ELEMENT MATERIALS TECHNOLOGY,
Columbia MD
(formerly PCTEST)
7185 Oakland Mills Road, Columbia, MD 21046 USA
Tel. 410.290.6652 / Fax 410.381.1520
http://www.element.com

MEASUREMENT REPORT
FCC PART 15.407 802.11ax/be (OFDMA)

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

Date of Testing:
11/12/25 - 12/23/25
Test Report Issue Date:
1/9/2026
Test Site/Location:
Element Lab., Columbia, MD, USA
Test Report Serial No.:
1M2508270083-16-R1.A3L

FCC ID:	**A3LSMS947B**
APPLICANT:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model:	SM-S947B/DS
Additional Model(s):	SM-S947B
EUT Type:	Portable Handset
Frequency Range:	5180 – 5885MHz
Modulation Type:	OFDMA
FCC Equipment Class:	Unlicensed National Information Infrastructure TX (NII)
FCC Rule Part(s):	Part 15 Subpart E (15.407)
Test Procedure(s):	ANSI C63.10:2020 + Cor. 1:2023, KDB 648474 D03 v01r04

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 C63.10:2020. Test results reported herein relate only to the item(s) tested.

This revised Test Report (S/N: 1M2508270083-16-R1.A3L) supersedes and replaces the previously issued test report (S/N: 1M2508270083-16.A3L) on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

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.

RJ Ortanez
Executive Vice President

ACCREDITED
CERT #2041.01

TEST REPORT REVISION HISTORY

Rev. No.	Description	Issue Date	Revised By
-	Initial Release	1/9/2026	WKR0000005826
1	Addressed comments made by TCB reviewer	1/9/2026	WKR0000005883

TABLE OF CONTENTS

Channel Bandwidth [MHz]	UNII Band	Tx Frequency [MHz]	MIMO	
			Max. Power [mW]	Max. Power [dBm]
20	1	5180 - 5240	115.98	20.64
	2A	5260 - 5320	118.47	20.74
	2C	5500 - 5720	117.84	20.71
	3	5745 - 5825	117.24	20.69
	4	5845 - 5885	80.41	19.05
40	1	5190 - 5230	77.94	18.92
	2A	5270 - 5310	78.75	18.96
	2C	5510 - 5710	77.28	18.88
	3	5755 - 5795	77.28	18.88
	4	5835 - 5875	51.92	17.15
80	1	5210	76.99	18.86
	2A	5290	76.74	18.85
	2C	5530 - 5690	76.87	18.86
	3	5775	76.31	18.83
	4	5855	51.92	17.15
160	1/2A	5250	62.09	17.93
	2C	5570	46.77	16.70
	3/4	5815	42.61	16.30

EUT Overview

Note: The UNII Band 4 max power values shown in the above table are e.i.r.p values.

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.

1.2 Element Test Location

Measurements were conducted at the Element laboratory(ies) indicated in Section 1.3 below. All measurement facilities are compliant with the test site requirements specified in ANSI C63.4:2014 and KDB 414788 D01 v01r01.

1.3 Test Facility / Accreditations

Measurements were performed at Element lab located in Columbia, MD 21046, U.S.A.

- Element Washington DC LLC is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.

- Element Washington DC LLC TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).

- Element Washington DC LLC facility is a registered test laboratory with the site description on file with ISED (Wireless Test Lab number 2451B) and FCC (Designation Number US1113).

- Element Washington DC LLC is a Recognized U.S. Certification Assessment Body (CAB # US0110) for ISED Canada as designated by NIST under the U.S. and Canada Mutual Recognition Agreements (MRAs).

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMS947B**. The test data contained in this report pertains only to the emissions due to the EUT's UNII transmitter.

Test Device Serial No.: 2938M, 2948M, 2809M, 2846M, 2956M, 2974M

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, Multi-band 5G NR (FR1), 802.11b/g/n/ac/ax/be, WLAN, 802.11a/n/ac/ax/be UNII (5GHz and 6GHz), Bluetooth (1x, EDR, LE), NFC, Wireless Power Transfer, UWB

Band 1		Band 2A		Band 2C		Band 3		Band 3/4	
Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
36	5180	52	5260	100	5500	149	5745	169	5845
:	:	:	:	:	:	:	:	:	:
40	5200	56	5280	120	5600	157	5785	173	5865
:	:	:	:	:	:	:	:	:	:
48	5240	64	5320	144	5720	165	5825	177	5885

Table 2-1. 802.11ax/be (20MHz) Frequency / Channel Operations

Band 1		Band 2A		Band 2C		Band 3		Band 3/4	
Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
38	5190	54	5270	102	5510	151	5755	167	5835
:	:	:	:	:	:	:	:	:	:
46	5230	62	5310	118	5590	159	5795	175	5875
				:	:				
				142	5710				

Table 2-2. 802.11ax/be (40MHz BW) Frequency / Channel Operations

Band 1		Band 2A		Band 2C		Band 3		Band 3/4	
Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
42	5210	58	5290	106	5530	155	5775	167	5835
				:	:				
				122	5610				
				:	:				
				138	5690				

Table 2-3. 802.11ax/be (80MHz BW) Frequency / Channel Operations

Band 1/2A		Band 2C		Band 3/4	
Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
50	5250	114	5570	163	5815

Table 2-4. 802.11ax/be (160MHz BW) Frequency / Channel Operations

Notes:

1. 5GHz NII operation is possible in 20MHz, 40MHz, 80MHz, and 160MHz channel bandwidths. 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 B)2)b) of ANSI C63.10:2020. 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:

Band	Bandwidth	Tone Type	Tone Size	MIMO (1+2)	
				Duty Cycle [%]	Radiated DCCF [dB]
5GHz	20MHz	RU	26T	94.82	0.23
			52T	95.59	0.20
			106T	95.52	0.20
			242T	95.09	0.22
		MRU	52+26T	95.14	0.22
			106+26T	95.17	0.22
	40MHz	RU	26T	94.31	0.25
			52T	95.58	0.20
			106T	95.17	0.22
			242T	94.86	0.23
			484T	94.22	0.26
		MRU	52+26T	94.56	0.24
			106+26T	94.38	0.25
	80MHz	RU	26T	94.25	0.26
			52T	98.89	N/A
			106T	98.23	N/A
			242T	98.13	N/A
			484T	98.82	N/A
			996T	98.02	N/A
		MRU	52+26T	97.93	0.09
			106+26T	98.02	N/A
			484+242T	98.02	N/A
	160MHz	RU	26T	99.56	N/A
			52T	99.62	N/A
			106T	99.45	N/A
			242T	99.51	N/A
			484T	99.56	N/A
			996T	99.56	N/A
			2x996T	99.60	N/A
		MRU	52+26T	99.45	N/A
			106+26T	99.36	N/A
			484+242T	99.45	N/A
			996+484T	99.36	N/A

Table 2-5. 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
5GHz	11ax	✓	✓	✓	✓	✓	✓
	11be	✓	✓	✓	✓	✓	✓

Table 2-6. Frequency / Channel Operations

✓= 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			484T			996T			2x996T			
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	0.8µs 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	17.2	16.3	14.6	36	34	30.6	72.1	68.1	61.3
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	34.4	32.5	29.3	72.1	68.1	61.3	144.1	136.1	122.5
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	51.6	48.8	43.9	108.1	102.1	91.9	216.2	204.2	183.8
3	1	3.5	3.3	3	7.1	6.7	6	15	14.2	12.8	34.4	32.5	29.3	68.8	65	58.5	144.1	136.1	122.5	288.2	272.2	245
4	1	5.3	5	4.5	10.6	10	9	22.5	21.3	19.1	51.6	48.8	43.9	103.2	97.5	87.8	216.2	204.2	183.8	432.4	408.3	367.5
5	1	7.1	6.7	6	14.1	13.3	12	30	28.3	25.5	68.8	65	58.5	137.6	130	117	288.2	272.2	245	576.5	544.4	490
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	154.9	146.3	131.6	324.3	306.3	275.6	648.5	612.5	551.3
7	1	8.8	8.3	7.5	17.6	16.7	15	37.5	35.4	31.9	86	81.3	73.1	172.1	162.5	146.3	360.3	340.3	306.3	720.6	680.6	612.5
8	1	10.6	10	9	21.2	20	18	45	42.5	38.3	103.2	97.5	87.8	206.5	195	175.5	432.4	408.3	367.5	864.7	816.7	735
9	1	11.8	11.1	10	23.5	22.2	20	50	47.2	42.5	114.7	108.3	97.5	229.4	216.7	195	480.4	453.7	408.3	960.8	907.4	816.7
10	1	13.2	12.5	11.3	26.5	25	22.5	56.3	53.1	47.8	129	121.9	109.7	258.1	243.8	219.4	540.4	510.4	459.4	1080.9	1020.8	918.8
11	1	14.7	13.9	12.5	29.4	27.8	25	62.5	59	53.1	143.4	135.4	121.9	286.8	270.8	243.8	600.5	567.1	510.4	1201	1134.3	1020.8
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	34.4	32.5	29.3	72.1	68.1	61.3	144.1	136.1	122.5
1	2	3.5	3.3	3	7.1	6.7	6	15	14.2	12.8	34.4	32.5	29.3	68.8	65	58.5	144.1	136.1	122.5	288.2	272.2	245
2	2	5.3	5	4.5	10.6	10	9	22.5	21.3	19.1	51.6	48.8	43.9	103.2	97.5	87.8	216.2	204.2	183.8	432.4	408.3	367.5
3	2	7.1	6.7	6	14.1	13.3	12	30	28.3	25.5	68.8	65	58.5	137.6	130	117	288.2	272.2	245	576.5	544.4	490
4	2	10.6	10	9	21.2	20	18	45	42.5	38.3	103.2	97.5	87.8	206.5	195	175.5	432.4	408.3	367.5	864.7	816.7	735
5	2	14.1	13.3	12	28.2	26.7	24	60	56.7	51	137.6	130	117	275.3	260	234	576.5	544.4	490	1152.9	1088.9	980
6	2	15.9	15	13.5	31.8	30	27	67.5	63.8	57.4	154.9	146.3	131.6	309.7	292.5	263.3	648.5	612.5	551.3	1297.1	1225	1102.5
7	2	17.6	16.7	15	35.3	33.3	30	75	70.8	63.8	172.1	162.5	146.3	344.1	325	292.5	720.6	680.6	612.5	1441.2	1361.1	1225
8	2	21.2	20	18	42.4	40	36	90	85	76.5	206.5	195	175.5	412.9	390	351	864.7	816.7	735	1729.4	1633.3	1470
9	2	23.5	22.2	20	47.1	44.4	40	100	94.4	85	229.4	216.7	195	458.8	433.3	390	960.8	907.4	816.7	1921.6	1814.8	1633.3
10	2	26.5	25	22.5	52.9	50	45	112.5	106.3	95.6	258.1	243.8	219.4	516.2	487.5	438.8	1080.9	1020.8	918.8	2161.8	2041.7	1837.5
11	2	29.4	27.8	25	58.8	55.6	50	125	118.1	106.3	286.8	270.8	243.8	573.5	541.7	487.5	1201	1134.3	1020.8	2402	2268.5	2041.7

Table 2-7. Supported Data Rates

2.3 Antenna Description

The manufacturer provided the antenna gains which can affect the validity of test results used for determination of compliance. The following antenna gains are used in this device per the "Unlicensed Band Antenna Gain" document provided by the client. This document is also included in the filing as a public exhibit.

Frequency [GHz]	Antenna 1 Gain (dBi)	Antenna 2 Gain (dBi)	Directional Gain (dBi)
5.20	-5.43	-8.69	-3.90
5.30	-4.31	-6.97	-2.53
5.50	-3.95	-8.37	-2.87
5.80	-3.21	-8.39	-2.41
5.85	-3.21	-6.50	-1.69

Table 2-8. Antenna Peak Gain

2.4 Test Configuration

ANSI C63.10:2020 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing. See the UNII 5GHz OFDM test report for AC line conducted emissions test setups, 7.6 for radiated emissions test setups, and 7.2, 7.3, 7.4, and 7.5 for antenna port conducted emissions test setups.

This device supports wireless charging capability and, thus, is subject to the test requirements of KDB 648474 D03 v01r04. Additional radiated spurious emission measurements were performed with the EUT lying flat on an authorized wireless charging pad (WCP) EP-2400 while operating under normal conditions in a simulated call or data transmission configuration. The worst case radiated emissions data is shown in this report.

2.5 Software and Firmware

The test was conducted with software/firmware version S947BXXU0AYKQ 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 C63.10:2020) 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 15°C to 35°C. 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 connection to an external antenna.

Conclusion:

The EUT 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 C63.10:2020. 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	1.13
Line Conducted Disturbance	3.09
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

Table 5-1. Measurement Uncertainty Budget

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	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	MD 1M 40	EMC Cable and Switch System	2/25/2025	Annual	2/25/2026	MD 1M 40
-	AP1-002	EMC Cable and Switch System	2/25/2025	Annual	2/25/2026	AP1-002
-	AP2-001	EMC Cable and Switch System	2/25/2025	Annual	2/25/2026	AP2-001
-	AP2-002	EMC Cable and Switch System	2/25/2025	Annual	2/25/2026	AP2-002
-	ETS-001	EMC Cable and Switch System	12/11/2024	Annual	12/11/2025	ETS-001
-	ETS-002	EMC Cable and Switch System	12/11/2024	Annual	12/11/2025	ETS-002
-	WL25-1	Conducted Cable Set (25GHz)	2/25/2025	Annual	2/25/2026	WL25-1
-	WL25-2	Conducted Cable Set (25GHz)	2/25/2025	Annual	2/25/2026	WL25-2
-	WL40-1	Conducted Cable Set (40GHz)	2/25/2025	Annual	2/25/2026	WL40-1
Agilent	N9038A	MXE EMI Receiver	11/10/2025	Annual	11/10/2026	MY51210133
Anritsu	MA24408A	POWER SENSOR	2/11/2025	Annual	2/11/2026	12776
EMCO	3115	Horn Antenna (1-18GHz)	9/6/2024	Biennial	9/6/2026	9704-5182
Espec	ESX-2CA	Environmental Chamber	11/20/2024	Biennial	11/20/2026	17620
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	6/4/2025	Biennial	6/4/2027	125518
ETS-Lindgren	3164-05	Quad Ridge Horn (Small) 2 - 18GHz	6/4/2025	Biennial	6/4/2027	208255
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	6/6/2025	Annual	6/6/2026	MY52350166
Keysight Technologies	N9020A	MXA Signal Analyzer	6/4/2025	Annual	6/4/2026	MY54500644
Keysight Technologies	N9030A	PXA Signal Analyzer	11/3/2025	Annual	11/3/2026	MY54490576
Rohde & Schwarz	ESW44	EMI Test Receiver 2Hz to 44 GHz	3/25/2025	Annual	3/25/2026	101716
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	10/16/2024	Annual	12/31/2025	100342
Rohde & Schwarz	180-422-KF	Horn (18 - 40GHz)	10/9/2024	Biennial	10/9/2026	U157403-01
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	9/11/2024	Biennial	9/11/2026	A051107
Sunol	JB6	Bi-Log Antenna (30M - 5GHz)	3/24/2025	Biennial	3/24/2027	A082816

Table 6-1. Test Equipment Calibration Table

Note:

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.

Component	Serial Number
MegaPhase Cable TM26-S1S1-36	18160103 003
Pasternack 6dB Attenuator PE7005-6	N/A

Table 6-2. WL25-1 Conducted Cable Set Components

Component	Serial Number
MiniCircuirs Cable CBL-2FT-SMSM+	77743
MCL 6dB Attenuator BW-S6W2+	1314

Table 6-3. WL25-2 Conducted Cable Set Components

Component	Serial Number
MegaPhase Cable TM40K1K1-36	18160102 001
MCL 10dB Attenuator BW-K10 2W44+	1902

Table 6-4. WL40-1 Conducted Cable Set Components

Component	Serial Number
Pasternack Cable RG214/U	111815
MegaPhase (CAGE 1GVT4) Cable GR18-N5N5-24	14042714 001

Table 6-5. ETS-001 EMC Cable and Switch System Components

Component	Serial Number
MegaPhase (CAGE 1GVT4) Cable GR18-N5N5-24	14042714 001
MegaPhase (CAGE 1GVT4) Cable NC29-N1N1-324	20502201 001
Rohde & Schwarz SF Unit	102134
Minicircuits Cable CBL=0.5M-NMNM+	15440

Table 6-6. ETS-002 EMC Cable and Switch System Components

Component	Serial Number
Sucoflex 106A Cable	501992
MegaPhase Cable N29-N1N1-324	20335606 001
Rohde & Schwarz SF Unit	102133
MiniCircuits Cable CBL-2FT-SMSM+	77745
MegaPhase Cable 10511-1	15034701 001
MiniCircuits Switch RC 2SPDT-A18	11703270 041
Sucoflex 104 Cable	320259/4
Sucoflex 104 Cable	321999/4
Sucoflex 104 Cable	321995/4

Table 6-7. AP1-002 EMC Cable and Switch System Components

Component	Serial Number
Flex Cable	P2A-0001
Micro-Coax Utilfex Cable UFB311A-Q-3346-50U50U MFR 64639	231978-003
Chamber Passthrough	CP4/X12
Micro-Coax Utilfex Cable UFB311A-1-0629-50U50U MFR 64639	231986-003
Micro-Coax Utiflex Cable UFB142A-0-0629-5GU200 MFR 6463	232069-001
Rohde & Schwarz TS-PR8 Pre-Amplifier	102335
Rohde & Schwarz OSP130 Open Switch and Control Unit	101181

Table 6-8. AP2-001 EMC Cable and Switch System Components

Component	Serial Number
MiniCircuits Cable CBL-0.5M-SMNM+	47261
Micro-Coax Utilfex Cable UFB311A-Q-3346-50U50U MFR 64639	231978-001
Micro-Coax Utilfex Cable UFB311A-1-0629-50U50U MFR 64639	231986-002
MegaPhase (CAGE 1GVT4) Cable NC29-N1N1-324	19046401 001
Megaphase (CAGE 1GVT4) Flex Cable 10511-1	15044701-006
Micro-Coax Utiflex Cable UFB311A-Q-3346-50U50U MFR 64639	231978-002
Micro-Coax Utilfex Cable UFB311A-1-0629-50U50U MFR 64639	231986-004
Micro-Coax Utiflex Cable UFB142A-0-0629-5GU200 MFR 64639	232069-001
Rohde & Schwarz SF Unit	102138
Rohde & Schwarz OSP130 Open Switch and Control Unit	101181
Micro-Coax Utilfex Cable UFB311A-Q-3346-50U50U MFR 64639	231978-003
Micro-Coax Utilfex Cable UFB311A-1-0629-50U50U MFR 64639	231986-003
Rohde & Schwarz TS-PR8 Pre-Amplifier	102335

Table 6-9. AP2-002 EMC Cable and Switch System Components

Component	Serial Number
MegaPhase Cable TM40-K1K1-30	20233002-004
UTIPLEX Cable	64639 232063-001
Rohde & Schwarz Pre-amp RS-PR1840 18G-40G	9037.7670.02

Table 6-10. MD 1M 18-40 EMC Cable and Switch System Components

7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.
FCC ID: A3LSMS947B
FCC Classification: Unlicensed National Information Infrastructure (NII)

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
N/A	26dB Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
15.407(e)	6dB Bandwidth	>500kHz (5725-5850MHz and 5850 – 5895MHz)		PASS	Section 7.3
15.407 (a)(1)(iv), (a)(2), (a)(3)	Maximum Conducted Output Power	Maximum conducted powers must meet the limits detailed in 15.407 (a) (RSS-247 [6.2])		PASS	Section 7.4
15.407(a)(3) (iii)	Maximum e.i.r.p. (UNII-4, 5.85 – 5.895GHz)	< 30dBm		PASS	Section 7.4
15.407 (a)(1)(iv), (a)(2), (a)(3)(i)/(iii)	Maximum Power Spectral Density	Maximum power spectral density must meet the limits detailed in 15.407 (a) (RSS-247 [6.2])		PASS	Section 7.5
15.407(h)	Dynamic Frequency Selection	See DFS Test Report		PASS	See DFS Test Report
15.407(b)(1) – (b)(5)	Undesirable Emissions	Undesirable emissions must meet the limits detailed in 15.407(b) (RSS-247 [6.2])	RADIATED	PASS	Section 7.6
15.205, 15.407(b)(1) – (b)(5)	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])		PASS	Section 7.6, 7.7

Table 7-1. Summary of Test Results

Notes:

1) All channels, modes, and modulations/data rates were investigated among all UNII bands. 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 "UNII Automation," Version 4.7.
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 1.5.0.
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) Only one RU index could be selected at a time, so no contiguous or non-contiguous RUs were considered for testing.

7.2 26dB Bandwidth Measurement

Test Overview and Limit

The bandwidth at 26dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating at its maximum duty cycle, at its maximum power control level, as defined in ANSI C63.10:2020, and at the appropriate frequencies. The spectrum analyzer's bandwidth measurement function is configured to measure the 26dB bandwidth.

The 26dB bandwidth is used to determine the conducted power limits.

Test Procedure Used

ANSI C63.10:2020 – Section 12.5

Test Settings

1. The signal analyzers' automatic bandwidth measurement capability was used to perform the 26dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 26. The automatic bandwidth measurement function also has the capability of simultaneously measuring the 99% occupied bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = approximately 1% of the emission bandwidth
3. VBW $\geq$ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold

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

The 26dB Bandwidth measurement for each channel was measured with the RU index showing the highest conducted power.

MIMO 26dB Bandwidth Measurements

	Frequency [MHz]	802.11 MODE	Channel	Antenna-1 26dB Bandwidth [MHz]	Antenna-2 26dB Bandwidth [MHz]	Antenna-1 OBW [MHz]	Antenna-2 OBW [MHz]
Band 1	5180	be (20MHz)	36	21.23	21.28	19.13	19.02
	5200	be (20MHz)	40	21.45	21.38	19.08	19.15
	5240	be (20MHz)	48	21.26	21.33	19.04	19.15
	5190	be (40MHz)	38	25.15	24.24	21.68	21.71
	5230	be (40MHz)	46	25.07	24.41	21.71	21.53
	5210	be (80MHz)	42	35.66	34.61	30.81	28.87
Band 1/2A	5250	be (160MHz)	50	52.32	47.18	43.70	42.26
Band 2A	5260	be (20MHz)	52	20.84	21.64	18.99	19.06
	5280	be (20MHz)	56	21.48	21.43	19.08	19.09
	5320	be (20MHz)	64	21.08	21.30	18.87	19.05
	5270	be (40MHz)	54	25.91	24.26	21.81	21.54
	5310	be (40MHz)	62	26.53	24.38	22.08	21.67
	5290	be (80MHz)	58	35.86	35.13	30.13	28.61
Band 2C	5500	be (20MHz)	100	21.34	20.86	19.02	18.97
	5600	be (20MHz)	120	21.58	21.27	19.06	19.08
	5720	be (20MHz)	144	21.29	21.28	19.05	19.09
	5510	be (40MHz)	102	22.80	22.39	19.72	19.70
	5590	be (40MHz)	118	26.76	24.68	22.27	21.64
	5710	be (40MHz)	142	26.18	24.29	21.95	21.58
	5530	be (80MHz)	106	34.69	35.03	30.06	28.37
	5610	be (80MHz)	122	33.87	34.64	28.91	28.18
	5690	be (80MHz)	138	34.40	35.07	29.83	28.79
	5570	be (160MHz)	114	54.10	48.16	43.38	40.44

Table 7-2. Bands 1, 2A, 2C Conducted 26dB Bandwidth Measurements MIMO (26 Tones)

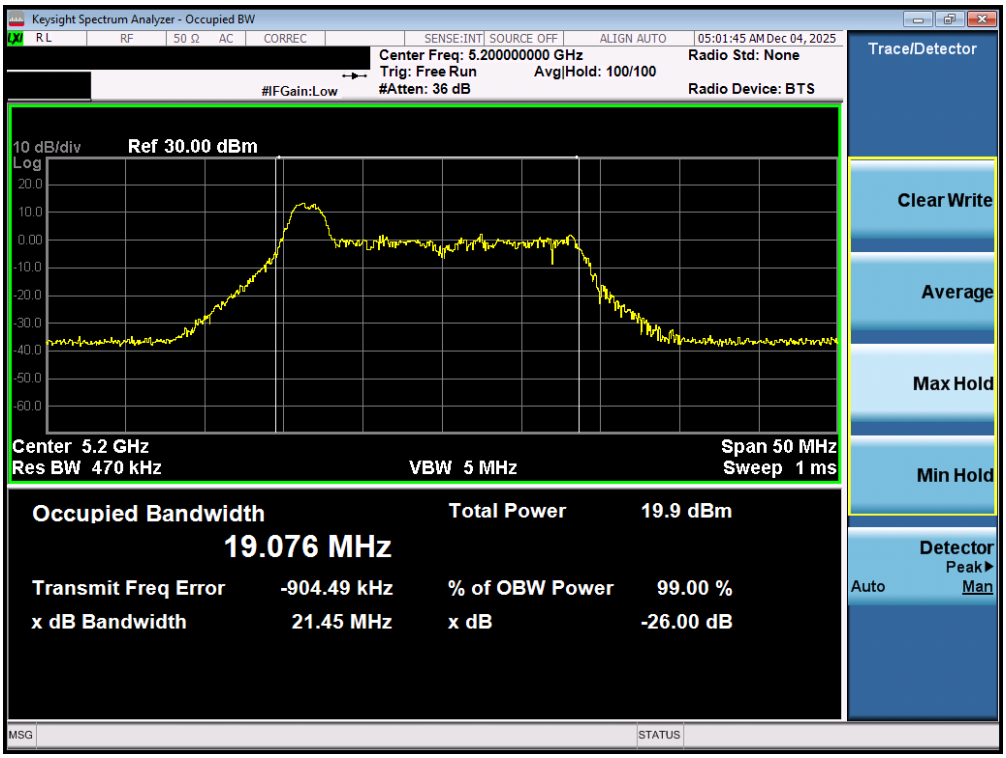
	Frequency [MHz]	802.11 MODE	Channel	Antenna-1 26dB Bandwidth [MHz]	Antenna-2 26dB Bandwidth [MHz]	Antenna-1 OBW [MHz]	Antenna-2 OBW [MHz]
Band 1	5180	be (20MHz)	36	29.89	29.83	19.56	19.46
	5200	be (20MHz)	40	27.26	27.46	19.55	19.43
	5240	be (20MHz)	48	24.18	23.77	19.49	19.41
	5190	be (40MHz)	38	45.12	45.14	38.58	38.65
	5230	be (40MHz)	46	44.60	44.84	38.49	38.54
	5210	be (80MHz)	42	92.13	90.12	78.66	78.50
Band 1/2A	5250	be (160MHz)	50	182.31	178.22	158.32	158.33
Band 2A	5260	be (20MHz)	52	24.17	24.29	19.45	19.35
	5280	be (20MHz)	56	24.20	23.39	19.47	19.33
	5320	be (20MHz)	64	24.05	23.55	19.47	19.29
	5270	be (40MHz)	54	45.04	44.98	38.50	38.44
	5310	be (40MHz)	62	45.30	44.74	38.53	38.52
	5290	be (80MHz)	58	90.29	89.81	78.41	78.33
Band 2C	5500	be (20MHz)	100	24.17	23.38	19.45	19.28
	5600	be (20MHz)	120	24.05	23.34	19.45	19.31
	5720	be (20MHz)	144	23.51	23.23	19.45	19.31
	5510	be (40MHz)	102	44.63	44.99	38.48	38.54
	5590	be (40MHz)	118	45.45	45.37	38.50	38.47
	5710	be (40MHz)	142	44.72	45.13	38.53	38.53
	5530	be (80MHz)	106	90.84	88.95	78.56	78.61
	5610	be (80MHz)	122	93.39	90.40	78.73	78.43
	5690	be (80MHz)	138	91.95	89.84	78.79	78.31
	5570	be (160MHz)	114	183.38	178.50	158.88	158.55

Table 7-3. Bands 1, 2A, 2C Conducted 26dB Bandwidth Measurements MIMO (Full Tones)

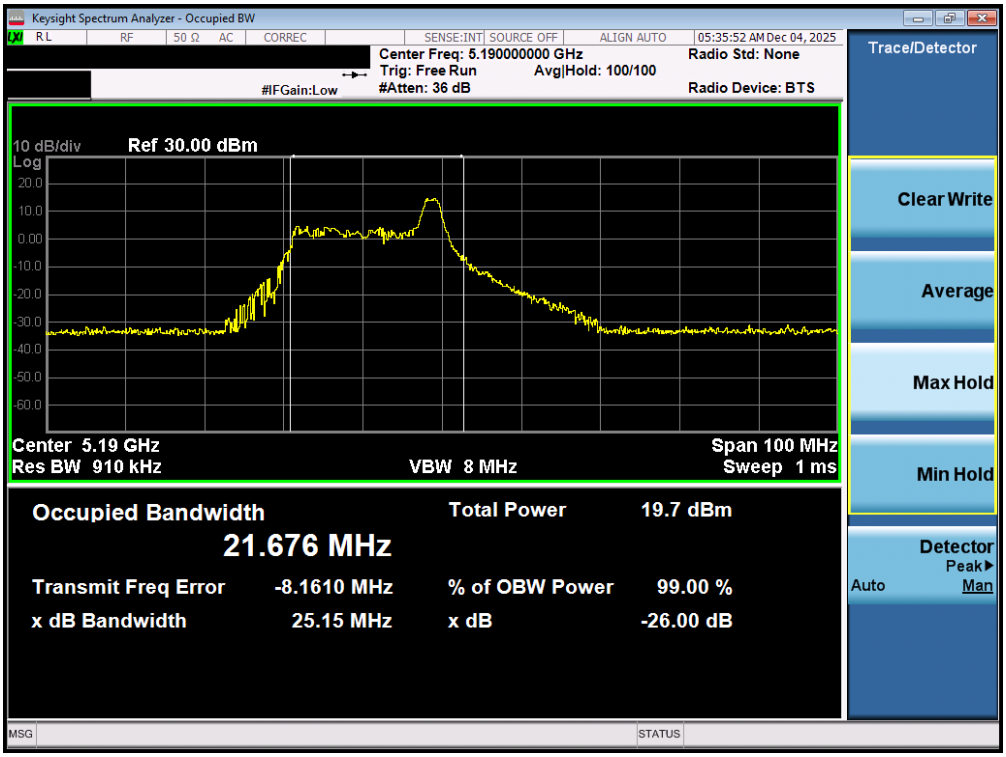
	Frequency [MHz]	802.11 MODE	Channel	MRU Configuration	Antenna-1 6dB Bandwidth [MHz]	Antenna-2 6dB Bandwidth [MHz]	Antenna-1 OBW [MHz]	Antenna-2 OBW [MHz]
Band 1	5200	be (20MHz)	40	52+26T	20.74	19.27	17.42	19.27
	5200	be (20MHz)	40	106+26T	21.44	21.63	18.54	21.63
	5210	be (80MHz)	42	484+242T	89.36	92.48	78.79	92.48
Band 1/2A	5250	be (160MHz)	50	996+484T	177.46	177.67	158.49	177.67
Band 2A	5280	be (20MHz)	56	52+26T	20.28	19.48	17.41	19.48
	5280	be (20MHz)	56	106+26T	21.50	21.33	18.42	21.33
	5290	be (80MHz)	58	484+242T	89.50	91.40	78.70	91.40
Band 2C	5600	be (20MHz)	120	52+26T	20.62	19.39	17.42	19.39
	5600	be (20MHz)	120	106+26T	22.33	21.66	18.52	21.66
	5610	be (80MHz)	122	484+242T	89.33	92.42	78.78	92.42
	5570	be (160MHz)	114	996+484T	176.85	176.96	158.49	176.96

Table 7-4. Bands 1, 2A, 2C Conducted 26dB Bandwidth Measurements MIMO (MRU)

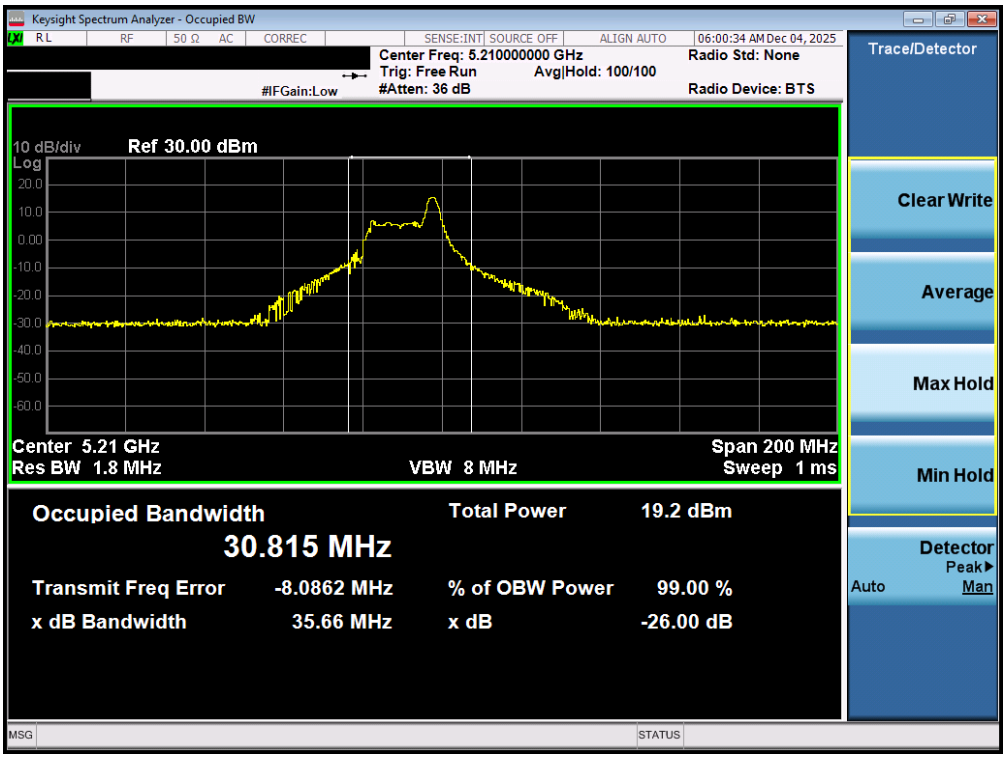
7.2.1 MIMO Antenna-1 26dB Bandwidth Measurements



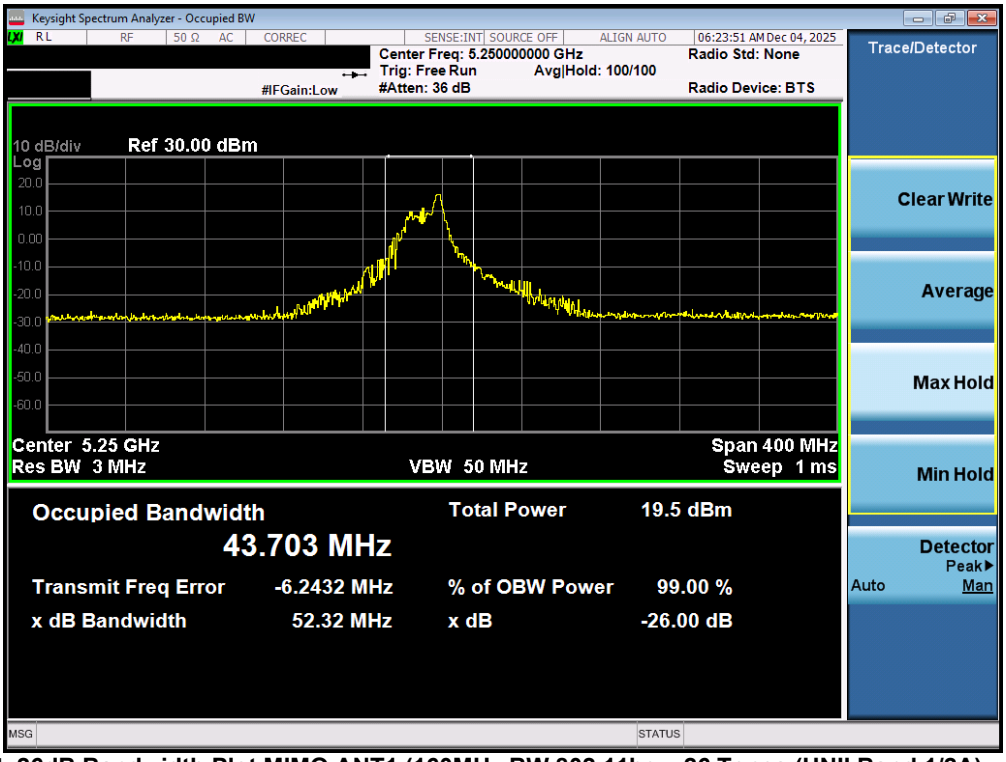
Plot 7-1. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11be – 26 Tones (UNII Band 1) – Ch. 40)



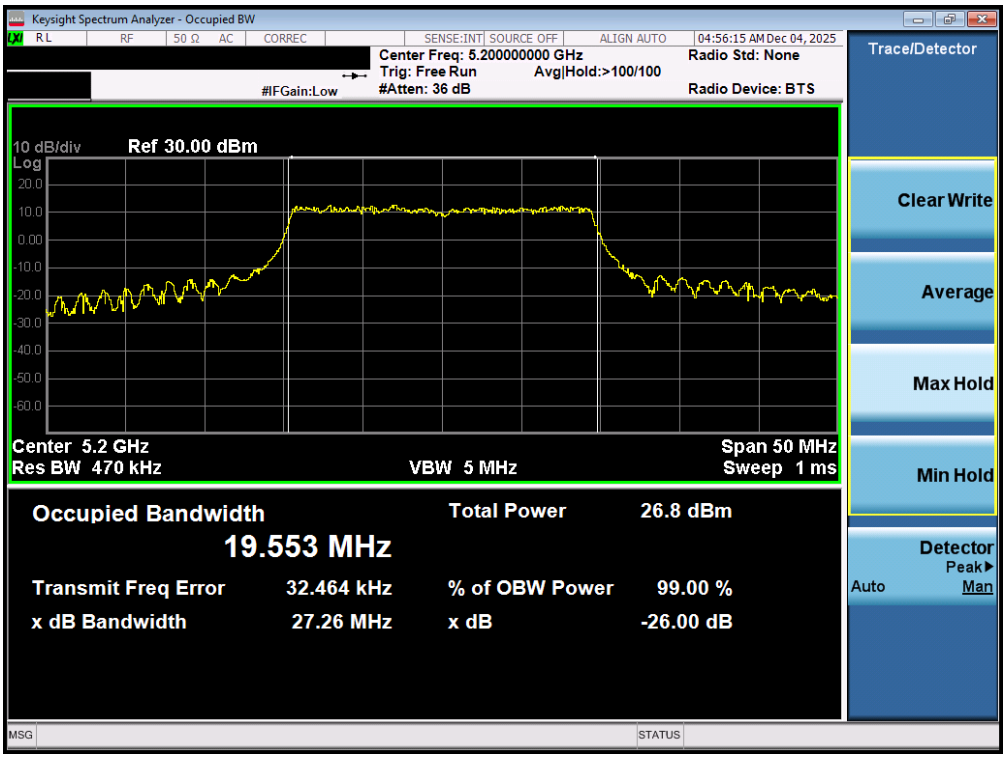
Plot 7-2. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11be – 26 Tones (UNII Band 1) – Ch. 38)



