

**MEASUREMENT REPORT
FCC PART 15.407 802.11ax (OFDMA)**

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

Date of Testing:
11/6/2023 - 1/2/2024
Test Report Issue Date:
1/2/2024
Test Site/Location:
Element lab., Columbia, MD, USA
Test Report Serial No.:
1M2310260110-10.A3L

FCC ID:	A3LSMA356E
APPLICANT:	Samsung Electronics Co., Ltd.

Application Type: Certification
Model: SM-A356E/DS
Additional Model(s): SM-A356E
EUT Type: Portable Handset
Frequency Range: 5180 – 5850MHz
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.



RJ Ortanez
Executive Vice President



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Channel Bandwidth [MHz]	UNII Band	Tx Frequency [MHz]	MIMO	
			Max. Power [mW]	Max. Power [dBm]
20	1	5180 - 5240	48.37	16.85
	2A	5260 - 5320	46.96	16.72
	2C	5500 - 5720	47.40	16.76
	3	5745 - 5825	46.70	16.69
40	1	5190 - 5230	46.52	16.68
	2A	5270 - 5310	42.60	16.29
	2C	5510 - 5710	42.86	16.32
	3	5755 - 5795	42.86	16.32
80	1	5210	37.45	15.73
	2A	5290	32.32	15.10
	2C	5530 - 5690	34.63	15.39
	3	5775	33.91	15.30

EUT Overview

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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 **Samsung Portable Handset FCC ID: A3LSMA356E**. The test data contained in this report pertains only to the emissions due to the EUT's UNII transmitter.

Test Device Serial No.: 1194M, 1199M, 0554M, 0592M, 0654M, 0645M

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/ax WLAN, 802.11a/n/ac/ax UNII (5GHz), Bluetooth (1x, EDR, LE), NFC

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

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

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

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

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

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

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Notes:

- 5GHz NII operation is possible in 20MHz, 40MHz, and 80MHz 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	97.98
			52T	97.89
			106T	97.92
			242T	94.38
	40MHz	RU	26T	97.98
			52T	97.91
			106T	97.58
			242T	94.72
	80MHz	RU	26T	97.94
			52T	97.91
			106T	97.76
			242T	95.10
			484T	91.57
			996T	86.15

Table 2-4. Measured Duty Cycles

- 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	✓	✓	✓	✓	✓	✓

Table 2-5. Frequency / Channel Operations

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

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

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MCS Index		Spatial Stream	OFDMA (802.11ax)																	
			26T			52T			106T			242T			484T			996T		
HE	EHT		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	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
1	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
2	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
3	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
4	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
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
6	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
7	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
8	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
9	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
10	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
11	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
12	1	1	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
13	1	1	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
0	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
1	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
2	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
3	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
4	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
5	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
6	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
7	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
8	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
9	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
10	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
11	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
12	2	2	31.8	30	27	63.5	60	54	135	127.5	114.8	309.7	292.5	263.3	619.4	585	526.5	1297.1	1225	1102.5
13	2	2	35.3	33.3	30	70.6	66.7	60	150	141.7	127.5	344.1	325	292.5	688.2	650	585	1441.2	1361.1	1225

Table 2-6. 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 Gain (dBi)
5.20	-3.55	-3.47	-0.50
5.30	-2.54	-2.59	0.45
5.50	-3.24	-3.44	-0.33
5.80	-1.20	-5.17	0.05

Table 2-7. 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 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 A356BXXU0AWJ3 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
-	AP2-001	EMC Cable and Switch System	1/11/2023	Annual	1/11/2024	AP2-001
-	ETS-001	EMC Cable and Switch System	1/11/2023	Annual	1/11/2024	ETS-001
-	ETS-002	EMC Cable and Switch System	1/11/2023	Annual	1/11/2024	ETS-002
-	MD 1M 18-40	EMC Cable and Switch System	1/11/2023	Annual	1/11/2024	MD 1M 18-40
-	WL40-1	Conducted Cable Set (40GHz)	1/12/2023	Annual	1/12/2024	WL40-1
-	WL25-1	Conducted Cable Set (25GHz)	1/12/2023	Annual	1/12/2024	WL25-1
Anritsu	MA24406A	Microwave Peak Power Sensor	9/7/2023	Annual	9/7/2024	11240
Emco	3115	Horn Antenna (1-18GHz)	8/8/2022	Biennial	8/8/2024	9704-5182
Emco	3116	Horn Antenna (18 - 40GHz)	7/5/2022	Biennial	7/5/2024	9203-2178
Pasternack	MNLC-2	Line Conducted Emission Cable (NM)	1/11/2023	Annual	1/11/2024	MNLC-2
ETS-Lindgren	3816/2NM	Line Impedance Stabilization Network	8/11/2022	Biennial	8/11/2024	114451
ETS Lindgren	3116C	1-18 GHz DRG Horn Antenna	2/27/2023	Biennial	2/27/2024	00218893
ETS Lindgren	3115	Double Ridged Guide Horn	4/12/2022	Biennial	4/12/2024	82333
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	4/13/2022	Biennial	4/13/2025	121034
Keysight Technologies	N9020A	MXA Signal Analyzer	3/15/2023	Annual	3/15/2024	MY54500644
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	3/15/2023	Annual	3/15/2024	MY52350166
Keysight Technologies	N9030A	PXA Signal Analyzer	1/31/2023	Annual	1/31/2024	MY55410501
Keysight Technologies	N9030B	PXA Signal Analyzer, Multi-touch	9/7/2023	Annual	9/7/2024	MY57141001
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	ESW44	EMI Test Receiver 2Hz to 44 GHz	3/1/2023	Annual	3/1/2024	101716
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	1/13/2023	Annual	1/13/2024	103200
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	2/21/2023	Biennial	2/21/2025	A051107
Sunol	JB6	LB6 Antenna	3/2/2023	Biennial	3/2/2025	A082816

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: Samsung Electronics Co., Ltd.
 FCC ID: A3LSMA356E
 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(e)	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 “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.

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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 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.

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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	ax (20MHz)	36	18.48	18.19
	5200	ax (20MHz)	40	21.68	21.94
	5240	ax (20MHz)	48	22.60	21.81
	5190	ax (40MHz)	38	22.18	22.68
	5230	ax (40MHz)	46	22.99	22.12
	5210	ax (80MHz)	42	12.02	21.93
Band 2A	5260	ax (20MHz)	52	22.13	21.80
	5280	ax (20MHz)	56	22.02	21.37
	5320	ax (20MHz)	64	22.88	21.60
	5270	ax (40MHz)	54	20.45	21.96
	5310	ax (40MHz)	62	20.73	19.42
	5290	ax (80MHz)	58	12.95	22.79
Band 2C	5500	ax (20MHz)	100	18.86	18.36
	5600	ax (20MHz)	120	22.52	21.28
	5720	ax (20MHz)	144	22.00	21.28
	5510	ax (40MHz)	102	22.07	21.48
	5590	ax (40MHz)	118	21.85	21.91
	5710	ax (40MHz)	142	16.90	23.17
	5530	ax (80MHz)	106	24.17	21.93
	5610	ax (80MHz)	122	22.77	23.82
	5690	ax (80MHz)	138	24.14	23.84

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

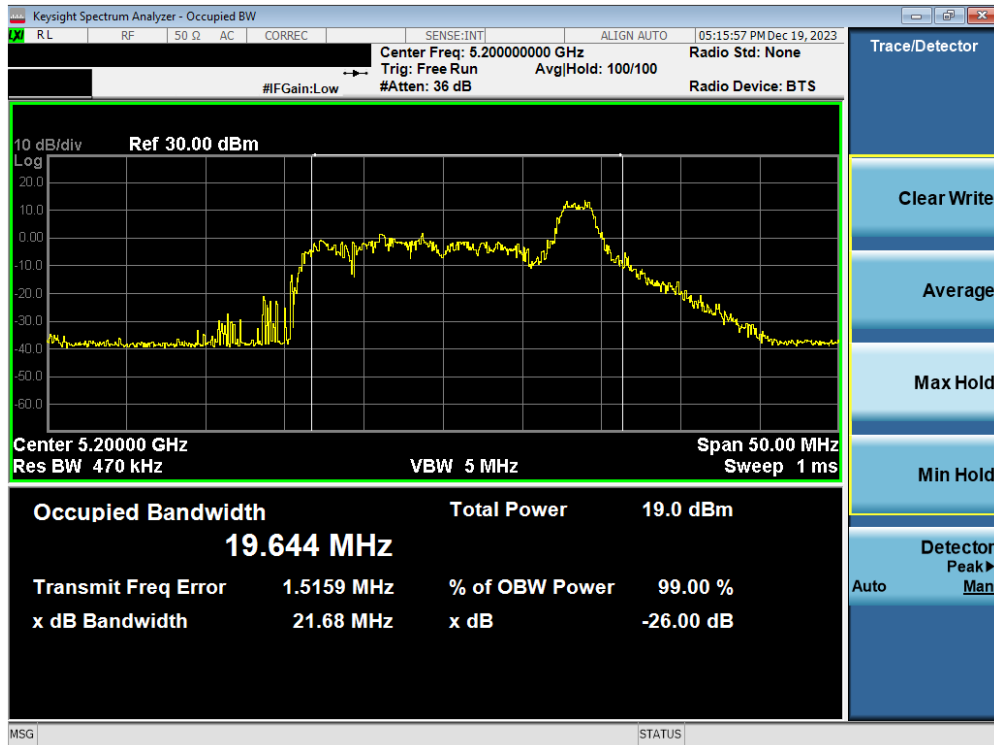
FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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	Frequency [MHz]	802.11 MODE	Channel	Antenna-1 26dB Bandwidth [MHz]	Antenna-2 26dB Bandwidth [MHz]
Band 1	5180	ax (20MHz)	36	37.37	32.86
	5200	ax (20MHz)	40	34.43	29.80
	5240	ax (20MHz)	48	27.92	30.84
	5190	ax (40MHz)	38	64.70	63.41
	5230	ax (40MHz)	46	65.19	49.19
	5210	ax (80MHz)	42	87.83	86.26
Band 2A	5260	ax (20MHz)	52	29.71	27.73
	5280	ax (20MHz)	56	31.91	30.38
	5320	ax (20MHz)	64	27.41	32.03
	5270	ax (40MHz)	54	58.63	47.97
	5310	ax (40MHz)	62	63.98	49.56
	5290	ax (80MHz)	58	87.23	87.09
Band 2C	5500	ax (20MHz)	100	32.32	29.25
	5600	ax (20MHz)	120	28.56	28.86
	5720	ax (20MHz)	144	29.58	27.37
	5510	ax (40MHz)	102	66.58	63.36
	5590	ax (40MHz)	118	66.09	59.75
	5710	ax (40MHz)	142	61.16	63.33
	5530	ax (80MHz)	106	87.93	86.72
	5610	ax (80MHz)	122	87.20	87.14
	5690	ax (80MHz)	138	88.10	86.08

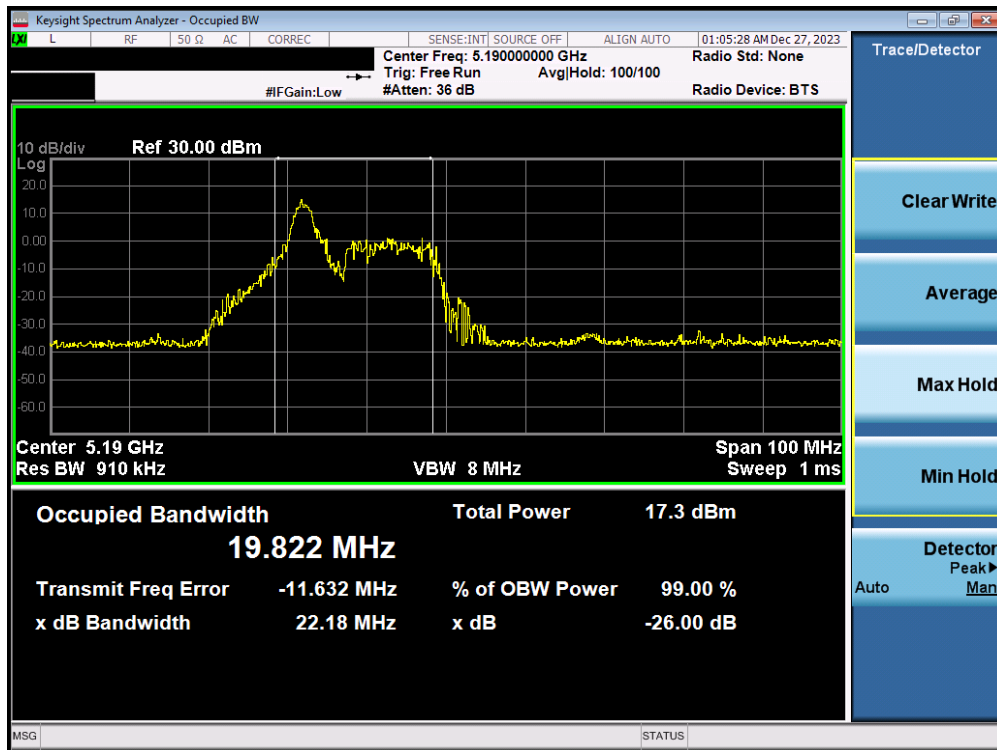
Table 7-3. Bands 1, 2A, 2C Conducted 26dB Bandwidth Measurements MIMO (Full Tones)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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7.2.1 MIMO Antenna-1 26dB Bandwidth Measurements

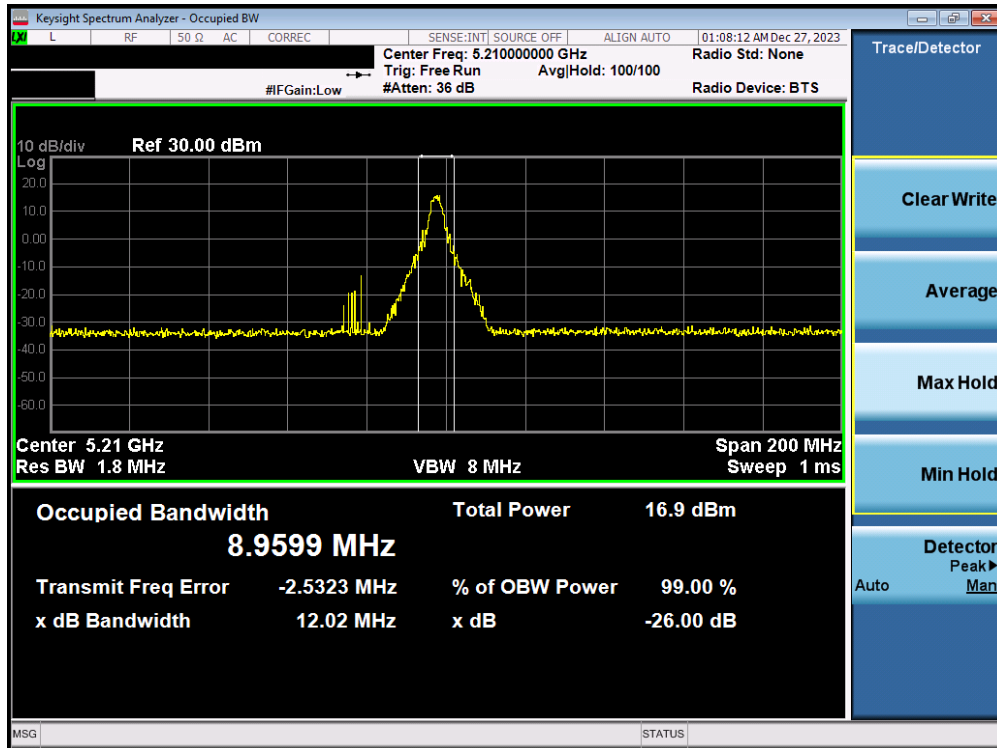


Plot 7-1. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 40)

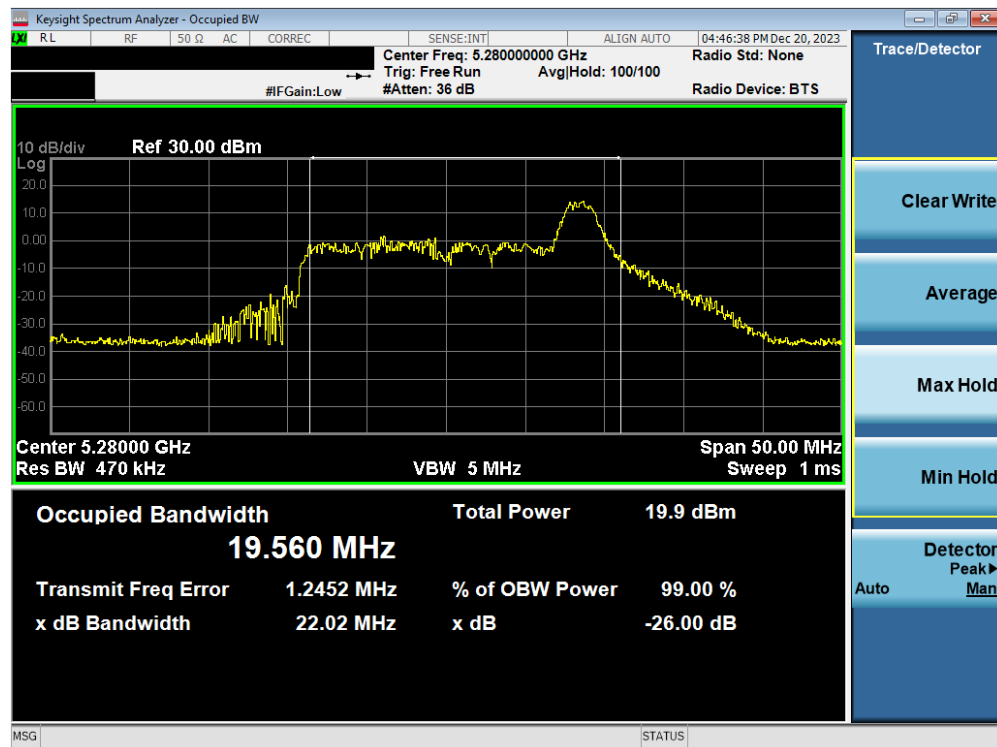


Plot 7-2. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 38)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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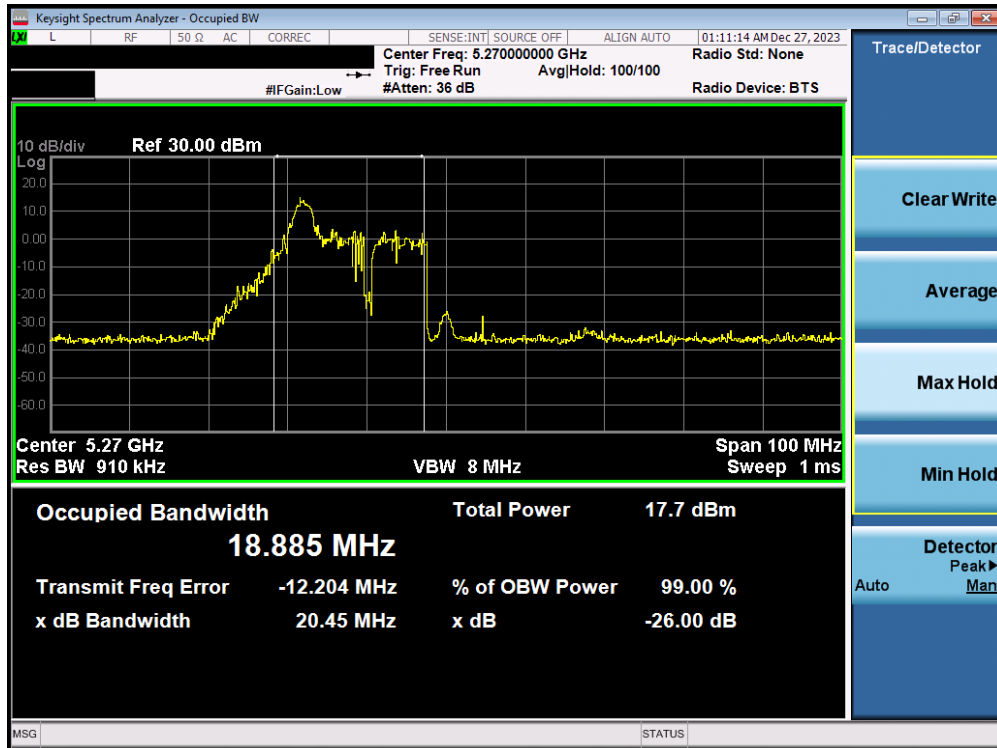


Plot 7-3. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 42)

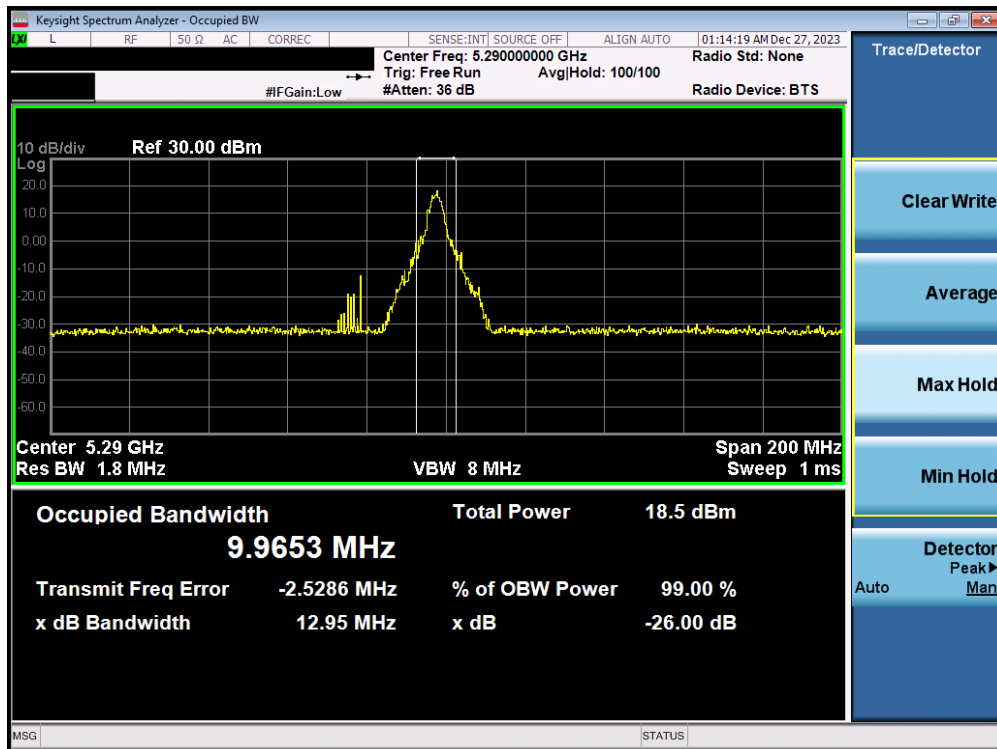


Plot 7-4. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 56)

FCC ID: A3LSMA356E		MEASUREMENT REPORT		Approved by: Technical Manager
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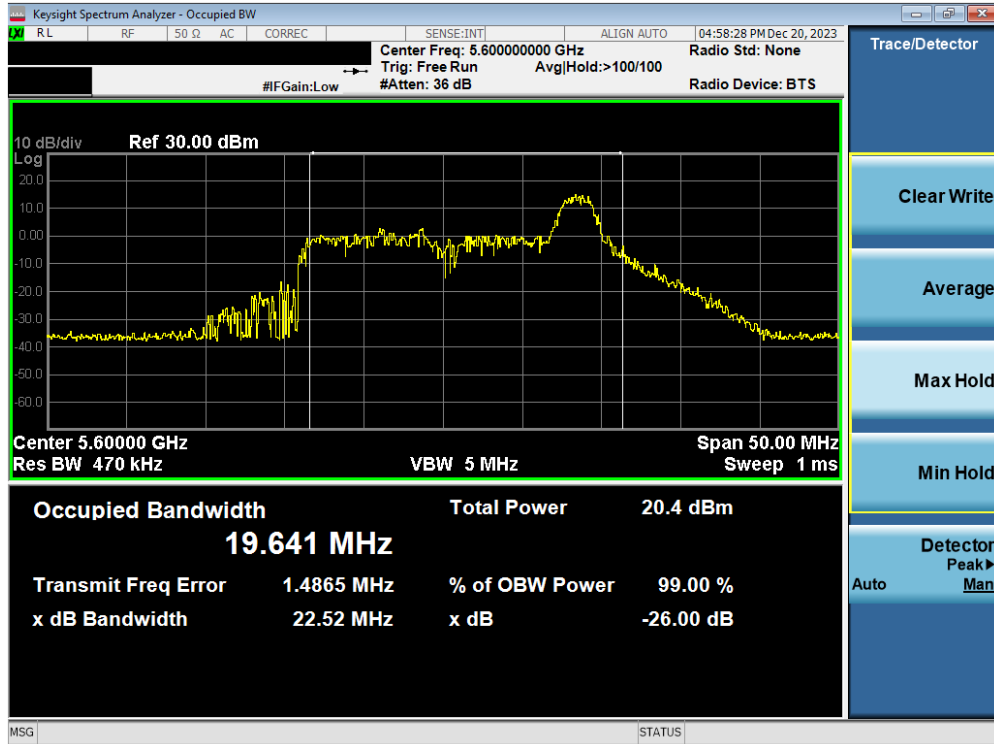


Plot 7-5. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 54)

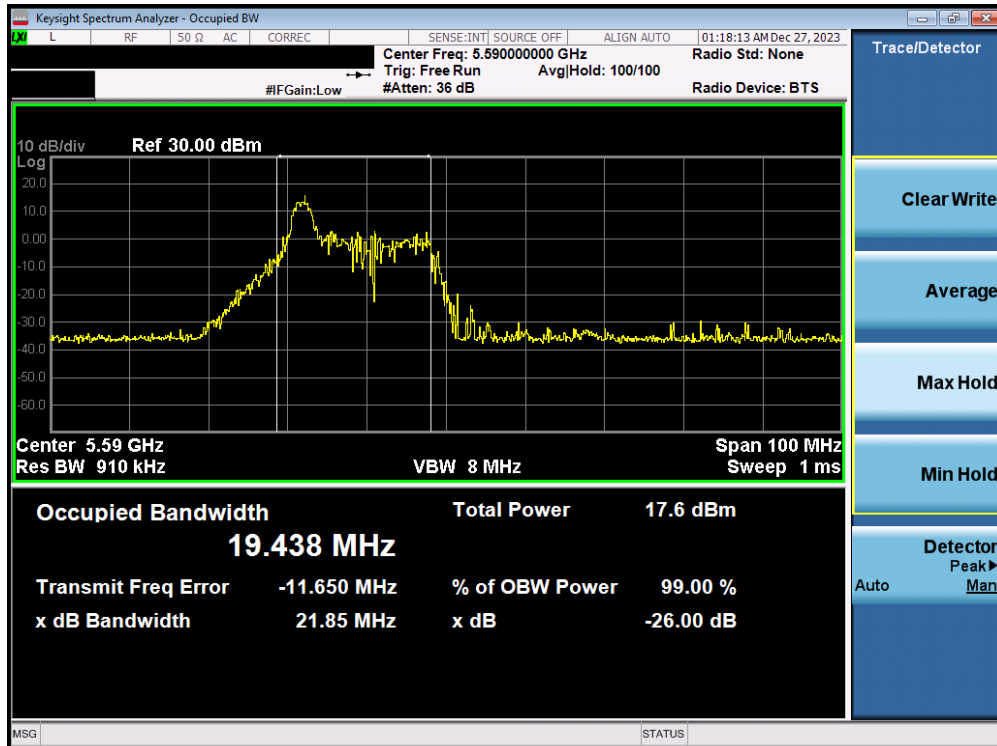


Plot 7-6. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 58)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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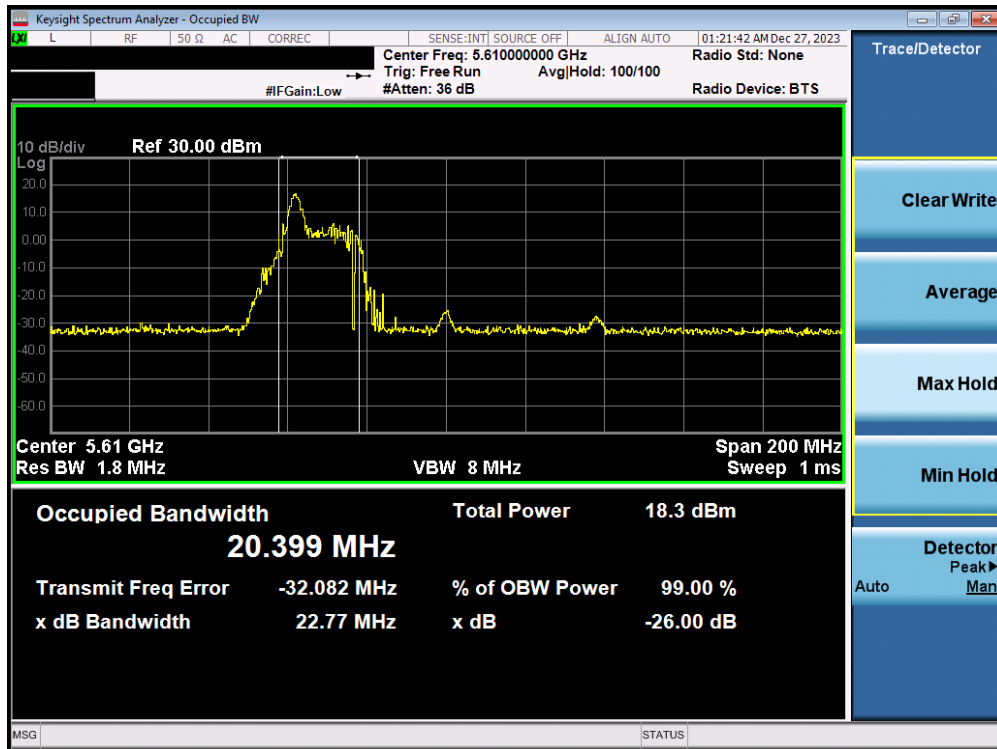


Plot 7-7. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 120)

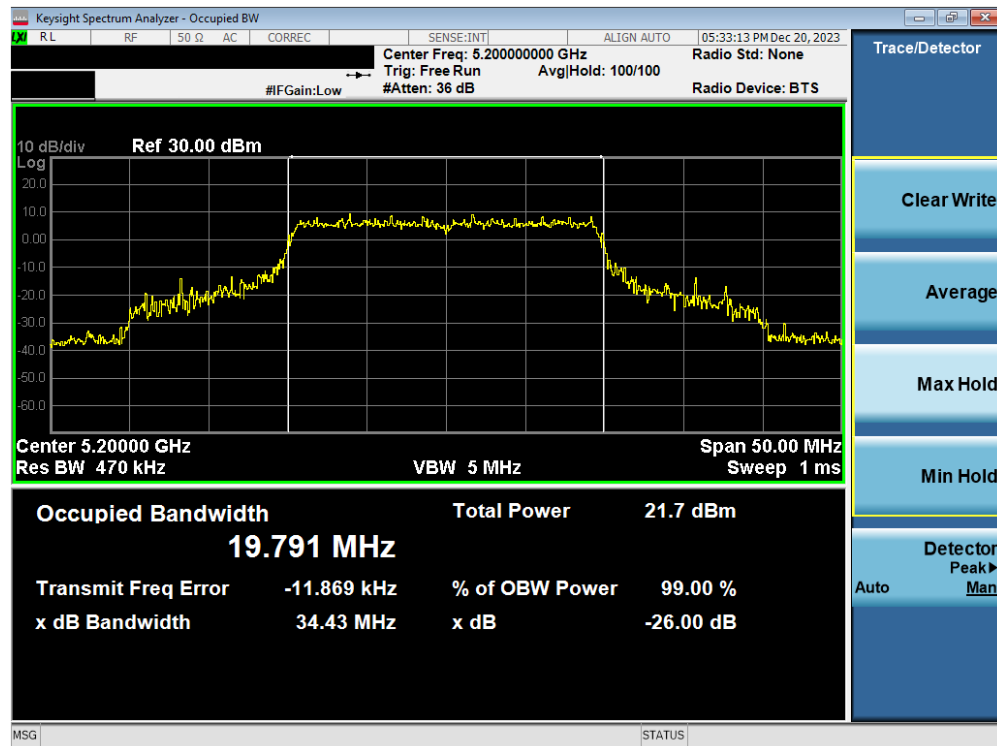


Plot 7-8. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 118)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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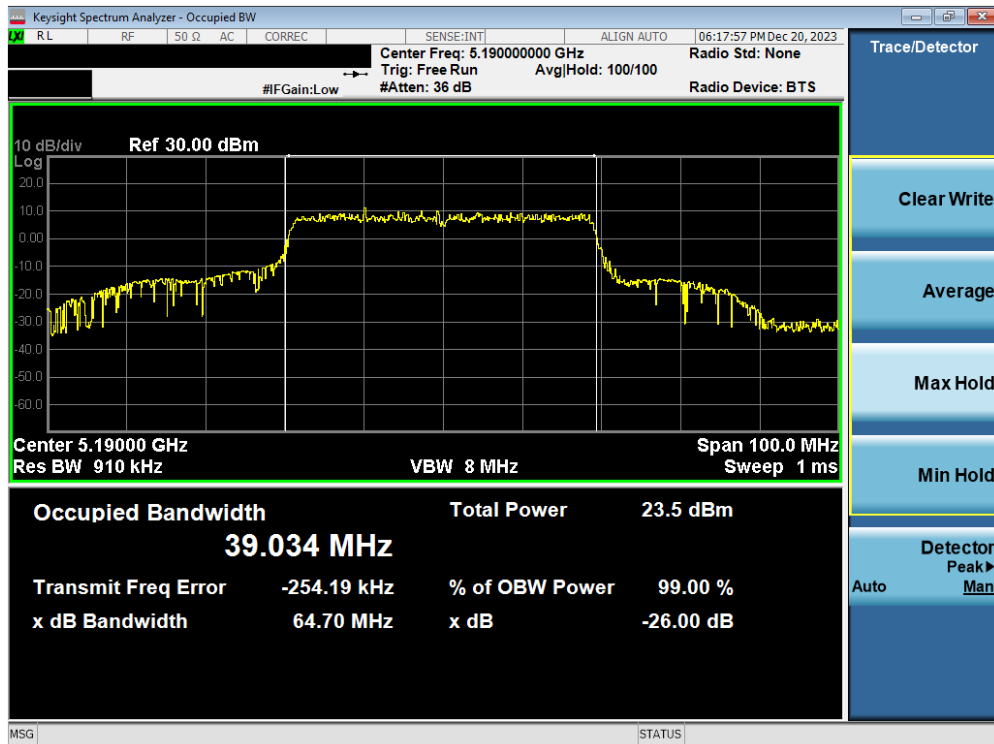


