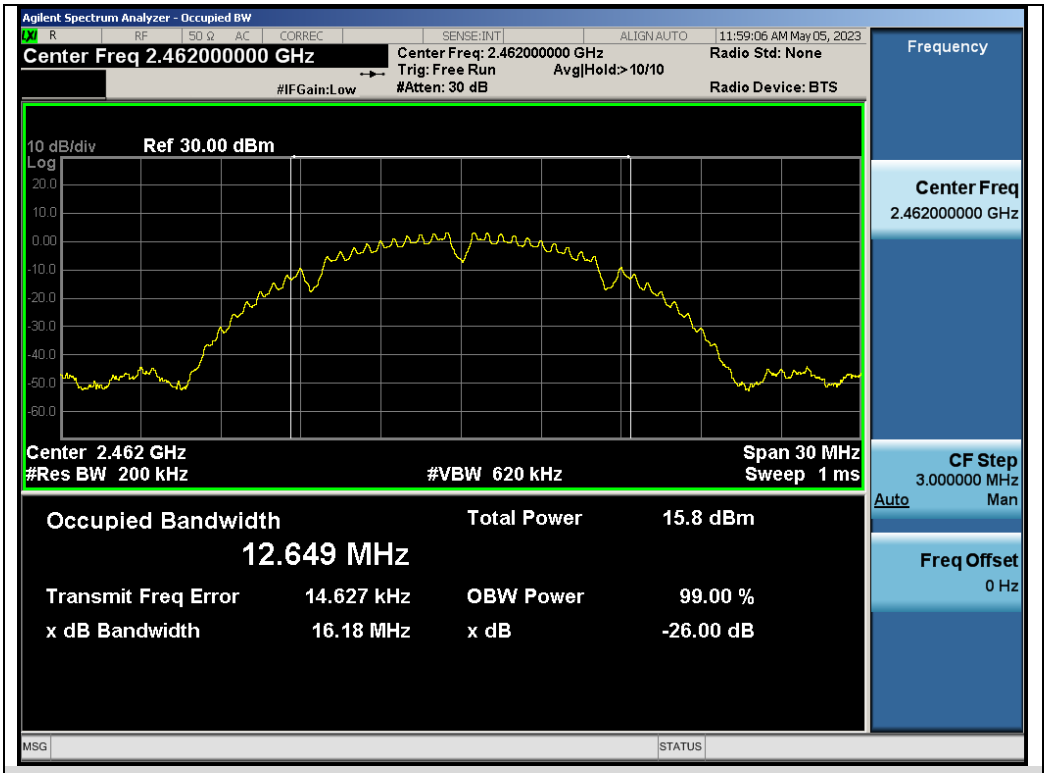
Test_Graph_802.11n40_ANT1_2452_MCS0_OBW



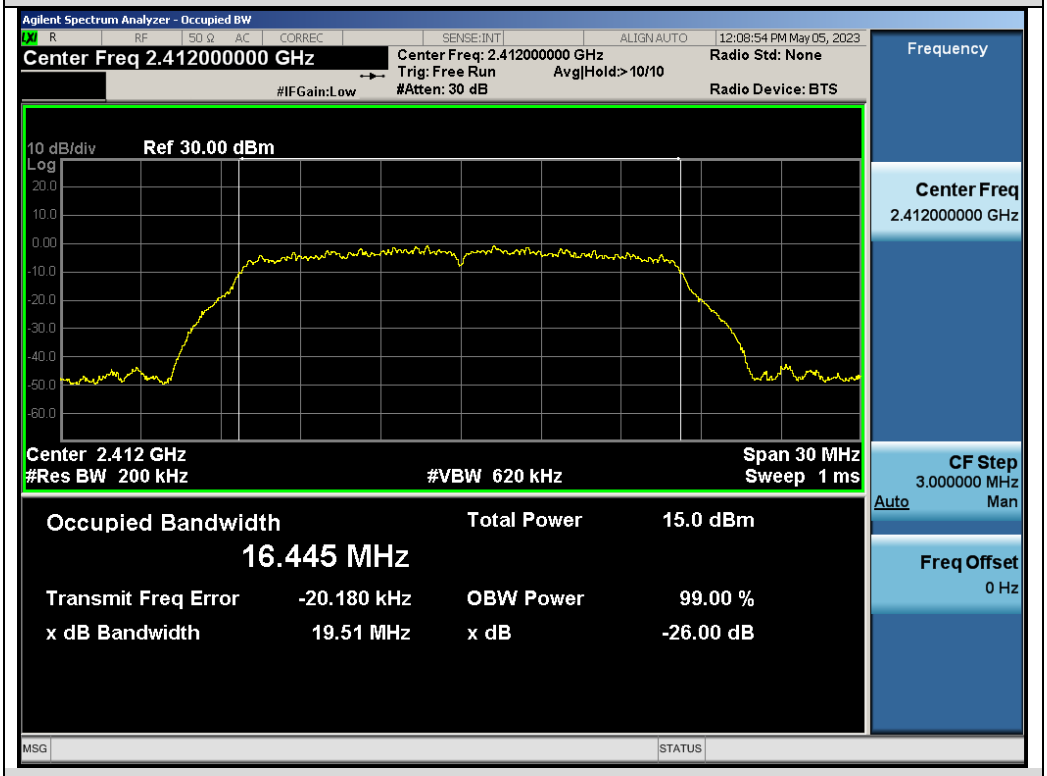
Test_Graph_802.11b_ANT2_2412_1Mbps_OBW



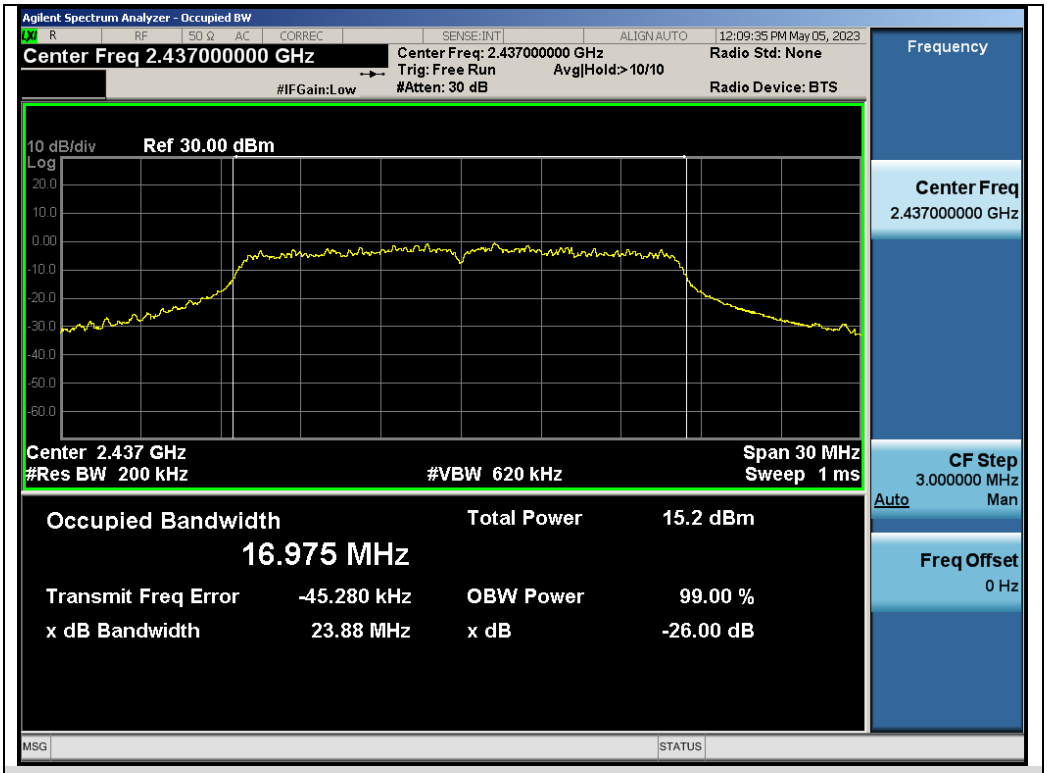
Test_Graph_802.11b_ANT2_2437_1Mbps_OBW



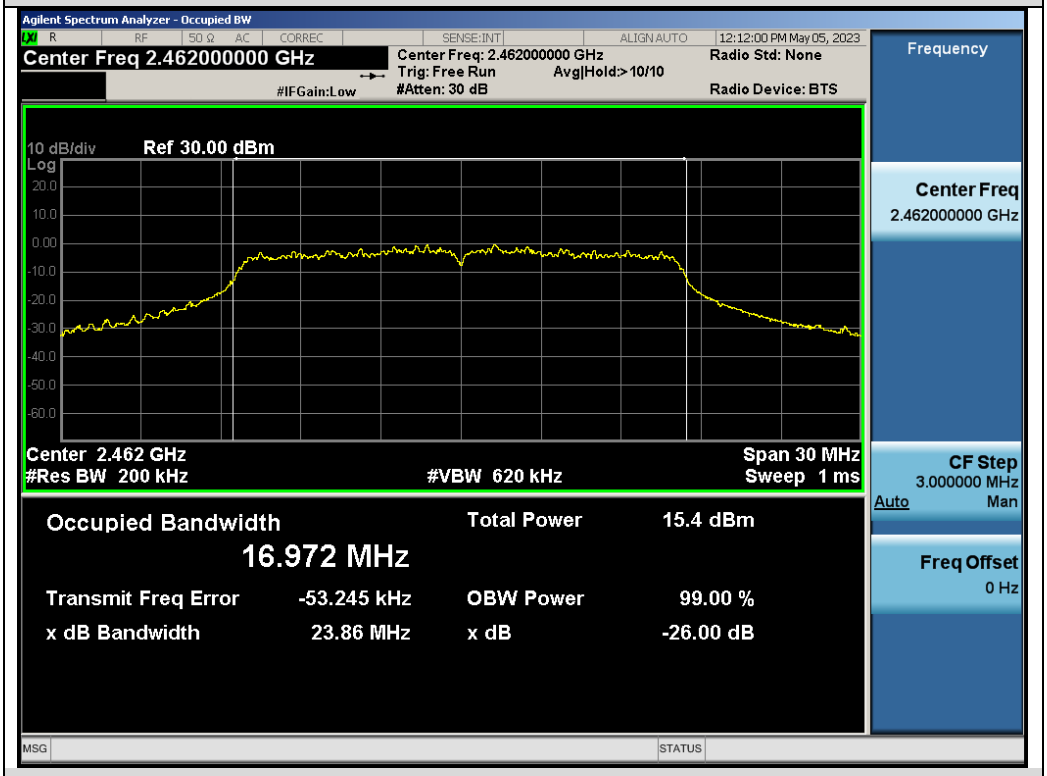
Test_Graph_802.11b_ANT2_2462_1Mbps_OBW



Test_Graph_802.11g_ANT2_2412_6Mbps_OBW



Test_Graph_802.11g_ANT2_2437_6Mbps_OBW



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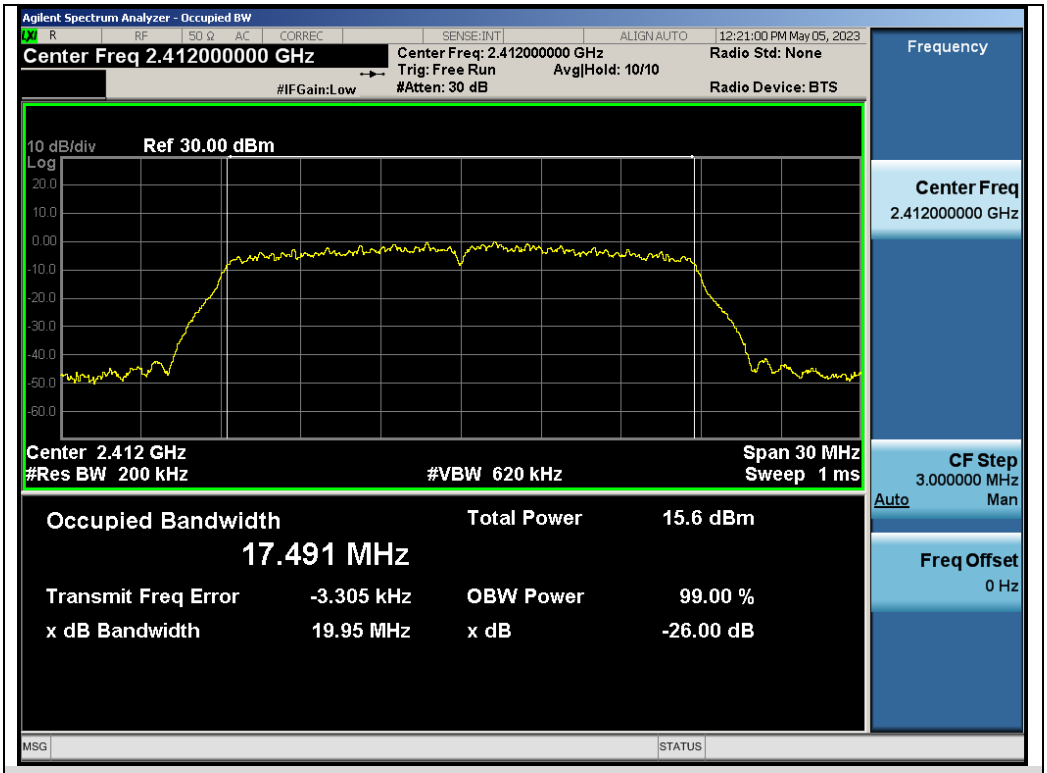
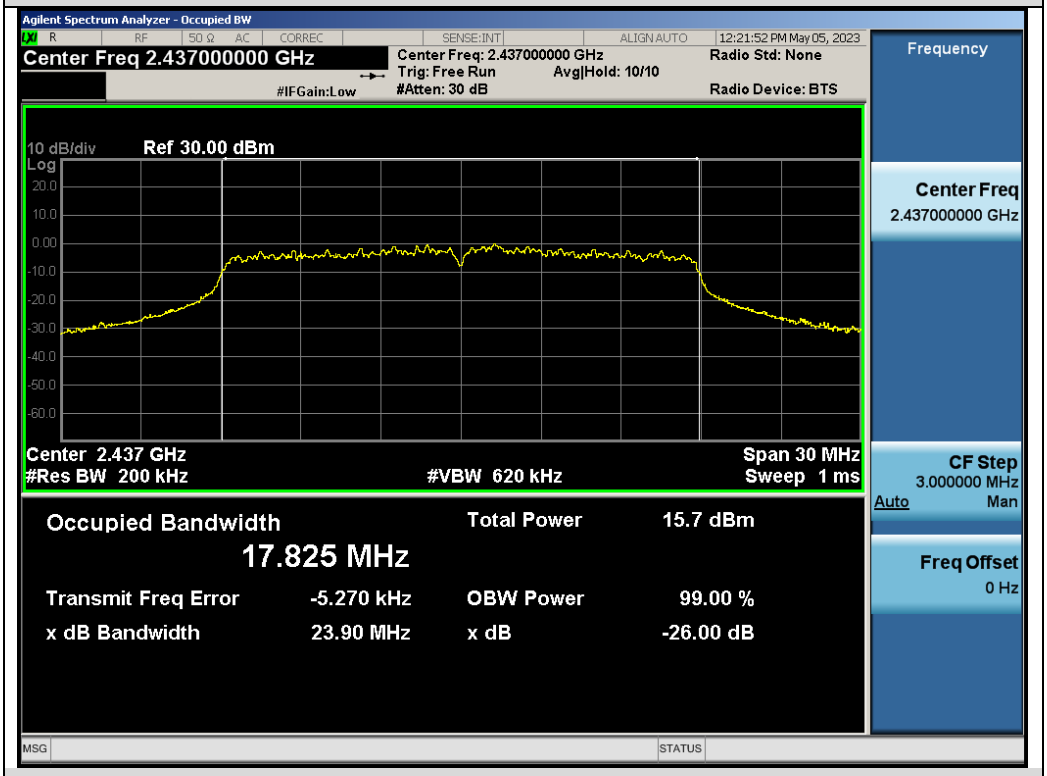
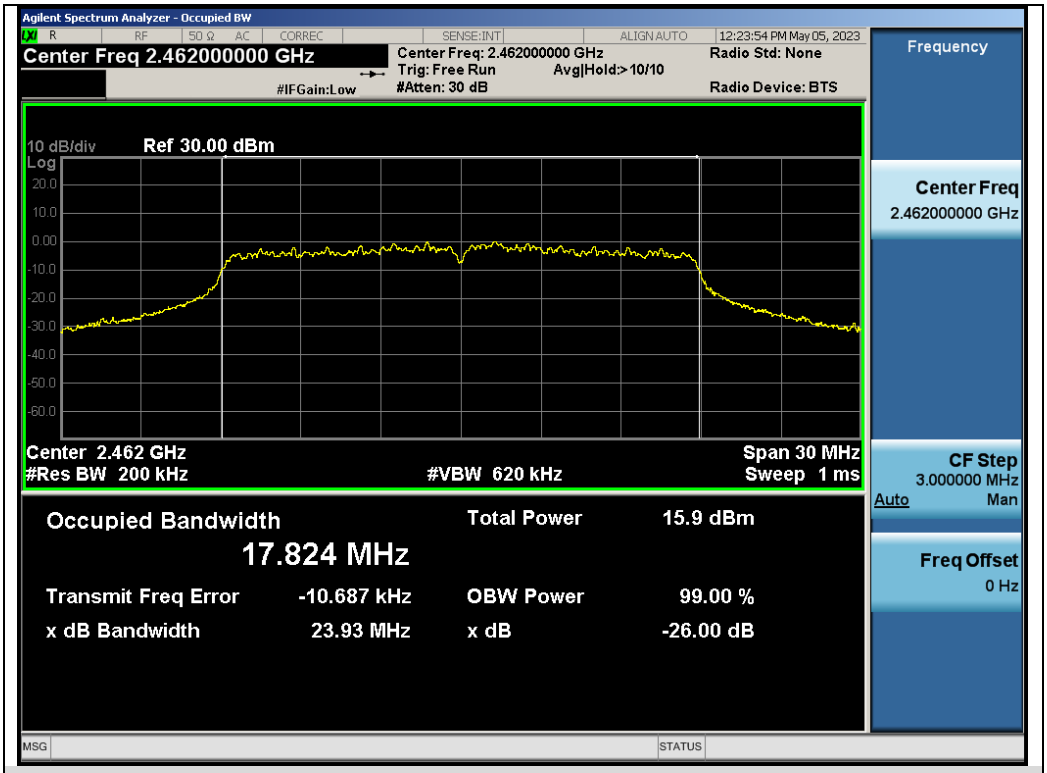