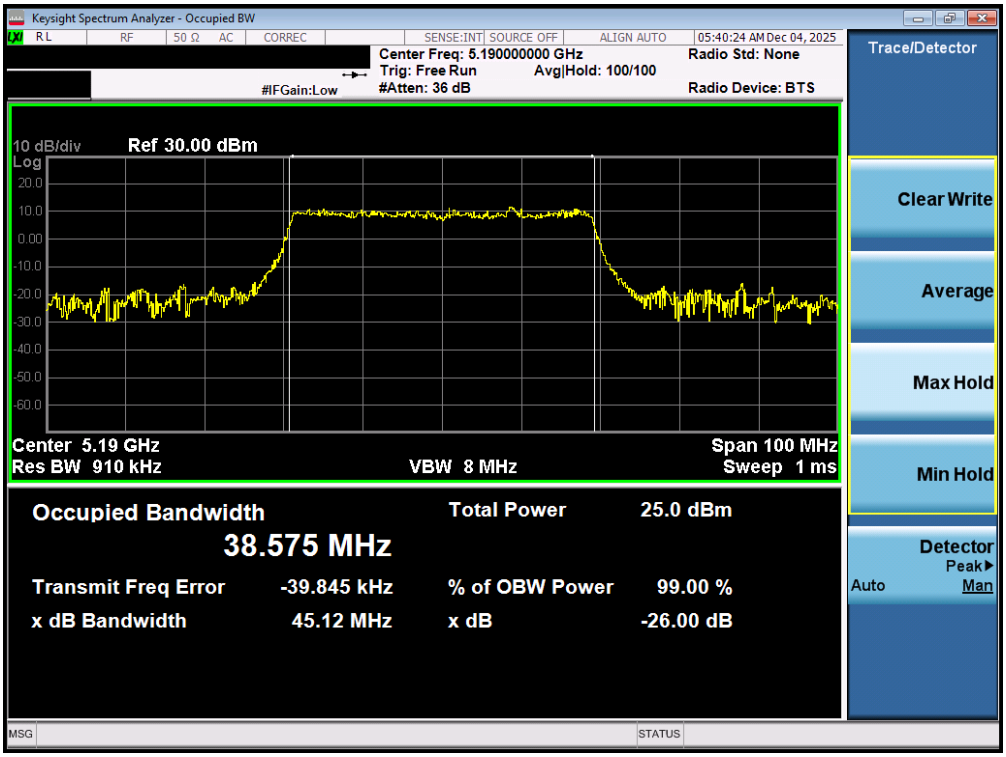
Plot 7-3. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11be – 26 Tones (UNII Band 1) – Ch. 42)



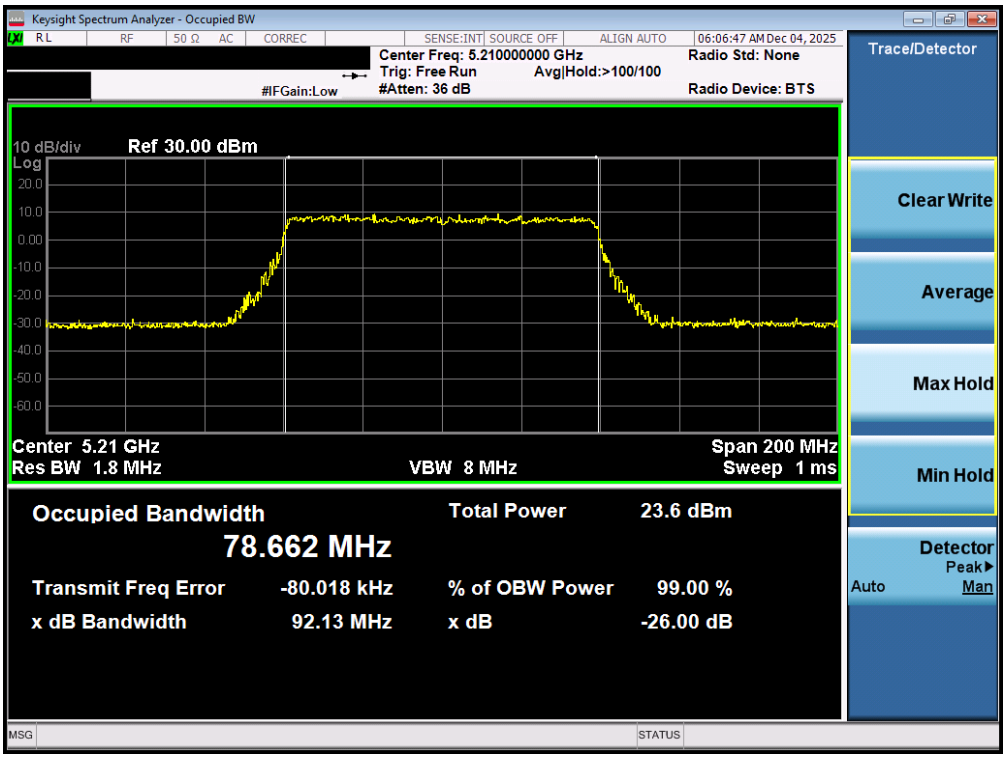
Plot 7-4. 26dB Bandwidth Plot MIMO ANT1 (160MHz BW 802.11be – 26 Tones (UNII Band 1/2A) – Ch. 50)



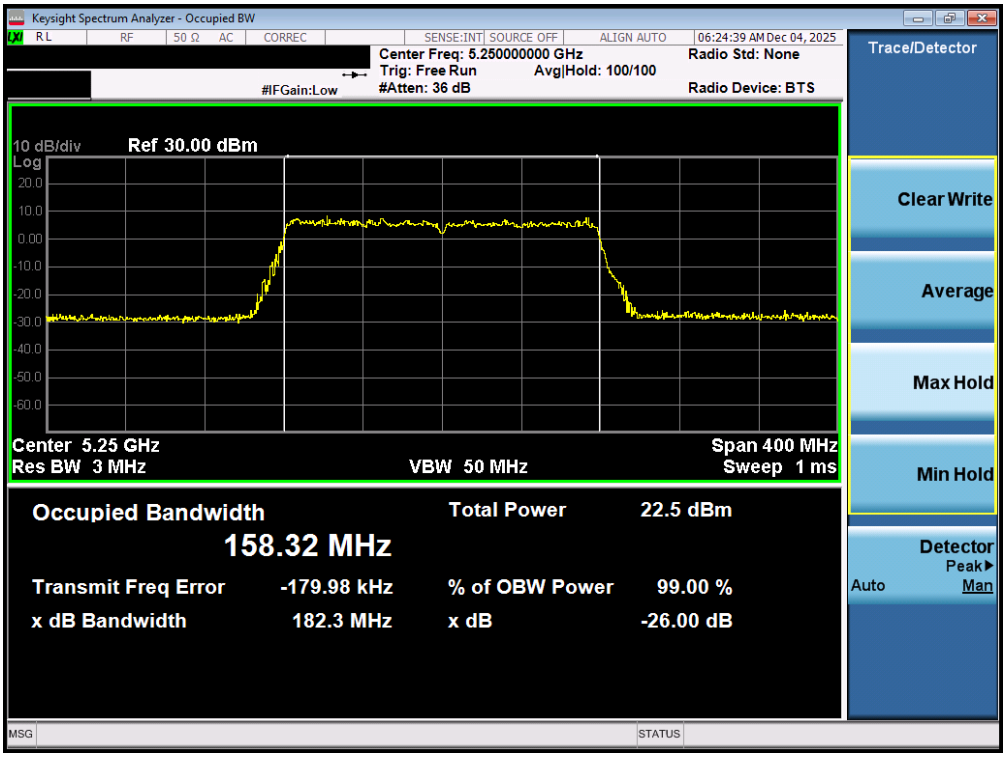
Plot 7-5. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11be – 242 Tones (UNII Band 1) – Ch. 40)



Plot 7-6. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11be – 484 Tones (UNII Band 1) – Ch. 38)

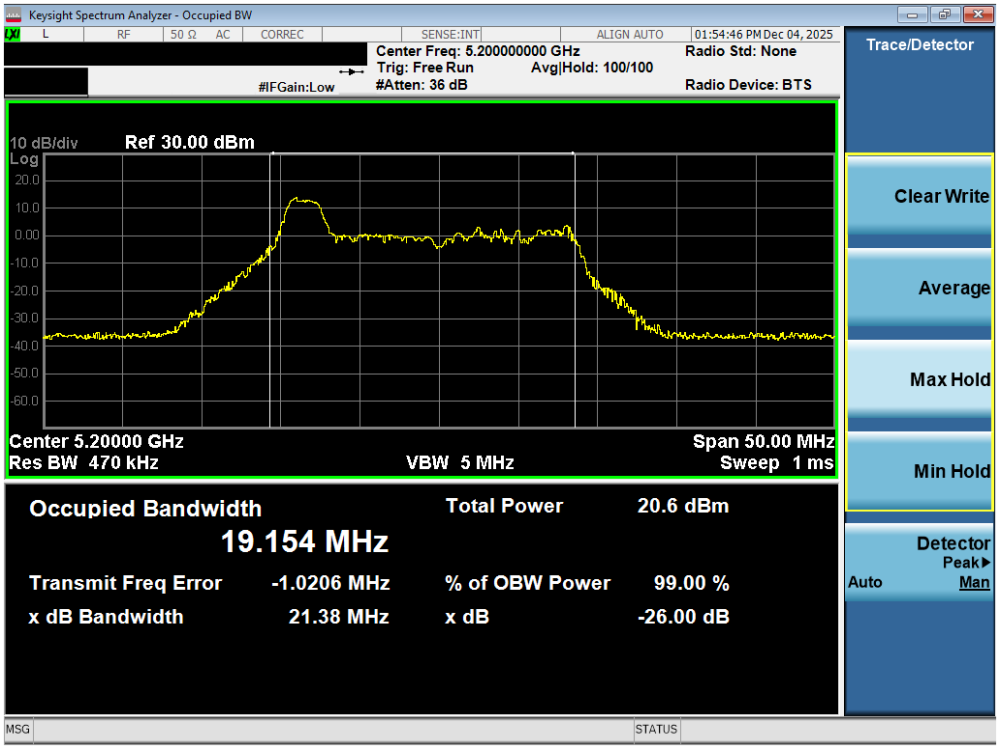


Plot 7-7. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11be – 996 Tones (UNII Band 1) – Ch. 42)

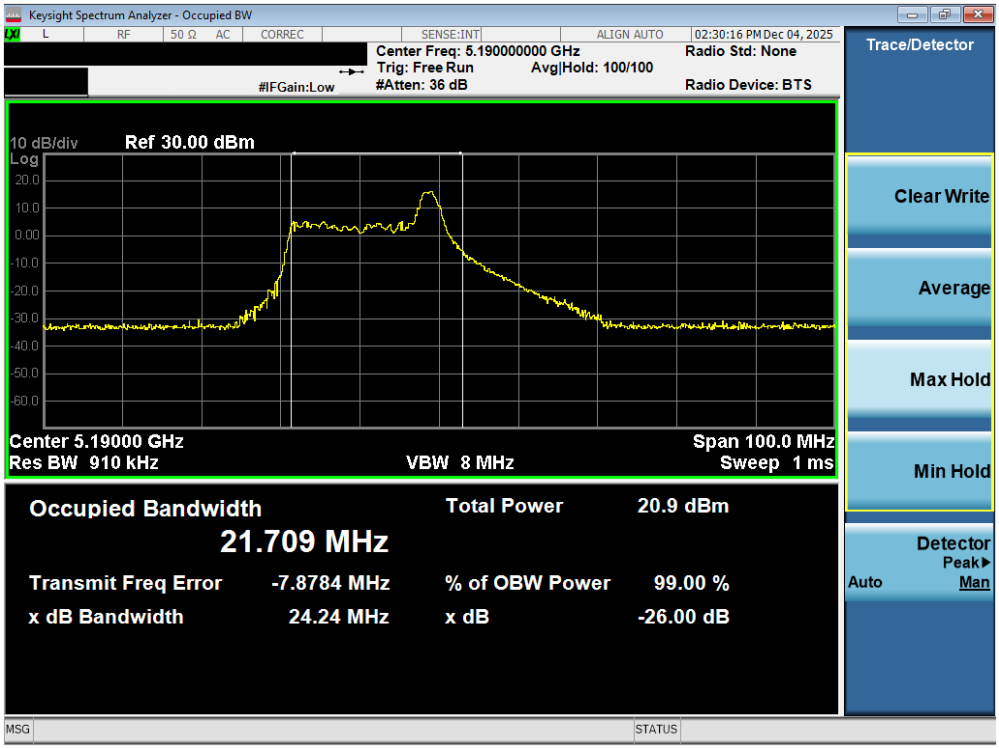


Plot 7-8. 26dB Bandwidth Plot MIMO ANT1 (160MHz BW 802.11be – 2x996 Tones (UNII Band 1/2A) – Ch. 50)

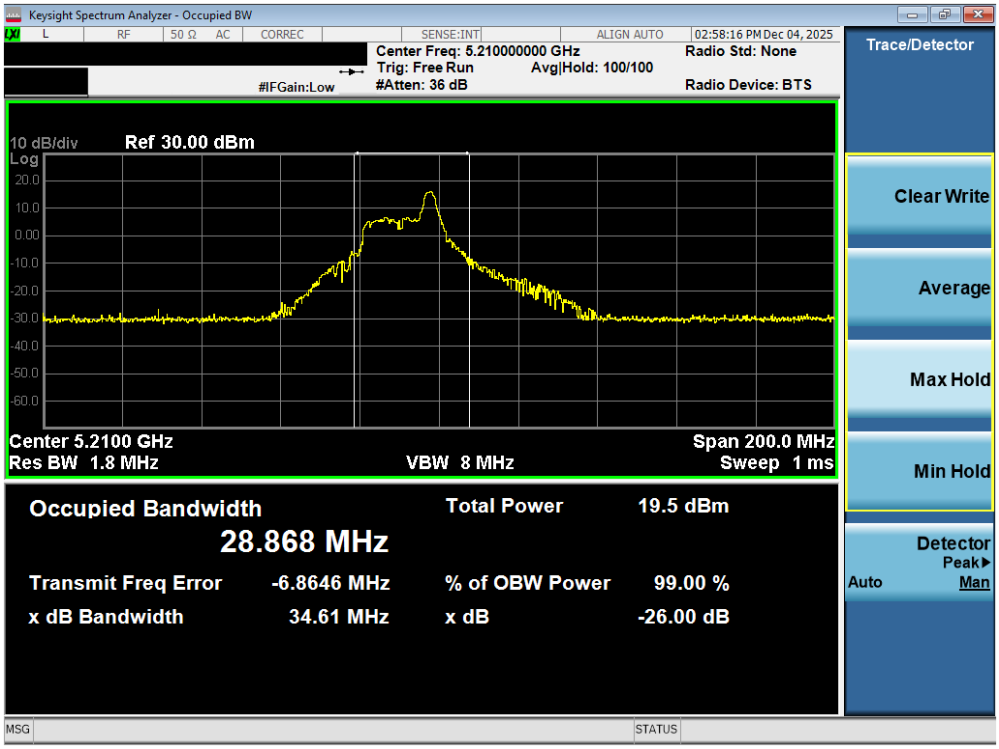
7.2.2 MIMO Antenna-2 26dB Bandwidth Measurements



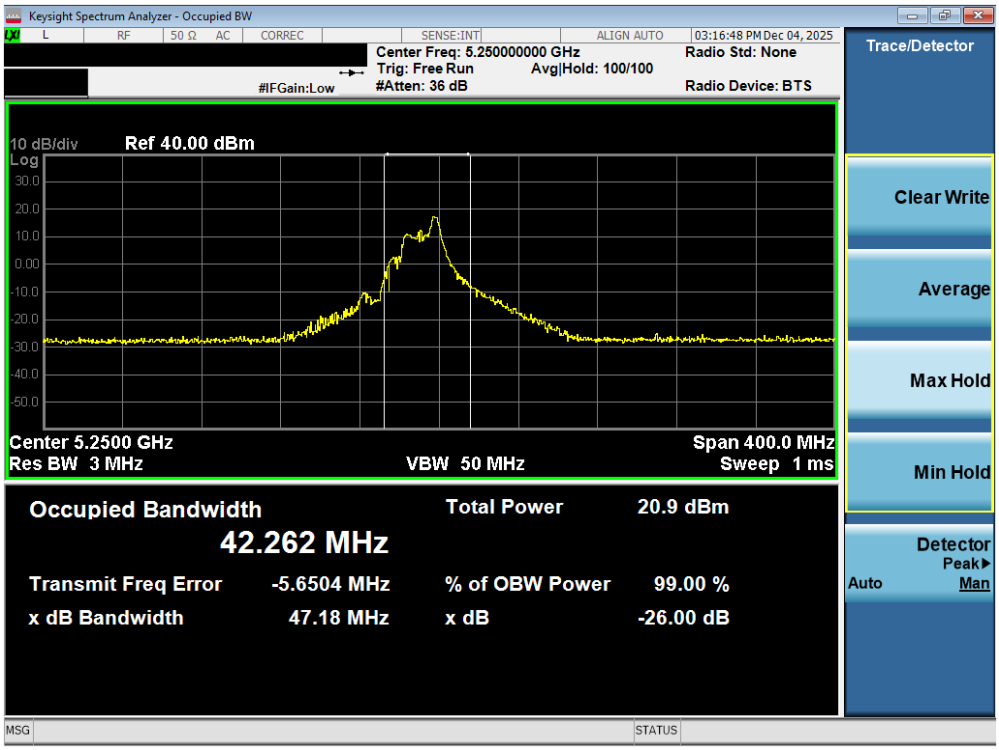
Plot 7-9. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11be – 26 Tones (UNII Band 1) – Ch. 40)



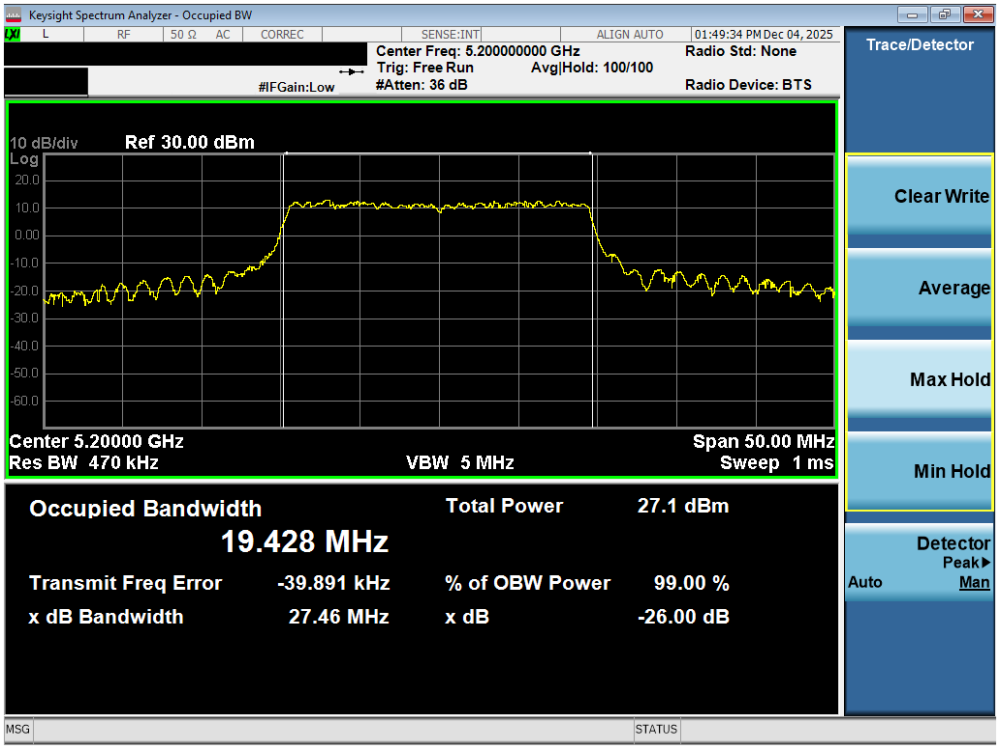
Plot 7-10. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11be – 26 Tones (UNII Band 1) – Ch. 38)



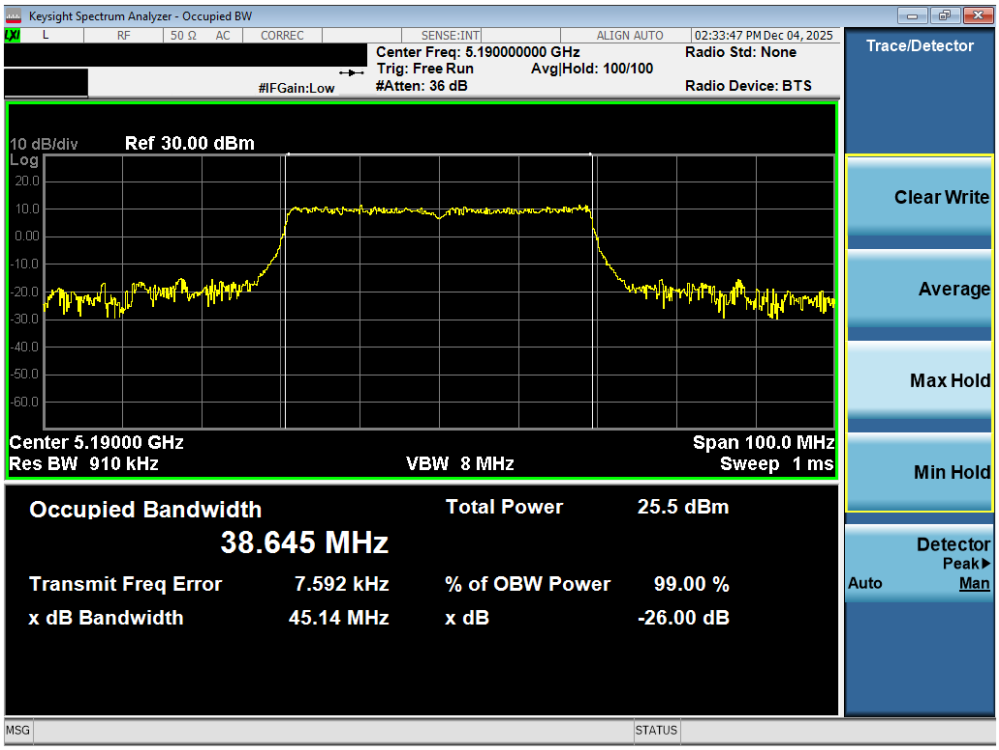
Plot 7-11. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11be – 26 Tones (UNII Band 1) – Ch. 42)



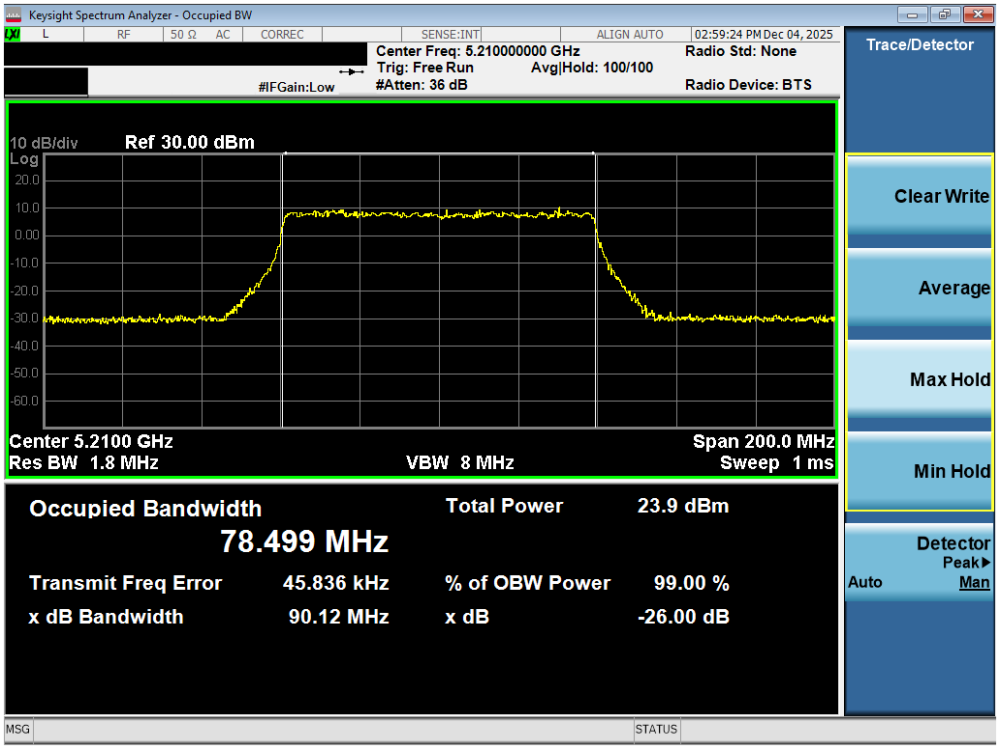
Plot 7-12. 26dB Bandwidth Plot MIMO ANT2 (160MHz(U) BW 802.11be – 26 Tones (UNII Band 1/2A) – Ch. 50)



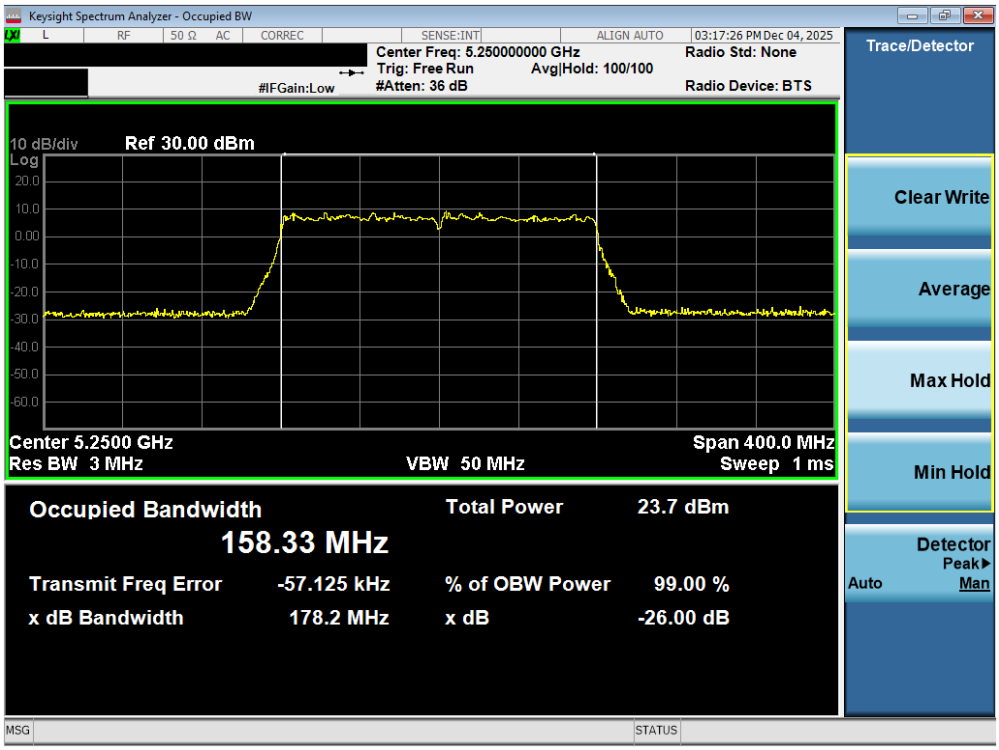
Plot 7-13. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11be – 242 Tones (UNII Band 1) – Ch. 40)



Plot 7-14. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11be – 484 Tones (UNII Band 1) – Ch. 38)



Plot 7-15. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11be – 996 Tones (UNII Band 1) – Ch. 42)



Plot 7-16. 26dB Bandwidth Plot MIMO ANT2 (160MHz BW 802.11be – 2x996 Tones (UNII Band 1/2A) – Ch. 50)

7.3 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 antenna terminal while the EUT is operating at its maximum duty cycle, at its maximum power control level, as defined in ANSI C63.10:2020, and at the appropriate frequencies. The spectrum analyzer's bandwidth measurement function is configured to measure the 6dB bandwidth.

In the 5.725 – 5.850GHz and 5.850-5.895GHz bands, the 6dB bandwidth must be ≥ 500 kHz.

Test Procedure Used

ANSI C63.10:2020 – Section 6.9.2

Test Settings

1. The signal analyzers' automatic bandwidth measurement capability was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 6. The automatic bandwidth measurement function also has the capability of simultaneously measuring the 99% occupied bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 100 kHz
3. VBW ≥ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple

Test Setup

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

Figure 7-2. Test Instrument & Measurement Setup

Test Notes

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

MIMO 6dB Bandwidth Measurements

	Frequency [MHz]	802.11 MODE	Channel	Antenna-1 6dB Bandwidth [MHz]	Antenna-2 6dB Bandwidth [MHz]	Antenna-1 OBW [MHz]	Antenna-2 OBW [MHz]
Band 3	5745	be (20MHz)	149	2.05	2.12	18.31	18.39
	5785	be (20MHz)	157	2.13	2.14	19.06	18.29
	5825	be (20MHz)	165	2.04	2.14	18.10	18.45
	5755	be (40MHz)	151	2.12	2.21	18.84	18.74
	5795	be (40MHz)	159	2.12	2.21	18.49	18.95
	5775	be (80MHz)	155	2.26	2.27	17.97	18.18

Table 7-5. Band 3 Conducted 6dB Bandwidth Measurements MIMO (26 Tones)

	Frequency [MHz]	802.11 MODE	Channel	Antenna-1 6dB Bandwidth [MHz]	Antenna-2 6dB Bandwidth [MHz]	Antenna-1 OBW [MHz]	Antenna-2 OBW [MHz]
Band 3/4	5845	be (20MHz)	169	2.01	2.12	18.10	18.37
Band 4	5865	be (20MHz)	173	2.02	2.14	18.29	18.37
	5885	be (20MHz)	177	2.03	2.14	18.31	18.40
Band 3/4	5835	be (40MHz)	167	2.15	2.20	18.72	18.92
Band 4	5875	be (40MHz)	175	2.13	2.22	18.61	18.92
Band 3/4	5855	be (80MHz)	171	2.27	2.26	17.84	18.17
Band 4	5815	be (160MHz)	163	2.56	2.65	18.39	17.99

Table 7-6. Band 3/4 Conducted 6dB Bandwidth Measurements MIMO (26 Tones)

	Frequency [MHz]	802.11 MODE	Channel	Antenna-1 6dB Bandwidth [MHz]	Antenna-2 6dB Bandwidth [MHz]	Antenna-1 OBW [MHz]	Antenna-2 OBW [MHz]
Band 3	5745	be (20MHz)	149	19.09	19.10	19.03	19.04
	5785	be (20MHz)	157	19.11	19.09	19.04	19.03
	5825	be (20MHz)	165	19.03	19.06	19.07	19.03
	5755	be (40MHz)	151	38.14	38.39	37.93	38.11
	5795	be (40MHz)	159	38.19	38.25	38.04	38.04
	5775	be (80MHz)	155	78.28	78.10	77.68	77.55
	5775	be (80MHz)	155	78.28	78.10	77.68	77.55

Table 7-7. Band 3 Conducted 6dB Bandwidth Measurements MIMO (Full Tones)

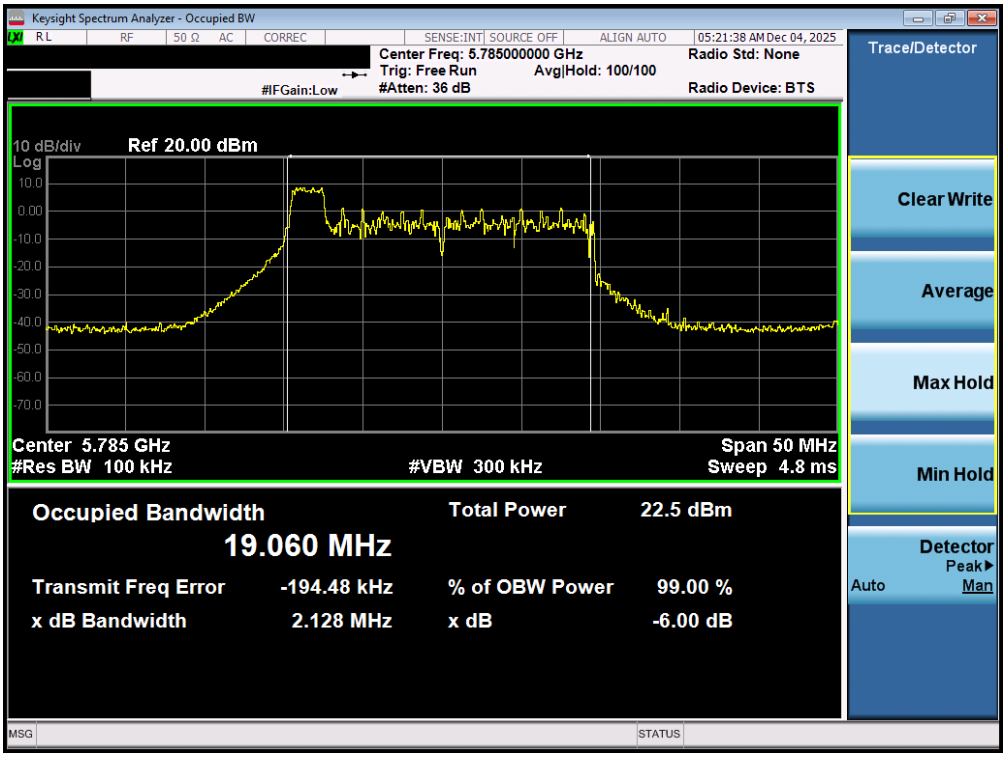
	Frequency [MHz]	802.11 MODE	Channel	Antenna-1 6dB Bandwidth [MHz]	Antenna-2 6dB Bandwidth [MHz]	Antenna-1 OBW [MHz]	Antenna-2 OBW [MHz]
Band 3/4	5845	be (20MHz)	169	19.08	19.09	19.08	19.05
Band 4	5865	be (20MHz)	173	19.07	19.07	19.08	19.05
	5885	be (20MHz)	177	19.10	19.05	19.06	19.03
Band 3/4	5835	be (40MHz)	167	38.19	38.23	38.00	38.00
Band 4	5875	be (40MHz)	175	38.19	38.25	38.03	38.06
Band 3/4	5855	be (80MHz)	171	78.24	78.12	77.63	77.54
	5815	be (160MHz)	163	158.41	157.98	156.69	156.57

Table 7-8. Bands 3/4 Conducted 6dB Bandwidth Measurements MIMO (Full Tones)

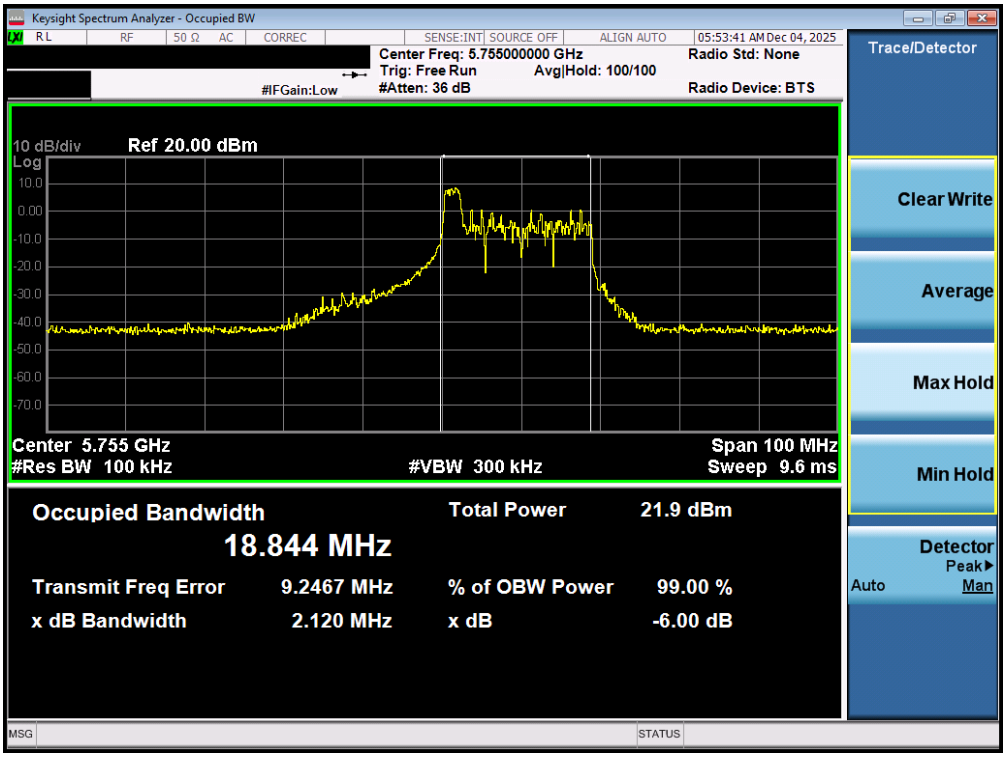
	Frequency [MHz]	802.11 MODE	Channel	MRU Configuration	Antenna-1 6dB Bandwidth [MHz]	Antenna-2 6dB Bandwidth [MHz]	Antenna-1 OBW [MHz]	Antenna-2 OBW [MHz]
Band 3	5785	be (20MHz)	157	52+26T	13.86	15.02	17.39	15.02
	5785	be (20MHz)	157	106+26T	17.21	17.18	17.97	17.18
	5775	be (80MHz)	155	484+242T	78.26	78.11	77.81	78.11
Band 4	5865	be (20MHz)	173	52+26T	15.13	15.10	17.39	15.10
	5865	be (20MHz)	173	106+26T	18.36	18.41	18.21	18.41
Band 3/4	5775	be (80MHz)	171	484+242T	78.32	78.33	77.80	78.33
	5815	be (160MHz)	163	996+484T	158.51	158.25	157.30	158.25

Table 7-9. Bands 3/4 Conducted 6dB Bandwidth Measurements MIMO (MRU)

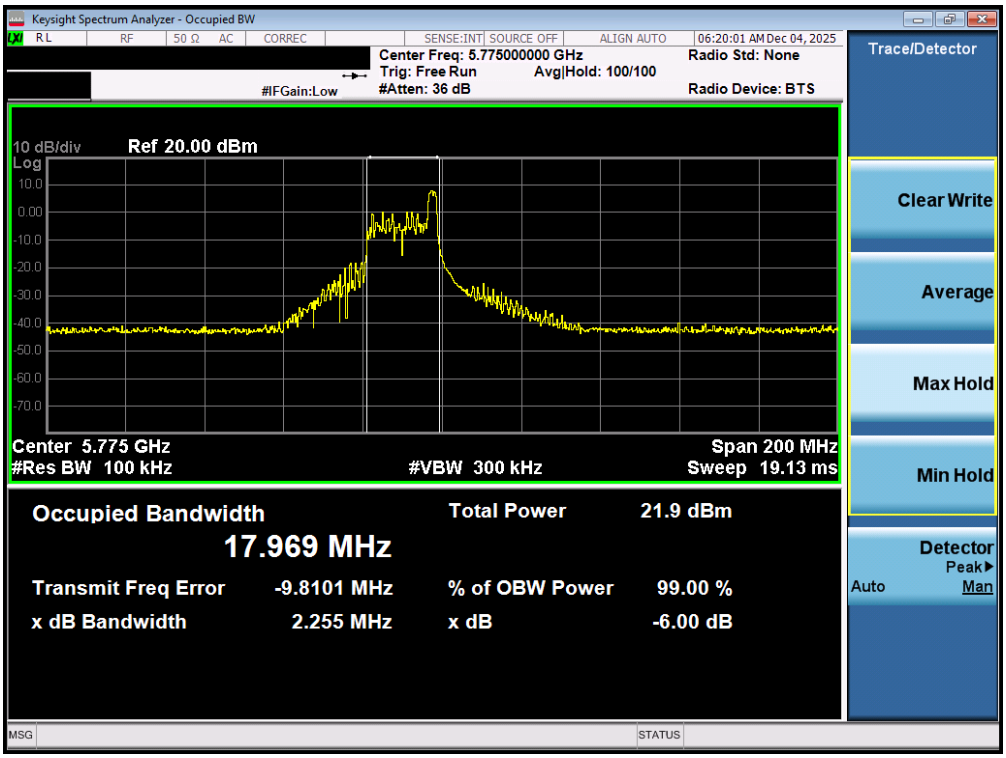
7.3.1 MIMO Antenna-1 6dB Bandwidth Measurements



