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MEASUREMENT REPORT
FCC Part 15.407 802.11ax 6E (OFDMA)

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

Date of Testing:
04/03/2023 - 05/20/2023
Test Report Issue Date:
05/20/2023
Test Site/Location:
Element Lab. Yongin-Si, Gyeonggi-do, South Korea
Element Lab. Columbia, MD United States
Test Report Serial No.:
1M2303200036-09.A3L

FCC ID:	**A3LSMX910**
IC:	**649E-SMX910**
APPLICANT:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model/HVIN:	SM-X910
EUT Type:	Portable Tablet
Frequency Range:	5935 – 7115MHz
Modulation Type:	OFDMA
FCC Classification:	15E 6GHz Low Power Dual Client (6CD)
FCC Rule Part(s):	Part 15 Subpart E (15.407)
ISED Specification:	RSS-248 Issue 2
Test Procedure(s):	ANSI C63.10-2013, KDB 987594 D02 v01r01

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

ACCREDITED CERT #2041.04
ACCREDITED CERT #2041.01

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Channel Bandwidth [MHz]	UNII Band	Tx Frequency [MHz]	MIMO	
			Max Conducted Power [mW]	Max Conducted Power [dBm]
20	5	5935 - 6415	36.646	15.64
	6	6435 - 6515	35.397	15.49
	7	6535 - 6875	37.042	15.69
	8	6895 - 7115	39.611	15.98
40	5	5965 - 6405	55.272	17.43
	6	6445 - 6525	55.620	17.45
	7	6565 - 6845	60.943	17.85
	8	6885 - 7085	59.156	17.72
80	5	5985 - 6385	58.470	17.67
	6	6465	55.163	17.42
	7	6545 - 6865	60.788	17.84
	8	6945 - 7025	55.252	17.42
160	5	6025 - 6345	49.314	16.93
	6	6505	45.291	16.56
	7	6665 - 6825	44.774	16.51
	8	6985	44.064	16.44

EUT Overview

1 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 Locations

These measurement tests were conducted at two different Element laboratories: **Element Suwon Laboratory** located at 13, Heungdeok 1-ro, Giheung-gu, Yongin-si, Gyeonggi-do, 16954, South Korea and **Element Materials Technology Washington DC LLC** located at 7185 Oakland Mills Road, Columbia, MD 21046, United States. Both measurement facilities are compliant with the test site requirements specified in ANSI C63.4-2014.

1.3 Test Facility / Accreditations

Accreditation information for both Element laboratories is shown below:

Element Materials Technology Suwon, Ltd. located at (#1407) 13, Heungdeok 1-ro, Giheung-gu, Yongin-si, Gyeonggi-do 16954, South Korea

- Element Materials Technology Suwon, Ltd. is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation(A2LA) with Certificate number 2041.04 for Specific Absorption Rate (SAR), and Electromagnetic Compatibility (EMC) & Telecommunications testing for FCC and Innovation, Science, and Economic Development Canada rules.

- Element Materials Technology Suwon, Ltd. facility is accredited, designated, and recognized in accordance with the provision of Radio Wave Act and International Standard ISO/IEC 17025:2017 under the National Radio Research Agency.

    - Designation Number / CABID: KR0169
    - Test Firm Registration Number of FCC: 417945
    - Test Firm Registration Number of ISED: 26168

Element Materials Technology Washington DC LLC located at 7185 Oakland Mills Road, Columbia, MD 21046, United States

- 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 Agreement.

2 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Electronics Co., Ltd. Portable Tablet FCC: A3LSMX910, IC: 649E-SMX910**. The test data contained in this report pertains only to the emissions due to the EUT's UNII transmitter while operating in the 6GHz band.

Test Device Serial No.: 4628G, 0150M, 4613G, 0154M, 0155M

2.2 Device Capabilities

This device contains the following capabilities:

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

Band 5		Band 6		Band 7		Band 8	
Ch.	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**
2	5935	97	6435	117	6535	189	6895
:	:	:	:	:	:	:	:
45	6175	105	6475	149	6695	209	6995
:	:	:	:	:	:	:	:
93	6415	113	6515	185	6875	233	7115

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

Band 5		Band 6		Band 7		Band 8	
Ch.	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**
3	5965	99	6445	123	6565	187	6885
:	:	:	:	:	:	:	:
43	6165	107	6485	155	6725	211	7005
:	:	:	:	:	:	:	:
91	6405	115	6525	179	6845	227	7085

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

Band 5		Band 6		Band 7		Band 8	
Ch.	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**
7	5985	103	6465	119	6545	199	6945
:	:			:	:	:	:
39	6145			151	6705	215	7025
:	:			:	:		
87	6385			183	6865		

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

Band 5	
Ch.	**Frequency (MHz)**
15	6025
:	:
47	6185
:	:
79	6345

Band 6	
Ch.	**Frequency (MHz)**
111	6505

Band 7	
Ch.	**Frequency (MHz)**
143	6665
:	:
175	6825

Band 8	
Ch.	**Frequency (MHz)**
207	6985

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

Notes:

1. 6GHz 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:

Mode	Antenna	Bandwidth [MHz]	Channel	Tone	Duty Cycle
802.11ax NII RU 6E	MIMO	20	2	26T	99.1
				52T	99.4
				106T	98.6
				242T	97.4
802.11ax NII RU 6E	MIMO	40	3	26T	99.1
				52T	99.1
				106T	98.6
				242T	97.4
				484T	95.6
802.11ax NII RU 6E	MIMO	80	7	26T	99.1
				52T	99.4
				106T	99.0
				242T	97.4
				484T	95.5
				996T	95.8
802.11ax NII RU 6E	MIMO	160L	15	26T	99.1
				52T	99.4
				106T	98.7
				242T	97.9
				484T	96.5
				996T	95.8
802.11ax NII RU 6E	MIMO	160U	15	26T	99.1
				52T	99.4
				106T	99.0
				242T	97.5
				484T	95.8
				996T	95.8
802.11ax NII RU 6E	MIMO	160	15	996T x 2	99.3

Table 2-5. Measured Duty Cycles

For those measured duty cycles that are less than 98%, a DCCF (duty cycle correction factor) is calculated and applied to final measurements. The DCCF is calculated using the following equation:

$$DCCF\ (dB) = 10\log_{10}(1/Duty\ Cycle)$$

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

WiFi Configurations		SISO		CDD		SDM	
		ANT1	ANT2	ANT1	ANT2	ANT1	ANT2
6GHz	11a	×	×	✓	✓	×	×
	11ax	×	×	✓	✓	✓	✓

Table 2-6. Frequency / Channel Operations

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

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

MCS Index	Spatial Stream	OFDMA (802.11ax)																				
		26T			52T			106T			242T			484T			996T			2x996T		
HE		0.8µs GI	1.6µs GI	3.2µs GI	0.8µs GI	1.6µs GI	3.2µs GI	0.8µs GI	1.6µs GI	3.2µs GI	0.8µs GI	1.6µs GI	3.2µs GI	0.8µs GI	1.6µs GI	3.2µs GI	0.8µs GI	1.6µs GI	3.2µs GI	0.8µs GI	1.6µs GI	3.2µs GI
0	1	0.9	0.8	0.8	1.8	1.7	1.5	3.8	3.5	3.2	8.6	8.1	7.3	17.2	16.3	14.6	36	34	30.6	72.1	68.1	61.3
1	1	1.8	1.7	1.5	3.5	3.3	3	7.5	7.1	6.4	17.2	16.3	14.6	34.4	32.5	29.3	72.1	68.1	61.3	144.1	136.1	122.5
2	1	2.6	2.5	2.3	5.3	5	4.5	11.3	10.6	9.6	25.8	24.4	21.9	51.6	48.8	43.9	108.1	102.1	91.9	216.2	204.2	183.8
3	1	3.5	3.3	3	7.1	6.7	6	15	14.2	12.8	34.4	32.5	29.3	68.8	65	58.5	144.1	136.1	122.5	288.2	272.2	245
4	1	5.3	5	4.5	10.6	10	9	22.5	21.3	19.1	51.6	48.8	43.9	103.2	97.5	87.8	216.2	204.2	183.8	432.4	408.3	367.5
5	1	7.1	6.7	6	14.1	13.3	12	30	28.3	25.5	68.8	65	58.5	137.6	130	117	288.2	272.2	245	576.5	544.4	490
6	1	7.9	7.5	6.8	15.9	15	13.5	33.8	31.9	28.7	77.4	73.1	65.8	154.9	146.3	131.6	324.3	306.3	275.6	648.5	612.5	551.3
7	1	8.8	8.3	7.5	17.6	16.7	15	37.5	35.4	31.9	86	81.3	73.1	172.1	162.5	146.3	360.3	340.3	306.3	720.6	680.6	612.5
8	1	10.6	10	9	21.2	20	18	45	42.5	38.3	103.2	97.5	87.8	206.5	195	175.5	432.4	408.3	367.5	864.7	816.7	735
9	1	11.8	11.1	10	23.5	22.2	20	50	47.2	42.5	114.7	108.3	97.5	229.4	216.7	195	480.4	453.7	408.3	960.8	907.4	816.7
10	1	13.2	12.5	11.3	26.5	25	22.5	56.3	53.1	47.8	129	121.9	109.7	258.1	243.8	219.4	540.4	510.4	459.4	1080.9	1020.8	918.8
11	1	14.7	13.9	12.5	29.4	27.8	25	62.5	59	53.1	143.4	135.4	121.9	286.8	270.8	243.8	600.5	567.1	510.4	1201	1134.3	1020.8
0	2	1.8	1.7	1.5	3.5	3.3	3	7.5	7.1	6.4	17.2	16.3	14.6	34.4	32.5	29.3	72.1	68.1	61.3	144.1	136.1	122.5
1	2	3.5	3.3	3	7.1	6.7	6	15	14.2	12.8	34.4	32.5	29.3	68.8	65	58.5	144.1	136.1	122.5	288.2	272.2	245
2	2	5.3	5	4.5	10.6	10	9	22.5	21.3	19.1	51.6	48.8	43.9	103.2	97.5	87.8	216.2	204.2	183.8	432.4	408.3	367.5
3	2	7.1	6.7	6	14.1	13.3	12	30	28.3	25.5	68.8	65	58.5	137.6	130	117	288.2	272.2	245	576.5	544.4	490
4	2	10.6	10	9	21.2	20	18	45	42.5	38.3	103.2	97.5	87.8	206.5	195	175.5	432.4	408.3	367.5	864.7	816.7	735
5	2	14.1	13.3	12	28.2	26.7	24	60	56.7	51	137.6	130	117	275.3	260	234	576.5	544.4	490	1152.9	1088.9	980
6	2	15.9	15	13.5	31.8	30	27	67.5	63.8	57.4	154.9	146.3	131.6	309.7	292.5	263.3	648.5	612.5	551.3	1297.1	1225	1102.5
7	2	17.6	16.7	15	35.3	33.3	30	75	70.8	63.8	172.1	162.5	146.3	344.1	325	292.5	720.6	680.6	612.5	1441.2	1361.1	1225
8	2	21.2	20	18	42.4	40	36	90	85	76.5	206.5	195	175.5	412.9	390	351	864.7	816.7	735	1729.4	1633.3	1470
9	2	23.5	22.2	20	47.1	44.4	40	100	94.4	85	229.4	216.7	195	458.8	433.3	390	960.8	907.4	816.7	1921.6	1814.8	1633.3
10	2	26.5	25	22.5	52.9	50	45	112.5	106.3	95.6	258.1	243.8	219.4	516.2	487.5	438.8	1080.9	1020.8	918.8	2161.8	2041.7	1837.5
11	2	29.4	27.8	25	58.8	55.6	50	125	118.1	106.3	286.8	270.8	243.8	573.5	541.7	487.5	1201	1134.3	1020.8	2402	2268.5	2041.7

Table 2-7. Supported Data Rates

2.3 Antenna Description

The following antenna gains were used for the testing.

Frequency (MHz)	Ant1 Peak Gain [dBi]	Ant2 Peak Gain [dBi]	Directional Gain [dBi]
5915	-6.89	-7.84	-4.34
6015	-6.14	-8.42	-4.20
6115	-6.17	-7.98	-4.02
6215	-5.99	-8.27	-4.05
6315	-7.21	-9.47	-5.26
6350	-7.45	-9.9	-5.58
6415	-8.71	-11.1	-6.81
6515	-9.73	-11.8	-7.69
6615	-10.6	-12.5	-8.49
6700	-9.74	-12.75	-8.10
6715	-9.9	-12.5	-8.09
6815	-9.96	-12.5	-8.13
6915	-9.92	-11.7	-7.75
7015	-9.82	-11.8	-7.74
7100	-10.26	-12.29	-8.21
7125	-10.1	-13.2	-8.50

Table 2-8 Antenna Peak Gain per Frequency

2.4 Test Configuration

The EUT was tested per the guidance of ANSI C63.10-2013 and KDB 987594 D02 v01r01. 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, 3.3 for radiated emissions test setups, and 7.2, 7.3, 7.4, 7.5 and 7.6 for antenna port conducted emissions test setups.

2.5 Software and Firmware

The test was conducted with firmware version X910XXU0AWD5 installed on the EUT.

2.6 EMI Suppression Device(s) / Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

3 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) and the guidance provided in KDB 987594 D02 v01r01 were 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.

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 15ºC to 35ºC. The relative humidity is controlled within range of 10% to 75%. The atmospheric pressure is monitored within the range 86-106kPa (860-1060mbar).

4 ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:
"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

- The antennas of the EUT are **permanently attached.**
- There are no provisions for connection to an external antenna.

Conclusion:

The EUT complies with the requirement of §15.203.

5 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 (±dB)
Contention Based Protocol Conducted Measurements	0.86
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 – MD

Contribution	Expanded Uncertainty (±dB)
Conducted Bench Top Measurements	1.37
Conducted Disturbance	3.09
Radiated Disturbance (<1GHz)	3.94
Radiated Disturbance (>1GHz)	4.75
Radiated Disturbance (>18GHz)	4.84

Table 5-2. MEASUREMENT UNCERTAINTY – EK

6 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
-	MVG-001	EMC Cable and Switch System	1/12/2023	Annual	1/12/2024	MVG-001
-	MVG-002	EMC Cable and Switch System	1/12/2023	Annual	1/12/2024	MVG-002
-	WL40-1	WLAN Cable Set (40GHz)	1/12/2023	Annual	1/12/2024	WL40-1
-	WL40-2	WLAN Cable Set (40GHz)	1/12/2023	Annual	1/12/2024	WL40-2
-	MD 1M 18-40	EMC Cable and Switch System	1/11/2023	Annual	1/11/2024	MD 1M 18-40
EMCO	3115	Horn Antenna (1-18GHz)	8/8/2022	Biennial	8/8/2024	9203-2178
EMCO	3116	Horn Antenna (18-40GHz)	7/20/2021	Biennial	7/20/2023	9704-5182
Keysight Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	8/18/2022	Annual	8/18/2023	MY54500644
Keysight Technologies	N9030A	PXA Signal Analyzer	9/6/2022	Annual	9/6/2023	MY55410501
Keysight Technologies	N9038A	MXE EMI Receiver	1/21/2022	Annual	6/21/2023	MY51210133
Sunol Sciences	DRH-118	Horn (Small)	2/14/2022	Biennial	2/14/2024	A102416-2
Sunol Sciences	JB5	Bi-Log Antenna (30M-5GHz)	8/30/2022	Biennial	8/30/2024	A102416-1
Sunol Sciences	DRH-118	Horn Antenna (1-18GHz)	7/14/2021	Biennial	7/14/2023	A051107
Rohde & Schwarz	ESW26	ESW26 EMI Test Receiver	5/19/2022	Annual	5/19/2023	161675

Table 6-1. Annual Test Equipment Calibration Schedule – MD

Manufacturer	Model	Dual Directional Coupler	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	N9030A	PXA Signal Analyzer(3Hz-26.5GHz)	7/4/2022	Annual	7/3/2023	MY49432391
Anritsu	S820E	Cable and Antenna Analyzer	7/6/2022	Annual	7/5/2023	1839097
Anritsu	TOSLKF50A-40	Calibration Kit	N/A	-	N/A	1825024
Anritsu	MA24106A	USB Power Sensor	1/13/2023	Annual	1/12/2024	1344557
COM-Power Corporatior	AL-130R	Active Loop Antenna	10/21/2022	Biennial	10/20/2024	10160045
MINI-CIRCUITS	BW-N10W5+	ATTENUATOR(DC-18GHz)	4/6/2023	Annual	4/5/2024	2106
NARDA	180-442A-KF	Horn Antenna(18GHz-40GHz)	11/23/2022	Biennial	11/22/2024	T058701-03
Rohde & Schwarz	ESW	EMI Test Receiver(2Hz-44GHz)	7/4/2022	Annual	7/3/2023	101761
Rohde & Schwarz	FSW43	Signal and Spectrum Analyzer(2Hz-43.5GHz)	1/13/2023	Annual	1/12/2024	101955
Rohde & Schwarz	TS-SFUNIT-Rx	Shielded Filter Unit	1/13/2023	Annual	1/12/2024	102131
Rohde & Schwarz	TS-PR1840	Preamplifier(18GHz-40GHz)	7/6/2022	Annual	7/5/2023	100049
Rohde & Schwarz	ENV216	Two-Line V-Network	4/7/2023	Annual	4/6/2024	101319
Schwarzbeck	VULB9162	Broadband TRILOG Antenna(30MHz-1GHz)	7/13/2021	Biennial	7/12/2023	9162-217
Sunol Sciences	DRH-118	Horn Antenna(1GHz-18GHz)	1/26/2023	Biennial	1/25/2025	A102416-1
TESTEK	-	LISN Extension Cord	4/7/2023	Annual	4/6/2024	N/A

Table 6-2. Annual Test Equipment Calibration Schedule – EK

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.

7 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.
FCC ID: A3LSMX910
IC: 649E-SMX910
FCC Classification: 15E 6GHz Low Power Dual Client (6CD)

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference	Test Lab Location
2.1046, 15.407(a)(11)	Maximum Conducted Output Power	N/A	CONDUCTED	PASS	Section 7.3	EK
15.407(a)(8)	Maximum Radiated Output Power	< 24dBm over the frequency band of operation		PASS	Section 7.3	EK
2.1049, 15.407(a)(10)	Occupied Bandwidth/ 26dB Bandwidth	99% of the occupied bandwidth of any channel must be contained within each of its respective U-NII sub bands The maximum transmitter channel bandwidth for U-NII devices in the 5.925-7.125 GHz band is 320 megahertz.		PASS	Section 7.2	EK
15.407(a)(8)	Maximum Power Spectral Density	< -1dBm/MHz e.i.r.p.		PASS	Section 7.4	EK
15.407(b)(7)	In-Band Emissions	EUT must meet the limits detailed in 15.407(b)(6)		PASS	Section 7.5	MD
15.407(d)(6)	Contention Based Protocol	EUT must detect AWGN signal with 90% (or better) certainty	RADIATED	PASS	Section 7.6	MD
15.407(b)(6)	Undesirable Emissions	< -27dBm/MHz e.i.r.p. outside of the 5.925 – 7.125GHz band		PASS	Section 7.7	EK, MD
15.205, 15.209	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		PASS	Section 7.7	EK, MD
15.407	AC Conducted Emissions 150kHz – 30MHz	<FCC 15.207 limits	LINE CONDUCTED	PASS	Please see UNII 6E OFDM report	EK

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 1.3.1.
6) 802.11ax OFDMA testing was performed for all signal tone configurations as specified by the 802.11ax standard. Worst case results are determined and reported per the guidance provided at the October 2018 TCB Workshop.
7) Only one RU index could be selected at a time, so no contiguous or non-contiguous RUs were considered for testing.
8) For test lab location, "MD" indicates testing performed in the Maryland lab and "EK" indicates testing performed in the Korea lab. For test cases marked as "EK, MD", testing was performed across both locations. These tests are present on Scopes of Accreditation 2041.01 and 2041.04 for the MD and Korea labs, respectively.
9) Per 15.407(a)(7), a device operating under the control of a standard power access point in 5.925-6.425 GHz and 6.525-6.875 GHz bands must not have the maximum power spectral density exceed 17 dBm/MHz e.i.r.p., must limit the maximum e.i.r.p. over the frequency band of operation not exceed 30 dBm, and must limit its power to no more than 6 dB below its associated standard power access point's authorized transmit power. Compliance to this clause is addressed via submission of an attestation following Appendix B of KDB 987594 D01 v01r03.

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.

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

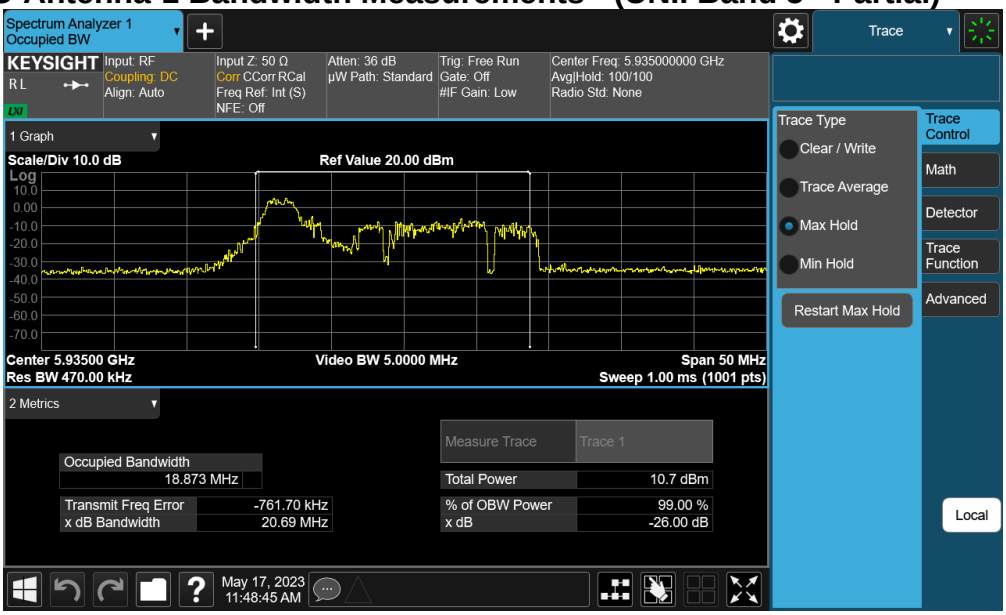
The EUT and measurement equipment were set up as shown in the diagram below.

