RHEIN TECH LABORATORIES, INC.

Engineering Solutions & Electromagnetic Compatibility Services

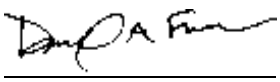
Certification Application Report
FCC Part 15.407 & ISED RSS-247

Test Lab:		Applicant:	
Rhein Tech Laboratories, Inc. Phone: 703-689 0368 360 Herndon Parkway www.rheintech.com Suite 1400 Herndon, VA 20170		L3Harris Technologies 221 Jefferson Ridge Parkway Lynchburg, VA 24501 USA	
FCC ID/ IC	OWDTR-0166-E/ 3636B-0166	**Test Report Date**	April 18, 2023
Platform	N/A	**RTL Work Order #**	2022003
Model / HVIN	XL-95P V/U / XL-x5-V/U	**RTL Quote Number**	QRTL22-003A

American National Standard Institute	ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
FCC Classification	NII-Unlicensed National Information Infrastructure TX
FCC Rule Part(s)	FCC Rules Part 15.407: Unlicensed National Information Infrastructure Devices - General Technical Requirements (10/01/21)
ISED Standards	RSS-247 Issue 2: Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices RSS-Gen Issue 5 Amendments 1/2: General Requirements for Compliance of Radio Apparatus
Digital Interface Information	Digital Interface was found to be compliant

Frequency Range (MHz)	Output Power (W) Conducted	Frequency Tolerance	Emission Designator
5180 – 5240	0.004	N/A	N/A
5745 – 5825	0.002	N/A	N/A

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards. Furthermore, there was no deviation from, additions to, or exclusions from, the applicable parts of FCC Part 2, FCC Part 15, ANSI C63.10, and ISED RSS-247 and RSS-Gen.

Signature:  Date: April 18, 2023

Typed/Printed Name: Desmond A. Fraser Position: President

These tests are accredited and meet the requirements of ISO/IEC 17025 as verified by ANAB.
Refer to certificate and scope of accreditation AT-1445.
This report replaces R1.2.

Table of Contents

1 General Information 6
1.1 Scope 6
1.2 Description of EUT 6
1.3 Test Facility 6
1.4 Related Submittal(s)/Grant(s) 6
1.5 Modifications 6
2 Test Information 7
2.1 Description of Test Modes 7
2.2 Exercising the EUT 7
2.3 Test Result Summary 7
2.4 Tested System Details 8
2.5 Configuration of Tested System 8
3 Maximum Output Power – FCC 15.407(a)(1) & (a)(3); RSS-247 6.2 9
3.1 Power Output Test Procedure 9
3.2 Power Output Test Results 9
4 Compliance with the Band Edge – FCC 15.407(b)(7); RSS-247 6.2 22
4.1 Band Edge Test Procedure 22
4.2 Restricted Band Edge Test Results 23
4.1 Band Edge Plots 23
5 Antenna Conducted Spurious Emissions – FCC 15.407(b)(6); RSS-247 6.2 31
5.1 Antenna Conducted Spurious Emissions Test Procedures 31
5.2 Antenna Conducted Spurious Emissions Test Results 31
6 Bandwidths – FCC 15.407(a) and (e); RSS-247 6.2; RSS-Gen 6.7 33
6.1 Bandwidth Test Procedure 33
6.2 Modulated Bandwidth Test Results 33
6.3 Bandwidth Plots – U-NII1 34
6.4 Bandwidth Plots – U-NII3 37
7 Power Spectral Density – FCC 15.407(a)(1) & (a)(3); RSS-247 6.2 52
7.1 Power Spectral Density Test Procedure 52
7.2 Power Spectral Density Test Results 52
7.3 Power Spectral Density Plots – U-NII1 53
7.4 Power Spectral Density Plots – U-NII3 56
8 Frequency Stability – FCC 15.407(g); RSS-Gen 6.11 59
8.1 Frequency Stability Test Procedure 59
8.2 Frequency Stability Test Result 59
9 AC Conducted Emissions – FCC 15.207; RSS-Gen 8.8 61
9.1 Conducted Emissions Test Procedure 61
9.2 Conducted Emissions Limits 61
9.3 Conducted Emissions Test Results 62
10 Radiated Emissions – FCC 15.407(b); 15.209; RSS-247 6.2; RSS-Gen 6.13/7.1 74
10.1 Limits of Radiated Emissions Measurement 74
10.2 Radiated Emissions Measurement Test Procedure 74
10.3 Radiated Emissions Test Results 75
11 Conclusion 78

Figure Index

Figure 2-1: Configuration of System Under Test 8

Table Index

Table 2-1: Channels Tested for Wi-Fi 802.11a 7
Table 2-2: Test Result Summary – FCC Part 15, Subpart C (Section 15.407); RSS-247, RSS-Gen 7
Table 2-3: Equipment Under Test (EUT) 8
Table 2-4: Support Equipment 8
Table 2-5: Auxiliary Equipment 8
Table 3-1: Power Output Test Equipment 9
Table 3-2: Power Output Test Data – U-NII1 – 802.11a (9.0 Mbps) 9
Table 3-3: Power Output Test Data – U-NII3 – 802.11a (48.0 Mbps) 9
Table 3-4: Power Output Test Data – U-NII1 – 802.11n (65.0 Mbps) 10
Table 3-5: Power Output Test Data – U-NII3 – 802.11n (65.0 Mbps) 10
Table 4-1: Band Edge Test Equipment 22
Table 5-1: Antenna Conducted Spurious Emissions Test Equipment 31
Table 6-1: Bandwidth Test Equipment 33
Table 6-2: Modulated Bandwidth Test Data – U-NII1 – 802.11a (9.0 Mbps) 33
Table 6-3: Modulated Bandwidth Test Data – U-NII1 – 802.11n (65.0 Mbps) 33
Table 6-4: Modulated Bandwidth Test Data – U-NII3 – 802.11a (9.0 Mbps) 33
Table 6-5: Modulated Bandwidth Test Data – U-NII3 – 802.11n (65.0 Mbps) 33
Table 7-1: Power Spectral Density Test Equipment 52
Table 7-2: Power Spectral Density Test Data – U-NII1 – 802.11a (9.0 Mbps), FCC 52
Table 7-3: Power Spectral Density Test Data – U-NII1 – 802.11a (9.0 Mbps), ISED 52
Table 7-4: Power Spectral Density Test Data – U-NII3 – 802.11a (48.0 Mbps) 52
Table 8-1: Frequency Stability Test Equipment 59
Table 8-2: Frequency Stability at Extreme Temperatures – U-NII1 59
Table 8-3: Frequency Stability at Extreme Voltage Levels – U-NII1 59
Table 8-4: Frequency Stability at Extreme Temperatures – U-NII3 59
Table 8-5: Frequency Stability at Extreme Voltage Levels – U-NII3 59
Table 9-1: Conducted Emissions Limits per FCC Part 15.207 61
Table 9-2: Conducted Emissions Test Equipment 61
Table 9-3: Conducted Emissions Test Result, AC, Neutral, U-NII1, 5180 MHz 62
Table 9-4: Conducted Emissions Test Result, AC, Line, U-NII1, 5180 MHz 63
Table 9-5: Conducted Emissions Test Result, AC, Neutral, U-NII1, 5200 MHz 64
Table 9-6: Conducted Emissions Test Result, AC, Line, U-NII1, 5200 MHz 65
Table 9-7: Conducted Emissions Test Result, AC, Neutral, U-NII1, 5240 MHz 66
Table 9-8: Conducted Emissions Test Result, AC, Line, U-NII1, 5240 MHz 67
Table 9-9: Conducted Emissions Test Result, AC, Neutral, U-NII3, 5745 MHz 68
Table 9-10: Conducted Emissions Test Result, AC, Line, U-NII3, 5745 MHz 69
Table 9-11: Conducted Emissions Test Result, AC, Neutral, U-NII3, 5785 MHz 70
Table 9-12: Conducted Emissions Test Result, AC, Line, U-NII3, 5785 MHz 71
Table 9-13: Conducted Emissions Test Result, AC, Neutral, U-NII3, 5825 MHz 72
Table 9-14: Conducted Emissions Test Result, AC, Line, U-NII3, 5825 MHz 73
Table 10-1: Radiated Emissions Test Equipment 75
Table 10-2: Radiated Emissions Harmonics/Spurious – 5180 MHz, Restricted 75
Table 10-3: Radiated Emissions Harmonics/Spurious – 5180 MHz, Non-Restricted, Peak 75
Table 10-4: Radiated Emissions Harmonics/Spurious – 5200 MHz, Restricted 76
Table 10-5: Radiated Emissions Harmonics/Spurious – 5200 MHz, Non-Restricted, Peak 76
Table 10-6: Radiated Emissions Harmonics/Spurious – 5240 MHz, Restricted 76
Table 10-7: Radiated Emissions Harmonics/Spurious – 5240 MHz, Non-Restricted, Peak 76
Table 10-8: Radiated Emissions Harmonics/Spurious – 5745 MHz, Restricted 77
Table 10-9: Radiated Emissions Harmonics/Spurious – 5745 MHz, Non-Restricted, Peak 77

Table 10-10: Radiated Emissions Harmonics/Spurious – 5785 MHz, Restricted 77
Table 10-11: Radiated Emissions Harmonics/Spurious – 5785 MHz, Non-Restricted, Peak 77
Table 10-12: Radiated Emissions Harmonics/Spurious – 5825 MHz, Restricted 78
Table 10-13: Radiated Emissions Harmonics/Spurious – 5825 MHz, Non-Restricted, Peak 78

Plot Index

Plot 3-1: Power Output – U-NII1 – 802.11a (9.0 Mbps) – 5180 MHz 10
Plot 3-2: Power Output – U-NII1 – 802.11a (9.0 Mbps) – 5200 MHz 11
Plot 3-3: Power Output – U-NII1 – 802.11a (9.0 Mbps) – 5240 MHz 12
Plot 3-4: Power Output – U-NII3– 802.11a (48.0 Mbps) – 5745 MHz 13
Plot 3-5: Power Output – U-NII3 – 802.11a (48.0 Mbps) – 5785 MHz 14
Plot 3-6: Power Output – U-NII3– 802.11a (48.0 Mbps) – 5825 MHz 15
Plot 3-7: Power Output – U-NII1 – 802.11n (65.0 Mbps) – 5180 MHz 16
Plot 3-8: Power Output – U-NII1 – 802.11n (65.0 Mbps) – 5200 MHz 17
Plot 3-9: Power Output – U-NII1 – 802.11n (65.0 Mbps) – 5240 MHz 18
Plot 3-10: Power Output – U-NII1 – 802.11n (65.0 Mbps) – 5745 MHz 19
Plot 3-11: Power Output – U-NII1 – 802.11n (65.0 Mbps) – 5785 MHz 20
Plot 3-12: Power Output – U-NII1 – 802.11n (65.0 Mbps) – 5825 MHz 21
Plot 4-1: Lower Band Edge – U-NII1 – 802.11a (48.0 Mbps) – Average 23
Plot 4-2: Lower Band Edge – U-NII1 – 802.11a (48.0 Mbps) – Peak 24
Plot 4-3: Upper Band Edge – U-NII1 – 802.11a (48.0 Mbps) – Average 25
Plot 4-4: Upper Band Edge – U-NII1 – 802.11a (48.0 Mbps) – Peak 26
Plot 4-5: Lower Band Edge – Average – U-NII3 – 802.11a (12.0 Mbps) 27
Plot 4-6: Lower Band Edge – Peak – U-NII3 – 802.11a (12.0 Mbps) 28
Plot 4-7: Upper Band Edge – Average – U-NII3 – 802.11a (12.0 Mbps) 29
Plot 4-8: Upper Band Edge – Peak – U-NII3 – 802.11a (12.0 Mbps) 30
Plot 5-1: 5240 MHz in the band 5250-5350 – 802.11n (65.0 Mbps) 32
Plot 6-1: 99% Bandwidth – 5180 MHz – 802.11a (9.0 Mbps) 34
Plot 6-2: 99% Bandwidth – 5200 MHz – 802.11a (9.0 Mbps) 35
Plot 6-3: 99% Bandwidth – 5240 MHz – 802.11a (9.0 Mbps) 36
Plot 6-4: 99% Bandwidth – 5745 MHz – 802.11a (9.0 Mbps) 37
Plot 6-5: 6 dB Bandwidth – 5745 MHz – 802.11a (9.0 Mbps) 38
Plot 6-6: 99% Bandwidth – 5785 MHz – 802.11a (9.0 Mbps) 39
Plot 6-7: 6 dB Bandwidth – 5785 MHz – 802.11a (9.0 Mbps) 40
Plot 6-8: 99% Bandwidth – 5825 MHz – 802.11a (9.0 Mbps) 41
Plot 6-9: 6 dB Bandwidth – 5825 MHz – 802.11a (9.0 Mbps) 42
Plot 6-10: 99% Bandwidth – 5180 MHz – 802.11n (65.0 Mbps) 43
Plot 6-11: 99% Bandwidth – 5200 MHz – 802.11n (65.0 Mbps) 44
Plot 6-12: 99% Bandwidth – 5240 MHz – 802.11n (65.0 Mbps) 45
Plot 6-13: 99% Bandwidth – 5745 MHz – 802.11n (65.0 Mbps) 46
Plot 6-14: 99% Bandwidth – 5785 MHz – 802.11n (65.0 Mbps) 47
Plot 6-15: 99% Bandwidth – 5825 MHz – 802.11n (65.0 Mbps) 48
Plot 6-16: 6 dB Bandwidth – 5745 MHz – 802.11n (65.0 Mbps) 49
Plot 6-17: 6 dB Bandwidth – 5785 MHz – 802.11n (65.0 Mbps) 50
Plot 6-18: 6 dB Bandwidth – 5825 MHz – 802.11n (65.0 Mbps) 51
Plot 7-1: Power Spectral Density – 5180 MHz – 802.11a (9.0 Mbps) 53
Plot 7-2: Power Spectral Density – 5200 MHz – 802.11a (9.0 Mbps) 54
Plot 7-3: Power Spectral Density – 5240 MHz – 802.11a (9.0 Mbps) 55
Plot 7-4: Power Spectral Density – 5745 MHz – 802.11a (48.0 Mbps) 56
Plot 7-5: Power Spectral Density – 5785 MHz – 802.11a (48.0 Mbps) 57
Plot 7-6: Power Spectral Density – 5825 MHz – 802.11a (48.0 Mbps) 58
Plot 9-1: Conducted Emissions, AC, Neutral, U-NII1, 5180 MHz 62
Plot 9-2: Conducted Emissions, AC, Line, U-NII1, 5180 MHz 63

Plot 9-3: Conducted Emissions, AC, Neutral, U-NII1, 5200 MHz 64
Plot 9-4: Conducted Emissions, AC, Line, U-NII1, 5200 MHz 65
Plot 9-5: Conducted Emissions, AC, Neutral, U-NII1, 5240 MHz 66
Plot 9-6: Conducted Emissions, AC, Line, U-NII1, 5240 MHz 67
Plot 9-7: Conducted Emissions, AC, Neutral, U-NII3, 5745 MHz 68
Plot 9-8: Conducted Emissions, AC, Line, U-NII3, 5745 MHz 69
Plot 9-9: Conducted Emissions, AC, Neutral, U-NII3, 5785 MHz 70
Plot 9-10: Conducted Emissions, AC, Line, U-NII3, 5785 MHz 71
Plot 9-11: Conducted Emissions, AC, Neutral, U-NII3, 5825 MHz 72
Plot 9-12: Conducted Emissions, AC, Line, U-NII3, 5825 MHz 73

1 General Information

1.1 Scope

Applicable Standards

- FCC Rules Part 15.407: Unlicensed National Information Infrastructure Devices - General Technical Requirements
- ISED RSS-247: Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
- ISED RSS-Gen Issue 5 Amendments 1/2: General Requirements for Compliance of Radio Apparatus

1.2 Description of EUT

Equipment Under Test	Portable Radio
Model / Model #	XL-95P Multi-Band Portable, V/U
Power Supply	7.4 VDC
Modulation Type	OFDM (802.11a,n)
Frequency Range	5180 – 5240 MHz, 5745 – 5825 MHz

1.3 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170.

ISED CAB ID: US0079, Company Number: 2956A.

1.4 Related Submittal(s)/Grant(s)

This is an original certification application for L3Harris Technologies XL-95P Multi-Band Portable V/U Radio, HVIN: XL-x5-V/U, FCC ID: OWDTR-0166-E, IC: 3636B-0166.

1.5 Modifications

No modifications were required for compliance.

2 Test Information

2.1 Description of Test Modes

In accordance with FCC 15.31(m), and because the EUT utilizes an operating band greater than 10 MHz, the following frequencies were tested.

Table 2-1: Channels Tested for Wi-Fi 802.11a

Channel (#)	Frequency (MHz)
36 (U-NII1)	5180
40 (U-NII1)	5200
48 (U-NII1)	5240
149 (U-NII3)	5745
157 (U-NII3)	5785
165 (U-NII3)	5825

2.2 Exercising the EUT

The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. The EUT was provided with software to continuously transmit during testing. The carrier was also checked to verify that information was being transmitted; all modes were investigated and the worst-case mode was used for final testing. There were no deviations from the test standard(s) and/or methods. The test results reported relate only to the item tested.

2.3 Test Result Summary

Table 2-2: Test Result Summary – FCC Part 15, Subpart C (Section 15.407); RSS-247, RSS-Gen

FCC	ISED	Test	Result
FCC 15.207	RSS-Gen 8.8	AC Conducted Emissions	Pass
FCC 15.209	RSS-247 6.2; RSS-Gen 6.13	Radiated Emissions	Pass
FCC 15.407(a/1/3)	RSS-247 6.2; RSS-Gen 6.12	Maximum Peak Power Output	Pass
FCC 15.407(a/1/3)	RSS-247 6.2	Power Spectral Density	Pass
FCC 15.407(g)	RSS-Gen 6.11	Frequency Stability	Pass
FCC 15.407(b)(7)	RSS-247 6.2	Band Edge Measurement	Pass
FCC 15.407(b)(6)	RSS-247 6.2	Antenna Conducted Spurious Emissions	Pass
FCC 15.407(a) and (e)	RSS-247 6.2	26 dB and 6dB Bandwidth	Pass
N/A	RSS-Gen 6.7/ TRC-43	99% Bandwidth	Pass

2.4 Tested System Details

The test samples were received on December 10, 2020 and August 22, 2022. The FCC identifiers for all applicable equipment, plus descriptions of all cables used in the tested system, are identified in the following tables.

Table 2-3: Equipment Under Test (EUT)

Part	Manufacturer	Model / HVIN	Serial Number	FCC ID	RTL Bar Code
Handheld Radio (conducted)	L3Harris Technologies	XL-95P 7/800 MHz	A40198E2A016	OWDTR-0162-E	23756
Radio (radiated)	L3Harris Technologies	XL-95P V/U	A40199E24A-001	OWDTR-0166-E	24159
Radio (radiated)	L3Harris Technologies	XL-95P V/U	A40199E24A-002	OWDTR-0166-E	24216

Table 2-4: Support Equipment

Part	Manufacturer	Model	PN/SN	FCC ID	RTL Bar Code
Laptop	ASUS	N550J	F2N0CY33003067G	N/A	N/A

Table 2-5: Auxiliary Equipment

Part	Manufacturer	Model	PN/SN	FCC ID	RTL Bar Code
Handheld Mic	L3Harris Technologies	N/A	01HE3327	N/A	23762

2.5 Configuration of Tested System

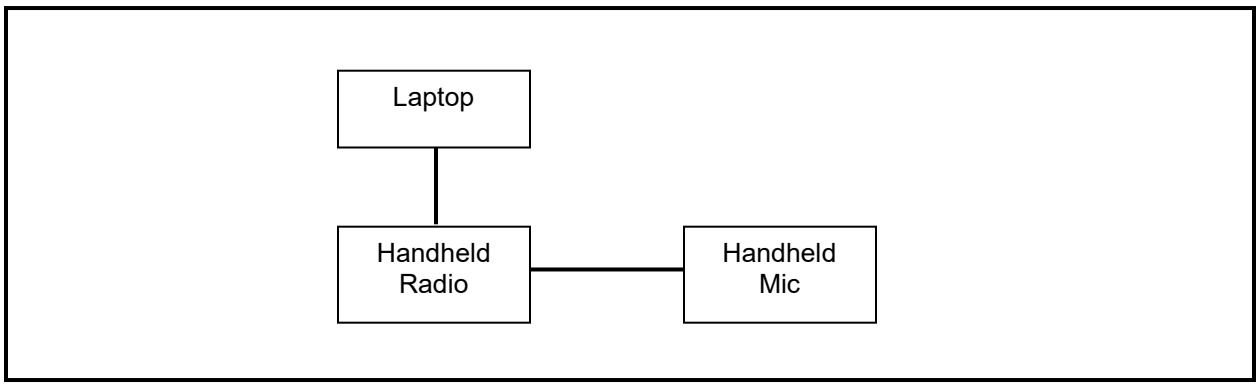


Figure 2-1: Configuration of System Under Test

3 Maximum Output Power – FCC 15.407(a)(1) & (a)(3); RSS-247 6.2

3.1 Power Output Test Procedure

ANSI C63.10 12.4.2.6 Method SA-3
Method SA-3 uses rms detection with max-hold. The procedure for this method is as follows:
a) Set span to encompass the entire 99% OBW of the signal.
b) Set sweep trigger to "free run."
c) Set RBW = 1 MHz.
d) Set VBW ≥ 3 MHz
e) Number of points in sweep ≥ [2 × span / RBW]. (This gives bin-to-bin spacing ≤ RBW / 2, so that narrowband signals are not lost between frequency bins.)
f) Sweep time ≤ [(number of points in sweep) × T], where T is defined in 12.2. If this gives a sweep time less than the auto sweep time of the instrument, then method SA-3A shall not be used. (The purpose of this step is so that averaging time in each bin is less than or equal to the minimum time of a transmission.)
g) Detector = Power averaging (rms).
h) Trace mode = max-hold.
i) Allow max-hold to run for at least 60 s or longer as needed to allow the trace to stabilize.
j) Compute power by integrating the spectrum across the 99% OBW of the signal using the instrument's band-power measurement function with band limits set equal to the EBW or OBW band-edges.

Note that the peak gain of the antenna in the 5 GHz band is -0.45 dBi. The more stringent ISED limit is shown for the U-NII1 band. As the device passes the ISED limit, it will also pass the FCC limit (30 dBm).

Table 3-1: Power Output Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	12/01/2024

3.2 Power Output Test Results

Table 3-2: Power Output Test Data – U-NII1 – 802.11a (9.0 Mbps)

Channel (#)	Frequency (MHz)	Conducted Avg. Power (dBm)	ISED Limit (dBm)	Margin (dB)
36	5180	6.3	23.0	-16.7
40	5200	6.1	23.0	-16.9
48	5240	5.8	23.0	-17.2

Table 3-3: Power Output Test Data – U-NII3 – 802.11a (48.0 Mbps)

Channel (#)	Frequency (MHz)	Conducted Avg. Power (dBm)	Limit (dBm)	Margin (dB)
149	5745	3.3	30.0	-26.7
157	5785	3.1	30.0	-26.9
165	5825	2.9	30.0	-27.1

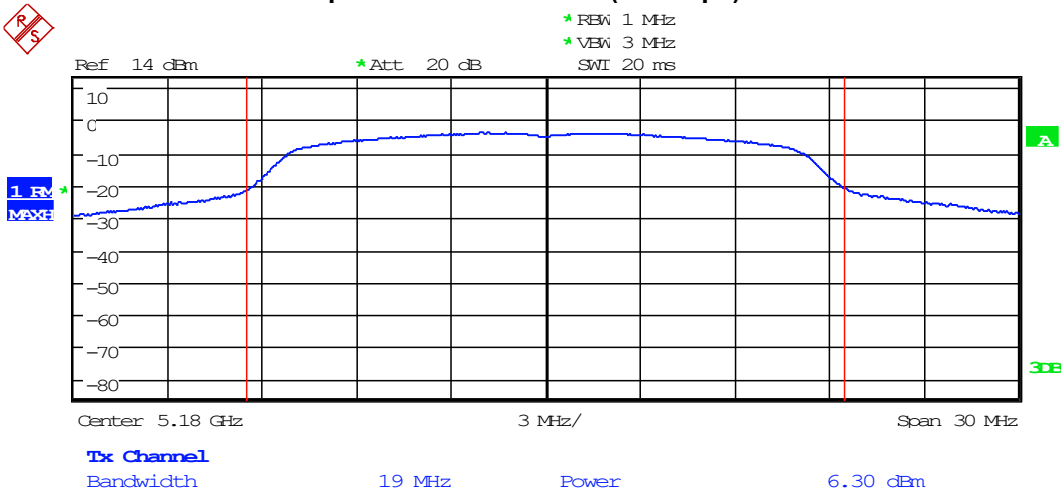
Table 3-4: Power Output Test Data – U-NII1 – 802.11n (65.0 Mbps)

Channel (#)	Frequency (MHz)	Conducted Avg. Power (dBm)	Limit (dBm)	Margin (dB)
36	5180	2.0	30.0	-28.0
40	5200	1.9	30.0	-28.1
48	5240	1.7	30.0	-28.3

Table 3-5: Power Output Test Data – U-NII3 – 802.11n (65.0 Mbps)

Channel (#)	Frequency (MHz)	Conducted Avg. Power (dBm)	Limit (dBm)	Margin (dB)
149	5745	-0.6	30.0	-30.6
157	5785	-1.1	30.0	-31.1
165	5825	-1.5	30.0	-31.5

Plot 3-1: Power Output – U-NII1 – 802.11a (9.0 Mbps) – 5180 MHz



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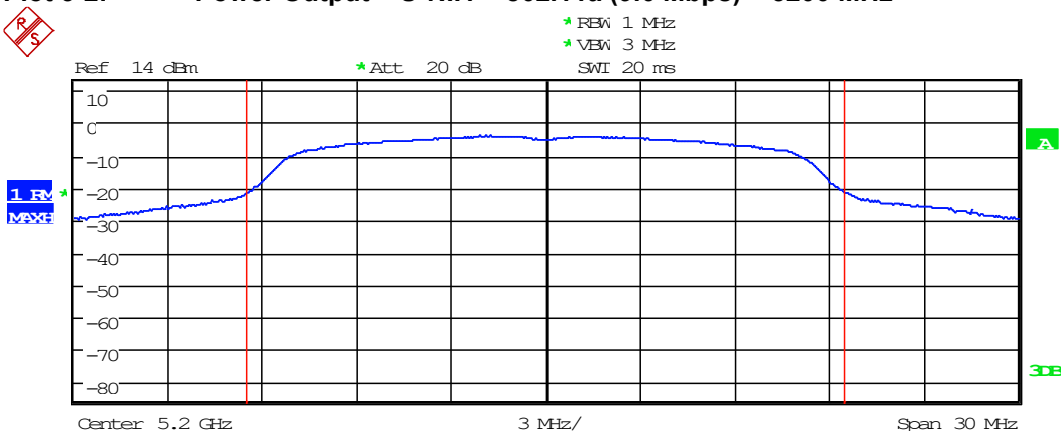
Plot 3-2: Power Output – U-NII1 – 802.11a (9.0 Mbps) – 5200 MHz



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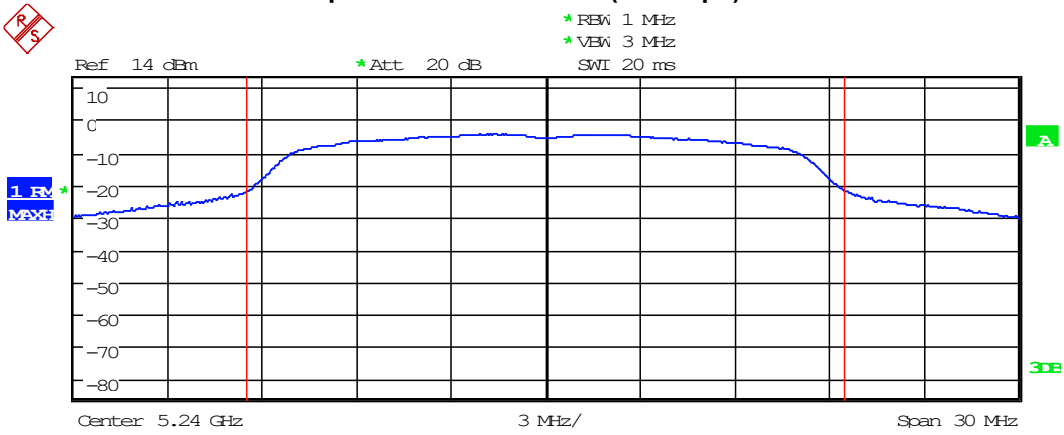
Plot 3-3: Power Output – U-NII1 – 802.11a (9.0 Mbps) – 5240 MHz



