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

Applicant Name:

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

Date of Testing:

09/03/2024 - 11/07/2024

Test Report Issue Date:

11/10/2024

Test Site/Location:

Element Lab., Columbia, MD, USA
Element Lab., Morgan Hill, CA, USA

Test Report Serial No.:

1M2408260069-18.A3L

FCC ID:

A3LSMS938B

APPLICANT:

Samsung Electronics Co., Ltd.

Application Type:

Certification

Model:

SM-S938B/DS

Additional Model:

SM-S938B

EUT Type:

Portable Handset

Frequency Range:

5180 – 5825MHz

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, KDB 648474 D03 v01r04

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. 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]	Antenna-1		Antenna-2		MIMO	
			Max. Power [mW]	Max. Power [dBm]	Max. Power [mW]	Max. Power [dBm]	Max. Power [mW]	Max. Power [dBm]
20	1	5180 - 5240	62.37	17.95	64.42	18.09	109.68	20.40
	2A	5260 - 5320	60.95	17.85	61.66	17.90	103.18	20.14
	2C	5500 - 5720	52.48	17.20	55.98	17.48	104.69	20.20
	3	5745 - 5825	53.95	17.32	59.02	17.71	100.80	20.03
	4	5845 - 5885	17.70	12.48	20.09	13.03	71.31	18.53
40	1	5190 - 5230	56.49	17.52	53.83	17.31	110.75	20.44
	2A	5270 - 5310	53.95	17.32	52.48	17.20	105.57	20.24
	2C	5510 - 5710	53.09	17.25	62.95	17.99	107.21	20.30
	3	5755 - 5795	47.32	16.75	57.94	17.63	107.21	20.30
	4	5835 - 5875	16.14	12.08	19.01	12.79	70.65	18.49
80	1	5210	28.77	14.59	28.31	14.52	58.83	17.70
	2A	5290	33.19	15.21	34.36	15.36	66.94	18.26
	2C	5530 - 5690	54.45	17.36	61.38	17.88	113.68	20.56
	3	5775	36.22	15.59	42.17	16.25	77.65	18.90
	4	5855	16.14	12.08	19.01	12.79	70.65	18.49
160	1/2A	5250	23.55	13.72	23.23	13.66	60.27	17.80
	2C	5570	13.58	11.33	14.19	11.52	39.61	15.98
	3/4	5815	6.87	8.37	7.38	8.68	46.19	16.65

EUT Overview

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

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1.0 INTRODUCTION

1.1 Scope

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

1.2 Element Test Location

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

1.3 Test Facility / Accreditations

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

- Element Washington DC LLC is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- Element Washington DC LLC TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).
- Element Washington DC LLC facility is a registered (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).

Measurements were performed at Element located in Morgan Hill, CA 95037, U.S.A.

- Element is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.02 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 facility is a registered (22831) test laboratory with the site description on file with ISED.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMS938B**. The test data contained in this report pertains only to the emissions due to the EUT's UNII transmitter.

Test Device Serial No.: 0568M, 0304M, 0298M, 0073M, 0076M, 0111M, 0108M, 0131M, 0079M, 0066M

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 and FR2), 802.11b/g/n/ax/be WLAN, 802.11a/n/ac/ax/be UNII (5GHz and 6GHz), Bluetooth (1x, EDR, LE), NFC, Wireless Power Transfer, UWB

Band 1		Band 2A		Band 2C		Band 3	
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/be (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/be (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/be (80MHz BW) Frequency / Channel Operations

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

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

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Notes:

- 5GHz NII operation is possible in 20MHz, 40MHz, 80MHz, and 160MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = peak per the guidance of Section B)2)b) of ANSI C63.10-2013. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Band	Bandwidth	Tone Type	Tone Size	ANT1		ANT2		MIMO (1+2)	
				Duty Cycle [%]	Radiated DCCF [dB]	Duty Cycle [%]	Radiated DCCF [dB]	Duty Cycle [%]	Radiated DCCF [dB]
5GHz	20MHz	RU	26T	99.56	N/A	99.52	N/A	99.63	N/A
			52T	99.56	N/A	99.56	N/A	99.27	N/A
			106T	99.20	N/A	99.20	N/A	99.10	N/A
			242T	98.33	N/A	98.33	N/A	98.43	N/A
		MRU	52+26T	99.38	N/A	99.40	N/A	99.63	N/A
			106+26T	99.07	N/A	99.02	N/A	99.44	N/A
	40MHz	RU	26T	98.87	N/A	99.39	N/A	99.24	N/A
			52T	99.17	N/A	99.50	N/A	99.24	N/A
			106T	99.12	N/A	99.08	N/A	98.56	N/A
			242T	98.24	N/A	98.24	N/A	97.20	0.12
			484T	90.09	0.45	99.06	N/A	97.15	0.13
		MRU	52+26T	99.06	N/A	99.43	N/A	99.01	N/A
			106+26T	99.07	N/A	98.92	N/A	98.34	N/A
	80MHz	RU	26T	99.48	N/A	99.48	N/A	99.24	N/A
			52T	99.39	N/A	99.17	N/A	99.24	N/A
			106T	99.12	N/A	99.04	N/A	98.71	N/A
			242T	98.24	N/A	98.33	N/A	97.21	0.12
			484T	98.96	N/A	99.06	N/A	95.26	0.21
			996T	98.01	N/A	98.20	N/A	95.23	0.21
		MRU	52+26T	99.40	N/A	99.40	N/A	99.01	N/A
			106+26T	98.93	N/A	99.02	N/A	98.34	N/A
			484+242T	98.54	N/A	98.61	N/A	96.23	0.17
	160MHz	RU	26T	99.59	N/A	99.54	N/A	99.24	N/A
			52T	99.61	N/A	99.56	N/A	99.24	N/A
			106T	99.20	N/A	99.12	N/A	98.56	N/A
			242T	98.33	N/A	98.25	N/A	97.18	0.12
			484T	99.06	N/A	99.06	N/A	95.18	0.21
			996T	98.30	N/A	98.11	N/A	95.28	0.21
			2x996T	97.13	0.13	98.10	N/A	95.18	0.21
		MRU	52+26T	99.32	N/A	99.43	N/A	98.96	N/A
			106+26T	99.37	N/A	99.02	N/A	98.25	N/A
			484+242T	98.61	N/A	98.61	N/A	96.29	0.16
			996+484T	97.70	0.10	98.57	N/A	96.18	0.17
			966+484+242T	99.67	N/A	99.53	N/A	96.18	0.17

Table 2-5. Measured Duty Cycles

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

WiFi Configurations		SISO		SDM		CDD	
		ANT1	ANT2	ANT1	ANT2	ANT1	ANT2
5GHz	11ax	✓	✓	✓	✓	✓	✓
	11be	✓	✓	✓	✓	✓	✓

Table 2-6. Frequency / Channel Operations

✓ = Support; ✕ = NOT Support

SISO = Single Input Single Output

SDM = Spatial Diversity Multiplexing – MIMO function

CDD = Cyclic Delay Diversity – 2Tx Function

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

MCS Index	Spatial Stream	OFDMA (802.11ax)																	
		26T			52T			106T			242T			484T			996T		
		0.8μs GI	1.6μs GI	3.2μs GI	0.8μs GI	1.6μs GI	3.2μs GI	0.8μs GI	1.6μs GI	3.2μs GI	0.8μs GI	1.6μs GI	3.2μs GI	0.8μs GI	1.6μs GI	3.2μs GI	0.8μs GI	1.6μs GI	3.2μs GI
0	1	0.9	0.8	0.8	1.8	1.7	1.5	3.8	3.5	3.2	8.6	8.1	7.3	17.2	16.3	14.6	36	34	30.6
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	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	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	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	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	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	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	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	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	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	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
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	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	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	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	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	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	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	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	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	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	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	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

Table 2-7. 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	-5.38	-7.03	-3.16
5.22	-5.17	-6.95	-3.00
5.25	-3.59	-6.30	-1.83
5.28	-2.95	-5.59	-1.16
5.30	-3.23	-5.09	-1.10
5.50	-4.61	-4.95	-1.77
5.60	-4.30	-3.63	-0.95
5.70	-2.50	-2.73	0.40
5.785	-2.50	-3.32	0.11
5.80	-4.04	-3.41	-0.71
5.805	-4.16	-3.51	-0.82
5.85	-5.03	-4.87	-1.94
5.885	-5.79	-4.32	-2.01

Table 2--8. Antenna Peak Gain by Frequency

Frequency [GHz]	Antenna 1 Gain (dBi)	Antenna 2 Gain (dBi)	Directional Gain (dBi)
5.15-5.25	-3.59	-6.30	-1.83
5.25-5.35	-3.23	-5.09	-1.16
5.47-5.725	-2.50	-2.73	0.40
5.725-5.85	-2.50	-3.32	0.11
5.85-5.895	-5.03	-4.87	-1.94

Table 2--9. Antenna Peak Gain by Band

2.4 Test Configuration

ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing. See 5GHz OFDM Report for AC line conducted emissions test setups, 7.6 for radiated emissions test setups, and 7.2, 7.3, 7.4, and 7.5 for antenna port conducted emissions test setups.

This device supports wireless charging capability and, thus, is subject to the test requirements of KDB 648474 D03 v01r04. Additional radiated spurious emission measurements were performed with the EUT lying flat on an authorized wireless charging pad (WCP) Model: NQ-WC-06 while operating under normal conditions in a simulated call or data transmission configuration. The worst case radiated emissions data is shown in this report.

2.5 Software and Firmware

The test was conducted with software/firmware version S938BXXU0AXHN 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

Table 5-1. Measurement Uncertainty Budget – MD

Contribution	Expanded Uncertainty (\pm dB)
Conducted Bench Top Measurements	1.65
Line Conducted Disturbance	2.71
Radiated Disturbance (<30MHz)	4.06
Radiated Disturbance (30MHz - 1GHz)	4.30
Radiated Disturbance (1 - 18GHz)	4.78
Radiated Disturbance (>18GHz)	4.79

Table 5-2. Measurement Uncertainty Budget – CA

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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
-	WL25-1	Conducted Cable Set (25GHz)	4/2/2024	Annual	4/2/2025	WL25-1
-	WL25-2	Conducted Cable Set (25GHz)	4/2/2024	Annual	4/2/2025	WL25-2
-	WL40-1	Conducted Cable Set (40GHz)	4/2/2024	Annual	4/2/2025	WL40-1
-	API-002	EMC Cable and Switch System	4/2/2024	Annual	4/2/2025	API-002
-	ETS-001	EMC Cable and Switch System	4/2/2024	Annual	4/2/2025	ETS-001
-	ETS-002	EMC Cable and Switch System	4/2/2024	Annual	4/2/2025	ETS-002
-	MD 1M 18-40	EMC Cable and Switch System	4/2/2024	Annual	4/2/2025	MD 1M 18-40
Anritsu	MA24408A	Microwave Peak Power Sensor	5/21/2024	Annual	5/21/2025	11675
Anritsu	MA24408A	Microwave Peak Power Sensor	4/10/2024	Annual	4/10/2025	12798
ETS-Lindgren	3116C	Horn Antenna (18-40GHz)	2/27/2023	Biennial	2/27/2025	218893
Rohde & Schwarz	TC-TA18	Vivaldi Antenna	2/23/2023	Biennial	2/23/2025	26040036
Rohde & Schwarz	FSW26	Signal and Spectrum Analyzer (26.5GHz)	3/8/2024	Annual	3/8/2025	103187
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 (44GHz)	4/5/2024	Annual	4/5/2025	101716
Pasternak	NMLC-2	EMI Test Receiver (2Hz to 44GHz)	4/2/2024	Annual	4/2/2025	NMLC-2
Rohde & Schwarz	ENV216	Two-Line V-Network	1/31/2023	Biennial	1/31/2025	101379
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	4/9/2024	Annual	4/9/2025	MY52350166
Keysight Technologies	N9020A	MXA Signal Analyzer	4/11/2024	Annual	4/11/2025	MY54500644
Keysight Technologies	N9030A	PXA Signal Analyzer	2/29/2024	Annual	3/1/2025	MY55410501
Keysight Technologies	N9030B	PXA Signal Analyzer, Multi-touch	9/19/2024	Annual	9/19/2025	MY57141001
Sunol	JB6	JB6 Antenna	3/2/2023	Biennial	3/2/2025	A082816
Sunol	JB5	Bi-Log Antenna (20M-5GHz)	9/11/2024	Biennial	9/11/2026	A051107
Rohde & Schwarz	SMW200A	Vector Signal Generator	4/4/2024	Annual	4/4/2025	109456

Table 6-1. Test Equipment Calibration Table – MD

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
ETS-Lindgren	3117	Double Ridged Guide Antenna (1-18 GHz)	4/9/2024	Annual	4/9/2025	00218555
Rohde & Schwarz	TS-PR18	Pre-Amplifier (1GHz - 18GHz)	5/29/2024	Annual	11/29/2024	102132
Rohde & Schwarz	TS-PR18	Pre-Amplifier (1GHz - 18GHz)	8/14/2024	Annual	8/15/2025	101648
Rohde & Schwarz	FSV40	Signal Analyzer (10Hz-40GHz)	5/29/2024	Annual	5/29/2025	101619
Rohde & Schwarz	ESW44	EMI Test Receiver	5/1/2024	Annual	5/1/2025	101867
Rohde & Schwarz	FSW67	Signal and Spectrum Analyzer (2Hz-67GHz)	7/5/2024	Annual	7/5/2025	101366
Rohde & Schwarz	TS-PR8	Pre-Amplifier (30MHz - 8GHz)	7/3/2024	Annual	7/3/2025	102356
Schwarzbeck	VULB 9162	Bilog Antenna (30MHz - 6GHz)	4/29/2024	Annual	4/29/2025	00304

Table 6-2. Test Equipment Calibration Table – CA

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: A3LSMS938B
 FCC Classification: Unlicensed National Information Infrastructure (NII)

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference	Test Lab Location
N/A	RSS-Gen [6.7]	26dB Bandwidth	N/A	CONDUCTED	PASS	Section 7.2	MD
15.407(e)	RSS-Gen [6.7]	6dB Bandwidth	>500kHz (5725-5850MHz and 5850 – 5895MHz)		PASS	Section 7.3	MD
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	MD
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	MD
15.407(h)	RSS-247 [6.3]	Dynamic Frequency Selection	See DFS Test Report		PASS	See DFS Test Report	MD
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	CA
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	CA

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 “EMC Software Tool,” Version 2.3.0.
- 6) 802.11ax/be OFDMA testing was performed for all signal tone configurations as specified by the 802.11ax standard. Worst case results are determined and reported per the guidance provided at the October 2018 TCB Workshop.
- 7) Only one RU index could be selected at a time, so no contiguous or non-contiguous RUs were considered for testing.

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- 8) Data was leveraged from model SM-S938U for the certification of SM-S938B/DS. See Table 7-2 for spot-check results.

FCC Rules	Test Item	Test Case	Units	Limit	Reference Model: SM-S938U	Variant Model: SM-S938B	Deviation (dB)	Max Deviation (dB)	Pass/Fail
2.1046, 15.407(a)(8)	Conducted Output Power	Mid Channel Each UNII Band - 802.11be 242T	dBm	23.98	20.40	20.57	0.17	1	PASS
15.209, 15.407(b)(1), 15.407(b)(2), 15.407(b)(3), 15.407(b)(4)	Radiated Spurious Emissions	802.11ax MIMO 26 Tone Ch.36 - 7252 MHz - Average	dBm	53.98	50.34	50.97	0.63	3	PASS
15.209	Radiated Band Edge Emissions	802.11ax MIMO 242 Tone Ch.36 - Average	dBm	53.98	51.74	50.04	-1.70	3	PASS

Table 7-2. Summary of Spot-checks

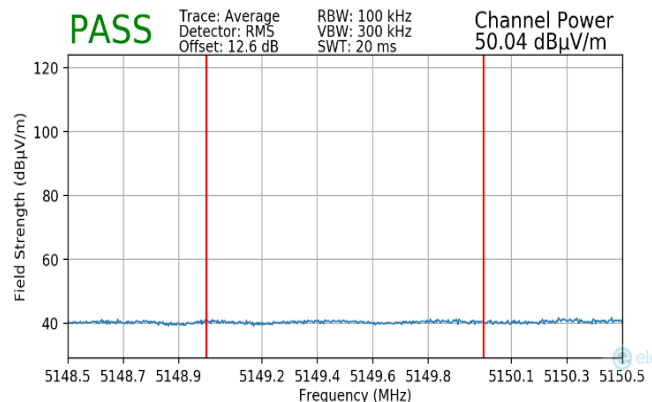
20MHz BW	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm)			Conducted Power Limit [dBm]	Conducted Power Margin [dB]
					RU Index				
					61				
					ANT1	ANT2	MIMO		
	1	5200	40	242T	17.42	17.70	20.57	23.98	-3.41
2A	5280	56	242T	17.51	17.44	20.49	23.98	-3.49	
2C	5600	120	242T	17.34	17.28	20.32	23.98	-3.66	
3	5785	157	242T	17.37	17.42	20.41	30	-9.59	
4	5865	173	242T	17.11	17.19	20.16	-	-	

Table 7-3. Conducted Output Power Measurements (Spot-check)

Mode	Antenna	UNII Band	Channel	Test Channel Freq. [MHz]	RU Index	Restricted	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
802.11ax RU 26T	MIMO	1	36	5180	4	*	7252.00	Average	V	-	-	-65.20	9.17	0.00	50.97	53.98	-3.01

Table 7-4. Radiated Measurements MIMO (Spot-check)

Worst Case Mode: 802.11ax
Worst Case Transfer Rate: MCS0
RU Index: 61
Distance of Measurements: 3 Meters
Operating Frequency: 5180MHz
Channel: 36



Plot 7-1. Radiated Lower Band Edge Plot MIMO (Average – UNII Band 1 – 242 Tones)

- Each spot check test on the EUT was performed using the same procedure and setting that were used to perform the test on the corresponding reference device.
- All test cases were performed to verify the variant EUT is still in compliance with the spot checked results to the reference device and was performed using the guidance of ANSI C63.10-2013.

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7.2 26dB Bandwidth Measurement

Test Overview and Limit

The bandwidth at 26dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating at its maximum duty cycle, at its maximum power control level, as defined in ANSI C63.10-2013, and at the appropriate frequencies. The spectrum analyzer's bandwidth measurement function is configured to measure the 26dB bandwidth.

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

Test Procedure Used

ANSI C63.10-2013 – Section 12.4

Test Settings

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

Test Setup

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



Figure 7-1. Test Instrument & Measurement Setup

Test Notes

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

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MIMO 26dB Bandwidth Measurements

	Frequency [MHz]	802.11 MODE	Channel	Antenna-1 26dB Bandwidth [MHz]	Antenna-2 26dB Bandwidth [MHz]
Band 1	5180	be (20MHz)	36	19.84	20.04
	5200	be (20MHz)	40	20.16	20.04
	5240	be (20MHz)	48	20.38	20.03
	5190	be (40MHz)	38	24.29	24.07
	5230	be (40MHz)	46	23.55	23.75
	5210	be (80MHz)	42	29.73	27.16
Band 1/2A	5250	be (160MHz)	50	38.28	37.16
Band 2A	5260	be (20MHz)	52	20.17	20.09
	5280	be (20MHz)	56	19.87	20.00
	5320	be (20MHz)	64	20.21	20.13
	5270	be (40MHz)	54	23.45	23.94
	5310	be (40MHz)	62	23.68	23.53
	5290	be (80MHz)	58	30.06	27.38
Band 2C	5500	be (20MHz)	100	20.15	19.83
	5600	be (20MHz)	120	20.26	20.05
	5720	be (20MHz)	144	20.09	20.06
	5510	be (40MHz)	102	23.37	24.86
	5590	be (40MHz)	118	23.19	23.69
	5710	be (40MHz)	142	22.33	23.74
	5530	be (80MHz)	106	28.40	27.38
	5610	be (80MHz)	122	29.44	27.64
	5690	be (80MHz)	138	27.06	27.89
	5570	be (160MHz)	114	39.84	37.81

Table 7-5. Bands 1, 2A, 2C Conducted 26dB Bandwidth Measurements MIMO (26 Tones)

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	Frequency [MHz]	802.11 MODE	Channel	Antenna-1 26dB Bandwidth [MHz]	Antenna-2 26dB Bandwidth [MHz]
Band 1	5180	be (20MHz)	36	21.61	21.69
	5200	be (20MHz)	40	21.62	21.74
	5240	be (20MHz)	48	21.41	21.73
	5190	be (40MHz)	38	42.25	43.25
	5230	be (40MHz)	46	42.33	43.04
	5210	be (80MHz)	42	90.84	90.80
Band 1/2A	5250	be (160MHz)	50	177.43	181.12
Band 2A	5260	be (20MHz)	52	21.19	21.82
	5280	be (20MHz)	56	21.89	21.72
	5320	be (20MHz)	64	21.61	21.66
	5270	be (40MHz)	54	42.87	42.82
	5310	be (40MHz)	62	42.57	42.98
	5290	be (80MHz)	58	90.96	91.16
Band 2C	5500	be (20MHz)	100	21.63	21.75
	5600	be (20MHz)	120	21.50	21.63
	5720	be (20MHz)	144	21.58	21.85
	5510	be (40MHz)	102	42.19	43.44
	5590	be (40MHz)	118	42.03	43.45
	5710	be (40MHz)	142	42.80	42.93
	5530	be (80MHz)	106	91.06	91.35
	5610	be (80MHz)	122	91.45	91.54
	5690	be (80MHz)	138	90.43	90.75
	5570	be (160MHz)	114	188.01	188.54

Table 7-6. Bands 1, 2A, 2C Conducted 26dB Bandwidth Measurements MIMO (Full Tones)

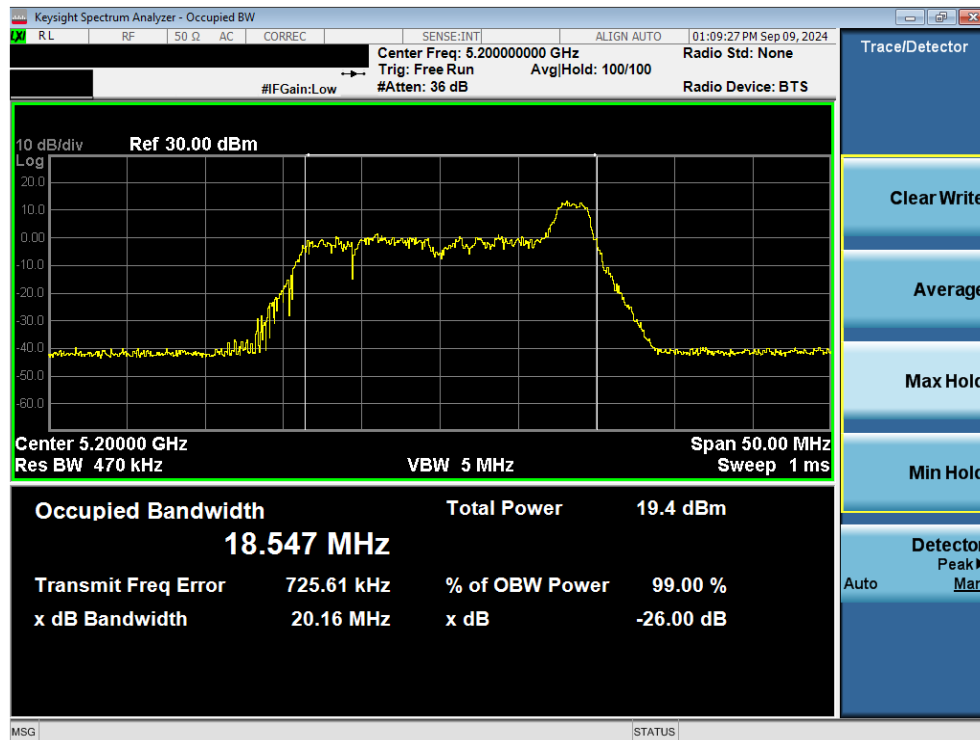
FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
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	Frequency [MHz]	802.11 MODE	Channel	MRU Configuration	Antenna-1 26dB Bandwidth [MHz]	Antenna-2 26dB Bandwidth [MHz]
Band 1	5200	be (20MHz)	40	52+26T	18.76	19.05
	5200	be (20MHz)	40	106+26T	20.41	20.28
	5210	be (80MHz)	42	484+242T	89.25	88.63
Band 1/2A	5250	be (160MHz)	50	996+484T	174.67	175.86
Band 2A	5280	be (20MHz)	56	52+26T	19.19	18.74
	5280	be (20MHz)	56	106+26T	19.99	20.37
	5290	be (80MHz)	58	484+242T	89.58	89.74
Band 2C	5600	be (20MHz)	120	52+26T	18.68	19.05
	5600	be (20MHz)	120	106+26T	20.10	20.69
	5610	be (80MHz)	122	484+242T	88.34	89.73
	5570	be (160MHz)	114	996+484T	175.70	176.67

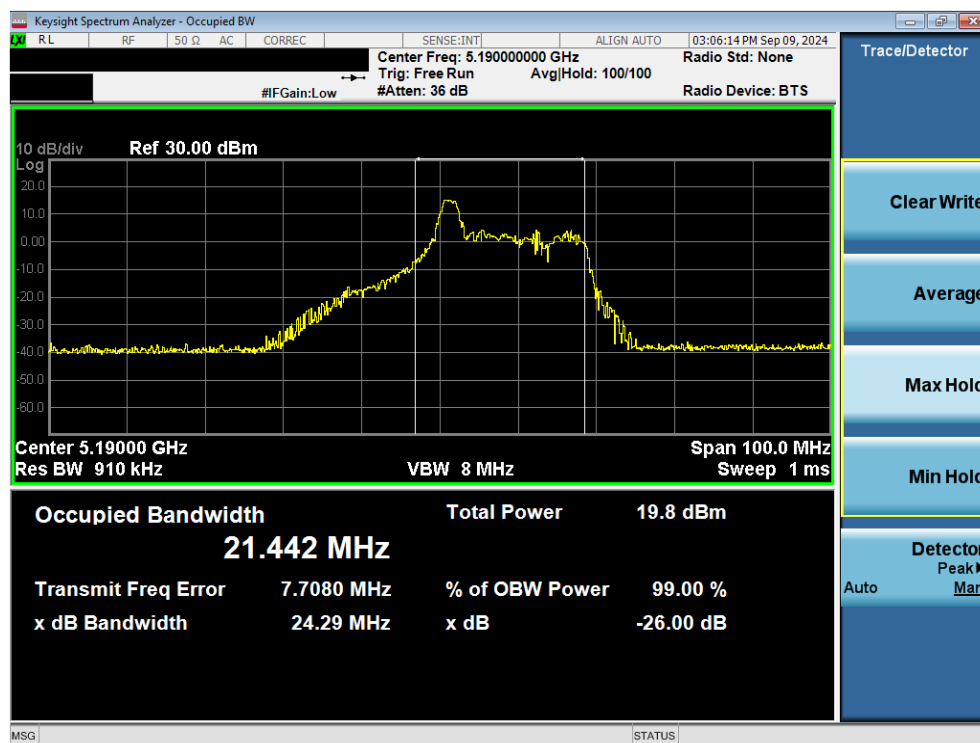
Table 7-7. Bands 1, 2A, 2C Conducted 26dB Bandwidth Measurements MIMO (MRU Cases)

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7.2.1 MIMO Antenna-1 26dB Bandwidth Measurements