Plot 7-9. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 122)

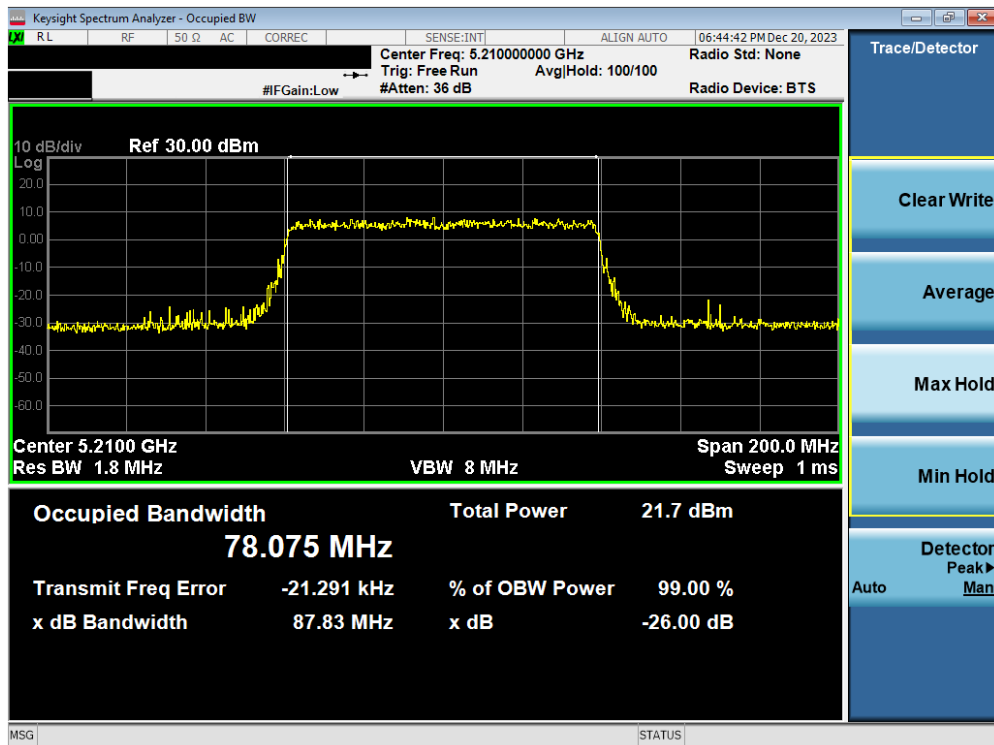


Plot 7-10. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 242 Tones (UNII Band 1) – Ch. 40)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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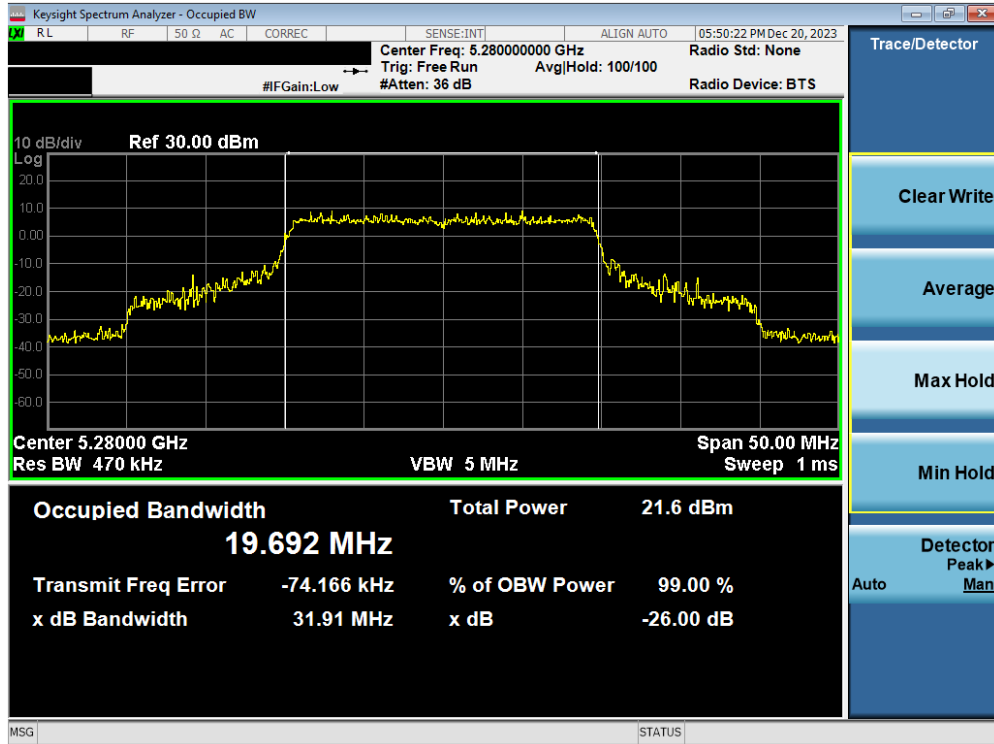


Plot 7-11. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 484 Tones (UNII Band 1) – Ch. 38)

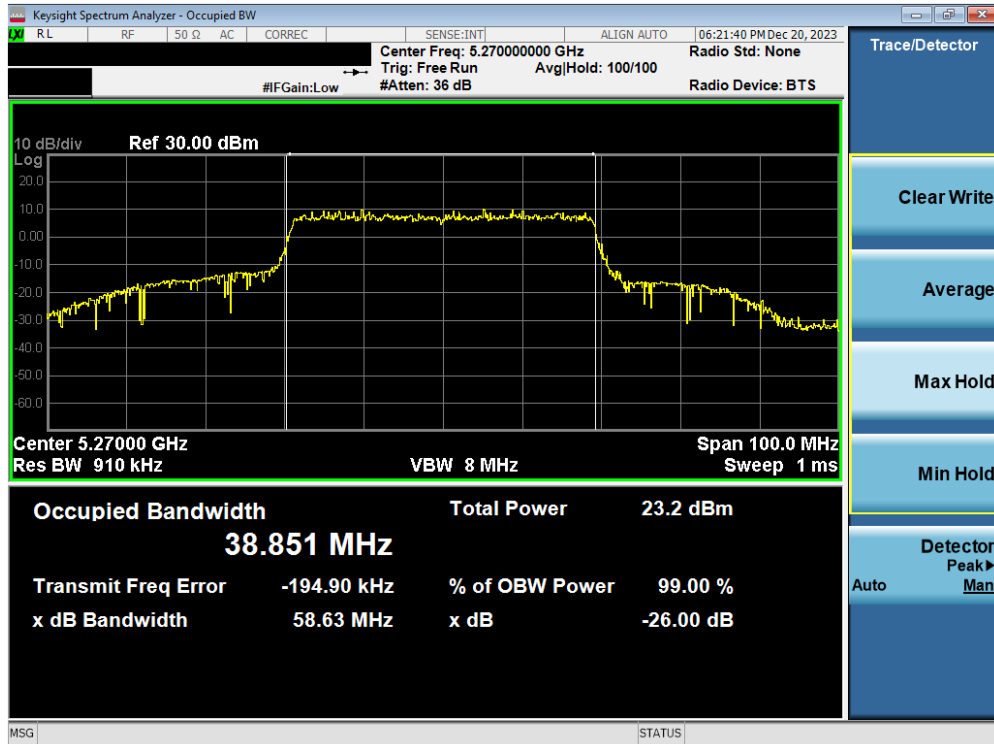


Plot 7-12. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax – 996 Tones (UNII Band 1) – Ch. 42)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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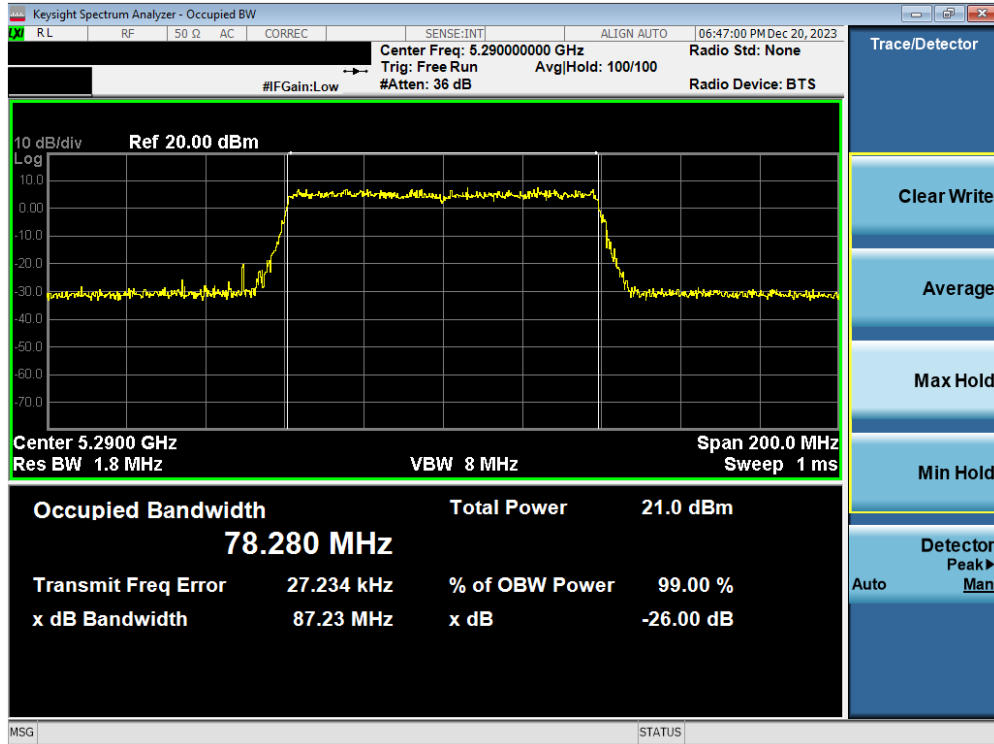


Plot 7-13. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 242 Tones (UNII Band 2A) – Ch. 56)

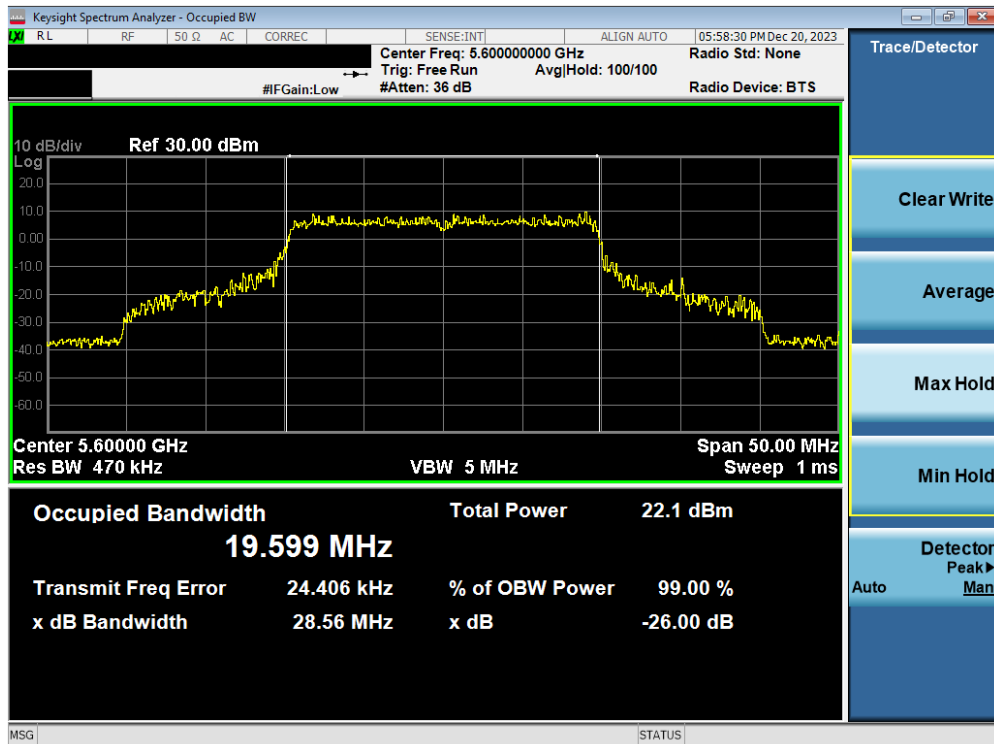


Plot 7-14. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 484 Tones (UNII Band 2A) – Ch. 54)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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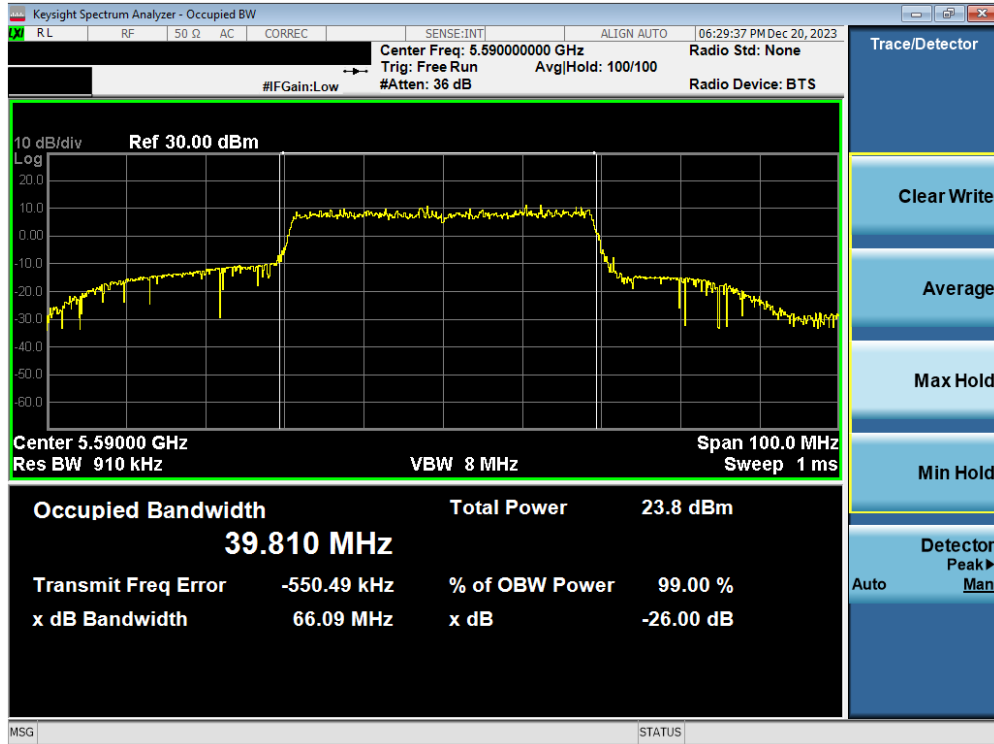


Plot 7-15. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax – 996 Tones (UNII Band 2A) – Ch. 58)

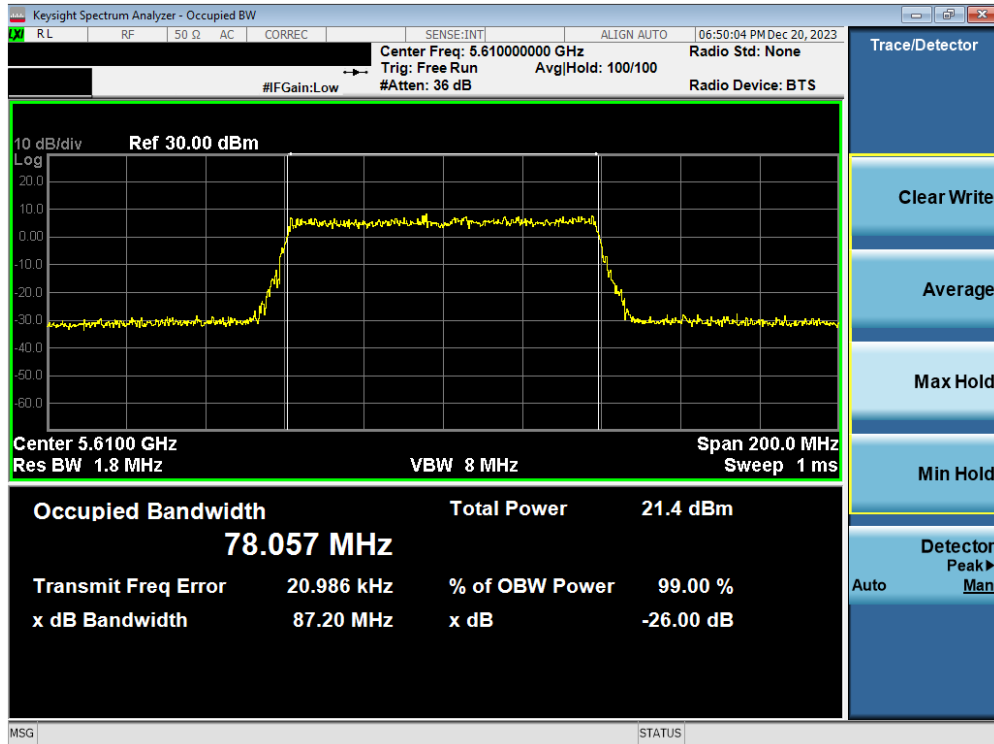


Plot 7-16. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 242 Tones (UNII Band 2C) – Ch. 120)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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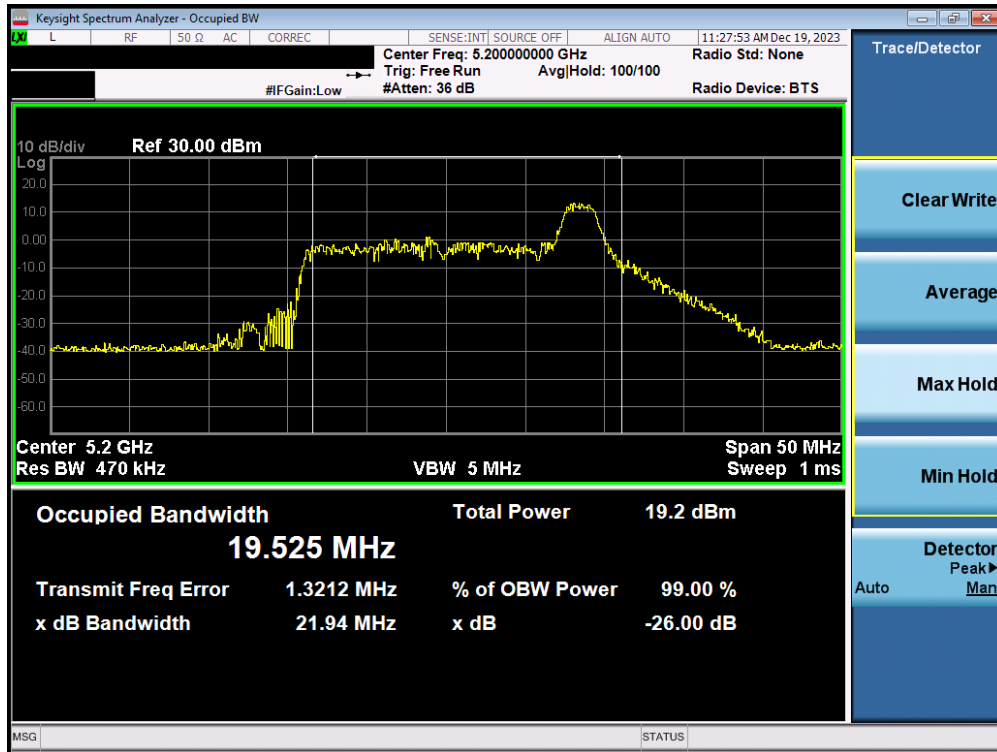
Plot 7-17. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 484 Tones (UNII Band 2C) – Ch. 118)



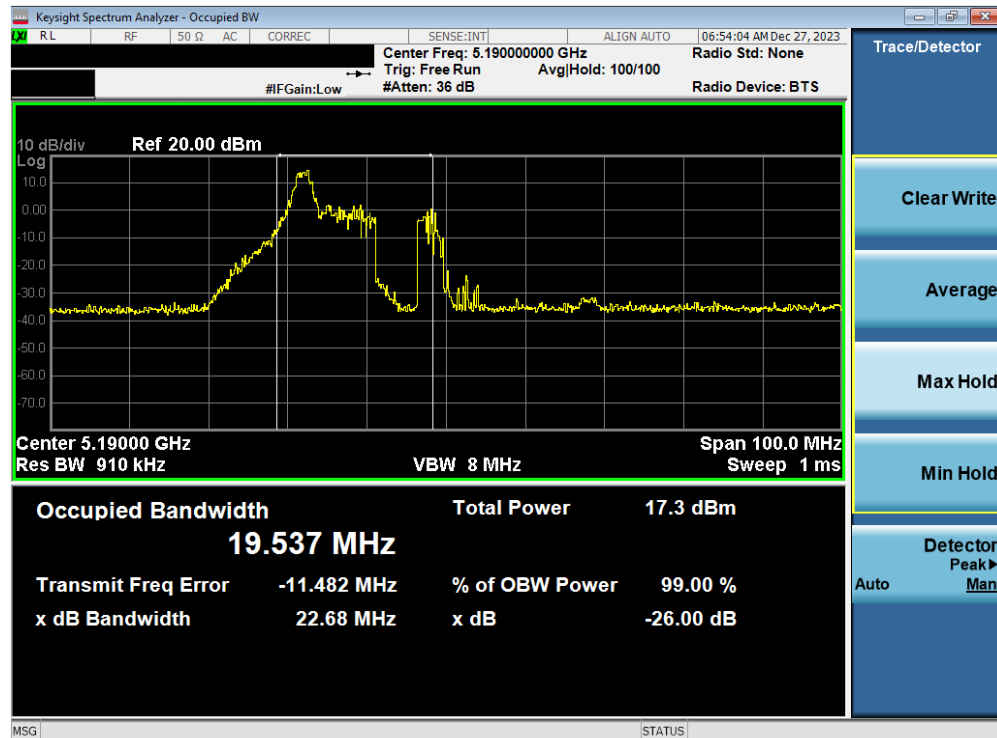
Plot 7-18. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax – 996 Tones (UNII Band 2C) – Ch. 122)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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7.2.2 MIMO Antenna-2 26dB Bandwidth Measurements

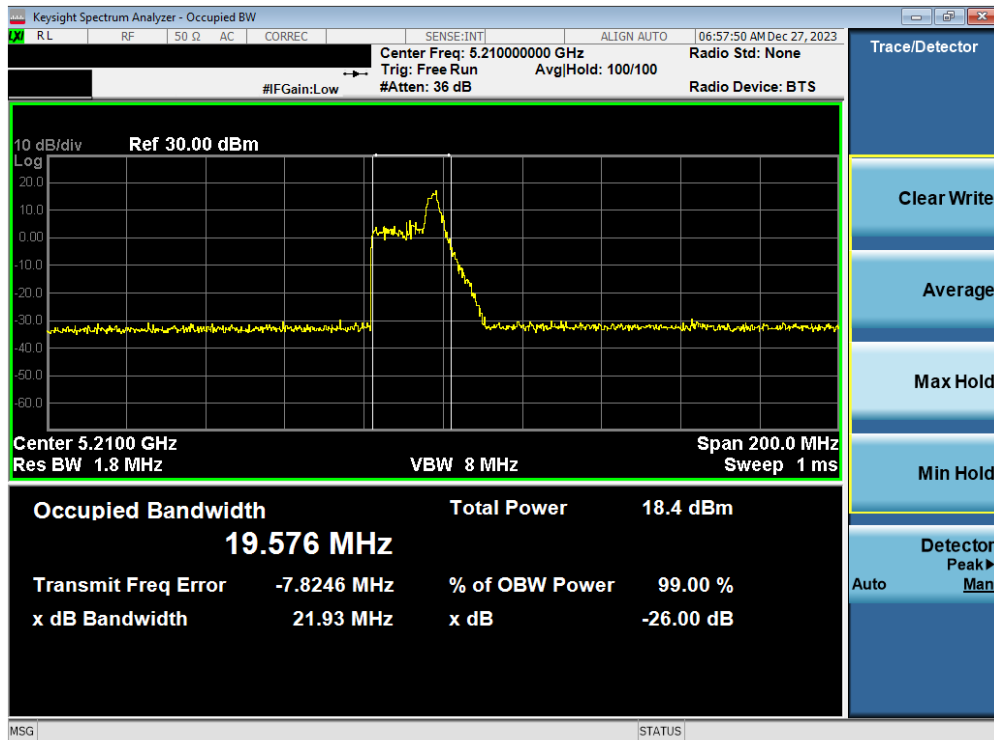


Plot 7-19. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 40)

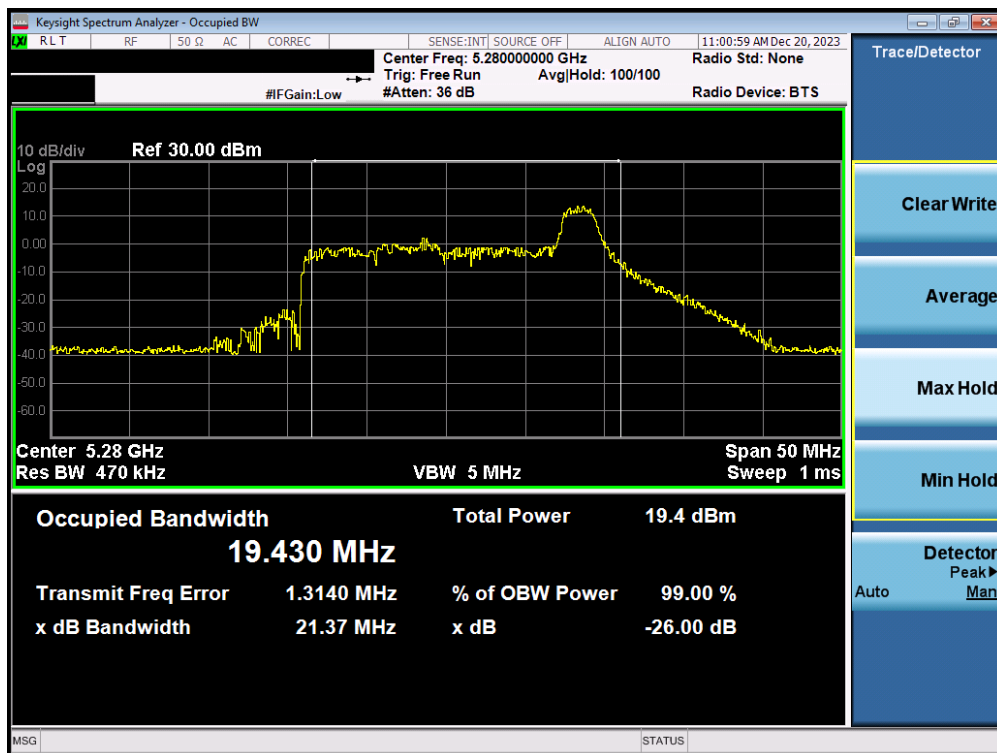


Plot 7-20. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 38)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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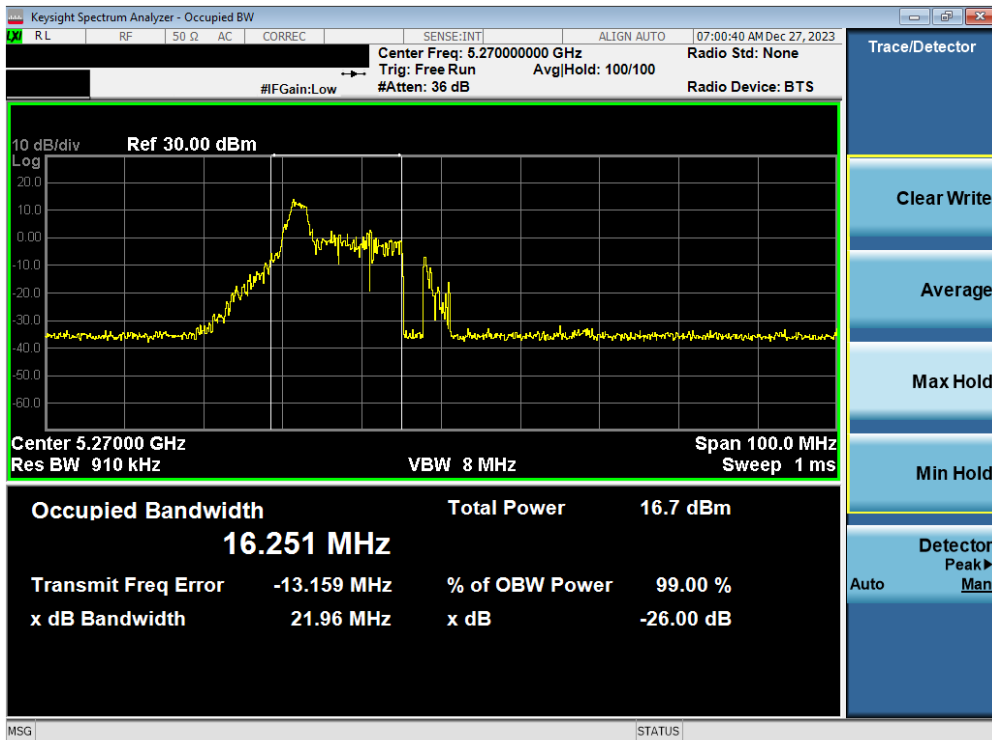


Plot 7-21. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 42)

