

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

Applicant Name:
Microsoft Corporation
One Microsoft Way
Redmond, WA 98052
United States

Date of Testing:
12/14/2023 - 04/11/2024
Test Report Issue Date:
4/11/2024
Test Site/Location:
Element lab., Columbia, MD, USA
Test Report Serial No.:
1M2312040120-20.C3K

FCC ID:	C3K2077
APPLICANT:	Microsoft Corporation

Application Type: Certification
Model: 2077
EUT Type: Portable Computing Device
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 C63.10-2013

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

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



R.J. Ortanez
Executive Vice President



FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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Channel Bandwidth [MHz]	UNII Band	Tx Frequency [MHz]	MIMO	
			Max. Power [mW]	Max. Power [dBm]
20	1	5180 - 5240	166.95	22.23
	2A	5260 - 5320	166.52	22.21
	2C	5500 - 5720	158.48	22.00
	3	5745 - 5825	230.66	23.63
	4	5845 - 5885	576.96	27.61
40	1	5190 - 5230	118.77	20.75
	2A	5270 - 5310	61.46	17.89
	2C	5510 - 5710	131.17	21.18
	3	5755 - 5795	104.91	20.21
	4	5835 - 5875	803.65	29.05
80	1	5210	66.03	18.20
	2A	5290	54.52	17.37
	2C	5530 - 5690	129.03	21.11
	3	5775	105.76	20.24
	4	5855	488.79	26.89
160	1/2A	5250	50.64	17.05
	2C	5570	42.39	16.27
	3/4	5815	158.18	21.99

EUT Overview

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

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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

These measurement tests were conducted at the Element laboratory located at 7185 Oakland Mills Road, Columbia, MD 21046. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

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 (2451B) test laboratory with the site description on file with ISED.
- 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).

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Microsoft Corporation Portable Computing Device FCC ID: C3K2077**. The test data contained in this report pertains only to the emissions due to the EUT's UNII transmitter.

Test Device Serial No.: 7CDR2, B44G2, B44D2, 7CF42, 7CDQ2, 7CDB2

2.2 Device Capabilities

This device contains the following capabilities:

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)

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

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Notes:

- 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 C63.10-2013. 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 [%]
5GHz	20MHz	RU	26T	99.78
			52T	99.78
			106T	99.77
			242T	99.59
	40MHz	RU	26T	99.78
			52T	99.78
			106T	99.82
			242T	99.60
			484T	99.82
	80MHz	RU	26T	99.78
			52T	99.78
			106T	99.78
			242T	99.59
			484T	99.93
			996T	99.82
	160MHz	RU	26T	99.78
			52T	99.78
			106T	99.77
			242T	99.60
			484T	99.82
			996T	99.82
			2x996T	99.82

Table 2-5. Measured Duty Cycles – 11ax

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Band	Bandwidth	Tone Type	Tone Size	MIMO (1+2)
				Duty Cycle [%]
5GHz	20MHz	RU	26T	99.53
			52T	99.53
			106T	99.50
			242T	99.15
		MRU	52+26T	99.53
			106+26T	99.10
	40MHz	RU	26T	99.79
			52T	99.53
			106T	99.50
			242T	99.14
			484T	98.45
	80MHz	RU	26T	99.76
			52T	99.53
			106T	99.50
			242T	99.14
			484T	98.55
			996T	99.81
		MRU	484+242T	98.25
	160MHz	RU	26T	99.53
			52T	99.53
			106T	99.50
			242T	99.15
			484T	98.44
			996T	97.70
2x996T			97.43	
MRU		996+484T	97.98	

Table 2-6. Measured Duty Cycles – 11be

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

WiFi Configurations		SISO		SDM		CDD	
		ANT1	ANT2	ANT1	ANT2	ANT1	ANT2
5GHz	11a	✓	✓	✗	✗	✓	✓
	11n	✓	✓	✓	✓	✓	✓
	11ac	✓	✓	✓	✓	✓	✓
	11ax	✓	✓	✓	✓	✓	✓
	11be	✓	✓	✓	✓	✓	✓

Table 2-7. 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					
		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	144.1	136.1	122.5
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	288.2	272.2	245
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	432.4	408.3	367.5
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	576.5	544.4	490
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	864.7	816.7	735
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	1152.9	1088.9	980
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	1297.1	1225	1102.5
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	1512.1	1417.1	1275
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	1729.4	1633.3	1470
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	2011.7	1837.5	1665
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	2241.7	2117.1	1875
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	2402	2268.5	2041.7
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	288.2	272.2	245
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	576.5	544.4	490
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	864.7	816.7	735
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	1152.9	1088.9	980
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	1729.4	1633.3	1470
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	2305.8	2177.8	1950
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	2594.1	2452.5	2175
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	3122.4	2961.1	2625
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	4058.8	3866.6	3450
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	4512.4	4301.1	3825
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	5041.7	4781.2	4275
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	5547.1	5281.2	4725

Table 2-8. Supported Data Rates

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2.3 Antenna Description

The following antenna gains were used for the testing.

Frequency [GHz]	Antenna 1 Gain [dBi]	Antenna 2 Gain [dBi]	Directional Ant. Gain [dBi]
5.20	1.38	2.15	4.78
5.30	1.39	2.43	4.94
5.50	1.99	3.39	5.73
5.80	2.58	2.72	5.66
5.85	2.58	2.52	5.56

Table 2-9. Antenna Peak Gain

2.4 Test Configuration

ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing. See 5GHz UNII OFDM 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.

2.5 Software and Firmware

The test was conducted with software/firmware version 2024.111.46 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.

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

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

Deviation from measurement procedure.....None

3.2 Radiated Emissions

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

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

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

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

3.3 Environmental Conditions

The temperature is controlled within range of 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).

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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.

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5.0 MEASUREMENT UNCERTAINTY

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

Contribution	Expanded Uncertainty (\pm 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

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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
N/A	WL25-1	Conducted Cable Set (25GHz)	11/15/2023	Annual	11/15/2024	WL25-1
N/A	WL25-2	WLAN Cable Set (25GHz)	11/15/2023	Annual	11/15/2024	WL25-2
N/A	WL40-1	WLAN Cable Set (40GHz)	11/15/2023	Annual	11/15/2024	WL40-1
N/A	ETS-001	EMC Cable and Switch System	11/15/2023	Annual	11/15/2024	ETS-001
N/A	ETS-002	EMC Cable and Switch System	11/15/2023	Annual	11/15/2024	ETS-002
N/A	AP1-002	EMC Cable and Switch System	11/15/2023	Annual	11/15/2024	AP1-002
N/A	AP2-001	EMC Cable and Switch System	11/15/2023	Annual	11/15/2024	AP2-001
N/A	AP2-002	EMC Cable and Switch System	11/15/2023	Annual	11/15/2024	AP2-002
Anritsu	MA2411B	Pulse Power Sensor	11/8/2023	Annual	11/8/2024	1027293
Anritsu	MA2411B	Pulse Power Sensor	6/14/2023	Annual	6/14/2024	1911105
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	4/13/2022	Biennial	4/13/2024	121034
Keysight Technologies	N9038A	MXE EMI Receiver	8/30/2023	Annual	8/30/2024	MY51210133
Keysight Technologies	N9030A	PXA Signal Analyzer	2/29/2024	Annual	3/1/2025	MY55410501
Keysight Technologies	N9020A	MXA Signal Analyzer	3/15/2023	Annual	3/15/2024	MY54500644
Pasternack	NMLC-2	Line Conducted Emissions Cable (NM)	11/15/2023	Annual	11/15/2024	NMLC-2
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	9/25/2023	Annual	9/25/2024	100342
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	9/11/2023	Annual	9/11/2024	100348
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	2/15/2024	Annual	2/15/2025	103200
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	3/15/2023	Biennial	3/15/2025	102136
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	3/15/2023	Biennial	3/15/2025	102132
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	1/11/2024	Annual	1/11/2025	102151
Sunol Sciences	DRH-118	Horn (Small)	2/21/2024	Biennial	2/21/2026	A050307
Sunol Sciences	JB5	Bi-Log Antenna (30M-5GHz)	8/30/2022	Biennial	8/30/2024	A051107

Table 6-1. Annual Test Equipment Calibration Schedule

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.

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7.0 TEST RESULTS

7.1 Summary

Company Name: Microsoft Corporation
 FCC ID: C3K2077
 FCC Classification: Unlicensed National Information Infrastructure (UNII)

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
N/A	RSS-Gen [6.7]	26dB Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
15.407€	RSS-Gen [6.7]	6dB Bandwidth	>500kHz (5725-5850MHz and 5850 – 5895MHz)		PASS	Section 7.3
15.407 (a)(1)(iv), (a)(2), (a)(3)	RSS-247 [6.2]	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)(1)(iv), (a)(2), (a)(3)	RSS-247 [6.2]	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)	RSS-247 [6.3]	Dynamic Frequency Selection	See DFS Test Report		PASS	See DFS Test Report
15.407(b)(1), (b)(2), (b)(3), (b)(4)	RSS-247 [6.2]	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)(4), (b)(5), (b)(6)	RSS-Gen [8.9]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS-Gen [8.9])		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 “EMC Software Tool,” Version 1.2.1.
- 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 1.6.4.
- 6) 802.11ax/be 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.

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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 C63.10-2013, 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 C63.10-2013 – Section 12.4

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 $\geq 3 \times$ 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.

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MIMO 26dB Bandwidth Measurements

	Frequency [MHz]	802.11 MODE	Channel	Antenna-1 26dB Bandwidth [MHz]	Antenna-2 26dB Bandwidth [MHz]
Band 1	5180	be (20MHz)	36	18.53	18.16
	5200	be (20MHz)	40	18.20	18.30
	5240	be (20MHz)	48	18.37	18.30
	5190	be (40MHz)	38	39.56	40.45
	5230	be (40MHz)	46	39.76	39.36
	5210	be (80MHz)	42	80.78	79.85
Band 1/2A	5250	be (160MHz)	50	160.34	160.92
Band 2A	5260	be (20MHz)	52	18.45	18.26
	5280	be (20MHz)	56	18.58	18.21
	5320	be (20MHz)	64	18.35	18.28
	5270	be (40MHz)	54	39.83	39.38
	5310	be (40MHz)	62	39.37	39.34
	5290	be (80MHz)	58	80.05	80.17
Band 2C	5500	be (20MHz)	100	18.70	18.46
	5600	be (20MHz)	120	18.55	18.41
	5720	be (20MHz)	144	18.74	18.21
	5510	be (40MHz)	102	39.38	40.24
	5590	be (40MHz)	118	39.67	39.50
	5710	be (40MHz)	142	40.71	39.56
	5530	be (80MHz)	106	80.68	79.98
	5610	be (80MHz)	122	80.29	80.30
	5690	be (80MHz)	138	80.01	80.09
	5570	be (160MHz)	114	160.16	162.38

Table 7-2. Bands 1, 2A, 2C Conducted 26dB Bandwidth Measurements MIMO ANT1/2 (26 Tones)

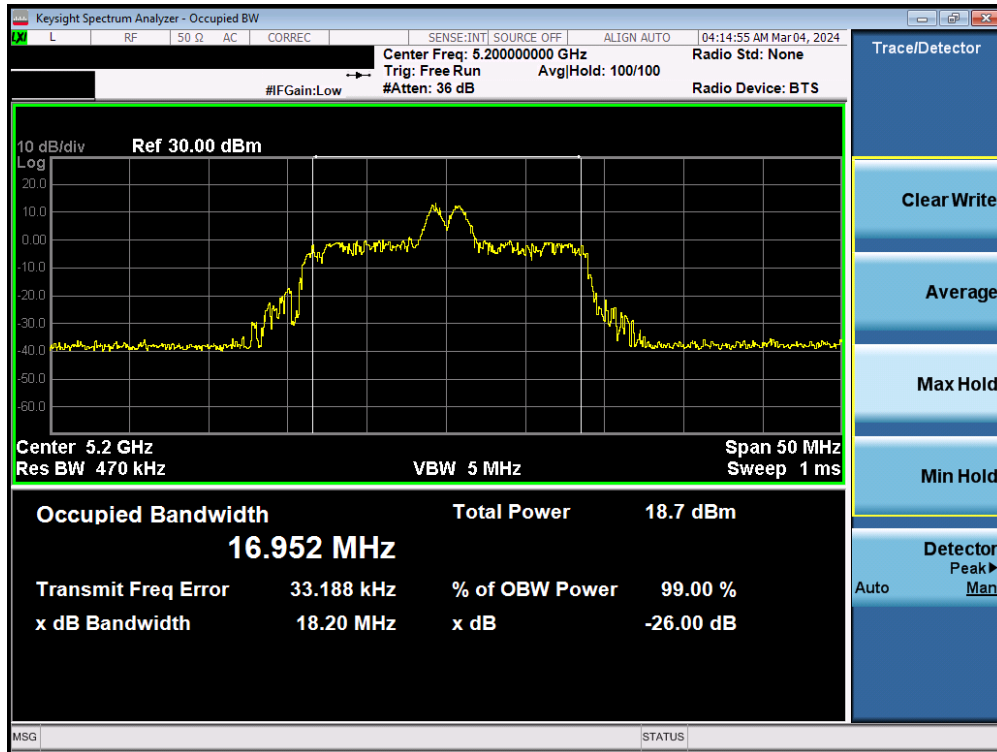
FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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	Frequency [MHz]	802.11 MODE	Channel	Antenna-1 26dB Bandwidth [MHz]	Antenna-2 26dB Bandwidth [MHz]
Band 1	5180	be (20MHz)	36	22.23	22.21
	5200	be (20MHz)	40	22.55	21.80
	5240	be (20MHz)	48	22.22	22.38
	5190	be (40MHz)	38	44.61	44.06
	5230	be (40MHz)	46	44.31	43.63
	5210	be (80MHz)	42	92.15	90.54
Band 1/2A	5250	be (160MHz)	50	175.88	173.40
Band 2A	5260	be (20MHz)	52	22.12	22.49
	5280	be (20MHz)	56	22.08	22.12
	5320	be (20MHz)	64	22.10	22.25
	5270	be (40MHz)	54	44.52	44.79
	5310	be (40MHz)	62	43.84	44.33
	5290	be (80MHz)	58	94.28	90.46
Band 2C	5500	be (20MHz)	100	21.98	22.25
	5600	be (20MHz)	120	22.21	22.00
	5720	be (20MHz)	144	21.90	22.34
	5510	be (40MHz)	102	45.85	44.46
	5590	be (40MHz)	118	45.56	43.37
	5710	be (40MHz)	142	44.97	44.30
	5530	be (80MHz)	106	93.95	90.03
	5610	be (80MHz)	122	91.70	88.68
	5690	be (80MHz)	138	91.93	86.79
	5570	be (160MHz)	114	175.00	173.08

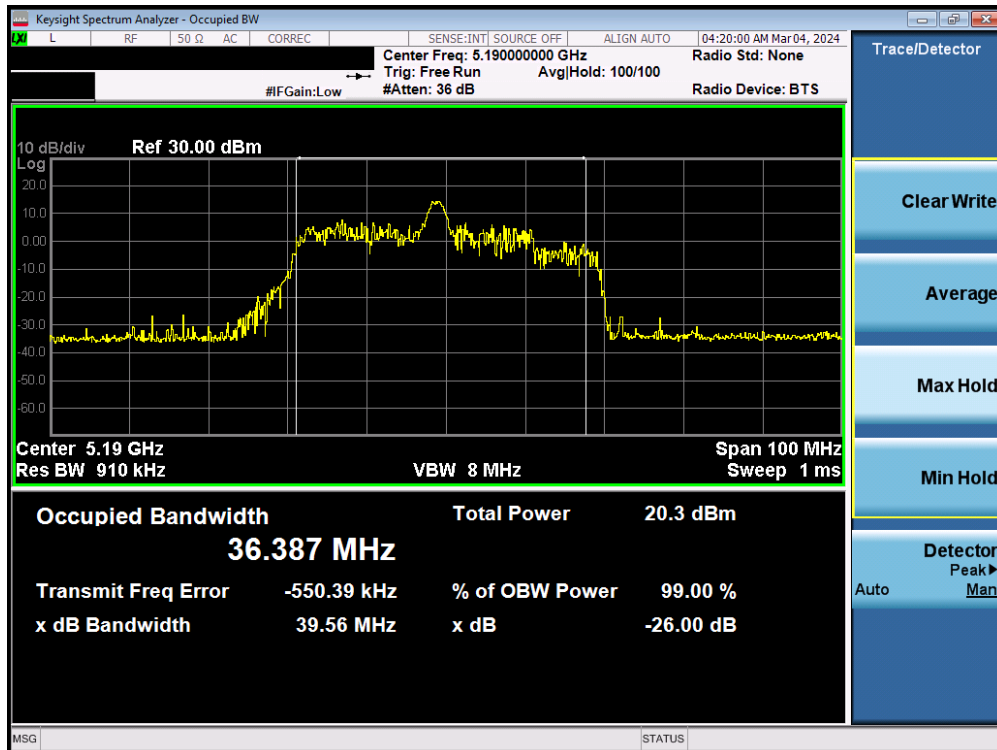
Table 7-3. Bands 1, 2A, 2C Conducted 26dB Bandwidth Measurements MIMO ANT1/2 (Full Tones)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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7.2.1 MIMO Antenna-1 26dB Bandwidth Measurements

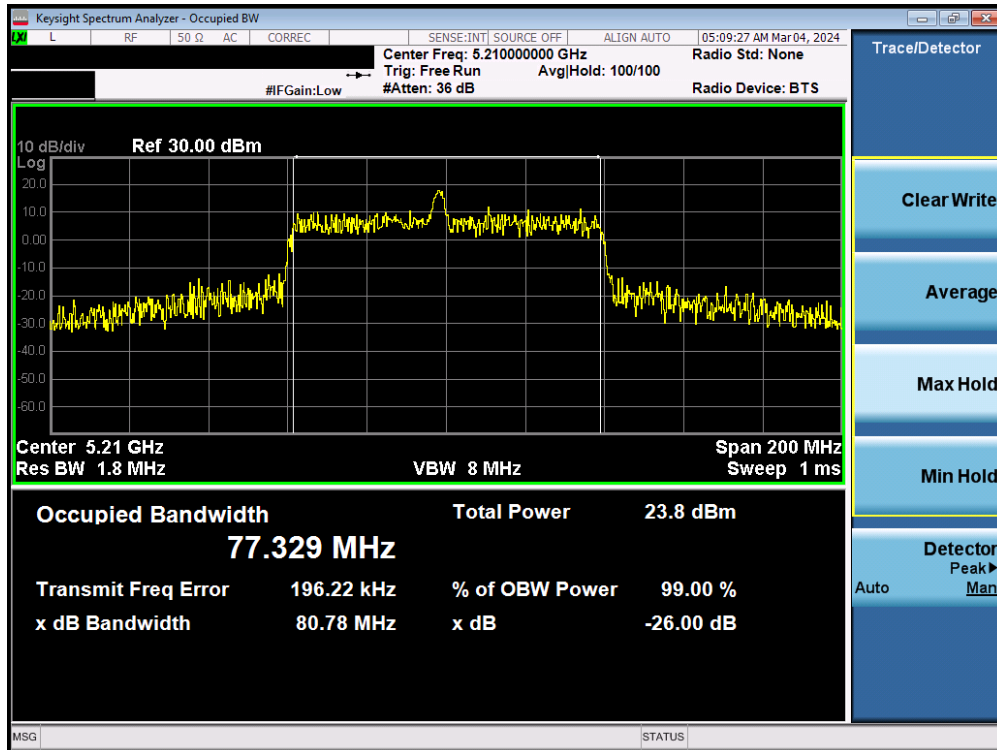


Plot 7-1. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11be – 26 Tones (UNII Band 1) – Ch. 40)

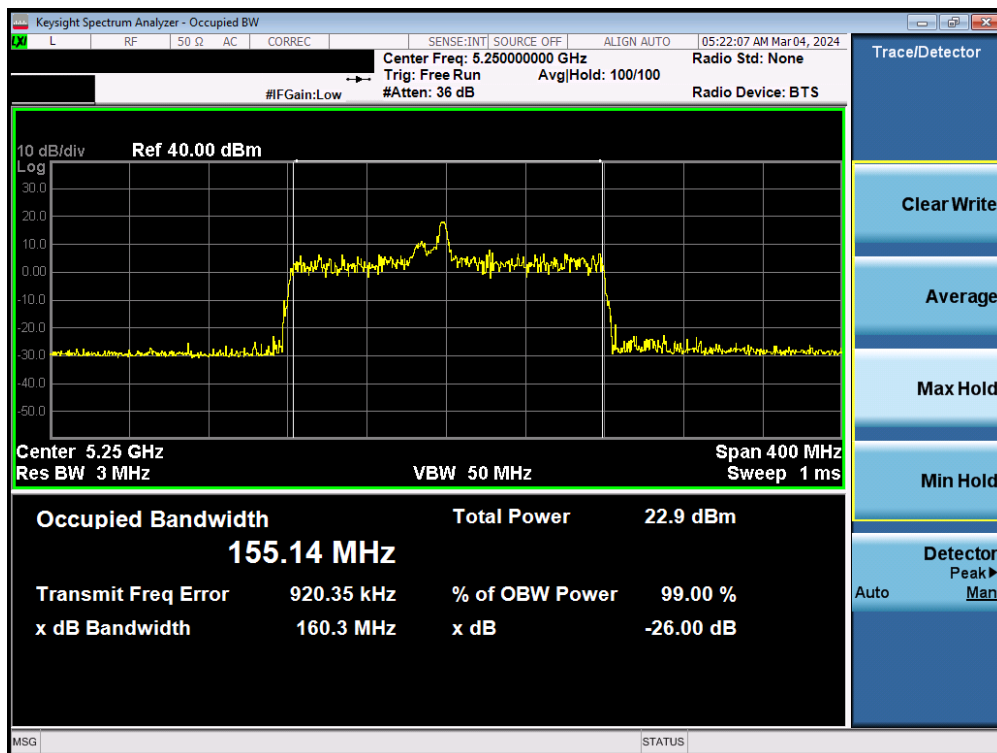


Plot 7-2. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11be – 26 Tones (UNII Band 1) – Ch. 38)

FCC ID: C3K2077		MEASUREMENT REPORT		Approved by: Technical Manager
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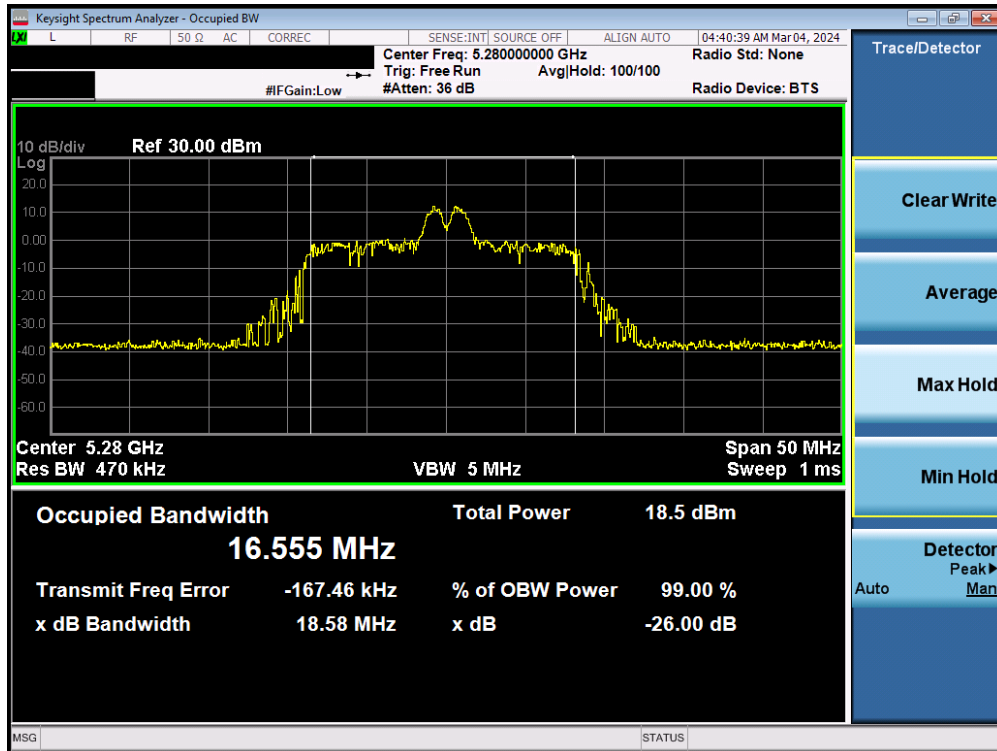


Plot 7-3. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11be – 26 Tones (UNII Band 1) – Ch. 42)

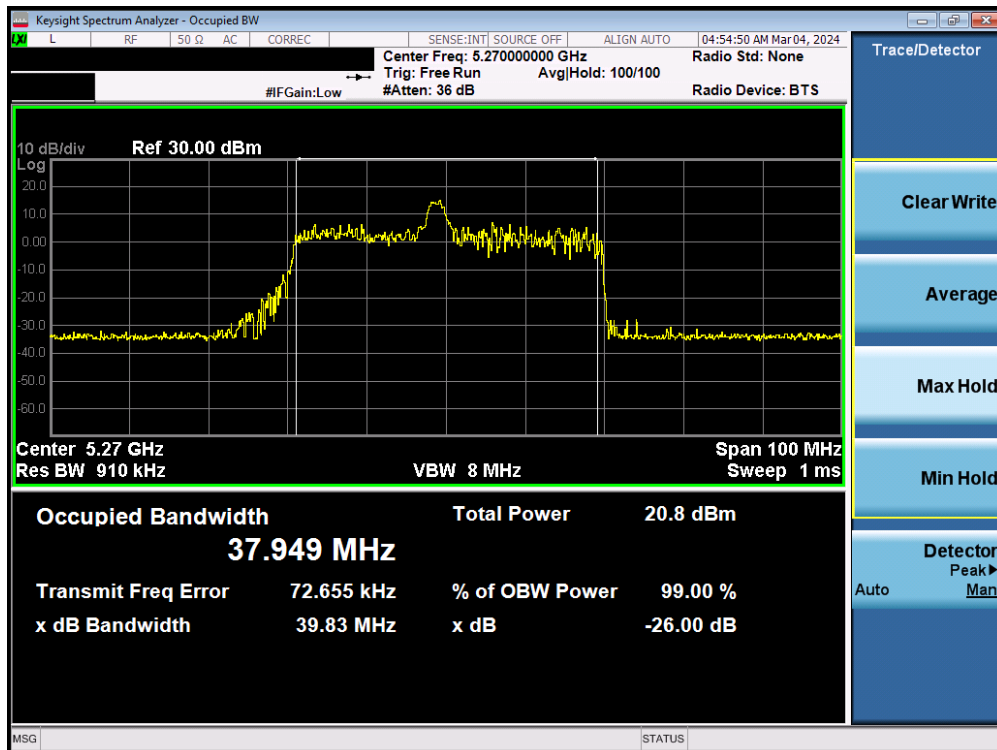


Plot 7-4. 26dB Bandwidth Plot MIMO ANT1 (160MHz BW 802.11be – 26 Tones (UNII Band 1/2A) – Ch. 50)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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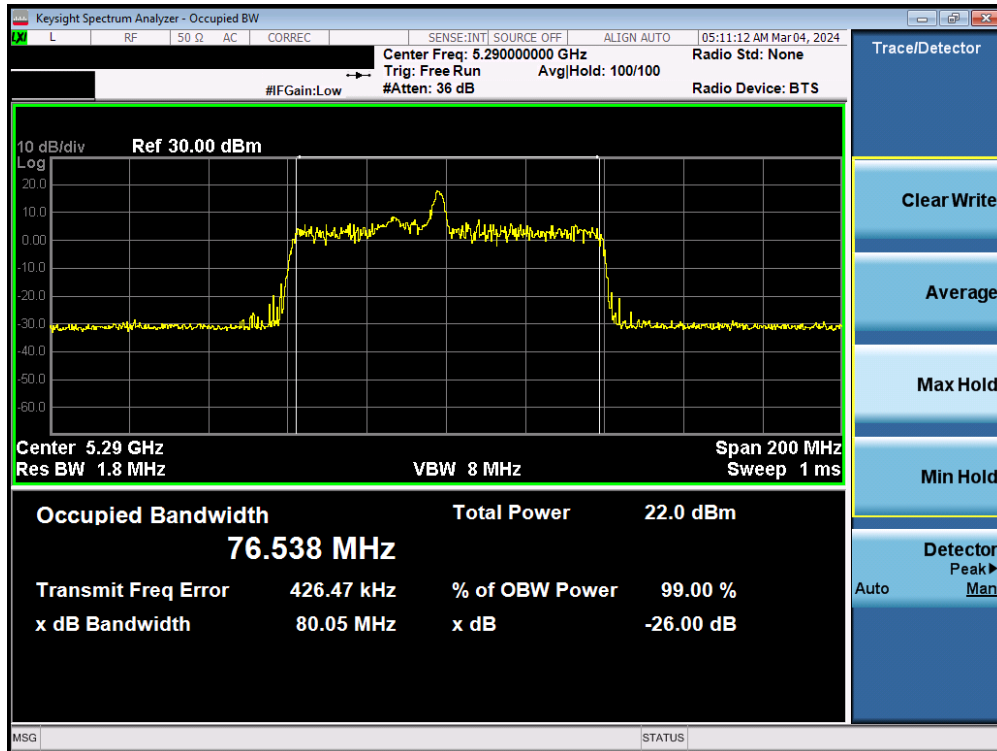


Plot 7-5. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11be – 26 Tones (UNII Band 2A) – Ch. 56)

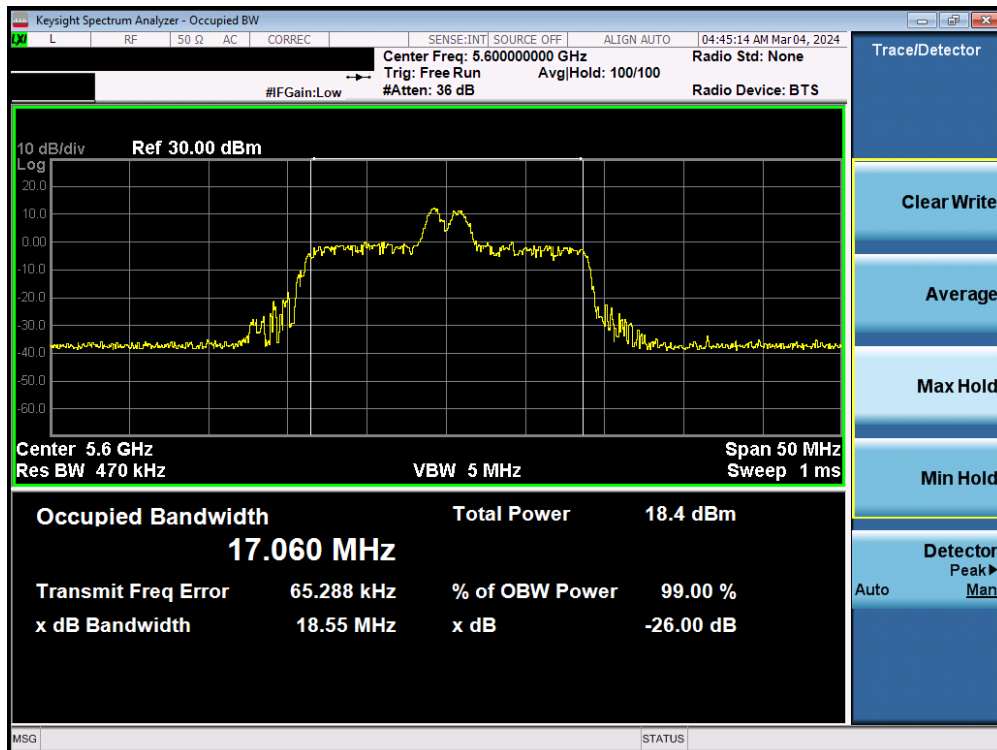


Plot 7-6. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11be – 26 Tones (UNII Band 2A) – Ch. 54)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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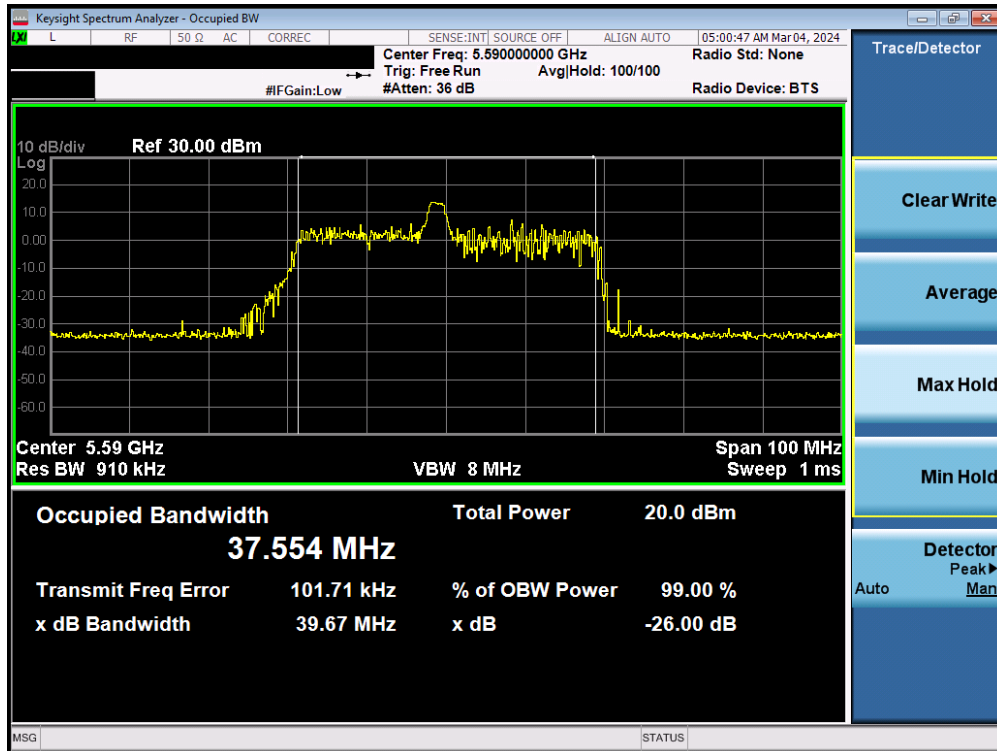


Plot 7-7. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11be – 26 Tones (UNII Band 2A) – Ch. 58)

