

June 30, 2020

Viavi Solutions
20250 Century Blvd.
Germantown, MD 20874

Dear Jaryk Kuzel,

Enclosed is the EMC Wireless test report for compliance testing of the Viavi Solutions, OneAdvisor ONA-800A as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Part 15 Subpart C for Intentional Radiators.

Thank you for using the services of Eurofins E&E North America. If you have any questions regarding these results or if we can be of further service to you, please feel free to contact me.

Sincerely yours,
EUROFINS E&E NORTH AMERICA

A handwritten signature in cursive script that reads "Michelle Tawmging".

Michelle Tawmging
Documentation Department

Reference: (\\Viavi Solutions\\WIR106969A-FCC247 DTS Rev. 1)

Certificates and reports shall not be reproduced except in full, without the written permission of Eurofins E&E North America. This letter of transmittal is not a part of the attached report.

Eurofins MET Laboratories Inc. (Eurofins E&E North America) is part of the Eurofins Electrical & Electronics (E&E) global compliance network.

Electromagnetic Compatibility Criteria Test Report

for the

**Viavi Solutions
OneAdvisor ONA-800A**

Tested under
the FCC Certification Rules
contained in
15.247 Subpart C for Intentional Radiators

Report: WIR106969A-FCC247 DTS Rev. 1

June 30, 2020

Prepared For:

**Viavi Solutions
20250 Century Blvd.
Germantown, MD 20874**

Prepared By:
Eurofins E&E North America
914 West Patapsco Ave.,
Baltimore MD 21230

Electromagnetic Compatibility Criteria Test Report

for the

Viavi Solutions
OneAdvisor ONA-800A

Tested under
the FCC Certification Rules
contained in
15.247 Subpart C for Intentional Radiators



Donald Salguero
Electromagnetic Compatibility Lab



Michelle Tawmging
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules Part 15.247 under normal use and maintenance.



Deepak Giri,
Manager, Wireless Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	May 29, 2020	Initial Issue.
1	June 30, 2020	TCB Comments

Table of Contents

I.	Executive Summary	1
	A. Purpose of Test.....	2
	B. Executive Summary	2
II.	Equipment Configuration.....	3
	A. Overview.....	4
	B. References.....	4
	C. Test Site.....	4
	D. Description of Test Sample	5
	E. Equipment Configuration.....	6
	F. Support Equipment.....	6
	G. Ports and Cabling Information	6
	H. Mode of Operation	7
	I. Method of Monitoring EUT Operation	7
	J. Modifications	8
	a) Modifications to EUT	8
	b) Modifications to Test Standard.....	8
	K. Disposition of EUT	8
III.	Electromagnetic Compatibility Criteria for Intentional Radiators	9
	§ 15.247(d) Radiated Spurious Emissions Requirements and Band Edge.....	10
IV.	Test Equipment	35
V.	Certification & User's Manual Information	37
	A. Certification Information.....	38
	B. Label and User's Manual Information	42

List of Figures

Figure 1: Executive Summary of EMC Part 15.247 Compliance Testing	2
Figure 2: EUT Summary Table	4
Figure 3: References	4
Figure 4: Block Diagram of Test Configuration	5
Figure 5: Equipment Configuration	6
Figure 6: Support Equipment	6
Figure 7: Ports and Cabling Information	6
Figure 8: Restricted Bands of Operation	10
Figure 9: Radiated Emissions Limits Calculated from FCC Part 15, § 15.209 (a)	11
Figure 10: Average Radiated Emissions - 802.11b 20MHz 2412MHz - 1-7GHz	11
Figure 11: Average Radiated Emissions - 802.11b 20MHz 2437Hz - 1-7GHz	12
Figure 12: Average Radiated Emissions - 802.11b 20MHz 2462MHz - 1-7GHz	12
Figure 13: Average Radiated Emissions - 802.11g 20MHz 2412MHz - 1-7GHz	13
Figure 14: Average Radiated Emissions - 802.11g 20MHz 2437MHz - 1-7GHz	13
Figure 15: Average Radiated Emissions - 802.11g 20MHz 2462MHz - 1-7GHz	14
Figure 16: Average Radiated Emissions - 802.11n 20MHz 2412MHz MIMO - 1-7GHz	14
Figure 17: Average Radiated Emissions - 802.11n 20MHz 2437MHz MIMO - 1-7GHz	15
Figure 18: Average Radiated Emissions - 802.11n 20MHz 2462MHz MIMO - 1-7GHz	15
Figure 19: Average Radiated Emissions - 802.11n 40MHz 2422MHz MIMO - 1-7GHz	16
Figure 20: Average Radiated Emissions - 802.11n 40MHz 2437MHz MIMO - 1-7GHz	16
Figure 21: Average Radiated Emissions - 802.11n 40MHz 2452MHz MIMO - 1-7GHz	17
Figure 22: Average Radiated Emissions Worst Case 7-18GHz	17
Figure 23: Radiated Emissions, Average, 18 GHz – 26 GHz	18
Figure 24: Peak Radiated Emissions - 802.11b 20MHz 2412MHz - 1-7GHz	18
Figure 25: Peak Radiated Emissions - 802.11b 20MHz 2437MHz - 1-7GHz	19
Figure 26: Peak Radiated Emissions - 802.11b 20MHz 2462MHz - 1-7GHz	19
Figure 27: Peak Radiated Emissions - 802.11g 20MHz 2412MHz - 1-7GHz	20
Figure 28: Peak Radiated Emissions - 802.11g 20MHz 2437MHz - 1-7GHz	20
Figure 29: Peak Radiated Emissions - 802.11g 20MHz 2462MHz - 1-7GHz	21
Figure 30: Peak Radiated Emissions - 802.11n 20MHz 2412MHz MIMO - 1-7GHz	21
Figure 31: Peak Radiated Emissions - 802.11n 20MHz 2437MHz MIMO - 1-7GHz	22
Figure 32: Peak Radiated Emissions - 802.11n 20MHz 2462MHz MIMO - 1-7GHz	22
Figure 33: Peak Radiated Emissions - 802.11n 40MHz 2422MHz MIMO - 1-7GHz	23
Figure 34: Peak Radiated Emissions - 802.11n 40MHz 2437MHz MIMO - 1-7GHz	23
Figure 35: Peak Radiated Emissions - 802.11n 40MHz 2452MHz MIMO - 1-7GHz	24
Figure 36: Peak Radiated Emissions Worst Case 7-18GHz	24
Figure 37: Radiated Emissions, Peak, 18 GHz – 26 GHz	25
Figure 38: Radiated Emissions, Worst Case, 30-1000MHz	25
Figure 39: 802.11b 2390MHz Average Radiated Bandedge 1Mbps CCK 20MHz 2412MHz	26
Figure 40: 802.11b 2390MHz Peak Radiated Bandedge 1Mbps CCK 20MHz 2412MHz	27
Figure 41: 802.11b 2483.5MHz Average Radiated Bandedge 1Mbps CCK 20MHz 2462MHz	27
Figure 42: 802.11b 2483.5MHz Peak Radiated Bandedge 1Mbps CCK 20MHz 2462MHz	28
Figure 43: 802.11g 2390MHz Average Radiated Bandedge 6Mbps noHT 20MHz 2412MHz	28
Figure 44: 802.11g 2390MHz Peak Radiated Bandedge 6Mbps noHT 20MHz 2412MHz	29
Figure 45: 802.11g 2483.5MHz Average Radiated Bandedge 6Mbps noHT 20MHz 2462MHz	29
Figure 46: 802.11g 2483.5MHz Peak Radiated Bandedge 6Mbps noHT 20MHz 2462MHz	30
Figure 47: 802.11n 2390MHz Average Radiated Bandedge MCS0 HT20 20MHz 2412MHz	30
Figure 48: 802.11n 2390MHz Average Radiated Bandedge MCS0 HT40 40MHz 2422MHz	31
Figure 49: 802.11n 2390MHz Peak Radiated Bandedge MCS0 HT20 20MHz 2412MHz	31
Figure 50: 802.11n 2390MHz Peak Radiated Bandedge MCS0 HT40 40MHz 2422MHz	32
Figure 51: 802.11n 2483.5MHz Average Radiated Bandedge MCS0 HT20 20MHz 2462MHz	32

Figure 52: 802.11n 2483.5MHz Average Radiated Bandedge MCS0 HT40 40MHz 2452MHz.	33
Figure 53: 802.11n 2483.5MHz Peak Radiated Bandedge MCS0 HT20 20MHz 2462MHz.	33
Figure 54: 802.11n 2483.5MHz Peak Radiated Bandedge MCS0 HT40 40MHz 2452MHz.	34
Figure 53: Radiated Emissions Test Setup Above 1GHz	Error! Bookmark not defined.
Figure 54: Radiated Emissions Test Setup Below 1GHz	Error! Bookmark not defined.
Figure 55: Test Equipment List	36

List of Terms and Abbreviations

AC	Alternating Current
ACF	Antenna Correction Factor
Cal	Calibration
d	Measurement Distance
dB	Decibels
dBμA	Decibels above one microamp
dBμV	Decibels above one microvolt
dBμA/m	Decibels above one microamp per meter
dBμV/m	Decibels above one microvolt per meter
DC	Direct Current
E	Electric Field
DSL	Digital Subscriber Line
ESD	Electrostatic Discharge
EUT	Equipment Under Test
f	Frequency
FCC	Federal Communications Commission
GRP	Ground Reference Plane
H	Magnetic Field
HCP	Horizontal Coupling Plane
Hz	Hertz
IEC	International Electrotechnical Commission
kHz	kilohertz
kPa	kilopascal
kV	kilovolt
LISN	Line Impedance Stabilization Network
MHz	Megahertz
μH	microhenry
μ	microfarad
μs	microseconds
NEBS	Network Equipment-Building System
PRF	Pulse Repetition Frequency
RF	Radio Frequency
RMS	Root-Mean-Square
TWT	Traveling Wave Tube
V/m	Volts per meter
VCP	Vertical Coupling Plane

Executive Summary

A. Purpose of Test

An EMC Wireless evaluation was performed to determine compliance of the Viavi Solutions OneAdvisor ONA-800A, with the requirements of Part 15, §15.247. All references are to the most current version of Title 47 of the Code of Federal Regulations in effect. In accordance with §2.1033, the following data is presented in support of the Certification of the OneAdvisor ONA-800A. Viavi Solutions should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the OneAdvisor ONA-800A, has been **permanently** discontinued.

B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, §15.247, in accordance with Viavi Solutions, purchase order number 2941000132. All tests were conducted using measurement procedure ANSI C63.10-2013.

FCC Reference 47 CFR Part 15.247:2005	Description	Compliance
Title 47 of the CFR, Part 15 §15.247(d); §15.209; §15.205	Radiated Spurious Emissions Requirements	Compliant

Figure 1: Executive Summary of EMC Part 15.247 Compliance Testing

Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Viavi Solutions to perform testing on the OneAdvisor ONA-800A, under Viavi Solutions' purchase order number 2941000132.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Viavi Solutions, OneAdvisor ONA-800A.

The results obtained relate only to the item(s) tested.

Model(s) Tested:	OneAdvisor ONA-800A		
Model(s) Covered:	OneAdvisor ONA-800A		
EUT Specifications:	Primary Power: 100-240VAC		
	FCC ID: WUW-SXPCEAC2		
	Type of Modulations:	DSSS , OFDM	GFSK, 8DPSK, $\pi/4$ DQPSK
	Equipment Code:	DTS	DXX
	Peak RF Output Power:	0.485 W*	0.002*
	EUT Frequency Ranges:	2412-2462 MHz 2422-2452 MHz	2402-2480 MHz
Analysis:	The results obtained relate only to the item(s) tested.		
Environmental Test Conditions:	Temperature: 15-35° C		
	Relative Humidity: 30-60%		
	Barometric Pressure: 860-1060 mbar		
Evaluated by:	Donald Salguero		
Report Date(s):	June 30, 2020		

Figure 2: EUT Summary Table

B. References

CFR 47, Part 15, Subpart C	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 15: General Rules and Regulations, Allocation, Assignment, and Use of Radio Frequencies
ANSI C63.4:2014	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
ISO/IEC 17025:2017	General Requirements for the Competence of Testing and Calibration Laboratories
ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

Figure 3: References

C. Test Site

All testing was performed at Eurofins MET Laboratories, Inc., 914 W. Patapsco Avenue, Baltimore, MD 21230. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a 3 meter semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

Eurofins MET Laboratories Inc. (Eurofins E&E North America) is part of the Eurofins Electrical & Electronics (E&E) global compliance network.

D. Description of Test Sample

The OneAdvisor ONA-800A, Equipment Under Test (EUT) for the remainder of this document, is a portable handheld test platform that is used to test wireless telecommunications infrastructure. Different test capabilities are added through the use of attached expansion modules. The platform consists of the product mainframe ONA-800A-MF and its display ONA-800-DISPL.

The expansion modules listed below, tested with the platform in this report, are considered representative of all modules from their respective families. This particular combination of modules is intended to be used by telecommunications network installation and maintenance technicians at cellular antenna and base station sites.

CAA06MA – Cable and Antenna Analyzer (CAA) module

E41DWDMC - Optical Time Domain Reflectometer (OTDR) module

The ONA-800 supports both wired and wireless network connections for remote control and transfer of saved results and configurations.

Power is supplied by either the internal battery or the external AC/DC adapter.

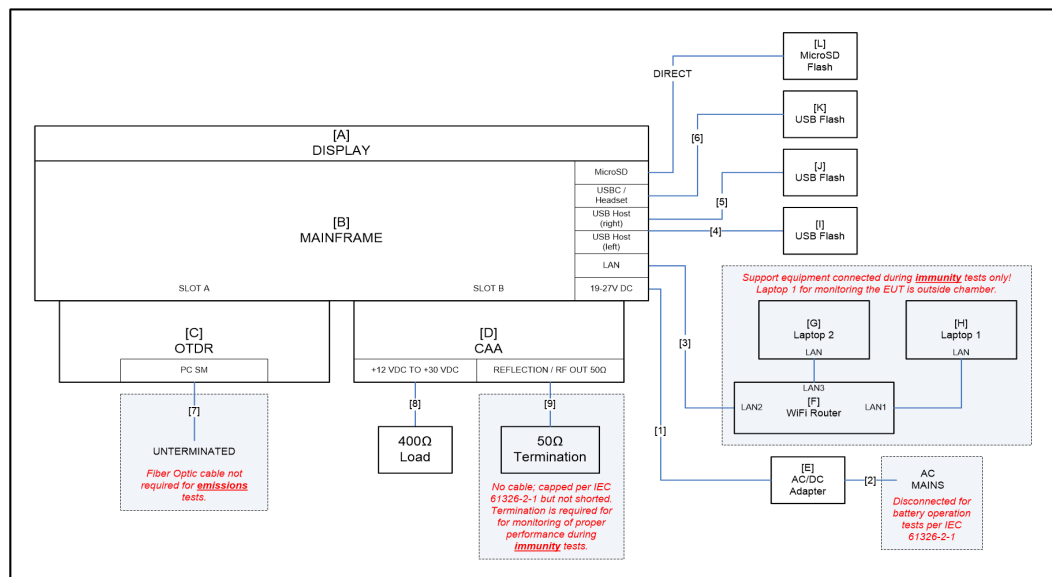


Figure 4: Block Diagram of Test Configuration

E. Equipment Configuration

The EUT was set up as outlined in Figure 4. All cards, racks, etc., incorporated as part of the EUT is included in the following list.

Ref. ID	Slot #	Name / Description	Model Number	Part Number	Serial Number	Rev. #
[A]	-	OneAdvisor ONA-800A Display	ONA-800A- DISPL	-	N/A	000
[B]	-	OneAdvisor ONA-800A Mainframe	ONA-800A-MF	-	WMSH0040300020	000
[C]	A	METRO-ACCESS/PON 1310/1550/1625 NM PC OTDR MODULE	E41DWDMC- PC	-	34193	000
[D]	B	6 GHz Cable and Antenna Analyzer Module	CAA06MA	22130016-001	JCFA0022	001
[E]	-	AC/DC Adapter	ATS160TP190	ATS160TP190Q15204	N/A	N/A

Figure 5: Equipment Configuration

F. Support Equipment

Support equipment necessary for the operation and testing of the EUT is included in the following list.