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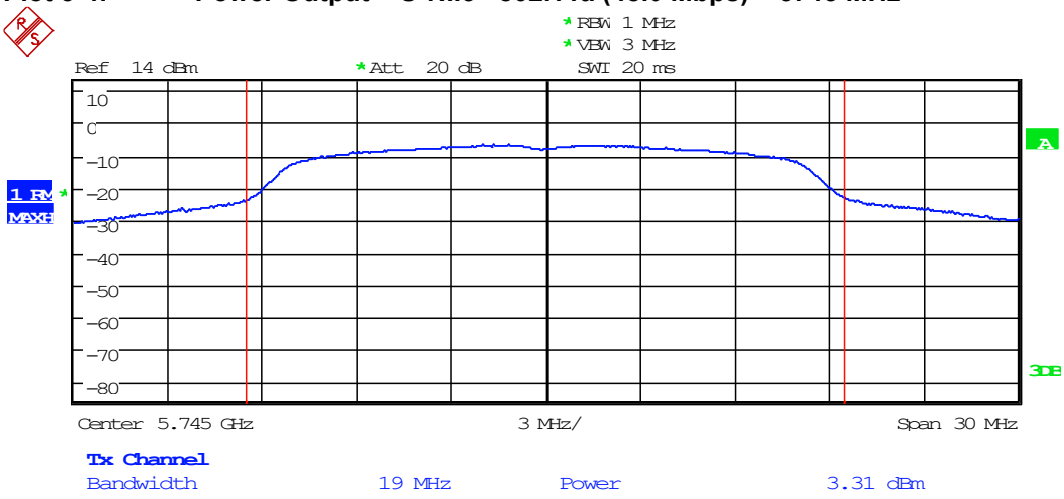
Plot 3-4: Power Output – U-NII3– 802.11a (48.0 Mbps) – 5745 MHz



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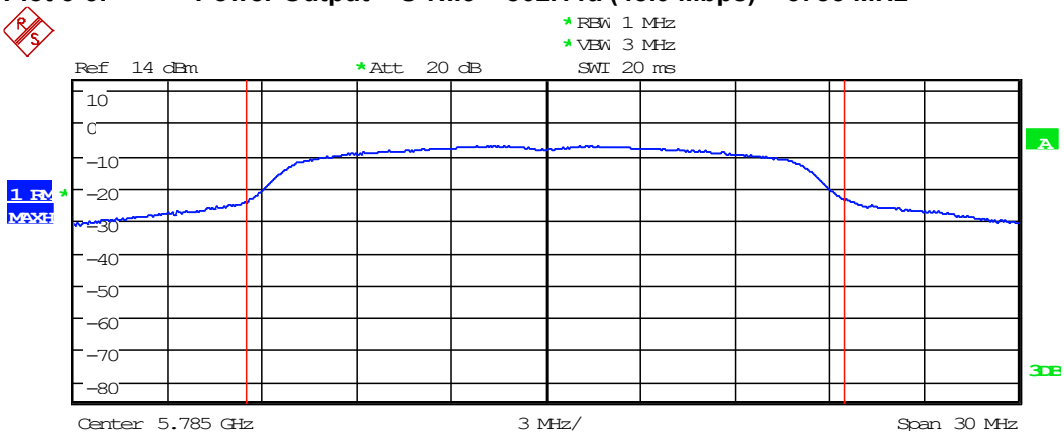
Plot 3-5: Power Output – U-NII3 – 802.11a (48.0 Mbps) – 5785 MHz



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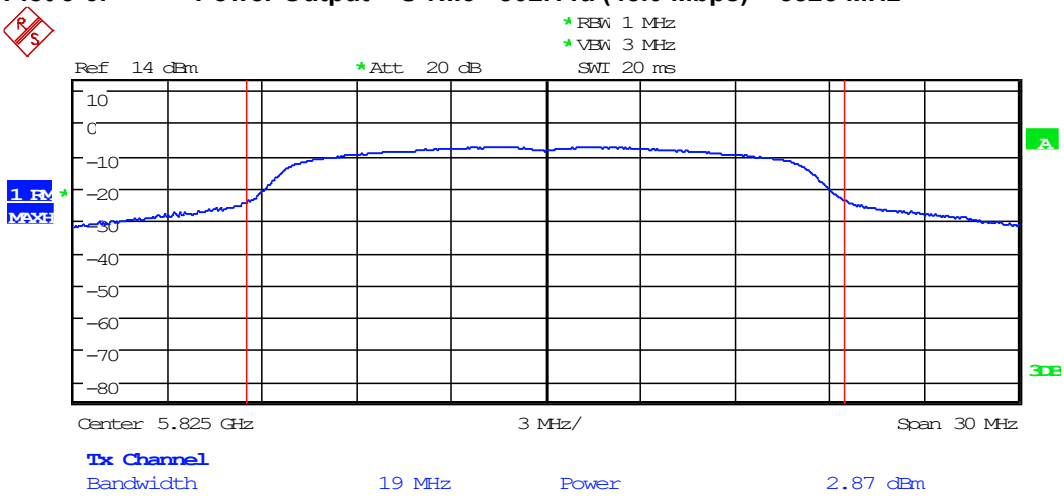
Plot 3-6: Power Output – U-NII3– 802.11a (48.0 Mbps) – 5825 MHz



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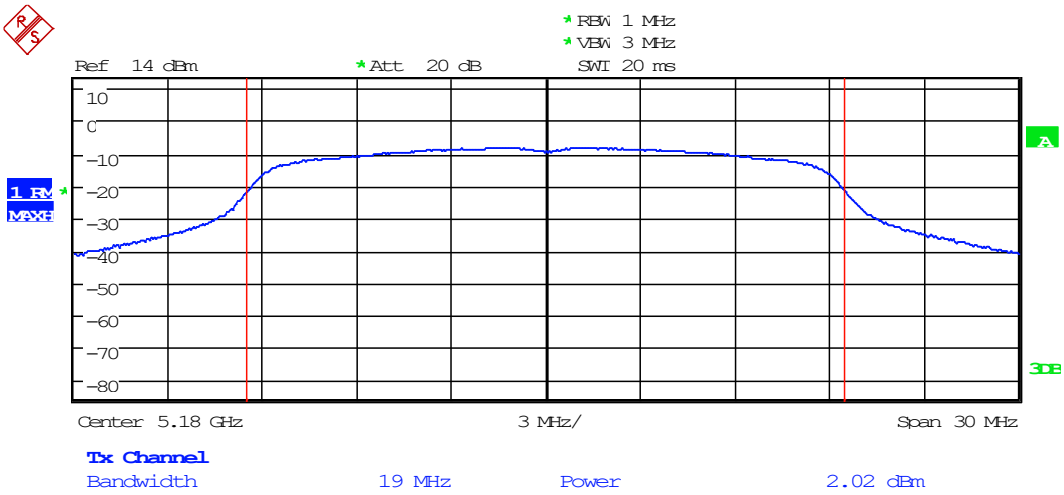
Plot 3-7: Power Output – U-NII1 – 802.11n (65.0 Mbps) – 5180 MHz



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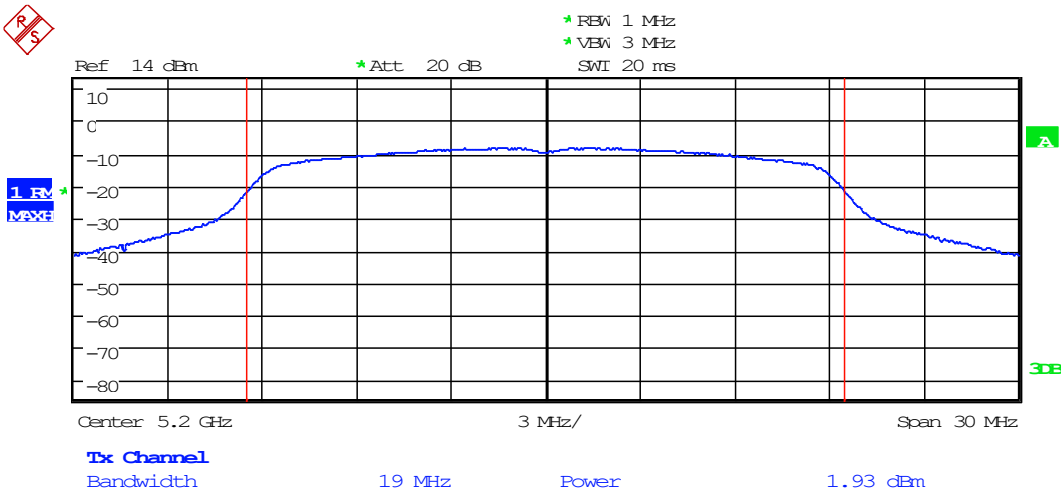
Plot 3-8: Power Output – U-NII1 – 802.11n (65.0 Mbps) – 5200 MHz



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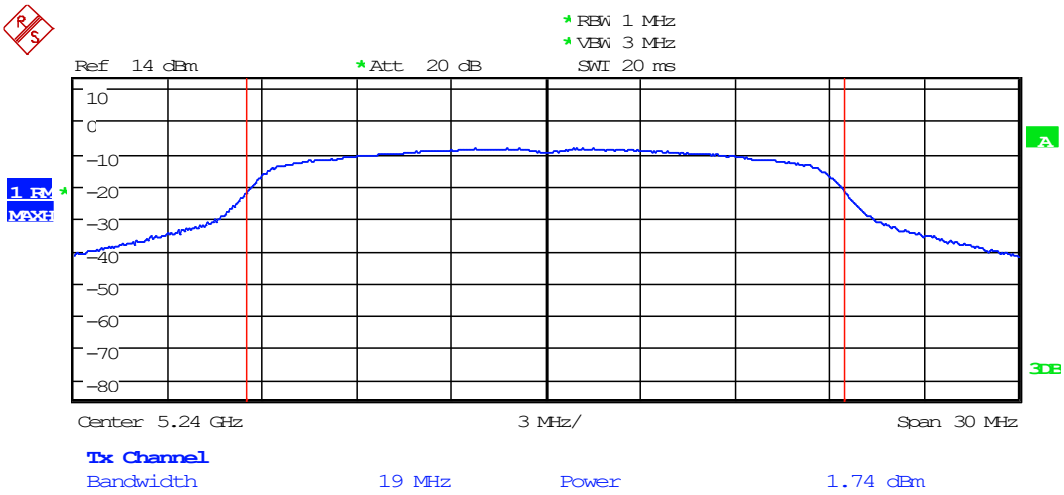
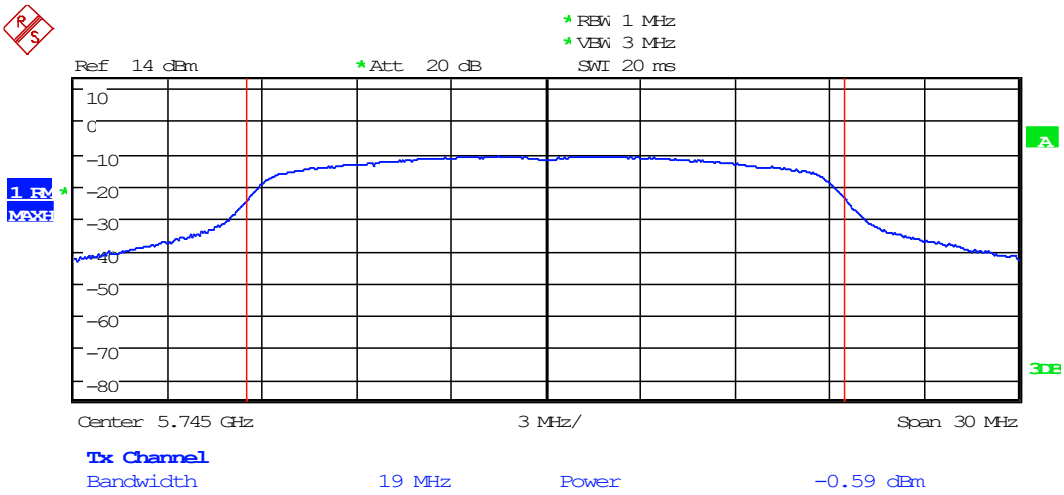
Plot 3-9: Power Output – U-NII1 – 802.11n (65.0 Mbps) – 5240 MHz



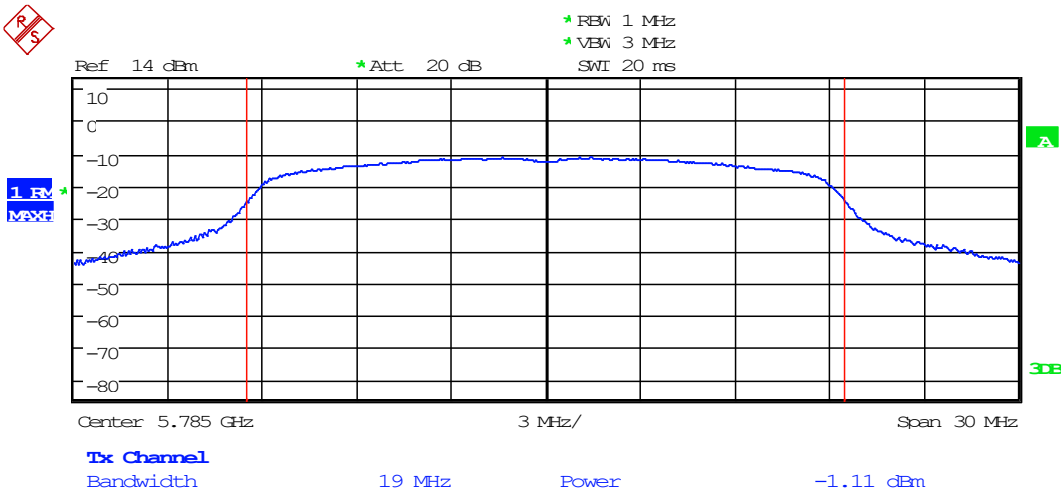
Date: 17.APR.2023 16:03:00

Plot 3-10: Power Output – U-NII1 – 802.11n (65.0 Mbps) – 5745 MHz



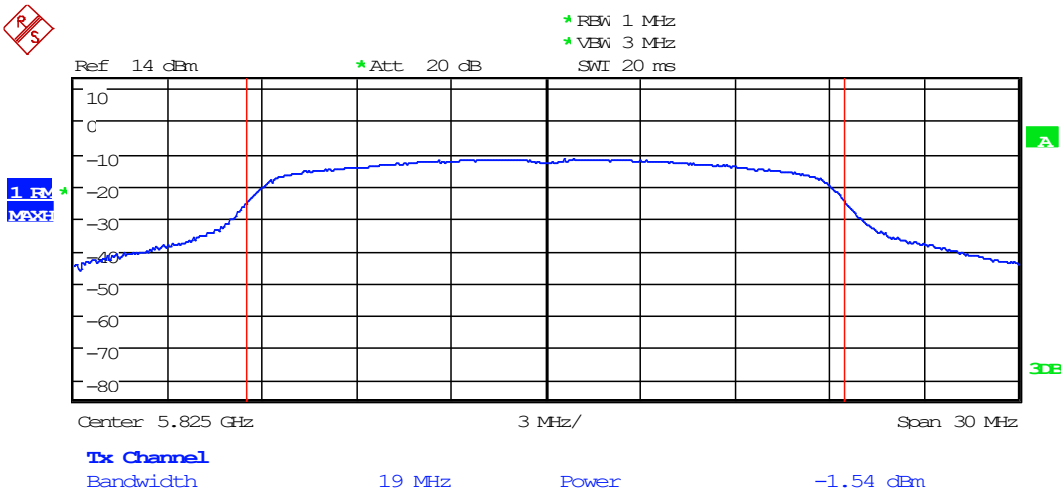
Date: 17.APR.2023 16:12:16

Plot 3-11: Power Output – U-NII1 – 802.11n (65.0 Mbps) – 5785 MHz



Date: 17.APR.2023 16:14:48

Plot 3-12: Power Output – U-NII1 – 802.11n (65.0 Mbps) – 5825 MHz



Date: 17.APR.2023 16:17:17

Measurement uncertainty: ±0.5 dB. This measurement uncertainty is an expanded uncertainty for 95% confidence level received with a coverage factor k=2.

Results: Pass

Test Personnel:

Dan Baltzell		April 17, 2023
Test Engineer	Signature	Date of Test

4 Compliance with the Band Edge – FCC 15.407(b)(7); RSS-247 6.2

4.1 Band Edge Test Procedure

The transmitter output was connected to its appropriate antenna. 1 MHz integrated peak and 1 MHz integrated average corrected measurements were taken within the restricted band to show compliance.

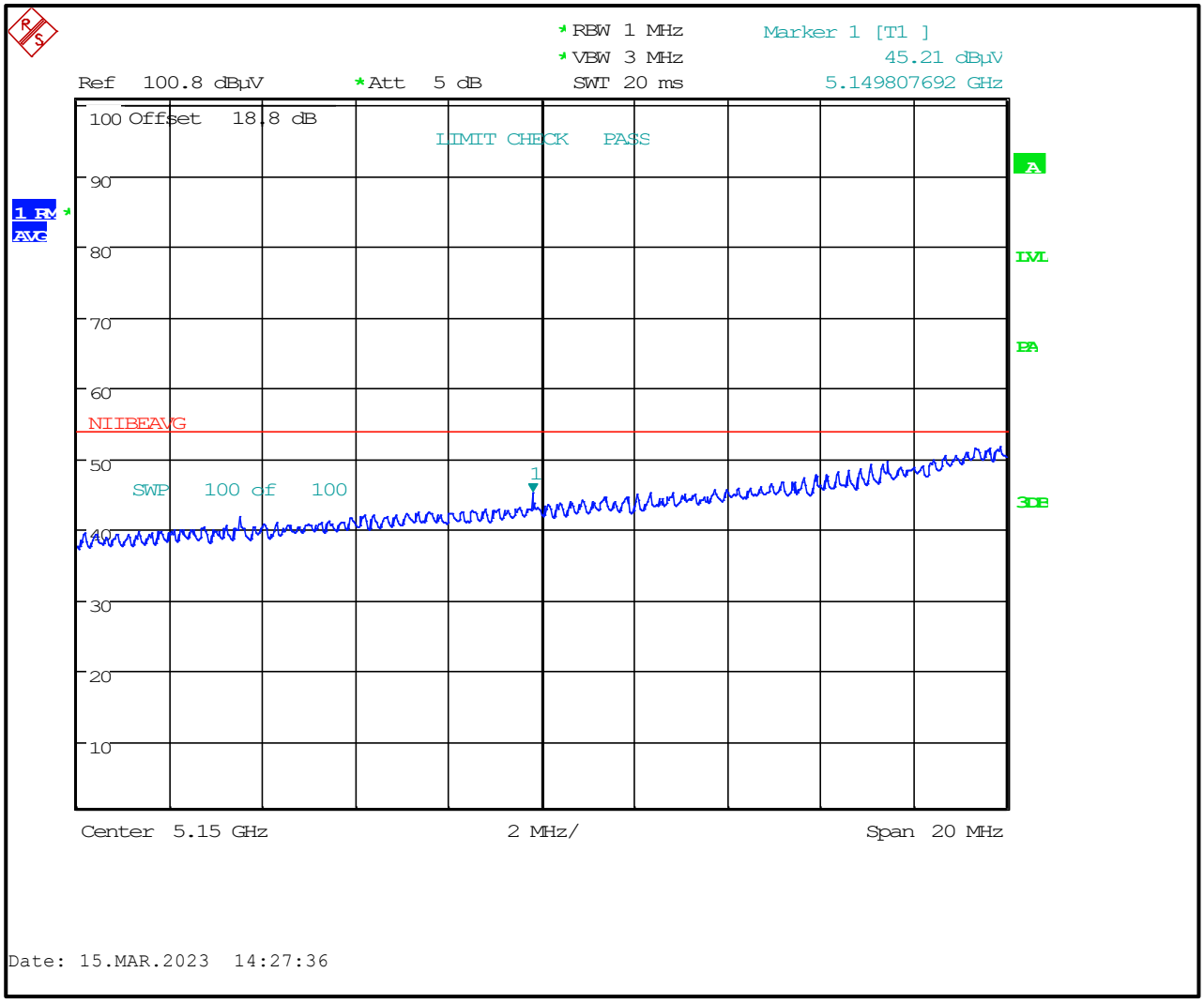
Table 4-1: Band Edge Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	12/01/2024
900321	EMCO	3161-03	Horn Antennas (4.0–8.2 GHz)	9508-1020	08/05/2024

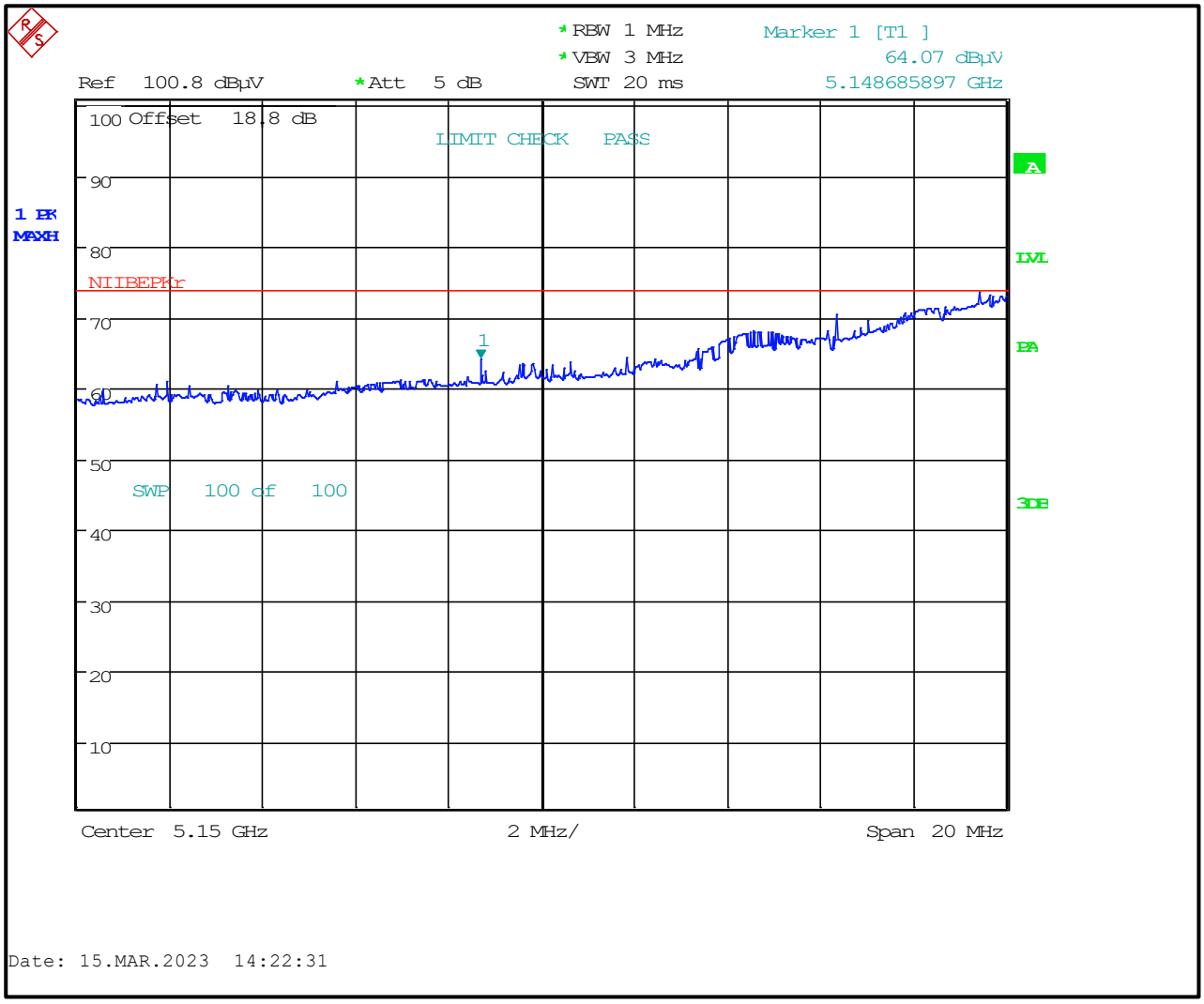
4.2 Restricted Band Edge Test Results

4.1 Band Edge Plots

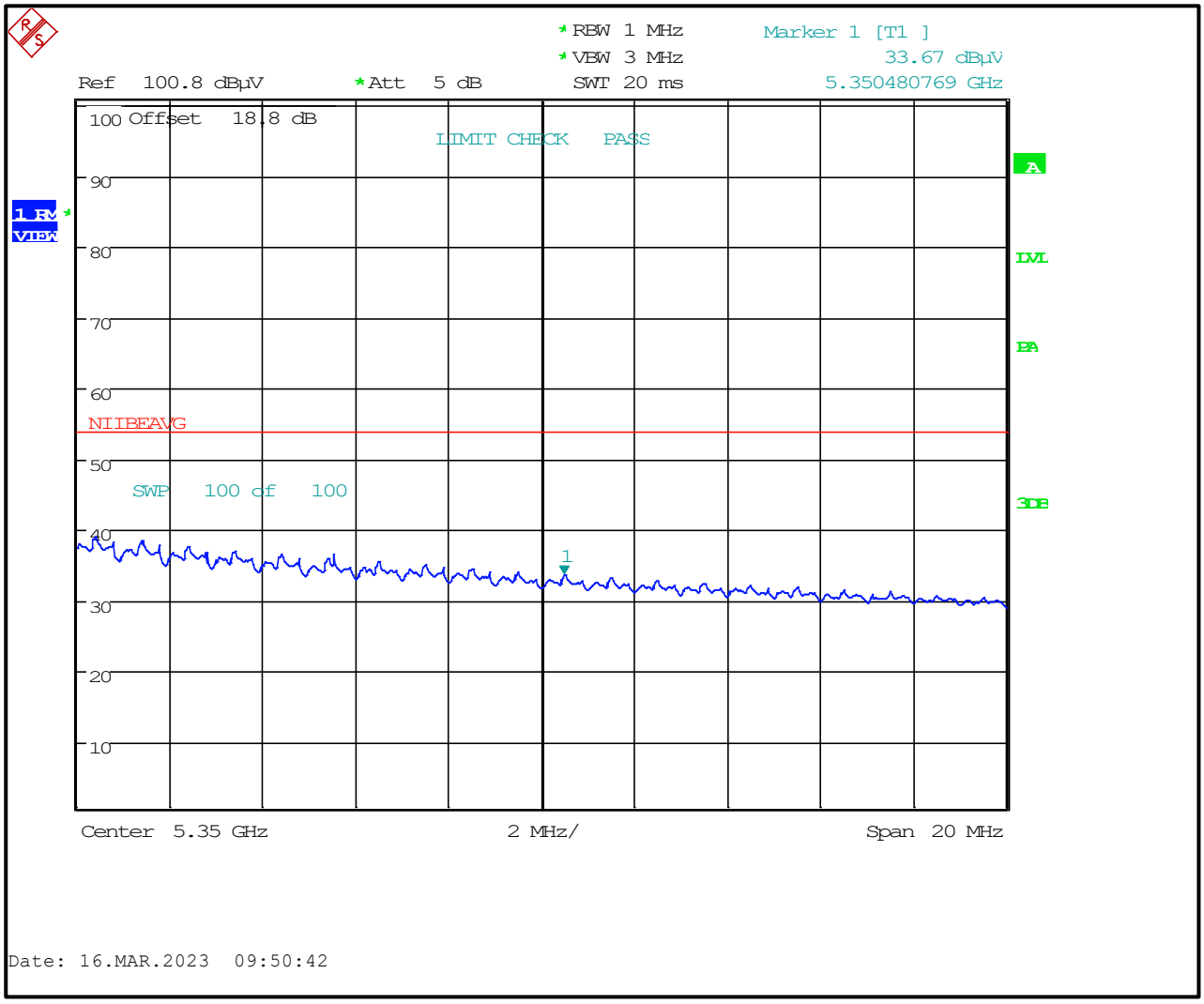
Plot 4-1: Lower Band Edge – U-NII1 – 802.11a (48.0 Mbps) – Average