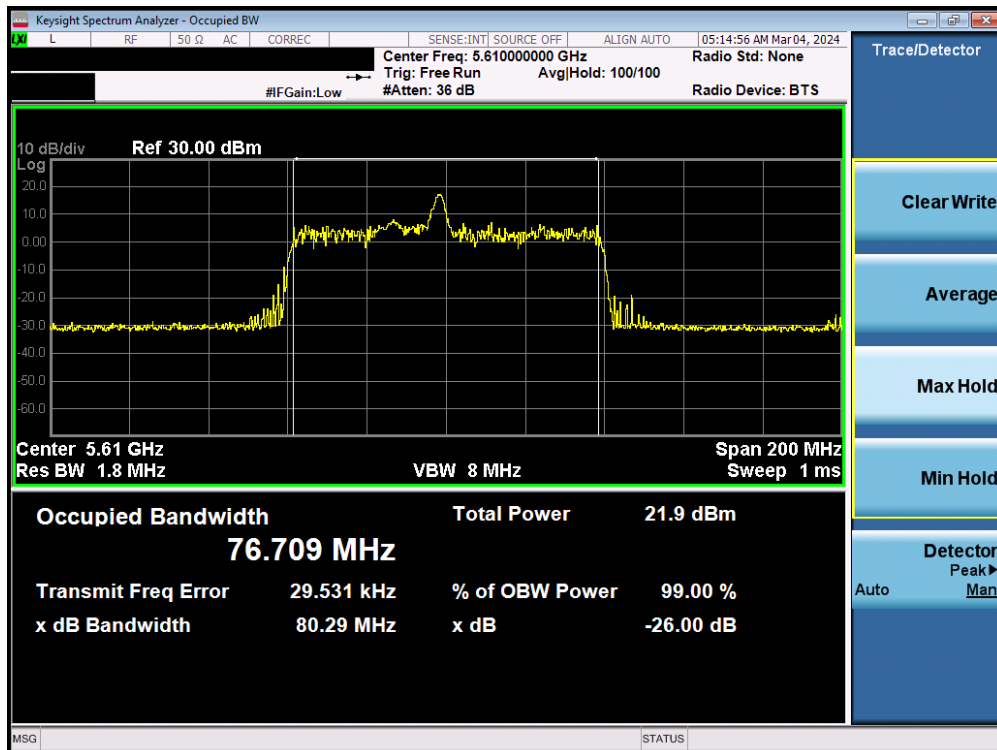


Plot 7-8. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11be – 26 Tones (UNII Band 2C) – Ch. 120)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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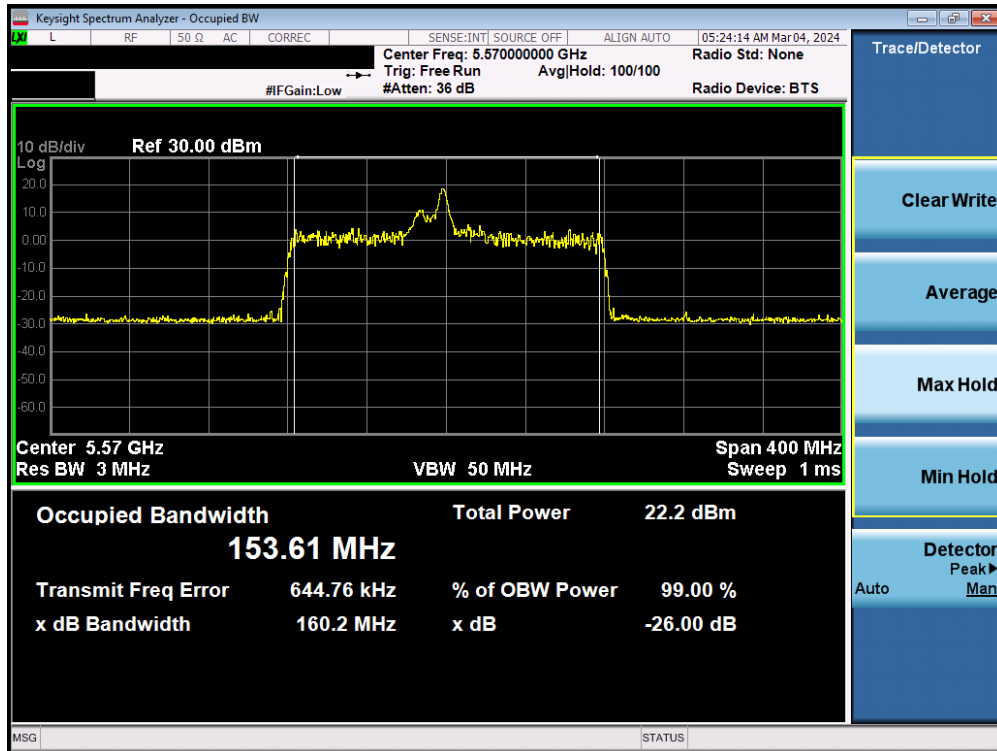


Plot 7-9. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11be – 26 Tones (UNII Band 2C) – Ch. 118)

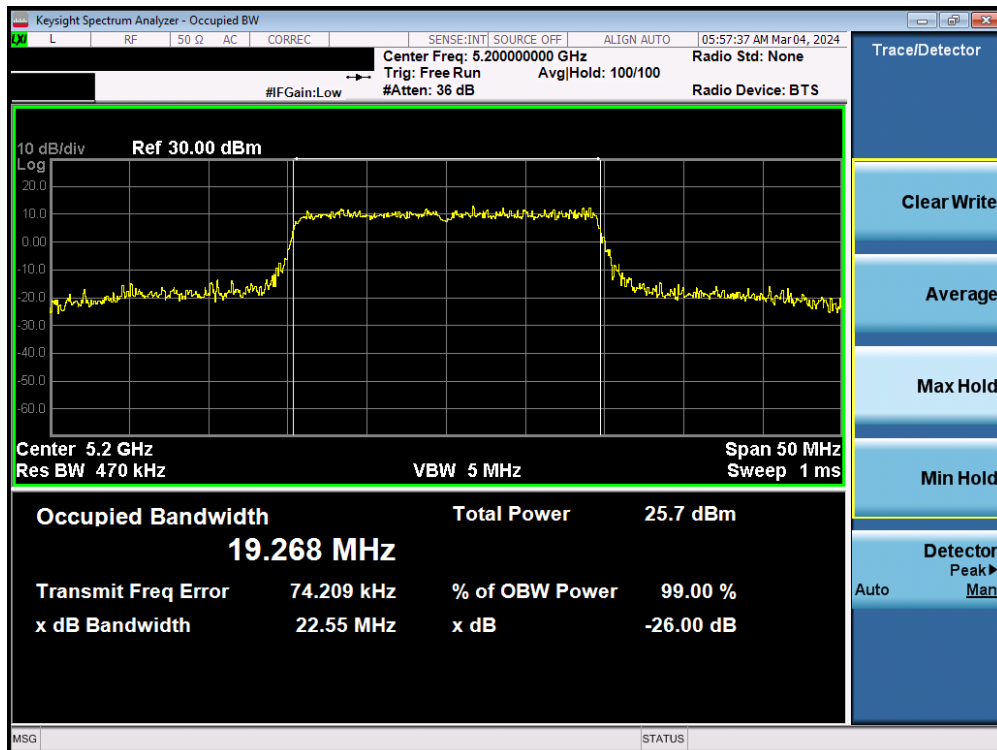


Plot 7-10. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11be – 26 Tones (UNII Band 2C) – Ch. 122)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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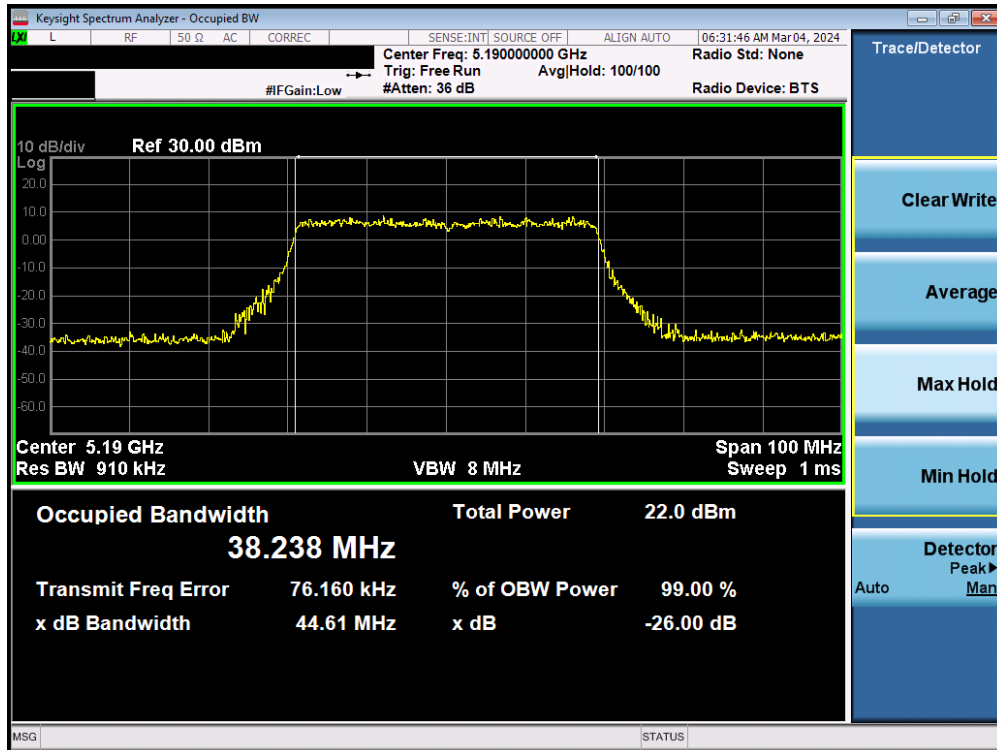


Plot 7-11. 26dB Bandwidth Plot MIMO ANT1 (160MHz BW 802.11be – 26 Tones (UNII Band 2C) – Ch. 114)

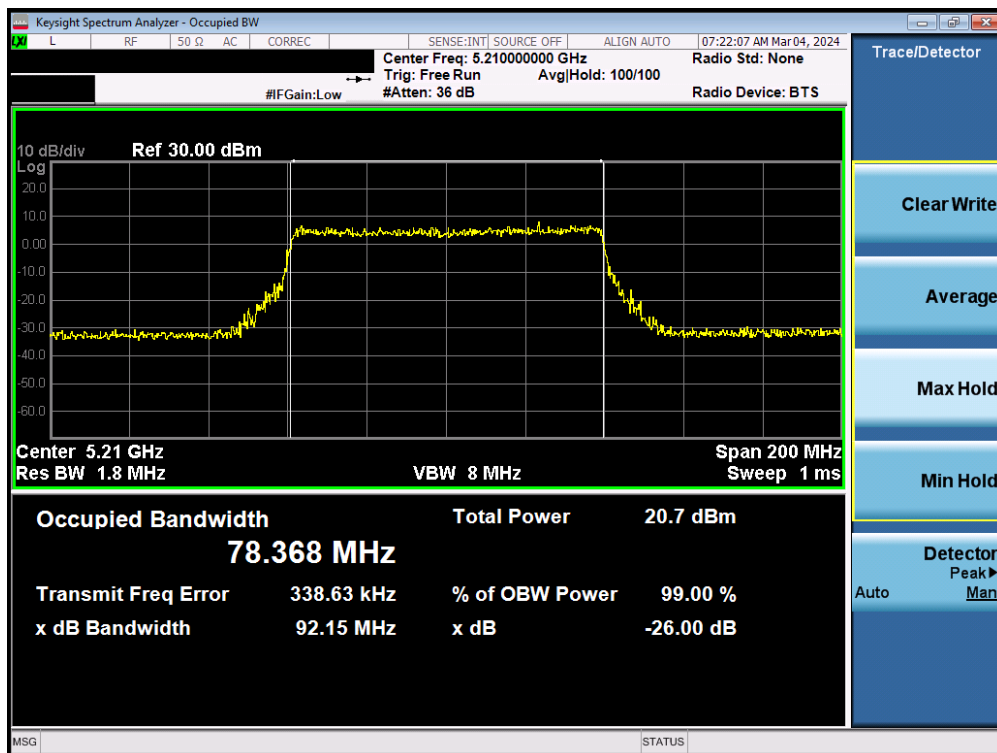


Plot 7-12. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11be – 242 Tones (UNII Band 1) – Ch. 40)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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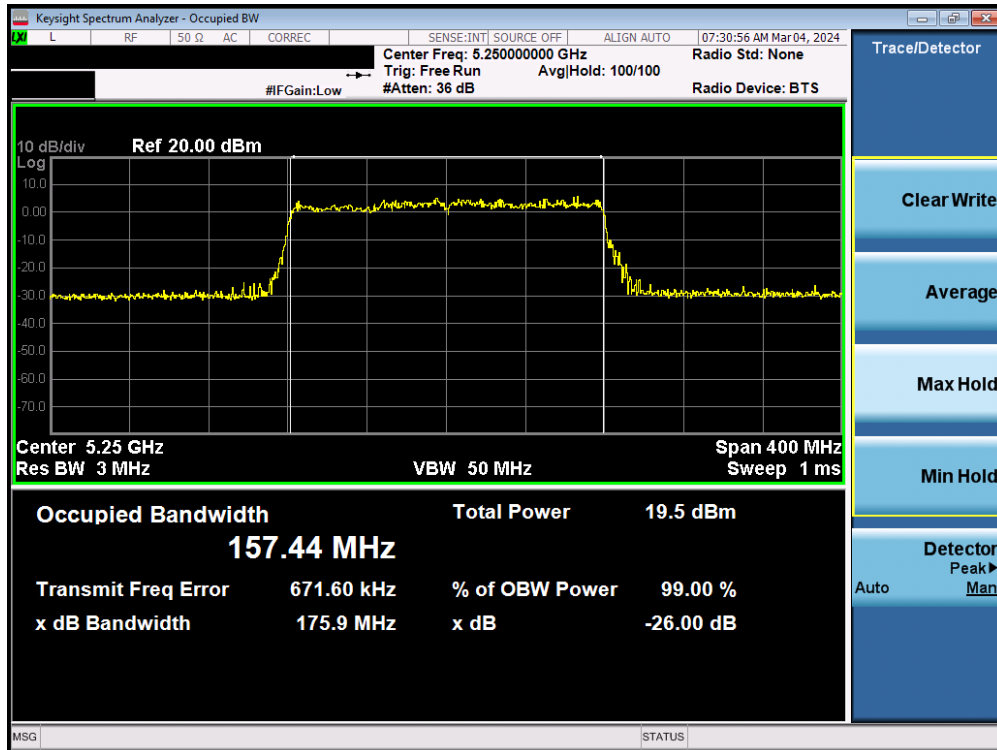


Plot 7-13. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11be – 484 Tones (UNII Band 1) – Ch. 38)

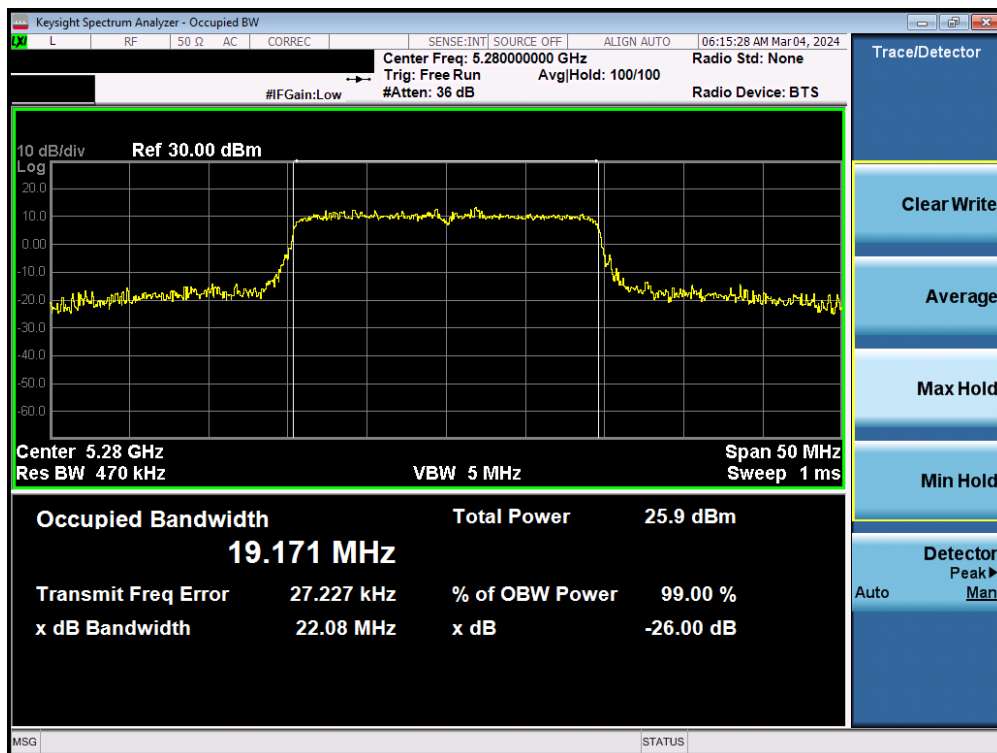


Plot 7-14. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11be – 996 Tones (UNII Band 1) – Ch. 42)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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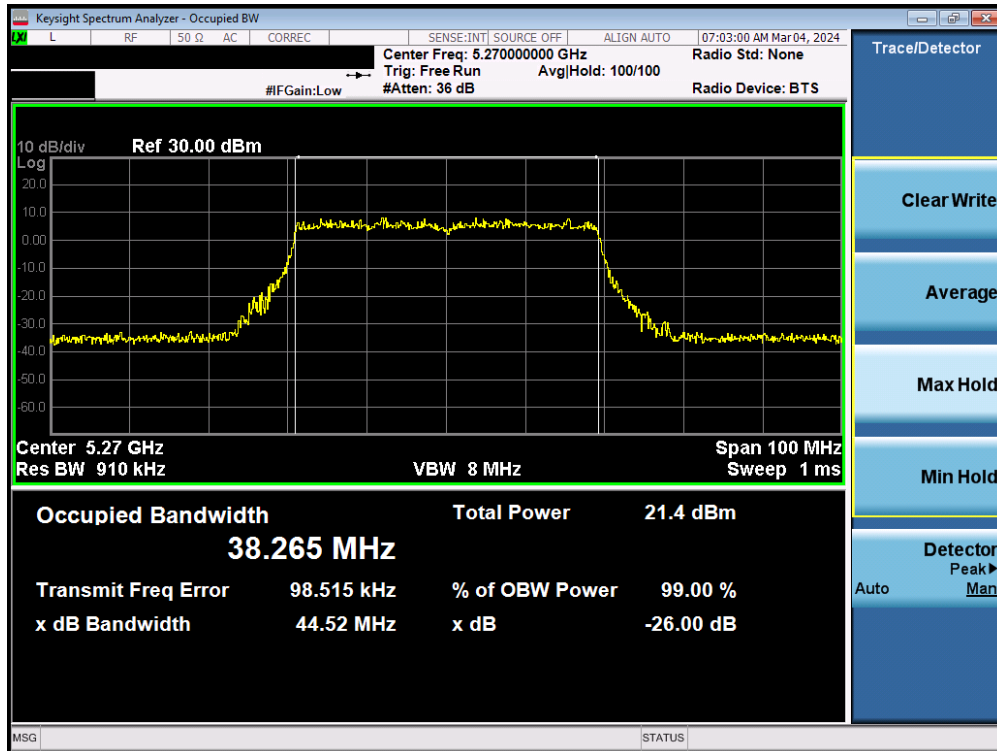


Plot 7-15. 26dB Bandwidth Plot MIMO ANT1 (160MHz BW 802.11be – 2x996 Tones (UNII Band 1/2A) – Ch. 50)

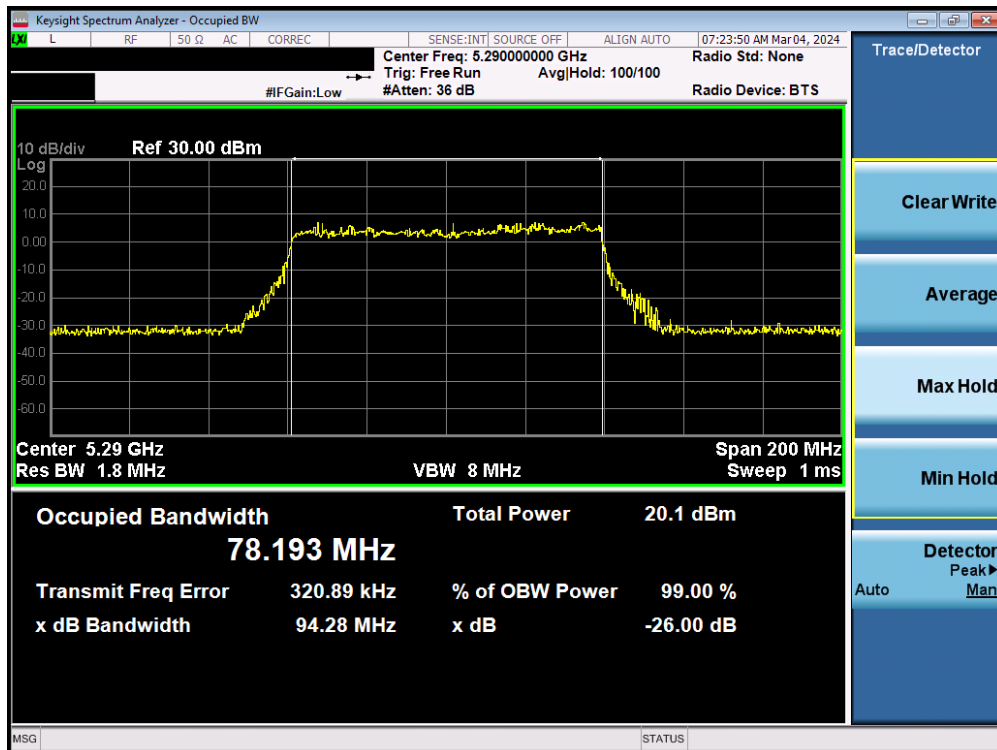


Plot 7-16. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11be – 242 Tones (UNII Band 2A) – Ch. 56)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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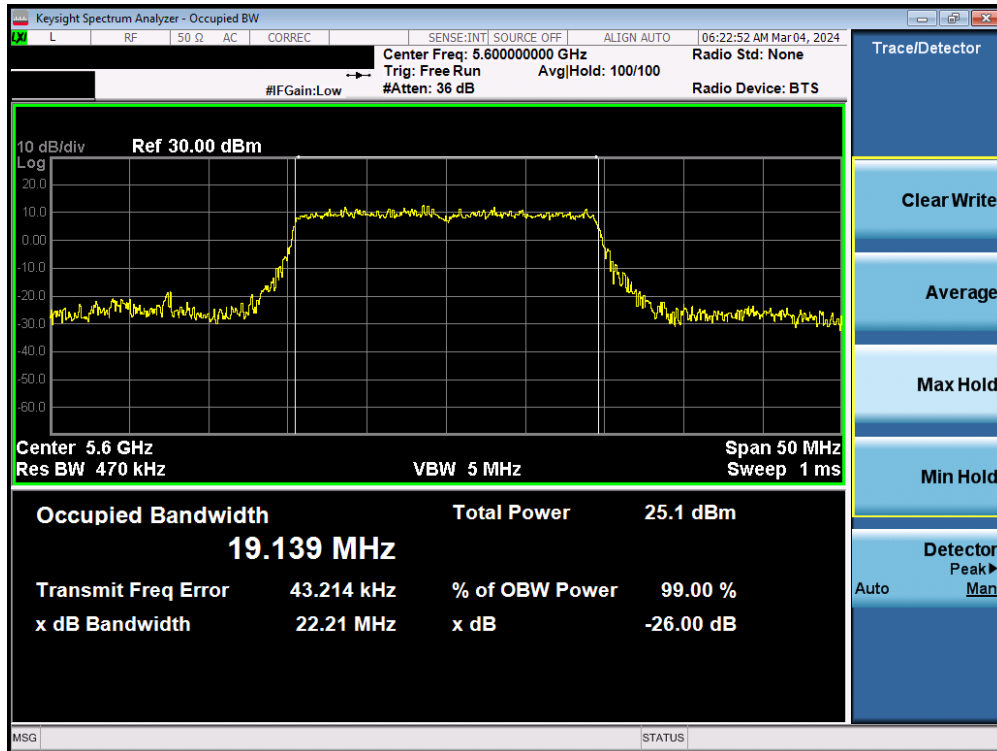


Plot 7-17. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11be – 484 Tones (UNII Band 2A) – Ch. 54)

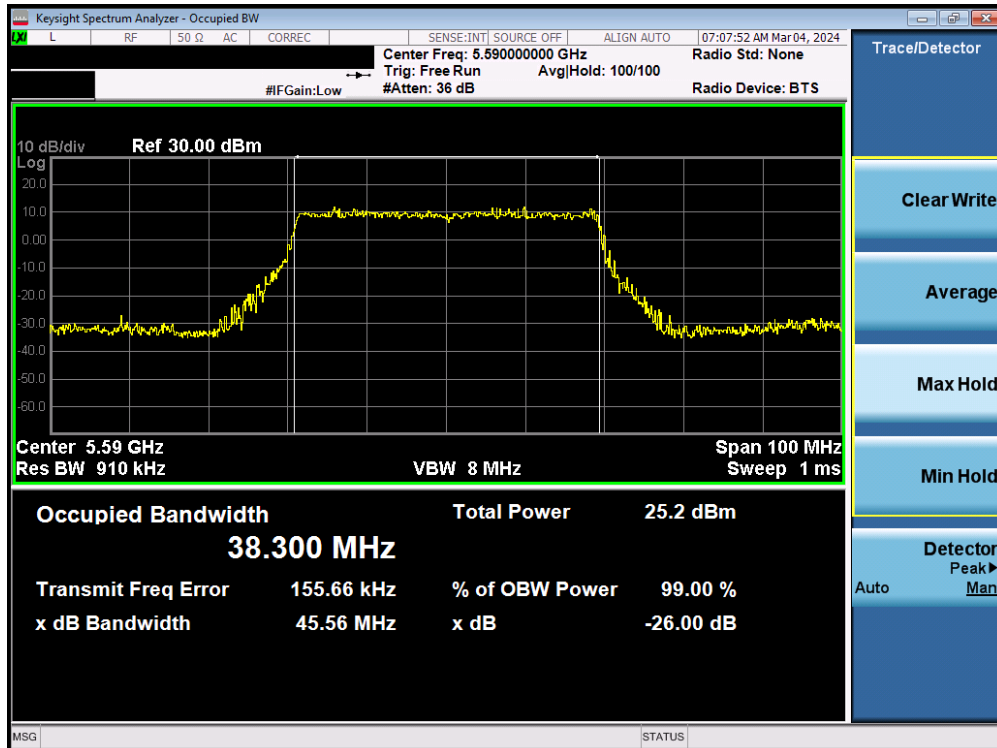


Plot 7-18. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11be – 996 Tones (UNII Band 2A) – Ch. 58)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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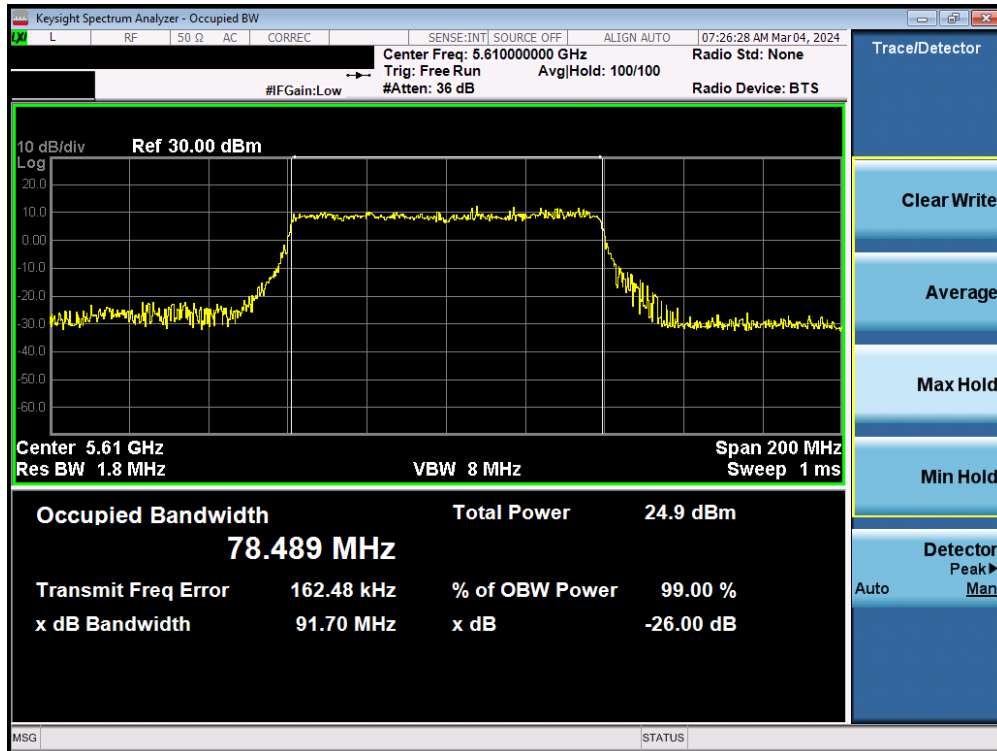


Plot 7-19. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11be – 242 Tones (UNII Band 2C) – Ch. 120)

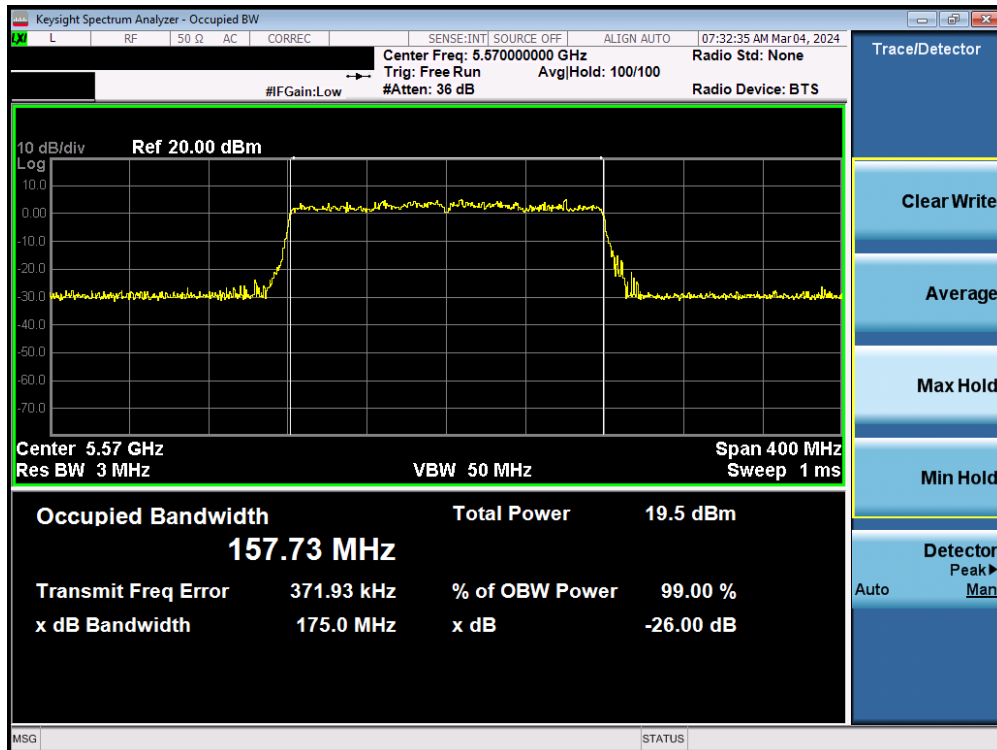


Plot 7-20. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11be – 484 Tones (UNII Band 2C) – Ch. 118)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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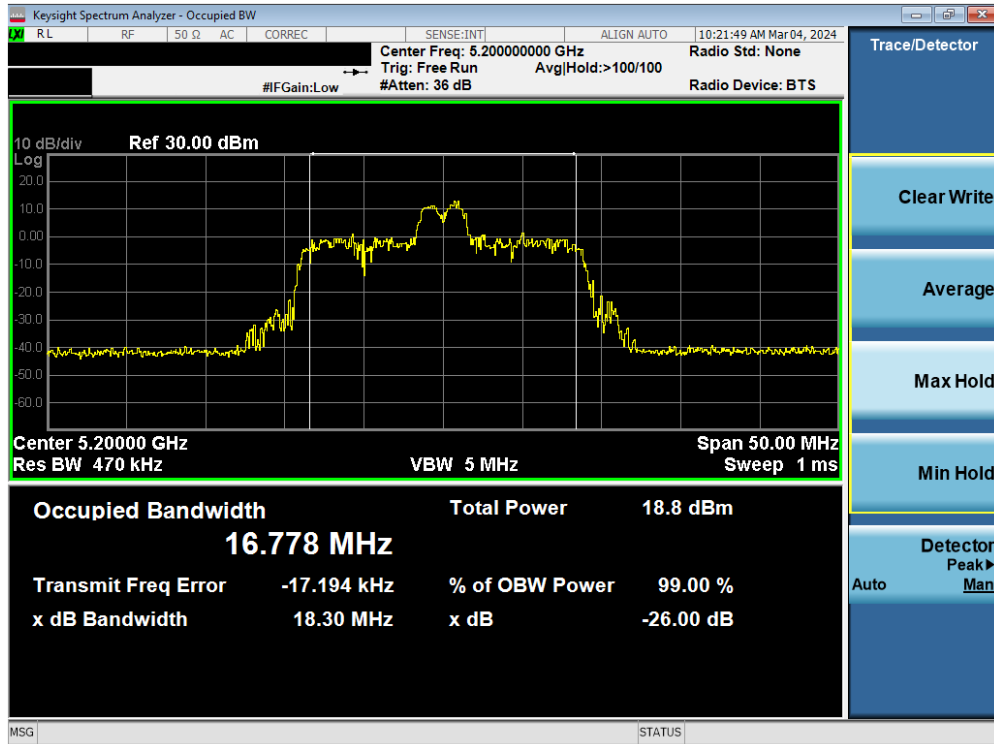
Plot 7-21. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11be – 996 Tones (UNII Band 2C) – Ch. 122)



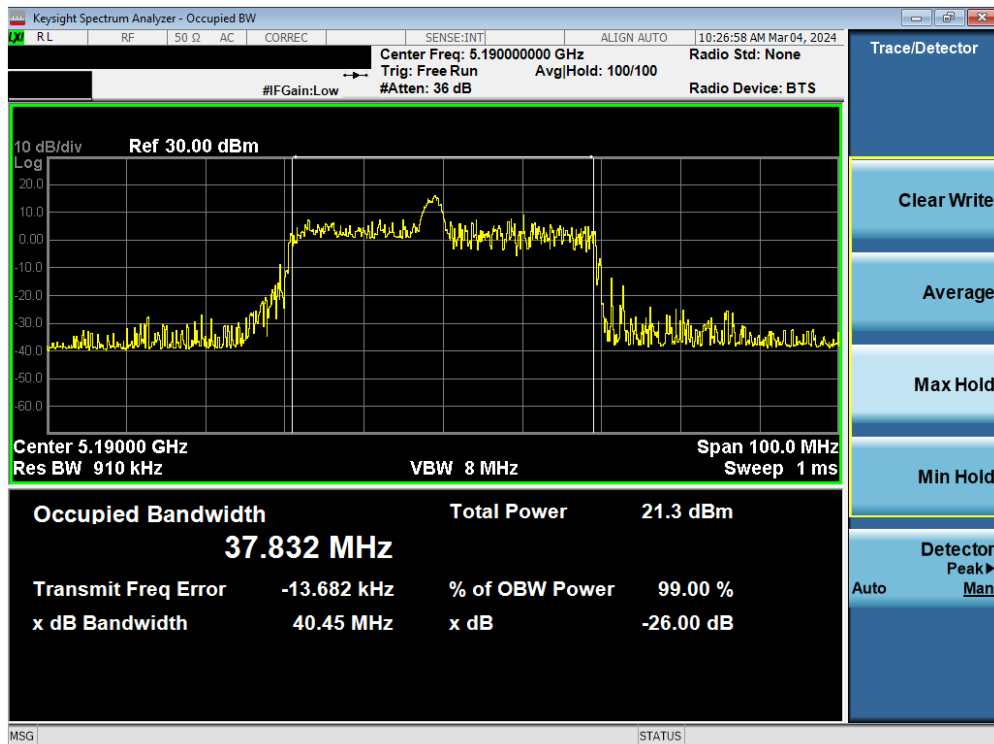
Plot 7-22. 26dB Bandwidth Plot MIMO ANT1 (160MHz BW 802.11be – 2x996 Tones (UNII Band 2C) – Ch. 114)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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7.2.2 MIMO Antenna-2 26dB Bandwidth Measurements

