RHEIN TECH LABORATORIES, INC.

Engineering Solutions & Electromagnetic Compatibility Services

Certification Application Report
FCC Part 15.247 & 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	DTS – Part 15 Digital Transmission System		
FCC Rule Part(s)	FCC Rules Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz (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		
Frequency Range (MHz)	**Output Power (mW) Peak Conducted**	**Frequency Tolerance**	**Emission Designator**
2412 – 2462	8.3	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.

This report may not be reproduced, except in full, without the written approval of Rhein Tech Laboratories, Inc. and L3Harris Technologies. The test results relate only to the item(s) tested.

Table of Contents

1 General Information 5
1.1 Scope 5
1.2 Description of EUT 5
1.3 Test Facility 5
1.4 Related Submittal(s)/Grant(s) 5
1.5 Modifications 5
2 Test Information 6
2.1 Description of Test Modes 6
2.2 Exercising the EUT 6
2.3 Test Result Summary 6
2.4 Tested System Details 6
3 Peak Output Power – FCC 15.247(b)(1); RSS-247 5.4(b), RSS-Gen 6.12 8
3.1 Power Output Test Procedure 8
3.2 Power Output Test Results 8
4 Compliance with the Band Edge – FCC 15.247(d); RSS-247 5.5 9
4.1 Band Edge Test Procedure 9
4.2 Restricted Band Edge Test Results 10
4.3 Band Edge Plots 10
5 Antenna Conducted Spurious Emissions – FCC 15.247(d); RSS-247 5.5, RSS-Gen 6.13 16
5.1 Antenna Conducted Spurious Emissions Test Procedures 16
5.2 Antenna Conducted Spurious Emissions Test Results 16
6 Bandwidths – FCC 15.247(a)(2); RSS-247 5.2(a); RSS-Gen 6.7 17
6.1 Bandwidth Test Procedure 17
6.2 Modulated Bandwidth Test Results 17
6.3 Bandwidth Plots 18
7 Power Spectral Density – FCC 15.247(e); RSS-247 5.2(b) 27
7.1 Power Spectral Density Test Procedure 27
7.2 Power Spectral Density Test Results 27
7.3 Power Spectral Density Plots 28
8 AC Conducted Emissions – FCC 15.207; RSS-Gen 8.8 31
8.1 Conducted Emissions Test Procedure 31
8.2 Conducted Emissions Limits 31
8.3 Conducted Emissions Test Results 32
9 Radiated Emissions – FCC 15.209; RSS-247 5.5; RSS-Gen 8.9, 8.10 38
9.1 Limits of Radiated Emissions Measurement 38
9.2 Radiated Emissions Measurement Test Procedure 38
9.3 Radiated Emissions Test Results 40
10 Conclusion 44

Figure Index

Figure 2-1: Configuration of System Under Test 7

Table Index

Table 2-1: Channels Tested for Wi-Fi – 802.11b (11 Mbps); 802.11g (54 Mbps); 802.11n (6.5 Mbps) 6
Table 2-2: Test Result Summary – FCC Part 15, Subpart C (Section 15.247); RSS-247, RSS-Gen 6
Table 2-3: Equipment Under Test (EUT) 7
Table 2-4: Support Equipment 7
Table 2-5: Auxiliary Equipment 7
Table 3-1: Power Output Test Equipment 8
Table 3-2: Power Output Test Data 8
Table 4-1: Band Edge Test Equipment 9
Table 5-1: Antenna Conducted Spurious Emissions Test Equipment 16
Table 6-1: Bandwidth Test Equipment 17
Table 6-2: Modulated Bandwidth Test Data 17
Table 7-1: Power Spectral Density Test Equipment 27
Table 7-2: Power Spectral Density Test Data 27
Table 8-1: Conducted Emissions Limits per FCC Part 15.207 31
Table 8-2: Conducted Emissions Test Equipment 31
Table 8-3: Conducted Emissions Test Result, AC, Neutral, 2412 MHz 32
Table 8-4: Conducted Emissions Test Result, AC, Line, 2412 MHz 33
Table 8-5: Conducted Emissions Test Result, AC, Neutral, 2437 MHz 34
Table 8-6: Conducted Emissions Test Result, AC, Line, 2437 MHz 35
Table 8-7: Conducted Emissions Test Result, AC, Neutral, 2462 MHz 36
Table 8-8: Conducted Emissions Test Result, AC, Line, 2462 MHz 37
Table 9-1: Radiated Emissions Test Equipment 39
Table 9-2: Radiated Emissions Harmonics/Spurious – 2412 MHz, Peak Detector; 802.11b 40
Table 9-3: Radiated Emissions Harmonics/Spurious – 2412 MHz, Average Detector; 802.11b 40
Table 9-4: Radiated Emissions Harmonics/Spurious – 2437 MHz, Peak Detector; 802.11b 40
Table 9-5: Radiated Emissions Harmonics/Spurious – 2437 MHz, Average Detector; 802.11b 40
Table 9-6: Radiated Emissions Harmonics/Spurious – 2462 MHz, Peak Detector; 802.11b 41
Table 9-7: Radiated Emissions Harmonics/Spurious – 2462 MHz, Average Detector; 802.11b 41
Table 9-8: Radiated Emissions Harmonics/Spurious – 2412 MHz, Peak Detector; 802.11g 41
Table 9-9: Radiated Emissions Harmonics/Spurious – 2412 MHz, Average Detector; 802.11g 41
Table 9-10: Radiated Emissions Harmonics/Spurious – 2437 MHz, Peak Detector; 802.11g 42
Table 9-11: Radiated Emissions Harmonics/Spurious – 2437 MHz, Average Detector; 802.11g 42
Table 9-12: Radiated Emissions Harmonics/Spurious – 2462 MHz, Peak Detector; 802.11g 42
Table 9-13: Radiated Emissions Harmonics/Spurious – 2462 MHz, Average Detector; 802.11g 42
Table 9-14: Radiated Emissions Harmonics/Spurious – 2412 MHz, Peak Detector; 802.11n 43
Table 9-15: Radiated Emissions Harmonics/Spurious – 2412 MHz, Average Detector; 802.11n 43
Table 9-16: Radiated Emissions Harmonics/Spurious – 2437 MHz, Peak Detector; 802.11n 43
Table 9-17: Radiated Emissions Harmonics/Spurious – 2437 MHz, Average Detector; 802.11n 43
Table 9-18: Radiated Emissions Harmonics/Spurious – 2462 MHz, Peak Detector; 802.11n 44
Table 9-19: Radiated Emissions Harmonics/Spurious – 2462 MHz, Average Detector; 802.11n 44

Plot Index

Plot 4-1: Lower Band Edge – 802.11b (1.0 Mbps) 10
Plot 4-2: Upper Band Edge – 802.11b (1.0 Mbps) 11
Plot 4-3: Lower Band Edge – 802.11g (12.0 Mbps) 12
Plot 4-4: Upper Band Edge – 802.11g (12.0 Mbps) 13
Plot 4-5: Lower Band Edge – 802.11n (65 Mbps) 14
Plot 4-6: Upper Band Edge – 802.11n (65.0 Mbps) 15
Plot 6-1: 6 dB and 99% Bandwidth – 2412 MHz – 802.11b (11.0 Mbps) 18
Plot 6-2: 6 dB and 99% Bandwidth – 2437 MHz – 802.11b (11.0 Mbps) 19
Plot 6-3: 6 dB and 99% Bandwidth – 2462 MHz – 802.11b (11.0 Mbps) 20
Plot 6-4: 6 dB and 99% Bandwidth – 2412 MHz – 802.11g (54.0 Mbps) 21
Plot 6-5: 6 dB and 99% Bandwidth – 2437 MHz – 802.11g (54.0 Mbps) 22
Plot 6-6: 6 dB and 99% Bandwidth – 2462 MHz – 802.11g (54.0 Mbps) 23
Plot 6-7: 6 dB and 99% Bandwidth – 2412 MHz – 802.11n (65.0 Mbps) 24
Plot 6-8: 6 dB and 99% Bandwidth – 2437 MHz – 802.11n (65.0 Mbps) 25
Plot 6-9: 6 dB and 99% Bandwidth – 2462 MHz – 802.11n (65.0 Mbps) 26
Plot 7-1: Power Spectral Density – 2412 MHz – 802.11g (24.0 Mbps) 28
Plot 7-2: Power Spectral Density – 2437 MHz – 802.11g (24.0 Mbps) 29
Plot 7-3: Power Spectral Density – 2462 MHz – 802.11g (24.0 Mbps) 30
Plot 8-1: Conducted Emissions, AC, Neutral, 2412 MHz 32
Plot 8-2: Conducted Emissions, AC, Line, 2412 MHz 33
Plot 8-3: Conducted Emissions, AC, Neutral, 2437 MHz 34
Plot 8-4: Conducted Emissions, AC, Line, 2437 MHz 35
Plot 8-5: Conducted Emissions, AC, Neutral, 2462 MHz 36
Plot 8-6: Conducted Emissions, AC, Line, 2462 MHz 37

1 General Information

1.1 Scope

Applicable Standards

- FCC Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz
- 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	XL-95P Multi-Band Portable, V/U
Power Supply	7.4 VDC
Modulation Type	CCK, DSSS, OFDM (802.11b/g/n)
Frequency Range	2412 – 2462 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 – 802.11b (11 Mbps); 802.11g (54 Mbps); 802.11n (6.5 Mbps)

Channel (#)	Frequency (MHz)
1	2412
6	2437
11	2462

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 (11.0 Mbps for 802.11b, 24.0 Mbps for 802.11g, and 19.5 Mbps for 802.11n). 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 15.247); RSS-247, RSS-Gen

FCC	ISED	Test	Result
FCC 15.207	RSS-Gen 8.8	AC Conducted Emissions	Pass
FCC 15.209	RSS-247 5.5; RSS-Gen 8.9, 8.10	Radiated Emissions	Pass
FCC 15.247(a)(2)	RSS-247 5.2(a)	6 dB Bandwidth	Pass
FCC 15.247(b)(1)	RSS-247 5.4(b); RSS-Gen 6.12	Maximum Peak Power Output	Pass
FCC 15.247(d)	RSS-247 5.5; RSS-Gen 6.13	Antenna Conducted Spurious Emissions	Pass
FCC 15.247(d)	RSS-247 5.5	Band Edge Measurement	Pass
FCC 15.247(e)	RSS-247 5.2(b)	Power Spectral Density	Pass
N/A	RSS-Gen 6.7	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

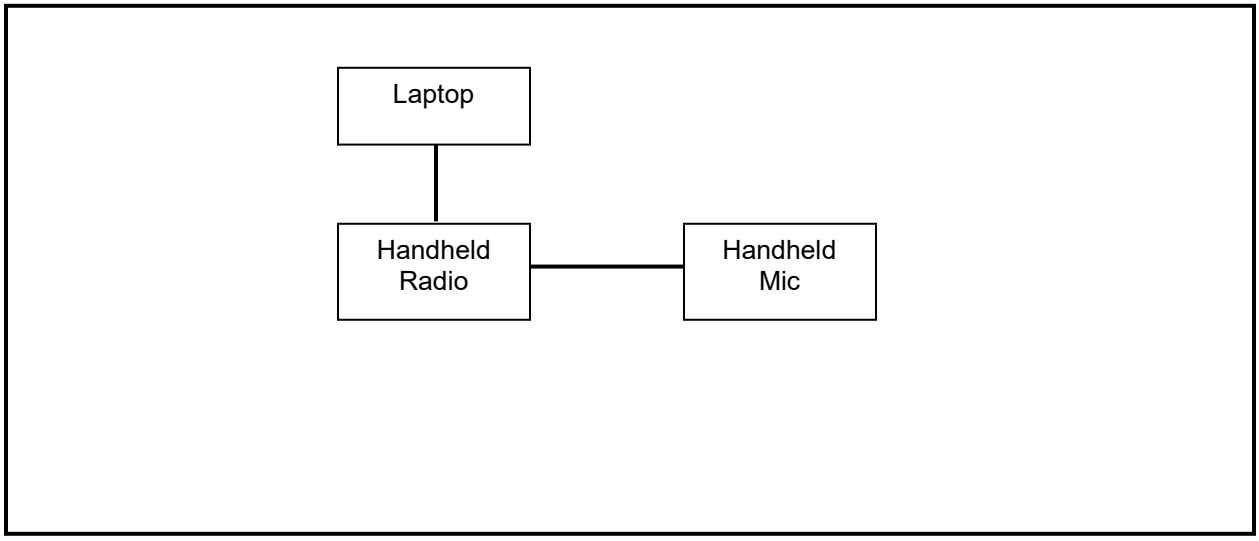


Figure 2-1: Configuration of System Under Test

3 Peak Output Power – FCC 15.247(b)(1); RSS-247 5.4(b), RSS-Gen 6.12

3.1 Power Output Test Procedure

A conducted power measurement of the EUT was taken using an Agilent Analyzer. The following settings were used:

1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel (5 MHz used)
2) RBW >20 dB bandwidth of the emission being measured (2 MHz used)
3) VBW ≥RBW (3 MHz used)
4) Sweep: Auto
5) Detector function: Peak
6) Trace: Max hold. The trace was allowed to stabilize, and the marker-to-peak function was used to set the marker to the peak of the emission.

