PCTEST
7185 Oakland Mills Road, Columbia, MD 21046 USA
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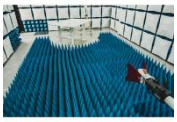

MEASUREMENT REPORT
FCC PART 15.407 / ISED RSS-247 UNII OFDMA

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

Date of Testing:
06/30/2021 - 07/27/2021
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
1M2106280072-08.A3L

FCC ID:	**A3LSMA528B**
APPLICANT:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Models:	SM-A528B/DS
Additional Model(s):	SM-A528B
EUT Type:	Portable Handset
Frequency Range:	5180 – 5825MHz
Modulation Type:	OFDMA
FCC Equipment Class:	Unlicensed National Information Infrastructure TX (NII)
Test Procedure(s):	ANSI C63.10-2013, KDB 789033 D02 v02r01,

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013 and KDB 789033 D02 v02r01. 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.

Randy Ortanez
President

ACCREDITED
CERT #2041.01

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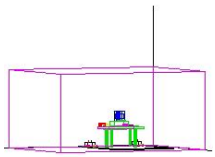
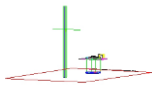


MEASUREMENT REPORT



UNII Band	Channel Bandwidth (MHz)	Tx Frequency (MHz)	ANT1	
			Max. Power (mW)	Max. Power (dBm)
1	20	5180 - 5240	15.812	11.99
2A		5260 - 5320	15.812	11.99
2C		5500 - 5720	15.812	11.99
3		5745 - 5825	15.812	11.99
1	40	5190 - 5230	15.812	11.99
2A		5270 - 5310	15.740	11.97
2C		5510 - 5710	15.812	11.99
3		5755 - 5795	15.812	11.99
1	80	5210	15.812	11.99
2A		5290	15.812	11.99
2C		5530 - 5690	15.704	11.96
3		5775	15.812	11.99

EUT Overview

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 PCTEST Test Location

These measurement tests were conducted at the PCTEST facility 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 PCTEST located in Columbia, MD 21046, U.S.A.

- PCTEST 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.

- PCTEST 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).

- PCTEST facility is a registered (2451B) test laboratory with the site description on file with ISED.

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMA528B**. The test data contained in this report pertains only to the emissions due to the EUT's UNII transmitter.

Test Device Serial No.: 1849M, 1873M, 0627M, 0648M

2.2 Device Capabilities

This device contains the following capabilities:

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

Band 1		Band 2A		Band 2C		Band 3	
Ch.	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**
36	5180	52	5260	100	5500	149	5745
:	:	:	:	:	:	:	:
42	5210	56	5280	120	5600	157	5785
:	:	:	:	:	:	:	:
48	5240	64	5320	144	5720	165	5825

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

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

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

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

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

Notes:

1. 5GHz NII operation is possible in 20MHz, and 40MHz, and 80MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = peak per the guidance of Section B)2)b) of ANSI C63.10-2013 and KDB 789033 D02 v02r01. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Mode	Antenna	Bandwidth [MHz]	Channel	Duty Cycle
802.11ax NII RU	1	20	36	99.6
				99.7
				99.4
				98.8
802.11ax NII RU	1	40	38	99.6
				99.7
				99.4
				98.8
				97.8
802.11ax NII RU	1	80	42	99.7
				99.7
				99.4
				98.7
				97.6
				95.7

Table 2-4. Measured Duty Cycles

2.3 Antenna Description

Following antenna was used for the testing.

Frequency [GHz]	Antenna Gain (dBi)
5.20	-3.48
5.30	-3.31
5.50	-3.37
5.80	-4.00

Table 2-5. Antenna Peak Gain

2.4 Software and Firmware

The test was conducted with firmware version 528BXXU0AUF3 installed on the EUT.

2.5 Test Configuration

The EUT was tested per the guidance of KDB 789033 D02 v02r01. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing.

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) and the guidance provided in KDB 789033 D02 v02r01 were 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 474788 D01.

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	1.13
Line Conducted Disturbance	3.09
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

6.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	WL25-1	Conducted Cable Set (25GHz)	2/23/2021	Annual	2/23/2022	WL25-1
-	WL25-2	Conducted Cable Set (25GHz)	2/23/2021	Annual	2/23/2022	WL25-2
Keysight Technologies	N9038A	MXE EMI Receiver	8/11/2020	Annual	8/11/2021	MY51210133
Agilent	N9020A	MXA Signal Analyzer	8/4/2020	Annual	8/4/2021	US46470561
Anritsu	ML2495A	Power Meter	1/18/2021	Annual	1/18/2022	941001
Anritsu	MA2411B	Pulse Power Sensor	2/5/2021	Annual	2/5/2022	846215
COM-Power	AL-130R	Active Loop Antenna	8/22/2019	Biennial	8/22/2021	121085
Emco	3115	Horn Antenna (1-18GHz)	6/18/2020	Biennial	6/18/2022	9704-5182
Emco	3116	Horn Antenna (18 - 40GHz)	8/7/2018	Triennial	8/7/2021	9203-2178
ETS-Lindgren	3816/2NM	Line Impedance Stabilization Network	7/9/2020	Biennial	7/9/2022	114451
Pasternack	NMLC-2	Line Conducted Emissions Cable (NM)	2/25/2021	Annual	2/25/2022	NMLC-2
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	5/25/2021	Annual	5/25/2022	100342
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	8/10/2020	Annual	8/10/2021	103200
Solar Electronics	8012-50-R-24-BNC	Line Impedance Stabilization Network	10/1/2019	Biennial	10/1/2021	310233
	AP1	EMC Cable and Switch System	9/10/2020	Annual	9/10/2021	AP1
	AP2	EMC Cable and Switch System	9/9/2020	Annual	9/9/2021	AP2
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	7/27/2020	Biennial	7/27/2022	A051107

Table 6-1. Annual Test Equipment Calibration Schedule

Note:

For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.
FCC ID: A3LSMA528B
FCC Classification: Unlicensed National Information Infrastructure (UNII)

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
N/A	RSS-Gen [6.7]	26dB Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
15.407(e)	RSS-Gen [6.7]	6dB Bandwidth	>500kHz(5725-5850MHz)		PASS	Section 7.3
15.407 (a.1.iv), (a.2), (a.3)	RSS-247 [6.2]	Maximum Conducted Output Power	Maximum conducted powers must meet the limits detailed in 15.407 (a) (RSS-247 [6.2])		PASS	Section 7.4
15.407 (a.1.iv), (a.2), (a.3)	RSS-247 [6.2]	Maximum Power Spectral Density	Maximum power spectral density must meet the limits detailed in 15.407 (a) (RSS-247 [6.2])		PASS	Section 7.5
15.407(h)	RSS-247 [6.3]	Dynamic Frequency Selection	See DFS Test Report		PASS	See DFS Test Report
15.407(b.1), (2), (3), (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), (4), (5), (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 PCTEST "UNII Automation," Version 4.7.
5) For radiated band edge, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "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 RU's were considered for testing.

7.2 26dB Bandwidth Measurement – 802.11ax OFDMA

RSS-Gen [6.2]

Test Overview and Limit

The bandwidth at 26dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating at its maximum duty cycle, at its maximum power control level, as defined in ANSI C63.10-2013 and KDB 789033 D02 v02r01, and at the appropriate frequencies. The spectrum analyzer's bandwidth measurement function is configured to measure the 26dB bandwidth.

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

Test Procedure Used

ANSI C63.10-2013 – Section 12.4
KDB 789033 D02 v02r01 – Section C

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

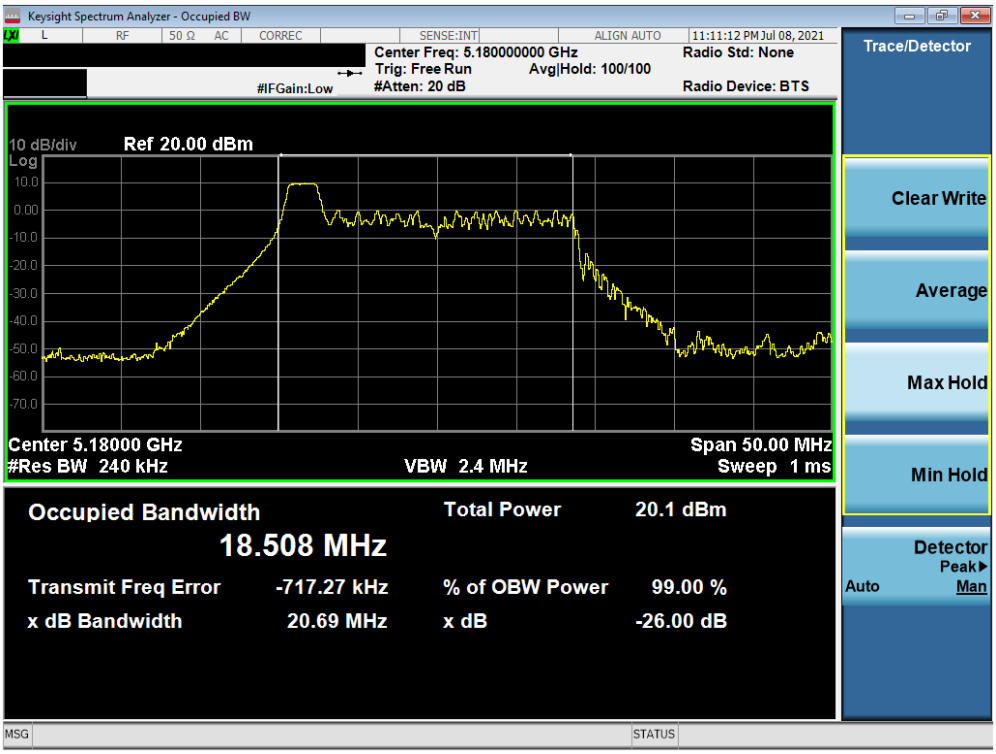
Test Notes

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

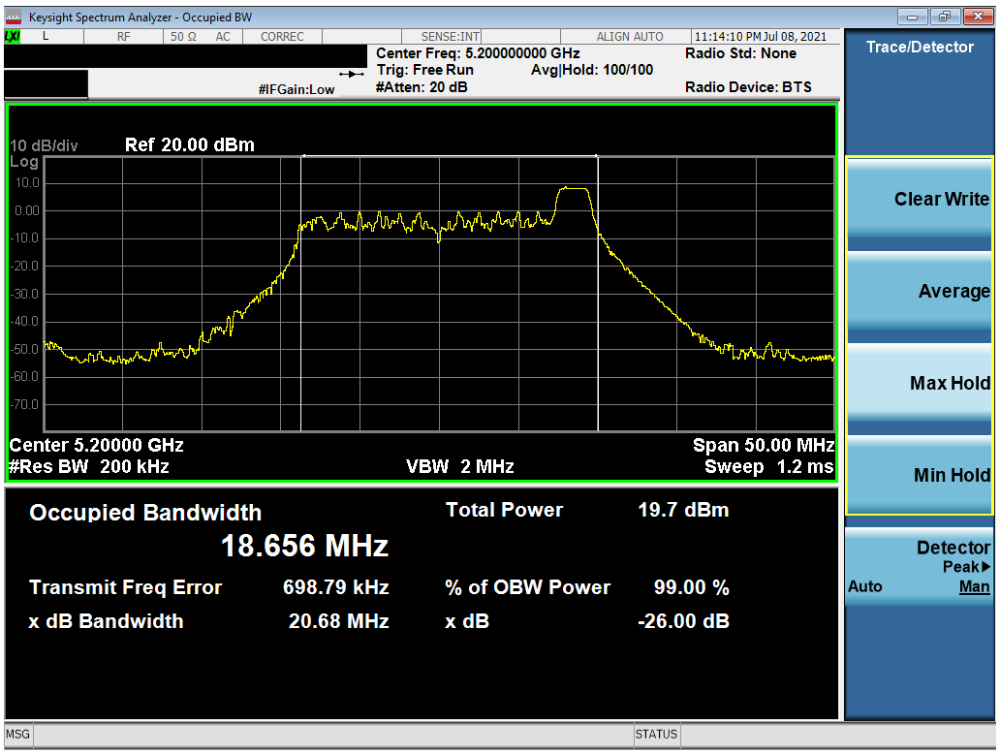
26 dB Bandwidth Measurements (26 Tones)

	Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured 26dB Bandwidth [MHz]
Band 1	5180	36	ax (20MHz)	26T	MCS0	20.69
	5200	40	ax (20MHz)	26T	MCS0	20.68
	5240	48	ax (20MHz)	26T	MCS0	20.76
	5190	38	ax (40MHz)	26T	MCS0	40.55
	5230	46	ax (40MHz)	26T	MCS0	40.68
	5210	42	ax (80MHz)	26T	MCS0	82.59
Band 2A	5260	52	ax (20MHz)	26T	MCS0	18.59
	5280	56	ax (20MHz)	26T	MCS0	18.79
	5320	64	ax (20MHz)	26T	MCS0	18.91
	5270	54	ax (40MHz)	26T	MCS0	40.48
	5310	62	ax (40MHz)	26T	MCS0	40.50
	5290	58	ax (80MHz)	26T	MCS0	81.15
Band 2C	5500	100	ax (20MHz)	26T	MCS0	18.87
	5600	120	ax (20MHz)	26T	MCS0	18.89
	5720	144	ax (20MHz)	26T	MCS0	18.86
	5510	102	ax (40MHz)	26T	MCS0	38.22
	5590	118	ax (40MHz)	26T	MCS0	40.17
	5710	142	ax (40MHz)	26T	MCS0	38.14
	5530	106	ax (80MHz)	26T	MCS0	81.62
	5610	122	ax (80MHz)	26T	MCS0	80.91
	5690	138	ax (80MHz)	26T	MCS0	81.20

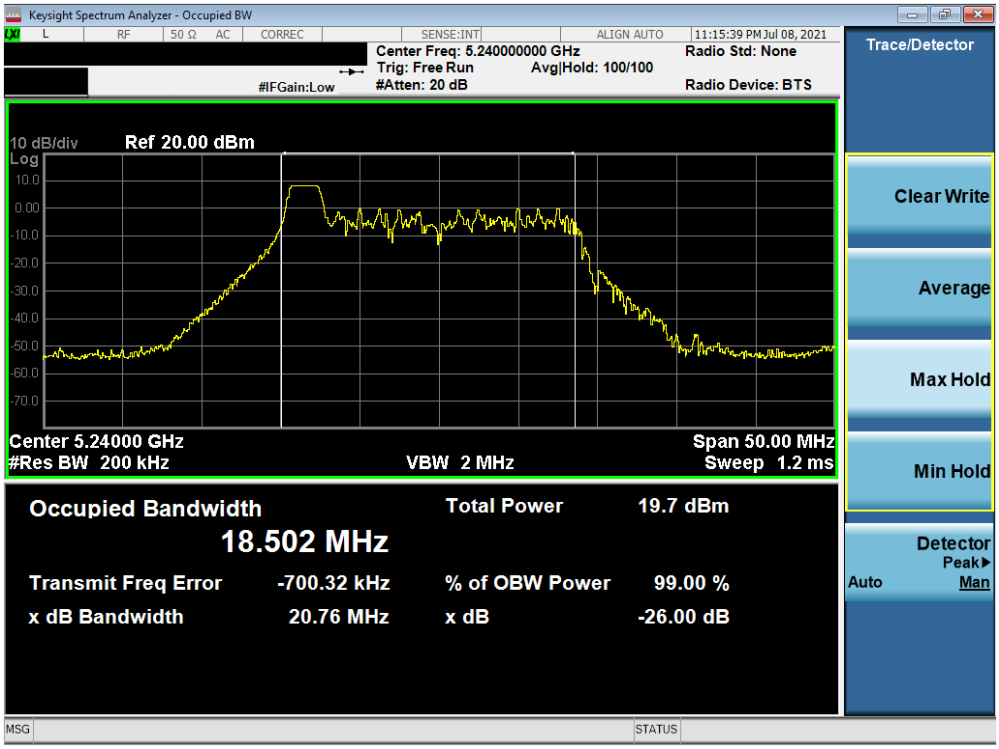
Table 7-2. Conducted Bandwidth Measurements (26 Tones)



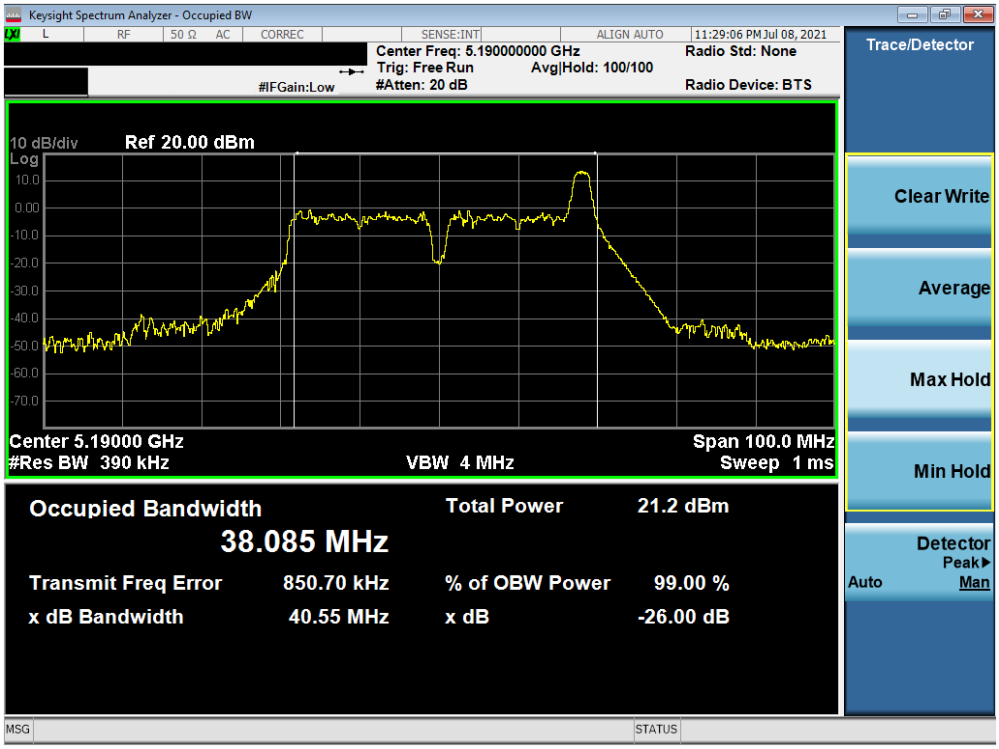
Plot 7-1. 26dB Bandwidth Plot (20MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 36)



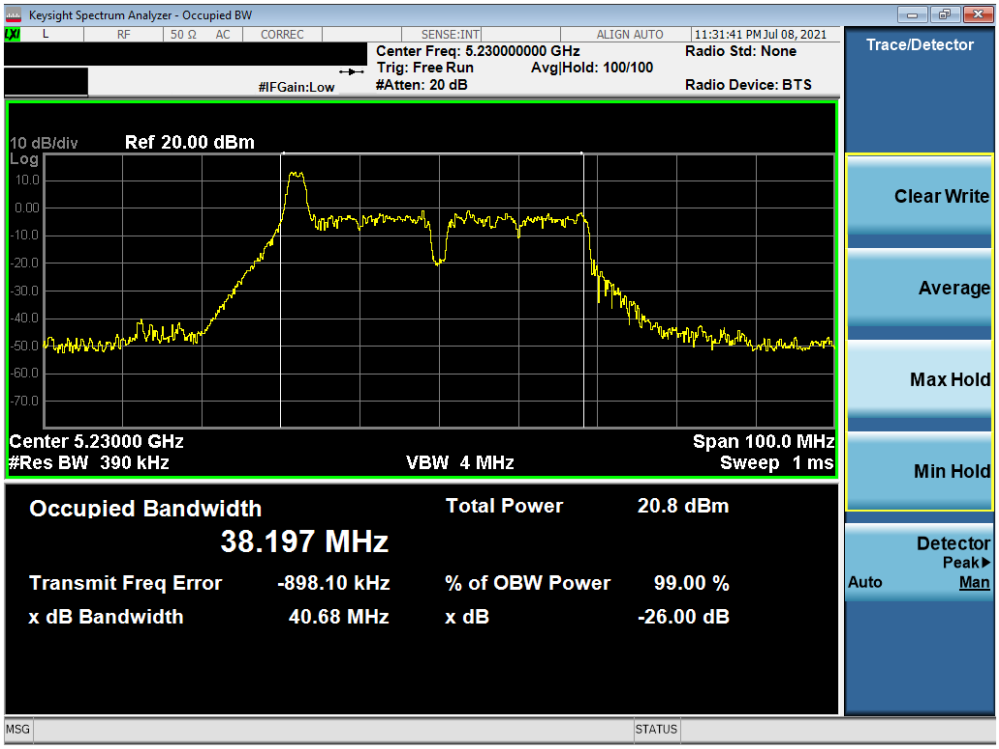
Plot 7-2. 26dB Bandwidth Plot (20MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 40)



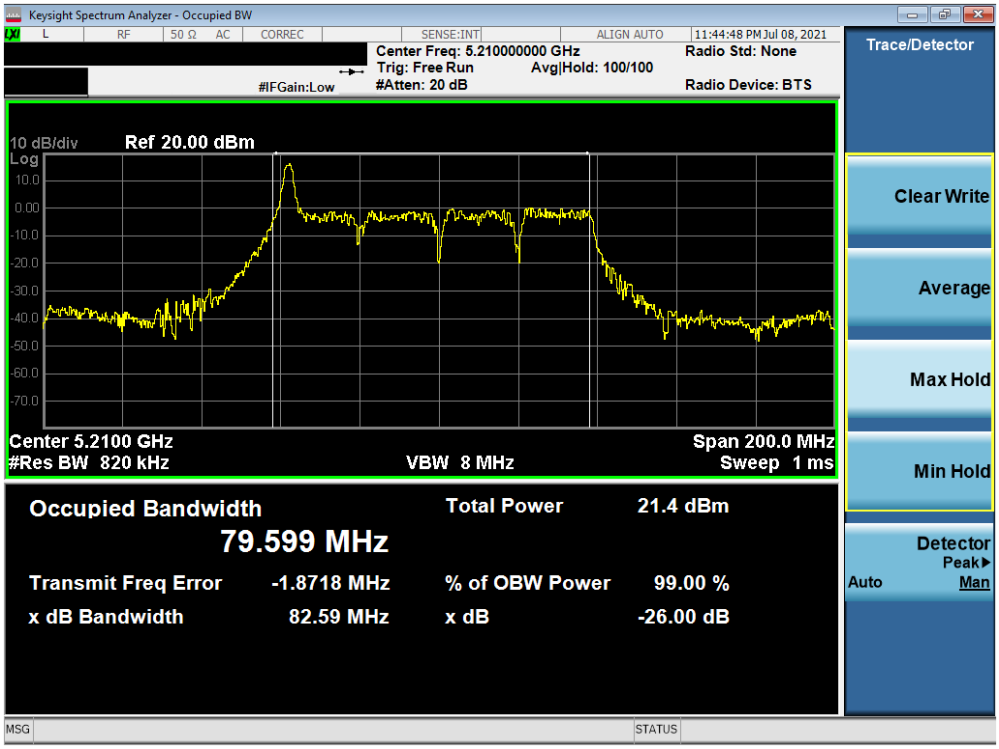
Plot 7-3. 26dB Bandwidth Plot (20MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 48)



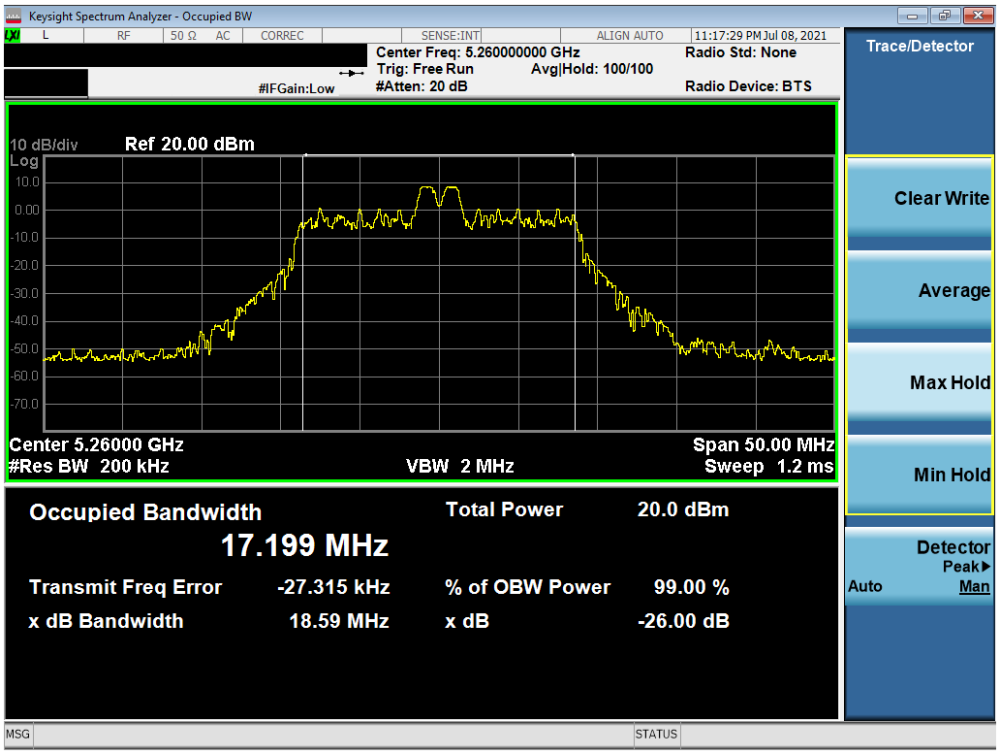
Plot 7-4. 26dB Bandwidth Plot (40MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 38)



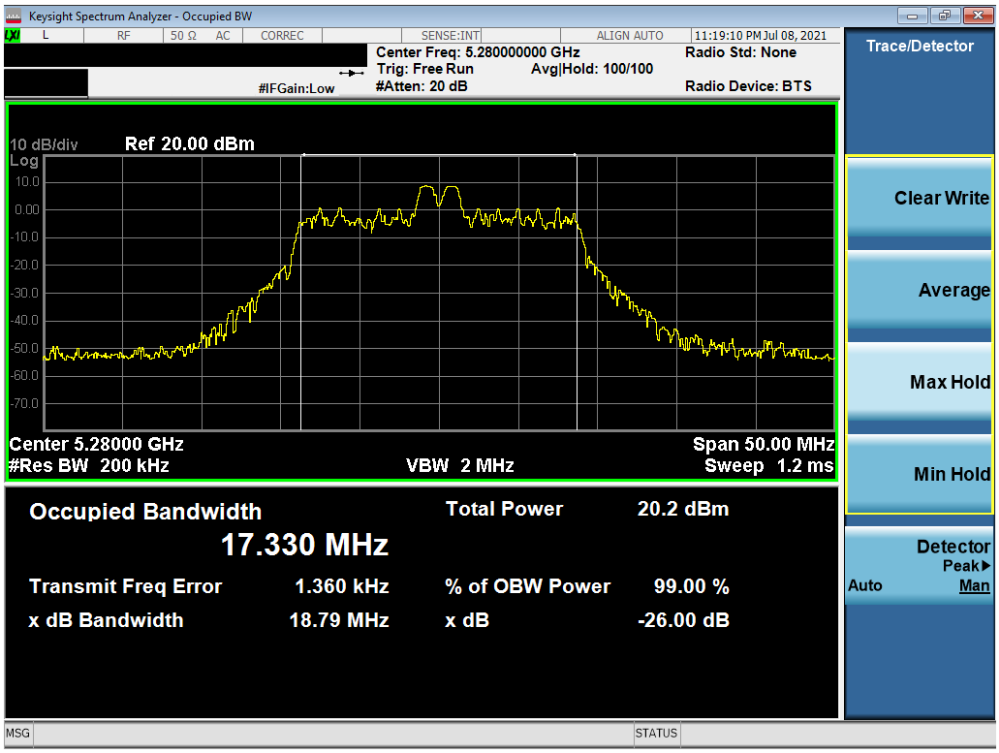
Plot 7-5. 26dB Bandwidth Plot (40MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 46)



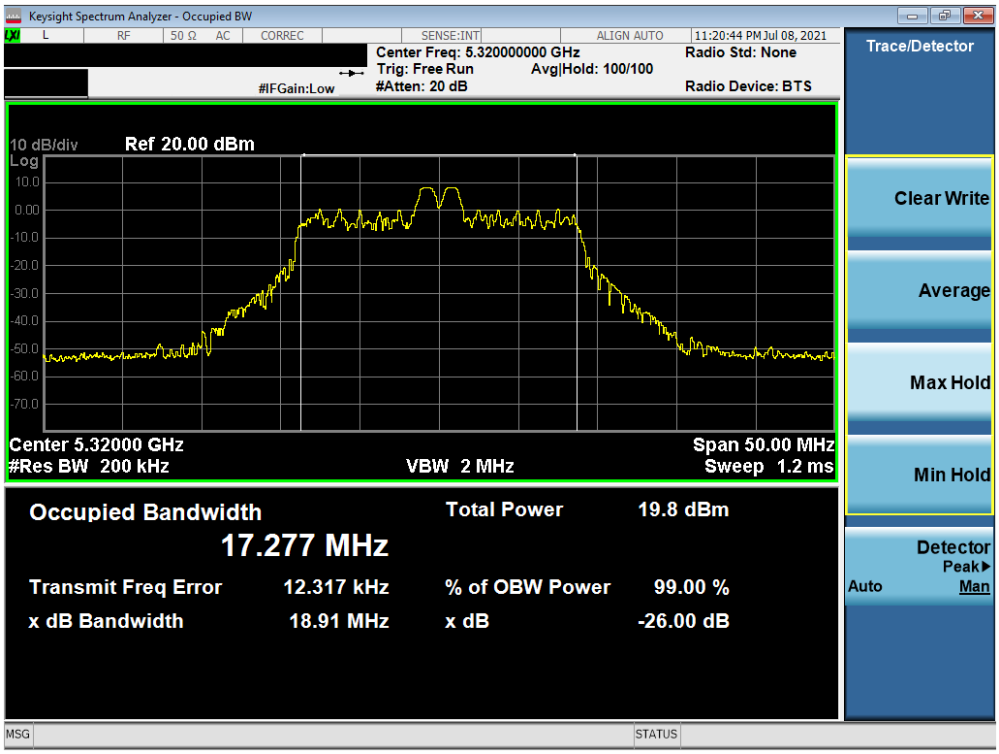
Plot 7-6. 26dB Bandwidth Plot (80MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 42)



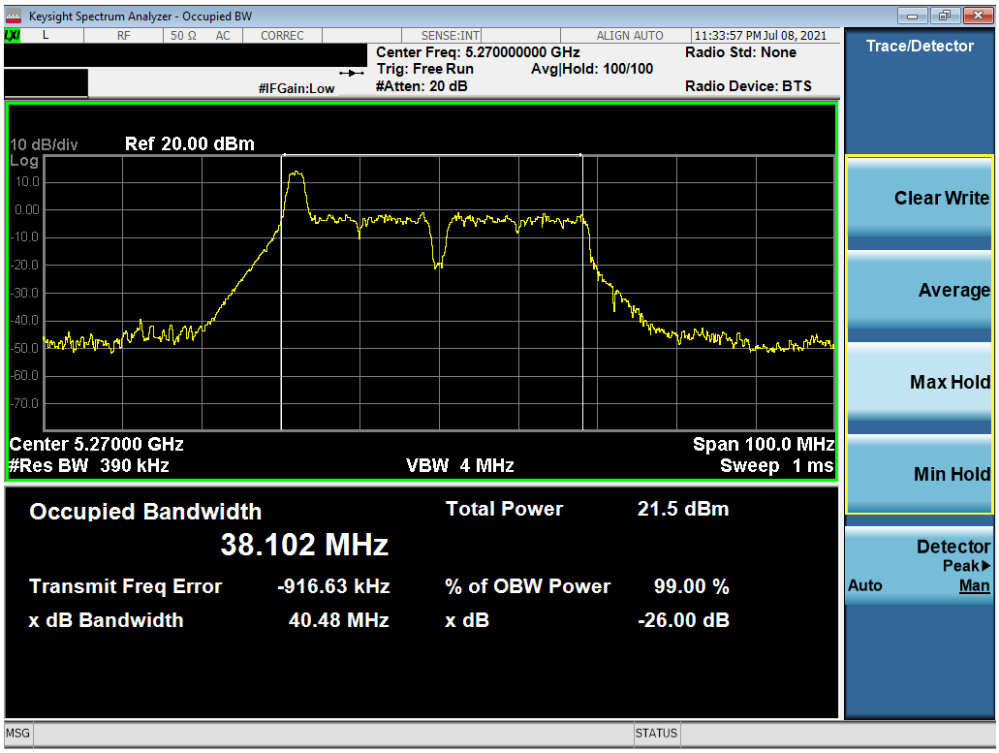
Plot 7-7. 26dB Bandwidth Plot (20MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 52)



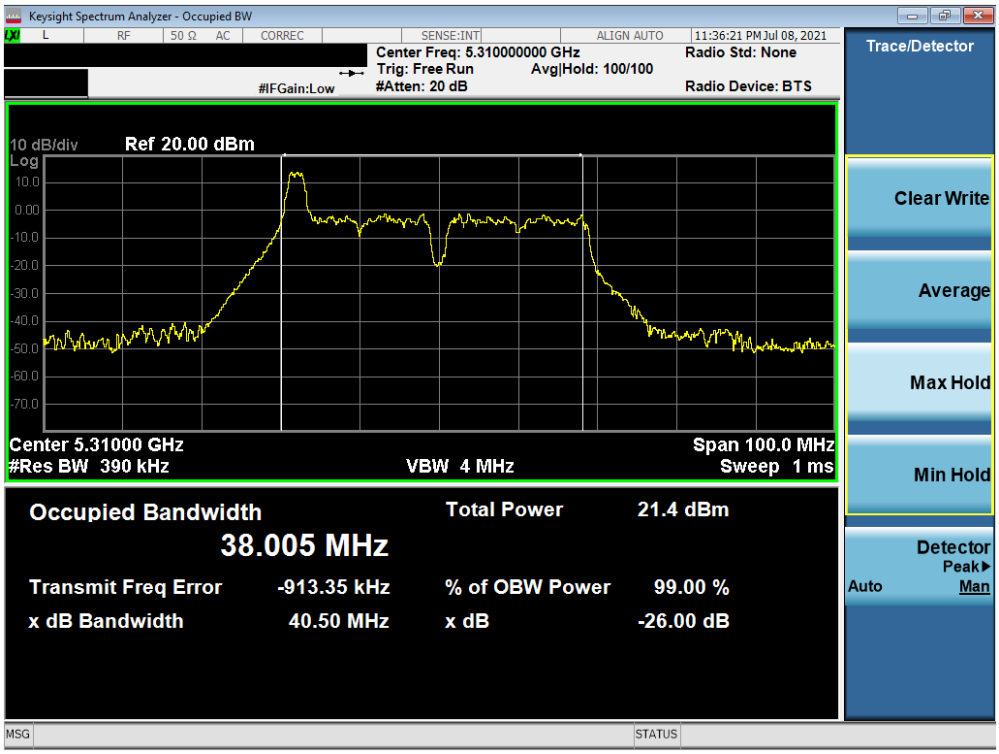
Plot 7-8. 26dB Bandwidth Plot (20MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 56)



