



# ELEMENT WASHINGTON DC LLC

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## MEASUREMENT REPORT FCC PART 15.407 802.11a/n/ac/ax (OFDM)

**Applicant Name:**  
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**Date of Testing:**  
11/6/2023 - 12/27/2023  
**Test Report Issue Date:**  
12/27/2023  
**Test Site/Location:**  
Element lab., Columbia, MD, USA  
**Test Report Serial No.:**  
1M2310260110-09.A3L

<b>FCC ID:</b>	<b>A3LSMA356E</b>
<b>APPLICANT:</b>	<b>Samsung Electronics Co., Ltd.</b>

<b>Application Type:</b>	Certification
<b>Model:</b>	SM-A356E/DS
<b>Additional Model(s):</b>	SM-A356E
<b>EUT Type:</b>	Portable Handset
<b>Frequency Range:</b>	5180 – 5850MHz
<b>Modulation Type:</b>	OFDM
<b>FCC Equipment Class:</b>	Unlicensed National Information Infrastructure TX (NII)
<b>FCC Rule Part(s):</b>	Part 15 Subpart E (15.407)
<b>Test Procedure(s):</b>	ANSI C63.10-2013, KDB 662911 D01 v02r01

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

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

**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	99.54	19.98
	2A	5260 - 5320	93.76	19.72
	2C	5500 - 5720	95.51	19.80
	3	5745 - 5825	98.07	19.92
40	1	5190 - 5230	79.25	18.99
	2A	5270 - 5310	74.47	18.72
	2C	5510 - 5710	69.50	18.42
	3	5755 - 5795	73.96	18.69
80	1	5210	49.66	16.96
	2A	5290	45.39	16.57
	2C	5530 - 5690	48.98	16.90
	3	5775	47.53	16.77

**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:

802.11 Mode/Band		MIMO (1+2)
		Duty Cycle [%]
5GHz	a	96.27
	n (HT20)	97.91
	ac (VHT20)	95.99
	ax (HE20)	94.75
	n (HT40)	96.16
	ac (VHT40)	91.53
	ax (HE40)	90.24
	ac (VHT80)	89.35
	ax (HE80)	88.79

**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. Antenna / Technology Configuration**

✓ = Support ; ✗ = NOT Support

**SISO** = Single Input Single Output

**SDM** = Spatial Diversity Multiplexing – MIMO function

**CDD** = Cyclic Delay Diversity – 2Tx Function

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

802.11a 20MHz	MCS Index			Spatial Stream	OFDM (802.11n/802.11ac)				OFDM (802.11ac)				OFDM (802.11ax)								
	HT	VHT	HE		20MHz		40MHz		80MHz		160MHz		20MHz			40MHz			80MHz		
					0.8µs GI	0.4µs GI	0.8µs GI	0.4µs GI	0.8µs GI	0.4µs GI	0.8µs GI	0.4µs 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
6	0	0	0	1	6.5	7.2	13.5	15	29.3	32.5	58.5	65	8.6	8.1	7.3	17.2	16.3	14.6	36	34	30.6
9	1	1	1	1	13	14.4	27	30	58.5	65	117	130	17.2	16.3	14.6	34.4	32.5	29.3	72.1	68.1	61.3
12	2	2	2	1	19.5	21.7	40.5	45	87.8	97.5	175.5	195	25.8	24.4	21.9	51.6	48.8	43.9	108.1	102.1	91.9
18	3	3	3	1	26	28.9	54	60	117	130	234	260	34.4	32.5	29.3	68.8	65	58.5	144.1	136.1	122.5
24	4	4	4	1	39	43.3	81	90	175.5	195	351	390	51.6	48.8	43.9	103.2	97.5	87.8	216.2	204.2	183.8
36	5	5	5	1	52	57.8	108	120	234	260	468	520	68.8	65	58.5	137.6	130	117	288.2	272.2	245
48	6	6	6	1	58.5	65	121.5	135	263.3	292.5	526.5	585	77.4	73.1	65.8	154.9	146.3	131.6	324.3	306.3	275.6
54	7	7	7	1	65	72.2	135	150	292.5	325	585	650	86	81.3	73.1	172.1	162.5	146.3	360.3	340.3	306.3
		8	8	1	78	86.7	162	180	351	390	702	780	103.2	97.5	87.8	206.5	195	175.5	432.4	408.3	367.5
		9	9	1	N/A	N/A	180	200	390	433.3	780	866.7	114.7	108.3	97.5	229.4	216.7	195	480.4	453.7	408.3
				10	1								129	121.9	109.7	258.1	243.8	219.4	540.4	510.4	459.4
				11	1								143.4	135.4	121.9	286.8	270.8	243.8	600.5	567.1	510.4
				1	1								154.9	146.3	131.6	309.7	292.5	263.3	648.5	612.5	551.3
				1	1								172.1	162.5	146.3	344.1	325	292.5	720.6	680.6	612.5
6	8	0	0	2	13	14.4	27	30	58.5	65	117	130	17.2	16.3	14.6	34.4	32.5	29.3	72.1	68.1	61.3
9	9	1	1	2	26	28.9	54	60	117	130	234	260	34.4	32.5	29.3	68.8	65	58.5	144.1	136.1	122.5
12	10	2	2	2	39	43.3	81	90	175.5	195	351	390	51.6	48.8	43.9	103.2	97.5	87.8	216.2	204.2	183.8
18	11	3	3	2	52	57.8	108	120	234	260	468	520	68.8	65	58.5	137.6	130	117	288.2	272.2	245
24	12	4	4	2	78	86.7	162	180	351	390	702	780	103.2	97.5	87.8	206.5	195	175.5	432.4	408.3	367.5
36	13	5	5	2	104	115.6	216	240	468	520	936	1040	137.6	130	117	275.3	260	234	576.5	544.4	490
48	14	6	6	2	117	130	243	270	526.5	585	1053	1170	154.9	146.3	131.6	309.7	292.5	263.3	648.5	612.5	551.3
54	15	7	7	2	130	144.4	270	300	585	650	1170	1300	172.1	162.5	146.3	344.1	325	292.5	720.6	680.6	612.5
		8	8	2	156	173.3	324	360	702	780	1404	1560	206.5	195	175.5	412.9	390	351	864.7	816.7	735
		9	9	2	N/A	N/A	360	400	780	866.7	1560	1733.3	229.4	216.7	195	458.8	433.3	390	960.8	907.4	816.7
				10	2								258.1	243.8	219.4	516.2	487.5	438.8	1080.9	1020.8	918.8
				11	2								286.8	270.8	243.8	573.5	541.7	487.5	1201	1134.3	1020.8
				2	2								309.7	292.5	263.3	619.4	585	526.5	1297.1	1225	1102.5
				2	2								344.1	325	292.5	688.2	650	585	1441.2	1361.1	1225

Table 2-6. Supported Data Rates

### 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

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## 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 Sections 3.2 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 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 AC Line Conducted Emissions

The line-conducted facility is located inside a 10'x16'x9' shielded enclosure. The shielded enclosure is manufactured by ETS Lindgren RF Enclosures. The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 65-5. A 1m x 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50μH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. The external power line filter is an ETS Lindgren Model LPRX-4X30 (100dB Attenuation, 14kHz-18GHz) and the two EMI/RFI filters are ETS Lindgren Model LRW-2030-S1 (100dB Minimum Insertion Loss, 14kHz – 10GHz). These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply line(s) will be connected to the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference groundplane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

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 RF output of the LISN was connected to the spectrum analyzer and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The spectrum was scanned from 150kHz to 30MHz with a spectrum analyzer. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 10kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions is used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

Line conducted emissions test results are shown in Section 7.7. The EMI Receiver mode of the Agilent MXE was used to perform AC line conducted emissions testing.

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### 3.3 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.

### 3.4 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  $U_{\text{CISPR}}$  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 [6.6]	26dB Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
15.407(e)	RSS-Gen [6.6]	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
15.407	RSS-Gen [8.8]	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 (RSS-Gen [8.8]) limits	LINE CONDUCTED	PASS	Section 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.

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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

None.

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## MIMO 26dB Bandwidth Measurements

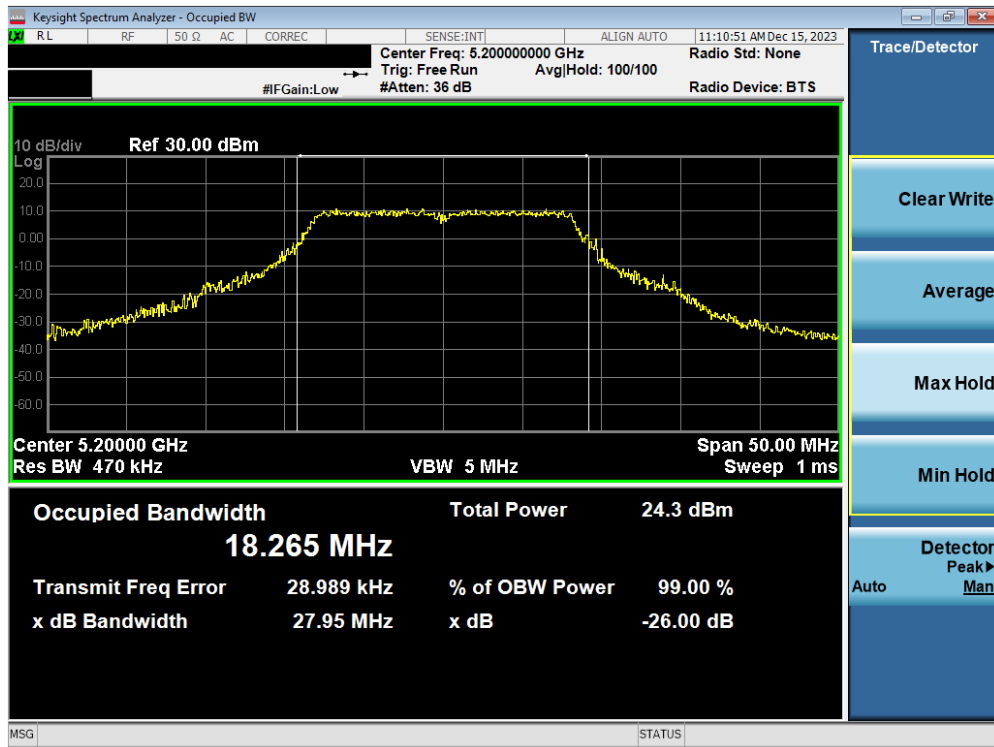
	Frequency [MHz]	Channel	802.11 MODE	Antenna-1 26dB Bandwidth [MHz]	Antenna-2 26dB Bandwidth [MHz]
Band 1	5180	36	a	27.28	28.58
	5200	40	a	27.95	28.31
	5240	48	a	26.51	27.61
	5180	36	n (20MHz)	30.30	30.69
	5200	40	n (20MHz)	30.82	30.64
	5240	48	n (20MHz)	30.36	30.18
	5180	36	ac (20MHz)	30.14	29.33
	5200	40	ac (20MHz)	30.69	30.23
	5240	48	ac (20MHz)	30.04	28.85
	5180	36	ax SU (20MHz)	30.58	30.53
	5200	40	ax SU (20MHz)	29.68	29.45
	5240	48	ax SU (20MHz)	29.23	30.66
	5190	38	n (40MHz)	56.71	53.54
	5230	46	n (40MHz)	55.63	52.34
	5190	38	ac (40MHz)	48.36	46.53
	5230	46	ac (40MHz)	48.00	45.44
	5190	38	ax SU (40MHz)	46.49	45.13
	5230	46	ax SU (40MHz)	45.99	45.65
	5210	42	ac (80MHz)	87.20	86.60
	5210	42	ax SU (80MHz)	87.53	87.39
Band 2A	5260	52	a	24.11	27.26
	5280	56	a	24.88	27.79
	5320	64	a	26.28	26.18
	5260	52	n (20MHz)	30.53	30.33
	5280	56	n (20MHz)	29.81	30.31
	5320	64	n (20MHz)	29.99	29.93
	5260	52	ac (20MHz)	29.74	27.78
	5280	56	ac (20MHz)	30.00	29.00
	5320	64	ac (20MHz)	30.06	27.79
	5260	52	ax SU (20MHz)	30.38	29.76
	5280	56	ax SU (20MHz)	30.72	29.54
	5320	64	ax SU (20MHz)	35.79	31.03
	5270	54	n (40MHz)	51.27	50.26
	5310	62	n (40MHz)	57.36	53.61
	5270	54	ac (40MHz)	48.22	45.99
	5310	62	ac (40MHz)	48.06	46.11
	5270	54	ax SU (40MHz)	46.67	45.02
	5310	62	ax SU (40MHz)	46.52	45.60
	5290	58	ac (80MHz)	87.45	87.24
	5290	58	ax SU (80MHz)	89.44	86.65
Band 2C	5500	100	a	26.38	26.22
	5600	120	a	26.34	25.44
	5720	144	a	27.12	26.15
	5500	100	n (20MHz)	29.86	30.36
	5600	120	n (20MHz)	30.33	29.50
	5720	144	n (20MHz)	29.73	30.17
	5500	100	ac (20MHz)	29.64	29.34
	5600	120	ac (20MHz)	29.90	29.13
	5720	144	ac (20MHz)	30.14	28.83
	5500	100	ax SU (20MHz)	29.48	28.76
	5600	120	ax SU (20MHz)	30.09	31.14
	5720	144	ax SU (20MHz)	29.52	31.09
	5510	102	n (40MHz)	55.33	52.43
	5590	118	n (40MHz)	52.73	54.85
	5710	142	n (40MHz)	56.87	57.15
	5510	102	ac (40MHz)	46.74	46.05
	5590	118	ac (40MHz)	47.55	46.23
	5710	142	ac (40MHz)	46.26	45.70
	5510	102	ax SU (40MHz)	45.34	44.85
	5590	118	ax SU (40MHz)	46.46	45.47
5710	142	ax SU (40MHz)	45.85	45.66	
5530	106	ac (80MHz)	87.89	86.95	
5610	122	ac (80MHz)	87.50	87.15	
5690	138	ac (80MHz)	87.67	86.63	
5530	106	ax SU (80MHz)	87.37	87.45	
5610	122	ax SU (80MHz)	87.89	86.71	
5690	138	ax SU (80MHz)	87.80	86.40	

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

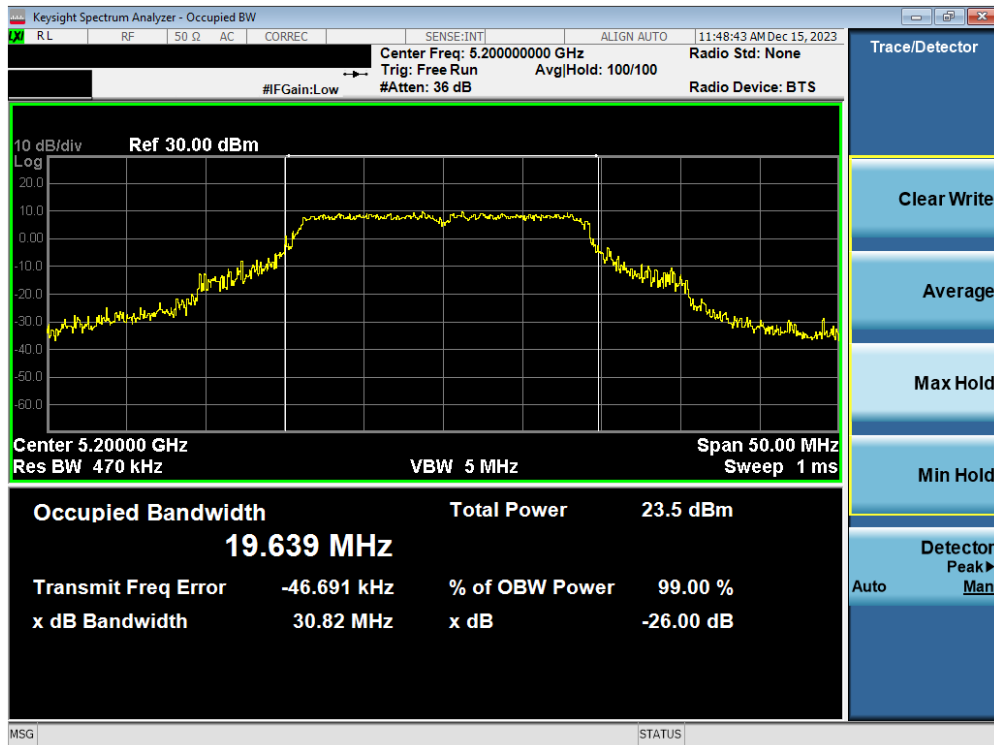
FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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## 7.2.1 MIMO Antenna-1 26dB Bandwidth Measurements

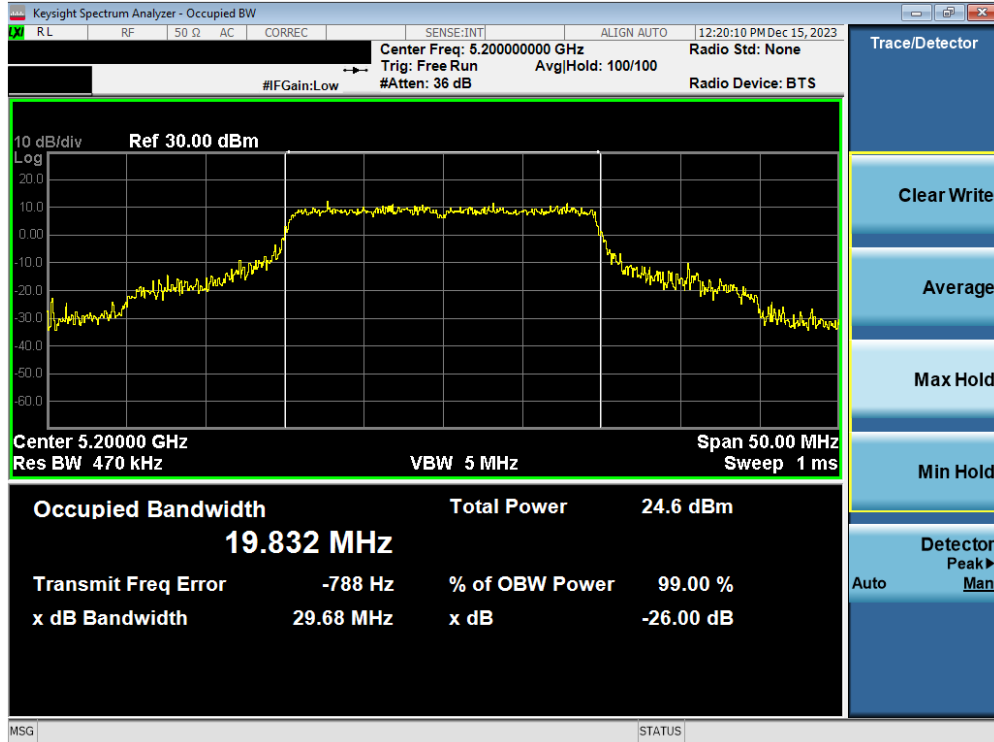


Plot 7-1. 26dB Bandwidth Plot MIMO ANT1 (802.11a (UNII Band 1) – Ch. 40)

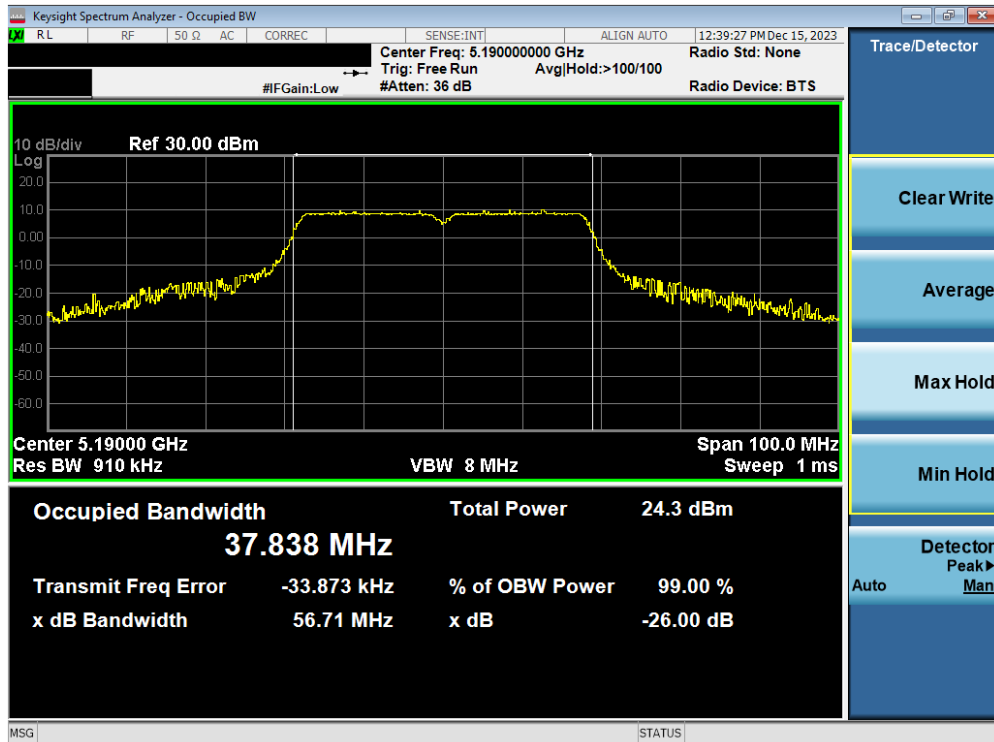


Plot 7-2. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11n (UNII Band 1) – Ch. 40)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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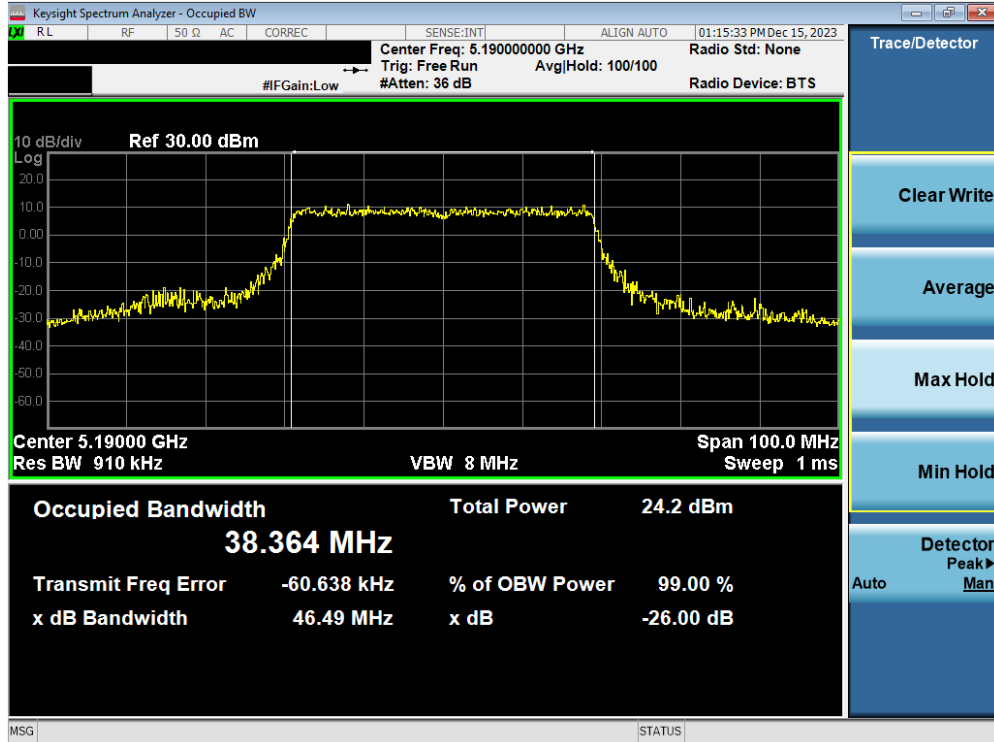


Plot 7-3. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax (UNII Band 1) – Ch. 40)

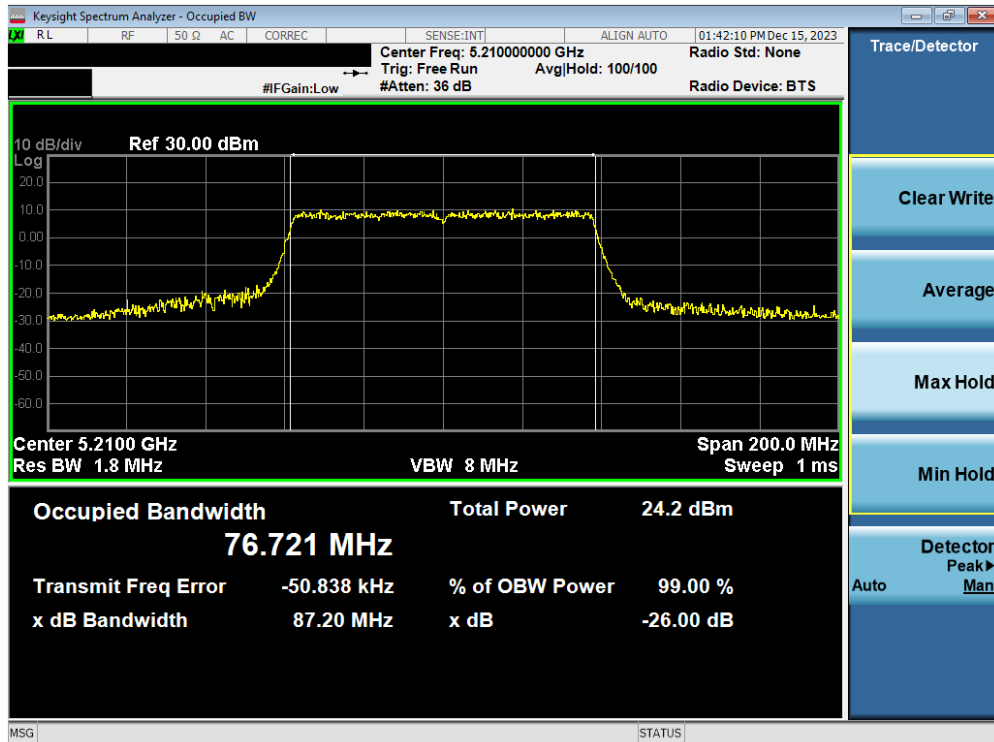


Plot 7-4. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11n (UNII Band 1) – Ch. 38)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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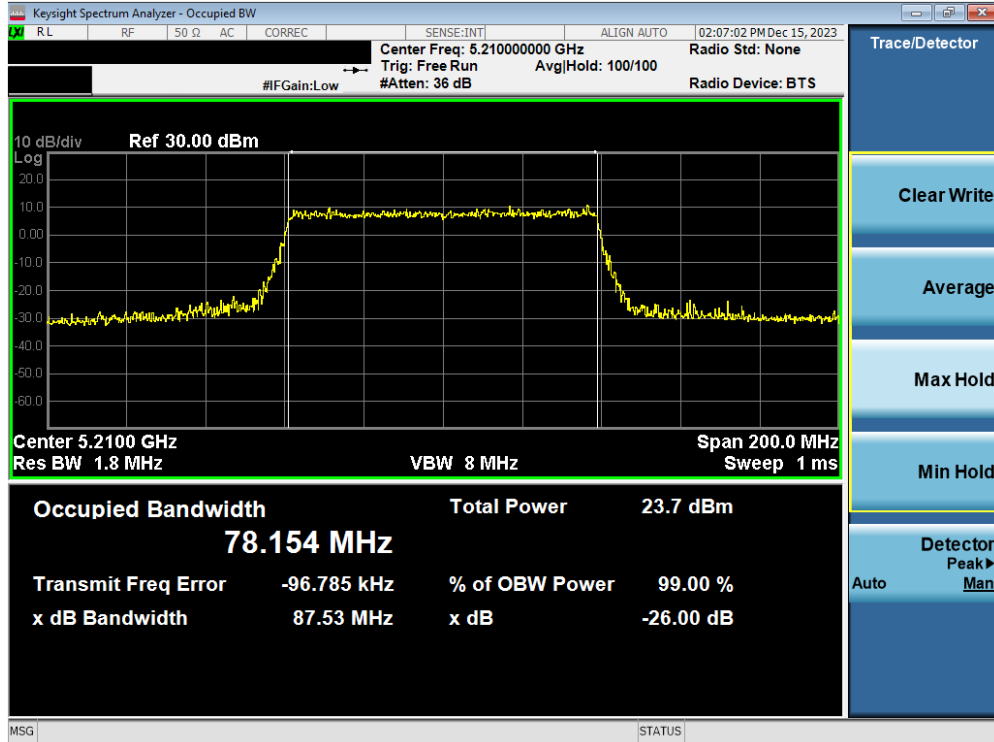


Plot 7-5. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax (UNII Band 1) – Ch. 38)

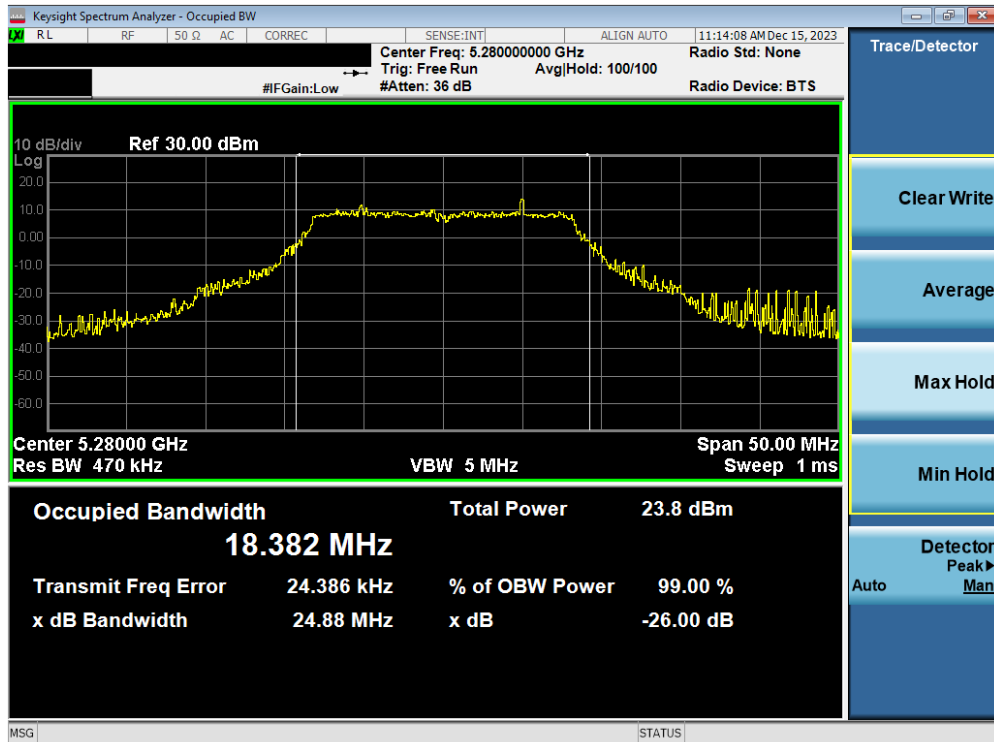


Plot 7-6. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ac (UNII Band 1) – Ch. 42)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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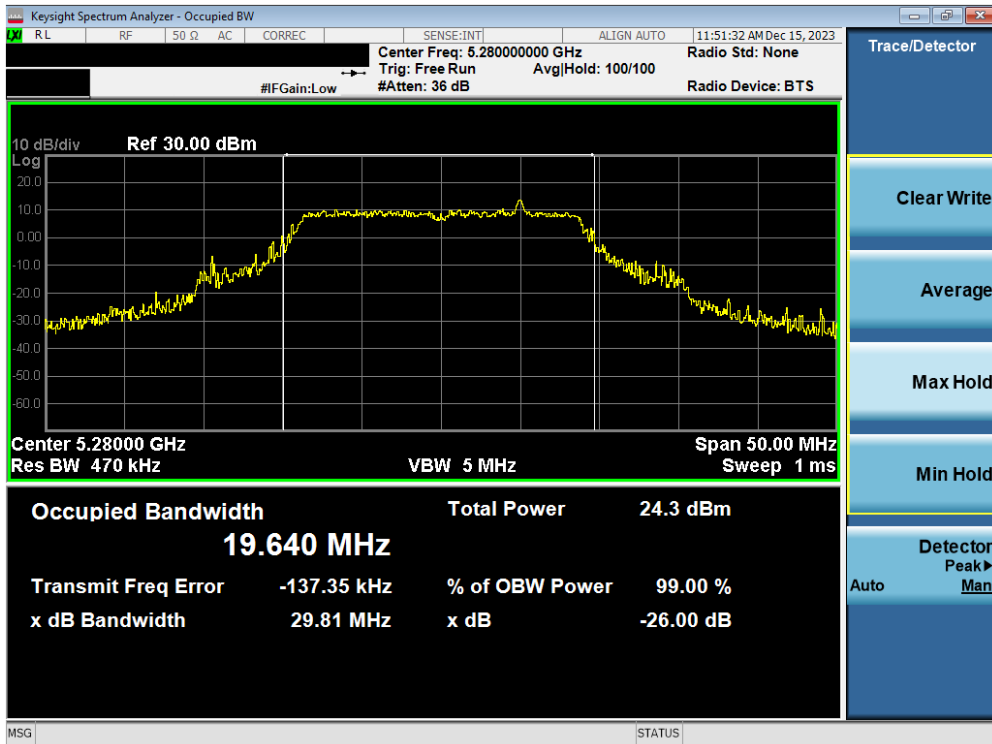