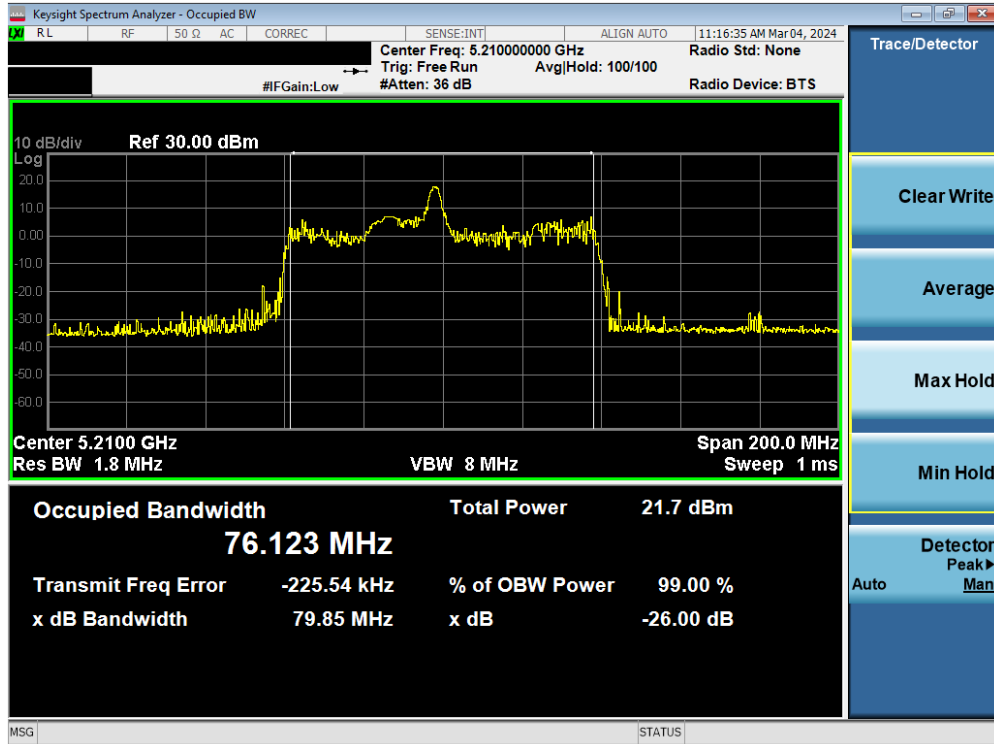


Plot 7-23. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11be – 26 Tones (UNII Band 1) – Ch. 40)

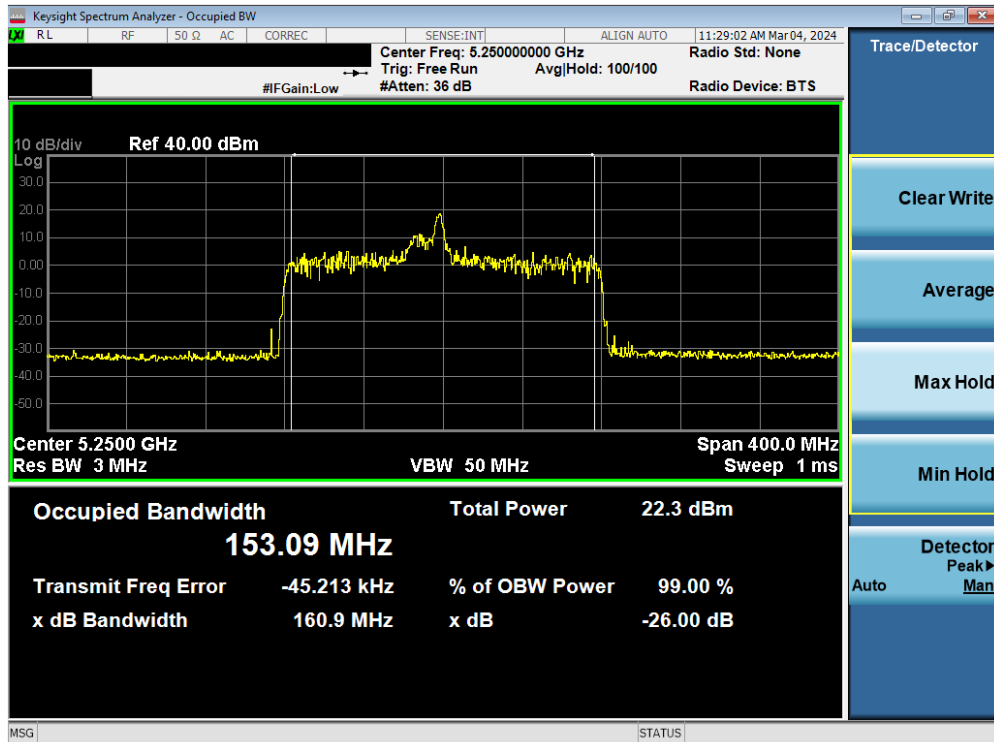


Plot 7-24. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11be – 26 Tones (UNII Band 1) – Ch. 38)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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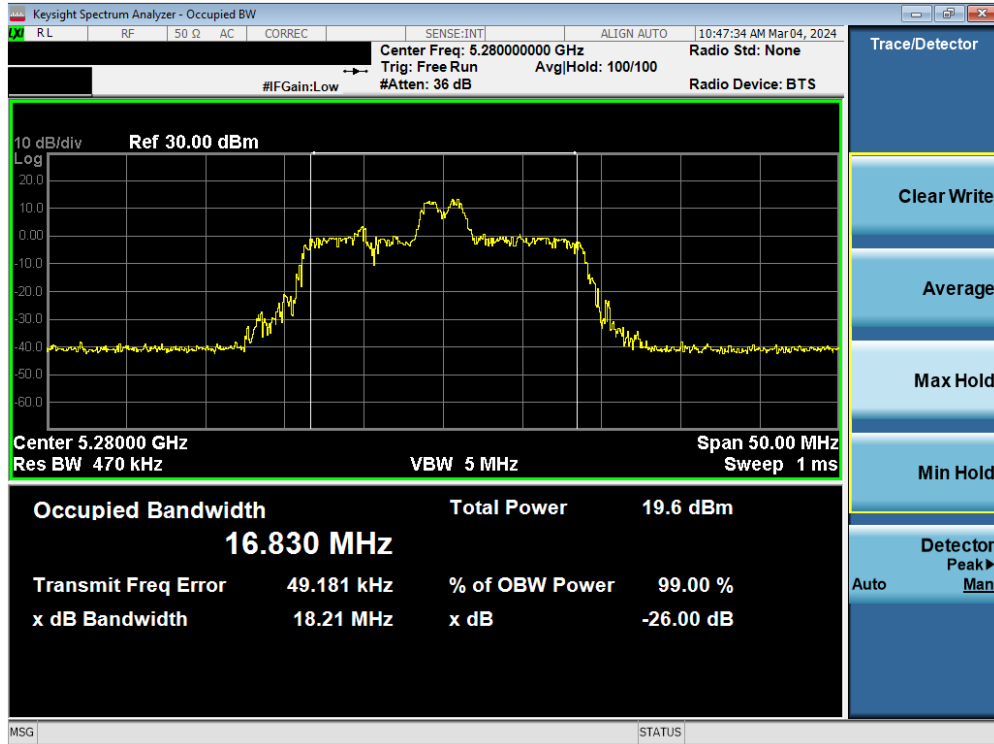


Plot 7-25. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11be – 26 Tones (UNII Band 1) – Ch. 42)

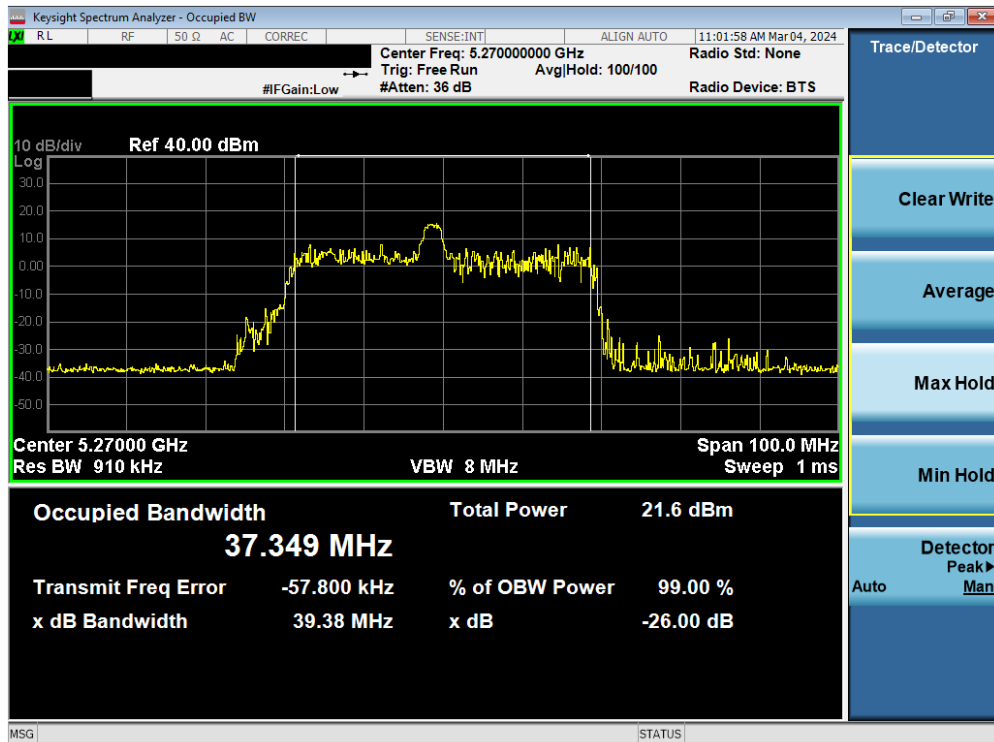


Plot 7-26. 26dB Bandwidth Plot MIMO ANT2 (160MHz BW 802.11be – 26 Tones (UNII Band 1/2A) – Ch. 50)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2312040120-20.C3K	Test Dates: 12/14/2023 - 04/11/2024	EUT Type: Portable Computing Device	Page 30 of 161

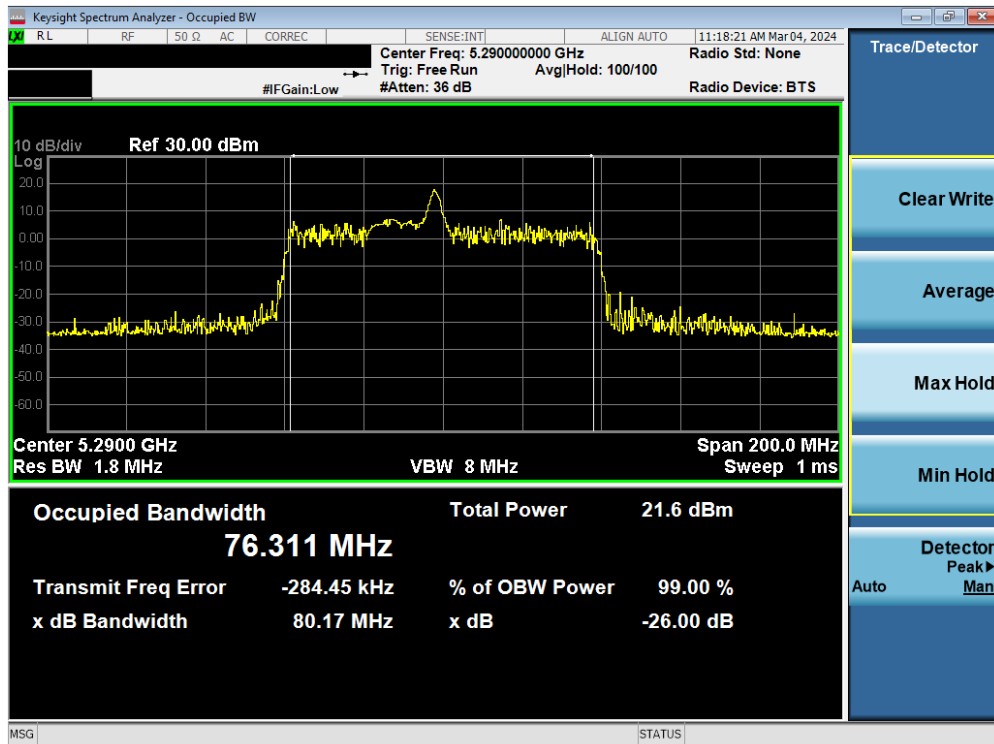


Plot 7-27. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11be – 26 Tones (UNII Band 2A) – Ch. 56)

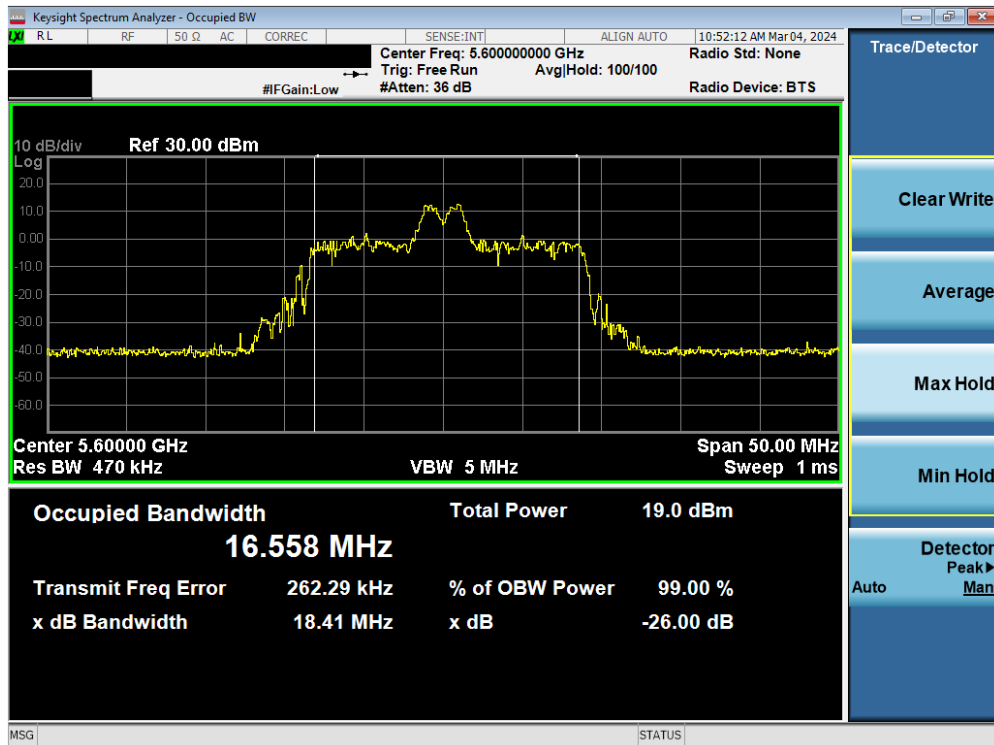


Plot 7-28. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11be – 26 Tones (UNII Band 2A) – Ch. 54)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2312040120-20.C3K	Test Dates: 12/14/2023 - 04/11/2024	EUT Type: Portable Computing Device	Page 31 of 161

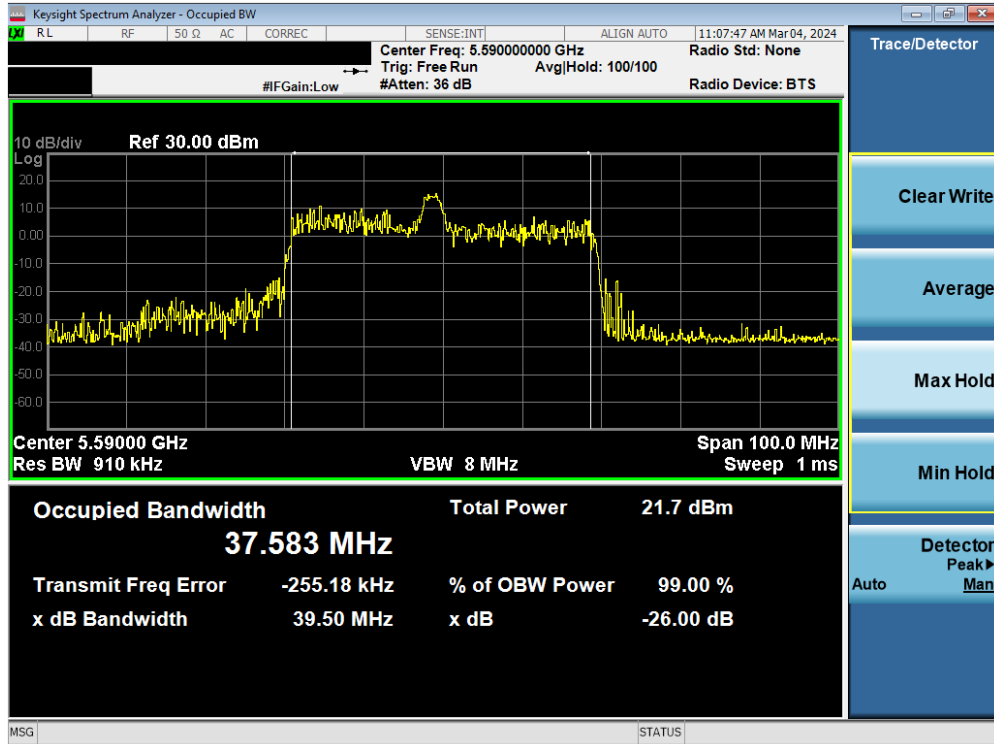


Plot 7-29. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11be – 26 Tones (UNII Band 2A) – Ch. 58)

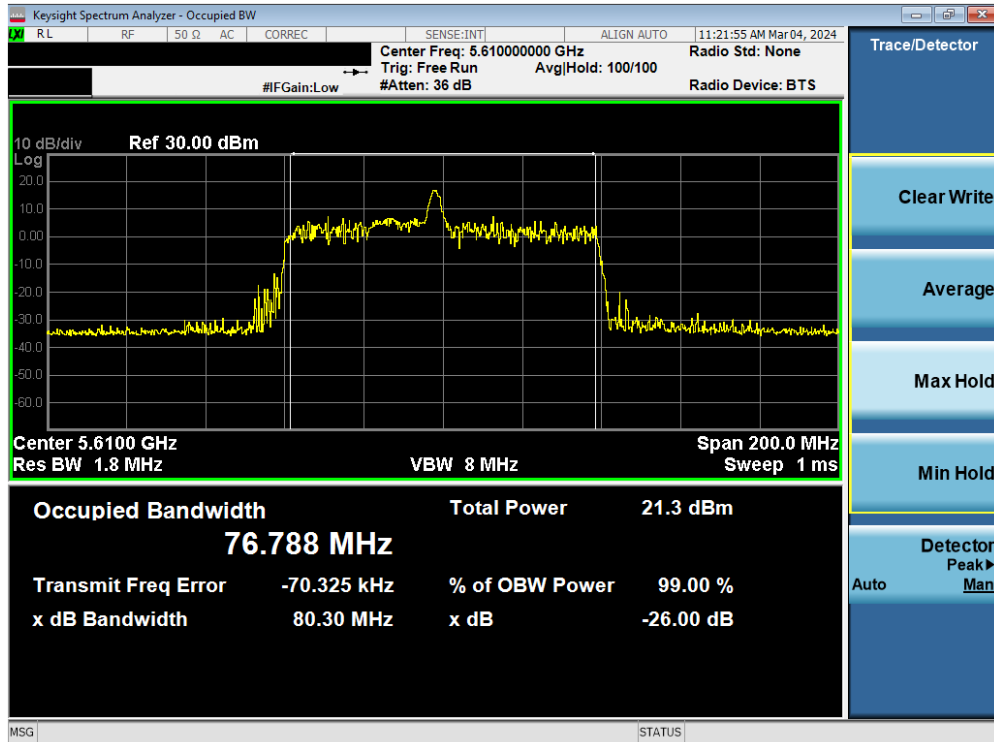


Plot 7-30. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11be – 26 Tones (UNII Band 2C) – Ch. 120)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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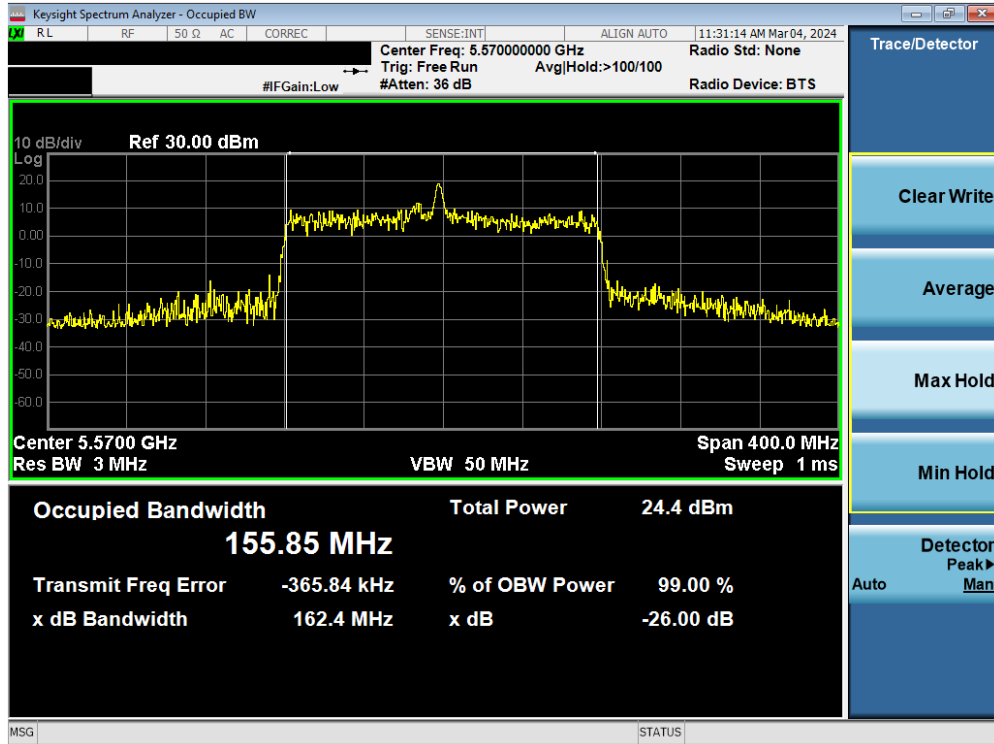


Plot 7-31. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11be – 26 Tones (UNII Band 2C) – Ch. 118)

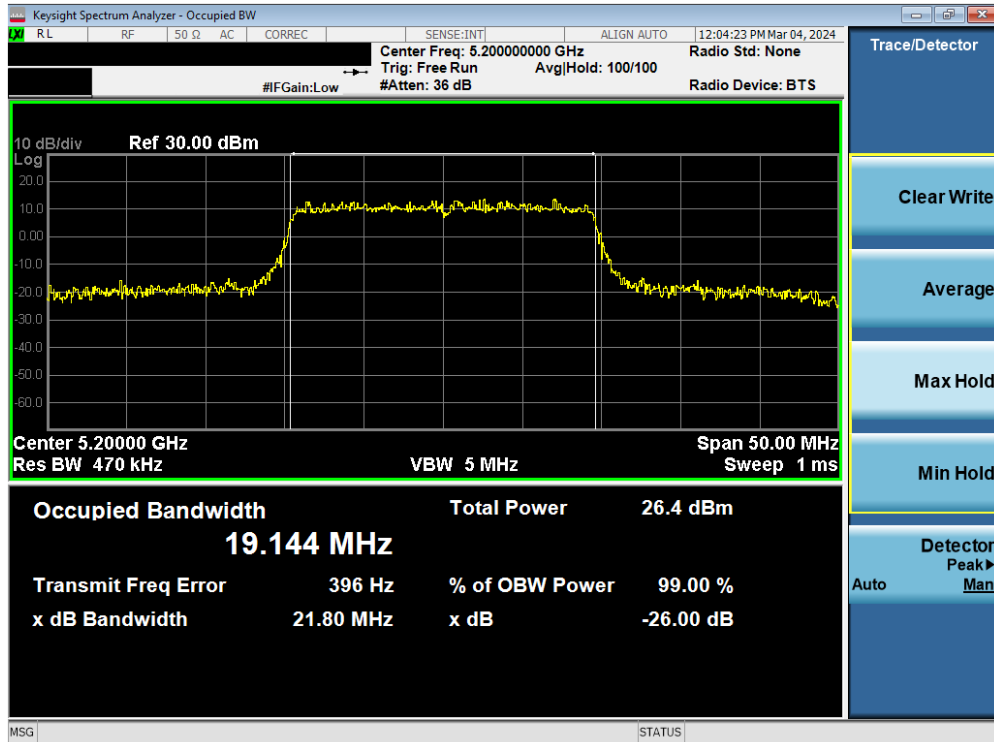


Plot 7-32. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11be – 26 Tones (UNII Band 2C) – Ch. 122)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2312040120-20.C3K	Test Dates: 12/14/2023 - 04/11/2024	EUT Type: Portable Computing Device	Page 33 of 161

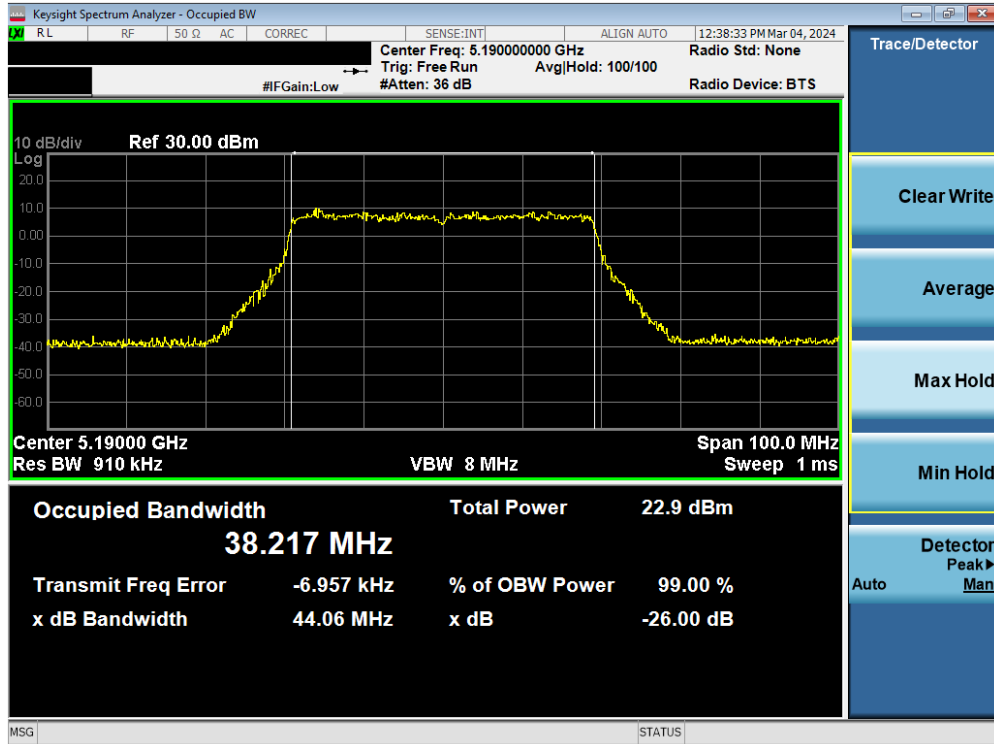


Plot 7-33. 26dB Bandwidth Plot MIMO ANT2 (160MHz BW 802.11be – 26 Tones (UNII Band 2C) – Ch. 114)

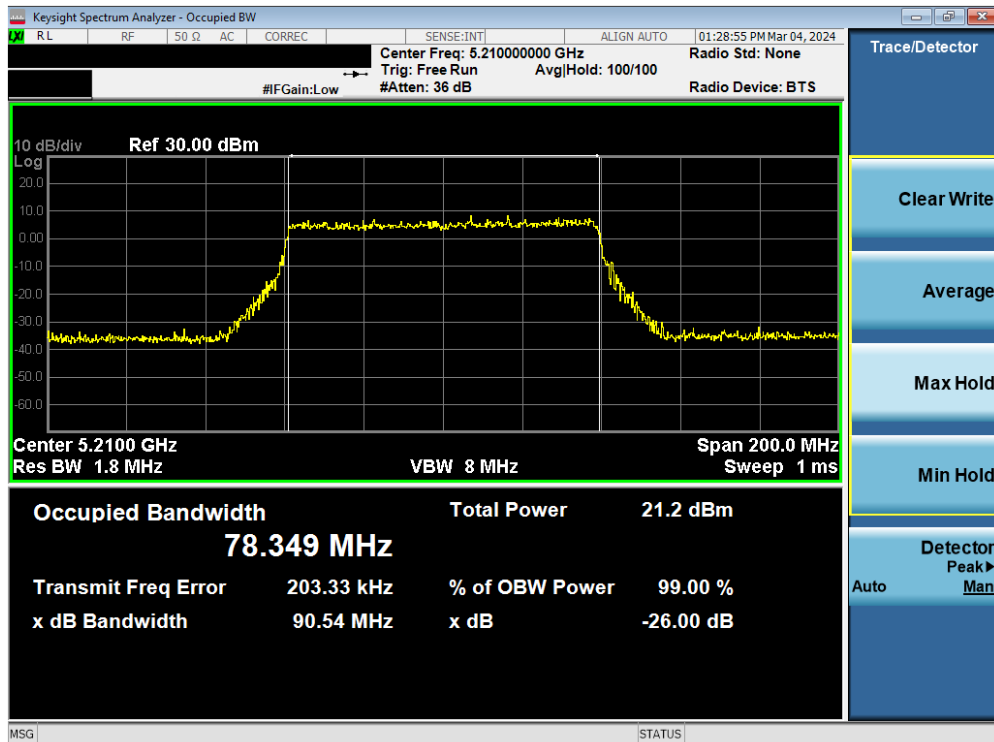


Plot 7-34. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11be – 242 Tones (UNII Band 1) – Ch. 40)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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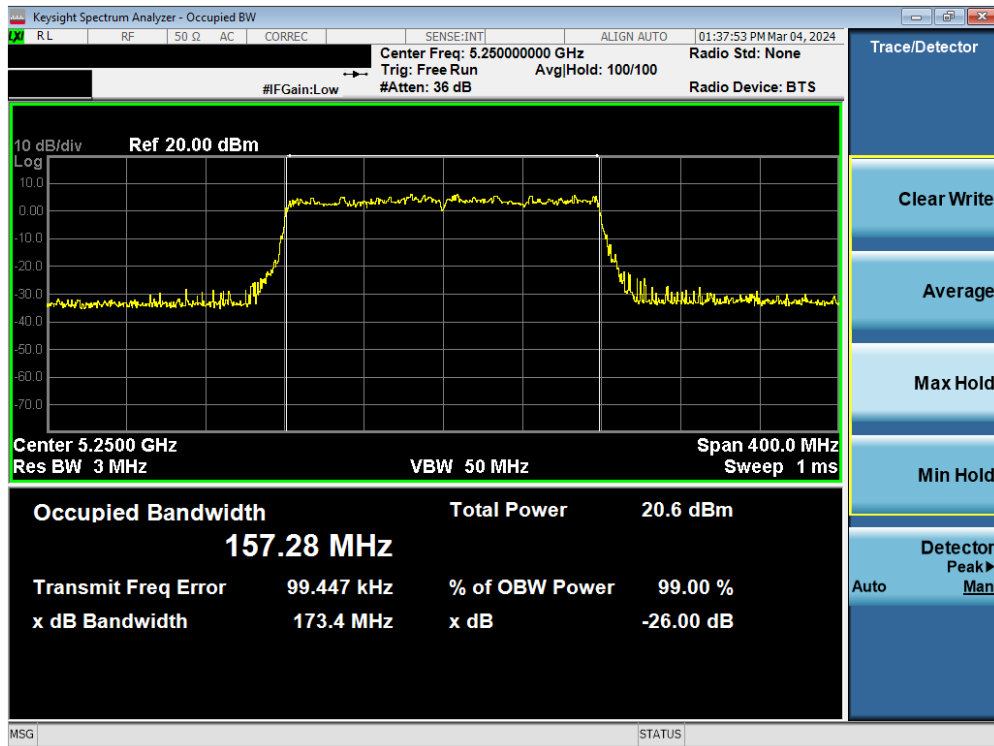


Plot 7-35. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11be – 484 Tones (UNII Band 1) – Ch. 38)

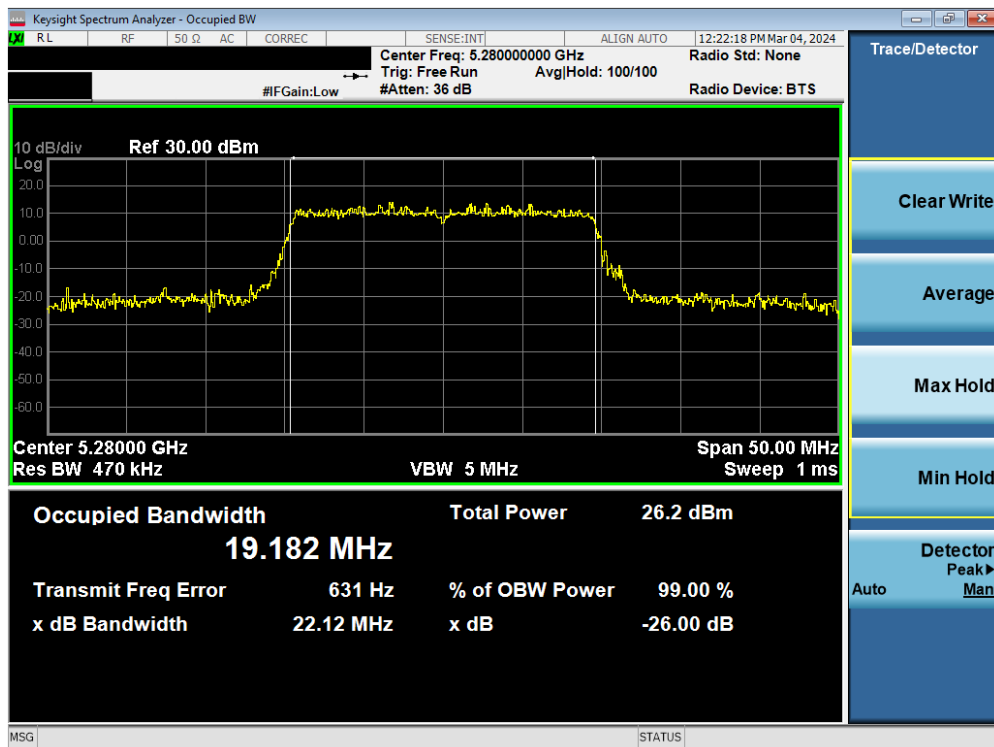


Plot 7-36. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11be – 996 Tones (UNII Band 1) – Ch. 42)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2312040120-20.C3K	Test Dates: 12/14/2023 - 04/11/2024	EUT Type: Portable Computing Device	Page 35 of 161