Table 3-1: Power Output 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	10/04/2024

3.2 Power Output Test Results

Table 3-2: Power Output Test Data

Rate (b/g/n, Mbps)	Channel (#)	Frequency (MHz)	Conducted Peak Power (dBm)	Limit (dBm)	Margin (dB)
802.11b 11.0	1	2412	7.9	30.0	-22.1
	6	2437	7.9	30.0	-22.1
	11	2462	8.2	30.0	-21.8
802.11g 24.0	1	2412	8.2	30.0	-21.8
	6	2437	8.0	30.0	-22.0
	11	2462	9.2	30.0	-20.8
802.11n 65.0	1	2412	8.1	30.0	-21.9
	6	2437	7.9	30.0	-22.1
	11	2462	8.0	30.0	-22.0

Highest conducted peak power measured: 9.2 dBm ≈ 8.3 mW

$P(\text{Watts}) = 10^{(\text{dBm} / 10)} / 1000$

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

<u>Results: Pass</u>

Test Personnel:

Khue Do / Daniel W. Baltzell	/	December 14, 2020 April 14, 2023
Test Engineer	Signature	Dates of Test

4 Compliance with the Band Edge – FCC 15.247(d); RSS-247 5.5

4.1 Band Edge Test Procedure

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

Table 4-1: Band Edge Test Equipment

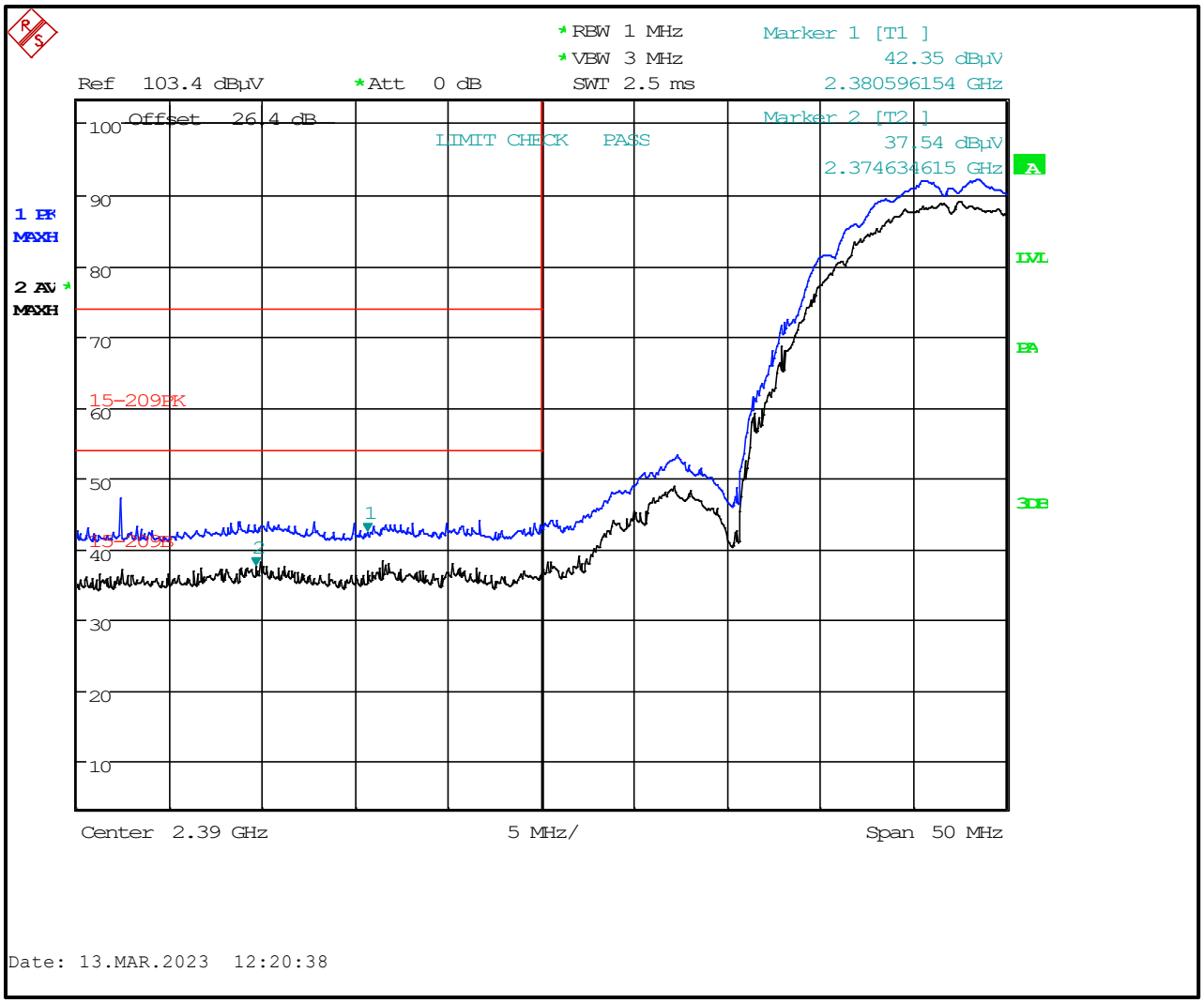
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	10/01/2024

4.2 Restricted Band Edge Test Results

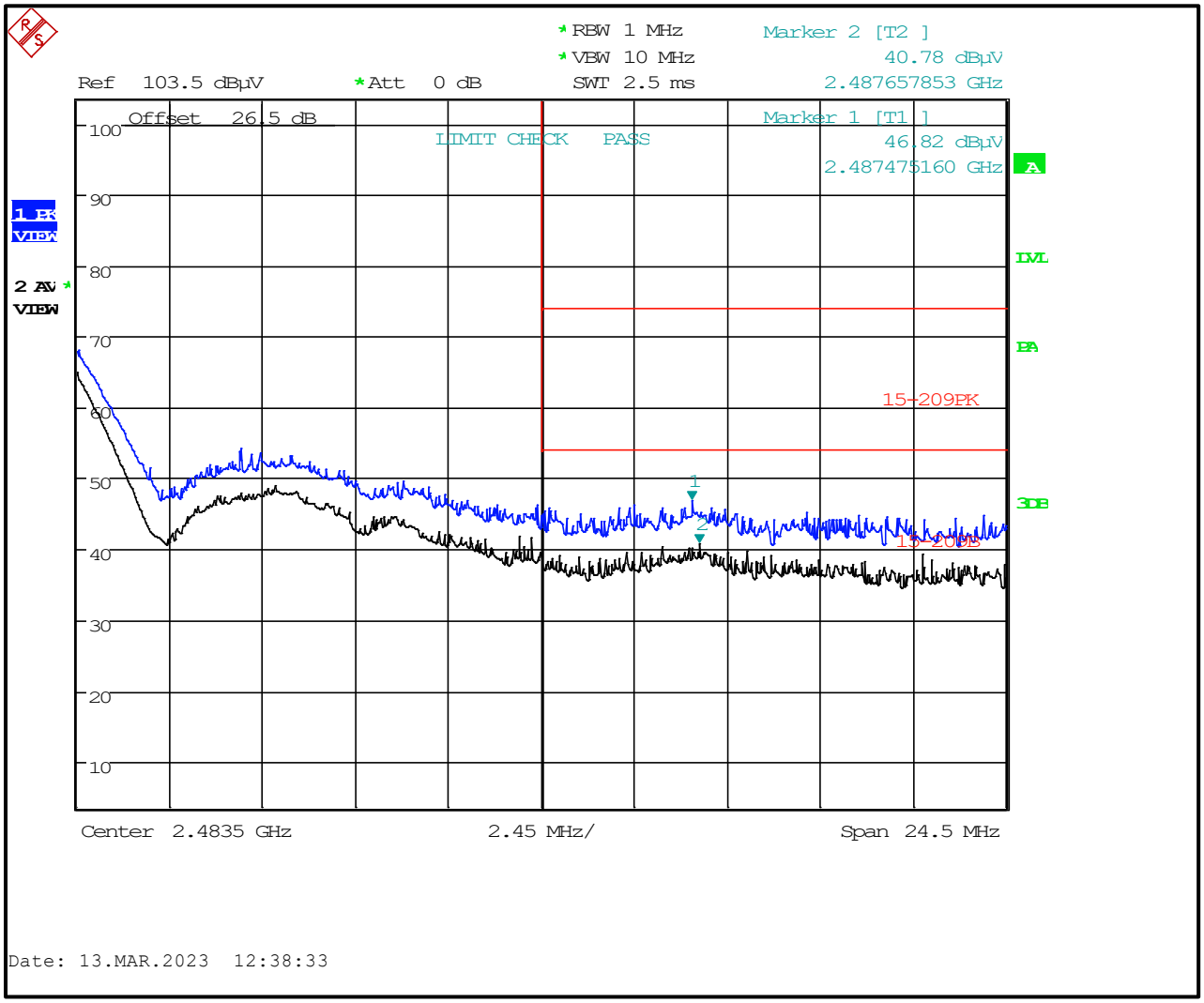
EUT was programmed to TX with 20 MHz BW and high power level for all test frequencies. Rate 1.0 Mbps was used for 802.11b, rate 12.0 Mbps was used for 802.11g, and rate 65 Mbps was used for 802.11n.

4.3 Band Edge Plots

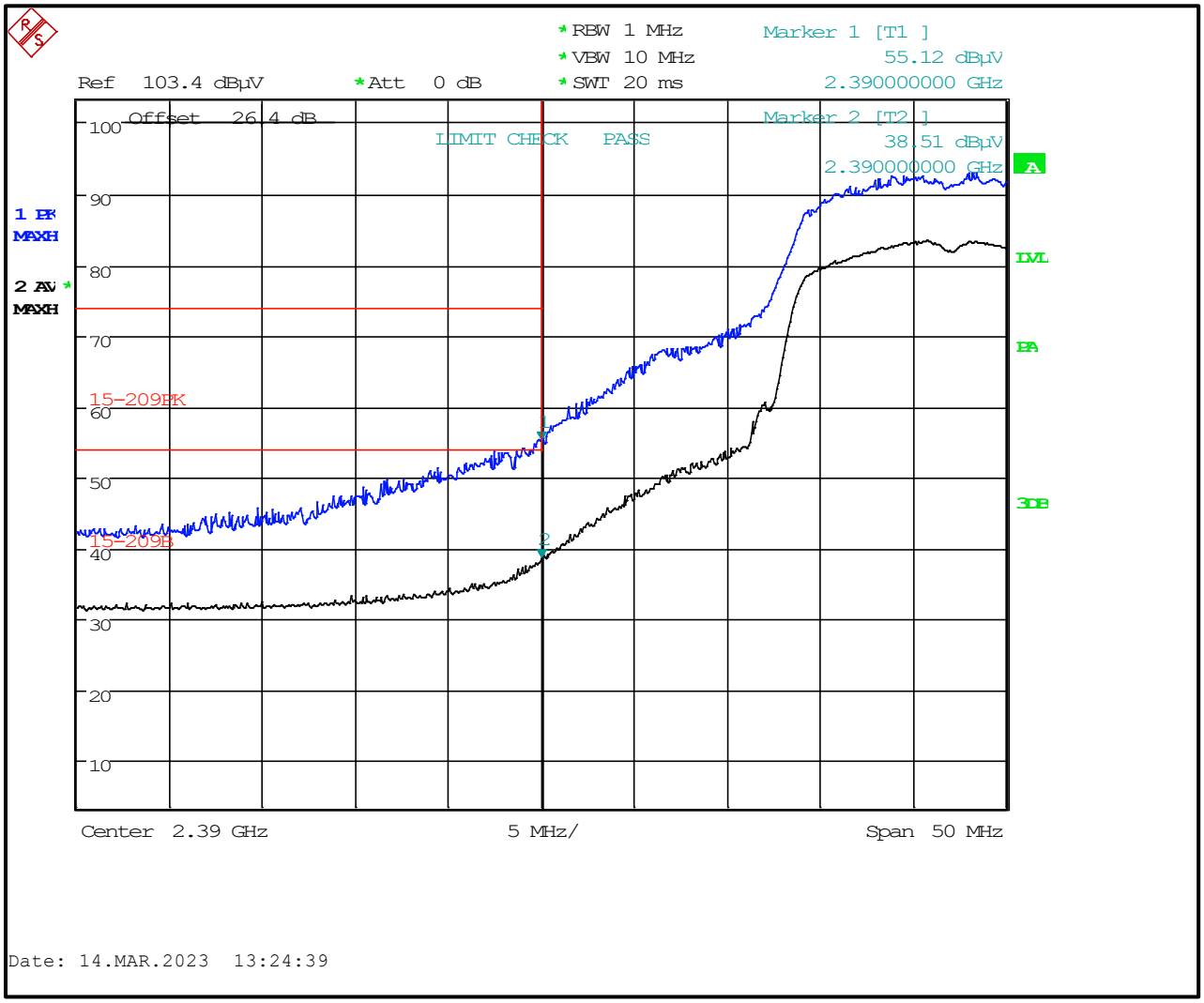
Plot 4-1: Lower Band Edge – 802.11b (1.0 Mbps)



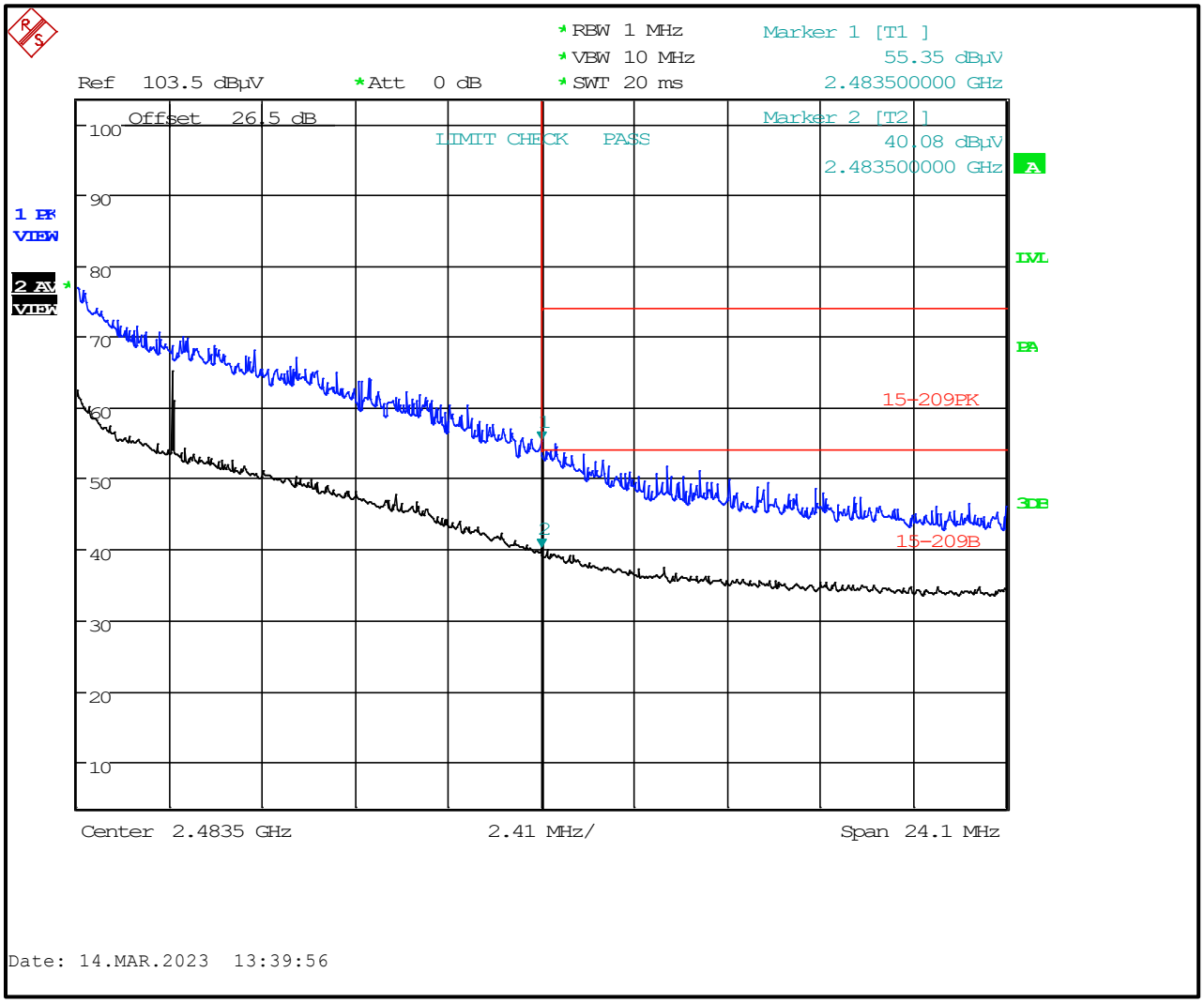
Plot 4-2: Upper Band Edge – 802.11b (1.0 Mbps)



