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MEASUREMENT REPORT

FCC Part 15.407 802.11ax/be WiFi 6GHz VLP (OFDMA)

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

Date of Testing:
9/2/2025-10/31/2025
Test Report Issue Date:
11/21/2025
Test Site/Location:
Element lab., Columbia, MD, USA
Test Report Serial No.:
1M2508250079-25-R1.A3L

FCC ID:	**A3LSMS948B**
APPLICANT:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model:	SM-S948B/DS
Additional Model(s):	SM-S948B
EUT Type:	Portable Handset
Frequency Range:	5935 - 7115MHz
Modulation Type:	OFDMA
FCC Classification:	15E 6GHz Very Low Power Device (6VL)
FCC Rule Part(s):	Part 15 Subpart E (15.407)
Test Procedure(s):	ANSI C63.10:2020, KDB 987594 D02 v03, KDB 648474 D03 v01r04, KDB 484596 D01 v03

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 C63.10:2020. Test results reported herein relate only to the item(s) tested.

This revised Test Report (S/N: 1M2508250079-25-R1.A3L) supersedes and replaces the previously issued test report (S/N: 1M2508250079-25.A3L) on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

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 #2041.01

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TEST REPORT REVISION HISTORY

Rev. No.	Report S/N	Description	Issue Date
-	1M2508250079-25.A3L	Initial Release	11/19/2025
1	1M2508250079-25-R1.A3L	Addressed comments made by TCB reviewer	11/21/2025

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Channel Bandwidth [MHz]	UNII Band	Tx Frequency [MHz]	MIMO	
			Max. Power [mW]	Max. Power [dBm]
20	5	5935 - 6415	3.78	5.77
	6	6435 - 6515	4.23	6.26
	7	6535 - 6875	4.58	6.61
	8	6895 - 7115	4.48	6.51
40	5	5965 - 6405	9.09	9.59
	6	6445 - 6525	9.32	9.69
	7	6565 - 6845	8.82	9.46
	8	6885 - 7085	8.84	9.47
80	5	5985 - 6385	18.52	12.68
	6	6465	16.34	12.13
	7	6545 - 6865	17.51	12.43
	8	6945 - 7025	18.77	12.73
160	5	6025 - 6345	20.17	13.05
	6	6505	18.62	12.70
	7	6665 - 6825	18.84	12.75
	8	6985	18.28	12.62
320	5	6105 - 6265	18.58	12.69
	6	6425	18.69	12.72
	7	6585 - 6745	18.84	12.75
	8	6905	19.26	12.85

EUT Overview - EIRP

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1.0 INTRODUCTION

1.1 Scope

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

1.2 Element Test Location

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

1.3 Test Facility / Accreditations

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

- Element Washington DC LLC is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.

- Element Washington DC LLC TCB is a Telecommunication Certification Body (TCB) accredited to ISO\\IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).

- Element Washington DC LLC facility is a registered test laboratory with the site description on file with ISED (Wireless Test Lab number 2451B) and FCC (Designation Number US1113).

- Element Washington DC LLC is a Recognized U.S. Certification Assessment Body (CAB # US0110) for ISED Canada as designated by NIST under the U.S. and Canada Mutual Recognition Agreements (MRAs).

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Electronics Co., Ltd. Portable Handset FCC ID: A3LSMS948B.** 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 in very low power (VLP) mode.

The authorization for these models (SM-S948B, SM-S948B/DS) utilize data referencing from FCC ID: A3LSMS948U (Model SM-S948U) as permitted per KDB 484596 D01 v03. Data referencing data test results are included in Appendix A of this report.

Test Device Serial No.: 0500M, 0527M, 0529M, 0550M, 0520M

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, Multi-band 5G NR (FR1), 802.11b/g/n/ac/ax/be WLAN, 802.11a/n/ac/ax/be UNII (5GHz and 6GHz), Bluetooth (1x, EDR, LE), NFC, Wireless Power Transfer, UWB

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/be (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/be (40MHz BW) Frequency / Channel Operations

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Band 5	
Ch.	**Frequency (MHz)**
7	5985
:	:
39	6145
:	:
87	6385

Band 6	
Ch.	**Frequency (MHz)**
103	6465

Band 7	
Ch.	**Frequency (MHz)**
119	6545
:	:
151	6705
:	:
183	6865

Band 8	
Ch.	**Frequency (MHz)**
199	6945
:	:
215	7025

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

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Band 5		Band 6		Band 7		Band 8	
Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
15	6025	111	6505	143	6665	207	6985
47	6185			175	6825		
79	6345						

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

Band 5		Band 6		Band 7		Band 8	
Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
31	6105	95	6425	127	6585	191	6905
63	6265			159	6745		

Table 2-5. 802.11be (320MHz BW) Frequency / Channel Operations

Notes:

1. 6GHz NII operation is possible in 20MHz, 40MHz, 80MHz, 160MHz, and 320MHz 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 C63.10:2020. 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:

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Band	Bandwidth	Tone Type	Tone Size	MIMO (1+2)			
				Duty Cycle [%]	Pulse Width	Period	Radiated DCCF [dB]
6GHz	20MHz	RU	26T	98.72	2.320	2.350	N/A
			52T	98.98	2.318	2.342	N/A
			106T	98.31	1.280	1.302	N/A
			242T	98.97	2.112	2.134	N/A
		MRU	52+26T	98.97	2.110	2.132	N/A
			106+26T	98.97	2.112	2.134	N/A
	40MHz	RU	26T	97.82	2.292	2.343	0.10
			52T	97.78	2.290	2.342	0.10
			106T	98.36	2.162	2.198	N/A
			242T	98.61	2.122	2.152	N/A
			484T	98.87	2.096	2.120	N/A
		MRU	52+26T	97.40	2.098	2.154	0.11
			106+26T	99.01	2.098	2.119	N/A
	80MHz	RU	26T	97.70	2.292	2.346	0.10
			52T	98.89	2.317	2.343	N/A
			106T	98.37	2.174	2.210	N/A
			242T	99.06	2.105	2.125	N/A
			484T	98.92	2.099	2.122	N/A
			996T	99.01	1.999	2.019	N/A
		MRU	52+26T	98.86	1.999	2.022	N/A
			106+26T	98.86	1.996	2.019	N/A
			484+242T	99.01	1.999	2.019	N/A
	160MHz	RU	26T	99.22	5.436	5.479	N/A
			52T	99.45	5.445	5.475	N/A
			106T	99.51	5.439	5.466	N/A
			242T	99.93	5.442	5.446	N/A
			484T	99.45	5.445	5.475	N/A
			996T	99.51	5.448	5.475	N/A
			2x996T	99.51	5.445	5.472	N/A
		MRU	52+26T	99.45	5.445	5.475	N/A
			106+26T	99.45	5.439	5.469	N/A
			484+242T	99.45	5.448	5.478	N/A
			996+484T	99.40	5.442	5.475	N/A
			966+484+242T	99.51	5.442	5.469	N/A
	320MHz	RU	26T	98.63	2.306	2.338	N/A
			52T	98.45	2.293	2.329	N/A
			106T	98.42	2.174	2.209	N/A
			242T	99.01	2.109	2.130	N/A
			484T	98.20	1.091	1.111	N/A
			996T	99.01	1.999	2.019	N/A
			2x996T	98.10	1.033	1.053	N/A
			4x996T	96.66	550.000	569.000	0.15
		MRU	52+26T	98.89	2.312	2.338	N/A
			106+26T	98.38	2.188	2.224	N/A
			484+242T	98.47	1.418	1.440	N/A
			996+484T	98.26	452.000	460.000	N/A
			966+484+242T	96.67	551.000	570.000	0.15
			2x996+484T	97.93	1.990	2.032	0.09
			3x996T	97.89	1.998	2.041	0.09
			3x996+484T	97.26	2.130	2.190	0.12

Table 2-6. Measured Duty Cycles

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

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

Table 2-7. Frequency / Channel Operations

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

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

MCS Index		Spatial Stream	OFDMA (802.11ax/be)																					OFDMA (802.11be)		
			26T			52T			106T			242T			484T			996T			2x996T			4x996T		
HE	EHT		0.8µs GI	1.6µs GI	3.2µs GI	0.8µs GI	1.6µs GI	3.2µs GI	0.8µs GI	1.6µs GI	3.2µs GI	0.8µs GI	1.6µs GI	3.2µs GI	0.8µs GI	1.6µs GI	3.2µs GI	0.8µs GI	1.6µs GI	3.2µs GI	0.8µs GI	1.6µs GI	3.2µs GI	0.8µs GI	1.6µs GI	3.2µs GI
0	0	1	0.9	0.8	0.8	1.8	1.7	1.5	3.8	3.5	3.2	8.6	8.1	7.3	17.2	16.3	14.6	36	34	30.6	72.1	68.1	61.3	144.1	136.1	122.5
1	1	1	1.8	1.7	1.5	3.5	3.3	3	7.5	7.1	6.4	17.2	16.3	14.6	34.4	32.5	29.3	72.1	68.1	61.3	144.1	136.1	122.5	288.2	272.2	245
2	2	1	2.6	2.5	2.3	5.3	5	4.5	11.3	10.6	9.6	25.8	24.4	21.9	51.6	48.8	43.9	108.1	102.1	91.9	216.2	204.2	183.8	432.4	408.3	367.5
3	3	1	3.5	3.3	3	7.1	6.7	6	15	14.2	12.8	34.4	32.5	29.3	68.8	65	58.5	144.1	136.1	122.5	288.2	272.2	245	576.5	544.4	490
4	4	1	5.3	5	4.5	10.6	10	9	22.5	21.3	19.1	51.6	48.8	43.9	103.2	97.5	87.8	216.2	204.2	183.8	432.4	408.3	367.5	864.7	816.7	735
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	1152.9	1088.9	980
6	6	1	7.9	7.5	6.8	15.9	15	13.5	33.8	31.9	28.7	77.4	73.1	65.8	154.9	146.3	131.6	324.3	306.3	275.6	648.5	612.5	551.3	1297.1	1225	1102.5
7	7	1	8.8	8.3	7.5	17.6	16.7	15	37.5	35.4	31.9	86	81.3	73.1	172.1	162.5	146.3	360.3	340.3	306.3	720.6	680.6	612.5	1441.2	1361.1	1225
8	8	1	10.6	10	9	21.2	20	18	45	42.5	38.3	103.2	97.5	87.8	206.5	195	175.5	432.4	408.3	367.5	864.7	816.7	735	1729.4	1633.3	1470
9	9	1	11.8	11.1	10	23.5	22.2	20	50	47.2	42.5	114.7	108.3	97.5	229.4	216.7	195	480.4	453.7	408.3	960.8	907.4	816.7	1921.6	1814.8	1633.3
10	10	1	13.2	12.5	11.3	26.5	25	22.5	56.3	53.1	47.8	129	121.9	109.7	258.1	243.8	219.4	540.4	510.4	459.4	1080.9	1020.8	918.8	2161.8	2041.7	1837.5
11	11	1	14.7	13.9	12.5	29.4	27.8	25	62.5	59	53.1	143.4	135.4	121.9	286.8	270.8	243.8	600.5	567.1	510.4	1201	1134.3	1020.8	2402	2268.5	2041.7
	12	1	15.9	15	13.5	31.8	30	27	67.5	63.8	57.4	154.9	146.3	131.6	309.7	292.5	263.3	648.5	612.5	551.3	1297.1	1225	1102.5	2594.1	2450	2205
	13	1	17.6	16.7	15	35.3	33.3	30	75	70.8	63.8	172.1	162.5	146.3	344.1	325	292.5	720.6	680.6	612.5	1441.2	1361.1	1225	2882.4	2722.2	2450
0	0	2	1.8	1.7	1.5	3.5	3.3	3	7.5	7.1	6.4	17.2	16.3	14.6	34.4	32.5	29.3	72.1	68.1	61.3	144.1	136.1	122.5	288.2	272.2	245
1	1	2	3.5	3.3	3	7.1	6.7	6	15	14.2	12.8	34.4	32.5	29.3	68.8	65	58.5	144.1	136.1	122.5	288.2	272.2	245	576.5	544.4	490
2	2	2	5.3	5	4.5	10.6	10	9	22.5	21.3	19.1	51.6	48.8	43.9	103.2	97.5	87.8	216.2	204.2	183.8	432.4	408.3	367.5	864.7	816.7	735
3	3	2	7.1	6.7	6	14.1	13.3	12	30	28.3	25.5	68.8	65	58.5	137.6	130	117	288.2	272.2	245	576.5	544.4	490	1152.9	1088.9	980
4	4	2	10.6	10	9	21.2	20	18	45	42.5	38.3	103.2	97.5	87.8	206.5	195	175.5	432.4	408.3	367.5	864.7	816.7	735	1729.4	1633.3	1470
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	1152.9	1088.9	980	2305.9	2177.8	1960
6	6	2	15.9	15	13.5	31.8	30	27	67.5	63.8	57.4	154.9	146.3	131.6	309.7	292.5	263.3	648.5	612.5	551.3	1297.1	1225	1102.5	2594.1	2450	2205
7	7	2	17.6	16.7	15	35.3	33.3	30	75	70.8	63.8	172.1	162.5	146.3	344.1	325	292.5	720.6	680.6	612.5	1441.2	1361.1	1225	2882.4	2722.2	2450
8	8	2	21.2	20	18	42.4	40	36	90	85	76.5	206.5	195	175.5	412.9	390	351	864.7	816.7	735	1729.4	1633.3	1470	3458.8	3266.7	2940
9	9	2	23.5	22.2	20	47.1	44.4	40	100	94.4	85	229.4	216.7	195	458.8	433.3	390	960.8	907.4	816.7	1921.6	1814.8	1633.3	3843.1	3629.6	3266.7
10	10	2	26.5	25	22.5	52.9	50	45	112.5	106.3	95.6	258.1	243.8	219.4	516.2	487.5	438.8	1080.9	1020.8	918.8	2161.8	2041.7	1837.5	4323.5	4083.3	3675
11	11	2	29.4	27.8	25	58.8	55.6	50	125	118.1	106.3	286.8	270.8	243.8	573.5	541.7	487.5	1201	1134.3	1020.8	2402	2268.5	2041.7	4803.9	4537	4083.3
	12	2	31.8	30	27	63.5	60	54	135	127.5	114.8	309.7	292.5	263.3	619.4	585	526.5	1297.1	1225	1102.5	2594.1	2450	2205	5188.2	4900	4410
	13	2	35.3	33.3	30	70.6	66.7	60	150	141.7	127.5	344.1	325	292.5	688.2	650	585	1441.2	1361.1	1225	2882.4	2722.2	2450	5764.7	5444.4	4900

Table 2-8. Supported Data Rates

4. The device supports either Standard Power (SP) or Low Power Indoor (LPI) or Very Low Power (VLP) operation in the following UNII bands:

UNII Band	Standard Power (SP)	Low Power Indoor (LPI)	Very Low Power (VLP)
UNII 5	✓	✓	✓
UNII 6	×	✓	✓
UNII 7	✓	✓	✓
UNII 8	×	✓	✓

Table 2-9. Power Operation

✓= Support; × = NOT Support

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2.3 Antenna Description

The following antenna gains were used for the testing.

Frequency	Ant1 Peak Gain [dBi]	Ant2 Peak Gain [dBi]
5925 MHz	-5.1	-6.68
6025 MHz	-6.25	-5.86
6125 MHz	-4.86	-5.98
6225 MHz	-6.81	-6.82
6325 MHz	-5.26	-4.97
6425 MHz	-6.11	-5.84
6525 MHz	-5.12	-5.35
6625MHz	-6.35	-6.33
6725MHz	-6.34	-6.19
6825MHz	-5.71	-6.86
6925MHz	-5.32	-6.2
7025MHz	-6.35	-5.28
7125MHz	-5.02	-6.89

Table 2-10 Antenna Peak Gain per Frequency

	Ant1 Peak Gain [dBi]	Ant2 Peak Gain [dBi]	Directional Gain [dBi]
5925 – 6425 MHz	-4.86	-4.97	-1.9
6425 – 6525 MHz	-5.12	-5.35	-2.22
6525 – 6875 MHz	-5.12	-5.35	-2.22
6875 – 7125 MHz	-5.02	-5.28	-2.14

Table 2-11. Antenna Peak Gain

2.4 Test Configuration

ANSI C63.10:2020 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.

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 firmware version S948USQU0AYIB 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 C63.10:2020) and the guidance provided in KDB 987594 D02 v03 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.

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3.3 Radiated Emissions

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

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

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

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

3.4 Environmental Conditions

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

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4.0 ANTENNA REQUIREMENTS

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

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

Conclusion:

The EUT complies with the requirement of §15.203.

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5.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10:2020. 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 Budget

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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
-	MD 1M 18-40	EMC Cable and Switch System	2/25/2025	Annual	2/25/2026	MD 1M 40
-	AP2-001	EMC Cable and Switch System	2/25/2025	Annual	2/25/2026	AP2-001
-	AP2-002	EMC Cable and Switch System	2/25/2025	Annual	2/25/2026	AP2-002
-	ETS-001	EMC Cable and Switch System	12/11/2024	Annual	12/11/2025	ETS-001
-	ETS-002	EMC Cable and Switch System	12/11/2024	Annual	12/11/2025	ETS-002
-	WL25-1	Conducted Cable Set (25GHz)	2/25/2025	Annual	2/25/2026	WL25-1
-	WL25-2	Conducted Cable Set (25GHz)	2/25/2025	Annual	2/25/2026	WL25-2
-	WL40-1	Conducted Cable Set (40GHz)	2/25/2025	Annual	2/25/2026	WL40-1
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	11/25/2024	Annual	11/25/2025	100348
Rohde & Schwarz	ESW44	EMI Test Receiver 2Hz to 44 GHz	3/25/2025	Annual	3/25/2026	101716
Agilent	N9038A	MXE EMI Receiver	9/16/2024	Annual	11/22/2025	MY51210133
Agilent	N9030A	50GHz PXA Signal Analyzer	8/22/2025	Annual	8/22/2026	US51350301
Agilent	N9030A	3Hz-44GHz PXA Signal Analyzer	9/15/2025	Annual	9/15/2026	MY49430494
Rohde & Schwarz	ENV216	Two-Line V-Network	3/21/2025	Biennial	3/21/2027	101380
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	6/4/2025	Biennial	6/4/2027	125518
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Test Antenna	4/15/2024	Biennial	4/15/2026	101058
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	9/11/2024	Biennial	9/11/2026	A051107
Sunol	JB6	Bi-Log Antenna (30M - 6GHz)	3/24/2025	Biennial	3/24/2027	A082816
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	6/6/2025	Annual	6/6/2026	MY52350166
Keysight Technologies	N9020A	MXA Signal Analyzer	5/7/2025	Annual	5/7/2026	US46470561
Keysight Technologies	N9020A	MXA Signal Analyzer	6/4/2025	Annual	6/4/2026	MY54500644
EMCO	3116	Horn Antenna (18-40GHz)	7/5/2024	Biennial	7/5/2026	9203-2178
Sunol Sciences	DRH-118	Horn Antenna (1-18GHz)	3/19/2025	Biennial	3/19/2027	A102416-2
Anritsu	MA24408A	Microwave Peak Power Sensor	10/2/2024	Annual	10/2/2025	11675
Anritsu	MA24406A	Microwave Peak Power Sensor	1/16/2025	Annual	1/16/2026	11240

Table 6-1. Test Equipment Calibration Table

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.

Component	Serial Number
MegaPhase Cable TM26-S1S1-36	18160103 003
Pasternack 6dB Attenuator PE7005-6	N/A

Table 6-2. WL25-1 Conducted Cable Set Components

Component	Serial Number
MiniCircuirs Cable CBL-2FT-SMSM+	77743
MCL 6dB Attenuator BW-S6W2+	1314

Table 6-3. WL25-2 Conducted Cable Set Components

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Component	Serial Number
MegaPhase Cable TM40K1K1-36	18160102 001
MCL 10dB Attenuator BW-K10 2W44+	1902

Table 6-4. WL40-1 Conducted Cable Set Components

Component	Serial Number
Pasternak Cable RG214/U	111815
Sucoflex Cable 106A	246420-001
Rohde & Schwarz SF Unit	102134

Table 6-5. ETS-001 EMC Cable and Switch System Components

Component	Serial Number
MiniCircuits Cable CBL-0.5M-SMNM+	47261
Micro-Coax Utiflex Cable UFB311A-Q-3346-50U50U MFR 64639	231978-001
Micro-Coax Utiflex Cable UFB311A-1-0629-50U50U MFR 64639	231986-002
MegaPhase Cable NC29-N1N1-324	19046401 001
MegaPhase Flex Cable 10511-1	15044701-006
Micro-Coas Utiflex Cable UFB311A-Q-3446-50U50U MFR 64639	231978-002
Micro-Coas Utiflex Cable UFB311A-1-0629-50U50U MFR 64639	231986-001
Micro-Coas Utiflex Cable UFB142A-0-0659-50U50U MFR 64639	232069-001
Rohde & Schwarz SF Unit	102138

Table 6-6. AP2-001 EMC Cable and Switch System Components

Component	Serial Number
MegaPhase Cable TM40-K1K1-30	20233002-004
UTIPLEX Cable	64639 232063-001
Rohde & Schwarz Pre-amp RS-PR1840 18G-40G	9037.7670.02

Table 6-7. MD 1M 18-40 EMC Cable and Switch System Components

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7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.
FCC ID: A3LSMS948B
FCC Classification: 15E 6GHz Very Low Power Device (6VL)

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference	Data Referencing
2.1046, 15.407(a)(12)	Maximum Conducted Output Power	N/A	CONDUCTED	PASS	Section 7.3	Yes
15.407(a)(9)	Maximum Radiated Output Power	< 14dBm e.i.r.p.		PASS	Section 7.3	Yes
2.1049, 15.407(a)(11)	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	Yes
15.407(a)(9)	Maximum Power Spectral Density	< -5dBm/MHz e.i.r.p.		PASS	Section 7.4	Yes
15.407(b)(7)	In-Band Emissions	EUT must meet the limits detailed in 15.407(b)(7)		PASS	Section 7.5	Yes
15.407(d)(6)	Contention Based Protocol	EUT must detect AWGN signal with 90% (or better) certainty	RADIATED	PASS	Please see WiFi 6GHz (6VL) OFDM report	Yes
15.407(d)(10)	Transmit Power Control	Must operate at least 6 dB below the maximum EIRP power spectral density (PSD) value of −5 dBm/MHz		PASS	Please see WiFi 6GHz (6VL) OFDM report	No
15.407(b)(6)	Undesirable Emissions	< -27dBm/MHz e.i.r.p. outside of the 5.925 – 7.125GHz band		PASS	Section 7.6	Yes
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 7.6	Yes
15.407(b)(9)	AC Conducted Emissions (150kHz – 30MHz)	< FCC 15.207 limits	LINE CONDUCTED	PASS	Please see WiFi 6GHz (6VL) OFDM report	No

Table 7-1. Summary of Test Results

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Notes:

1) All channels, modes, and modulations/data rates were investigated among all UNII bands. The test results shown in the following sections represent the worst-case emissions.
2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.
4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is Element "EMC Software Tool" Version 2.3.0.
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) Data was referenced from model SM-S948U for the certification of SM-S948B/DS. See Section 9.0 for spot-check results

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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 C63.10:2020, and at the appropriate frequencies. The spectrum analyzer's bandwidth measurement function is configured to measure the 26dB bandwidth.

Test Procedure Used

ANSI C63.10:2020 – Section 12.5

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

1. All cases were investigated; a subset of the plots taken were included to represent relevant settings and measurements.
2. In this section, the bandwidth data tables include mainly the 26dB bandwidth measurements. In case of 320MHz operation, an occupied bandwidth measurement was included in the table to demonstrate compliance. Thus, all measurements in the tables are 26dB bandwidth measurements except for the 320MHz bandwidth cases which are occupied bandwidth measurements.

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	Frequency [MHz]	Channel	802.11 MODE	Antenna-1 26dB Bandwidth [MHz]	Antenna-2 26dB Bandwidth [MHz]	Antenna-1 Occupied Bandwidth [MHz]	Antenna-2 Occupied Bandwidth [MHz]
Band 5	5935	2	be (20MHz)	18.92	18.64	17.58	17.34
	6175	45	be (20MHz)	18.87	18.69	17.60	17.34
	6415	93	be (20MHz)	19.00	18.49	17.61	17.30
	5965	3	be (40MHz)	25.17	24.97	32.16	24.84
	6165	43	be (40MHz)	25.37	23.98	32.77	24.82
	6405	91	be (40MHz)	25.89	24.67	36.69	24.60
	5985	7	be (80MHz)	45.48	38.98	49.73	41.12
	6145	39	be (80MHz)	45.09	38.97	50.39	37.89
	6385	87	be (80MHz)	36.60	38.56	49.54	54.65
	6025	15	be (160MHz)	55.06	47.70	62.02	64.73
	6185	47	be (160MHz)	54.71	48.72	71.07	59.81
	6345	79	be (160MHz)	52.77	49.22	63.91	53.35
	6105	31	be (320MHz)	48.06	44.09	147.76	54.17
	6265	63	be (320MHz)	45.33	41.07	79.75	65.52
Band 6	6435	97	be (20MHz)	18.95	18.67	17.63	17.35
	6475	105	be (20MHz)	18.89	18.65	17.65	17.35
	6515	113	be (20MHz)	18.77	18.60	17.62	17.33
	6445	99	be (40MHz)	24.98	24.16	35.41	24.81
	6485	107	be (40MHz)	26.12	24.17	35.25	24.20
	6525	115	be (40MHz)	25.85	24.30	31.46	23.96
	6465	103	be (80MHz)	35.00	38.38	45.73	43.44
	6505	111	be (160MHz)	54.06	47.58	61.05	53.81
Band 5/6/7	6425	95	be (320MHz)	40.98	45.00	62.39	54.62
Band 7	6695	117	be (20MHz)	18.91	18.59	17.67	17.35
	6695	149	be (20MHz)	18.66	18.74	17.63	17.39
	6875	185	be (20MHz)	18.73	18.47	17.52	17.32
	6565	123	be (40MHz)	26.15	24.43	32.30	24.26
	6685	155	be (40MHz)	25.65	25.05	33.19	25.20
	6845	179	be (40MHz)	26.04	24.42	32.06	23.88
	6545	119	be (80MHz)	35.56	40.72	44.66	60.16
	6705	151	be (80MHz)	36.91	38.09	50.02	42.35
	6865	183	be (80MHz)	36.24	39.17	44.91	51.65
	6665	143	be (160MHz)	55.11	48.81	70.81	71.73
	6825	175	be (160MHz)	52.84	49.25	64.94	68.48
Band 6/7	6585	127	be (320MHz)	40.57	40.89	60.73	62.28
Band 7/8	6745	159	be (320MHz)	46.48	43.42	65.08	57.40
Band 8	7115	189	be (20MHz)	18.93	18.61	17.67	17.33
	6995	209	be (20MHz)	18.93	18.43	17.60	17.21
	7115	233	be (20MHz)	18.85	18.56	17.57	17.34
	6885	187	be (40MHz)	24.60	24.94	36.20	24.17
	6965	211	be (40MHz)	25.19	24.64	29.23	23.95
	7085	227	be (40MHz)	24.80	24.69	27.61	24.72
	6945	199	be (80MHz)	36.15	38.71	44.59	46.58
	7025	215	be (80MHz)	46.08	39.52	57.41	52.25
	6985	207	be (160MHz)	56.81	47.94	68.53	54.08
Band 7/8	6905	191	be (320MHz)	41.60	45.14	57.87	61.19

Table 7-2. 26dB Bandwidth Results – 26 Tones – VLP

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	Frequency [MHz]	Channel	802.11 MODE	MRU Configuration	Antenna-1 26dB Bandwidth [MHz]	Antenna-2 26dB Bandwidth [MHz]	Antenna-1 Occupied Bandwidth [MHz]	Antenna-2 Occupied Bandwidth [MHz]
Band 5	6145	45	be (80MHz)	52+26T	20.97	19.38	17.67	17.26
	6175	45	be (20MHz)	106+26T	21.44	21.72	18.53	18.41
	6145	39	be (80MHz)	484+242T	92.74	90.41	79.29	78.76
	6185	47	be (160MHz)	996+484T	177.55	176.76	158.55	158.68
	6105	31	be (320MHz)	3x996+484T	-	-	315.86	315.43
	6105	31	be (320MHz)	3x996T	-	-	316.58	316.56
	6105	31	be (320MHz)	2x996+484T	319.52	317.59	240.25	241.77
Band 6	6475	105	be (20MHz)	52+26T	20.41	19.11	17.67	17.26
	6475	105	be (20MHz)	106+26T	21.51	21.68	18.53	18.49
	6465	103	be (80MHz)	484+242T	91.93	90.62	79.16	78.80
	6505	111	be (160MHz)	996+484T	176.86	177.48	158.43	158.62
Band 5/6/7	6425	95	be (320MHz)	3x996+484T	-	-	315.61	314.88
	6425	95	be (320MHz)	3x996T	-	-	315.41	315.51
	6425	95	be (320MHz)	2x996+484T	311.03	282.12	238.51	237.55
Band 7	6695	149	be (20MHz)	52+26T	20.53	19.24	17.59	17.26
	6695	149	be (20MHz)	106+26T	21.36	21.19	18.50	18.39
	6705	151	be (80MHz)	484+242T	92.42	90.91	79.15	78.77
	6665	143	be (160MHz)	996+484T	175.89	177.79	158.53	158.74
Band 7/8	6745	159	be (320MHz)	3x996+484T	-	-	315.87	315.05
	6745	159	be (320MHz)	3x996T	-	-	316.90	315.22
	6745	159	be (320MHz)	2x996+484T	313.46	314.38	239.80	238.15
Band 8	6995	209	be (20MHz)	52+26T	20.68	19.30	17.55	17.17
	6995	209	be (20MHz)	106+26T	21.26	21.22	18.47	18.33
	6945	199	be (80MHz)	484+242T	92.10	92.14	79.05	78.90
	6985	207	be (160MHz)	996+484T	175.18	175.37	158.39	158.65
Band 7/8	6905	191	be (320MHz)	3x996+484T	-	-	315.02	315.33
	6905	191	be (320MHz)	3x996T	-	-	316.48	315.24
	6905	191	be (320MHz)	2x996+484T	318.22	314.41	238.65	238.36

Table 7-3. 26dB Bandwidth Results – MRU – VLP

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	Frequency [MHz]	Channel	802.11 MODE	Antenna-1 26dB Bandwidth [MHz]	Antenna-2 26dB Bandwidth [MHz]	Antenna-1 Occupied Bandwidth [MHz]	Antenna-2 Occupied Bandwidth [MHz]
Band 5	5935	2	be (20MHz)	23.89	23.84	19.44	19.38
	6175	45	be (20MHz)	25.83	24.20	18.77	18.35
	6415	93	be (20MHz)	23.55	23.76	19.33	19.35
	5965	3	be (40MHz)	47.65	45.44	39.11	38.65
	6165	43	be (40MHz)	46.48	45.04	38.93	38.56
	6405	91	be (40MHz)	46.27	45.13	38.86	38.54
	5985	7	be (80MHz)	90.34	89.88	79.05	78.21
	6145	39	be (80MHz)	90.25	90.72	79.01	78.29
	6385	87	be (80MHz)	89.03	91.85	78.59	78.34
	6025	15	be (160MHz)	178.48	176.34	157.63	157.32
	6185	47	be (160MHz)	178.51	176.35	157.69	157.66
	6345	79	be (160MHz)	178.21	176.54	157.72	157.79
	6105	31	be (320MHz)	-	-	316.52	315.41
	6265	63	be (320MHz)	-	-	316.56	315.05
Band 6	6435	97	be (20MHz)	23.73	23.84	19.42	19.33
	6475	105	be (20MHz)	23.91	23.58	19.39	19.32
	6515	113	be (20MHz)	23.98	23.31	19.48	19.31
	6445	99	be (40MHz)	45.93	45.71	38.89	38.53
	6485	107	be (40MHz)	46.28	44.78	38.81	38.46
	6525	115	be (40MHz)	46.24	44.84	38.91	38.46
	6465	103	be (80MHz)	90.47	89.86	78.45	78.43
	6505	111	be (160MHz)	178.24	176.09	157.54	157.41
Band 5/6/7	6425	95	be (320MHz)	-	-	314.75	315.70
Band 7	6695	117	be (20MHz)	23.65	23.70	19.47	19.39
	6695	149	be (20MHz)	23.42	23.76	19.43	19.42
	6875	185	be (20MHz)	23.23	23.55	19.30	19.35
	6565	123	be (40MHz)	46.55	44.90	38.94	38.49
	6685	155	be (40MHz)	46.14	44.73	38.78	38.43
	6845	179	be (40MHz)	46.42	44.72	38.91	38.60
	6545	119	be (80MHz)	89.77	90.36	78.53	78.55
	6705	151	be (80MHz)	89.77	91.31	78.58	78.34
	6865	183	be (80MHz)	89.51	90.47	78.33	78.52
	6665	143	be (160MHz)	177.73	176.23	157.50	157.71
	6825	175	be (160MHz)	178.62	175.35	157.37	157.24
Band 6/7	6585	127	be (320MHz)	-	-	314.86	315.15
Band 7/8	6745	159	be (320MHz)	-	-	315.77	314.43
Band 8	7115	189	be (20MHz)	23.73	23.39	19.42	19.39
	6995	209	be (20MHz)	23.82	23.55	19.45	19.34
	7115	233	be (20MHz)	23.59	23.04	19.38	19.34
	6885	187	be (40MHz)	46.63	44.66	38.87	38.43
	6965	211	be (40MHz)	45.74	44.70	38.73	38.49
	7085	227	be (40MHz)	45.49	45.30	38.69	38.57
	6945	199	be (80MHz)	90.46	91.31	78.79	78.28
	7025	215	be (80MHz)	88.62	91.50	78.90	78.41
	6985	207	be (160MHz)	178.68	175.16	157.47	157.28
Band 7/8	6905	191	be (320MHz)	-	-	315.05	314.31

Table 7-4. 26dB Bandwidth Results – Full Tones – VLP

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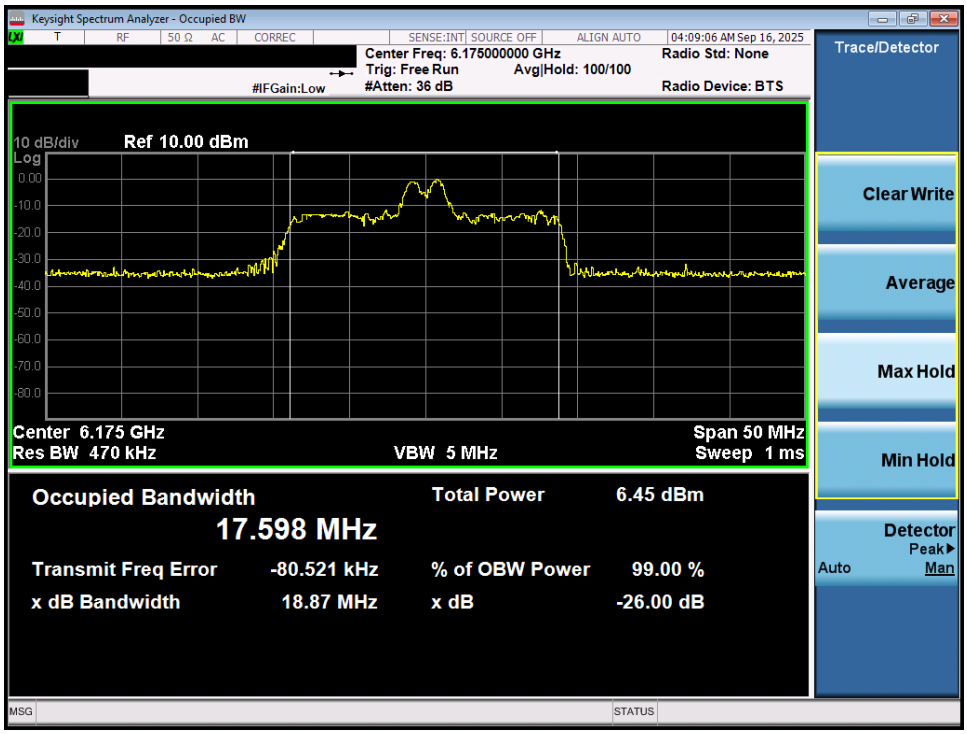
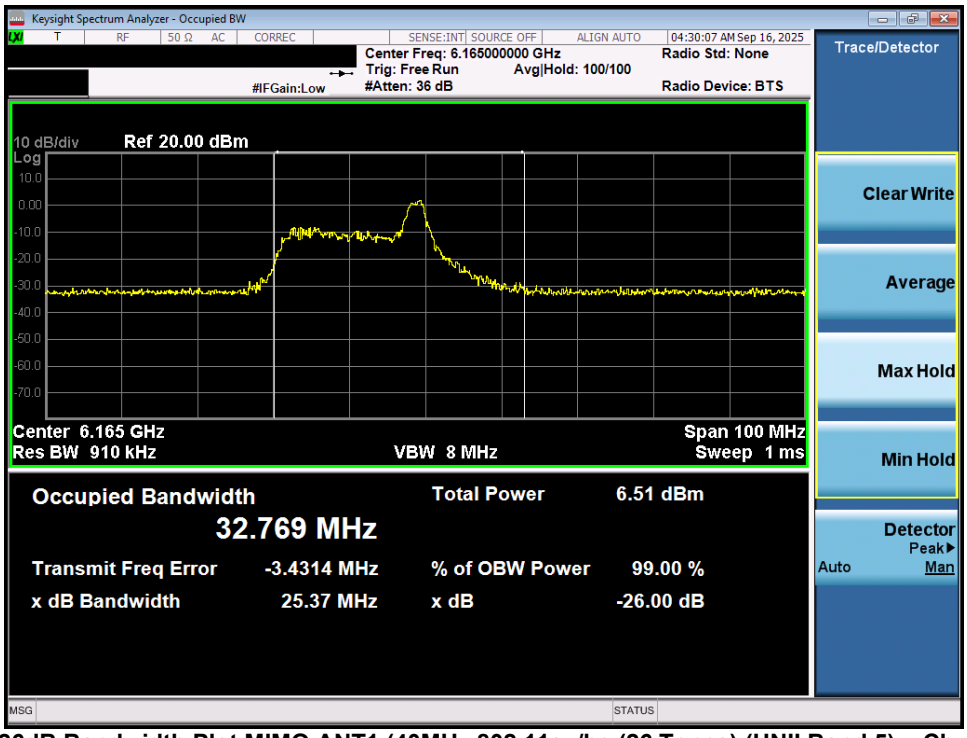
7.2.1 MIMO Antenna-1 Bandwidth Measurements - (Partial Tones)



Plot 7-1. 26dB Bandwidth Plot MIMO ANT1 (20MHz 802.11ax/be (26 Tones) (UNII Band 5) – Ch. 45) - VLP



Plot 7-2. 26dB Bandwidth Plot MIMO ANT1 (40MHz 802.11ax/be (26 Tones) (UNII Band 5) – Ch. 43) - VLP