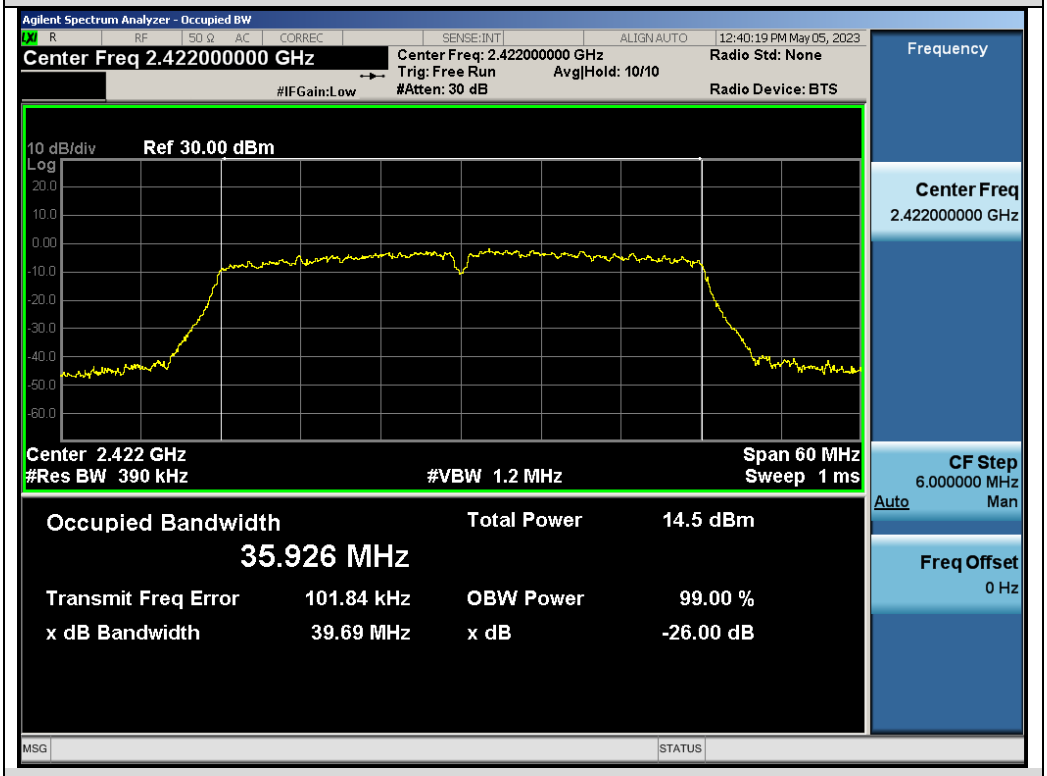
Test_Graph_802.11n20_ANT2_2412_MCS0_OBW



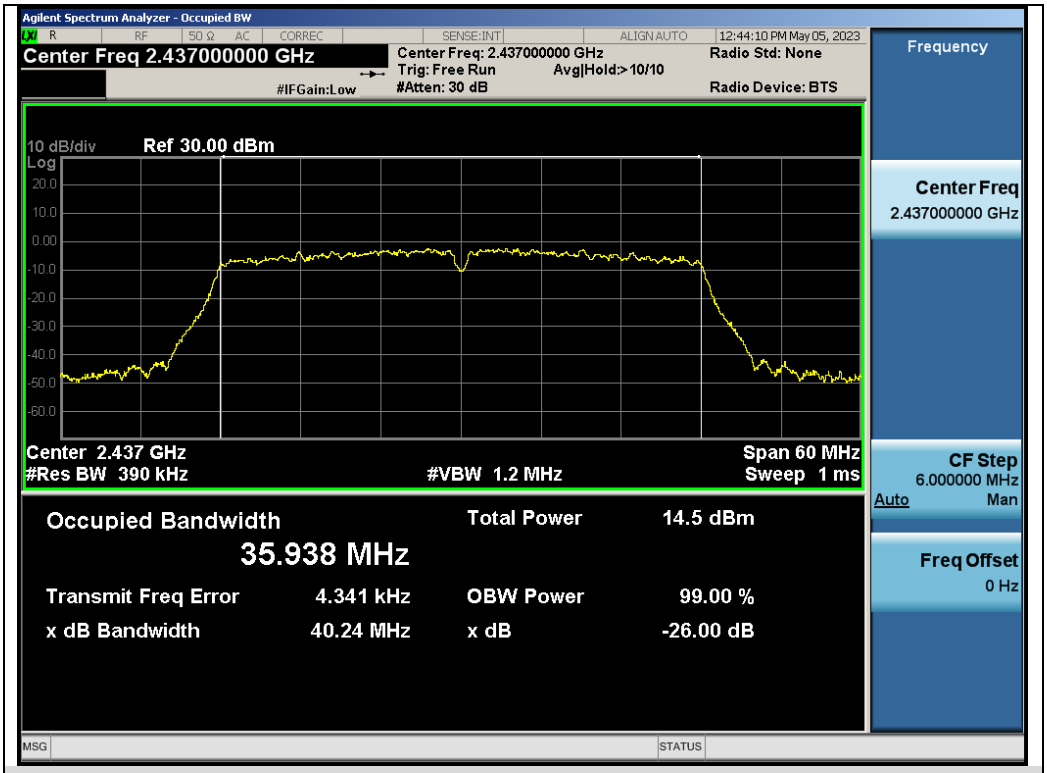
Test_Graph_802.11n20_ANT2_2437_MCS0_OBW



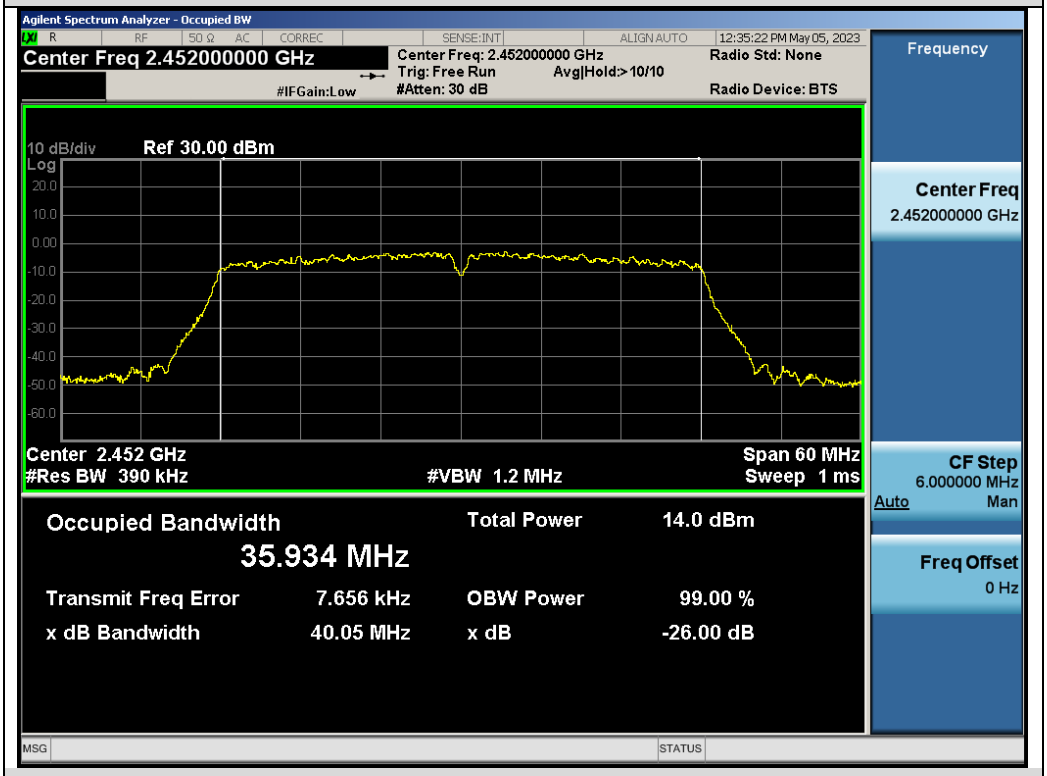
Test_Graph_802.11n20_ANT2_2462_MCS0_OBW



Test_Graph_802.11n40_ANT2_2422_MCS0_OBW

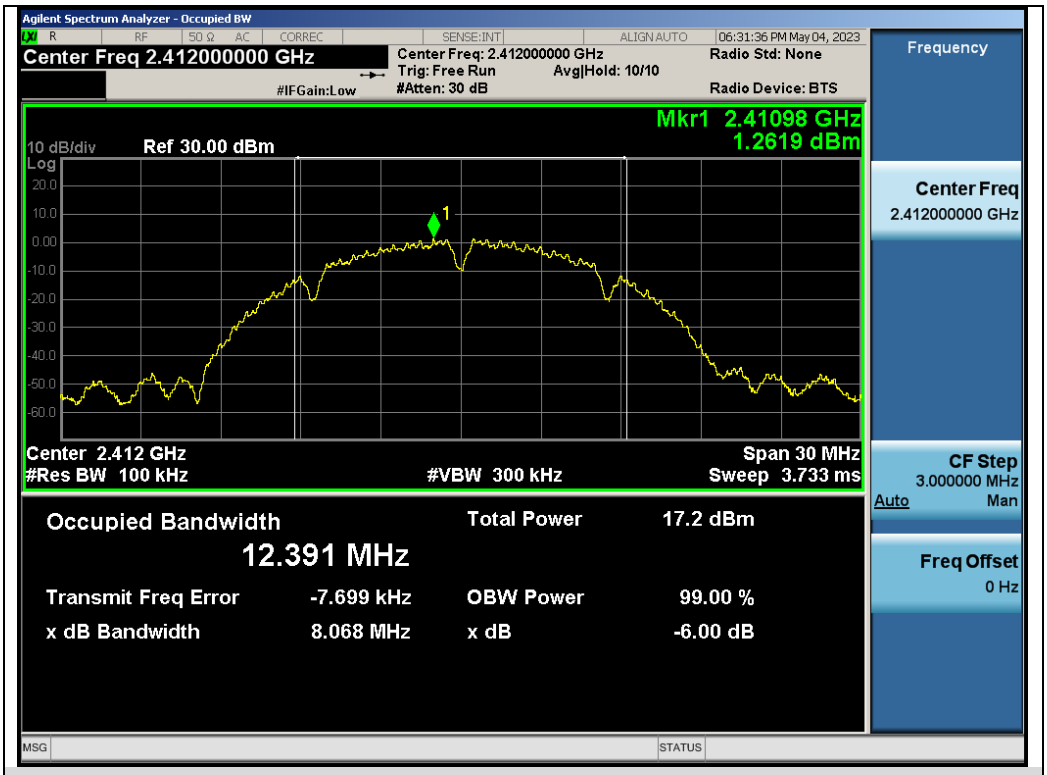


Test_Graph_802.11n40_ANT2_2437_MCS0_OBW

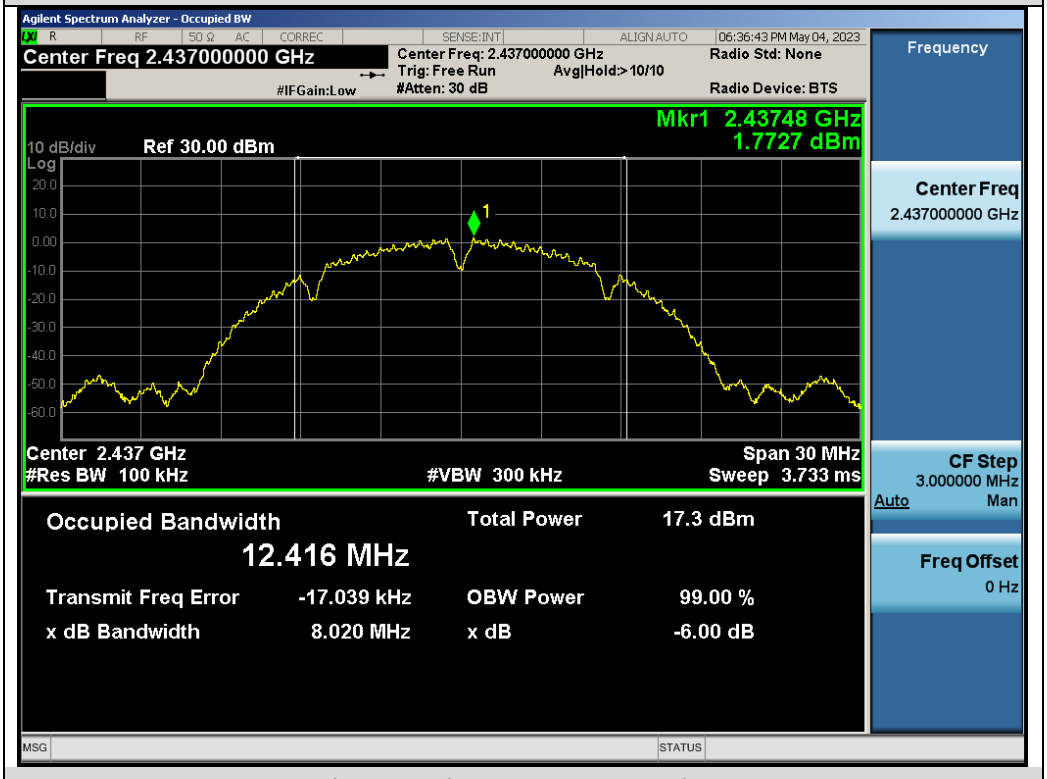


Test_Graph_802.11n40_ANT2_2452_MCS0_OBW

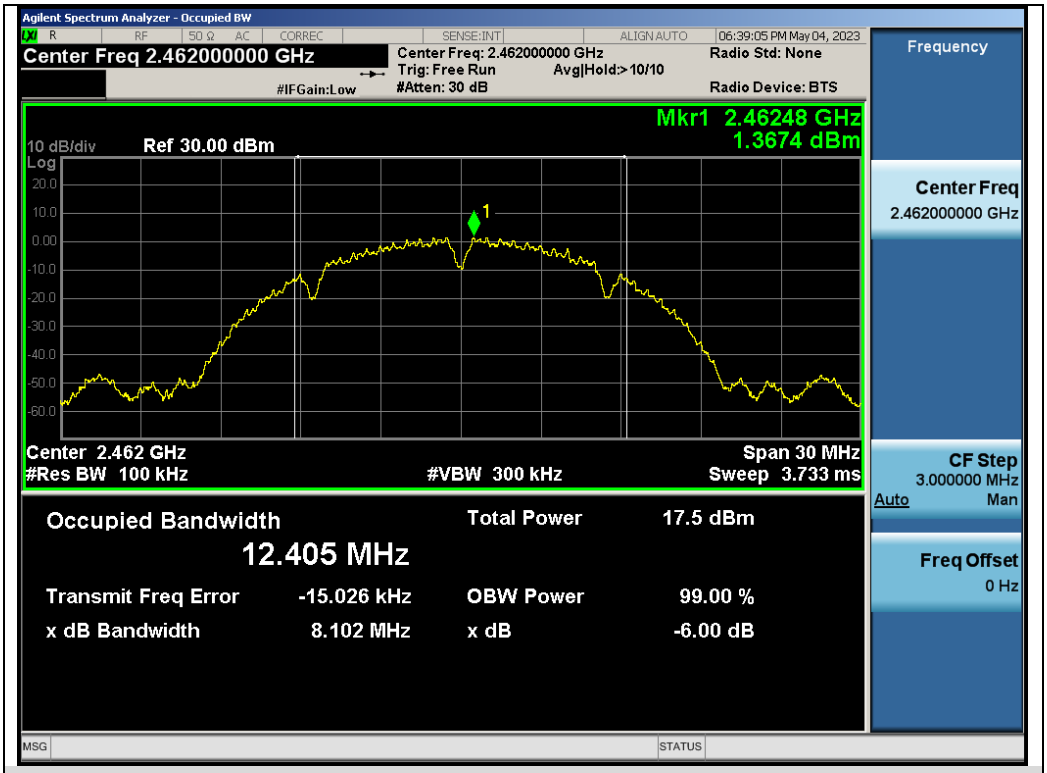
Test Graphs of DTS Bandwidth



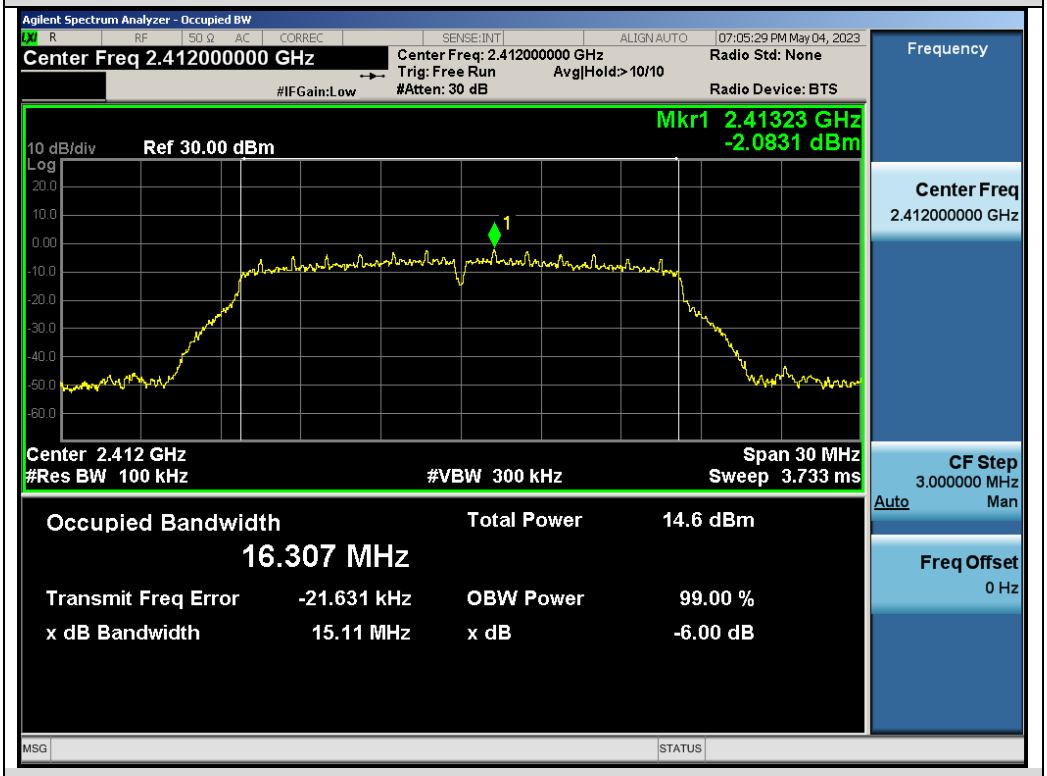
Test_Graph_802.11b_ANT1_2412_1Mbps_DTSBW



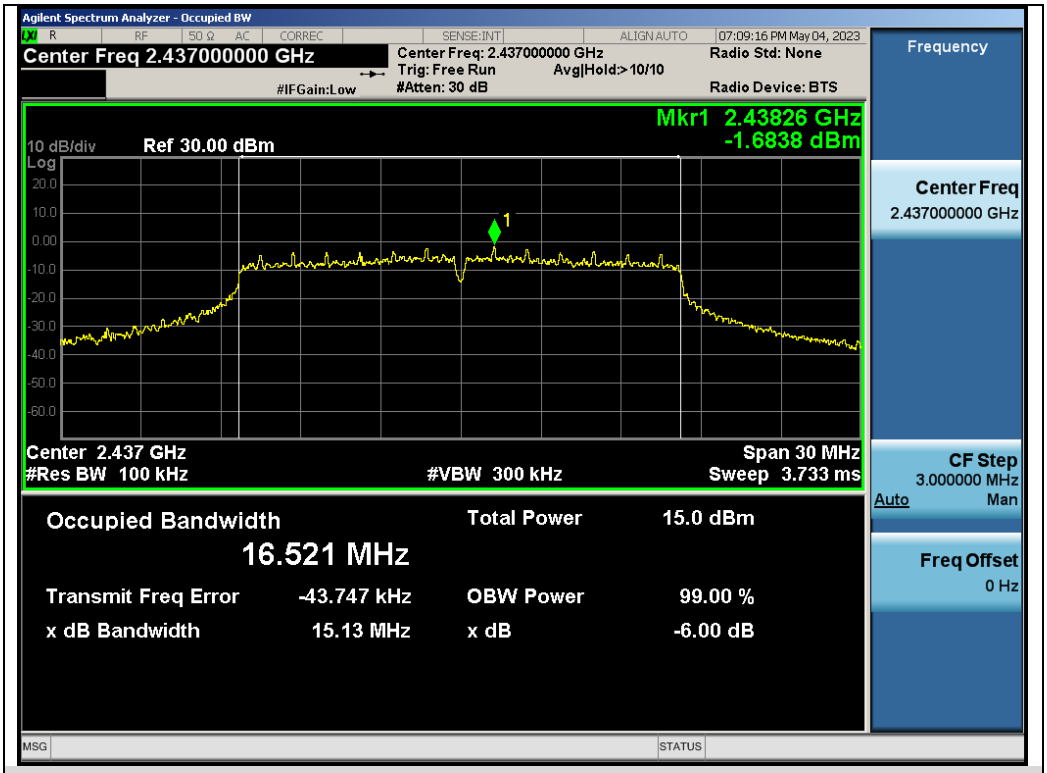
Test_Graph_802.11b_ANT1_2437_1Mbps_DTSBW



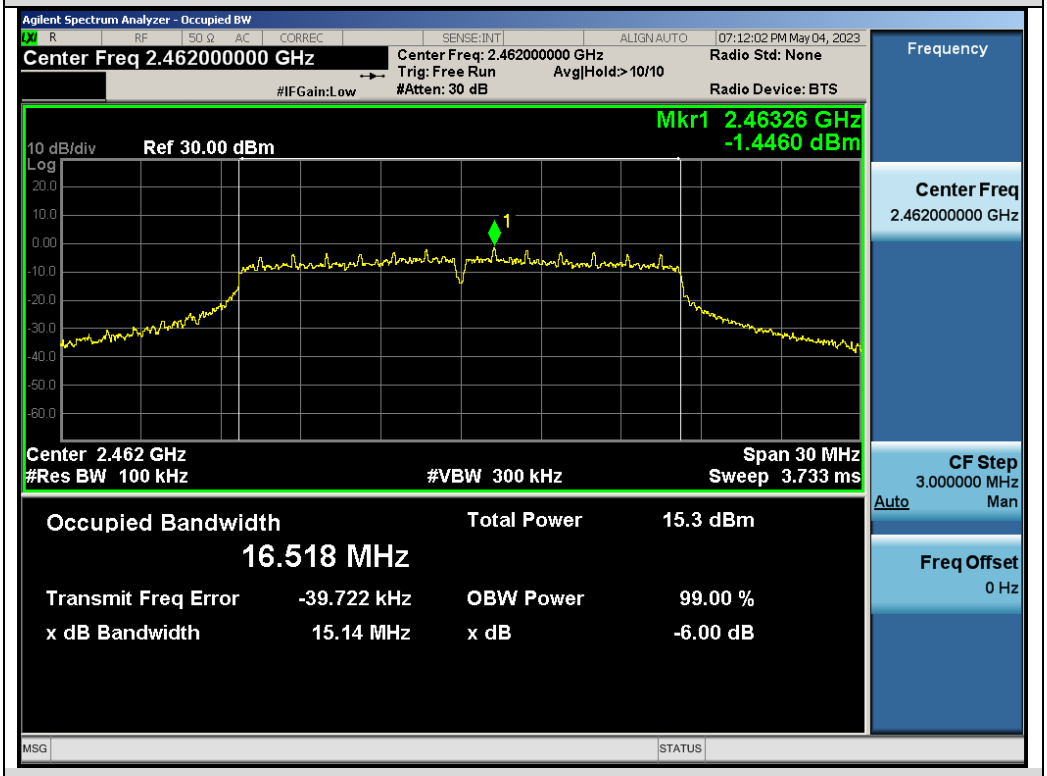
Test_Graph_802.11b_ANT1_2462_1Mbps_DTSBW



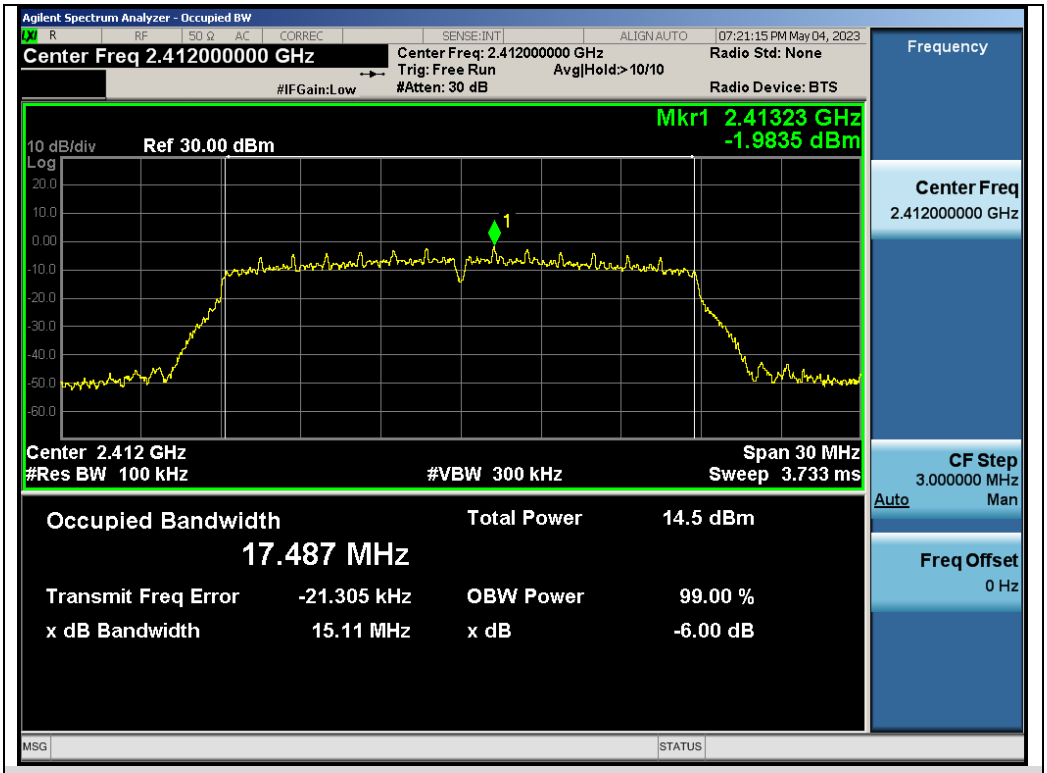
Test_Graph_802.11g_ANT1_2412_6Mbps_DTSBW



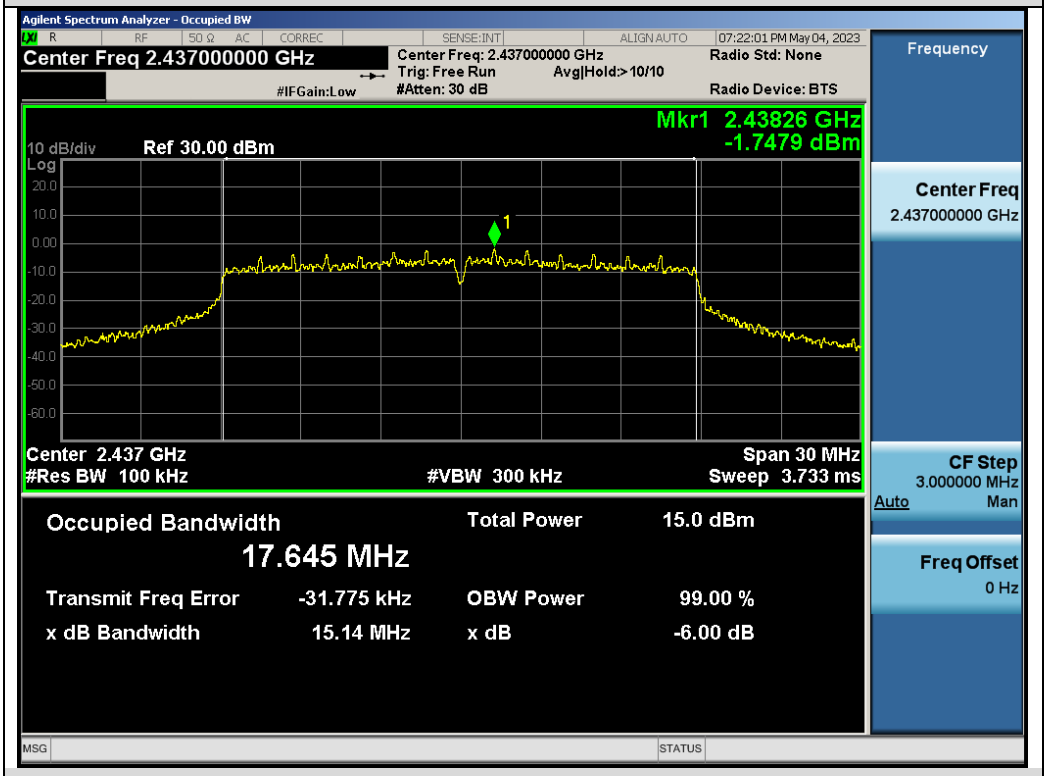
Test_Graph_802.11g_ANT1_2437_6Mbps_DTSBW



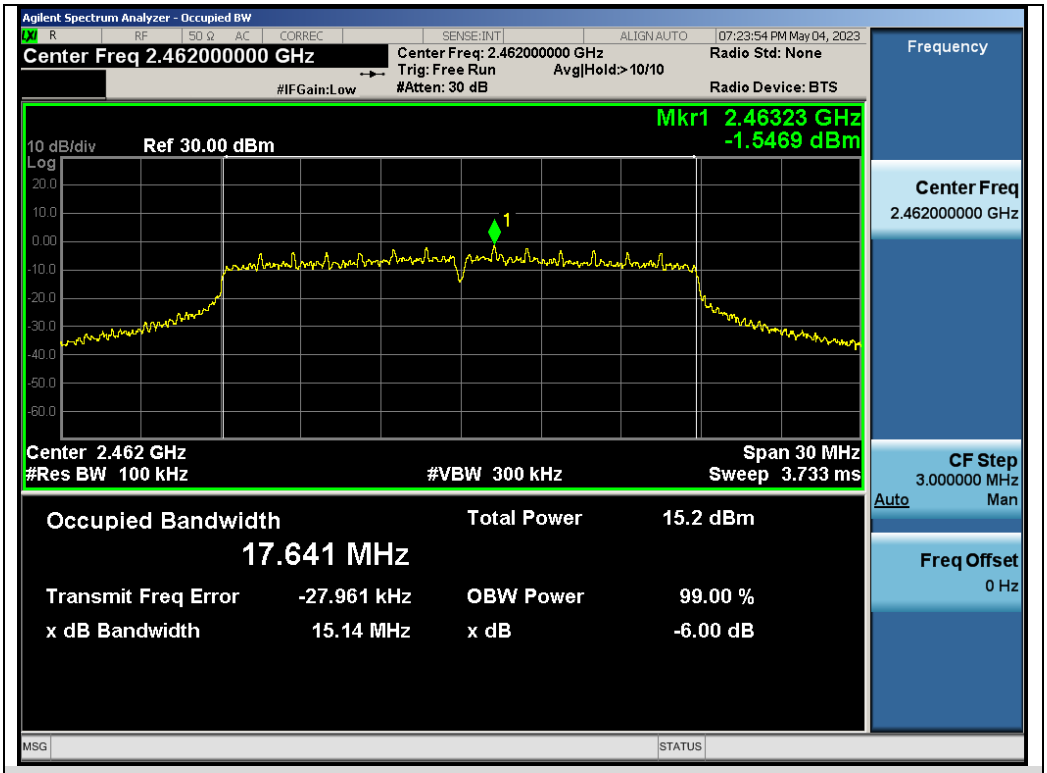
Test_Graph_802.11g_ANT1_2462_6Mbps_DTSBW



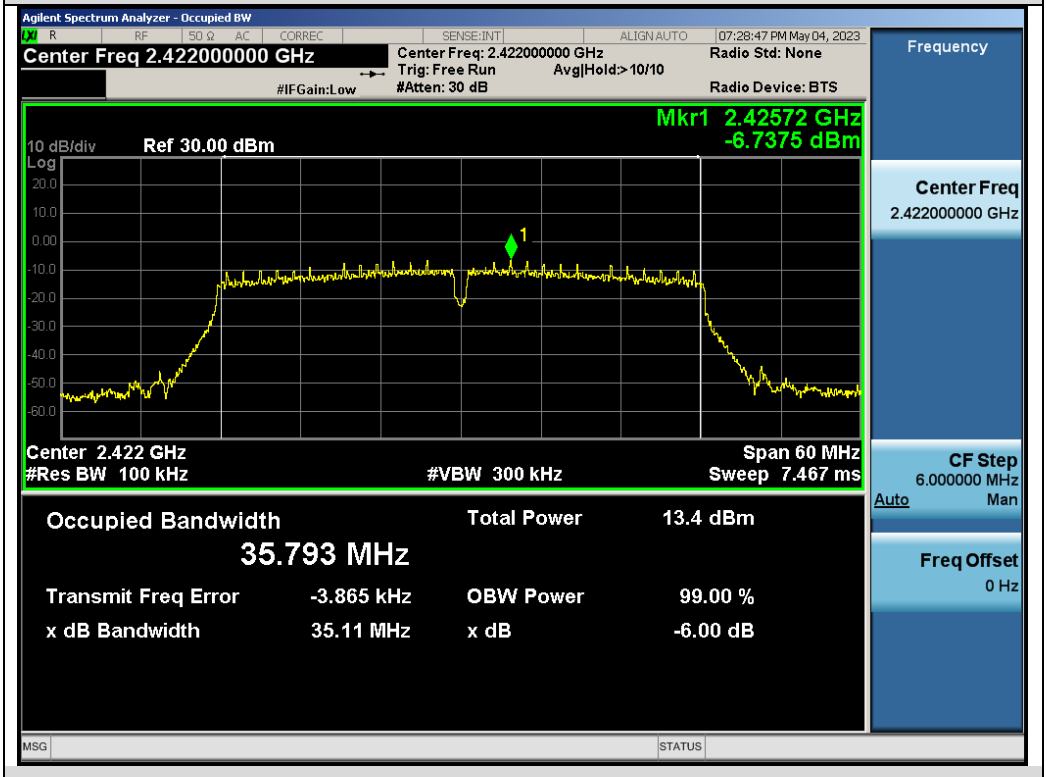
Test_Graph_802.11n20_ANT1_2412_MCS0_DTSBW



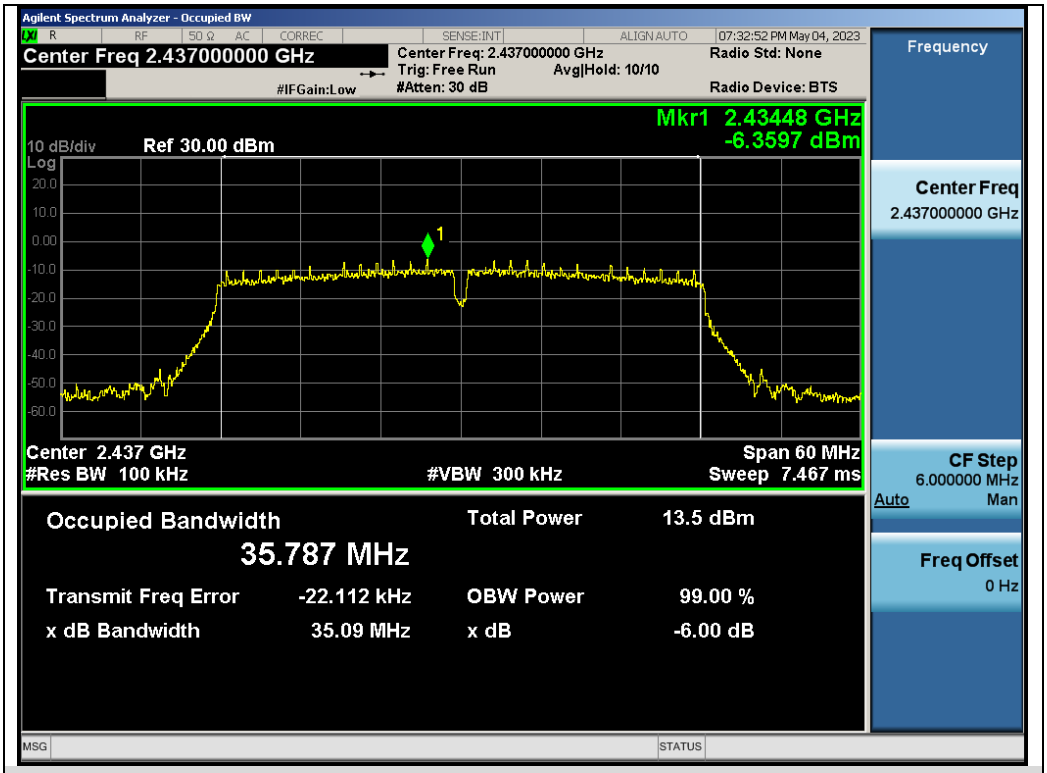
Test_Graph_802.11n20_ANT1_2437_MCS0_DTSBW



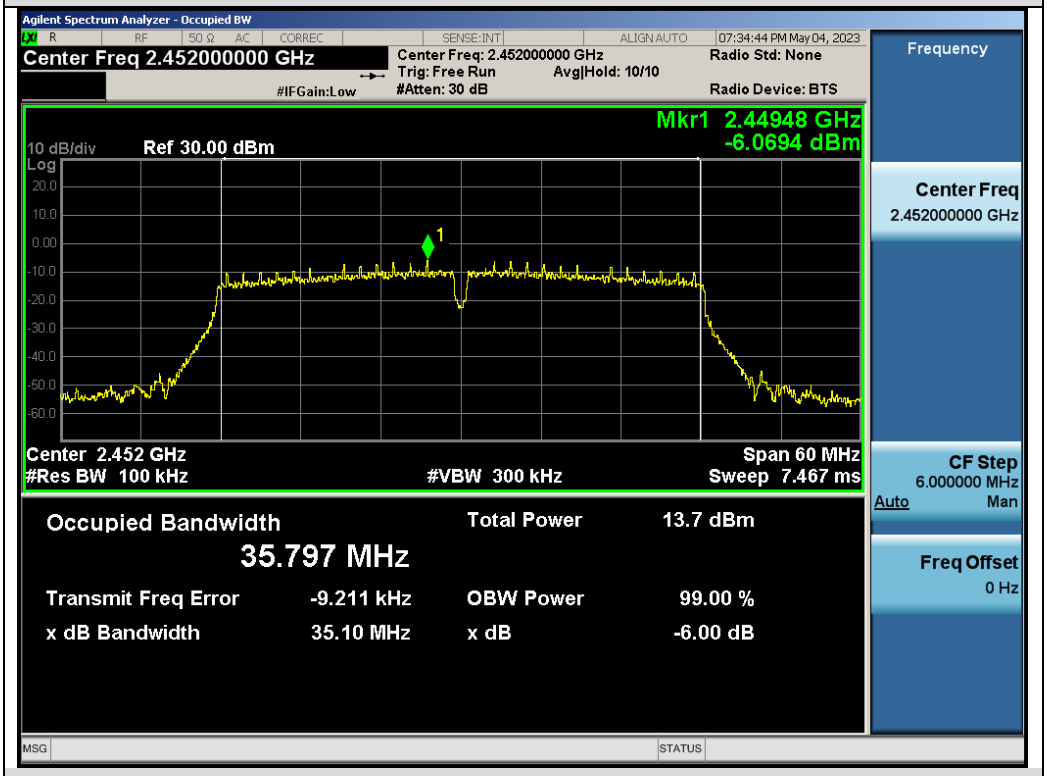
Test_Graph_802.11n20_ANT1_2462_MCS0_DTSBW



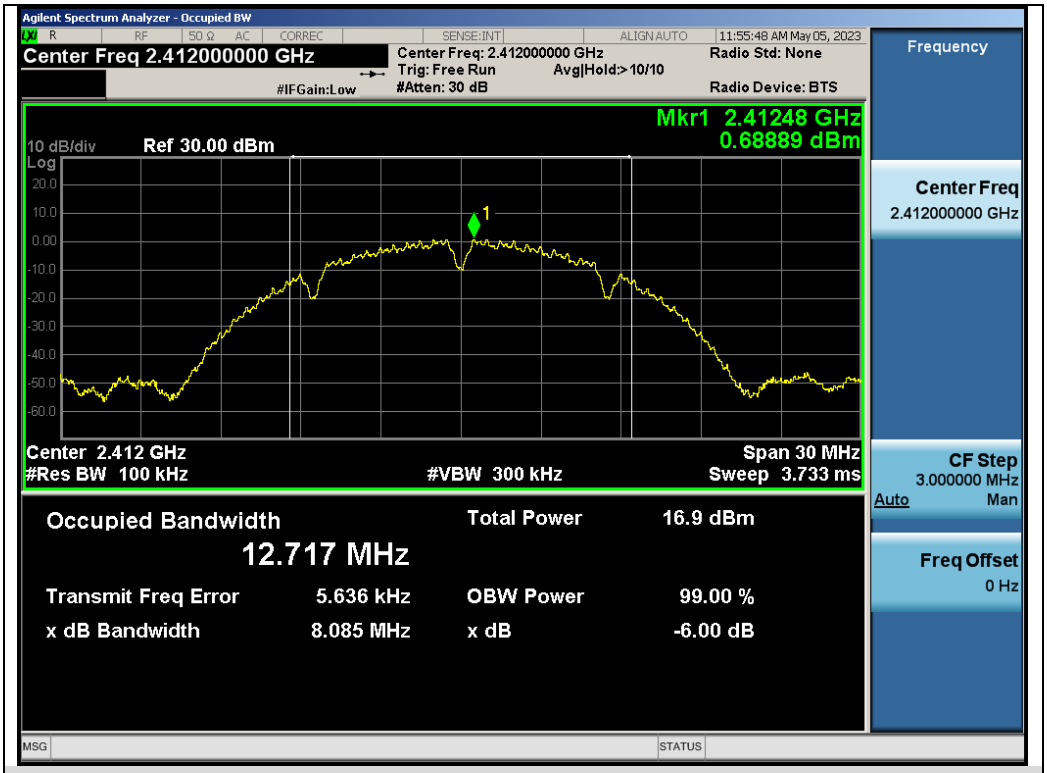
Test_Graph_802.11n40_ANT1_2422_MCS0_DTSBW



