FCC Test Report

Report No.: AGC15723230701FE04

FCC ID	:	2BBY2-A1
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	Video Door Bell
BRAND NAME	:	SMCM
MODEL NAME	:	A1, A2, A3, A4, A5, A6, A7, A8, A9, A10, A11, A12, A13, A14, A15, A16, A17, A18, A19, A20, A21, A22, A23, A24, A25, A26, A27, A28, A29, A30, X1, X2, X3, X4, X5, X6, X7, X8, X9, X10, X11, X12, X13, X14, X15, X16, X17, X18, X19, X2 Pro, X3 Pro, QR035, QR05, QR06, QR07, QR08, QR09, QR033, QR037, QR038, QR039, DDV-104, DDV-105, DDV-109, DDV-110, DDV-112, DDV-114, DDV-201, DDV-202, DDV-203, DDV-204, DDV-205, DDV-206, DDV-207, DDV-208, DDV-209, DDV-210, DDV-211, As1, As2, As3, As4, As5, As6, As7, As8, As9, As10, T1, T2, T3, T4, T5, T6, T7, T8, T9, T10, D1, D2, D3, D5, D6, D7, D8, D9, D10, DDV-106, DDV-107, DDV-108, DDV-111, DDV-113, DDV-115, DDV-116, DDV-117, DDV-118, DDV-119, BAT-01, BAT-02, BAT-03, BAT-04
APPLICANT	:	Shenzhen Haishaidouliang Culture Technology Co., Ltd
DATE OF ISSUE	:	Jul. 14, 2023
STANDARD(S)	:	FCC Part 15 subpart C §15.247
REPORT VERSION	:	V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd

Attestation of ***G***lobal ***C***ompliance (Shenzhen) Co., Ltd

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REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Jul. 14, 2023	Valid	Initial Release

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1. VERIFICATION OF CONFORMITY

Applicant	Shenzhen Haishuidouliang Culture Technology Co., Ltd
Address	515, Floor 5, Jingkai Building, Qinghu Silicon Valley Power Park, 416 Dahe Road, Longhua District, Shenzhen, China
manufacturer	Shenzhen Micro Star Electronic Technology Co., Ltd
Address	4F, Block C, NO. 56, FengTang Road, Fuyong street, Bao'an district, Shenzhen, China
Factory	Shenzhen Micro Star Electronic Technology Co., Ltd
Address	4F, Block C, NO. 56, FengTang Road, shajing, Bao'an district, Shenzhen, P.R.C.
Product Designation	Video Door Bell
Brand Name	SMCM
Test Model	A1
Series Model	A2, A3, A4, A5, A6, A7, A8, A9, A10, A11, A12, A13, A14, A15, A16, A17, A18, A19, A20, A21, A22, A23, A24, A25, A26, A27, A28, A29, A30, X1, X2, X3, X4, X5, X6, X7, X8, X9, X10, X11, X12, X13, X14, X15, X16, X17, X18, X19, X2 Pro, X3 Pro, QR035, QR05, QR06, QR07, QR08, QR09, QR033, QR037, QR038, QR039, DDV-104, DDV-105, DDV-109, DDV-110, DDV-112, DDV-114 , DDV-201, DDV-202, DDV-203, DDV-04, DDV-205, DDV-206, DDV-207, DDV-208, DDV-209, DDV-210, DDV-211, As1, As2, As3, As4, As5, As6, As7, As8, As9, As10, T1, T2, T3, T4, T5, T6, T7, T8, T9, T10, D1, D2, D3, D5, D6, D7, D8, D9, D10, DDV-106, DDV-107, DDV-108, DDV-111, DDV-113, DDV-115, DDV-116, DDV-117, DDV-118, DDV-119, BAT-01, BAT-02, BAT-03, BAT-04
Declaration of Difference	All the same except the model name and shell
Date of receipt of test item	Jul. 05, 2023
Date of test	Jul. 05, 2023 to Jul. 14, 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	Alan Duan (Project Engineer)	Jul. 14, 2023
Reviewed By	Calvin Liu (Reviewer)	Jul. 14, 2023
Approved By	Max Zhang (Authorized Officer)	Jul. 14, 2023

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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: 13.30dBm; IEEE 802.11g: 12.41dBm; IEEE 802.11n(HT20): 12.36dBm; IEEE 802.11n(HT40): 12.28dBm
Output Power (Peak)	IEEE 802.11b: 15.77dBm; IEEE 802.11g: 19.84dBm; IEEE 802.11n(HT20): 19.76dBm; IEEE 802.11n(HT40): 19.68dBm
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	IP06-V6.3
Software Version	V2.2.3
Antenna Designation	Metal antenna (Comply with requirements of the FCC part 15.203)
Antenna Gain	1.19dBi
Power Supply	DC 3.7V by battery

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2.2. TABLE OF CARRIER FREQUENCYS

For 2412-2462MHz:

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

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):

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	--		

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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

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2.4. IEEE 802.11AX MODULATION SCHEME

Table 27-79—HE-MCSs for 242-tone RU, N_{SS} = 1

HE-MCS Index	DCM	Modulation	R	N_{BPSCS}	N_{SD}	N_{CBPS}	N_{DBPS}	Data rate (Mb/s)		
								0.8 µs GI	1.6 µs GI	3.2 µs GI
0	1	BPSK	1/2	1	117	117	58	4.3	4.0	3.6
	0		1/2		234	234	117	8.6	8.1	7.3
1	1	QPSK	1/2	2	117	234	117	8.6	8.1	7.3
	0		1/2		234	468	234	17.2	16.3	14.6
2	N/A		3/4		234	468	351	25.8	24.4	21.9
3	1	16-QAM	1/2	4	117	468	234	17.2	16.3	14.6
	0		1/2		234	936	468	34.4	32.5	29.3
4	1		3/4		117	468	351	25.8	24.4	21.9
	0		3/4		234	936	702	51.6	48.8	43.9
5	N/A	64-QAM	2/3	6	234	1 404	936	68.8	65.0	58.5
6			3/4				1 053	77.4	73.1	65.8
7			5/6				1 170	86.0	81.3	73.1
8		256-QAM	3/4	8		1 872	1 404	103.2	97.5	87.8
9			5/6				1 560	114.7	108.3	97.5
10		1024-QAM	3/4	10		2 340	1 755	129.0	121.9	109.7
11			5/6				1 950	143.4	135.4	121.9

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

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Table 27-87—HE-MCSs for 484-tone RU, N_{SS} = 1

HE-MCS Index	DCM	Modulation	R	N_{BPSCS}	N_{SD}	N_{CBPS}	N_{DBPS}	Data rate (Mb/s)		
								0.8 µs GI	1.6 µs GI	3.2 µs GI
0	1	BPSK	1/2	1	234	234	117	8.6	8.1	7.3
	0		1/2		468	468	234	17.2	16.3	14.6
1	1	QPSK	1/2	2	234	468	234	17.2	16.3	14.6
	0		1/2		468	936	468	34.4	32.5	29.3
2	N/A		3/4		468	936	702	51.6	48.8	43.9
3	1	16-QAM	1/2	4	234	936	468	34.4	32.5	29.3
	0		1/2		468	1 872	936	68.8	65.0	58.5
4	1		3/4		234	936	702	51.6	48.8	43.9
	0		3/4		468	1 872	1 404	103.2	97.5	87.8
5	N/A	64-QAM	2/3	6	468	2 808	1 872	137.6	130.0	117.0
6			3/4				2 106	154.9	146.3	131.6
7			5/6				2 340	172.1	162.5	146.3
8		256-QAM	3/4	8		3 744	2 808	206.5	195.0	175.5
9			5/6				3 120	229.4	216.7	195.0
10		1024-QAM	3/4	10		4 680	3 510	258.1	243.8	219.4
11			5/6				3 900	286.8	270.8	243.8

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

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

This submittal(s) (test report) is intended for **FCC ID: 2BBY2-A1** filing to comply with the FCC Part 15 requirements.

2.6. 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)

2.7. SPECIAL ACCESSORIES

Refer to section 5.2.

2.8. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

2.9. 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 is 1.19dBi

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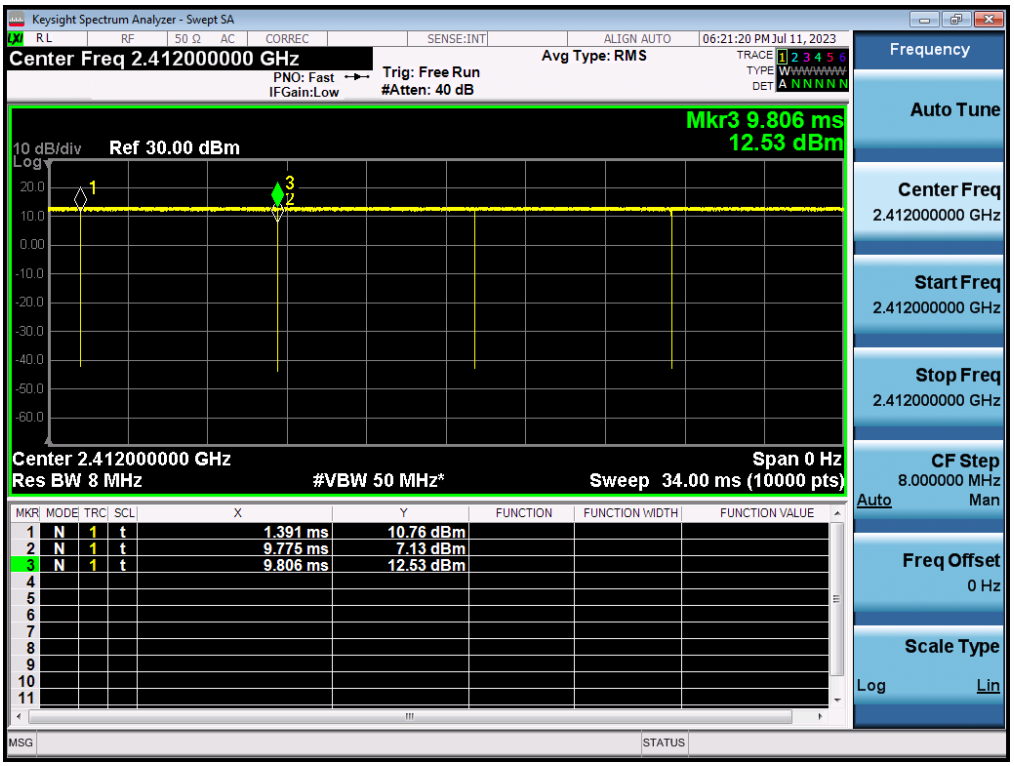
2.10. Duty cycle

The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW=8MHz, VBW=50MHz. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Test Mode	Frequency	Duty Cycle
GFSK 1M	2412MHz	99.6%

Test Graphs of Duty Cycle



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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 %

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4. DESCRIPTION OF TEST MODES

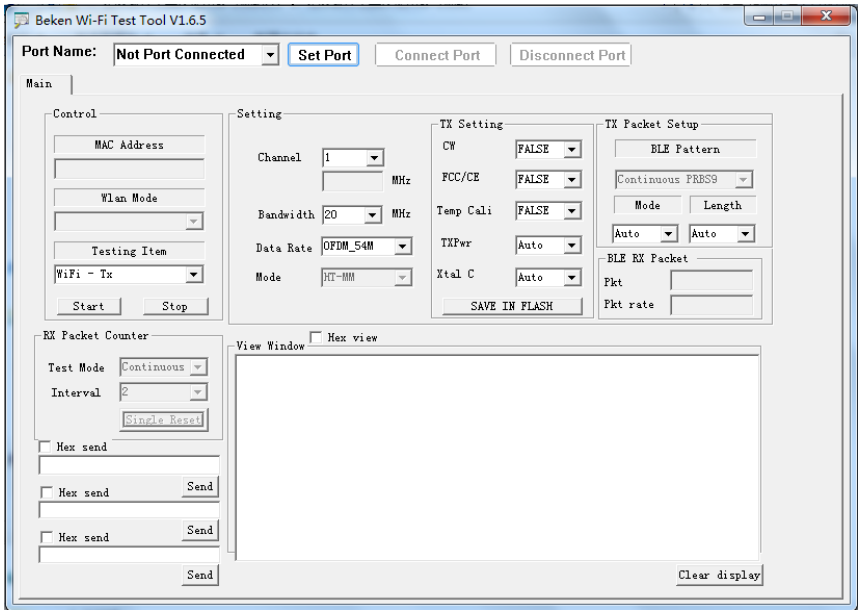
NO.	TEST MODE DESCRIPTION
1	Low channel transmitting (TX)
2	Middle channel transmitting (TX)
3	High channel transmitting (TX)

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



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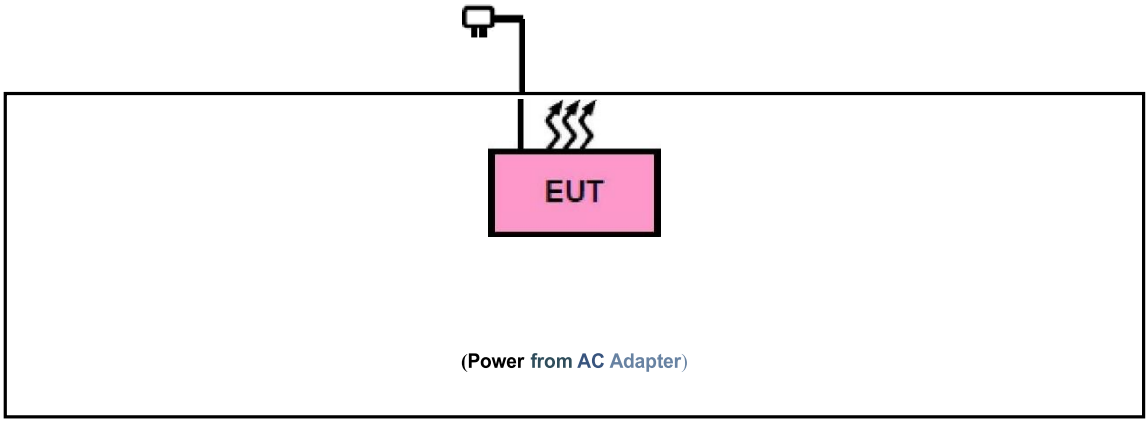
5. SYSTEM TEST CONFIGURATION

5.1. CONFIGURATION OF EUT SYSTEM



5.2. EQUIPMENT USED IN EUT SYSTEM

Item	Equipment	Model No.	Identifier	Note
1	Video Door Bell	A1	2BBY2-A1	EUT
2	Speaker	N/A	N/A	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

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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	Jun. 03, 2023	Jun. 02, 2024
LISN	R&S	ESH2-Z5	100086	Jun. 03, 2023	Jun. 02, 2024
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	Jun. 01, 2023	May. 31, 2024
2.4GHz Filter	EM Electronics	2400-2500MHz	N/A	N/A	N/A
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. 23, 2023	Mar. 22, 2024
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Sep. 01, 2022	Aug. 31, 2023
ANTENNA	SCHWARZBECK	VULB9168	494	Jan. 05, 2023	Jan. 04, 2025
Test software	Tonscend	JS32-RE (Ver.2.5)	N/A	N/A	N/A

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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.

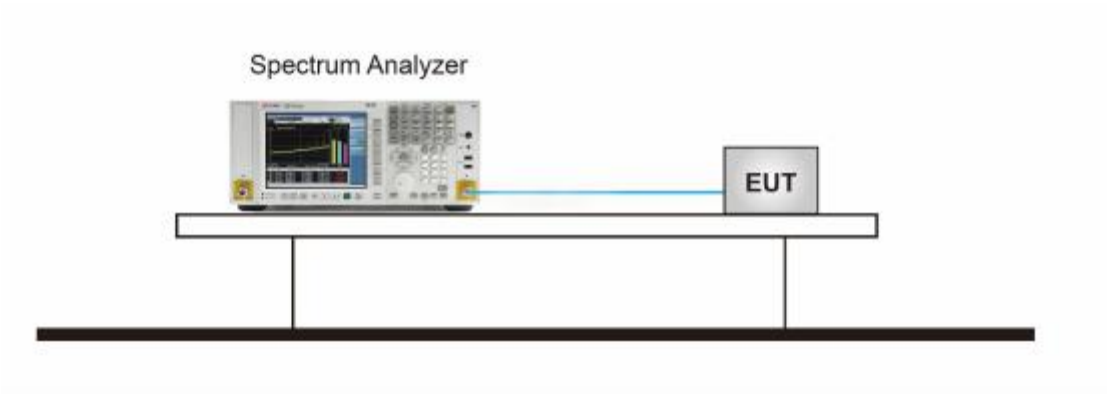
7.2 MEASUREMENT PROCEDURE

1. Connect EUT RF output port to power sensor.
2. Connect the power sensor to the PC.
3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
4. Set the gated average detector for average power measurement and peak detector for peak power measur ement.
5. Record the maximum power from the software.

Note：

The EUT was tested according to ANSI C63.10 (2013) for compliance to FCC 47CFR 15.247 requirements.

7.3 MEASUREMENT SETUP (BLOCK DIAGRAM OF CONFIGURATION)



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7.4 MEASUREMENT RESULT

Test Data of Conducted Output Power					
Test Mode	Test Channel (MHz)	Average Power (dBm)	Peak Power (dBm)	Limits (dBm)	Pass or Fail
802.11b	2412	13.30	15.77	≤30	Pass
	2437	13.02	15.63	≤30	Pass
	2462	12.37	14.82	≤30	Pass
802.11g	2412	11.92	19.34	≤30	Pass
	2437	12.41	19.84	≤30	Pass
	2462	11.76	19.24	≤30	Pass
802.11n20	2412	12.36	19.76	≤30	Pass
	2437	12.36	19.74	≤30	Pass
	2462	11.60	19.04	≤30	Pass
802.11n40	2422	12.28	19.67	≤30	Pass
	2437	12.19	19.68	≤30	Pass
	2452	11.75	19.29	≤30	Pass

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8. 6DB BANDWIDTH MEASUREMENT

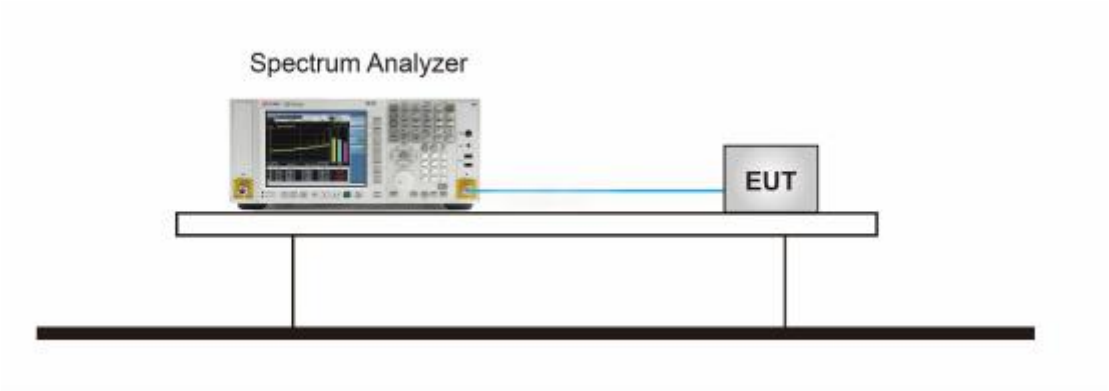
8.1 MEASUREMENT LIMITS

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. 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)



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8.4 MEASUREMENT RESULTS

Test Data of Occupied Bandwidth and DTS Bandwidth					
Test Mode	Test Channel (MHz)	99% Occupied Bandwidth (MHz)	-6dB Bandwidth (MHz)	-6dB Bandwidth Limits (MHz)	Pass or Fail
802.11b	2412	12.756	8.079	⩾0.5	Pass
	2437	13.008	8.090	⩾0.5	Pass
	2462	12.697	8.080	⩾0.5	Pass
802.11g	2412	16.461	15.131	⩾0.5	Pass
	2437	16.557	15.101	⩾0.5	Pass
	2462	16.412	15.105	⩾0.5	Pass
802.11n20	2412	17.485	15.102	⩾0.5	Pass
	2437	17.582	15.443	⩾0.5	Pass
	2462	17.464	15.092	⩾0.5	Pass
802.11n40	2422	35.723	32.559	⩾0.5	Pass
	2437	36.144	35.123	⩾0.5	Pass
	2452	35.877	35.079	⩾0.5	Pass