Plot 7-7. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax (UNII Band 1) – Ch. 42)

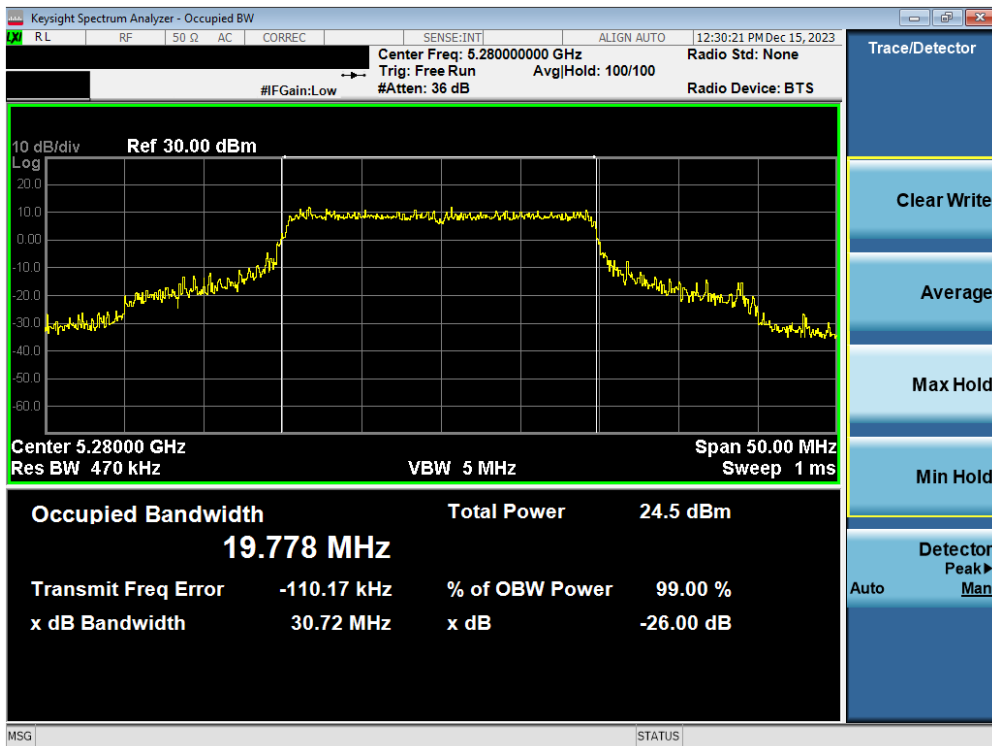


Plot 7-8. 26dB Bandwidth Plot MIMO ANT1 (802.11a (UNII Band 2A) – Ch. 56)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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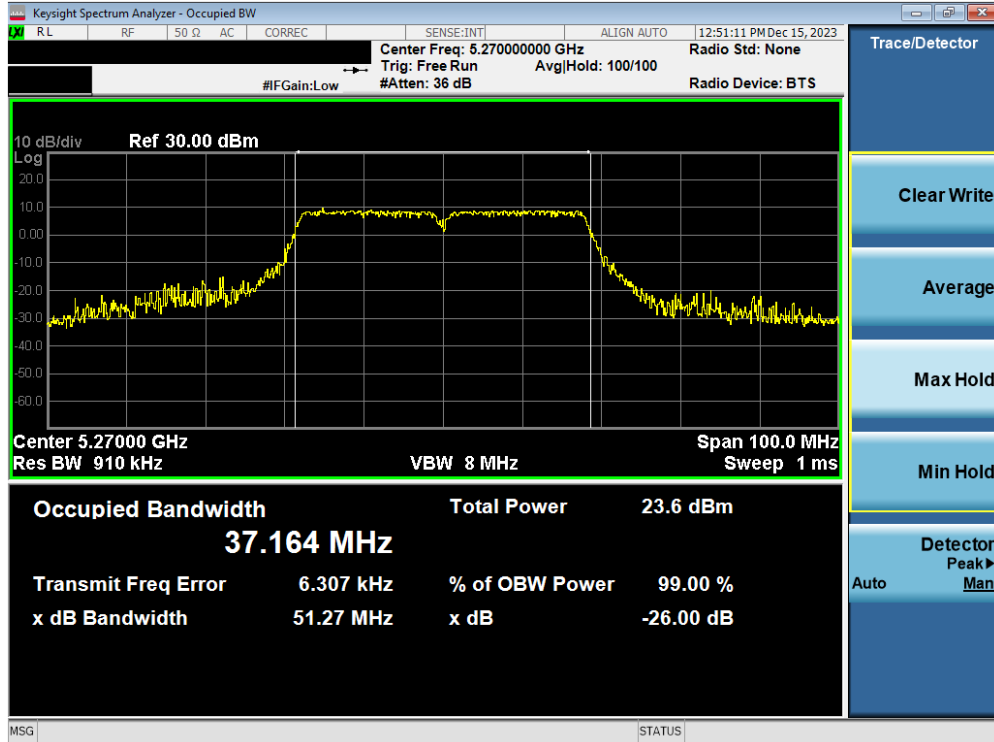


Plot 7-9. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11n (UNII Band 2A) – Ch. 56)

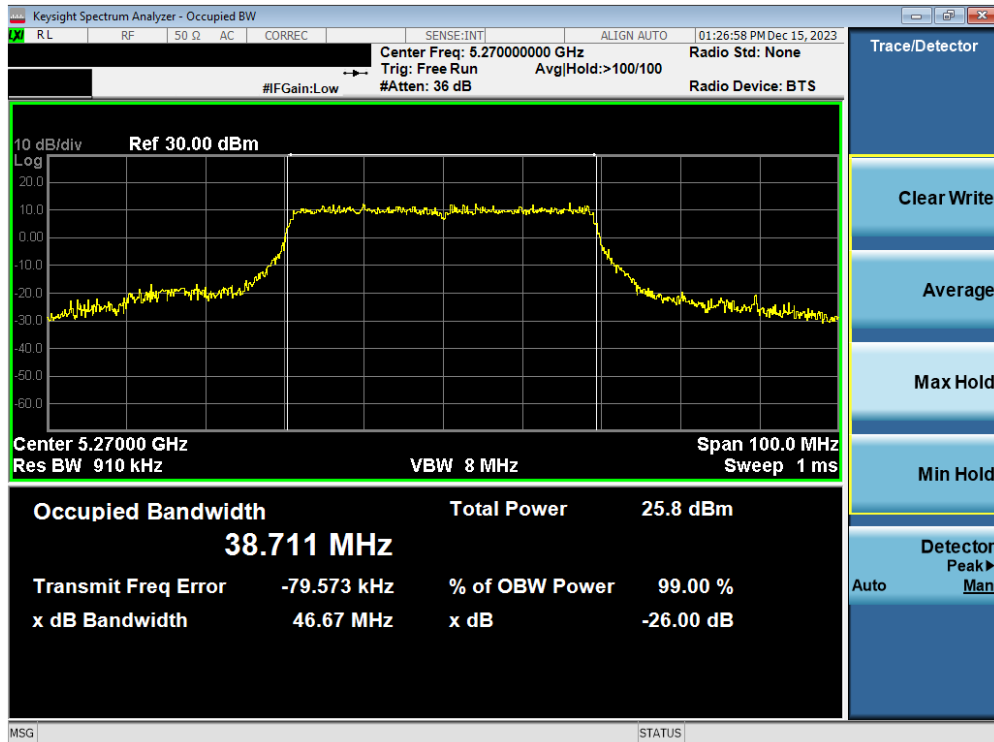


Plot 7-10. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax (UNII Band 2A) – Ch. 56)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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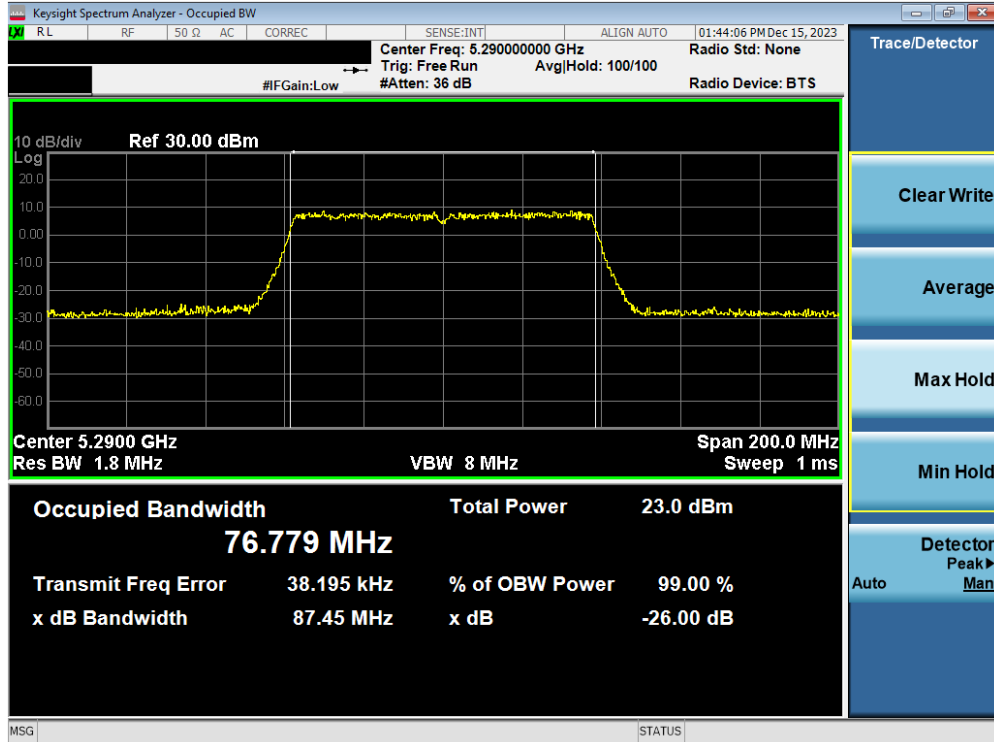


Plot 7-11. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11n (UNII Band 2A) – Ch. 54)

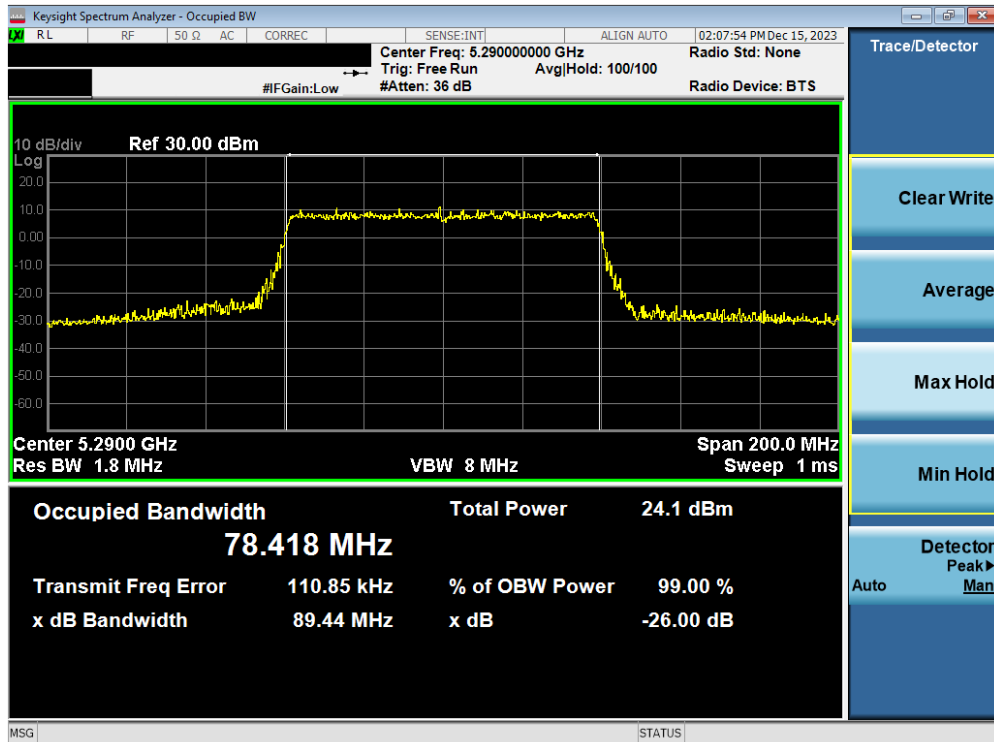


Plot 7-12. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax (UNII Band 2A) – Ch. 54)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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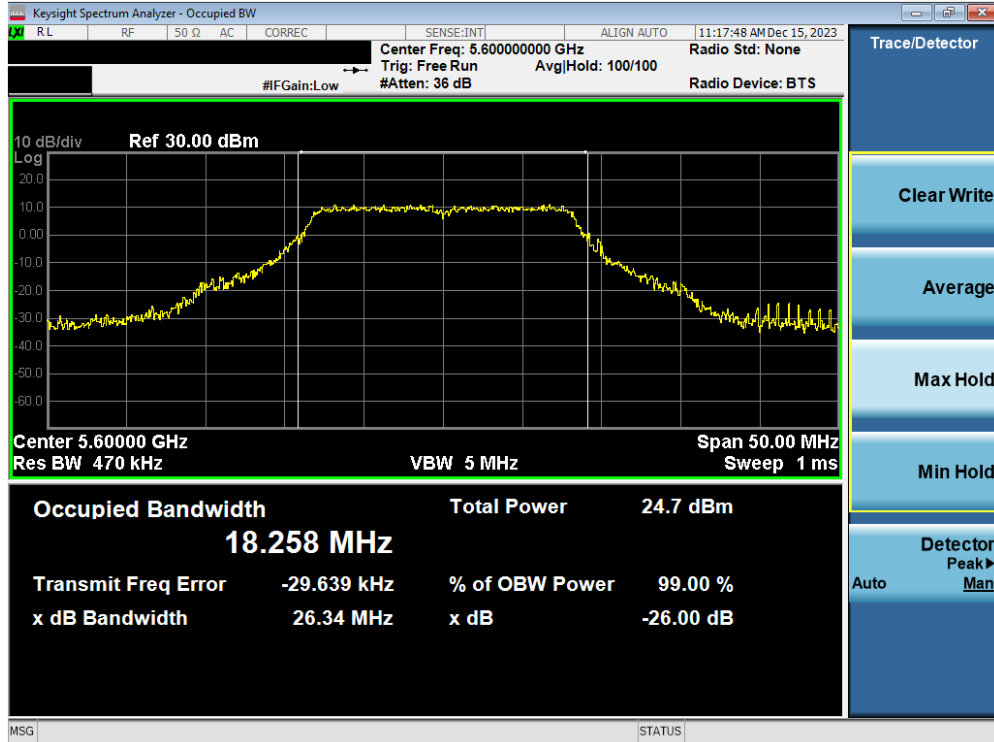


Plot 7-13. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ac (UNII Band 2A) – Ch. 58)

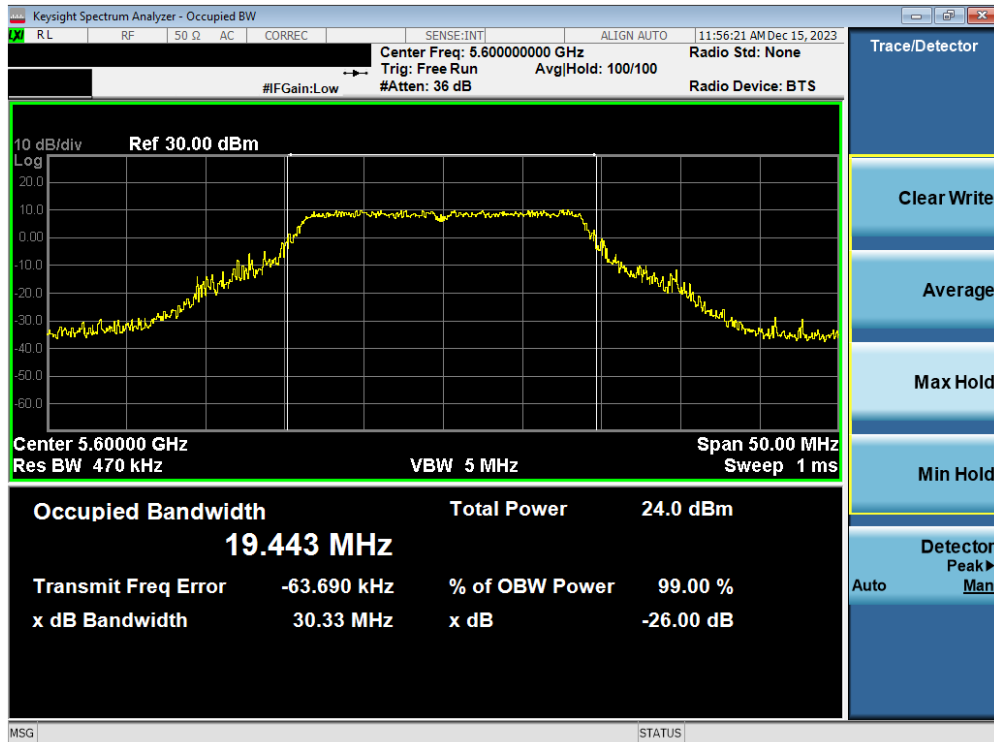


Plot 7-14. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax (UNII Band 2A) – Ch. 58)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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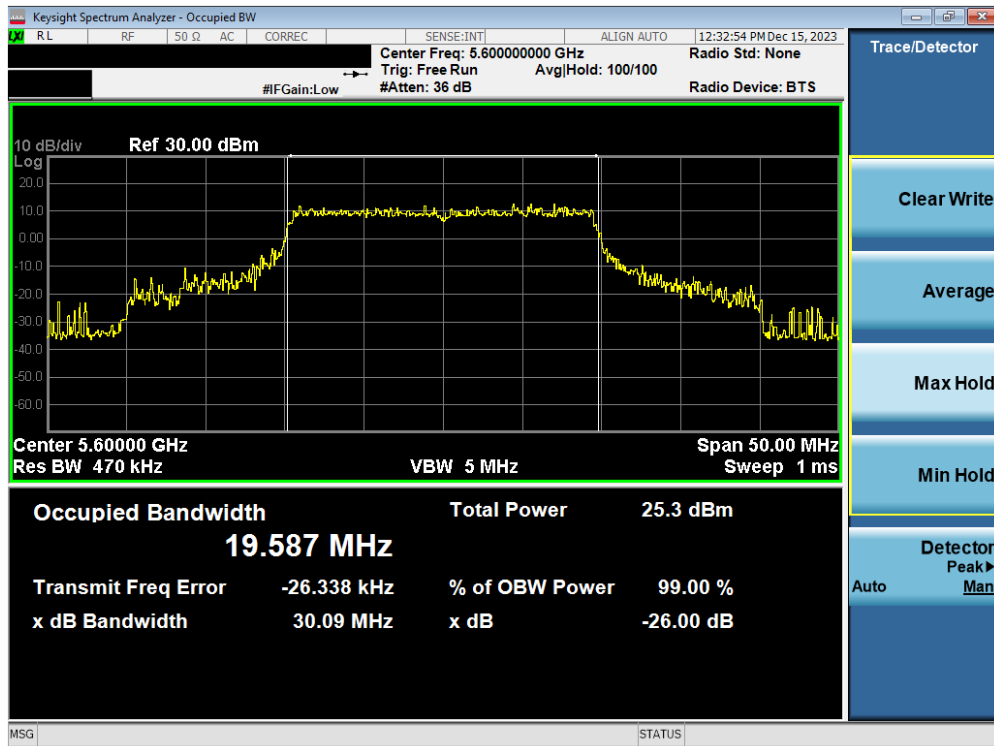
Plot 7-15. 26dB Bandwidth Plot MIMO ANT1 (802.11a (UNII Band 2C) – Ch. 120)



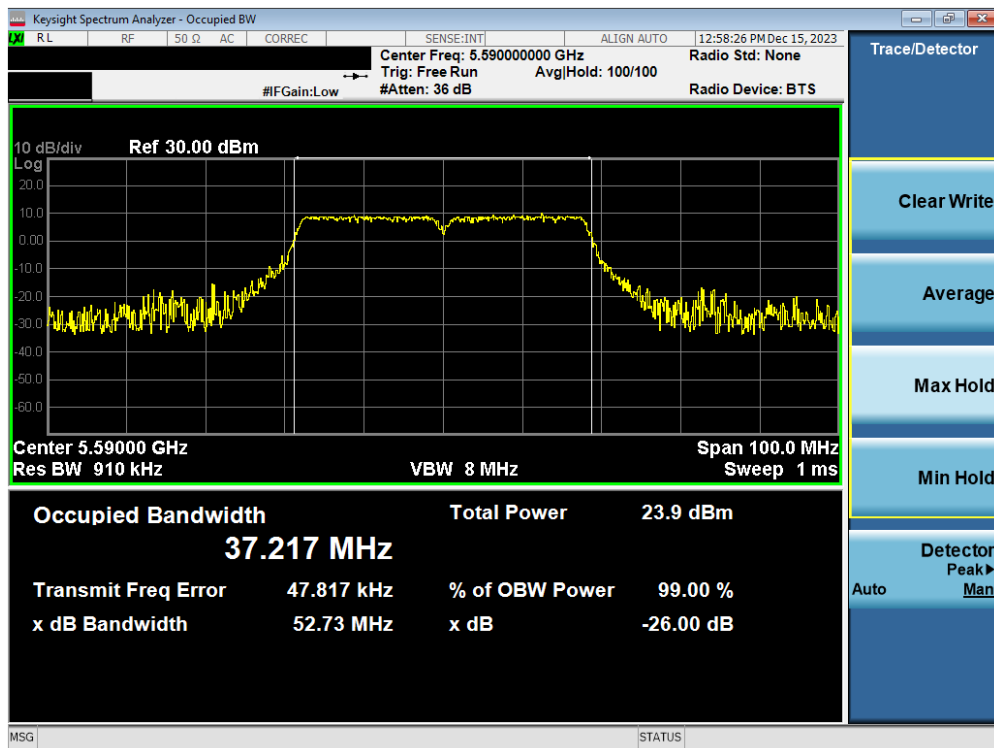
Plot 7-16. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11n (UNII Band 2C) – Ch. 120)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 24 of 116



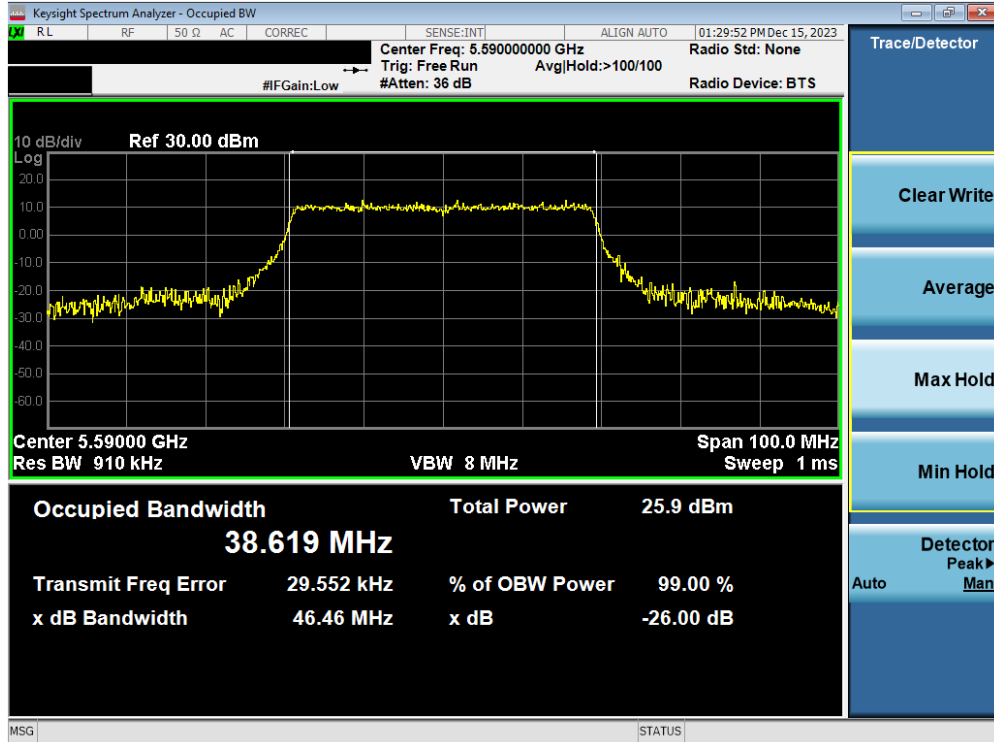


Plot 7-17. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax (UNII Band 2C) – Ch. 120)

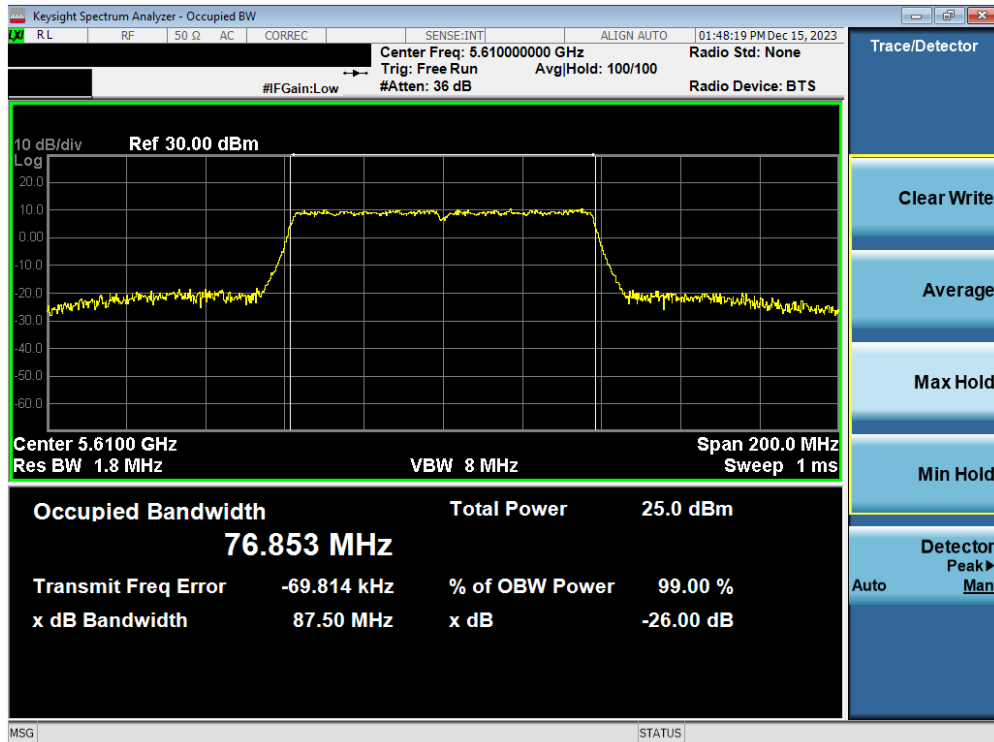


Plot 7-18. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11n (UNII Band 2C) – Ch. 118)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 25 of 116

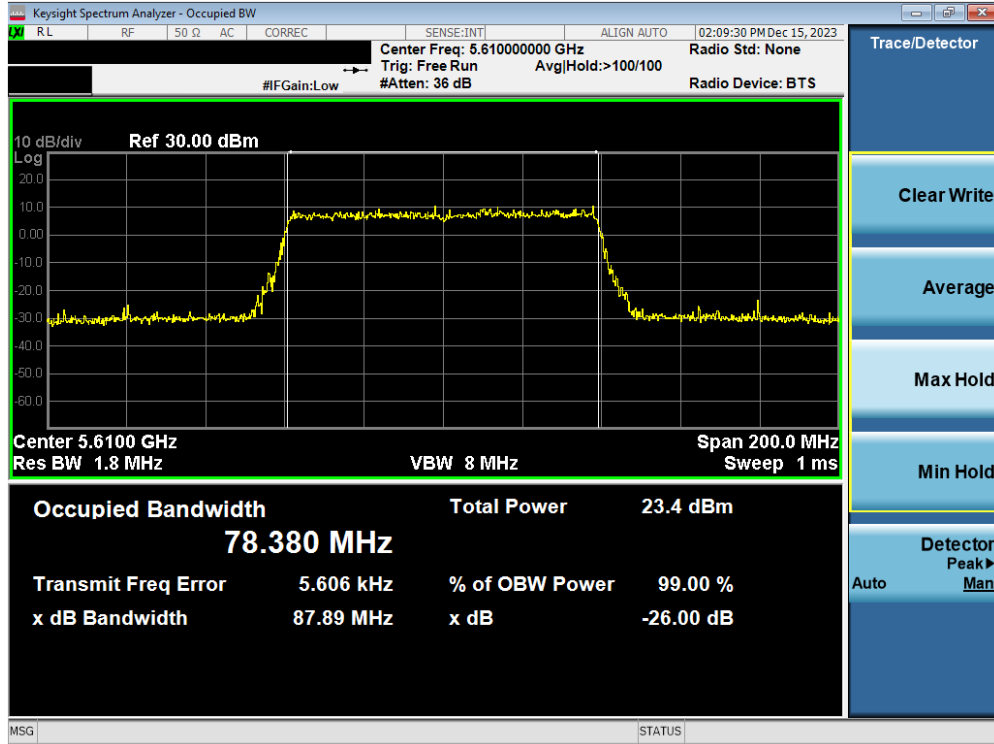


Plot 7-19. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax (UNII Band 2C) – Ch. 118)



Plot 7-20. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ac (UNII Band 2C) – Ch. 122)

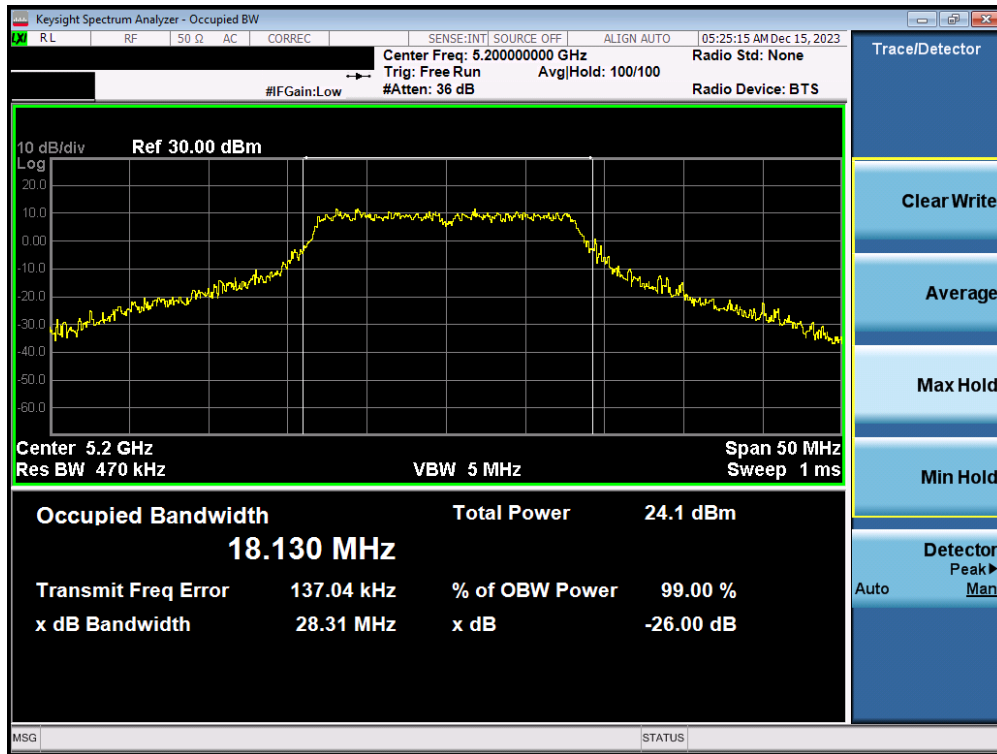
FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 26 of 116