Ref. ID	Name / Description	Manufacturer	Model Number	*Customer Supplied Calibration Data
[F]	Wi-Fi Router	Netgear	AC1200 / R6220	N/A
[G]	Laptop 2	Lenovo	ThinkPad X1 Carbon	N/A
[H]	Laptop 1	Dell	M4800	N/A
[I, J, K]	USB Flash	SanDisk	SDCZ60-016G	N/A
[L]	MicroSD Flash	ATP	AF1GUDI	N/A

Figure 6: Support Equipment

G. Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty	Length as tested (m)	Max Length (m)	Shielded? (Y/N)	Termination Box ID & Port Name
1	[B] 19-27V DC	2 conductor, 16 AWG UL 2464	1	1.5	1.5	N	[E] DC OUTPUT
2	[E] AC INPUT	3 conductor, 18 AWG	1	2.5	2.5	N	AC MAINS
3	[B] LAN	CAT5/5e/6, UTP	1	3	100	N	[F] LAN2
4	[B] USB Host (left)	USB A/A, STP	1	3	5	Y	[I] USB Flash
5	[B] USB Host (right)	USB A/A, STP	1	3	5	Y	[J] USB Flash
6	[B] USB C	USB C/A + USB A/A, STP	1	3.15	5	Y	[K] USB Flash
7	[C] PC SM	Optical fiber	1	~3000	N/A	N/A	Unterminated
8	[D] +12 VDC TO +30 VDC	RG-58 (3m) + RG-316 (0.25m)	1	3.25	>3m	Y	400Ω Load
9	[D] REFLECTION / RF OUT 50Ω	Capped, no cable per IEC61326-2-1. Termination required for immunity measurement	1	0m	>3m	Y	50Ω Termination

Figure 7: Ports and Cabling Information

H. Mode of Operation

The EUT will be running two simultaneous test applications during both emissions and immunity testing:

“Reflection Return Loss” test application running continuously on the CAA module
“OTDR EXPERT” test application in “Real Time” mode running continuously on the OTDR module

Additionally, the EUT will be running the following during immunity testing only:

Ethernet ping test running continuously between Laptop 2 and the EUT via the router
Wi-Fi ping test running continuously between Laptop 2 and the EUT via the router

The test software used during testing was:

EUT Software (internal to EUT):
platform-version 2.1.0-fab62f6.dev (12/03/20)
caa-solution 6.010.002b-1 (11/03/2020)
fiber-optic 99.99+svn62490-r0 (12/03/2020)

Support Software (used by support PC to exercise EUT): Remote Desktop, VNC client

I. Method of Monitoring EUT Operation

Each of the test applications below are monitored from outside the test chamber using a VNC client. Each test application is checked by switching focus between their respective tabs at the top of the display. Note: Stimulus must be applied when focus is on the CAA test application because it runs continuously only when selected.

For “Reflection Return Loss” test application running on CAA module:

1. In normal, error-free operation, the:
 - Reflection Return Loss trace is continuously updated and remains similar to the initial reference waveform
 - the Bias Voltage current measurement value is continuously updated and remains similar to the expected value
2. In continuously errored / broken state, the:
 - Reflection Return Loss trace is not updating or becomes consistently dissimilar to the initial reference waveform
 - the Bias Voltage current measurement value is not updating or is dissimilar to the expected value

For “OTDR EXPERT” test application running on CAA module:

1. In normal, error-free operation, the:
 - OTDR trace is continuously updated and remains similar to the initial reference waveform
2. In continuously errored / broken state, the:
 - OTDR trace is not updating or becomes consistently dissimilar to the initial reference waveform

Ethernet and Wi-Fi ping tests:

1. In normal, error-free operation, the:
 - Lost packets during a single test are $\leq 10\%$.
2. In errored state, the:
 - Lost packets during a single test are $> 10\%$.

Note regarding pass/fail criteria:

Note: Transient errors or measurement deviations do not constitute a failure per performance criteria B provided that performance returns to normal without user intervention after the immunity test stimulus is removed.

J. Modifications**a) Modifications to EUT**

No modifications were made to the EUT.

b) Modifications to Test Standard

No modifications were made to the test standard.

K. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Viavi Solutions upon completion of testing.

Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(d) Radiated Spurious Emissions Requirements and Band Edge

Test Requirements: §15.247(d); §15.205: Emissions outside the frequency band.

§15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a).

§15.205(a): Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090–0.110-----	16.42–16.423	399.9–410	4.5–5.15
¹ 0.495–0.505-----	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905-----	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128-----	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775-----	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775-----	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218-----	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825-----	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225-----	123–138	2200–2300	14.47–14.5
8.291–8.294-----	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366-----	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675-----	156.7–156.9	2655–2900	22.01–23.12
8.41425–8.41475-----	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293-----	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025-----	240–285	3345.8–3358 36.	43–36.5
12.57675–12.57725-----	322–335.4	3600–4400	(²)

Figure 8: Restricted Bands of Operation

¹ Until February 1, 1999, this restricted band shall be 0.490 – 0.510 MHz.

² Above 38.6

Test Requirement(s): § 15.209 (a): Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in Figure 9:

Frequency (MHz)	§ 15.209(a), Radiated Emission Limits (dBµV) @ 3m
30 - 88	40.00
88 - 216	43.50
216 - 960	46.00
Above 960	54.00

Figure 9: Radiated Emissions Limits Calculated from FCC Part 15, § 15.209 (a)

Test Procedures: The transmitter was turned on. Measurements were performed of the low, mid and high Channels. The EUT was rotated orthogonally through all three axes. Plots shown are corrected for both antenna correction factor and distance and compared to a 3 m limit line. Only noise floor was observed above 18 GHz, measurements were below the applicable limits by 6dB or more.

Test Results: The EUT was **compliant** with the Radiated Spurious Emission limits of § 15.247(d). No anomalies noted.

802.11b/g are SISO and it transmits on chain 0, transmitting from chain 1 is disabled while on these modes. 802.11n 20/40 are MIMO at the higher data rates

Test Engineer: Donald Salguero

Test Date: May 11, 2020

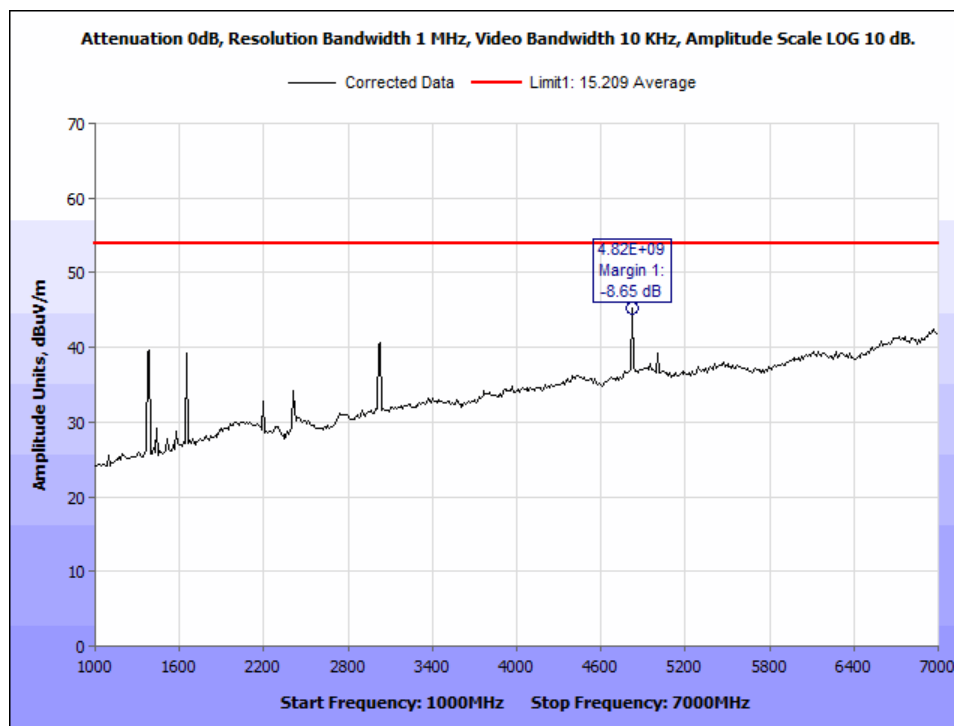


Figure 10: Average Radiated Emissions - 802.11b 20MHz 2412MHz - 1-7GHz.

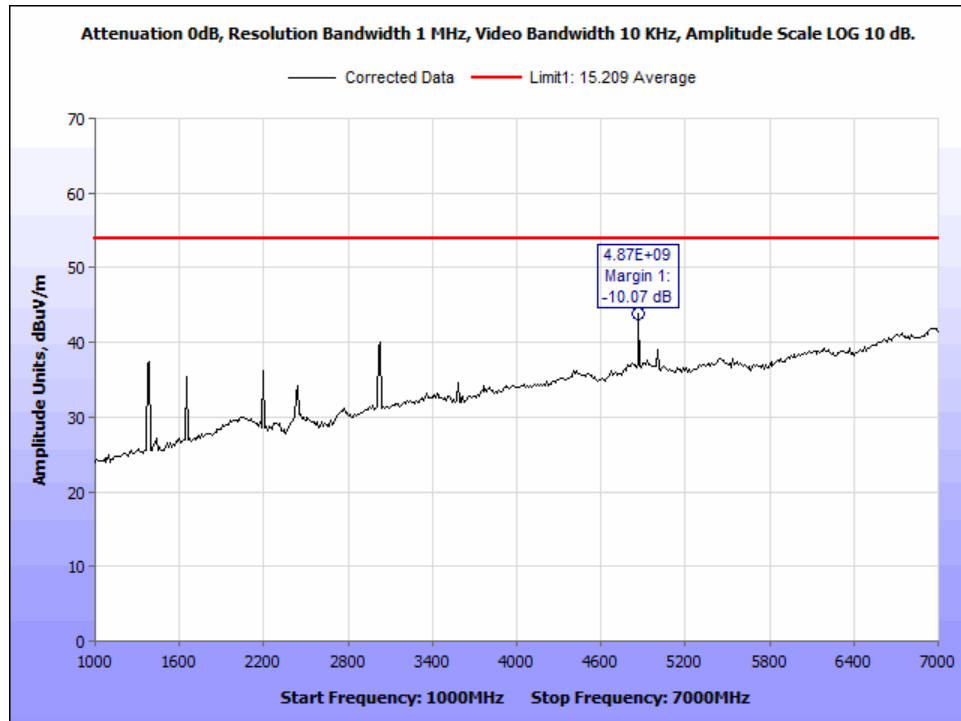


Figure 11: Average Radiated Emissions - 802.11b 20MHz 2437Hz - 1-7GHz.

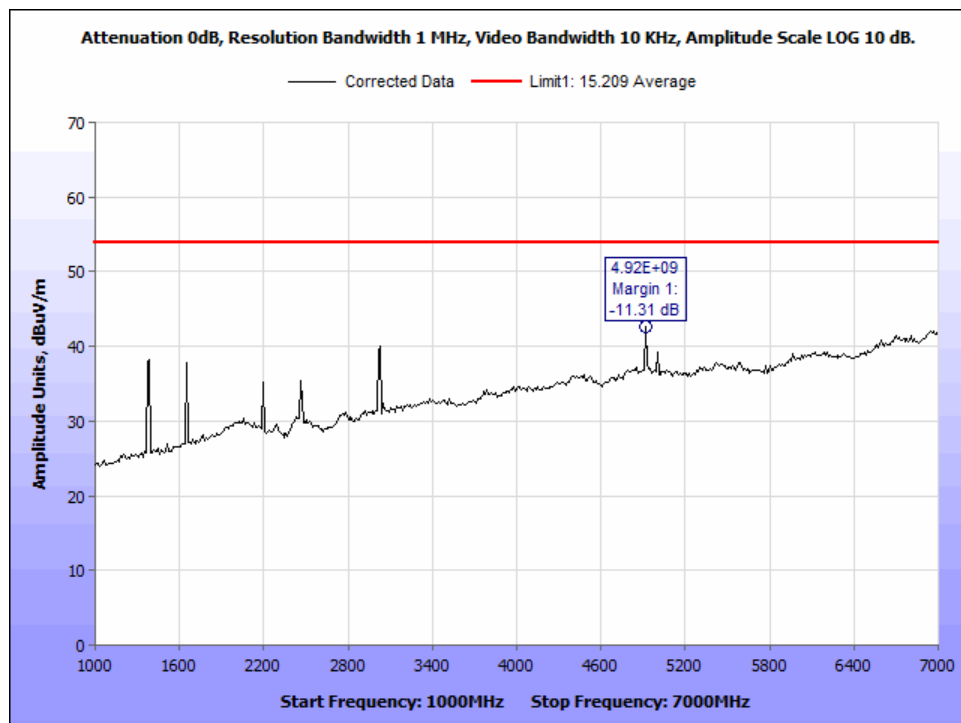


Figure 12: Average Radiated Emissions - 802.11b 20MHz 2462MHz - 1-7GHz.

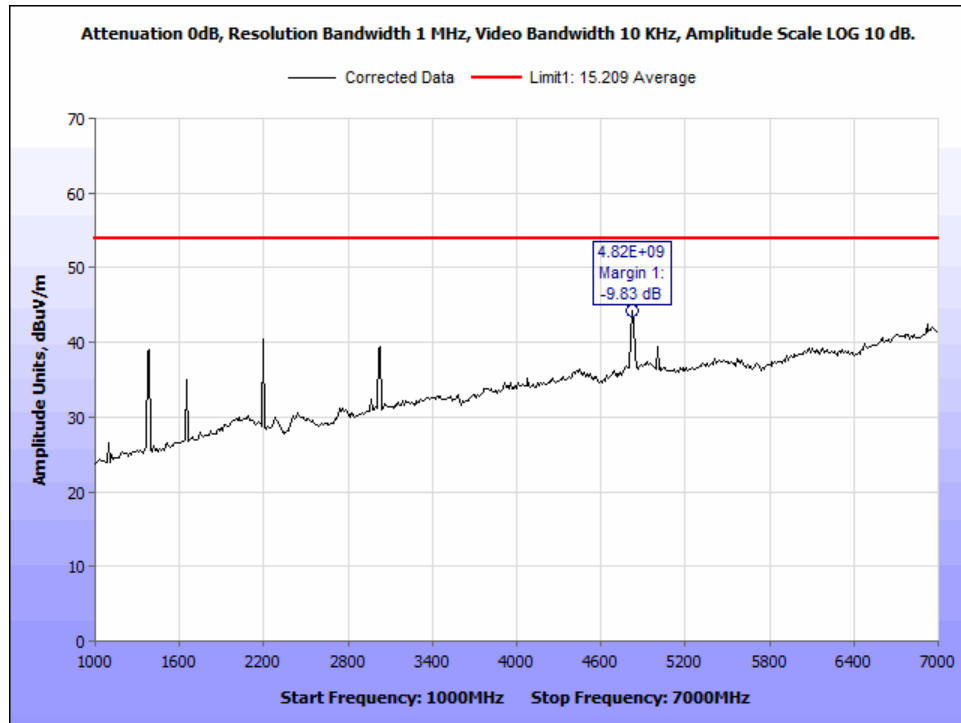


Figure 13: Average Radiated Emissions - 802.11g 20MHz 2412MHz - 1-7GHz.

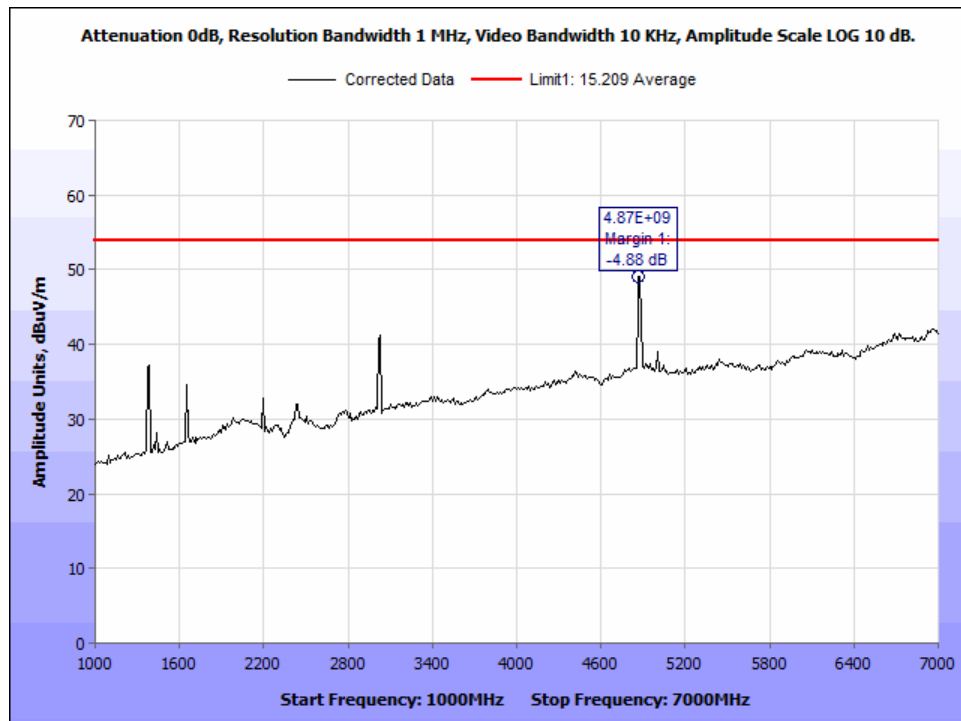


Figure 14: Average Radiated Emissions - 802.11g 20MHz 2437MHz - 1-7GHz.