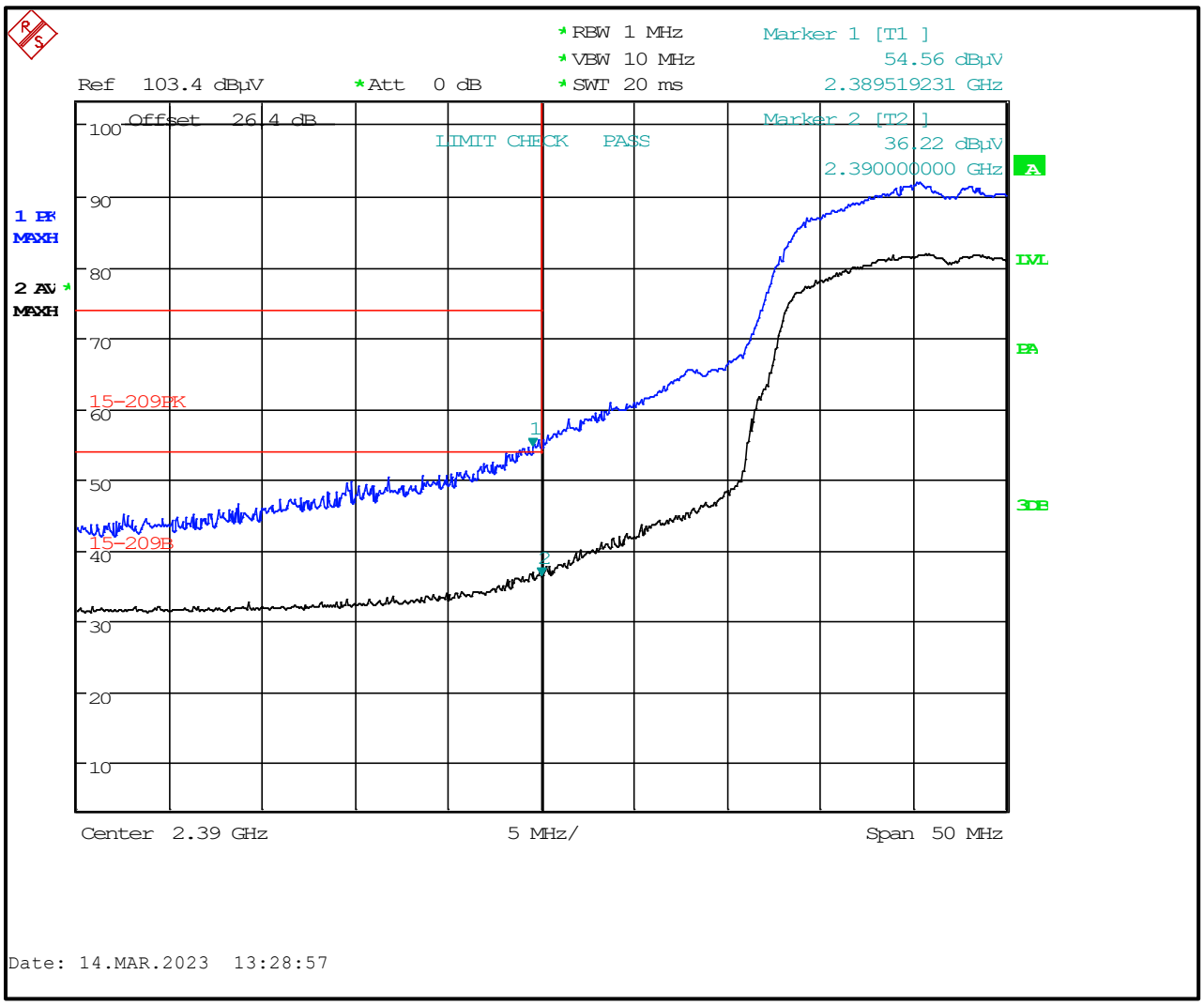
Plot 4-3: Lower Band Edge – 802.11g (12.0 Mbps)



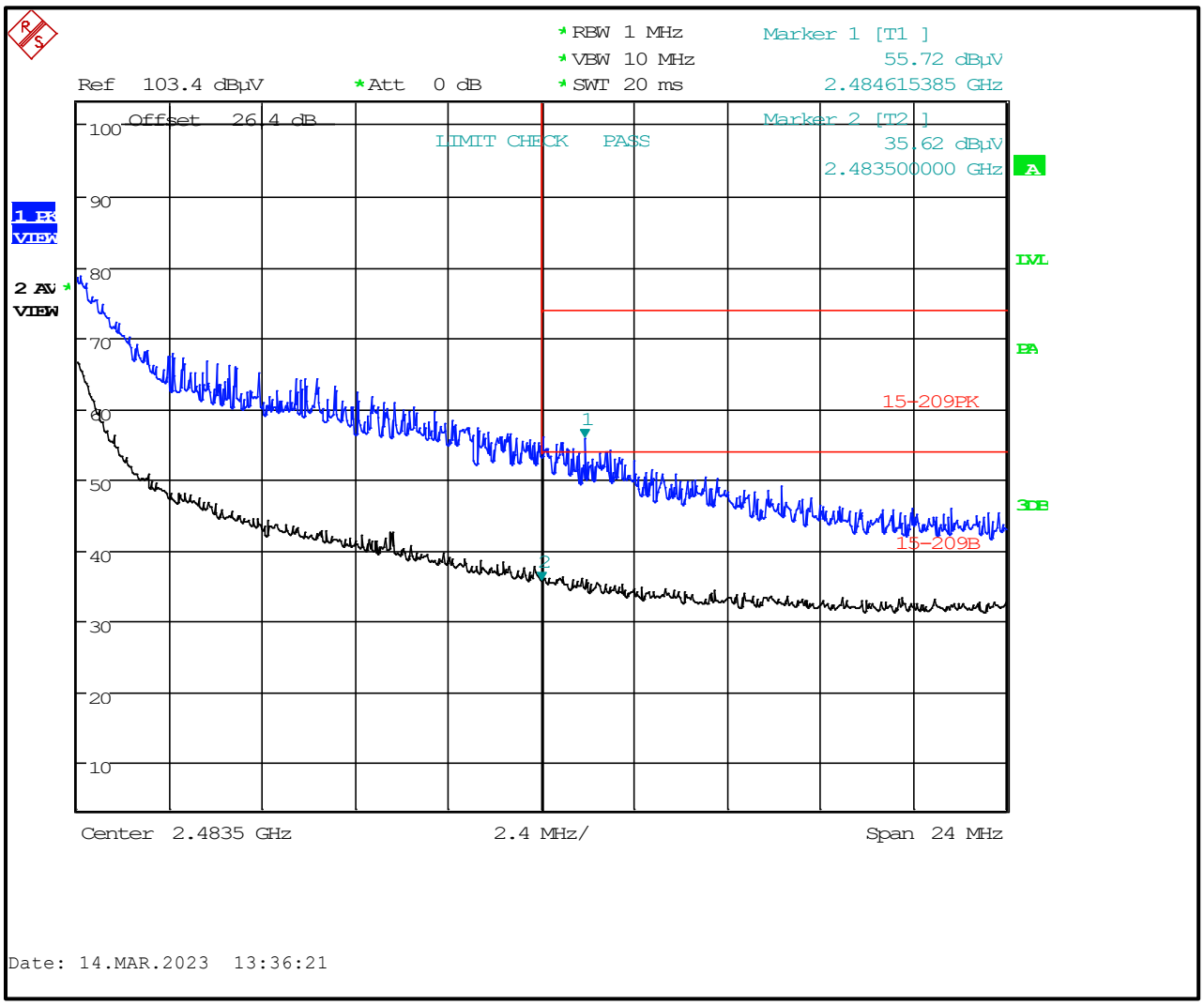
Plot 4-4: Upper Band Edge – 802.11g (12.0 Mbps)



Plot 4-5: Lower Band Edge – 802.11n (65 Mbps)



Plot 4-6: Upper Band Edge – 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

Daniel W. Baltzell		March 13-14, 2023
Test Engineer	Signature	Dates of Test

5 Antenna Conducted Spurious Emissions – FCC 15.247(d); RSS-247 5.5, RSS-Gen 6.13

5.1 Antenna Conducted Spurious Emissions Test Procedures

Antenna spurious emissions per FCC 15.247(d) were measured from the EUT antenna port using a 50-ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 100 kHz. The modulated carrier was identified at the following frequencies: 2412 MHz, 2437 MHz and 2462 MHz.

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

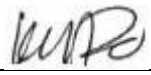
5.2 Antenna Conducted Spurious Emissions Test Results

No harmonics or spurs were found within 20 dB (note that we are reporting power as peak) of the limit from 30 MHz to the 10th harmonic of the carrier frequency; per FCC 2.1051 no data is being reported.

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 15, 2020
Test Engineer	Signature	Date of Test

6 Bandwidths – FCC 15.247(a)(2); RSS-247 5.2(a); RSS-Gen 6.7

6.1 Bandwidth Test Procedure

The minimum 6 dB and 99% bandwidths per FCC 15.247(a)(2), RSS-247 5.2(a) and RSS-Gen 6.7 were measured using a 50-ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at ≥3 x RBW. The device was modulated, VBW shall not be smaller than three times the RBW value. Video averaging is not permitted.

The minimum 6 dB bandwidth shall be at least 500 kHz.

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

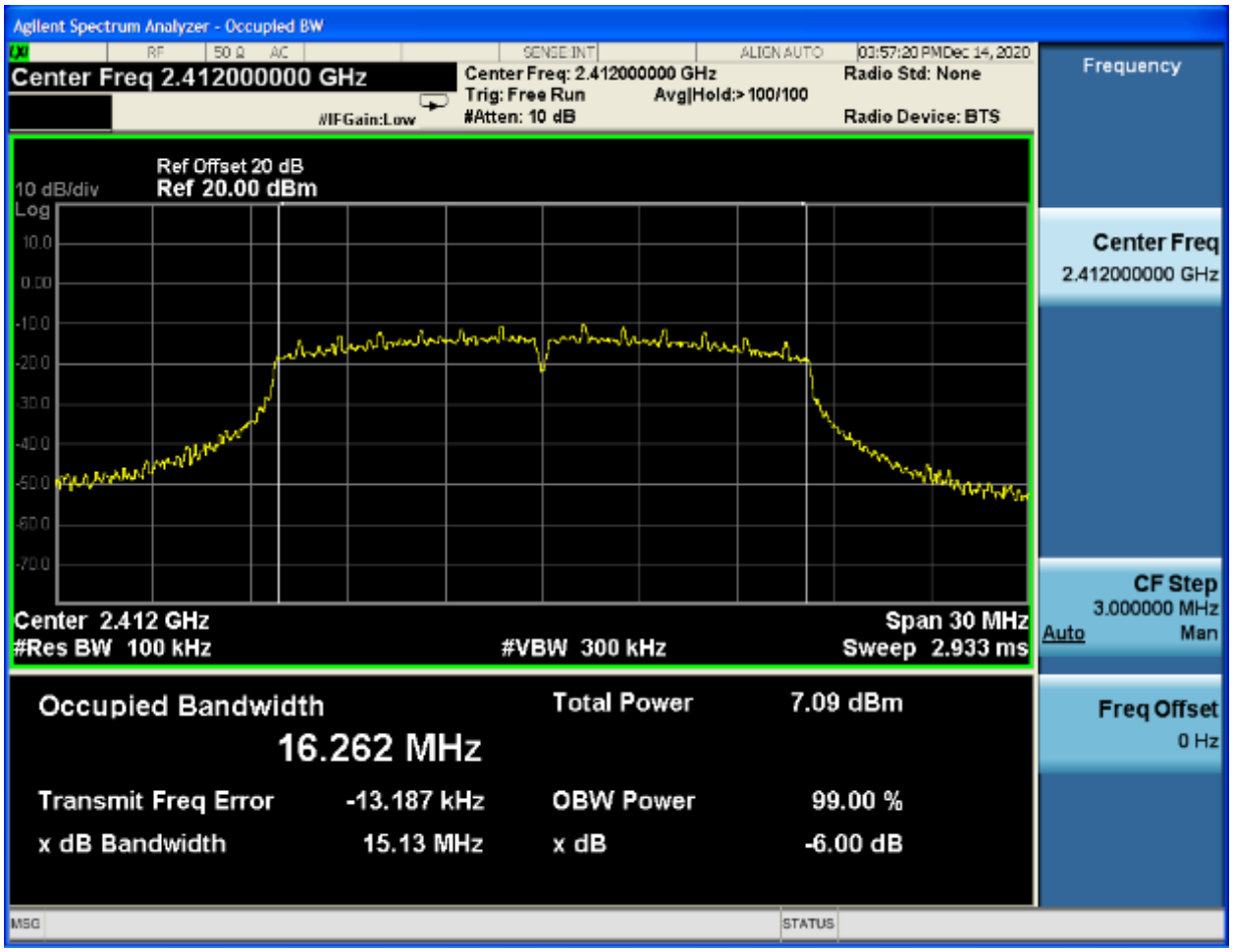
6.2 Modulated Bandwidth Test Results

Table 6-2: Modulated Bandwidth Test Data

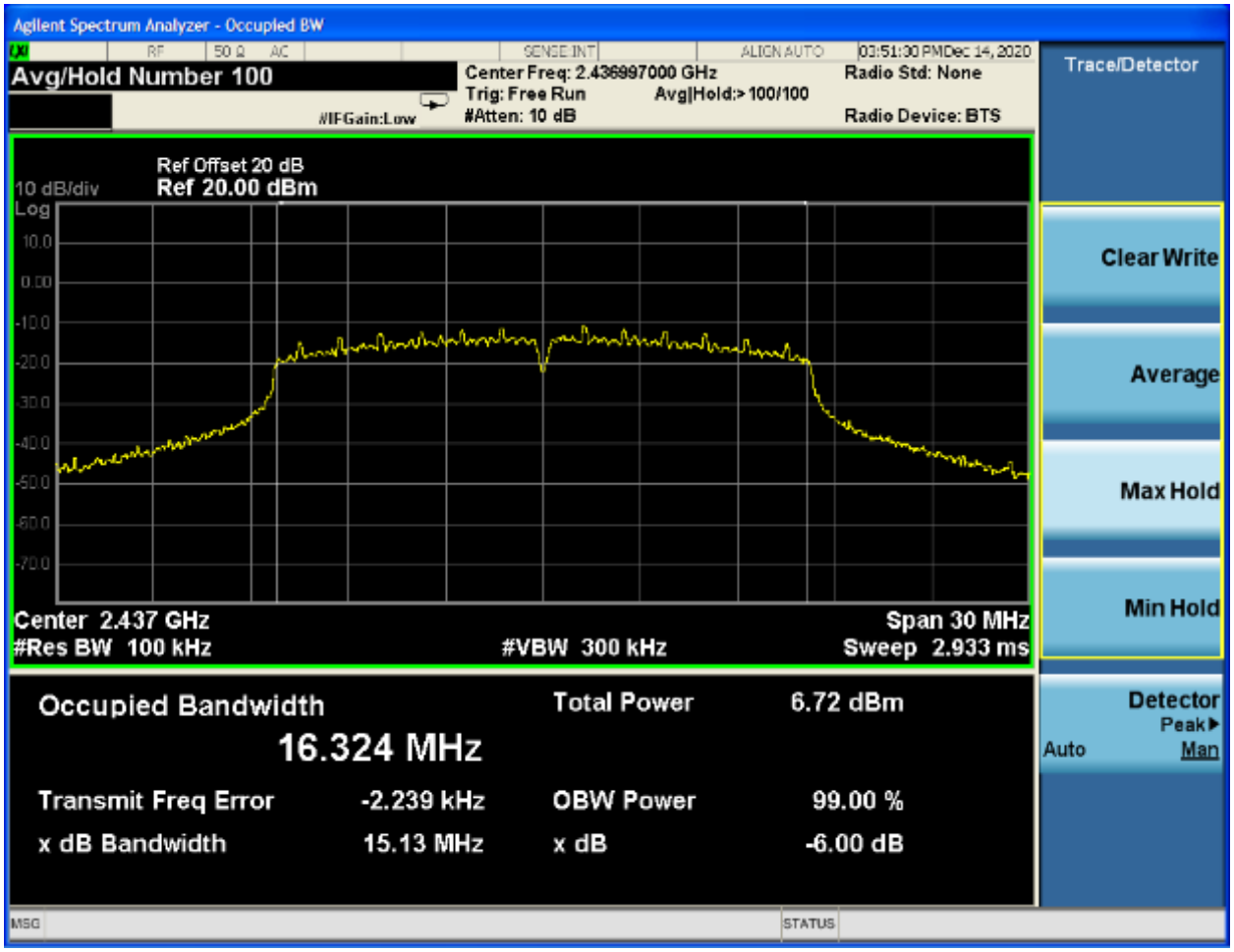
Rate (b/g/n, Mbps)	Frequency (MHz)	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11b 11.0	2412	15.13	16.262
	2437	15.13	16.324
	2462	15.13	16.247
802.11g 54.0	2412	15.14	17.479
	2437	15.13	17.524
	2462	15.44	17.464
802.11n 65.0	2412	15.14	17.464
	2437	15.13	17.464
	2462	15.15	17.427