Plot 7-21. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax (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

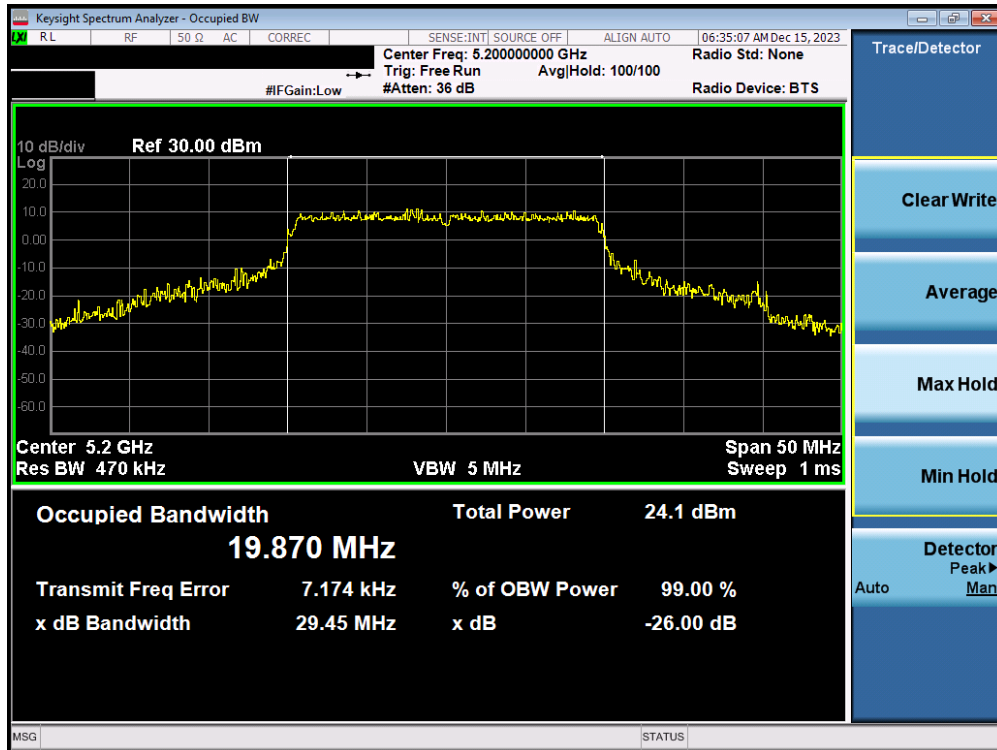


Plot 7-22. 26dB Bandwidth Plot MIMO ANT2 (802.11a (UNII Band 1) – Ch. 40)

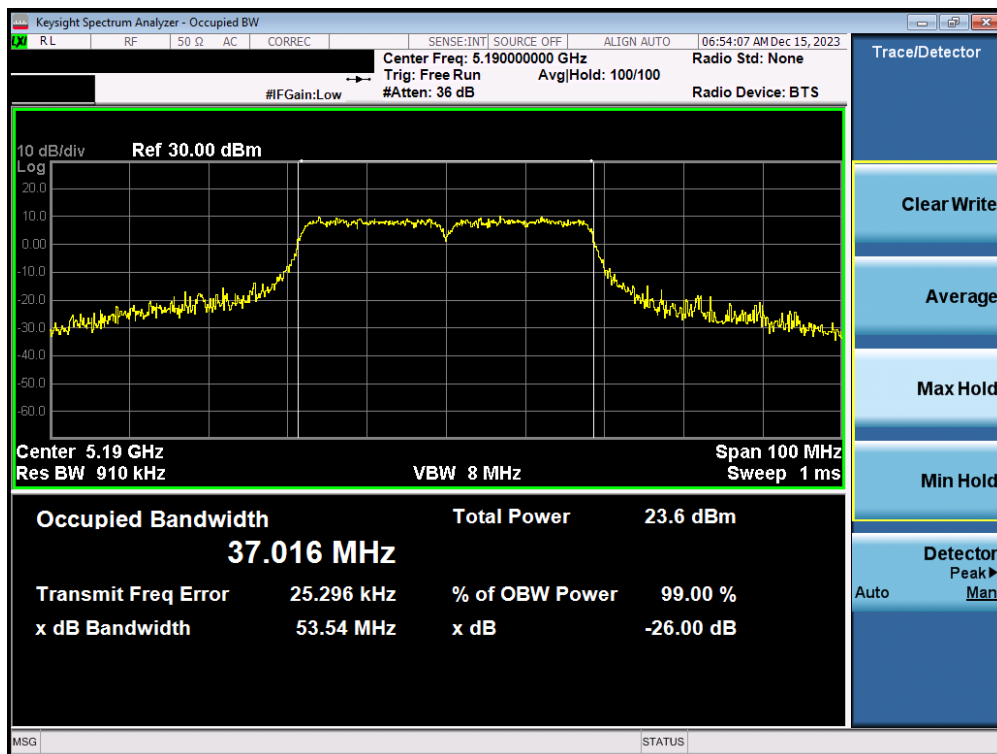


Plot 7-23. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11n (UNII Band 1) – Ch. 40)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 28 of 116

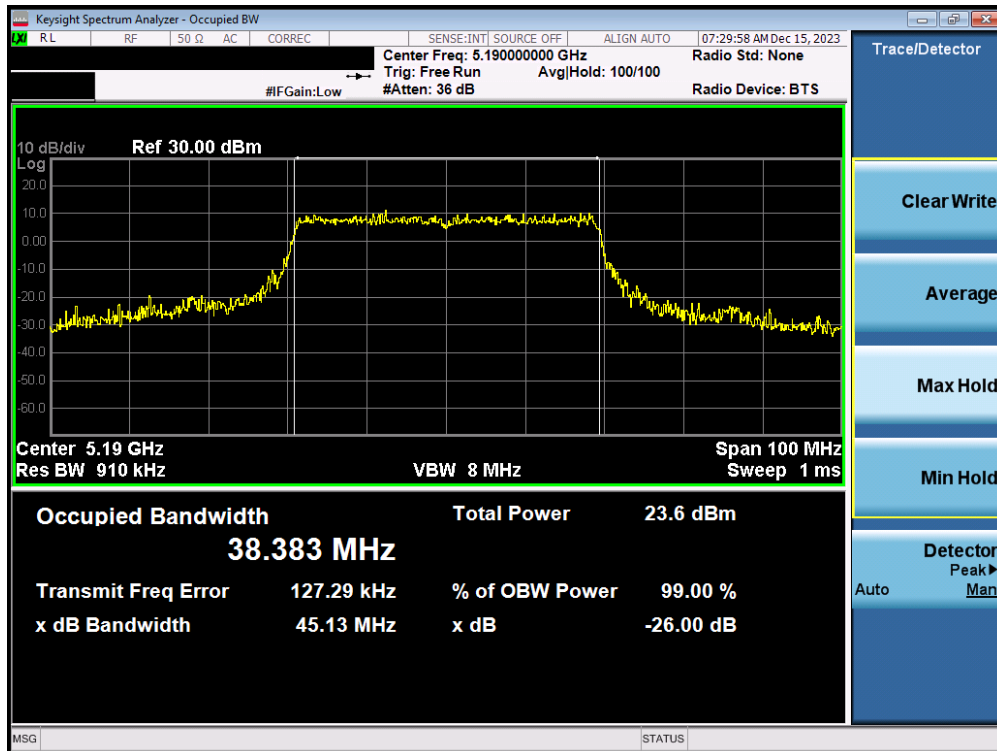


Plot 7-24. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax (UNII Band 1) – Ch. 40)

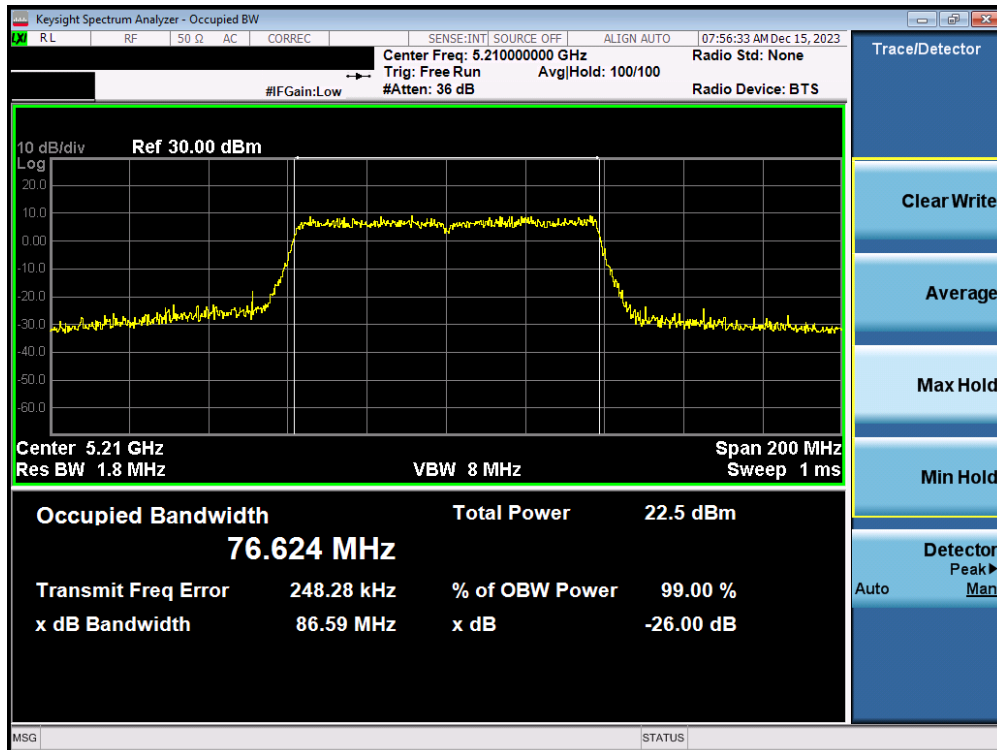


Plot 7-25. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11n (UNII Band 1) – Ch. 38)

FCC ID: A3LSMA356E		MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset		Page 29 of 116

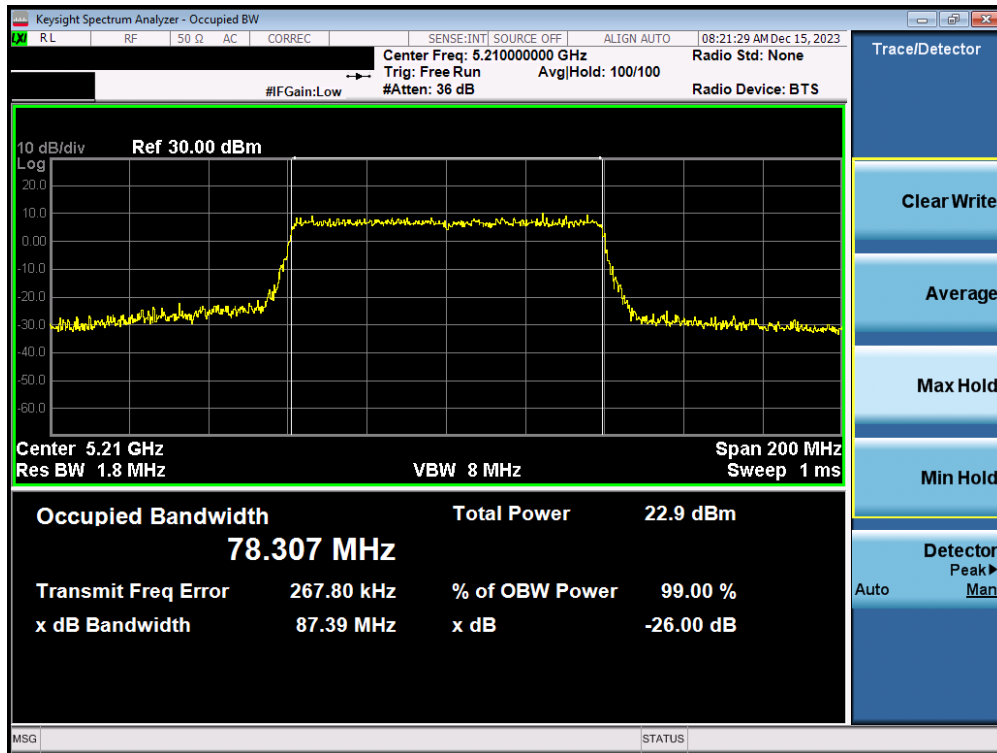


Plot 7-26. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax (UNII Band 1) – Ch. 38)

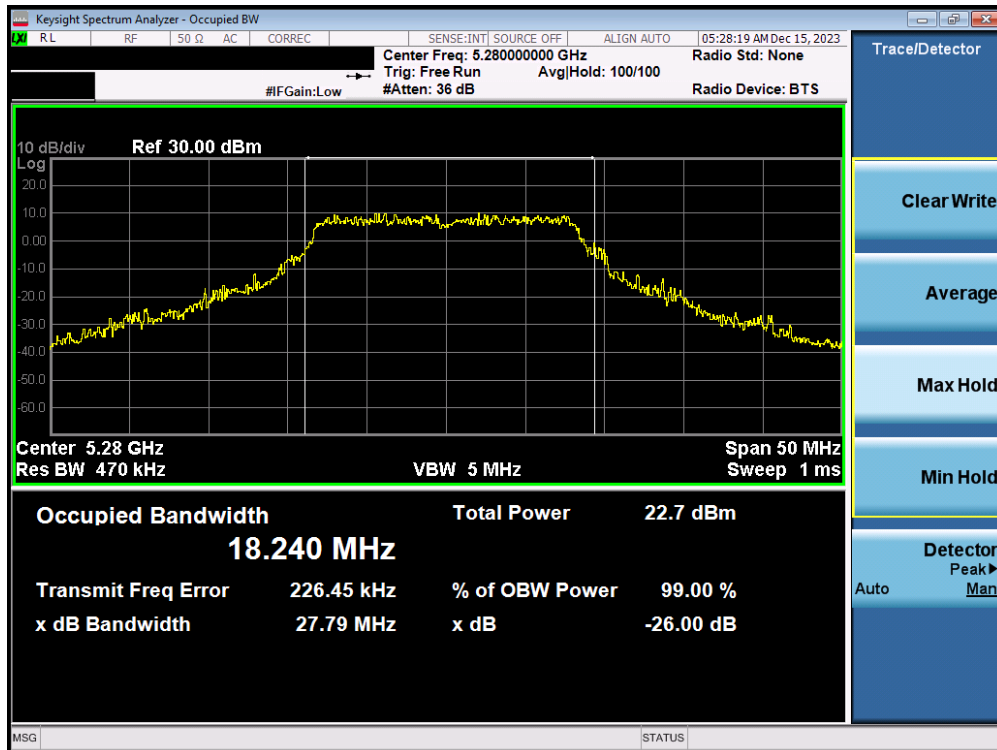


Plot 7-27. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ac (UNII Band 1) – Ch. 42)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 30 of 116

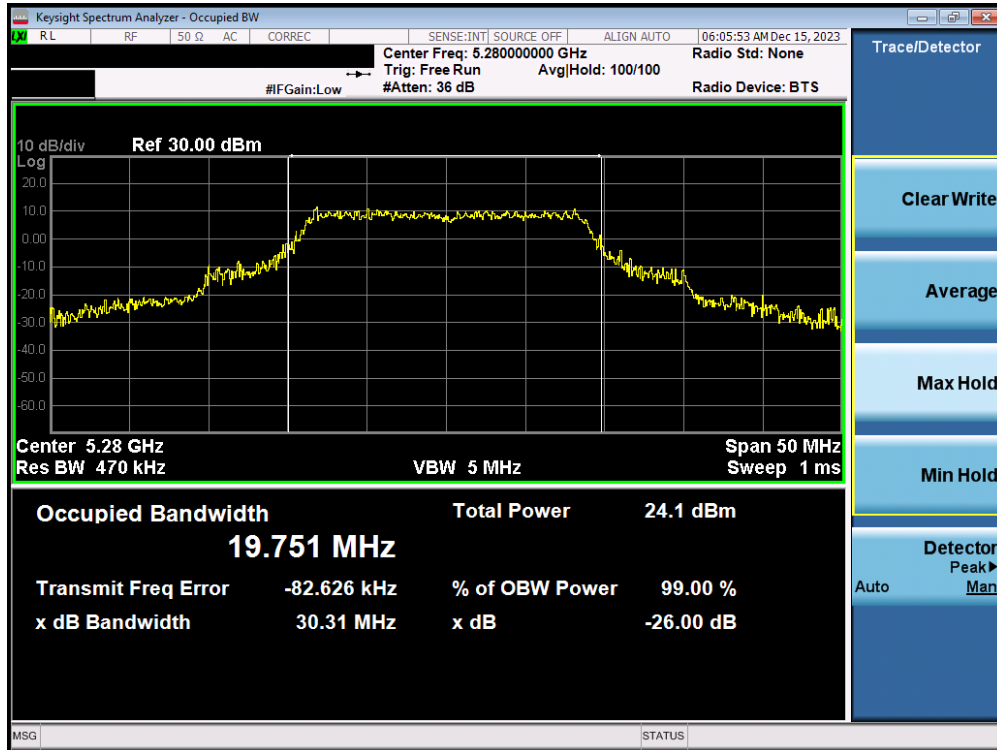


Plot 7-28. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ax (UNII Band 1) – Ch. 42)

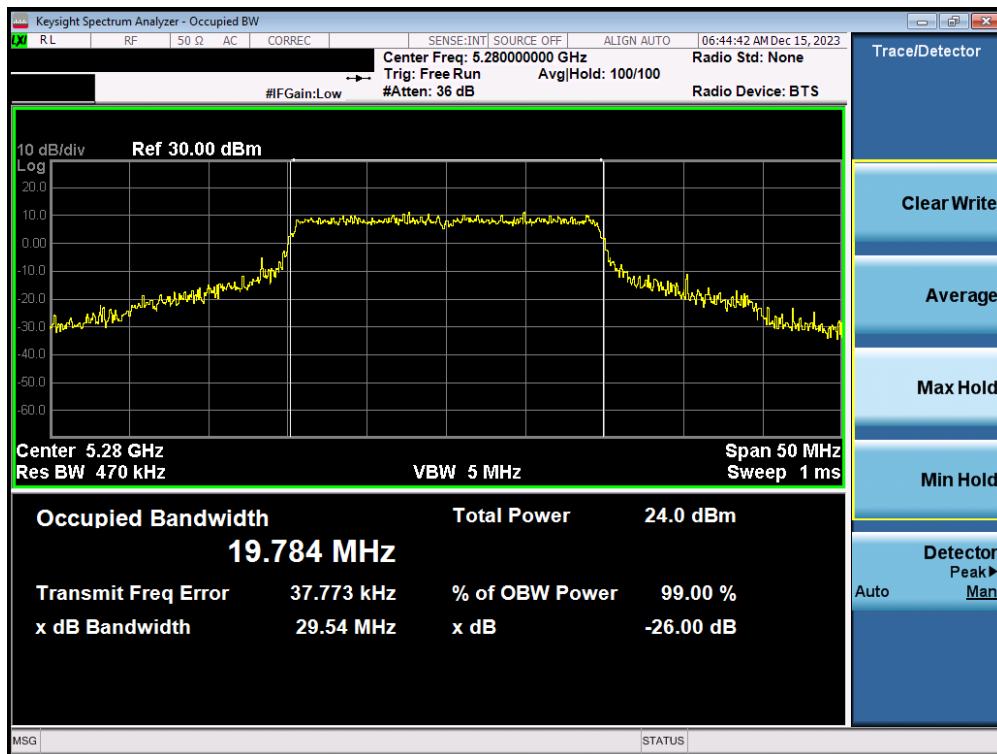


Plot 7-29. 26dB Bandwidth Plot MIMO ANT2 (802.11a (UNII Band 2A) – Ch. 56)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 31 of 116



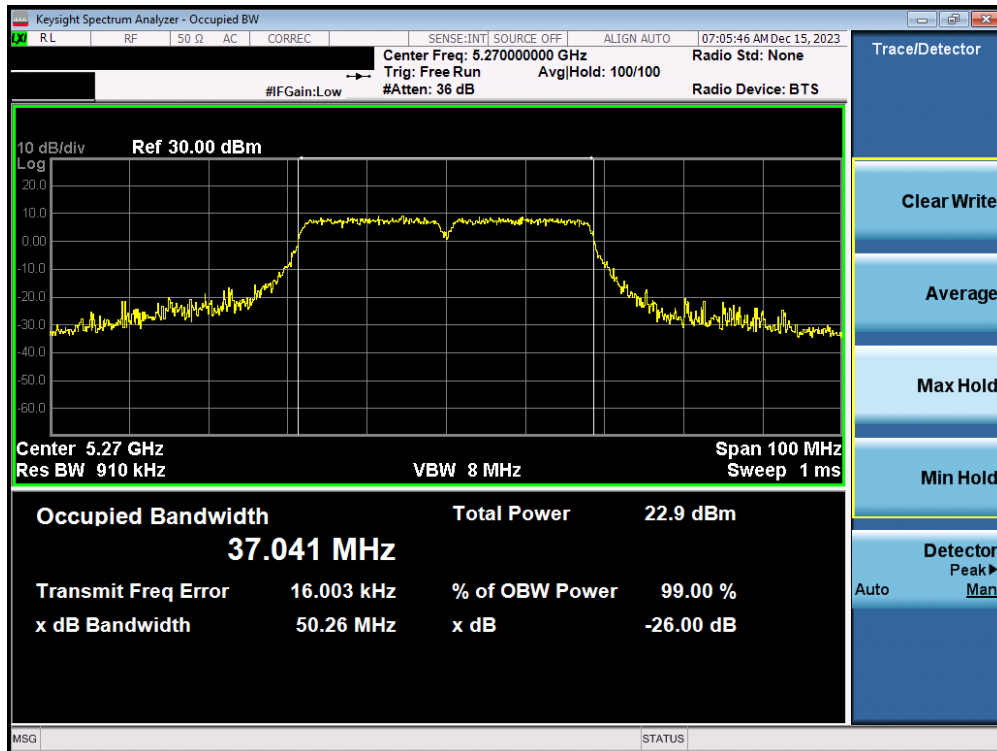
Plot 7-30. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11n (UNII Band 2A) – Ch. 56)



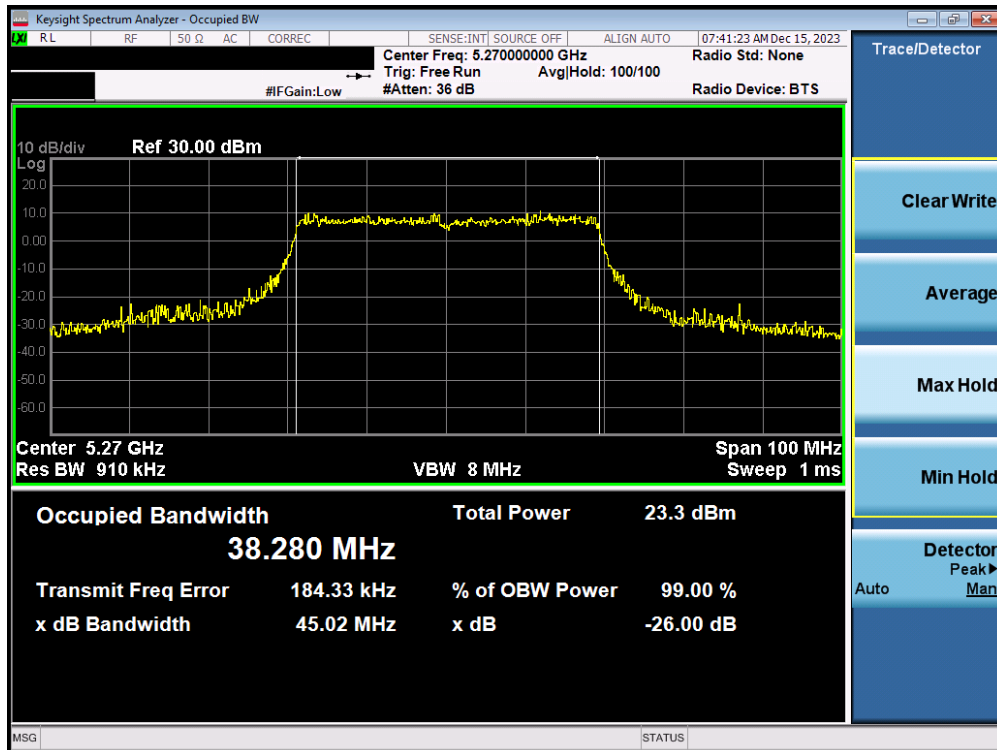
Plot 7-31. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax (UNII Band 2A) – Ch. 56)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 32 of 116



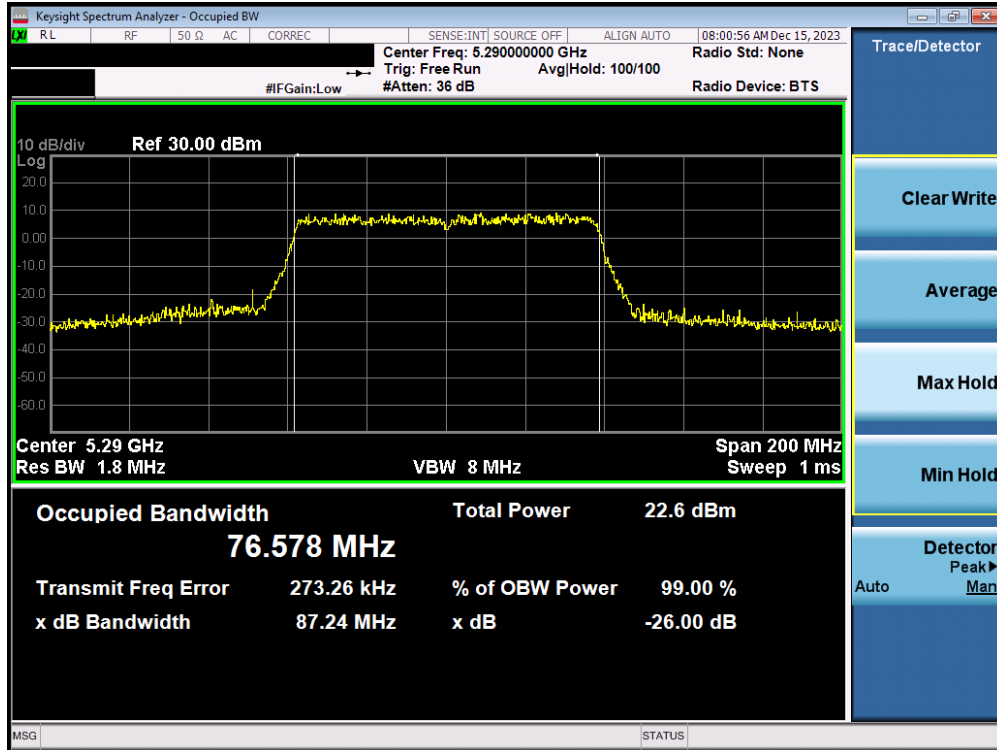


Plot 7-32. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11n (UNII Band 2A) – Ch. 54)

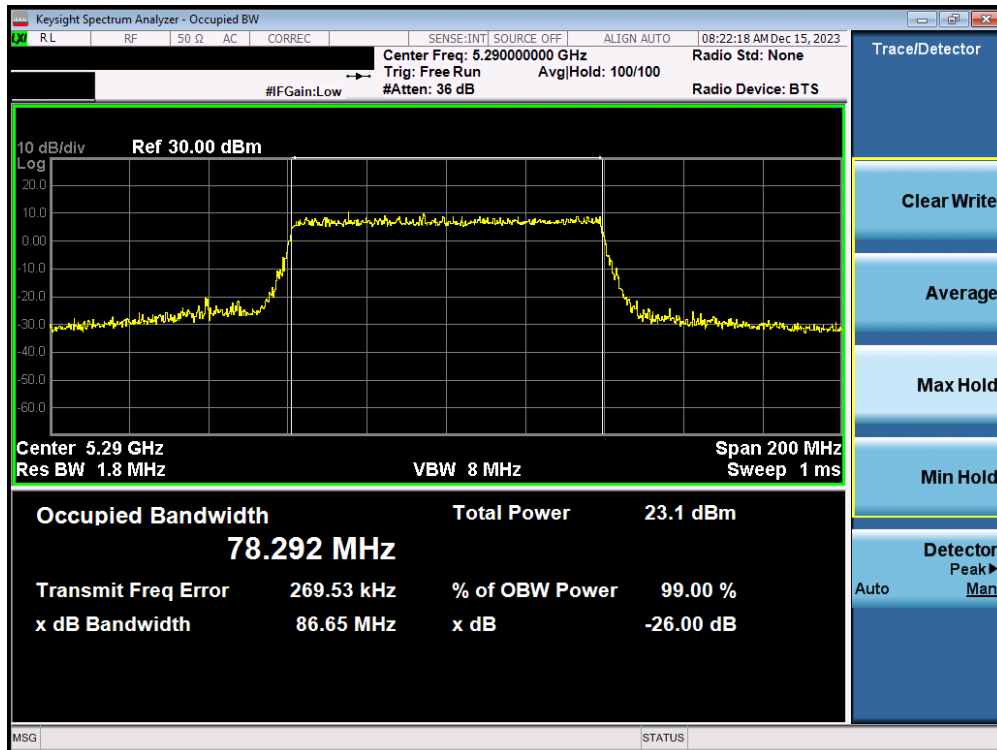


Plot 7-33. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax (UNII Band 2A) – Ch. 54)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 33 of 116

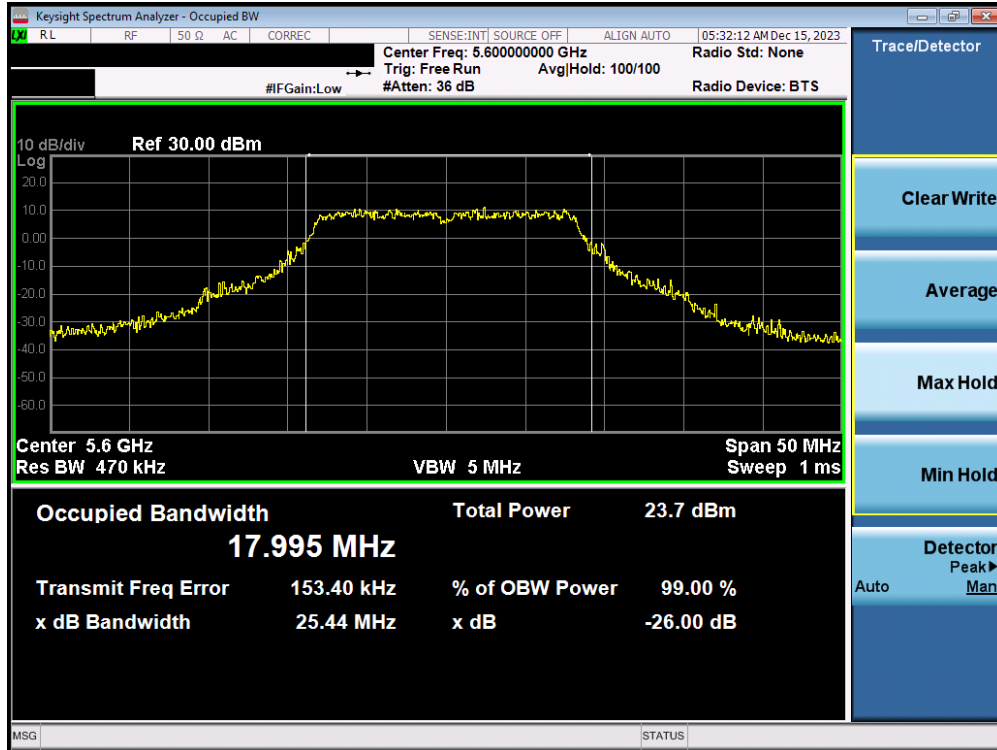


Plot 7-34. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ac (UNII Band 2A) – Ch. 58)