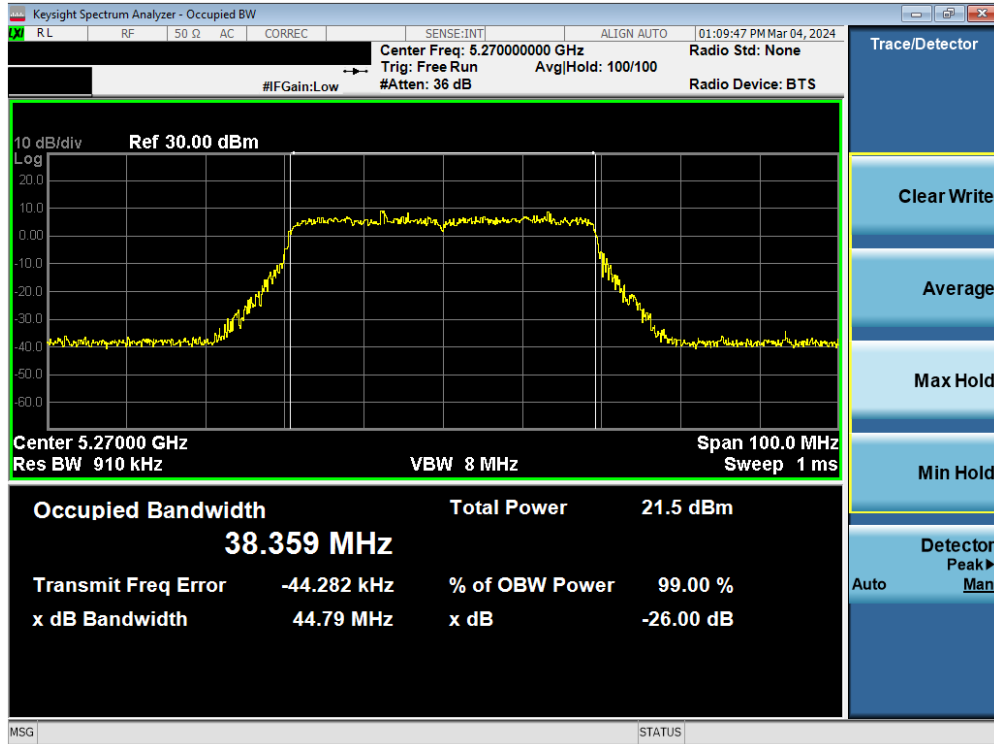


Plot 7-37. 26dB Bandwidth Plot MIMO ANT2 (160MHz BW 802.11be – 2x996 Tones (UNII Band 1/2A) – Ch. 50)

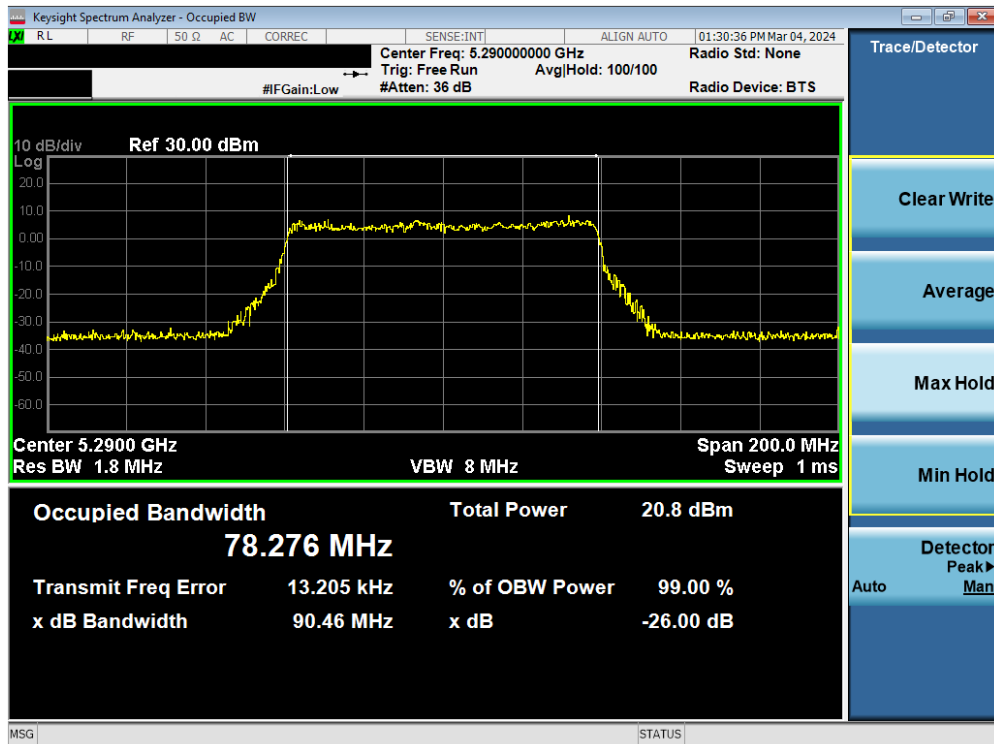


Plot 7-38. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11be – 242 Tones (UNII Band 2A) – Ch. 56)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2312040120-20.C3K	Test Dates: 12/14/2023 - 04/11/2024	EUT Type: Portable Computing Device	Page 36 of 161

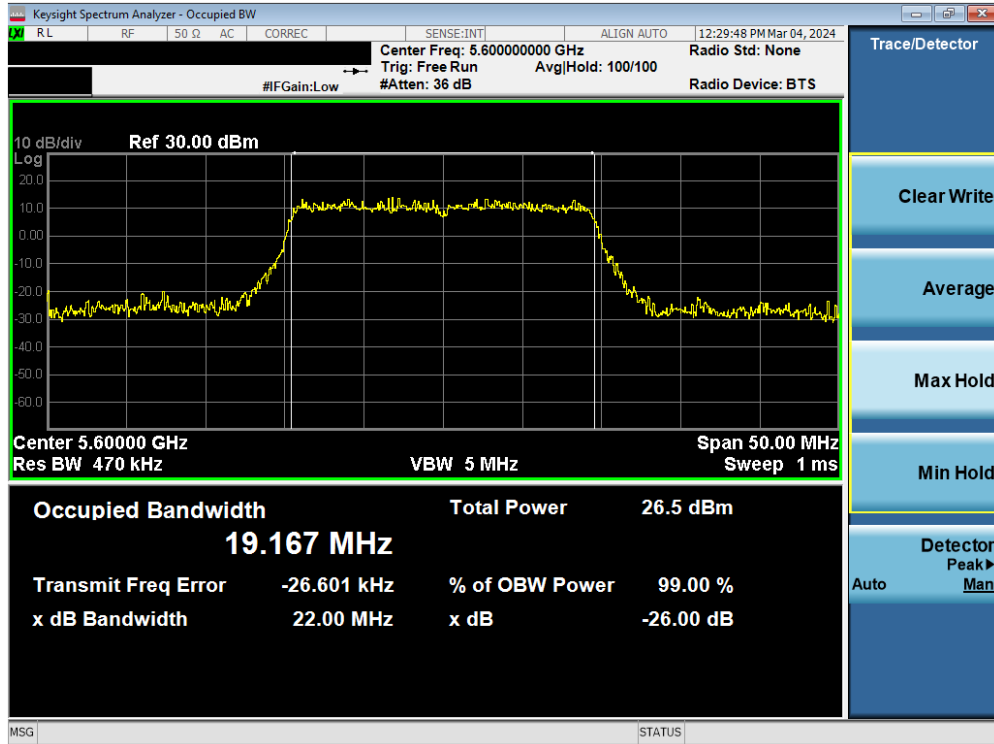


Plot 7-39. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11be – 484 Tones (UNII Band 2A) – Ch. 54)

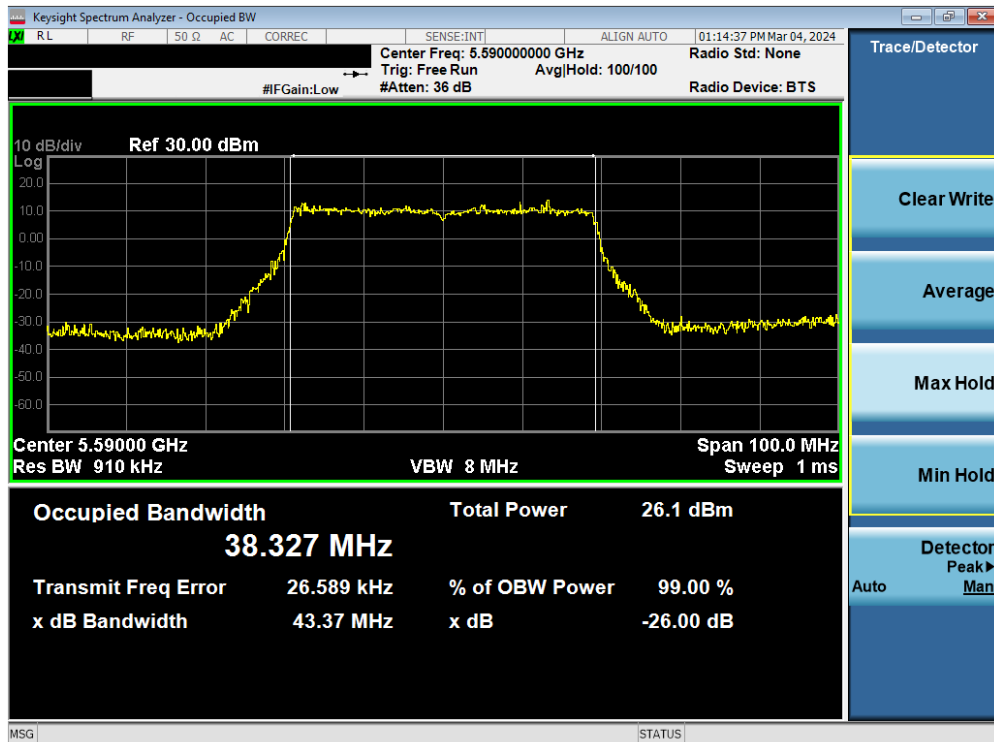


Plot 7-40. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11be – 996 Tones (UNII Band 2A) – Ch. 58)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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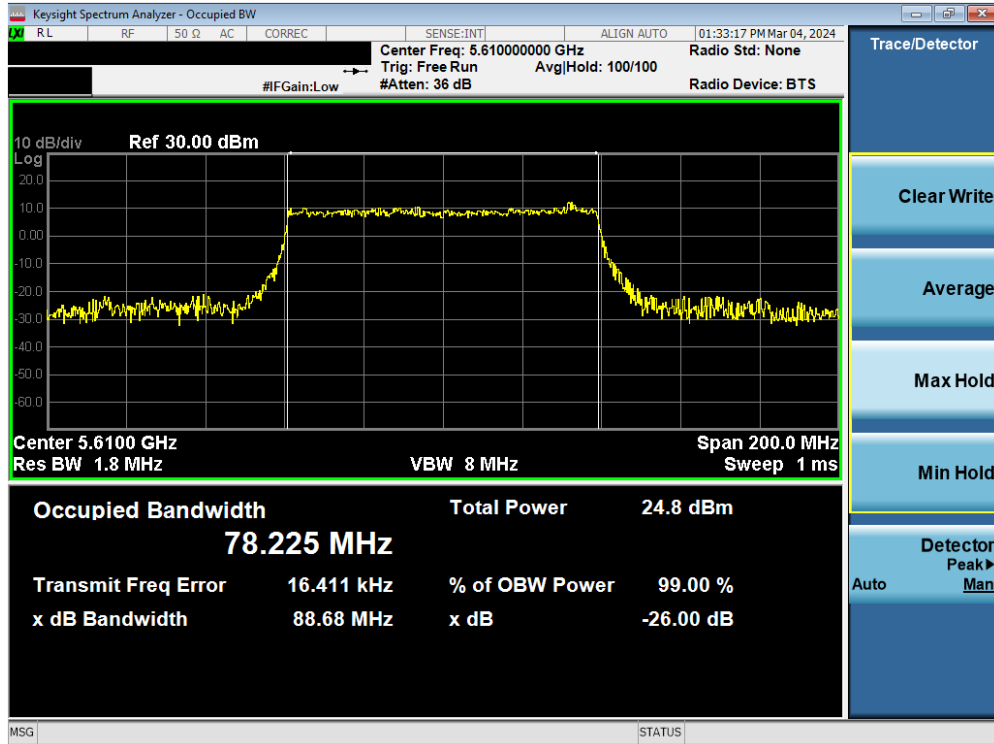


Plot 7-41. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11be – 242 Tones (UNII Band 2C) – Ch. 120)

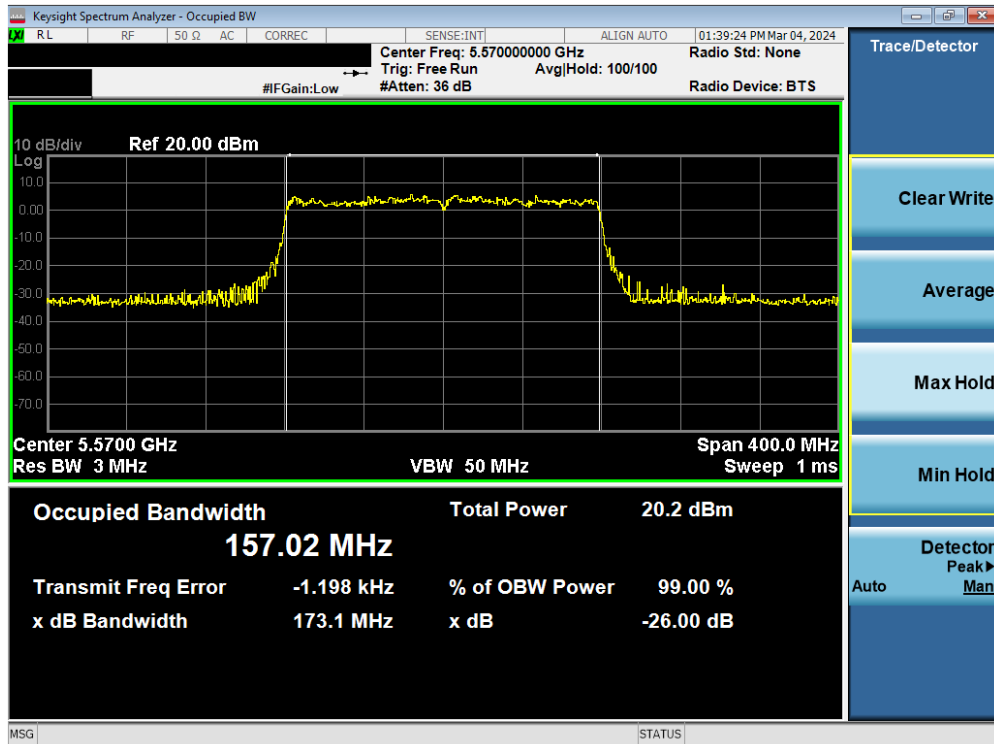


Plot 7-42. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11be – 484 Tones (UNII Band 2C) – Ch. 118)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-43. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11be – 996 Tones (UNII Band 2C) – Ch. 122)



Plot 7-44. 26dB Bandwidth Plot MIMO ANT2 (160MHz BW 802.11be – 2x996 Tones (UNII Band 2C) – Ch. 114)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2312040120-20.C3K	Test Dates: 12/14/2023 - 04/11/2024	EUT Type: Portable Computing Device	Page 39 of 161

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 C63.10-2013, 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 C63.10-2013 – 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 $\geq 3 \times$ 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.

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MIMO 6dB Bandwidth Measurements

	Frequency [MHz]	802.11 MODE	Channel	Antenna-1 6dB Bandwidth [MHz]	Antenna-2 6dB Bandwidth [MHz]
Band 3	5745	be (20MHz)	149	2.75	2.64
	5785	be (20MHz)	157	2.74	2.72
	5825	be (20MHz)	165	2.76	2.72
	5755	be (40MHz)	151	2.14	2.28
	5795	be (40MHz)	159	2.15	2.22
	5775	be (80MHz)	155	2.26	2.29

Table 7-4. Band 3 Conducted 6dB Bandwidth Measurements MIMO ANT1/2 (26 Tones)

	Frequency [MHz]	802.11 MODE	Channel	Antenna-1 6dB Bandwidth [MHz]	Antenna-2 6dB Bandwidth [MHz]
Band 3/4	5845	be (20MHz)	169	2.72	2.72
Band 4	5865	be (20MHz)	173	2.77	2.67
	5885	be (20MHz)	177	2.72	2.65
Band 3/4	5835	be (40MHz)	167	2.14	2.26
Band 4	5875	be (40MHz)	175	2.13	2.31
Band 3/4	5855	be (80MHz)	171	2.28	2.26
	5815	be (160MHz)	163	2.56	2.76

Table 7-5. Bands 3/4 Conducted 6dB Bandwidth Measurements MIMO ANT1/2 (26 Tones)

	Frequency [MHz]	802.11 MODE	Channel	Antenna-1 6dB Bandwidth [MHz]	Antenna-2 6dB Bandwidth [MHz]
Band 3	5745	be (20MHz)	149	19.03	18.92
	5785	be (20MHz)	157	19.00	18.88
	5825	be (20MHz)	165	18.92	18.77
	5755	be (40MHz)	151	38.17	38.01
	5795	be (40MHz)	159	38.27	37.96
	5775	be (80MHz)	155	78.00	78.09

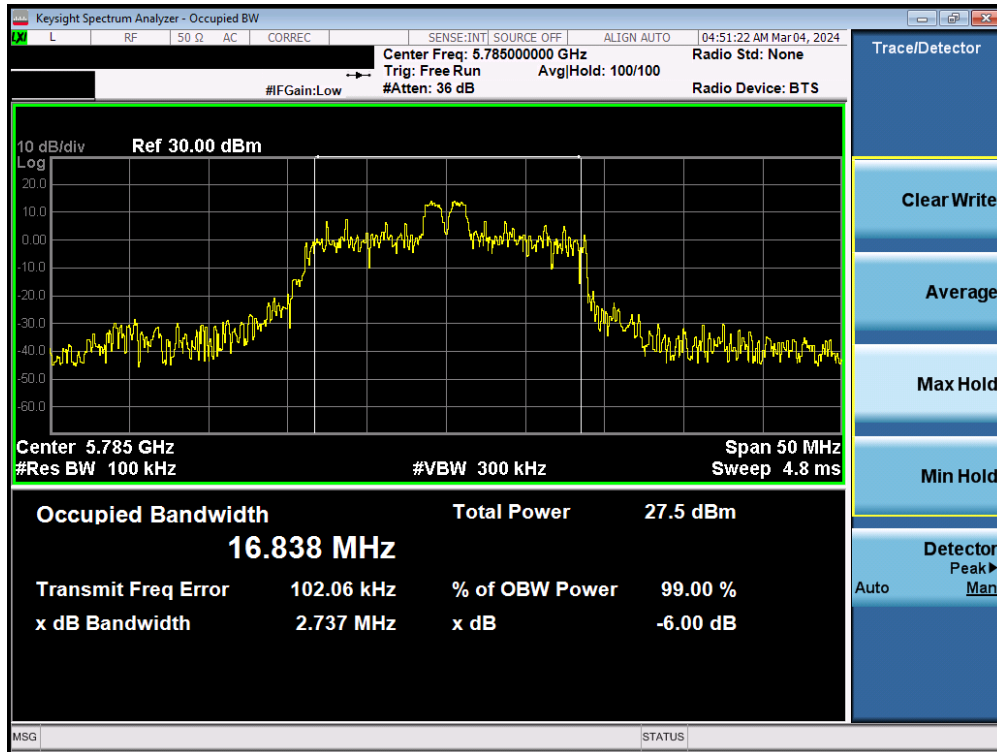
Table 7-6. Band 3 Conducted 6dB Bandwidth Measurements MIMO ANT1/2 (Full Tones)

	Frequency [MHz]	802.11 MODE	Channel	Antenna-1 6dB Bandwidth [MHz]	Antenna-2 6dB Bandwidth [MHz]
Band 3/4	5845	be (20MHz)	169	18.90	18.97
Band 4	5865	be (20MHz)	173	18.96	18.78
	5885	be (20MHz)	177	18.86	18.97
Band 3/4	5835	be (40MHz)	167	38.30	37.99
Band 4	5875	be (40MHz)	175	38.29	38.06
Band 3/4	5855	be (80MHz)	171	78.12	77.85
	5815	be (160MHz)	163	158.20	158.16

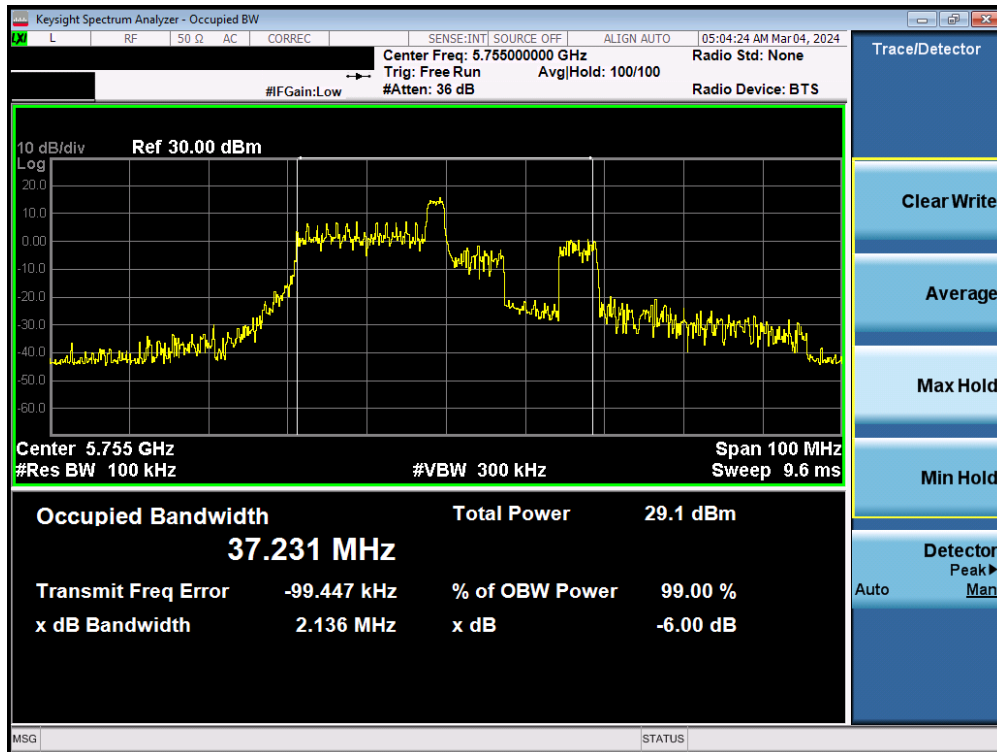
Table 7-7. Bands 3/4 Conducted 6dB Bandwidth Measurements MIMO ANT1/2 (Full Tones)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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7.3.1 MIMO Antenna-1 6dB Bandwidth Measurements

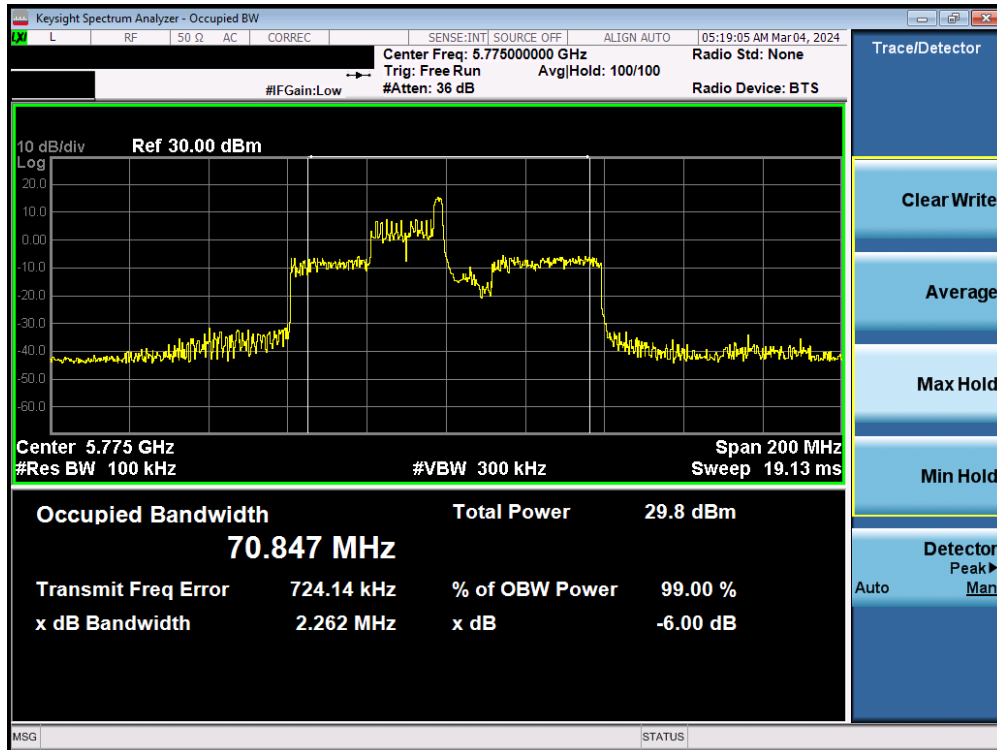


Plot 7-45. 6dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11be – 26 Tones (UNII Band 3) – Ch. 157)

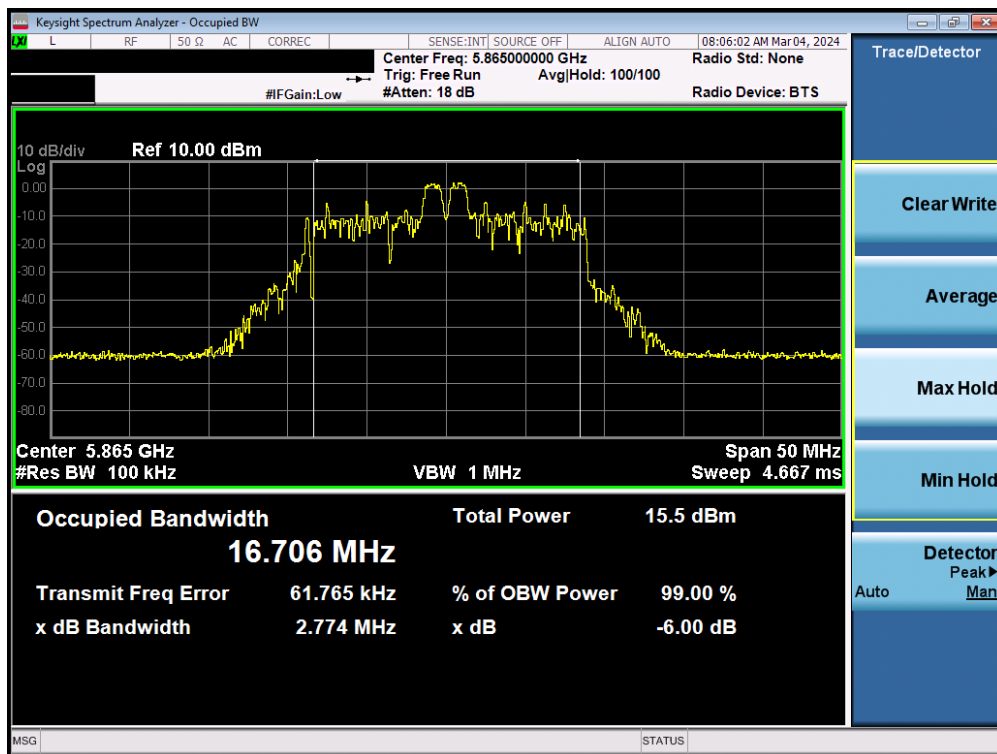


Plot 7-46. 6dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11be – 26 Tones (UNII Band 3) – Ch. 151)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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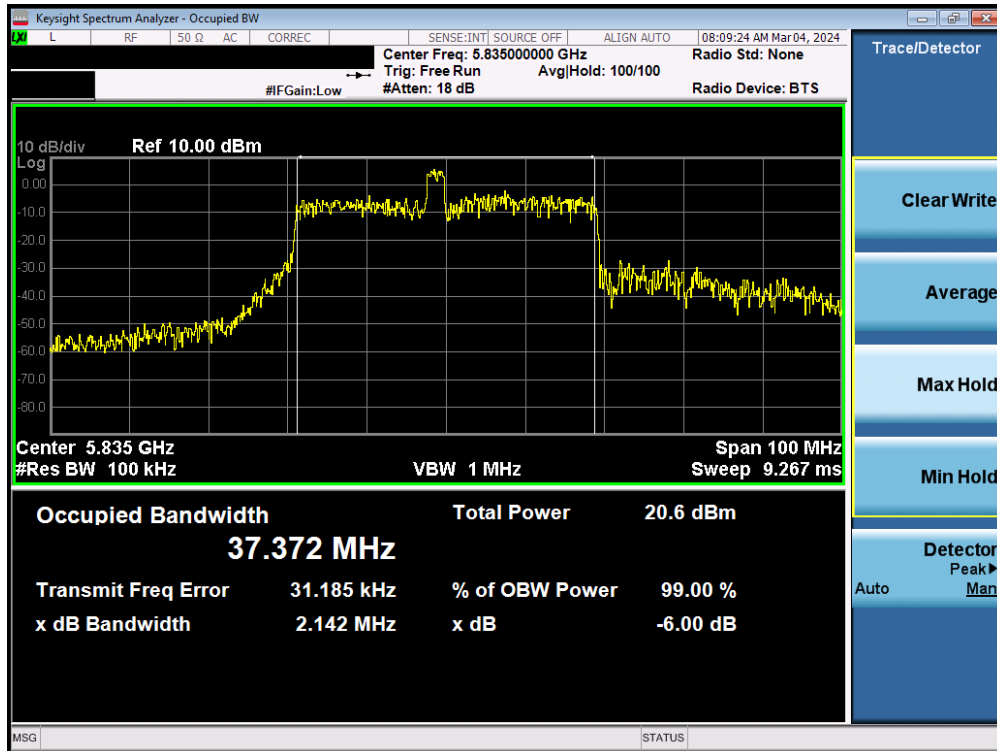


Plot 7-47. 6dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11be – 26 Tones (UNII Band 3) – Ch. 155)

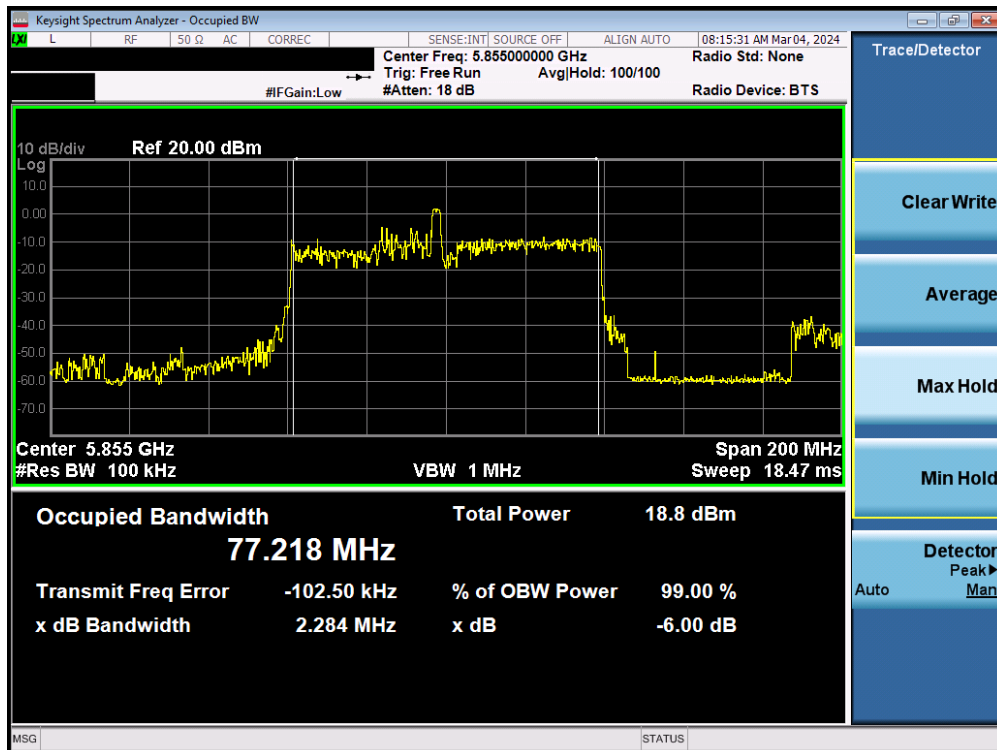


Plot 7-48. 6dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11be – 26 Tones (UNII Band 4) – Ch. 173)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2312040120-20.C3K	Test Dates: 12/14/2023 - 04/11/2024	EUT Type: Portable Computing Device	Page 43 of 161

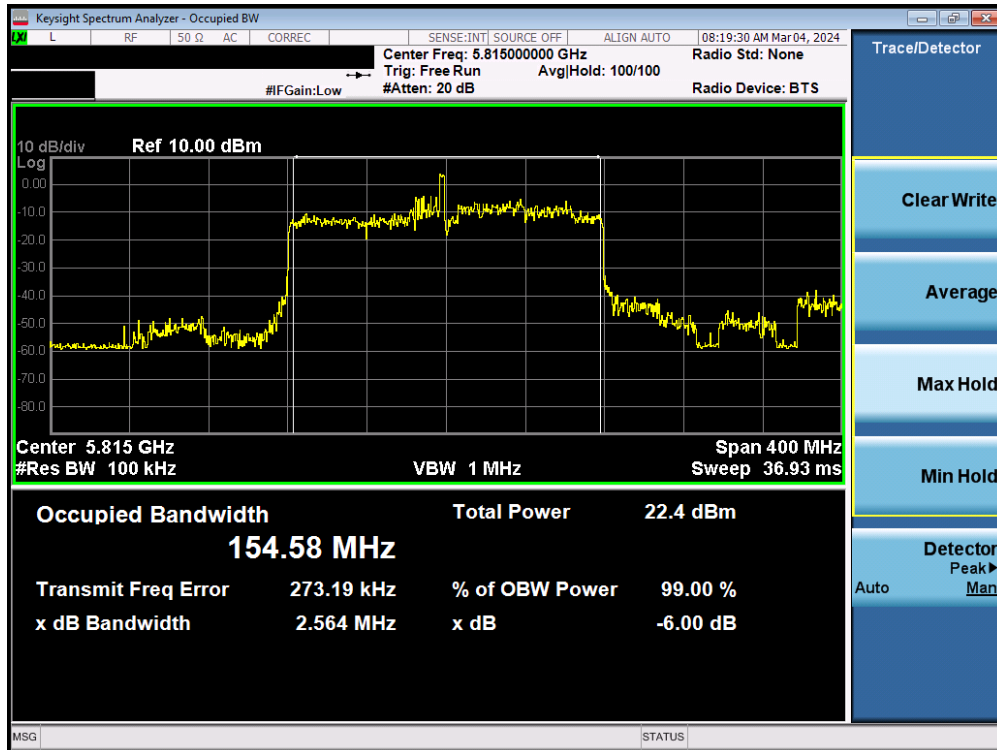


Plot 7-49. 6dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11be – 26 Tones (UNII Band 3/4) – Ch. 167)

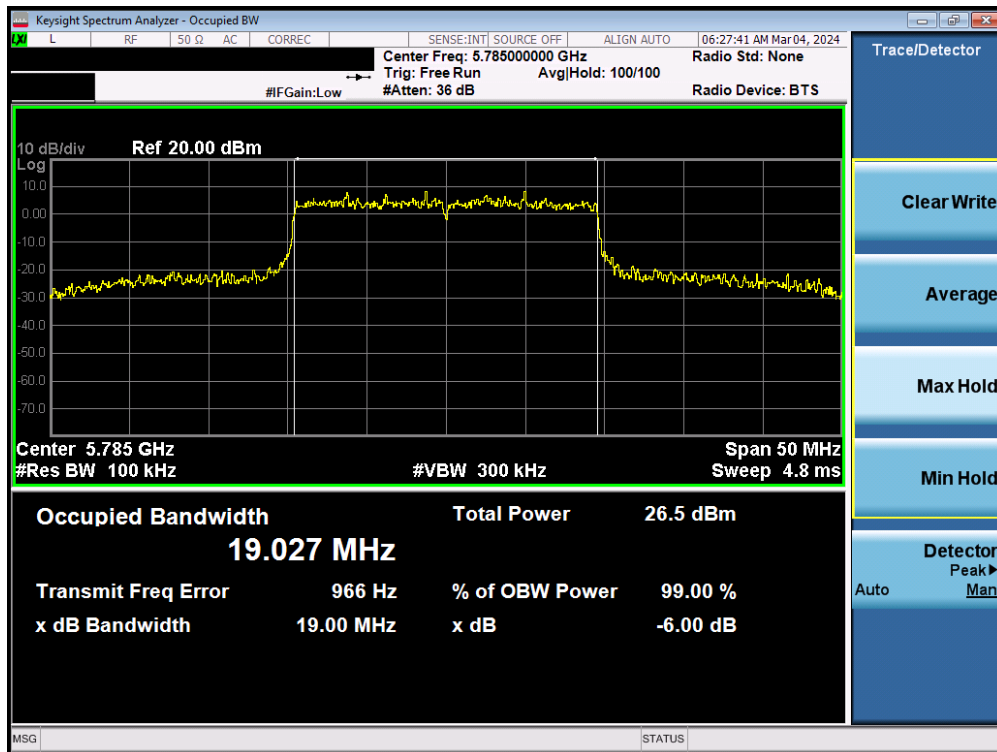


Plot 7-50. 6dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11be – 26 Tones (UNII Band 3/4) – Ch. 171)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2312040120-20.C3K	Test Dates: 12/14/2023 - 04/11/2024	EUT Type: Portable Computing Device	Page 44 of 161