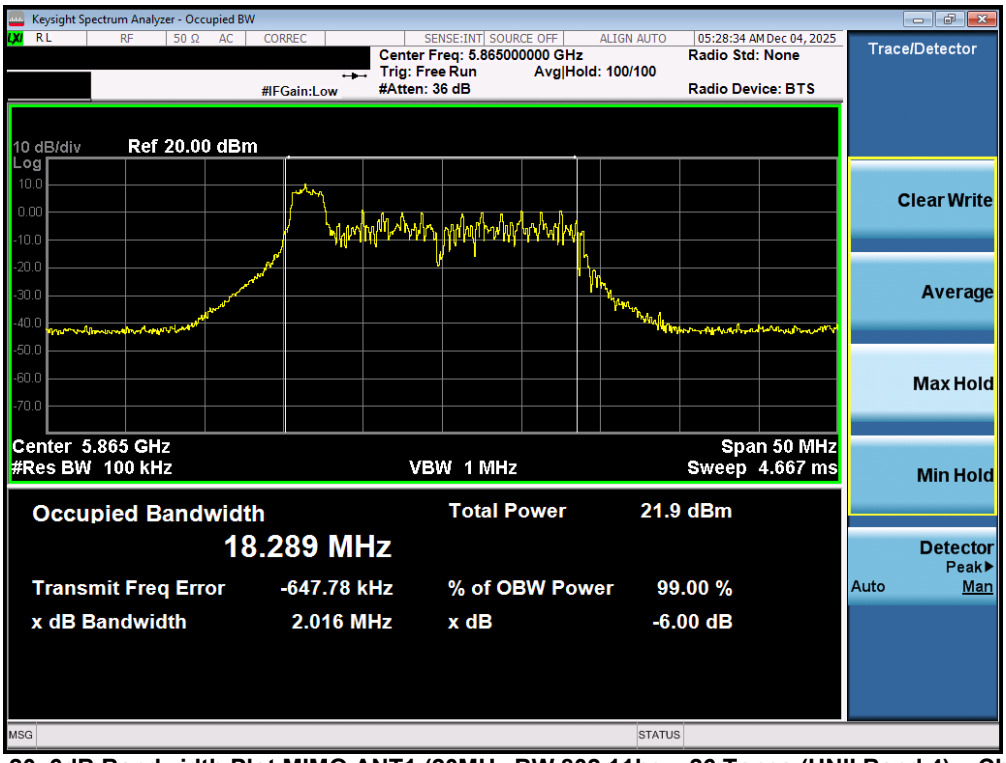
Plot 7-17. 6dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11be – 26 Tones (UNII Band 3) – Ch. 157)



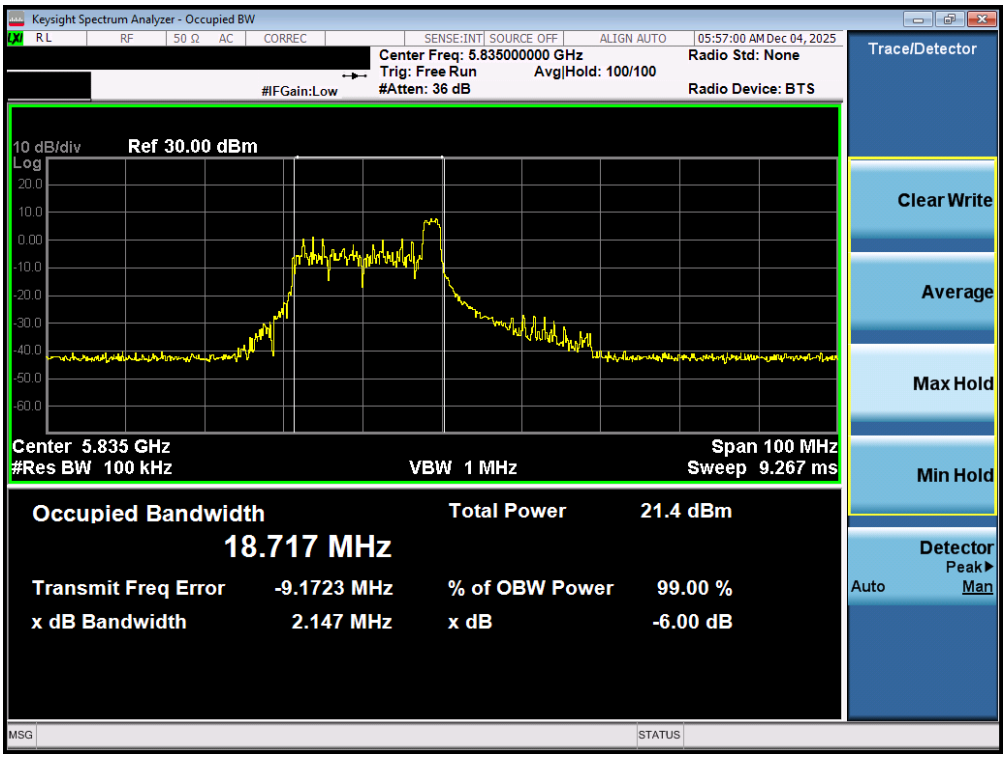
Plot 7-18. 6dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11be – 26 Tones (UNII Band 3) – Ch. 151)



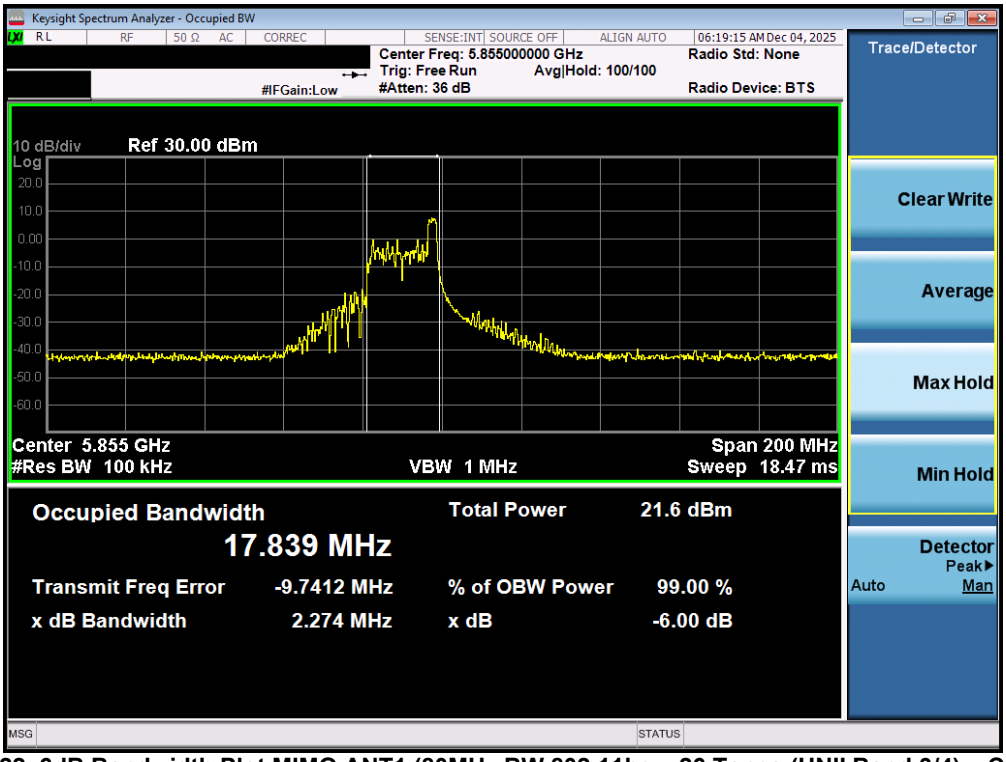
Plot 7-19. 6dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11be – 26 Tones (UNII Band 3) – Ch. 155)



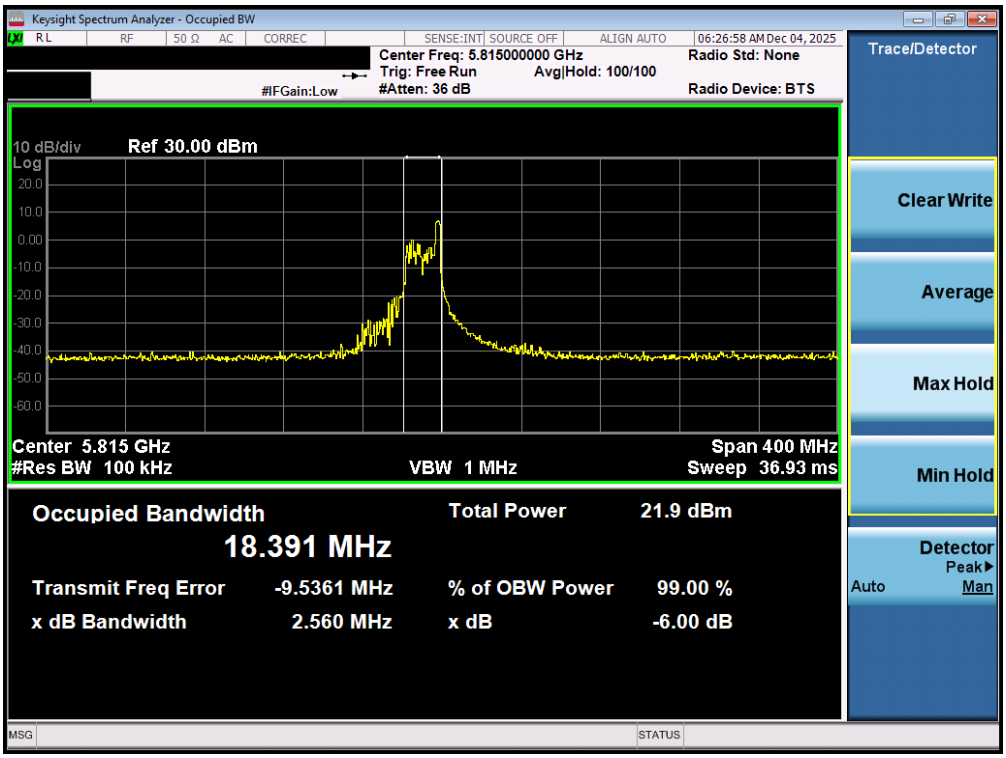
Plot 7-20. 6dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11be – 26 Tones (UNII Band 4) – Ch. 173)



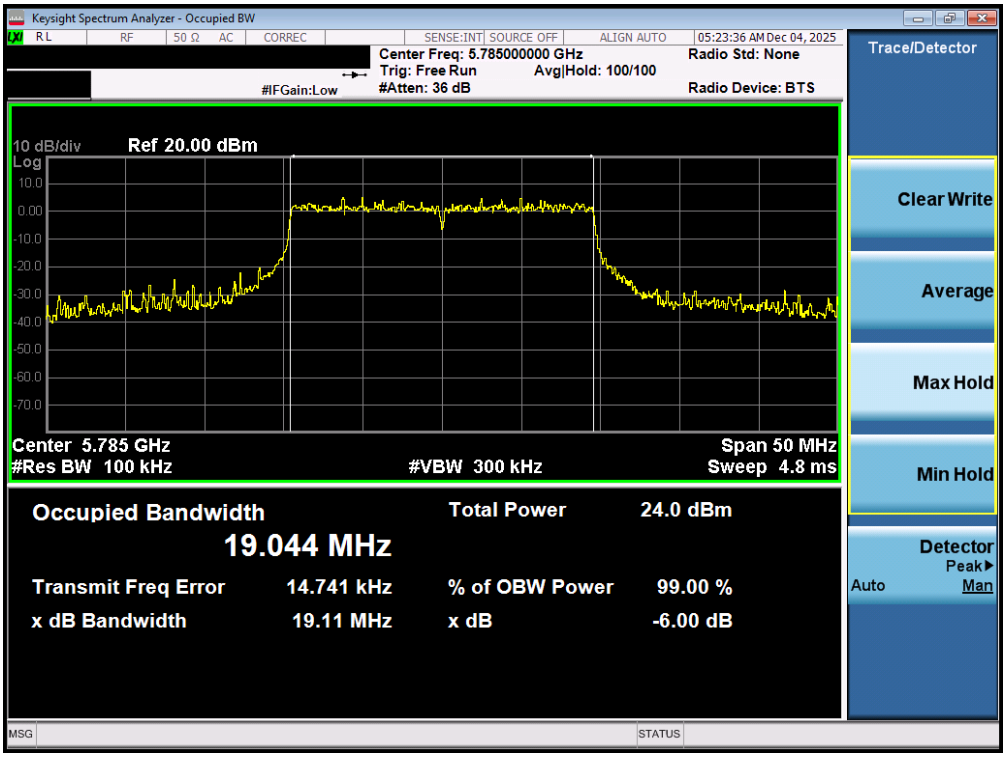
Plot 7-21. 6dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11be – 26 Tones (UNII Band 3/4) – Ch. 167)



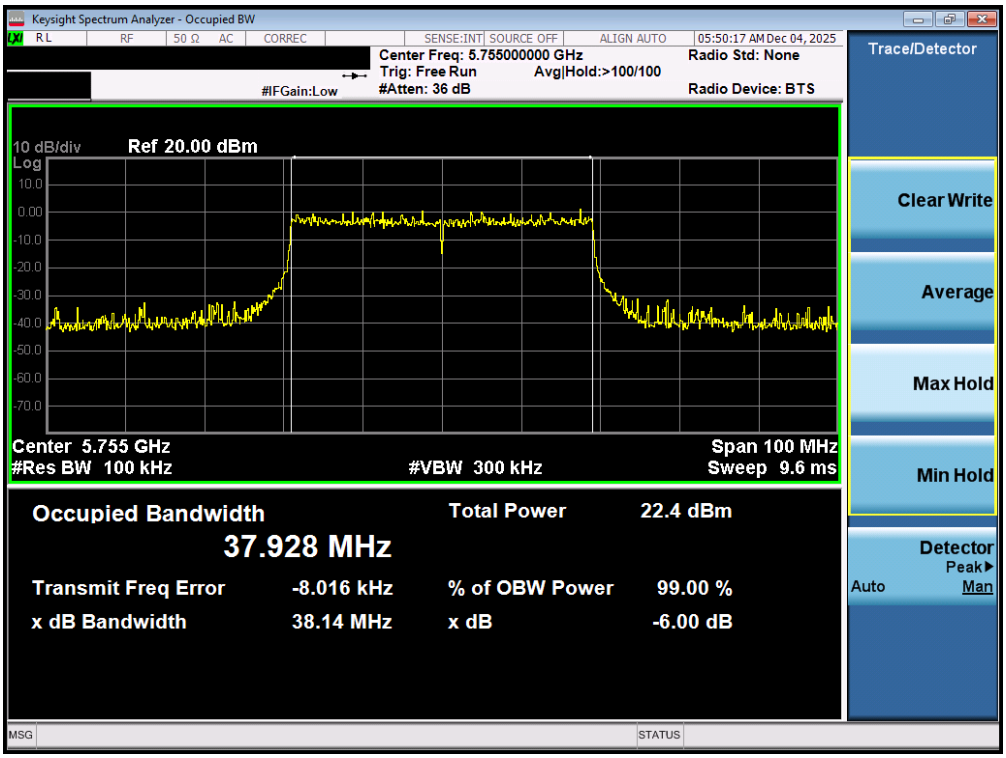
Plot 7-22. 6dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11be – 26 Tones (UNII Band 3/4) – Ch. 171)



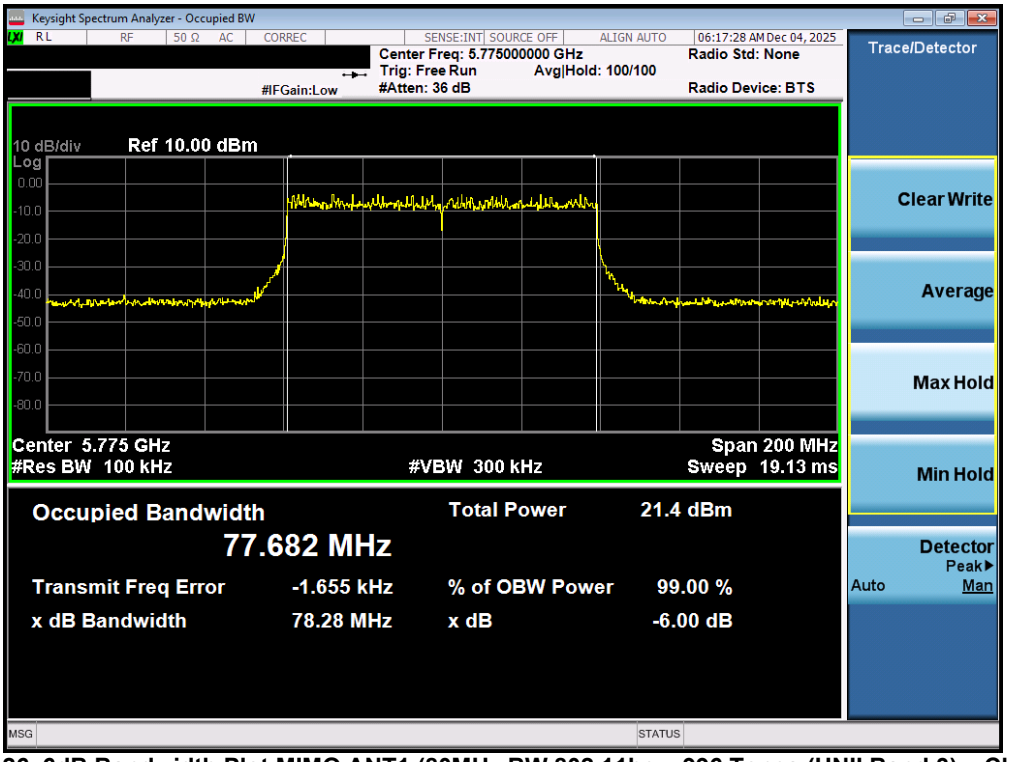
Plot 7-23. 6dB Bandwidth Plot MIMO ANT1 (160MHz(U) BW 802.11be – 26 Tones (UNII Band 3/4) – Ch. 163)



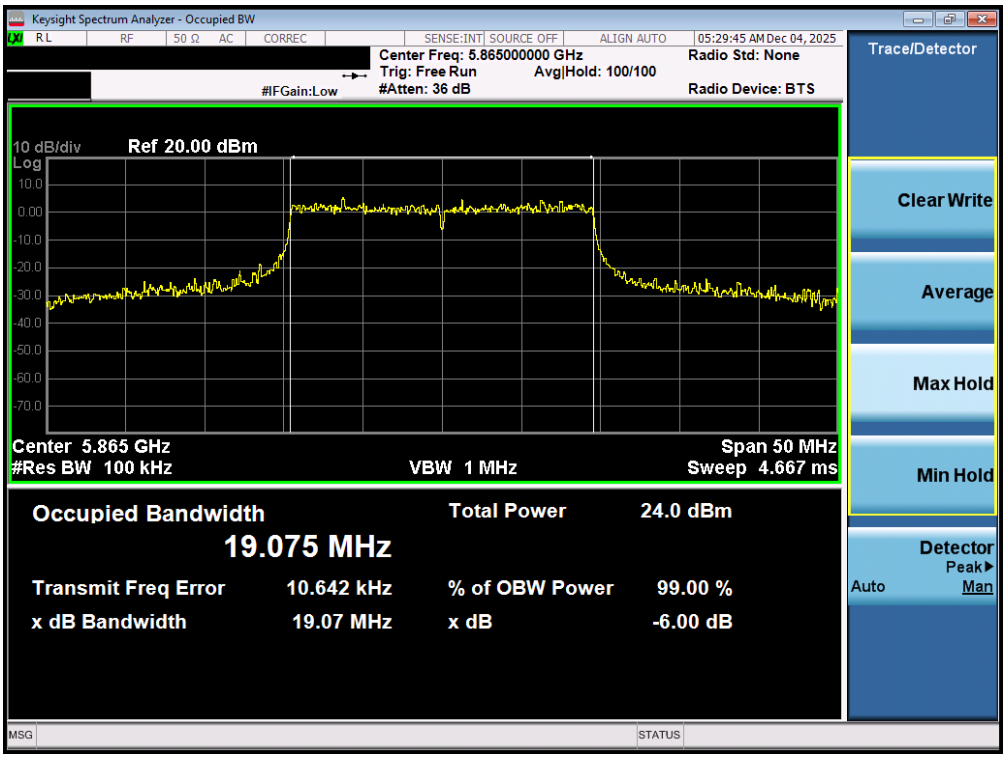
Plot 7-24. 6dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11be – 242 Tones (UNII Band 3) – Ch. 157)



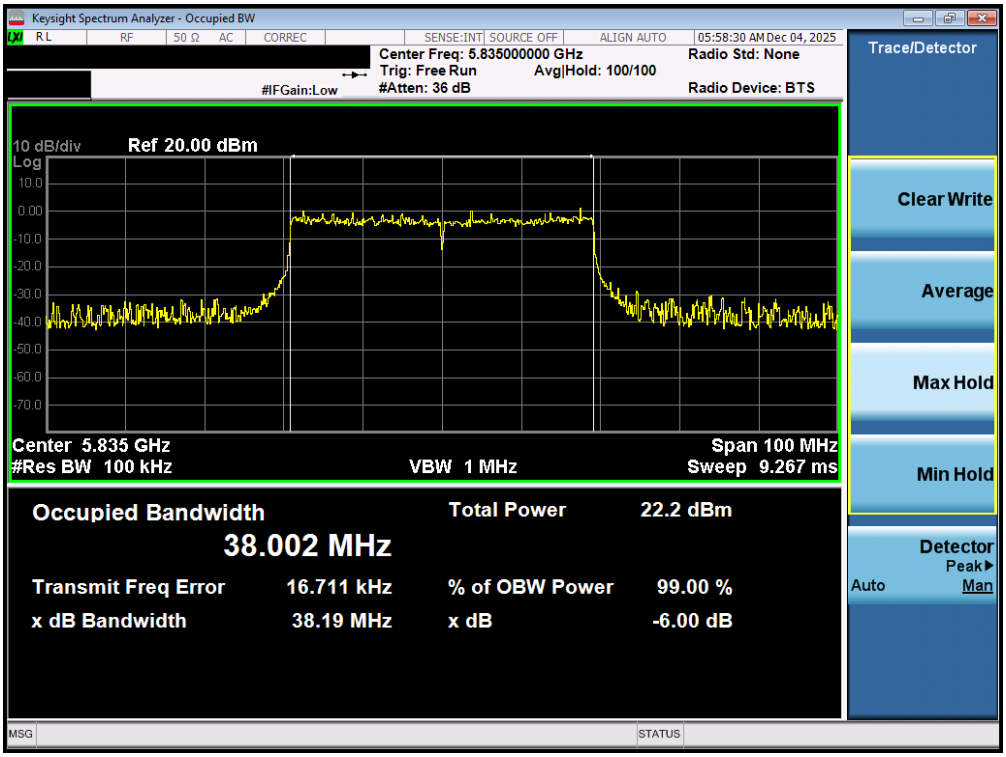
Plot 7-25. 6dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11be – 484 Tones (UNII Band 3) – Ch. 151)



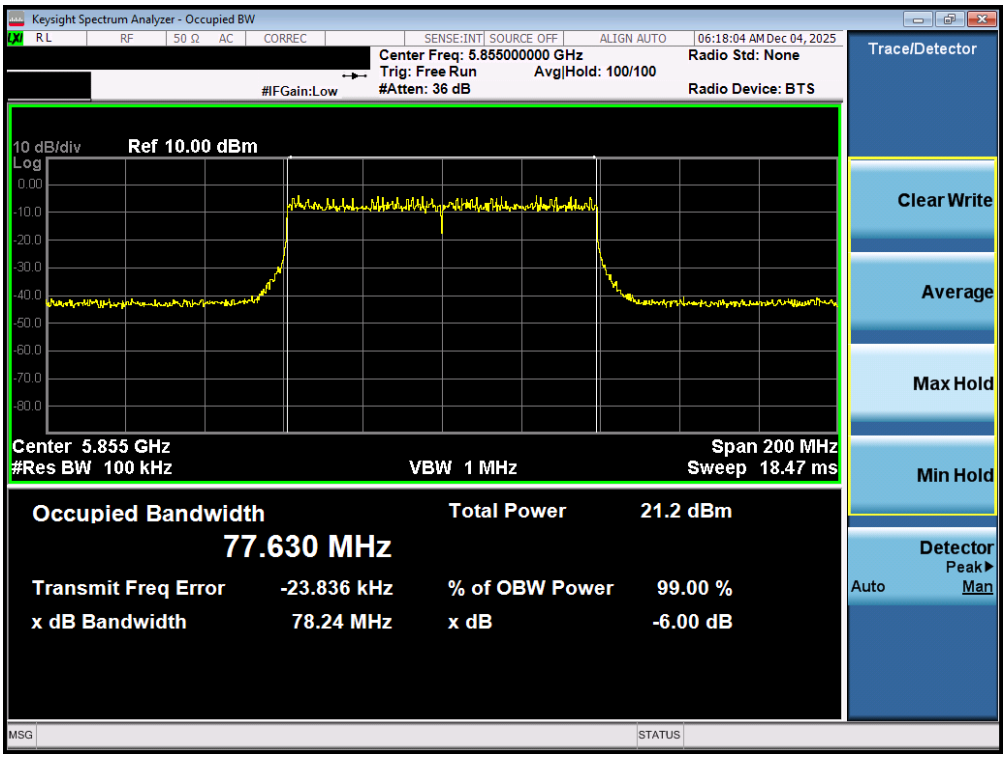
Plot 7-26. 6dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11be – 996 Tones (UNII Band 3) – Ch. 155)



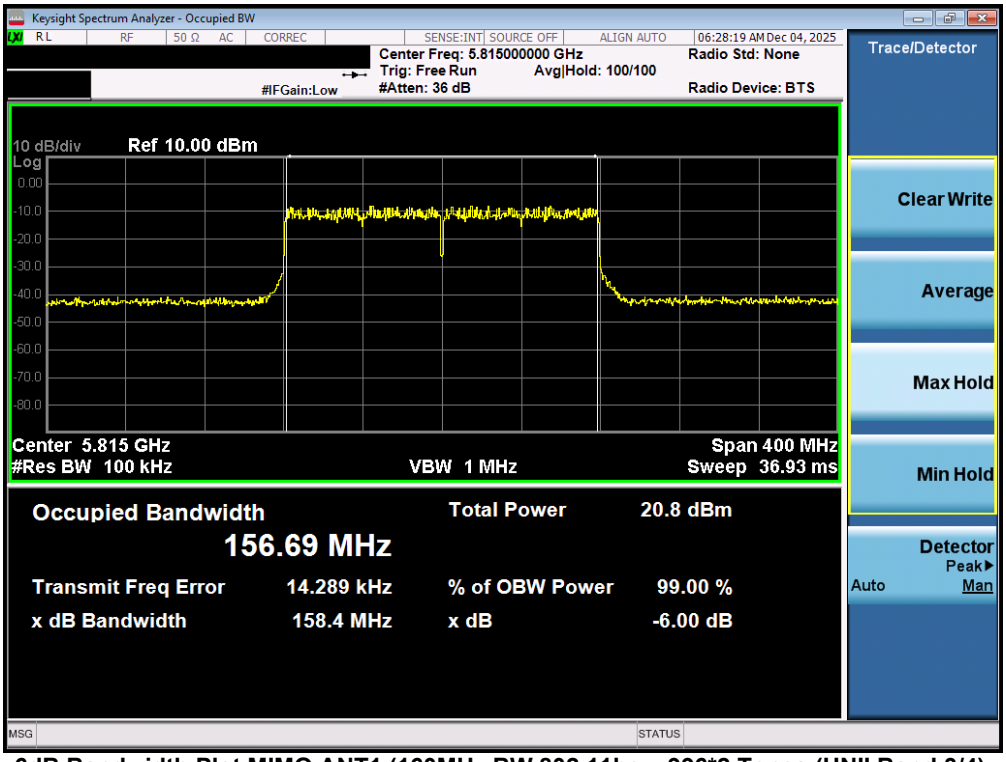
Plot 7-27. 6dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11be – 242 Tones (UNII Band 4) – Ch. 173)



Plot 7-28. 6dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11be – 484 Tones (UNII Band 3/4) – Ch. 167)

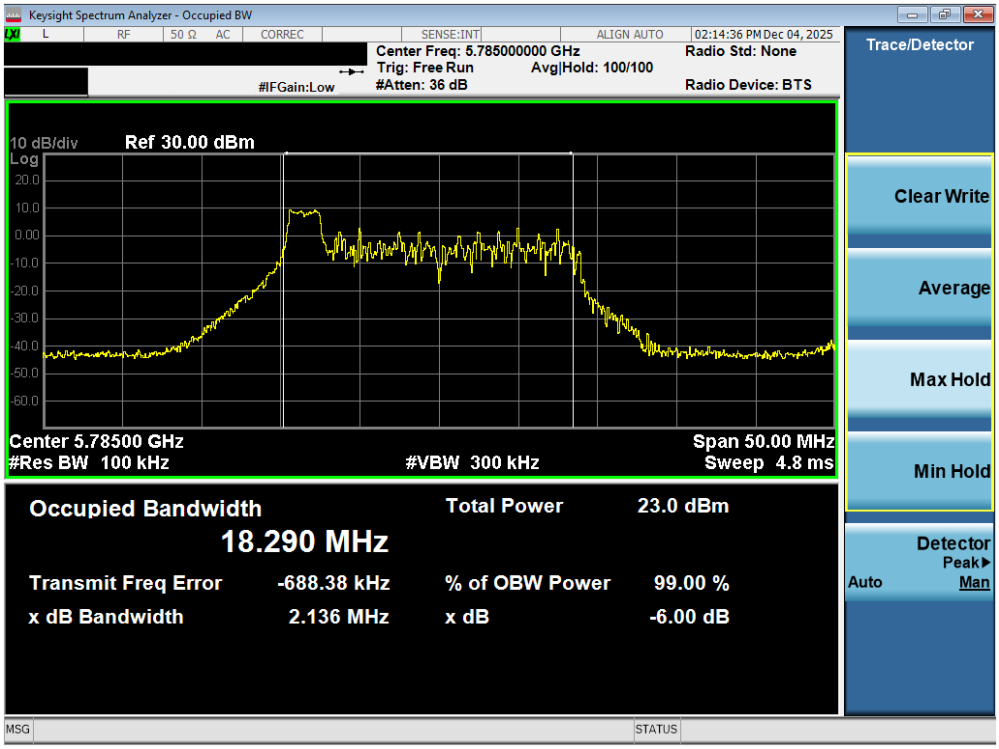


Plot 7-29. 6dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11be – 996 Tones (UNII Band 3/4) – Ch. 171)

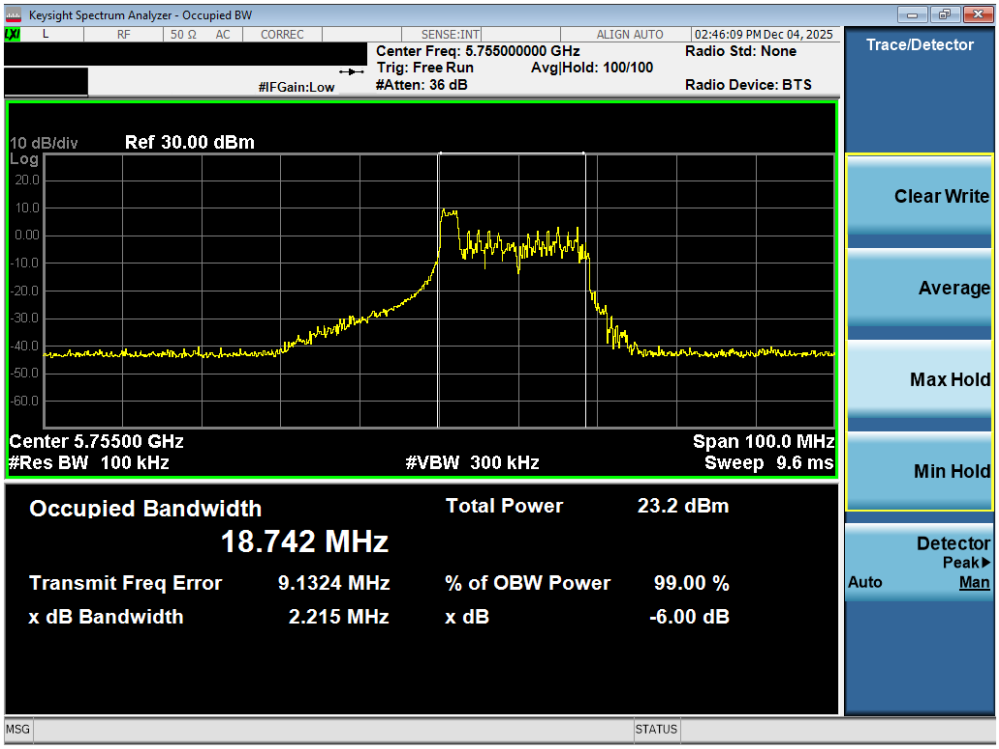


Plot 7-30. 6dB Bandwidth Plot MIMO ANT1 (160MHz BW 802.11be – 996*2 Tones (UNII Band 3/4) – Ch. 163)

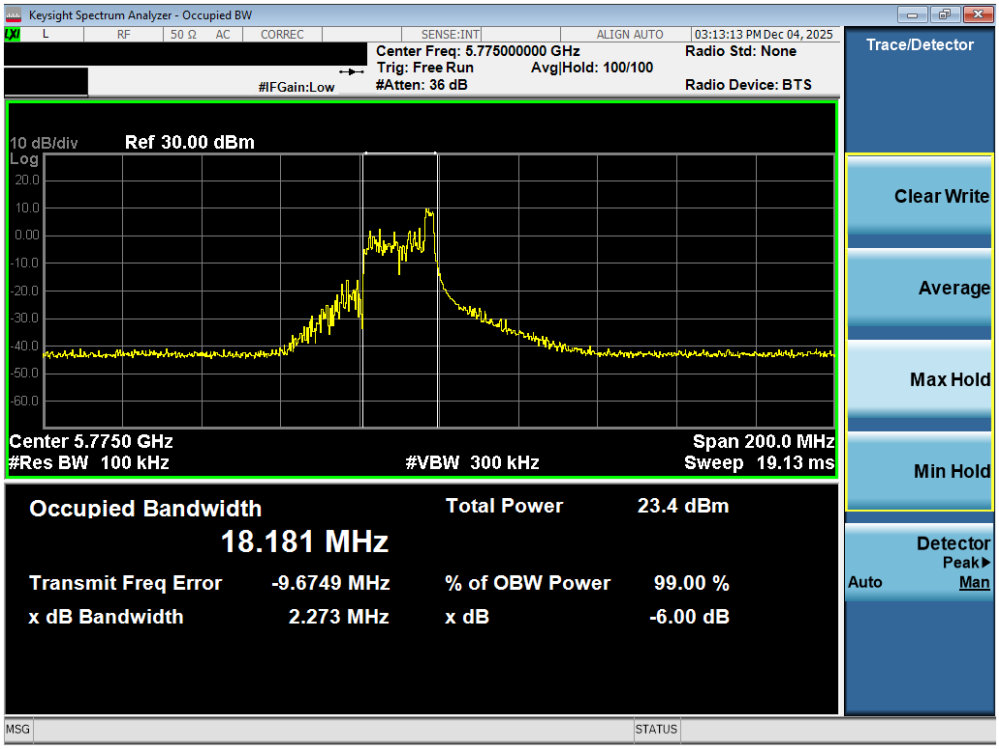
7.3.2 MIMO Antenna-2 6dB Bandwidth Measurements



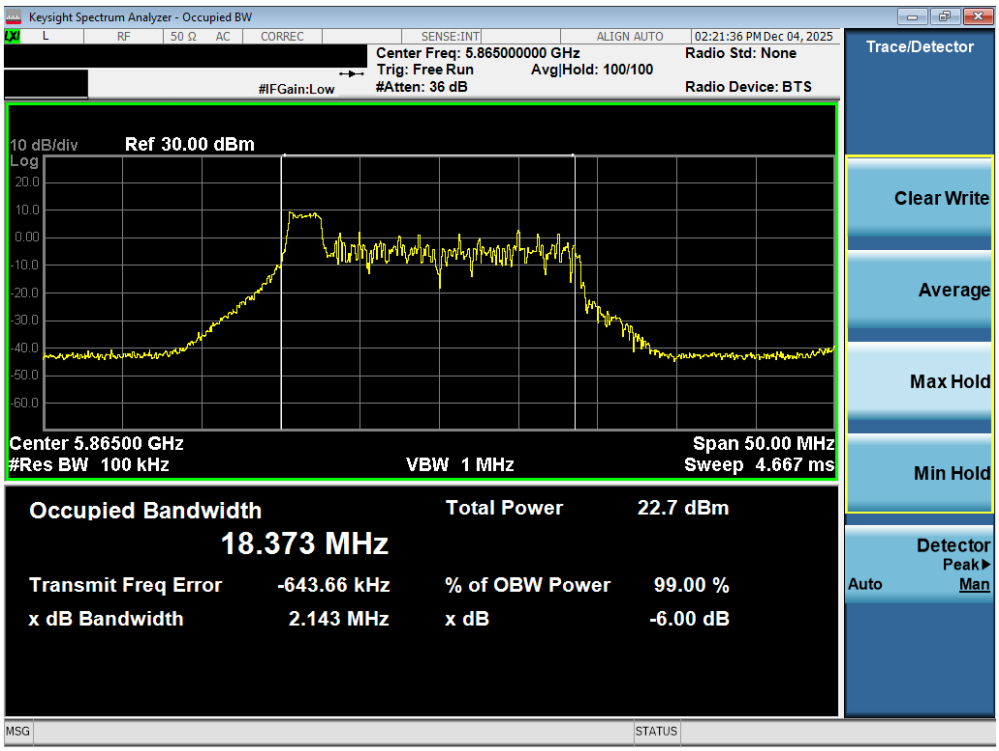
Plot 7-31. 6dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11be – 26 Tones (UNII Band 3) – Ch. 157)



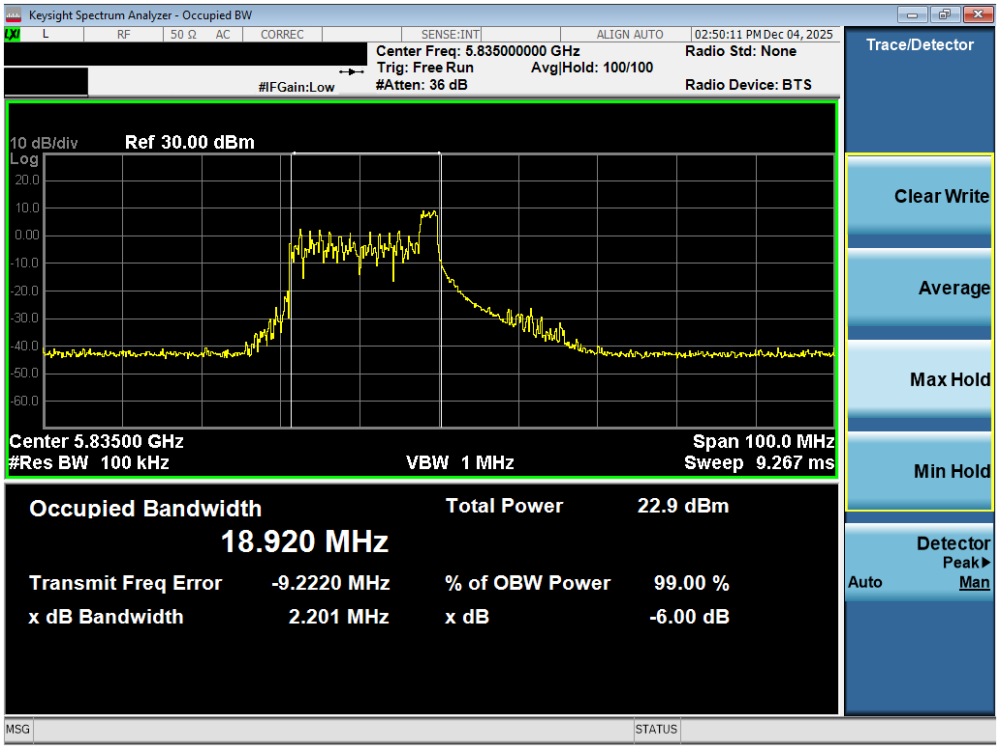
Plot 7-32. 6dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11be – 26 Tones (UNII Band 3) – Ch. 151)