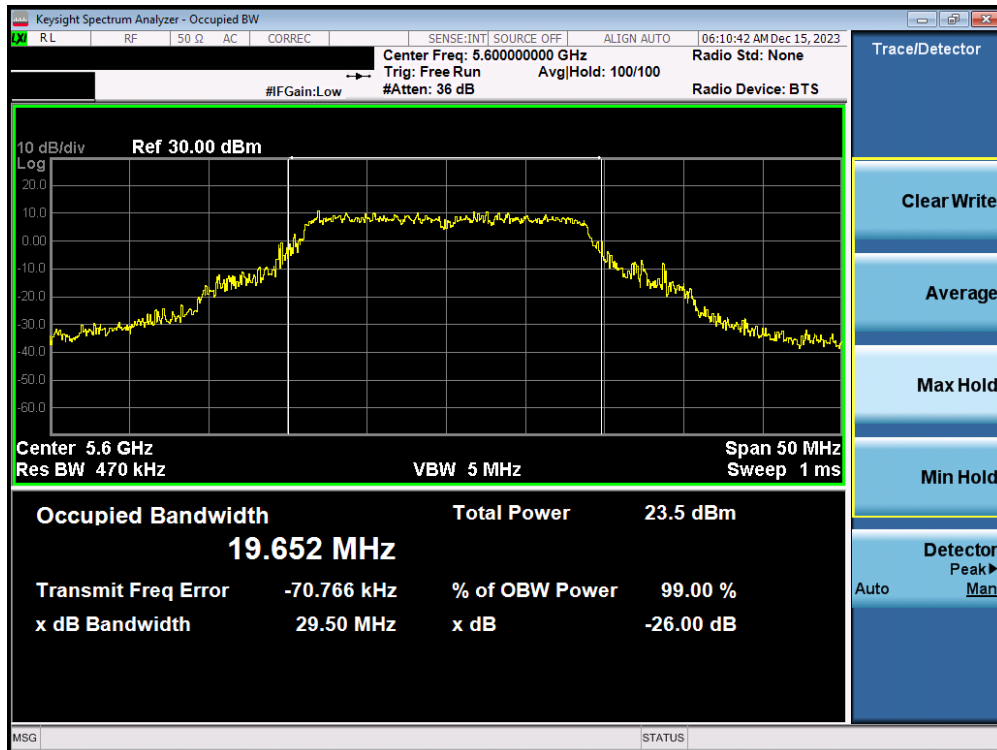


Plot 7-35. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ax (UNII Band 2A) – Ch. 58)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 34 of 116

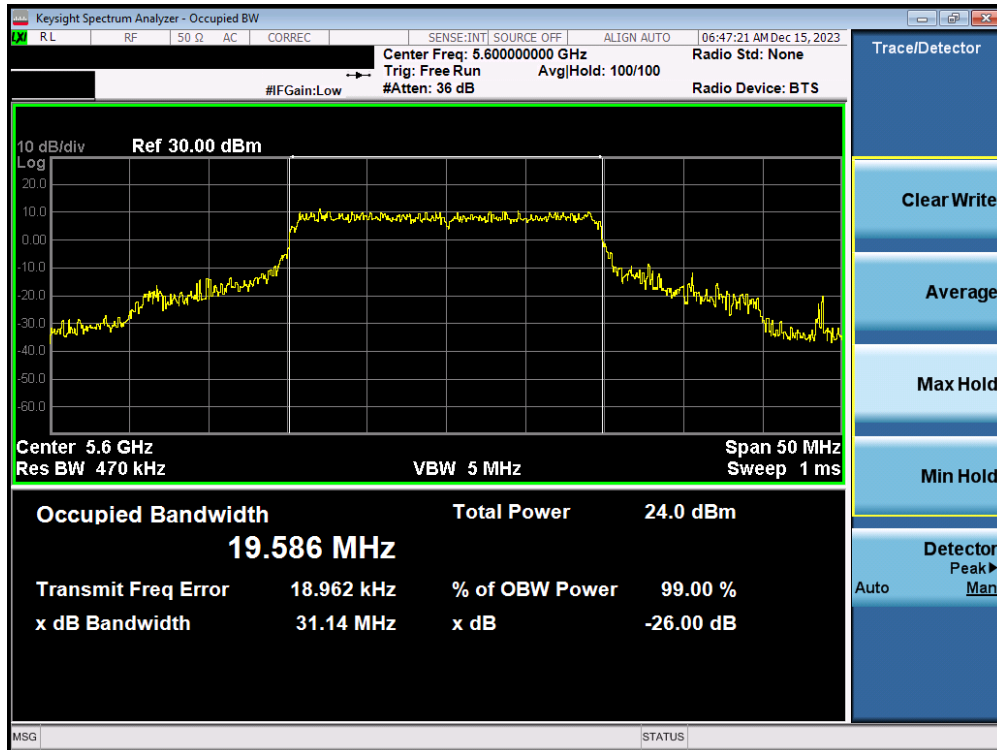


Plot 7-36. 26dB Bandwidth Plot MIMO ANT2 (802.11a (UNII Band 2C) – Ch. 120)

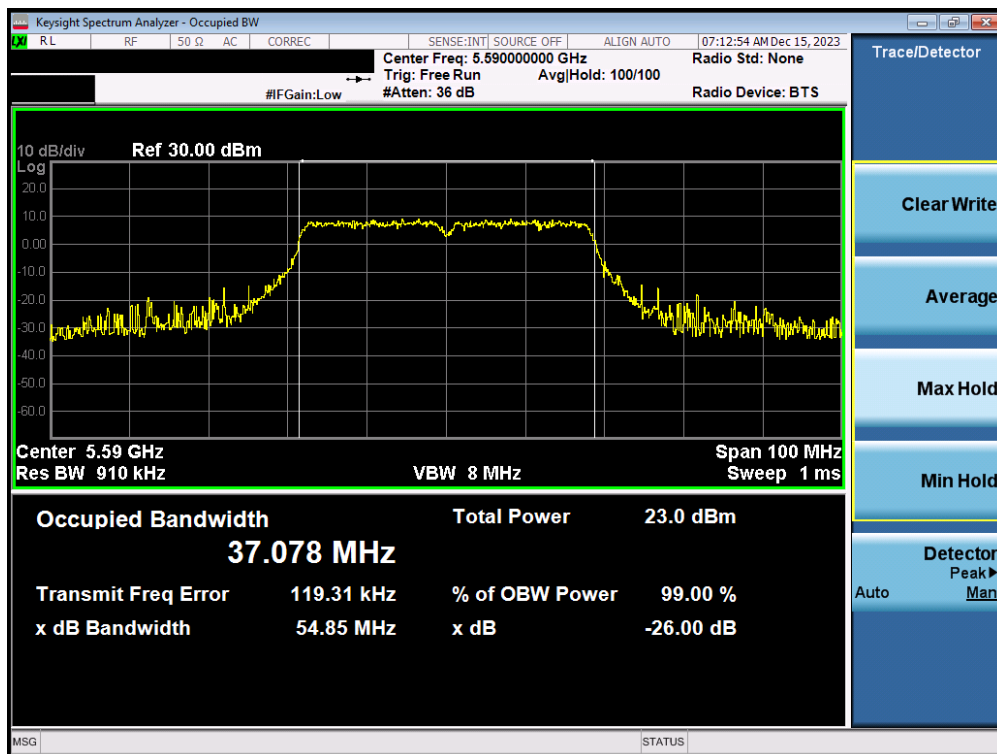


Plot 7-37. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11n (UNII Band 2C) – Ch. 120)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 35 of 116

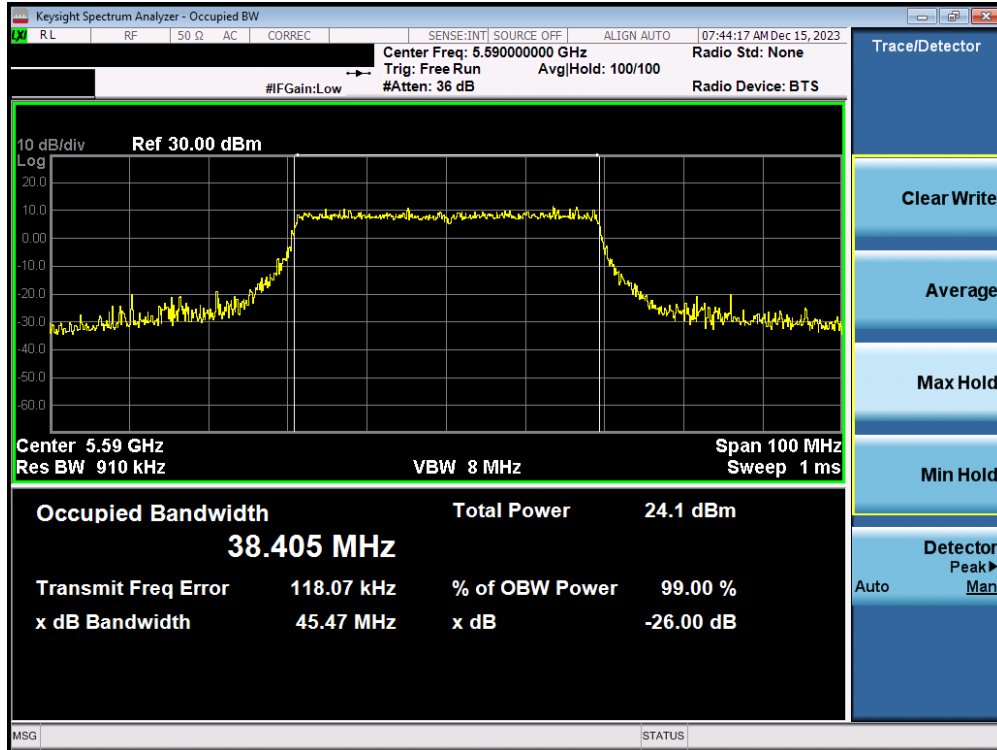


Plot 7-38. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax (UNII Band 2C) – Ch. 120)

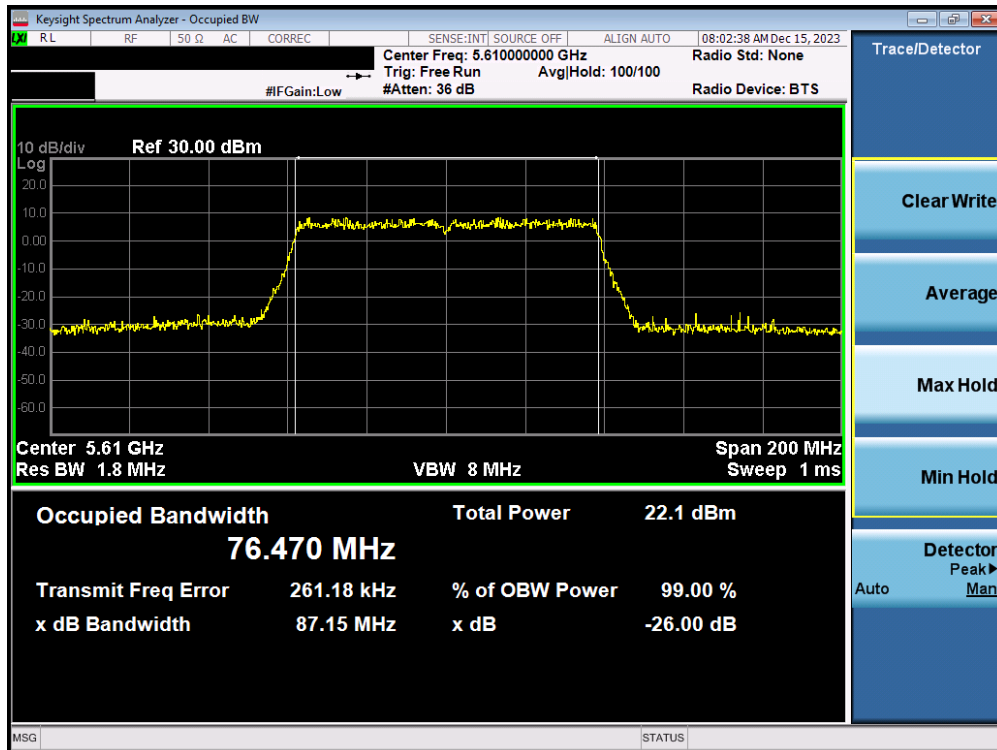


Plot 7-39. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11n (UNII Band 2C) – Ch. 118)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 36 of 116

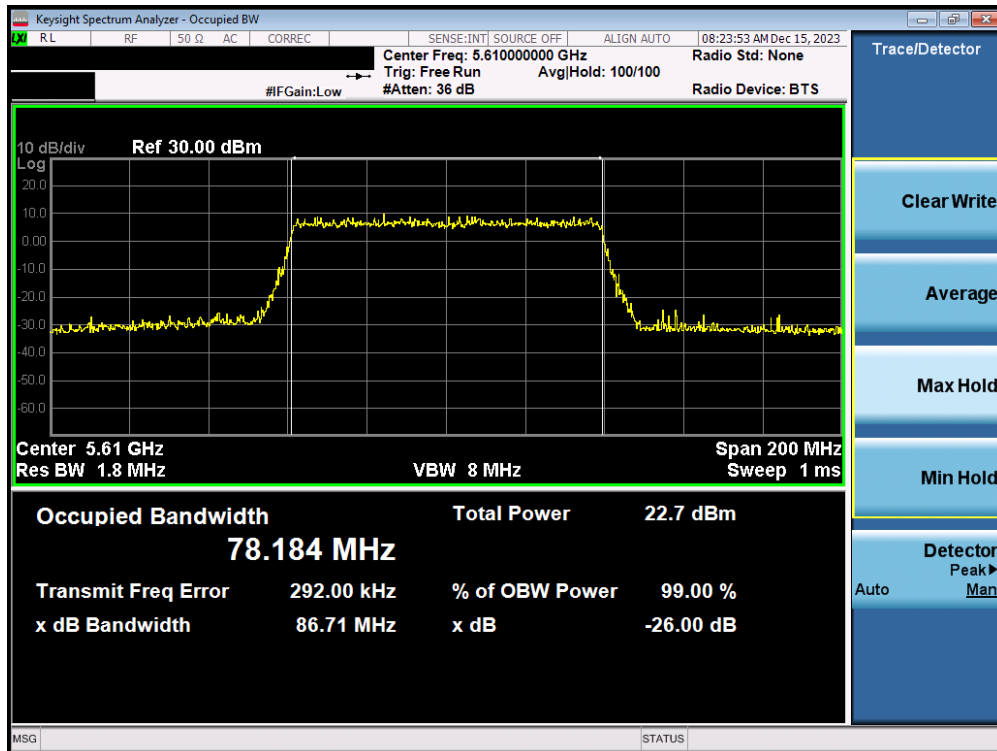


Plot 7-40. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax (UNII Band 2C) – Ch. 118)



Plot 7-41. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ac (UNII Band 2C) – Ch. 122)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-42. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ax (UNII Band 2C) – Ch. 122)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 38 of 116

### 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

None.

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 39 of 116

## MIMO 6dB Bandwidth Measurements

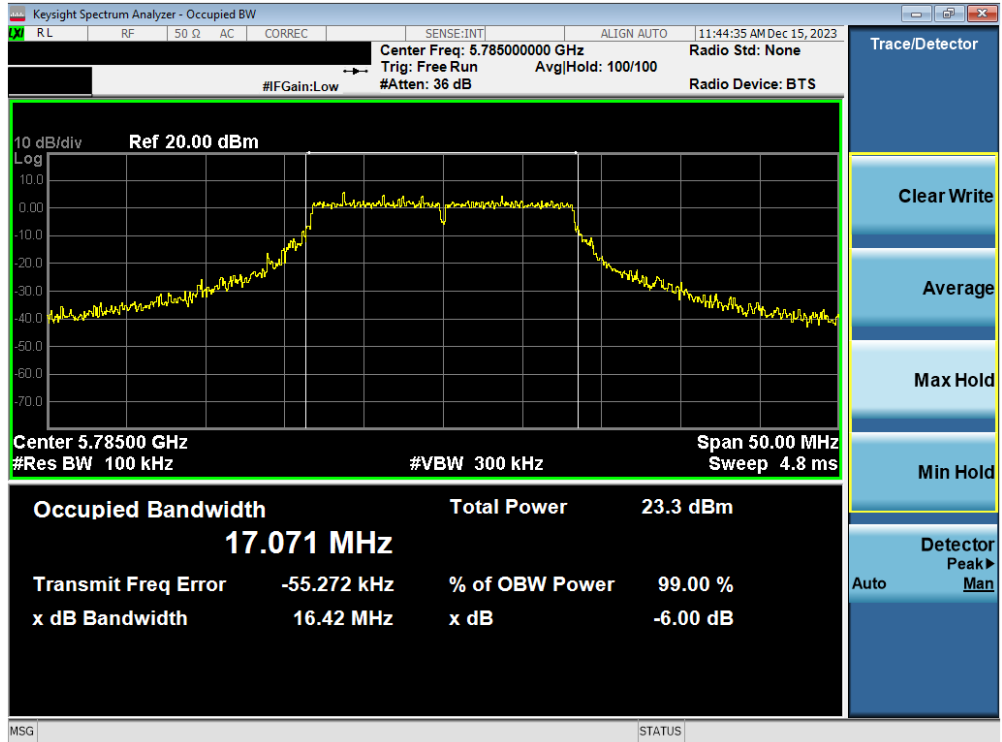
	Frequency [MHz]	Channel	802.11 MODE	Antenna-1 6dB Bandwidth [MHz]	Antenna-2 6dB Bandwidth [MHz]
<b>Band 3</b>	5745	149	a	16.44	16.42
	5785	157	a	16.42	16.43
	5825	165	a	16.43	16.44
	5745	149	n (20MHz)	17.71	17.66
	5785	157	n (20MHz)	17.71	17.65
	5825	165	n (20MHz)	17.65	17.66
	5745	149	ac (20MHz)	17.64	17.66
	5785	157	ac (20MHz)	17.64	17.67
	5825	165	ac (20MHz)	17.66	17.69
	5745	149	ax SU (20MHz)	19.08	19.13
	5785	157	ax SU (20MHz)	19.12	19.07
	5825	165	ax SU (20MHz)	19.42	19.34
	5755	151	n (40MHz)	36.43	36.50
	5795	159	n (40MHz)	36.49	36.50
	5755	151	ac (40MHz)	36.47	36.49
	5795	159	ac (40MHz)	36.45	36.50
	5755	151	ax SU (40MHz)	38.24	38.21
	5795	159	ax SU (40MHz)	38.23	38.24
	5775	155	ac (80MHz)	76.56	76.57
	5775	155	ax SU (80MHz)	78.17	78.13

**Table 7-3. Band 3 Conducted 6dB Bandwidth Measurements**

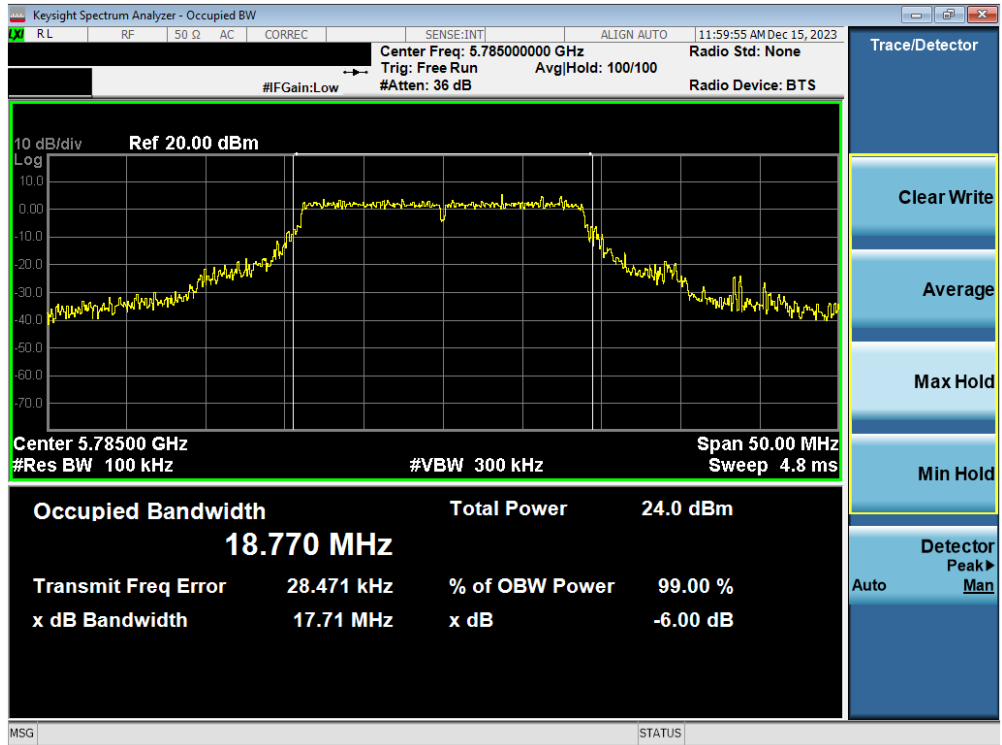
<b>FCC ID:</b> A3LSMA356E	<b>MEASUREMENT REPORT</b>		<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1M2310260110-09.A3L	<b>Test Dates:</b> 11/6/2023 - 12/27/2023	<b>EUT Type:</b> Portable Handset	Page 40 of 116



### 7.3.1 MIMO Antenna-1 6dB Bandwidth Measurements

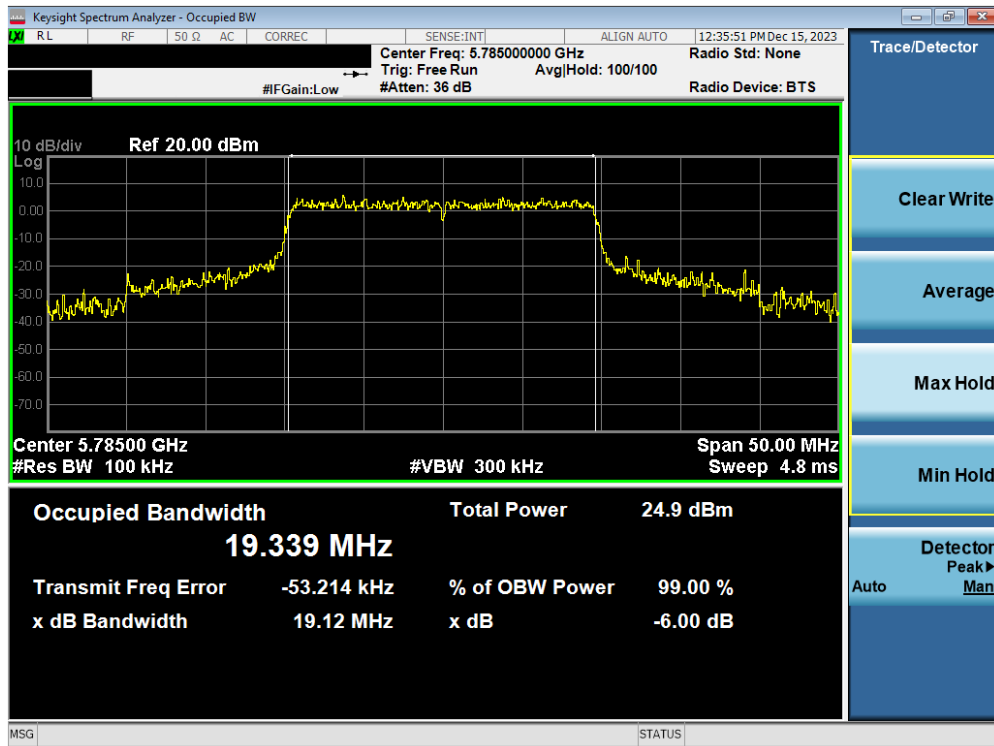


Plot 7-43. 6dB Bandwidth Plot MIMO ANT1 (802.11a (UNII Band 3) – Ch. 157)

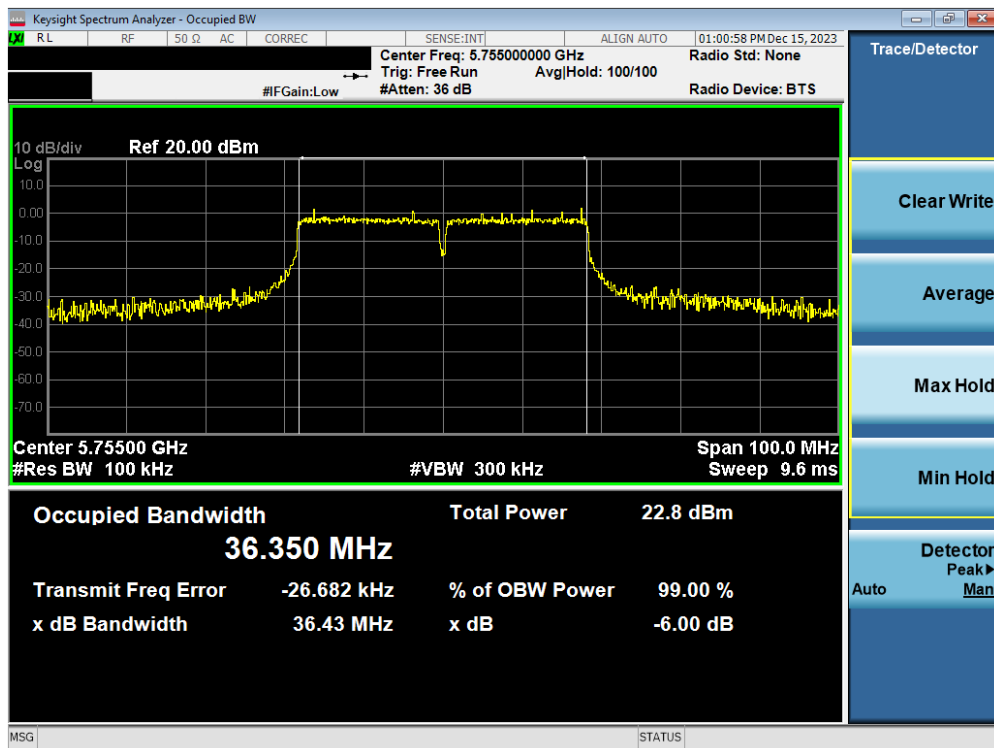


Plot 7-44. 6dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11n (UNII Band 3) – Ch. 157)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 41 of 116

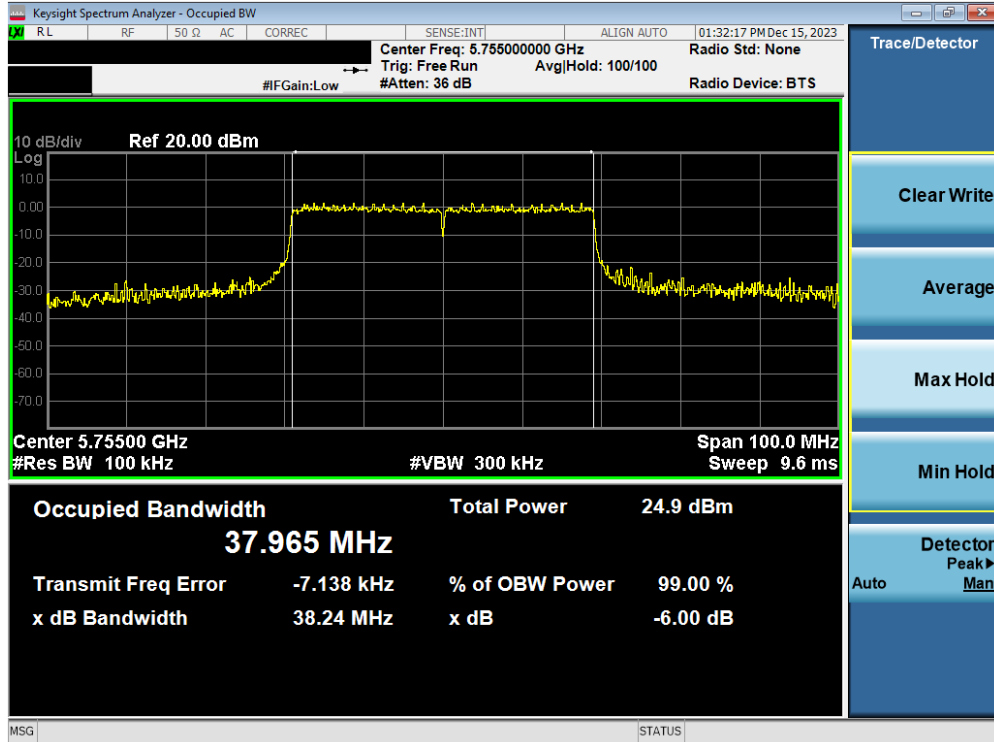


Plot 7-45. 6dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax (UNII Band 3) – Ch. 157)

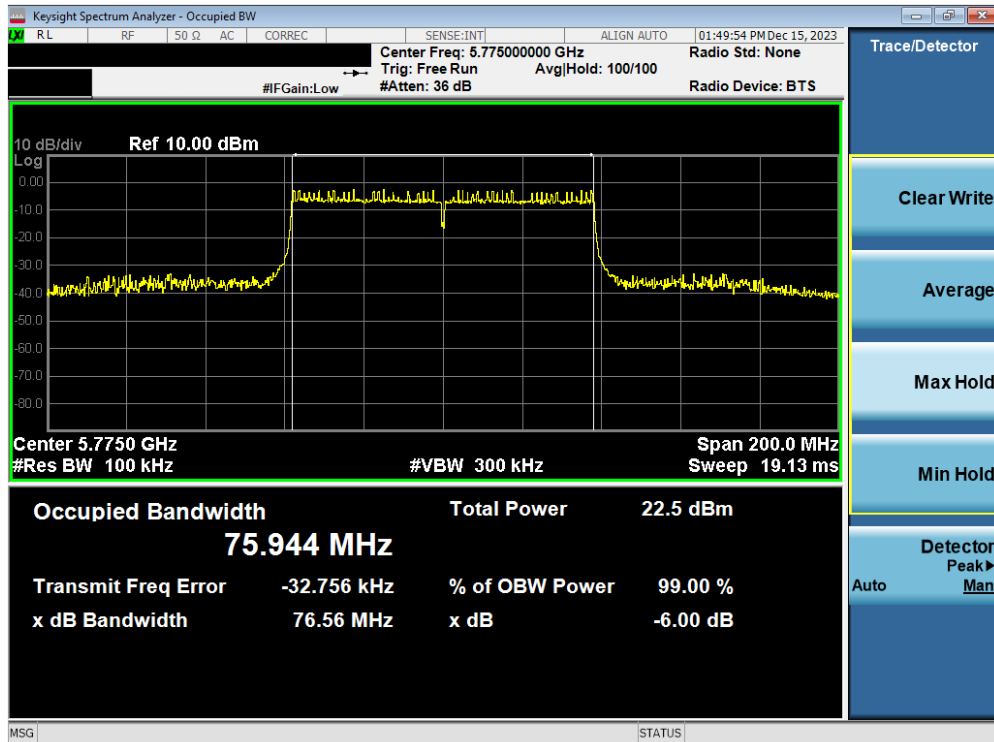


Plot 7-46. 6dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11n (UNII Band 3) – Ch. 151)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 42 of 116

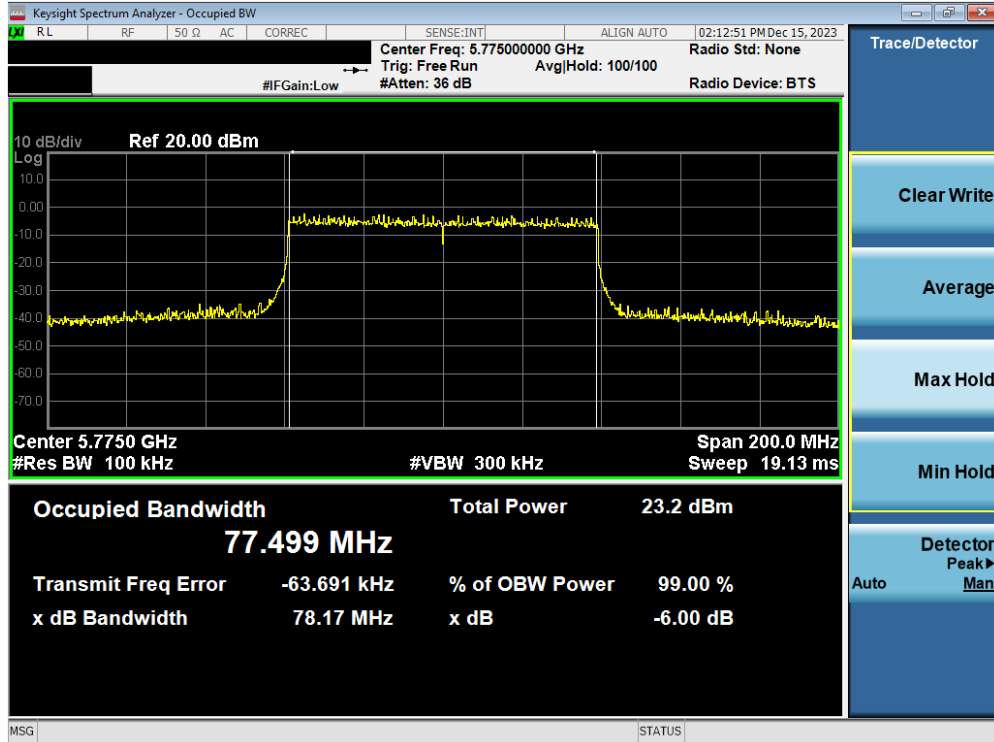


Plot 7-47. 6dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax (UNII Band 3) – Ch. 151)