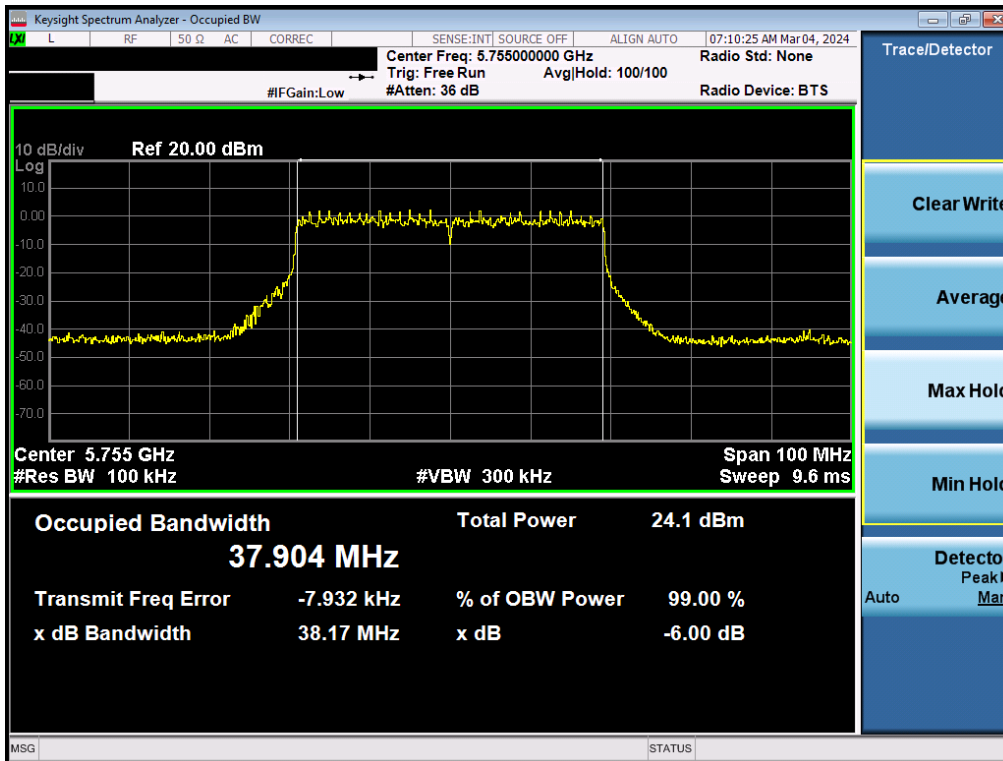


Plot 7-51. 6dB Bandwidth Plot MIMO ANT1 (160MHz BW 802.11be – 26 Tones (UNII Band 3/4) – Ch. 163)

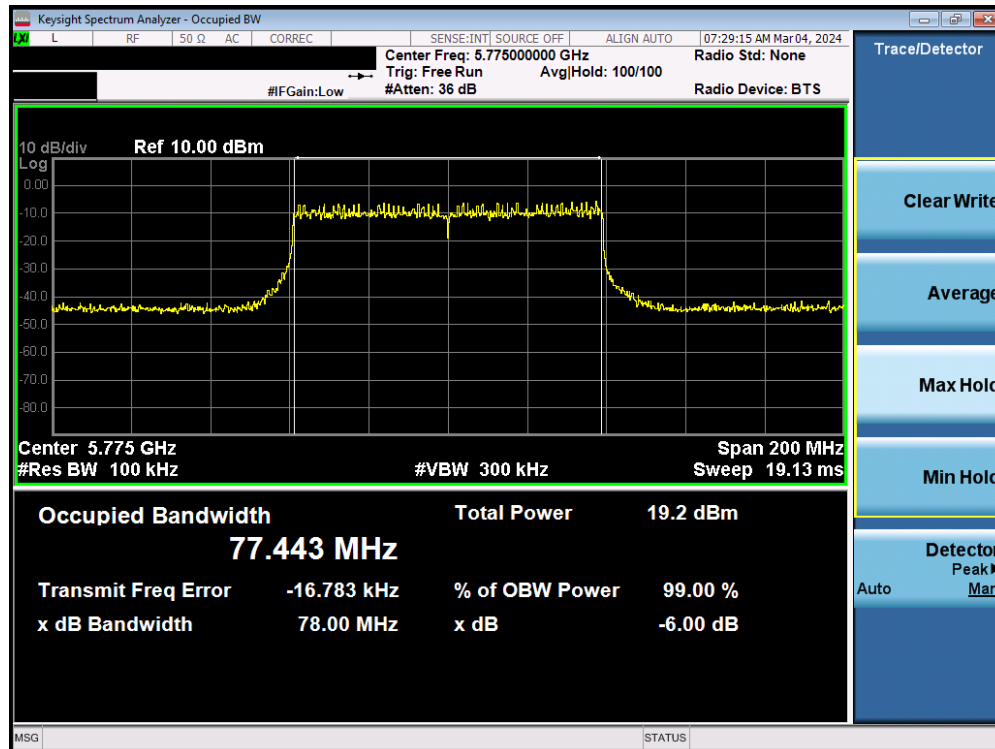


Plot 7-52. 6dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11be – 242 Tones (UNII Band 3) – Ch. 157)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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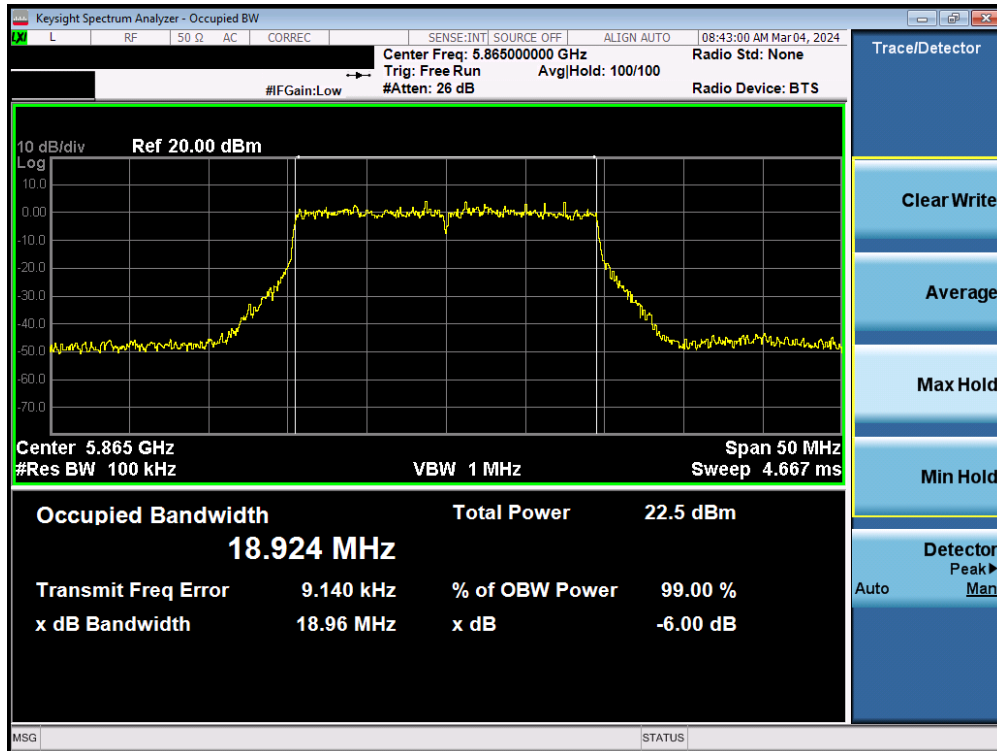


Plot 7-53. 6dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11be – 484 Tones (UNII Band 3) – Ch. 151)

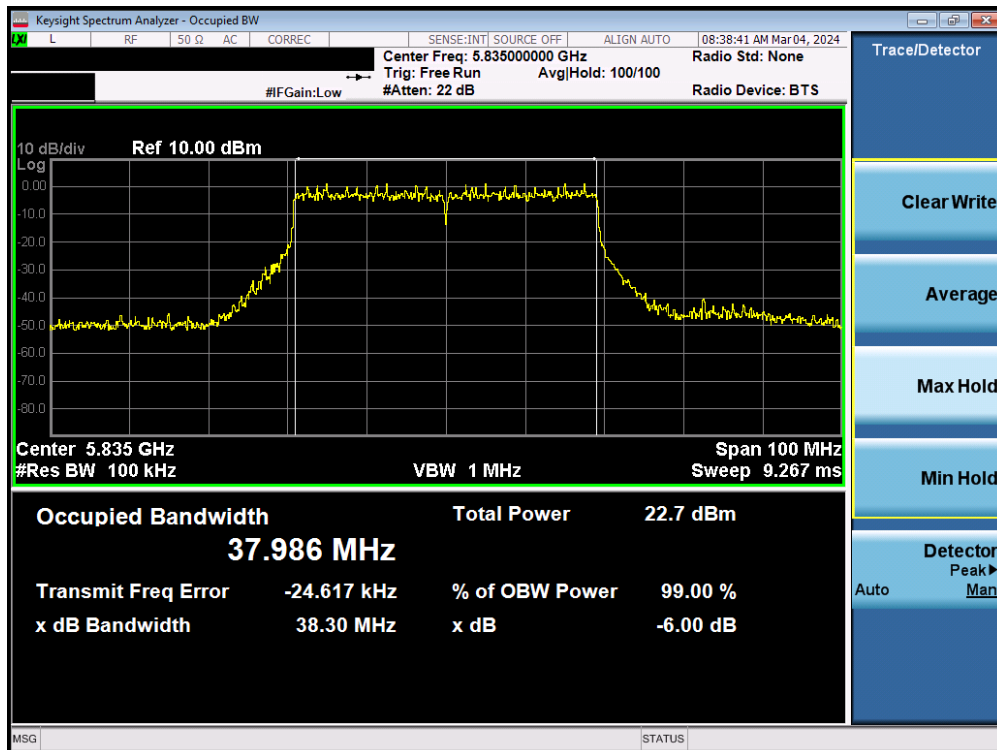


Plot 7-54. 6dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11be – 996 Tones (UNII Band 3) – Ch. 155)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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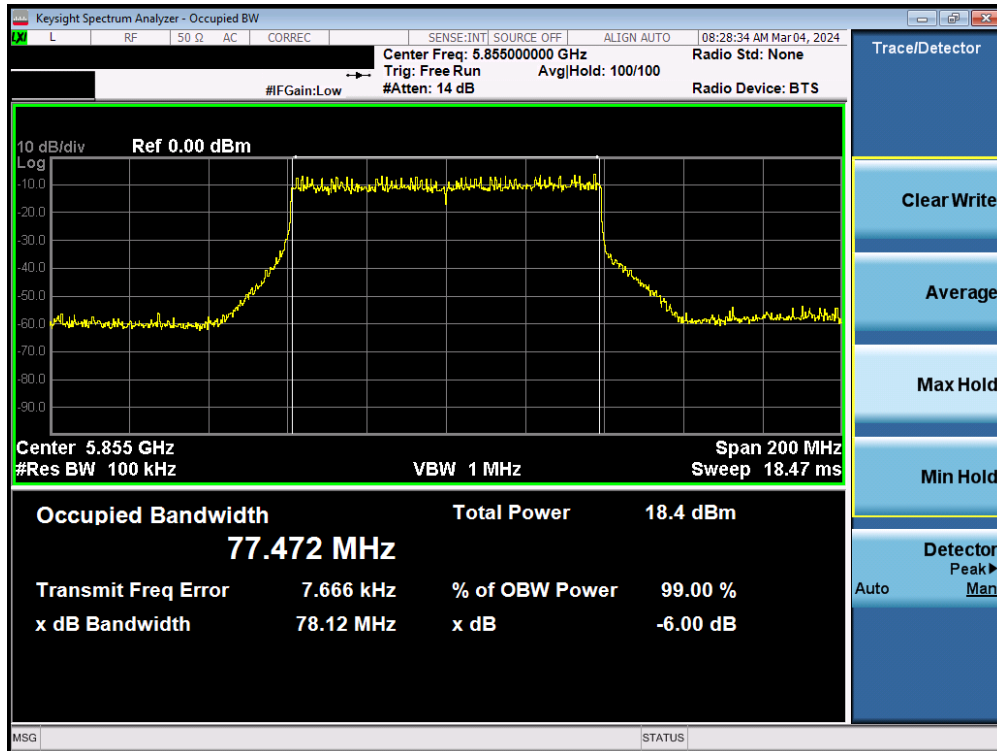


Plot 7-55. 6dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11be – 242 Tones (UNII Band 4) – Ch. 173)

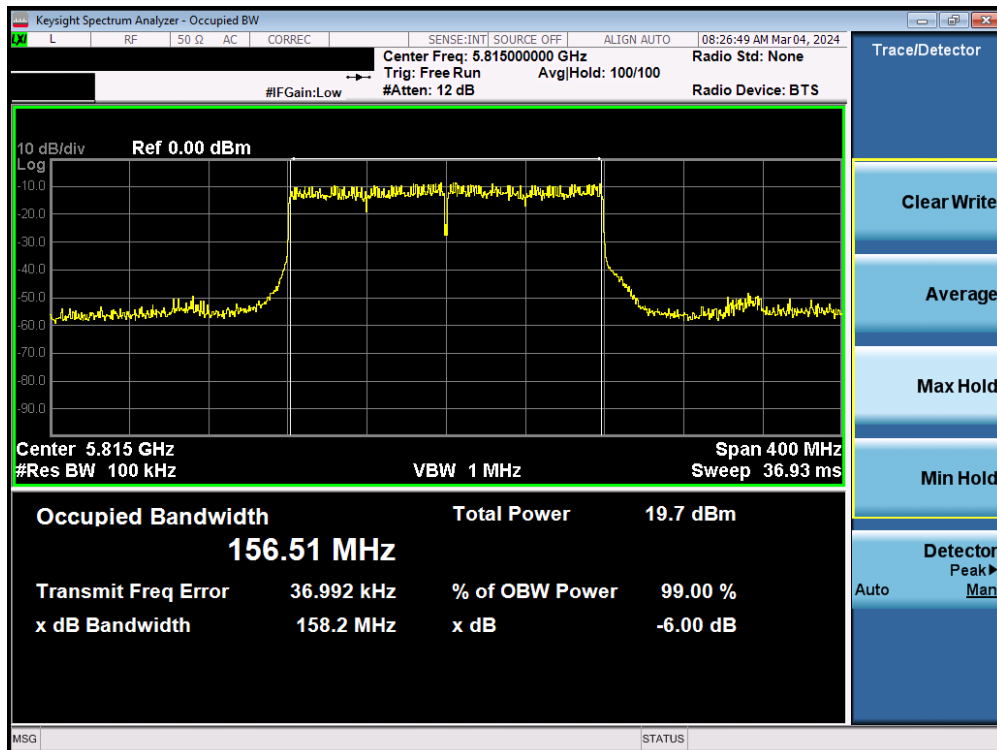


Plot 7-56. 6dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11be – 484 Tones (UNII Band 3/4) – Ch. 167)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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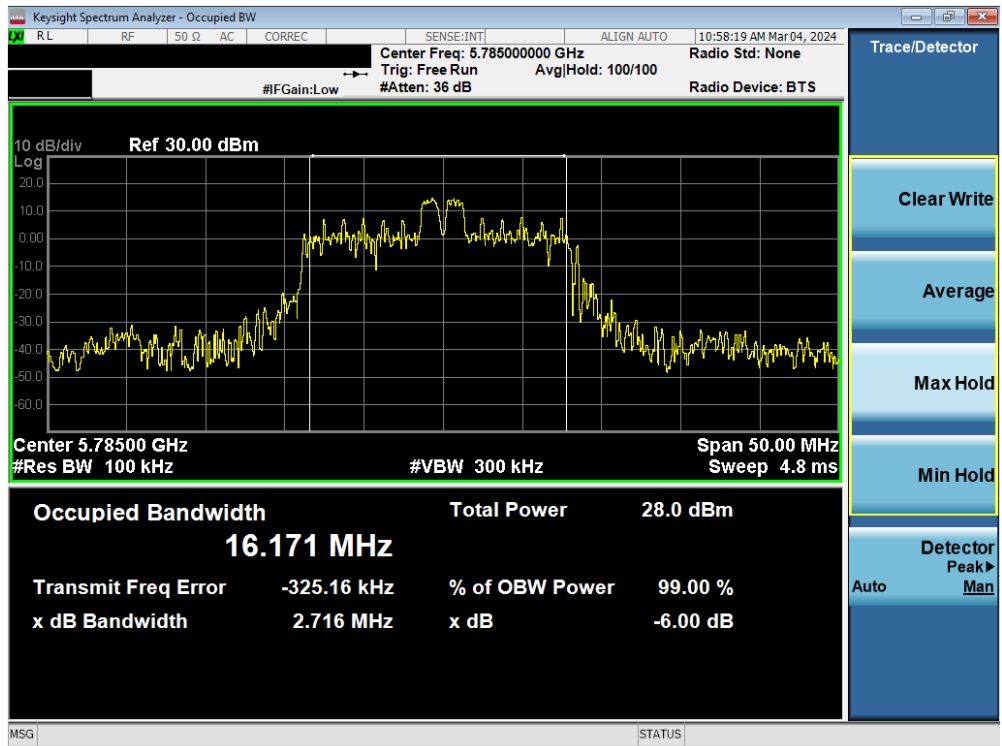
Plot 7-57. 6dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11be – 996 Tones (UNII Band 3/4) – Ch. 171)



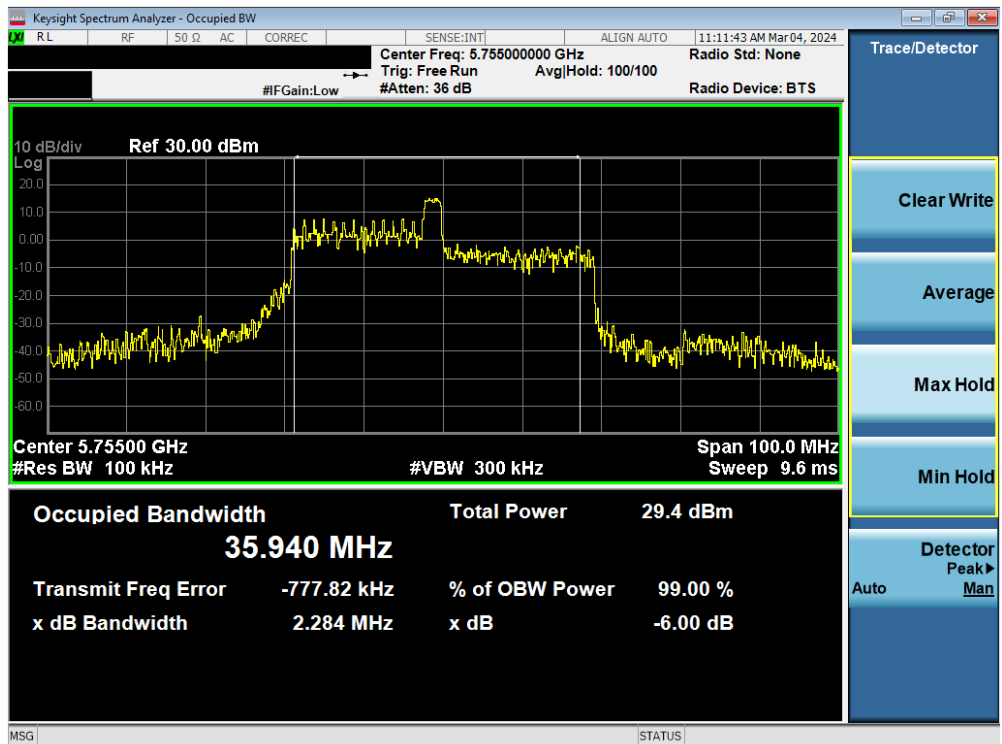
Plot 7-58. 6dB Bandwidth Plot MIMO ANT1 (160MHz BW 802.11be – 996*2 Tones (UNII Band 3/4) – Ch. 163)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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7.3.2 MIMO Antenna-2 6dB Bandwidth Measurements

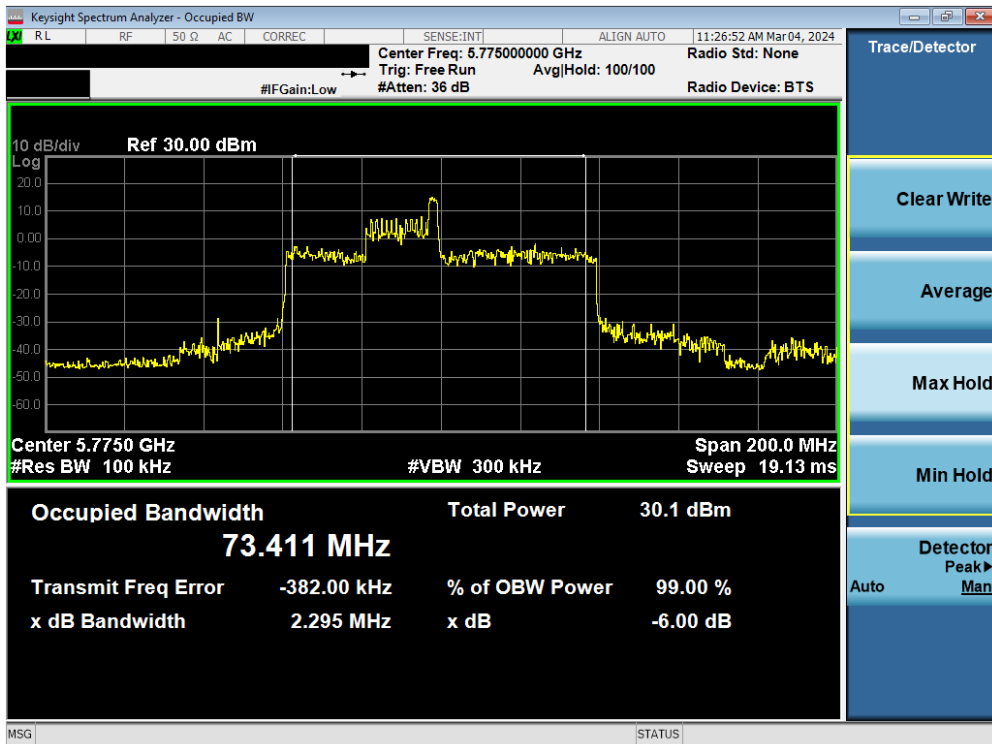


Plot 7-59. 6dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11be – 26 Tones (UNII Band 3) – Ch. 157)

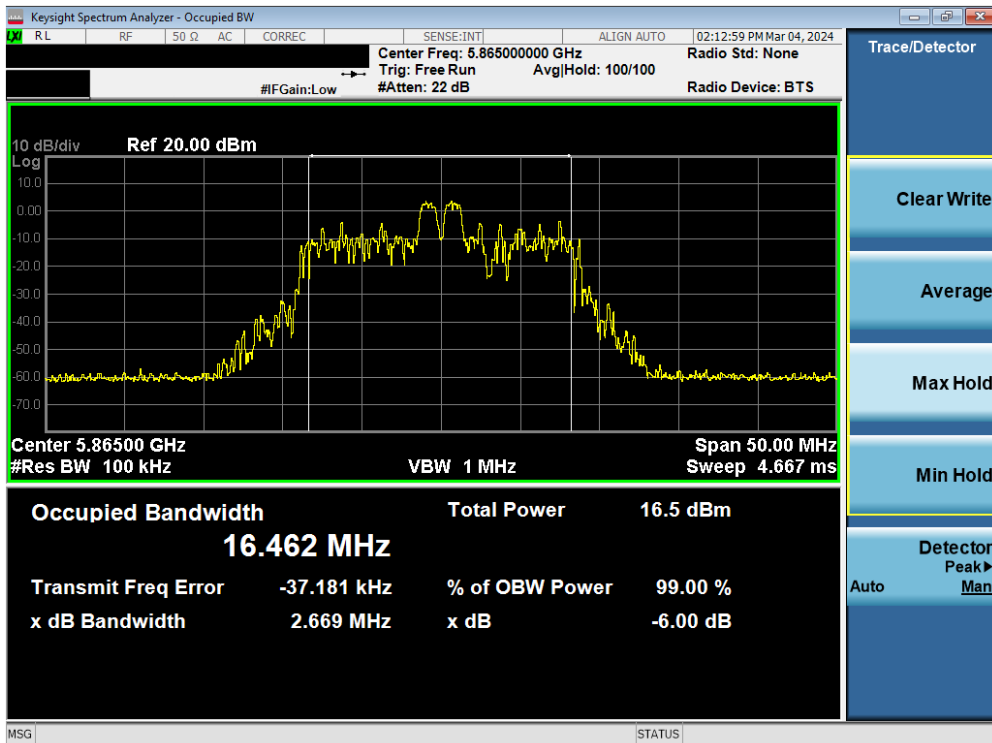


Plot 7-60. 6dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11be – 26 Tones (UNII Band 3) – Ch. 151)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2312040120-20.C3K	Test Dates: 12/14/2023 - 04/11/2024	EUT Type: Portable Computing Device	Page 49 of 161

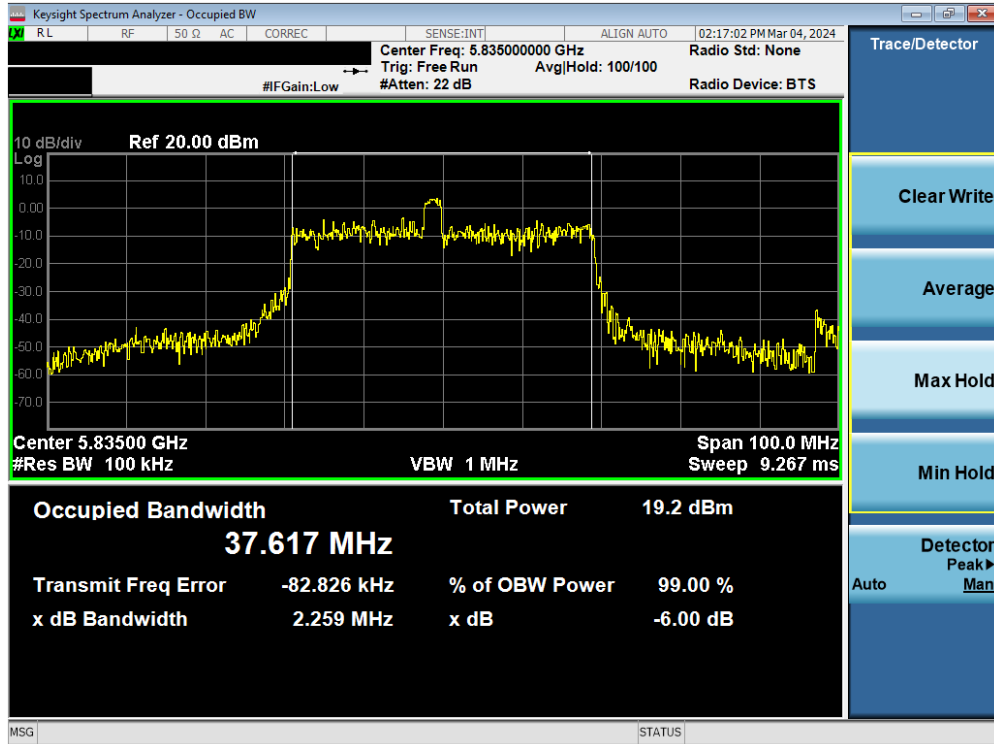


Plot 7-61. 6dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11be – 26 Tones (UNII Band 3) – Ch. 155)

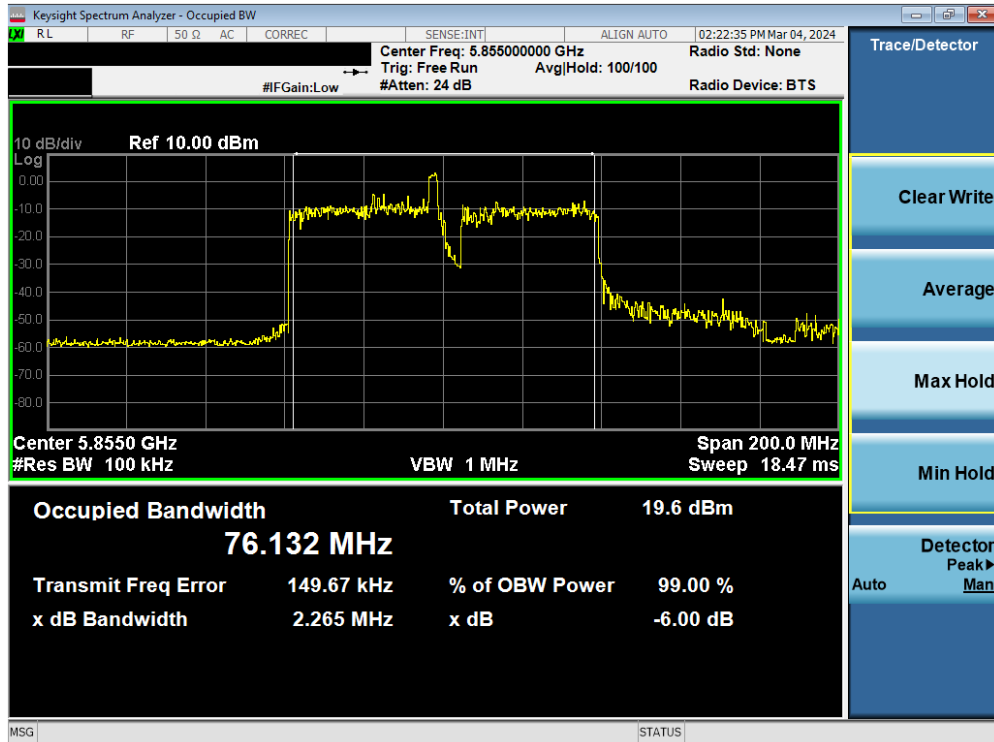


Plot 7-62. 6dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11be – 26 Tones (UNII Band 4) – Ch. 173)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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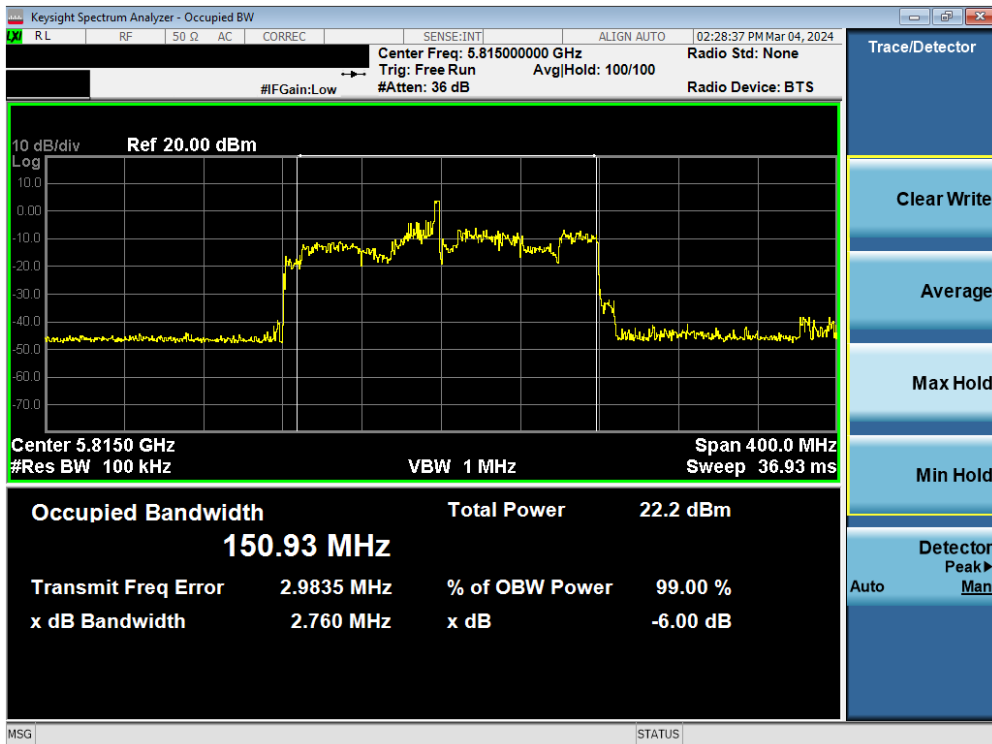


Plot 7-63. 6dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11be – 26 Tones (UNII Band 3/4) – Ch. 167)

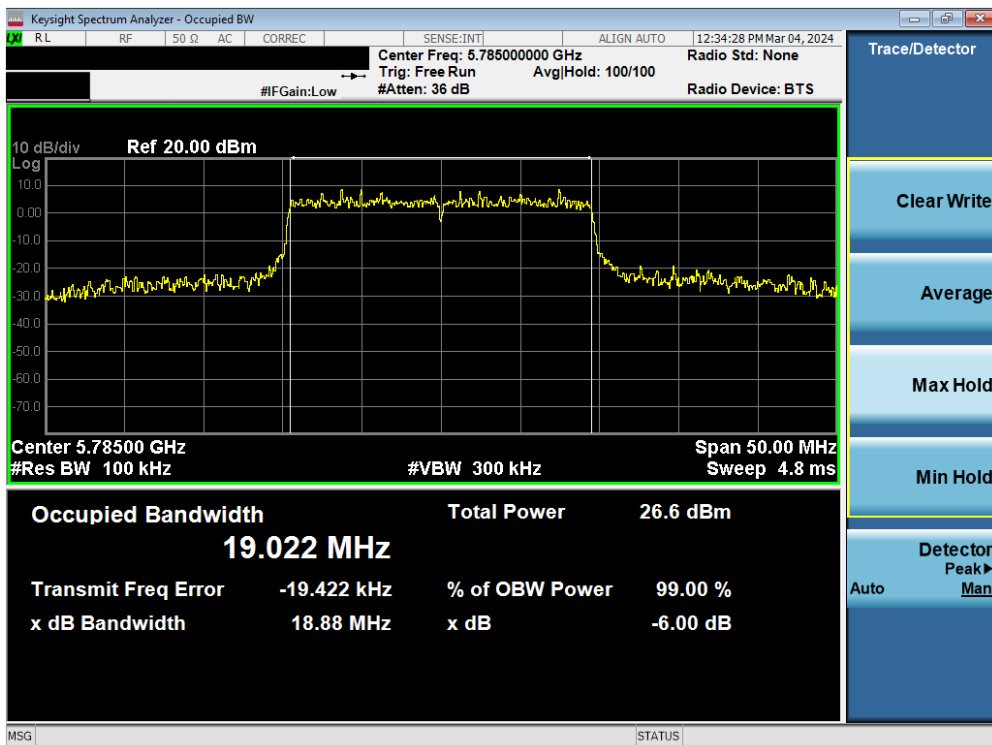


Plot 7-64. 6dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11be – 26 Tones (UNII Band 3/4) – Ch. 171)