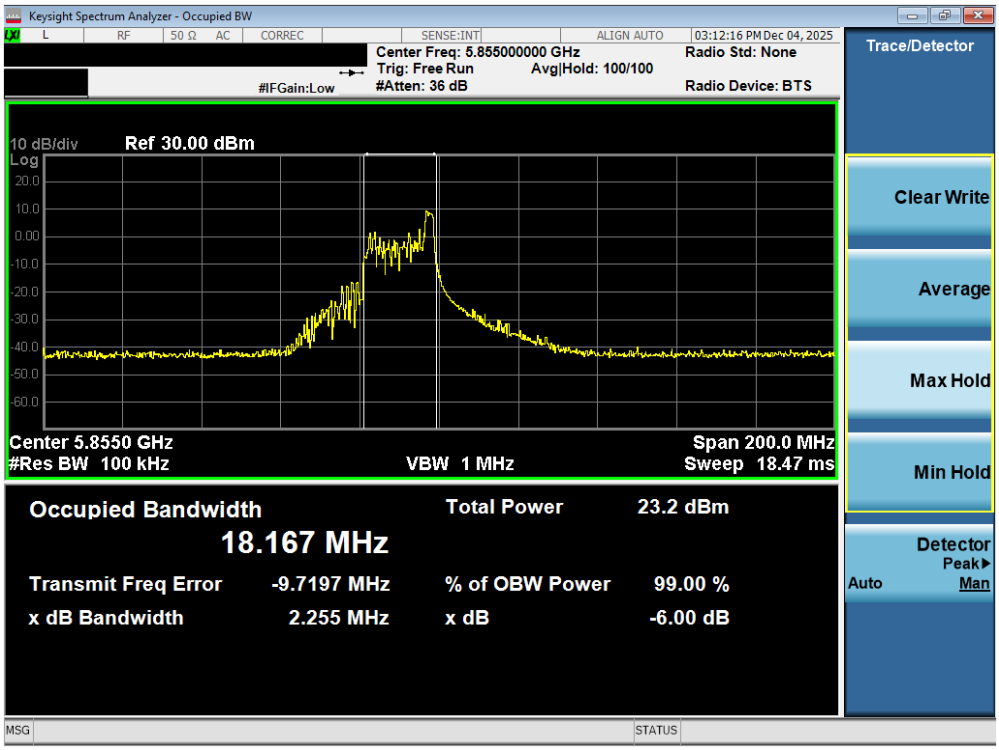
Plot 7-33. 6dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11be – 26 Tones (UNII Band 3) – Ch. 155)



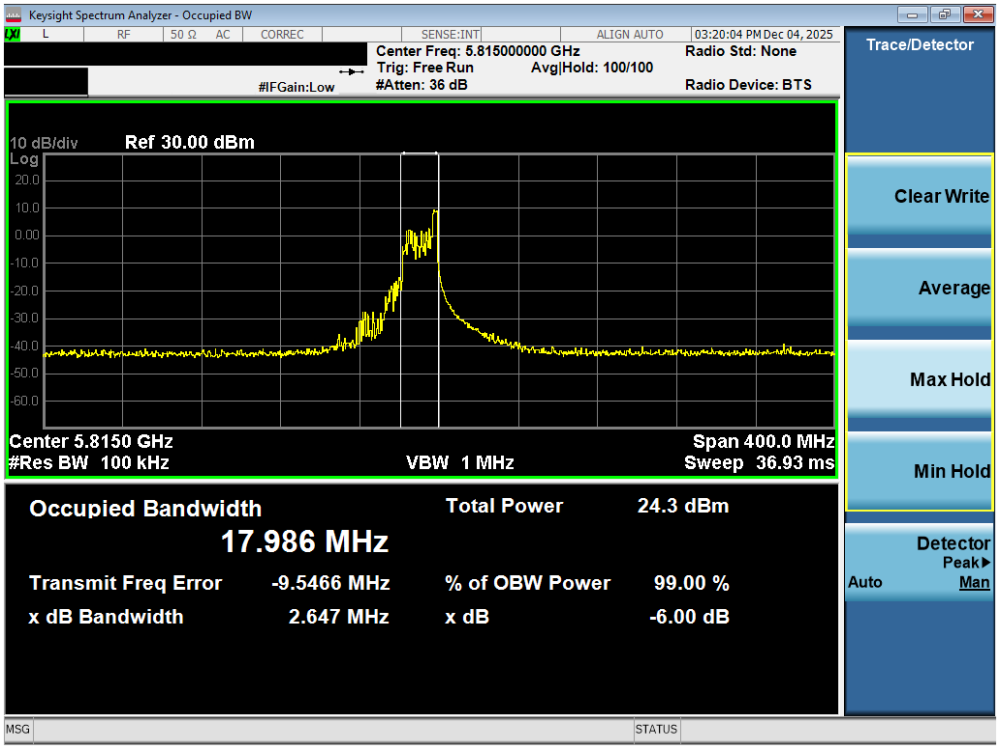
Plot 7-34. 6dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11be – 26 Tones (UNII Band 4) – Ch. 173)



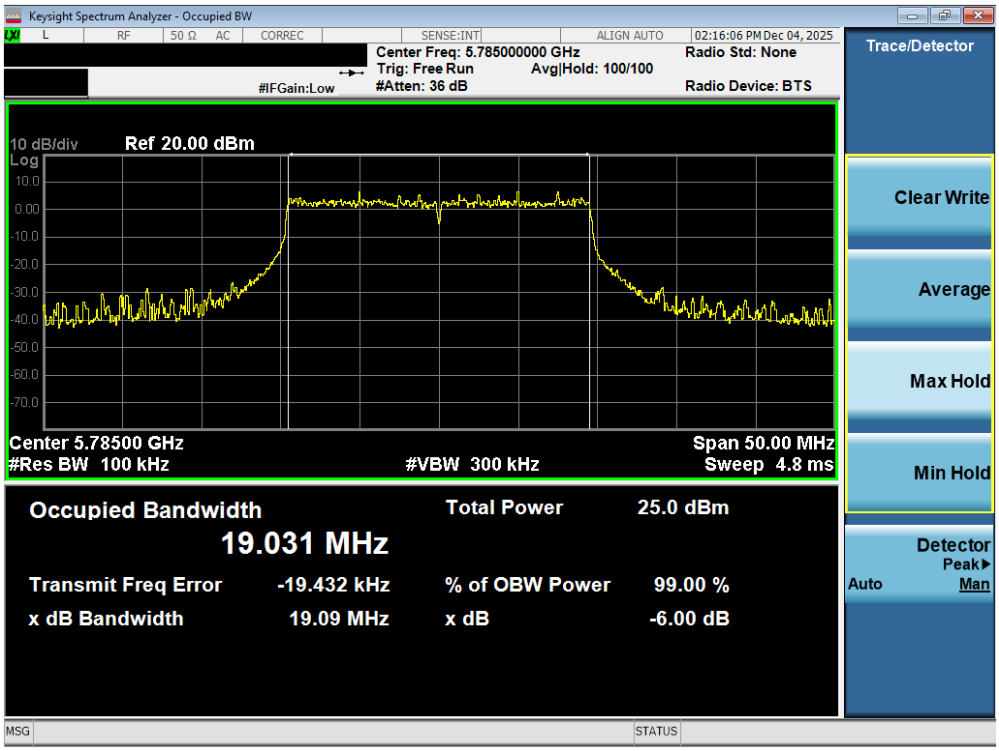
Plot 7-35. 6dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11be – 26 Tones (UNII Band 3/4) – Ch. 167)



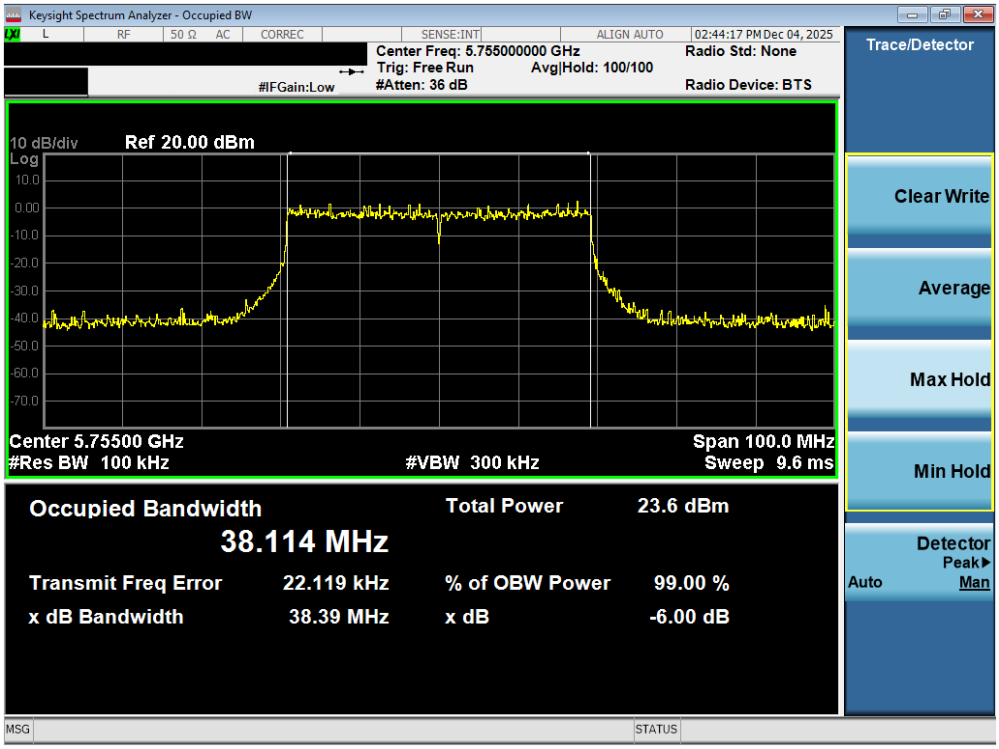
Plot 7-36. 6dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11be – 26 Tones (UNII Band 3/4) – Ch. 171)



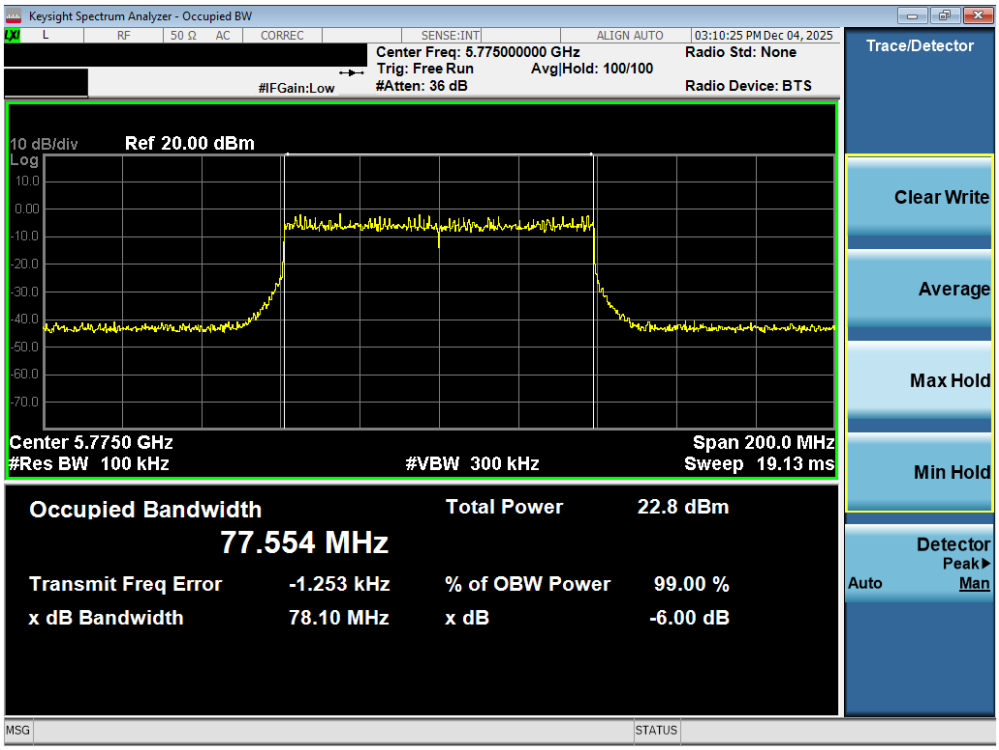
Plot 7-37. 6dB Bandwidth Plot MIMO ANT2 (160MHz BW 802.11be – 26 Tones (UNII Band 3/4) – Ch. 163)



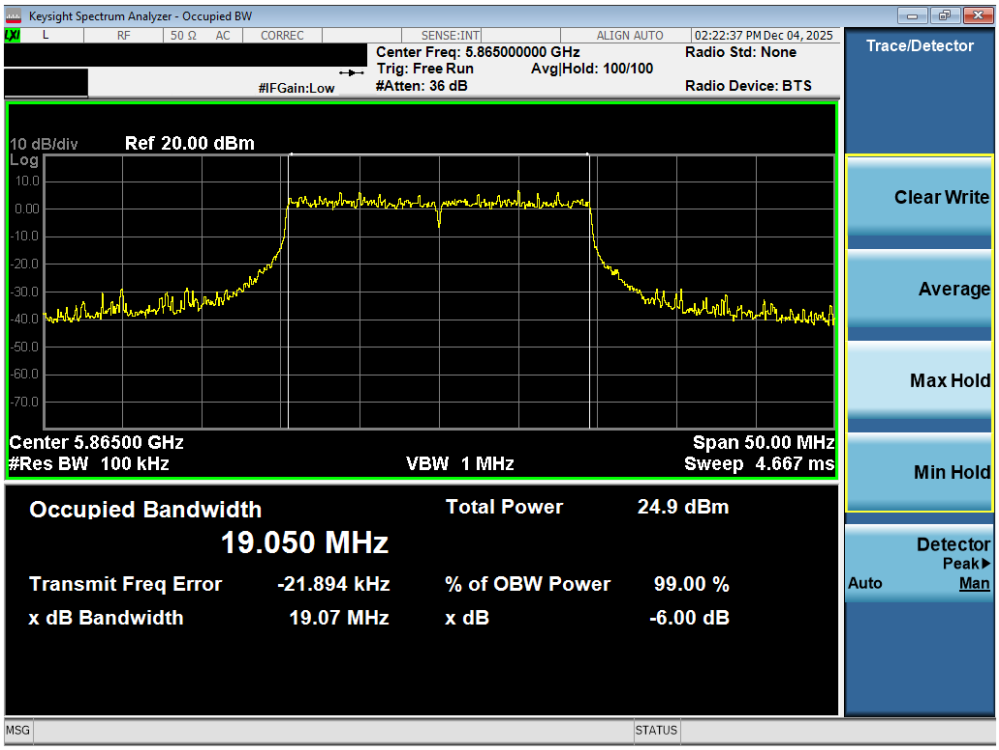
Plot 7-38. 6dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11be – 242 Tones (UNII Band 3) – Ch. 157)



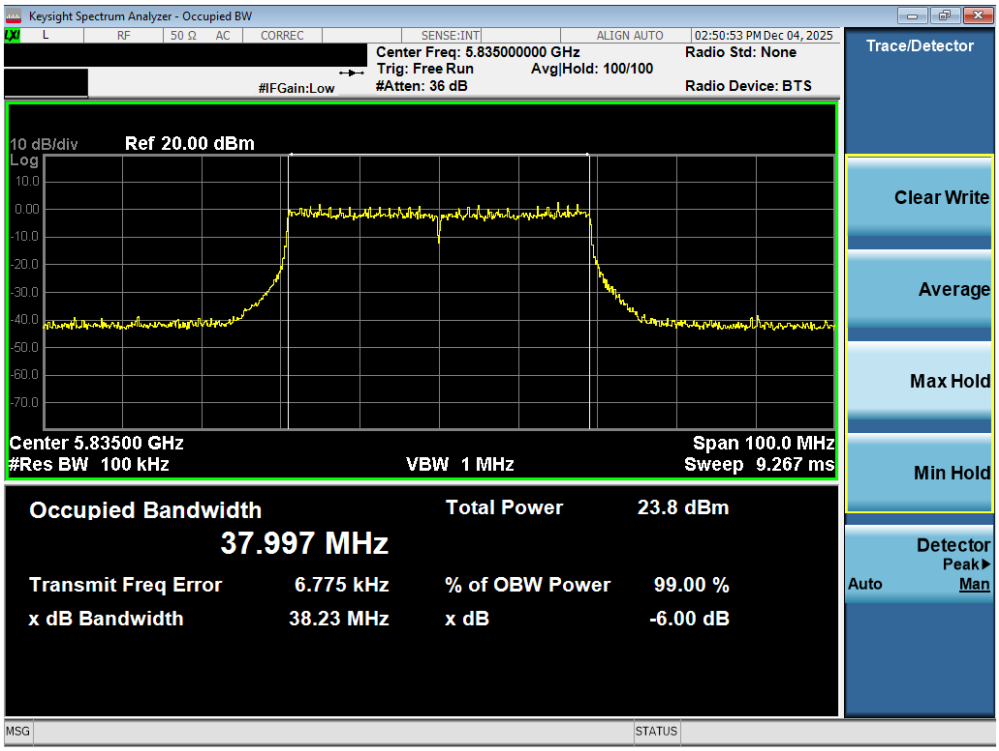
Plot 7-39. 6dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11be – 484 Tones (UNII Band 3) – Ch. 151)



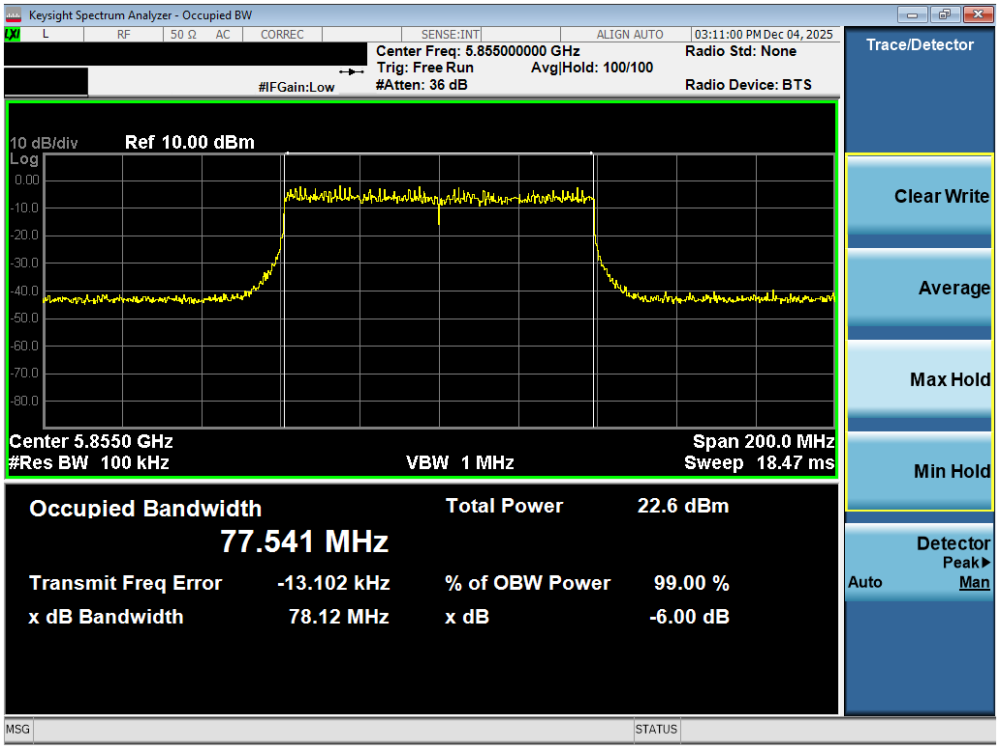
Plot 7-40. 6dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11be – 996 Tones (UNII Band 3) – Ch. 155)



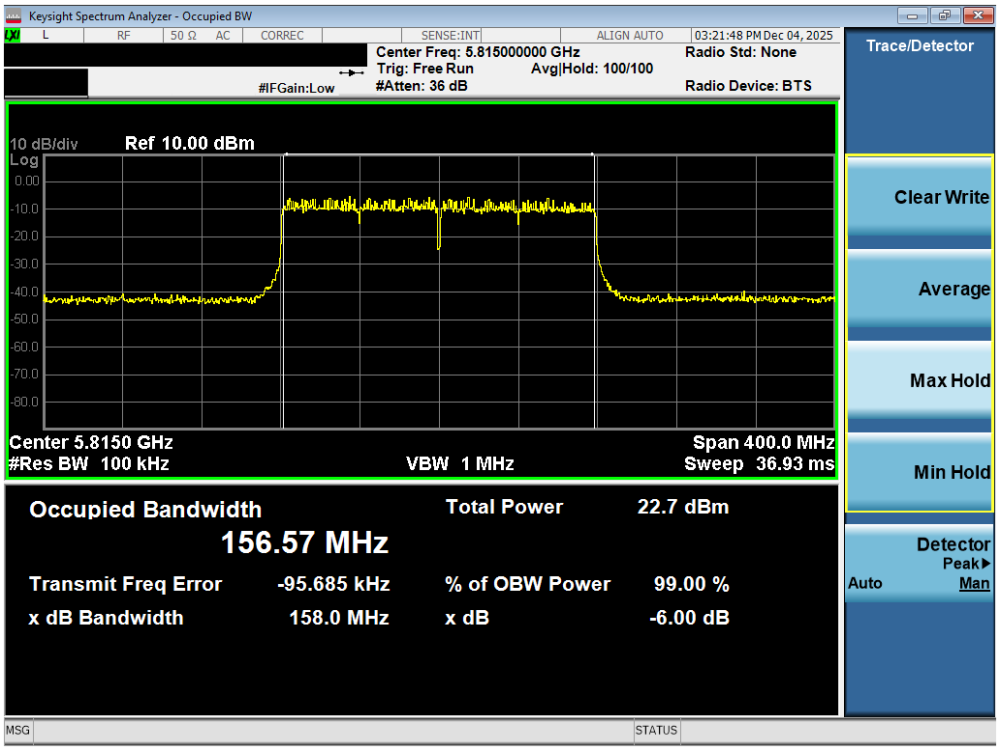
Plot 7-41. 6dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11be – 242 Tones (UNII Band 4) – Ch. 173)



Plot 7-42. 6dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11be – 484 Tones (UNII Band 3/4) – Ch. 167)



Plot 7-43. 6dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11be – 996 Tones (UNII Band 3/4) – Ch. 171)



Plot 7-44. 6dB Bandwidth Plot MIMO ANT2 (160MHz BW 802.11be – 996*2 Tones (UNII Band 3/4) – Ch. 163)

7.4 UNII Output Power Measurement

Test Overview and Limits

A transmitter antenna terminal of the EUT is connected to the input of an RF pulse power sensor. Measurement is made using a broadband average power meter while the EUT is operating at its maximum duty cycle, at its maximum power control level, as defined in ANSI C63.10:2020, and at the appropriate frequencies.

The output power limits are specified in the tables below.

UNII Band	Frequency Range	Maximum Conducted Power Limit	Maximum e.i.r.p
		FCC	FCC
UNII 1	5.15 – 5.25GHz	23.98dBm (250mW)	N/A
UNII 2A	5.25 – 5.35GHz	The lesser of 23.98dBm (250mW) **or** 11dBm + 10log$_{10}$B	N/A
UNII 2C	5.47 – 5.725GHz		
UNII 3	5.725 – 5.850GHz	30dBm (1W)	N/A
UNII 4	5.850 – 5.895GHz	N/A	30dBm (1W)

Test Procedure Used

ANSI C63.10:2020 – Section 12.4.3.2 Method PM-G
ANSI C63.10:2020 – Section 14.5.2.3 Measure-and-Sum Technique

Test Settings

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 diagram below.

Figure 7-3. Test Instrument & Measurement Setup

Test Notes

None.

MIMO Conducted Output Power Measurements (26 Tones)

Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) RU Index 0 ANT1	0 ANT2	0 MIMO	4 ANT1	4 ANT2	4 MIMO	8 ANT1	8 ANT2	8 MIMO	Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
1	5180	36	26T	10.28	9.82	13.07	10.28	10.49	13.39	10.02	10.10	13.07	23.98	-10.59	-3.90	9.50	30.00	-20.50
	5200	40	26T	10.49	9.88	13.20	10.46	10.49	13.49	10.25	10.16	13.22	23.98	-10.49	-3.90	9.59	30.00	-20.41
	5240	48	26T	10.43	9.93	13.20	10.05	10.12	13.10	10.28	10.09	13.20	23.98	-10.78	-3.90	9.30	30.00	-20.70
2A	5260	52	26T	10.40	9.80	13.12	10.18	10.24	13.22	10.36	10.03	13.21	23.98	-10.76	-2.53	10.69	30.00	-19.31
	5280	56	26T	10.05	9.22	12.66	10.16	10.13	13.15	10.32	10.09	13.22	23.98	-10.76	-2.53	10.69	30.00	-19.31
	5320	64	26T	10.30	9.85	13.09	10.46	10.49	13.49	10.11	10.04	13.09	23.98	-10.49	-2.53	10.96	30.00	-19.04
2C	5500	100	26T	10.49	10.21	13.36	10.43	10.49	13.47	10.39	10.32	13.36	23.98	-10.51	-2.87	10.60	30.00	-19.40
	5600	120	26T	10.28	10.20	13.25	10.37	10.49	13.44	10.10	10.18	13.15	23.98	-10.54	-2.87	10.57	30.00	-19.43
	5720	144	26T	9.79	10.21	13.02	10.21	10.34	13.28	10.43	10.49	13.47	23.98	-10.51	-2.87	10.60	30.00	-19.40
3	5745	149	26T	10.17	10.21	13.20	10.49	10.37	13.44	10.32	10.15	13.25	30.00	-16.56	-2.41	11.03	36.00	-24.97
	5785	157	26T	10.16	10.23	13.21	10.46	10.43	13.46	10.31	10.07	13.20	30.00	-16.54	-2.41	11.05	36.00	-24.95
	5825	165	26T	10.02	10.27	13.16	10.44	10.41	13.43	10.20	10.22	13.22	30.00	-16.57	-2.41	11.03	36.00	-24.97
4	5845	169	26T	10.07	10.24	13.16	10.46	10.49	13.49	10.20	10.27	13.25	-	-	-1.69	11.80	30.00	-18.20
	5865	173	26T	9.98	10.45	13.23	10.38	10.49	13.45	10.08	10.38	13.24	-	-	-1.69	11.76	30.00	-18.24
	5885	177	26T	10.00	10.43	13.23	10.34	10.49	13.43	10.07	10.33	13.21	-	-	-1.69	11.74	30.00	-18.26

Table 7-10. MIMO 20MHz BW (UNII) Maximum Conducted Output Power (26 Tones)

MIMO Conducted Output Power Measurements (52 Tones)

Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm)									Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
				RU Index														
				37			39			40								
				ANT1	ANT2	MIMO	ANT1	ANT2	MIMO	ANT1	ANT2	MIMO						
1	5180	36	52T	12.98	12.68	15.84	12.59	12.96	15.79	12.73	12.84	15.80	23.98	-8.14	-3.90	11.94	30.00	-18.06
	5200	40	52T	12.73	12.21	15.49	12.86	12.94	15.91	12.96	12.92	15.95	23.98	-8.03	-3.90	12.05	30.00	-17.95
	5240	48	52T	12.77	12.27	15.53	12.42	12.76	15.60	12.99	12.94	15.98	23.98	-8.00	-3.90	12.08	30.00	-17.92
2A	5260	52	52T	12.87	12.27	15.59	12.66	12.83	15.76	12.99	12.96	15.99	23.98	-7.99	-2.53	13.46	30.00	-16.54
	5280	56	52T	12.82	12.04	15.46	12.65	12.61	15.64	12.99	12.81	15.91	23.98	-8.07	-2.53	13.38	30.00	-16.62
	5320	64	52T	12.99	12.70	15.86	12.36	12.64	15.51	12.74	12.91	15.84	23.98	-8.12	-2.53	13.33	30.00	-16.67
2C	5500	100	52T	12.92	12.39	15.67	12.88	12.79	15.85	12.65	12.60	15.64	23.98	-8.13	-2.87	12.98	30.00	-17.02
	5600	120	52T	12.88	12.92	15.91	12.51	12.78	15.66	12.74	12.88	15.82	23.98	-8.07	-2.87	13.04	30.00	-16.96
	5720	144	52T	12.70	12.66	15.69	12.96	12.99	15.99	12.77	12.59	15.69	23.98	-7.99	-2.87	13.11	30.00	-16.89
3	5745	149	52T	12.95	12.70	15.84	12.96	12.62	15.80	12.99	12.58	15.80	30.00	-14.16	-2.41	13.43	36.00	-22.57
	5785	157	52T	12.91	12.80	15.86	12.98	12.48	15.75	12.99	12.57	15.80	30.00	-14.14	-2.41	13.46	36.00	-22.54
	5825	165	52T	12.91	12.91	15.92	12.99	12.52	15.77	12.96	12.67	15.82	30.00	-14.08	-2.41	13.51	36.00	-22.49
4	5845	169	52T	12.83	12.88	15.87	12.96	12.63	15.81	12.97	12.83	15.91	-	-	-1.69	14.22	30.00	-15.78
	5865	173	52T	12.86	12.99	15.94	12.97	12.77	15.88	12.87	12.84	15.86	-	-	-1.69	14.25	30.00	-15.75
	5885	177	52T	12.72	12.95	15.84	12.81	12.60	15.72	12.85	12.79	15.83	-	-	-1.69	14.15	30.00	-15.85

Table 7-11. MIMO 20MHz BW (UNII) Maximum Conducted Output Power (52 Tones)

MIMO Conducted Output Power Measurements (106 Tones)

Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) RU Index 53 ANT1	53 ANT2	53 MIMO	54 ANT1	54 ANT2	54 MIMO	Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
1	5180	36	106T	15.83	15.82	18.83	15.52	15.99	18.77	23.98	-5.15	-3.90	14.93	30.00	-15.07
	5200	40	106T	15.99	15.82	18.91	15.52	15.53	18.53	23.98	-5.07	-3.90	15.02	30.00	-14.98
	5240	48	106T	15.62	15.39	18.51	15.36	15.62	18.50	23.98	-5.47	-3.90	14.61	30.00	-15.39
2A	5260	52	106T	15.74	15.34	18.55	15.47	15.63	18.56	23.98	-5.42	-2.53	16.03	30.00	-13.97
	5280	56	106T	15.84	15.29	18.59	15.59	15.49	18.55	23.98	-5.39	-2.53	16.06	30.00	-13.94
	5320	64	106T	15.76	15.88	18.83	15.53	15.99	18.77	23.98	-5.15	-2.53	16.30	30.00	-13.70
2C	5500	100	106T	15.88	15.45	18.68	15.66	15.59	18.63	23.98	-5.30	-2.87	15.81	30.00	-14.19
	5600	120	106T	15.68	15.90	18.80	15.48	15.87	18.69	23.98	-5.18	-2.87	15.93	30.00	-14.07
	5720	144	106T	15.56	15.99	18.79	15.61	15.84	18.74	23.98	-5.19	-2.87	15.92	30.00	-14.08
3	5745	149	106T	15.83	15.99	18.92	15.84	15.84	18.85	30.00	-11.08	-2.41	16.51	36.00	-19.49
	5785	157	106T	15.73	15.99	18.87	15.88	15.87	18.88	30.00	-11.12	-2.41	16.47	36.00	-19.53
	5825	165	106T	15.65	15.99	18.83	15.84	15.88	18.87	30.00	-11.13	-2.41	16.46	36.00	-19.54
4	5845	169	106T	15.62	15.99	18.82	15.79	15.99	18.90	-	-	-1.69	17.21	30.00	-12.79
	5865	173	106T	15.33	15.54	18.45	15.71	15.99	18.86	-	-	-1.69	17.17	30.00	-12.83
	5885	177	106T	15.17	15.71	18.46	15.32	15.58	18.46	-	-	-1.69	16.77	30.00	-13.23

Table 7-12. MIMO 20MHz BW (UNII) Maximum Conducted Output Power (106 Tones)

MIMO Conducted Output Power Measurements (242 Tones)

Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) RU Index 61			Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
				ANT1	ANT2	MIMO						
1	5180	36	242T	15.96	16.27	19.12	23.98	-4.86	-3.90	15.23	30.00	-14.77
	5200	40	242T	17.69	17.57	20.64	23.98	-3.34	-3.90	16.75	30.00	-13.25
	5240	48	242T	17.75	17.49	20.64	23.98	-3.34	-3.90	16.74	30.00	-13.26
2A	5260	52	242T	17.83	17.53	20.69	23.98	-3.29	-2.53	18.16	30.00	-11.84
	5280	56	242T	17.85	17.60	20.74	23.98	-3.24	-2.53	18.21	30.00	-11.79
	5320	64	242T	16.55	16.77	19.67	23.98	-4.31	-2.53	17.14	30.00	-12.86
2C	5500	100	242T	16.36	16.49	19.43	23.98	-4.55	-2.87	16.56	30.00	-13.44
	5600	120	242T	17.53	17.87	20.71	23.98	-3.27	-2.87	17.84	30.00	-12.16
	5720	144	242T	17.38	17.68	20.54	23.98	-3.44	-2.87	17.67	30.00	-12.33
3	5745	149	242T	17.61	17.75	20.69	30.00	-9.31	-2.41	18.28	36.00	-17.72
	5785	157	242T	17.59	17.75	20.68	30.00	-9.32	-2.41	18.27	36.00	-17.73
	5825	165	242T	17.52	17.76	20.65	30.00	-9.35	-2.41	18.24	36.00	-17.76
4	5845	169	242T	17.50	17.78	20.65	-	-	-1.69	18.96	30.00	-11.04
	5865	173	242T	17.54	17.92	20.74	-	-	-1.69	19.05	30.00	-10.95
	5885	177	242T	17.51	17.81	20.67	-	-	-1.69	18.98	30.00	-11.02

Table 7-13. MIMO 20MHz BW (UNII) Maximum Conducted Output Power (242 Tones)

MIMO Conducted Output Power Measurements (484 Tones)

Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) RU Index 65			Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
				ANT1	ANT2	MIMO						
1	5190	38	484T	14.96	14.99	17.99	23.98	-5.99	-3.90	14.09	30.00	-15.91
	5230	46	484T	15.94	15.88	18.92	23.98	-5.06	-3.90	15.02	30.00	-14.98
2A	5270	54	484T	15.99	15.91	18.96	23.98	-5.02	-2.53	16.43	30.00	-13.57
	5310	62	484T	14.58	14.33	17.47	23.98	-6.51	-2.53	14.94	30.00	-15.06
2C	5510	102	484T	13.91	13.84	16.89	23.98	-7.09	-2.87	14.02	30.00	-15.98
	5590	118	484T	15.41	15.65	18.54	23.98	-5.44	-2.87	15.67	30.00	-14.33
	5710	142	484T	15.63	15.90	18.78	23.98	-5.20	-2.87	15.91	30.00	-14.09
3	5755	151	484T	15.75	15.99	18.88	30.00	-11.12	-2.41	16.47	36.00	-19.53
	5795	159	484T	15.73	15.95	18.85	30.00	-11.15	-2.41	16.44	36.00	-19.56
4	5835	167	484T	15.67	15.99	18.84	-	-	-1.69	17.15	30.00	-12.85
	5875	175	484T	15.21	15.73	18.49	-	-	-1.69	16.80	30.00	-13.20

Table 7-14. MIMO 40MHz BW (UNII) Maximum Conducted Output Power (484 Tones)

MIMO Conducted Output Power Measurements (996 Tones)

Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) RU Index 67			Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
				ANT1	ANT2	MIMO						
1	5210	42	996T	14.76	14.64	17.71	23.98	-6.27	-3.90	13.81	30.00	-16.19
2A	5290	58	996T	14.83	14.44	17.65	23.98	-6.33	-2.53	15.12	30.00	-14.88
2C	5530	106	996T	14.65	14.47	17.57	23.98	-6.41	-2.87	14.70	30.00	-15.30
	5610	122	996T	14.86	14.90	17.89	23.98	-6.09	-2.87	15.02	30.00	-14.98
	5690	138	996T	14.67	14.81	17.75	23.98	-6.23	-2.87	14.88	30.00	-15.12
3	5775	155	996T	14.79	14.70	17.76	30.00	-12.24	-2.41	15.35	36.00	-20.65
4	5855	171	996T	14.77	14.86	17.82	-	-	-1.69	16.13	30.00	-13.87

Table 7-15. MIMO 80MHz BW (UNII) Maximum Conducted Output Power (996 Tones)

MIMO Conducted Output Power Measurements (2x996 Tones)

Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) RU Index 68			Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
				ANT1	ANT2	MIMO						
1/2A	5250	50	2x996T	13.97	13.95	16.97	23.98	-7.01	-3.90	13.07	30.00	-16.93
2C	5570	114	2x996T	13.78	13.60	16.70	23.98	-7.28	-2.87	13.83	30.00	-16.17
3/4	5815	163	2x996T	13.52	13.64	16.59	-	-	-1.69	14.90	30.00	-15.10

Table 7-16. MIMO 160MHz BW (UNII) Maximum Conducted Output Power (2x996 Tones)

MIMO Conducted Output Power Measurements (MRU)

Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) MRU Index 70 ANT1	70 ANT2	70 MIMO	71 ANT1	71 ANT2	71 MIMO	72 ANT1	72 ANT2	72 MIMO	Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
1	5200	40	52T	14.79	14.44	17.62	14.67	14.45	17.57	14.52	14.71	17.62	23.98	-6.36	-3.90	13.73	30.00	-16.27
2A	5280	56	52T	14.66	13.99	17.35	14.96	14.45	17.72	14.88	14.66	17.78	23.98	-6.20	-2.53	15.25	30.00	-14.75
2C	5600	120	52T	14.68	14.89	17.80	14.61	14.86	17.75	14.46	14.91	17.70	23.98	-6.18	-2.87	14.92	30.00	-15.08
3	5785	157	52T	14.78	14.80	17.80	14.74	14.78	17.77	14.82	14.63	17.74	30.00	-12.20	-2.41	15.39	36.00	-20.61
4	5865	173	52T	14.70	14.99	17.86	14.73	14.96	17.86	14.74	14.82	17.79	-	-	-1.69	16.17	30.00	-13.83

Table 7-17. MIMO 20MHz BW (UNII) Maximum Conducted Output Power (52+26 Tones)

Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) MRU Index 82 ANT1	82 ANT2	82 MIMO	83 ANT1	83 ANT2	83 MIMO	Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
1	5200	40	106T	15.84	15.60	18.73	15.63	15.76	18.71	23.98	-5.25	-3.90	14.83	30.00	-15.17
2A	5280	56	106T	15.85	15.49	18.68	15.64	15.64	18.65	23.98	-5.30	-2.53	16.16	30.00	-13.84
2C	5600	120	106T	15.65	15.74	18.70	15.48	15.73	18.62	23.98	-5.28	-2.87	15.83	30.00	-14.17
3	5785	157	106T	15.72	15.70	18.72	15.85	15.56	18.72	30.00	-11.28	-2.41	16.31	36.00	-19.69
4	5865	173	106T	15.54	15.72	18.64	15.66	15.60	18.64	-	-	-1.69	16.95	30.00	-13.05

Table 7-18. MIMO 20MHz BW (UNII) Maximum Conducted Output Power (106+26 Tones)

Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) MRU Index 90 ANT1	90 ANT2	90 MIMO	91 ANT1	91 ANT2	91 MIMO	93 ANT1	93 ANT2	93 MIMO	Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
1	5210	42	484+242T	15.81	15.77	18.80	15.94	15.77	18.86	15.94	15.71	18.84	23.98	-5.12	-3.90	14.97	30.00	-15.03
2A	5290	58	484+242T	15.97	15.50	18.75	15.99	15.69	18.85	15.99	15.68	18.85	23.98	-5.13	-2.53	16.32	30.00	-13.68
2C	5530	106	484+242T	15.67	15.42	18.55	15.74	15.45	18.61	15.74	15.56	18.66	23.98	-5.32	-2.87	15.79	30.00	-14.21
	5610	122	484+242T	15.75	15.81	18.79	15.59	15.87	18.74	15.71	15.98	18.86	23.98	-5.12	-2.87	15.99	30.00	-14.01
	5690	138	484+242T	15.78	15.68	18.74	15.57	15.83	18.71	15.53	15.99	18.78	23.98	-5.20	-2.87	15.90	30.00	-14.10
3	5775	155	484+242T	15.80	15.56	18.69	15.69	15.82	18.77	15.64	15.98	18.83	30.00	-11.17	-2.41	16.42	36.00	-19.58
4	5855	171	484+242T	15.89	15.89	18.90	15.58	15.99	18.80	15.65	15.99	18.83	-	-	-1.69	17.21	30.00	-12.79

Table 7-19. MIMO 80MHz BW (UNII) Maximum Conducted Output Power (484+242 Tones)

Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) MRU Index 94 ANT1	94 ANT2	94 MIMO	95 ANT1	95 ANT2	95 MIMO	1095 ANT1	1095 ANT2	1095 MIMO	Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
1/2A	5250	50	996+484T	14.92	14.88	17.91	14.90	14.94	17.93	14.67	14.58	17.64	23.98	-6.05	-3.90	14.03	30.00	-15.97
2C	5570	114	996+484T	14.99	14.85	17.93	14.69	14.57	17.64	14.99	14.93	17.97	23.98	-6.01	-2.87	15.10	30.00	-14.90
3/4	5815	163	996+484T	14.86	14.79	17.83	14.96	14.99	17.99	14.78	14.86	17.83	-	-	-1.69	16.30	30.00	-13.70

Table 7-20. MIMO 160MHz BW (UNII) Maximum Conducted Output Power (996+484 Tones)

Note:

Per ANSI C63.10:2020, 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.