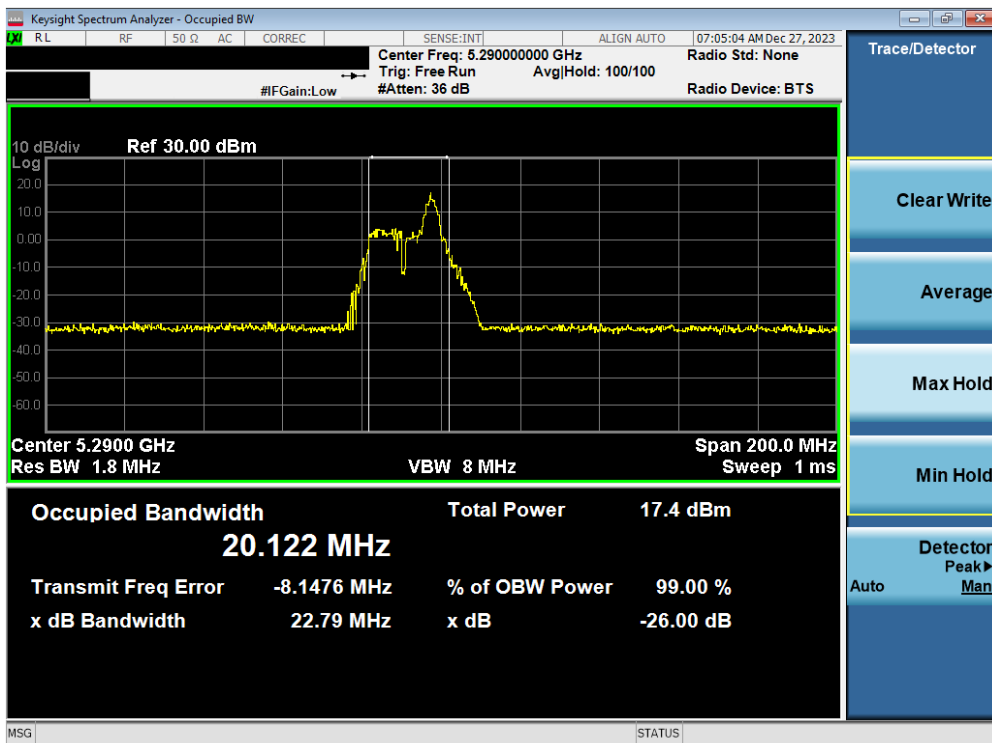


Plot 7-22. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 56)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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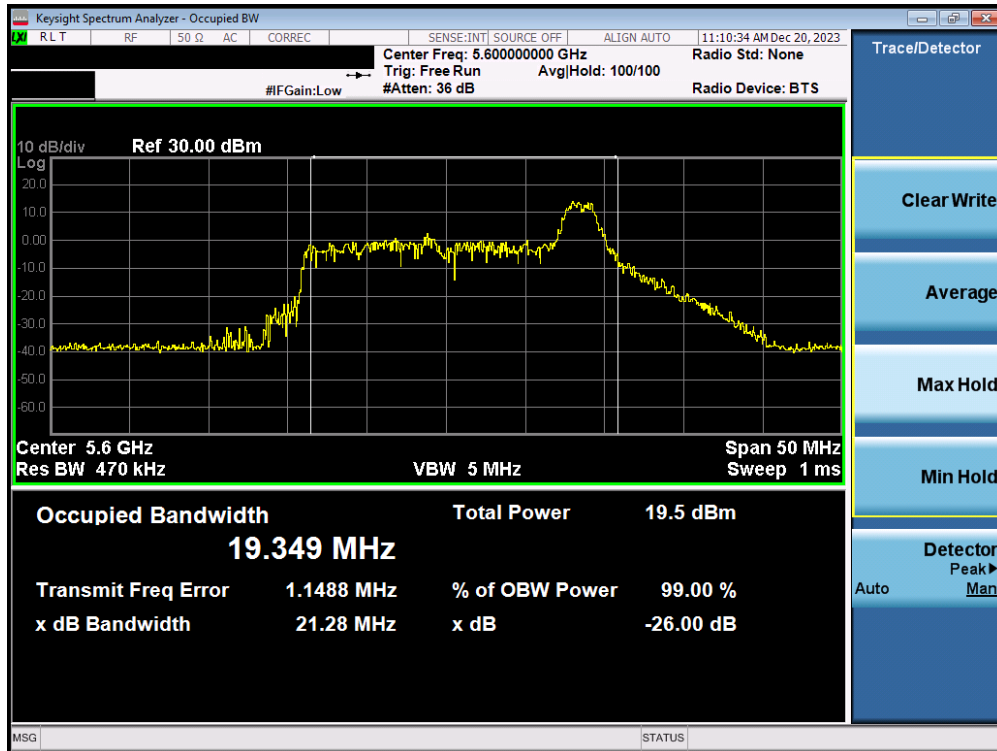


Plot 7-23. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 54)

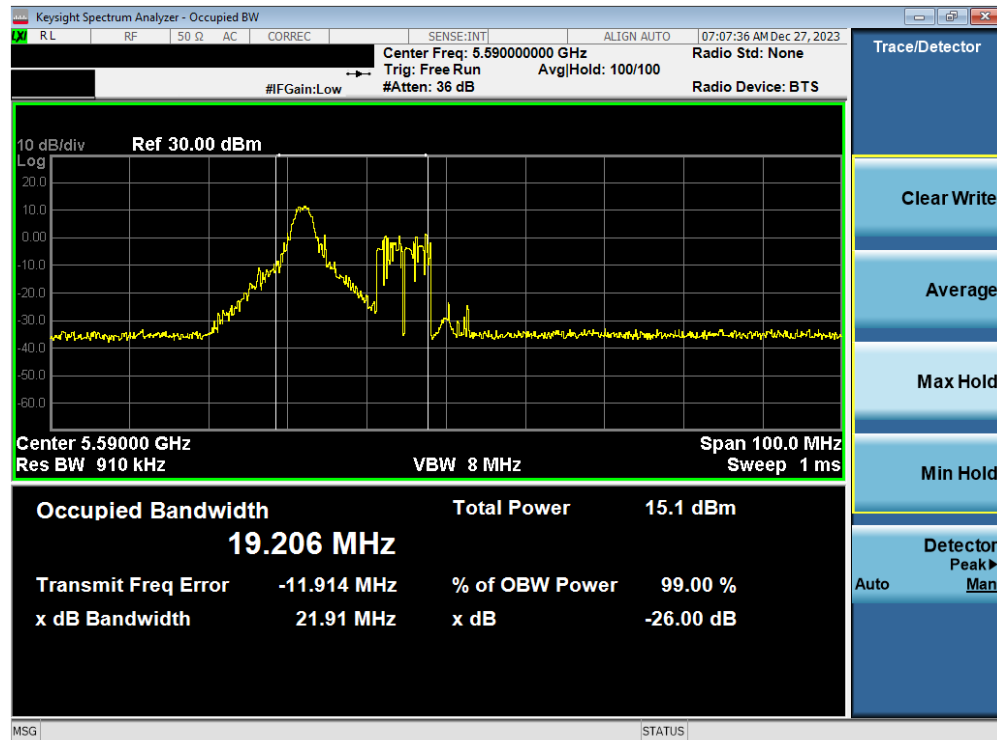


Plot 7-24. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 58)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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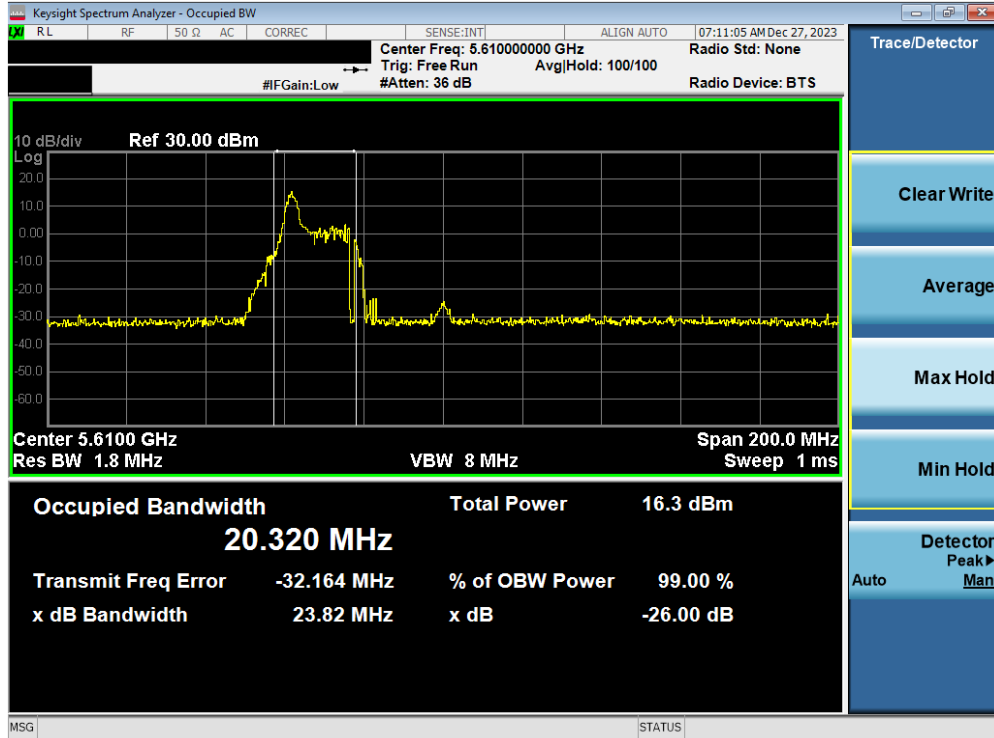


Plot 7-25. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 120)

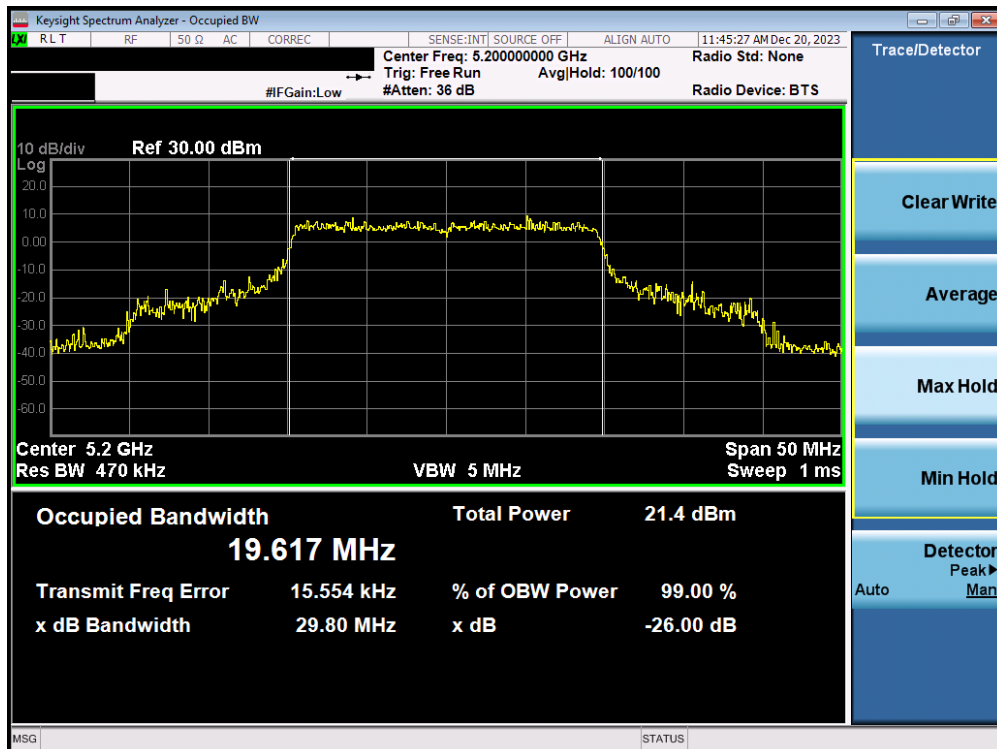


Plot 7-26. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 118)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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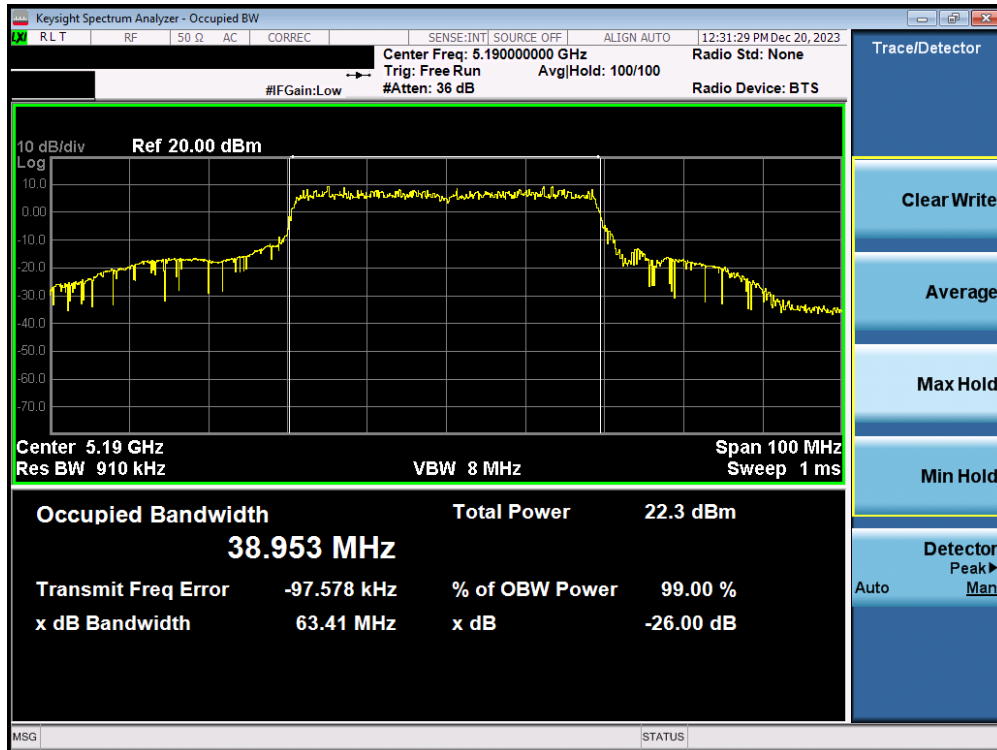


Plot 7-27. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 122)

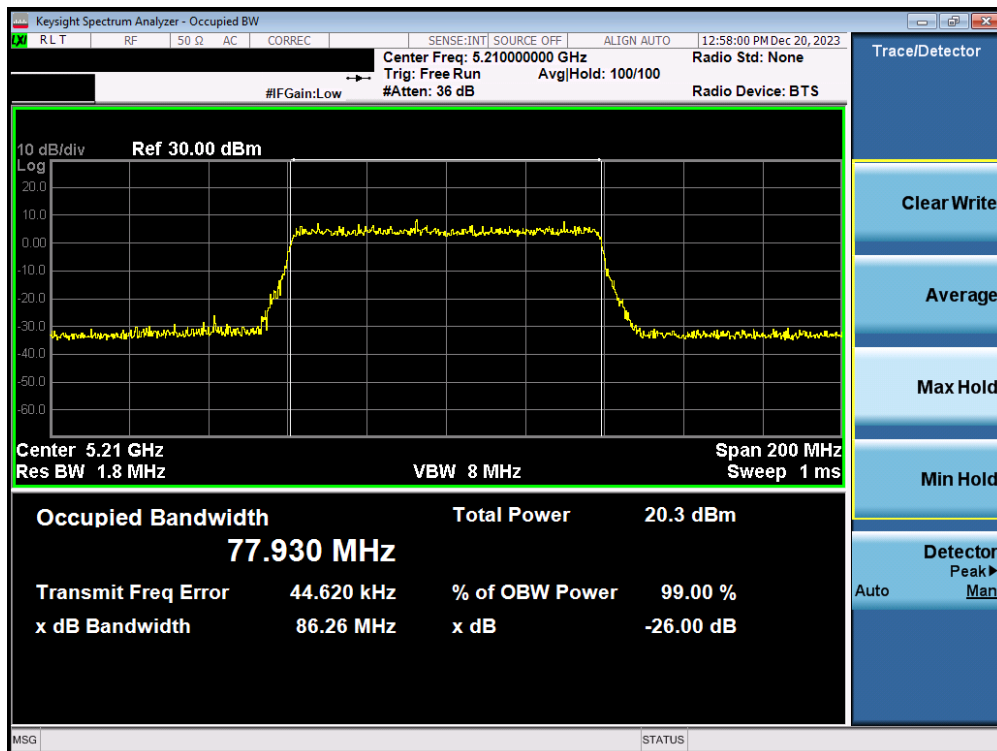


Plot 7-28. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 242 Tones (UNII Band 1) – Ch. 40)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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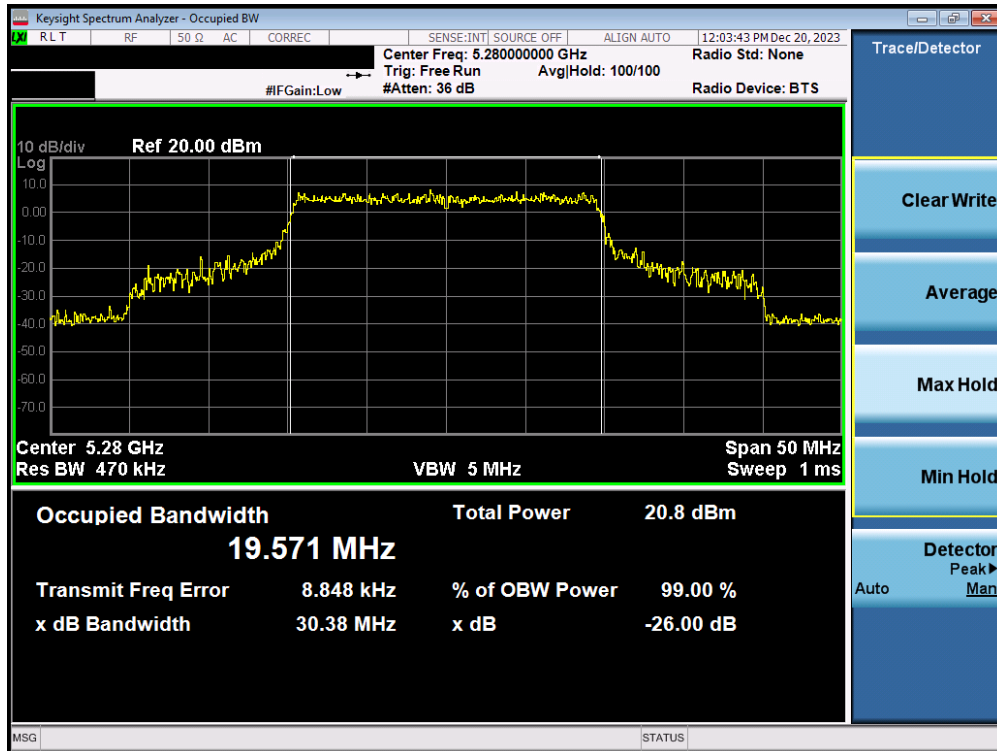


Plot 7-29. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 484 Tones (UNII Band 1) – Ch. 38)

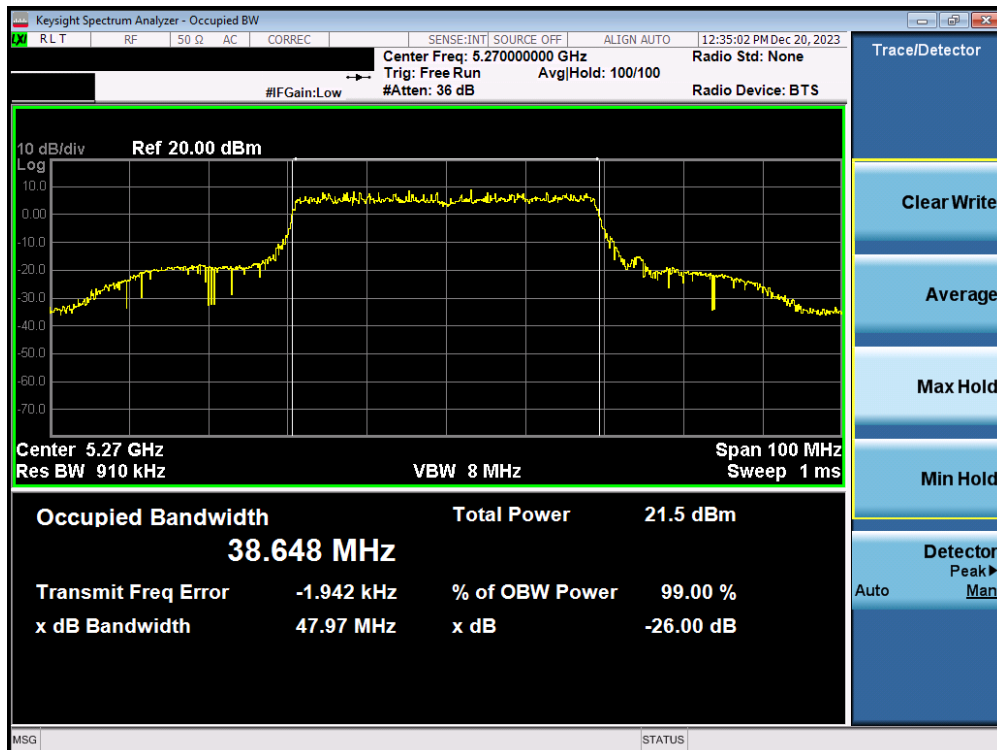


Plot 7-30. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ax – 996 Tones (UNII Band 1) – Ch. 42)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-10.A3L	Test Dates: 11/6/2023 – 1/2/2024	EUT Type: Portable Handset	Page 31 of 108

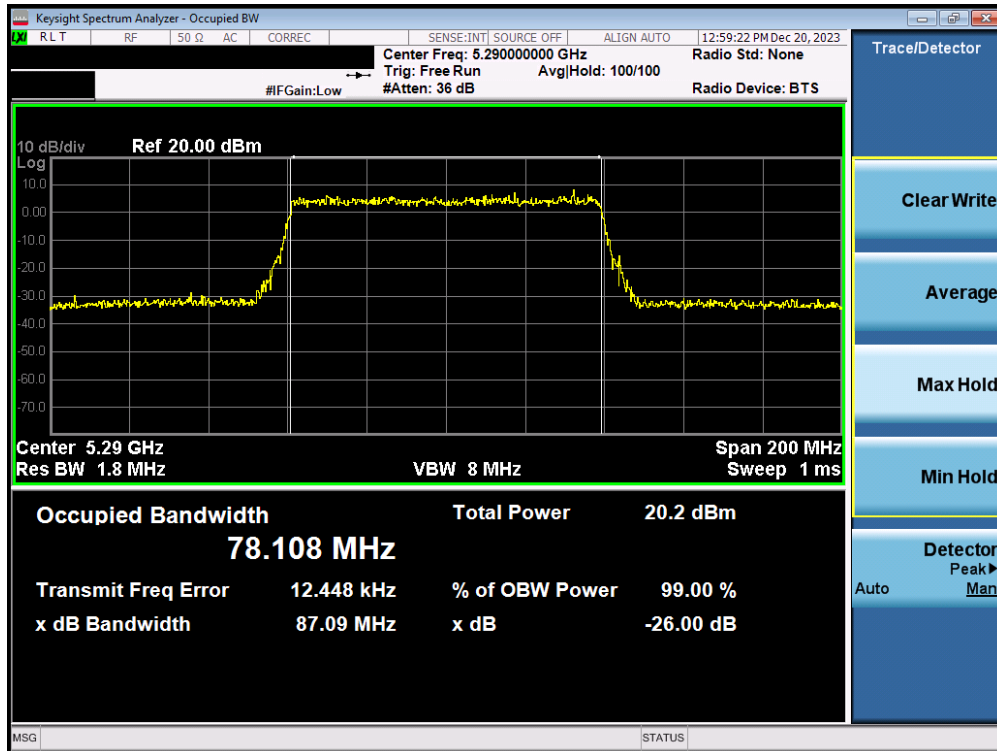


Plot 7-31. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 242 Tones (UNII Band 2A) – Ch. 56)

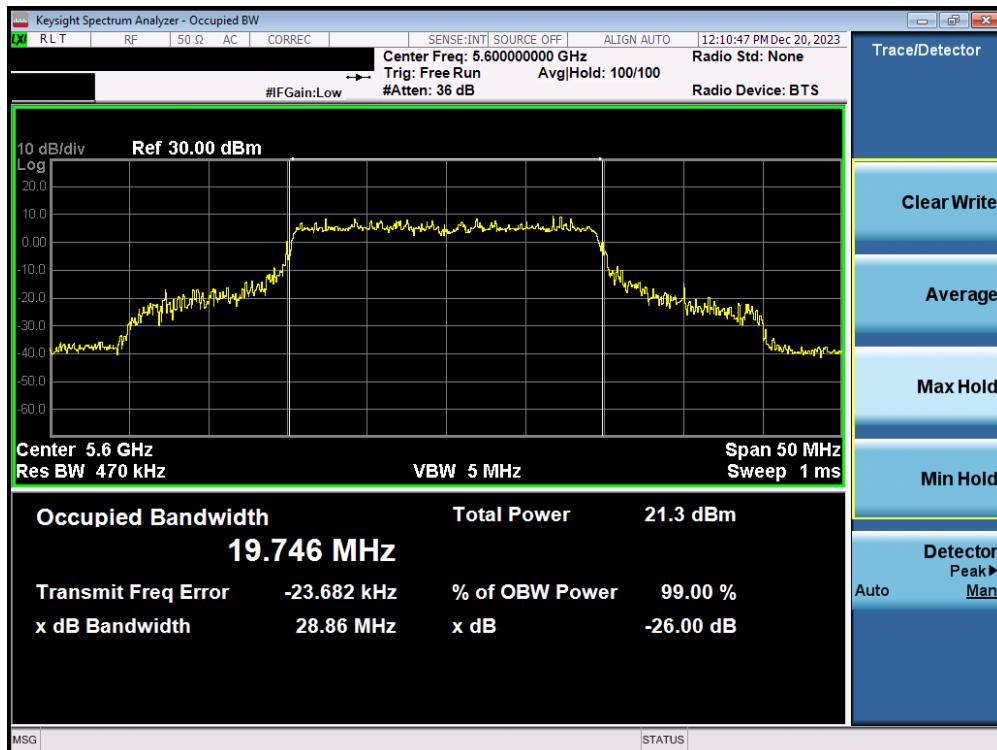


Plot 7-32. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 484 Tones (UNII Band 2A) – Ch. 54)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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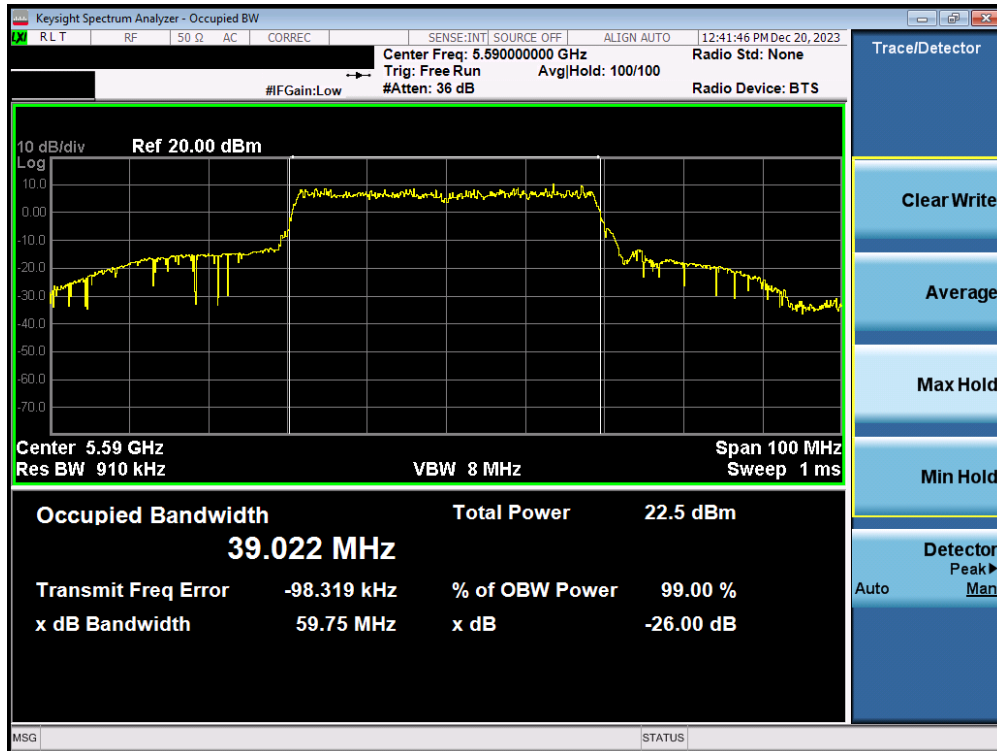


Plot 7-33. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ax – 996 Tones (UNII Band 2A) – Ch. 58)

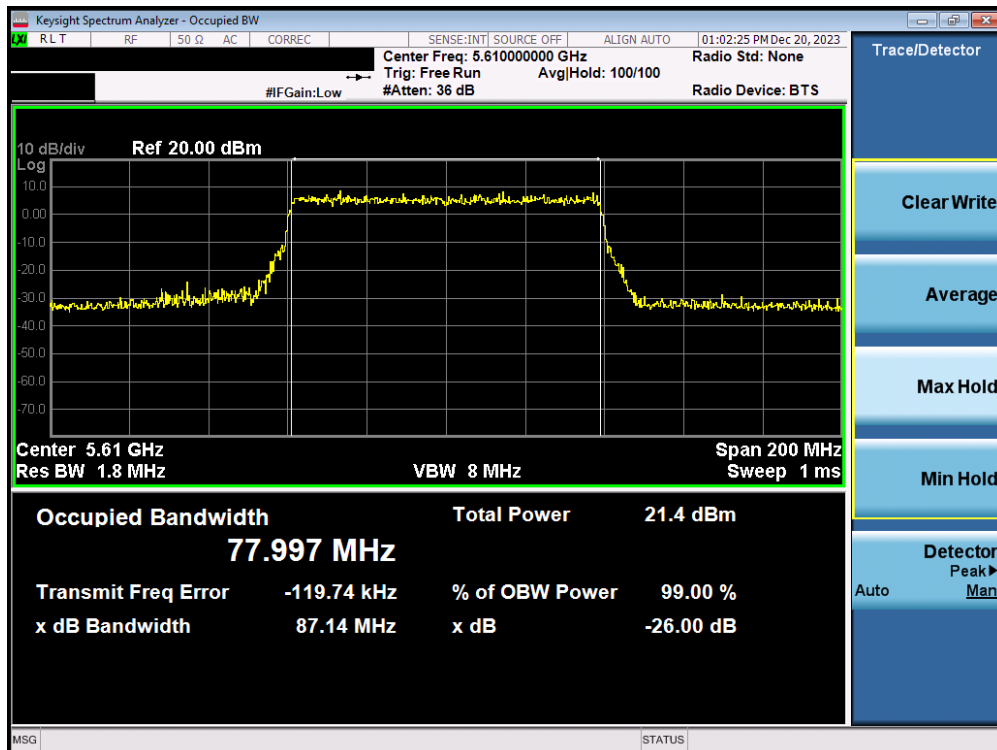


Plot 7-34. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 242 Tones (UNII Band 2C) – Ch. 120)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-10.A3L	Test Dates: 11/6/2023 – 1/2/2024	EUT Type: Portable Handset	Page 33 of 108



Plot 7-35. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 484 Tones (UNII Band 2C) – Ch. 118)



Plot 7-36. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ax – 996 Tones (UNII Band 2C) – Ch. 122)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-10.A3L	Test Dates: 11/6/2023 – 1/2/2024	EUT Type: Portable Handset	Page 34 of 108

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 band, the 6dB bandwidth must be \geq 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 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.