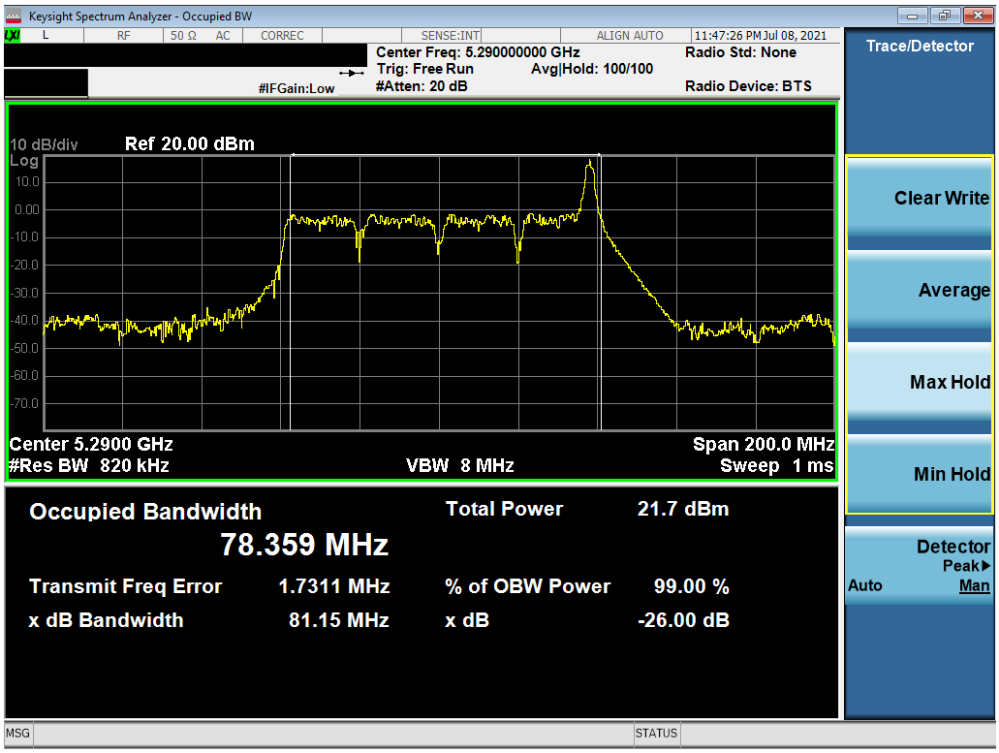
Plot 7-9. 26dB Bandwidth Plot (20MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 64)



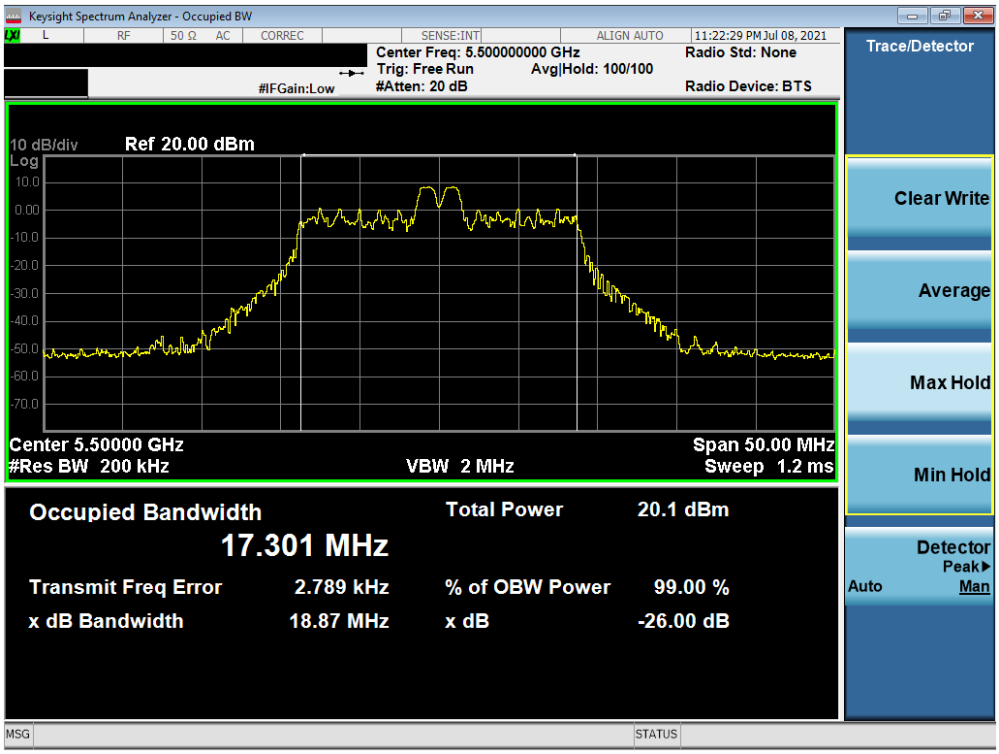
Plot 7-10. 26dB Bandwidth Plot (40MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 54)



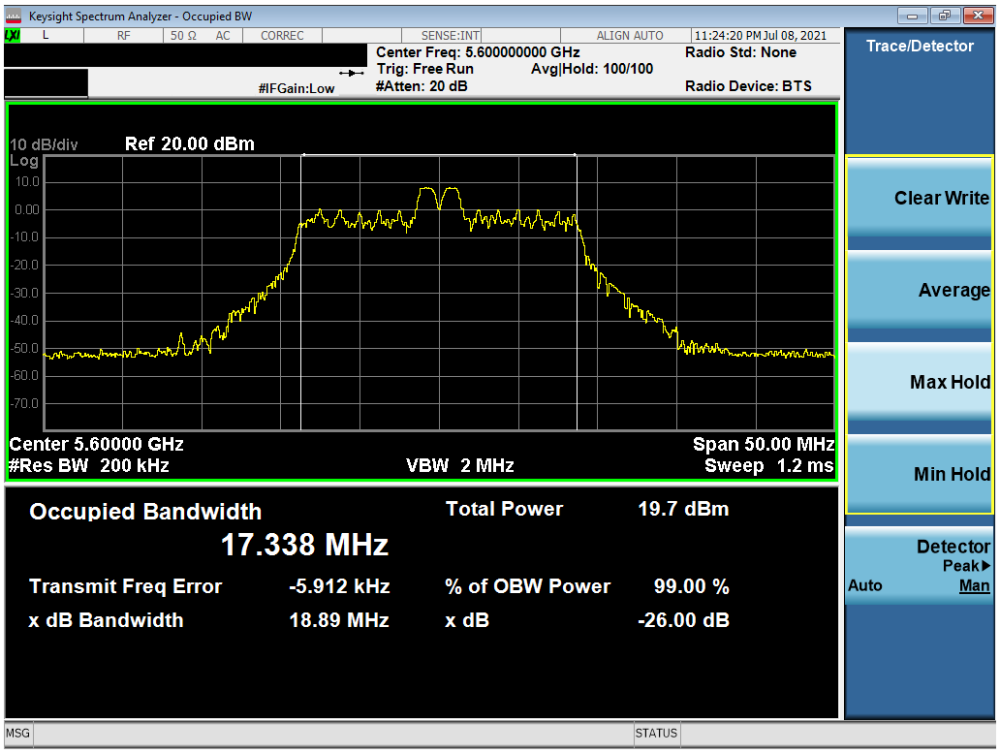
Plot 7-11. 26dB Bandwidth Plot (40MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 62)



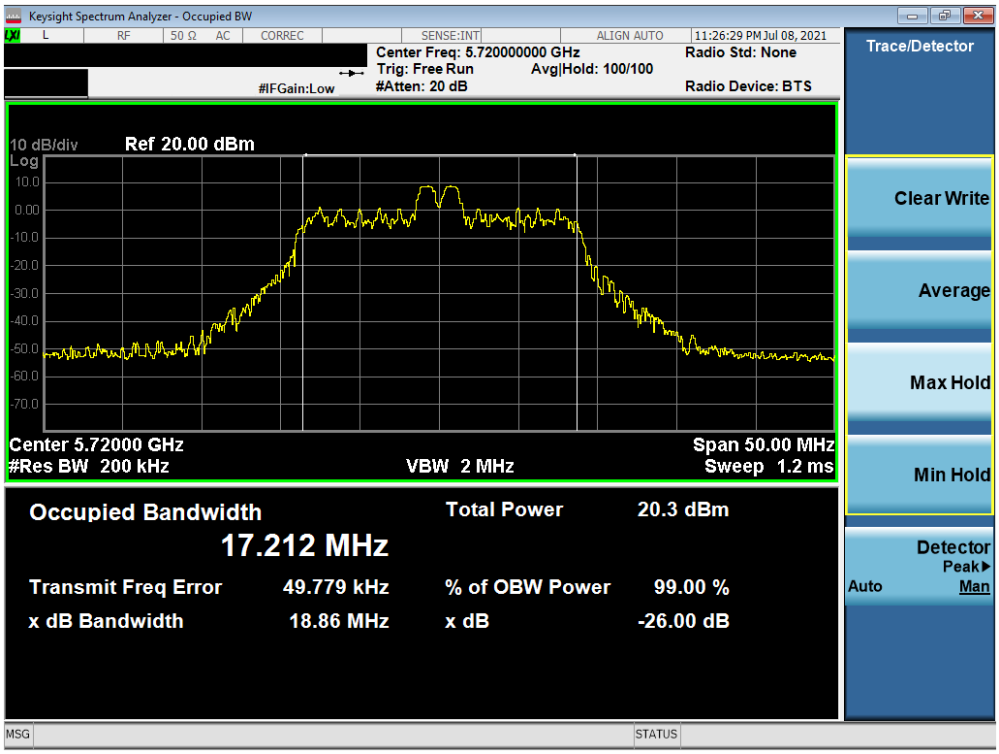
Plot 7-12. 26dB Bandwidth Plot (80MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 58)



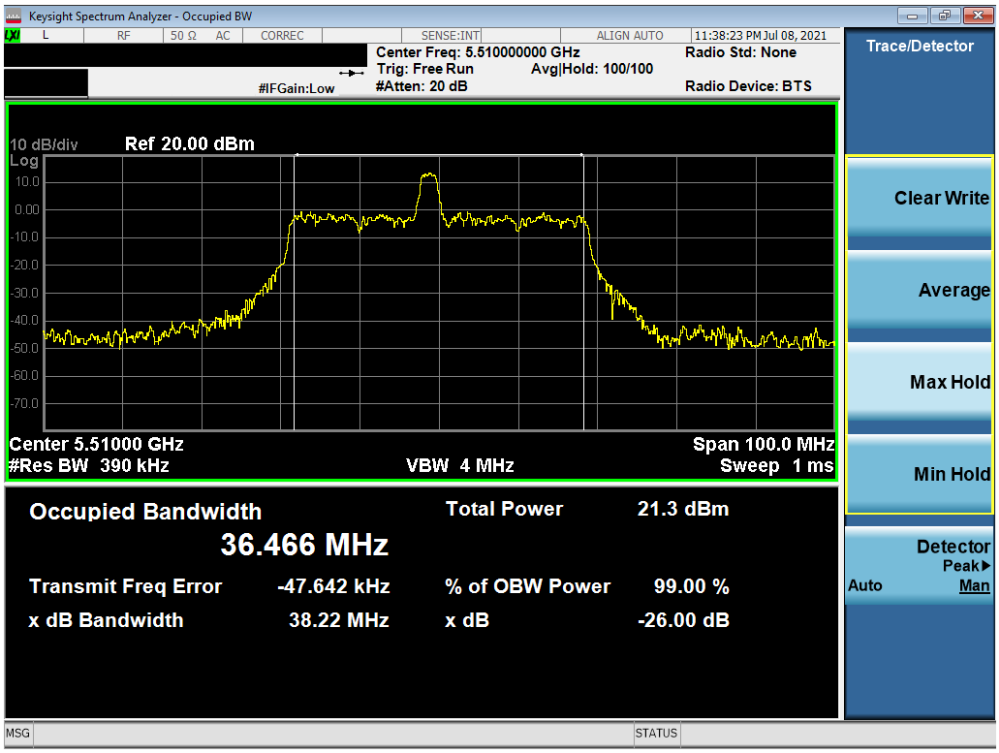
Plot 7-13. 26dB Bandwidth Plot (20MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 100)



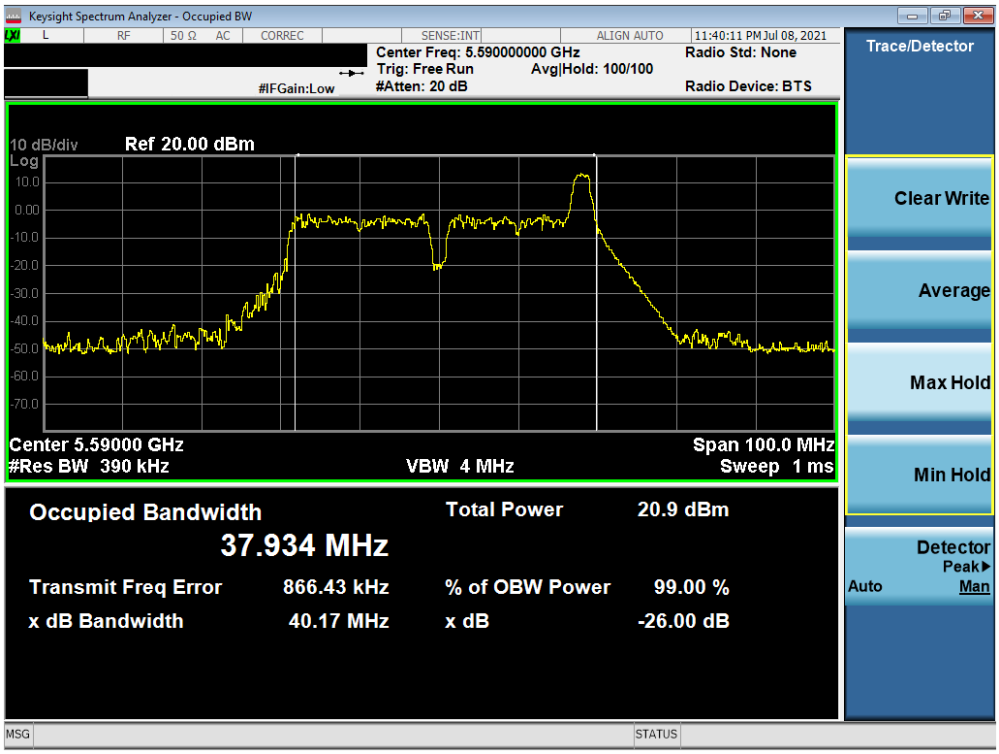
Plot 7-14. 26dB Bandwidth Plot (20MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 120)



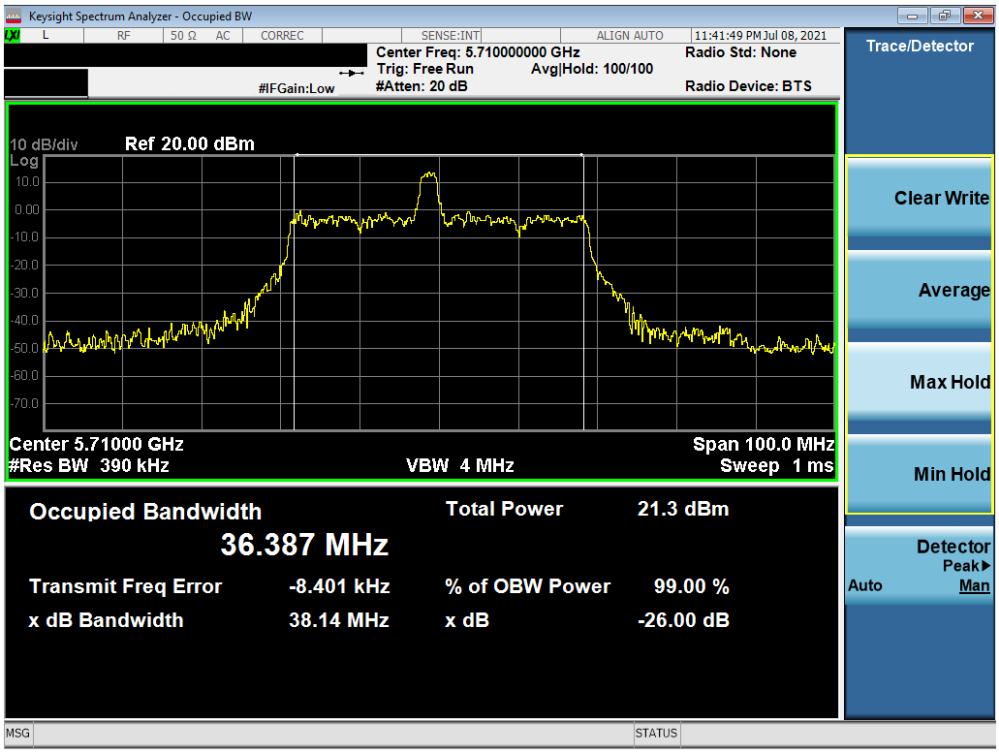
Plot 7-15. 26dB Bandwidth Plot (20MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 144)



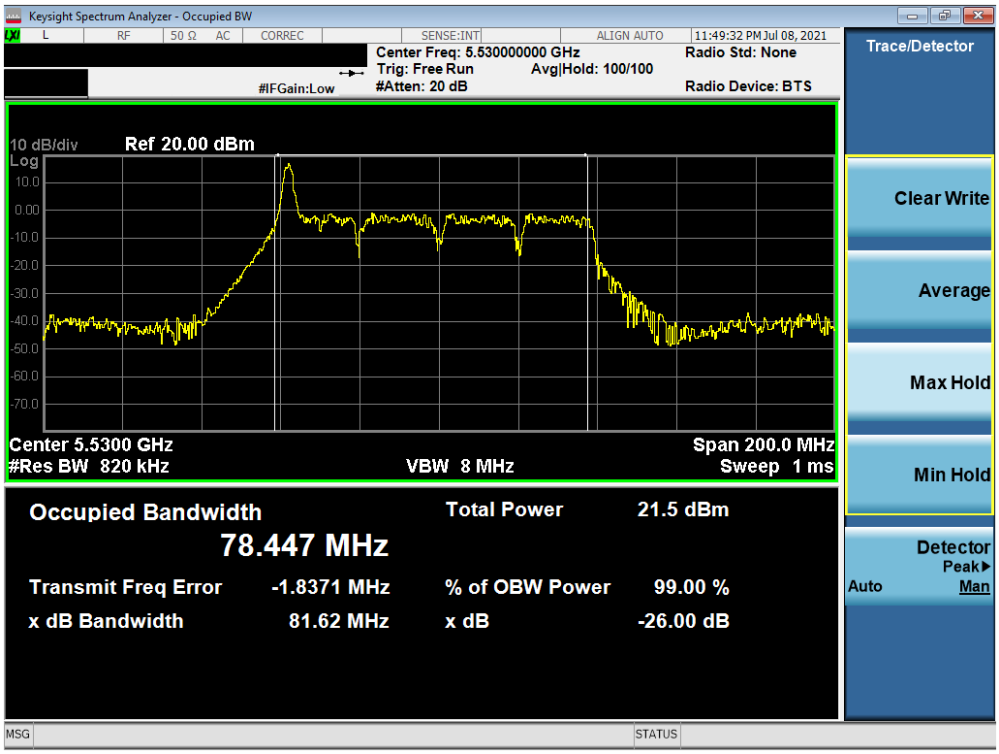
Plot 7-16. 26dB Bandwidth Plot (40MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 102)



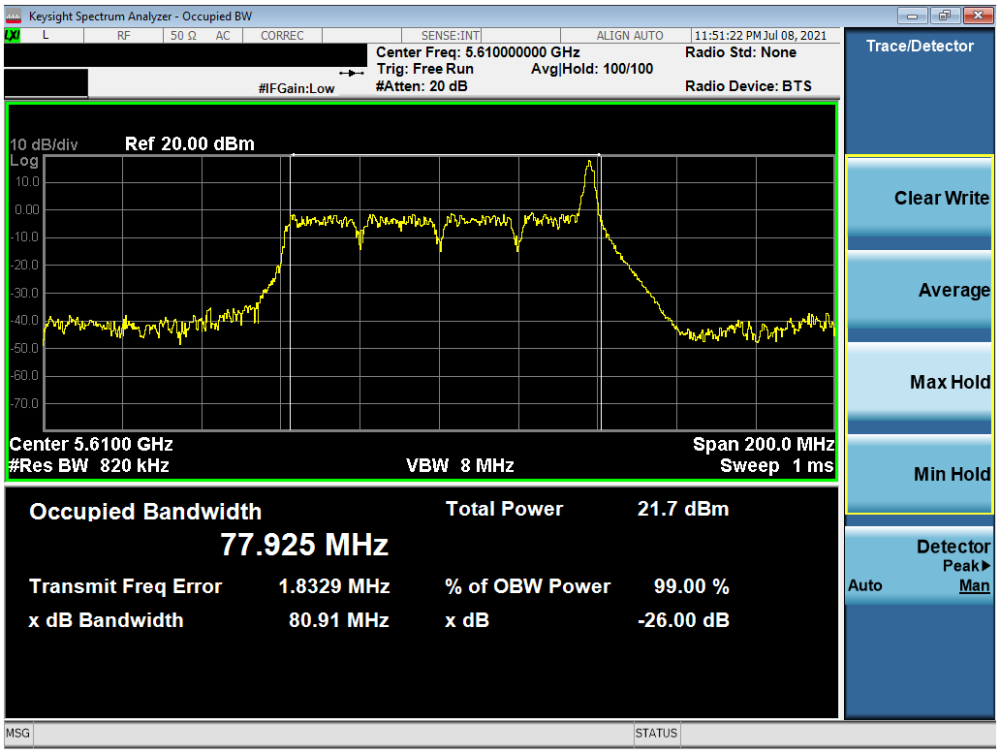
Plot 7-17. 26dB Bandwidth Plot (40MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 118)



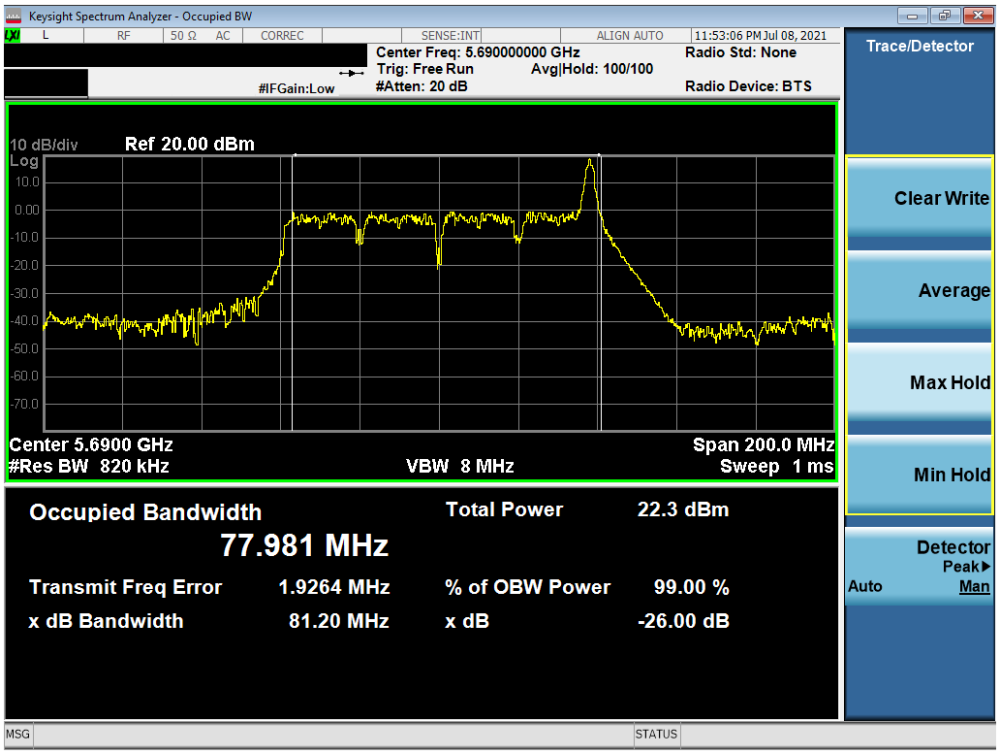
Plot 7-18. 26dB Bandwidth Plot (40MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 142)



Plot 7-19. 26dB Bandwidth Plot (80MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 106)



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

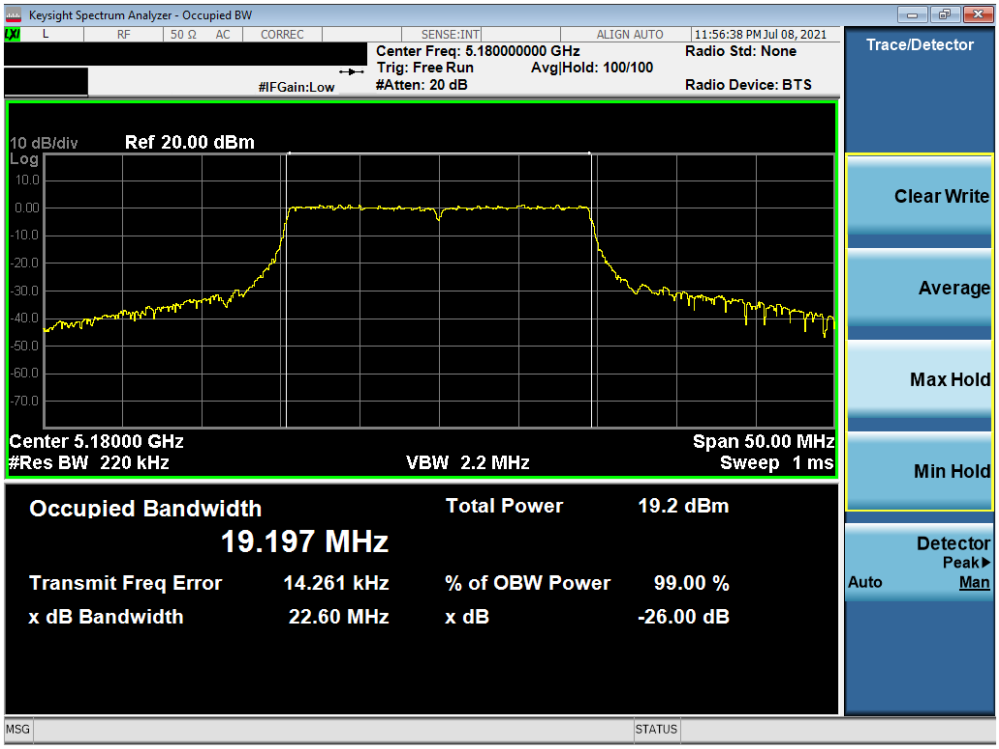


Plot 7-21. 26dB Bandwidth Plot (80MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 138)

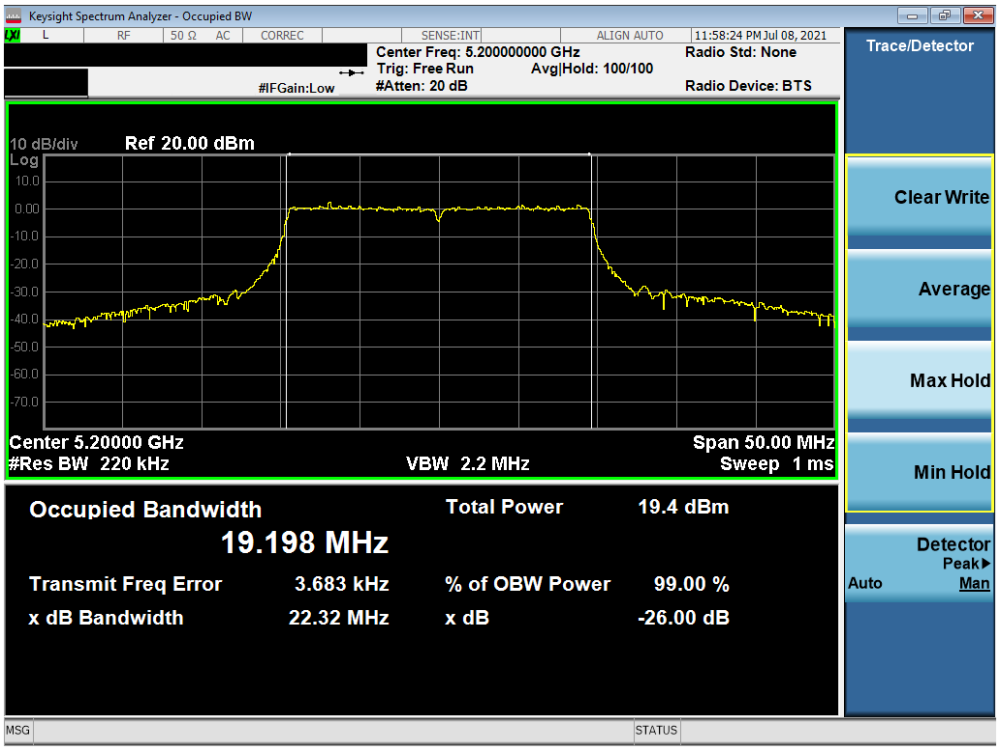
26 dB Bandwidth Measurements (Full Tones)

	Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured 26dB Bandwidth [MHz]
Band 1	5180	36	ax (20MHz)	242T	MCS0	22.60
	5200	40	ax (20MHz)	242T	MCS0	22.32
	5240	48	ax (20MHz)	242T	MCS0	22.22
	5190	38	ax (40MHz)	484T	MCS0	43.65
	5230	46	ax (40MHz)	484T	MCS0	43.50
	5210	42	ax (80MHz)	996T	MCS0	87.29
Band 2A	5260	52	ax (20MHz)	242T	MCS0	22.22
	5280	56	ax (20MHz)	242T	MCS0	22.61
	5320	64	ax (20MHz)	242T	MCS0	22.96
	5270	54	ax (40MHz)	484T	MCS0	43.71
	5310	62	ax (40MHz)	484T	MCS0	43.76
	5290	58	ax (80MHz)	996T	MCS0	89.57
Band 2C	5500	100	ax (20MHz)	242T	MCS0	22.60
	5600	120	ax (20MHz)	242T	MCS0	22.62
	5720	144	ax (20MHz)	242T	MCS0	22.56
	5510	102	ax (40MHz)	484T	MCS0	43.71
	5590	118	ax (40MHz)	484T	MCS0	43.85
	5710	142	ax (40MHz)	484T	MCS0	43.65
	5530	106	ax (80MHz)	996T	MCS0	88.09
	5610	122	ax (80MHz)	996T	MCS0	87.30
	5690	138	ax (80MHz)	996T	MCS0	86.91

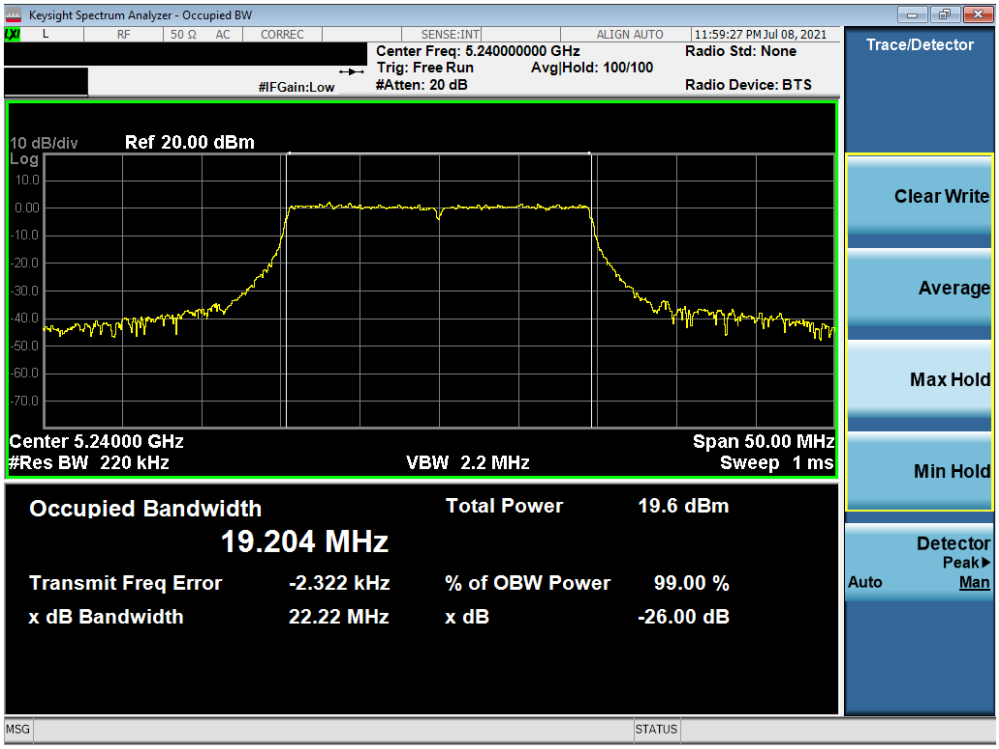
Table 7-3. Conducted Bandwidth Measurements (Full Tones)



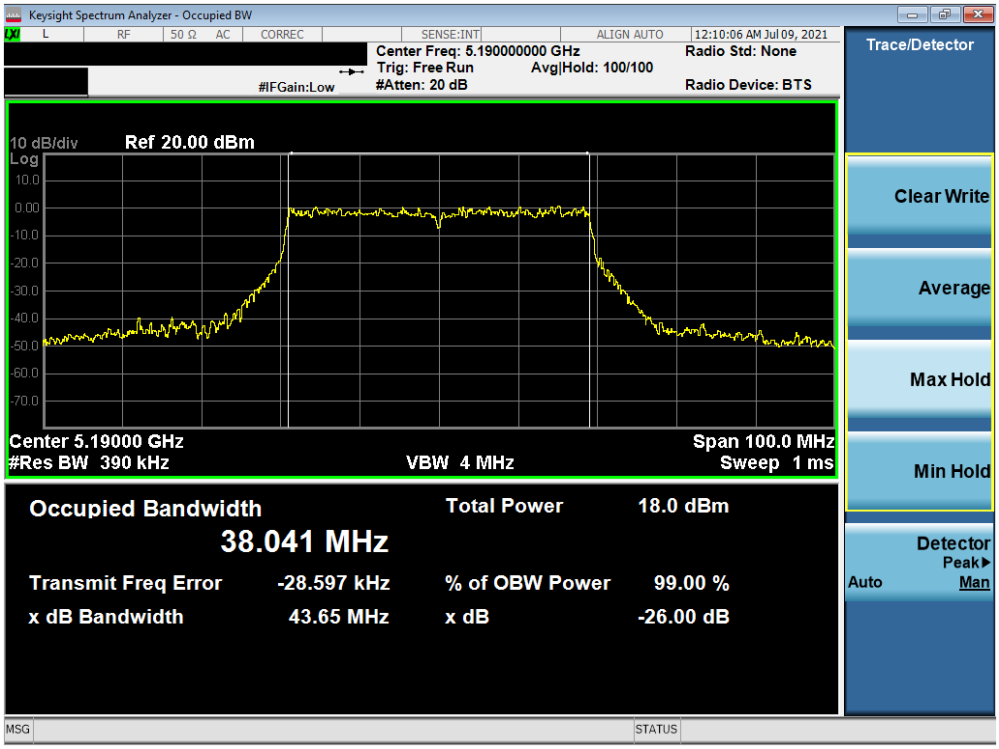
Plot 7-22. 26dB Bandwidth Plot (20MHz BW 802.11ax – 242 Tones (UNII Band 1) – Ch. 36)



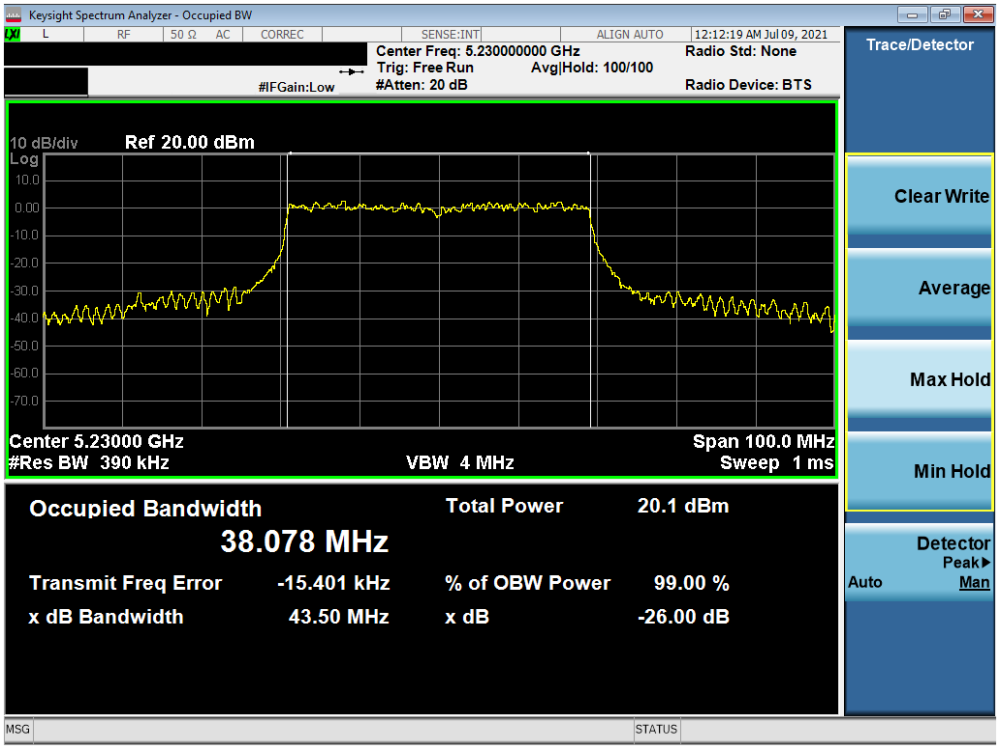
Plot 7-23. 26dB Bandwidth Plot (20MHz BW 802.11ax – 242 Tones (UNII Band 1) – Ch. 40)



