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MEASUREMENT REPORT
FCC PART 15.407 802.11be (OFDMA)

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

Date of Testing:
12/15/2023 – 1/11/2024
Test Report Issue Date:
1/18/2024
Test Site/Location:
Element lab., Gyeonggi-do, South Korea
Test Report Serial No.:
1M2312180128-05.A3L

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

Application Type:	Class II Permissive Change
Original Grant Date:	06/08/2023
Model:	SM-X910
EUT Type:	Portable Tablet
Frequency Range:	5180 – 5885MHz
Modulation Type:	OFDMA
FCC Equipment Class:	Unlicensed National Information Infrastructure TX (NII)
FCC Rule Part(s):	Part 15 Subpart E (15.407)
ISED Specification:	RSS-247 Issue 3
Test Procedure(s):	ANSI C63.10-2013
Class II Permissive Change:	Enabling WiFi 7 functionality via software

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

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

Prepared by

Reviewed by

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Channel Bandwidth [MHz]	IEEE Mode	UNII Band	Tx Frequency [MHz]	MIMO	
				Max. Power [mW]	Max. Power [dBm]
20	802.11be	1	5180 - 5240	54.94	17.40
	802.11be	2A	5260 - 5320	57.41	17.59
	802.11be	2C	5500 - 5720	55.14	17.41
	802.11be	3	5745 - 5825	61.26	17.87
	802.11be	4	5845 - 5885	27.49	14.39
80	802.11be	1	5210	68.94	18.38
	802.11be	2A	5290	61.39	17.88
	802.11be	2C	5530 - 5690	61.45	17.89
	802.11be	3	5775	68.39	18.35
	802.11be	4	5855	34.04	15.32
160	802.11be	1/2A	5250	58.29	17.66
	802.11be	2C	5570	54.33	17.35
	802.11be	3/4	5815	26.34	14.21

EUT Overview

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

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 Suwon Laboratory located at 13, Heungdeok 1-ro, Giheung-gu, Yongin-si, Gyeonggi-do, 16954, South Korea. 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 Materials Technology Suwon, Ltd. located in Yongin-si, Gyeonggi-do, 16954, South Korea.

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

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

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

2.0 PRODUCT INFORMATION

2.1 Equipment Description

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

Test Device Serial No.: 0150M, 4628G, 3657M

2.2 Device Capabilities

This device contains the following capabilities:

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

Band 1		Band 2A		Band 2C		Band 3		Band 3/4	
Ch.	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**
36	5180	52	5260	100	5500	149	5745	169	5845
:	:	:	:	:	:	:	:	:	:
40	5200	56	5280	120	5600	157	5785	173	5865
:	:	:	:	:	:	:	:	:	:
48	5240	64	5320	144	5720	165	5825	177	5885

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

Band 1		Band 2A		Band 2C		Band 3		Band 3/4	
Ch.	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**
38	5190	54	5270	102	5510	151	5755	167	5835
:	:	:	:	:	:	:	:	:	:
46	5230	62	5310	118	5590	159	5795	175	5875
				:	:				
				142	5710				

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

Band 1		Band 2A		Band 2C		Band 3		Band 3/4	
Ch.	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**
42	5210	58	5290	106	5530	155	5775	167	5835
				:	:				
				122	5610				
				:	:				
				138	5690				

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

Band 1/2A		Band 2C		Band 3/4	
Ch.	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**
50	5250	114	5570	163	5815

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

Notes:

1. 5GHz NII operation is possible in 20MHz, 40MHz, 80MHz, and 160MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = peak per the guidance of Section B)2)b) of ANSI C63.10-2013. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Band	Bandwidth	Tone Type	Tone Size	MIMO (1+2)	
				Duty Cycle [%]	Radiated DCCF [dB]
5GHz	20MHz	MRU	52+26T	99.19	N/A
			106+26T	98.88	N/A
	40MHz	MRU	52+26T	99.22	N/A
			106+26T	99.20	N/A
	80MHz	MRU	52+26T	99.23	N/A
			106+26T	99.51	N/A
			484+242T	99.30	N/A
	160MHz	MRU	52+26T	98.31	N/A
			106+26T	99.24	N/A
			484+242T	99.22	N/A
			996+484T	99.35	N/A
			966+484+242T	99.60	N/A

Table 2-5. Measured Duty Cycles – 11be

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

WiFi Configurations		SISO		SDM		CDD	
		ANT1	ANT2	ANT1	ANT2	ANT1	ANT2
5GHz	11a	×	×	✓	✓	✓	✓
	11n	×	×	✓	✓	✓	✓
	11ac	×	×	✓	✓	✓	✓
	11ax	×	×	✓	✓	✓	✓
	11be	×	×	✓	✓	✓	✓

Table 2-6. Frequency / Channel Operations

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

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

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

Table 2-7. Supported Data Rates

2.3 Antenna Description

The following antenna gains were used for the testing.

Frequency [MHz]	Antenna 1 Gain (dBi)	Antenna 2 Gain (dBi)	Directional Gain (dBi)
5200	-5.65	-6.89	-3.24
5300	-5.26	-6.16	-2.69
5500	-5.35	-5.80	-2.56
5800	-5.86	-6.92	-3.36
5850	-5.91	-7.06	-3.46

Table 2-8. Antenna Peak Gain

2.4 Test Configuration

ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions. See Sections 7.6 for radiated emissions test setups, and 7.2, 7.3, 7.4 and 7.3 for antenna port conducted emissions test setups.

2.5 Software and Firmware

The test was conducted with software/firmware version X910XXU1BWL3 installed on the EUT.

2.6 EMI Suppression Device(s) / Modifications

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

3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) was used in the measurement of the EUT**.**

Deviation from measurement procedure……..…….....None

3.2 Radiated Emissions

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

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

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

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

3.3 Environmental Conditions

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

4.0 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.

5.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013. All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty (±dB)
Conducted Bench Top Measurements	1.95
Line Conducted Disturbance	3.09
Radiated Disturbance (<1GHz)	4.10
Radiated Disturbance (>1GHz)	4.82
Radiated Disturbance (>18GHz)	4.96

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
Agilent	N9030A	PXA Signal Analyzer	7/6/2023	Annual	7/3/2024	MY49432391
Antritsu	S820E	Cable and Antenna Analyzer	7/4/2023	Annual	7/3/2024	1839097
Antritsu	TOSLKF50A-40	Calibration Kit	N/A	-	N/A	1825024
Com-Power	AL-130R	Active Loop Antenna	10/21/2022	Biennial	10/20/2024	10160045
Fairview Microwave	FM2CP1122-10	Coupler	7/4/2023	Annual	7/3/2024	1946
Keysight Technologies	N9030B	PXA Signal Analyzer	4/6/2023	Annual	4/5/2024	MY57142018
Mini-Circuits	BW-N10W5+	Attenuator	4/6/2023	Annual	4/5/2024	TEMPNO.01-151
Rohde & Schwarz	TS-PR1840	Preamplifier	7/6/2023	Annual	7/5/2024	100049
Rohde & Schwarz	ESW	EMI TEST Receiver	7/5/2023	Annual	7/4/2024	101761
Rohde & Schwarz	FSW43	Signal & Spectrum Analyzer	4/6/2023	Annual	4/5/2024	101250
Rohde & Schwarz	TS-SFUNIT-Rx	Shielded Filter Unit	1/13/2023	Annual	1/12/2024	102151
Schwarzbeck	VULB9162	Broadband TRILOG Antenna	6/1/2023	Biennial	5/31/2025	9162-217
Sunol Sciences	DRH-118	Horn Antenna	1/26/2023	Biennial	1/25/2025	A102416-1
Anritsu	MA24106A	Power Sensor	7/4/2023	Annual	7/3/2024	1244512

Table 6-1. Annual Test Equipment Calibration Schedule

Note:

1. 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.

2. Equipment with a calibration date of “N/A” shown in this list was not used to make direct calibrated measurements.

7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.
FCC ID: A3LSMX910
IC: 649E-SMX910
FCC Classification: Unlicensed National Information Infrastructure (UNII)

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.407 (a)(1)(iv), (a)(2), (a)(3)	RSS-247 [6.2]	Maximum Conducted Output Power	Maximum conducted powers must meet the limits detailed in 15.407 (a) (RSS-247 [6.2])	CONDUCTED	PASS	Section 7.4
15.407 (a)(1)(iv), (a)(2), (a)(3)	RSS-247 [6.2]	Maximum Power Spectral Density	Maximum power spectral density must meet the limits detailed in 15.407 (a) (RSS-247 [6.2])		PASS	Section 7.5
15.407(h)	RSS-247 [6.3]	Dynamic Frequency Selection	See DFS Test Report		PASS	See DFS Test Report
15.407(b)(1), (b)(2), (b)(3), (b)(4)	RSS-247 [6.2]	Undesirable Emissions	Undesirable emissions must meet the limits detailed in 15.407(b) (RSS-247 [6.2])	RADIATED	PASS	Section 7.6
15.205, 15.407(b)(1), (b)(4), (b)(5), (b)(6)	RSS-Gen [8.9]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS-Gen [8.9])		PASS	Section 7.6, 7.7

Table 7-1. Summary of Test Results

Notes:

1) All channels, modes, and modulations/data rates were investigated among all UNII bands. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.
4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is Element "EMC Software Tool," Version 1.2.1.
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 1.6.4.
6) 802.11ax/be OFDMA testing was performed for all signal tone configurations as specified by the 802.11ax standard. Worst case results are determined and reported per the guidance provided at the October 2018 TCB Workshop.
7) Only one RU index could be selected at a time, so no contiguous or non-contiguous RUs were considered for testing.

7.2 UNII Output Power Measurement

Test Overview and Limits

A transmitter antenna terminal of the EUT is connected to the input of an RF pulse power sensor. Measurement is made using a broadband average power meter while the EUT is operating at its maximum duty cycle, at its maximum power control level, as defined in ANSI C63.10-2013, and at the appropriate frequencies.

The output power limits are specified in the tables below.

UNII Band	Frequency Range	Maximum Conducted Power Limit		Maximum e.i.r.p	
		FCC	ISED	FCC	ISED
UNII 1	5.15 – 5.25GHz	23.98dBm (250mW)	N/A	N/A	The lesser of 23.01dBm (200mW) **or** 10dBm + 10log$_{10}$B
UNII 2A	5.25 – 5.35GHz	The lesser of 23.98dBm (250mW) **or** 11dBm + 10log$_{10}$B		N/A	The lesser of 30dBm (1W) **or** 17dBm + 10log$_{10}$B
UNII 2C	5.47 – 5.725GHz				
UNII 3	5.725 – 5.850GHz	30dBm (1W)		N/A	N/A
UNII 4	5.850 – 5.895GHz	N/A		30dBm (1W)	Not Supported

Test Procedure Used

ANSI C63.10-2013 – Section 12.3.3.2 Method PM-G
ANSI C63.10-2013 – Section 14.2 Measure-and-Sum Technique

Test Settings

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter. The trace was averaged over 100 traces to obtain the final measured average power.

Test Setup

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

Figure 7-1. Test Instrument & Measurement Setup

Test Notes

None.