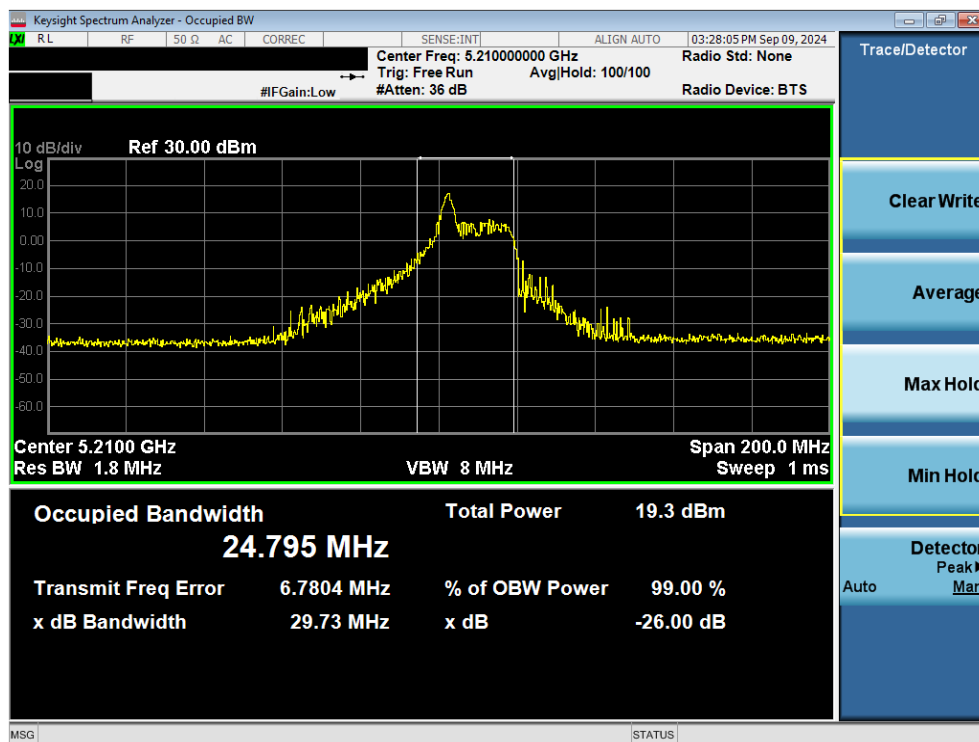


Plot 7-2. 26dB Bandwidth Plot MIMO ANT1 (20MHz 802.11ax/be (26 Tones) (UNII Band 1) – Ch. 40)

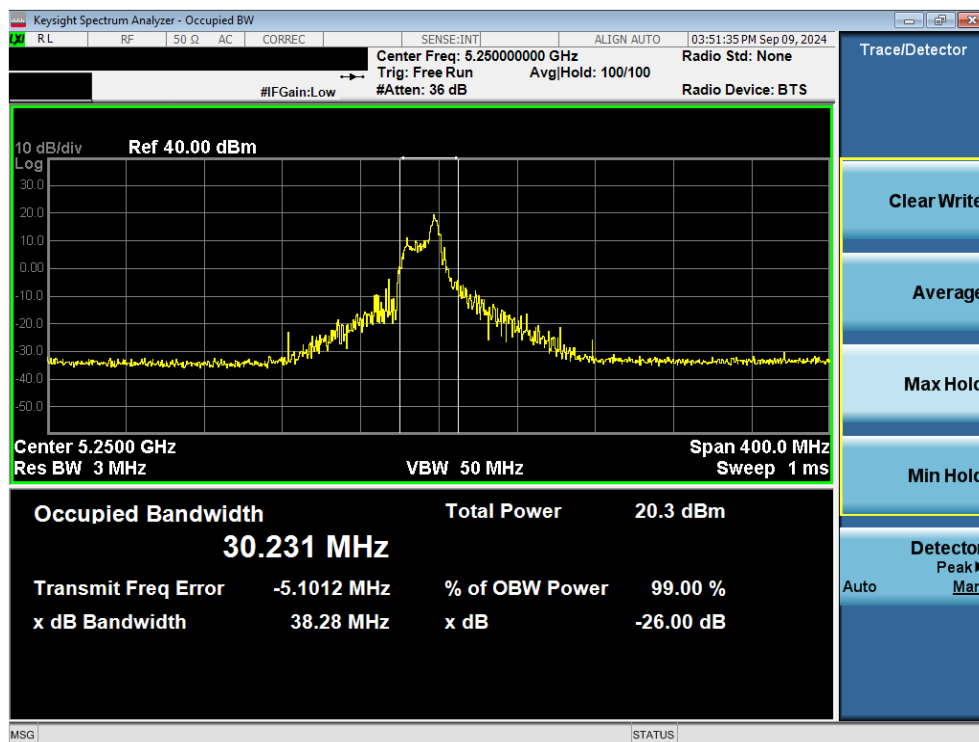


Plot 7-3. 26dB Bandwidth Plot MIMO ANT1 (40MHz 802.11ax/be (26 Tones) (UNII Band 1) – Ch. 38)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
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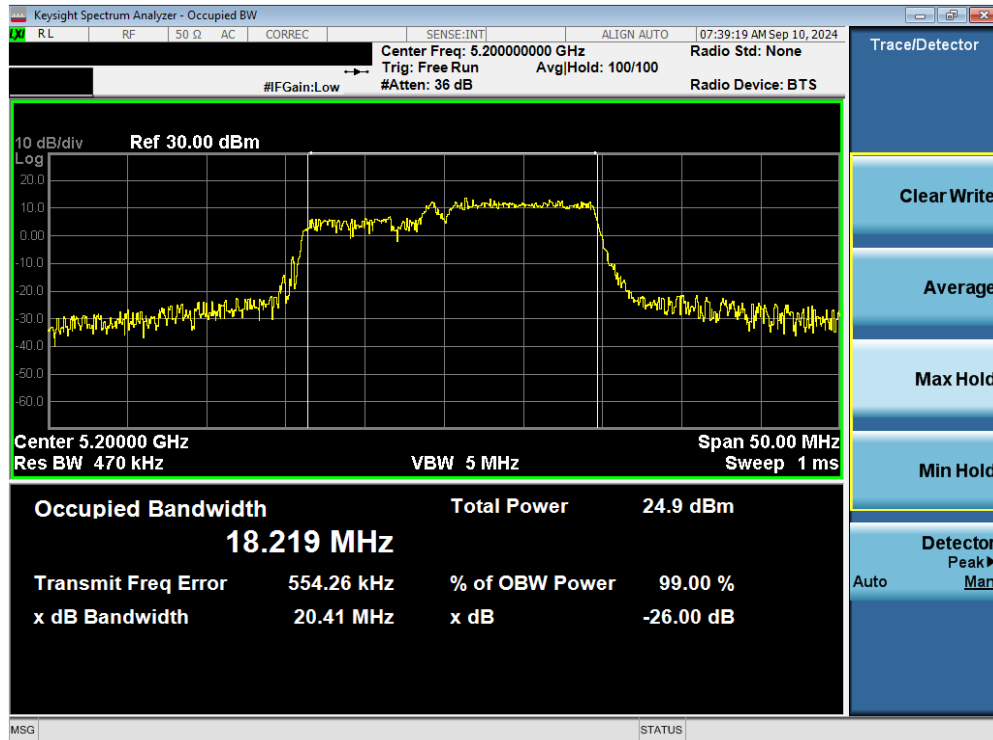


Plot 7-4. 26dB Bandwidth Plot MIMO ANT1 (80MHz 802.11ax/be (26 Tones) (UNII Band 1) – Ch. 42)

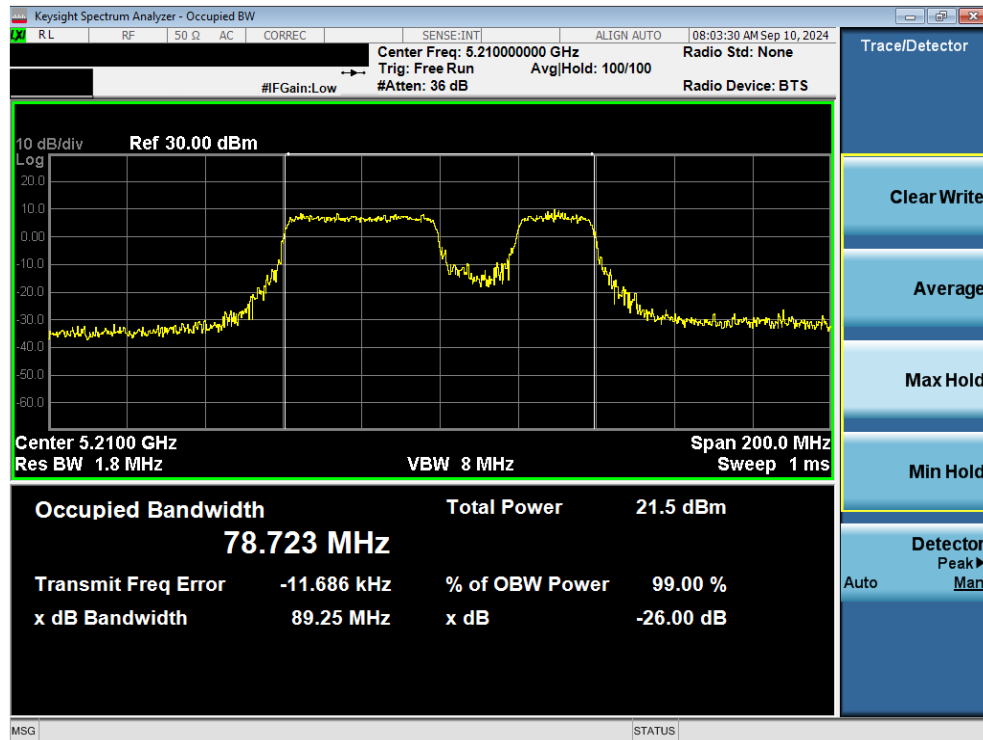


Plot 7-5. 26dB Bandwidth Plot MIMO ANT1 (160MHz 802.11ax/be (26 Tones) (UNII Band 1/2A) – Ch. 50)

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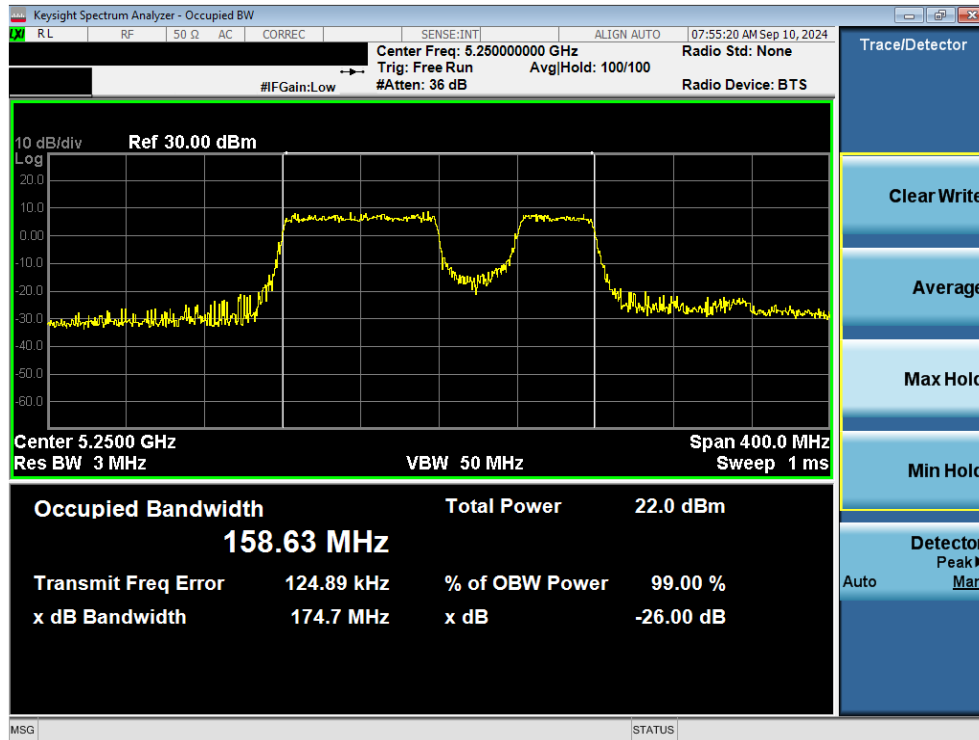


Plot 7-6. 26dB Bandwidth Plot MIMO ANT1 (20MHz 802.11be (106+26 Tones) (UNII Band 1) – Ch. 40)

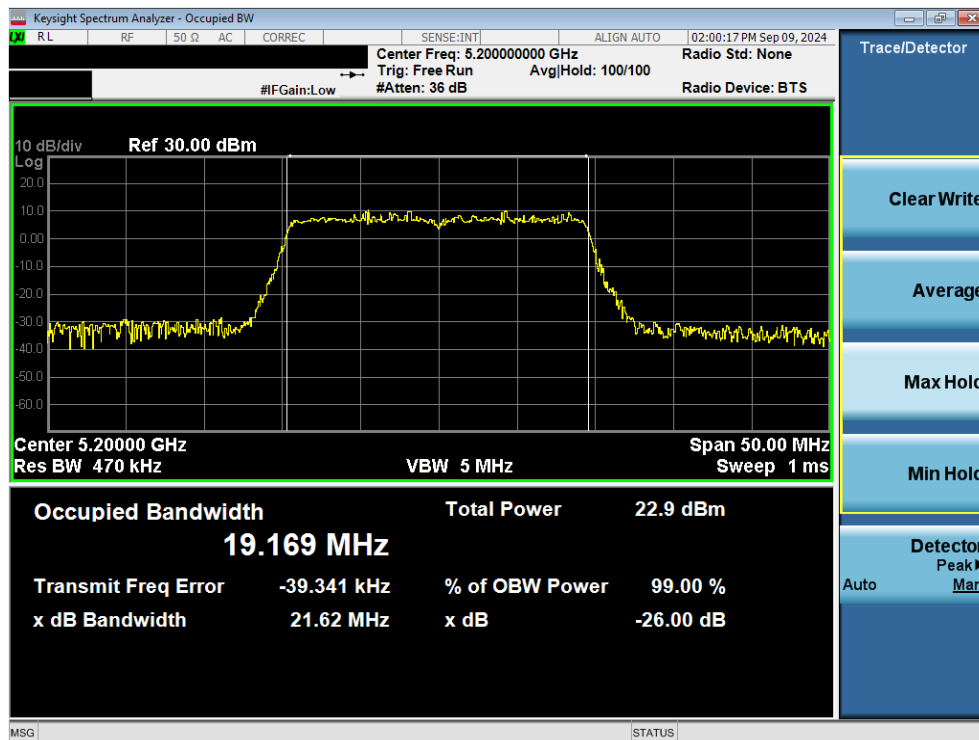


Plot 7-7. 26dB Bandwidth Plot MIMO ANT1 (80MHz 802.11be (484+242 Tones) (UNII Band 1) – Ch. 42)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
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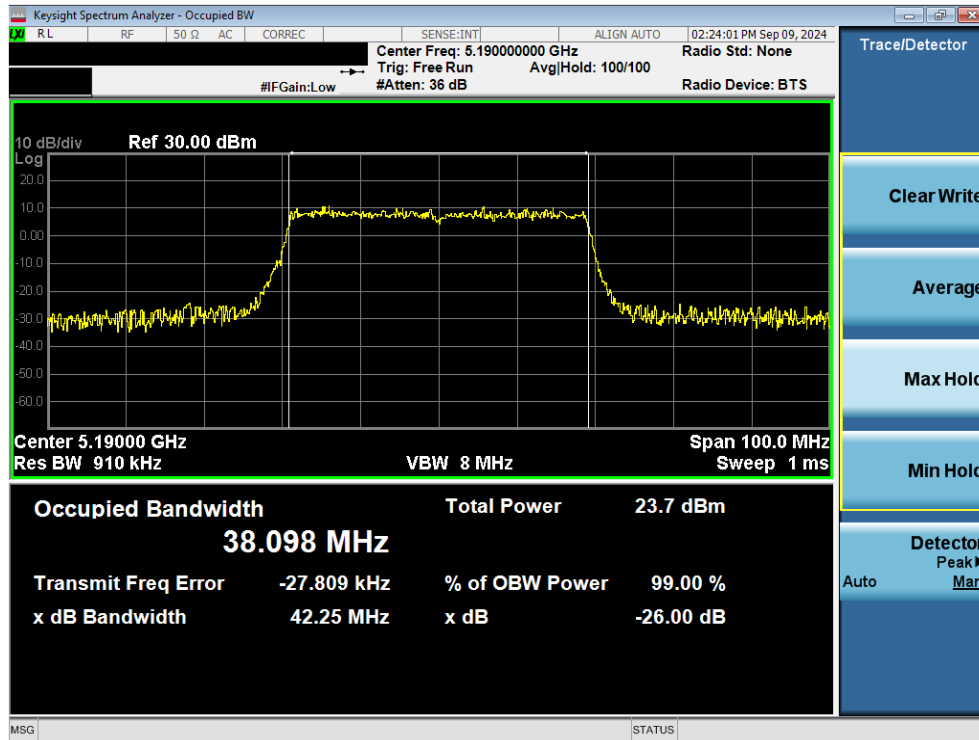


Plot 7-8. 26dB Bandwidth Plot MIMO ANT1 (160MHz 802.11be (996+484 Tones) (UNII Band 1/2A) – Ch. 50)

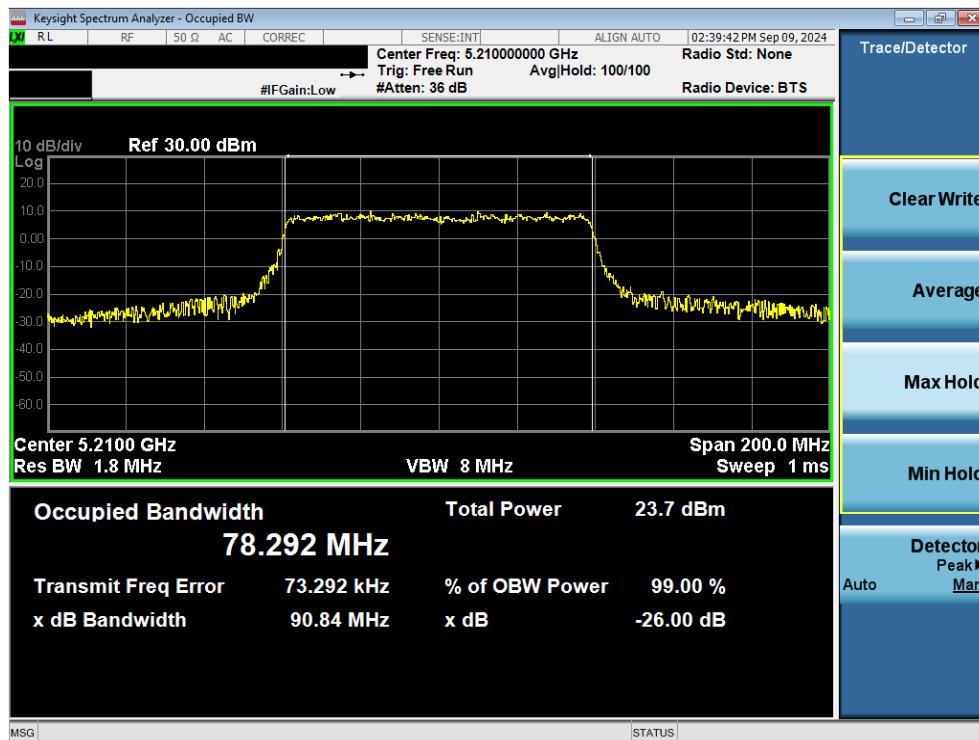


Plot 7-9. 26dB Bandwidth Plot MIMO ANT1 (20MHz 802.11ax/be (Full Tones) (UNII Band 1) – Ch. 40)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 22 of 105

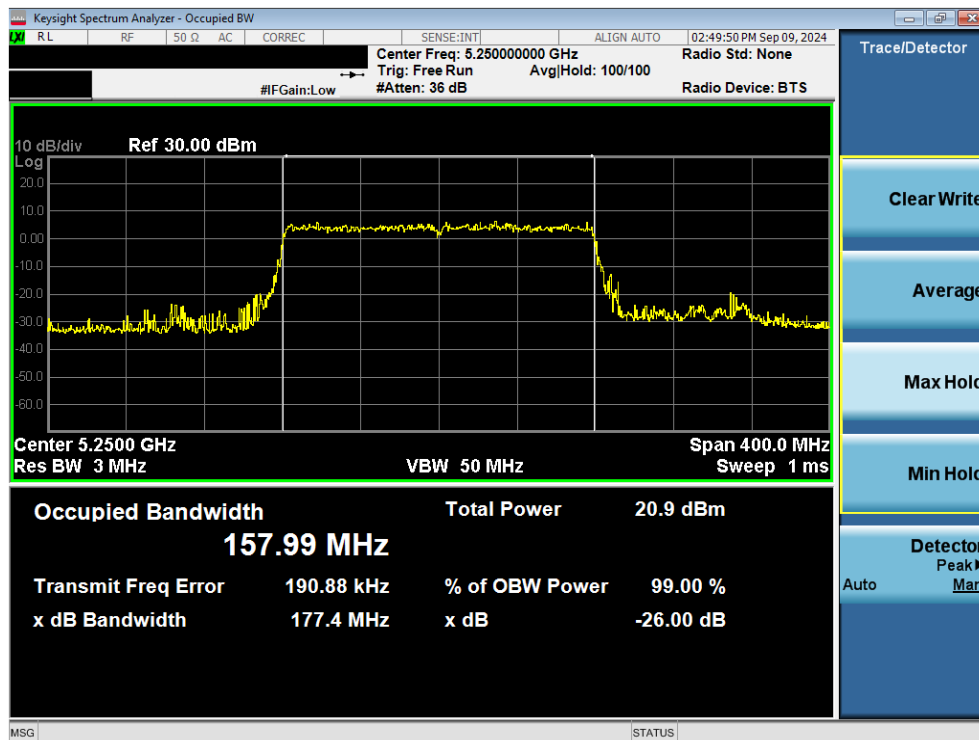


Plot 7-10. 26dB Bandwidth Plot MIMO ANT1 (40MHz 802.11ax/be (Full Tones) (UNII Band 1) – Ch. 38)



Plot 7-11. 26dB Bandwidth Plot MIMO ANT1 (80MHz 802.11ax/be (Full Tones) (UNII Band 1) – Ch. 42)

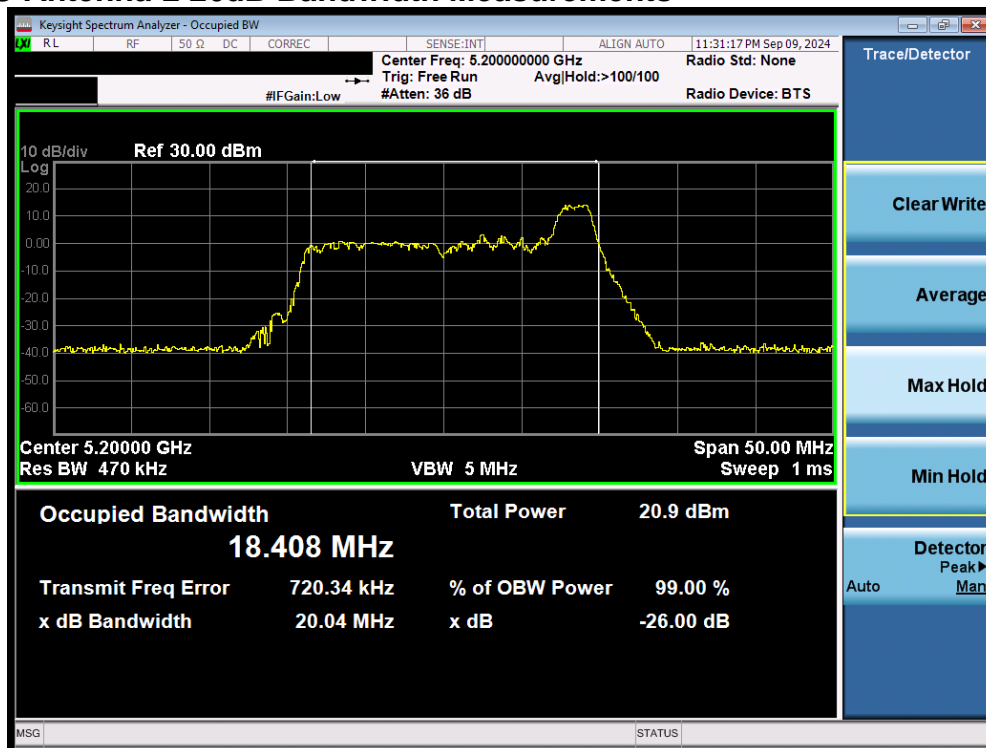
FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 23 of 105



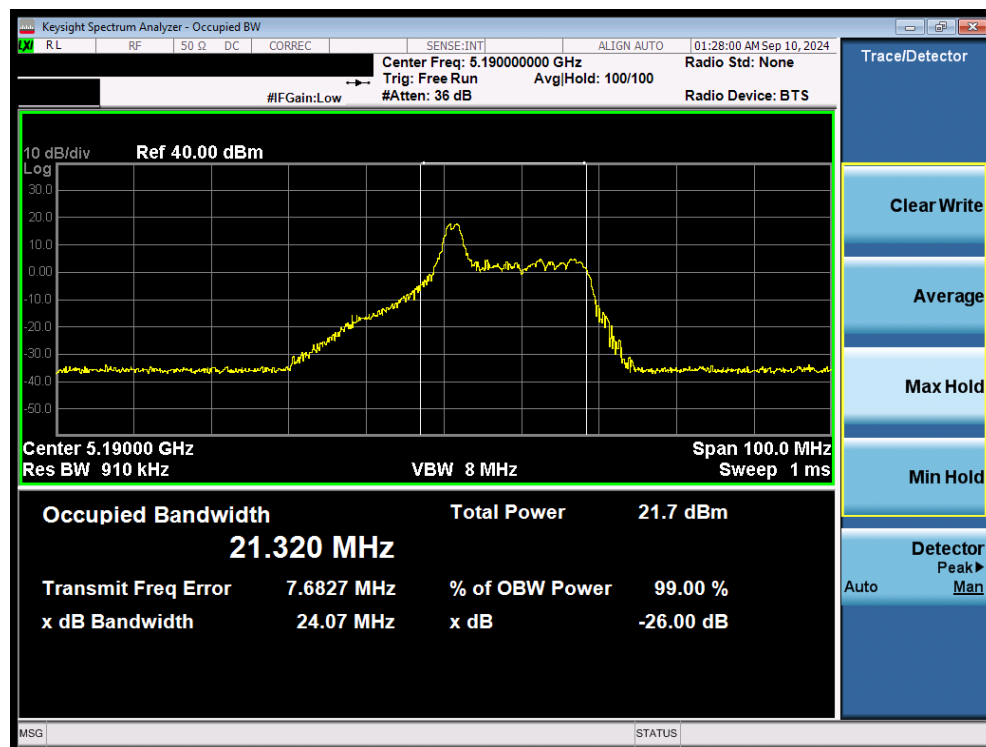
Plot 7-12. 26dB Bandwidth Plot MIMO ANT1 (160MHz 802.11ax/be (Full Tones) (UNII Band 1/2A) – Ch. 50)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 24 of 105

7.2.2 MIMO Antenna-2 26dB Bandwidth Measurements

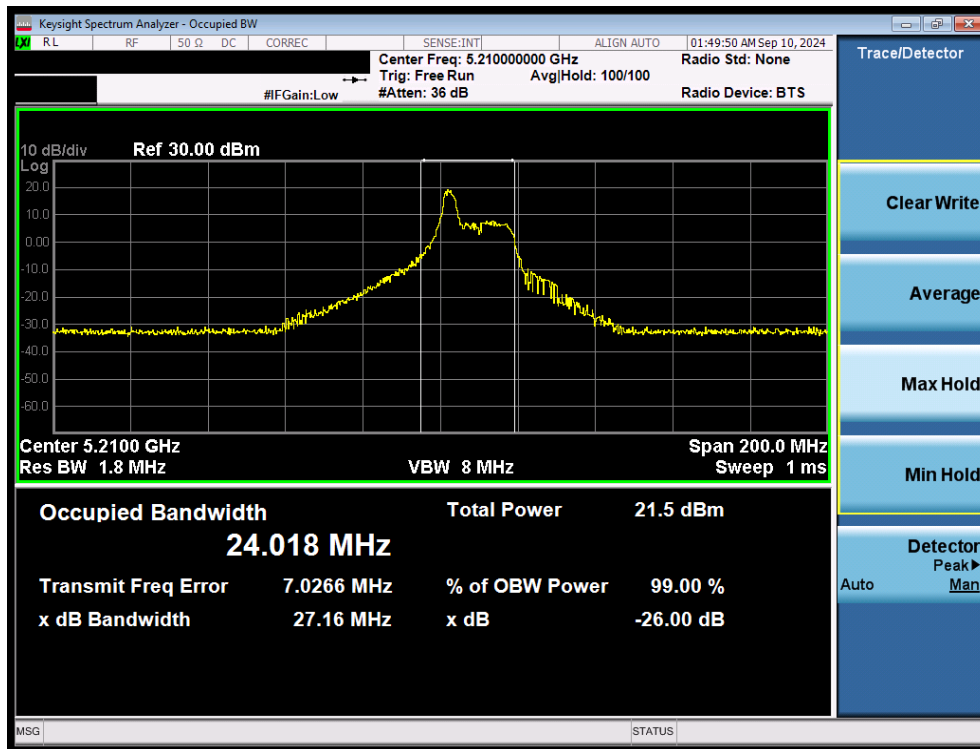


Plot 7-13. 26dB Bandwidth Plot MIMO ANT2 (20MHz 802.11ax/be (26 Tones) (UNII Band 1) – Ch. 40)