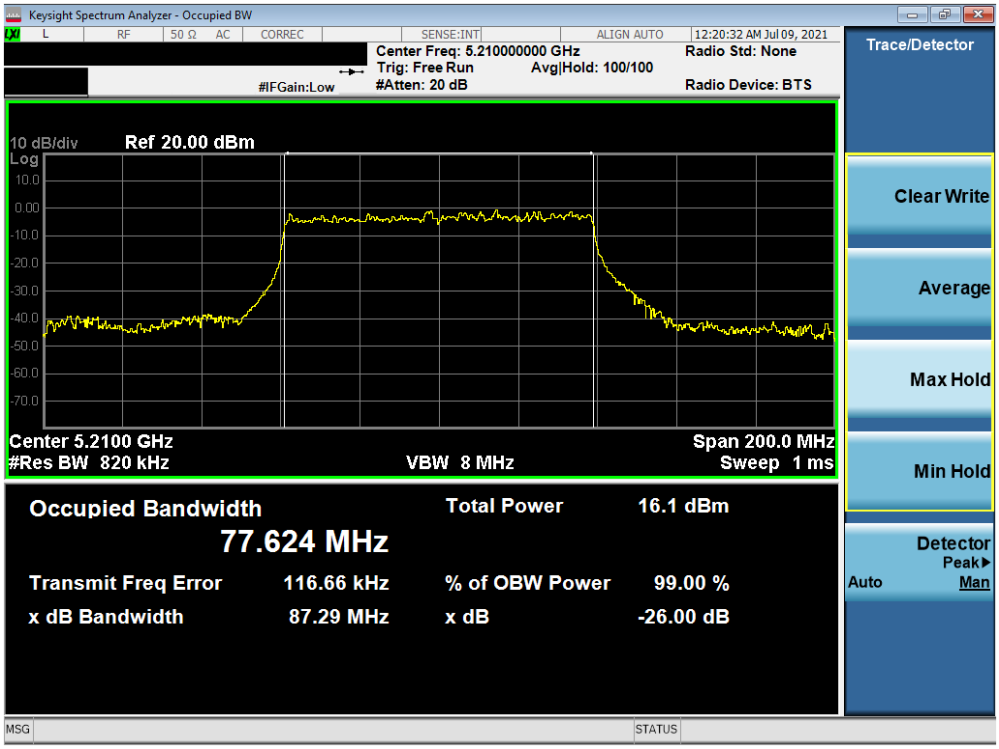
Plot 7-24. 26dB Bandwidth Plot (20MHz BW 802.11ax – 242 Tones (UNII Band 1) – Ch. 48)



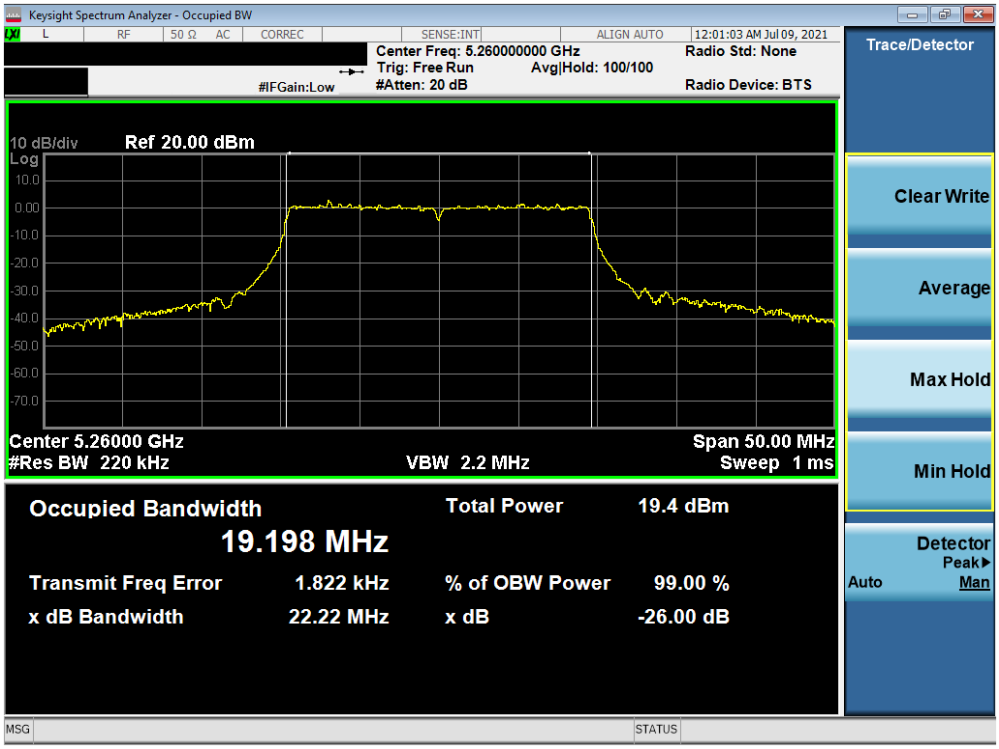
Plot 7-25. 26dB Bandwidth Plot (40MHz BW 802.11ax – 484 Tones (UNII Band 1) – Ch. 38)



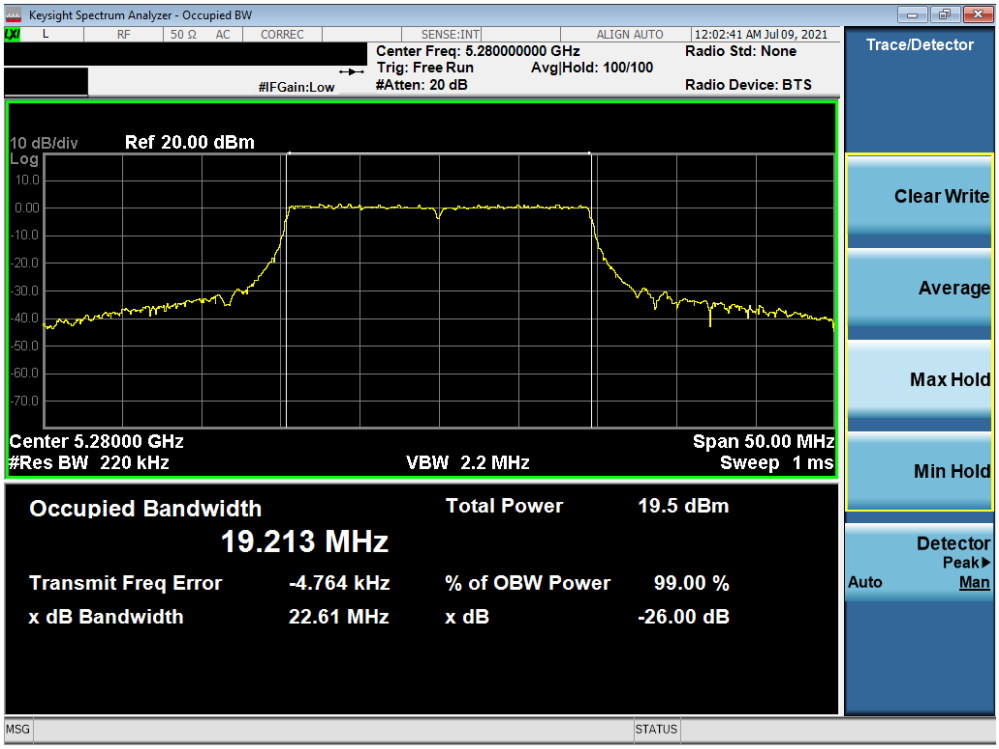
Plot 7-26. 26dB Bandwidth Plot (40MHz BW 802.11ax – 484 Tones (UNII Band 1) – Ch. 46)



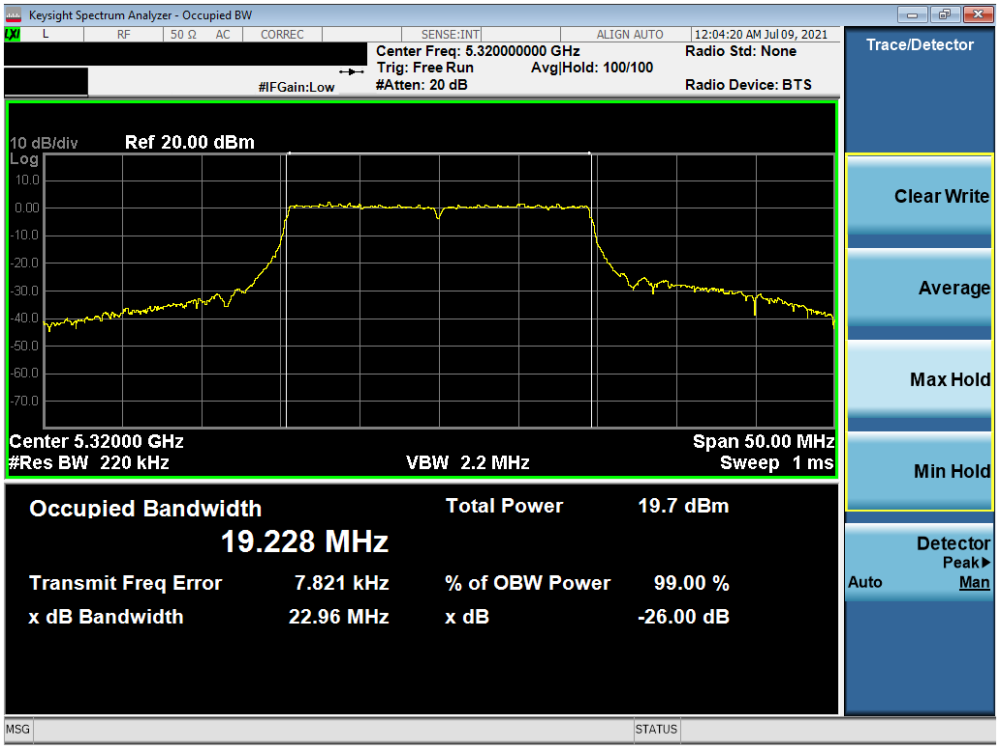
Plot 7-27. 26dB Bandwidth Plot (80MHz BW 802.11ax – 996 Tones (UNII Band 1) – Ch. 42)



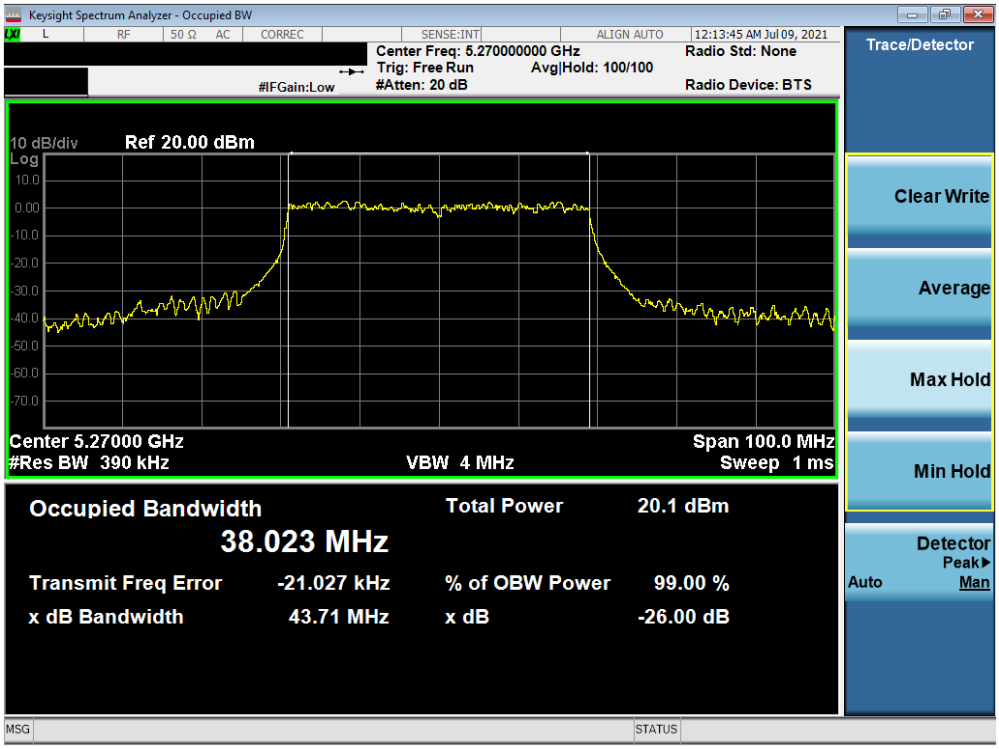
Plot 7-28. 26dB Bandwidth Plot (20MHz BW 802.11ax – 242 Tones (UNII Band 2A) – Ch. 52)



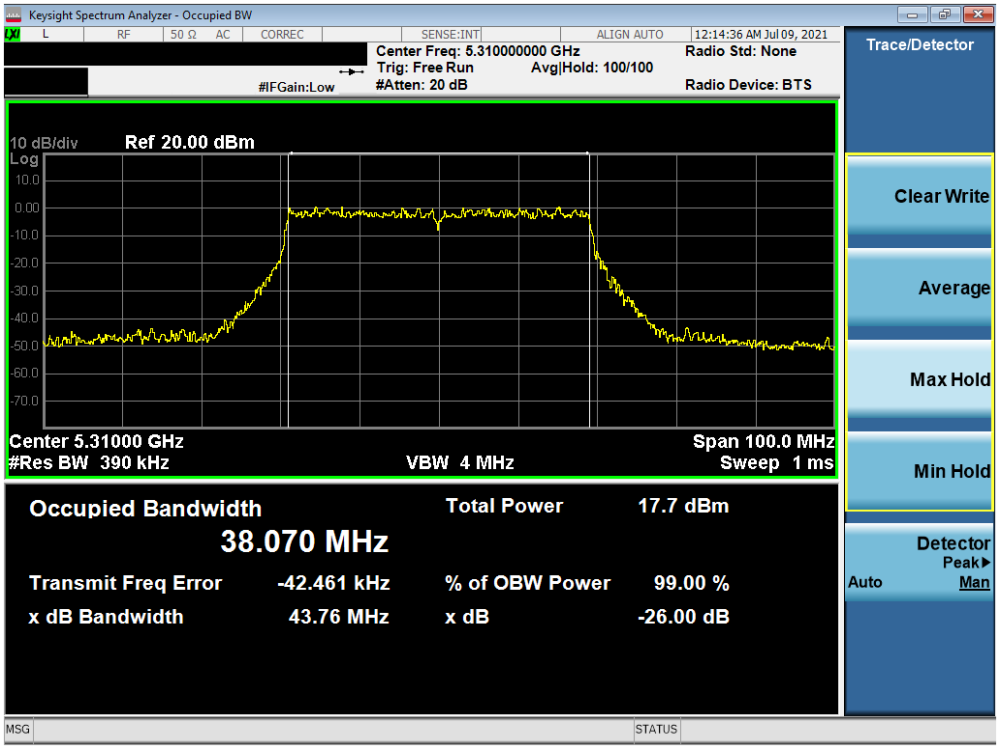
Plot 7-29. 26dB Bandwidth Plot (20MHz BW 802.11ax – 242 Tones (UNII Band 2A) – Ch. 56)



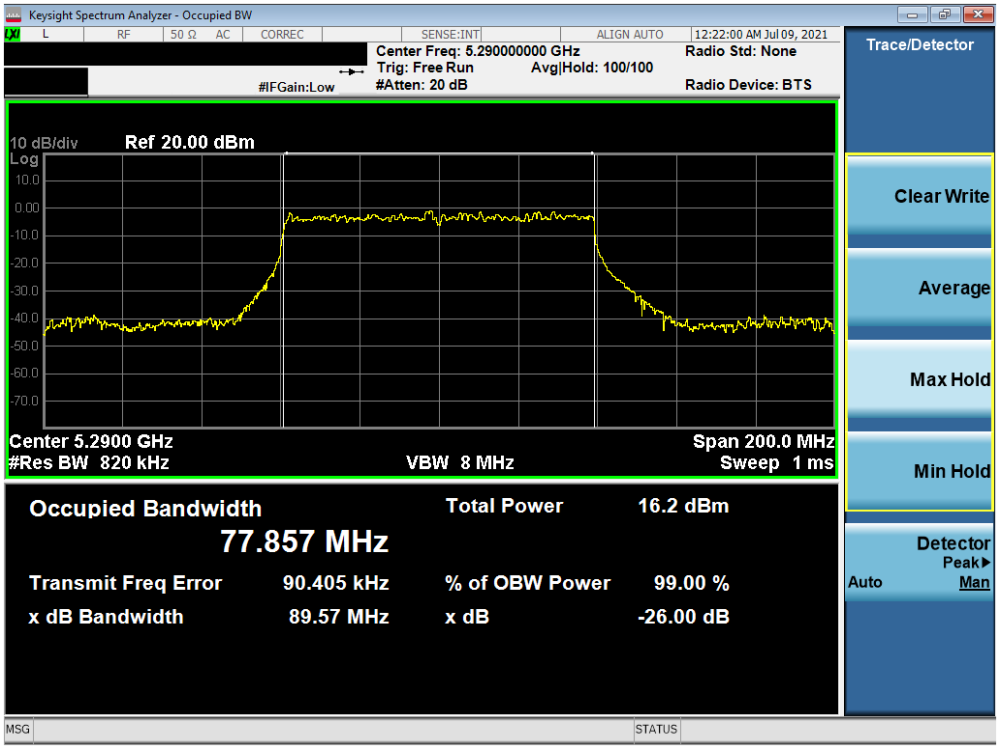
Plot 7-30. 26dB Bandwidth Plot (20MHz BW 802.11ax – 242 Tones (UNII Band 2A) – Ch. 64)



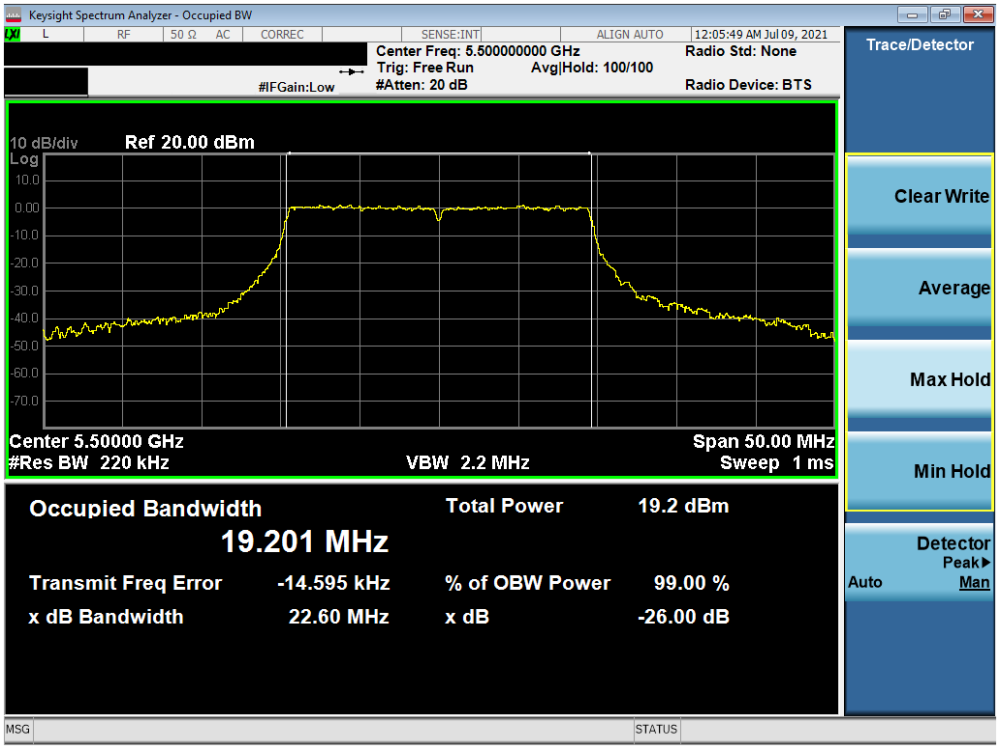
Plot 7-31. 26dB Bandwidth Plot (40MHz BW 802.11ax – 484 Tones (UNII Band 2A) – Ch. 54)



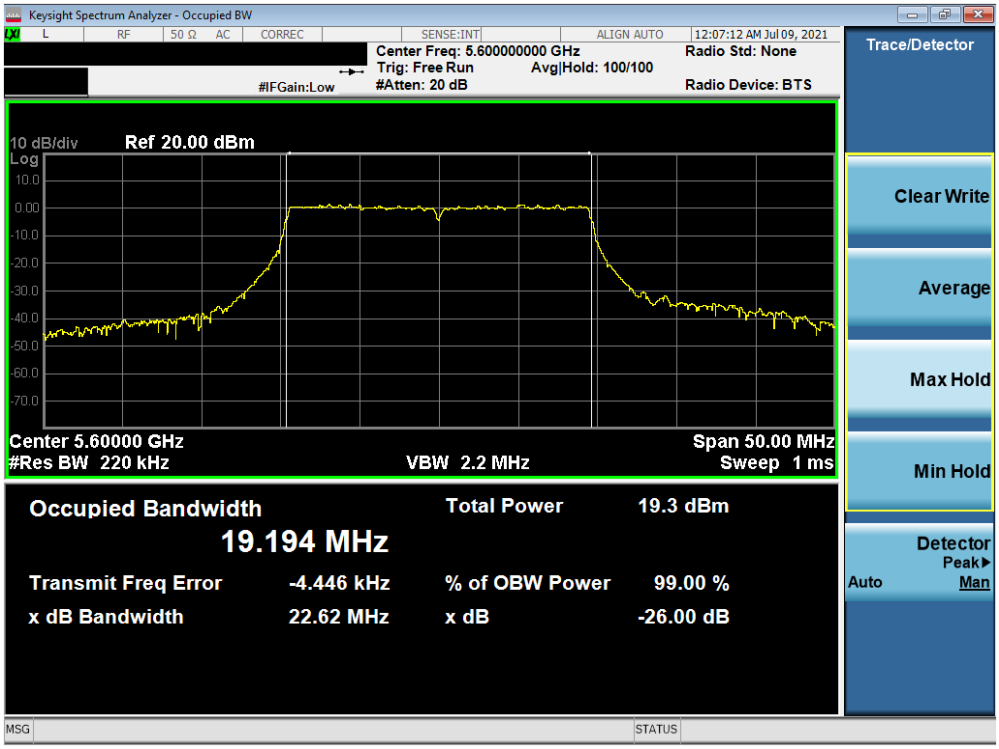
Plot 7-32. 26dB Bandwidth Plot (40MHz BW 802.11ax – 484 Tones (UNII Band 2A) – Ch. 62)



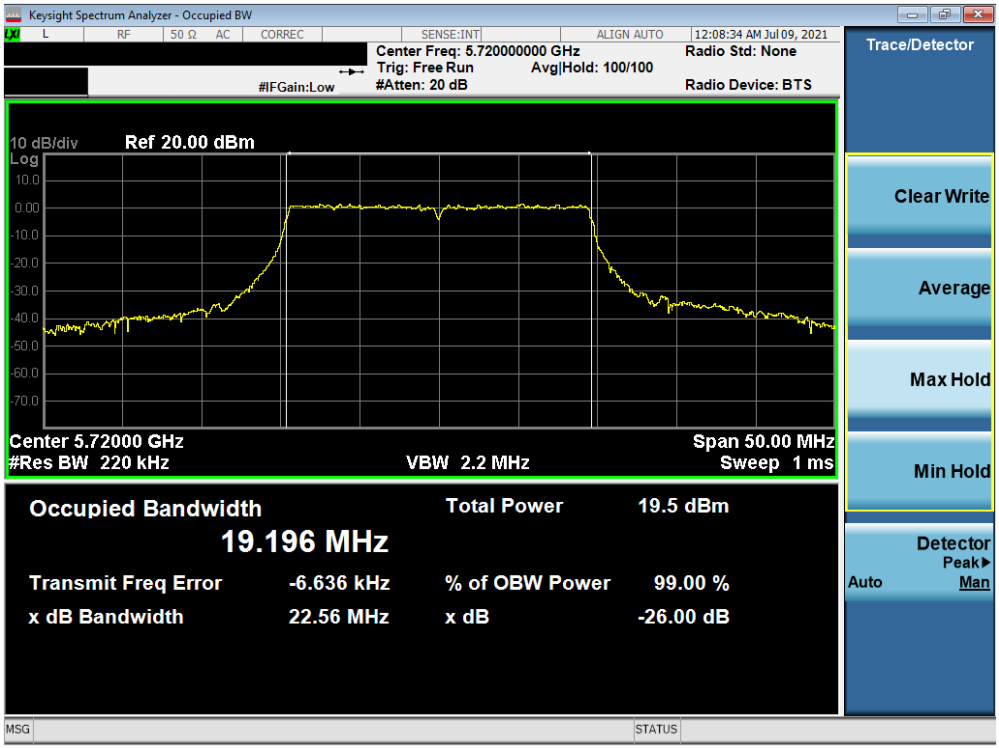
Plot 7-33. 26dB Bandwidth Plot (80MHz BW 802.11ax – 996 Tones (UNII Band 2A) – Ch. 58)



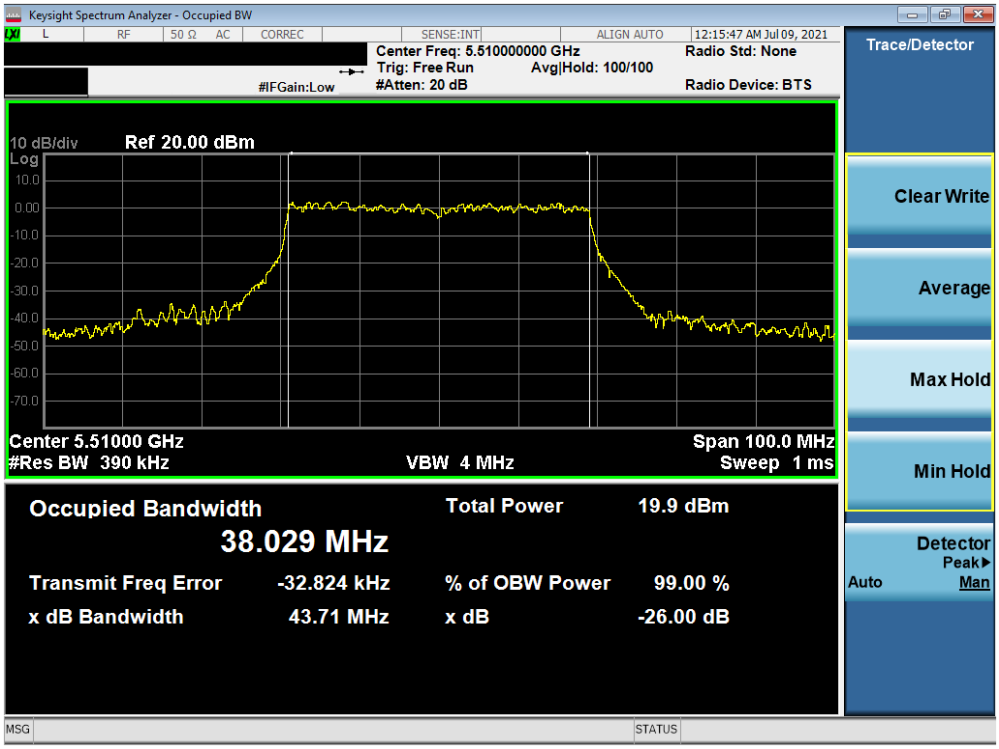
Plot 7-34. 26dB Bandwidth Plot (20MHz BW 802.11ax – 242 Tones (UNII Band 2C) – Ch. 100)



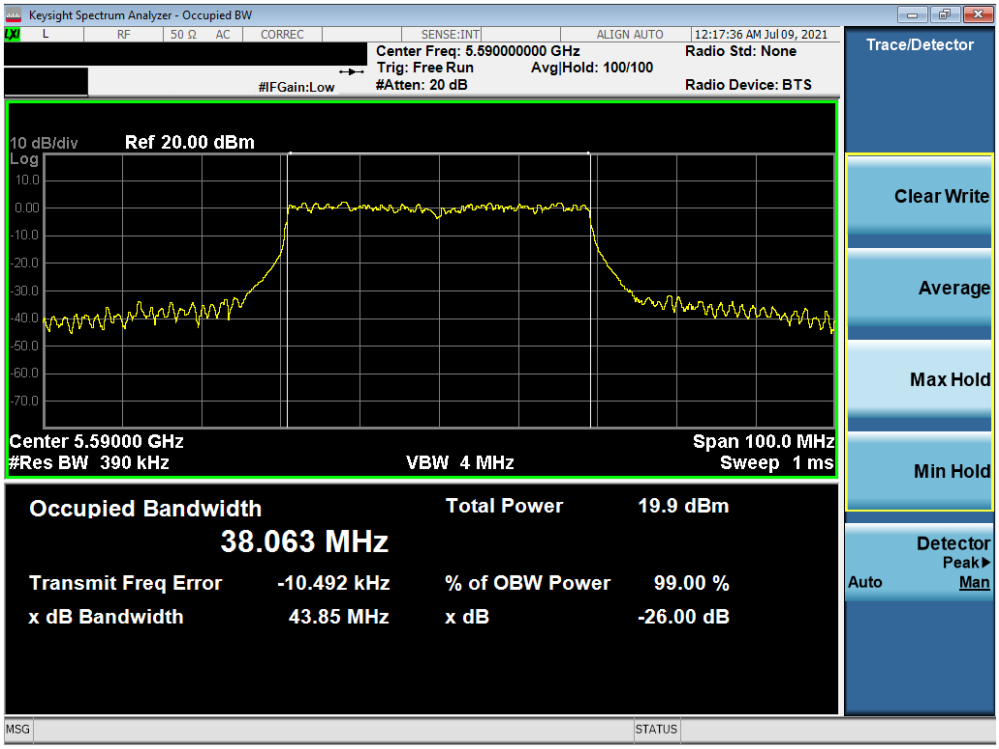
Plot 7-35. 26dB Bandwidth Plot (20MHz BW 802.11ax – 242 Tones (UNII Band 2C) – Ch. 120)



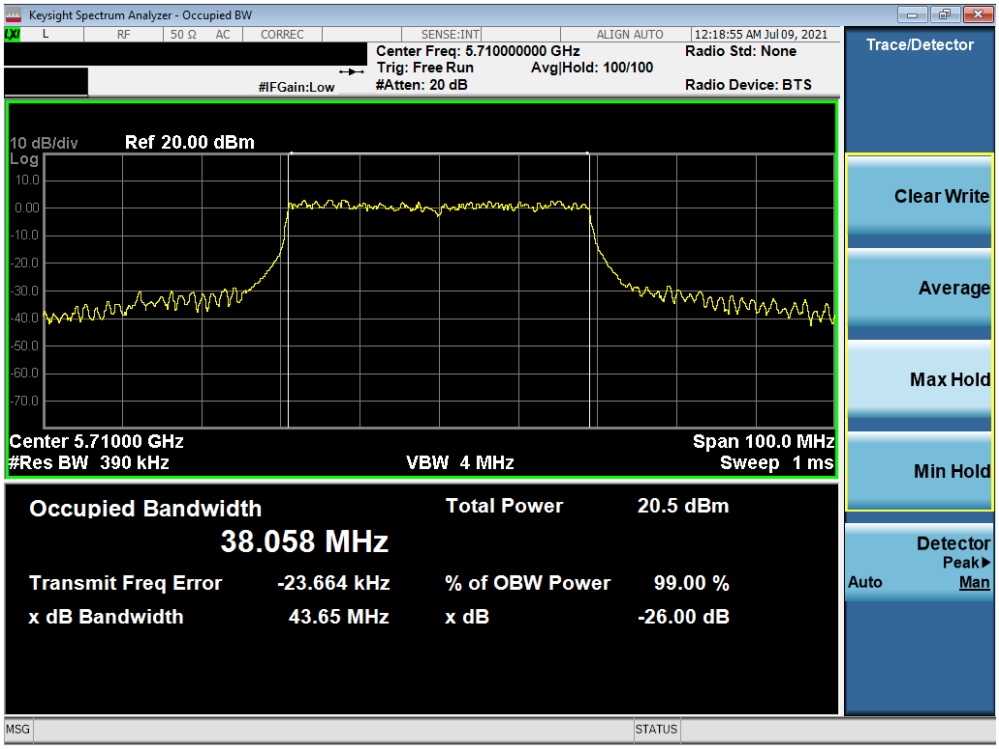
Plot 7-36. 26dB Bandwidth Plot (20MHz BW 802.11ax – 242 Tones (UNII Band 2C) – Ch. 144)



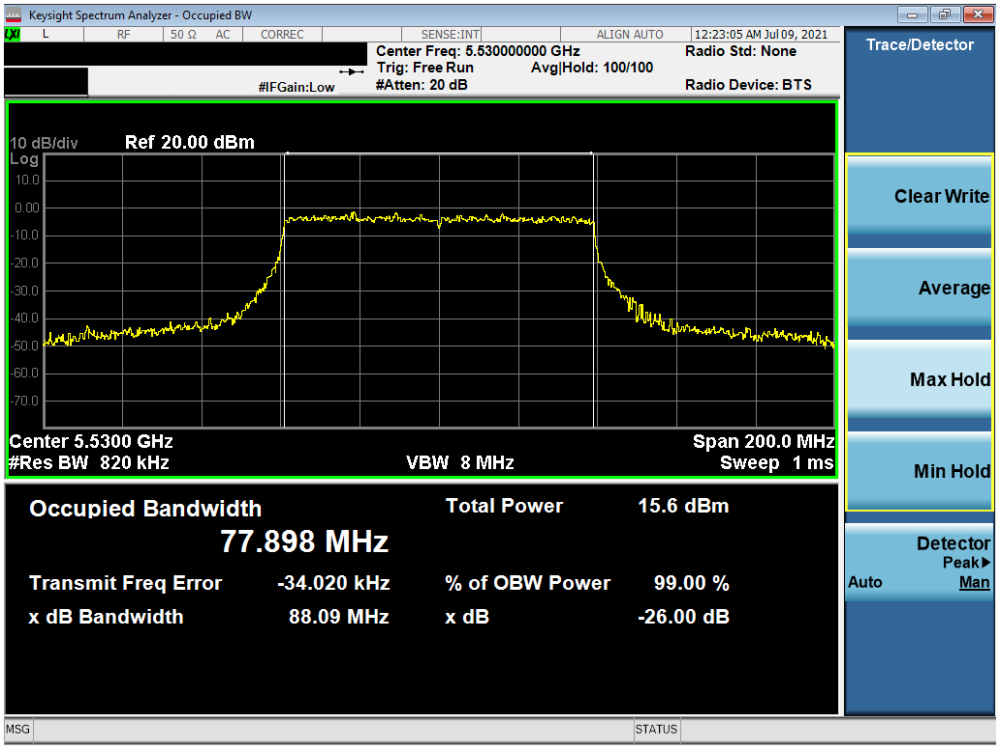
Plot 7-37. 26dB Bandwidth Plot (40MHz BW 802.11ax – 484 Tones (UNII Band 2C) – Ch. 102)



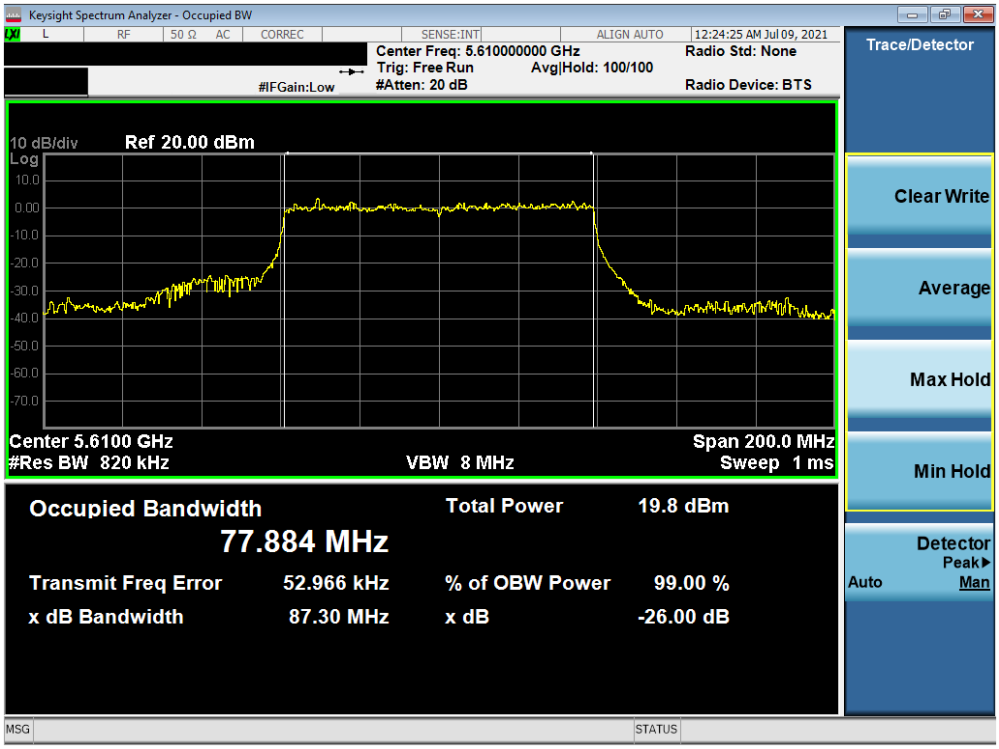
Plot 7-38. 26dB Bandwidth Plot (40MHz BW 802.11ax – 484 Tones (UNII Band 2C) – Ch. 118)



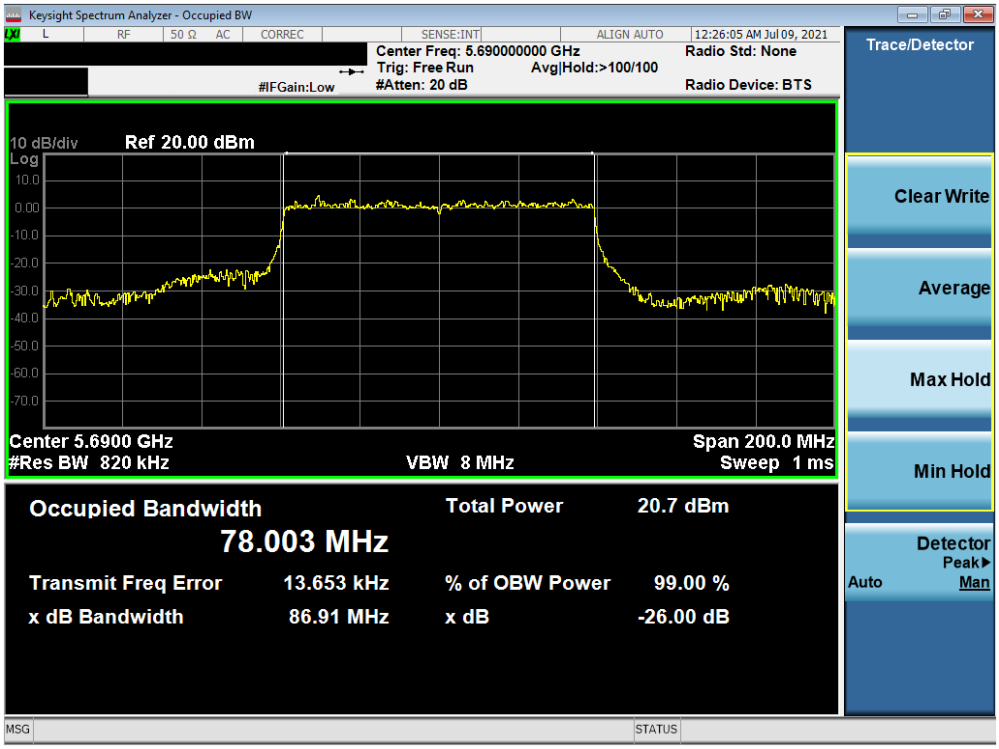
Plot 7-39. 26dB Bandwidth Plot (40MHz BW 802.11ax – 484 Tones (UNII Band 2C) – Ch. 142)



Plot 7-40. 26dB Bandwidth Plot (80MHz BW 802.11ax – 996 Tones (UNII Band 2C) – Ch. 106)



Plot 7-41. 26dB Bandwidth Plot (80MHz BW 802.11ax – 996 Tones (UNII Band 2C) – Ch. 122)



Plot 7-42. 26dB Bandwidth Plot (80MHz BW 802.11ax – 996 Tones (UNII Band 2C) – Ch. 138)

7.3 6dB Bandwidth Measurement – 802.11ax OFDMA

§15.407 (e); RSS-Gen [6.7]

Test Overview and Limit

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating at its maximum duty cycle, at its maximum power control level, as defined in ANSI C63.10-2013 and KDB 789033 D02 v02r01, and at the appropriate frequencies. The spectrum analyzer's bandwidth measurement function is configured to measure the 6dB bandwidth.