Plot 7-48. 6dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ac (UNII Band 3) – Ch. 155)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 43 of 116



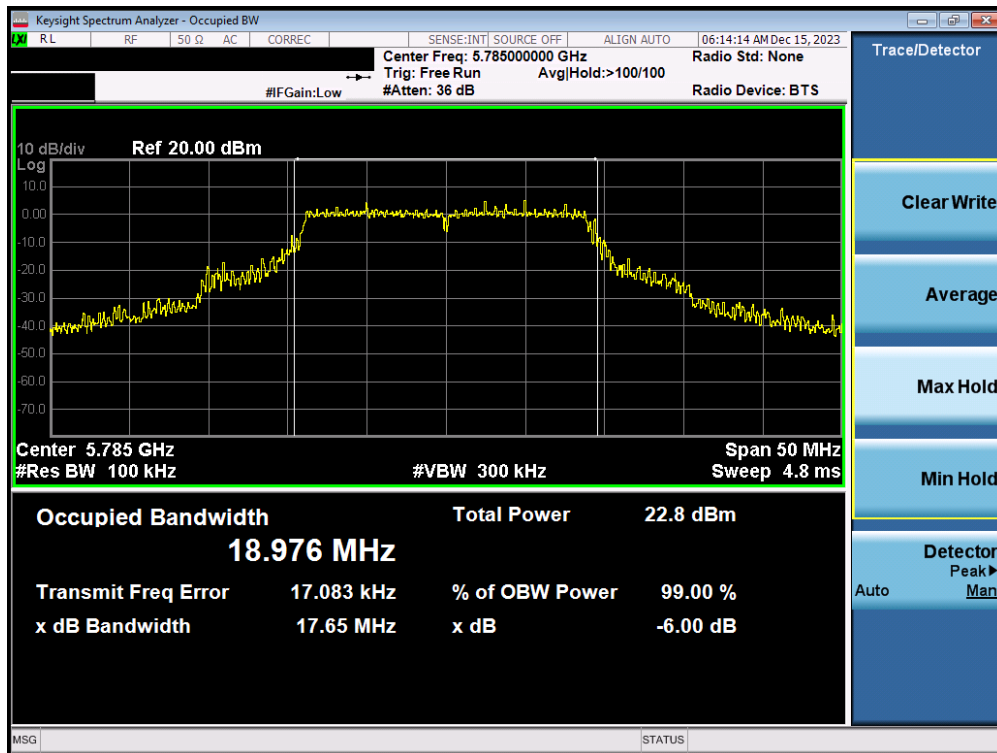
Plot 7-49. 6dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax (UNII Band 3) – Ch. 155)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 44 of 116

### 7.3.2 MIMO Antenna-2 6dB Bandwidth Measurements

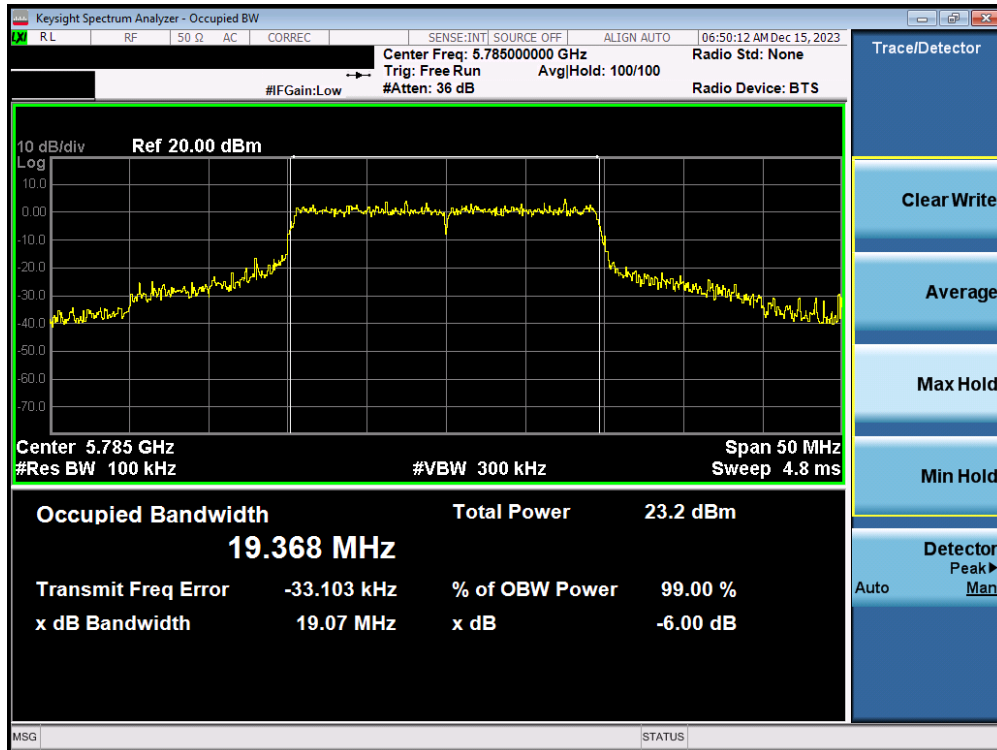


Plot 7-50. 6dB Bandwidth Plot MIMO ANT2 (802.11a (UNII Band 3) – Ch. 157)

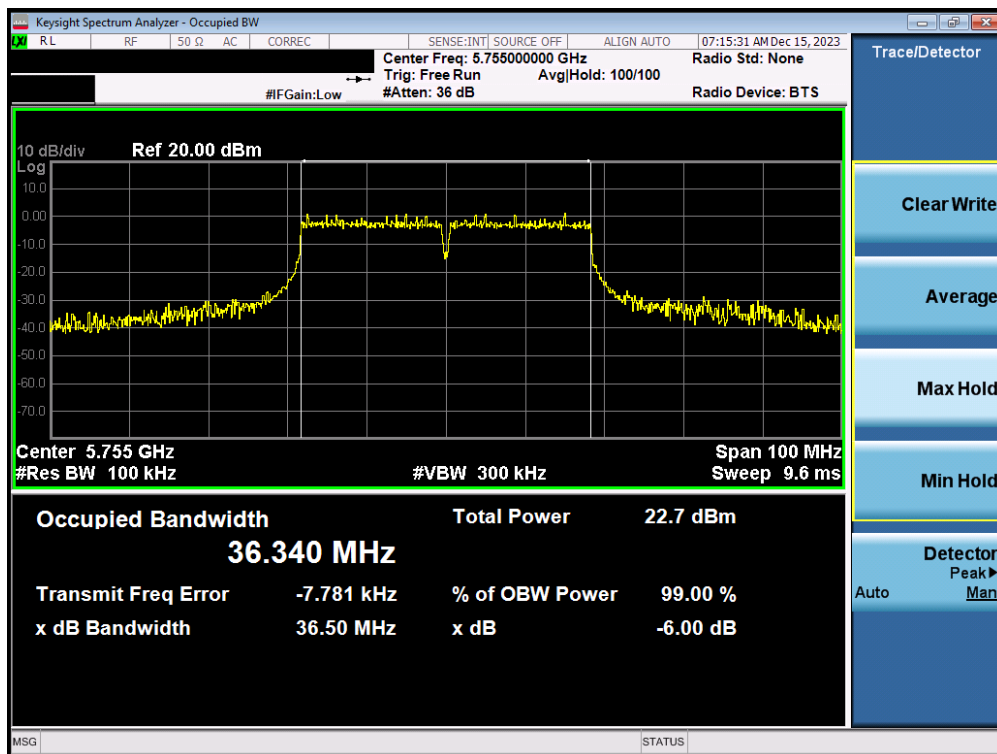


Plot 7-51. 6dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11n (UNII Band 3) – Ch. 157)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 45 of 116

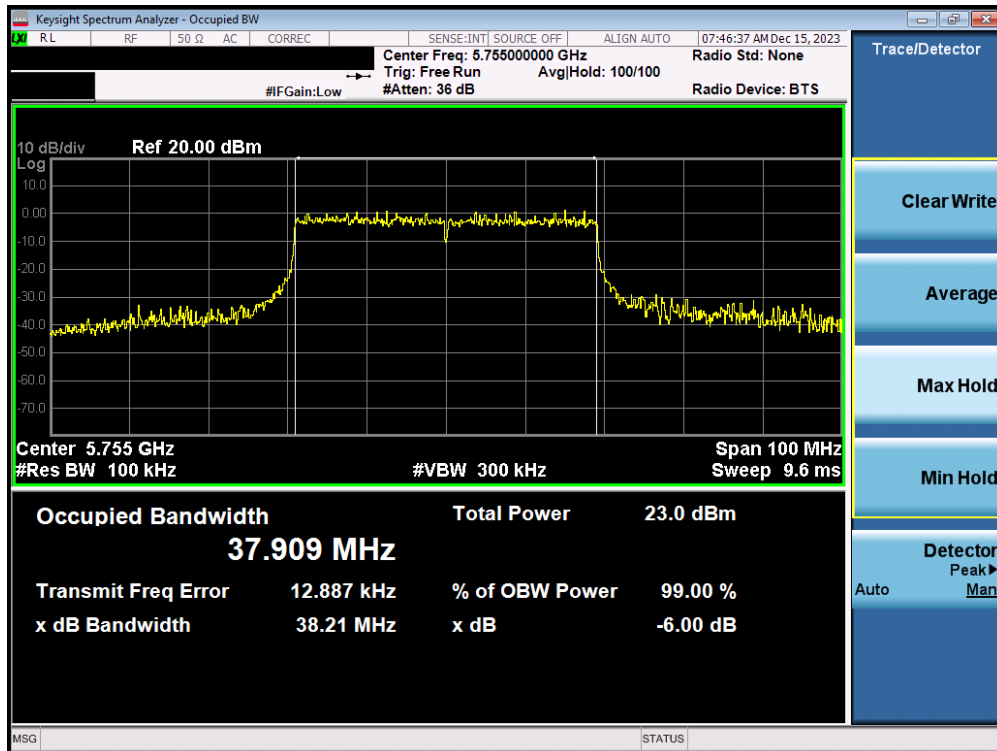


Plot 7-52. 6dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax (UNII Band 3) – Ch. 157)

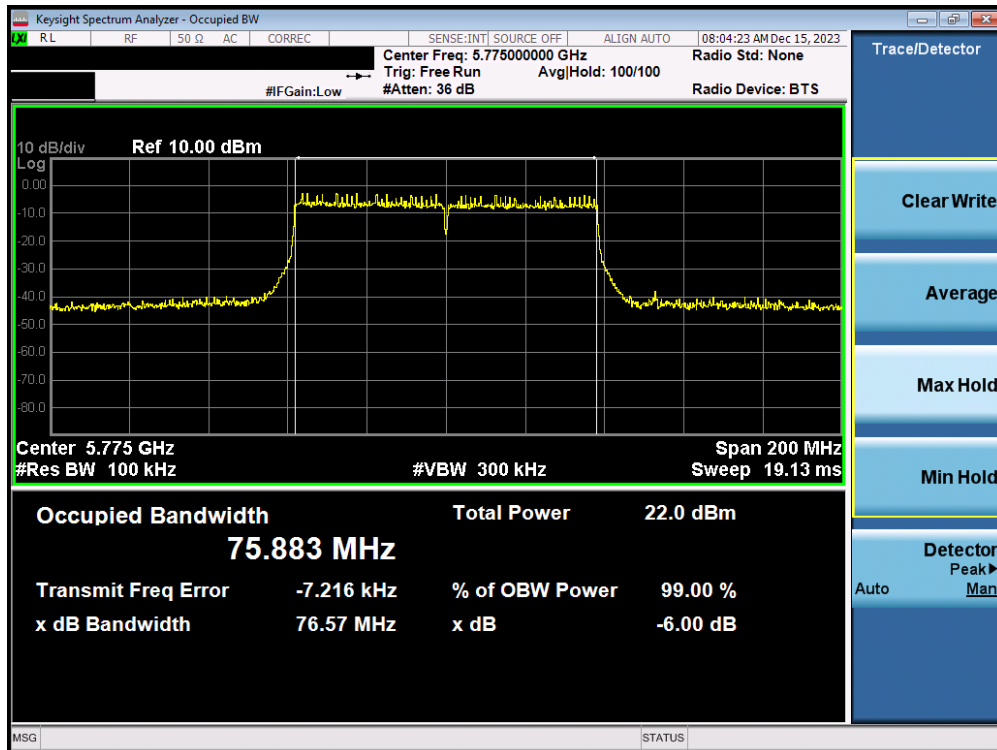


Plot 7-53. 6dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11n (UNII Band 3) – Ch. 151)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 46 of 116

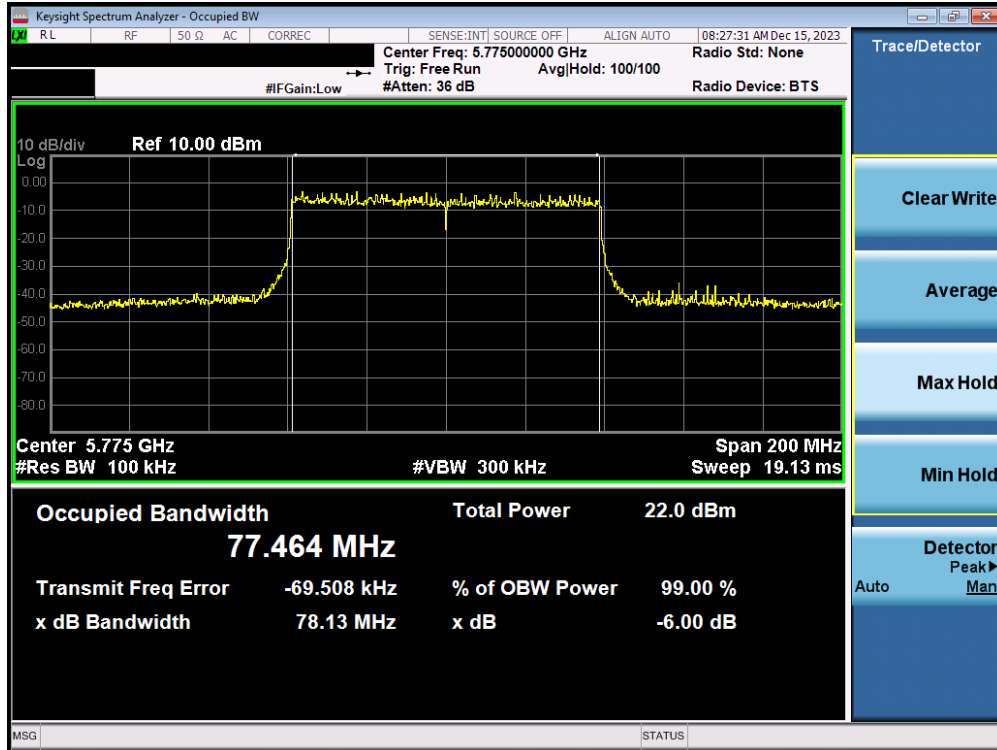


Plot 7-54. 6dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax (UNII Band 3) – Ch. 151)



Plot 7-55. 6dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ac (UNII Band 3) – Ch. 155)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 47 of 116



Plot 7-56. 6dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ax (UNII Band 3) – Ch. 155)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 48 of 116



## 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 as 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) <b>or</b> 10dBm + 10log <sub>10</sub> B
UNII 2A	5.25 – 5.35GHz	The lesser of 23.98dBm (250mW) <b>or</b> 11dBm + 10log <sub>10</sub> B		N/A	The lesser of 30dBm (1W) <b>or</b> 17dBm + 10log <sub>10</sub> B
UNII 2C	5.47 – 5.725GHz				
UNII 3	5.725 – 5.850GHz	30dBm (1W)		N/A	N/A

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

UNII Band	Frequency Range	Maximum Conducted Power Limit		Maximum e.i.r.p
		ISED		ISED
UNII 1	5.15 – 5.25GHz	N/A		The lesser of 23.01dBm (200mW) <b>or</b> 10dBm + 10log <sub>10</sub> B
UNII 2A	5.25 – 5.35GHz	The lesser of 23.98dBm (250mW) <b>or</b> 11dBm + 10log <sub>10</sub> B		The lesser of 30dBm (1W) <b>or</b> 17dBm + 10log <sub>10</sub> B
UNII 2C	5.47 – 5.725GHz			
UNII 3	5.725 – 5.850GHz	30dBm (1W)		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.

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**Figure 7-3. Test Instrument & Measurement Setup**

**Test Notes**

None.

<b>FCC ID:</b> A3LSMA356E	<b>MEASUREMENT REPORT</b>		<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1M2310260110-09.A3L	<b>Test Dates:</b> 11/6/2023 - 12/27/2023	<b>EUT Type:</b> Portable Handset	Page 50 of 116

## MIMO Maximum Conducted Output Power Measurements

IEEE 802.11a	5GHz WIFI (20MHz 802.11a MIMO)					Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]	
	Band	Freq [MHz]	Channel	Avg. Conducted Powers [dBm]								
				ANT1	ANT2							MIMO
	UNII-1	5180	36	16.92	16.75							19.85
5200		40	16.80	16.58	19.70	23.98	-4.28	-0.50	19.20	30.00	-10.80	
5220		44	16.83	16.38	19.62	23.98	-4.36	-0.50	19.12	30.00	-10.88	
5240		48	16.26	16.51	19.40	23.98	-4.58	-0.50	18.90	30.00	-11.10	
UNII-2A	5260	52	16.85	15.65	19.30	23.98	-4.68	0.45	19.75	30.00	-10.25	
	5280	56	16.90	16.01	19.49	23.98	-4.49	0.45	19.94	30.00	-10.06	
	5300	60	16.81	16.31	19.58	23.98	-4.40	0.45	20.03	30.00	-9.97	
	5320	64	16.99	15.72	19.41	23.98	-4.57	0.45	19.86	30.00	-10.14	
UNII-2C	5500	100	16.99	15.24	19.21	23.98	-4.77	-0.33	18.88	30.00	-11.12	
	5600	120	16.42	16.32	19.38	23.98	-4.60	-0.33	19.05	30.00	-10.95	
	5620	124	16.89	15.80	19.39	23.98	-4.59	-0.33	19.06	30.00	-10.94	
	5720	144	16.65	15.99	19.34	23.98	-4.64	-0.33	19.01	30.00	-10.99	
UNII-3	5745	149	16.84	15.93	19.42	30.00	-10.58	0.05	19.47	36.00	-16.53	
	5785	157	16.89	16.21	19.57	30.00	-10.43	0.05	19.62	36.00	-16.38	
	5825	165	16.30	16.68	19.50	30.00	-10.50	0.05	19.55	36.00	-16.45	

Table 7-4. MIMO 20MHz BW 802.11a (UNII) Maximum Conducted Output Power

IEEE 802.11n	5GHz WIFI (20MHz 802.11n MIMO)					Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]	
	Band	Freq [MHz]	Channel	Avg. Conducted Powers [dBm]								
				ANT1	ANT2							MIMO
	UNII-1	5180	36	16.62	16.72							19.68
5200		40	16.99	16.63	19.82	23.98	-4.16	-0.50	19.32	30.00	-10.68	
5220		44	16.96	16.10	19.56	23.98	-4.42	-0.50	19.06	30.00	-10.94	
5240		48	16.99	16.55	19.79	23.98	-4.19	-0.50	19.29	30.00	-10.71	
UNII-2A	5260	52	16.96	16.15	19.58	23.98	-4.40	0.45	20.03	30.00	-9.97	
	5280	56	16.89	16.50	19.71	23.98	-4.27	0.45	20.16	30.00	-9.84	
	5300	60	16.99	16.12	19.59	23.98	-4.39	0.45	20.04	30.00	-9.96	
	5320	64	16.99	15.60	19.36	23.98	-4.62	0.45	19.81	30.00	-10.19	
UNII-2C	5500	100	16.99	15.40	19.28	23.98	-4.70	-0.33	18.95	30.00	-11.05	
	5600	120	16.49	16.56	19.54	23.98	-4.44	-0.33	19.21	30.00	-10.79	
	5620	124	16.82	15.45	19.20	23.98	-4.78	-0.33	18.87	30.00	-11.13	
	5720	144	16.79	15.42	19.17	23.98	-4.81	-0.33	18.84	30.00	-11.16	
UNII-3	5745	149	16.98	15.88	19.48	30.00	-10.52	0.05	19.53	36.00	-16.47	
	5785	157	16.99	16.25	19.65	30.00	-10.35	0.05	19.70	36.00	-16.30	
	5825	165	16.30	16.02	19.17	30.00	-10.83	0.05	19.22	36.00	-16.78	

Table 7-5. MIMO 20MHz BW 802.11n (UNII) Maximum Conducted Output Power

IEEE 802.11ac	5GHz WIFI (20MHz 802.11ac MIMO)					Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]	
	Band	Freq [MHz]	Channel	Avg. Conducted Powers [dBm]								
				ANT1	ANT2							MIMO
	UNII-1	5180	36	16.85	16.78							19.83
5200		40	16.73	16.56	19.66	23.98	-4.32	-0.50	19.16	30.00	-10.84	
5220		44	16.99	16.46	19.74	23.98	-4.24	-0.50	19.24	30.00	-10.76	
5240		48	16.99	16.42	19.72	23.98	-4.26	-0.50	19.22	30.00	-10.78	
UNII-2A	5260	52	16.99	15.94	19.51	23.98	-4.47	0.45	19.96	30.00	-10.04	
	5280	56	16.68	16.30	19.50	23.98	-4.48	0.45	19.95	30.00	-10.05	
	5300	60	16.90	16.06	19.51	23.98	-4.47	0.45	19.96	30.00	-10.04	
	5320	64	16.88	16.20	19.56	23.98	-4.42	0.45	20.01	30.00	-9.99	
UNII-2C	5500	100	16.99	15.15	19.18	23.98	-4.80	-0.33	18.85	30.00	-11.15	
	5600	120	16.99	15.64	19.38	23.98	-4.60	-0.33	19.05	30.00	-10.95	
	5620	124	16.99	15.73	19.42	23.98	-4.56	-0.33	19.09	30.00	-10.91	
	5720	144	16.99	15.55	19.34	23.98	-4.64	-0.33	19.01	30.00	-10.99	
UNII-3	5745	149	16.83	15.67	19.30	30.00	-10.70	0.05	19.35	36.00	-16.65	
	5785	157	16.91	16.90	19.92	30.00	-10.08	0.05	19.97	36.00	-16.03	
	5825	165	16.53	16.67	19.61	30.00	-10.39	0.05	19.66	36.00	-16.34	

Table 7-6. MIMO 20MHz BW 802.11ac (UNII) Maximum Conducted Output Power

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IEEE 802.11ax SU	5GHz WIFI (20MHz 802.11ax MIMO)					Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]	
	Band	Freq [MHz]	Channel	Avg. Conducted Powers [dBm]								
				ANT1	ANT2							MIMO
UNII-1	5180	36	16.98	16.96	19.98	23.98	-4.00	-0.50	19.48	30.00	-10.52	
	5200	40	16.42	16.50	19.47	23.98	-4.51	-0.50	18.97	30.00	-11.03	
	5220	44	16.92	16.40	19.68	23.98	-4.30	-0.50	19.18	30.00	-10.82	
	5240	48	16.99	16.44	19.73	23.98	-4.25	-0.50	19.23	30.00	-10.77	
UNII-2A	5260	52	16.90	15.57	19.30	23.98	-4.68	0.45	19.75	30.00	-10.25	
	5280	56	16.99	16.42	19.72	23.98	-4.26	0.45	20.17	30.00	-9.83	
	5300	60	16.81	16.15	19.50	23.98	-4.48	0.45	19.95	30.00	-10.05	
	5320	64	16.63	15.95	19.31	23.98	-4.67	0.45	19.76	30.00	-10.24	
UNII-2C	5500	100	16.83	15.80	19.36	23.98	-4.62	-0.33	19.03	30.00	-10.97	
	5600	120	16.80	16.50	19.66	23.98	-4.32	-0.33	19.33	30.00	-10.67	
	5620	124	16.73	15.47	19.16	23.98	-4.82	-0.33	18.83	30.00	-11.17	
	5720	144	16.77	16.81	19.80	23.98	-4.18	-0.33	19.47	30.00	-10.53	
UNII-3	5745	149	16.99	15.62	19.37	30.00	-10.63	0.05	19.42	36.00	-16.58	
	5785	157	16.74	15.81	19.31	30.00	-10.69	0.05	19.36	36.00	-16.64	
	5825	165	16.45	16.78	19.63	30.00	-10.37	0.05	19.68	36.00	-16.32	

Table 7-7. MIMO 20MHz BW 802.11ax (UNII) Maximum Conducted Output Power

IEEE 802.11n	5GHz WIFI (40MHz 802.11n MIMO)					Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]	
	Band	Freq [MHz]	Channel	Avg. Conducted Powers [dBm]								
				ANT1	ANT2							MIMO
UNII-1	5190	38	15.92	15.40	18.68	23.98	-5.30	-0.50	18.18	30.00	-11.82	
	5230	46	15.99	15.97	18.99	23.98	-4.99	-0.50	18.49	30.00	-11.51	
UNII-2A	5270	54	15.84	15.36	18.62	23.98	-5.36	0.45	19.07	30.00	-10.93	
	5310	62	15.99	15.40	18.72	23.98	-5.26	0.45	19.17	30.00	-10.83	
UNII-2C	5510	102	13.66	13.01	16.36	23.98	-7.62	-0.33	16.03	30.00	-13.97	
	5590	118	15.76	14.82	18.33	23.98	-5.65	-0.33	18.00	30.00	-12.00	
	5630	126	15.85	14.83	18.38	23.98	-5.60	-0.33	18.05	30.00	-11.95	
	5710	142	15.30	14.79	18.06	23.98	-5.92	-0.33	17.73	30.00	-12.27	
UNII-3	5755	151	15.60	15.75	18.69	30.00	-11.31	0.05	18.74	36.00	-17.26	
	5795	159	15.57	15.30	18.45	30.00	-11.55	0.05	18.50	36.00	-17.50	

Table 7-8. MIMO 40MHz BW 802.11n (UNII) Maximum Conducted Output Power

IEEE 802.11ac	5GHz WIFI (40MHz 802.11ac MIMO)					Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]	
	Band	Freq [MHz]	Channel	Avg. Conducted Powers [dBm]								
				ANT1	ANT2							MIMO
UNII-1	5190	38	14.69	14.44	17.58	23.98	-6.40	-0.50	17.08	30.00	-12.92	
	5230	46	15.99	15.32	18.68	23.98	-5.30	-0.50	18.18	30.00	-11.82	
UNII-2A	5270	54	15.99	14.56	18.34	23.98	-5.64	0.45	18.79	30.00	-11.21	
	5310	62	14.86	13.69	17.32	23.98	-6.66	0.45	17.77	30.00	-12.23	
UNII-2C	5510	102	13.32	12.89	16.12	23.98	-7.86	-0.33	15.79	30.00	-14.21	
	5590	118	15.78	14.95	18.40	23.98	-5.58	-0.33	18.07	30.00	-11.93	
	5630	126	15.70	14.70	18.24	23.98	-5.74	-0.33	17.91	30.00	-12.09	
	5710	142	15.62	14.92	18.29	23.98	-5.69	-0.33	17.96	30.00	-12.04	
UNII-3	5755	151	15.33	14.98	18.17	30.00	-11.83	0.05	18.22	36.00	-17.78	
	5795	159	15.55	15.01	18.30	30.00	-11.70	0.05	18.35	36.00	-17.65	

Table 7-9. MIMO 40MHz BW 802.11ac (UNII) Maximum Conducted Output Power

IEEE 802.11ax SU	5GHz WIFI (40MHz 802.11ax MIMO)					Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]	
	Band	Freq [MHz]	Channel	Avg. Conducted Powers [dBm]								
				ANT1	ANT2							MIMO
UNII-1	5190	38	14.30	14.03	17.18	23.98	-6.80	-0.50	16.68	30.00	-13.32	
	5230	46	15.81	15.26	18.55	23.98	-5.43	-0.50	18.05	30.00	-11.95	
UNII-2A	5270	54	15.81	14.57	18.24	23.98	-5.74	0.45	18.69	30.00	-11.31	
	5310	62	14.99	13.69	17.40	23.98	-6.58	0.45	17.85	30.00	-12.15	
UNII-2C	5510	102	13.53	12.98	16.27	23.98	-7.71	-0.33	15.94	30.00	-14.06	
	5590	118	15.82	14.96	18.42	23.98	-5.56	-0.33	18.09	30.00	-11.91	
	5630	126	15.22	15.17	18.21	23.98	-5.77	-0.33	17.88	30.00	-12.12	
	5710	142	15.80	14.82	18.35	23.98	-5.63	-0.33	18.02	30.00	-11.98	
UNII-3	5755	151	15.50	14.96	18.25	30.00	-11.75	0.05	18.30	36.00	-17.70	
	5795	159	15.39	14.82	18.12	30.00	-11.88	0.05	18.17	36.00	-17.83	

Table 7-10. MIMO 40MHz BW 802.11ax (UNII) Maximum Conducted Output Power

IEEE 802.11ac	5GHz WIFI (80MHz 802.11ac MIMO)					Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]	
	Band	Freq [MHz]	Channel	Avg. Conducted Powers [dBm]								
				ANT1	ANT2							MIMO
UNII-1	5210	42	13.67	13.50	16.60	23.98	-7.38	-0.50	16.10	30.00	-13.90	
UNII-2A	5290	58	12.80	12.30	15.57	23.98	-8.41	0.45	16.02	30.00	-13.98	
	5530	106	13.51	12.62	16.10	23.98	-7.88	-0.33	15.77	30.00	-14.23	
UNII-2C	5610	122	13.99	13.79	16.90	23.98	-7.08	-0.33	16.57	30.00	-13.43	
	5690	138	13.91	13.85	16.89	23.98	-7.09	-0.33	16.56	30.00	-13.44	
UNII-3	5775	155	13.73	13.62	16.69	30.00	-13.31	0.05	16.74	36.00	-19.26	

Table 7-11. MIMO 80MHz BW 802.11ac (UNII) Maximum Conducted Output Power

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IEEE 802.11ax SU	5GHz WIFI (80MHz 802.11ax MIMO)					Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
	Band	Freq [MHz]	Channel	Avg. Conducted Powers [dBm]							
				ANT1	ANT2	MIMO					
	UNII-1	5210	42	13.99	13.91	16.96	23.98	-7.02	-0.50	16.46	30.00
UNII-2A	5290	58	12.61	12.15	15.40	23.98	-8.58	0.45	15.85	30.00	-14.15
	5530	106	13.99	13.20	16.62	23.98	-7.36	-0.33	16.29	30.00	-13.71
UNII-2C	5610	122	13.94	13.68	16.82	23.98	-7.16	-0.33	16.49	30.00	-13.51
	5690	138	13.96	13.62	16.80	23.98	-7.18	-0.33	16.47	30.00	-13.53
UNII-3	5775	155	13.88	13.64	16.77	30.00	-13.23	0.05	16.82	36.00	-19.18

**Table 7-12. MIMO 80MHz BW 802.11ax (UNII) Maximum Conducted Output Power**

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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 802.11a (20MHz BW) mode, the average conducted output power was measured to be 16.92 dBm for Antenna 1 and 16.75 dBm for Antenna 2.

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

$$(16.92\text{dBm} + 16.75 \text{ dBm}) = (49.20 \text{ mW} + 47.32 \text{ mW}) = 96.52 \text{ mW} = 19.85 \text{ dBm}$$

**Sample e.i.r.p Calculation:**

At 5180MHz in 802.11a (20MHz BW) mode, the average MIMO conducted power was calculated to be 19.85 dBm with directional gain of -0.50 dBi.