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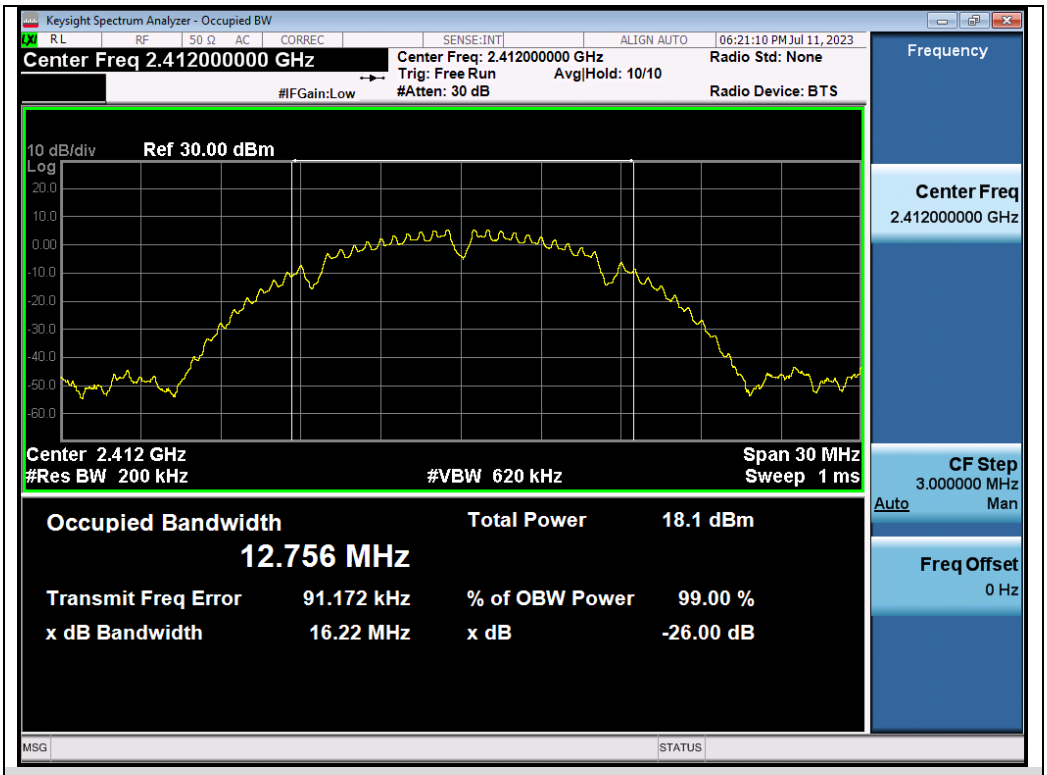
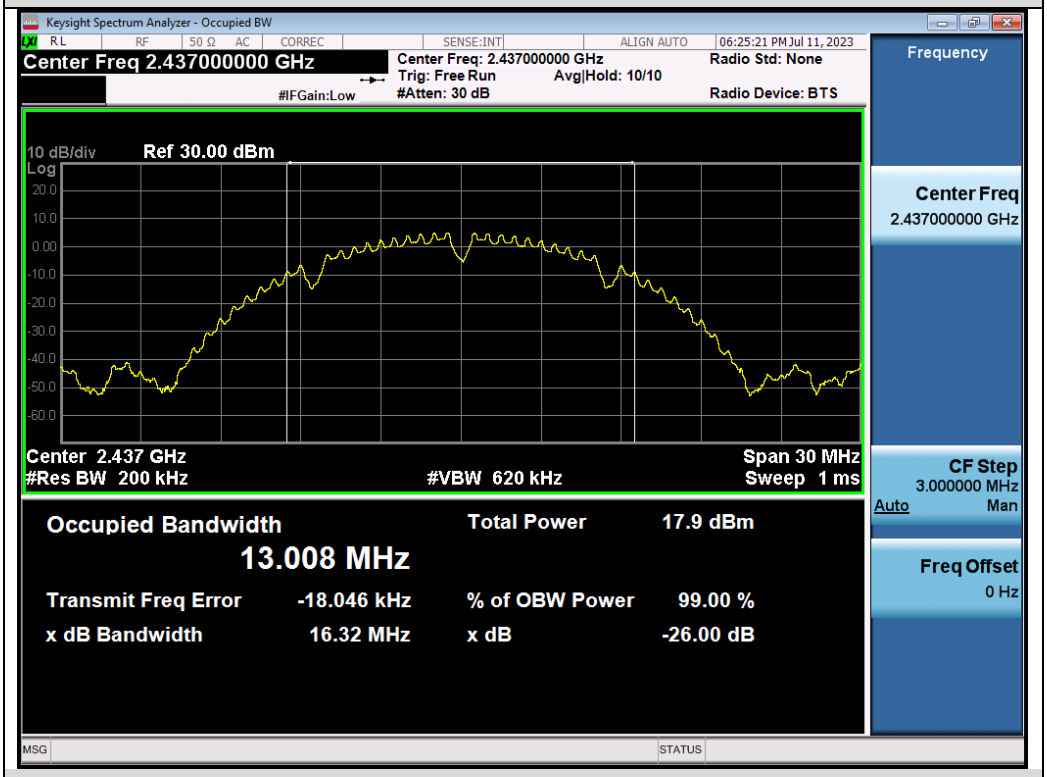
Test Graphs of Occupied Bandwidth



Test_Graph_802.11b_ANT1_2412_1Mbps_OBW



Test_Graph_802.11b_ANT1_2437_1Mbps_OBW

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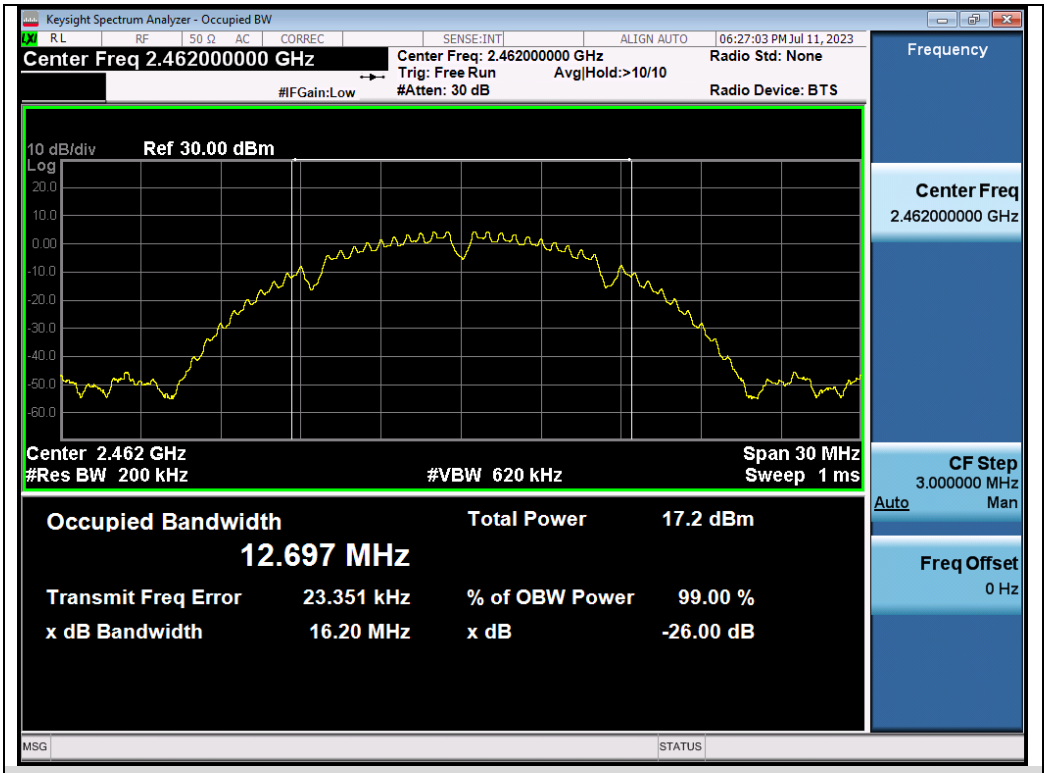

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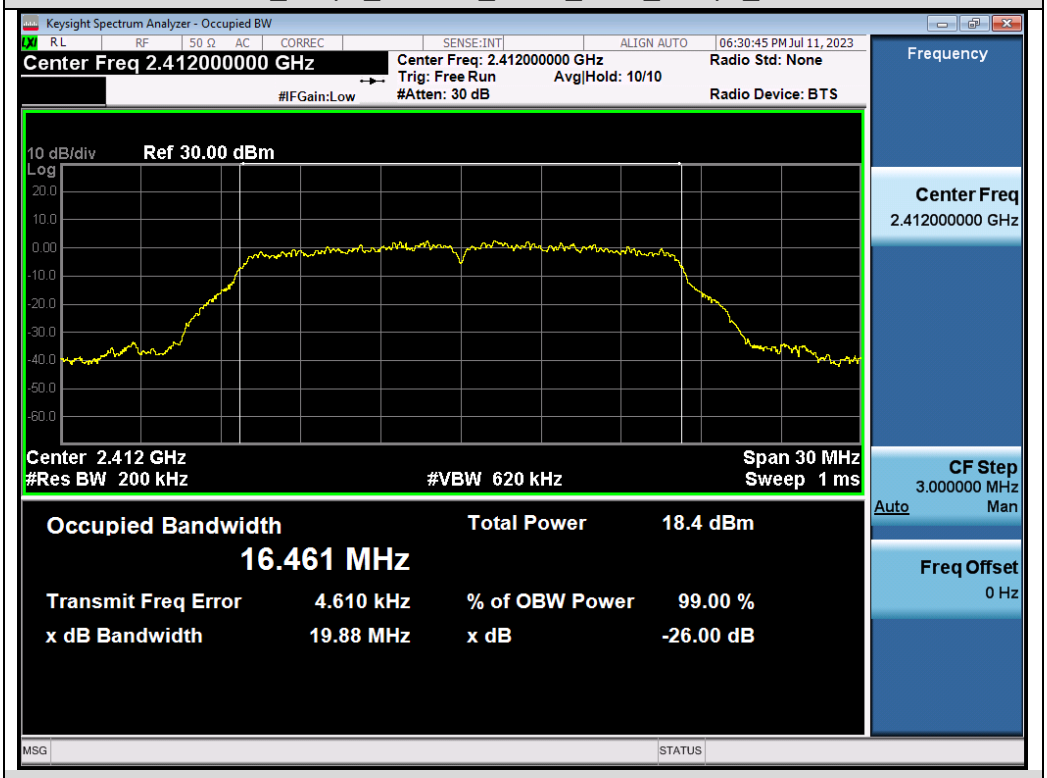

Test_Graph_802.11g_ANT1_2412_6Mbps_OBW

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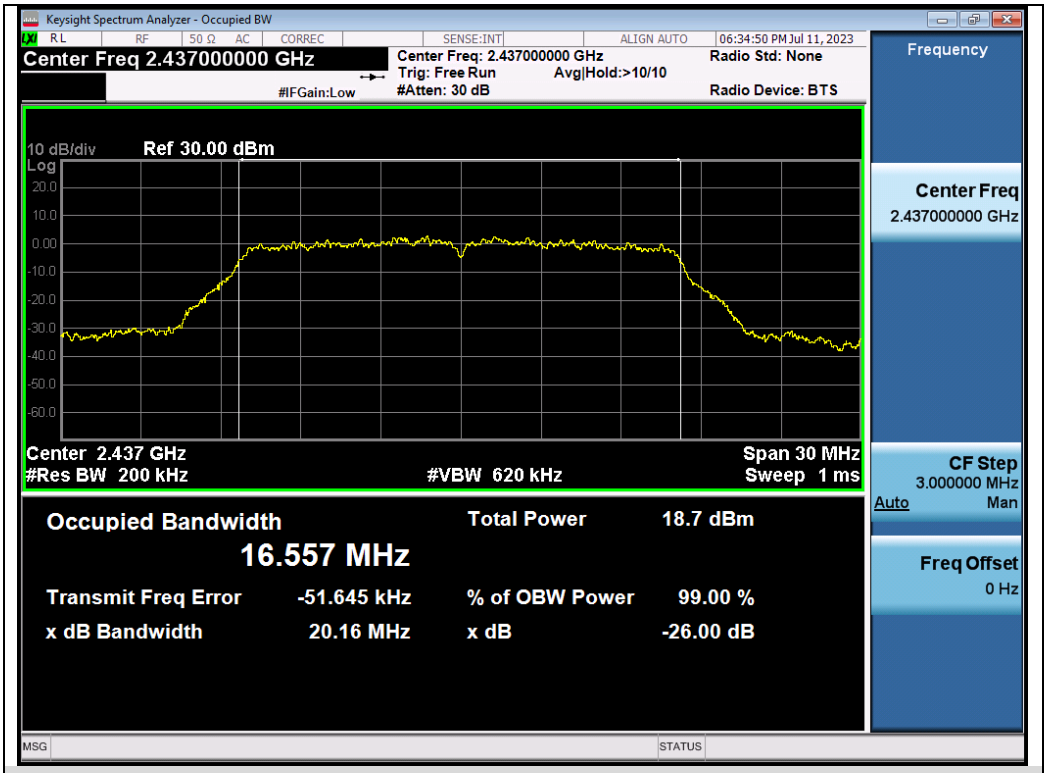
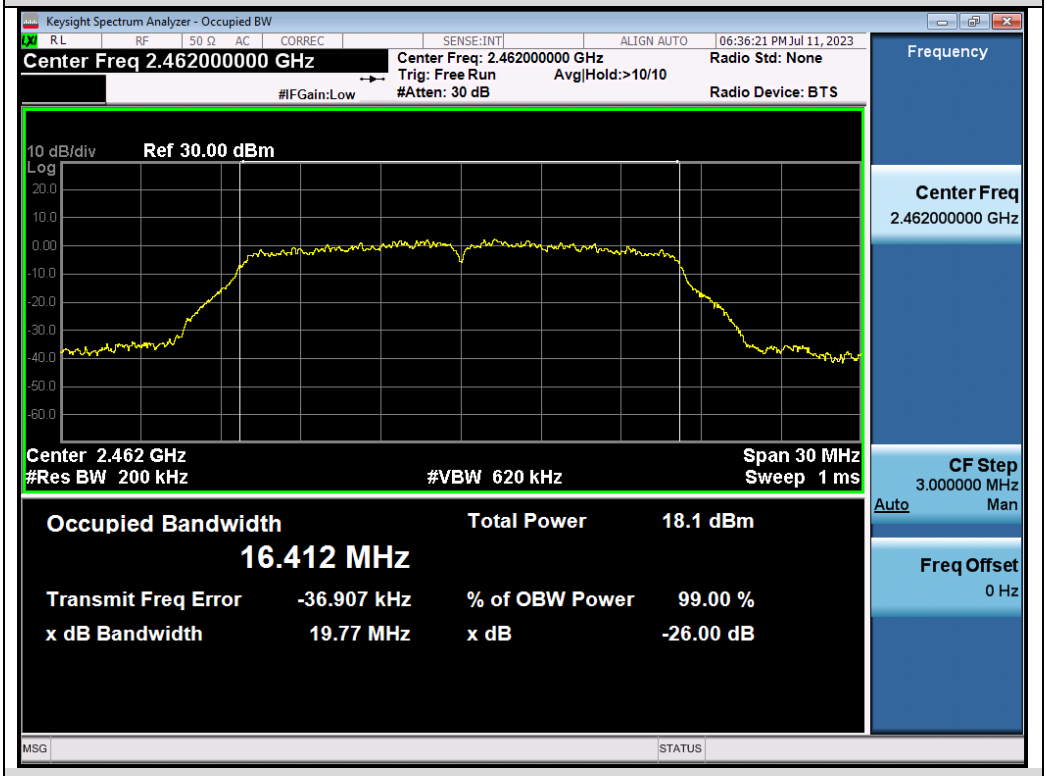


Test_Graph_802.11g_ANT1_2437_6Mbps_OBW



Test_Graph_802.11g_ANT1_2462_6Mbps_OBW

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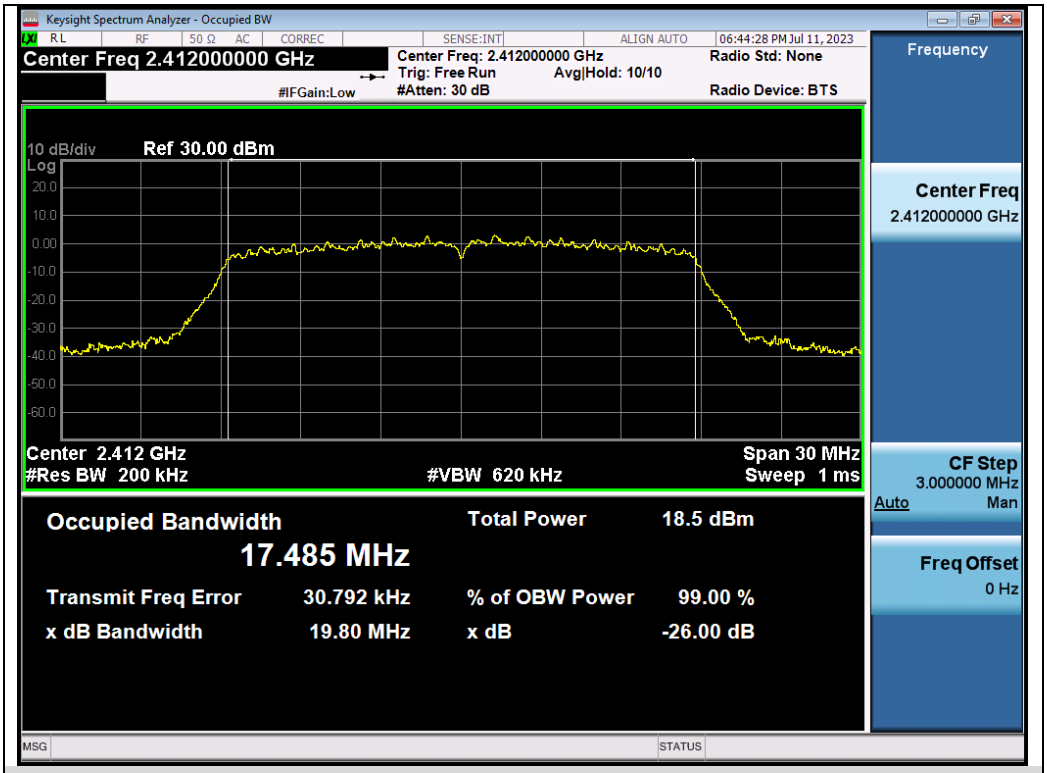

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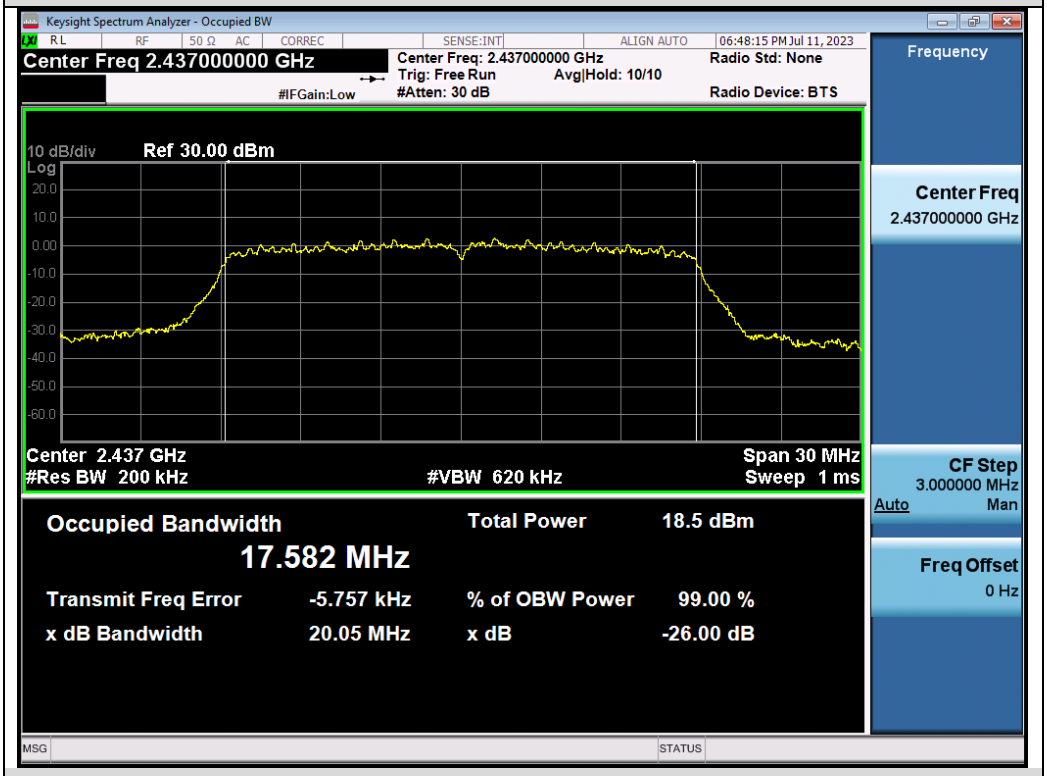

Test_Graph_802.11n20_ANT1_2437_MCS0_OBW

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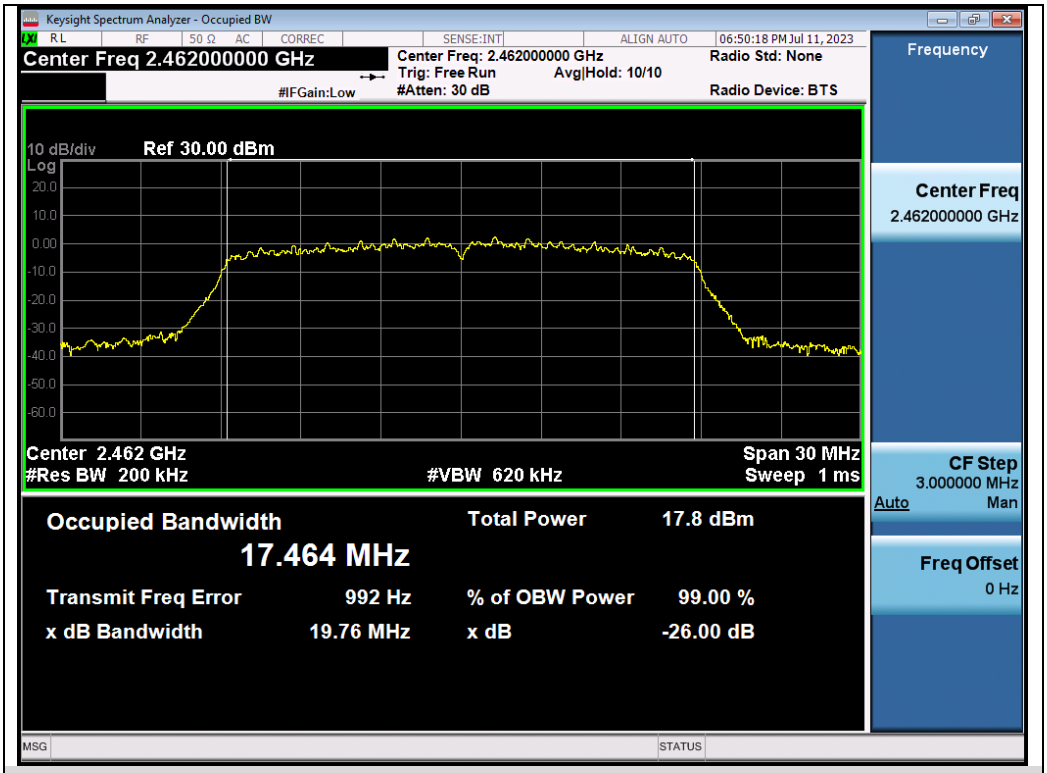