6.3 Bandwidth Plots

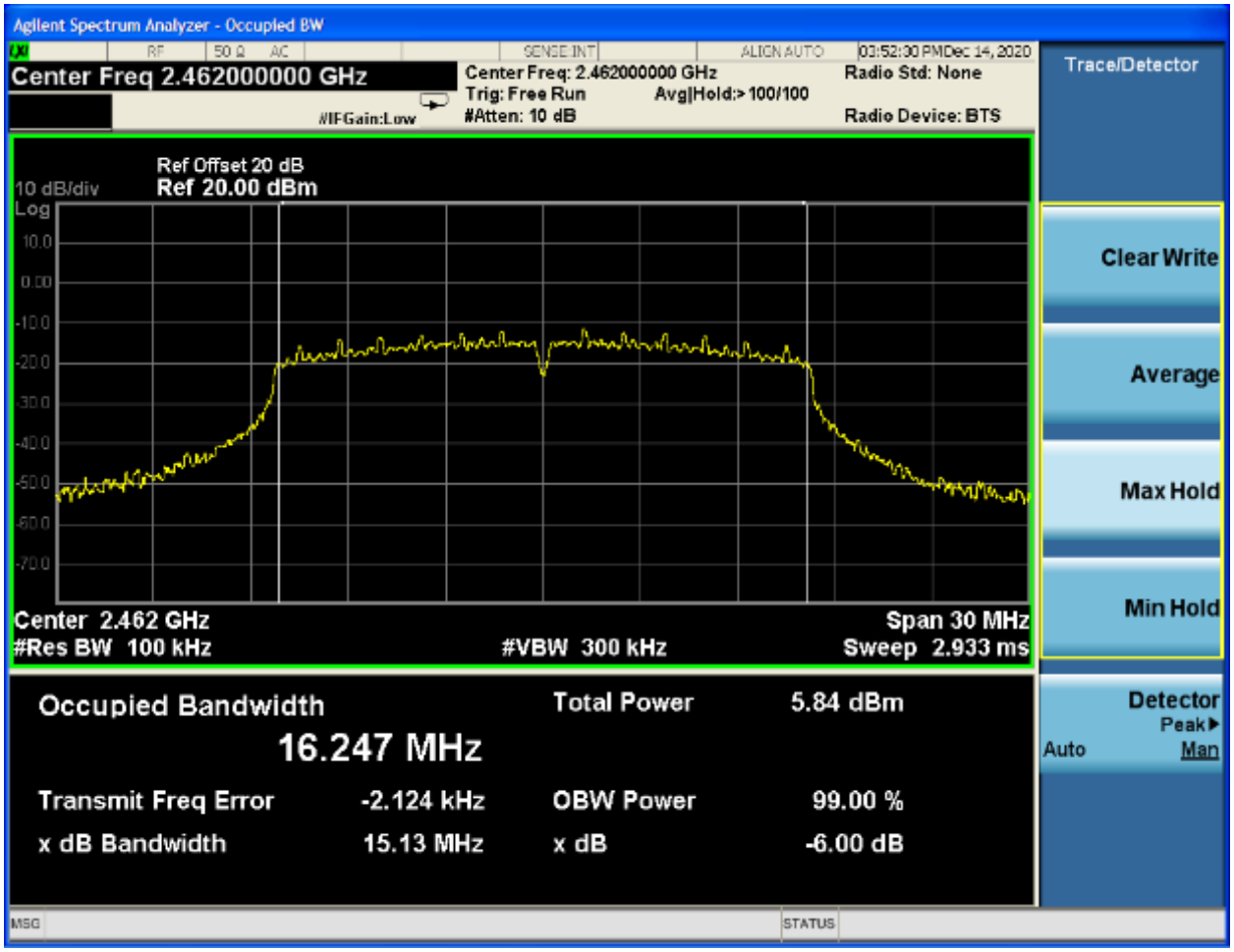
Plot 6-1: 6 dB and 99% Bandwidth – 2412 MHz – 802.11b (11.0 Mbps)



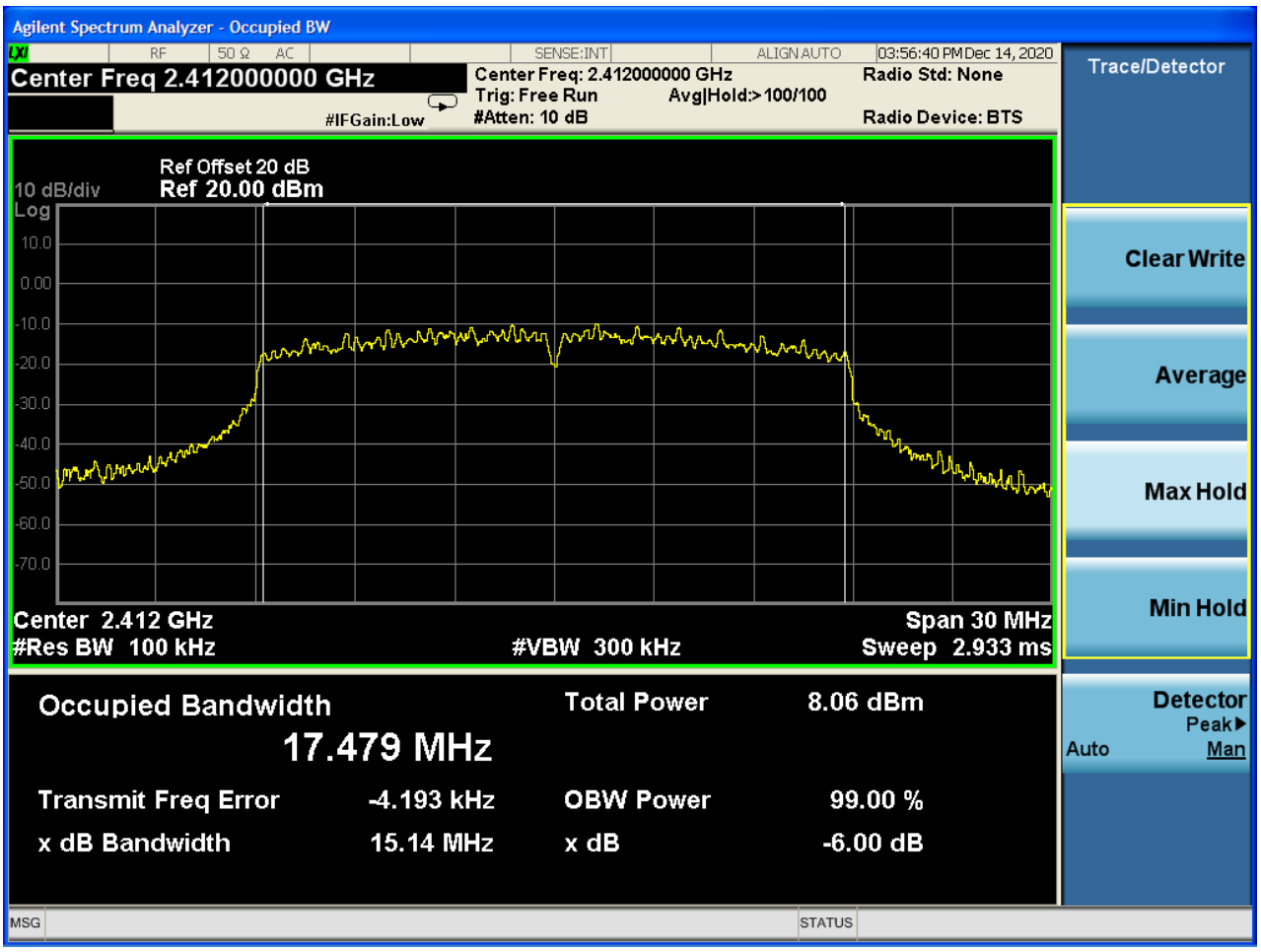
Plot 6-2: 6 dB and 99% Bandwidth – 2437 MHz – 802.11b (11.0 Mbps)



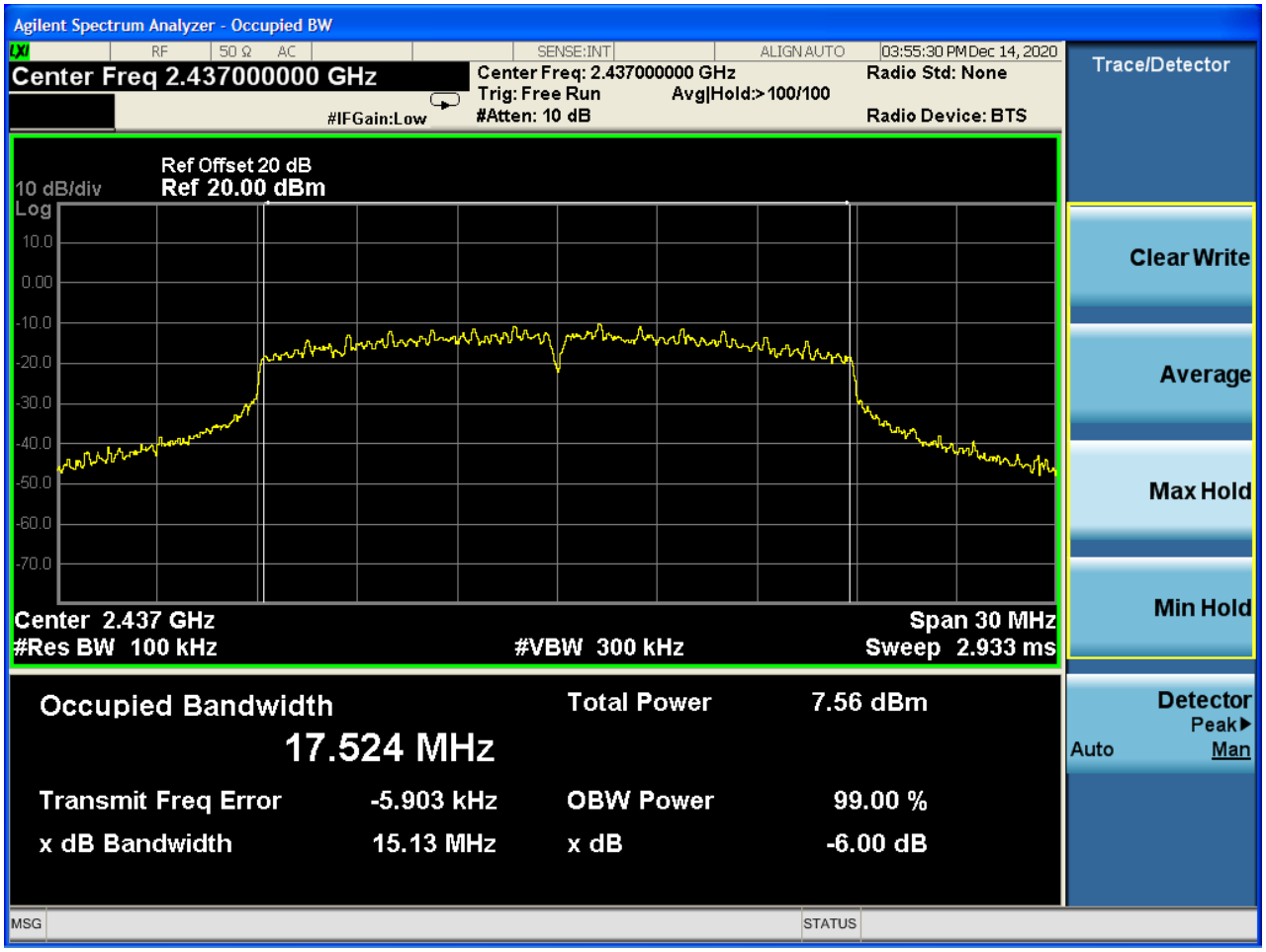
Plot 6-3: 6 dB and 99% Bandwidth – 2462 MHz – 802.11b (11.0 Mbps)