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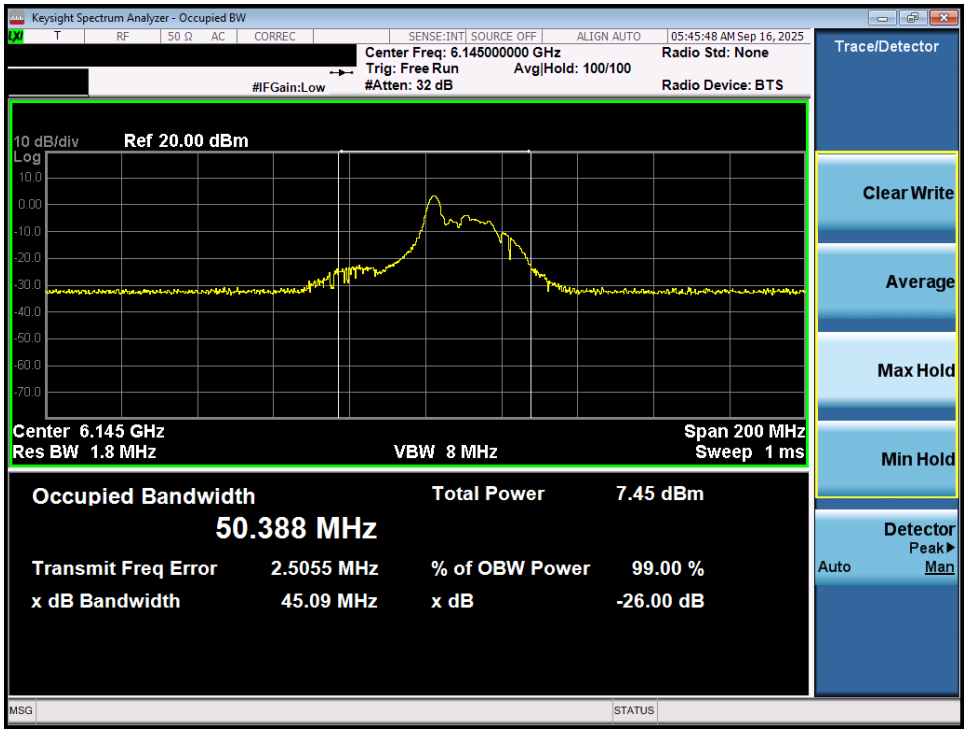
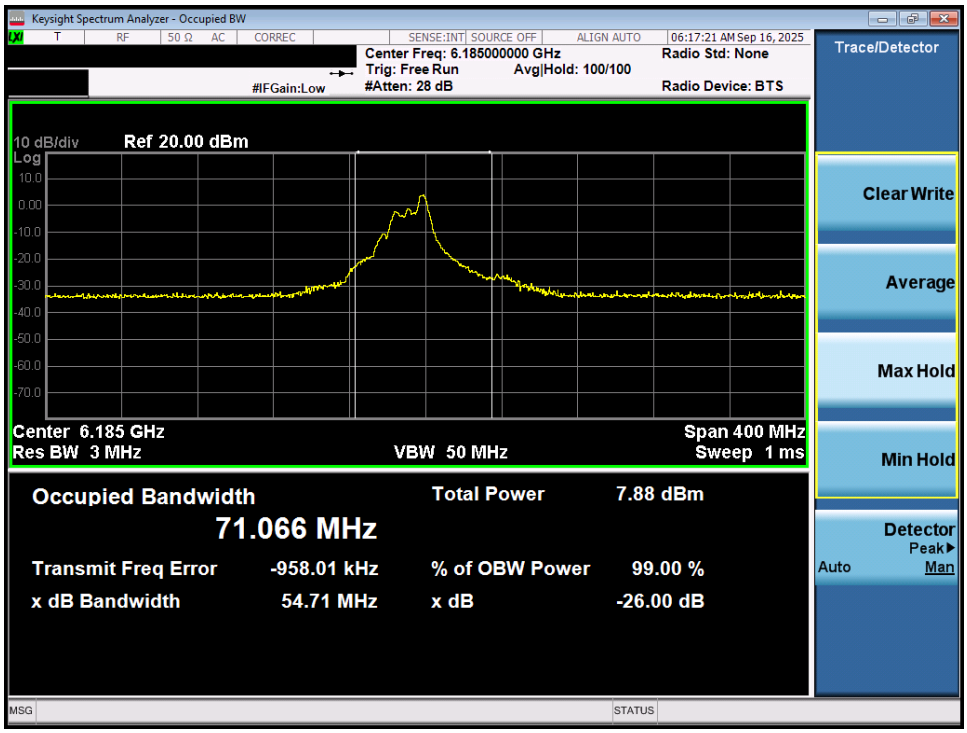


Plot 7-3. 26dB Bandwidth Plot MIMO ANT1 (80MHz 802.11ax/be (26 Tones) (UNII Band 5) – Ch. 39) - VLP



Plot 7-4. 26dB Bandwidth Plot MIMO ANT1 (160MHz 802.11ax/be (26 Tones) (UNII Band 5) – Ch. 47) - VLP

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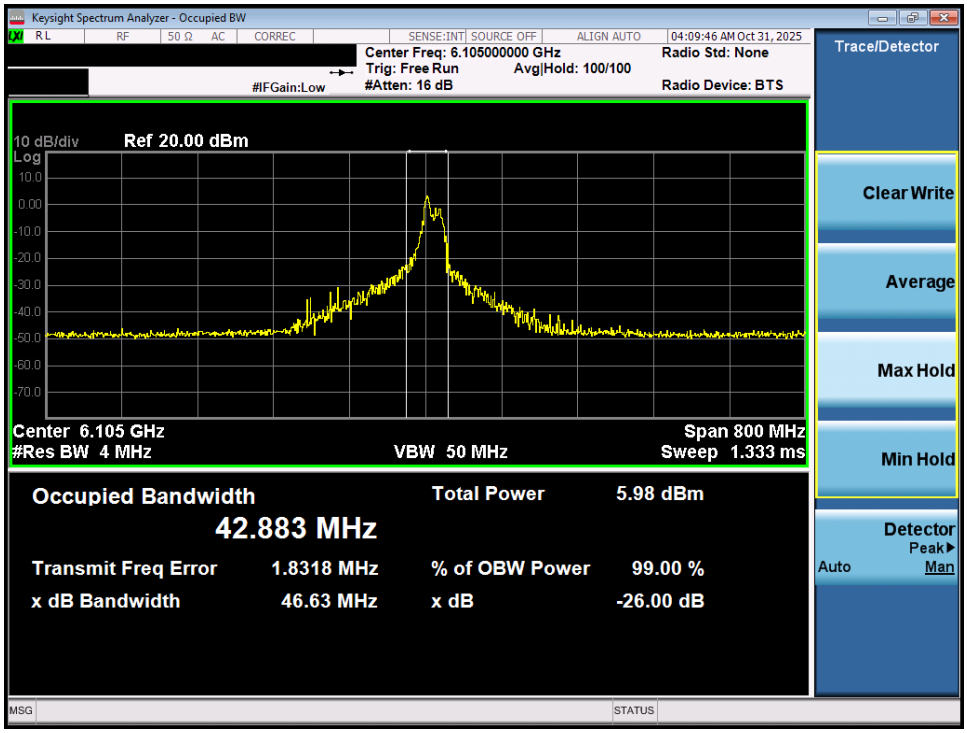
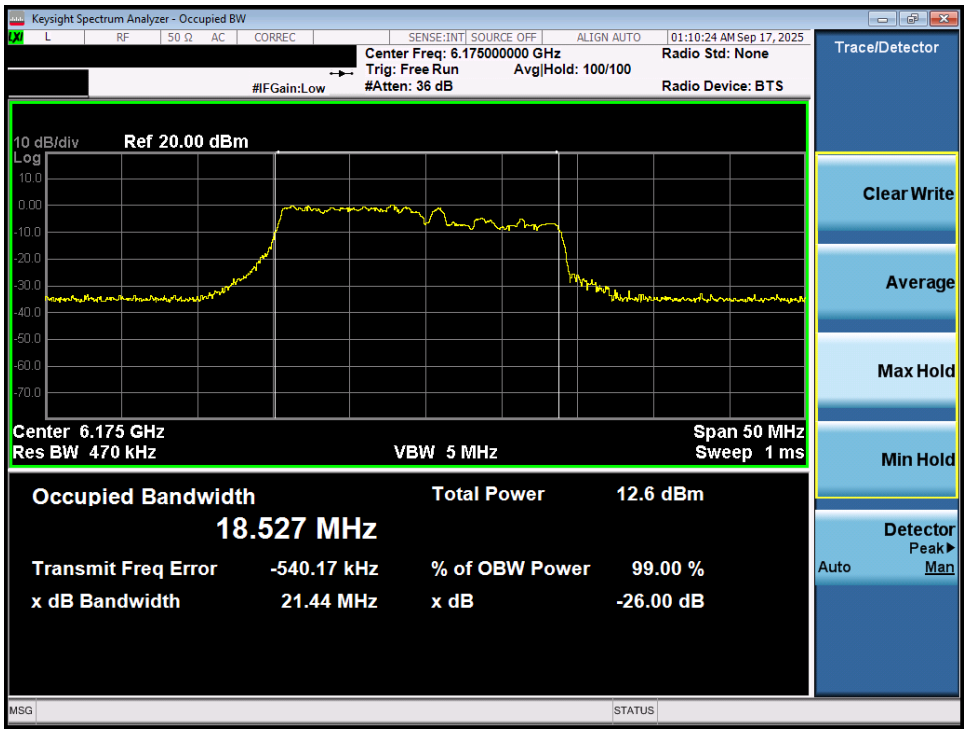


Plot 7-5. 26dB Bandwidth Plot MIMO ANT1 (320MHz 802.11be (26 Tones) (UNII Band 5) – Ch. 31) - VLP



Plot 7-6. 26dB Bandwidth Plot MIMO ANT1 (20MHz 802.11be (106+26 Tones) (UNII Band 5) – Ch. 45) - VLP

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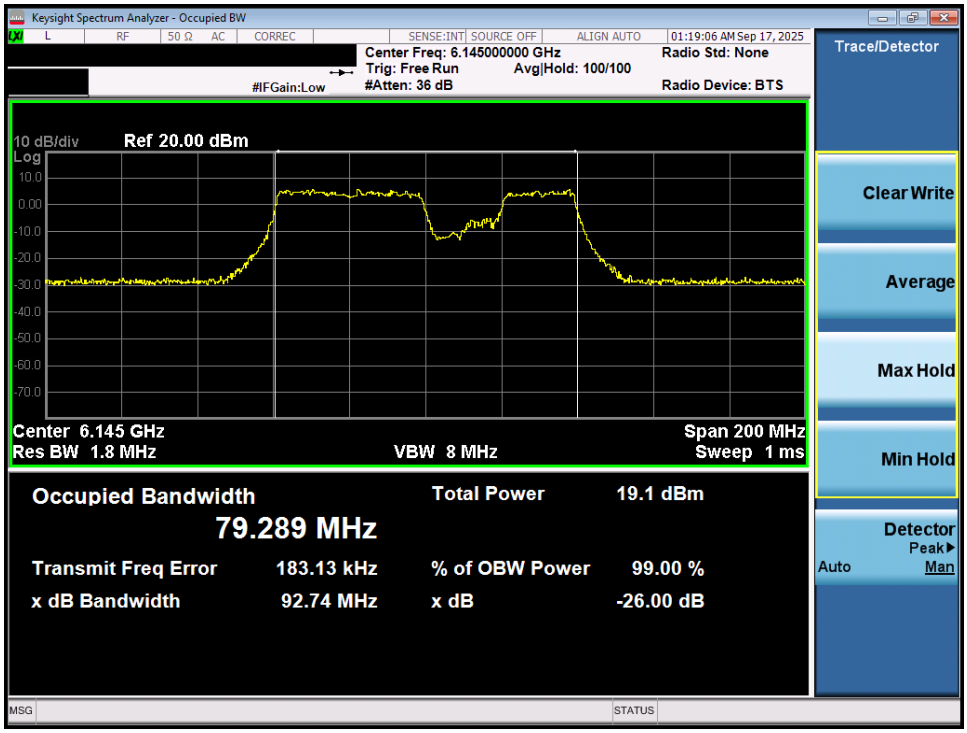
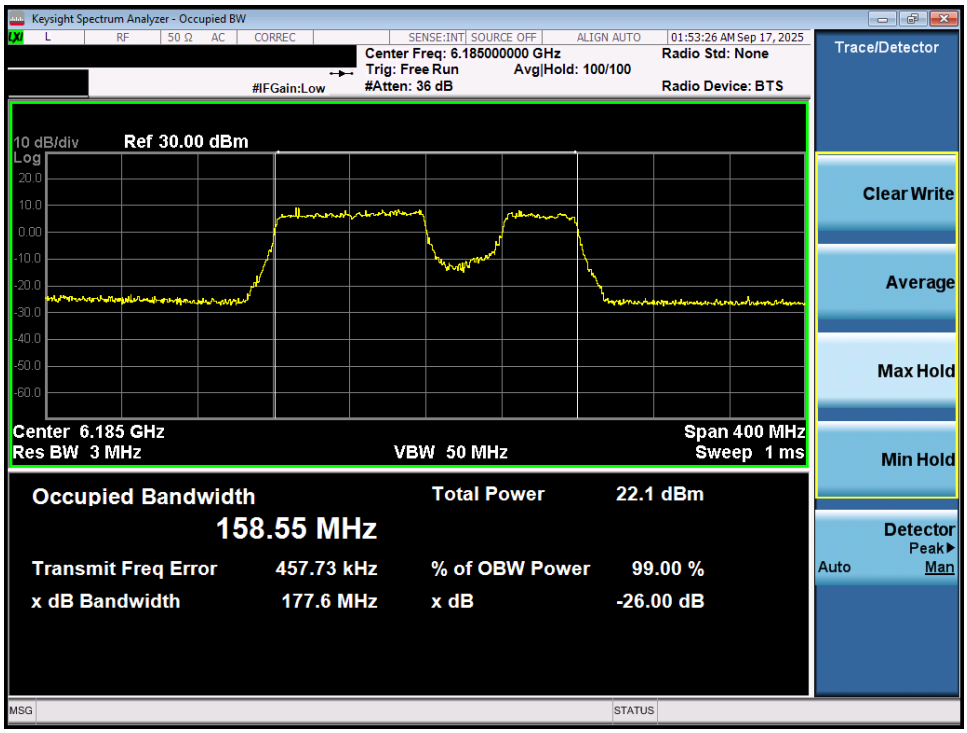


Plot 7-7. 26dB Bandwidth Plot MIMO ANT1 (80MHz 802.11be (484+242 Tones) (UNII Band 5) – Ch. 39) VLP



Plot 7-8. 26dB Bandwidth Plot MIMO ANT1 (160MHz 802.11be (996+484 Tones) (UNII Band 5) – Ch. 47) VLP

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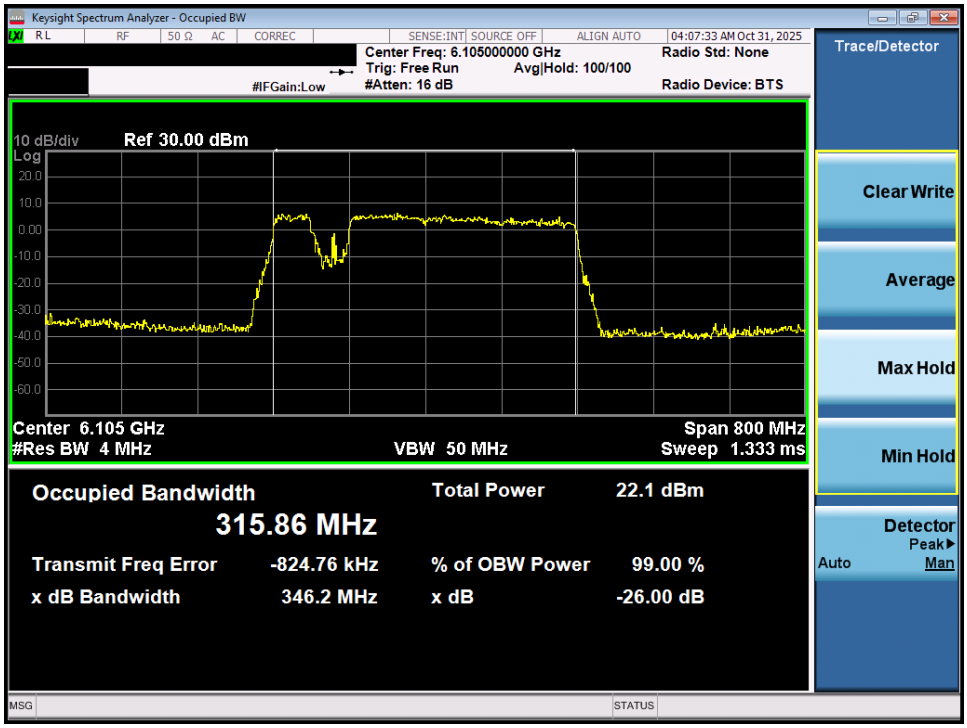

Plot 7-9. 26dB Bandwidth Plot MIMO ANT1 (320MHz 802.11be (3*996+484 Tones) (UNII Band 5) – Ch. 31) VLP

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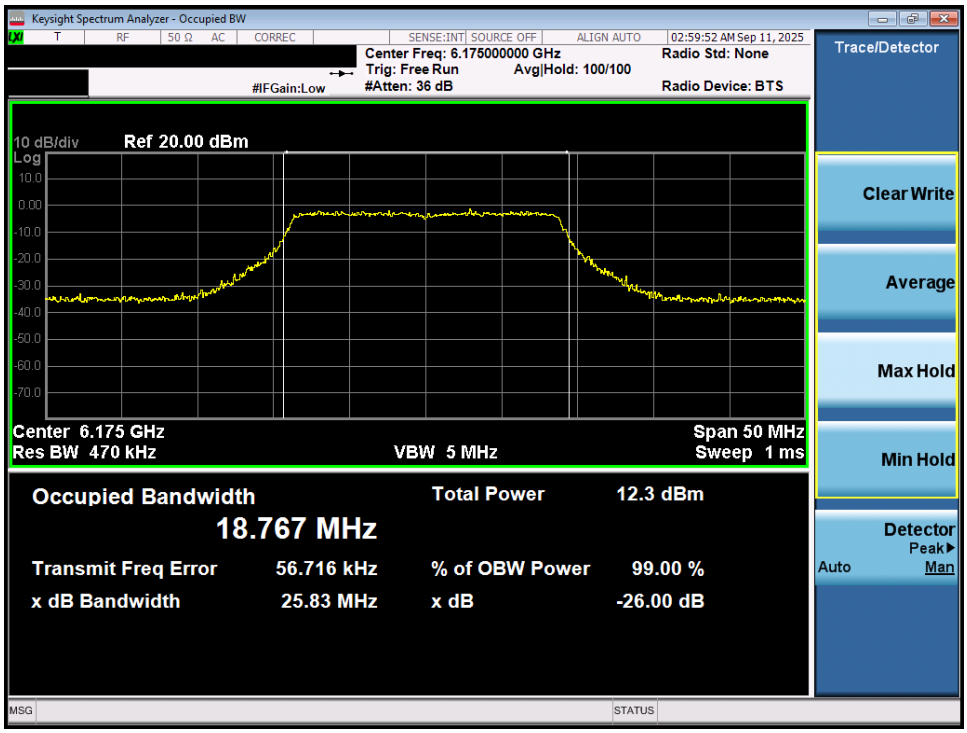
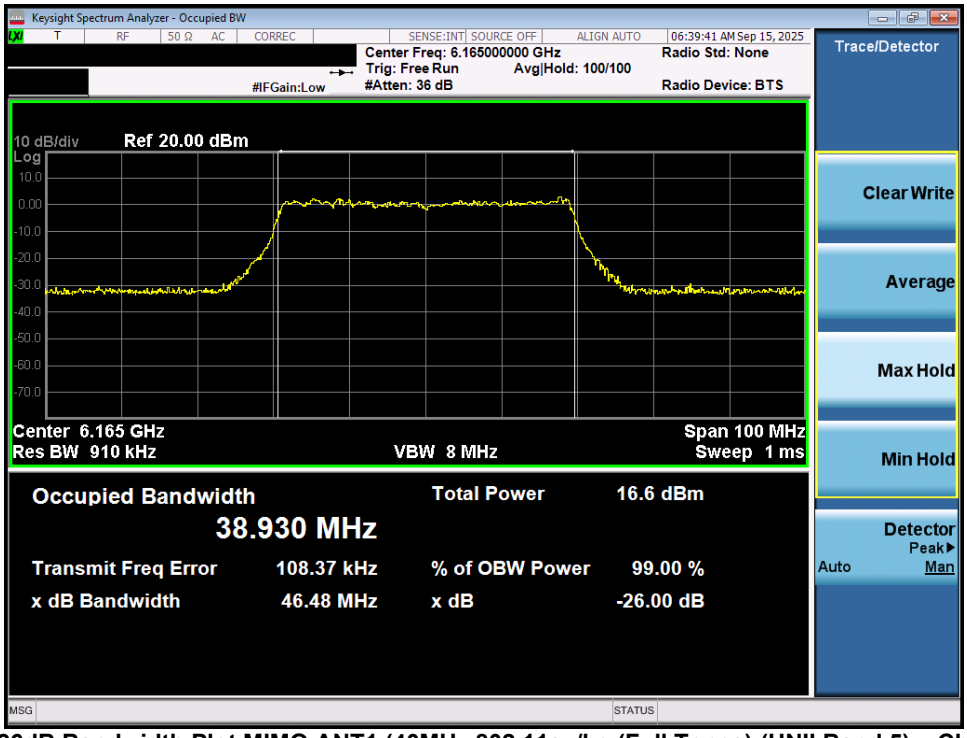
7.2.2 MIMO Antenna-1 Bandwidth Measurements - (Full Tones)



Plot 7-10. 26dB Bandwidth Plot MIMO ANT1 (20MHz 802.11ax/be (Full Tones) (UNII Band 5) – Ch. 45) - VLP



Plot 7-11. 26dB Bandwidth Plot MIMO ANT1 (40MHz 802.11ax/be (Full Tones) (UNII Band 5) – Ch. 43) - VLP

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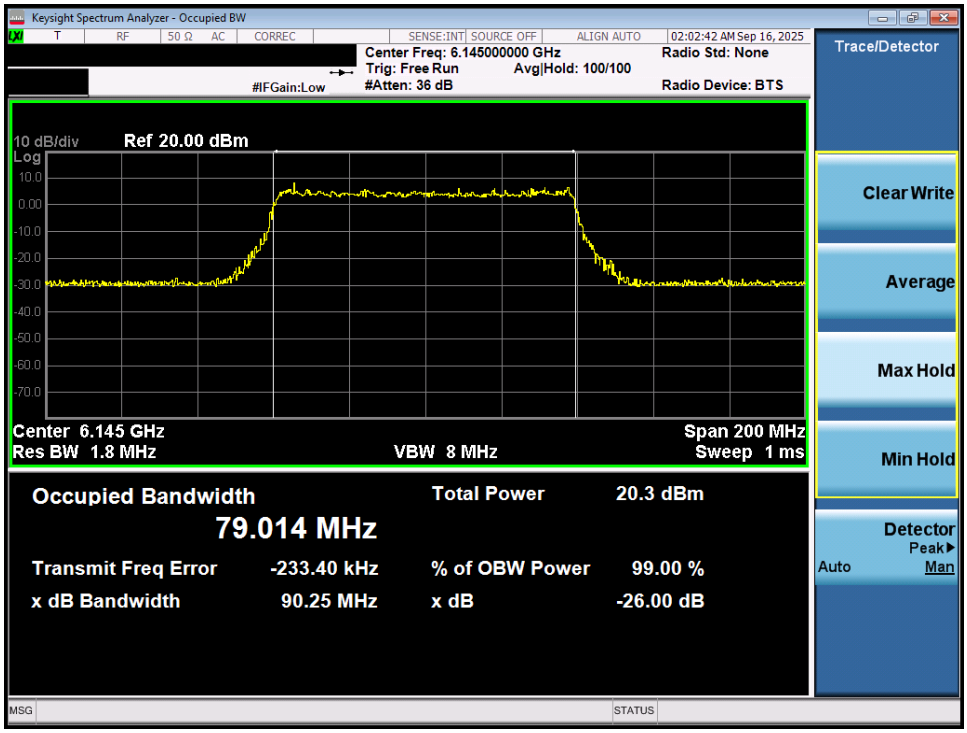
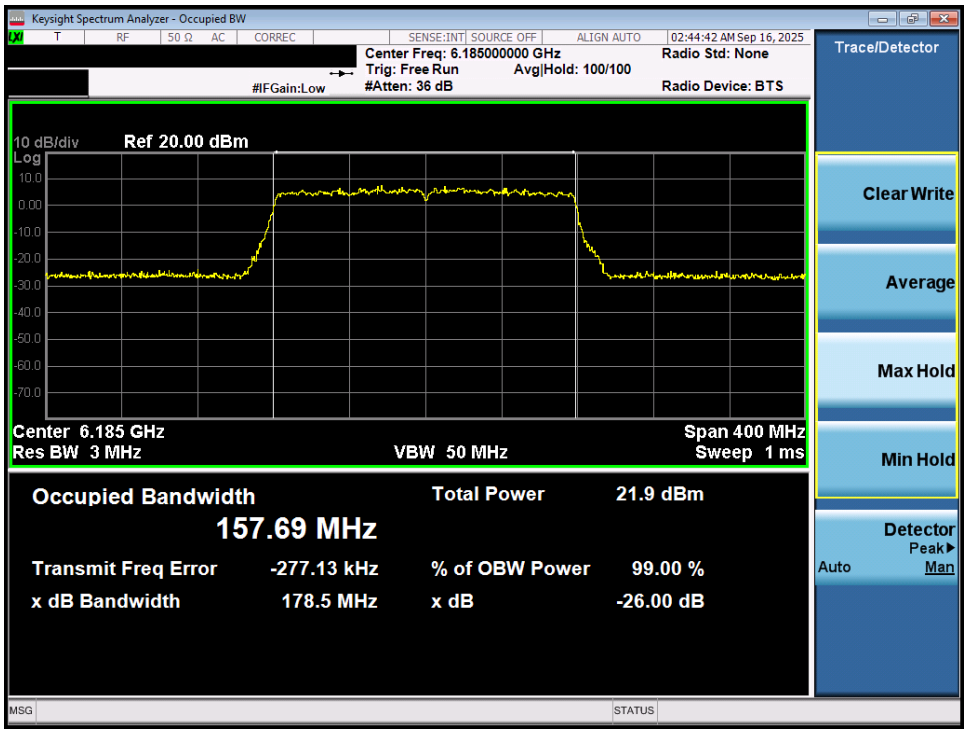


Plot 7-12. 26dB Bandwidth Plot MIMO ANT1 (80MHz 802.11ax/be (Full Tones) (UNII Band 5) – Ch. 39) - VLP



Plot 7-13. 26dB Bandwidth Plot MIMO ANT1 (160MHz 802.11ax/be (Full Tones) (UNII Band 5) – Ch. 47) - VLP

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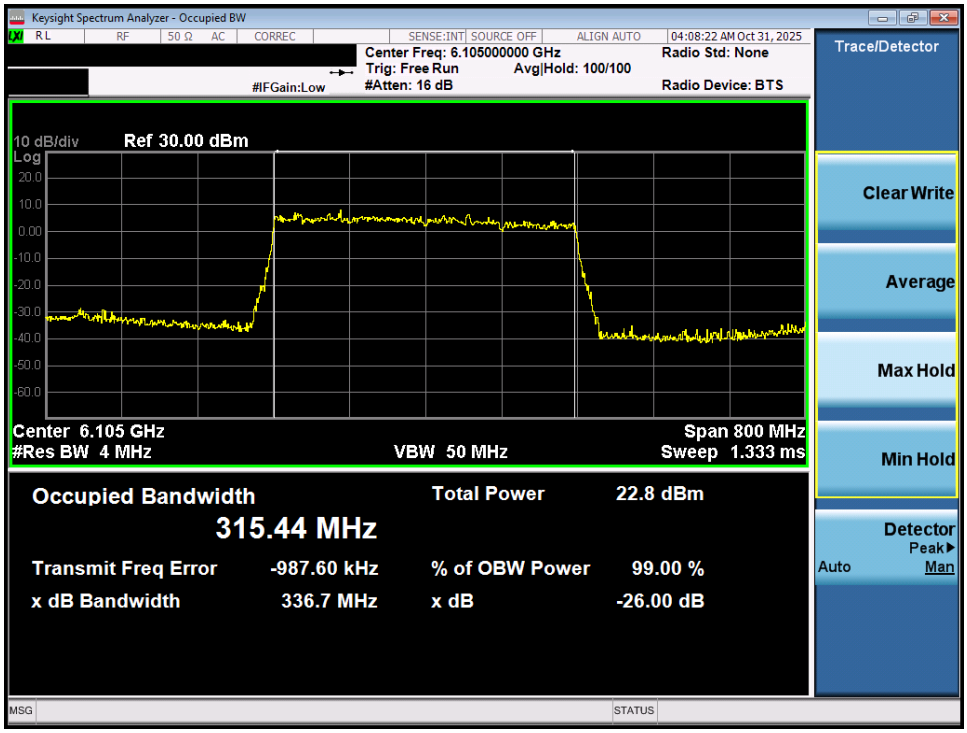

Plot 7-14. 26dB Bandwidth Plot MIMO ANT1 (320MHz 802.11be (Full Tones) (UNII Band 5) – Ch. 31) - VLP

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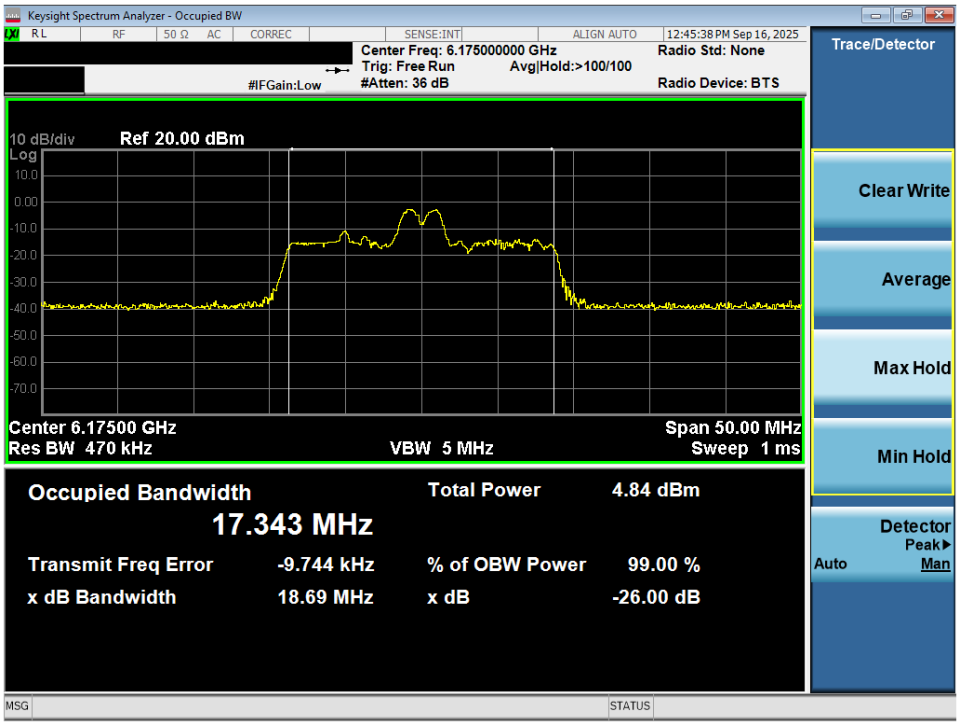
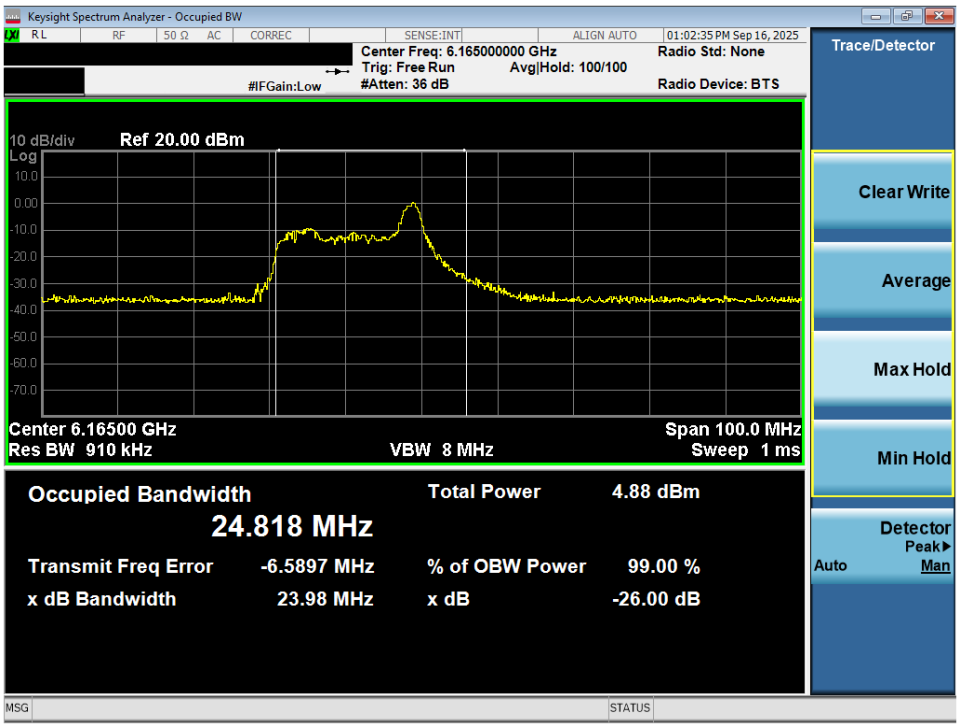
7.2.3 MIMO Antenna-2 Bandwidth Measurements – (Partial Tones)



Plot 7-15. 26dB Bandwidth Plot MIMO ANT2 (20MHz 802.11ax/be (26 Tones) (UNII Band 5) – Ch. 45) - VLP



Plot 7-16. 26dB Bandwidth Plot MIMO ANT2 (40MHz 802.11ax/be (26 Tones) (UNII Band 5) – Ch. 43) - VLP

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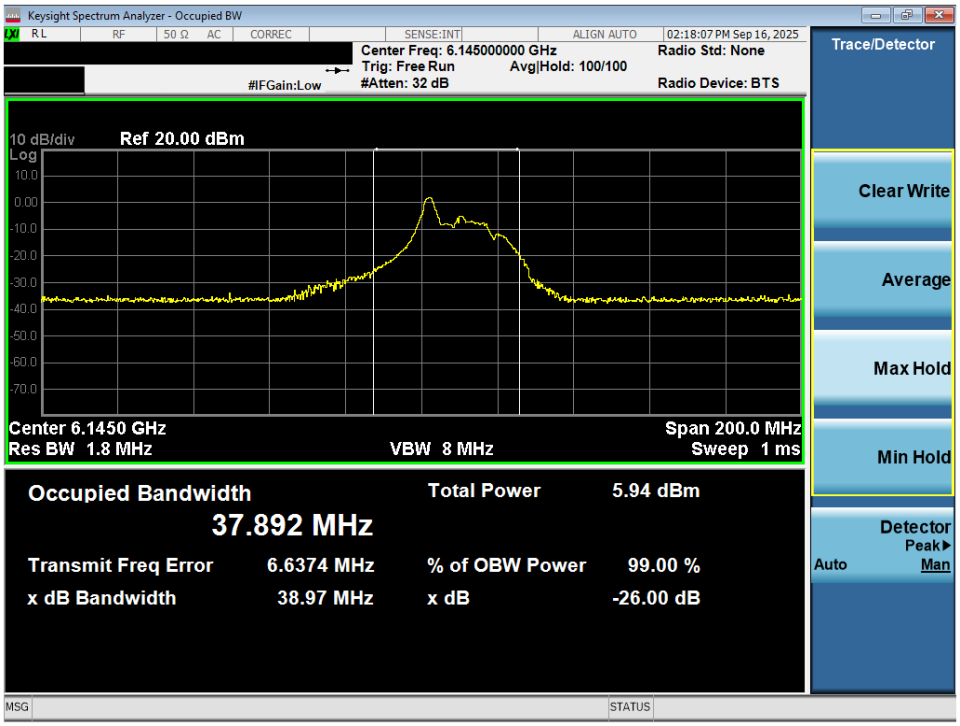
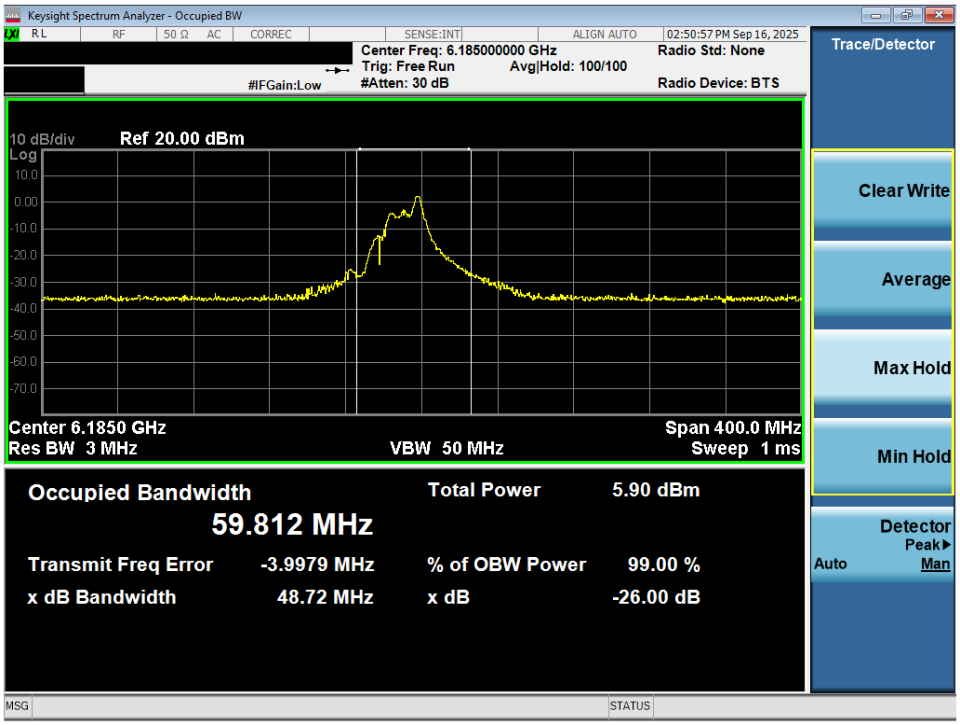


Plot 7-17. 26dB Bandwidth Plot MIMO ANT2 (80MHz 802.11ax/be (26 Tones) (UNII Band 5) – Ch. 39) - VLP



Plot 7-18. 26dB Bandwidth Plot MIMO ANT2 (160MHz 802.11ax/be (26 Tones) (UNII Band 5) – Ch. 47) - VLP