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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	ax (20MHz)	149	2.07	2.12
	5785	ax (20MHz)	157	2.09	2.14
	5825	ax (20MHz)	165	2.10	2.13
	5755	ax (40MHz)	151	2.18	2.10
	5795	ax (40MHz)	159	2.18	2.12
	5775	ax (80MHz)	155	2.25	2.25

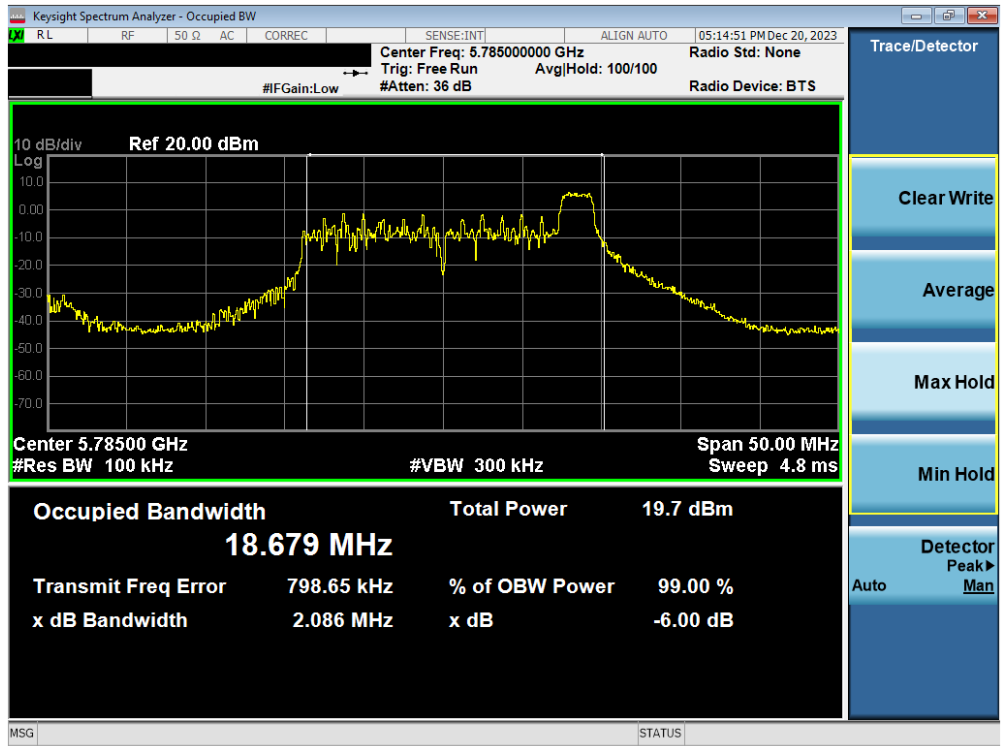
Table 7-4. Band 3 Conducted 6dB Bandwidth Measurements MIMO (26 Tones)

	Frequency [MHz]	802.11 MODE	Channel	Antenna-1 6dB Bandwidth [MHz]	Antenna-2 6dB Bandwidth [MHz]
Band 3	5745	ax (20MHz)	149	19.20	18.99
	5785	ax (20MHz)	157	19.14	19.05
	5825	ax (20MHz)	165	19.15	18.96
	5755	ax (40MHz)	151	38.21	38.15
	5795	ax (40MHz)	159	38.18	38.16
	5775	ax (80MHz)	155	78.22	78.10

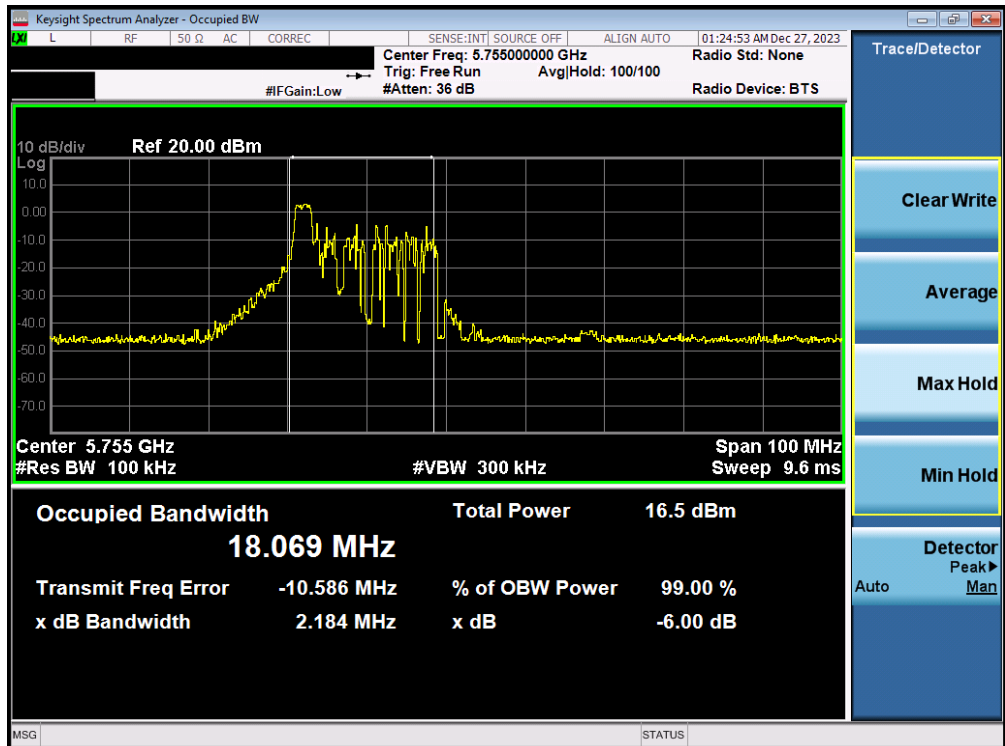
Table 7-5. Band 3 Conducted 6dB Bandwidth Measurements MIMO (Full Tones)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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7.3.1 MIMO Antenna-1 6dB Bandwidth Measurements

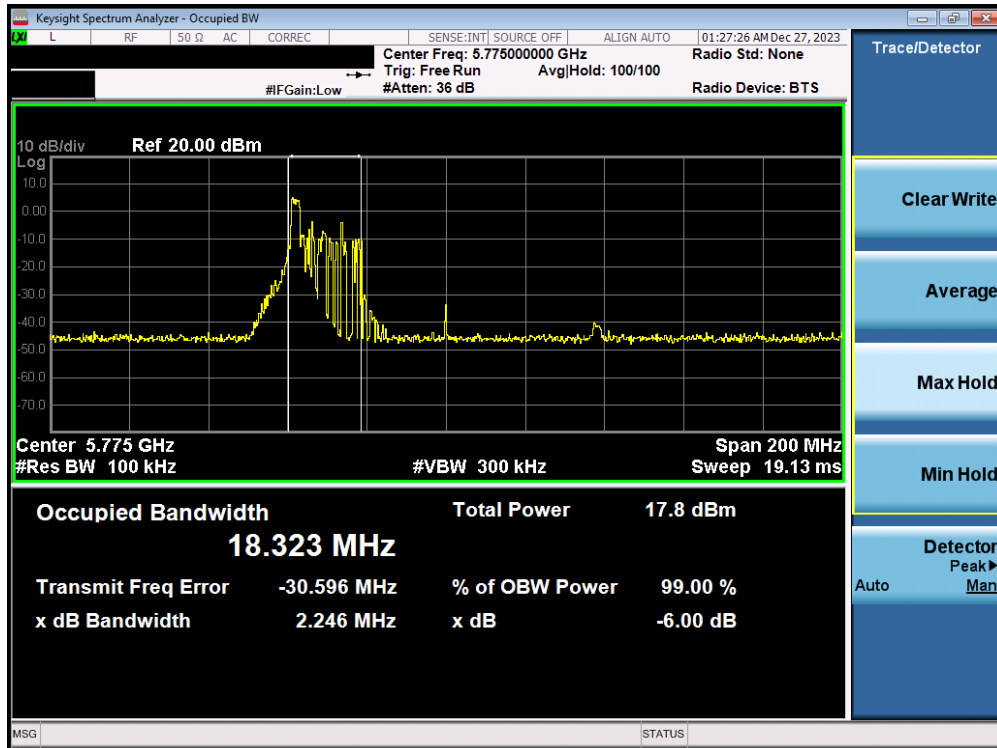


Plot 7-37. 6dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 157)

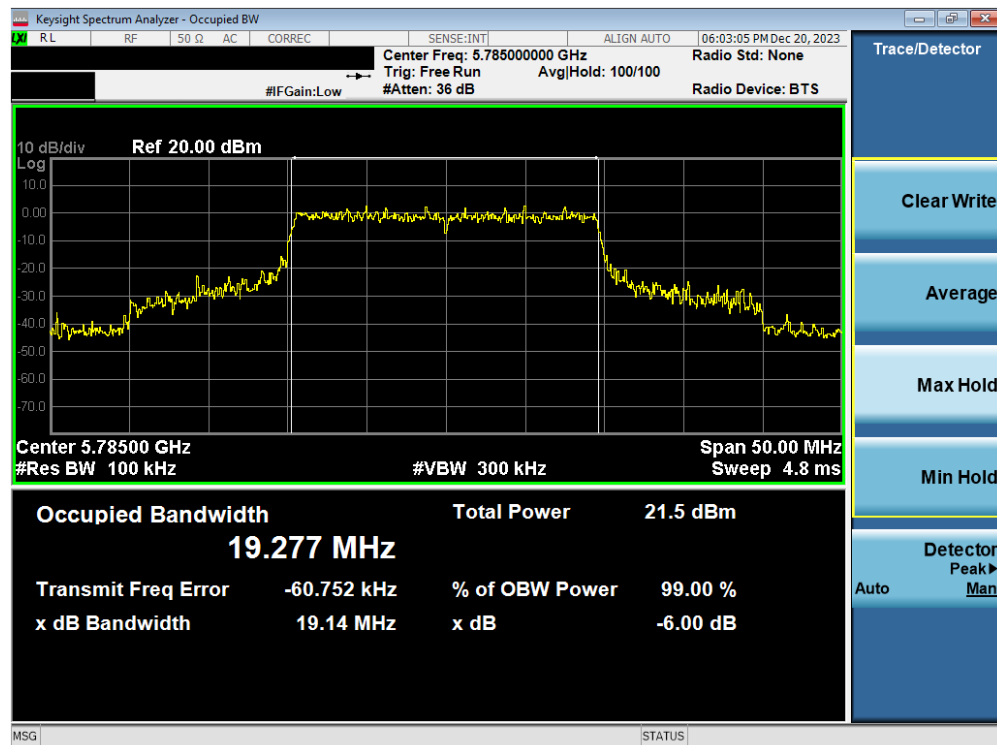


Plot 7-38. 6dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 151)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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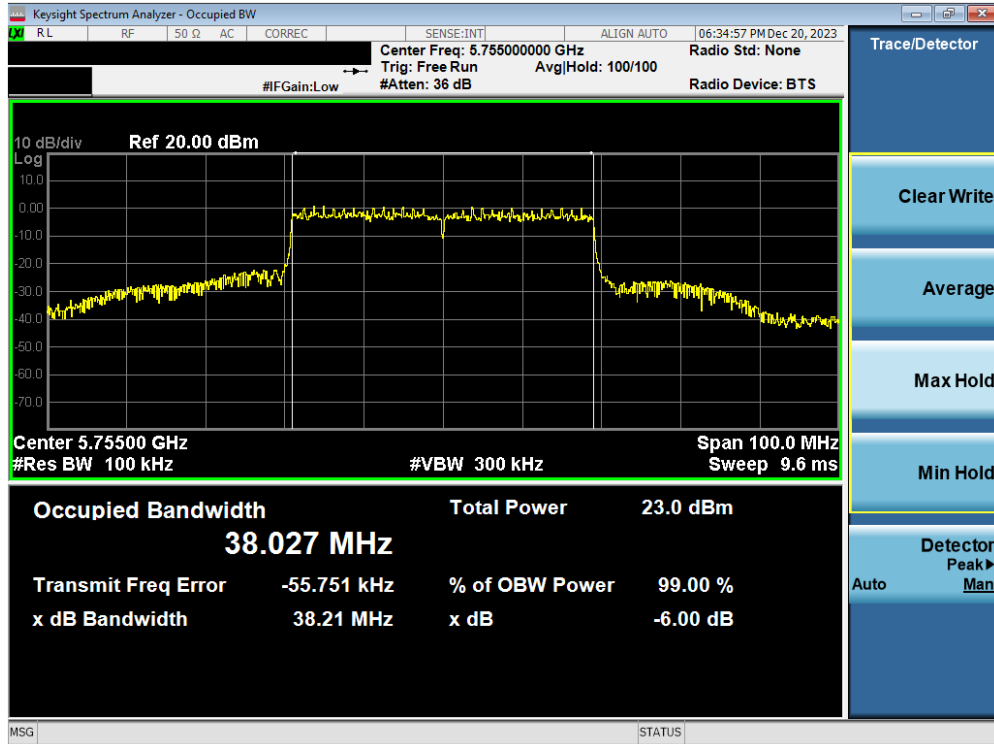


Plot 7-39. 6dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 155)

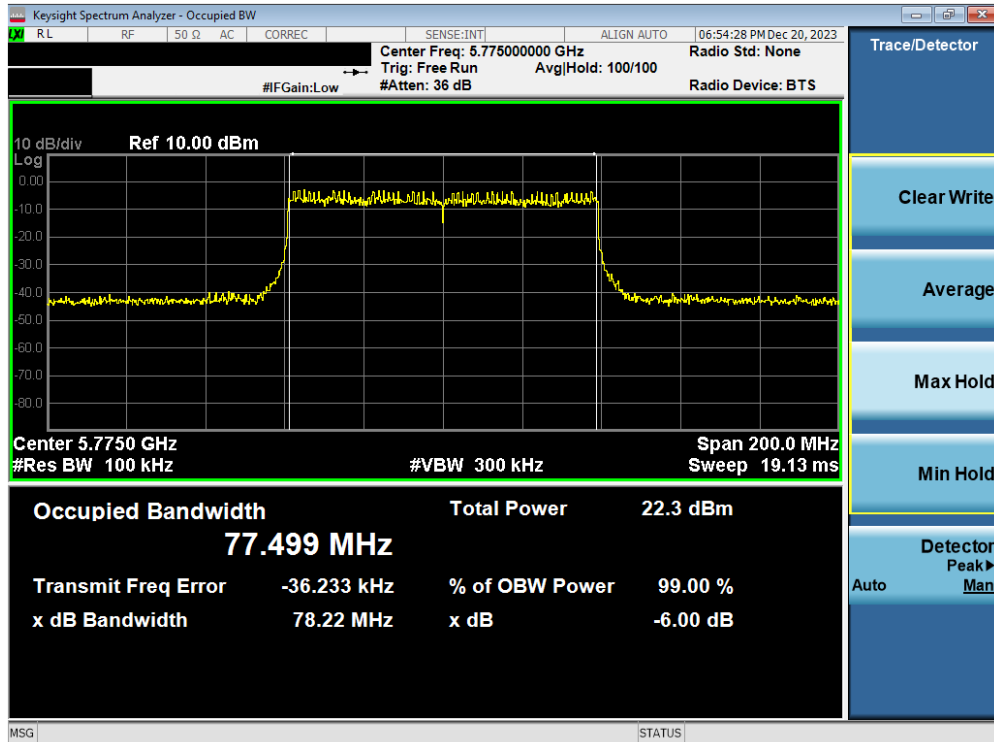


Plot 7-40. 6dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 242 Tones (UNII Band 3) – Ch. 157)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-41. 6dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 484 Tones (UNII Band 3) – Ch. 151)



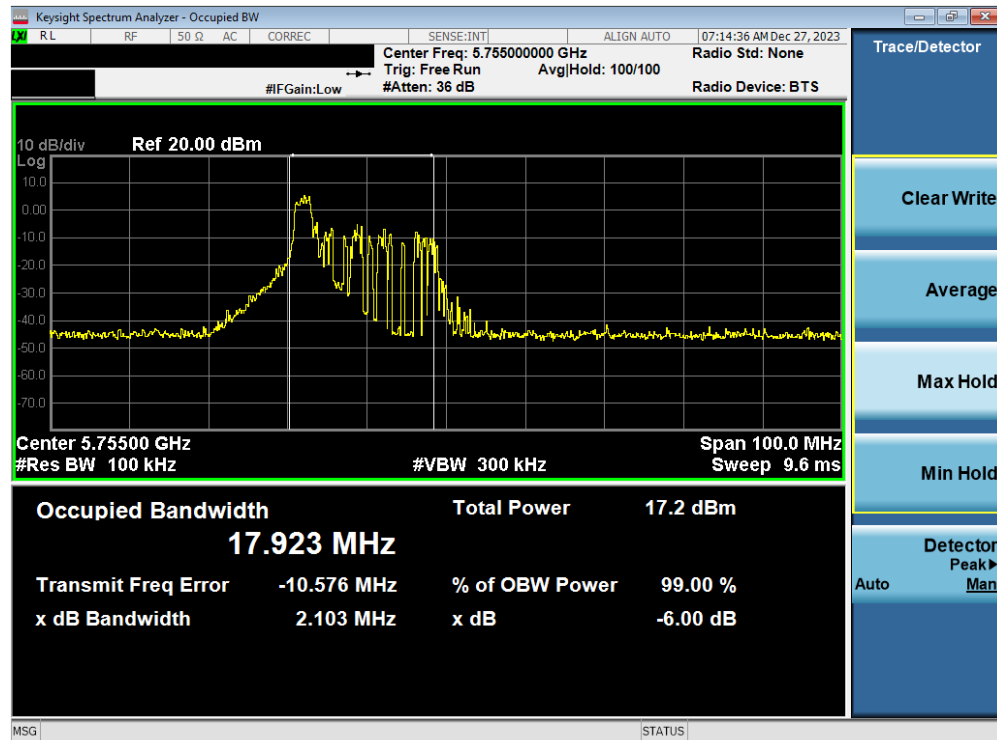
Plot 7-42. 6dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax – 996 Tones (UNII Band 3) – Ch. 155)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-10.A3L	Test Dates: 11/6/2023 – 1/2/2024	EUT Type: Portable Handset	Page 39 of 108

7.3.2 MIMO Antenna-2 6dB Bandwidth Measurements

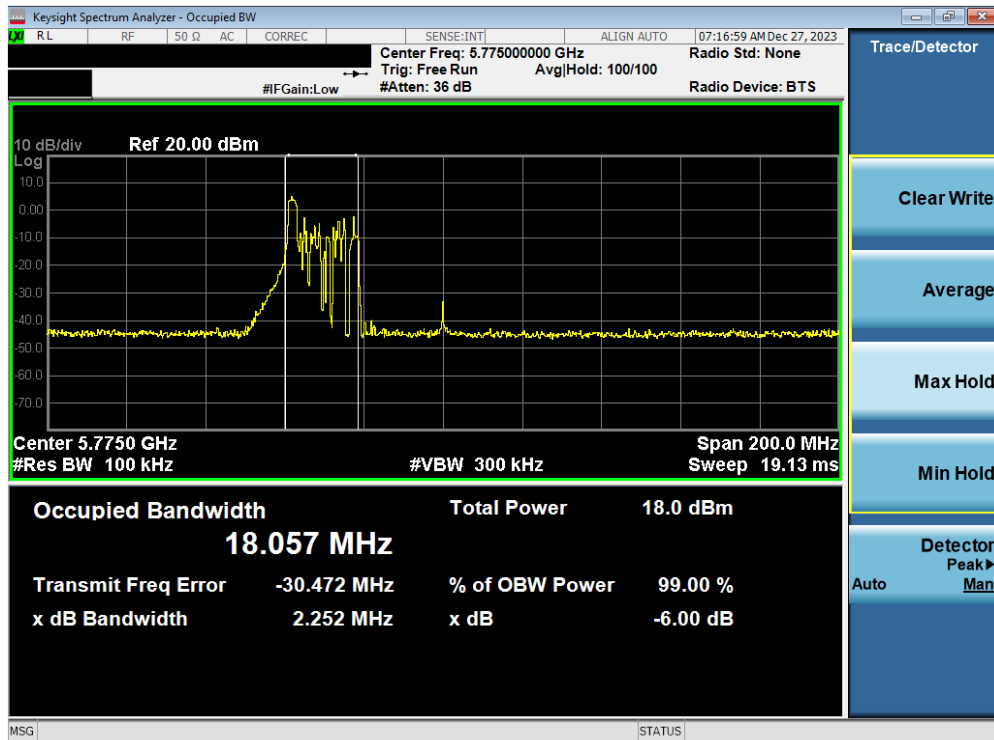


Plot 7-43. 6dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 157)

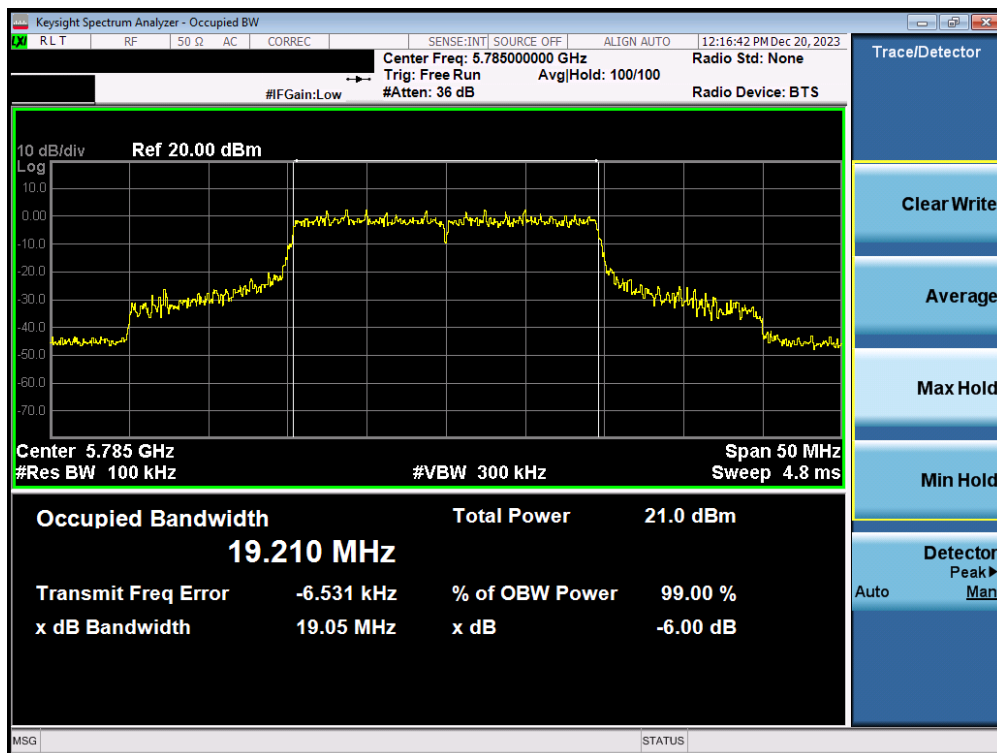


Plot 7-44. 6dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 151)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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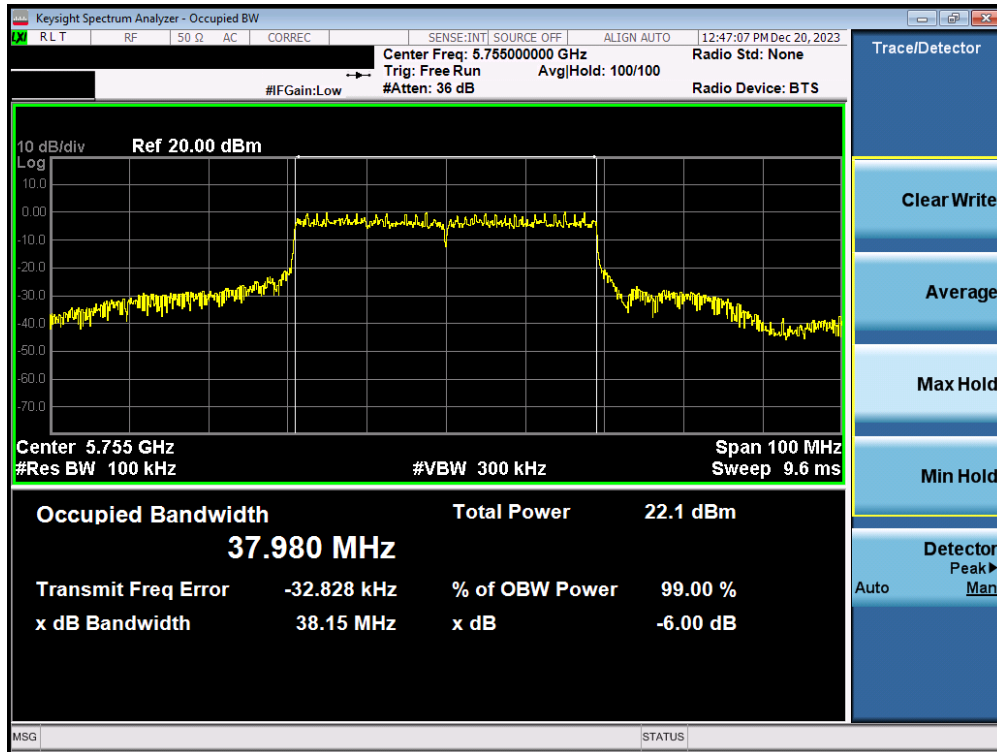


Plot 7-45. 6dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 155)

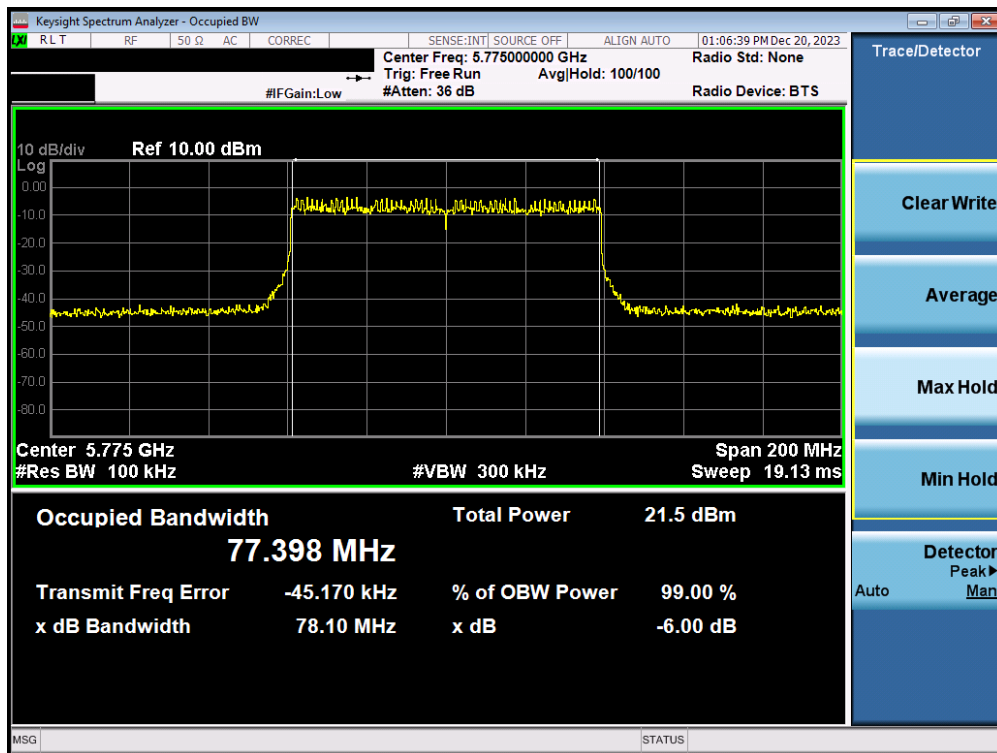


Plot 7-46. 6dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 242 Tones (UNII Band 3) – Ch. 157)

FCC ID: A3LSMA356E		MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-47. 6dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 484 Tones (UNII Band 3) – Ch. 151)



Plot 7-48. 6dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ax – 996 Tones (UNII Band 3) – Ch. 155)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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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

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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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 802.11ax (20MHz BW) mode, the average conducted output power was measured to be 9.56dBm for Antenna 1 and 9.51dBm for Antenna 2.

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

$$(9.56 \text{ dBm} + 9.51\text{dBm}) = (9.04 \text{ mW} + 8.93 \text{ mW}) = 17.97 \text{ mW} = 12.55 \text{ dBm}$$

Sample e.i.r.p. Calculation:

At 5180MHz in 802.11ax (20MHz BW) mode, the average MIMO conducted power was calculated to be 12.55 dBm with directional gain of -0.50dBi.

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

$$12.55 \text{ dBm} + -0.50 \text{ dBi} = 12.35 \text{ dBm}$$

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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	

Test Procedure Used

ANSI C63.10-2013 – Section 12.3.2.3 (Method SA-2)

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 $\geq 2 \times$ (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.

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Summed MIMO Power Spectral Density Measurements

	Frequency [MHz]	802.11 MODE	Channel	Antenna 1 PSD [dBm]	Antenna 2 PSD [dBm]	DCCF [dB]	MIMO Summed PSD [dBm]	Max Conducted PSD [dBm]	Margin [dB]
Band 1	5180	ax (20MHz)	36	5.59	5.88	0.09	8.83	11.00	-2.17
	5200	ax (20MHz)	40	7.00	6.57	0.09	9.89	11.00	-1.11
	5240	ax (20MHz)	48	7.45	7.03	0.09	10.35	11.00	-0.65
	5190	ax (40MHz)	38	5.10	5.75	0.09	8.54	11.00	-2.46
	5230	ax (40MHz)	46	4.97	4.57	0.09	7.88	11.00	-3.12
	5210	ax (80MHz)	42	5.83	6.16	0.09	9.09	11.00	-1.91
Band 2A	5260	ax (20MHz)	52	7.53	6.57	0.09	10.18	11.00	-0.82
	5280	ax (20MHz)	56	6.87	6.68	0.09	9.87	11.00	-1.13
	5320	ax (20MHz)	64	7.08	6.65	0.09	9.97	11.00	-1.03
	5270	ax (40MHz)	54	5.70	4.81	0.09	8.38	11.00	-2.62
	5310	ax (40MHz)	62	5.78	4.73	0.09	8.39	11.00	-2.61
	5290	ax (80MHz)	58	6.13	5.03	0.09	8.72	11.00	-2.28
Band 2C	5500	ax (20MHz)	100	6.75	6.43	0.09	9.69	11.00	-1.31
	5600	ax (20MHz)	120	7.85	6.92	0.09	10.51	11.00	-0.49
	5720	ax (20MHz)	144	7.77	7.13	0.09	10.56	11.00	-0.44
	5510	ax (40MHz)	102	5.49	4.08	0.09	7.94	11.00	-3.06
	5590	ax (40MHz)	118	5.27	4.23	0.09	7.88	11.00	-3.12
	5710	ax (40MHz)	142	5.32	5.46	0.09	8.49	11.00	-2.51
	5530	ax (80MHz)	106	6.24	4.97	0.09	8.75	11.00	-2.25
	5610	ax (80MHz)	122	5.64	4.12	0.09	8.05	11.00	-2.95
	5690	ax (80MHz)	138	5.98	5.07	0.09	8.64	11.00	-2.36

Table 7-12. 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 Summed PSD [dBm]	Max Conducted PSD [dBm]	Margin [dB]
Band 3	5745	ax (20MHz)	149	4.71	4.43	0.09	7.67	30.00	-22.33
	5785	ax (20MHz)	157	5.42	5.33	0.09	8.47	30.00	-21.53
	5825	ax (20MHz)	165	4.64	4.75	0.09	7.80	30.00	-22.20
	5755	ax (40MHz)	151	4.02	3.81	0.09	7.02	30.00	-22.98
	5795	ax (40MHz)	159	3.82	3.90	0.09	6.96	30.00	-23.04
	5775	ax (80MHz)	155	3.99	3.28	0.09	6.75	30.00	-23.25

Table 7-13. Band 3 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]	DCCF [dB]	MIMO Summed PSD [dBm]	Max Conducted PSD [dBm]	Margin [dB]
Band 1	5180	ax (20MHz)	36	1.73	1.39	0.25	4.83	11.00	-6.17
	5200	ax (20MHz)	40	2.17	1.26	0.25	5.00	11.00	-6.00
	5240	ax (20MHz)	48	2.57	1.55	0.25	5.35	11.00	-5.65
	5190	ax (40MHz)	38	-0.82	-1.96	0.45	2.11	11.00	-8.89
	5230	ax (40MHz)	46	-1.31	-2.89	0.45	1.44	11.00	-9.56
	5210	ax (80MHz)	42	-5.65	-6.77	0.65	-2.52	11.00	-13.52
Band 2A	5260	ax (20MHz)	52	1.95	1.45	0.25	4.97	11.00	-6.03
	5280	ax (20MHz)	56	2.07	0.82	0.25	4.75	11.00	-6.25
	5320	ax (20MHz)	64	1.52	1.12	0.25	4.58	11.00	-6.42
	5270	ax (40MHz)	54	-0.85	-2.99	0.45	1.67	11.00	-9.33
	5310	ax (40MHz)	62	-1.45	-1.97	0.45	1.76	11.00	-9.24
	5290	ax (80MHz)	58	-6.25	-7.21	0.65	-3.05	11.00	-14.05
Band 2C	5500	ax (20MHz)	100	2.01	1.35	0.25	4.95	11.00	-6.05
	5600	ax (20MHz)	120	2.35	1.51	0.25	5.21	11.00	-5.79
	5720	ax (20MHz)	144	2.05	1.78	0.25	5.18	11.00	-5.82
	5510	ax (40MHz)	102	-0.83	-1.26	0.45	2.42	11.00	-8.58
	5590	ax (40MHz)	118	-0.65	-1.99	0.45	2.19	11.00	-8.81
	5710	ax (40MHz)	142	-0.17	-1.18	0.45	2.82	11.00	-8.18
	5530	ax (80MHz)	106	-5.35	-5.65	0.65	-1.83	11.00	-12.83
	5610	ax (80MHz)	122	-5.95	-5.76	0.65	-2.20	11.00	-13.20
5690	ax (80MHz)	138	-5.27	-5.96	0.65	-1.94	11.00	-12.94	