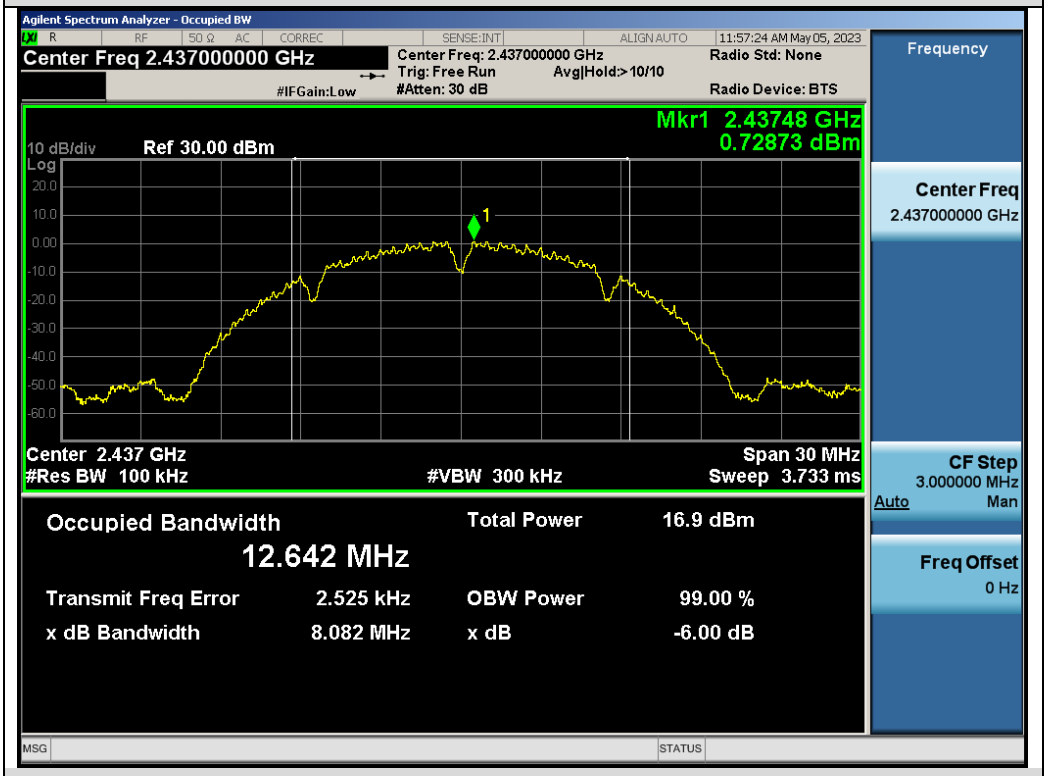
Test_Graph_802.11n40_ANT1_2437_MCS0_DTSBW



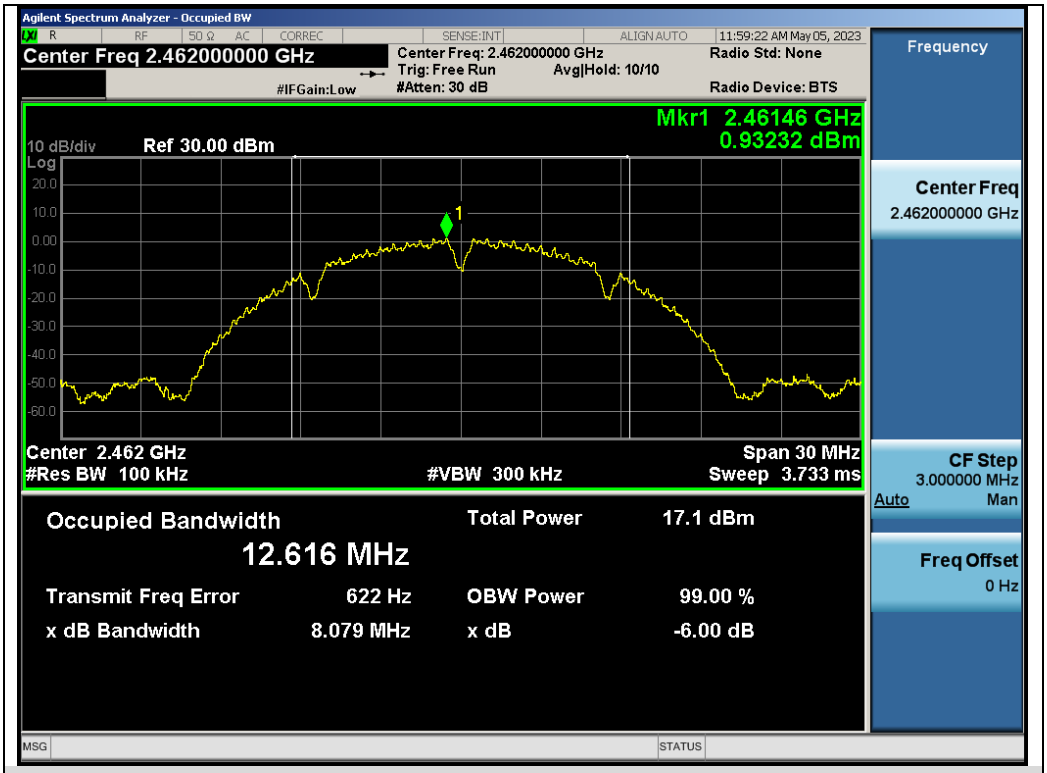
Test_Graph_802.11n40_ANT1_2452_MCS0_DTSBW



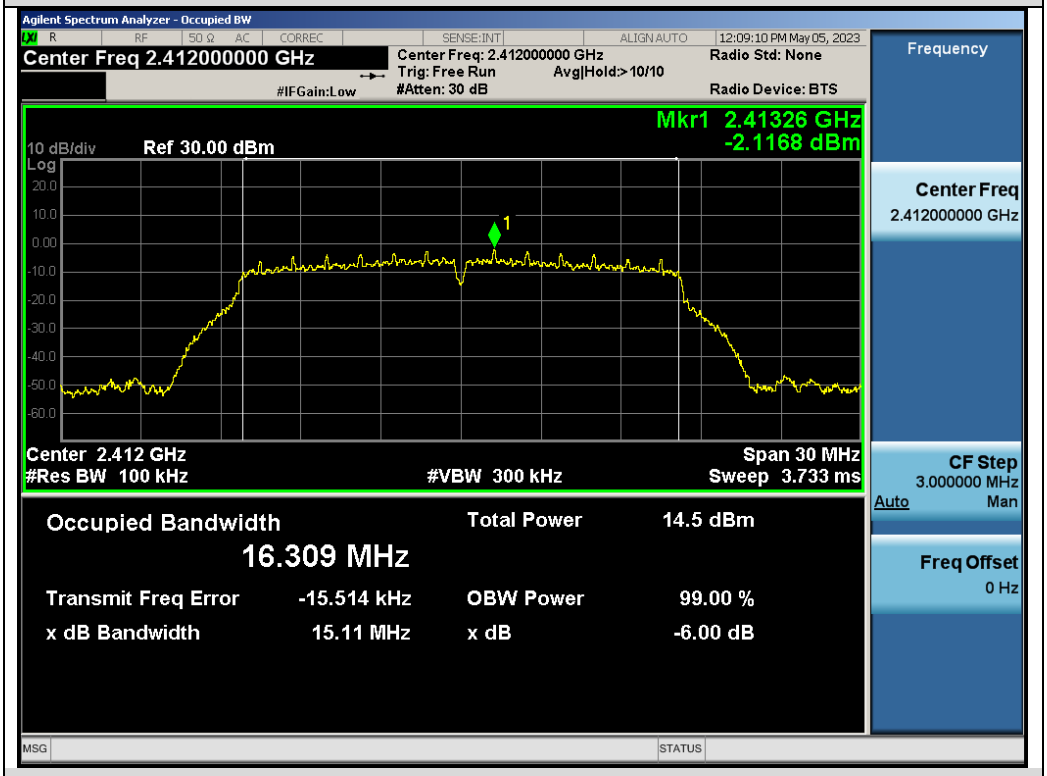
Test_Graph_802.11b_ANT2_2412_1Mbps_DTSBW



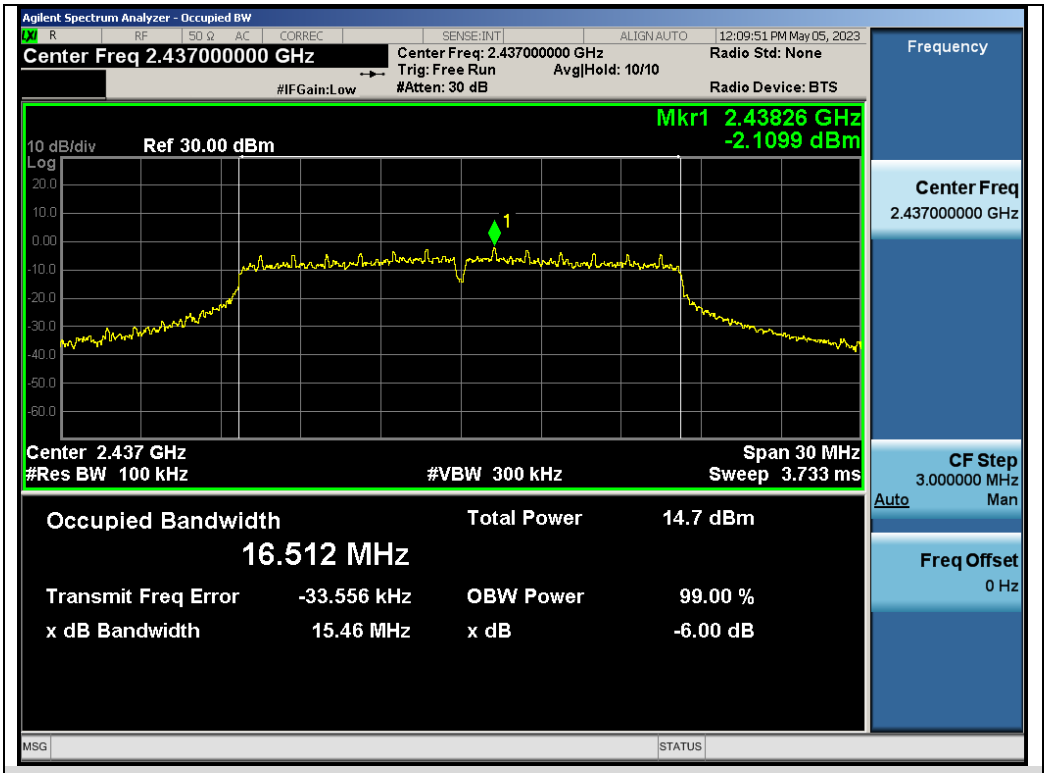
Test_Graph_802.11b_ANT2_2437_1Mbps_DTSBW



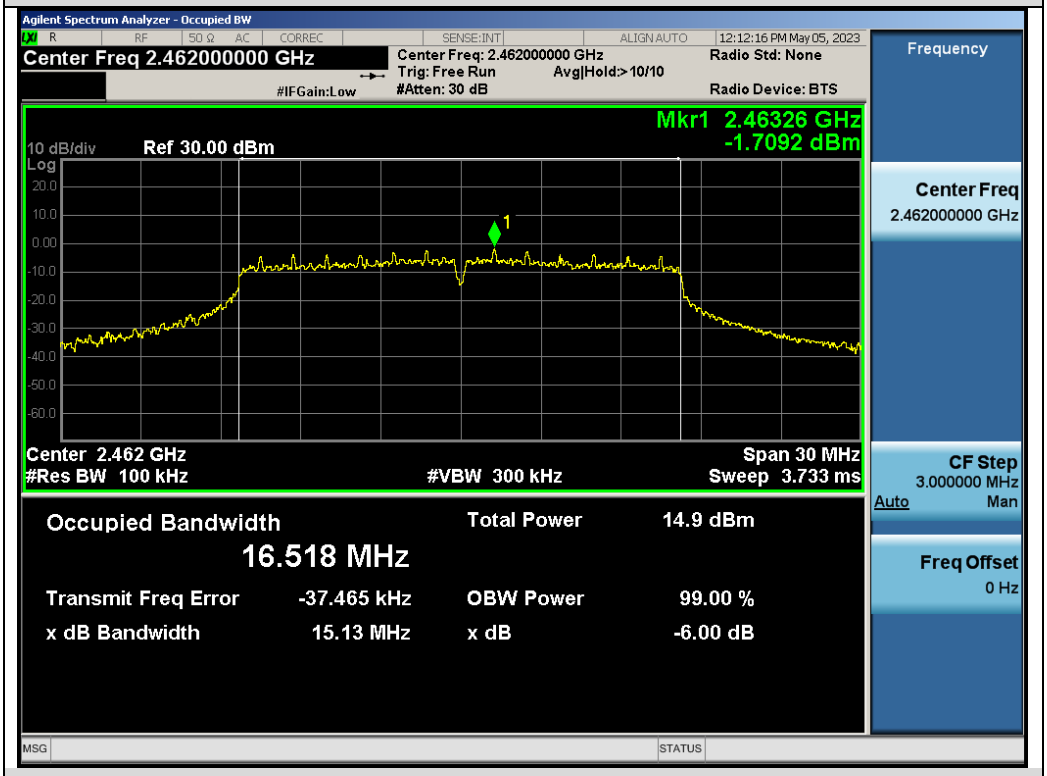
Test_Graph_802.11b_ANT2_2462_1Mbps_DTSBW



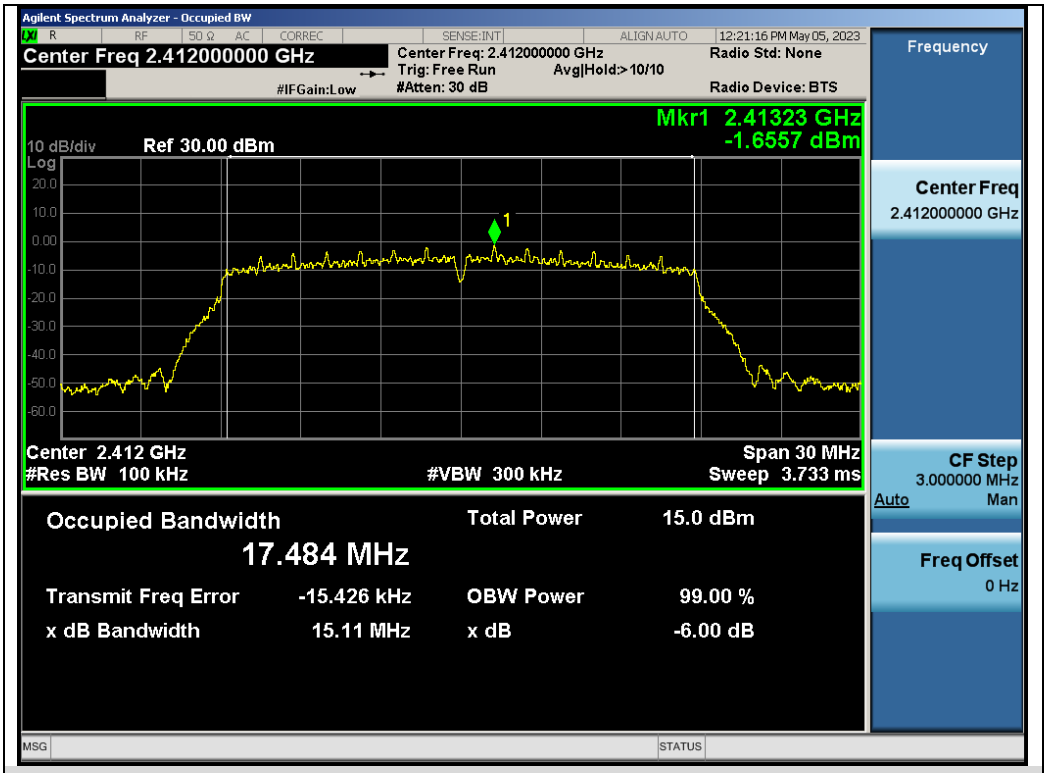
Test_Graph_802.11g_ANT2_2412_6Mbps_DTSBW



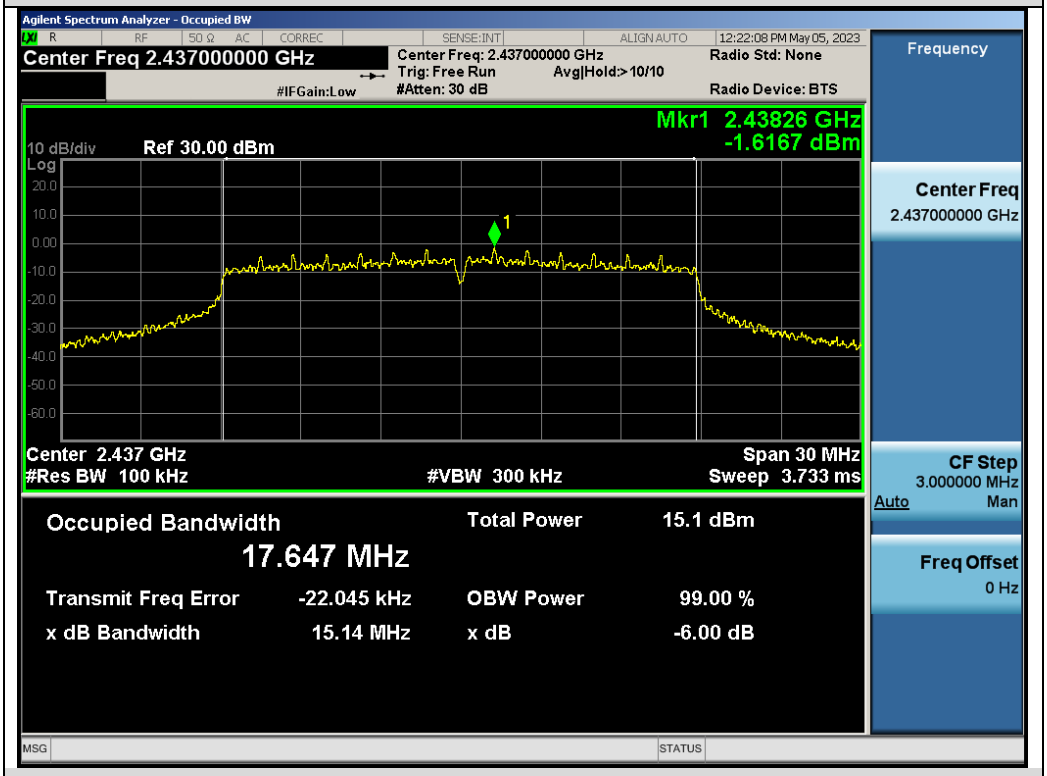
Test_Graph_802.11g_ANT2_2437_6Mbps_DTSBW



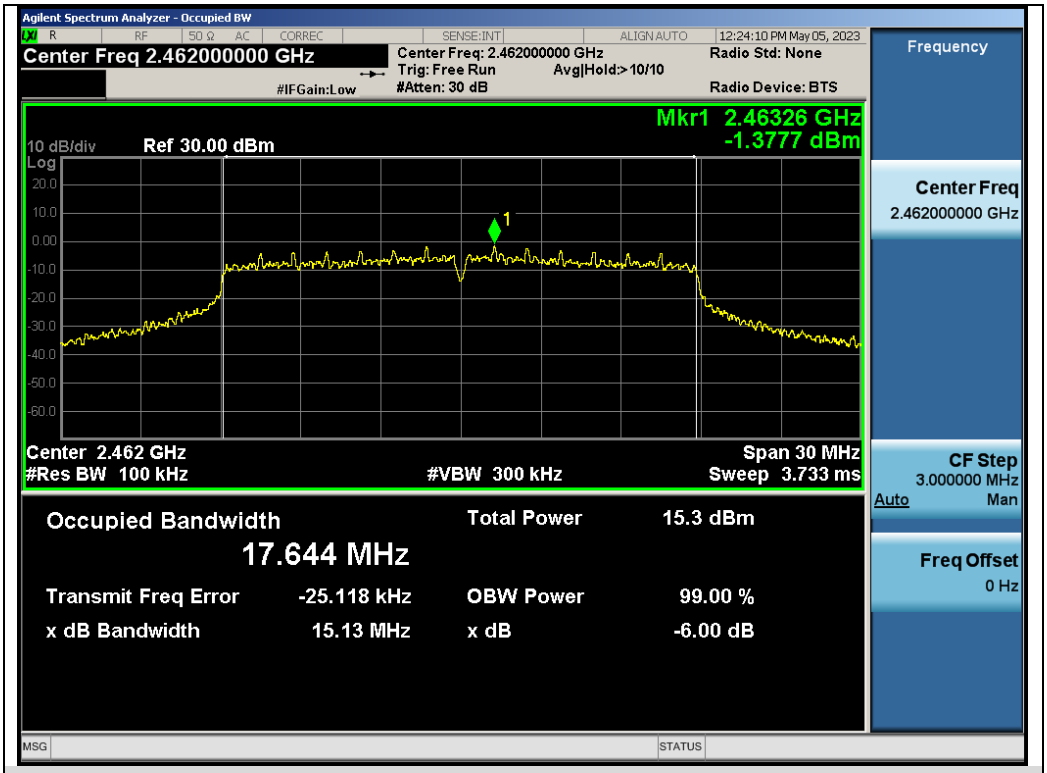
Test_Graph_802.11g_ANT2_2462_6Mbps_DTSBW



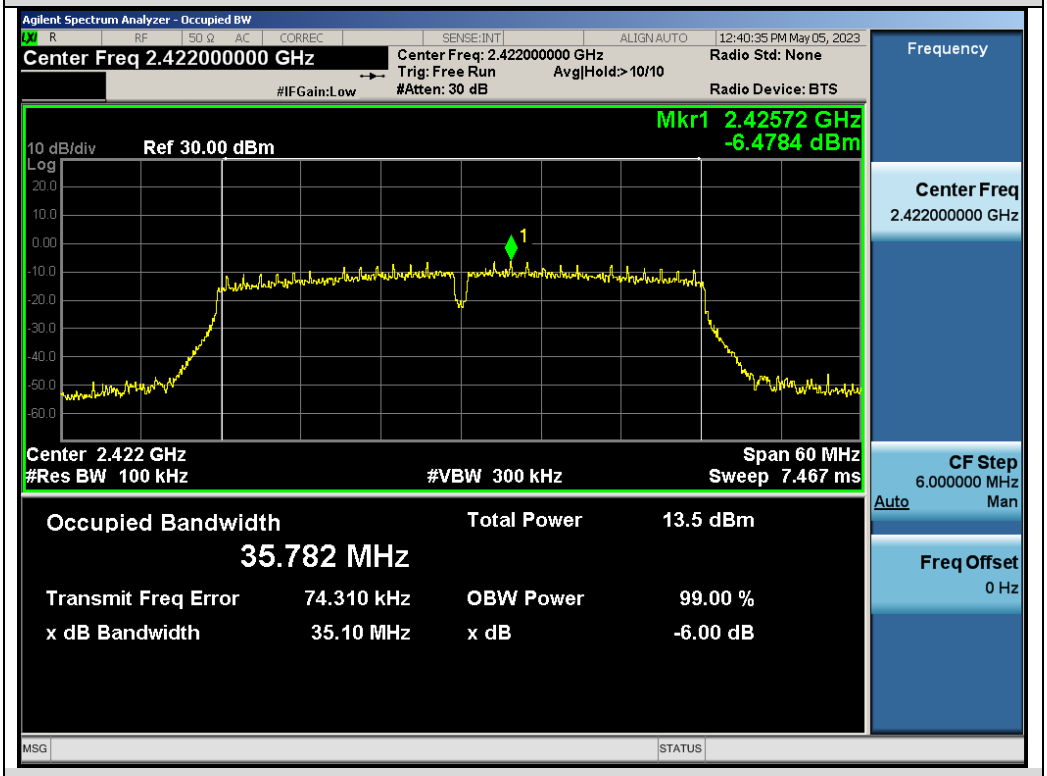
Test_Graph_802.11n20_ANT2_2412_MCS0_DTSBW



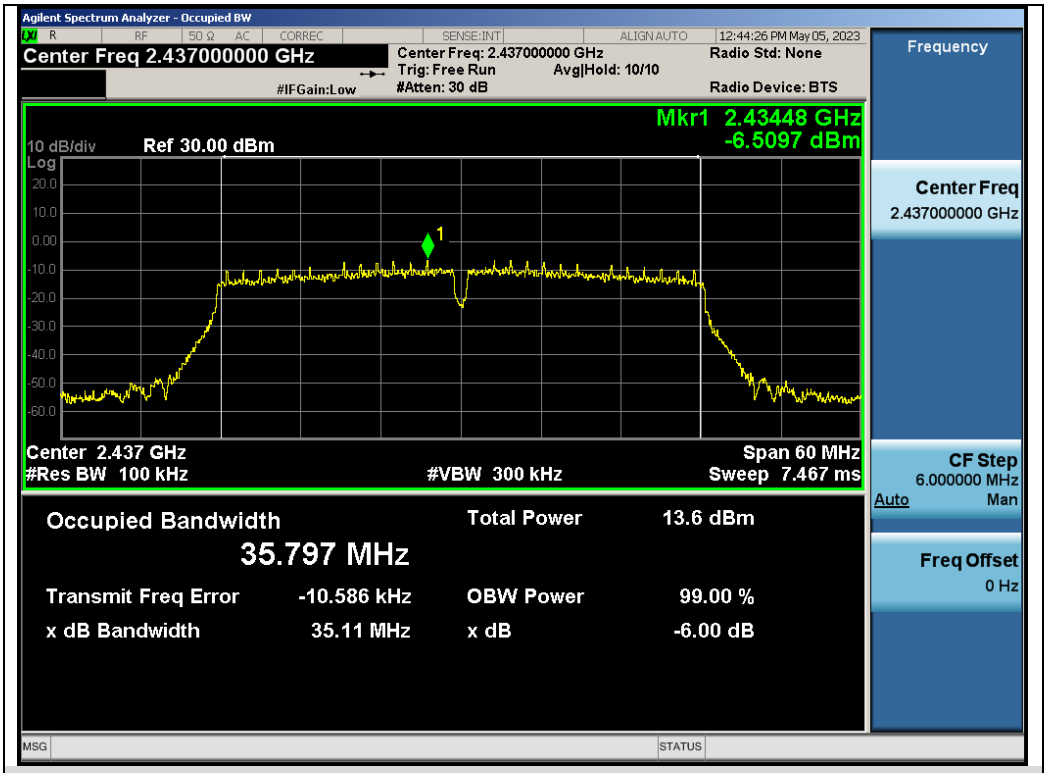
Test_Graph_802.11n20_ANT2_2437_MCS0_DTSBW



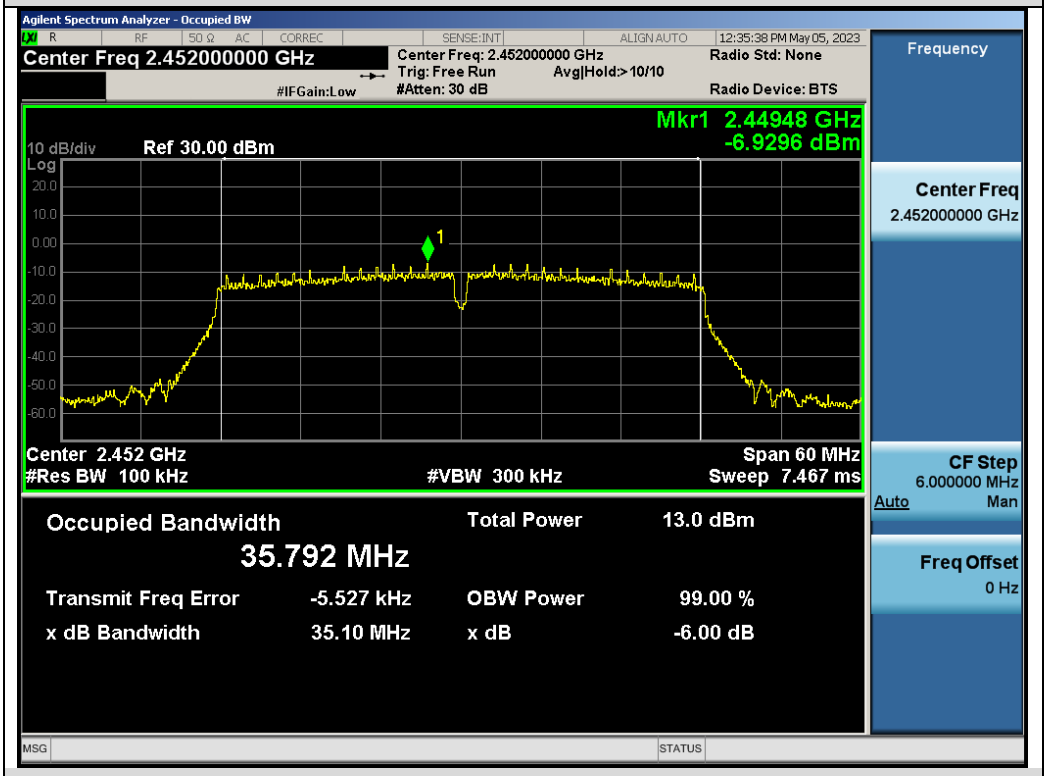
Test_Graph_802.11n20_ANT2_2462_MCS0_DTSBW



Test_Graph_802.11n40_ANT2_2422_MCS0_DTSBW



Test_Graph_802.11n40_ANT2_2437_MCS0_DTSBW



Test_Graph_802.11n40_ANT2_2452_MCS0_DTSBW

9. CONDUCTED SPURIOUS EMISSION

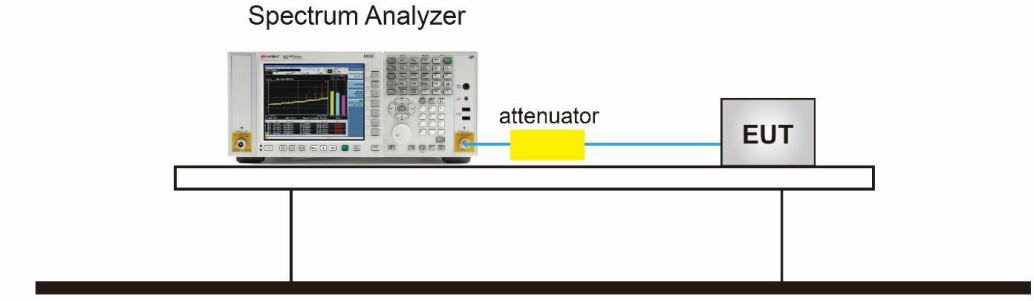
9.1 MEASUREMENT LIMIT

Limits and Measurement Result		
Applicable Limits	Measurement Result	
	Test Data	Criteria
In any 100 kHz Bandwidth Outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power. In addition, radiation emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in§15.209(a))	At least -20dBc than the limit Specified on the Bottom Channel	PASS
	At least -20dBc than the limit Specified on the Top Channel	PASS

9.2 MEASUREMENT PROCEDURE

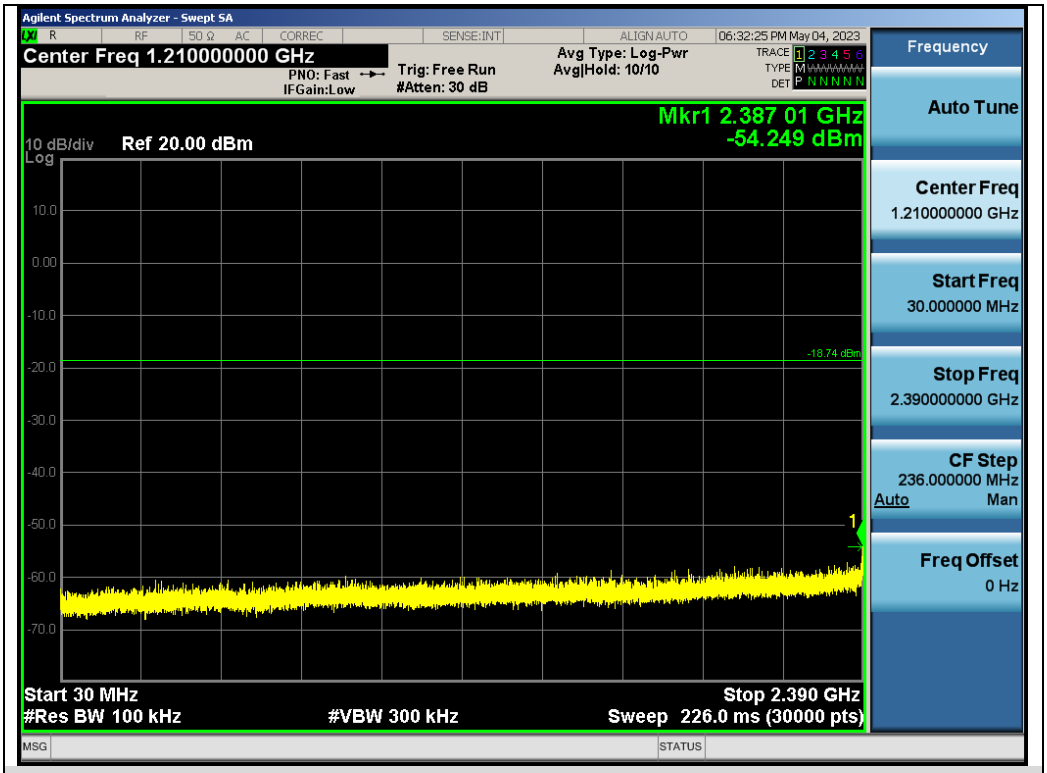
1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the Middle and the bottom operation frequency individually.
3. Set the Span = wide enough to capture the peak level of the in-band emission and all spurious emissions from the lowest frequency generated in the EUT up through the 10th harmonic.
4. RBW = 100 kHz; VBW= 300 kHz; Sweep = auto; Detector function = peak.(Test frequency below 1GHz)
5. RBW = 1 MHz; VBW= 3 MHz; Sweep = auto; Detector function = peak.(Test frequency Above 1GHz)
6. Set SPA Trace 1 Max hold, then View.
7. Mark the maximum useless stray point and compare it with the limit value to record the result.