Figure 7-1. Test Instrument & Measurement Setup

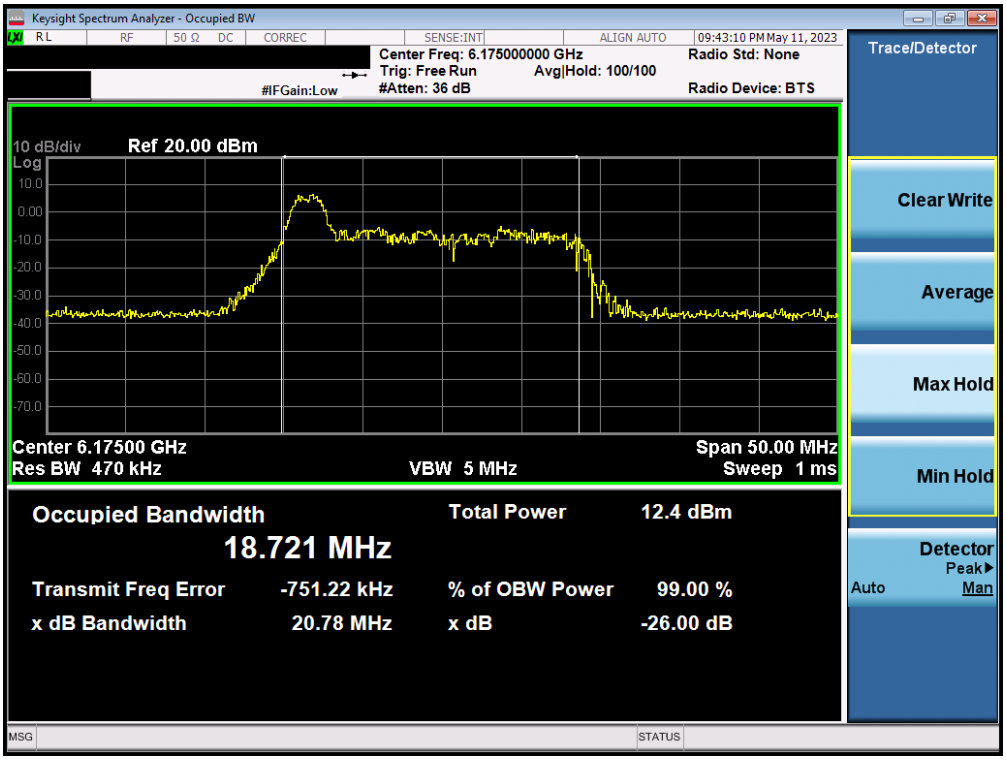
Test Notes

None.

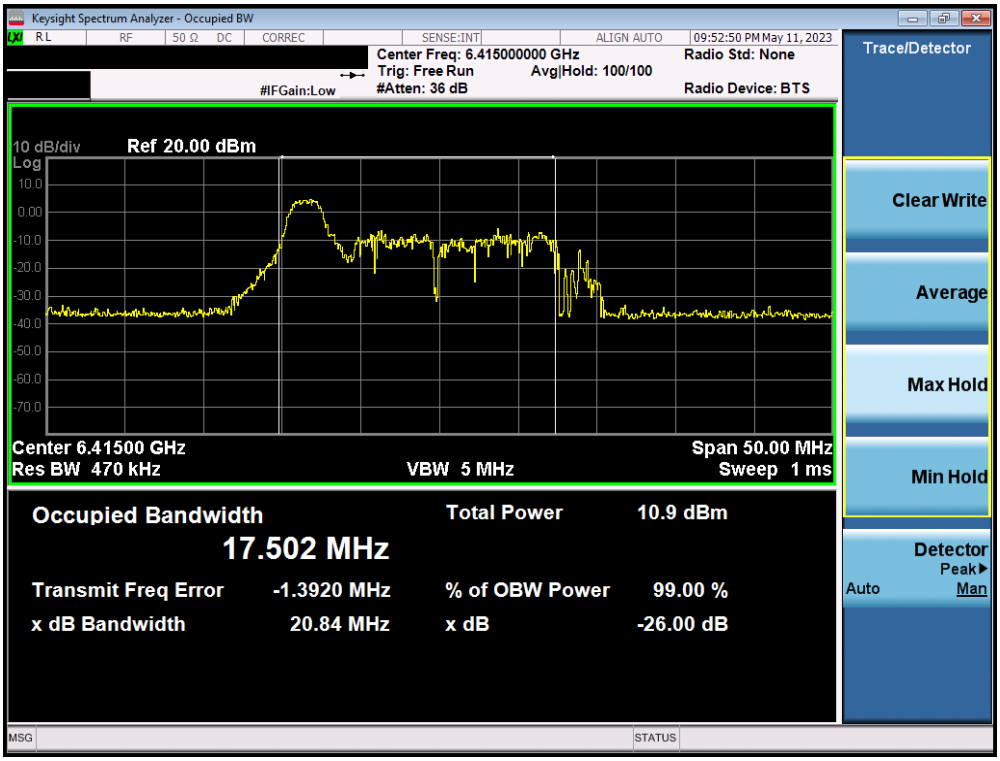
7.2.1 MIMO Antenna-1 Bandwidth Measurements - (UNII Band 5 - Partial)



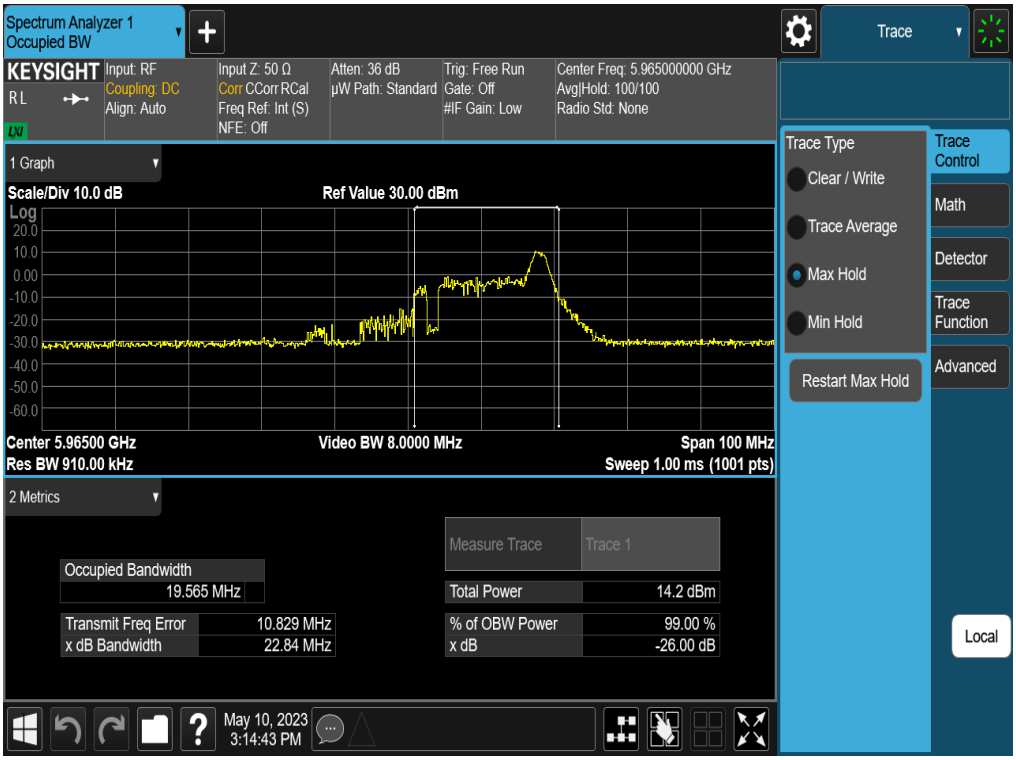
Plot 7-1. Occupied Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax (26 Tones) UNII Band 5) – Ch. 2



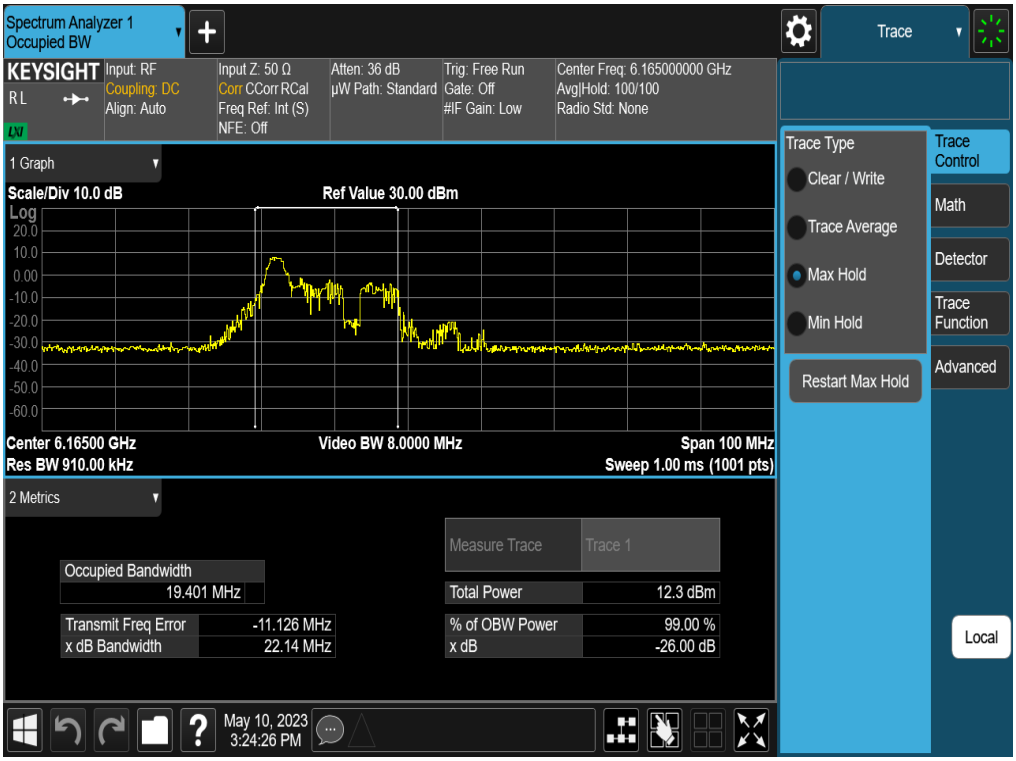
Plot 7-2. Occupied Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax (26 Tones) (UNII Band 5) – Ch. 45)



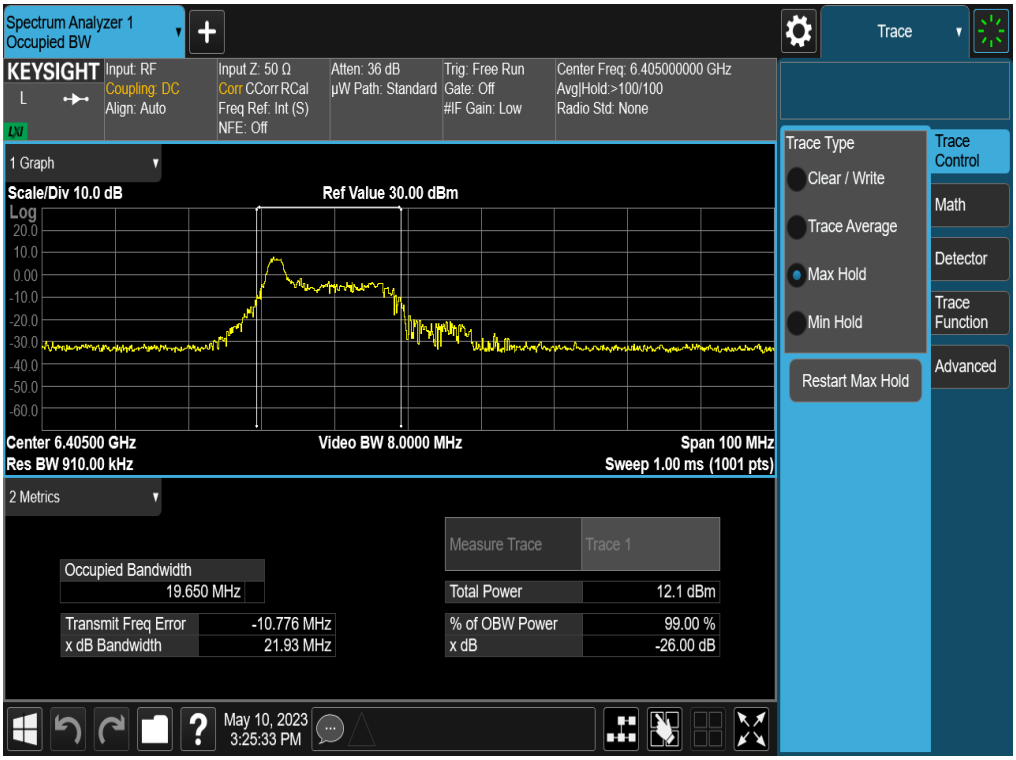
Plot 7-3. Occupied Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax (26 Tones) UNII Band 5) – Ch. 93)



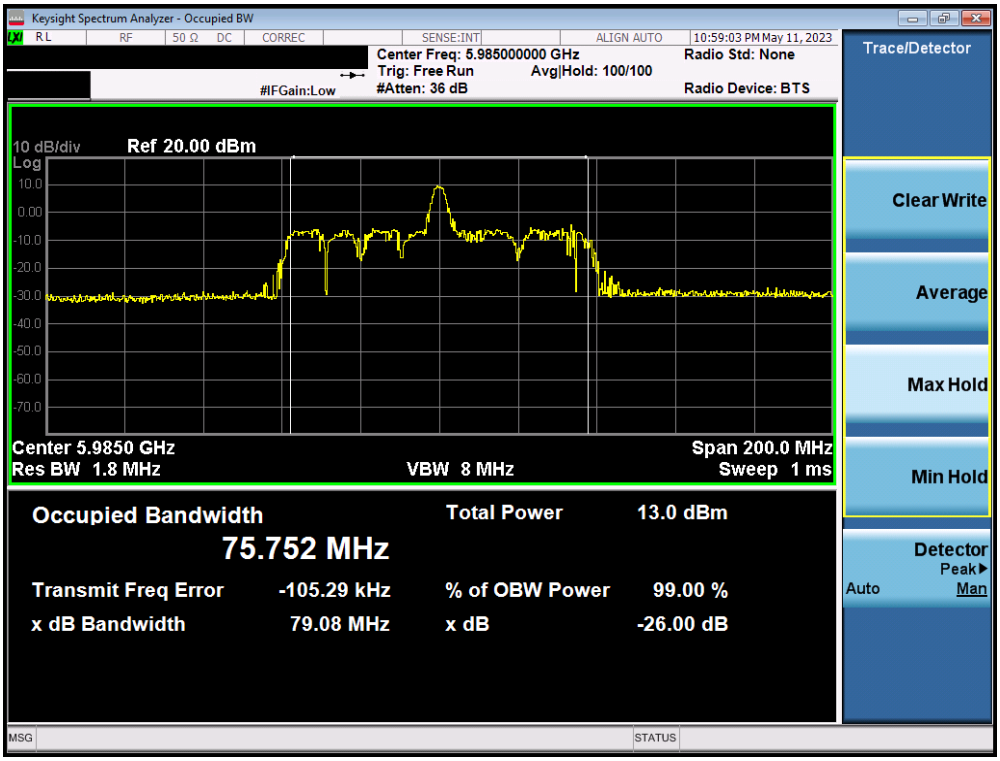
Plot 7-4. Occupied Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax (26 Tones) (UNII Band 5) – Ch. 3)



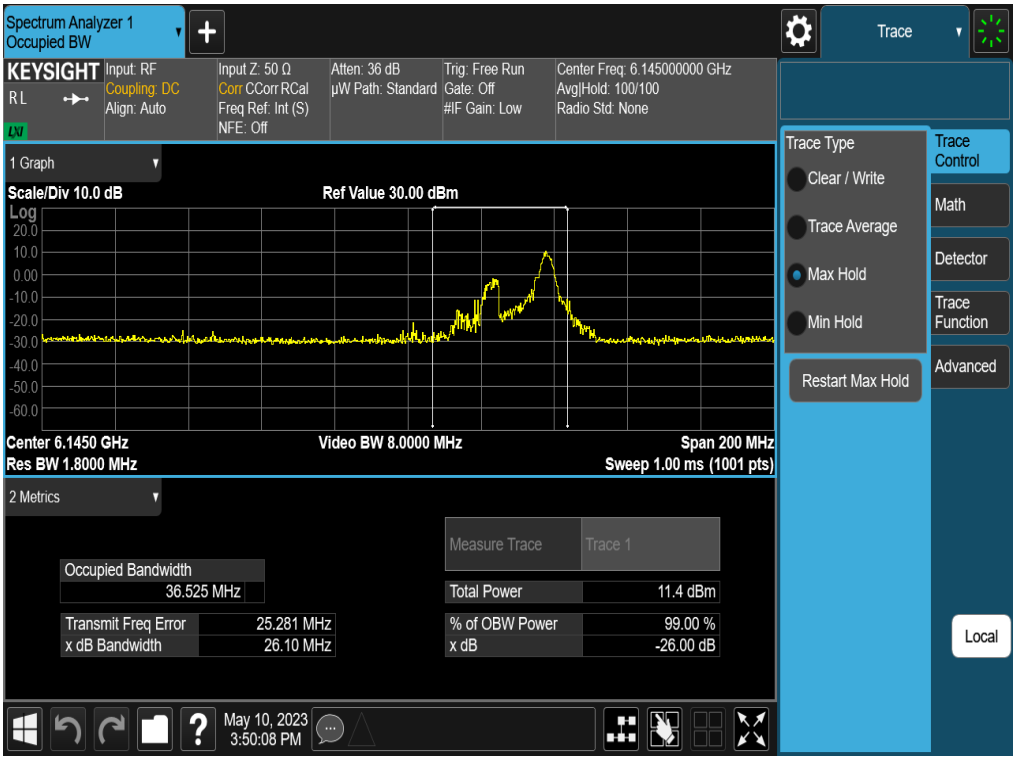
Plot 7-5. Occupied Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax (26 Tones) (UNII Band 5) – Ch. 43)



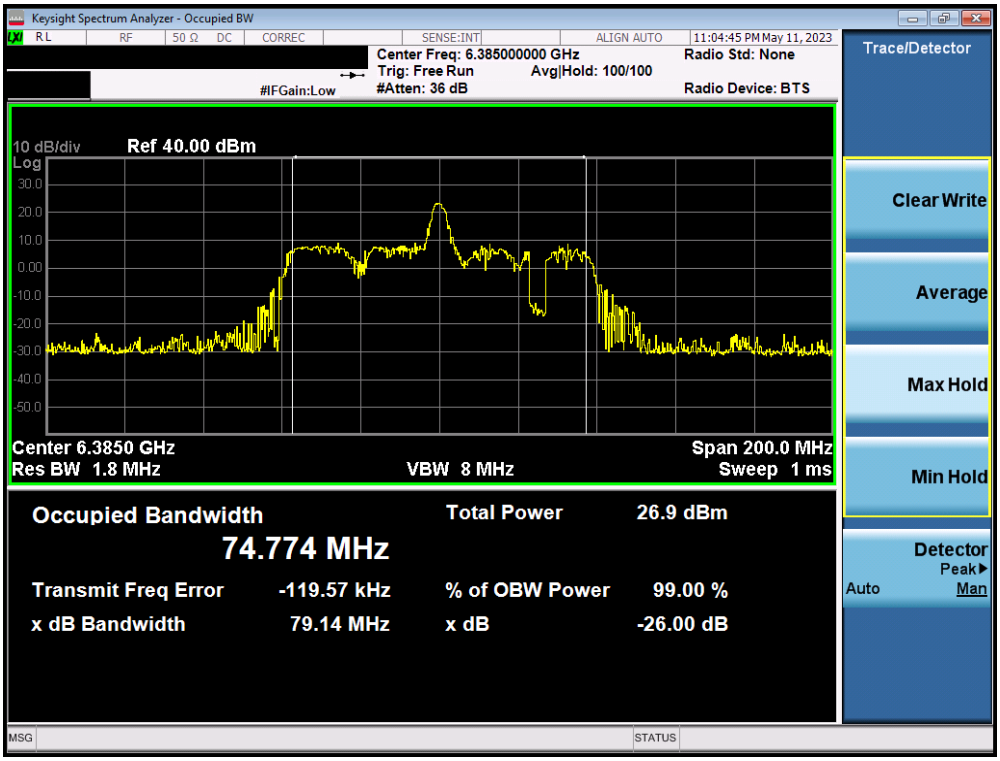
Plot 7-6. Occupied Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax (26 Tones) (UNII Band 5) – Ch. 91)