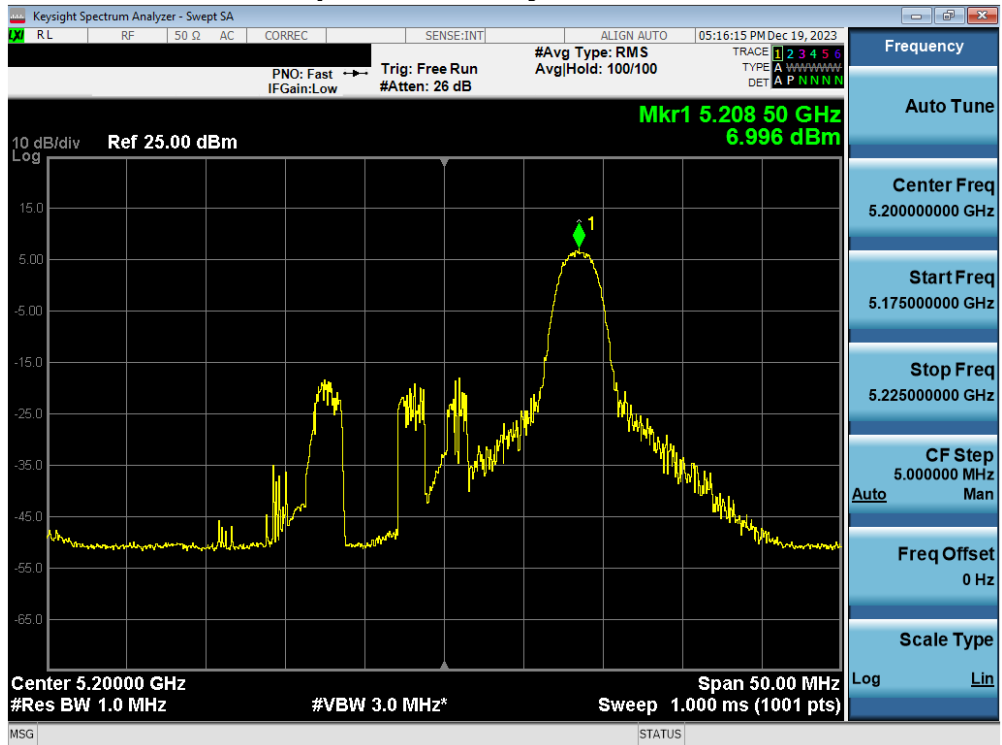
Table 7-14. Bands 1, 2A, 2C MIMO Conducted Power Spectral Density Measurements MIMO (Full Tones)

	Frequency [MHz]	802.11 MODE	Channel	Antenna 1 PSD [dBm]	Antenna 2 PSD [dBm]	DCCF [dB]	MIMO Summed PSD [dBm]	Max Conducted PSD [dBm]	Margin [dB]
Band 3	5745	ax (20MHz)	149	-0.45	-0.90	0.25	2.59	30.00	-27.41
	5785	ax (20MHz)	157	-0.66	-0.39	0.25	2.74	31.00	-28.26
	5825	ax (20MHz)	165	-0.42	-0.57	0.25	2.76	32.00	-29.24
	5755	ax (40MHz)	151	-2.86	-3.81	0.45	0.15	36.00	-35.85
	5795	ax (40MHz)	159	-3.13	-3.15	0.45	0.32	37.00	-36.68
	5775	ax (80MHz)	155	-7.76	-7.61	0.65	-4.02	40.00	-44.02

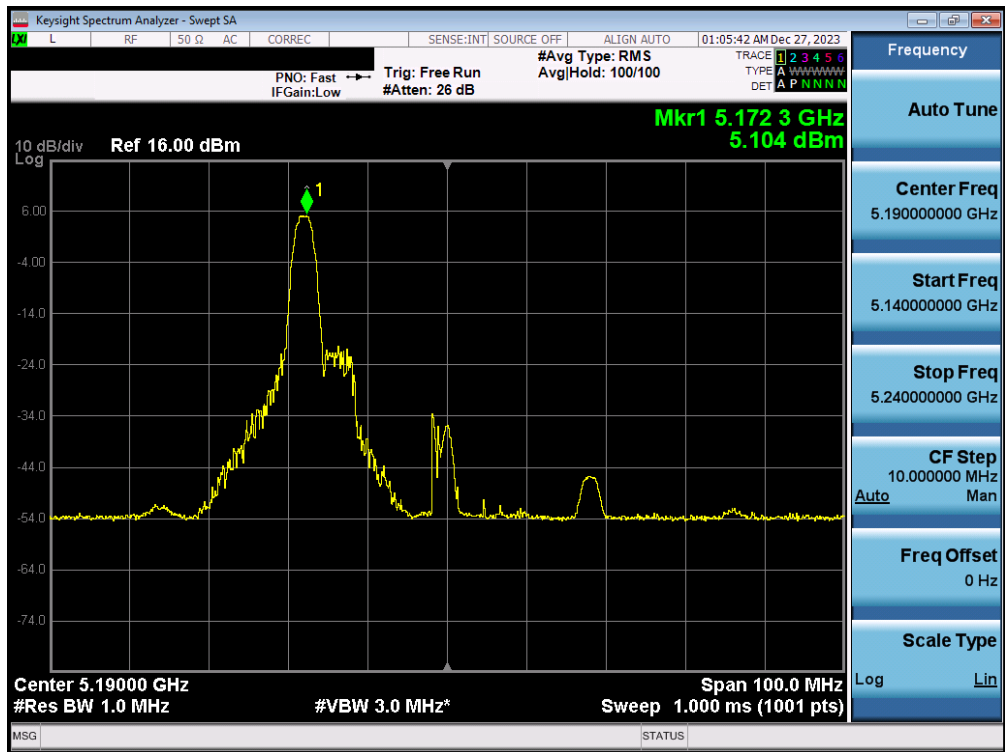
Table 7-15. Band 3 MIMO Conducted Power Spectral Density Measurements MIMO (Full Tones)

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7.5.1 MIMO Antenna-1 Power Spectral Density Measurements

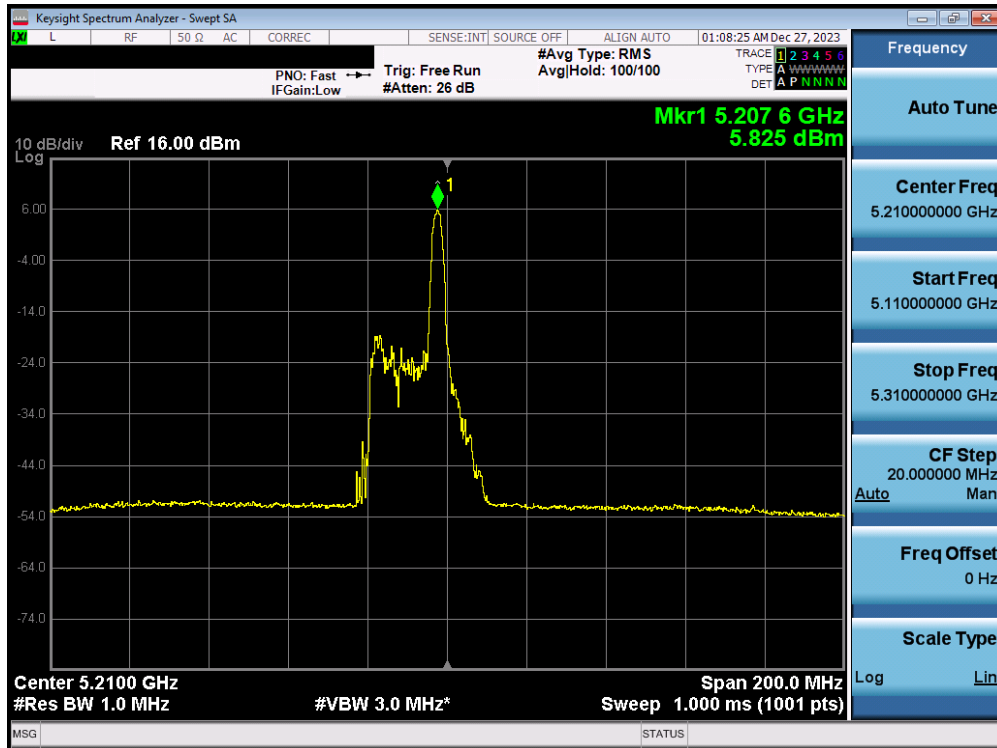


Plot 7-49. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 40)

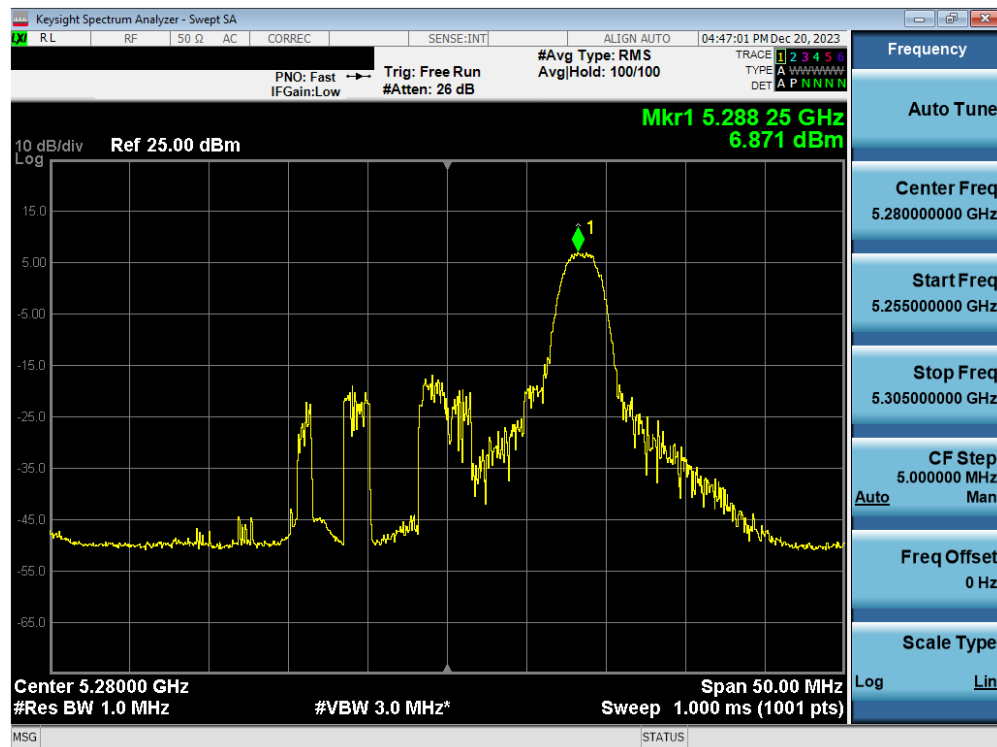


Plot 7-50. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 38)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-10.A3L	Test Dates: 11/6/2023 – 1/2/2024	EUT Type: Portable Handset	Page 49 of 108

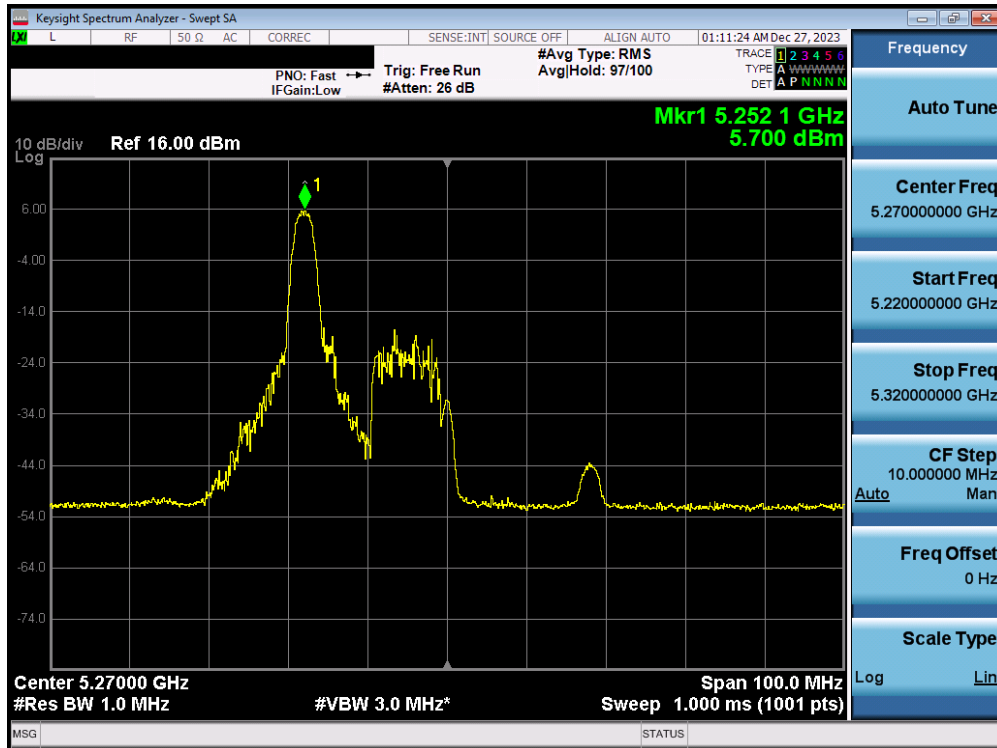


Plot 7-51. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 42)

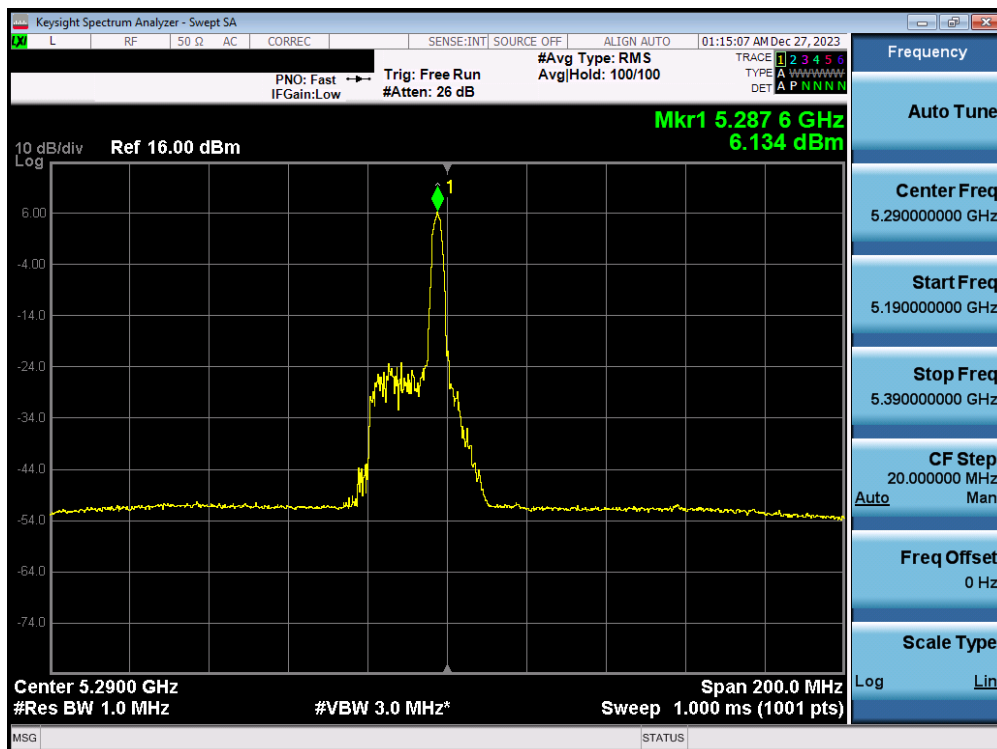


Plot 7-52. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 56)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-10.A3L	Test Dates: 11/6/2023 – 1/2/2024	EUT Type: Portable Handset	Page 50 of 108

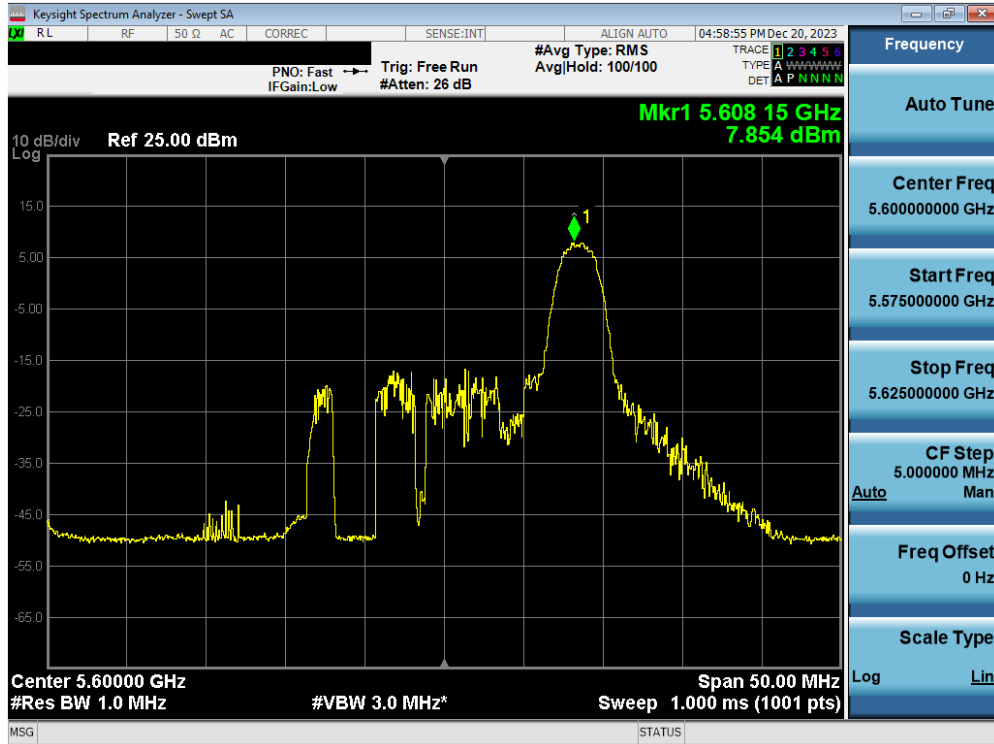


Plot 7-53. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 54)

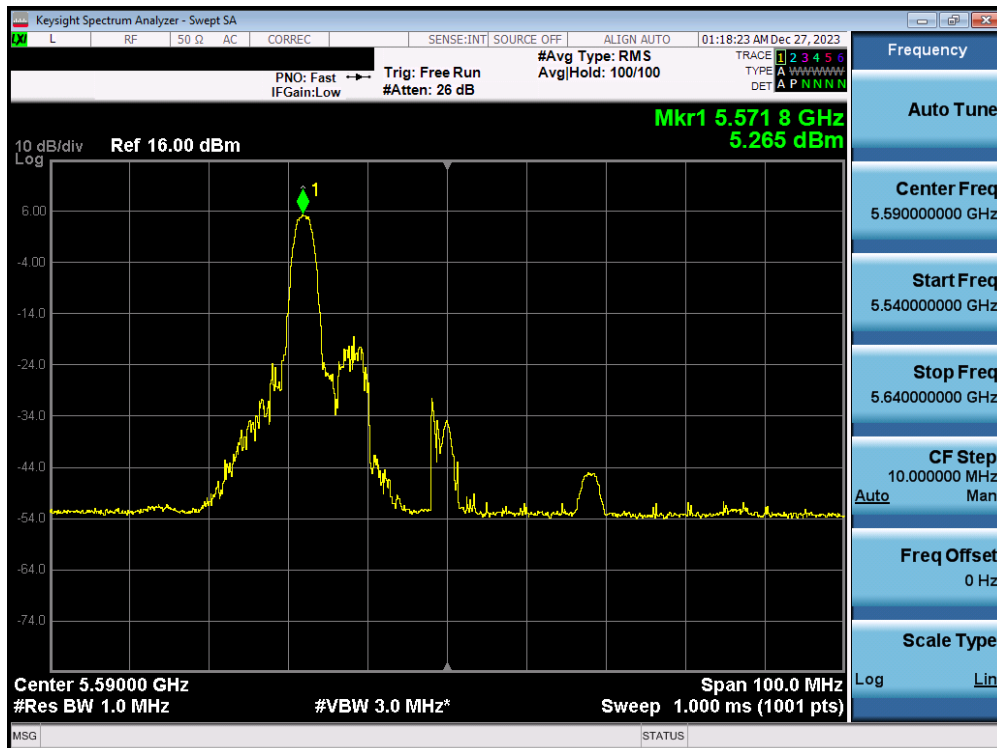


Plot 7-54. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 58)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-10.A3L	Test Dates: 11/6/2023 – 1/2/2024	EUT Type: Portable Handset	Page 51 of 108

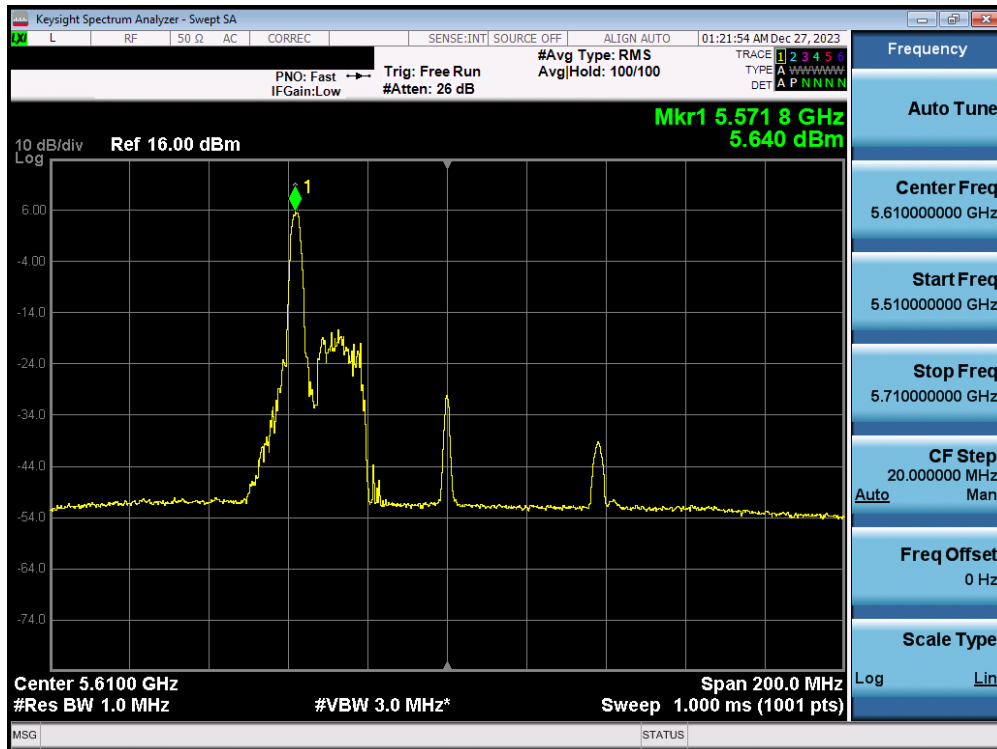


Plot 7-55. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 120)

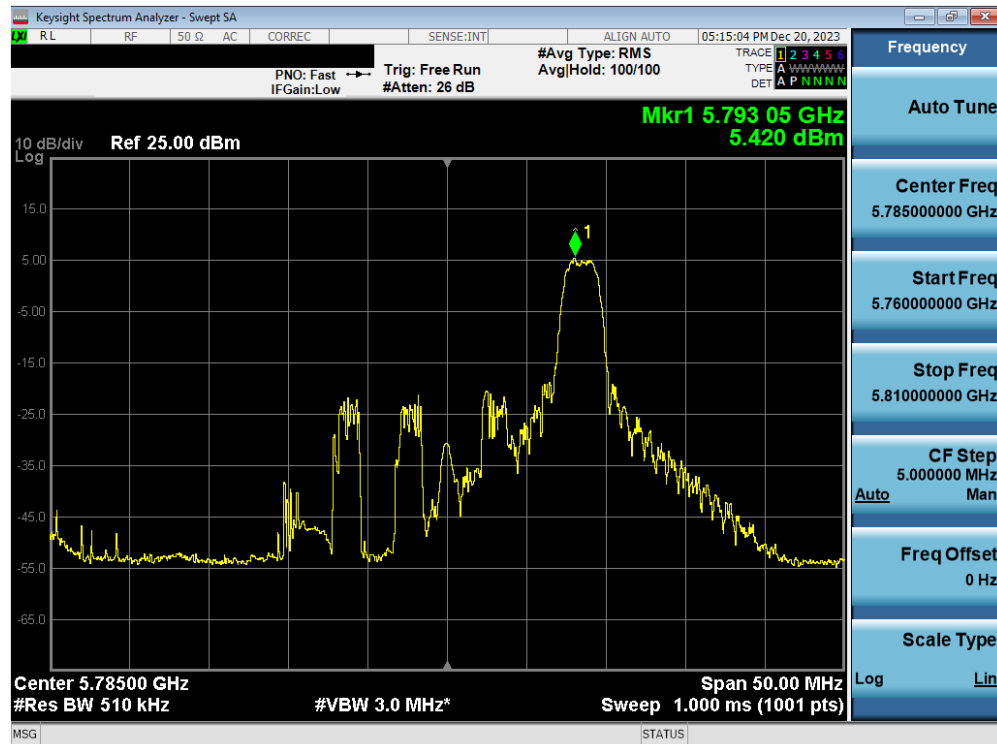


Plot 7-56. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 118)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-10.A3L	Test Dates: 11/6/2023 – 1/2/2024	EUT Type: Portable Handset	Page 52 of 108

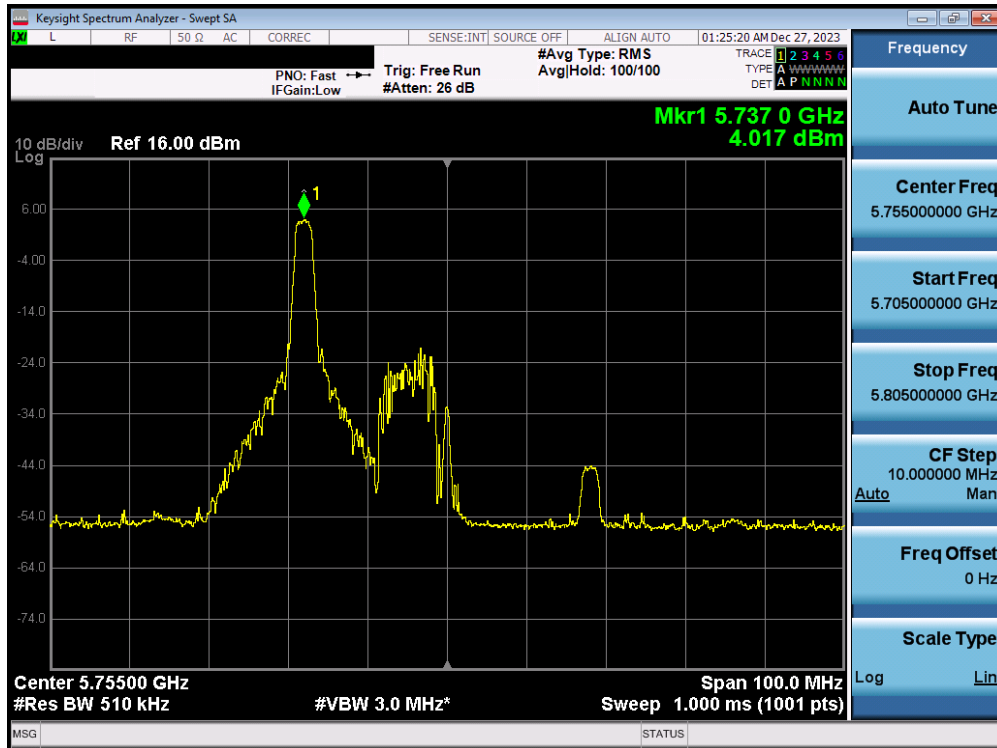


Plot 7-57. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 122)

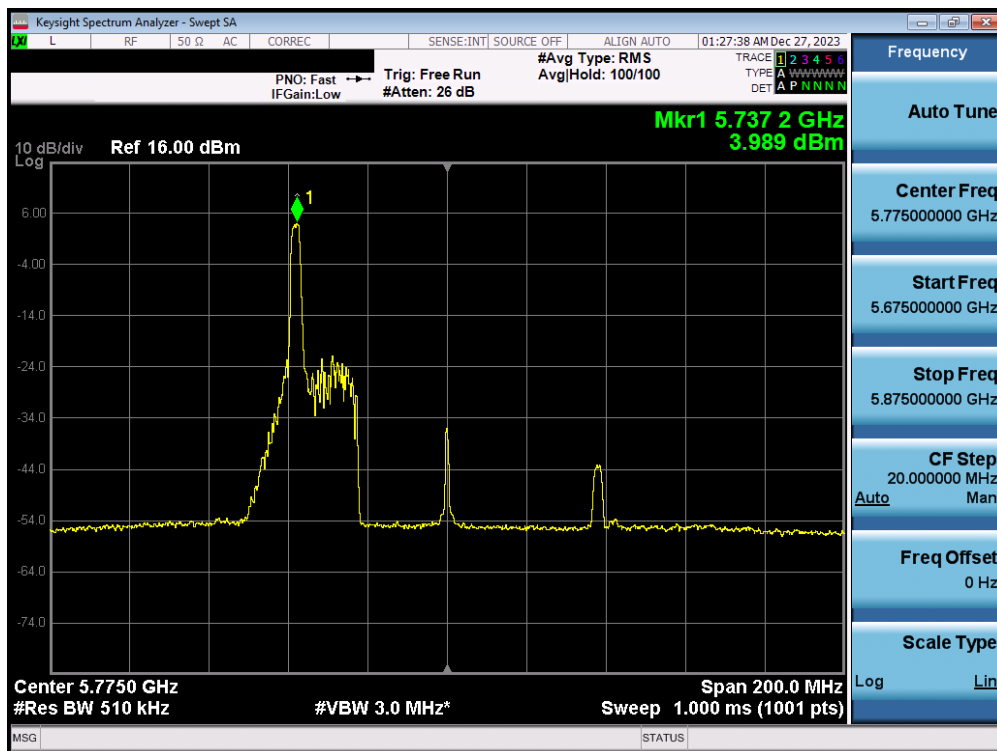


Plot 7-58. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 157)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-10.A3L	Test Dates: 11/6/2023 – 1/2/2024	EUT Type: Portable Handset	Page 53 of 108

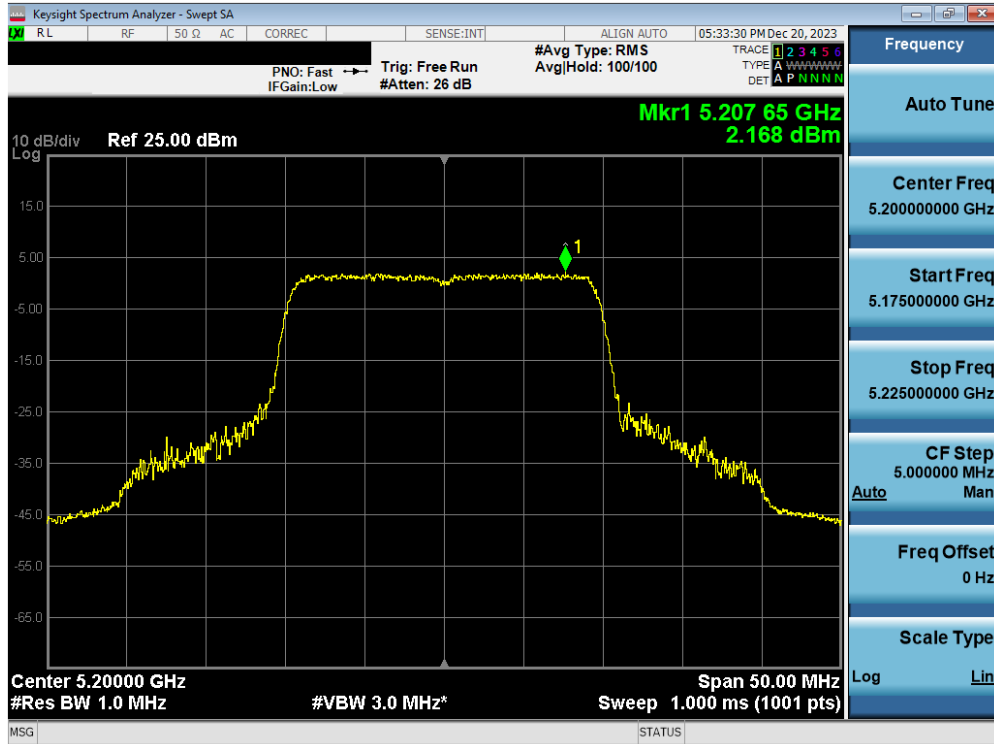


Plot 7-59. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 151)