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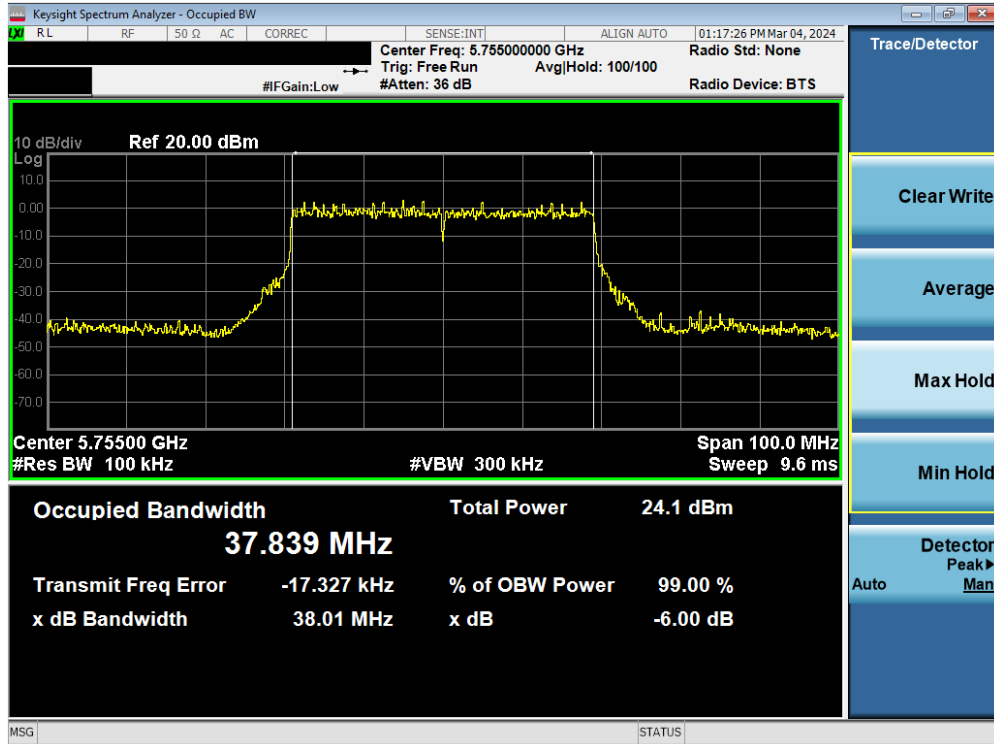


Plot 7-65. 6dB Bandwidth Plot MIMO ANT2 (160MHz BW 802.11be – 26 Tones (UNII Band 3/4) – Ch. 163)

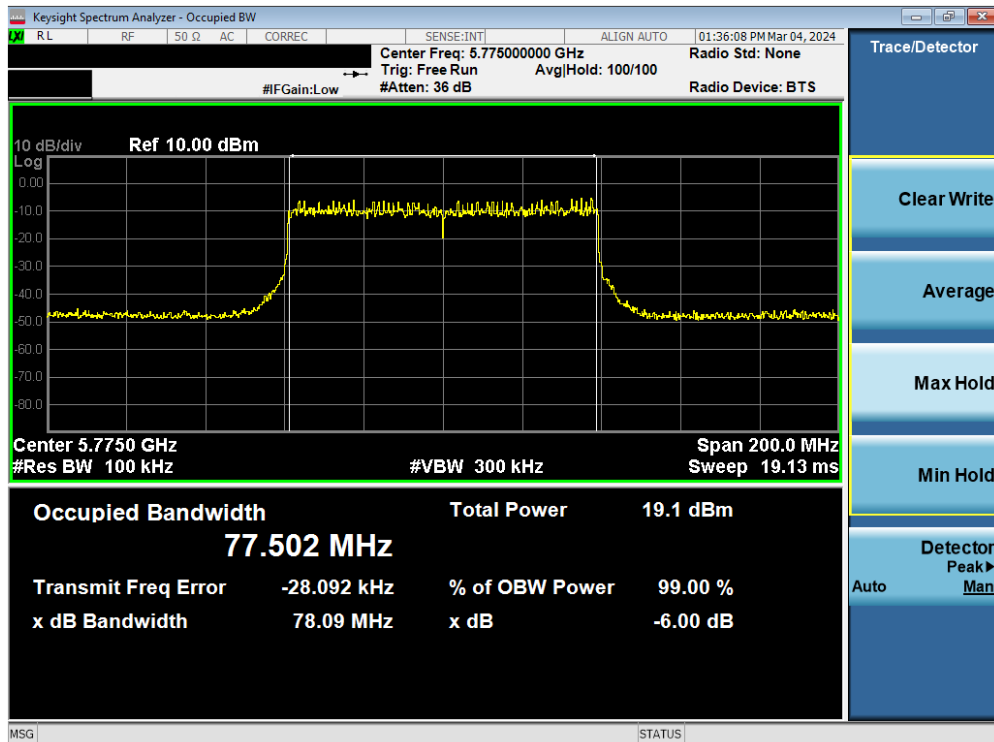


Plot 7-66. 6dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11be – 242 Tones (UNII Band 3) – Ch. 157)

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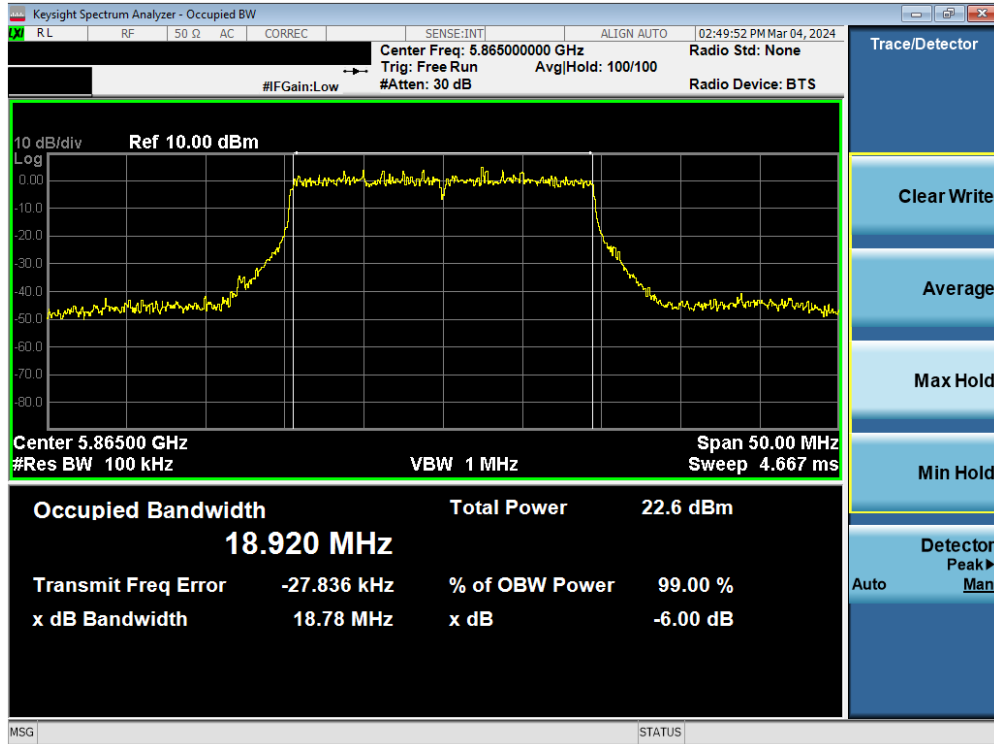


Plot 7-67. 6dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11be – 484 Tones (UNII Band 3) – Ch. 151)

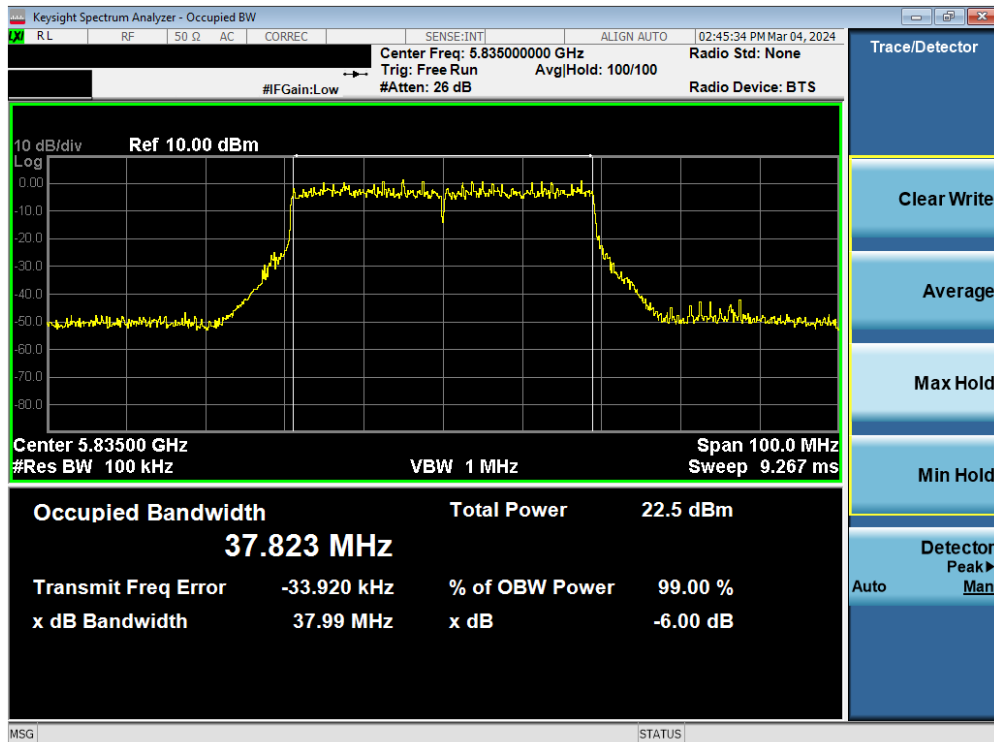


Plot 7-68. 6dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11be – 996 Tones (UNII Band 3) – Ch. 155)

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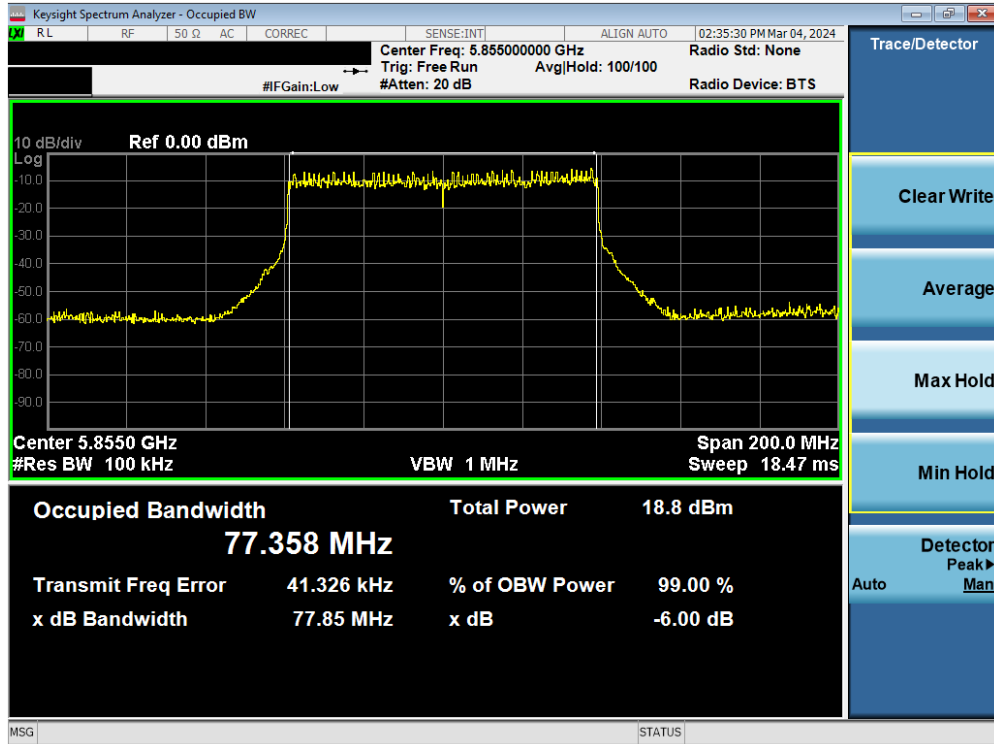


Plot 7-69. 6dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11be – 242 Tones (UNII Band 4) – Ch. 173)

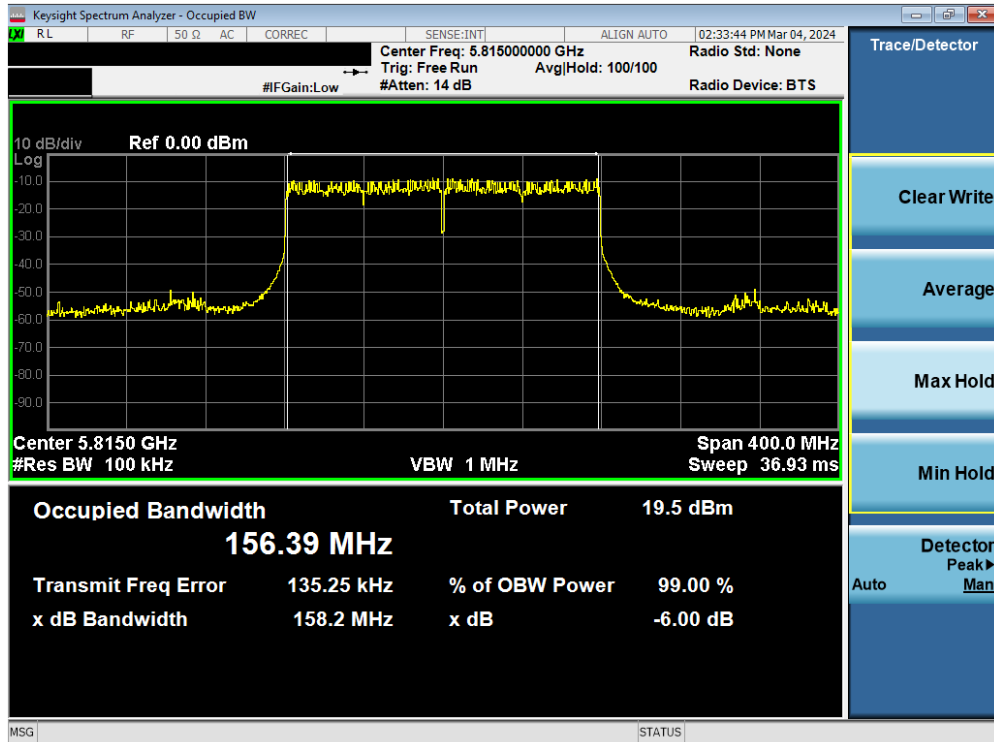


Plot 7-70. 6dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11be – 484 Tones (UNII Band 3/4) – Ch. 167)

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Plot 7-71. 6dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11be – 996 Tones (UNII Band 3/4) – Ch. 171)



Plot 7-72. 6dB Bandwidth Plot MIMO ANT2 (160MHz BW 802.11be – 996*2 Tones (UNII Band 3/4) – Ch. 163)

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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 C63.10-2013, 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	ISED	FCC	ISED
UNII 1	5.15 – 5.25GHz	23.98dBm (250mW)	N/A	N/A	The lesser of 23.01dBm (200mW) or 10dBm + 10log ₁₀ B
UNII 2A	5.25 – 5.35GHz	The lesser of 23.98dBm (250mW) or 11dBm + 10log ₁₀ B		N/A	The lesser of 30dBm (1W) or 17dBm + 10log ₁₀ B
UNII 2C	5.47 – 5.725GHz				
UNII 3	5.725 – 5.850GHz	30dBm (1W)	N/A	N/A	N/A
UNII 4	5.850 – 5.895GHz	N/A	N/A	30dBm (1W)	30dBm (1W)

Test Procedure Used

ANSI C63.10-2013 – Section 12.3.3.2 Method PM-G

ANSI C63.10-2013 – Section 14.2 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.

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80MHz BW	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								
					67								
					ANT1	ANT2	MIMO						
1	5210	42	996T	13.65	13.51	16.59	23.98	-7.39	4.78	21.37	30.0	-8.63	
2A	5290	58	996T	14.10	13.99	17.06	23.98	-6.92	4.94	21.99	30.0	-8.01	
2C	5530	106	996T	11.51	11.61	14.57	23.98	-9.41	5.73	20.30	30.0	-9.70	
	5610	122	996T	18.05	18.08	21.07	23.98	-2.91	5.73	26.80	30.0	-3.20	
3	5690	138	996T	18.10	18.03	21.08	23.98	-2.90	5.73	26.80	30.0	-3.20	
	5775	155	996T	13.40	13.26	16.34	30	-13.66	5.66	22.00	36.0	-14.00	
4	5855	171	996T	13.10	13.05	16.08	-	-	5.56	21.64	30.0	-8.36	

Table 7-13. MIMO 80MHz BW (UNII) Maximum Conducted Output Power (996 Tones)

160MHz BW	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								
					68								
					ANT1	ANT2	MIMO						
1/2A	5250	50	2x996T	13.14	13.01	16.09	23.98	-7.89	4.78	20.87	30.0	-9.13	
2C	5570	114	2x996T	13.09	13.43	16.27	23.98	-7.71	5.73	22.00	30.0	-8.00	
3/4	5815	163	2x996T	13.16	13.15	16.16	-	-	5.56	21.72	30.0	-8.28	

Table 7-14. MIMO 160MHz BW (UNII) Maximum Conducted Output Power (2x996 Tones)

20MHz BW	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]
					MRU Index														
					70			71			72								
					ANT1	ANT2	MIMO	ANT1	ANT2	MIMO	ANT1	ANT2	MIMO						
					1	5200	40	521+261	12.87	12.81	15.85	12.97	12.97						
2A	5280	56	521+261	12.84	12.97	15.91	12.92	13.02	15.98	12.89	12.99	15.95	23.98	-8.00	4.94	20.92	30.0	-9.08	
	5600	120	521+261	12.62	12.75	15.70	12.70	12.78	15.75	12.56	12.63	15.61	23.98	-8.23	5.73	21.48	30.0	-8.52	
3	5785	157	521+261	19.64	19.73	22.69	19.65	19.83	22.75	19.84	20.29	23.98	30	-6.97	5.66	28.69	36.0	-7.31	
4	5865	173	521+261	12.75	12.61	15.69	12.85	12.69	15.78	12.80	12.61	15.71	-	-	5.56	21.34	30.0	-8.66	

Table 7-15. MIMO 20MHz BW (UNII) Maximum Conducted Output Power (52 + 26 Tones)

20MHz BW	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]
					MRU Index											
					82			83								
					ANT1	ANT2	MIMO	ANT1	ANT2	MIMO						
1	5200	40	1061+26T	15.21	15.26	18.24	15.27	15.28	18.29	23.98	-5.69	4.78	23.07	30.0	-6.93	
2A	5280	56	1061+26T	15.24	15.23	18.25	15.30	15.28	18.30	23.98	-5.68	4.94	23.24	30.0	-6.76	
2C	5600	120	1061+26T	14.56	14.60	17.59	14.51	14.52	17.52	23.98	-6.39	5.73	23.32	30.0	-6.68	
4	5865	173	1061+26T	14.68	14.62	17.66	14.95	14.66	17.82	30	-6.74	5.56	23.38	30.0	-6.62	

Table 7-16. MIMO 20MHz BW (UNII) Maximum Conducted Output Power (106 + 26 Tones)

80MHz BW	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]
					MRU Index														
					90			92											
					ANT1	ANT2	MIMO	ANT1	ANT2	MIMO									
					1	5210	42	484+242T	15.21	15.16	18.20	14.97	15.02						
2A	5290	58	484+242T	14.34	14.38	17.37	14.37	14.31	17.35	23.98	-6.61	4.94	22.30	30.0	-7.70				
	5530	106	484+242T	15.09	15.19	18.15	15.07	15.19	18.14	23.98	-5.83	5.73	23.88	30.0	-6.12				
2C	5610	122	484+242T	18.09	18.11	21.11	17.95	18.00	20.98	23.98	-2.87	5.73	26.84	30.0	-3.16				
	5690	138	484+242T	18.04	18.01	21.03	17.97	17.86	20.92	23.98	-2.95	5.73	26.76	30.0	-3.24				
3	5775	155	484+242T	17.26	17.21	20.24	17.09	17.07	20.09	30	-9.76	5.66	25.90	36.0	-10.10				
4	5855	171	484+242T	16.42	16.22	19.32	16.24	16.07	19.17	-	-	5.56	26.99	30.0	-9.11				

Table 7-17. MIMO 80MHz BW (UNII) Maximum Conducted Output Power (484 + 242 Tones)

160MHz BW	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]
					MRU Index											
					94			1095								
					ANT1	ANT2	MIMO	ANT1	ANT2	MIMO						
1/2A	5250	50	996+484T	14.05	14.02	17.05	13.91	13.79	16.86	23.98	-6.93	4.78	21.83	30.0	-8.17	
2C	5570	114	996+484T	11.59	11.79	14.70	11.71	11.98	14.86	23.98	-9.12	5.73	20.58	30.0	-9.42	
3/4	5815	163	996+484T	13.47	13.37	16.45	13.41	13.36	16.40	-	-	5.56	21.99	30.0	-8.01	

Table 7-18. MIMO 160MHz BW (UNII) Maximum Conducted Output Power (996 + 484 Tones)

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Note:

Per ANSI C63.10-2013 and KDB 662911 v02r01 Section E1), 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 C63.10-2013 Section 14.4.3, 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.

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

Sample MIMO Calculation:

At 5180MHz in 802.11be (20MHz BW 242T) mode, the average conducted output power was measured to be 17.41 dBm for Antenna 1 and 17.71 dBm for Antenna 2.

$$\text{Antenna 1} + \text{Antenna 2} = \text{MIMO}$$

$$(17.41 \text{ dBm} + 17.71 \text{ dBm}) = (55.08 \text{ mW} + 59.02 \text{ mW}) = 114.10 \text{ mW} = 20.57\text{dBm}$$

Sample e.i.r.p. Calculation:

At 5180MHz in 802.11be (20MHz BW 242T) mode, the average MIMO conducted power was calculated to be 20.57dBm with directional gain of 4.78dBi.

$$\text{e.i.r.p. (dBm)} = \text{Conducted Power (dBm)} + \text{Ant gain (dBi)}$$

$$20.57 \text{ dBm} + 4.78 \text{ dBi} = 25.36 \text{ dBm}$$

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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 C63.10-2013, and at the appropriate frequencies. Method SA-1, as defined in ANSI C63.10-2013, 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 Power Spectral Density	
		FCC	ISED
UNII 1	5.15 – 5.25GHz	11dBm/MHz	10dBm/MHz e.i.r.p
UNII 2A	5.25 – 5.35GHz	11dBm/MHz	
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 C63.10-2013 – Section 12.3.2.2 (Method SA-1)

ANSI C63.10-2013 – Section 14.3.2.2 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 $\geq 2 \times (\text{span}/\text{RBW})$
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.

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Summed MIMO Power Spectral Density Measurements

	Frequency [MHz]	802.11 MODE	Channel	Antenna 1 PSD [dBm]	Antenna 2 PSD [dBm]	MIMO Summed PSD [dBm]	Max Conducted PSD [dBm]	Margin [dB]
Band 1	5180	be (20MHz)	36	5.65	6.35	9.03	11.00	-1.97
	5200	be (20MHz)	40	6.04	6.30	9.18	11.00	-1.82
	5240	be (20MHz)	48	6.26	6.63	9.46	11.00	-1.54
	5190	be (40MHz)	38	6.51	6.75	9.64	11.00	-1.36
	5230	be (40MHz)	46	6.67	7.29	10.00	11.00	-1.00
Band 1/2A	5210	be (80MHz)	42	6.55	6.91	9.74	11.00	-1.26
Band 2A	5250	be (160MHz)	50	6.47	7.12	9.82	11.00	-1.18
	5260	be (20MHz)	52	5.95	6.09	9.03	11.00	-1.97
	5280	be (20MHz)	56	5.73	6.25	9.01	11.00	-1.99
	5320	be (20MHz)	64	6.32	6.44	9.39	11.00	-1.61
	5270	be (40MHz)	54	6.53	7.01	9.78	11.00	-1.22
Band 2C	5310	be (40MHz)	62	7.08	7.10	10.10	11.00	-0.90
	5290	be (80MHz)	58	6.90	6.94	9.93	11.00	-1.07
	5500	be (20MHz)	100	5.68	6.14	8.92	11.00	-2.08
	5600	be (20MHz)	120	5.44	5.95	8.71	11.00	-2.29
	5720	be (20MHz)	144	6.16	6.18	9.18	11.00	-1.82
	5510	be (40MHz)	102	6.93	7.24	10.10	11.00	-0.90
	5590	be (40MHz)	118	6.02	6.83	9.45	11.00	-1.55
	5710	be (40MHz)	142	6.55	7.09	9.84	11.00	-1.16
	5530	be (80MHz)	106	6.33	6.71	9.54	11.00	-1.46
	5610	be (80MHz)	122	6.37	5.94	9.17	11.00	-1.83
5690	be (80MHz)	138	6.43	6.17	9.31	11.00	-1.69	
	5570	be (160MHz)	114	6.52	6.66	9.60	11.00	-1.40

Table 7-19. 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]	MIMO Summed PSD [dBm]	Max Conducted PSD [dBm]	Margin [dB]
Band 3	5745	be (20MHz)	149	13.97	13.93	16.96	30.00	-13.04
	5785	be (20MHz)	157	13.69	13.77	16.74	30.00	-13.26
	5825	be (20MHz)	165	13.05	13.64	16.36	30.00	-13.64
	5755	be (40MHz)	151	14.04	13.76	16.91	30.00	-13.09
	5795	be (40MHz)	159	13.16	13.75	16.47	30.00	-13.53
	5775	be (80MHz)	155	13.71	13.63	16.68	30.00	-13.32

Table 7-20. 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]	Antenna Gain [dBi]	MIMO Summed EIRP PSD [dBm]	Max EIRP PSD [dBm]	Margin [dB]
Band 3/4	5845	be (20MHz)	169	3.92	4.24	5.56	12.65	14.00	-1.35
Band 4	5865	be (20MHz)	173	3.72	4.59	5.56	12.75	14.00	-1.25
	5885	be (20MHz)	177	3.74	4.34	5.56	12.62	14.00	-1.38
Band 3/4	5835	be (40MHz)	167	4.89	5.43	5.56	13.74	14.00	-0.26
Band 4	5875	be (40MHz)	175	4.30	5.18	5.56	13.33	14.00	-0.67
Band 3/4	5855	be (80MHz)	171	4.07	3.87	5.56	12.54	14.00	-1.46
	5815	be (160MHz)	163	5.40	5.29	5.56	13.92	14.00	-0.08

Table 7-21. Bands 3/4 MIMO Conducted Power Spectral Density Measurements MIMO (26 Tones)

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	Frequency [MHz]	802.11 MODE	Channel	Antenna 1 PSD [dBm]	Antenna 2 PSD [dBm]	MIMO Summed PSD [dBm]	Max Conducted PSD [dBm]	Margin [dB]
Band 1	5180	be (20MHz)	36	5.07	5.55	8.33	11.00	-2.67
	5200	be (20MHz)	40	6.84	7.34	10.11	11.00	-0.89
	5240	be (20MHz)	48	6.80	7.05	9.94	11.00	-1.06
	5190	be (40MHz)	38	-0.30	0.13	2.93	11.00	-8.07
	5230	be (40MHz)	46	2.59	3.16	5.90	11.00	-5.10
	5210	be (80MHz)	42	-4.88	-4.20	-1.52	11.00	-12.52
Band 1/2A	5250	be (160MHz)	50	-9.69	-8.23	-5.89	11.00	-16.89
Band 2A	5260	be (20MHz)	52	6.84	6.82	9.84	11.00	-1.16
	5280	be (20MHz)	56	6.90	7.08	10.00	11.00	-1.00
	5320	be (20MHz)	64	5.53	5.35	8.45	11.00	-2.55
	5270	be (40MHz)	54	-1.34	-0.84	1.93	11.00	-9.07
	5310	be (40MHz)	62	-0.10	0.12	3.02	11.00	-7.98
	5290	be (80MHz)	58	-5.63	-4.87	-2.22	11.00	-13.22
Band 2C	5500	be (20MHz)	100	5.05	5.64	8.36	11.00	-2.64
	5600	be (20MHz)	120	6.49	7.14	9.84	11.00	-1.16
	5720	be (20MHz)	144	4.12	4.82	7.49	11.00	-3.51
	5510	be (40MHz)	102	-0.34	-0.02	2.84	11.00	-8.16
	5590	be (40MHz)	118	2.83	3.40	6.13	11.00	-4.87
	5710	be (40MHz)	142	3.07	3.90	6.51	11.00	-4.49
	5530	be (80MHz)	106	-7.53	-7.11	-4.30	11.00	-15.30
	5610	be (80MHz)	122	-1.00	-0.83	2.09	11.00	-8.91
	5690	be (80MHz)	138	-1.44	-1.52	1.53	11.00	-9.47
	5570	be (160MHz)	114	-9.17	-8.76	-5.95	11.00	-16.95

Table 7-22. 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]	MIMO Summed PSD [dBm]	Max Conducted PSD [dBm]	Margin [dB]
Band 3	5745	be (20MHz)	149	5.69	5.79	8.75	30.00	-21.25
	5785	be (20MHz)	157	5.79	5.56	8.69	30.00	-21.31
	5825	be (20MHz)	165	5.36	5.43	8.40	30.00	-21.60
	5755	be (40MHz)	151	-0.45	-0.09	2.74	30.00	-27.26
	5795	be (40MHz)	159	-0.54	-0.48	2.50	30.00	-27.50
	5775	be (80MHz)	155	-8.64	-8.74	-5.68	30.00	-35.68

Table 7-23. 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]	Antenna Gain [dBi]	MIMO Summed EIRP PSD [dBm]	Max EIRP PSD [dBm]	Margin [dB]
Band 3/4	5845	be (20MHz)	169	4.47	4.28	5.56	12.95	14.00	-1.05
Band 4	5865	be (20MHz)	173	4.31	4.36	5.56	12.90	14.00	-1.10
	5885	be (20MHz)	177	4.14	4.74	5.56	13.02	14.00	-0.98
Band 3/4	5835	be (40MHz)	167	0.92	0.81	5.56	9.43	14.00	-4.57
Band 4	5875	be (40MHz)	175	0.82	0.97	5.56	9.47	14.00	-4.53
Band 3/4	5855	be (80MHz)	171	-6.44	-6.49	5.56	2.10	14.00	-11.90
	5815	be (160MHz)	163	-9.02	-9.60	5.56	-0.73	14.00	-14.73

Table 7-24. Bands 3/4 MIMO Conducted Power Spectral Density Measurements MIMO (Full Tones)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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	Frequency [MHz]	802.11 MODE	MRU Case	Channel	Antenna 1 PSD [dBm]	Antenna 2 PSD [dBm]	DCCF [dB]	MIMO Summed PSD [dBm]	Max Conducted PSD [dBm]	Margin [dB]
Band 1	5200	be (20MHz)	52+26T	40	5.30	5.74	0.00	8.54	11.00	-2.46
	5200	be (20MHz)	106+26T	40	5.80	5.98	0.00	8.90	11.00	-2.10
	5210	be (80MHz)	484+242T	42	-0.91	-0.76	0.00	2.18	11.00	-8.82
Band 1/2A	5250	be (160MHz)	996+484T	50	-5.13	-5.01	0.09	-1.97	11.00	-12.97
Band 2A	5280	be (20MHz)	52+26T	56	5.77	5.85	0.00	8.82	11.00	-2.18
	5280	be (20MHz)	106+26T	56	5.83	6.07	0.00	8.96	11.00	-2.04
	5290	be (80MHz)	484+242T	58	-1.69	-1.76	0.00	1.29	11.00	-9.71
Band 2C	5600	be (20MHz)	52+26T	120	5.22	5.65	0.00	8.45	11.00	-2.55
	5600	be (20MHz)	106+26T	120	4.84	5.20	0.00	8.03	11.00	-2.97
	5610	be (80MHz)	484+242T	122	1.84	1.79	0.00	4.83	11.00	-6.17
	5570	be (160MHz)	996+484T	114	-7.28	-6.59	0.09	-3.82	11.00	-14.82

Table 7-25. Bands 1, 2A, 2C MIMO Conducted Power Spectral Density Measurements MIMO (MRU Cases)

	Frequency [MHz]	802.11 MODE	MRU Case	Channel	Antenna 1 PSD [dBm]	Antenna 2 PSD [dBm]	MIMO Summed PSD [dBm]	Max Conducted PSD [dBm]	Margin [dB]
Band 3	5785	be (20MHz)	52+26T	157	7.91	7.78	10.86	30.00	-19.14
	5785	be (20MHz)	106+26T	157	6.92	7.08	10.01	30.00	-19.99
	5775	be (80MHz)	484+242T	155	-1.76	-1.75	1.26	30.00	-28.74

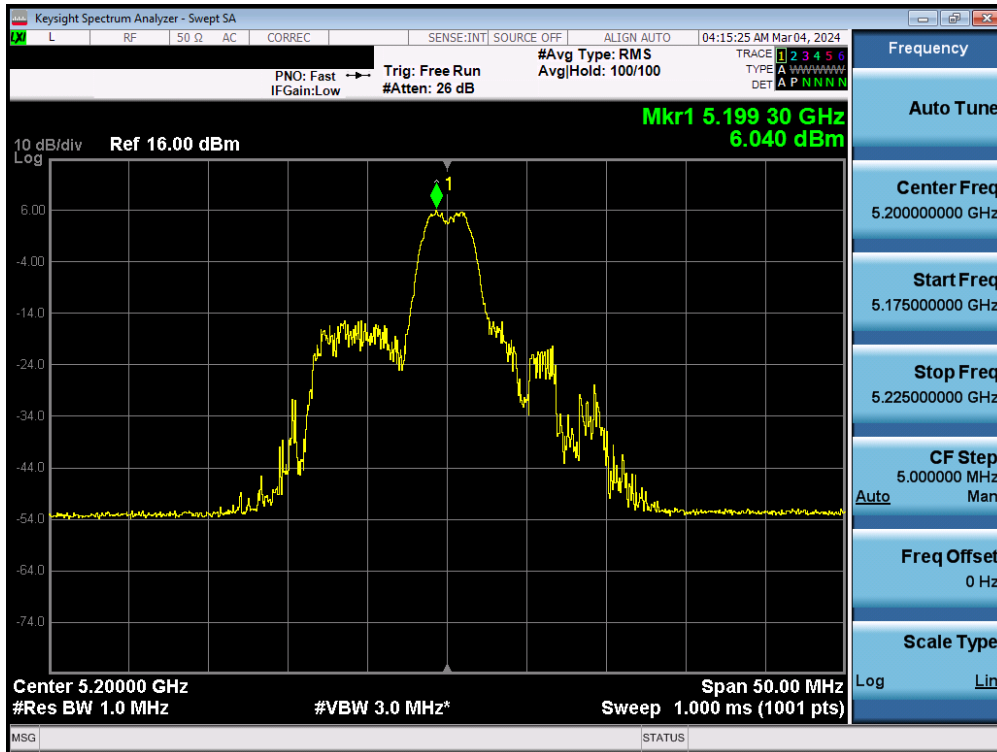
Table 7-26. Band 3 MIMO Conducted Power Spectral Density Measurements MIMO (MRU Cases)

	Frequency [MHz]	802.11 MODE	MRU Case	Channel	Antenna 1 PSD [dBm]	Antenna 2 PSD [dBm]	DCCF [dB]	Antenna Gain [dBi]	MIMO Summed EIRP PSD [dBm]	Max EIRP PSD [dBm]	Margin [dB]
Band 4	5865	be (20MHz)	52+26T	173	5.28	5.25	0.00	5.56	13.83	14.00	-0.17
Band 4	5865	be (20MHz)	106+26T	173	5.26	5.30	0.00	5.56	13.85	14.00	-0.15
Band 3/4	5855	be (80MHz)	484+242T	171	2.09	1.61	0.00	5.56	10.43	14.00	-3.57
	5815	be (160MHz)	996+484T	163	-5.96	-5.81	0.09	5.56	2.77	14.00	-11.23