MIMO Conducted Output Power Measurements (52 + 26 Tones)

	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) RU Index 71 ANT1	ANT2	MIMO	Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
20MHz BW	1	5200	40	52+26T	12.23	12.02	15.14	23.98	-8.84	-3.24	11.90	30.0	-18.10
	2A	5280	56	52+26T	12.32	12.08	15.21	23.98	-8.77	-2.69	12.52	30.0	-17.48
	2C	5600	120	52+26T	12.52	12.48	15.51	23.98	-8.47	-2.56	12.95	30.0	-17.05
	3	5785	157	52+26T	12.85	12.94	15.91	30.00	-14.09	-3.38	12.53	36.0	-23.47
	4	5865	173	52+26T	12.96	12.78	15.88	-	-	-3.46	12.43	30.0	-17.57

Table 7-2. MIMO MRU 20MHz BW (UNII) Maximum Conducted Output Power

MIMO Conducted Output Power Measurements (106 + 26 Tones)

	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) RU Index 82 ANT1	ANT2	MIMO	83 ANT1	ANT2	MIMO	Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
20MHz BW	1	5180	36	106+26T	14.15	14.56	17.37	14.11	14.65	17.40	23.98	-6.58	-3.24	14.16	30.0	-15.84
	2A	5320	64	106+26T	14.24	14.87	17.58	14.21	14.92	17.59	23.98	-6.39	-2.69	14.90	30.0	-15.10
	2C	5500	100	106+26T	14.04	14.74	17.41	14.01	14.61	17.33	23.98	-6.57	-2.56	14.85	30.0	-15.15
	3	5785	157	106+26T	14.74	14.98	17.87	14.72	14.95	17.85	30.00	-12.13	-3.38	14.49	36.0	-21.51
	4	5885	177	106+26T	14.92	14.64	17.79	14.98	14.69	17.85	-	-	-3.46	14.39	30.0	-15.61

Table 7-3. MIMO MRU 20MHz BW (UNII) Maximum Conducted Output Power

MIMO Conducted Output Power Measurements (484 + 242 Tones)

	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) MRU Index 90 ANT1	ANT2	MIMO	91 ANT1	ANT2	MIMO	Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
80MHz BW	1	5210	42	484+242T	15.51	15.12	18.33	15.56	15.18	18.38	23.98	-5.60	-3.24	15.15	30.0	-14.85
	2A	5290	58	484+242T	14.95	14.78	17.88	14.93	14.81	17.88	23.98	-6.10	-2.69	15.19	30.0	-14.81
	2C	5530	106	484+242T	14.86	14.87	17.88	14.89	14.86	17.89	23.98	-6.09	-2.56	15.32	30.0	-14.68
	3	5775	155	484+242T	15.62	15.04	18.35	15.54	15.05	18.31	30	-11.65	-3.38	14.97	36.0	-21.03
	4	5855	171	484+242T	15.98	15.54	18.78	15.95	15.42	18.70	-	-	-3.46	15.32	30.0	-14.68

Table 7-4. MIMO MRU 80MHz BW (UNII) Maximum Conducted Output Power

MIMO Conducted Output Power Measurements (996 + 484 Tones)

	Band	Freq [MHz]	Channel	Tones	Average Conducted Power (dBm) MRU Index 94 ANT1	ANT2	MIMO	95 ANT1	ANT2	MIMO	Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Dir. Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
160MHz BW	1/2A	5250	50	996+484T	14.73	14.56	17.66	14.68	14.32	17.51	23.98	-6.32	-3.24	14.42	30.0	-15.58
	2C	5570	114	996+484T	14.13	14.54	17.35	14.11	14.42	17.28	23.98	-6.63	-2.56	14.79	30.0	-15.21
	3/4	5815	163	996+484T	14.78	14.52	17.66	14.61	14.29	17.46	-	-	-3.46	14.21	30.0	-15.79

Table 7-5. MIMO MRU 160MHz BW (UNII) Maximum Conducted Output Power

Note:

Per ANSI C63.10-2013 and KDB 662911 v02r01 Section E)1), the conducted powers at Antenna 1 and Antenna 2 were first measured separately during MIMO transmission as shown in the section above. The measured values were then summed in linear power units then converted back to dBm.

Per ANSI C63.10-2013 Section 14.4.3, the directional gain is calculated using the following formula, where G_N is the gain of the nth antenna and N_{ANT}, the total number of antennas used.

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

Sample MIMO Calculation:

At 5180MHz in 802.11be (20MHz BW) mode, the average conducted output power was measured to be 14.15dBm for Antenna 1 and 14.56dBm for Antenna 2.

Antenna 1 + Antenna 2 = MIMO

(14.15dBm + 14.56dBm) = (26.00 mW + 28.58 mW) = 54.48 mW = 17.37dBm

Sample e.i.r.p. Calculation:

At 5180MHz in 802.11be (20MHz BW) mode, the average MIMO conducted power was calculated to be 17.37dBm with directional gain of -3.24dBi.

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

17.37 dBm + (- 3.24 dBi) = 14.13 dBm

7.3 Maximum Power Spectral Density

Test Overview and Limit

The spectrum analyzer was connected to the antenna terminal while the EUT was operating at its maximum duty cycle, at its maximum power control level, as defined in ANSI C63.10-2013, and at the appropriate frequencies. Method SA-1, as defined in ANSI C63.10-2013, was used to measure the power spectral density.

The output power density limits are as specified in the tables below.

UNII Band	Frequency Range	Maximum Power Spectral Density	
		FCC	ISED
UNII 1	5.15 – 5.25GHz	11dBm/MHz	10dBm/MHz e.i.r.p
UNII 2A	5.25 – 5.35GHz	11dBm/MHz	
UNII 2C	5.47 – 5.725GHz		
UNII 3	5.725 – 5.850GHz	30dBm/500kHz	
UNII 4	5.850 – 5.895GHz	14dBm/MHz e.i.r.p	N/A

Test Procedure Used

ANSI C63.10-2013 – Section 12.3.2.2 (Method SA-1)
ANSI C63.10-2013 – Section 14.3.2.2 Measure-and-Sum Technique

Test Settings

1. Analyzer was set to the center frequency of the UNII channel under investigation
2. Span was set to encompass the entire emission bandwidth of the signal
3. RBW = 1MHz
4. VBW = 3MHz
5. Number of sweep points $\geq$ 2 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 7-2. Test Instrument & Measurement Setup

Test Notes

The power spectral density for each channel was measured with the RU index showing the highest conducted power.

Summed MIMO Power Spectral Density Measurements

	Frequency [MHz]	802.11 MODE	Channel	MRU Cases	MRU Index	Antenna 1 PSD [dBm]	Antenna 2 PSD [dBm]	MIMO Summed PSD [dBm]	Max Conducted PSD [dBm]	Margin [dB]
Band 1	5180	be (20MHz)	36	106+26T	82	4.71	4.00	7.38	11.00	-3.62
	5180	be (20MHz)	36	106+26T	83	4.83	3.96	7.43	11.00	-3.57
	5200	be (20MHz)	40	52+26T	71	**4.81**	**4.10**	7.48	11.00	-3.52
	5210	be (80MHz)	42	484+242T	90	-1.05	-1.85	1.58	11.00	-9.42
	5210	be (80MHz)	42	484+242T	91	-0.86	-1.84	1.69	11.00	-9.31
Band 1/2A	5250	be (160MHz)	50	996+484T	94	-5.39	-6.30	-2.81	11.00	-13.81
	5250	be (160MHz)	50	996+484T	95	**-5.30**	**-6.35**	-2.78	11.00	-13.78
Band 2A	5280	be (20MHz)	56	52+26T	71	5.20	4.78	8.01	11.00	-2.99
	5320	be (20MHz)	64	106+26T	82	**5.62**	**5.40**	8.52	11.00	-2.48
	5320	be (20MHz)	64	106+26T	83	5.30	5.31	8.31	11.00	-2.69
	5290	be (80MHz)	58	484+242T	90	-1.08	-1.61	1.67	11.00	-9.33
	5290	be (80MHz)	58	484+242T	91	-1.28	-1.57	1.59	11.00	-9.41
Band 2C	5500	be (20MHz)	100	106+26T	82	**5.06**	**5.01**	8.05	11.00	-2.95
	5500	be (20MHz)	100	106+26T	83	4.86	4.97	7.93	11.00	-3.07
	5600	be (20MHz)	120	52+26T	71	5.42	4.94	8.20	11.00	-2.80
	5530	be (80MHz)	106	484+242T	90	-1.55	-1.58	1.45	11.00	-9.55
	5530	be (80MHz)	106	484+242T	91	-1.21	-0.93	1.94	11.00	-9.06
	5570	be (160MHz)	114	996+484T	94	-5.76	-5.93	-2.83	11.00	-13.83
	5570	be (160MHz)	114	996+484T	95	-5.65	-5.41	-2.52	11.00	-13.52

Table 7-6. Bands 1, 2A, 2C MIMO Conducted Power Spectral Density Measurements MIMO (MRU)

	Frequency [MHz]	802.11 MODE	Channel	MRU Cases	MRU Index	Antenna 1 PSD [dBm]	Antenna 2 PSD [dBm]	MIMO Summed PSD [dBm]	Max Conducted PSD [dBm]	Margin [dB]
Band 3	5785	be (20MHz)	157	52+26T	71	5.75	5.50	8.64	30.00	-21.36
	5785	be (20MHz)	157	106+26T	82	5.80	5.45	8.63	30.00	-21.37
	5785	be (20MHz)	157	106+26T	83	**5.92**	**5.38**	8.67	30.00	-21.33
	5775	be (80MHz)	155	484+242T	90	-0.95	-1.51	1.79	30.00	-28.21
	5775	be (80MHz)	155	484+242T	91	-0.75	-1.59	1.86	30.00	-28.14

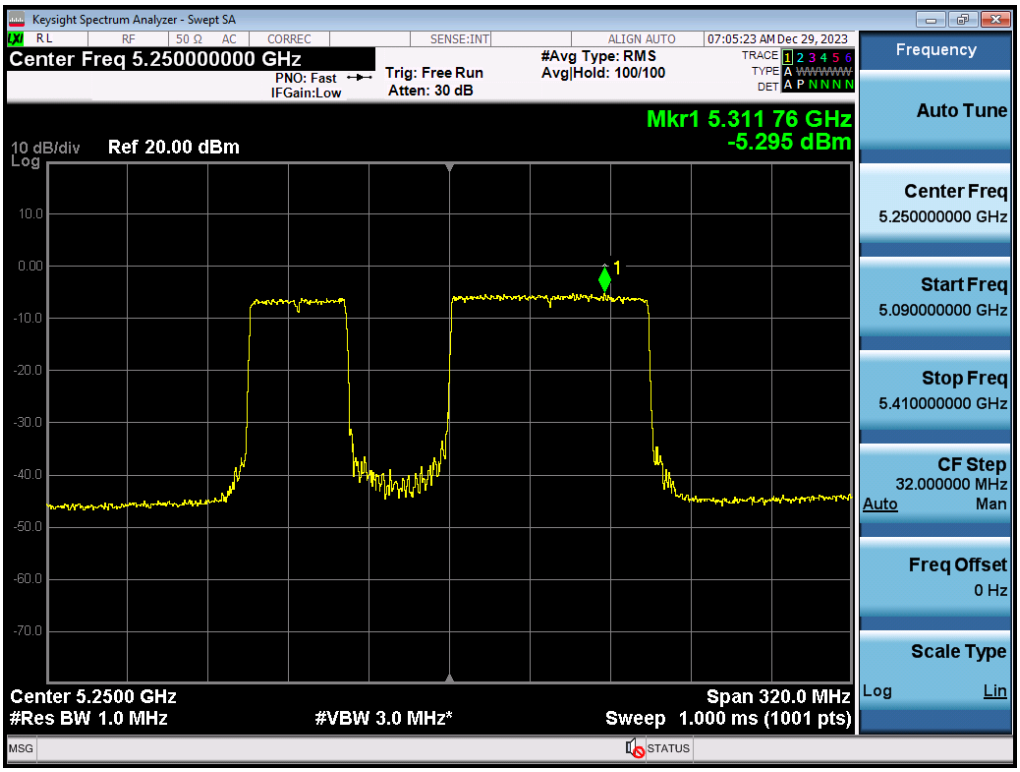
Table 7-7. Band 3 MIMO Conducted Power Spectral Density Measurements MIMO (MRU)

	Frequency [MHz]	802.11 MODE	Channel	MRU Cases	MRU Index	Antenna 1 PSD [dBm]	Antenna 2 PSD [dBm]	Antenna Gain [dBi]	MIMO Summed EIRP PSD [dBm]	Max EIRP PSD [dBm]	Margin [dB]
Band 4	5865	be (20MHz)	173	52+26T	71	**6.34**	**5.36**	-3.46	5.43	14.00	-8.57
	5885	be (20MHz)	177	106+26T	82	5.90	4.62	-3.46	4.86	14.00	-9.14
	5885	be (20MHz)	177	106+26T	83	6.20	4.84	-3.46	5.12	14.00	-8.88
Band 3/4	5855	be (80MHz)	171	484+242T	90	**-0.10**	**-0.99**	-3.46	-0.97	14.00	-14.97
	5855	be (80MHz)	171	484+242T	91	-0.04	-1.35	-3.46	-1.09	14.00	-15.09
	5815	be (160MHz)	163	996+484T	94	-5.16	-5.42	-3.36	-5.64	14.00	-19.64
	5815	be (160MHz)	163	996+484T	95	-5.13	-5.20	-3.36	-5.51	14.00	-19.51

Table 7-8. Bands 3/4 MIMO Conducted Power Spectral Density Measurements MIMO (MRU)

7.3.1 MIMO Antenna-1 Power Spectral Density Measurements – MRU

Plot 7-1. Power Spectral Density MIMO ANT1 (20MHz 802.11be (UNII Band 1) 52+26 Tones – RU Index 71 – Ch. 40)

