



REGULATORY COMPLIANCE TEST REPORT

FCC CFR 47 15.407

Report No.: MIKO95-U4 Rev A Radiated Addendum

Company: Mikrotikls SIA (MikroTik)

Model: RBD23UGS-5HPacD2HnD-NM-US

Marketing Name: NetMetal ac²



TEST REPORT
FROM
MiCOM Labs
opening wireless markets

Test of: Mikrotikls SIA (MikroTik) RBD23UGS-5HPacD2HnD-NM-US

To: FCC CFR 47 Part 15 Subpart E 15.407

Test Report Serial No.: MIKO95-U4 Rev A Radiated Addendum

This report supersedes: NONE

This is an Addendum Report to show compliance for additional antenna (HGO-Antenna-Out) to RBD23UGS-5HPacD2HnD-NM-US. MiCOM Labs Test Report MIKO95-U4 Rev A is the original complete test report.

Applicant: Mikrotikls SIA (MikroTik)
Brivibas gatve 214i
Riga, LV-1039
Latvia

Issue Date: 13th February 2020

This Test Report is Issued Under the Authority of:

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MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

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1. ACCREDITATION, LISTINGS & RECOGNITION

1.1. TESTING ACCREDITATION

MiCOM Labs, Inc. is an accredited Electrical testing laboratory per the international standard ISO/IEC 17025:2005. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.01. MiCOM Labs test schedule is available at the following URL; <http://www.a2la.org/scopepdf/2381-01.pdf>



This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

Presented this 14th day of May 2018.



Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2381.01
Valid to February 29, 2020
Revised November 7, 2019

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

1.2. RECOGNITION

MiCOM Labs, Inc has widely recognized wireless testing capabilities. Our international recognition includes Conformity Assessment Body designation by APEC MRA countries. MiCOM Labs test reports are accepted globally.

Country	Recognition Body	Status	Phase	Identification No.
USA	Federal Communications Commission (FCC)	TCB	-	US0159 Listing #: 102167
Canada	Industry Canada (IC)	FCB	APEC MRA 2	US0159 Listing #: 4143A-2 4143A-3
Japan	MIC (Ministry of Internal Affairs and Communication)	CAB	APEC MRA 2	RCB 210
	VCCI	--	--	A-0012
Europe	European Commission	NB	EU MRA	NB 2280
Australia	Australian Communications and Media Authority (ACMA)	CAB	APEC MRA 1	US0159
Hong Kong	Office of the Telecommunication Authority (OFTA)	CAB	APEC MRA 1	
Korea	Ministry of Information and Communication Radio Research Laboratory (RRL)	CAB	APEC MRA 1	
Singapore	Infocomm Development Authority (IDA)	CAB	APEC MRA 1	
Taiwan	National Communications Commission (NCC) Bureau of Standards, Metrology and Inspection (BSMI)	CAB	APEC MRA 1	
Vietnam	Ministry of Communication (MIC)	CAB	APEC MRA 1	

EU MRA – European Union Mutual Recognition Agreement.

NB – Notified Body

APEC MRA – Asia Pacific Economic Community Mutual Recognition Agreement. Recognition agreement under which test lab is accredited to regulatory standards of the APEC member countries.

Phase I - recognition for product testing

Phase II – recognition for both product testing and certification

1.3. PRODUCT CERTIFICATION

MiCOM Labs, Inc. is an accredited Product Certification Body per the international standard ISO/IEC 17065:2012. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.02. MiCOM Labs test schedule is available at the following URL; <http://www.a2la.org/scopepdf/2381-02.pdf>



Accredited Product Certification Body

A2LA has accredited

MiCOM LABS

Pleasanton, CA

This product certification body is accredited in accordance with the recognized International Standard ISO/IEC 17065:2012 Requirements for bodies certifying products, processes and services. This product certification body also meets the A2LA R322 – Specific Requirements – Notified Body Accreditation Requirements and A2LA R308 - Specific Requirements - ISO-IEC 17065 - Telecommunication Certification Body Accreditation Program. This accreditation demonstrates technical competence for a defined scope and the operation of a management system.

