Element Suwon
13, Heungdeok 1-ro, Giheung-gu, Yongin-si,
Gyeonggi-do, 16954 South Korea
Tel. 031.660.7319 / Fax 031.660.7318
http://www.element.com

MEASUREMENT REPORT
FCC PART 15.247 WLAN OFDMA

Applicant Name:
Samsung Electronics Co., Ltd.
129, Samsung-ro,
Yeongtong-gu, Suwon-si
Gyeonggi-do, 16677, Korea

Date of Testing:
04/03/2023 - 05/18/2023
Test Report Issue Date:
05/19/2023
Test Site/Location:
Element Lab. Yongin-Si, Gyeonggi-do, South Korea
Test Report Serial No.:
1M2303200036-05.A3L

FCC ID:	**A3LSMX910**
IC:	**649E-SMX910**
APPLICANT:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model/HVIN:	SM-X910
EUT Type:	Portable Tablet
Frequency Range:	2412 – 2472MHz
Modulation Type:	OFDMA
FCC Classification:	Digital Transmission System (DTS)
FCC Rule Part(s):	Part 15 Subpart C (15.247)
ISED Specification:	RSS-247 Issue 2
Test Procedure(s):	ANSI C63.10-2013, KDB 558074 D01 v05r02, KDB 662911 D01 v02r01

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Prepared by

Reviewed by

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MEASUREMENT REPORT

Mode	Tones	Tx Frequency [MHz]	ANT2				MIMO			
			Avg Conducted		Peak Conducted		Avg Conducted		Peak Conducted	
			Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)
802.11ax OFDMA	26T	2412 - 2472	9.750	9.89	34.995	15.44	19.891	12.99	89.834	19.53
802.11ax OFDMA	52T	2412 - 2472	19.815	12.97	75.858	18.80	39.527	15.97	171.179	22.33
802.11ax OFDMA	106T	2412 - 2472	30.620	14.86	109.144	20.38	62.907	17.99	263.037	24.20
802.11ax OFDMA	242T	2412 - 2472	59.704	17.76	262.422	24.19	116.973	20.68	394.971	25.97

EUT Overview

1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.

1.1 Element Test Location

These measurement tests were conducted at the Element Suwon Laboratory located at 13, Heungdeok 1-ro, Giheung-gu, Yongin-si, Gyeonggi-do, 16954, South Korea. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

1.2 Test Facility / Accreditations

Measurements were performed at Element Materials Technology Suwon, Ltd. located in Yongin-si, Gyeonggi-do, 16954, South Korea.

- Element Materials Technology Suwon, Ltd. is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation(A2LA) with Certificate number 2041.04 for Specific Absorption Rate (SAR), and Electromagnetic Compatibility (EMC) & Telecommunications testing for FCC and Innovation, Science, and Economic Development Canada rules.

- Element Materials Technology Suwon, Ltd. facility is accredited, designated, and recognized in accordance with the provision of Radio Wave Act and International Standard ISO/IEC 17025:2017 under the National Radio Research Agency.

  - Designation Number / CABID: KR0169
  - Test Firm Registration Number of FCC: 417945
  - Test Firm Registration Number of ISED: 26168

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Tablet FCC ID: A3LSMX910, IC: 649E-SMX910**. The test data contained in this report pertains only to the emissions due to the EUT's WLAN (DTS) transmitter.

Test Device Serial No.: 0150M, 4628G, 3657M

2.2 Device Capabilities

This device contains the following capabilities:

802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII (5 and 6 GHz), Bluetooth (1x, EDR, LE), Wireless Power Transfer

Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	12	2467
6	2437	13	2472
7	2442		

Table 2-1. Frequency/ Channel Operations

Notes:

1. 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, and detector = peak per the guidance of Section 6.0 b) of ANSI C63.10-2013 and KDB 558074 D01 v05r02. 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:

Mode	Antenna	Tone	Duty Cycle
802.11ax DTS RU	2	26T	99.6
		52T	99.5
		106T	98.9
		242T	98.0
802.11ax DTS RU	MIMO CDD	26T	99.1
		52T	99.1
		106T	98.3
		242T	96.8

Table 2-2. Measured Duty Cycles

2. The device employs MIMO technology. Below are the possible configurations.

WiFi Configurations		SISO		SDM		CDD	
		ANT1	ANT2	ANT1	ANT2	ANT1	ANT2
2.4GHz	11ax	×	✓	✓	✓	✓	✓

Table 2-3. Antenna Configuration

✓= Support ; × = NOT Support
SISO = Single Input Single Output
SDM = Spatial Diversity Multiplexing – MIMO function
CDD = Cyclic Delay Diversity - 2Tx Function

3. The device supports the following data rates (shown in Mbps):

MCS Index	Spatial Stream	OFDMA (802.11ax)											
		26T			52T			106T			242T		
HE		0.8µs GI	1.6µs GI	3.2µs GI	0.8µs GI	1.6µs GI	3.2µs GI	0.8µs GI	1.6µs GI	3.2µs GI	0.8µs GI	1.6µs GI	3.2µs GI
0	1	0.9	0.8	0.8	1.8	1.7	1.5	3.8	3.5	3.2	8.6	8.1	7.3
1	1	1.8	1.7	1.5	3.5	3.3	3	7.5	7.1	6.4	17.2	16.3	14.6
2	1	2.6	2.5	2.3	5.3	5	4.5	11.3	10.6	9.6	25.8	24.4	21.9
3	1	3.5	3.3	3	7.1	6.7	6	15	14.2	12.8	34.4	32.5	29.3
4	1	5.3	5	4.5	10.6	10	9	22.5	21.3	19.1	51.6	48.8	43.9
5	1	7.1	6.7	6	14.1	13.3	12	30	28.3	25.5	68.8	65	58.5
6	1	7.9	7.5	6.8	15.9	15	13.5	33.8	31.9	28.7	77.4	73.1	65.8
7	1	8.8	8.3	7.5	17.6	16.7	15	37.5	35.4	31.9	86	81.3	73.1
8	1	10.6	10	9	21.2	20	18	45	42.5	38.3	103.2	97.5	87.8
9	1	11.8	11.1	10	23.5	22.2	20	50	47.2	42.5	114.7	108.3	97.5
10	1	13.2	12.5	11.3	26.5	25	22.5	56.3	53.1	47.8	129	121.9	109.7
11	1	14.7	13.9	12.5	29.4	27.8	25	62.5	59	53.1	143.4	135.4	121.9
0	2	1.8	1.7	1.5	3.5	3.3	3	7.5	7.1	6.4	17.2	16.3	14.6
1	2	3.5	3.3	3	7.1	6.7	6	15	14.2	12.8	34.4	32.5	29.3
2	2	5.3	5	4.5	10.6	10	9	22.5	21.3	19.1	51.6	48.8	43.9
3	2	7.1	6.7	6	14.1	13.3	12	30	28.3	25.5	68.8	65	58.5
4	2	10.6	10	9	21.2	20	18	45	42.5	38.3	103.2	97.5	87.8
5	2	14.1	13.3	12	28.2	26.7	24	60	56.7	51	137.6	130	117
6	2	15.9	15	13.5	31.8	30	27	67.5	63.8	57.4	154.9	146.3	131.6
7	2	17.6	16.7	15	35.3	33.3	30	75	70.8	63.8	172.1	162.5	146.3
8	2	21.2	20	18	42.4	40	36	90	85	76.5	206.5	195	175.5
9	2	23.5	22.2	20	47.1	44.4	40	100	94.4	85	229.4	216.7	195
10	2	26.5	25	22.5	52.9	50	45	112.5	106.3	95.6	258.1	243.8	219.4
11	2	29.4	27.8	25	58.8	55.6	50	125	118.1	106.3	286.8	270.8	243.8

Table 2-4. Supported Data Rates

2.3 Test Configuration

ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing. See Sections 7.7 for radiated emissions test setups, and 7.2, 7.3, 0, 7.5, and 7.6 for antenna port conducted emissions test setups.

2.4 Antenna Description

The following antenna gains were used for the testing.

Frequency [MHz]	Antenna-1 Gain [dBi]	Antenna-2 Gain [dBi]	Directional Gain [dBi]
2400	-5.39	-5.83	-2.60
2451	-5.01	-6.21	-2.57
2473	-5.42	-6.74	-3.04
2480	-5.59	-6.45	-3.00

Table 2-5. Antenna Peak Gain

2.5 Software and Firmware

The test was conducted with software/firmware version X910XXU0AWD5 installed on the EUT.

2.6 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) was used in the measurement of the EUT**.**

Deviation from measurement procedure…….....None

3.2 Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. An 80cm tall test table made of Styrodur is placed on top of the turn table. For measurements above 1GHz, an additional Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33 depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions.

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014. Additionally, radiated emissions below 30MHz are also validated on an Open Area Test Site to assert correlation with the chamber measurements per the requirements of KDB 414788 D01 v01r01.

3.3 Environmental Conditions

The temperature is controlled within range of 15ºC to 35ºC. The relative humidity is controlled within range of 10% to 75%. The atmospheric pressure is monitored within the range 86-106kPa (860-1060mbar).

4.0 ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:
"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

- The antennas of the EUT are **permanently attached.**
- There are no provisions for connections to an external antenna.

Conclusion:

The EUT unit complies with the requirement of §15.203.

5.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013. All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty (±dB)
Conducted Bench Top Measurements	1.37
Conducted Disturbance	3.09
Radiated Disturbance (<1GHz)	3.94
Radiated Disturbance (>1GHz)	4.75
Radiated Disturbance (>18GHz)	4.84

6.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Dual Directional Coupler	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	N9030A	PXA Signal Analyzer(3Hz-26.5GHz)	7/4/2022	Annual	7/3/2023	MY49432391
Anritsu	S820E	Cable and Antenna Analyzer	7/6/2022	Annual	7/5/2023	1839097
Anritsu	TOSLKF50A-40	Calibration Kit	N/A	-	N/A	1825024
COM-Power Corporatior	AL-130R	Active Loop Antenna	10/21/2022	Biennial	10/20/2024	10160045
MINI-CIRCUITS	BW-N10W5+	ATTENUATOR(DC-18GHz)	4/6/2023	Annual	4/5/2024	2106
NARDA	180-442A-KF	Horn Antenna(18GHz-40GHz)	11/23/2022	Biennial	11/22/2024	T058701-03
PASTER NACK	PE2209-6	Dual Directional Coupler	7/5/2022	Annual	7/4/2023	N/A
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	8/26/2022	Annual	8/25/2023	166818
Rohde & Schwarz	ENV216	Two-Line V-Network	4/7/2023	Annual	4/6/2024	101319
Rohde & Schwarz	ESW	EMI Test Receiver(2Hz-44GHz)	7/4/2022	Annual	7/3/2023	101761
Rohde & Schwarz	FSW43	Signal and Spectrum Analyzer(2Hz-43.5GHz)	1/13/2023	Annual	1/12/2024	101955
Rohde & Schwarz	TS-PR1840	Preamplifier(18GHz-40GHz)	7/6/2022	Annual	7/5/2023	100049
Rohde & Schwarz	TS-SFUNIT-Rx	Shielded Filter Unit	1/13/2023	Annual	1/12/2024	102131
Schwarzbeck	VULB9162	Broadband TRILOG Antenna(30MHz-1GHz)	7/13/2021	Biennial	7/12/2023	9162-217
Sunol Sciences	DRH-118	Horn Antenna(1GHz-18GHz)	1/26/2023	Biennial	1/25/2025	A102416-1
TESTEK	-	LISN Extension Cord	4/7/2023	Annual	4/6/2024	N/A

Table 6-1. Annual Test Equipment Calibration Schedule

Note:

1. For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.
2. Equipment with a calibration date of “N/A” shown in this list was not used to make direct calibrated measurements.

7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.

FCC ID: A3LSMX910

IC: 649E-SMX910

FCC Classification: Digital Transmission System (DTS)

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(2)	RSS-247 [5.2(a)]	6dB Bandwidth	The minimum 6 dB bandwidth shall be at least 500 kHz.	CONDUCTED	PASS	Section 7.2
15.247(b)(3)	RSS-247 [5.4(b)]	Transmitter Output Power	shall not exceed 1 W		PASS	Section 7.3
N/A	RSS-247 [5.4(b)]	e.i.r.p	Shall not exceed 4 W		PASS	Section 7.3
15.247(e)	RSS-247 [5.2(b)]	Transmitter Power Spectral Density	shall not be greater than 8 dBm in any 3 kHz band		PASS	Section 0
15.247(d)	RSS-247 [5.5]	Band Edge / Out-of-Band Emissions	≥ 20dBc		PASS	Sections 7.5, 7.6
15.205 15.209	RSS-Gen [8.9]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS-Gen [8.9])	RADIATED	PASS	Section 7.7

Table 7-1. Summary of Test Results

Notes:

1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst-case emissions.
2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.
4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is Element "WLAN Automation," Version 3.5.
5) For radiated band edge, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is Element "Chamber Automation," Version 1.3.1.

6) 802.11ax OFDMA testing was performed for all signal tone configurations as specified by the 802.11ax standard. Worst case results are determined and reported per the guidance provided at the October 2018 TCB Workshop.

7.2 6dB Bandwidth Measurement

Test Overview and Limit

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the transmitter antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated and the worst-case configuration results are reported in this section.

The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Procedure Used

ANSI C63.10-2013 – Section 11.8.2 Option 2

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 6. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 100kHz
3. VBW ≥ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

Figure 7-1. Test Instrument & Measurement Setup

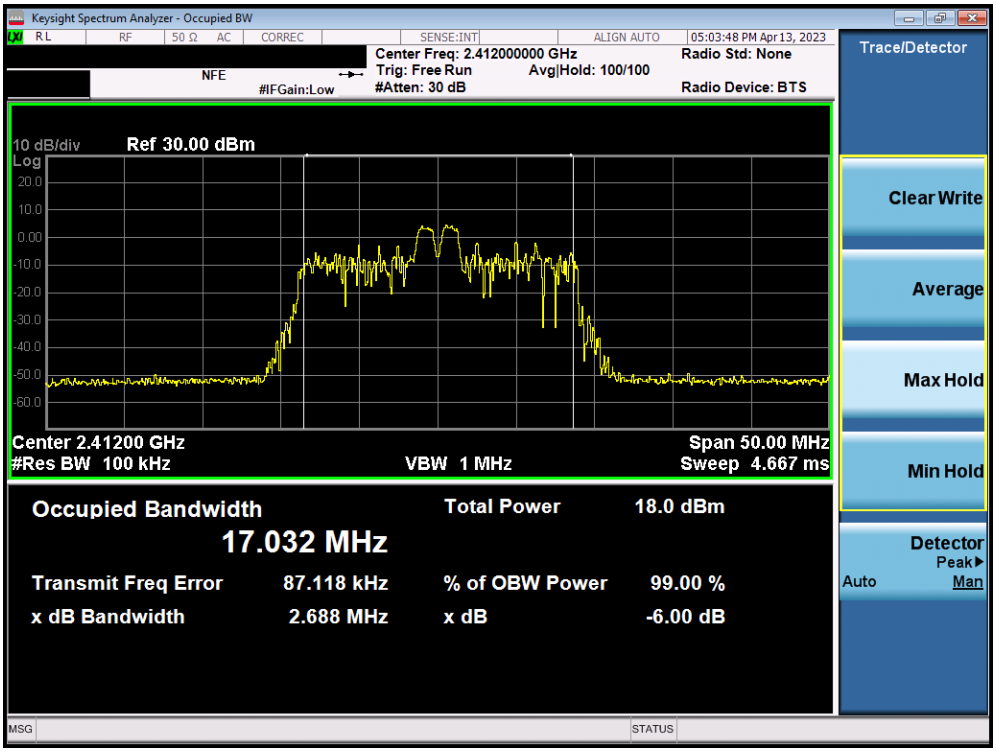
Test Notes

1. Based on preliminary measurements, it was determined that, of all the tone configurations, the 26T configuration produced the worst case 6dB Bandwidth measurement. Only the worst-case data is included in this section.

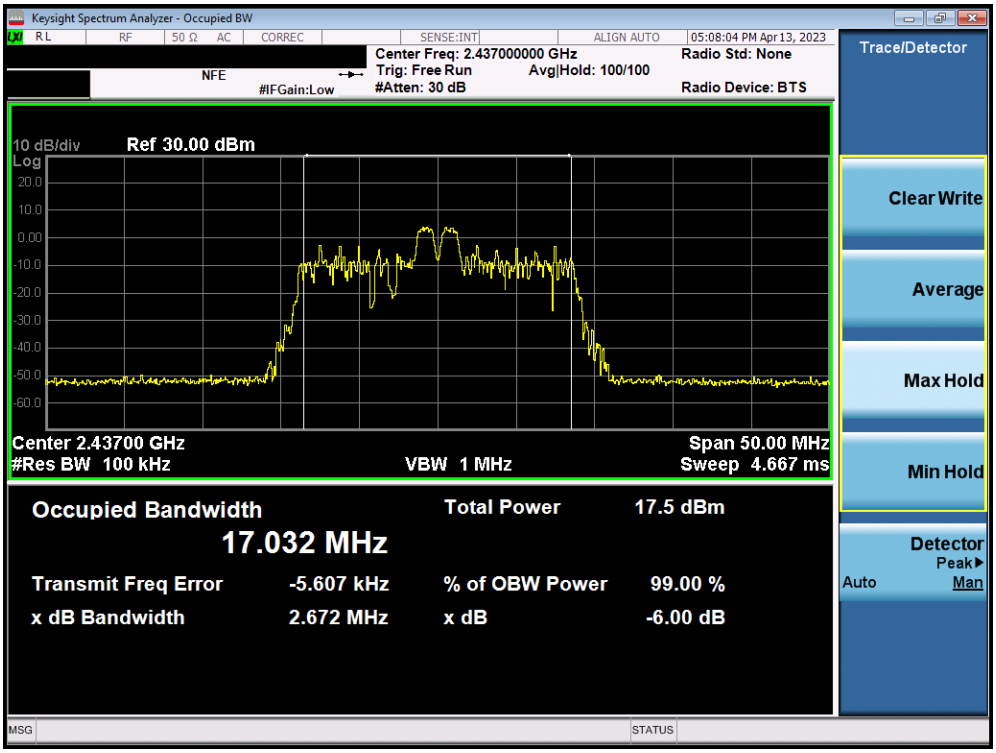
2. The 6dB bandwidth for each channel was measured with the RU index showing the highest conducted power.

7.2.1 SISO Antenna-2 6 dB Bandwidth Measurements

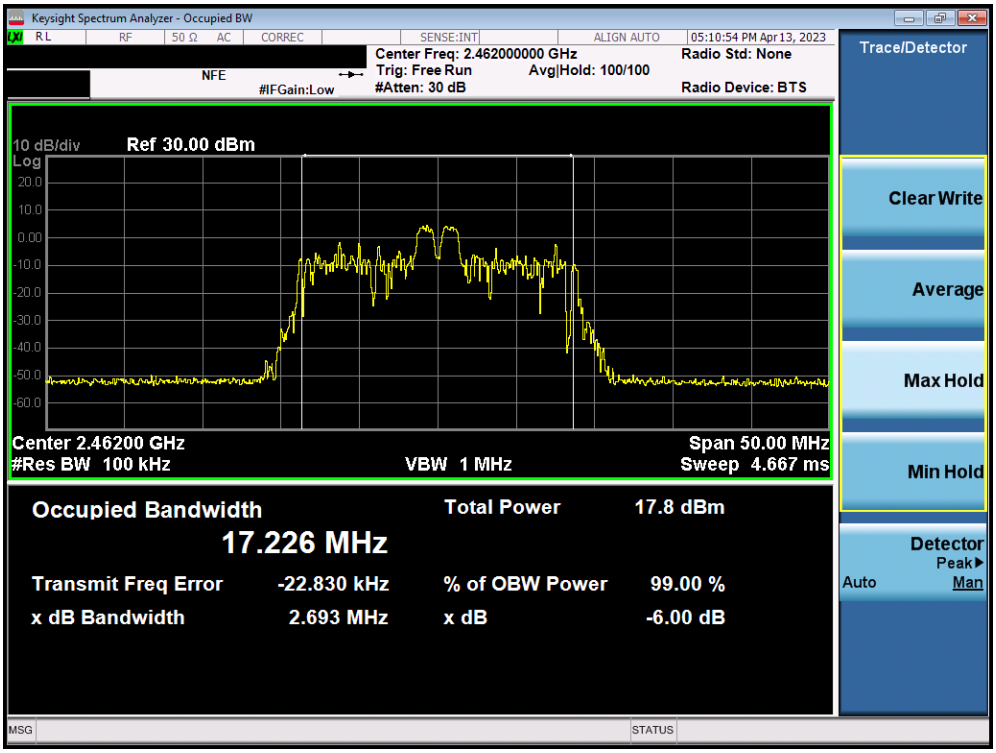
Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
2412	1	ax	26T	MCS0	2.688	0.500
2437	6	ax	26T	MCS0	2.672	0.500
2462	11	ax	26T	MCS0	2.693	0.500
2412	1	ax	242T	MCS0	19.04	0.500
2437	6	ax	242T	MCS0	18.99	0.500
2462	11	ax	242T	MCS0	19.02	0.500



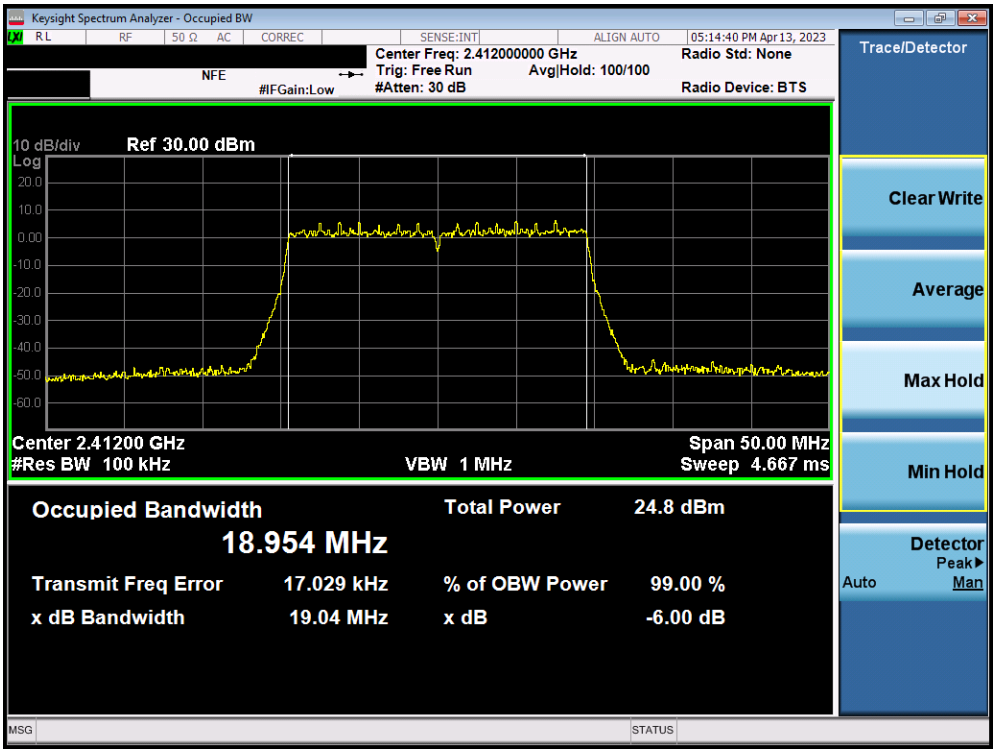
Plot 7-1. 6dB Bandwidth Plot SISO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 1)



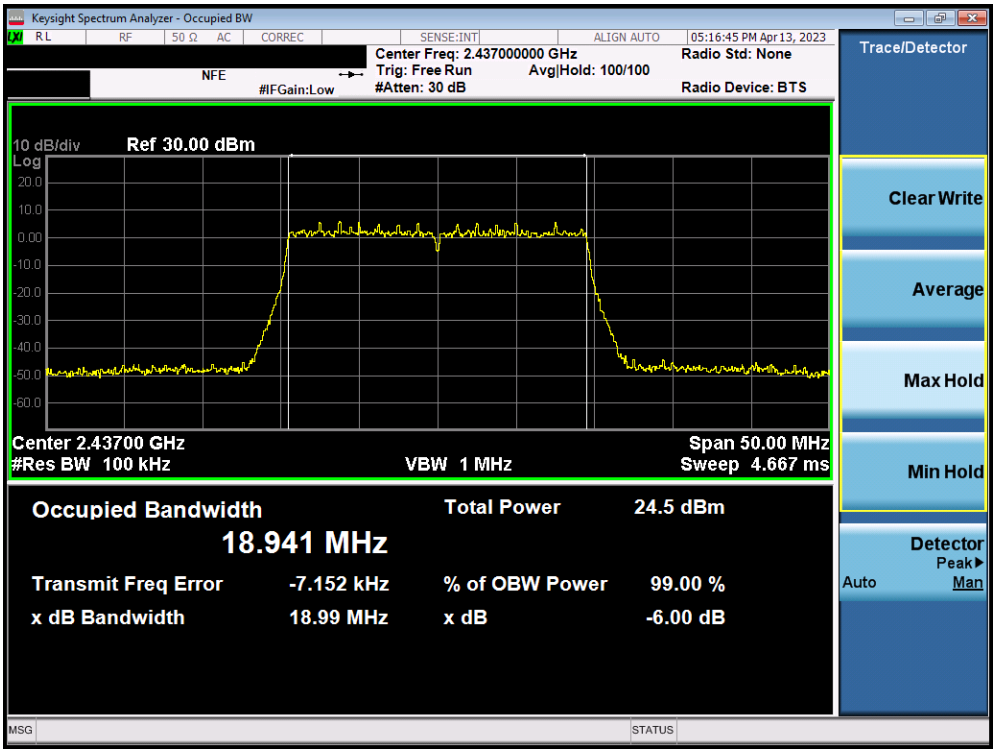
Plot 7-2. 6dB Bandwidth Plot SISO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 6)



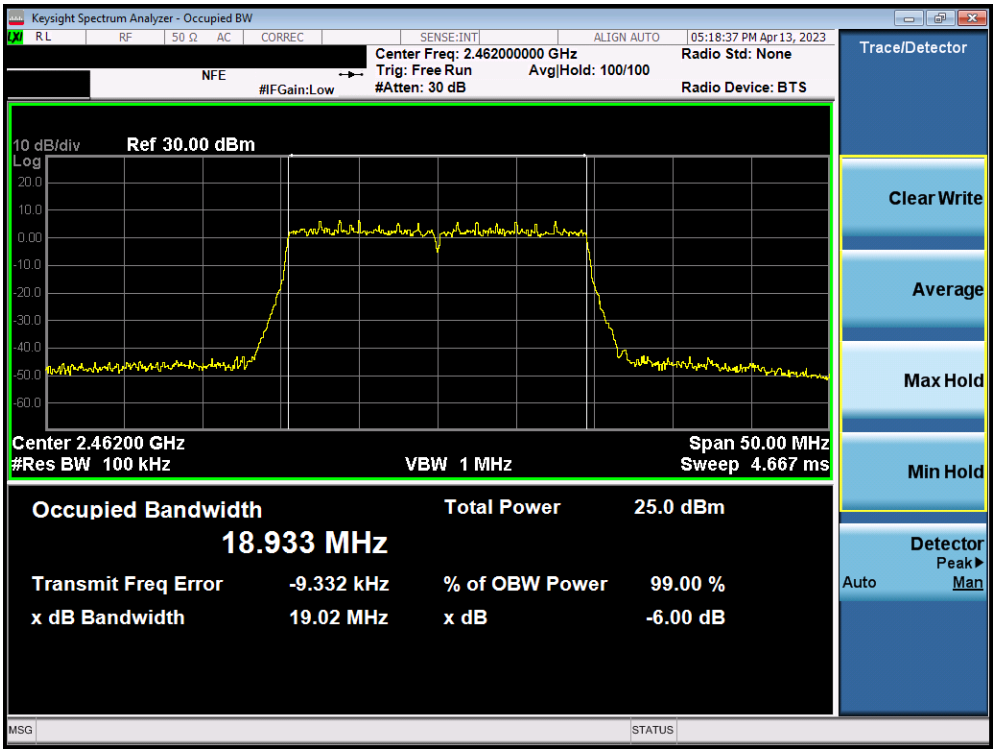
Plot 7-3. 6dB Bandwidth Plot SISO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 11)



Plot 7-4. 6dB Bandwidth Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 1)



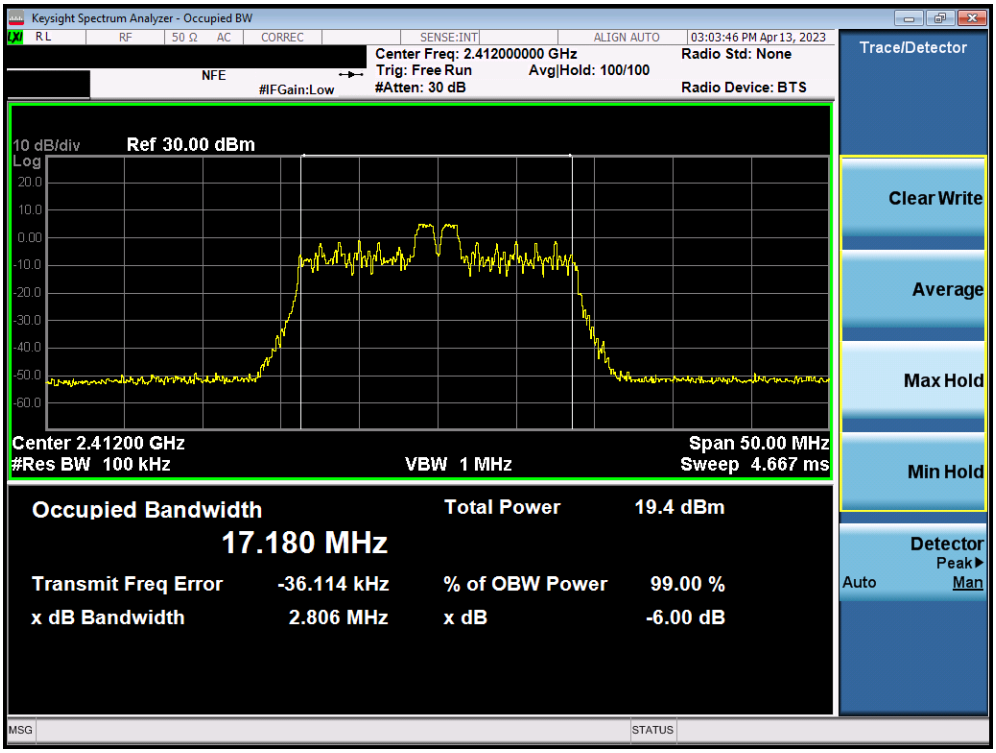
Plot 7-5. 6dB Bandwidth Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 6)