In the 5.725 – 5.850GHz band, the 6dB bandwidth must be ≥ 500 kHz.

Test Procedure Used

ANSI C63.10-2013 – Section 6.9.2
KDB 789033 D02 v02r01 – Section C

Test Settings

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

Test Setup

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

Figure 7-2. Test Instrument & Measurement Setup

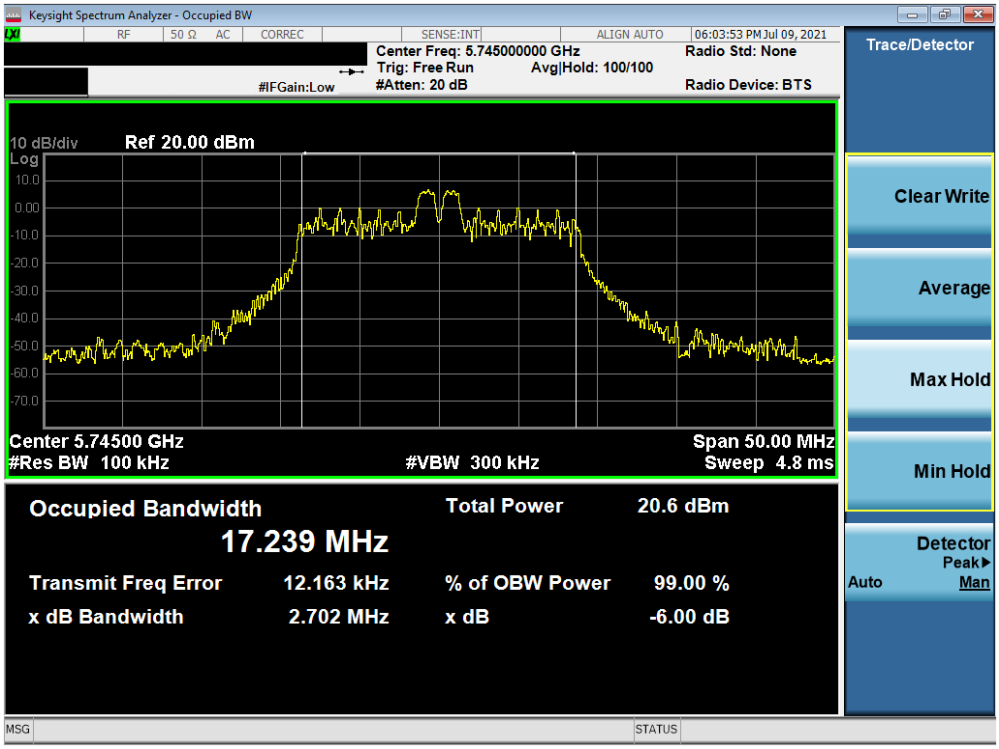
Test Notes

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

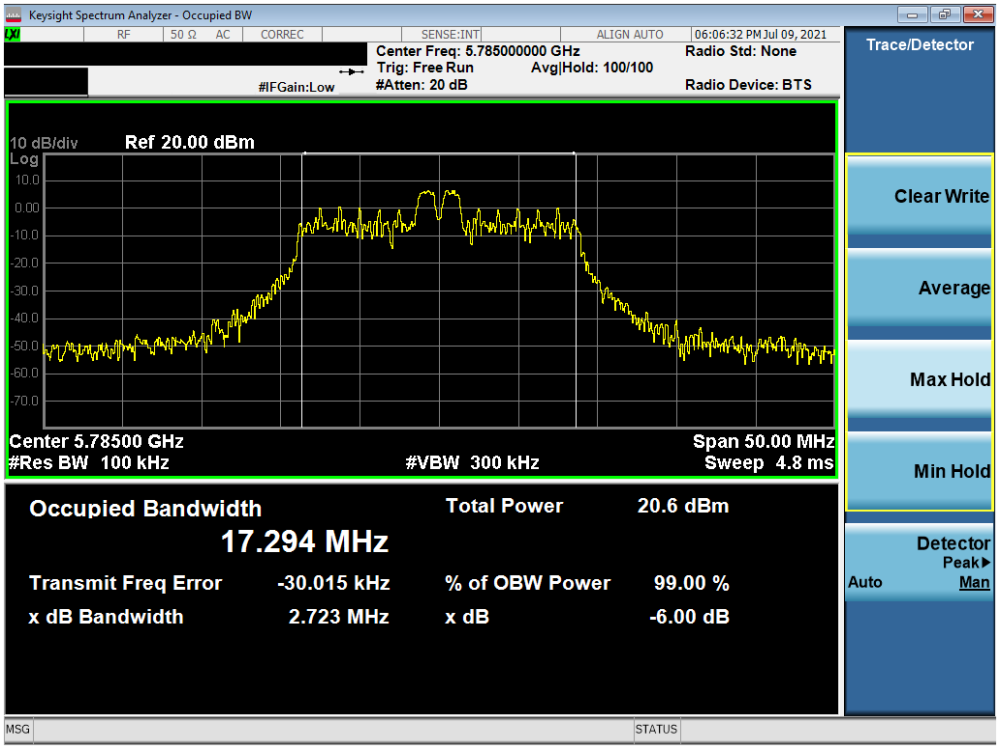
6 dB Bandwidth Measurements (26 Tones)

	Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured 6dB Bandwidth [MHz]
Band 3	5745	149	ax (20MHz)	26T	MCS0	2.70
	5785	157	ax (20MHz)	26T	MCS0	2.72
	5825	165	ax (20MHz)	26T	MCS0	2.12
	5755	151	ax (40MHz)	26T	MCS0	2.16
	5795	159	ax (40MHz)	26T	MCS0	2.19
	5775	155	ax (80MHz)	26T	MCS0	2.95

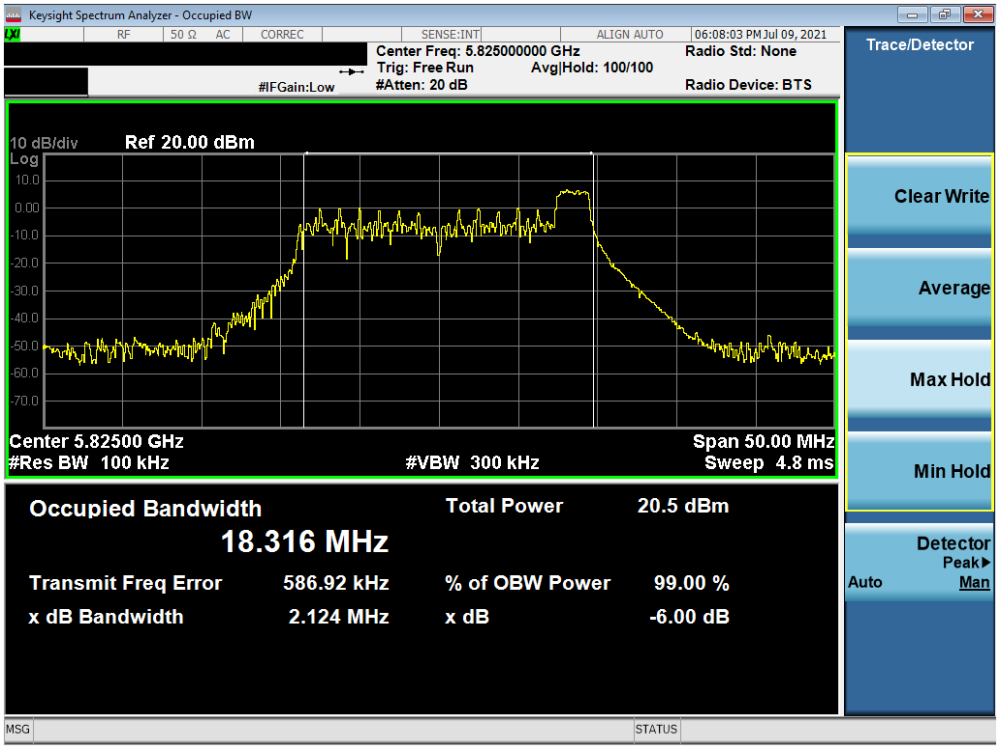
Table 7-4. Conducted Bandwidth Measurements (26 Tones)



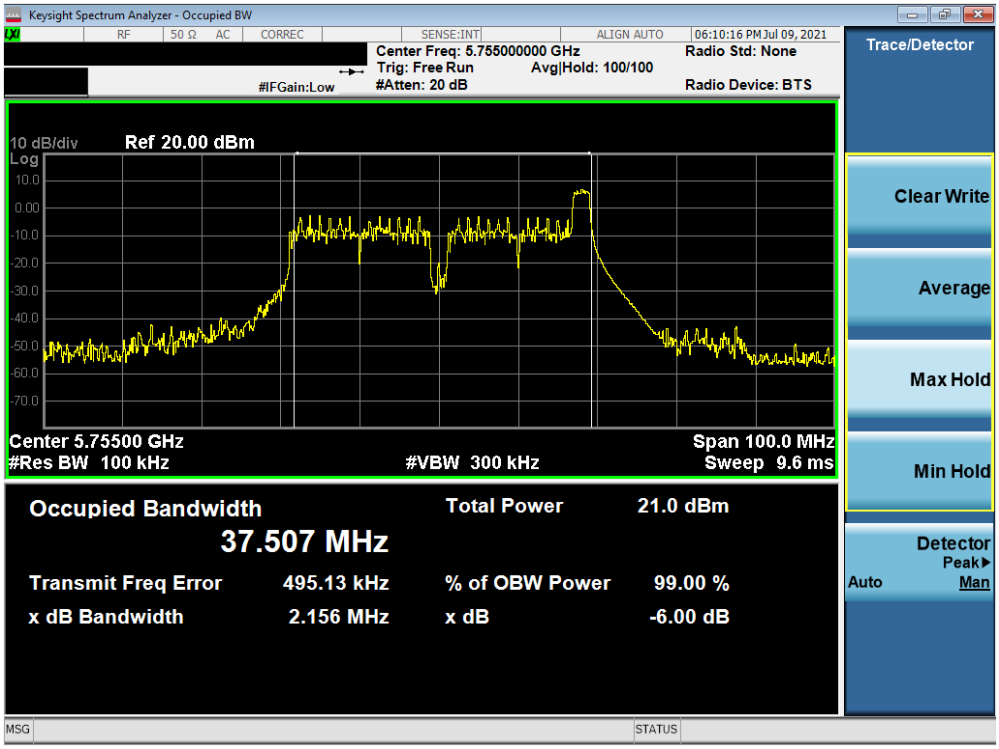
Plot 7-43. 6dB Bandwidth Plot (20MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 149)



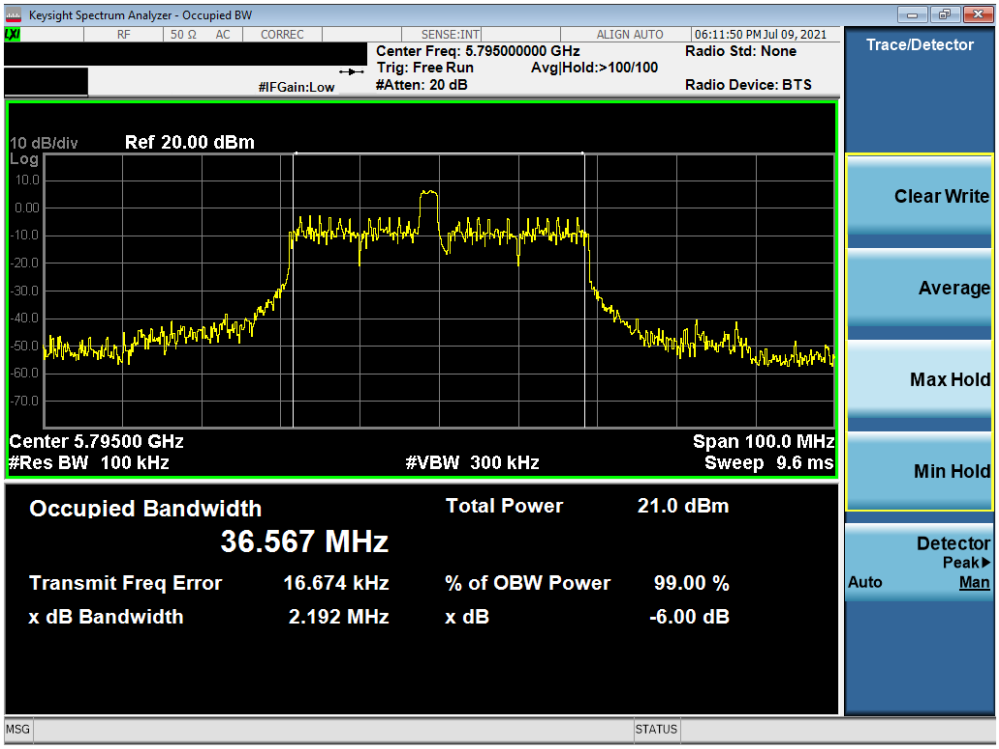
Plot 7-44. 6dB Bandwidth Plot (20MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 157)



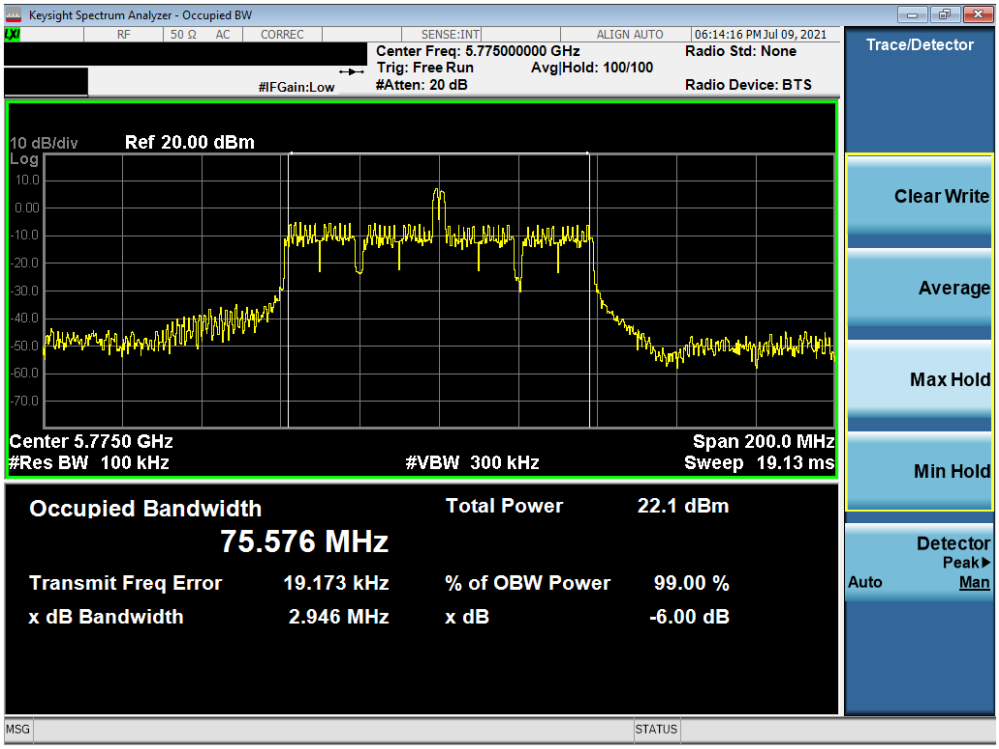
Plot 7-45. 6dB Bandwidth Plot (20MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 165)



Plot 7-46. 6dB Bandwidth Plot (40MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 151)



Plot 7-47. 6dB Bandwidth Plot (40MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 159)

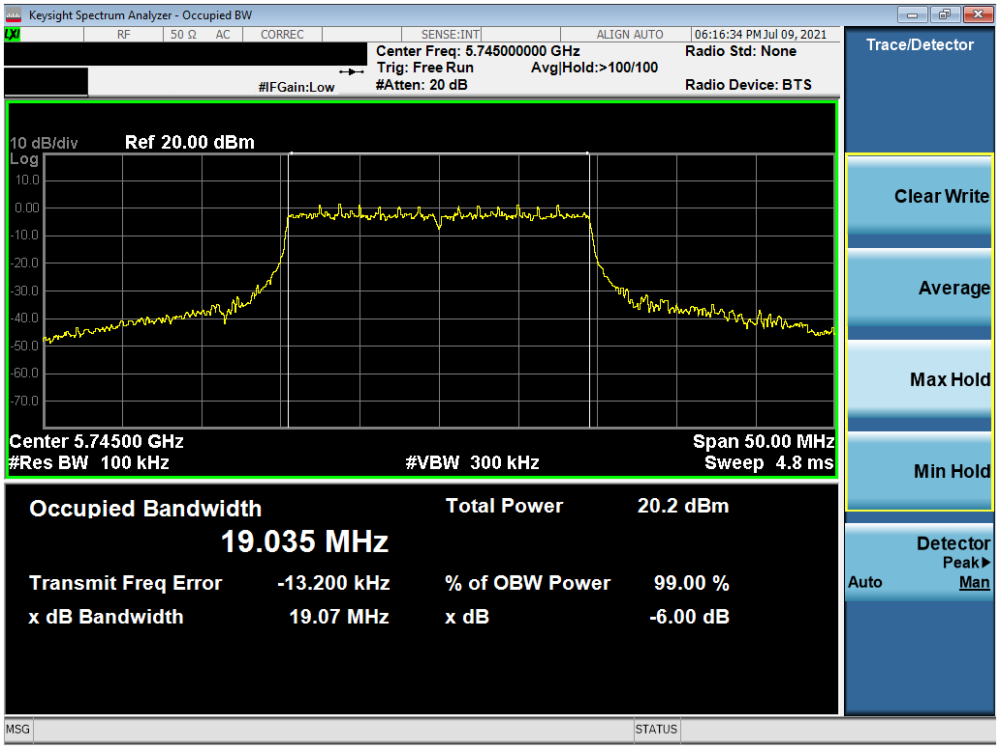


Plot 7-48. 6dB Bandwidth Plot (80MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 155)

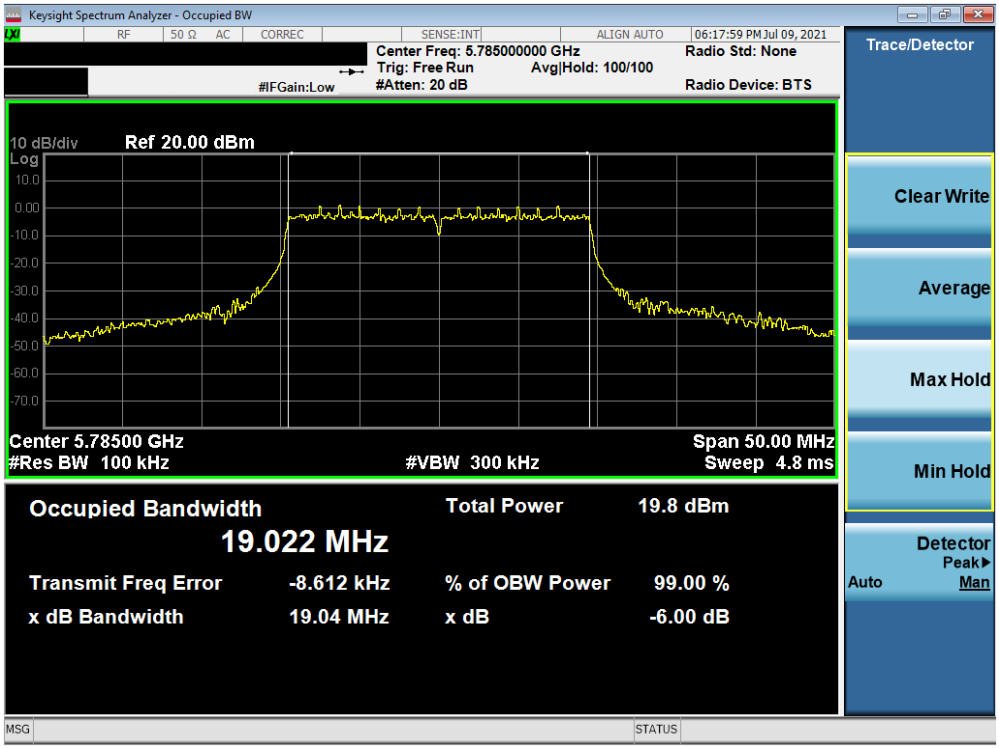
6 dB Bandwidth Measurements (Full Tones)

	Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured 6dB Bandwidth [MHz]
Band 3	5745	149	ax (20MHz)	242T	MCS0	19.07
	5785	157	ax (20MHz)	242T	MCS0	19.04
	5825	165	ax (20MHz)	242T	MCS0	19.06
	5755	151	ax (40MHz)	484T	MCS0	38.24
	5795	159	ax (40MHz)	484T	MCS0	38.24
	5775	155	ax (80MHz)	996T	MCS0	78.31

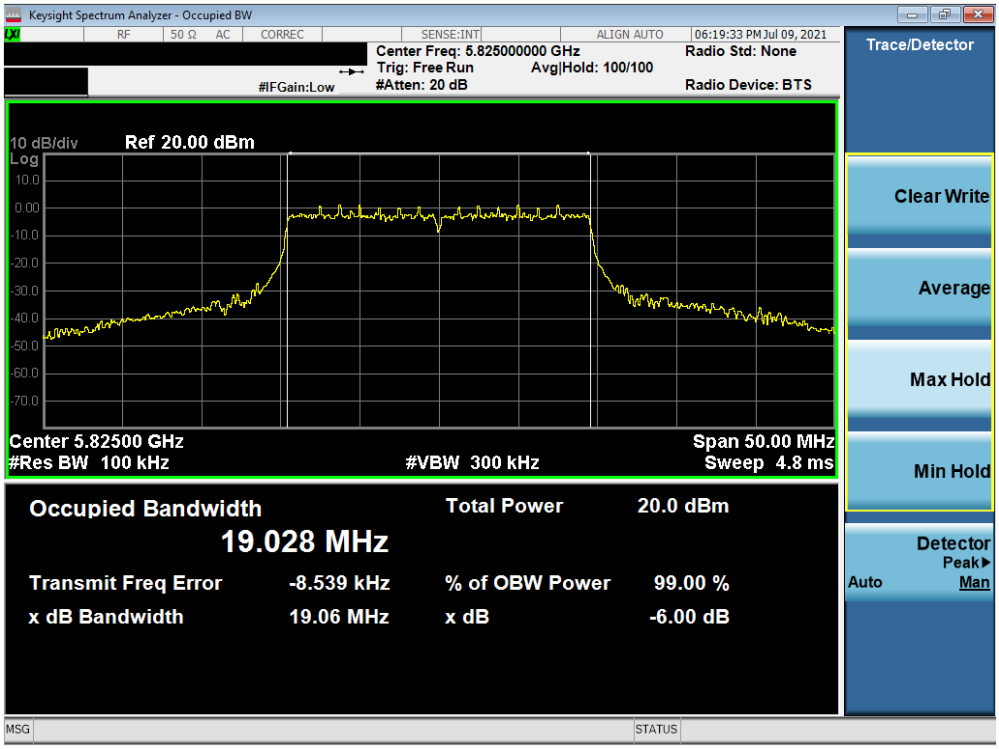
Table 7-5. Conducted Bandwidth Measurements (Full Tones)



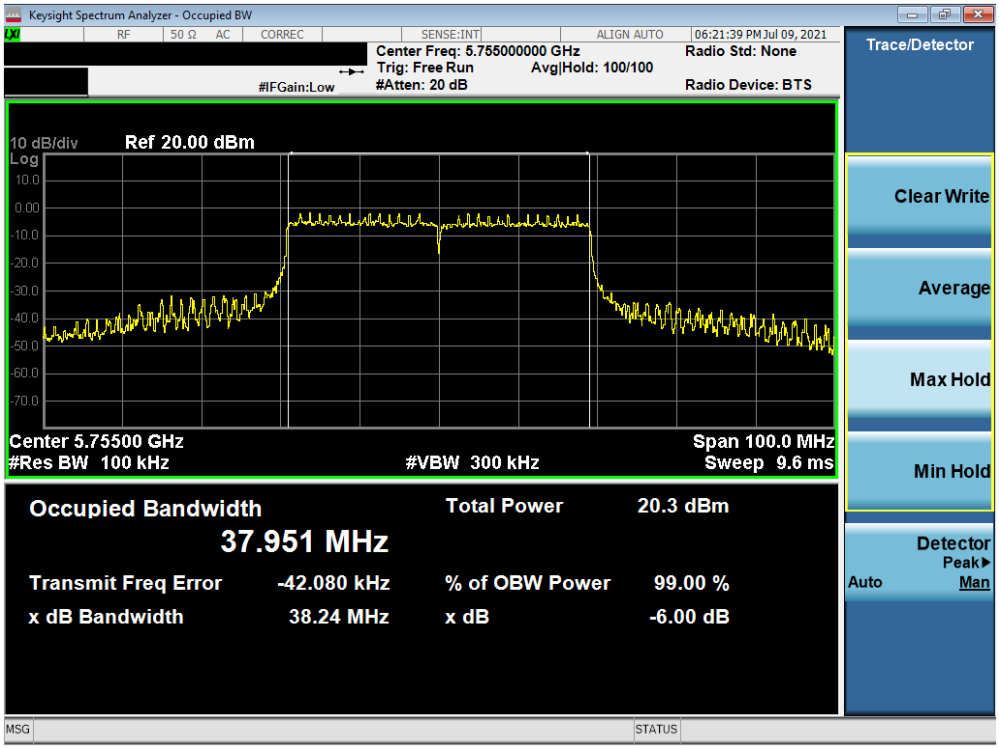
Plot 7-49. 6dB Bandwidth Plot (20MHz BW 802.11ax – 242 Tones (UNII Band 3) – Ch. 149)



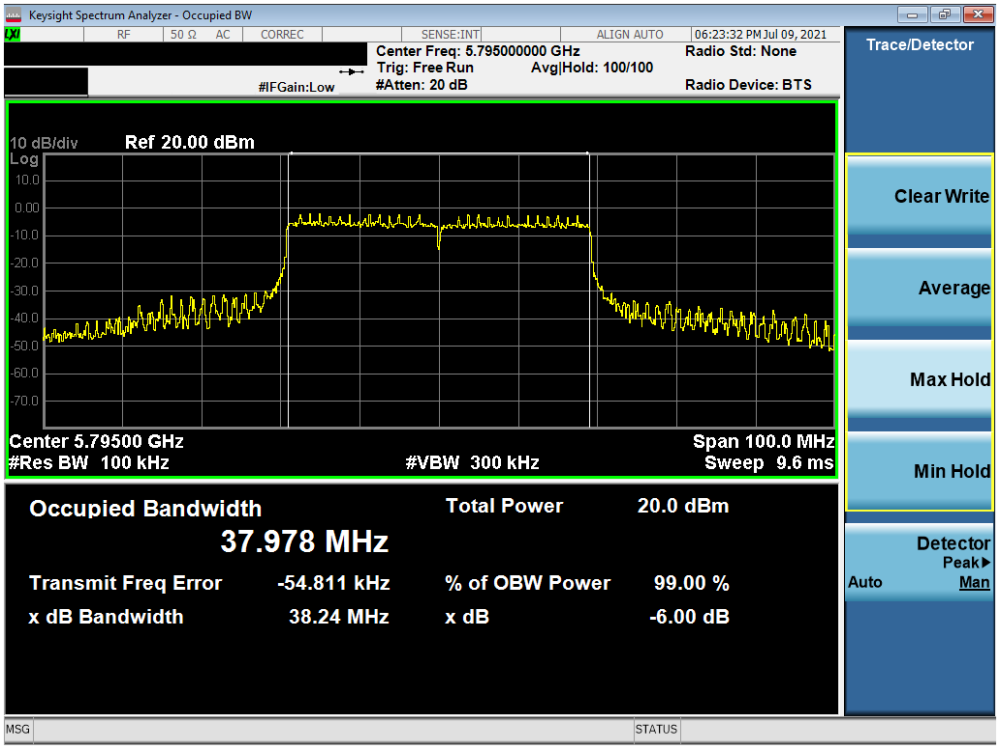
Plot 7-50. 6dB Bandwidth Plot (20MHz BW 802.11ax – 242 Tones (UNII Band 3) – Ch. 157)



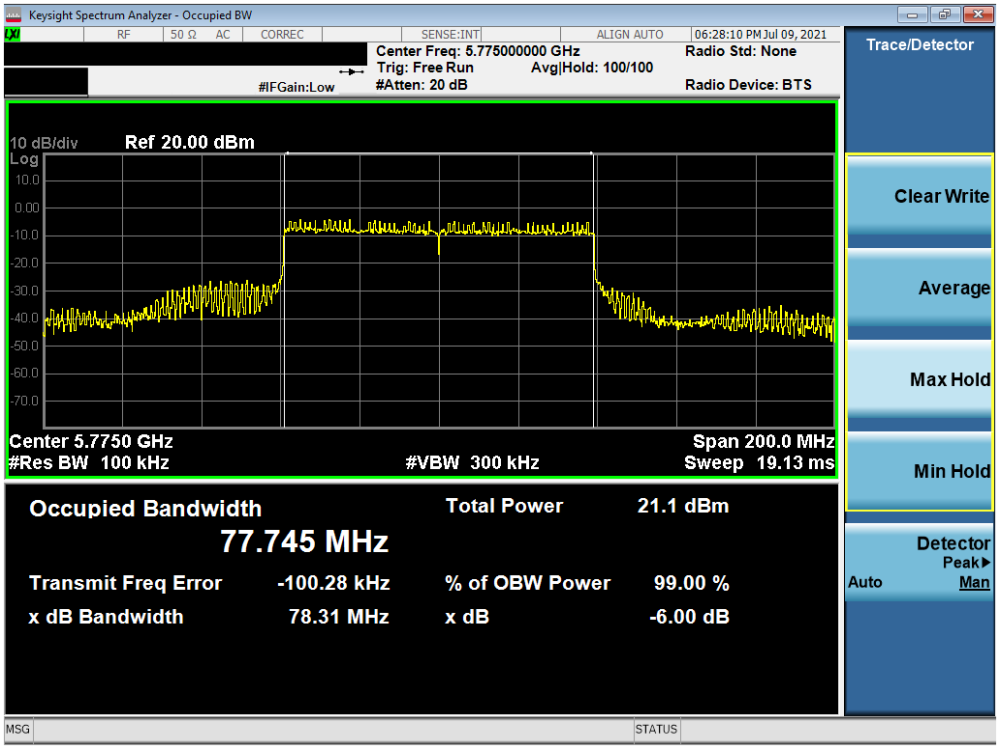
Plot 7-51. 6dB Bandwidth Plot (20MHz BW 802.11ax – 242 Tones (UNII Band 3) – Ch. 165)



Plot 7-52. 6dB Bandwidth Plot (40MHz BW 802.11ax – 484 Tones (UNII Band 3) – Ch. 151)



Plot 7-53. 6dB Bandwidth Plot (40MHz BW 802.11ax – 484 Tones (UNII Band 3) – Ch. 159)



Plot 7-54. 6dB Bandwidth Plot (80MHz BW 802.11ax – 996 Tones (UNII Band 3) – Ch. 155)

7.4 UNII Output Power Measurement – 802.11ax OFDMA

§15.407(a.1.iv) §15.407(a.2) §15.407(a.3); RSS-247 [6.2]

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 KDB 789033 D02 v02r01, and at the appropriate frequencies.

In the 5.15 – 5.25GHz band, the maximum permissible conducted output power is 250mW (23.98dBm). The maximum e.i.r.p. shall not exceed the lesser of 200 mW or 10 + 10 log10B, dBm.