Per ANSI C63.10:2020 Section 14.6.3, the directional gain is calculated using the following formula, where G_N is the gain of the nth antenna and N_{ANT}, the total number of antennas used.

$$\text{Directional gain} = 10 \log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}] \text{ dBi}$$

Sample MIMO Calculation:

At 5180MHz in 802.11n (20MHz BW) mode, the average conducted output power was measured to be 10.28 dBm for Antenna 1 and 9.82 dBm for Antenna 2.

Antenna 1 + Antenna 2 = MIMO

(10.28 dBm + 9.82dBm) = (10.666 mW + 9.594 mW) = 20.260 mW = 13.07 dBm

Sample e.i.r.p. Calculation:

At 5180MHz in 802.11n (20MHz BW) mode, the average MIMO conducted power was calculated to be 13.07dBm with directional gain of -3.90 dBi.

e.i.r.p. (dBm) = Conducted Power (dBm) + Ant gain (dBi)

13.07 dBm + -3.90 dBi = 9.17 dBm

7.5 Maximum Power Spectral Density

Test Overview and Limit

The spectrum analyzer was connected to the antenna terminal while the EUT was operating at its maximum duty cycle, at its maximum power control level, as defined in ANSI C63.10:2020, and at the appropriate frequencies. Method SA-1, as defined in ANSI C63.10:2020, was used to measure the power spectral density.

The output power density limits are as specified in the tables below.

UNII Band	Frequency Range	Maximum Conducted Power Limit
		FCC
UNII 1	5.15 – 5.25GHz	11dBm/MHz
UNII 2A	5.25 – 5.35GHz	
UNII 2C	5.47 – 5.725GHz	
UNII 3	5.725 – 5.850GHz	30dBm/500kHz
UNII 4	5.850 – 5.895GHz	14dBm/MHz e.i.r.p

Test Procedure Used

ANSI C63.10:2020 – Section 12.4.2.4 (Method SA-2) (← if you applied duty cycle correction factor)
ANSI C63.10:2020 – Section 14.5.2.2 Measure-and-Sum Technique

Test Settings

1. Analyzer was set to the center frequency of the UNII channel under investigation
2. Span was set to encompass the entire emission bandwidth of the signal
3. RBW = 1MHz
4. VBW = 3MHz
5. Number of sweep points ≥ 2 x (span/RBW)
6. Sweep time = auto
7. Detector = power averaging (RMS)
8. Trigger was set to free run for all modes
9. Trace was averaged over 100 sweeps
10. The peak search function of the spectrum analyzer was used to find the peak of the spectrum.

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

The power spectral density for each channel was measured with the RU index showing the highest conducted power.

Summed MIMO Power Spectral Density Measurements

	Frequency [MHz]	802.11 MODE	Channel	Antenna 1 PSD [dBm]	Antenna 2 PSD [dBm]	DCCF [dB]	MIMO PSD [dB]	Conducted PSD Limit [dBm]	Margin [dB]
Band 1	5180	be (20MHz)	36	7.13	7.44	0.23	10.52	11.00	-0.48
	5200	be (20MHz)	40	7.08	7.21	0.23	10.39	11.00	-0.61
	5240	be (20MHz)	48	7.02	7.62	0.23	10.57	11.00	-0.43
	5190	be (40MHz)	38	7.01	7.29	0.25	10.41	11.00	-0.59
	5230	be (40MHz)	46	6.75	7.31	0.25	10.30	11.00	-0.70
	5210	be (80MHz)	42	6.62	6.79	0.26	9.97	11.00	-1.03
Band 1/2A	5250	be (160MHz)	50	6.66	7.45	0.00	10.08	11.00	-0.92
Band 2A	5260	be (20MHz)	52	7.13	8.07	0.23	10.86	11.00	-0.14
	5280	be (20MHz)	56	6.95	7.88	0.23	10.68	11.00	-0.32
	5320	be (20MHz)	64	7.21	7.72	0.23	10.71	11.00	-0.29
	5270	be (40MHz)	54	6.47	7.56	0.25	10.31	11.00	-0.69
	5310	be (40MHz)	62	7.18	7.21	0.25	10.46	11.00	-0.54
	5290	be (80MHz)	58	6.93	7.35	0.26	10.41	11.00	-0.59
Band 2C	5500	be (20MHz)	100	7.10	7.69	0.23	10.64	11.00	-0.36
	5600	be (20MHz)	120	7.43	7.45	0.23	10.68	11.00	-0.32
	5720	be (20MHz)	144	7.21	7.24	0.23	10.47	11.00	-0.53
	5510	be (40MHz)	102	6.93	7.47	0.25	10.47	11.00	-0.53
	5590	be (40MHz)	118	6.85	7.66	0.25	10.54	11.00	-0.46
	5710	be (40MHz)	142	6.52	7.91	0.25	10.53	11.00	-0.47
	5530	be (80MHz)	106	6.55	7.55	0.26	10.35	11.00	-0.65
	5610	be (80MHz)	122	6.78	7.96	0.26	10.68	11.00	-0.32
	5690	be (80MHz)	138	6.77	7.82	0.26	10.59	11.00	-0.41
	5570	be (160MHz)	114	6.56	7.60	0.00	10.12	11.00	-0.88

Table 7-21. Bands 1, 2A, 2C MIMO Conducted Power Spectral Density Measurements MIMO (26 Tones)

	Frequency [MHz]	802.11 MODE	Channel	Antenna 1 PSD [dBm]	Antenna 2 PSD [dBm]	DCCF [dB]	MIMO PSD [dB]	Conducted PSD Limit [dBm]	Margin [dB]
Band 3	5745	be (20MHz)	149	8.02	8.69	0.23	11.61	30.00	-18.39
	5785	be (20MHz)	157	8.03	8.92	0.23	11.74	30.00	-18.26
	5825	be (20MHz)	165	7.70	8.70	0.23	11.47	30.00	-18.53
	5755	be (40MHz)	151	6.63	8.42	0.25	10.88	30.00	-19.12
	5795	be (40MHz)	159	7.36	8.91	0.25	11.46	30.00	-18.54
	5775	be (80MHz)	155	6.52	8.72	0.26	11.03	30.00	-18.97

Table 7-22. Band 3 MIMO Conducted Power Spectral Density Measurements MIMO (26 Tones)

	Frequency [MHz]	802.11 MODE	Channel	Antenna 1 PSD [dBm]	Antenna 2 PSD [dBm]	MIMO PSD [dB]	DCCF [dB]	Directional Antenna Gain [dBi]	MIMO EIRP PSD [dBm]	EIRP PSD Limit[dBm]	Margin [dB]
Band 3/4	5845	be (20MHz)	169	10.20	11.32	13.81	0.23	-1.69	12.35	14.00	-1.65
Band 4	5865	be (20MHz)	173	10.23	11.27	13.79	0.23	-1.69	12.33	14.00	-1.67
	5885	be (20MHz)	177	9.84	11.28	13.63	0.23	-1.69	12.17	14.00	-1.83
Band 3/4	5835	be (40MHz)	167	9.14	10.70	13.00	0.25	-1.69	11.56	14.00	-2.44
Band 4	5875	be (40MHz)	175	9.53	10.45	13.03	0.25	-1.69	11.59	14.00	-2.41
Band 3/4	5855	be (80MHz)	171	9.23	10.62	12.99	0.26	-1.69	11.55	14.00	-2.45
Band 4	5815	be (160MHz)	163	8.73	11.30	13.21	0.00	-1.69	11.52	14.00	-2.48

Table 7-23. Bands 3/4 MIMO Conducted Power Spectral Density Measurements MIMO (26 Tones)

	Frequency [MHz]	802.11 MODE	Channel	Antenna 1 PSD [dBm]	Antenna 2 PSD [dBm]	DCCF [dB]	MIMO PSD [dB]	Conducted PSD Limit [dBm]	Margin [dB]
Band 1	5180	be (20MHz)	36	6.06	6.41	0.22	9.47	11.00	-1.53
	5200	be (20MHz)	40	6.03	6.06	0.22	9.28	11.00	-1.72
	5240	be (20MHz)	48	5.46	6.34	0.22	9.15	11.00	-1.85
	5190	be (40MHz)	38	1.81	1.83	0.26	5.09	11.00	-5.91
	5230	be (40MHz)	46	1.37	1.73	0.26	4.83	11.00	-6.17
	5210	be (80MHz)	42	-2.99	-2.98	0.00	0.02	11.00	-10.98
Band 1/2A	5250	be (160MHz)	50	-7.33	-6.72	0.00	-4.00	11.00	-15.00
Band 2A	5260	be (20MHz)	52	5.72	6.45	0.22	9.33	11.00	-1.67
	5280	be (20MHz)	56	5.78	6.10	0.22	9.17	11.00	-1.83
	5320	be (20MHz)	64	5.84	6.04	0.22	9.17	11.00	-1.83
	5270	be (40MHz)	54	1.37	1.88	0.26	4.90	11.00	-6.10
	5310	be (40MHz)	62	1.21	1.58	0.26	4.67	11.00	-6.33
	5290	be (80MHz)	58	-3.07	-3.13	0.00	-0.09	11.00	-11.09
Band 2C	5500	be (20MHz)	100	5.54	5.97	0.22	8.99	11.00	-2.01
	5600	be (20MHz)	120	5.63	5.86	0.22	8.98	11.00	-2.02
	5720	be (20MHz)	144	5.56	5.40	0.22	8.71	11.00	-2.29
	5510	be (40MHz)	102	1.00	1.60	0.26	4.58	11.00	-6.42
	5590	be (40MHz)	118	1.01	1.91	0.26	4.76	11.00	-6.24
	5710	be (40MHz)	142	0.91	1.60	0.26	4.54	11.00	-6.46
	5530	be (80MHz)	106	-3.75	-2.72	0.00	-0.20	11.00	-11.20
	5610	be (80MHz)	122	-3.59	-2.55	0.00	-0.03	11.00	-11.03
	5690	be (80MHz)	138	-3.66	-2.98	0.00	-0.30	11.00	-11.30
	5570	be (160MHz)	114	-7.73	-6.72	0.00	-4.18	11.00	-15.18

Table 7-24. Bands 1, 2A, 2C MIMO Conducted Power Spectral Density Measurements MIMO (Full Tones)

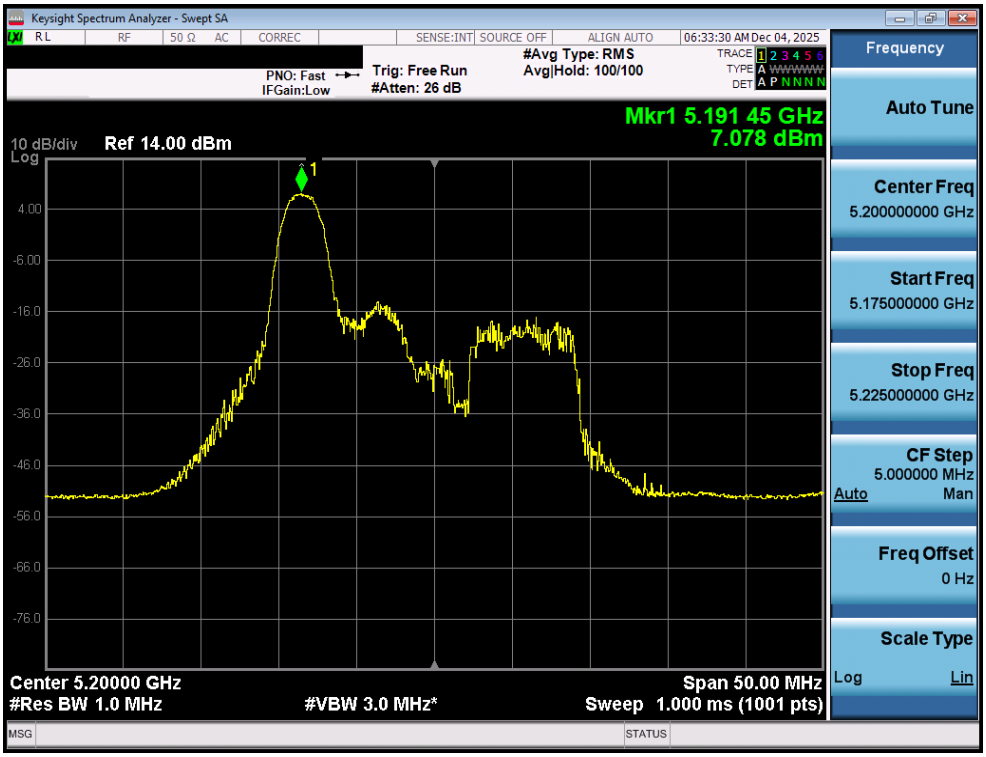
	Frequency [MHz]	802.11 MODE	Channel	Antenna 1 PSD [dBm]	Antenna 2 PSD [dBm]	DCCF [dB]	MIMO PSD [dB]	Conducted PSD Limit [dBm]	Margin [dB]
Band 3	5745	be (20MHz)	149	2.44	2.74	0.22	5.83	30.00	-24.17
	5785	be (20MHz)	157	2.06	3.23	0.22	5.91	30.00	-24.09
	5825	be (20MHz)	165	2.22	3.55	0.22	6.17	30.00	-23.83
	5755	be (40MHz)	151	-2.39	-1.08	0.26	1.59	30.00	-28.41
	5795	be (40MHz)	159	-2.66	-1.46	0.26	1.25	30.00	-28.75
	5775	be (80MHz)	155	-7.27	-5.44	0	-3.25	30.00	-33.25

Table 7-25. Band 3 MIMO Conducted Power Spectral Density Measurements MIMO (Full Tones)

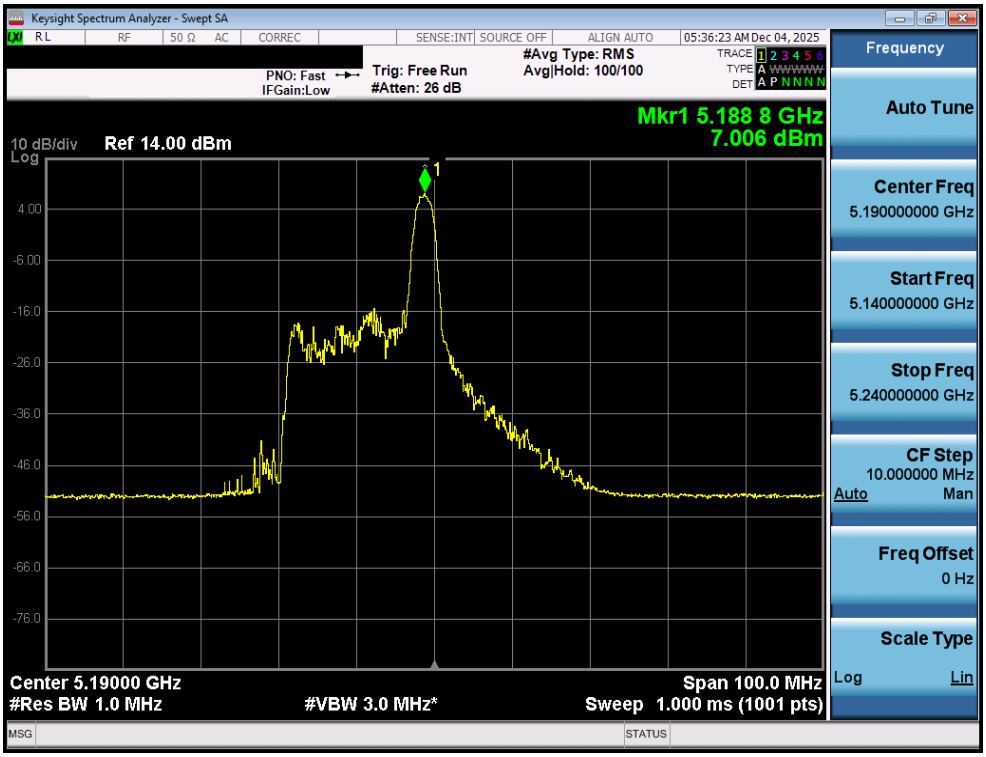
	Frequency [MHz]	802.11 MODE	Channel	Antenna 1 PSD [dBm]	Antenna 2 PSD [dBm]	MIMO PSD [dB]	DCCF [dB]	Directional Antenna Gain [dBi]	MIMO EIRP PSD [dBm]	EIRP PSD Limit[dBm]	Margin [dB]
Band 3/4	5845	be (20MHz)	169	5.19	6.35	8.82	0.22	-1.69	7.35	14.00	-6.65
Band 4	5865	be (20MHz)	173	4.93	5.92	8.46	0.22	-1.69	6.99	14.00	-7.01
	5885	be (20MHz)	177	4.76	5.96	8.41	0.22	-1.69	6.94	14.00	-7.06
Band 3/4	5835	be (40MHz)	167	0.05	1.24	3.69	0.26	-1.69	2.26	14.00	-11.74
Band 4	5875	be (40MHz)	175	0.21	1.47	3.89	0.26	-1.69	2.46	14.00	-11.54
Band 3/4	5855	be (80MHz)	171	-4.72	-3.07	-0.81	0.00	-1.69	-2.50	14.00	-16.50
	5815	be (160MHz)	163	-8.33	-6.71	-4.43	0.00	-1.69	-6.12	14.00	-20.12

Table 7-26. Bands 3/4 MIMO Conducted Power Spectral Density Measurements MIMO (Full Tones)

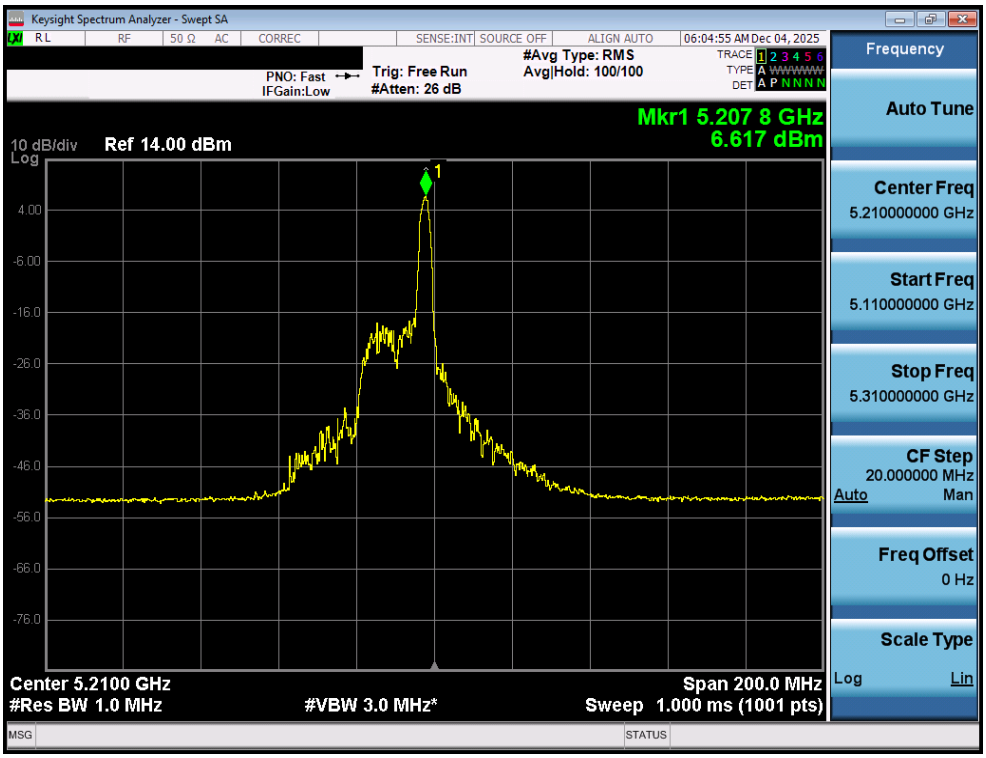
7.5.1 MIMO Antenna-1 Power Spectral Density Measurements



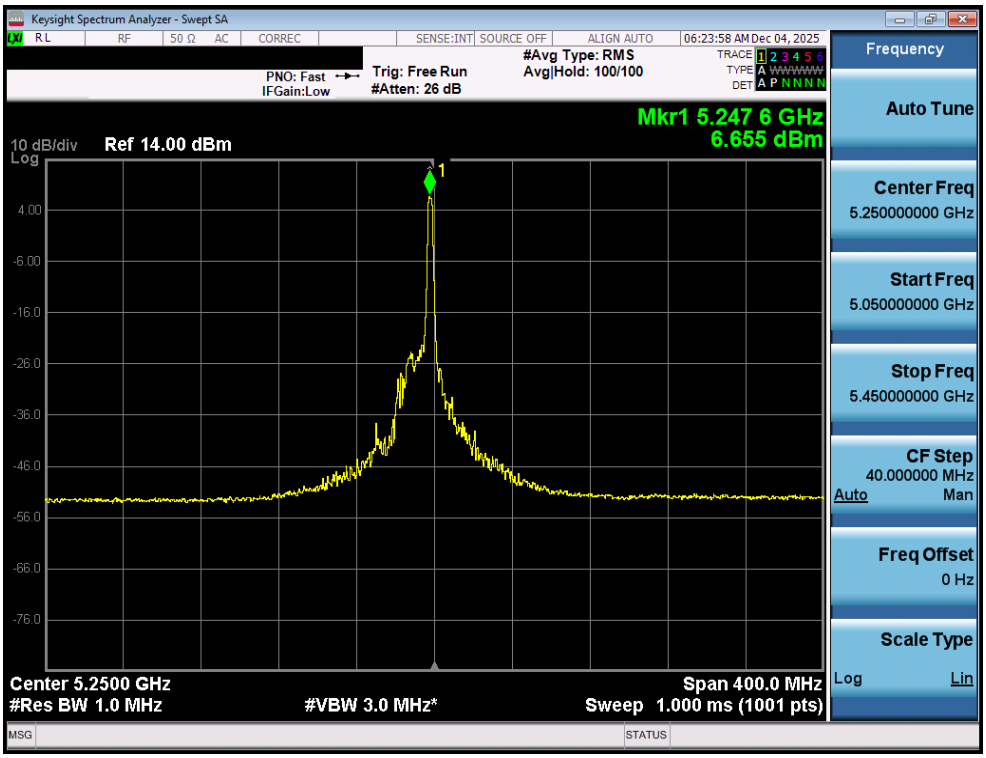
Plot 7-45. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11be – 26 Tones (UNII Band 1) – Ch. 40)



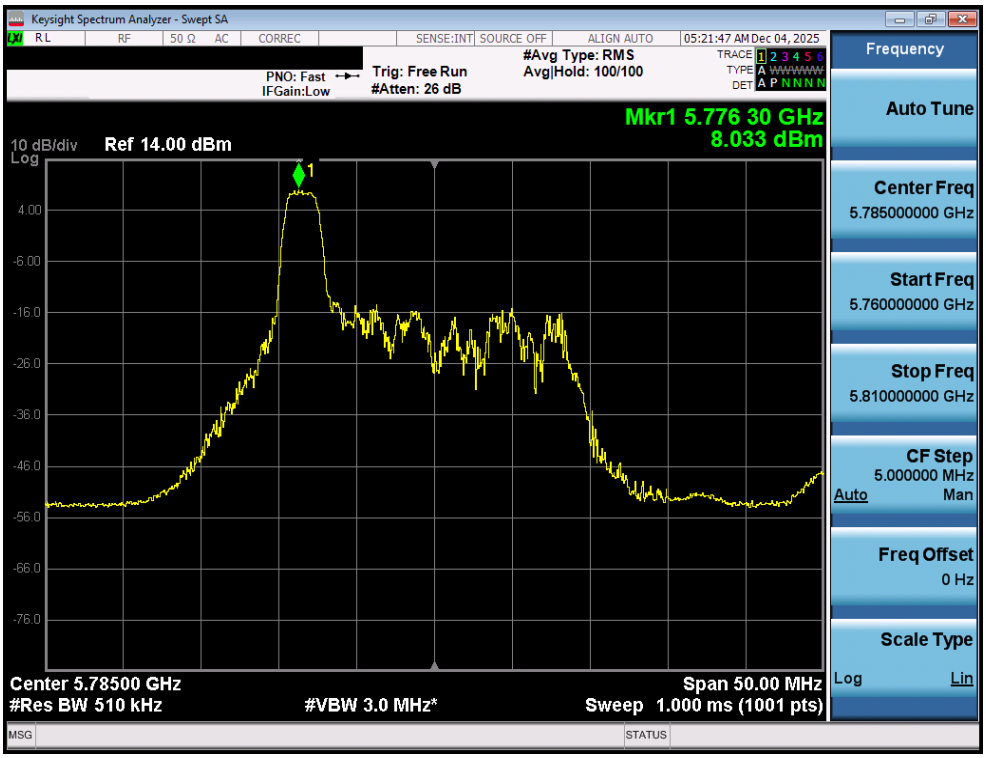
Plot 7-46. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11be – 26 Tones (UNII Band 1) – Ch. 38)



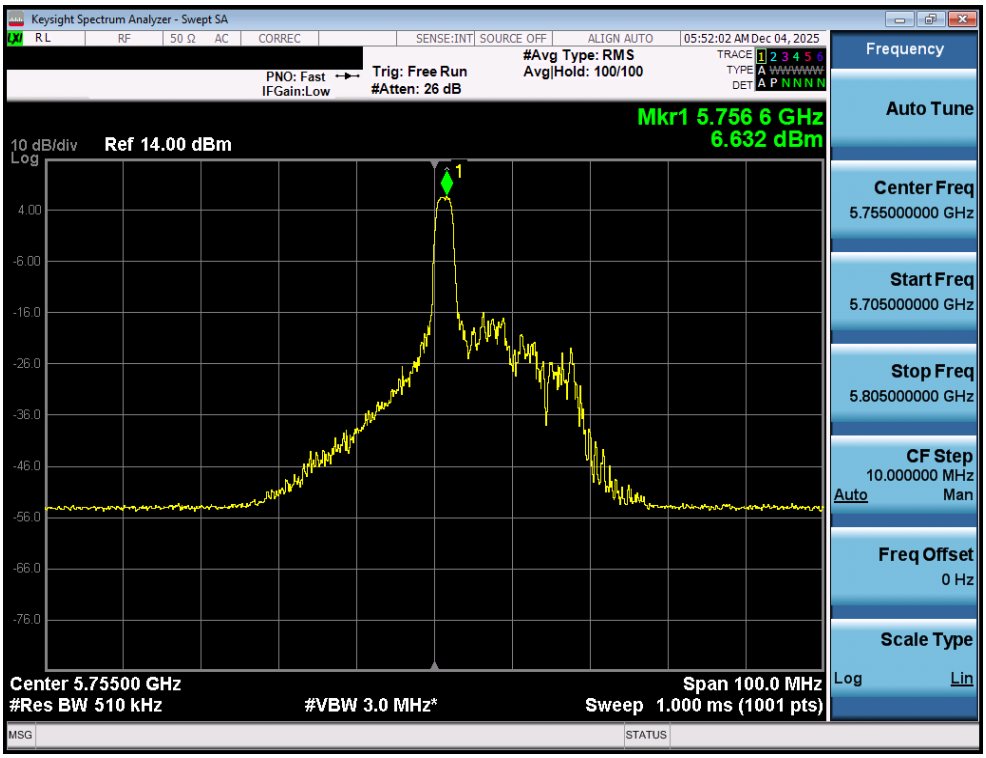
Plot 7-47. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11be – 26 Tones (UNII Band 1) – Ch. 42)



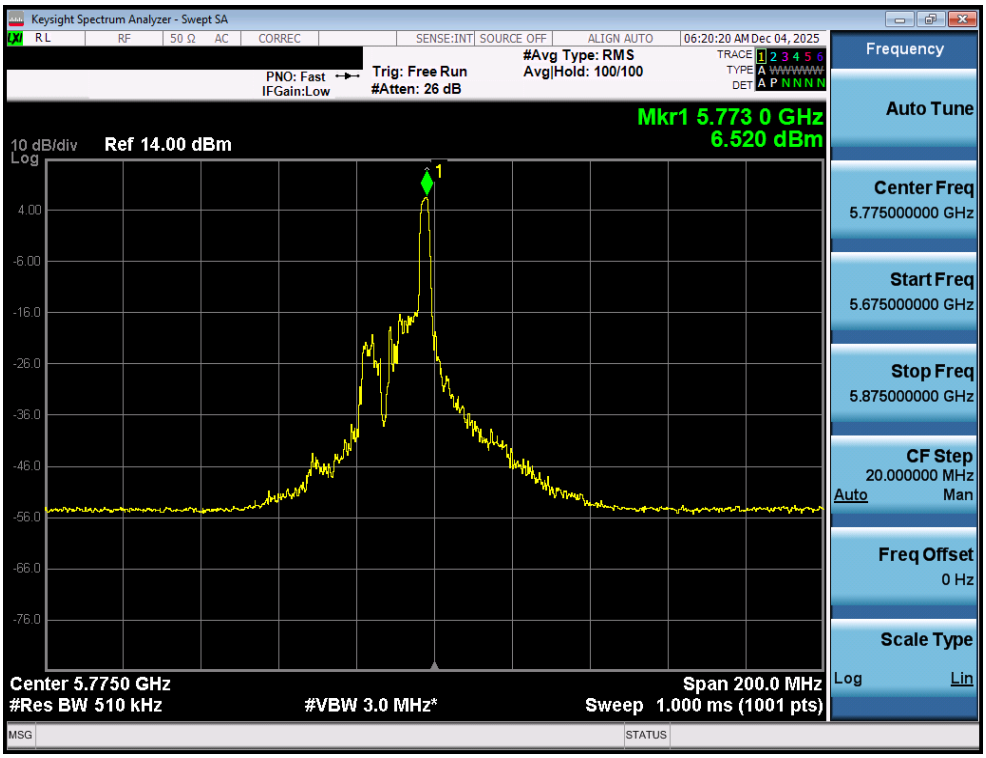
Plot 7-48. Power Spectral Density Plot MIMO ANT1 (160MHz BW 802.11be – 26 Tones (UNII Band 1/2A) – Ch. 50)



Plot 7-49. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11be – 26 Tones (UNII Band 3) – Ch. 157)

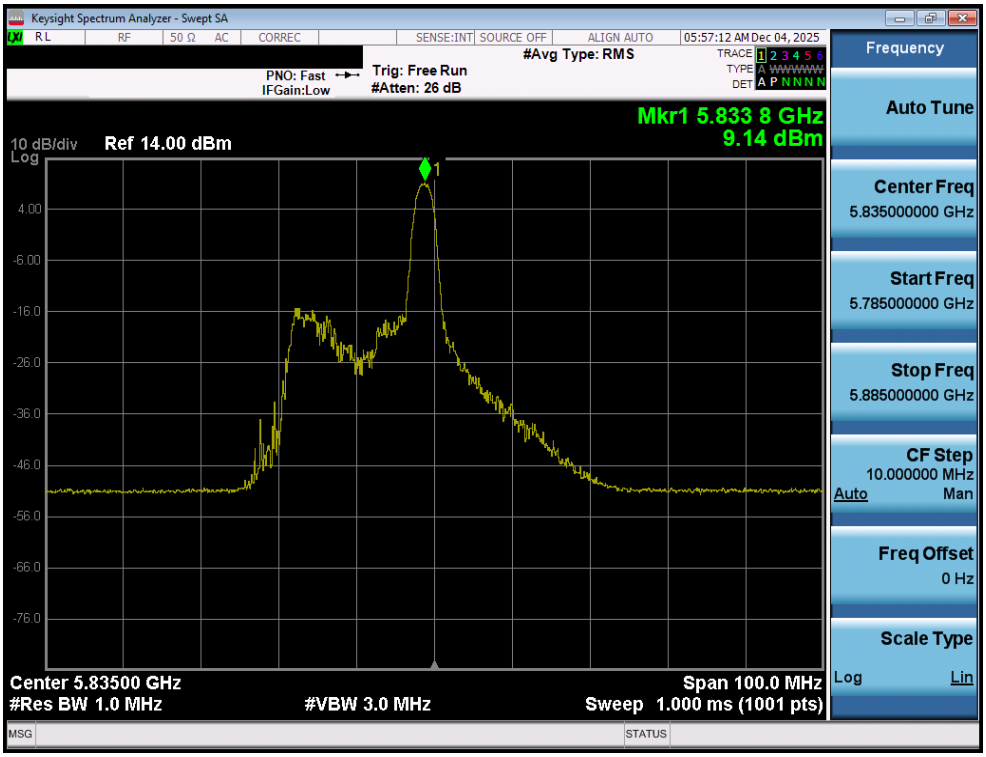


Plot 7-50. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11be – 26 Tones (UNII Band 3) – Ch. 151)

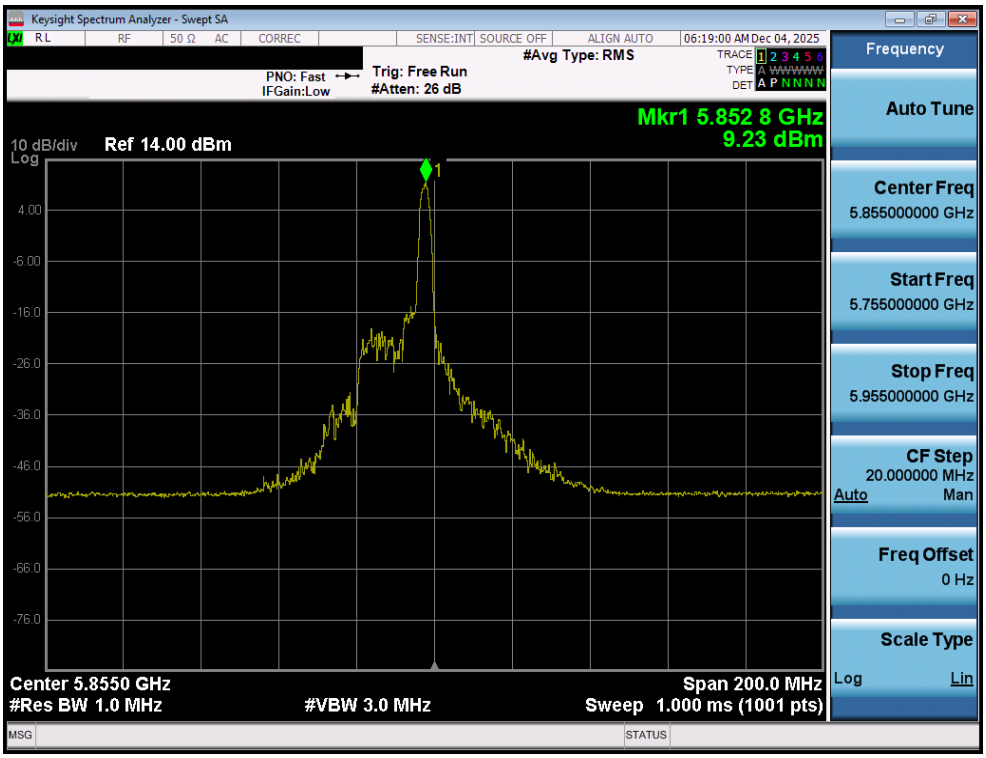


Plot 7-51. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11be – 26 Tones (UNII Band 3) – Ch. 155)

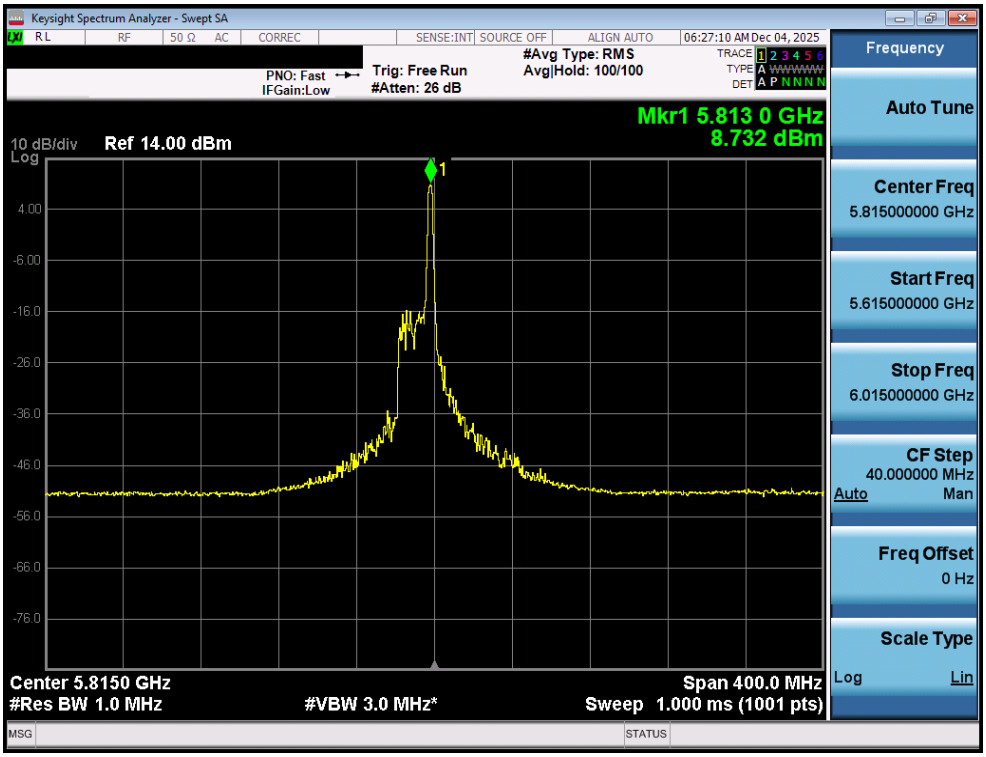
Plot 7-52. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11be – 26 Tones (UNII Band 4) – Ch. 173)



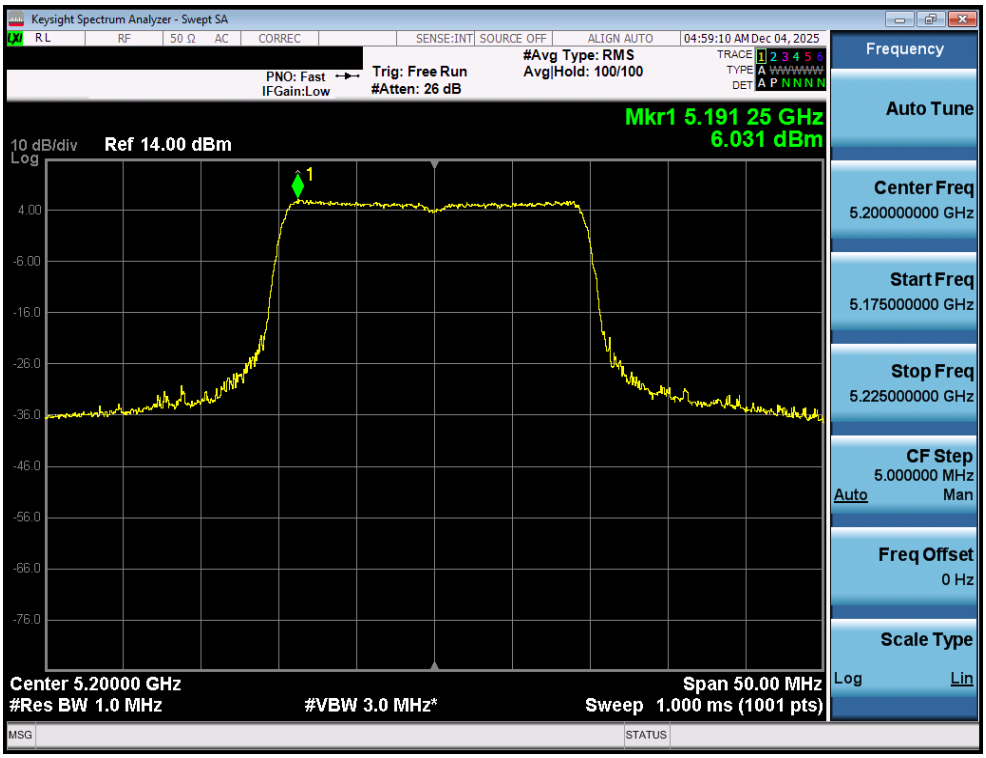
Plot 7-53. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11be – 26 Tones (UNII Band 3/4) – Ch. 167)