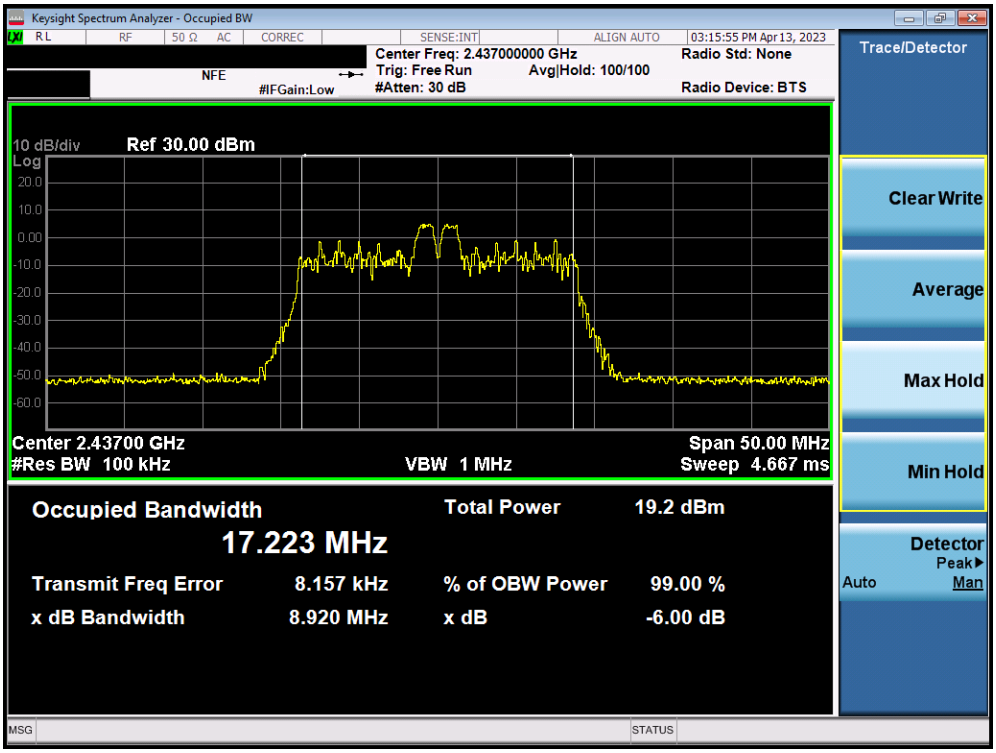
Plot 7-6. 6dB Bandwidth Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 11)

7.2.2 MIMO 6 dB Bandwidth Measurements - ANT1

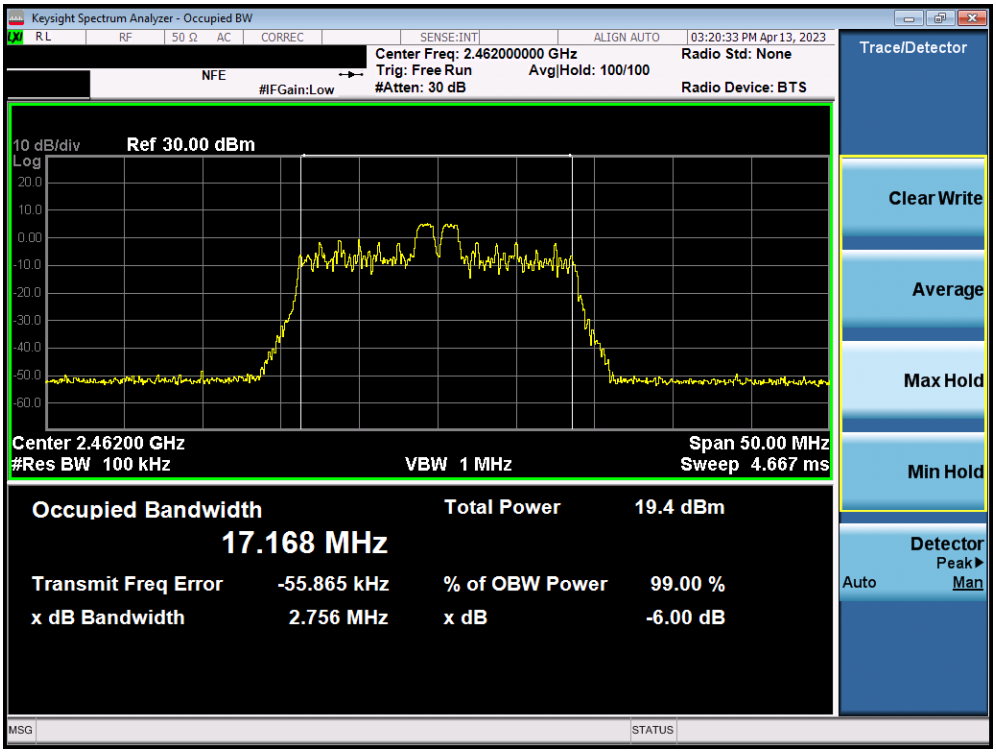
Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
2412	1	ax	26T	MCS0	2.806	0.500
2437	6	ax	26T	MCS0	8.920	0.500
2462	11	ax	26T	MCS0	2.756	0.500
2412	1	ax	242T	MCS0	18.88	0.500
2437	6	ax	242T	MCS0	19.03	0.500
2462	11	ax	242T	MCS0	18.86	0.500



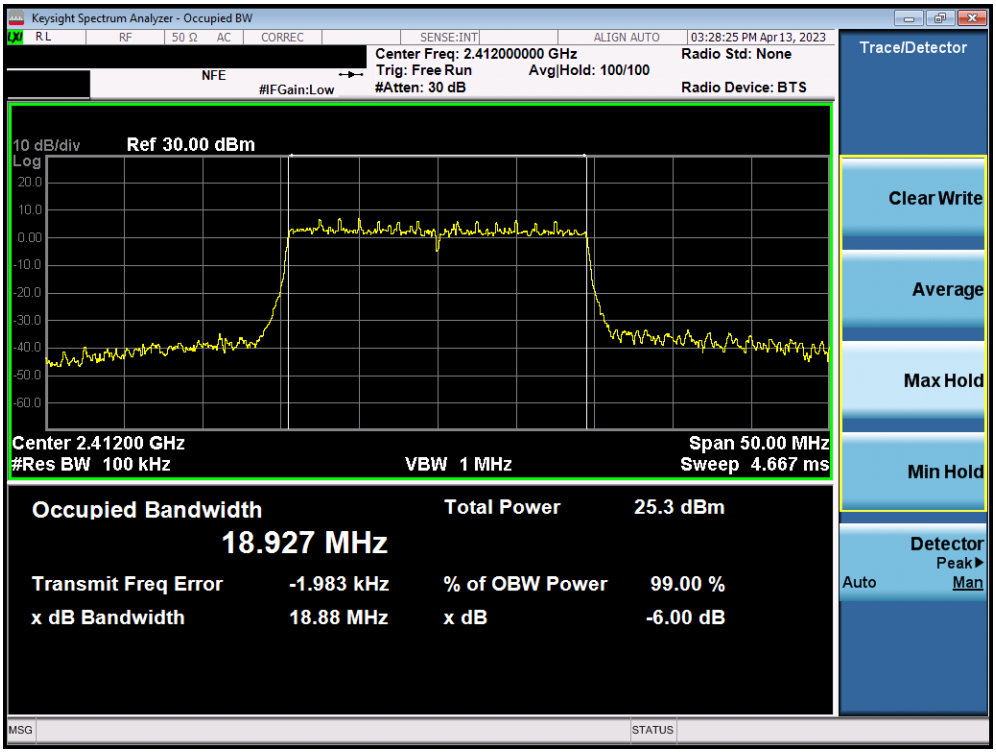
Plot 7-7. 6dB Bandwidth Plot MIMO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 1)



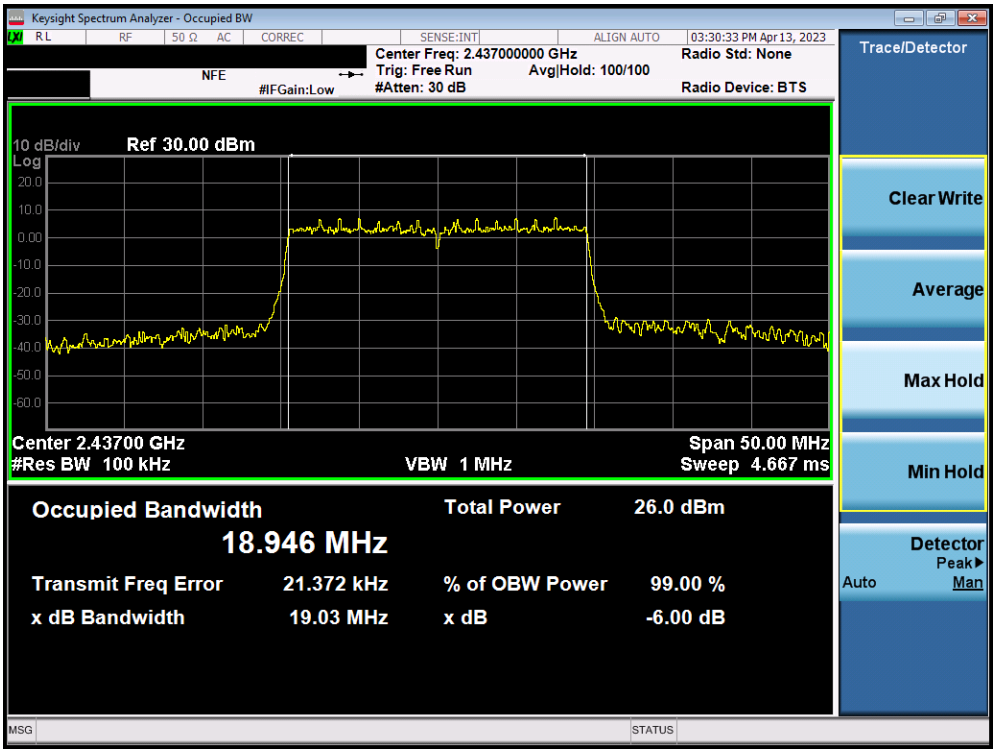
Plot 7-8. 6dB Bandwidth Plot MIMO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 6)



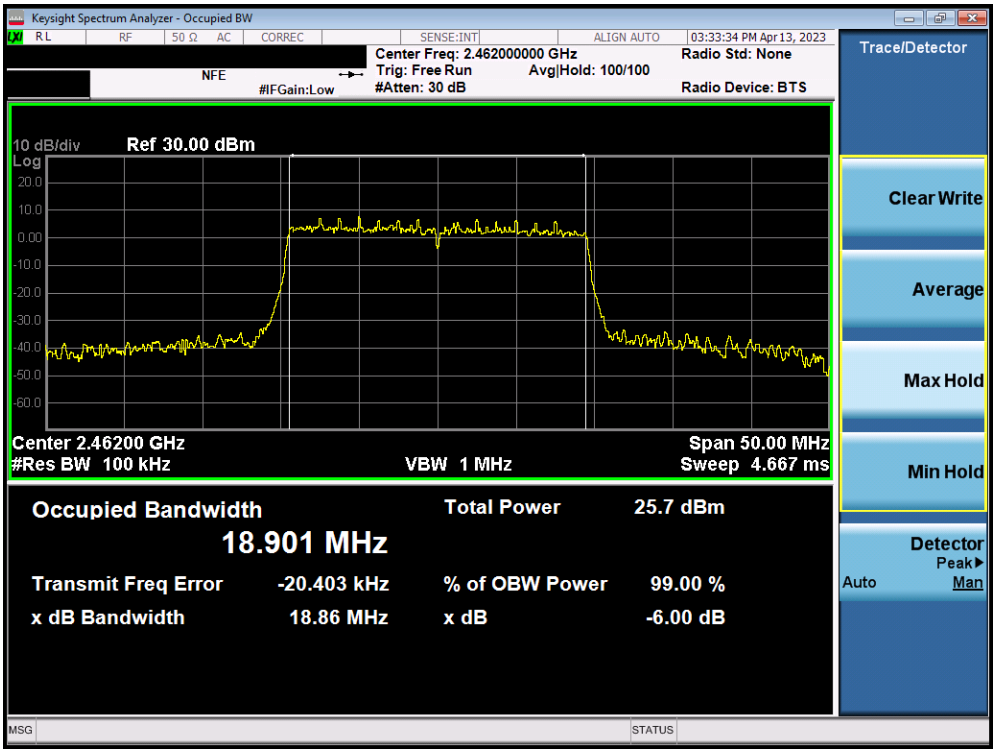
Plot 7-9. 6dB Bandwidth Plot MIMO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 11)



Plot 7-10. 6dB Bandwidth Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 1)



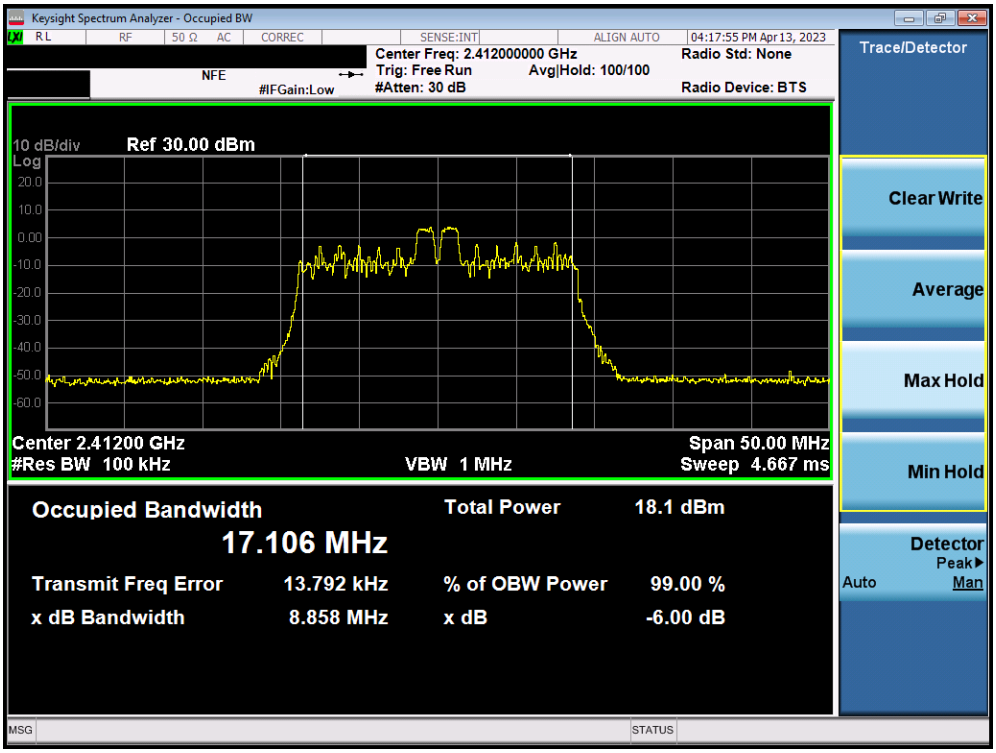
Plot 7-11. 6dB Bandwidth Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 6)



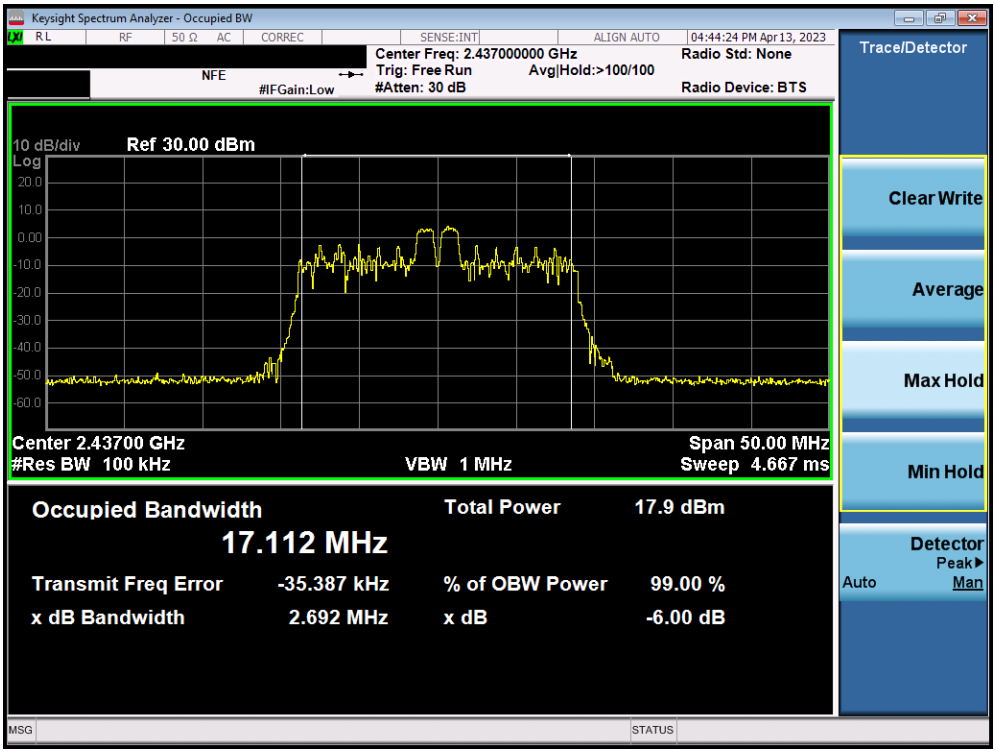
Plot 7-12. 6dB Bandwidth Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 11)

7.2.3 MIMO 6 dB Bandwidth Measurements – ANT2

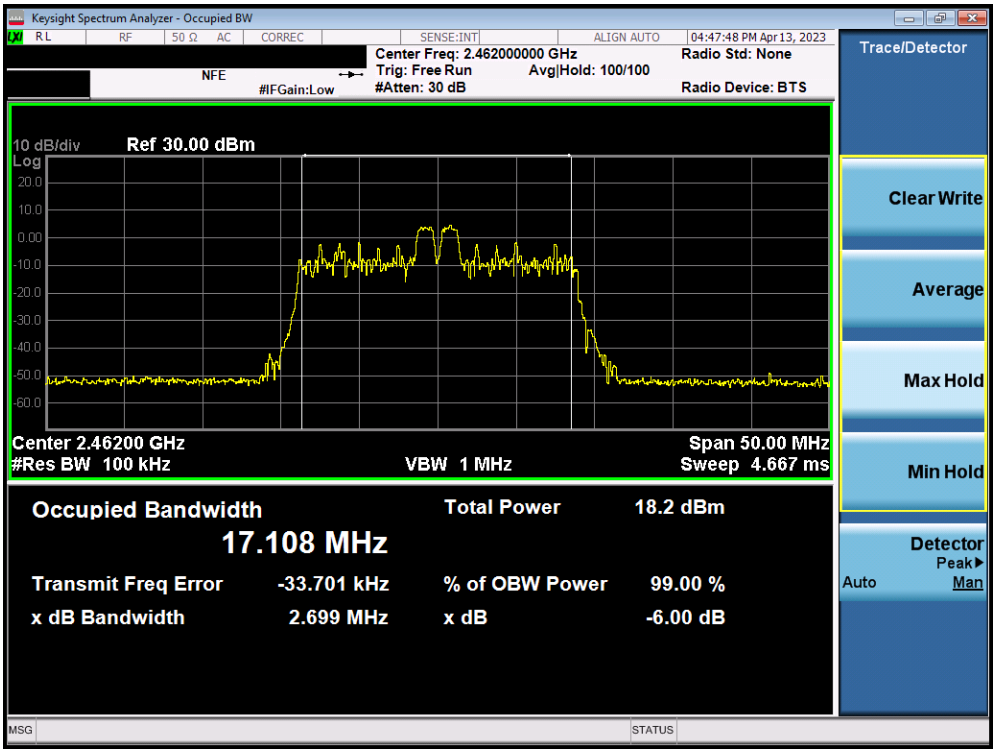
Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
2412	1	ax	26T	MCS0	8.858	0.500
2437	6	ax	26T	MCS0	2.692	0.500
2462	11	ax	26T	MCS0	2.699	0.500
2412	1	ax	242T	MCS0	19.11	0.500
2437	6	ax	242T	MCS0	19.10	0.500
2462	11	ax	242T	MCS0	19.12	0.500



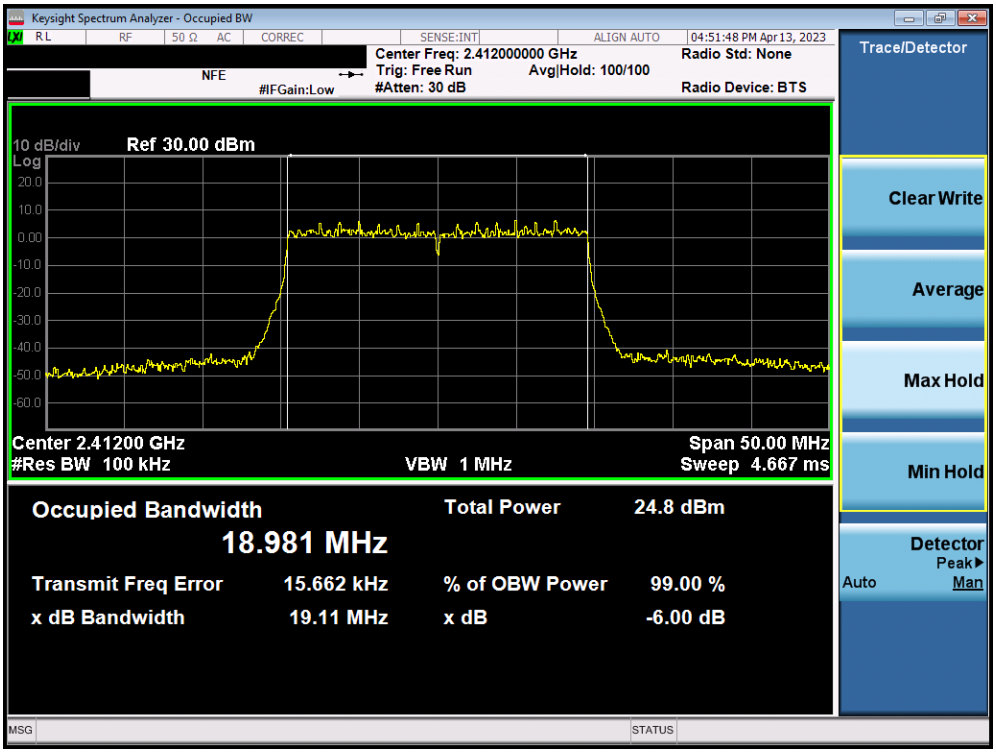
Plot 7-13. 6dB Bandwidth Plot MIMO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 1)



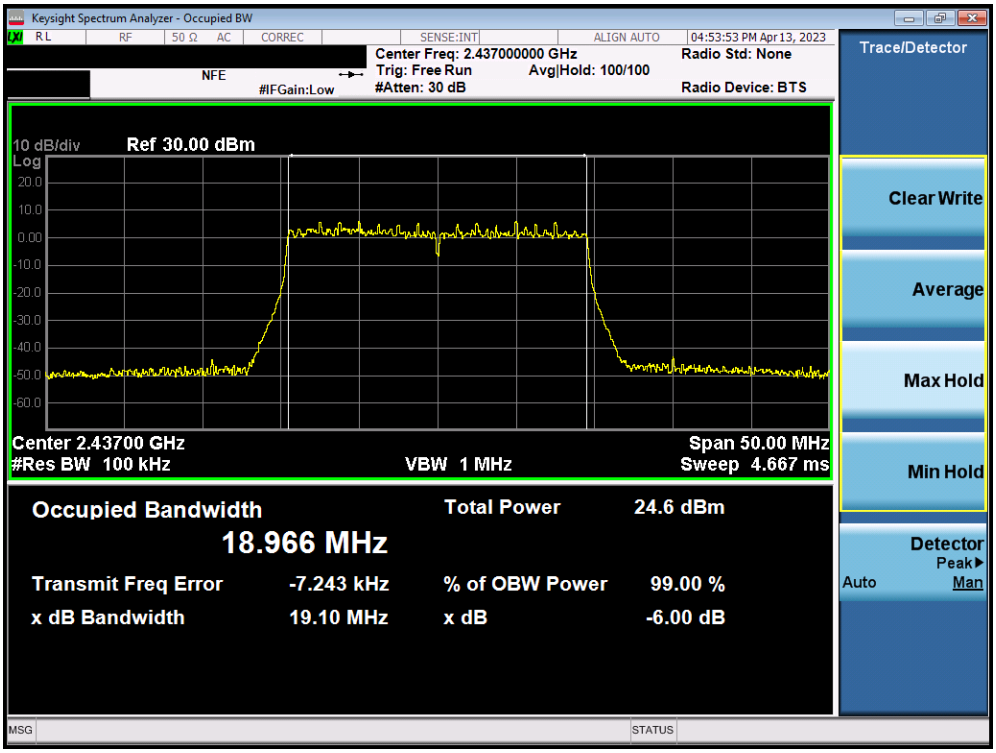
Plot 7-14. 6dB Bandwidth Plot MIMO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 6)



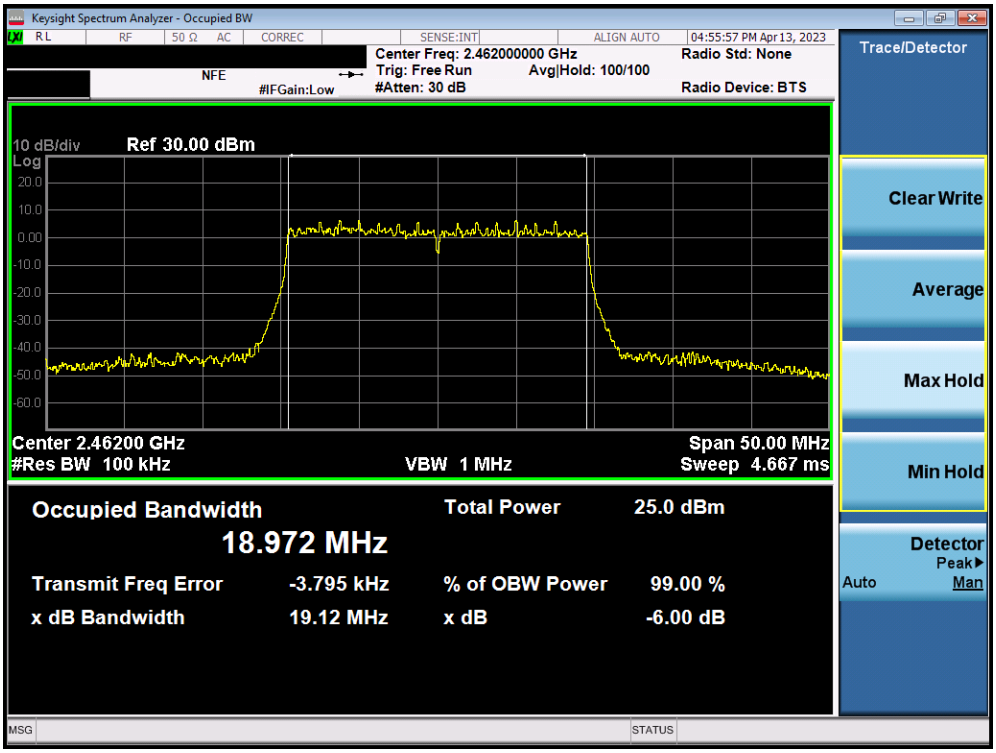
Plot 7-15. 6dB Bandwidth Plot MIMO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 11)



Plot 7-16. 6dB Bandwidth Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 1)



Plot 7-17. 6dB Bandwidth Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 6)



Plot 7-18. 6dB Bandwidth Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 11)

7.3 Output Power Measurement

Test Overview and Limits

A transmitter antenna terminal of EUT is connected to the input of an RF power sensor. Measurement is made using a broadband power meter capable of making peak and average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

The maximum permissible conducted output power is 1 Watt per 15.247 and RSS-247.

The e.i.r.p. shall not exceed 4 W per RSS-247.

Test Procedure Used

ANSI C63.10-2013 – Section 11.9.1.3 PKPM1 Peak Power Method
ANSI C63.10-2013 – Section 11.9.2.3.2 Method AVGPM-G
ANSI C63.10-2013 – Section 14.2 Measure-and-Sum Technique

Test Settings

Method PKPM1 (Peak Power Measurement)

Peak power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The pulse sensor employs a VBW = 50MHz so this method was only used for signals whose DTS bandwidth was less than or equal to 50MHz.

Method AVGPM-G (Average Power Measurement)

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter. The trace was averaged over 100 traces to obtain the final measured average power.

Test Setup

The EUT and measurement equipment were set up as shown in the diagrams below.

Figure 7-2. Test Instrument & Measurement Setup for Power Meter Measurements

Test Notes

None.