In the 5.25 – 5.35GHz band, the maximum permissible conducted output power is the lesser of 250mW (23.98dBm) or 11 dBm + 10log$_{10}$(26dB BW) = 11 dBm + 10log$_{10}$(18.94) = 23.77dBm. The maximum e.i.r.p. shall not exceed the lesser of 1.0 W or 17 + 10 log10B, dBm.

In the 5.47 – 5.725GHz band, the maximum permissible conducted output power is the lesser of 250mW (23.98dBm) or 11 dBm + 10log$_{10}$(26dB BW) = 11 dBm + 10log$_{10}$(19.33) = 23.86dBm. The maximum e.i.r.p. shall not exceed the lesser of 1.0 W or 17 + 10 log10B, dBm.

In the 5.725 – 5.850GHz band, the maximum permissible conducted output power is 1W (30dBm). The maximum e.i.r.p. is 36 dBm.

Test Procedure Used

ANSI C63.10-2013 – Section 12.3.3.2 Method PM-G
KDB 789033 D02 v02r01 – Section E)3)b) Method PM-G
ANSI C63.10-2013 – Section 14.2 Measure-and-Sum Technique

Test Settings

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

Test Setup

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

Figure 7-3. Test Instrument & Measurement Setup

Conducted Output Power Measurements (26 Tones)

5GHz (20MHz Bandwidth)	Freq [MHz]	Channel	Detector	Tones	RU Index			Conducted Power Limit [dBm]	Conducted Power Margin [dB]
					0	4	8		
	5180	36	AVG	26T	10.99	10.60	10.99	23.98	-12.99
	5200	40	AVG	26T	10.62	10.62	10.99	23.98	-12.99
	5240	48	AVG	26T	7.72	7.75	7.61	23.98	-16.23
	5260	52	AVG	26T	10.80	10.80	10.78	23.47	-12.67
	5280	56	AVG	26T	10.95	10.99	10.90	23.47	-12.48
	5320	64	AVG	26T	10.70	10.79	10.67	23.47	-12.68
	5500	100	AVG	26T	10.86	10.91	10.85	22.80	-11.89
	5600	120	AVG	26T	10.74	10.85	10.74	22.80	-11.95
	5720	144	AVG	26T	10.99	10.99	10.91	22.80	-11.81
	5745	149	AVG	26T	10.69	10.76	10.59	30.00	-19.24
	5785	157	AVG	26T	10.98	10.99	10.83	30.00	-19.01
	5825	165	AVG	26T	10.66	10.72	10.99	30.00	-19.01

Table 7-6. 20MHz BW (UNII) Maximum Conducted Output Power (26 Tones)

5GHz (40MHz Bandwidth)	Freq [MHz]	Channel	Detector	Tones	RU Index			Conducted Power Limit [dBm]	Conducted Power Margin [dB]
					0	8	17		
	5190	38	AVG	26T	10.67	10.89	10.99	23.98	-12.99
	5230	46	AVG	26T	10.95	10.62	10.79	23.98	-13.03
	5270	54	AVG	26T	10.91	10.58	10.72	23.47	-12.56
	5310	62	AVG	26T	10.99	10.58	10.79	23.47	-12.48
	5510	102	AVG	26T	10.89	10.99	10.73	22.80	-11.81
	5590	118	AVG	26T	10.61	10.82	10.99	22.80	-11.81
	5710	142	AVG	26T	10.73	10.96	10.53	22.80	-11.84
	5755	151	AVG	26T	10.60	10.73	10.81	30.00	-19.19
	5795	159	AVG	26T	10.92	10.99	10.52	30.00	-19.01

Table 7-7. 40MHz BW (UNII) Maximum Conducted Output Power (26 Tones)

5GHz (80MHz Bandwidth)	Freq [MHz]	Channel	Detector	Tones	RU Index			Conducted Power Limit [dBm]	Conducted Power Margin [dB]
					0	18	36		
	5210	42	AVG	26T	10.90	10.64	10.66	23.98	-13.08
	5290	58	AVG	26T	10.71	10.68	10.95	23.47	-12.52
	5530	106	AVG	26T	10.99	10.82	10.59	22.80	-11.81
	5610	122	AVG	26T	10.78	10.84	10.99	22.80	-11.81
	5690	138	AVG	26T	10.83	10.56	10.99	22.80	-11.81
	5775	155	AVG	26T	10.81	10.99	10.92	30.00	-19.01

Table 7-8. 80MHz BW (UNII) Maximum Conducted Output Power (26 Tones)

Conducted Output Power Measurements (52 Tones)

5GHz (20MHz Bandwidth)	Freq [MHz]	Channel	Detector	Tones	RU Index			Conducted Power Limit [dBm]	Conducted Power Margin [dB]
					37	39	40		
	5180	36	AVG	52T	11.96	11.72	11.77	23.98	-12.02
	5200	40	AVG	52T	11.95	11.70	11.84	23.98	-12.03
	5240	48	AVG	52T	10.87	10.65	10.79	23.98	-13.11
	5260	52	AVG	52T	11.68	11.92	11.99	23.47	-11.48
	5280	56	AVG	52T	11.87	11.98	11.69	23.47	-11.49
	5320	64	AVG	52T	11.59	11.82	11.97	23.47	-11.50
	5500	100	AVG	52T	11.67	11.91	11.99	22.80	-10.81
	5600	120	AVG	52T	11.98	11.71	11.84	22.80	-10.82
	5720	144	AVG	52T	11.76	11.89	11.60	22.80	-10.91
	5745	149	AVG	52T	11.92	11.60	11.73	30.00	-18.08
	5785	157	AVG	52T	11.85	11.94	11.99	30.00	-18.01
	5825	165	AVG	52T	11.99	11.99	11.72	30.00	-18.01

Table 7-9. 20MHz BW (UNII) Maximum Conducted Output Power (52 Tones)

5GHz (40MHz Bandwidth)	Freq [MHz]	Channel	Detector	Tones	RU Index			Conducted Power Limit [dBm]	Conducted Power Margin [dB]
					37	40	44		
	5190	38	AVG	52T	11.81	11.99	11.99	23.98	-11.99
	5230	46	AVG	52T	11.99	11.74	11.74	23.98	-11.99
	5270	54	AVG	52T	11.97	11.60	11.62	23.47	-11.50
	5310	62	AVG	52T	11.54	11.77	11.83	23.47	-11.64
	5510	102	AVG	52T	11.83	11.54	11.64	22.80	-10.97
	5590	118	AVG	52T	11.70	11.89	11.96	22.80	-10.84
	5710	142	AVG	52T	11.81	11.99	11.99	22.80	-10.81
	5755	151	AVG	52T	11.68	11.83	11.71	30.00	-18.17
	5795	159	AVG	52T	11.99	11.67	11.56	30.00	-18.01

Table 7-10. 40MHz BW (UNII) Maximum Conducted Output Power (52 Tones)

5GHz (80MHz Bandwidth)	Freq [MHz]	Channel	Detector	Tones	RU Index			Conducted Power Limit [dBm]	Conducted Power Margin [dB]
					37	44	52		
	5210	42	AVG	52T	11.84	11.99	11.65	23.98	-11.99
	5290	58	AVG	52T	11.56	11.93	11.78	23.47	-11.54
	5530	106	AVG	52T	11.69	11.87	11.71	22.80	-10.93
	5610	122	AVG	52T	11.81	11.69	11.88	22.80	-10.92
	5690	138	AVG	52T	11.86	11.54	11.88	22.80	-10.92
	5775	155	AVG	52T	11.89	11.99	11.84	30.00	-18.01

Table 7-11. 80MHz BW (UNII) Maximum Conducted Output Power (52 Tones)

Conducted Output Power Measurements (106 Tones)

	Freq [MHz]	Channel	Detector	Tones	RU Index		Conducted Power Limit [dBm]	Conducted Power Margin [dB]
					53	54		
5GHz (20MHz Bandwidth)	5180	36	AVG	106T	11.97	11.93	23.98	-12.01
	5200	40	AVG	106T	11.99	11.96	23.98	-11.99
	5240	48	AVG	106T	11.97	11.82	23.98	-12.01
	5260	52	AVG	106T	11.70	11.61	23.47	-11.77
	5280	56	AVG	106T	11.87	11.69	23.47	-11.60
	5320	64	AVG	106T	11.66	11.99	23.47	-11.48
	5500	100	AVG	106T	11.61	11.60	22.80	-11.19
	5600	120	AVG	106T	11.99	11.97	22.80	-10.81
	5720	144	AVG	106T	11.87	11.68	22.80	-10.93
	5745	149	AVG	106T	11.99	11.94	30.00	-18.01
	5785	157	AVG	106T	11.94	11.77	30.00	-18.06
	5825	165	AVG	106T	11.99	11.89	30.00	-18.01

Table 7-12. 20MHz BW (UNII) Maximum Conducted Output Power (106 Tones)

	Freq [MHz]	Channel	Detector	Tones	RU Index			Conducted Power Limit [dBm]	Conducted Power Margin [dB]
					53	54	56		
5GHz (40MHz Bandwidth)	5190	38	AVG	106T	11.85	11.61	11.99	23.98	-11.99
	5230	46	AVG	106T	11.99	11.89	11.81	23.98	-11.99
	5270	54	AVG	106T	11.94	11.73	11.58	23.47	-11.53
	5310	62	AVG	106T	11.52	11.88	11.76	23.47	-11.59
	5510	102	AVG	106T	11.95	11.76	11.63	22.80	-10.85
	5590	118	AVG	106T	11.67	11.97	11.91	22.80	-10.83
	5710	142	AVG	106T	11.80	11.58	11.98	22.80	-10.82
	5755	151	AVG	106T	11.66	11.93	11.73	30.00	-18.07
	5795	159	AVG	106T	11.54	11.85	11.58	30.00	-18.15

Table 7-13. 40MHz BW (UNII) Maximum Conducted Output Power (106 Tones)

	Freq [MHz]	Channel	Detector	Tones	RU Index			Conducted Power Limit [dBm]	Conducted Power Margin [dB]
					53	56	60		
5GHz (80MHz Bandwidth)	5210	42	AVG	106T	11.87	11.98	11.99	23.98	-11.99
	5290	58	AVG	106T	11.67	11.99	11.77	23.47	-11.48
	5530	106	AVG	106T	11.64	11.62	11.64	22.80	-11.16
	5610	122	AVG	106T	11.83	11.80	11.81	22.80	-10.97
	5690	138	AVG	106T	11.80	11.62	11.83	22.80	-10.97
	5775	155	AVG	106T	11.89	11.63	11.86	30.00	-18.11

Table 7-14. 80MHz BW (UNII) Maximum Conducted Output Power (106 Tones)

Conducted Output Power Measurements (242 Tones)

	Freq [MHz]	Channel	Detector	Tones	RU Index	Conducted Power Limit [dBm]	Conducted Power Margin [dB]
					61		
5GHz (20MHz Bandwidth)	5180	36	AVG	242T	11.87	23.98	-12.11
	5200	40	AVG	242T	11.84	23.98	-12.14
	5240	48	AVG	242T	11.90	23.98	-12.08
	5260	52	AVG	242T	11.60	23.47	-11.87
	5280	56	AVG	242T	11.72	23.47	-11.75
	5320	64	AVG	242T	11.99	23.47	-11.48
	5500	100	AVG	242T	11.59	22.80	-11.21
	5600	120	AVG	242T	11.97	22.80	-10.83
	5720	144	AVG	242T	11.71	22.80	-11.09
	5745	149	AVG	242T	11.87	30.00	-18.13
	5785	157	AVG	242T	11.74	30.00	-18.26
	5825	165	AVG	242T	11.92	30.00	-18.08

Table 7-15. 20MHz BW (UNII) Maximum Conducted Output Power (242 Tones)

	Freq [MHz]	Channel	Detector	Tones	RU Index		Conducted Power Limit [dBm]	Conducted Power Margin [dB]
					61	62		
5GHz (40MHz Bandwidth)	5190	38	AVG	242T	11.60	11.98	23.98	-12.00
	5230	46	AVG	242T	11.95	11.66	23.98	-12.03
	5270	54	AVG	242T	11.76	11.53	23.47	-11.71
	5310	62	AVG	242T	11.94	11.70	23.47	-11.53
	5510	102	AVG	242T	11.73	11.53	22.80	-11.07
	5590	118	AVG	242T	11.99	11.90	22.80	-10.81
	5710	142	AVG	242T	11.63	11.94	22.80	-10.86
	5755	151	AVG	242T	11.99	11.69	30.00	-18.01
	5795	159	AVG	242T	11.92	11.55	30.00	-18.08

Table 7-16. 40MHz BW (UNII) Maximum Conducted Output Power (242 Tones)

	Freq [MHz]	Channel	Detector	Tones	RU Index			Conducted Power Limit [dBm]	Conducted Power Margin [dB]
					61	62	64		
5GHz (80MHz Bandwidth)	5210	42	AVG	242T	11.90	11.99	11.95	23.98	-11.99
	5290	58	AVG	242T	11.81	11.98	11.71	23.47	-11.49
	5530	106	AVG	242T	11.61	11.89	11.67	22.80	-10.91
	5610	122	AVG	242T	11.80	11.73	11.79	22.80	-11.00
	5690	138	AVG	242T	11.77	11.56	11.90	22.80	-10.90
	5775	155	AVG	242T	11.88	11.67	11.90	30.00	-18.10

Table 7-17. 80MHz BW (UNII) Maximum Conducted Output Power (242 Tones)

Conducted Output Power Measurements (484 Tones)

5GHz (40MHz Bandwidth)	Freq [MHz]	Channel	Detector	Tones	RU Index	Conducted Power Limit [dBm]	Conducted Power Margin [dB]
					65		
	5190	38	AVG	484T	10.55	23.98	-13.43
	5230	46	AVG	484T	11.82	23.98	-12.16
	5270	54	AVG	484T	11.62	23.47	-11.85
	5310	62	AVG	484T	10.14	23.47	-13.33
	5510	102	AVG	484T	11.58	22.80	-11.22
	5590	118	AVG	484T	11.82	22.80	-10.98
	5710	142	AVG	484T	11.99	22.80	-10.81
	5755	151	AVG	484T	11.83	30.00	-18.17
	5795	159	AVG	484T	11.68	30.00	-18.32

Table 7-18. 40MHz BW (UNII) Maximum Conducted Output Power (484 Tones)

5GHz (80MHz Bandwidth)	Freq [MHz]	Channel	Detector	Tones	RU Index		Conducted Power Limit [dBm]	Conducted Power Margin [dB]
					65	66		
	5210	42	AVG	484T	11.89	11.81	23.98	-12.09
	5290	58	AVG	484T	11.82	11.95	23.47	-11.52
	5530	106	AVG	484T	11.96	11.73	22.80	-10.84
	5610	122	AVG	484T	11.70	11.73	22.80	-11.07
	5690	138	AVG	484T	11.57	11.91	22.80	-10.89
	5775	155	AVG	484T	11.65	11.90	30.00	-18.10

Table 7-19. 80MHz BW (UNII) Maximum Conducted Output Power (484 Tones)

Conducted Output Power Measurements (996 Tones)

5GHz (80MHz Bandwidth)	Freq [MHz]	Channel	Detector	Tones	RU Index	Conducted Power Limit [dBm]	Conducted Power Margin [dB]
					67		
	5210	42	AVG	996T	8.23	23.98	-15.75
	5290	58	AVG	996T	8.11	23.47	-15.36
	5530	106	AVG	996T	8.87	22.80	-13.93
	5610	122	AVG	996T	11.70	22.80	-11.10
	5690	138	AVG	996T	11.96	22.80	-10.84
	5775	155	AVG	996T	11.97	30.00	-18.03

Table 7-20. 80MHz BW (UNII) Maximum Conducted Output Power (996 Tones)

7.5 Maximum Power Spectral Density – 802.11ax OFDMA

§15.407(a.1.iv) §15.407(a.2) §15.407(a.3); RSS-247 [6.2]

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 KDB 789033 D02 v02r01, and at the appropriate frequencies. Method SA-1, as defined in ANSI C63.10-2013 and KDB 789033 D02 v02r01, was used to measure the power spectral density.

In the 5.15 – 5.25GHz, 5.25 – 5.35GHz, 5.47 – 5.725GHz bands, the maximum permissible power spectral density is 11dBm/MHz.

In the 5.725 – 5.850GHz band, the maximum permissible power spectral density is 30dBm/500kHz.

Test Procedure Used

ANSI C63.10-2013 – Section 12.3.2.2
KDB 789033 D02 v02r01 – Section F
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 7-4. Test Instrument & Measurement Setup

Test Notes

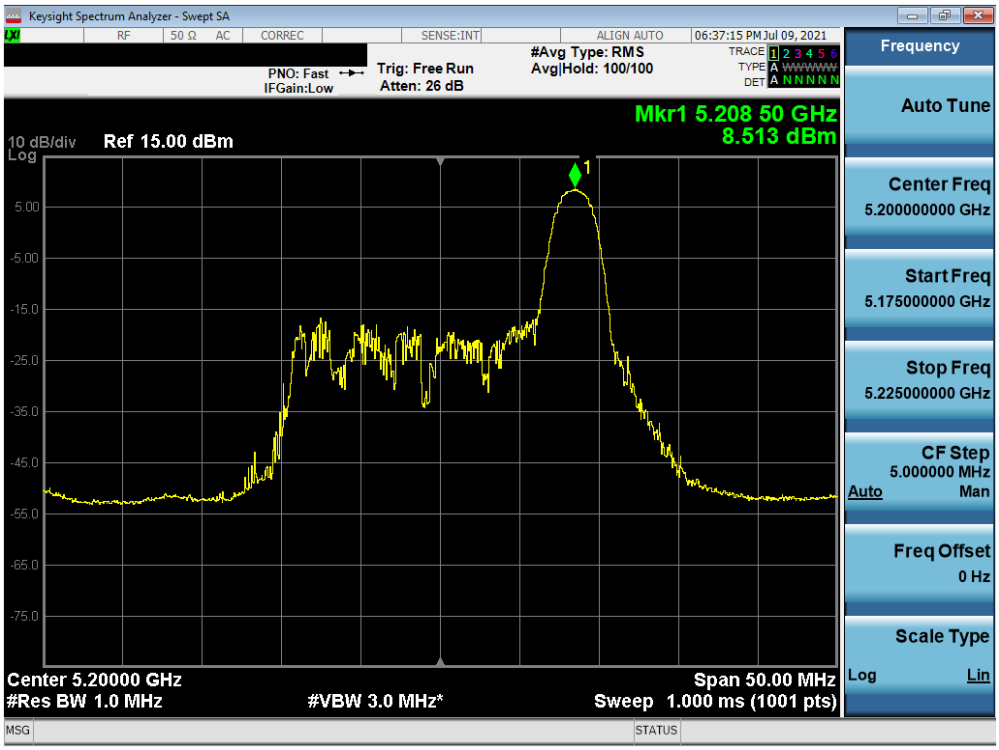
The power spectral density for each channel was measured with the RU index showing the highest conducted power

Power Spectral Density Measurements (26 Tones)

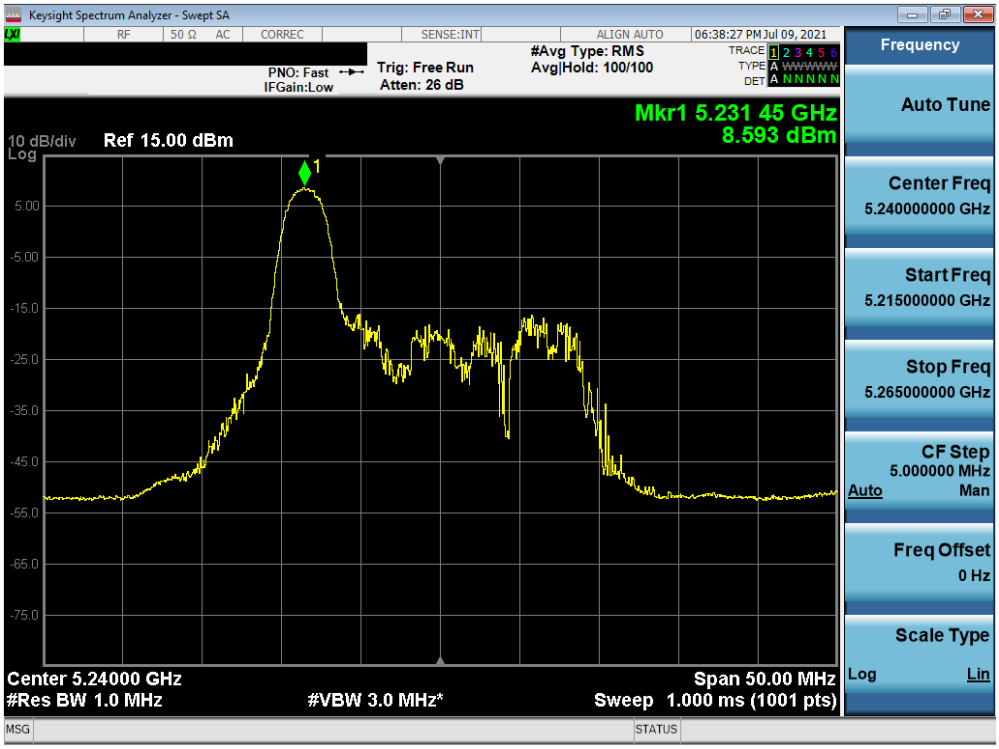
	Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured Power Density [dBm]	Max Power Density [dBm/MHz]	Margin [dB]
Band 1	5180	36	ax (20MHz)	26T	MCS0	8.40	11.0	-2.61
	5200	40	ax (20MHz)	26T	MCS0	8.51	11.0	-2.49
	5240	48	ax (20MHz)	26T	MCS0	8.59	11.0	-2.41
	5190	38	ax (40MHz)	26T	MCS0	8.38	11.0	-2.62
	5230	46	ax (40MHz)	26T	MCS0	8.54	11.0	-2.46
	5210	42	ax (80MHz)	26T	MCS0	8.52	11.0	-2.48
Band 2A	5260	52	ax (20MHz)	26T	MCS0	7.69	11.0	-3.31
	5280	56	ax (20MHz)	26T	MCS0	7.75	11.0	-3.25
	5320	64	ax (20MHz)	26T	MCS0	7.32	11.0	-3.68
	5270	54	ax (40MHz)	26T	MCS0	8.71	11.0	-2.29
	5310	62	ax (40MHz)	26T	MCS0	8.60	11.0	-2.40
	5290	58	ax (80MHz)	26T	MCS0	7.91	11.0	-3.09
Band 2C	5500	100	ax (20MHz)	26T	MCS0	7.71	11.0	-3.29
	5600	120	ax (20MHz)	26T	MCS0	7.20	11.0	-3.80
	5720	144	ax (20MHz)	26T	MCS0	8.19	11.0	-2.81
	5510	102	ax (40MHz)	26T	MCS0	8.38	11.0	-2.62
	5590	118	ax (40MHz)	26T	MCS0	8.17	11.0	-2.83
	5710	142	ax (40MHz)	26T	MCS0	8.66	11.0	-2.34
	5530	106	ax (80MHz)	26T	MCS0	8.19	11.0	-2.81
	5610	122	ax (80MHz)	26T	MCS0	8.42	11.0	-2.59
	5690	138	ax (80MHz)	26T	MCS0	8.96	11.0	-2.04

Table 7-21. Bands 1, 2A, 2C Conducted Power Spectral Density Measurements (26 Tones)

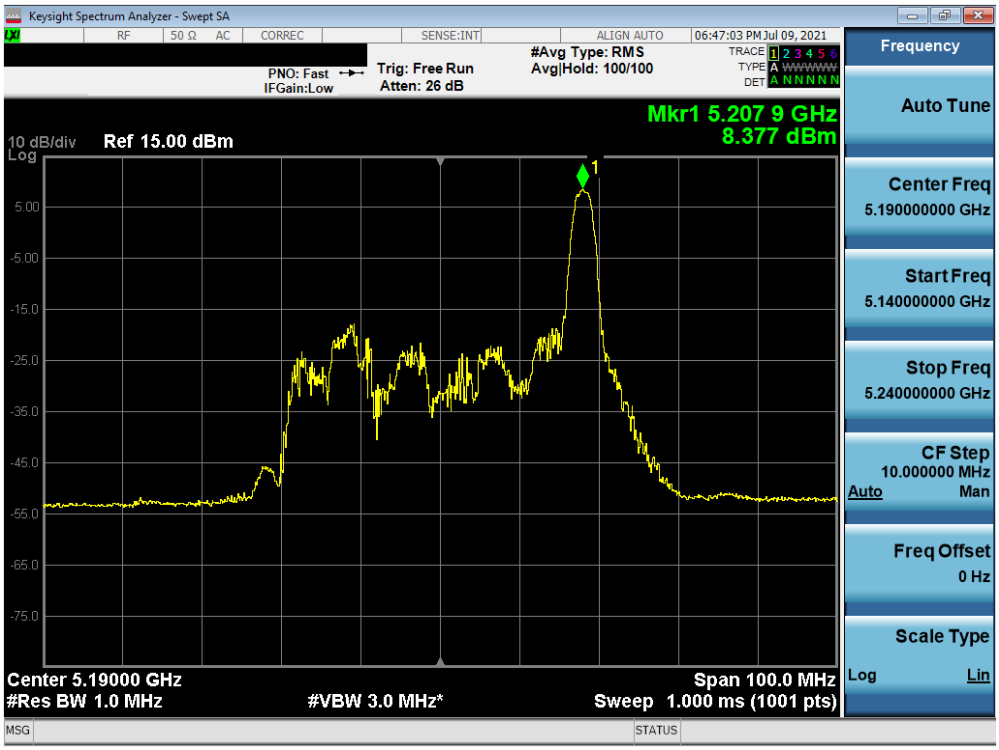
Plot 7-55. Power Spectral Density Plot (20MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 36)



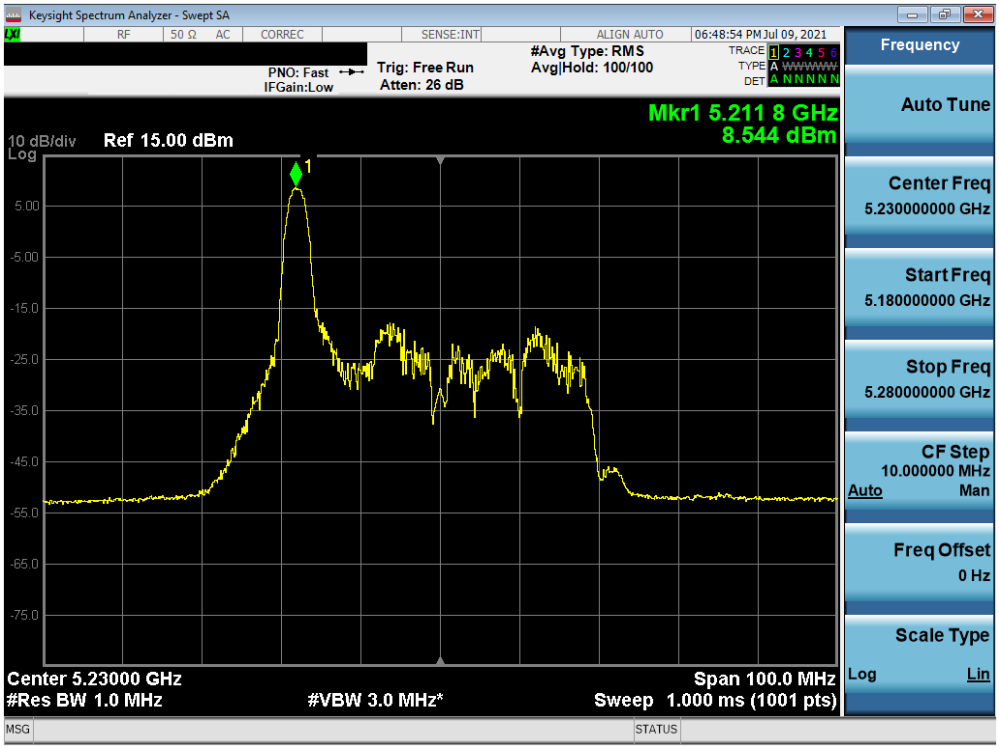
Plot 7-56. Power Spectral Density Plot (20MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 40)



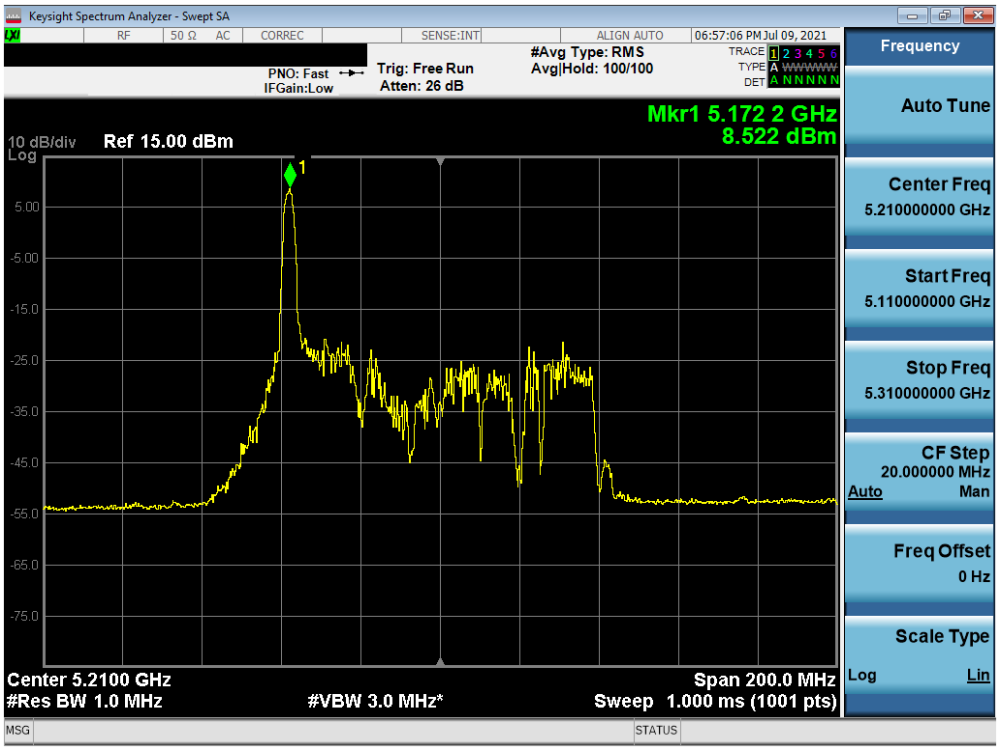
Plot 7-57. Power Spectral Density Plot (20MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 48)



Plot 7-58. Power Spectral Density Plot (40MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 38)

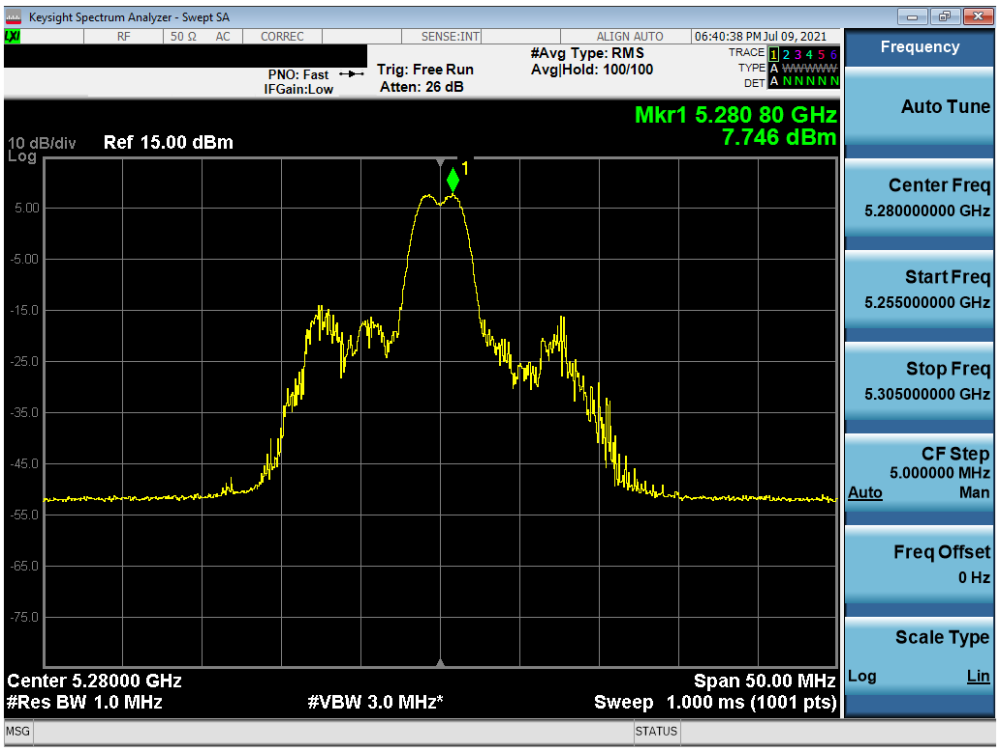


Plot 7-59. Power Spectral Density Plot (40MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 46)

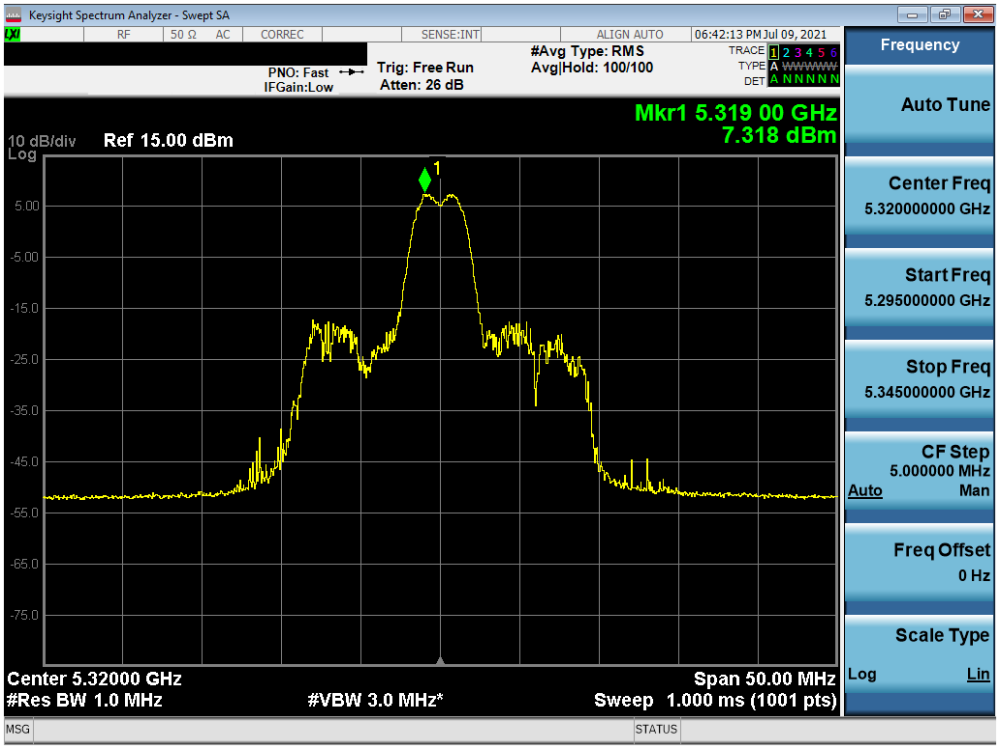


Plot 7-60. Power Spectral Density Plot (80MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 42)

Plot 7-61. Power Spectral Density Plot (20MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 52)