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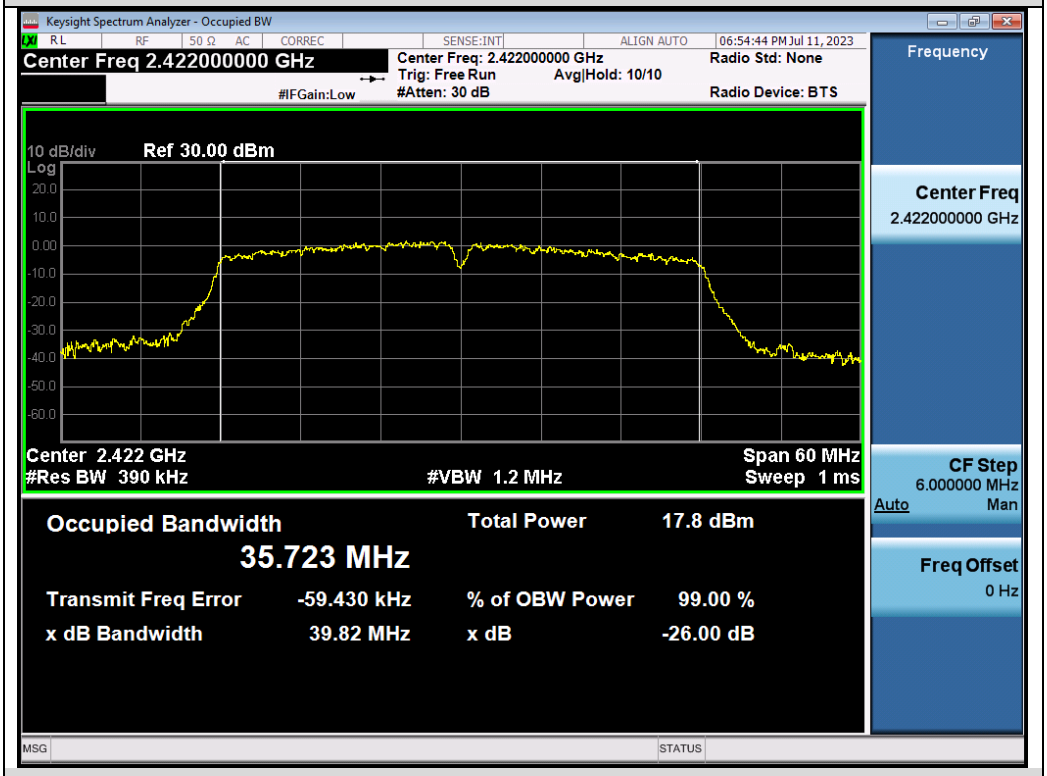

Test_Graph_802.11n40_ANT1_2422_MCS0_OBW

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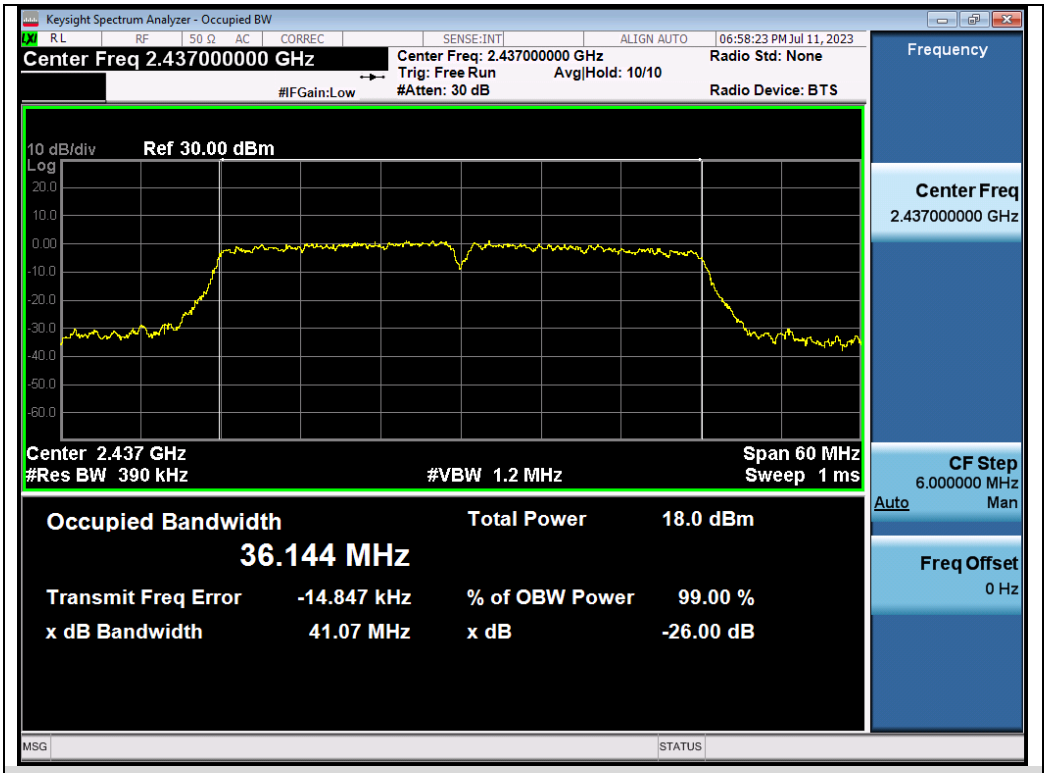

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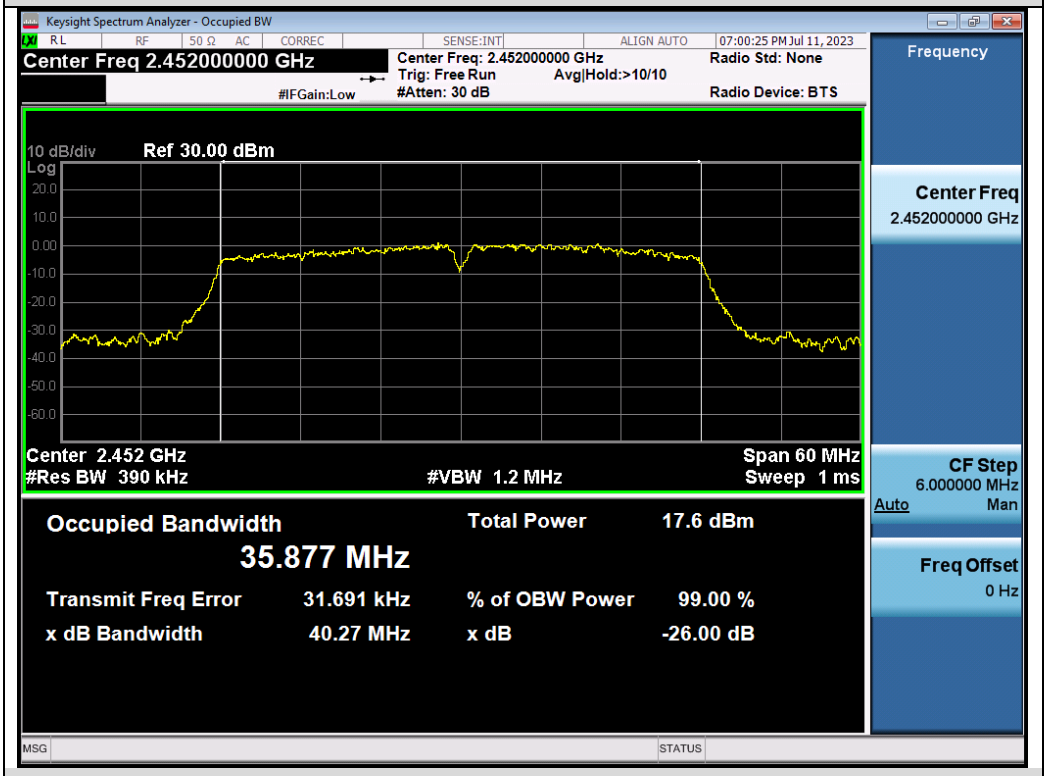

Test_Graph_802.11n40_ANT1_2452_MCS0_OBW

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Test Graphs of DTS Bandwidth

Test_Graph_802.11b_ANT1_2412_1Mbps_DTSBW

Test_Graph_802.11b_ANT1_2437_1Mbps_DTSBW

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Test_Graph_802.11b_ANT1_2462_1Mbps_DTSBW

Test_Graph_802.11g_ANT1_2412_6Mbps_DTSBW

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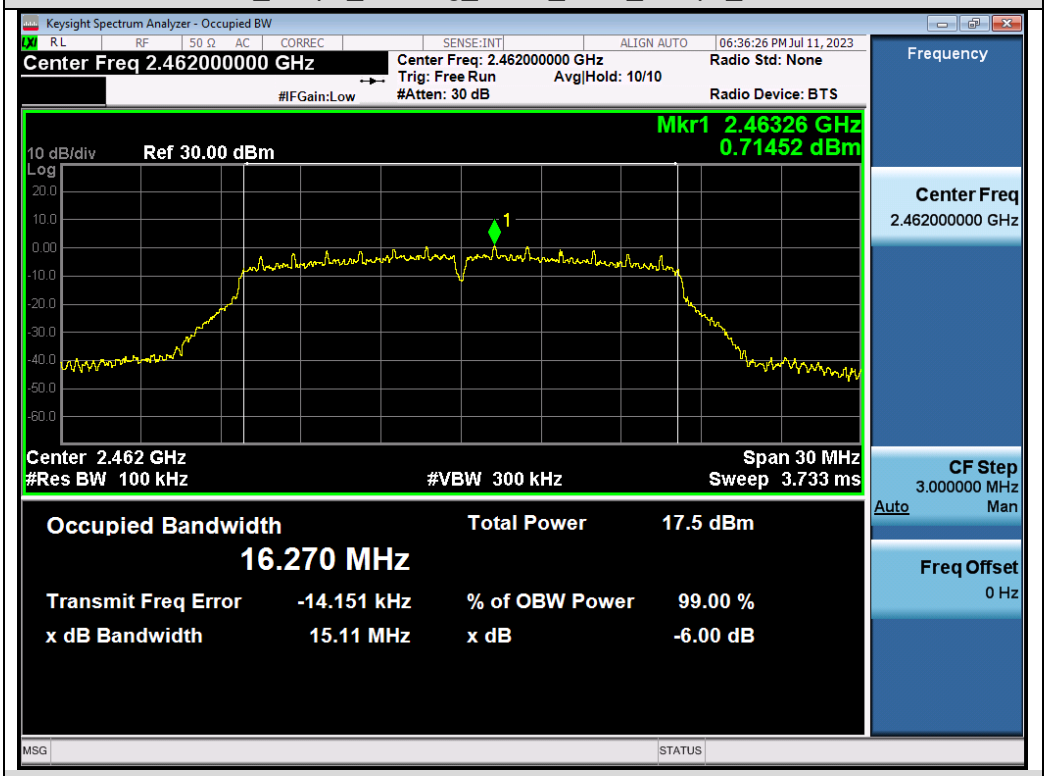
Test_Graph_802.11g_ANT1_2437_6Mbps_DTSBW



Test_Graph_802.11g_ANT1_2462_6Mbps_DTSBW

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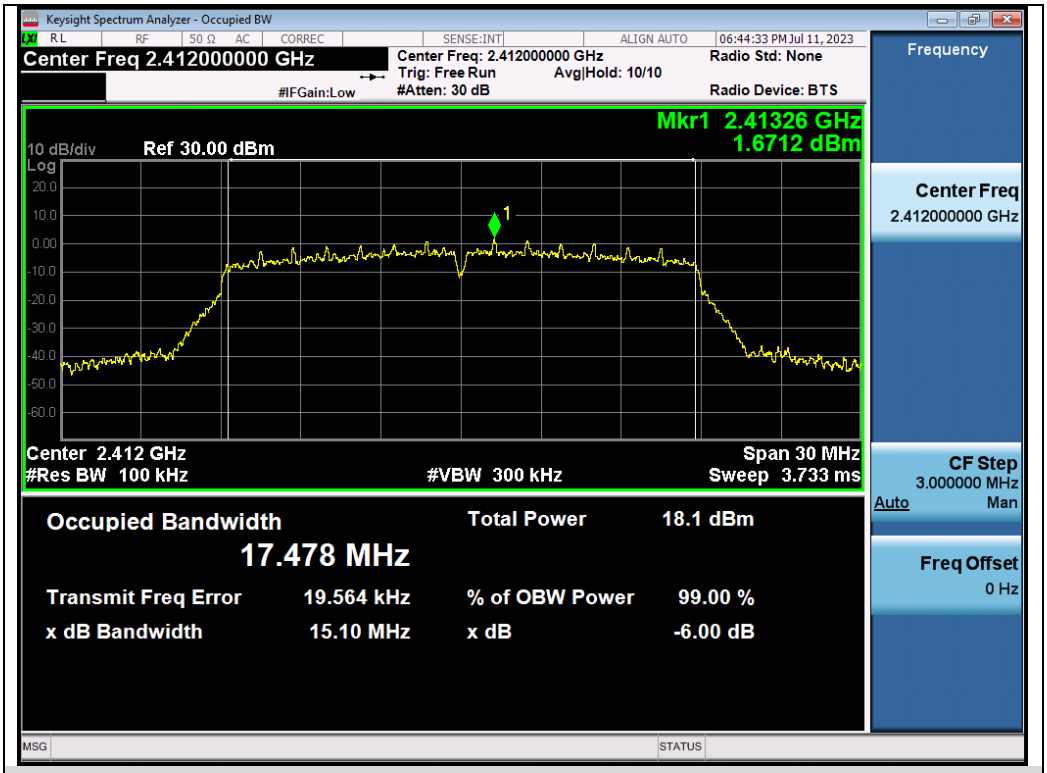

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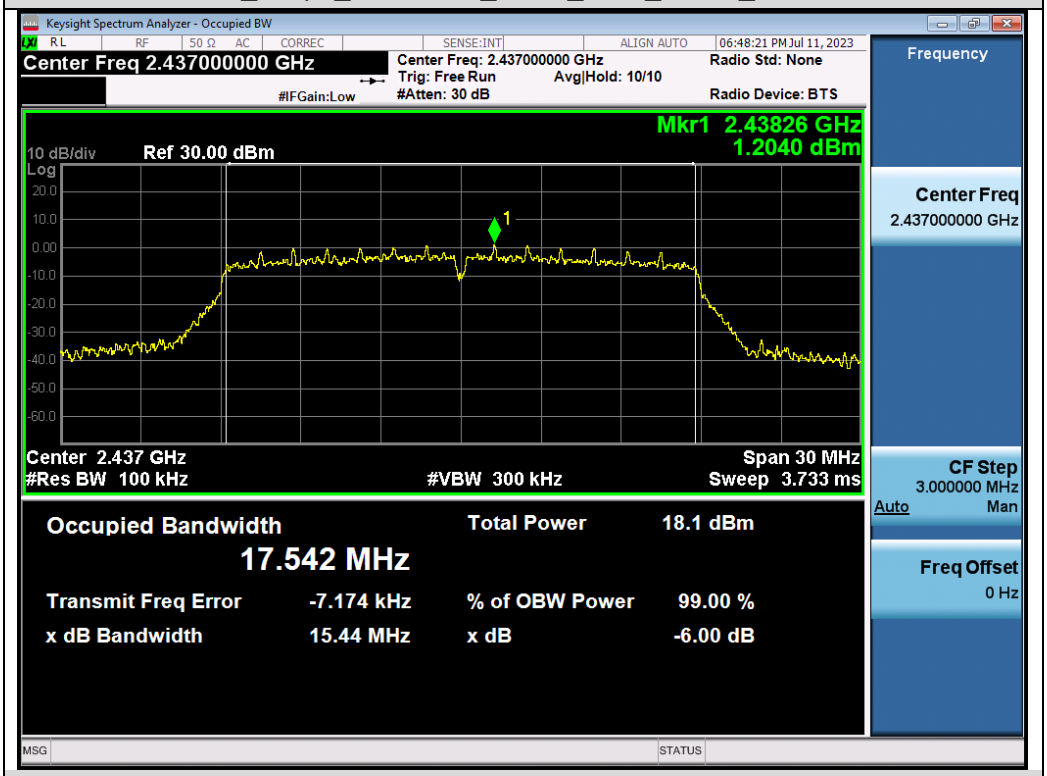

Test_Graph_802.11n20_ANT1_2437_MCS0_DTSBW

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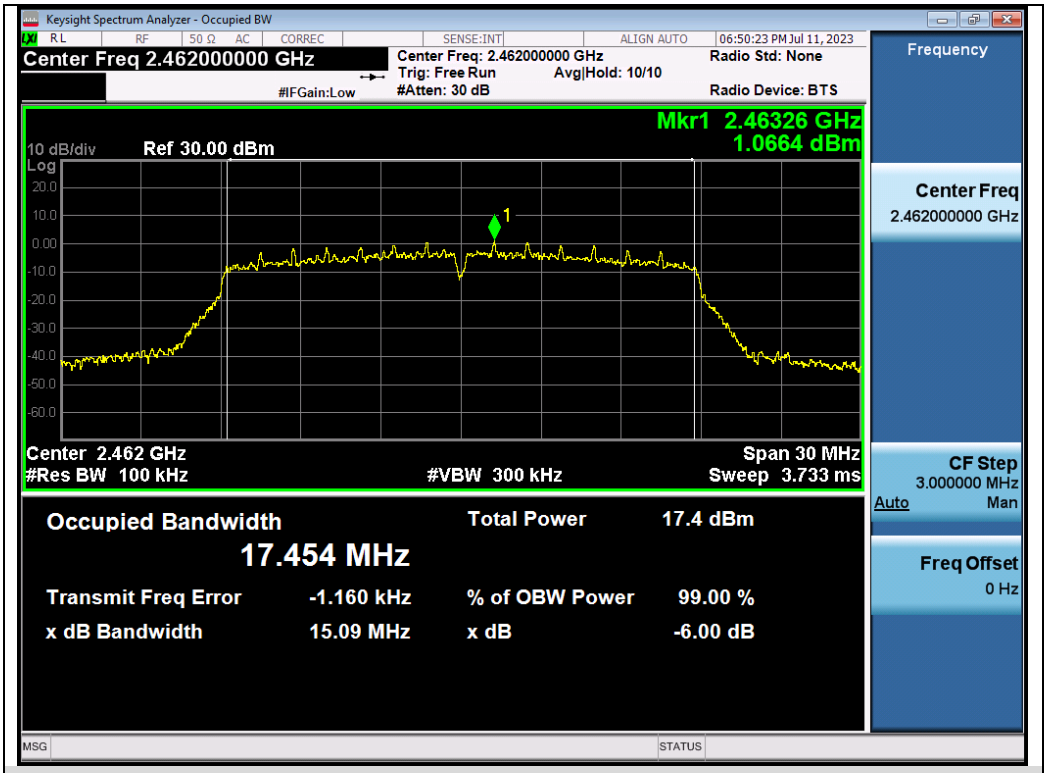

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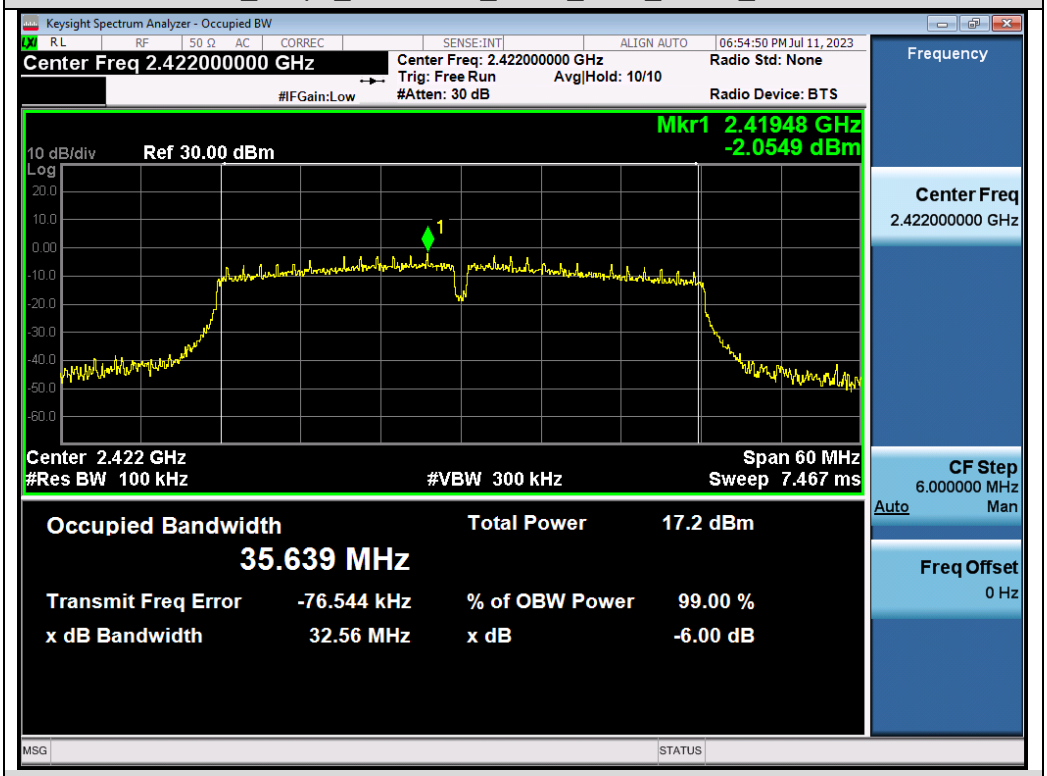