	Freq [MHz]	Channel	Tones	RU Index	Detector	Conducted Powers (dBm)	Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
2.4GHz	2412	1	26T	0	AVG	9.89	30.00	-20.11	-5.83	4.06	36.02	-31.96
					PEAK	15.27	30.00	-14.73	-5.83	9.44	36.02	-26.58
				4	AVG	9.77	30.00	-20.23	-5.83	3.94	36.02	-32.08
					PEAK	15.11	30.00	-14.89	-5.83	9.28	36.02	-26.74
				8	AVG	9.02	30.00	-20.98	-5.83	3.19	36.02	-32.83
					PEAK	15.12	30.00	-14.88	-5.83	9.29	36.02	-26.73
	2437	6	26T	0	AVG	9.85	30.00	-20.15	-5.83	4.02	36.02	-32.00
					PEAK	14.73	30.00	-15.27	-5.83	8.90	36.02	-27.12
				4	AVG	9.89	30.00	-20.11	-5.83	4.06	36.02	-31.96
					PEAK	14.81	30.00	-15.19	-5.83	8.98	36.02	-27.04
				8	AVG	9.01	30.00	-20.99	-5.83	3.18	36.02	-32.84
					PEAK	14.90	30.00	-15.10	-5.83	9.07	36.02	-26.95
	2462	11	26T	0	AVG	9.79	30.00	-20.21	-5.83	3.96	36.02	-32.06
					PEAK	15.00	30.00	-15.00	-5.83	9.17	36.02	-26.85
				4	AVG	9.65	30.00	-20.35	-5.83	3.82	36.02	-32.20
					PEAK	15.44	30.00	-14.56	-5.83	9.61	36.02	-26.41
				8	AVG	9.17	30.00	-20.83	-5.83	3.34	36.02	-32.68
					PEAK	15.20	30.00	-14.80	-5.83	9.37	36.02	-26.65
	2467	12	26T	0	AVG	8.42	30.00	-21.58	-5.83	2.59	36.02	-33.43
					PEAK	14.54	30.00	-15.46	-5.83	8.71	36.02	-27.31
				4	AVG	8.75	30.00	-21.25	-5.83	2.92	36.02	-33.10
					PEAK	14.94	30.00	-15.06	-5.83	9.11	36.02	-26.91
				8	AVG	8.03	30.00	-21.97	-5.83	2.20	36.02	-33.82
					PEAK	13.72	30.00	-16.28	-5.83	7.89	36.02	-28.13
	2472	13	26T	0	AVG	2.73	30.00	-27.27	-5.83	-3.10	36.02	-39.12
					PEAK	8.74	30.00	-21.26	-5.83	2.91	36.02	-33.11
				4	AVG	2.62	30.00	-27.38	-5.83	-3.21	36.02	-39.23
					PEAK	8.52	30.00	-21.48	-5.83	2.69	36.02	-33.33
				8	AVG	2.01	30.00	-27.99	-5.83	-3.82	36.02	-39.84
					PEAK	7.21	30.00	-22.79	-5.83	1.38	36.02	-34.64

Table 7-2. Conducted Output Power Measurements SISO ANT2 (26 Tones)

	Freq [MHz]	Channel	Tones	RU Index	Detector	Conducted Powers (dBm)	Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
2.4GHz	2412	1	52T	37	AVG	12.91	30.00	-17.09	-5.83	7.08	36.02	-28.94
					PEAK	17.77	30.00	-12.23	-5.83	11.94	36.02	-24.08
				38	AVG	12.94	30.00	-17.06	-5.83	7.11	36.02	-28.91
					PEAK	18.09	30.00	-11.91	-5.83	12.26	36.02	-23.76
				40	AVG	12.64	30.00	-17.36	-5.83	6.81	36.02	-29.21
					PEAK	18.40	30.00	-11.60	-5.83	12.57	36.02	-23.45
	2437	6	52T	37	AVG	12.92	30.00	-17.08	-5.83	7.09	36.02	-28.93
					PEAK	18.13	30.00	-11.87	-5.83	12.30	36.02	-23.72
				38	AVG	12.97	30.00	-17.03	-5.83	7.14	36.02	-28.88
					PEAK	18.15	30.00	-11.85	-5.83	12.32	36.02	-23.70
				40	AVG	12.57	30.00	-17.43	-5.83	6.74	36.02	-29.28
					PEAK	18.51	30.00	-11.49	-5.83	12.68	36.02	-23.34
	2462	11	52T	37	AVG	12.90	30.00	-17.10	-5.83	7.07	36.02	-28.95
					PEAK	18.80	30.00	-11.20	-5.83	12.97	36.02	-23.05
				38	AVG	12.77	30.00	-17.23	-5.83	6.94	36.02	-29.08
					PEAK	18.44	30.00	-11.56	-5.83	12.61	36.02	-23.41
				40	AVG	12.35	30.00	-17.65	-5.83	6.52	36.02	-29.50
					PEAK	18.47	30.00	-11.53	-5.83	12.64	36.02	-23.38
	2467	12	52T	37	AVG	8.65	30.00	-21.35	-5.83	2.82	36.02	-33.20
					PEAK	15.24	30.00	-14.76	-5.83	9.41	36.02	-26.61
				38	AVG	8.79	30.00	-21.21	-5.83	2.96	36.02	-33.06
					PEAK	14.96	30.00	-15.04	-5.83	9.13	36.02	-26.89
				40	AVG	8.05	30.00	-21.95	-5.83	2.22	36.02	-33.80
					PEAK	14.08	30.00	-15.92	-5.83	8.25	36.02	-27.77
	2472	13	52T	37	AVG	2.74	30.00	-27.26	-5.83	-3.09	36.02	-39.11
					PEAK	9.32	30.00	-20.68	-5.83	3.49	36.02	-32.53
				38	AVG	2.83	30.00	-27.17	-5.83	-3.00	36.02	-39.02
					PEAK	9.33	30.00	-20.67	-5.83	3.50	36.02	-32.52
				40	AVG	2.03	30.00	-27.97	-5.83	-3.80	36.02	-39.82
					PEAK	8.52	30.00	-21.48	-5.83	2.69	36.02	-33.33

Table 7-3. Conducted Output Power Measurements SISO ANT2 (52 Tones)

	Freq [MHz]	Channel	Tones	RU Index	Detector	Conducted Powers (dBm)	Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
2.4GHz	2412	1	106T	53	AVG	14.58	30.00	-15.42	-5.83	8.75	36.02	-27.27
					PEAK	19.97	30.00	-10.03	-5.83	14.14	36.02	-21.88
				54	AVG	14.66	30.00	-15.34	-5.83	8.83	36.02	-27.19
					PEAK	20.26	30.00	-9.74	-5.83	14.43	36.02	-21.59
	2437	6	106T	53	AVG	14.61	30.00	-15.39	-5.83	8.78	36.02	-27.24
					PEAK	20.38	30.00	-9.62	-5.83	14.55	36.02	-21.47
				54	AVG	14.67	30.00	-15.33	-5.83	8.84	36.02	-27.18
					PEAK	20.01	30.00	-9.99	-5.83	14.18	36.02	-21.84
	2462	11	106T	53	AVG	14.86	30.00	-15.14	-5.83	9.03	36.02	-26.99
					PEAK	19.34	30.00	-10.66	-5.83	13.51	36.02	-22.51
				54	AVG	14.61	30.00	-15.39	-5.83	8.78	36.02	-27.24
					PEAK	20.06	30.00	-9.94	-5.83	14.23	36.02	-21.79
	2467	12	106T	53	AVG	8.76	30.00	-21.24	-5.83	2.93	36.02	-33.09
					PEAK	14.83	30.00	-15.17	-5.83	9.00	36.02	-27.02
				54	AVG	8.25	30.00	-21.75	-5.83	2.42	36.02	-33.60
					PEAK	14.31	30.00	-15.69	-5.83	8.48	36.02	-27.54
	2472	13	106T	53	AVG	2.87	30.00	-27.13	-5.83	-2.96	36.02	-38.98
					PEAK	9.09	30.00	-20.91	-5.83	3.26	36.02	-32.76
				54	AVG	2.13	30.00	-27.87	-5.83	-3.70	36.02	-39.72
					PEAK	8.08	30.00	-21.92	-5.83	2.25	36.02	-33.77

Table 7-4. Conducted Output Power Measurements SISO ANT2 (106 Tones)

	Freq [MHz]	Channel	Tones	RU Index	Detector	Conducted Powers (dBm)	Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
2.4GHz	2412	1	242T	61	AVG	16.45	30.00	-13.55	-5.83	10.62	36.02	-25.40
					PEAK	21.67	30.00	-8.33	-5.83	15.84	36.02	-20.18
	2417	2	242T	61	AVG	16.99	30.00	-13.01	-5.83	11.16	36.02	-24.86
					PEAK	21.97	30.00	-8.03	-5.83	16.14	36.02	-19.88
	2422	3	242T	61	AVG	17.43	30.00	-12.57	-5.83	11.60	36.02	-24.42
					PEAK	23.61	30.00	-6.39	-5.83	17.78	36.02	-18.24
	2437	6	242T	61	AVG	17.25	30.00	-12.75	-5.83	11.42	36.02	-24.60
					PEAK	22.61	30.00	-7.39	-5.83	16.78	36.02	-19.24
	2452	9	242T	61	AVG	17.76	30.00	-12.24	-5.83	11.93	36.02	-24.09
					PEAK	24.19	30.00	-5.81	-5.83	18.36	36.02	-17.66
	2457	10	242T	61	AVG	16.84	30.00	-13.16	-5.83	11.01	36.02	-25.01
					PEAK	21.84	30.00	-8.16	-5.83	16.01	36.02	-20.01
	2462	11	242T	61	AVG	15.65	30.00	-14.35	-5.83	9.82	36.02	-26.20
					PEAK	19.84	30.00	-10.16	-5.83	14.01	36.02	-22.01
	2467	12	242T	61	AVG	8.57	30.00	-21.43	-5.83	2.74	36.02	-33.28
					PEAK	14.57	30.00	-15.43	-5.83	8.74	36.02	-27.28
	2472	13	242T	61	AVG	2.53	30.00	-27.47	-5.83	-3.30	36.02	-39.32
					PEAK	8.66	30.00	-21.34	-5.83	2.83	36.02	-33.19

Table 7-5. Conducted Output Power Measurements SISO ANT2 (242 Tones)

	Freq [MHz]	Channel	Tones	RU Index	Detector	Conducted Power [dBm]			Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
						ANT1	ANT2	MIMO						
2.4GHz	2412	1	26T	0	AVG	10.48	9.02	12.82	30.00	-17.18	-2.86	9.96	36.02	-26.06
					PEAK	16.07	14.72	18.46	30.00	-11.54	-2.86	15.60	36.02	-20.42
				4	AVG	10.62	9.22	12.99	30.00	-17.01	-2.86	10.13	36.02	-25.89
					PEAK	15.77	15.47	18.63	30.00	-11.37	-2.86	15.77	36.02	-20.25
				8	AVG	10.74	8.43	12.75	30.00	-17.25	-2.86	9.89	36.02	-26.13
					PEAK	15.21	15.58	18.41	30.00	-11.59	-2.86	15.55	36.02	-20.47
	2437	6	26T	0	AVG	10.47	8.89	12.76	30.00	-17.24	-2.86	9.90	36.02	-26.12
					PEAK	16.35	14.99	18.73	30.00	-11.27	-2.86	15.87	36.02	-20.15
				4	AVG	10.49	9.38	12.98	30.00	-17.02	-2.86	10.12	36.02	-25.90
					PEAK	16.52	15.08	18.87	30.00	-11.13	-2.86	16.01	36.02	-20.01
				8	AVG	11.11	8.19	12.90	30.00	-17.10	-2.86	10.04	36.02	-25.98
					PEAK	16.94	14.56	18.92	30.00	-11.08	-2.86	16.06	36.02	-19.96
	2462	11	26T	0	AVG	10.04	9.39	12.74	30.00	-17.26	-2.86	9.88	36.02	-26.14
					PEAK	16.36	14.89	18.70	30.00	-11.30	-2.86	15.84	36.02	-20.18
				4	AVG	10.10	9.09	12.63	30.00	-17.37	-2.86	9.77	36.02	-26.25
					PEAK	17.10	15.86	19.53	30.00	-10.47	-2.86	16.67	36.02	-19.35
				8	AVG	10.07	8.17	12.23	30.00	-17.77	-2.86	9.37	36.02	-26.65
					PEAK	15.68	15.00	18.36	30.00	-11.64	-2.86	15.50	36.02	-20.52
	2467	12	26T	0	AVG	5.89	5.11	8.53	30.00	-21.47	-2.86	5.67	36.02	-30.35
					PEAK	11.90	11.47	14.70	30.00	-15.30	-2.86	11.84	36.02	-24.18
				4	AVG	5.65	5.16	8.42	30.00	-21.58	-2.86	5.56	36.02	-30.46
					PEAK	12.12	11.28	14.73	30.00	-15.27	-2.86	11.87	36.02	-24.15
				8	AVG	5.28	5.03	8.17	30.00	-21.83	-2.86	5.31	36.02	-30.71
					PEAK	5.58	10.67	11.84	30.00	-18.16	-2.86	8.98	36.02	-27.04
	2472	13	26T	0	AVG	0.16	-0.26	2.97	30.00	-27.03	-2.86	0.11	36.02	-35.92
					PEAK	6.77	6.35	9.58	30.00	-20.42	-2.86	6.72	36.02	-29.31
				4	AVG	0.05	-0.22	2.93	30.00	-27.07	-2.86	0.07	36.02	-35.95
					PEAK	6.95	6.47	9.73	30.00	-20.27	-2.86	6.87	36.02	-29.15
				8	AVG	-0.89	-1.01	2.06	30.00	-27.94	-2.86	-0.80	36.02	-36.82
					PEAK	5.54	4.96	8.27	30.00	-21.73	-2.86	5.41	36.02	-30.61

Table 7-6. Conducted Output Power Measurements MIMO (26 Tones)

	Freq [MHz]	Channel	Tones	RU Index	Detector	Conducted Power [dBm]			Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
						ANT1	ANT2	MIMO						
2.4GHz	2412	1	52T	37	AVG	13.52	12.01	15.84	30.00	-14.16	-2.86	12.98	36.02	-23.04
					PEAK	19.45	18.11	21.84	30.00	-8.16	-2.86	18.98	36.02	-17.04
				38	AVG	13.41	12.11	15.82	30.00	-14.18	-2.86	12.96	36.02	-23.06
					PEAK	19.22	18.39	21.84	30.00	-8.16	-2.86	18.98	36.02	-17.05
				40	AVG	13.29	12.60	15.97	30.00	-14.03	-2.86	13.11	36.02	-22.91
					PEAK	18.65	18.94	21.81	30.00	-8.19	-2.86	18.95	36.02	-17.07
	2437	6	52T	37	AVG	12.92	12.02	15.50	30.00	-14.50	-2.86	12.64	36.02	-23.38
					PEAK	19.40	18.58	22.02	30.00	-7.98	-2.86	19.16	36.02	-16.86
				38	AVG	12.82	12.58	15.71	30.00	-14.29	-2.86	12.85	36.02	-23.17
					PEAK	19.80	18.22	22.09	30.00	-7.91	-2.86	19.23	36.02	-16.79
				40	AVG	13.50	12.34	15.97	30.00	-14.03	-2.86	13.11	36.02	-22.91
					PEAK	20.10	18.03	22.20	30.00	-7.80	-2.86	19.34	36.02	-16.68
	2462	11	52T	37	AVG	13.23	12.58	15.93	30.00	-14.07	-2.86	13.07	36.02	-22.95
					PEAK	19.46	18.42	21.98	30.00	-8.02	-2.86	19.12	36.02	-16.90
				38	AVG	12.91	12.31	15.63	30.00	-14.37	-2.86	12.77	36.02	-23.25
					PEAK	19.93	18.62	22.33	30.00	-7.67	-2.86	19.47	36.02	-16.55
				40	AVG	12.90	12.51	15.72	30.00	-14.28	-2.86	12.86	36.02	-23.16
					PEAK	18.84	19.05	21.96	30.00	-8.04	-2.86	19.10	36.02	-16.92
	2467	12	52T	37	AVG	5.87	5.43	8.67	30.00	-21.33	-2.86	5.81	36.02	-30.21
					PEAK	12.58	11.47	15.07	30.00	-14.93	-2.86	12.21	36.02	-23.81
				38	AVG	5.88	5.31	8.61	30.00	-21.39	-2.86	5.75	36.02	-30.27
					PEAK	12.55	11.55	15.09	30.00	-14.91	-2.86	12.23	36.02	-23.79
				40	AVG	5.33	4.98	8.17	30.00	-21.83	-2.86	5.31	36.02	-30.71
					PEAK	11.51	11.29	14.41	30.00	-15.59	-2.86	11.55	36.02	-24.47
	2472	13	52T	37	AVG	-0.17	0.09	2.97	30.00	-27.03	-2.86	0.11	36.02	-35.91
					PEAK	6.65	6.47	9.57	30.00	-20.43	-2.86	6.71	36.02	-29.31
				38	AVG	-0.21	0.02	2.92	30.00	-27.08	-2.86	0.06	36.02	-35.96
					PEAK	6.40	6.45	9.44	30.00	-20.56	-2.86	6.58	36.02	-29.45
				40	AVG	-0.84	-0.52	2.33	30.00	-27.67	-2.86	-0.53	36.02	-36.55
					PEAK	6.14	6.07	9.12	30.00	-20.88	-2.86	6.26	36.02	-29.77

Table 7-7. Conducted Output Power Measurements MIMO (52 Tones)

	Freq [MHz]	Channel	Tones	RU Index	Detector	Conducted Power [dBm]			Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
						ANT1	ANT2	MIMO						
2.4GHz	2412	1	106T	53	AVG	15.74	14.05	17.99	30.00	-12.01	-2.86	15.13	36.02	-20.89
					PEAK	21.37	19.15	23.41	30.00	-6.59	-2.86	20.55	36.02	-15.47
				54	AVG	14.79	14.61	17.71	30.00	-12.29	-2.86	14.85	36.02	-21.17
					PEAK	21.29	20.36	23.86	30.00	-6.14	-2.86	21.00	36.02	-15.02
	2437	6	106T	53	AVG	15.38	14.32	17.89	30.00	-12.11	-2.86	15.03	36.02	-20.99
					PEAK	21.67	20.65	24.20	30.00	-5.80	-2.86	21.34	36.02	-14.68
				54	AVG	14.99	14.37	17.70	30.00	-12.30	-2.86	14.84	36.02	-21.18
					PEAK	21.97	20.23	24.20	30.00	-5.80	-2.86	21.34	36.02	-14.68
	2462	11	106T	53	AVG	15.25	14.26	17.79	30.00	-12.21	-2.86	14.93	36.02	-21.09
					PEAK	21.37	20.16	23.82	30.00	-6.18	-2.86	20.96	36.02	-15.06
				54	AVG	14.64	14.37	17.52	30.00	-12.48	-2.86	14.66	36.02	-21.36
					PEAK	20.41	20.05	23.24	30.00	-6.76	-2.86	20.38	36.02	-15.64
	2467	12	106T	53	AVG	5.98	5.42	8.72	30.00	-21.28	-2.86	5.86	36.02	-30.16
					PEAK	12.05	11.89	14.98	30.00	-15.02	-2.86	12.12	36.02	-23.90
				54	AVG	5.23	5.11	8.18	30.00	-21.82	-2.86	5.32	36.02	-30.70
					PEAK	11.94	11.21	14.60	30.00	-15.40	-2.86	11.74	36.02	-24.28
	2472	13	106T	53	AVG	-0.21	0.15	2.98	30.00	-27.02	-2.86	0.12	36.02	-35.90
					PEAK	6.48	6.56	9.53	30.00	-20.47	-2.86	6.67	36.02	-29.35
				54	AVG	-0.94	-0.52	2.29	30.00	-27.71	-2.86	-0.57	36.02	-36.60
					PEAK	6.06	4.52	8.37	30.00	-21.63	-2.86	5.51	36.02	-30.51

Table 7-8. Conducted Output Power Measurements MIMO (106 Tones)

	Freq [MHz]	Channel	Tones	RU Index	Detector	Conducted Power [dBm]			Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
						ANT1	ANT2	MIMO						
2.4GHz	2412	1	242T	61	AVG	16.99	15.60	19.36	30.00	-10.64	-2.86	16.50	36.02	-19.52
					PEAK	22.01	21.03	24.56	30.00	-5.44	-2.86	21.70	36.02	-14.32
	2417	2	242T	61	AVG	17.63	16.61	20.16	30.00	-9.84	-2.86	17.30	36.02	-18.72
					PEAK	23.31	22.20	25.80	30.00	-4.20	-2.86	22.94	36.02	-13.08
	2422	3	242T	61	AVG	17.23	17.44	20.35	30.00	-9.65	-2.86	17.49	36.02	-18.53
					PEAK	22.07	22.53	25.32	30.00	-4.68	-2.86	22.46	36.02	-13.56
	2437	6	242T	61	AVG	18.01	17.26	20.66	30.00	-9.34	-2.86	17.80	36.02	-18.22
					PEAK	23.48	22.05	25.83	30.00	-4.17	-2.86	22.97	36.02	-13.05
	2452	9	242T	61	AVG	17.60	17.74	20.68	30.00	-9.32	-2.86	17.82	36.02	-18.20
					PEAK	23.01	22.90	25.97	30.00	-4.03	-2.86	23.11	36.02	-12.91
	2457	10	242T	61	AVG	17.89	16.75	20.37	30.00	-9.63	-2.86	17.51	36.02	-18.51
					PEAK	23.04	21.47	25.34	30.00	-4.66	-2.86	22.48	36.02	-13.54
	2462	11	242T	61	AVG	16.36	15.24	18.85	30.00	-11.15	-2.86	15.99	36.02	-20.03
					PEAK	21.89	20.32	24.19	30.00	-5.81	-2.86	21.33	36.02	-14.69
	2467	12	242T	61	AVG	5.68	5.31	8.51	30.00	-21.49	-2.86	5.65	36.02	-30.37
					PEAK	10.59	9.41	13.05	30.00	-16.95	-2.86	10.19	36.02	-25.83
	2472	13	242T	61	AVG	0.17	-0.33	2.94	30.00	-27.06	-2.86	0.08	36.02	-35.94
					PEAK	5.32	4.49	7.94	30.00	-22.06	-2.86	5.08	36.02	-30.95

Table 7-9. Conducted Output Power Measurements MIMO (242 Tones)

Note:

Per ANSI C63.10-2013 Section 14.2, the conducted powers at Antenna 1 and Antenna 2 were first measured separately during MIMO transmission as shown in the section above. The measured values were then summed in linear power units then converted back to dBm.

Sample MIMO Calculation:

At 2437MHz the average conducted output power was measured to be 18.01 dBm for Antenna 1 and 17.26 dBm for Antenna 2.

Antenna 1 + Antenna 2 = MIMO

(18.01 dBm + 17.26 dBm) = (63.241 mW + 53.211 mW) = 116.452 mW = 20.66 dBm

7.4 Power Spectral Density

Test Overview and Limit

The peak power density is measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates, tones configurations, and RU indices were investigated and the worst-case configuration results are reported in this section.

The maximum permissible power spectral density shall not be greater than 8 dBm in any 3 kHz band.

Test Procedure Used

ANSI C63.10-2013 – Section 11.10.2 Method PKPSD
ANSI C63.10-2013 – Section 14.3.1 Measure-and-Sum Technique

Test Settings

1. Analyzer was set to the center frequency of the DTS channel under investigation
2. Span = 1.5 times the DTS channel bandwidth
3. RBW = 3kHz
4. VBW = 1MHz
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

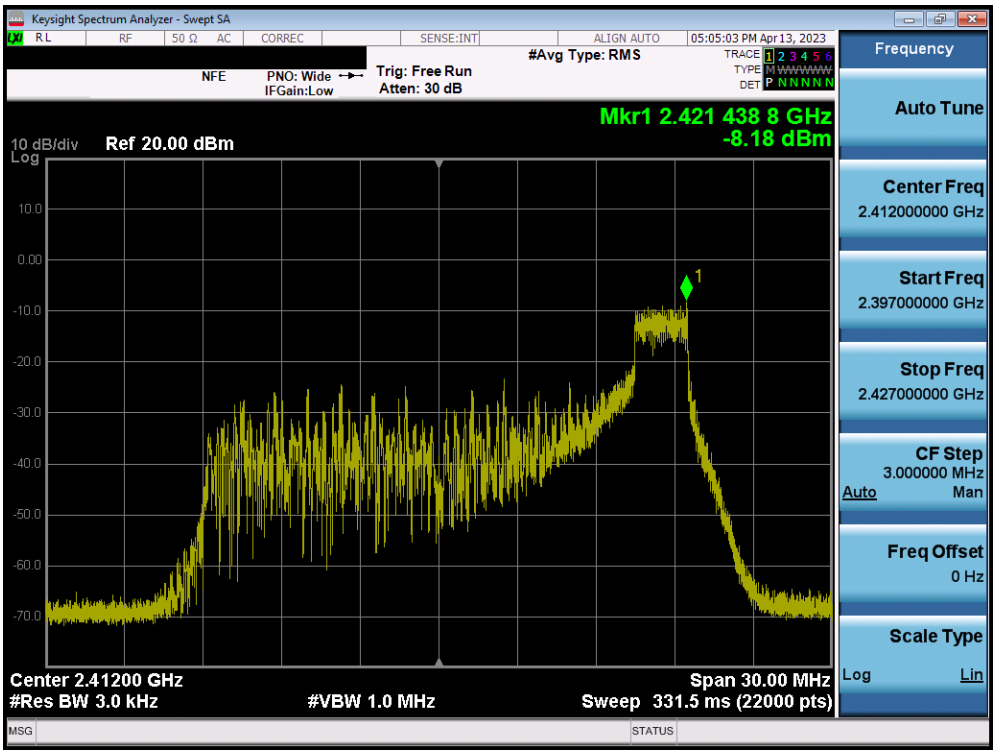
Figure 7-3. Test Instrument & Measurement Setup

Test Notes

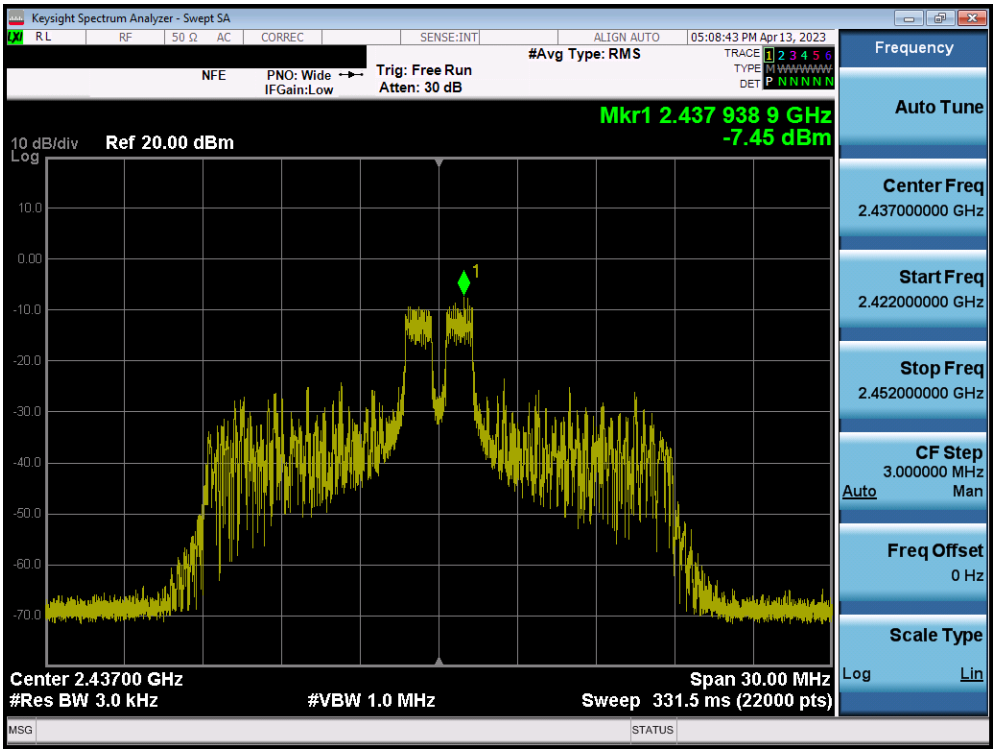
1. Based on preliminary measurements, it was determined that, of all of the tone configurations, the 26T configuration produced the worst case power spectral density measurement for partial loaded case. Therefore, only the 26 Tone configuration and 242 Tone data is included in this section.
2. The power spectral density for each channel was measured with the RU index showing the highest conducted power.

7.4.1 SISO Antenna-2 Power Spectral Density Measurements

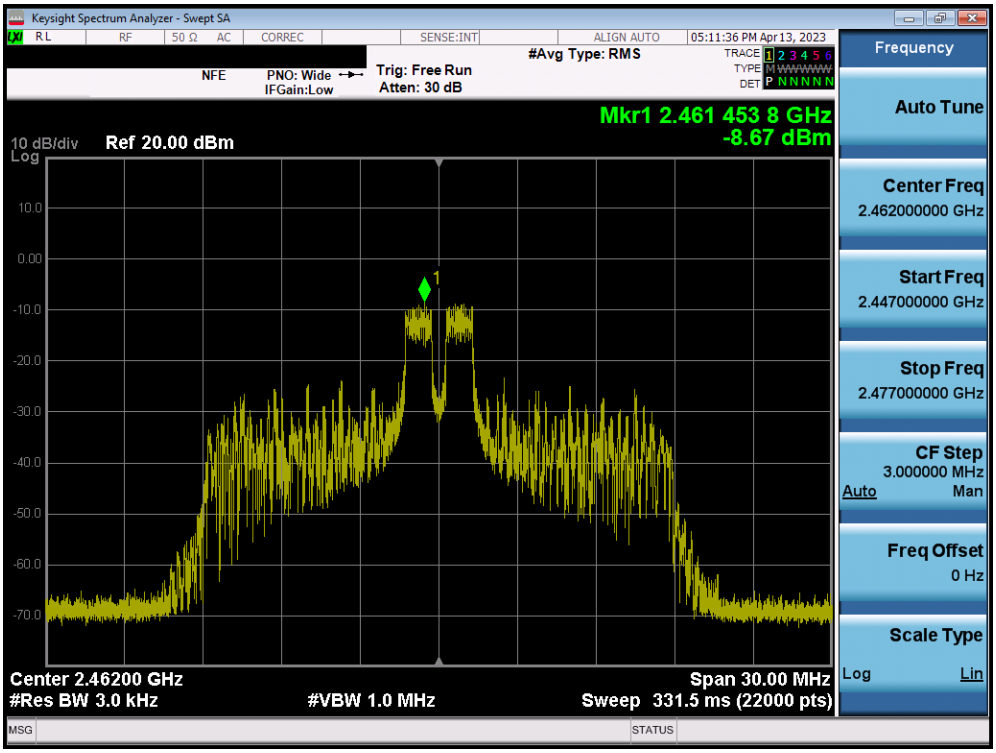
Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured Power Spectral Density [dBm]	Maximum Permissible Power Density [dBm / 3kHz]	Margin [dB]	Pass / Fail
2412	1	ax	26T	MCS0	-8.18	8.00	-16.18	Pass
2437	6	ax	26T	MCS0	-7.45	8.00	-15.45	Pass
2462	11	ax	26T	MCS0	-8.67	8.00	-16.67	Pass
2412	1	ax	242T	MCS0	-7.89	8.00	-15.89	Pass
2437	6	ax	242T	MCS0	-8.28	8.00	-16.28	Pass
2462	11	ax	242T	MCS0	-7.76	8.00	-15.76	Pass



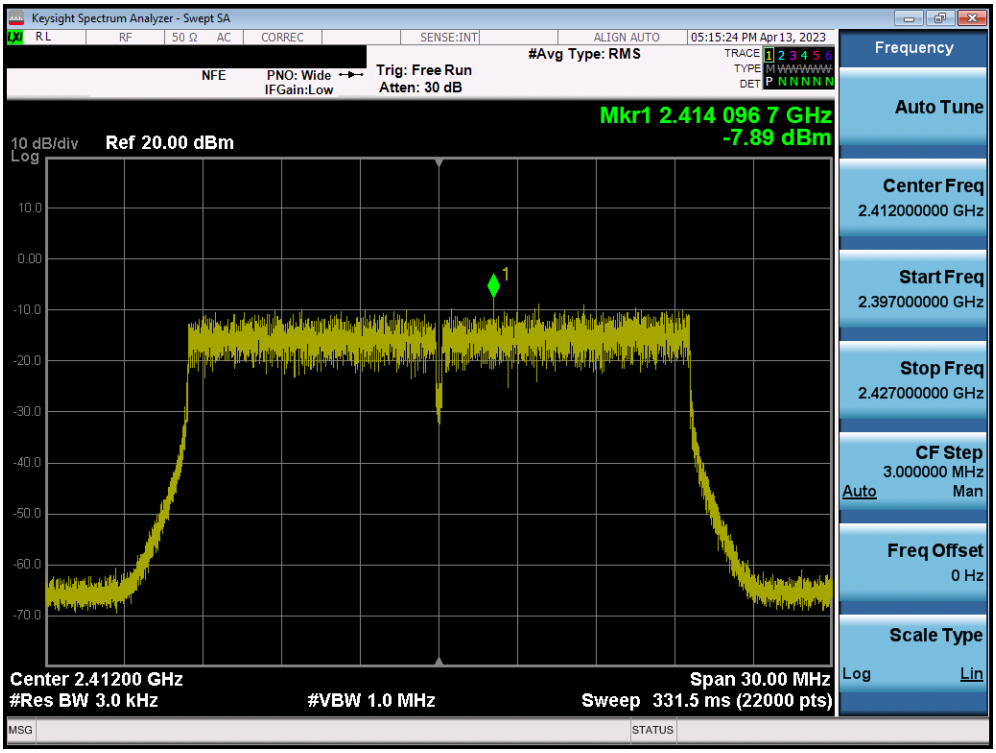
Plot 7-19. Power Spectral Density Plot SISO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 1)



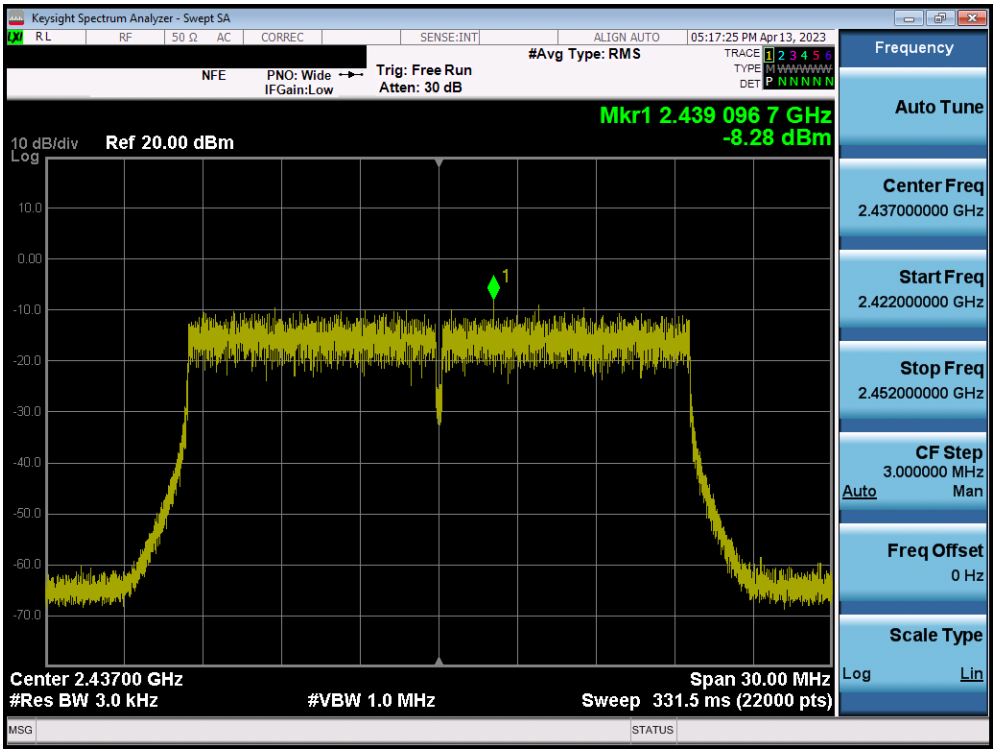
Plot 7-20. Power Spectral Density Plot SISO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 6)