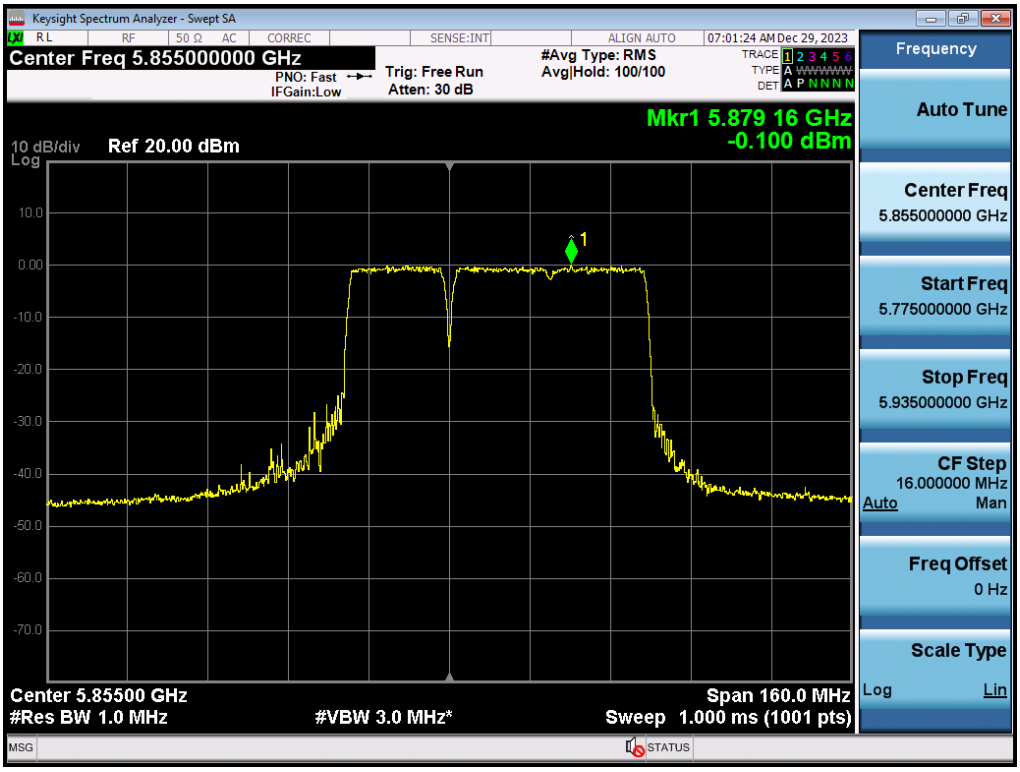


Plot 7-2. Power Spectral Density MIMO ANT1 (160MHz 802.11be (UNII Band 1/2A) 996+484 Tones – RU Index 95 – Ch. 50)

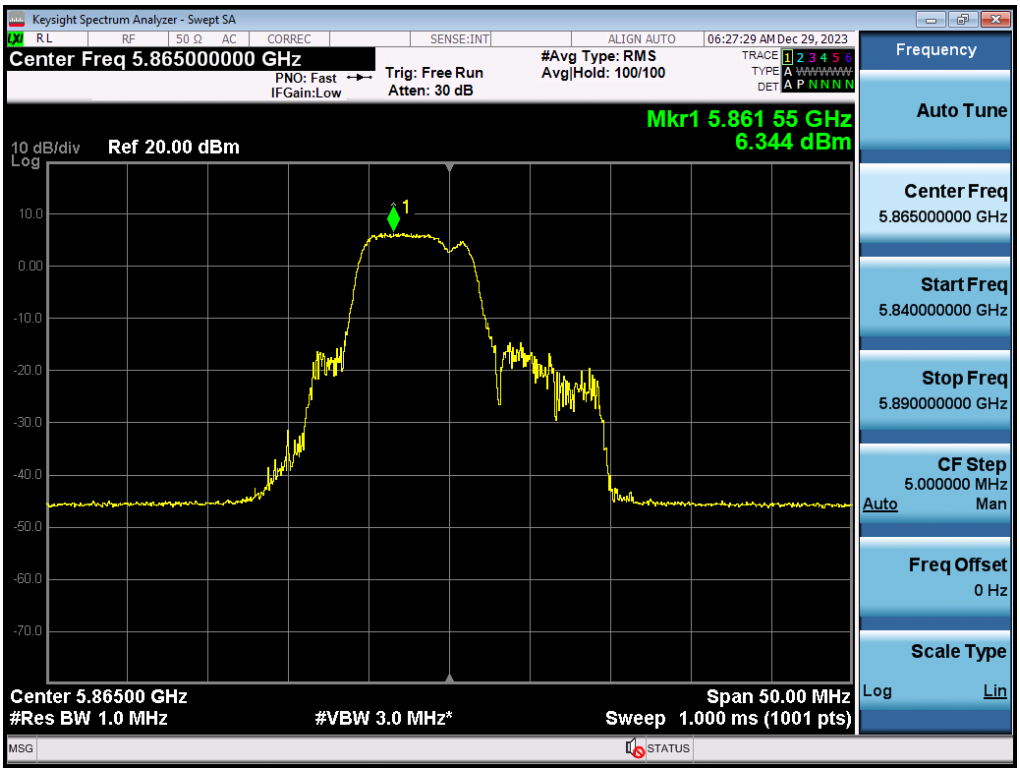
Plot 7-3. Power Spectral Density MIMO ANT1 (20MHz 802.11be (UNII Band 2A) 106+26 Tones – RU Index 82 – Ch. 64)

Plot 7-4. Power Spectral Density MIMO ANT1 (20MHz 802.11be (UNII Band 2C) 106+26 Tones – RU Index 82 – Ch. 100)

Plot 7-5. Power Spectral Density MIMO ANT1 (20MHz 802.11be (UNII Band 3) 106+26 Tones – RU Index 83 – Ch. 157)

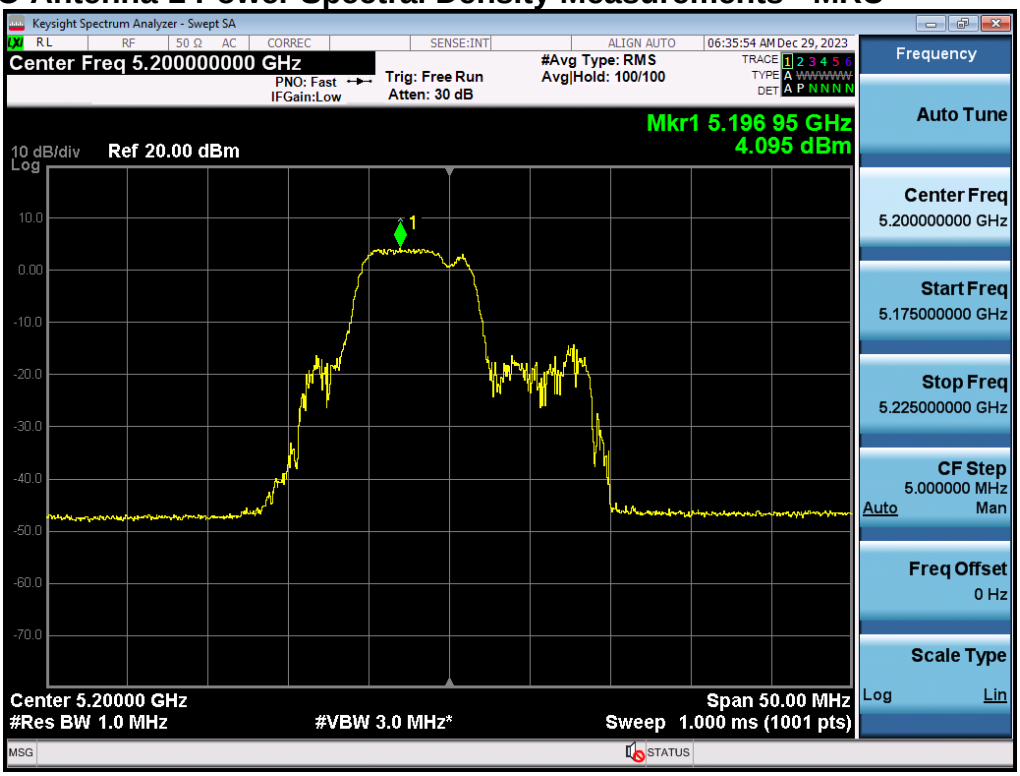


Plot 7-6. Power Spectral Density MIMO ANT1 (80MHz 802.11be (UNII Band 3/4) 484+242 Tones – RU Index 90 – Ch. 171)

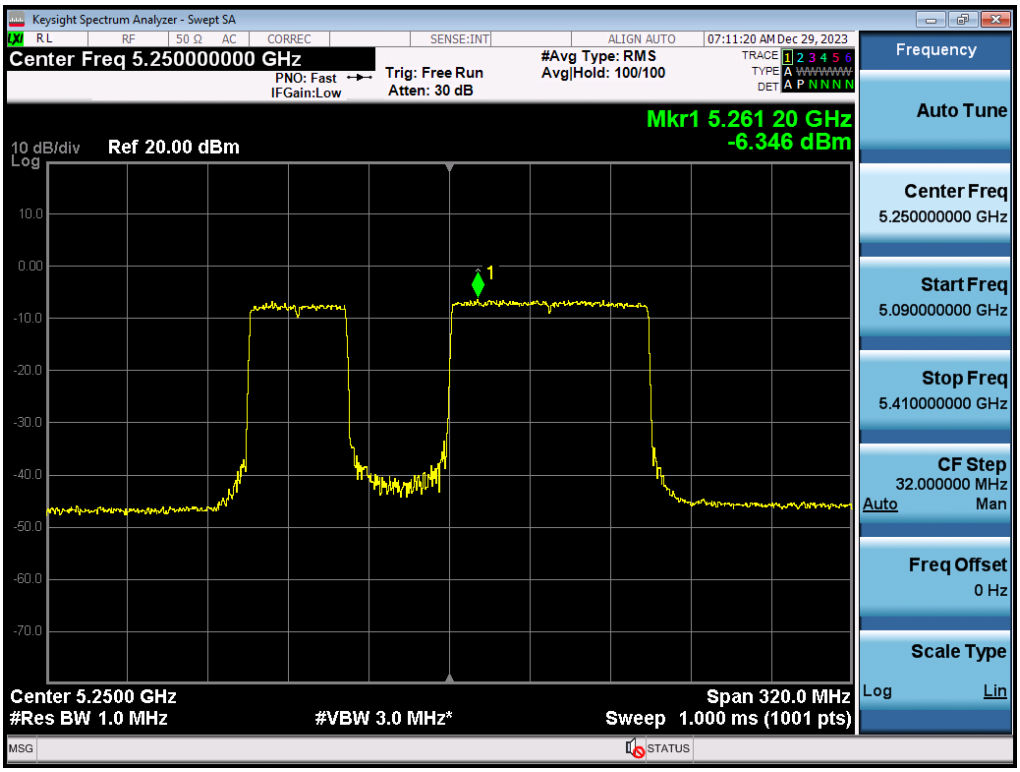


Plot 7-7. Power Spectral Density MIMO ANT1 (20MHz 802.11be (UNII Band 4) 484+242 Tones – RU Index 71 – Ch. 173)

7.3.2 MIMO Antenna-2 Power Spectral Density Measurements - MRU



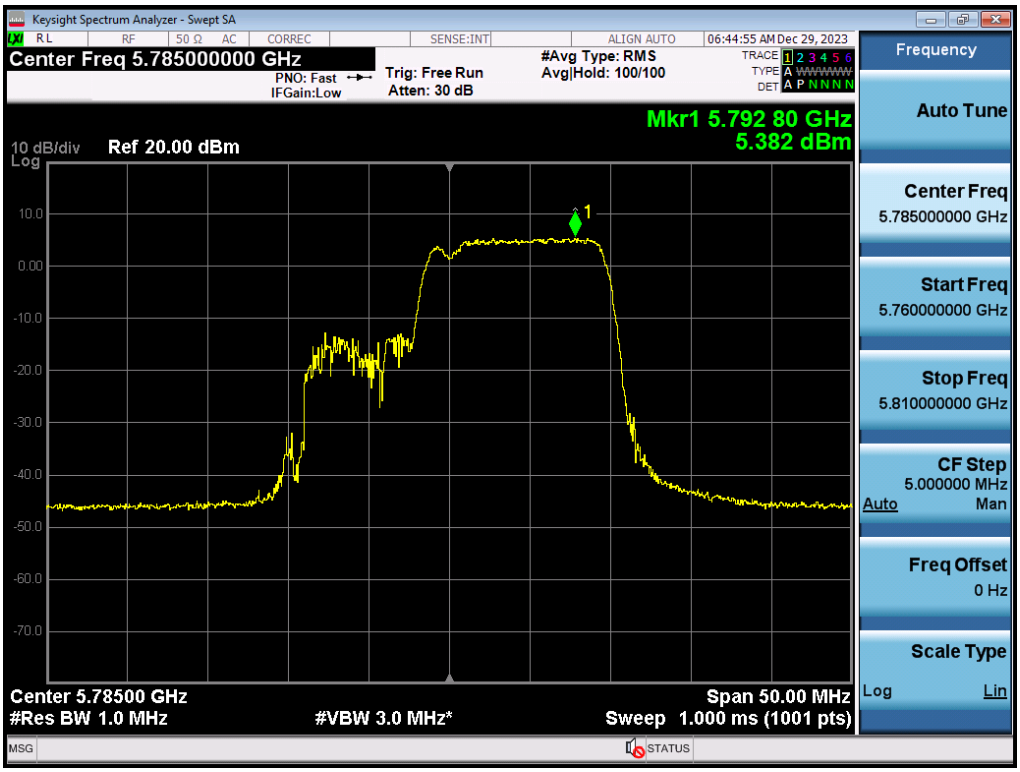
Plot 7-8. Power Spectral Density MIMO ANT2 (20MHz 802.11be (UNII Band 1) 52+26 Tones – RU Index 71 – Ch. 40)