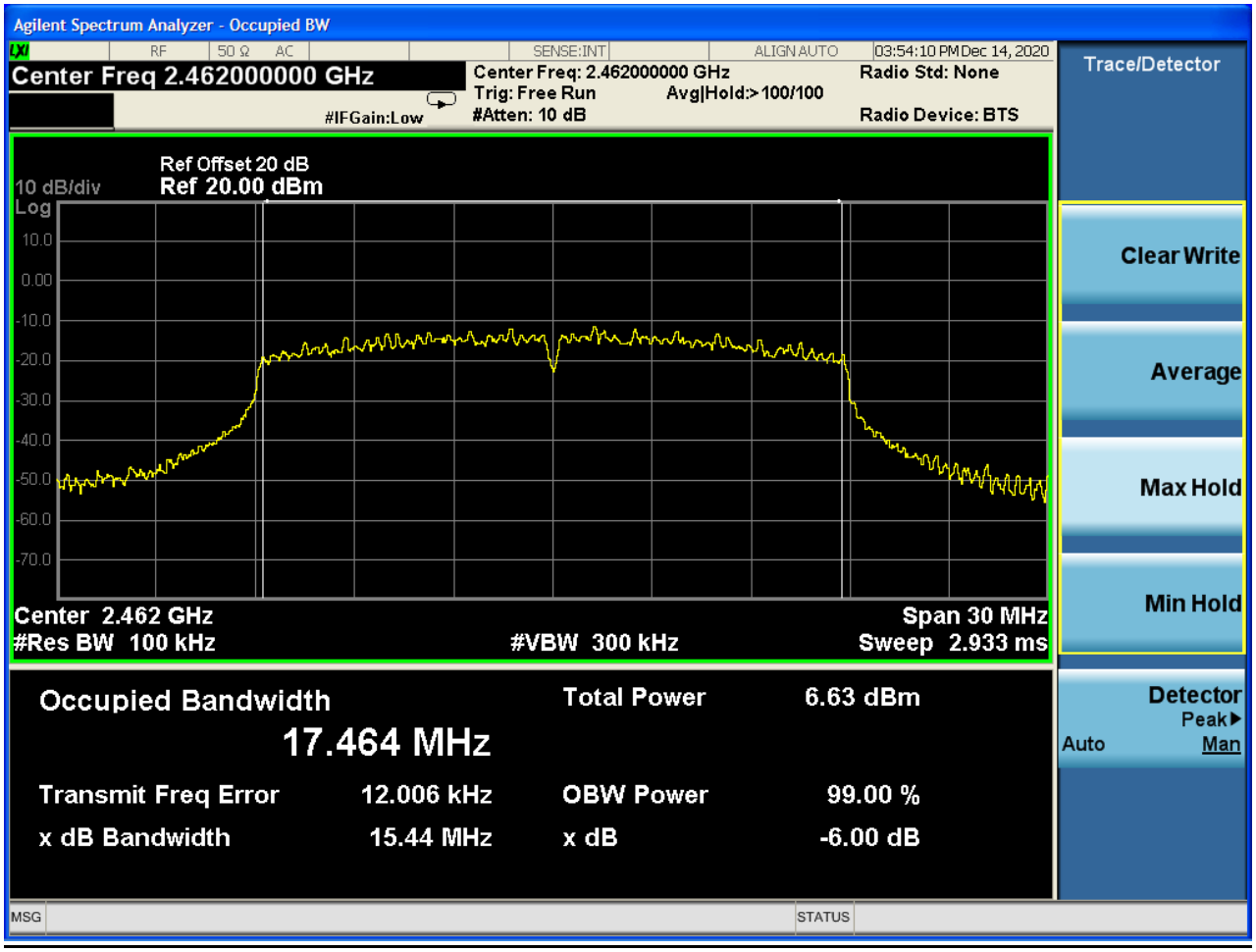
Plot 6-4: 6 dB and 99% Bandwidth – 2412 MHz – 802.11g (54.0 Mbps)



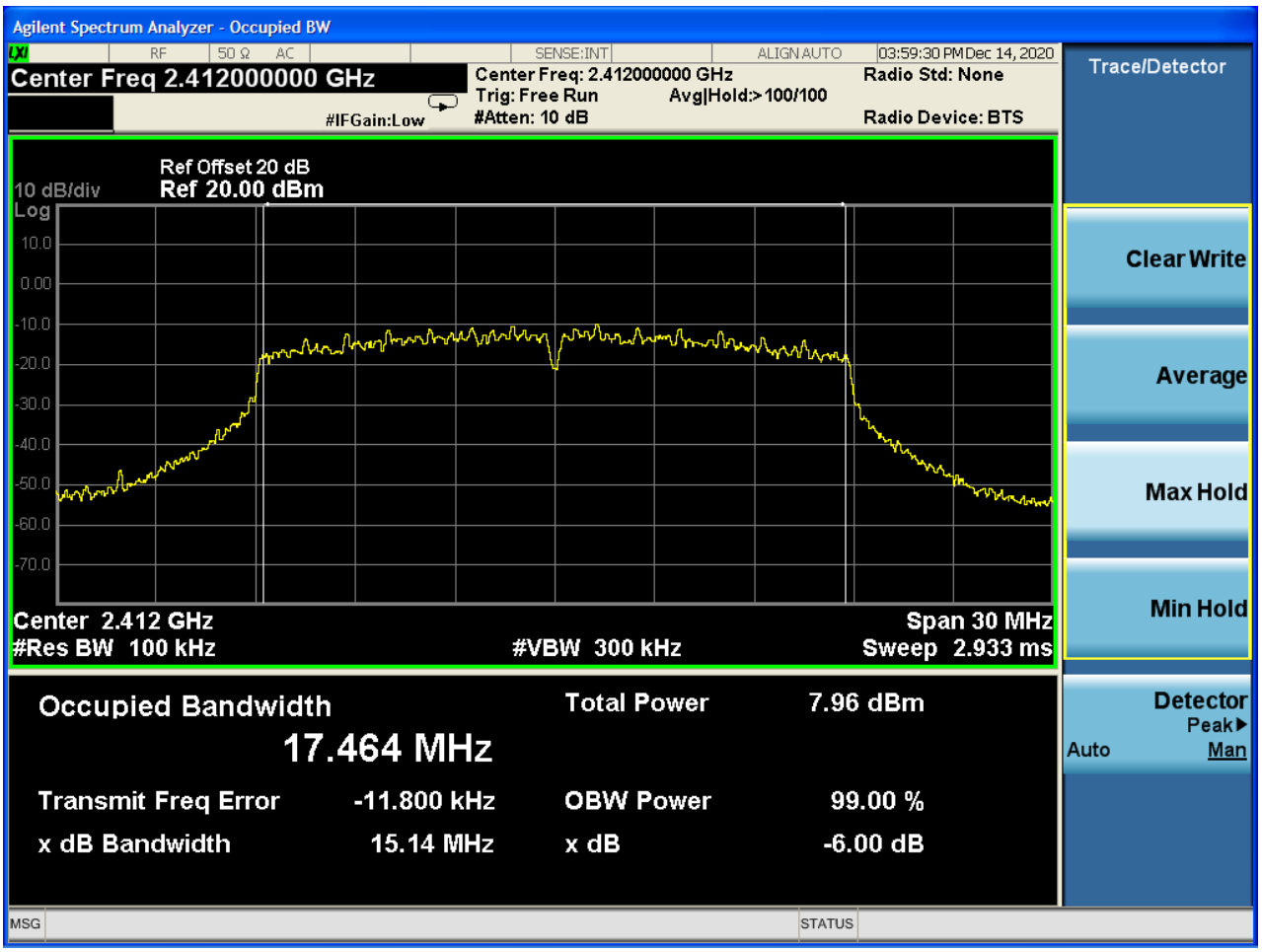
Plot 6-5: 6 dB and 99% Bandwidth – 2437 MHz – 802.11g (54.0 Mbps)



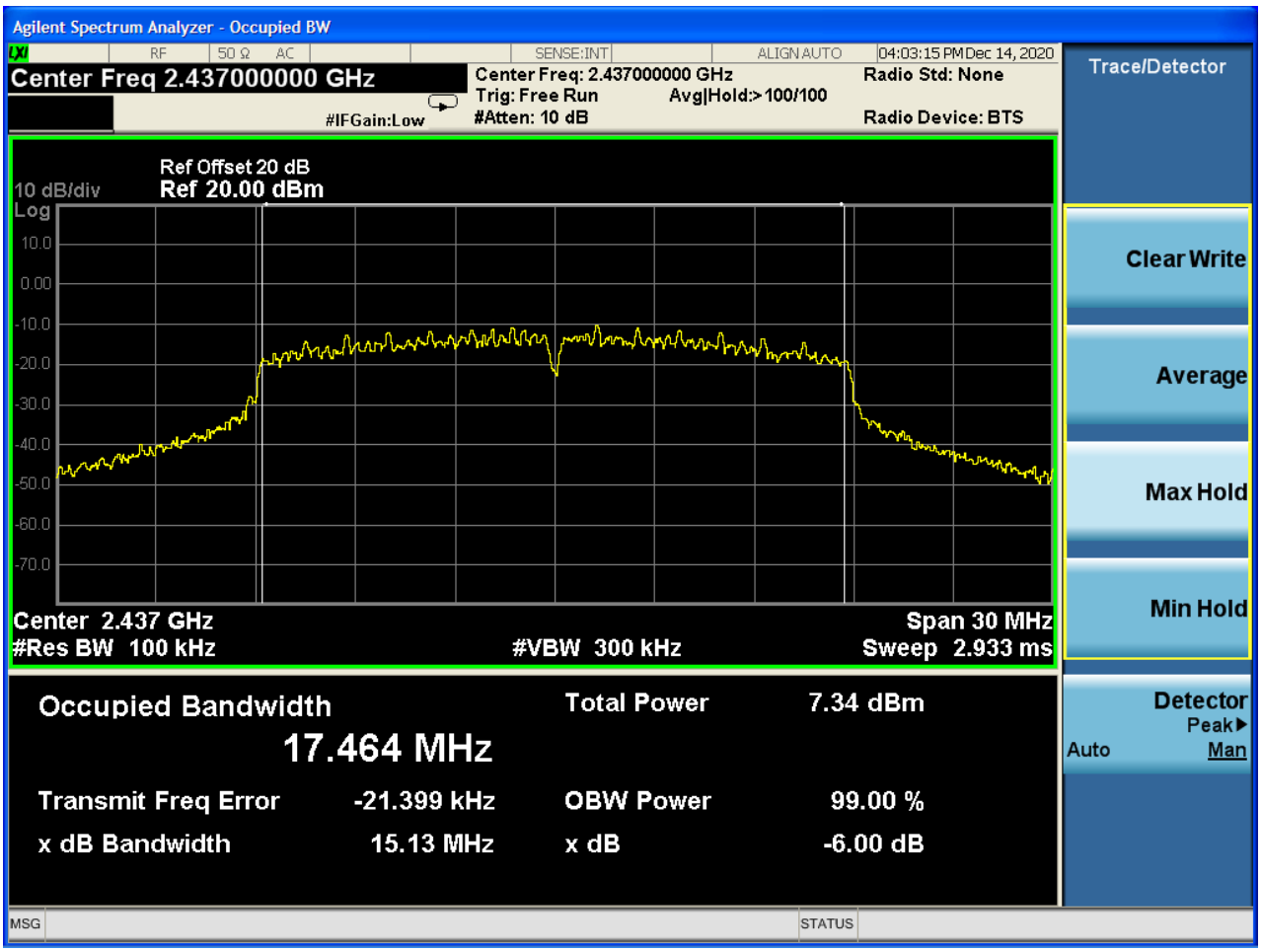
Plot 6-6: 6 dB and 99% Bandwidth – 2462 MHz – 802.11g (54.0 Mbps)



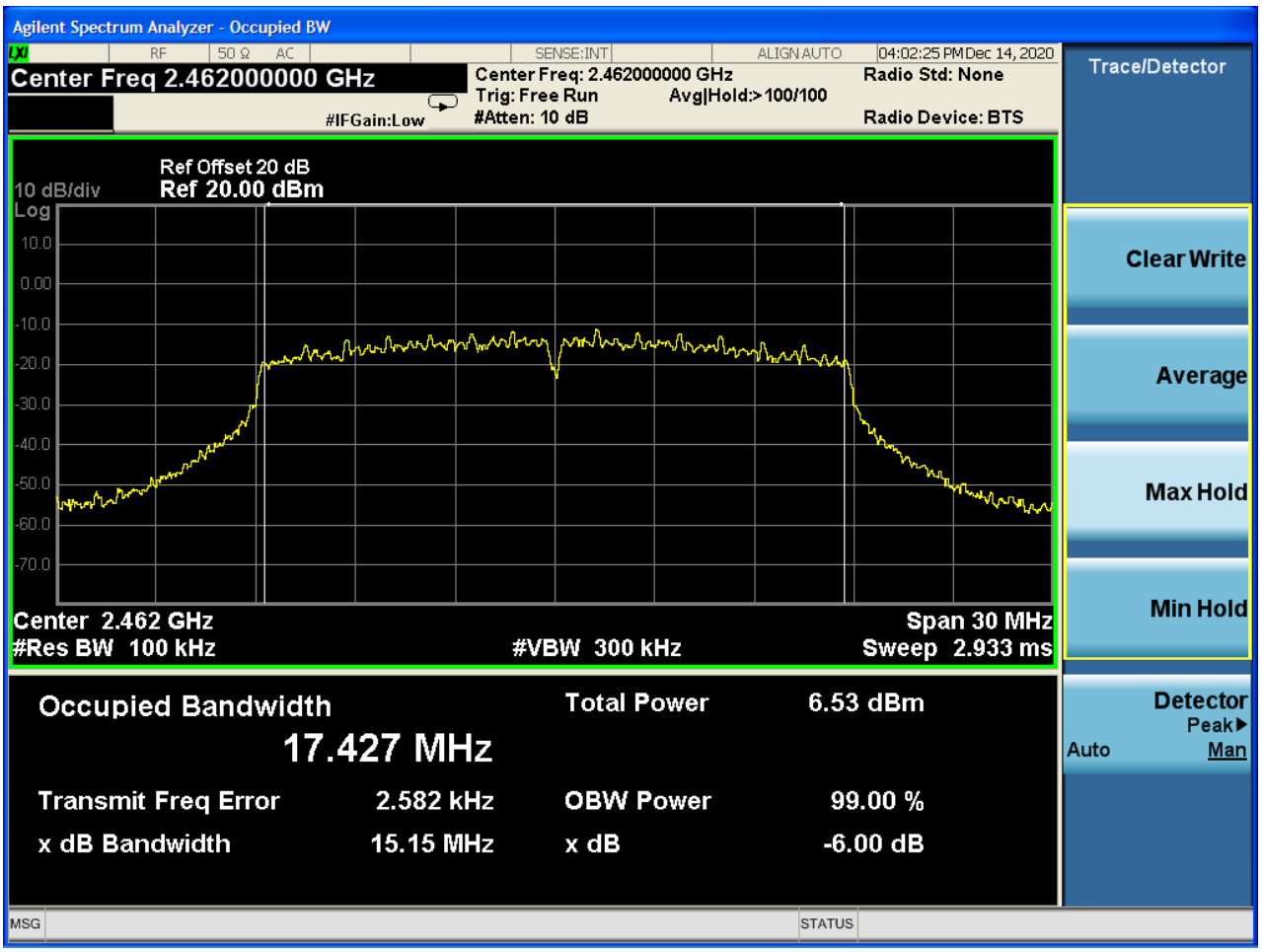
Plot 6-7: 6 dB and 99% Bandwidth – 2412 MHz – 802.11n (65.0 Mbps)



Plot 6-8: 6 dB and 99% Bandwidth – 2437 MHz – 802.11n (65.0 Mbps)



Plot 6-9: 6 dB and 99% Bandwidth – 2462 MHz – 802.11n (65.0 Mbps)



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.

<u>Results: Pass</u>

Test Personnel:

Khue Do		December 14, 2020
Test Engineer	Signature	Date of Test

7 Power Spectral Density – FCC 15.247(e); RSS-247 5.2(b)

7.1 Power Spectral Density Test Procedure

The power spectral density per FCC 15.247(e) was measured using a 50-ohm spectrum analyzer with the resolution bandwidth set at 3 kHz <= RBW <= 100 kHz, the video bandwidth set at VBW >= (3 X RBW), and the auto sweep time. The spectral lines were resolved for the modulated carriers at 2412 MHz, 2437 MHz, and 2462 MHz for Wi-Fi. These levels are below the +8 dBm limit.