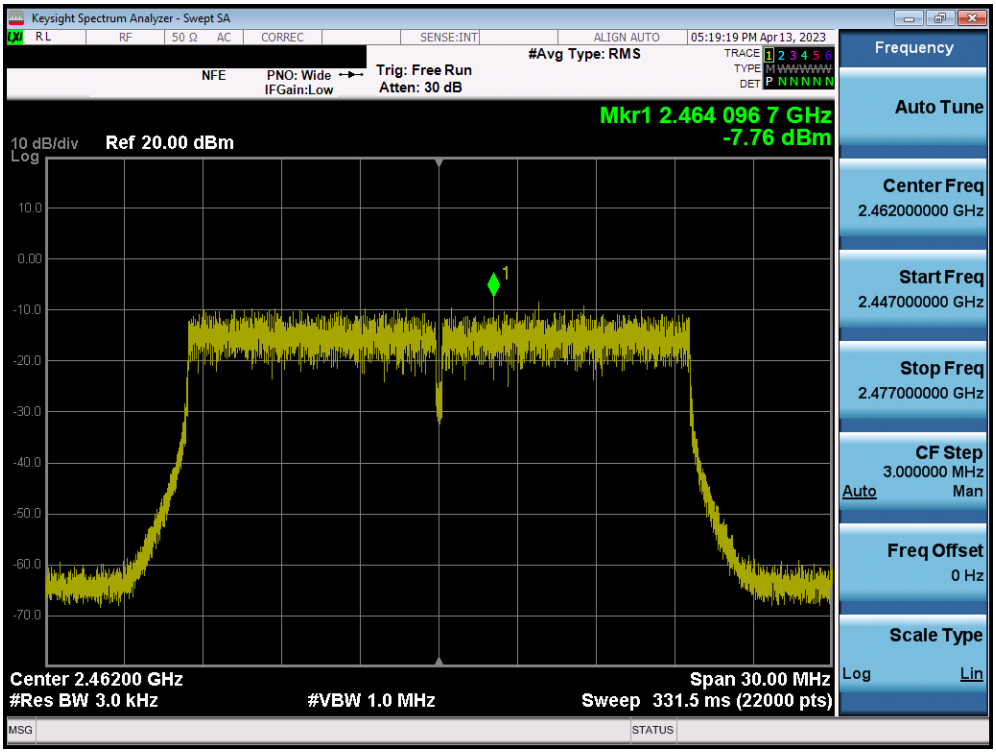
Plot 7-21. Power Spectral Density Plot SISO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 11)



Plot 7-22. Power Spectral Density Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 1)



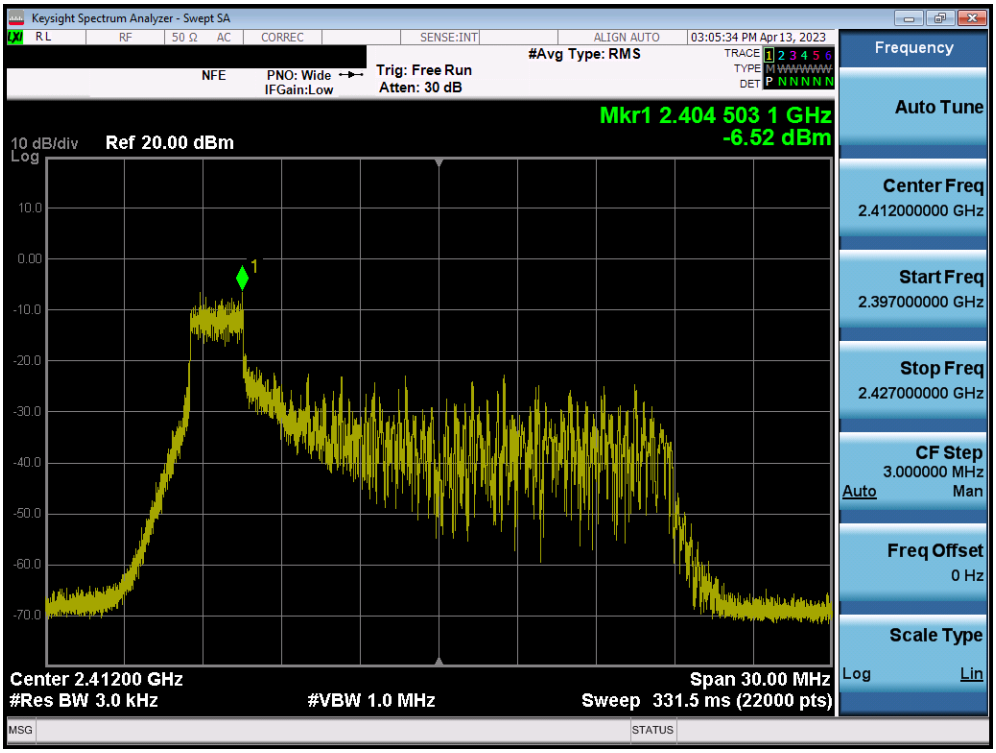
Plot 7-23. Power Spectral Density Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 6)



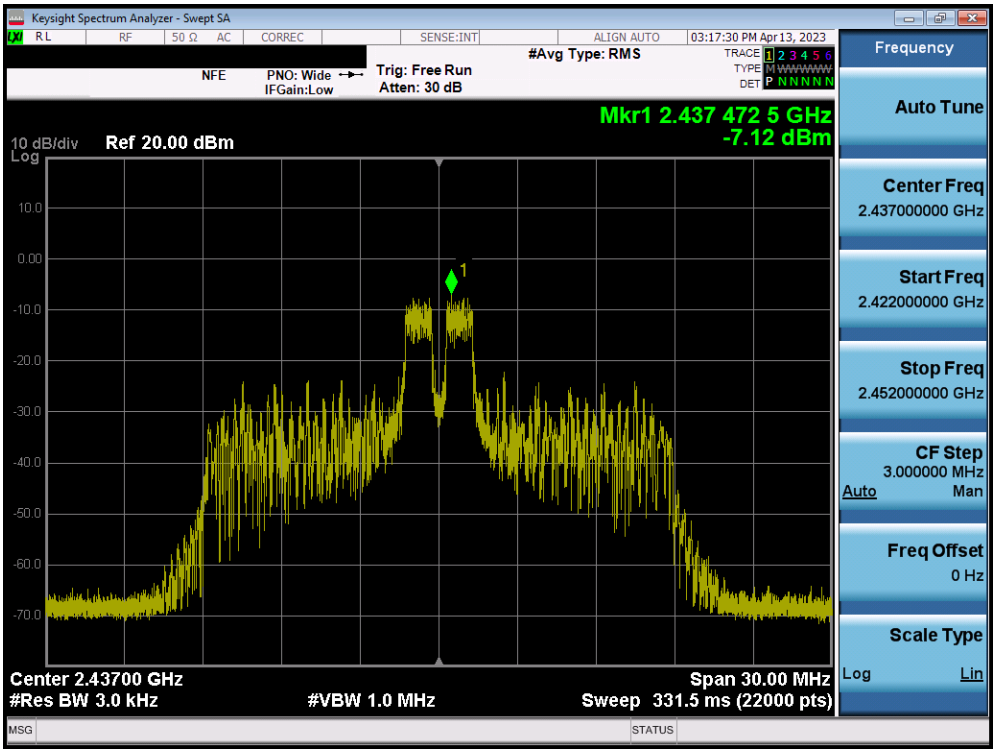
Plot 7-24. Power Spectral Density Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 11)

7.4.2 MIMO Power Spectral Density Measurements

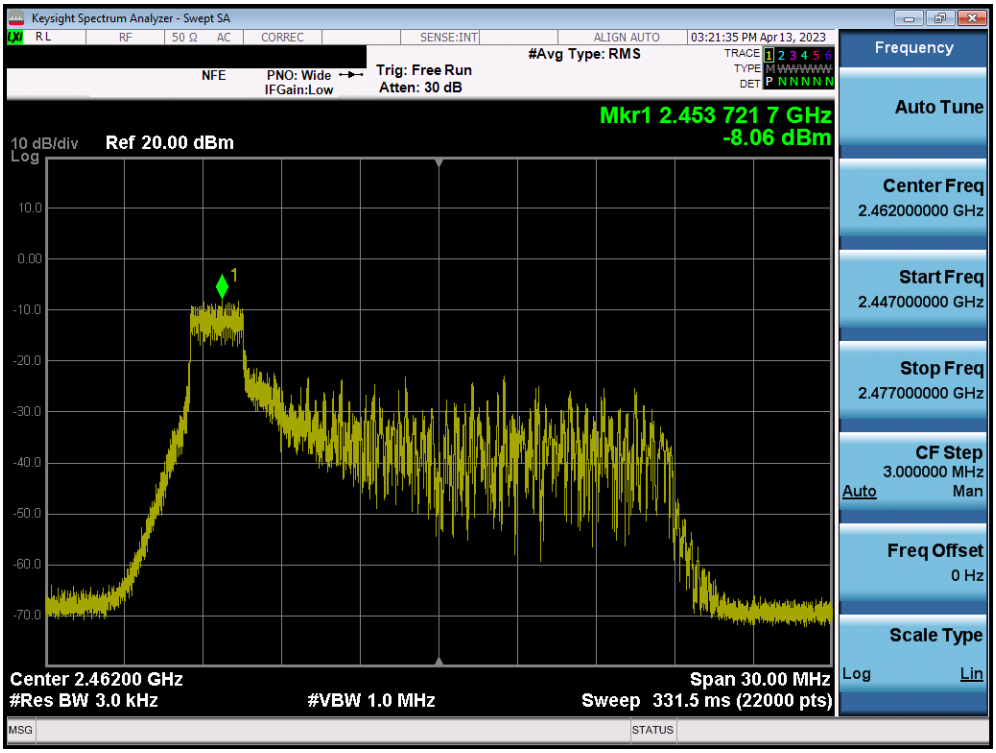
Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	ANT 1 Power Spectral Density [dBm]	ANT 2 Power Spectral Density [dBm]	Summed MIMO Power Spectral Density [dBm]	Maximum Permissible Power Density [dBm / 3kHz]	Margin [dB]	Pass / Fail
2412	1	ax	26T	MCS0	-6.52	-8.57	-4.41	8.00	-12.41	Pass
2437	6	ax	26T	MCS0	-7.12	-8.50	-4.75	8.00	-12.75	Pass
2462	11	ax	26T	MCS0	-8.06	-8.17	-5.11	8.00	-13.11	Pass
2412	1	ax	242T	MCS0	-8.42	-8.56	-5.48	8.00	-13.48	Pass
2437	6	ax	242T	MCS0	-8.09	-8.48	-5.27	8.00	-13.27	Pass
2462	11	ax	242T	MCS0	-7.92	-8.24	-5.07	8.00	-13.07	Pass



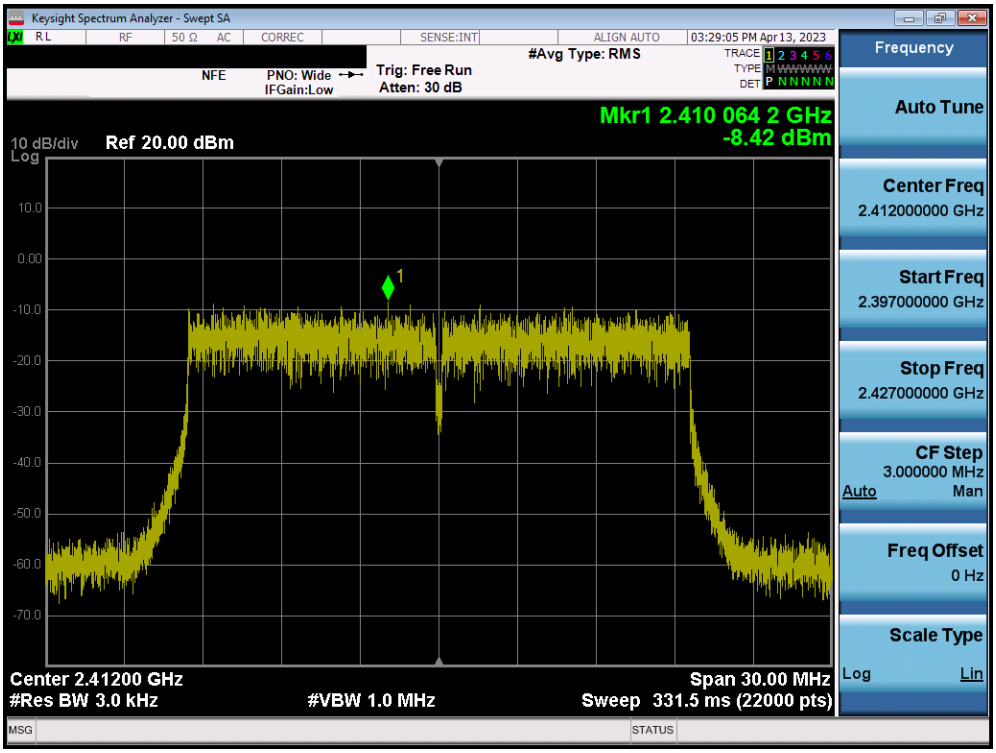
Plot 7-25. Power Spectral Density Plot MIMO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 1)



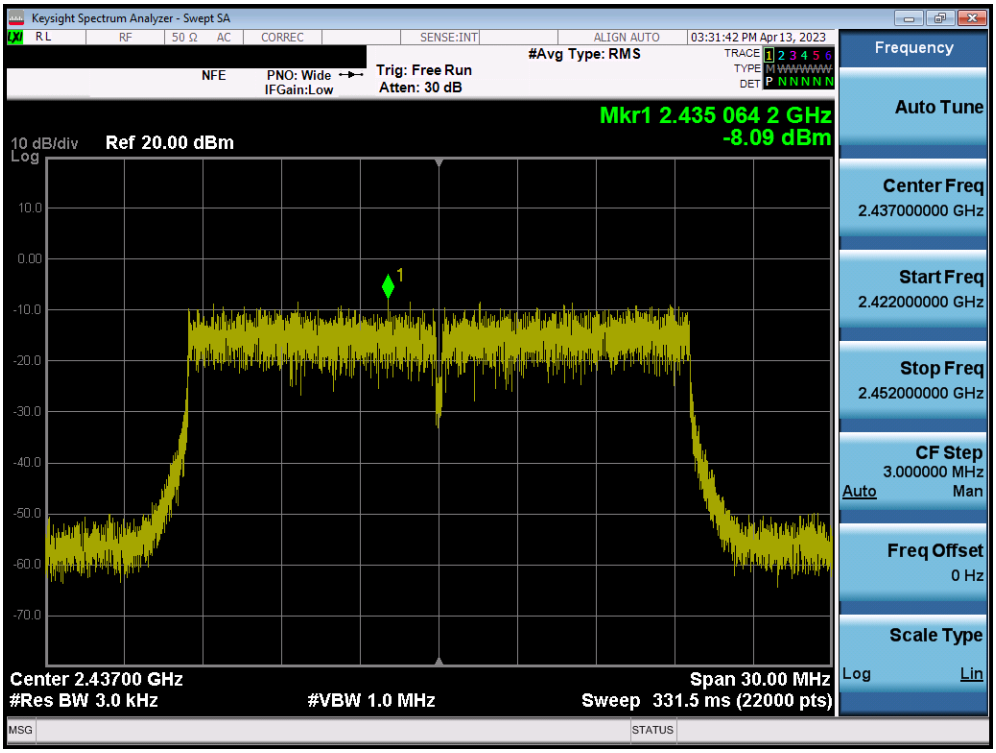
Plot 7-26. Power Spectral Density Plot MIMO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 6)



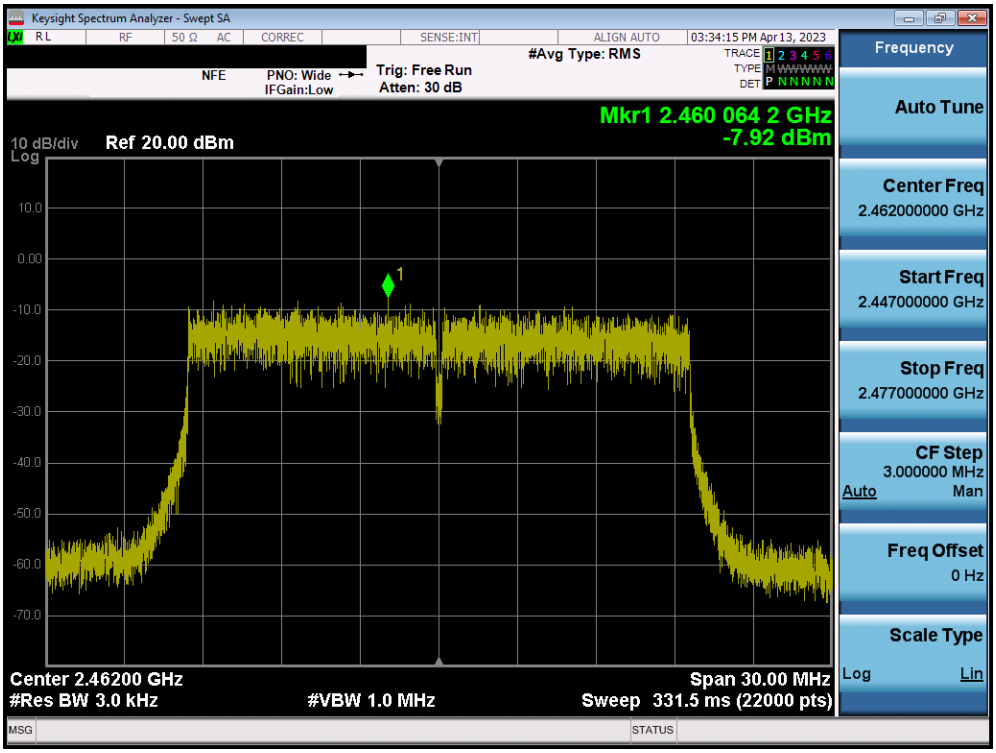
Plot 7-27. Power Spectral Density Plot MIMO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 11)



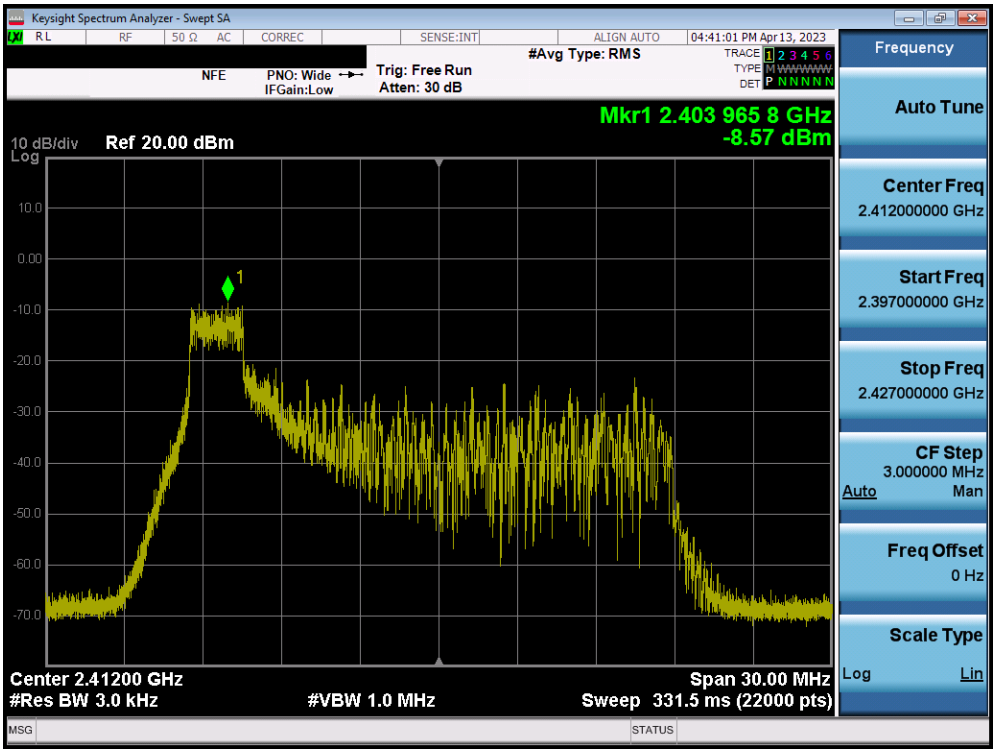
Plot 7-28. Power Spectral Density Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 1)



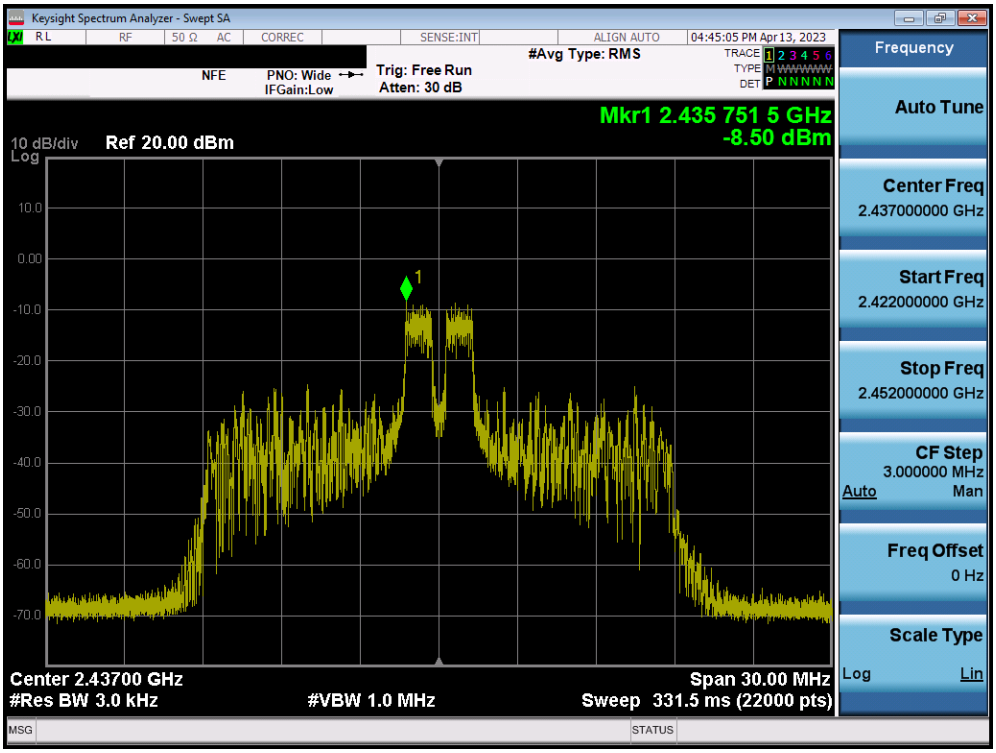
Plot 7-29. Power Spectral Density Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 6)



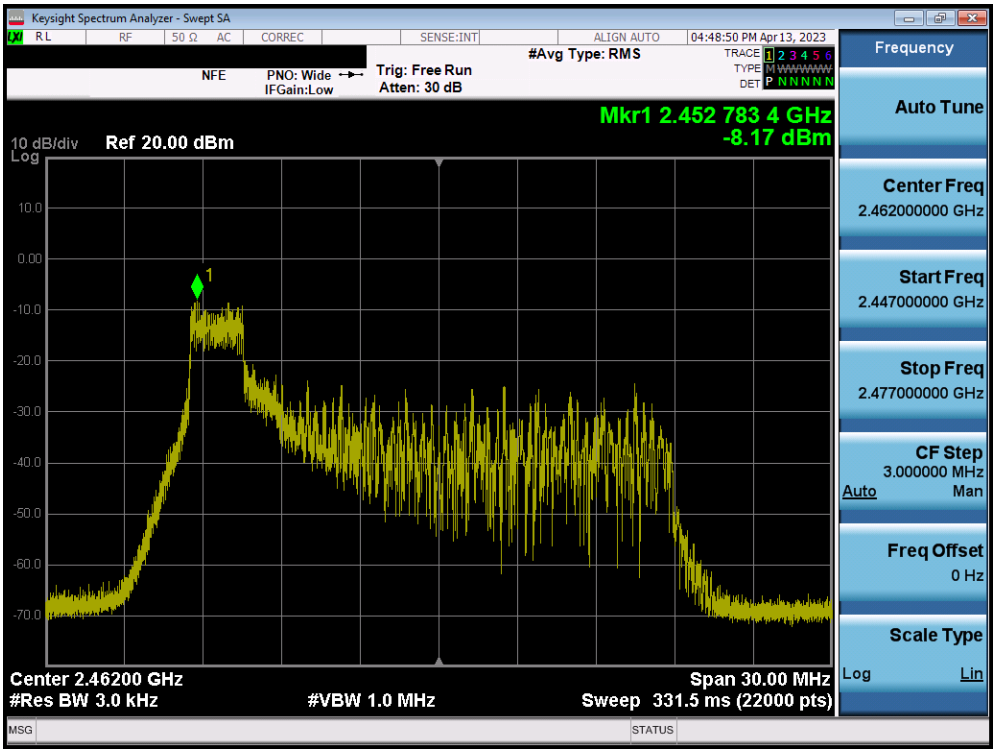
Plot 7-30. Power Spectral Density Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 11)



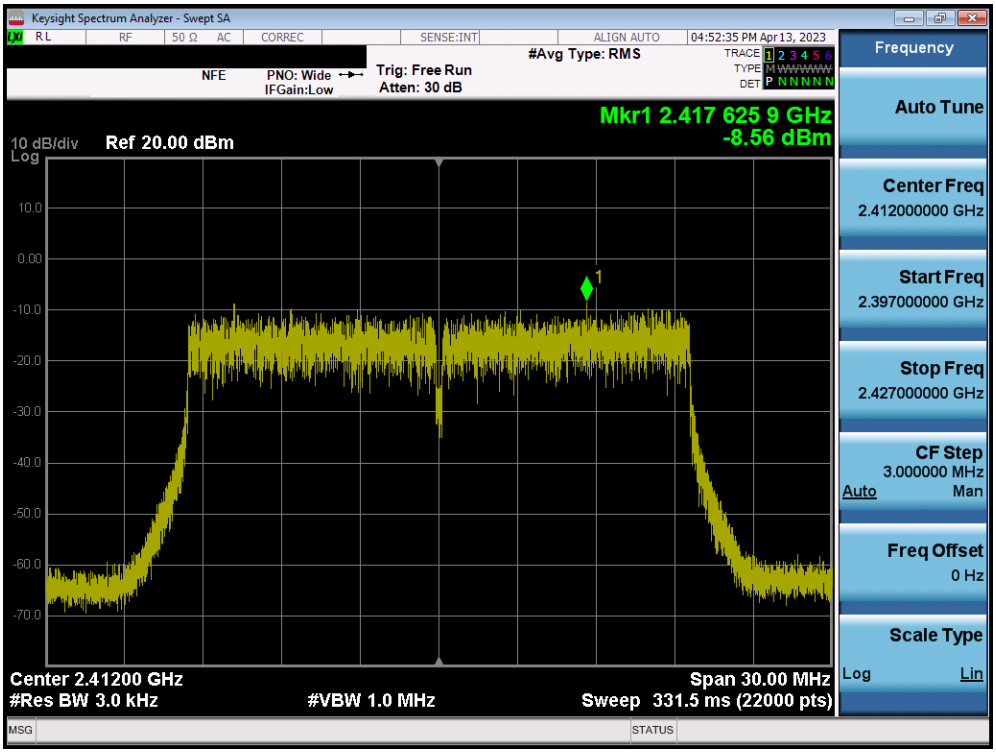
Plot 7-31. Power Spectral Density Plot MIMO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 1)



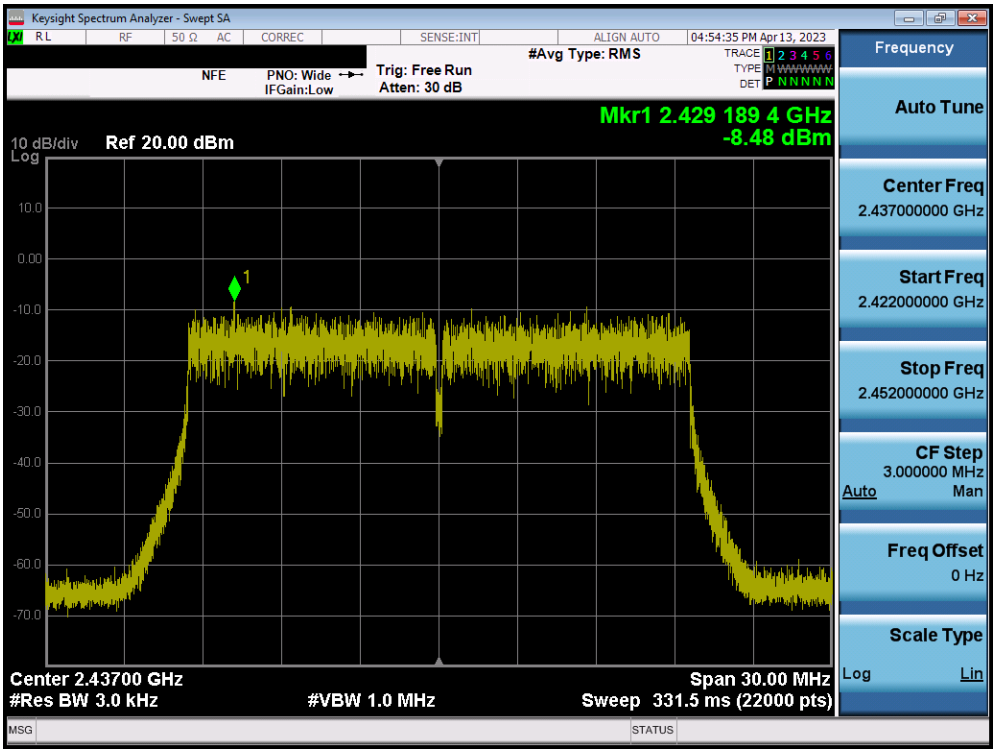
Plot 7-32. Power Spectral Density Plot MIMO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 6)



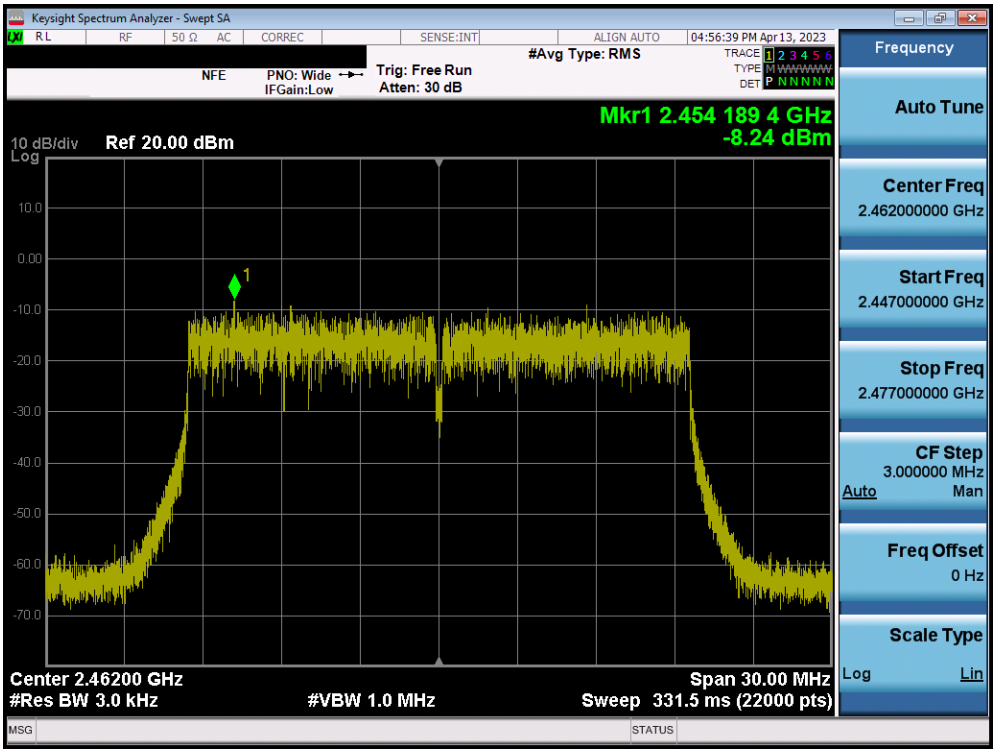
Plot 7-33. Power Spectral Density Plot MIMO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 11)



Plot 7-34. Power Spectral Density Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 1)



Plot 7-35. Power Spectral Density Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 6)



Plot 7-36. Power Spectral Density Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 11)

Note:

Per ANSI C63.10-2013 Section 14.3.1, the power spectral density at Antenna 1 and Antenna 2 were first measured separately as shown in the section above. The measured values were then summed in linear power units then converted back to dBm.