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

$$19.85 \text{ dBm} + -0.5 \text{ dBi} = 19.35 \text{ dBm}$$

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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	

UNII Band	Frequency Range	Maximum Conducted Power Limit
		FCC
UNII 1	5.15 – 5.25GHz	11dBm/MHz
UNII 2A	5.25 – 5.35GHz	
UNII 2C	5.47 – 5.725GHz	
UNII 3	5.725 – 5.850GHz	30dBm/500kHz

UNII Band	Frequency Range	Maximum Conducted Power Limit
		ISED
UNII 1	5.15 – 5.25GHz	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

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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**

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## Summed MIMO Power Spectral Density Measurements

	Frequency [MHz]	Channel	802.11 MODE	Antenna 1 PSD [dBm]	Antenna 2 PSD [dBm]	DCCF [dB]	MIMO Summed PSD [dBm]	Max PSD [dBm]	Margin [dB]
Band 1	5180	36	a	5.20	5.26	0.16	8.40	11.00	-2.60
	5200	40	a	6.15	5.60	0.16	9.05	11.00	-1.95
	5240	48	a	5.89	5.14	0.16	8.70	11.00	-2.30
	5180	36	n (20MHz)	5.22	5.09	0.09	8.25	11.00	-2.75
	5200	40	n (20MHz)	5.83	4.96	0.09	8.52	11.00	-2.48
	5240	48	n (20MHz)	6.22	5.66	0.09	9.05	11.00	-1.95
	5180	36	ac (20MHz)	5.40	5.09	0.18	8.44	11.00	-2.56
	5200	40	ac (20MHz)	5.91	5.20	0.18	8.76	11.00	-2.24
	5240	48	ac (20MHz)	5.87	5.11	0.18	8.70	11.00	-2.30
	5180	36	ax SU (20MHz)	5.08	5.16	0.23	8.36	11.00	-2.64
	5200	40	ax SU (20MHz)	4.79	4.32	0.23	7.80	11.00	-3.20
	5240	48	ax SU (20MHz)	5.70	4.79	0.23	8.51	11.00	-2.49
	5190	38	n (40MHz)	1.60	1.16	0.17	4.57	11.00	-6.43
	5230	46	n (40MHz)	1.65	1.34	0.17	4.68	11.00	-6.32
	5190	38	ac (40MHz)	1.38	0.48	0.38	4.34	11.00	-6.66
	5230	46	ac (40MHz)	1.30	0.42	0.38	4.28	11.00	-6.72
	5190	38	ax SU (40MHz)	1.27	0.20	0.45	4.23	11.00	-6.77
	5230	46	ax SU (40MHz)	1.65	0.61	0.45	4.62	11.00	-6.38
	5210	42	ac (80MHz)	-3.39	-3.81	0.49	-0.09	11.00	-11.09
	5210	42	ax SU (80MHz)	-2.90	-3.21	0.52	0.48	11.00	-10.52
Band 2A	5260	52	a	5.85	4.89	0.16	8.57	11.00	-2.43
	5280	56	a	5.63	4.35	0.16	8.21	11.00	-2.79
	5320	64	a	5.59	5.12	0.16	8.53	11.00	-2.47
	5260	52	n (20MHz)	5.47	5.03	0.09	8.36	11.00	-2.64
	5280	56	n (20MHz)	5.93	5.26	0.09	8.70	11.00	-2.30
	5320	64	n (20MHz)	5.35	5.09	0.09	8.32	11.00	-2.68
	5260	52	ac (20MHz)	5.73	4.54	0.18	8.36	11.00	-2.64
	5280	56	ac (20MHz)	5.87	5.15	0.18	8.71	11.00	-2.29
	5320	64	ac (20MHz)	5.38	4.81	0.18	8.30	11.00	-2.70
	5260	52	ax SU (20MHz)	5.25	4.60	0.23	8.18	11.00	-2.82
	5280	56	ax SU (20MHz)	5.17	4.53	0.23	8.10	11.00	-2.90
	5320	64	ax SU (20MHz)	5.05	4.35	0.23	7.95	11.00	-3.05
	5270	54	n (40MHz)	1.52	0.56	0.17	4.24	11.00	-6.76
	5310	62	n (40MHz)	1.16	0.23	0.17	3.90	11.00	-7.10
	5270	54	ac (40MHz)	1.32	0.38	0.38	4.27	11.00	-6.73
	5310	62	ac (40MHz)	0.84	-0.46	0.38	3.63	11.00	-7.37
	5270	54	ax SU (40MHz)	1.41	0.01	0.45	4.23	11.00	-6.77
	5310	62	ax SU (40MHz)	0.83	0.21	0.45	3.99	11.00	-7.01
	5290	58	ac (80MHz)	-4.43	-3.50	0.49	-0.44	11.00	-11.44
	5290	58	ax SU (80MHz)	-2.78	-3.71	0.52	0.31	11.00	-10.69
Band 2C	5500	100	a	5.88	5.23	0.16	8.74	11.00	-2.26
	5600	120	a	6.35	5.19	0.16	8.98	11.00	-2.02
	5720	144	a	6.14	4.89	0.16	8.73	11.00	-2.27
	5500	100	n (20MHz)	5.49	5.18	0.09	8.44	11.00	-2.56
	5600	120	n (20MHz)	5.84	4.82	0.09	8.46	11.00	-2.54
	5720	144	n (20MHz)	6.30	4.91	0.09	8.76	11.00	-2.24
	5500	100	ac (20MHz)	5.85	4.93	0.18	8.61	11.00	-2.39
	5600	120	ac (20MHz)	6.28	4.86	0.18	8.82	11.00	-2.18
	5720	144	ac (20MHz)	6.29	4.93	0.18	8.85	11.00	-2.15
	5500	100	ax SU (20MHz)	5.56	4.62	0.23	8.35	11.00	-2.65
	5600	120	ax SU (20MHz)	5.74	4.40	0.23	8.36	11.00	-2.64
	5720	144	ax SU (20MHz)	6.38	4.68	0.23	8.85	11.00	-2.15
	5510	102	n (40MHz)	1.28	0.16	0.17	3.94	11.00	-7.06
	5590	118	n (40MHz)	1.60	0.63	0.17	4.32	11.00	-6.68
	5710	142	n (40MHz)	1.35	0.42	0.17	4.09	11.00	-6.91
	5510	102	ac (40MHz)	0.87	0.16	0.38	3.92	11.00	-7.08
	5590	118	ac (40MHz)	1.44	0.57	0.38	4.42	11.00	-6.58
	5710	142	ac (40MHz)	1.61	0.67	0.38	4.56	11.00	-6.44
	5510	102	ax SU (40MHz)	0.51	-0.18	0.45	3.64	11.00	-7.36
	5590	118	ax SU (40MHz)	1.38	0.26	0.45	4.32	11.00	-6.68
5710	142	ax SU (40MHz)	1.46	0.59	0.45	4.51	11.00	-6.49	
5530	106	ac (80MHz)	-3.33	-4.31	0.49	-0.29	11.00	-11.29	
5610	122	ac (80MHz)	-3.05	-4.34	0.49	-0.14	11.00	-11.14	
5690	138	ac (80MHz)	-2.93	-4.47	0.49	-0.13	11.00	-11.13	
5530	106	ax SU (80MHz)	-3.30	-4.49	0.52	-0.32	11.00	-11.32	
5610	122	ax SU (80MHz)	-3.50	-4.14	0.52	-0.28	11.00	-11.28	
5690	138	ax SU (80MHz)	-2.94	-3.87	0.52	0.15	11.00	-10.85	

Table 7-13. Bands 1, 2A, 2C MIMO Conducted Power Spectral Density Measurements

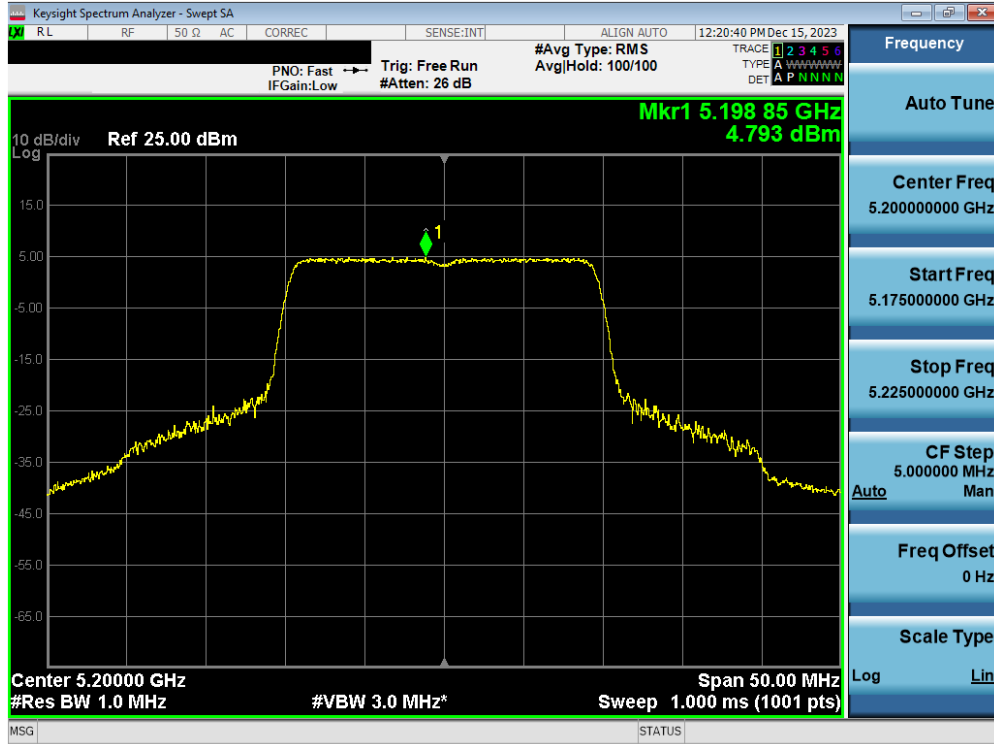
FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 57 of 116

	Frequency [MHz]	Channel	802.11 MODE	Antenna 1 PSD [dBm]	Antenna 2 PSD [dBm]	DCCF [dB]	MIMO Summed PSD [dBm]	Max PSD [dBm]	Margin [dB]
<b>Band 3</b>	5745	149	a	3.64	2.55	0.16	6.30	11.00	-4.70
	5785	157	a	3.15	2.62	0.16	6.06	11.00	-4.94
	5825	165	a	2.18	1.73	0.16	5.13	11.00	-5.87
	5745	149	n	3.69	2.20	0.09	6.11	11.00	-4.89
	5785	157	n	3.44	2.23	0.09	5.97	11.00	-5.03
	5825	165	n	2.50	2.53	0.09	5.62	11.00	-5.38
	5745	149	ac	3.53	2.45	0.18	6.21	11.00	-4.79
	5785	157	ac	3.30	2.41	0.18	6.06	11.00	-4.94
	5825	165	ac	2.18	2.07	0.18	5.31	11.00	-5.69
	5745	149	ax SU	3.69	2.38	0.23	6.32	11.00	-4.68
	5785	157	ax SU	3.42	1.65	0.23	5.86	11.00	-5.14
	5825	165	ax SU	2.32	1.46	0.23	5.15	11.00	-5.85
	5755	151	n	-1.37	-2.02	0.17	1.50	11.00	-9.50
	5795	159	n	-1.62	-1.82	0.17	1.46	11.00	-9.54
	5755	151	ac	-1.47	-2.01	0.38	1.66	11.00	-9.34
	5795	159	ac	-1.85	-1.93	0.38	1.50	11.00	-9.50
	5755	151	ax SU	-1.55	-1.90	0.45	1.74	11.00	-9.26
	5795	159	ax SU	-1.94	-2.06	0.45	1.46	11.00	-9.54
5775	155	ac	-6.03	-6.41	0.49	-2.71	11.00	-13.71	
5775	155	ax SU	-6.32	-6.43	0.52	-2.84	11.00	-13.84	

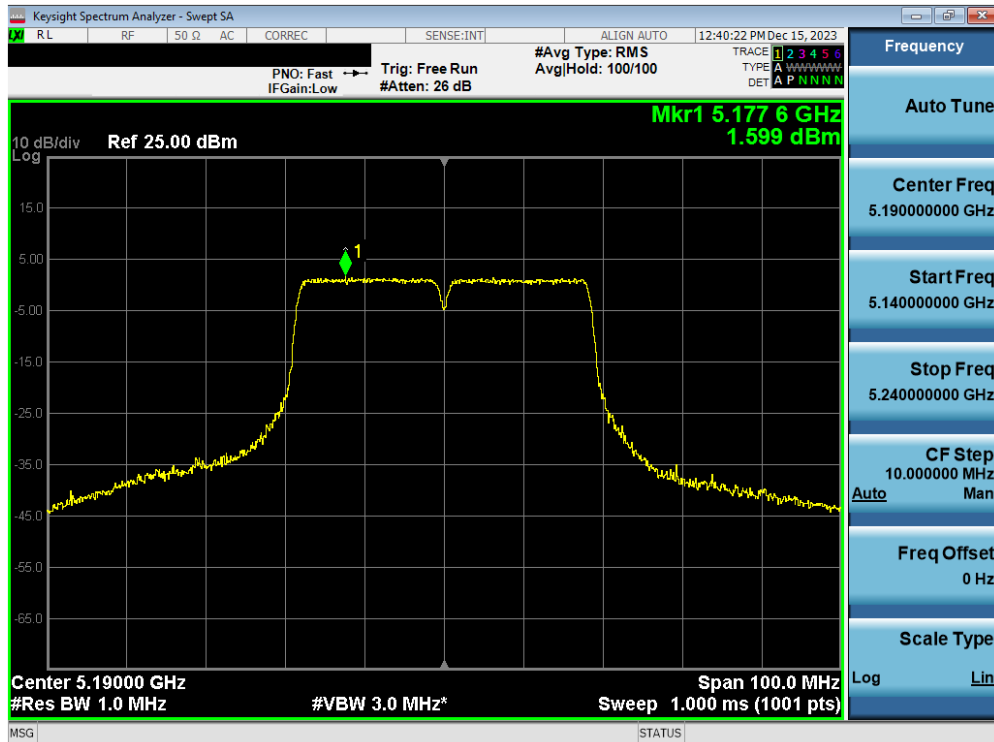
**Table 7-14. Band 3 MIMO Conducted Power Spectral Density Measurements**

<b>FCC ID:</b> A3LSMA356E	<b>MEASUREMENT REPORT</b>		<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1M2310260110-09.A3L	<b>Test Dates:</b> 11/6/2023 - 12/27/2023	<b>EUT Type:</b> Portable Handset	Page 58 of 116



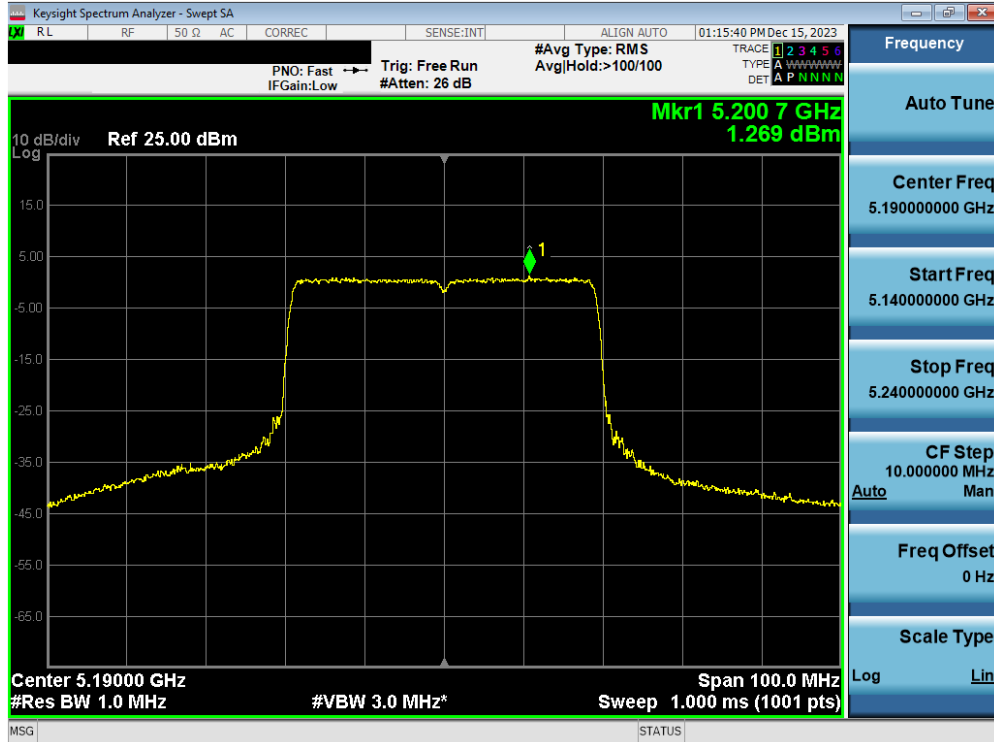


Plot 7-59. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11ax (UNII Band 1) – Ch. 40)

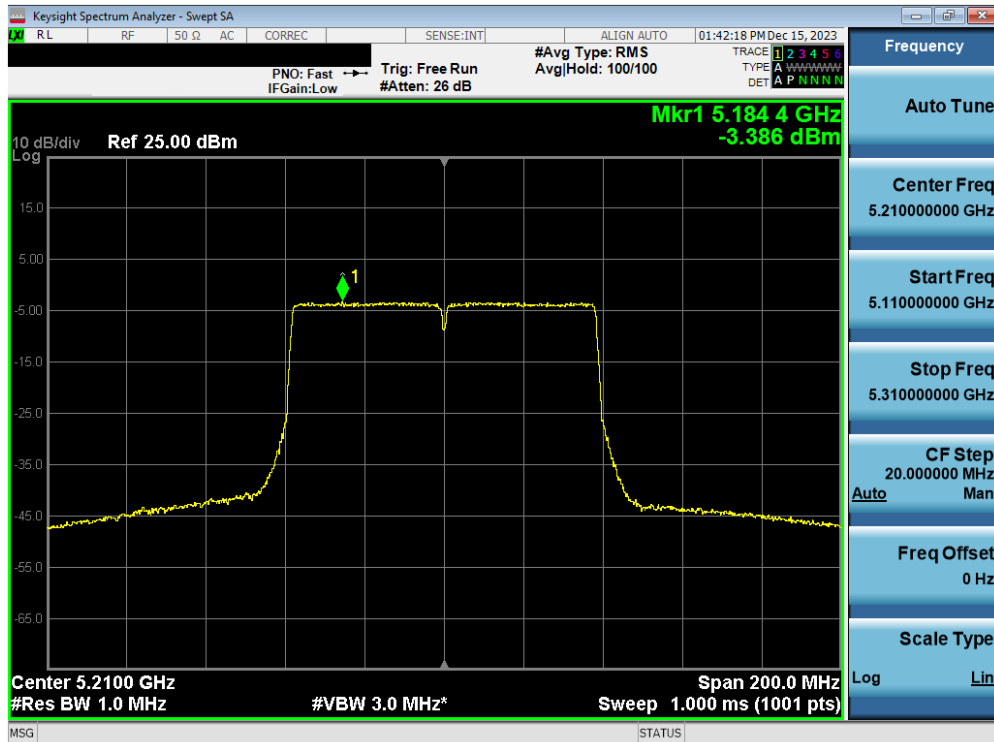


Plot 7-60. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11n (UNII Band 1) – Ch. 38)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 60 of 116

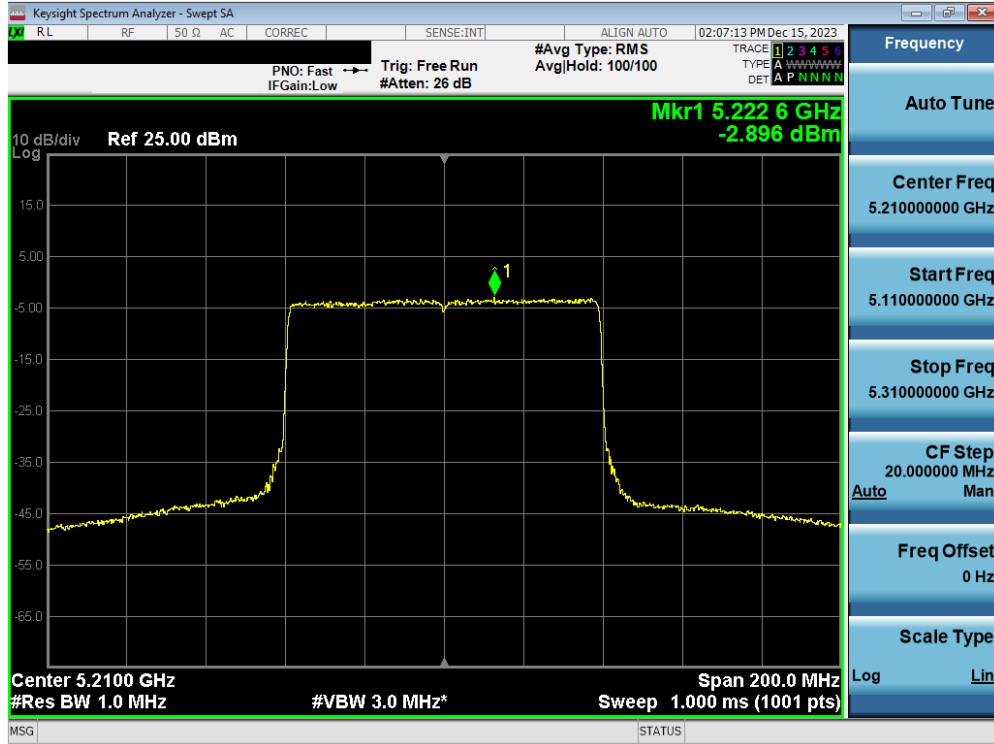


Plot 7-61. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11ax (UNII Band 1) – Ch. 38)

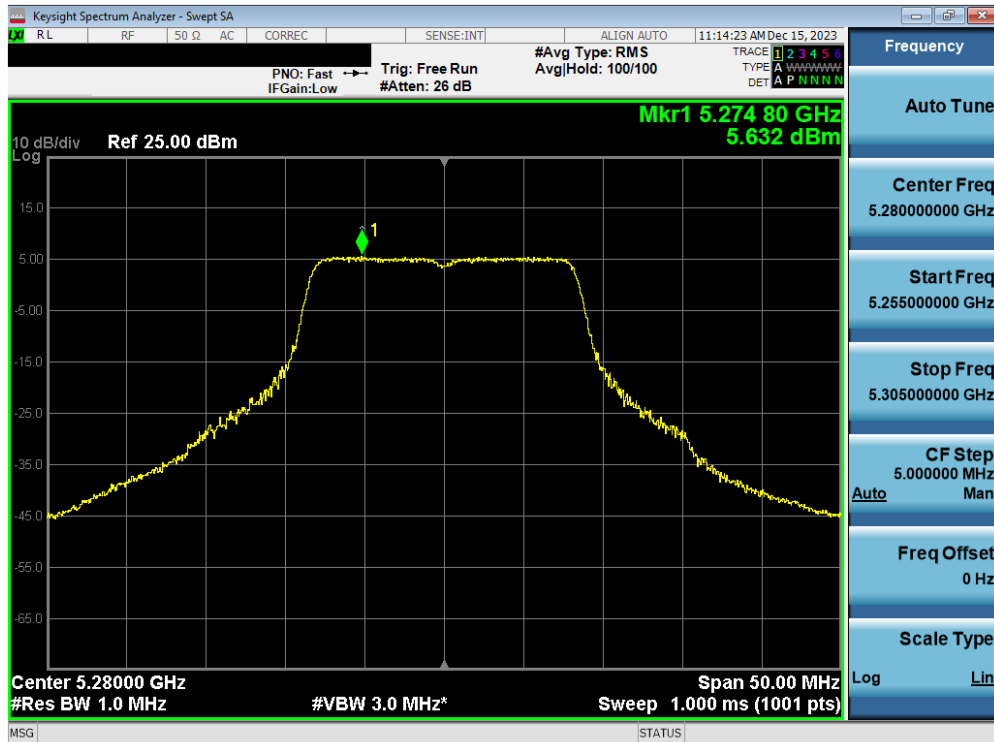


Plot 7-62. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11ac (UNII Band 1) – Ch. 42)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 61 of 116

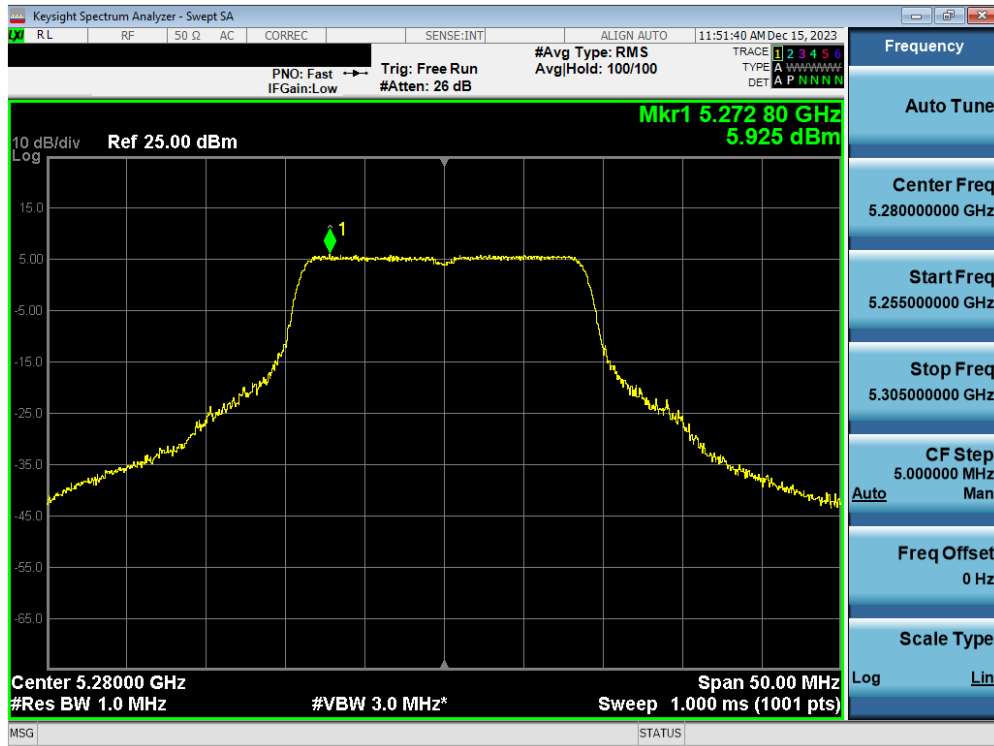


Plot 7-63. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11ax (UNII Band 1) – Ch. 42)

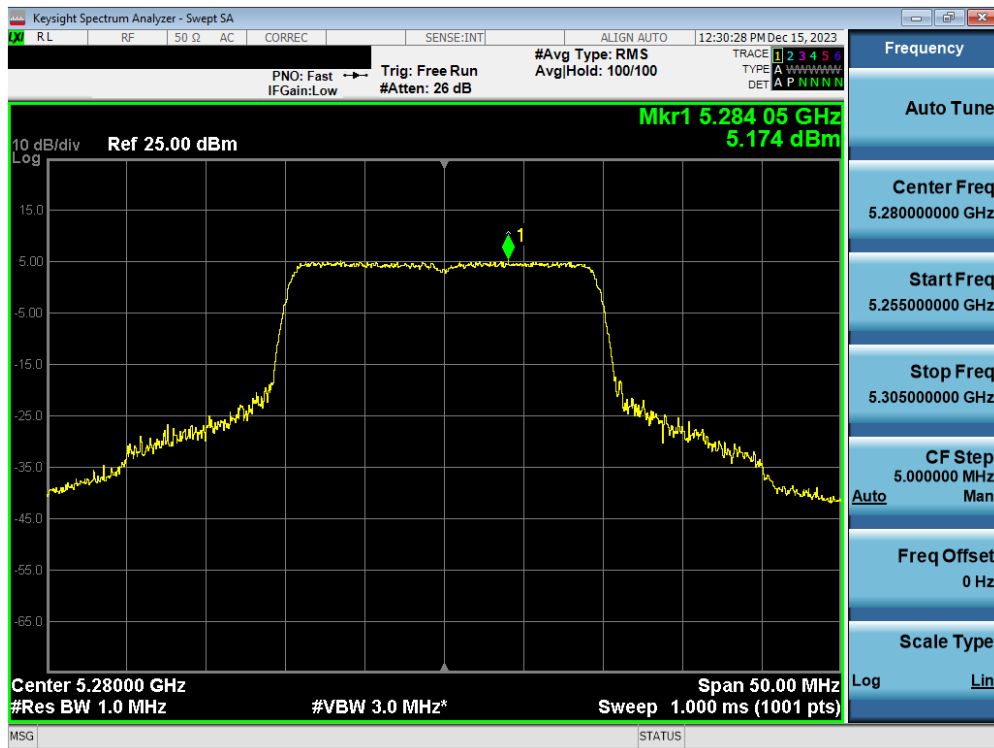


Plot 7-64. Power Spectral Density Plot MIMO ANT1 (802.11a (UNII Band 2A) – Ch. 56)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 62 of 116

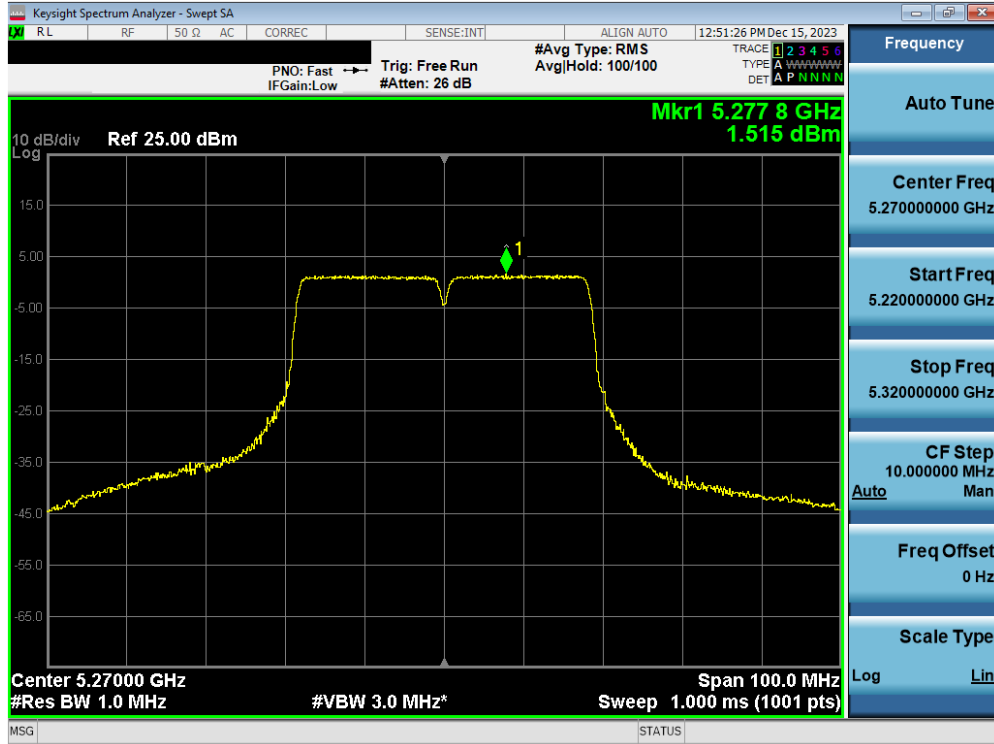


Plot 7-65. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11n (UNII Band 2A) – Ch. 56)

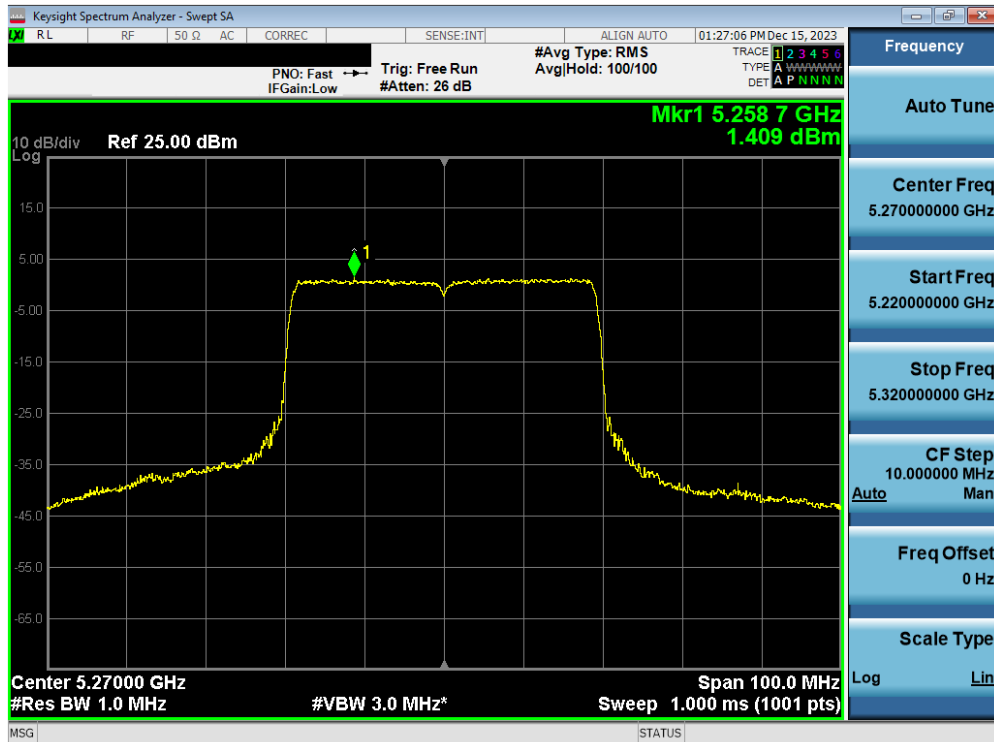


Plot 7-66. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11ax (UNII Band 2A) – Ch. 56)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 63 of 116