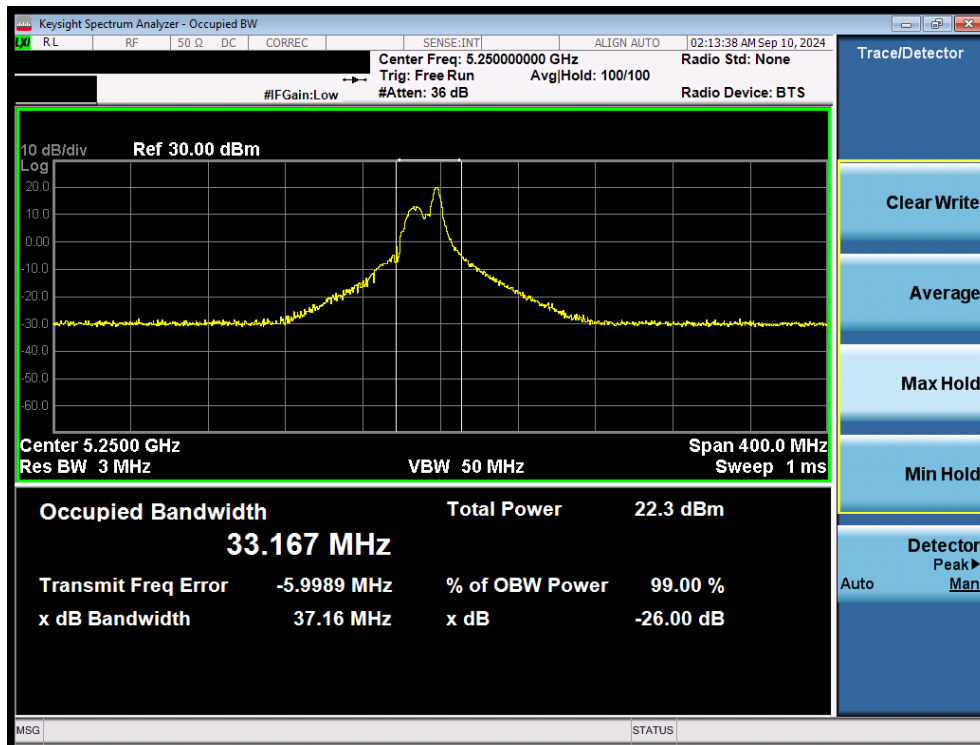


Plot 7-14. 26dB Bandwidth Plot MIMO ANT2 (40MHz 802.11ax/be (26 Tones) (UNII Band 1) – Ch. 38)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 25 of 105

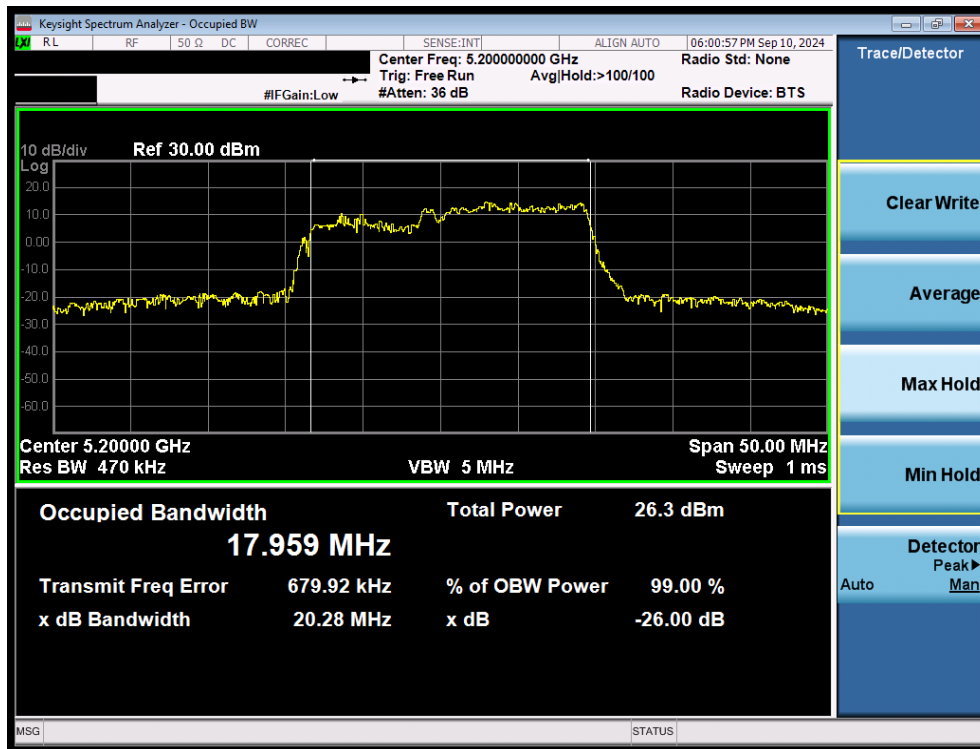


Plot 7-15. 26dB Bandwidth Plot MIMO ANT2 (80MHz 802.11ax/be (26 Tones) (UNII Band 1) – Ch. 42)

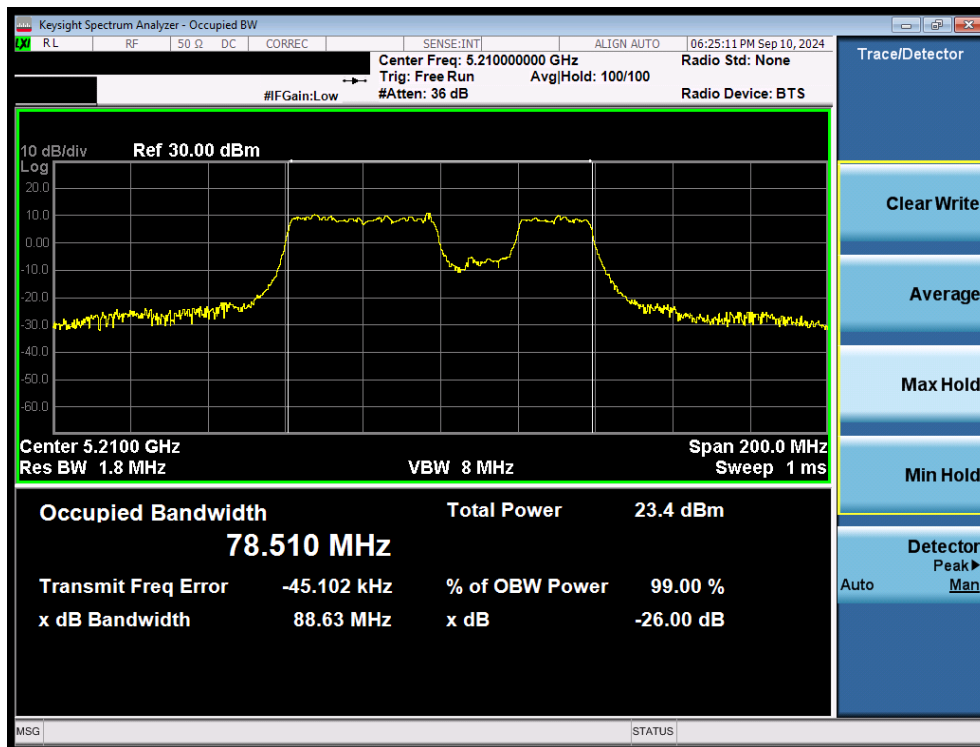


Plot 7-16. 26dB Bandwidth Plot MIMO ANT2 (160MHz 802.11ax/be (26 Tones) (UNII Band 1/2A) – Ch. 50)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 26 of 105

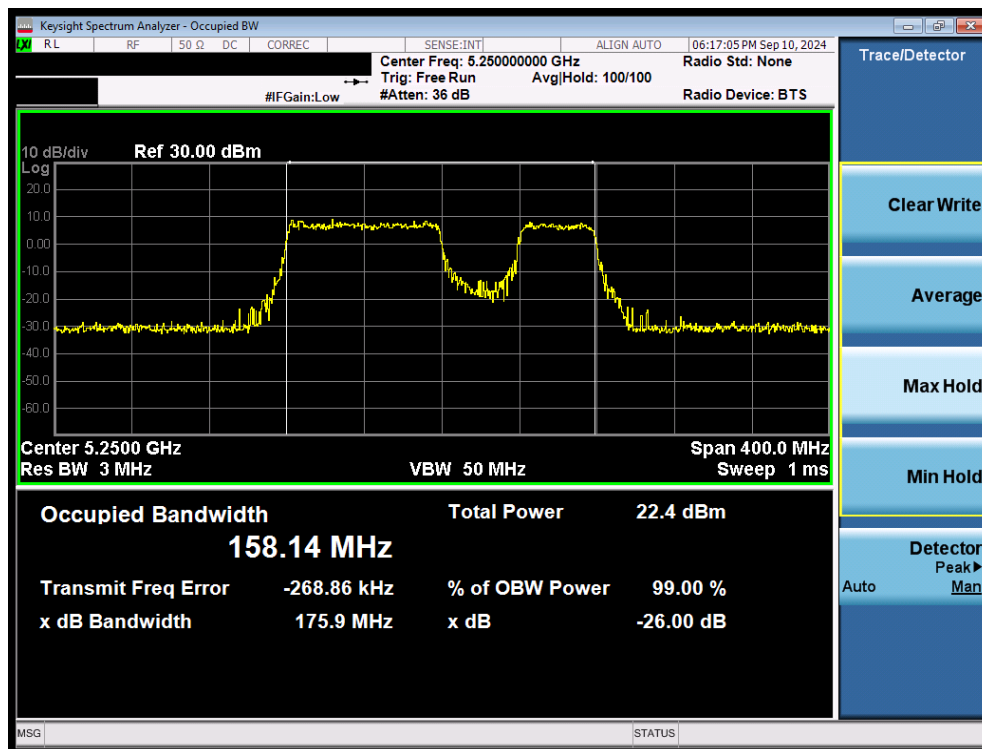


Plot 7-17. 26dB Bandwidth Plot MIMO ANT2 (20MHz 802.11be (106+26 Tones) (UNII Band 1) – Ch. 40)

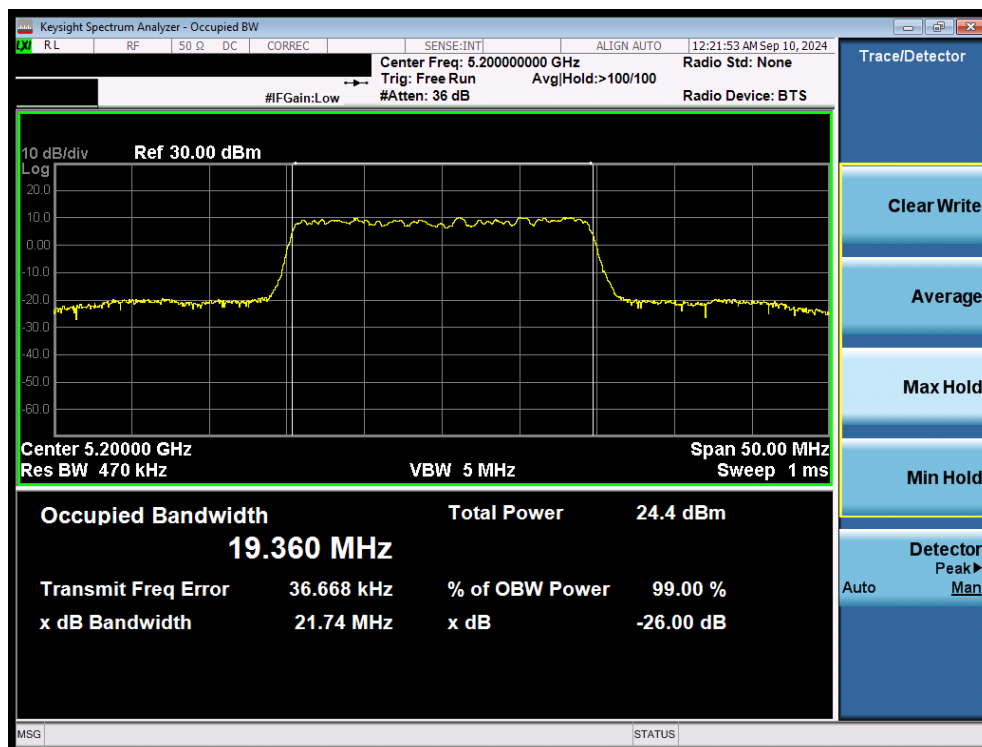


Plot 7-18. 26dB Bandwidth Plot MIMO ANT2 (80MHz 802.11be (484+242 Tones) (UNII Band 1) – Ch. 42)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
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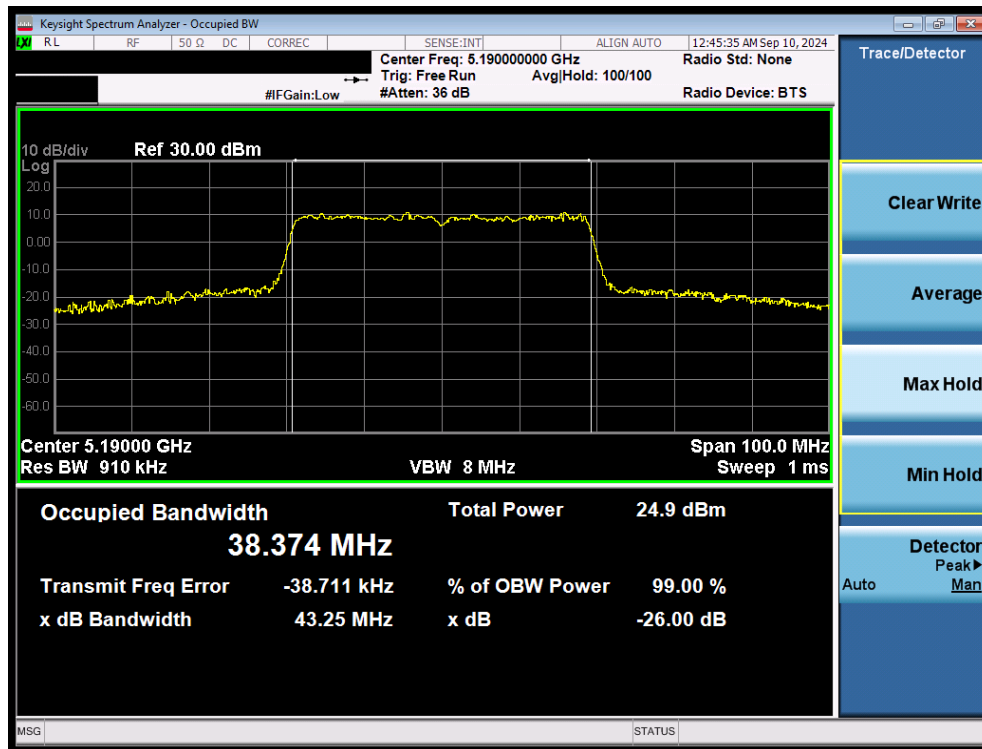


Plot 7-19. 26dB Bandwidth Plot MIMO ANT2 (160MHz 802.11be (996+484 Tones) (UNII Band 1/2A) – Ch. 50)

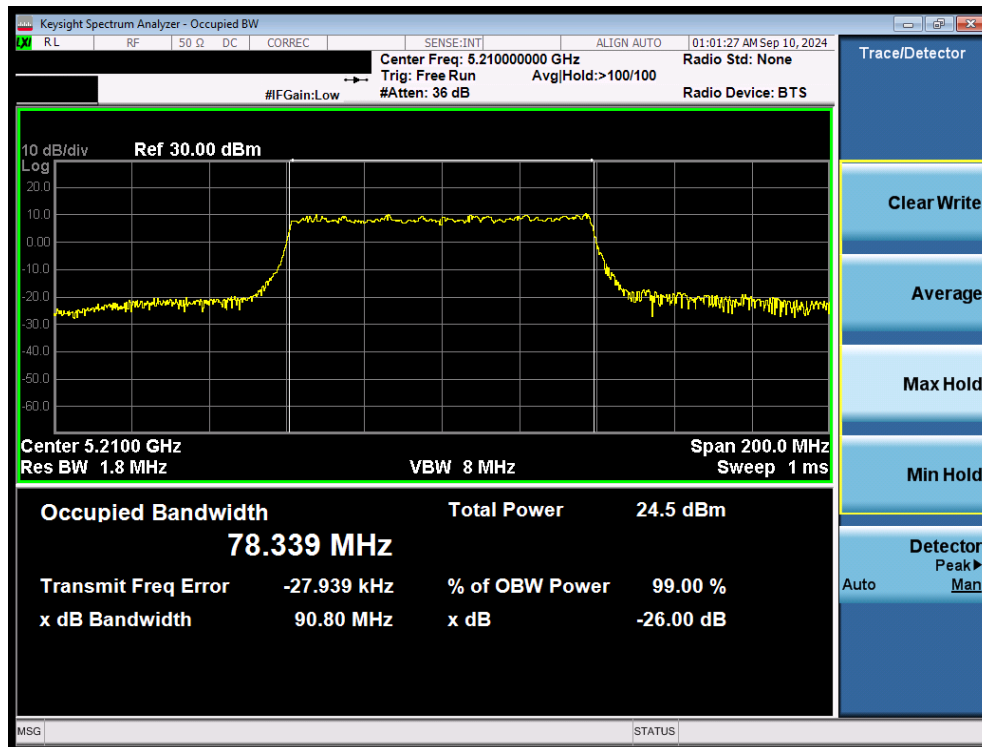


Plot 7-20. 26dB Bandwidth Plot MIMO ANT2 (20MHz 802.11ax/be (Full Tones) (UNII Band 1) – Ch. 40)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 28 of 105

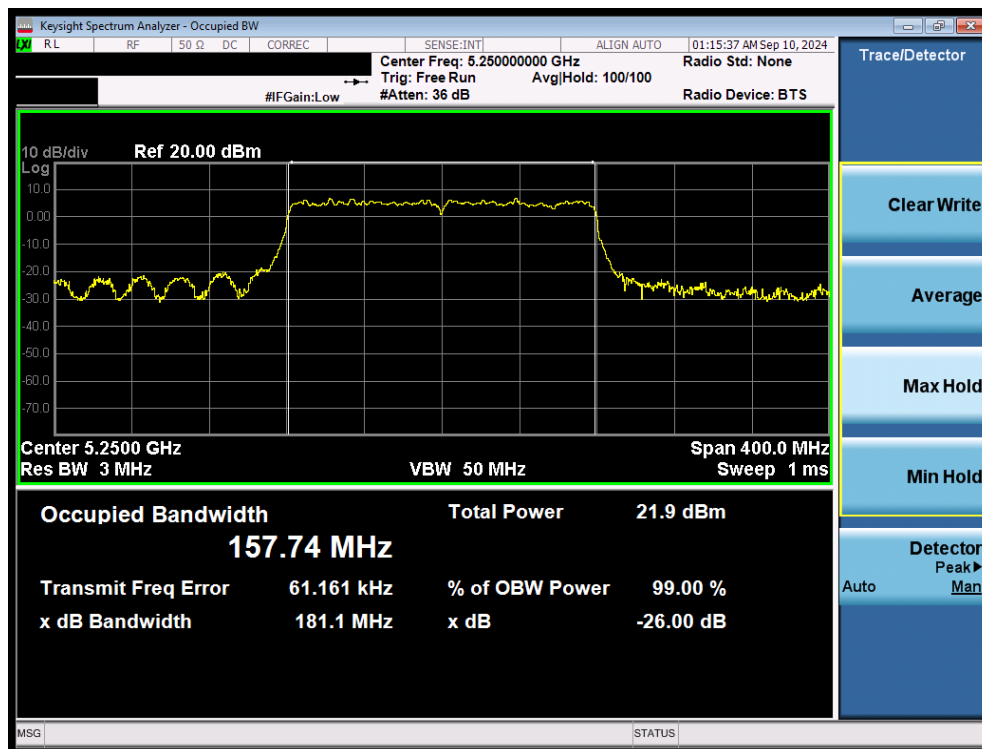


Plot 7-21. 26dB Bandwidth Plot MIMO ANT2 (40MHz 802.11ax/be (Full Tones) (UNII Band 1) – Ch. 38)



Plot 7-22. 26dB Bandwidth Plot MIMO ANT2 (80MHz 802.11ax/be (Full Tones) (UNII Band 1) – Ch. 42)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-23. 26dB Bandwidth Plot MIMO ANT2 (160MHz 802.11ax/be (Full Tones) (UNII Band 1/2A) – Ch. 50)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 30 of 105

7.3 6dB Bandwidth Measurement

Test Overview and Limit

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating at its maximum duty cycle, at its maximum power control level, as defined in ANSI C63.10-2013, and at the appropriate frequencies. The spectrum analyzer's bandwidth measurement function is configured to measure the 6dB bandwidth.

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

Test Procedure Used

ANSI C63.10-2013 – Section 6.9.2

Test Settings

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

Test Setup

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



Figure 7-2. Test Instrument & Measurement Setup

Test Notes

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

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MIMO 6dB Bandwidth Measurements

	Frequency [MHz]	802.11 MODE	Channel	Antenna-1 6dB Bandwidth [MHz]	Antenna-2 6dB Bandwidth [MHz]
Band 3	5745	be (20MHz)	149	2.07	2.11
	5785	be (20MHz)	157	1.96	2.11
	5825	be (20MHz)	165	1.98	2.12
	5755	be (40MHz)	151	2.17	2.23
	5795	be (40MHz)	159	2.12	2.19
	5775	be (80MHz)	155	2.18	2.32

Table 7-8. 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	be (20MHz)	149	19.01	18.97
	5785	be (20MHz)	157	19.02	18.99
	5825	be (20MHz)	165	19.01	19.13
	5755	be (40MHz)	151	38.06	38.20
	5795	be (40MHz)	159	38.23	38.25
	5775	be (80MHz)	155	78.19	78.19

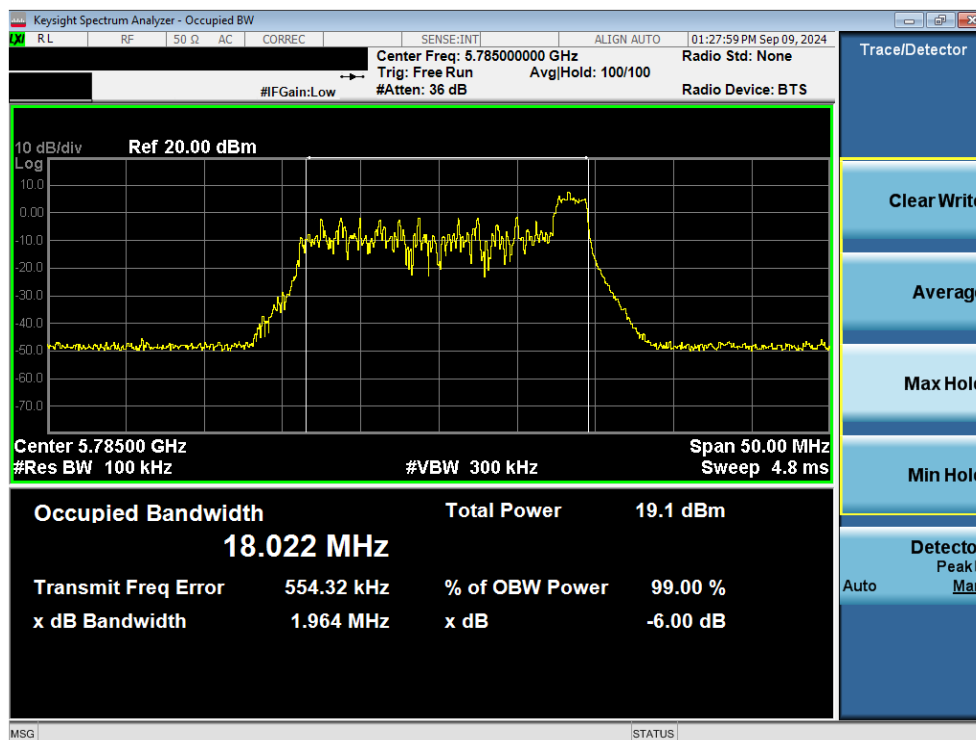
Table 7-9. Band 3 Conducted 6dB Bandwidth Measurements MIMO (Full Tones)

	Frequency [MHz]	802.11 MODE	Channel	MRU Configuration	Antenna-1 6dB Bandwidth [MHz]	Antenna-2 6dB Bandwidth [MHz]
Band 3	5785	be (20MHz)	157	52+26T	15.14	15.17
	5785	be (20MHz)	157	106+26T	17.21	17.13
	5775	be (80MHz)	155	484+242T	78.08	78.43

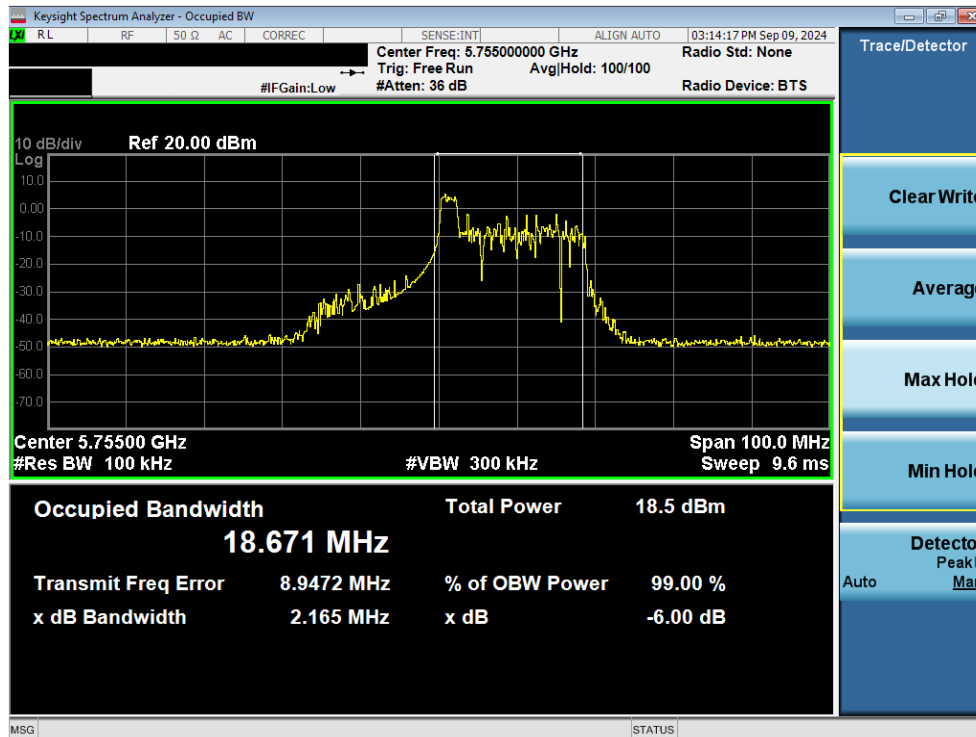
Table 7-10. Bands 3/4 Conducted 6dB Bandwidth Measurements MIMO (MRU Cases)