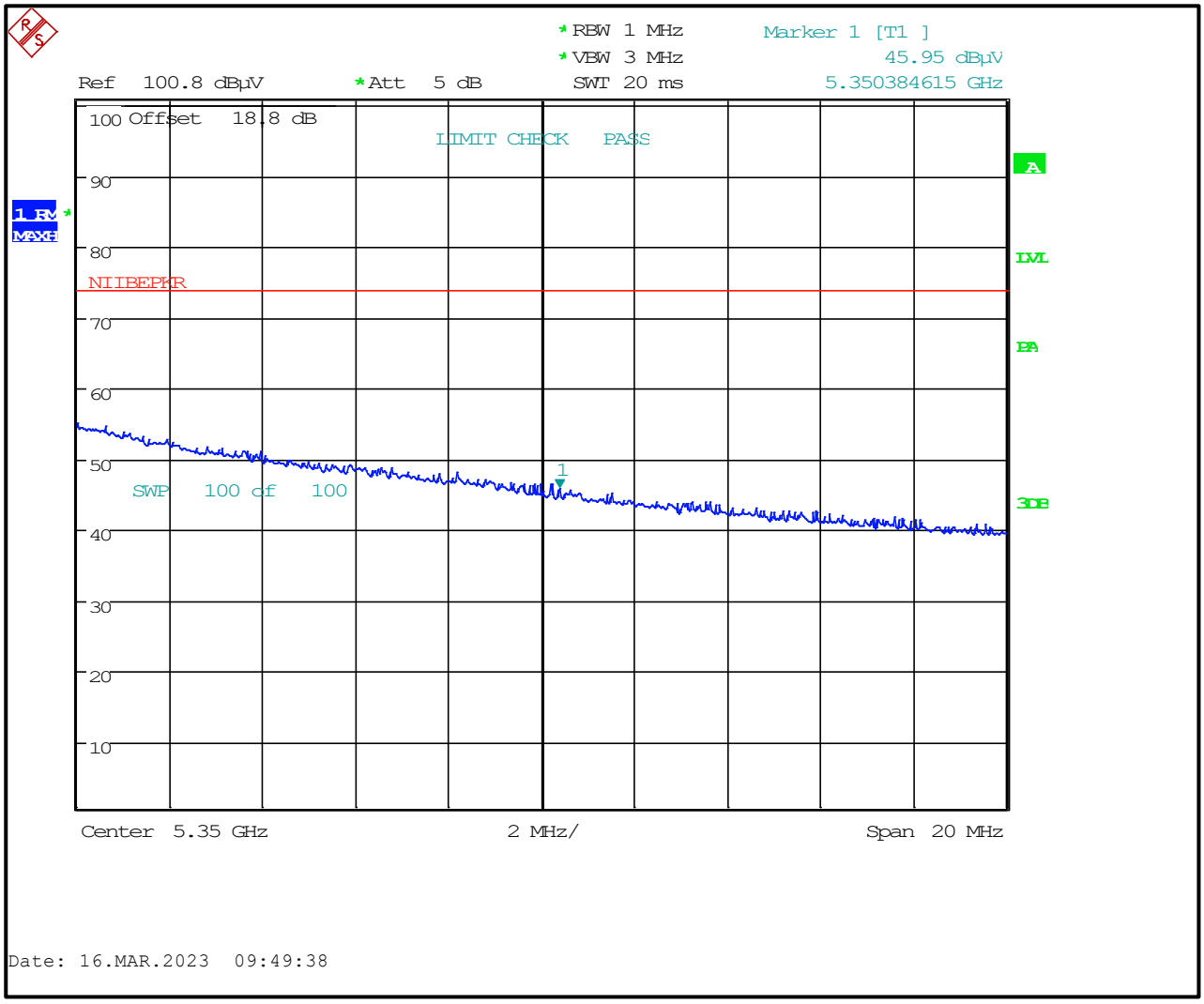
Plot 4-2: Lower Band Edge – U-NII1 – 802.11a (48.0 Mbps) – Peak



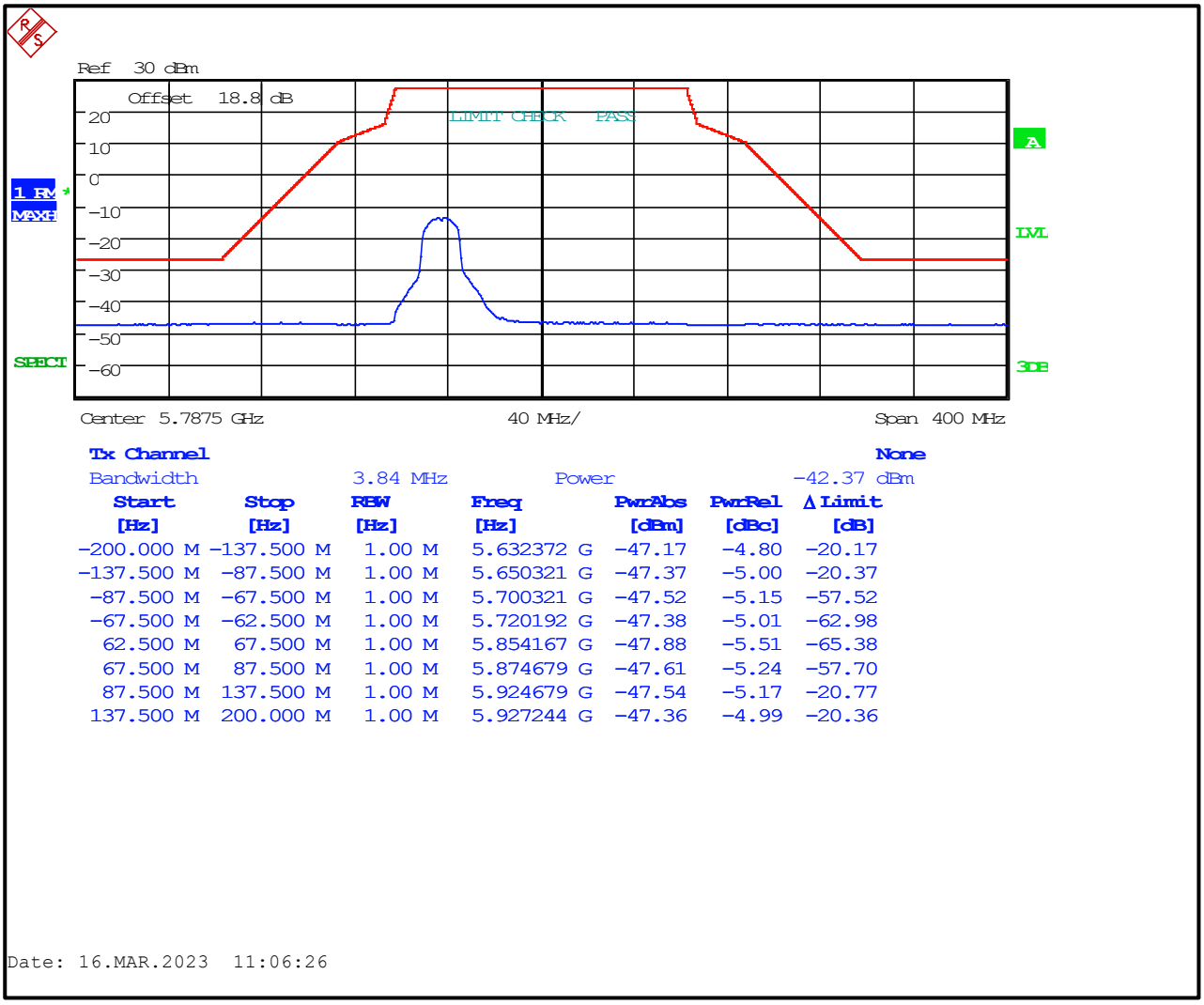
Plot 4-3: Upper Band Edge – U-NII1 – 802.11a (48.0 Mbps) – Average



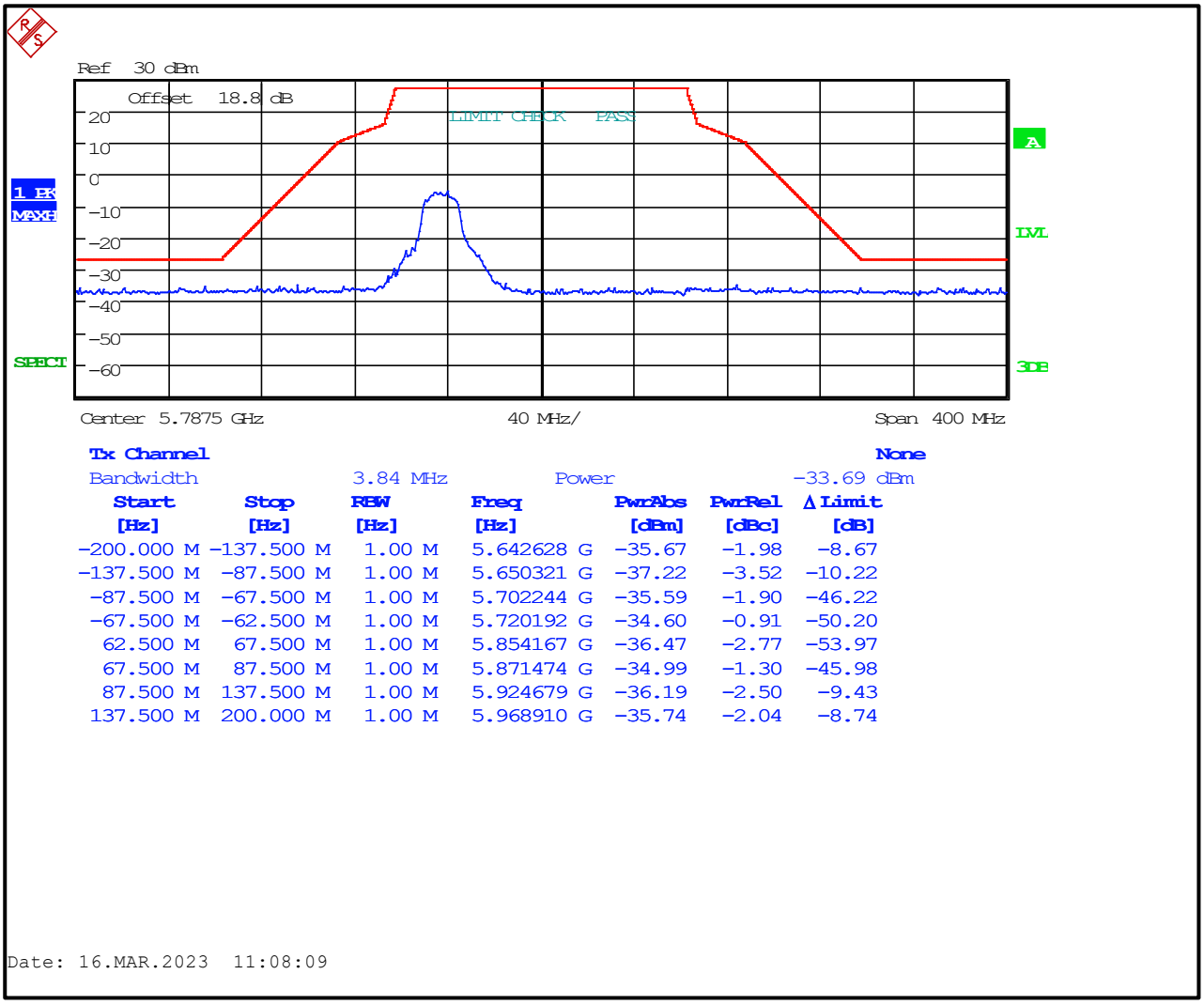
Plot 4-4: Upper Band Edge – U-NII1 – 802.11a (48.0 Mbps) – Peak



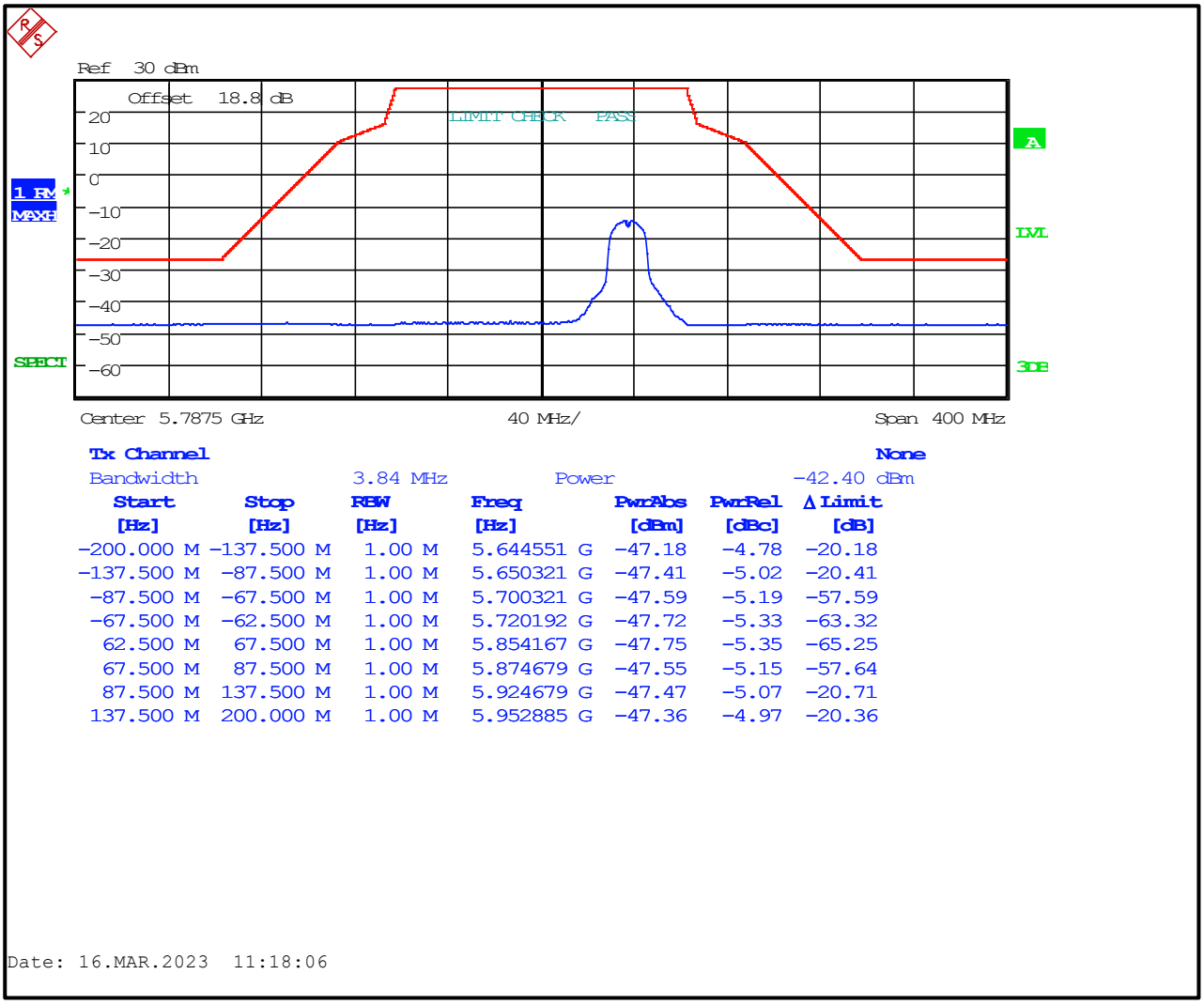
Plot 4-5: Lower Band Edge – Average – U-NII3 – 802.11a (12.0 Mbps)



Plot 4-6: Lower Band Edge – Peak – U-NII3 – 802.11a (12.0 Mbps)



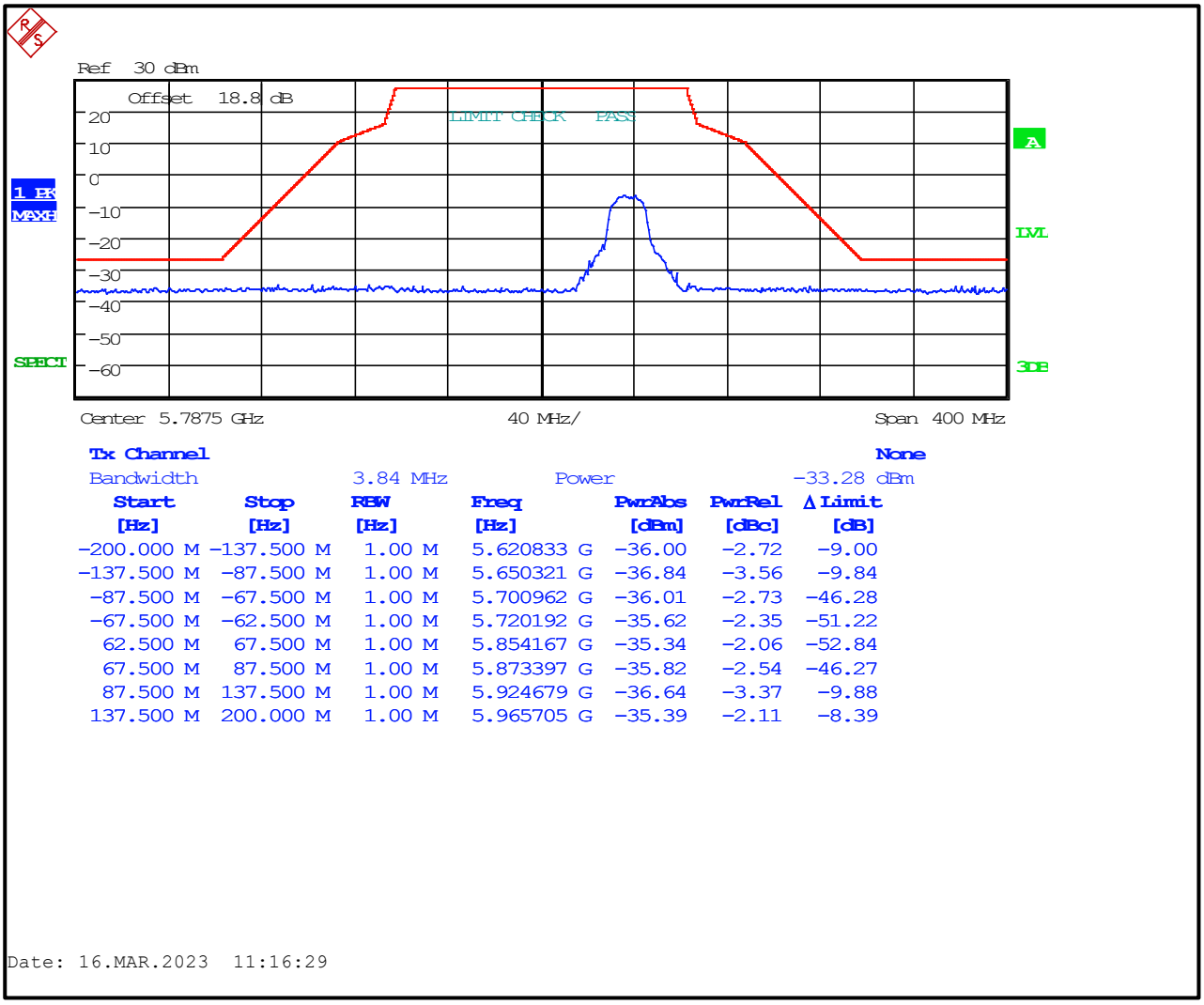
Plot 4-7: Upper Band Edge – Average – U-NII3 – 802.11a (12.0 Mbps)



Tx Channel						None
Bandwidth		3.84 MHz	Power			-42.40 dBm
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-200.000 M	-137.500 M	1.00 M	5.644551 G	-47.18	-4.78	-20.18
-137.500 M	-87.500 M	1.00 M	5.650321 G	-47.41	-5.02	-20.41
-87.500 M	-67.500 M	1.00 M	5.700321 G	-47.59	-5.19	-57.59
-67.500 M	-62.500 M	1.00 M	5.720192 G	-47.72	-5.33	-63.32
62.500 M	67.500 M	1.00 M	5.854167 G	-47.75	-5.35	-65.25
67.500 M	87.500 M	1.00 M	5.874679 G	-47.55	-5.15	-57.64
87.500 M	137.500 M	1.00 M	5.924679 G	-47.47	-5.07	-20.71
137.500 M	200.000 M	1.00 M	5.952885 G	-47.36	-4.97	-20.36

Date: 16.MAR.2023 11:18:06

Plot 4-8: Upper Band Edge – Peak – U-NII3 – 802.11a (12.0 Mbps)



Measurement uncertainty: ±0.5 dB. This measurement uncertainty is an expanded uncertainty for 95% confidence level received with a coverage factor k=2.

Results: Pass

Test Personnel:

Dan Baltzell		March 15-16, 2023
Test Engineer	Signature	Dates of Test

5 Antenna Conducted Spurious Emissions – FCC 15.407(b)(6); RSS-247 6.2

5.1 Antenna Conducted Spurious Emissions Test Procedures

Antenna conducted spurious emissions per FCC 15.407(b)(6) were measured from the EUT antenna port using a 50-ohm spectrum analyzer with the resolution bandwidth set at 1 MHz, and the video bandwidth set at >3 x RBW.

Table 5-1: Antenna Conducted Spurious Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901583*	Agilent Technologies	N9010A	EXA Signal Analyzer (10 Hz-26.5 GHz)	MY51250846	03/18/2021
901581**	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	12/01/2024

** original conducted spurious measurements*
*** Plot 5-1*

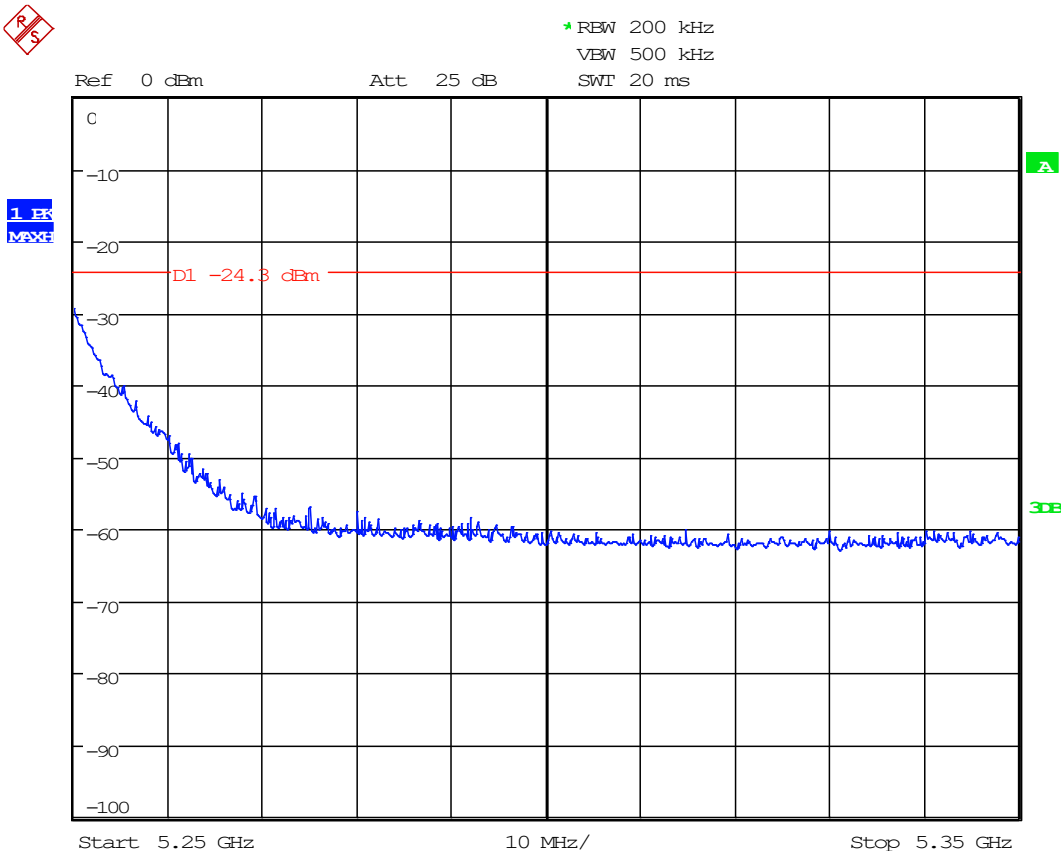
5.2 Antenna Conducted Spurious Emissions Test Results

No other harmonics or spurs were found within 20 dB of the limit from 30 MHz to the 10th harmonic of the carrier frequency than below; per FCC 2.1051 no other data is being reported.

RSS-247 6.2.1.2

Unwanted emission limits For transmitters with operating frequencies in the band 5150-5250 MHz, all emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. Any unwanted emissions that fall into the band 5250-5350 MHz shall be attenuated below the channel power by at least 26 dB, when measured using a resolution bandwidth between 1 and 5% of the occupied bandwidth (i.e. 99% bandwidth), above 5250 MHz. The 26 dB bandwidth may fall into the 5250-5350 MHz band; however, if the occupied bandwidth also falls within the 5250-5350 MHz band, the transmission is considered as intentional and the devices shall comply with all requirements in the band 5250-5350 MHz including implementing dynamic frequency selection (DFS) and TPC, on the portion of the emission that resides in the 5250- 5350 MHz band.

Plot 5-1: 5240 MHz in the band 5250-5350 – 802.11n (65.0 Mbps)



Measurement uncertainty: ±0.5 dB. This measurement uncertainty is an expanded uncertainty for 95% confidence level received with a coverage factor k=2.

Results: Pass

Test Personnel:

Khue Do / Dan Baltzell	/	December 15, 2020 April 18, 2023
Test Engineer	Signature	Date of Test

6 Bandwidths – FCC 15.407(a) and (e); RSS-247 6.2; RSS-Gen 6.7

6.1 Bandwidth Test Procedure

The minimum 6 dB, 26 dB and 99% bandwidths per FCC 15.407(a) and (e), RSS-247 6.2 and RSS-Gen 6.7 were measured using a 50-ohm spectrum analyzer with the resolution bandwidth set approximately 1% of the emission bandwidth, and the video bandwidth set > RBW.