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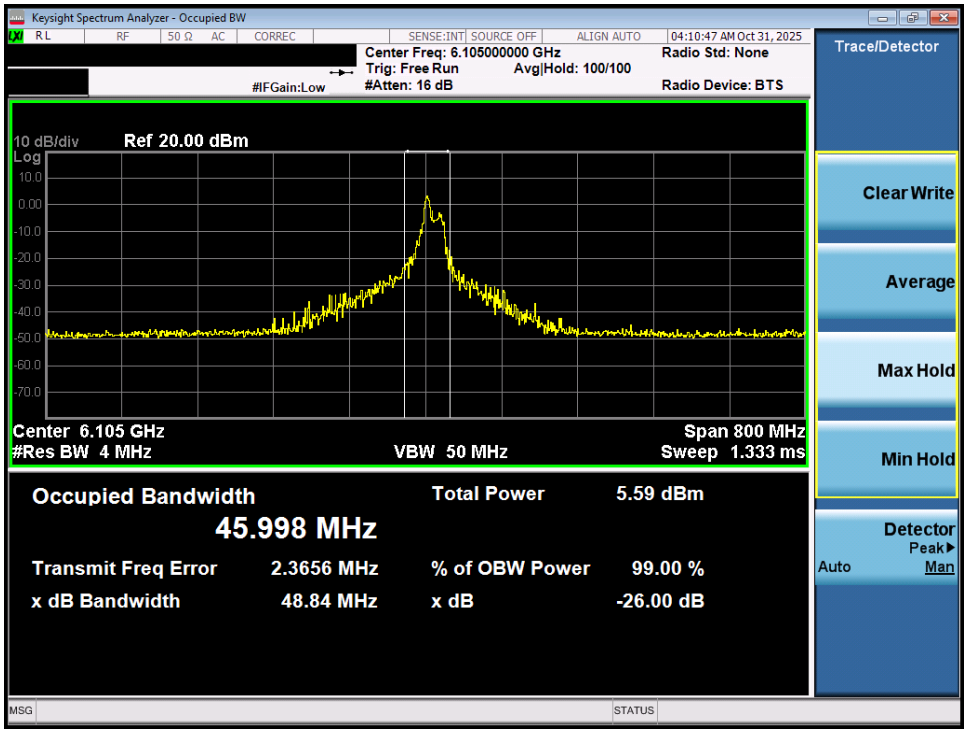
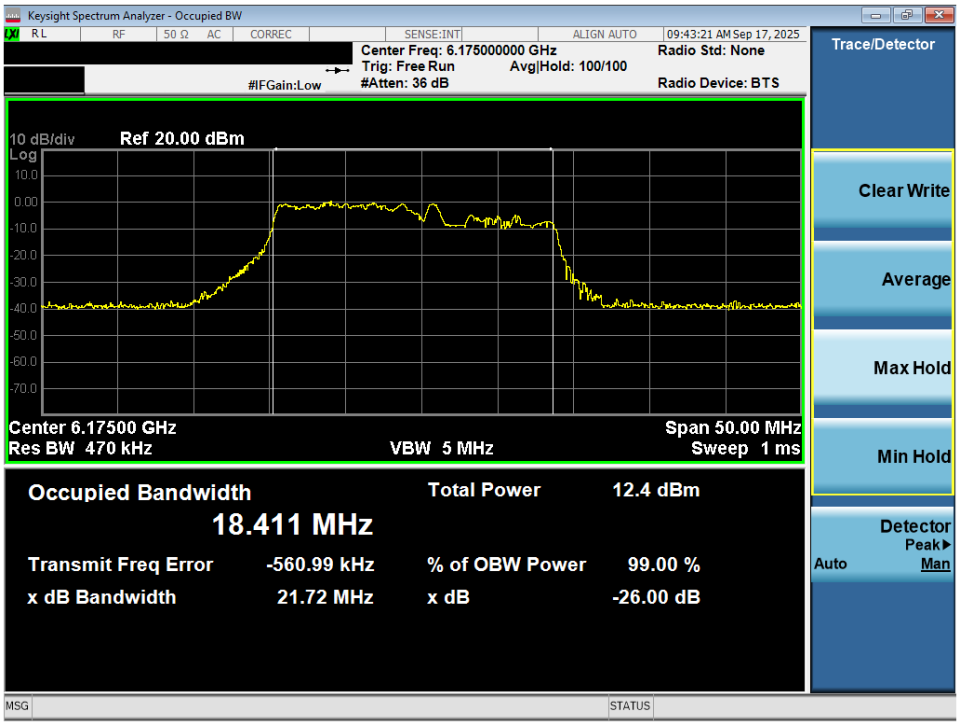


Plot 7-19. 26dB Bandwidth Plot MIMO ANT2 (320MHz 802.11be (26 Tones) (UNII Band 5) – Ch. 31) - VLP



Plot 7-20. 26dB Bandwidth Plot MIMO ANT2 (20MHz 802.11be (106+26 Tones) (UNII Band 5) – Ch. 45) - VLP

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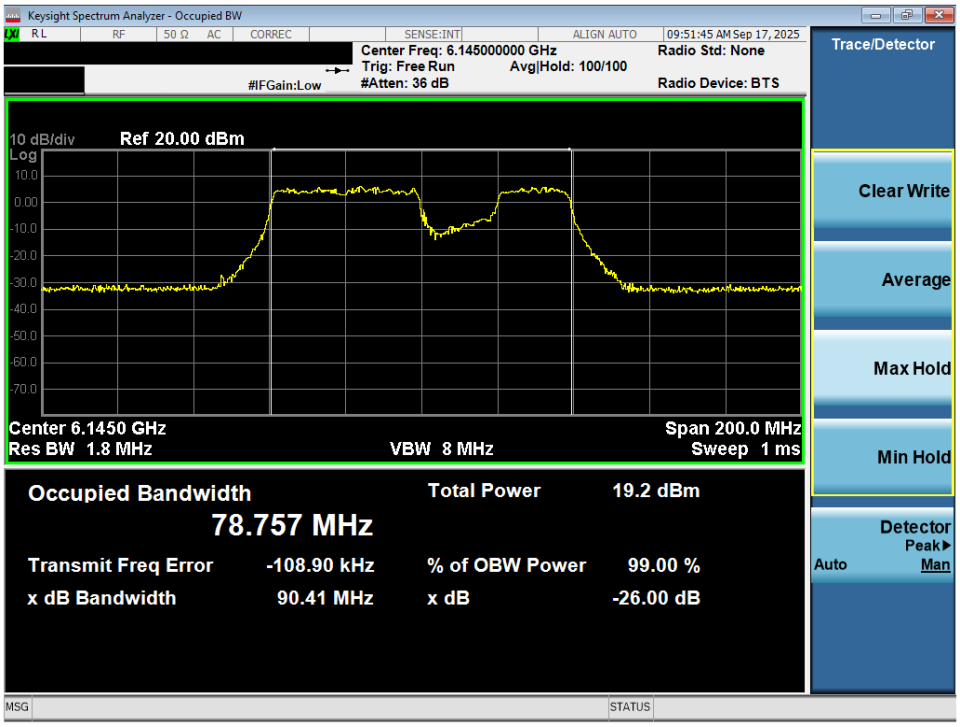
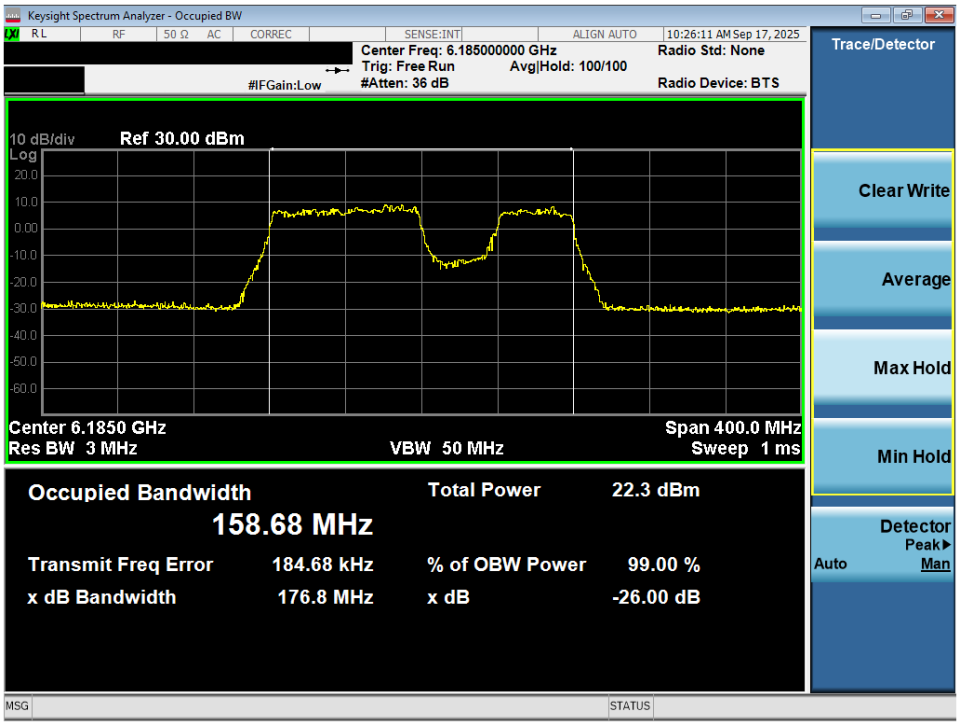


Plot 7-21. 26dB Bandwidth Plot MIMO ANT2 (80MHz 802.11be (484+242 Tones) (UNII Band 5) – Ch. 39) VLP



Plot 7-22. 26dB Bandwidth Plot MIMO ANT2 (160MHz 802.11be (996+484 Tones) (UNII Band 5) – Ch. 47) VLP

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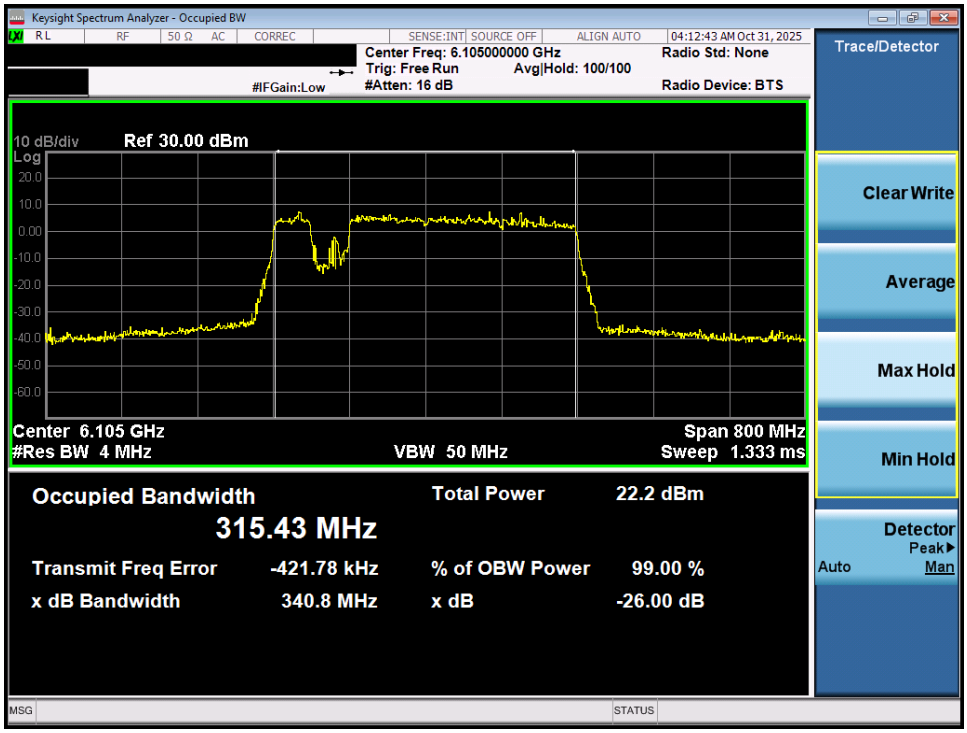

Plot 7-23. 26dB Bandwidth Plot MIMO ANT2 (320MHz 802.11be (3*996+484 Tones) (UNII Band 5) – Ch. 31) VLP

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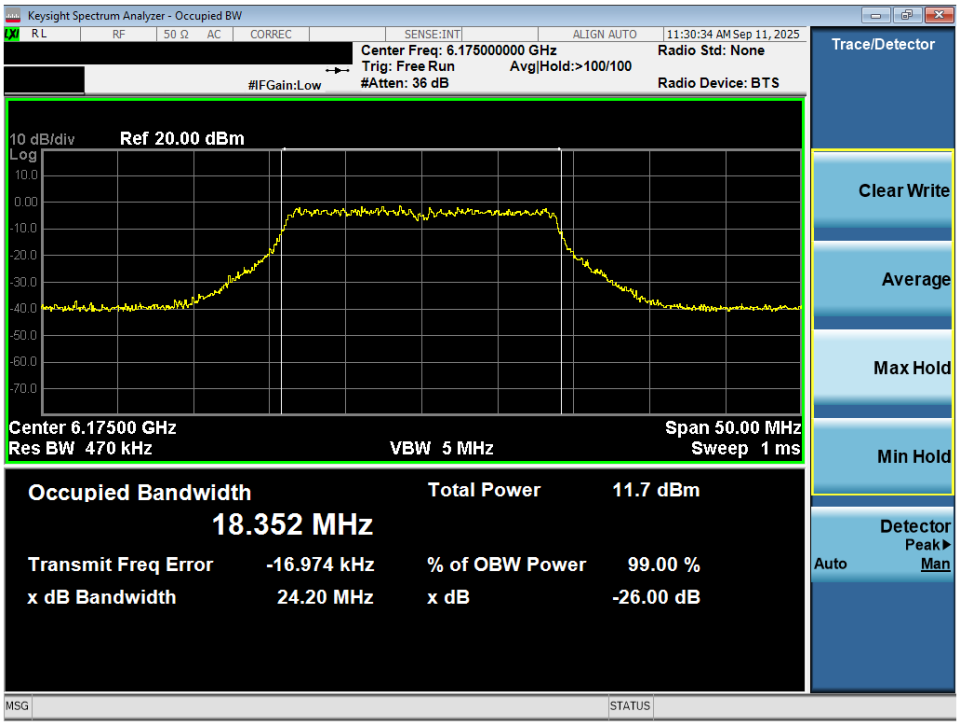
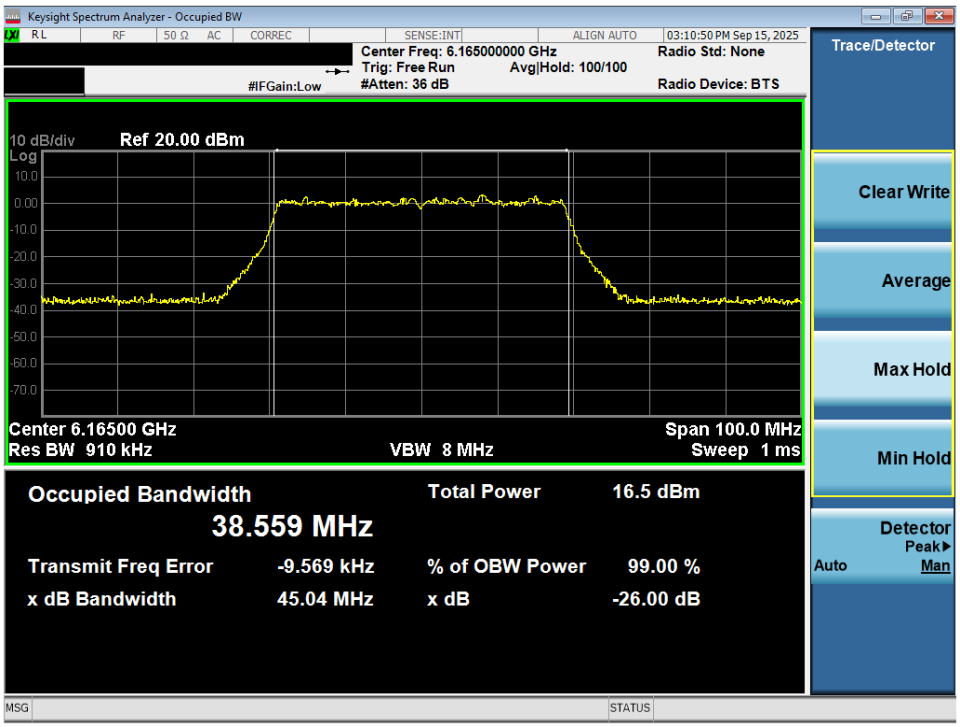
7.2.4 MIMO Antenna-2 Bandwidth Measurements – (Full Tones)



Plot 7-24. 26dB Bandwidth Plot MIMO ANT2 (20MHz 802.11ax/be (Full Tones) (UNII Band 5) – Ch. 45) - VLP



Plot 7-25. 26dB Bandwidth Plot MIMO ANT2 (40MHz 802.11ax/be (Full Tones) (UNII Band 5) – Ch. 43) - VLP

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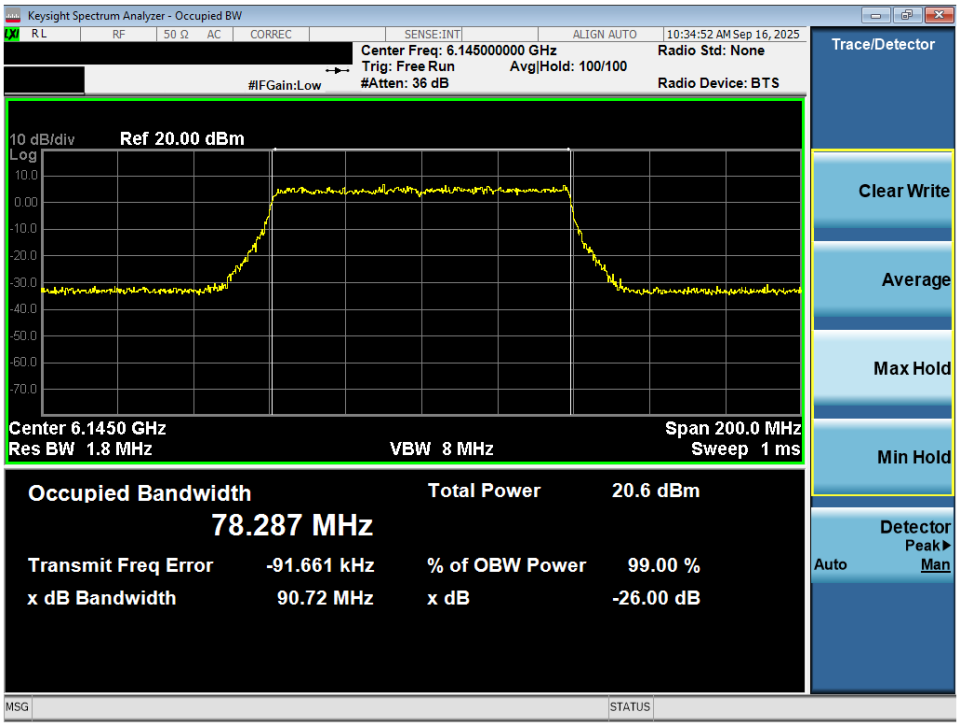
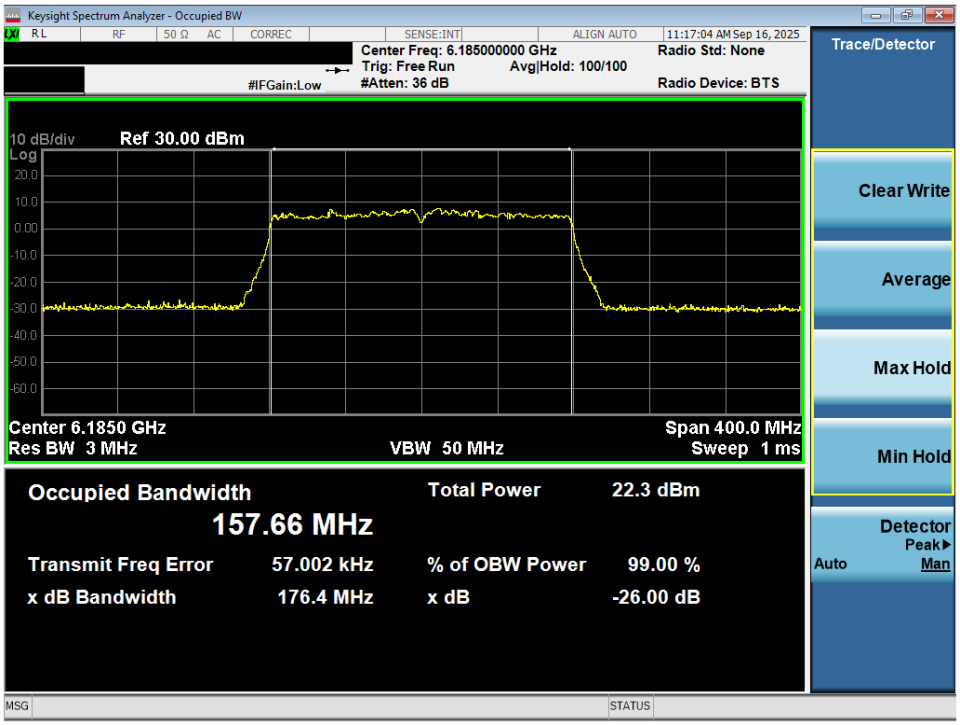


Plot 7-26. 26dB Bandwidth Plot MIMO ANT2 (80MHz 802.11ax/be (Full Tones) (UNII Band 5) – Ch. 39) - VLP



Plot 7-27. 26dB Bandwidth Plot MIMO ANT2 (160MHz 802.11ax/be (Full Tones) (UNII Band 5) – Ch. 47) - VLP

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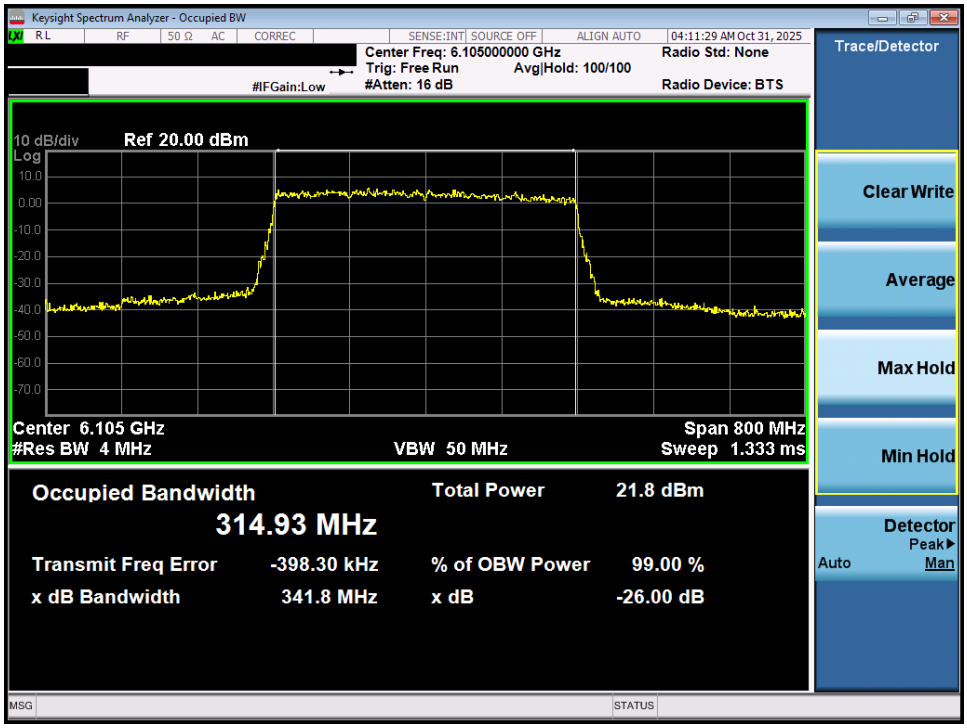

Plot 7-28. 26dB Bandwidth Plot MIMO ANT2 (320MHz 802.11be (Full Tones) (UNII Band 5) – Ch. 31) - VLP

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7.3 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 C63.10:2020, and at the appropriate frequencies.

For very low power devices operating in the 5.925-7.125 GHz band, the maximum power spectral density must not exceed −5 dBm e.i.r.p in any 1-megahertz band and the maximum e.i.r.p must not exceed 14 dBm.

Test Procedure Used

ANSI C63.10:2020 – Section 12.4.3.2 Method PM-G
ANSI C63.10:2020 – Section 14.5.2.3 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.

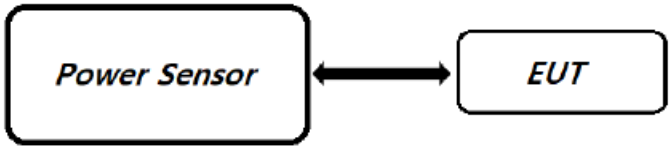

Figure 7-2. Test Instrument & Measurement Setup

Test Notes

The manufacturer assigns MRU target powers as such:

EHT320 Target power → RU 4*996
EHT160 Target power → RU2*996 / MRU 2*996+484 / MRU 3*996 / MRU3*996+484
EHT80 Target power → RU996 / MRU996+484 / MRU996+484+242
EHT40 Target power → RU484 / MRU 484+242
EHT20 Target power → RU242
RU106 = RU106 / MRU106+26
RU52 = RU52 / MRU 52+26
RU26 = RU26

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MIMO Maximum Conducted Output Power Measurements (26 Tones)

	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) RU Index 0 ANT1	0 ANT2	0 MIMO	4 ANT1	4 ANT2	4 MIMO	8 ANT1	8 ANT2	8 MIMO	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
20MHz BW	5	5935	2	26T	-4.01	-4.18	-1.09	-4.08	-4.40	-1.23	-4.11	-4.46	-1.27	-1.90	-2.99	14.00	-16.99
		6175	45	26T	-4.33	-5.10	-1.68	-4.01	-4.69	-1.33	-4.26	-5.14	-1.67	-1.90	-3.23	14.00	-17.23
		6415	93	26T	-4.01	-4.76	-1.36	-4.21	-4.68	-1.43	-4.16	-4.48	-1.30	-1.90	-3.21	14.00	-17.21
	6	6435	97	26T	-4.17	-4.76	-1.44	-4.29	-4.73	-1.50	-4.27	-4.53	-1.39	-2.22	-3.62	14.00	-17.62
		6475	105	26T	-4.15	-4.97	-1.53	-4.42	-4.97	-1.67	-4.32	-4.88	-1.58	-2.22	-3.76	14.00	-17.76
		6515	113	26T	-4.01	-4.31	-1.15	-4.11	-4.41	-1.25	-4.16	-4.34	-1.24	-2.22	-3.37	14.00	-17.37
	7	6535	117	26T	-4.02	-4.74	-1.35	-4.40	-4.87	-1.62	-4.18	-4.83	-1.48	-2.22	-3.58	14.00	-17.58
		6695	149	26T	-4.14	-4.12	-1.12	-4.21	-4.23	-1.21	-4.14	-4.18	-1.15	-2.22	-3.35	14.00	-17.35
		6875	185	26T	-4.15	-4.86	-1.48	-4.30	-4.99	-1.62	-4.29	-5.00	-1.62	-2.22	-3.70	14.00	-17.70
	8	6895	189	26T	-4.26	-4.95	-1.58	-4.01	-4.65	-1.31	-4.01	-4.67	-1.32	-2.14	-3.45	14.00	-17.45
		6995	209	26T	-4.35	-4.79	-1.55	-4.40	-5.03	-1.69	-4.01	-4.56	-1.26	-2.14	-3.40	14.00	-17.40
		7115	233	26T	-4.34	-4.18	-1.25	-4.42	-4.36	-1.38	-4.40	-4.35	-1.36	-2.14	-3.39	14.00	-17.39

Table 7-5. MIMO 20MHz BW 802.11ax/be (UNII) Maximum Conducted Output Power – VLP

MIMO Maximum Conducted Output Power Measurements (52 Tones)

	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) RU Index 37 ANT1	37 ANT2	37 MIMO	39 ANT1	39 ANT2	39 MIMO	40 ANT1	40 ANT2	40 MIMO	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
20MHz BW	5	5935	2	52T	-1.30	-1.42	1.65	-1.21	-1.33	1.74	-1.02	-1.15	1.93	-1.90	0.02	14.00	-13.98
		6175	45	52T	-1.01	-1.50	1.76	-1.28	-1.84	1.46	-1.01	-1.50	1.76	-1.90	-0.14	14.00	-14.14
		6415	93	52T	-1.22	-1.67	1.57	-1.07	-1.31	1.82	-1.31	-1.45	1.63	-1.90	-0.08	14.00	-14.08
	6	6435	97	52T	-1.21	-1.56	1.63	-1.09	-1.22	1.85	-1.30	-1.37	1.68	-2.22	-0.37	14.00	-14.37
		6475	105	52T	-1.12	-1.80	1.56	-1.01	-1.52	1.75	-1.25	-1.72	1.54	-2.22	-0.47	14.00	-14.47
		6515	113	52T	-1.01	-1.17	1.92	-1.33	-1.48	1.61	-1.06	-1.19	1.89	-2.22	-0.30	14.00	-14.30
	7	6535	117	52T	-1.11	-1.78	1.58	-1.02	-1.56	1.73	-1.26	-1.81	1.49	-2.22	-0.50	14.00	-14.50
		6695	149	52T	-1.04	-1.07	1.96	-1.05	-1.05	1.96	-1.06	-1.03	1.97	-2.22	-0.26	14.00	-14.26
		6875	185	52T	-1.34	-1.70	1.50	-1.22	-1.58	1.62	-1.01	-1.31	1.85	-2.22	-0.37	14.00	-14.37
	8	6895	189	52T	-1.01	-1.35	1.83	-1.26	-1.75	1.51	-1.05	-1.48	1.75	-2.14	-0.31	14.00	-14.31
		6995	209	52T	-1.34	-1.60	1.54	-1.14	-1.64	1.63	-1.42	-1.90	1.36	-2.14	-0.51	14.00	-14.51
		7115	233	52T	-1.25	-1.11	1.83	-1.11	-1.03	1.94	-1.31	-1.23	1.74	-2.14	-0.20	14.00	-14.20

Table 7-6. MIMO 20MHz BW 802.11ax/be (UNII) Maximum Conducted Output Power – VLP

MIMO Maximum Conducted Output Power Measurements (106 Tones)

	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) RU Index 53 ANT1	53 ANT2	53 MIMO	54 ANT1	54 ANT2	54 MIMO	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
20MHz BW	5	5935	2	106T	1.99	1.49	4.76	1.97	1.35	4.68	-1.90	2.85	14.00	-11.15
		6175	45	106T	1.76	1.08	4.44	1.80	1.09	4.47	-1.90	2.57	14.00	-11.43
		6415	93	106T	1.44	1.99	4.73	1.07	1.72	4.41	-1.90	2.83	14.00	-11.17
	6	6435	97	106T	0.90	1.95	4.47	0.89	1.99	4.48	-2.22	2.26	14.00	-11.74
		6475	105	106T	1.07	1.74	4.43	1.09	1.81	4.47	-2.22	2.25	14.00	-11.75
		6515	113	106T	1.69	1.77	4.74	1.67	1.89	4.79	-2.22	2.56	14.00	-11.44
	7	6535	117	106T	1.61	1.78	4.71	1.55	1.82	4.70	-2.22	2.48	14.00	-11.52
		6695	149	106T	1.05	1.79	4.45	1.11	1.72	4.44	-2.22	2.22	14.00	-11.78
		6875	185	106T	1.48	1.91	4.71	1.42	1.87	4.67	-2.22	2.48	14.00	-11.52
	8	6895	189	106T	1.58	1.99	4.80	1.48	1.96	4.74	-2.14	2.66	14.00	-11.34
		6995	209	106T	1.42	1.11	4.28	1.35	0.98	4.18	-2.14	2.14	14.00	-11.86
		7115	233	106T	1.01	1.18	4.10	1.00	1.05	4.03	-2.14	1.97	14.00	-12.03

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

MIMO Maximum Conducted Output Power Measurements (242 Tones)

	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) RU Index 61 ANT1	61 ANT2	61 MIMO	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
20MHz BW	5	5935	2	242T	4.63	3.93	7.31	-1.90	5.40	14.00	-8.60
		6175	45	242T	4.15	4.16	7.16	-1.90	5.26	14.00	-8.74
		6415	93	242T	4.35	4.96	7.67	-1.90	5.77	14.00	-8.23
	6	6435	97	242T	4.31	5.99	8.24	-2.22	6.02	14.00	-7.98
		6475	105	242T	4.55	5.20	7.90	-2.22	5.68	14.00	-8.32
		6515	113	242T	5.79	5.14	8.48	-2.22	6.26	14.00	-7.74
	7	6535	117	242T	5.73	5.12	8.45	-2.22	6.22	14.00	-7.78
		6695	149	242T	5.08	5.76	8.44	-2.22	6.22	14.00	-7.78
		6875	185	242T	5.64	5.99	8.83	-2.22	6.61	14.00	-7.39
	8	6895	189	242T	5.26	5.73	8.51	-2.14	6.37	14.00	-7.63
		6995	209	242T	5.07	5.81	8.47	-2.14	6.33	14.00	-7.67
		7115	233	242T	5.25	5.99	8.65	-2.14	6.51	14.00	-7.49

Table 7-8. MIMO 20MHz BW 802.11ax/be (UNII) Maximum Conducted Output Power – VLP

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MIMO Maximum Conducted Output Power Measurements (484 Tones)

	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) RU Index 65			Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
					ANT1	ANT2	MIMO				
40MHz BW	5	5965	3	484T	7.98	7.62	10.81	-1.90	8.91	14.00	-5.09
		6005	11	484T	7.87	7.47	10.69	-1.90	8.78	14.00	-5.22
		6165	43	484T	7.96	7.47	10.73	-1.90	8.83	14.00	-5.17
		6405	91	484T	7.90	8.99	11.49	-1.90	9.59	14.00	-4.41
	6	6445	99	484T	7.78	8.93	11.41	-2.22	9.18	14.00	-4.82
		6485	107	484T	8.00	8.57	11.30	-2.22	9.08	14.00	-4.92
		6525	115	484T	8.82	8.99	11.92	-2.22	9.69	14.00	-4.31
	7	6565	123	484T	8.23	8.60	11.43	-2.22	9.20	14.00	-4.80
		6685	147	484T	8.33	8.99	11.68	-2.22	9.46	14.00	-4.54
		6845	179	484T	8.14	8.74	11.46	-2.22	9.24	14.00	-4.76
	8	6885	187	484T	8.30	8.82	11.58	-2.14	9.44	14.00	-4.56
		7005	211	484T	8.19	8.97	11.60	-2.14	9.47	14.00	-4.53
		7085	227	484T	7.81	8.53	11.19	-2.14	9.06	14.00	-4.94

Table 7-9. MIMO 40MHz BW 802.11ax/be (UNII) Maximum Conducted Output Power – VLP

MIMO Maximum Conducted Output Power Measurements (996 Tones)

	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) RU Index 67			Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
					ANT1	ANT2	MIMO				
80MHz BW	5	5985	7	996T	11.68	11.30	14.50	-1.90	12.60	14.00	-1.40
		6145	39	996T	11.75	11.06	14.43	-1.90	12.52	14.00	-1.48
		6385	87	996T	11.11	11.99	14.58	-1.90	12.68	14.00	-1.32
	6	6465	103	996T	10.86	11.79	14.36	-2.22	12.13	14.00	-1.87
	7	6545	119	996T	11.49	11.70	14.61	-2.22	12.38	14.00	-1.62
		6705	151	996T	11.04	11.80	14.45	-2.22	12.22	14.00	-1.78
		6865	183	996T	11.40	11.89	14.66	-2.22	12.43	14.00	-1.57
	8	6945	199	996T	11.73	11.99	14.87	-2.14	12.73	14.00	-1.27
		7025	215	996T	11.17	11.99	14.61	-2.14	12.47	14.00	-1.53

Table 7-10. MIMO 80MHz BW 802.11ax/be (UNII) Maximum Conducted Output Power – VLP

MIMO Maximum Conducted Output Power Measurements (2x996 Tones)

	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) RU Index 68			Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
					ANT1	ANT2	MIMO				
160MHz BW	5	6025	15	2x996T	11.84	11.51	14.69	-1.90	12.79	14.00	-1.21
		6185	47	2x996T	11.97	11.42	14.71	-1.90	12.81	14.00	-1.19
		6345	79	2x996T	11.24	11.99	14.64	-1.90	12.74	14.00	-1.26
	6	6505	111	2x996T	11.73	11.87	14.81	-2.22	12.59	14.00	-1.41
	7	6665	143	2x996T	10.93	11.77	14.38	-2.22	12.16	14.00	-1.84
		6825	175	2x996T	11.50	11.84	14.68	-2.22	12.46	14.00	-1.54
	8	6985	207	2x996T	11.26	11.99	14.65	-2.14	12.51	14.00	-1.49

Table 7-11. MIMO 160MHz BW 802.11ax/be (UNII) Maximum Conducted Output Power – VLP

MIMO Maximum Conducted Output Power Measurements (4x996 Tones)

	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) RU Index 69			Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
					ANT1	ANT2	MIMO				
320MHz BW	5	6105	31	4x996T	11.27	11.45	14.37	-1.90	12.47	14.00	-1.53
		6265	63	4x996T	10.29	11.42	13.90	-1.90	12.00	14.00	-2.00
	6	6425	95	4x996T	11.97	11.90	14.94	-2.22	12.72	14.00	-1.28
	7	6585	127	4x996T	11.24	11.91	14.60	-2.22	12.38	14.00	-1.62
		6745	159	4x996T	11.54	11.31	14.44	-2.22	12.21	14.00	-1.79
	8	6905	191	4x996T	11.93	11.70	14.83	-2.14	12.69	14.00	-1.31

Table 7-12. MIMO 320MHz BW 802.11be (UNII) Maximum Conducted Output Power – VLP

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MIMO Maximum Conducted Output Power Measurements (MRU)

20MHz BW	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) MRU Index 70 ANT1	70 ANT2	70 MIMO	71 ANT1	71 ANT2	71 MIMO	72 ANT1	72 ANT2	72 MIMO	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
	5	6175	45	52+26T	-1.35	-1.62	1.53	-1.35	-1.65	1.52	-1.26	-1.52	1.62	-1.90	-0.28	14.00	-14.28
	6	6475	105	52+26T	-1.56	-1.05	1.71	-1.62	-1.14	1.64	-1.46	-1.13	1.72	-2.22	-0.51	14.00	-14.51
	7	6695	149	52+26T	-1.01	-1.33	1.84	-1.09	-1.45	1.75	-1.03	-1.42	1.79	-2.22	-0.38	14.00	-14.38
	8	6995	209	52+26T	-1.08	-1.27	1.84	-1.21	-1.36	1.73	-1.29	-1.28	1.72	-2.14	-0.30	14.00	-14.30

Table 7-13. MIMO 20MHz BW 802.11be (UNII) Maximum Conducted Output Power (52+26 Tones) – VLP

20MHz BW	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) MRU Index 82 ANT1	82 ANT2	82 MIMO	83 ANT1	83 ANT2	83 MIMO	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
	5	6175	45	106+26T	1.62	1.52	4.58	1.60	1.51	4.57	-1.90	2.67	14.00	-11.33
	6	6475	105	106+26T	1.78	0.93	4.38	1.87	0.90	4.42	-2.22	2.20	14.00	-11.80
	7	6695	149	106+26T	1.99	1.03	4.55	1.99	1.01	4.54	-2.22	2.32	14.00	-11.68
	8	6995	209	106+26T	1.36	1.30	4.34	1.26	1.21	4.25	-2.14	2.20	14.00	-11.80

Table 7-14. MIMO 20MHz BW 802.11be (UNII) Maximum Conducted Output Power (106+26 Tones) – VLP