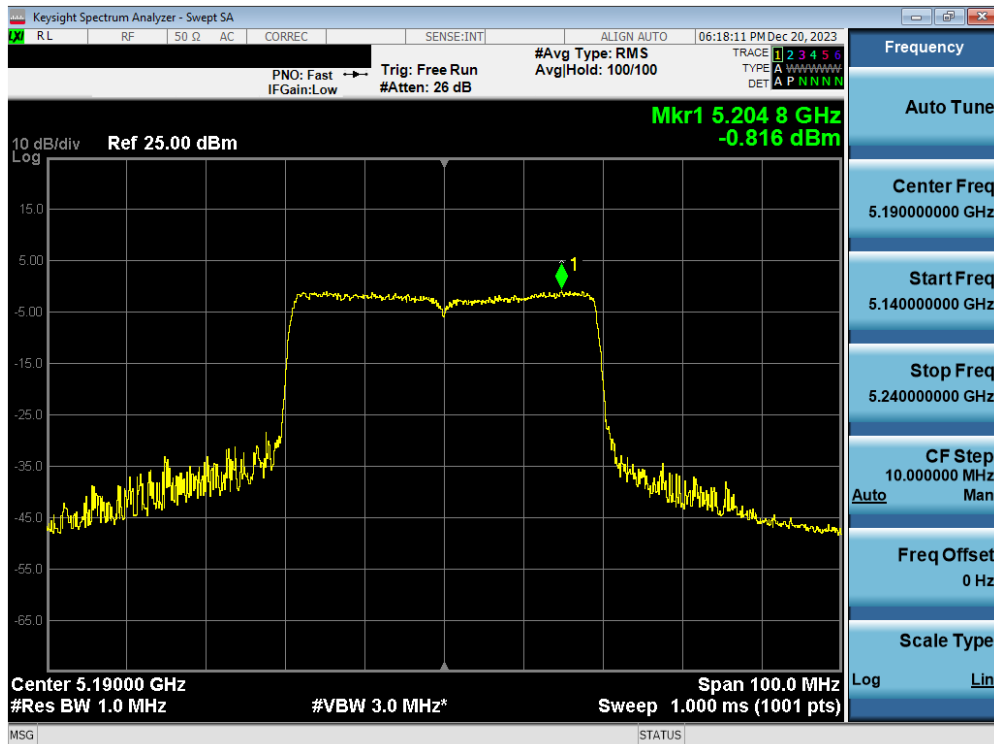


Plot 7-60. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 155)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-10.A3L	Test Dates: 11/6/2023 – 1/2/2024	EUT Type: Portable Handset	Page 54 of 108

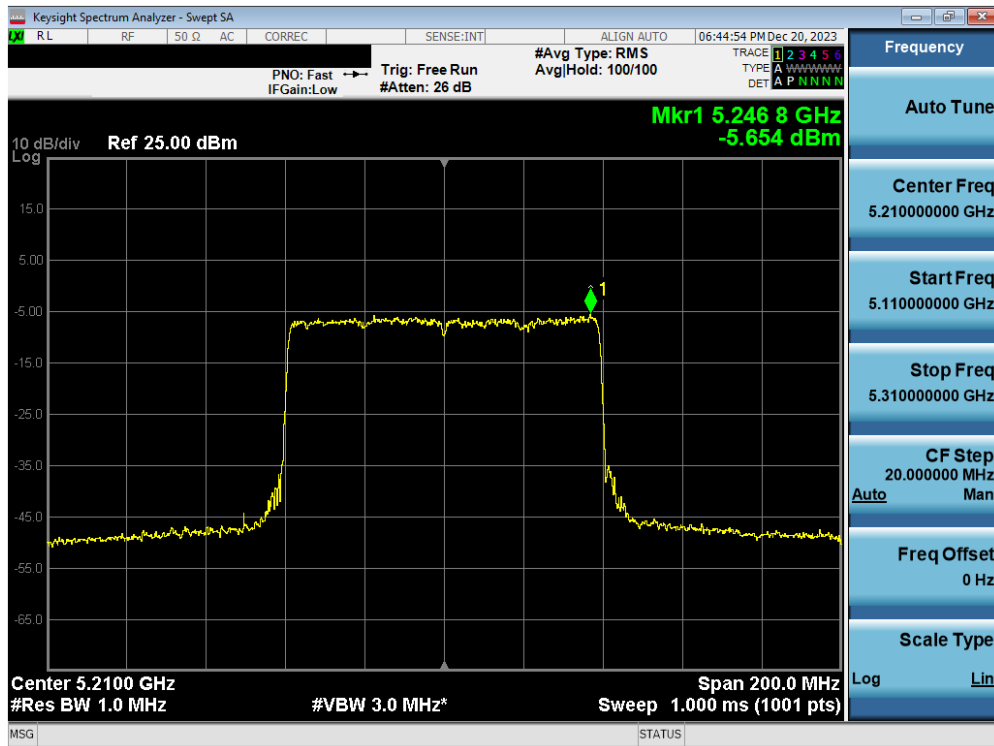


Plot 7-61. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11ax – 242 Tones (UNII Band 1) – Ch. 40)

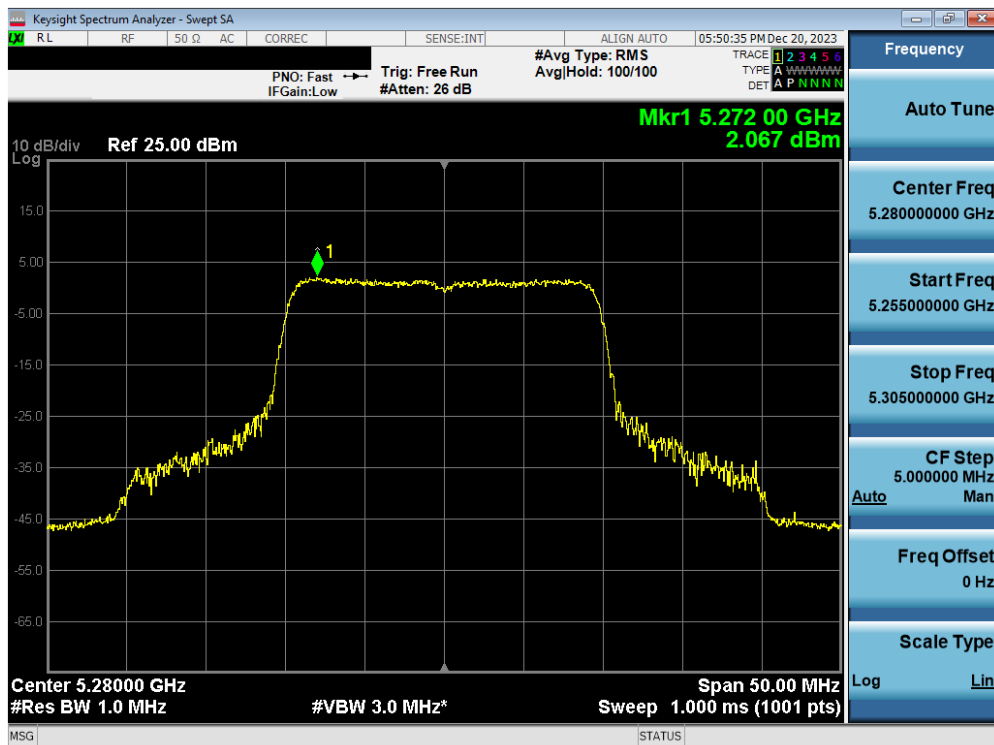


Plot 7-62. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11ax – 484 Tones (UNII Band 1) – Ch. 38)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-10.A3L	Test Dates: 11/6/2023 – 1/2/2024	EUT Type: Portable Handset	Page 55 of 108

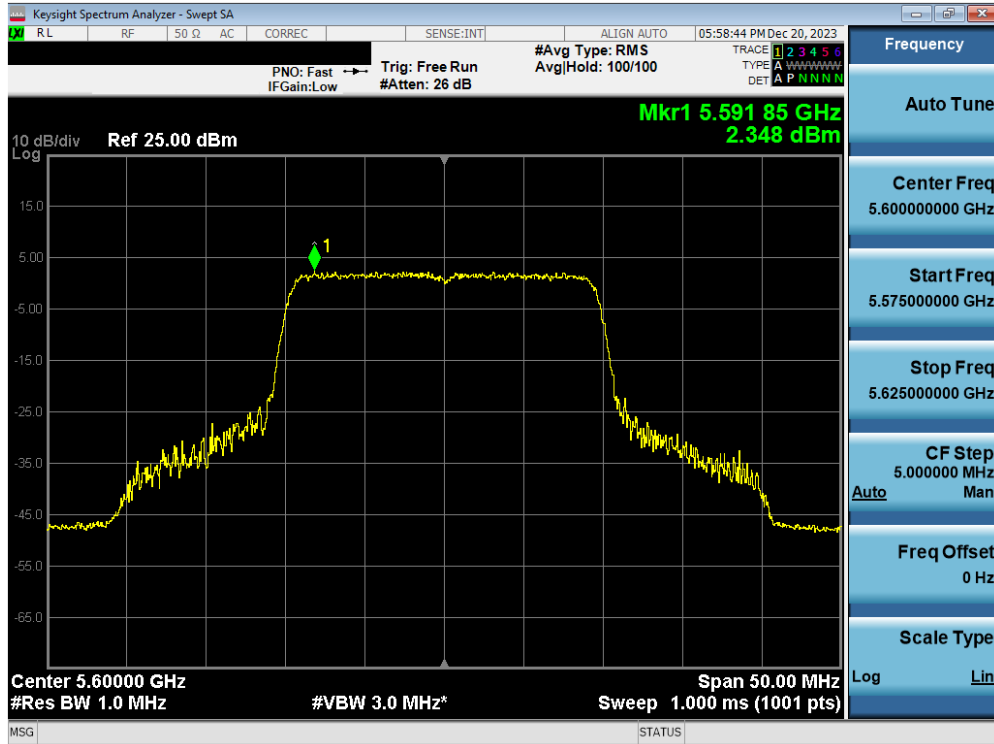


Plot 7-63. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11ax – 996 Tones (UNII Band 1) – Ch. 42)

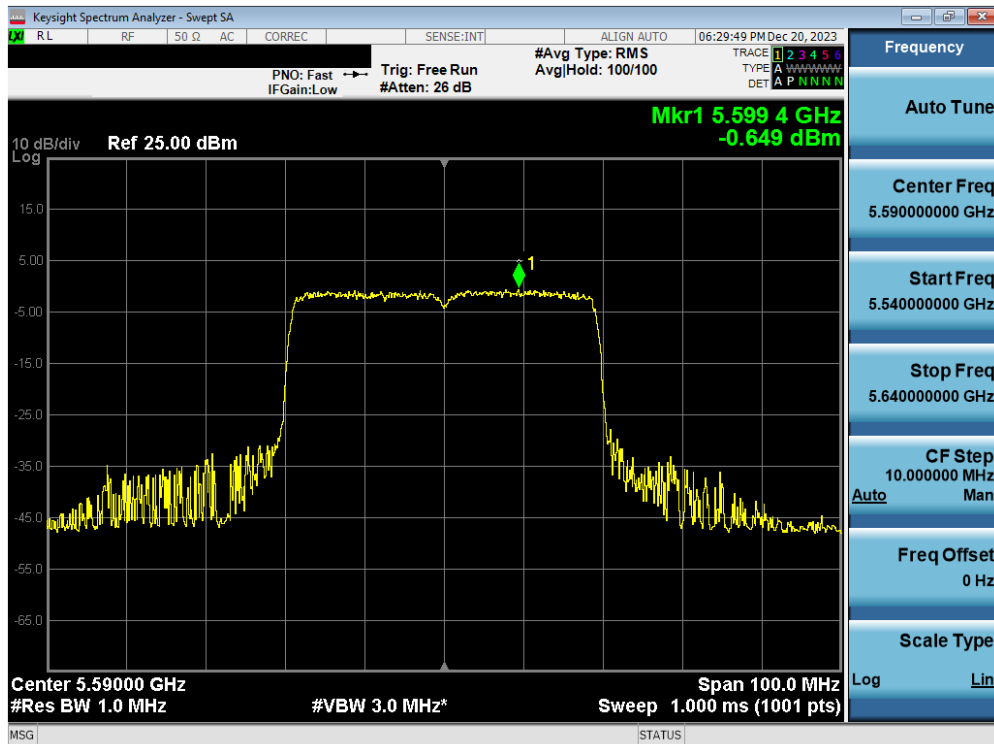


Plot 7-64. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11ax – 242 Tones (UNII Band 2A) – Ch. 56)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-10.A3L	Test Dates: 11/6/2023 – 1/2/2024	EUT Type: Portable Handset	Page 56 of 108

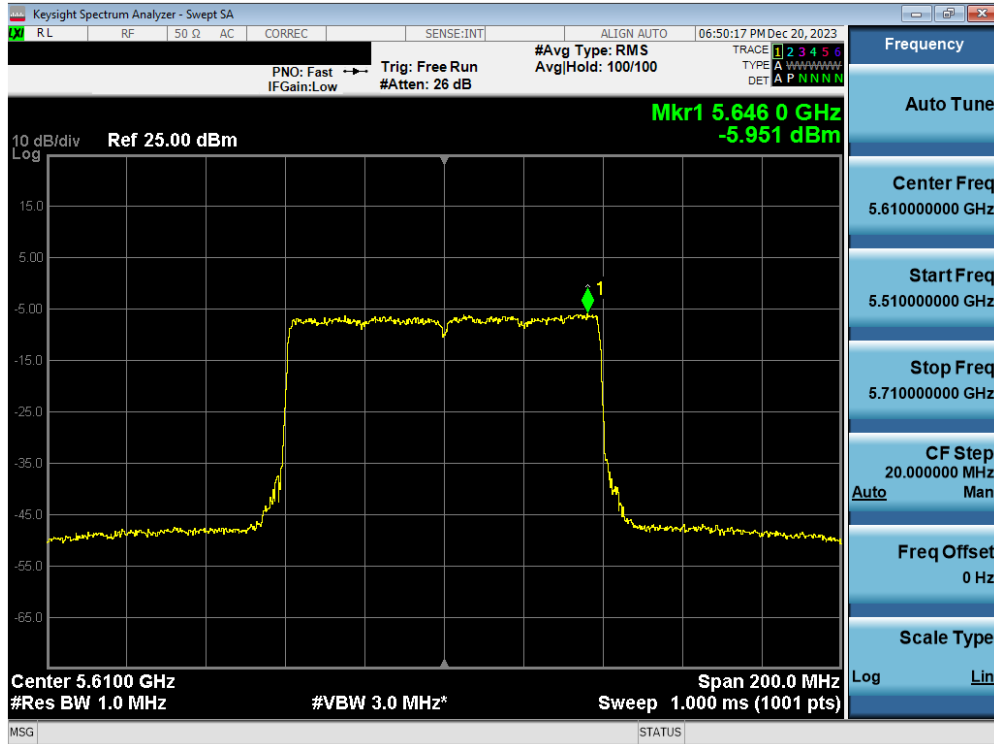


Plot 7-67. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11ax – 242 Tones (UNII Band 2C) – Ch. 120)

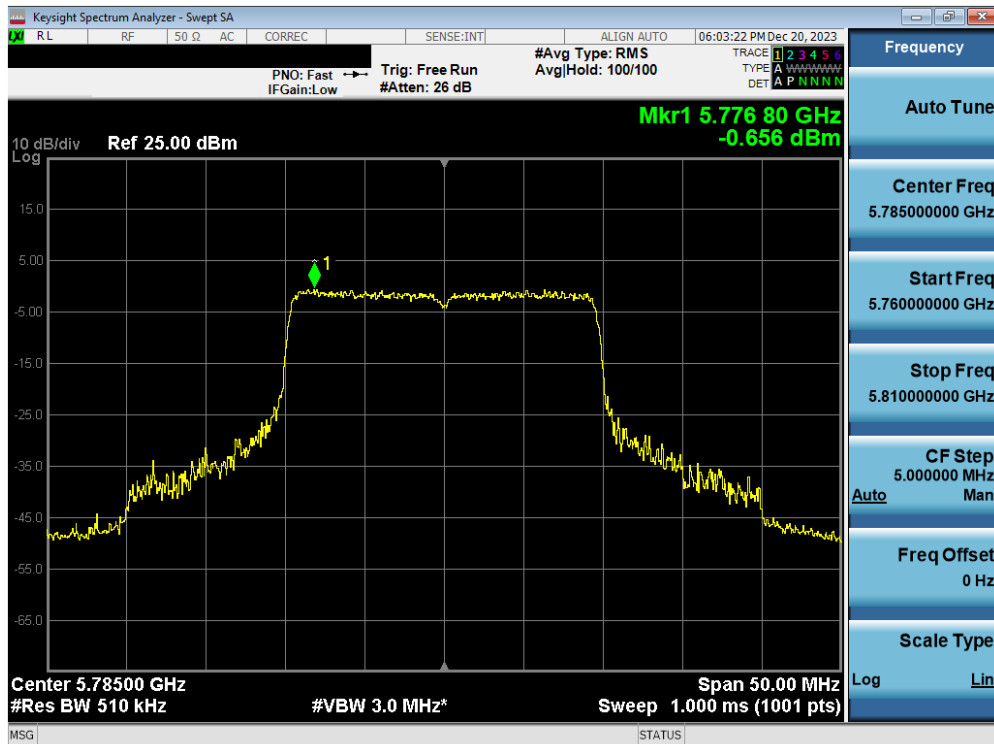


Plot 7-68. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11ax – 484 Tones (UNII Band 2C) – Ch. 118)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-10.A3L	Test Dates: 11/6/2023 – 1/2/2024	EUT Type: Portable Handset	Page 58 of 108

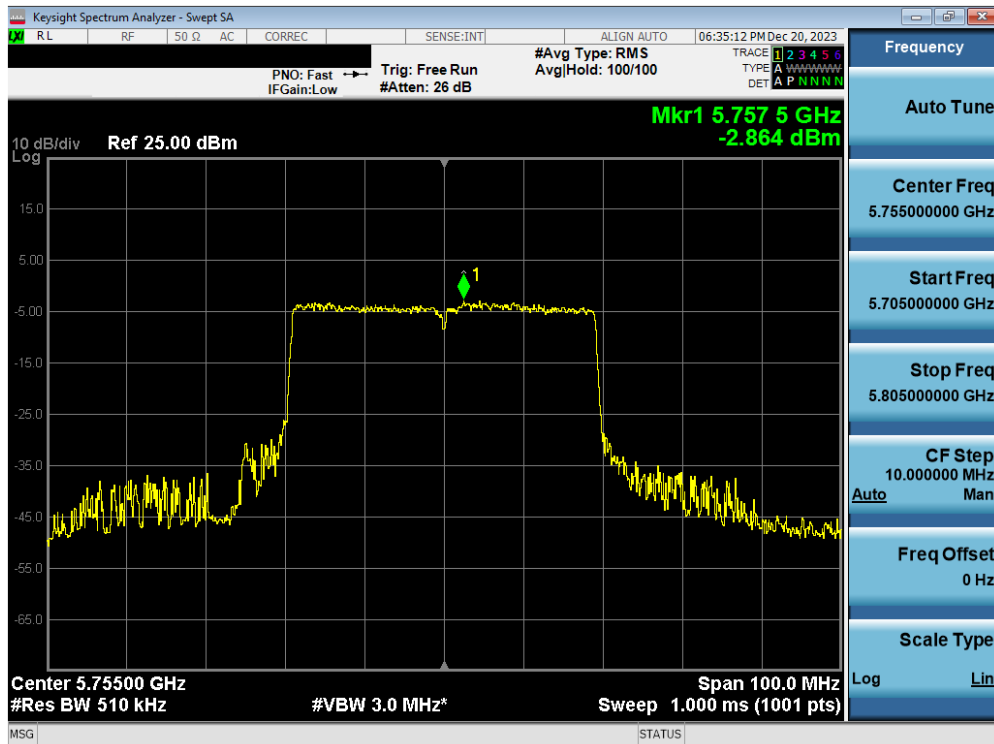


Plot 7-69. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11ax – 996 Tones (UNII Band 2C) – Ch. 122)

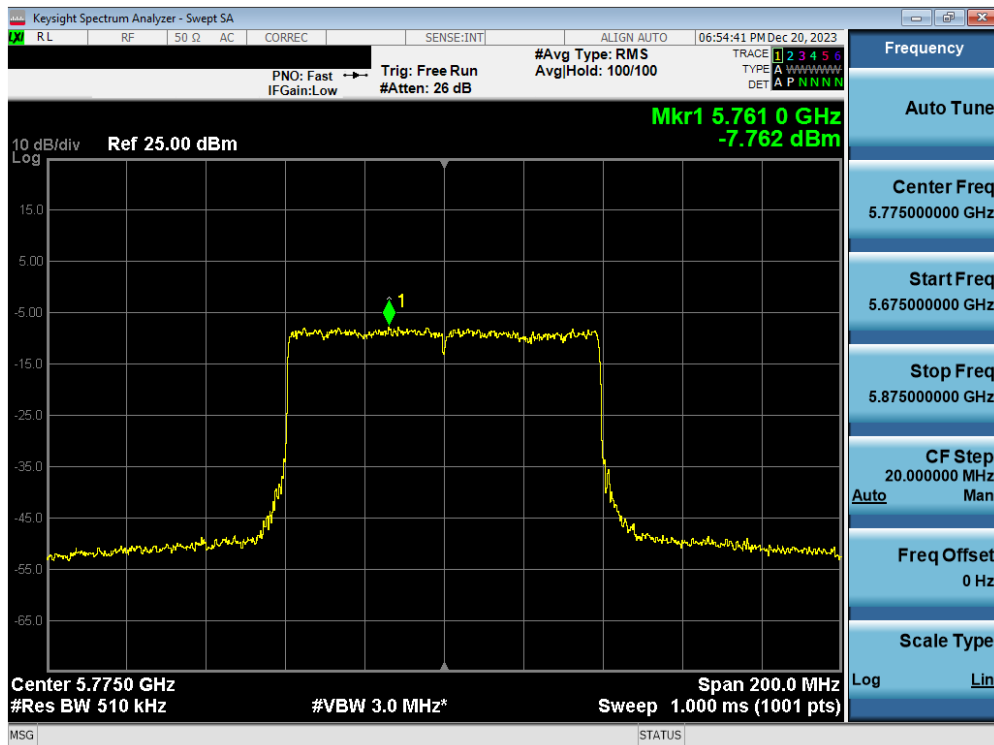


Plot 7-70. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11ax – 242 Tones (UNII Band 3) – Ch. 157)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-10.A3L	Test Dates: 11/6/2023 – 1/2/2024	EUT Type: Portable Handset	Page 59 of 108



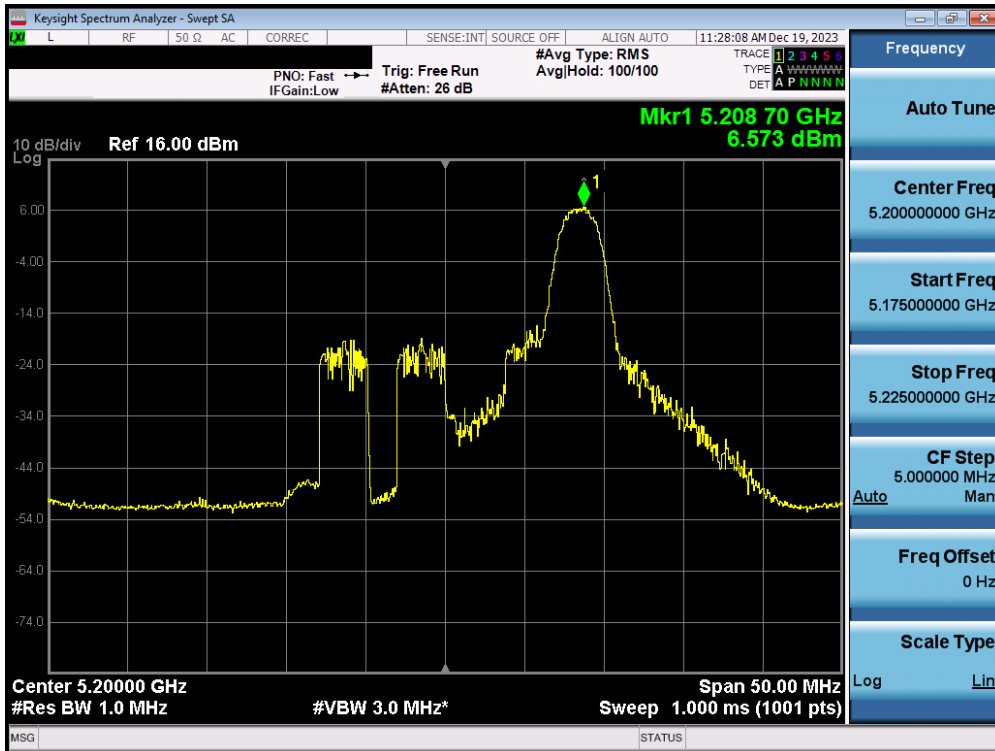
Plot 7-71. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11ax – 484 Tones (UNII Band 3) – Ch. 151)



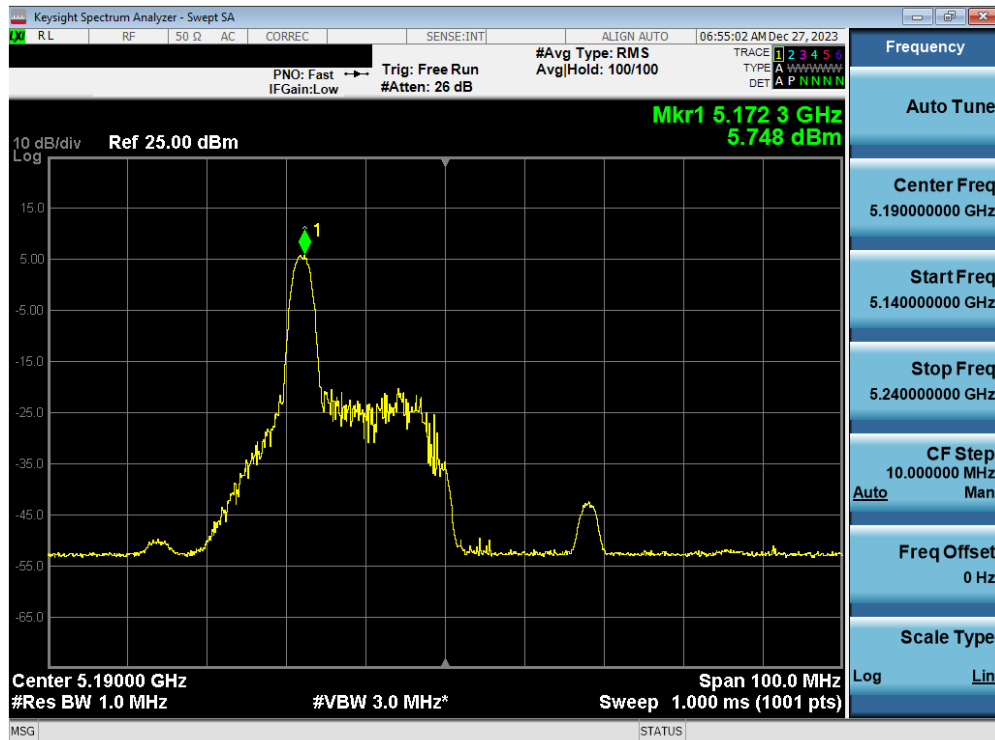
Plot 7-72. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11ax – 996 Tones (UNII Band 3) – Ch. 155)

7.5.2 MIMO Antenna-2 Power Spectral Density Measurements

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-10.A3L	Test Dates: 11/6/2023 – 1/2/2024	EUT Type: Portable Handset	Page 60 of 108

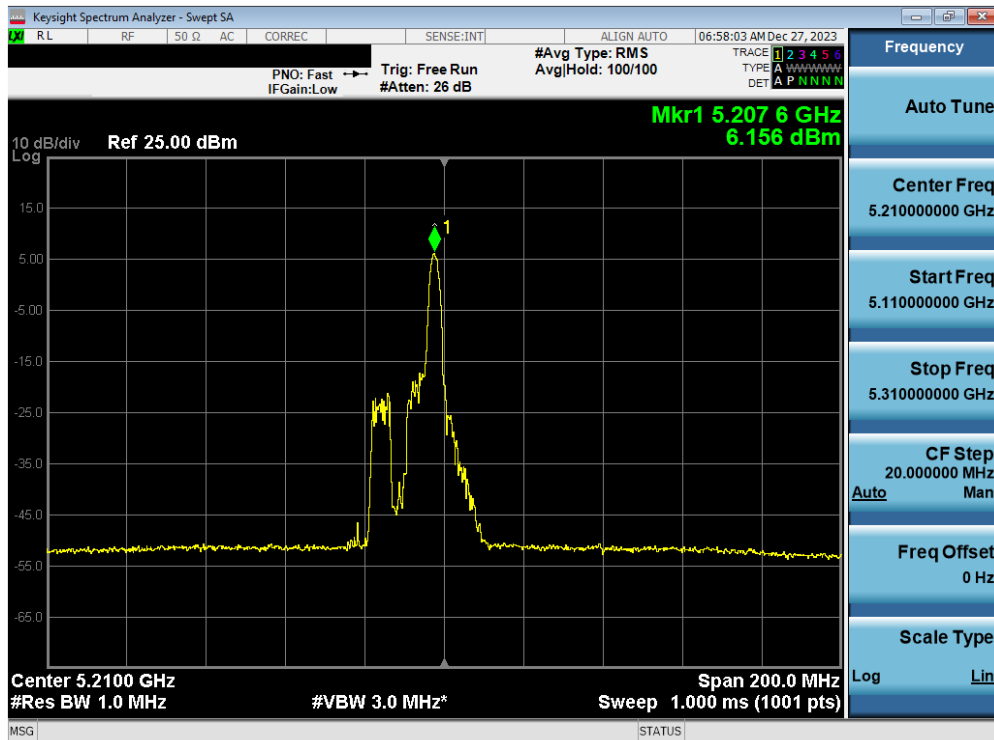


Plot 7-73. Power Spectral Density Plot MIMO ANT2 (20MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 40)

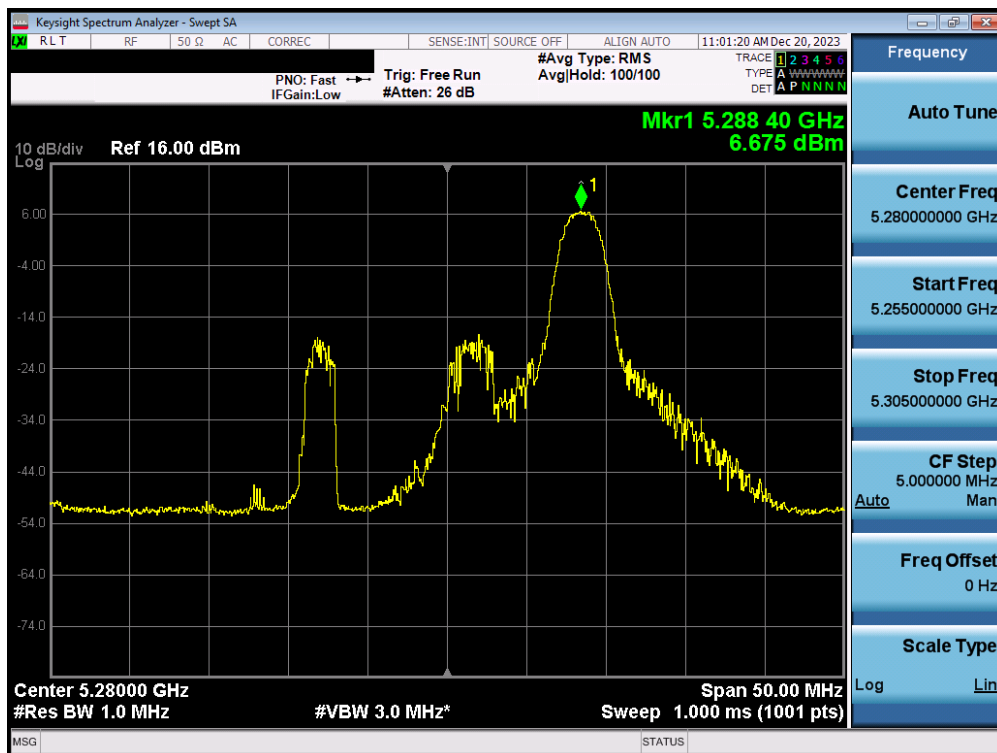


Plot 7-74. Power Spectral Density Plot MIMO ANT2 (40MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 38)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-10.A3L	Test Dates: 11/6/2023 – 1/2/2024	EUT Type: Portable Handset	Page 61 of 108