Sample MIMO Calculation:

At 2412MHz the average conducted power spectral density was measured to be -6.52 dBm for Antenna 1 and -8.57 dBm for Antenna 2.

Antenna 1 + Antenna 2 = MIMO

(-6.52 dBm + -8.57 dBm) = (0.223 mW + 0.139 mW) = 0.362 mW = -4.41 dBm

7.5 Conducted Band Edge Emissions

Test Overview and Limit

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates, tone configurations, and RU indices were investigated to determine the worst-case configuration. For the following out of band conducted emissions plots at the band edge, the EUT was set to a data rate of MCS0 in 802.11ax mode as this setting produced the worst-case emissions.

The limit for out-of-band spurious emissions at the band edge is 30dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100kHz bandwidth per the PSD procedure (Section 7.4).

Test Procedure Used

ANSI C63.10-2013 – Section 11.11.3

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW = 100kHz
4. VBW = 1MHz
5. Detector = Peak
6. Number of sweep points ≥ 2 x Span/RBW
7. Trace mode = max hold
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

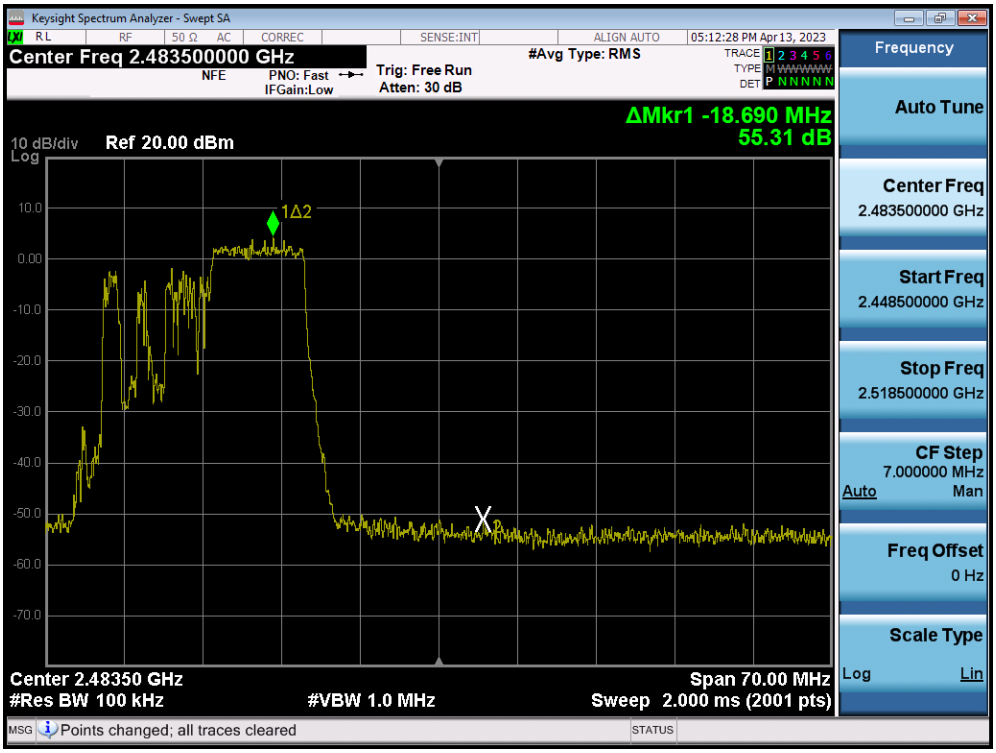
Figure 7-4. Test Instrument & Measurement Setup

Test Notes

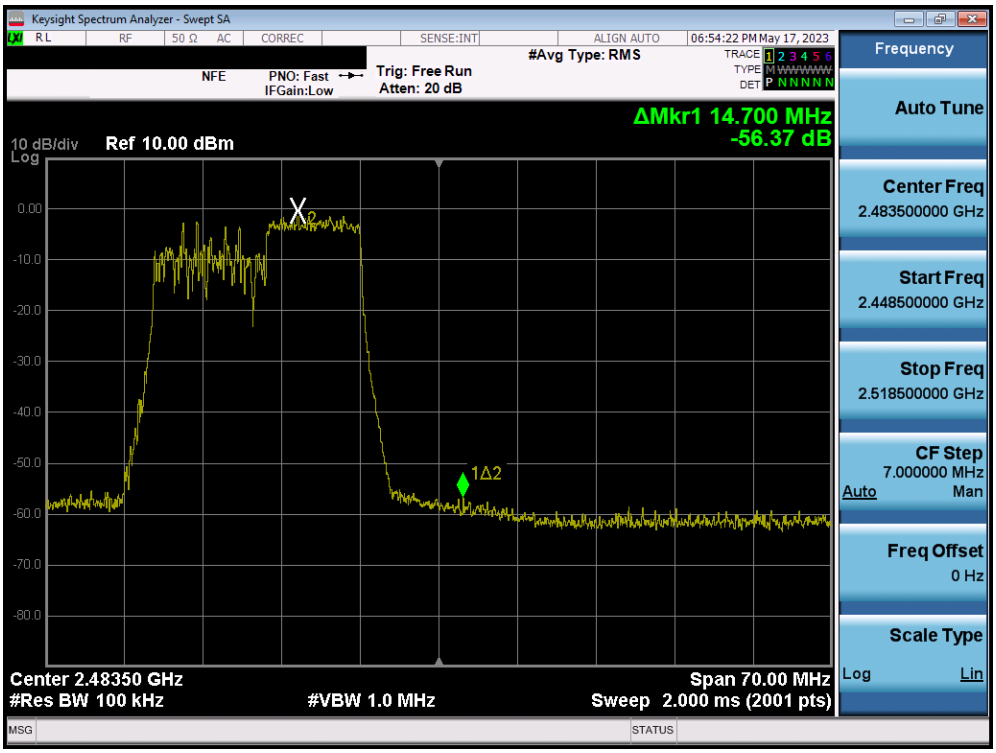
None.

7.5.1 SISO Antenna-2 Conducted Emissions at the Band Edge

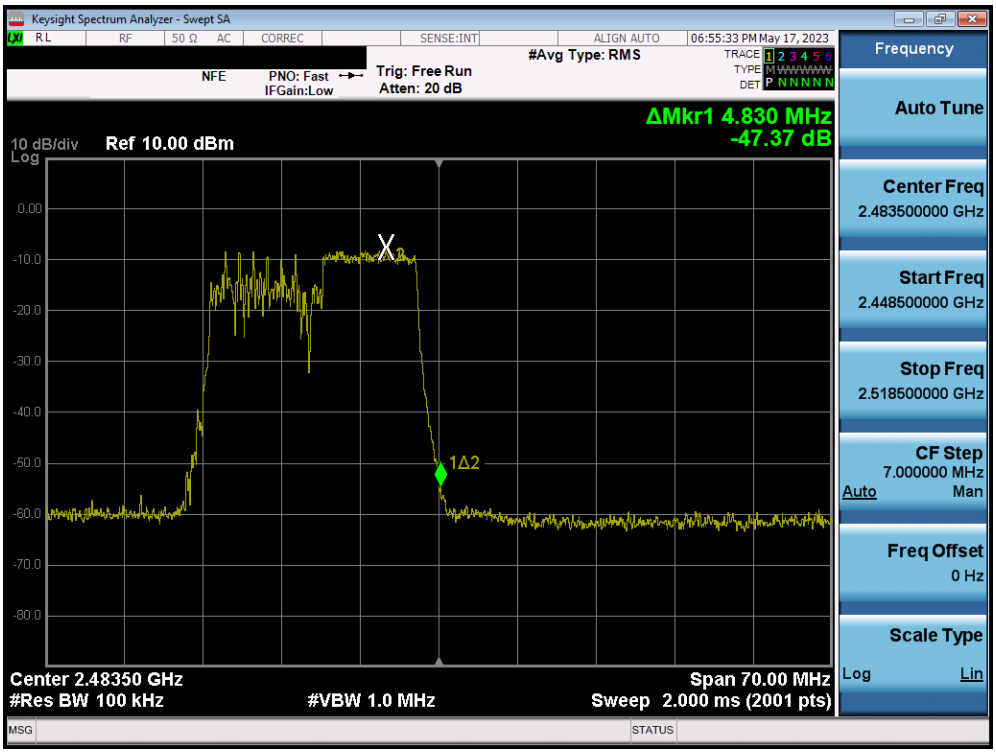
Plot 7-37. Band Edge Plot SISO ANT2 (802.11ax OFDMA – 106 Tones – Ch. 1)



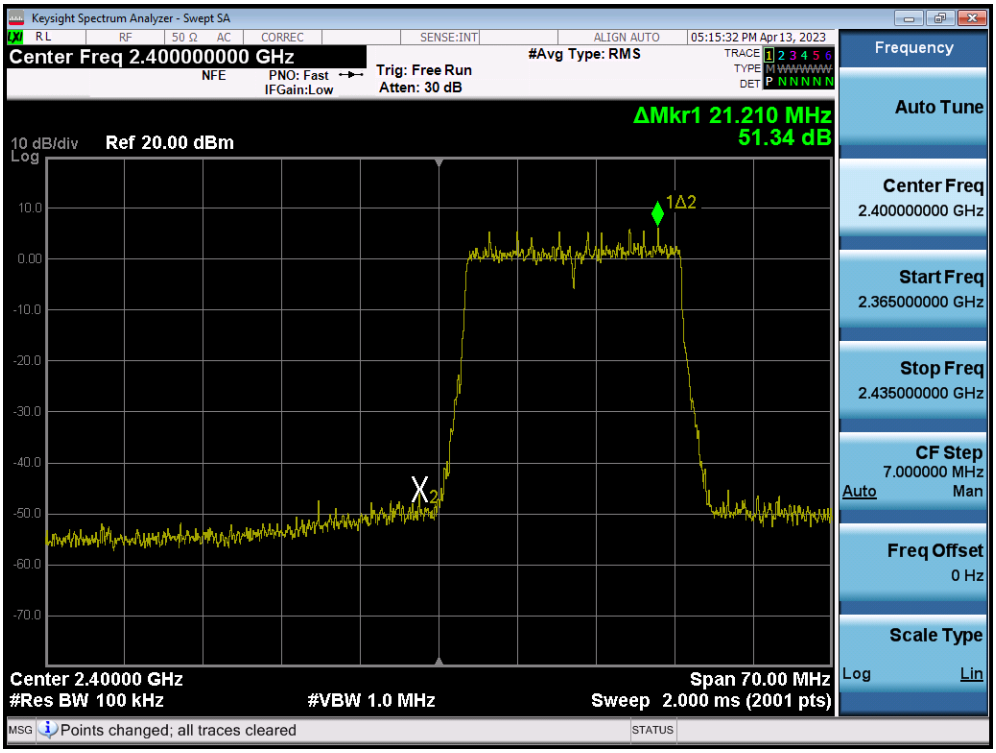
Plot 7-38. Band Edge Plot SISO ANT2 (802.11ax OFDMA – 106 Tones – Ch. 11)



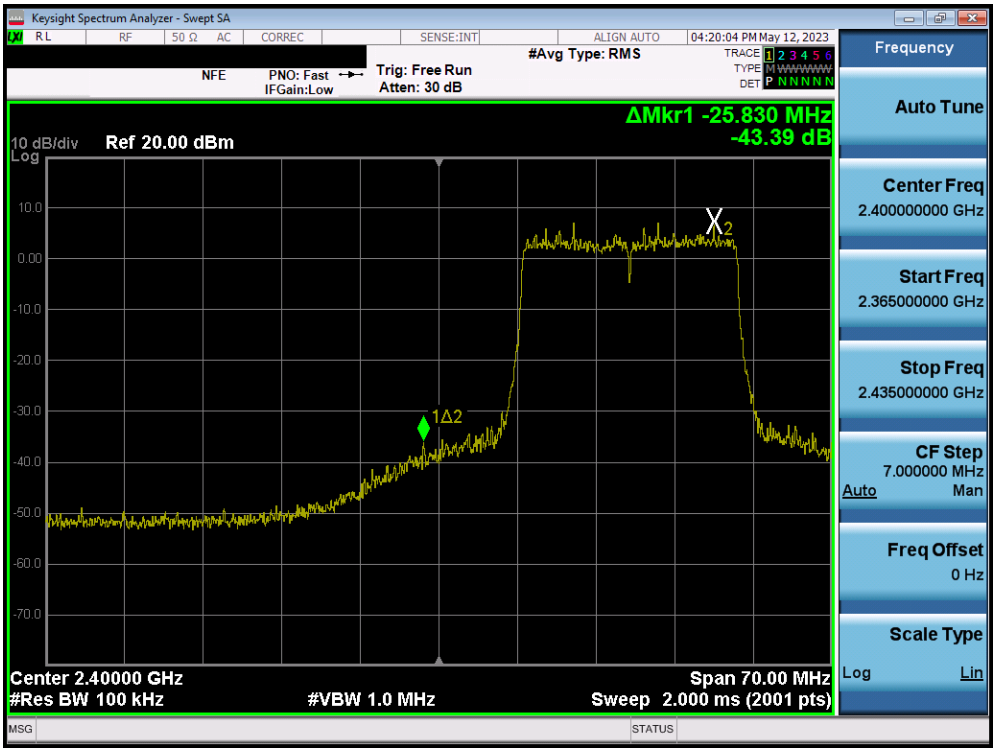
Plot 7-39. Band Edge Plot SISO ANT2 (802.11ax OFDMA – 106 Tones – Ch. 12)



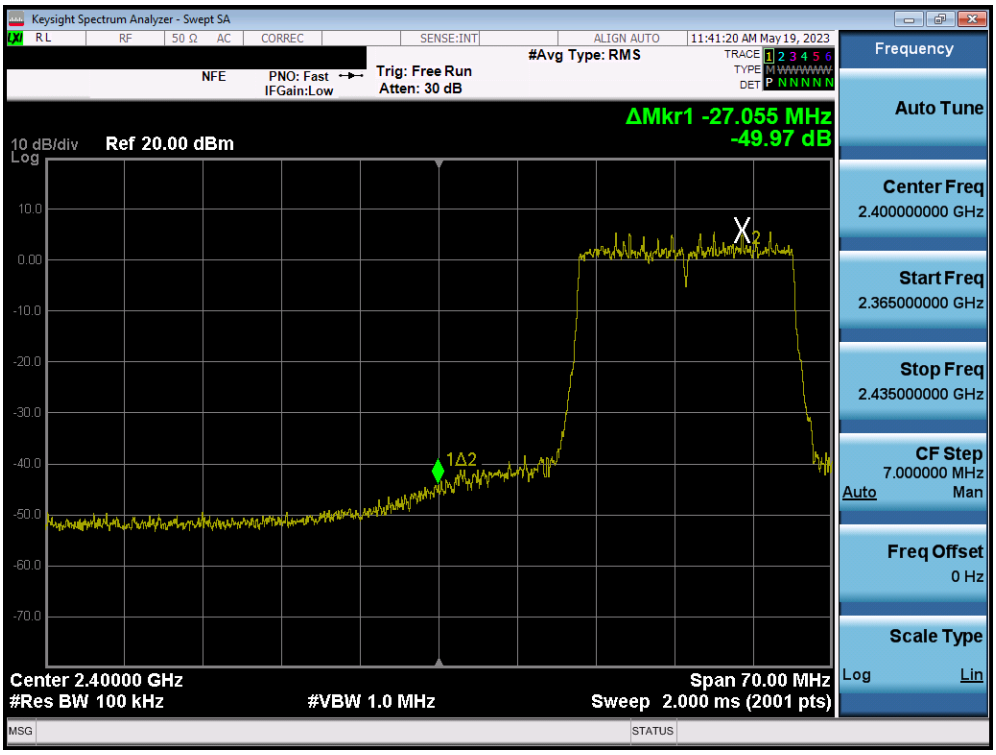
Plot 7-40. Band Edge Plot SISO ANT2 (802.11ax OFDMA – 106 Tones – Ch. 13)



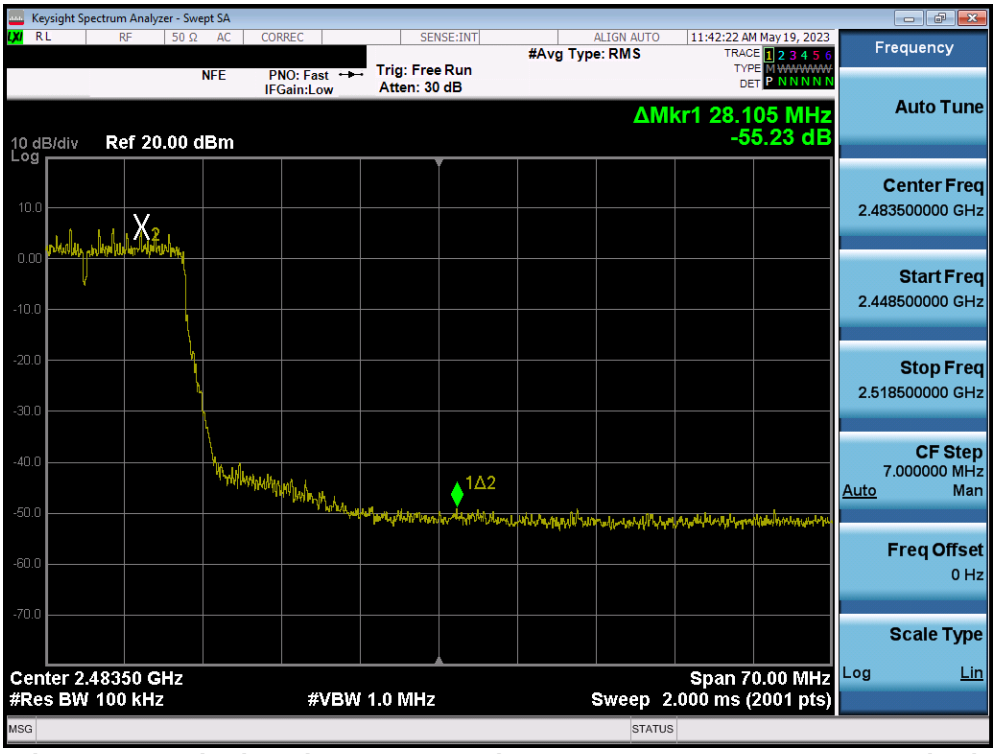
Plot 7-41. Band Edge Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 1)



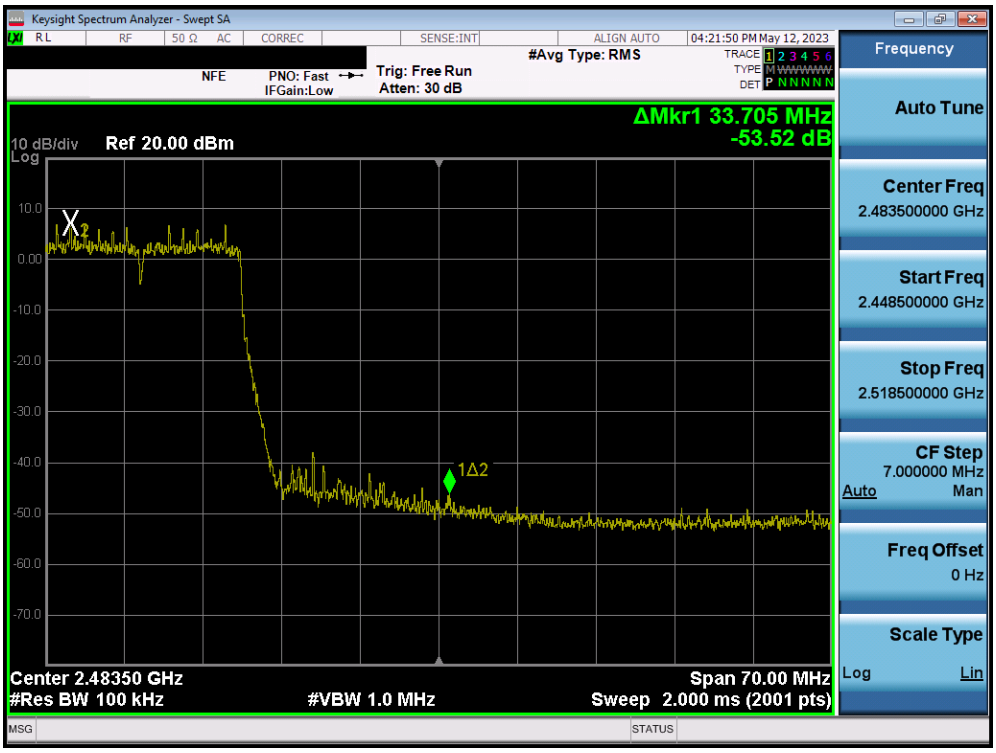
Plot 7-42. Band Edge Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 2)



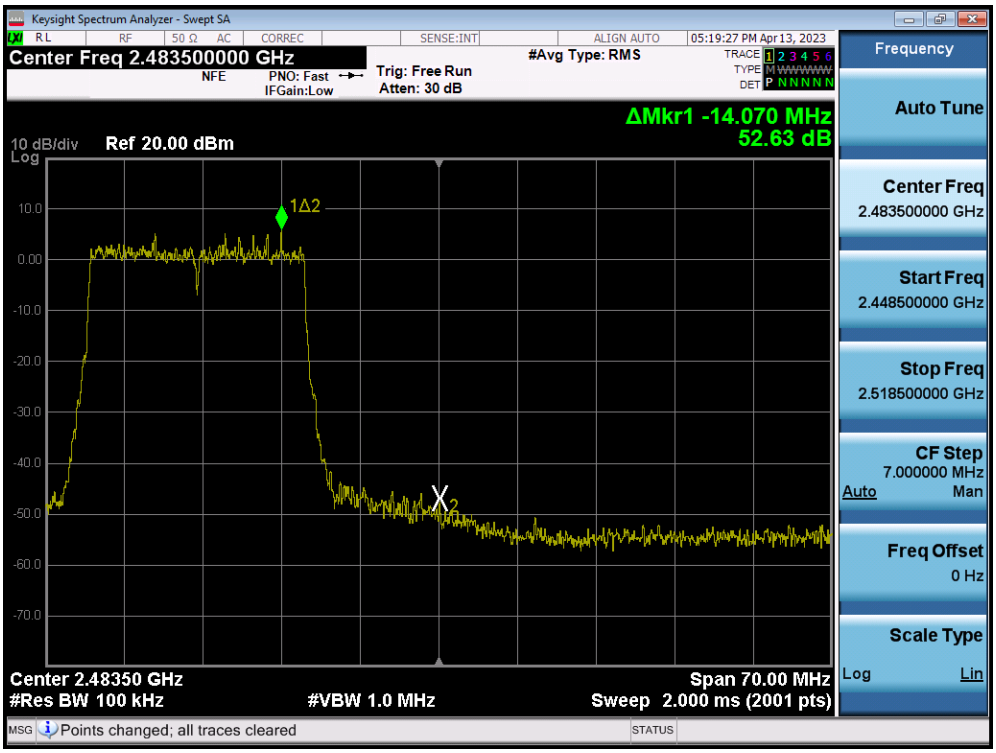
Plot 7-43. Band Edge Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 3)



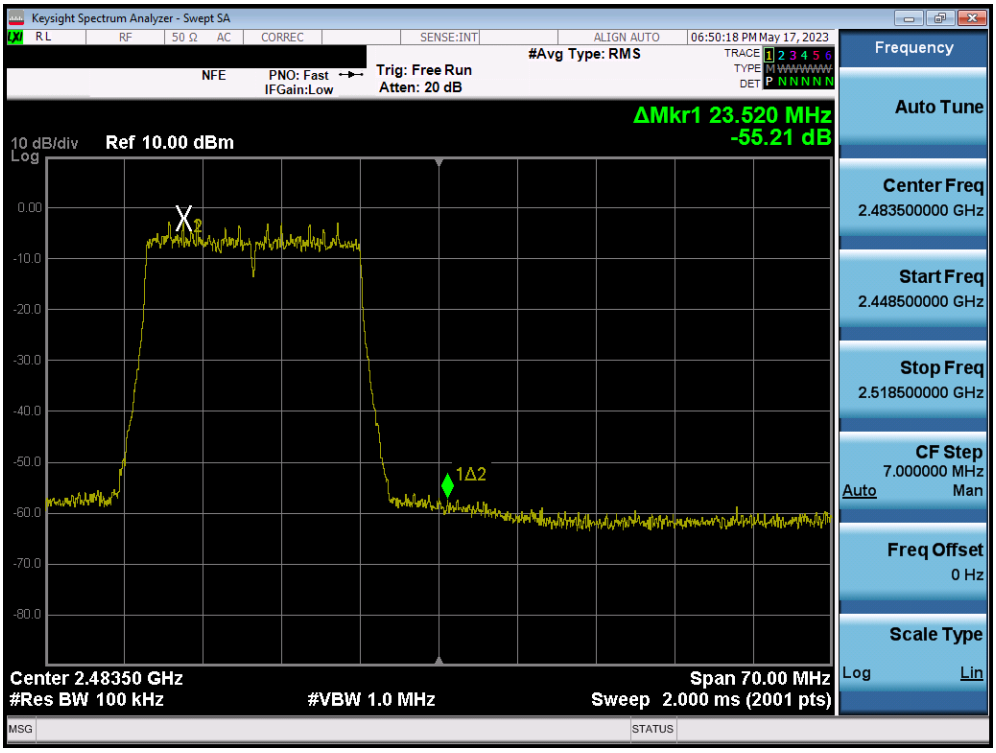
Plot 7-44. Band Edge Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 9)



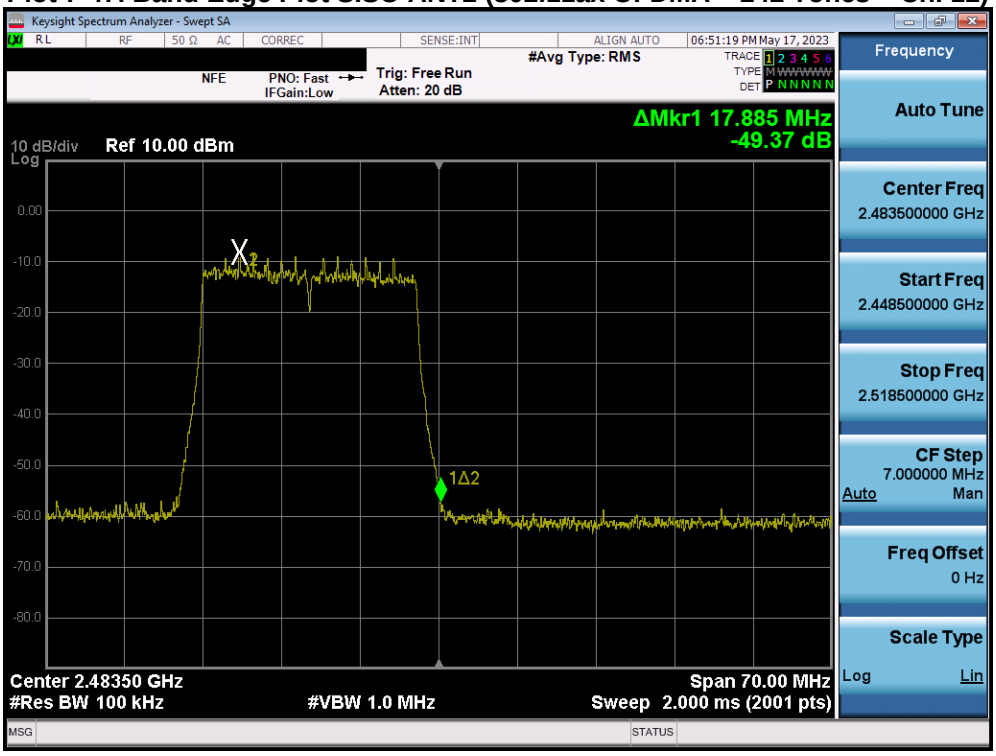
Plot 7-45. Band Edge Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 10)



Plot 7-46. Band Edge Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 11)

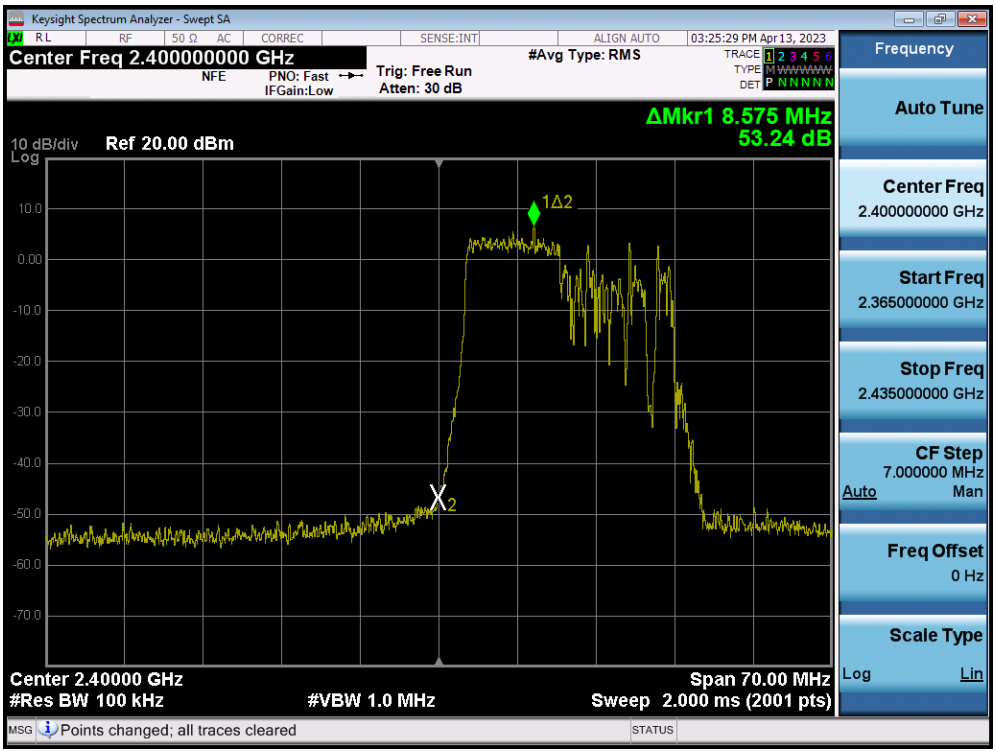


Plot 7-47. Band Edge Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 12)