80MHz BW	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) MRU Index 90 ANT1	90 ANT2	90 MIMO	91 ANT1	91 ANT2	91 MIMO	93 ANT1	93 ANT2	93 MIMO	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
	5	5985	7	242+484T	7.72	7.32	10.53	7.86	7.42	10.66	7.93	7.68	10.82	-1.90	8.91	14.00	-5.09
		6145	39	242+484T	7.83	7.17	10.52	7.89	7.23	10.59	7.96	7.20	10.61	-1.90	8.70	14.00	-5.30
		6385	87	242+484T	6.81	7.74	10.31	6.72	7.70	10.25	6.80	7.70	10.28	-1.90	8.41	14.00	-5.59
	6	6465	103	242+484T	8.01	8.76	11.41	8.05	8.90	11.51	8.17	8.90	11.56	-2.22	9.34	14.00	-4.66
	7	6545	119	242+484T	8.58	8.83	11.72	8.60	8.80	11.71	8.75	8.94	11.85	-2.22	9.63	14.00	-4.37
		6705	151	242+484T	8.16	8.89	11.55	8.26	8.93	11.62	8.36	8.99	11.70	-2.22	9.47	14.00	-4.53
		6865	183	242+484T	8.49	8.93	11.72	8.57	8.94	11.77	8.71	8.99	11.86	-2.22	9.64	14.00	-4.36
	8	6945	199	242+484T	8.36	7.61	11.01	8.41	8.81	11.63	8.60	8.99	11.81	-2.14	9.67	14.00	-4.33
		7025	215	242+484T	8.30	8.99	11.67	7.91	8.66	11.31	8.05	8.85	11.48	-2.14	9.53	14.00	-4.47

Table 7-15. MIMO 80MHz BW 802.11be (UNII) Maximum Conducted Output Power (484+242 Tones) – VLP

160MHz BW	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) MRU Index 94 ANT1	94 ANT2	94 MIMO	95 ANT1	95 ANT2	95 MIMO	1095 ANT1	1095 ANT2	1095 MIMO	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
	5	6025	15	996+484T	11.55	11.93	14.75	11.89	11.99	14.95	11.78	11.92	14.86	-1.90	13.05	14.00	-0.95
		6185	47	996+484T	11.46	11.59	14.53	11.59	11.86	14.73	11.77	11.99	14.89	-1.90	12.99	14.00	-1.01
		6345	79	996+484T	11.86	10.93	14.43	11.54	10.60	14.11	11.68	10.95	14.34	-1.90	12.53	14.00	-1.47
	6	6505	111	996+484T	11.87	11.95	14.92	11.54	11.62	14.59	11.87	11.95	14.92	-2.22	12.70	14.00	-1.30
	7	6665	143	996+484T	11.74	11.24	14.51	11.99	11.44	14.73	11.86	11.24	14.57	-2.22	12.51	14.00	-1.49
		6825	175	996+484T	11.68	11.79	14.74	11.94	11.99	14.97	11.86	11.80	14.84	-2.22	12.75	14.00	-1.25
	8	6985	207	996+484T	11.80	11.44	14.64	11.61	11.11	14.38	11.99	11.49	14.76	-2.14	12.62	14.00	-1.38

Table 7-16. MIMO 160MHz BW 802.11be (UNII) Maximum Conducted Output Power (996+484 Tones) – VLP

320MHz BW	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) MRU Index 100 ANT1	100 ANT2	100 MIMO	101 ANT1	101 ANT2	101 MIMO	11102 ANT1	11102 ANT2	11102 MIMO	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
	5	6105	31	2x996+484T	11.64	11.05	14.36	11.75	10.84	14.33	11.83	11.00	14.45	-1.90	12.54	14.00	-1.46
		6265	63	2x996+484T	11.93	10.76	14.39	11.83	10.68	14.30	11.97	10.68	14.38	-1.90	12.49	14.00	-1.51
	6	6425	95	2x996+484T	11.73	11.57	14.66	11.63	11.44	14.54	11.60	11.46	14.54	-2.22	12.43	14.00	-1.57
	7	6585	127	2x996+484T	11.69	11.59	14.65	11.95	10.90	14.47	11.87	11.09	14.51	-2.22	12.43	14.00	-1.57
		6745	159	2x996+484T	11.99	11.94	14.97	11.63	11.57	14.61	11.51	11.46	14.50	-2.22	12.75	14.00	-1.25
	8	6905	191	2x996+484T	11.96	11.99	14.98	11.86	11.92	14.90	11.32	11.41	14.38	-2.14	12.85	14.00	-1.15

Table 7-17. MIMO 320MHz BW 802.11be (UNII) Maximum Conducted Output Power (2*996+484 Tones) – VLP

320MHz BW	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) MRU Index 104 ANT1	104 ANT2	104 MIMO	10104 ANT1	10104 ANT2	10104 MIMO	11104 ANT1	11104 ANT2	11104 MIMO	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
	5	6105	31	3x996T	11.69	10.88	14.31	11.70	11.00	14.37	11.86	11.24	14.57	-1.90	12.67	14.00	-1.33
		6265	63	3x996T	11.99	10.57	14.35	11.91	10.95	14.47	11.99	11.00	14.53	-1.90	12.63	14.00	-1.37
	6	6425	95	3x996T	11.85	11.71	14.79	11.88	11.97	14.94	11.91	11.77	14.85	-2.22	12.71	14.00	-1.29
	7	6585	127	3x996T	11.70	10.83	14.30	11.99	11.15	14.60	11.84	10.84	14.38	-2.22	12.38	14.00	-1.62
		6745	159	3x996T	11.90	11.94	14.93	11.73	11.76	14.75	11.99	11.93	14.97	-2.22	12.74	14.00	-1.26
	8	6905	191	3x996T	11.96	11.99	14.99	11.44	11.64	14.55	11.71	11.82	14.78	-2.14	12.85	14.00	-1.15

Table 7-18. MIMO 320MHz BW 802.11be (UNII) Maximum Conducted Output Power (3*996 Tones) – VLP

320MHz BW	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) MRU Index 105 ANT1	105 ANT2	105 MIMO	106 ANT1	106 ANT2	106 MIMO	11105 ANT1	11105 ANT2	11105 MIMO	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
	5	6105	31	3x996+484T	11.95	11.19	14.60	11.88	11.07	14.51	11.80	11.32	14.58	-1.90	12.69	14.00	-1.31
		6265	63	3x996+484T	11.99	10.86	14.47	11.99	10.75	14.42	11.99	11.06	14.56	-1.90	12.66	14.00	-1.34
	6	6425	95	3x996+484T	11.78	11.69	14.74	11.69	11.65	14.68	11.42	11.49	14.47	-2.22	12.52	14.00	-1.48
	7	6585	127	3x996+484T	11.82	11.23	14.55	11.99	11.18	14.61	11.85	10.77	14.35	-2.22	12.39	14.00	-1.61
		6745	159	3x996+484T	11.78	11.76	14.78	11.62	11.56	14.60	11.93	11.95	14.95	-2.22	12.73	14.00	-1.27
	8	6905	191	3x996+484T	11.49	11.64	14.58	11.38	11.43	14.41	11.66	11.85	14.77	-2.14	12.63	14.00	-1.37

Table 7-19. MIMO 320MHz BW 802.11be (UNII) Maximum Conducted Output Power (3*996+484 Tones) – VLP

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Sample MIMO Calculation:

At 5935MHz in 802.11ax (20MHz BW – 26 Tones) mode, the average conducted output power was measured to be –4.01 dBm for Antenna-1 and -4.18 dBm for Antenna-2.

Antenna 1 + Antenna 2 = MIMO

(-4.01 dBm + -4.18 dBm) = (0.397 mW + 0.382 mW) = 0.779 mW = -1.09 dBm

Sample Directional Gain Calculation:

Per ANSI C63.10:2020 Section 14.6.3, 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.

$$\text{Directional gain} = 10 \log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}] \text{ dBi}$$

Sample e.i.r.p. Calculation:

At 5935MHz in 802.11ax (20MHz BW – 26 Tones) mode, the average MIMO conducted power was calculated to be -1.09 dBm with directional gain of -1.90 dBi.

e.i.r.p. (dBm) = Conducted Power (dBm) + Ant gain (dBi)

-1.09 dBm + -1.90 dBi = -2.99 dBm

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7.4 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 C63.10:2020, and at the appropriate frequencies. Method SA-1, as defined in ANSI C63.10:2020, was used to measure the power spectral density.

For very low power devices operating in the 5.925-7.125 GHz band, the maximum power spectral density must not exceed −5 dBm e.i.r.p in any 1-megahertz band and the maximum e.i.r.p must not exceed 14 dBm.

Test Procedure Used

ANSI C63.10:2020 – Section 12.4.2.2
ANSI C63.10:2020 – Section 14.5.2.3 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 ≥ 2 x (span/RBW)
6. Sweep time = auto
7. Detector = power averaging (RMS)
8. Trigger was set to free run for all modes
9. Trace was averaged over 100 sweeps
10. The peak search function of the spectrum analyzer was used to find the peak of the spectrum.

Test Setup

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

Figure 7-3. Test Instrument & Measurement Setup

Test Notes

None.

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MIMO Power Spectral Density Measurements

	Frequency [MHz]	Channel	802.11 MODE	Antenna-1 Power Density [dBm/MHz]	Antenna-2 Power Density [dBm/MHz]	Antenna-1 Gain [dBi]	Antenna-2 Gain [dBi]	Summed MIMO Power Density [dBm/MHz]	Directional Gain [dBi]	DCCF	EIRP Density [dBm/MHz]	EIRP Density Limit [dBm/MHz]	Margin [dB]
Band 5	5935	2	be (20MHz)	-7.03	-8.72	-4.86	-4.97	-4.78	-1.90	0.00	-6.68	-5	-1.68
	6175	45	be (20MHz)	-7.57	-7.58	-4.86	-4.97	-4.56	-1.90	0.00	-6.47	-5	-1.47
	6415	93	be (20MHz)	-7.52	-9.04	-4.86	-4.97	-5.21	-1.90	0.00	-7.11	-5	-2.11
	5965	3	be (40MHz)	-6.70	-8.52	-4.86	-4.97	-4.50	-1.90	0.10	-6.31	-5	-1.31
	6165	43	be (40MHz)	-7.01	-8.31	-4.86	-4.97	-4.60	-1.90	0.10	-6.40	-5	-1.40
	6405	91	be (40MHz)	-6.95	-7.98	-4.86	-4.97	-4.42	-1.90	0.10	-6.23	-5	-1.23
	5985	7	be (80MHz)	-5.92	-7.18	-4.86	-4.97	-3.49	-1.90	0.10	-5.29	-5	-0.29
	6145	39	be (80MHz)	-5.87	-7.36	-4.86	-4.97	-3.54	-1.90	0.10	-5.35	-5	-0.35
	6385	87	be (80MHz)	-5.99	-6.91	-4.86	-4.97	-3.42	-1.90	0.10	-5.22	-5	-0.22
	6025	15	be (160MHz)	-5.78	-8.02	-4.86	-4.97	-3.74	-1.90	0.00	-5.65	-5	-0.65
	6185	47	be (160MHz)	-7.15	-7.28	-4.86	-4.97	-4.20	-1.90	0.00	-6.11	-5	-1.11
	6345	79	be (160MHz)	-7.52	-6.56	-4.86	-4.97	-4.00	-1.90	0.00	-5.90	-5	-0.90
	6105	31	be (320MHz)	-7.09	-8.84	-4.86	-4.97	-4.87	-1.90	0.00	-6.77	-5	-1.77
	6265	63	be (320MHz)	-7.47	-10.84	-4.86	-4.97	-5.82	-1.90	0.00	-7.73	-5	-2.73
Band 6	6435	97	be (20MHz)	-7.54	-8.85	-5.12	-5.35	-5.13	-2.22	0.00	-7.36	-5	-2.36
	6475	105	be (20MHz)	-7.67	-8.55	-5.12	-5.35	-5.08	-2.22	0.00	-7.30	-5	-2.30
	6515	113	be (20MHz)	-7.23	-8.56	-5.12	-5.35	-4.83	-2.22	0.00	-7.06	-5	-2.06
	6445	99	be (40MHz)	-7.09	-8.32	-5.12	-5.35	-4.65	-2.22	0.10	-6.78	-5	-1.78
	6485	107	be (40MHz)	-6.75	-7.73	-5.12	-5.35	-4.20	-2.22	0.10	-6.33	-5	-1.33
	6525	115	be (40MHz)	-6.59	-8.12	-5.12	-5.35	-4.28	-2.22	0.10	-6.40	-5	-1.40
	6465	103	be (80MHz)	-5.18	-7.62	-5.12	-5.35	-3.22	-2.22	0.10	-5.34	-5	-0.34
	6505	111	be (160MHz)	-5.45	-6.76	-5.12	-5.35	-3.05	-2.22	0.00	-5.27	-5	-0.27
Band 5/6/7	6425	95	be (320MHz)	-6.82	-7.11	-4.86	-4.97	-3.95	-1.90	0.00	-5.86	-5	-0.86
Band 7	6695	117	be (20MHz)	-6.90	-8.47	-5.12	-5.35	-4.60	-2.22	0.00	-6.82	-5	-1.82
	6695	149	be (20MHz)	-7.15	-9.05	-5.12	-5.35	-4.99	-2.22	0.00	-7.21	-5	-2.21
	6875	185	be (20MHz)	-7.11	-8.30	-5.12	-5.35	-4.66	-2.22	0.00	-6.88	-5	-1.88
	6565	123	be (40MHz)	-6.76	-7.84	-5.12	-5.35	-4.26	-2.22	0.10	-6.38	-5	-1.38
	6725	155	be (40MHz)	-6.83	-8.42	-5.12	-5.35	-4.54	-2.22	0.10	-6.66	-5	-1.66
	6845	179	be (40MHz)	-6.54	-7.37	-5.12	-5.35	-3.93	-2.22	0.10	-6.05	-5	-1.05
	6545	119	be (80MHz)	-5.37	-6.98	-5.12	-5.35	-3.09	-2.22	0.10	-5.22	-5	-0.22
	6705	151	be (80MHz)	-6.26	-7.64	-5.12	-5.35	-3.88	-2.22	0.10	-6.01	-5	-1.01
	6865	183	be (80MHz)	-5.39	-7.51	-5.12	-5.35	-3.31	-2.22	0.10	-5.44	-5	-0.44
	6665	143	be (160MHz)	-5.89	-8.17	-5.12	-5.35	-3.87	-2.22	0.00	-6.10	-5	-1.10
	6825	175	be (160MHz)	-5.75	-7.13	-5.12	-5.35	-3.37	-2.22	0.00	-5.60	-5	-0.60
Band 6/7	6585	127	be (320MHz)	-6.50	-7.47	-5.12	-5.35	-3.95	-2.22	0.00	-6.17	-5	-1.17
Band 7/8	6745	159	be (320MHz)	-6.81	-7.92	-5.02	-5.28	-4.32	-2.14	0.00	-6.46	-5	-1.46
Band 8	6895	189	be (20MHz)	-7.37	-8.36	-5.02	-5.28	-4.83	-2.14	0.00	-6.97	-5	-1.97
	6995	209	be (20MHz)	-6.43	-7.77	-5.02	-5.28	-4.04	-2.14	0.00	-6.18	-5	-1.18
	7115	233	be (20MHz)	-6.14	-8.34	-5.02	-5.28	-4.09	-2.14	0.00	-6.23	-5	-1.23
	6885	187	be (40MHz)	-6.68	-7.63	-5.02	-5.28	-4.12	-2.14	0.10	-6.15	-5	-1.15
	6965	211	be (40MHz)	-6.15	-7.43	-5.02	-5.28	-3.73	-2.14	0.10	-5.77	-5	-0.77
	7085	227	be (40MHz)	-4.96	-7.89	-5.02	-5.28	-3.17	-2.14	0.10	-5.21	-5	-0.21
	6945	199	be (80MHz)	-6.37	-5.92	-5.02	-5.28	-3.13	-2.14	0.10	-5.16	-5	-0.16
	7025	215	be (80MHz)	-6.87	-8.68	-5.02	-5.28	-4.67	-2.14	0.10	-6.71	-5	-1.71
	6985	207	be (160MHz)	-5.60	-7.09	-5.02	-5.28	-3.27	-2.14	0.00	-5.41	-5	-0.41
Band 7/8	6985	191	be (320MHz)	-7.58	-8.25	-5.02	-5.28	-4.89	-2.14	0.00	-7.03	-5	-2.03

Table 7-20. MIMO e.i.r.p. Conducted Power Spectral Density Measurements (26 Tones) – VLP

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	Frequency [MHz]	Channel	802.11 MODE	MRU Cases	Antenna-1 Power Density [dBm/MHz]	Antenna-2 Power Density [dBm/MHz]	Antenna-1 Gain [dBi]	Antenna-2 Gain [dBi]	Summed MIMO Power Density [dBm/MHz]	Directional Gain [dBi]	DCCF	EIRP Density [dBm/MHz]	EIRP Density Limit [dBm/MHz]	Margin [dB]
Band 5	6175	45	be (20MHz)	52+26T	-8.02	-9.73	-4.86	-4.97	-5.78	-1.90	0.00	-7.68	-5	-2.68
	6175	45	be (20MHz)	106+26T	-6.28	-6.62	-4.86	-4.97	-3.43	-1.90	0.00	-5.34	-5	-0.34
	6145	39	be (80MHz)	484+242T	-6.96	-7.39	-4.86	-4.97	-4.16	-1.90	0.00	-6.07	-5	-1.07
	6185	47	be (160MHz)	996+484T	-6.66	-6.96	-4.86	-4.97	-3.80	-1.90	0.00	-5.71	-5	-0.71
	6105	31	be (320MHz)	3x996+484T	-10.07	-9.79	-4.86	-4.97	-6.92	-1.90	0.12	-8.70	-5	-3.70
	6105	31	be (320MHz)	3x996T	-9.66	-9.92	-4.86	-4.97	-6.78	-1.90	0.09	-8.59	-5	-3.59
	6105	31	be (320MHz)	2x996+484T	-8.83	-9.46	-4.86	-4.97	-6.12	-1.90	0.09	-7.94	-5	-2.94
Band 6	6475	105	be (20MHz)	52+26T	-7.82	-8.85	-4.86	-4.97	-5.29	-1.90	0.00	-7.20	-5	-2.20
	6475	105	be (20MHz)	106+26T	-6.33	-7.45	-4.86	-4.97	-3.84	-1.90	0.00	-5.74	-5	-0.74
	6465	103	be (80MHz)	484+242T	-6.56	-7.92	-4.86	-4.97	-4.18	-1.90	0.00	-6.08	-5	-1.08
	6505	111	be (160MHz)	996+484T	-6.54	-7.02	-4.86	-4.97	-3.76	-1.90	0.00	-5.67	-5	-0.67
Band 5/6/7	6425	95	be (320MHz)	3x996+484T	-10.07	-11.21	-4.86	-4.97	-7.60	-1.90	0.12	-9.38	-5	-4.38
	6425	95	be (320MHz)	3x996T	-10.04	-10.98	-4.86	-4.97	-7.47	-1.90	0.09	-9.29	-5	-4.29
	6425	95	be (320MHz)	2x996+484T	-9.08	-10.29	-4.86	-4.97	-6.63	-1.90	0.09	-8.44	-5	-3.44
Band 7	6695	149	be (20MHz)	52+26T	-7.79	-9.36	-5.12	-5.35	-5.49	-2.22	0.00	-7.72	-5	-2.72
	6695	149	be (20MHz)	106+26T	-5.81	-7.09	-5.12	-5.35	-3.39	-2.22	0.00	-5.62	-5	-0.62
	6705	151	be (80MHz)	484+242T	-6.48	-7.31	-5.12	-5.35	-3.87	-2.22	0.00	-6.09	-5	-1.09
	6665	143	be (160MHz)	996+484T	-6.58	-7.56	-5.12	-5.35	-4.03	-2.22	0.00	-6.25	-5	-1.25
Band 7/8	6745	159	be (320MHz)	3x996+484T	-9.58	-10.54	-5.02	-5.28	-7.02	-2.14	0.12	-9.04	-5	-4.04
	6745	159	be (320MHz)	3x996T	-8.87	-9.65	-5.02	-5.28	-6.23	-2.14	0.09	-8.28	-5	-3.28
	6745	159	be (320MHz)	2x996+484T	-8.50	-9.59	-5.02	-5.28	-6.00	-2.14	0.09	-8.05	-5	-3.05
Band 8	6995	209	be (20MHz)	52+26T	-7.06	-8.25	-5.02	-5.28	-4.60	-2.14	0.00	-6.74	-5	-1.74
	6995	209	be (20MHz)	106+26T	-6.48	-7.73	-5.02	-5.28	-4.05	-2.14	0.00	-6.18	-5	-1.18
	6945	199	be (80MHz)	484+242T	-6.05	-6.46	-5.02	-5.28	-3.24	-2.14	0.00	-5.38	-5	-0.38
	6985	207	be (160MHz)	996+484T	-6.13	-7.11	-5.02	-5.28	-3.58	-2.14	0.00	-5.72	-5	-0.72
Band 7/8	6905	191	be (320MHz)	3x996+484T	-9.78	-9.54	-5.02	-5.28	-6.65	-2.14	0.12	-8.67	-5	-3.67
	6905	191	be (320MHz)	3x996T	-8.73	-8.60	-5.02	-5.28	-5.66	-2.14	0.09	-7.70	-5	-2.70
	6905	191	be (320MHz)	2x996+484T	-8.50	-8.67	-5.02	-5.28	-5.57	-2.14	0.09	-7.62	-5	-2.62

Table 7-21. MIMO e.i.r.p. Conducted Power Spectral Density Measurements (MRU Cases) – VLP

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	Frequency [MHz]	Channel	802.11 MODE	Antenna-1 Power Density [dBm/MHz]	Antenna-2 Power Density [dBm/MHz]	Antenna-1 Gain [dBi]	Antenna-2 Gain [dBi]	Summed MIMO Power Density [dBm/MHz]	Directional Gain [dBi]	EIRP Density [dBm/MHz]	EIRP Density Limit [dBm/MHz]	Margin [dB]
Band 5	5935	2	be (20MHz)	-5.32	-5.45	-4.86	-4.97	-2.37	-1.90	-5.22	-5	-0.22
	6175	45	be (20MHz)	-6.78	-7.86	-4.86	-4.97	-4.28	-1.90	-6.18	-5	-1.18
	6415	93	be (20MHz)	-6.82	-8.08	-4.86	-4.97	-4.39	-1.90	-6.30	-5	-1.30
	5965	3	be (40MHz)	-6.21	-6.88	-4.86	-4.97	-3.52	-1.90	-5.43	-5	-0.43
	6165	43	be (40MHz)	-6.44	-6.70	-4.86	-4.97	-3.55	-1.90	-5.46	-5	-0.46
	6405	91	be (40MHz)	-5.78	-7.52	-4.86	-4.97	-3.55	-1.90	-5.46	-5	-0.46
	5985	7	be (80MHz)	-6.38	-6.56	-4.86	-4.97	-3.46	-1.90	-5.36	-5	-0.36
	6145	39	be (80MHz)	-6.82	-6.70	-4.86	-4.97	-3.75	-1.90	-5.65	-5	-0.65
	6385	87	be (80MHz)	-6.11	-7.65	-4.86	-4.97	-3.80	-1.90	-5.71	-5	-0.71
	6025	15	be (160MHz)	-7.81	-8.18	-4.86	-4.97	-4.98	-1.90	-6.89	-5	-1.89
	6185	47	be (160MHz)	-8.26	-8.32	-4.86	-4.97	-5.28	-1.90	-7.19	-5	-2.19
	6345	79	be (160MHz)	-8.04	-9.69	-4.86	-4.97	-5.78	-1.90	-7.68	-5	-2.68
	6105	31	be (320MHz)	-10.42	-11.18	-4.86	-4.97	-7.77	-1.90	-9.68	-5	-4.68
	6265	63	be (320MHz)	-11.11	-11.73	-4.86	-4.97	-8.40	-1.90	-10.30	-5	-5.30
Band 6	6435	97	be (20MHz)	-6.38	-7.87	-5.12	-5.35	-4.05	-2.22	-6.28	-5	-1.28
	6475	105	be (20MHz)	-6.51	-7.55	-5.12	-5.35	-3.99	-2.22	-6.21	-5	-1.21
	6515	113	be (20MHz)	-7.05	-5.75	-5.12	-5.35	-3.34	-2.22	-5.56	-5	-0.56
	6445	99	be (40MHz)	-6.25	-6.71	-5.12	-5.35	-3.46	-2.22	-5.68	-5	-0.68
	6485	107	be (40MHz)	-5.63	-6.93	-5.12	-5.35	-3.22	-2.22	-5.44	-5	-0.44
	6525	115	be (40MHz)	-5.74	-6.08	-5.12	-5.35	-2.90	-2.22	-5.12	-5	-0.12
	6465	103	be (80MHz)	-6.17	-7.16	-5.12	-5.35	-3.62	-2.22	-5.85	-5	-0.85
	6505	111	be (160MHz)	-7.93	-8.16	-5.12	-5.35	-5.03	-2.22	-7.25	-5	-2.25
Band 5/6/7	6425	95	be (320MHz)	-10.76	-12.05	-4.86	-4.97	-8.34	-1.90	-10.25	-5	-5.25
Band 7	6695	117	be (20MHz)	-7.16	-5.76	-5.12	-5.35	-3.39	-2.22	-5.61	-5	-0.61
	6695	149	be (20MHz)	-6.39	-6.19	-5.12	-5.35	-3.28	-2.22	-5.50	-5	-0.50
	6875	185	be (20MHz)	-6.04	-6.52	-5.12	-5.35	-3.26	-2.22	-5.49	-5	-0.49
	6565	123	be (40MHz)	-6.43	-6.10	-5.12	-5.35	-3.25	-2.22	-5.48	-5	-0.48
	6725	155	be (40MHz)	-6.27	-6.36	-5.12	-5.35	-3.31	-2.22	-5.53	-5	-0.53
	6845	179	be (40MHz)	-6.54	-5.85	-5.12	-5.35	-3.17	-2.22	-5.39	-5	-0.39
	6545	119	be (80MHz)	-6.28	-6.96	-5.12	-5.35	-3.60	-2.22	-5.82	-5	-0.82
	6705	151	be (80MHz)	-6.08	-6.65	-5.12	-5.35	-3.35	-2.22	-5.57	-5	-0.57
	6865	183	be (80MHz)	-6.05	-6.50	-5.12	-5.35	-3.26	-2.22	-5.49	-5	-0.49
	6665	143	be (160MHz)	-8.07	-8.75	-5.12	-5.35	-5.39	-2.22	-7.61	-5	-2.61
	6825	175	be (160MHz)	-7.84	-8.05	-5.12	-5.35	-4.93	-2.22	-7.16	-5	-2.16
Band 6/7	6585	127	be (320MHz)	-10.27	-10.41	-5.12	-5.35	-7.33	-2.22	-9.55	-5	-4.55
Band 7/8	6745	159	be (320MHz)	-9.95	-10.39	-5.02	-5.28	-7.15	-2.14	-9.29	-5	-4.29
Band 8	6895	189	be (20MHz)	-7.30	-7.10	-5.02	-5.28	-4.19	-2.14	-6.33	-5	-1.33
	6995	209	be (20MHz)	-6.05	-7.23	-5.02	-5.28	-3.59	-2.14	-5.73	-5	-0.73
	7115	233	be (20MHz)	-6.35	-7.60	-5.02	-5.28	-3.92	-2.14	-6.06	-5	-1.06
	6885	187	be (40MHz)	-6.40	-6.11	-5.02	-5.28	-3.24	-2.14	-5.38	-5	-0.38
	6965	211	be (40MHz)	-5.86	-6.52	-5.02	-5.28	-3.17	-2.14	-5.31	-5	-0.31
	7085	227	be (40MHz)	-5.83	-6.84	-5.02	-5.28	-3.30	-2.14	-5.44	-5	-0.44
	6945	199	be (80MHz)	-5.95	-6.30	-5.02	-5.28	-3.11	-2.14	-5.25	-5	-0.25
	7025	215	be (80MHz)	-6.07	-7.38	-5.02	-5.28	-3.66	-2.14	-5.80	-5	-0.80
	6985	207	be (160MHz)	-7.39	-8.10	-5.02	-5.28	-4.72	-2.14	-6.86	-5	-1.86
Band 7/8	6905	191	be (320MHz)	-10.35	-10.19	-5.02	-5.28	-7.26	-2.14	-9.40	-5	-4.40

Table 7-22. MIMO e.i.r.p. Conducted Power Spectral Density Measurements (Full Tones) – VLP

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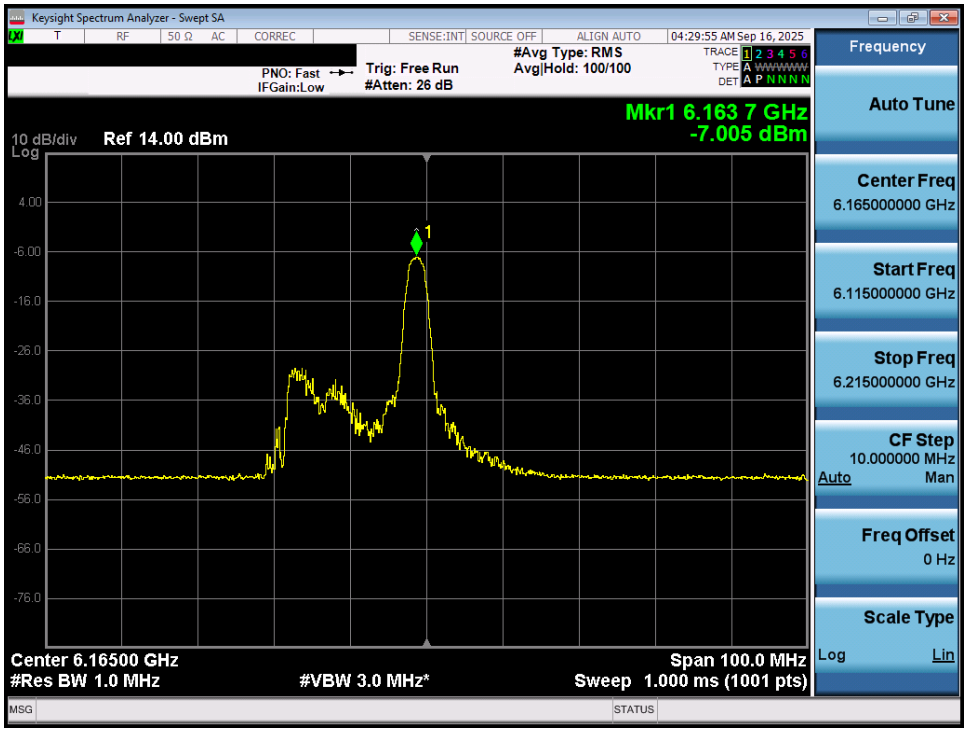
7.4.1 MIMO Antenna-1 Power Spectral Density Measurements

Plot 7-29. Power Spectral Density Plot MIMO ANT1 (20MHz 802.11ax/be (26 Tones) (UNII Band 5) – Ch. 45) - VLP



Plot 7-30. Power Spectral Density Plot MIMO ANT1 (40MHz 802.11ax/be (26 Tones) (UNII Band 5) – Ch. 43) - VLP

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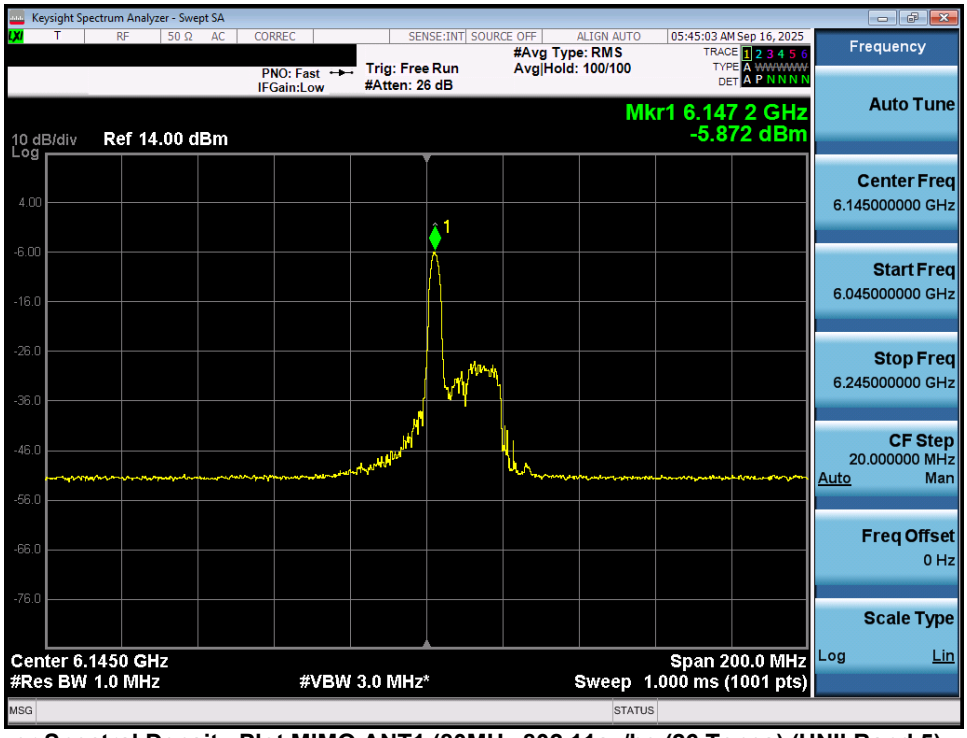
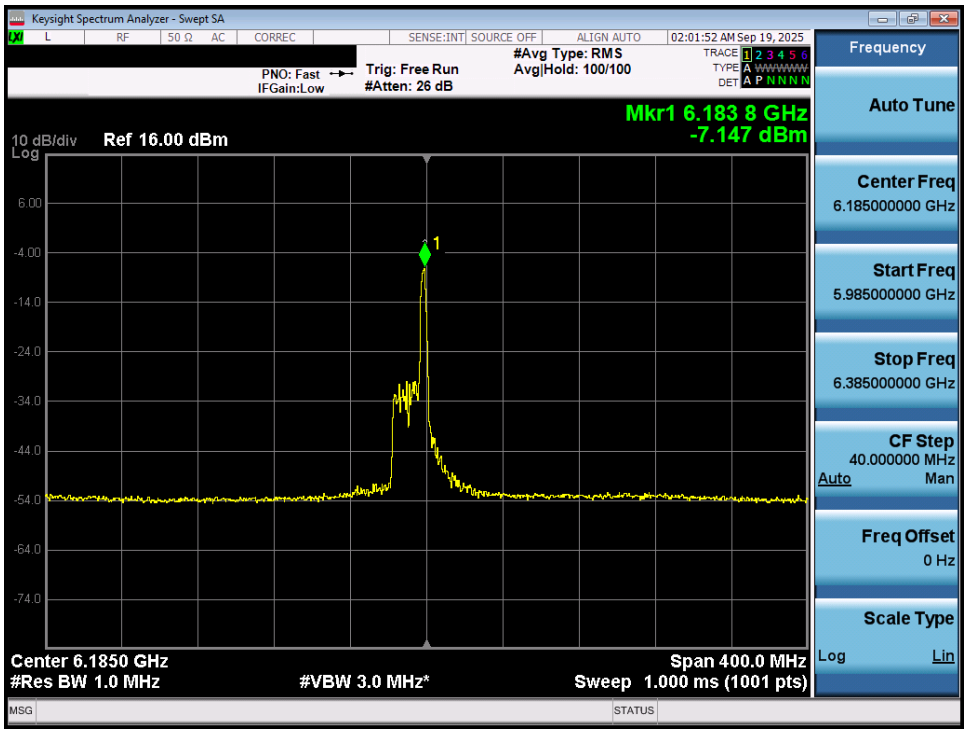


Plot 7-31. Power Spectral Density Plot MIMO ANT1 (80MHz 802.11ax/be (26 Tones) (UNII Band 5) – Ch. 39) - VLP



Plot 7-32. Power Spectral Density Plot MIMO ANT1 (160MHz 802.11ax/be (26 Tones) (UNII Band 5) – Ch. 47) - VLP

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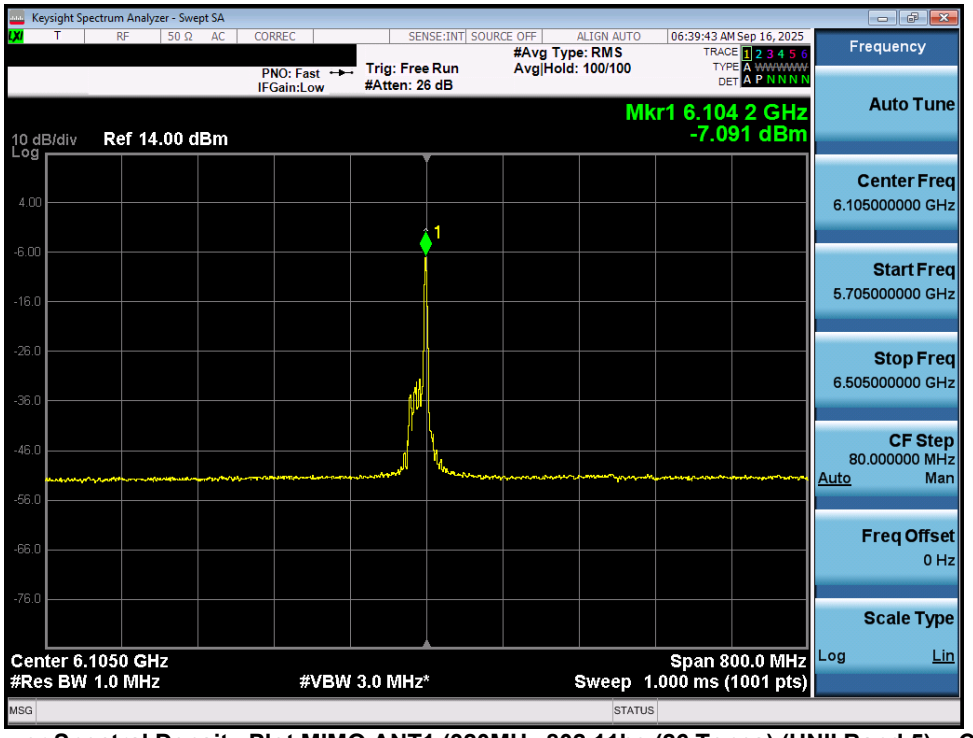
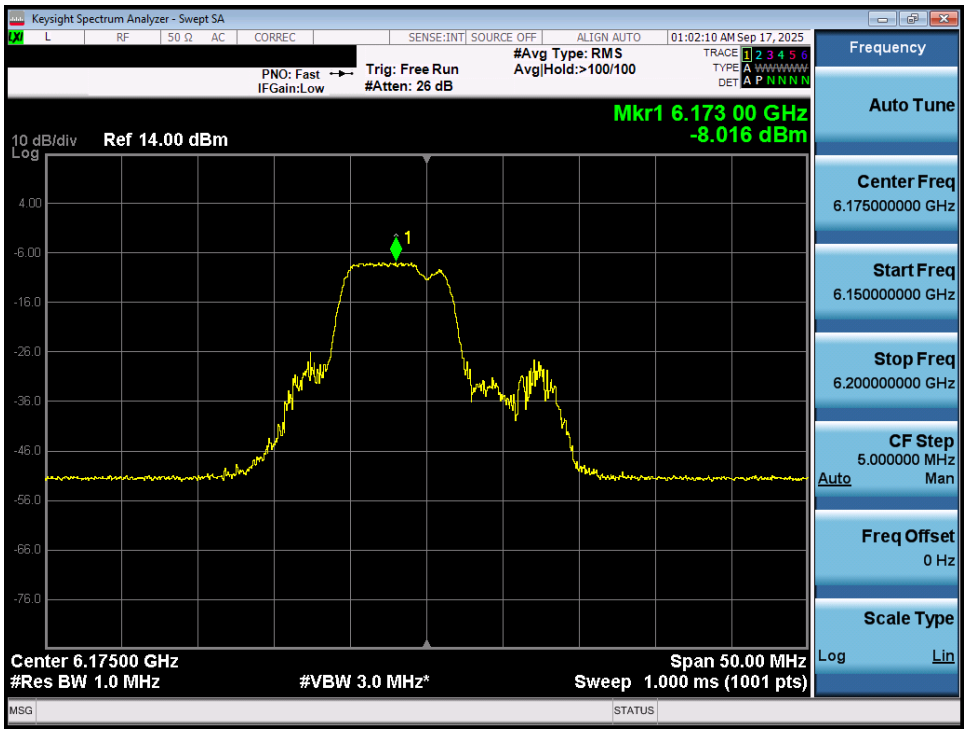