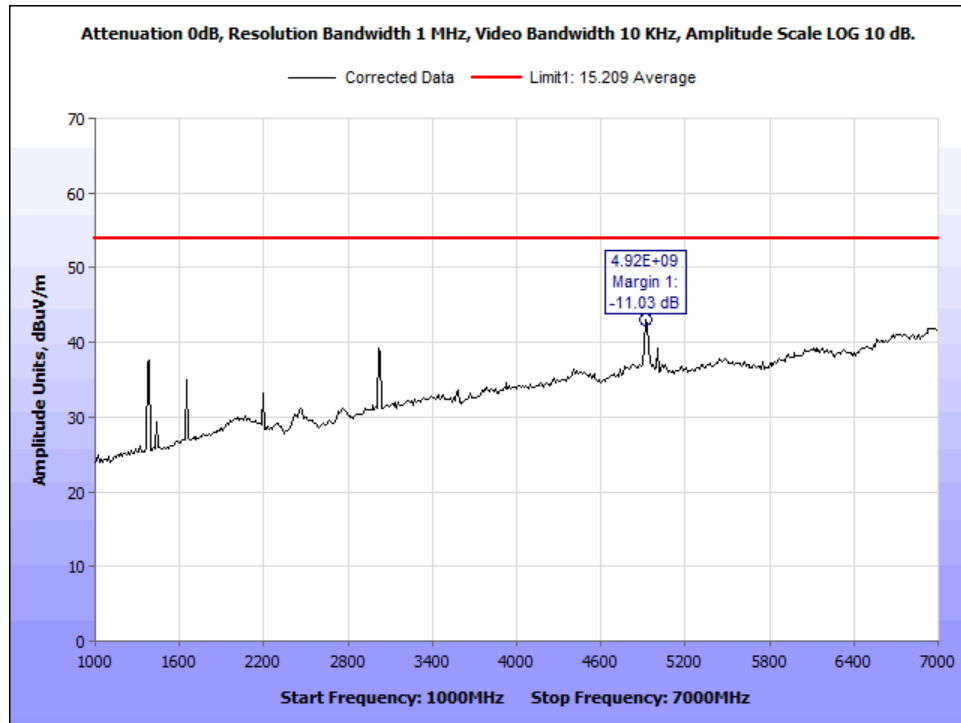


Figure 15: Average Radiated Emissions - 802.11g 20MHz 2462MHz - 1-7GHz.

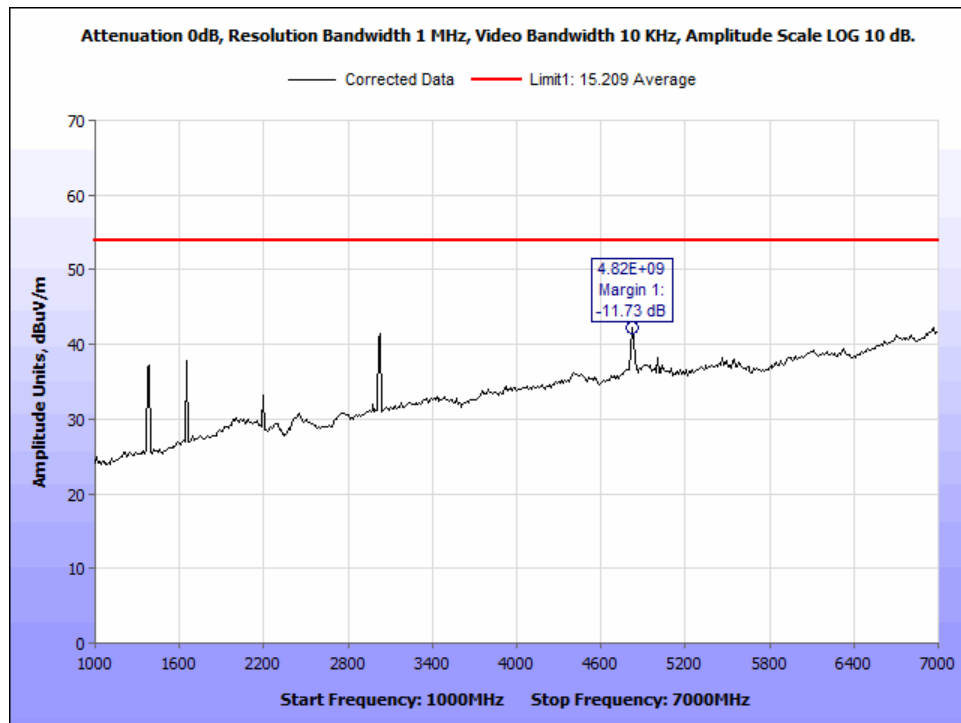


Figure 16: Average Radiated Emissions - 802.11n 20MHz 2412MHz MIMO - 1-7GHz.

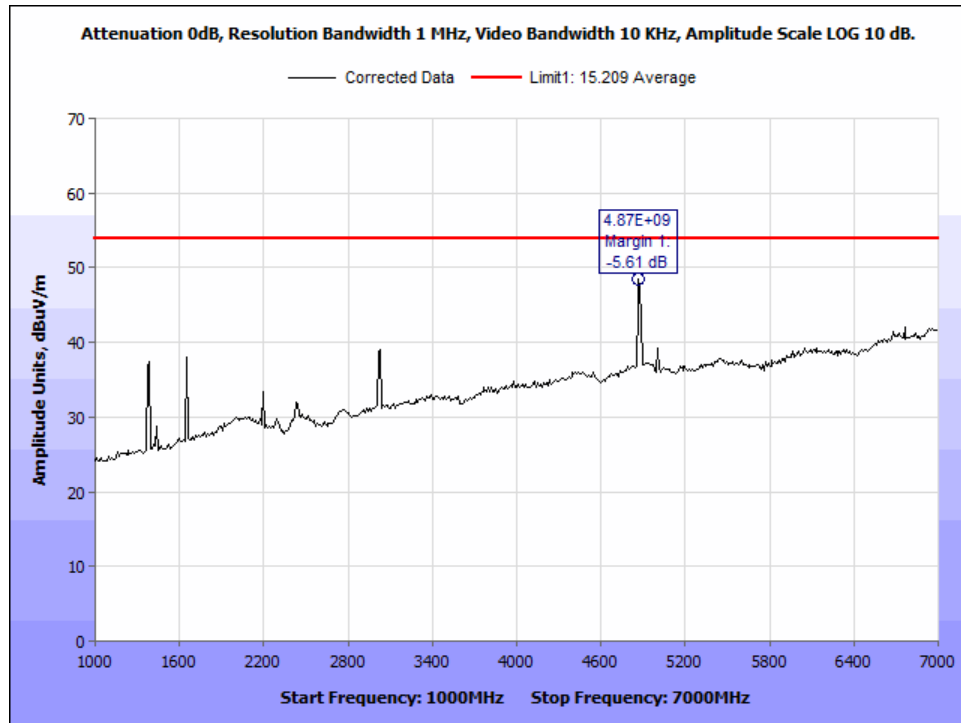


Figure 17: Average Radiated Emissions - 802.11n 20MHz 2437MHz MIMO - 1-7GHz.

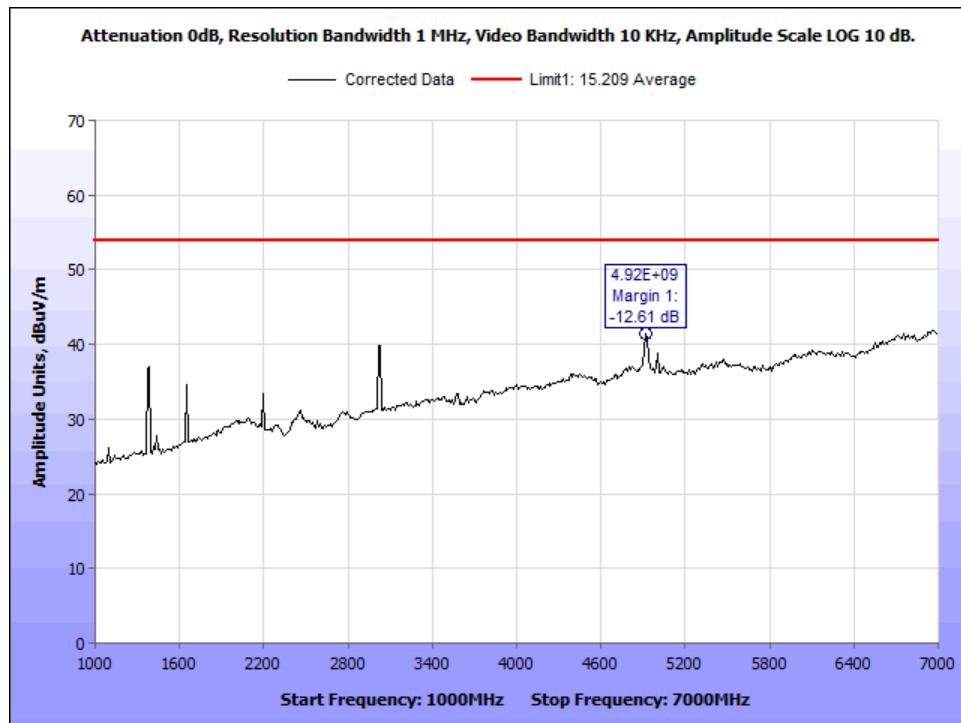


Figure 18: Average Radiated Emissions - 802.11n 20MHz 2462MHz MIMO - 1-7GHz.

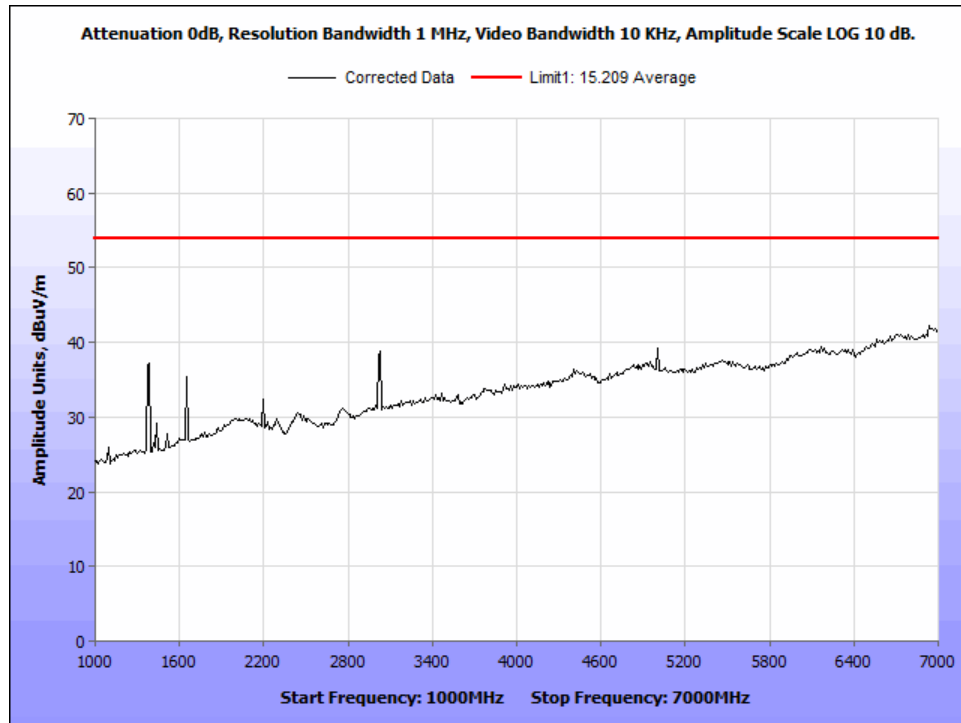


Figure 19: Average Radiated Emissions - 802.11n 40MHz 2422MHz MIMO - 1-7GHz.

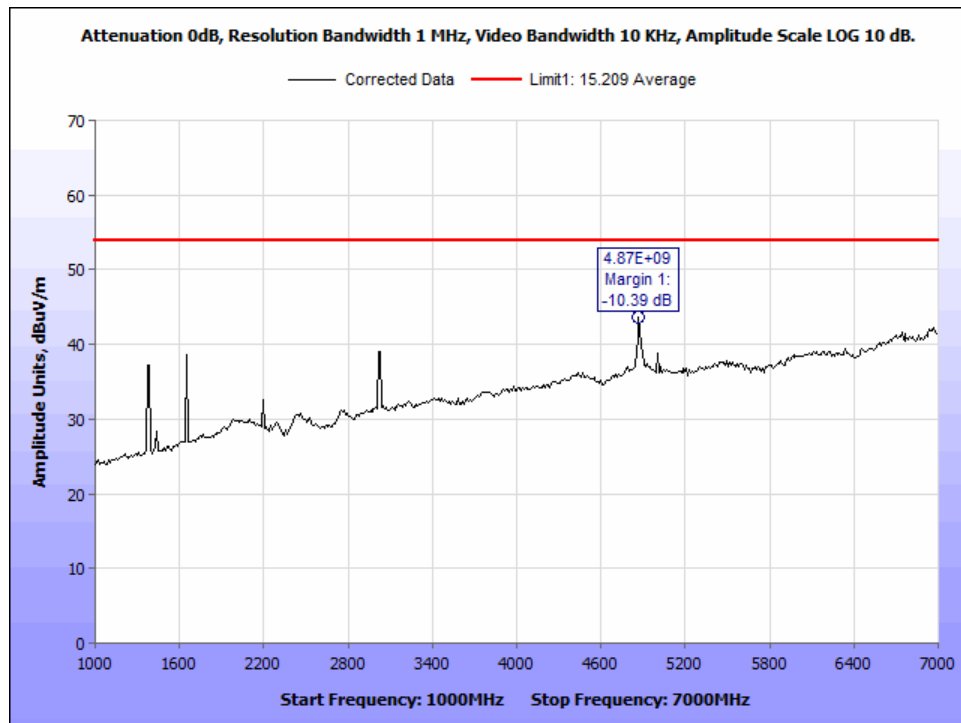


Figure 20: Average Radiated Emissions - 802.11n 40MHz 2437MHz MIMO - 1-7GHz.

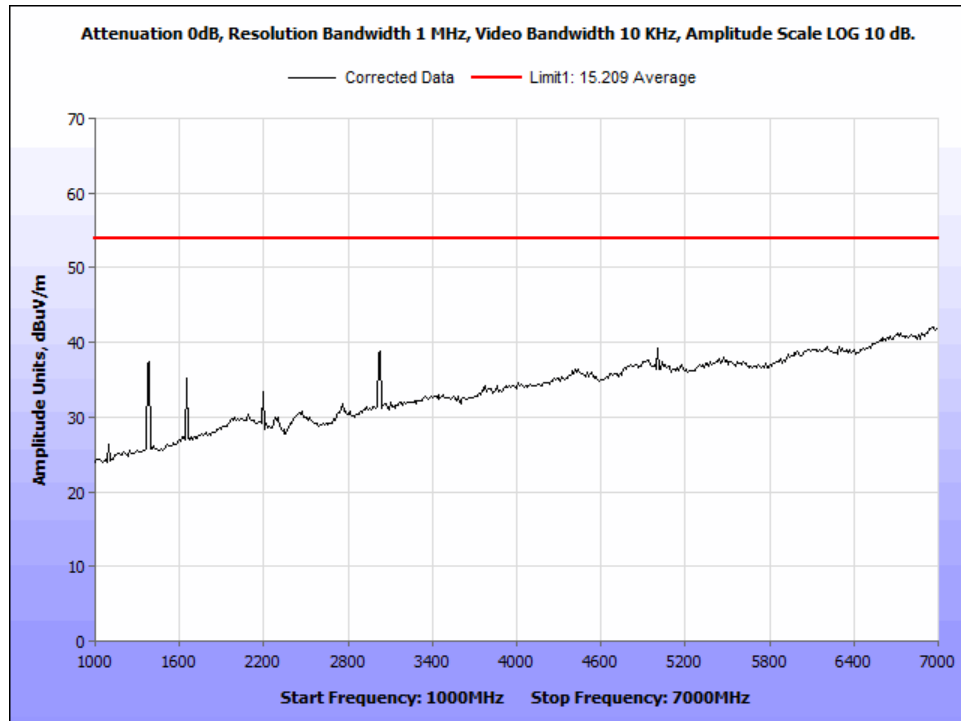


Figure 21: Average Radiated Emissions - 802.11n 40MHz 2452MHz MIMO - 1-7GHz.