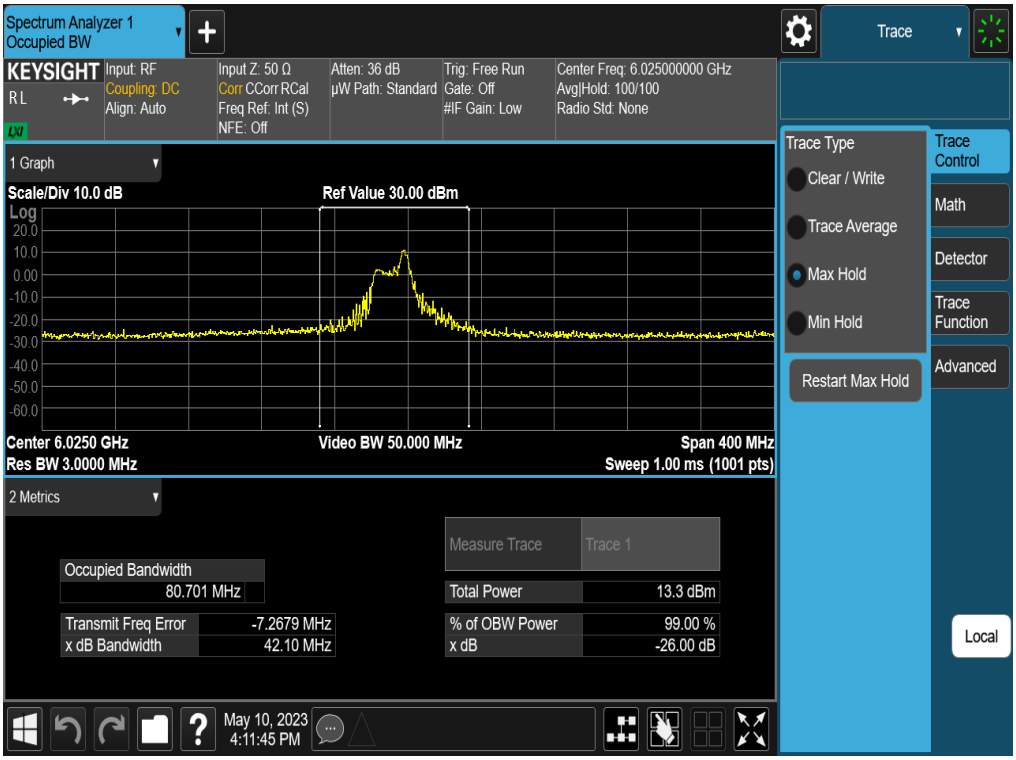
Plot 7-7. Occupied Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax (26 Tones) (UNII Band 5) – Ch. 7)



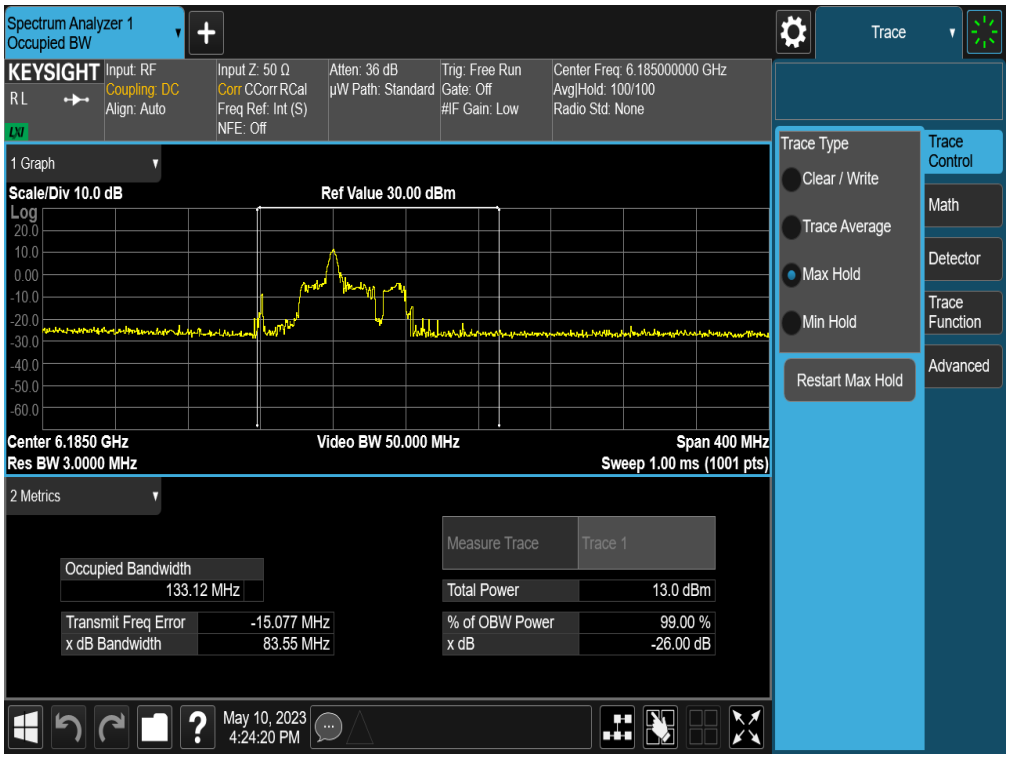
Plot 7-8. Occupied Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax (26 Tones) (UNII Band 5) – Ch. 39)



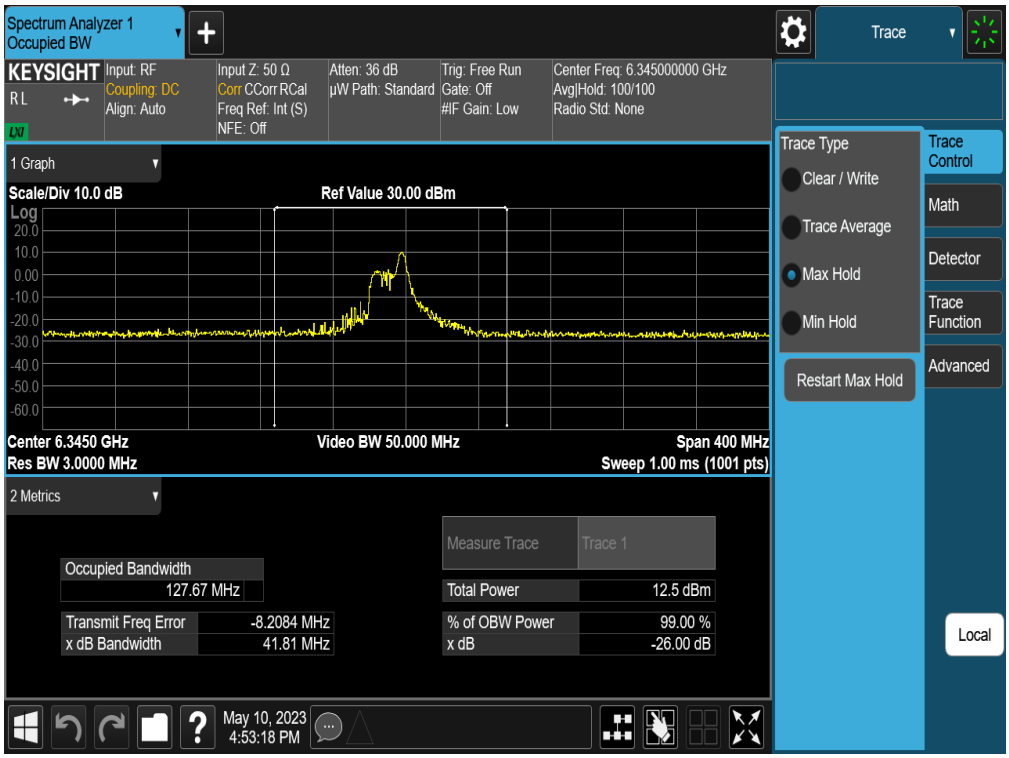
Plot 7-9. Occupied Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax (26 Tones) (UNII Band 5) – Ch. 87)



Plot 7-10. Occupied Bandwidth Plot MIMO ANT1 (160MHz BW 802.11ax (26 Tones) (UNII Band 5) – Ch. 15)

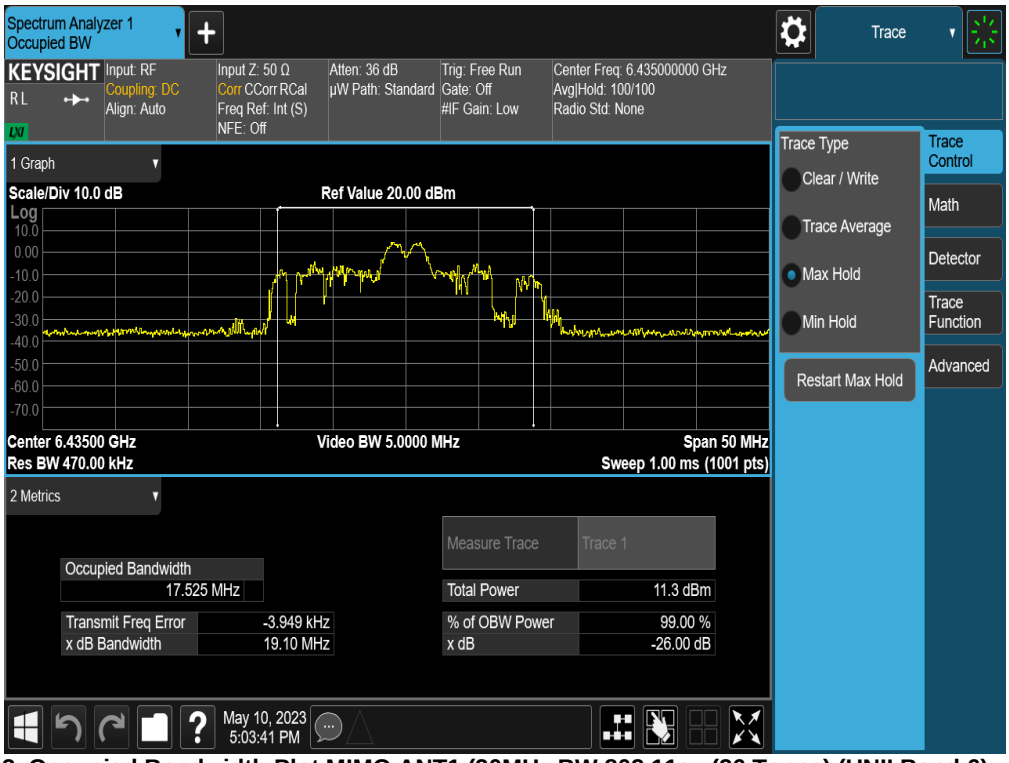


Plot 7-11. Occupied Bandwidth Plot MIMO ANT1 (160MHz BW 802.11ax (26 Tones) (UNII Band 5) – Ch. 47)

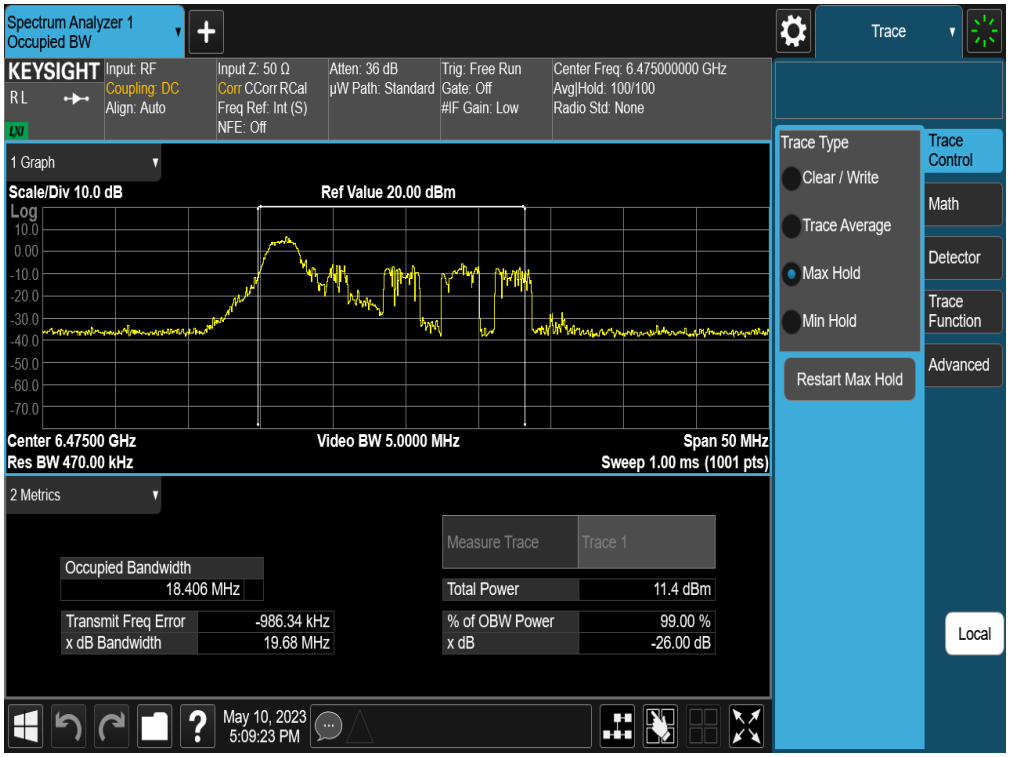


Plot 7-12. Occupied Bandwidth Plot MIMO ANT1 (160MHz BW 802.11ax (26 Tones) (UNII Band 5) – Ch. 79)

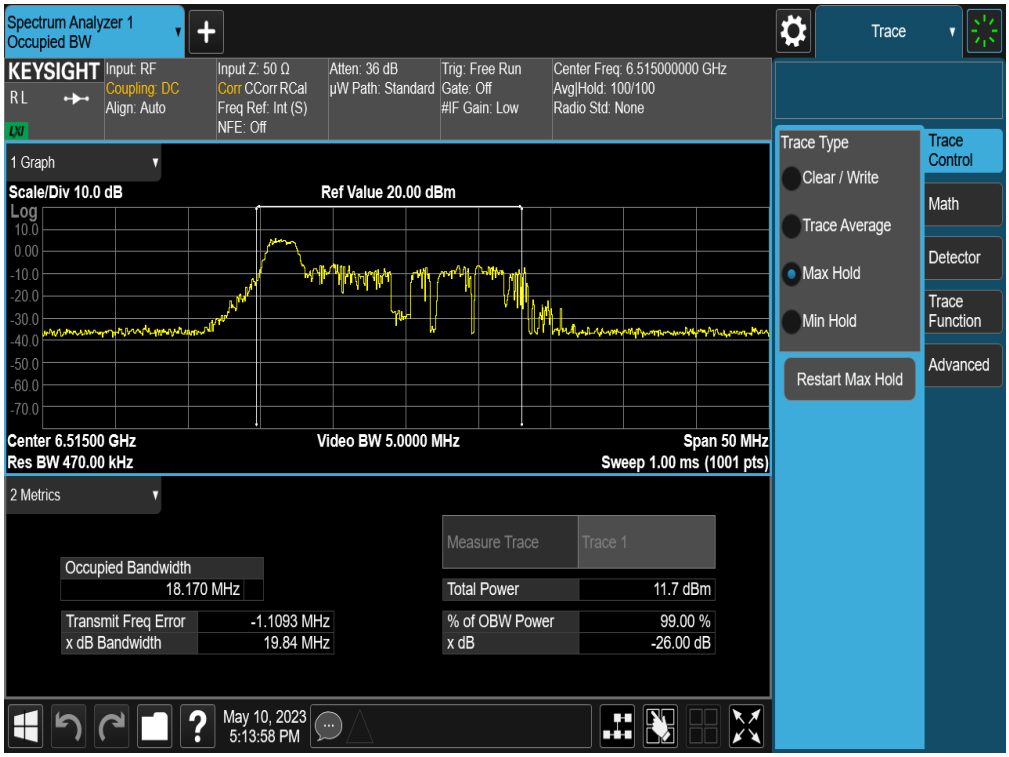
7.2.2 MIMO Antenna-1 Bandwidth Measurements - (UNII Band 6 - Partial)



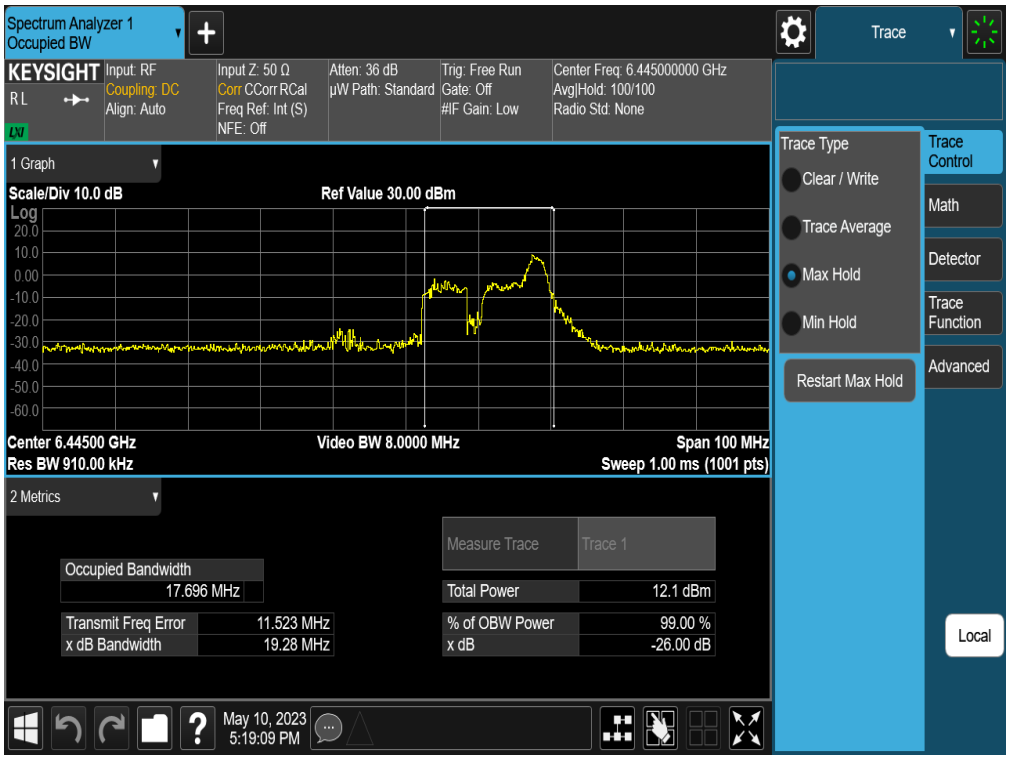
Plot 7-13. Occupied Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax (26 Tones) (UNII Band 6) – Ch. 97)



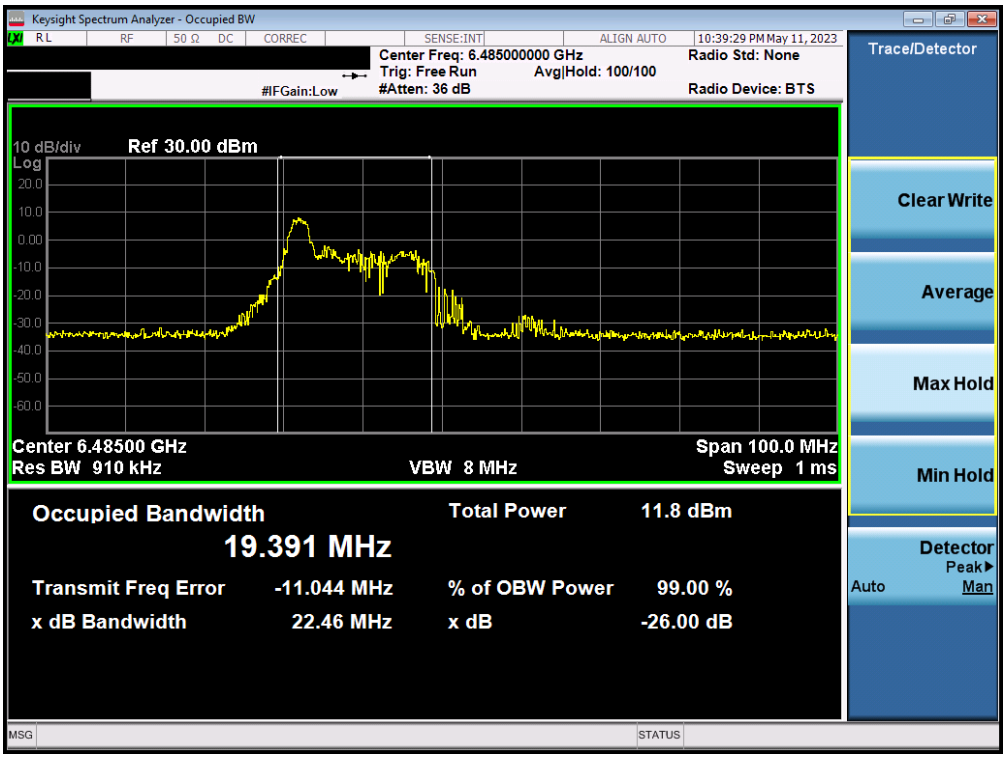
Plot 7-14. Occupied Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax (26 Tones) (UNII Band 6) – Ch. 105)



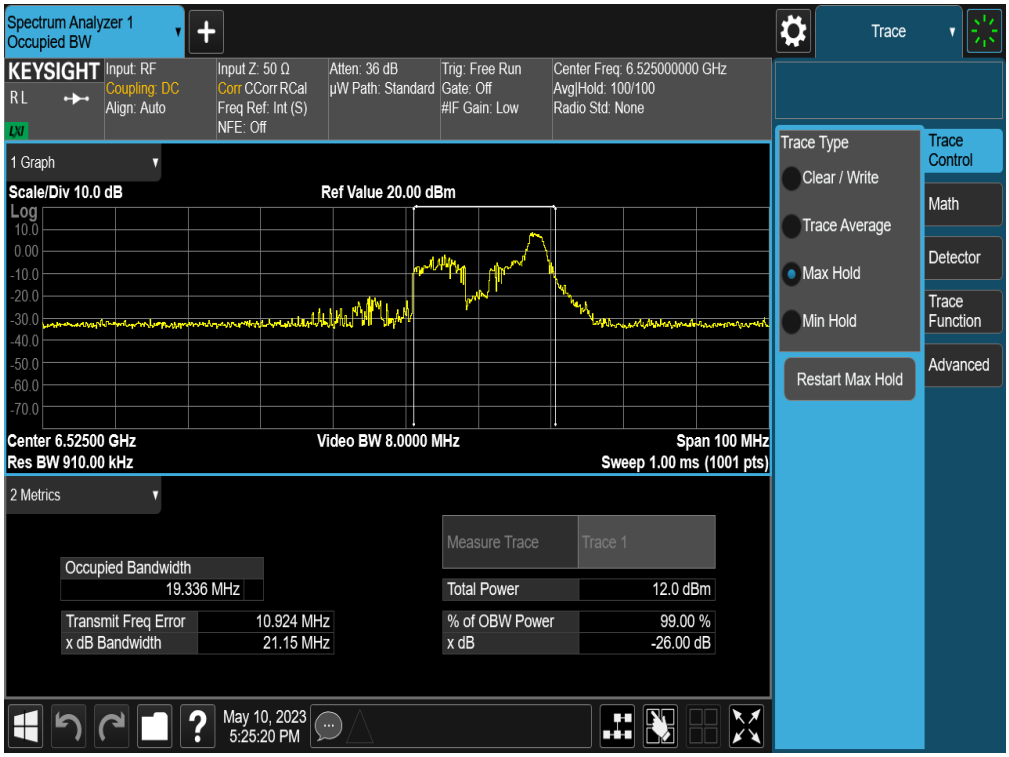
Plot 7-15. Occupied Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax (26 Tones) (UNII Band 6) – Ch. 113)