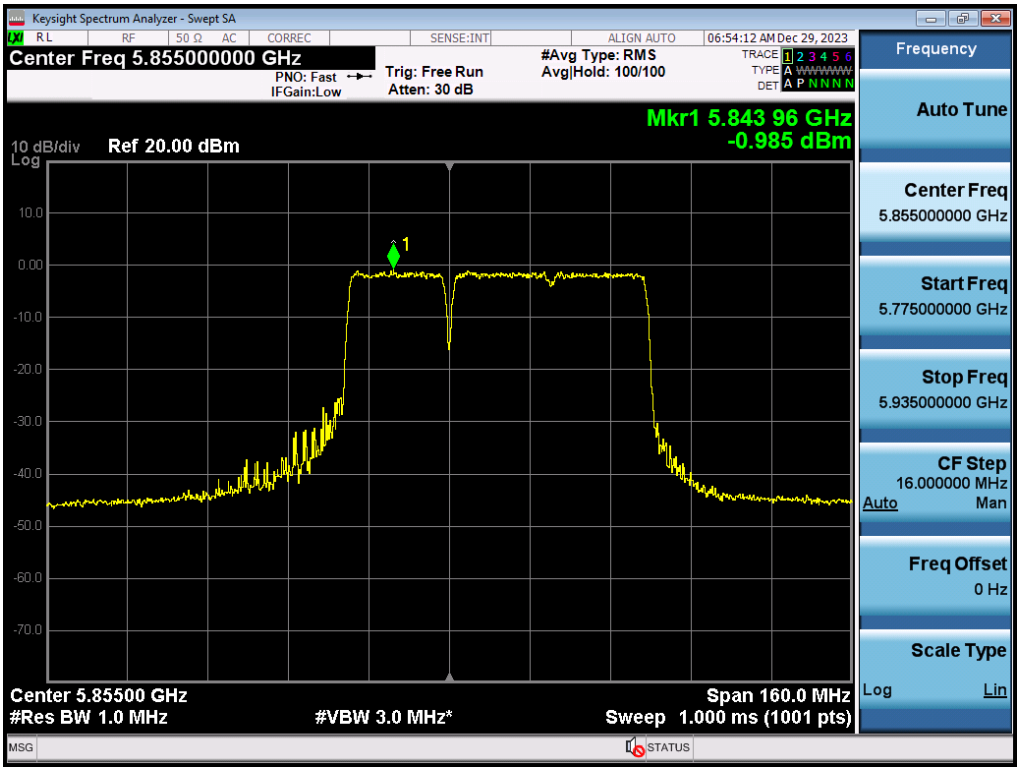
Plot 7-9. Power Spectral Density MIMO ANT2 (160MHz 802.11be (UNII Band 1/2A) 996+484 Tones – RU Index 95 – Ch. 50)

Plot 7-10. Power Spectral Density MIMO ANT2 (20MHz 802.11be (UNII Band 2A) 106+26 Tones – RU Index 82 – Ch. 64)

Plot 7-11. Power Spectral Density MIMO ANT2 (20MHz 802.11be (UNII Band 2C) 106+26 Tones – RU Index 82 – Ch. 100)



Plot 7-12. Power Spectral Density MIMO ANT2 (20MHz 802.11be (UNII Band 3) 106+26 Tones – RU Index 83 – Ch. 157)



Plot 7-13. Power Spectral Density MIMO ANT2 (80MHz 802.11be (UNII Band 3/4) 484+242 Tones – RU Index 90 – Ch. 171)

Plot 7-14. Power Spectral Density MIMO ANT2 (20MHz 802.11be (UNII Band 4) 484+242 Tones – RU Index 71 – Ch. 173)

Note:

Per ANSI C63.10-2013 Section 14.3.2.2 and KDB 662911 v02r01 Section E)2), the power spectral density at Antenna-1 and Antenna-2 were first measured separately with reduced Antenna-1 and Antenna-2 powers per manufacture's tune-up document. The measured values were then summed in linear power units then converted back to dBm.

Sample Directional Gain Calculation:

Assuming the antenna gain is -5.91 dBi for Antenna-1 and -7.06 dBi for Antenna-2.

$$\text{Directional gain} = 10\log[(10^{G_1/20} + 10^{G_2/20} + \ldots + 10^{G_N/20})^2 / N_{ANT}]\ \text{dBi}$$
$$= 10\log[(10^{-5.91/20} + 10^{-7.06/20} / 2]\ \text{dBi}$$
$$= (-3.46)\ \text{dBi}$$

Sample MIMO Calculation:

Assuming the average conducted power spectral density was measured to be 6.34 dBm for Antenna-1 and 5.36 dBm for Antenna-2.

Antenna-1 + Antenna-2 = MIMO

(6.34 dBm + 5.36 dBm) = (4.31 mW + 3.44 mW) = 7.74mW = 8.89 dBm

Sample e.i.r.p Power Spectral Density Calculation:
Assuming the average MIMO power density was calculated to be 8.89 dBm with directional gain of -3.46 dBi.

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

8.89 dBm + (-3.46 dBi) = 5.43 dBm

7.4 Radiated Emission Measurements

Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at its maximum duty cycle, at its maximum power control level, as defined in ANSI C63.10-2013 and KDB 789033 D02 v02r01, and at the appropriate frequencies. All channels, modes, and modulations/data rates were investigated among all UNII bands. Only the radiated emissions of the configuration that produced the worst-case emissions are reported in this section.

For transmitters operating in the 5.15-5.25 GHz and 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of −27 dBm/MHz.

For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of −27 dBm/MHz.

For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

For transmitters operating in the 5.850 – 5.895 GHz band: all emissions at or above 5.895GHz shall not exceed an e.i.r.p. of -5dBm/MHz and shall decrease linearly up to an e.i.r.p. of -27dBm/MHz at or above 5.925GHz, and all emissions below 5.725 GHz shall not exceed an e.i.r.p. of -27dBm/MHz at 5.65 GHz increasing linearly to 10dBm/MHz at 5.7GHz and from 5.7GHz increasing linearly to a level of 15.6dMb/MHz at 5.72GHz, and from 5.72GHz increasing linearly to a level of 27dBm/MHz at 5.725GHz.

All out of band emissions appearing in a restricted band as specified in FCC §15.205 of the Title 47 CFR and Table 6 of RSS-Gen (8.10) must not exceed the limits shown in the table below per FCC §15.209 and RSS-Gen (8.9).

Frequency	Field Strength [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 7-9. Radiated Limits

Test Procedures Used

ANSI C63.10-2013 – Sections 12.7.7.2, 12.7.6, 12.7.5 (Radiated Spurious Emissions)
ANSI C63.10-2013 – Section 12.7.4.4 (Band Edge Measurements)

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.

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.

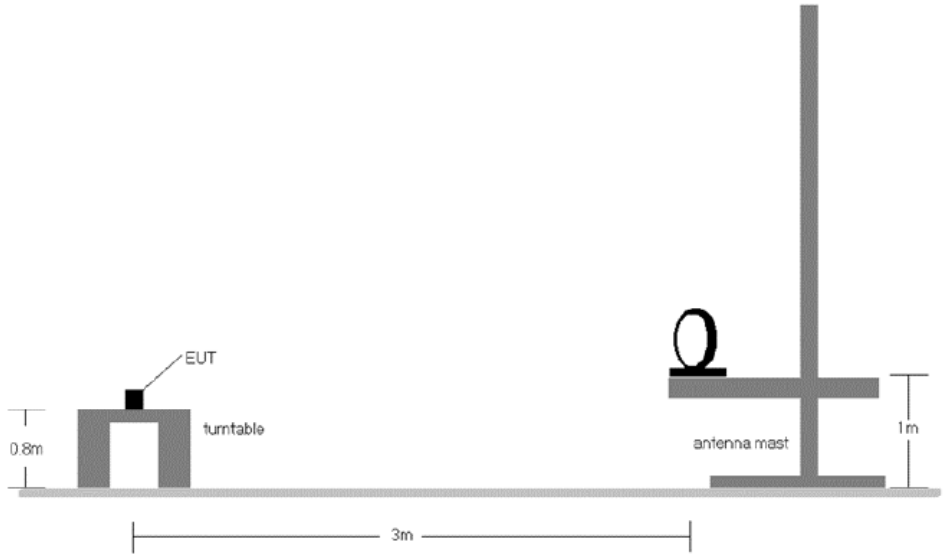


Figure 7-3. Radiated Test Setup < 30MHz

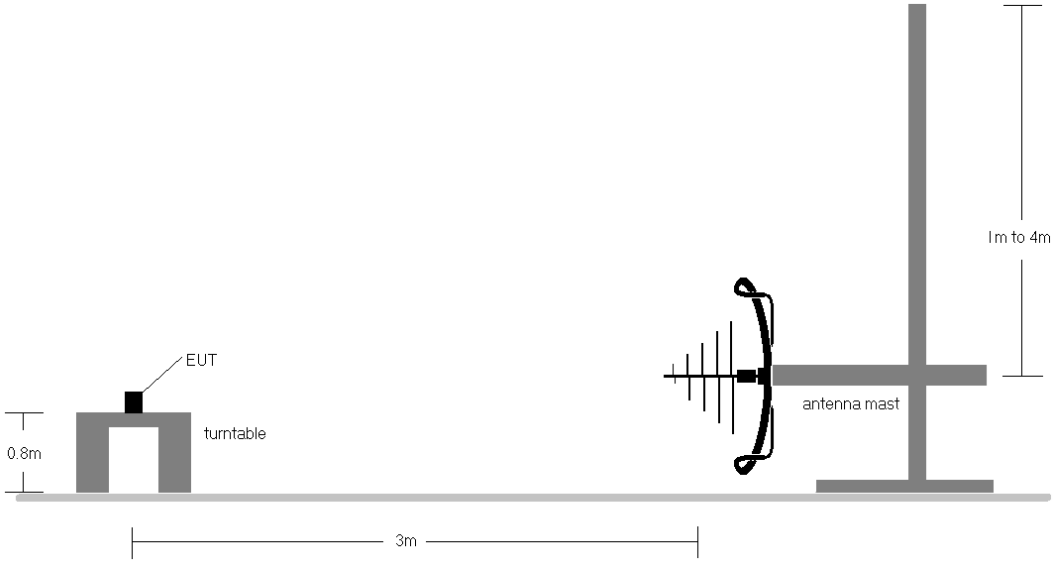


Figure 7-4. Radiated Test Setup < 1GHz

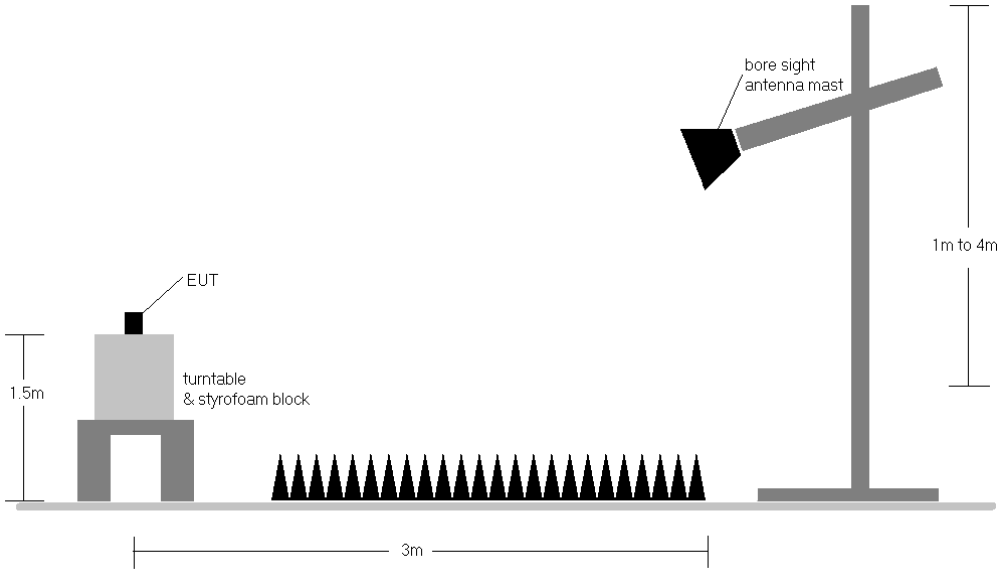


Figure 7-5. Radiated Test Setup > 1GHz

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. In the case where a peak-detector measurement passed the given RMS limit it was determined sufficient to demonstrate compliance.
10. The results recorded using the broadband antenna are known to correlate with the results obtained by using a tuned dipole with an acceptable degree of accuracy. The VSWR for the measurement antenna was found to be less than 2:1.
11. For radiated measurements, emissions were investigated for the fully-loaded RU configuration and for all of the partially-loaded RU configurations. Among all of the available partially-loaded RU configurations, only the configuration with the worst case emissions is reported.