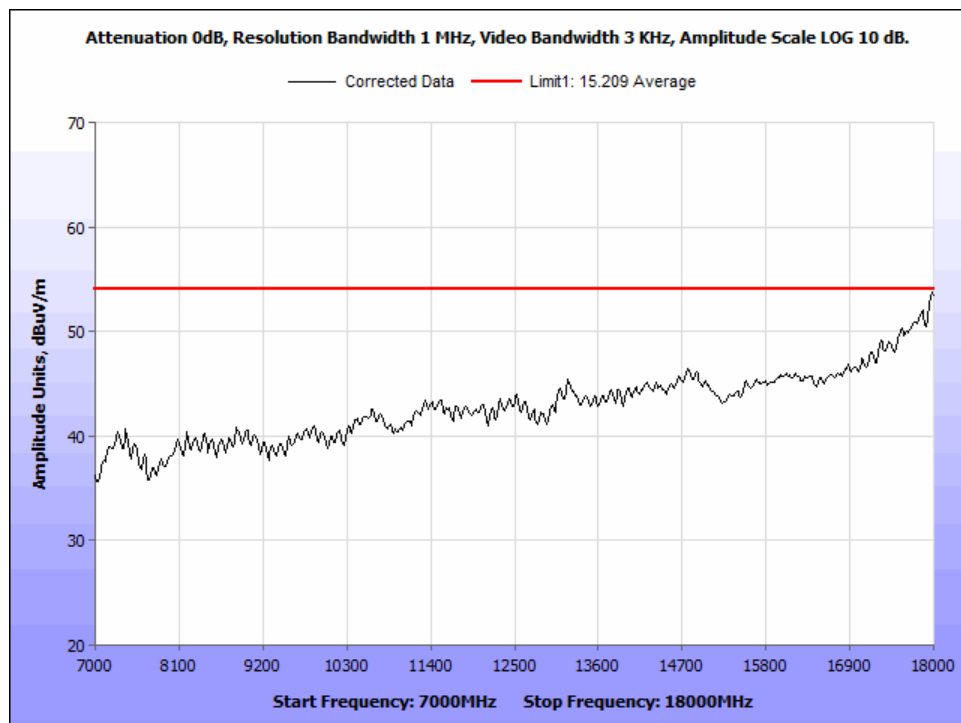


Figure 22: Average Radiated Emissions Worst Case 7-18GHz.

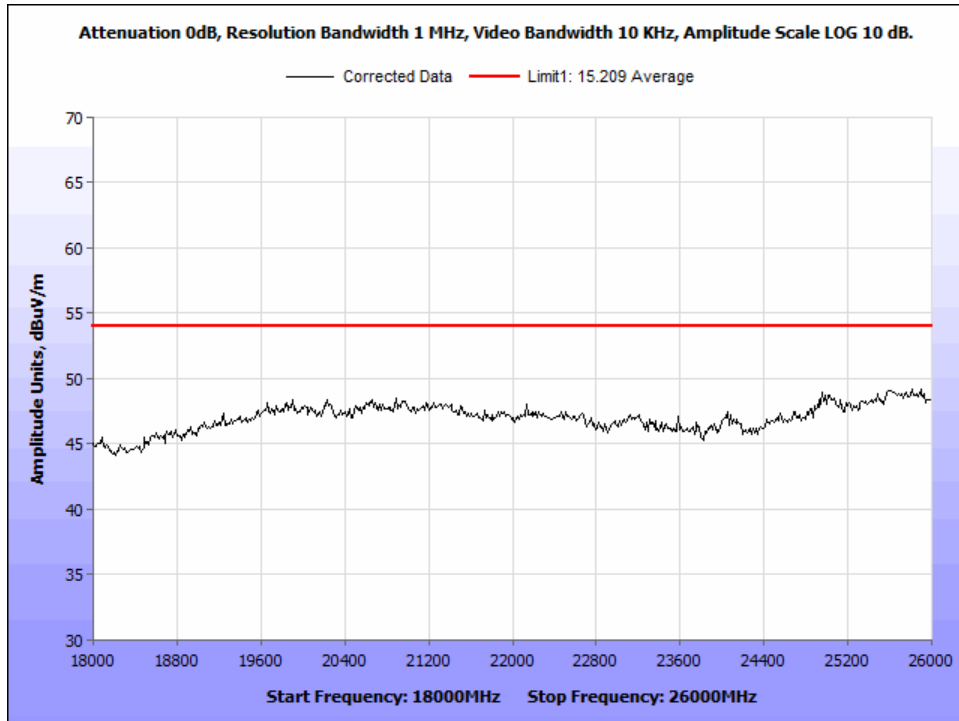


Figure 23: Radiated Emissions, Average, 18 GHz – 26 GHz

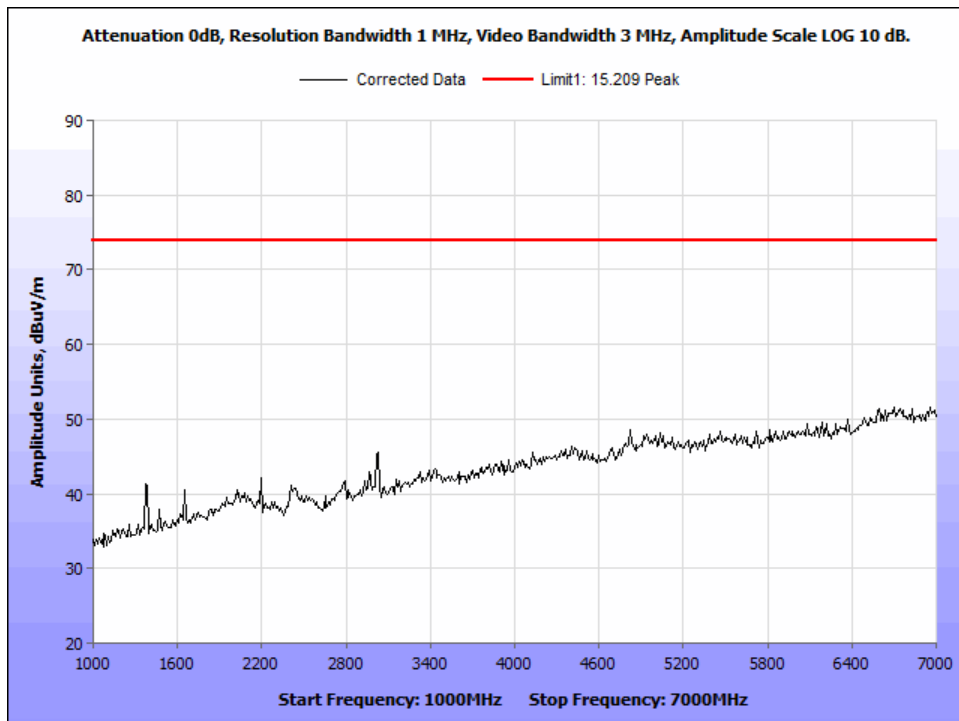


Figure 24: Peak Radiated Emissions - 802.11b 20MHz 2412MHz - 1-7GHz.

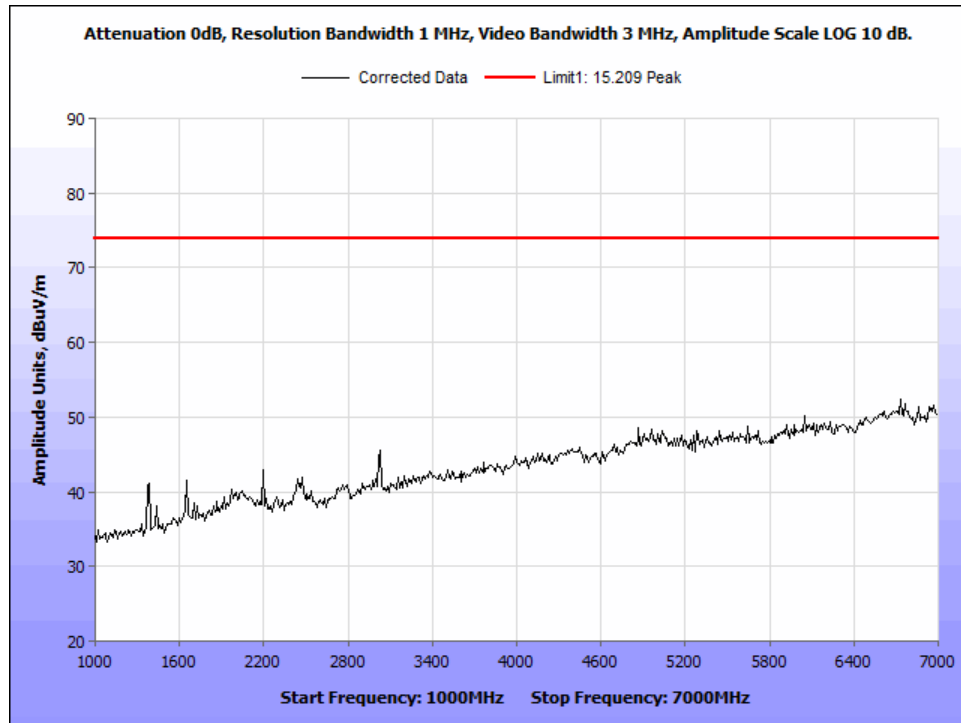


Figure 25: Peak Radiated Emissions - 802.11b 20MHz 2437MHz - 1-7GHz.

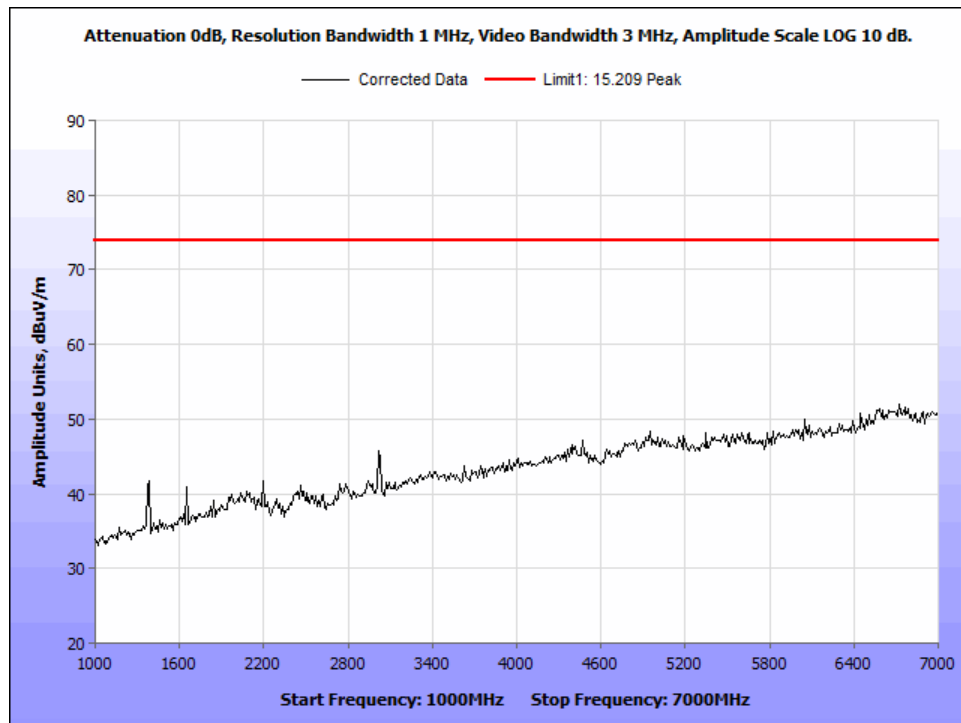


Figure 26: Peak Radiated Emissions - 802.11b 20MHz 2462MHz - 1-7GHz.

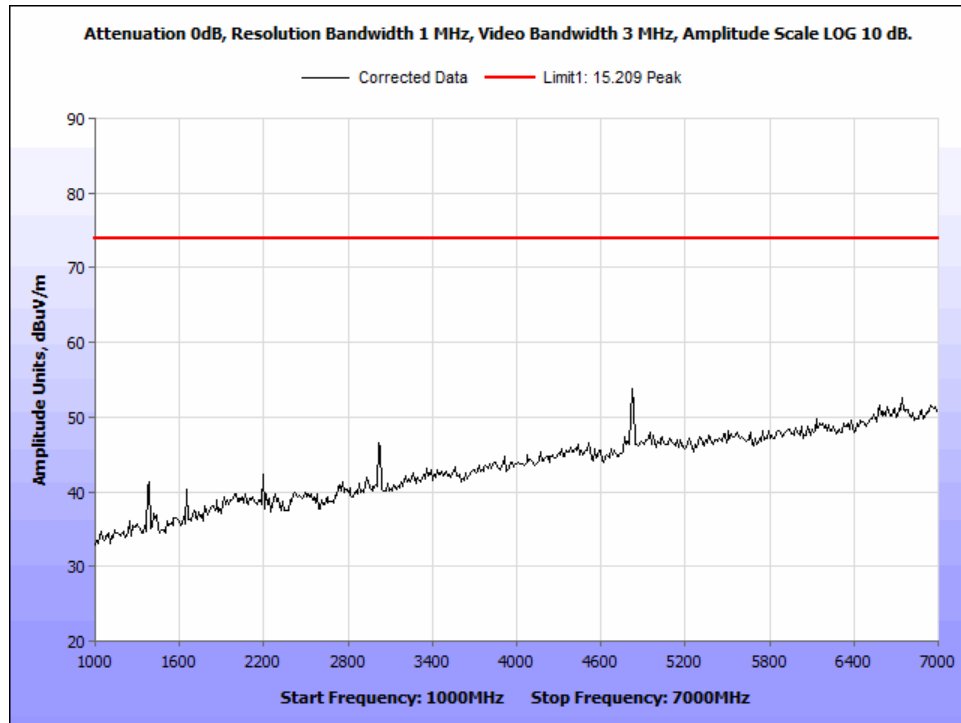


Figure 27: Peak Radiated Emissions - 802.11g 20MHz 2412MHz - 1-7GHz.

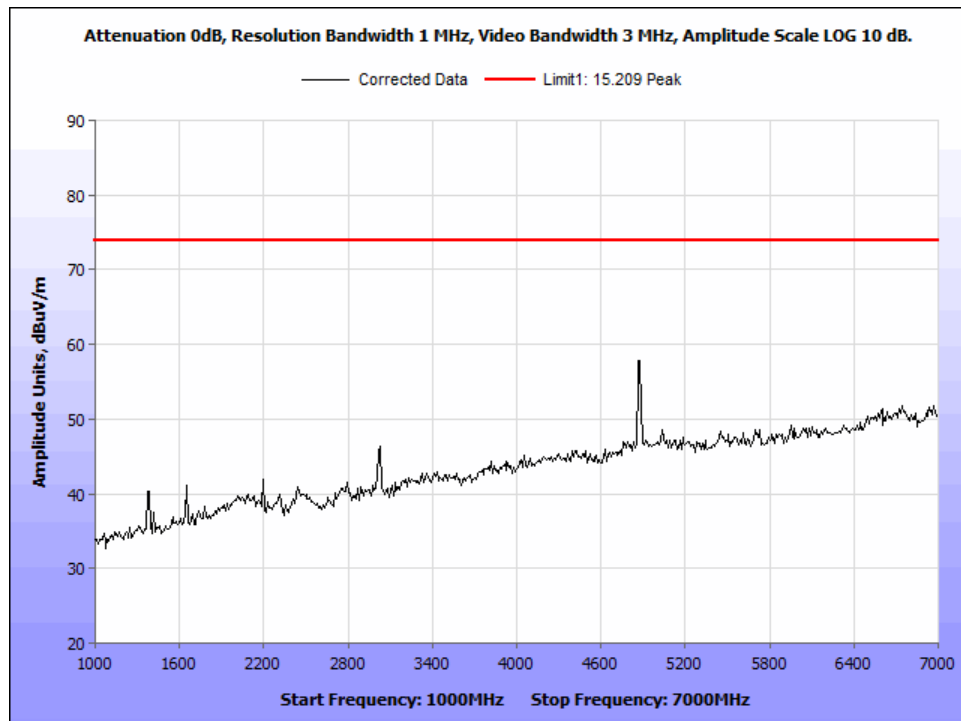


Figure 28: Peak Radiated Emissions - 802.11g 20MHz 2437MHz - 1-7GHz.