Presented this 14th day of May 2018



Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2381.02
Valid to February 29, 2020
Revised November 7, 2019



For the product certification schemes to which this accreditation applies, please refer to the organization's Product Certification Scope of Accreditation.

United States of America – Telecommunication Certification Body (TCB)

Industry Canada – Certification Body, CAB Identifier – US0159

Europe – Notified Body (NB), NB Identifier - 2280

Japan – Recognized Certification Body (RCB), RCB Identifier - 210

2. DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft	23rd January 2020	<p>Draft report for client review.</p> <p>Addendum report created to show compliance testing results for the MikroTik RBD23UGS-5HPacD2HnD-NM-US with additional antenna (HGO-Antenna-Out)</p>
Rev A	13 th February 2020	Initial Release

In the above table the latest report revision will replace all earlier versions.

3. TEST RESULT CERTIFICATE

Manufacturer: Mikrotikls SIA (MikroTik)
Brivibas gatve 214i
Riga, LV-1039
Latvia

Tested By: MiCOM Labs, Inc.
575 Boulder Court
Pleasanton
California 94566 USA

Model: RBD23UGS-5HPacD2HnD-NM-US

Telephone: +1 925 462 0304

With HGO-Antenna-Out

Equipment Type: Wireless Access Point

Fax: +1 925 462 0306

S/N's: 744D28F89F6F

Test Date(s): 12-13th January 2020

Website: www.micomlabs.com

STANDARD(S)

FCC CFR 47 Part 15 Subpart E 15.407

TEST RESULTS

EQUIPMENT COMPLIES

Radiated Emissions

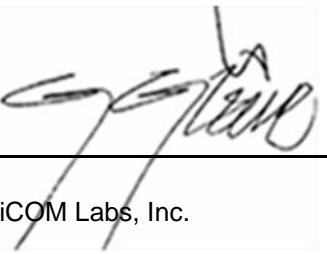
MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

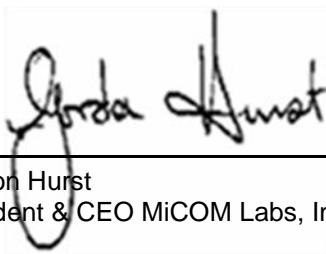
Notes:

1. This document reports conditions under which testing was conducted and the results of testing performed.
2. Details of test methods used have been recorded and kept on file by the laboratory.
3. Test results apply only to the item(s) tested.

Approved & Released for MiCOM Labs, Inc. by:




Graeme Grieve
Quality Manager MiCOM Labs, Inc.


Gordon Hurst
President & CEO MiCOM Labs, Inc.

4. REFERENCES AND MEASUREMENT UNCERTAINTY

4.1. Normative References

REF.	PUBLICATION	YEAR	TITLE
I	KDB 662911 D01 & D02	Oct 31 2013	Guidance for measurement of output emission of devices that employ single transmitter with multiple outputs or systems with multiple transmitters operating simultaneously in the same frequency band
II	KDB 905462 D07 v02	22nd August 2016	Test guidance to demonstrate compliance for U-NII devices subject to DFS requirements.
III	KDB 926956 D01 v02	22nd August 2016	U-NII Device Transition Plan
IV	A2LA	August 2018	R105 - Requirement's When Making Reference to A2LA Accreditation Status
V	ANSI C63.10	2013	American National Standard for Testing Unlicensed Wireless Devices
VI	ANSI C63.4	2014	American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
VII	CISPR 32	2015	Electromagnetic compatibility of multimedia equipment - Emission requirements
VIII	ETSI TR 100 028	2001-12	Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
IX	FCC 06-96	Jun 30 2006	Memorandum Opinion and Order
X	FCC 47 CFR Part 15.407	2016	Radio Frequency Devices; Subpart E –Unlicensed National Information Infrastructure Devices
XI	ICES-003	Issue 6 Jan 2016; Updated April 2019	Information Technology Equipment (Including Digital Apparatus) – Limits and methods of measurement.
XII	M 3003	Edition 3 Nov.2012	Expression of Uncertainty and Confidence in Measurements
XV	FCC 47 CFR Part 2.1033	2016	FCC requirements and rules regarding photographs and test setup diagrams.
XVI	KDB 905462 D02 v02	April 8 2016	Compliance Measurement Procedures for Unlicensed National Information Infrastructure devices operating in the 5250 to 5350 MHz and 5470 to 5725 MHz bands incorporating Dynamic Frequency Selection.
XVII	KDB 789033 D02 V02r01	14th December, 2017	Guidelines For Compliance Testing Of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E