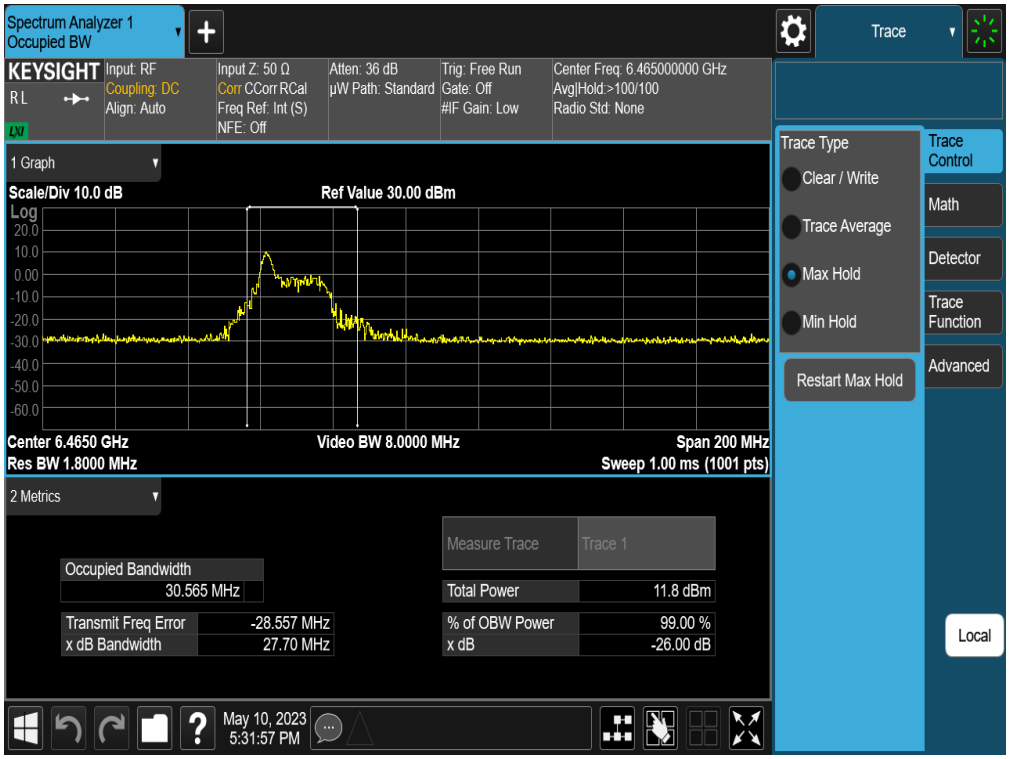
Plot 7-16. Occupied Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax (26 Tones) (UNII Band 6) – Ch. 99)



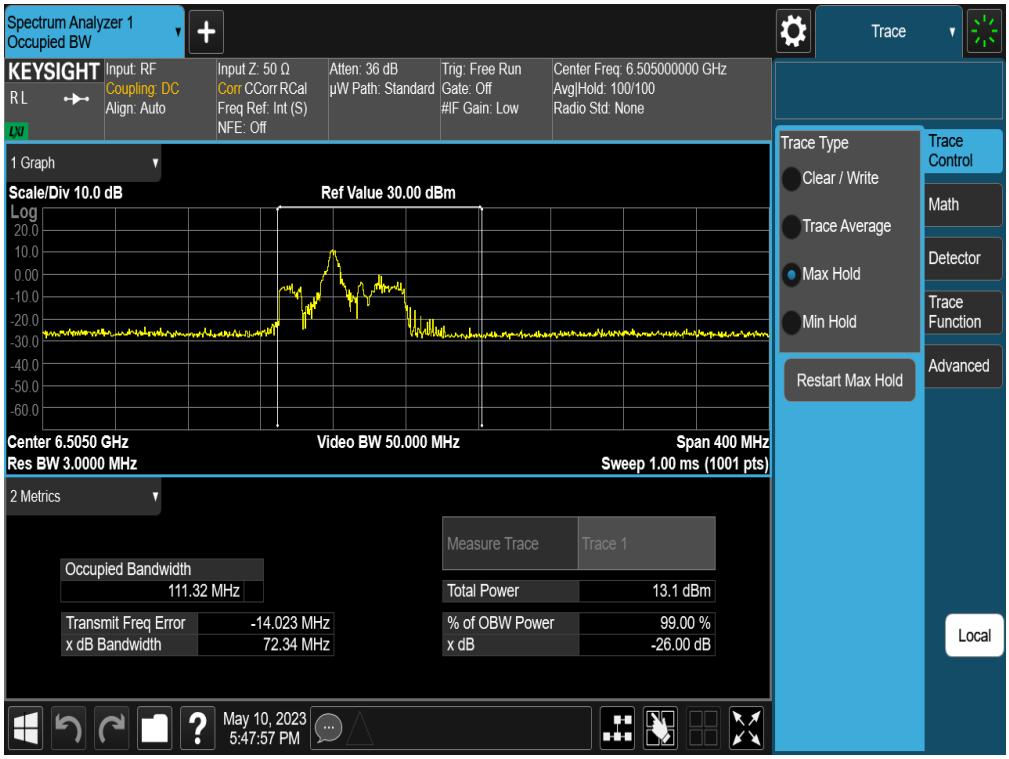
Plot 7-17. Occupied Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax (26 Tones) (UNII Band 6) – Ch. 107)



Plot 7-18. Occupied Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax (26 Tones) (UNII Band 6) – Ch. 115)

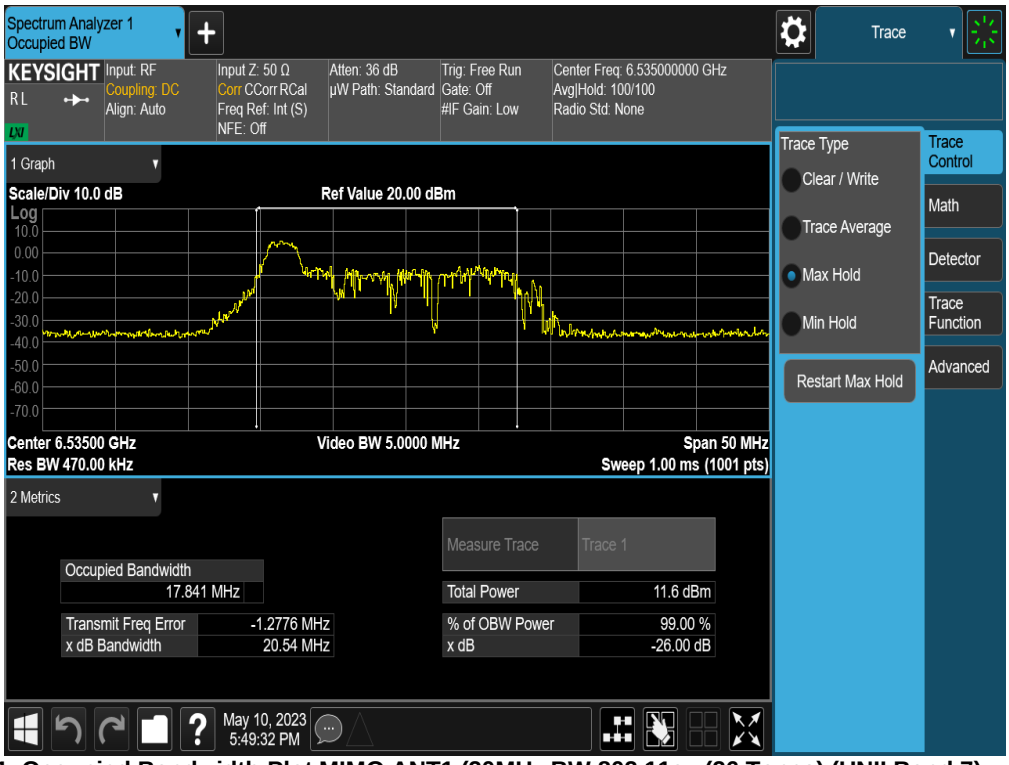


Plot 7-19. Occupied Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax (26 Tones) (UNII Band 6) – Ch. 103)

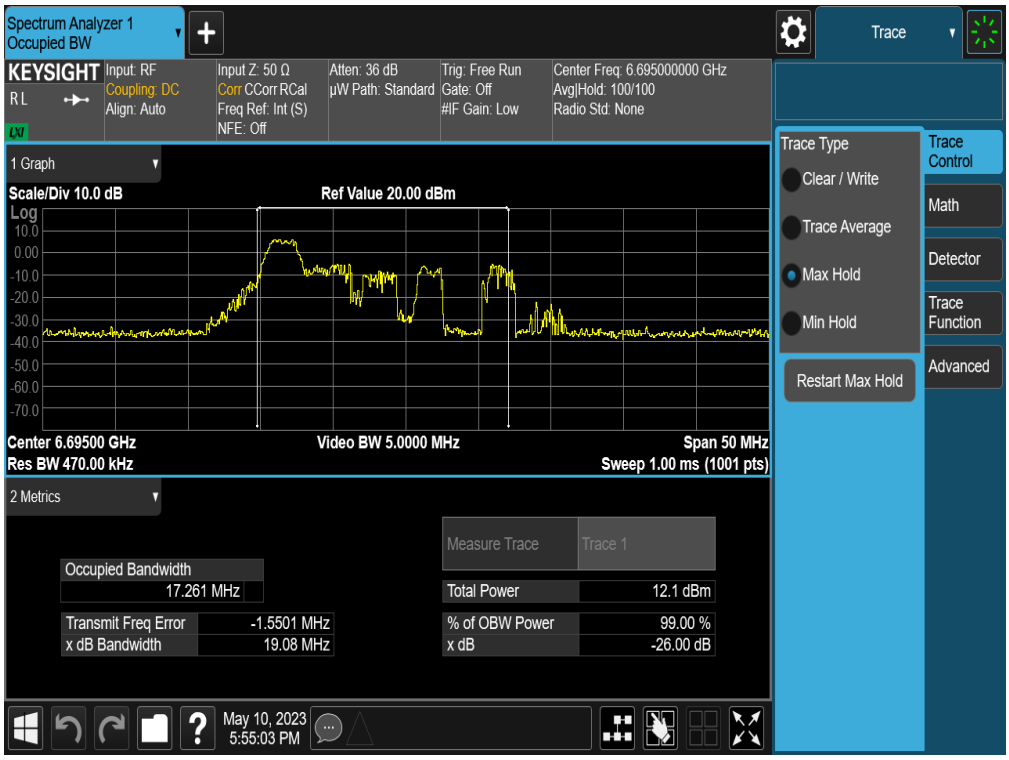


Plot 7-20. Occupied Bandwidth Plot MIMO ANT1 (160MHz BW 802.11ax (26 Tones) (UNII Band 6) – Ch. 111)

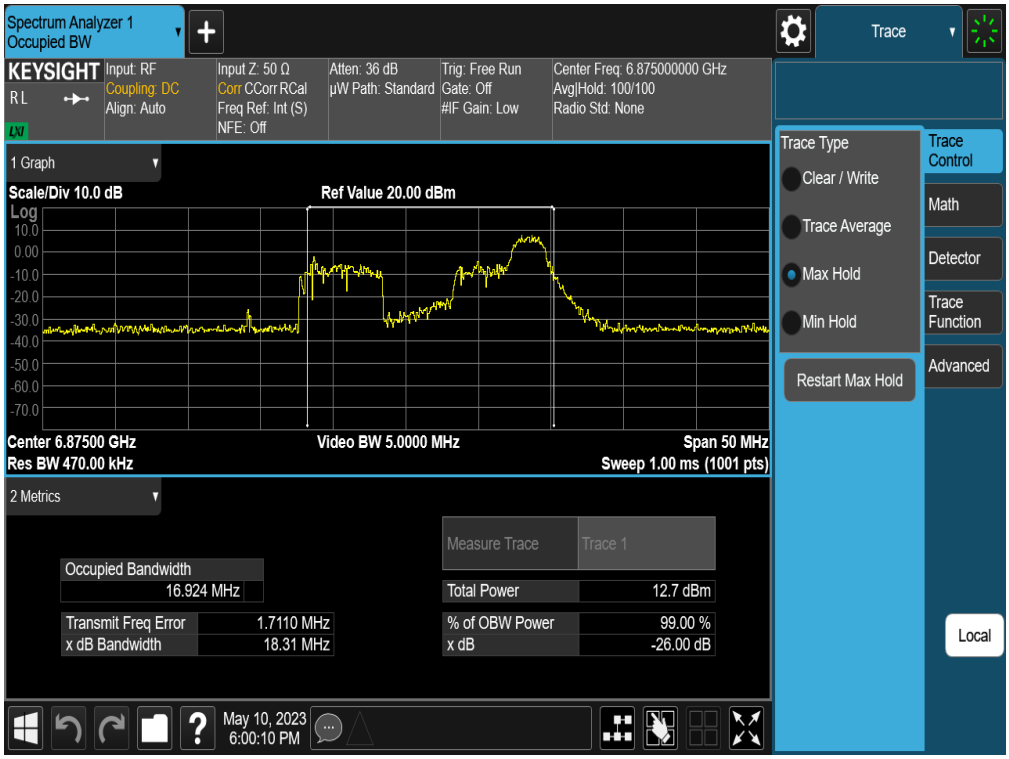
7.2.3 MIMO Antenna-1 Bandwidth Measurements - (UNII Band 7 - Partial)



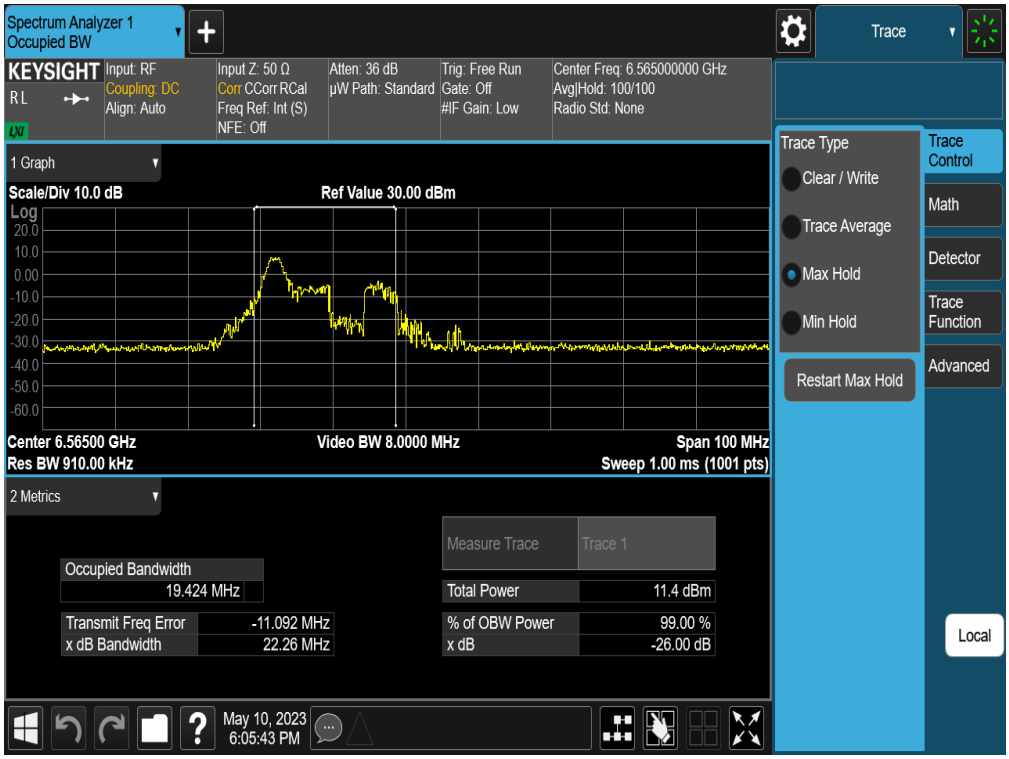
Plot 7-21. Occupied Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax (26 Tones) (UNII Band 7) – Ch. 117)



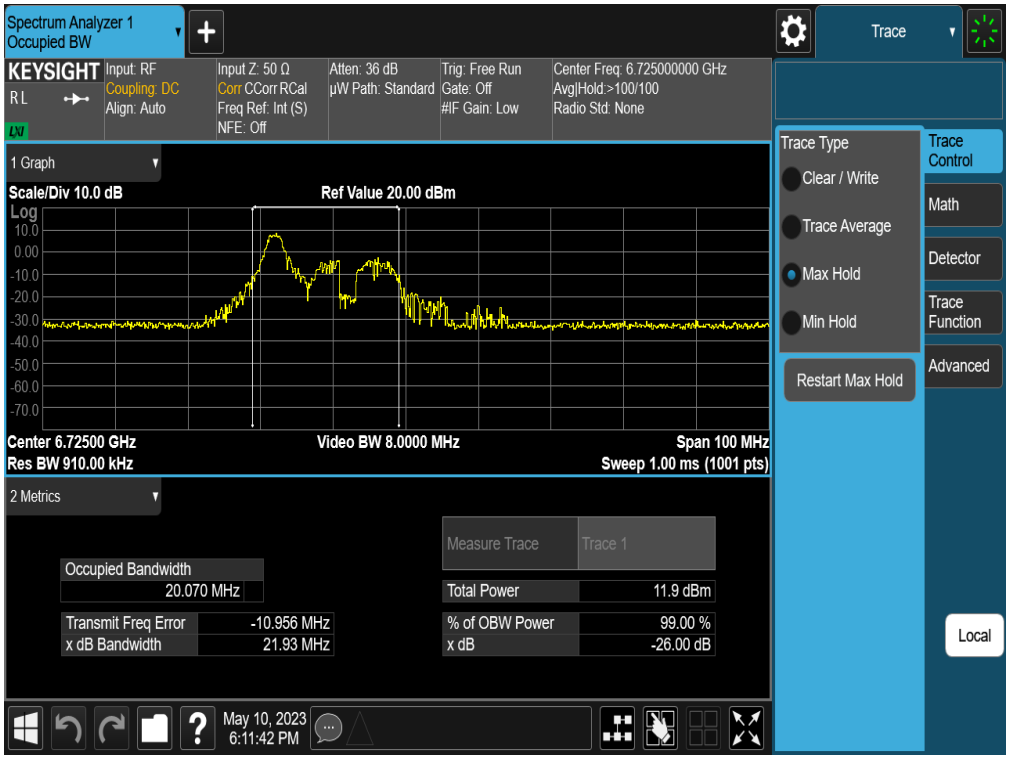
Plot 7-22. Occupied Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax (26 Tones) (UNII Band 7) – Ch. 149)



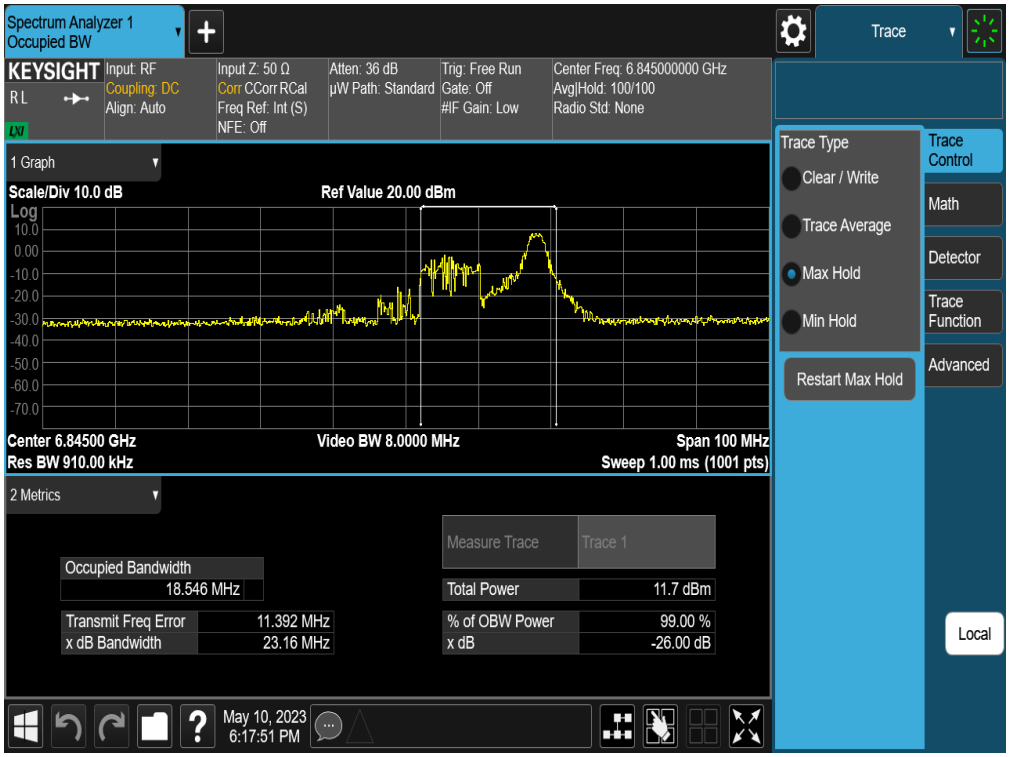
Plot 7-23. Occupied Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax (26 Tones) (UNII Band 7) – Ch. 185)