Test_Graph_802.11n40_ANT1_2422_MCS0_DTSBW

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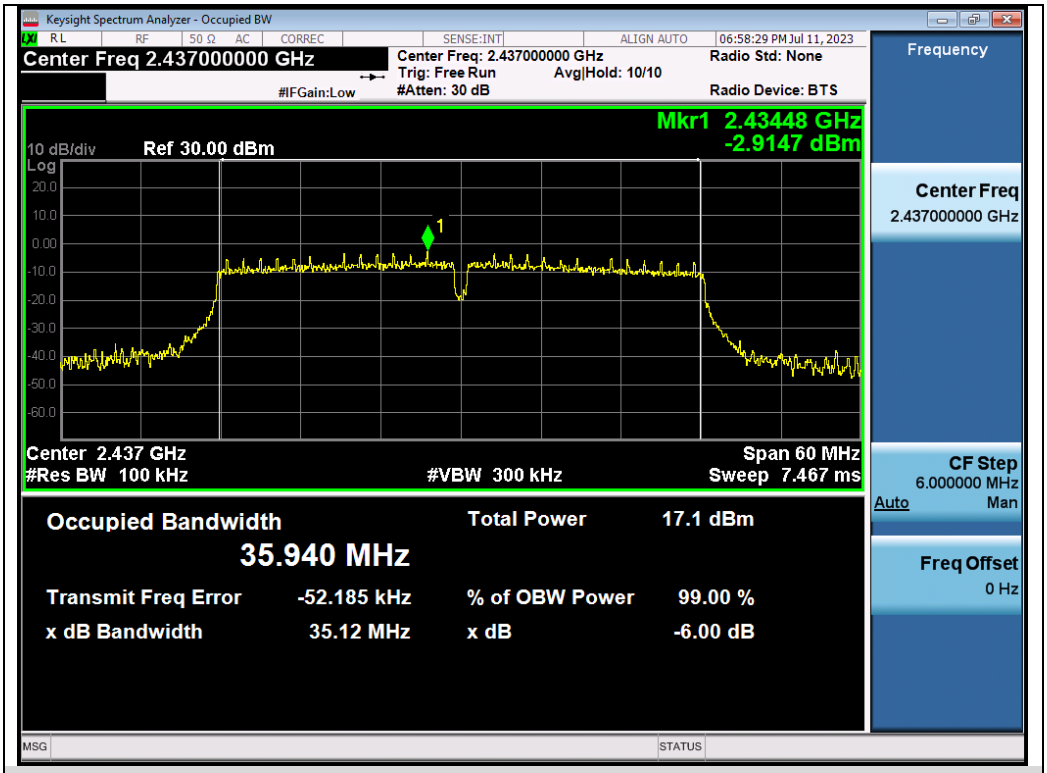
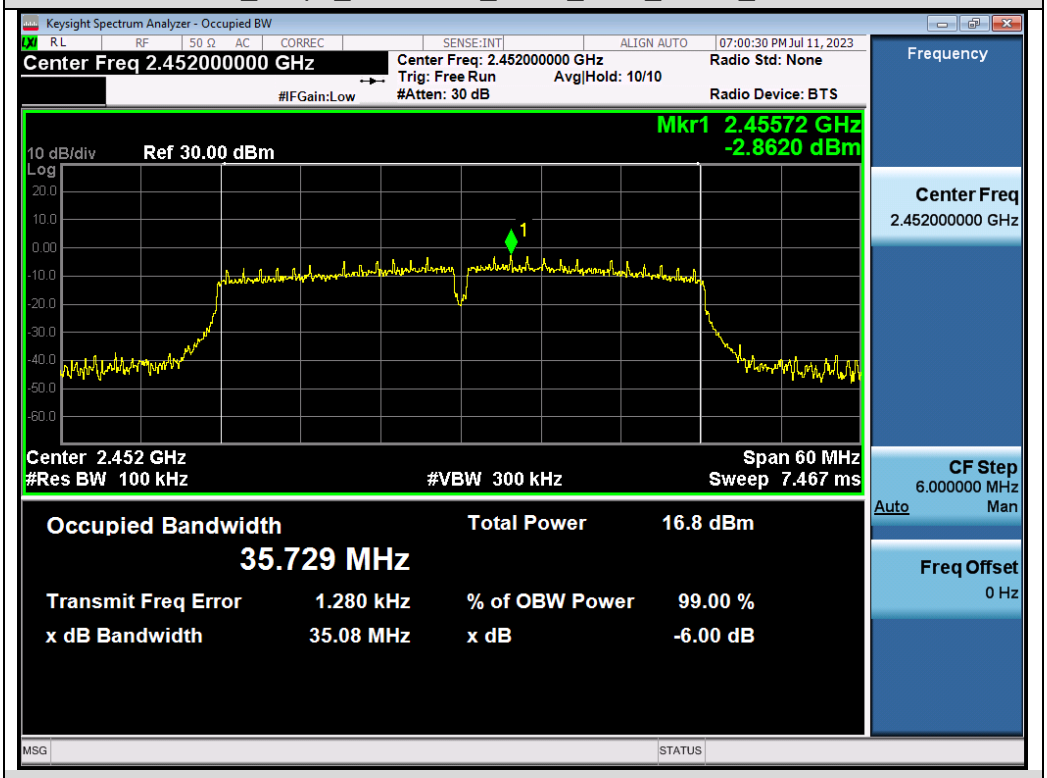


Test_Graph_802.11n40_ANT1_2437_MCS0_DTSBW



Test_Graph_802.11n40_ANT1_2452_MCS0_DTSBW

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9. CONDUCTED SPURIOUS EMISSION

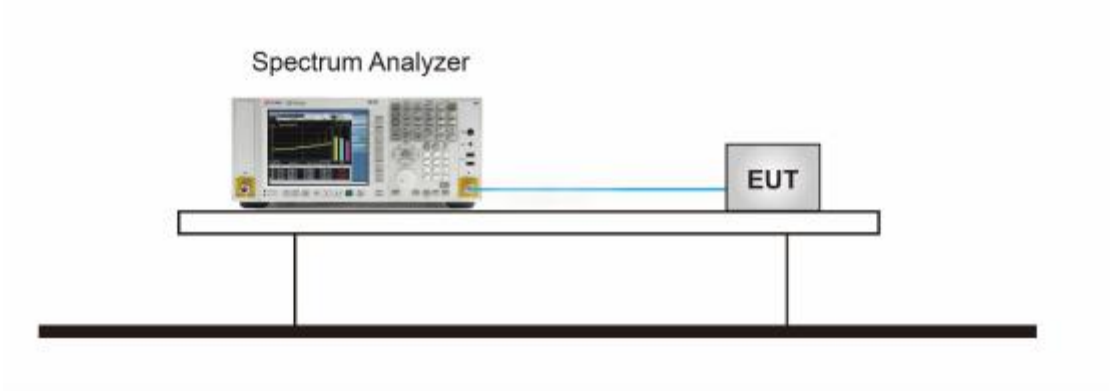
9.1 MEASUREMENT LIMIT

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
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)



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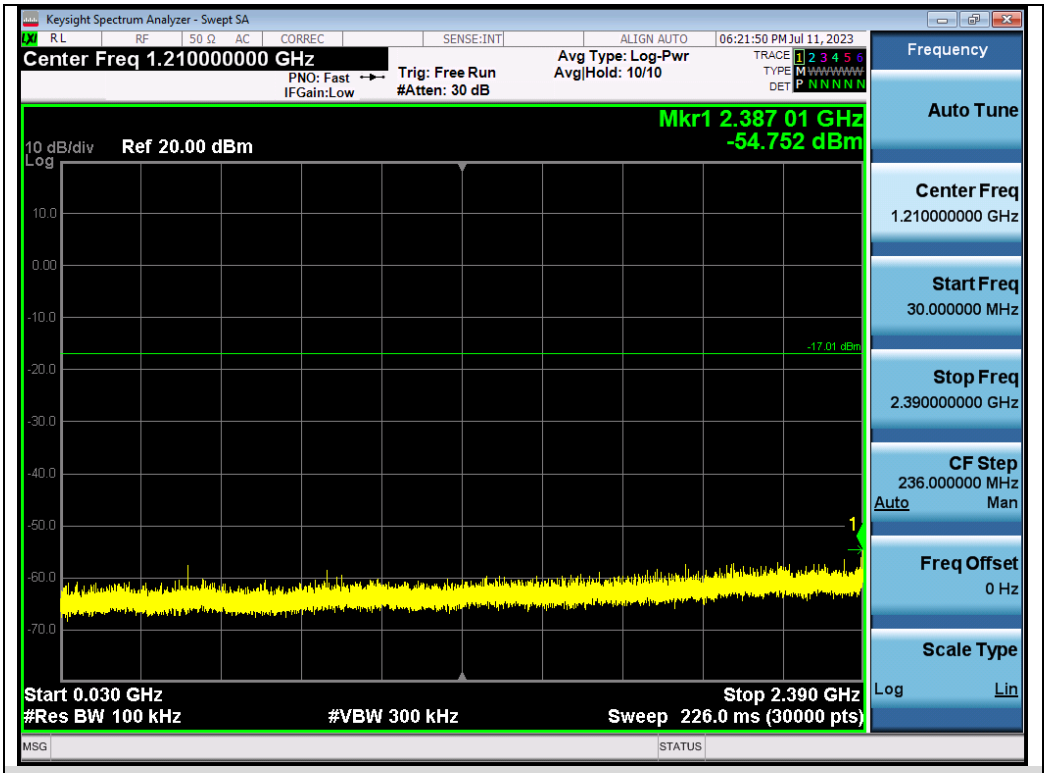
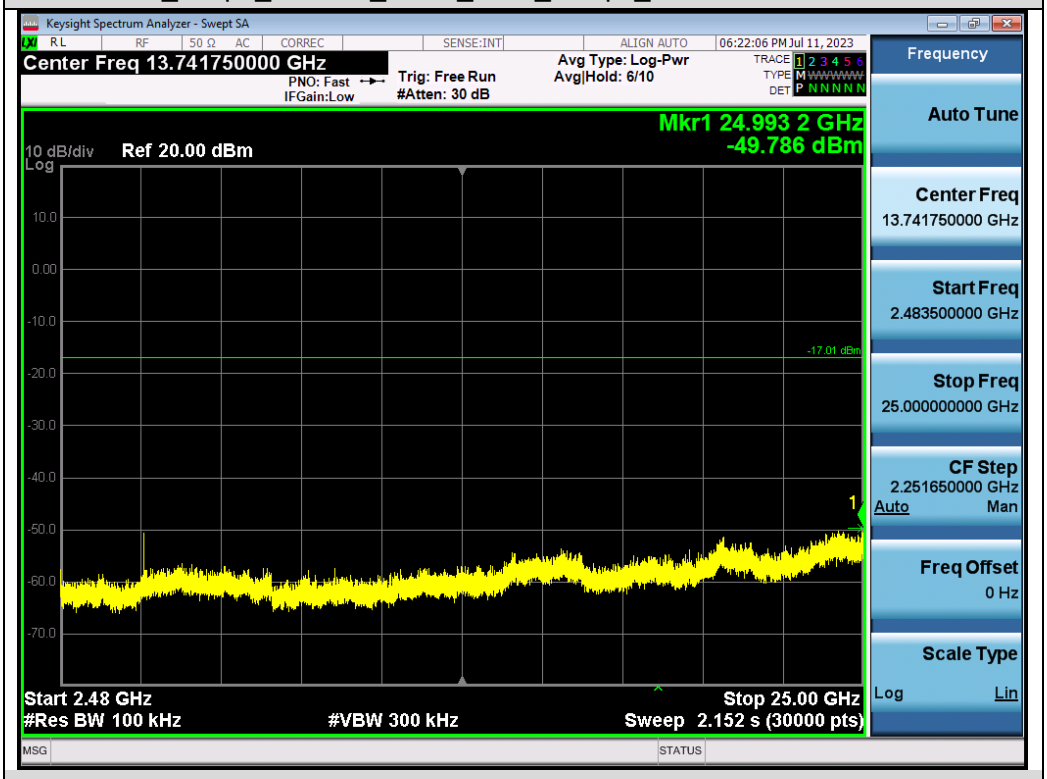
9.4 MEASUREMENT RESULTS

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

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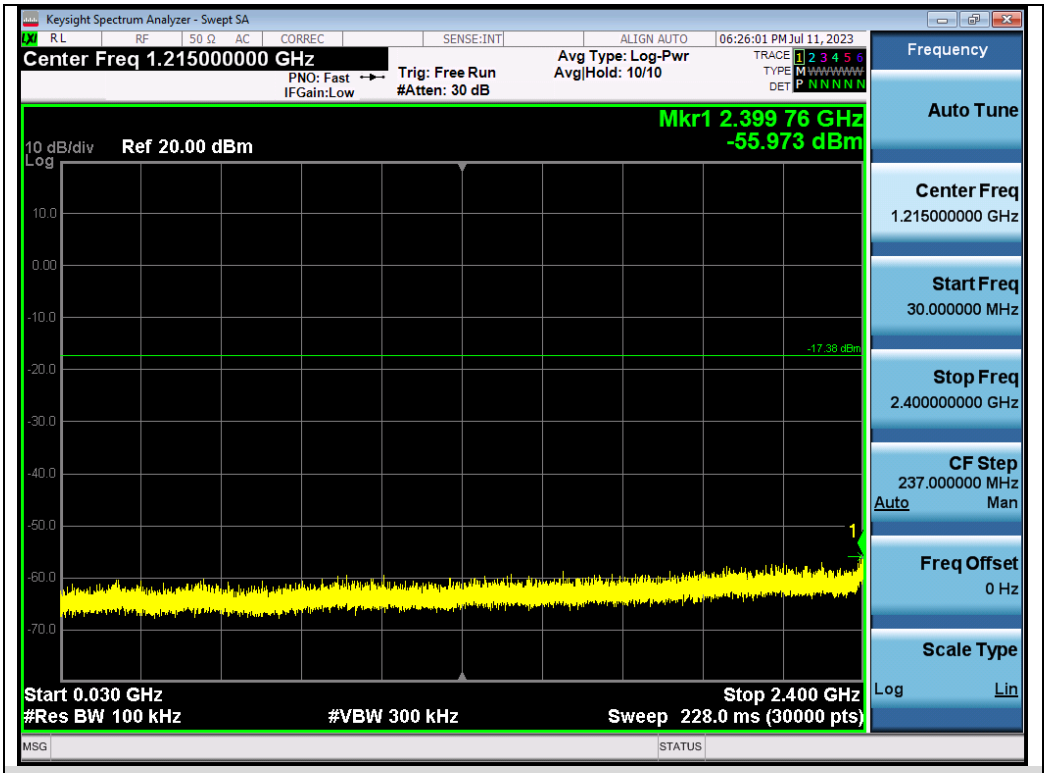
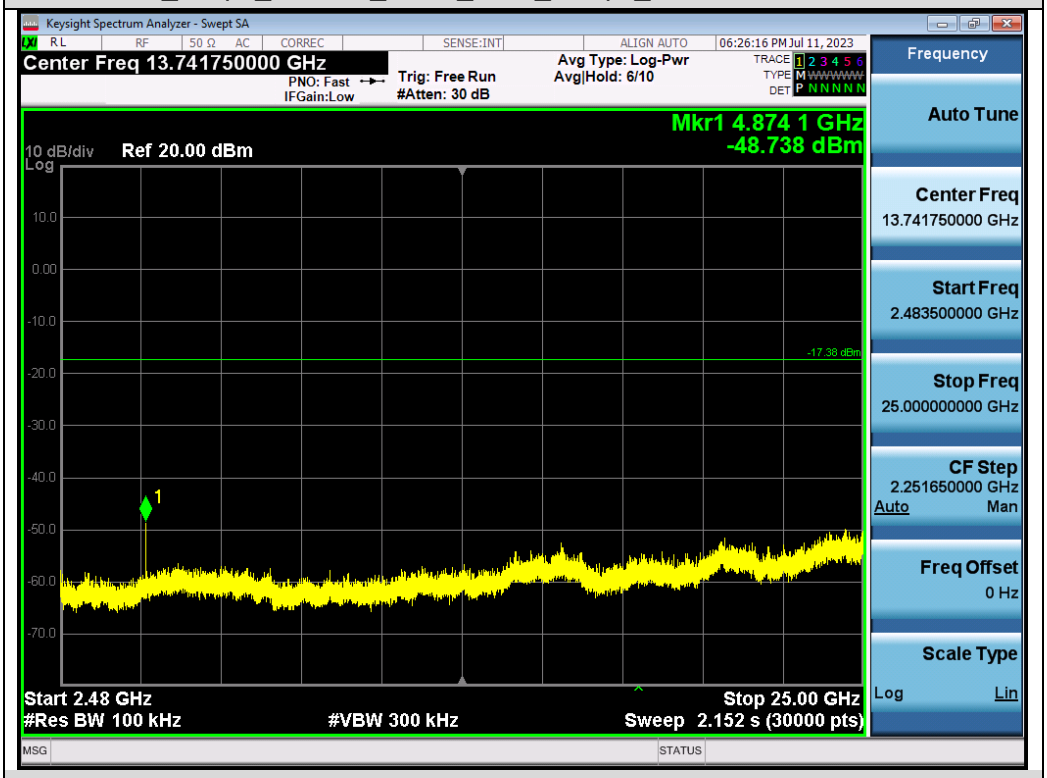


Test_Graph_802.11b_ANT1_2437_1Mbps_Lower Band Emissions



Test_Graph_802.11b_ANT1_2437_1Mbps_Higher Band Emissions

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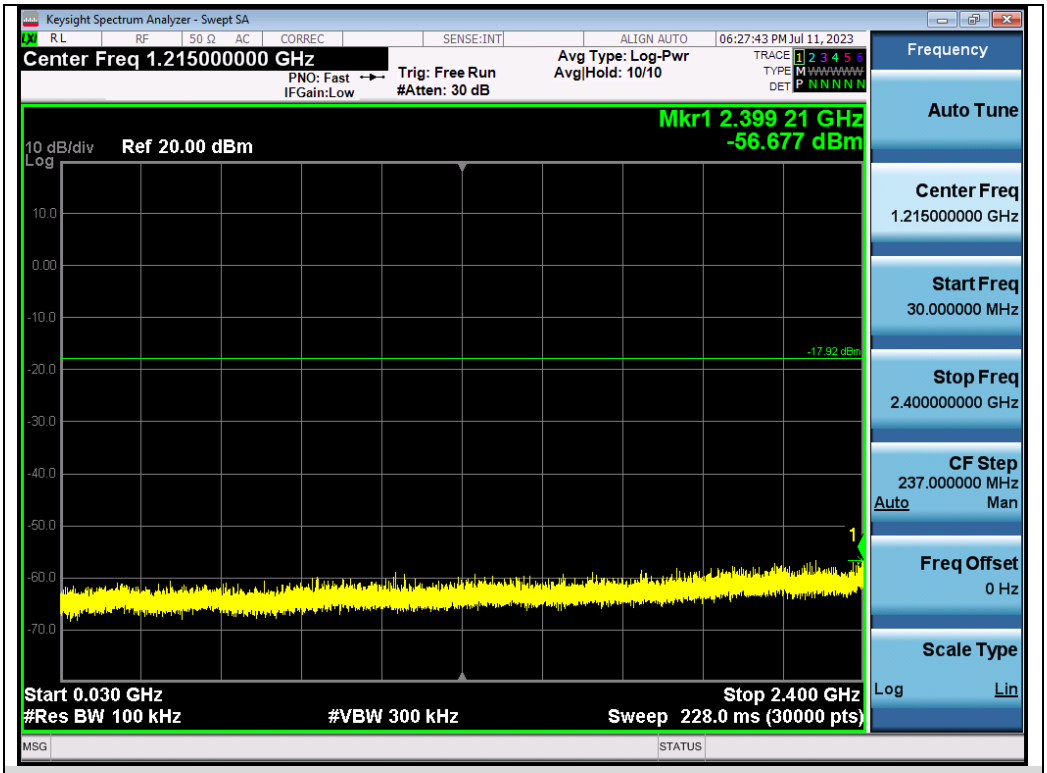
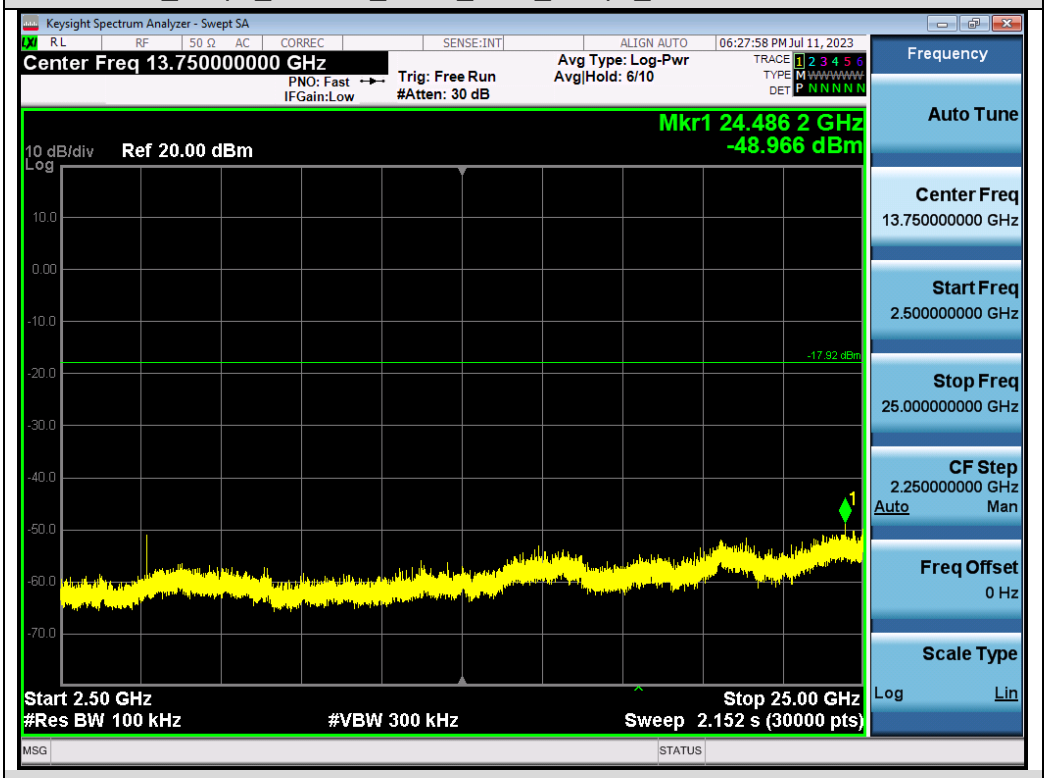