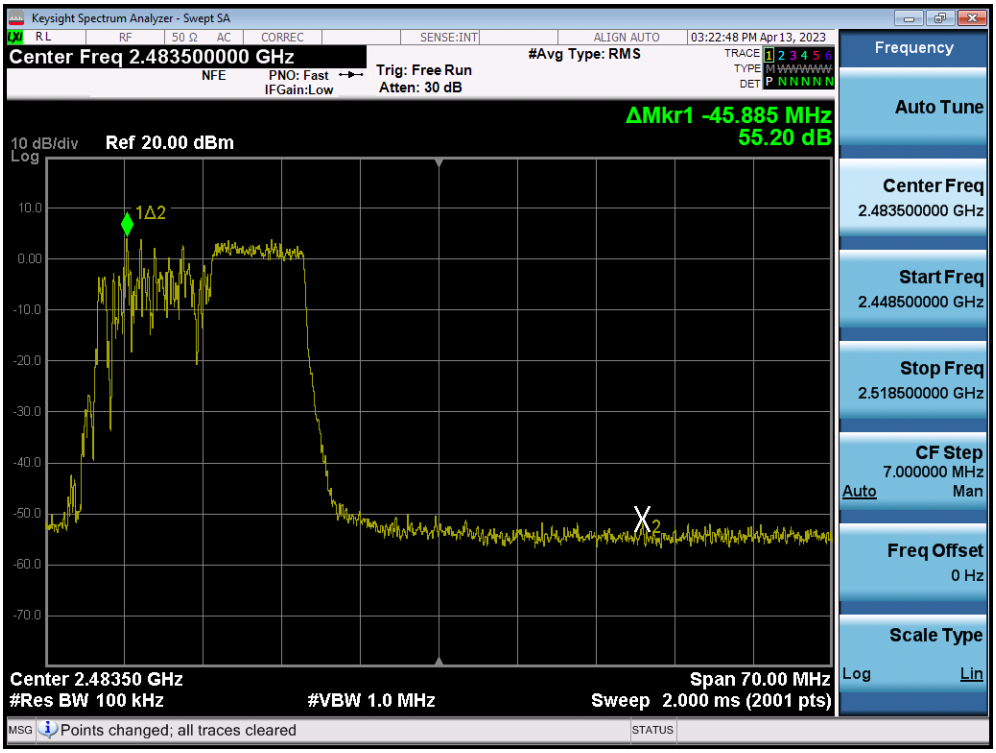


Plot 7-48. Band Edge Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 13)

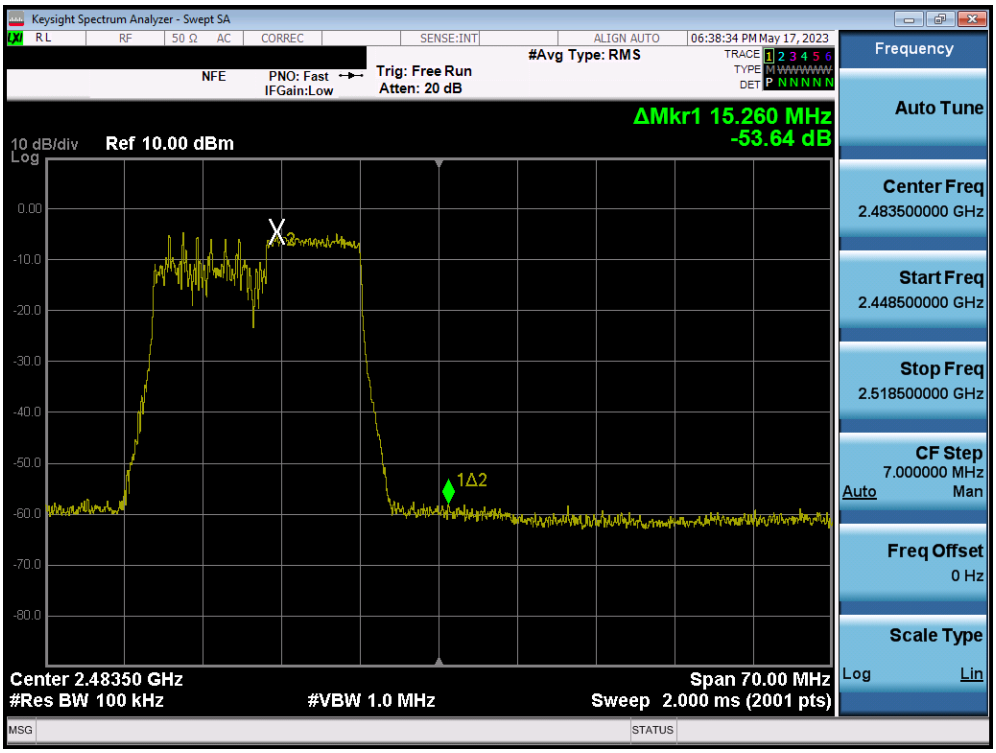
7.5.2 MIMO Conducted Band Edge Emissions – ANT 1



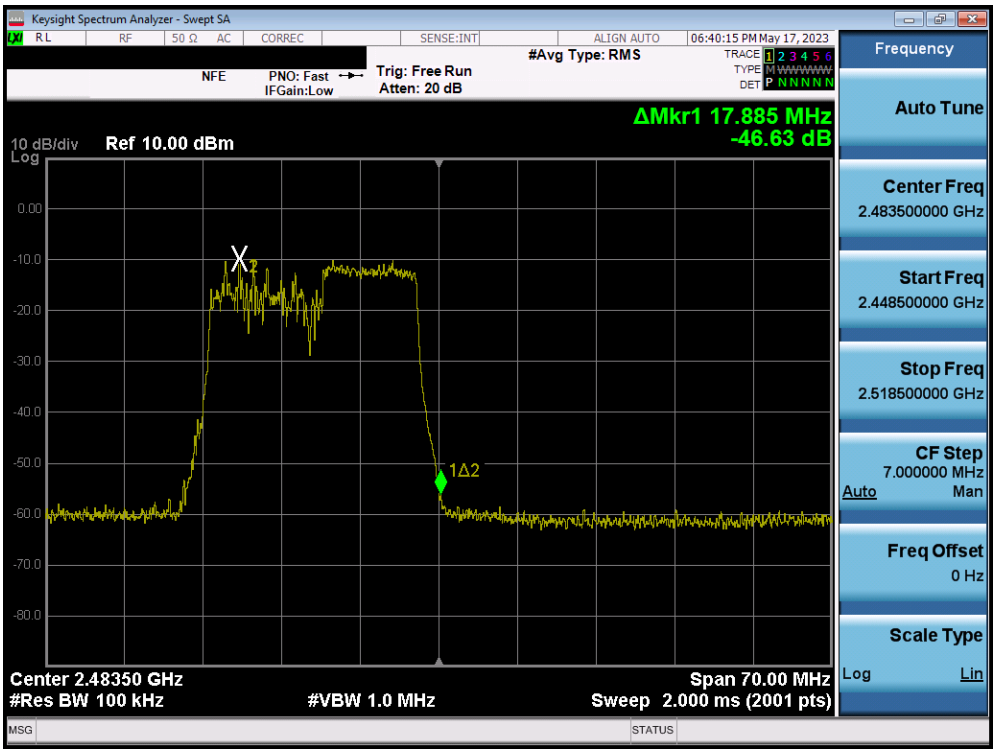
Plot 7-49. Band Edge Plot MIMO ANT1 (802.11ax OFDMA – 106 Tones – Ch. 1)



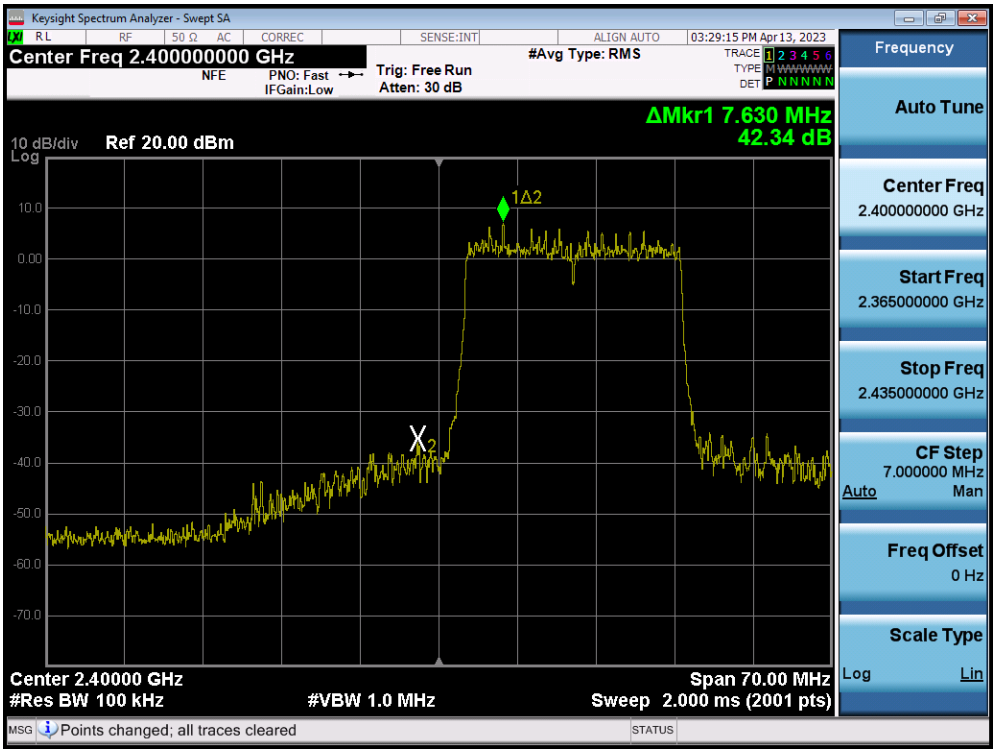
Plot 7-50. Band Edge Plot MIMO ANT1 (802.11ax OFDMA – 106 Tones – Ch. 11)



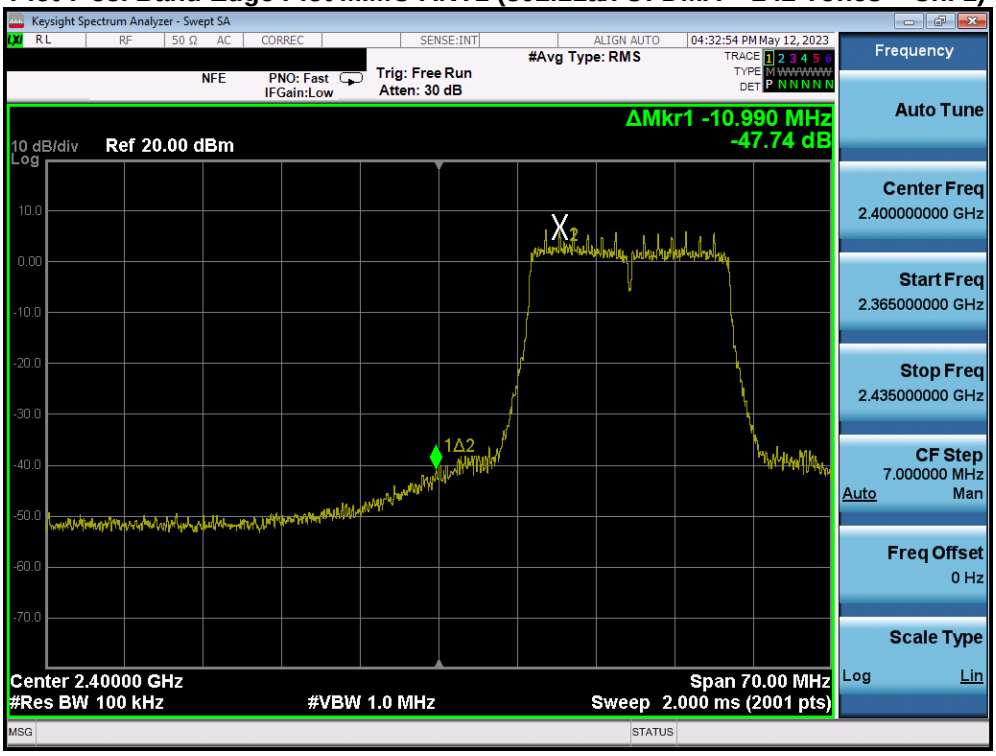
Plot 7-51. Band Edge Plot MIMO ANT1 (802.11ax OFDMA – 106 Tones – Ch. 12)



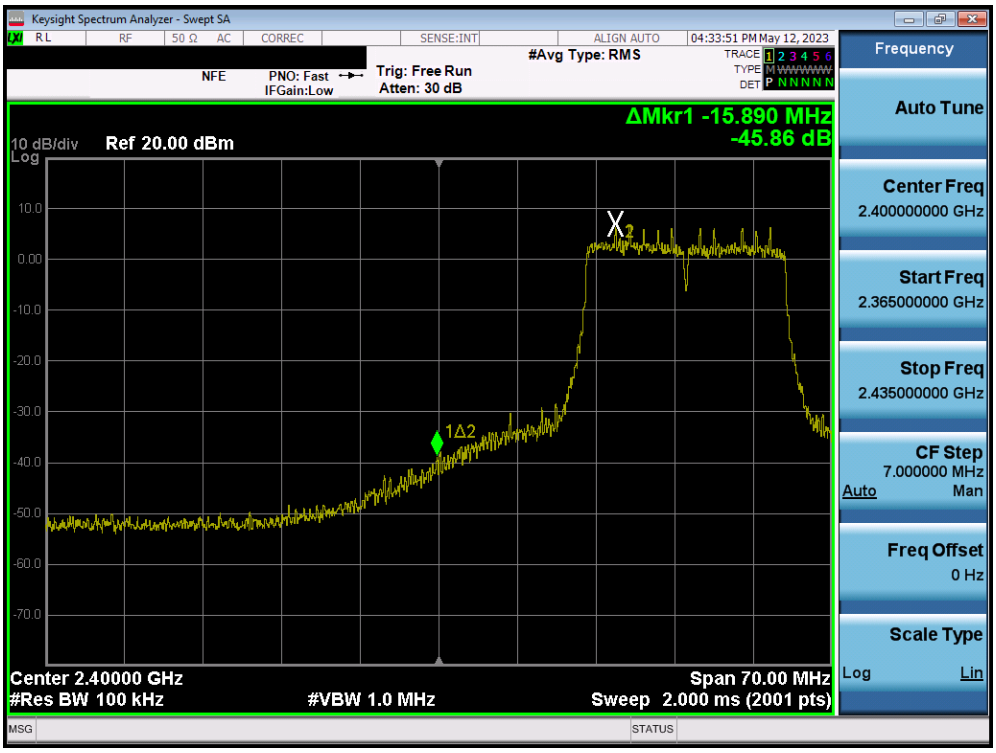
Plot 7-52. Band Edge Plot MIMO ANT1 (802.11ax OFDMA – 106 Tones – Ch. 13)



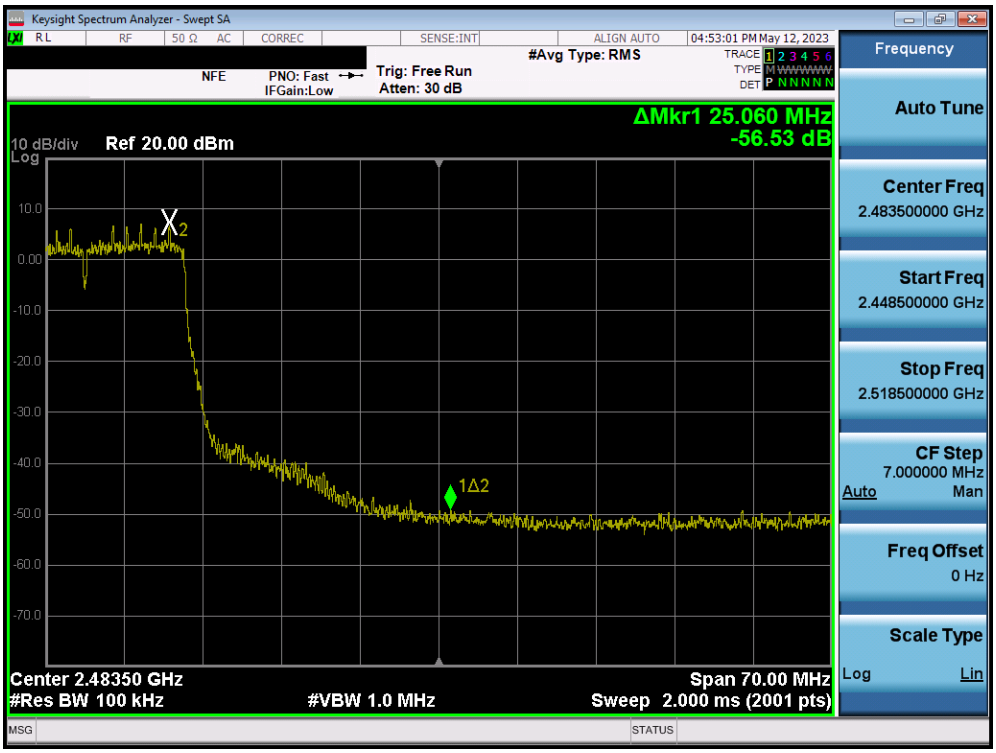
Plot 7-53. Band Edge Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 1)



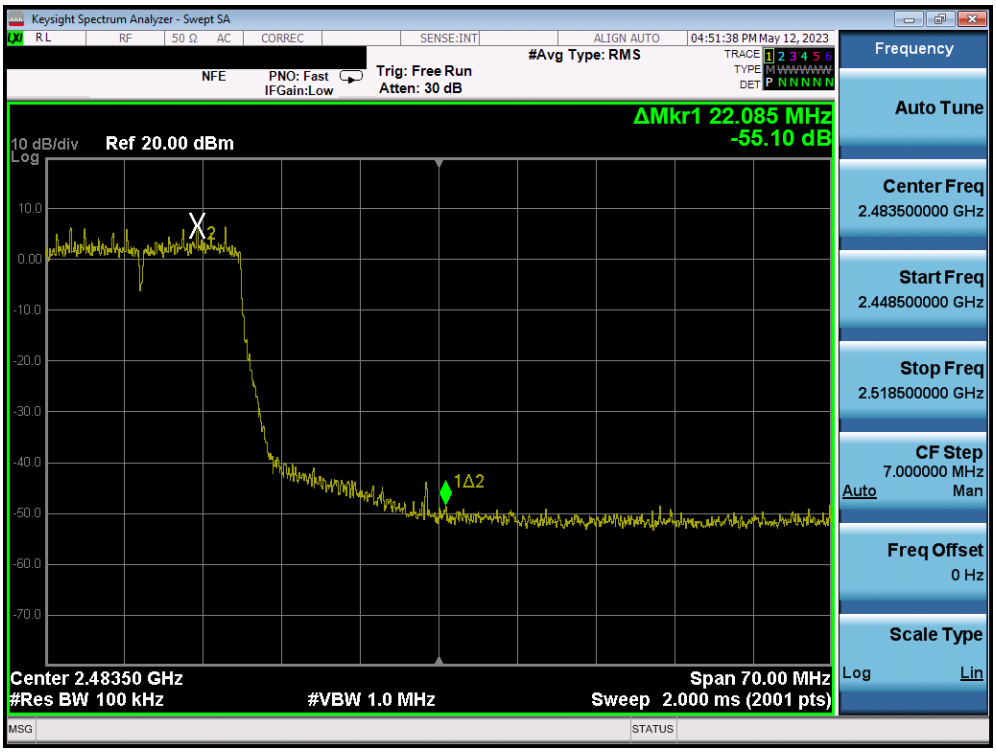
Plot 7-54. Band Edge Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 2)



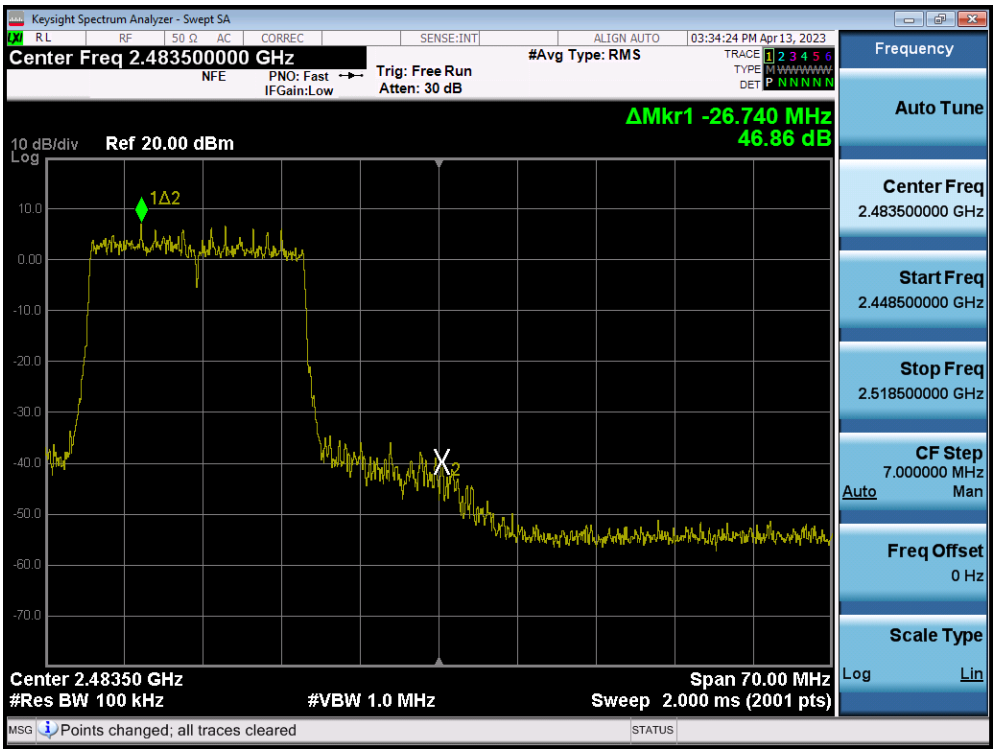
Plot 7-55. Band Edge Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 3)



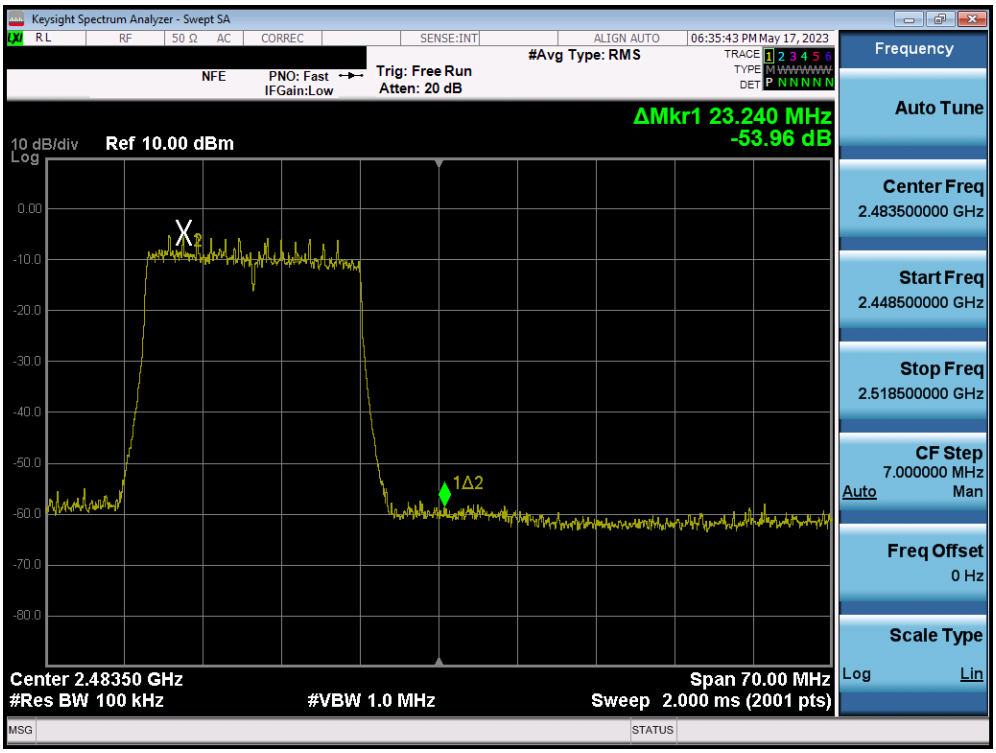
Plot 7-56. Band Edge Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 9)



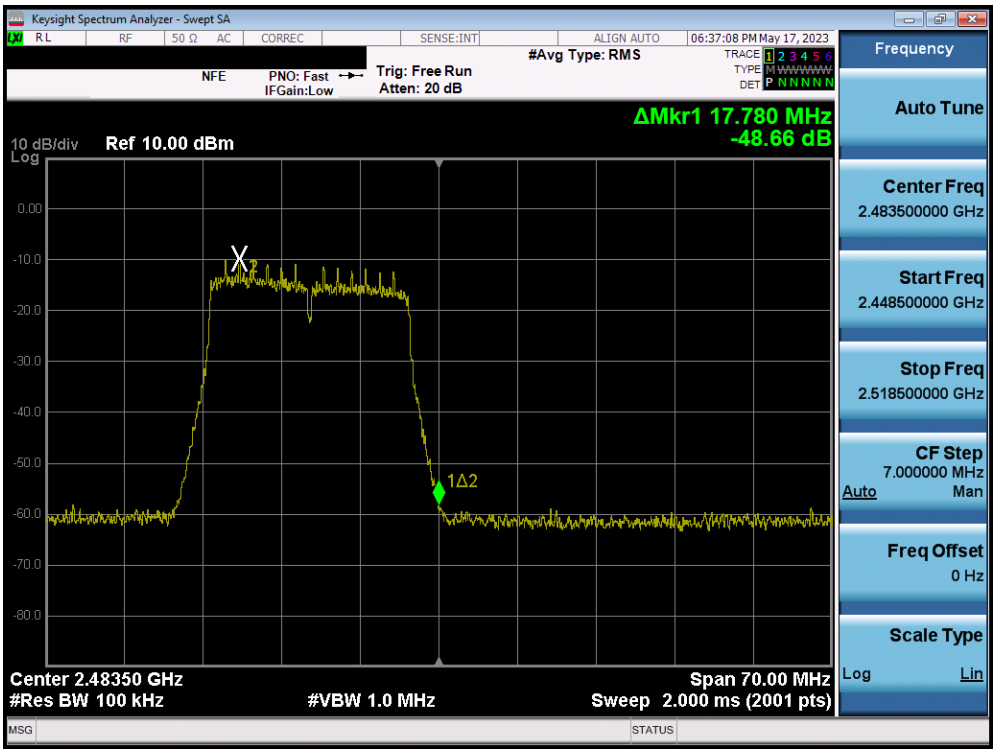
Plot 7-57. Band Edge Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 10)



Plot 7-58. Band Edge Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 11)

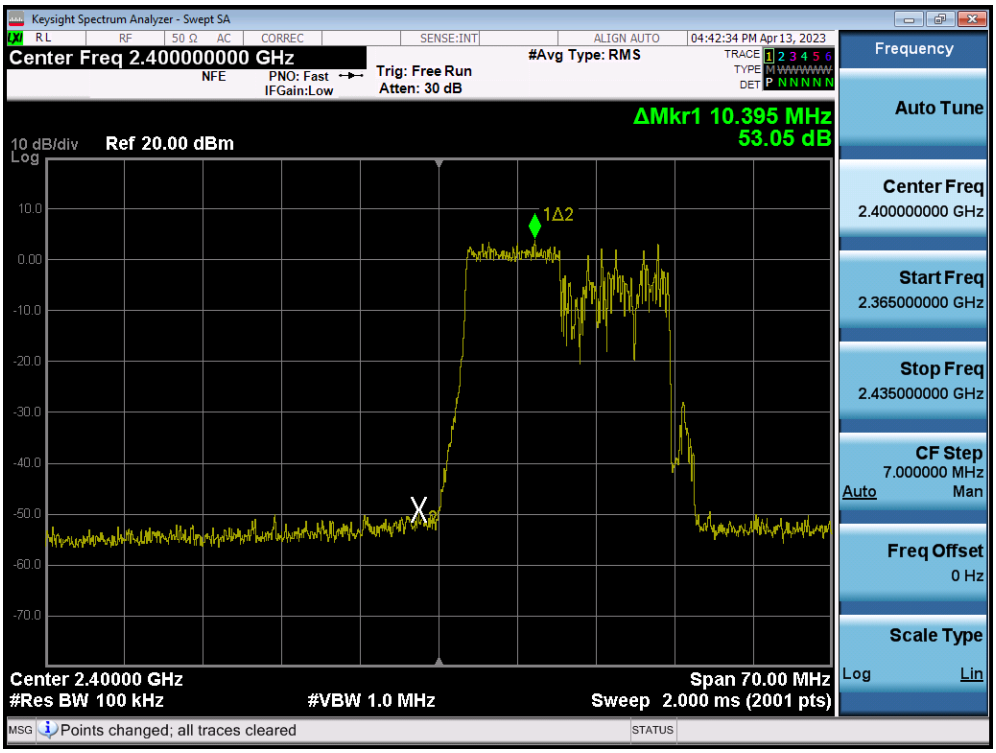


Plot 7-59. Band Edge Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 12)

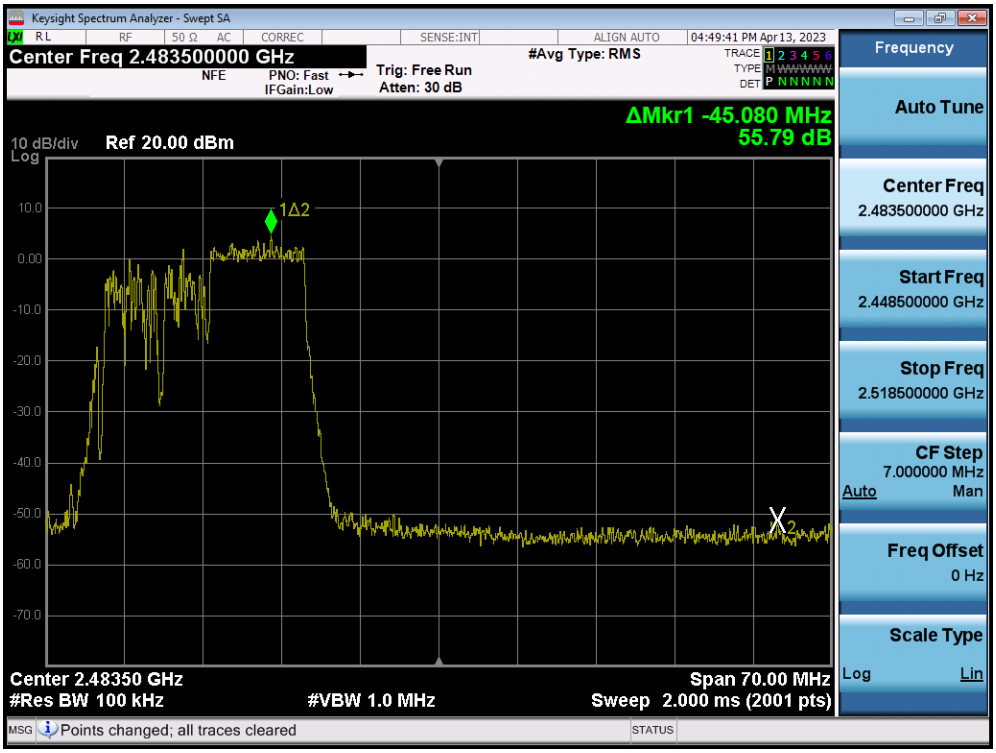


Plot 7-60. Band Edge Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 13)