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 in Section Radiated Spurious Emission Measurements – Above 1GHz was calculated using the formula:
  Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

7.4.1 MIMO Radiated Spurious Emission Measurements

MIMO Radiated Spurious Emission Measurements – UNII 1

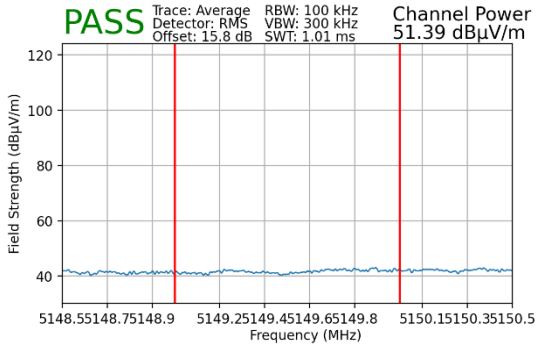
Worst Case Mode:	802.11be (20MHz BW)
Worst Case Transfer Rate:	MCS0
RU Index:	61
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	5180MHz
Channel:	36

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]
10360.00	Peak	H	119	218	-66.16	10.92	0.00	51.76	68.20	-16.44
15540.00	Average	H	330	248	-80.62	15.08	0.00	41.46	53.98	-12.52
15540.00	Peak	H	330	248	-68.50	15.08	0.00	53.58	73.98	-20.40
20720.00	Average	H	-	-	-62.38	-3.38	-9.54	31.70	53.98	-22.28
20720.00	Peak	H	-	-	-52.97	-3.38	-9.54	41.11	73.98	-32.87
25900.00	Peak	H	-	-	-51.39	-2.56	-9.54	43.51	68.20	-24.69

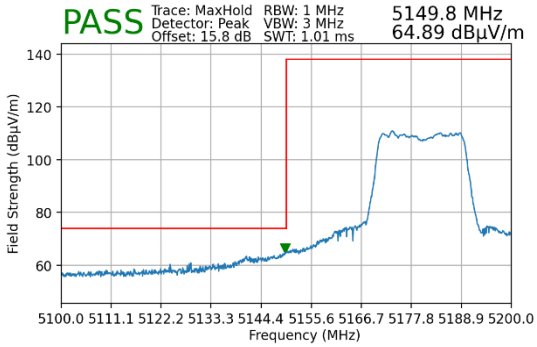
Table 7-10. Radiated Measurements MIMO (242 Tones)

7.4.2 MIMO Radiated Band Edge Measurements (20MHz BW – Full Tone – 242T)

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

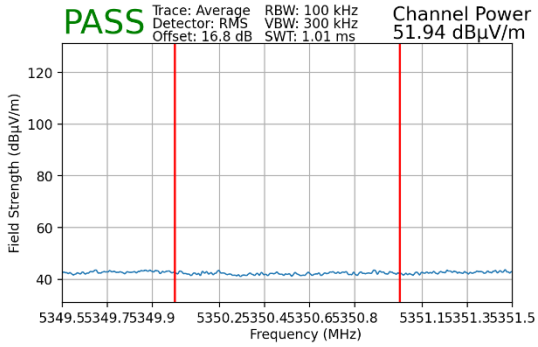


Plot 7-15. Radiated Lower Band Edge Plot MIMO (Average – UNII Band 1 – 242 Tones)

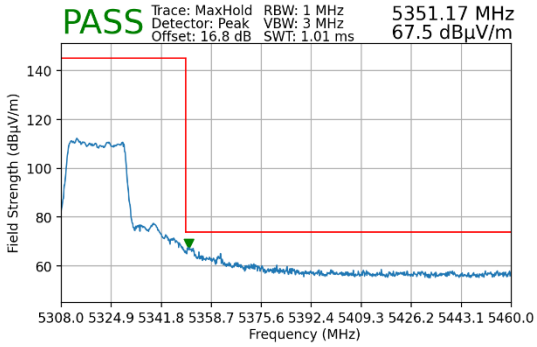


Plot 7-16. Radiated Lower Band Edge Plot MIMO (Peak – UNII Band 1 – 242 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	5320MHz
Channel:	64

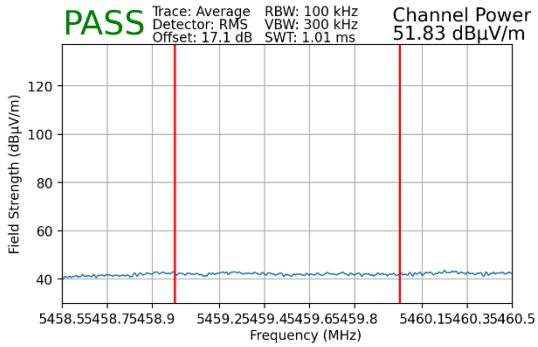


Plot 7-17. Radiated Upper Band Edge Plot MIMO (Average – UNII Band 2A – 242 Tones)

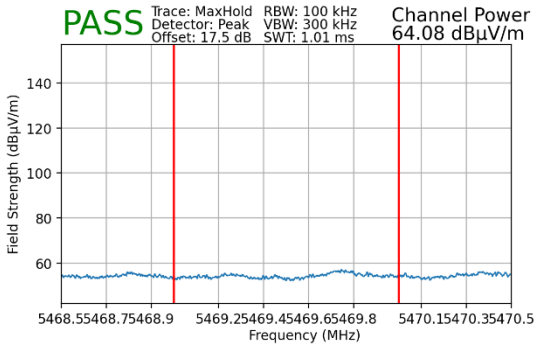


Plot 7-18. Radiated Upper Band Edge Plot MIMO (Peak – UNII Band 2A – 242 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	5500MHz
Channel:	100

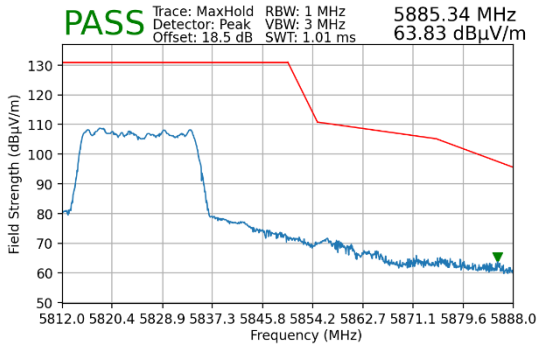


Plot 7-19. Radiated Lower Band Edge Plot MIMO (Average – UNII Band 2C – 242 Tones)



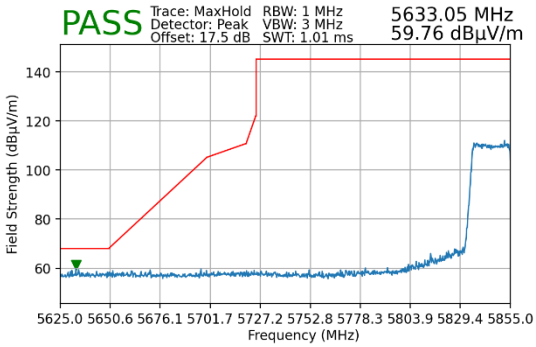
Plot 7-20. Radiated Lower Band Edge Plot MIMO (Peak – UNII Band 2C – 242 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	5825MHz
Channel:	165



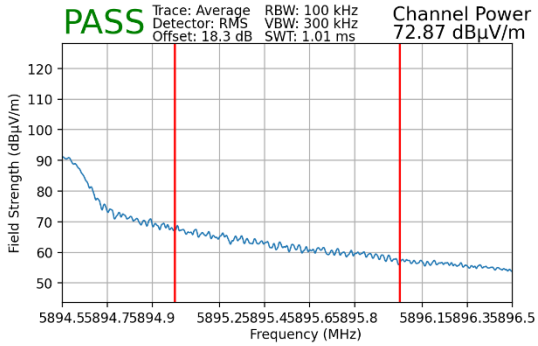
Plot 7-21. Radiated Upper Band Edge Plot MIMO (Peak – UNII Band 3 – 242 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	5845MHz
Channel:	169

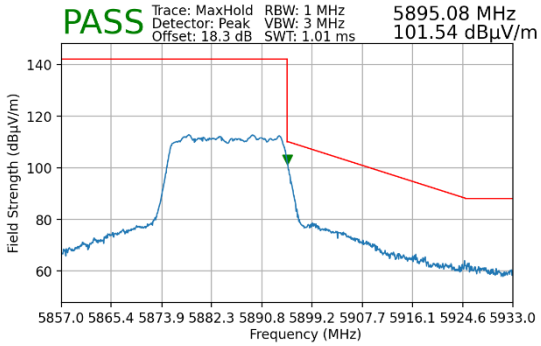


Plot 7-22. Radiated Lower Band Edge Plot MIMO (Peak – UNII Band 4 – 242 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	5885MHz
Channel:	177



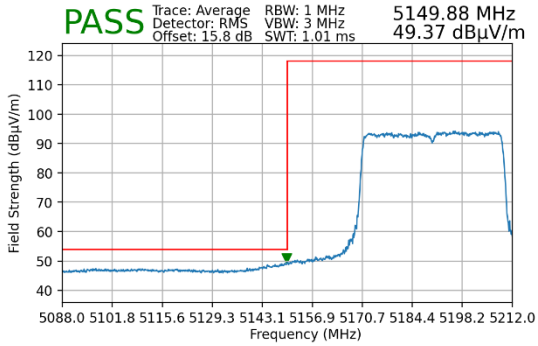
Plot 7-23. Radiated Upper Band Edge Plot MIMO (Average – UNII Band 4 – 242 Tones)



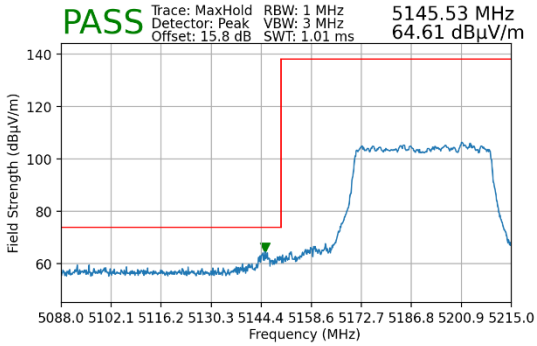
Plot 7-24. Radiated Upper Band Edge Plot MIMO (Peak – UNII Band 4 – 242 Tones)

7.4.3 MIMO Radiated Band Edge Measurements (40MHz BW – Full Tone – 484T)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	65
Distance of Measurements:	3 Meters
Operating Frequency:	5190MHz
Channel:	38

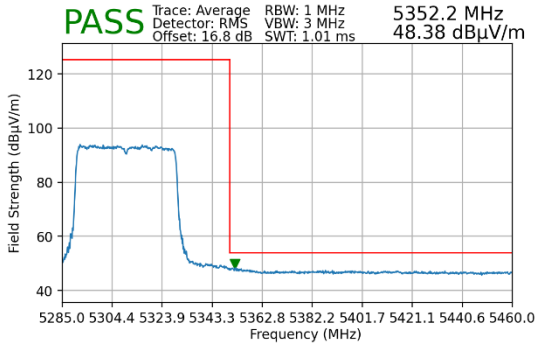


Plot 7-25. Radiated Lower Band Edge Plot MIMO (Average – UNII Band 1 – 484 Tones)