Test_Graph_802.11b_ANT1_2462_1Mbps_Lower Band Emissions



Test_Graph_802.11b_ANT1_2462_1Mbps_Higher Band Emissions

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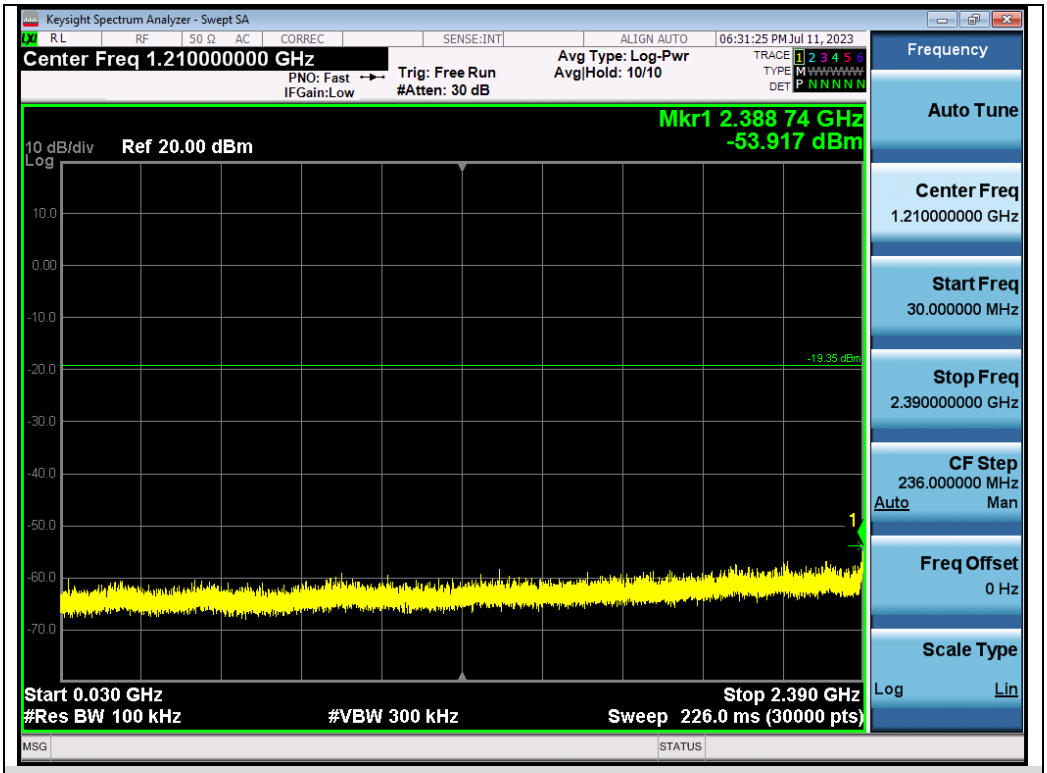

Test_Graph_802.11g_ANT1_2412_6Mbps_Lower Band Emissions

Test_Graph_802.11g_ANT1_2412_6Mbps_Higher Band Emissions

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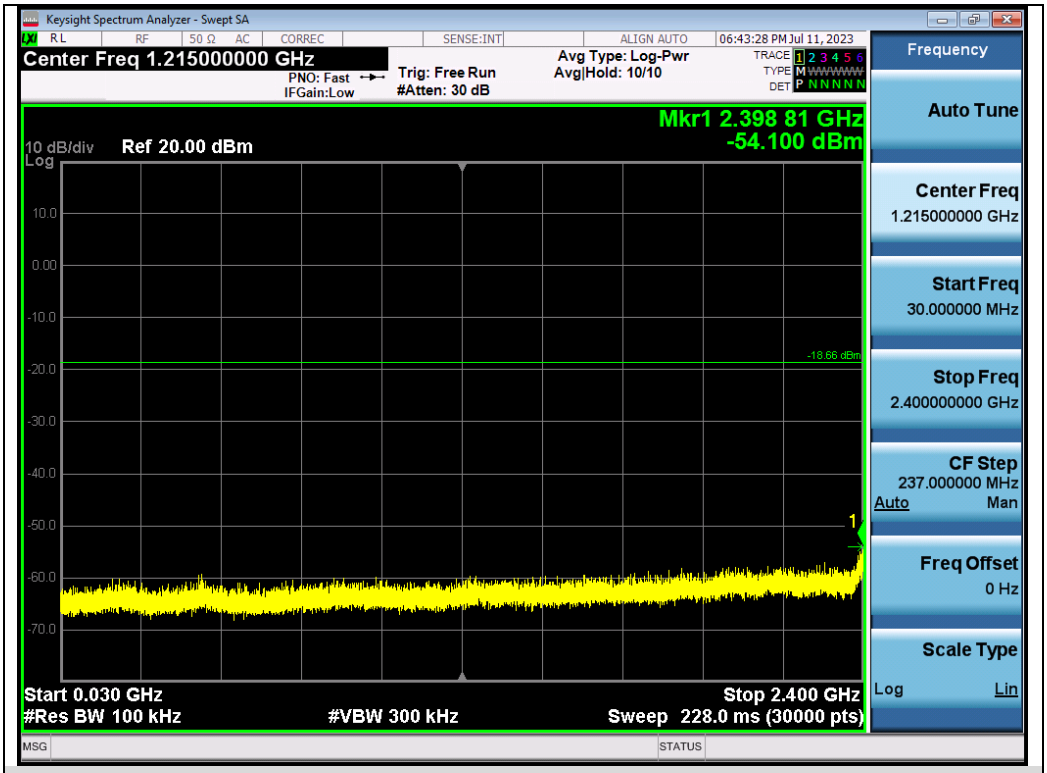

Test_Graph_802.11g_ANT1_2437_6Mbps_Lower Band Emissions

Test_Graph_802.11g_ANT1_2437_6Mbps_Higher Band Emissions

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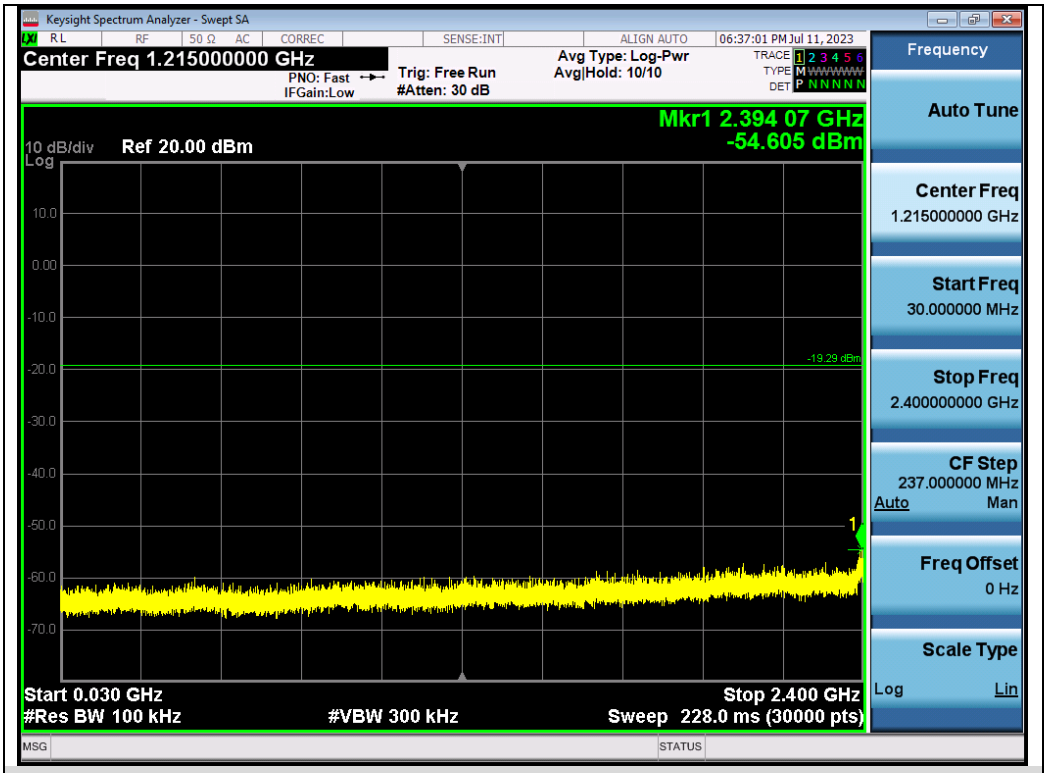
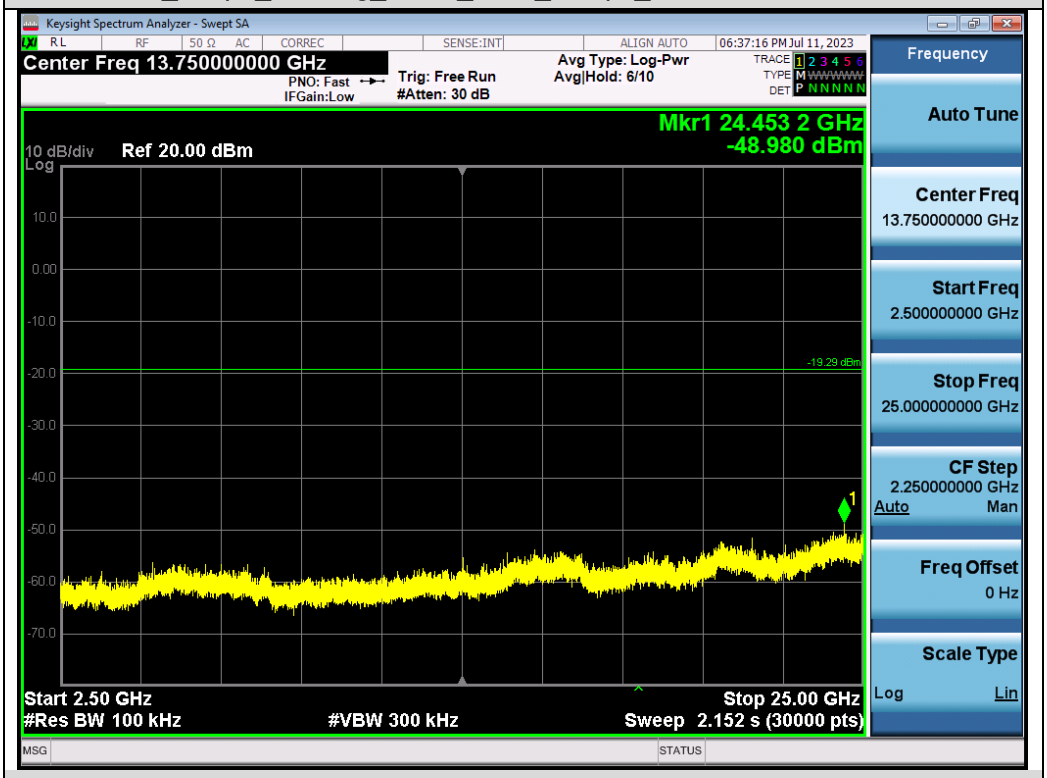


Test_Graph_802.11g_ANT1_2462_6Mbps_Lower Band Emissions



Test_Graph_802.11g_ANT1_2462_6Mbps_Higher Band Emissions

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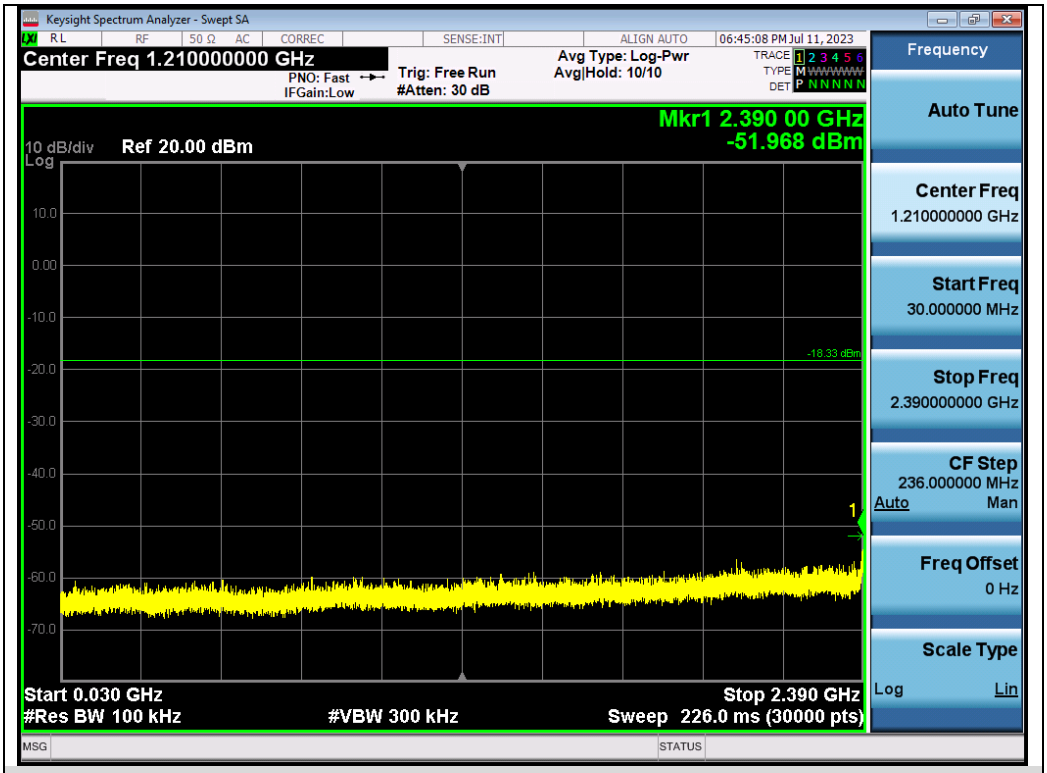
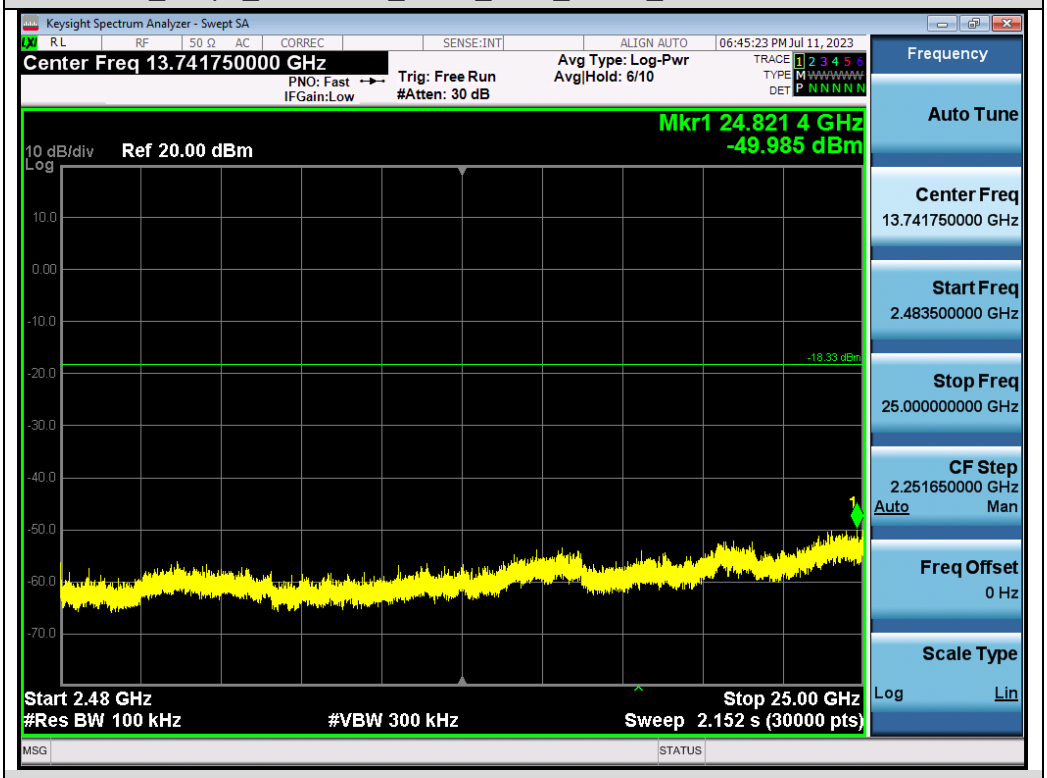


Test_Graph_802.11n20_ANT1_2412_MCS0_Lower Band Emissions



Test_Graph_802.11n20_ANT1_2412_MCS0_Higher Band Emissions

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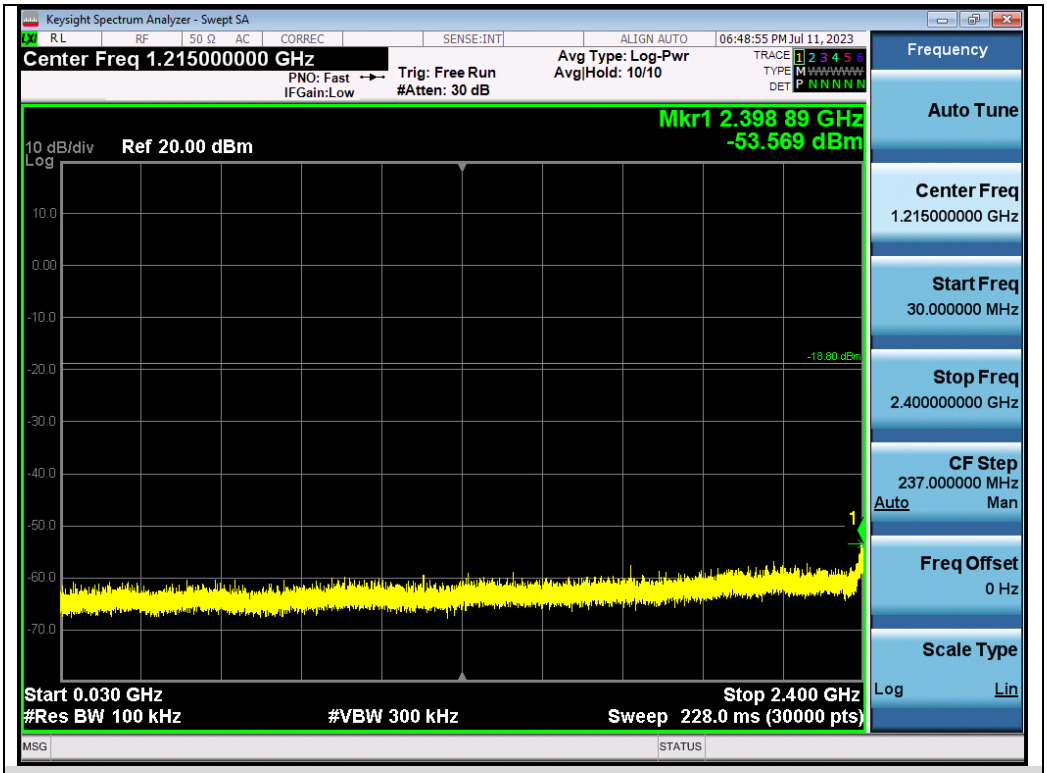
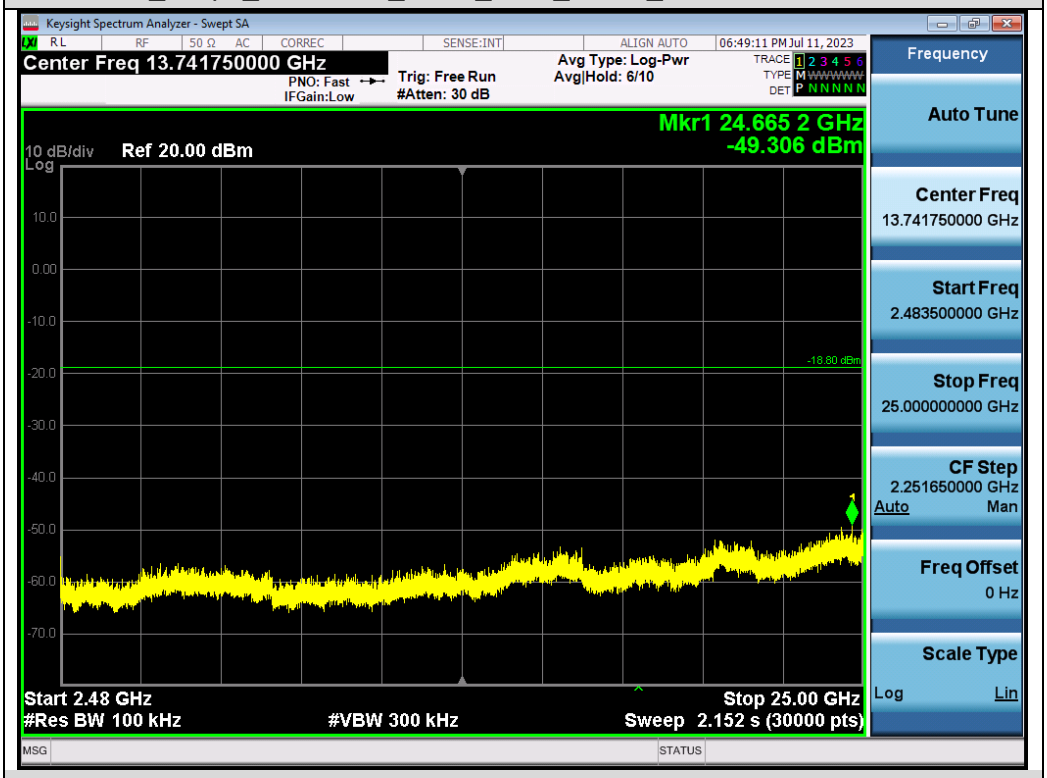