Table 6-1: Bandwidth Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901583	Agilent Technologies	N9010A	EXA Signal Analyzer (10 Hz-26.5 GHz)	MY51250846	03/18/2021
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	12/01/2024

6.2 Modulated Bandwidth Test Results

Table 6-2: Modulated Bandwidth Test Data – U-NII1 – 802.11a (9.0 Mbps)

Channel (#)	Frequency (MHz)	99% Bandwidth (MHz)
36	5180	19.042
40	5200	20.046
48	5240	19.918

Table 6-3: Modulated Bandwidth Test Data – U-NII1 – 802.11n (65.0 Mbps)

Channel (#)	Frequency (MHz)	99% Bandwidth (MHz)
36	5180	18.365
40	5200	18.365
48	5240	18.365

Table 6-4: Modulated Bandwidth Test Data – U-NII3 – 802.11a (9.0 Mbps)

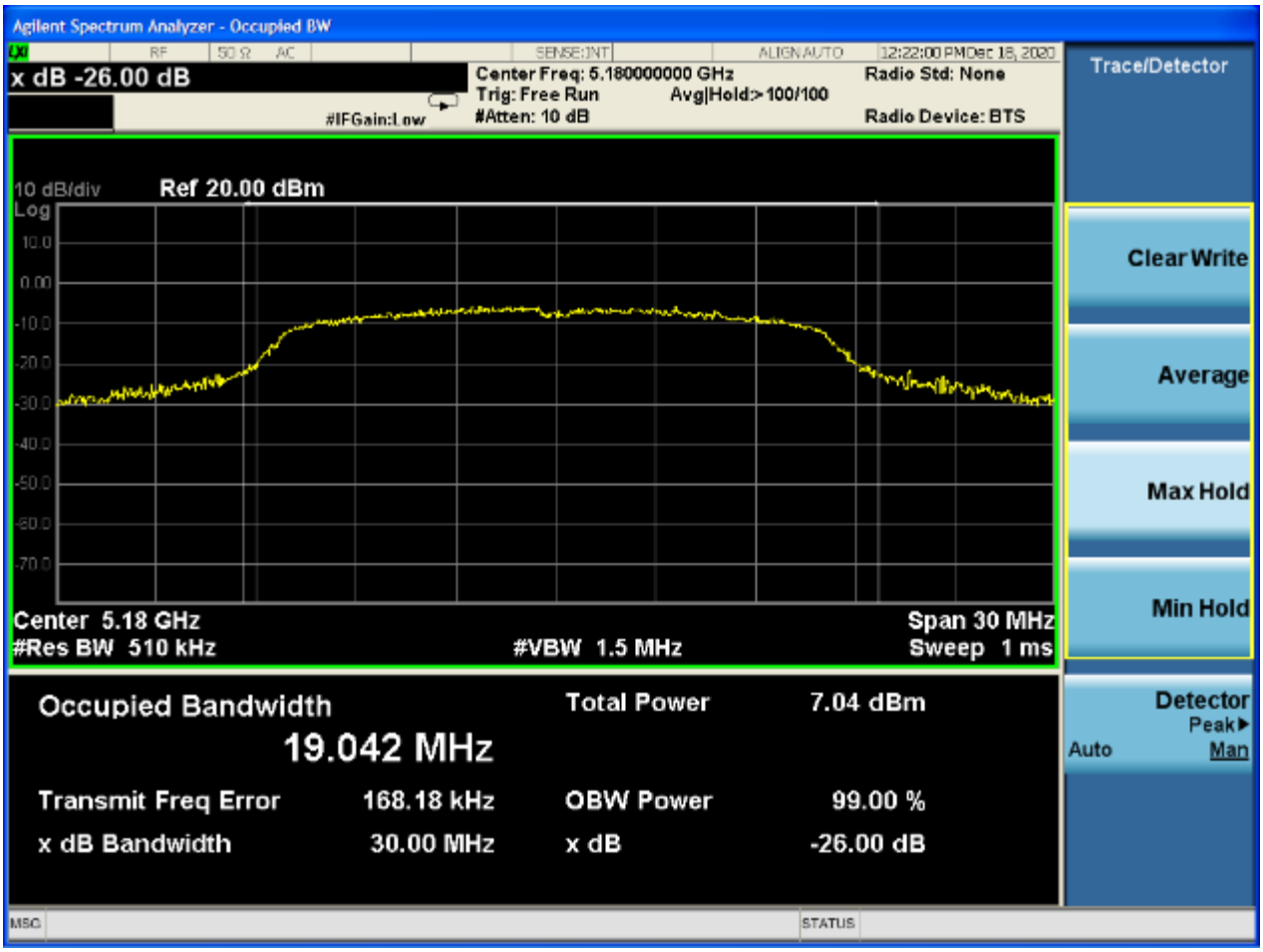
Channel (#)	Frequency (MHz)	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)
149	5745	15.240	19.911
157	5785	15.240	19.198
165	5825	15.240	17.520

Table 6-5: Modulated Bandwidth Test Data – U-NII3 – 802.11n (65.0 Mbps)

Channel (#)	Frequency (MHz)	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)
149	5745	15.529	18.413
157	5785	15.288	18.365
165	5825	15.240	18.413

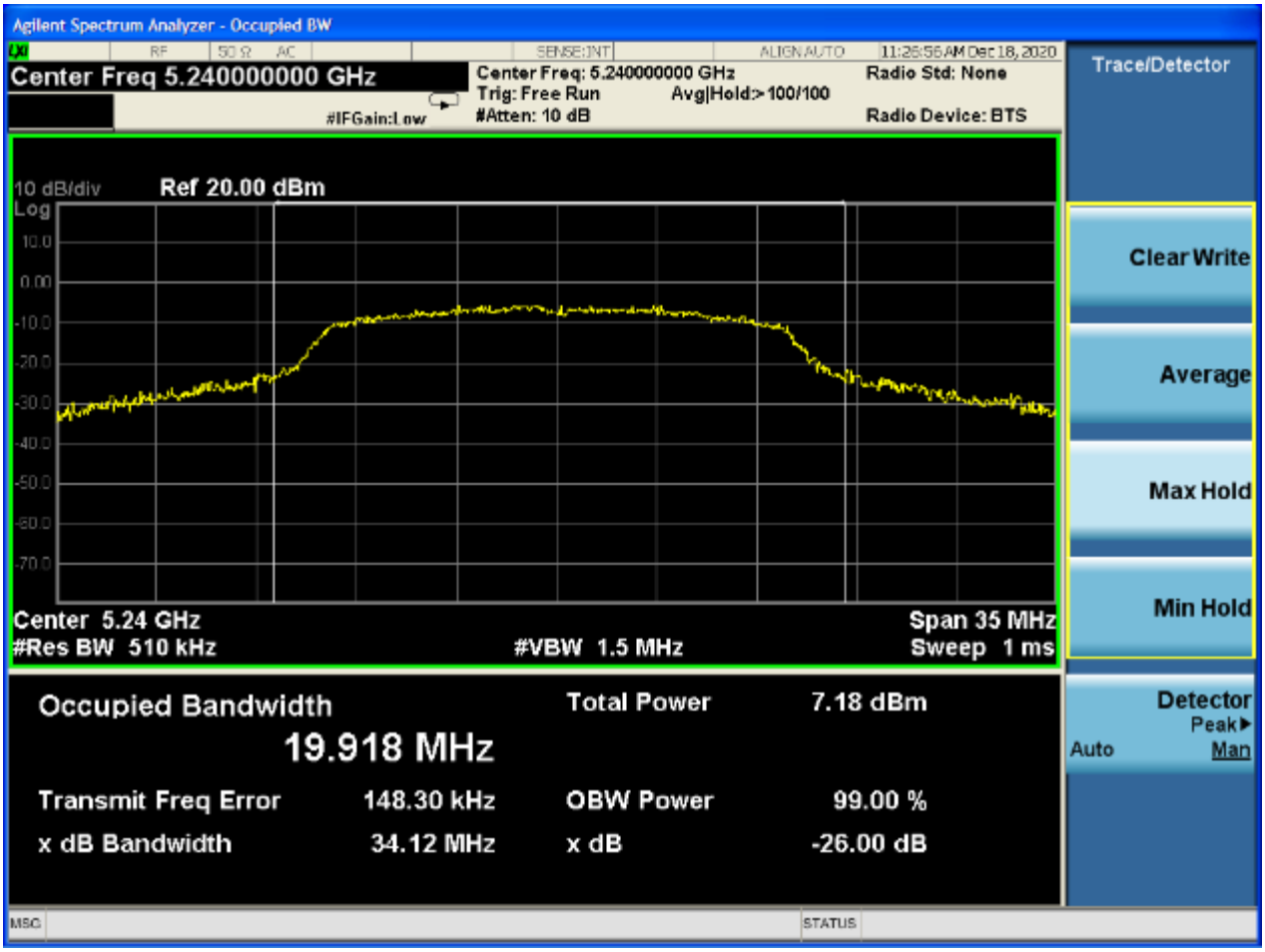
6.3 Bandwidth Plots – U-NII1

Plot 6-1: 99% Bandwidth – 5180 MHz – 802.11a (9.0 Mbps)



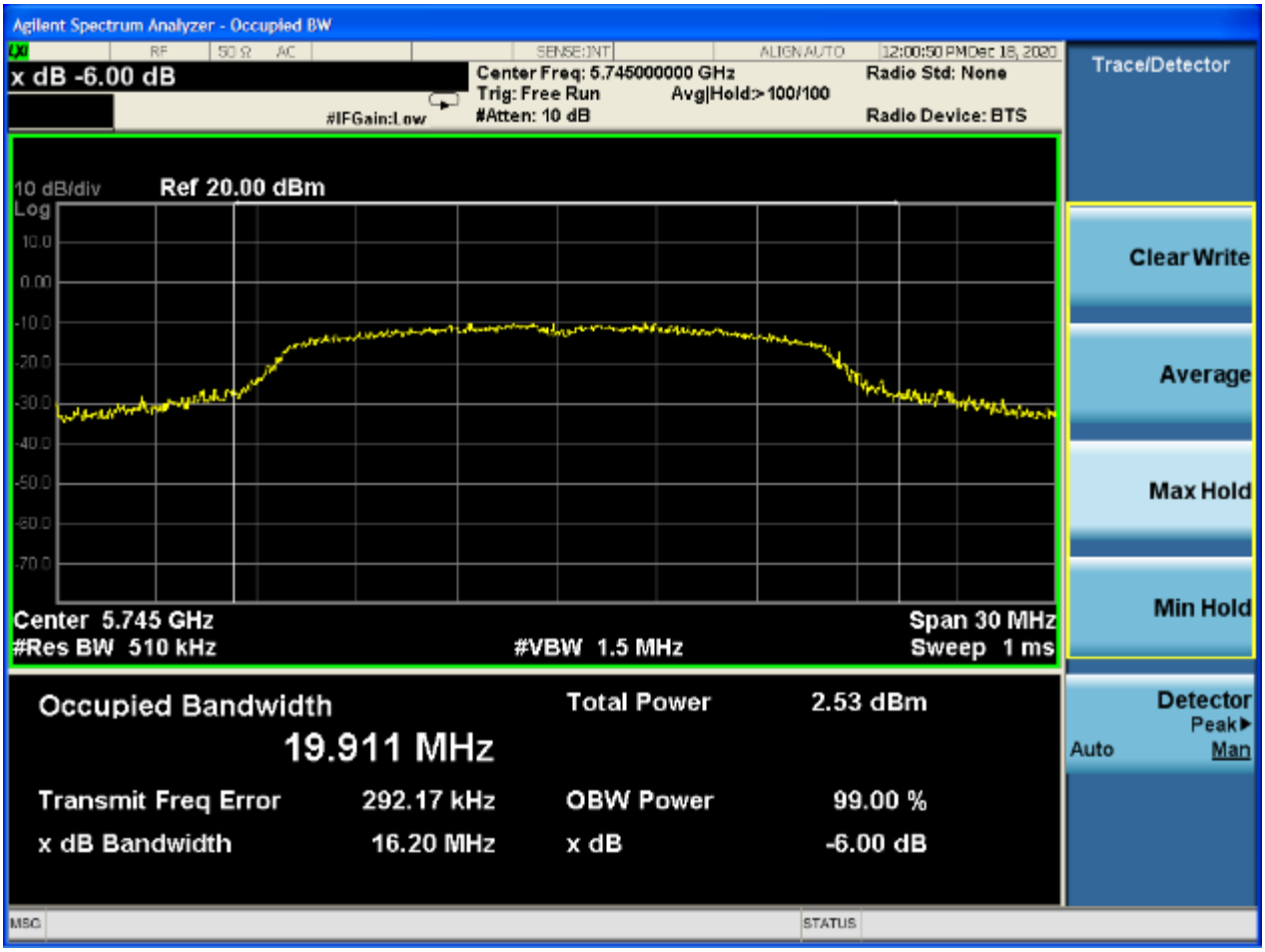
Plot 6-2: 99% Bandwidth – 5200 MHz – 802.11a (9.0 Mbps)

Plot 6-3: 99% Bandwidth – 5240 MHz – 802.11a (9.0 Mbps)

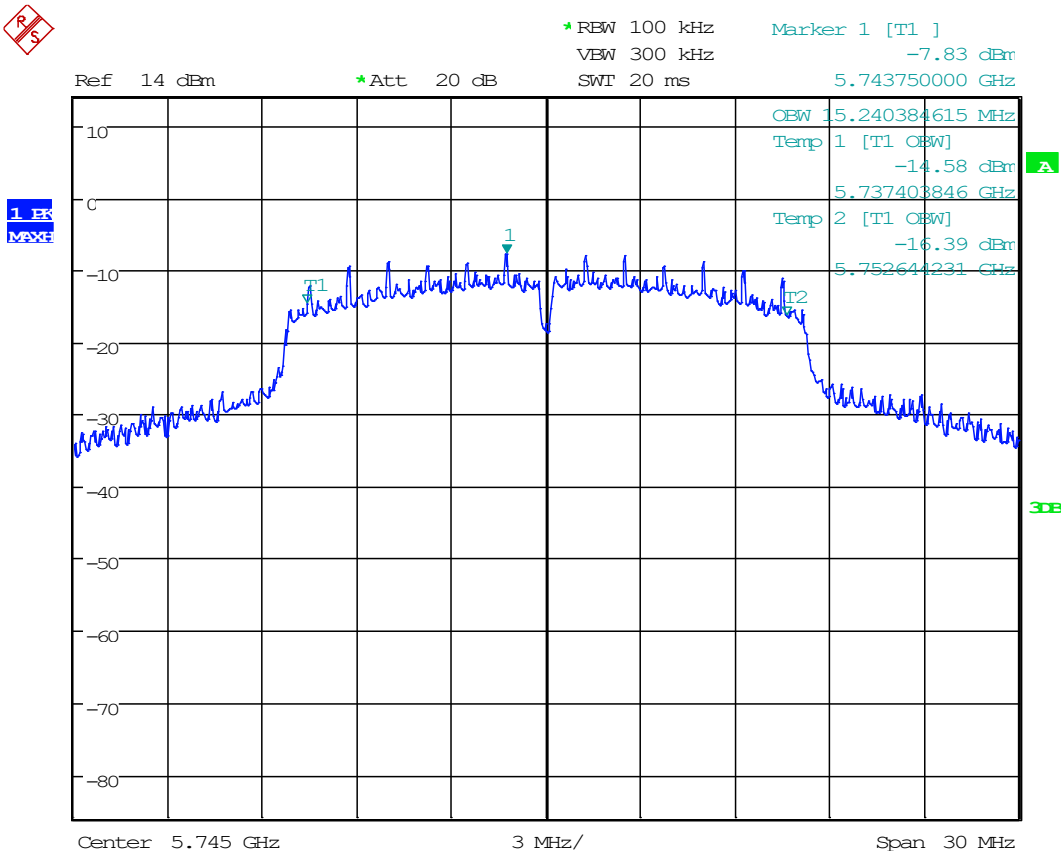


6.4 Bandwidth Plots – U-NII3

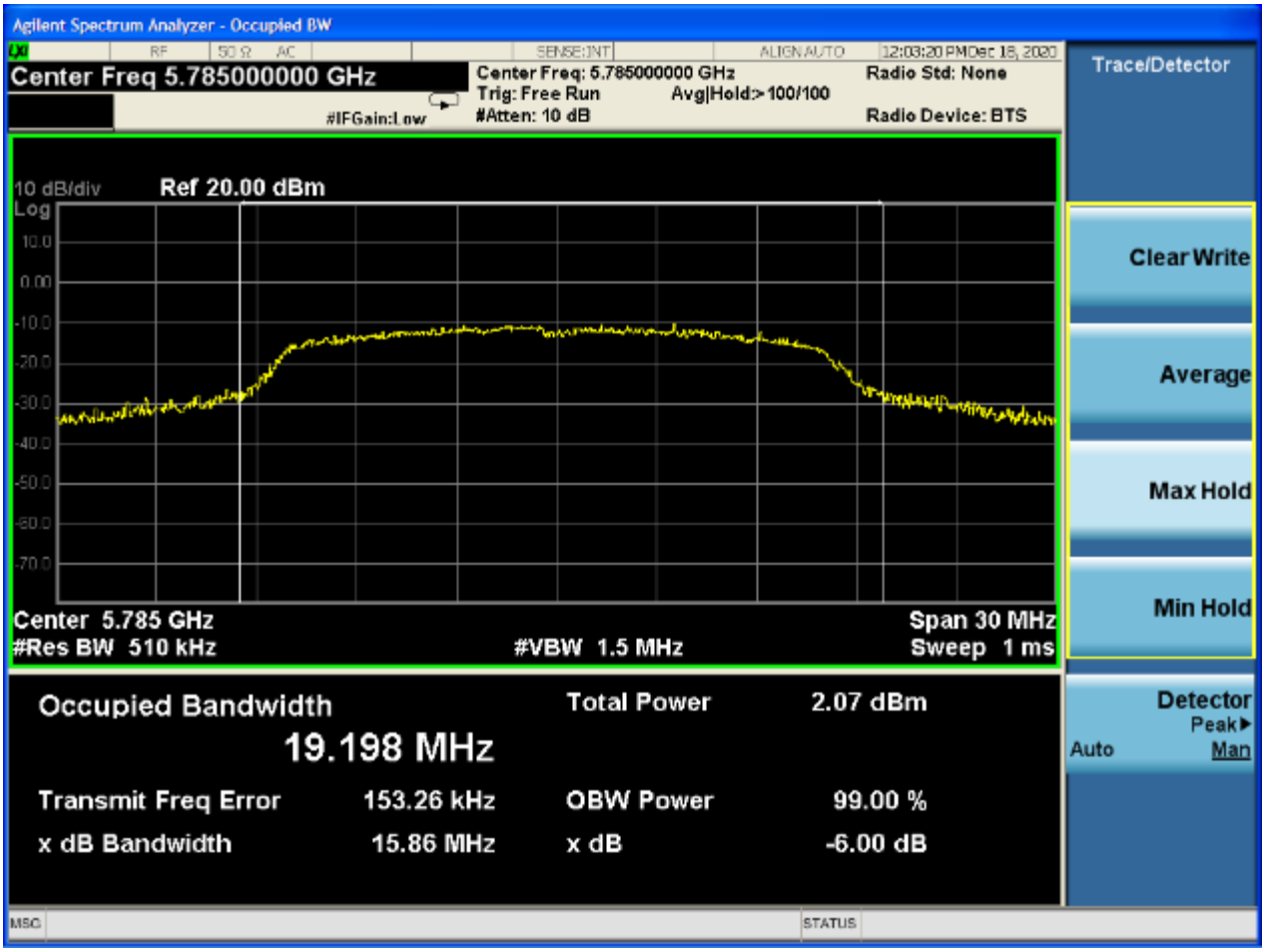
Plot 6-4: 99% Bandwidth – 5745 MHz – 802.11a (9.0 Mbps)



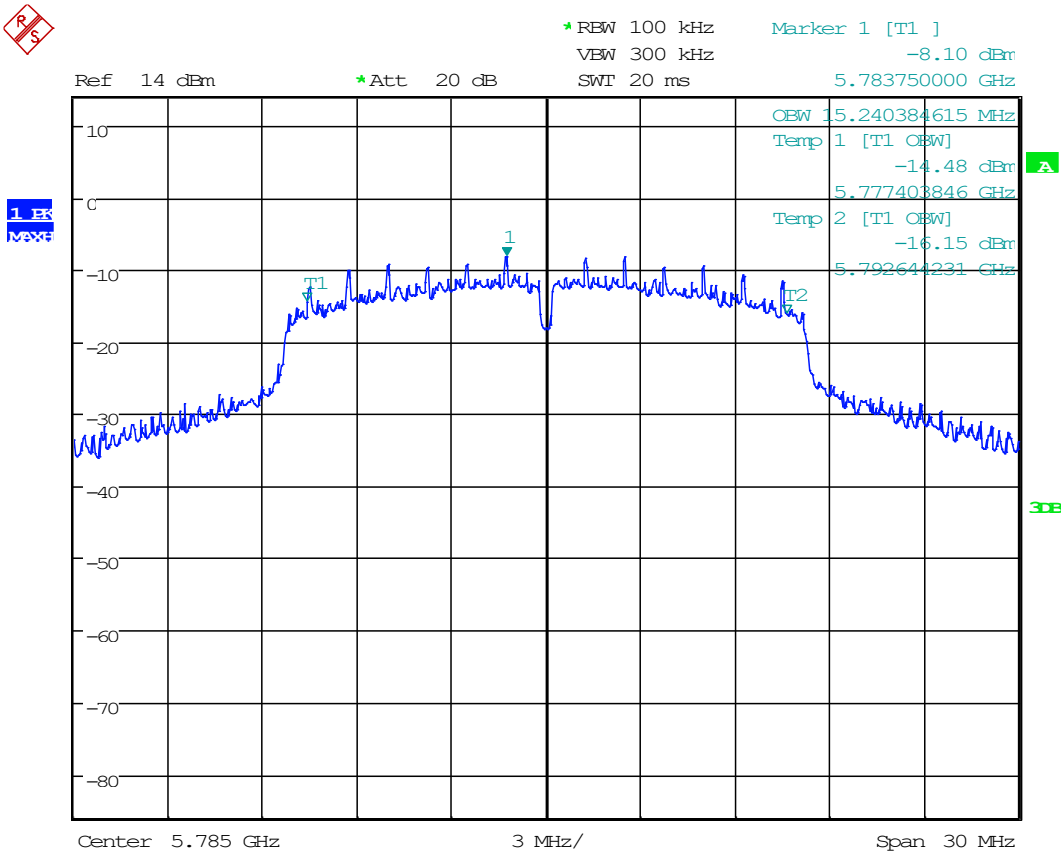
Plot 6-5: 6 dB Bandwidth – 5745 MHz – 802.11a (9.0 Mbps)



Plot 6-6: 99% Bandwidth – 5785 MHz – 802.11a (9.0 Mbps)

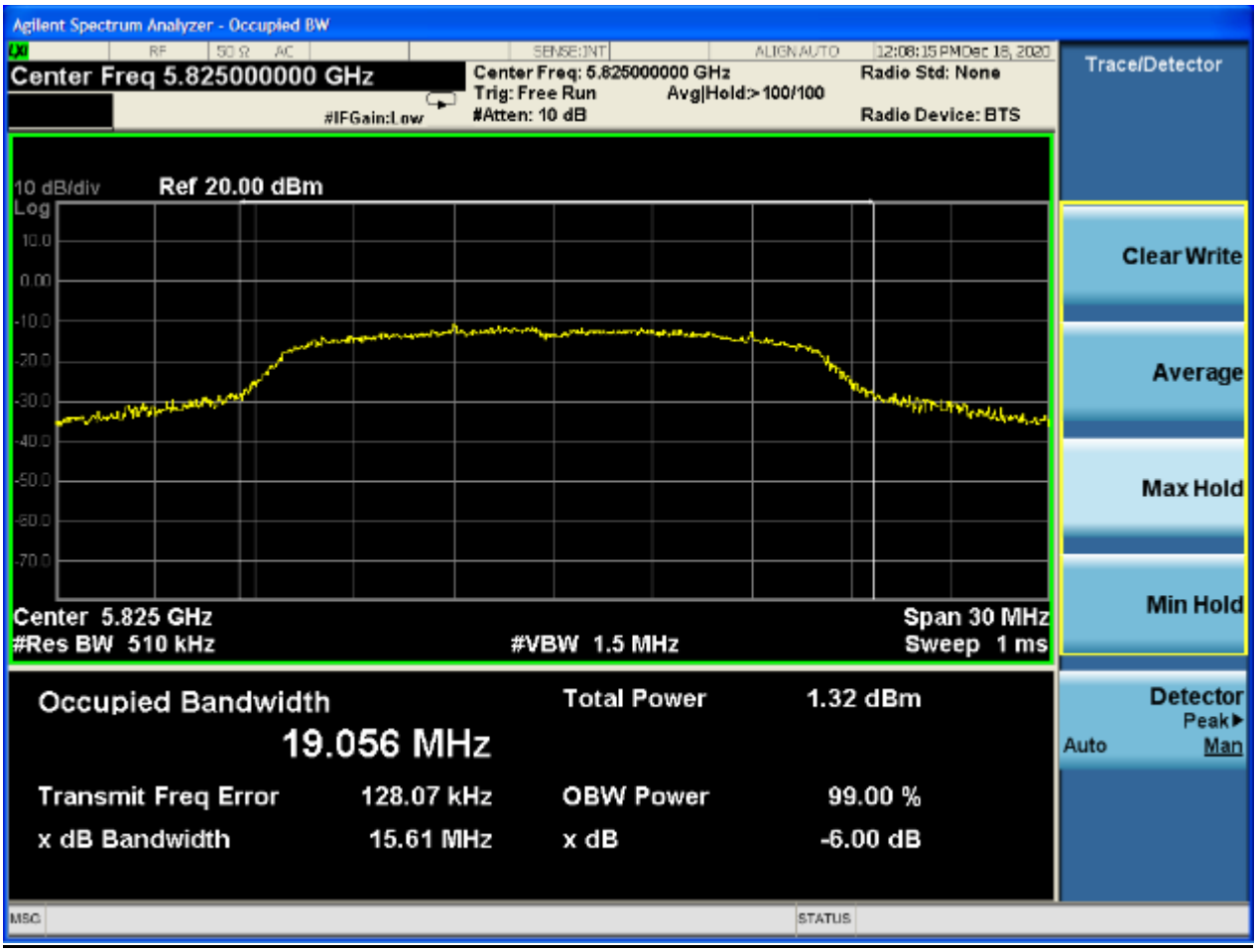


Plot 6-7: 6 dB Bandwidth – 5785 MHz – 802.11a (9.0 Mbps)

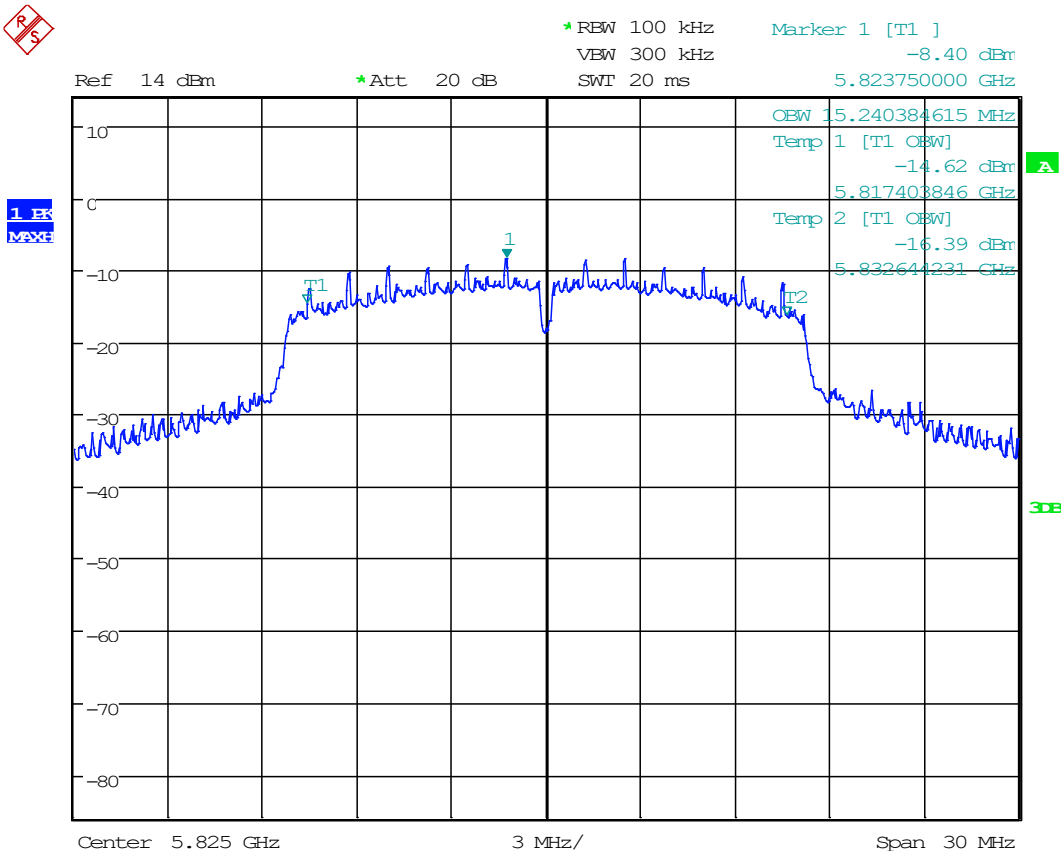


Date: 17.APR.2023 15:21:49

Plot 6-8: 99% Bandwidth – 5825 MHz – 802.11a (9.0 Mbps)