FCC ID: A3LSMS938B	MEASUREMENT REPORT			Approved by: Technical Manager
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7.3.1 MIMO Antenna-1 6dB Bandwidth Measurements

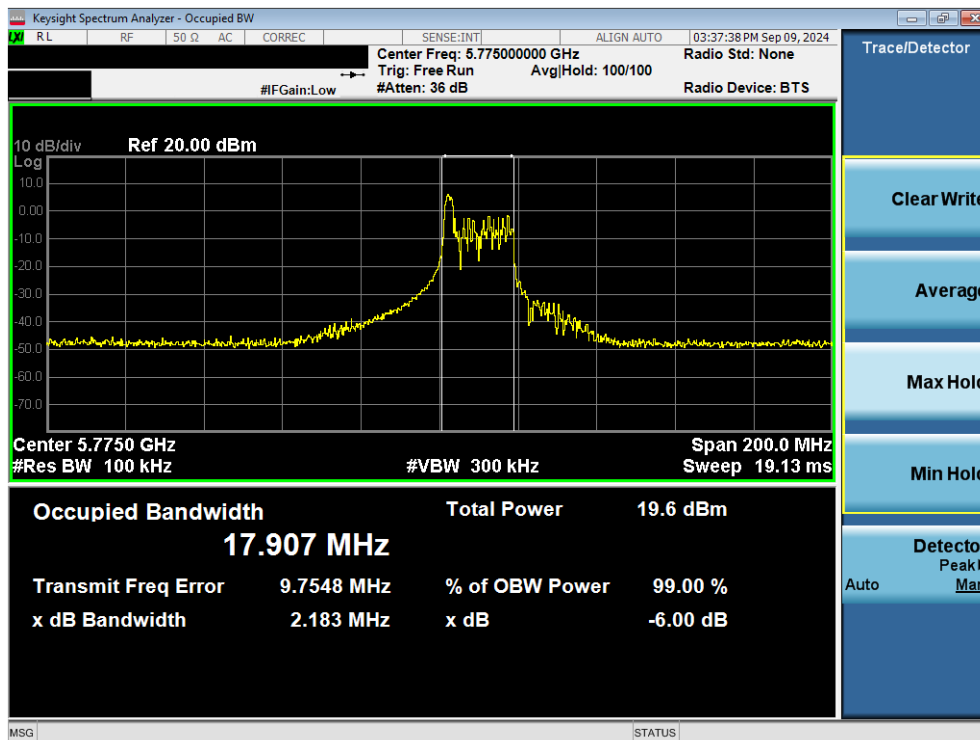


Plot 7-24. 6dB Bandwidth Plot MIMO ANT1 (20MHz 802.11ax/be (26 Tones) (UNII Band 3) – Ch. 157)

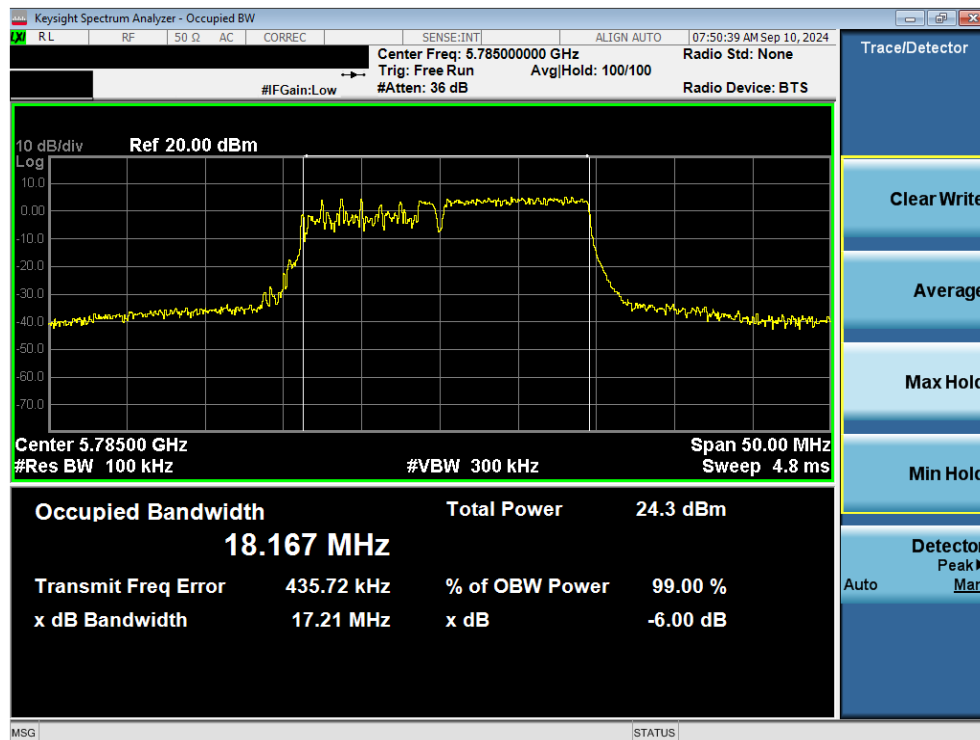


Plot 7-25. 6dB Bandwidth Plot MIMO ANT1 (40MHz 802.11ax/be (26 Tones) (UNII Band 3) – Ch. 151)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 33 of 105

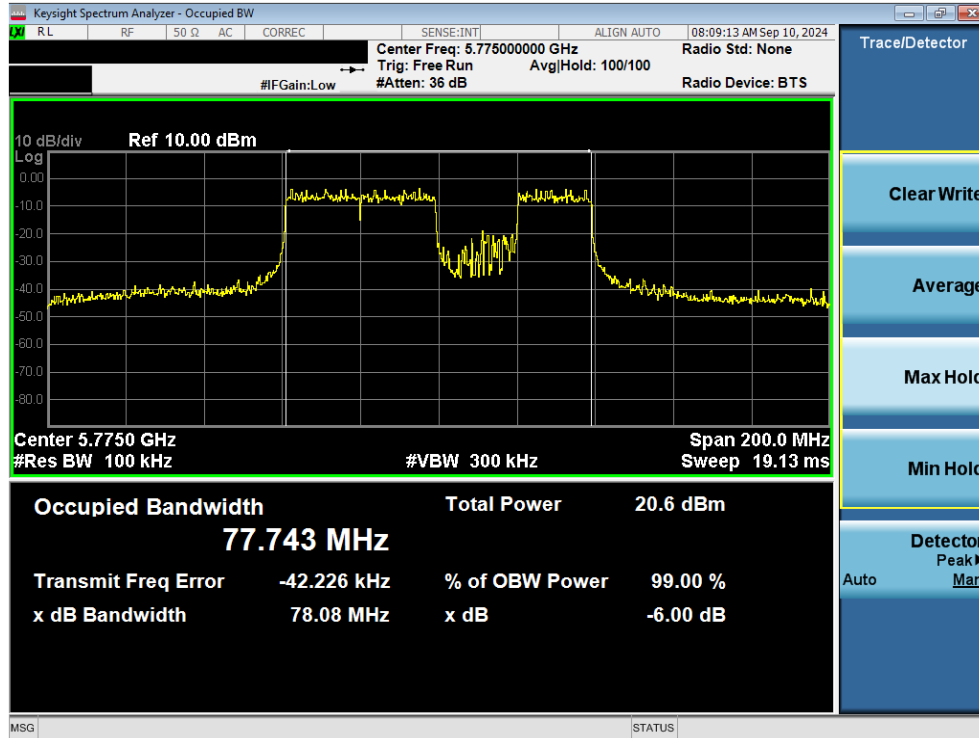


Plot 7-26. 6dB Bandwidth Plot MIMO ANT1 (80MHz 802.11ax/be (26 Tones) (UNII Band 3) – Ch. 155)

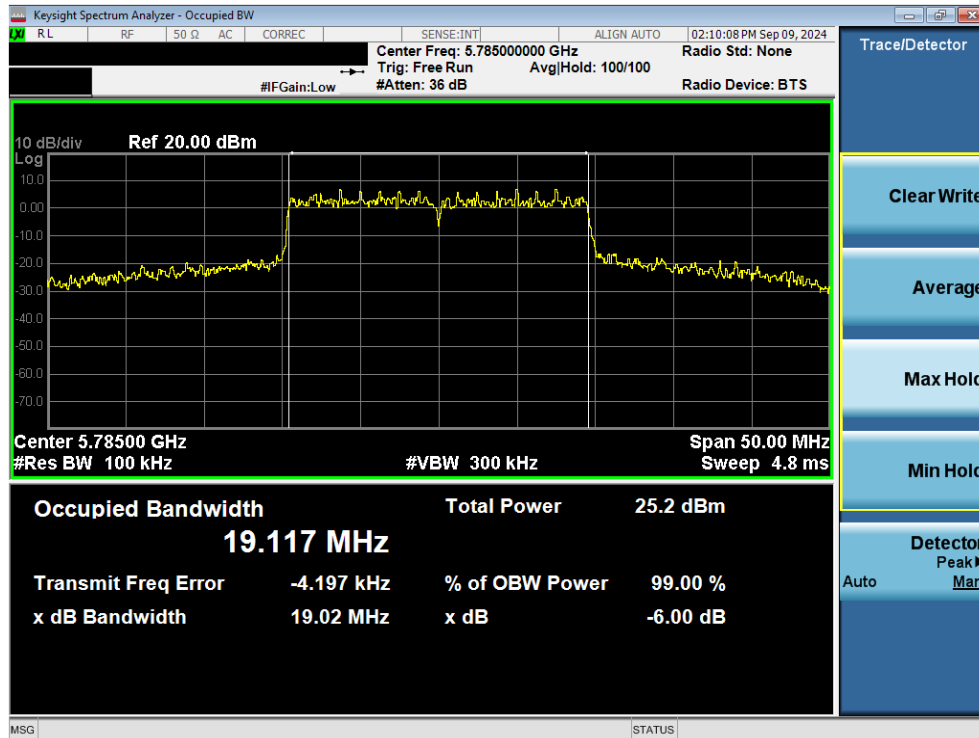


Plot 7-27. 6dB Bandwidth Plot MIMO ANT1 (20MHz 802.11be (106+26 Tones) (UNII Band 3) – Ch. 157)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 34 of 105

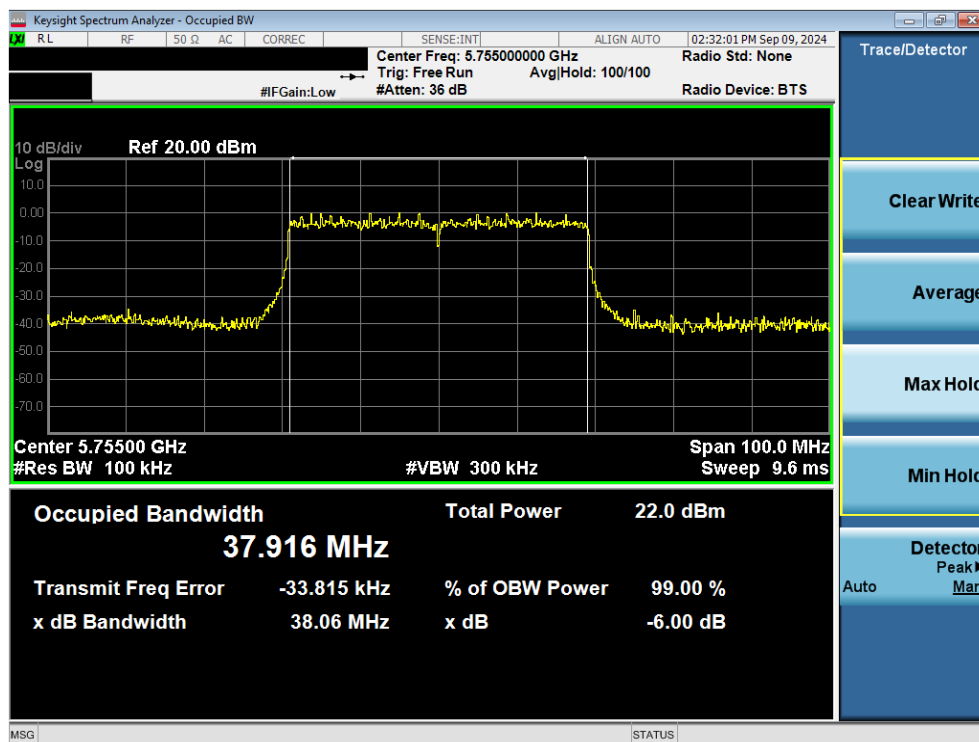


Plot 7-28. 6dB Bandwidth Plot MIMO ANT1 (80MHz 802.11be (484+242 Tones) (UNII Band 3) – Ch. 155)

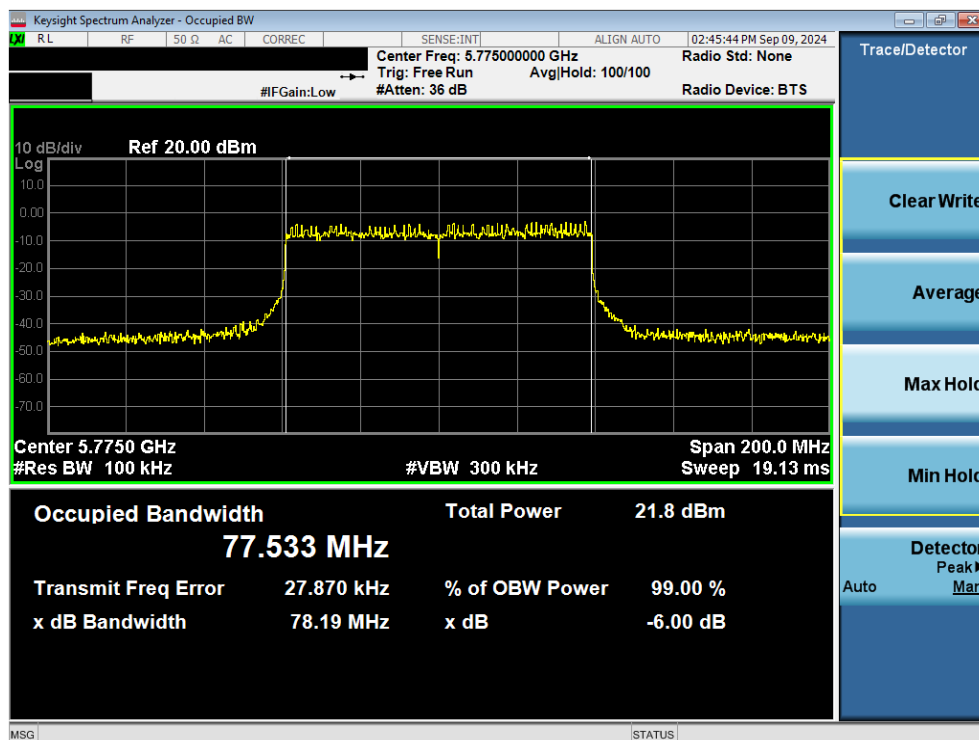


Plot 7-29. 6dB Bandwidth Plot MIMO ANT1 (20MHz 802.11ax/be (Full Tones) (UNII Band 3) – Ch. 157)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 35 of 105



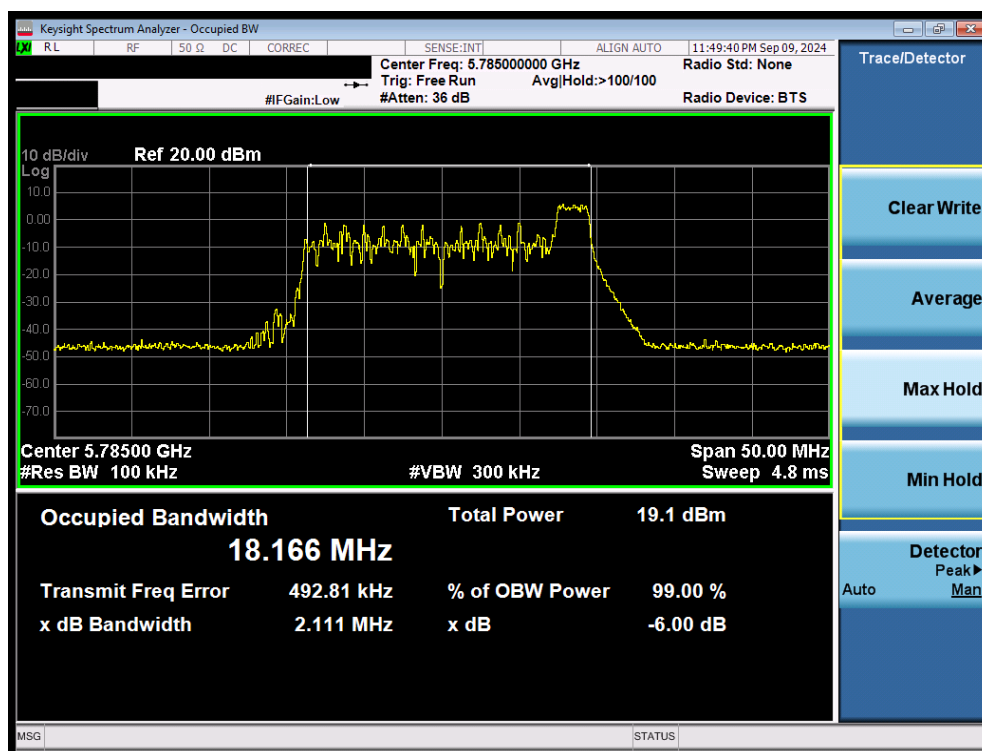
Plot 7-30. 6dB Bandwidth Plot MIMO ANT1 (40MHz 802.11ax/be (Full Tones) (UNII Band 3) – Ch. 151)



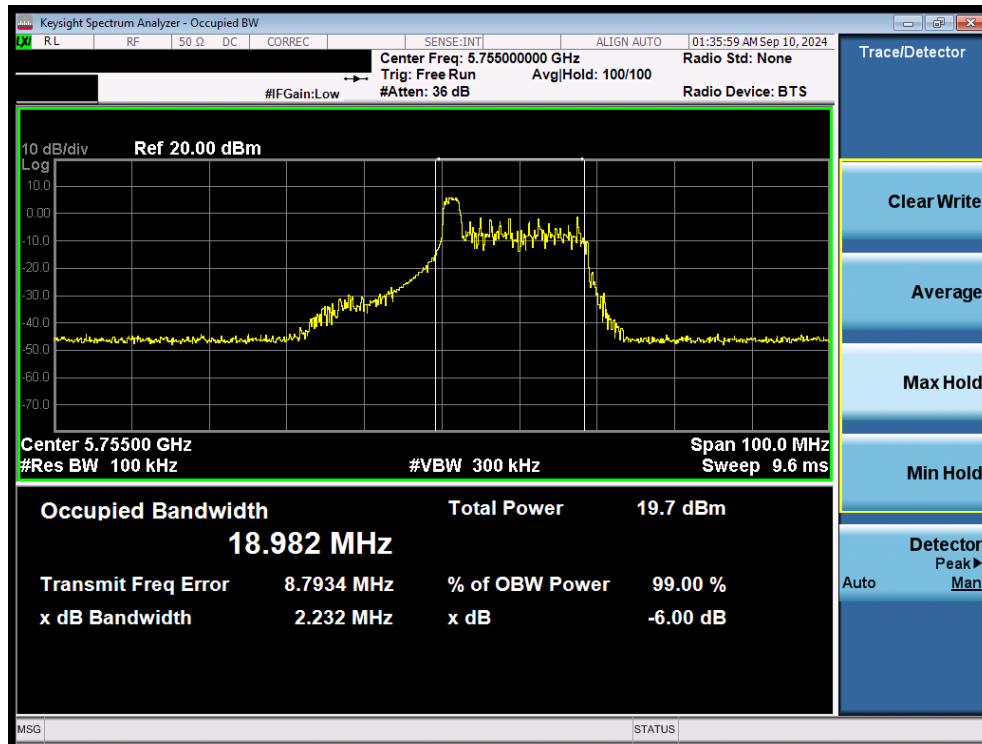
Plot 7-31. 6dB Bandwidth Plot MIMO ANT1 (80MHz 802.11ax/be (Full Tones) (UNII Band 3) – Ch. 155)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
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7.3.2 MIMO Antenna-2 6dB Bandwidth Measurements

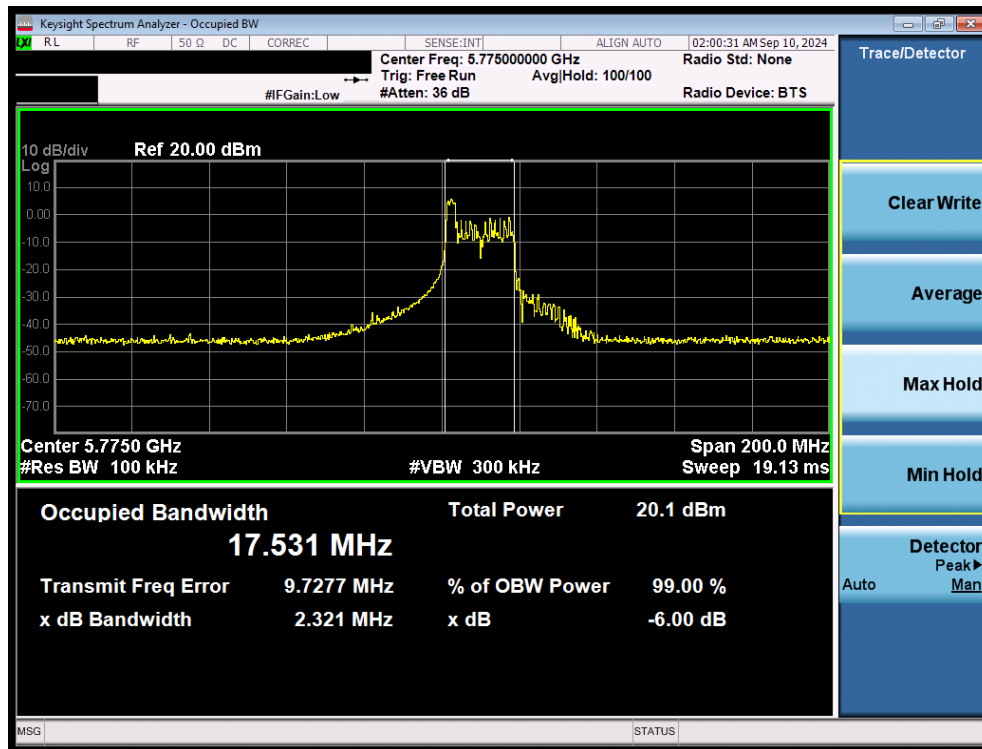


Plot 7-32. 6dB Bandwidth Plot MIMO ANT2 (20MHz 802.11ax/be (26 Tones) (UNII Band 3) – Ch. 157)

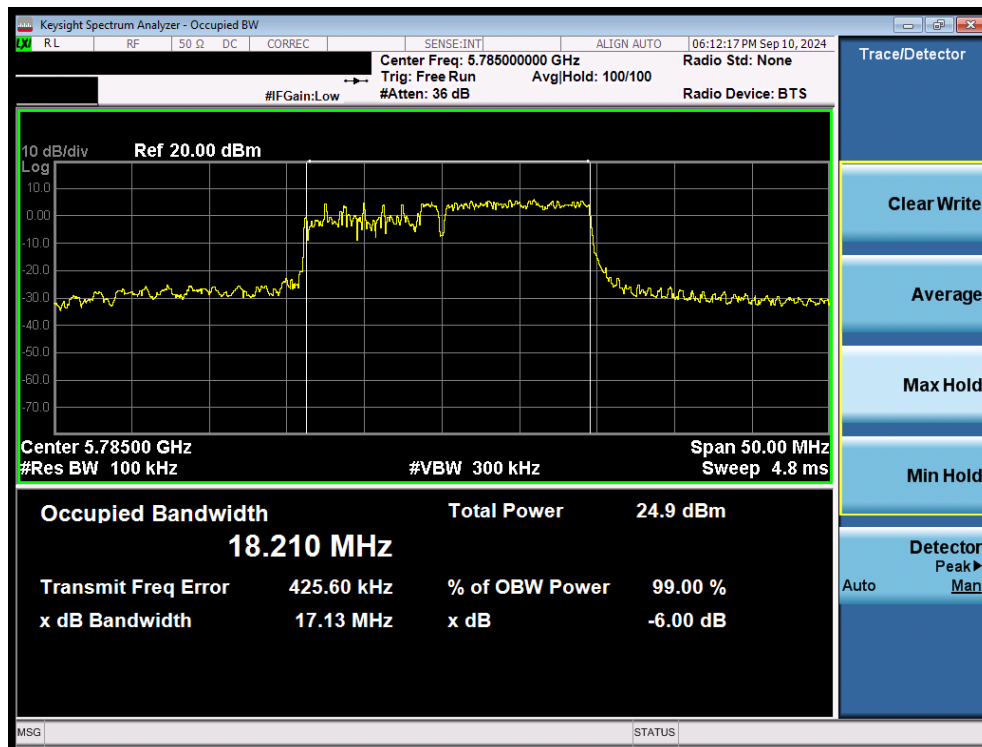


Plot 7-33. 6dB Bandwidth Plot MIMO ANT2 (40MHz 802.11ax/be (26 Tones) (UNII Band 3) – Ch. 151)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 37 of 105

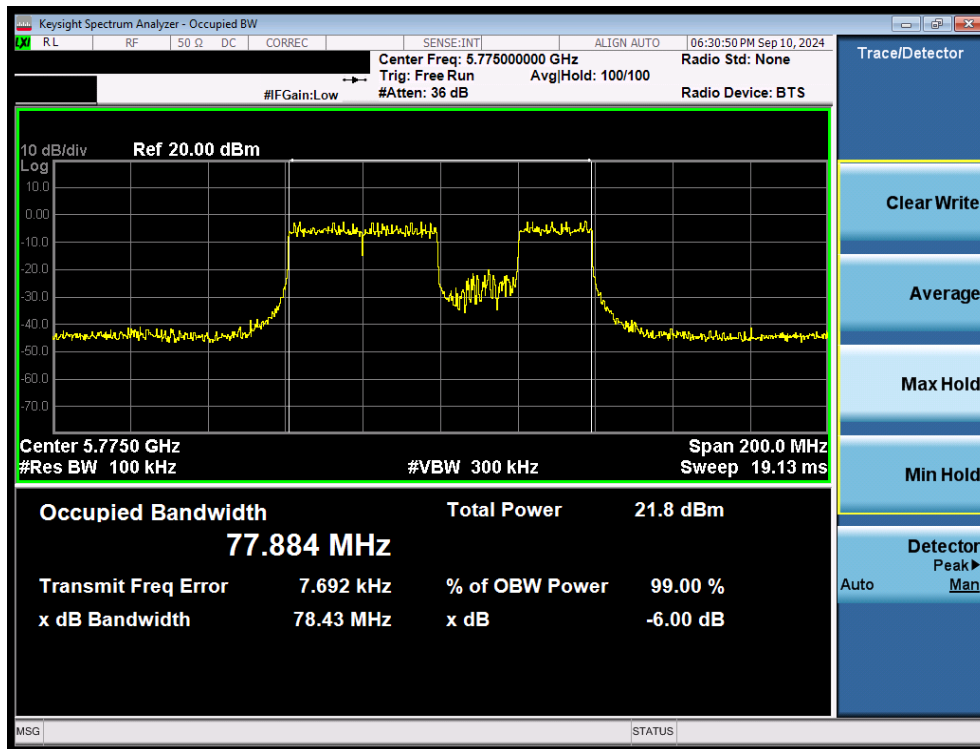


Plot 7-34. 6dB Bandwidth Plot MIMO ANT2 (80MHz 802.11ax/be (26 Tones) (UNII Band 3) – Ch. 155)