Test_Graph_802.11n20_ANT1_2437_MCS0_Lower Band Emissions



Test_Graph_802.11n20_ANT1_2437_MCS0_Higher Band Emissions

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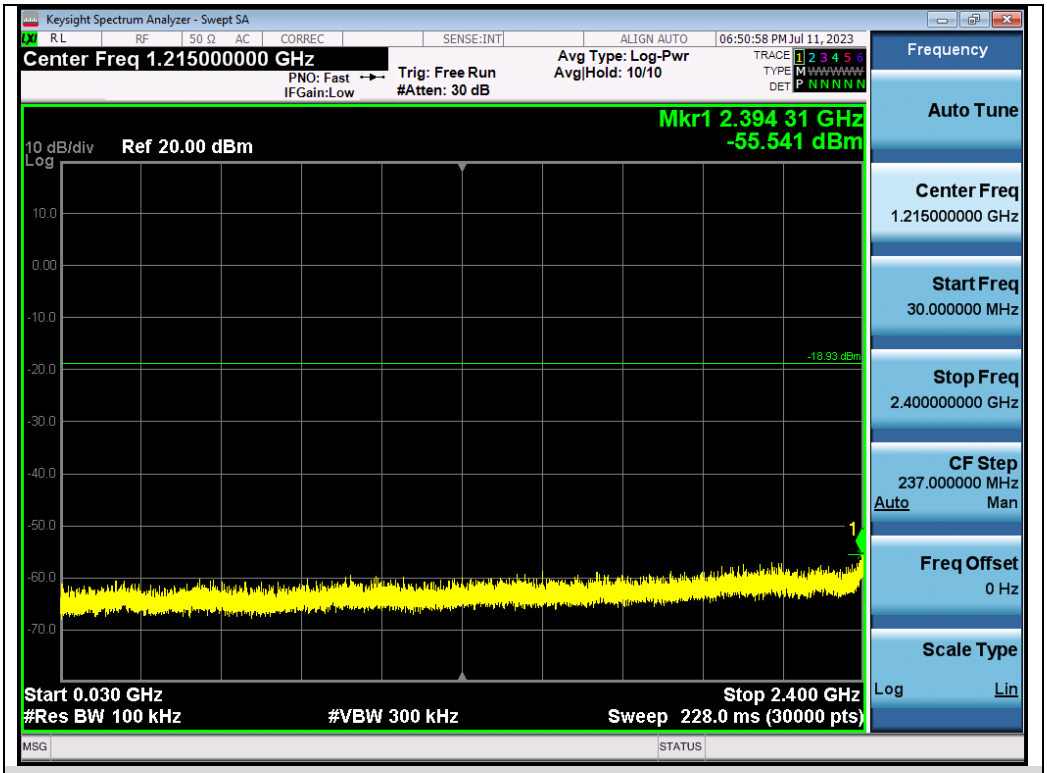
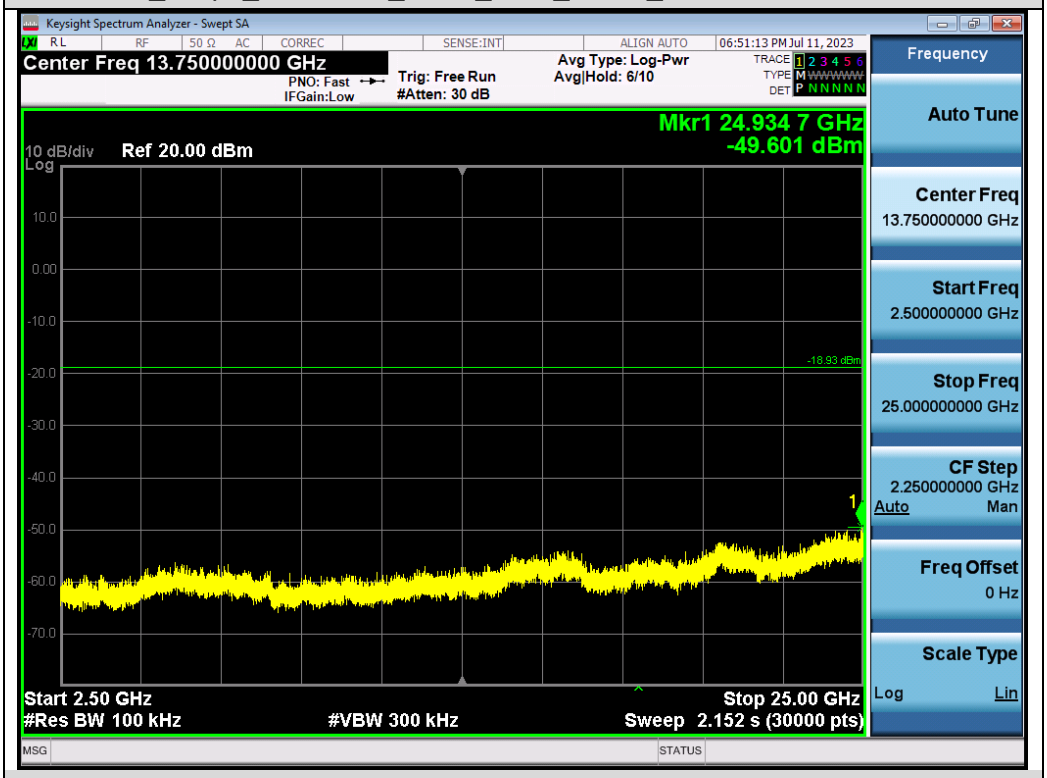


Test_Graph_802.11n20_ANT1_2462_MCS0_Lower Band Emissions



Test_Graph_802.11n20_ANT1_2462_MCS0_Higher Band Emissions

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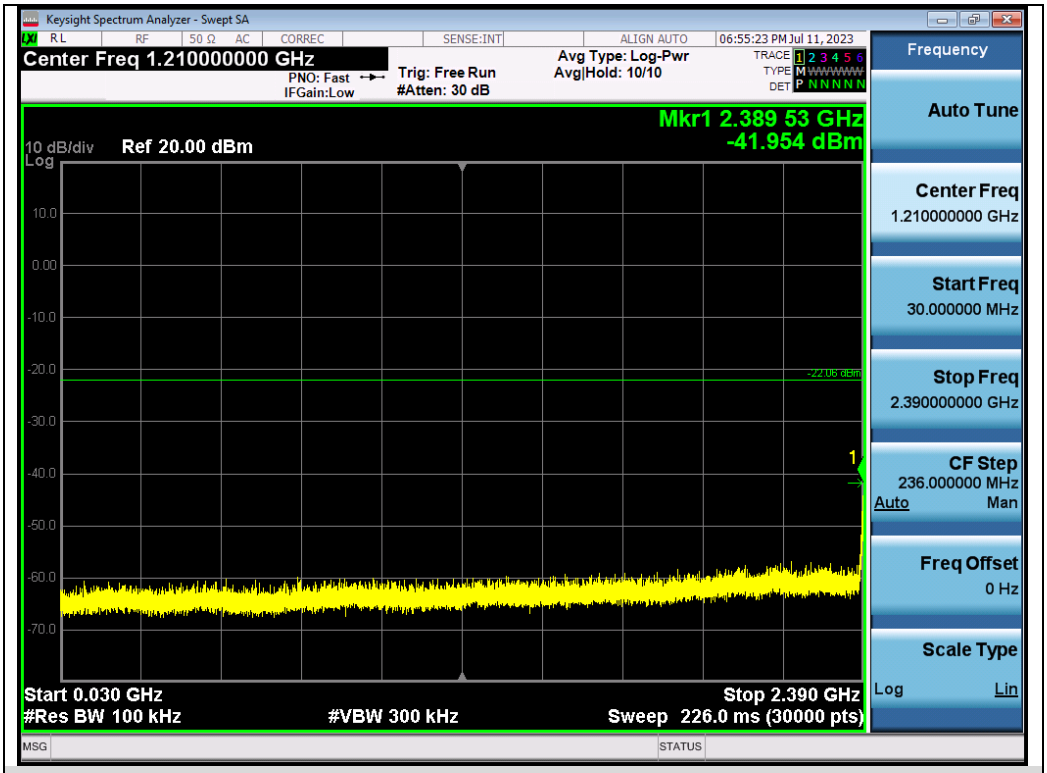
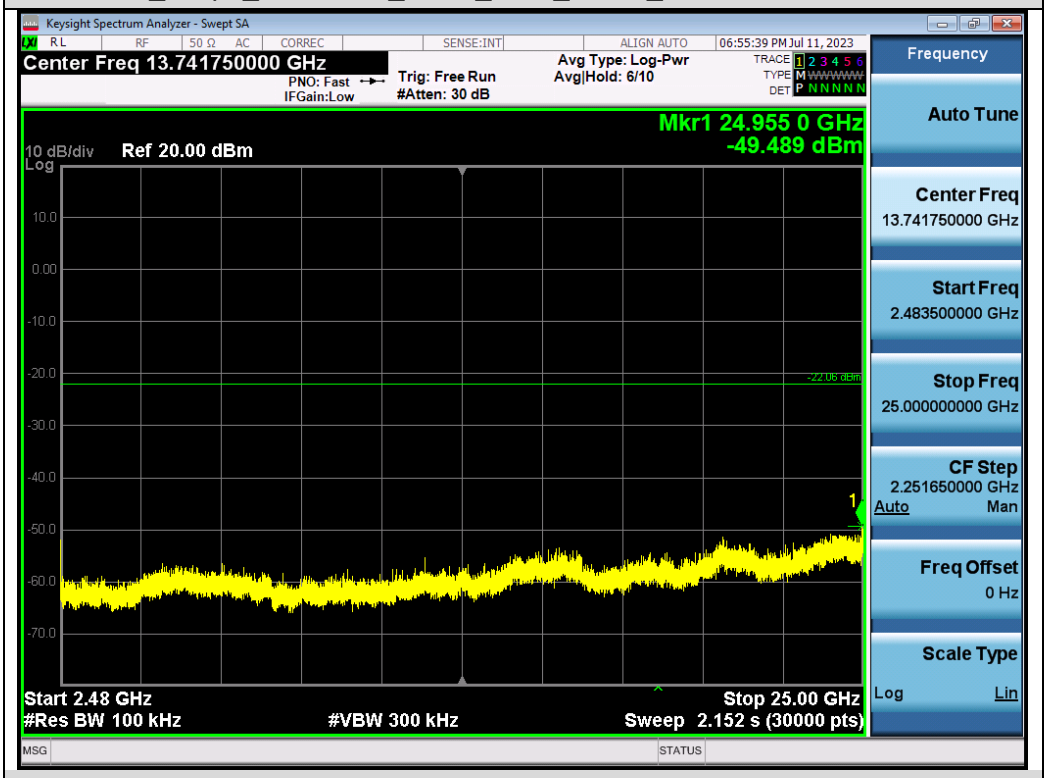


Test_Graph_802.11n40_ANT1_2422_MCS0_Lower Band Emissions



Test_Graph_802.11n40_ANT1_2422_MCS0_Higher Band Emissions

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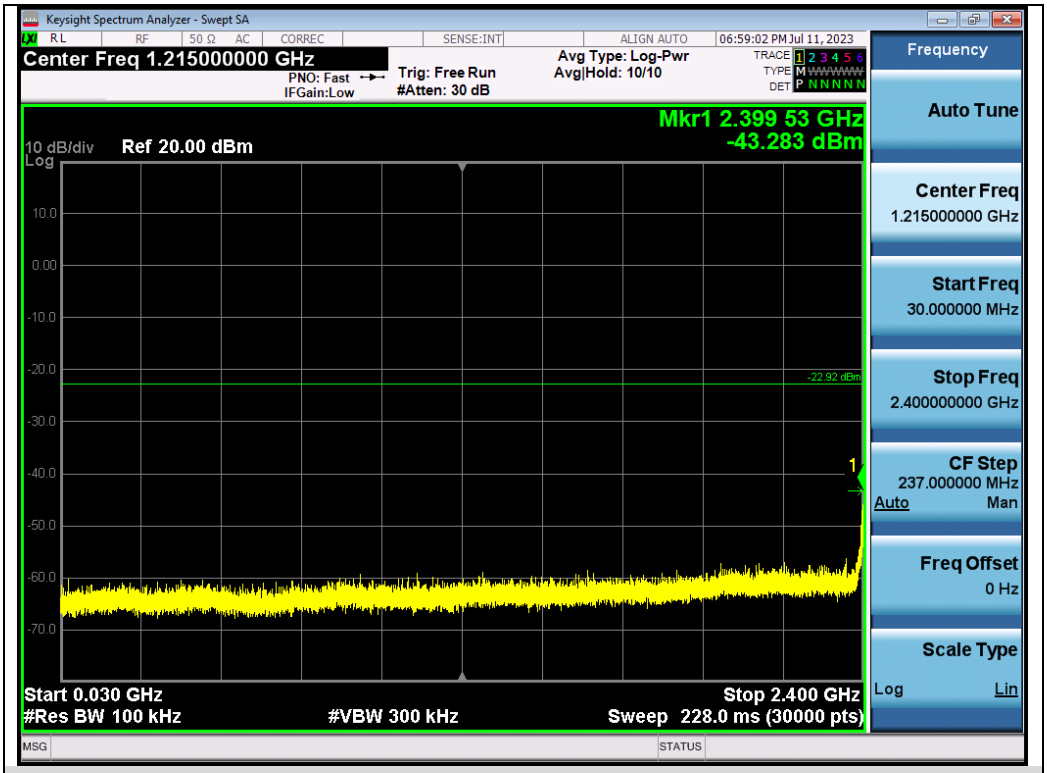
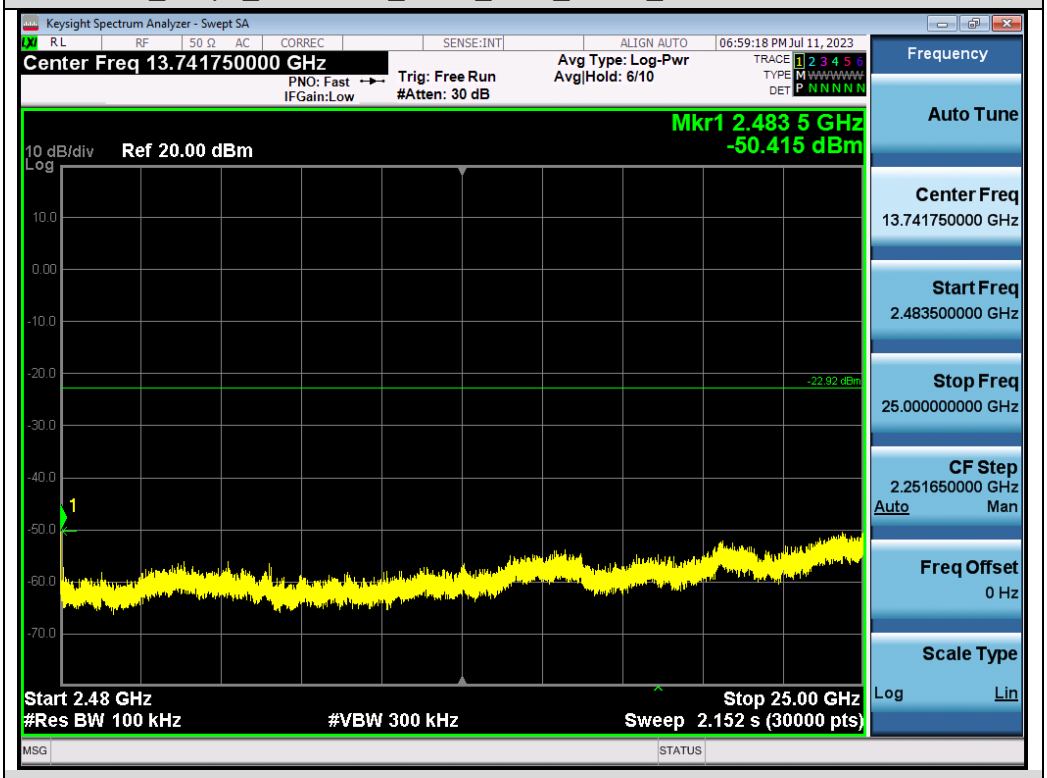


Test_Graph_802.11n40_ANT1_2437_MCS0_Lower Band Emissions



Test_Graph_802.11n40_ANT1_2437_MCS0_Higher Band Emissions

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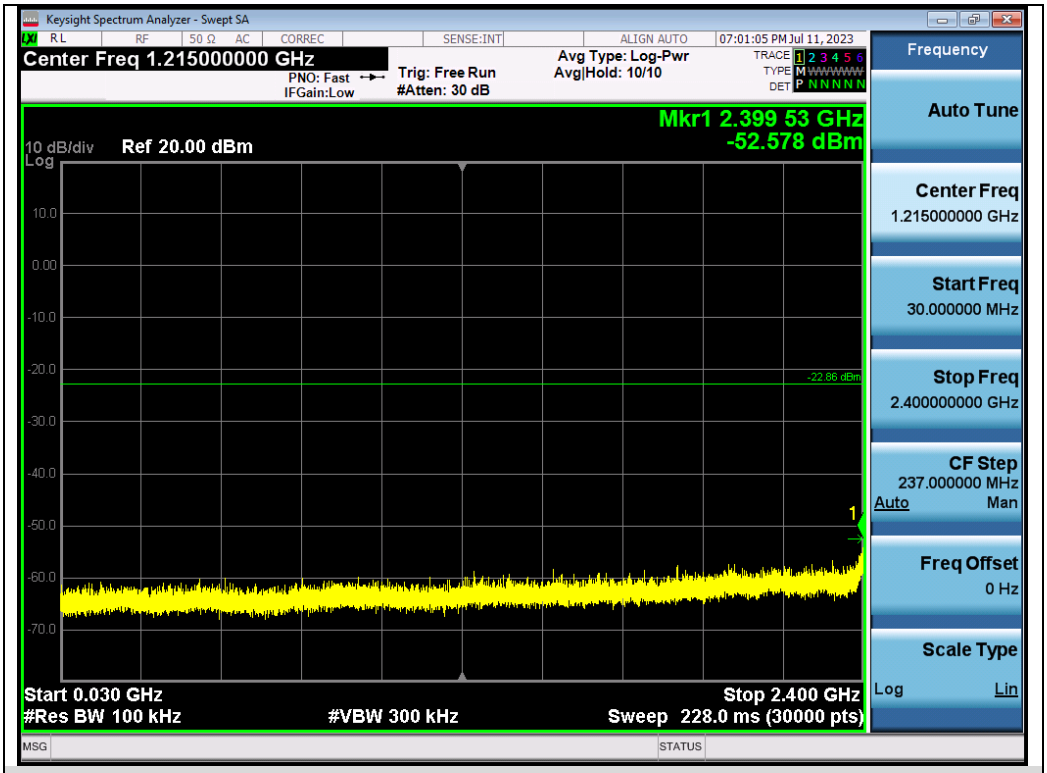
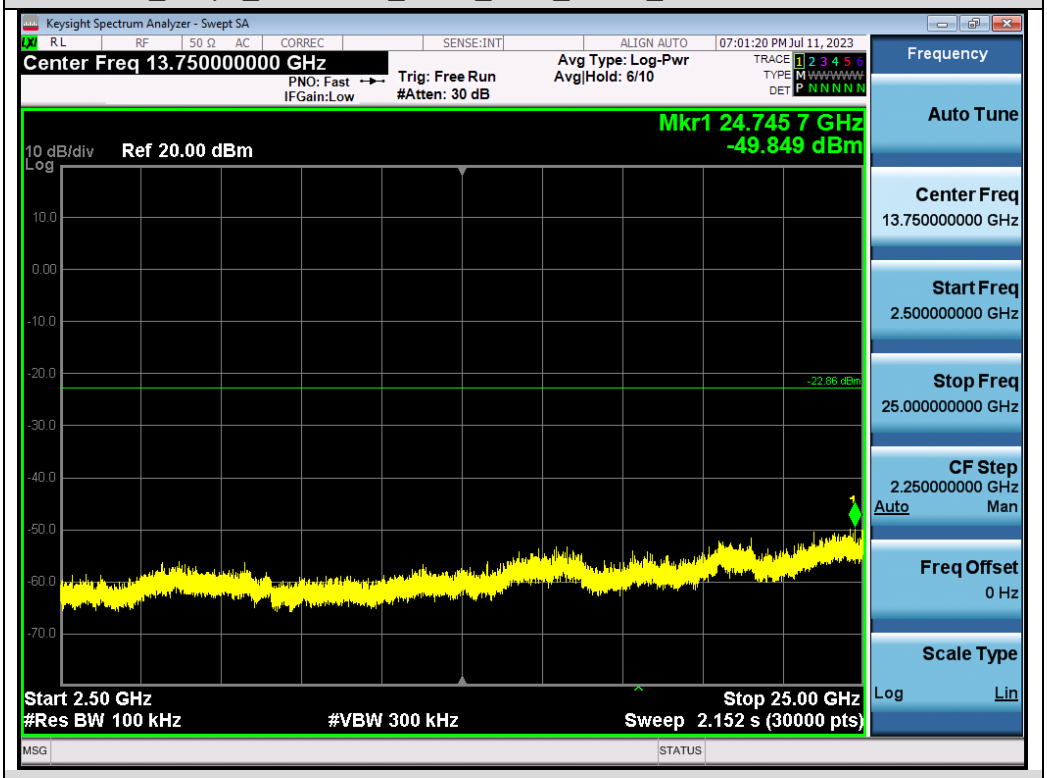


Test_Graph_802.11n40_ANT1_2452_MCS0_Lower Band Emissions



Test_Graph_802.11n40_ANT1_2452_MCS0_Higher Band Emissions

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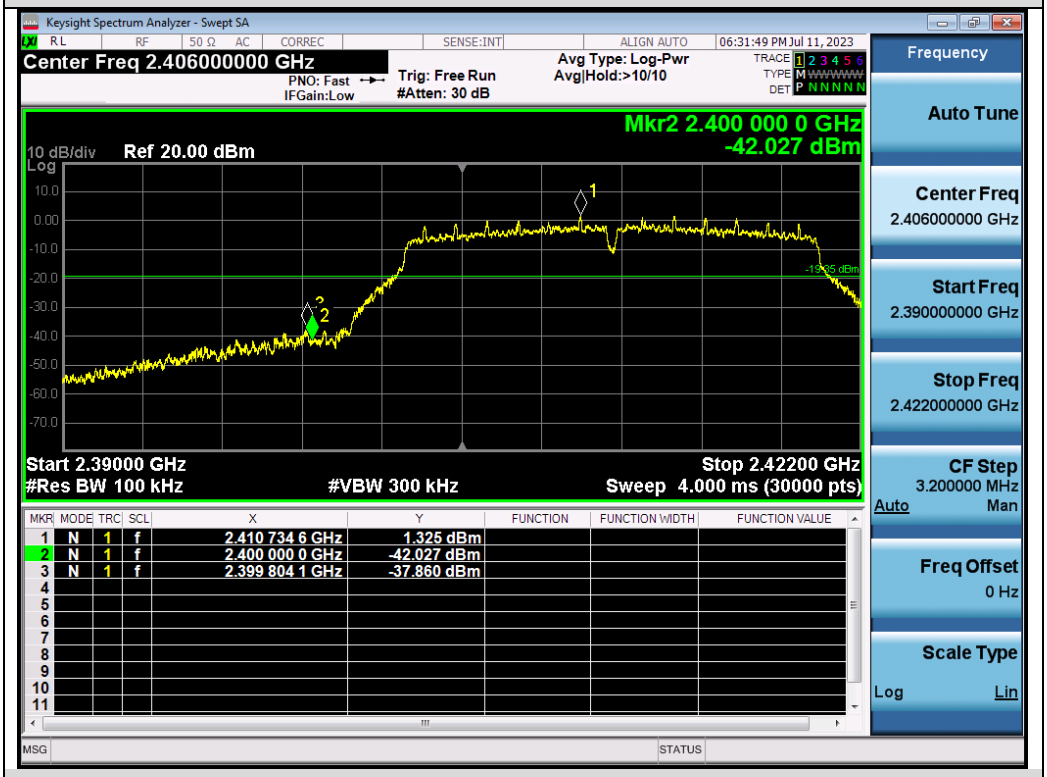
Test Graphs of Band Edge Emissions in Non-Restricted Frequency Bands

Test_Graph_802.11b_ANT1_2412_1Mbps_Lower Band Edge Emissions



Test_Graph_802.11g_ANT1_2412_6Mbps_Lower Band Edge Emissions

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Test_Graph_802.11n20_ANT1_2412_MCS0_Lower Band Edge Emissions

Test_Graph_802.11n40_ANT1_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.