9.3 MEASUREMENT SETUP (BLOCK DIAGRAM OF CONFIGURATION)

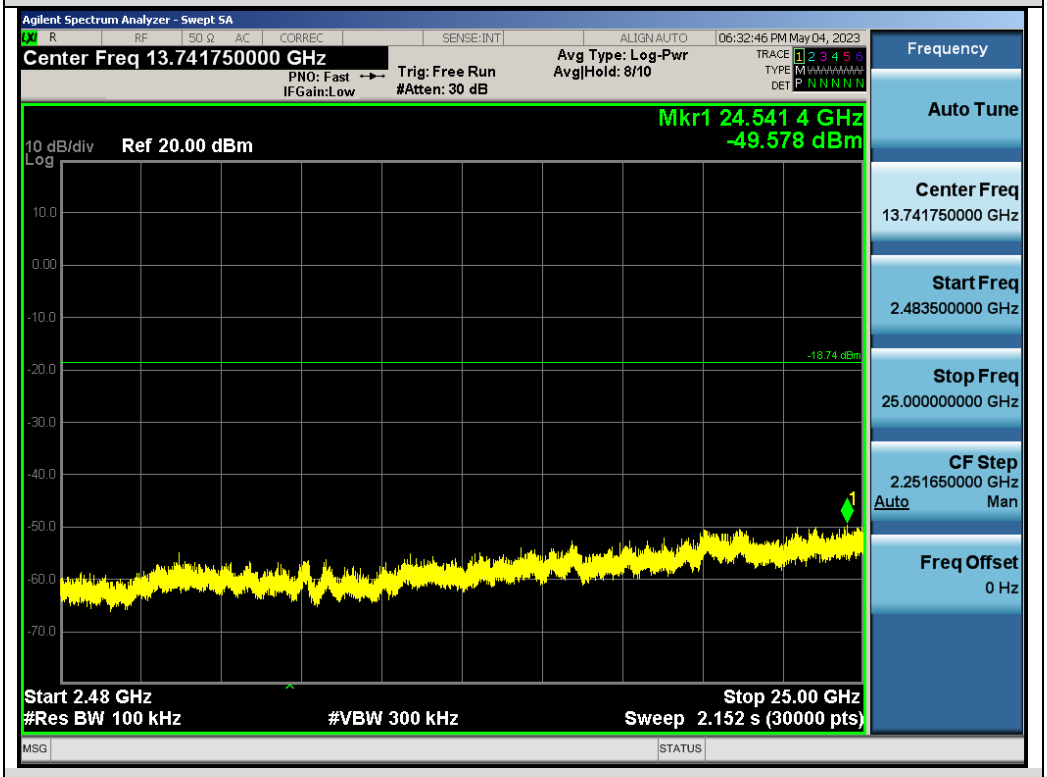


9.4 MEASUREMENT RESULTS

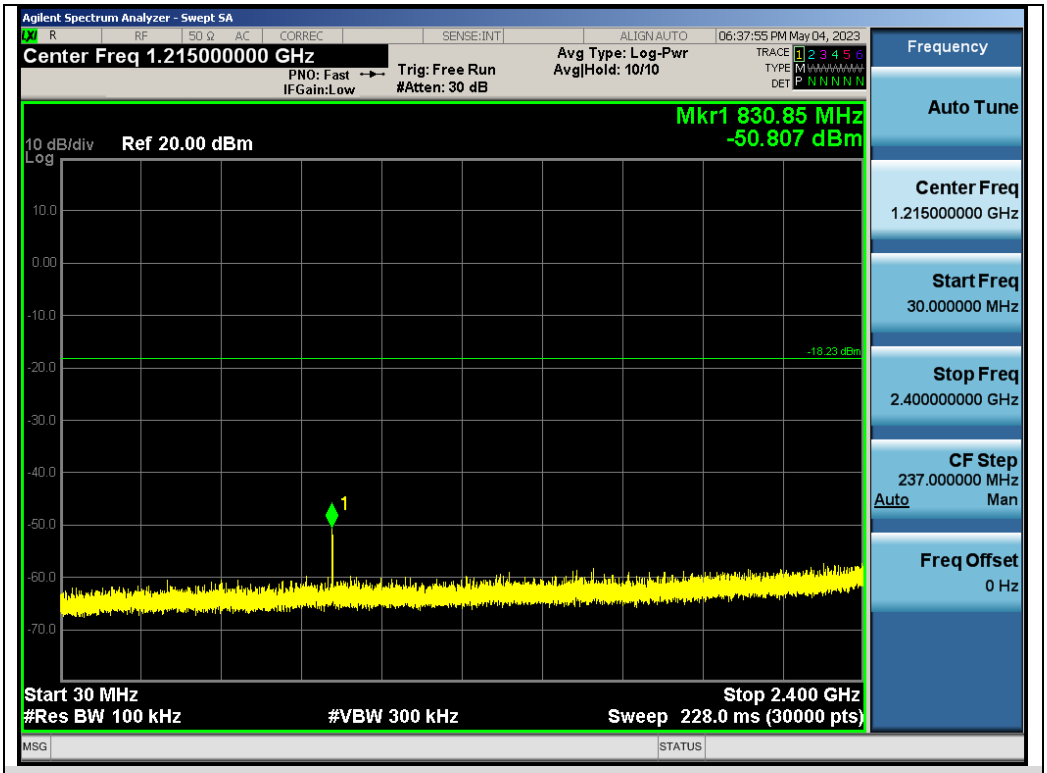
Test Graphs of Spurious Emissions in Non-Restricted Frequency Bands



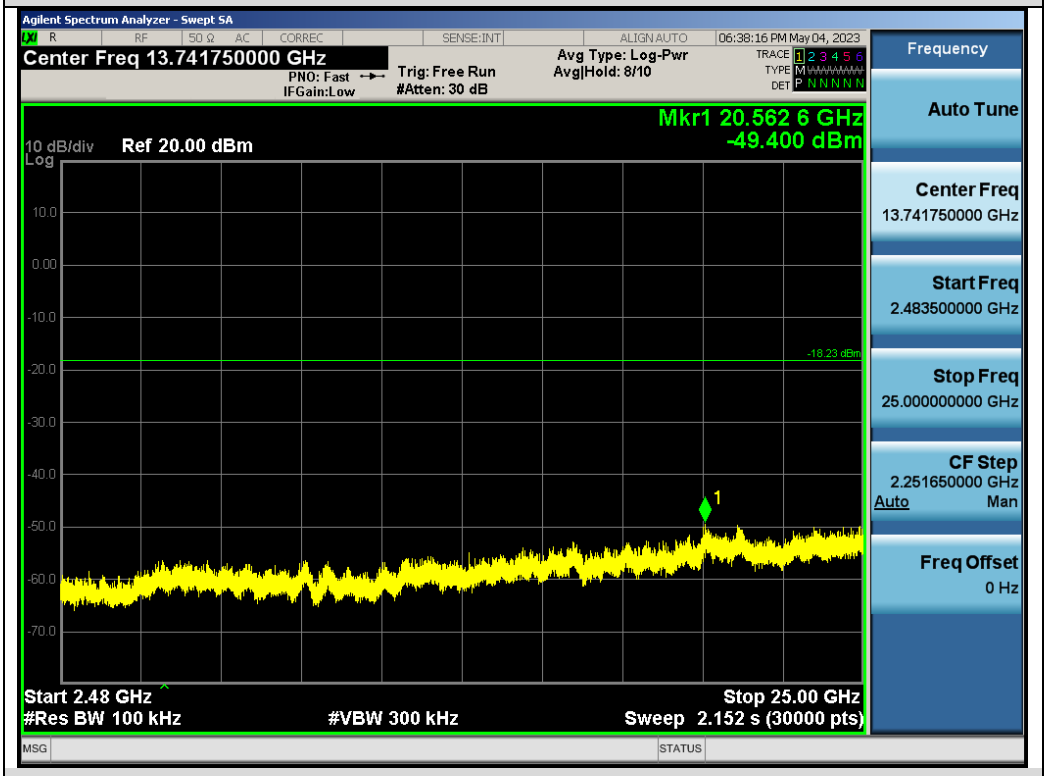
Test_Graph_802.11b_ANT1_2412_1Mbps_Lower Band Emissions



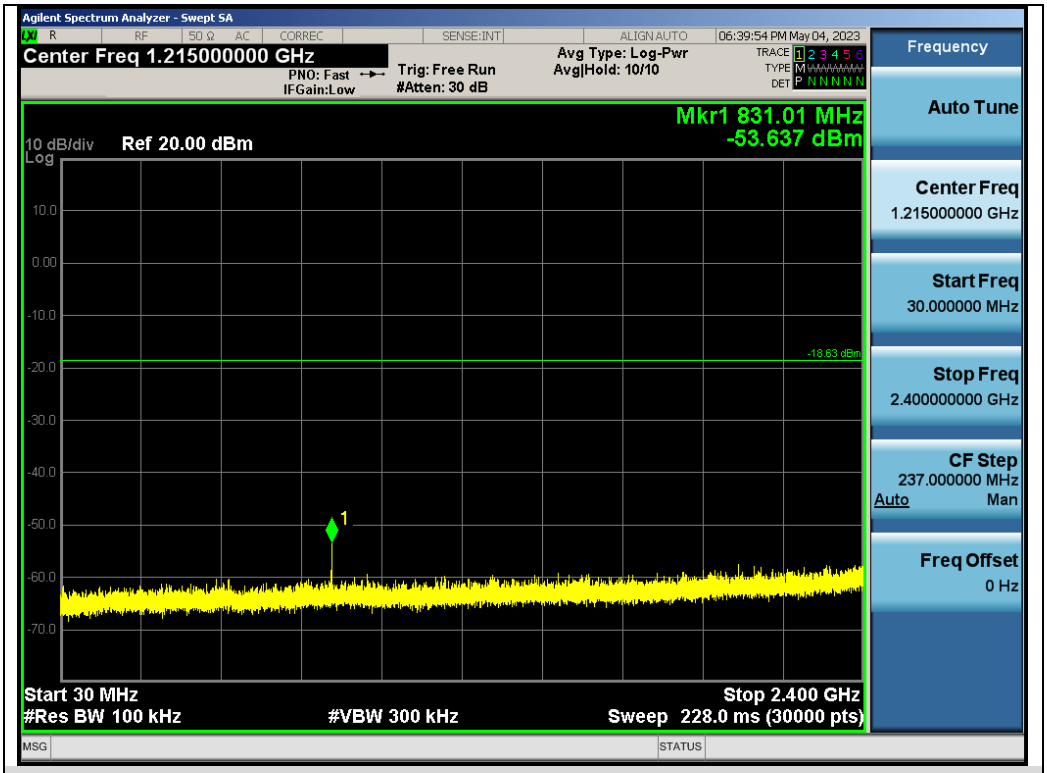
Test_Graph_802.11b_ANT1_2412_1Mbps_Higher Band Emissions



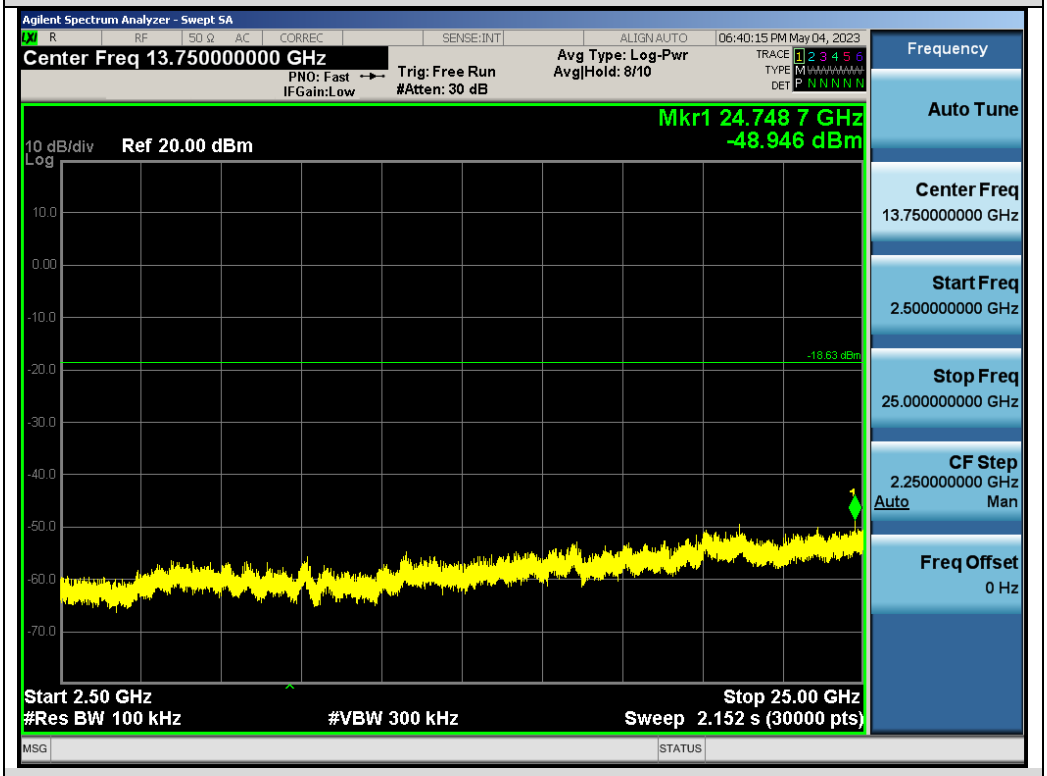
Test_Graph_802.11b_ANT1_2437_1Mbps_Lower Band Emissions



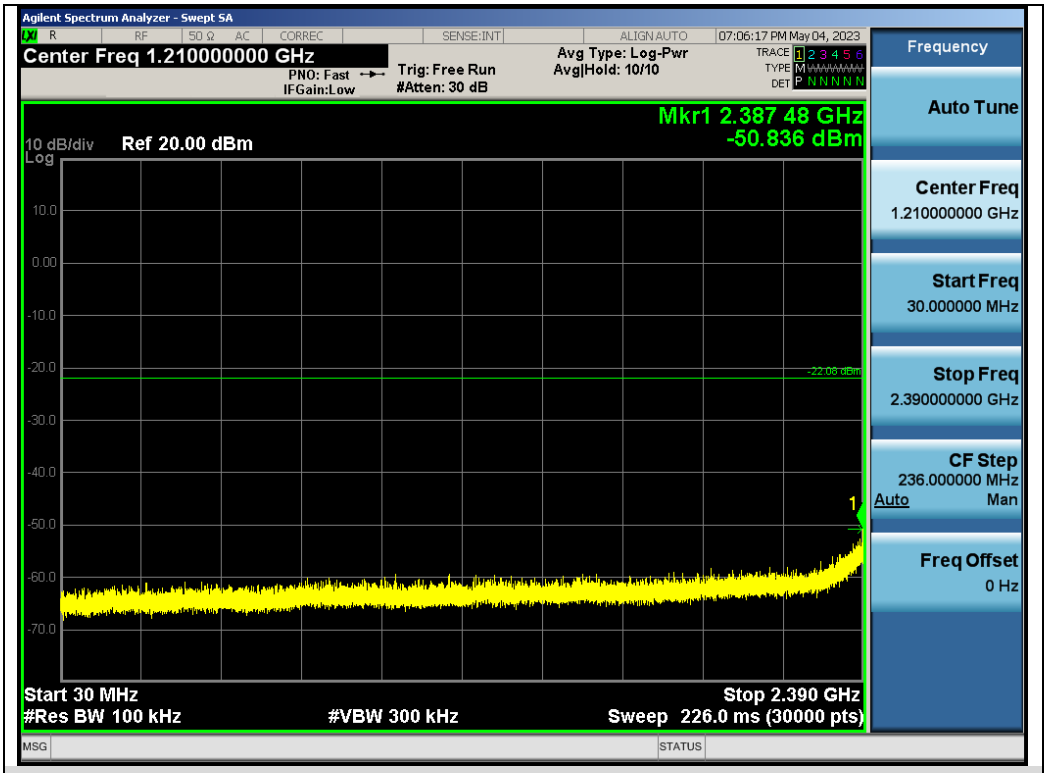
Test_Graph_802.11b_ANT1_2437_1Mbps_Higher Band Emissions



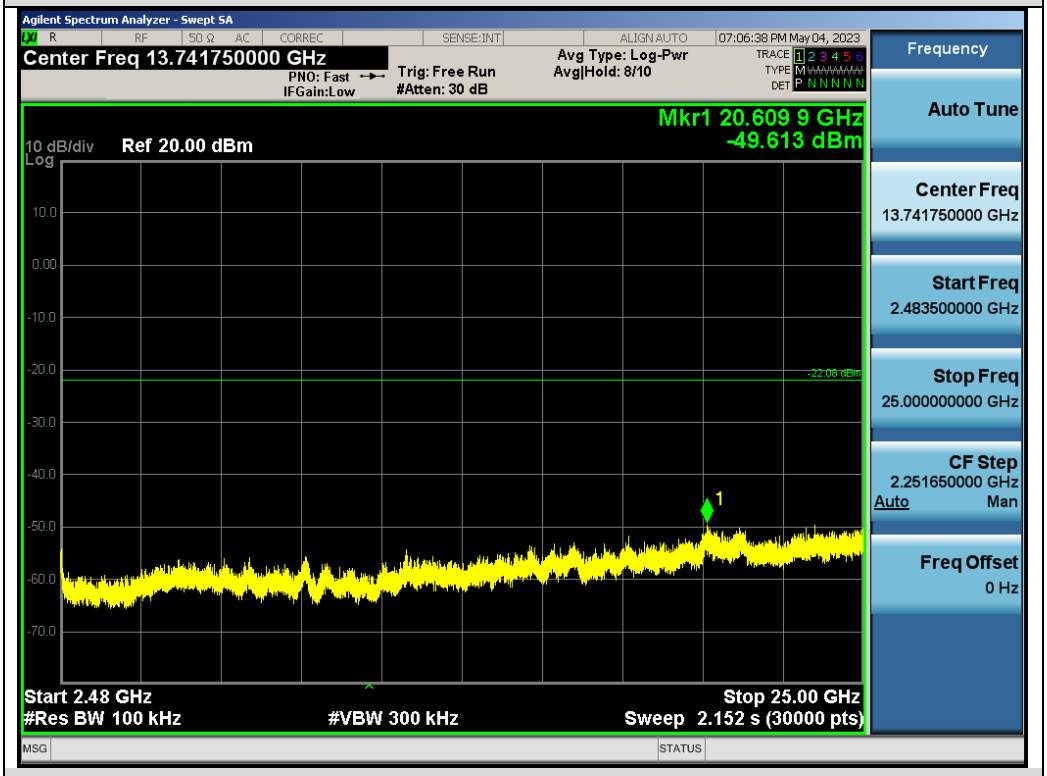
Test_Graph_802.11b_ANT1_2462_1Mbps_Lower Band Emissions



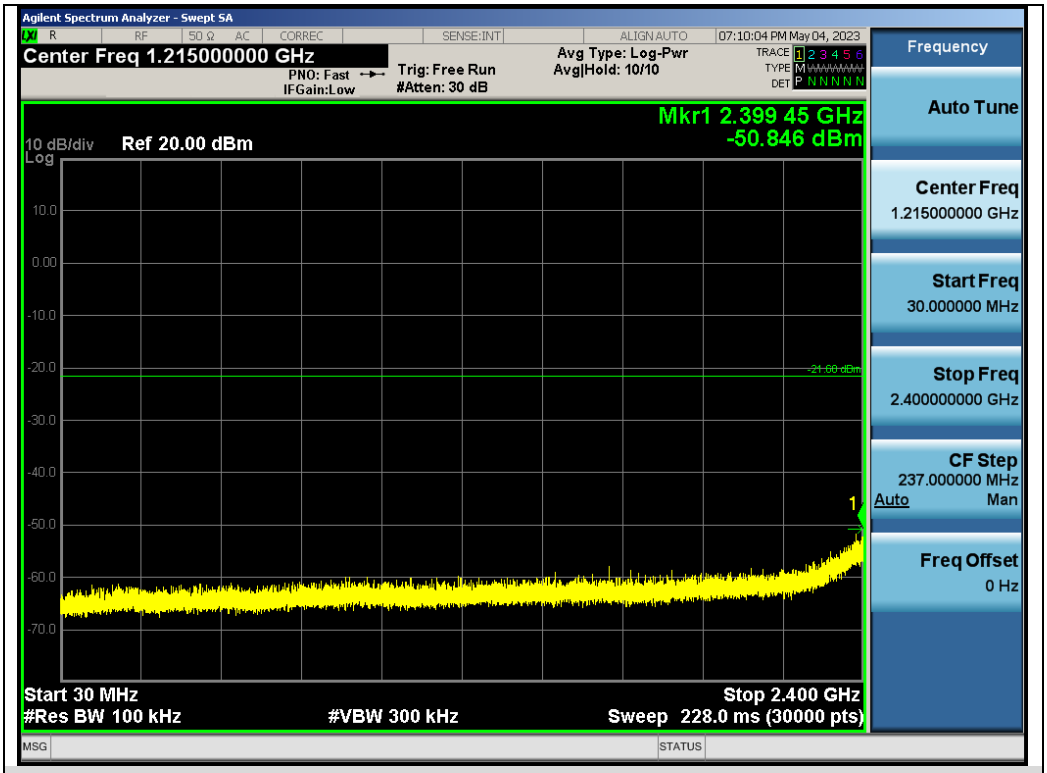
Test_Graph_802.11b_ANT1_2462_1Mbps_Higher Band Emissions



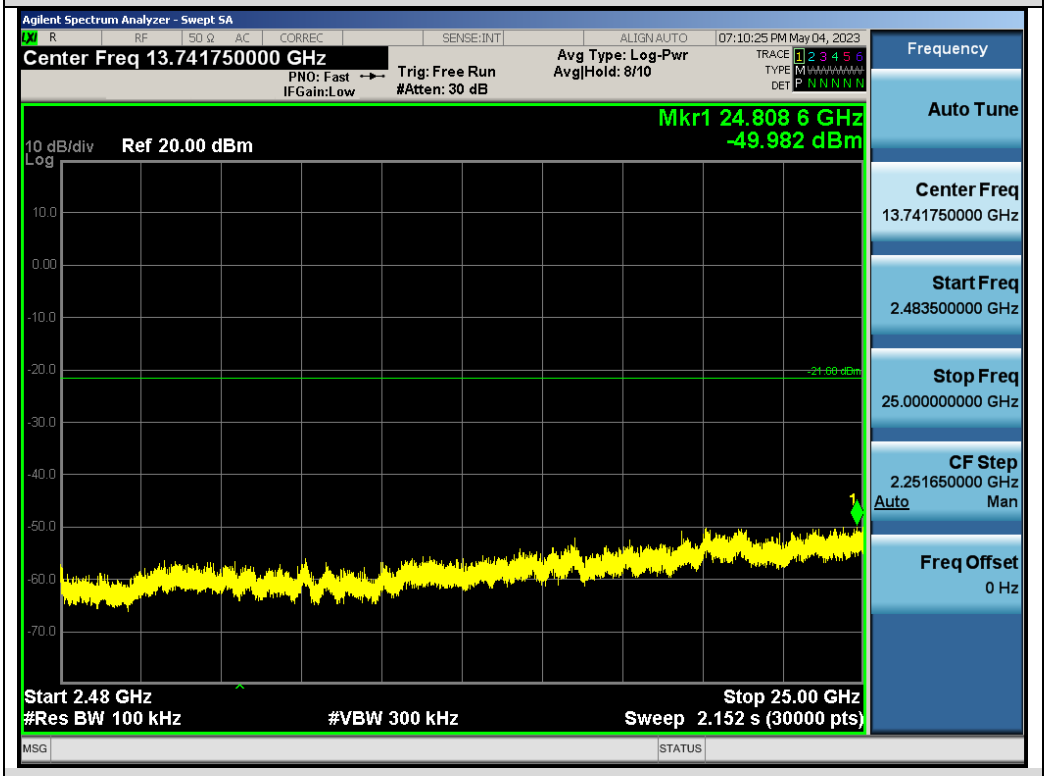
Test_Graph_802.11g_ANT1_2412_6Mbps_Lower Band Emissions



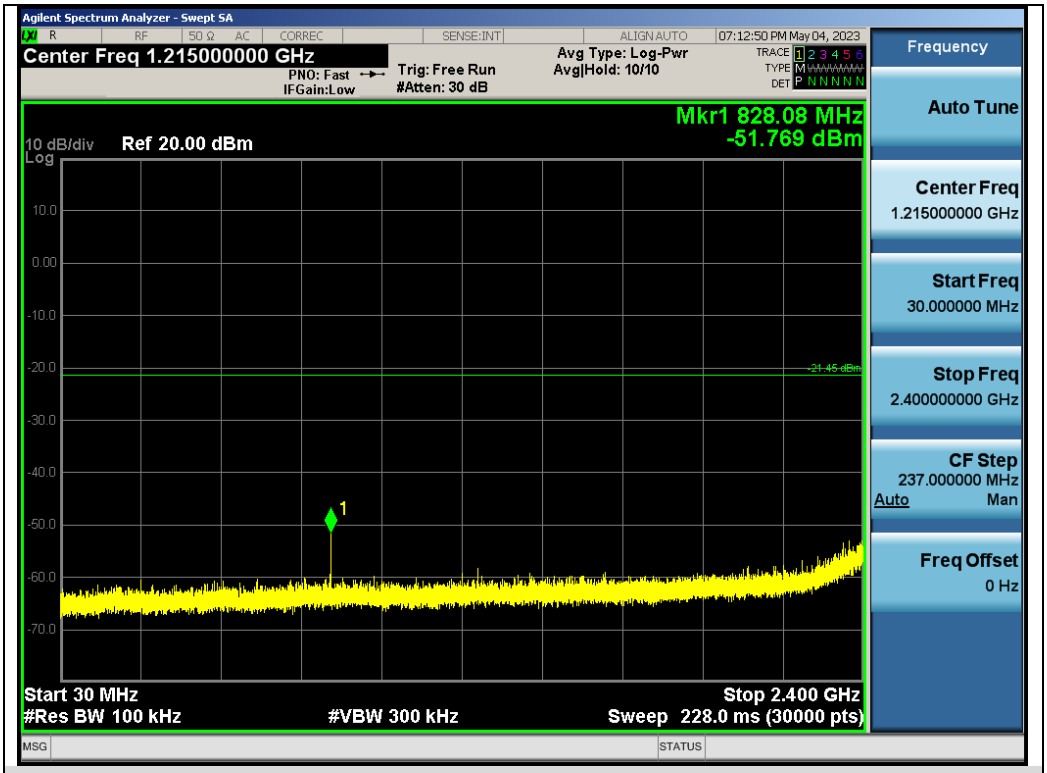
Test_Graph_802.11g_ANT1_2412_6Mbps_Higher Band Emissions