Plot 7-33. Power Spectral Density Plot MIMO ANT1 (320MHz 802.11be (26 Tones) (UNII Band 5) – Ch. 31) - VLP



Plot 7-34. Power Spectral Density Plot MIMO ANT1 (20MHz 802.11be (52+26 Tones) (UNII Band 5) – Ch. 45) - VLP

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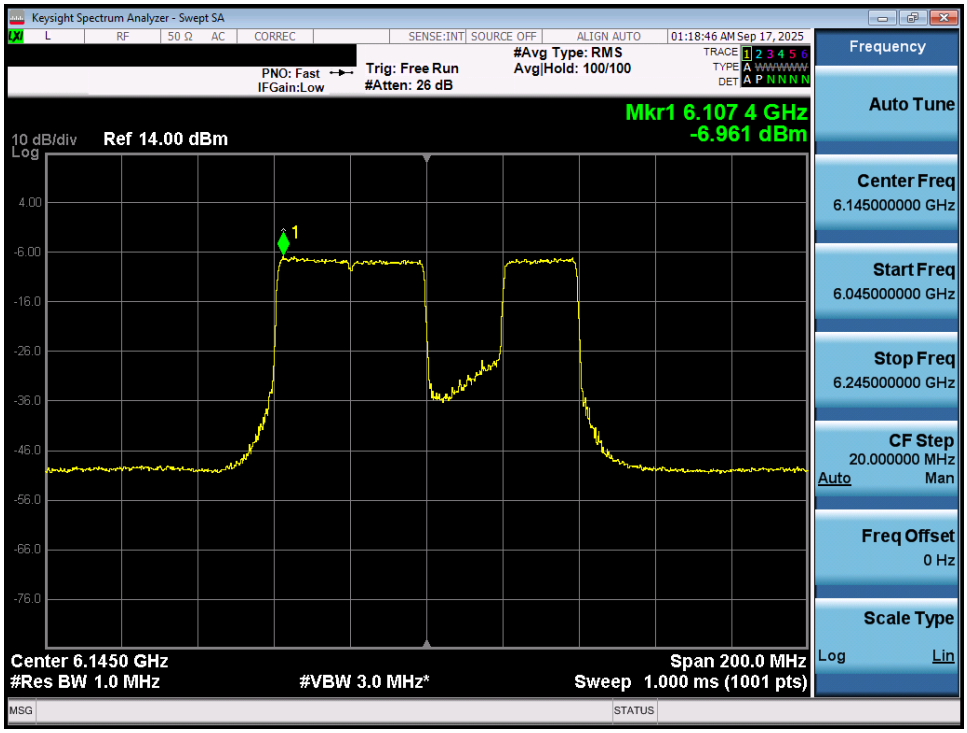
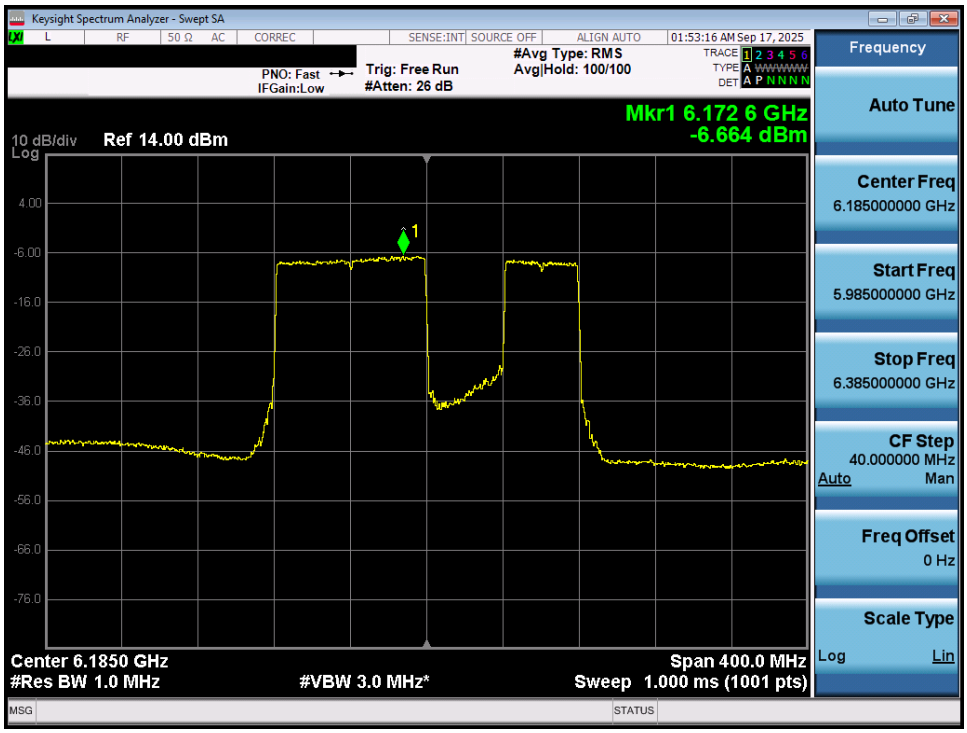


Plot 7-35. Power Spectral Density Plot MIMO ANT1 (80MHz 802.11be (484+242 Tones) (UNII Band 5) – Ch. 39) VLP



Plot 7-36. Power Spectral Density Plot MIMO ANT1 (160MHz 802.11be (996+484 Tones) (UNII Band 5) – Ch. 47) VLP

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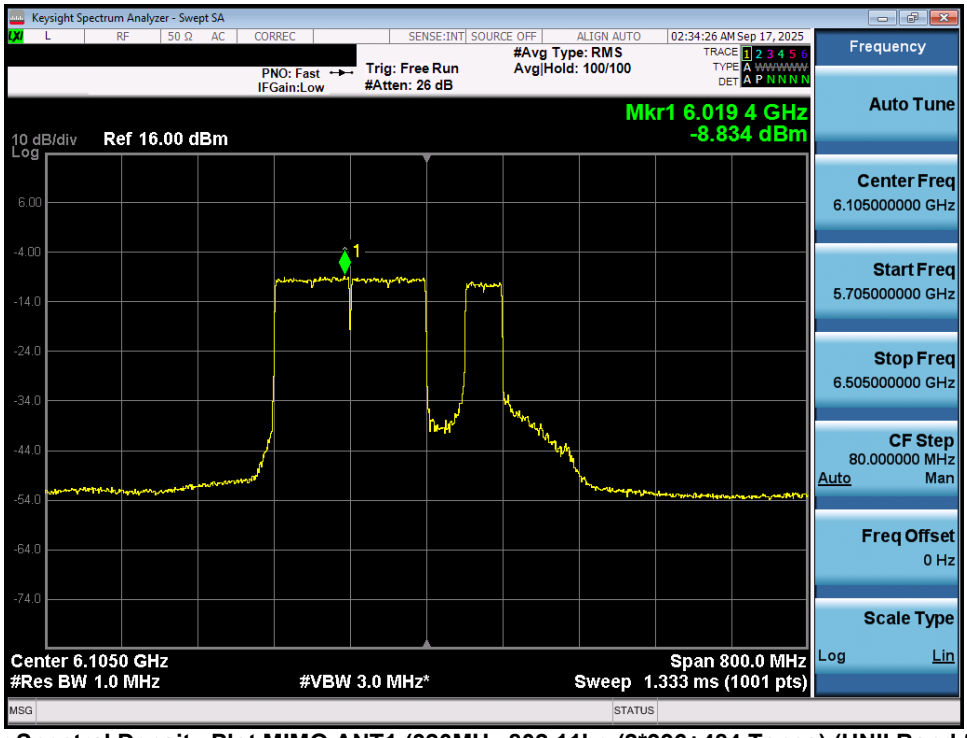
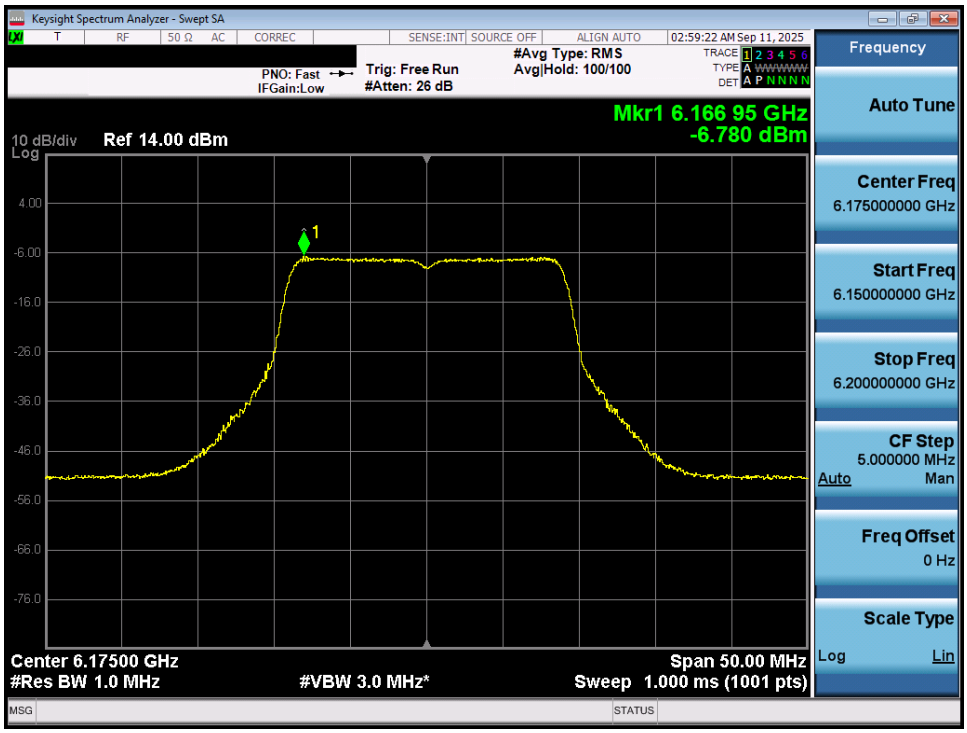


Plot 7-37. Power Spectral Density Plot MIMO ANT1 (320MHz 802.11be (2*996+484 Tones) (UNII Band 5) – Ch. 31) VLP



Plot 7-38. Power Spectral Density Plot MIMO ANT1 (20MHz 802.11ax/be (Full Tones) (UNII Band 5) – Ch. 45) - VLP

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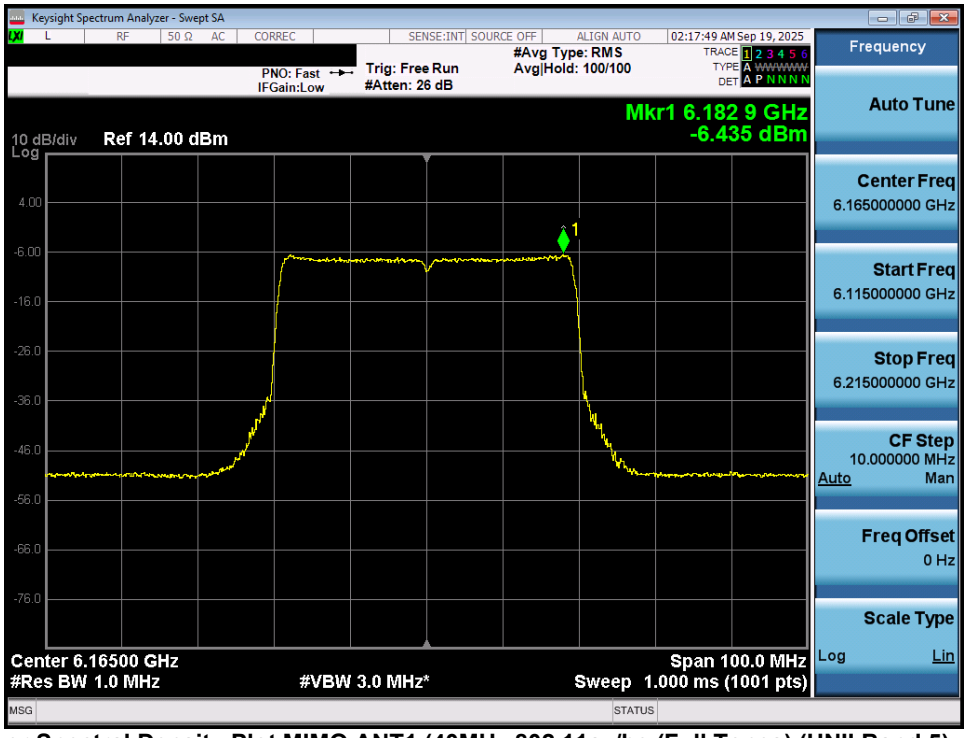
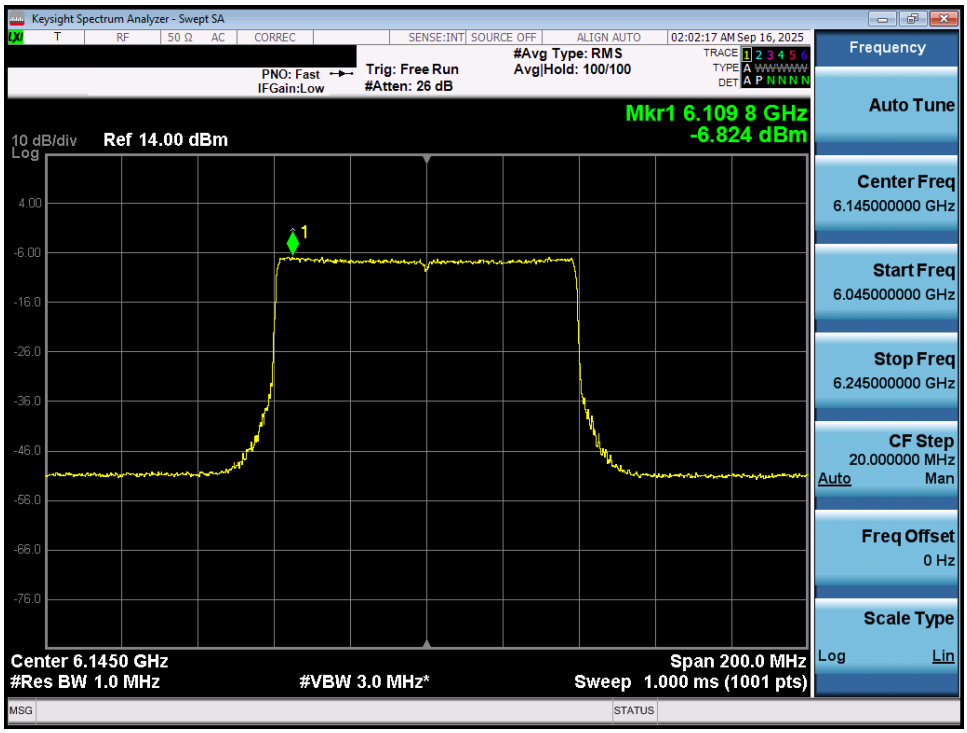


Plot 7-39. Power Spectral Density Plot MIMO ANT1 (40MHz 802.11ax/be (Full Tones) (UNII Band 5) – Ch. 43) - VLP



Plot 7-40. Power Spectral Density Plot MIMO ANT1 (80MHz 802.11ax/be (Full Tones) (UNII Band 5) – Ch. 39) - VLP

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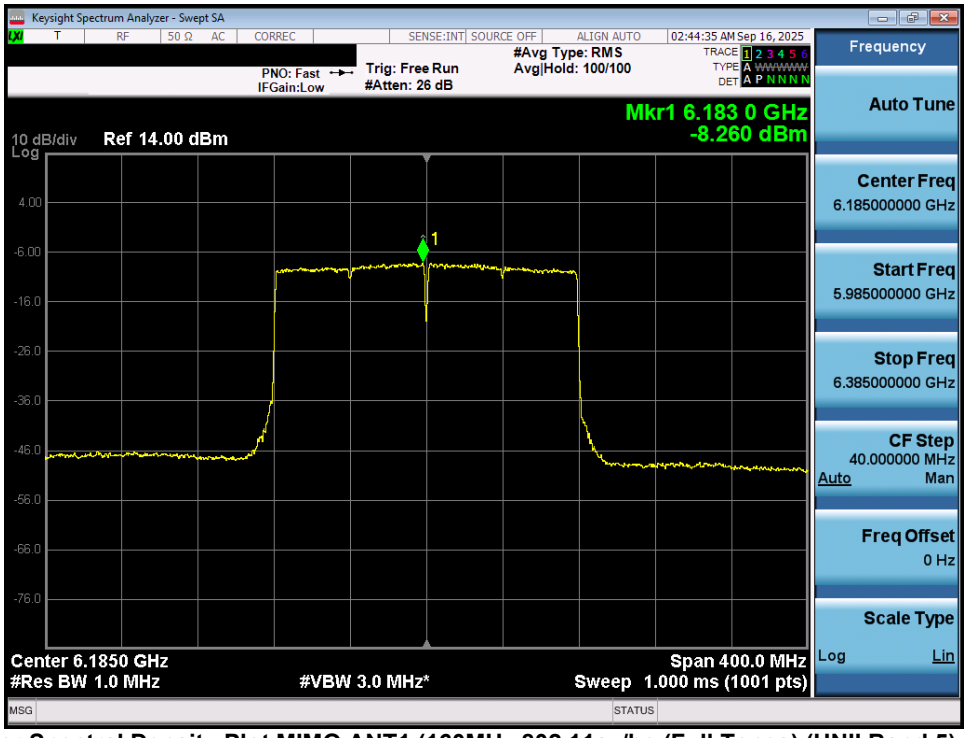
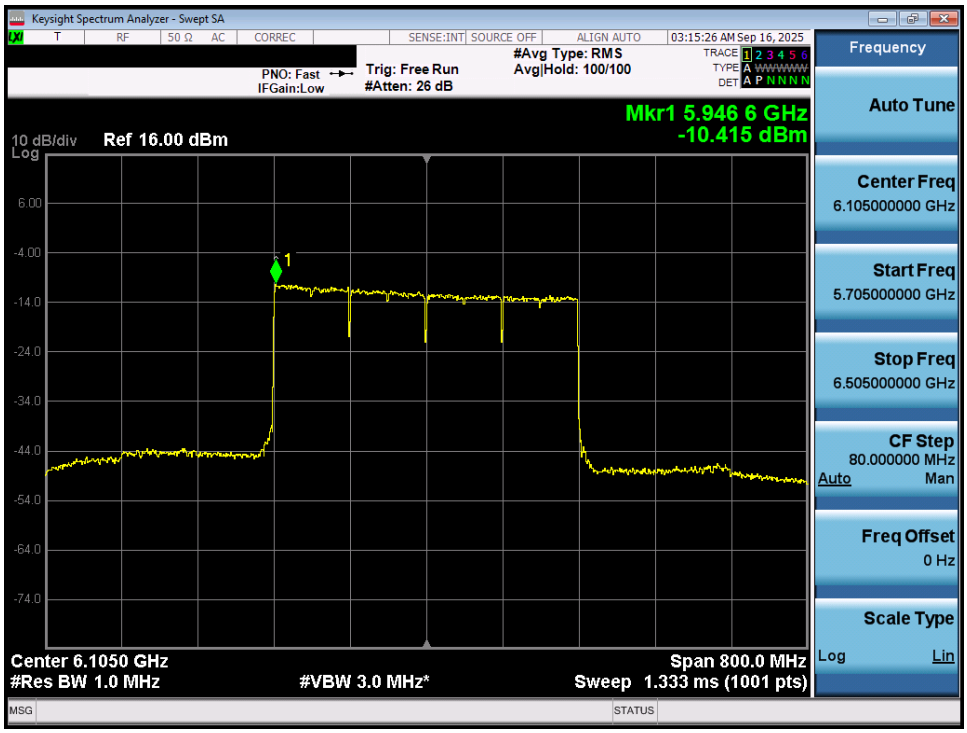


Plot 7-41. Power Spectral Density Plot MIMO ANT1 (160MHz 802.11ax/be (Full Tones) (UNII Band 5) – Ch. 47) - VLP



Plot 7-42. Power Spectral Density Plot MIMO ANT1 (320MHz 802.11be (Full Tones) (UNII Band 5) – Ch. 31) - VLP

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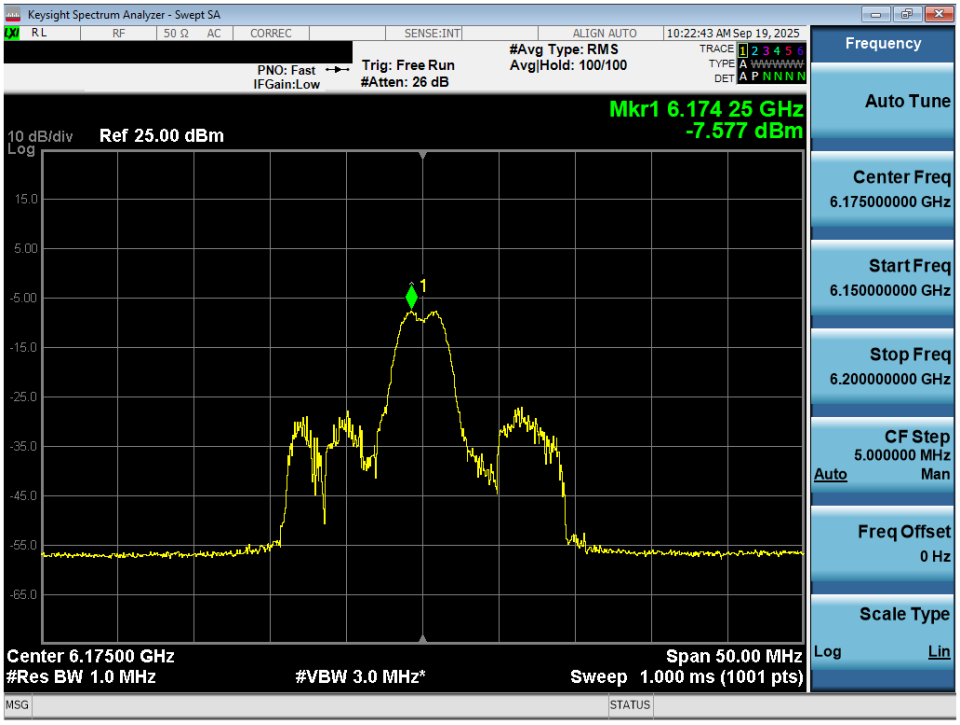
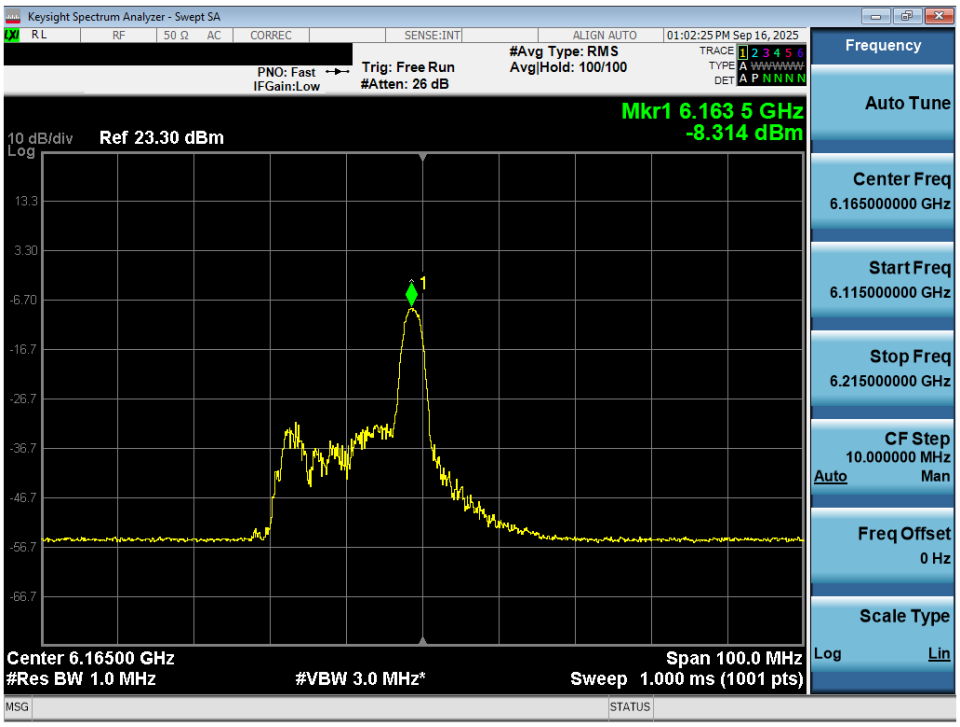
7.4.2 MIMO Antenna-2 Power Spectral Density Measurements



Plot 7-43. Power Spectral Density Plot MIMO ANT2 (20MHz 802.11ax/be (26 Tones) (UNII Band 5) – Ch. 45) - VLP



Plot 7-44. Power Spectral Density Plot MIMO ANT2 (40MHz 802.11ax/be (26 Tones) (UNII Band 5) – Ch. 43) - VLP

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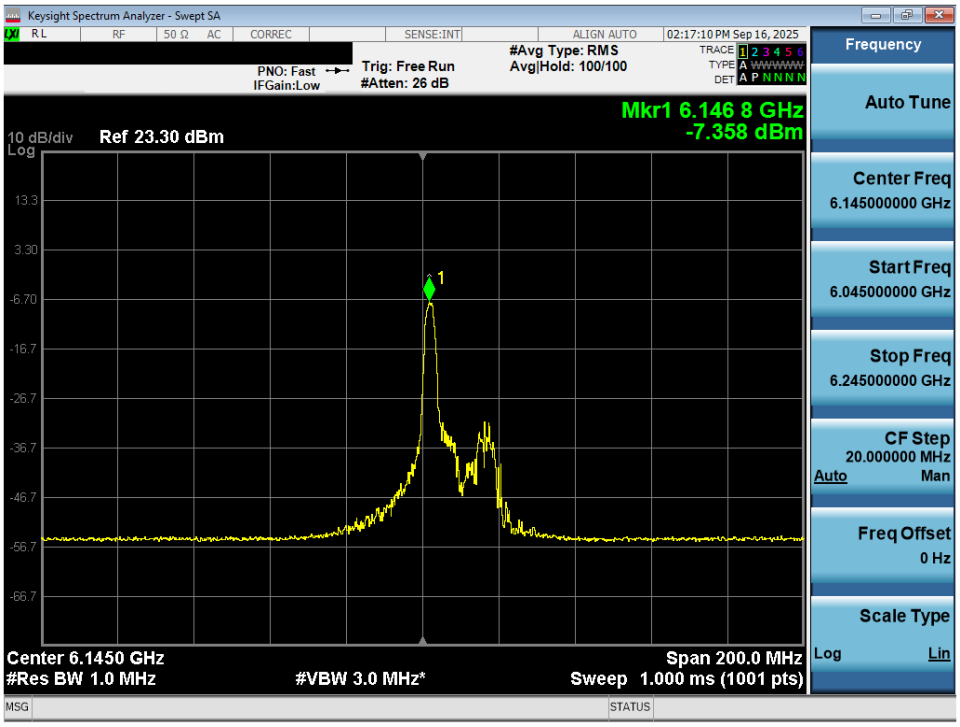
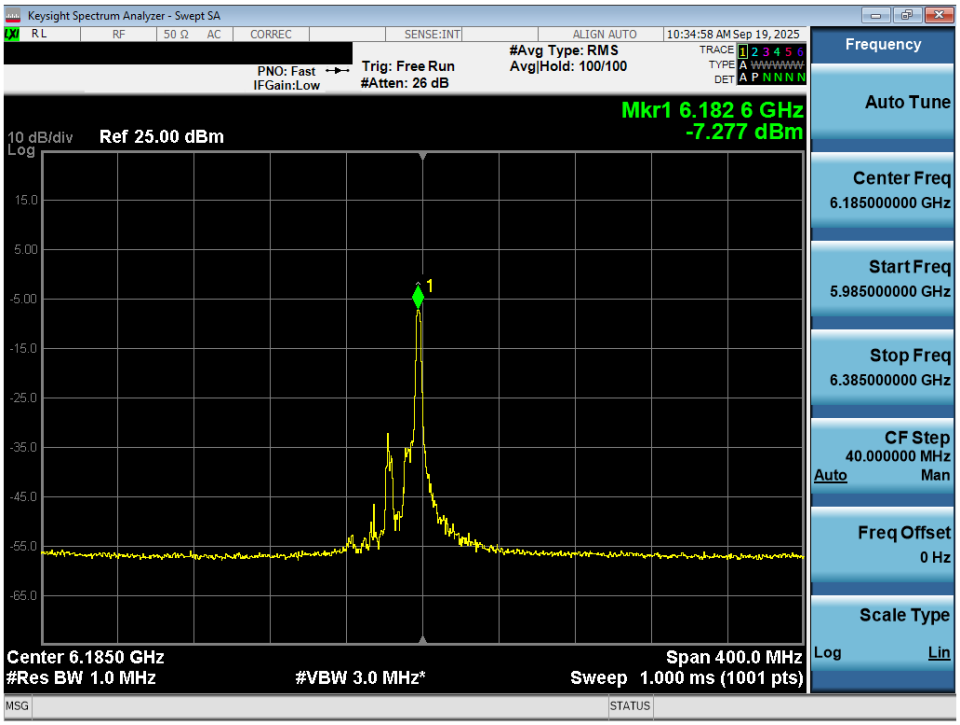


Plot 7-45. Power Spectral Density Plot MIMO ANT2 (80MHz 802.11ax/be (26 Tones) (UNII Band 5) – Ch. 39) - VLP



Plot 7-46. Power Spectral Density Plot MIMO ANT2 (160MHz 802.11ax/be (26 Tones) (UNII Band 5) – Ch. 47) - VLP

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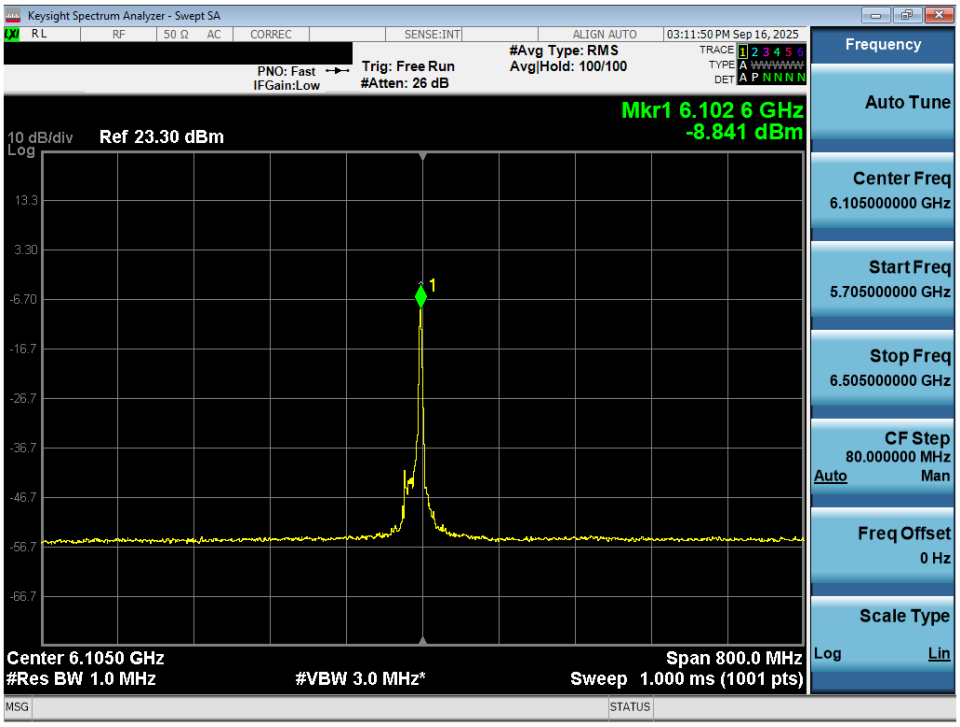
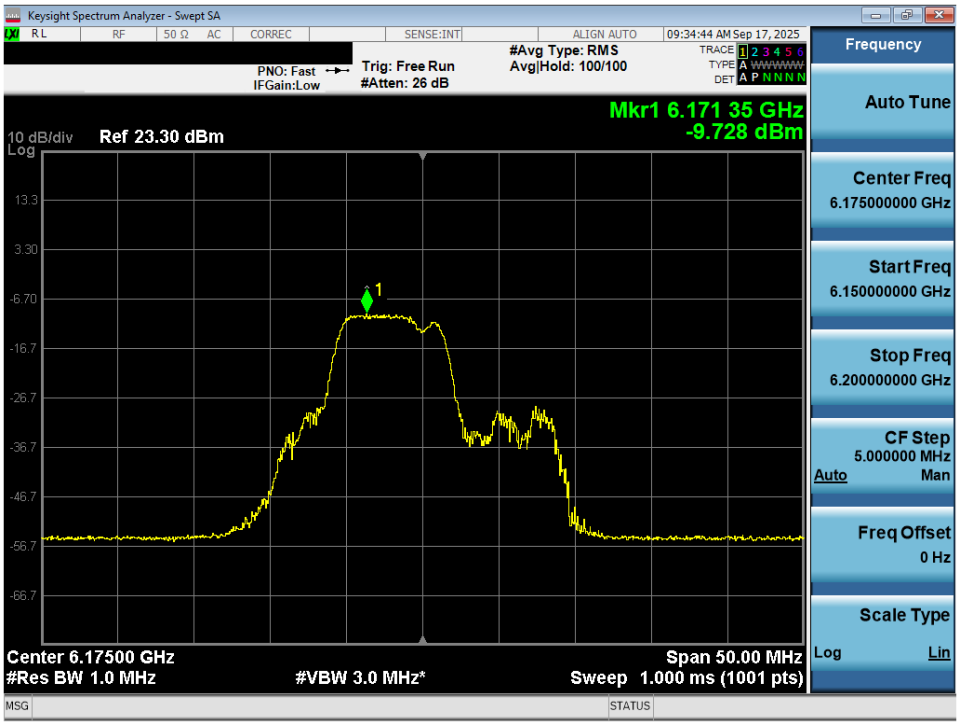


Plot 7-47. Power Spectral Density Plot MIMO ANT2 (320MHz 802.11be (26 Tones) (UNII Band 5) – Ch. 31) - VLP



Plot 7-48. Power Spectral Density Plot MIMO ANT2 (20MHz 802.11be (52+26 Tones) (UNII Band 5) – Ch. 45) - VLP

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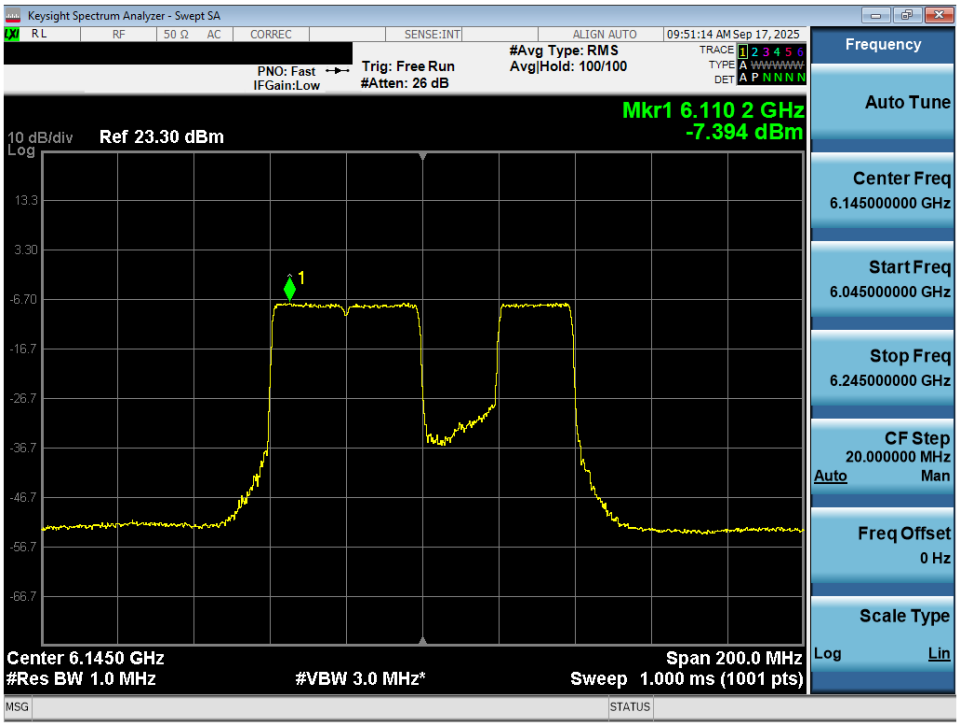
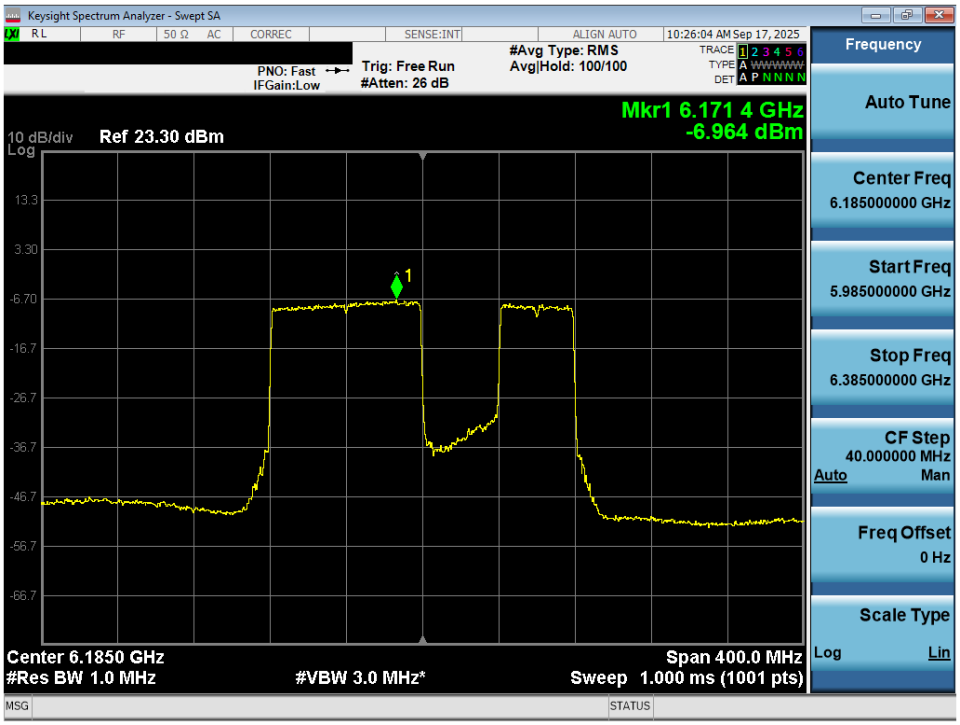