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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
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 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.
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.

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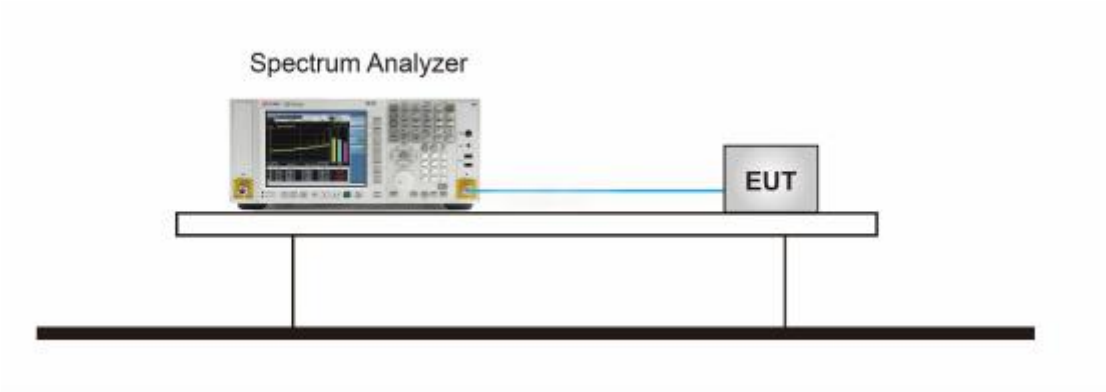
10.3 MEASUREMENT SETUP (BLOCK DIAGRAM OF CONFIGURATION)



10.4 MEASUREMENT RESULT

Test Data of Conducted Output Power Spectral Density					
Test Mode	Test Channel (MHz)	Power density (dBm/20kHz)	Power density (dBm/3kHz)	Limit (dBm/3kHz)	Pass or Fail
802.11b	2412	-2.034	-10.273	≤8	Pass
	2437	-2.349	-10.588	≤8	Pass
	2462	-2.692	-10.931	≤8	Pass
802.11g	2412	-3.955	-12.194	≤8	Pass
	2437	-5.474	-13.713	≤8	Pass
	2462	-5.604	-13.843	≤8	Pass
802.11n20	2412	-3.852	-12.091	≤8	Pass
	2437	-4.102	-12.341	≤8	Pass
	2462	-4.250	-12.489	≤8	Pass
802.11n40	2422	-7.509	-15.748	≤8	Pass
	2437	-8.710	-16.949	≤8	Pass
	2452	-8.358	-16.597	≤8	Pass

Note: Power density(dBm/3kHz) = Power density(dBm/20kHz) – 10*log(20/3).

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Test Graphs of Conducted Output Power Spectral Density

Test_Graph_802.11b_ANT1_2412_1Mbps_PSD

Test_Graph_802.11b_ANT1_2437_1Mbps_PSD

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Test_Graph_802.11b_ANT1_2462_1Mbps_PSD

Test_Graph_802.11g_ANT1_2412_6Mbps_PSD

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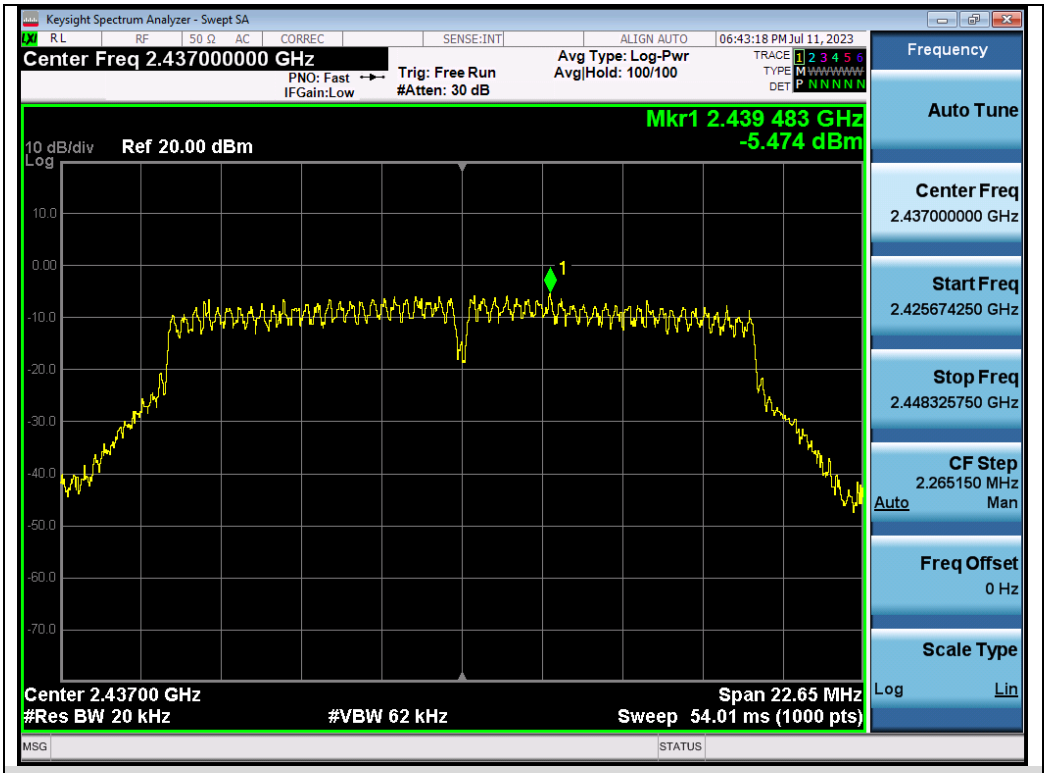

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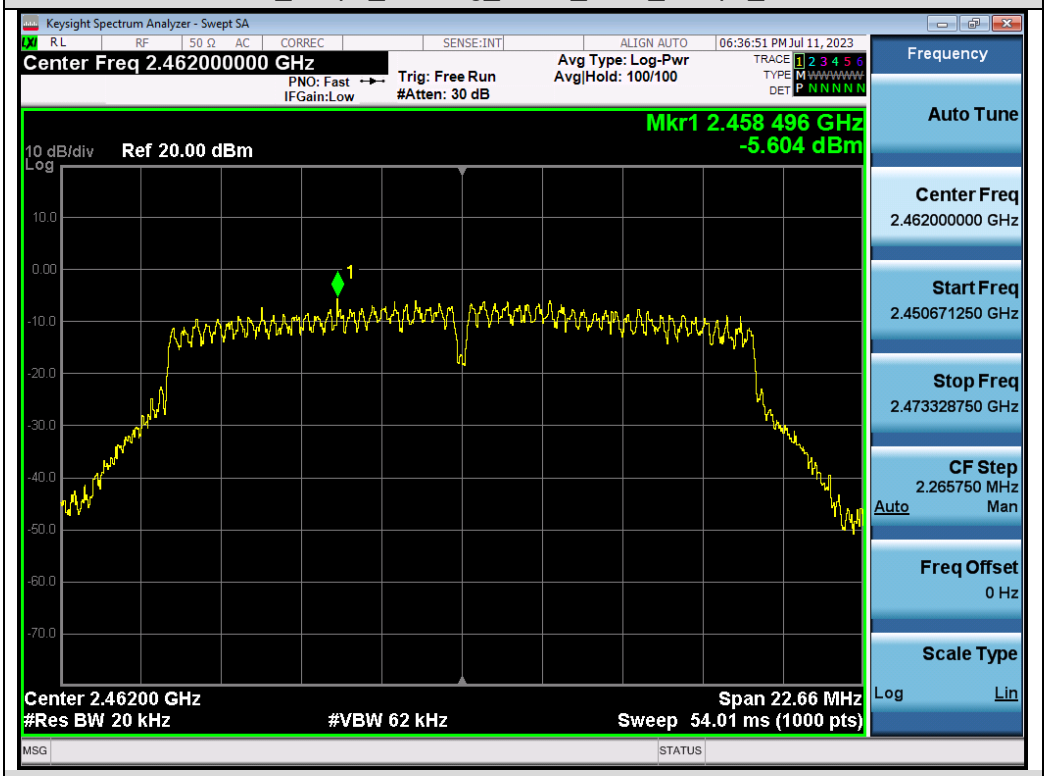

Test_Graph_802.11g_ANT1_2462_6Mbps_PSD

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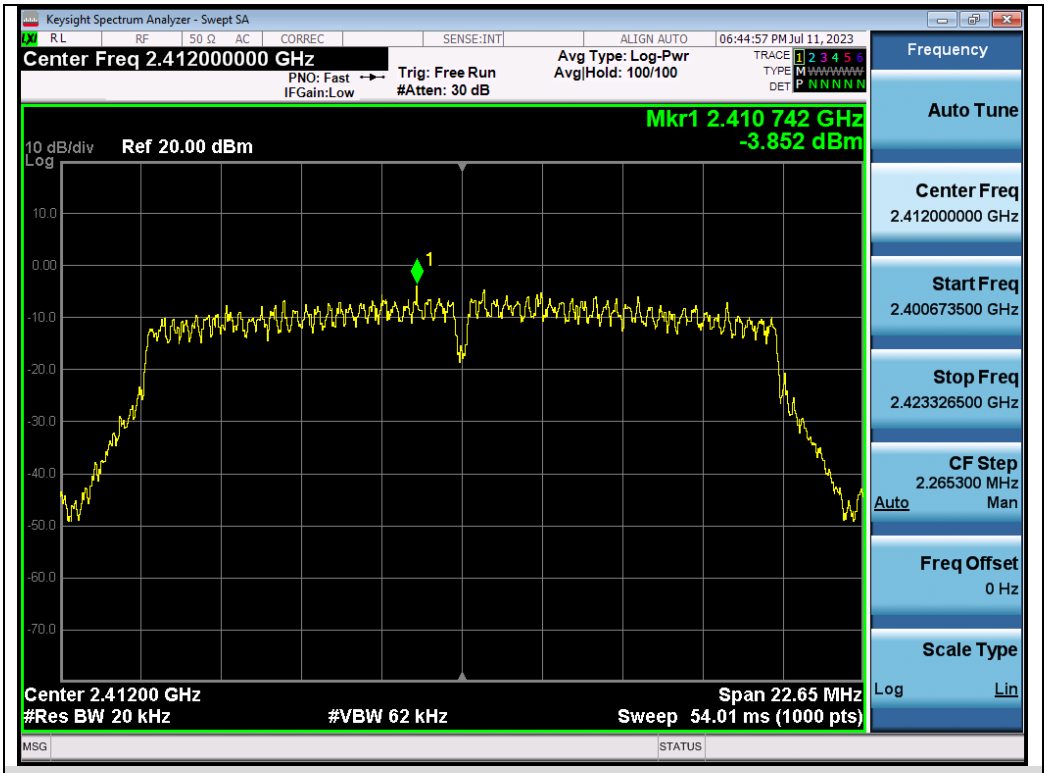

Test_Graph_802.11n20_ANT1_2412_MCS0_PSD

Test_Graph_802.11n20_ANT1_2437_MCS0_PSD

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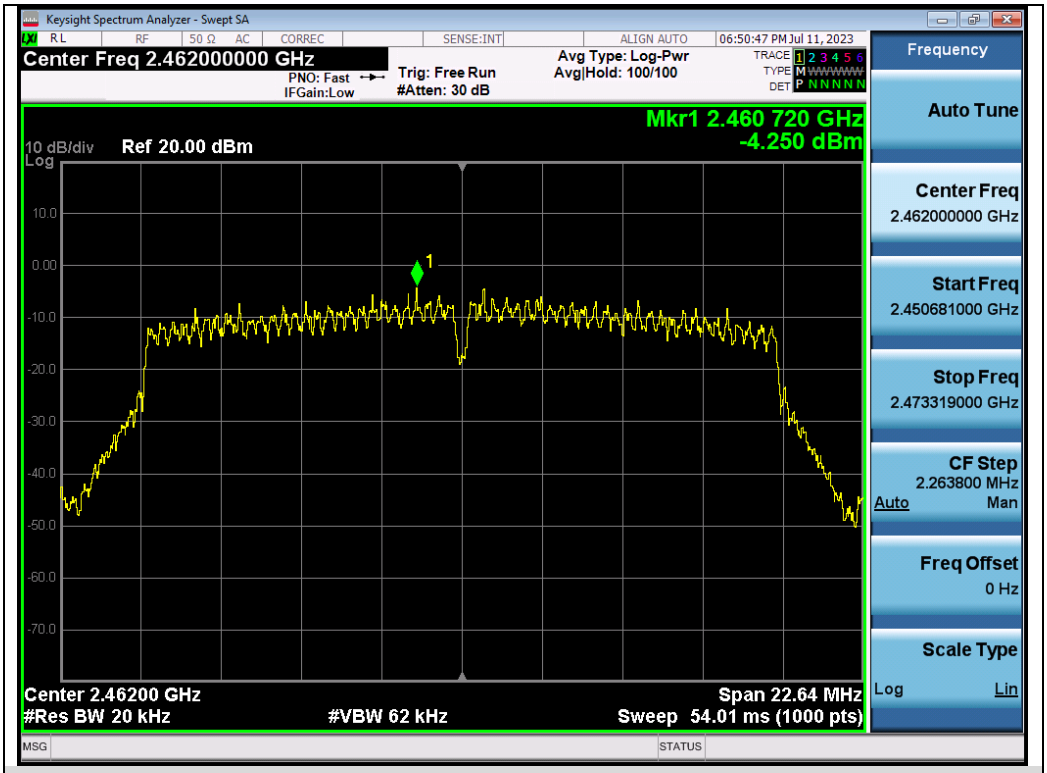
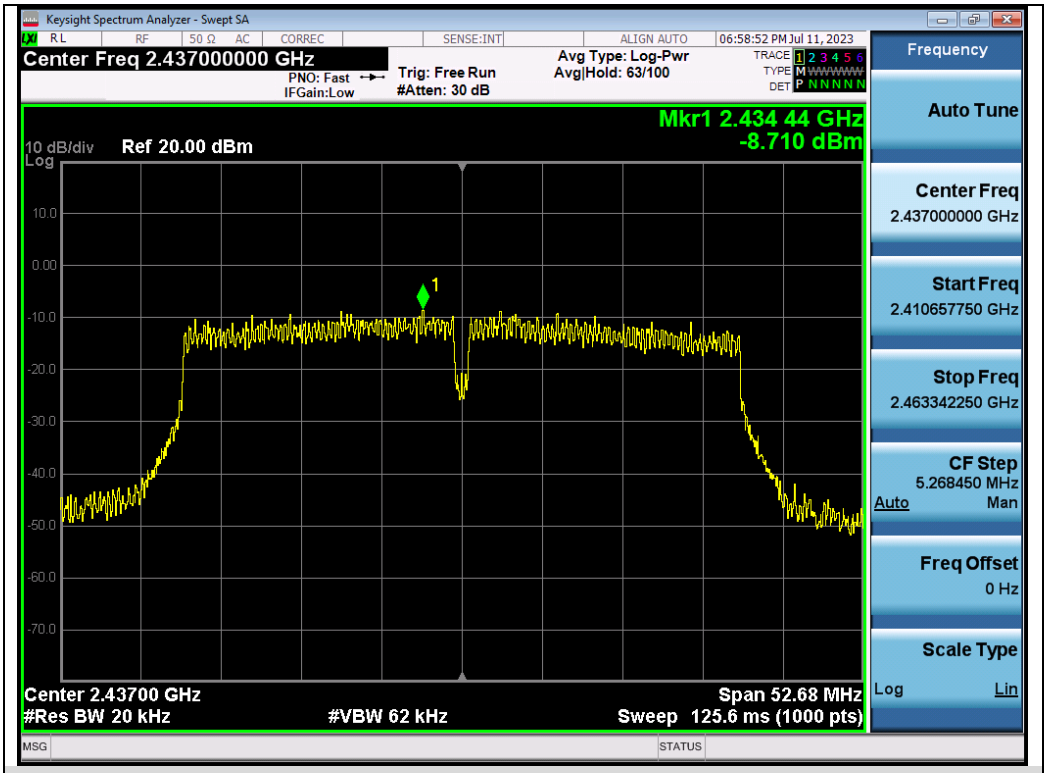


Test_Graph_802.11n20_ANT1_2462_MCS0_PSD

Test_Graph_802.11n40_ANT1_2422_MCS0_PSD

Any report having not been signed by authorized approver, or having been altered without authorization, or having not been stamped by the "Dedicated Testing/Inspection Stamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the written authorization of AGC. The test results presented in the report apply only to the tested sample. Any objections to report issued by AGC should be submitted to AGC within 15days after the issuance of the test report. Further enquiry of validity or verification of the test report should be addressed to AGC by agc01@agccert.com.



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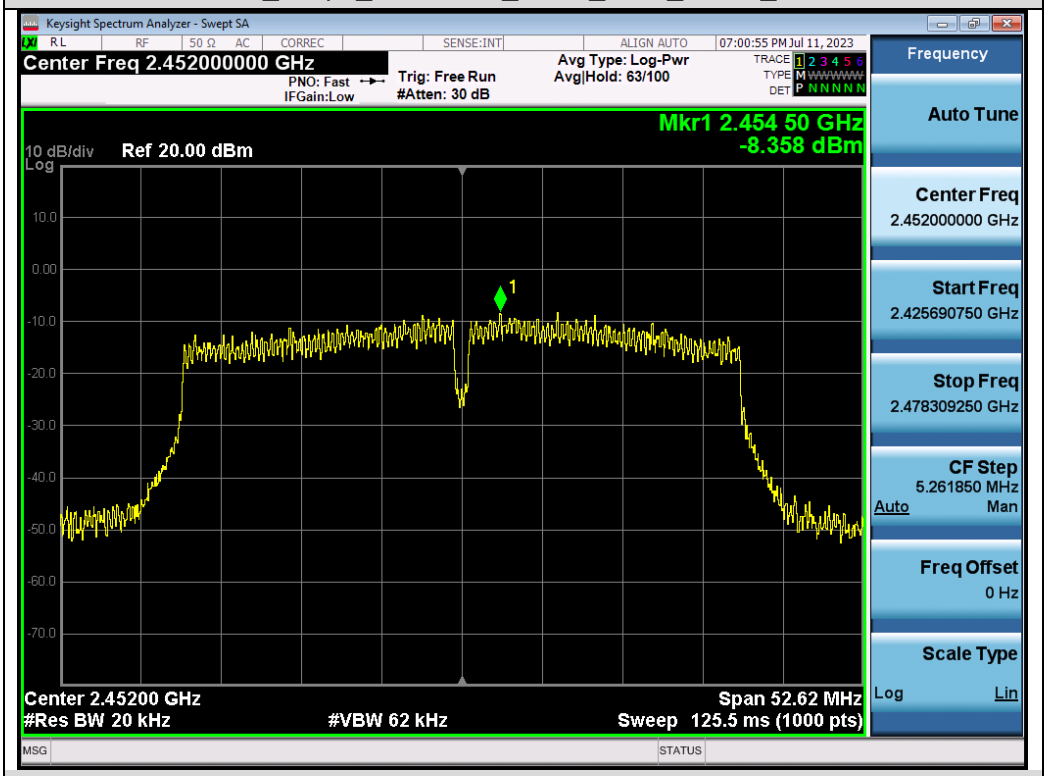

Test_Graph_802.11n40_ANT1_2452_MCS0_PSD

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11. RADIATED EMISSION

11.1 MEASUREMENT LIMITS

15.209(a) Limit in the below table has to be followed

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Note: All modes were tested for restricted band radiated emission, the test records reported below are the worst result compared to other modes.