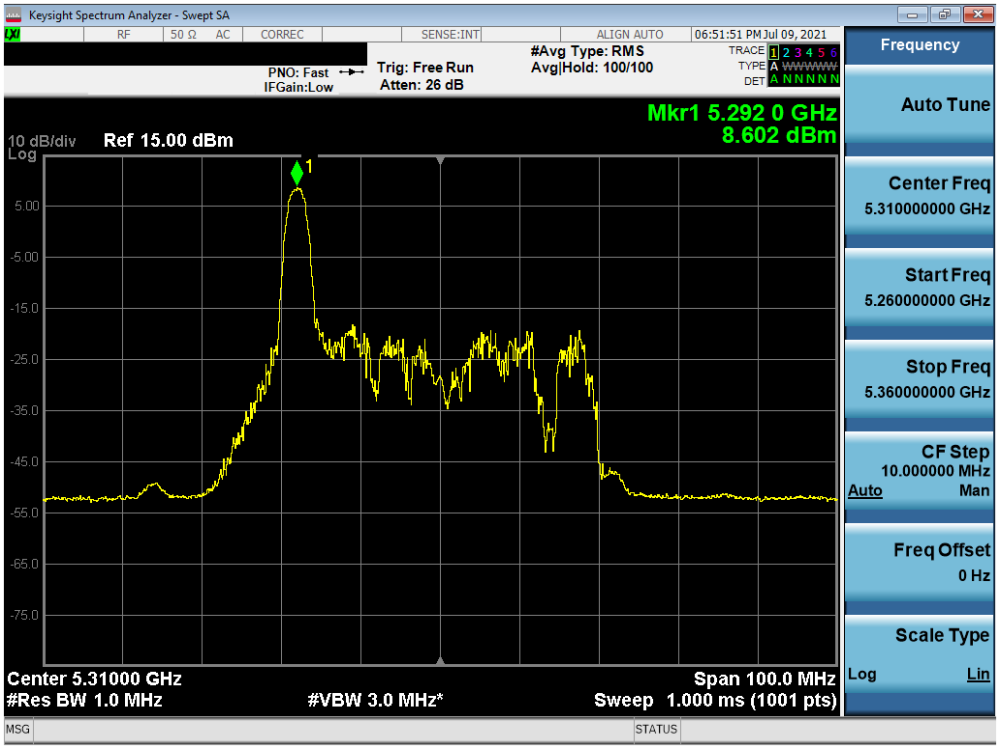


Plot 7-62. Power Spectral Density Plot (20MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 56)

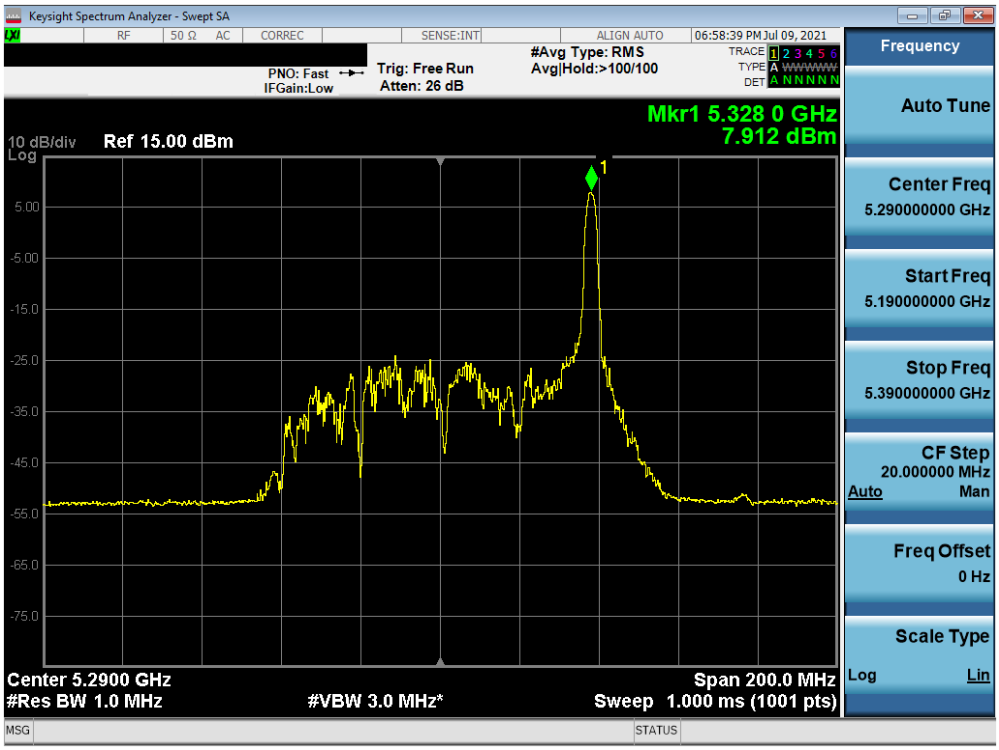


Plot 7-63. Power Spectral Density Plot (20MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 64)

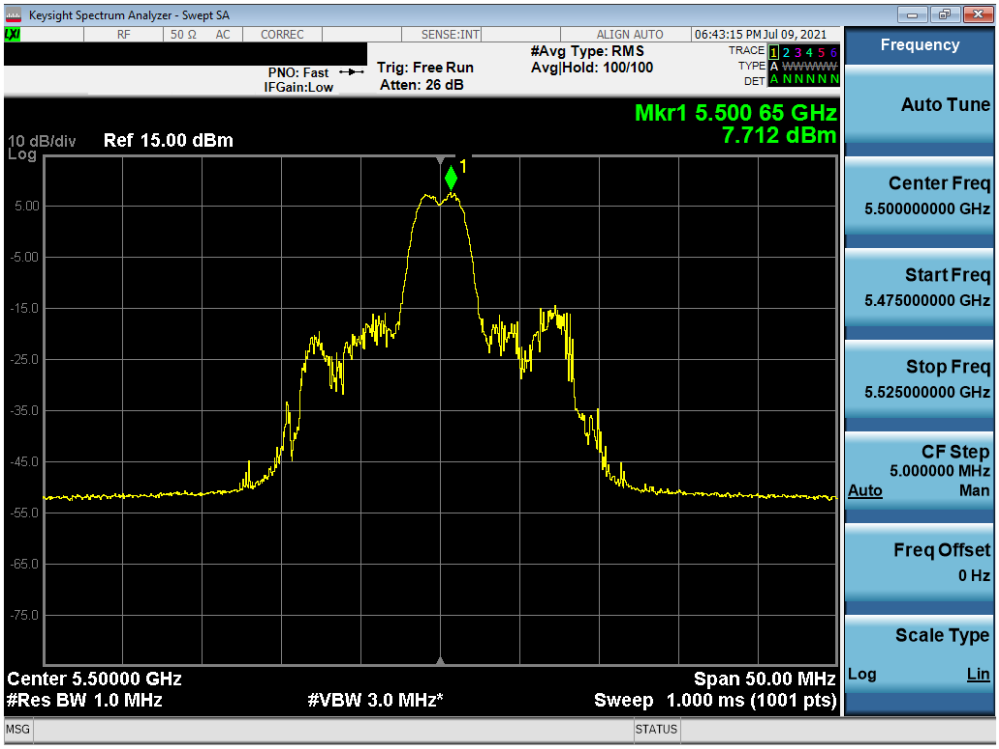
Plot 7-64. Power Spectral Density Plot (40MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 54)



Plot 7-65. Power Spectral Density Plot (40MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 62)

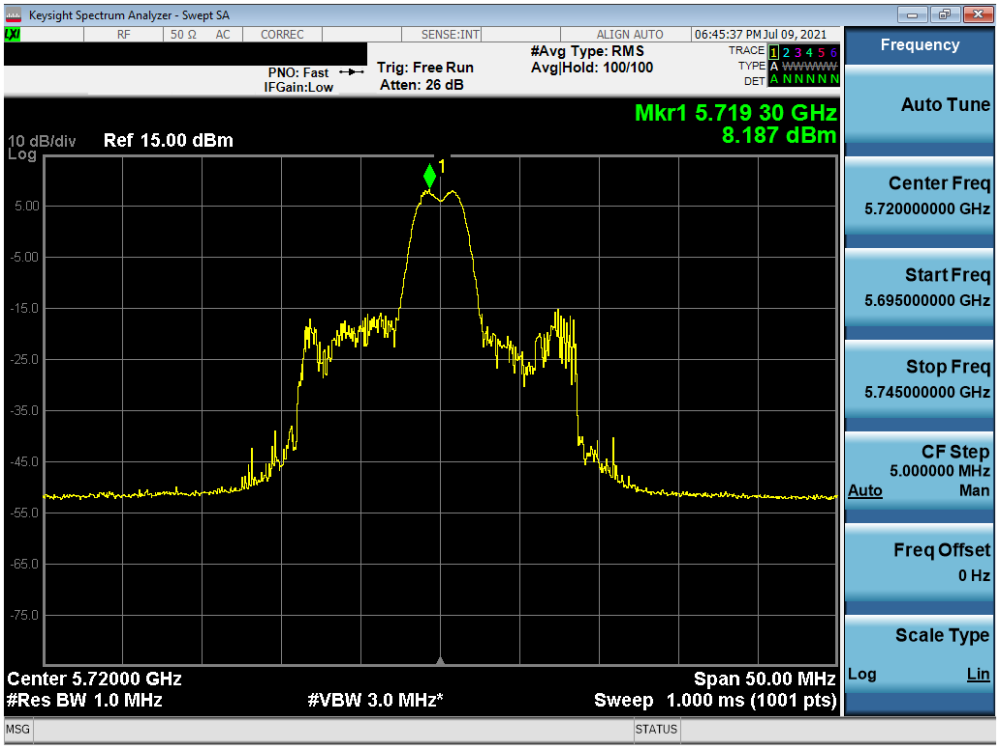


Plot 7-66. Power Spectral Density Plot (80MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 58)



Plot 7-67. Power Spectral Density Plot (20MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 100)

Plot 7-68. Power Spectral Density Plot (20MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 120)

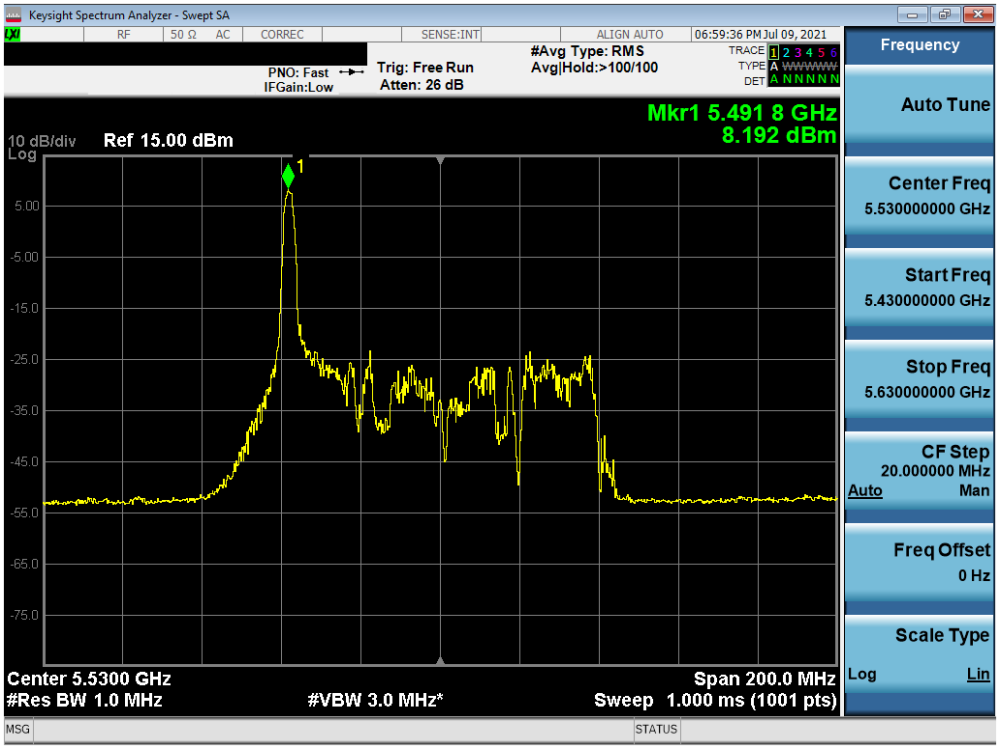


Plot 7-69. Power Spectral Density Plot (20MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 144)

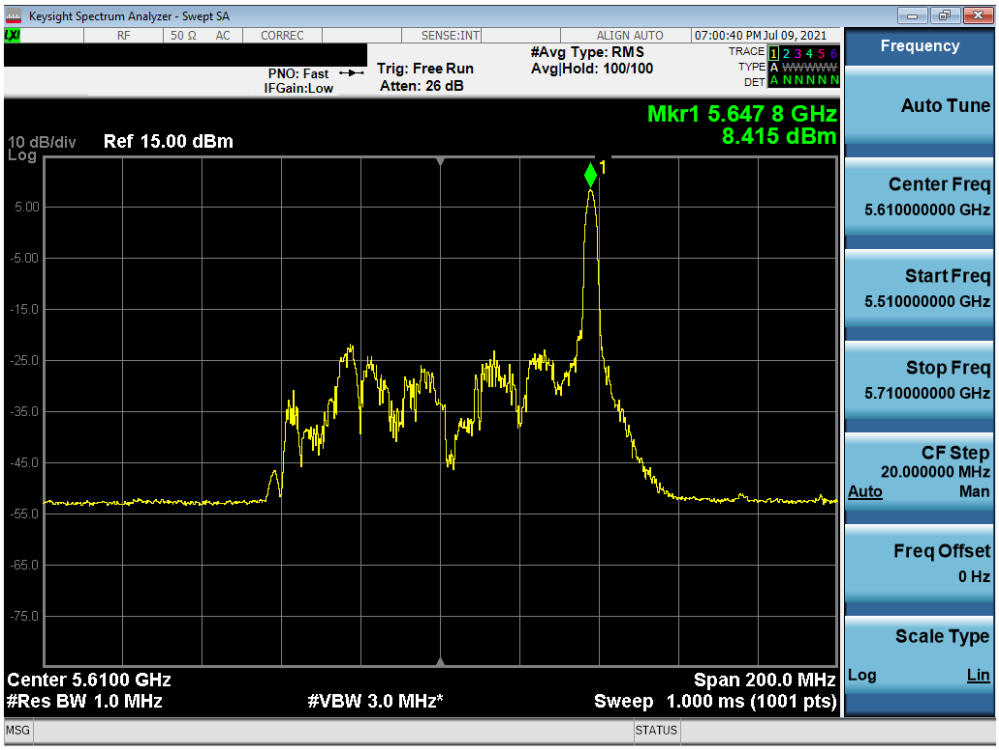
Plot 7-70. Power Spectral Density Plot (40MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 102)

Plot 7-71. Power Spectral Density Plot (40MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 118)

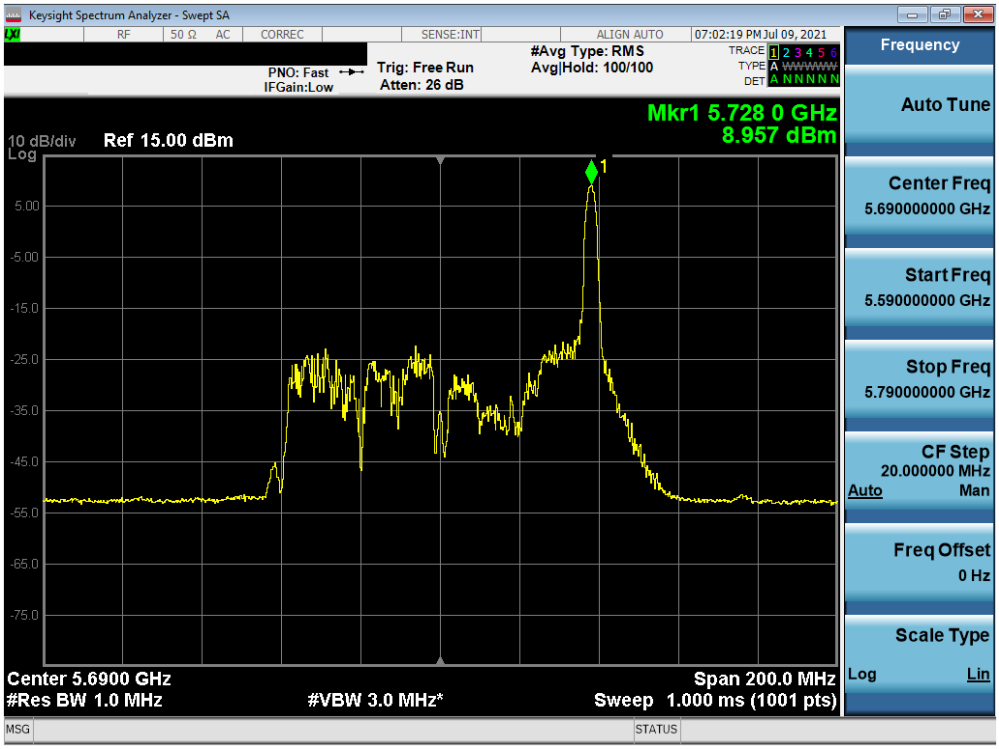
Plot 7-72. Power Spectral Density Plot (40MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 142)



Plot 7-73. Power Spectral Density Plot (80MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 106)



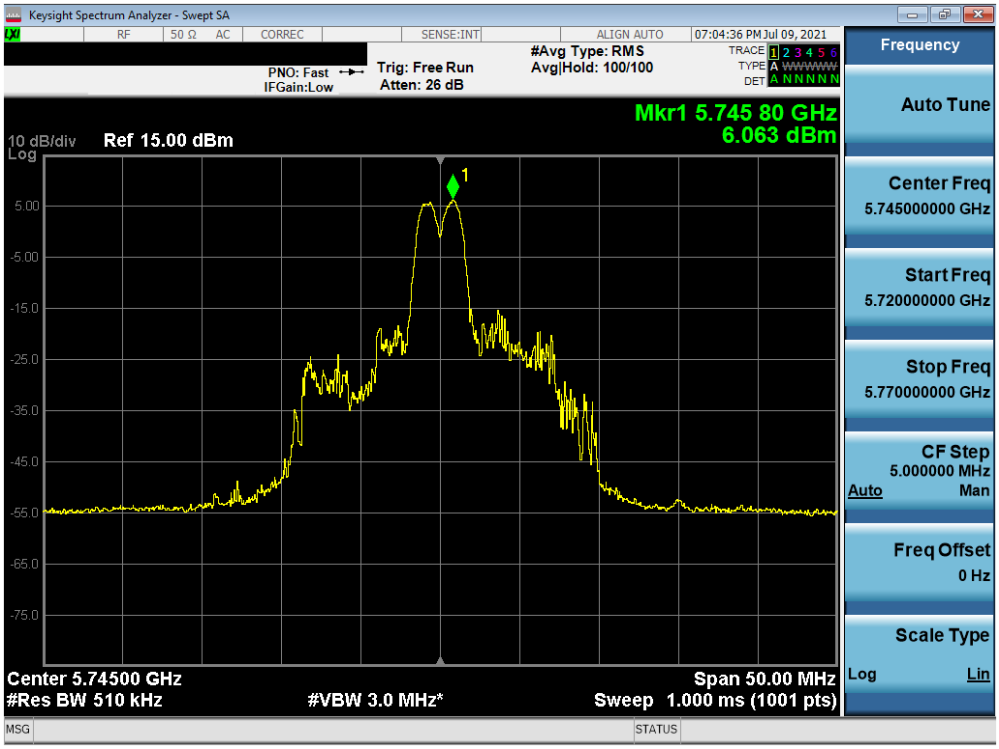
Plot 7-74. Power Spectral Density Plot (80MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 122)



Plot 7-75. Power Spectral Density Plot (80MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 138)

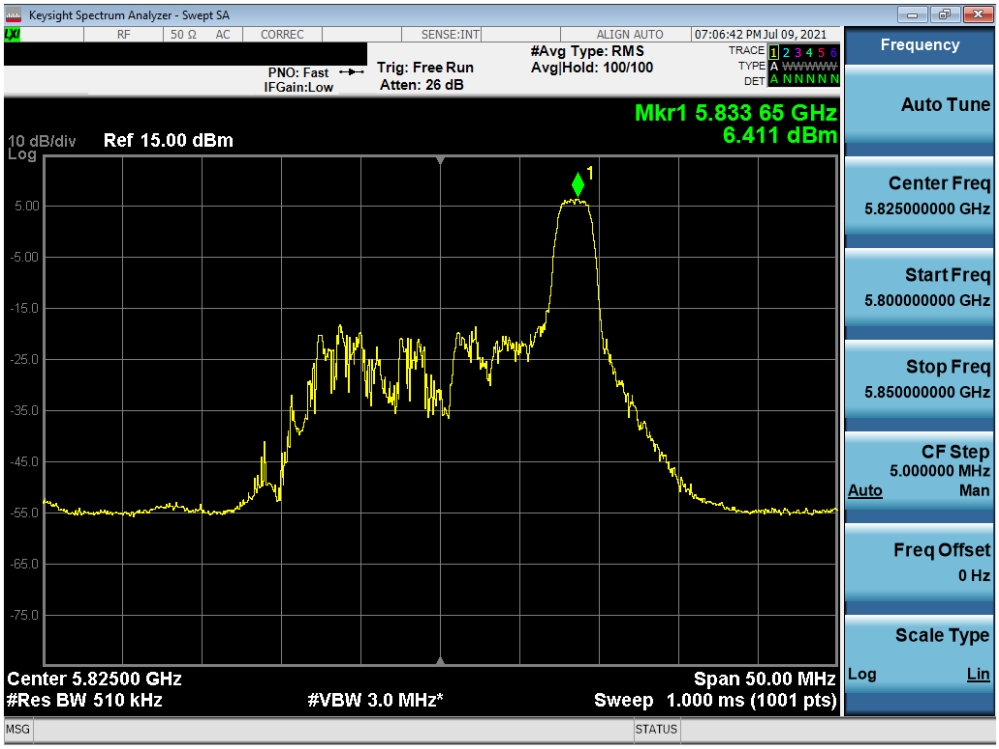
	Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured Power Density [dBm]	Max Permissible Power Density [dBm/500kHz]	Margin [dB]
Band 3	5745	149	ax (20MHz)	26T	MCS0	6.06	30.00	-23.94
	5785	157	ax (20MHz)	26T	MCS0	5.97	30.00	-24.03
	5825	165	ax (20MHz)	26T	MCS0	6.41	30.00	-23.59
	5755	151	ax (40MHz)	26T	MCS0	5.68	30.00	-24.33
	5795	159	ax (40MHz)	26T	MCS0	6.27	30.00	-23.73
	5775	155	ax (80MHz)	26T	MCS0	5.74	30.00	-24.26

Table 7-22. Band 3 Conducted Power Spectral Density Measurements (26 Tones)

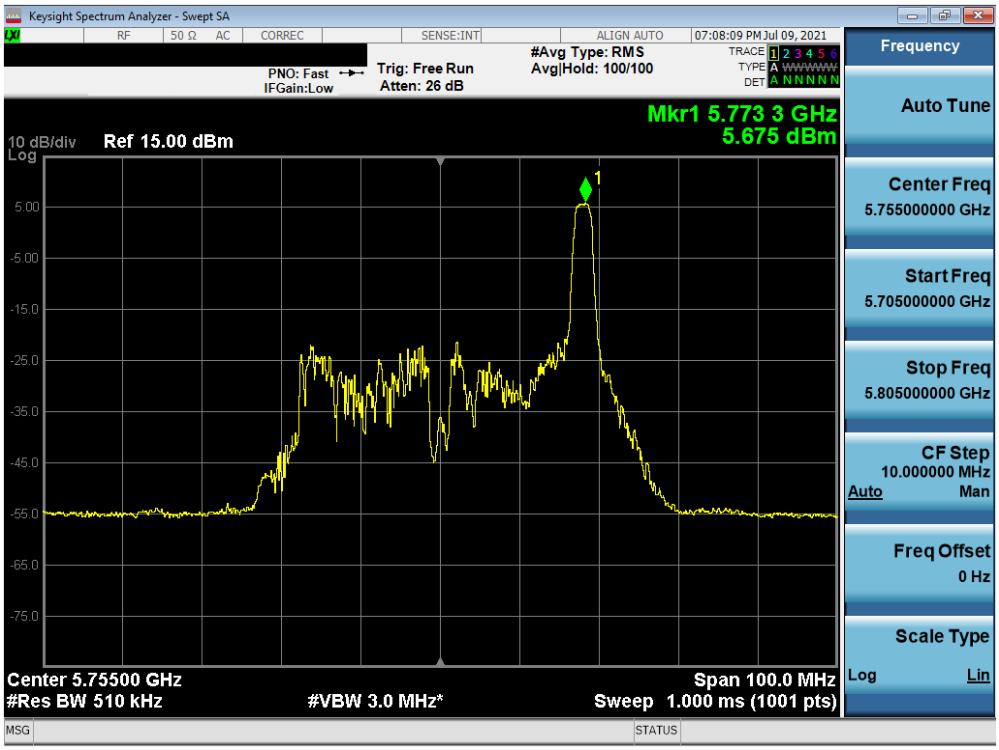


Plot 7-76. Power Spectral Density Plot (20MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 149)

Plot 7-77. Power Spectral Density Plot (20MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 157)

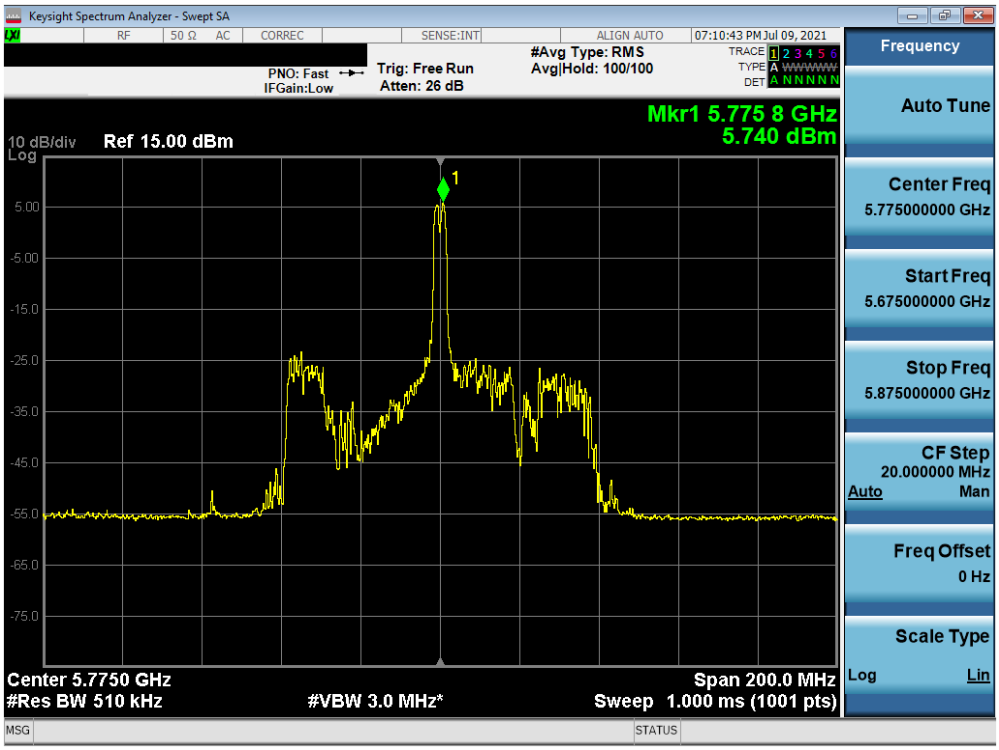


Plot 7-78. Power Spectral Density Plot (20 MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 165)



Plot 7-79. Power Spectral Density Plot (40MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 151)

Plot 7-80. Power Spectral Density Plot (40MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 159)

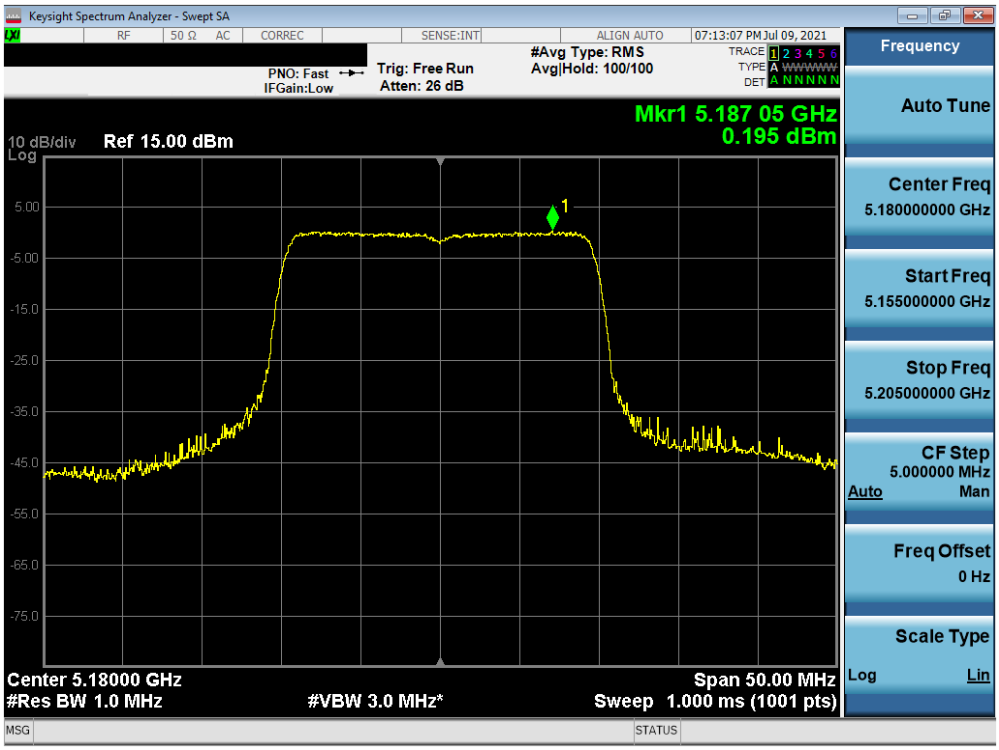


Plot 7-81. Power Spectral Density Plot (80MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 155)

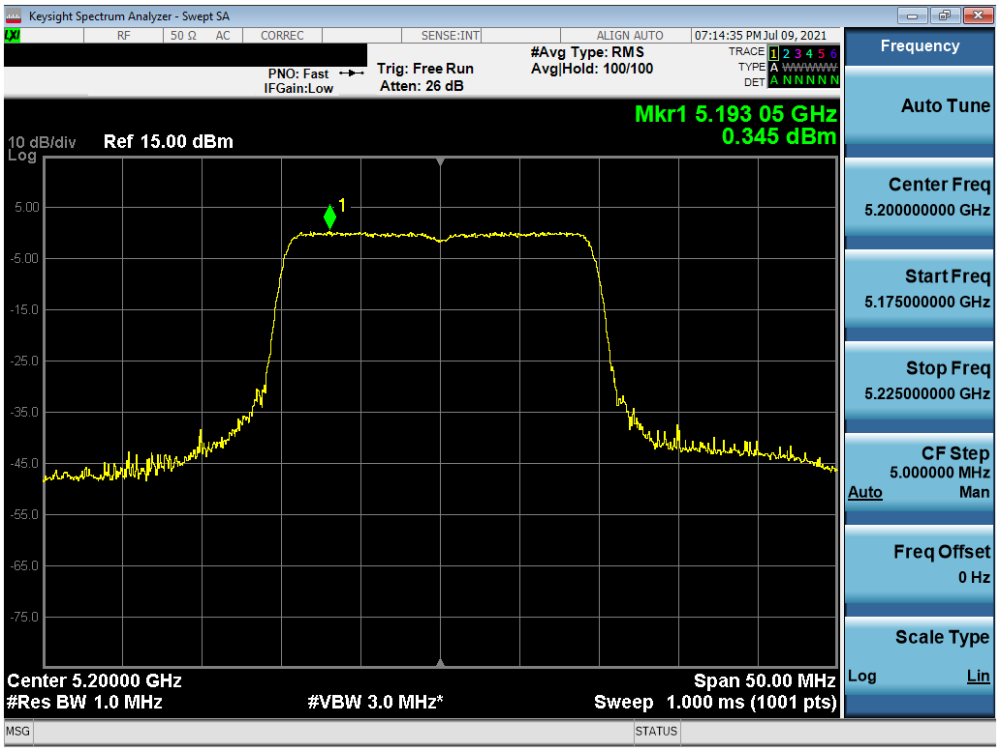
Power Spectral Density Measurements (Full Tones)

	Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured Power Density [dBm]	Max Power Density [dBm/MHz]	Margin [dB]
Band 1	5180	36	ax (20MHz)	242T	MCS0	0.20	11.0	-10.81
	5200	40	ax (20MHz)	242T	MCS0	0.35	11.0	-10.66
	5240	48	ax (20MHz)	242T	MCS0	0.52	11.0	-10.48
	5190	38	ax (40MHz)	484T	MCS0	-4.12	11.0	-15.12
	5230	46	ax (40MHz)	484T	MCS0	-2.67	11.0	-13.67
	5210	42	ax (80MHz)	996T	MCS0	-8.96	11.0	-19.96
Band 2A	5260	52	ax (20MHz)	242T	MCS0	0.22	11.0	-10.78
	5280	56	ax (20MHz)	242T	MCS0	0.53	11.0	-10.47
	5320	64	ax (20MHz)	242T	MCS0	0.50	11.0	-10.50
	5270	54	ax (40MHz)	484T	MCS0	-2.60	11.0	-13.60
	5310	62	ax (40MHz)	484T	MCS0	-4.32	11.0	-15.32
	5290	58	ax (80MHz)	996T	MCS0	-9.68	11.0	-20.68
Band 2C	5500	100	ax (20MHz)	242T	MCS0	0.49	11.0	-10.51
	5600	120	ax (20MHz)	242T	MCS0	0.15	11.0	-10.86
	5720	144	ax (20MHz)	242T	MCS0	0.61	11.0	-10.39
	5510	102	ax (40MHz)	484T	MCS0	-2.81	11.0	-13.81
	5590	118	ax (40MHz)	484T	MCS0	-2.88	11.0	-13.88
	5710	142	ax (40MHz)	484T	MCS0	-2.13	11.0	-13.13
	5530	106	ax (80MHz)	996T	MCS0	-9.09	11.0	-20.09
	5610	122	ax (80MHz)	996T	MCS0	-6.13	11.0	-17.13
	5690	138	ax (80MHz)	996T	MCS0	-5.46	11.0	-16.46

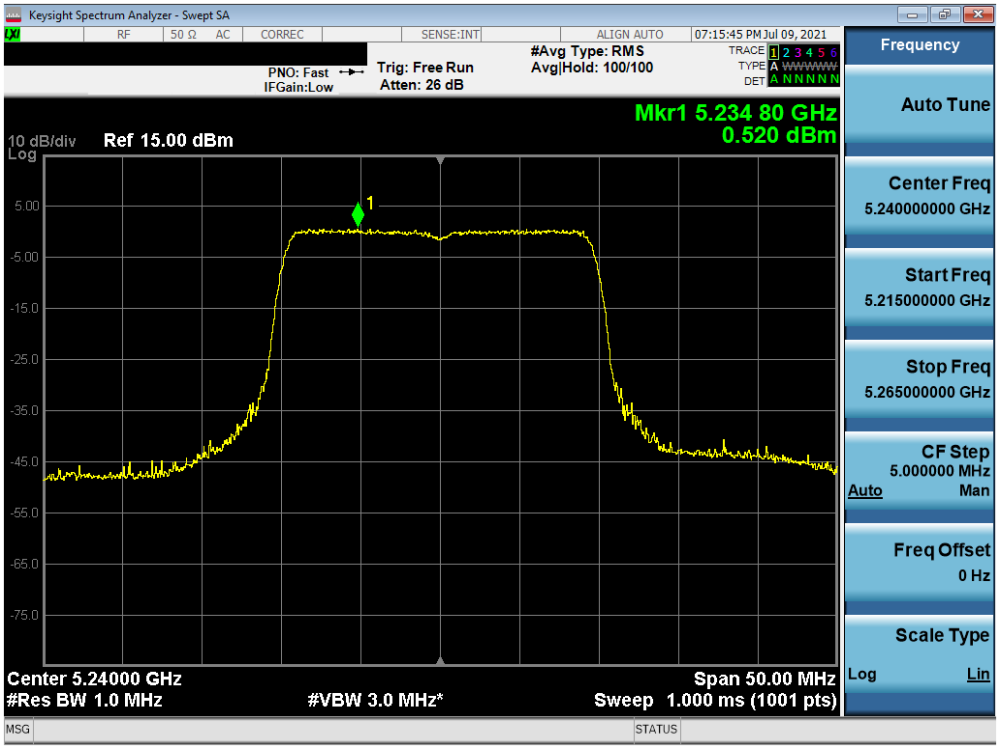
Table 7-23. Bands 1, 2A, 2C Conducted Power Spectral Density Measurements (Full Tones)