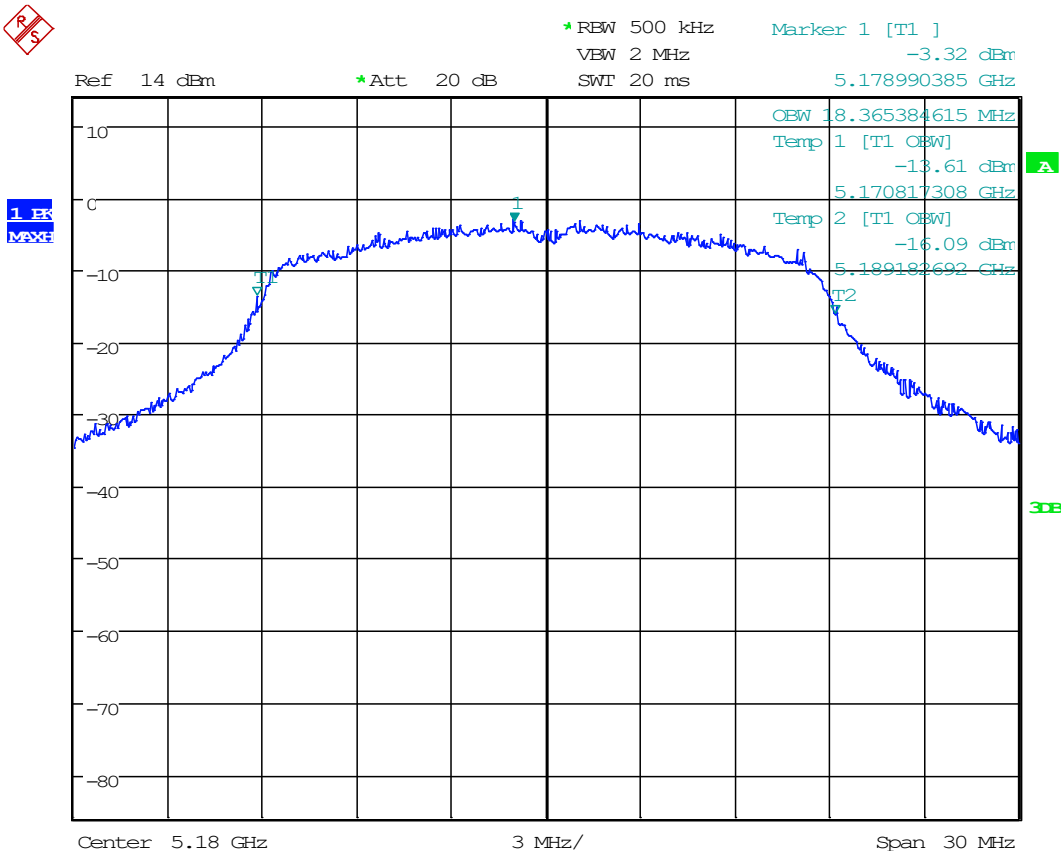


Plot 6-9: 6 dB Bandwidth – 5825 MHz – 802.11a (9.0 Mbps)



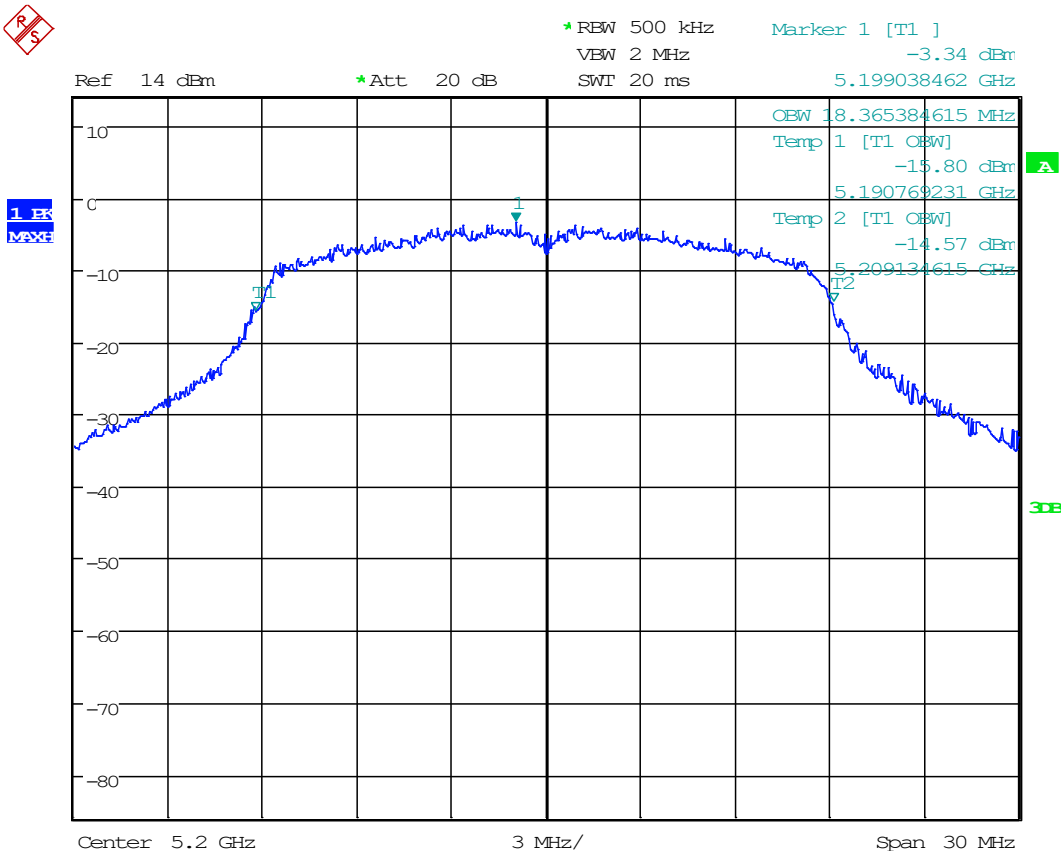
Date: 17.APR.2023 15:20:58

Plot 6-10: 99% Bandwidth – 5180 MHz – 802.11n (65.0 Mbps)



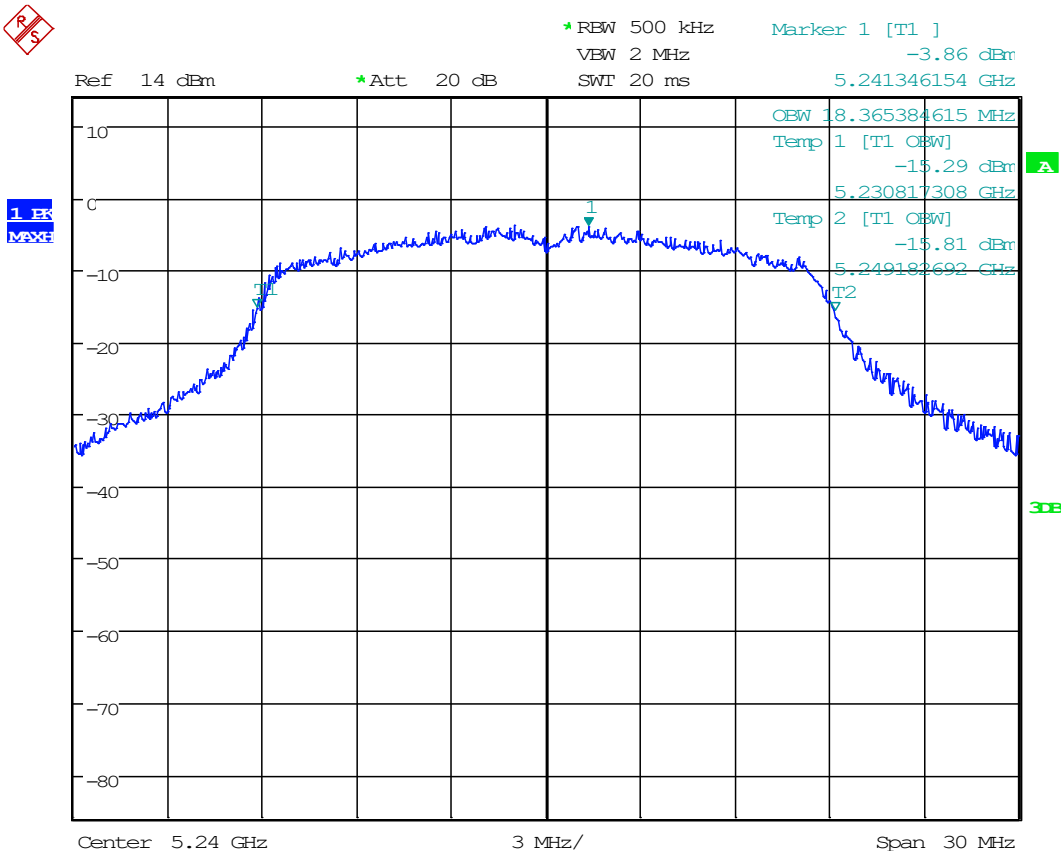
Date: 17.APR.2023 15:00:48

Plot 6-11: 99% Bandwidth – 5200 MHz – 802.11n (65.0 Mbps)



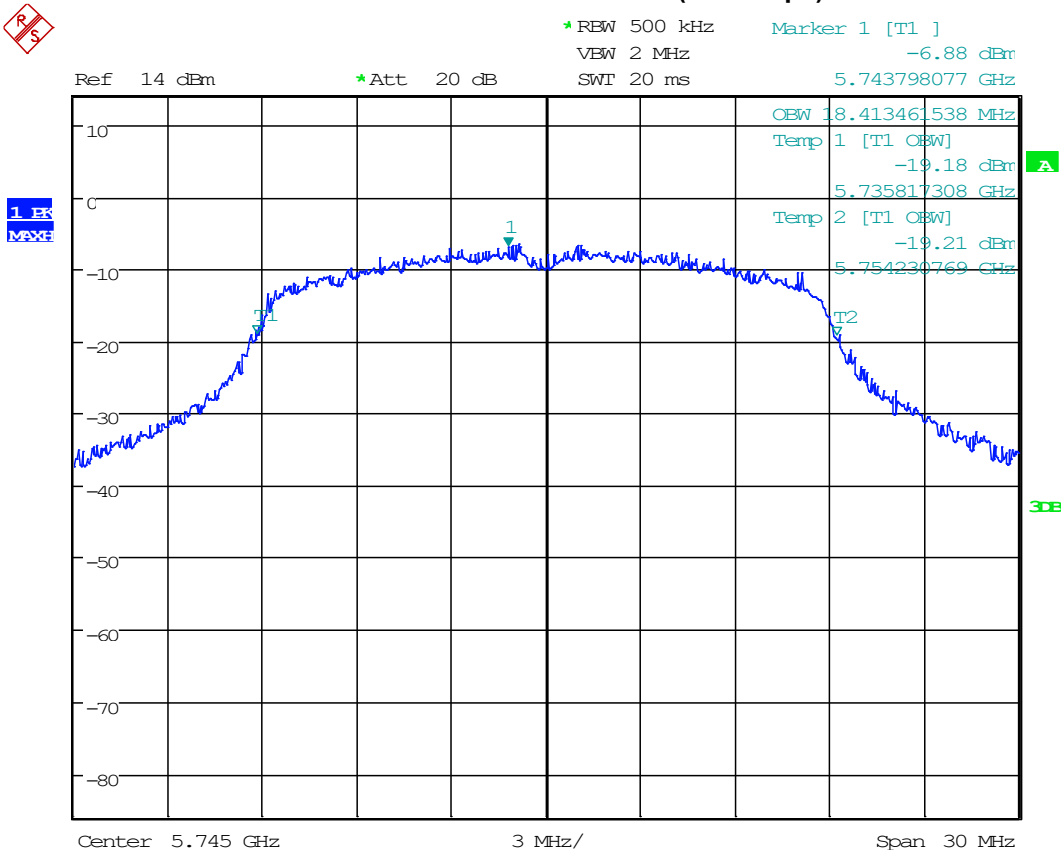
Date: 17.APR.2023 15:01:46

Plot 6-12: 99% Bandwidth – 5240 MHz – 802.11n (65.0 Mbps)



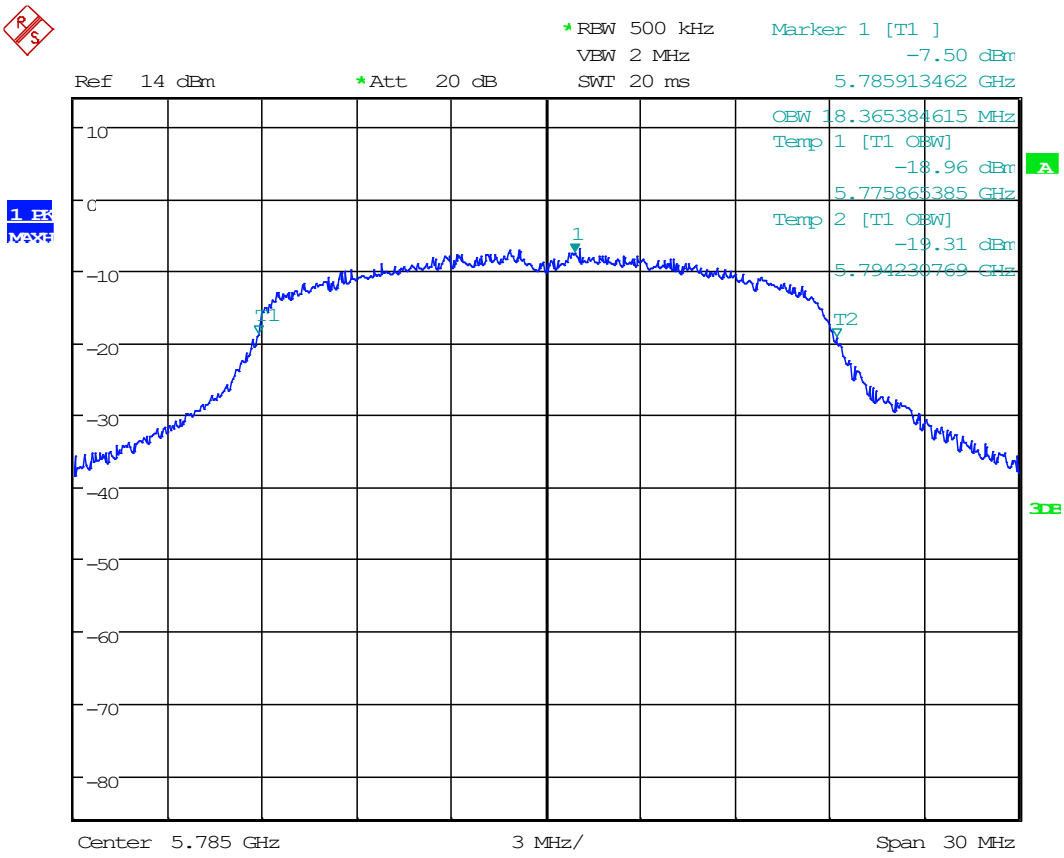
Date: 17.APR.2023 15:02:32

Plot 6-13: 99% Bandwidth – 5745 MHz – 802.11n (65.0 Mbps)



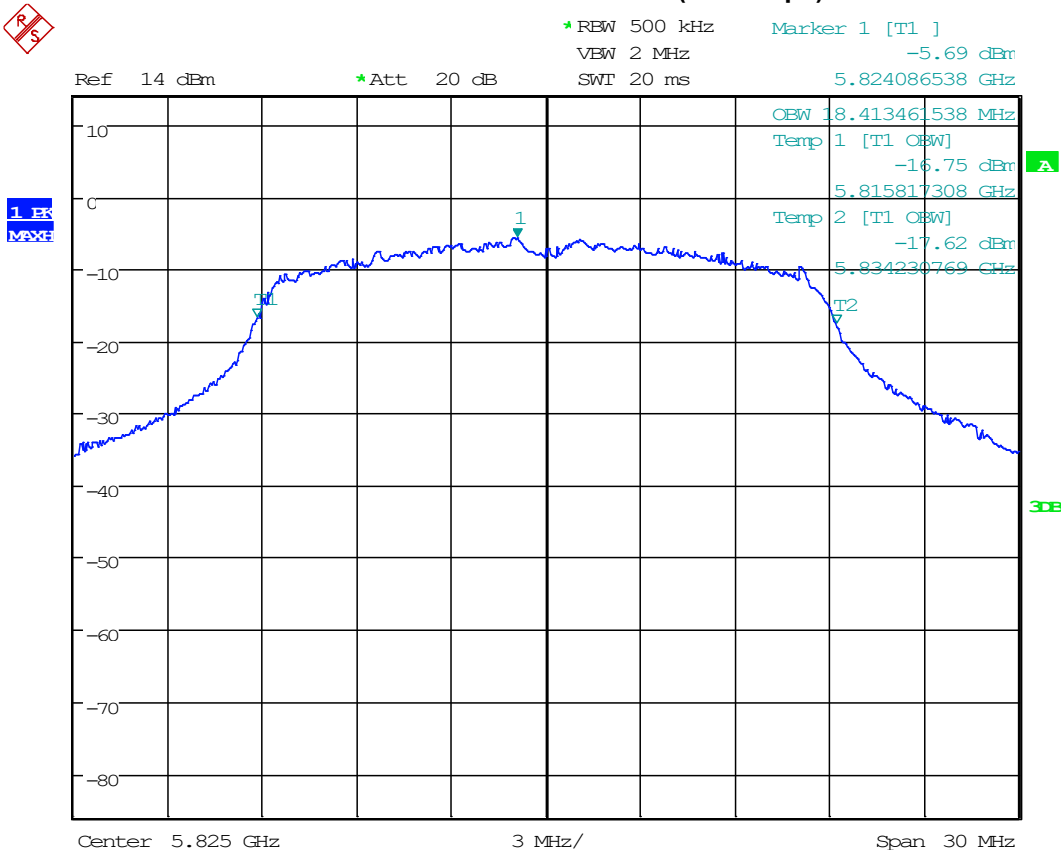
Date: 17.APR.2023 14:39:19

Plot 6-14: 99% Bandwidth – 5785 MHz – 802.11n (65.0 Mbps)



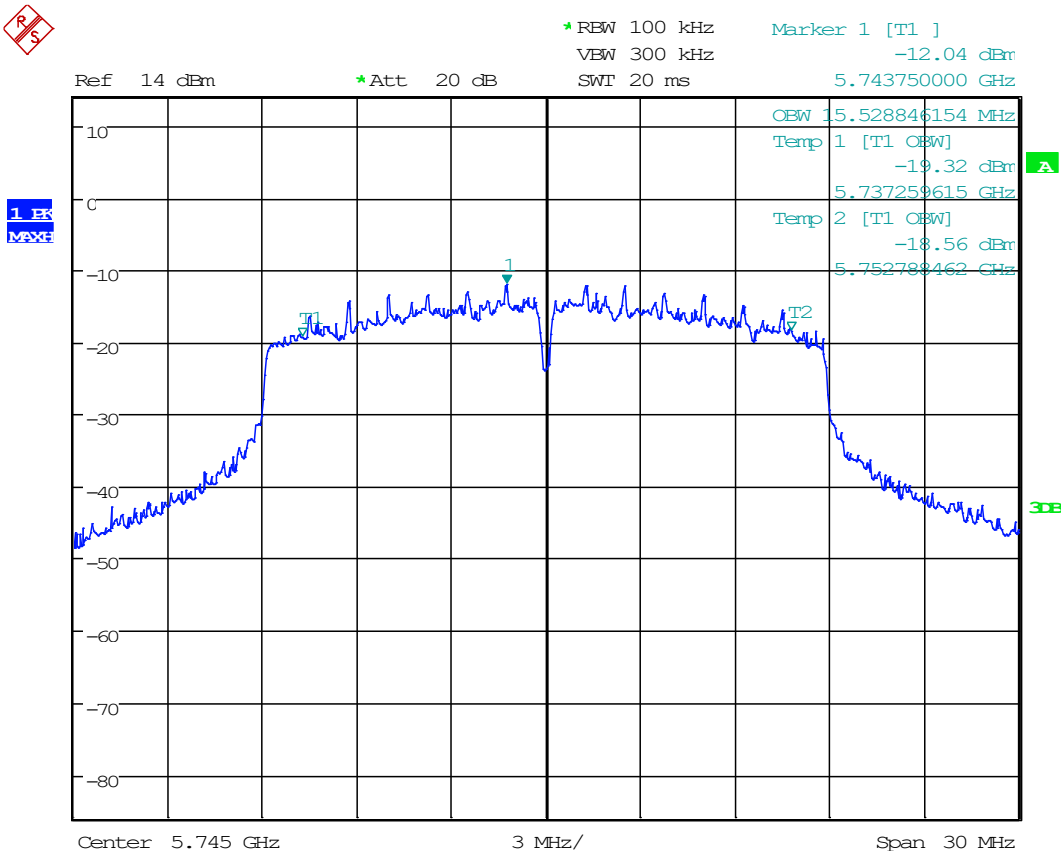
Date: 17.APR.2023 14:38:37

Plot 6-15: 99% Bandwidth – 5825 MHz – 802.11n (65.0 Mbps)



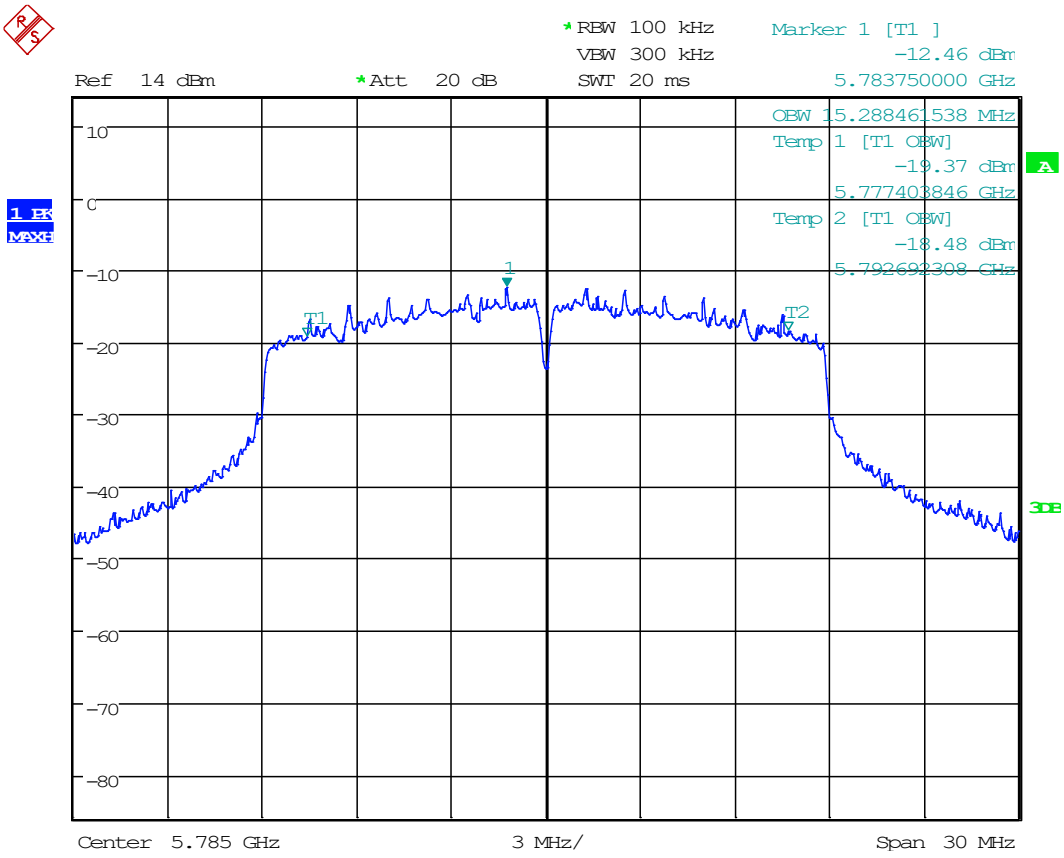
Date: 17.APR.2023 14:36:32

Plot 6-16: 6 dB Bandwidth – 5745 MHz – 802.11n (65.0 Mbps)



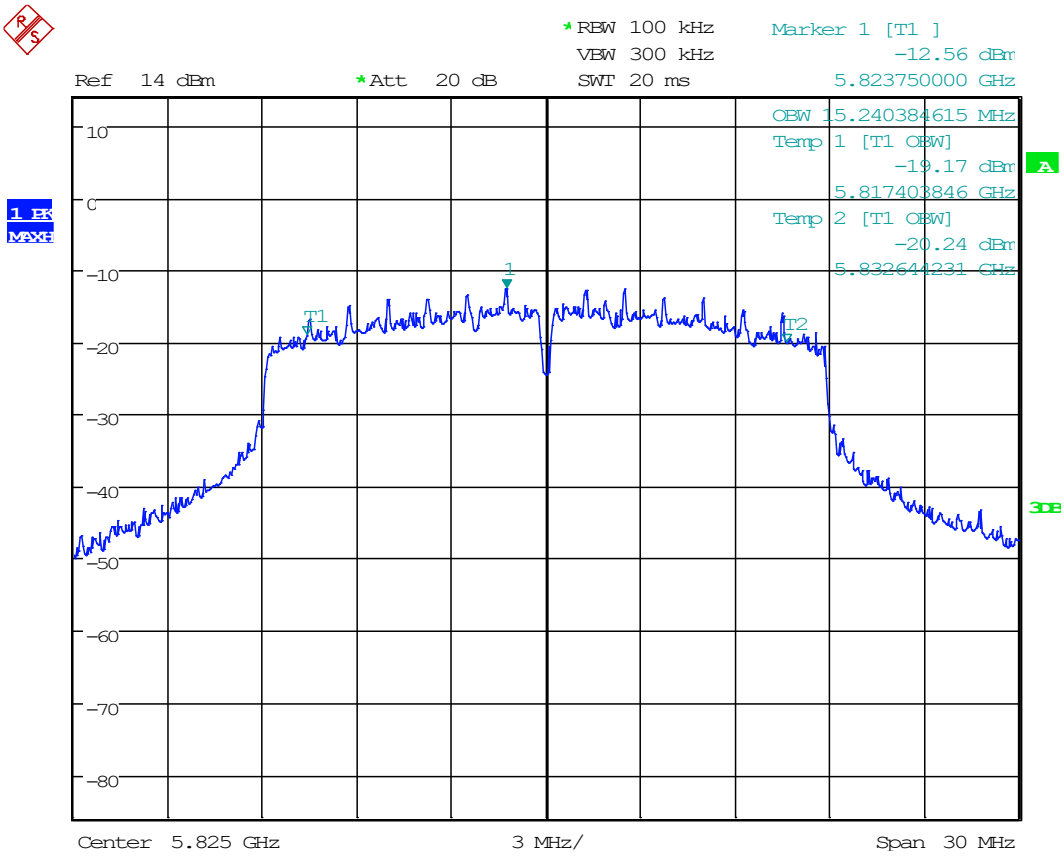
Date: 17.APR.2023 15:10:25

Plot 6-17: 6 dB Bandwidth – 5785 MHz – 802.11n (65.0 Mbps)



Date: 17.APR.2023 15:14:38

Plot 6-18: 6 dB Bandwidth – 5825 MHz – 802.11n (65.0 Mbps)



Date: 17.APR.2023 15:17:17

Measurement uncertainty: ±1 x 10^{-6} Hz. This measurement uncertainty is an expanded uncertainty for 95% confidence level received with a coverage factor k=2.

Test Personnel:

Khue Do / Dan Baltzell	/	December 18, 2020 April 17, 2023
Test Engineer	Signature	Date of Test

7 Power Spectral Density – FCC 15.407(a)(1) & (a)(3); RSS-247 6.2

7.1 Power Spectral Density Test Procedure

The power spectral density per FCC 15.407(a)(1)(3) was measured using a 50-ohm spectrum analyzer. The spectral lines were resolved for the modulated carriers. These levels are below the limits. See the power spectral density table and plots.