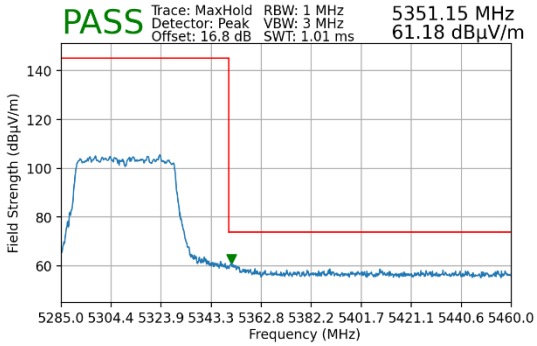


Plot 7-26. Radiated Lower Band Edge Plot MIMO (Peak – UNII Band 1 – 484 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	65
Distance of Measurements:	3 Meters
Operating Frequency:	5310MHz
Channel:	62

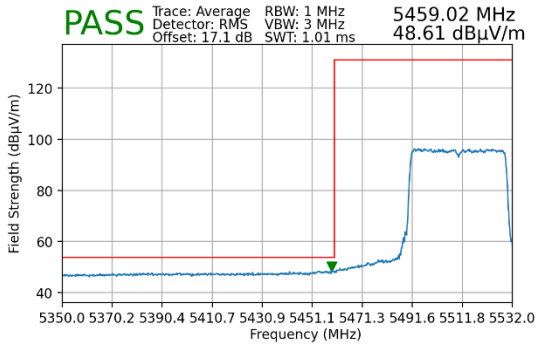


Plot 7-27. Radiated Upper Band Edge Plot MIMO (Average – UNII Band 2A – 484 Tones)

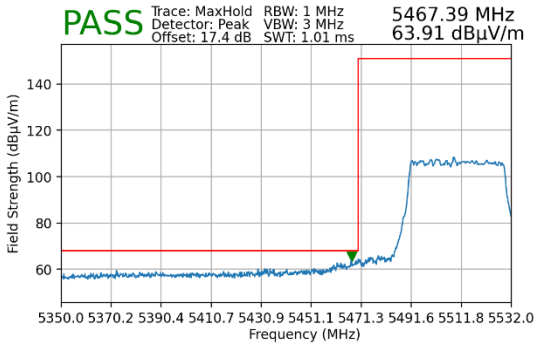


Plot 7-28. Radiated Upper Band Edge Plot MIMO (Peak – UNII Band 2A – 484 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	65
Distance of Measurements:	3 Meters
Operating Frequency:	5510MHz
Channel:	102

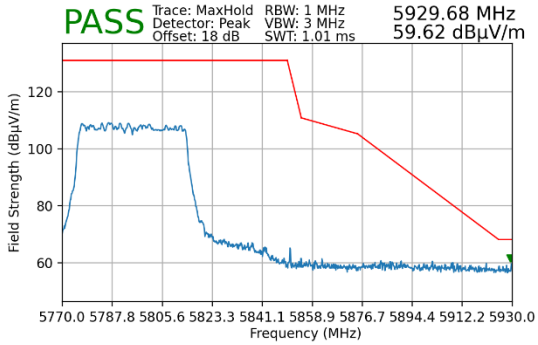


Plot 7-29. Radiated Lower Band Edge Plot MIMO (Average – UNII Band 2C – 484 Tones)



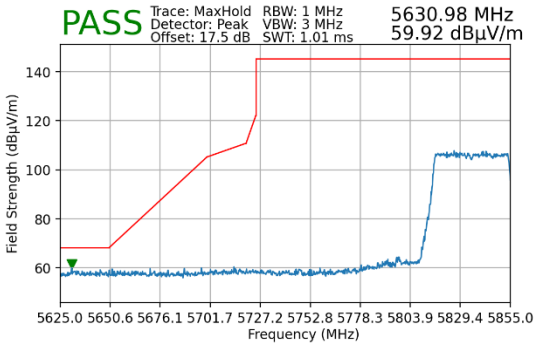
Plot 7-30. Radiated Lower Band Edge Plot MIMO (Peak – UNII Band 2C – 484 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	65
Distance of Measurements:	3 Meters
Operating Frequency:	5795MHz
Channel:	159



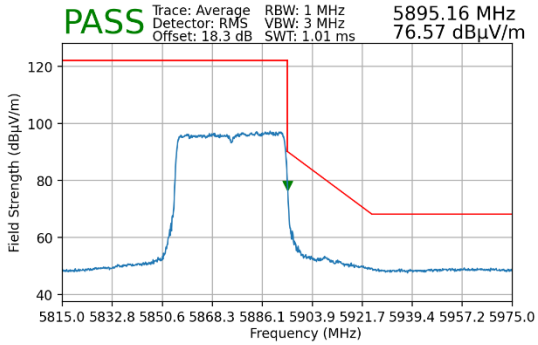
Plot 7-31. Radiated Upper Band Edge Plot MIMO (Peak – UNII Band 3 – 484 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	65
Distance of Measurements:	3 Meters
Operating Frequency:	5835MHz
Channel:	167

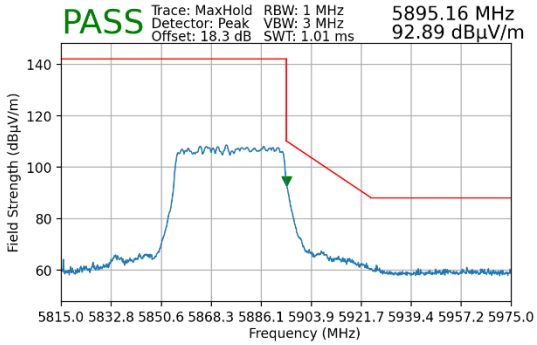


Plot 7-32. Radiated Lower Band Edge Plot MIMO (Peak – UNII Band 4 – 484 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	65
Distance of Measurements:	3 Meters
Operating Frequency:	5875MHz
Channel:	175



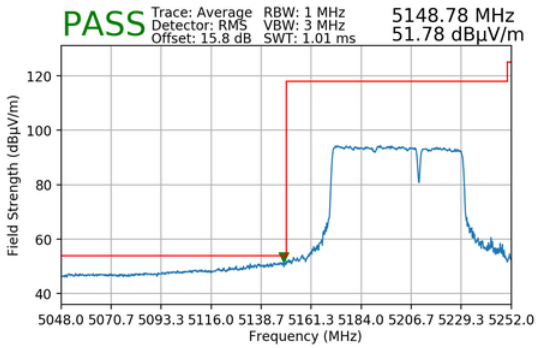
Plot 7-33. Radiated Upper Band Edge Plot MIMO (Average – UNII Band 4 – 484 Tones)



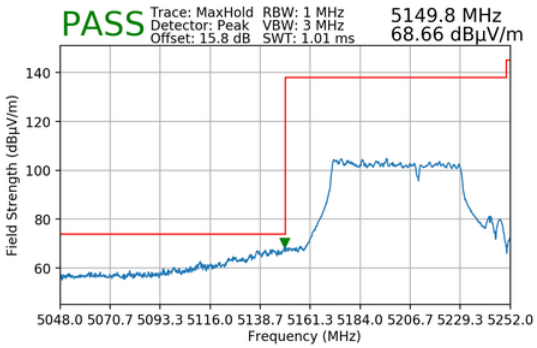
Plot 7-34. Radiated Upper Band Edge Plot MIMO (Peak – UNII Band 4 – 484 Tones)

7.4.4 MIMO Radiated Band Edge Measurements (80MHz BW – Partial Tones – 484 + 242T)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	93
Distance of Measurements:	3 Meters
Operating Frequency:	5210MHz
Channel:	42

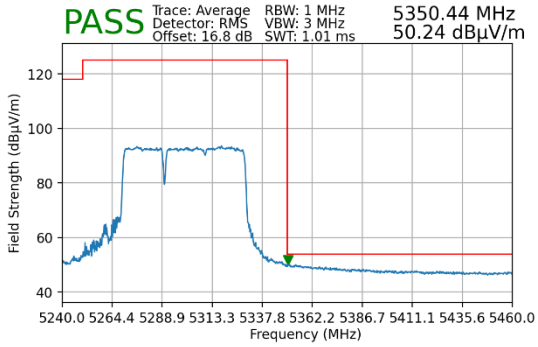


Plot 7-35. Radiated Lower Band Edge Plot MIMO (Average – UNII Band 1 – 484 + 242 Tones)

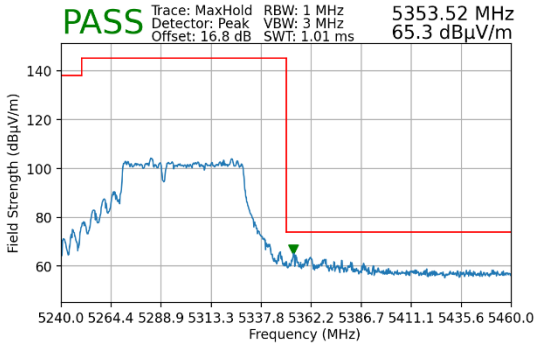


Plot 7-36. Radiated Lower Band Edge Plot MIMO (Peak – UNII Band 1 – 484 + 242 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	90
Distance of Measurements:	3 Meters
Operating Frequency:	5290MHz
Channel:	58

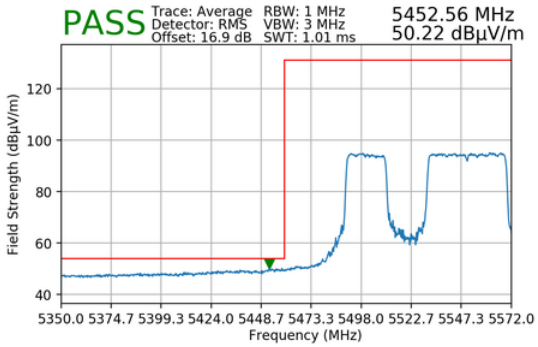


Plot 7-37. Radiated Upper Band Edge Plot MIMO (Average – UNII Band 2A – 484 + 242 Tones)

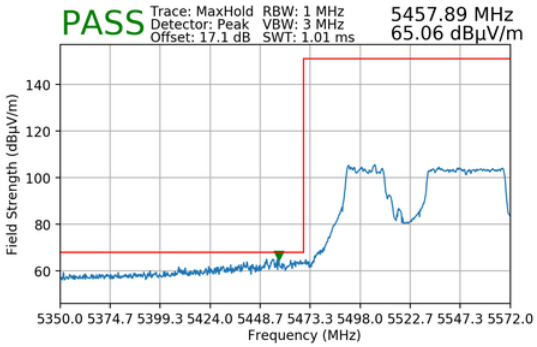


Plot 7-38. Radiated Upper Band Edge Plot MIMO (Peak – UNII Band 2A – 484 + 242 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	91
Distance of Measurements:	3 Meters
Operating Frequency:	5530MHz
Channel:	106

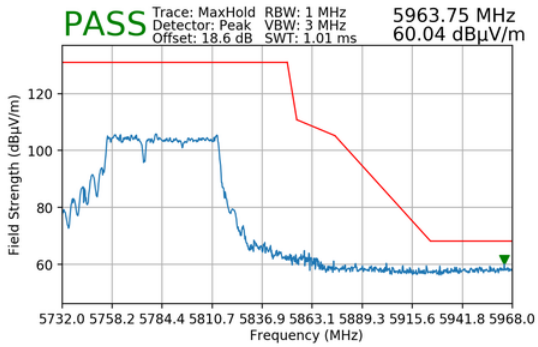


Plot 7-39. Radiated Lower Band Edge Plot MIMO (Average – UNII Band 2C – 484 + 242 Tones)



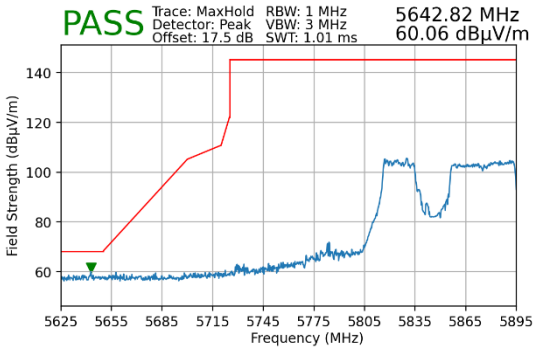
Plot 7-40. Radiated Lower Band Edge Plot MIMO (Peak – UNII Band 2C – 484 + 242 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	90
Distance of Measurements:	3 Meters
Operating Frequency:	5775MHz
Channel:	155