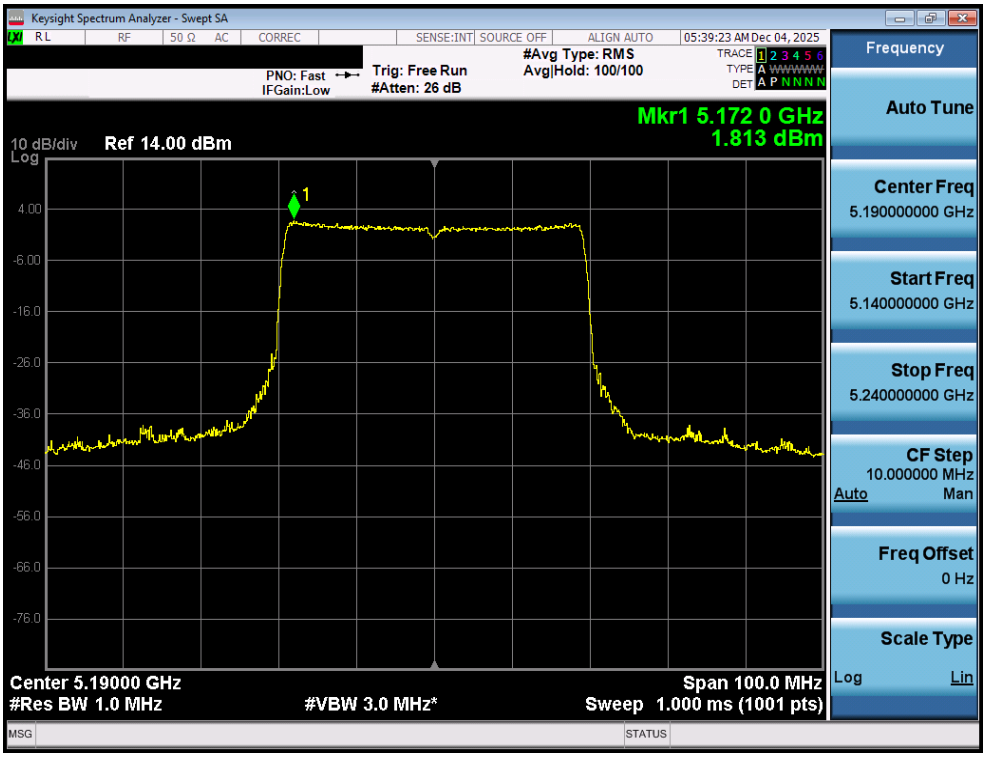
Plot 7-54. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11be – 26 Tones (UNII Band 3/4) – Ch. 171)



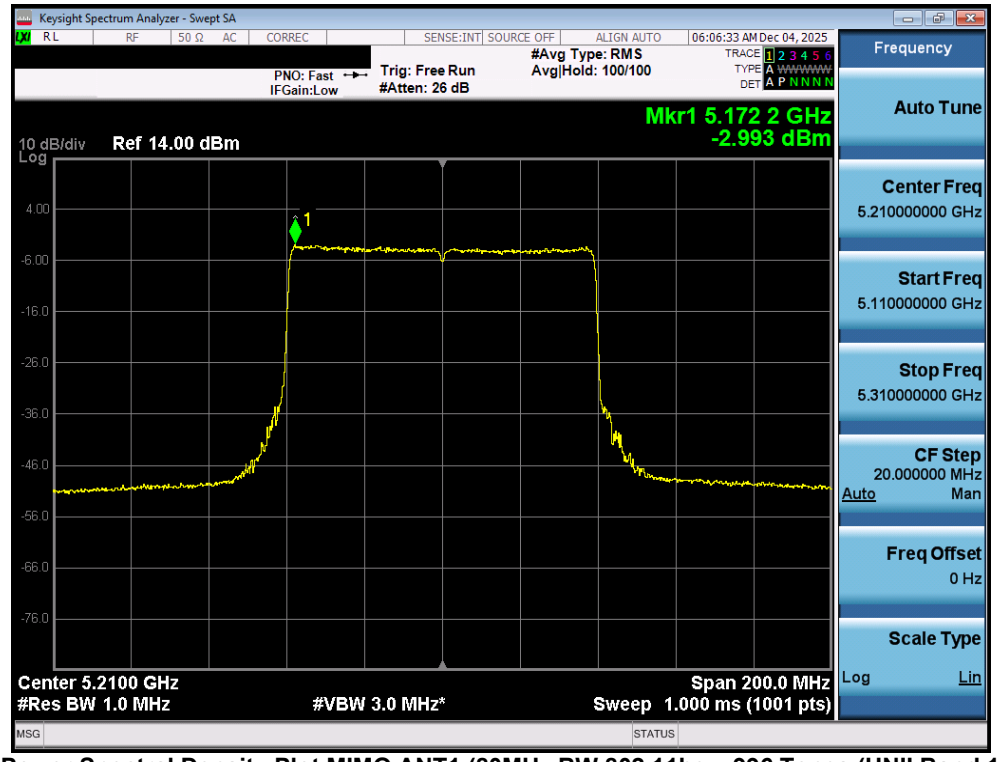
Plot 7-55. Power Spectral Density Plot MIMO ANT1 (160MHz(U) BW 802.11be – 26 Tones (UNII Band 3/4) – Ch. 163)



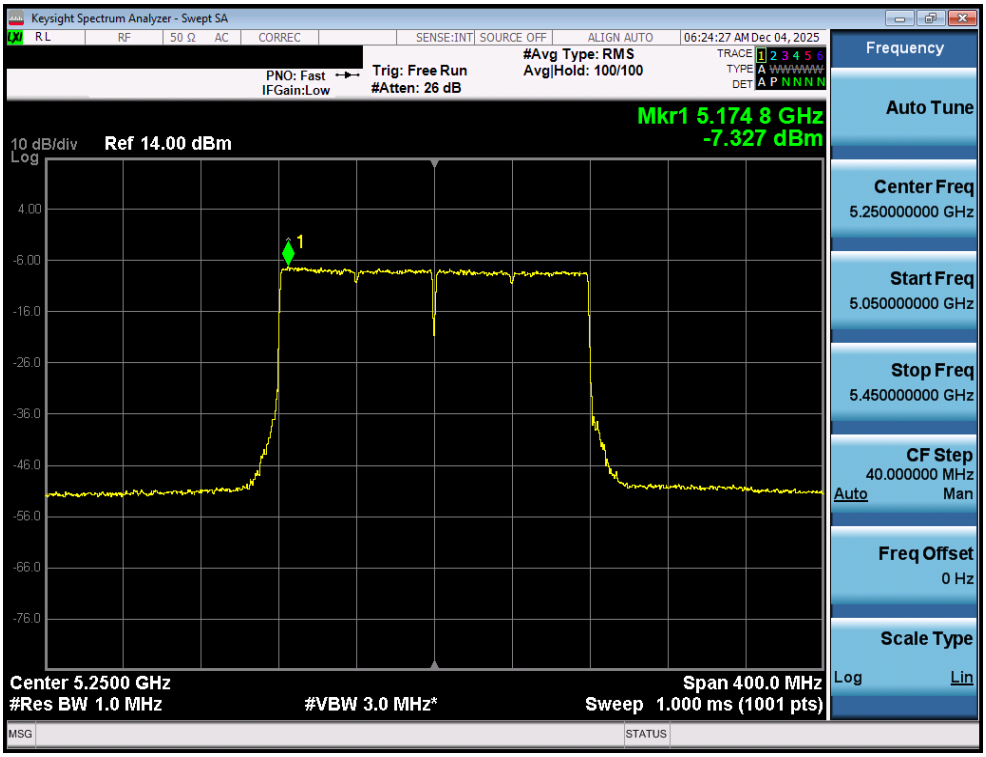
Plot 7-56. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11be – 242 Tones (UNII Band 1) – Ch. 40)



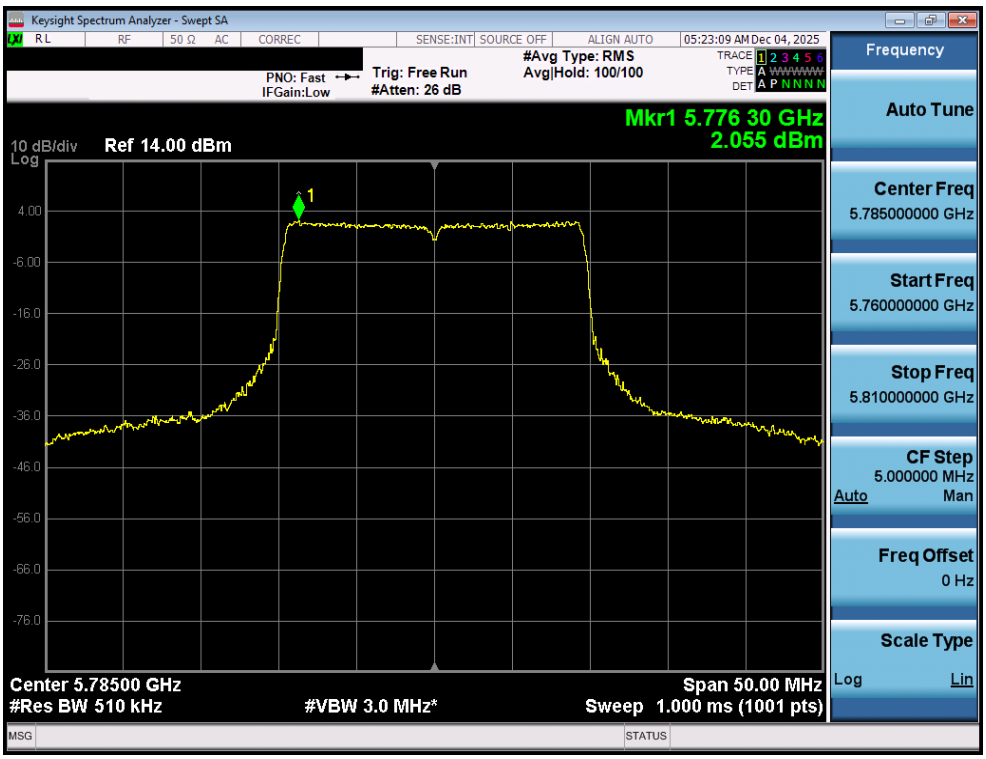
Plot 7-57. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11be – 484 Tones (UNII Band 1) – Ch. 38)



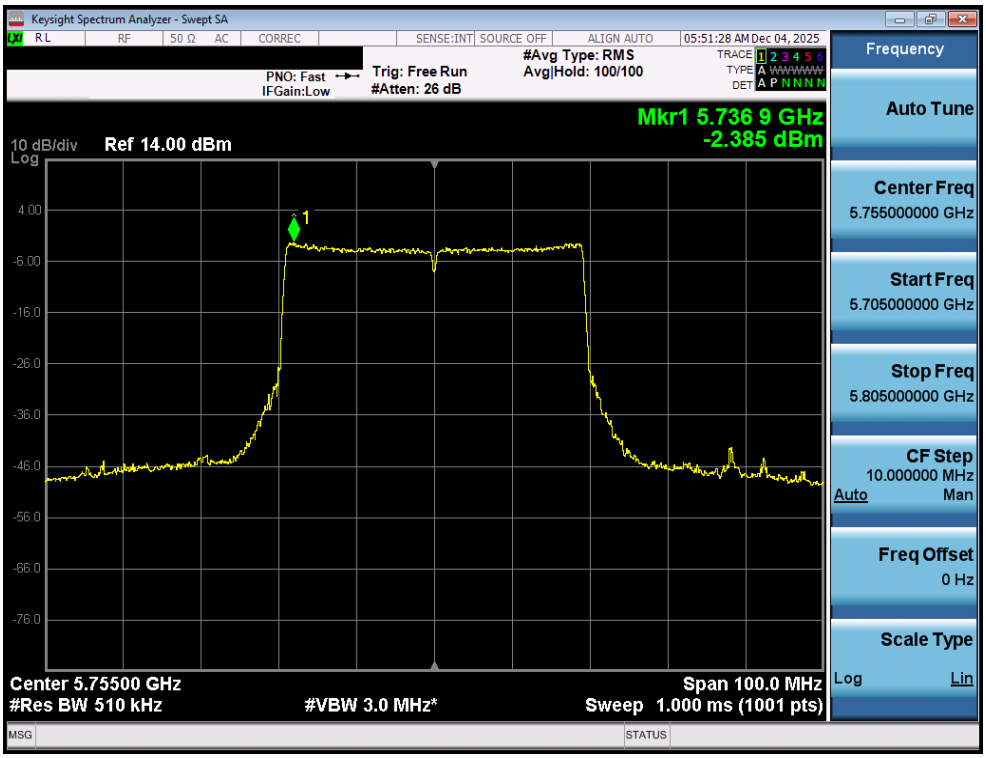
Plot 7-58. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11be – 996 Tones (UNII Band 1) – Ch. 42)



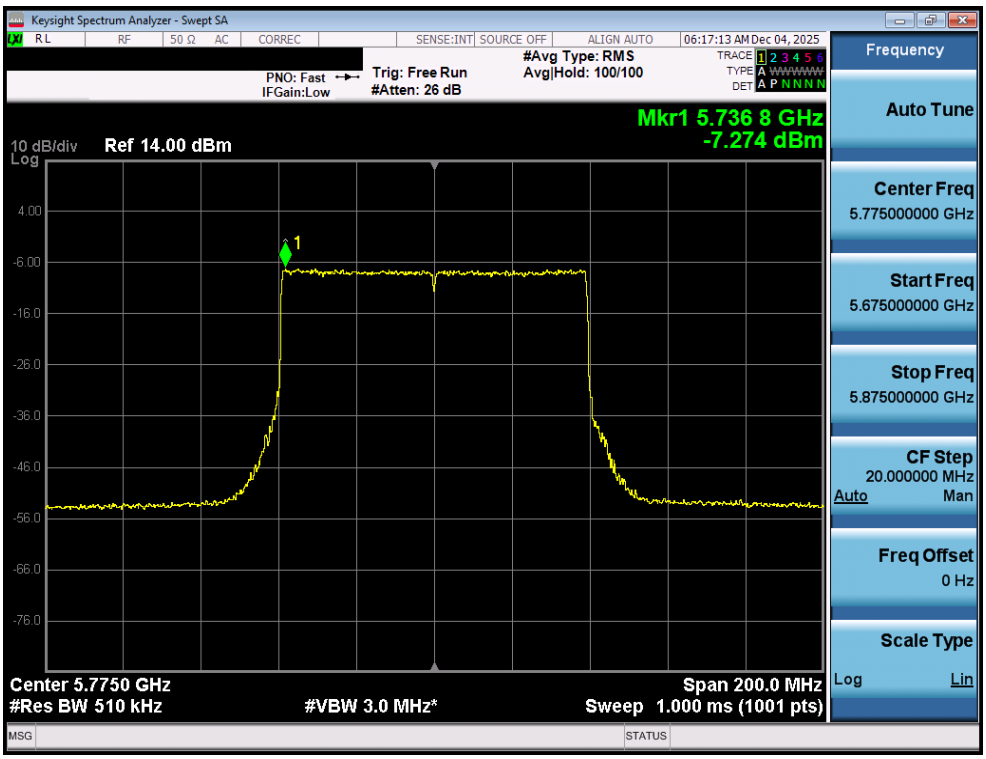
Plot 7-59. Power Spectral Density Plot MIMO ANT1 (160MHz BW 802.11be – 2x996 Tones (UNII Band 1/2A) – Ch. 50)



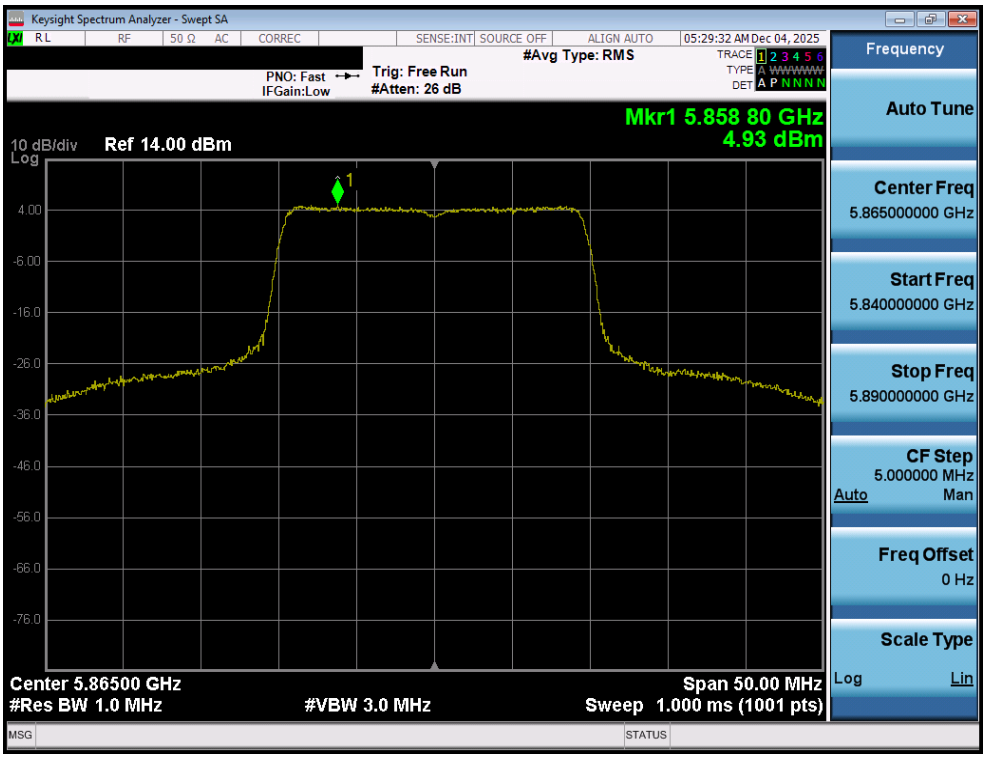
Plot 7-60. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11be – 242 Tones (UNII Band 3) – Ch. 157)



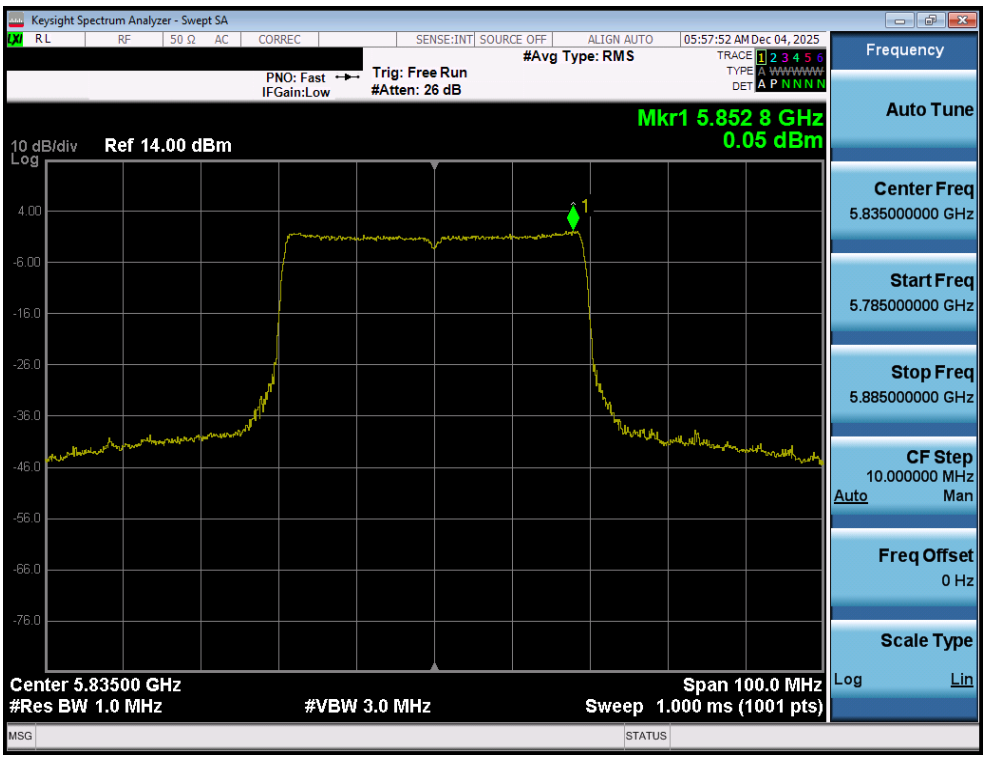
Plot 7-61. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11be – 484 Tones (UNII Band 3) – Ch. 151)



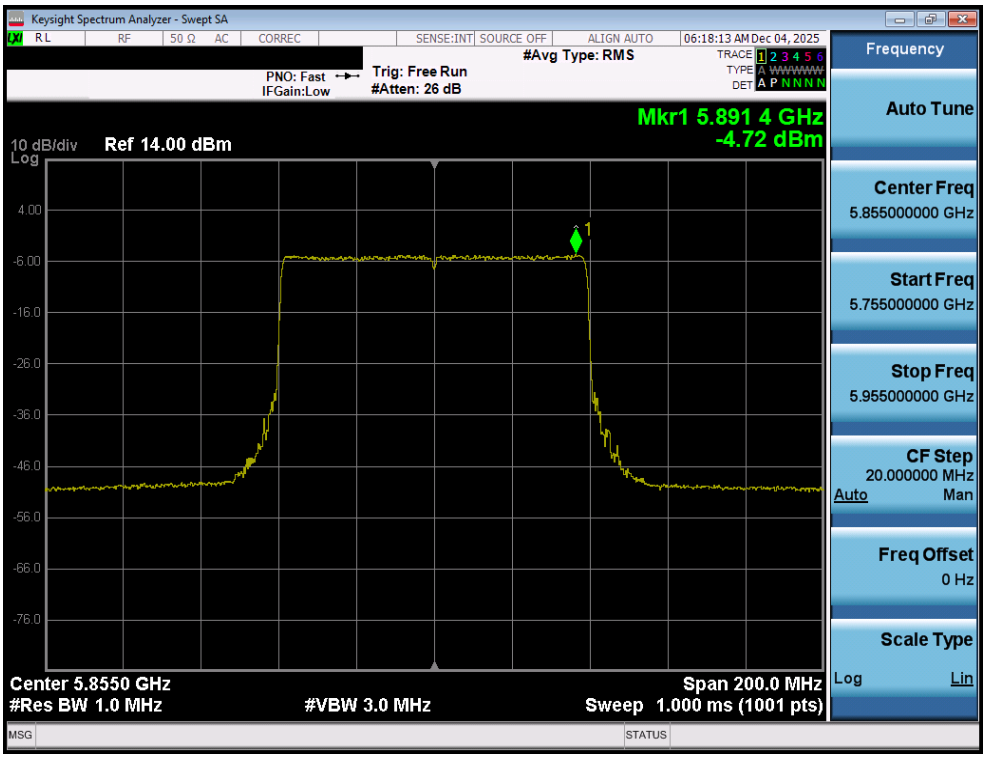
Plot 7-62. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11be – 996 Tones (UNII Band 3) – Ch. 155)



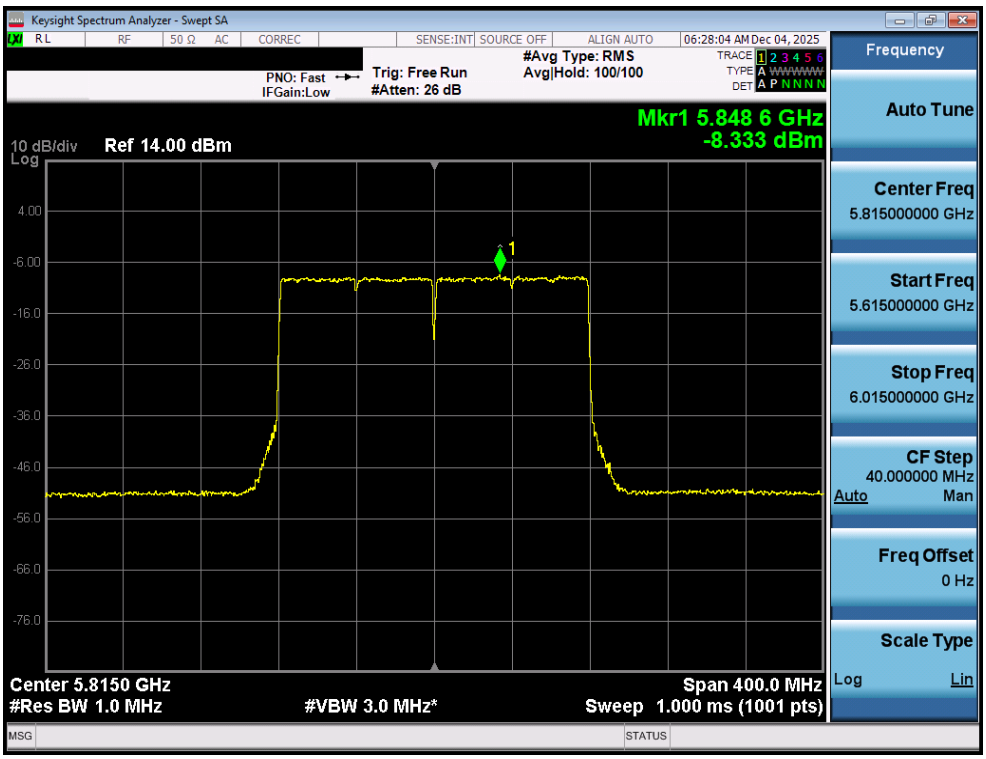
Plot 7-63. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11be – 242 Tones (UNII Band 4) – Ch. 173)



Plot 7-64. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11be – 484 Tones (UNII Band 3/4) – Ch. 167)

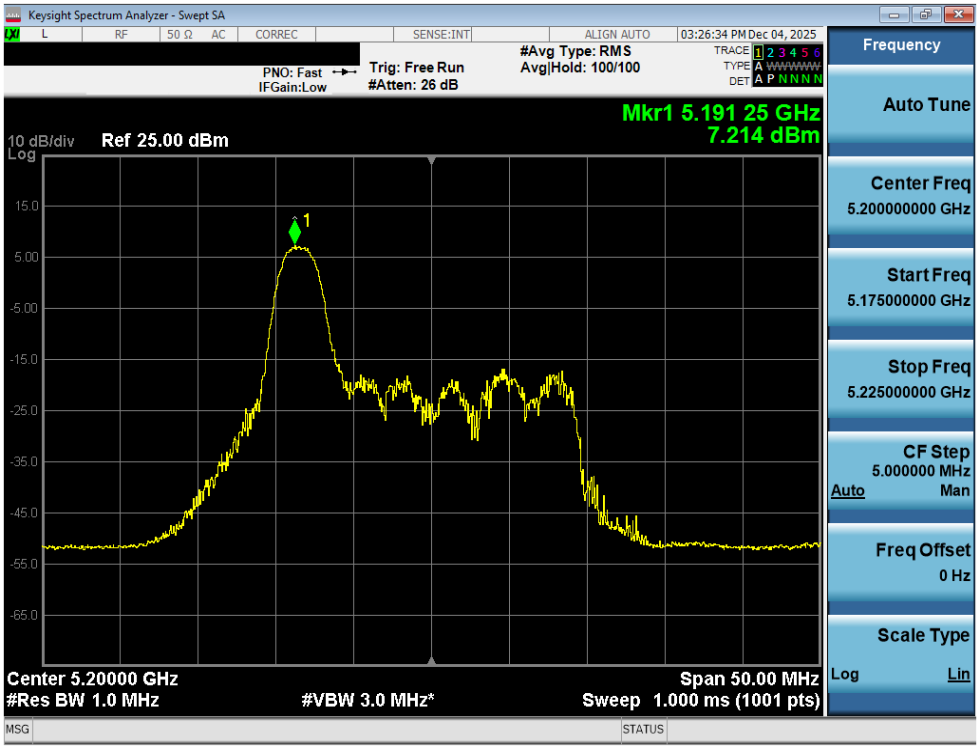


Plot 7-65. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11be – 996 Tones (UNII Band 3/4) – Ch. 171)

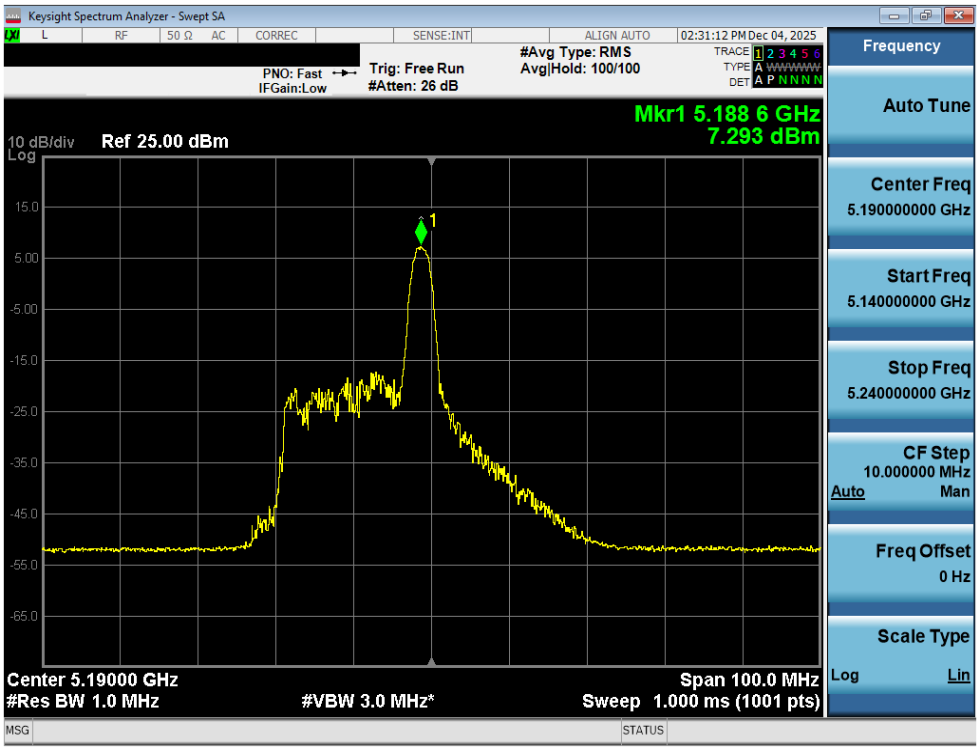


Plot 7-66. Power Spectral Density Plot MIMO ANT1 (160MHz BW 802.11be – 996*2 Tones (UNII Band 3/4) – Ch. 163)

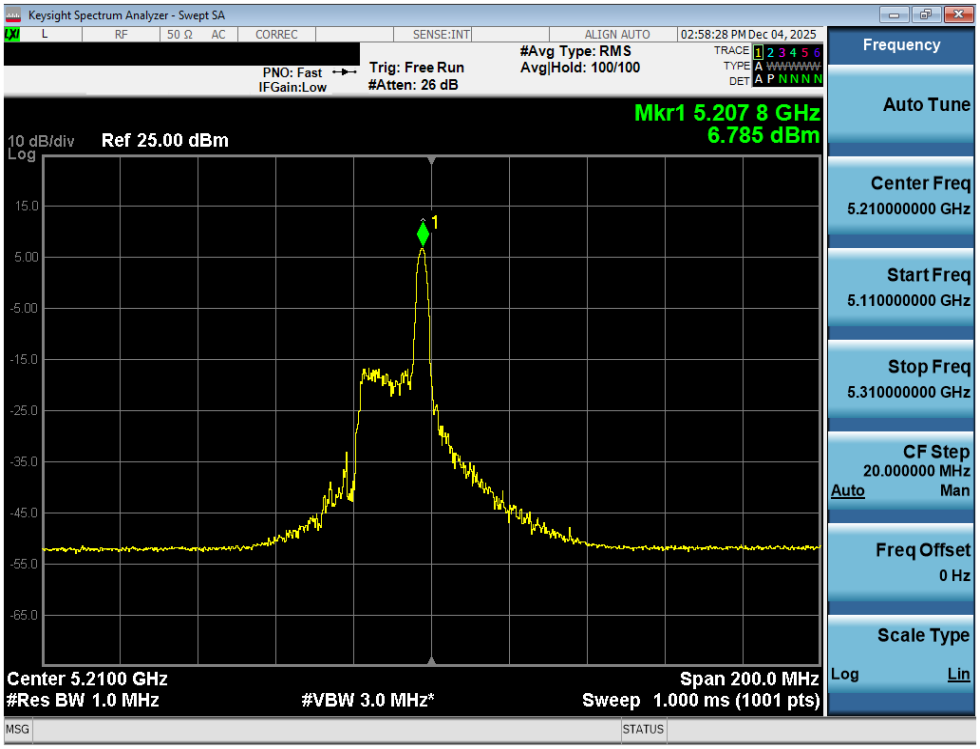
7.5.2 MIMO Antenna-2 Power Spectral Density Measurements



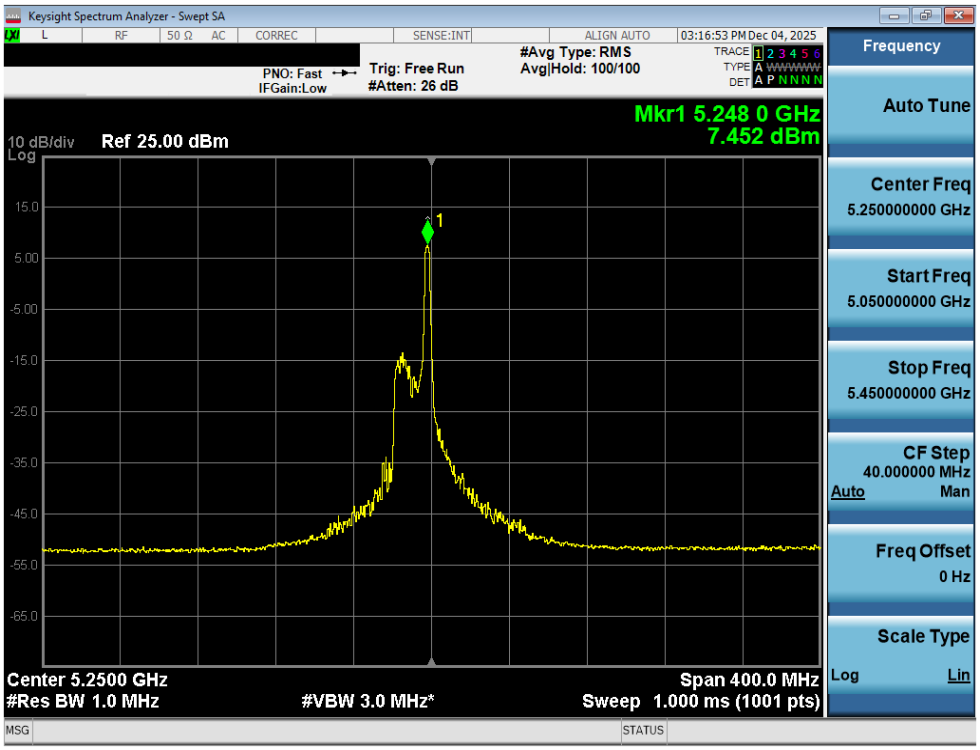
Plot 7-67. Power Spectral Density Plot MIMO ANT2 (20MHz BW 802.11be – 26 Tones (UNII Band 1) – Ch. 40)



Plot 7-68. Power Spectral Density Plot MIMO ANT2 (40MHz BW 802.11be – 26 Tones (UNII Band 1) – Ch. 38)

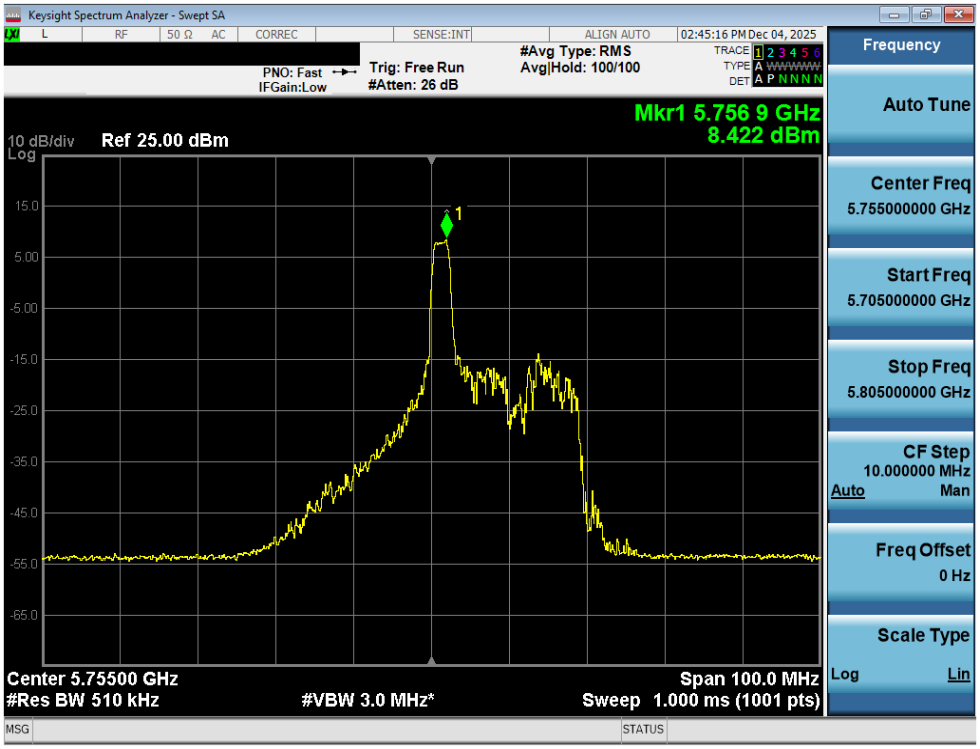


Plot 7-69. Power Spectral Density Plot MIMO ANT2 (80MHz BW 802.11be – 26 Tones (UNII Band 1) – Ch. 42)

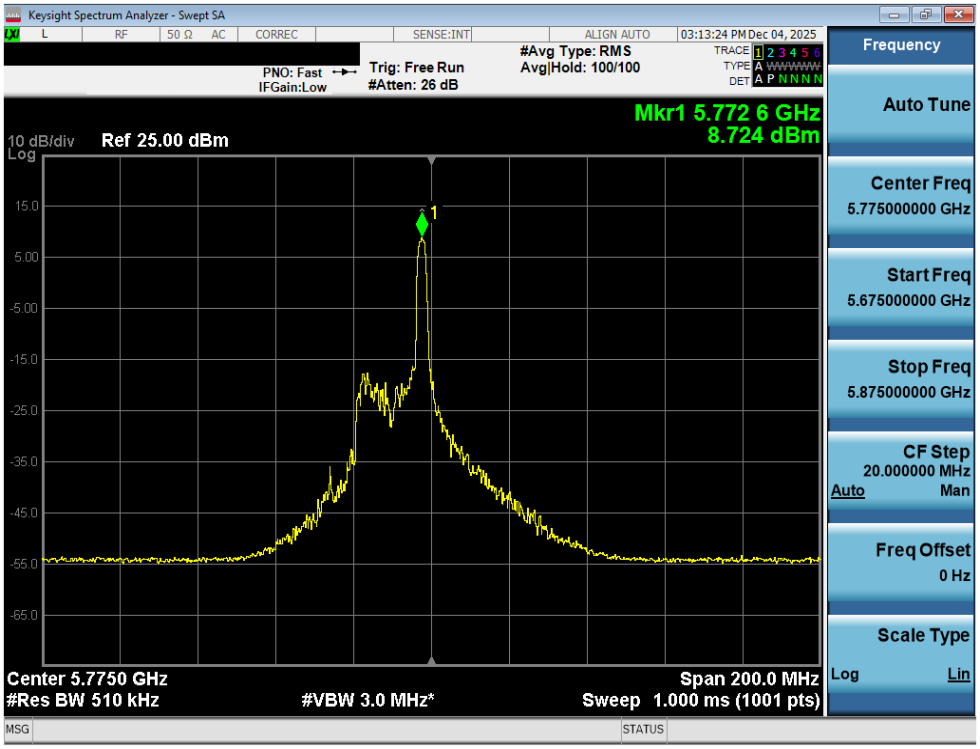


Plot 7-70. Power Spectral Density Plot MIMO ANT2 (160MHz BW 802.11be – 26 Tones (UNII Band 1/2A) – Ch. 50)