Table 7-1: Power Spectral Density 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

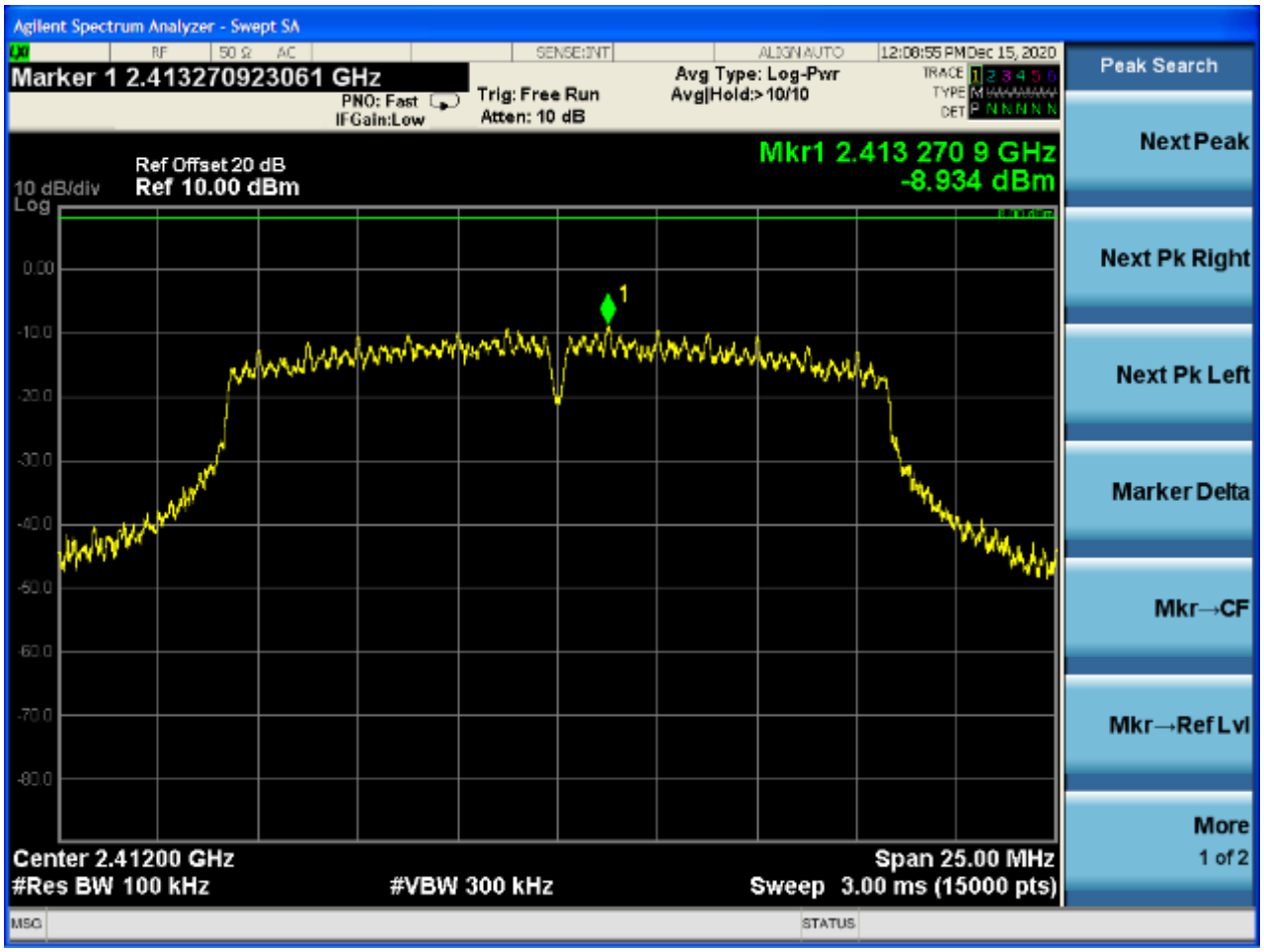
7.2 Power Spectral Density Test Results

Table 7-2: Power Spectral Density Test Data

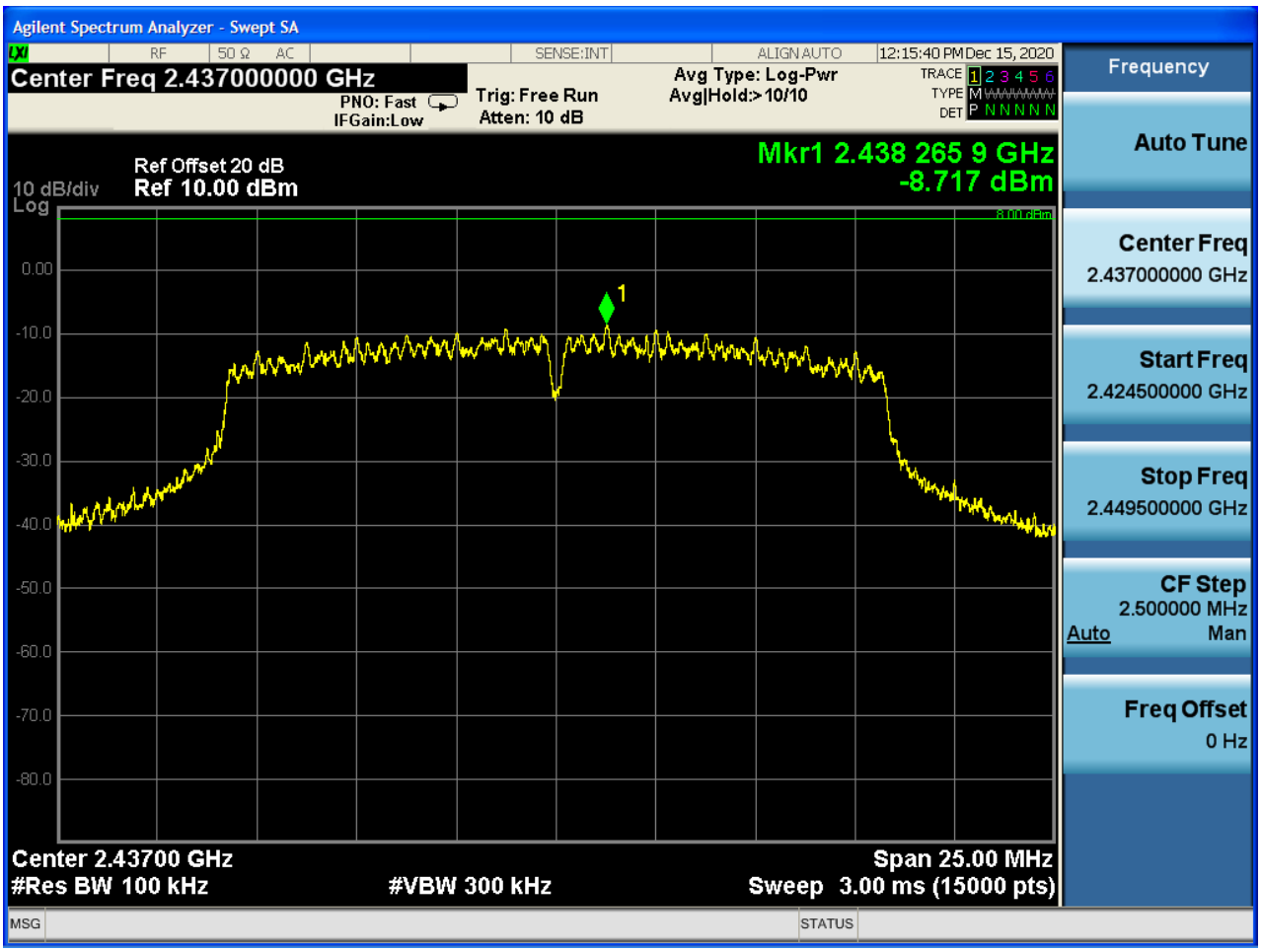
Rate (b/g/n, Mbps)	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
802.11g 24.0	2412	-8.9	8.0	-16.9
	2437	-8.7	8.0	-16.7
	2462	-9.6	8.0	-17.6

7.3 Power Spectral Density Plots

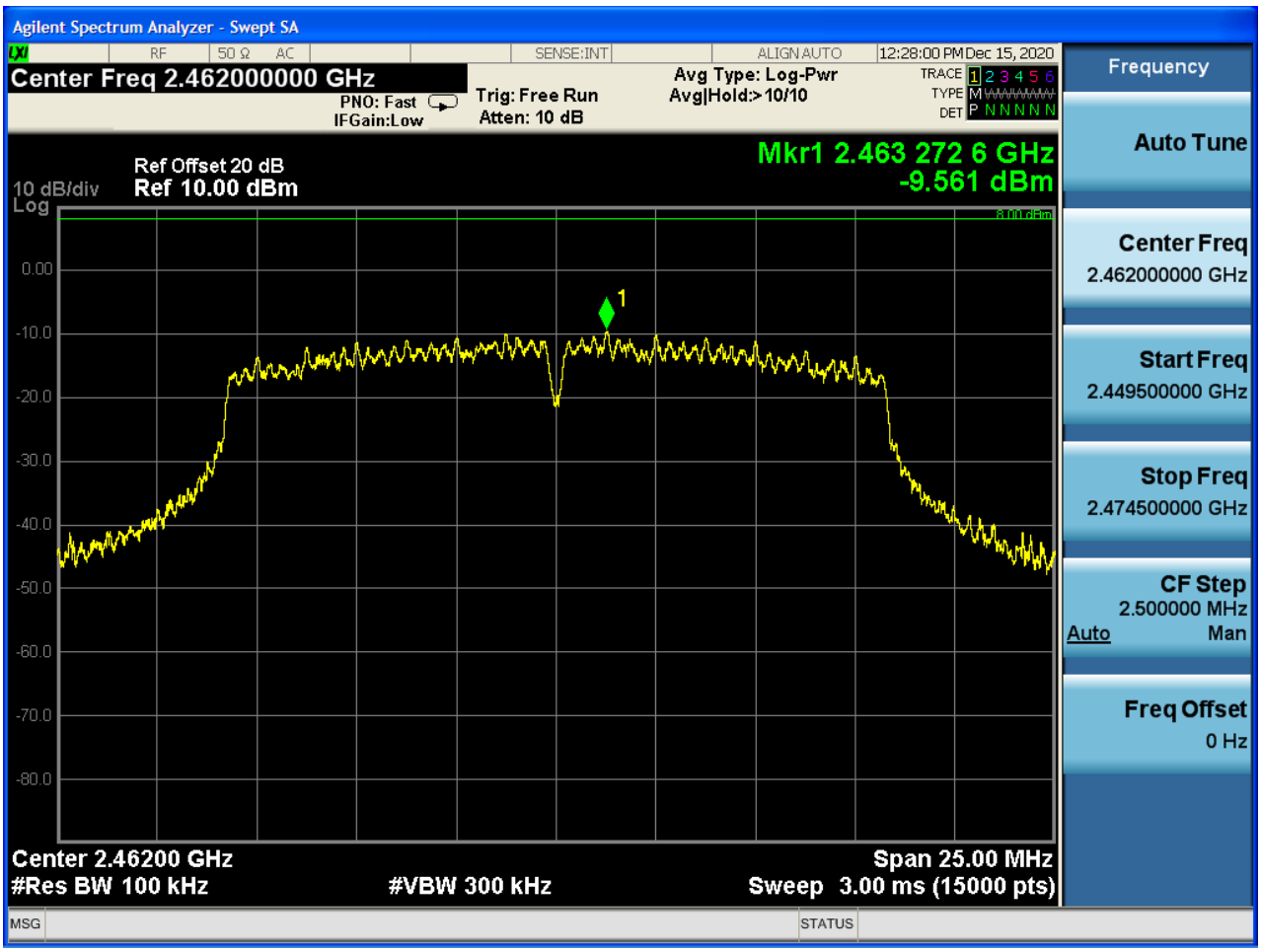
Plot 7-1: Power Spectral Density – 2412 MHz – 802.11g (24.0 Mbps)



Plot 7-2: Power Spectral Density – 2437 MHz – 802.11g (24.0 Mbps)



Plot 7-3: Power Spectral Density – 2462 MHz – 802.11g (24.0 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		December 15, 2020
Test Engineer	Signature	Date of Test

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

8.1 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 802.11b 11 Mbps was chosen for this test at 2412, 2437 and 2462 MHz.

8.2 Conducted Emissions Limits

Table 8-1: 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 8-2: 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/	Test Software	ETS Lindgren	TILE! 7	7.1.3.20	N/A

8.3 Conducted Emissions Test Results

Plot 8-1: Conducted Emissions, AC, Neutral, 2412 MHz

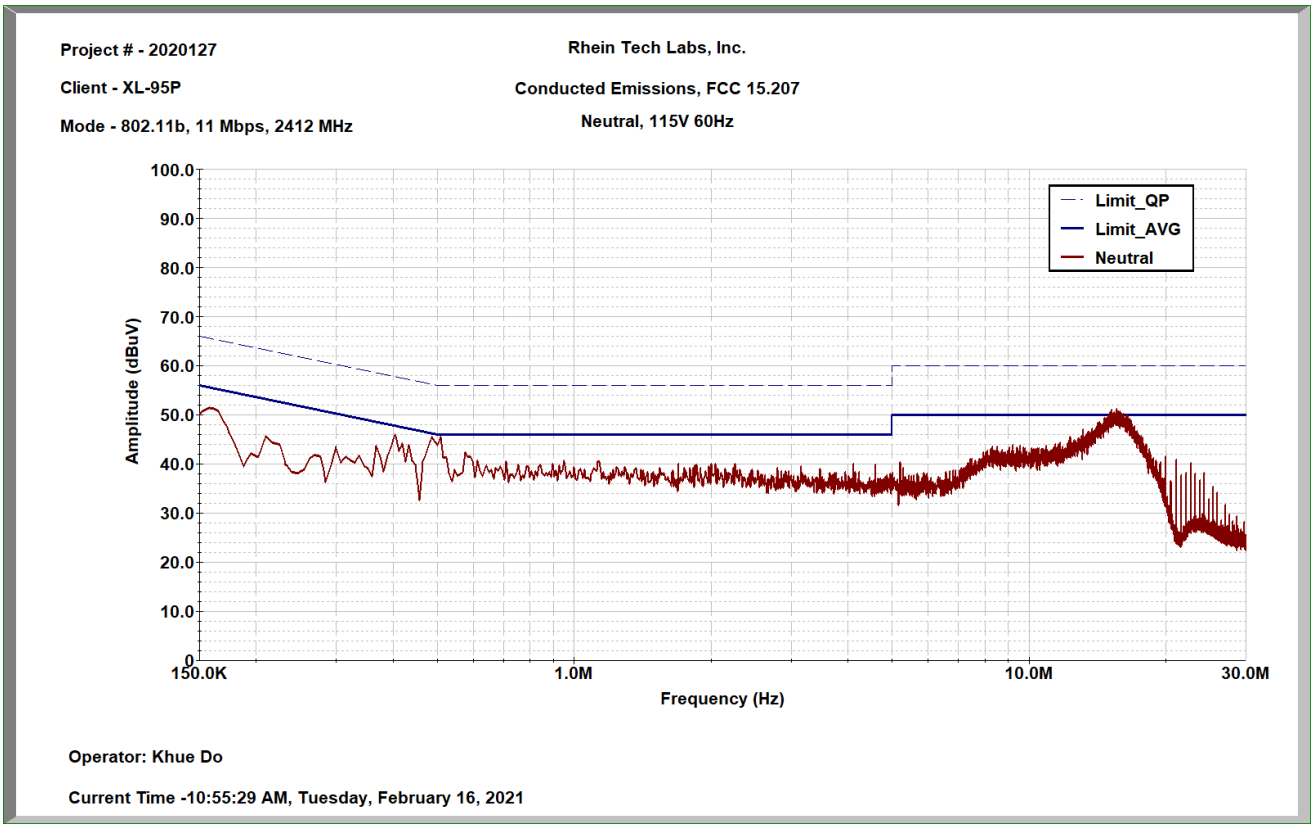


Table 8-3: Conducted Emissions Test Result, AC, Neutral, 2412 MHz

Frequency (MHz)	Detector Type	Emission (dBµV)	Limit (dBµV)	Margin (dB)	Result
15.668	AVG	27.7	50.0	-22.3	Pass
15.668	QPK	45.2	60.0	-14.8	Pass