Table 7-1: Power Spectral Density Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rhode & Schwarz	1166.1660.50	FSU Spectrum Analyzer (20 Hz–50 GHz)	200106	04/26/2021

7.2 Power Spectral Density Test Results

Table 7-2: Power Spectral Density Test Data – U-NII1 – 802.11a (9.0 Mbps), FCC

Frequency (MHz)	PSD (dBm)	Limit (dBm/MHz)	Margin (dB)	Result (Pass / Fail)
5180	-10.7	11.0	-21.7	Pass
5200	-10.5	11.0	-21.5	Pass
5240	-9.7	11.0	-20.7	Pass

Table 7-3: Power Spectral Density Test Data – U-NII1 – 802.11a (9.0 Mbps), ISED

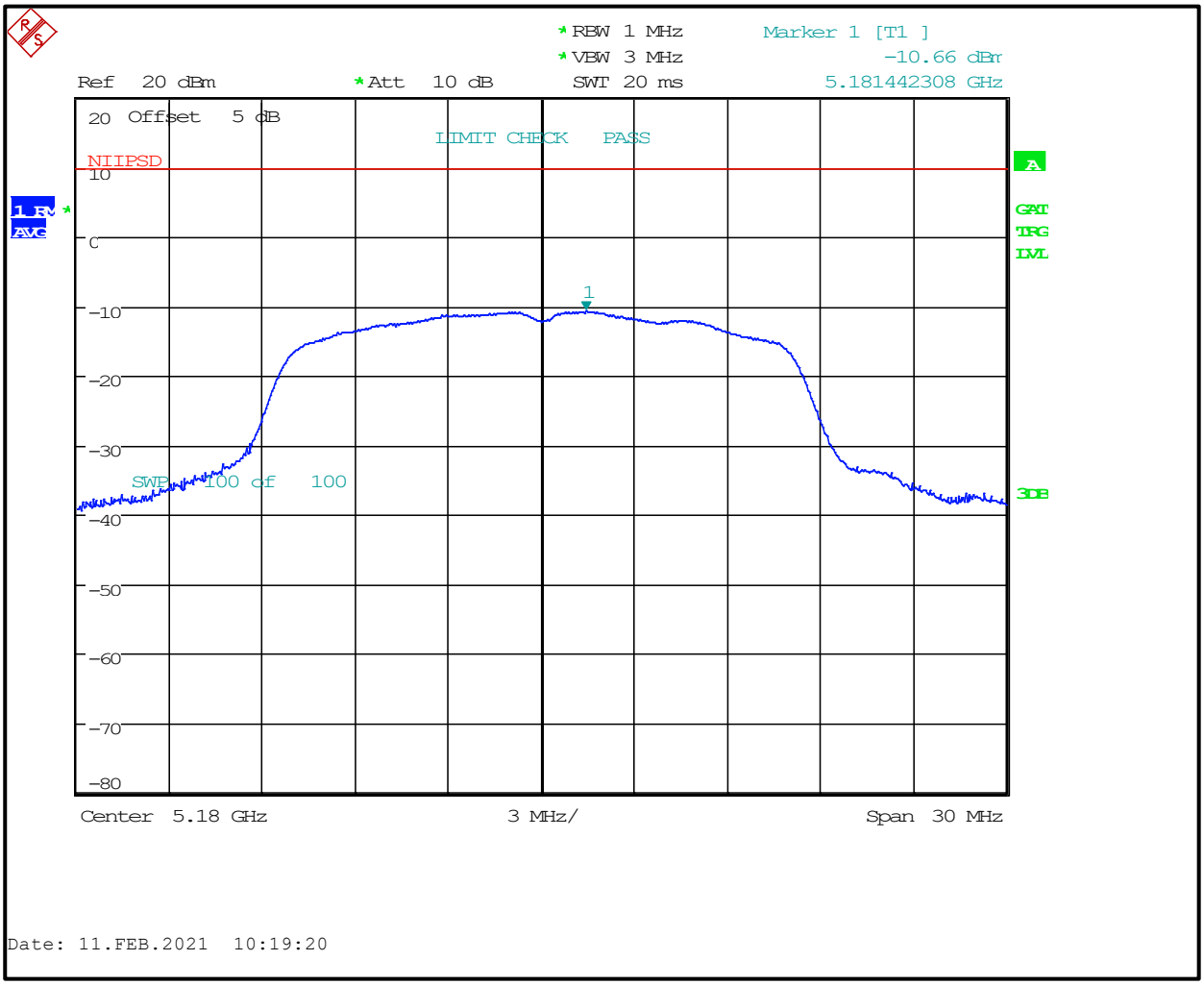
Frequency (MHz)	PSD (EIRP dBm)	Limit (dBm/MHz)	Margin (dB)	Result (Pass / Fail)
5180	-10.7	10.0	-20.7	Pass
5200	-10.5	10.0	-20.5	Pass
5240	-9.7	10.0	-19.7	Pass

Table 7-4: Power Spectral Density Test Data – U-NII3 – 802.11a (48.0 Mbps)

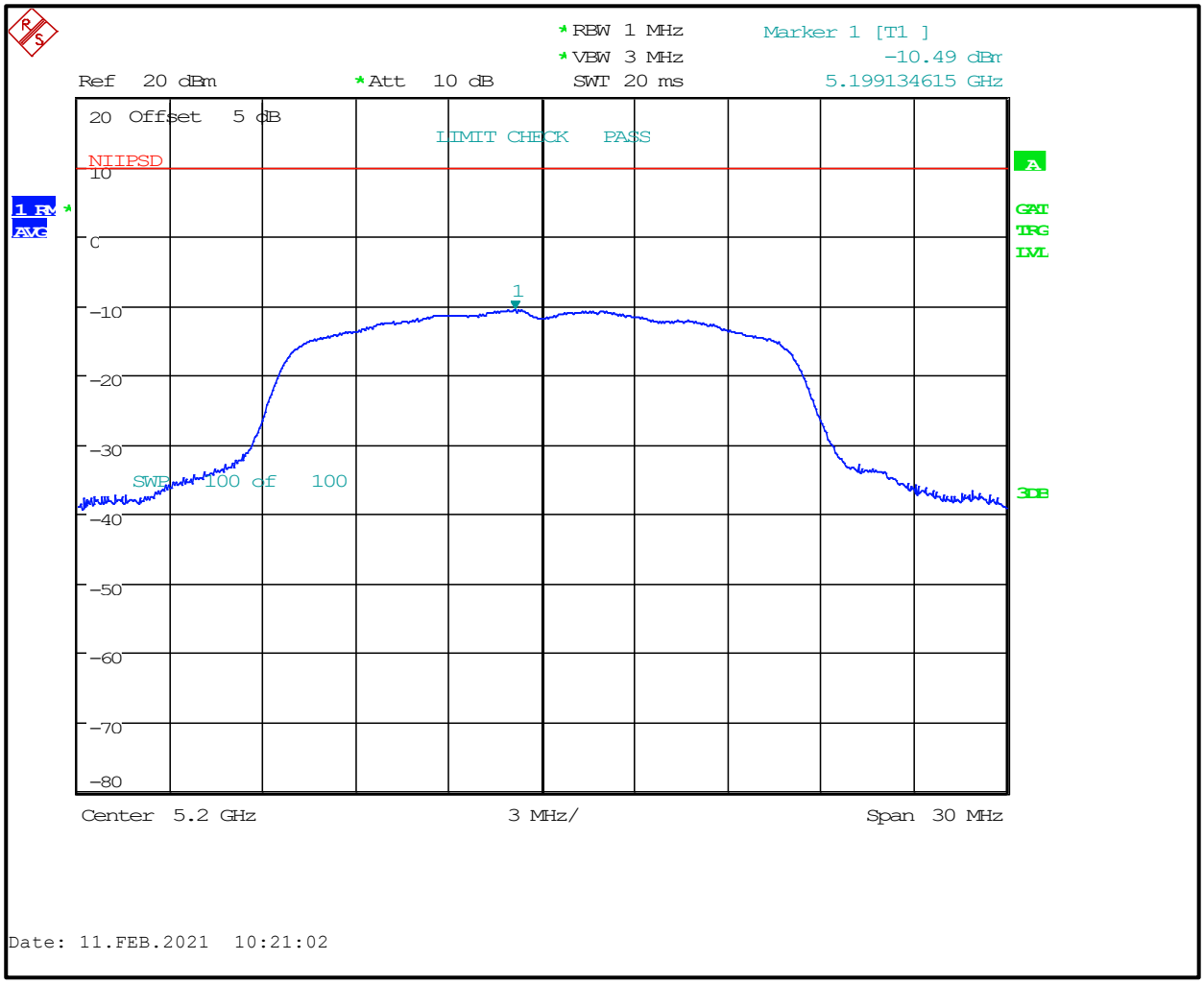
Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)	Result (Pass / Fail)
5745	-14.4	30.0	-44.4	Pass
5785	-15.5	30.0	-45.5	Pass
5825	-16.2	30.0	-46.2	Pass

7.3 Power Spectral Density Plots – U-NII1

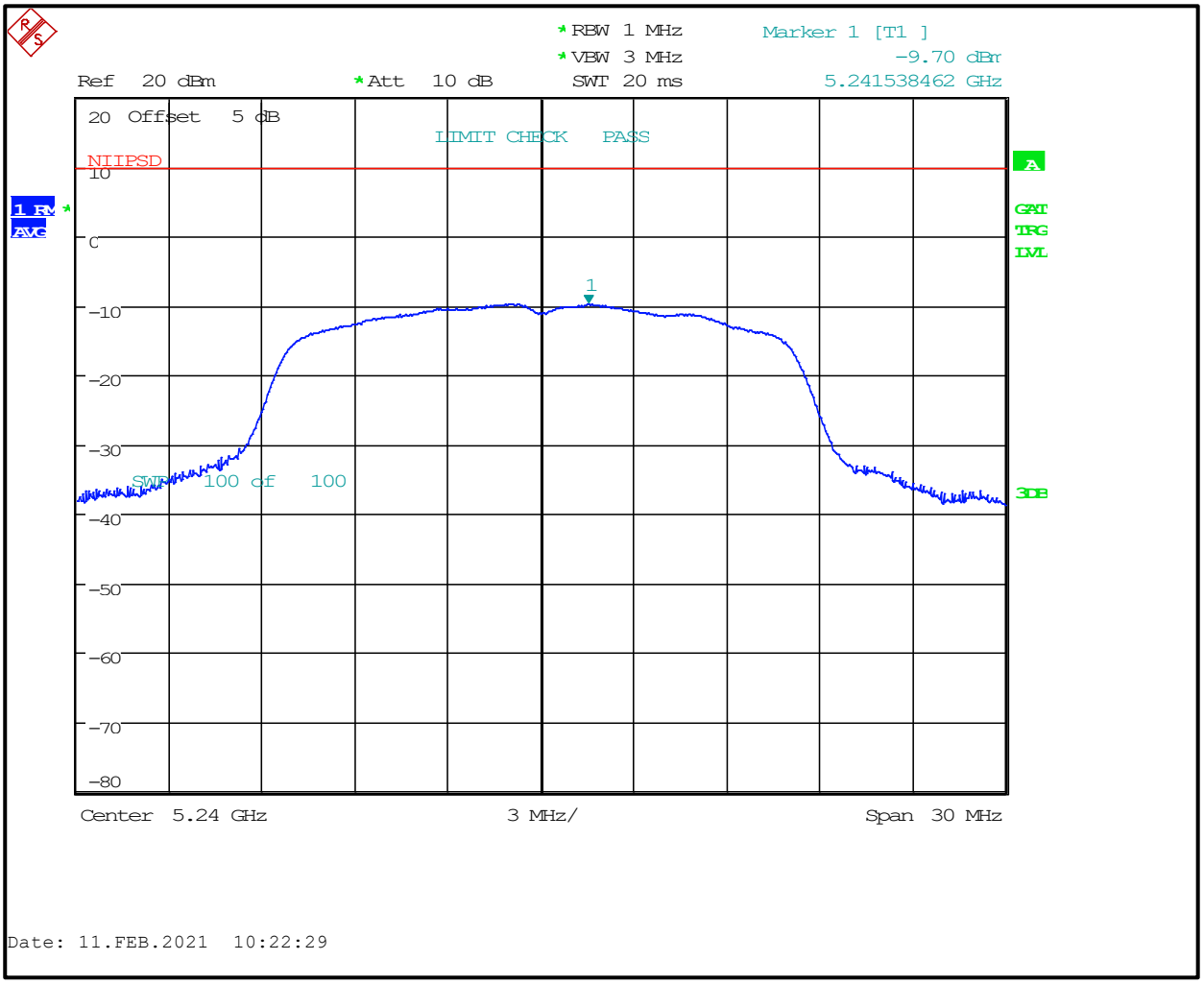
Plot 7-1: Power Spectral Density – 5180 MHz – 802.11a (9.0 Mbps)



Plot 7-2: Power Spectral Density – 5200 MHz – 802.11a (9.0 Mbps)

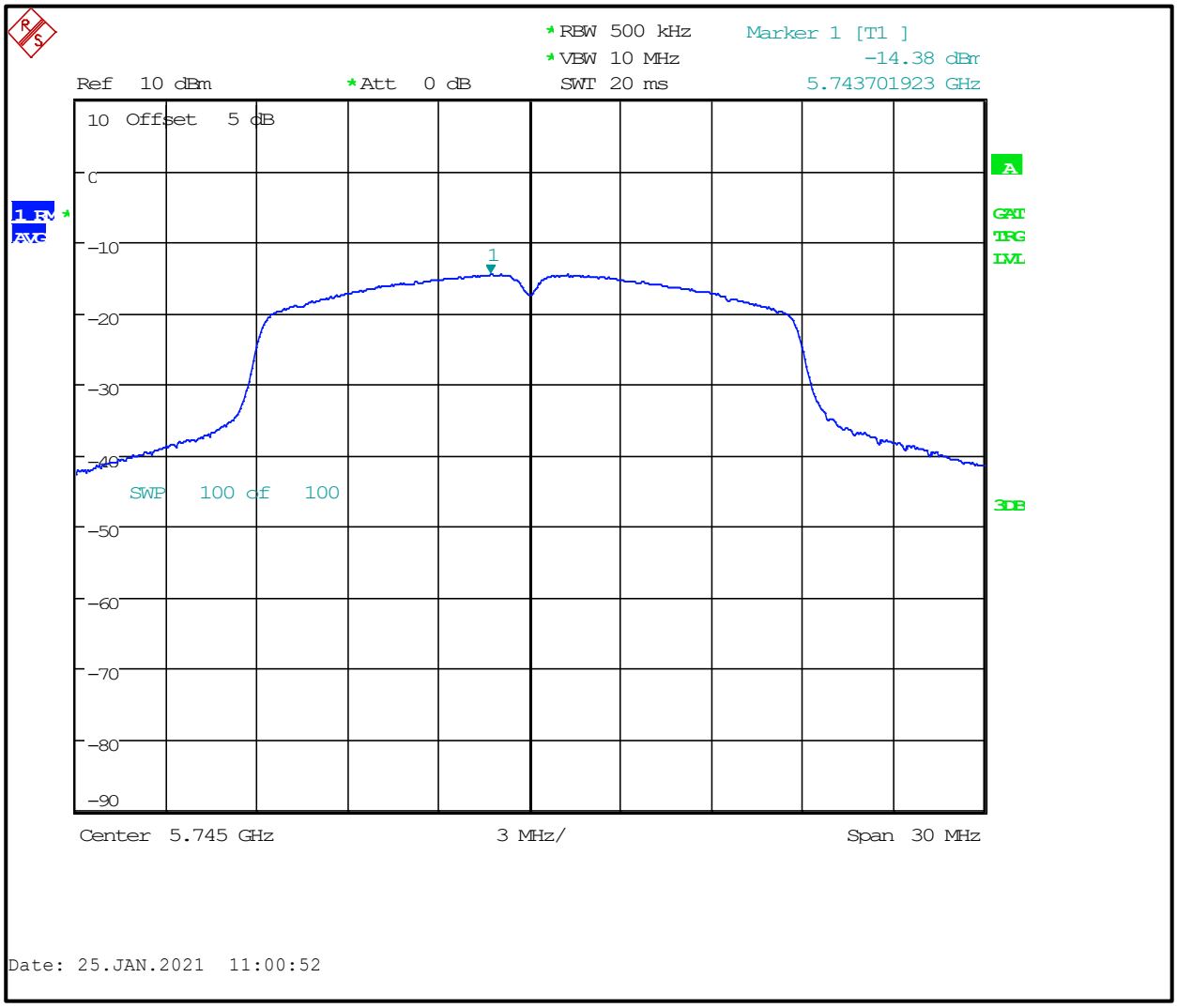


Plot 7-3: Power Spectral Density – 5240 MHz – 802.11a (9.0 Mbps)

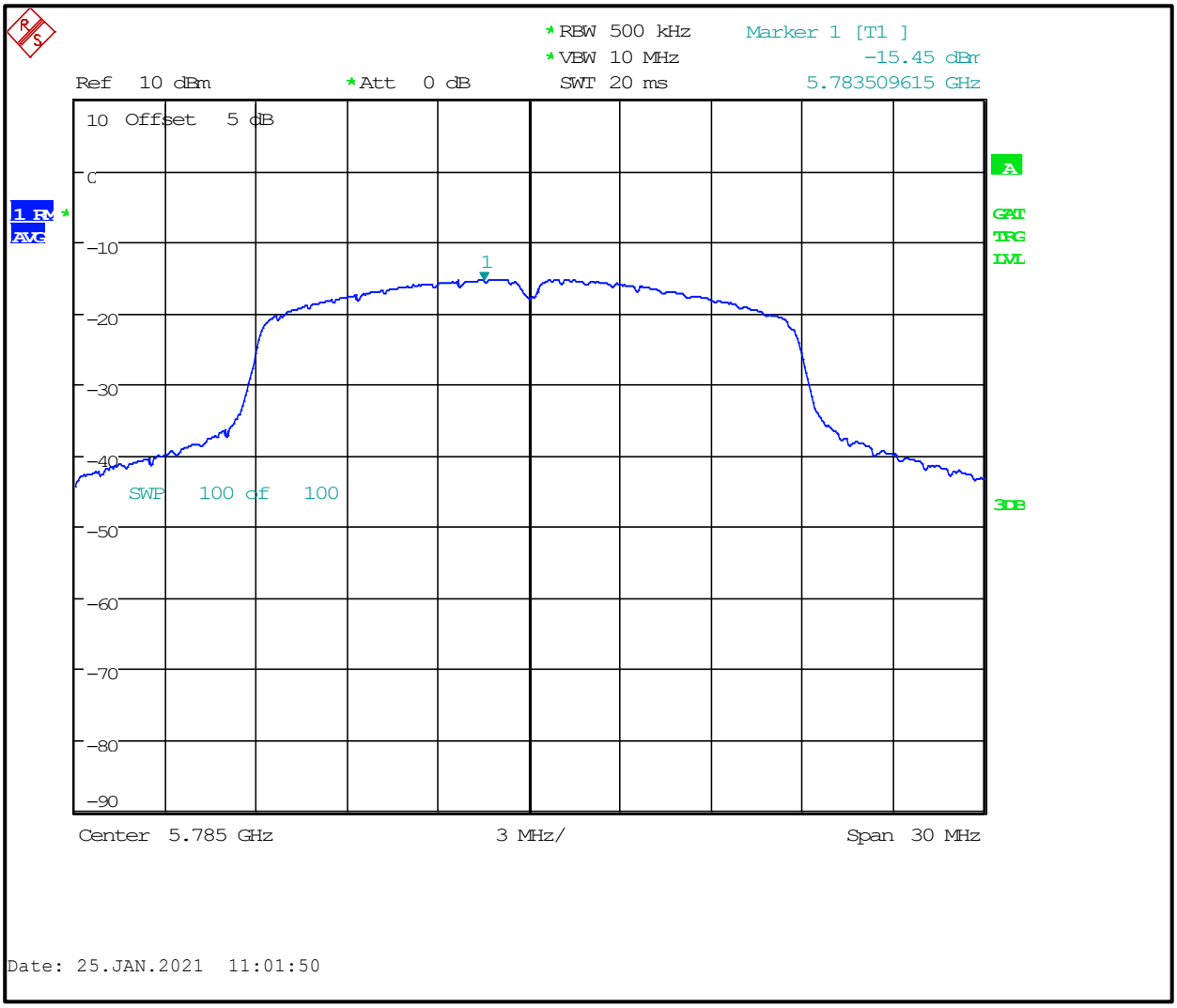


7.4 Power Spectral Density Plots – U-NII3

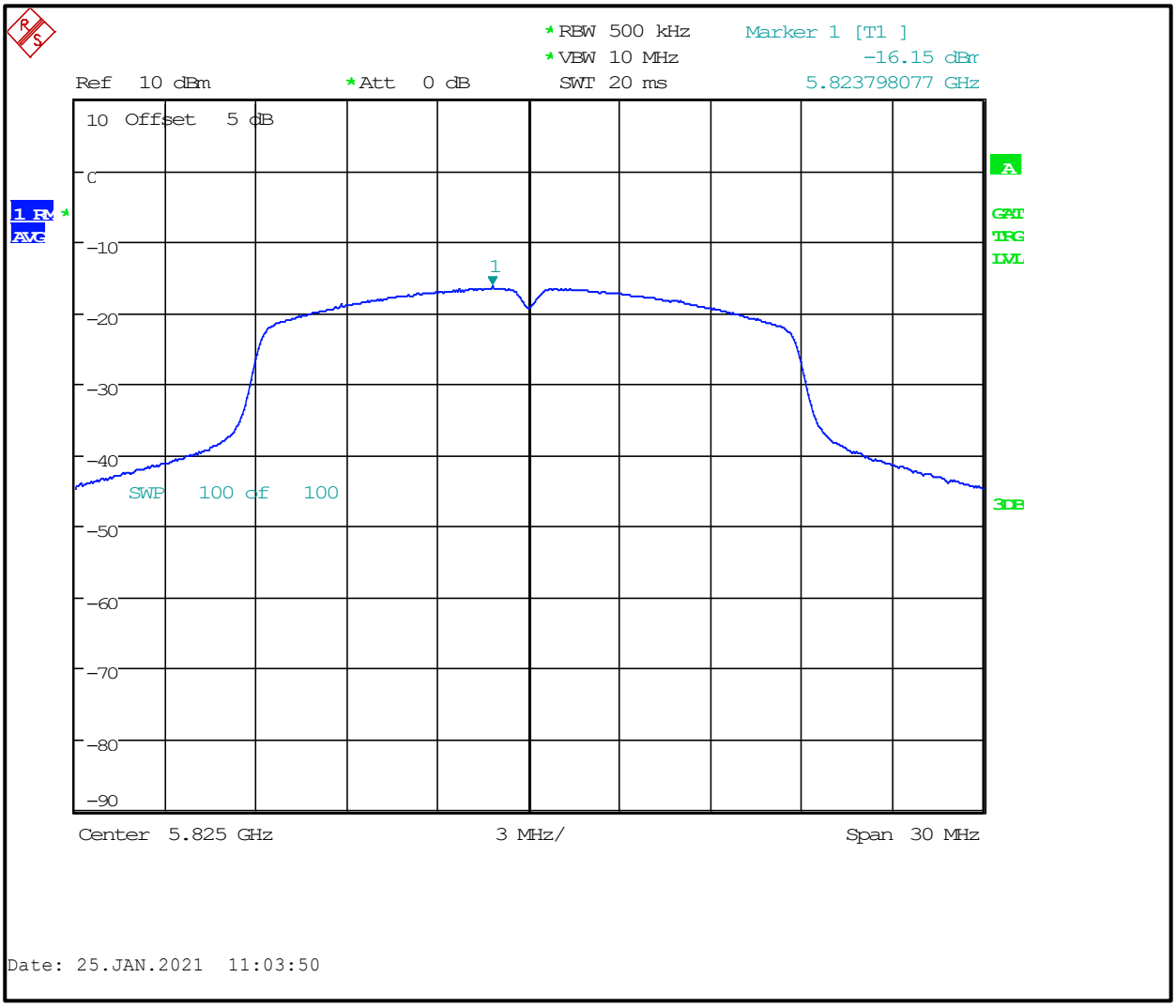
Plot 7-4: Power Spectral Density – 5745 MHz – 802.11a (48.0 Mbps)



Plot 7-5: Power Spectral Density – 5785 MHz – 802.11a (48.0 Mbps)



Plot 7-6: Power Spectral Density – 5825 MHz – 802.11a (48.0 Mbps)



Measurement uncertainty: ±0.5 dB. This measurement uncertainty is an expanded uncertainty for 95% confidence level received with a coverage factor k=2.

Results: Pass

Test Personnel:

Khue Do		January 25 & February 11, 2021
Test Engineer	Signature	Dates of Test

8 Frequency Stability – FCC 15.407(g); RSS-Gen 6.11

8.1 Frequency Stability Test Procedure

The EUT was placed inside the temperature chamber and supplied by nominal 7.4 VDC. The EUT was connected to an analyzer which was located outside of the chamber. The temperature was set to the lowest level of -20.0°C and the EUT was allowed to stabilize with power off for a period of 1 hour. The EUT was then powered up and the frequency was measured. This was continued at +20.0°C and +50.0°C. The chamber was allowed to stabilize between measurements for approximately 30 minutes. At +20.0°C, the EUT supply voltage was adjusted to 85% (6.29 VDC) and 115% (8.51 VDC) of the nominal voltage, and the frequency was recorded.

Table 8-1: Frequency Stability Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900946	Tenney Engineering Inc.	TH65	Temperature and Humidity Chamber	11380	04/07/2022
901672	Rhode & Schwarz	FSEM30	Spectrum Analyzer	833063/13	04/25/2022

8.2 Frequency Stability Test Result

Table 8-2: Frequency Stability at Extreme Temperatures – U-NII1

Temperature (°C)	Measured Frequency (MHz)	ppm
-20.0	5200.020	3.846
+20.0 (reference)	5200.000	0.000
+50.0	5200.060	11.538

Table 8-3: Frequency Stability at Extreme Voltage Levels – U-NII1

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.29	5199.983	-3.269
7.40 (reference)	5200.000	0.000
8.51	5200.005	0.962
Endpoint: 5.9	5200.005	0.962

Table 8-4: Frequency Stability at Extreme Temperatures – U-NII3

Temperature (°C)	Measured Frequency (MHz)	ppm
-20.0	5785.062	10.717
+20.0 (reference)	5784.995	-0.864
+50.0	5785.060	10.372

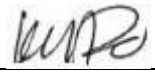
Table 8-5: Frequency Stability at Extreme Voltage Levels – U-NII3

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.29	5784.985	-2.593
7.40 (reference)	5784.995	-0.864
8.51	5785.011	1.901
Endpoint: 5.9	5785.018	3.111

Measurement uncertainty: ±0.5 dB. This measurement uncertainty is an expanded uncertainty for 95% confidence level received with a coverage factor k=2.

Results: Pass

Test Personnel:

Khue Do		December 28, 2020
Test Engineer	Signature	Date of Test

9 AC Conducted Emissions – FCC 15.207; RSS-Gen 8.8

9.1 Conducted Emissions Test Procedure

The powerline conducted emissions measurement were performed in a Series 81 Type shielded enclosure manufactured by Rayproof. The EUT was assembled on a wooden table 80 cm high. Power was fed to the EUT through a 50 Ω/ 50 µH Line Impedance Stabilization Network (LISN). The EUT LISN was fed power through an AC filter box on the outside of the shielded enclosure. The filter box and EUT LISN housing are bonded to the ground plane of the shielded enclosure. A second LISN, the peripheral LISN, provides isolation for the EUT test peripherals. This peripheral LISN was also fed AC power. A metal power outlet box, which is bonded to the ground plane and electrically connected to the peripheral LISN, powers a DC power supply which powers the EUT.

The spectrum analyzer (SA) was connected to the AC line through an isolation transformer. The 50 Ω output of the LISN was connected to the SA input through a Solar 100 kHz high-pass filter. The filter is used to prevent overload of the SA from noise below 100 kHz. Conducted emission levels were measured on each current-carrying line with the SA operating in the CISPR quasi-peak (QPK) mode or peak (PK) mode if applicable.

The SA's 6 dB bandwidth was set to 9 kHz. Video bandwidth (VBW) filter less than 10 times the resolution bandwidth (RBW) is not used. Average (AVG) measurements are performed in linear mode using a 10 kHz RBW, 1 Hz VBW, and by increasing the sweep time in order to obtain a calibrated measurement. The emission spectrum was scanned from 150 kHz to 30 MHz. The highest emission amplitudes relative to the appropriate limits were measured and recorded.