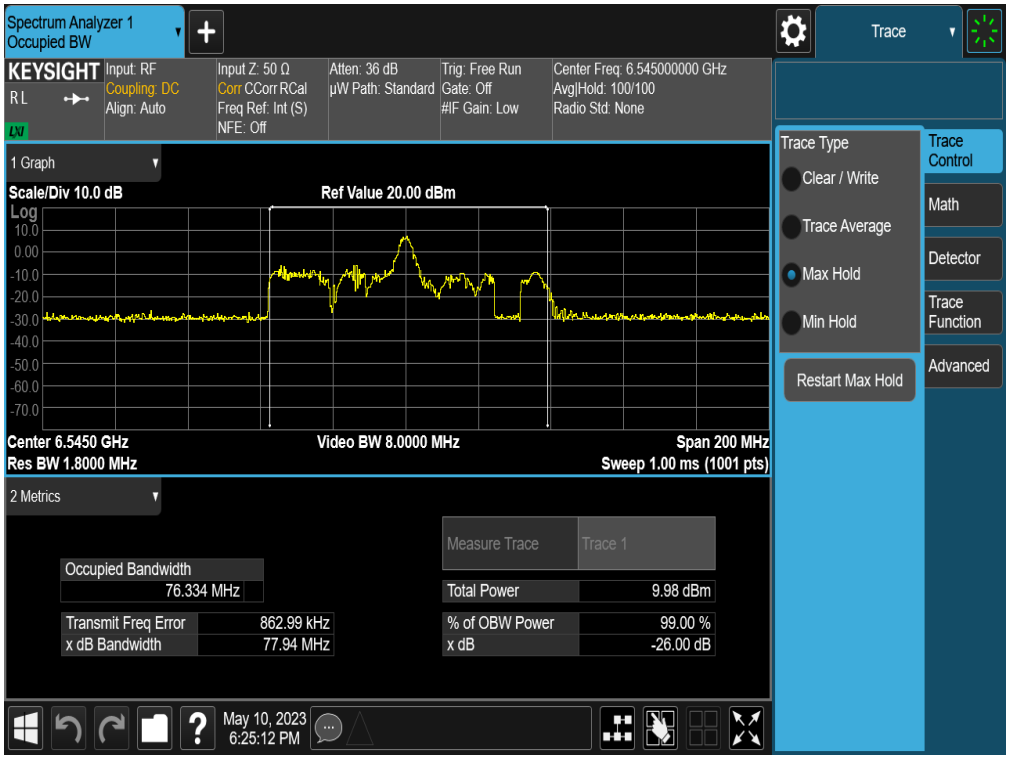
Plot 7-24. Occupied Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax (26 Tones) (UNII Band 7) – Ch. 123)



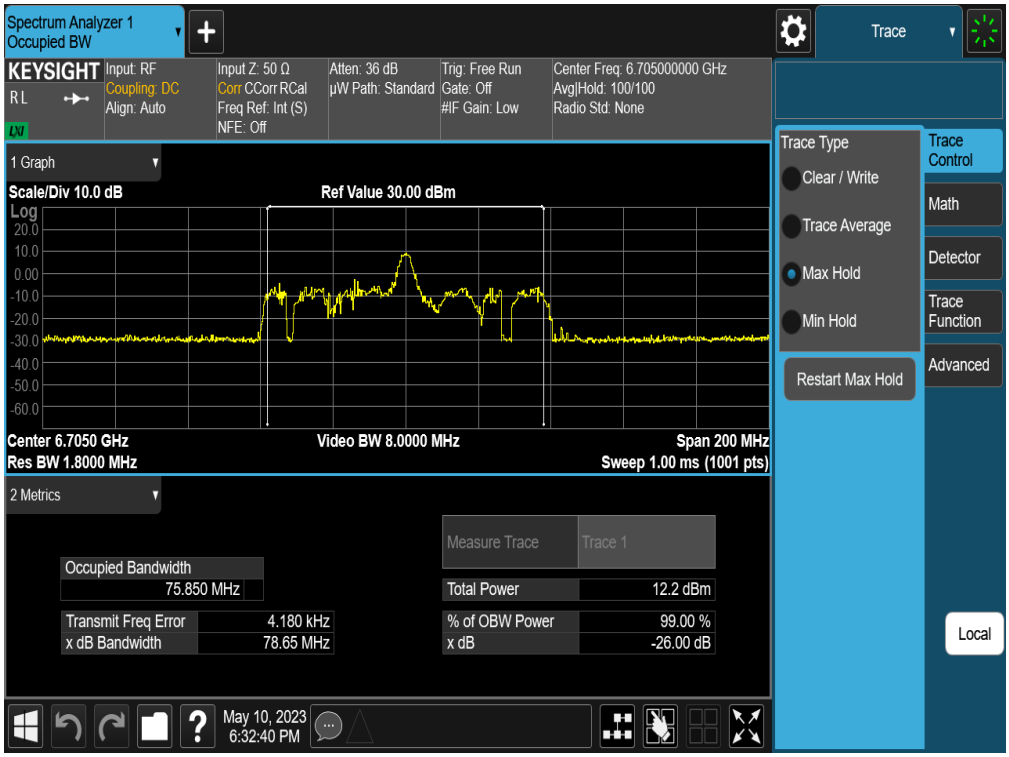
Plot 7-25. Occupied Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax (26 Tones) (UNII Band 7) – Ch. 155)



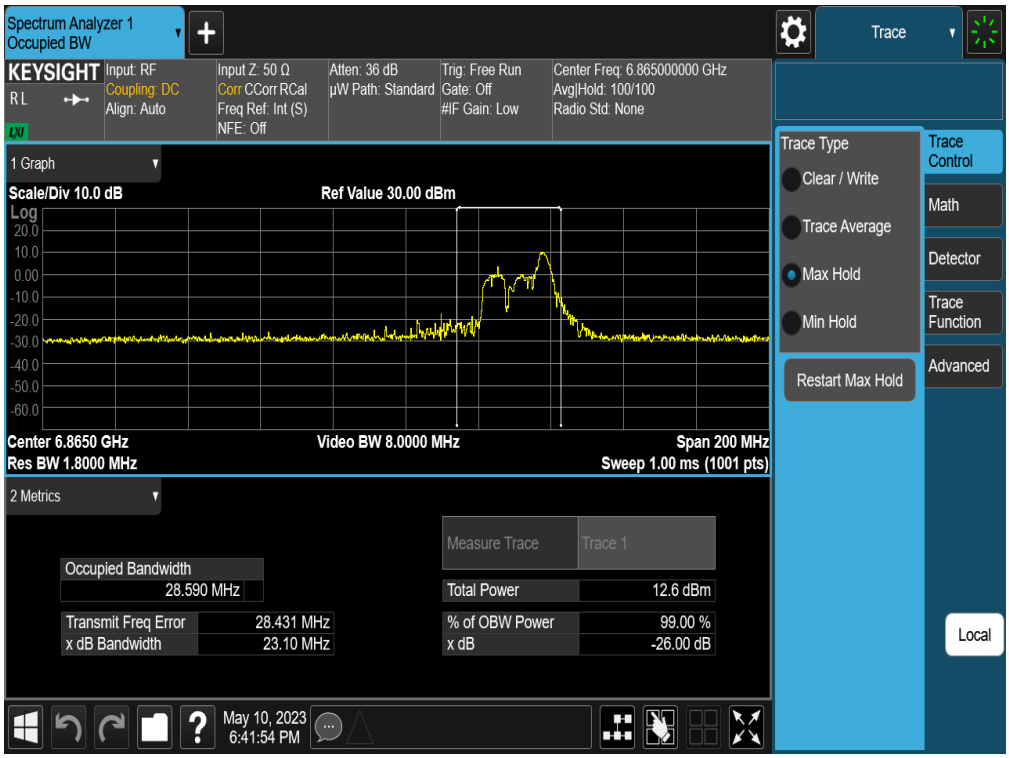
Plot 7-26. Occupied Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax (26 Tones) (UNII Band 7) – Ch. 179)



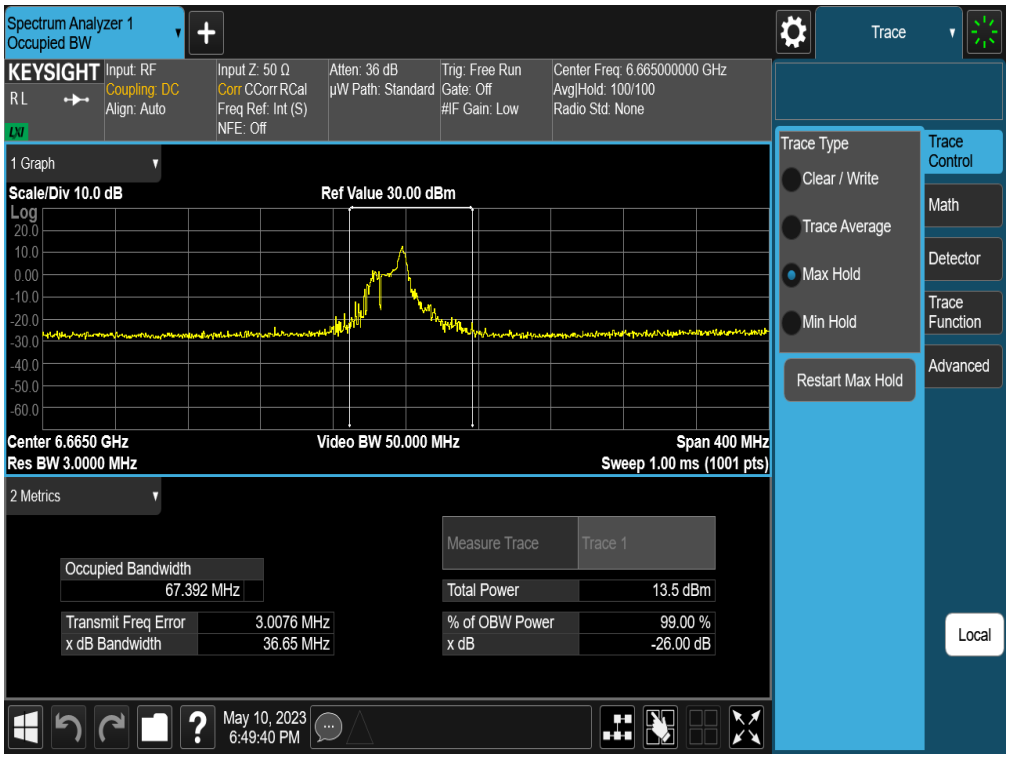
Plot 7-27. Occupied Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax (26 Tones) (UNII Band 7) – Ch. 119)



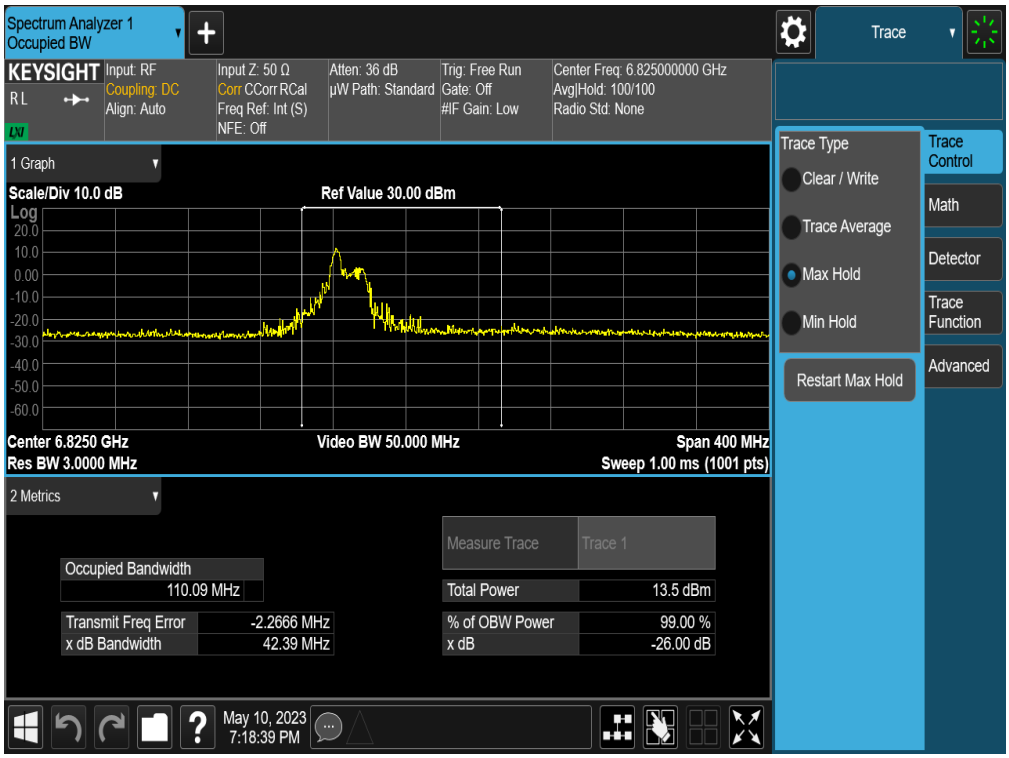
Plot 7-28. Occupied Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax (26 Tones) (UNII Band 7) – Ch. 151)



Plot 7-29. Occupied Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax (26 Tones) (UNII Band 7) – Ch. 183)

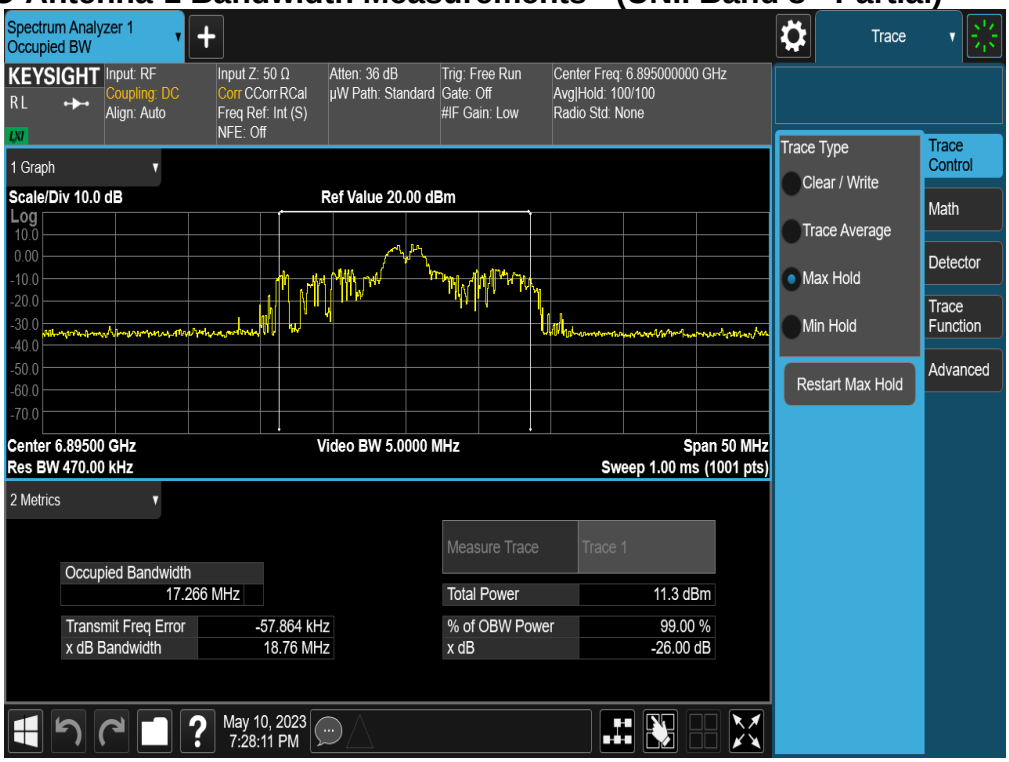


Plot 7-30. Occupied Bandwidth Plot MIMO ANT1 (160MHz BW 802.11ax (26 Tones) (UNII Band 7) – Ch. 143)

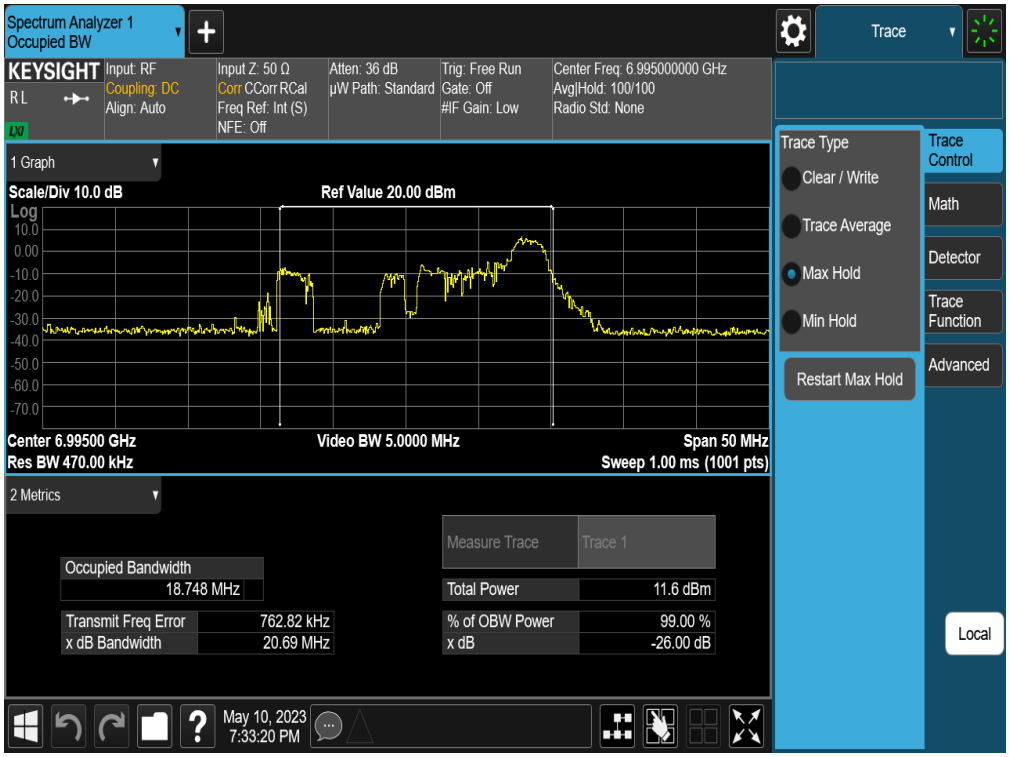


Plot 7-31. Occupied Bandwidth Plot MIMO ANT1 (160MHz BW 802.11ax (26 Tones) (UNII Band 7) – Ch. 175)

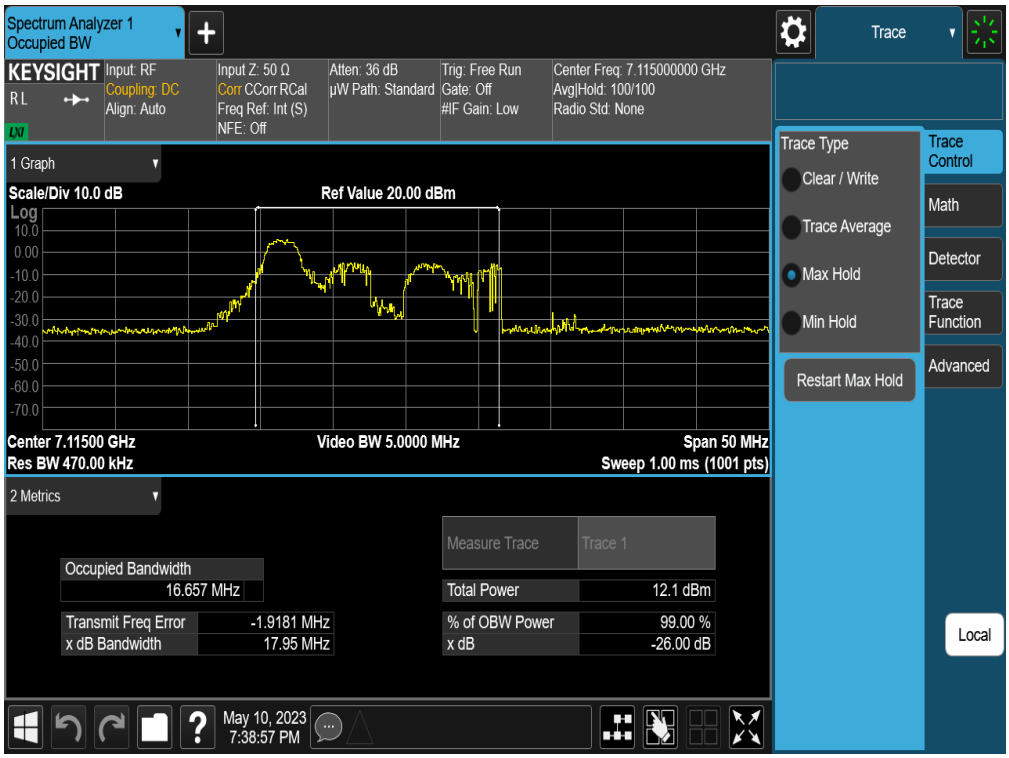
7.2.4 MIMO Antenna-1 Bandwidth Measurements - (UNII Band 8 - Partial)



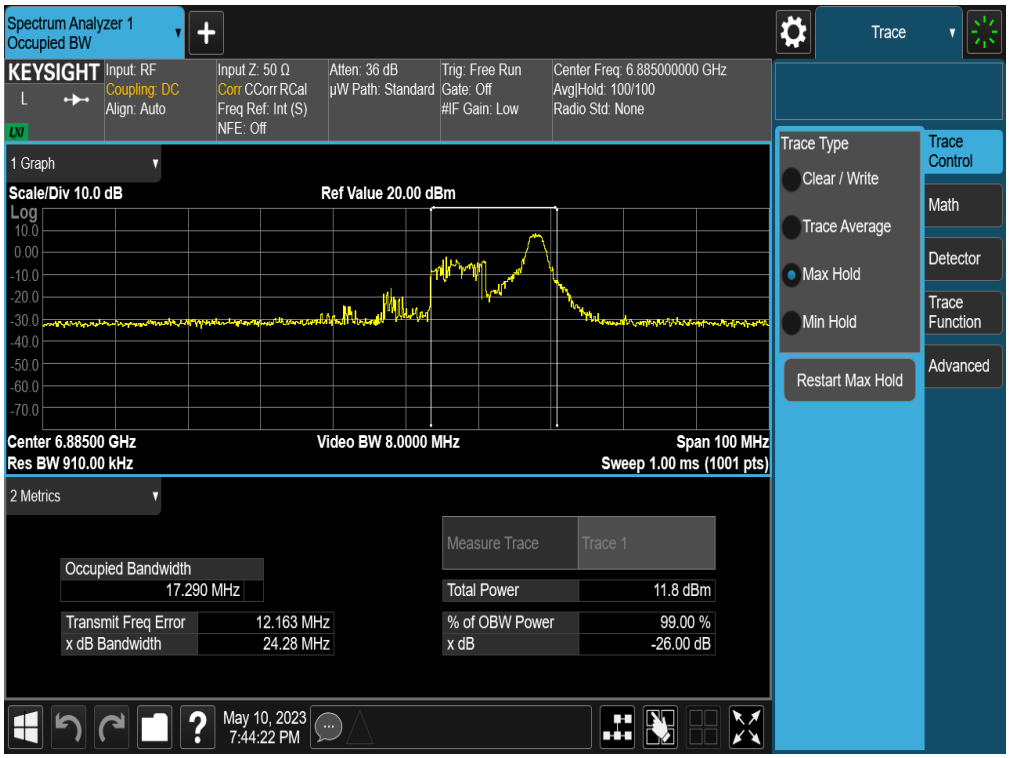
Plot 7-32. Occupied Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax (26 Tones) (UNII Band 8) – Ch. 189)