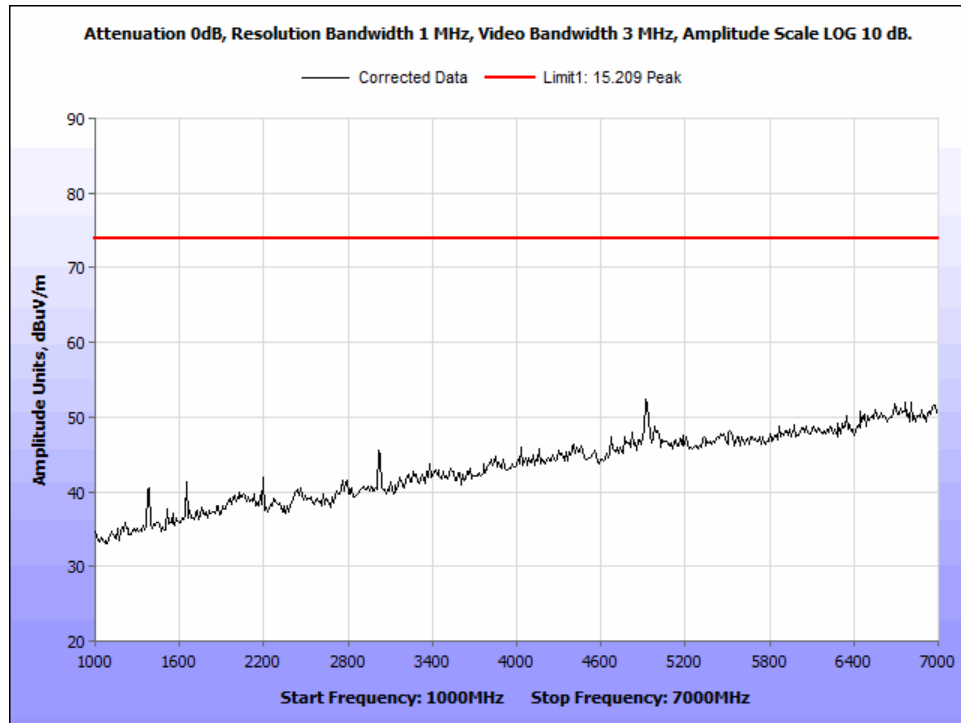


Figure 29: Peak Radiated Emissions - 802.11g 20MHz 2462MHz - 1-7GHz.

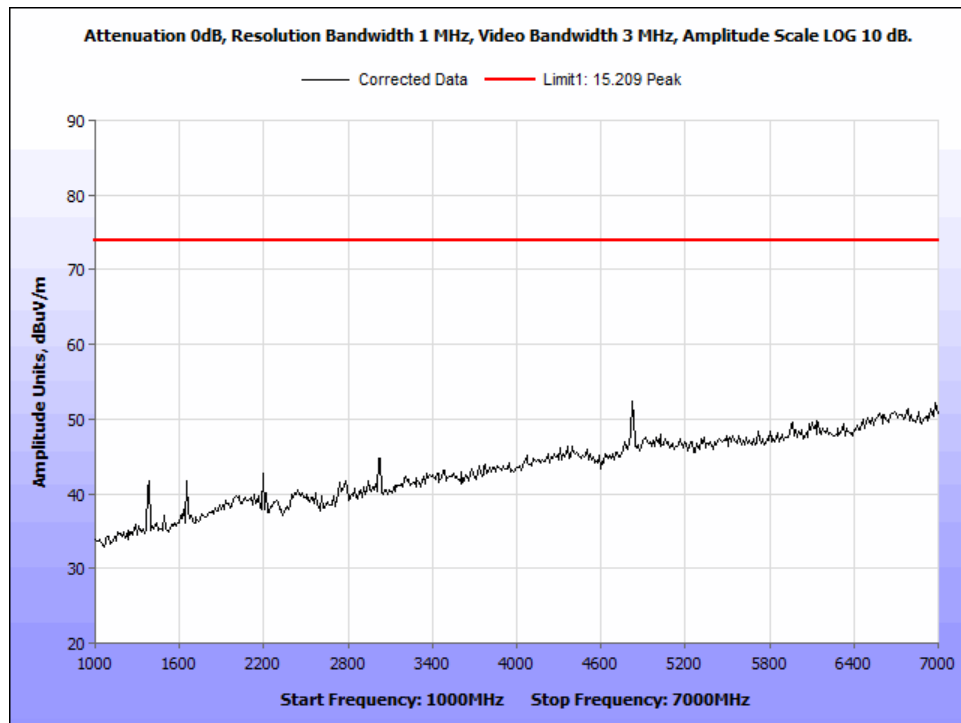


Figure 30: Peak Radiated Emissions - 802.11n 20MHz 2412MHz MIMO - 1-7GHz.

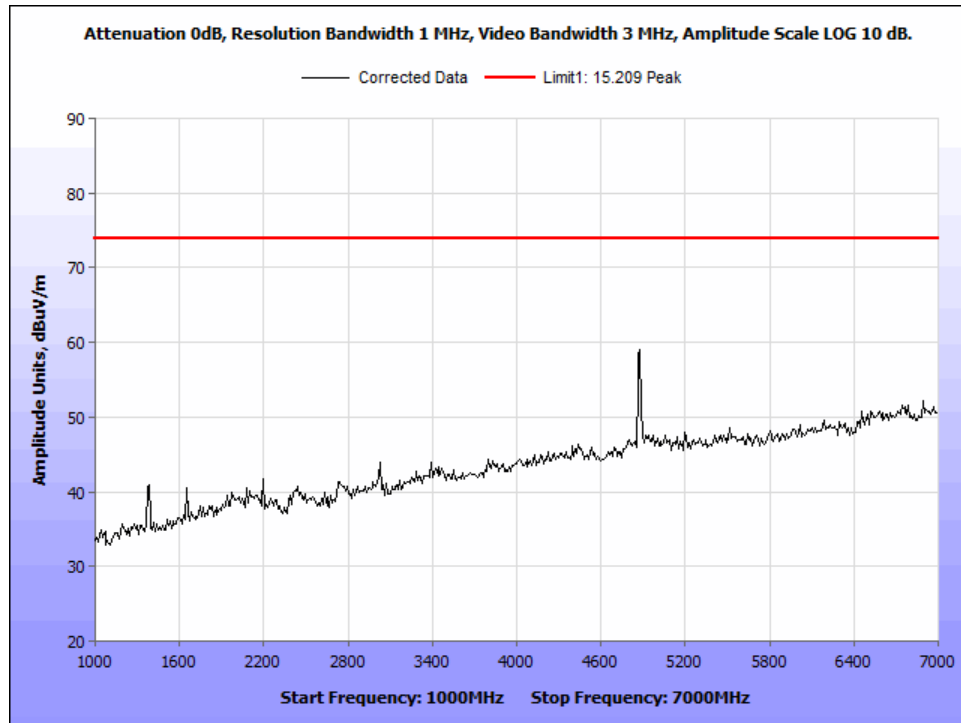


Figure 31: Peak Radiated Emissions - 802.11n 20MHz 2437MHz MIMO - 1-7GHz.

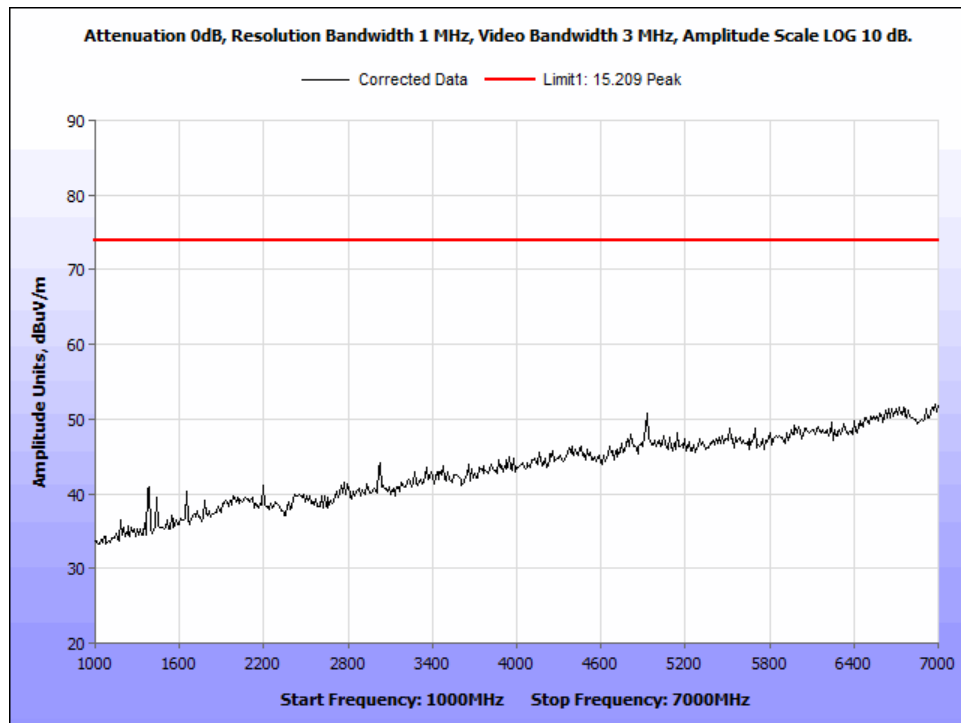


Figure 32: Peak Radiated Emissions - 802.11n 20MHz 2462MHz MIMO - 1-7GHz.

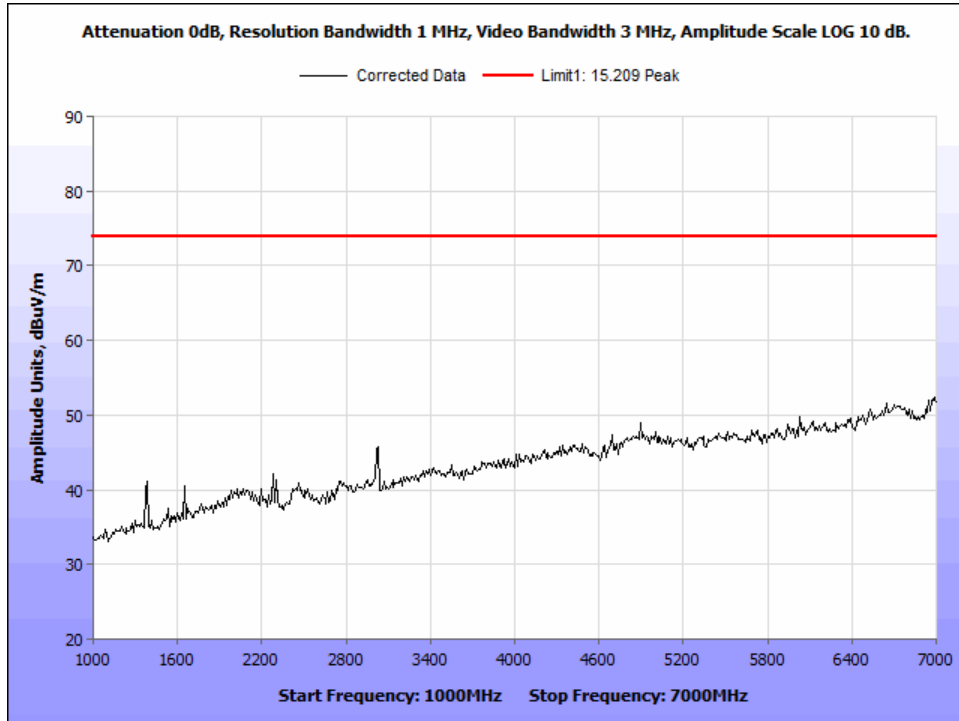


Figure 33: Peak Radiated Emissions - 802.11n 40MHz 2422MHz MIMO - 1-7GHz.

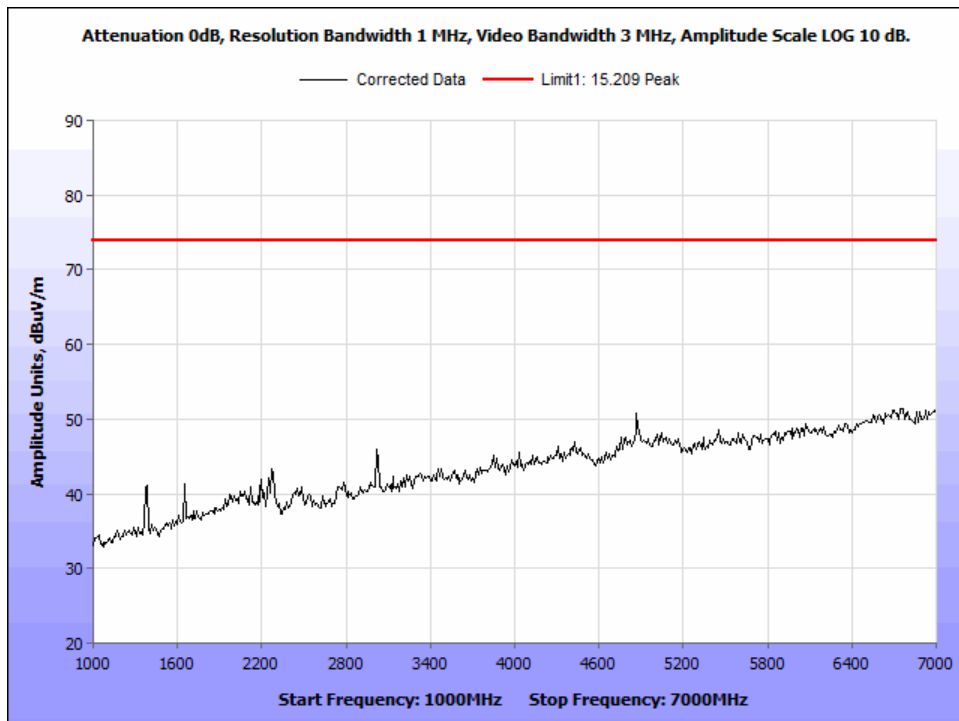


Figure 34: Peak Radiated Emissions - 802.11n 40MHz 2437MHz MIMO - 1-7GHz.

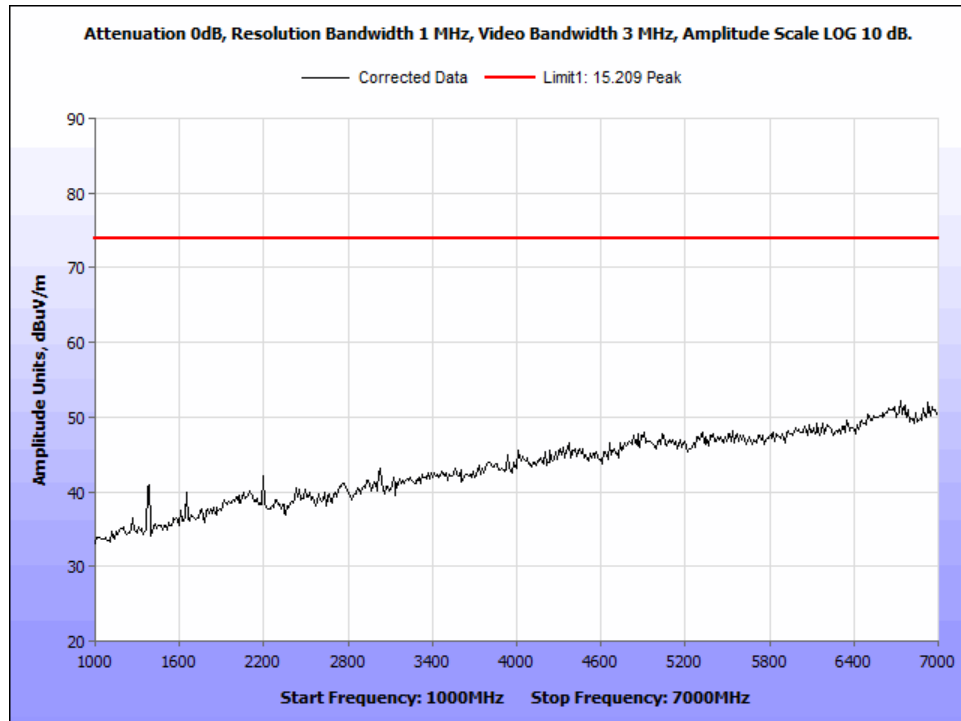


Figure 35: Peak Radiated Emissions - 802.11n 40MHz 2452MHz MIMO - 1-7GHz.

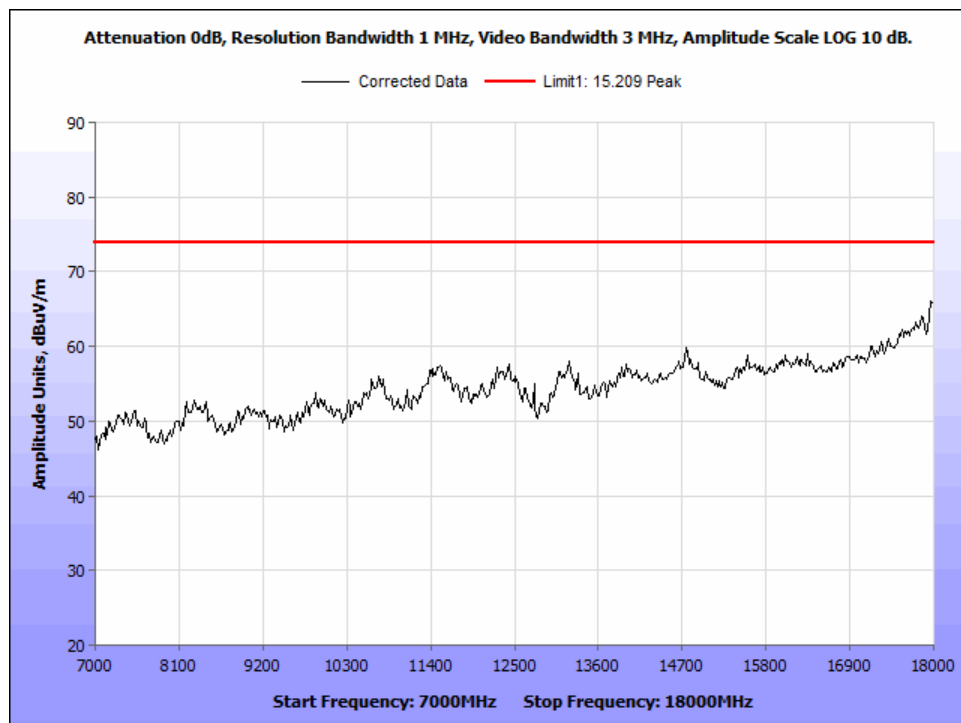


Figure 36: Peak Radiated Emissions Worst Case 7-18GHz.