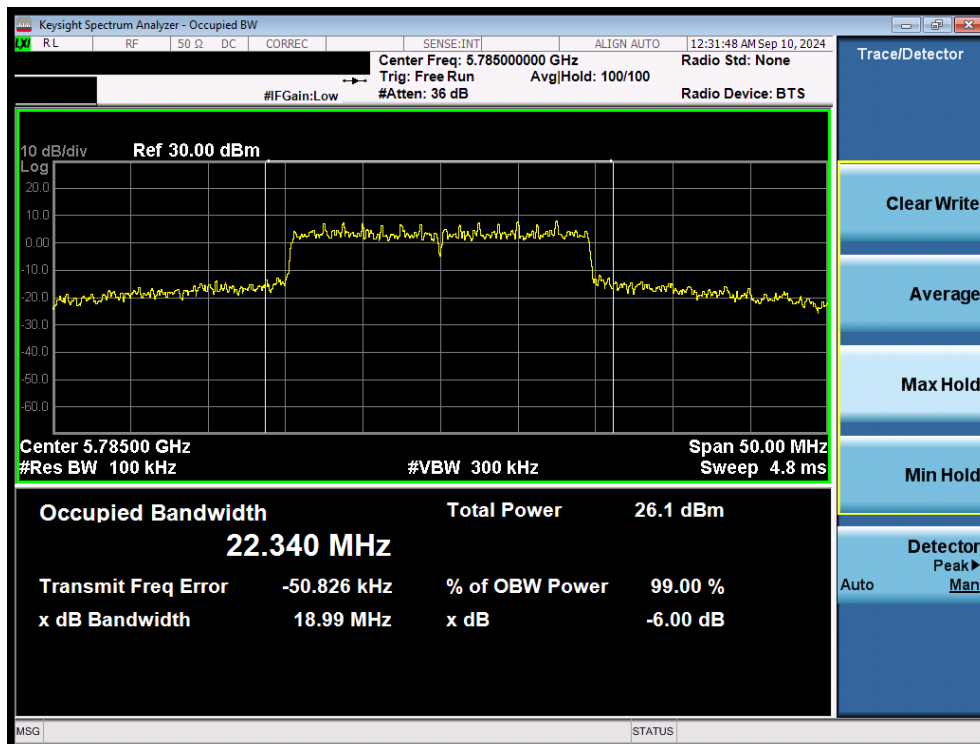


Plot 7-35. 6dB Bandwidth Plot MIMO ANT2 (20MHz 802.11be (106+26 Tones) (UNII Band 3) – Ch. 157)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 38 of 105

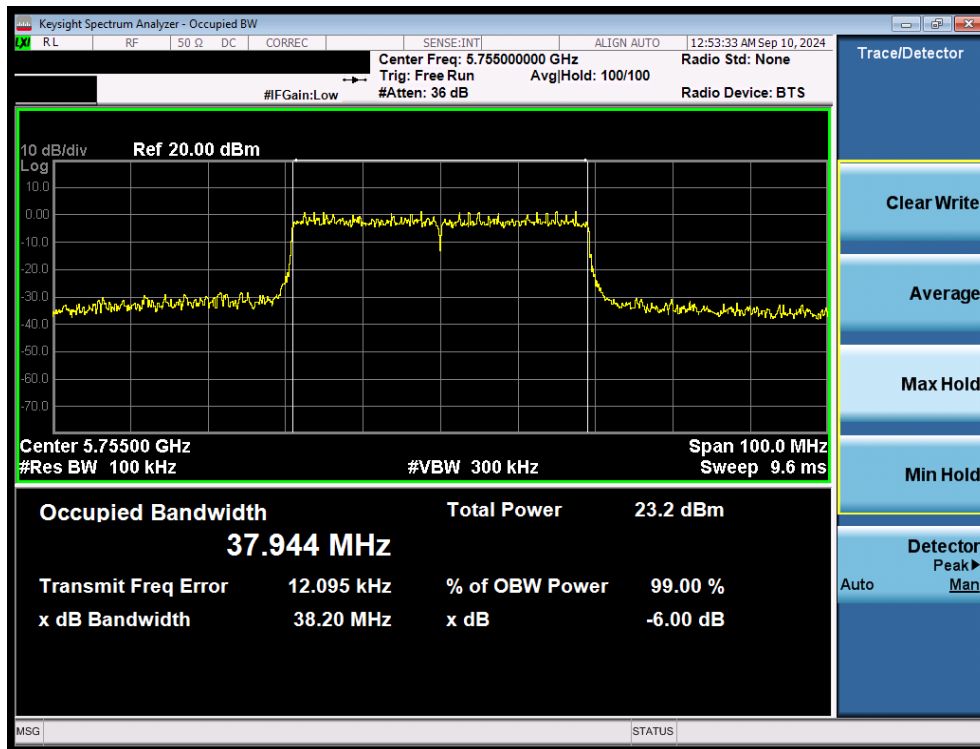


Plot 7-36. 6dB Bandwidth Plot MIMO ANT2 (80MHz 802.11be (484+242 Tones) (UNII Band 3) – Ch. 155)

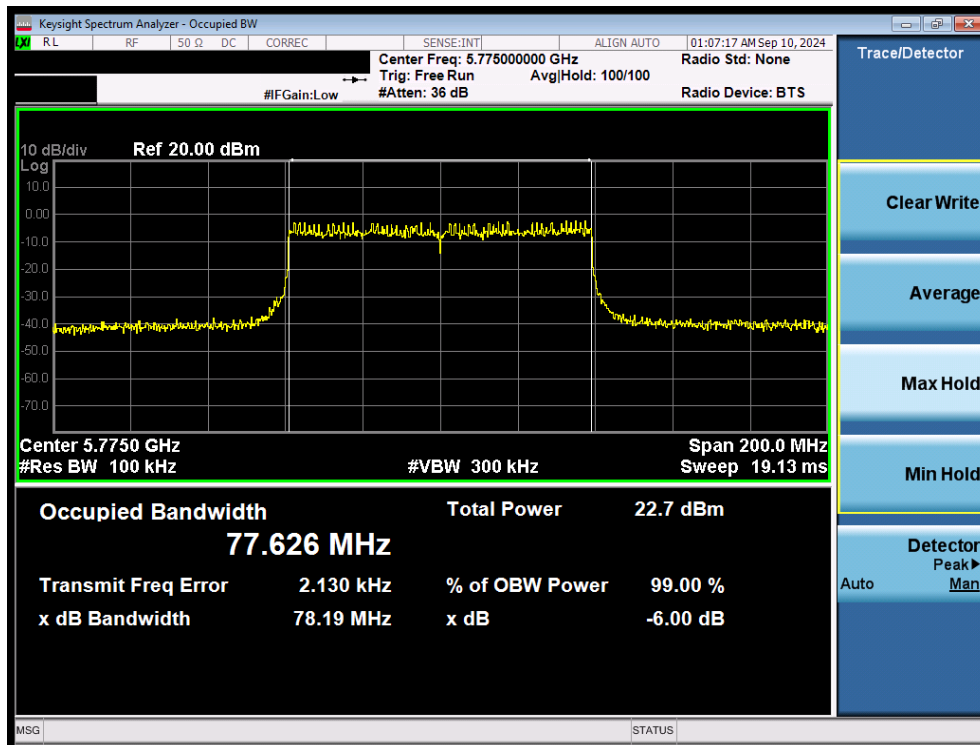


Plot 7-37. 6dB Bandwidth Plot MIMO ANT2 (20MHz 802.11ax/be (Full Tones) (UNII Band 3) – Ch. 157)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-38. 6dB Bandwidth Plot MIMO ANT2 (40MHz 802.11ax/be (Full Tones) (UNII Band 3) – Ch. 151)



Plot 7-39. 6dB Bandwidth Plot MIMO ANT2 (80MHz 802.11ax/be (Full Tones) (UNII Band 3) – Ch. 155)

FCC ID: A3LSMS938B	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	FCC
UNII 1	5.15 – 5.25GHz	23.98dBm (250mW)	N/A
UNII 2A	5.25 – 5.35GHz	The lesser of 23.98dBm (250mW) or $11\text{dBm} + 10\log_{10}B$	N/A
UNII 2C	5.47 – 5.725GHz		
UNII 3	5.725 – 5.850GHz	30dBm (1W)	N/A
UNII 4	5.850 – 5.895GHz	N/A	30dBm (1W)

Test Procedure Used

ANSI C63.10-2013 – 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.

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
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MIMO Conducted Output Power Measurements

	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm)												Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Dir. Ant. Gain [dBi]	Max e.i.r.p. [dBm]	e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
					RU Index																	
					0			8			8			8								
					ANT1	ANT2	MIMO	ANT1	ANT2	MIMO	ANT1	ANT2	MIMO	ANT1	ANT2	MIMO						
20MHz BW	1	5180	36	26T	9.35	9.60	12.54	9.37	9.82	12.78	23.98	-11.20	-1.83	10.95	30.0	-19.05						
		5200	40	26T	9.60	9.80	12.71	9.09	9.37	12.24	9.98	9.76	12.88	23.98	-11.10	-1.83	10.05	30.0	-18.95			
		5240	48	26T	9.23	9.59	12.64	9.29	9.79	12.66	9.20	9.99	12.62	23.98	-11.32	-1.83	10.83	30.0	-19.17			
		5260	52	26T	9.07	9.87	12.50	9.05	9.87	12.49	9.21	9.79	12.52	23.98	-11.58	-1.10	11.30	30.0	-18.70			
		5280	56	26T	9.09	9.64	12.38	9.21	9.74	12.49	9.26	9.57	12.43	23.98	-11.49	-1.10	11.39	30.0	-18.61			
		5300	60	26T	9.12	9.40	12.32	9.16	9.60	12.40	9.13	9.47	12.31	23.98	-11.58	-1.10	11.30	30.0	-18.70			
	2A	5500	100	26T	9.26	9.78	12.54	9.11	9.79	12.47	9.06	9.68	12.39	23.98	-11.44	0.40	12.93	30.0	-17.07			
		5600	120	26T	9.39	9.60	12.51	8.77	9.29	12.05	9.15	9.66	12.42	23.98	-11.47	0.40	12.93	30.0	-17.10			
		5720	144	26T	9.22	9.99	12.63	8.76	9.79	12.32	8.86	9.99	12.47	23.98	-11.58	0.10	12.90	30.0	-17.10			
		5745	149	26T	8.95	9.98	12.51	8.59	9.73	12.21	9.12	9.98	12.58	30	-17.42	0.11	12.69	36.0	-23.31			
		5765	153	26T	9.45	9.88	12.68	9.09	9.51	12.32	9.56	9.89	12.74	30	-17.34	0.11	12.77	36.0	-23.23			
		5825	165	26T	9.30	9.97	12.66	8.96	9.60	12.30	9.23	9.95	12.62	30	-17.34	0.11	12.77	36.0	-23.23			

Table 7-11. MIMO 20MHz BW (UNII) Maximum Conducted Output Power (26 Tones)

	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm)												Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
					RU Index																	
					37			38			40											
					ANT1	ANT2	MIMO	ANT1	ANT2	MIMO	ANT1	ANT2	MIMO									
20MHz BW	1	5180	36	52T	12.13	12.58	15.37	12.23	12.40	15.33	12.63	12.63	15.64	23.98	-8.34	-1.83	13.81	30.0	-16.19			
		5200	40	52T	12.42	12.70	15.57	12.45	12.57	15.52	12.73	12.77	15.76	23.98	-8.22	-1.83	13.93	30.0	-16.07			
		5240	48	52T	12.21	12.88	15.57	12.47	12.98	15.74	12.24	12.88	15.58	23.98	-8.24	-1.83	13.91	30.0	-16.09			
		5260	52	52T	12.09	12.66	15.39	12.33	12.89	15.63	12.20	12.66	15.45	23.98	-8.35	-1.83	14.53	30.0	-15.47			
		5280	56	52T	12.10	12.58	15.36	12.49	12.78	15.65	12.34	12.43	15.40	23.98	-8.30	-1.10	14.55	30.0	-15.45			
		5320	64	52T	12.04	12.38	15.22	12.28	12.64	15.42	12.09	12.29	15.20	23.98	-8.56	-1.10	14.32	30.0	-15.68			
	2C	5360	72	52T	12.08	12.65	15.38	12.26	12.86	15.58	12.34	12.99	15.69	23.98	-8.29	0.40	16.08	30.0	-13.92			
		5600	120	52T	12.33	12.31	15.48	11.82	12.35	15.10	12.11	12.56	15.35	23.98	-8.50	0.40	15.88	30.0	-14.12			
		5720	144	52T	12.11	12.96	15.57	11.72	12.93	15.38	11.92	12.98	15.49	23.98	-8.36	0.40	15.96	30.0	-14.04			
		5745	149	52T	11.84	12.97	15.45	11.69	12.73	15.25	12.01	12.95	15.52	30	-14.48	0.11	15.63	36.0	-20.37			
		5785	157	52T	12.39	12.75	15.38	11.95	12.53	15.26	12.37	12.89	15.60	30	-14.40	0.11	15.71	36.0	-20.29			
		5825	165	106T	14.97	15.81	18.42	14.73	15.76	18.29	14.97	15.81	18.42	30	-11.58	0.11	18.53	36.0	-17.47			
3	5865	173	106T	15.19	15.50	18.36	15.51	15.59	18.56	15.19	15.59	18.56	30	-11.58	0.11	18.53	36.0	-17.47				
	5905	181	106T	15.45	15.61	18.54	15.65	15.68	18.68	15.45	15.68	18.68	30	-11.58	0.11	18.53	36.0	-17.47				
	5945	189	106T	15.71	15.87	18.82	15.92	15.95	18.92	15.71	15.95	18.92	30	-11.58	0.11	18.53	36.0	-17.47				

Table 7-12. MIMO 20MHz BW (UNII) Maximum Conducted Output Power (52 Tones)

	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm)						Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Dir. Ant. Gain [dB]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
					RU Index											
					53			54								
					ANT1	ANT2	MIMO	ANT1	ANT2	MIMO						
20MHz BW	1	5180	36	106T	15.19	15.50	18.36	15.51	15.59	18.56	23.98	-5.42	-1.83	16.73	30.0	-13.27
		5200	40	106T	15.45	15.61	18.54	15.65	15.68	18.68	23.98	-5.61	-1.83	16.85	30.0	-13.15
		5240	48	106T	14.94	15.74	18.37	15.00	15.70	18.37	23.98	-5.61	-1.83	16.54	30.0	-13.46
		5260	52	106T	14.70	15.54	18.15	15.34	15.99	18.69	23.98	-5.29	-1.10	17.59	30.0	-12.41
		5280	56	106T	15.32	15.98	18.67	15.45	15.94	18.71	23.98	-5.27	-1.10	17.61	30.0	-12.39
		5320	64	106T	15.19	15.69	18.46	15.12	15.63	18.39	23.98	-5.52	-1.10	17.36	30.0	-12.64
	2A	5500	100	106T	13.81	14.55	17.21	13.51	14.52	17.05	23.98	-6.77	0.40	17.60	30.0	-12.40
		5600	120	106T	15.13	15.63	18.40	14.85	15.55	18.22	23.98	-5.58	0.40	18.49	30.0	-11.21
		5720	144	106T	14.46	15.62	18.09	14.52	15.58	18.09	23.98	-5.89	0.40	18.79	30.0	-11.51
		5745	156	106T	14.66	15.66	18.12	14.55	15.95	18.12	30	-11.68	0.11	18.57	36.0	-11.57
		5785	157	106T	15.08	15.72	18.42	14.86	15.70	18.31	30	-11.58	0.11	18.53	36.0	-17.47
		5825	165	106T	14.97	15.81	18.42	14.73	15.76	18.29	30	-11.58	0.11	18.53	36.0	-17.47

80MHz BW	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm)			Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
					RU Index								
					67								
					ANT1	ANT2	MIMO						
1	5210	42	996T	14.61	14.56	17.60	23.98	-6.38	-1.83	15.77	30.0	-14.23	
2A	5290	58	996T	15.14	15.35	18.26	23.98	-5.72	-1.10	17.16	30.0	-12.84	
2C	5530	106	996T	13.06	13.33	16.21	23.98	-7.77	0.40	16.60	30.0	-13.40	
	5610	122	996T	17.35	17.49	20.43	23.98	-3.55	0.40	20.83	30.0	-9.17	
	5690	138	996T	17.22	17.85	20.56	23.98	-3.42	0.40	20.95	30.0	-9.05	
3	5775	155	996T	15.50	16.25	18.90	30	-11.10	0.11	19.01	36.0	-16.99	

Table 7-16. MIMO 80MHz BW (UNII) Maximum Conducted Output Power (996 Tones)

160MHz BW	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm)			Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
					RU Index								
					68								
					ANT1	ANT2	MIMO						
	1/2A	5250	50	2x996T	13.83	13.68	16.77	23.98	-7.21	-1.83	14.94	30.0	-15.06
2C	5570	114	2x996T	11.27	11.85	14.58	23.98	-9.40	0.40	14.98	30.0	-15.02	

Table 7-17. MIMO 160MHz BW (UNII) Maximum Conducted Output Power (2x996 Tones)

20MHz BW	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm)												Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
					MRU Index																	
					71			70			72			71								
					ANT1	ANT2	MIMO	ANT1	ANT2	MIMO	ANT1	ANT2	MIMO	ANT1	ANT2	MIMO						
1	5200	40	52T											23.98	-8.58	-1.83	13.57	30.0	-16.43			
2A	5280	56	52T											23.98	-8.29	-1.10	14.59	30.0	-15.41			
2B	5600	120	52T											23.98	-8.51	0.40	15.87	30.0	-14.13			
3	5785	157	52T											30	-14.62	0.11	15.49	36.0	-20.51			

Table 7-18. MIMO 20MHz BW (UNII) Maximum Conducted Output Power (52+26Tones)

20MHz± BW	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm)						Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
					MRU Index											
					82			83								
					ANT1	ANT2	MIMO	ANT1	ANT2	MIMO						
1A	5200	40	106T	15.81	15.00	18.43	15.79	14.98	18.41	23.98	-5.55	-1.83	16.60	30.0	-13.40	
2C	5280	56	106T	15.88	15.40	18.66	15.83	15.44	18.65	23.98	-5.32	-1.10	17.56	30.0	-12.44	
3	5600	120	106T	15.99	14.87	18.48	15.98	14.87	18.47	23.98	-5.50	0.40	18.87	30.0	-11.13	
	5785	157	106T	15.74	14.78	18.30	15.73	14.67	18.24	30	-11.70	0.11	18.41	36.0	-17.59	

Table 7-19. MIMO 20MHz BW (UNII) Maximum Conducted Output Power (160+26Tones)

80MHz BW	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm)												Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
					MRU Index																	
					84			85			86											
					ANT1	ANT2	MIMO	ANT1	ANT2	MIMO	ANT1	ANT2	MIMO	ANT1	ANT2	MIMO						
1	5210	42	484+242T	15.27	14.01	17.70	15.21	13.95	17.64	15.23	13.97	17.66	23.98	-6.28	-1.83	15.87	30.0	-14.13				
2A	5290	58	484+242T	15.44	14.83	18.16	15.46	14.88	18.19	15.49	14.84	18.19	23.98	-5.79	-1.10	17.09	30.0	-12.91				
2C	5610	122	484+242T	17.92	16.62	20.33	17.98	16.65	20.38	17.99	16.78	20.44	23.98	-3.54	0.40	20.83	30.0	-9.17				
3	5775	155	484+242T	15.90	14.49	18.26	15.89	14.51	18.26	15.94	14.42	18.26	30	-11.74	0.11	18.37	36.0	-17.63				

Table 7-20. MIMO 80MHz BW (UNII) Maximum Conducted Output Power (484+242Tones)

100MHz BW	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm)												Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
					MRU Index																	
					94			95			1094											
					ANT1	ANT2	MIMO	ANT1	ANT2	MIMO	ANT1	ANT2	MIMO	ANT1	ANT2	MIMO						
					ANT1	ANT2	MIMO	ANT1	ANT2	MIMO	ANT1	ANT2	MIMO	ANT1	ANT2	MIMO						
1/2A	5250	50	996+484T	15.29	14.11	17.75	15.31	14.20	17.80	15.29	14.14	17.76	23.98	-6.18	-1.83	15.97	30.0	-14.03				
2C	5570	114	996+484T	13.31	12.46	15.92	13.43	12.45	15.98	13.40	12.46	15.97	23.98	-8.00	0.40	16.37	30.0	-13.63				

Table 7-21. MIMO 160MHz BW (UNII) Maximum Conducted Output Power (996+484Tones)

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Note:

Per ANSI C63.10-2013 and KDB 662911 v02r01 Section E)1), 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 – 26Tone (20MHz BW) mode, the average conducted output power was measured to be 9.35 dBm for Antenna 1 and 9.71 dBm for Antenna 2.

Antenna 1 + Antenna 2 = MIMO

$$(9.35 \text{ dBm} + 9.71 \text{ dBm}) = (9.268 \text{ mW} + 9.683 \text{ mW}) = 18.951 \text{ mW} = 12.78 \text{ dBm}$$

Sample e.i.r.p. Calculation:

At 5180MHz in 802.11ax – 26Tone (20MHz BW) mode, the average MIMO conducted power was calculated to be 12.78 dBm with directional gain of -1.83 dBi.

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

$$12.78 \text{ dBm} + -1.83 \text{ dBi} = 10.95 \text{ dBm}$$

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

Test Procedure Used

ANSI C63.10-2013 – 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 $\geq 2 \times (\text{span}/\text{RBW})$
6. Sweep time = auto
7. Detector = power averaging (RMS)
8. Trigger was set to free run for all modes
9. Trace was averaged over 100 sweeps
10. The peak search function of the spectrum analyzer was used to find the peak of the spectrum.

Test Setup

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



Figure 7-4. Test Instrument & Measurement Setup

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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	be (20MHz)	36	7.58	7.87	0.00	10.73	11.00	-0.27
	5200	be (20MHz)	40	7.83	7.76	0.00	10.80	11.00	-0.20
	5240	be (20MHz)	48	7.70	7.60	0.00	10.66	11.00	-0.34
	5190	be (40MHz)	38	7.22	8.06	0.00	10.67	11.00	-0.33
	5230	be (40MHz)	46	7.38	7.88	0.00	10.65	11.00	-0.35
	5210	be (80MHz)	42	7.50	7.56	0.00	10.54	11.00	-0.46
Band 1/2A	5250	be (160MHz)	50	7.69	7.02	0.00	10.38	11.00	-0.62
Band 2A	5260	be (20MHz)	52	7.53	7.71	0.00	10.63	11.00	-0.37
	5280	be (20MHz)	56	7.46	7.61	0.00	10.55	11.00	-0.45
	5320	be (20MHz)	64	7.59	8.01	0.00	10.81	11.00	-0.19
	5270	be (40MHz)	54	7.28	7.95	0.00	10.63	11.00	-0.37
	5310	be (40MHz)	62	6.99	7.67	0.00	10.35	11.00	-0.65
	5290	be (80MHz)	58	7.80	7.42	0.00	10.62	11.00	-0.38
Band 2C	5500	be (20MHz)	100	7.56	7.98	0.00	10.79	11.00	-0.21
	5600	be (20MHz)	120	7.28	8.30	0.00	10.83	11.00	-0.17
	5720	be (20MHz)	144	6.84	8.09	0.00	10.52	11.00	-0.48
	5510	be (40MHz)	102	6.71	7.88	0.00	10.34	11.00	-0.66
	5590	be (40MHz)	118	6.92	7.90	0.00	10.45	11.00	-0.55
	5710	be (40MHz)	142	6.66	7.60	0.00	10.16	11.00	-0.84
	5530	be (80MHz)	106	6.88	7.40	0.00	10.16	11.00	-0.84
	5610	be (80MHz)	122	6.78	7.34	0.00	10.08	11.00	-0.92
	5690	be (80MHz)	138	6.58	7.21	0.00	9.91	11.00	-1.09
	5570	be (160MHz)	114	6.60	7.16	0.00	9.90	11.00	-1.10

Table 7-22. 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	be (20MHz)	149	4.45	5.17	0.00	7.83	30.00	-22.17
	5785	be (20MHz)	157	5.12	5.27	0.00	8.21	30.00	-21.79
	5825	be (20MHz)	165	4.82	5.51	0.00	8.19	30.00	-21.81
	5755	be (40MHz)	151	4.61	4.90	0.00	7.77	30.00	-22.23
	5795	be (40MHz)	159	4.47	5.03	0.00	7.77	30.00	-22.23
	5775	be (80MHz)	155	4.09	4.68	0.00	7.41	30.00	-22.59

Table 7-23. 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	be (20MHz)	36	6.99	7.03	0.00	10.02	11.00	-0.98
	5200	be (20MHz)	40	6.89	7.04	0.00	9.97	11.00	-1.03
	5240	be (20MHz)	48	6.68	7.02	0.00	9.87	11.00	-1.13
	5190	be (40MHz)	38	3.84	3.98	0.13	7.05	11.00	-3.95
	5230	be (40MHz)	46	3.56	3.90	0.13	6.87	11.00	-4.13
	5210	be (80MHz)	42	0.29	0.73	0.21	3.74	11.00	-7.26
Band 1/2A	5250	be (160MHz)	50	-2.51	-2.53	0.21	0.70	11.00	-10.30
Band 2A	5260	be (20MHz)	52	6.73	6.81	0.00	9.78	11.00	-1.22
	5280	be (20MHz)	56	6.72	6.76	0.00	9.75	11.00	-1.25
	5320	be (20MHz)	64	6.68	7.41	0.00	10.07	11.00	-0.93
	5270	be (40MHz)	54	3.62	3.73	0.13	6.82	11.00	-4.18
	5310	be (40MHz)	62	3.57	3.73	0.13	6.79	11.00	-4.21
	5290	be (80MHz)	58	0.80	0.45	0.21	3.85	11.00	-7.15
Band 2C	5500	be (20MHz)	100	6.71	7.22	0.00	9.98	11.00	-1.02
	5600	be (20MHz)	120	6.63	7.17	0.00	9.92	11.00	-1.08
	5720	be (20MHz)	144	6.25	6.84	0.00	9.57	11.00	-1.43
	5510	be (40MHz)	102	3.23	4.01	0.13	6.78	11.00	-4.22
	5590	be (40MHz)	118	3.49	4.14	0.13	6.97	11.00	-4.03
	5710	be (40MHz)	142	3.18	3.84	0.13	6.66	11.00	-4.34
	5530	be (80MHz)	106	0.35	0.89	0.21	3.85	11.00	-7.15
	5610	be (80MHz)	122	0.05	0.99	0.21	3.77	11.00	-7.23
	5690	be (80MHz)	138	-0.01	0.86	0.21	3.67	11.00	-7.33
	5570	be (160MHz)	114	-2.45	-2.30	0.21	0.85	11.00	-10.15

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

	Frequency [MHz]	802.11 MODE	Channel	Antenna 1 PSD [dBm]	Antenna 2 PSD [dBm]	DCCF [dB]	MIMO Summed PSD [dBm]	Max Conducted PSD [dBm]	Margin [dB]
Band 3	5745	be (20MHz)	149	3.64	4.28	0.00	6.98	30.00	-23.02
	5785	be (20MHz)	157	3.76	4.11	0.00	6.95	30.00	-23.05
	5825	be (20MHz)	165	3.48	4.38	0.00	6.96	30.00	-23.04
	5755	be (40MHz)	151	0.14	1.09	0.13	3.78	30.00	-26.22
	5795	be (40MHz)	159	0.87	0.91	0.13	4.03	30.00	-25.97
	5775	be (80MHz)	155	-2.36	-2.05	0.21	1.02	30.00	-28.98

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

FCC ID: A3LSMS938B	MEASUREMENT REPORT			Approved by: Technical Manager
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	Frequency [MHz]	802.11 MODE	Channel	MRU Configuration	Antenna 1 PSD [dBm]	Antenna 2 PSD [dBm]	DCCF [dB]	MIMO Summed PSD [dBm]	Max Conducted PSD [dBm]	Margin [dB]
Band 1	5200	be (20MHz)	40	52+26T	6.05	6.25	0.00	9.16	11.00	-1.84
	5200	be (20MHz)	40	106+26T	6.86	7.28	0.00	10.09	11.00	-0.91
	5210	be (80MHz)	42	484+242T	2.03	2.77	0.17	5.60	11.00	-5.40
Band 1/2A	5250	be (160MHz)	50	996+484T	-1.31	-0.86	0.17	2.10	11.00	-8.90
Band 2A	5280	be (20MHz)	56	52+26T	6.05	6.25	0.00	9.16	11.00	-1.84
	5280	be (20MHz)	56	106+26T	7.03	7.15	0.00	10.10	11.00	-0.90
	5290	be (80MHz)	58	484+242T	2.18	2.13	0.17	5.33	11.00	-5.67
Band 2C	5600	be (20MHz)	120	52+26T	6.04	6.68	0.00	9.38	11.00	-1.62
	5600	be (20MHz)	120	106+26T	6.76	7.50	0.00	10.15	11.00	-0.85
	5610	be (80MHz)	122	484+242T	1.83	2.73	0.17	5.49	11.00	-5.51
	5570	be (160MHz)	114	996+484T	-1.25	-0.84	0.17	2.14	11.00	-8.86