Plot 8-2: Conducted Emissions, AC, Line, 2412 MHz

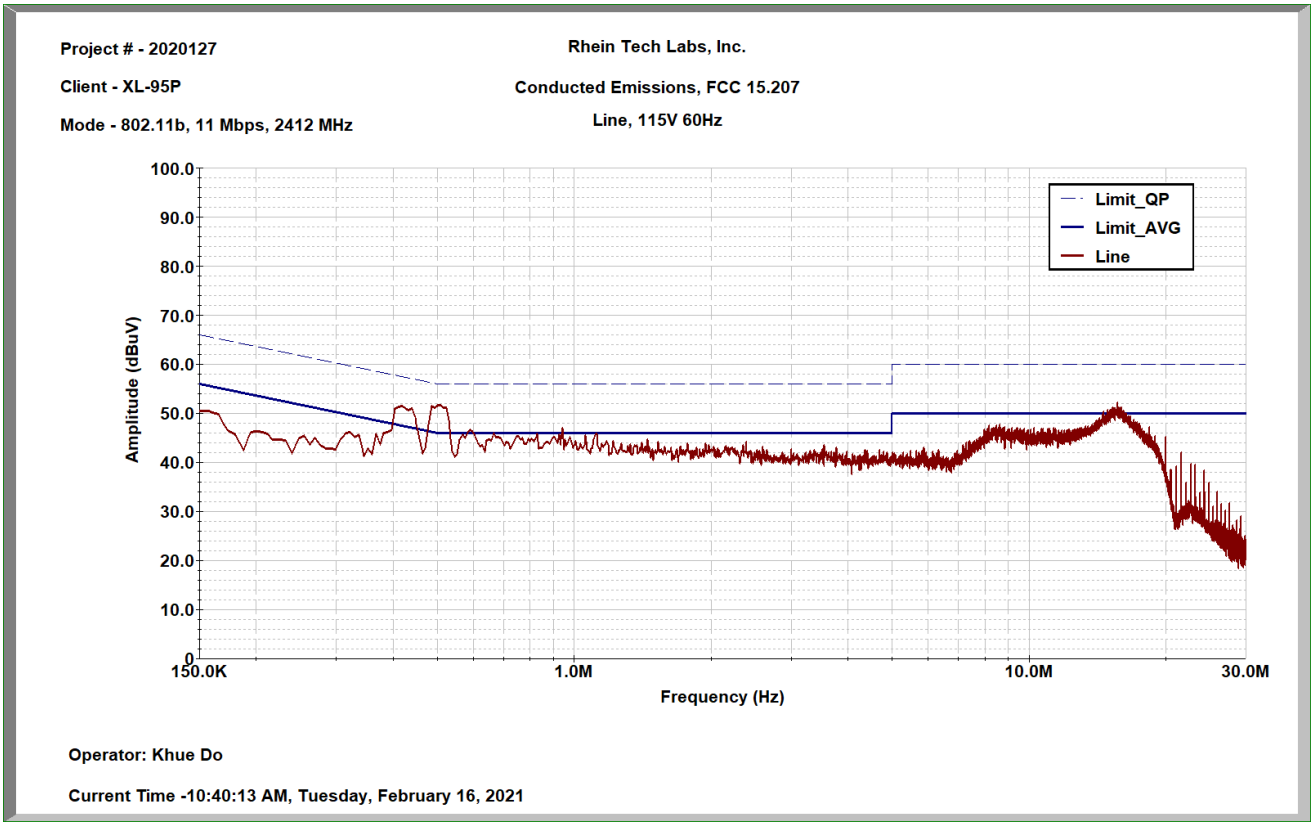


Table 8-4: Conducted Emissions Test Result, AC, Line, 2412 MHz

Frequency (MHz)	Detector Type	Emission (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.575	AVG	23.2	46.0	-22.8	Pass
0.575	QPK	32.9	56.0	-23.1	Pass
15.670	AVG	30.5	50.0	-19.5	Pass
15.670	QPK	44.8	60.0	-15.2	Pass

Plot 8-3: Conducted Emissions, AC, Neutral, 2437 MHz

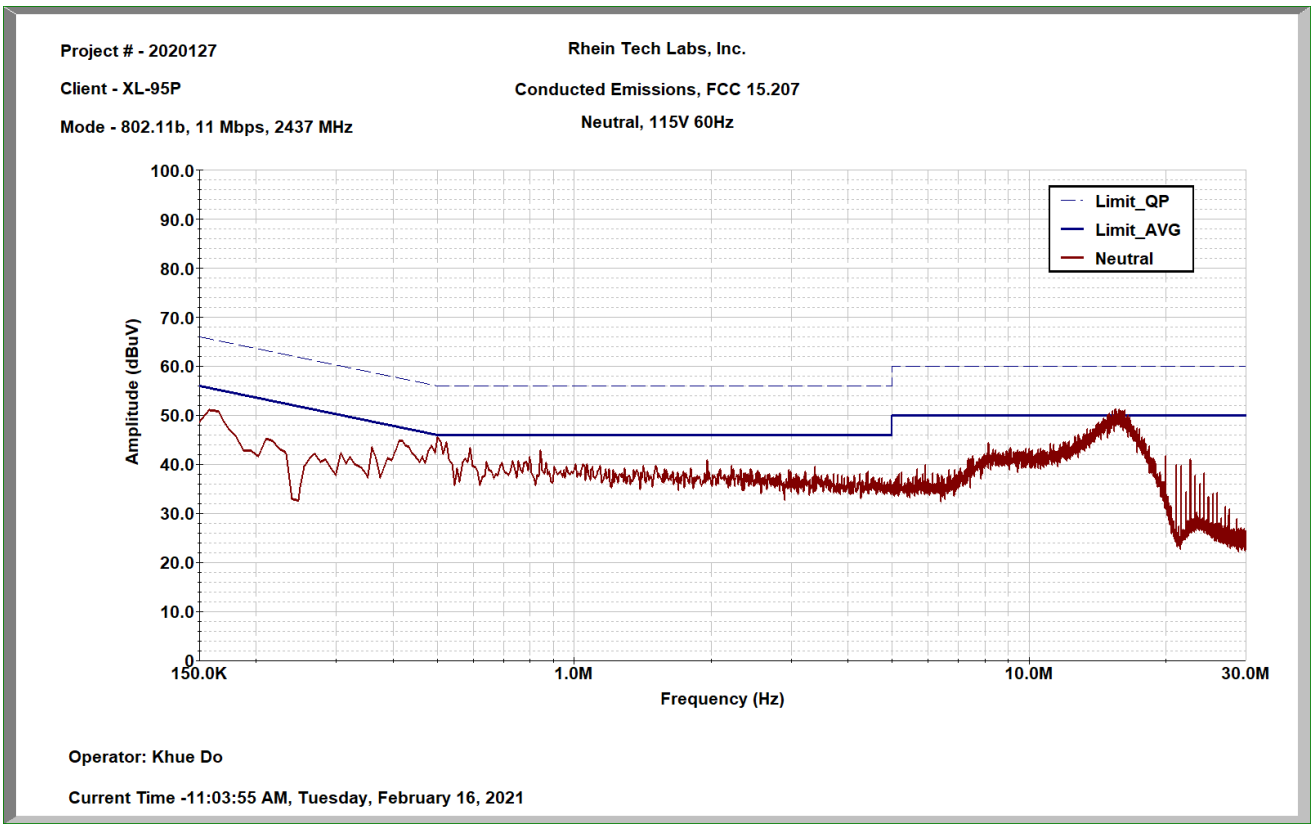


Table 8-5: Conducted Emissions Test Result, AC, Neutral, 2437 MHz

Frequency (MHz)	Detector Type	Emission (dBµV)	Limit (dBµV)	Margin (dB)	Result
15.640	AVG	28.8	50.0	-21.2	Pass
15.640	QPK	45.8	60.0	-14.2	Pass

Plot 8-4: Conducted Emissions, AC, Line, 2437 MHz

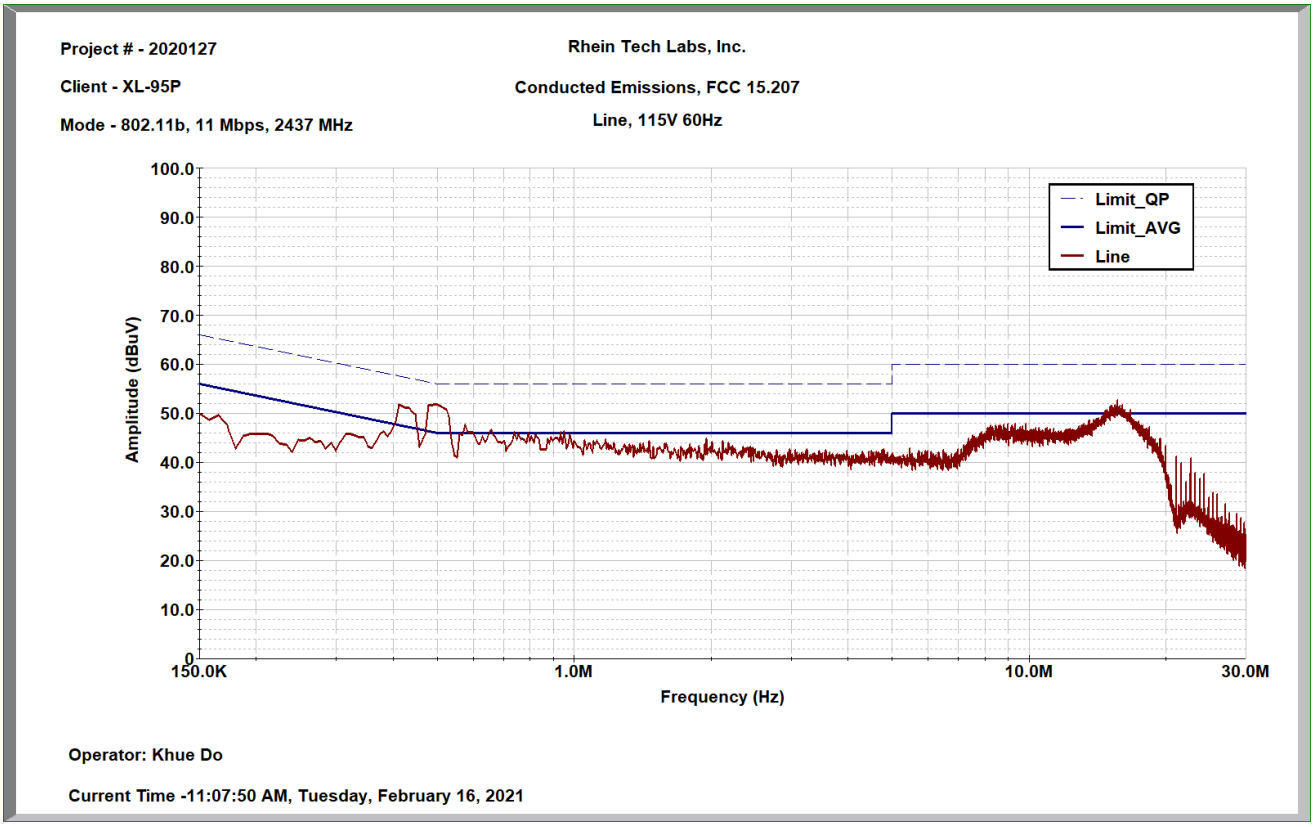


Table 8-6: Conducted Emissions Test Result, AC, Line, 2437 MHz

Frequency (MHz)	Detector Type	Emission (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.531	AVG	31.3	46.0	-14.7	Pass
0.531	QPK	49.7	56.0	-6.3	Pass
15.620	AVG	28.8	50.0	-21.2	Pass
15.620	QPK	45.6	60.0	-14.4	Pass

Plot 8-5: Conducted Emissions, AC, Neutral, 2462 MHz

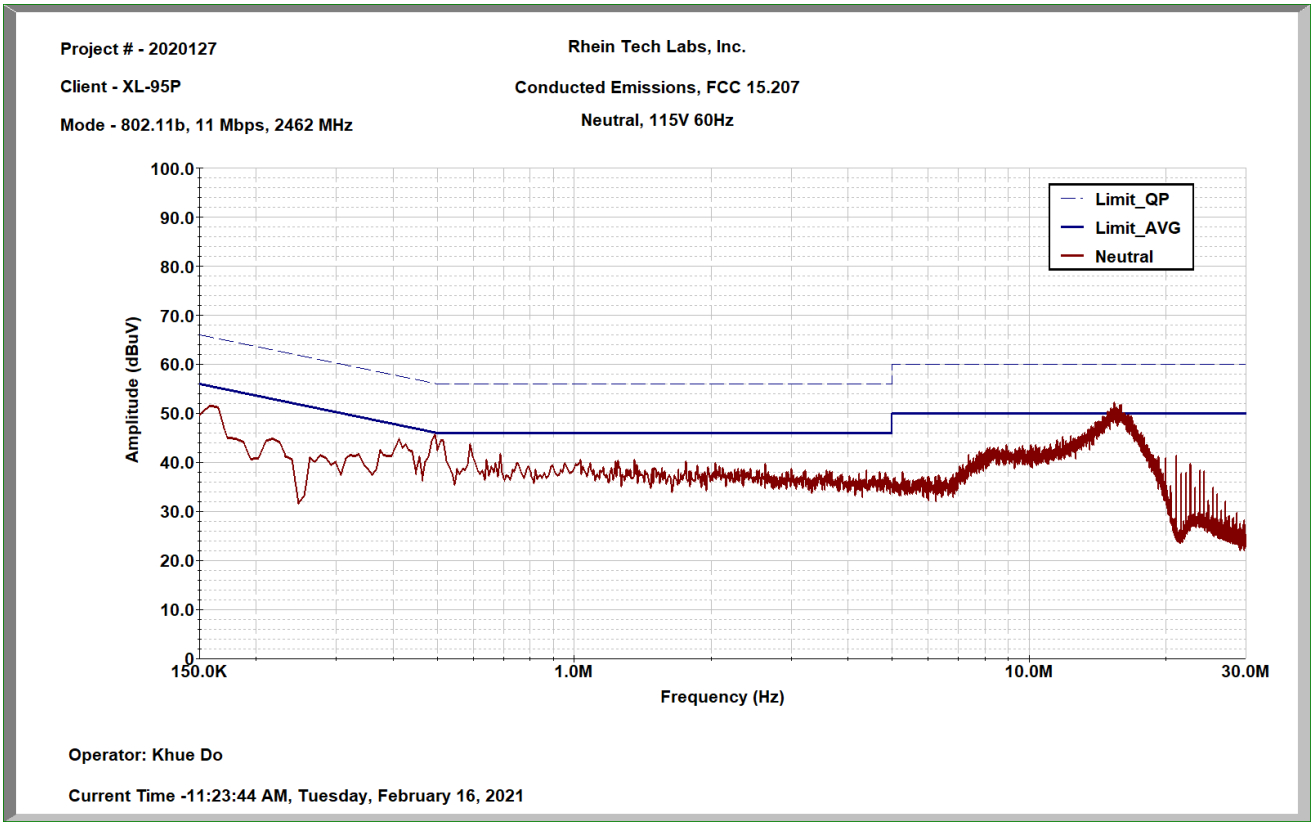


Table 8-7: Conducted Emissions Test Result, AC, Neutral, 2462 MHz

Frequency (MHz)	Detector Type	Emission (dBµV)	Limit (dBµV)	Margin (dB)	Result
15.636	AVG	28.6	50.0	-21.4	Pass
15.636	QPK	48.3	60.0	-11.7	Pass