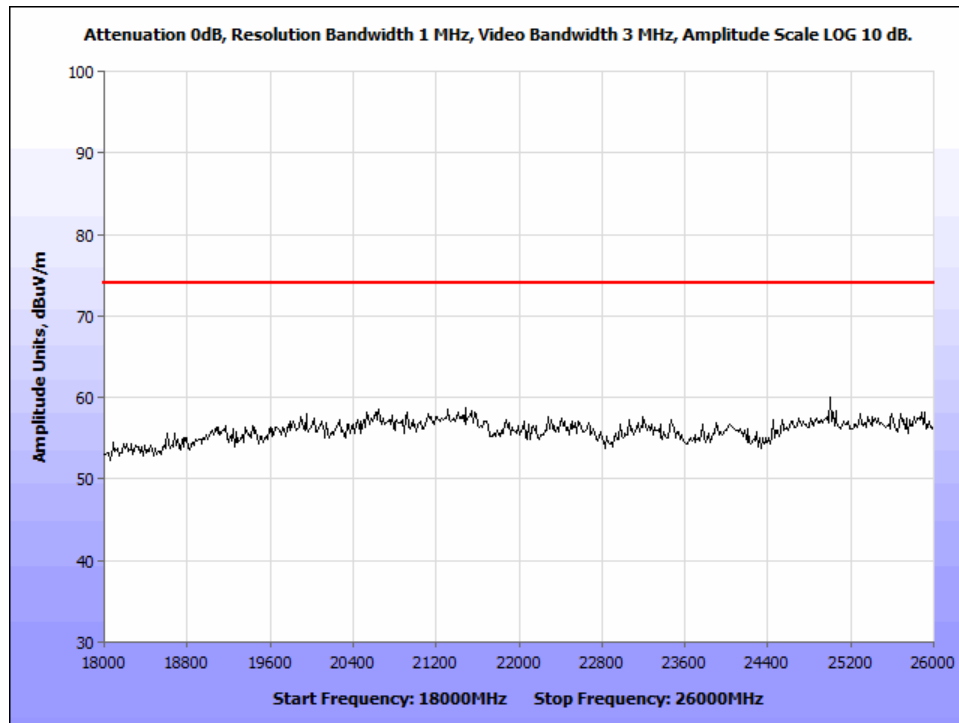


Figure 37: Radiated Emissions, Peak, 18 GHz – 26 GHz

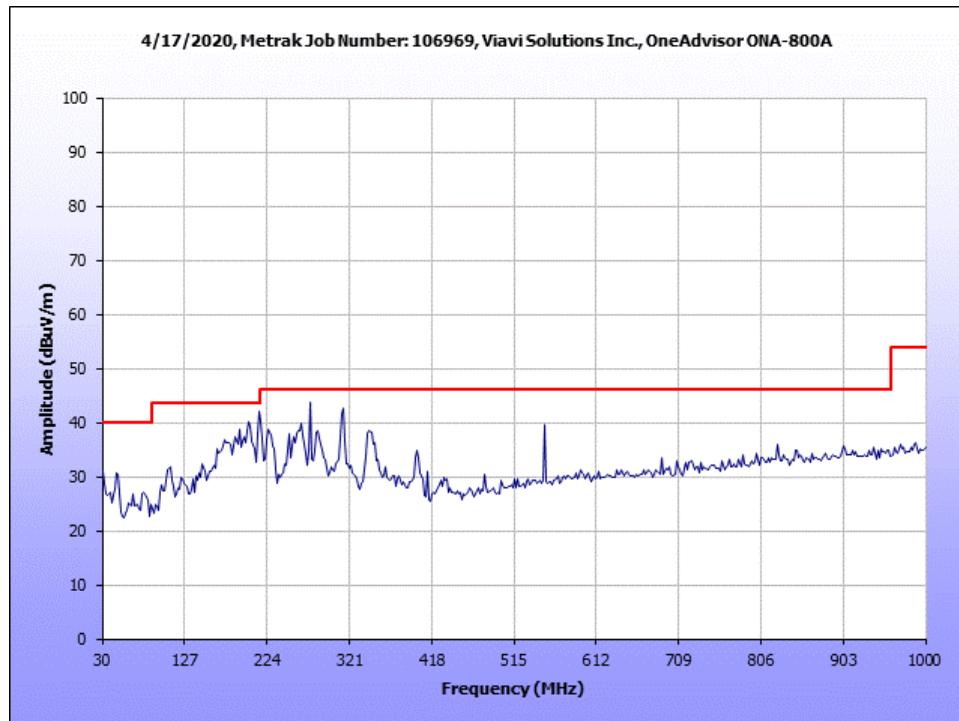


Figure 38: Radiated Emissions, Worst Case, 30-1000MHz

Radiated Band Edge Measurements

Test Procedures: The transmitter was turned on. Measurements were performed of the low, mid and high Channels. The EUT was rotated orthogonally through all three axes. Plots shown are corrected for both antenna correction factor and distance and compared to a 3 m limit line.

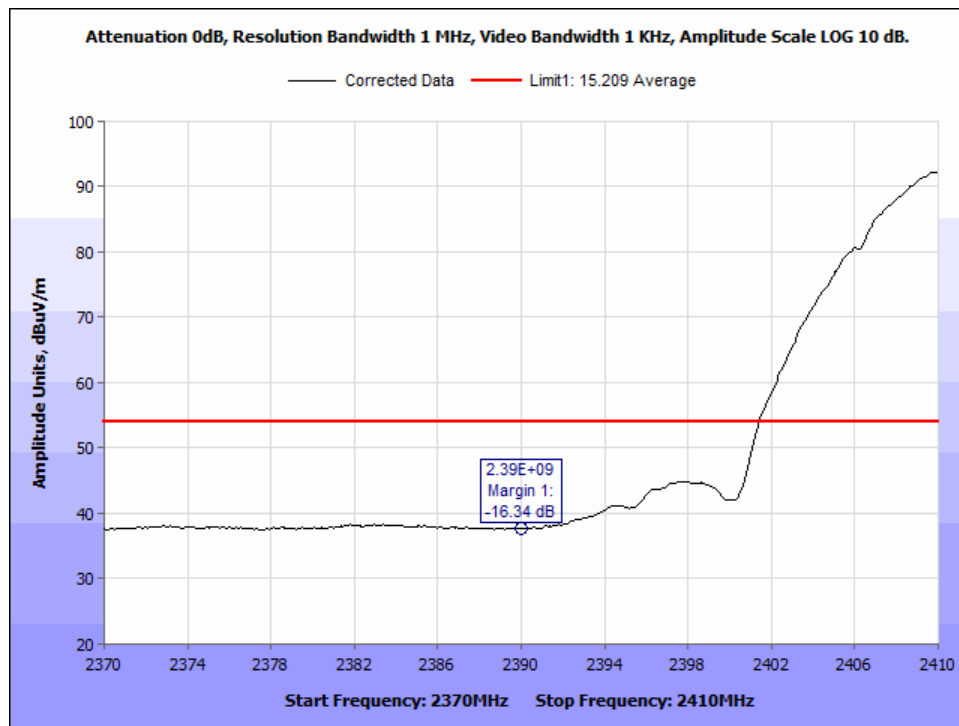


Figure 39: 802.11b 2390MHz Average Radiated Bandedge 1Mbps CCK 20MHz 2412MHz.

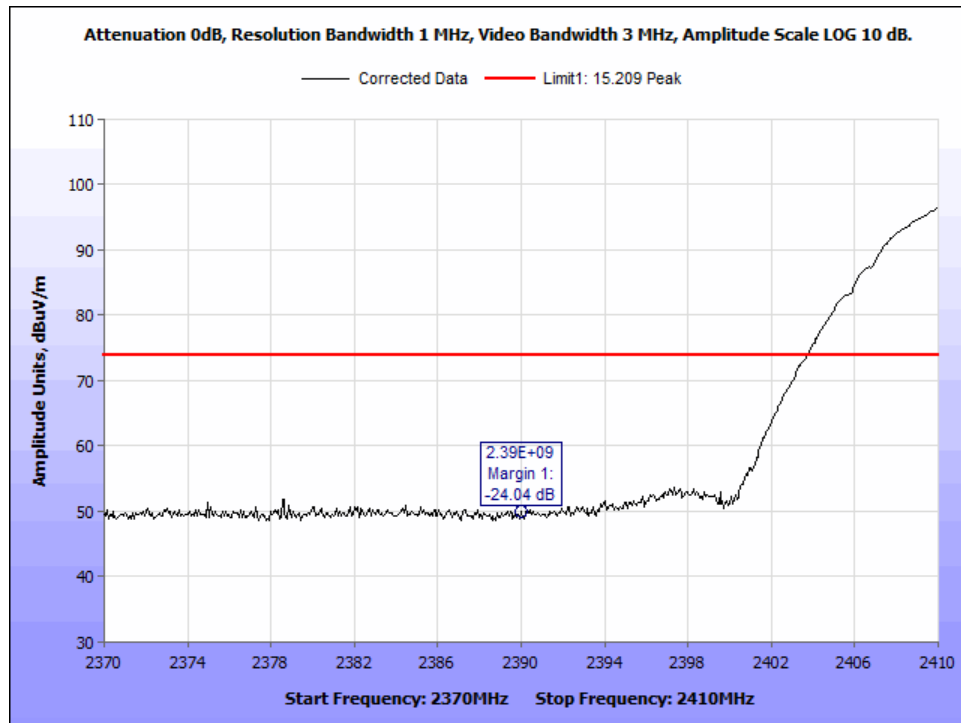


Figure 40: 802.11b 2390MHz Peak Radiated Bandedge 1Mbps CCK 20MHz 2412MHz.

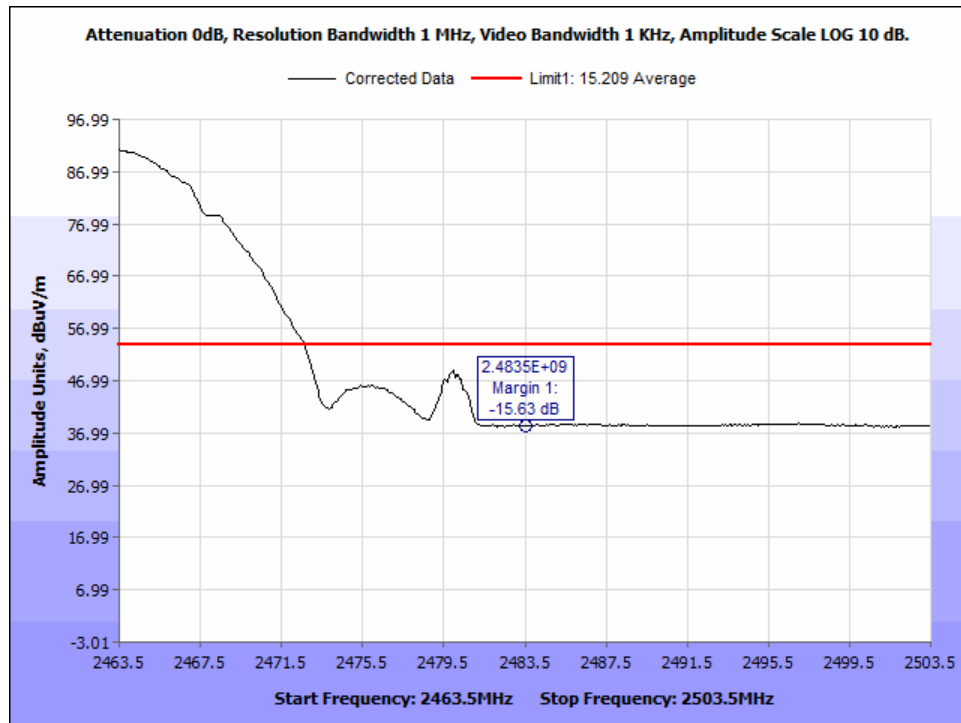


Figure 41: 802.11b 2483.5MHz Average Radiated Bandedge 1Mbps CCK 20MHz 2462MHz.

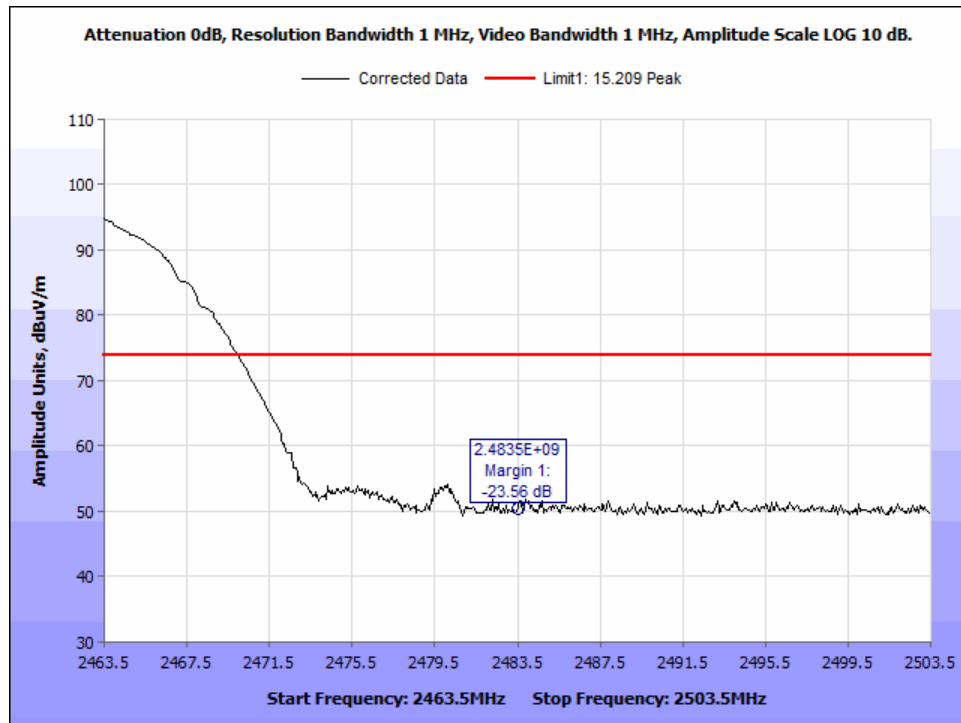


Figure 42: 802.11b 2483.5MHz Peak Radiated Bandedge 1Mbps CCK 20MHz 2462MHz.

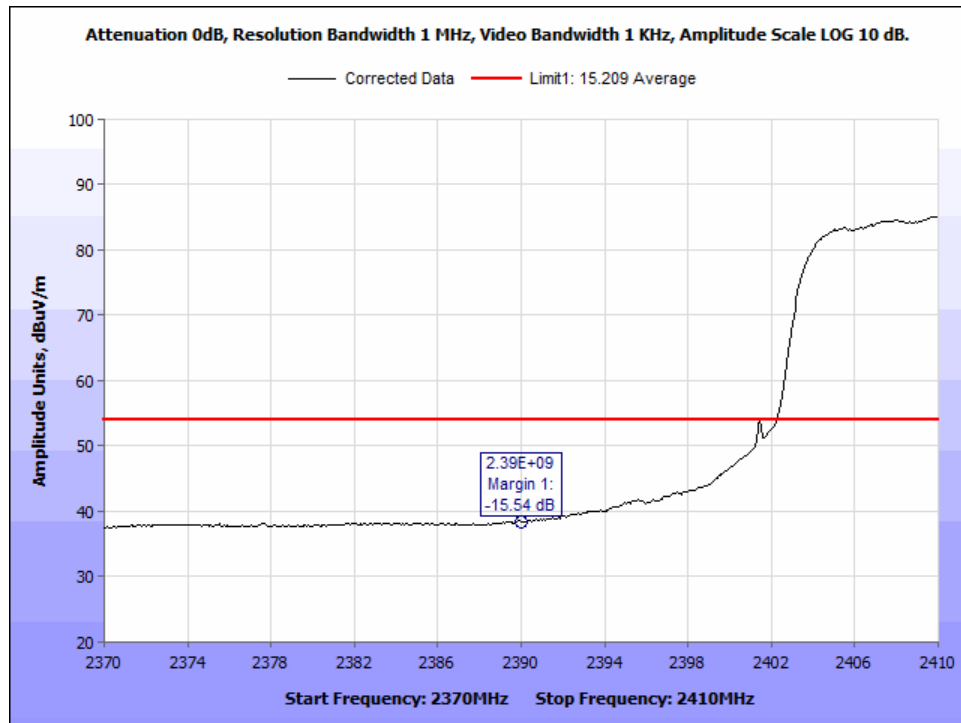


Figure 43: 802.11g 2390MHz Average Radiated Bandedge 6Mbps noHT 20MHz 2412MHz.