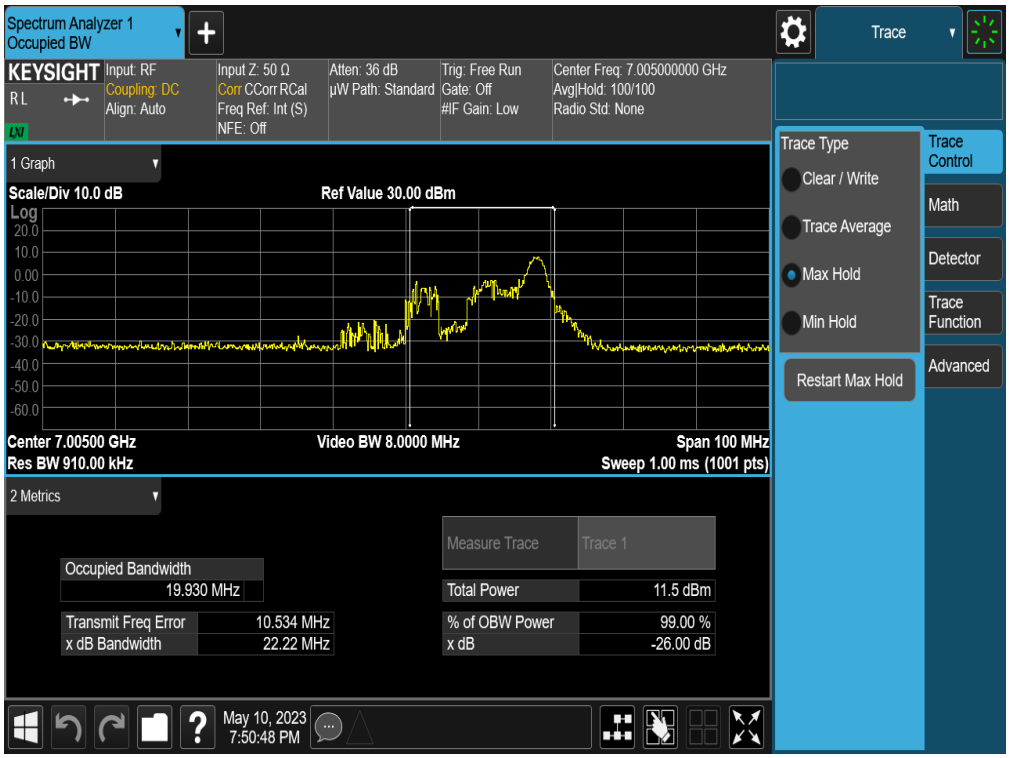
Plot 7-33. Occupied Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax (26 Tones) (UNII Band 8) – Ch. 209)



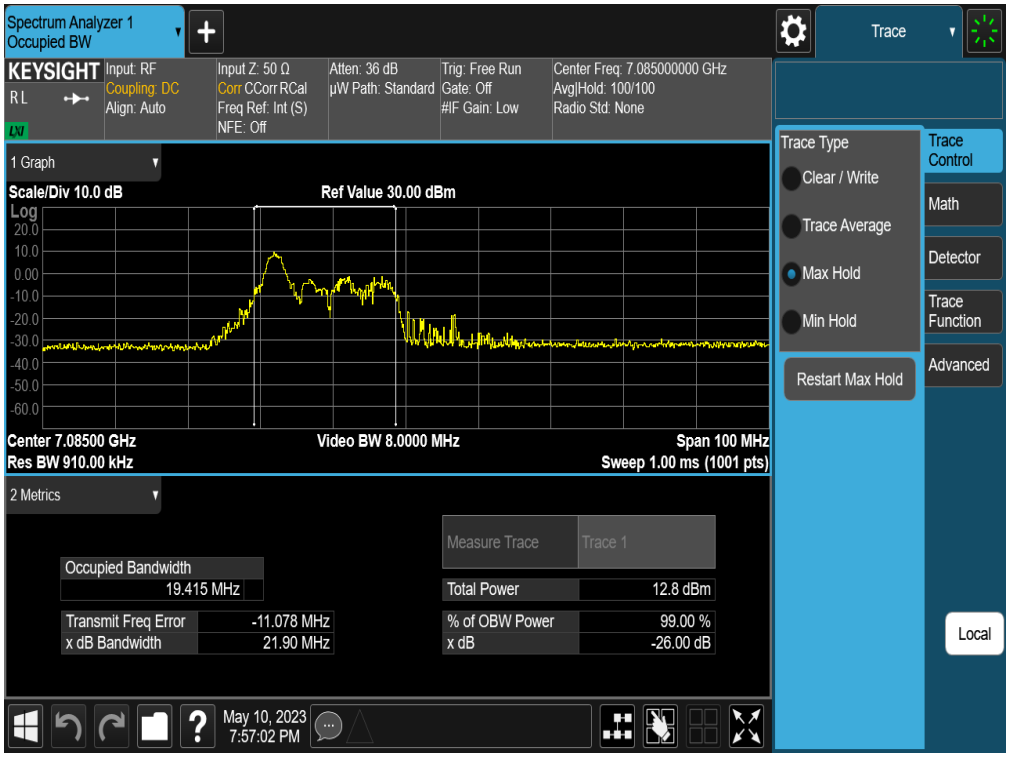
Plot 7-34. Occupied Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax (26 Tones) (UNII Band 8) – Ch. 233)



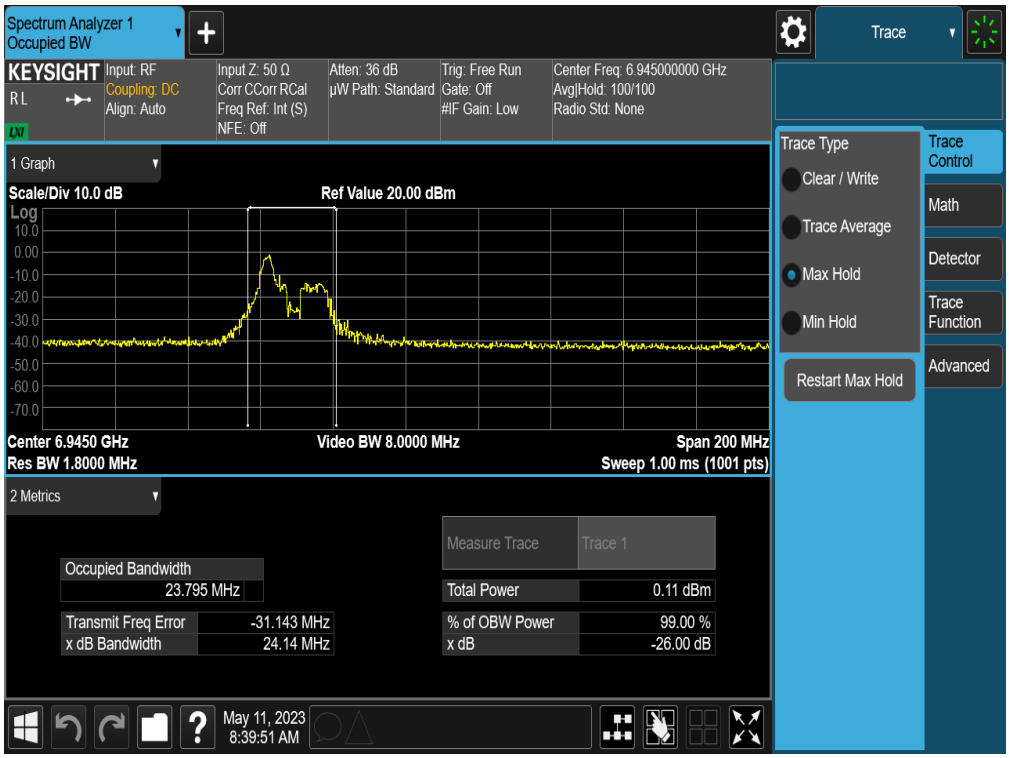
Plot 7-35. Occupied Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax (26 Tones) (UNII Band 8) – Ch. 187)



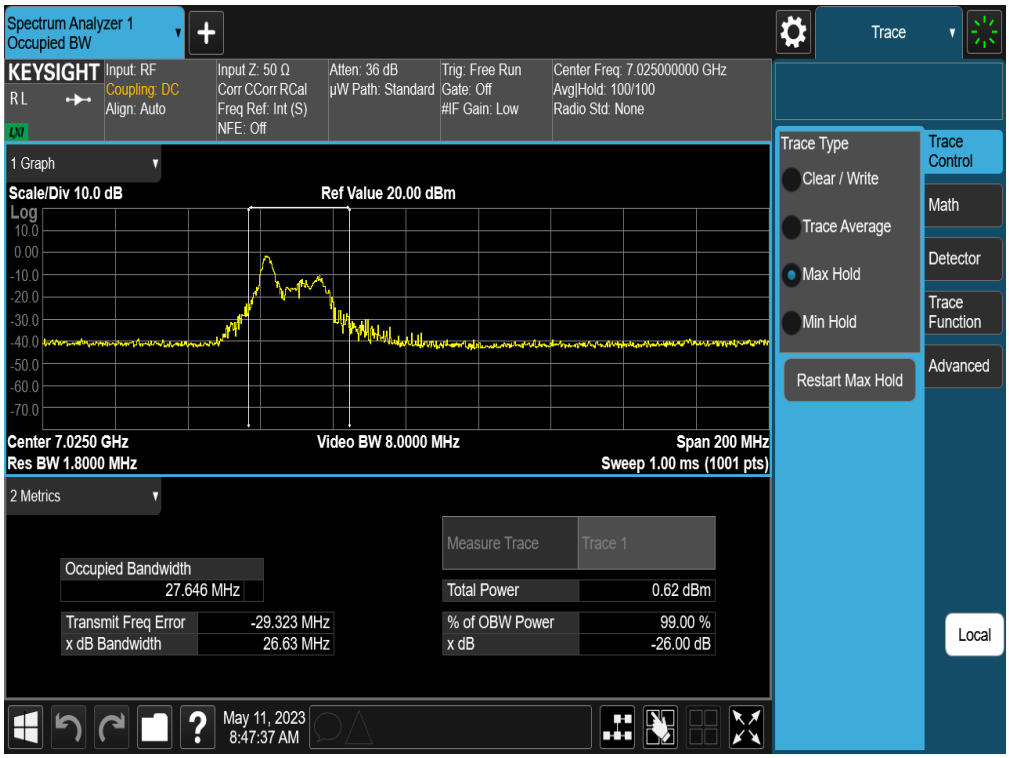
Plot 7-36. Occupied Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax (26 Tones) (UNII Band 8) – Ch. 211)



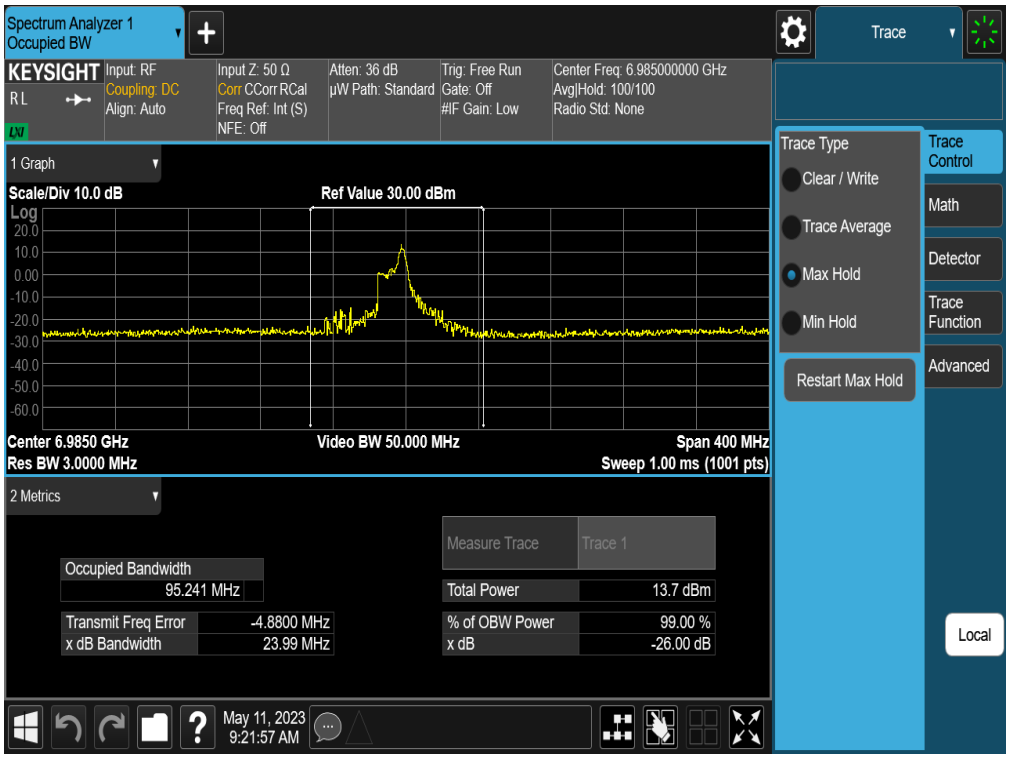
Plot 7-37. Occupied Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax (26 Tones) (UNII Band 8) – Ch. 227)



Plot 7-38. Occupied Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax (26 Tones) (UNII Band 8) – Ch. 199)

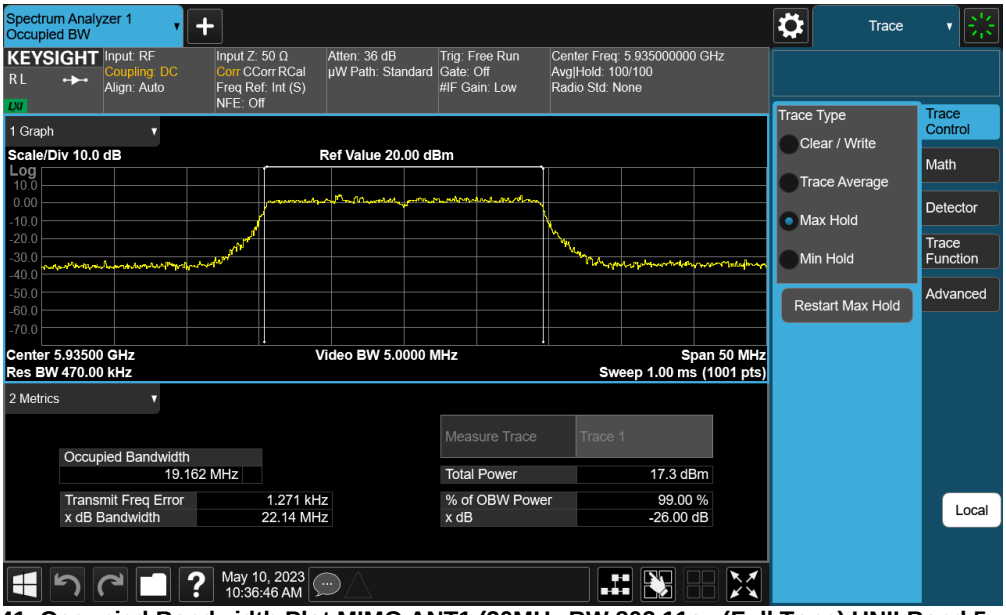


Plot 7-39. Occupied Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax (26 Tones) (UNII Band 8) – Ch. 215)

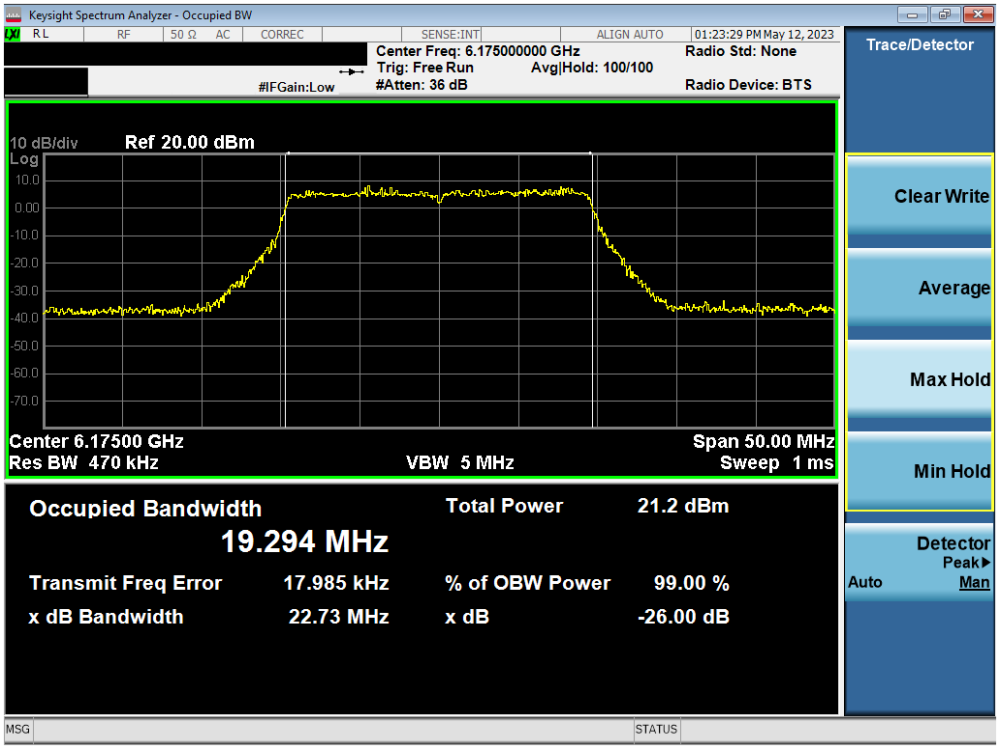


Plot 7-40. Occupied Bandwidth Plot MIMO ANT1 (160MHz BW 802.11ax (26 Tones) (UNII Band 8) – Ch. 207)

7.2.5 MIMO Antenna-1 Bandwidth Measurements - (UNI Band 5 - Full)

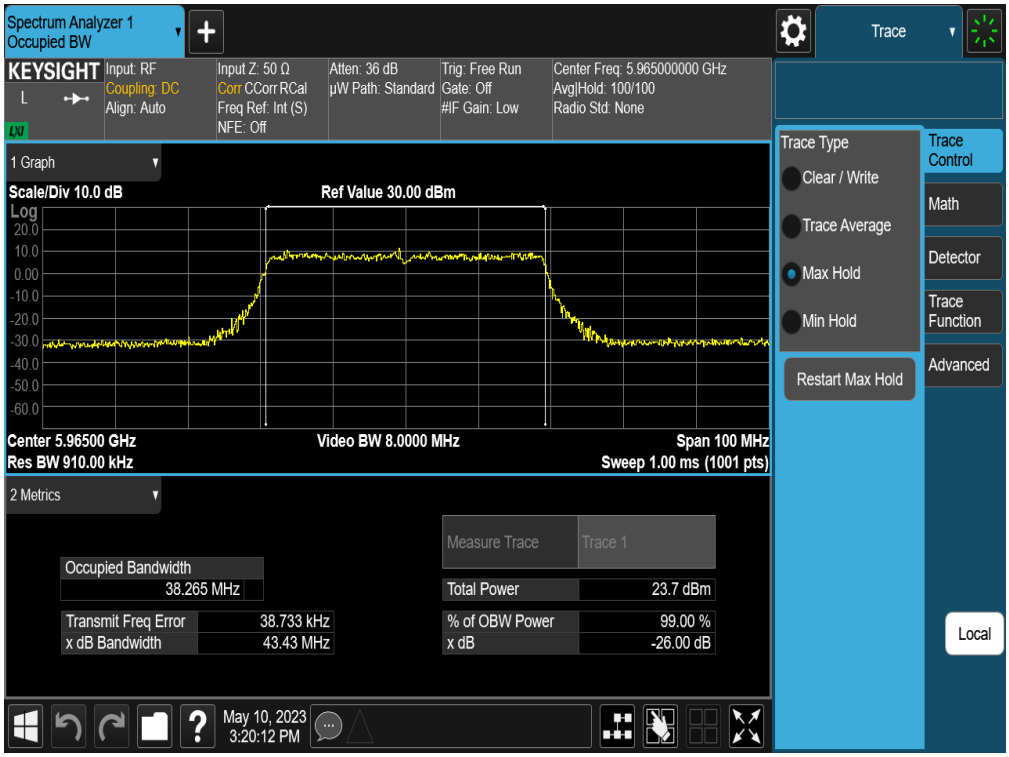


Plot 7-41. Occupied Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax (Full Tone) UNII Band 5 – Ch. 2)