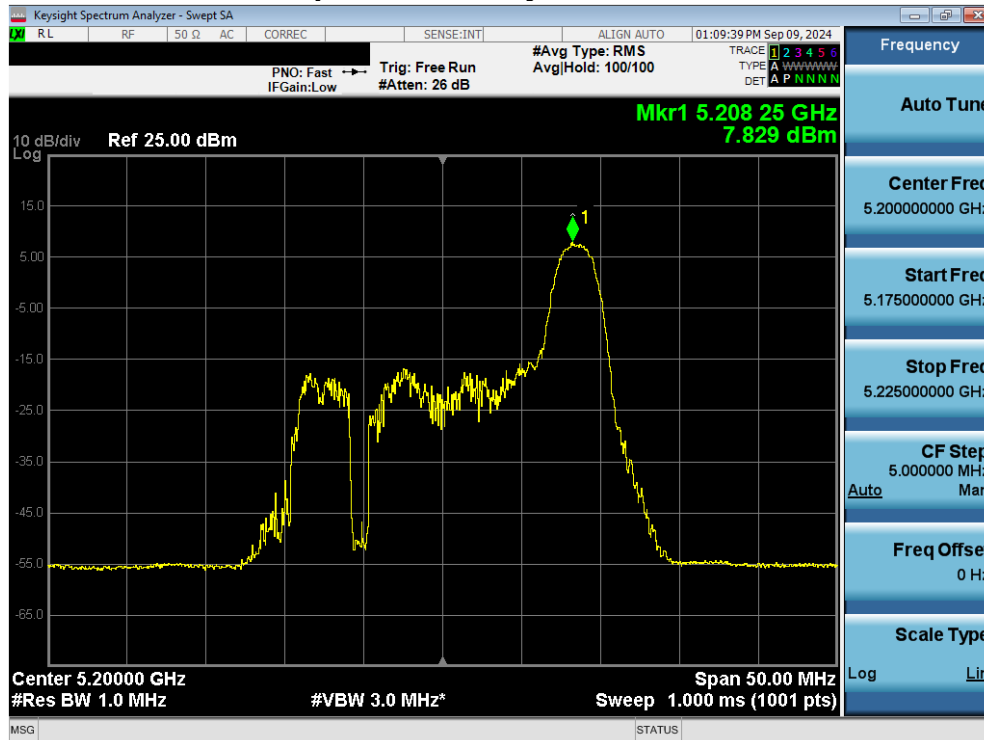
Table 7-26. Bands 1, 2A, 2C MIMO Conducted Power Spectral Density Measurements MIMO (MRU Cases)

	Frequency [MHz]	802.11 MODE	Channel	MRU Configuration	Antenna 1 PSD [dBm]	Antenna 2 PSD [dBm]	DCCF [dB]	MIMO Summed PSD [dBm]	Max Conducted PSD [dBm]	Margin [dB]
Band 3	5785	be (20MHz)	157	52+26T	3.05	3.49	0.00	6.29	30.00	-23.71
	5785	be (20MHz)	157	106+26T	4.03	4.37	0.00	7.21	30.00	-22.79
	5775	be (80MHz)	155	484+242T	-0.94	-0.44	0.17	2.50	30.00	-27.50

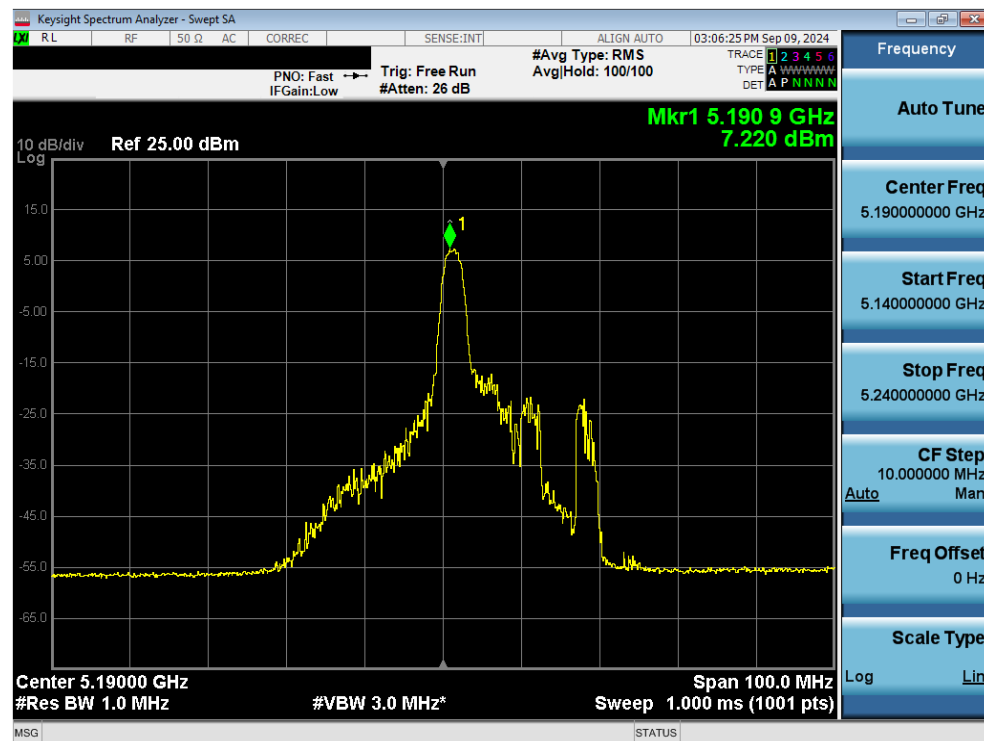
Table 7-27. Bands 3 MIMO Conducted Power Spectral Density Measurements MIMO (MRU Cases)

FCC ID: A3LSMS938B	MEASUREMENT REPORT			Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset		Page 49 of 105

7.5.1 MIMO Antenna-1 Power Spectral Density Measurements

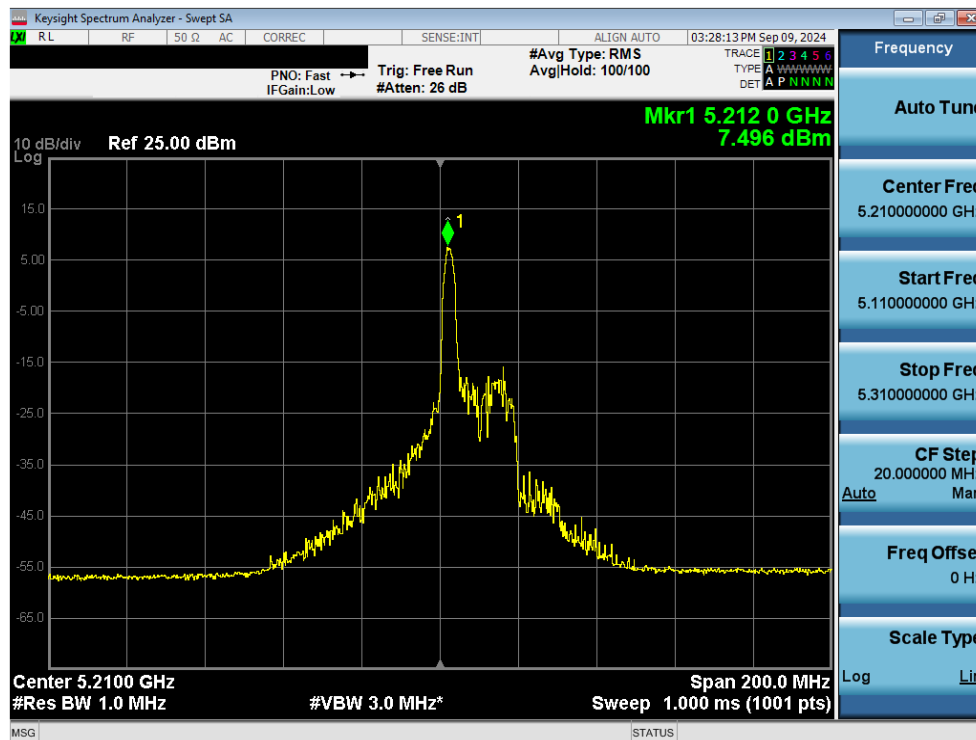


Plot 7-40. Power Spectral Density Plot MIMO ANT1 (20MHz 802.11ax/be (26 Tones) (UNII Band 1) – Ch. 40)

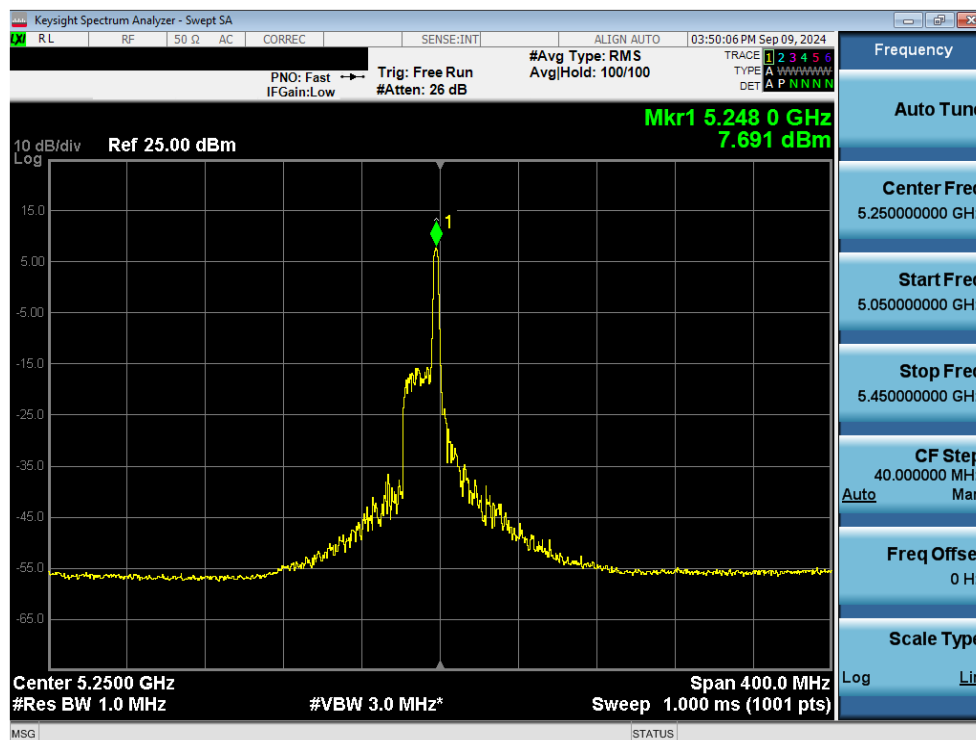


Plot 7-41. Power Spectral Density Plot MIMO ANT1 (40MHz 802.11ax/be (26 Tones) (UNII Band 1) – Ch. 38)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 50 of 105

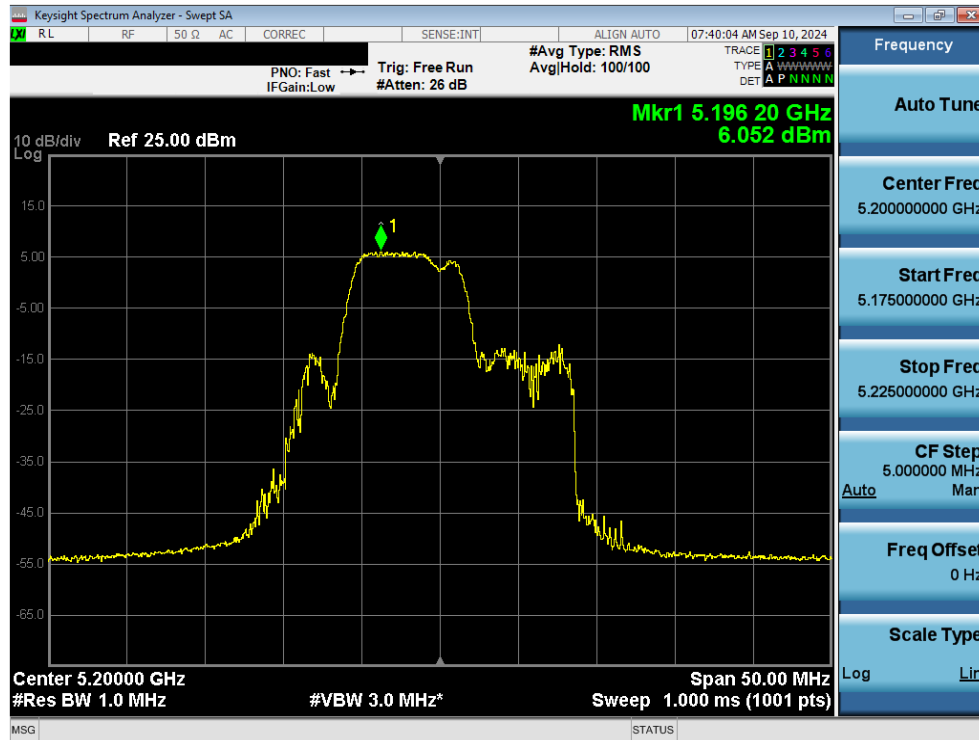


Plot 7-42. Power Spectral Density Plot MIMO ANT1 (80MHz 802.11ax/be (26 Tones) (UNII Band 1) – Ch. 42)

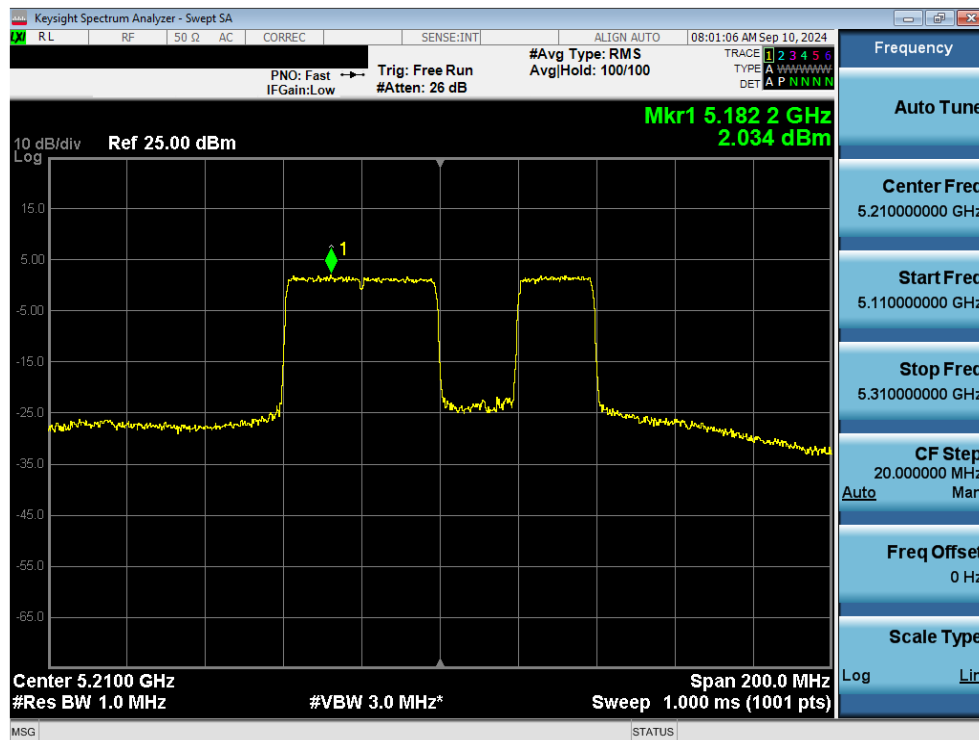


Plot 7-43. Power Spectral Density Plot MIMO ANT1 (160MHz 802.11ax/be (26 Tones) (UNII Band 1/2A) – Ch. 50)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 51 of 105

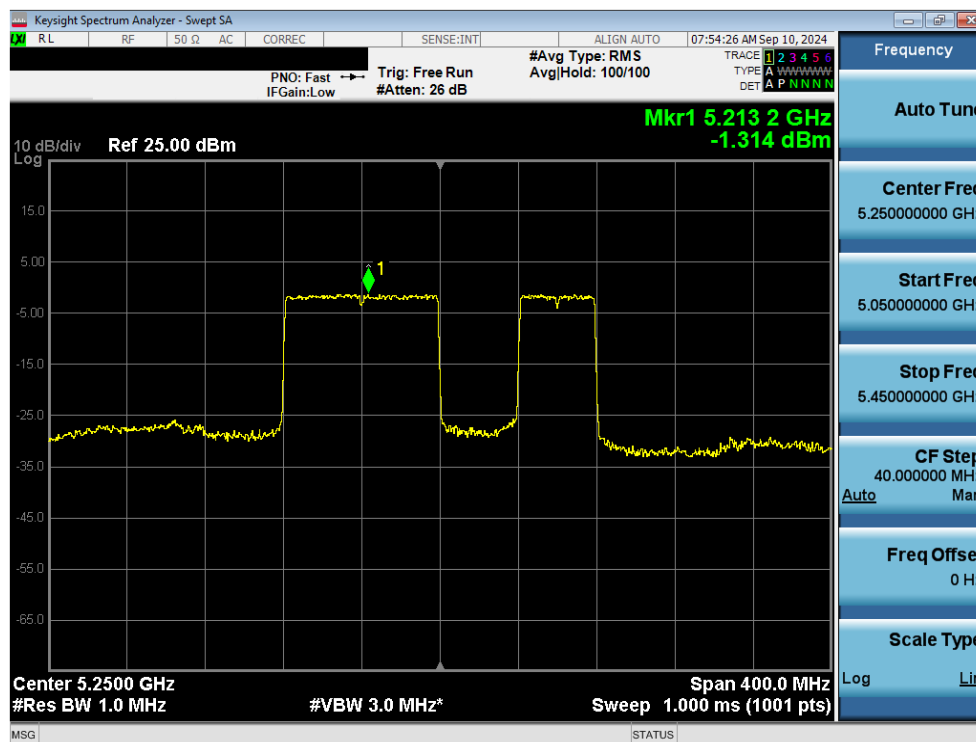


Plot 7-44. Power Spectral Density Plot MIMO ANT1 (20MHz 802.11be (52+26 Tones) (UNII Band 1) – Ch. 40)

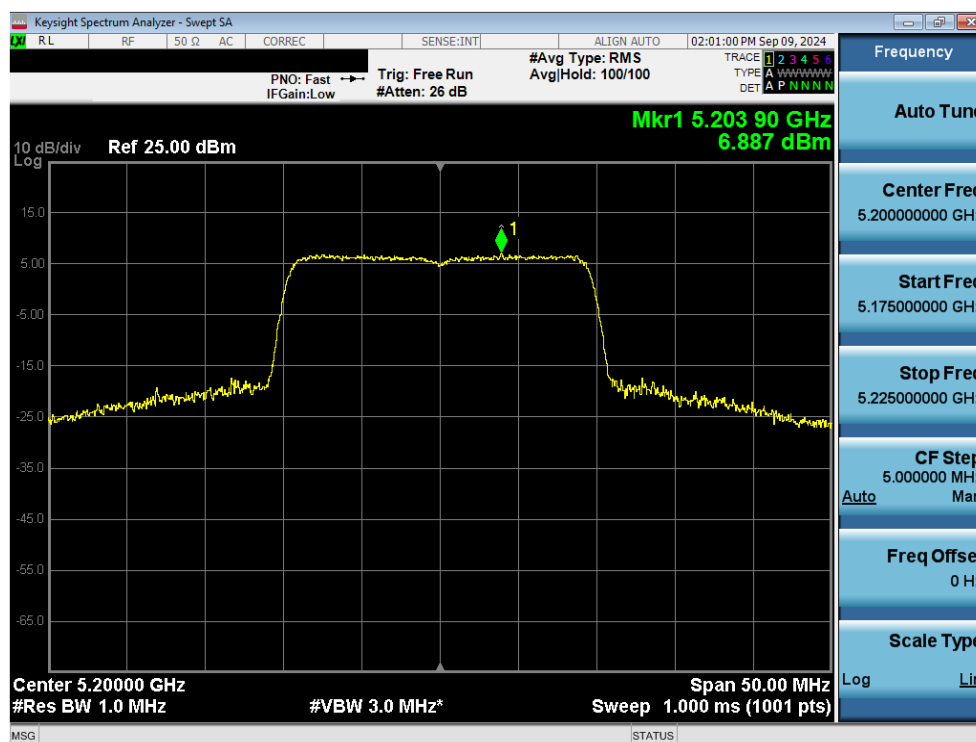


Plot 7-45. Power Spectral Density Plot MIMO ANT1 (80MHz 802.11be (484+242 Tones) (UNII Band 1) – Ch. 42)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 52 of 105

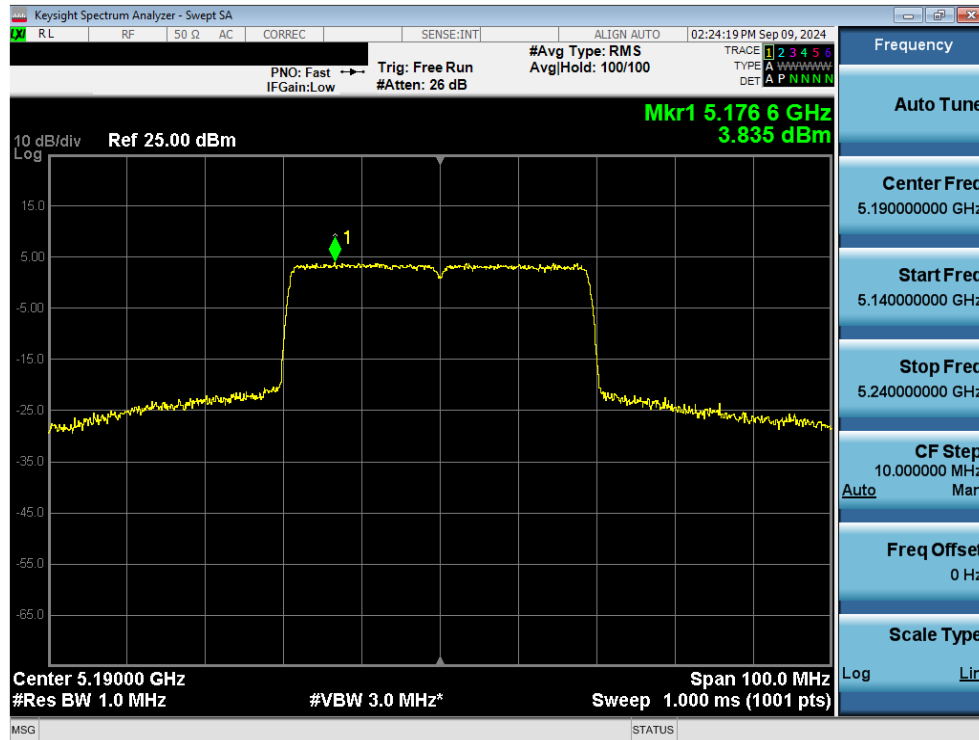


Plot 7-46. Power Spectral Density Plot MIMO ANT1 (160MHz 802.11be (996+484 Tones) (UNII Band 1/2A) – Ch. 50)

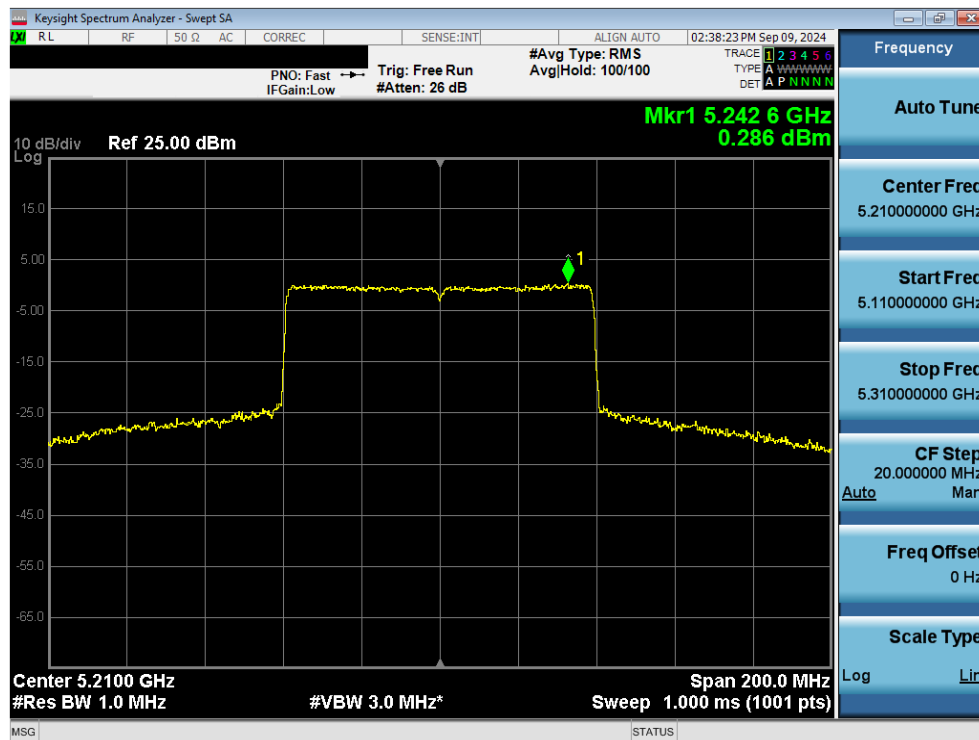


Plot 7-47. Power Spectral Density Plot MIMO ANT1 (20MHz 802.11ax/be (Full Tones) (UNII Band 1) – Ch. 40)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 53 of 105

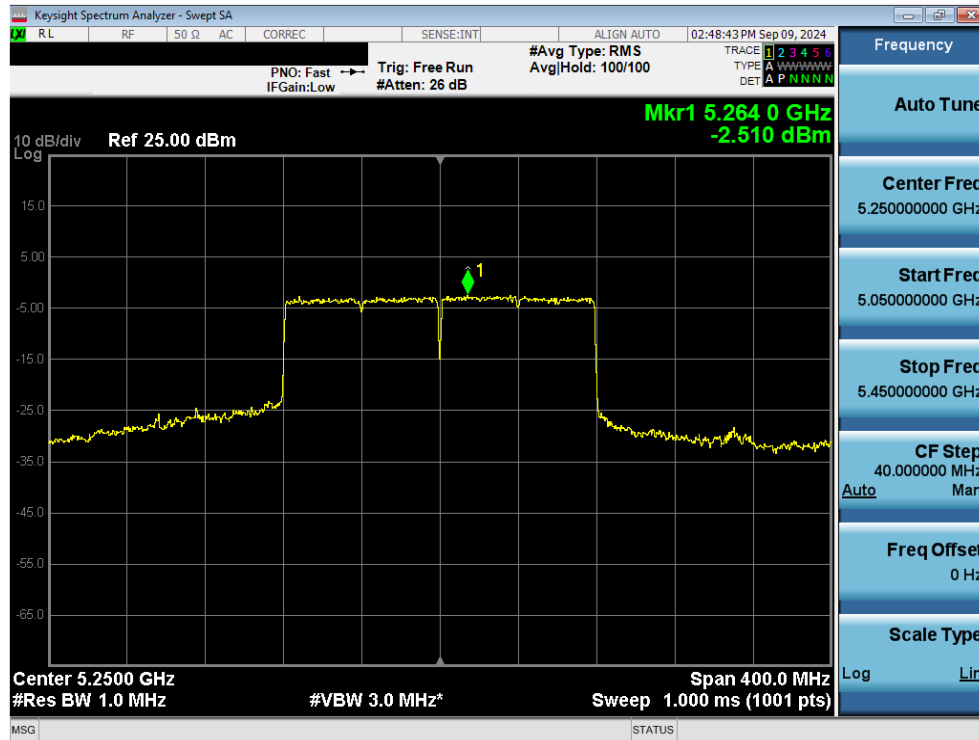


Plot 7-48. Power Spectral Density Plot MIMO ANT1 (40MHz 802.11ax/be (Full Tones) (UNII Band 1) – Ch. 38)