Plot 7-49. Power Spectral Density Plot MIMO ANT2 (80MHz 802.11be (484+242 Tones) (UNII Band 5) – Ch. 39) VLP



Plot 7-50. Power Spectral Density Plot MIMO ANT2 (160MHz 802.11be (996+484 Tones) (UNII Band 5) – Ch. 47) VLP

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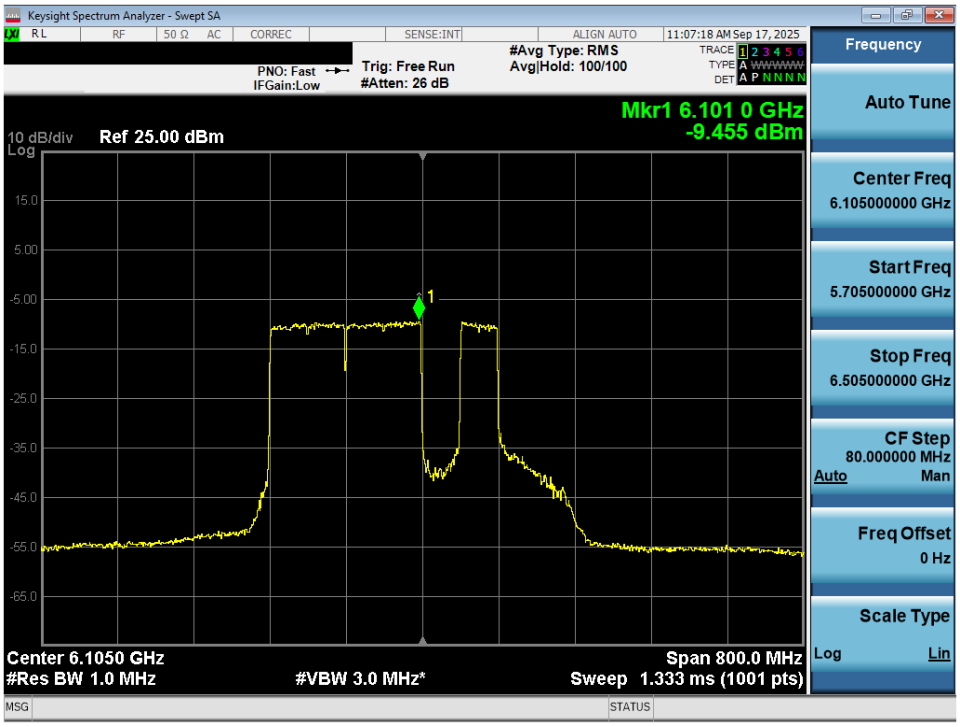
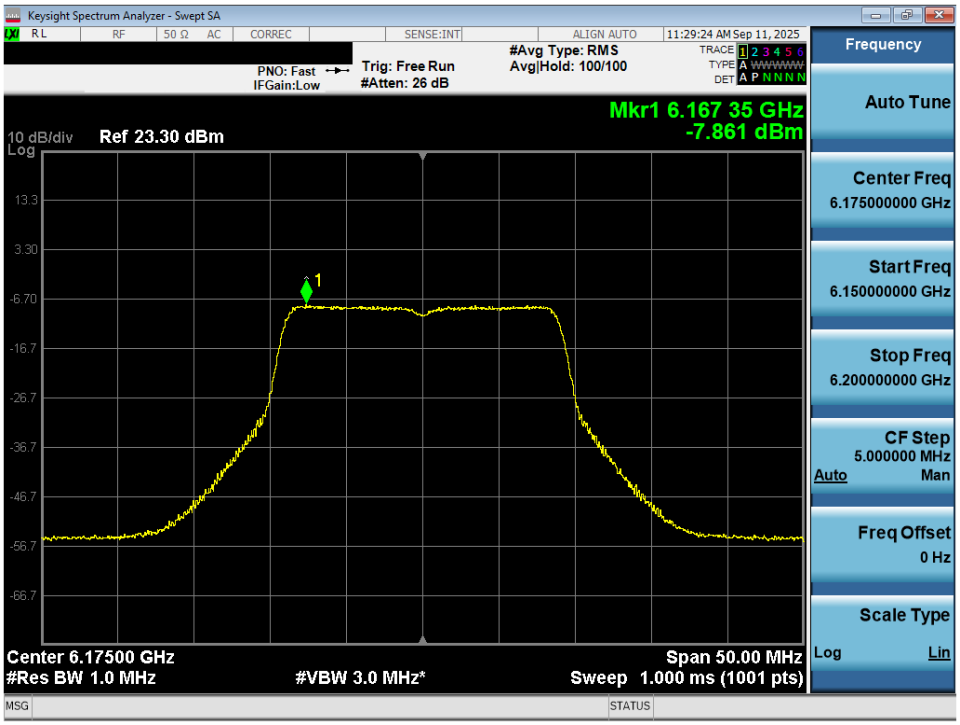


Plot 7-51. Power Spectral Density Plot MIMO ANT2 (320MHz 802.11be (2*996+484 Tones) (UNII Band 5) – Ch. 31) VLP



Plot 7-52. Power Spectral Density Plot MIMO ANT2 (20MHz 802.11ax/be (Full Tones) (UNII Band 5) – Ch. 45) - VLP

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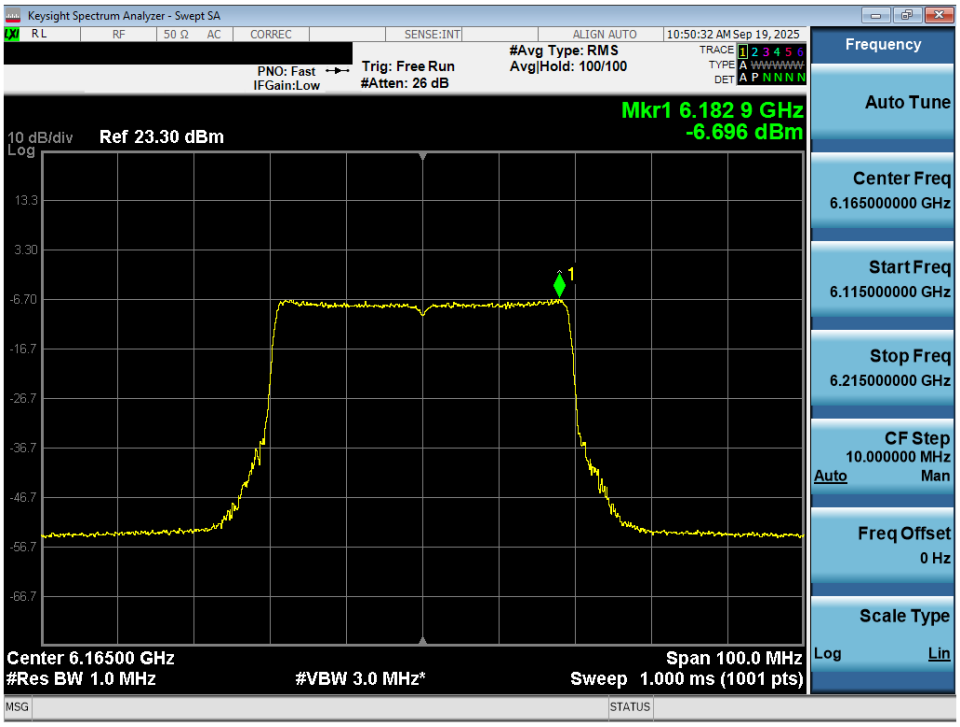
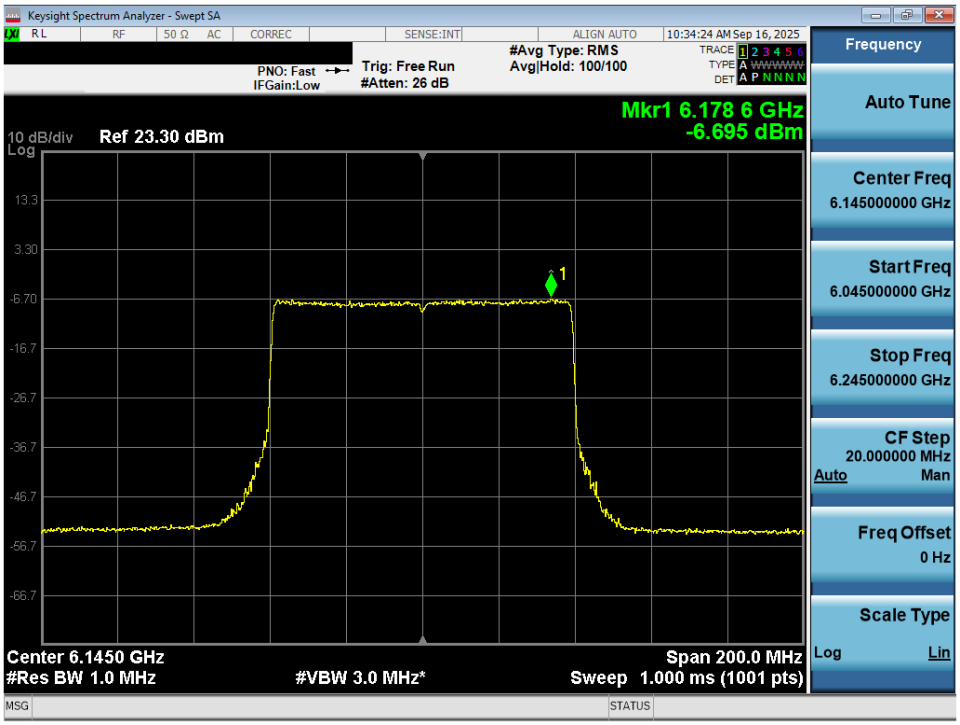


Plot 7-53. Power Spectral Density Plot MIMO ANT2 (40MHz 802.11ax/be (Full Tones) (UNII Band 5) – Ch. 43) - VLP



Plot 7-54. Power Spectral Density Plot MIMO ANT2 (80MHz 802.11ax/be (Full Tones) (UNII Band 5) – Ch. 39) - VLP

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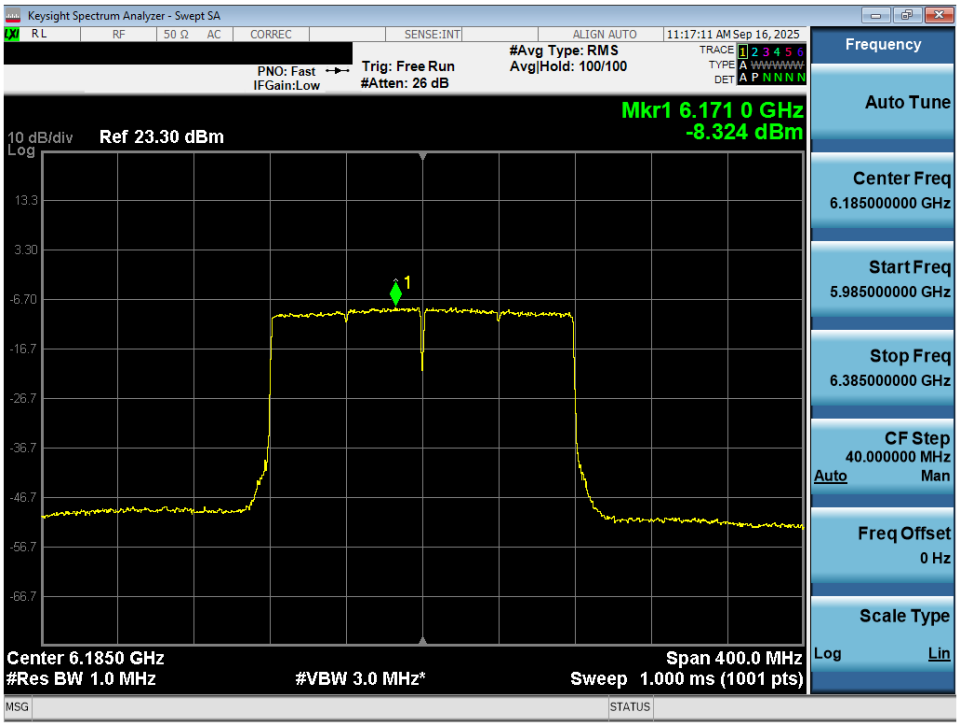
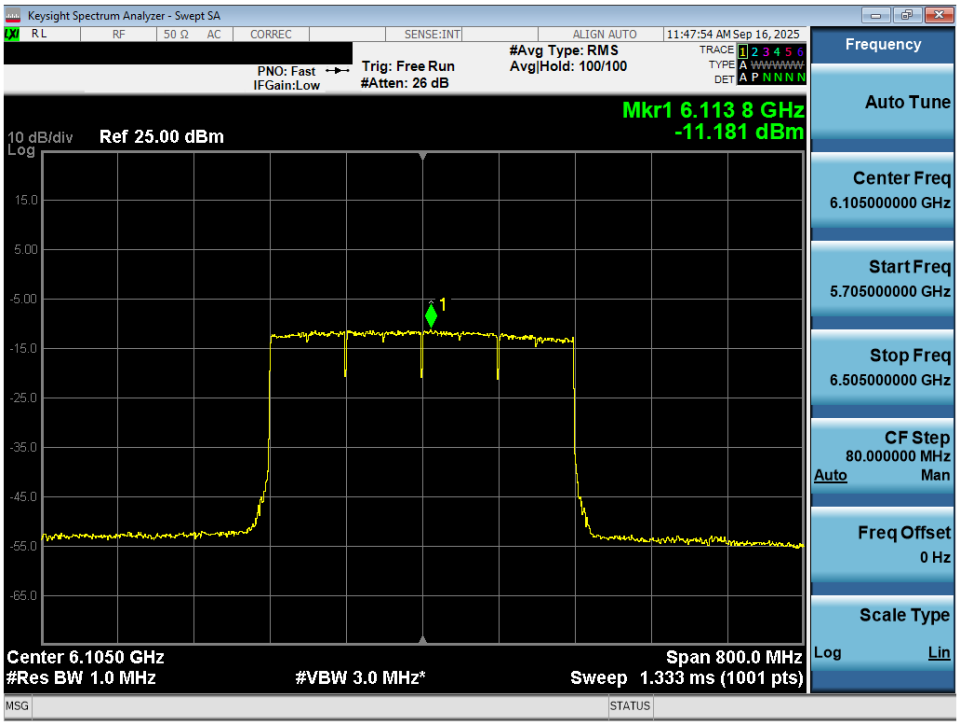


Plot 7-55. Power Spectral Density Plot MIMO ANT2 (160MHz 802.11ax/be (Full Tones) (UNII Band 5) – Ch. 47) - VLP



Plot 7-56. Power Spectral Density Plot MIMO ANT2 (320MHz 802.11be (Full Tones) (UNII Band 5) – Ch. 31) - VLP

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Note:

Per ANSI C63.10:2020 Section 14.5.2.3 the power spectral density at Antenna 1 and Antenna 2 were first measured separately as shown in the section above. The measured values were then summed in linear power units then converted back to dBm.

Per ANSI C63.10:2020 Section 14.6.3, 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.

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

Sample MIMO Calculation:

At 5935MHz in 802.11ax (20MHz BW) mode, the average conducted power spectral density was measured to be - 7.03 dBm for Antenna-1 and - 8.72 dBm for Antenna-2.

Antenna 1 + Antenna 2 = MIMO

(-7.03 dBm + -8.72 dBm) = (0.198 mW + 0.134 mW) = 0.333 mW = --4.78 dBm

Sample e.i.r.p Power Spectral Density Calculation:

At 5935 MHz in 802.11ax (20MHz BW) mode, the average MIMO power density was calculated to be -4.78 dBm with directional gain of -1.90 dBi.

e.i.r.p. Power Spectral Density(dBm) = Power Spectral Density (dBm) + Ant gain (dBi)

-4.78 dBm + -1.90 dBi = -6.68 dBm

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7.5 In-Band Emissions

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 C63.10:2020, and at the appropriate frequencies.

For transmitters operating within the 5.925-7.125 GHz bands: Power spectral density must be suppressed by 20 dB at 1 MHz outside of channel edge, by 28 dB at one channel bandwidth from the channel center, and by 40 dB at one- and one-half times the channel bandwidth away from channel center. At frequencies between one megahertz outside an unlicensed device's channel edge and one channel bandwidth from the center of the channel, the limits must be linearly interpolated between 20 dB and 28 dB suppression, and at frequencies between one and one- and one-half times an unlicensed device's channel bandwidth, the limits must be linearly interpolated between 28 dB and 40 dB suppression. Emissions removed from the channel center by more than one- and one-half times the channel bandwidth must be suppressed by at least 40 dB.

Test Procedure Used

KDB 987594 D02 v03

Test Settings

1. Connect output of the antenna port to a spectrum analyzer or EMI receiver, with appropriate attenuation, as to not damage the instrumentation.
2. Set the reference level of the measuring equipment in accordance with procedure 4.1.6.2 of ANSI C63.10:2020.
3. Measure the 26 dB EBW using the test procedure 12.5.2 of ANSI C63.10:2020. (This will be used to determine the channel edge.)
4. Measure the power spectral density (which will be used for emissions mask reference) using the following procedure:
    a) Set the span to encompass the entire 26 dB EBW of the signal.
    b) Set RBW = same RBW used for 26 dB EBW measurement.
    c) Set VBW ≥ 3 X RBW
    d) Number of points in sweep ≥ [2 X span / RBW].
    e) Sweep time = auto.
    f) Detector = RMS (i.e., power averaging)
    g) Trace average at least 100 traces in power averaging (rms) mode.
    h) Use the peak search function on the instrument to find the peak of the spectrum.
5. For the purposes of developing the emission mask, the channel bandwidth is defined as the 26 dB EBW.
6. Using the measuring equipment limit line function, develop the emissions mask based on the following requirements. The emissions power spectral density must be reduced below the peak power spectral density (in dB) as follows:
    a) Suppressed by 20 dB at 1 MHz outside of the channel edge. (The channel edge is defined as the 26-dB point on either side of the carrier center frequency.)
    b) Suppressed by 28 dB at one channel bandwidth from the channel center.
    c) Suppressed by 40 dB at one- and one-half times the channel bandwidth from the channel center.
7. Adjust the span to encompass the entire mask as necessary.
8. Clear trace.
9. Trace average at least 100 traces in power averaging (rms) mode.
10. Adjust the reference level as necessary so that the crest of the channel touches the top of the emission mask.

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Test Setup

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

Figure 7-4. Test Instrument & Measurement Setup

Test Notes

None.

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	Frequency [MHz]	Channel	802.11 MODE	Antenna-1 In-Band Emission	Antenna-2 In-Band Emission
Band 5	5935	2	be (20MHz)	PASS	PASS
	6175	45	be (20MHz)	PASS	PASS
	6415	93	be (20MHz)	PASS	PASS
	5965	3	be (40MHz)	PASS	PASS
	6165	43	be (40MHz)	PASS	PASS
	6405	91	be (40MHz)	PASS	PASS
	5985	7	be (80MHz)	PASS	PASS
	6145	39	be (80MHz)	PASS	PASS
	6385	87	be (80MHz)	PASS	PASS
	6025	15	be (160MHz)	PASS	PASS
	6185	47	be (160MHz)	PASS	PASS
	6345	79	be (160MHz)	PASS	PASS
	6105	31	be (320MHz)	PASS	PASS
	6265	63	be (320MHz)	PASS	PASS
Band 6	6435	97	be (20MHz)	PASS	PASS
	6475	105	be (20MHz)	PASS	PASS
	6515	113	be (20MHz)	PASS	PASS
	6445	99	be (40MHz)	PASS	PASS
	6485	107	be (40MHz)	PASS	PASS
	6525	115	be (40MHz)	PASS	PASS
	6465	103	be (80MHz)	PASS	PASS
	6505	111	be (160MHz)	PASS	PASS
Band 5/6/7	6425	95	be (320MHz)	PASS	PASS
Band 7	6695	117	be (20MHz)	PASS	PASS
	6695	149	be (20MHz)	PASS	PASS
	6875	185	be (20MHz)	PASS	PASS
	6565	123	be (40MHz)	PASS	PASS
	6725	155	be (40MHz)	PASS	PASS
	6845	179	be (40MHz)	PASS	PASS
	6545	119	be (80MHz)	PASS	PASS
	6705	151	be (80MHz)	PASS	PASS
	6865	183	be (80MHz)	PASS	PASS
	6665	143	be (160MHz)	PASS	PASS
	6825	175	be (160MHz)	PASS	PASS
Band 6/7	6585	127	be (320MHz)	PASS	PASS
Band 7/8	6745	159	be (320MHz)	PASS	PASS
Band 8	6895	189	be (20MHz)	PASS	PASS
	6995	209	be (20MHz)	PASS	PASS
	7115	233	be (20MHz)	PASS	PASS
	6885	187	be (40MHz)	PASS	PASS
	6965	211	be (40MHz)	PASS	PASS
	7085	227	be (40MHz)	PASS	PASS
	6945	199	be (80MHz)	PASS	PASS
	7025	215	be (80MHz)	PASS	PASS
	6985	207	be (160MHz)	PASS	PASS
Band 7/8	6985	191	be (320MHz)	PASS	PASS

Table 7-23. In Band Emission Results (26 Tones)

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	Frequency [MHz]	Channel	802.11 MODE	Antenna-1 In-Band Emission	Antenna-2 In-Band Emission
Band 5	5935	2	be (20MHz)	PASS	PASS
	6175	45	be (20MHz)	PASS	PASS
	6415	93	be (20MHz)	PASS	PASS
	5965	3	be (40MHz)	PASS	PASS
	6165	43	be (40MHz)	PASS	PASS
	6405	91	be (40MHz)	PASS	PASS
	5985	7	be (80MHz)	PASS	PASS
	6145	39	be (80MHz)	PASS	PASS
	6385	87	be (80MHz)	PASS	PASS
	6025	15	be (160MHz)	PASS	PASS
	6185	47	be (160MHz)	PASS	PASS
	6345	79	be (160MHz)	PASS	PASS
	6105	31	be (320MHz)	PASS	PASS
	6265	63	be (320MHz)	PASS	PASS
Band 6	6435	97	be (20MHz)	PASS	PASS
	6475	105	be (20MHz)	PASS	PASS
	6515	113	be (20MHz)	PASS	PASS
	6445	99	be (40MHz)	PASS	PASS
	6485	107	be (40MHz)	PASS	PASS
	6525	115	be (40MHz)	PASS	PASS
	6465	103	be (80MHz)	PASS	PASS
	6505	111	be (160MHz)	PASS	PASS
Band 5/6/7	6425	95	be (320MHz)	PASS	PASS
Band 7	6695	117	be (20MHz)	PASS	PASS
	6695	149	be (20MHz)	PASS	PASS
	6875	185	be (20MHz)	PASS	PASS
	6565	123	be (40MHz)	PASS	PASS
	6725	155	be (40MHz)	PASS	PASS
	6845	179	be (40MHz)	PASS	PASS
	6545	119	be (80MHz)	PASS	PASS
	6705	151	be (80MHz)	PASS	PASS
	6865	183	be (80MHz)	PASS	PASS
	6665	143	be (160MHz)	PASS	PASS
	6825	175	be (160MHz)	PASS	PASS
Band 6/7	6585	127	be (320MHz)	PASS	PASS
Band 7/8	6745	159	be (320MHz)	PASS	PASS
Band 8	6895	189	be (20MHz)	PASS	PASS
	6995	209	be (20MHz)	PASS	PASS
	7115	233	be (20MHz)	PASS	PASS
	6885	187	be (40MHz)	PASS	PASS
	6965	211	be (40MHz)	PASS	PASS
	7085	227	be (40MHz)	PASS	PASS
	6945	199	be (80MHz)	PASS	PASS
	7025	215	be (80MHz)	PASS	PASS
	6985	207	be (160MHz)	PASS	PASS
Band 7/8	6905	191	be (320MHz)	PASS	PASS

Table 7-24. In Band Emission Results (Full Tones)

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	Frequency [MHz]	Channel	802.11 MODE	MRU Cases	Antenna-1 In-Band Emission	Antenna-2 In-Band Emission
Band 5	6175	45	be (20MHz)	52+26T	PASS	PASS
	6175	45	be (20MHz)	106+26T	PASS	PASS
	6145	39	be (80MHz)	484+242T	PASS	PASS
	6185	47	be (160MHz)	996+484T	PASS	PASS
	6105	31	be (320MHz)	2x996+484T	PASS	PASS
	6105	31	be (320MHz)	3x996T	PASS	PASS
	6105	31	be (320MHz)	2x996+484T	PASS	PASS
Band 6	6475	105	be (20MHz)	52+26T	PASS	PASS
	6475	105	be (20MHz)	106+26T	PASS	PASS
	6465	103	be (80MHz)	484+242T	PASS	PASS
	6505	111	be (160MHz)	996+484T	PASS	PASS
Band 5/6/7	6425	95	be (320MHz)	3x996+484T	PASS	PASS
	6425	95	be (320MHz)	3x996T	PASS	PASS
	6425	95	be (320MHz)	2x996+484T	PASS	PASS
Band 7	6695	149	be (20MHz)	52+26T	PASS	PASS
	6695	149	be (20MHz)	106+26T	PASS	PASS
	6705	151	be (80MHz)	484+242T	PASS	PASS
	6665	143	be (160MHz)	996+484T	PASS	PASS
Band 7/8	6745	159	be (320MHz)	3x996+484T	PASS	PASS
	6745	159	be (320MHz)	3x996T	PASS	PASS
	6745	159	be (320MHz)	2x996+484T	PASS	PASS
Band 8	6995	209	be (20MHz)	52+26T	PASS	PASS
	6995	209	be (20MHz)	106+26T	PASS	PASS
	6945	199	be (80MHz)	484+242T	PASS	PASS
	6985	207	be (160MHz)	996+484T	PASS	PASS
Band 7/8	6905	191	be (320MHz)	3x996+484T	PASS	PASS
	6905	191	be (320MHz)	3x996T	PASS	PASS
	6905	191	be (320MHz)	2x996+484T	PASS	PASS

Table 7-25. In Band Emission Results (MRU)

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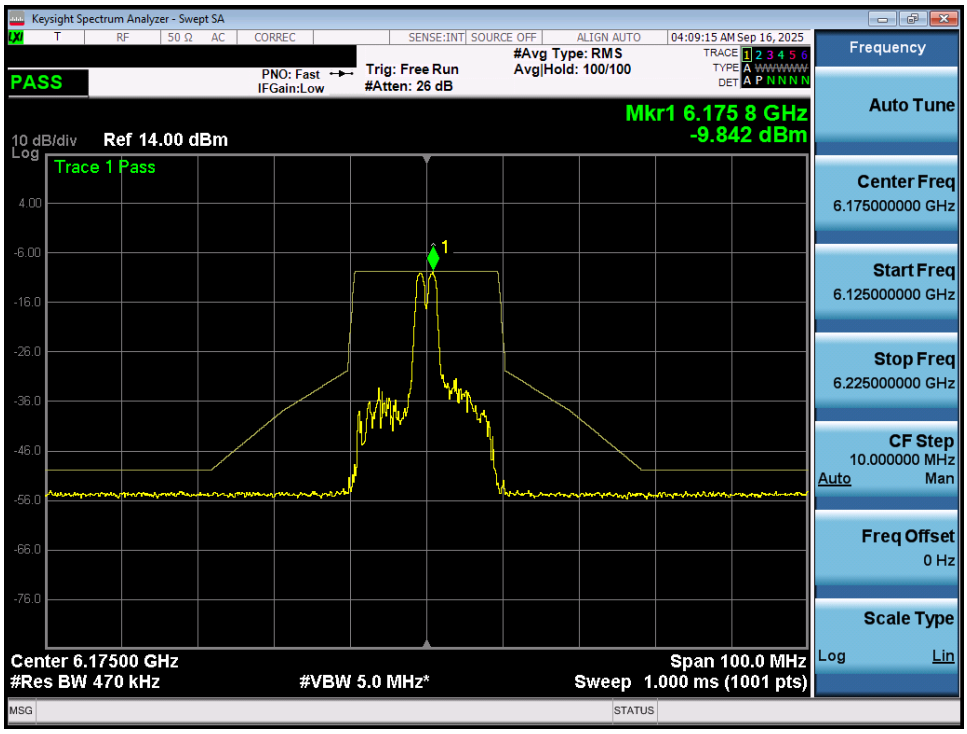
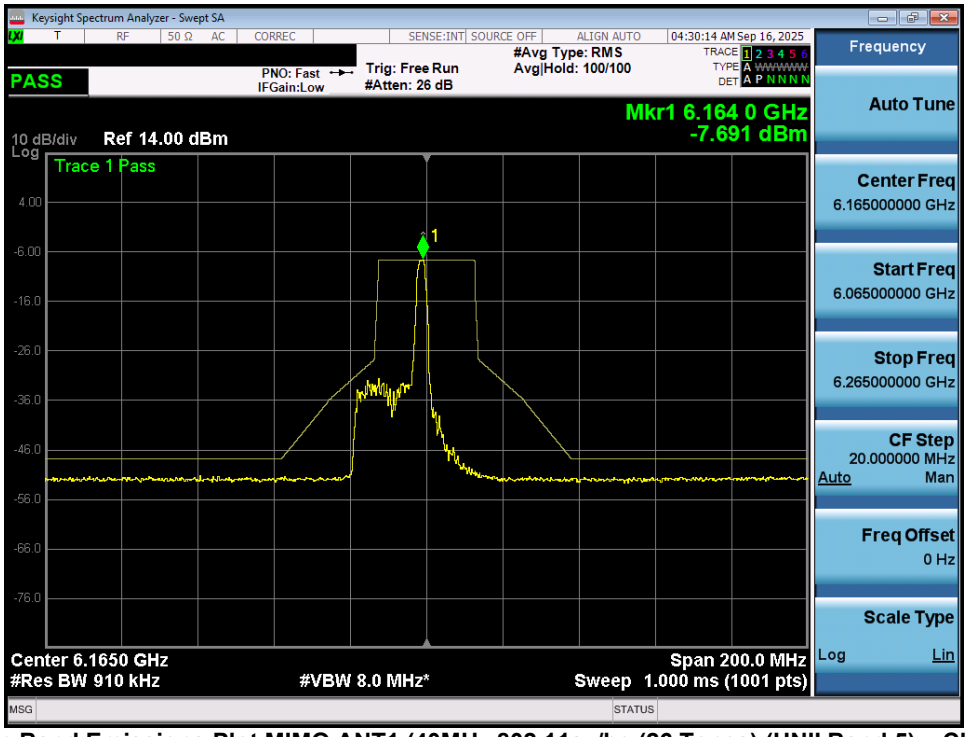
7.5.1 MIMO Antenna-1 In-Band Emission Measurements



Plot 7-57. In Band Emissions Plot MIMO ANT1 (20MHz 802.11ax/be (26 Tones) (UNII Band 5) – Ch. 45) - VLP



Plot 7-58. In Band Emissions Plot MIMO ANT1 (40MHz 802.11ax/be (26 Tones) (UNII Band 5) – Ch. 43) - VLP

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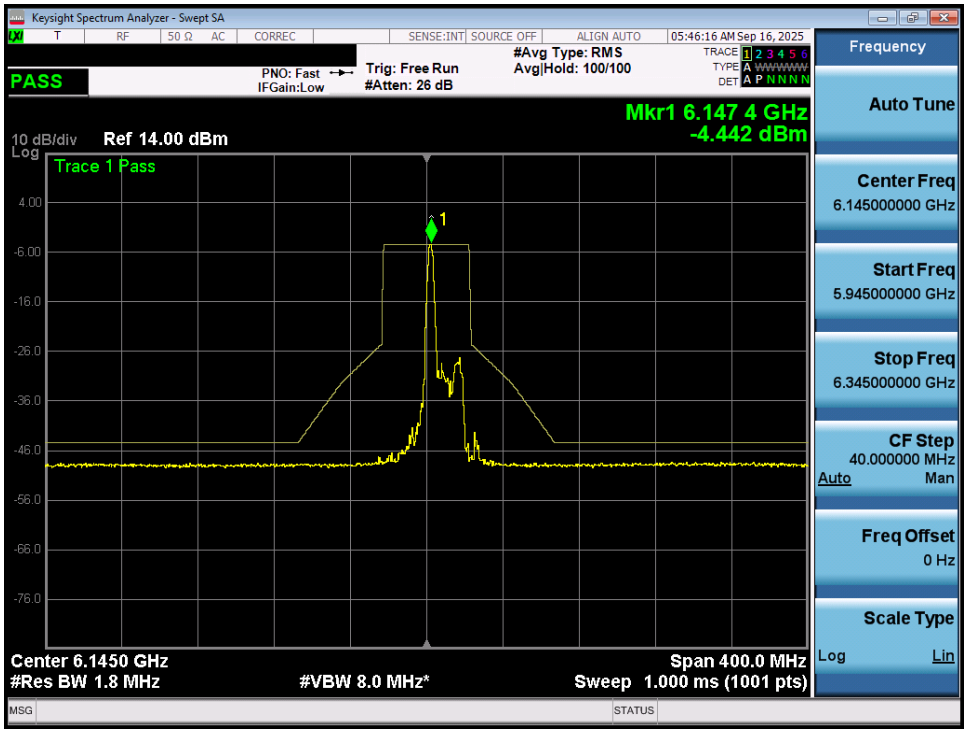
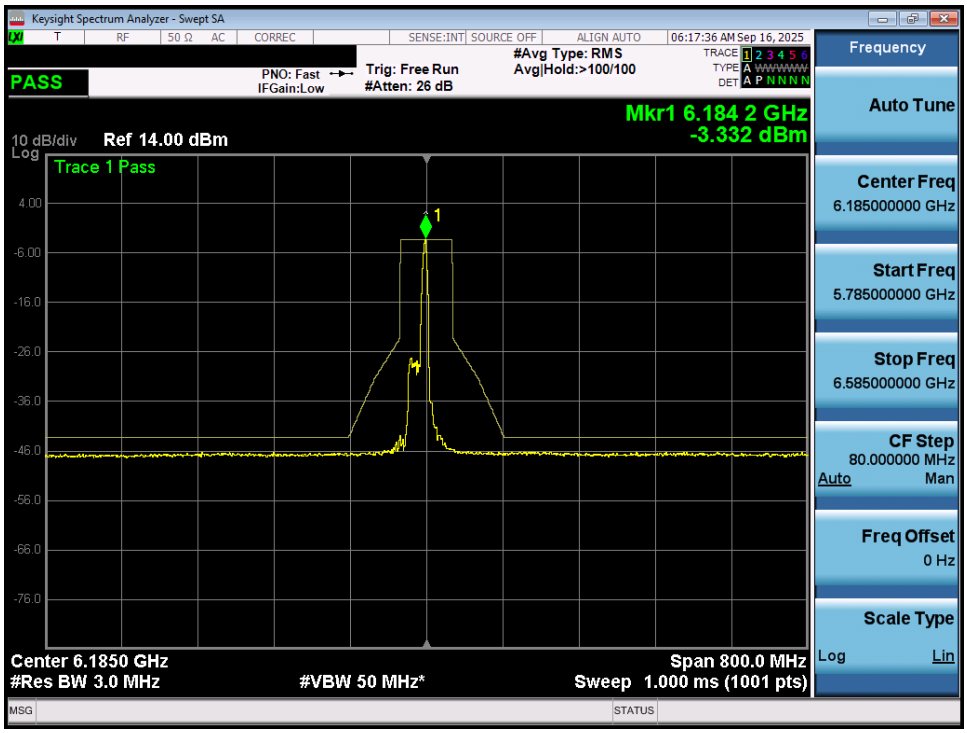


Plot 7-59. In Band Emissions Plot MIMO ANT1 (80MHz 802.11ax/be (26 Tones) (UNII Band 5) – Ch. 39) - VLP



Plot 7-60. In Band Emissions Plot MIMO ANT1 (160MHz 802.11ax/be (26 Tones) (UNII Band 5) – Ch. 47) - VLP

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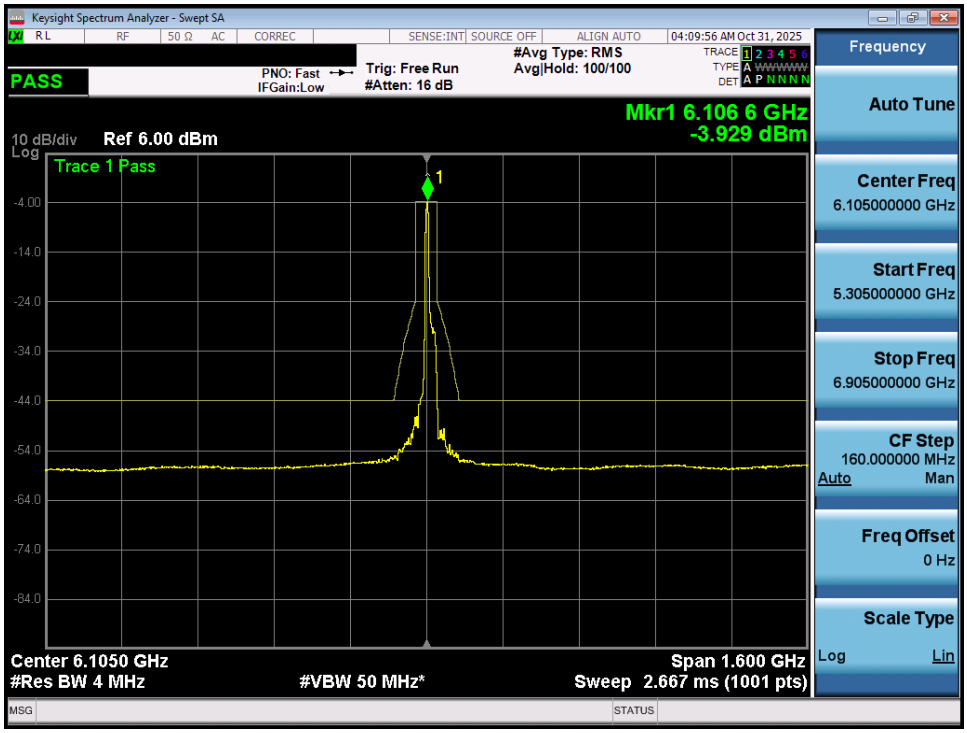
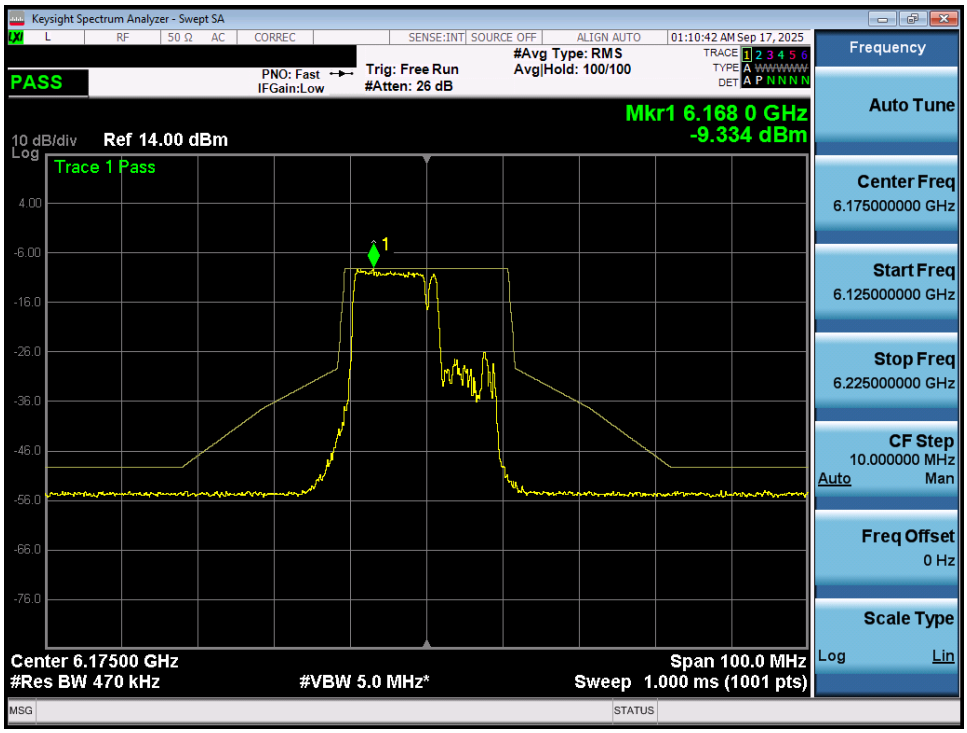