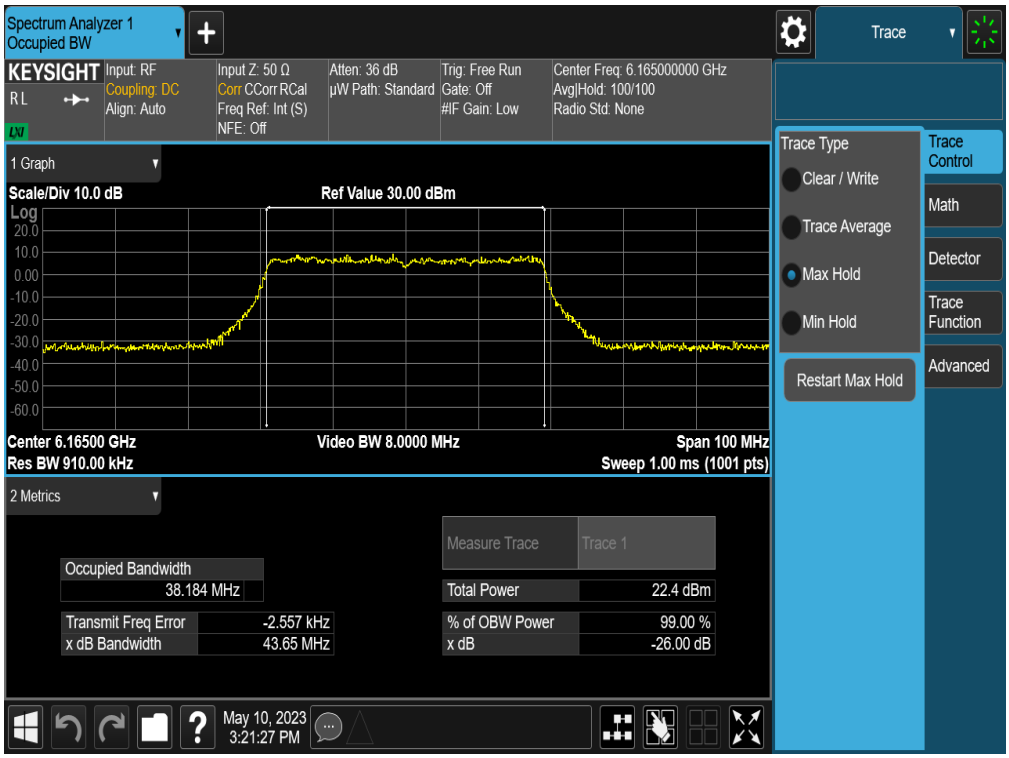


Plot 7-42. Occupied Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax (Full Tone) (UNII Band 5) – Ch. 45)

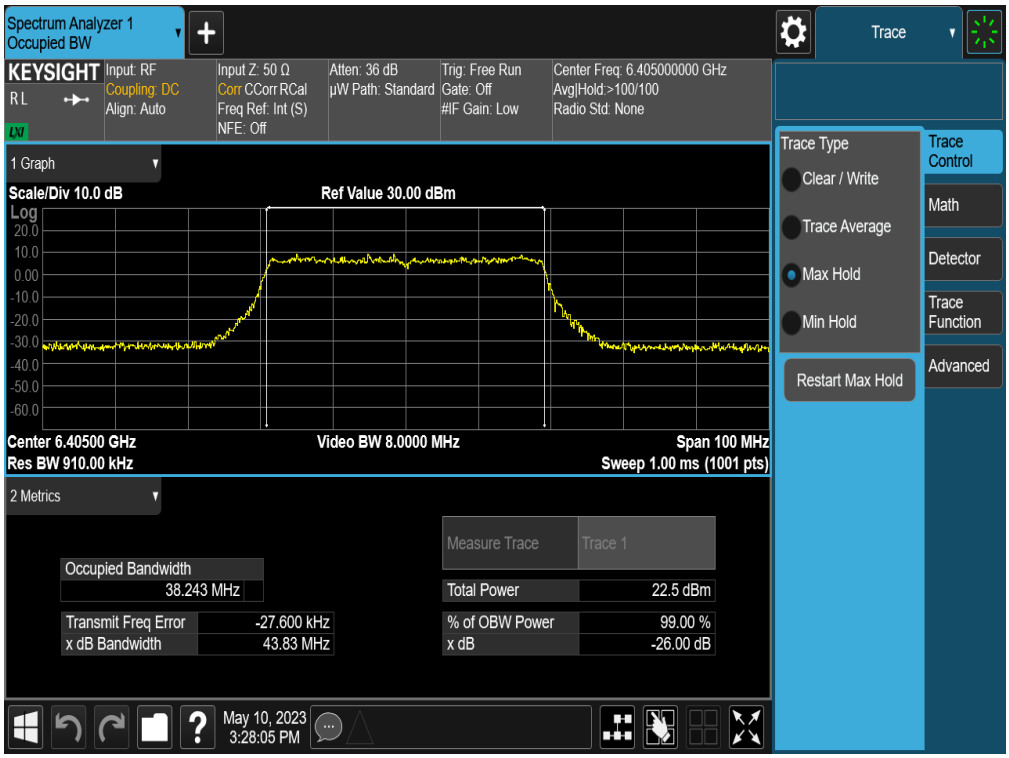
Plot 7-43. Occupied Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax (Full Tone) UNII Band 5) – Ch. 93)



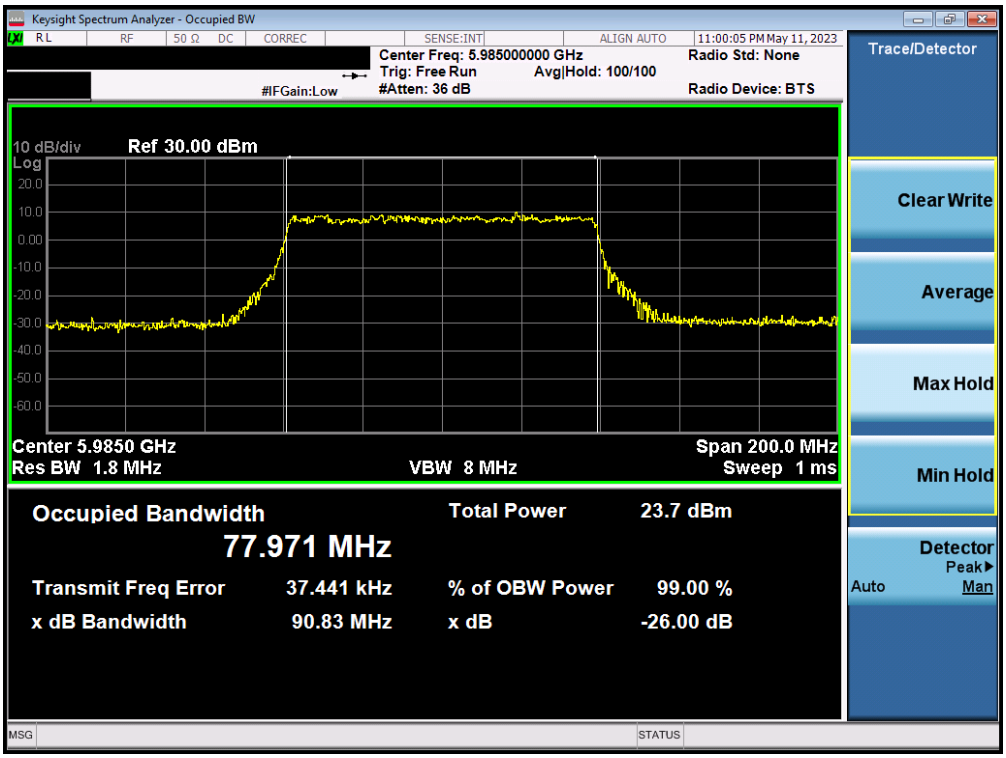
Plot 7-44. Occupied Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax (Full Tone) (UNII Band 5) – Ch. 3)



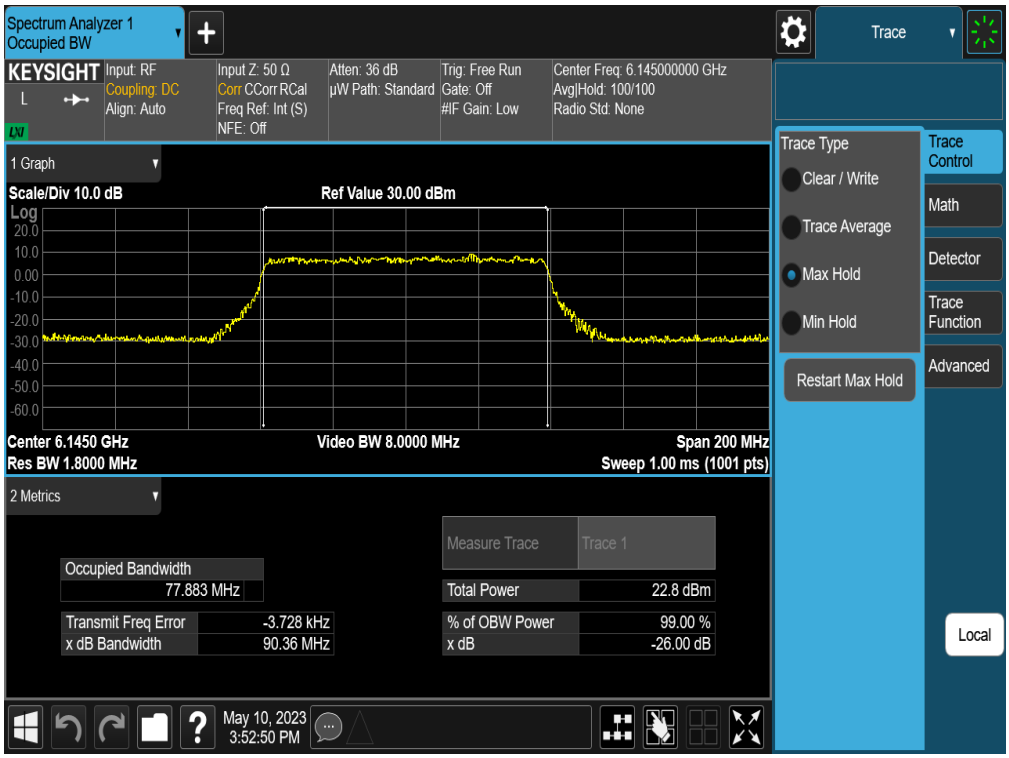
Plot 7-45. Occupied Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax (Full Tone) (UNII Band 5) – Ch. 43)



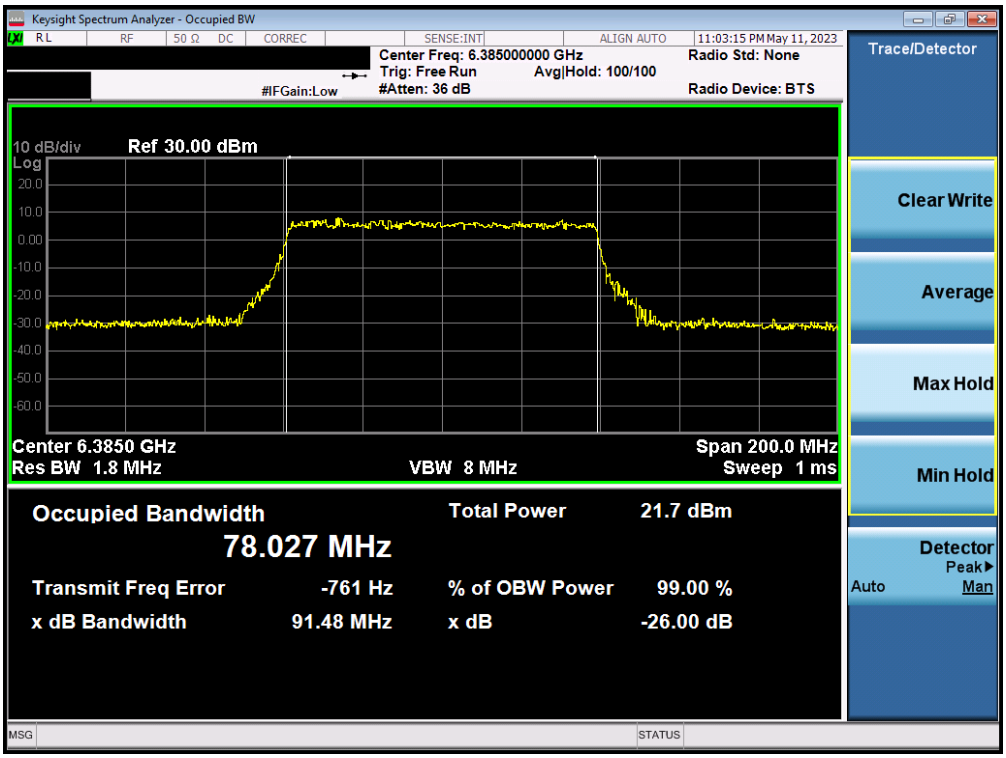
Plot 7-46. Occupied Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax (Full Tone) (UNII Band 5) – Ch. 91)



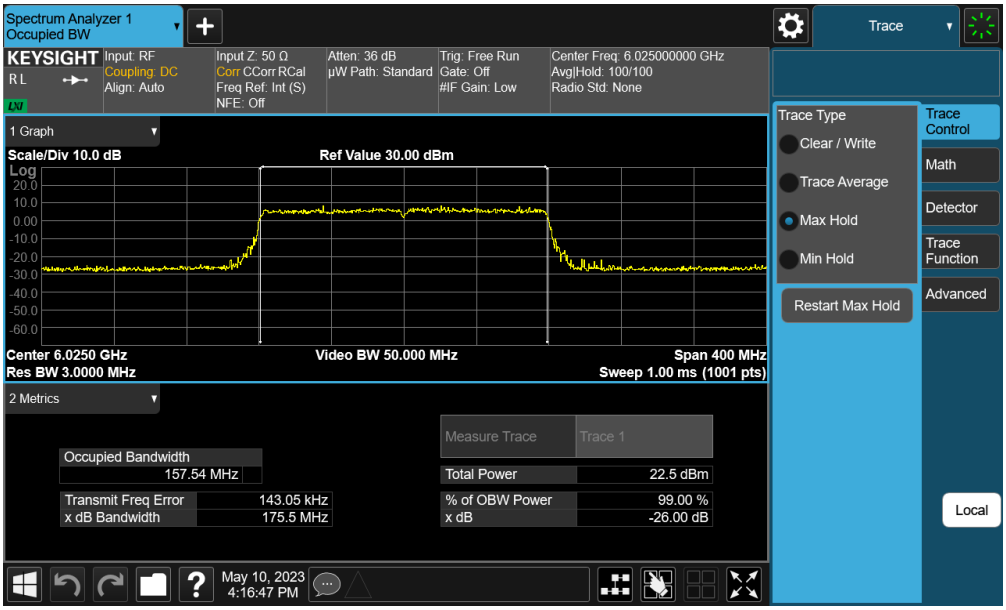
Plot 7-47. Occupied Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax (Full Tone) (UNII Band 5) – Ch. 7)



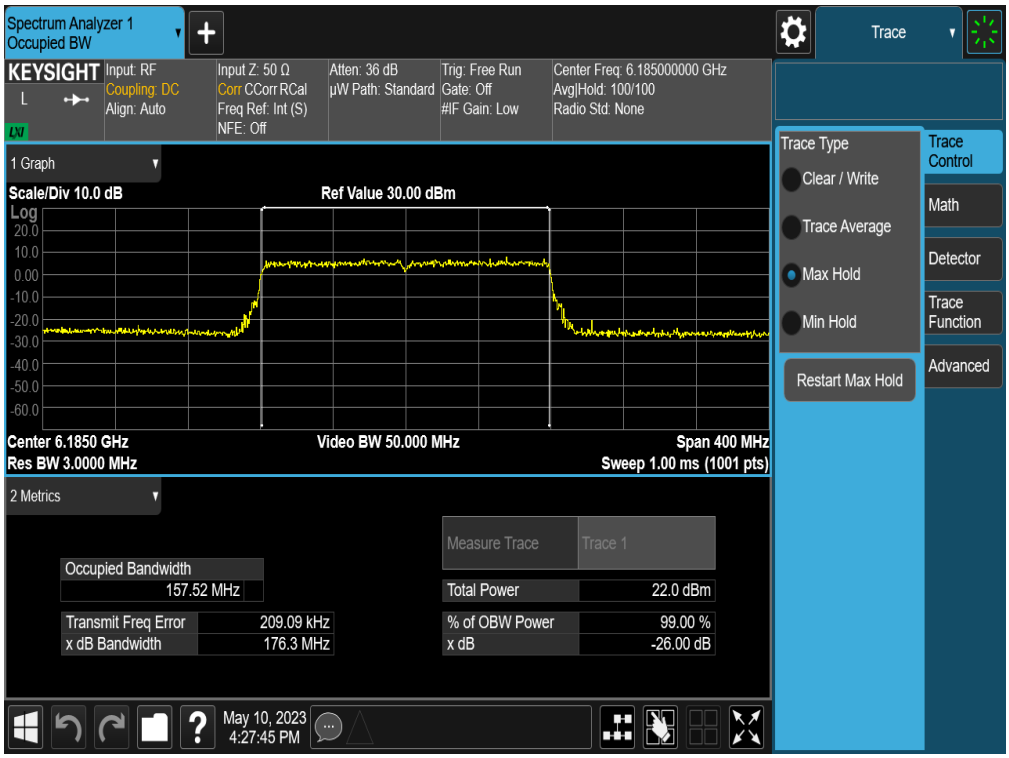
Plot 7-48. Occupied Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax (Full Tone) (UNII Band 5) – Ch. 39)



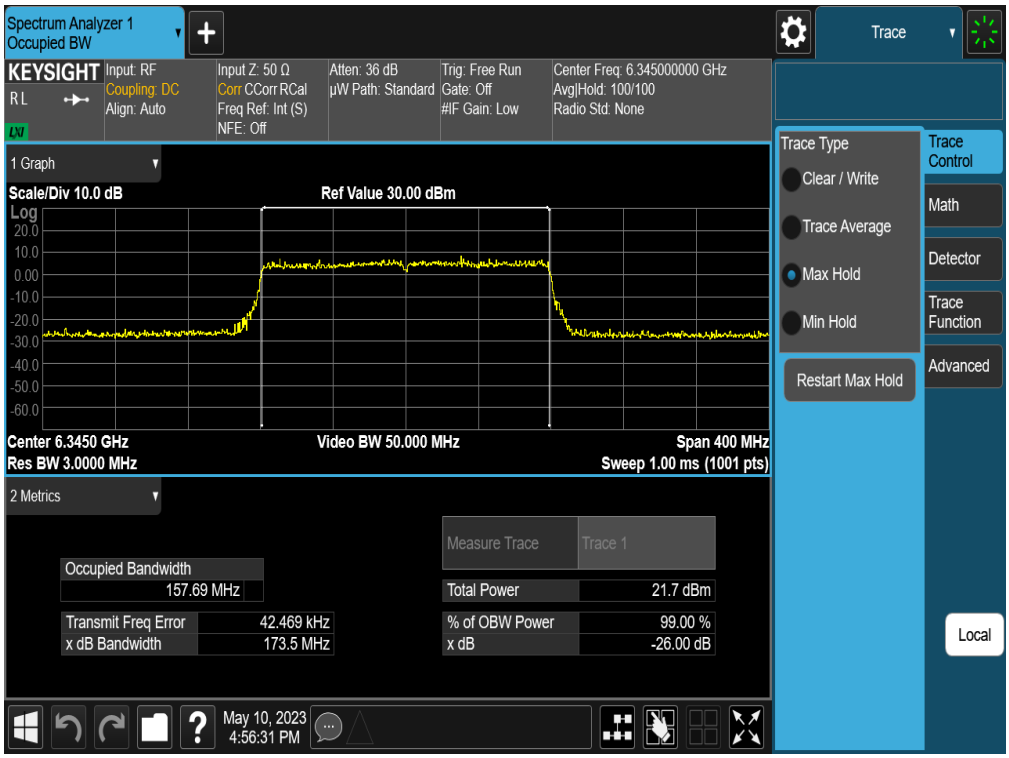
Plot 7-49. Occupied Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax (Full Tone) (UNII Band 5) – Ch. 87)



Plot 7-50. Occupied Bandwidth Plot MIMO ANT1 (160MHz BW 802.11ax (Full Tone) (UNII Band 5) – Ch. 15)

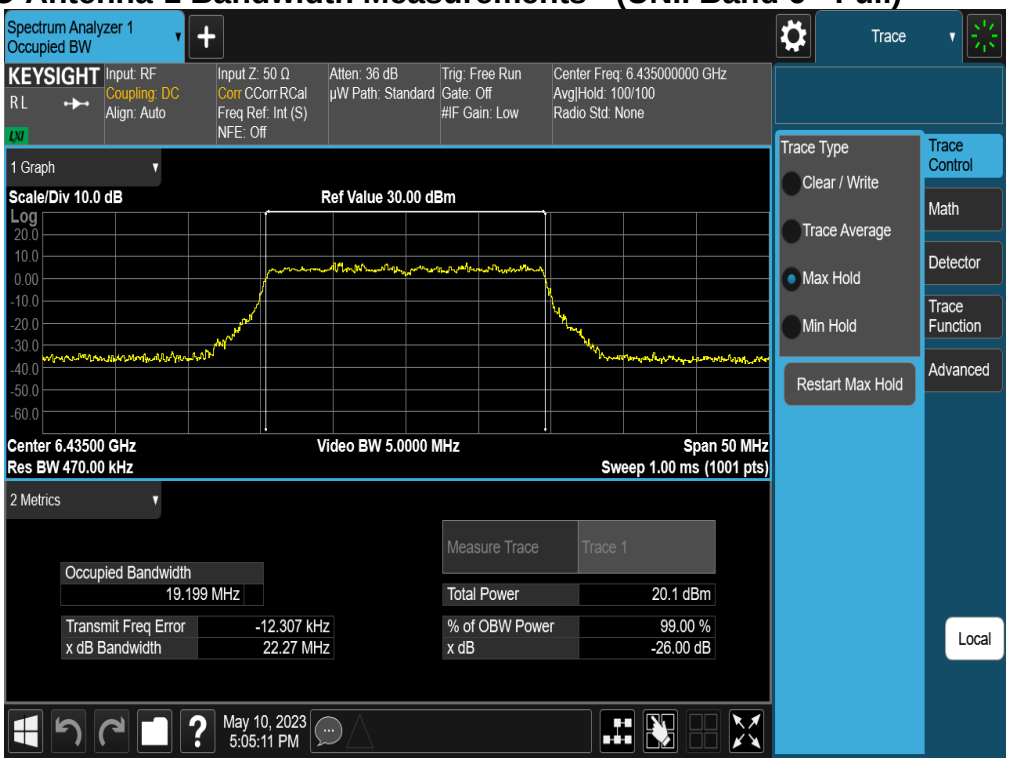


Plot 7-51. Occupied Bandwidth Plot MIMO ANT1 (160MHz BW 802.11ax (Full Tone) (UNII Band 5) – Ch. 47)