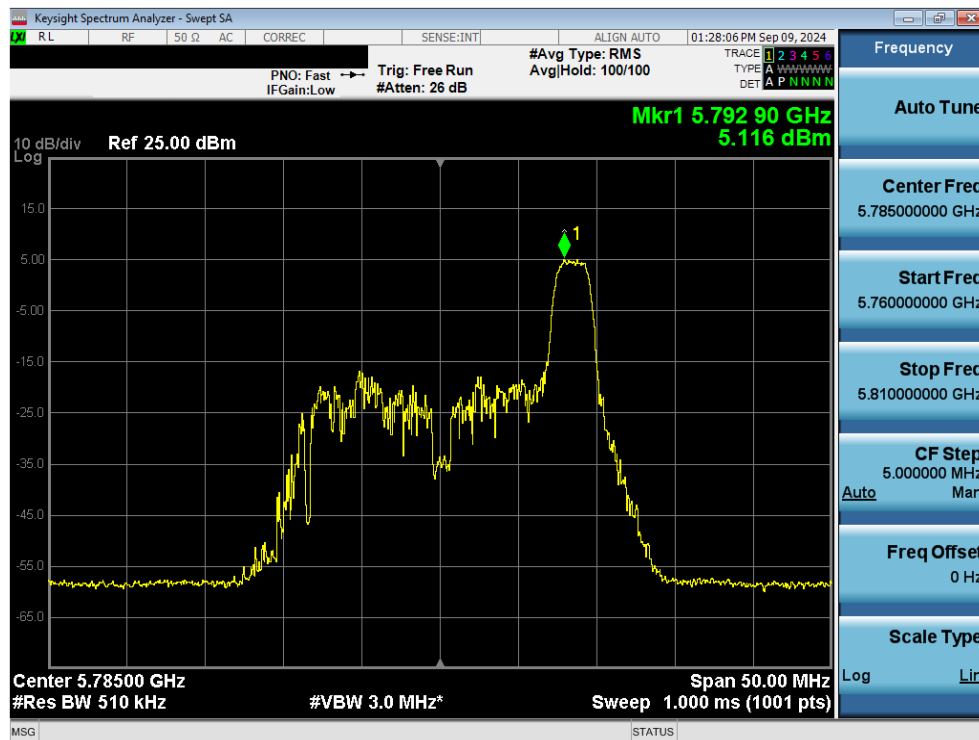


Plot 7-49. Power Spectral Density Plot MIMO ANT1 (80MHz 802.11ax/be (Full Tones) (UNII Band 1) – Ch. 42)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 54 of 105

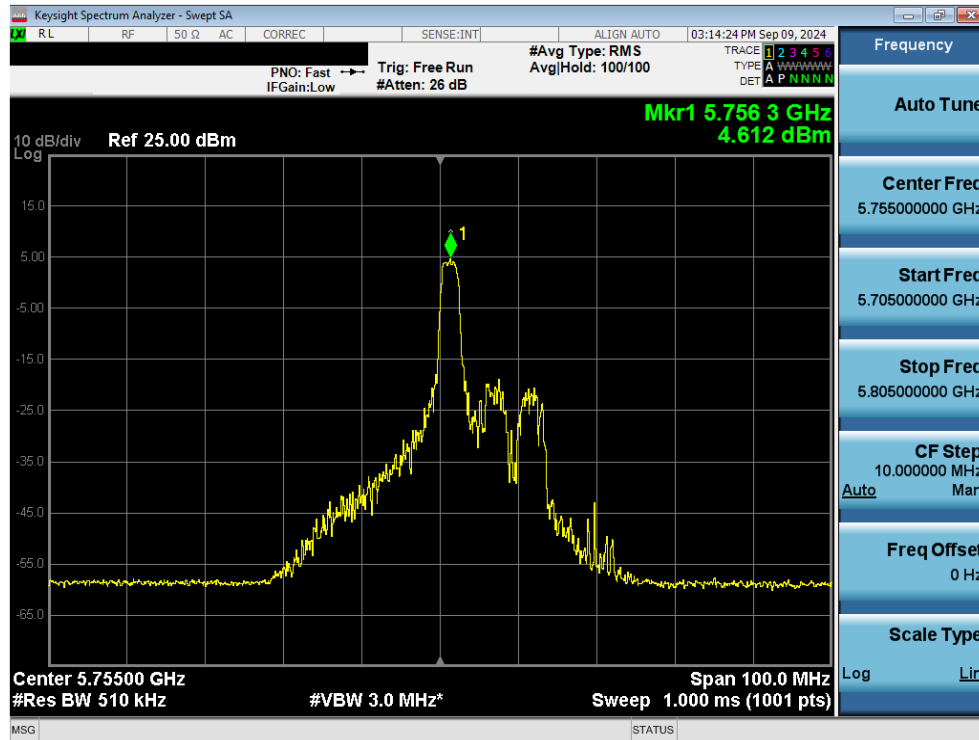


Plot 7-50. Power Spectral Density Plot MIMO ANT1 (160MHz 802.11ax/be (Full Tones) (UNII Band 1/2A) – Ch. 50)

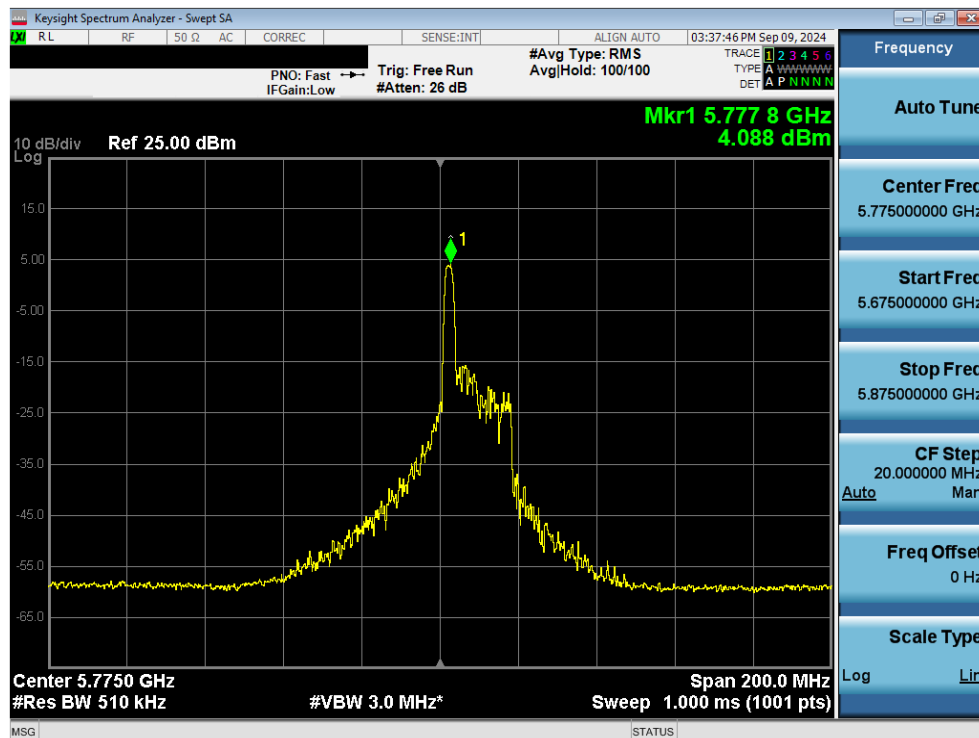


Plot 7-51. Power Spectral Density Plot MIMO ANT1 (20MHz 802.11ax/be (26 Tones) (UNII Band 3) – Ch. 157)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 55 of 105

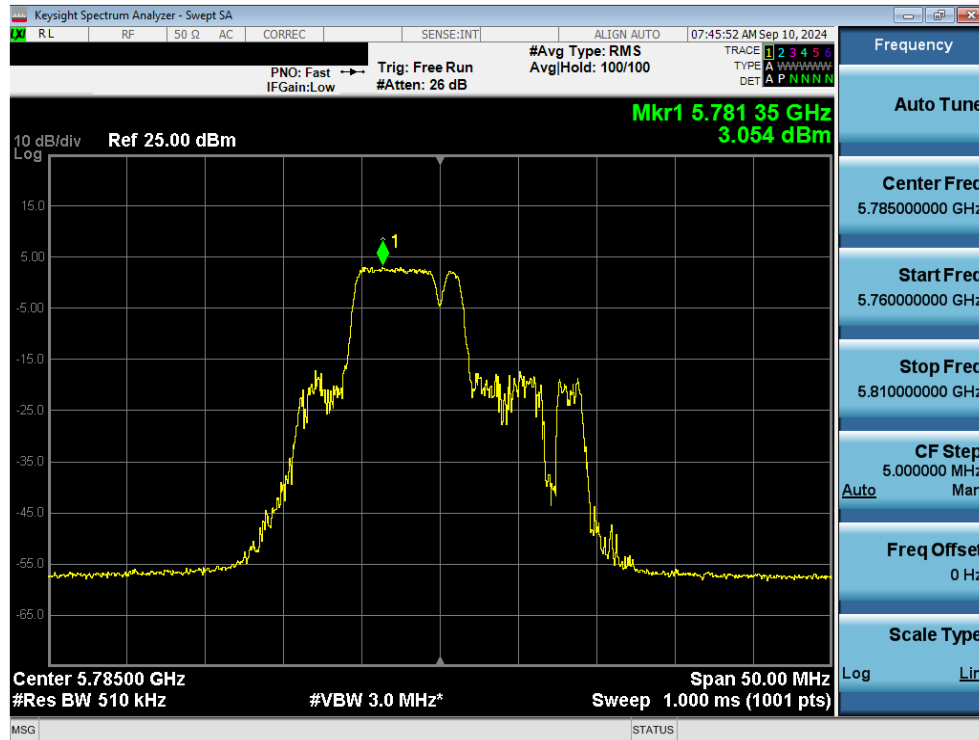


Plot 7-52. Power Spectral Density Plot MIMO ANT1 (40MHz 802.11ax/be (26 Tones) (UNII Band 3) – Ch. 151)

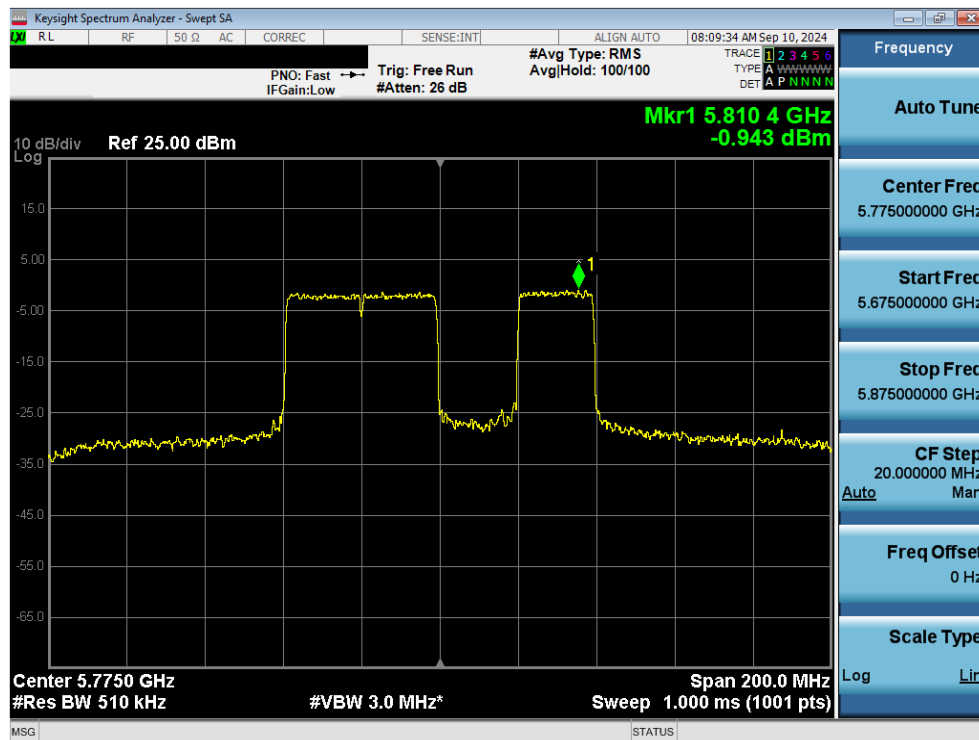


Plot 7-53. Power Spectral Density Plot MIMO ANT1 (80MHz 802.11ax/be (26 Tones) (UNII Band 3) – Ch. 155)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 56 of 105

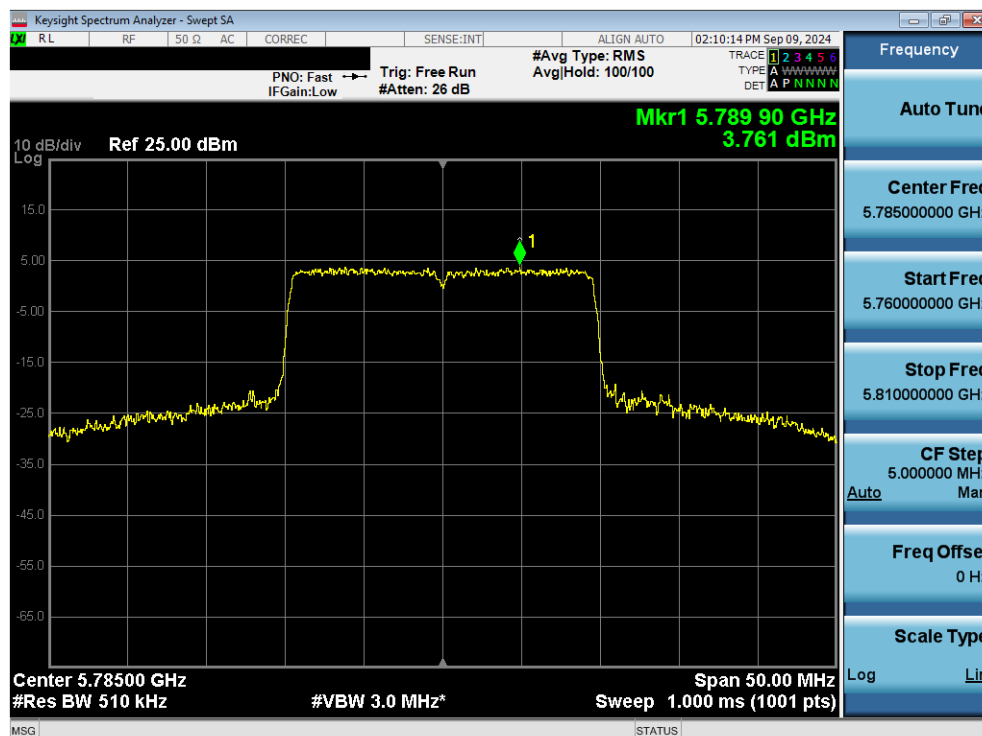


Plot 7-54. Power Spectral Density Plot MIMO ANT1 (20MHz 802.11be (52+26 Tones) (UNII Band 3) – Ch. 157)

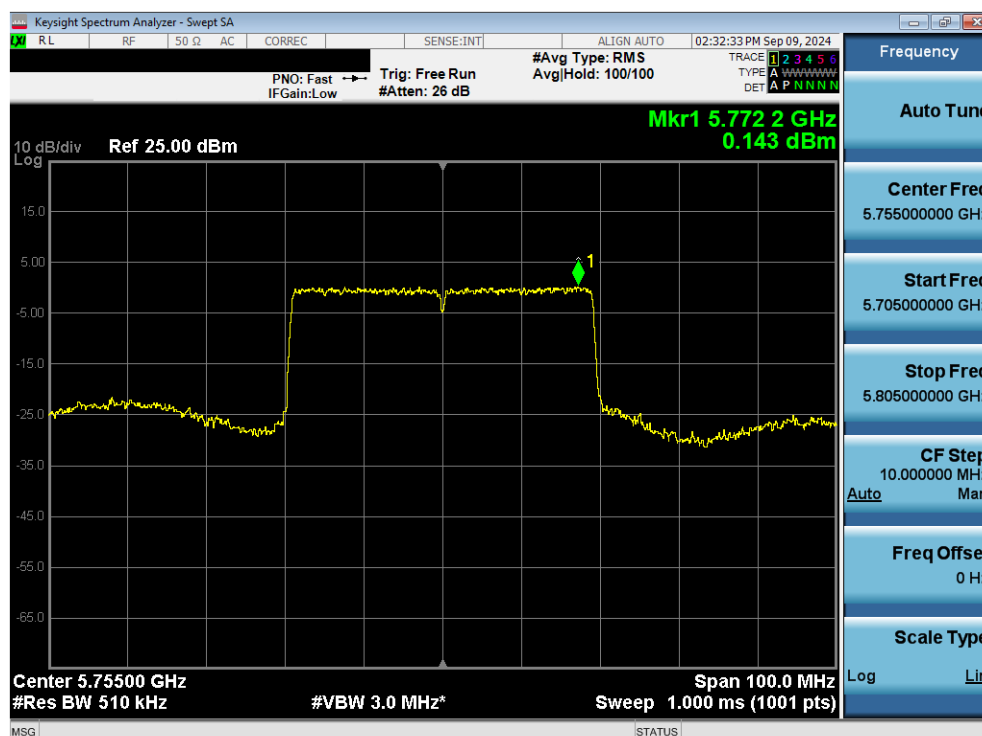


Plot 7-55. Power Spectral Density Plot MIMO ANT1 (80MHz 802.11be (484+242 Tones) (UNII Band 3) – Ch. 155)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 57 of 105

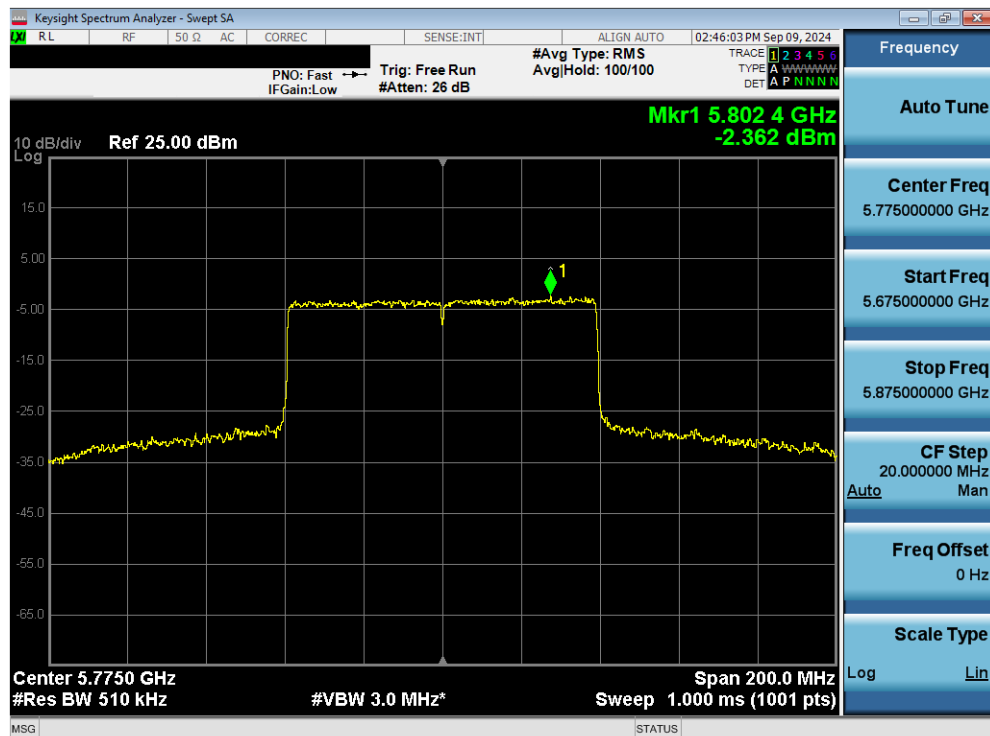


Plot 7-56. Power Spectral Density Plot MIMO ANT1 (20MHz 802.11ax/be (Full Tones) (UNII Band 3) – Ch. 157)



Plot 7-57. Power Spectral Density Plot MIMO ANT1 (40MHz 802.11ax/be (Full Tones) (UNII Band 3) – Ch. 151)

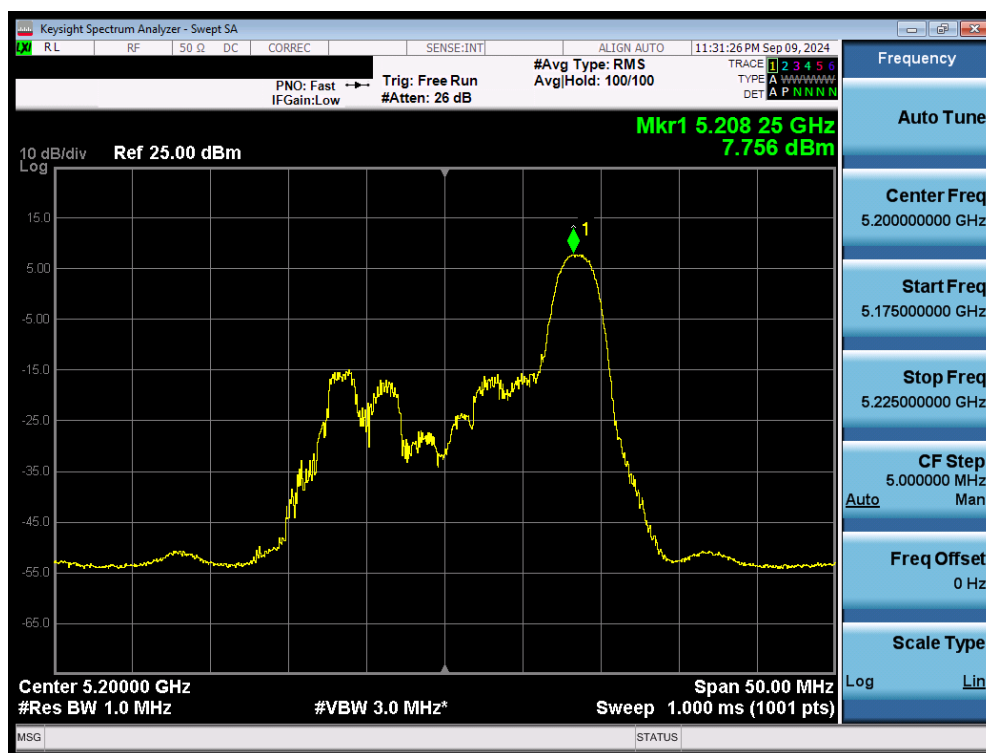
FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 58 of 105



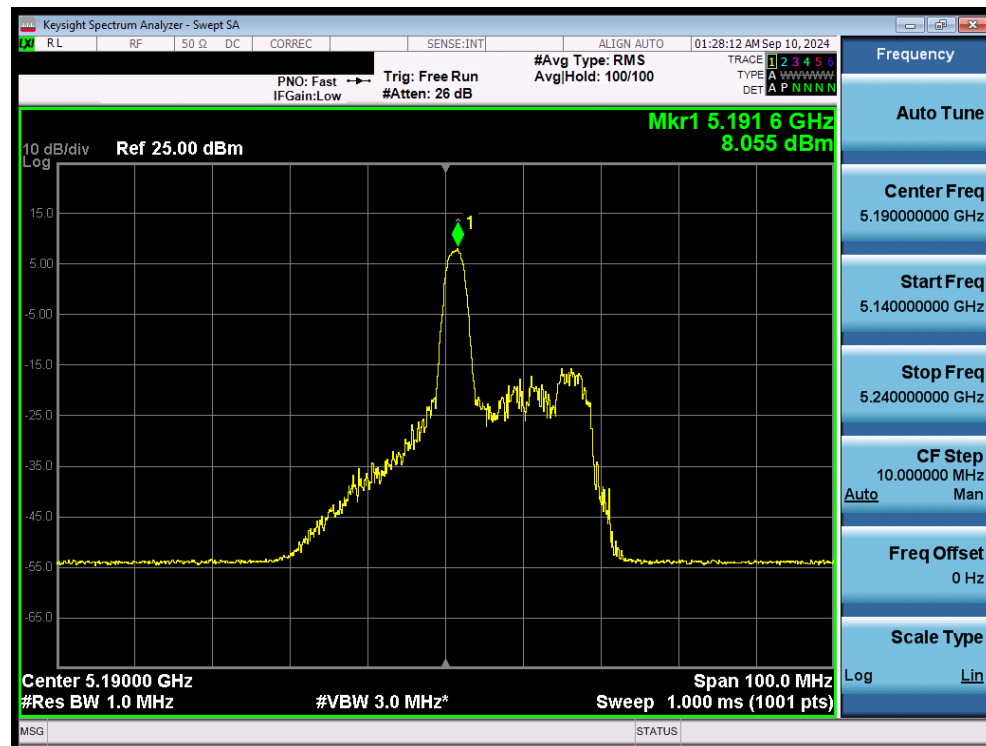
Plot 7-58. Power Spectral Density Plot MIMO ANT1 (80MHz 802.11ax/be (Full Tones) (UNII Band 3) – Ch. 155)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 59 of 105

7.5.2 MIMO Antenna-2 Power Spectral Density Measurements

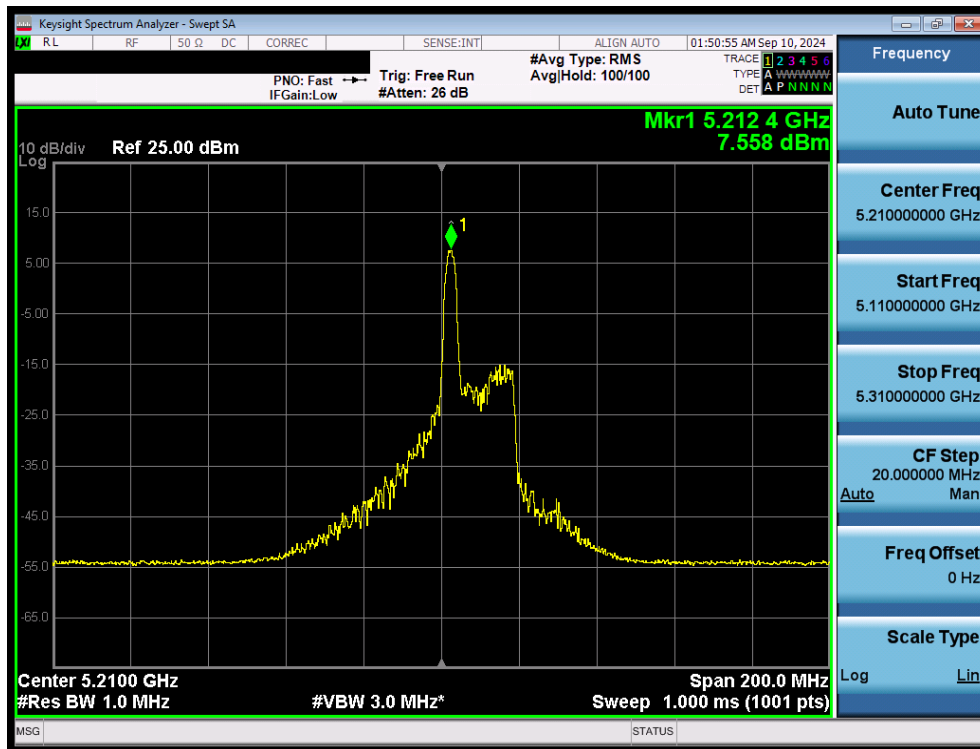


Plot 7-59. Power Spectral Density Plot MIMO ANT2 (20MHz 802.11ax/be (26 Tones) (UNII Band 1) – Ch. 40)