4.2. Test and Uncertainty Procedure

Conducted and radiated emission measurements were conducted in accordance with American National Standards Institute ANSI C63.4, listed in the Normative References section of this report.

Measurement uncertainty figures are calculated in accordance with ETSI TR 100 028 Parts 1 and 2.

Measurement uncertainties stated are based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95 % in accordance with UKAS document M 3003 listed in the Normative References section of this report.

5. PRODUCT DETAILS AND TEST CONFIGURATIONS

5.1. Technical Details

Details	Description
Purpose:	Test of the Mikrotikls SIA (MikroTik) RBD23UGS-5HPacD2HnD-NM-US to FCC CFR 47 Part 15 Subpart E 15.407.
Applicant:	Mikrotikls SIA (MikroTik) Brivibas gatve 214i Riga, LV-1039 Latvia
Manufacturer:	Mikrotikls SIA (MikroTik)
Laboratory performing the tests:	MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA
Test report reference number:	MIKO95-U4 Rev A Radiated Addendum
Date EUT received:	21 st October 2019
Standard(s) applied:	FCC CFR 47 Part 15 Subpart E 15.407
Dates of test (from - to):	31 st October – 19 th November 2019, 12-13 th January 2020
No of Units Tested:	2
Product Family Name:	NetMetal ac ²
Model(s):	RBD23UGS-5HPacD2HnD-NM-US
Location for use:	Outdoors
Declared Frequency Range(s):	5150 - 5250 MHz; 5725 - 5850 MHz;
Type of Modulation:	OFDM
EUT Modes of Operation:	802.11a; ac-80; HT-20; HT-40;
Transmit/Receive Operation:	Transceiver
Rated Input Voltage and Current:	AC Input 100-240V 50/60 Hz DC Output: 48V 0.95A POE Input 24-57V DC 0.95 A
Operating Temperature Range:	-40 to 70 °C
ITU Emission Designator:	802.11a 16M4D1D 802.11n – HT-20 17M6D1D 802.11n – HT-40 36M0D1D 802.11ac-80 76M0D1D
Equipment Dimensions:	140 / 50 / 2450 mm
Weight:	0.8 Kg
Hardware Rev:	R1
Software Rev:	RouterOS 6.45.6

5.2. Scope Of Test Program

Mikrotikls SIA (MikroTik) RBD23UGS-5HPacD2HnD-NM-US

The scope of the test program was to test the Mikrotikls SIA (MikroTik) RBD23UGS-5HPacD2HnD-NM-US with additional antenna (HGO-Antenna-Out) configuration in the frequency ranges 5150 - 5250 MHz, 5725 - 5850 MHz for compliance against the following specification:

FCC CFR 47 Part 15 Subpart E 15.407

Radio Frequency Devices; Subpart E – Unlicensed National Information Infrastructure Devices