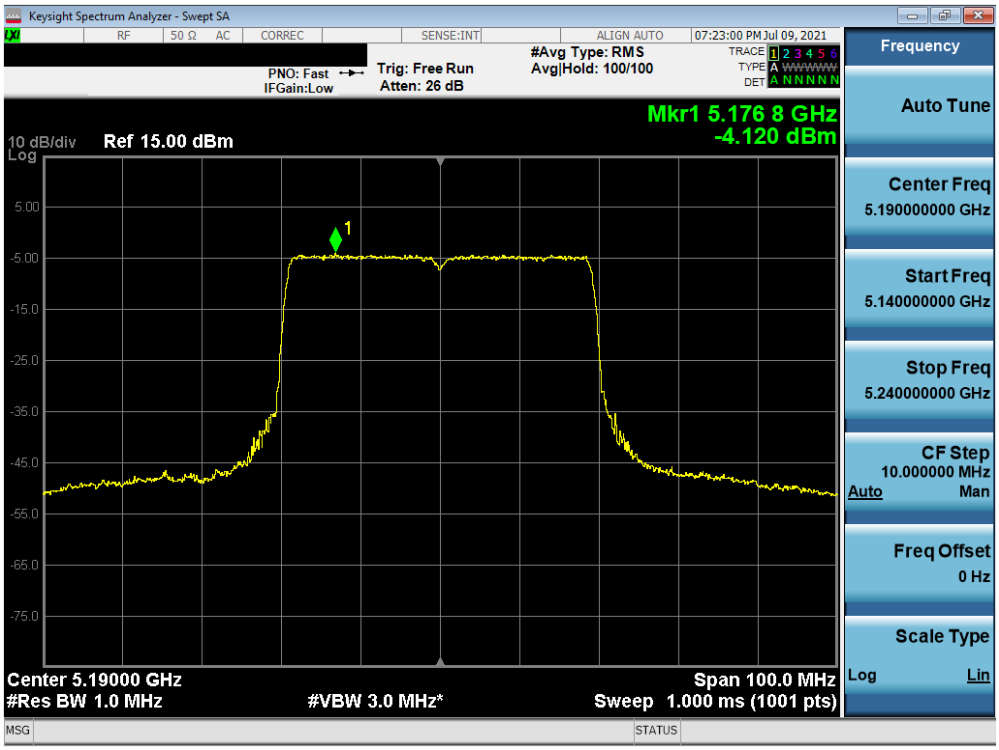
Plot 7-82. Power Spectral Density Plot (20MHz BW 802.11ax – Full Tones (UNII Band 1) – Ch. 36)



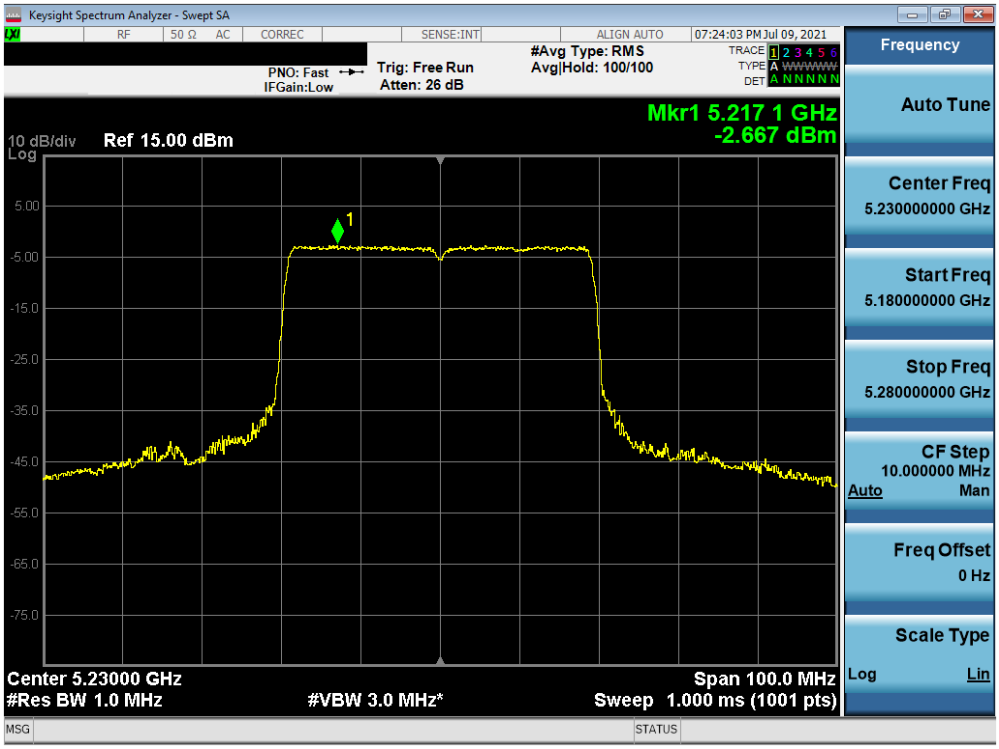
Plot 7-83. Power Spectral Density Plot (20MHz BW 802.11ax – Full Tones (UNII Band 1) – Ch. 40)



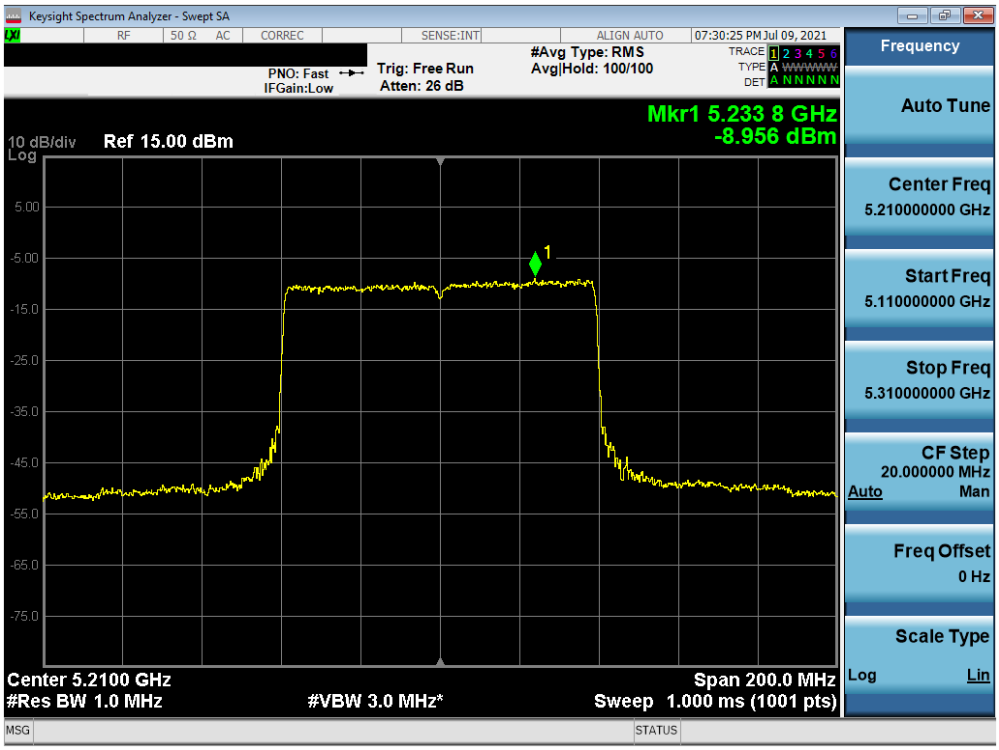
Plot 7-84. Power Spectral Density Plot (20MHz BW 802.11ax – Full Tones (UNII Band 1) – Ch. 48)



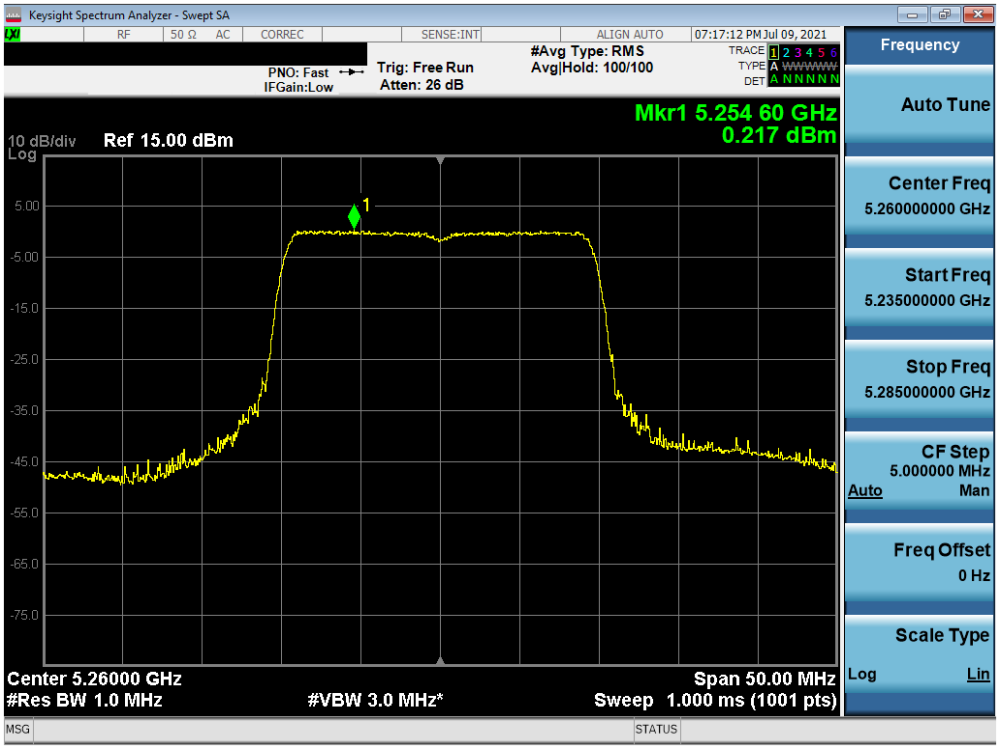
Plot 7-85. Power Spectral Density Plot (40MHz BW 802.11ax – Full Tones (UNII Band 1) – Ch. 38)



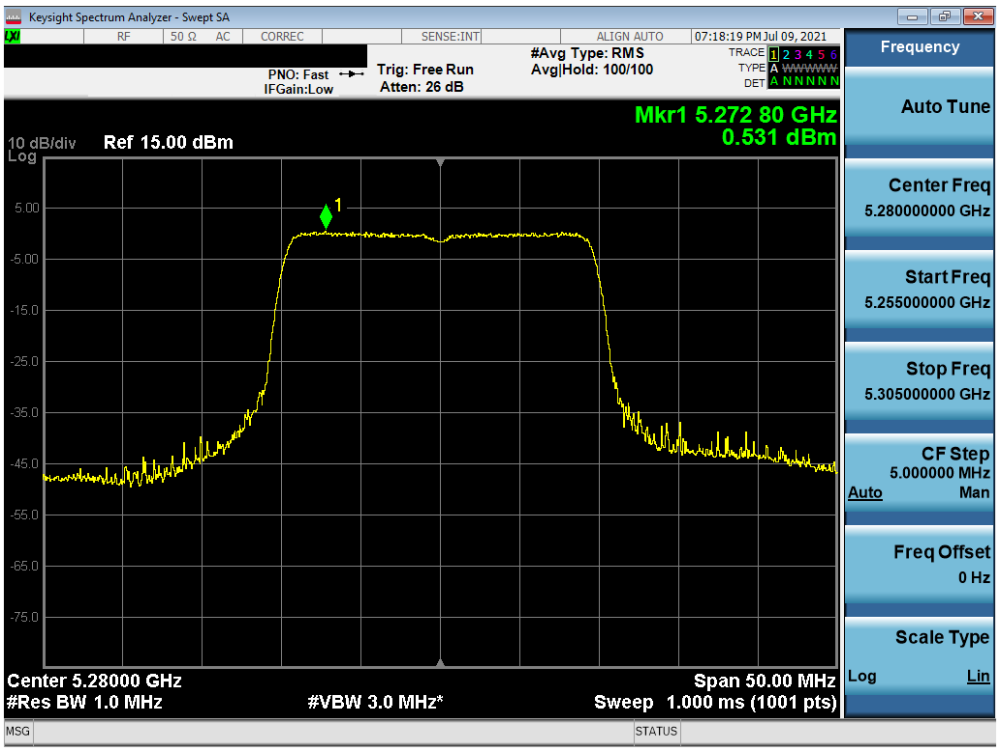
Plot 7-86. Power Spectral Density Plot (40MHz BW 802.11ax – Full Tones (UNII Band 1) – Ch. 46)



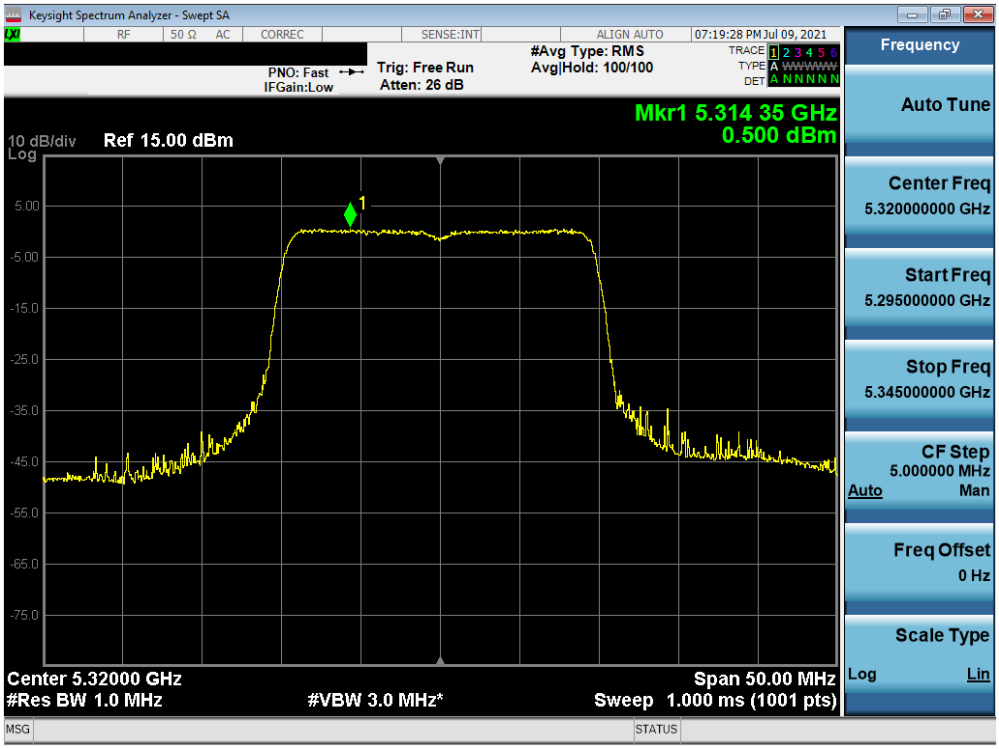
Plot 7-87. Power Spectral Density Plot (80MHz BW 802.11ax – Full Tones (UNII Band 1) – Ch. 42)



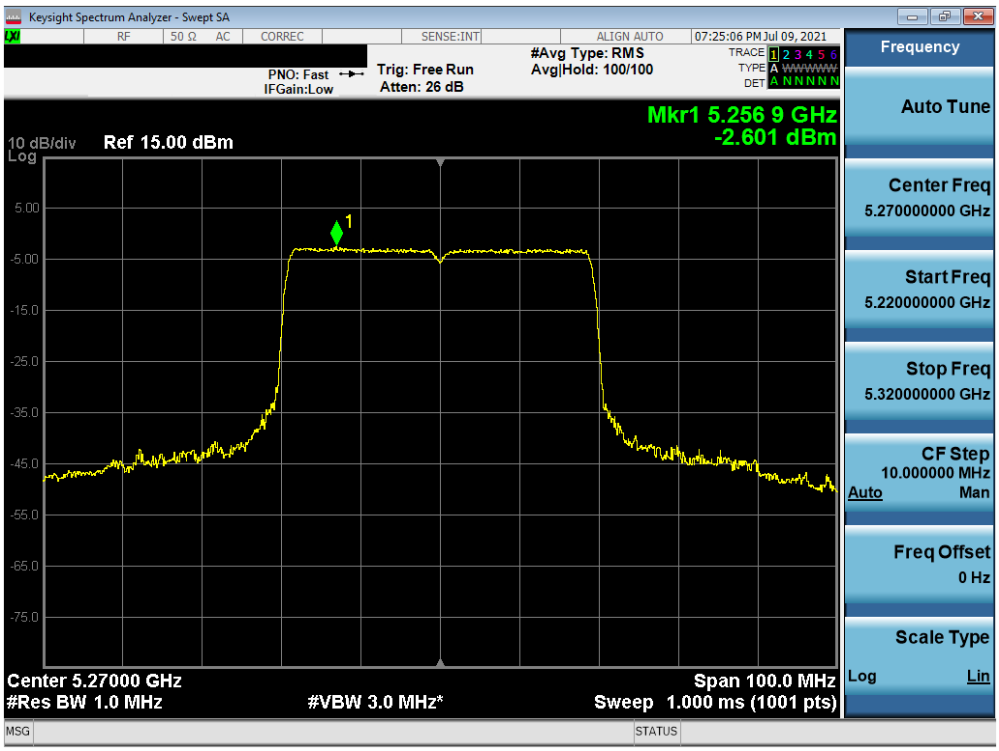
Plot 7-88. Power Spectral Density Plot (20MHz BW 802.11ax – Full Tones (UNII Band 2A) – Ch. 52)



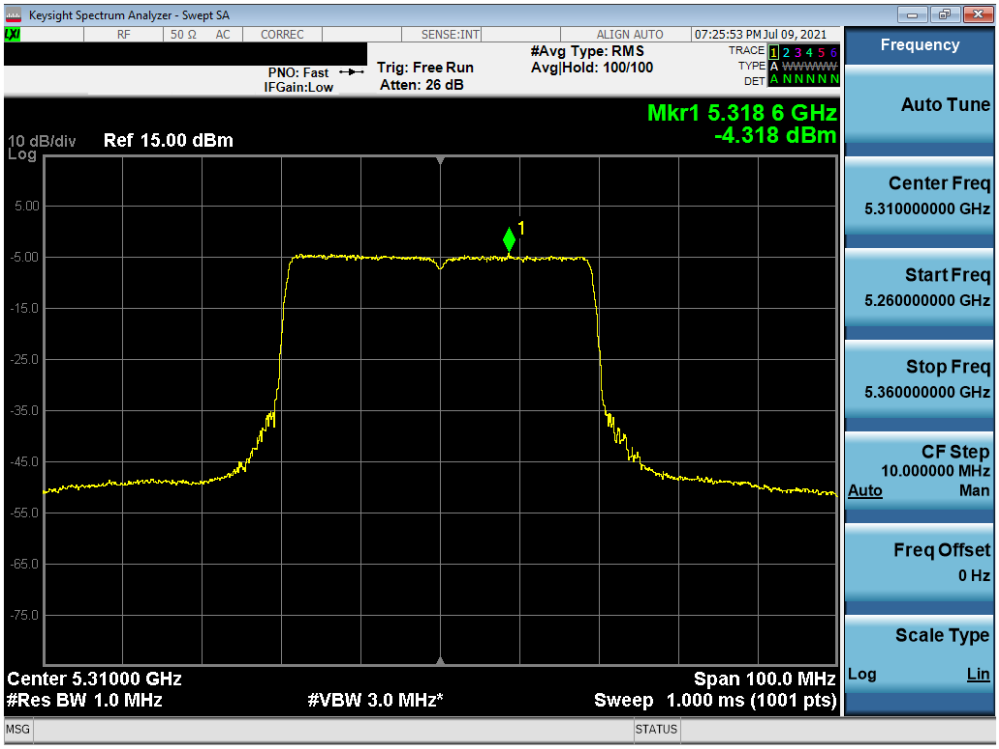
Plot 7-89. Power Spectral Density Plot (20MHz BW 802.11ax – Full Tones (UNII Band 2A) – Ch. 56)



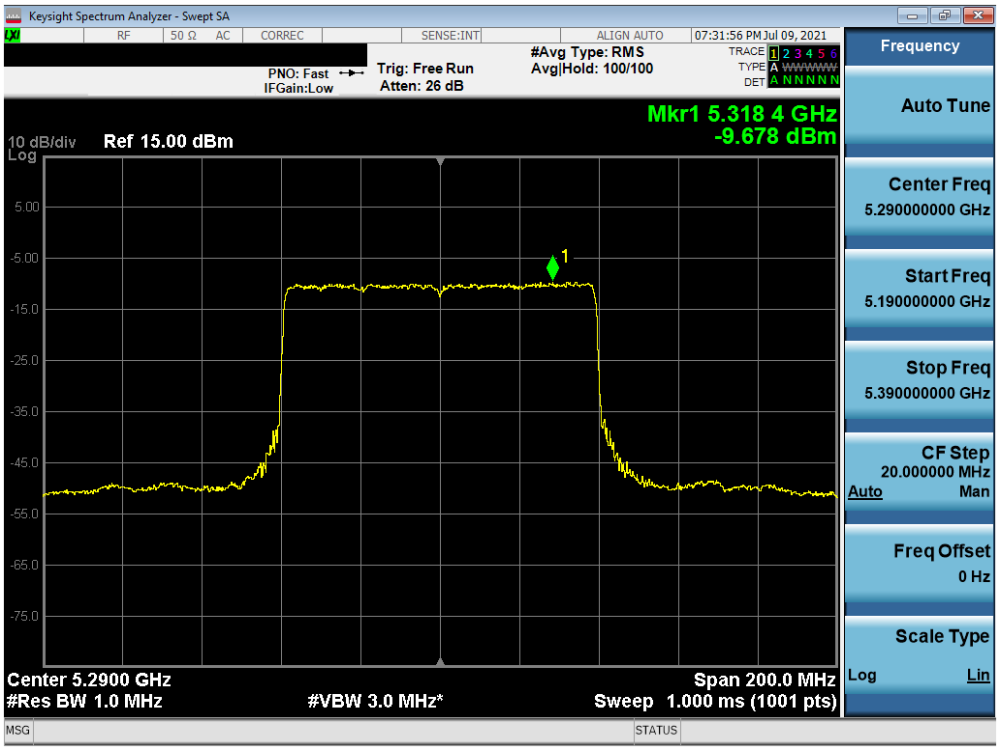
Plot 7-90. Power Spectral Density Plot (20MHz BW 802.11ax – Full Tones (UNII Band 2A) – Ch. 64)



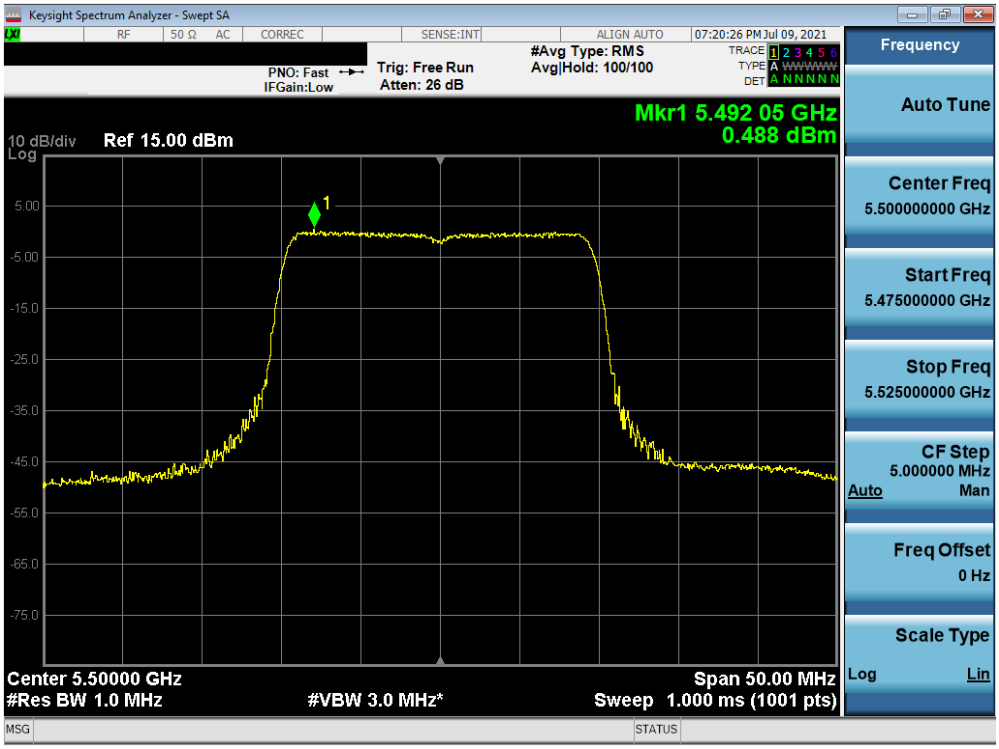
Plot 7-91. Power Spectral Density Plot (40MHz BW 802.11ax – Full Tones (UNII Band 2A) – Ch. 54)



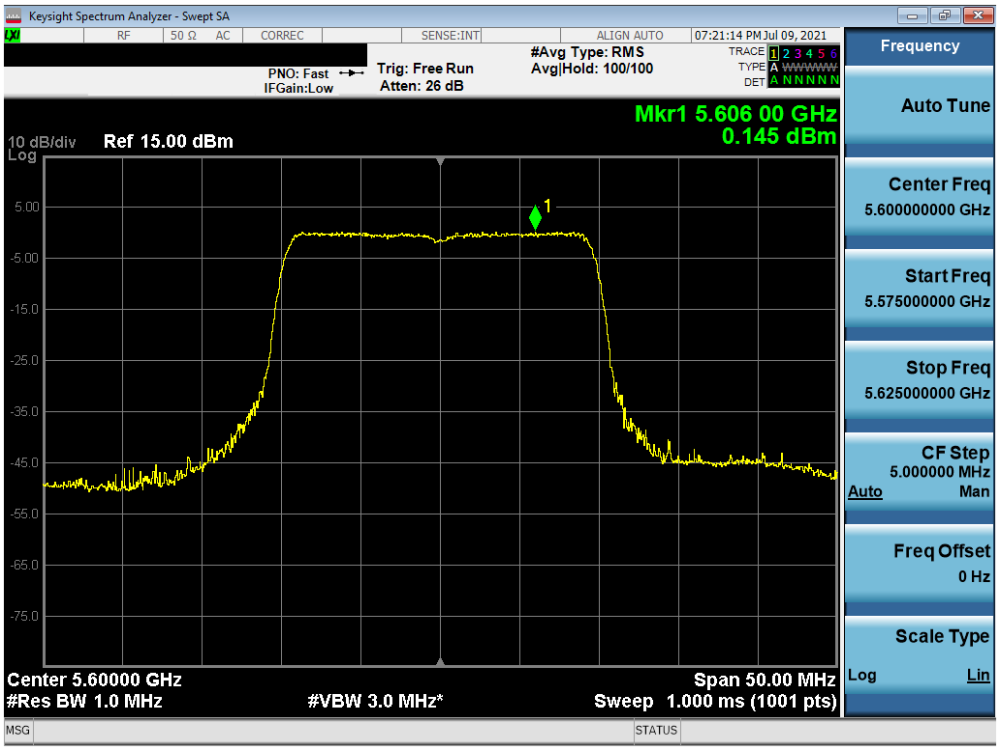
Plot 7-92. Power Spectral Density Plot (40MHz BW 802.11ax – Full Tones (UNII Band 2A) – Ch. 62)



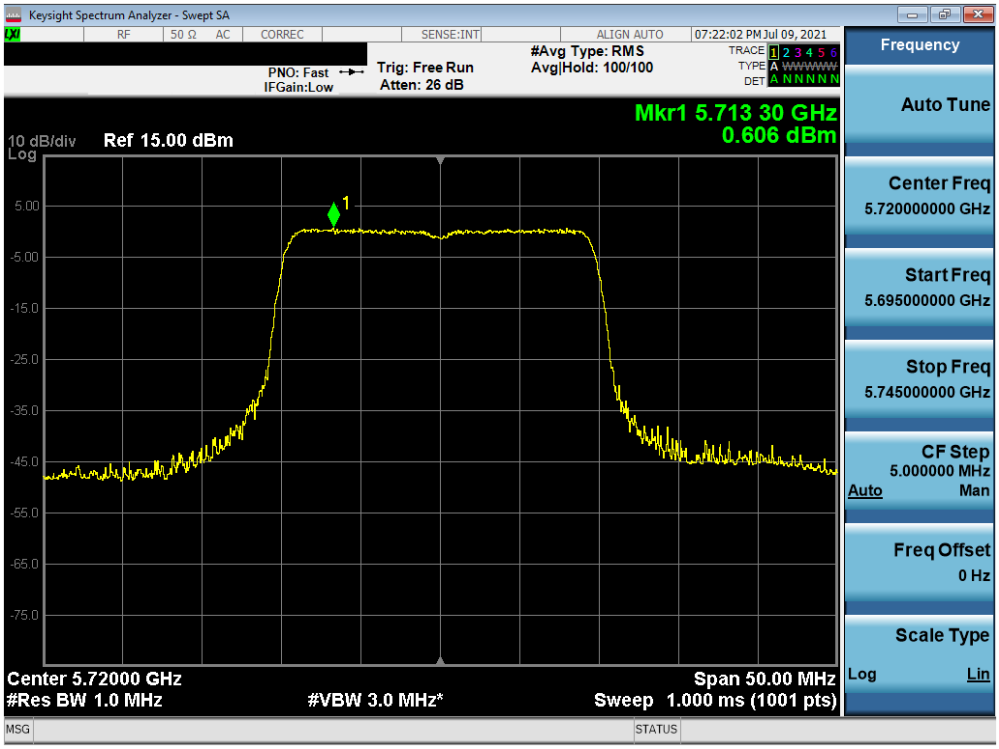
Plot 7-93. Power Spectral Density Plot (80MHz BW 802.11ax – Full Tones (UNII Band 2A) – Ch. 58)



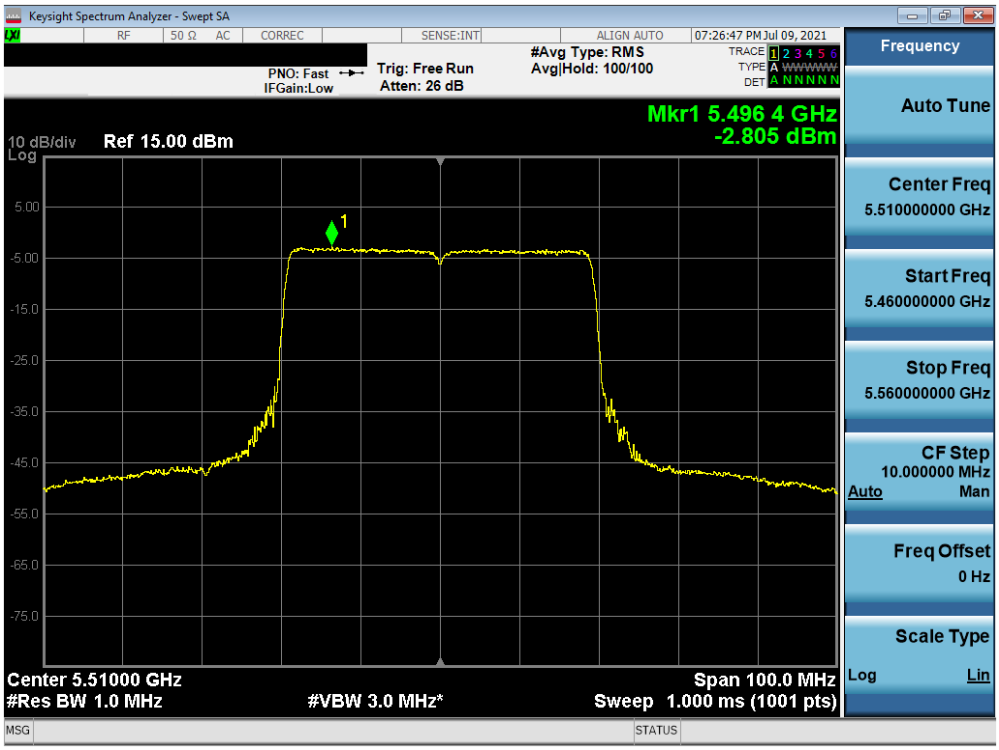
Plot 7-94. Power Spectral Density Plot (20MHz BW 802.11ax – Full Tones (UNII Band 2C) – Ch. 100)



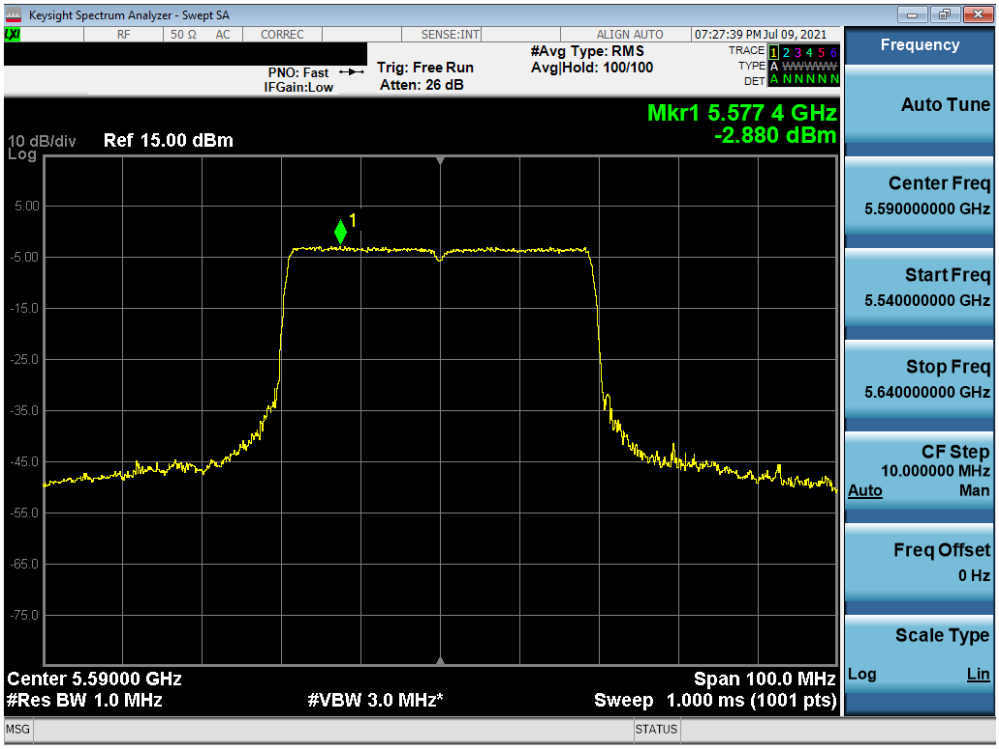
Plot 7-95. Power Spectral Density Plot (20MHz BW 802.11ax – Full Tones (UNII Band 2C) – Ch. 120)



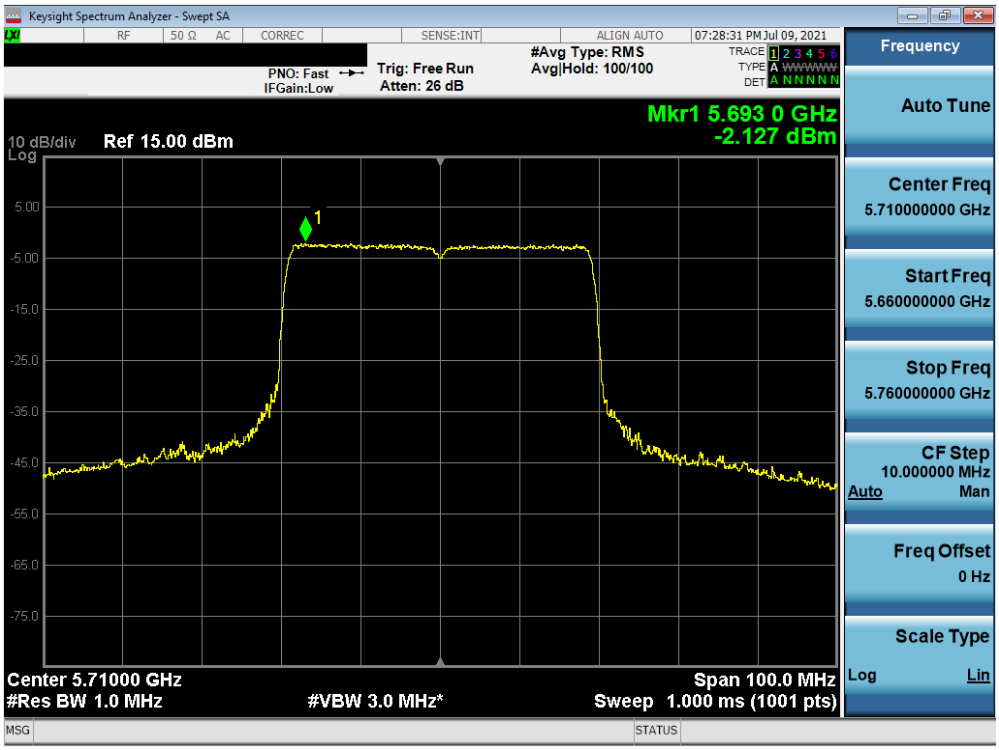
Plot 7-96. Power Spectral Density Plot (20MHz BW 802.11ax – Full Tones (UNII Band 2C) – Ch. 144)