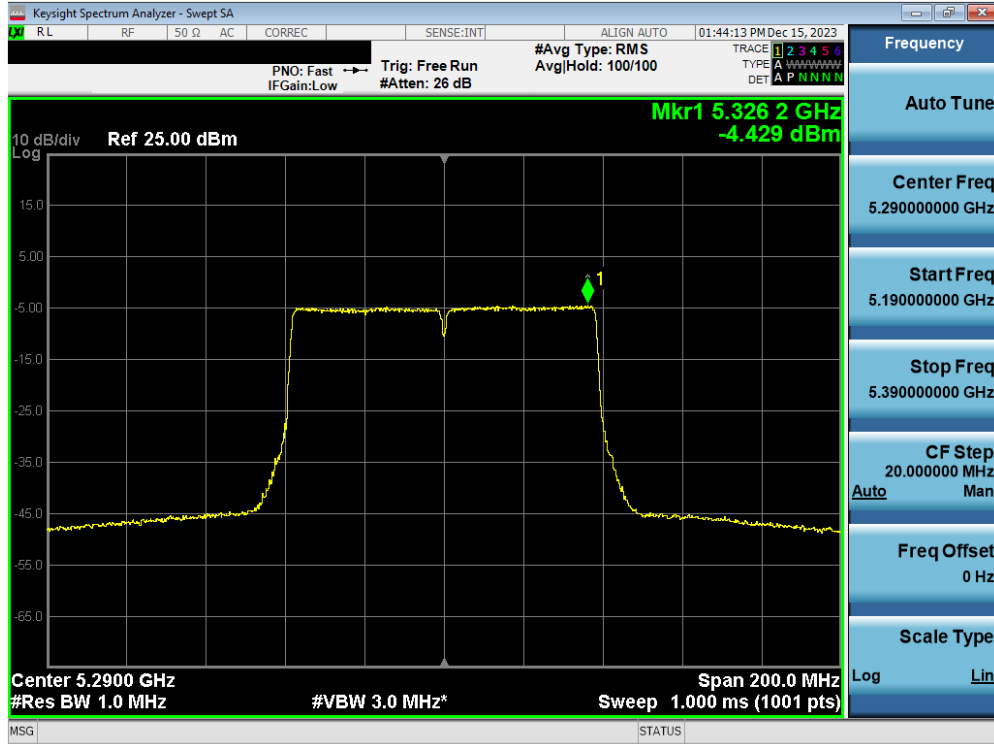
Plot 7-67. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11n (UNII Band 2A) – Ch. 54)



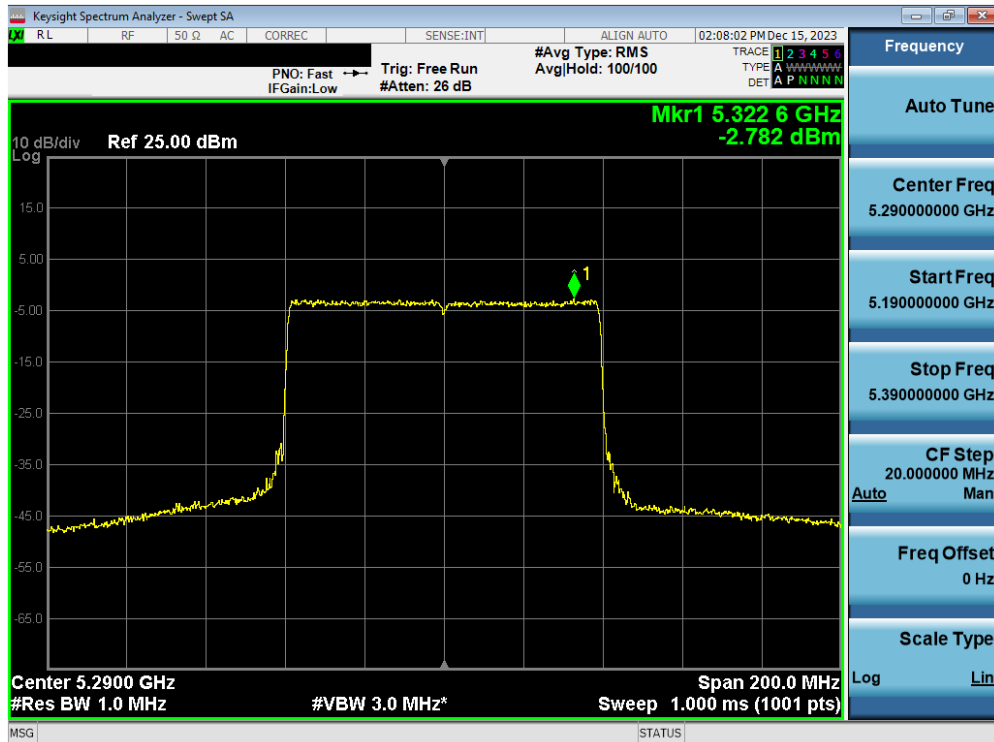
Plot 7-68. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11ax (UNII Band 2A) – Ch. 54)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 64 of 116





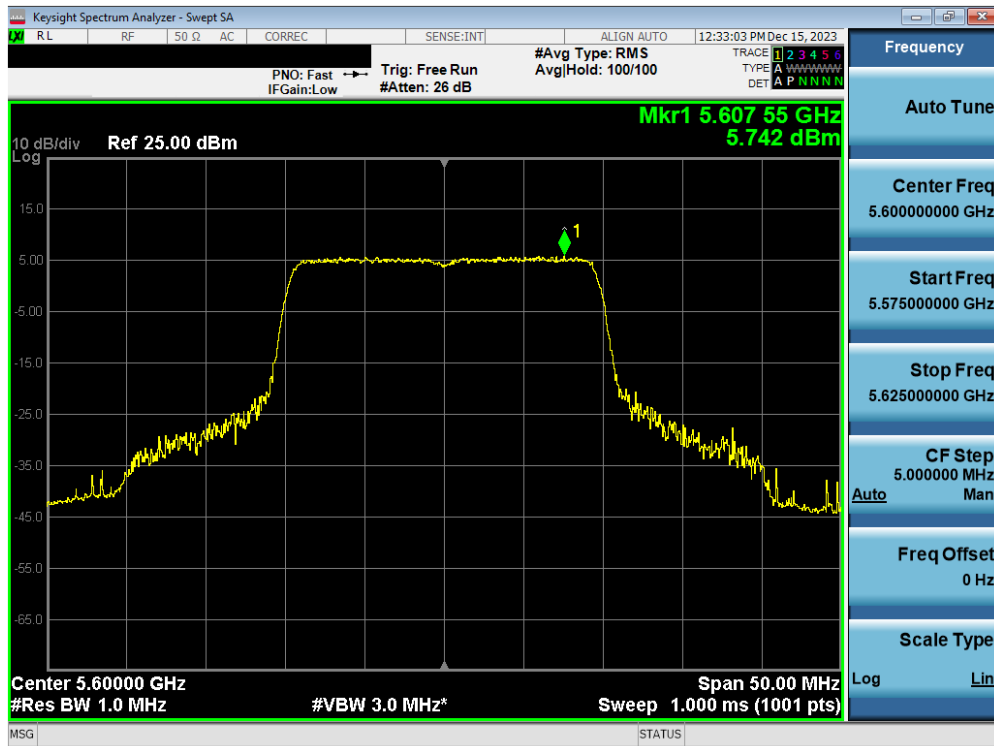
Plot 7-69. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11ac (UNII Band 2A) – Ch. 58)



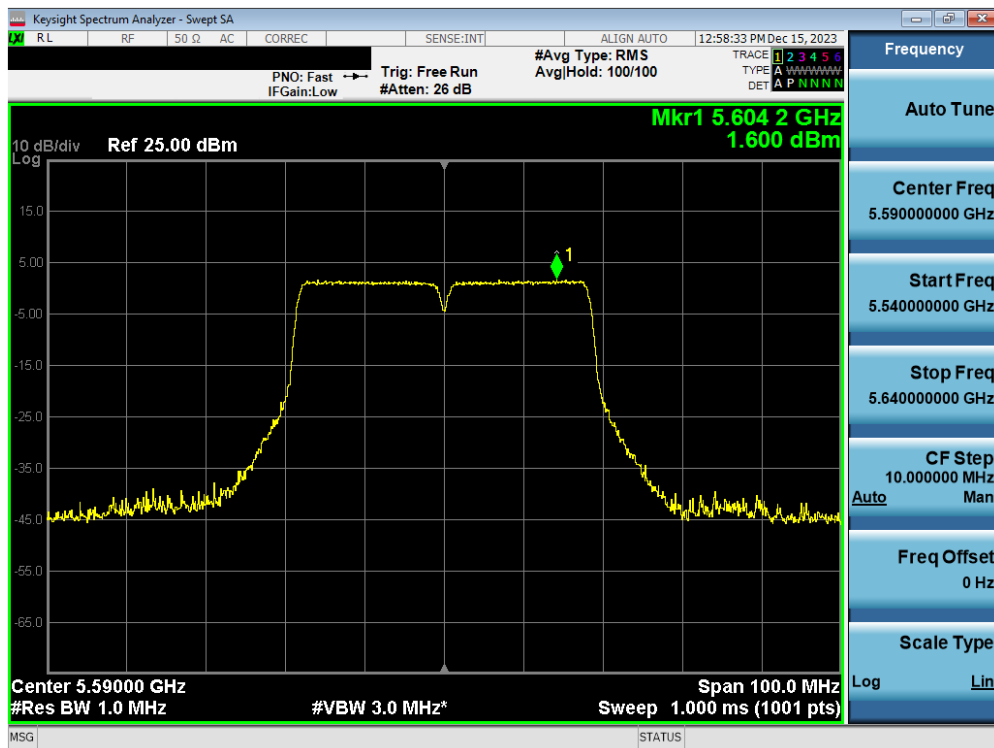
Plot 7-70. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11ax (UNII Band 2A) – Ch. 58)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 65 of 116



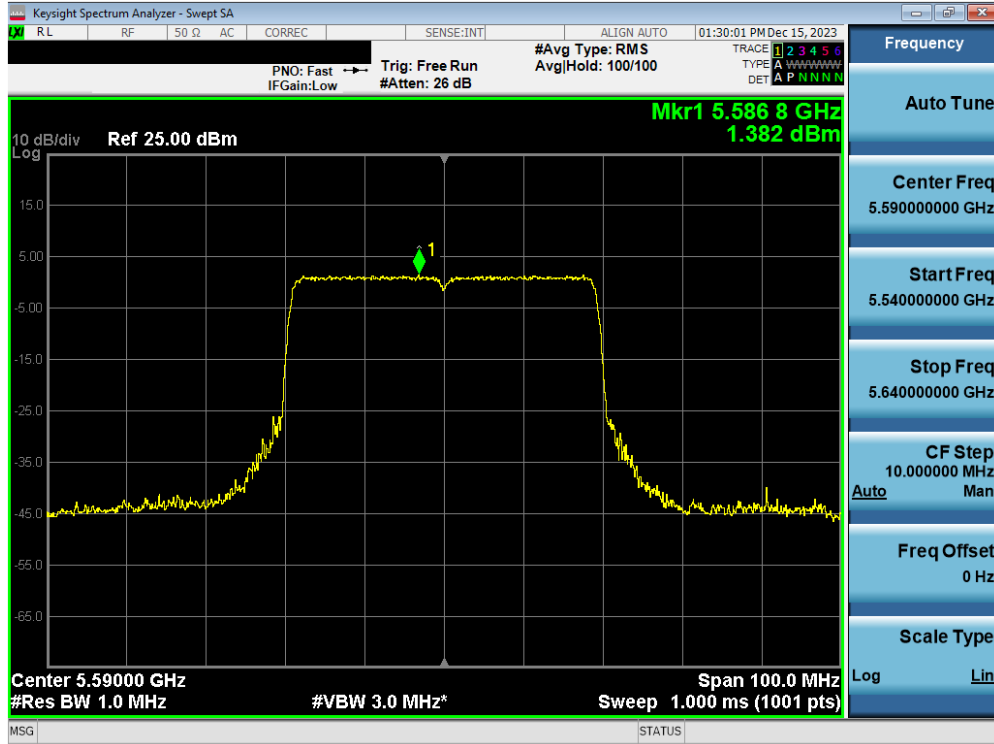


Plot 7-73. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11ax (UNII Band 2C) – Ch. 120)

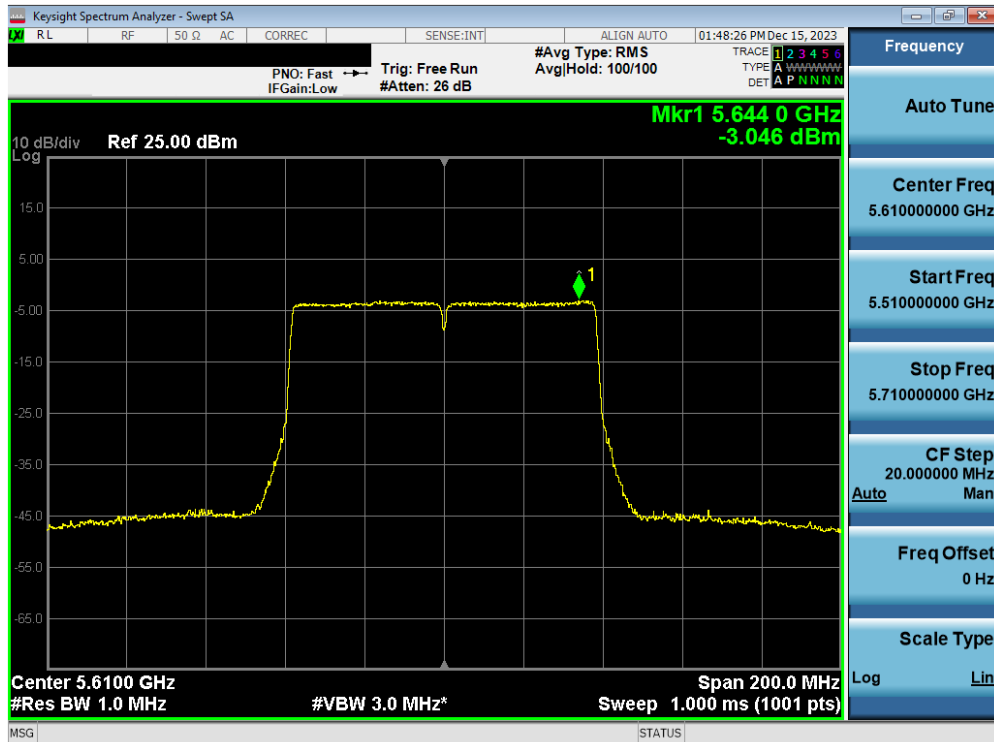


Plot 7-74. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11n (UNII Band 2C) – Ch. 118)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 67 of 116

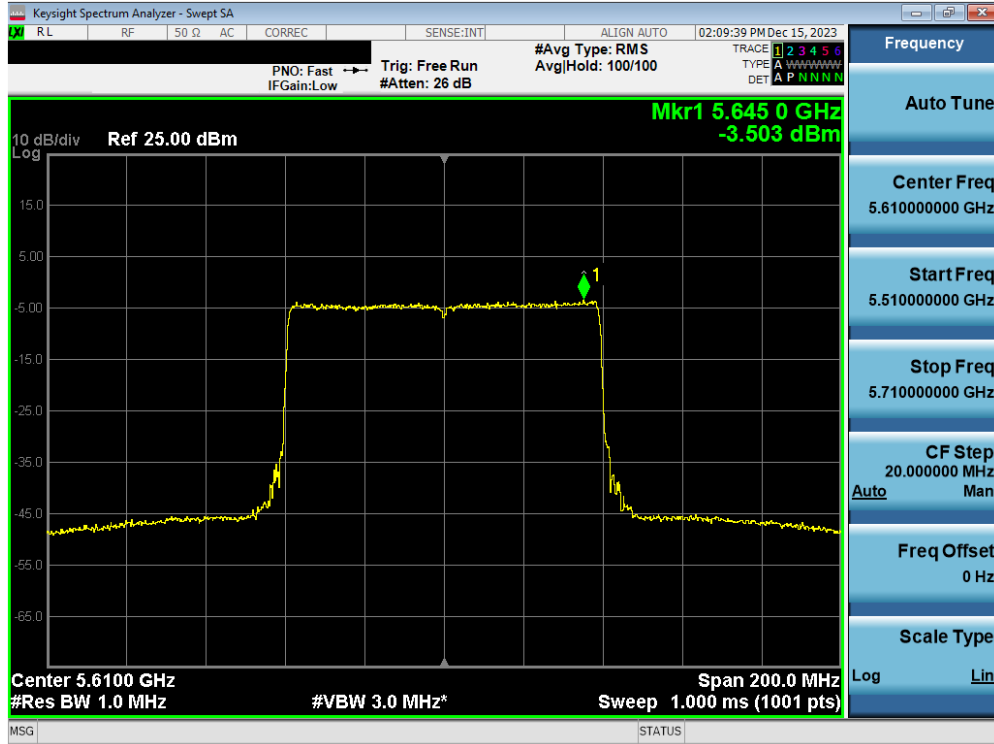


Plot 7-75. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11ax (UNII Band 2C) – Ch. 118)

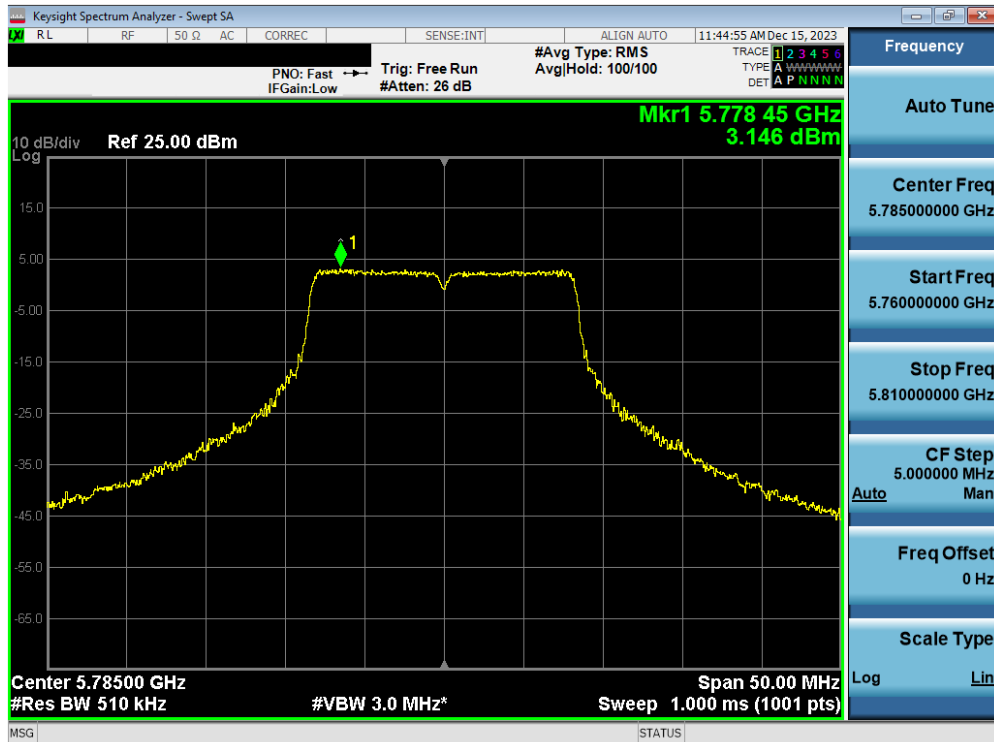


Plot 7-76. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11ac (UNII Band 2C) – Ch. 122)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 68 of 116

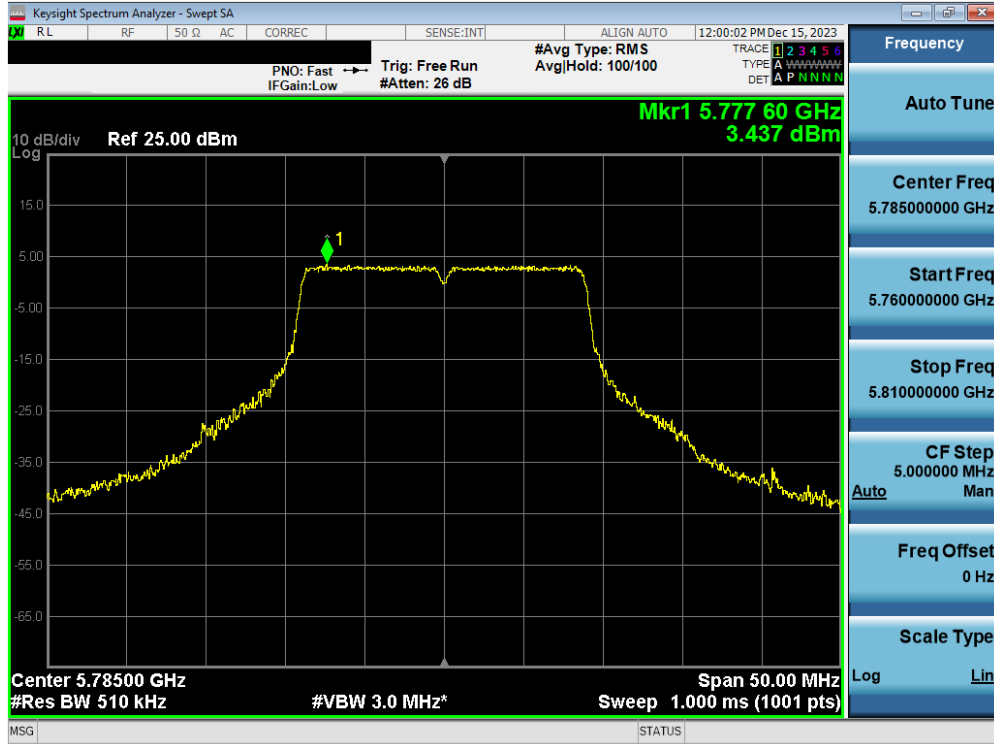


Plot 7-77. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11ax (UNII Band 2C) – Ch. 122)

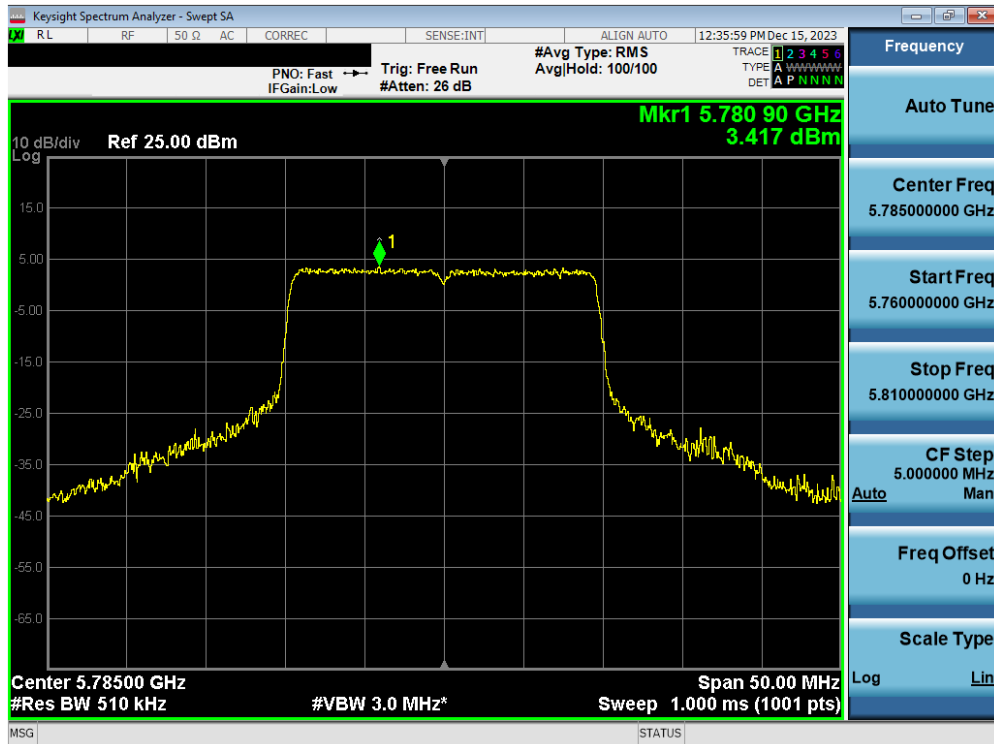


Plot 7-78. Power Spectral Density Plot MIMO ANT1 (802.11a (UNII Band 3) – Ch. 157)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 69 of 116

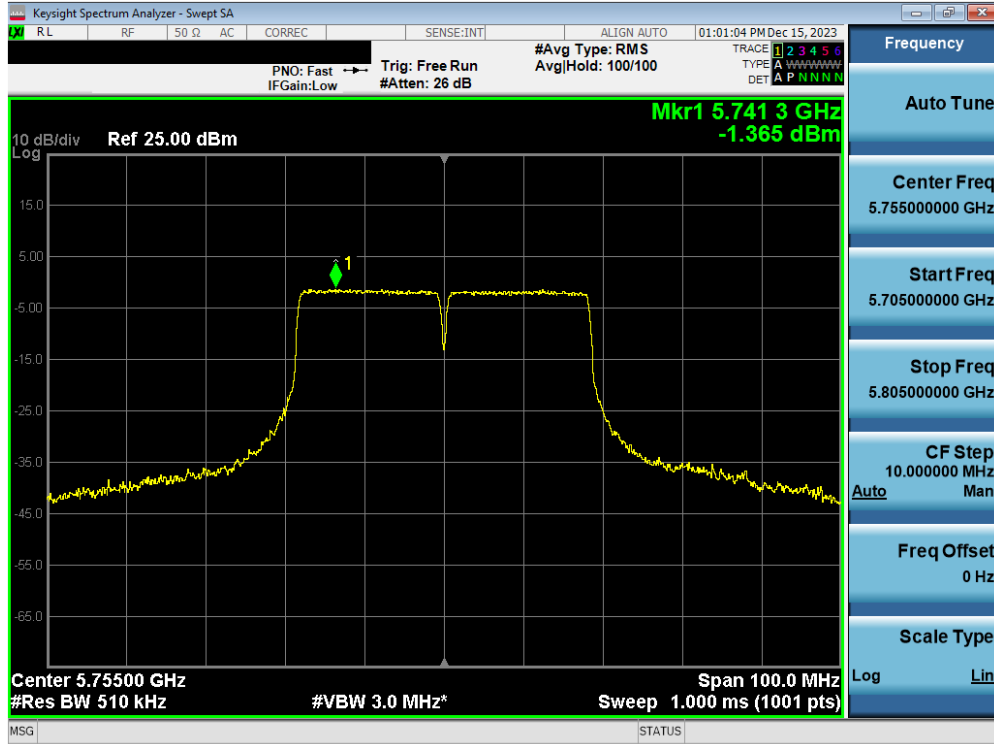


Plot 7-79. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11n (UNII Band 3) – Ch. 157)

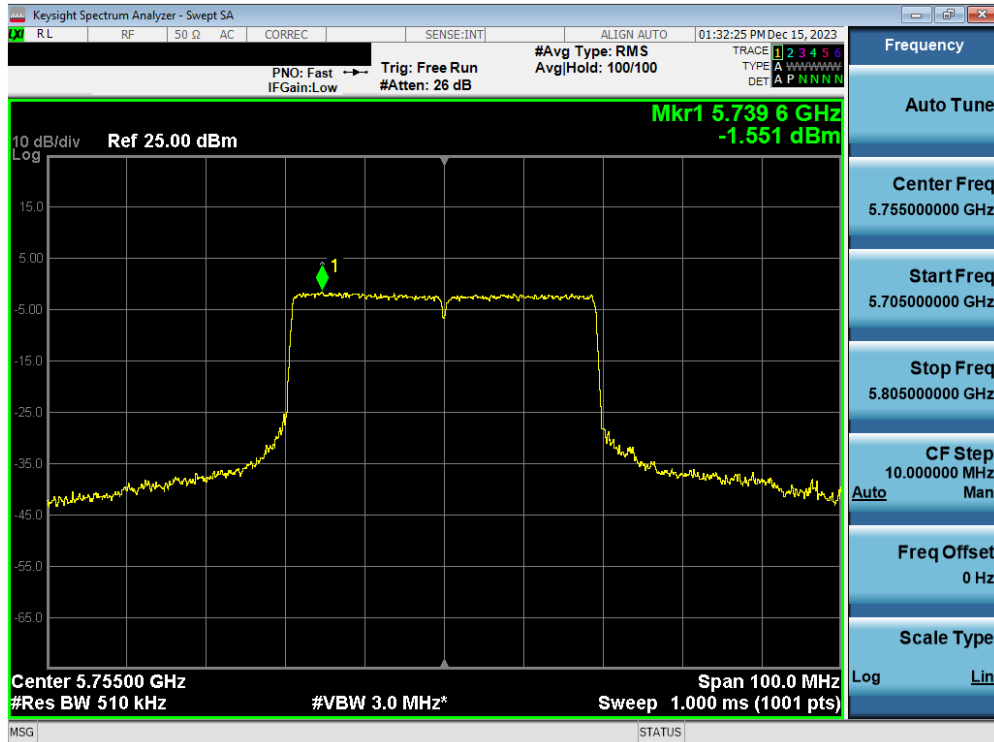


Plot 7-80. Power Spectral Density Plot MIMO ANT1 (20MHz BW 802.11ax (UNII Band 3) – Ch. 157)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 70 of 116

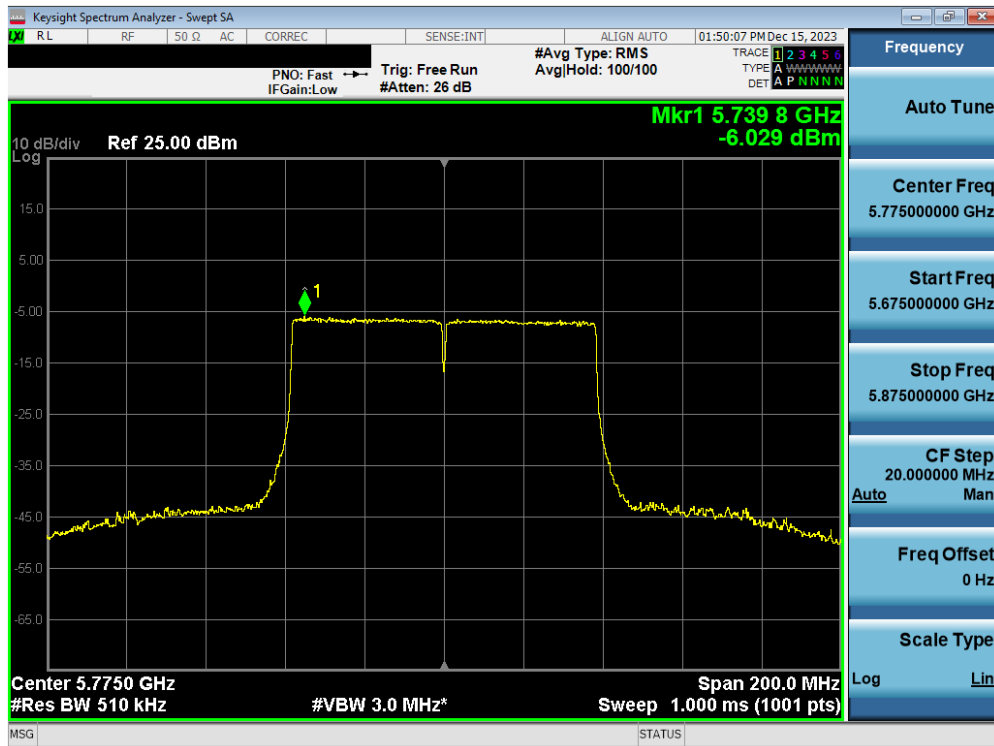


Plot 7-81. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11n (UNII Band 3) – Ch. 151)