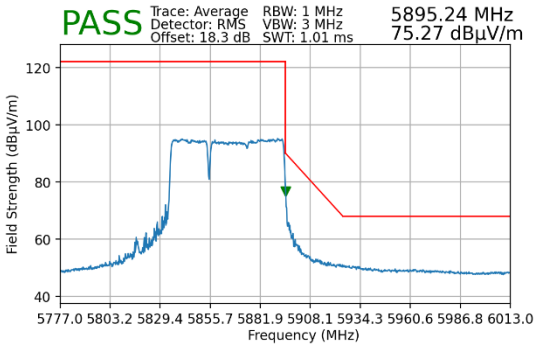
Plot 7-41. Radiated Upper Band Edge Plot MIMO (Peak – UNII Band 3 – 484 + 242 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	91
Distance of Measurements:	3 Meters
Operating Frequency:	5855MHz
Channel:	171

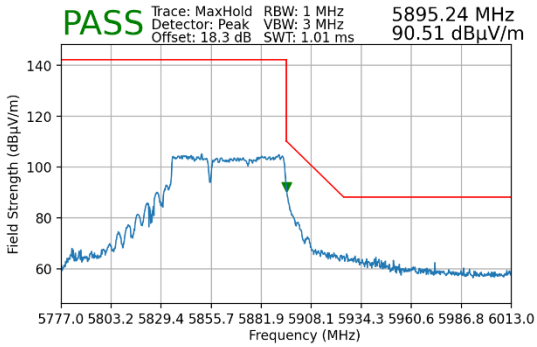


Plot 7-42. Radiated Lower Band Edge Plot MIMO (Peak – UNII Band 4 – 484 + 242 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	90
Distance of Measurements:	3 Meters
Operating Frequency:	5855MHz
Channel:	171



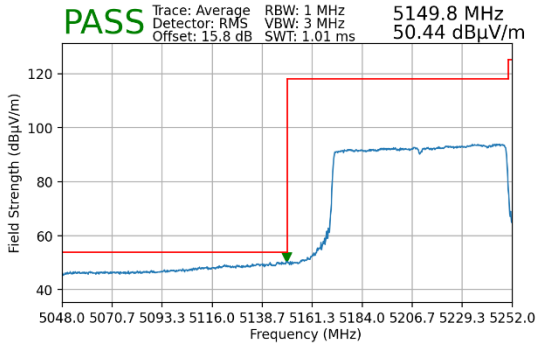
Plot 7-43. Radiated Upper Band Edge Plot MIMO (Average – UNII Band 4 – 484 + 242 Tones)



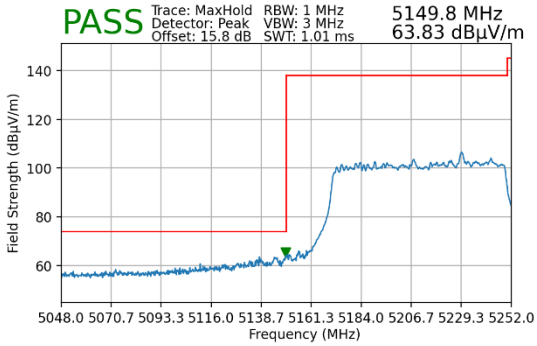
Plot 7-44. Radiated Upper Band Edge Plot MIMO (Peak – UNII Band 4 – 484 + 242 Tones)

7.4.5 MIMO Radiated Band Edge Measurements (80MHz BW – Full Tone – 996T)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	67
Distance of Measurements:	3 Meters
Operating Frequency:	5210MHz
Channel:	42

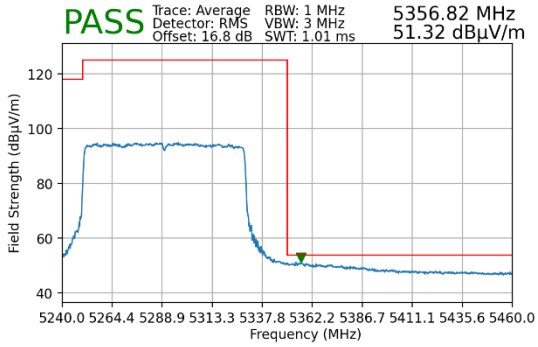


Plot 7-45. Radiated Lower Band Edge Plot MIMO (Average – UNII Band 1 – 996 Tones)

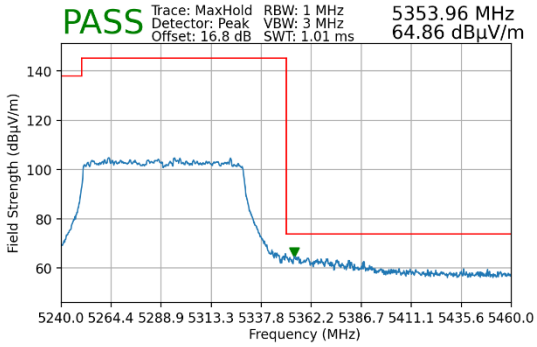


Plot 7-46. Radiated Lower Band Edge Plot MIMO (Peak – UNII Band 1 – 996 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	67
Distance of Measurements:	3 Meters
Operating Frequency:	5290MHz
Channel:	58

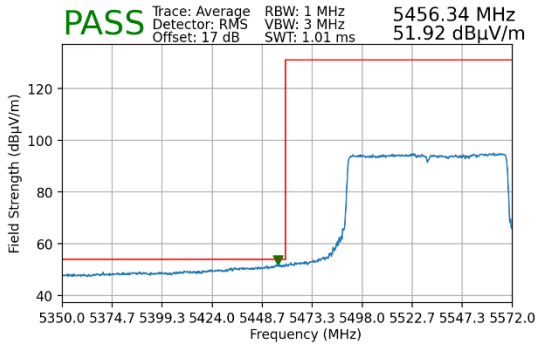


Plot 7-47. Radiated Upper Band Edge Plot MIMO (Average – UNII Band 2A – 996 Tones)

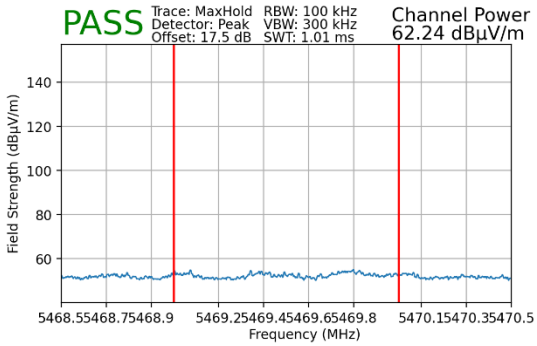


Plot 7-48. Radiated Upper Band Edge Plot MIMO (Peak – UNII Band 2A – 996 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	67
Distance of Measurements:	3 Meters
Operating Frequency:	5530MHz
Channel:	106

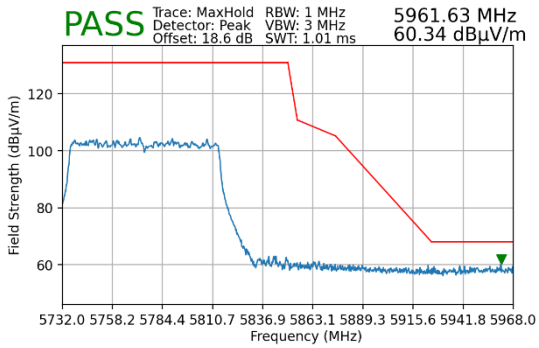


Plot 7-49. Radiated Lower Band Edge Plot MIMO (Average – UNII Band 2C – 996 Tones)



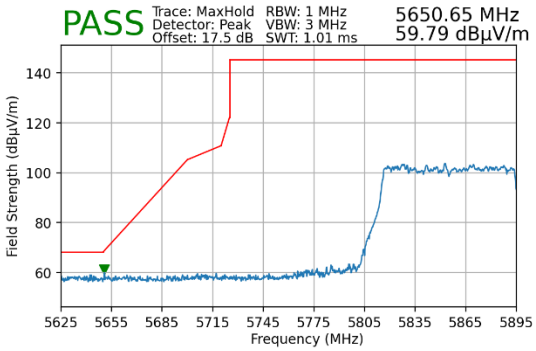
Plot 7-50. Radiated Lower Band Edge Plot MIMO (Peak – UNII Band 2C – 996 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	67
Distance of Measurements:	3 Meters
Operating Frequency:	5775MHz
Channel:	155



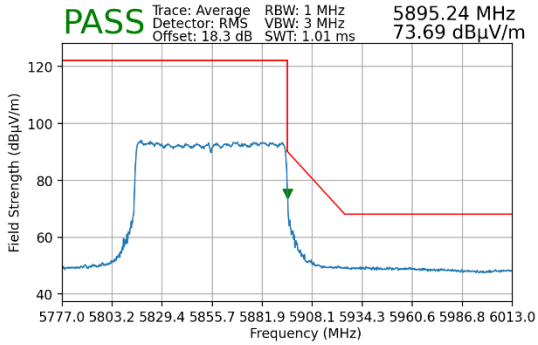
Plot 7-51. Radiated Upper Band Edge Plot MIMO (Peak – UNII Band 3 – 996 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	67
Distance of Measurements:	3 Meters
Operating Frequency:	5855MHz
Channel:	171

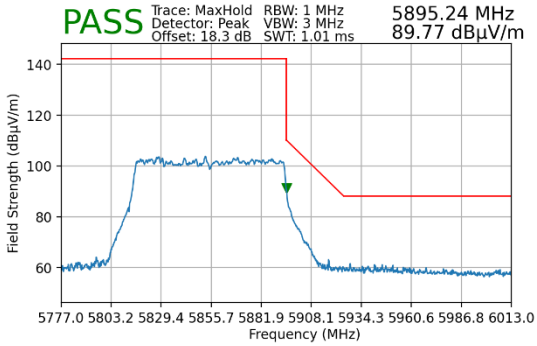


Plot 7-52. Radiated Lower Band Edge Plot MIMO (Peak – UNII Band 4 – 996 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	67
Distance of Measurements:	3 Meters
Operating Frequency:	5855MHz
Channel:	171



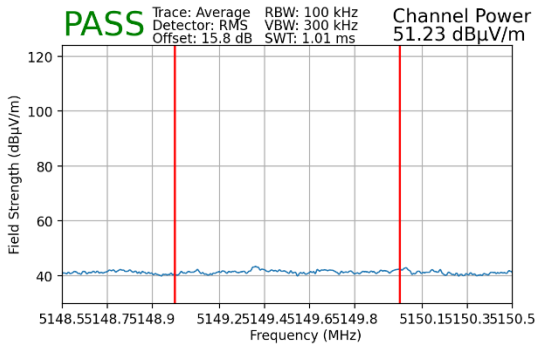
Plot 7-53. Radiated Upper Band Edge Plot MIMO (Average – UNII Band 4 – 996 Tones)



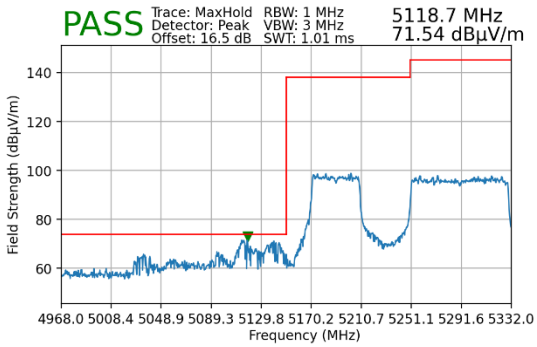
Plot 7-54. Radiated Upper Band Edge Plot MIMO (Peak – UNII Band 4 – 996 Tones)

7.4.6 MIMO Radiated Band Edge Measurements (160MHz BW – Partial Tones – 996 + 484T)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	95
Distance of Measurements:	3 Meters
Operating Frequency:	5250MHz
Channel:	50

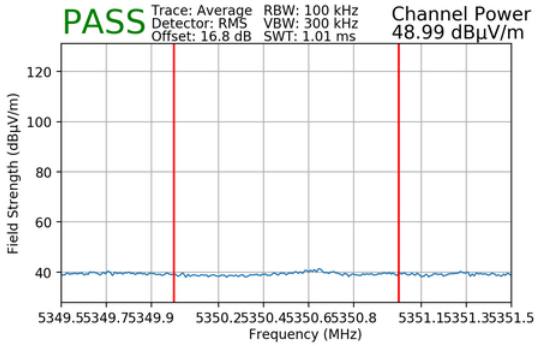


Plot 7-55. Radiated Lower Band Edge Plot MIMO (Average – UNII Band 1 – 996+484 Tones)

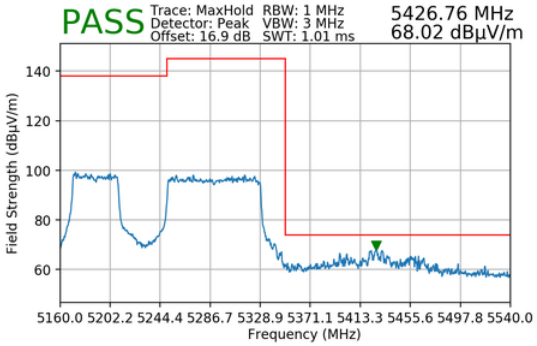


Plot 7-56. Radiated Lower Band Edge Plot MIMO (Peak – UNII Band 1 – 996+484 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	95
Distance of Measurements:	3 Meters
Operating Frequency:	5250MHz
Channel:	50