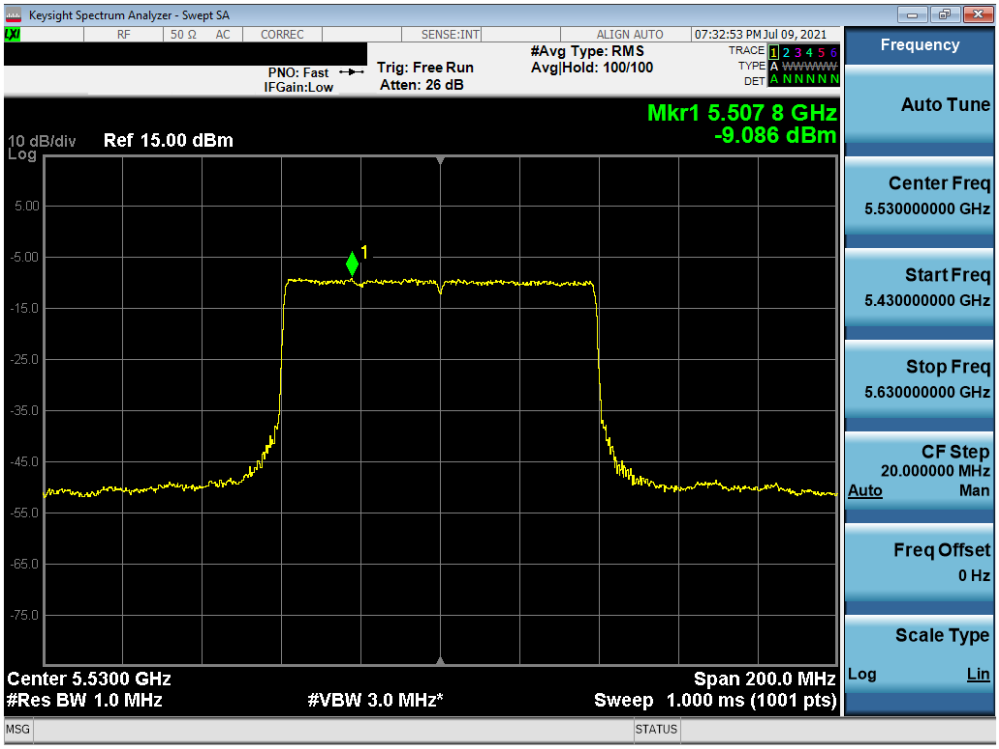
Plot 7-97. Power Spectral Density Plot (40MHz BW 802.11ax – Full Tones (UNII Band 2C) – Ch. 102)



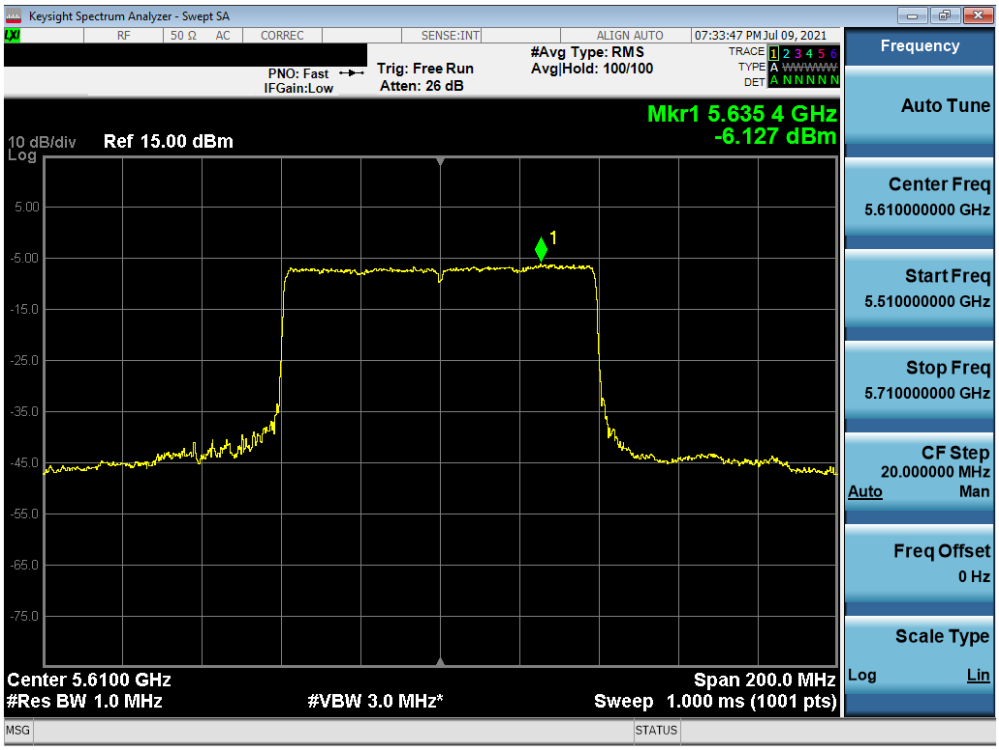
Plot 7-98. Power Spectral Density Plot (40MHz BW 802.11ax – Full Tones (UNII Band 2C) – Ch. 118)



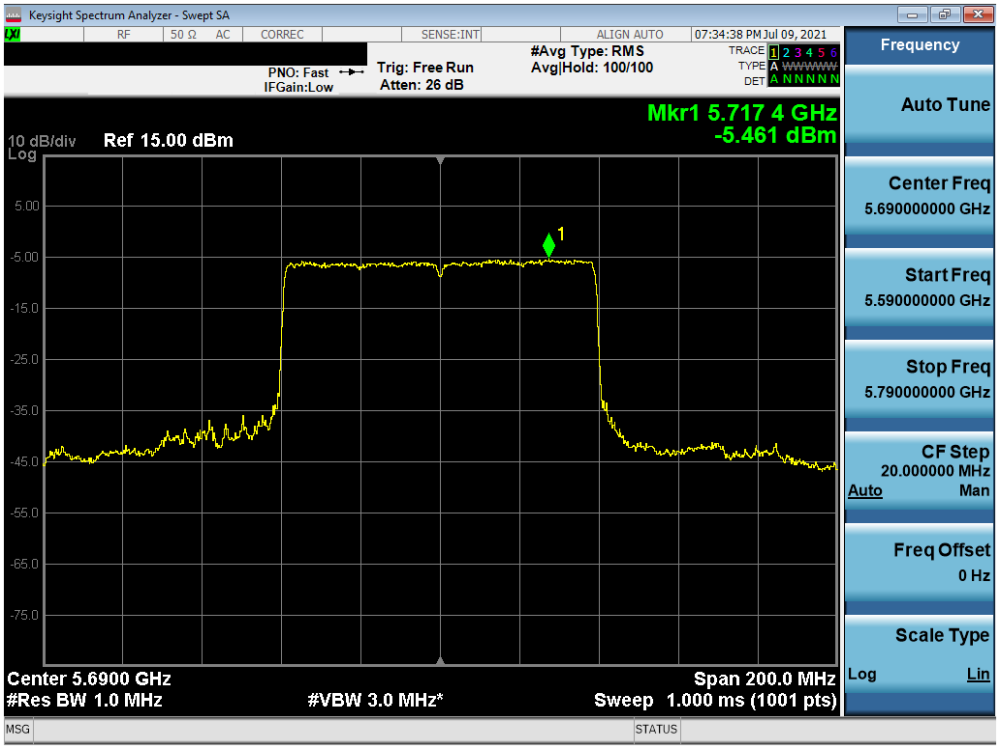
Plot 7-99. Power Spectral Density Plot (40MHz BW 802.11ax – Full Tones (UNII Band 2C) – Ch. 142)



Plot 7-100. Power Spectral Density Plot (80MHz BW 802.11ax – Full Tones (UNII Band 2C) – Ch. 106)



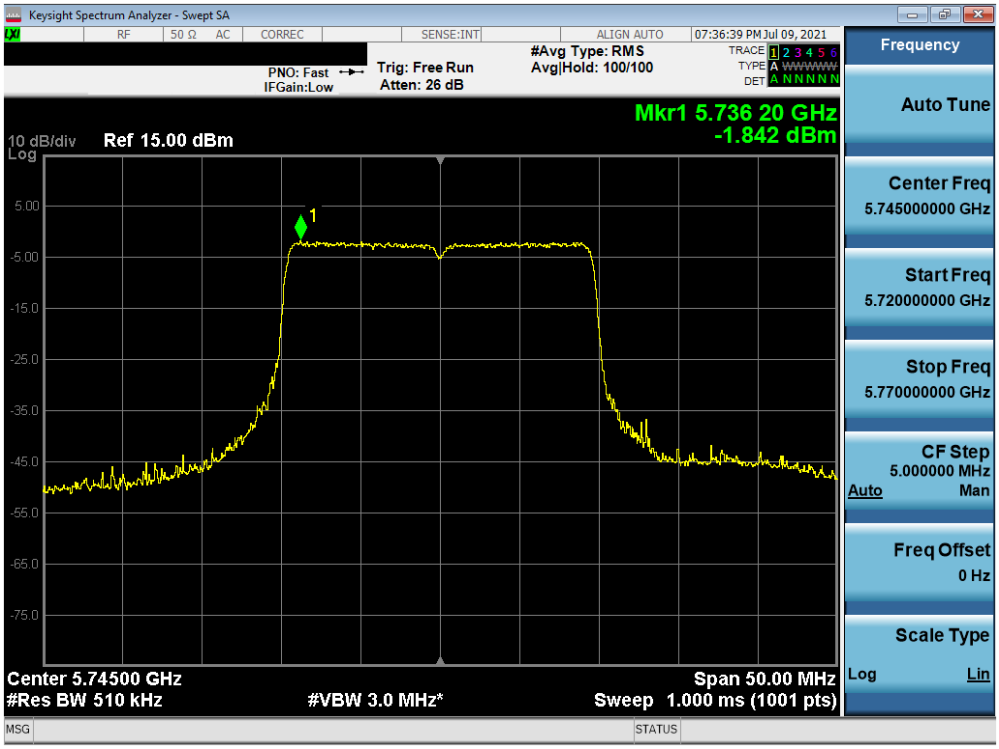
Plot 7-101. Power Spectral Density Plot (80MHz BW 802.11ax – Full Tones (UNII Band 2C) – Ch. 122)



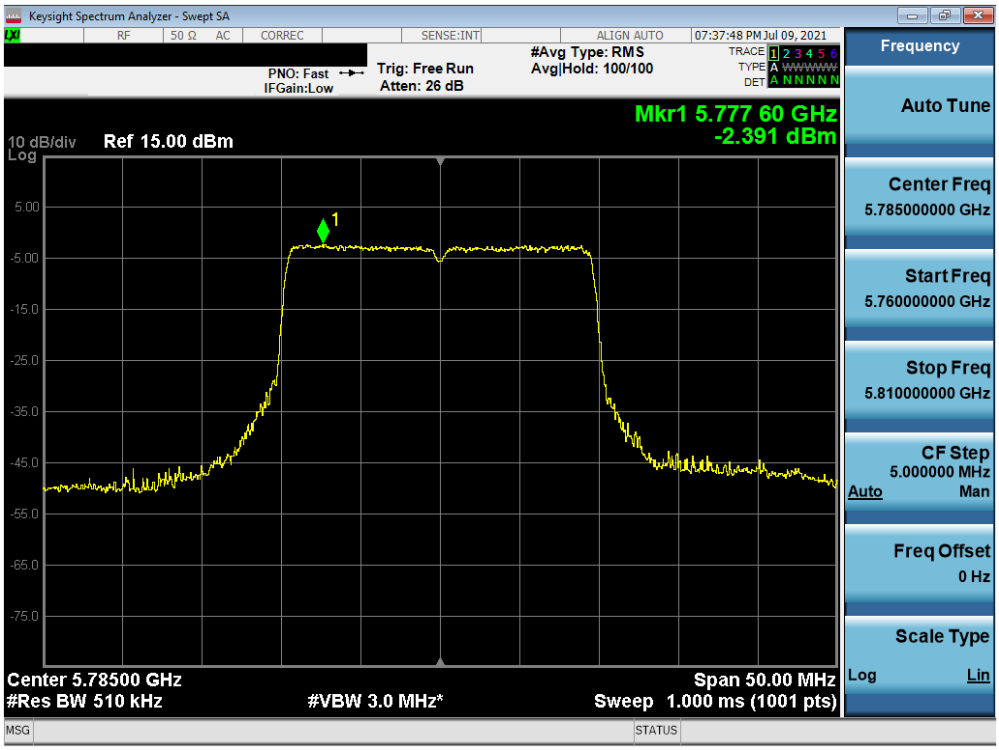
Plot 7-102. Power Spectral Density Plot (80MHz BW 802.11ax – Full Tones (UNII Band 2C) – Ch. 138)

	Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured Power Density [dBm]	Max Permissible Power Density [dBm/500kHz]	Margin [dB]
Band 3	5745	149	ax (20MHz)	242T	MCS0	-1.84	30.00	-31.84
	5785	157	ax (20MHz)	242T	MCS0	-2.39	30.00	-32.39
	5825	165	ax (20MHz)	242T	MCS0	-2.02	30.00	-32.02
	5755	151	ax (40MHz)	484T	MCS0	-4.76	30.00	-34.76
	5795	159	ax (40MHz)	484T	MCS0	-5.15	30.00	-35.15
	5775	155	ax (80MHz)	996T	MCS0	-7.94	30.00	-37.94

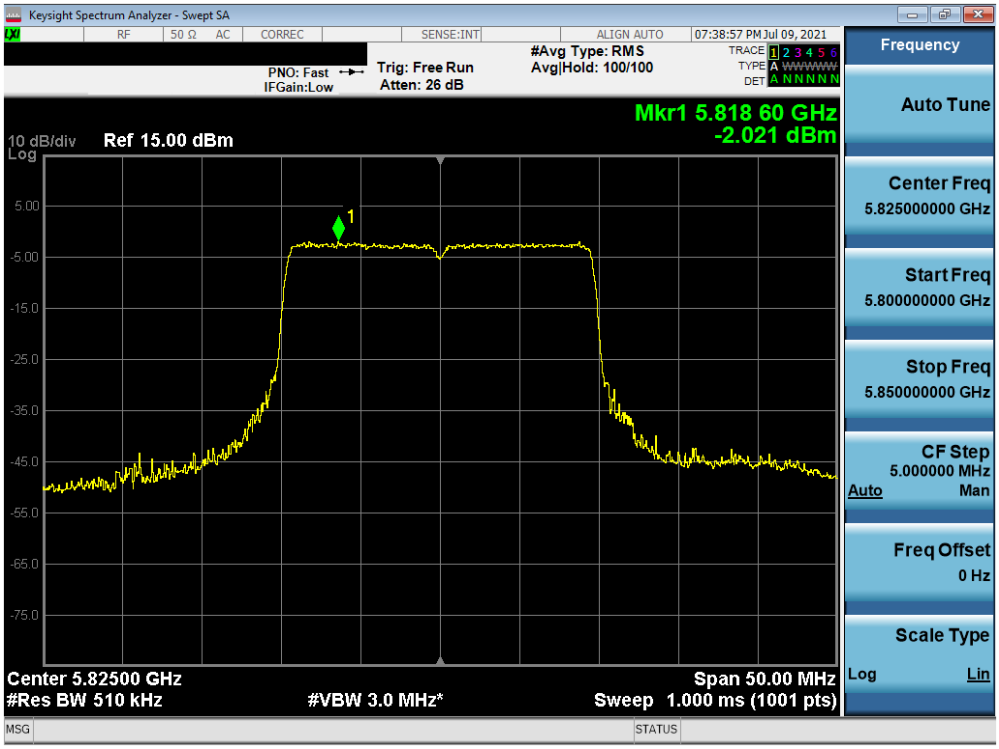
Table 7-24. Band 3 Conducted Power Spectral Density Measurements (Full Tones)



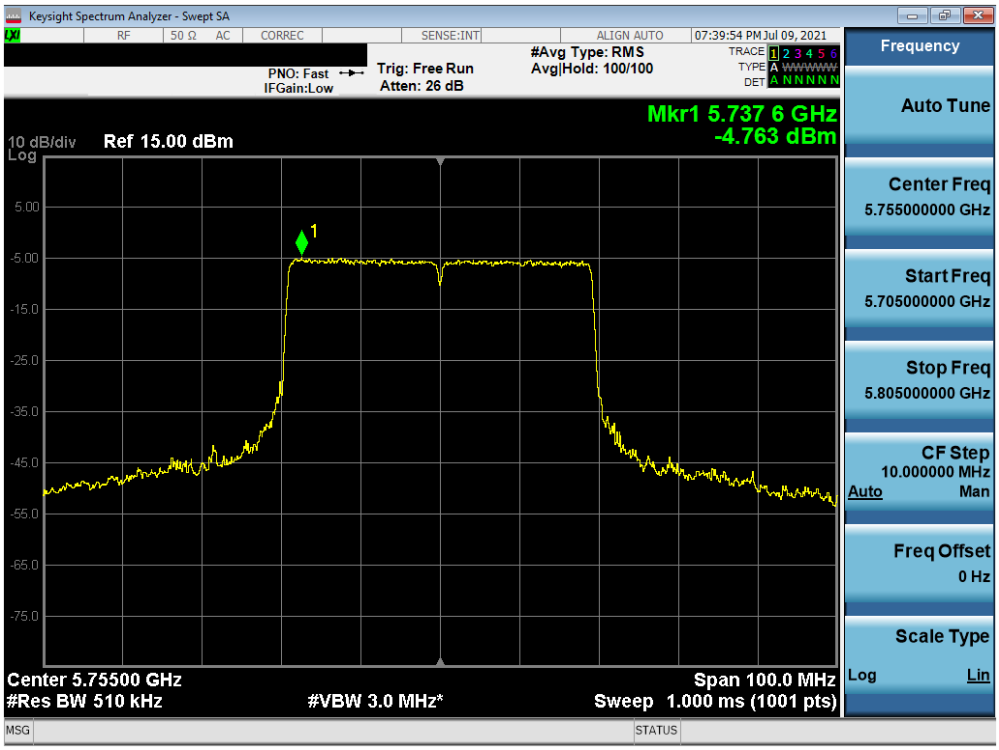
Plot 7-103. Power Spectral Density Plot (20MHz BW 802.11ax – Full Tones (UNII Band 3) – Ch. 149)



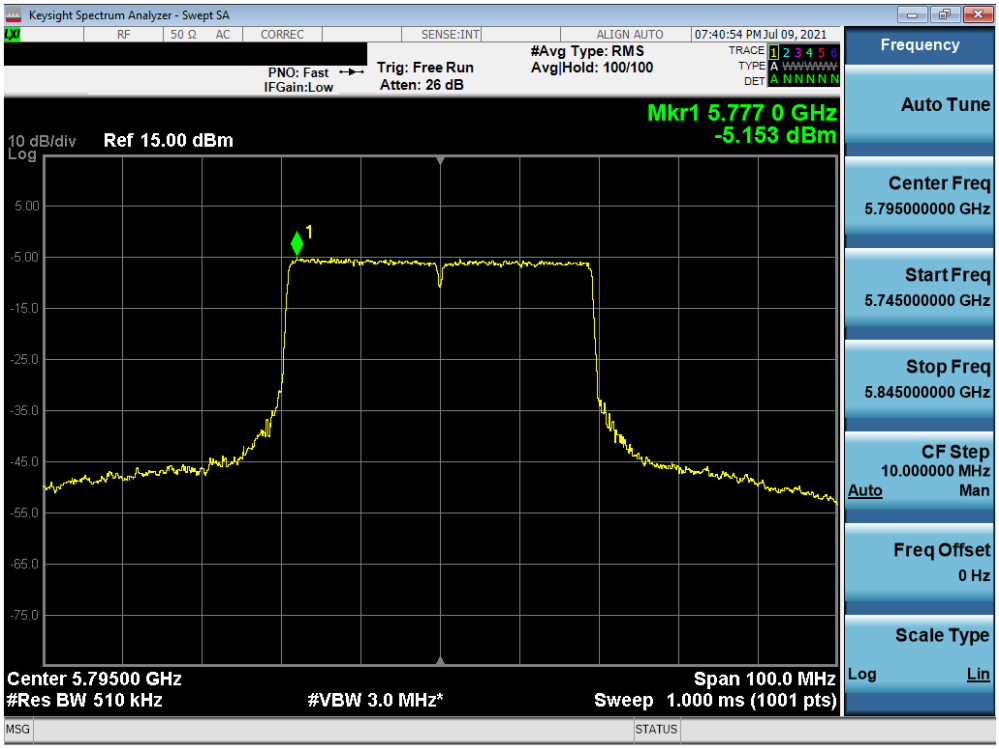
Plot 7-104. Power Spectral Density Plot (20MHz BW 802.11ax – Full Tones (UNII Band 3) – Ch. 157)



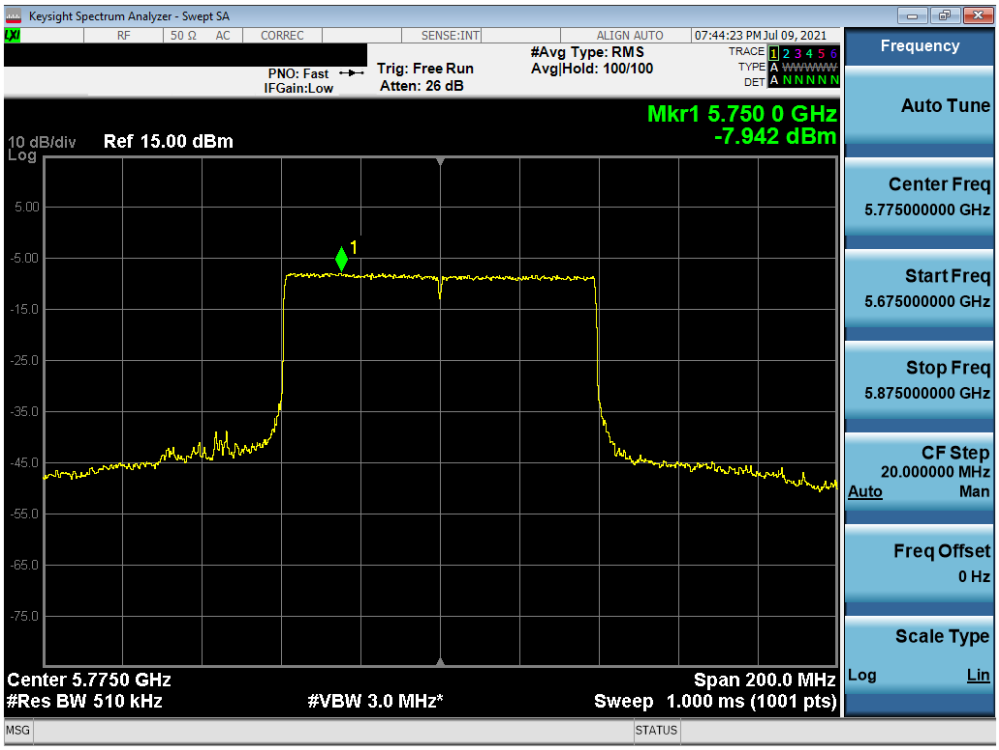
Plot 7-105. Power Spectral Density Plot (20 MHz BW 802.11ax – Full Tones (UNII Band 3) – Ch. 165)



Plot 7-106. Power Spectral Density Plot (40MHz BW 802.11ax – Full Tones (UNII Band 3) – Ch. 151)



Plot 7-107. Power Spectral Density Plot (40MHz BW 802.11ax – Full Tones (UNII Band 3) – Ch. 159)



Plot 7-108. Power Spectral Density Plot (80MHz BW 802.11ax – Full Tones (UNII Band 3) – Ch. 155)

7.6 Radiated Spurious Emission Measurements – Above 1GHz

§15.407(b) §15.205 §15.209; RSS-Gen [8.9]

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 (e.g. 26 Tones, 52 Tones, 106 Tones, 242 Tones, 484 Tones and 996 Tones), 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.

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR and Table 6 of RSS-Gen (8.10) must not exceed the limits shown in Table 7-25 per Section 15.209 and RSS-Gen (8.9).

Frequency	Field Strength [μV/m]	Measured Distance [Meters]
Above 960.0 MHz	500	3

Table 7-25. Radiated Limits

Test Procedures Used

ANSI C63.10-2013 – Sections 12.7.7.2, 12.7.6, 12.7.5
KDB 789033 D02 v02r01 – Section G

Test Settings

Average Measurements above 1GHz (Method AD)

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. Averaging type = power (RMS)
7. Sweep time = auto couple
8. Trace was averaged over 100 sweeps

Peak Measurements above 1GHz

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

Peak Measurements below 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. Span was set greater than 1MHz
3. RBW = 120kHz
4. Detector = CISPR quasi-peak
5. Sweep time = auto couple
6. Trace was allowed to stabilize

Test Setup

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

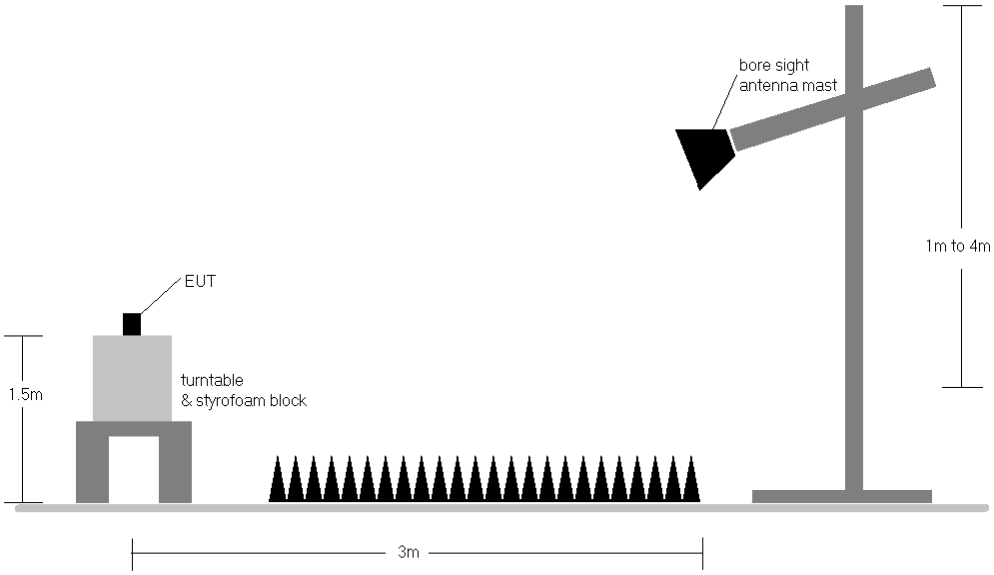


Figure 7-5. Test Instrument & Measurement Setup

Test Notes

1. All emissions that lie in the restricted bands (denoted by a * next to the frequency) specified in §15.205 and Section 8.10 of RSS-Gen are below the limit shown in Table 7-25.
2. All spurious emissions lying in restricted bands specified in §15.205 and Section 8.10 of RSS-Gen are below the limit shown in Table 7-25. All spurious emissions that do not lie in a restricted band are subject to a peak limit of -27dBm/MHz. At a distance of 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.
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 $_{[dB\mu V/m]}$

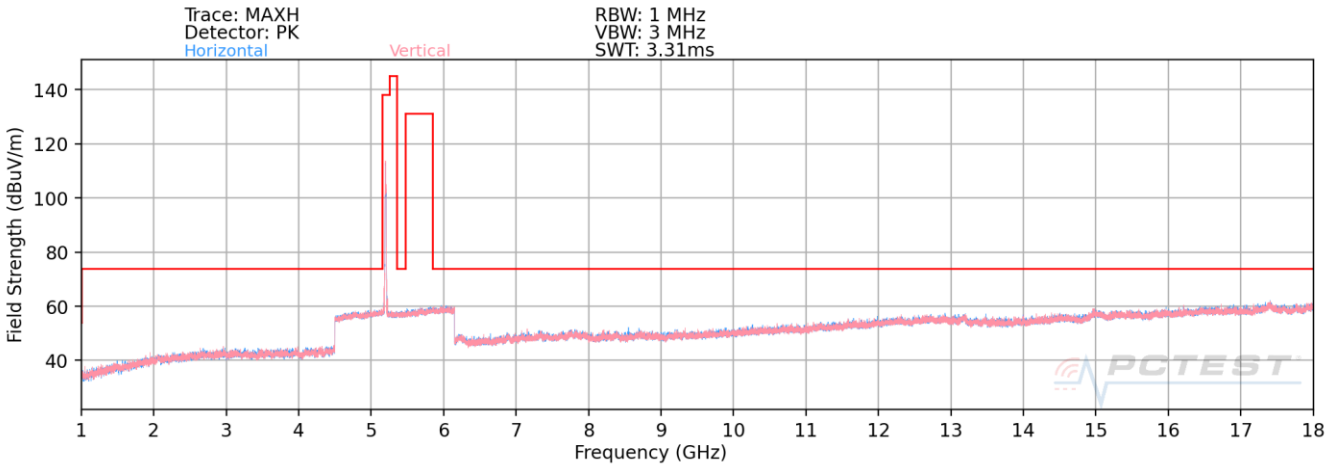
Radiated Band Edge Measurement Offset

- The amplitude offset shown in the radiated restricted band edge plots in Section 7.6 was calculated using the formula:

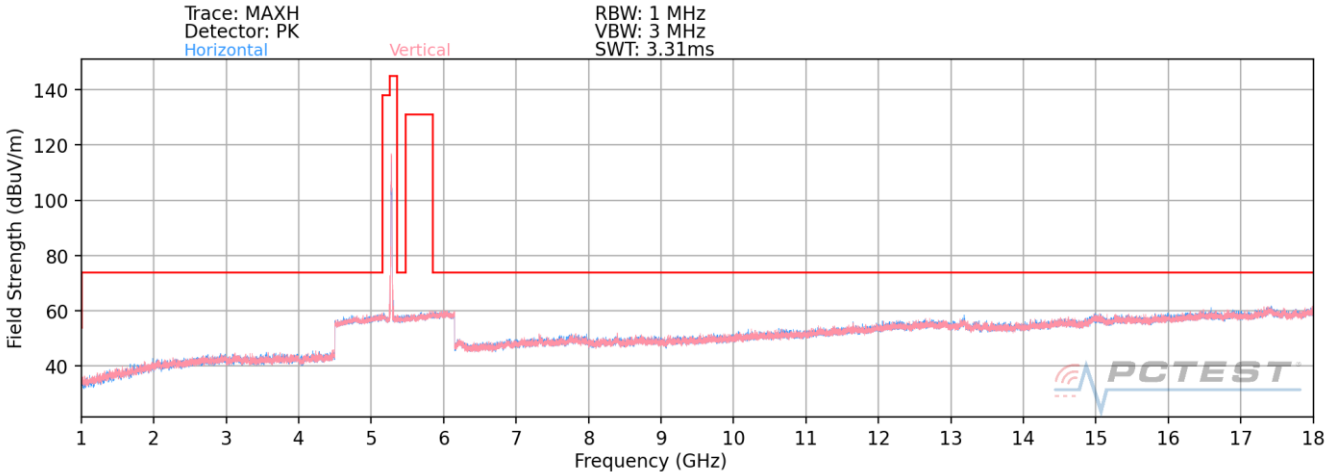
  Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

7.6.1 Radiated Spurious Emission Measurements

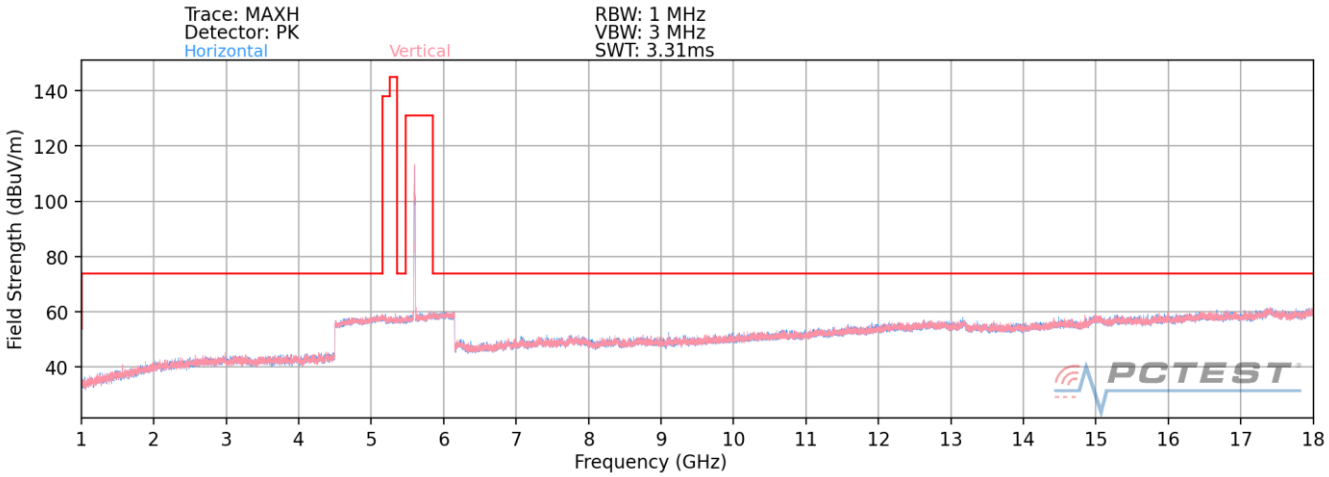
26 Tones



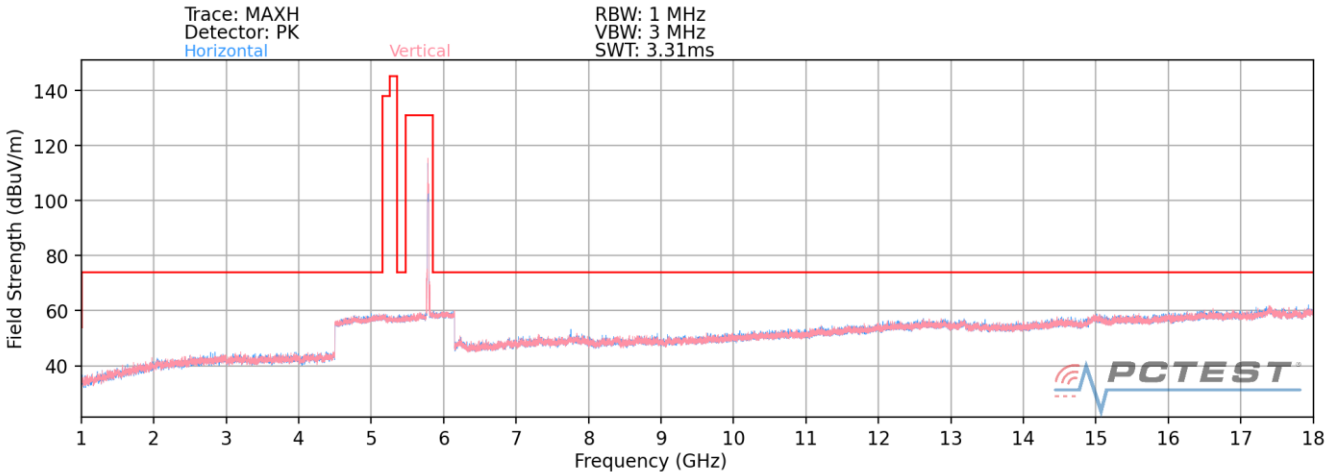
Plot 7-109. Radiated Spurious Plot above 1GHz (802.11ax – U1 Ch. 40 – 26 Tones)



Plot 7-110. Radiated Spurious Plot above 1GHz (802.11ax – U2A Ch. 56 – 26 Tones)



Plot 7-111. Radiated Spurious Plot above 1GHz (802.11ax – U2C Ch. 120 – 26 Tones)



Plot 7-112. Radiated Spurious Plot above 1GHz (802.11ax – U3 Ch. 157 – 26 Tones)