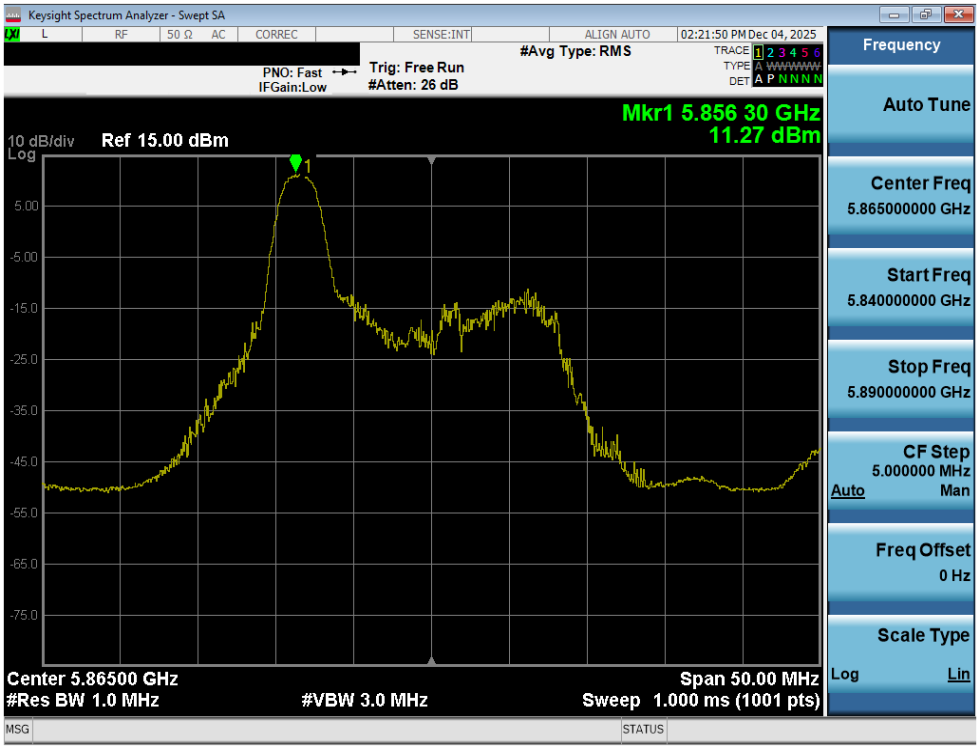
Plot 7-71. Power Spectral Density Plot MIMO ANT2 (20MHz BW 802.11be – 26 Tones (UNII Band 3) – Ch. 157)



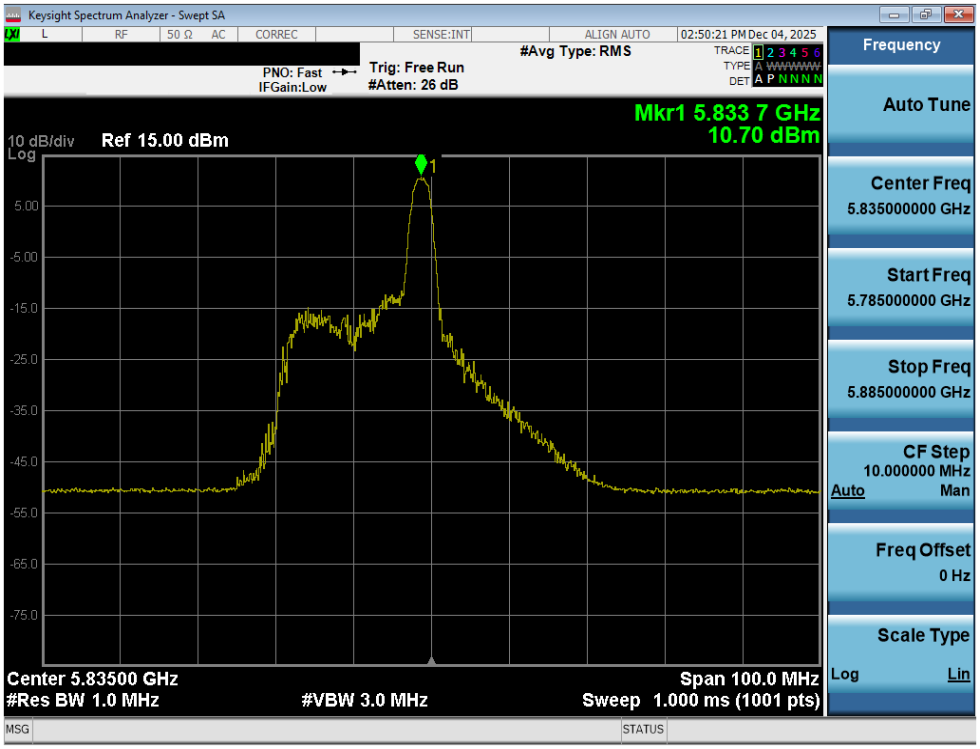
Plot 7-72. Power Spectral Density Plot MIMO ANT2 (40MHz BW 802.11be – 26 Tones (UNII Band 3) – Ch. 151)



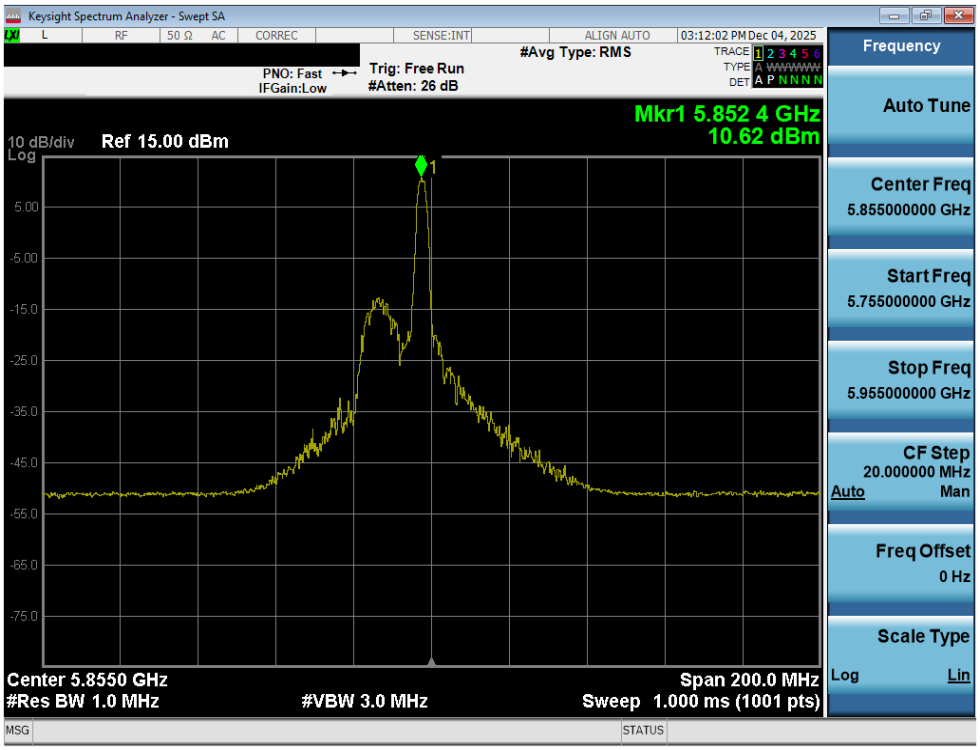
Plot 7-73. Power Spectral Density Plot MIMO ANT2 (80MHz BW 802.11be – 26 Tones (UNII Band 3) – Ch. 155)



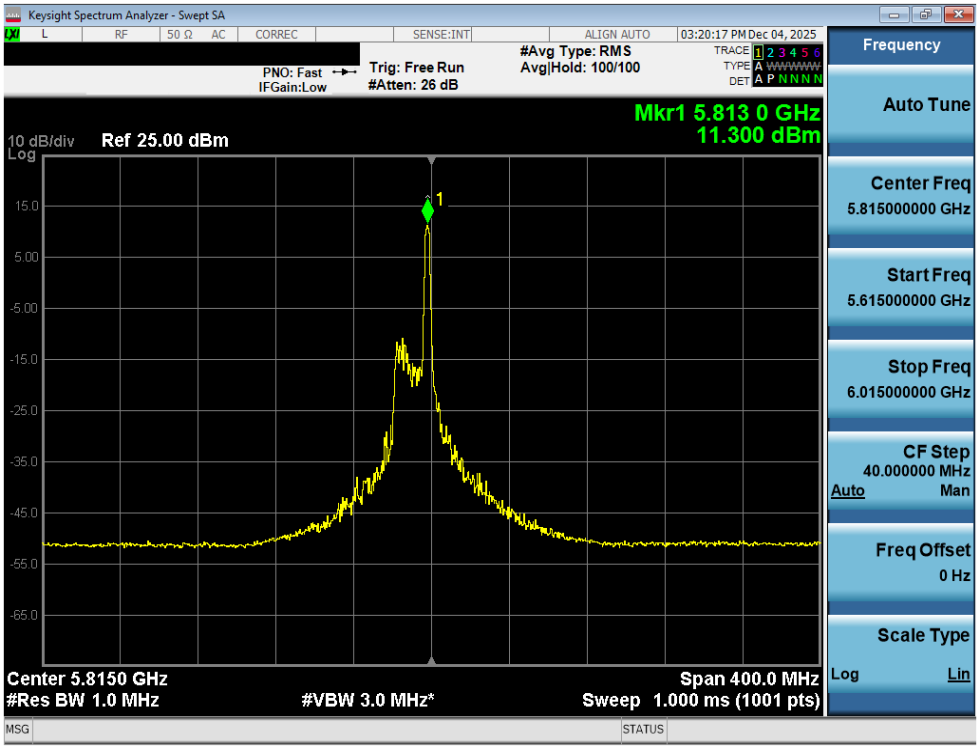
Plot 7-74. Power Spectral Density Plot MIMO ANT2 (20MHz BW 802.11be – 26 Tones (UNII Band 4) – Ch. 173)



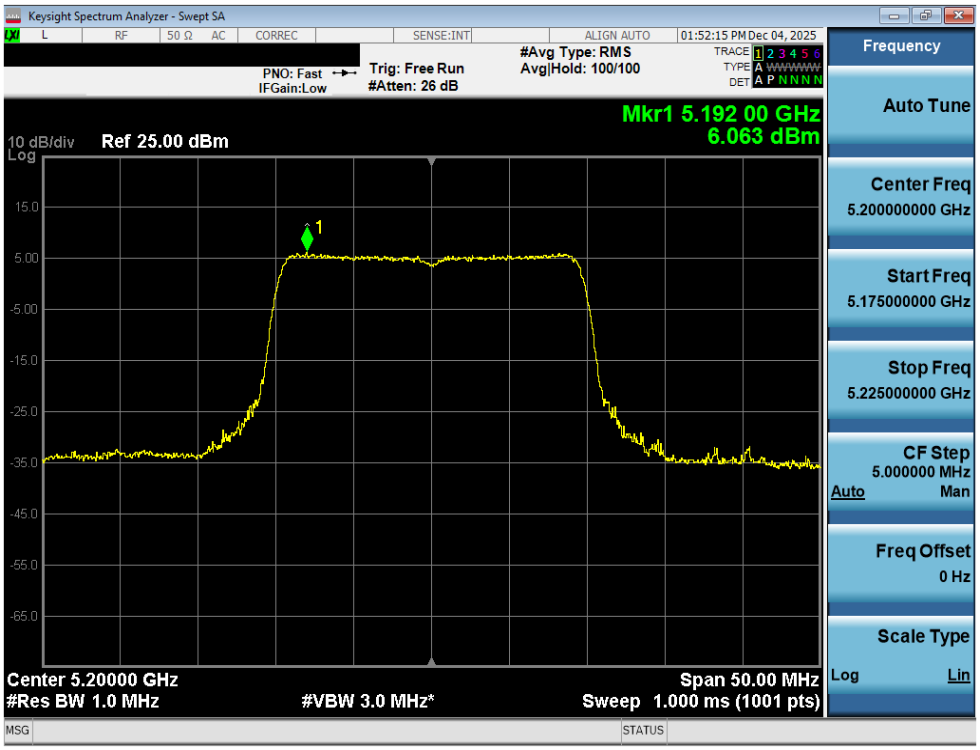
Plot 7-75. Power Spectral Density Plot MIMO ANT2 (40MHz BW 802.11be – 26 Tones (UNII Band 3/4) – Ch. 167)



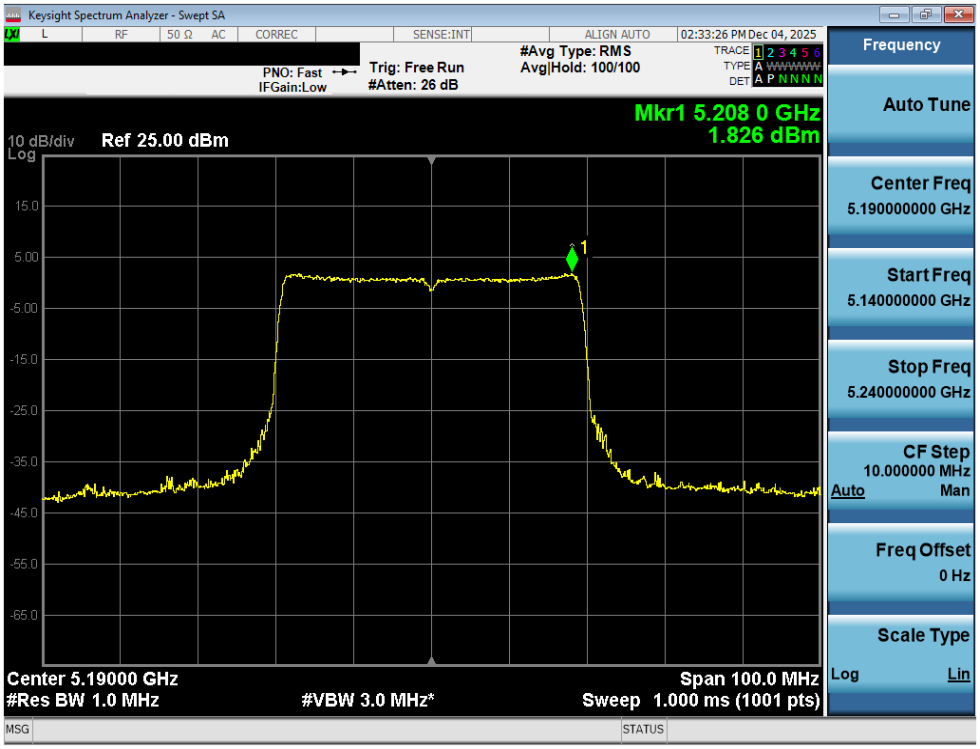
Plot 7-76. Power Spectral Density Plot MIMO ANT2 (80MHz BW 802.11be – 26 Tones (UNII Band 3/4) – Ch. 171)



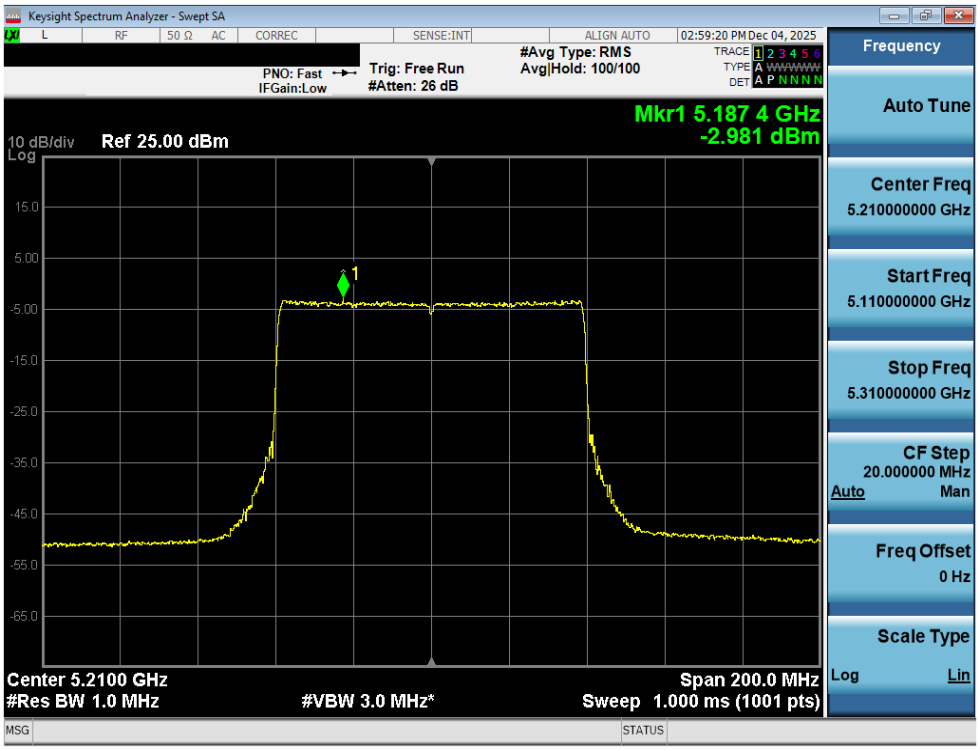
Plot 7-77. Power Spectral Density Plot MIMO ANT2 (160MHz(U) BW 802.11be – 26 Tones (UNII Band 3/4) – Ch. 163)



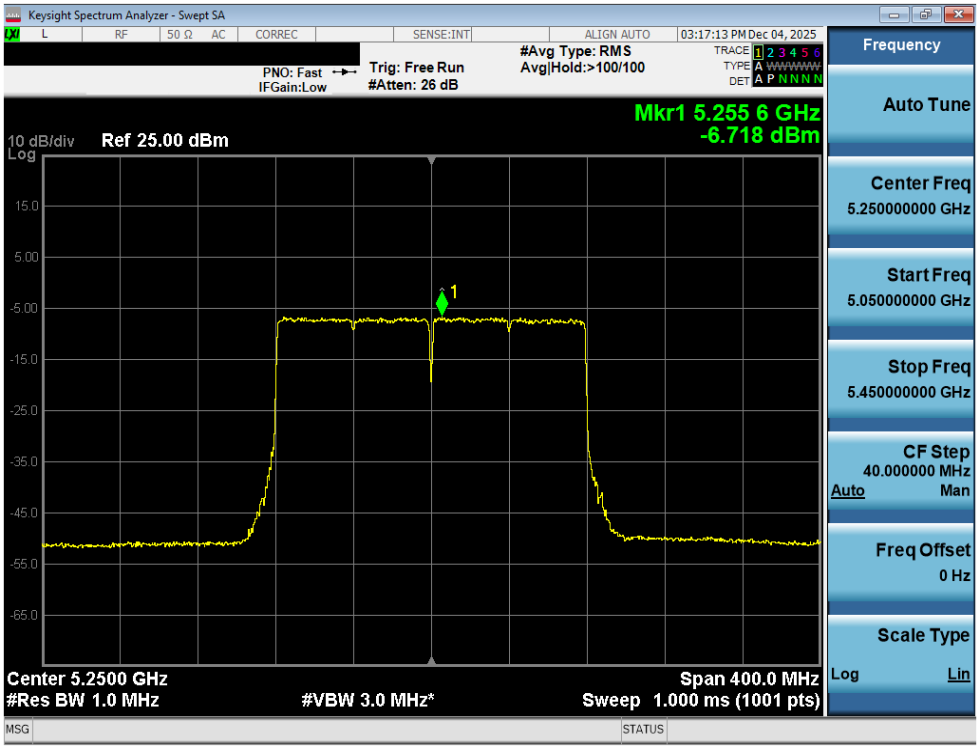
Plot 7-78. Power Spectral Density Plot MIMO ANT2 (20MHz BW 802.11be – 242 Tones (UNII Band 1) – Ch. 40)



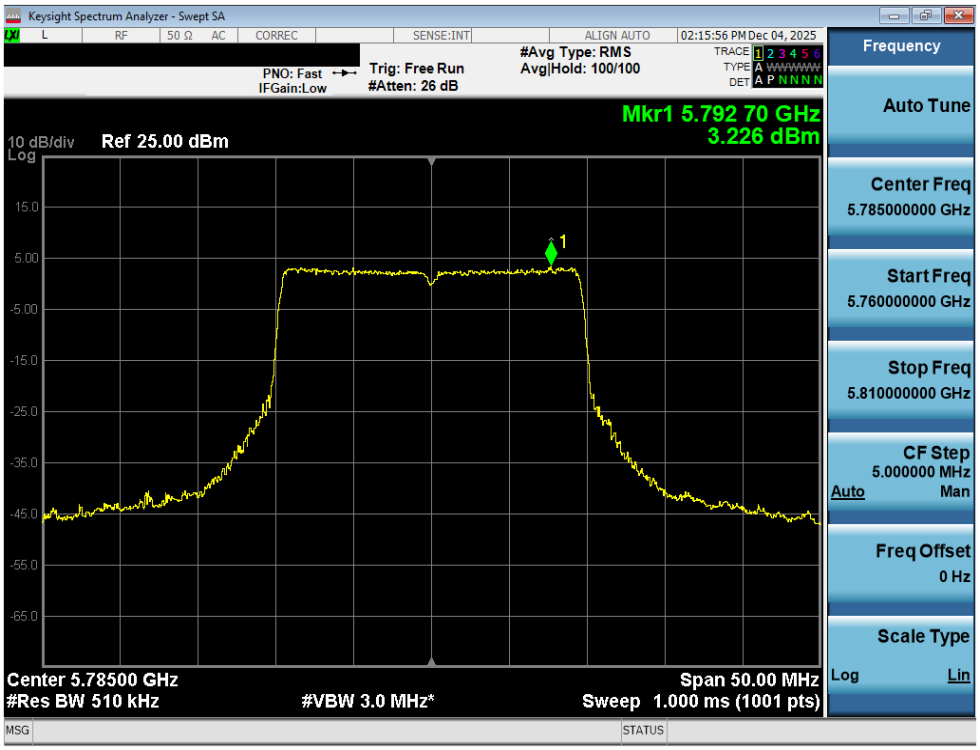
Plot 7-79. Power Spectral Density Plot MIMO ANT2 (40MHz BW 802.11be – 484 Tones (UNII Band 1) – Ch. 38)



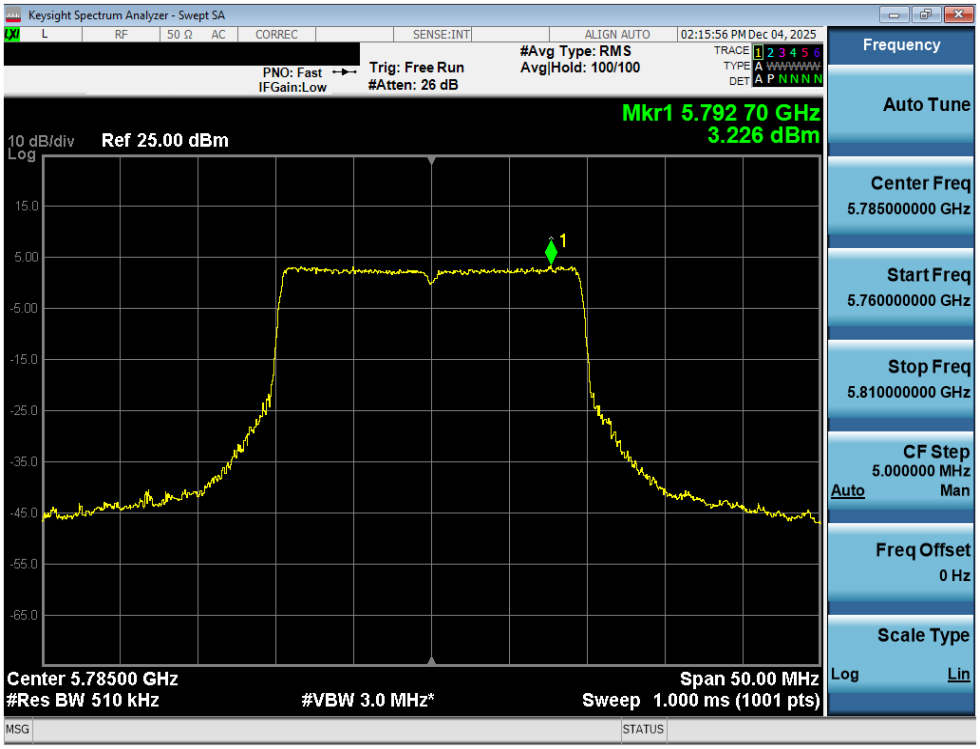
Plot 7-80. Power Spectral Density Plot MIMO ANT2 (80MHz BW 802.11be – 996 Tones (UNII Band 1) – Ch. 42)



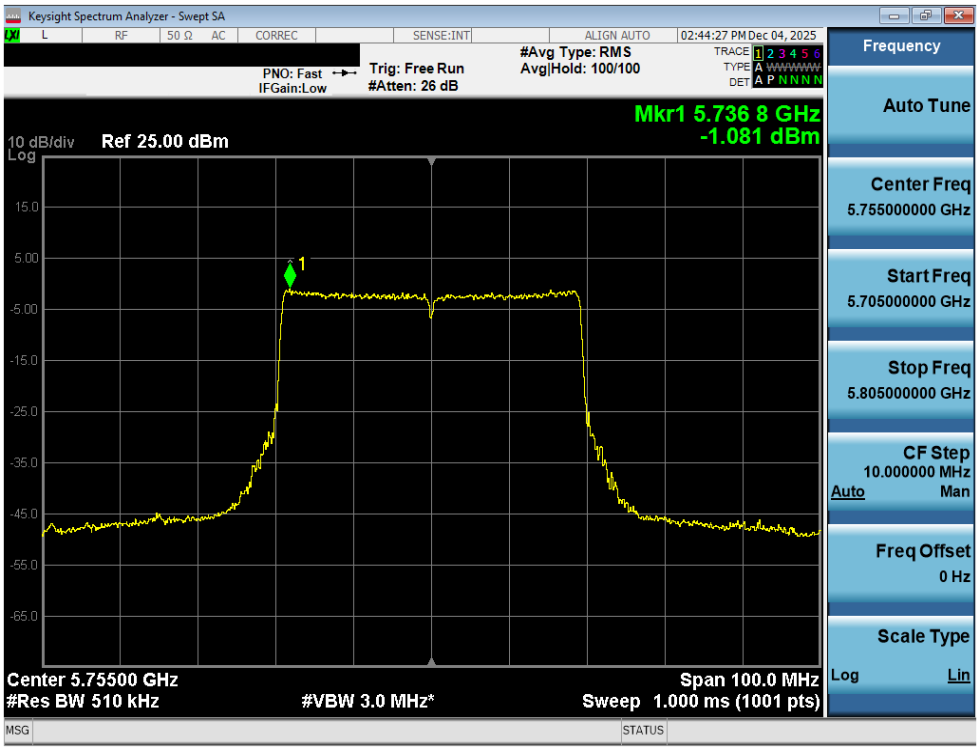
Plot 7-81. Power Spectral Density Plot MIMO ANT2 (160MHz BW 802.11be – 2x996 Tones (UNII Band 1/2A) – Ch. 50)



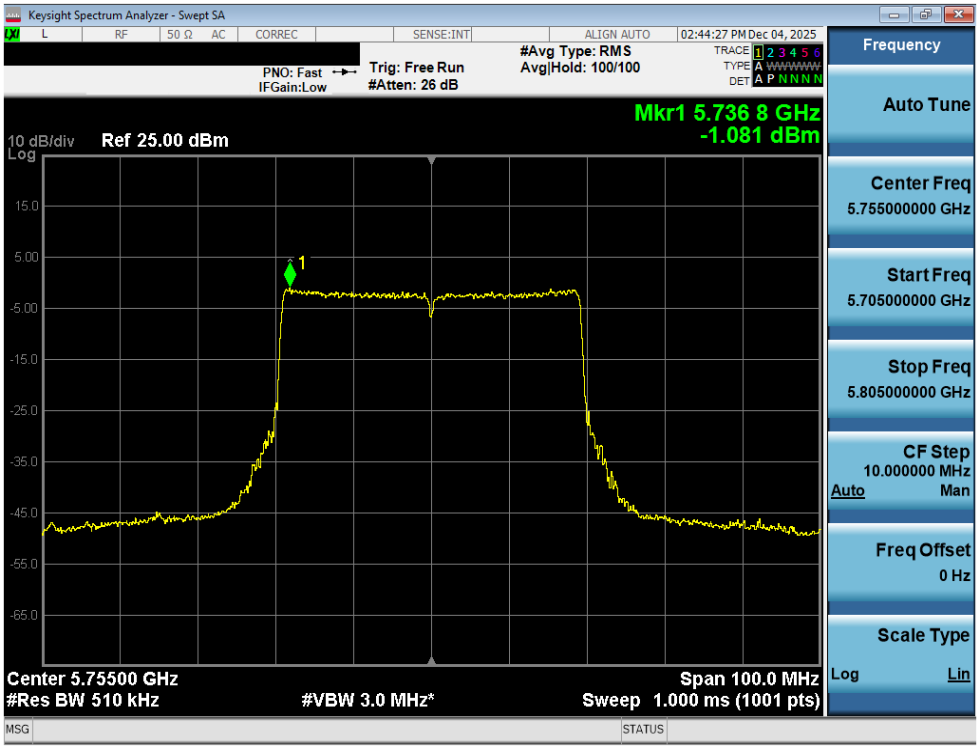
Plot 7-82. Power Spectral Density Plot MIMO ANT2 (20MHz BW 802.11ax – 242 Tones (UNII Band 3) – Ch. 157)



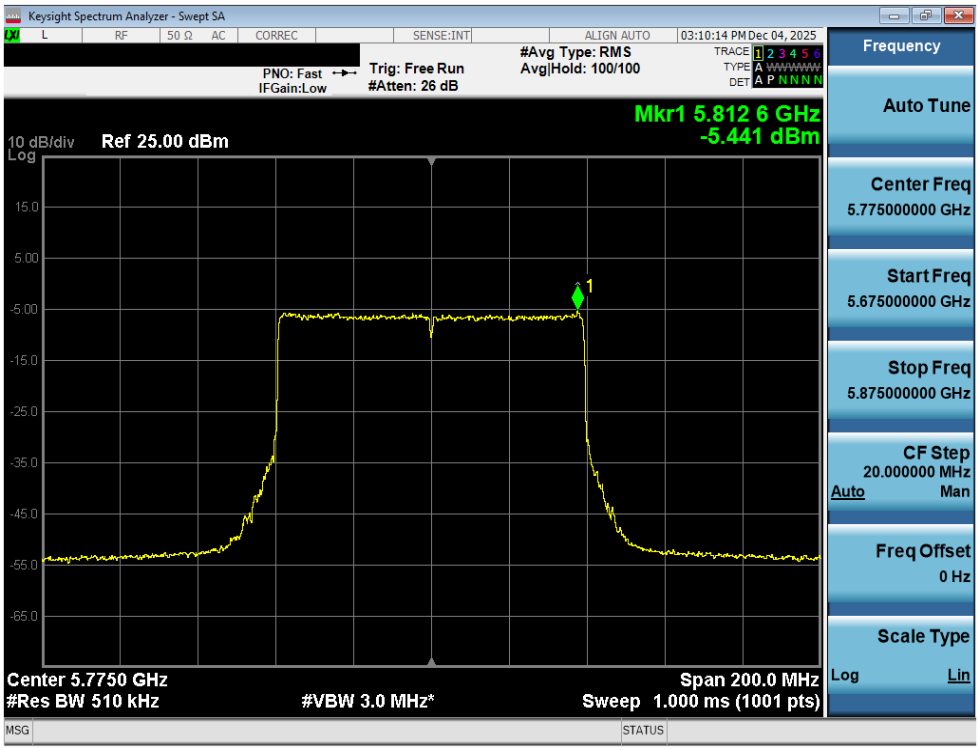
Plot 7-83. Power Spectral Density Plot MIMO ANT2 (20MHz BW 802.11be – 242 Tones (UNII Band 3) – Ch. 157)



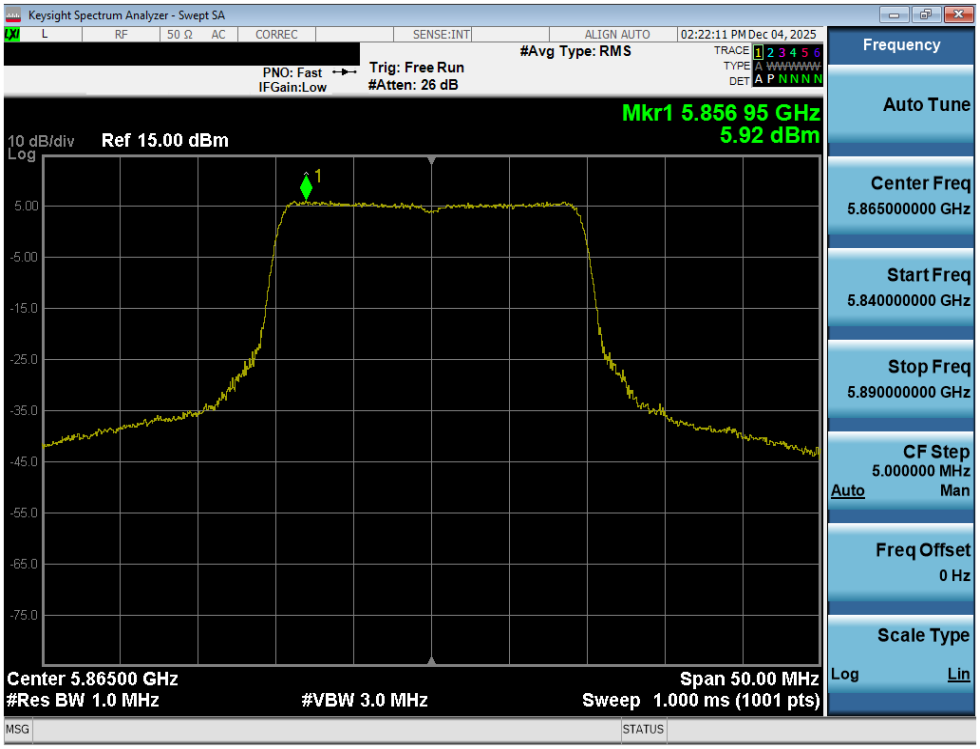
Plot 7-84. Power Spectral Density Plot MIMO ANT2 (40MHz BW 802.11ax – 484 Tones (UNII Band 3) – Ch. 151)



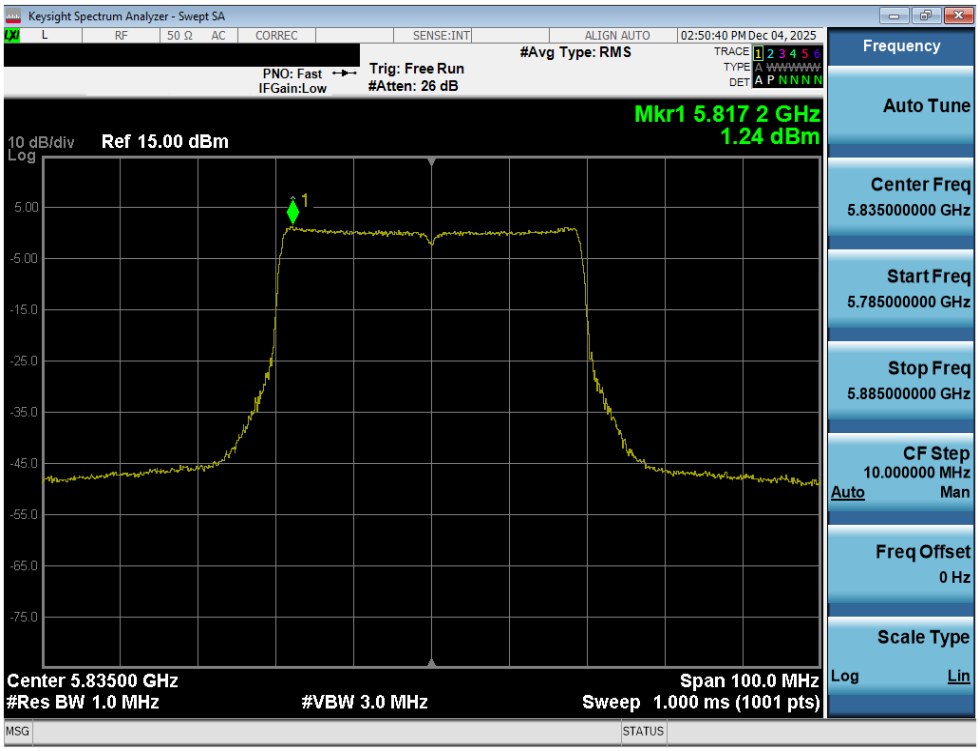
Plot 7-85. Power Spectral Density Plot MIMO ANT2 (40MHz BW 802.11be – 484 Tones (UNII Band 3) – Ch. 151)



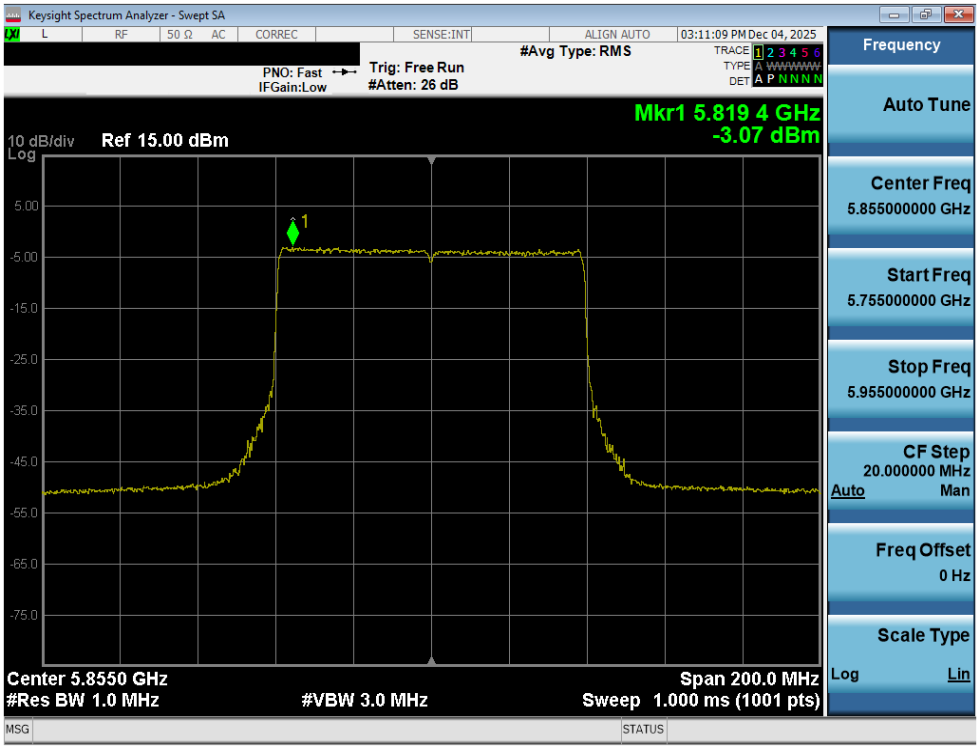
Plot 7-86. Power Spectral Density Plot MIMO ANT2 (80MHz BW 802.11be – 996 Tones (UNII Band 3) – Ch. 155)



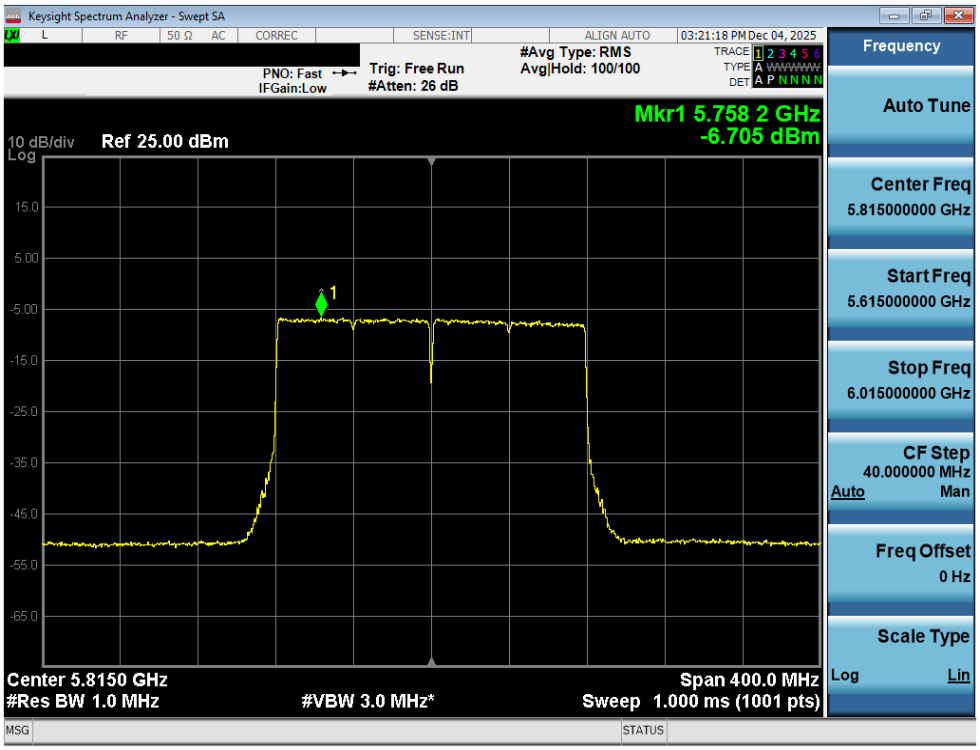
Plot 7-87. Power Spectral Density Plot MIMO ANT2 (20MHz BW 802.11ax – 242 Tones (UNII Band 4) – Ch. 173)



Plot 7-88. Power Spectral Density Plot MIMO ANT2 (40MHz BW 802.11be – 484 Tones (UNII Band 3/4) – Ch. 167)



Plot 7-89. Power Spectral Density Plot MIMO ANT2 (80MHz BW 802.11be – 996 Tones (UNII Band 3/4) – Ch. 171)



Plot 7-90. Power Spectral Density Plot MIMO ANT2 (160MHz BW 802.11be – 996*2 Tones (UNII Band 3/4) – Ch. 163)

Note:

Per ANSI C63.10:2020 Section 14.5.2.2, the power spectral density at Antenna-1 and Antenna-2 were first measured separately with reduced Antenna-1 and Antenna-2 powers per manufacture's tune-up document. The measured values were then summed in linear power units then converted back to dBm.