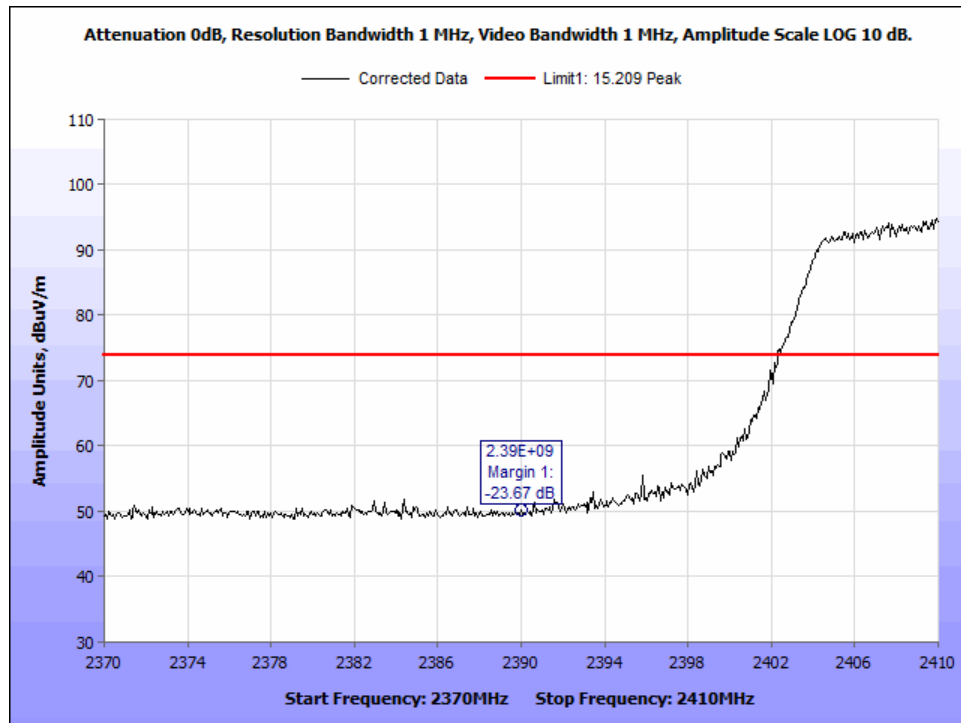


Figure 44: 802.11g 2390MHz Peak Radiated Bandedge 6Mbps noHT 20MHz 2412MHz.

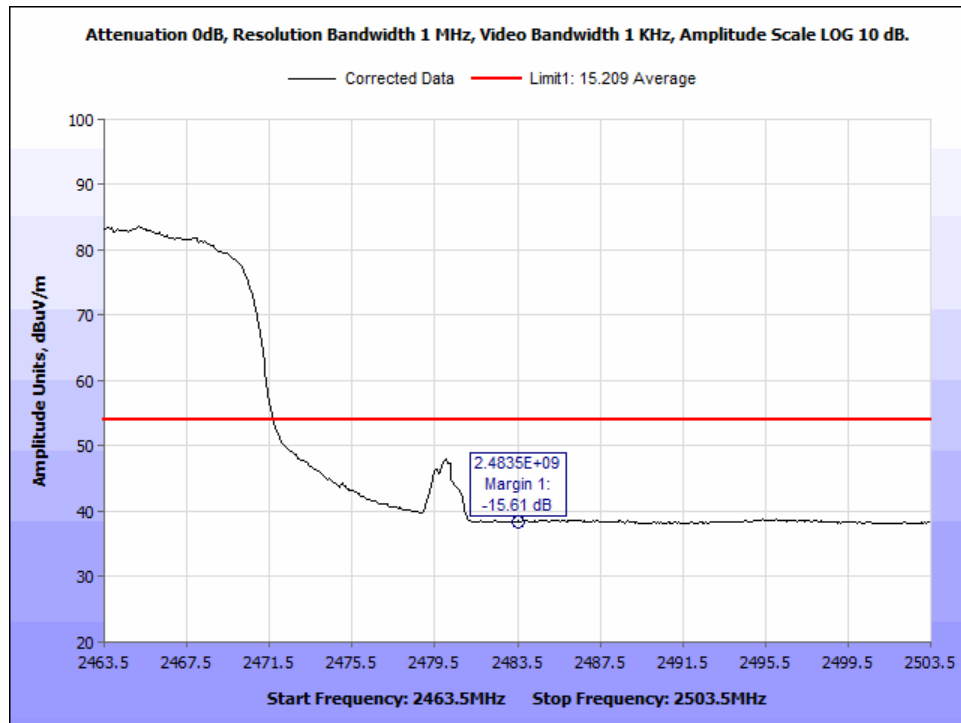


Figure 45: 802.11g 2483.5MHz Average Radiated Bandedge 6Mbps noHT 20MHz 2462MHz.

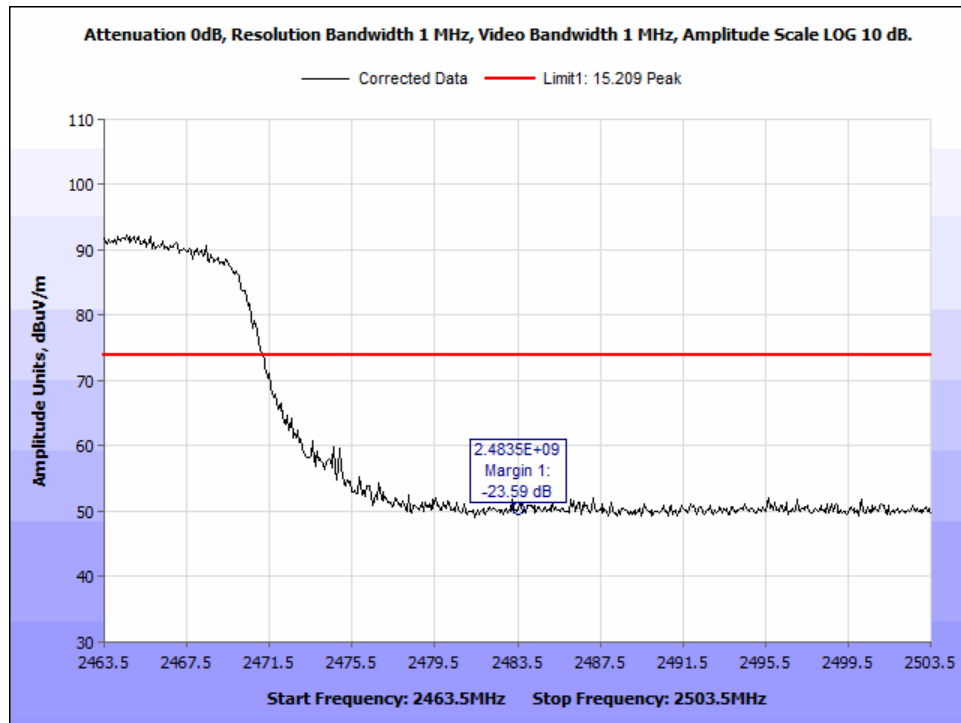


Figure 46: 802.11g 2483.5MHz Peak Radiated Bandedge 6Mbps noHT 20MHz 2462MHz.

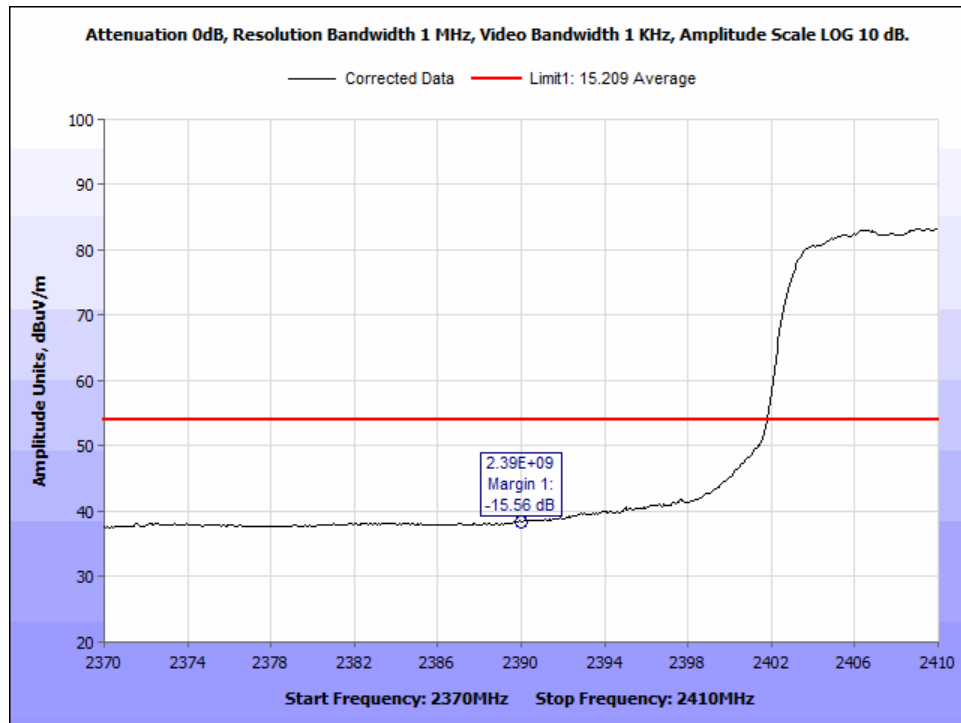


Figure 47: 802.11n 2390MHz Average Radiated Bandedge MCS0 HT20 20MHz 2412MHz.

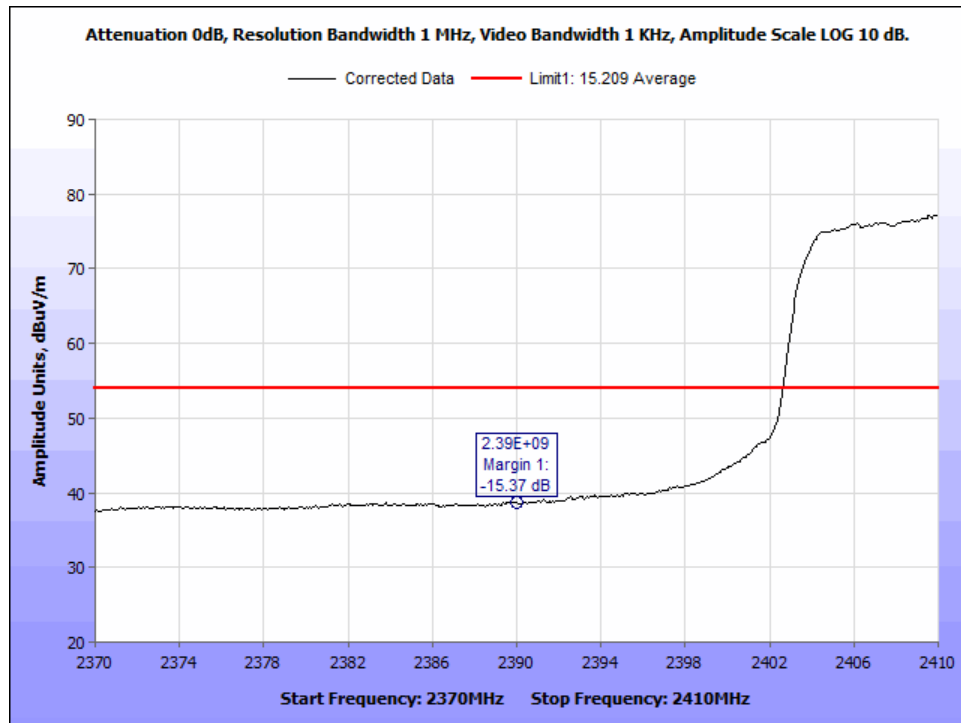


Figure 48: 802.11n 2390MHz Average Radiated Bandedge MCS0 HT40 40MHz 2422MHz.

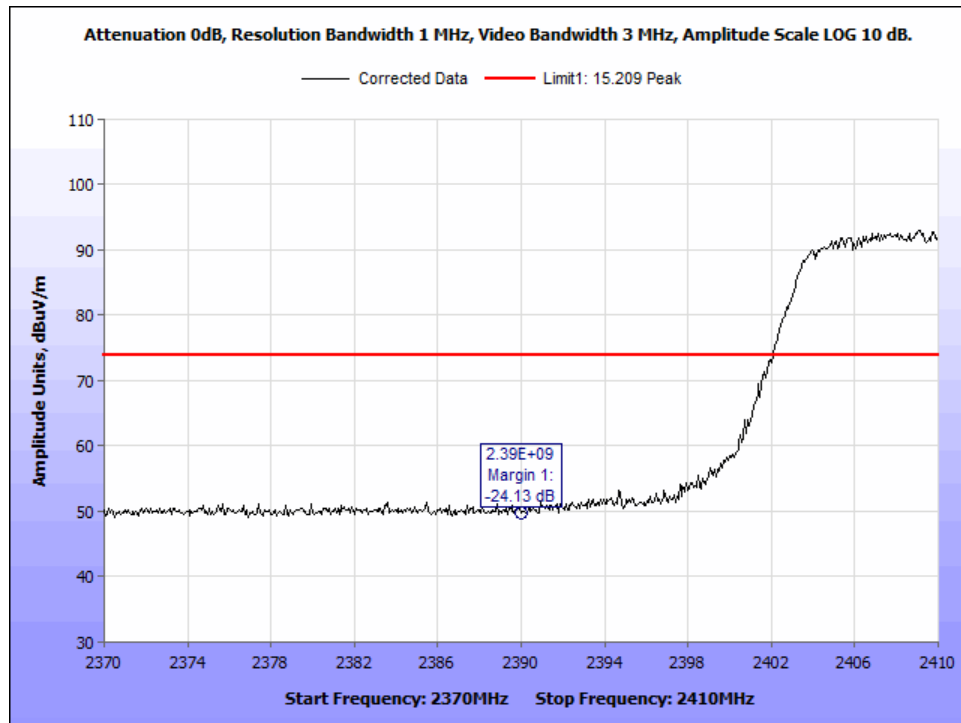


Figure 49: 802.11n 2390MHz Peak Radiated Bandedge MCS0 HT20 20MHz 2412MHz.

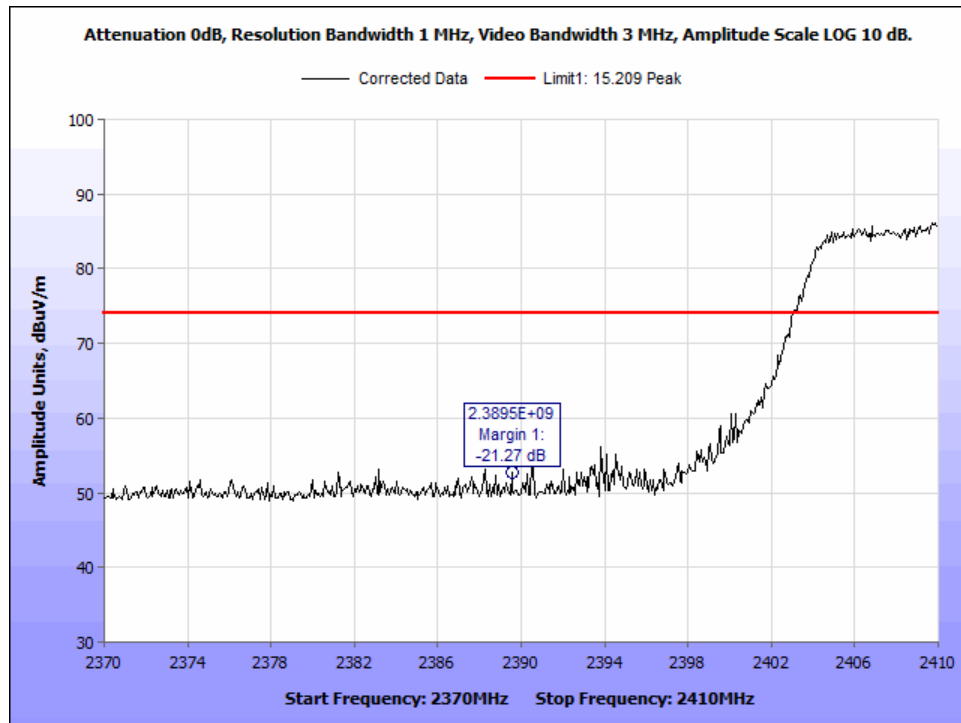


Figure 50: 802.11n 2390MHz Peak Radiated Bandedge MCS0 HT40 40MHz 2422MHz.