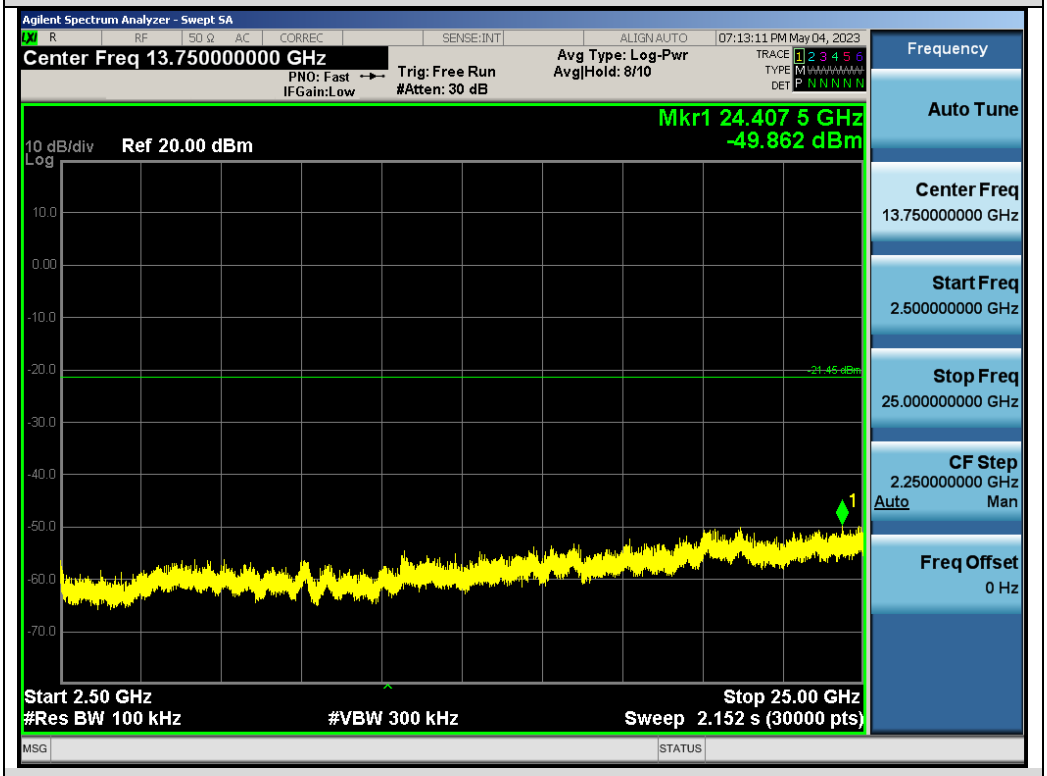
Test_Graph_802.11g_ANT1_2437_6Mbps_Lower Band Emissions



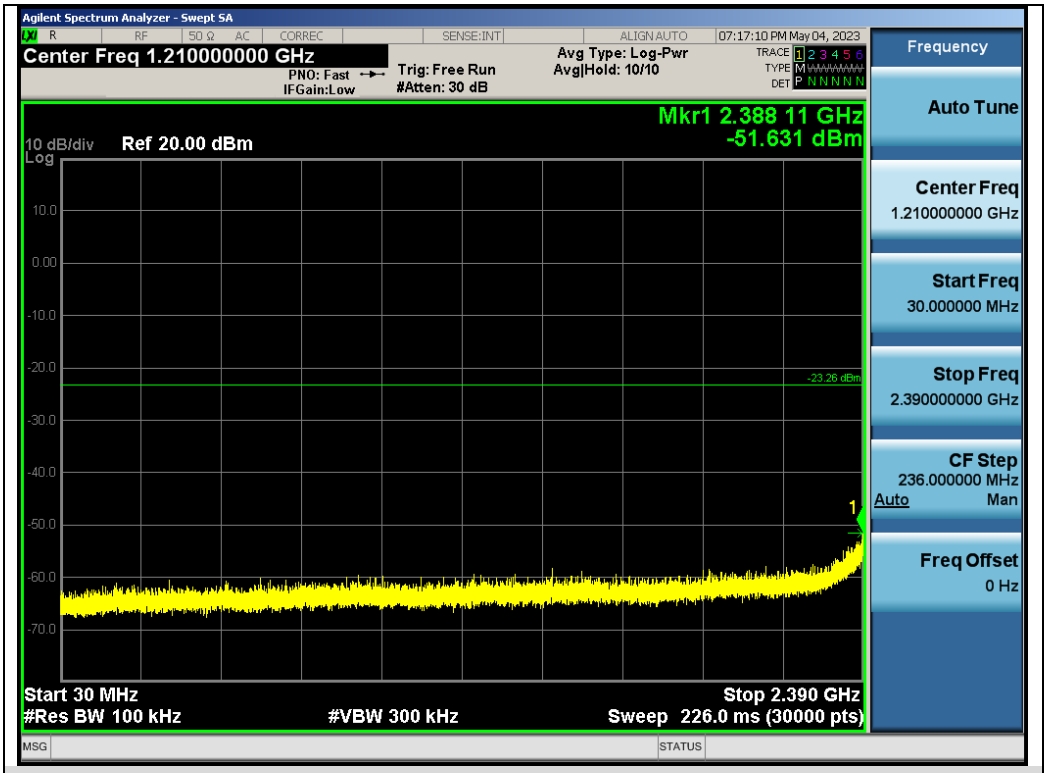
Test_Graph_802.11g_ANT1_2437_6Mbps_Higher Band Emissions



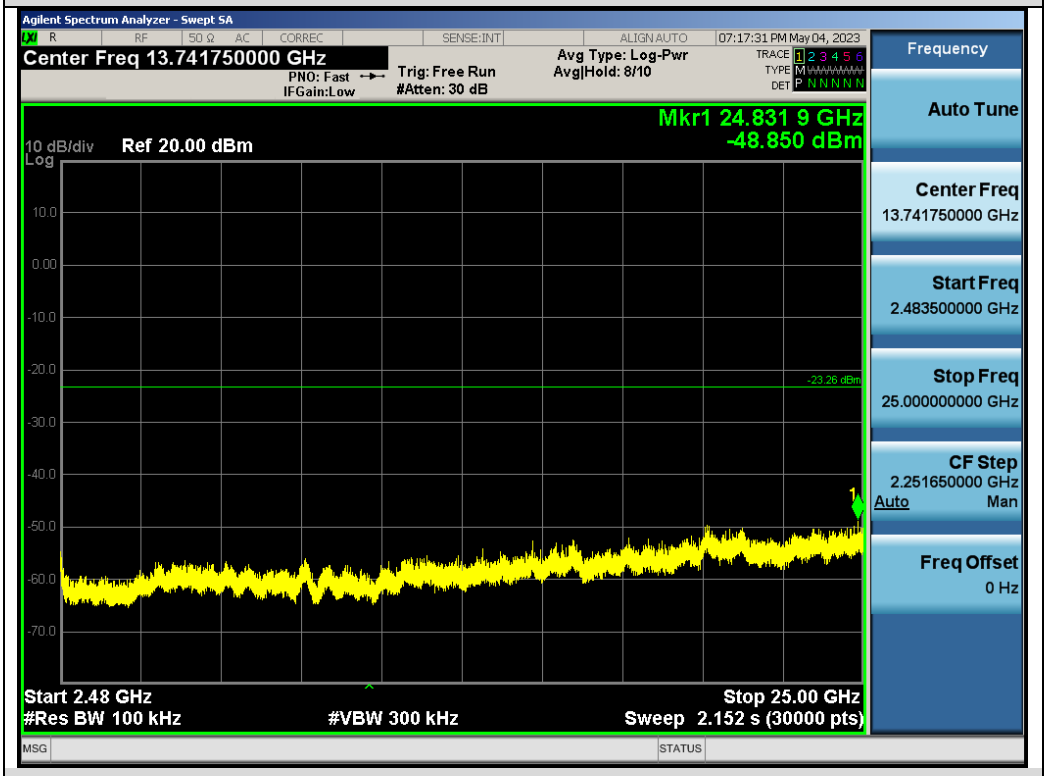
Test_Graph_802.11g_ANT1_2462_6Mbps_Lower Band Emissions



Test_Graph_802.11g_ANT1_2462_6Mbps_Higher Band Emissions



Test_Graph_802.11n20_ANT1_2412_MCS0_Lower Band Emissions



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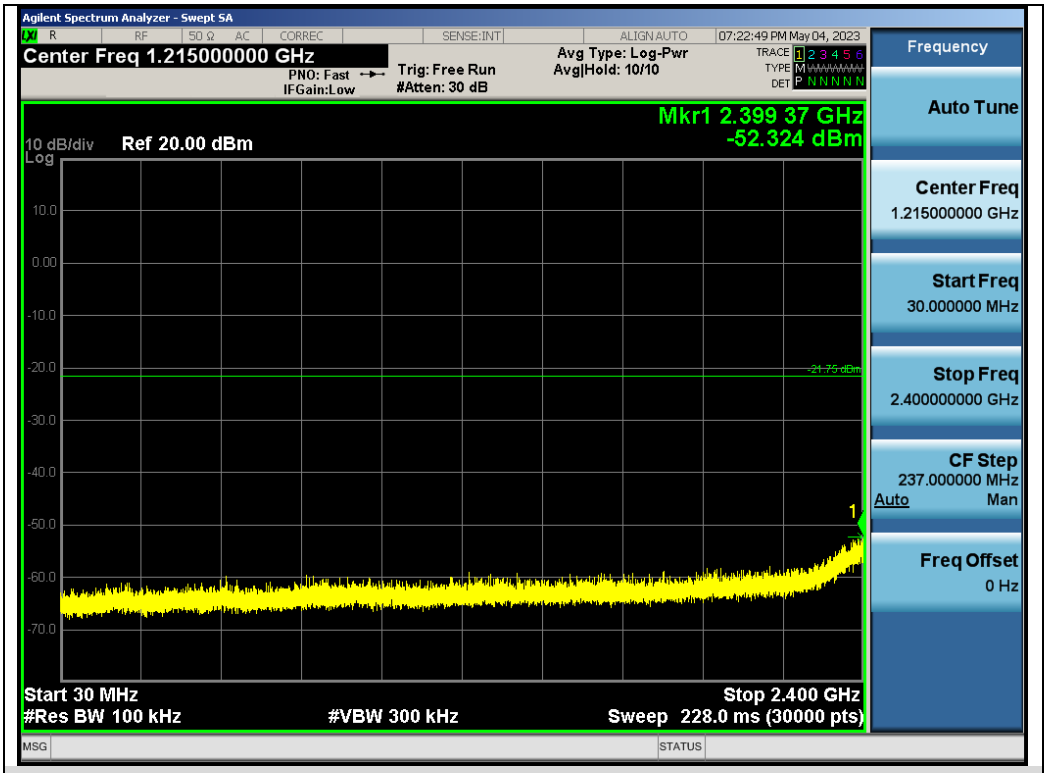

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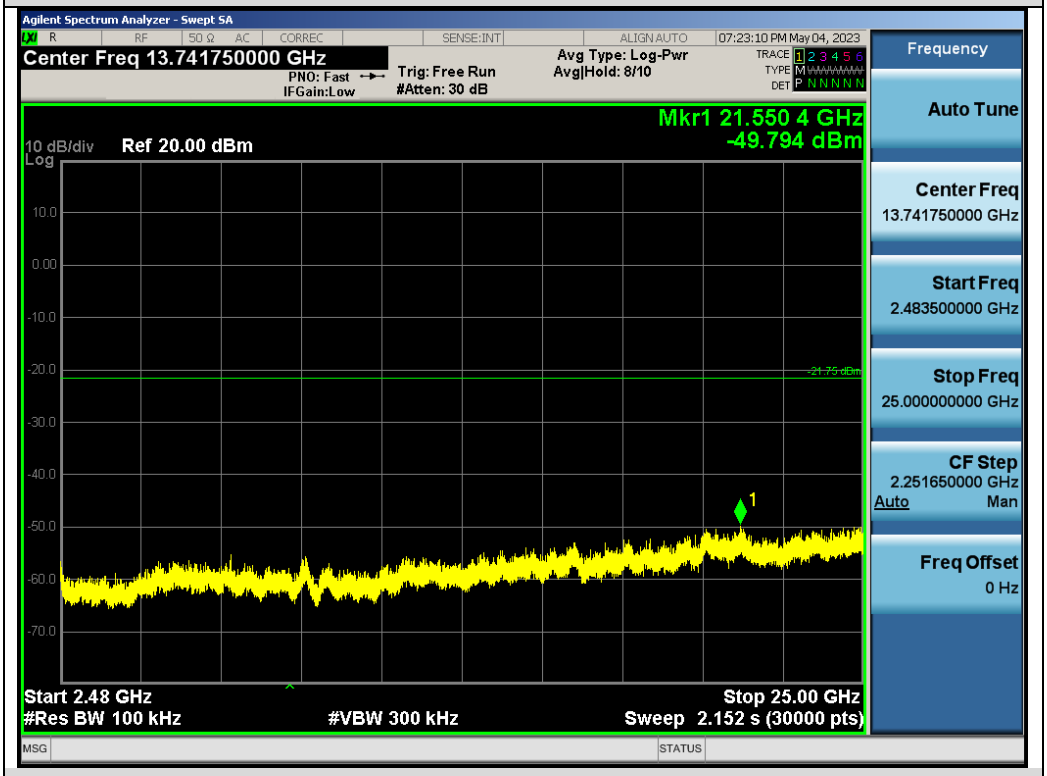

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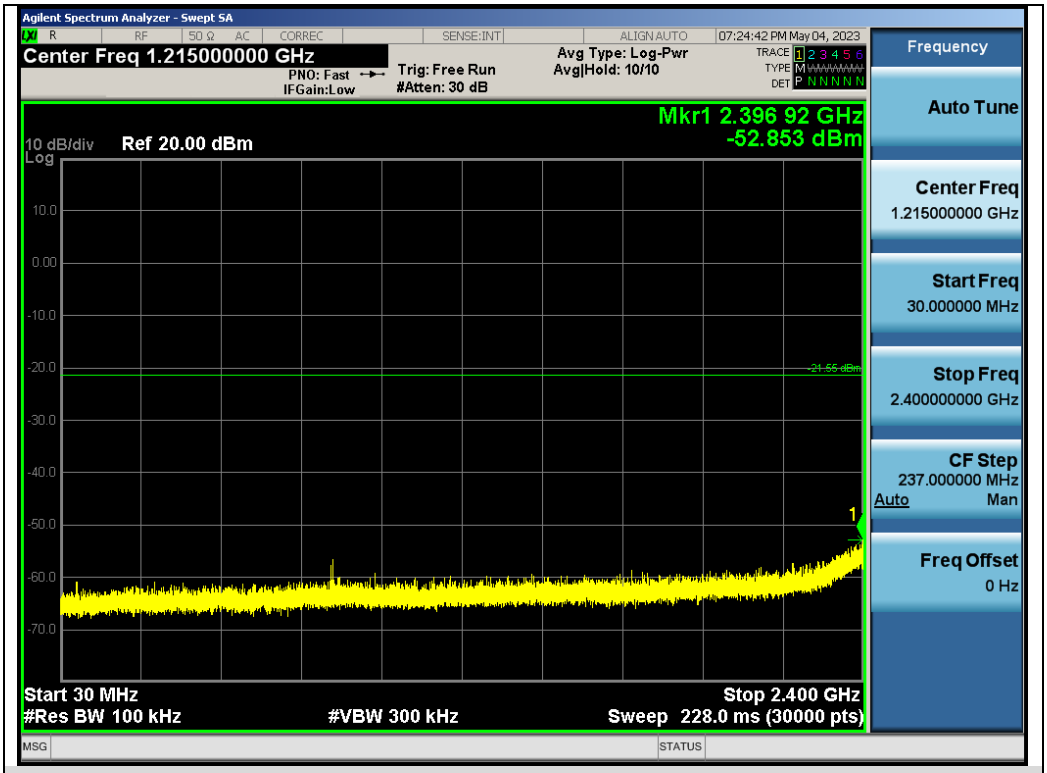

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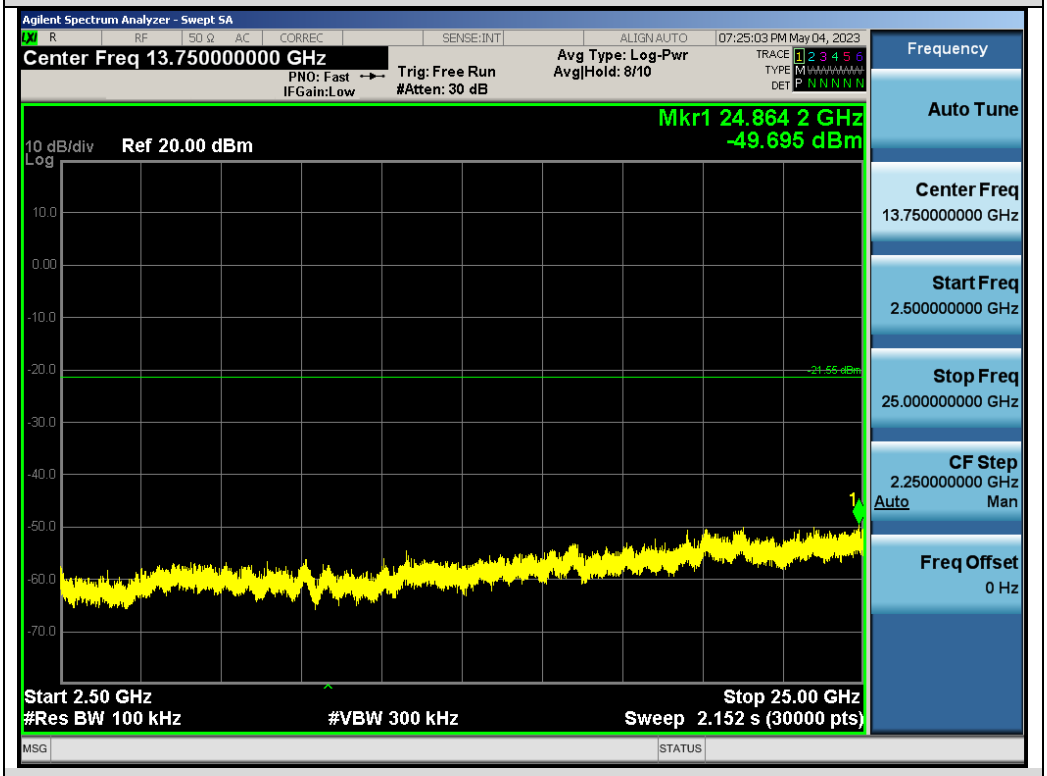
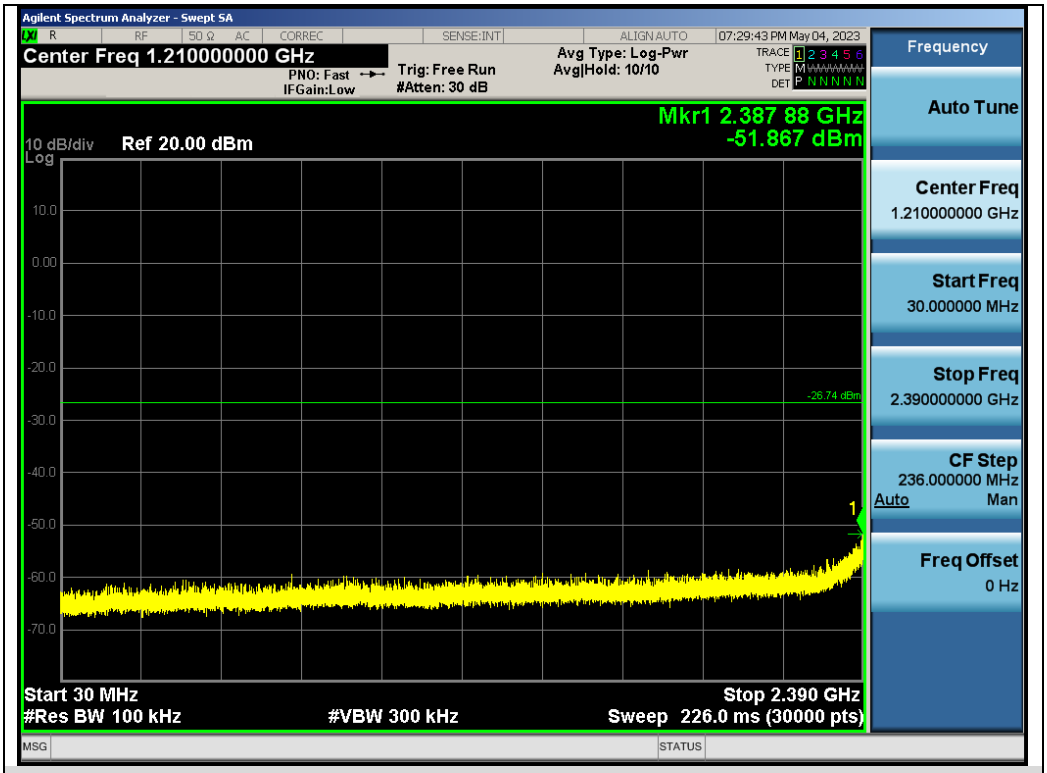
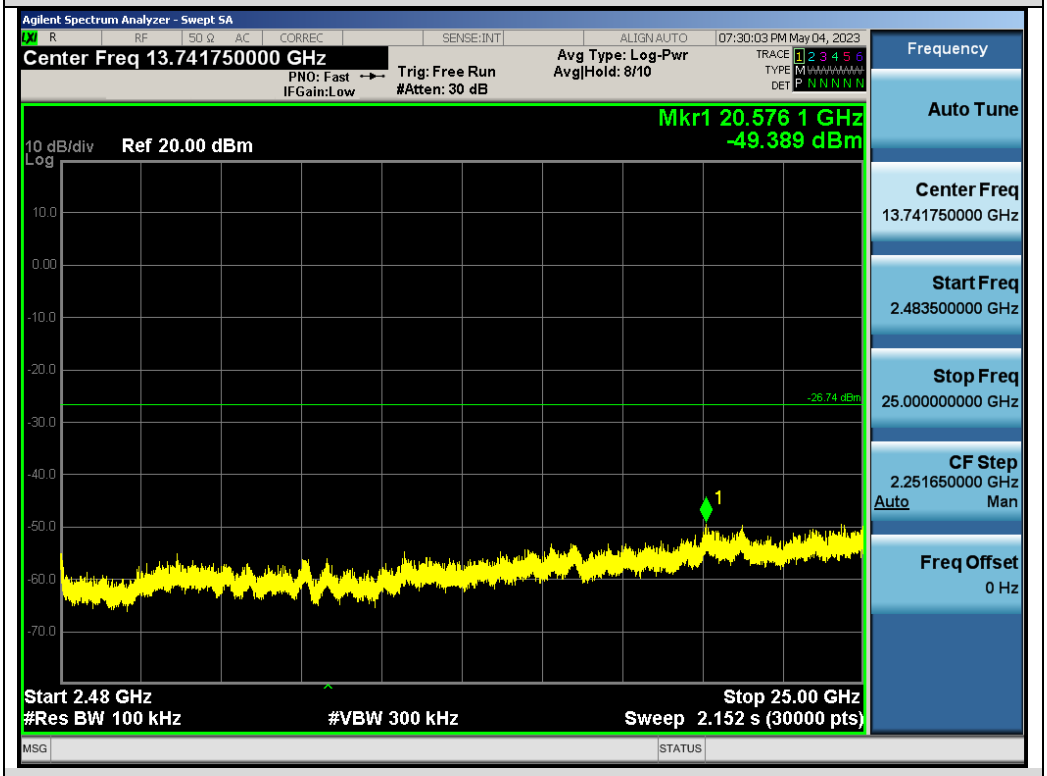


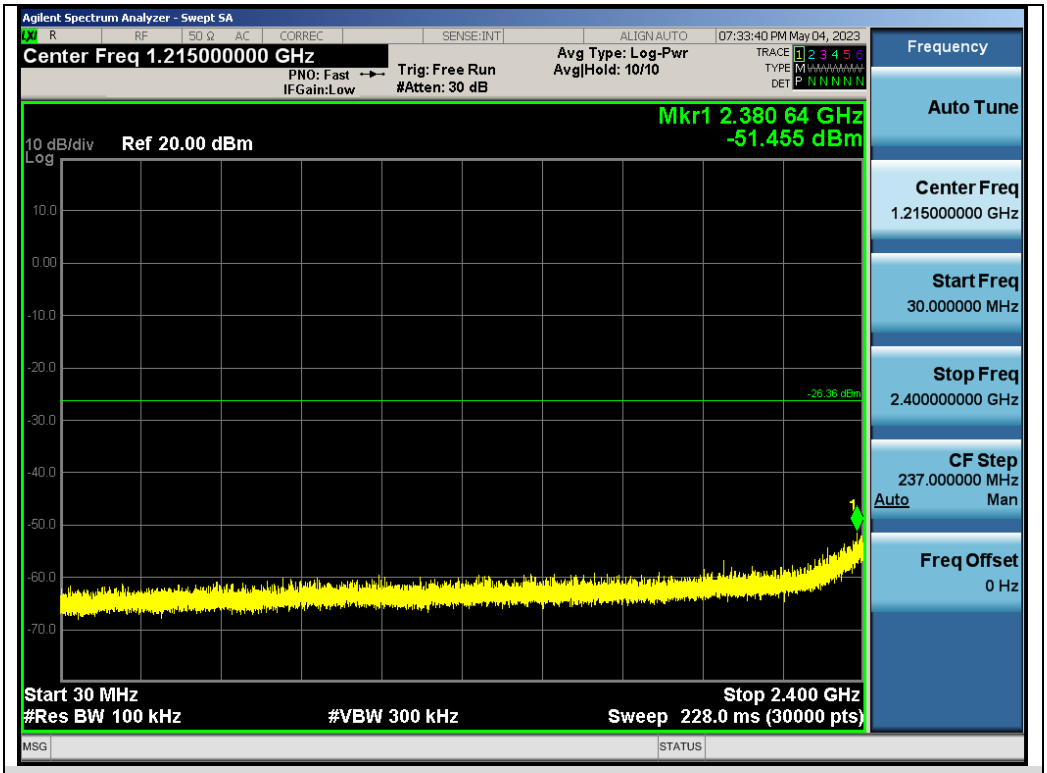
Test_Graph_802.11n20_ANT1_2462_MCS0_Higher Band Emissions



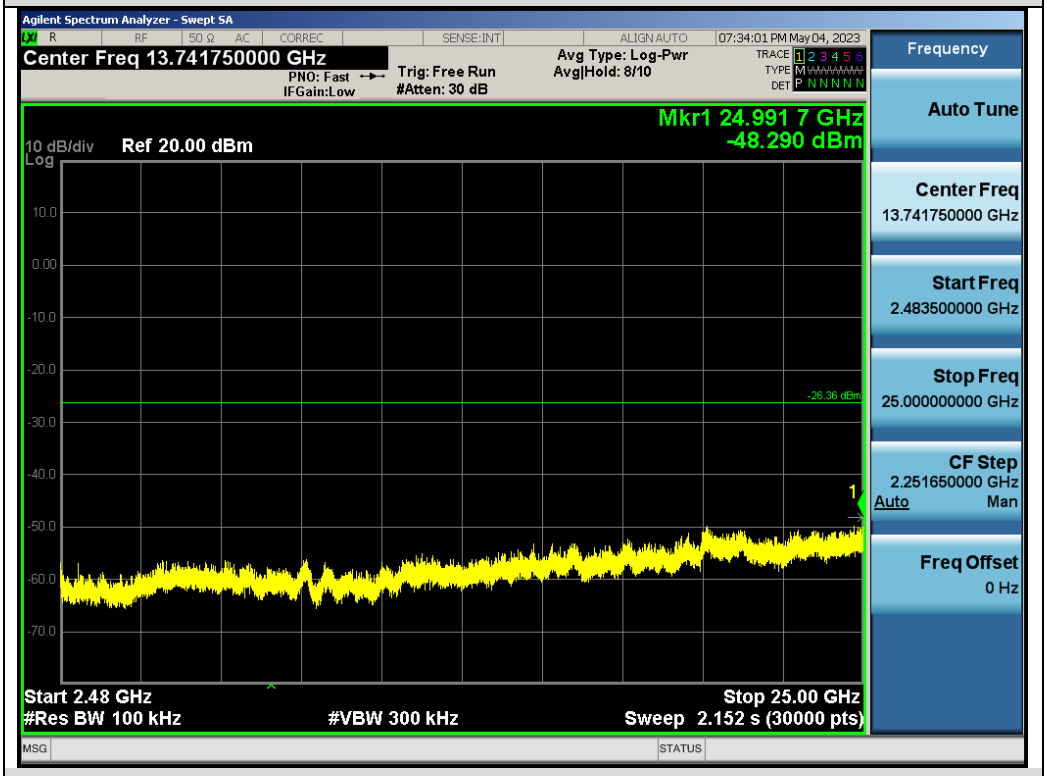
Test_Graph_802.11n40_ANT1_2422_MCS0_Lower Band Emissions



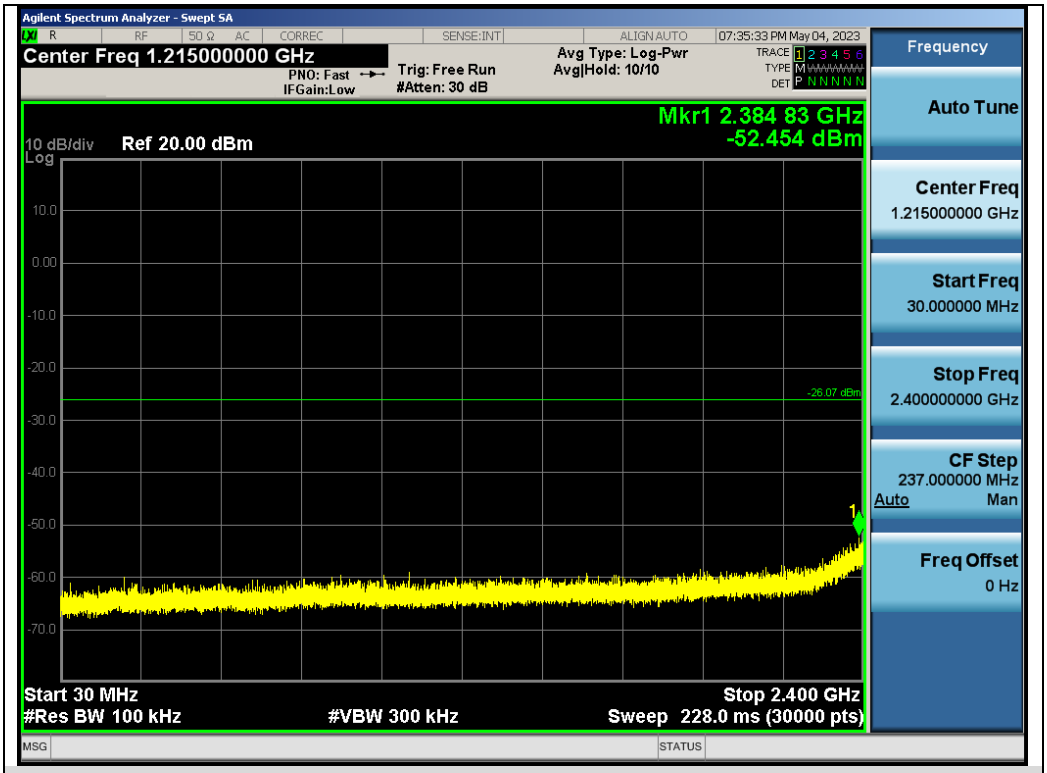
Test_Graph_802.11n40_ANT1_2422_MCS0_Higher Band Emissions