5.3. Equipment Model(s) and Serial Number(s)

Type (EUT/Support)	Equipment Description	Manufacturer	Model No.	Serial No.
EUT	Access Point	MikroTik	RBD23UGS-5HPacD2HnD-NM-US	744D28F89 F6F
Support	48V AC/DC Power Supply	Golden Profit Electronics Technology Ltd.	MT48-480095-11DGU	-
Support	Laptop	Dell	D620	

5.4. Antenna Details

Type	Manufacturer	Model	Family	Gain (dBi)	BF Gain	Dir BW	X-Pol	Frequency Band (MHz)
External	MikroTik	HGO-antenna-OUT	Dipole	6.68		360		5150 - 5250
External	MikroTik	HGO-antenna-OUT	Dipole	6.68		360		5725 - 5850
external	MikroTik	MTAD-5G-30D3	Parabolic	30.0	-	2.5	-	5150 - 5250
external	MikroTik	MTAD-5G-30D3	Parabolic	30.0	-	2.5	-	5725 - 5850
external	MikroTik	MTAS-5G-19D120	Sector	19.0	-	120	-	5150 - 5250
external	MikroTik	MTAS-5G-19D120	Sector	19.0	-	120	-	5725 - 5850
BF Gain - Beamforming Gain								
Dir BW - Directional BeamWidth								
X-Pol - Cross Polarization								

5.5. Cabling and I/O Ports

Port Type	Max Cable Length	# of Ports	Screened	Conn Type	Data Type	Bit Rate	Environment
USB	3m	1	Yes	USB-A	Digital	None	End-User Admin
dc Jack		1	No	dc jack	Analog	none	Power
SFP	>30m	1		SFP+	Packet Data	10,100,1000,10000	End-User
SIM Cards		1		SIM	Digital	None	End-User
Ethernet PoE IN	>30m	1		RJ45	Packet Data	10,100,1000	End-User

5.6. Test Configurations

Results for the following configurations are provided in this report:

Operational Mode(s) (802.11a/b/g/n/ac)	Data Rate with Highest Power MBit/s	Channel Frequency (MHz)		
		Low	Mid	High
5150 - 5250 MHz				
a	6	5,180.00	5,200.00	5,240.00
ac-80	29.3	5,210.00		--
HT-20	6.5	5,180.00		5,240.00
HT-40	13.5	5,190.00		5,230.00
5725 - 5850 MHz				
a	6	5,745.00	5,785.00	5,825.00
ac-80	29.3	5,775.00		5,775.00
HT-20	6.5	5,745.00		5,825.00
HT-40	13.5	5,755.00		5,795.00

5.7. Equipment Modifications

The following modifications were required to bring the equipment into compliance:

1. NONE

5.8. Deviations from the Test Standard

The following deviations from the test standard were required in order to complete the test program:

1. NONE

6. TEST SUMMARY

List of Measurements

Test Header	Result	Data Link
Peak Transmit Power	Complies	See Note 1
26 dB & 99% Bandwidth	Complies	See Note 1
6 dB & 99% Bandwidth	Complies	See Note 1
Power Spectral Density	Complies	See Note 1
Radiated	Complies	-
TX Spurious & Restricted Band Emissions	Complies	-
MikroTik MTAD-5G-30D3	Complies	See Note 1
MikroTik MTAS-5G-19D120	Complies	See Note 1
(i) TX Spurious & Restricted Band Emissions	Complies	View Data
Restricted Edge & Band-Edge Emissions	Complies	-
MikroTik MTAD-5G-30D3	Complies	See Note 1
MikroTik MTAS-5G-19D120	Complies	See Note 1
(ii) Restricted Edge & Band-Edge Emissions	Complies	View Data
Digital Emissions	Complies	See Note 1
AC Wireline	Complies	See Note 1