Plot 7-61. In Band Emissions Plot MIMO ANT1 (320MHz 802.11be (26 Tones) (UNII Band 5) – Ch. 31) - VLP



Plot 7-62. In Band Emissions Plot MIMO ANT1 (20MHz 802.11be (106+26 Tones) (UNII Band 5) – Ch. 45) - VLP

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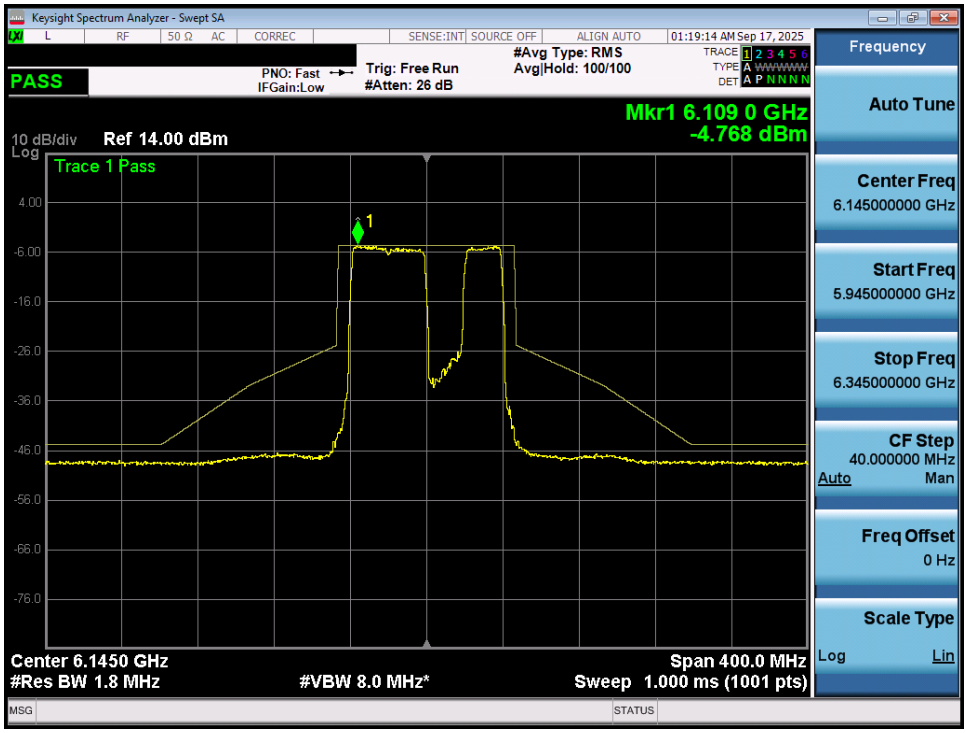
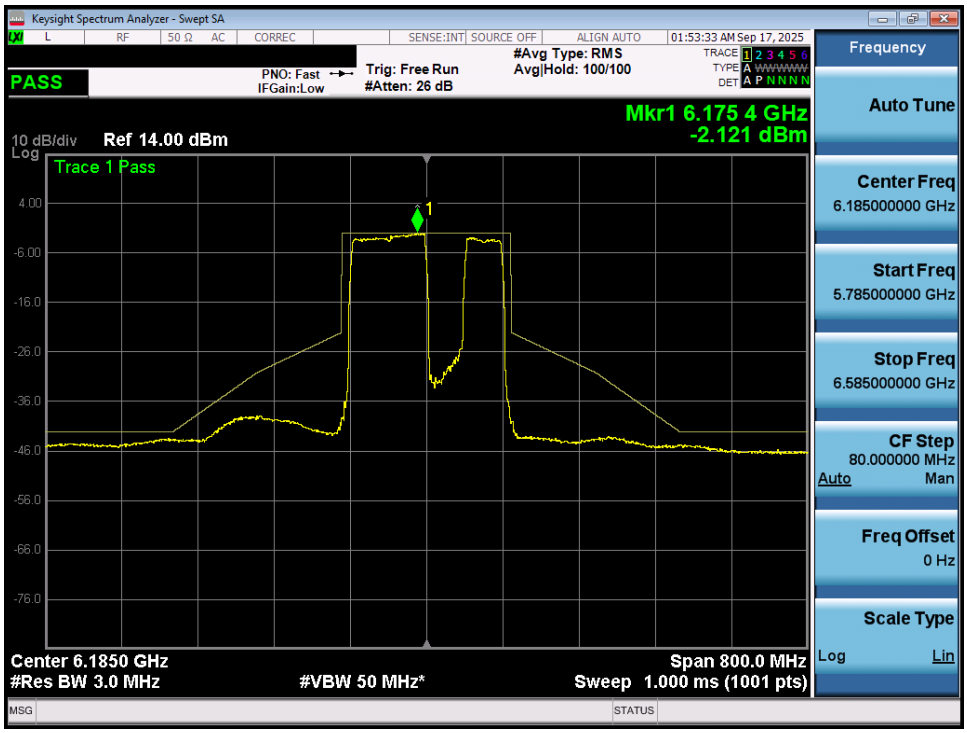


Plot 7-63. In Band Emissions Plot MIMO ANT1 (80MHz 802.11be (484+242 Tones) (UNII Band 5) – Ch. 39) VLP



Plot 7-64. In Band Emissions Plot MIMO ANT1 (160MHz 802.11be (996+484 Tones) (UNII Band 5) – Ch. 47) VLP

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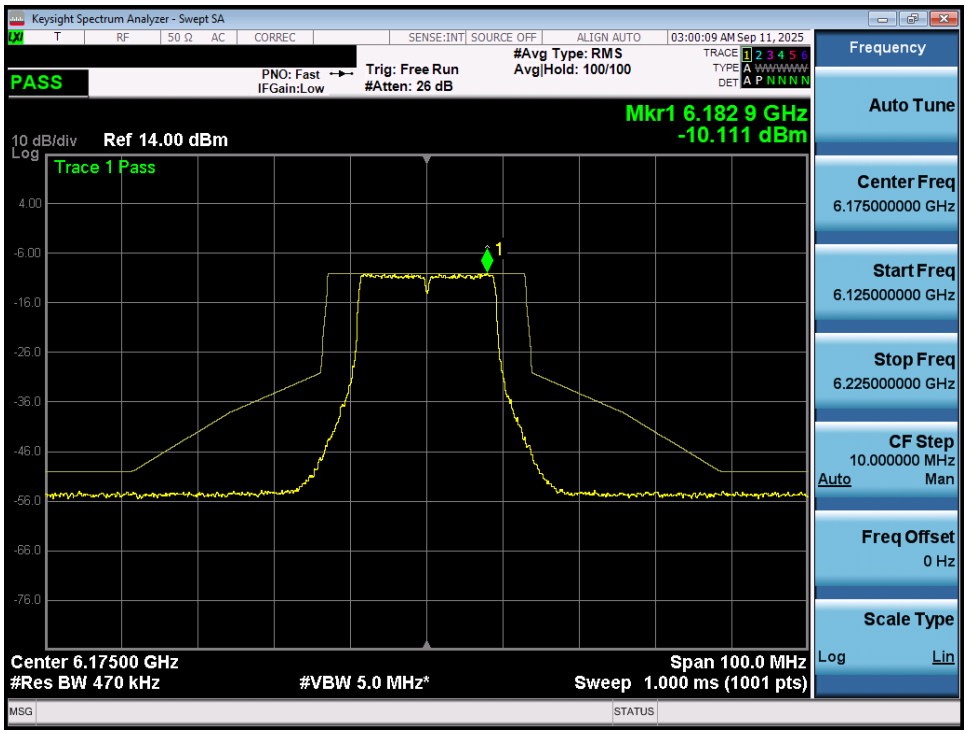
Plot 7-65. In Band Emissions Plot MIMO ANT1 (320MHz 802.11be (3*996+484 Tones) (UNII Band 5) – Ch. 31) VLP



Plot 7-66. In Band Emissions Plot MIMO ANT1 (20MHz 802.11ax/be (Full Tones) (UNII Band 5) – Ch. 45) - VLP

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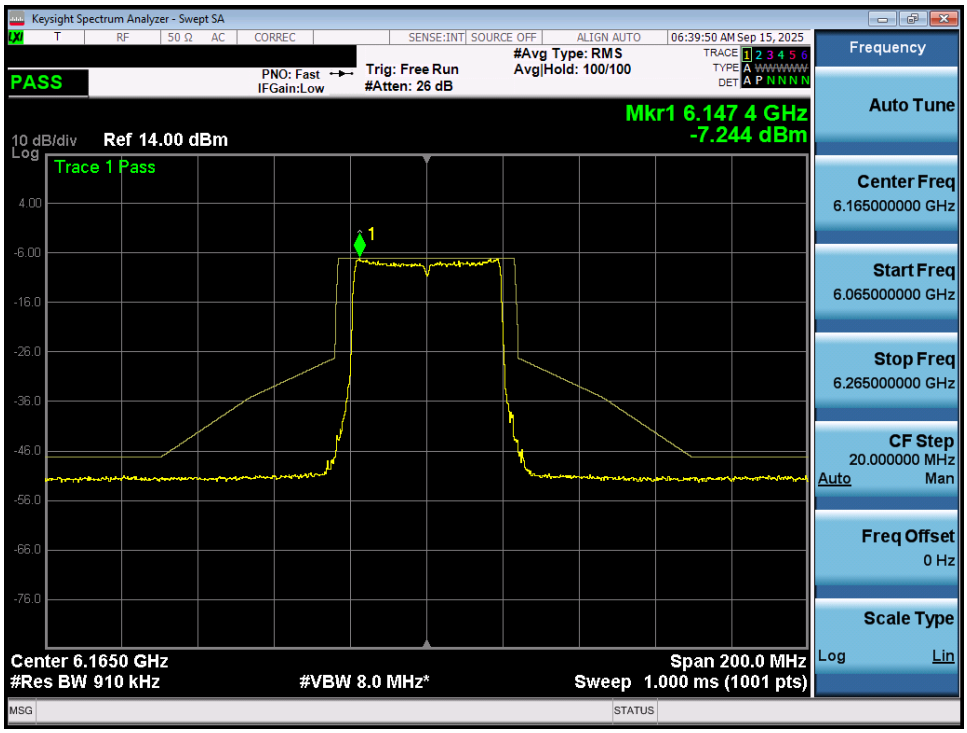
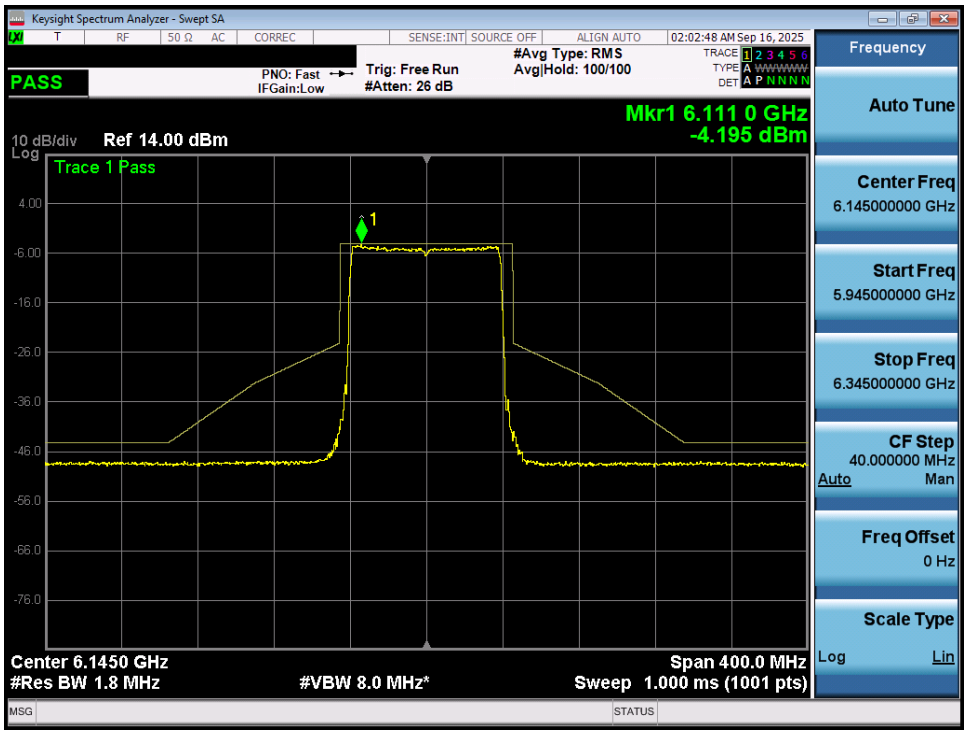


Plot 7-67. In Band Emissions Plot MIMO ANT1 (40MHz 802.11ax/be (Full Tones) (UNII Band 5) – Ch. 43) - VLP



Plot 7-68. In Band Emissions Plot MIMO ANT1 (80MHz 802.11ax/be (Full Tones) (UNII Band 5) – Ch. 39) - VLP

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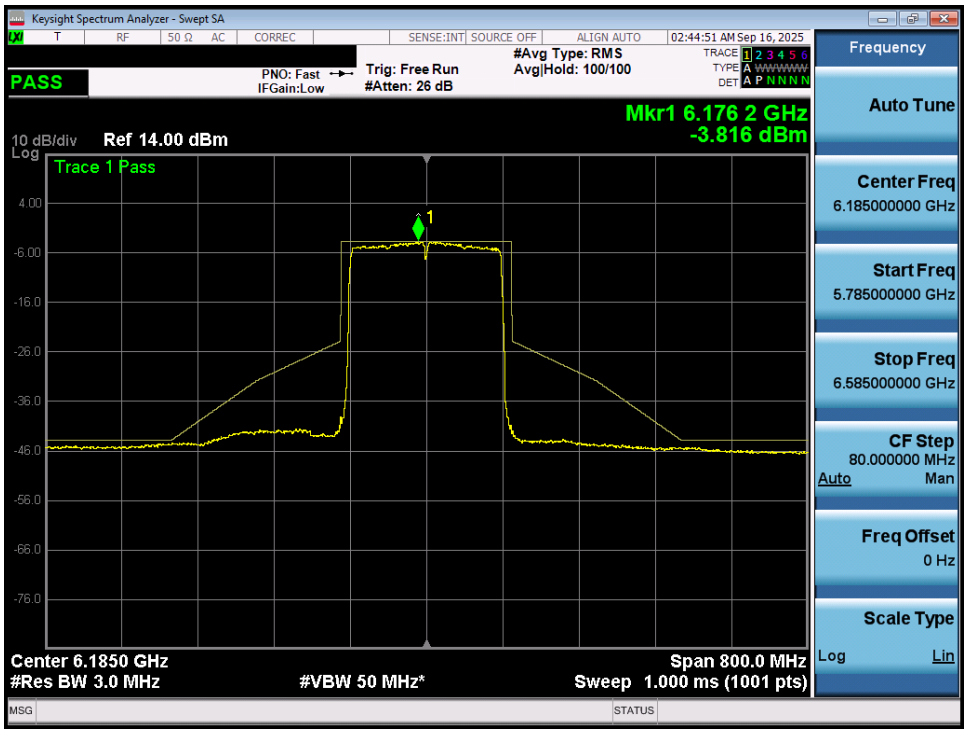

Plot 7-69. In Band Emissions Plot MIMO ANT1 (160MHz 802.11ax/be (Full Tones) (UNII Band 5) – Ch. 47) - VLP

Plot 7-70. In Band Emissions Plot MIMO ANT1 (320MHz 802.11be (Full Tones) (UNII Band 5) – Ch. 31) - VLP

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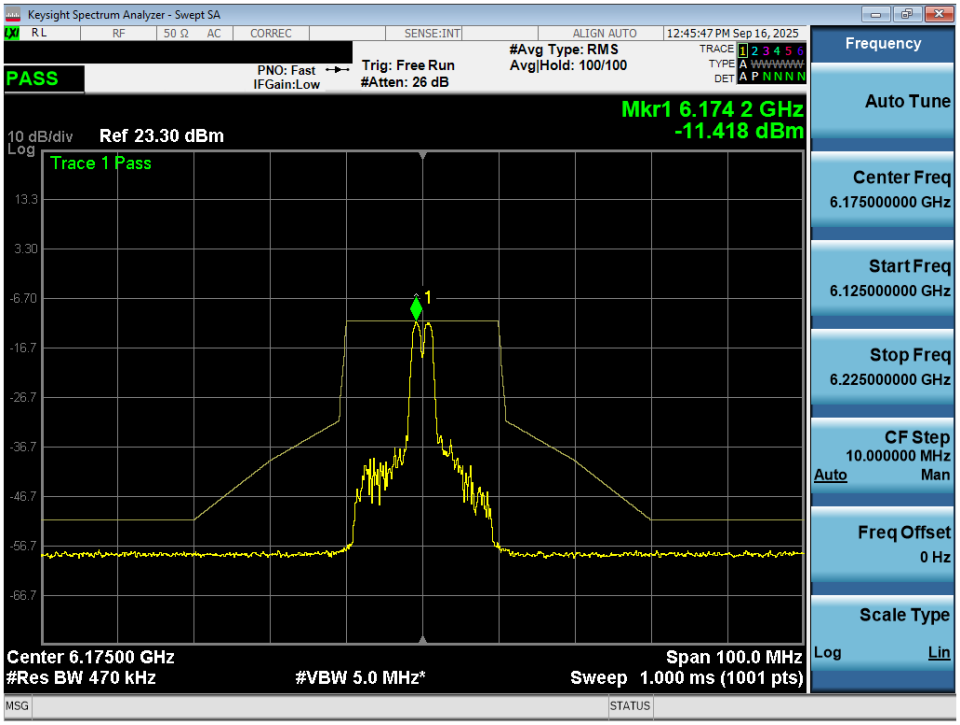
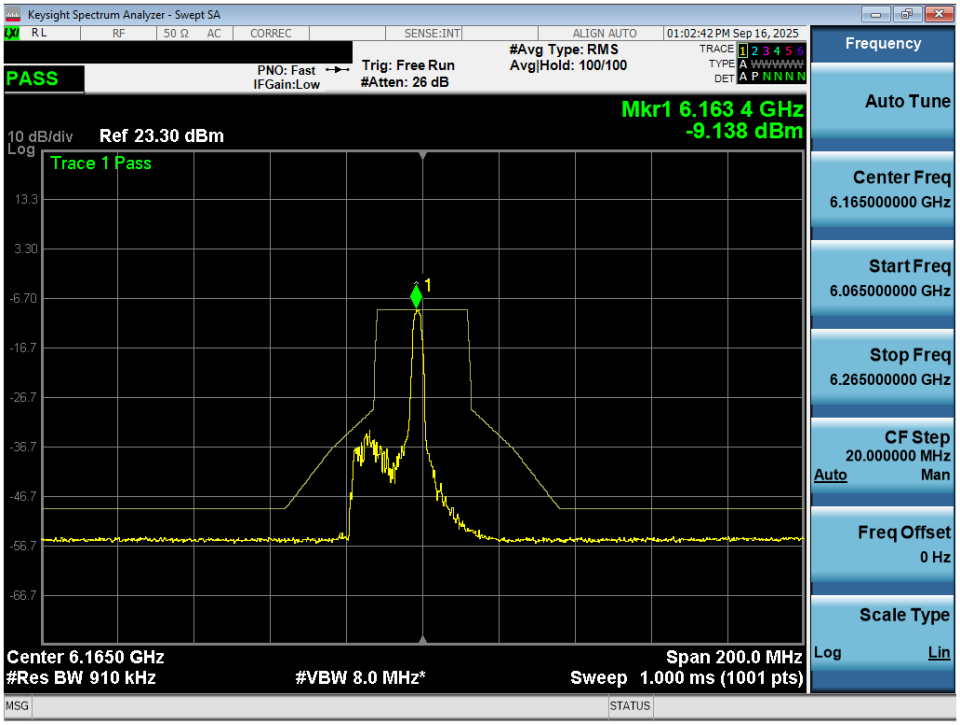
7.5.2 MIMO Antenna-2 In-Band Emission Measurements



Plot 7-71. In Band Emissions Plot MIMO ANT2 (20MHz 802.11ax/be (26 Tones) (UNII Band 5) – Ch. 45) - VLP



Plot 7-72. In Band Emissions Plot MIMO ANT2 (40MHz 802.11ax/be (26 Tones) (UNII Band 5) – Ch. 43) - VLP

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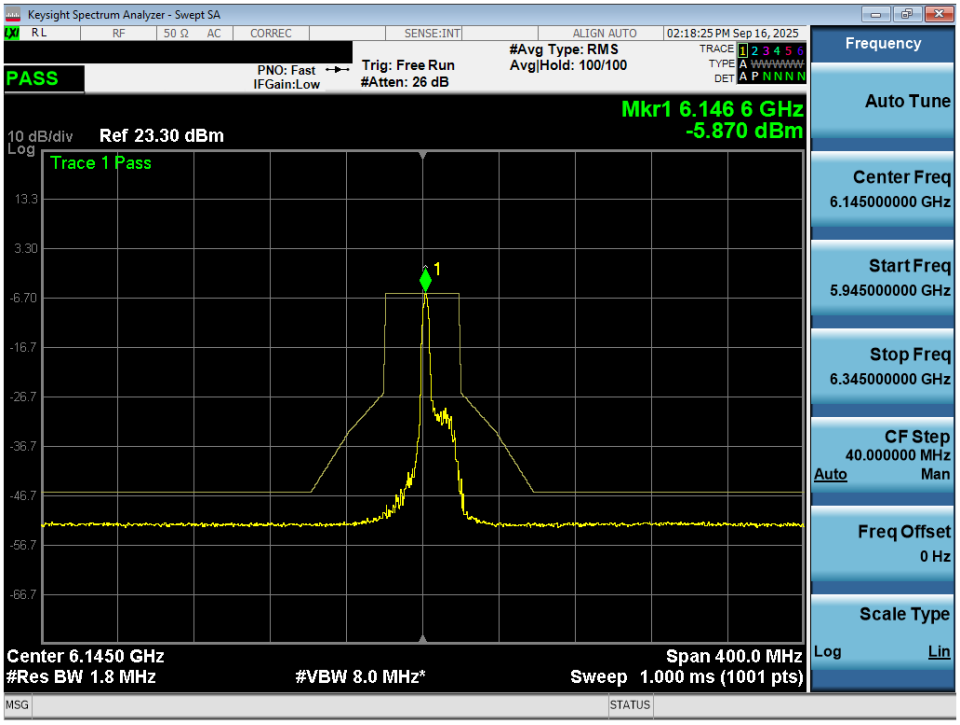
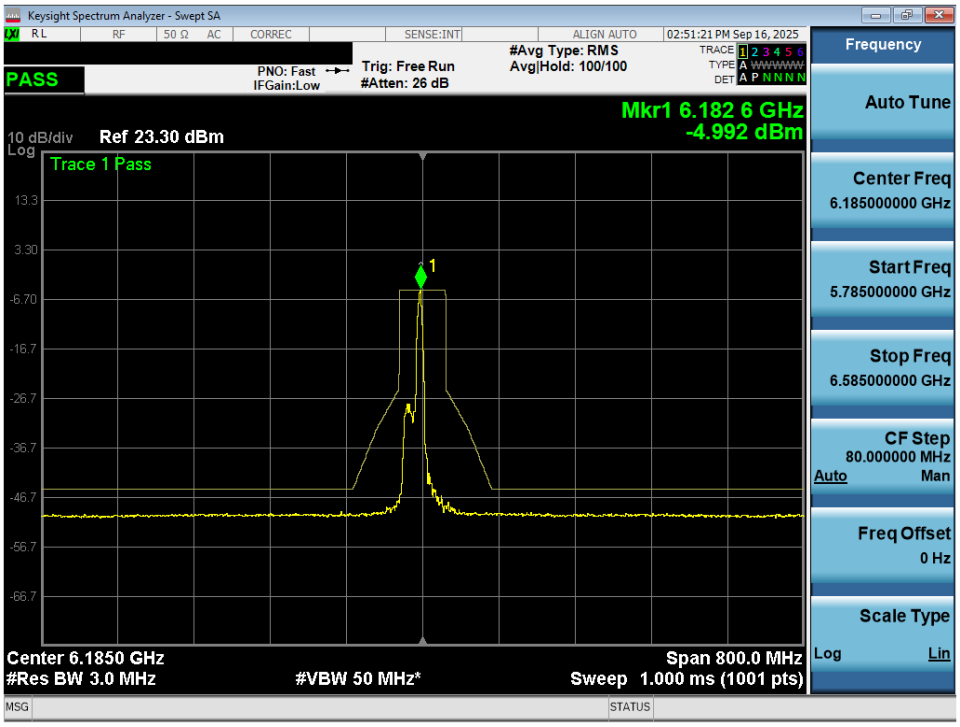


Plot 7-73. In Band Emissions Plot MIMO ANT2 (80MHz 802.11ax/be (26 Tones) (UNII Band 5) – Ch. 39) - VLP



Plot 7-74. In Band Emissions Plot MIMO ANT2 (160MHz 802.11ax/be (26 Tones) (UNII Band 5) – Ch. 47) - VLP

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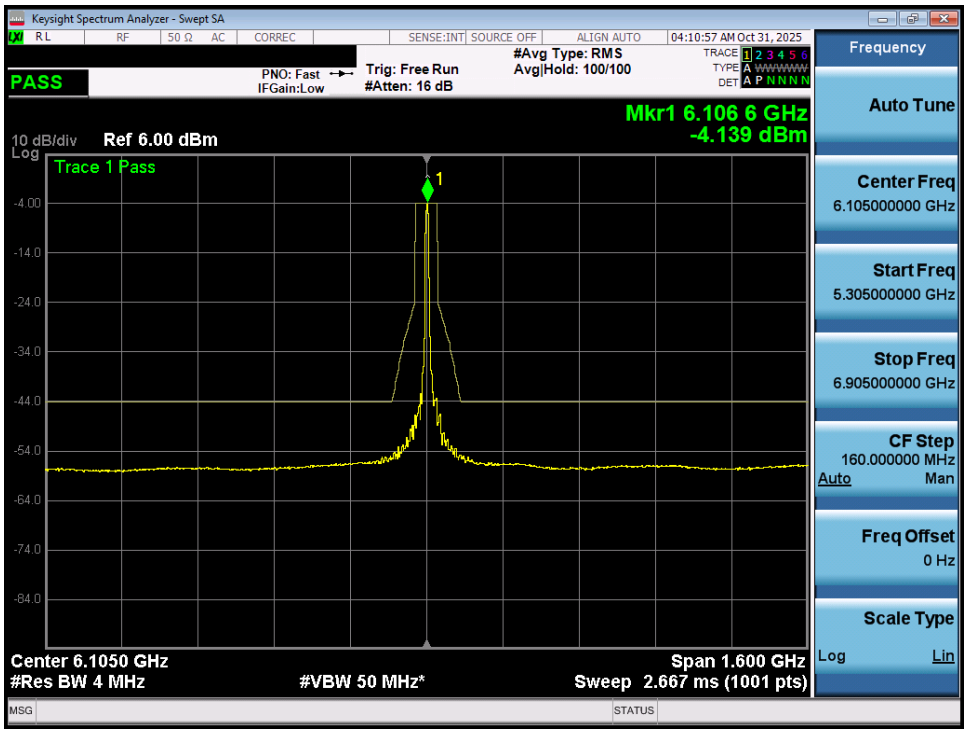
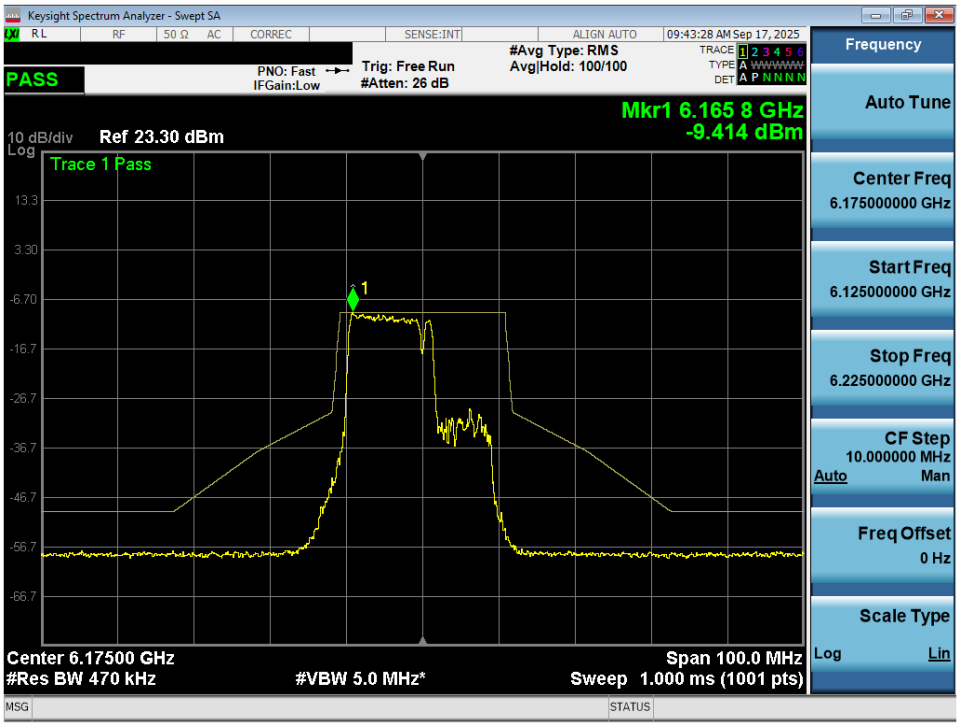


Plot 7-75. In Band Emissions Plot MIMO ANT2 (320MHz 802.11be (26 Tones) (UNII Band 5) – Ch. 31) - VLP



Plot 7-76. In Band Emissions Plot MIMO ANT2 (20MHz 802.11be (106+26 Tones) (UNII Band 5) – Ch. 45) - VLP

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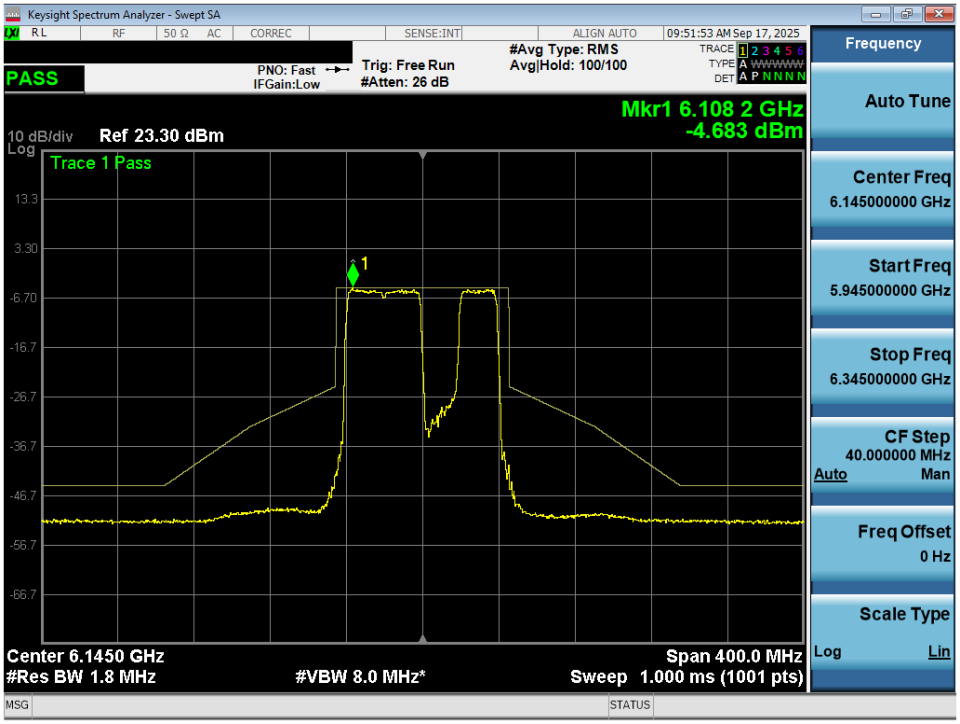
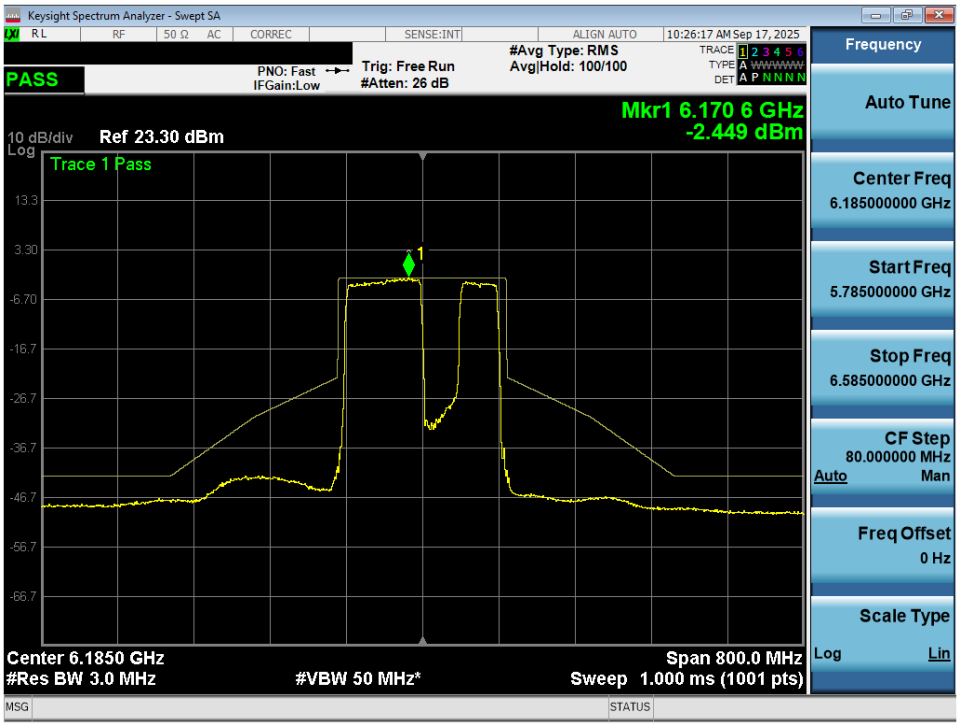


Plot 7-77. In Band Emissions Plot MIMO ANT2 (80MHz 802.11be (484+242 Tones) (UNII Band 5) – Ch. 39) VLP



Plot 7-78. In Band Emissions Plot MIMO ANT2 (160MHz 802.11be (996+484 Tones) (UNII Band 5) – Ch. 47) VLP

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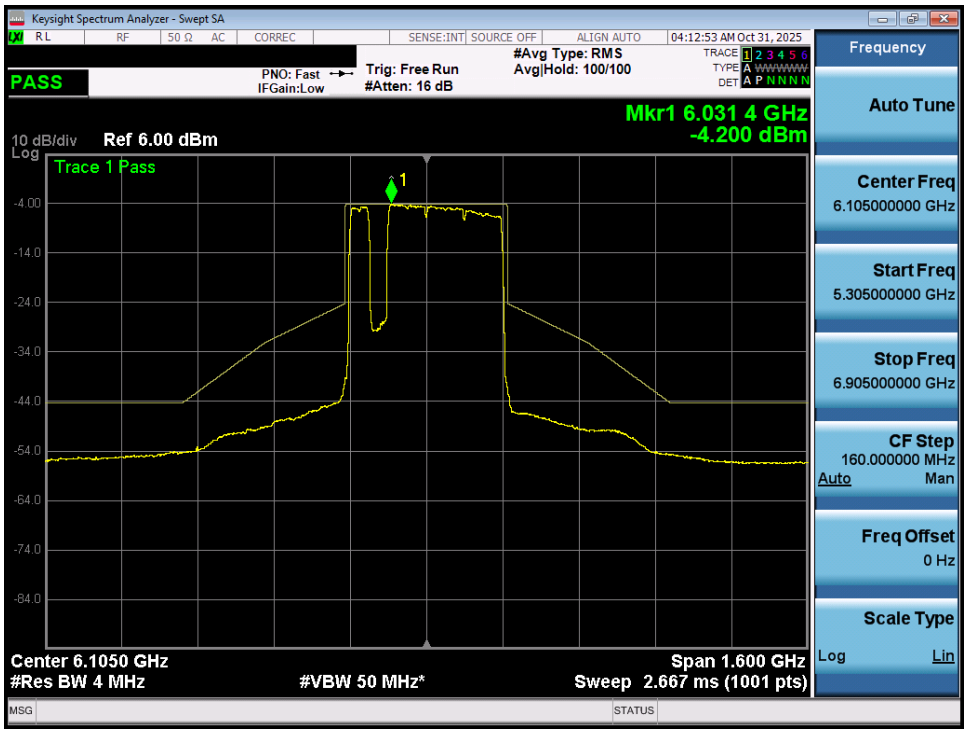
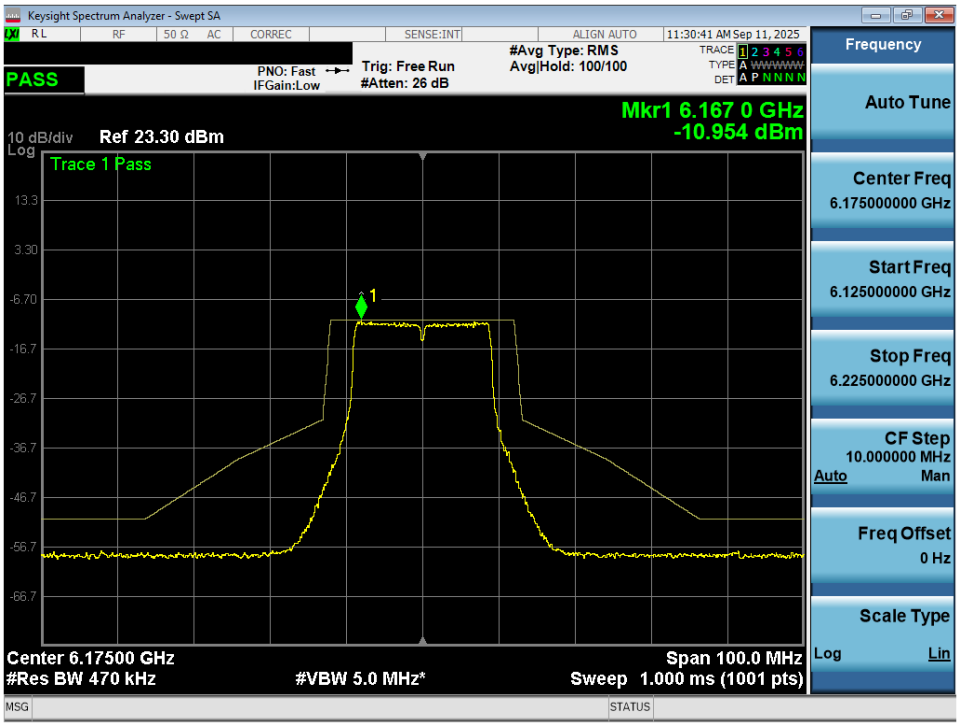