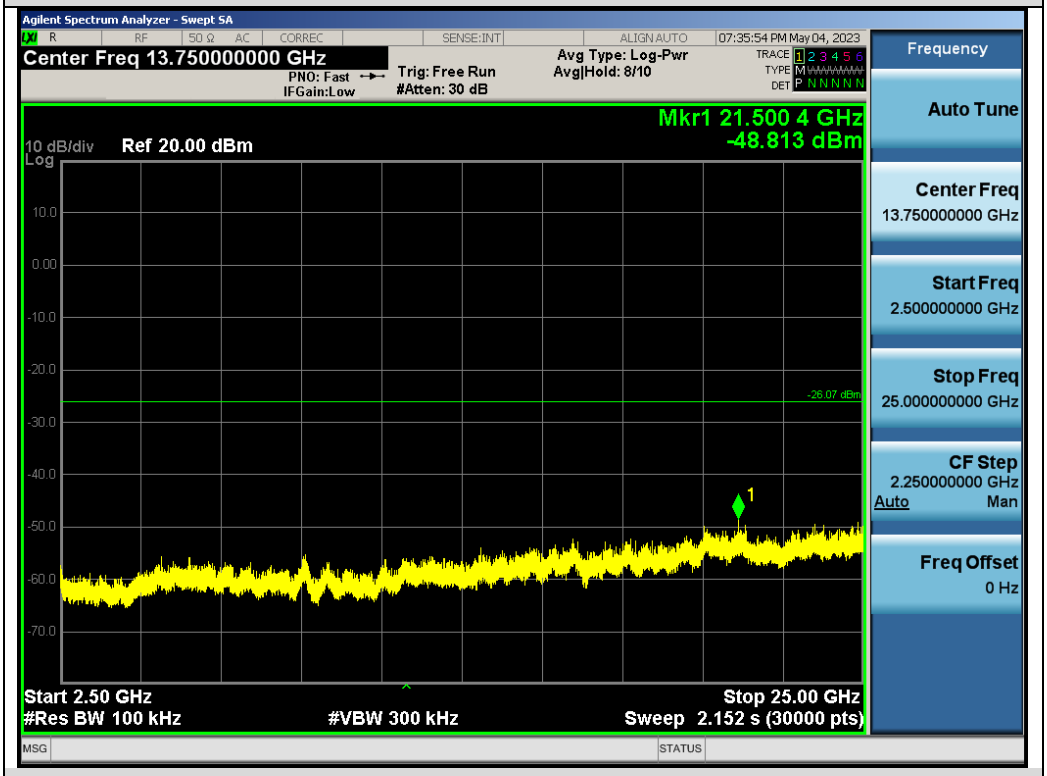
Test_Graph_802.11n40_ANT1_2437_MCS0_Lower Band Emissions



Test_Graph_802.11n40_ANT1_2437_MCS0_Higher Band Emissions



Test_Graph_802.11n40_ANT1_2452_MCS0_Lower Band Emissions



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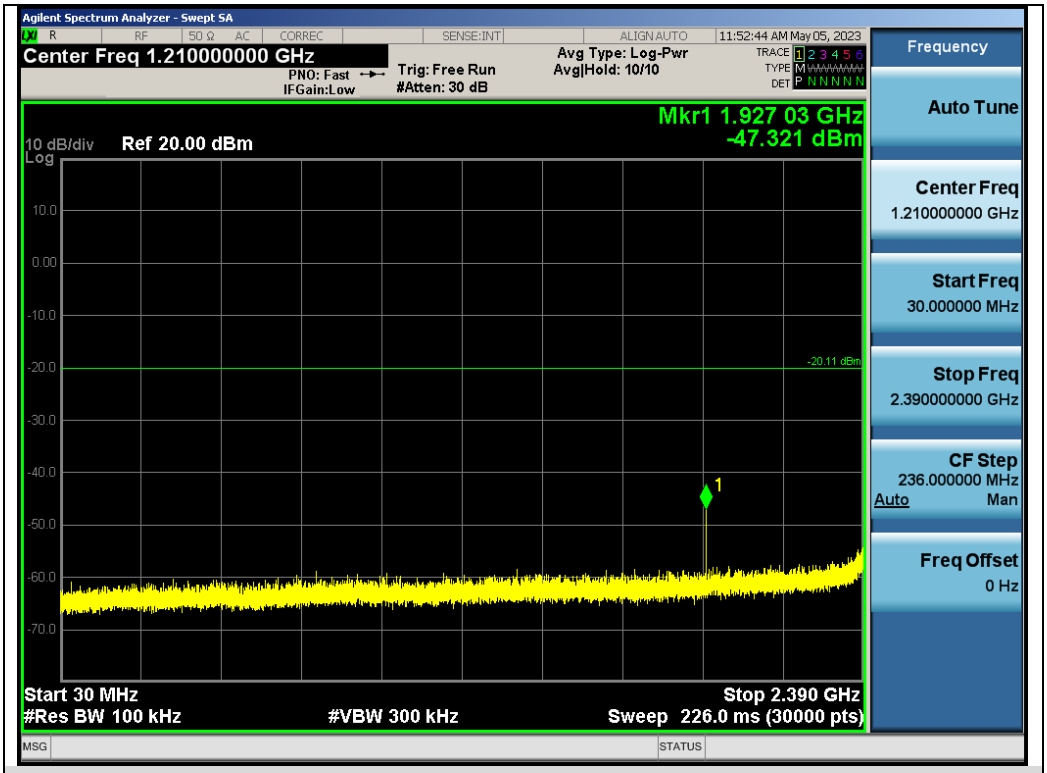
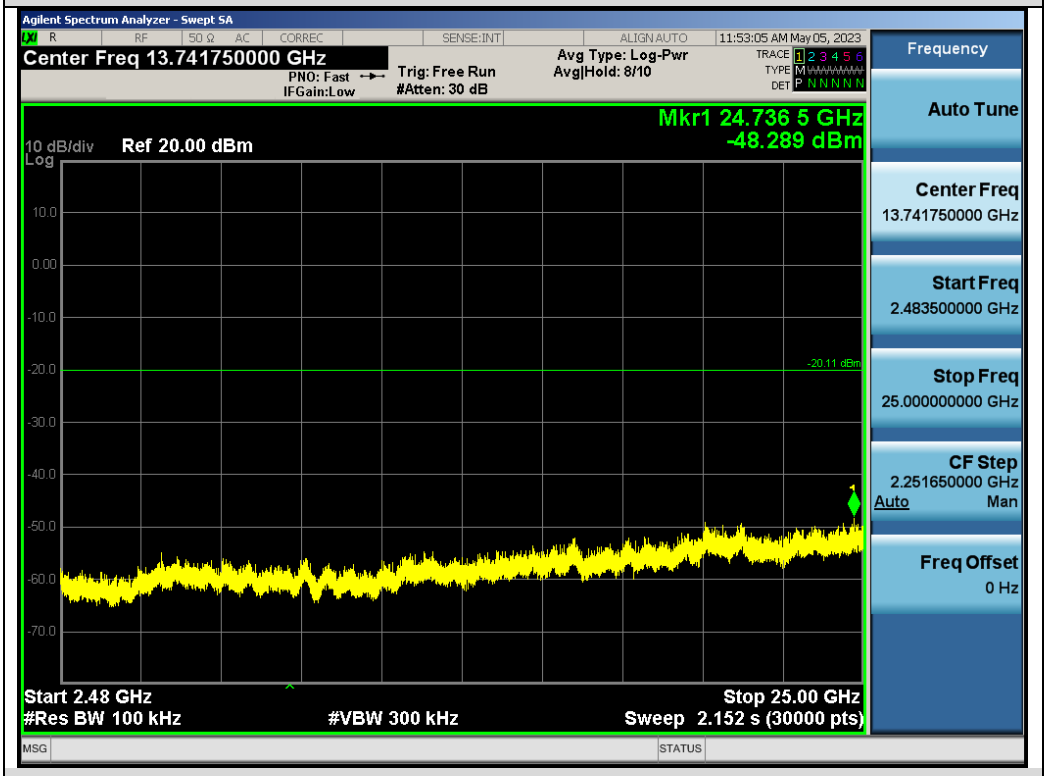
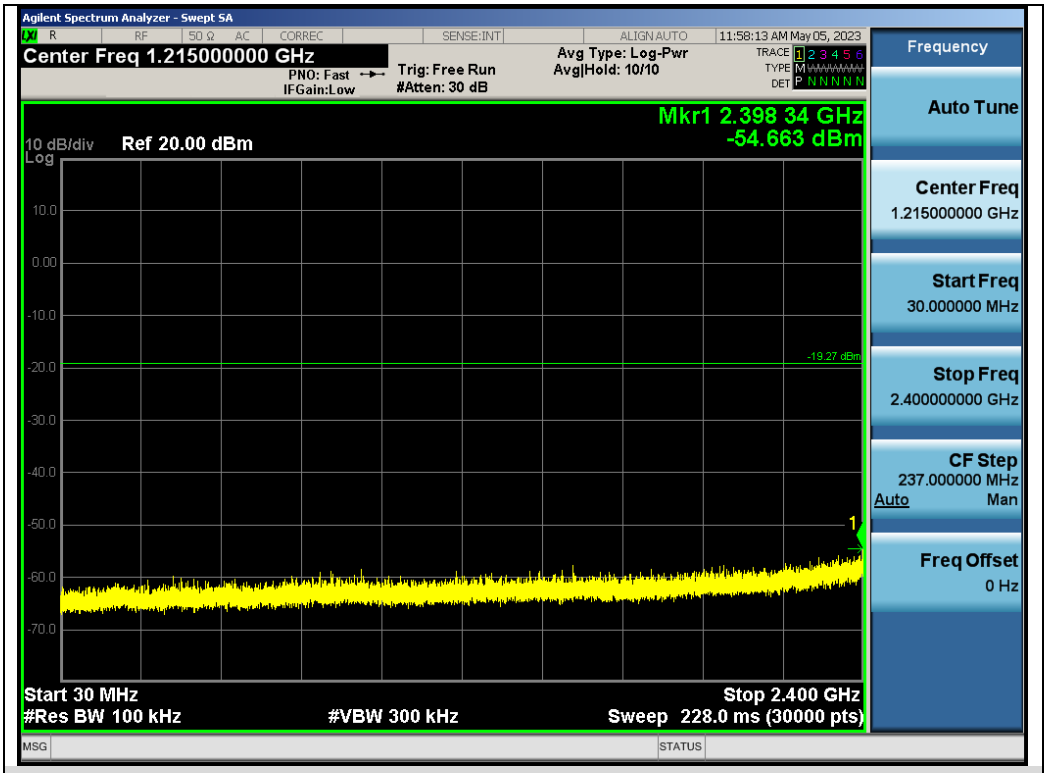


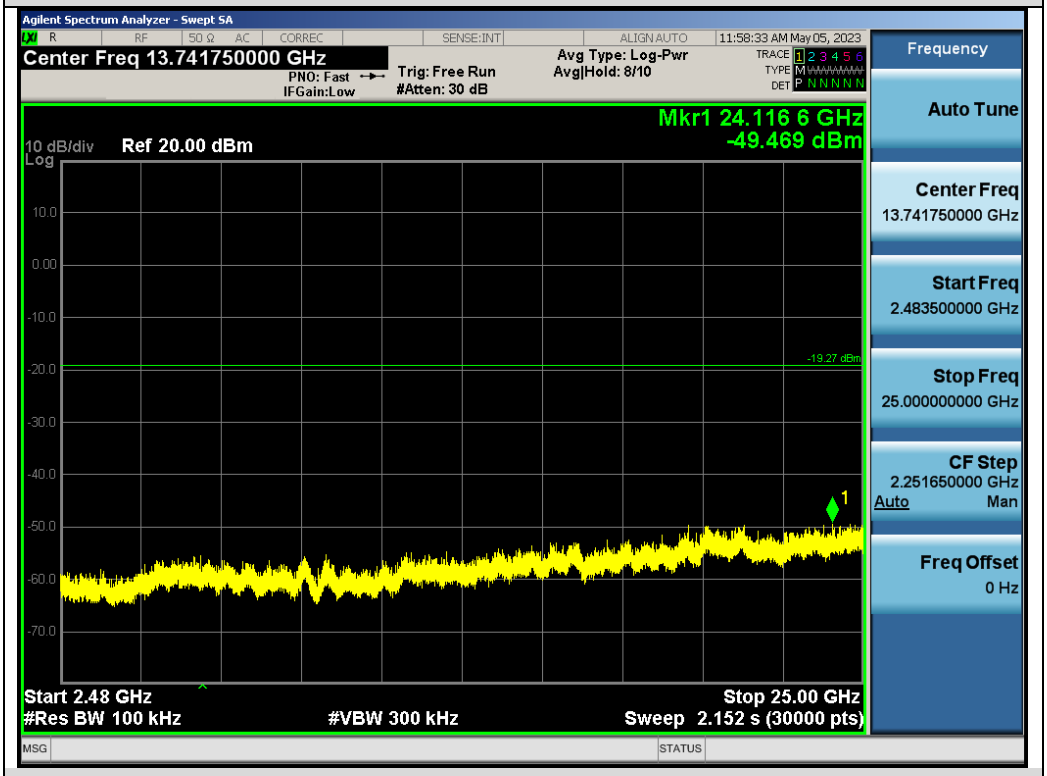
Test_Graph_802.11b_ANT2_2412_1Mbps_Lower Band Emissions



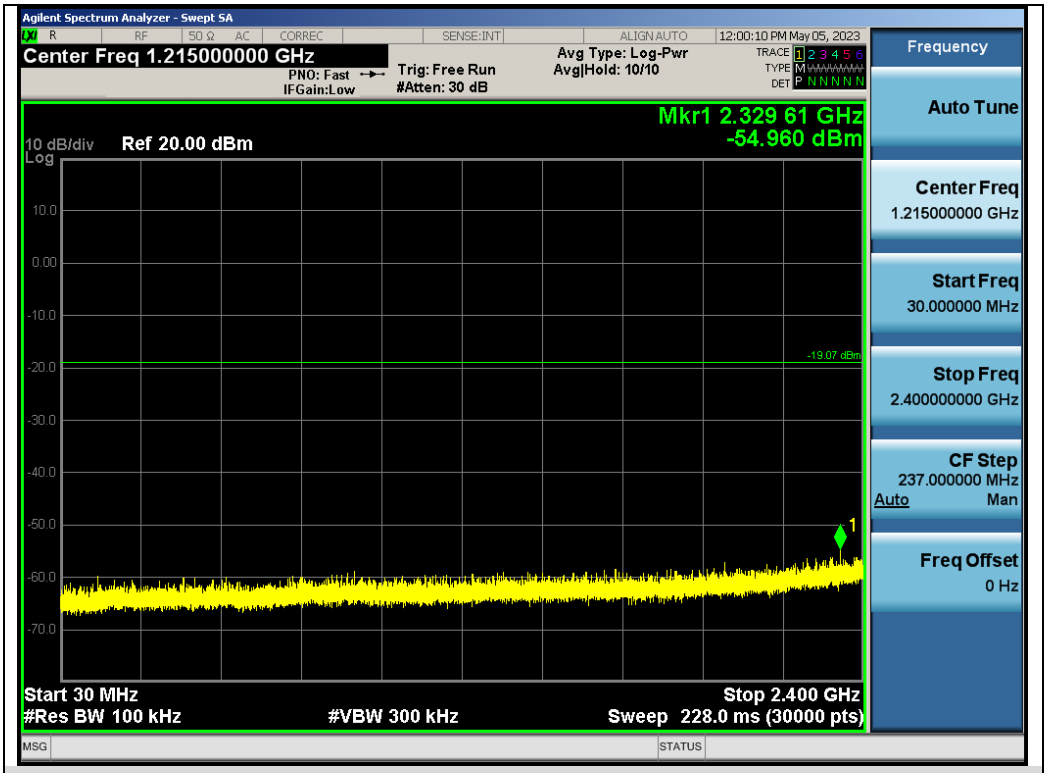
Test_Graph_802.11b_ANT2_2412_1Mbps_Higher Band Emissions



Test_Graph_802.11b_ANT2_2437_1Mbps_Lower Band Emissions



Test_Graph_802.11b_ANT2_2437_1Mbps_Higher Band Emissions



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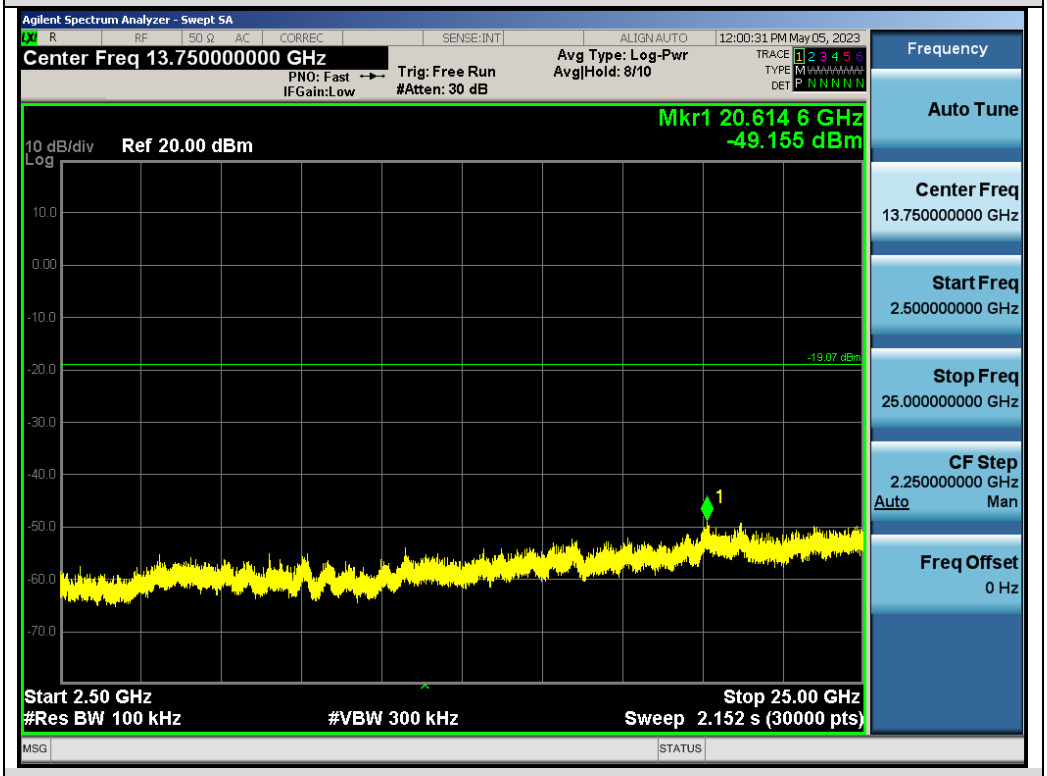
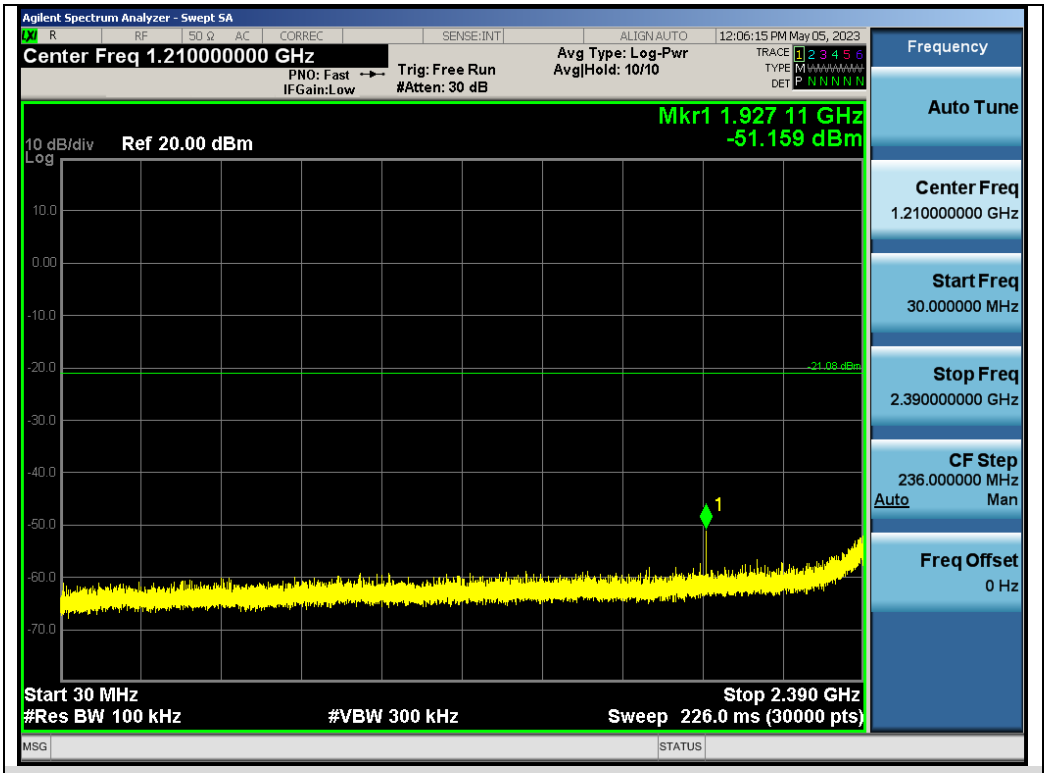
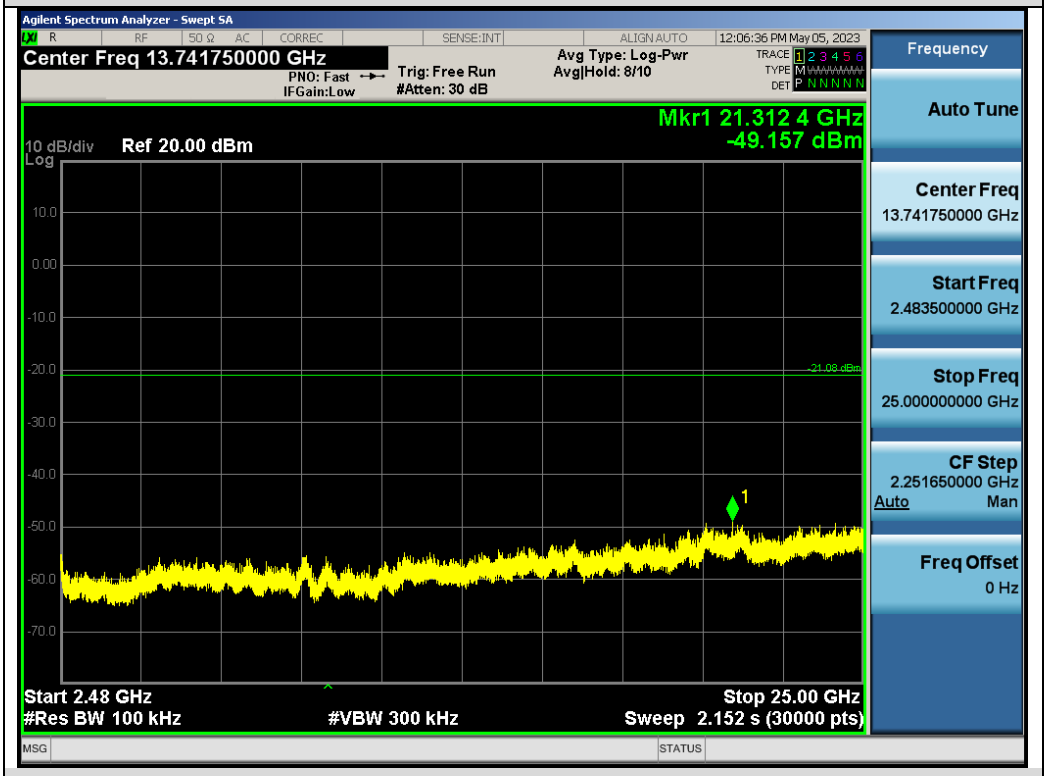


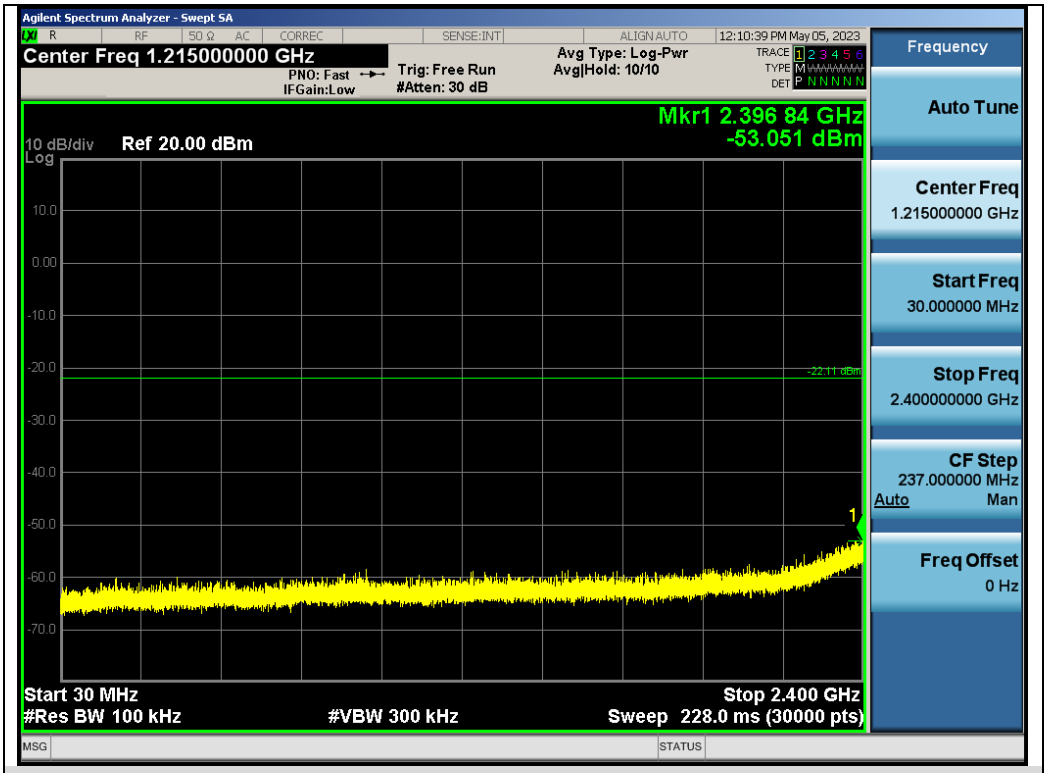
Test_Graph_802.11b_ANT2_2462_1Mbps_Higher Band Emissions



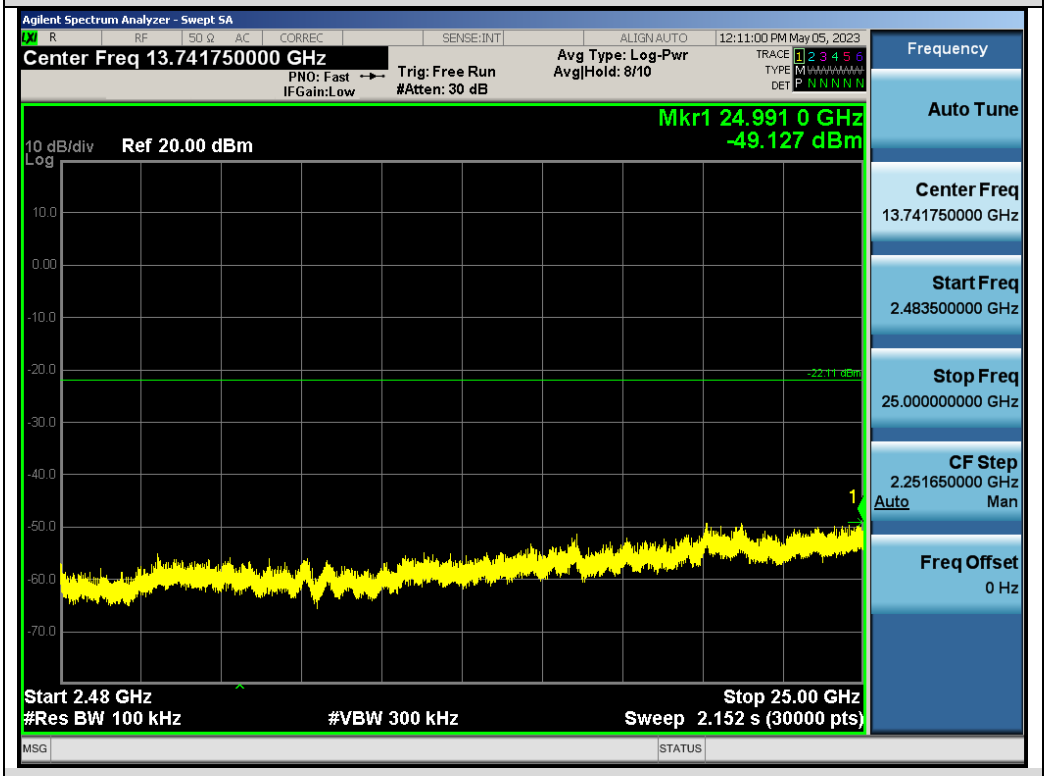
Test_Graph_802.11g_ANT2_2412_6Mbps_Lower Band Emissions



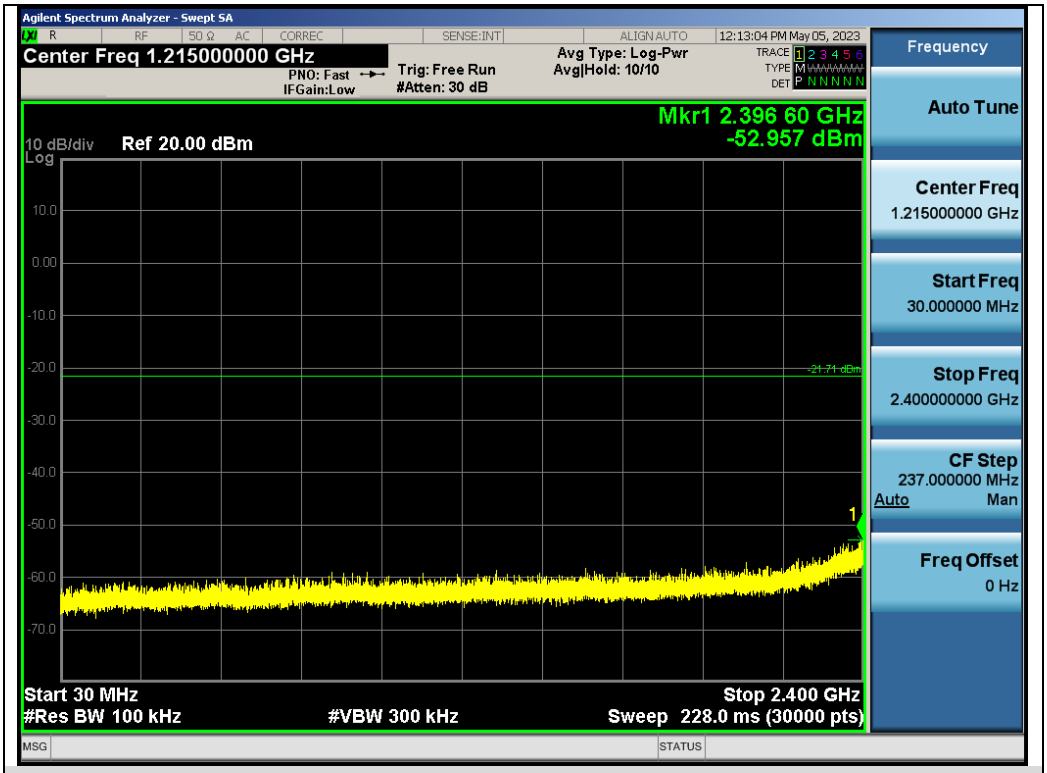
Test_Graph_802.11g_ANT2_2412_6Mbps_Higher Band Emissions