11.2 MEASUREMENT PROCEDURE

1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emission, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz RBW and 3MHz VBW for peak reading. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds.

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As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.

8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP
Start ~Stop Frequency	1GHz~26.5GHz 1MHz/3MHz for Peak, 1MHz/3MHz for Average

Receiver Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP

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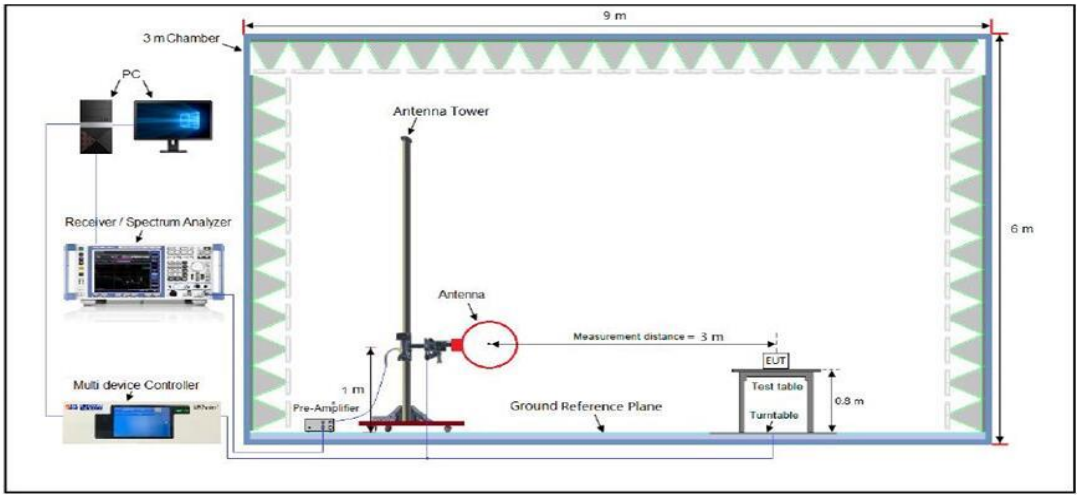
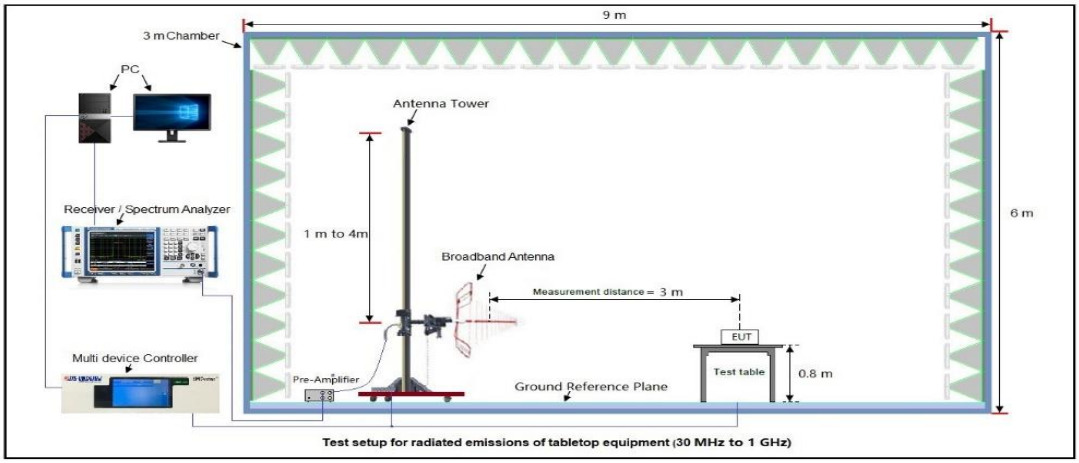
11.3 MEASUREMENT SETUP (BLOCK DIAGRAM OF CONFIGURATION)

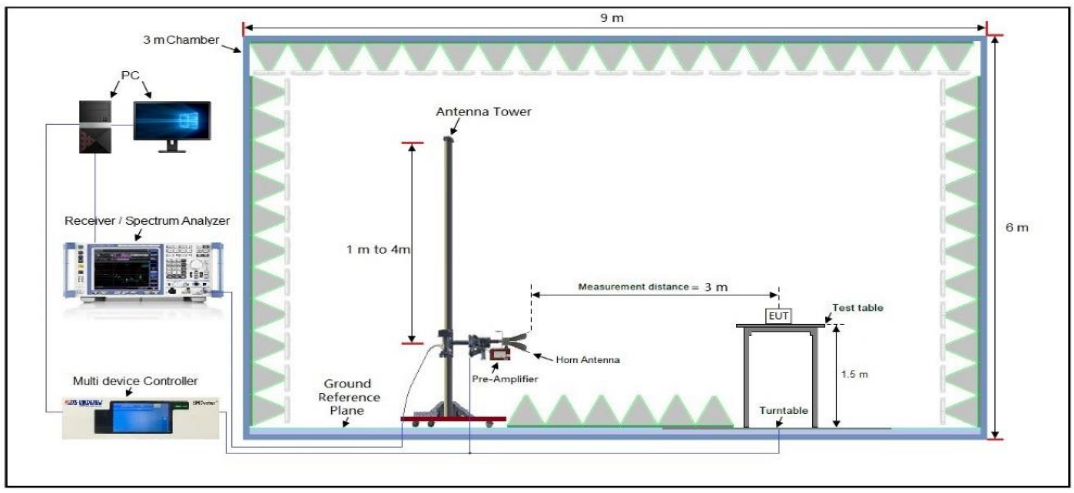
RADIATED EMISSION TEST SETUP 9KHz-30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



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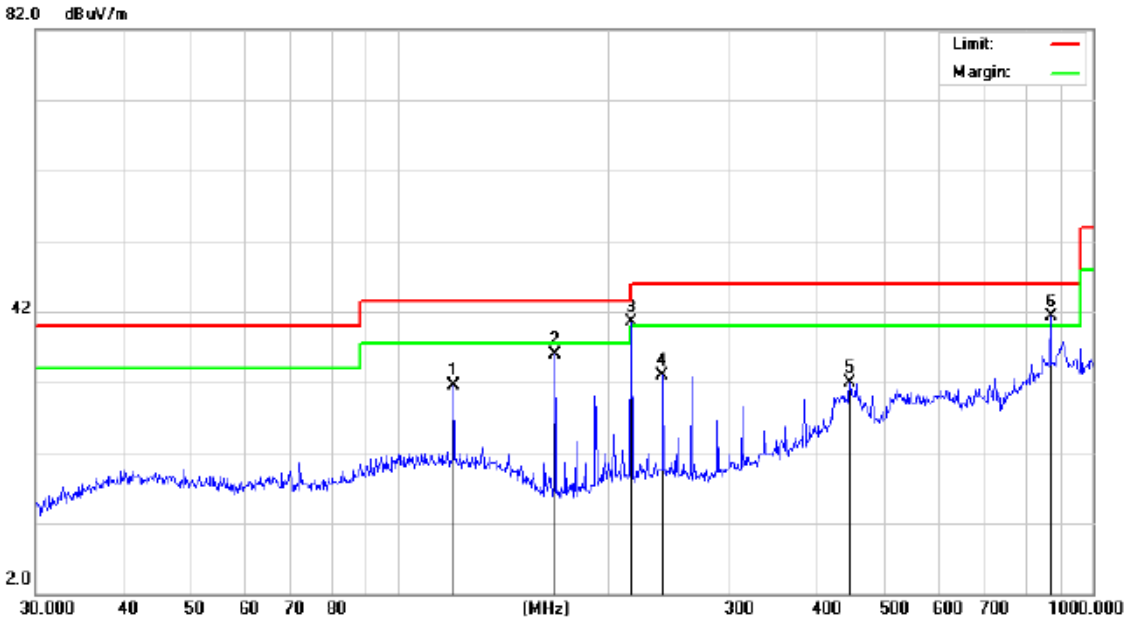
11.4 MEASUREMENT RESULT

Radiated emission below 30MHz

The amplitude of spurious emissions from 9kHz to 30MHz which are attenuated more than 20 dB below the permissible value need not be reported.

Radiated emission from 30MHz to 1000MHz

EUT	Video Door Bell	**Model Name**	A1
Temperature	25°C	**Relative Humidity**	58%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	802.11b with 2412MHz	**Antenna**	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		119.8555	15.12	16.40	31.52	43.50	-11.98	peak
2		167.8240	23.62	12.20	35.82	43.50	-7.68	peak
3	!	216.0240	26.15	14.42	40.57	46.00	-5.43	peak
4		239.9874	17.55	15.40	32.95	46.00	-13.05	peak
5		446.4141	7.10	24.88	31.98	46.00	-14.02	peak
6	*	869.1299	12.03	29.19	41.22	46.00	-4.78	peak

RESULT: PASS

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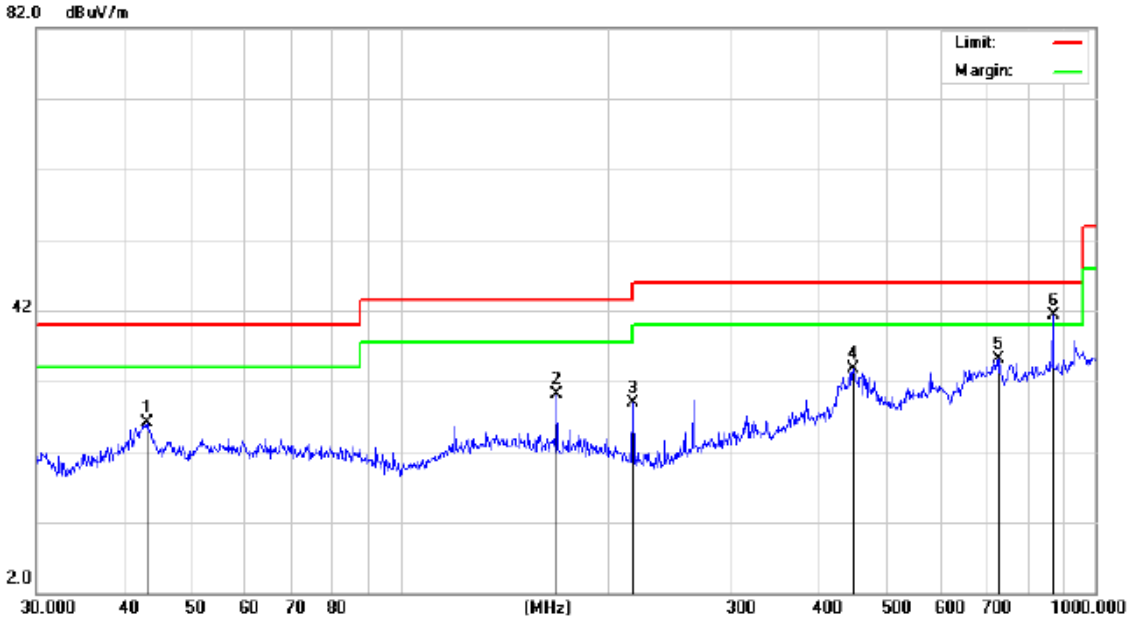
EUT	Video Door Bell	**Model Name**	A1
Temperature	25°C	**Relative Humidity**	58%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	802.11b with 2412MHz	**Antenna**	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		43.3534	9.12	16.93	26.05	40.00	-13.95	peak
2		167.8240	11.81	18.32	30.13	43.50	-13.37	peak
3		216.0240	12.25	16.70	28.95	46.00	-17.05	peak
4		447.9821	7.98	25.74	33.72	46.00	-12.28	peak
5		726.8052	6.89	28.15	35.04	46.00	-10.96	peak
6	*	869.1299	13.51	27.73	41.24	46.00	-4.76	peak

RESULT: PASS

Note: 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.

2. The “Factor” value can be calculated automatically by software of measurement system.

3. All test modes had been pre-tested. The 802.11b mode is the worst case and recorded in the report.

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Radiated emission above 1GHz

EUT	Video Door Bell	**Model Name**	A1
Temperature	25°C	**Relative Humidity**	58%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	802.11b with date rate 1_2412MHz	**Antenna**	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4824.000	52.42	0.08	52.50	74.00	-21.50	peak
4824.000	43.46	0.08	43.54	54.00	-10.46	AVG
7236.000	50.37	2.21	52.58	74.00	-21.42	peak
7236.000	41.17	2.21	43.38	54.00	-10.62	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	Video Door Bell	**Model Name**	A1
Temperature	25°C	**Relative Humidity**	58%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	802.11b with date rate 1_2412MHz	**Antenna**	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4824.000	50.77	0.08	50.85	74.00	-23.15	peak
4824.000	42.69	0.08	42.77	54.00	-11.23	AVG
7236.000	49.42	2.21	51.63	74.00	-22.37	peak
7236.000	40.79	2.21	43.00	54.00	-11.00	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

RESULT: PASS

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EUT	Video Door Bell	**Model Name**	A1
Temperature	25°C	**Relative Humidity**	58%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	802.11b with date rate 1_2437MHz	**Antenna**	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4874.000	52.89	0.14	53.03	74.00	-20.97	peak
4874.000	37.95	0.14	38.09	54.00	-15.91	AVG
7311.000	51.39	2.36	53.75	74.00	-20.25	peak
7311.000	35.81	2.36	38.17	54.00	-15.83	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	Video Door Bell	**Model Name**	A1
Temperature	25°C	**Relative Humidity**	58%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	802.11b with date rate 1_2437MHz	**Antenna**	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4874.000	50.97	0.14	51.11	74.00	-22.89	peak
4874.000	38.36	0.14	38.50	54.00	-15.50	AVG
7311.000	50.72	2.36	53.08	74.00	-20.92	peak
7311.000	36.61	2.36	38.97	54.00	-15.03	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

RESULT: PASS

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EUT	Video Door Bell	**Model Name**	A1
Temperature	25°C	**Relative Humidity**	58%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	802.11b with date rate 1_2462MHz	**Antenna**	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4924.000	51.39	0.22	51.61	74.00	-22.39	peak
4924.000	42.16	0.22	42.38	54.00	-11.62	AVG
7386.000	48.37	2.64	51.01	74.00	-22.99	peak
7386.000	39.69	2.64	42.33	54.00	-11.67	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	Video Door Bell	**Model Name**	A1
Temperature	25°C	**Relative Humidity**	58%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	802.11b with date rate 1_2462MHz	**Antenna**	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4924.000	49.76	0.22	49.98	74.00	-24.02	peak
4924.000	41.22	0.22	41.44	54.00	-12.56	AVG
7386.000	47.43	2.64	50.07	74.00	-23.93	peak
7386.000	38.65	2.64	41.29	54.00	-12.71	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

RESULT: PASS

Note:

The amplitude of other spurious emissions from 1G to 25 GHz which are attenuated more than 20 dB below the permissible value need not be reported.

Factor = Antenna Factor + Cable loss - Amplifier gain, Over= Limit-Measure.

The “Factor” value can be calculated automatically by software of measurement system.

All test modes had been pre-tested. The 802.11b mode is the worst case and recorded in the report.

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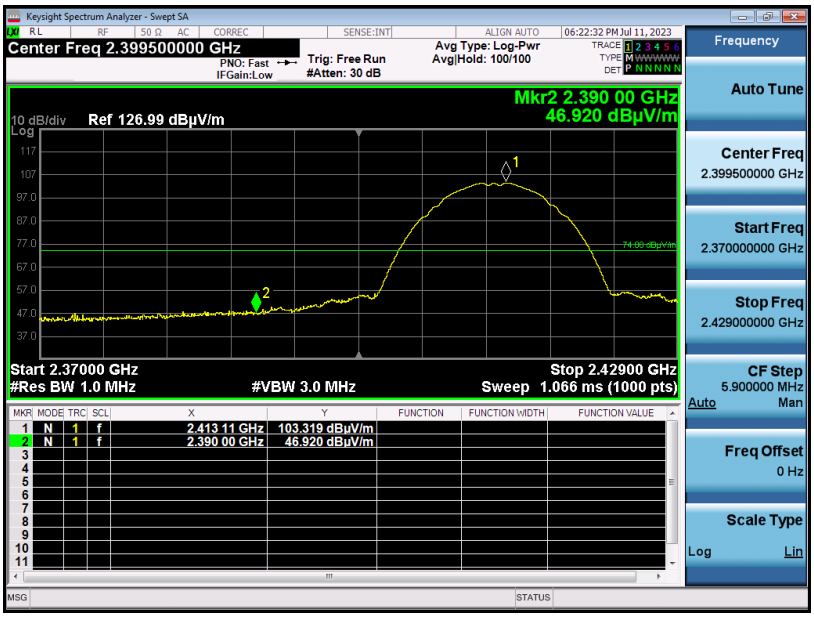
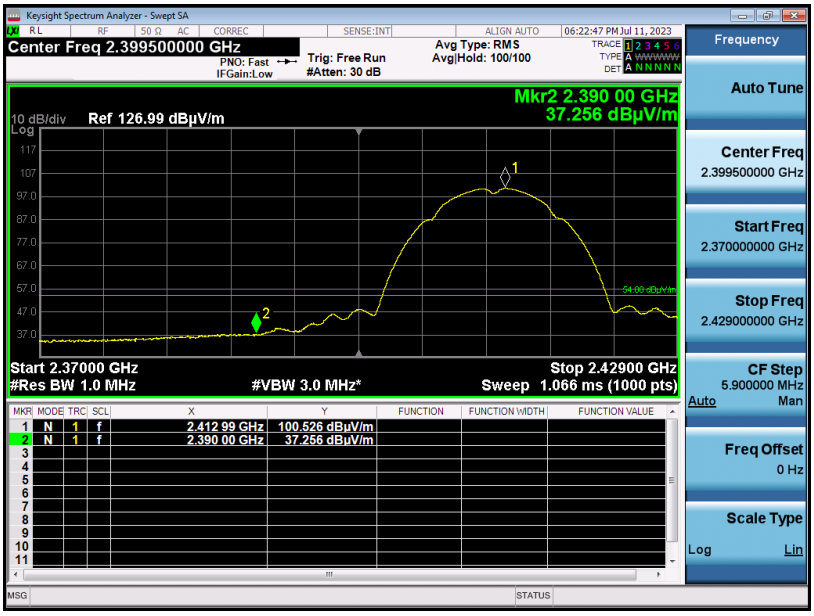
Test result for band edge emission at restricted bands

EUT	Video Door Bell	**Model Name**	A1
Temperature	25°C	**Relative Humidity**	60%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	802.11b with date rate 1_2412MHz	**Antenna**	Horizontal

Test Graph for Peak Measurement



Test Graph for Average Measurement



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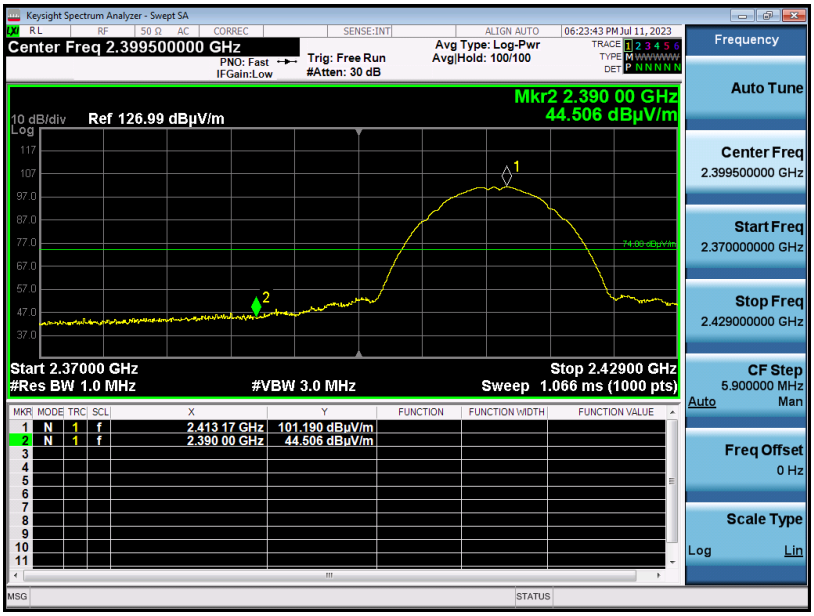
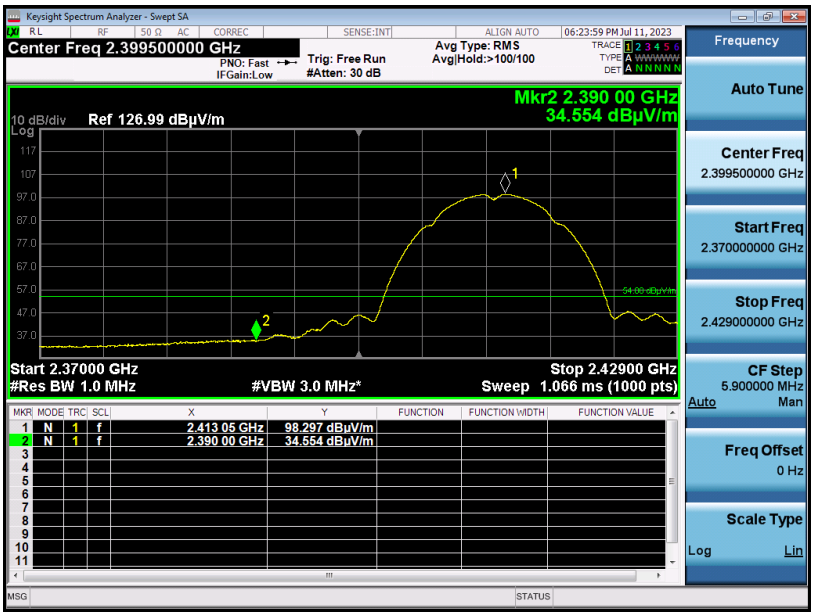
EUT	Video Door Bell	**Model Name**	A1
Temperature	25°C	**Relative Humidity**	60%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	802.11b with date rate 1_2412MHz	**Antenna**	Vertical

Test Graph for Peak Measurement



Test Graph for Average Measurement



RESULT: PASS

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