Plot 8-6: Conducted Emissions, AC, Line, 2462 MHz

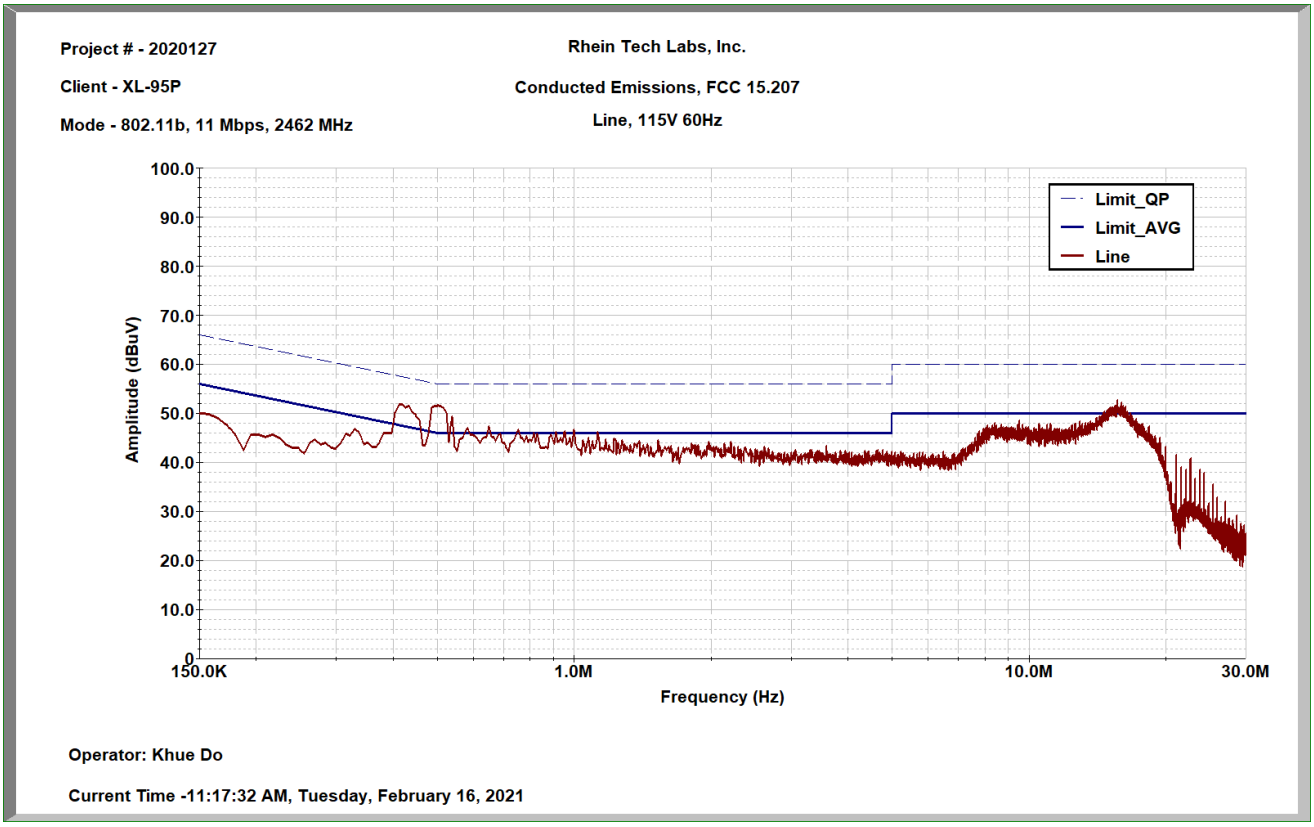


Table 8-8: Conducted Emissions Test Result, AC, Line, 2462 MHz

Frequency (MHz)	Detector Type	Emission (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.576	AVG	21.4	46.0	-24.6	Pass
0.576	QPK	34.0	56.0	-22.0	Pass
15.664	AVG	31.5	50.0	-18.5	Pass
15.664	QPK	48.1	60.0	-11.9	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

9 Radiated Emissions – FCC 15.209; RSS-247 5.5; RSS-Gen 8.9, 8.10

9.1 Limits of Radiated Emissions Measurement

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.

9.2 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 the 10th harmonic of the highest fundamental transmitter frequency (24.8 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.

Table 9-1: 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
901669	ETS-Lindgren	3142E	Biconilog Antenna (30 MHz–6000 MHz)	00166065	07/11/2025
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	12/01/2024
901583	Agilent Technologies	N9010A	EXA Signal Analyzer (10 Hz-26.5 GHz)	MY51250846	10/04/2024
901723	Hewlett Packard	8449B	Amplifier (1–26.5 GHz)	3008A00762	11/22/2023
900905	Rhein Tech Laboratories, Inc.	PR-1040	Amplifier (10 MHz–2 GHz)	1006	01/30/2024

9.3 Radiated Emissions Test Results

Table 9-2: Radiated Emissions Harmonics/Spurious – 2412 MHz, Peak Detector; 802.11b

Frequency (MHz)	Peak Analyzer (dBµV/m)	Site Correction Factor (dB/m)	Peak Corrected (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)
4824.0	18.1	34.0	52.1	74.0	-21.9
12060.0	12.7	44.8	57.5	74.0	-16.5
14472.0	13.7	48.8	62.5	74.0	-11.5
19296.0	4.2	53.8	58.0	74.0	-16.0

Table 9-3: Radiated Emissions Harmonics/Spurious – 2412 MHz, Average Detector; 802.11b

Frequency (MHz)	Average Analyzer (dBµV/m)	Site Correction Factor (dB/m)	Average Corrected (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)
4824.0	14.1	34.0	48.1	54.0	-5.9
12060.0	1.3	44.8	46.1	54.0	-7.9
14472.0	2.4	48.8	51.2	54.0	-2.8
19296.0	-7.6	53.8	46.2	54.0	-7.8

Table 9-4: Radiated Emissions Harmonics/Spurious – 2437 MHz, Peak Detector; 802.11b

Frequency (MHz)	Peak Analyzer (dBµV/m)	Site Correction Factor (dB/m)	Peak Corrected (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)
4874.0	17.6	34.0	51.6	74.0	-22.4
7311.0	12.6	36.5	49.1	74.0	-24.9
12185.0	12.0	44.9	56.9	74.0	-17.1
19496.0	2.4	53.8	56.2	74.0	-17.8

Table 9-5: Radiated Emissions Harmonics/Spurious – 2437 MHz, Average Detector; 802.11b

Frequency (MHz)	Average Analyzer (dBµV/m)	Site Correction Factor (dB/m)	Average Corrected (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)
4874.0	13.7	34.0	47.7	54.0	-6.3
7311.0	1.3	36.5	37.8	54.0	-16.2
12185.0	0.9	44.9	45.8	54.0	-8.2
19496.0	-8.4	53.8	45.4	54.0	-8.6

Table 9-6: Radiated Emissions Harmonics/Spurious – 2462 MHz, Peak Detector; 802.11b

Frequency (MHz)	Peak Analyzer (dBµV/m)	Site Correction Factor (dB/m)	Peak Corrected (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)
4924.0	17.7	34.1	51.8	74.0	-22.2
7386.0	11.9	36.6	48.5	74.0	-25.5
12310.0	12.0	44.9	56.9	74.0	-17.1
19696.0	2.9	53.9	56.8	74.0	-17.2
22158.0	3.0	55.6	58.6	74.0	-15.4

Table 9-7: Radiated Emissions Harmonics/Spurious – 2462 MHz, Average Detector; 802.11b

Frequency (MHz)	Average Analyzer (dBµV/m)	Site Correction Factor (dB/m)	Average Corrected (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)
4924.0	14.1	34.1	48.2	54.0	-5.8
7386.0	0.9	36.6	37.5	54.0	-16.5
12310.0	1.4	44.9	46.3	54.0	-7.7
19696.0	-7.9	53.9	46.0	54.0	-8.0
22158.0	-7.8	55.6	47.8	54.0	-6.2

Table 9-8: Radiated Emissions Harmonics/Spurious – 2412 MHz, Peak Detector; 802.11g

Frequency (MHz)	Peak Analyzer (dBµV/m)	Site Correction Factor (dB/m)	Peak Corrected (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)
4824.0	13.8	34.0	47.8	74.0	-26.2
12060.0	3.4	44.8	48.2	74.0	-25.8
14472.0	4.0	48.8	52.8	74.0	-21.2
19296.0	2.7	53.8	56.5	74.0	-17.5

Table 9-9: Radiated Emissions Harmonics/Spurious – 2412 MHz, Average Detector; 802.11g

Frequency (MHz)	Average Analyzer (dBµV/m)	Site Correction Factor (dB/m)	Average Corrected (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)
4824.0	3.6	34.0	37.6	54.0	-16.4
12060.0	-7.7	44.8	37.2	54.0	-16.8
14472.0	-7.7	48.8	41.1	54.0	-12.9
19296.0	-7.9	53.8	45.9	54.0	-8.1

Table 9-10: Radiated Emissions Harmonics/Spurious – 2437 MHz, Peak Detector; 802.11g

Frequency (MHz)	Peak Analyzer (dBµV/m)	Site Correction Factor (dB/m)	Peak Corrected (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)
4874.0	14.8	34.0	48.8	74.0	-25.2
7311.0	-2.5	36.5	34.0	74.0	-40.0
12185.0	-3.3	44.9	41.5	74.0	-32.5
19496.0	-3.1	53.8	50.8	74.0	-23.2

Table 9-11: Radiated Emissions Harmonics/Spurious – 2437 MHz, Average Detector; 802.11g

Frequency (MHz)	Average Analyzer (dBµV/m)	Site Correction Factor (dB/m)	Average Corrected (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)
4874.0	3.8	34.0	37.8	54.0	-16.2
7311.0	-12.7	36.5	23.8	54.0	-30.2
12185.0	-14.0	44.9	30.9	54.0	-23.1
19496.0	-14.3	53.8	39.5	54.0	-14.5

Table 9-12: Radiated Emissions Harmonics/Spurious – 2462 MHz, Peak Detector; 802.11g

Frequency (MHz)	Peak Analyzer (dBµV/m)	Site Correction Factor (dB/m)	Peak Corrected (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)
4924.0	14.0	34.1	48.1	74.0	-25.9
7386.0	11.7	36.6	48.3	74.0	-25.7
12310.0	5.1	44.9	50.0	74.0	-24.0
19696.0	-14.4	53.9	39.5	74.0	-34.5
22158.0	-1.5	55.6	54.1	74.0	-19.9

Table 9-13: Radiated Emissions Harmonics/Spurious – 2462 MHz, Average Detector; 802.11g

Frequency (MHz)	Average Analyzer (dBµV/m)	Site Correction Factor (dB/m)	Average Corrected (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)
4924.0	2.9	34.1	37.0	54.0	-17.0
7386.0	0.9	36.6	37.5	54.0	-16.5
12310.0	-1.7	44.9	43.1	54.0	-10.9
19696.0	-18.8	53.9	35.1	54.0	-18.9
22158.0	-12.5	55.6	43.1	54.0	-10.9

Table 9-14: Radiated Emissions Harmonics/Spurious – 2412 MHz, Peak Detector; 802.11n

Frequency (MHz)	Peak Analyzer (dBµV/m)	Site Correction Factor (dB/m)	Peak Corrected (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)
4824.0	9.9	34.0	43.9	74.0	-30.1
12060.0	3.1	44.8	48.0	74.0	-26.0
14472.0	3.6	48.8	52.4	74.0	-21.6
19296.0	-14.7	53.8	39.1	74.0	-34.9

Table 9-15: Radiated Emissions Harmonics/Spurious – 2412 MHz, Average Detector; 802.11n

Frequency (MHz)	Average Analyzer (dBµV/m)	Site Correction Factor (dB/m)	Average Corrected (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)
4824.0	0.2	34.0	34.2	54.0	-19.8
12060.0	-8.3	44.8	36.6	54.0	-17.4
14472.0	-8.1	48.8	40.7	54.0	-13.3
19296.0	-21.1	53.8	32.7	54.0	-21.3

Table 9-16: Radiated Emissions Harmonics/Spurious – 2437 MHz, Peak Detector; 802.11n

Frequency (MHz)	Peak Analyzer (dBµV/m)	Site Correction Factor (dB/m)	Peak Corrected (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)
4874.0	10.8	34.0	44.8	74.0	-29.2
7311.0	7.4	36.5	43.9	74.0	-30.1
12185.0	3.1	44.9	47.9	74.0	-26.1
19496.0	-15.3	53.8	38.5	74.0	-35.5

Table 9-17: Radiated Emissions Harmonics/Spurious – 2437 MHz, Average Detector; 802.11n

Frequency (MHz)	Average Analyzer (dBµV/m)	Site Correction Factor (dB/m)	Average Corrected (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)
4874.0	0.9	34.0	35.0	54.0	-19.0
7311.0	-4.2	36.5	32.3	54.0	-21.7
12185.0	-7.9	44.9	37.0	54.0	-17.0
19496.0	-21.5	53.8	32.3	54.0	-21.7

Table 9-18: Radiated Emissions Harmonics/Spurious – 2462 MHz, Peak Detector; 802.11n

Frequency (MHz)	Peak Analyzer (dBµV/m)	Site Correction Factor (dB/m)	Peak Corrected (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)
4924.0	8.2	34.1	42.3	74.0	-31.7
7386.0	7.0	36.6	43.6	74.0	-30.4
12310.0	3.5	44.9	48.3	74.0	-25.7
19696.0	-14.1	53.9	39.8	74.0	-34.2
22158.0	-16.5	55.6	39.1	74.0	-34.9

Table 9-19: Radiated Emissions Harmonics/Spurious – 2462 MHz, Average Detector; 802.11n

Frequency (MHz)	Average Analyzer (dBµV/m)	Site Correction Factor (dB/m)	Average Corrected (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)
4924.0	-1.9	34.1	32.1	54.0	-21.9
7386.0	-4.4	36.6	32.2	54.0	-21.8
12310.0	-6.6	44.9	38.3	54.0	-15.7
19696.0	-20.8	53.9	33.1	54.0	-20.9
22158.0	-27.5	55.6	28.0	54.0	-26.0

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

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

10 Conclusion

The data in this DTS 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.