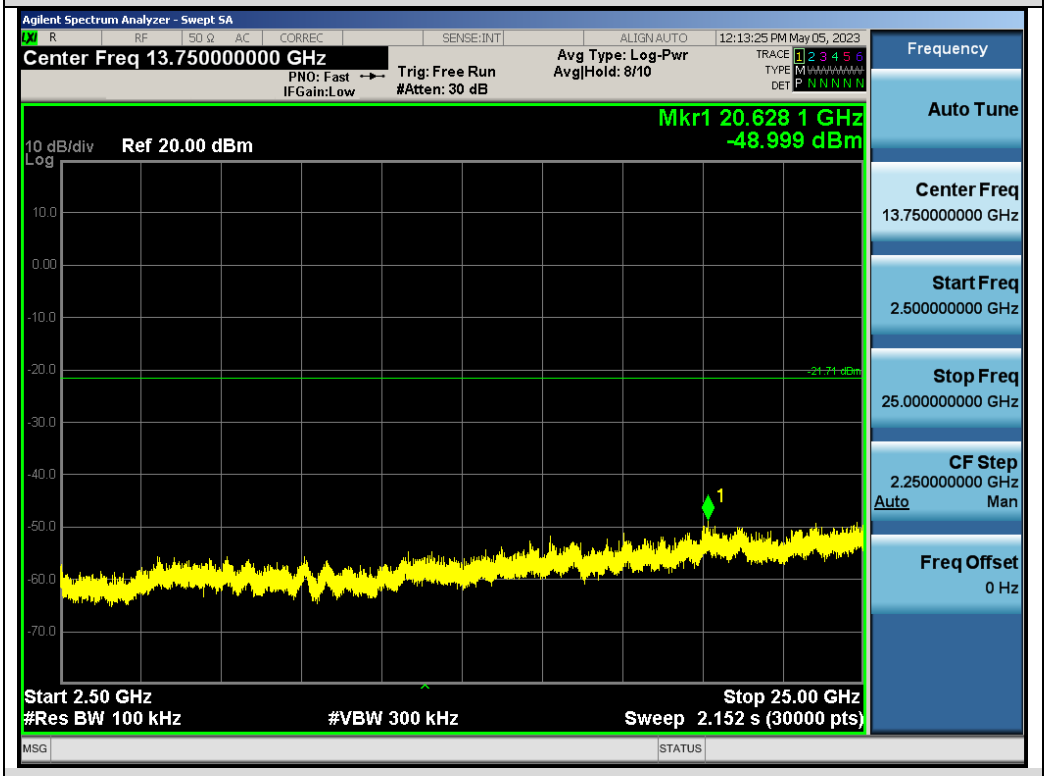
Test_Graph_802.11g_ANT2_2437_6Mbps_Lower Band Emissions



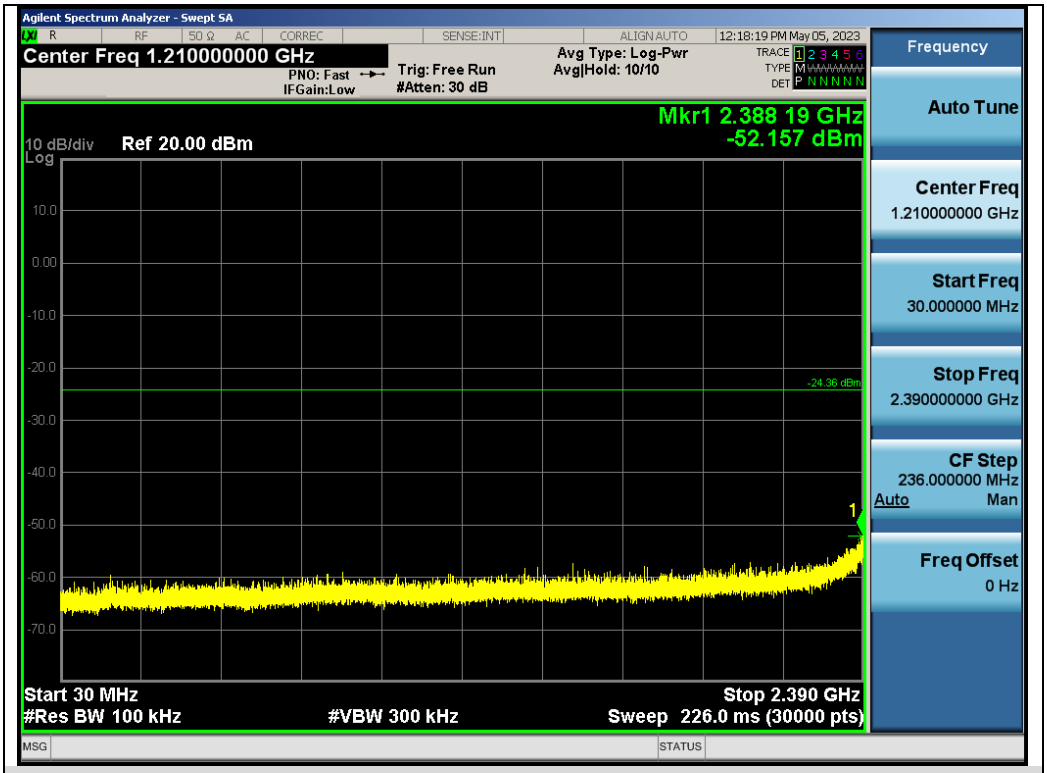
Test_Graph_802.11g_ANT2_2437_6Mbps_Higher Band Emissions



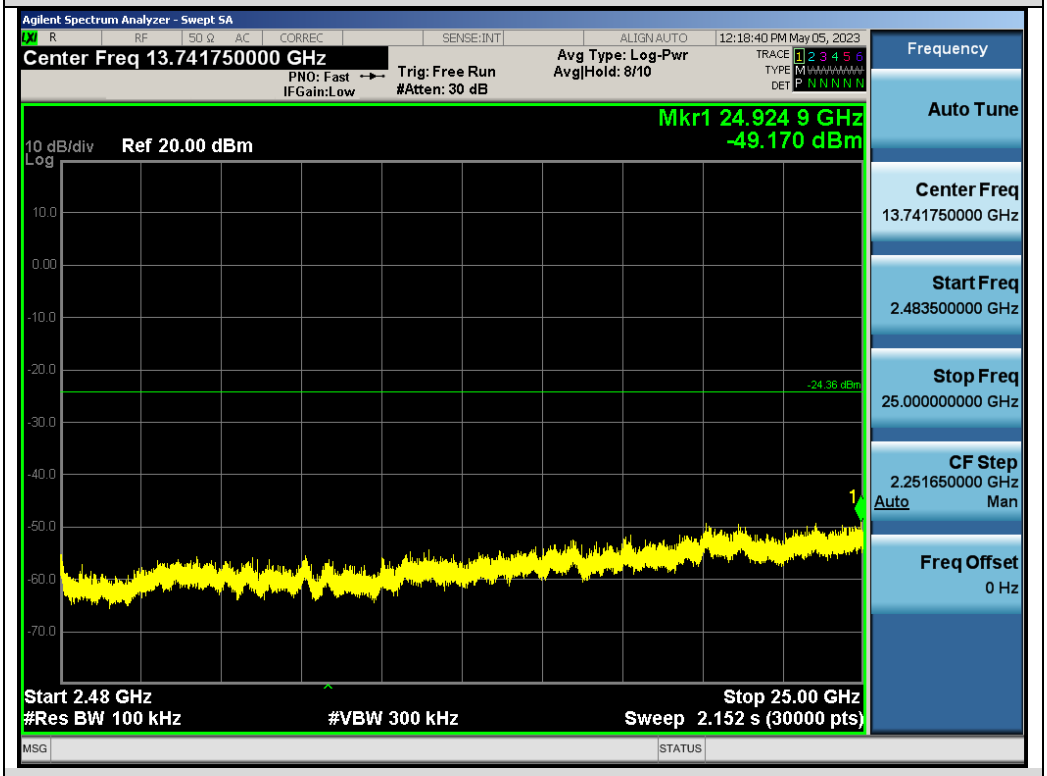
Test_Graph_802.11g_ANT2_2462_6Mbps_Lower Band Emissions



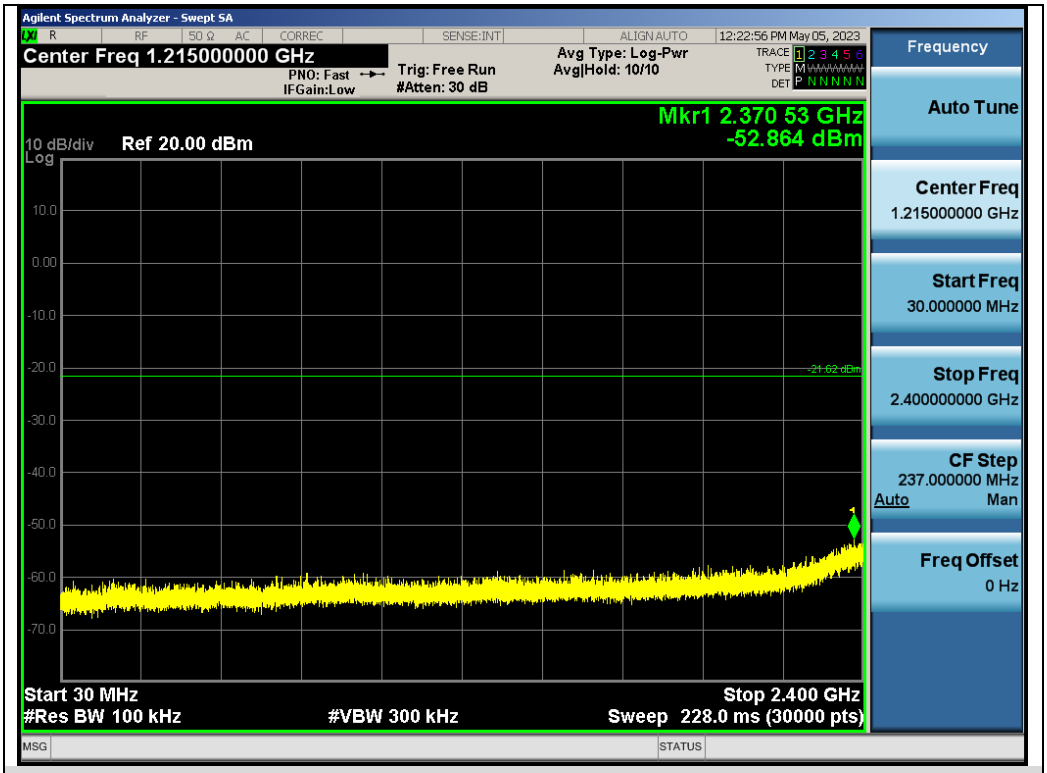
Test_Graph_802.11g_ANT2_2462_6Mbps_Higher Band Emissions



Test_Graph_802.11n20_ANT2_2412_MCS0_Lower Band Emissions



Test_Graph_802.11n20_ANT2_2412_MCS0_Higher Band Emissions



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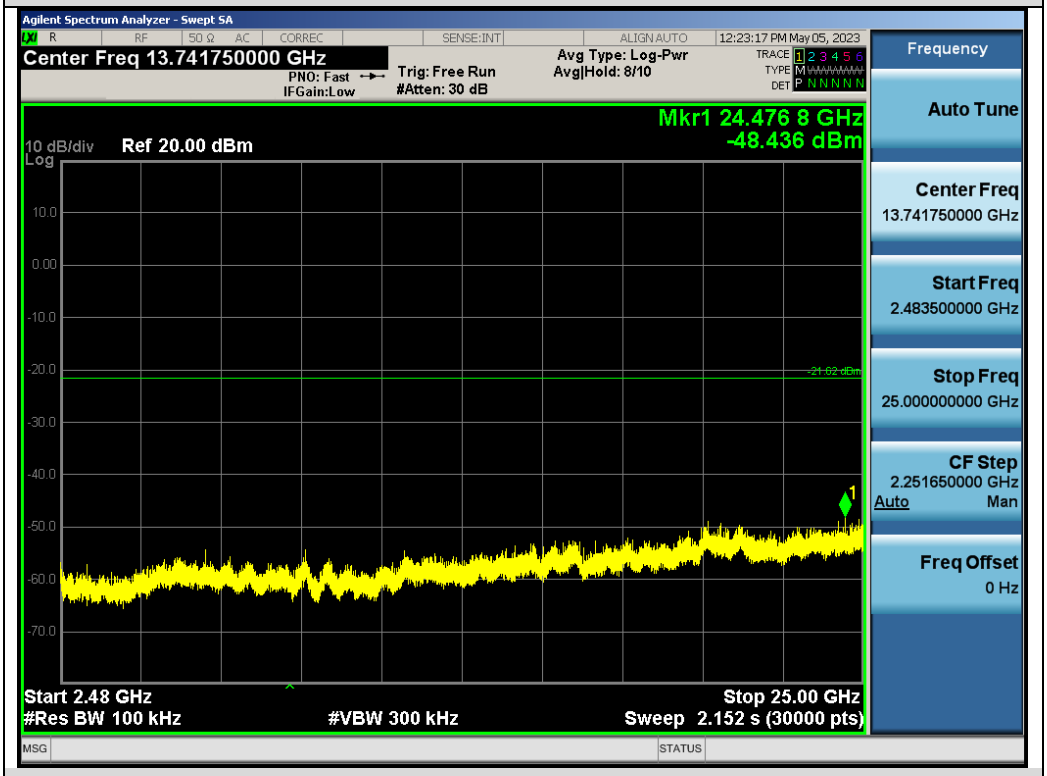
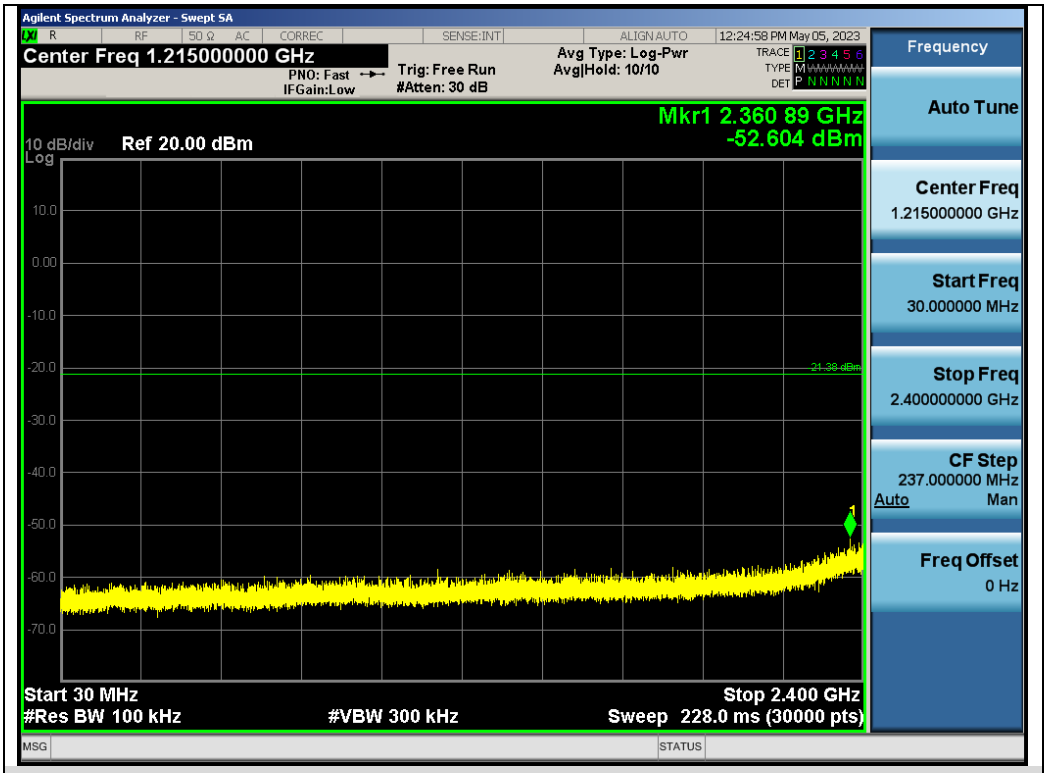
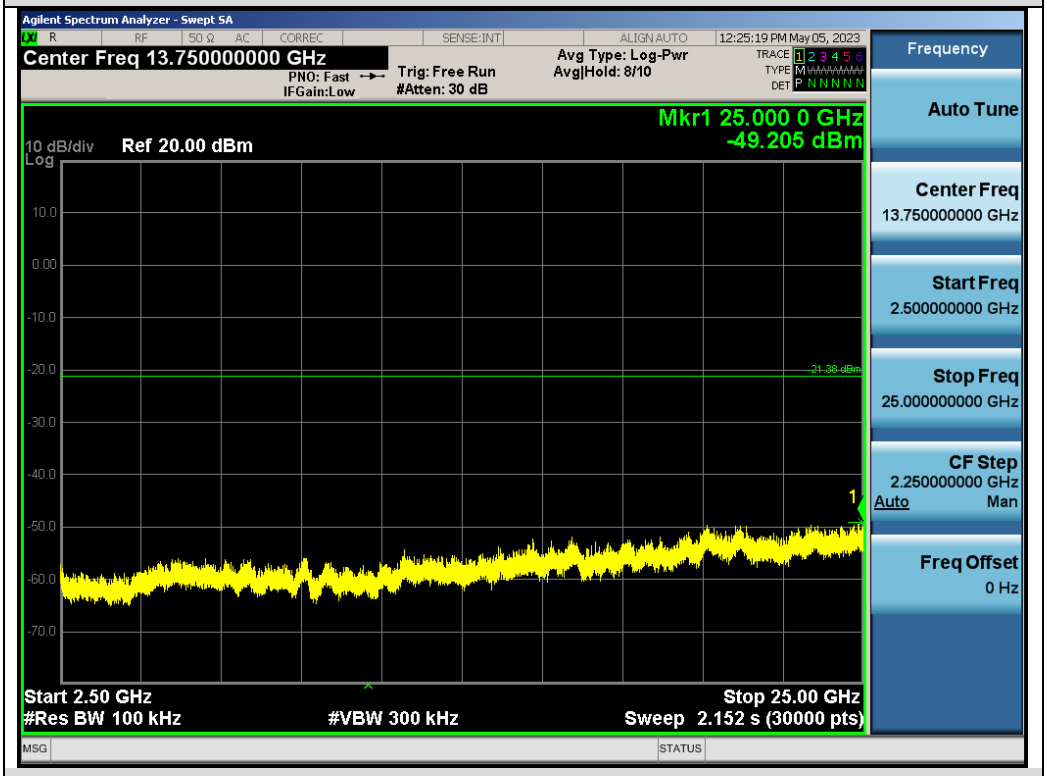


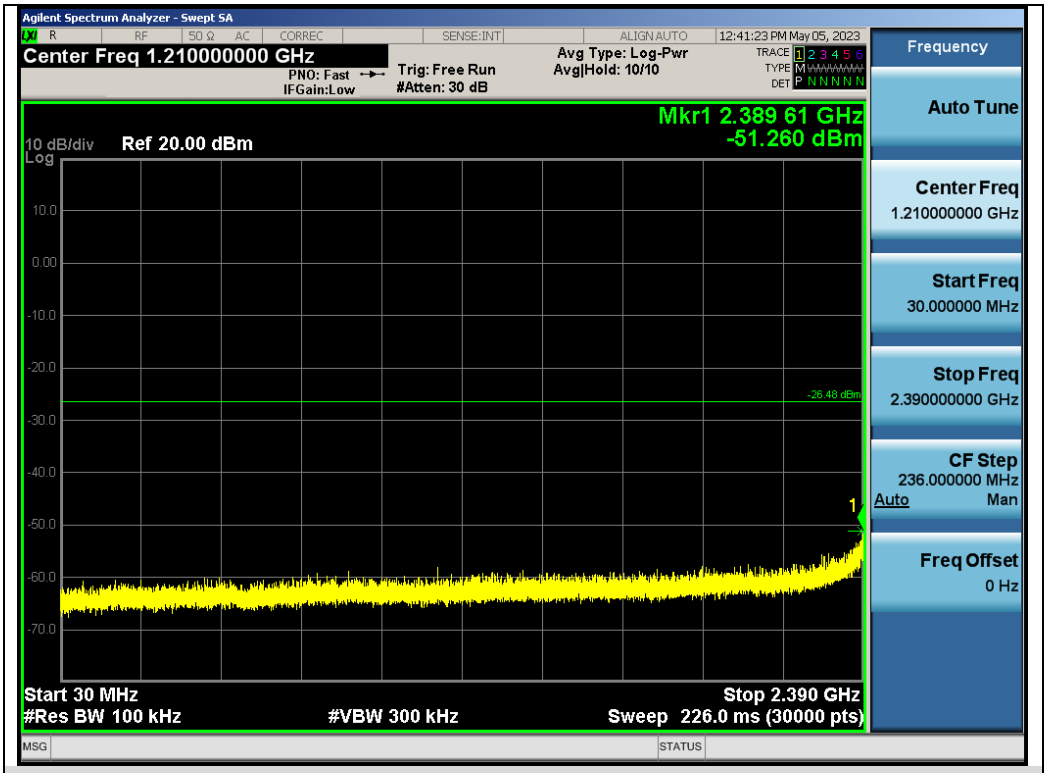
Test_Graph_802.11n20_ANT2_2437_MCS0_Higher Band Emissions



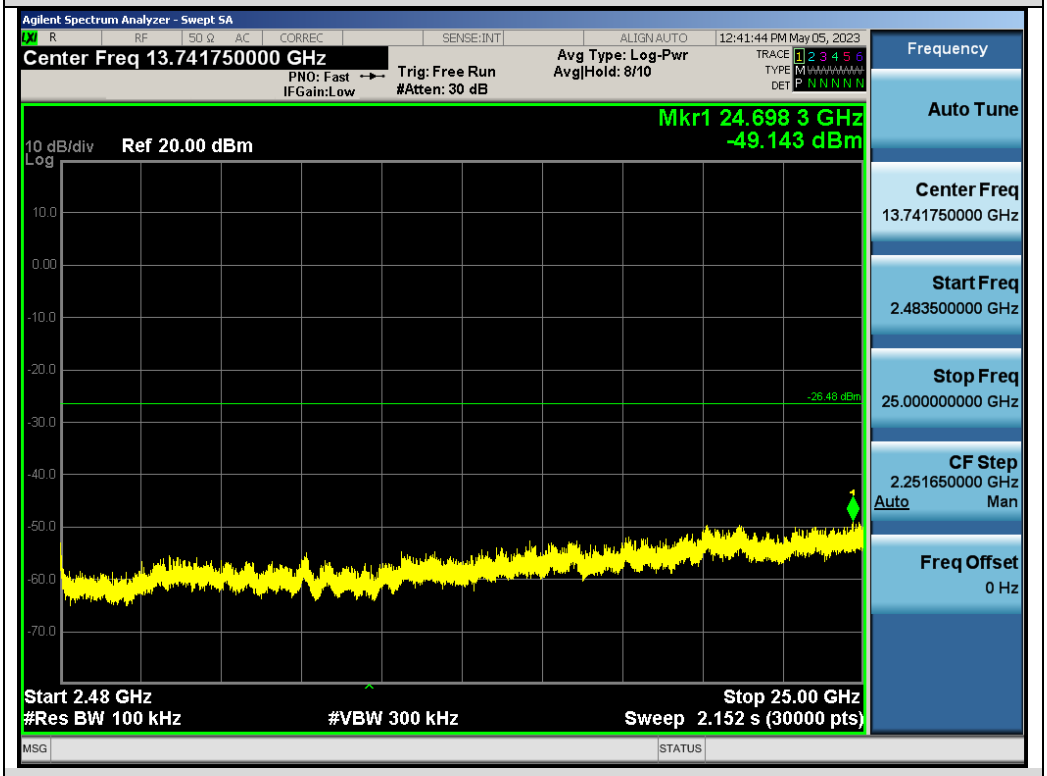
Test_Graph_802.11n20_ANT2_2462_MCS0_Lower Band Emissions



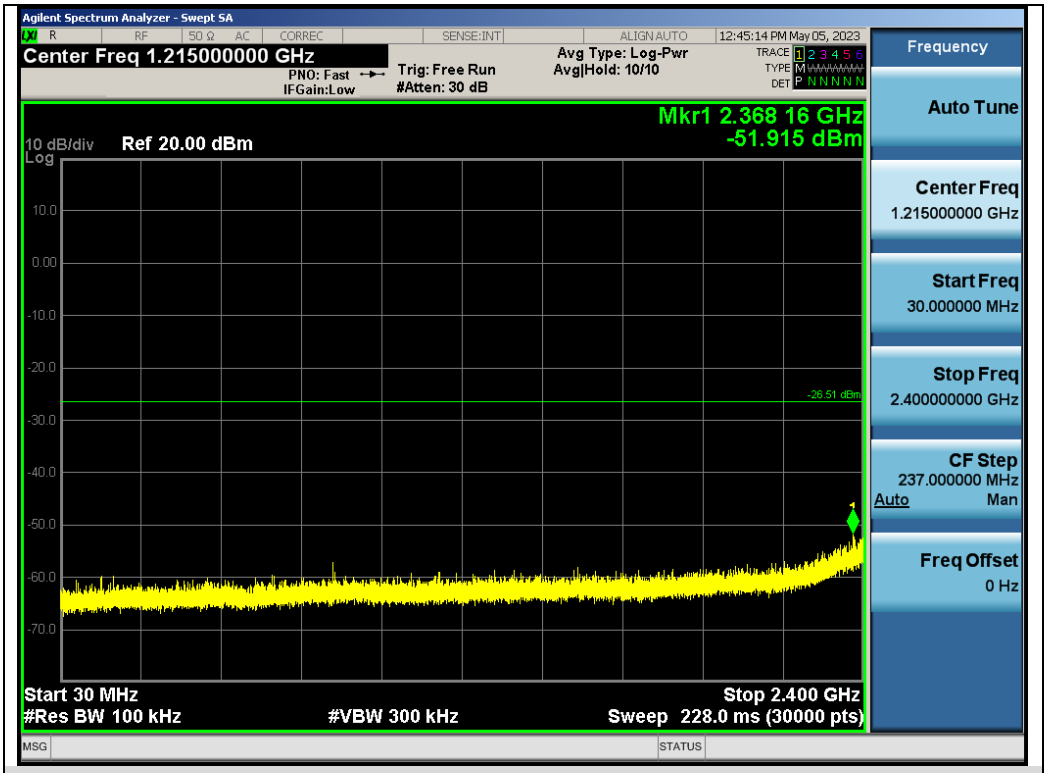
Test_Graph_802.11n20_ANT2_2462_MCS0_Higher Band Emissions



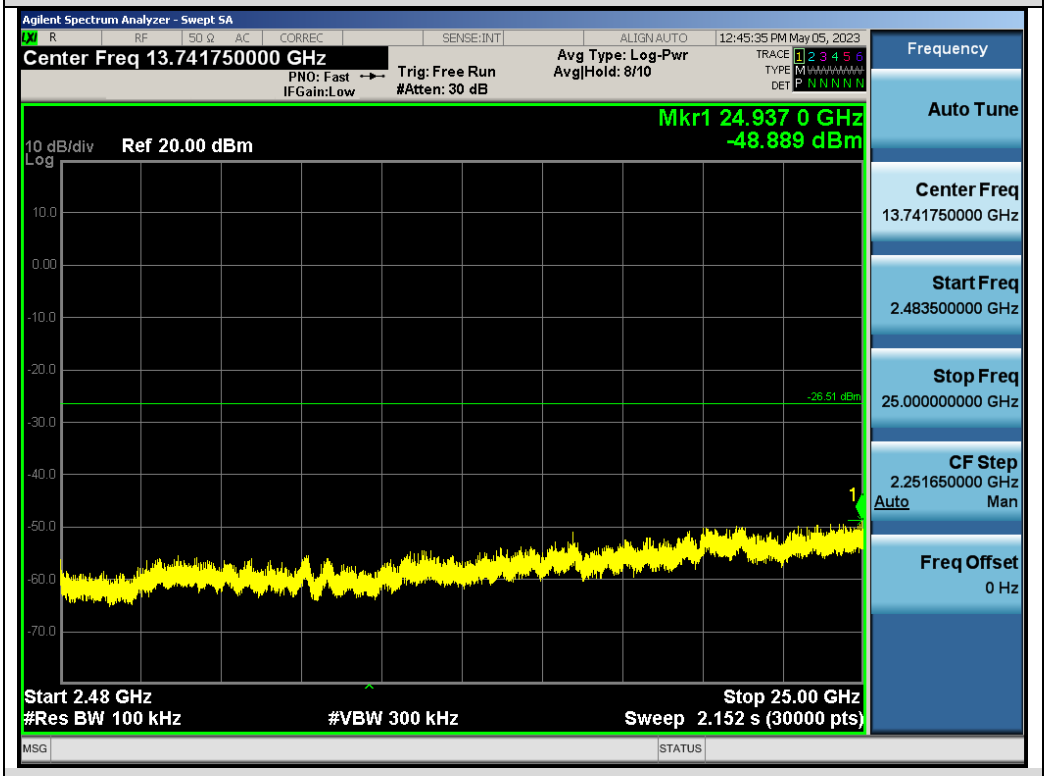
Test_Graph_802.11n40_ANT2_2422_MCS0_Lower Band Emissions