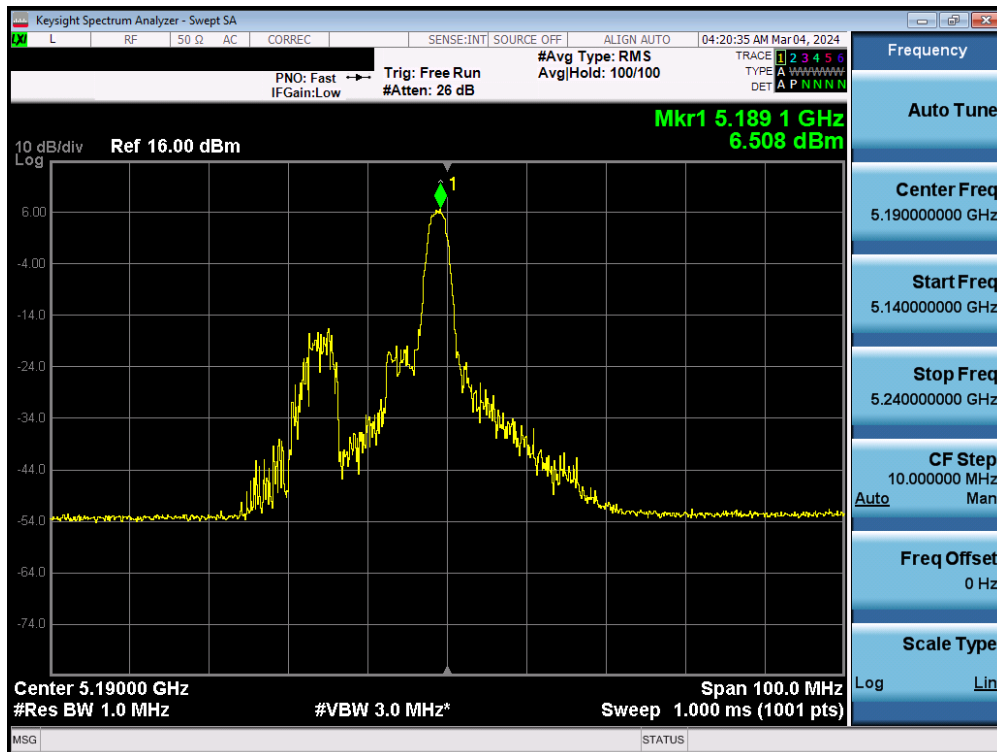
Table 7-27. Bands 3/4 MIMO Conducted Power Spectral Density Measurements MIMO (MRU Cases)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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7.5.1 MIMO Antenna-1 Power Spectral Density Measurements

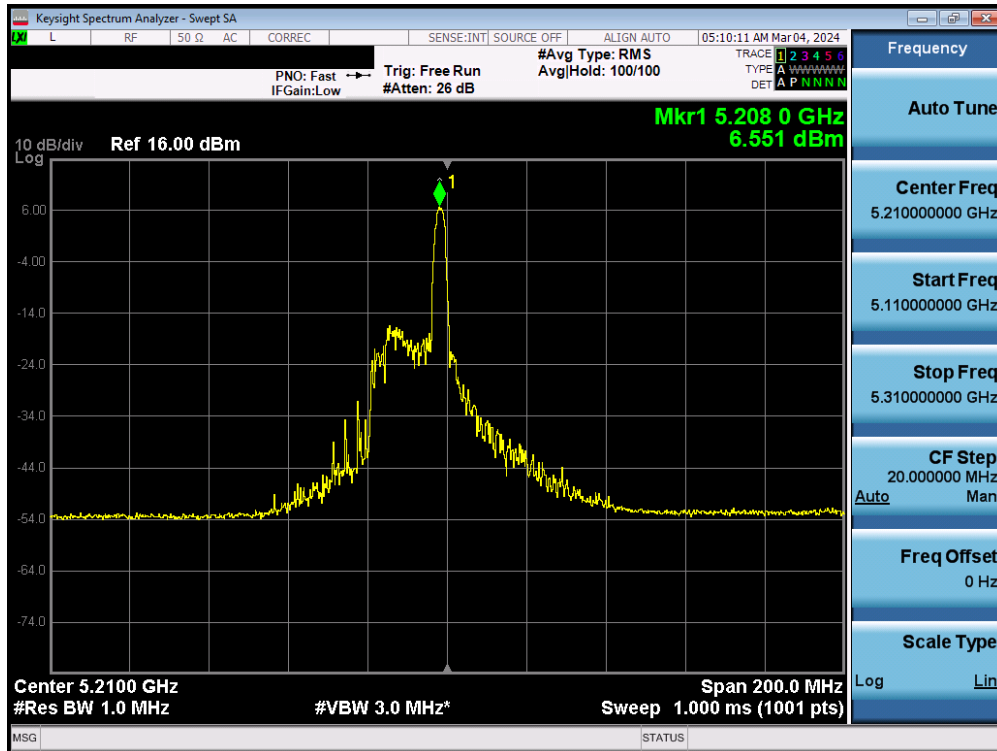


Plot 7-73. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11be – 26 Tones (UNII Band 1) – Ch. 40)

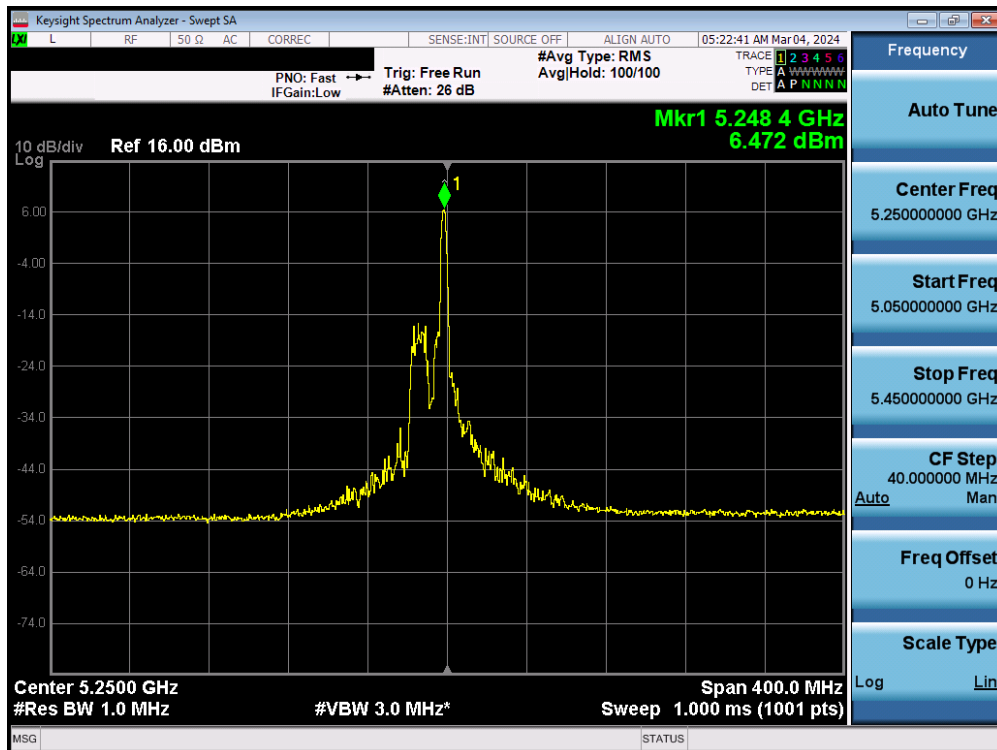


Plot 7-74. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11be – 26 Tones (UNII Band 1) – Ch. 38)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2312040120-20.C3K	Test Dates: 12/14/2023 - 04/11/2024	EUT Type: Portable Computing Device	Page 64 of 161

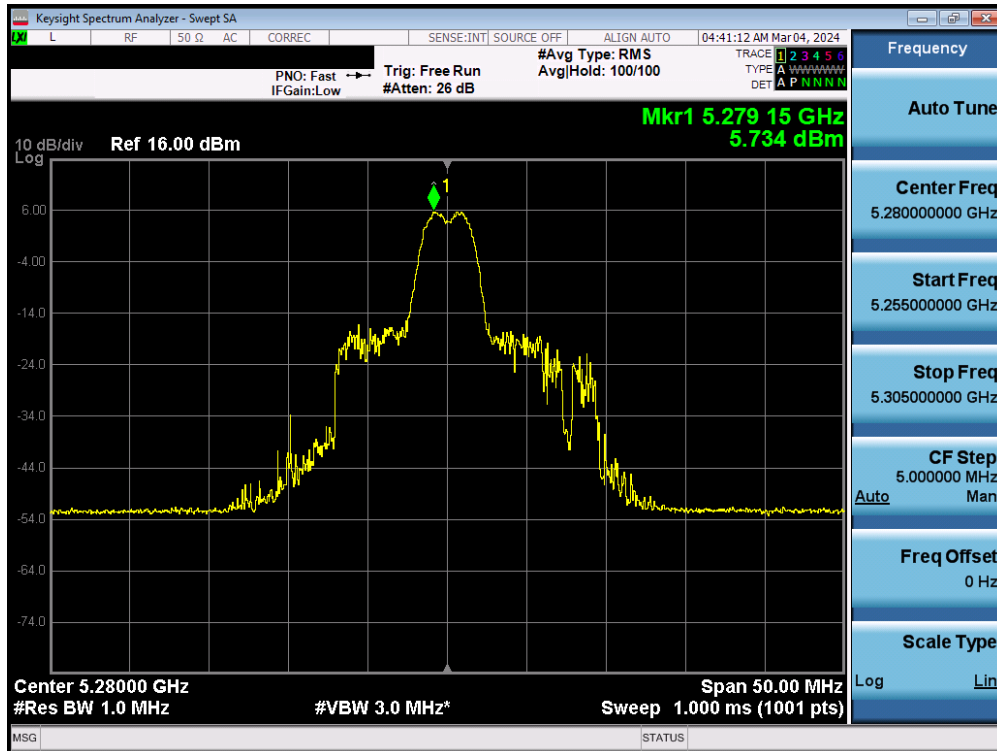


Plot 7-75. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11be – 26 Tones (UNII Band 1) – Ch. 42)

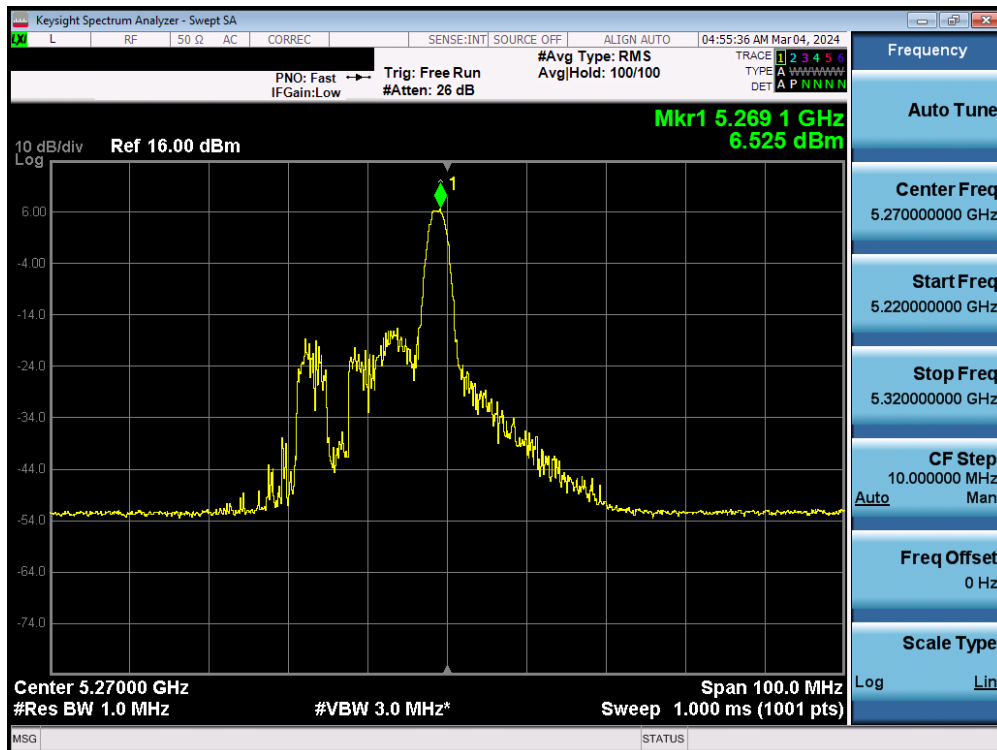


Plot 7-76. Power Spectral Density Plot MIMO ANT1 (160MHz BW 802.11be – 26 Tones (UNII Band 1/2A) – Ch. 50)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2312040120-20.C3K	Test Dates: 12/14/2023 - 04/11/2024	EUT Type: Portable Computing Device	Page 65 of 161

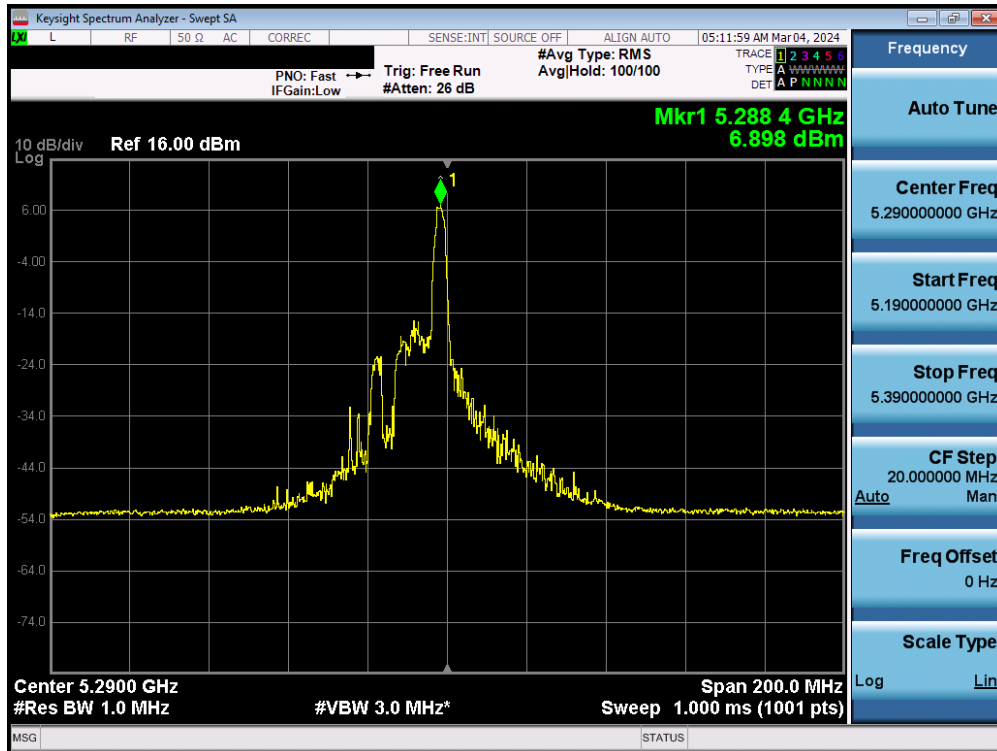


Plot 7-77. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11be – 26 Tones (UNII Band 2A) – Ch. 56)

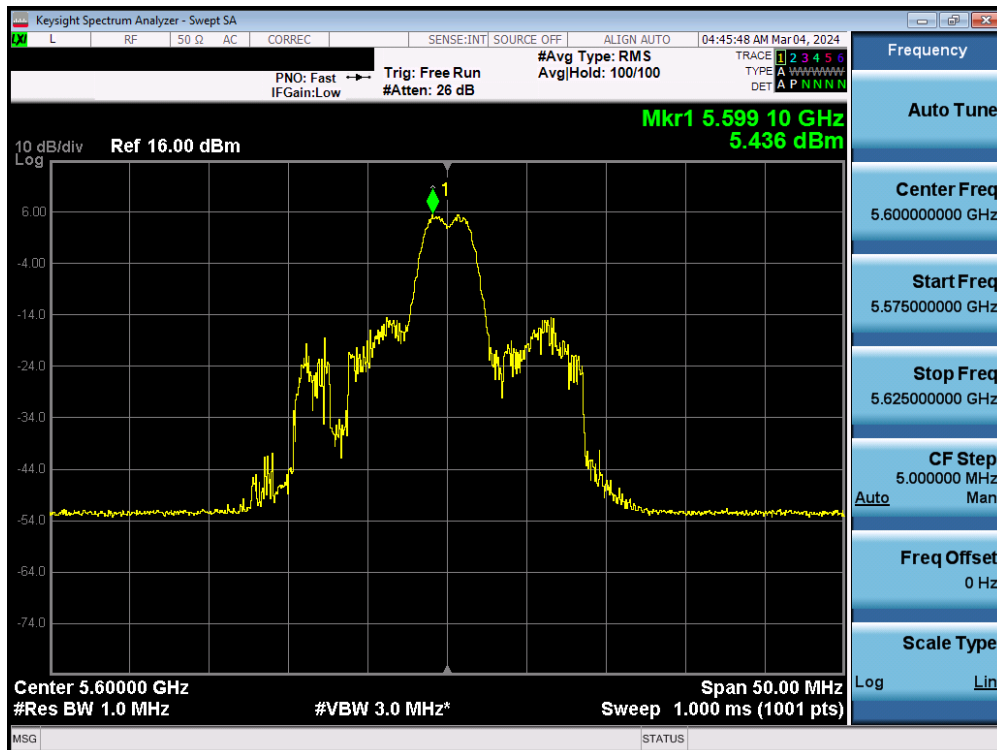


Plot 7-78. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11be – 26 Tones (UNII Band 2A) – Ch. 54)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2312040120-20.C3K	Test Dates: 12/14/2023 - 04/11/2024	EUT Type: Portable Computing Device	Page 66 of 161

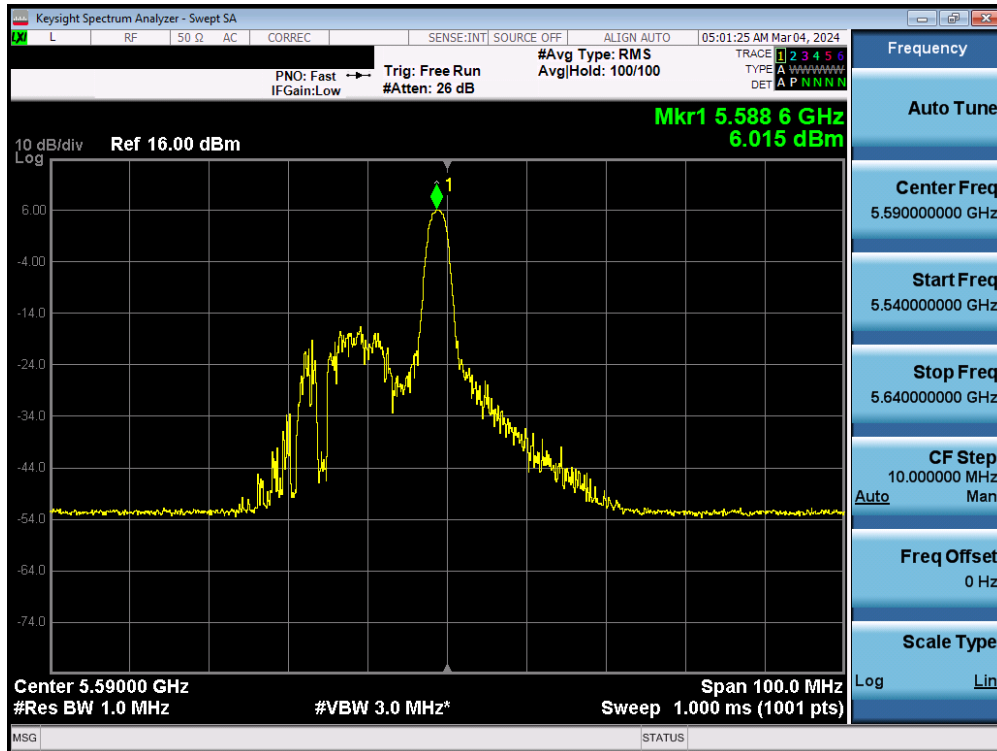


Plot 7-79. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11be – 26 Tones (UNII Band 2A) – Ch. 58)

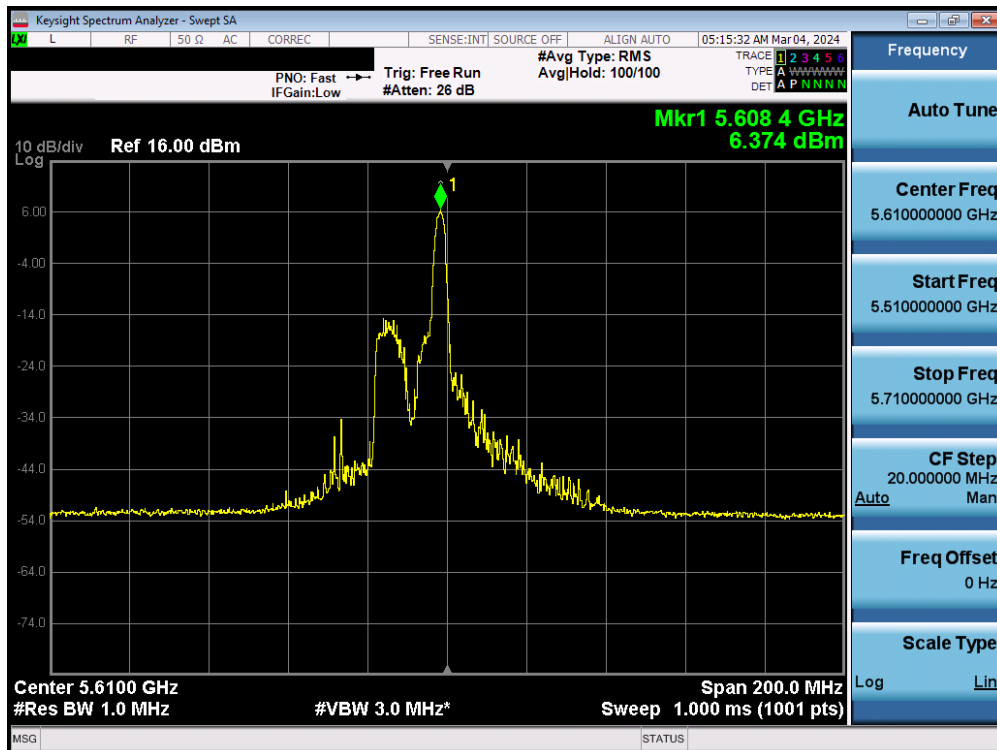


Plot 7-80. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11be – 26 Tones (UNII Band 2C) – Ch. 120)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2312040120-20.C3K	Test Dates: 12/14/2023 - 04/11/2024	EUT Type: Portable Computing Device	Page 67 of 161

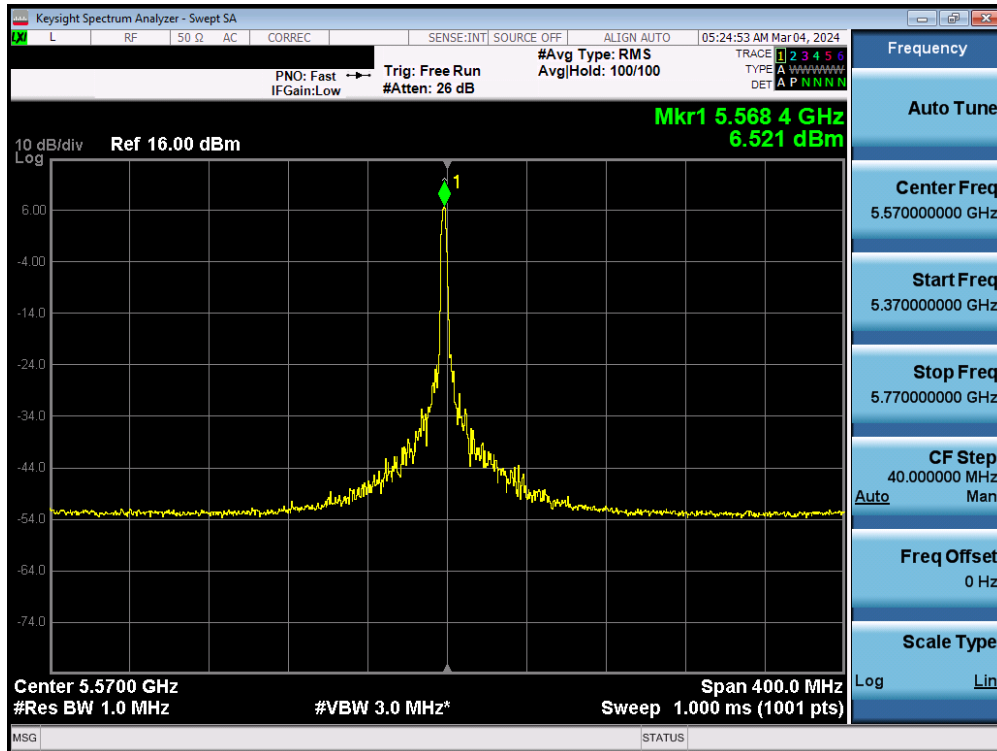


Plot 7-81. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11be – 26 Tones (UNII Band 2C) – Ch. 118)



Plot 7-82. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11be – 26 Tones (UNII Band 2C) – Ch. 122)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2312040120-20.C3K	Test Dates: 12/14/2023 - 04/11/2024	EUT Type: Portable Computing Device	Page 68 of 161

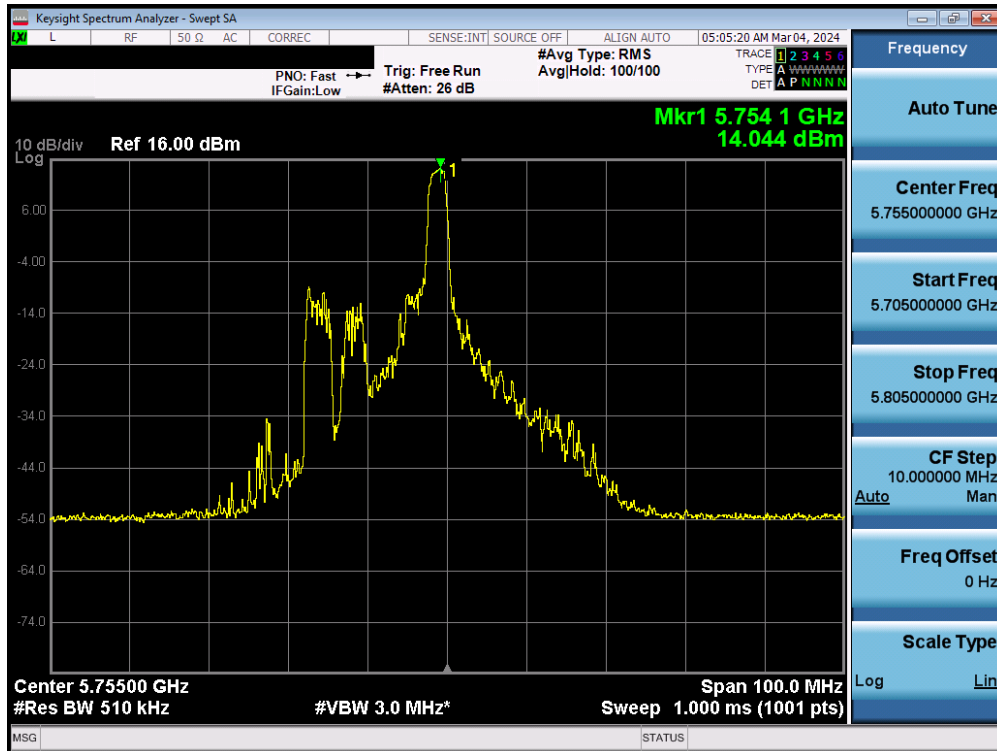


Plot 7-83. Power Spectral Density Plot MIMO ANT1 (160MHz BW 802.11be – 26 Tones (UNII Band 2C) – Ch. 114)

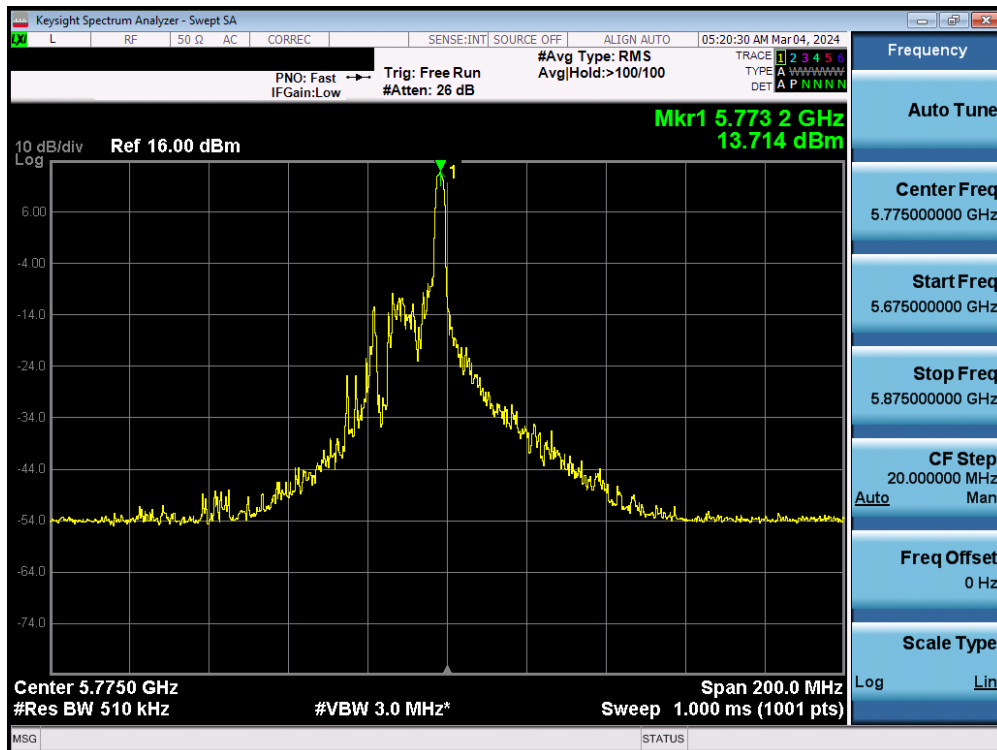


Plot 7-84. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11be – 26 Tones (UNII Band 3) – Ch. 157)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2312040120-20.C3K	Test Dates: 12/14/2023 - 04/11/2024	EUT Type: Portable Computing Device	Page 69 of 161

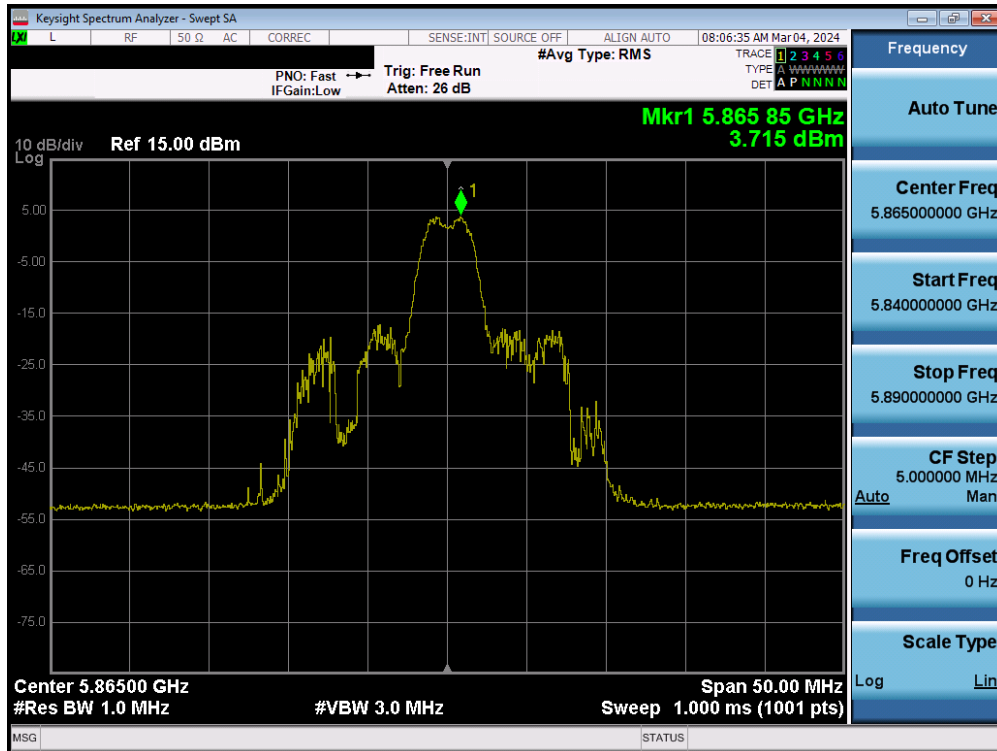


Plot 7-85. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11be – 26 Tones (UNII Band 3) – Ch. 151)

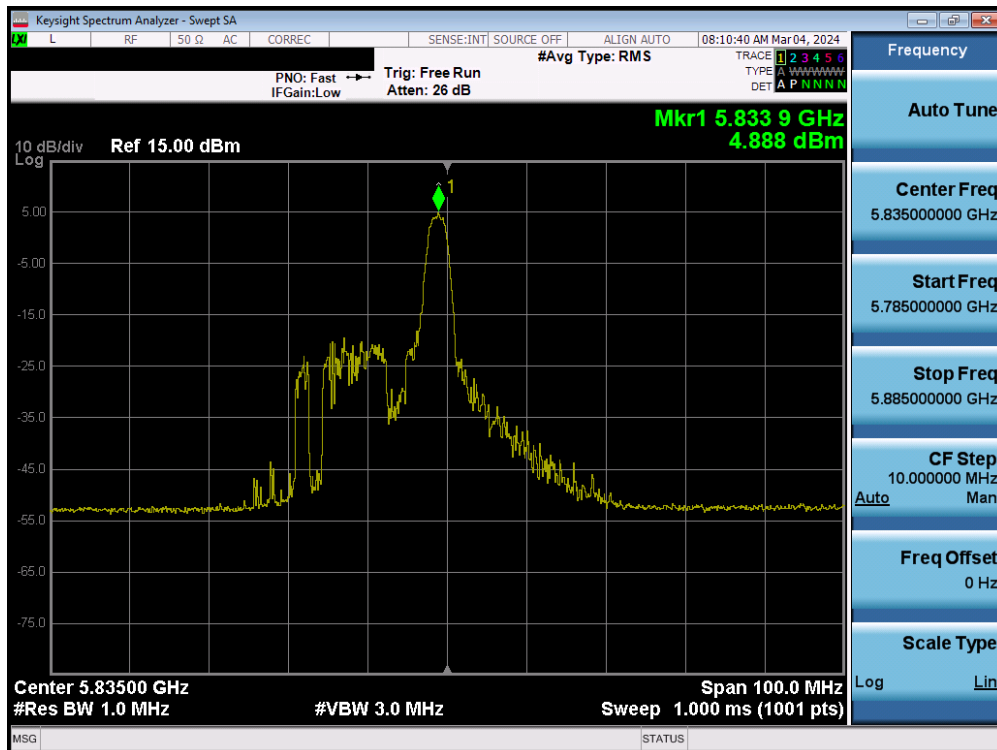


Plot 7-86. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11be – 26 Tones (UNII Band 3) – Ch. 155)