Plot 7-79. In Band Emissions Plot MIMO ANT2 (320MHz 802.11be (3*996+484 Tones) (UNII Band 5) – Ch. 31) VLP



Plot 7-80. In Band Emissions Plot MIMO ANT2 (20MHz 802.11ax/be (Full Tones) (UNII Band 5) – Ch. 45) - VLP

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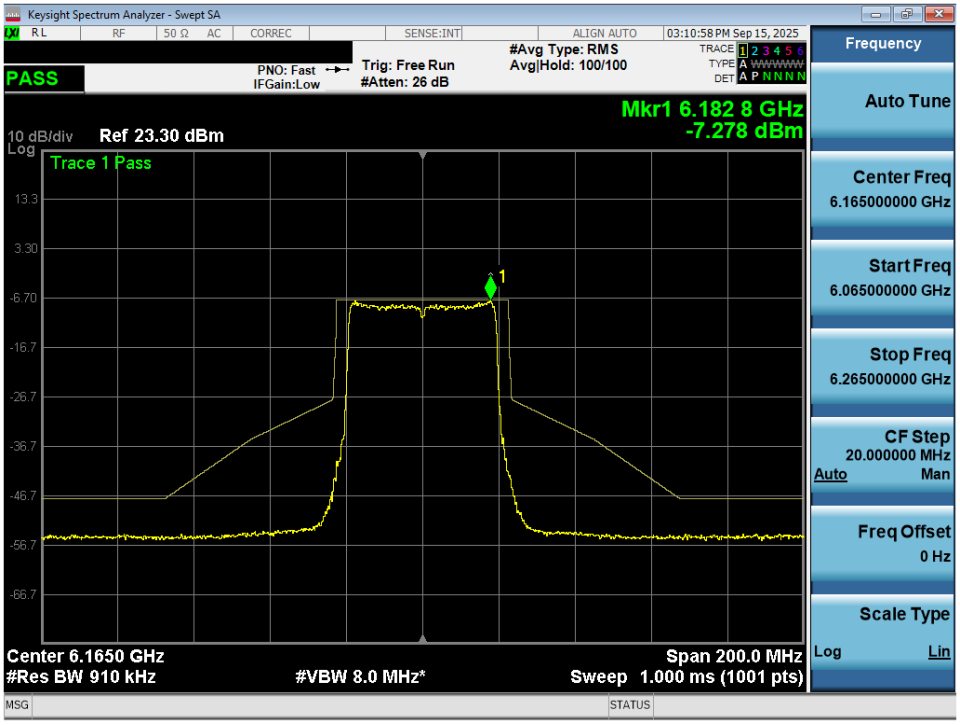
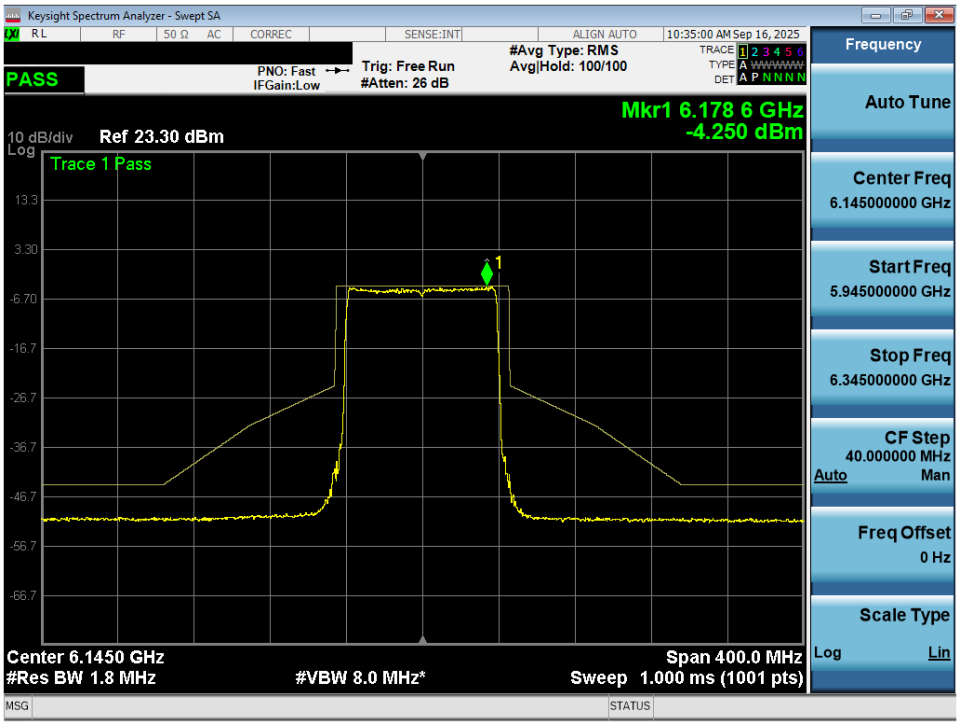


Plot 7-81. In Band Emissions Plot MIMO ANT2 (40MHz 802.11ax/be (Full Tones) (UNII Band 5) – Ch. 43) - VLP



Plot 7-82. In Band Emissions Plot MIMO ANT2 (80MHz 802.11ax/be (Full Tones) (UNII Band 5) – Ch. 39) - VLP

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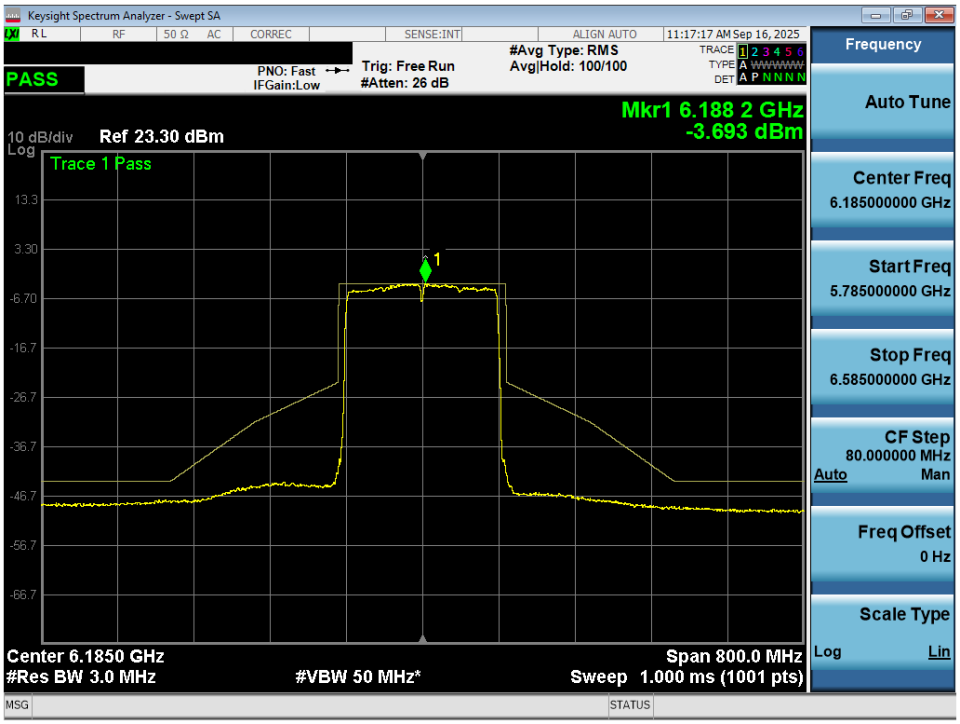
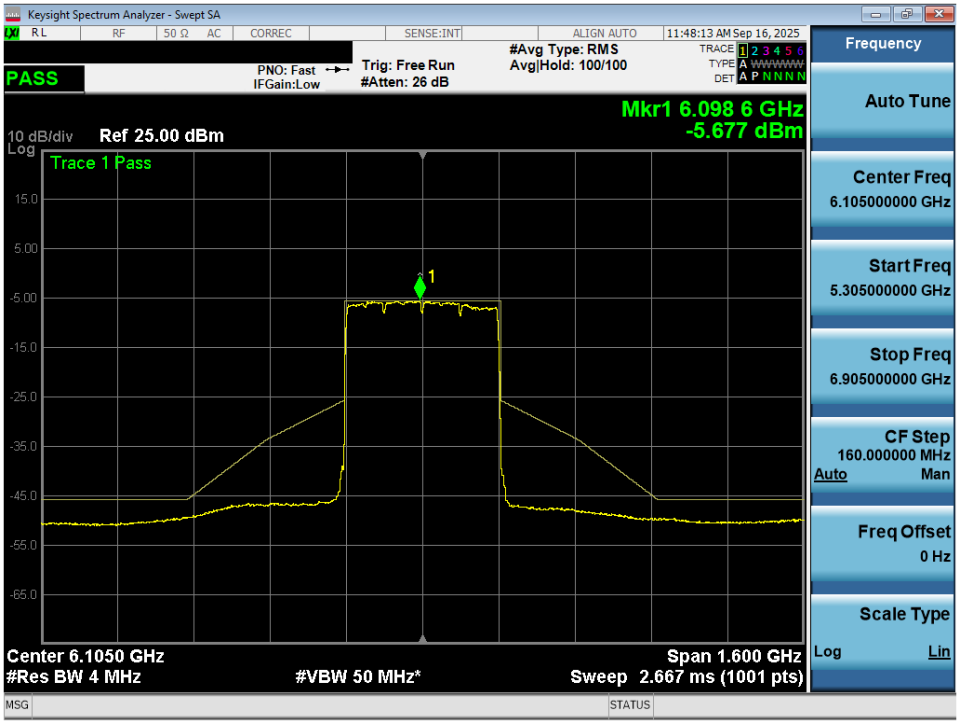


Plot 7-83. In Band Emissions Plot MIMO ANT2 (160MHz 802.11ax/be (Full Tones) (UNII Band 5) – Ch. 47) - VLP



Plot 7-84. In Band Emissions Plot MIMO ANT2 (320MHz 802.11be (Full Tones) (UNII Band 5) – Ch. 31) - VLP

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7.6 Radiated Emission Measurements

Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at its maximum duty cycle, at its maximum power control level, as defined in ANSI C63.10:2020, and at the appropriate frequencies. All channels, modes (e.g. 802.11ax and 802.11be (20/40/80/160/320MHz), and modulations/data rates were investigated among all UNII bands. Only the radiated emissions of the configuration that produced the worst-case emissions are reported in this section.

For transmitters operating within the 5.925-7.125 GHz band: Any emissions outside of the 5.925-7.125 GHz band must not exceed an e.i.r.p. of −27 dBm/MHz. Emissions found in a restricted band are subject to the limits of 15.209 as shown in the table below.

Frequency	Field Strength [µV/m]	Measured Distance [Meters]
0.009 – 0.490 MHz	2400/F (kHz)	300
0.490 – 1.705 MHz	24000/F (kHz)	30
1.705 – 30.00 MHz	30	30
30.00 – 88.00 MHz	100	3
88.00 – 216.0 MHz	150	3
216.0 – 960.0 MHz	200	3
Above 960.0 MHz	500	3

Table 7-26. Radiated Limits

Test Procedures Used

ANSI C63.10:2020 – Sections 12.7.7.2, 12.7.6, 12.7.5

Test Settings – Above 1GHz

Average Field Strength Measurements (Method AD – Average Detection)

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest.
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = power average (RMS)
5. Number of measurement points = 1001 (Number of points must be ≥ 2 x span/RBW)
6. Sweep time = auto
7. Trace (RMS) averaging was performed over at least 100 traces.

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Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest.
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize.

Test Settings – Below 1GHz

Quasi-Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest.
2. RBW = 120kHz (for emissions from 30MHz – 1GHz)
3. Detector = quasi-peak
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize.

Test Setup

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

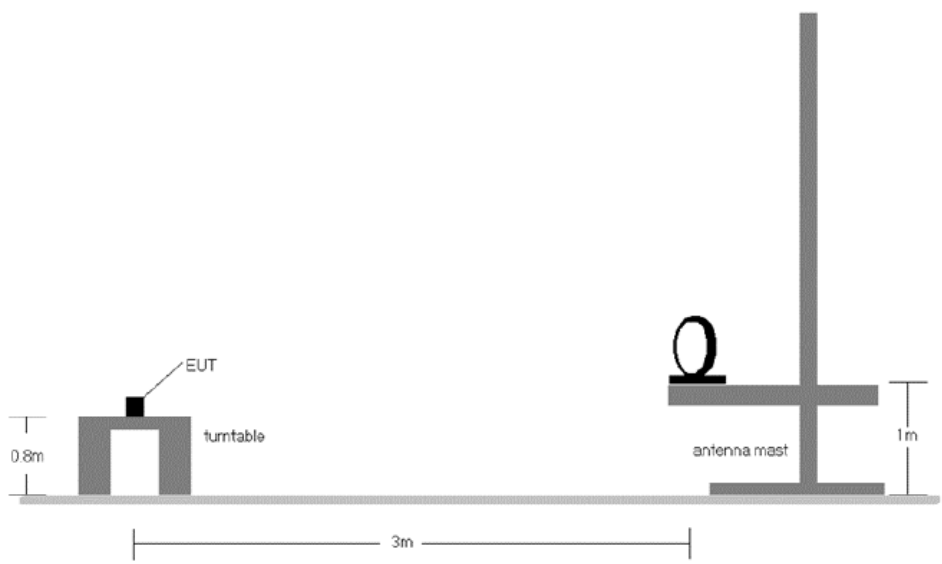

Figure 7-5. Radiated Test Setup < 30MHz

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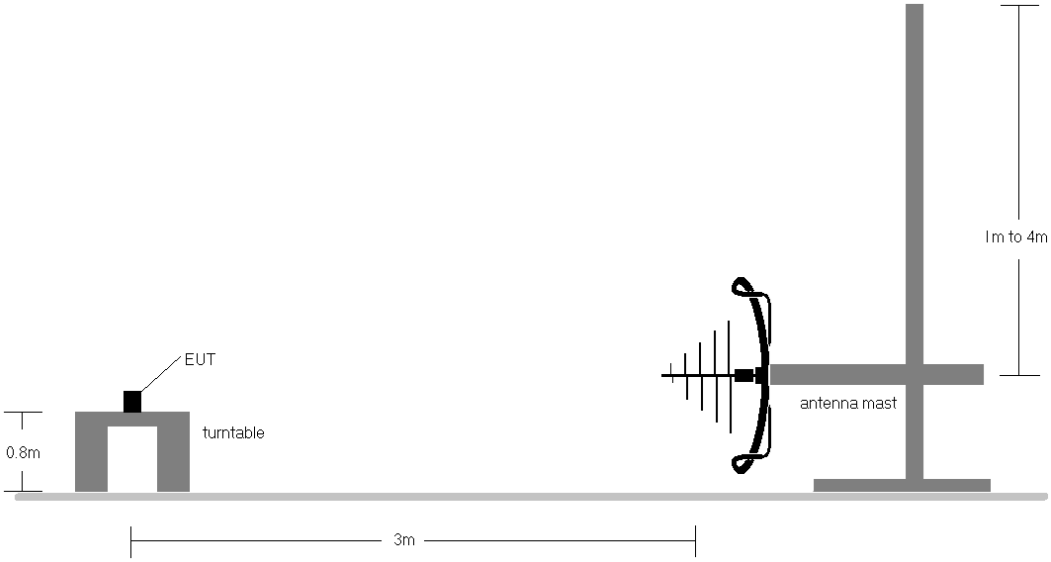

Figure 7-6. Radiated Test Setup < 1GHz

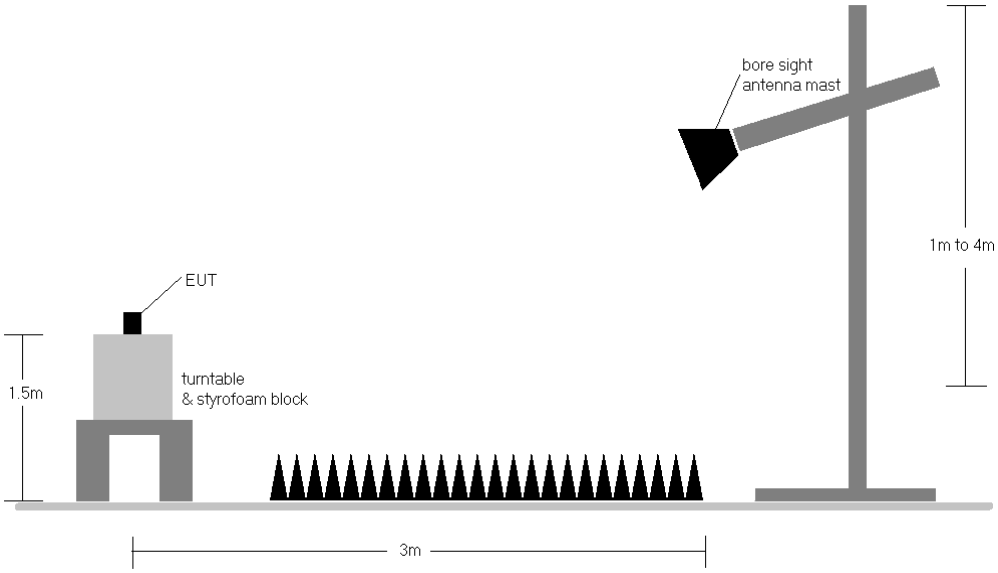

Figure 7-7. Radiated Test Setup > 1GHz

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Test Notes

1. All spurious emissions lying in restricted bands specified in §15.205 are below the limit shown in §15.209. All spurious emissions that do not lie in a restricted band are subject to an average limit of -27dBm/MHz. At 3 meters, the field strength limit in dBμV/m can be determined by adding a "conversion" factor of 95.2dB to the EIRP limit of -27dBm/MHz to obtain the limit for out of band spurious emissions of 68.2dBμV/m.
2. All spurious emissions that do not lie in a restricted band are subject to a peak limit not to exceed 20dB of the average limit [68.2dBμV/m]. If a peak measurement passes the average limit, it was determined no further investigation is necessary.
3. The antenna is manipulated through typical positions, polarity, and length during the tests. The EUT is manipulated through three orthogonal planes.
4. This unit was tested with its standard battery.
5. The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter using CISPR quasi peak detector below 1GHz. Above 1 GHz, average and peak measurements were taken using linearly polarized horn antennas. The worst-case emissions are reported, however emissions whose levels were not within 20dB of the respective limits were not reported.
6. Emissions below 18GHz were measured at a 3-meter test distance while emissions above 18GHz were measured at a 1-meter test distance with the application of a distance correction factor.
7. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. Any emissions found to be within 20dB of the limit are fully investigated and the results are shown in this section.
8. The "-" shown in the following RSE tables are used to denote a noise floor measurement.
9. For radiated measurements, emissions were investigated for the fully-loaded RU configuration and for all of the partially-loaded RU configurations. Among all of the available partially-loaded RU configurations, only the configuration with the worst case emissions is reported.

Sample Calculations

Determining Spurious Emissions Levels

- Field Strength Level $_{[dB\mu V/m]}$ = Analyzer Level $_{[dBm]}$ + 107 + AFCL $_{[dB/m]}$
- AFCL $_{[dB/m]}$ = Antenna Factor $_{[dB/m]}$ + Cable Loss $_{[dB]}$
- Margin $_{[dB]}$ = Field Strength Level $_{[dB\mu V/m]}$ – Limit $_{[dB\mu V/m]}$

Radiated Band Edge Measurement Offset

- The amplitude offset shown in the radiated restricted band edge plots was calculated using the formula: Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

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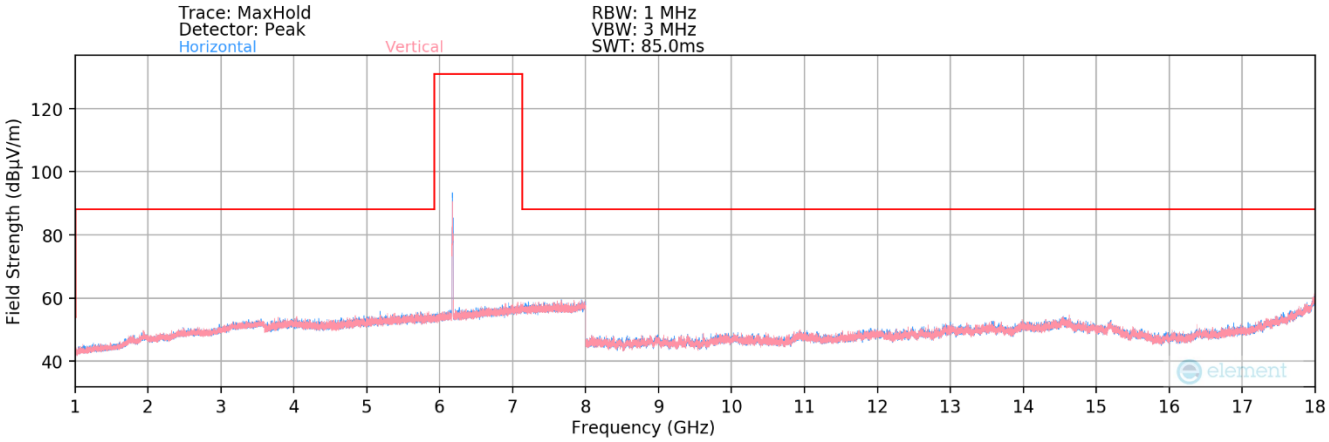
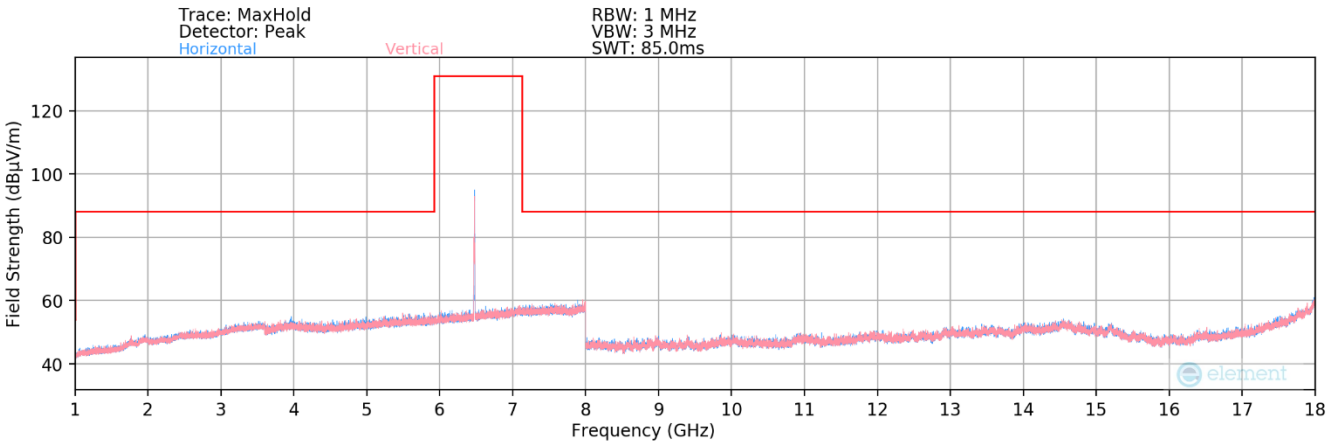
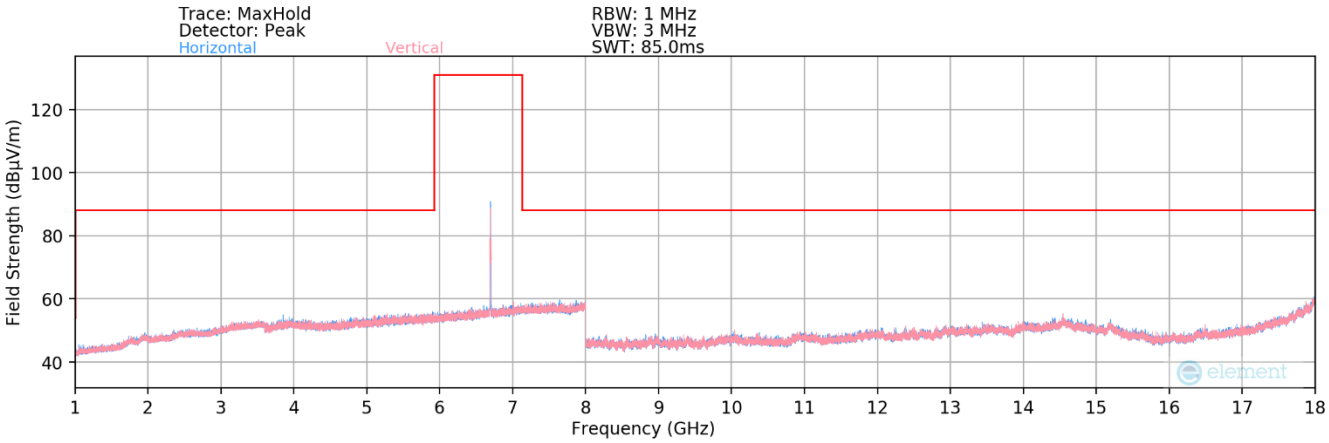
7.6.1 MIMO Radiated Spurious Emission Measurements (26 Tones)



Plot 7-85. Radiated Spurious Plot 1GHz – 18GHz MIMO (802.11ax – UNII Band 5 Ch. 45)



Plot 7-86. Radiated Spurious Plot 1GHz – 18GHz MIMO (802.11ax – UNII Band 6 Ch. 105)



Plot 7-87. Radiated Spurious Plot 1GHz – 18GHz MIMO (802.11ax – UNII Band 7 Ch. 149)

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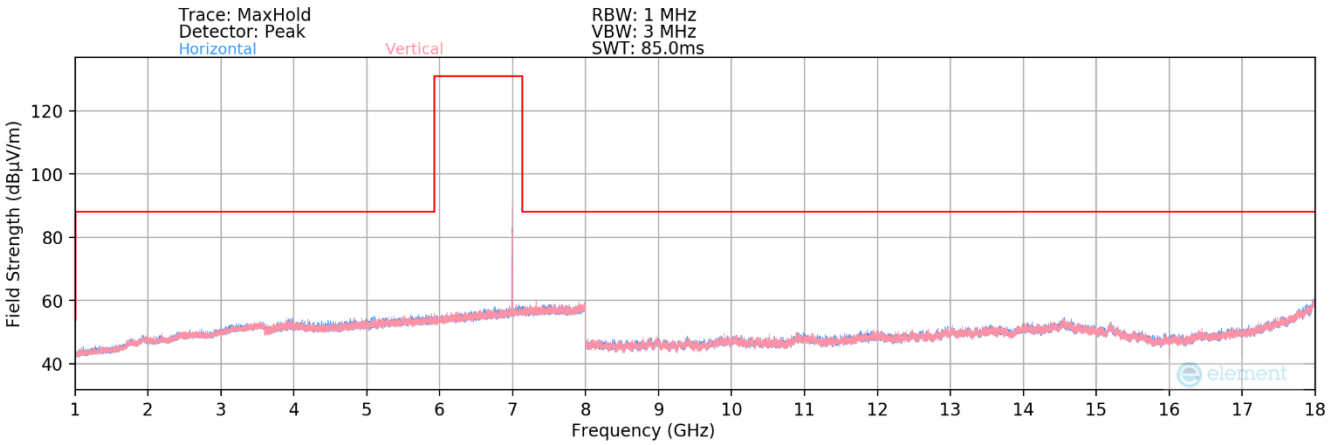
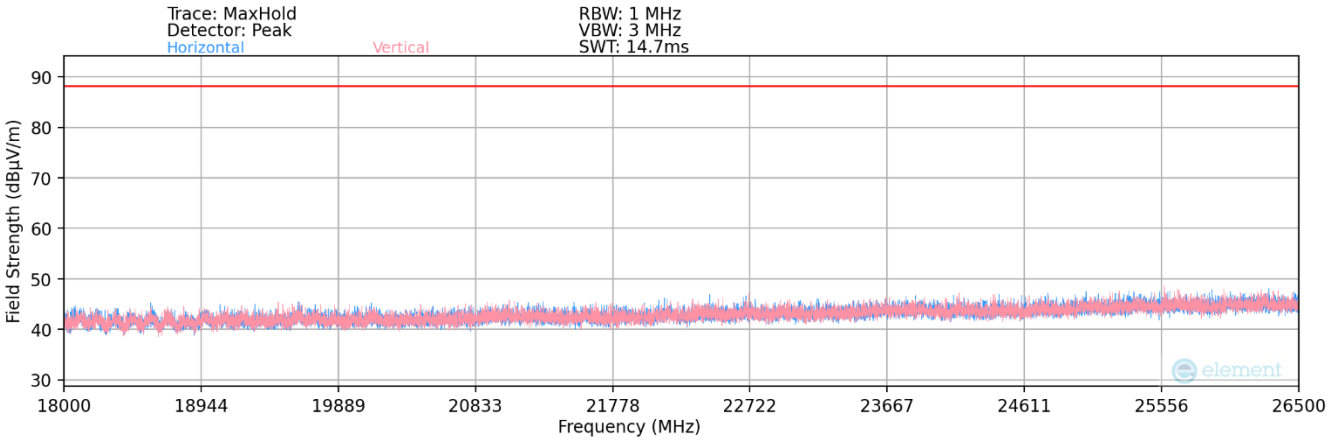
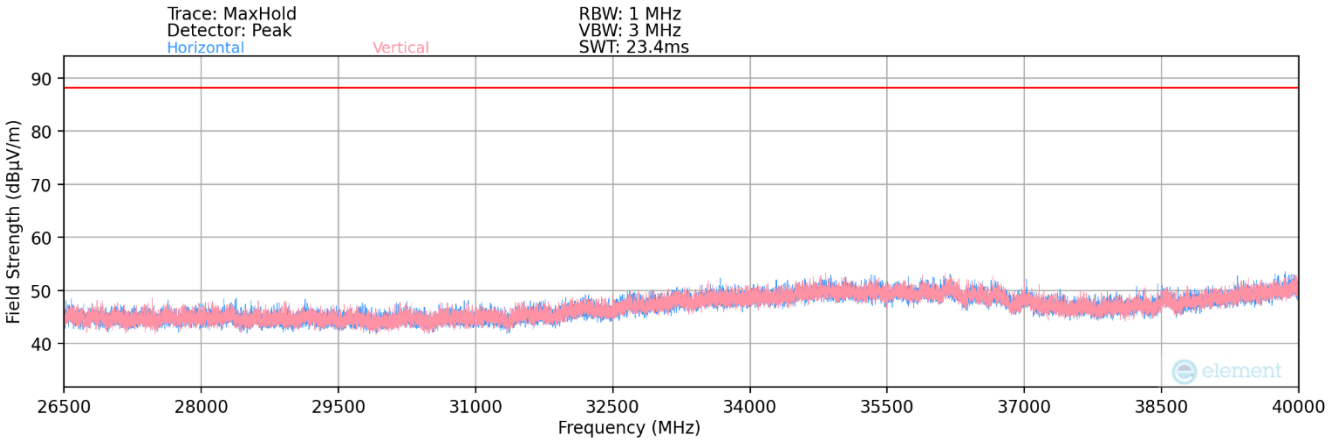


Plot 7-88. Radiated Spurious Plot 1GHz – 18GHz MIMO (802.11ax – U Band 8 Ch. 209)



Plot 7-89. Radiated Spurious Plot 18GHz - 26.5GHz (802.11ax) – Ch. 149



Plot 7-90. Radiated Spurious Plot 26.5GHz - 40GHz (802.11ax) – Ch. 149

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7.6.1.1 MIMO Radiated Spurious Emission Measurements (26 Tones) – UNII Band 5

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	MIMO	5	2	5935	4	*	11870.00	Average	V	-	-	-78.20	9.41	0.00	38.21	53.98	-15.77
						*	11870.00	Peak	V	-	-	-66.32	9.41	0.00	50.09	73.98	-23.89
						*	17805.00	Average	V	-	-	-77.82	16.76	0.00	45.94	53.98	-8.04
						*	17805.00	Peak	V	-	-	-66.32	16.76	0.00	57.44	73.98	-16.54
						*	23740.00	Average	V	-	-	-63.97	4.02	-9.54	37.51	53.98	-16.47
						*	23740.00	Peak	V	-	-	-52.13	4.02	-9.54	49.35	73.98	-24.63
							29675.00	Peak	V	-	-	-52.74	5.01	-9.54	49.73	68.20	-18.47
			45	6175	4	*	12350.00	Average	V	-	-	-78.62	9.78	0.00	38.16	53.98	-15.82
						*	12350.00	Peak	V	-	-	-67.03	9.78	0.00	49.75	73.98	-24.23
						*	18525.00	Average	V	-	-	-62.56	1.00	-9.54	35.90	53.98	-18.08
						*	18525.00	Peak	V	-	-	-50.46	1.00	-9.54	48.00	73.98	-25.98
							24700.00	Peak	V	-	-	-51.32	4.23	-9.54	50.37	68.20	-17.83
							30875.00	Peak	V	-	-	-51.84	5.66	-9.54	51.28	68.20	-16.92
			93	6415	4		12830.00	Peak	V	-	-	-66.13	10.40	0.00	51.27	68.20	-16.93
						*	19245.00	Average	V	-	-	-62.54	1.74	-9.54	36.66	53.98	-17.32
						*	19245.00	Peak	V	-	-	-50.90	1.74	-9.54	48.30	73.98	-25.68
							25660.00	Peak	V	-	-	-51.49	4.69	-9.54	50.66	68.20	-17.54
							32075.00	Peak	V	-	-	-52.59	6.47	-9.54	51.34	68.20	-16.86

Table 7-27. Radiated Measurements MIMO (26 Tones)

7.6.1.2 MIMO Radiated Spurious Emission Measurements (26 Tones) – UNII Band 6

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	MIMO	6	97	6435	4		12870.00	Peak	V	-	-	-67.46	10.56	0.00	50.10	68.20	-18.10
						*	19305.00	Average	V	-	-	-62.28	1.65	-9.54	36.83	53.98	-17.15
						*	19305.00	Peak	V	-	-	-50.67	1.65	-9.54	48.44	73.98	-25.54
							25740.00	Peak	V	-	-	-51.91	4.71	-9.54	50.26	68.20	-17.94
							32175.00	Peak	V	-	-	-52.03	6.76	-9.54	52.19	68.20	-16.01
			105	6475	4		12950.00	Peak	V	-	-	-66.31	10.59	0.00	51.28	68.20	-16.92
						*	19425.00	Average	V	-	-	-63.31	1.76	-9.54	35.91	53.98	-18.07
						*	19425.00	Peak	V	-	-	-50.08	1.76	-9.54	49.14	73.98	-24.84
							25900.00	Peak	V	-	-	-51.18	4.78	-9.54	51.07	68.20	-17.13
							32375.00	Peak	V	-	-	-51.62	6.56	-9.54	52.40	68.20	-15.80
			113	6515	4		13030.00	Peak	V	-	-	-65.82	10.85	0.00	52.03	68.20	-16.17
						*	19545.00	Average	V	-	-	-62.65	1.89	-9.54	36.70	53.98	-17.28
						*	19545.00	Peak	V	-	-	-50.84	1.89	-9.54	48.51	73.98	-25.47
							26060.00	Peak	V	-	-	-51.98	4.92	-9.54	50.40	68.20	-17.80
							32575.00	Peak	V	-	-	-52.50	6.76	-9.54	51.72	68.20	-16.48

Table 7-28. Radiated Measurements MIMO (26 Tones)

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7.6.1.3 MIMO Radiated Spurious Emission Measurements (26 Tones) – UNII Band 7

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	MIMO	7	117	6535	4		13070.00	Peak	V	-	-	-65.76	10.74	0.00	51.98	68.20	-16.22
						*	19605.00	Average	V	-	-	-62.87	2.20	-9.54	36.79	53.98	-17.19
						*	19605.00	Peak	V	-	-	-50.87	2.20	-9.54	48.79	73.98	-25.19
							26140.00	Peak	V	-	-	-51.39	4.98	-9.54	51.05	68.20	-17.15
							32675.00	Peak	V	-	-	-51.55	7.14	-9.54	53.05	68.20	-15.15
			149	6695	4	*	13390.00	Average	V	-	-	-78.19	11.04	0.00	39.85	53.98	-14.13
						*	13390.00	Peak	V	-	-	-65.88	11.04	0.00	52.16	73.98	-21.82
						*	20085.00	Average	V	-	-	-63.52	2.07	-9.54	36.01	53.98	-17.97
						*	20085.00	Peak	V	-	-	-51.10	2.07	-9.54	48.43	73.98	-25.55
							26780.00	Peak	V	-	-	-51.13	5.18	-9.54	51.51	68.20	-16.69
							33475.00	Peak	V	-	-	-52.00	8.48	-9.54	53.94	68.20	-14.26
			185	6875	4		13750.00	Peak	V	-	-	-66.73	11.51	0.00	51.78	68.20	-16.42
						*	20625.00	Average	V	-	-	-62.65	2.36	-9.54	37.17	53.98	-16.81
						*	20625.00	Peak	V	-	-	-51.46	2.36	-9.54	48.36	73.98	-25.62
							27500.00	Peak	V	-	-	-51.58	5.00	-9.54	50.88	68.20	-17.32
							34375.00	Peak	V	-	-	-52.52	9.46	-9.54	54.40	68.20	-13.80

Table 7-29. Radiated Measurements MIMO (26 Tones)

7.6.1.4 MIMO Radiated Spurious Emission Measurements (26 Tones) – UNII Band 8

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	MIMO	8	189	6895	4		13790.00	Peak	V	-	-	-65.81	11.38	0.00	52.57	68.20	-15.63
						*	20685.00	Average	V	-	-	-63.27	2.33	-9.54	36.52	53.98	-17.46
						*	20685.00	Peak	V	-	-	-51.01	2.33	-9.54	48.78	73.98	-25.20
							27580.00	Peak	V	-	-	-51.80	5.33	-9.54	50.99	68.20	-17.21
							34475.00	Peak	V	-	-	-52.27	9.33	-9.54	54.52	68.20	-13.68
			209	6995	4		13990.00	Peak	V	-	-	-66.43	11.63	0.00	52.20	68.20	-16.00
						*	20985.00	Average	V	-	-	-63.69	2.83	-9.54	36.60	53.98	-17.38
						*	20985.00	Peak	V	-	-	-50.96	2.83	-9.54	49.33	73.98	-24.65
							27980.00	Peak	V	-	-	-51.62	5.30	-9.54	51.14	68.20	-17.06
							34975.00	Peak	V	-	-	-52.81	9.79	-9.54	54.44	68.20	-13.76
			233	7115	4		14230.00	Peak	V	-	-	-66.35	12.35	0.00	53.00	68.20	-15.20
						*	21345.00	Average	V	-	-	-64.02	2.85	-9.54	36.29	53.98	-17.69
						*	21345.00	Peak	V	-	-	-51.67	2.85	-9.54	48.64	73.98	-25.34
							28460.00	Peak	V	-	-	-52.38	5.34	-9.54	50.42	68.20	-17.78
							35575.00	Peak	V	-	-	-52.41	9.53	-9.54	54.58	68.20	-13.62

Table 7-30. Radiated Measurements MIMO (26 Tones)

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