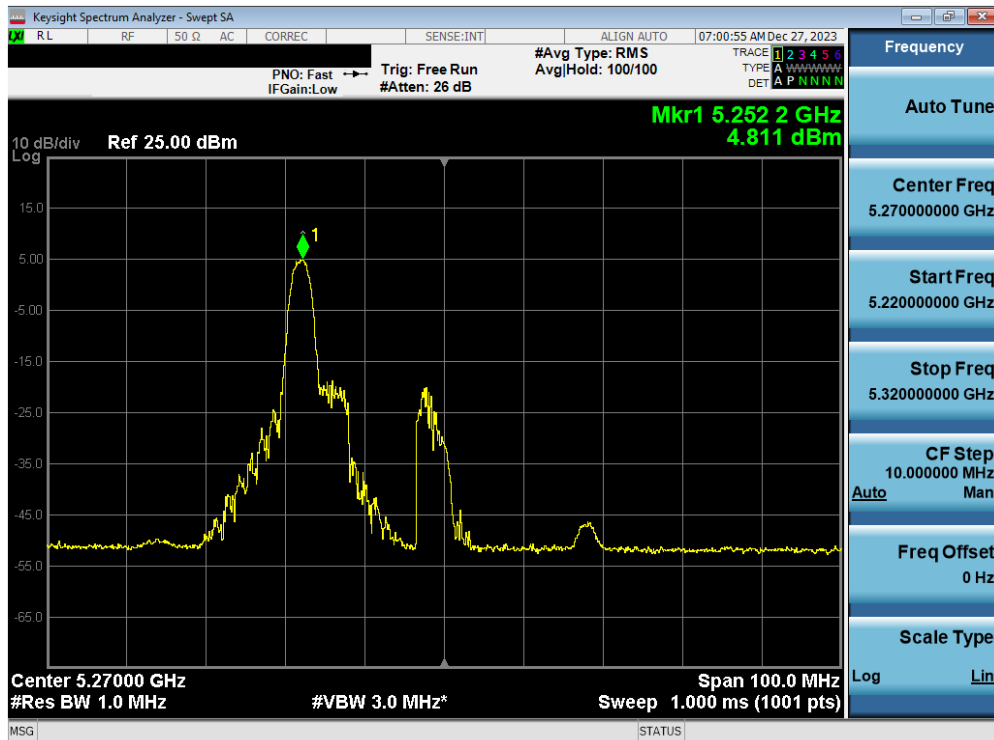


Plot 7-75. Power Spectral Density Plot MIMO ANT2 (80MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 42)

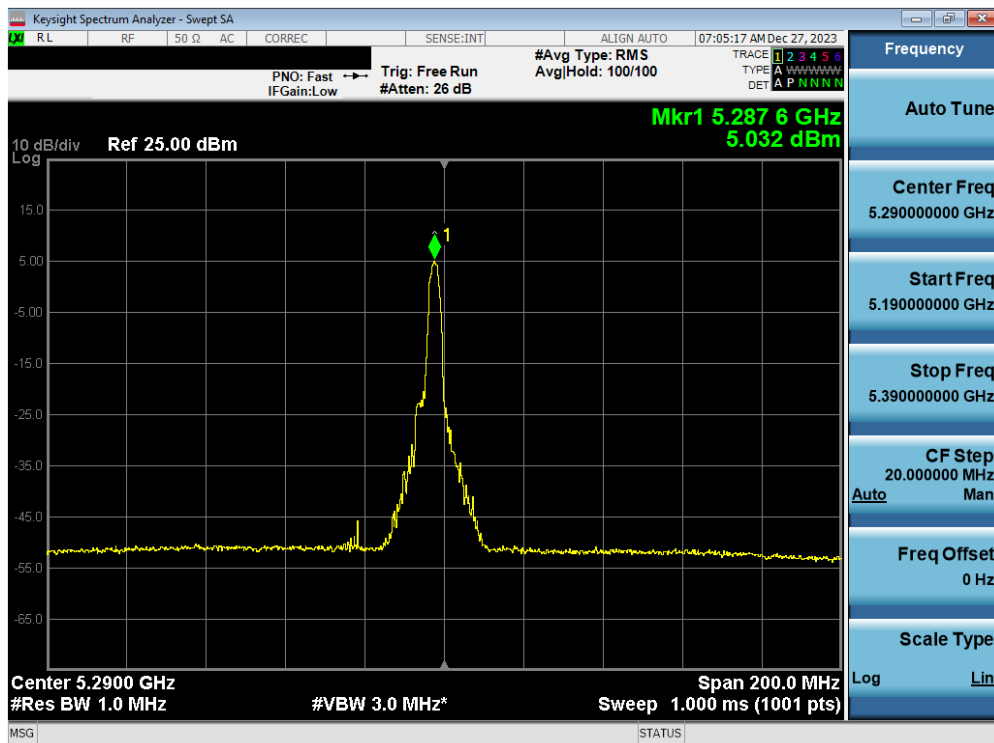


Plot 7-76. Power Spectral Density Plot MIMO ANT2 (20MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 56)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-10.A3L	Test Dates: 11/6/2023 – 1/2/2024	EUT Type: Portable Handset	Page 62 of 108

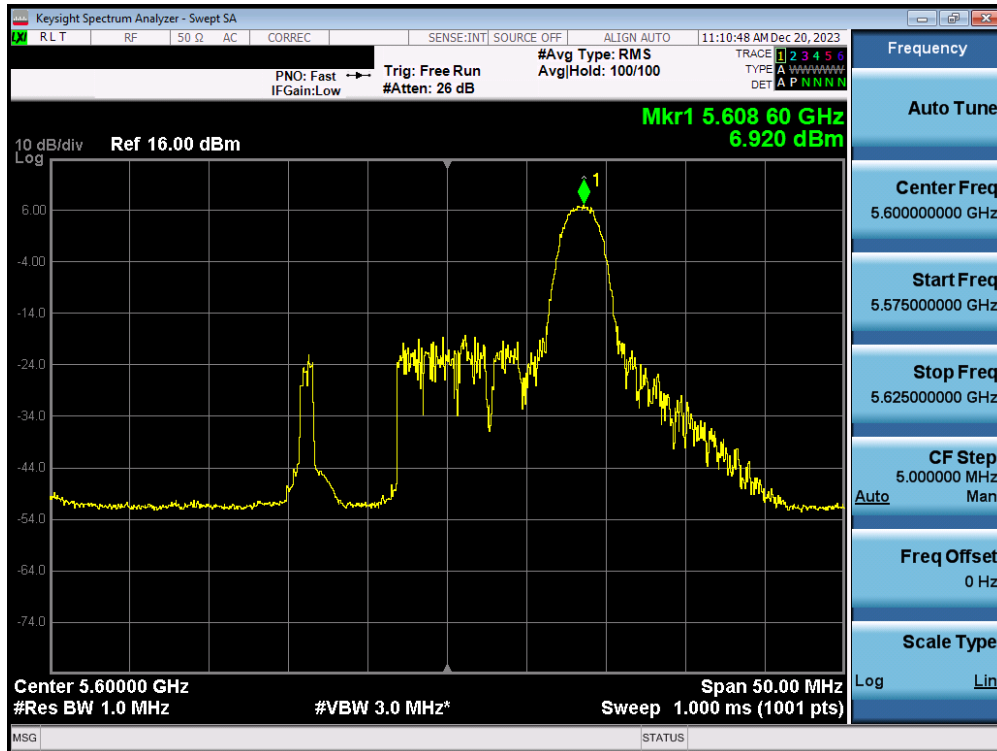


Plot 7-77. Power Spectral Density Plot MIMO ANT2 (40MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 54)

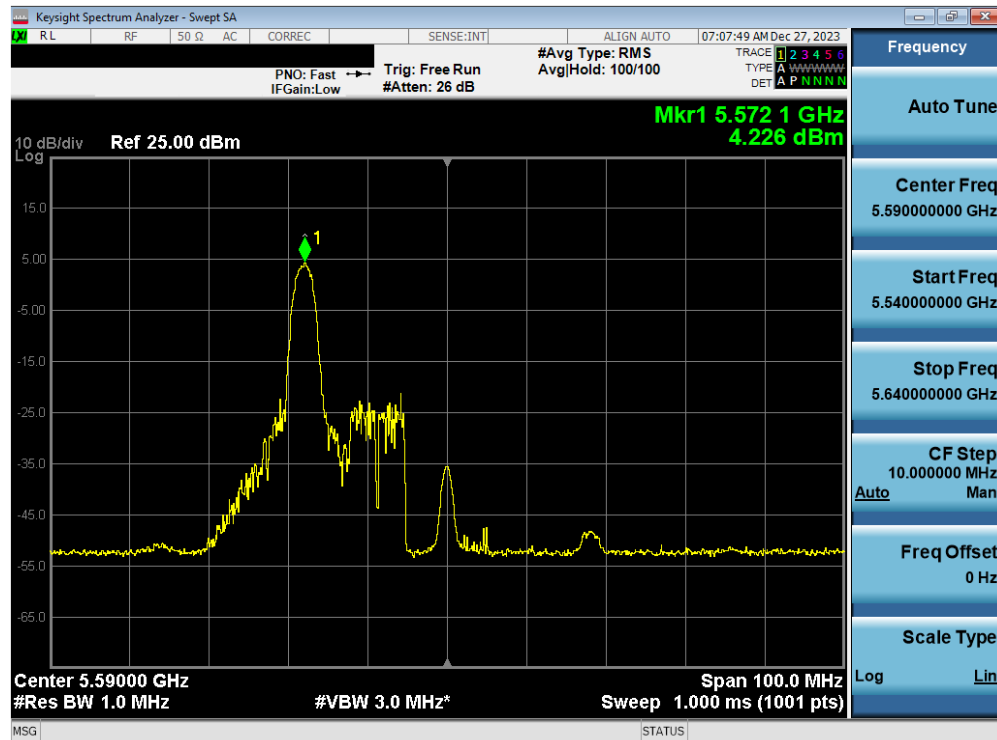


Plot 7-78. Power Spectral Density Plot MIMO ANT2 (80MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 58)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-10.A3L	Test Dates: 11/6/2023 – 1/2/2024	EUT Type: Portable Handset	Page 63 of 108

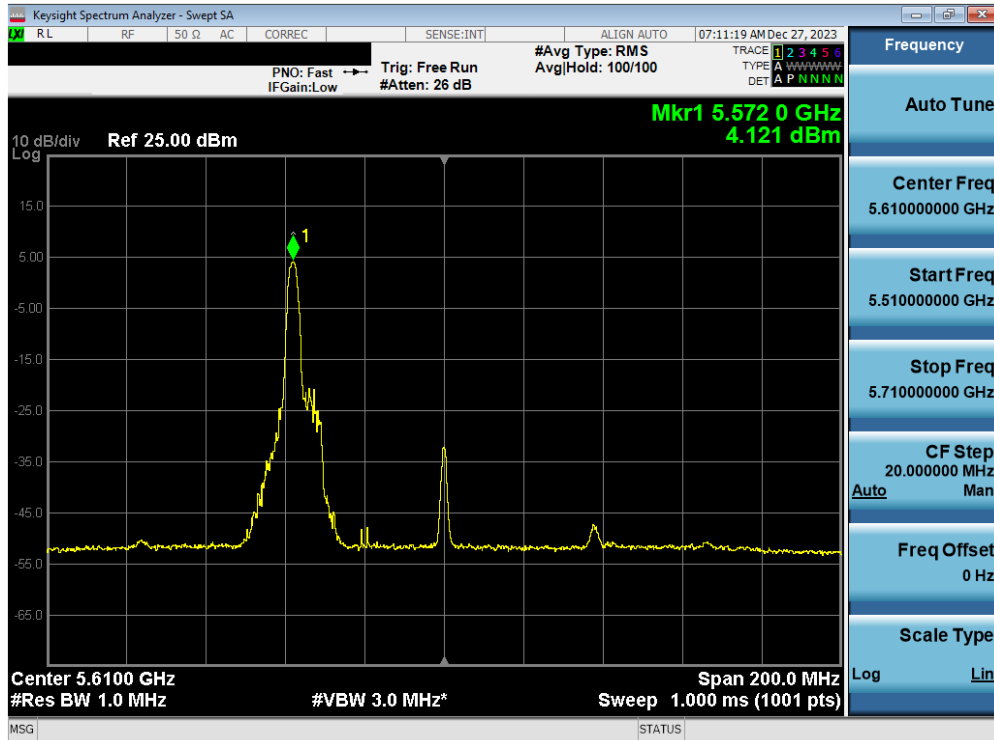


Plot 7-79. Power Spectral Density Plot MIMO ANT2 (20MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 120)

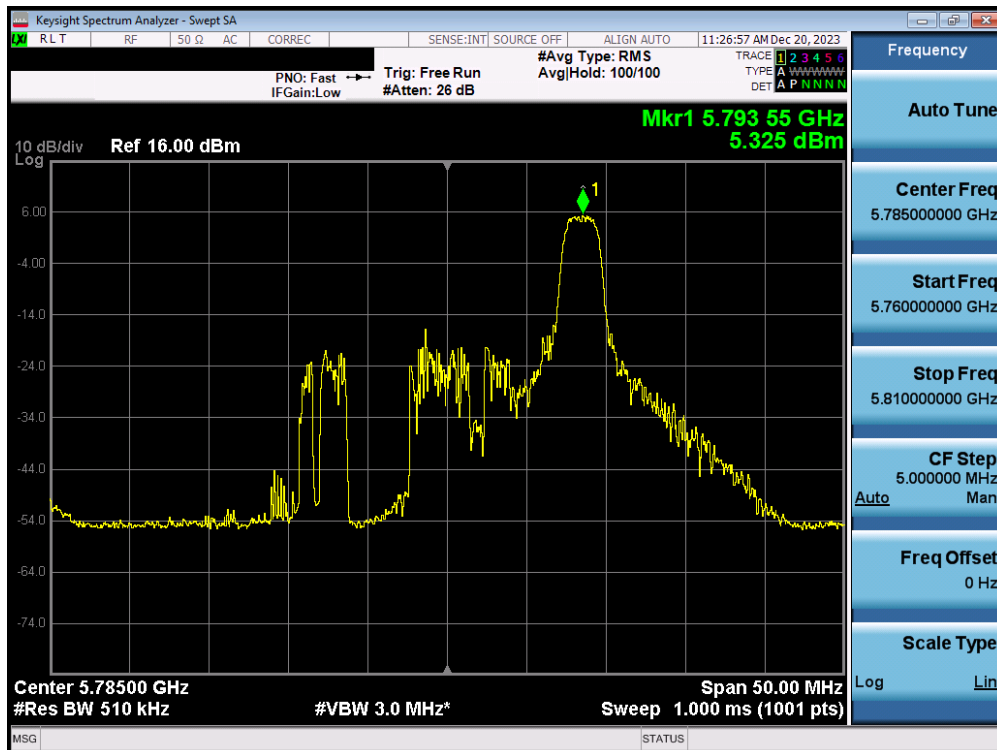


Plot 7-80. Power Spectral Density Plot MIMO ANT2 (40MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 118)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-10.A3L	Test Dates: 11/6/2023 – 1/2/2024	EUT Type: Portable Handset	Page 64 of 108

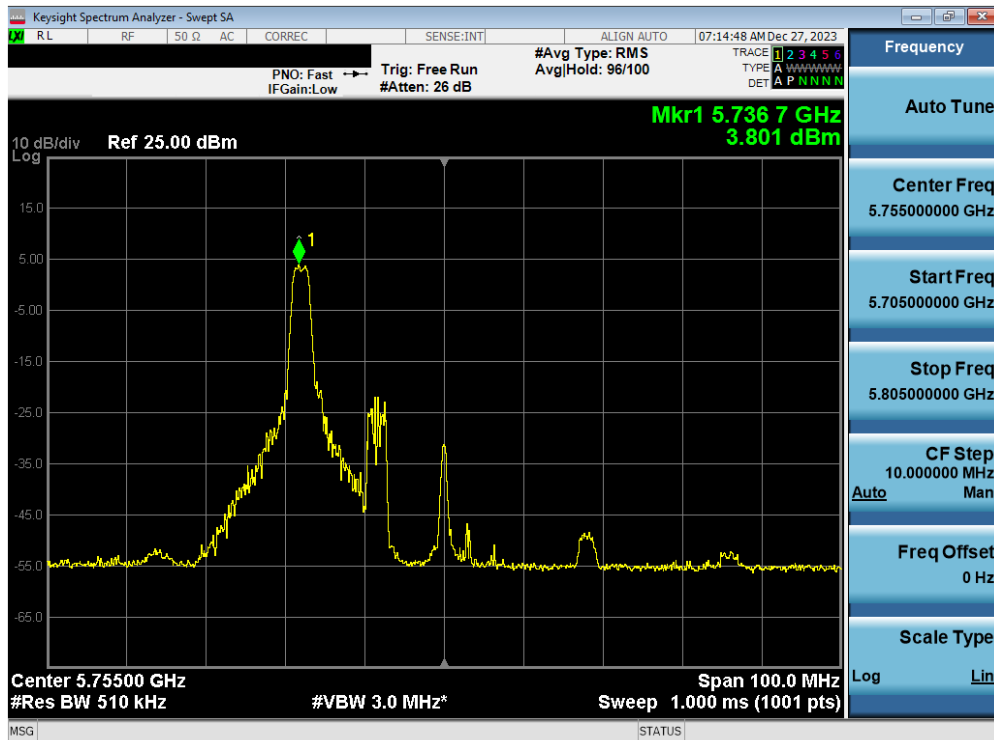


Plot 7-81. Power Spectral Density Plot MIMO ANT2 (80MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 122)

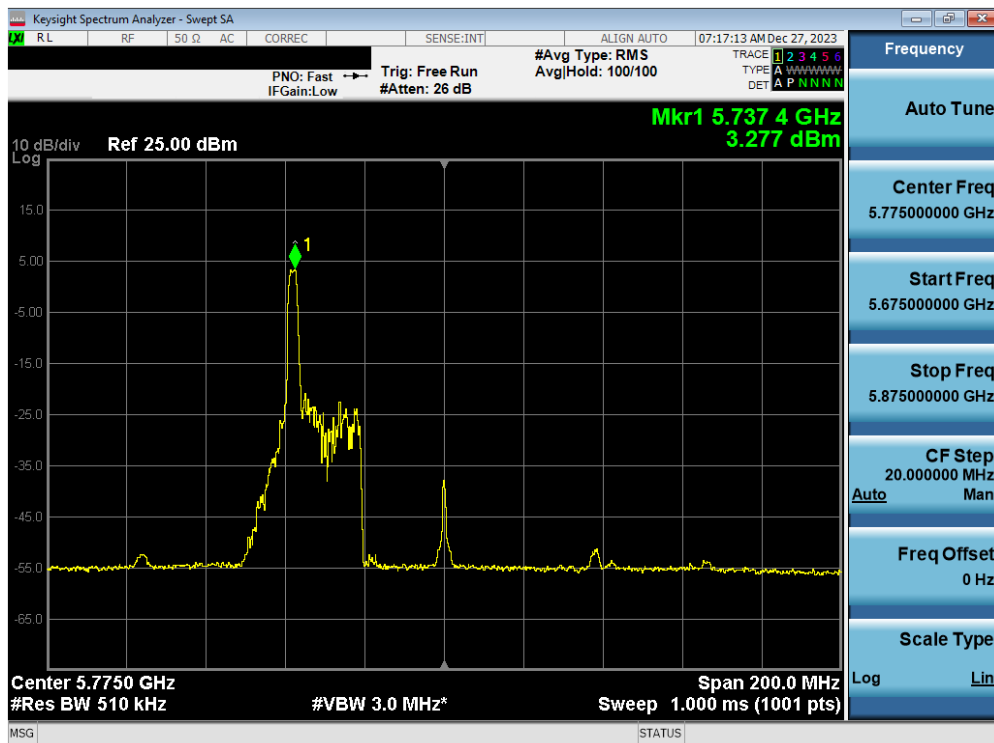


Plot 7-82. Power Spectral Density Plot MIMO ANT2 (20MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 157)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-10.A3L	Test Dates: 11/6/2023 – 1/2/2024	EUT Type: Portable Handset	Page 65 of 108

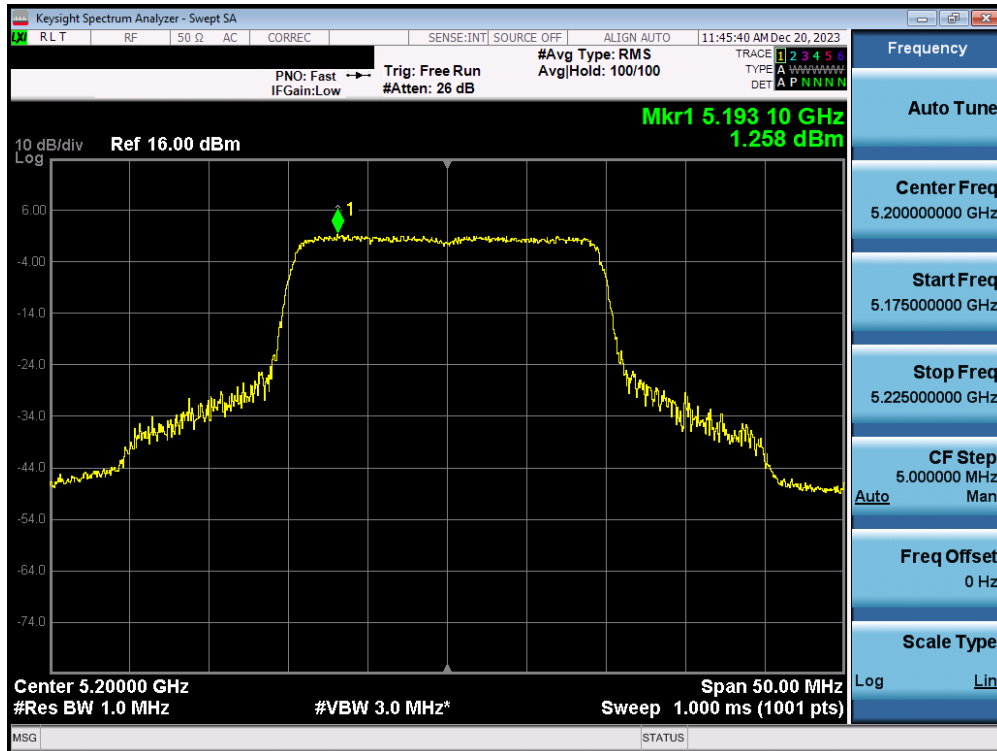


Plot 7-83. Power Spectral Density Plot MIMO ANT2 (40MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 151)

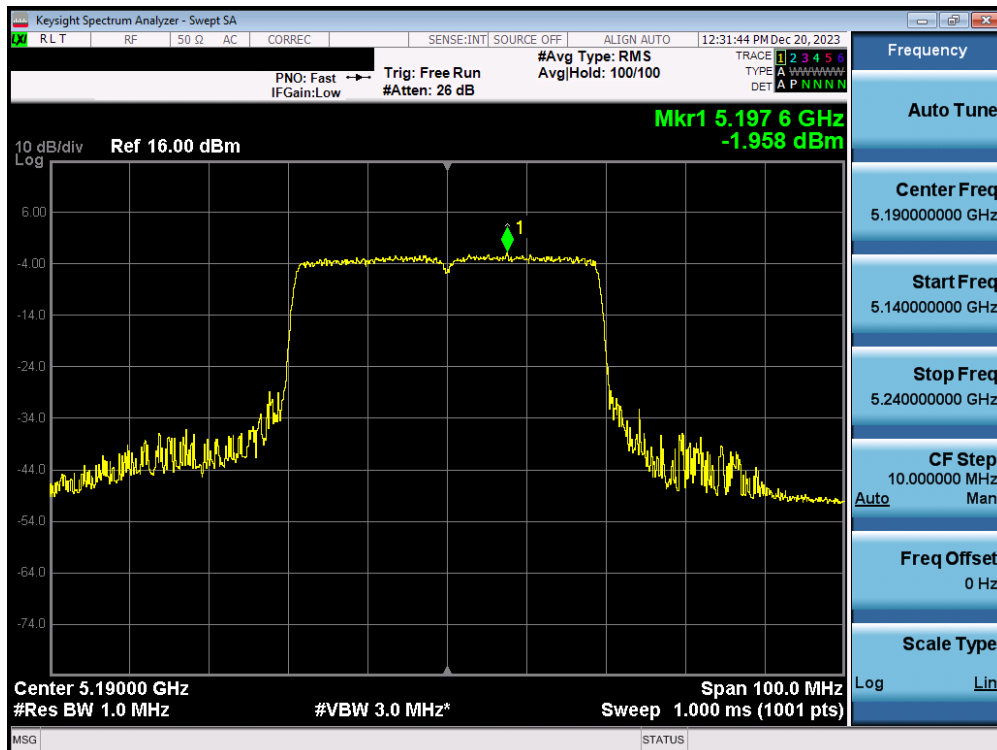


Plot 7-84. Power Spectral Density Plot MIMO ANT2 (80MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 155)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-10.A3L	Test Dates: 11/6/2023 – 1/2/2024	EUT Type: Portable Handset	Page 66 of 108

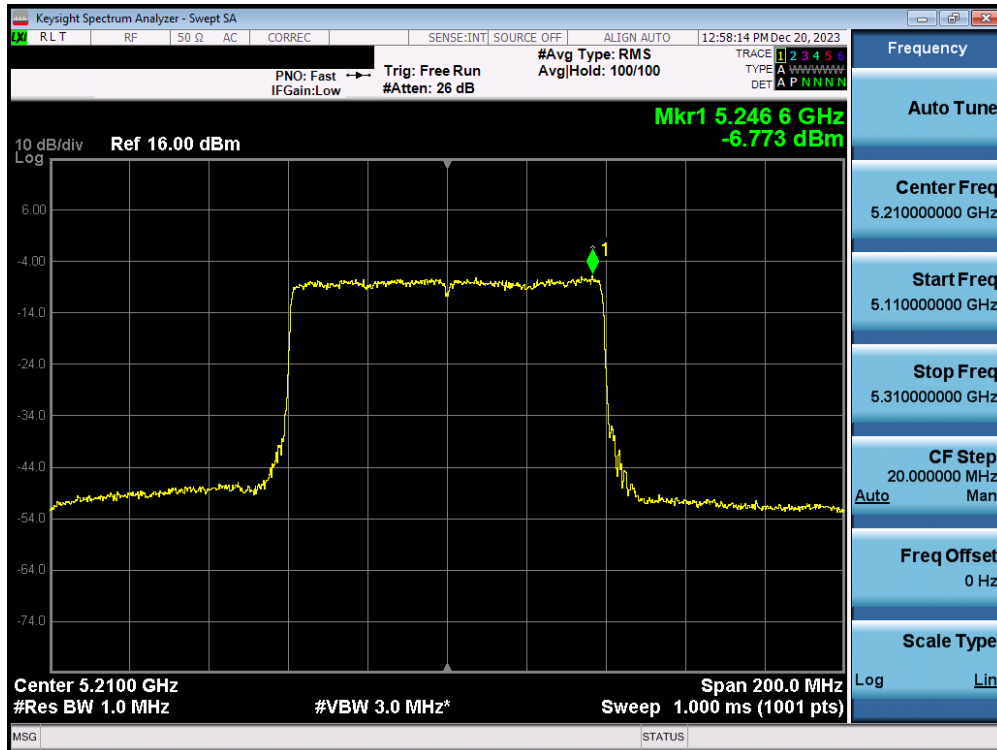


Plot 7-85. Power Spectral Density Plot MIMO ANT2 (20MHz BW 802.11ax – 242 Tones (UNII Band 1) – Ch. 40)

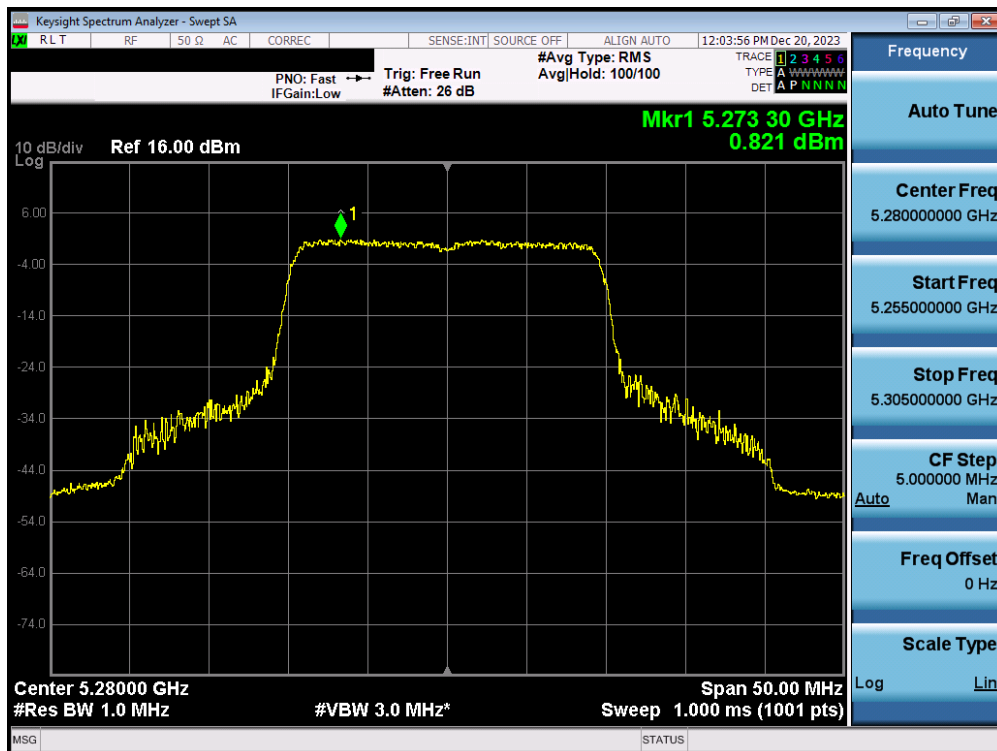


Plot 7-86. Power Spectral Density Plot MIMO ANT2 (40MHz BW 802.11ax – 484 Tones (UNII Band 1) – Ch. 38)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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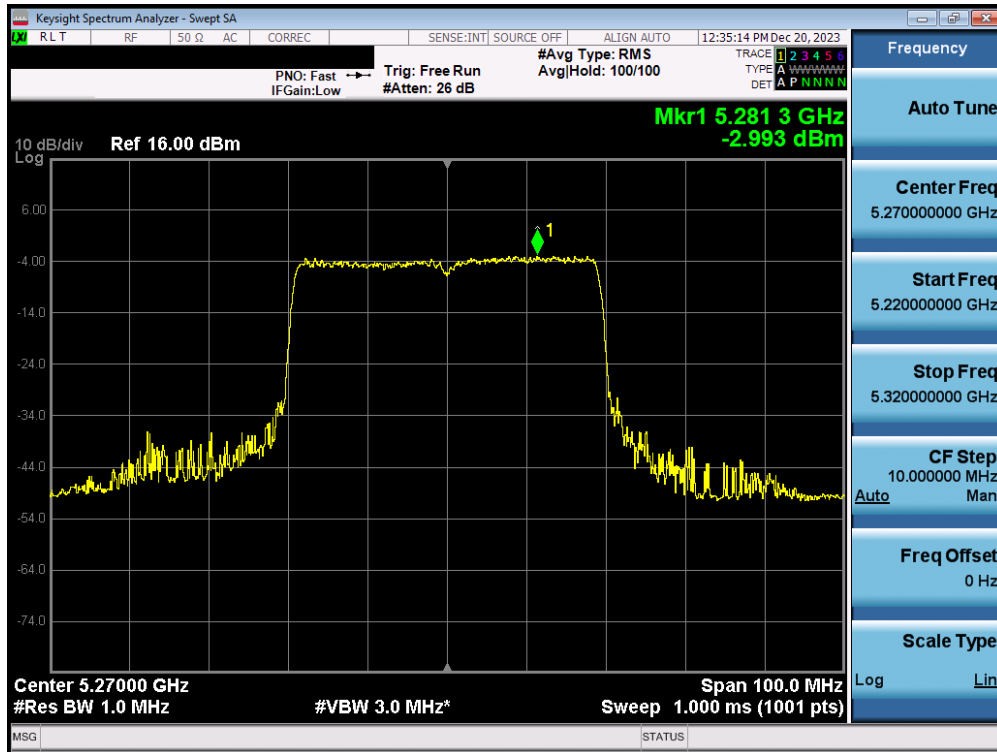