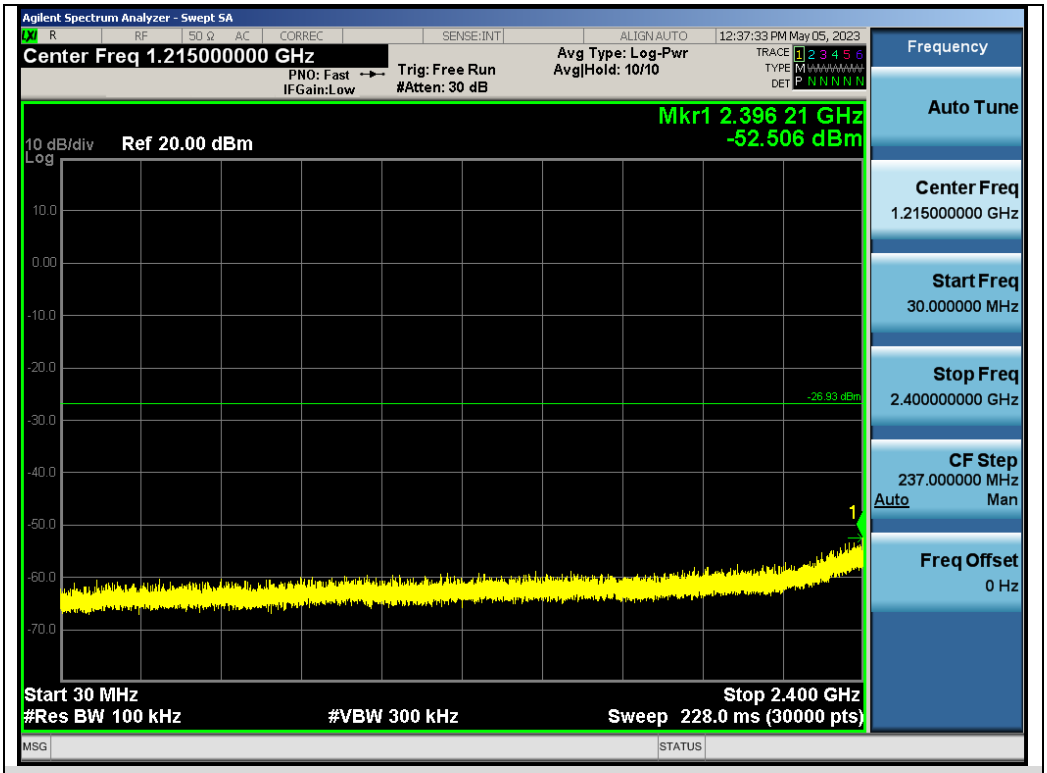
Test_Graph_802.11n40_ANT2_2422_MCS0_Higher Band Emissions



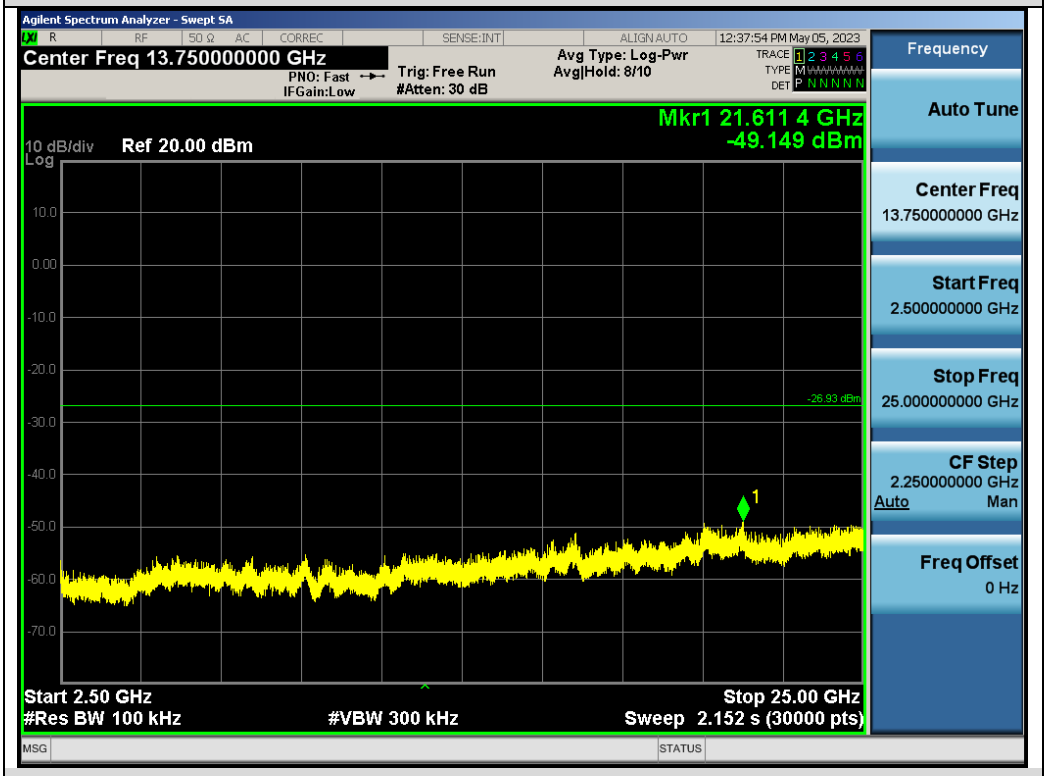
Test_Graph_802.11n40_ANT2_2437_MCS0_Lower Band Emissions



Test_Graph_802.11n40_ANT2_2437_MCS0_Higher Band Emissions

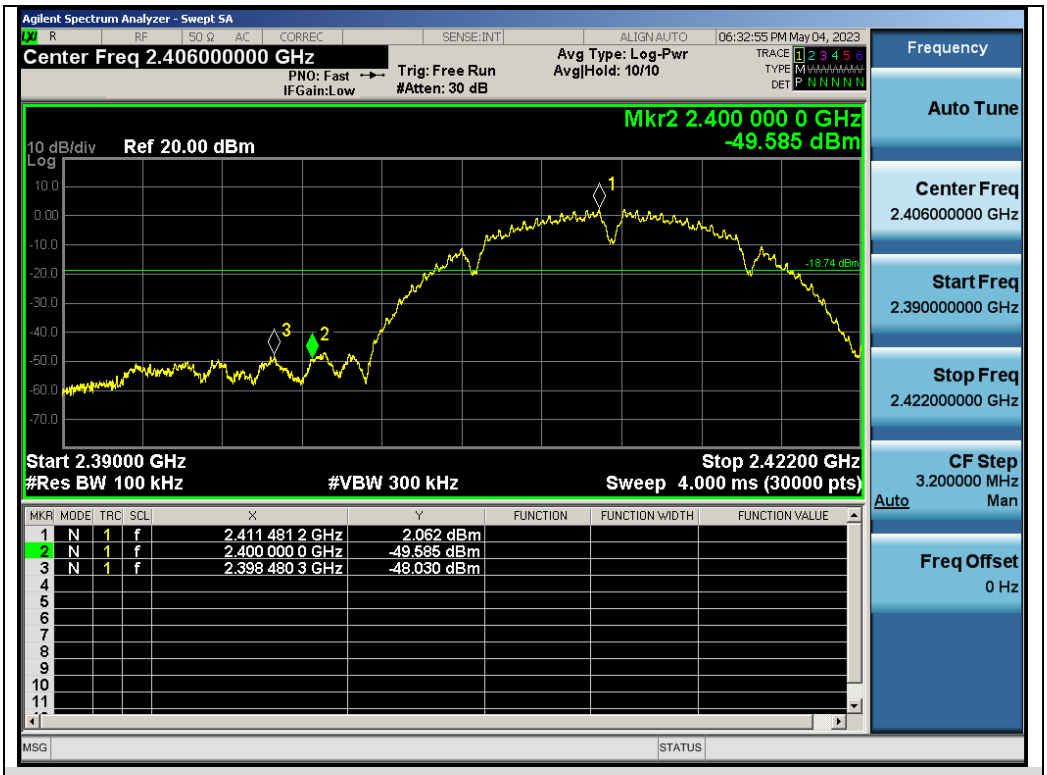


Test_Graph_802.11n40_ANT2_2452_MCS0_Lower Band Emissions

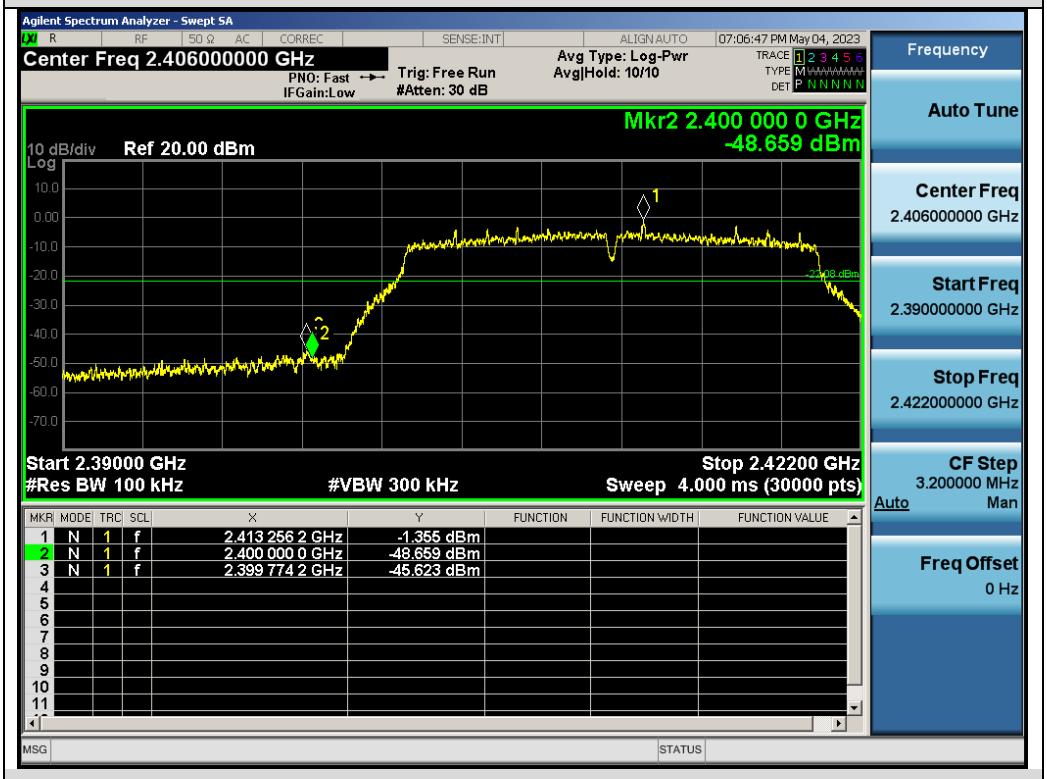


Test_Graph_802.11n40_ANT2_2452_MCS0_Higher Band Emissions

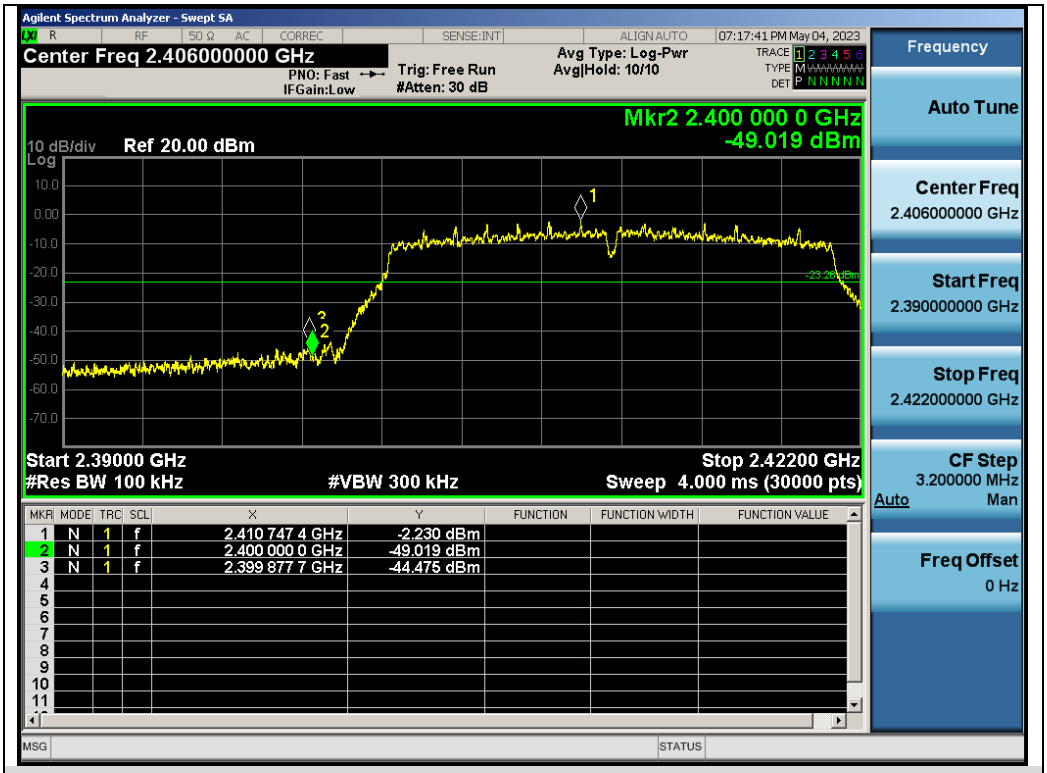
Test Graphs of Band Edge Emissions in Non-Restricted Frequency Bands



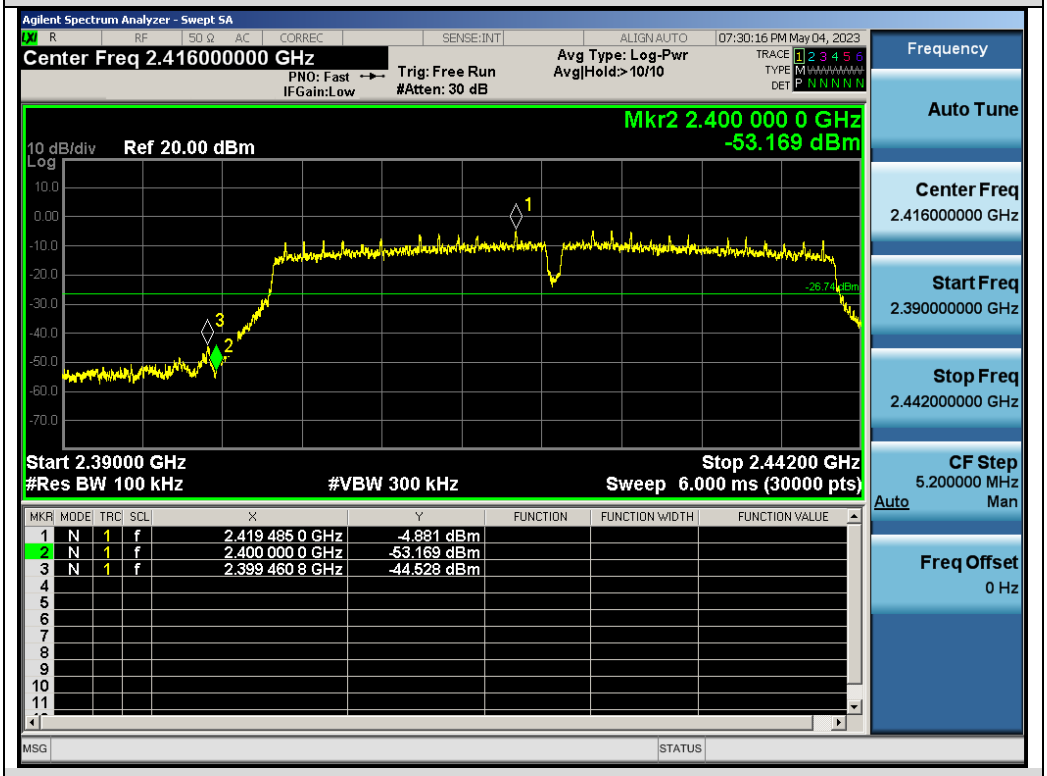
Test_Graph_802.11b_ANT1_2412_1Mbps_Lower Band Edge Emissions



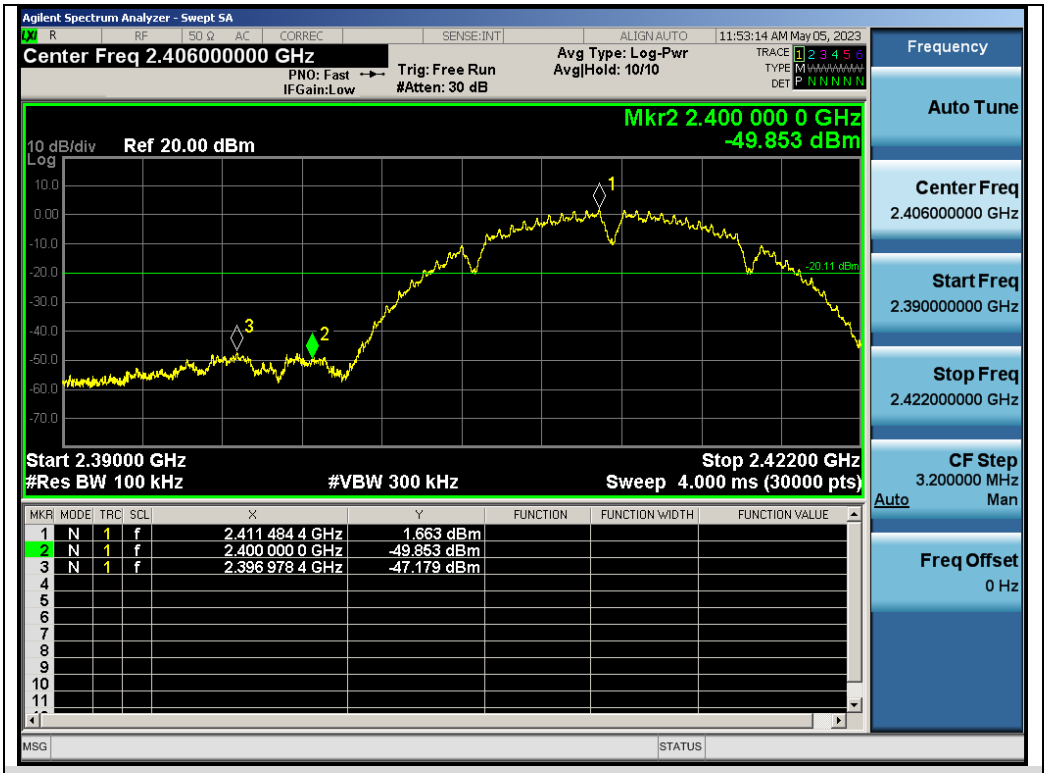
Test_Graph_802.11g_ANT1_2412_6Mbps_Lower Band Edge Emissions



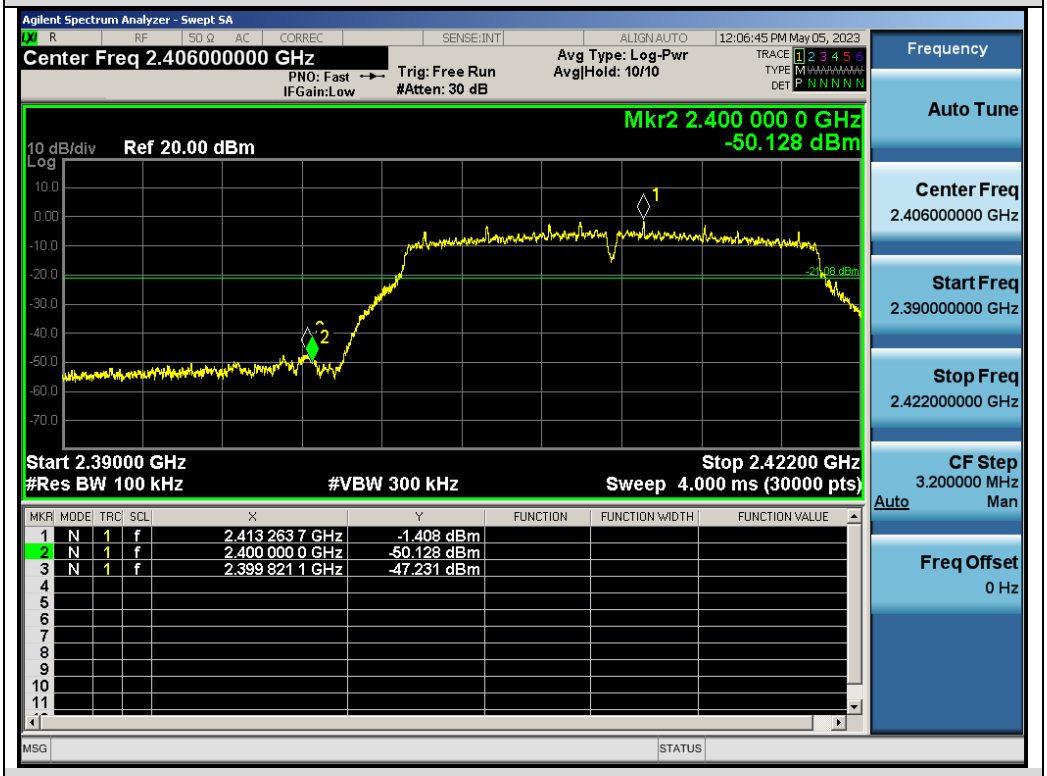
Test_Graph_802.11n20_ANT1_2412_MCS0_Lower Band Edge Emissions



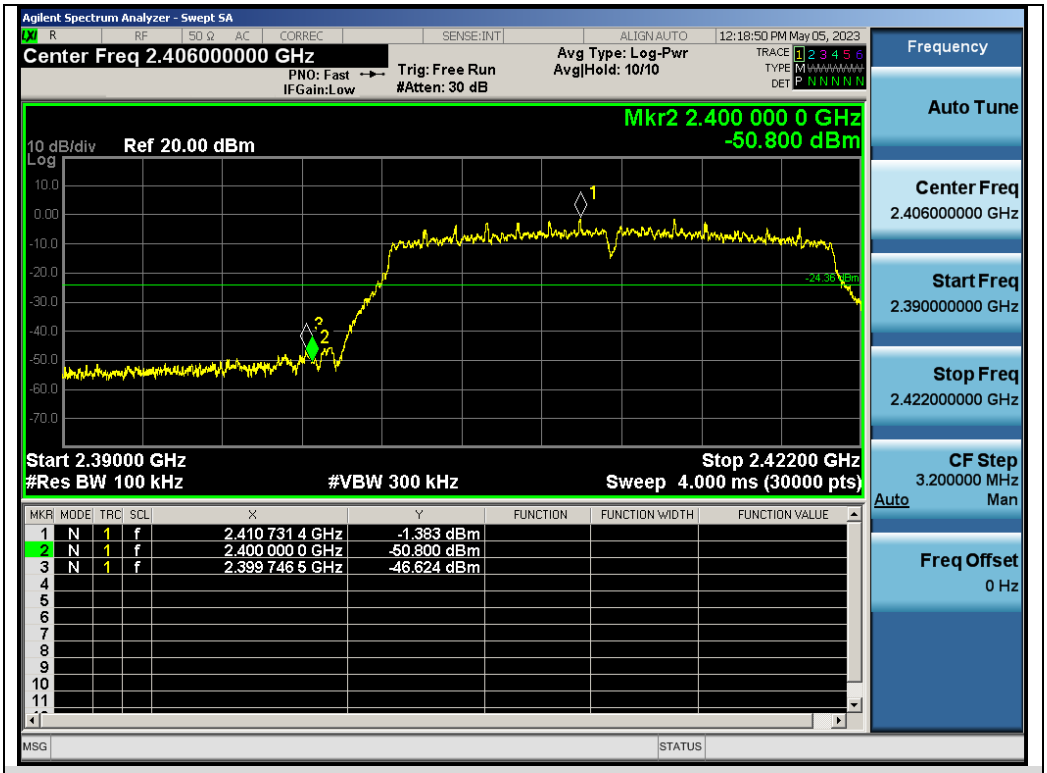
Test_Graph_802.11n40_ANT1_2422_MCS0_Lower Band Edge Emissions



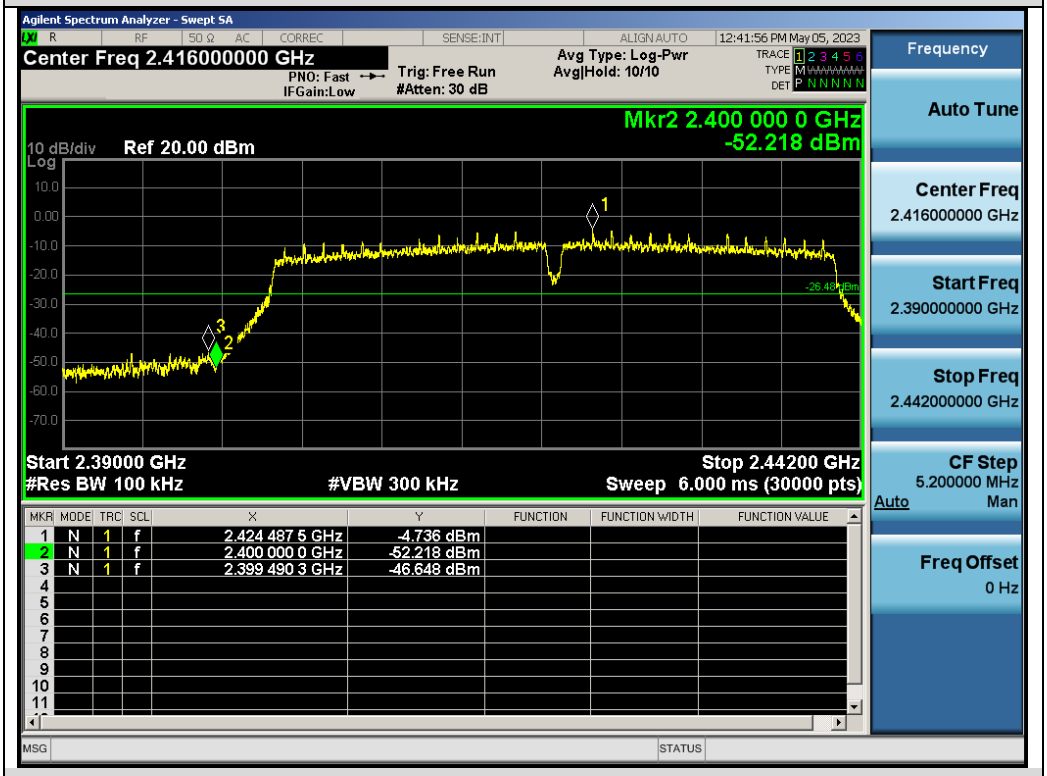
Test_Graph_802.11b_ANT2_2412_1Mbps_Lower Band Edge Emissions



Test_Graph_802.11g_ANT2_2412_6Mbps_Lower Band Edge Emissions



Test_Graph_802.11n20_ANT2_2412_MCS0_Lower Band Edge Emissions



Test_Graph_802.11n40_ANT2_2422_MCS0_Lower Band Edge Emissions

Note: Emissions from 2483.5-2500MHz which fall in the restricted bands had been considered with the radiated emission limits specified.

10. POWER SPECTRAL DENSITY

10.1 MEASUREMENT LIMITS

The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

10.2 MEASUREMENT PROCEDURE

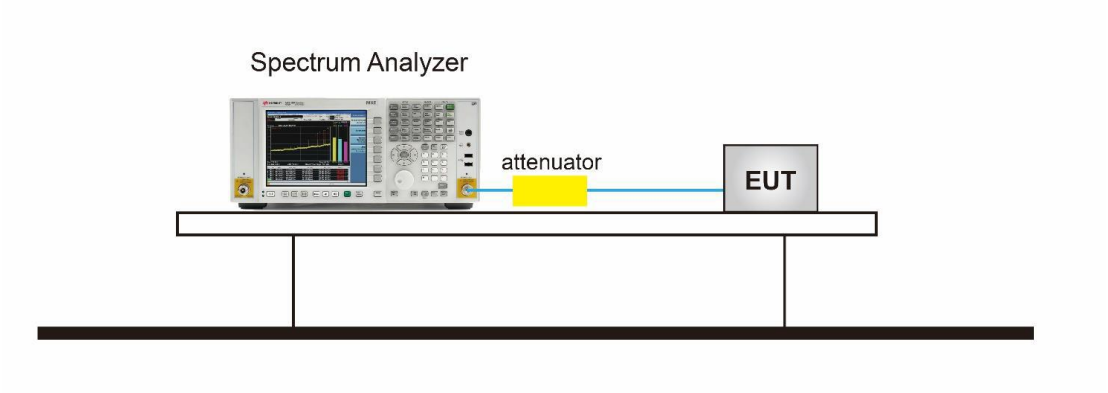
☒For Peak power spectral density test:

1. The testing follows the ANSI C63.10 Section 11.10.2 Method PKPSD.
2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
3. Set the RBW = 20 kHz.
4. Set the VBW ≥ [3 × RBW].
5. Set the Span ≥ [1.5 × DTS bandwidth].
6. Sweep time=Auto couple.
7. Detector function=Peak.
8. Trace Mode=Max hold.
9. When the measurement bandwidth of Maximum PSD is specified in 3 kHz, add a constant factor 10*log(3kHz/20kHz) = -8.23 dB to the measured result.
10. Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission.
11. The indicated level is the peak output power, after any corrections for external attenuators and cables.

☐For Average power spectral density test:

1. The testing follows the ANSI C63.10 Section 11.10.5 Method AVPSD.
2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator.
3. Set Span to at least 1.5 times the OBW.
4. Set RBW to:3 kHz ≤ RBW ≤ 100 kHz.
5. Set VBW≥[3×RBW].
6. Sweep Time=Auto couple.
7. Detector function=RMS (i.e., power averaging).
8. Trace average at least 100 traces in power averaging (rms) mode.
9. When the measurement bandwidth of Maximum PSD is specified in 3 kHz, add a constant factor 10*log(3kHz/20kHz) = -8.23 dB to the measured result.
10. Determine according to the duty cycle of the equipment: when it is less than 98%, follow the steps below.
11. Add [10 log (1 / D)], where D is the duty cycle, to the measured power to compute the average power during the actual transmission times (because the measurement represents an average over both the ON and OFF times of the transmission). For example, add [10 log (1/0.25)] = 6 dB if the duty cycle is 25%.
12. Record the test results in the report.

10.3 MEASUREMENT SETUP (BLOCK DIAGRAM OF CONFIGURATION)



10.4 MEASUREMENT RESULT

Test Data of Conducted Output Power Spectral Density-Ant 1					
Test Mode	Test Channel (MHz)	Power density (dBm/20kHz)	Power density (dBm/3kHz)	Limit (dBm/3kHz)	Pass or Fail
802.11b	2412	1.136	-7.103	≤8	Pass
	2437	1.193	-7.046	≤8	Pass
	2462	-4.125	-12.364	≤8	Pass
802.11g	2412	-7.924	-16.163	≤8	Pass
	2437	-7.275	-15.514	≤8	Pass
	2462	-7.266	-15.505	≤8	Pass
802.11n20	2412	-7.188	-15.427	≤8	Pass
	2437	-7.787	-16.026	≤8	Pass
	2462	-7.336	-15.575	≤8	Pass
802.11n40	2422	-11.643	-19.882	≤8	Pass
	2437	-10.720	-18.959	≤8	Pass
	2452	-11.159	-19.398	≤8	Pass