Sample Directional Gain Calculation:

Assuming the antenna gain is -8.61 dBi for Antenna-1 and -7.68 dBi for Antenna-2.

$$\text{Directional gain} = 10 \log[(10^{G_1/20} + 10^{G_2/20} + \ldots + 10^{G_N/20})^2 / N_{ANT}] \text{ dBi}$$

$$= 10 \log[(10^{-8.61/20} + 10^{-7.68/20} / 2] \text{ dBi}$$

$$= (-5.12) \text{ dBi}$$

Sample MIMO Calculation:

Assuming the average conducted power spectral density was measured to be 5.88 dBm for Antenna-1 and 6.27 dBm for Antenna-2.

Antenna-1 + Antenna-2 = MIMO

(5.88 dBm + 6.27 dBm) = (3.87 mW + 4.24 mW) = 8.11mW = 9.09 dBm

Sample e.i.r.p Power Spectral Density Calculation:
Assuming the average MIMO power density was calculated to be 9.09 dBm with directional gain of -5.12 dBi.

e.i.r.p. Power Spectral Density(dBm) = Power Spectral Density (dBm) + directional gain (dBi)

9.09 dBm + (-5.12) dBi = 3.97 dBm

7.6 Radiated Emission Measurements

Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at its maximum duty cycle, at its maximum power control level, as defined in ANSI C63.10:2020, and at the appropriate frequencies. All channels, modes, and modulations/data rates were investigated among all UNII bands. Only the radiated emissions of the configuration that produced the worst-case emissions are reported in this section.

For transmitters operating in the 5.15-5.25 GHz and 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of −27 dBm/MHz.

For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of −27 dBm/MHz.

For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

For transmitters operating in the 5.850 – 5.895 GHz band: all emissions at or above 5.895GHz shall not exceed an e.i.r.p. of -5dBm/MHz and shall decrease linearly up to an e.i.r.p. of -27dBm/MHz at or above 5.925GHz, and all emissions below 5.725 GHz shall not exceed an e.i.r.p. of -27dBm/MHz at 5.65 GHz increasing linearly to 10dBm/MHz at 5.7GHz and from 5.7GHz increasing linearly to a level of 15.6dMb/MHz at 5.72GHz, and from 5.72GHz increasing linearly to a level of 27dBm/MHz at 5.725GHz.

All out of band emissions appearing in a restricted band as specified in FCC §15.205 of the Title 47 CFR and Table 6 of RSS-Gen (8.10) must not exceed the limits shown in the table below per FCC §15.209 and RSS-Gen (8.9).

Frequency	Field Strength [μV/m]	Measured Distance [Meters]
0.009 – 0.490 MHz	2400\F (kHz)	300
0.490 – 1.705 MHz	24000\F (kHz)	30
1.705 – 30.00 MHz	30	30
30.00 – 88.00 MHz	100	3
88.00 – 216.0 MHz	150	3
216.0 – 960.0 MHz	200	3
Above 960.0 MHz	500	3

Table 7-27. Radiated Limits

Test Procedures Used

ANSI C63.10:2020 – Sections 12.7.7.2, 12.7.6, 12.7.5 (Radiated Spurious Emissions)
ANSI C63.10:2020 – Section 12.7.4.4 (Band Edge Measurements)

Test Settings – Above 1GHz

Average Field Strength Measurements (Method AD – Average Detection)

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest.
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = power average (RMS)
5. Number of measurement points = 1001 (Number of points must be ≥ 2 x span\\RBW)
6. Sweep time = auto
7. Trace (RMS) averaging was performed over at least 100 traces.

Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest.
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize.

Test Settings – Below 1GHz

Quasi-Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest.
2. RBW = 120kHz (for emissions from 30MHz – 1GHz)
3. Detector = quasi-peak
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize.

Test Setup

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

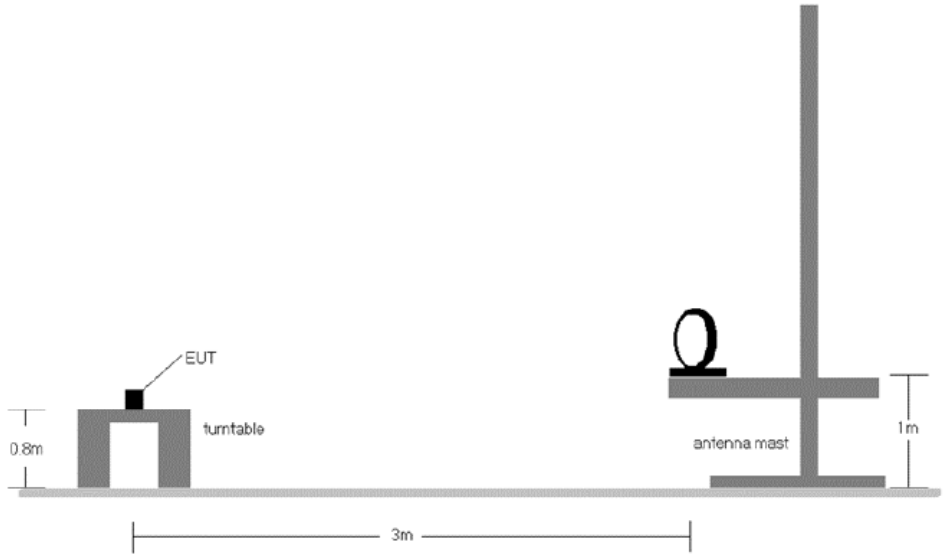


Figure 7-5. Radiated Test Setup < 30MHz

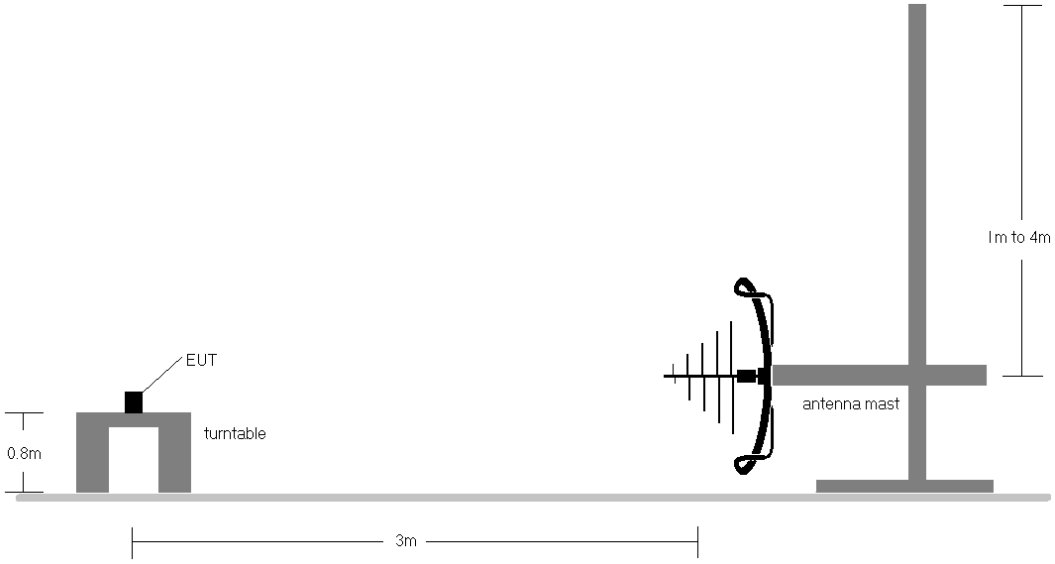


Figure 7-6. Radiated Test Setup < 1GHz

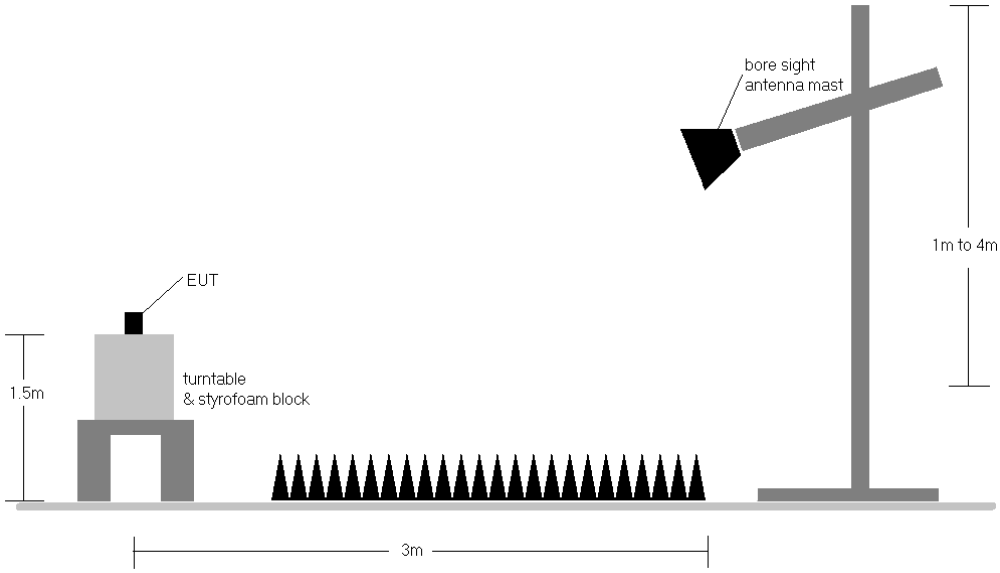


Figure 7-7. Radiated Test Setup > 1GHz

Test Notes

1. All spurious emissions lying in restricted bands specified in §15.205 are below the limit shown in §15.209. All spurious emissions that do not lie in a restricted band are subject to an average limit of -27dBm/MHz. At 3 meters, the field strength limit in dBμV/m can be determined by adding a “conversion” factor of 95.2dB to the EIRP limit of -27dBm/MHz to obtain the limit for out of band spurious emissions of 68.2dBμV/m.
2. All spurious emissions that do not lie in a restricted band are subject to a peak limit not to exceed 20dB of the average limit [68.2dBμV/m]. If a peak measurement passes the average limit, it was determined no further investigation is necessary.
3. The antenna is manipulated through typical positions, polarity, and length during the tests. The EUT is manipulated through three orthogonal planes.
4. This unit was tested with its standard battery.
5. The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter using CISPR quasi peak detector below 1GHz. Above 1 GHz, average and peak measurements were taken using linearly polarized horn antennas. The worst-case emissions are reported, however emissions whose levels were not within 20dB of the respective limits were not reported.
6. Emissions below 18GHz were measured at a 3-meter test distance while emissions above 18GHz were measured at a 1-meter test distance with the application of a distance correction factor.
7. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. Any emissions found to be within 20dB of the limit are fully investigated and the results are shown in this section.
8. The "-" shown in the following RSE tables are used to denote a noise floor measurement.
9. In the case where a peak-detector measurement passed the given RMS limit it was determined sufficient to demonstrate compliance.
10. The results recorded using the broadband antenna are known to correlate with the results obtained by using a tuned dipole with an acceptable degree of accuracy. The VSWR for the measurement antenna was found to be less than 2:1.
11. For radiated measurements, emissions were investigated for the fully-loaded RU configuration and for all of the partially-loaded RU configurations. Among all of the available partially-loaded RU configurations, only the configuration with the worst case emissions is reported.
12. In this section, plots showing measurements shown as "channel power" are recorded using the integration methods described in Section 11.12.3.2 of ANSI C63.10:2020 for average and peak measurements as allowed per Section 12.7.4.4.1. Also, the average measurements include the duty cycle correction factor shown in Section 2.2 of this report.

Sample Calculations

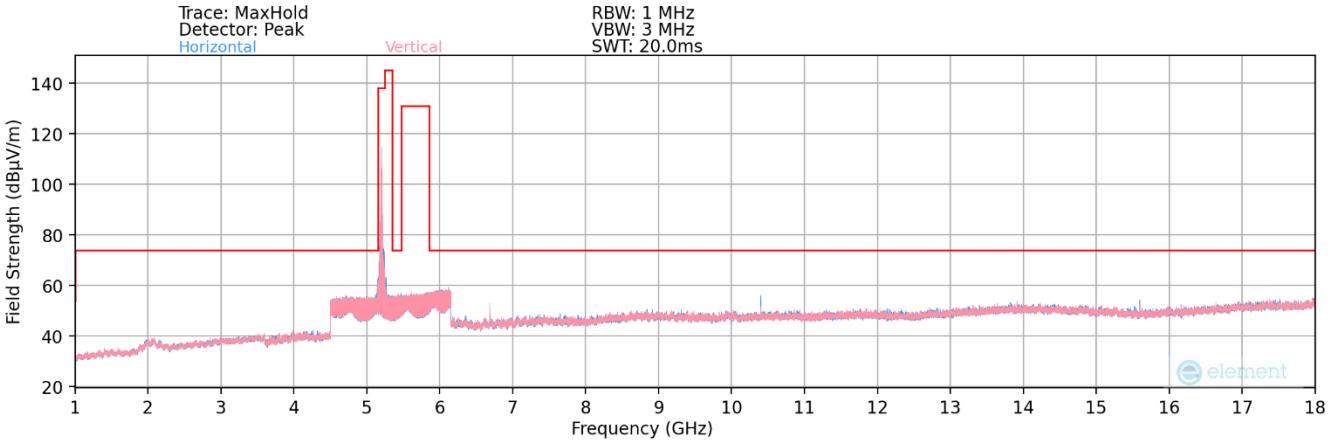
Determining Spurious Emissions Levels

- Field Strength Level [dBµV/m] = Analyzer Level [dBm] + 107 + AFCL [dB/m]
- AFCL [dB/m] = Antenna Factor [dB/m] + Cable Loss [dB]
- Margin [dB] = Field Strength Level [dBµV/m] – Limit [dBµV/m]

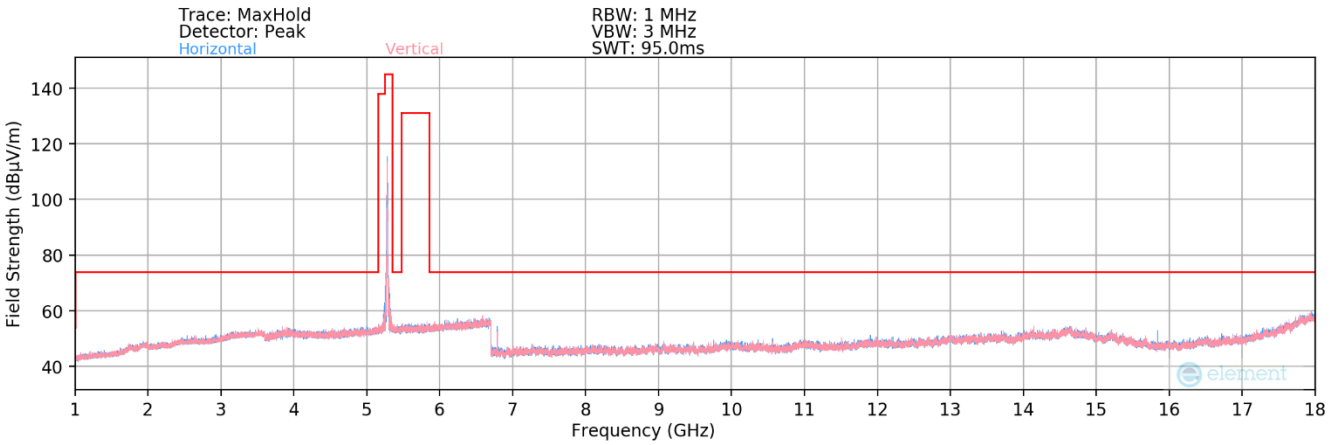
Radiated Band Edge Measurement Offset

- The amplitude offset shown in the radiated restricted band edge plots in Section Radiated Spurious Emission Measurements – Above 1GHz was calculated using the formula:
  Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

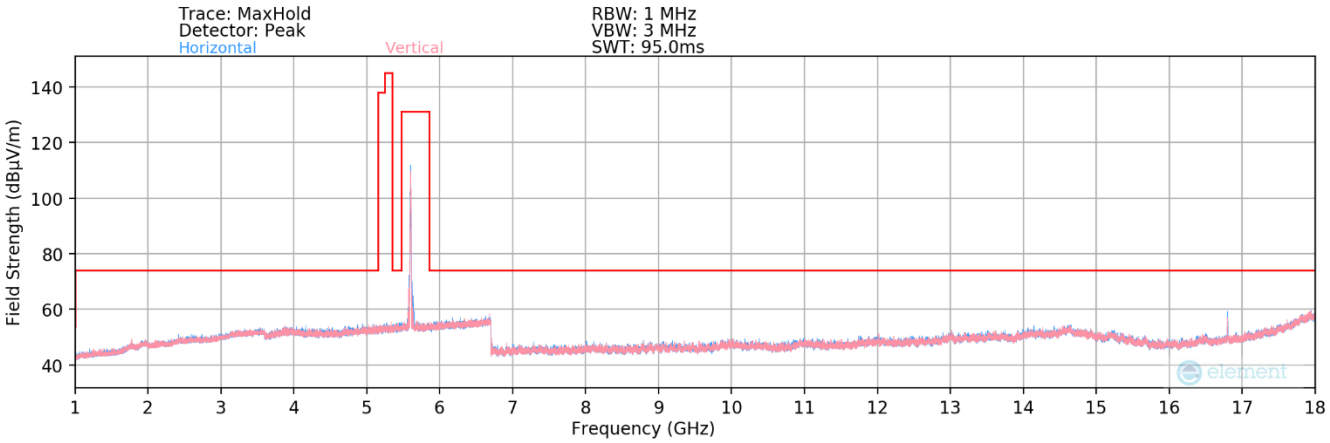
7.6.1 MIMO Radiated Spurious Emission Measurements (26 Tones)



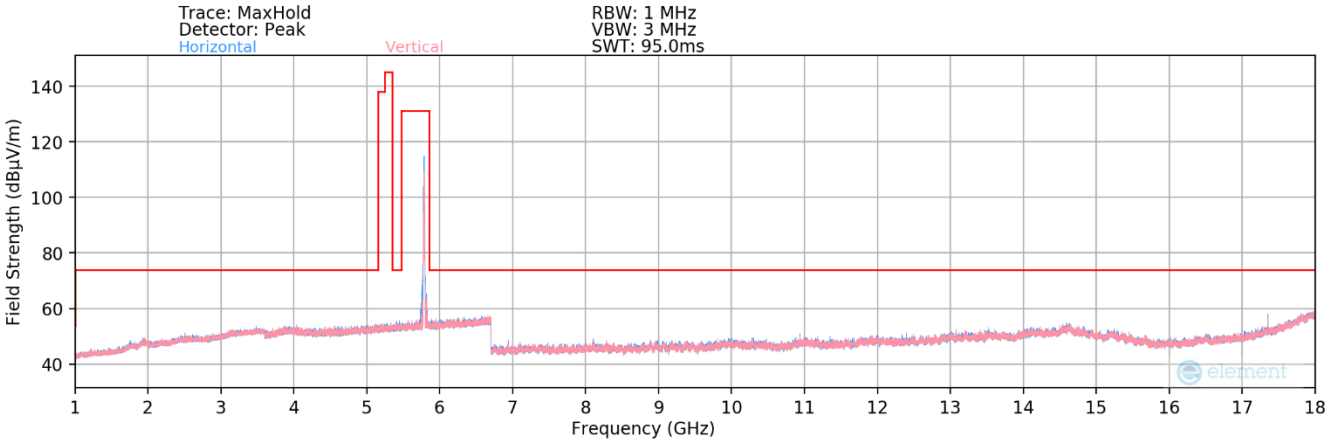
Plot 7-91. Radiated Spurious Plot above 1GHz MIMO (802.11ax – UNII 1 Ch. 40)



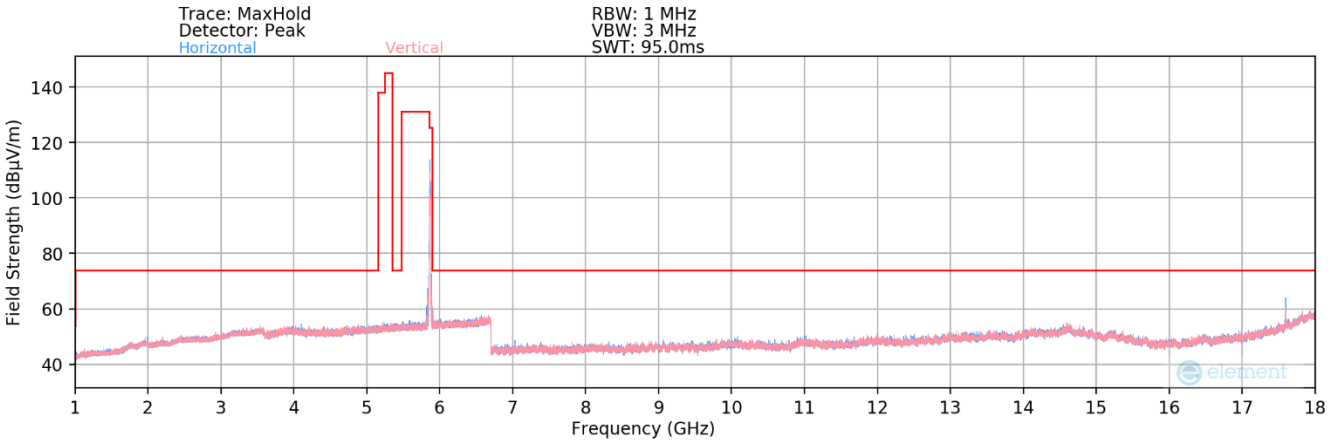
Plot 7-92. Radiated Spurious Plot above 1GHz MIMO (802.11ax – UNII 2A Ch. 56)



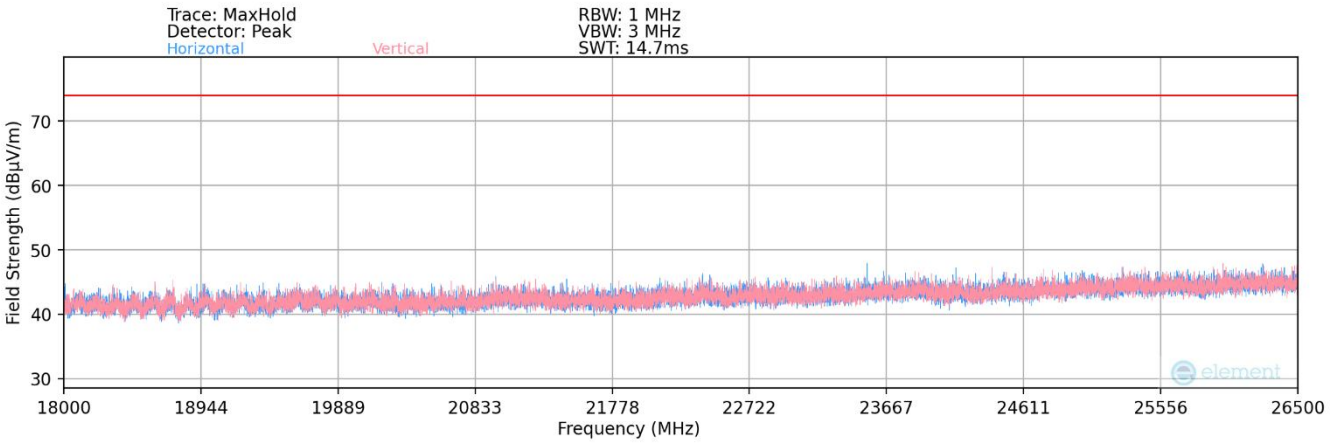
Plot 7-93. Radiated Spurious Plot above 1GHz MIMO (802.11ax – UNII 2C Ch. 120)



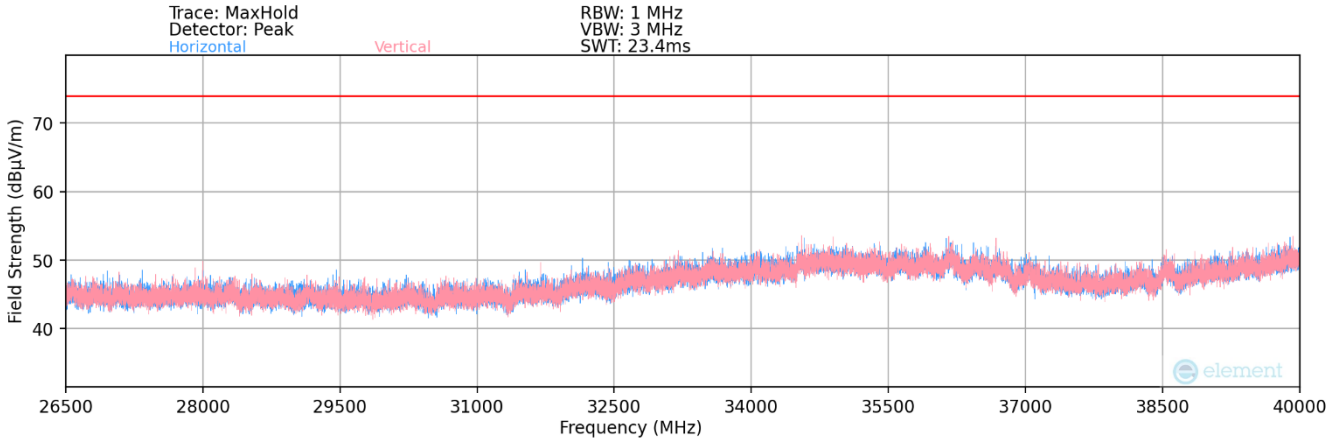
Plot 7-94. Radiated Spurious Plot above 1GHz MIMO (802.11ax – UNII 3 Ch. 157)



Plot 7-95. Radiated Spurious Plot above 1GHz MIMO (802.11ax – UNII 4 Ch. 173)



Plot 7-96. Radiated Spurious Plot 18GHz - 26.5GHz (802.11ax)



Plot 7-97. Radiated Spurious Plot 26.5GHz - 40GHz (802.11ax)

MIMO Radiated Spurious Emission Measurements (26 Tones) – UNII 1

Mode	Antenna	UNII Band	Channel	Test Channel Freq. [MHz]	RU Index	Restricted	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
802.11ax	MIMO	1	36	5180	4		10360.00	Peak	H	205	359	-59.25	9.03	0.00	56.78	68.20	-11.42
						*	15540.00	Average	H	-	-	-76.59	9.39	0.00	39.80	53.98	-14.18
						*	15540.00	Peak	H	-	-	-61.06	9.39	0.00	55.33	73.98	-18.65
						*	20720.00	Average	H	150	22	-60.48	2.48	-9.54	39.46	53.98	-14.52
						*	20720.00	Peak	H	150	22	-50.72	2.48	-9.54	49.22	73.98	-24.76
							25900.00	Peak	H	150	332	-52.15	4.78	-9.54	50.09	68.20	-18.11
			40	5200	4		10400.00	Peak	H	208	357	-59.84	8.59	0.00	55.75	68.20	-12.45
							6685.50	Peak	H	133	271	-59.76	8.04	0.00	55.28	68.20	-12.92
						*	15600.00	Average	H	126	33	-75.77	8.83	0.00	40.06	53.98	-13.92
						*	15600.00	Peak	H	126	33	-60.57	8.83	0.00	55.26	73.98	-18.72
						*	20800.00	Average	H	150	21	-60.06	2.52	-9.54	39.92	53.98	-14.06
						*	20800.00	Peak	H	150	21	-49.70	2.52	-9.54	50.28	73.98	-23.70
							26000.00	Peak	H	150	332	-51.45	4.78	-9.54	50.79	68.20	-17.41
			48	5240	4		10480.00	Peak	H	192	359	-61.39	7.98	0.00	53.59	68.20	-14.61
						*	15720.00	Average	H	116	35	-76.81	9.20	0.00	39.39	53.98	-14.59
						*	15720.00	Peak	H	116	35	-62.19	9.20	0.00	54.01	73.98	-19.97
						*	20960.00	Average	H	150	24	-62.20	2.84	-9.54	38.10	53.98	-15.88
						*	20960.00	Peak	H	150	24	-52.10	2.84	-9.54	48.20	73.98	-25.78
							26200.00	Peak	H	150	332	-52.12	4.91	-9.54	50.25	68.20	-17.95

Table 7-28. Radiated Measurements MIMO (26 Tones)

MIMO Radiated Spurious Emission Measurements (26 Tones) – UNII 2A

Mode	Antenna	UNII Band	Channel	Test Channel Freq. [MHz]	RU Index	Restricted	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
802.11ax	MIMO	2A	52	5260	4		10520.00	Peak	H	179	361	-62.86	8.04	0.00	52.18	68.20	-16.02
						*	15780.00	Average	H	123	37	-76.51	8.85	0.00	39.34	53.98	-14.64
						*	15780.00	Peak	H	123	37	-63.86	8.85	0.00	51.99	73.98	-21.99
						*	21040.00	Average	H	150	24	-61.60	2.92	-9.54	38.78	53.98	-15.20
						*	21040.00	Peak	H	150	24	-50.12	2.92	-9.54	50.26	73.98	-23.72
							26300.00	Peak	H	150	340	-53.32	4.91	-9.54	49.05	68.20	-19.15
			56	5280	4		10560.00	Peak	H	191	359	-62.85	7.52	0.00	51.67	68.20	-16.53
							6788.50	Peak	H	153	82	-54.81	3.67	0.00	55.86	68.20	-12.34
						*	15840.00	Average	H	133	34	-77.04	8.96	0.00	38.92	53.98	-15.06
						*	15840.00	Peak	H	133	34	-65.01	8.96	0.00	50.95	73.98	-23.03
						*	21120.00	Average	H	150	20	-61.40	2.87	-9.54	38.93	53.98	-15.05
						*	21120.00	Peak	H	150	20	-52.53	2.87	-9.54	47.80	73.98	-26.18
							26400.00	Peak	H	150	329	-53.26	4.85	-9.54	49.05	68.20	-19.15
			64	5320	4	*	10640.00	Average	H	178	368	-76.64	7.65	0.00	38.01	53.98	-15.97
						*	10640.00	Peak	H	178	368	-65.07	7.65	0.00	49.58	73.98	-24.40
						*	15960.00	Average	H	129	27	-76.79	8.91	0.00	39.12	53.98	-14.86
						*	15960.00	Peak	H	129	27	-65.29	8.91	0.00	50.62	73.98	-23.36
						*	21280.00	Average	H	150	23	-62.22	2.96	-9.54	38.20	53.98	-15.78
						*	21280.00	Peak	H	150	23	-51.91	2.96	-9.54	48.51	73.98	-25.47
							26600.00	Peak	H	150	332	-53.26	5.05	-9.54	49.25	68.20	-18.95

Table 7-29. Radiated Measurements MIMO (26 Tones)

MIMO Radiated Spurious Emission Measurements (26 Tones) – UNII 2C

Mode	Antenna	UNII Band	Channel	Test Channel Freq. [MHz]	RU Index	Restricted	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
802.11ax	MIMO	2C	100	5500	4	*	11000.00	Average	H	-	-	-77.79	8.27	0.00	37.48	53.98	-16.50
						*	11000.00	Peak	H	-	-	-66.34	8.27	0.00	48.93	73.98	-25.05
							16500.00	Peak	H	143	365	-60.85	9.57	-9.54	46.18	68.20	-22.02
							22000.00	Peak	H	150	16	-54.67	3.01	-9.54	45.80	68.20	-22.40
							27500.00	Peak	H	150	352	-50.56	5.00	-9.54	51.90	68.20	-16.30
			120	5600	4	*	11200.00	Average	H	135	76	-77.65	8.47	0.00	37.82	53.98	-16.16
						*	11200.00	Peak	H	135	76	-65.86	8.47	0.00	49.61	73.98	-24.37
							6720.00	Peak	H	159	85	-58.45	3.56	0.00	52.11	73.98	-21.87
							16800.00	Peak	H	138	367	-56.11	10.15	0.00	61.04	68.20	-7.16
						*	22400.00	Average	H	150	300	-64.23	3.44	-9.54	36.67	53.98	-17.31
						*	22400.00	Peak	H	150	300	-53.47	3.44	-9.54	47.43	73.98	-26.55
							28000.00	Peak	H	150	342	-49.53	5.31	-9.54	53.24	68.20	-14.96
			144	5720	4	*	11440.00	Average	H	233	68	-77.61	8.87	0.00	38.26	53.98	-15.72
						*	11440.00	Peak	H	233	68	-66.26	8.87	0.00	49.61	73.98	-24.37
							17160.00	Peak	H	156	363	-58.40	11.37	0.00	59.97	68.20	-8.23
						*	22880.00	Average	H	150	300	-64.58	3.60	-9.54	36.48	53.98	-17.50
						*	22880.00	Peak	H	150	300	-53.60	3.60	-9.54	47.46	73.98	-26.52
							28600.00	Peak	H	150	340	-53.19	5.30	-9.54	49.57	68.20	-18.63

Table 7-30. Radiated Measurements MIMO (26 Tones)

MIMO Radiated Spurious Emission Measurements (26 Tones) – UNII 3

Mode	Antenna	UNII Band	Channel	Test Channel Freq. [MHz]	RU Index	Restricted	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
802.11ax	MIMO	3	149	5745	4	*	11490.00	Average	H	175	63	-77.19	8.68	0.00	38.49	53.98	-15.49
						*	11490.00	Peak	H	175	63	-65.27	8.68	0.00	50.41	73.98	-23.57
							17235.00	Peak	H	158	359	-57.24	11.54	0.00	61.30	68.20	-6.90
						*	22980.00	Average	H	150	304	-65.10	3.63	-9.54	35.99	53.98	-17.99
						*	22980.00	Peak	H	150	304	-54.50	3.63	-9.54	46.59	73.98	-27.39
							28725.00	Peak	H	150	341	-51.95	5.24	-9.54	50.75	68.20	-17.45
			157	5785	4	*	11570.00	Average	H	157	62	-77.63	8.86	0.00	38.23	53.98	-15.75
						*	11570.00	Peak	H	157	62	-66.20	8.86	0.00	49.66	73.98	-24.32
							6942.00	Peak	H	133	18	-58.85	4.42	0.00	52.57	73.98	-21.41
							17355.00	Peak	H	163	358	-57.34	12.31	0.00	61.97	68.20	-6.23
							23140.00	Peak	H	150	301	-53.80	3.75	-9.54	47.41	68.20	-20.79
							28925.00	Peak	H	150	13	-52.97	5.12	-9.54	49.61	68.20	-18.59
			165	5825	4	*	11650.00	Average	H	214	68	-77.57	9.02	0.00	38.45	53.98	-15.53
						*	11650.00	Peak	H	214	68	-65.57	9.02	0.00	50.45	73.98	-23.53
							17475.00	Peak	H	193	363	-60.20	13.45	0.00	60.25	68.20	-7.95
							23300.00	Peak	H	150	16	-54.41	3.73	-9.54	46.78	68.20	-21.42
							29125.00	Peak	H	150	14	-53.77	5.23	-9.54	48.92	68.20	-19.28

Table 7-31. Radiated Measurements MIMO (26 Tones)

MIMO Radiated Spurious Emission Measurements (26 Tones) – UNII 4

Mode	Antenna	UNII Band	Channel	Test Channel Freq. [MHz]	RU Index	Restricted	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
802.11ax	MIMO	4	169	5845	4	*	11690.00	Average	H	189	65	-77.49	9.35	0.00	38.86	53.98	-15.12
						*	11690.00	Peak	H	189	65	-66.29	9.35	0.00	50.06	73.98	-23.92
							17535.00	Peak	H	159	84	-61.92	14.13	0.00	59.21	68.20	-8.99
							23380.00	Peak	H	150	17	-53.27	3.80	-9.54	47.99	68.20	-20.21
							29225.00	Peak	H	150	337	-52.25	5.22	-9.54	50.43	68.20	-17.77
			173	5865	4	*	11730.00	Average	H	301	55	-77.88	9.85	0.00	38.97	53.98	-15.01
						*	11730.00	Peak	H	301	55	-66.46	9.85	0.00	50.39	73.98	-23.59
							17595.00	Peak	H	168	89	-61.45	14.67	0.00	60.22	68.20	-7.98
							7038.00	Peak	H	114	86	-59.51	3.72	0.00	51.21	68.20	-16.99
							23460.00	Peak	H	150	14	-53.67	3.86	-9.54	47.65	68.20	-20.55
							29325.00	Peak	H	150	335	-51.41	5.14	-9.54	51.19	68.20	-17.01
			177	5885	4	*	11770.00	Average	H	181	72	-77.05	9.95	0.00	39.90	53.98	-14.08
						*	11770.00	Peak	H	181	72	-65.76	9.95	0.00	51.19	73.98	-22.79
							17655.00	Peak	H	161	90	-61.02	14.96	0.00	60.94	68.20	-7.26
							23540.00	Peak	H	150	14	-53.22	4.01	-9.54	48.25	68.20	-19.95
							29425.00	Peak	H	150	335	-53.52	5.11	-9.54	49.05	68.20	-19.15

Table 7-32. Radiated Measurements MIMO (26 Tones)

MIMO Radiated Spurious Emission Measurements (26 Tones) – With WCP

Mode	Antenna	UNII Band	Channel	Test Channel Freq. [MHz]	RU Index	Restricted	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
802.11ax	MIMO	3	157	5785	4	*	11570.00	Average	H	-	-	-79.35	8.86	0.00	36.51	53.98	-17.47
						*	11570.00	Peak	H	-	-	-66.87	8.86	0.00	48.99	73.98	-24.99
							17355.00	Peak	H	-	-	-65.10	12.31	0.00	54.21	68.20	-13.99

Table 7-33. Radiated Measurements MIMO with WCP (26 Tones)