Rate 802.11a 9 Mbps was chosen for U-NII1 and 48 Mbps for U-NII3.

9.2 Conducted Emissions Limits

Table 9-1: Conducted Emissions Limits per FCC Part 15.207

Frequency (MHz)	QPK (dBµV)	AVG (dBµV)
0.15 – 0.50	66 – 56	56 – 46
0.5 – 5.0	56	46
5 – 30	60	50

Table 9-2: Conducted Emissions Test Equipment

RTL Barcode	Part	Manufacture	Model	Serial Number	Calibration Due Date
900339	Quasi-Peak Adapter (30 Hz–1 GHz)	Hewlett Packard	85650A	2521A00743	04/24/2021
900728	High Pass Filter	Solar Electronics Co.	Type 8130	947305	04/30/2023
900968	Spectrum Analyzer (10 kHz–1.5 GHz)	Hewlett Packard	8567A	2602A00160	04/30/2021
900970	Spectrum Analyzer Display	Hewlett Packard	85662A	2542A11239	04/30/2021
901083	Line Impedance Stabilization Network	AFJ International	LS16	16010020080	02/16/2023
N/A	Test Software	ETS Lindgren	TILE! 7	7.1.3.20	N/A

9.3 Conducted Emissions Test Results

Plot 9-1: Conducted Emissions, AC, Neutral, U-NII1, 5180 MHz

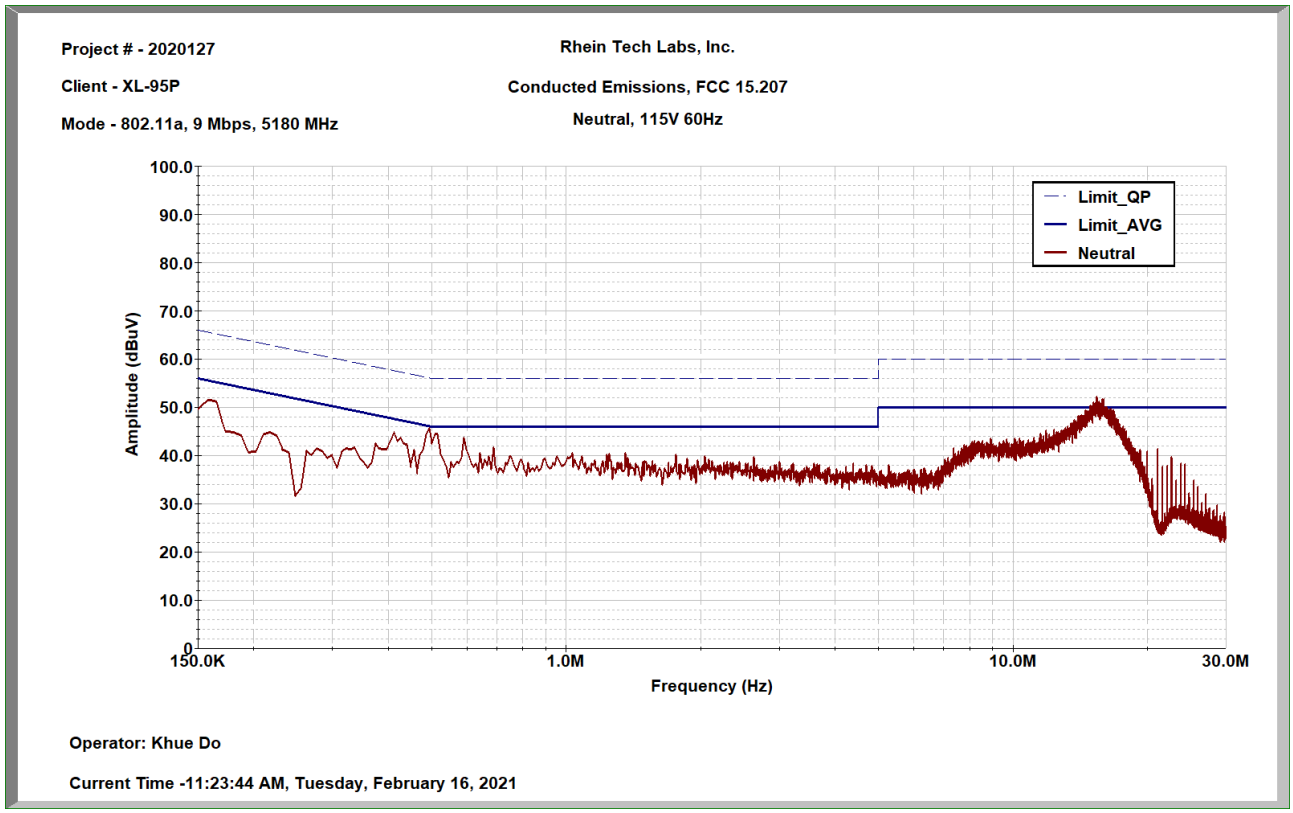


Table 9-3: Conducted Emissions Test Result, AC, Neutral, U-NII1, 5180 MHz

Frequency (MHz)	Detector Type	Emission (dBµV)	Limit (dBµV)	Margin (dB)	Result
15.652	AVG	29.2	50.0	-20.8	Pass
15.652	QPK	48.4	60.0	-11.6	Pass

Plot 9-2: Conducted Emissions, AC, Line, U-NII1, 5180 MHz

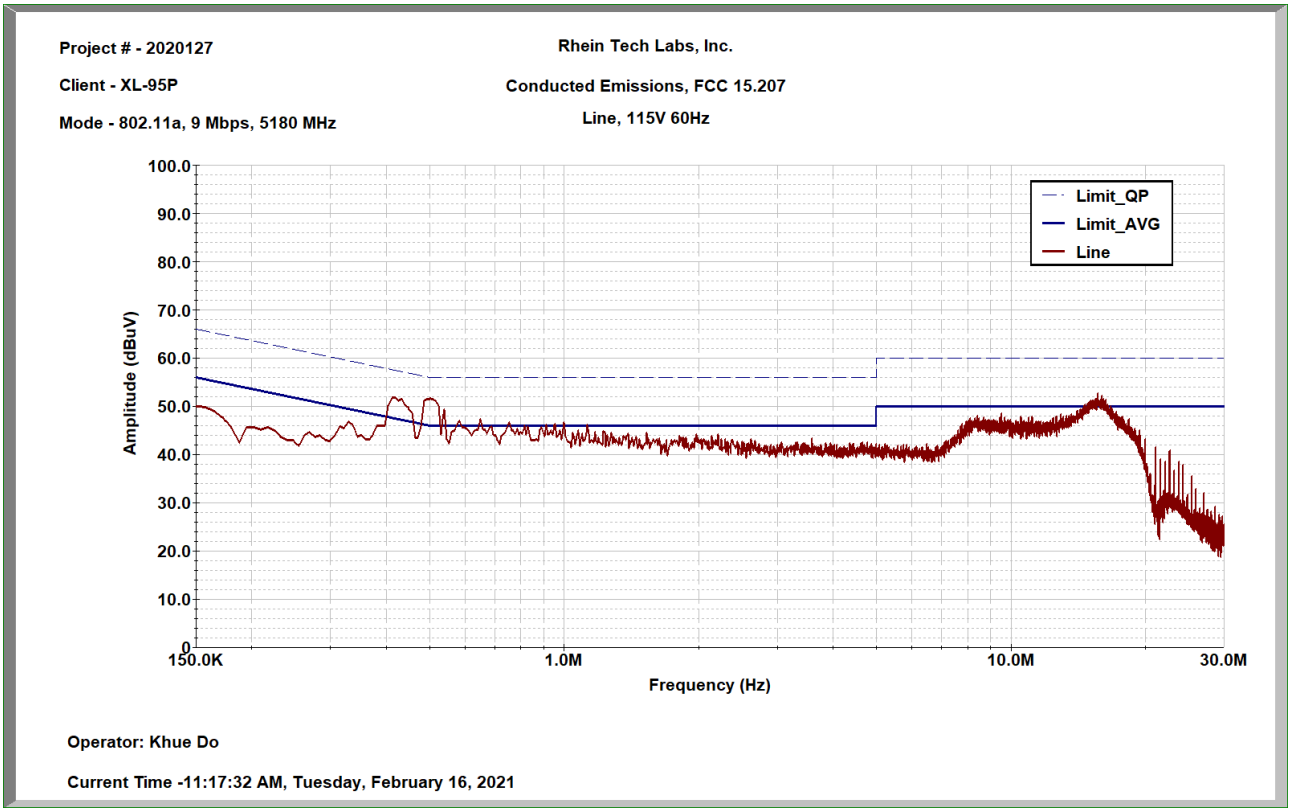


Table 9-4: Conducted Emissions Test Result, AC, Line, U-NII1, 5180 MHz

Frequency (MHz)	Detector Type	Emission (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.501	AVG	27.9	46.0	-18.1	Pass
0.501	QPK	41.1	56.0	-14.9	Pass
15.674	AVG	31.2	50.0	-18.8	Pass
15.674	QPK	48.2	60.0	-11.8	Pass

Plot 9-3: Conducted Emissions, AC, Neutral, U-NII1, 5200 MHz

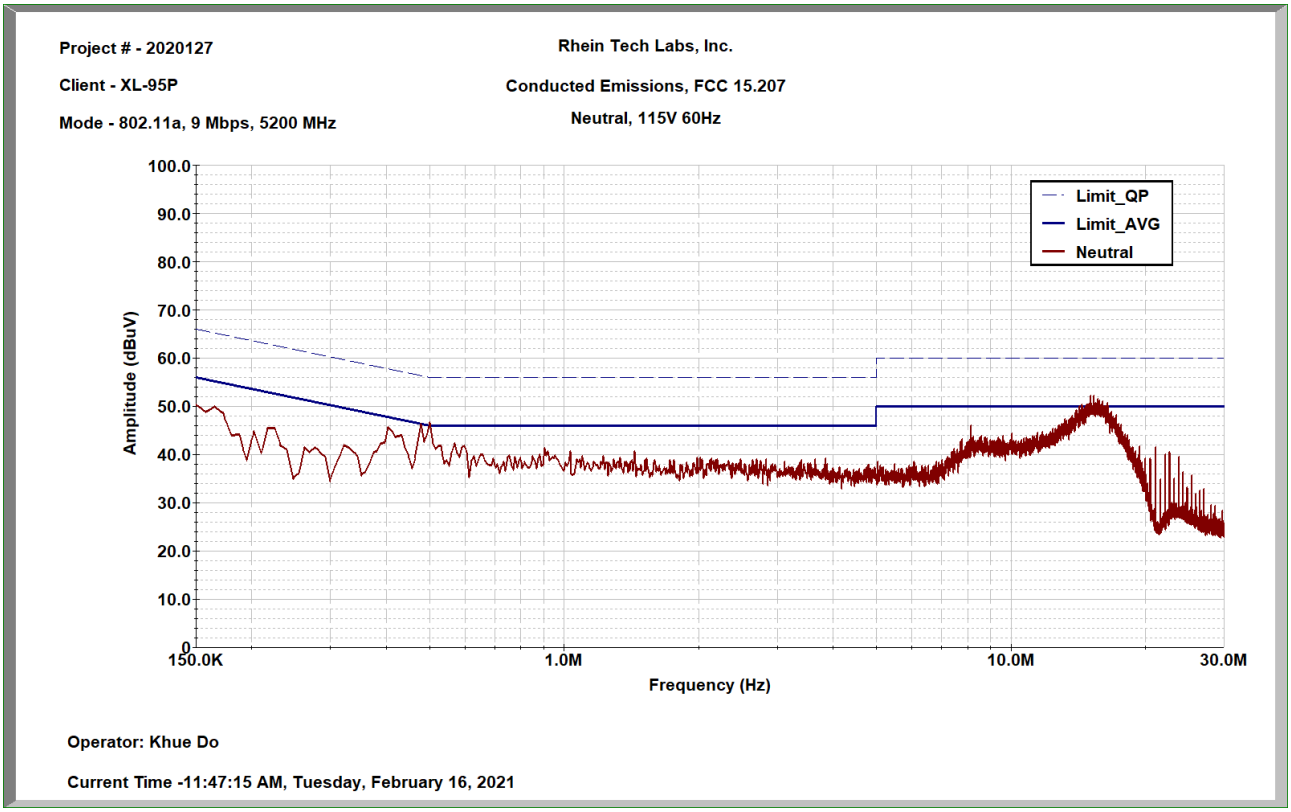


Table 9-5: Conducted Emissions Test Result, AC, Neutral, U-NII1, 5200 MHz

Frequency (MHz)	Detector Type	Emission (dBµV)	Limit (dBµV)	Margin (dB)	Result
15.656	AVG	29.4	50.0	-20.6	Pass
15.656	QPK	48.4	60.0	-11.6	Pass

Plot 9-4: Conducted Emissions, AC, Line, U-NII1, 5200 MHz

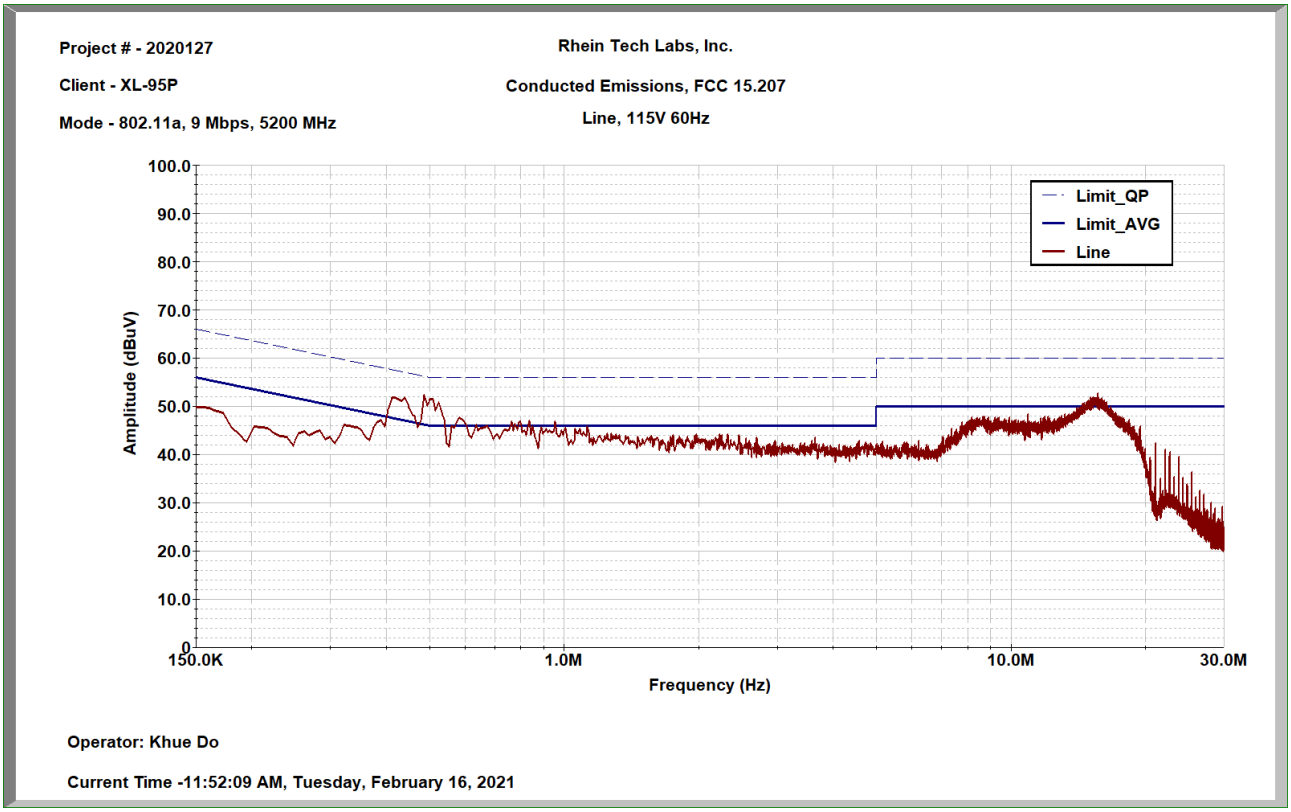


Table 9-6: Conducted Emissions Test Result, AC, Line, U-NII1, 5200 MHz

Frequency (MHz)	Detector Type	Emission (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.513	AVG	29.2	46.0	-16.8	Pass
0.513	QPK	41.1	56.0	-14.9	Pass
15.658	AVG	31.0	50.0	-19.0	Pass
15.658	QPK	47.8	60.0	-12.2	Pass

Plot 9-5: Conducted Emissions, AC, Neutral, U-NII1, 5240 MHz

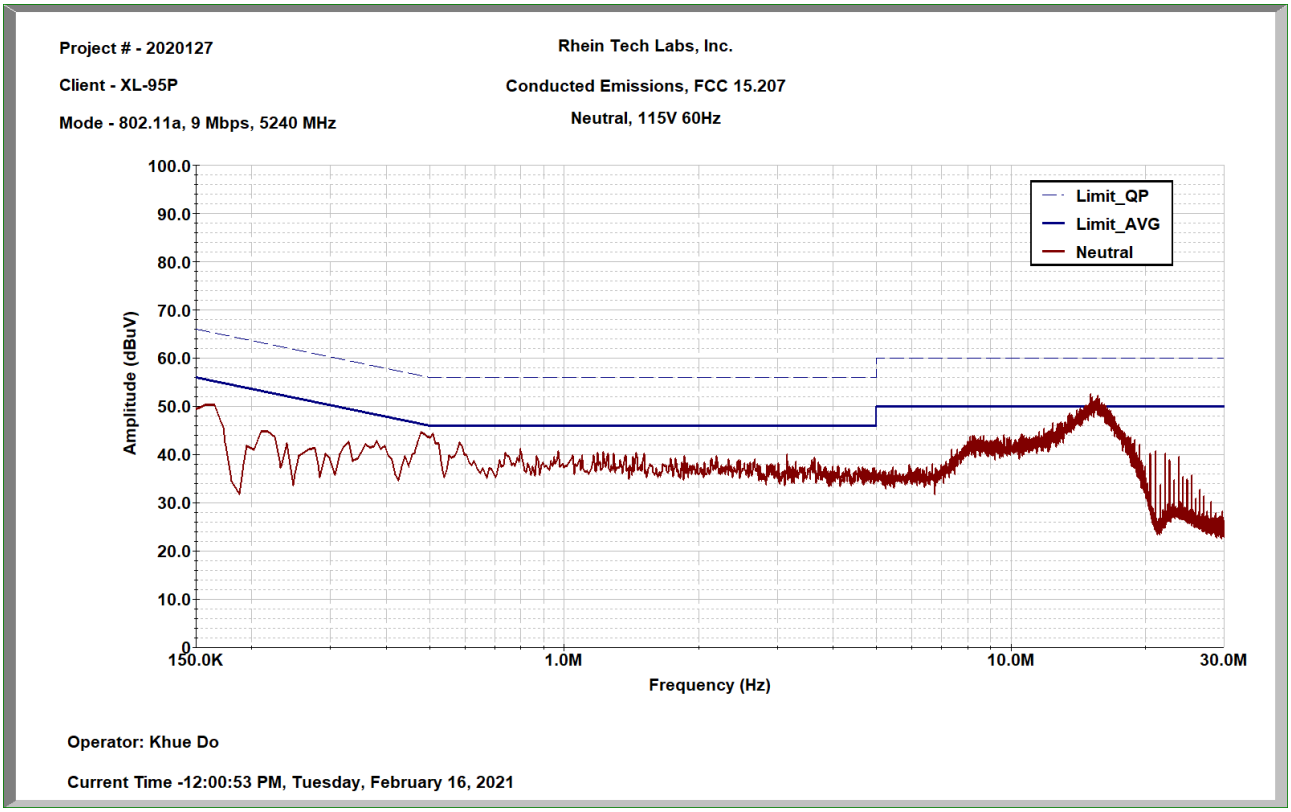


Table 9-7: Conducted Emissions Test Result, AC, Neutral, U-NII1, 5240 MHz

Frequency (MHz)	Detector Type	Emission (dBµV)	Limit (dBµV)	Margin (dB)	Result
15.655	AVG	30.0	50.0	-20.0	Pass
15.655	QPK	48.8	60.0	-11.2	Pass

Plot 9-6: Conducted Emissions, AC, Line, U-NII1, 5240 MHz

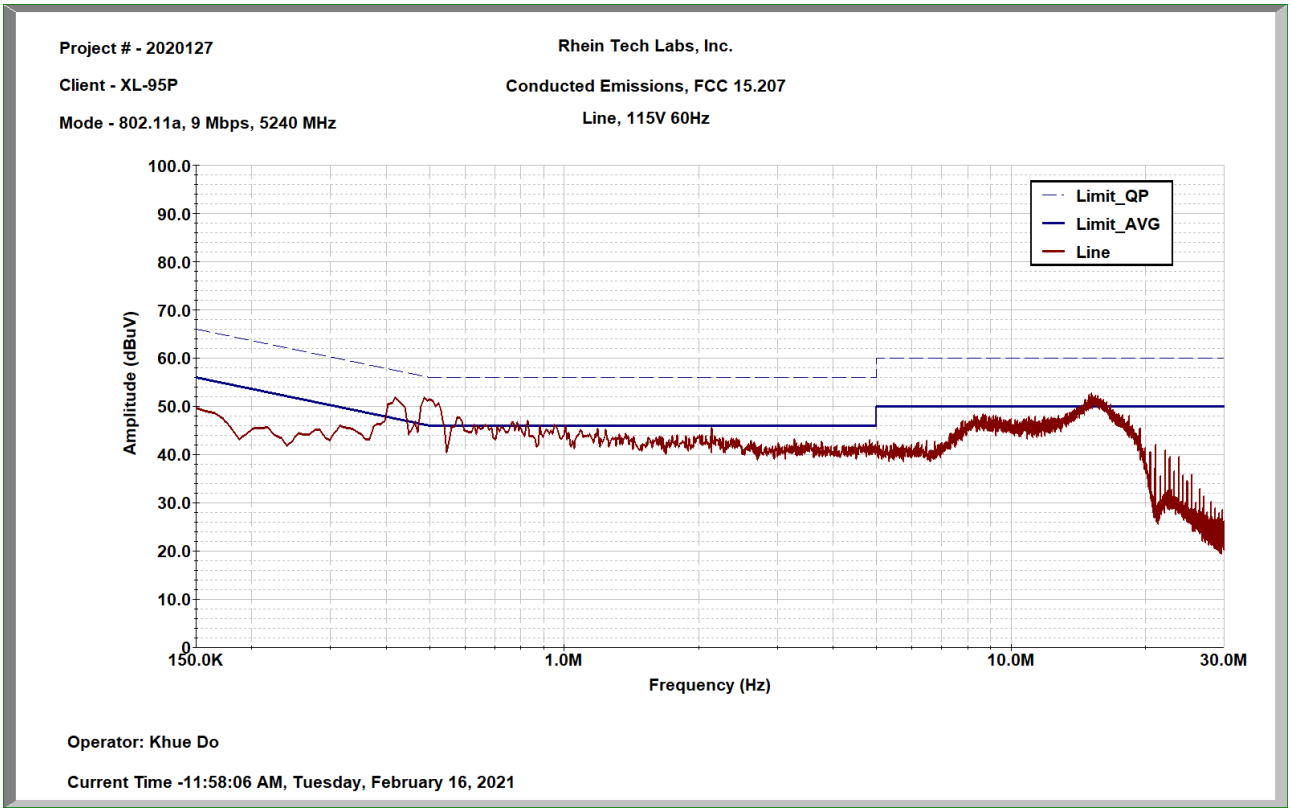


Table 9-8: Conducted Emissions Test Result, AC, Line, U-NII1, 5240 MHz

Frequency (MHz)	Detector Type	Emission (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.515	AVG	28.8	46.0	-17.2	Pass
0.515	QPK	40.8	56.0	-15.2	Pass
15.662	AVG	31.0	50.0	-19.0	Pass
15.662	QPK	48.1	60.0	-11.9	Pass

Plot 9-7: Conducted Emissions, AC, Neutral, U-NII3, 5745 MHz

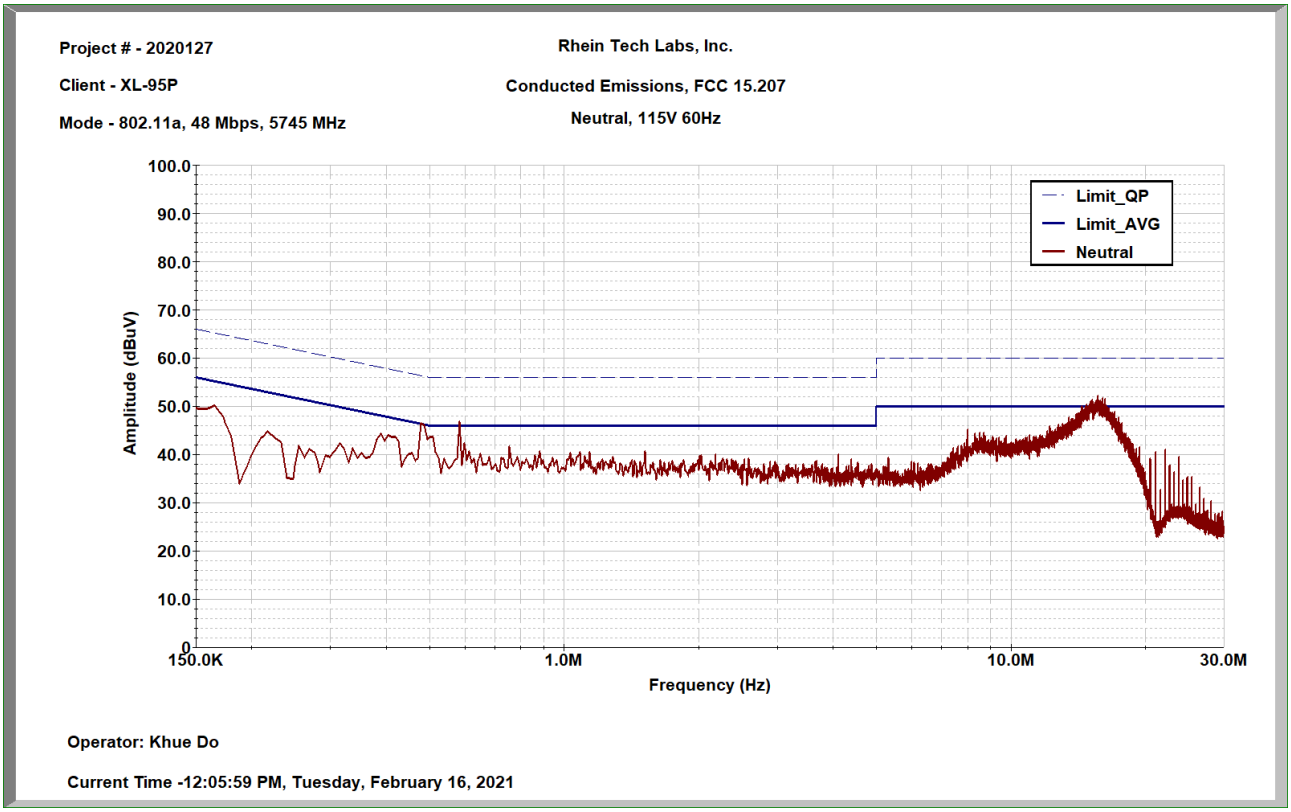


Table 9-9: Conducted Emissions Test Result, AC, Neutral, U-NII3, 5745 MHz

Frequency (MHz)	Detector Type	Emission (dBµV)	Limit (dBµV)	Margin (dB)	Result
15.648	AVG	31.0	50.0	-19.0	Pass
15.648	QPK	49.3	60.0	-10.7	Pass