FCC ID: C3K2077		MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2312040120-20.C3K	Test Dates: 12/14/2023 - 04/11/2024	EUT Type: Portable Computing Device		Page 70 of 161

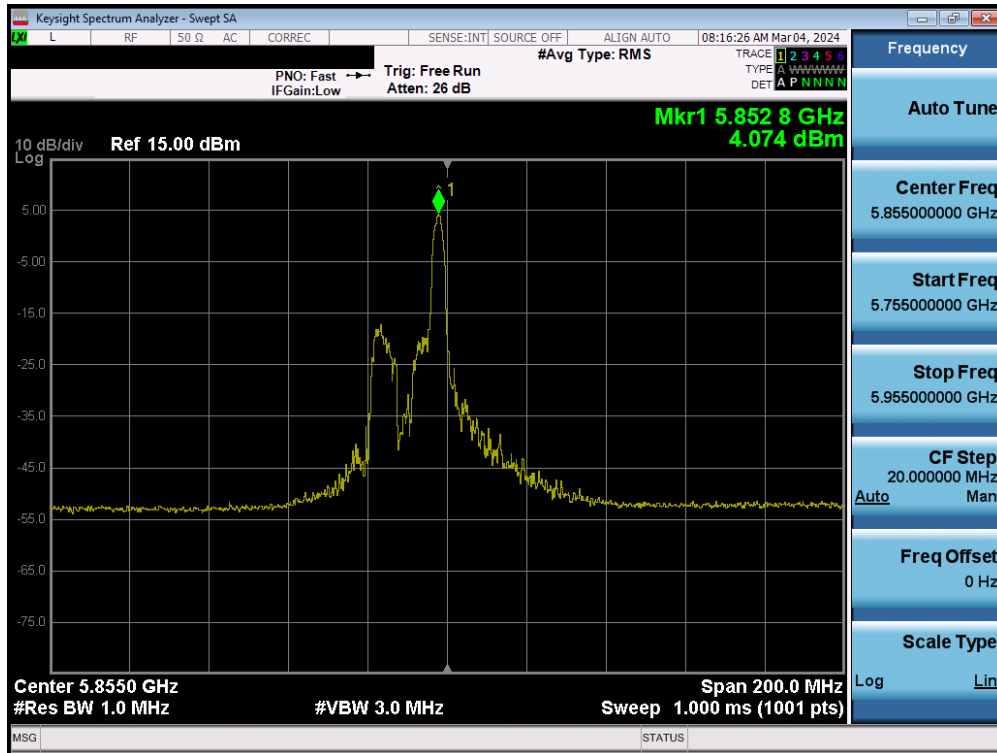


Plot 7-87. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11be – 26 Tones (UNII Band 4) – Ch. 173)

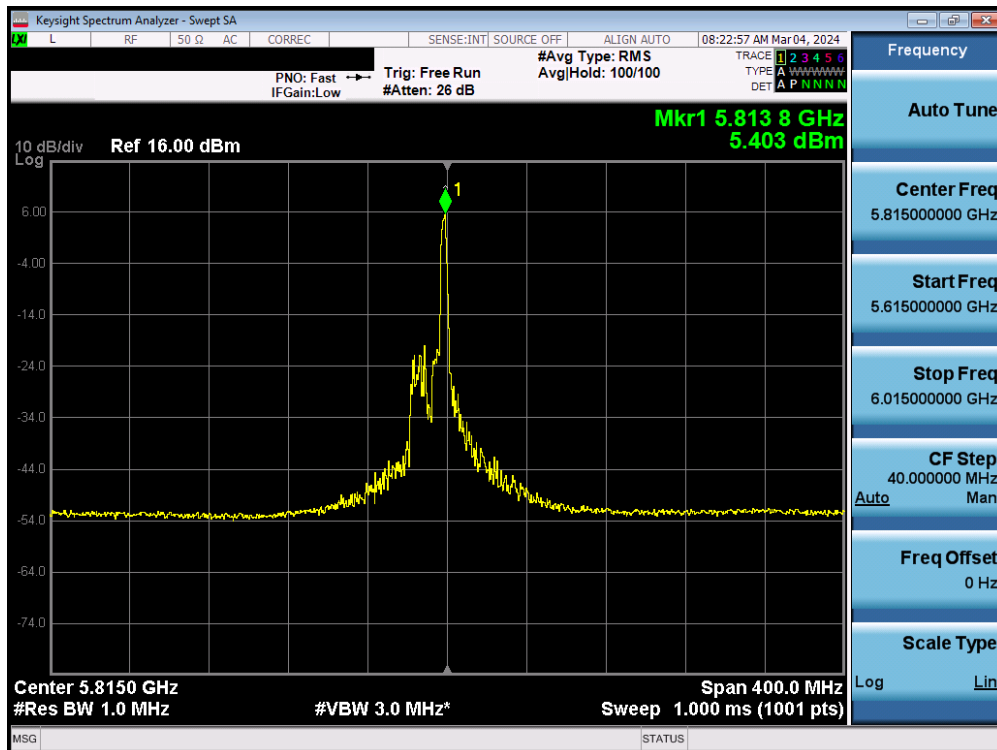


Plot 7-88. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11be – 26 Tones (UNII Band 3/4) – Ch. 167)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2312040120-20.C3K	Test Dates: 12/14/2023 - 04/11/2024	EUT Type: Portable Computing Device	Page 71 of 161

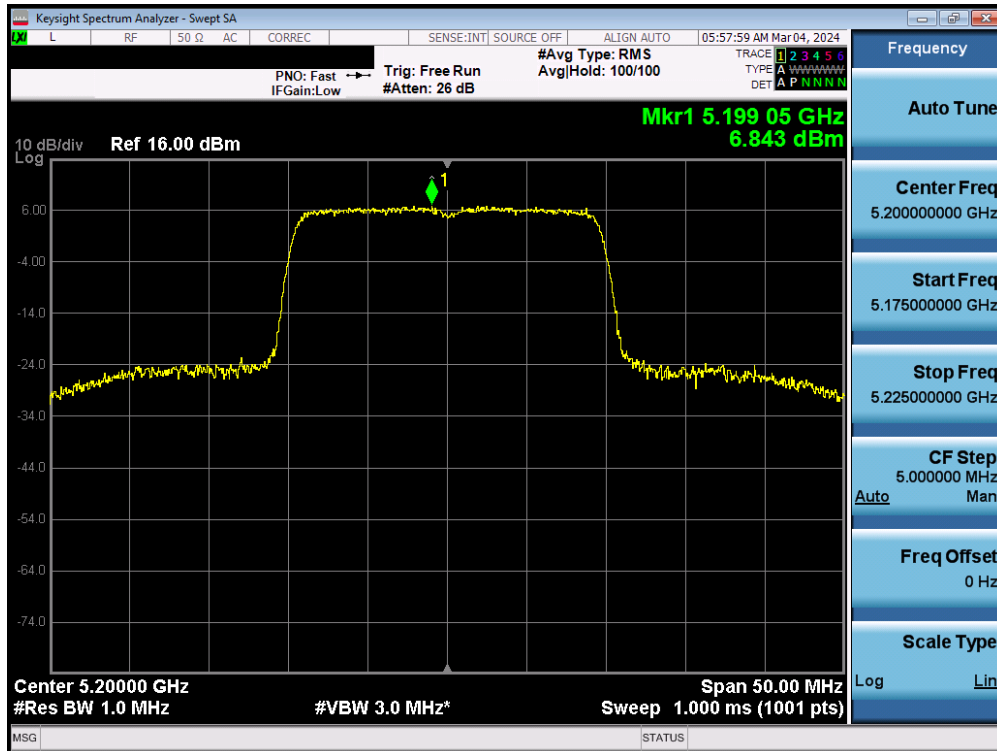


Plot 7-89. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11be – 26 Tones (UNII Band 3/4) – Ch. 171)

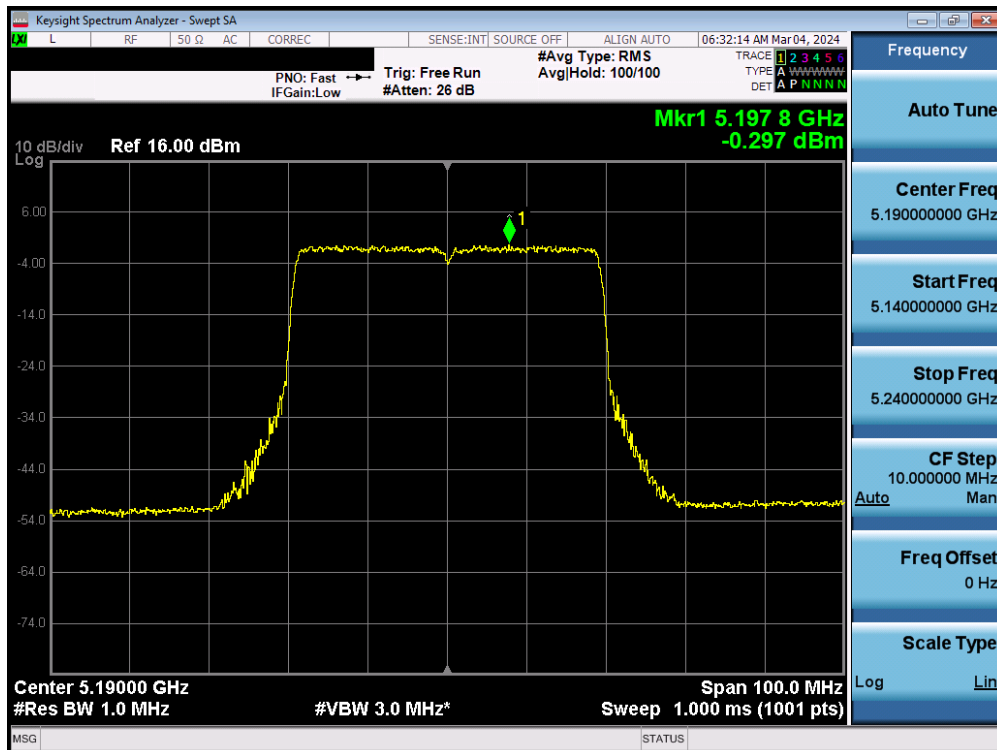


Plot 7-90. Power Spectral Density Plot MIMO ANT1 (160MHz BW 802.11be – 26 Tones (UNII Band 3/4) – Ch. 163)

FCC ID: C3K2077		MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2312040120-20.C3K	Test Dates: 12/14/2023 - 04/11/2024	EUT Type: Portable Computing Device	Page 72 of 161	

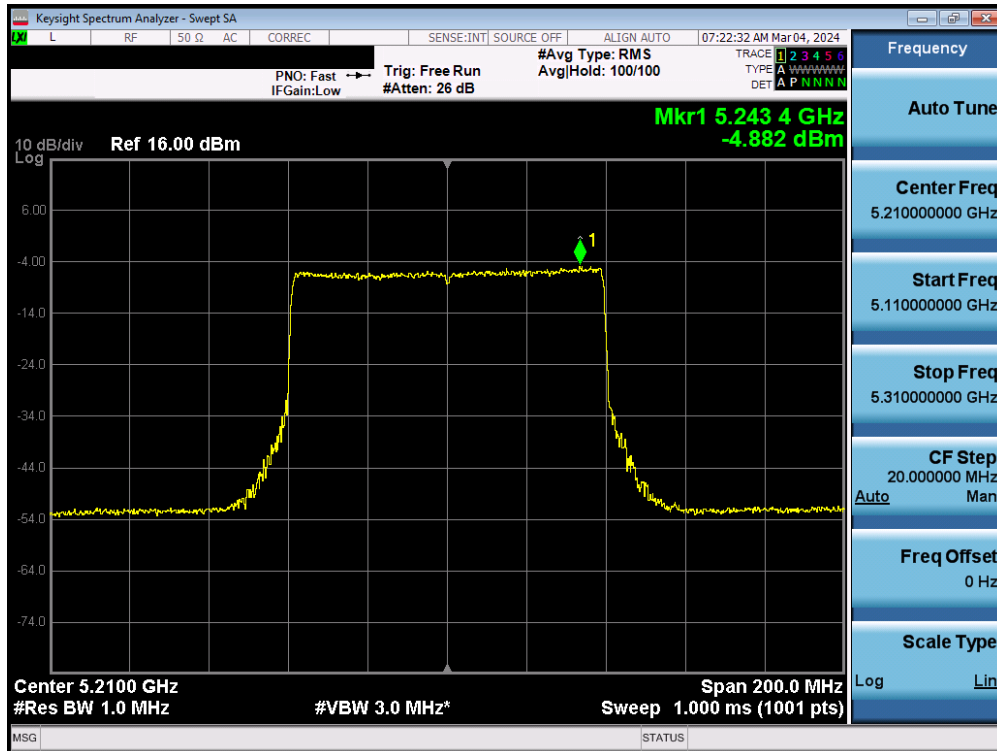


Plot 7-91. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11be – 242 Tones (UNII Band 1) – Ch. 40)

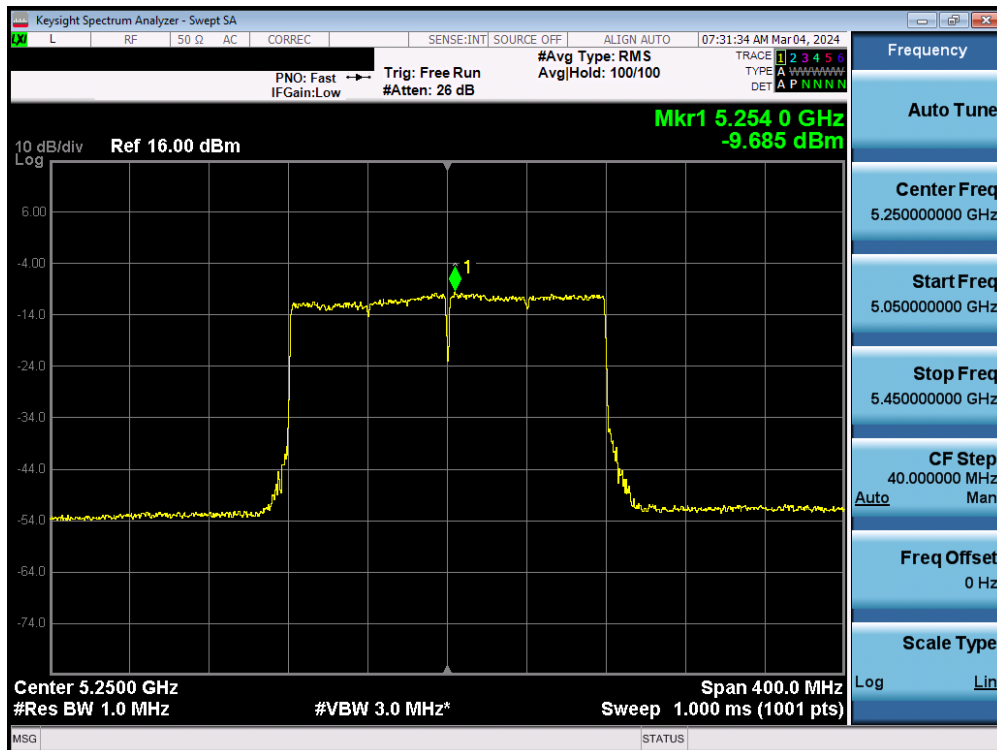


Plot 7-92. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11be – 484 Tones (UNII Band 1) – Ch. 38)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2312040120-20.C3K	Test Dates: 12/14/2023 - 04/11/2024	EUT Type: Portable Computing Device	Page 73 of 161

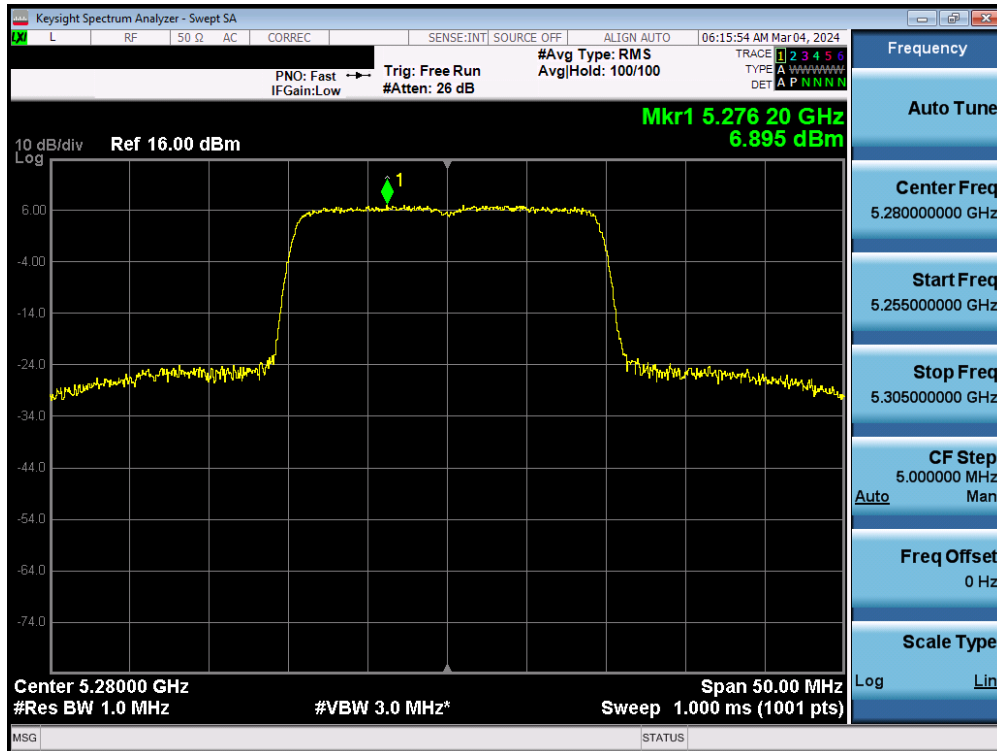


Plot 7-93. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11be – 996 Tones (UNII Band 1) – Ch. 42)

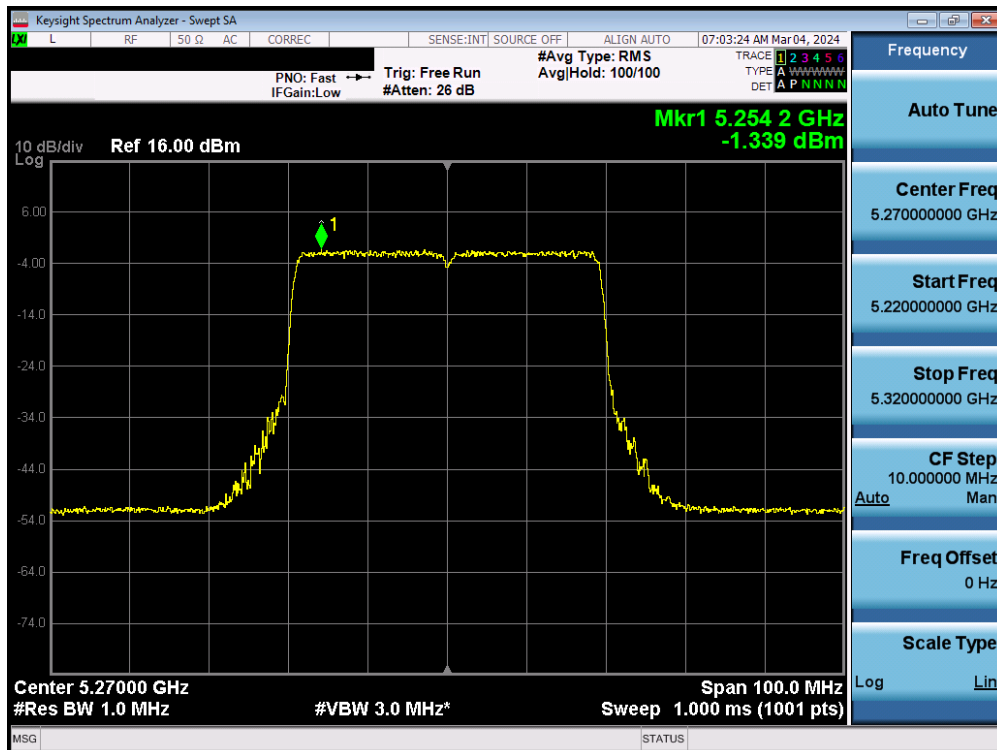


Plot 7-94. Power Spectral Density Plot MIMO ANT1 (160MHz BW 802.11be – 2x996 Tones (UNII Band 1/2A) – Ch. 50)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2312040120-20.C3K	Test Dates: 12/14/2023 - 04/11/2024	EUT Type: Portable Computing Device	Page 74 of 161

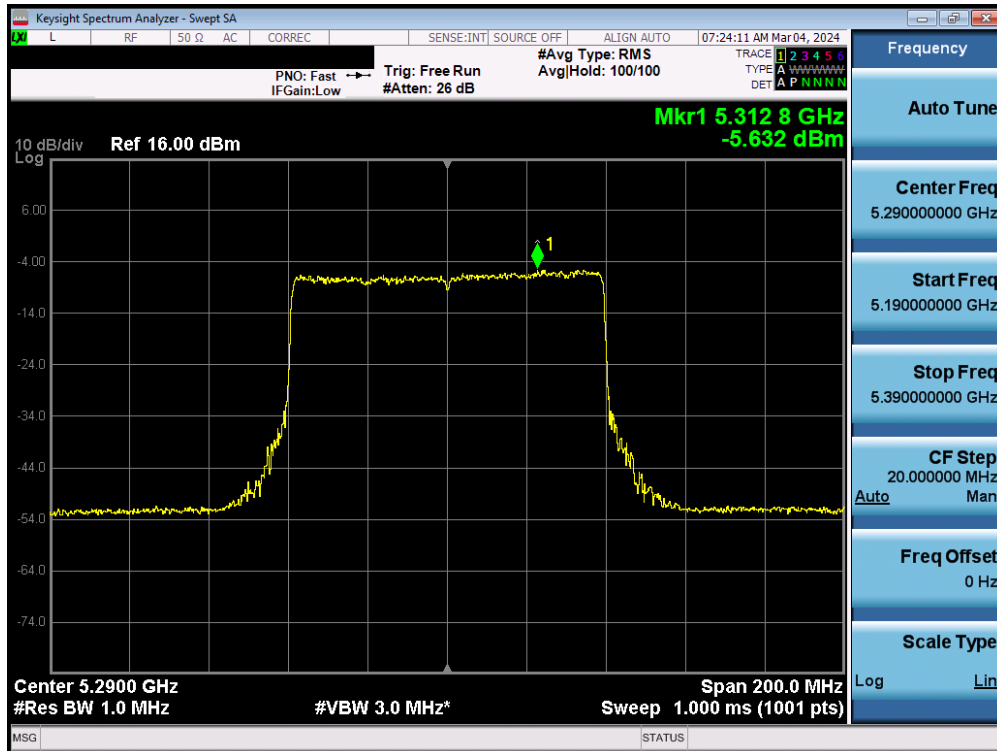


Plot 7-95. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11be – 242 Tones (UNII Band 2A) – Ch. 56)

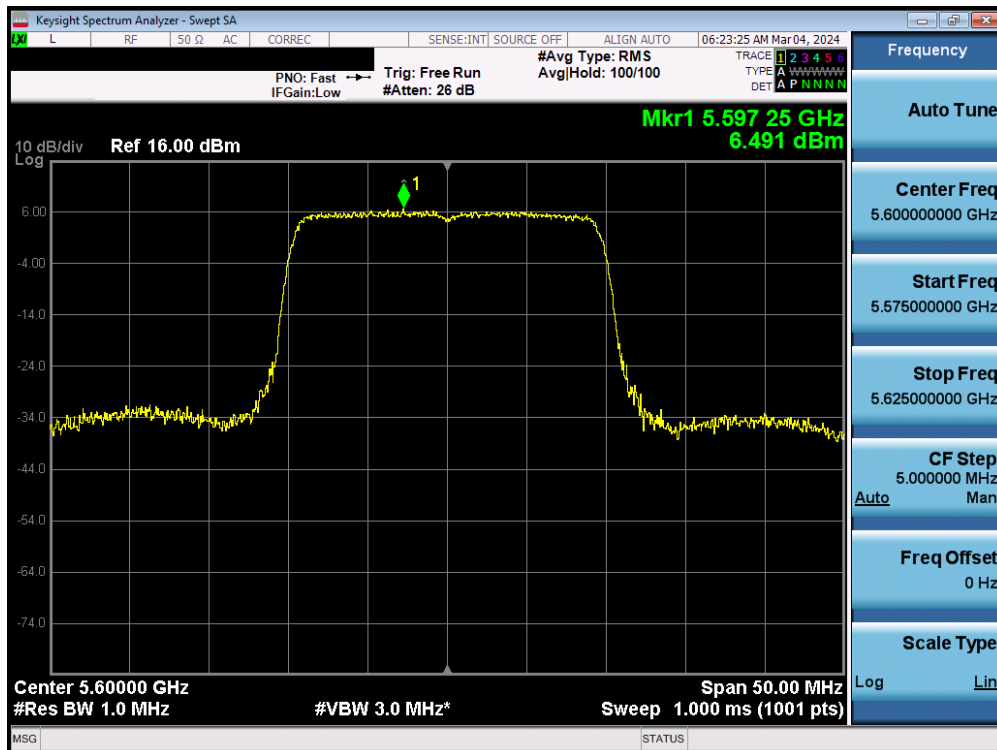


Plot 7-96. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11be – 484 Tones (UNII Band 2A) – Ch. 54)

FCC ID: C3K2077		MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2312040120-20.C3K	Test Dates: 12/14/2023 - 04/11/2024	EUT Type: Portable Computing Device		Page 75 of 161

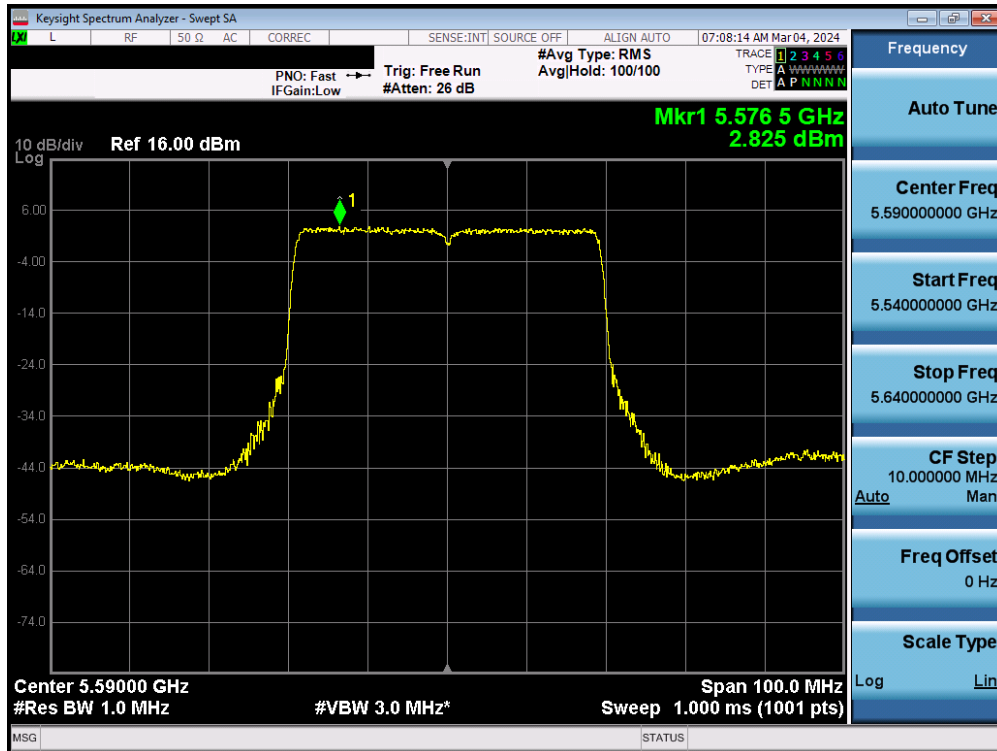


Plot 7-97. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11be – 996 Tones (UNII Band 2A) – Ch. 58)

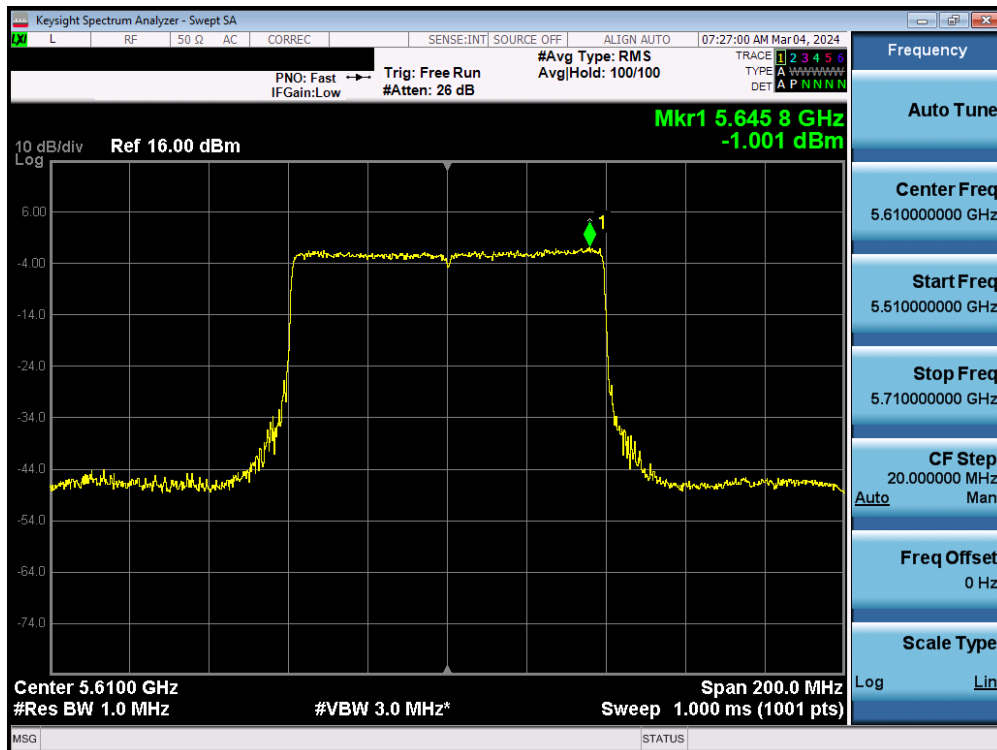


Plot 7-98. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11be – 242 Tones (UNII Band 2C) – Ch. 120)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2312040120-20.C3K	Test Dates: 12/14/2023 - 04/11/2024	EUT Type: Portable Computing Device	Page 76 of 161

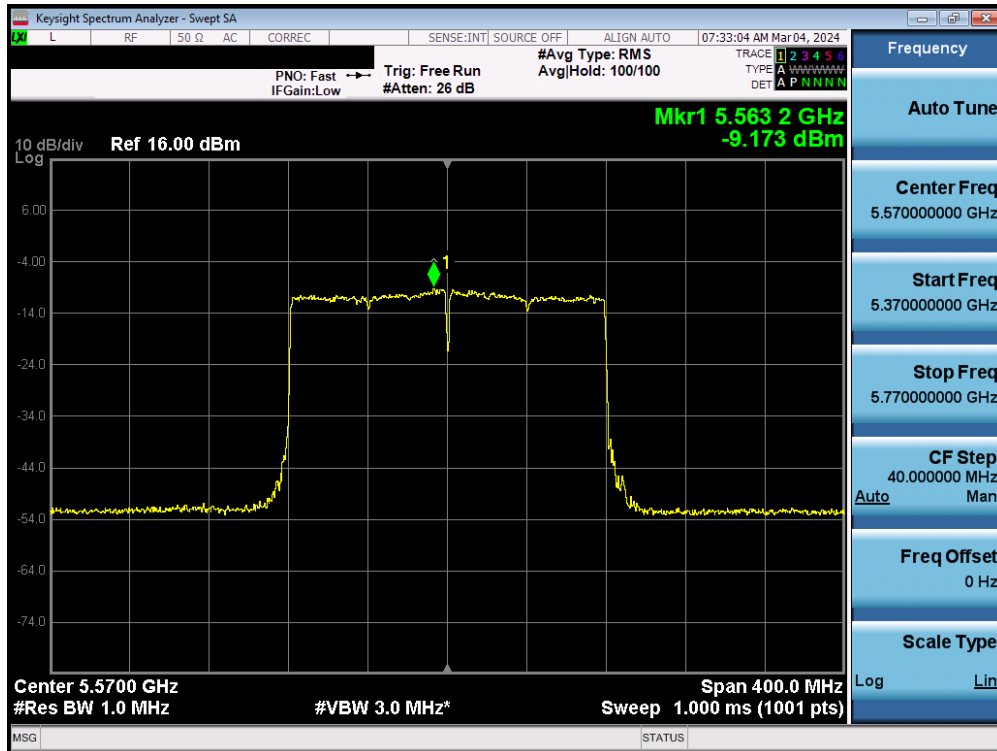


Plot 7-99. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11be – 484 Tones (UNII Band 2C) – Ch. 118)

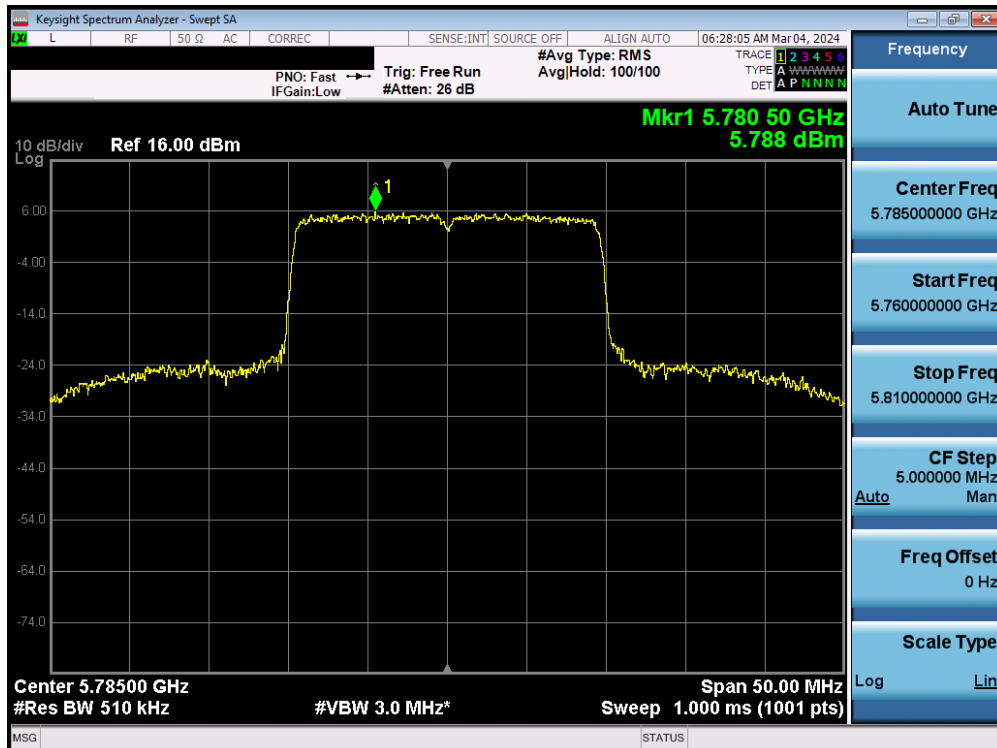


Plot 7-100. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11be – 996 Tones (UNII Band 2C) – Ch. 122)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-101. Power Spectral Density Plot MIMO ANT1 (160MHz BW 802.11be – 2x996 Tones (UNII Band 2C) – Ch. 114)



Plot 7-102. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11be – 242 Tones (UNII Band 3) – Ch. 157)

FCC ID: C3K2077	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2312040120-20.C3K	Test Dates: 12/14/2023 - 04/11/2024	EUT Type: Portable Computing Device	Page 78 of 161