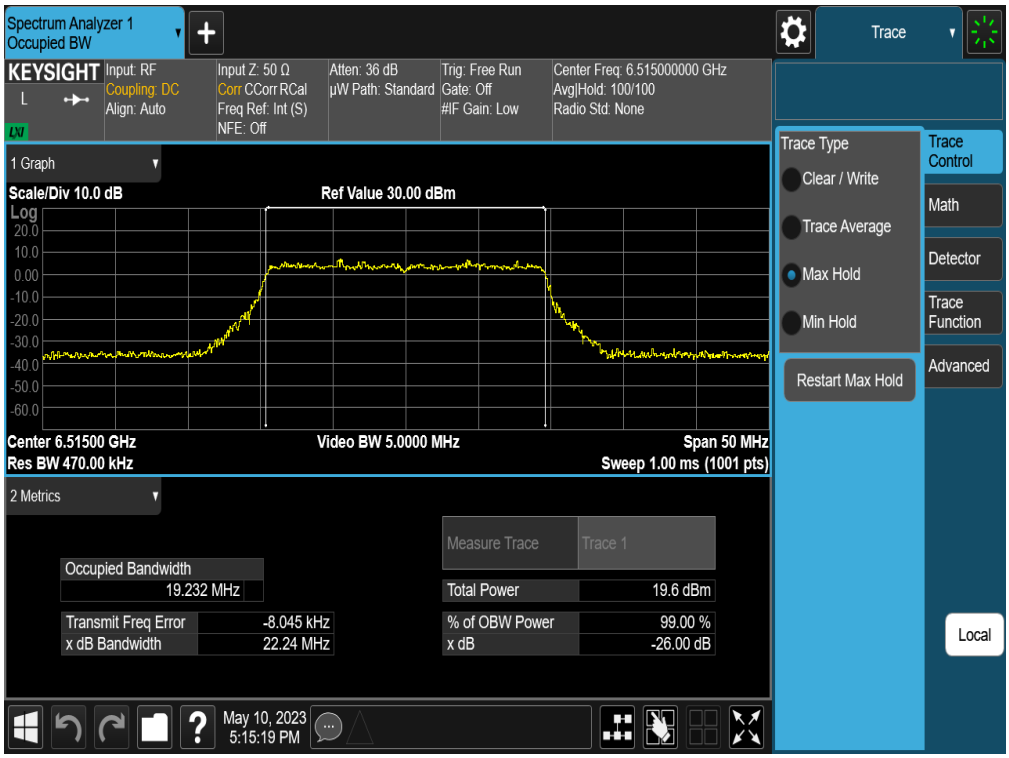
Plot 7-52. Occupied Bandwidth Plot MIMO ANT1 (160MHz BW 802.11ax (Full Tone) (UNII Band 5) – Ch. 79)

7.2.6 MIMO Antenna-1 Bandwidth Measurements - (UNII Band 6 - Full)

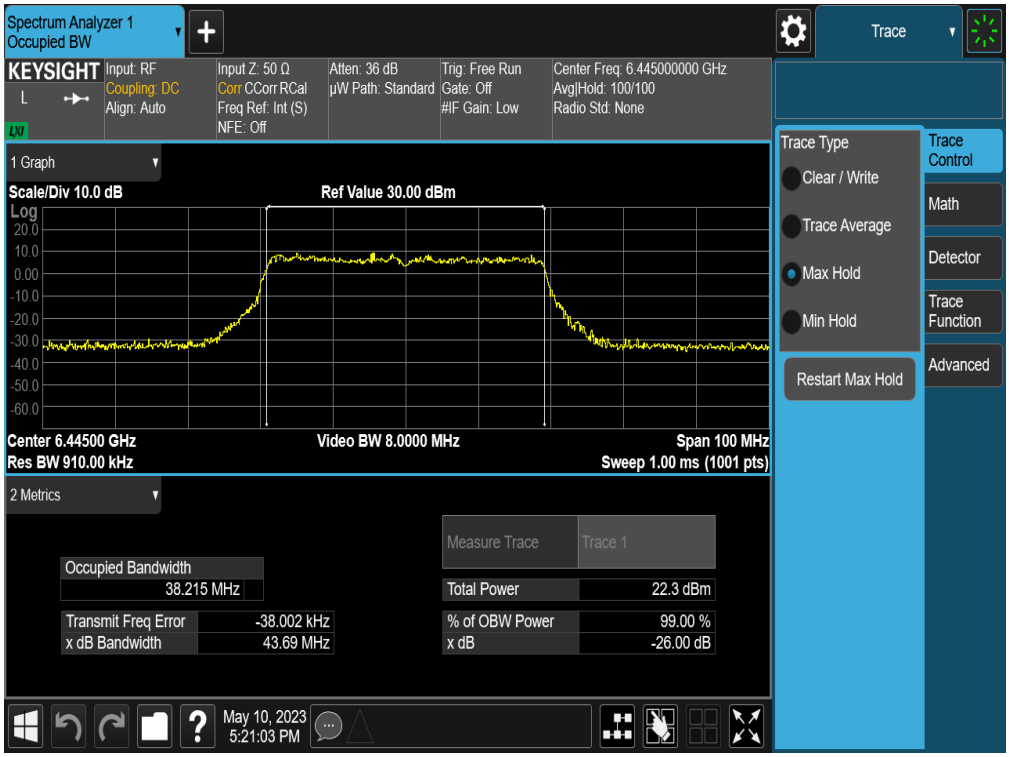


Plot 7-53. Occupied Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax (Full Tone) (UNII Band 6) – Ch. 97)

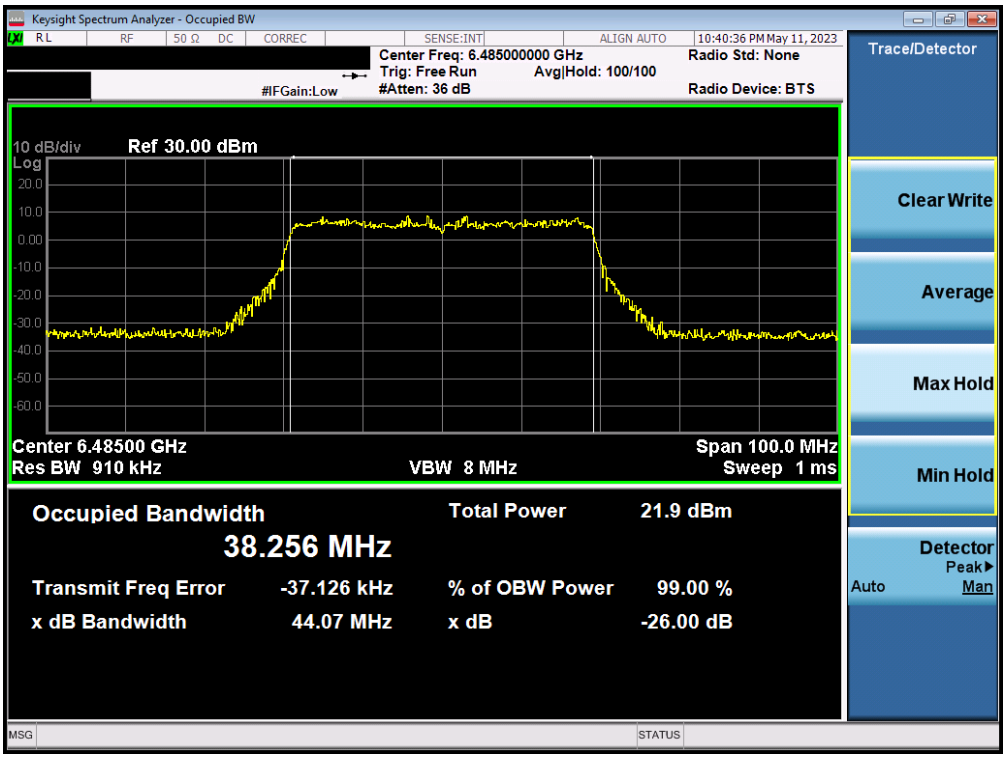
Plot 7-54. Occupied Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax (Full Tone) (UNII Band 6) – Ch. 105)



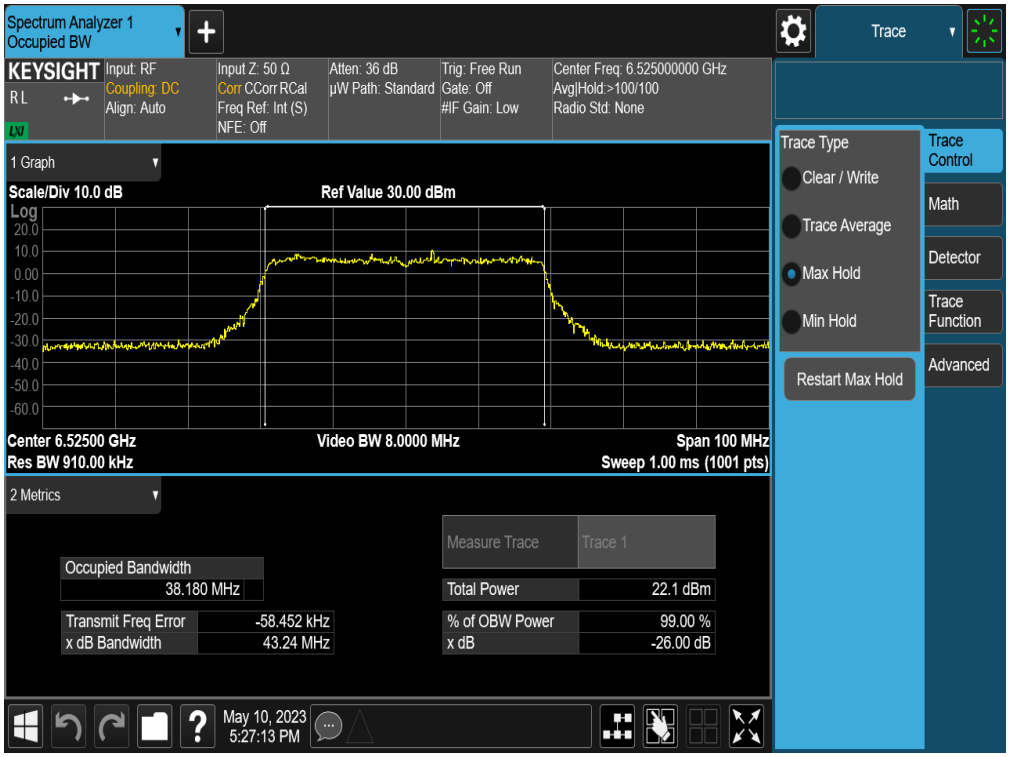
Plot 7-55. Occupied Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax (Full Tone) (UNII Band 6) – Ch. 113)



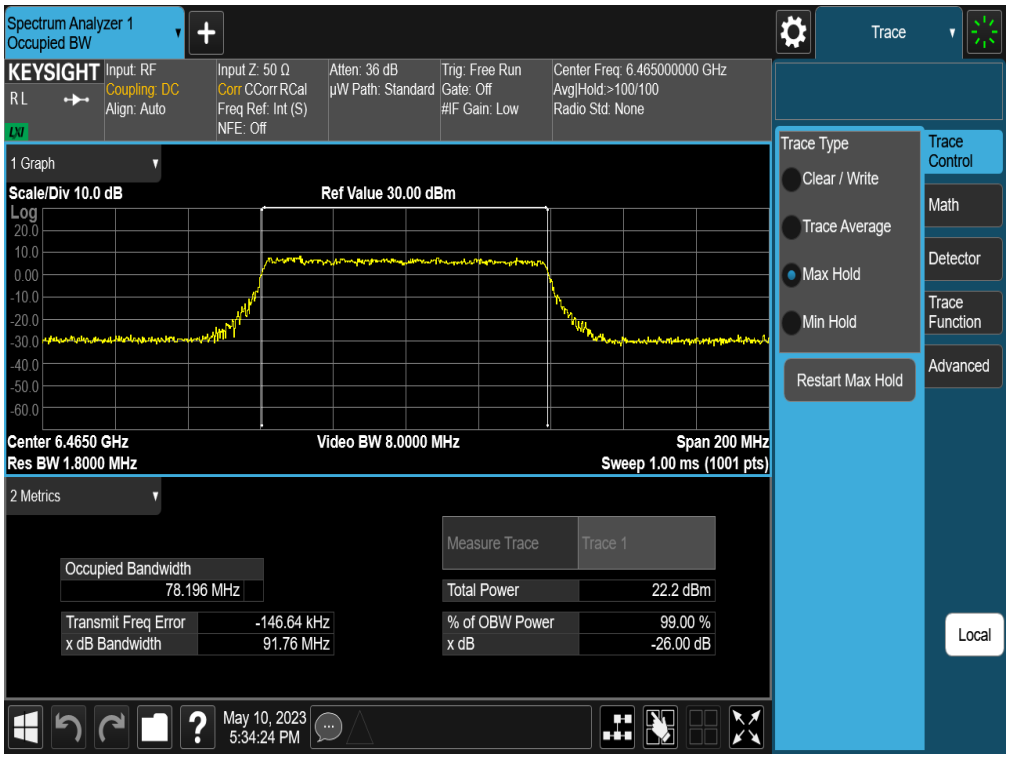
Plot 7-56. Occupied Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax (Full Tone) (UNII Band 6) – Ch. 99)



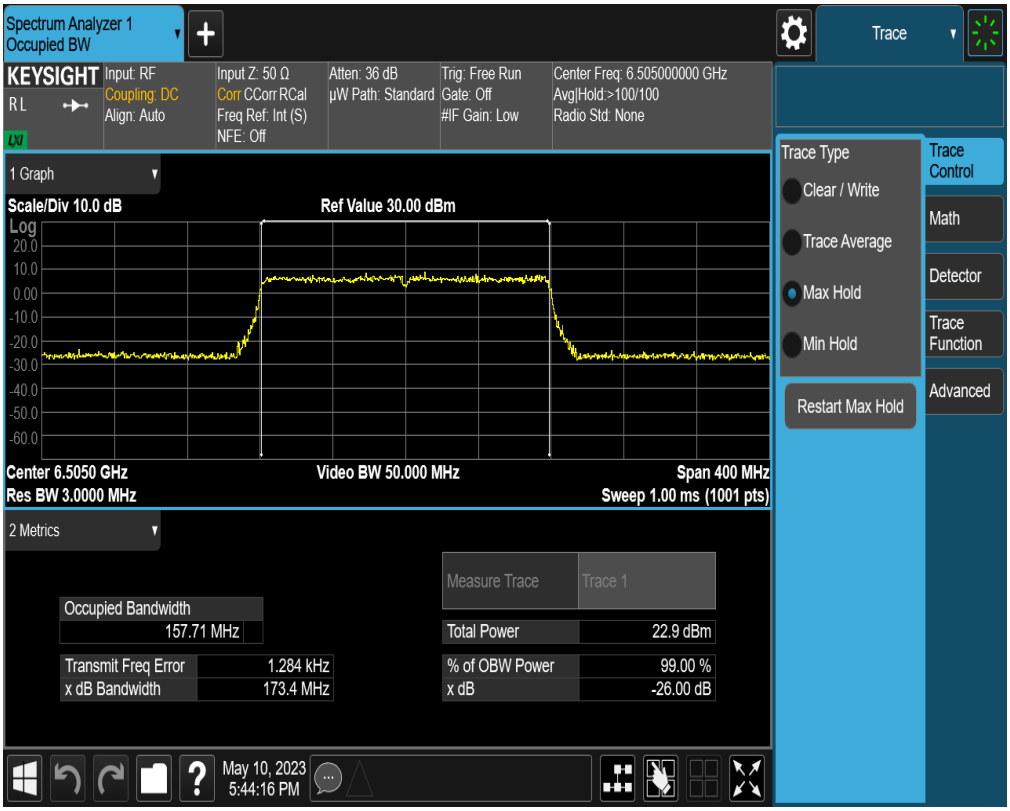
Plot 7-57. Occupied Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax (Full Tone) (UNII Band 6) – Ch. 107)



Plot 7-58. Occupied Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax (Full Tone) (UNII Band 6) – Ch. 115)

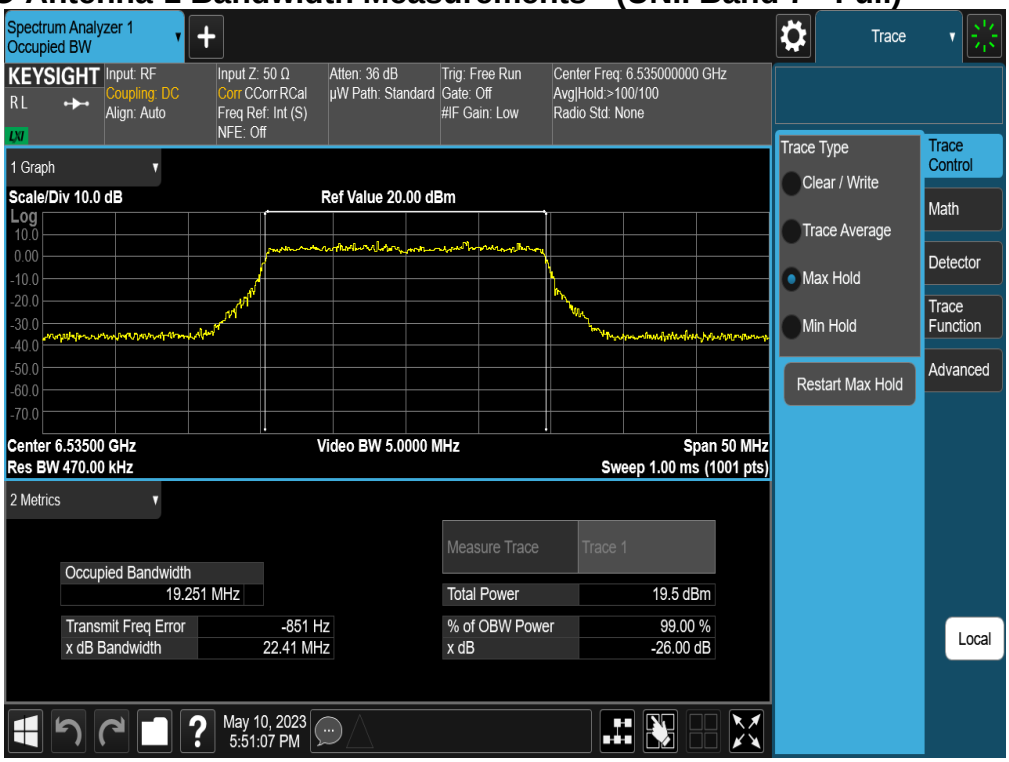


Plot 7-59. Occupied Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax (Full Tone) (UNII Band 6) – Ch. 103)

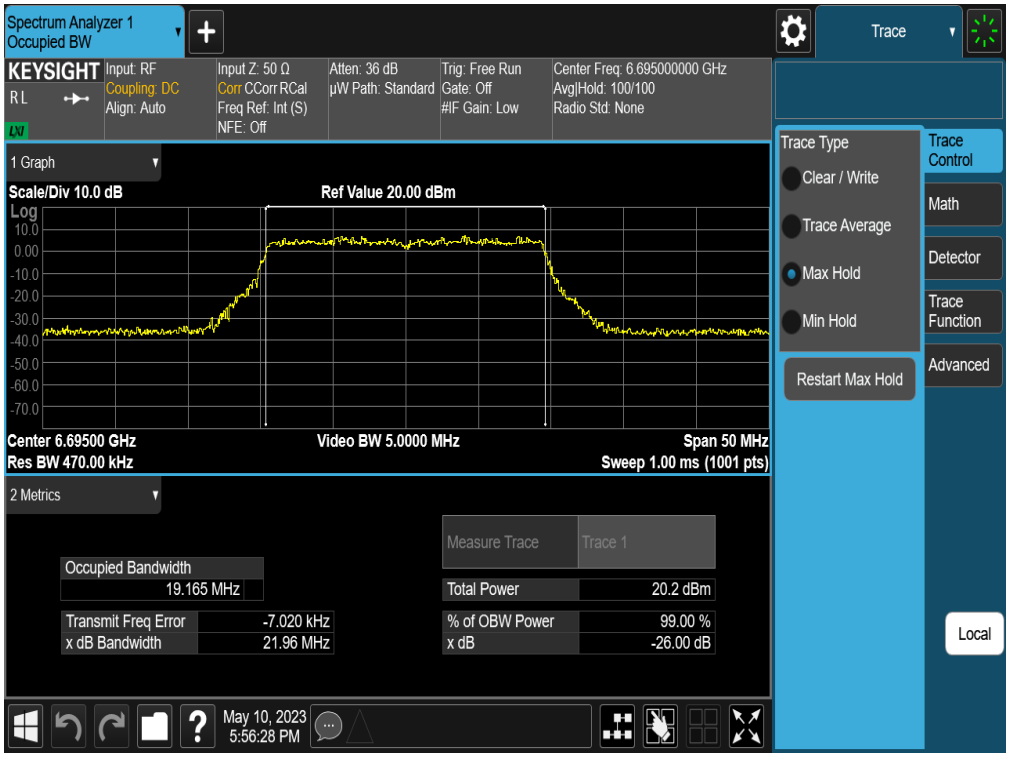


Plot 7-60. Occupied Bandwidth Plot MIMO ANT1 (160MHz BW 802.11ax (Full Tone) (UNII Band 6) – Ch. 111)

7.2.7 MIMO Antenna-1 Bandwidth Measurements - (UNII Band 7 - Full)



Plot 7-61. Occupied Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax (Full Tone) (UNII Band 7) – Ch. 117)



Plot 7-62. Occupied Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax (Full Tone) (UNII Band 7) – Ch. 149)