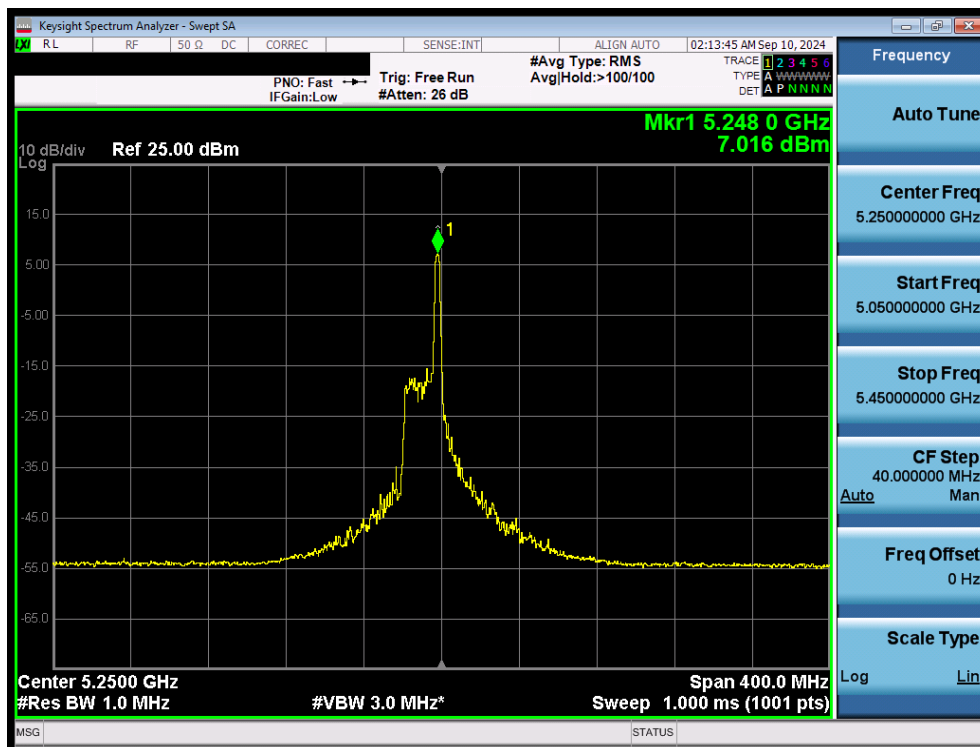


Plot 7-60. Power Spectral Density Plot MIMO ANT2 (40MHz 802.11ax/be (26 Tones) (UNII Band 1) – Ch. 38)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 60 of 105

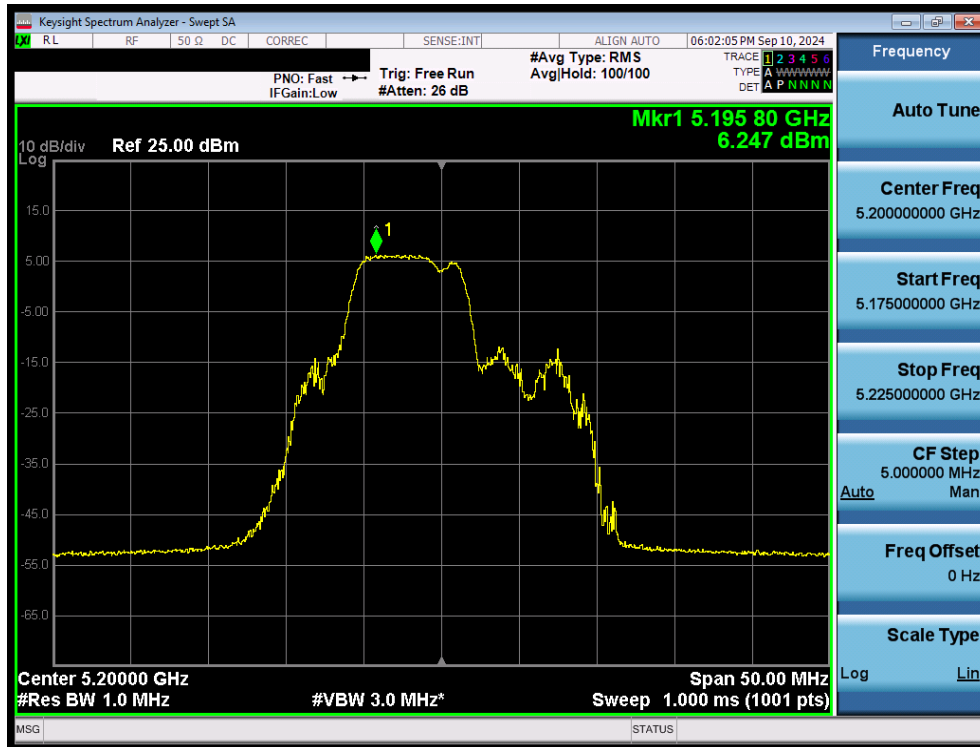


Plot 7-61. Power Spectral Density Plot MIMO ANT2 (80MHz 802.11ax/be (26 Tones) (UNII Band 1) – Ch. 42)

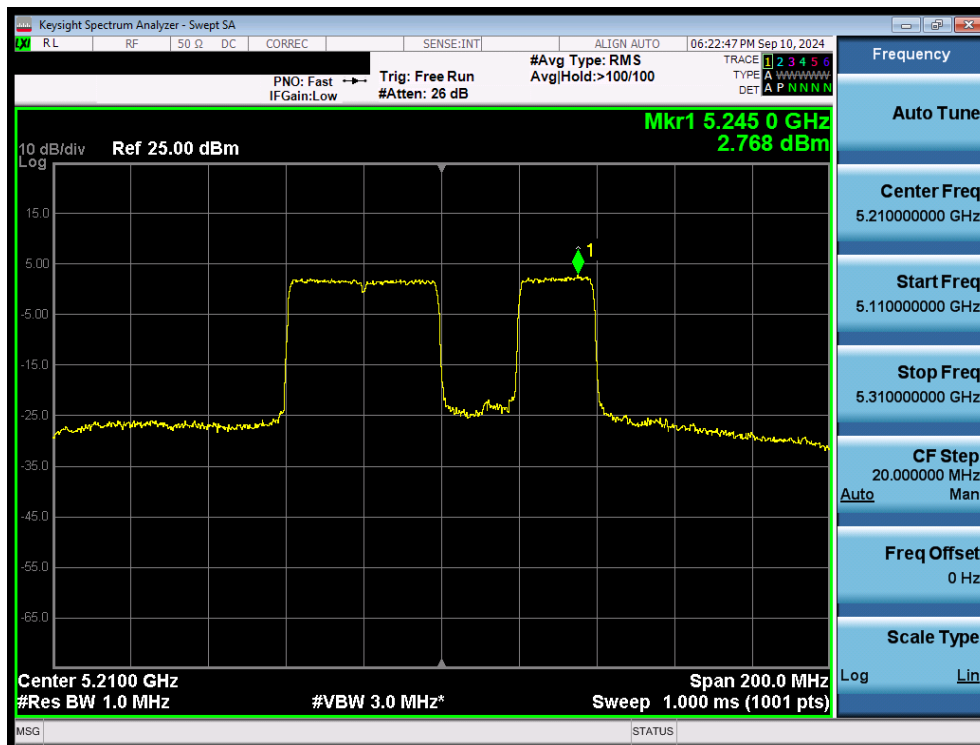


Plot 7-62. Power Spectral Density Plot MIMO ANT2 (160MHz 802.11ax/be (26 Tones) (UNII Band 1/2A) – Ch. 50)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 61 of 105

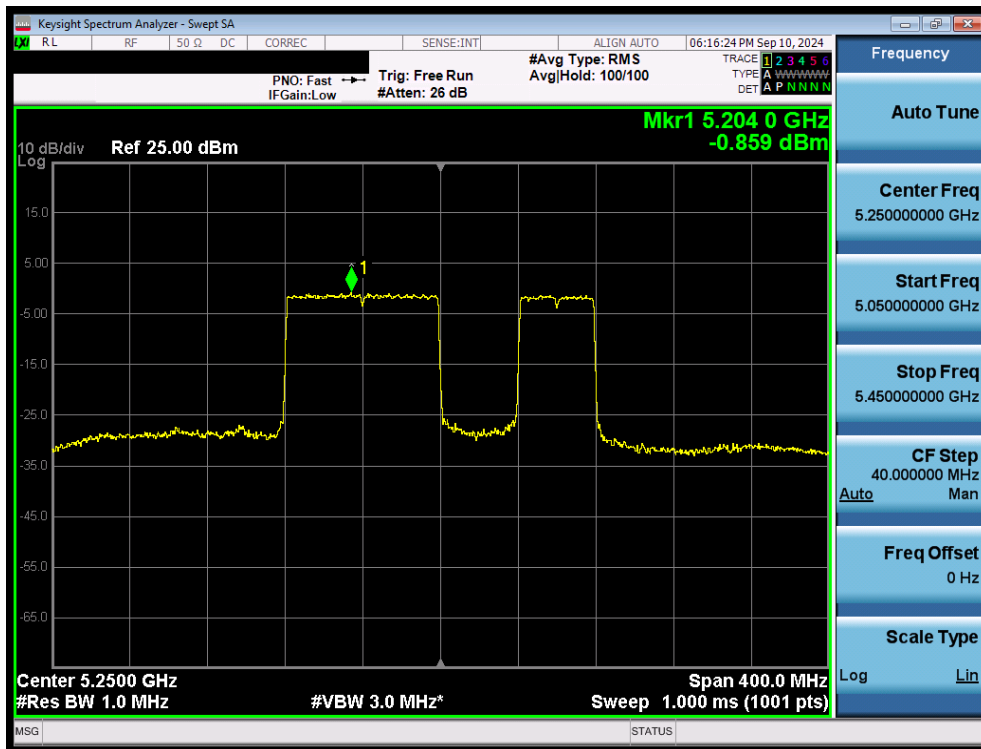


Plot 7-63. Power Spectral Density Plot MIMO ANT2 (20MHz 802.11be (52+26 Tones) (UNII Band 1) – Ch. 40)

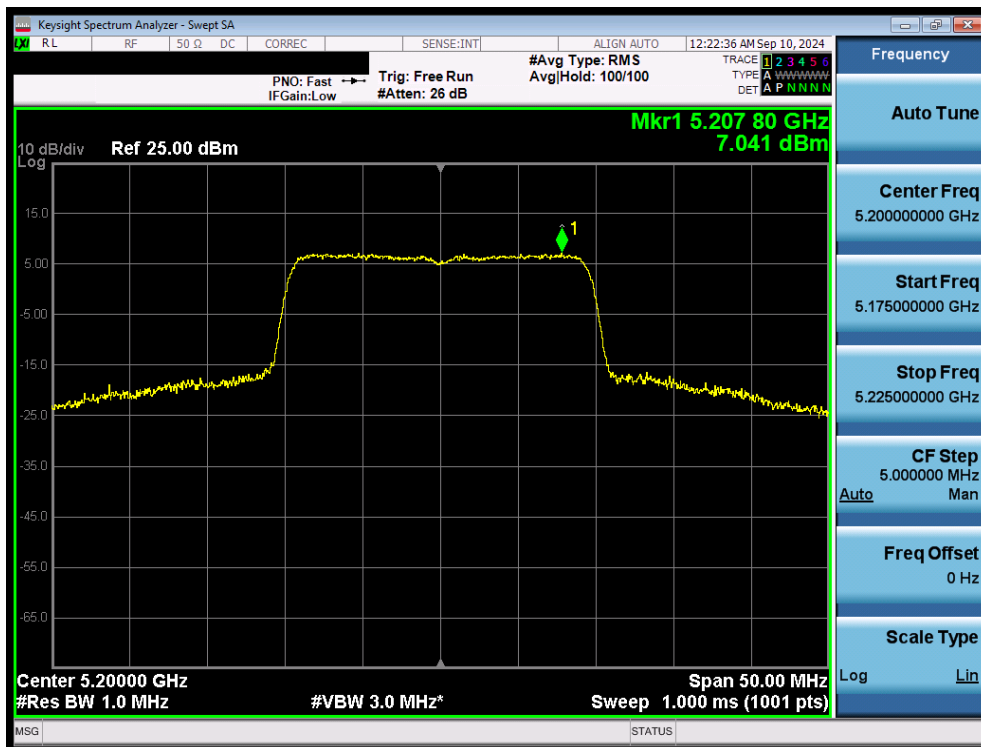


Plot 7-64. Power Spectral Density Plot MIMO ANT2 (80MHz 802.11be (484+242 Tones) (UNII Band 1) – Ch. 42)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 62 of 105



Plot 7-65. Power Spectral Density Plot MIMO ANT2 (160MHz 802.11be (996+484 Tones) (UNII Band 1/2A) – Ch. 50)



Plot 7-66. Power Spectral Density Plot MIMO ANT2 (20MHz 802.11ax/be (Full Tones) (UNII Band 1) – Ch. 40)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 63 of 105

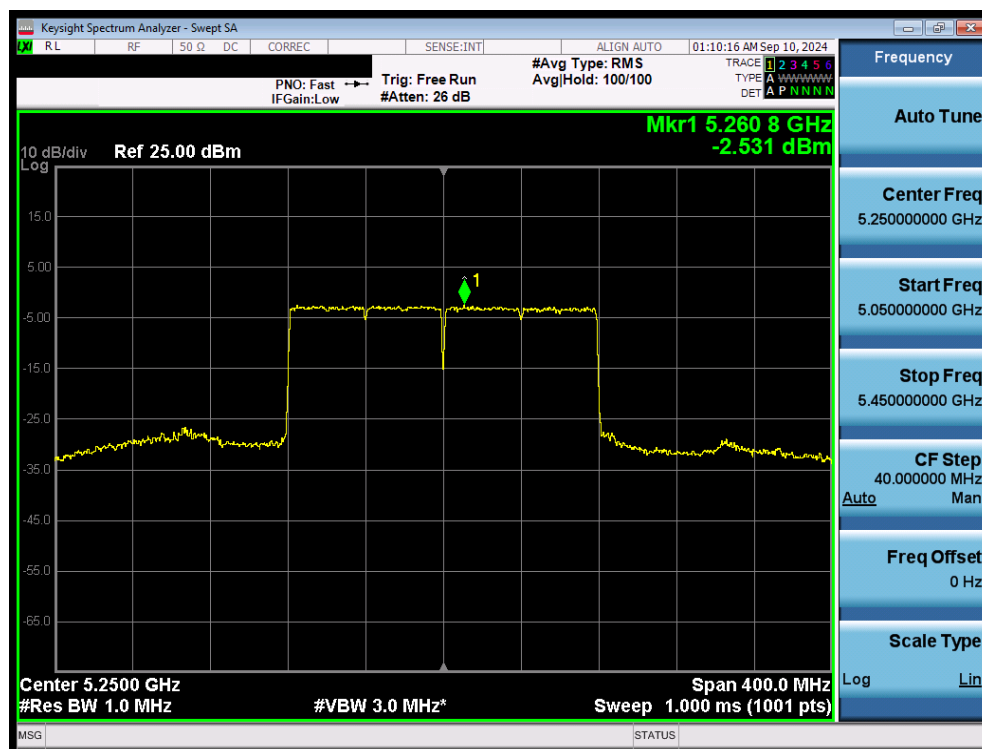


Plot 7-67. Power Spectral Density Plot MIMO ANT2 (40MHz 802.11ax/be (Full Tones) (UNII Band 1) – Ch. 38)

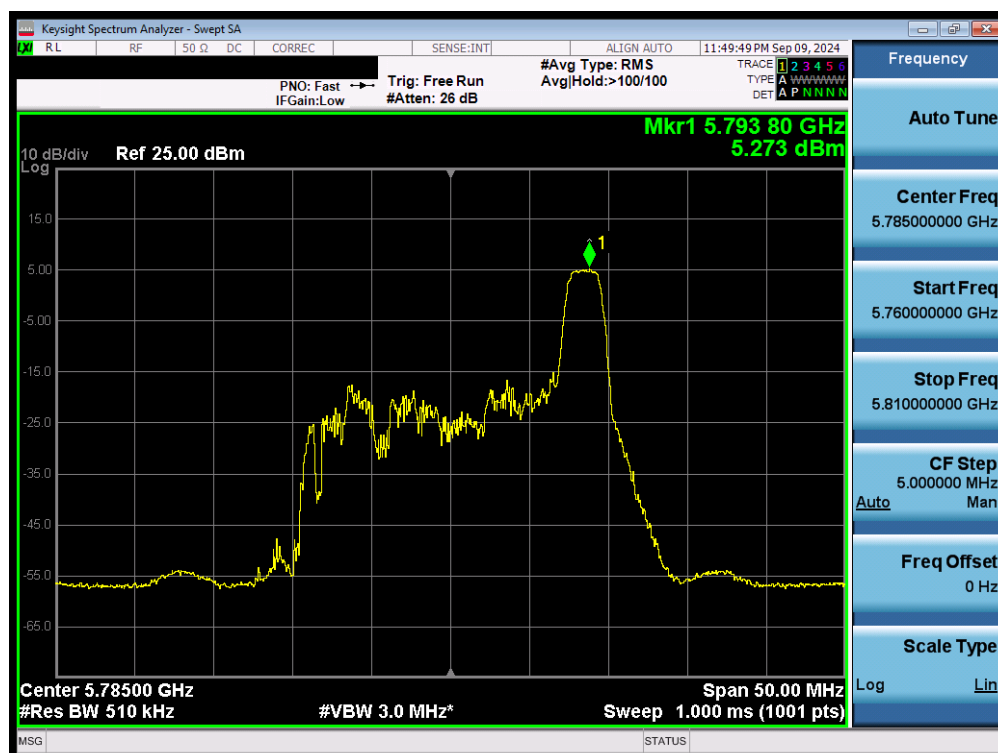


Plot 7-68. Power Spectral Density Plot MIMO ANT2 (80MHz 802.11ax/be (Full Tones) (UNII Band 1) – Ch. 42)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 64 of 105

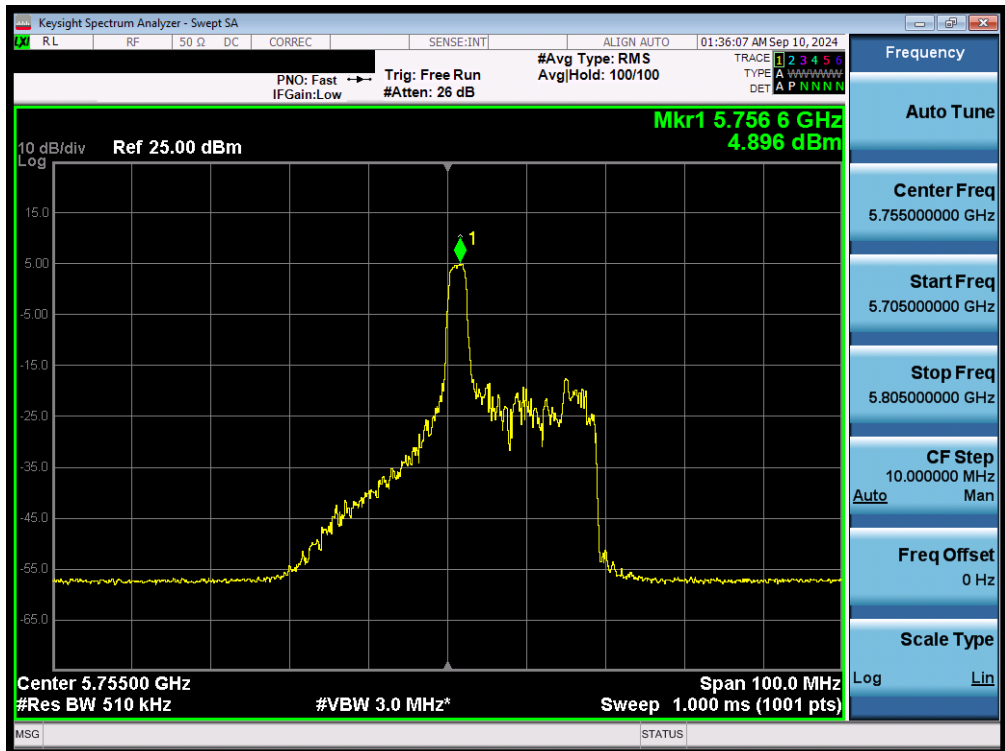


Plot 7-69. Power Spectral Density Plot MIMO ANT2 (160MHz 802.11ax/be (Full Tones) (UNII Band 1/2A) – Ch. 50)

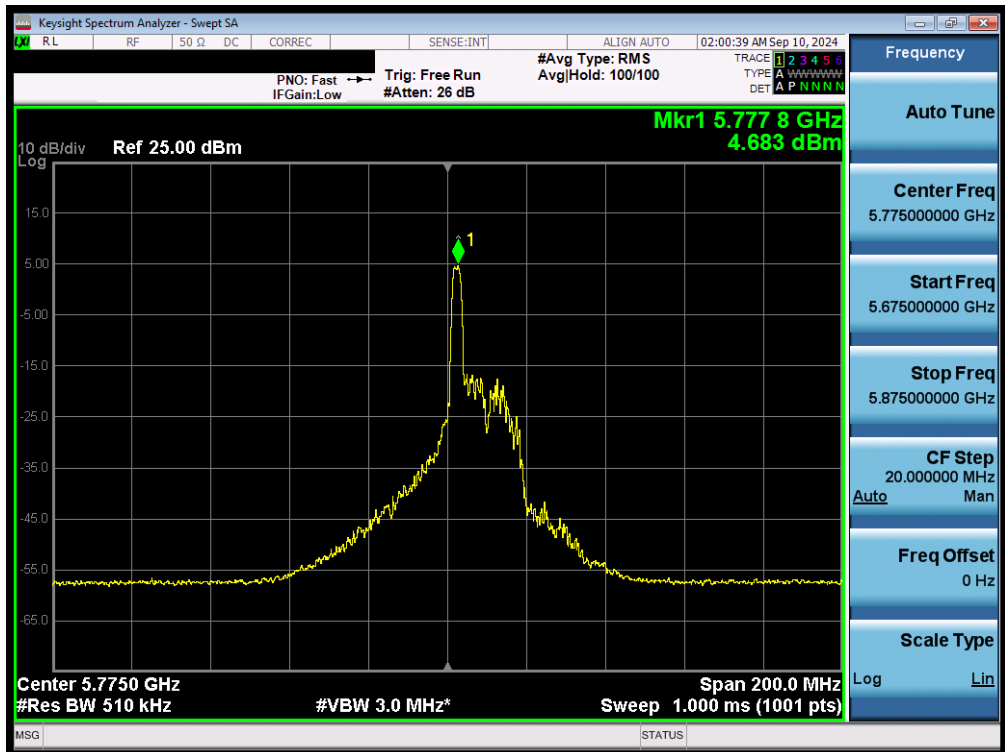


Plot 7-70. Power Spectral Density Plot MIMO ANT2 (20MHz 802.11ax/be (26 Tones) (UNII Band 3) – Ch. 157)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 65 of 105

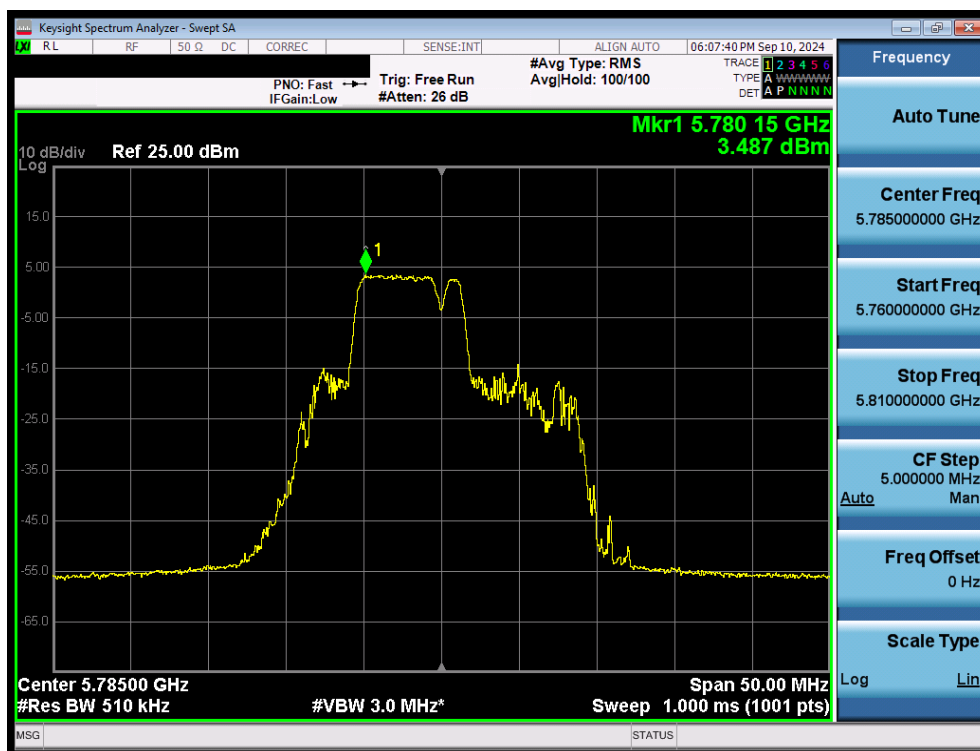


Plot 7-71. Power Spectral Density Plot MIMO ANT2 (40MHz 802.11ax/be (26 Tones) (UNII Band 3) – Ch. 151)

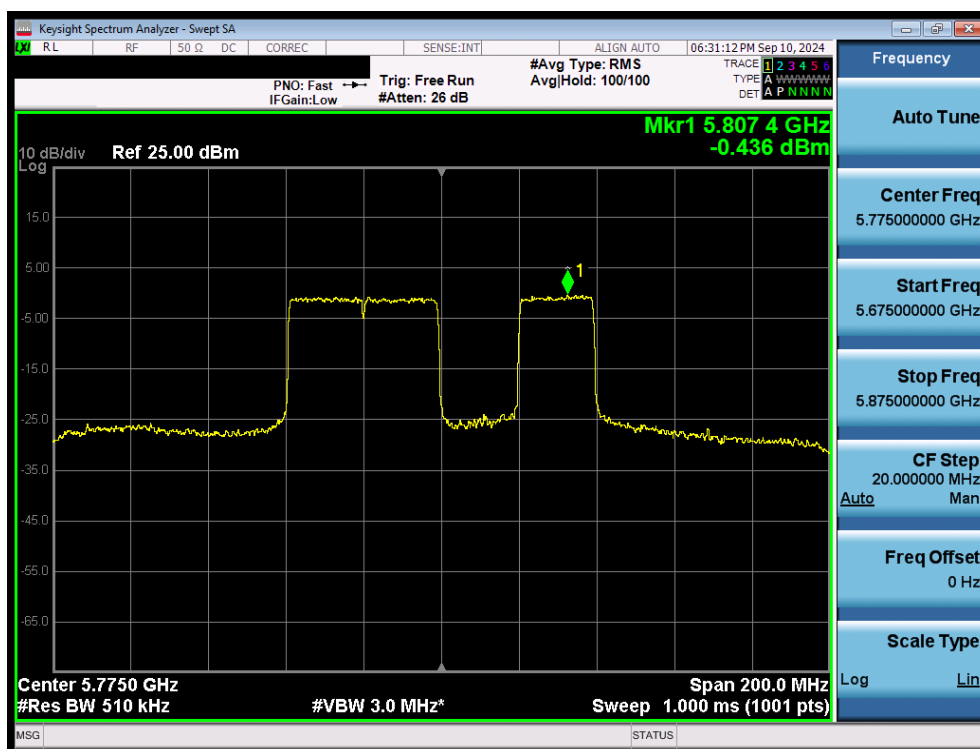


Plot 7-72. Power Spectral Density Plot MIMO ANT2 (80MHz 802.11ax/be (26 Tones) (UNII Band 3) – Ch. 155)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 66 of 105



Plot 7-73. Power Spectral Density Plot MIMO ANT2 (20MHz 802.11be (52+26 Tones) (UNII Band 3) – Ch. 157)



Plot 7-74. Power Spectral Density Plot MIMO ANT2 (80MHz 802.11be (484+242 Tones) (UNII Band 3) – Ch. 155)

FCC ID: A3LSMS938B	MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2408260069-18.A3L	Test Dates: 09/03/2024 - 11/07/2024	EUT Type: Portable Handset	Page 67 of 105