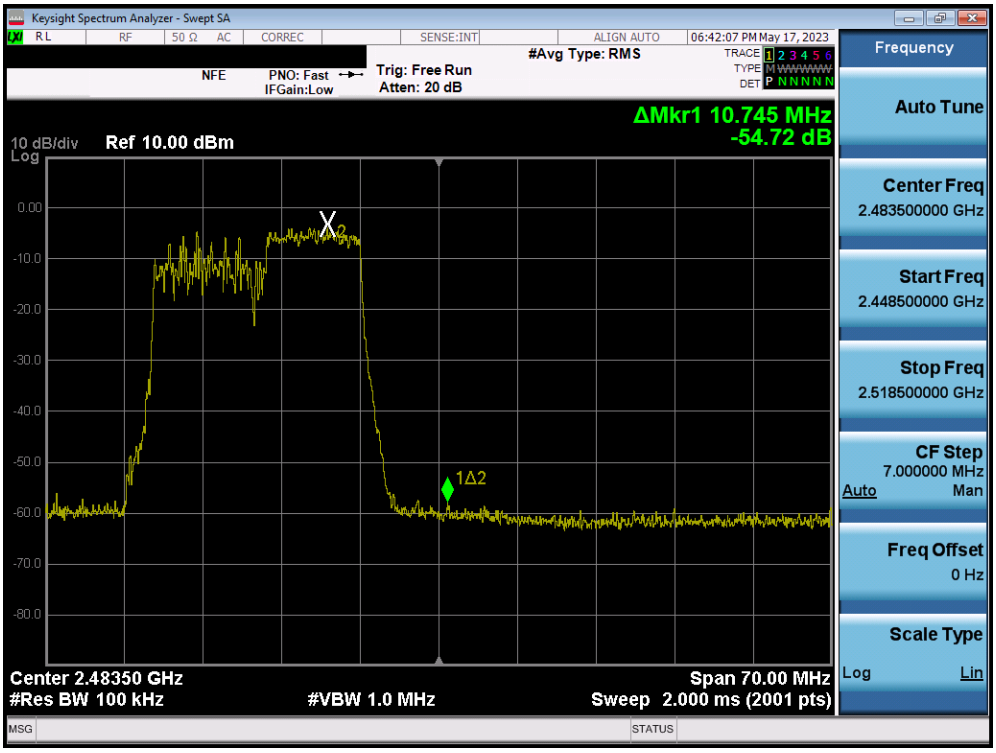
7.5.3 MIMO Conducted Band Edge Emissions – ANT 2



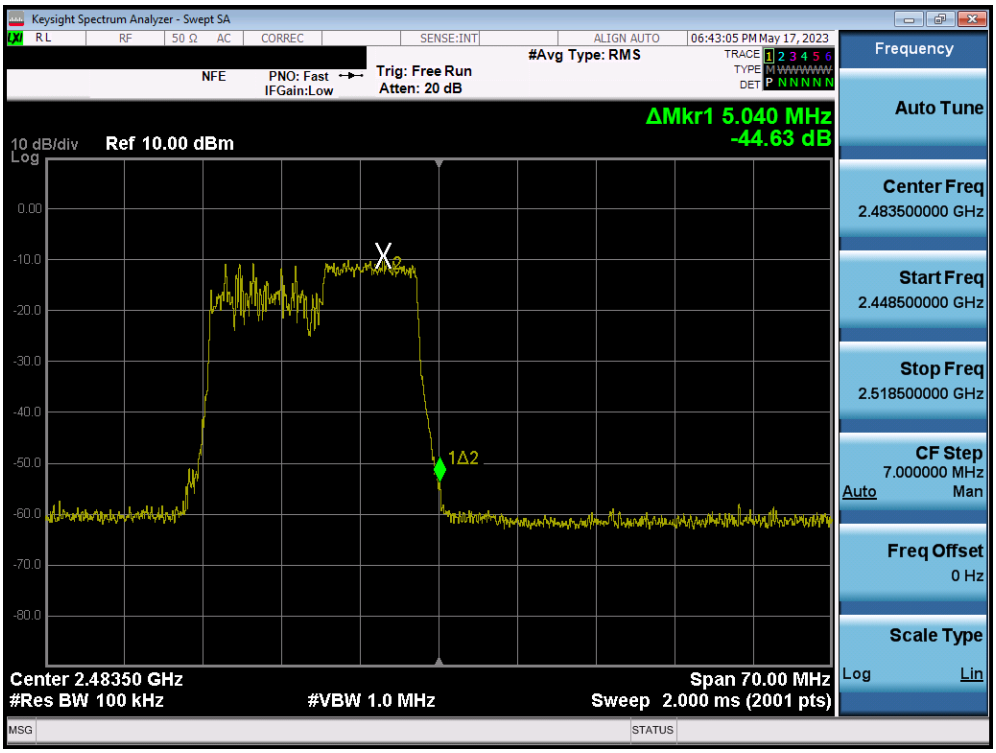
Plot 7-61. Band Edge Plot MIMO ANT2 (802.11ax OFDMA – 106 Tones – Ch. 1)



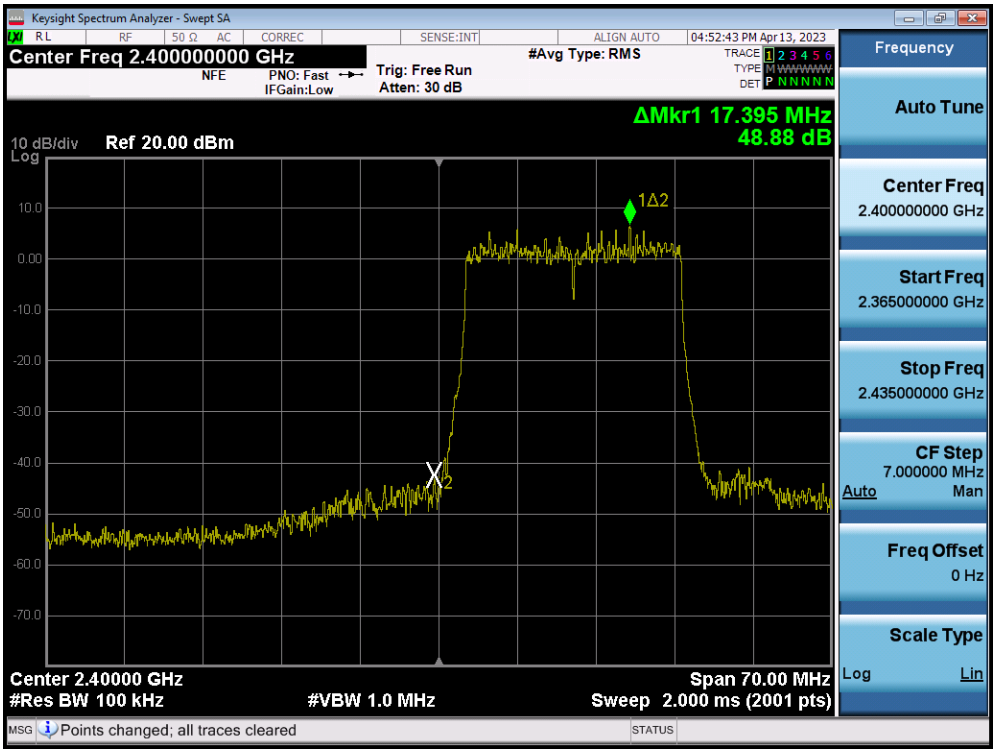
Plot 7-62. Band Edge Plot MIMO ANT2 (802.11ax OFDMA – 106 Tones – Ch. 11)



Plot 7-63. Band Edge Plot MIMO ANT2 (802.11ax OFDMA – 106 Tones – Ch. 12)

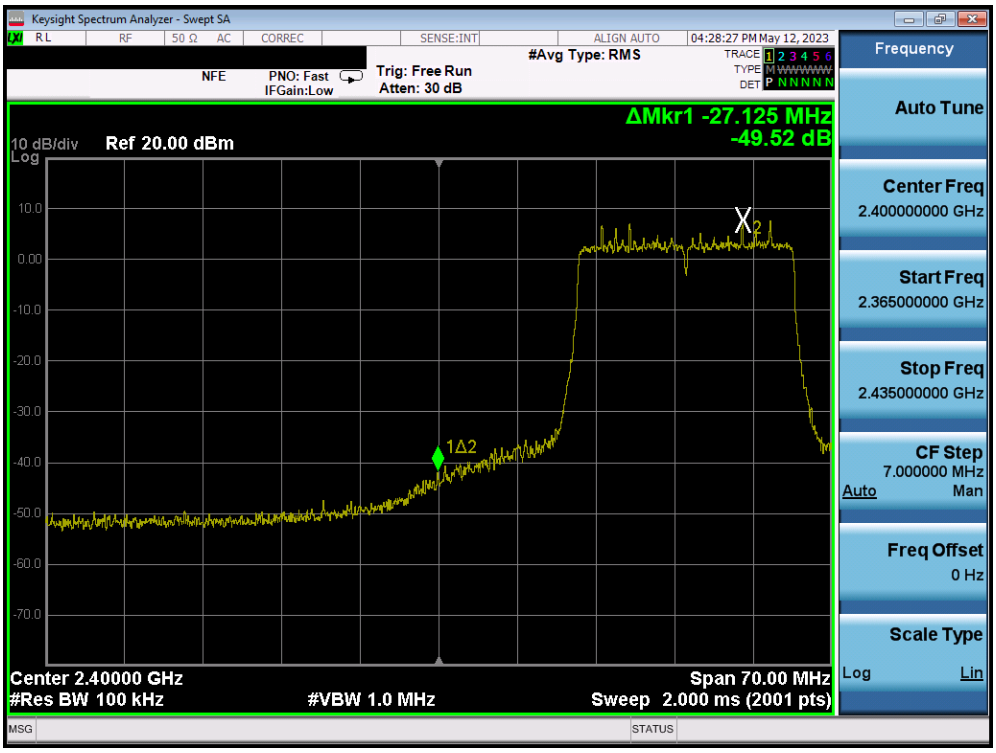


Plot 7-64. Band Edge Plot MIMO ANT2 (802.11ax OFDMA – 106 Tones – Ch. 13)

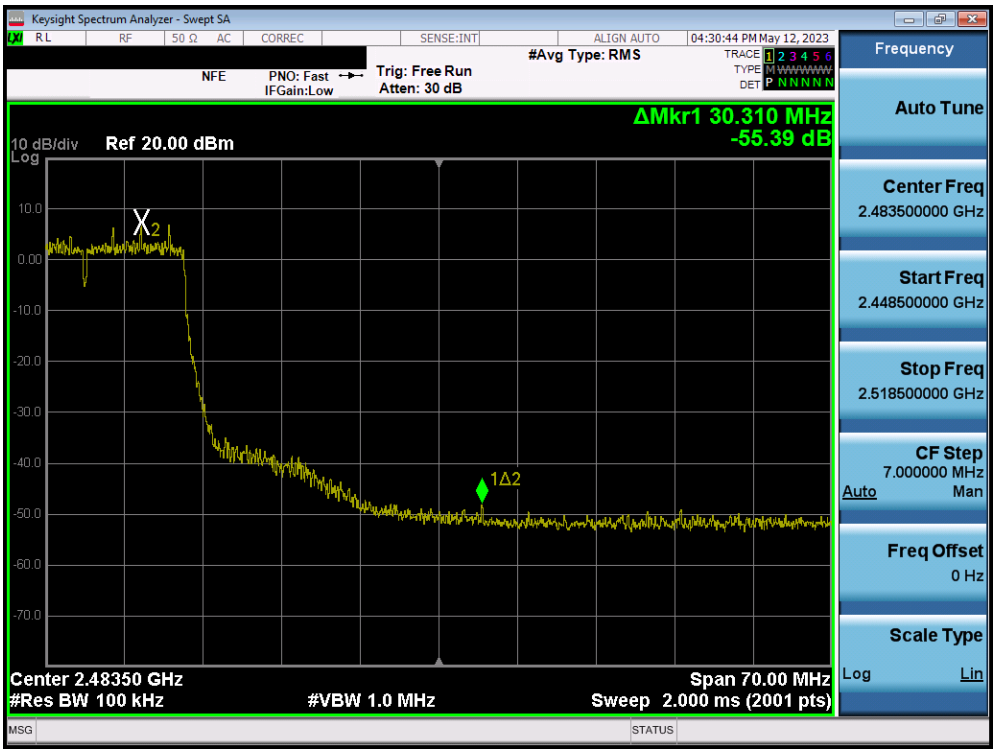


Plot 7-65. Band Edge Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 1)

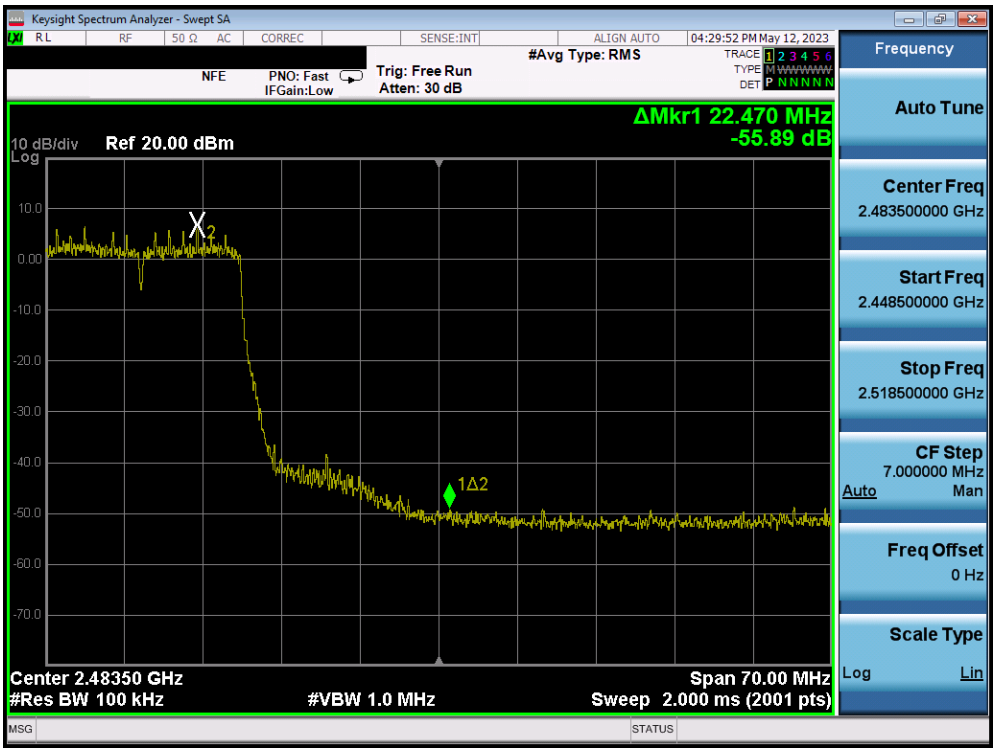
Plot 7-66. Band Edge Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 2)



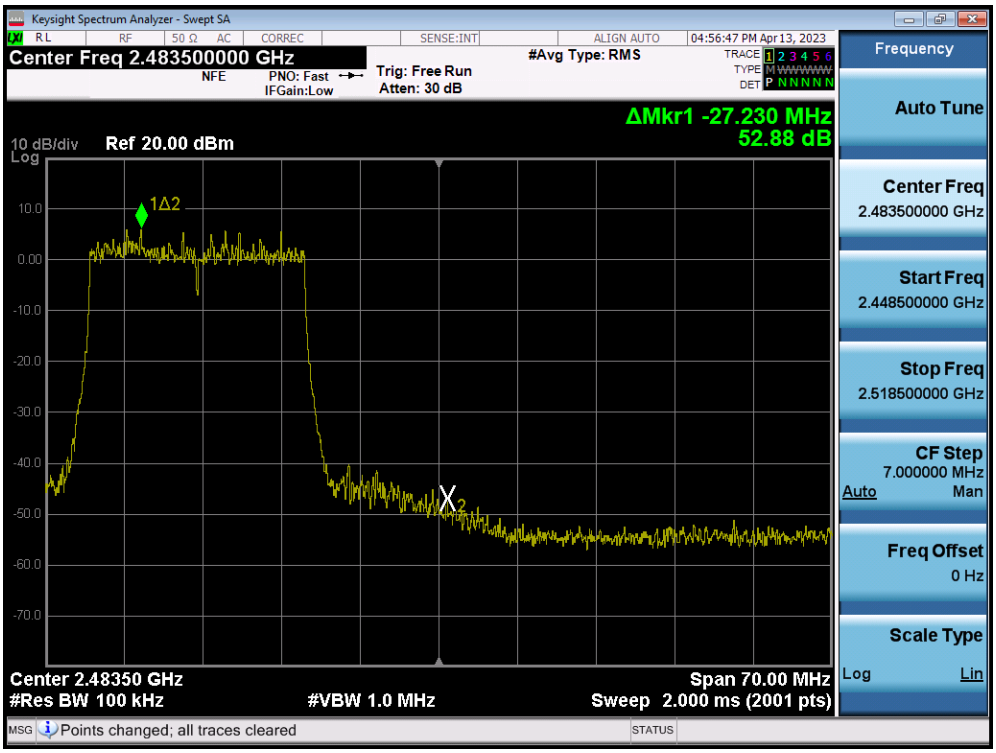
Plot 7-67. Band Edge Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 3)



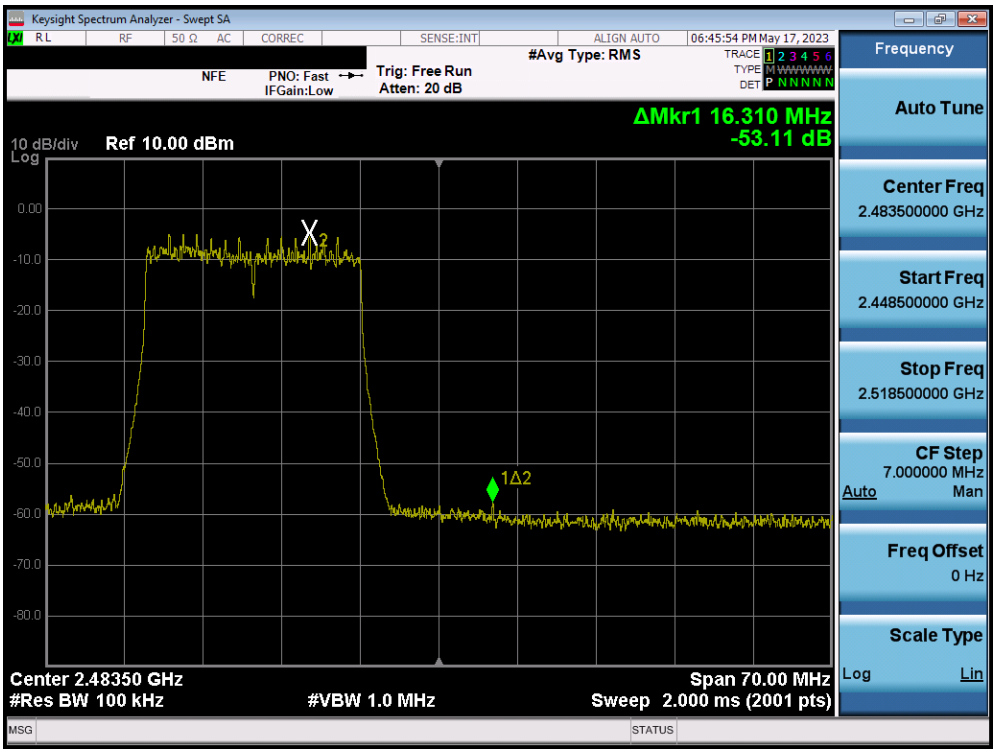
Plot 7-68. Band Edge Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 9)



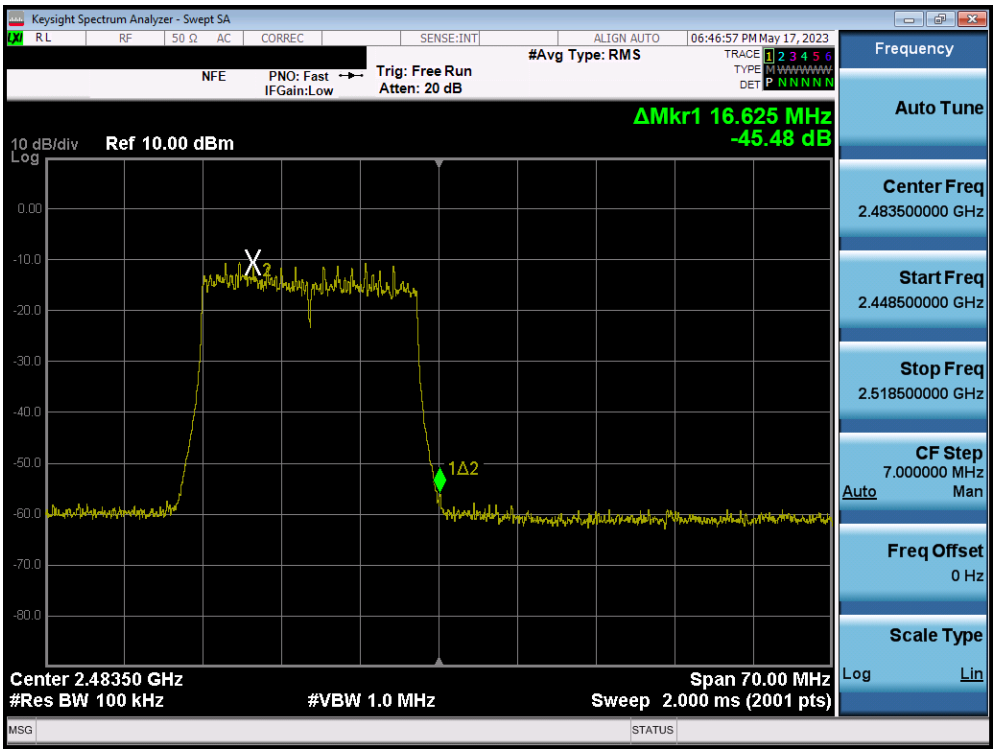
Plot 7-69. Band Edge Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 10)



Plot 7-70. Band Edge Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 11)



Plot 7-71. Band Edge Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 12)



Plot 7-72. Band Edge Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 13)

7.6 Conducted Spurious Emissions

Test Overview and Limit

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates, tone configurations, and RU indices were investigated to determine the worst-case configuration. For the following out of band conducted emissions plots, the EUT was set to a data rate of MCS0 in 802.11ax mode as this setting produced the worst-case emissions.

The limit for out-of-band spurious emissions at the band edge is 30dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100kHz bandwidth per the procedure in Section 11.11.3 of ANSI C63.10-2013.

Test Procedure Used

ANSI C63.10-2013 – Section 11.11.3
ANSI C63.10-2013 – Section 14.3.3

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 25GHz (separated into two plots per channel)
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = Peak
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

Figure 7-5. Test Instrument & Measurement Setup

Test Notes

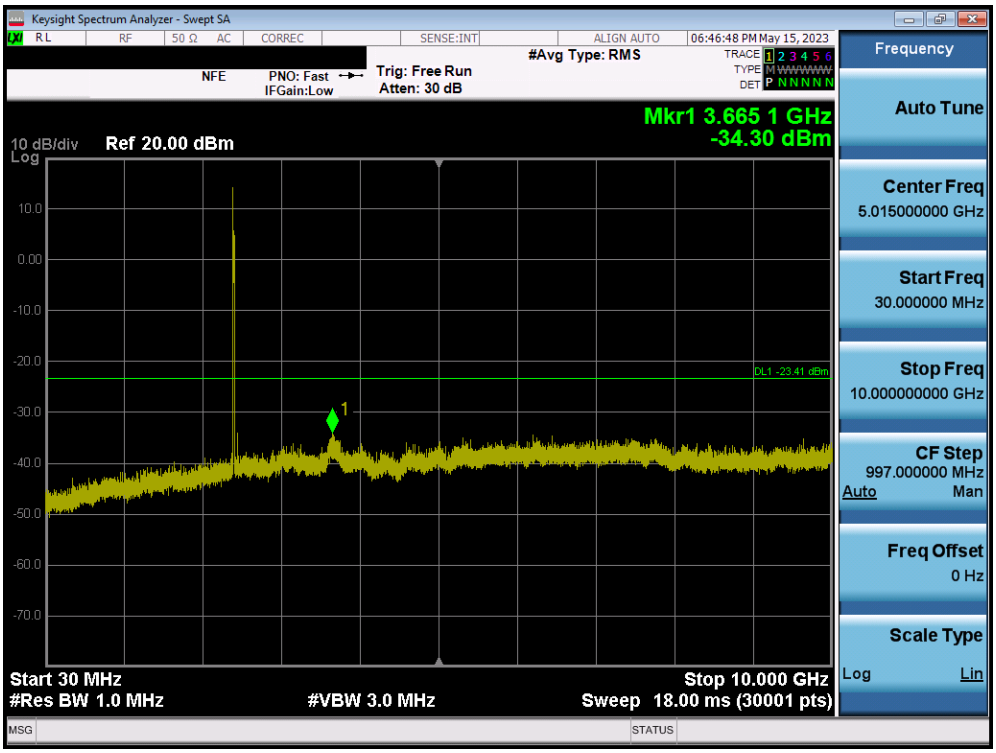
1. RBW was set to 1MHz rather than 100kHz in order to increase the measurement speed.

2. The display line shown in the following plots denotes the limit at 30dB below the fundamental emission level measured in a 100kHz bandwidth. However, since the traces in the following plots are measured with a 1MHz RBW, the display line may not necessarily appear to be 30dB below the level of the fundamental in a 1MHz bandwidth.

3. For plots showing conducted spurious emissions near the limit, the frequencies were investigated with a reduced RBW to ensure that no emissions were present.

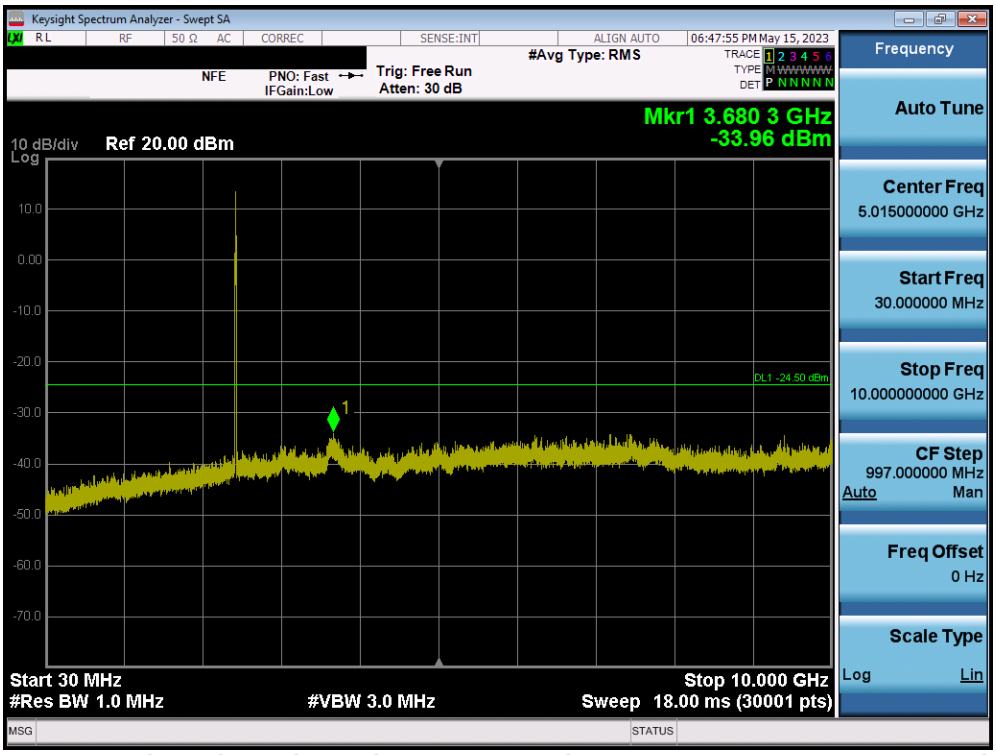
4. The conducted spurious emissions were measured to relative limits. Therefore, in accordance with ANSI C63.10-2013 Section 14.3.3, it was unnecessary to show compliance through the summation of test results of the individual outputs.