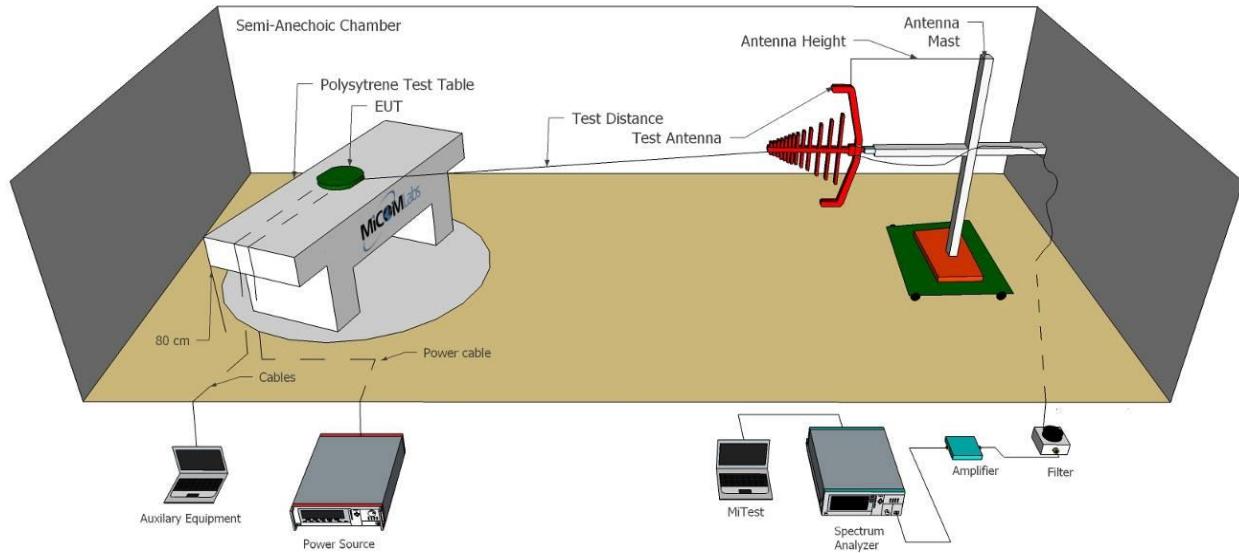
Note 1: See MiCOM Labs Test Report MIKO95-U4 Rev A