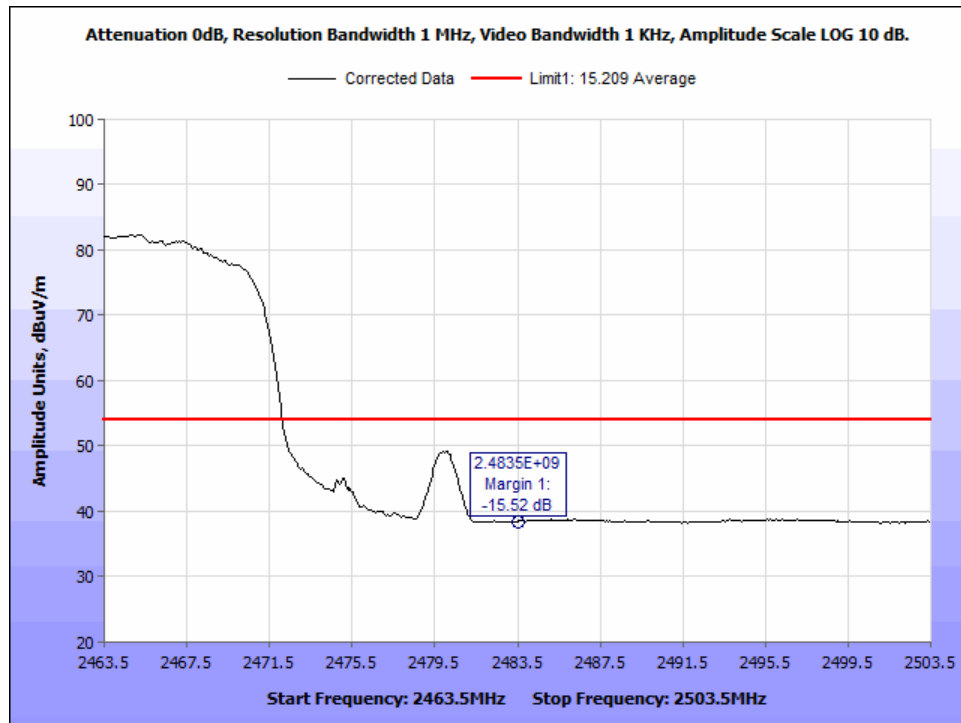


Figure 51: 802.11n 2483.5MHz Average Radiated Bandedge MCS0 HT20 20MHz 2462MHz.

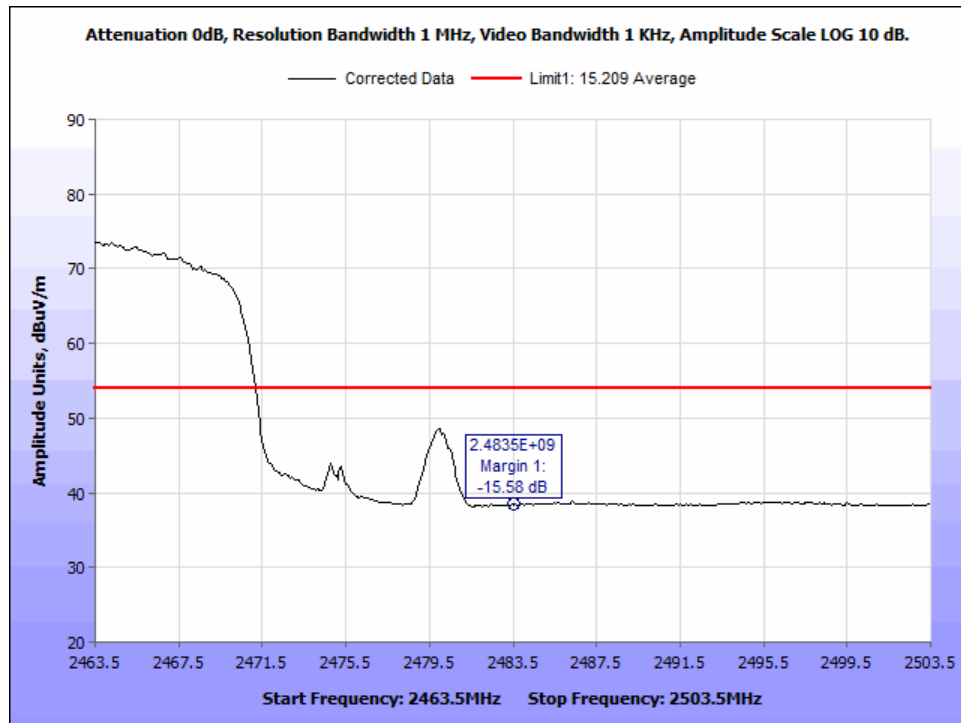


Figure 52: 802.11n 2483.5MHz Average Radiated Bandedge MCS0 HT40 40MHz 2452MHz.

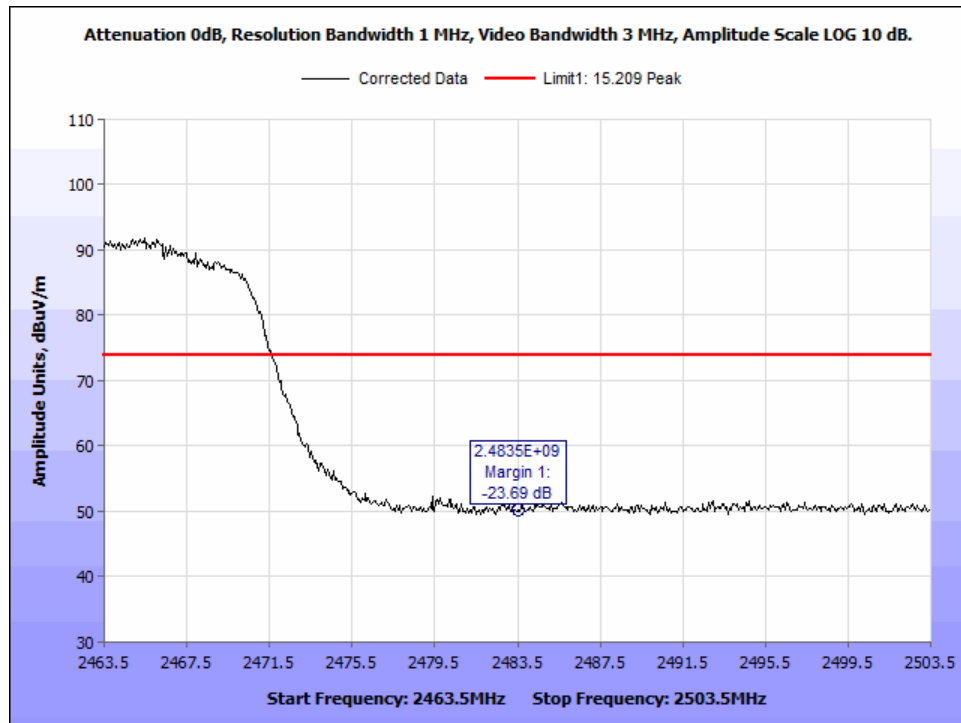


Figure 53: 802.11n 2483.5MHz Peak Radiated Bandedge MCS0 HT20 20MHz 2462MHz.

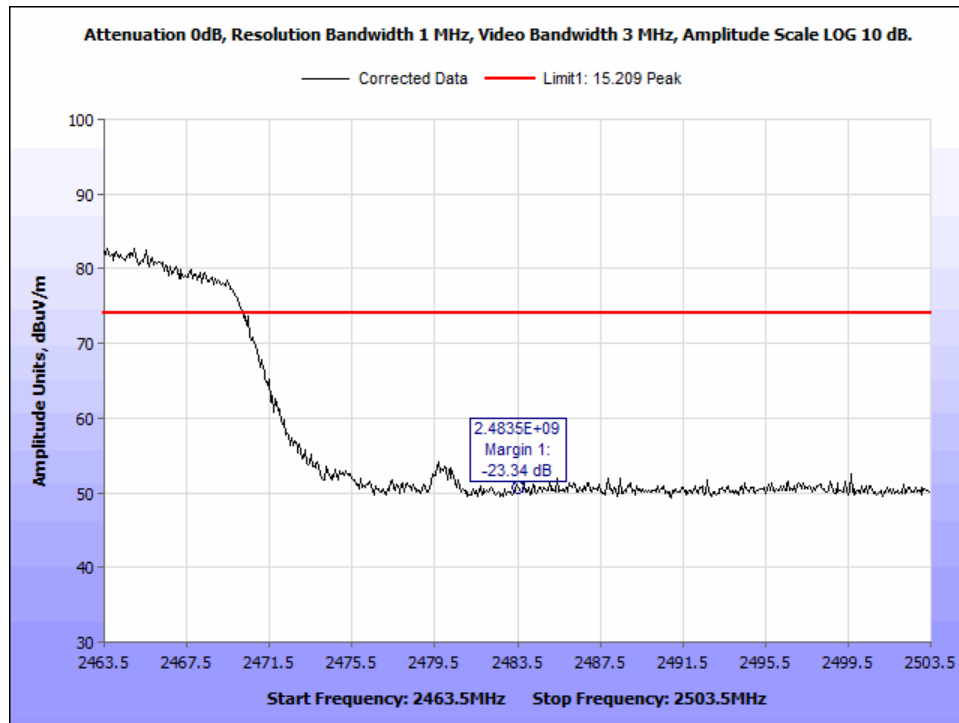


Figure 54: 802.11n 2483.5MHz Peak Radiated Bandedge MCS0 HT40 40MHz 2452MHz.

Test Equipment

Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

ASSET #	EQUIPMENT	MANUFACTURER	MODEL	LAST CAL	CAL DUE
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	1/4/2019	1/4/2021
1T4751	ANTENNA - BILOG	SUNOL SCIENCES	JB6	5/2/2019	11/2/2020
1T4905	HORN ANTENNA	COM-POWER	AH-118	5/7/2019	11/7/2020
1T4771	PSA SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4446A	2/26/2020	8/26/2021
1T4300B	SEMI-ANECHOIC 3M CHAMBER SVSWR	EMC TEST SYSTEMS	NONE	6/30/2019	12/30/2020
1T4300	SEMI-ANECHOIC CHAMBER (NSA)	EMC TEST SYSTEMS	NONE	6/30/2019	6/30/2020
1T8743	PREAMPLIFIER	A.H. SYSTEMS, INC.	PAM-0118P	NOT REQUIRED	NOT REQUIRED
1T4752	PRE-AMPLIFIER	MITEQ	JS44-18004000- 35-8P	FUNC VERIFY	
1T4745	ANTENNA, HORN	ETS-LINDGREN	3116	11/27/2018	5/27/2020

Figure 55: Test Equipment List

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

Certification & User's Manual Information

Certification & User's Manual Information

L. Certification Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart I — Marketing of Radio frequency devices:

§ 2.801 Radio-frequency device defined.

As used in this part, a radio-frequency device is any device which in its operation is capable of Emitting radio-frequency energy by radiation, conduction, or other means. Radio- frequency devices include, but are not limited to:

- (a) The various types of radio communication transmitting devices described throughout this chapter.
- (b) *The incidental, unintentional and intentional radiators defined in Part 15 of this chapter.*
- (c) The industrial, scientific, and medical equipment described in Part 18 of this chapter.
- (d) Any part or component thereof which in use emits radio-frequency energy by radiation, conduction, or other means.

§ 2.803 Marketing of radio frequency devices prior to equipment authorization.

- (a) Except as provided elsewhere in this chapter, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any radio frequency device unless:
 - (1) In the case of a device subject to certification, such device has been authorized by the Commission in accordance with the rules in this chapter and is properly identified and labeled as required by §2.925 and other relevant sections in this chapter; or
 - (2) In the case of a device that is not required to have a grant of equipment authorization issued by the Commission, but which must comply with the specified technical standards prior to use, such device also complies with all applicable administrative (including verification of the equipment or authorization under a Declaration of Conformity, where required), technical, labeling and identification requirements specified in this chapter.
- (d) Notwithstanding the provisions of paragraph (a) of this section, the offer for sale solely to business, commercial, industrial, scientific or medical users (but not an offer for sale to other parties or to end users located in a residential environment) of a radio frequency device that is in the conceptual, developmental, design or pre-production stage is permitted prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the prospective buyer is advised in writing at the time of the offer for sale that the equipment is subject to the FCC rules and that the equipment will comply with the appropriate rules before delivery to the buyer or to centers of distribution.

- (e)(1) Notwithstanding the provisions of paragraph (a) of this section, prior to equipment authorization or determination of compliance with the applicable technical requirements any radio frequency device may be operated, but not marketed, for the following purposes and under the following conditions:
- (i) *Compliance testing;*
 - (ii) Demonstrations at a trade show provided the notice contained in paragraph (c) of this section is displayed in a conspicuous location on, or immediately adjacent to, the device;
 - (iii) Demonstrations at an exhibition conducted at a business, commercial, industrial, scientific or medical location, but excluding locations in a residential environment, provided the notice contained in paragraphs (c) or (d) of this section, as appropriate, is displayed in a conspicuous location on, or immediately adjacent to, the device;
 - (iv) Evaluation of product performance and determination of customer acceptability, provided such operation takes place at the manufacturer's facilities during developmental, design or pre-production states; or
 - (v) Evaluation of product performance and determination of customer acceptability where customer acceptability of a radio frequency device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, provided the device is operated at a business, commercial, industrial, scientific or medical user's site, but not at a residential site, during the development, design or pre-production stages.
- (e)(2) For the purpose of paragraphs (e)(1)(iv) and (e)(1)(v) of this section, the term *manufacturer's facilities* includes the facilities of the party responsible for compliance with the regulations and the manufacturer's premises, as well as the facilities of other entities working under the authorization of the responsible party in connection with the development and manufacture, but not the marketing, of the equipment.
- (f) For radio frequency devices subject to verification and sold solely to business, commercial, industrial, scientific and medical users (excluding products sold to other parties or for operation in a residential environment), parties responsible for verification of the devices shall have the option of ensuring compliance with the applicable technical specifications of this chapter at each end user's location after installation, provided that the purchase or lease agreement includes a proviso that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.

Certification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart J — Equipment Authorization Procedures:

§ 2.901 Basis and Purpose

- (a) In order to carry out its responsibilities under the Communications Act and the various treaties and international regulations, and in order to promote efficient use of the radio spectrum, the Commission has developed technical standards for radio frequency equipment and parts or components thereof. The technical standards applicable to individual types of equipment are found in that part of the rules governing the service wherein the equipment is to be operated.¹ *In addition to the technical standards provided, the rules governing the service may require that such equipment be verified by the manufacturer or importer, be authorized under a Declaration of Conformity, or receive an equipment authorization from the Commission by one of the following procedures: certification or registration.*
- (b) The following sections describe the verification procedure, the procedure for a Declaration of Conformity, and the procedures to be followed in obtaining certification from the Commission and the conditions attendant to such a grant.

§ 2.907 Certification.

- (a) Certification is an equipment authorization issued by the Commission, based on representation and test data submitted by the applicant.
- (b) Certification attaches to all units subsequently marketed by the grantee which are identical (see Section 2.908) to the sample tested except for permissive changes or other variations authorized by the Commission pursuant to Section 2.1043.

¹ In this case, the equipment is subject to the rules of Part 15. More specifically, the equipment falls under Subpart B (of Part 15), which deals with unintentional radiators.

Certification & User's Manual Information

§ 2.948 Description of measurement facilities.

- (a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U.S. or its possessions, shall compile a description of the measurement facilities employed.
 - (1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.
 - (i) *If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for the verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.*
 - (ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.
 - (2) If the equipment is to be authorized by the Commission under the certification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but must be updated as changes are made to the measurement facilities or as otherwise described in this section. At least every three years, the organization responsible for filing the data with the Commission shall certify that the data on file is current.

Certification & User's Manual Information

1. Label and User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart A — General:

§ 15.19 Labeling requirements.

(a) *In addition to the requirements in Part 2 of this chapter, a device subject to certification or verification shall be labeled as follows:*

- (1) Receivers associated with the operation of a licensed radio service, e.g., FM broadcast under Part 73 of this chapter, land mobile operation under Part 90, etc., shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

- (2) A stand-alone cable input selector switch, shall bear the following statement in a conspicuous location on the device:

This device is verified to comply with Part 15 of the FCC Rules for use with cable television service.

- (3) All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

- (4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified under paragraph (a) of this section is required to be affixed only to the main control unit.

- (5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

§ 15.21 Information to user.

The user's manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Verification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart B — Unintentional Radiators:

§ 15.105 Information to the user.

- (a) For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at own expense.

- (b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

End of Report