7.6.1 SISO Antenna-2 Conducted Spurious Emissions



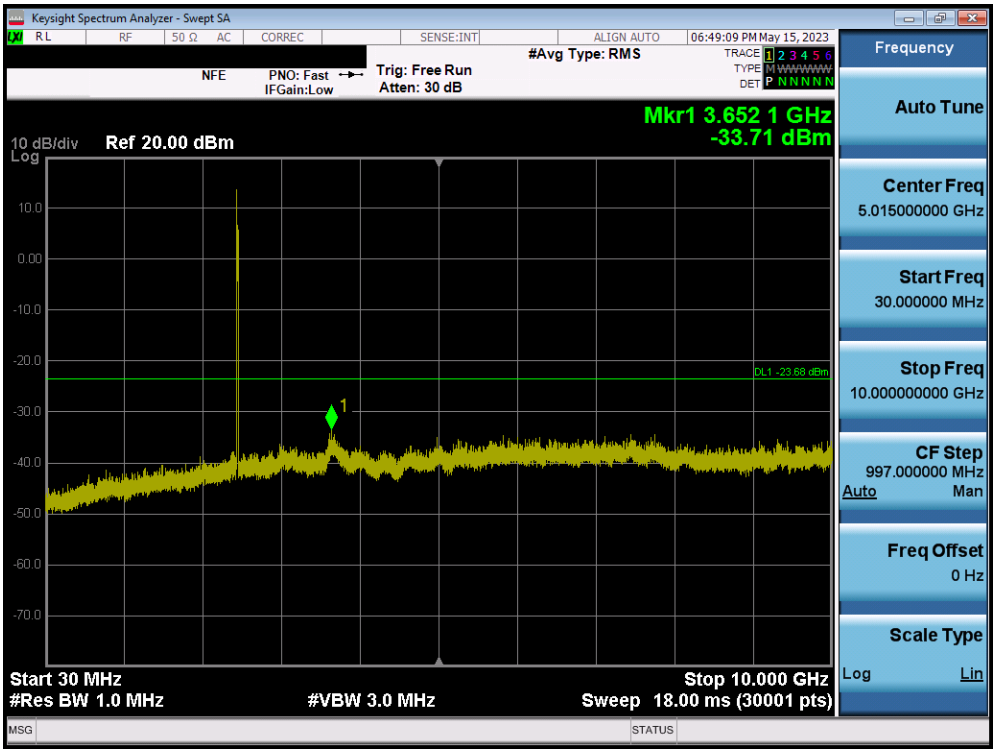
Plot 7-73. Conducted Spurious Plot SISO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 1)

Plot 7-74. Conducted Spurious Plot SISO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 1)



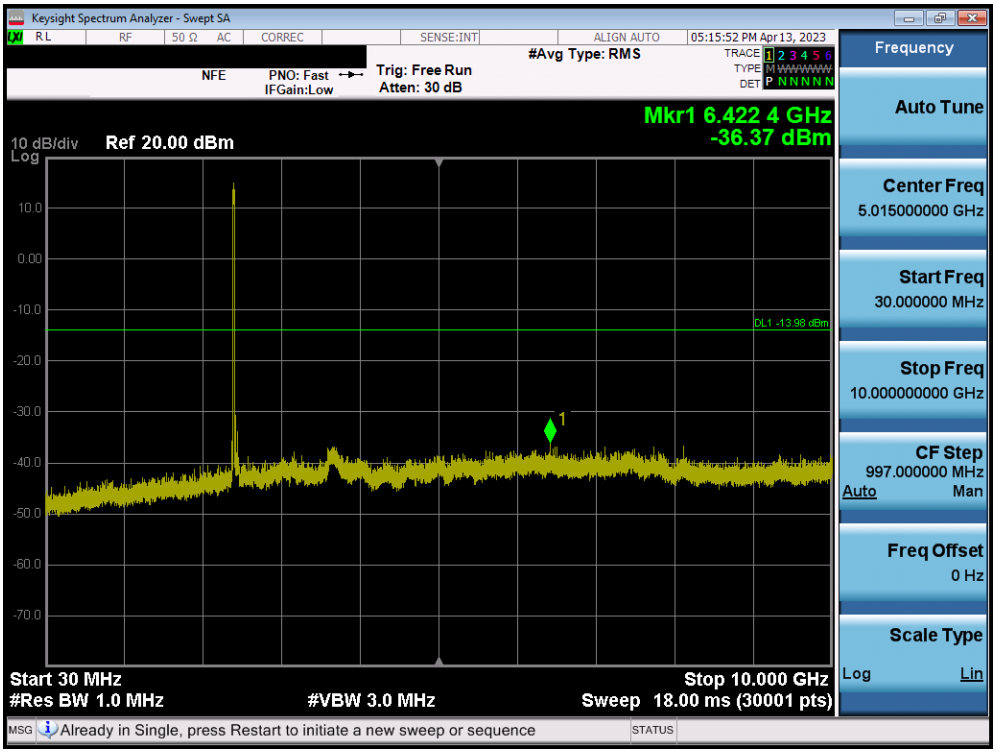
Plot 7-75. Conducted Spurious Plot SISO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 6)

Plot 7-76. Conducted Spurious Plot SISO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 6)



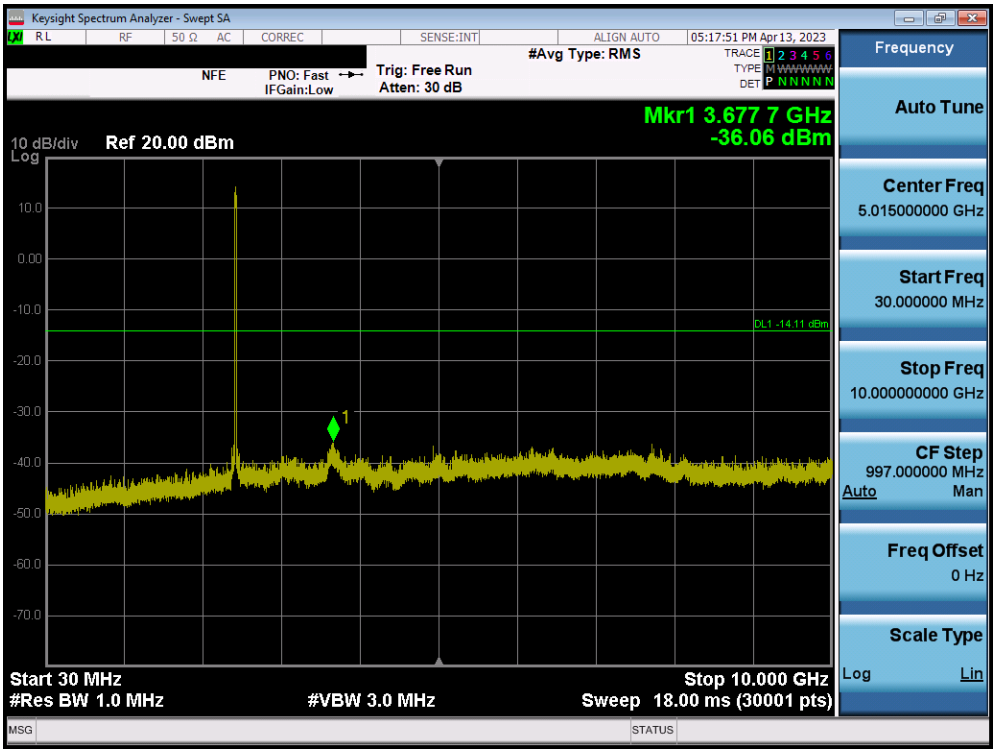
Plot 7-77. Conducted Spurious Plot SISO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 11)

Plot 7-78. Conducted Spurious Plot SISO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 11)

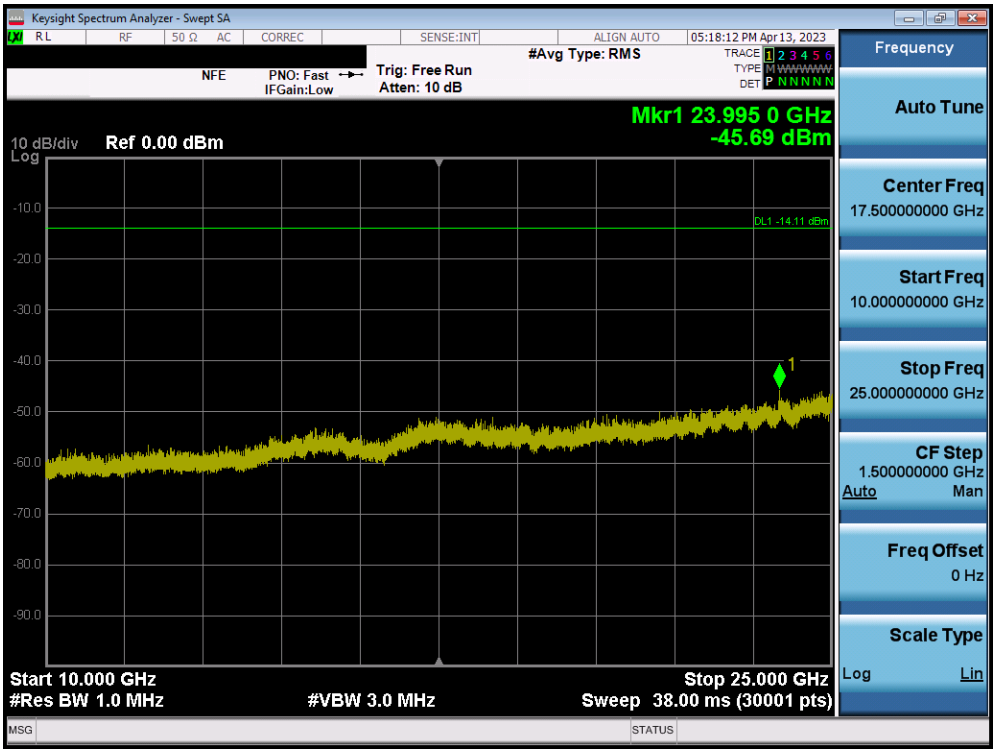


Plot 7-79. Conducted Spurious Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 1)

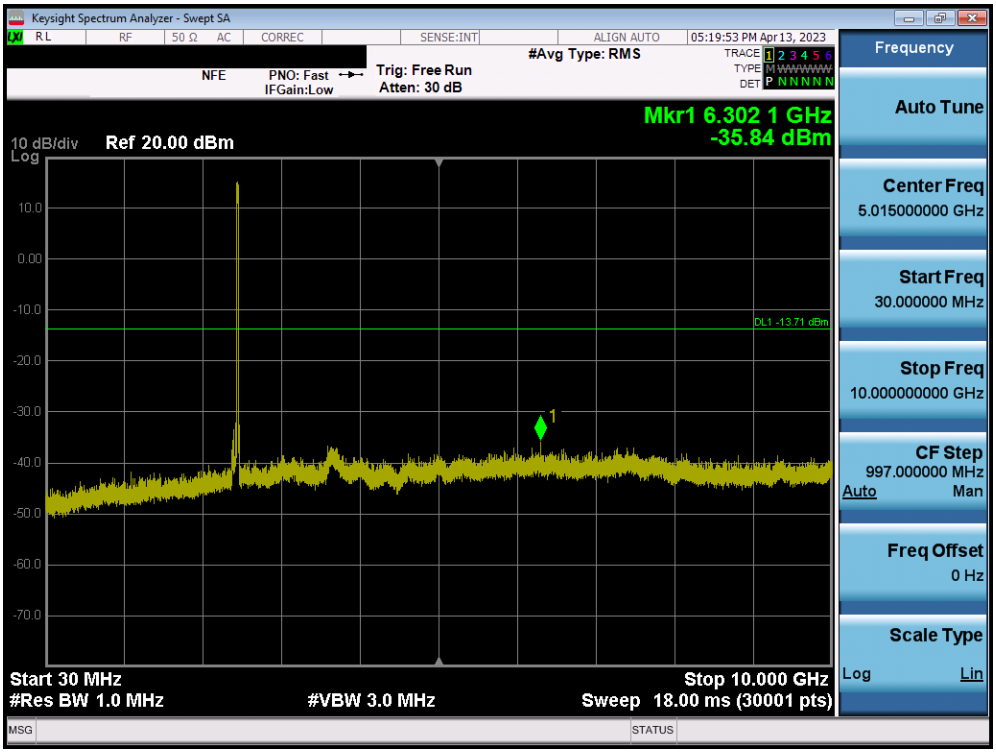
Plot 7-80. Conducted Spurious Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 1)



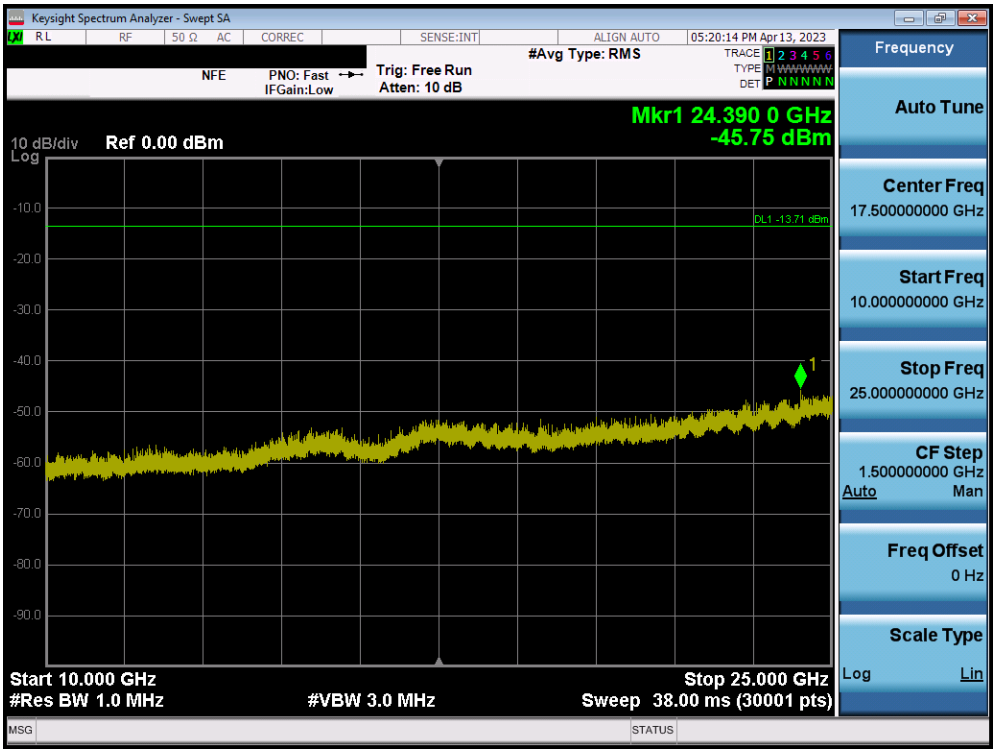
Plot 7-81. Conducted Spurious Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 6)



Plot 7-82. Conducted Spurious Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 6)

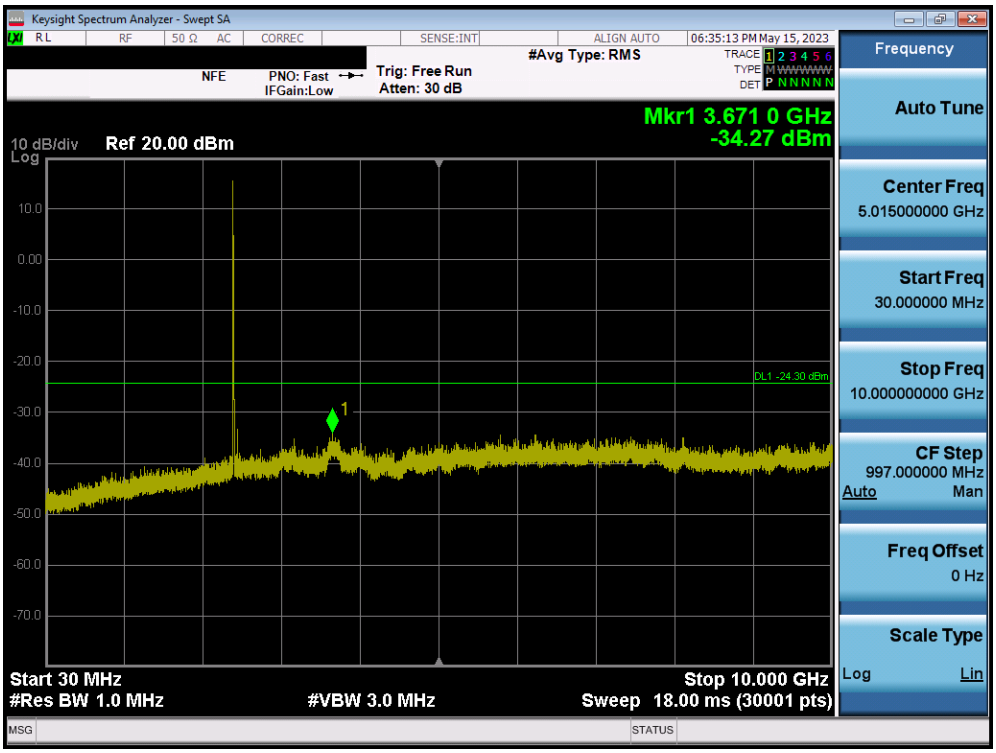


Plot 7-83. Conducted Spurious Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 11)



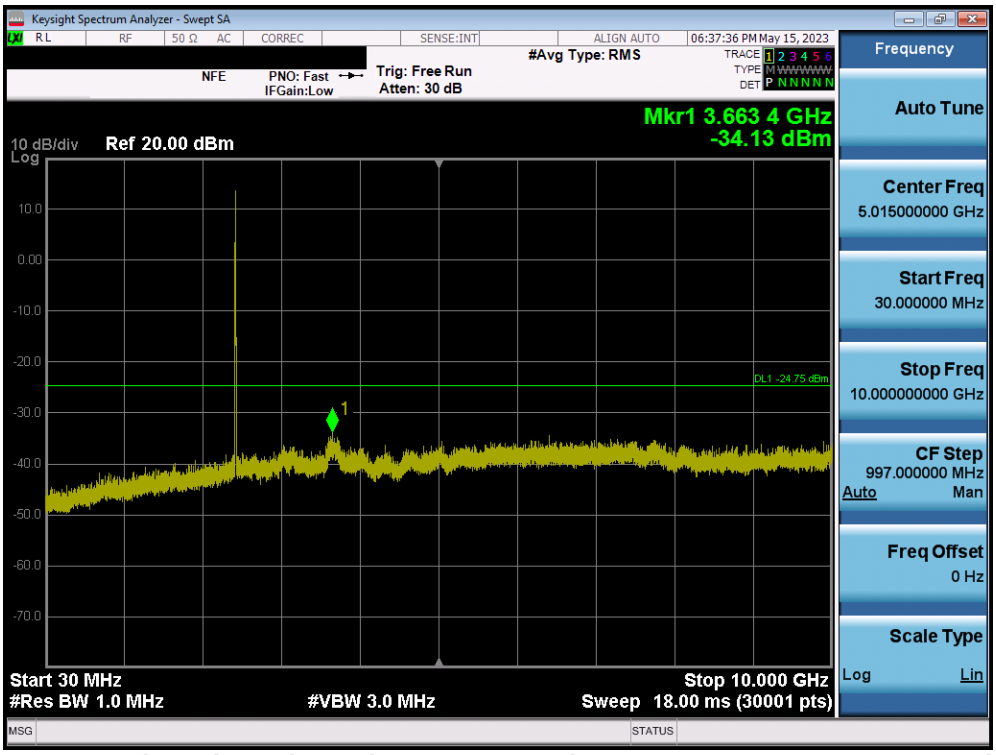
Plot 7-84. Conducted Spurious Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 11)

7.6.2 MIMO Conducted Spurious Emissions – ANT1



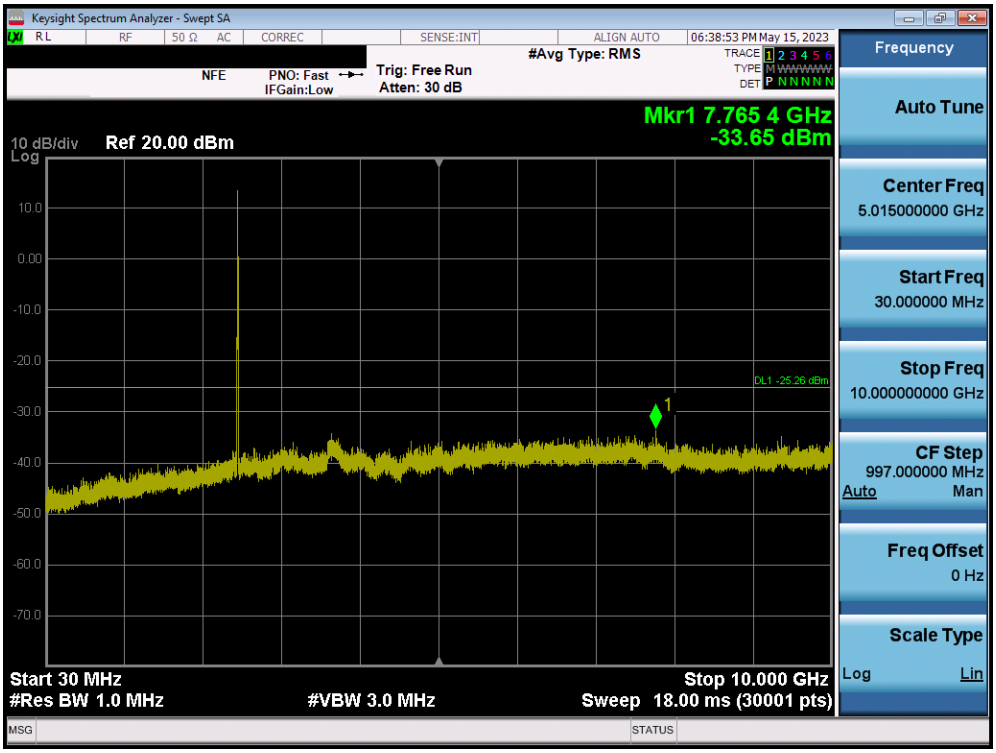
Plot 7-85. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 1)

Plot 7-86. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 1)



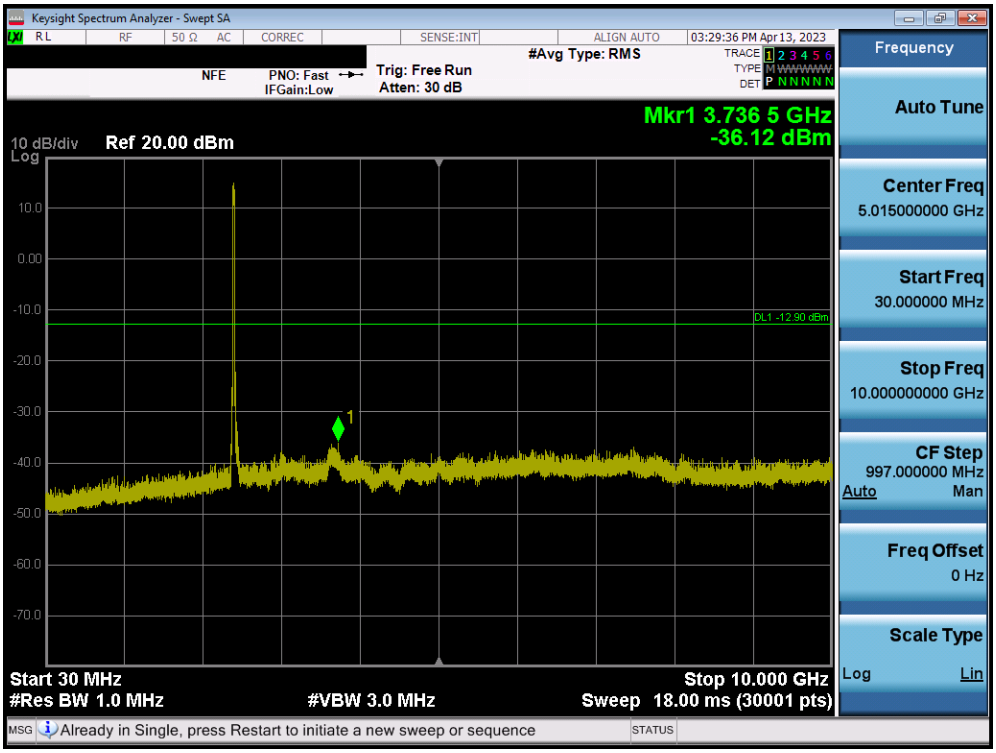
Plot 7-87. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 6)

Plot 7-88. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 6)

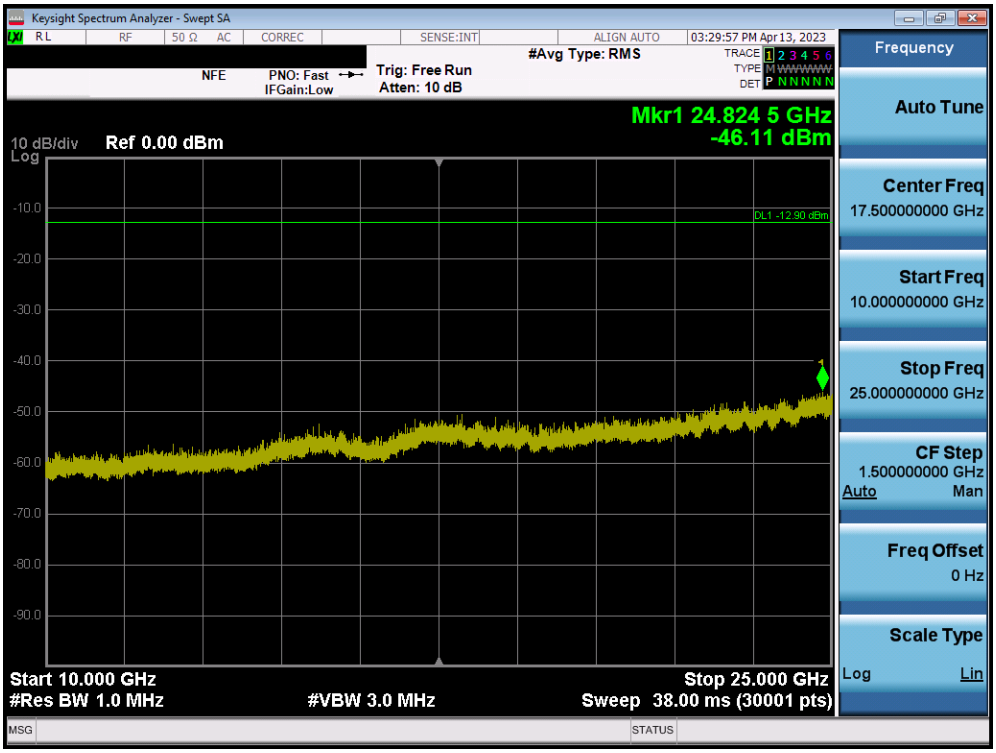


Plot 7-89. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 11)

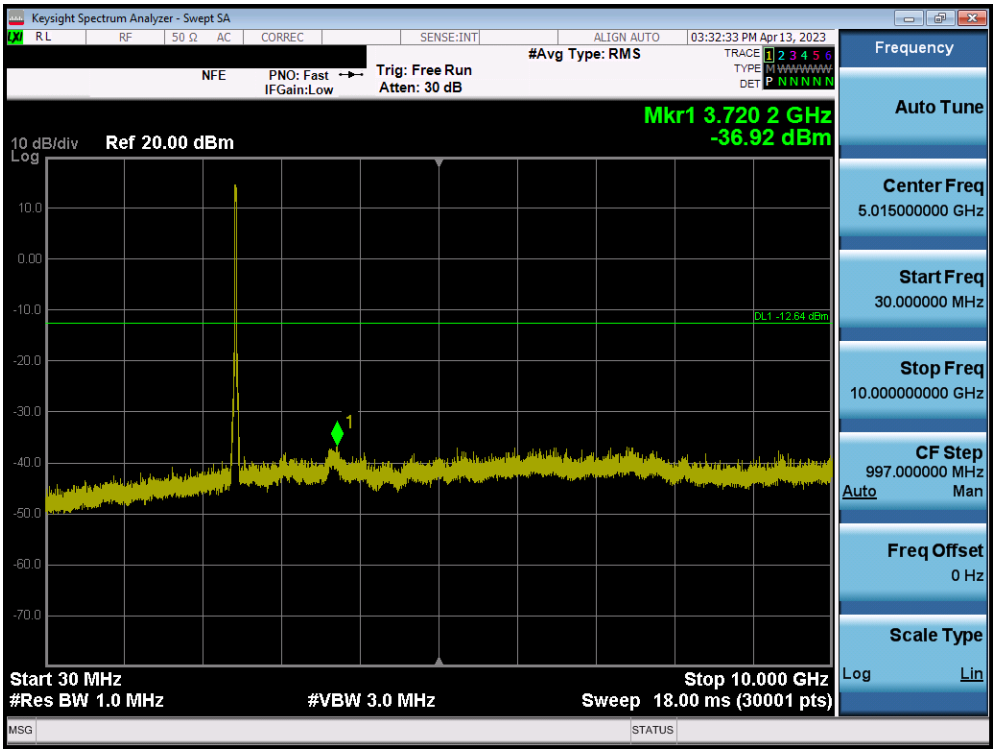
Plot 7-90. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 11)



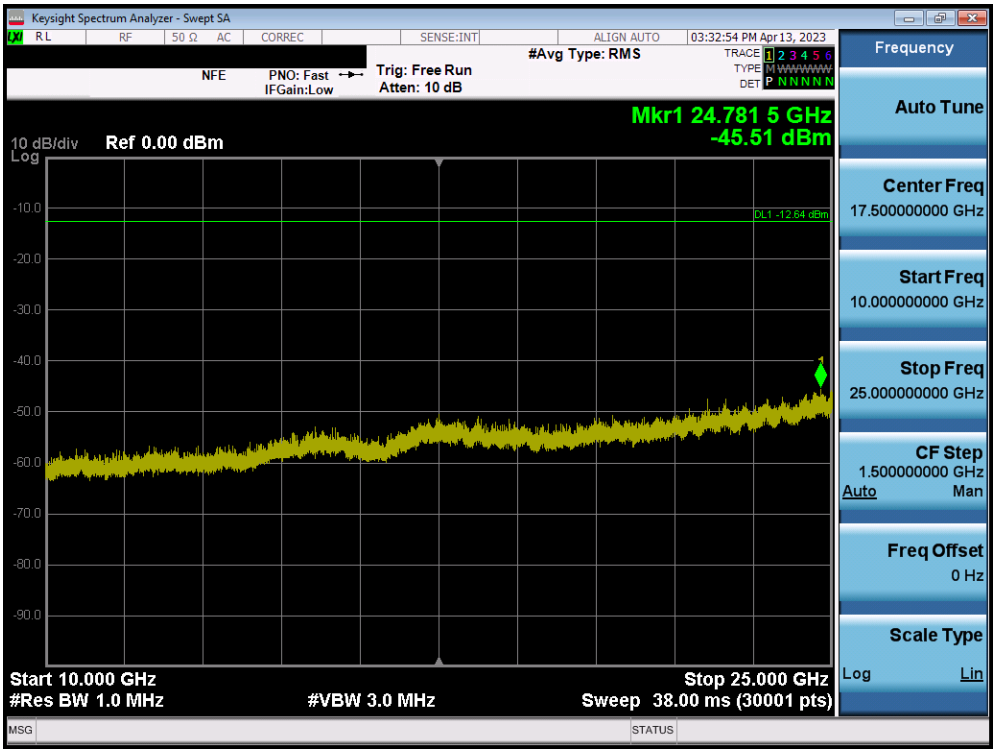
Plot 7-91. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 1)



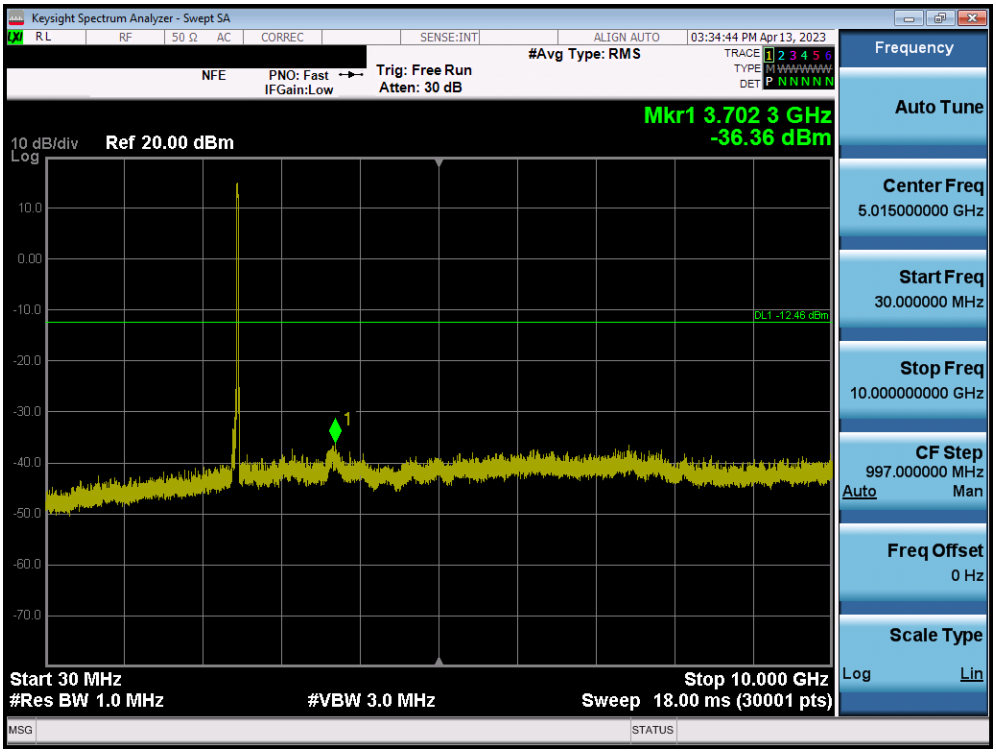
Plot 7-92. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 1)



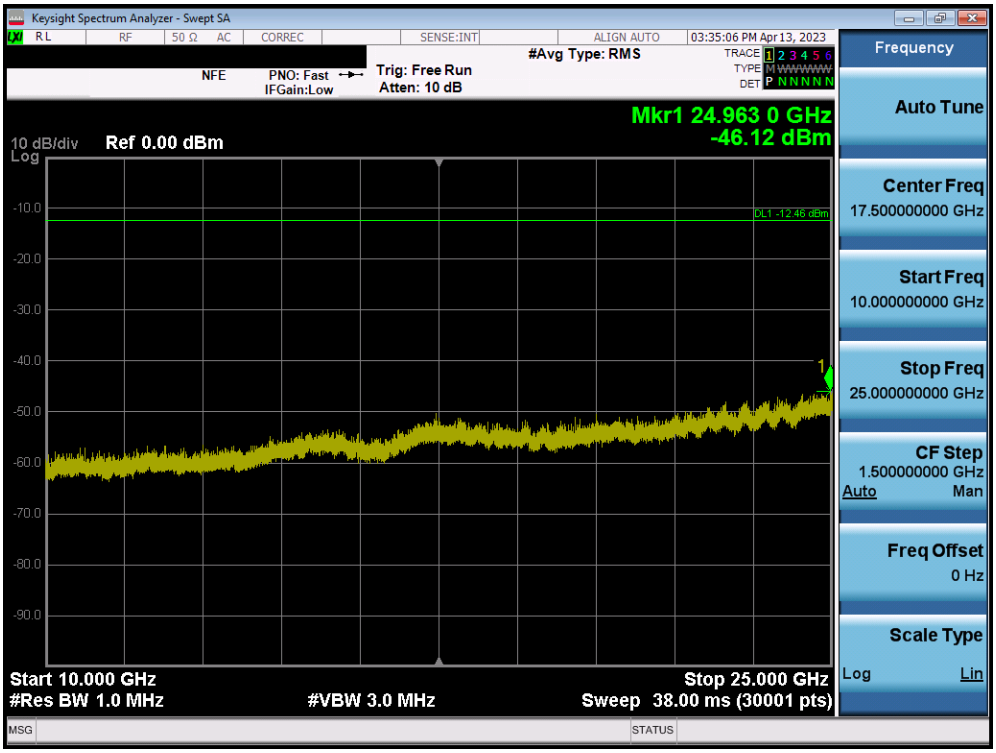
Plot 7-93. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 6)



Plot 7-94. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 6)



Plot 7-95. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 11)



Plot 7-96. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 11)