7. TEST EQUIPMENT CONFIGURATION(S)

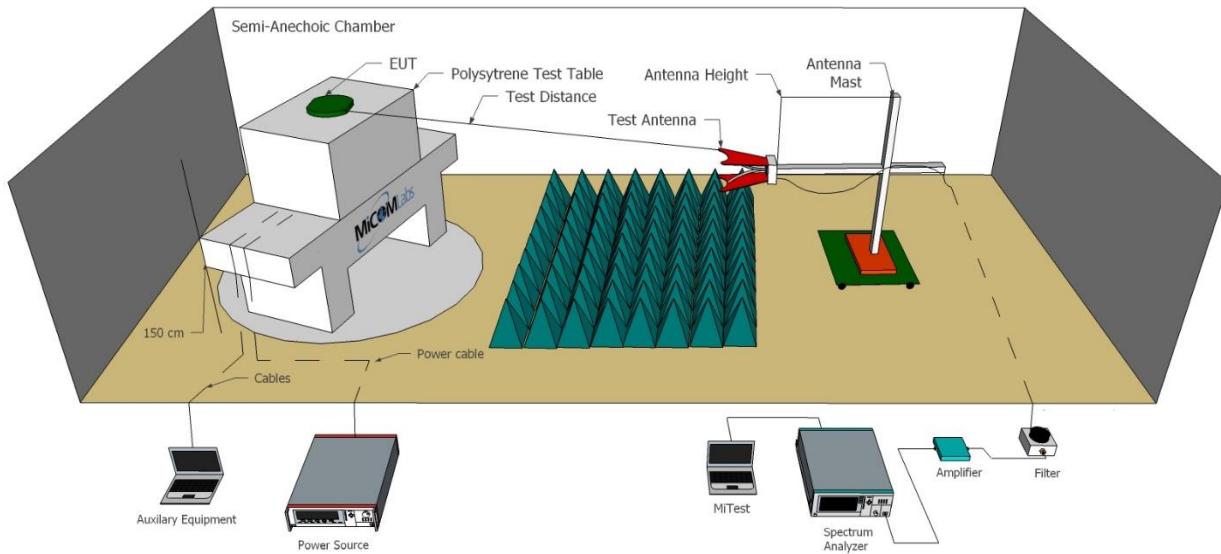
7.1. Radiated Emissions - 3m Chamber

Test Setup for Radiated Emissions for above and below 1 GHz

Radiated Emissions Below 1GHz Test Setup



Radiated Emissions Above 1GHz Test Setup



A full system calibration was performed on the test station and any resulting system losses (or gains) were taken into account in the production of all final measurement data.

Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
170	Video System Controller for Semi Anechoic Chamber	Panasonic	WV-CU101	04R08507	Not Required
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	8 Oct 2020
298	3M Radiated Emissions Chamber Maintenance Check	MiCOM	3M Chamber	298	26 Feb 2020
336	Active loop Ant 10kHz to 30 MHz	EMCO	EMCO 6502	00060498	29 Jan 2020
338	Sunol 30 to 3000 MHz Antenna	Sunol	JB3	A052907	4 Apr 2020
373	26III RMS Multimeter	Fluke	Fluke 26 series III	76080720	21 Jan 2020
377	Band Rejection Filter 5150 to 5880MHz	Microtronics	BRM50716	034	3 Sep 2020
378	Rohde & Schwarz 40 GHz Receiver with Generator	Rhode & Schwarz	ESIB40	100107/040	12 Oct 2020
396	2.4 GHz Notch Filter	Microtronics	BRM50701	001	3 Mar 2020
397	Amp 10 - 2500MHz	MiCOM Labs	Amp 10 - 2500 MHz	NA	6 Sep 2020
399	ETS 1-18 GHz Horn Antenna	ETS	3117	00154575	12 Oct 2020
406	Amplifier for Radiated Emissions	MiCOM Labs	40dB 1 to 18GHz Amp	0406	9 Sep 2020
410	Desktop Computer	Dell	Inspiron 620	WS38	Not Required
411	Mast/Turntable Controller	Sunol Sciences	SC98V	060199-1D	Not Required
412	USB to GPIB Interface	National Instruments	GPIB-USB HS	11B8DC2	Not Required
413	Mast Controller	Sunol Science	TWR95-4	030801-3	Not Required
415	Turntable Controller	Sunol Sciences	Turntable Controller	None	Not Required
416	Gigabit ethernet filter	ETS-Lingren	Gigafoil 260366	None	Not Required
447	MiTest Rad Emissions Test Software	MiCOM	Rad Emissions Test Software Version 1.0	447	Not Required
462	Schwarzbeck cable from Antenna to Amplifier.	Schwarzbeck	AK 9513	462	5 Sep 2020
463	Schwarzbeck cable from Amplifier to Bulkhead.	Schwarzbeck	AK 9513	463	5 Sep 2020
464	Schwarzbeck cable from Bulkhead to Receiver	Schwarzbeck	AK 9513	464	9 Sep 2020
465	Low Pass Filter DC-	Mini-Circuits	NLP-1200+	VUU01901402	3 Sep 2020