Plot 7-87. Power Spectral Density Plot MIMO ANT2 (80MHz BW 802.11ax – 996 Tones (UNII Band 1) – Ch. 42)

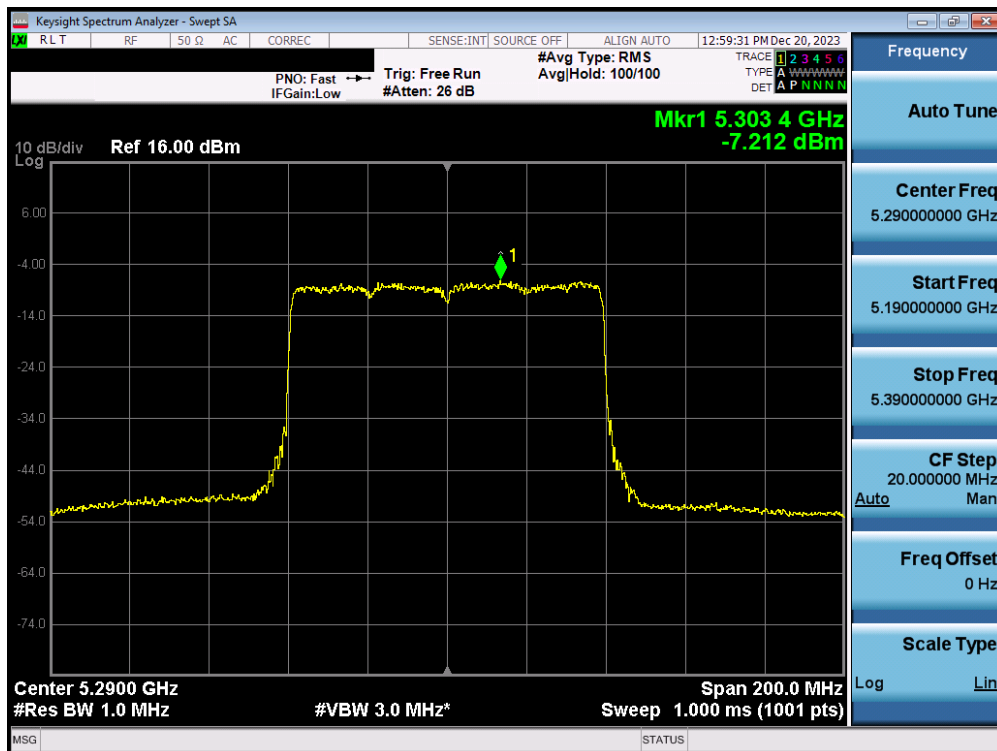


Plot 7-88. Power Spectral Density Plot MIMO ANT2 (20MHz BW 802.11ax – 242 Tones (UNII Band 2A) – Ch. 56)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-10.A3L	Test Dates: 11/6/2023 – 1/2/2024	EUT Type: Portable Handset	Page 68 of 108

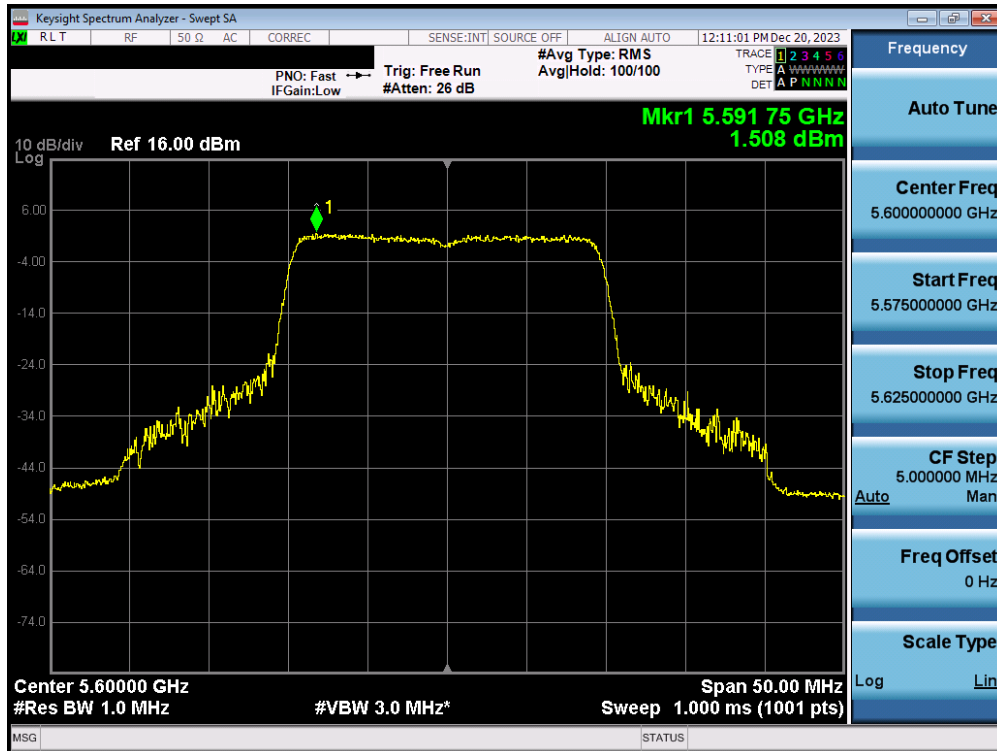


Plot 7-89. Power Spectral Density Plot MIMO ANT2 (40MHz BW 802.11ax – 484 Tones (UNII Band 2A) – Ch. 54)

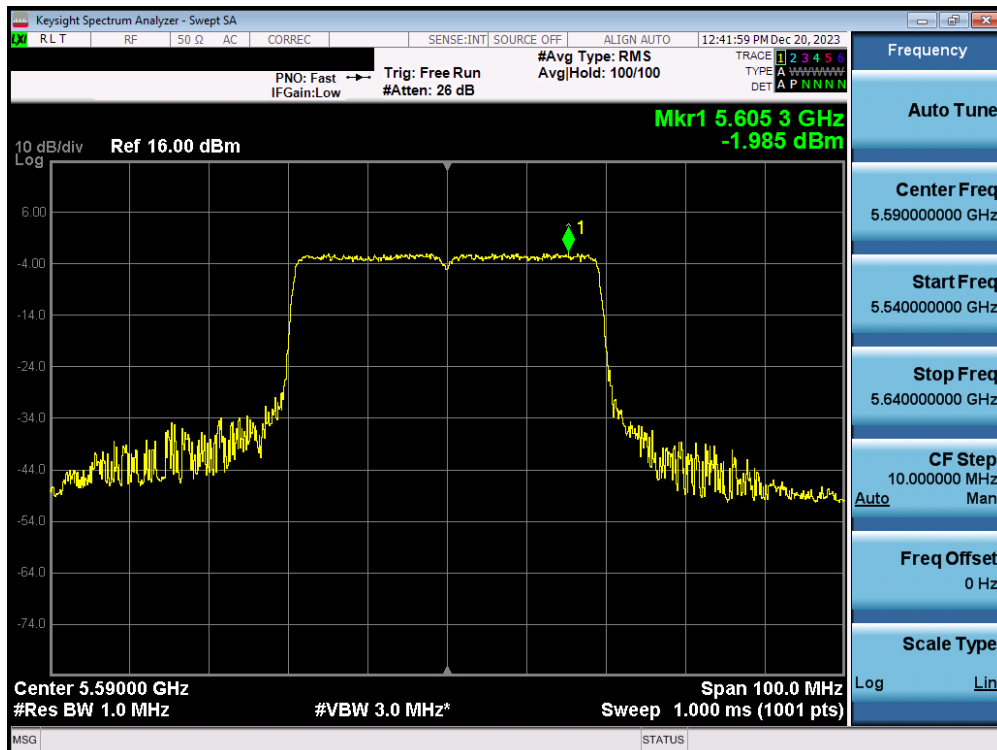


Plot 7-90. Power Spectral Density Plot MIMO ANT2 (80MHz BW 802.11ax – 996 Tones (UNII Band 2A) – Ch. 58)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-10.A3L	Test Dates: 11/6/2023 – 1/2/2024	EUT Type: Portable Handset	Page 69 of 108

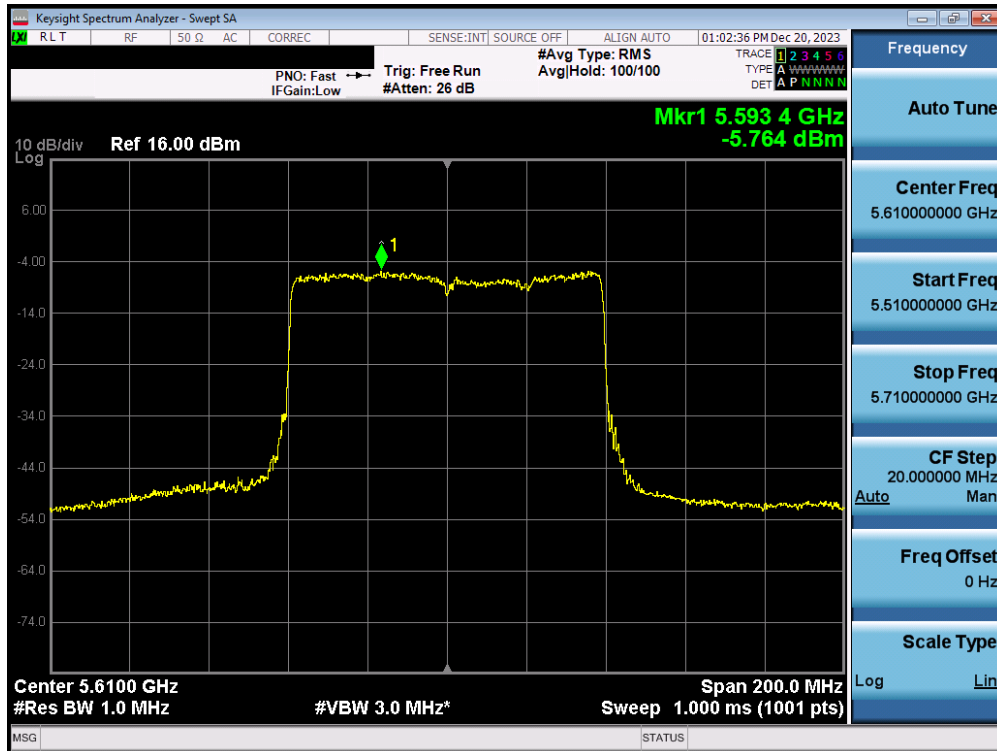


Plot 7-91. Power Spectral Density Plot MIMO ANT2 (20MHz BW 802.11ax – 242 Tones (UNII Band 2C) – Ch. 120)

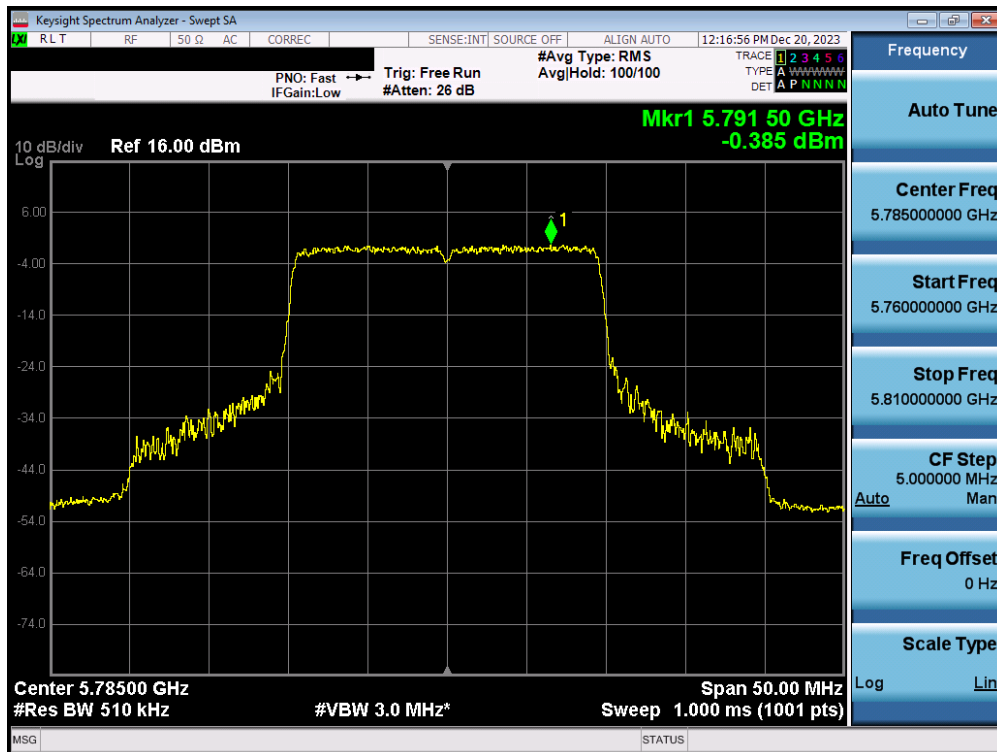


Plot 7-92. Power Spectral Density Plot MIMO ANT2 (40MHz BW 802.11ax – 484 Tones (UNII Band 2C) – Ch. 118)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-10.A3L	Test Dates: 11/6/2023 – 1/2/2024	EUT Type: Portable Handset	Page 70 of 108

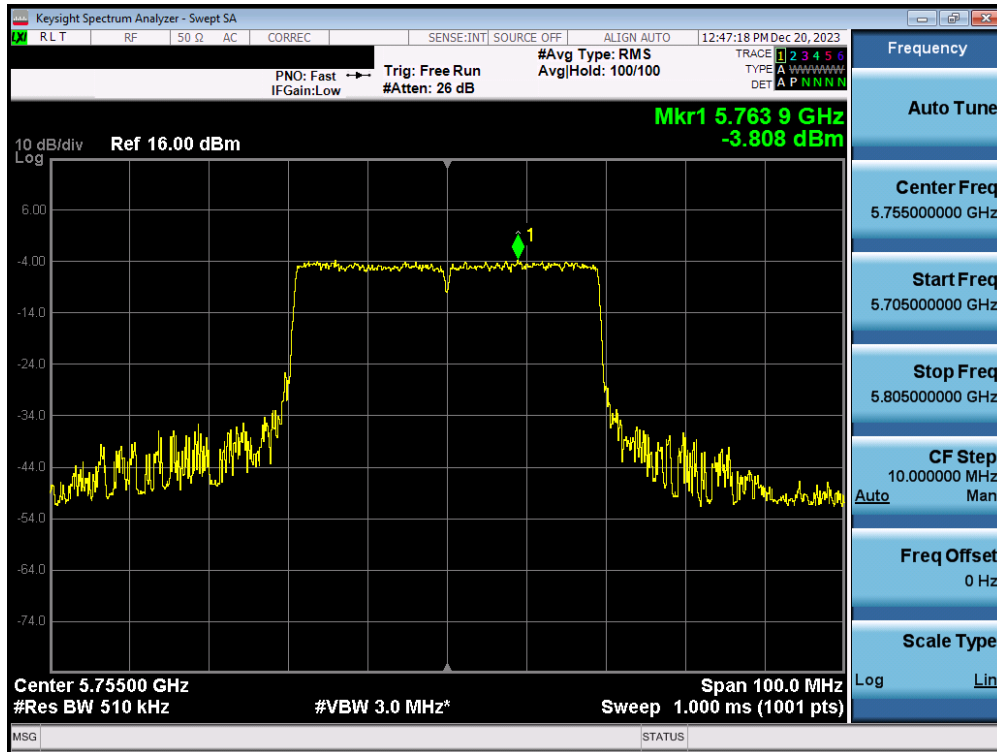


Plot 7-93. Power Spectral Density Plot MIMO ANT2 (80MHz BW 802.11ax – 996 Tones (UNII Band 2C) – Ch. 122)

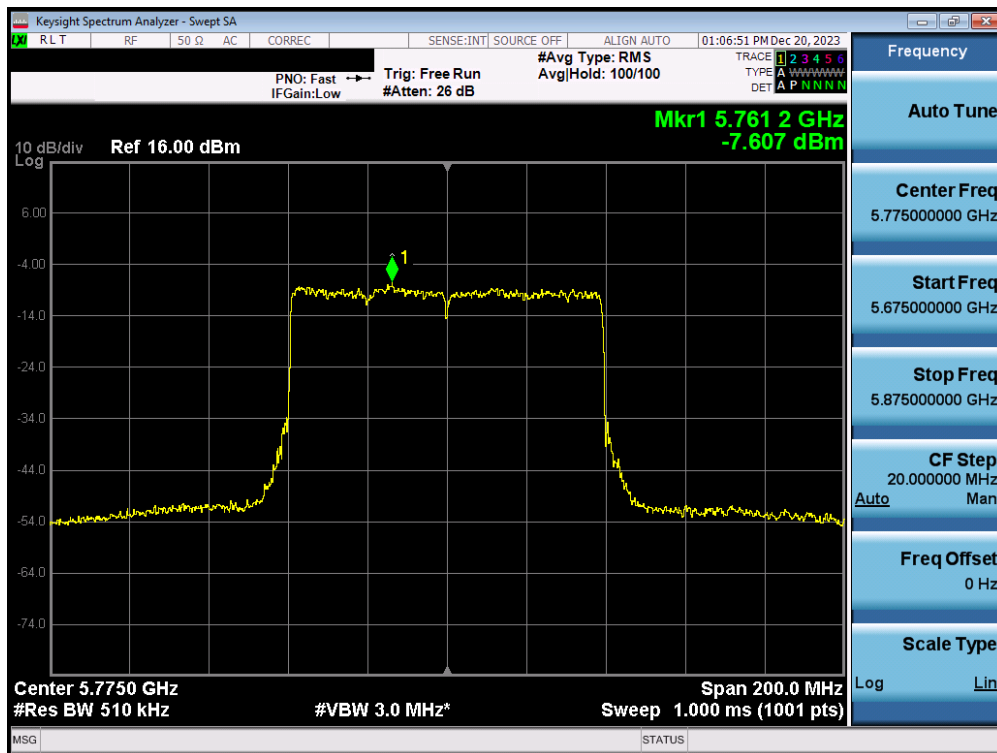


Plot 7-94. Power Spectral Density Plot MIMO ANT2 (20MHz BW 802.11ax – 242 Tones (UNII Band 3) – Ch. 157)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-95. Power Spectral Density Plot MIMO ANT2 (40MHz BW 802.11ax – 484 Tones (UNII Band 3) – Ch. 151)



Plot 7-96. Power Spectral Density Plot MIMO ANT2 (80MHz BW 802.11ax – 996 Tones (UNII Band 3) – Ch. 155)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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Note:

Per ANSI C63.10-2013 Section 14.3.2.2 and KDB 662911 v02r01 Section E)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.

$$\begin{aligned}
\text{Directional gain} &= 10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{\text{ANT}}] \text{ dBi} \\
&= 10 \log[(10^{-8.61/20} + 10^{-7.68/20} / 2)] \text{ dBi} \\
&= (-5.12) \text{ dBi}
\end{aligned}$$

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.

$$\begin{aligned}
&\text{Antenna-1} + \text{Antenna-2} = \text{MIMO} \\
(5.88 \text{ dBm} + 6.27 \text{ dBm}) &= (3.87 \text{ mW} + 4.24 \text{ mW}) = 8.11 \text{ mW} = 9.09 \text{ dBm}
\end{aligned}$$

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.

$$\begin{aligned}
\text{e.i.r.p. Power Spectral Density(dBm)} &= \text{Power Spectral Density (dBm)} + \text{directional gain (dBi)} \\
9.09 \text{ dBm} + (-5.12) \text{ dBi} &= 3.97 \text{ dBm}
\end{aligned}$$

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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 C63.10-2013 and KDB 789033 D02 v02r01, 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.

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 [μ V/m]	Measured Distance [Meters]
0.009 – 0.490 MHz	2400\sqrt{F} (kHz)	300
0.490 – 1.705 MHz	24000\sqrt{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 7-16. Radiated Limits

Test Procedures Used

ANSI C63.10-2013 – Sections 12.7.7.2, 12.7.6, 12.7.5 (Radiated Spurious Emissions)

ANSI C63.10-2013 – Section 12.7.4.4 (Band Edge Measurements)

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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 $\geq 2 \times \text{span} \backslash \backslash \text{RBW}$)
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.

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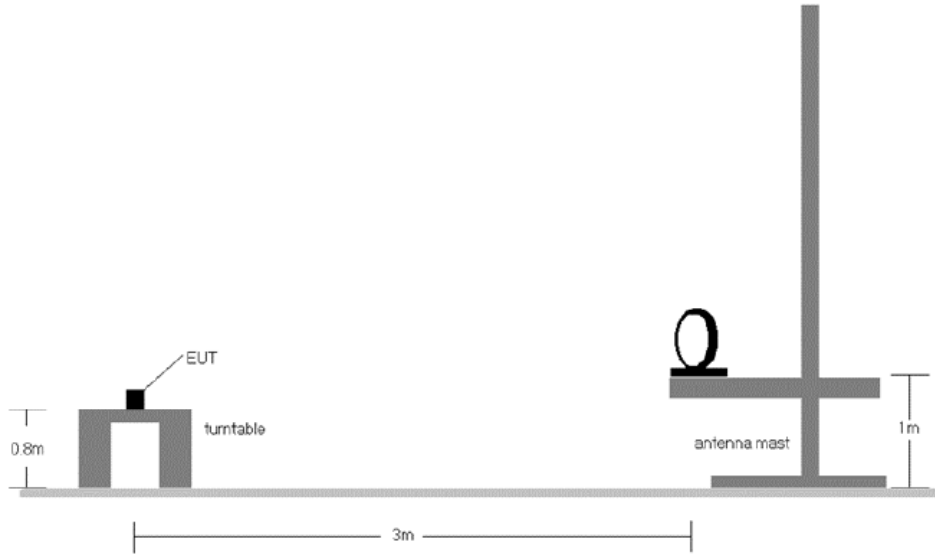


Figure 7-5. Radiated Test Setup < 30MHz

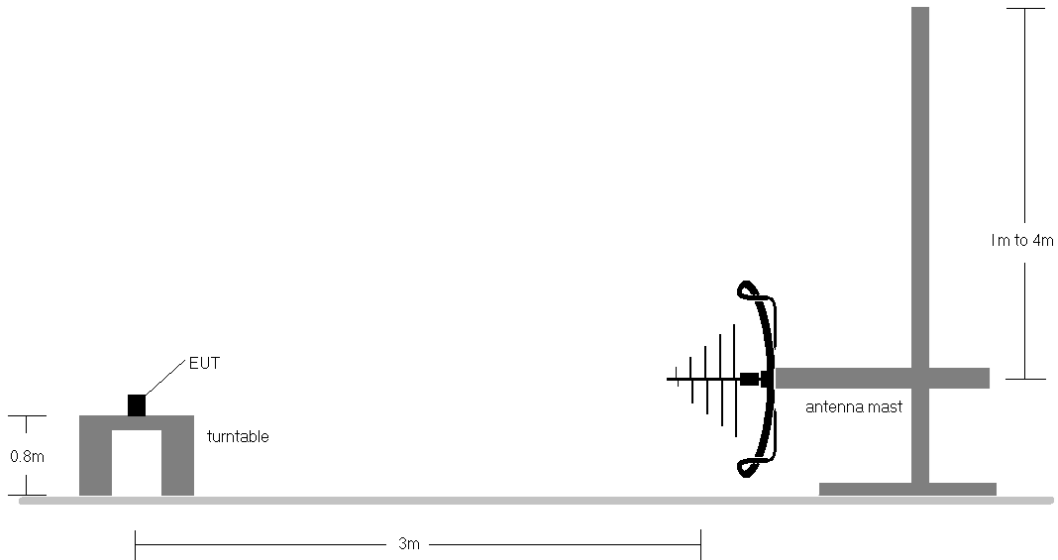


Figure 7-6. Radiated Test Setup < 1GHz

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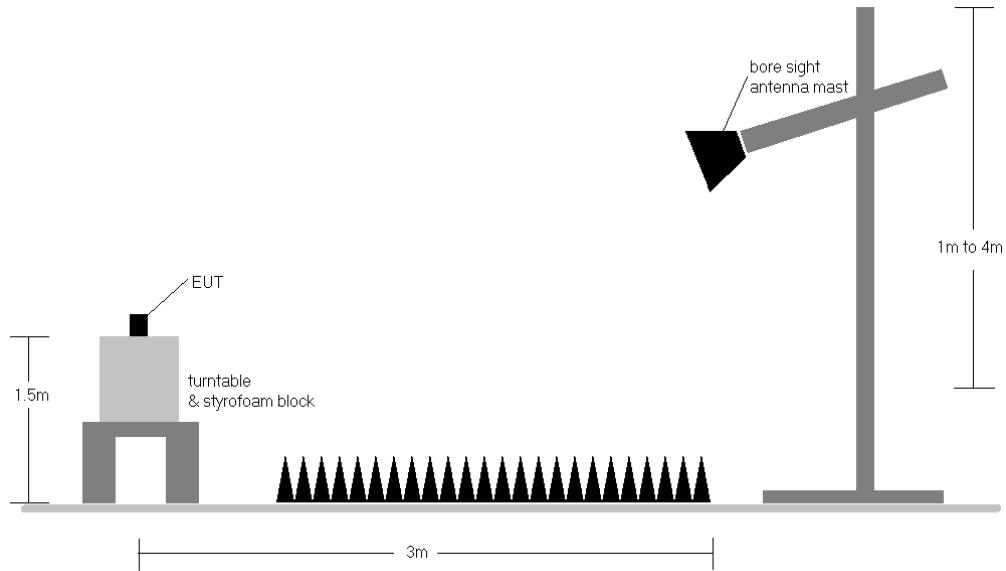


Figure 7-7. Radiated Test Setup > 1GHz

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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 dB μ V/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 68.2dB μ V/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 [68.2dB μ V/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.

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Sample Calculations

Determining Spurious Emissions Levels

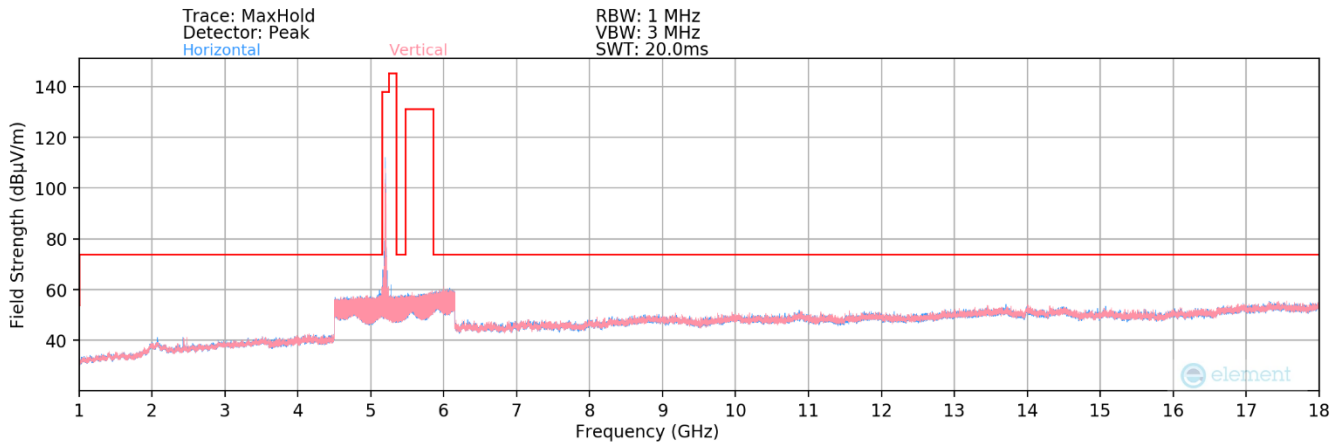
- Field Strength Level [dBμV/m] = Analyzer Level [dBm] + 107 + AFCL [dB/m]
- AFCL [dB/m] = Antenna Factor [dB/m] + Cable Loss [dB]
- Margin [dB] = Field Strength Level [dBμV/m] – Limit [dBμV/m]

Radiated Band Edge Measurement Offset

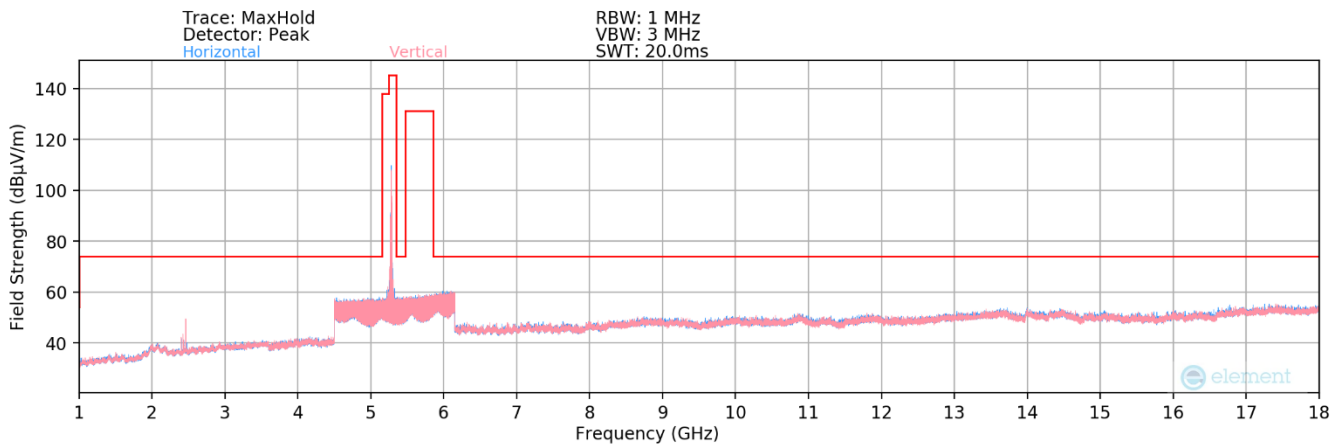
- The amplitude offset shown in the radiated restricted band edge plots in Section Radiated Spurious Emission Measurements – Above 1GHz was calculated using the formula:
Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

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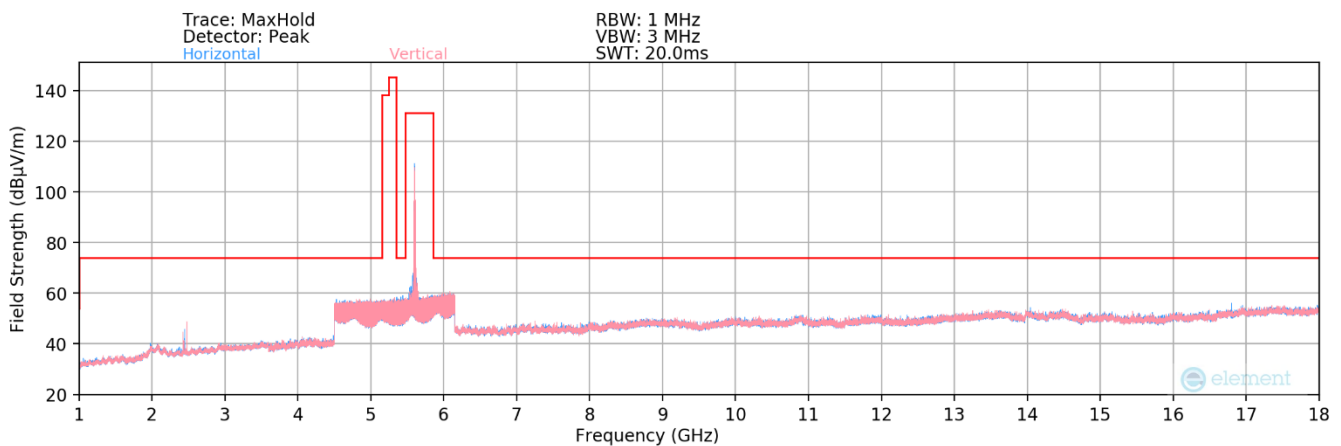
7.6.1 MIMO Radiated Spurious Emission Measurements (26 Tones)



Plot 7-97. Radiated Spurious Plot above 1GHz MIMO (802.11ax – UNII 1 Ch. 40)



Plot 7-98. Radiated Spurious Plot above 1GHz MIMO (802.11ax – UNII 2A Ch. 56)



Plot 7-99. Radiated Spurious Plot above 1GHz MIMO (802.11ax – UNII 2C Ch. 120)

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