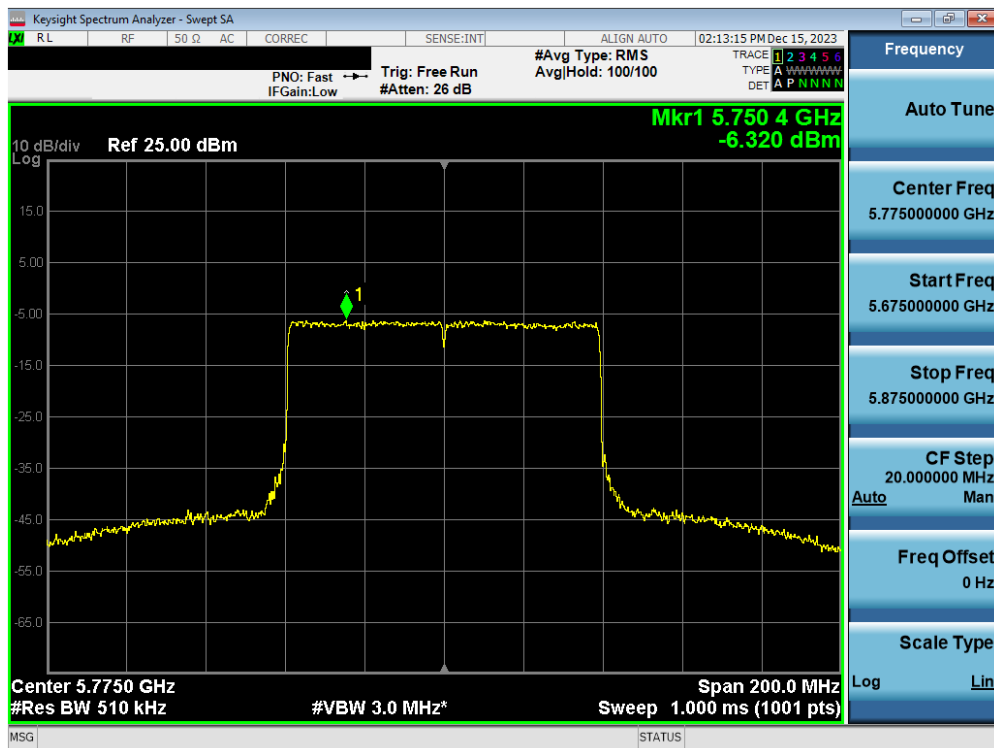


Plot 7-82. Power Spectral Density Plot MIMO ANT1 (40MHz BW 802.11ax (UNII Band 3) – Ch. 151)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 71 of 116



Plot 7-83. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11ac (UNII Band 3) – Ch. 155)

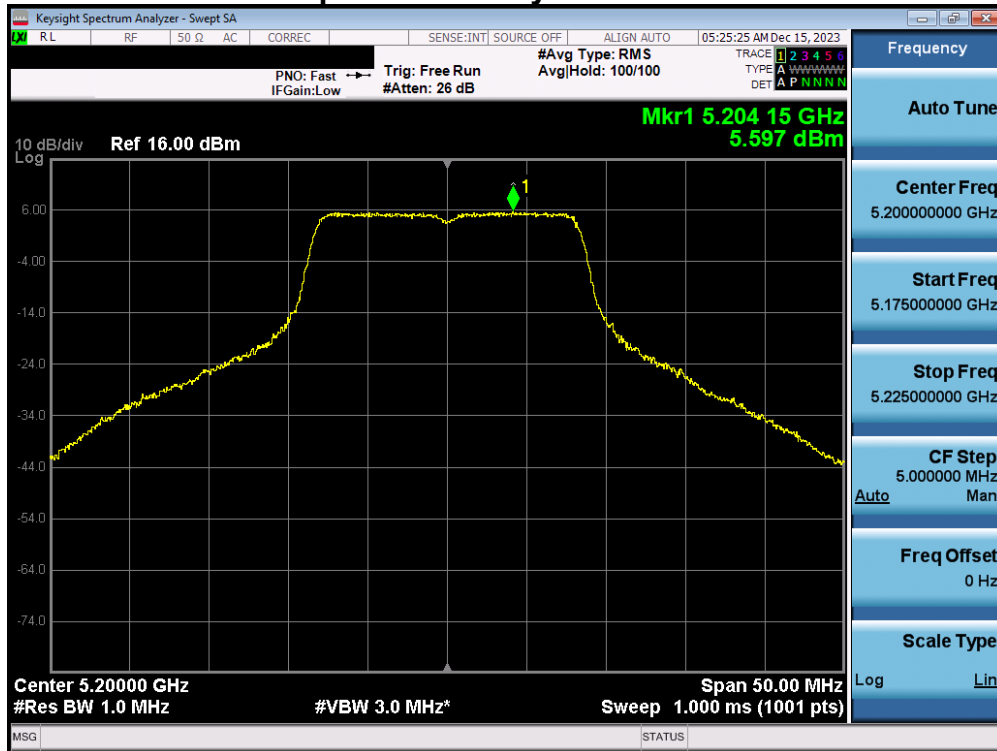


Plot 7-84. Power Spectral Density Plot MIMO ANT1 (80MHz BW 802.11ax (UNII Band 3) – Ch. 155)

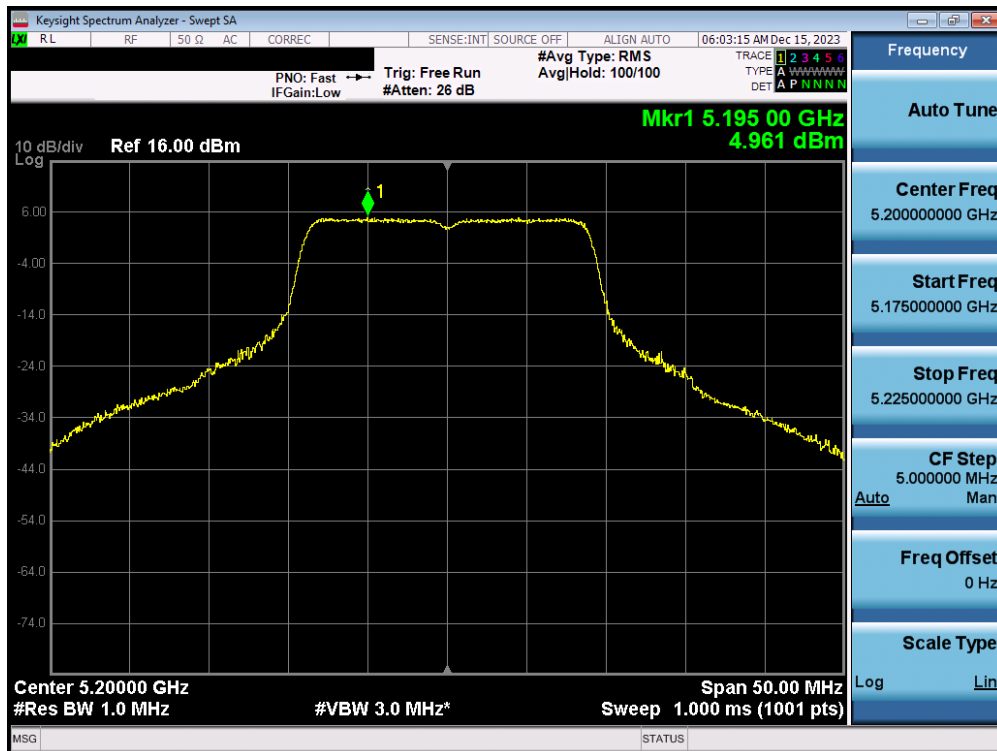
FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 72 of 116



## 7.5.2 MIMO Antenna-2 Power Spectral Density Measurements

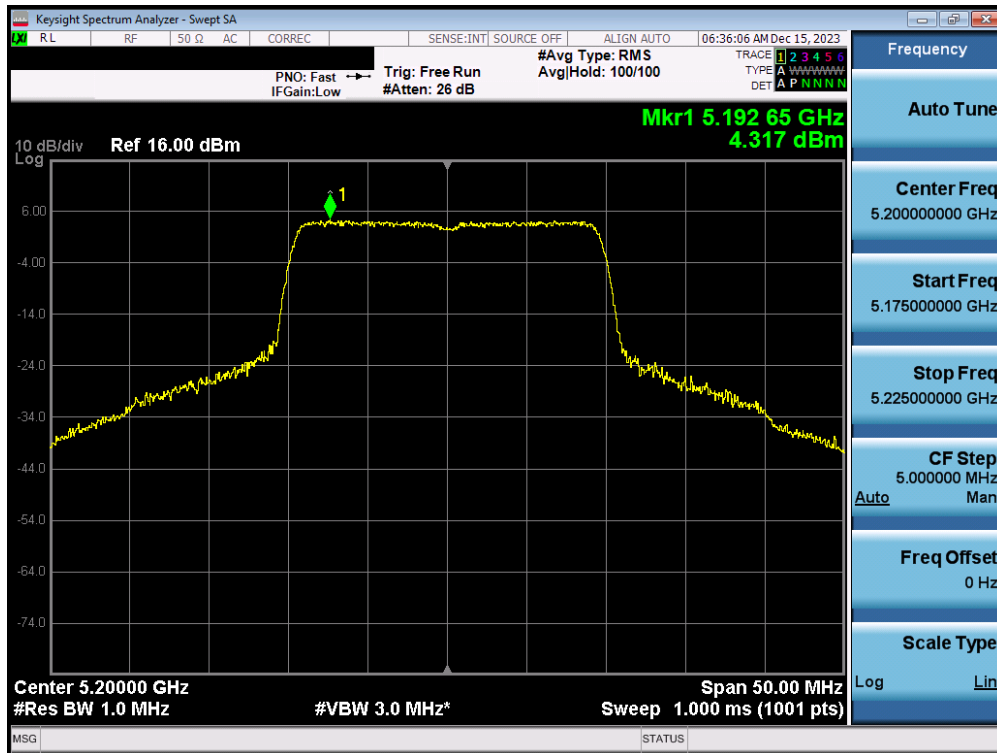


Plot 7-85. Power Spectral Density Plot MIMO ANT2 (802.11a (UNII Band 1) – Ch. 40)

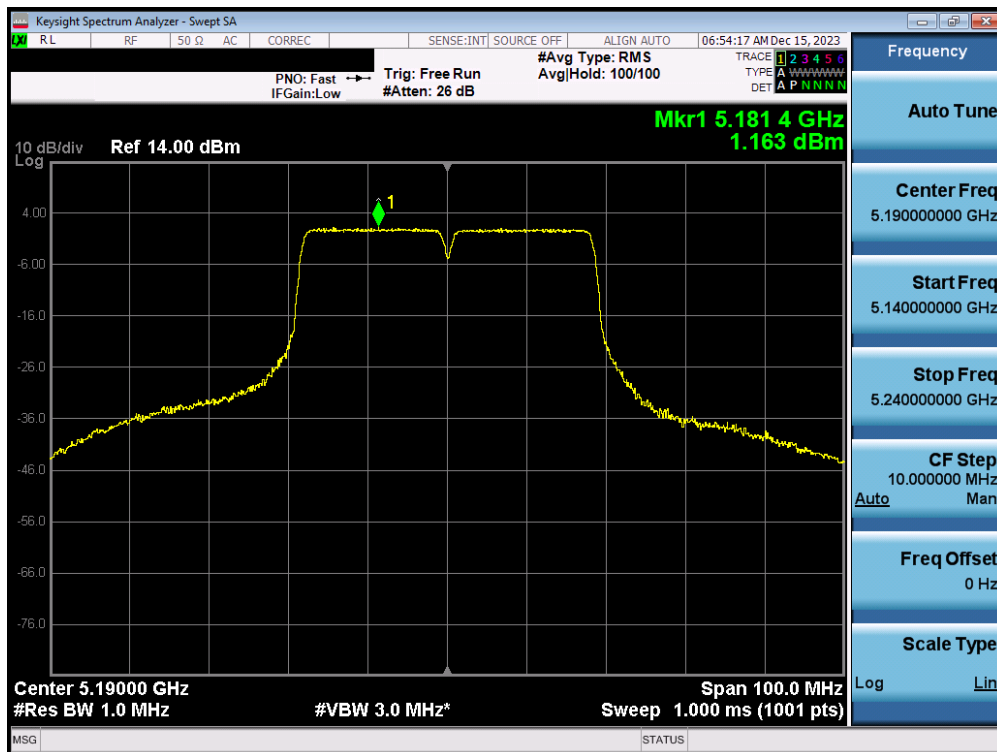


Plot 7-86. Power Spectral Density Plot MIMO ANT2 (20MHz BW 802.11n (UNII Band 1) – Ch. 40)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 73 of 116

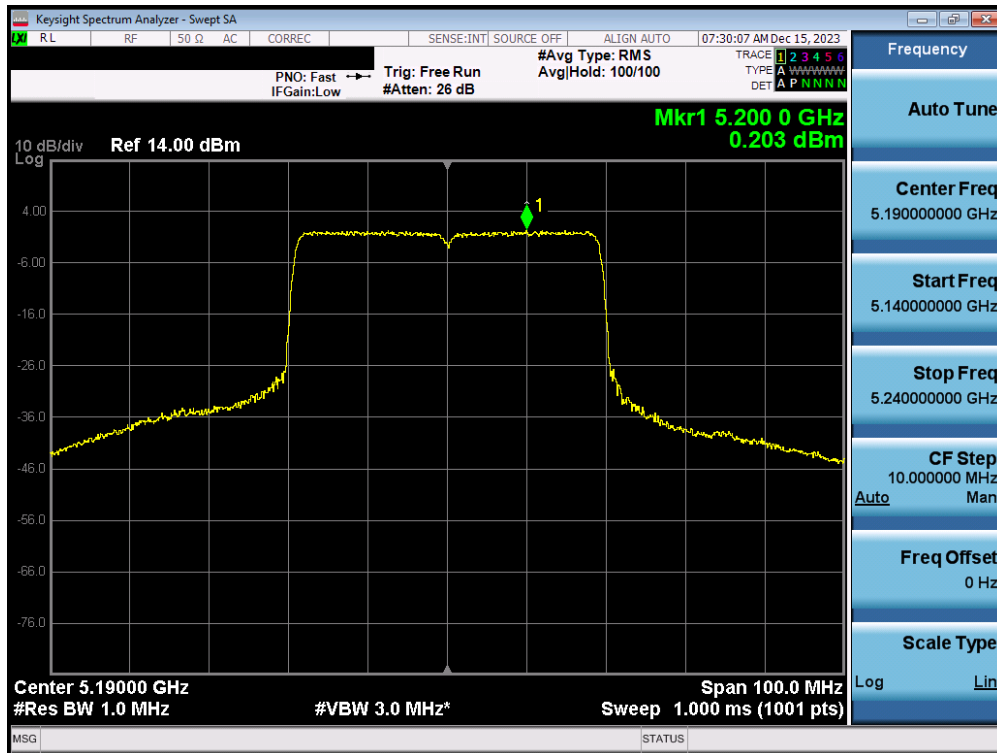


Plot 7-87. Power Spectral Density Plot MIMO ANT2 (20MHz BW 802.11ax (UNII Band 1) – Ch. 40)

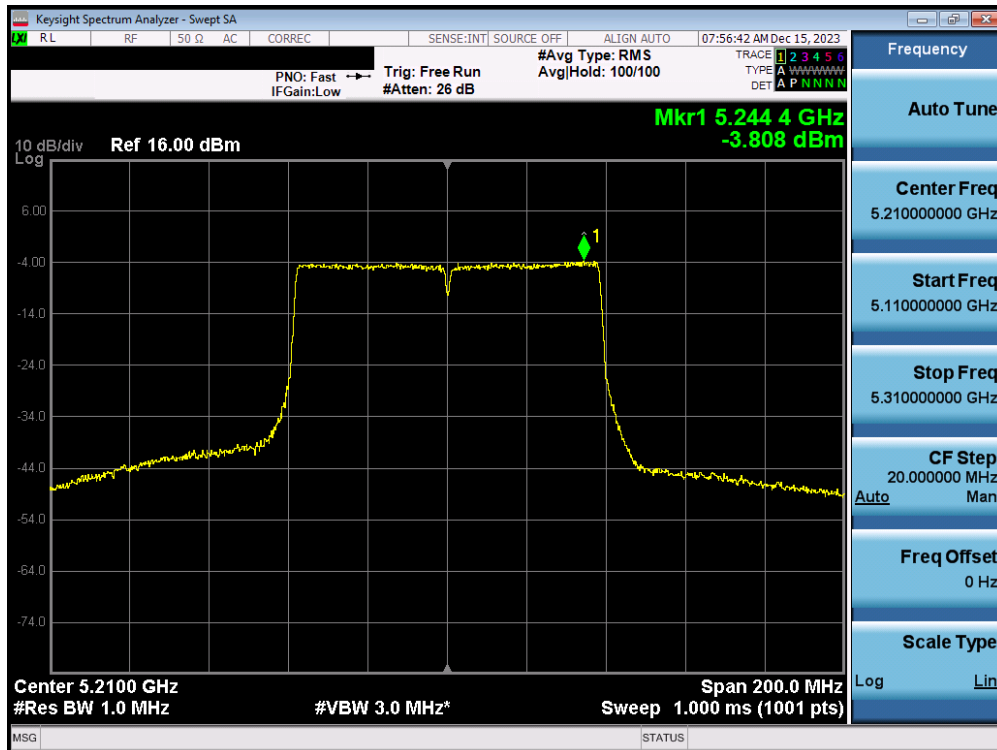


Plot 7-88. Power Spectral Density Plot MIMO ANT2 (40MHz BW 802.11n (UNII Band 1) – Ch. 38)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 74 of 116

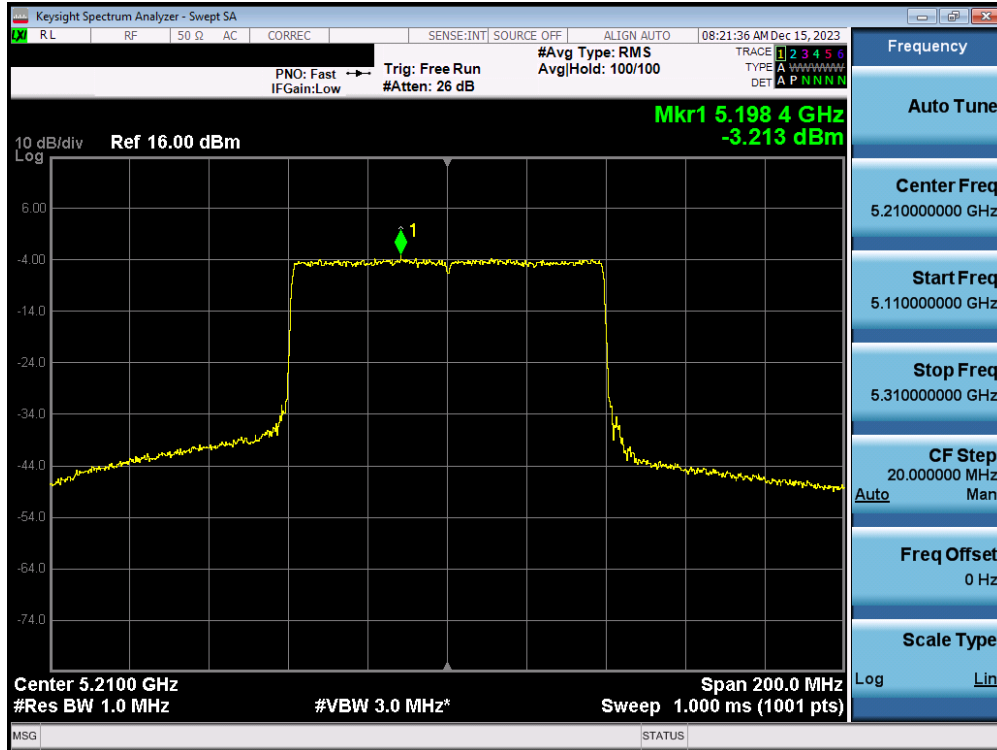


Plot 7-89. Power Spectral Density Plot MIMO ANT2 (40MHz BW 802.11ax (UNII Band 1) – Ch. 38)

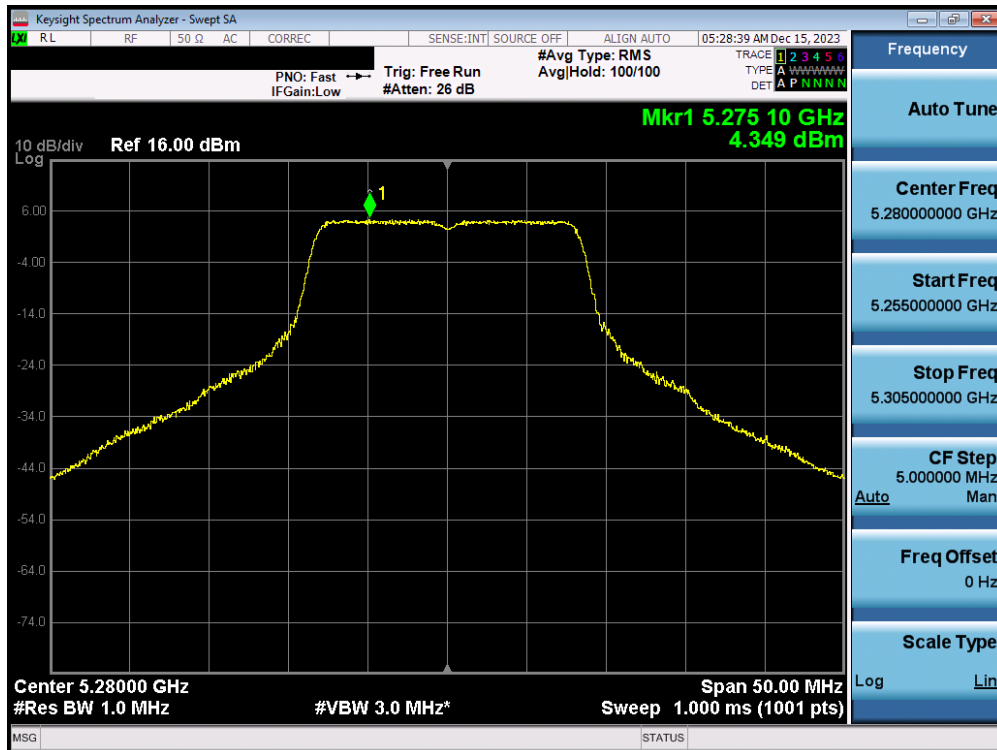


Plot 7-90. Power Spectral Density Plot MIMO ANT2 (80MHz BW 802.11ac (UNII Band 1) – Ch. 42)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 75 of 116

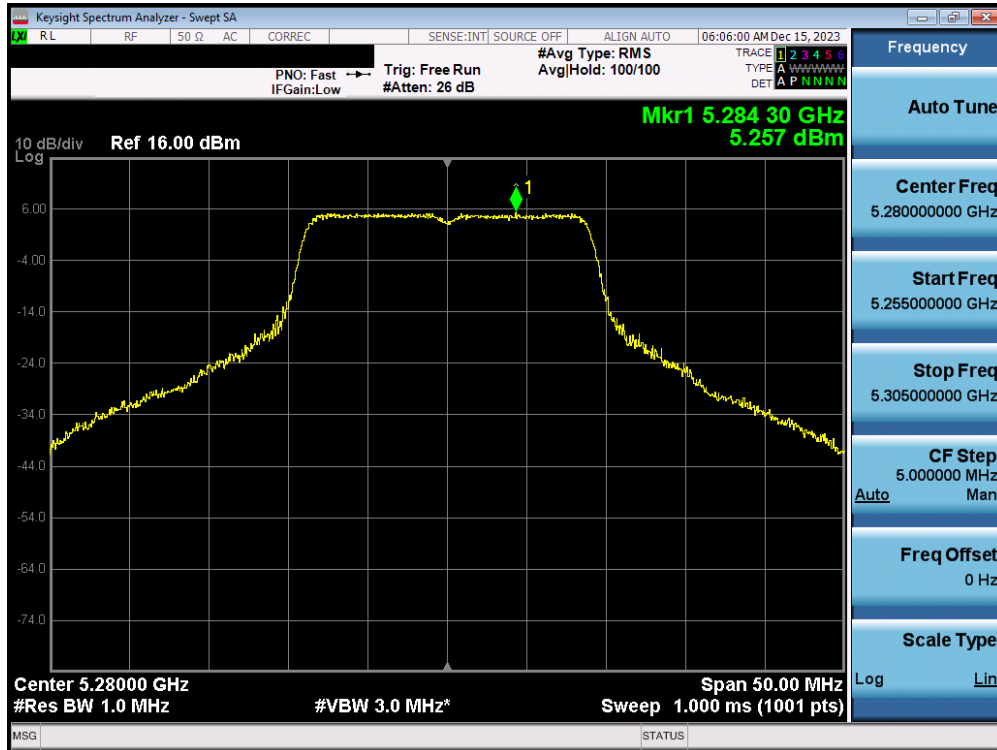


Plot 7-91. Power Spectral Density Plot MIMO ANT2 (80MHz BW 802.11ax (UNII Band 1) – Ch. 42)

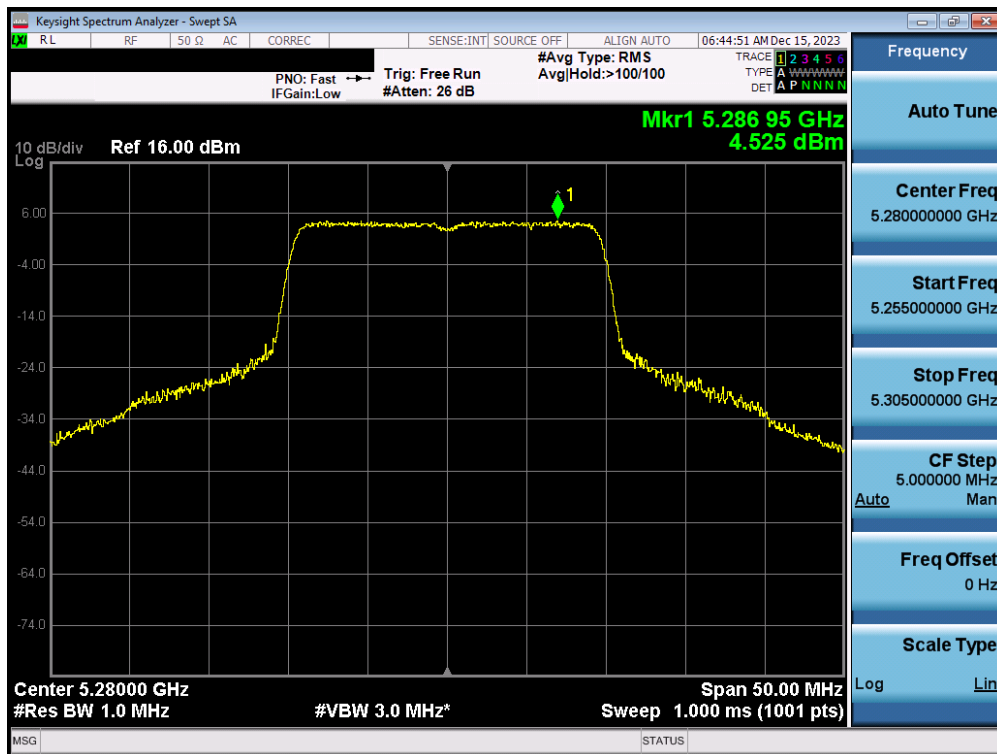


Plot 7-92. Power Spectral Density Plot MIMO ANT2 (802.11a (UNII Band 2A) – Ch. 56)

FCC ID: A3LSMA356E	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2310260110-09.A3L	Test Dates: 11/6/2023 - 12/27/2023	EUT Type: Portable Handset	Page 76 of 116

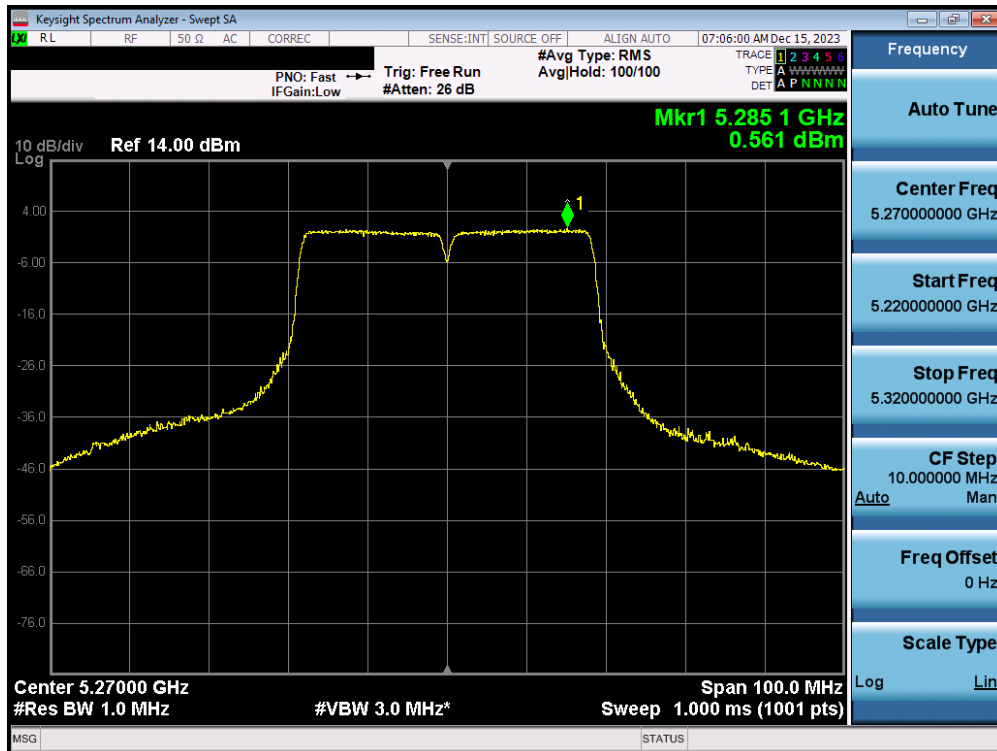


Plot 7-93. Power Spectral Density Plot MIMO ANT2 (20MHz BW 802.11n (UNII Band 2A) – Ch. 56)

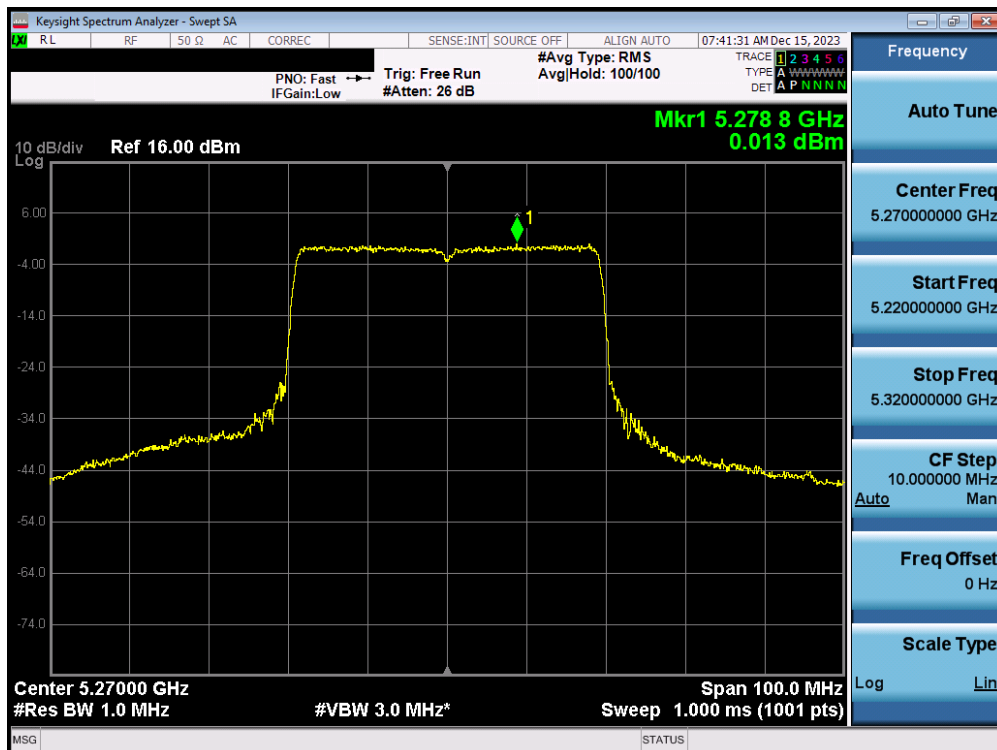


Plot 7-94. Power Spectral Density Plot MIMO ANT2 (20MHz BW 802.11ax (UNII Band 2A) – Ch. 56)

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Plot 7-95. Power Spectral Density Plot MIMO ANT2 (40MHz BW 802.11n (UNII Band 2A) – Ch. 54)



Plot 7-96. Power Spectral Density Plot MIMO ANT2 (40MHz BW 802.11ax (UNII Band 2A) – Ch. 54)

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