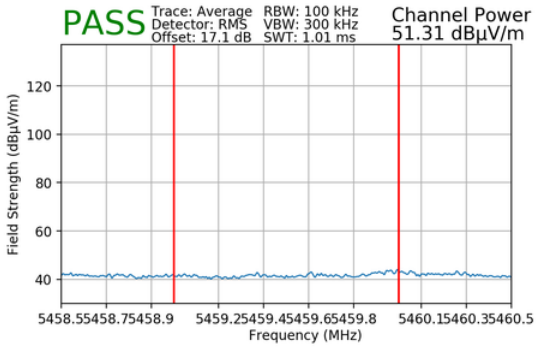


Plot 7-57. Radiated Upper Band Edge Plot MIMO (Average – UNII Band 2A – 996+484 Tones)

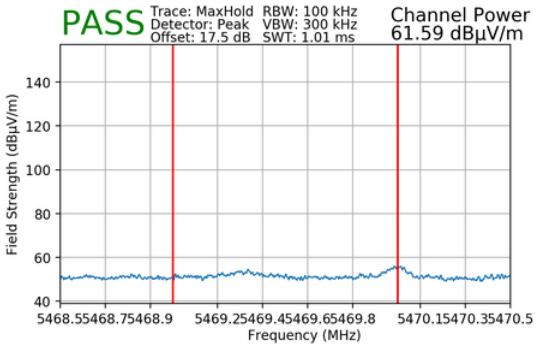


Plot 7-58. Radiated Upper Band Edge Plot MIMO (Peak – UNII Band 2A – 996+484 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	95
Distance of Measurements:	3 Meters
Operating Frequency:	5570MHz
Channel:	114

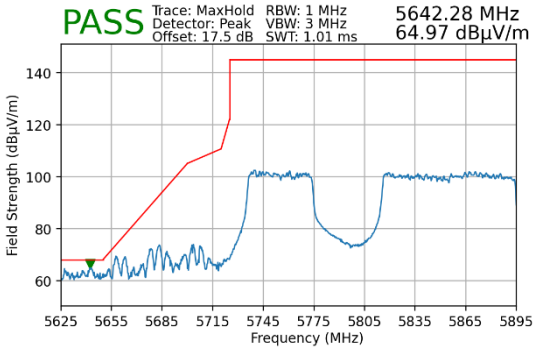


Plot 7-59. Radiated Lower Band Edge Plot MIMO (Average – UNII Band 2C – 996+484 Tones)



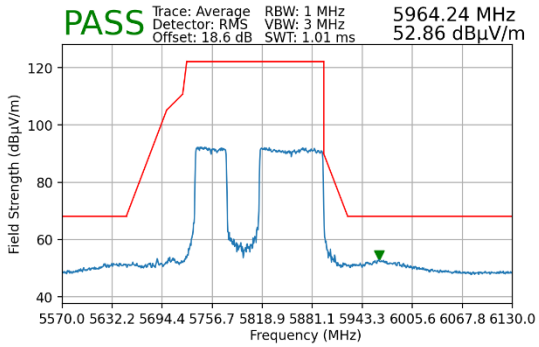
Plot 7-60. Radiated Lower Band Edge Plot MIMO (Peak – UNII Band 2C – 996+484 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	95
Distance of Measurements:	3 Meters
Operating Frequency:	5815MHz
Channel:	163

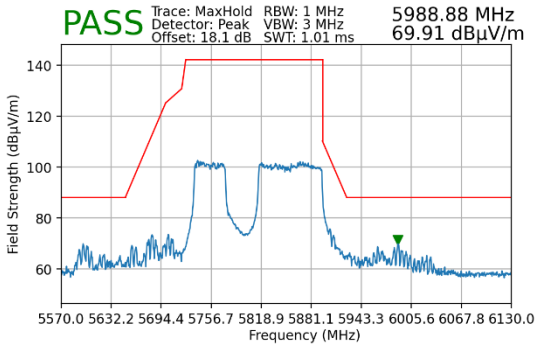


Plot 7-61. Radiated Lower Band Edge Plot MIMO (Peak – UNII Band 4 – 996+484 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	95
Distance of Measurements:	3 Meters
Operating Frequency:	5815MHz
Channel:	163



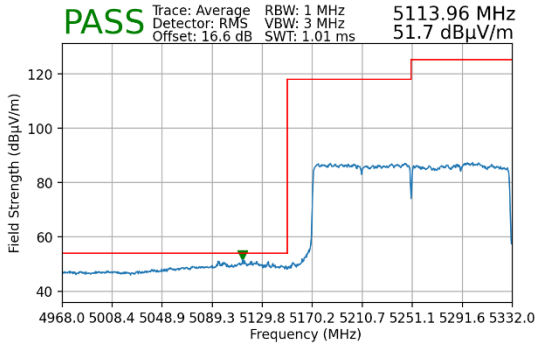
Plot 7-62. Radiated Upper Band Edge Plot MIMO (Average – UNII Band 4 – 996+484 Tones)



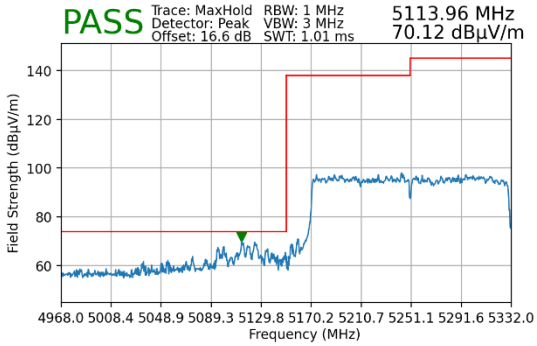
Plot 7-63. Radiated Upper Band Edge Plot MIMO (Peak – UNII Band 4 – 996+484 Tones)

7.4.7 MIMO Radiated Band Edge Measurements (160MHz BW – Full Tone – 2x996T)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	67
Distance of Measurements:	3 Meters
Operating Frequency:	5250MHz
Channel:	50

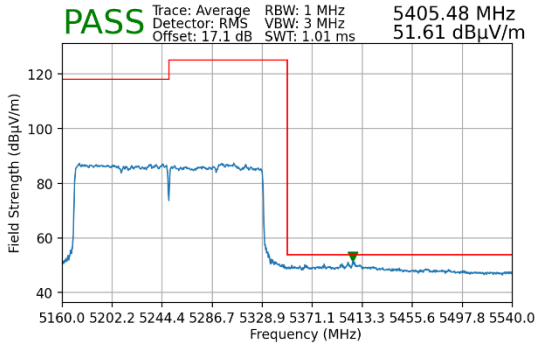


Plot 7-64. Radiated Lower Band Edge Plot MIMO (Average – UNII Band 1 – 2x996 Tones)

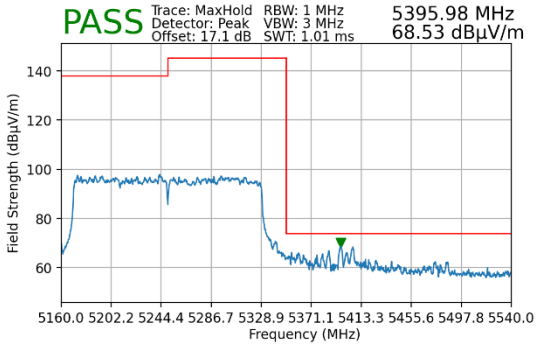


Plot 7-65. Radiated Lower Band Edge Plot MIMO (Peak – UNII Band 1 – 2x996 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	67
Distance of Measurements:	3 Meters
Operating Frequency:	5250MHz
Channel:	50

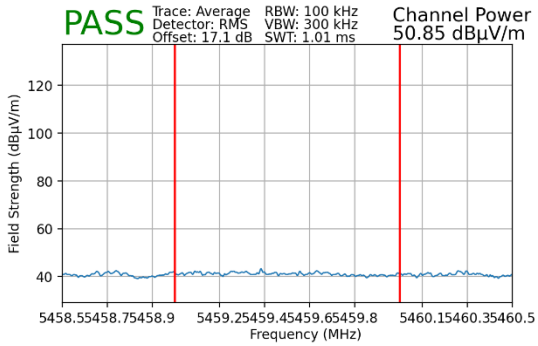


Plot 7-66. Radiated Upper Band Edge Plot MIMO (Average – UNII Band 2A – 2x996 Tones)

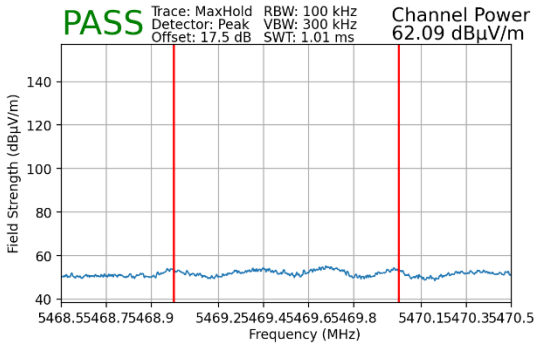


Plot 7-67. Radiated Upper Band Edge Plot MIMO (Peak – UNII Band 2A – 2x996 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	67
Distance of Measurements:	3 Meters
Operating Frequency:	5570MHz
Channel:	114

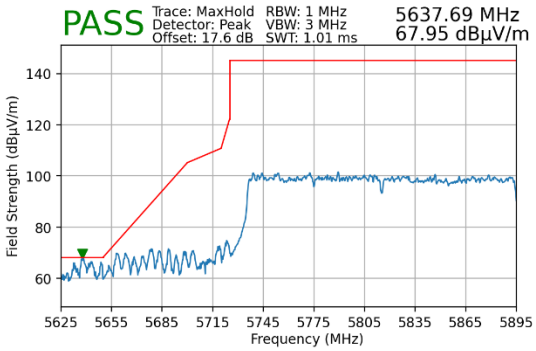


Plot 7-68. Radiated Lower Band Edge Plot MIMO (Average – UNII Band 2C – 2x996 Tones)



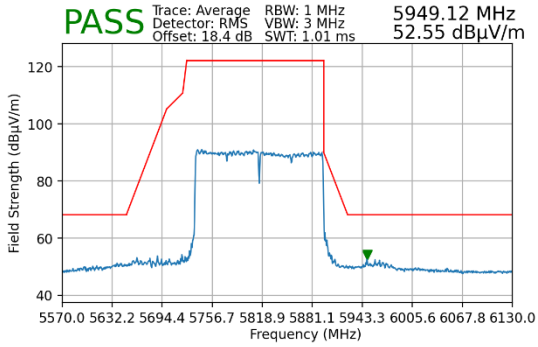
Plot 7-69. Radiated Lower Band Edge Plot MIMO (Peak – UNII Band 2C – 2x996 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	67
Distance of Measurements:	3 Meters
Operating Frequency:	5815MHz
Channel:	163

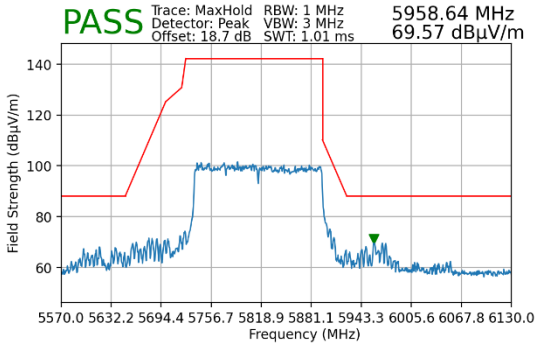


Plot 7-70. Radiated Lower Band Edge Plot MIMO (Peak – UNII Band 4 – 2x996 Tones)

Worst Case Mode:	802.11be
Worst Case Transfer Rate:	MCS0
RU Index:	67
Distance of Measurements:	3 Meters
Operating Frequency:	5815MHz
Channel:	163



Plot 7-71. Radiated Upper Band Edge Plot MIMO (Average – UNII Band 4 – 2x996 Tones)



Plot 7-72. Radiated Upper Band Edge Plot MIMO (Peak – UNII Band 4 – 2x996 Tones)

8.0 CONCLUSION

The data collected relate only the item(s) tested and show that the **Samsung Portable Tablet FCC ID: A3LSMX910, IC: 649E-SMX910** is in compliance with Part 15 Subpart C (15.247) of the FCC Rules and RSS-247 of the ISED Canada rules.