Plot 9-8: Conducted Emissions, AC, Line, U-NII3, 5745 MHz

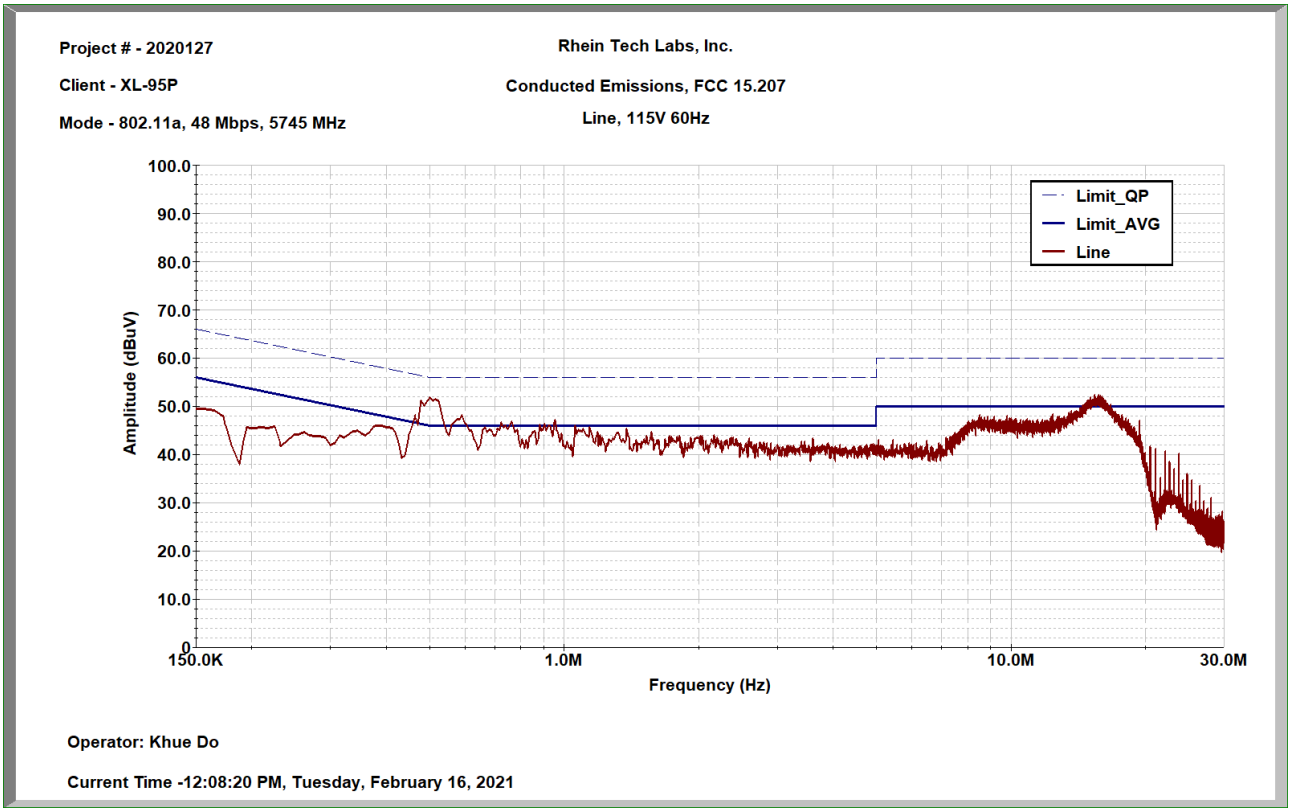


Table 9-10: Conducted Emissions Test Result, AC, Line, U-NII3, 5745 MHz

Frequency (MHz)	Detector Type	Emission (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.514	AVG	29.8	46.0	-16.2	Pass
0.514	QPK	41.3	56.0	-14.7	Pass
15.660	AVG	31.6	50.0	-18.4	Pass
15.660	QPK	49.1	60.0	-10.9	Pass

Plot 9-9: Conducted Emissions, AC, Neutral, U-NII3, 5785 MHz

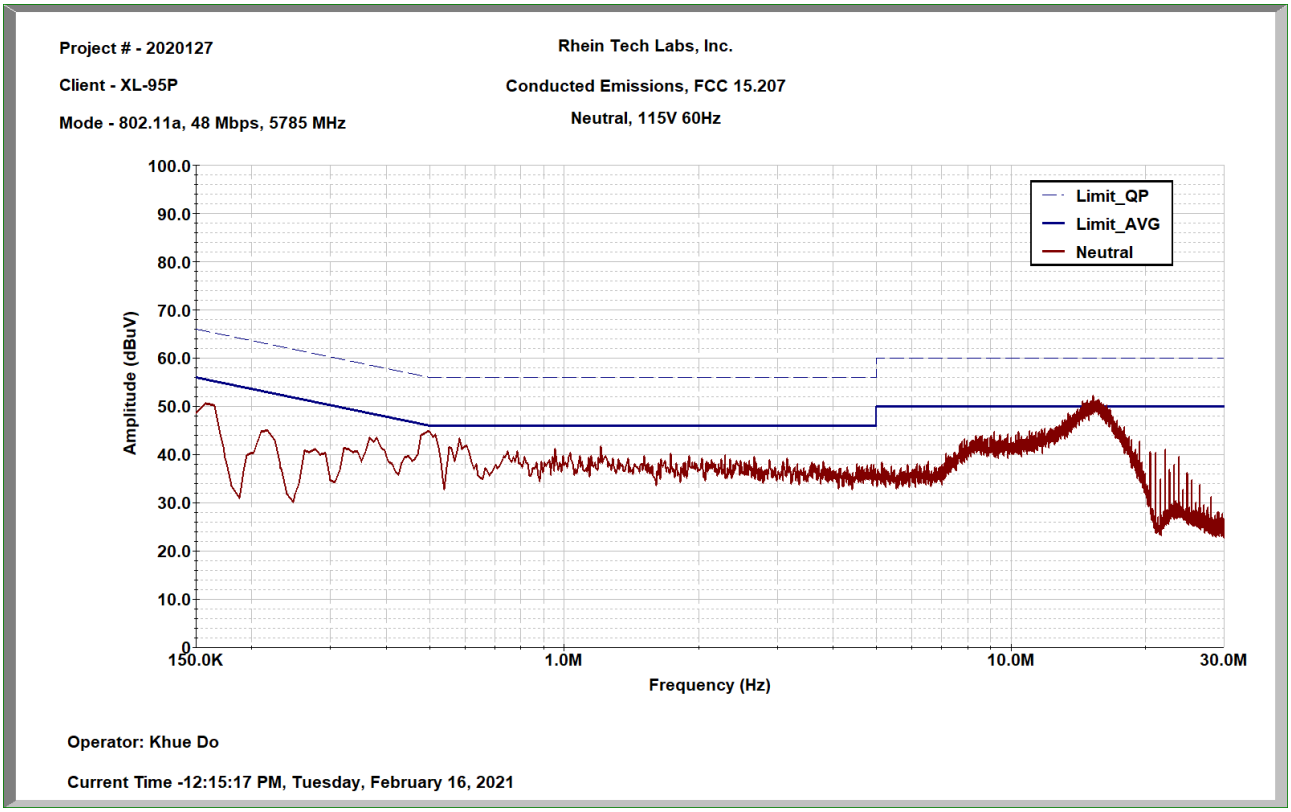


Table 9-11: Conducted Emissions Test Result, AC, Neutral, U-NII3, 5785 MHz

Frequency (MHz)	Detector Type	Emission (dBµV)	Limit (dBµV)	Margin (dB)	Result
15.672	AVG	30.7	50.0	-19.3	Pass
15.672	QPK	49.6	60.0	-10.4	Pass

Plot 9-10: Conducted Emissions, AC, Line, U-NII3, 5785 MHz

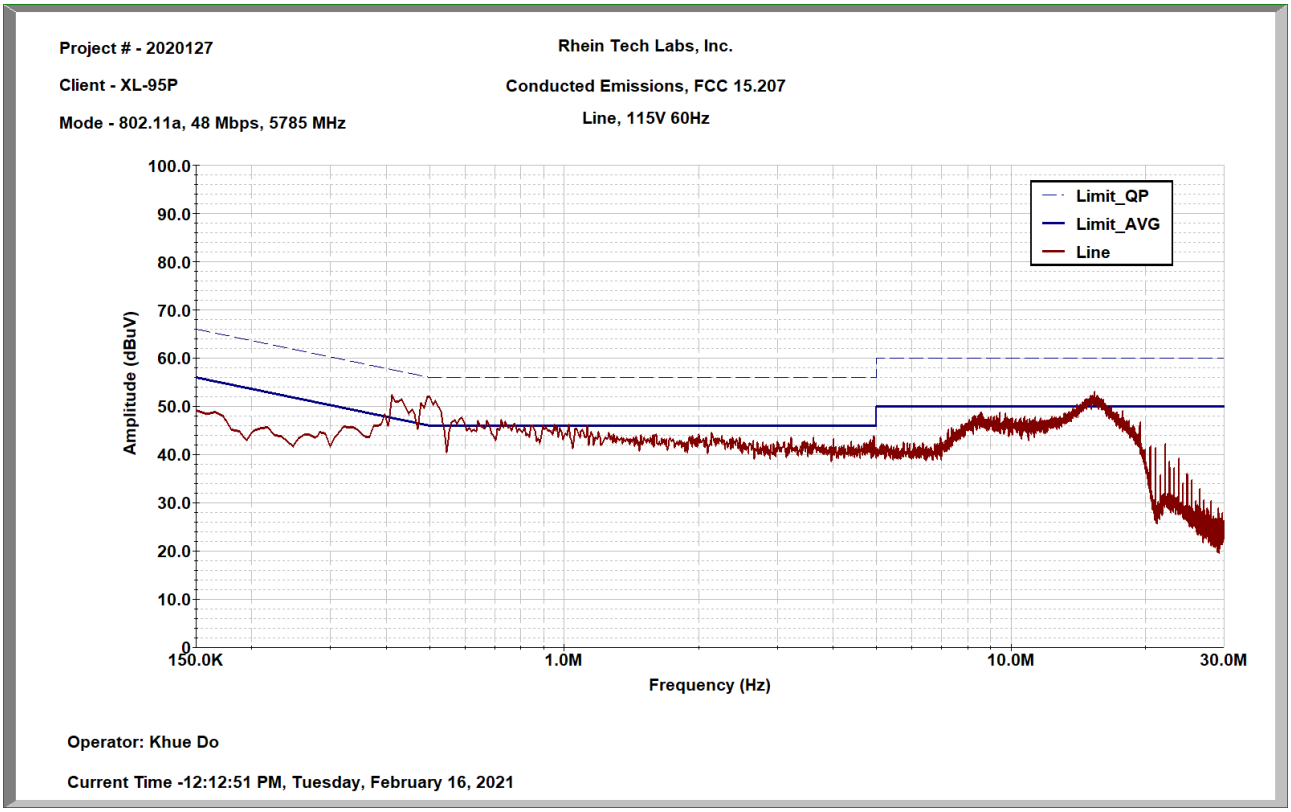


Table 9-12: Conducted Emissions Test Result, AC, Line, U-NII3, 5785 MHz

Frequency (MHz)	Detector Type	Emission (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.515	AVG	28.8	46.0	-17.2	Pass
0.515	QPK	40.8	56.0	-15.2	Pass
15.660	AVG	30.8	50.0	-19.2	Pass
15.660	QPK	47.9	60.0	-12.1	Pass

Plot 9-11: Conducted Emissions, AC, Neutral, U-NII3, 5825 MHz

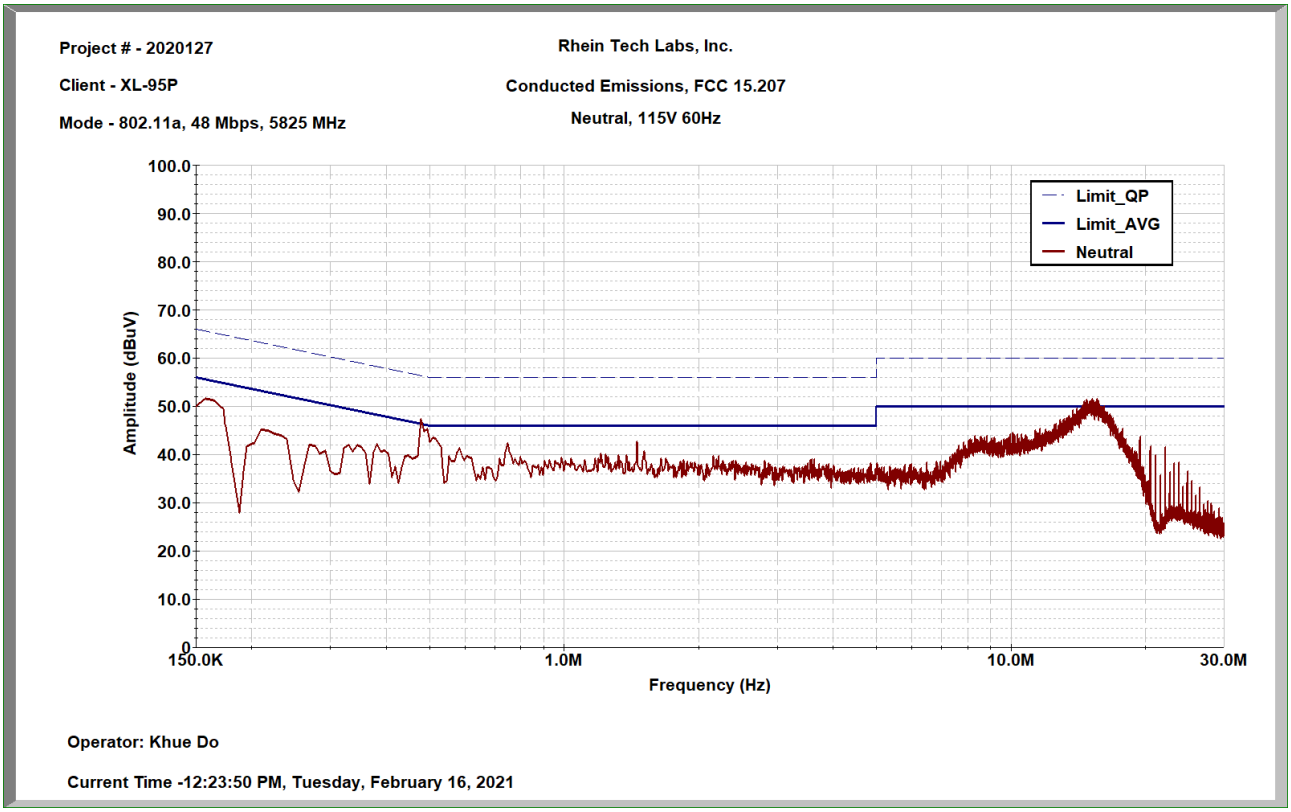


Table 9-13: Conducted Emissions Test Result, AC, Neutral, U-NII3, 5825 MHz

Frequency (MHz)	Detector Type	Emission (dBµV)	Limit (dBµV)	Margin (dB)	Result
15.597	AVG	30.1	50.0	-19.9	Pass
15.597	QPK	49.4	60.0	-10.6	Pass

Plot 9-12: Conducted Emissions, AC, Line, U-NII3, 5825 MHz

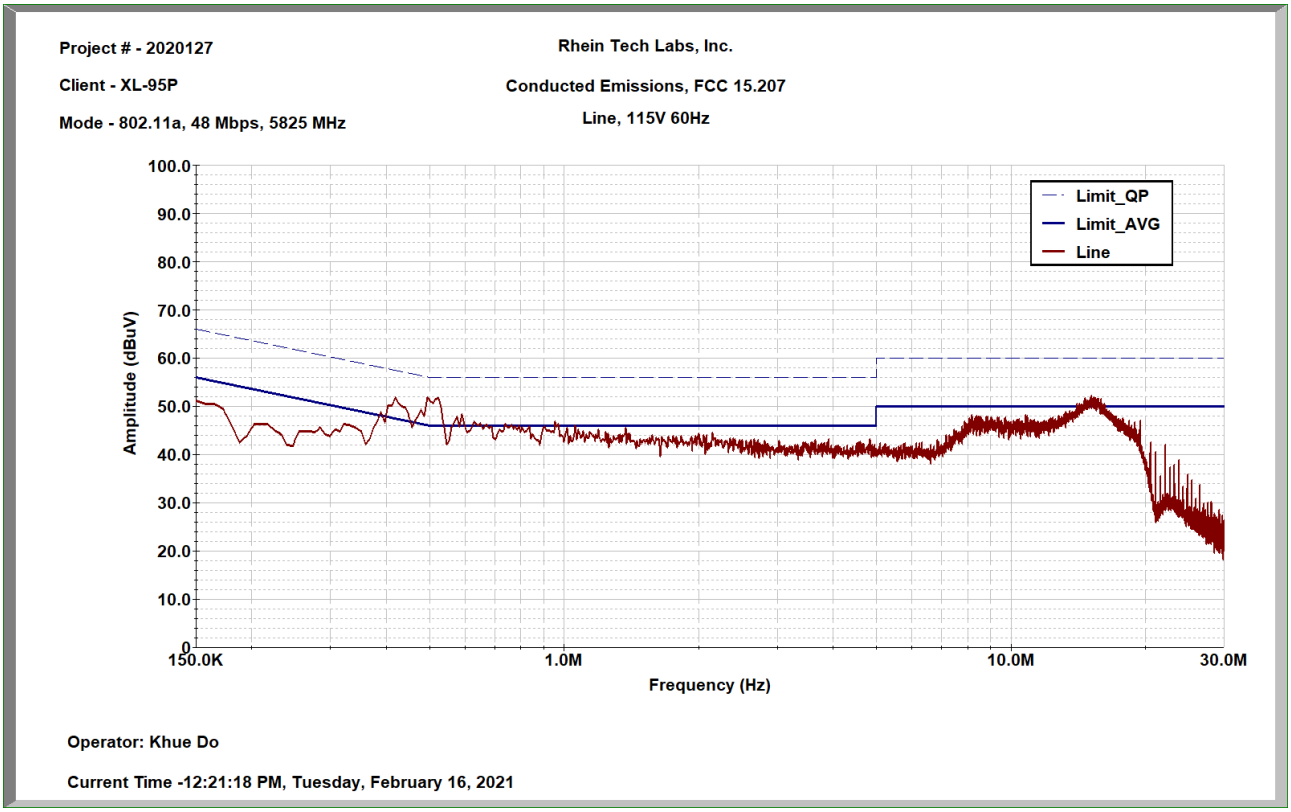


Table 9-14: Conducted Emissions Test Result, AC, Line, U-NII3, 5825 MHz

Frequency (MHz)	Detector Type	Emission (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.522	AVG	29.0	46.0	-17.0	Pass
0.522	QPK	41.4	56.0	-14.6	Pass
15.709	AVG	31.7	50.0	-18.3	Pass
15.709	QPK	49.1	60.0	-10.9	Pass

Measurement uncertainty: ±3.6 dB. This measurement uncertainty is an expanded uncertainty for 95% confidence level received with a coverage factor k=2.

Results: Pass

Test Personnel:

Khue Do		February 16, 2021
Test Engineer	Signature	Date of Test

10 Radiated Emissions – FCC 15.407(b); 15.209; RSS-247 6.2; RSS-Gen 6.13/7.1

10.1 Limits of Radiated Emissions Measurement

15.407(b) (1) 5150-5350 (2) 5150-5350 (3) 5470-5725: -27 dBm/MHz
(4) 5725-5850 (i) 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.

15.209:

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009-0.490	2400/f (kHz)	300
0.490-1.705	2400/f (kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

As shown in 15.35(b), for frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any circumstances of modulation.

10.2 Radiated Emissions Measurement Test Procedure

Before final measurements of radiated emissions were made on the open-field three/ten meter range, the EUT was scanned indoors at one and three meter distances. This was done in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to ensure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three/ten-meter, open-field test site. The EUT was placed on a nonconductive turntable 0.8 meters above the ground plane. The spectrum was examined from 9 kHz to 40.0 GHz.

At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations. For frequencies between 30 and 1000 MHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. For emissions above 1000 MHz, emissions are measured using the average detector function with a minimum resolution bandwidth of 1 MHz. No video filter less than 10 times the resolution bandwidth was used. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

Conversion of dBuV/m to dBm: dBuV/m -104.77 + 20log(3m) = -95.27 dB

Table 10-1: Radiated Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900772	EMCO	3161-02	Horn Antenna (2.0–4.0 GHz)	9804-1044	08/05/2024
900321	EMCO	3161-03	Horn Antennas (4.0–8.2 GHz)	9508-1020	08/05/2024
900323	EMCO	3160-7	Horn Antennas (8.2–12.4 GHz)	9605-1054	08/05/2024
900356	EMCO	3160-08	Horn Antenna (12.4–18.0 GHz)	9607-1044	08/05/2024
901218	EMCO	3160-09	Horn Antenna (18-26.5 GHz)	960281-003	08/05/2024
901303	EMCO	3160-10	Horn Antenna (26.5-40.0 GHz) WR-28	960452-007	08/05/2024
901669	ETS-Lindgren	3142E	Biconilog Antenna (30 MH –6000 MHz)	00166065	07/11/2025
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	12/01/2024

10.3 Radiated Emissions Test Results

Table 10-2: Radiated Emissions Harmonics/Spurious – 5180 MHz, Restricted

Frequency (MHz)	Detector	Raw Level (dBµV/m)	SCF (dB)	Corrected Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
15540.0	AVG	4.1	37.1	41.2	54.0	-12.8
15540.0	PK	19.1	37.1	56.2	74.0	-17.8
20720.0	AVG	2.8	40.3	43.1	54.0	-10.9
20720.0	PK	17.8	40.3	58.1	74.0	-15.9

Table 10-3: Radiated Emissions Harmonics/Spurious – 5180 MHz, Non-Restricted, Peak

Frequency (MHz)	Raw Level (dBµV/m)	SCF (dB)	Corrected Level (dBµV/m)	Converted Level (dBm)	Limit (dBm/MHz)	Margin (dB)
10360.0	24.1	33.5	57.6	-37.7	-27.0	-10.7
25900.0	-8.7	40.6	31.9	-63.4	-27.0	-36.4
31080.0	-7.3	43.9	36.6	-58.7	-27.0	-31.7

Table 10-4: Radiated Emissions Harmonics/Spurious – 5200 MHz, Restricted

Frequency (MHz)	Detector	Raw Level (dBµV/m)	SCF (dB)	Corrected Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
15600.0	AVG	4.7	37.1	41.8	54.0	-12.2
15600.0	PK	19.7	37.1	56.8	74.0	-17.2
20800.0	AVG	3.4	40.3	43.7	54.0	-10.3
20800.0	PK	18.4	40.3	58.7	74.0	-15.3
31200.0	AVG	-22.6	44.0	21.4	54.0	-32.6
31200.0	PK	-7.6	44.0	36.4	74.0	-37.6

Table 10-5: Radiated Emissions Harmonics/Spurious – 5200 MHz, Non-Restricted, Peak

Frequency (MHz)	Raw Level (dBµV/m)	SCF (dB)	Corrected Level (dBµV/m)	Converted Level (dBm)	Limit (dBm/MHz)	Margin (dB)
10384.0	22.6	33.5	56.1	-39.2	-27.0	-12.2
10400.0	19.5	33.5	53.0	-42.3	-27.0	-15.3
26000.0	-9.9	40.5	30.6	-64.6	-27.0	-37.6
36400.0	-7.5	44.1	36.6	-58.7	-27.0	-31.7

Table 10-6: Radiated Emissions Harmonics/Spurious – 5240 MHz, Restricted

Frequency (MHz)	Detector	Raw Level (dBµV/m)	SCF (dB)	Corrected Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
15720.0	AVG	5.6	37.1	42.7	54.0	-11.3
15720.0	PK	20.6	37.1	57.7	74.0	-16.3
20960.0	AVG	5.8	40.3	46.1	54.0	-7.9
20960.0	PK	20.8	40.3	61.1	74.0	-12.9
31440.0	AVG	-22.4	44.0	21.5	54.0	-32.5
31440.0	PK	-7.4	44.0	36.5	74.0	-37.5

Table 10-7: Radiated Emissions Harmonics/Spurious – 5240 MHz, Non-Restricted, Peak

Frequency (MHz)	Raw Level (dBµV/m)	SCF (dB)	Corrected Level (dBµV/m)	Converted Level (dBm)	Limit (dBm/MHz)	Margin (dB)
10480.0	19.9	33.5	53.4	-41.9	-27.0	-14.9
26200.0	-9.2	40.5	31.3	-63.9	-27.0	-36.9
36680.0	-8.3	44.2	35.9	-59.4	-27.0	-32.4

Table 10-8: Radiated Emissions Harmonics/Spurious – 5745 MHz, Restricted

Frequency (MHz)	Detector	Raw Level (dBµV/m)	SCF (dB)	Corrected Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11490.0	AVG	8.2	33.5	41.7	54.0	-12.3
11490.0	PK	23.2	33.5	56.7	74.0	-17.3
17235.0	AVG	6.8	37.1	43.9	54.0	-10.1
17235.0	PK	21.8	37.1	58.9	74.0	-15.1
22980.0	AVG	-22.8	40.5	17.8	54.0	-36.2
22980.0	PK	-7.8	40.5	32.8	74.0	-41.2

Table 10-9: Radiated Emissions Harmonics/Spurious – 5745 MHz, Non-Restricted, Peak

Frequency (MHz)	Raw Level (dBµV/m)	SCF (dB)	Corrected Level (dBµV/m)	Converted Level (dBm)	Limit (dBm/MHz)	Margin (dB)
28725.0	-2.8	43.7	40.9	-54.4	-27.0	-27.4
34470.0	-8.3	44.1	35.7	-59.5	-27.0	-32.5

Table 10-10: Radiated Emissions Harmonics/Spurious – 5785 MHz, Restricted

Frequency (MHz)	Detector	Raw Level (dBµV/m)	SCF (dB)	Corrected Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11570.0	AVG	7.4	33.5	40.9	54.0	-13.1
11570.0	PK	22.4	33.5	40.9	74.0	-33.1
17355.0	AVG	6.5	37.1	43.6	54.0	-10.4
17355.0	PK	21.5	37.1	58.6	74.0	-15.4
23140.0	AVG	-4.9	40.5	35.7	54.0	-18.3
23140.0	PK	10.1	40.5	50.7	74.0	-23.3

Table 10-11: Radiated Emissions Harmonics/Spurious – 5785 MHz, Non-Restricted, Peak

Frequency (MHz)	Raw Level (dBµV/m)	SCF (dB)	Corrected Level (dBµV/m)	Converted Level (dBm)	Limit (dBm/MHz)	Margin (dB)
28925.0	-1.6	43.7	42.1	-53.2	-27.0	-26.2
34710.0	-7.7	44.1	36.5	-58.8	-27.0	-31.8

Table 10-12: Radiated Emissions Harmonics/Spurious – 5825 MHz, Restricted

Frequency (MHz)	Detector	Raw Level (dBµV/m)	SCF (dB)	Corrected Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11650.0	AVG	9.4	33.5	42.9	54.0	-11.1
11650.0	PK	24.4	33.5	57.9	74.0	-16.1
17475.0	AVG	5.7	37.1	42.8	54.0	-11.2
17475.0	PK	20.7	37.1	57.8	74.0	-16.2
23300.0	AVG	-2.2	40.5	38.3	54.0	-15.7
23300.0	PK	12.8	40.5	53.3	74.0	-20.7

Table 10-13: Radiated Emissions Harmonics/Spurious – 5825 MHz, Non-Restricted, Peak

Frequency (MHz)	Raw Level (dBµV/m)	SCF (dB)	Corrected Level (dBµV/m)	Converted Level (dBm)	Limit (dBm/MHz)	Margin (dB)
29125.0	-2.3	43.7	41.4	-53.9	-27.0	-26.9
34950.0	-9.2	44.1	34.9	-60.4	-27.0	-33.4

Measurement uncertainty: ±4.6 dB. This measurement uncertainty is an expanded uncertainty for 95% confidence level received with a coverage factor k=2.

Results: Pass

Test Personnel:

Dan Baltzell		March 13-22, 2023
Test Engineer	Signature	Dates of Test

11 Conclusion

The data in this NII measurement report shows that the EUT as tested, L3Harris Technologies, XL-95P Multi-Band Portable V/U, HVIN: XL-x5-V/U, FCC ID: OWDTR-0166-E, IC: 3636B-0166, complies with the applicable requirements of FCC Parts 2 and 15 and ISED RSS-247 and RSS-Gen.