Title: MikroTik RBD23UGS-5HPacD2HnD-NM-US
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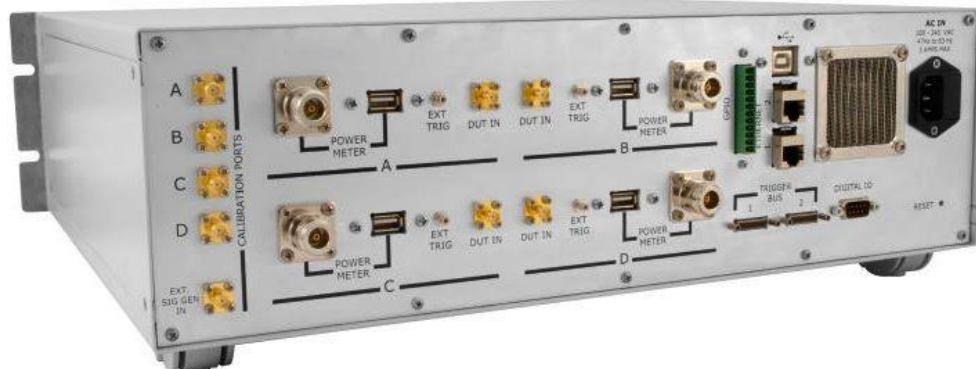
	1000 MHz				
466	Low Pass Filter DC-1500 MHz	Mini-Circuits	NLP-1750+	VUU10401438	3 Sep 2020
480	Cable - Bulkhead to Amp	SRC Haverhill	157-3050360	480	9 Sep 2020
481	Cable - Bulkhead to Receiver	SRC Haverhill	151-3050787	481	9 Sep 2020
510	Barometer/Thermometer	Control Company	68000-49	170871375	20 Dec 2020
518	Cable - Amp to Antenna	SRC Haverhill	157-3051574	518	9 Sep 2020
CC05	Confidence Check	MiCOM	CC05	None	4 Apr 2020

8. MEASUREMENT AND PRESENTATION OF TEST DATA

The measurement and graphical data presented in this test report was generated automatically using state-of-the-art technology creating an easy to read report structure. Numerical measurement data is separated from supporting graphical data (plots) through hyperlinks. Numerical measurement data can be reviewed without scrolling through numerous graphical pages to arrive at the next data matrix.

Plots have been relegated into the Appendix 'Graphical Data'.

Test and report automation was performed by [MiTest](#). [MiTest](#) is an automated test system developed by MiCOM Labs. [MiTest](#) is the first cloud based modular test system enabling end-to-end automation of regulatory compliance testing for conducted RF testing.



The MiCOM Labs "[MiTest](#)" Automated Test System" (Patent Pending)

9. TEST RESULTS

9.1. Radiated

Radiated Test Conditions for Radiated Spurious and Band-Edge Emissions			
Standard:	FCC CFR 47:15.407	Ambient Temp. (°C):	20.0 - 24.5
Test Heading:	Radiated Spurious and Band-Edge Emissions	Rel. Humidity (%):	32 - 45
Standard Section(s):	15.407 (b), 15.205, 15.209	Pressure (mBars):	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Radiated Spurious and Band-Edge Emissions

Radiated emissions for restricted bands above 1 GHz are measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode. Depending on the frequency band spanned a notch filter was used to remove the fundamental frequency. The highest emissions relative to the limit are listed for each frequency spanned.

Measurements on any restricted band frequency or frequencies above 1 GHz are based on the use of measurement instrumentation employing peak and average detectors. All measurements were performed using a resolution bandwidth of 1 MHz.

Test configuration and setup for Undesirable Measurement were per the Radiated Test Set-up specified in this document.

15.407 (b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

(5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

(7) The provisions of §15.205 apply to intentional radiators operating under this section.

(8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits.

Limits for Restricted Bands (15.205, 15.209)

Peak emission: 74 dBuV/m

Average emission: 54 dBuV/m

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR - FO

where:

FS = Field Strength

R = Measured Spectrum analyzer Input Amplitude

AF = Antenna Factor

CORR = Correction Factor = **CL** – **AG** + **NFL**

CL = Cable Loss

AG = Amplifier Gain

FO = Distance Falloff Factor

NFL = Notch Filter Loss

Example:

The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength (dB μ V/m);

$$E = \frac{1000000 \times \sqrt{30P}}{3} \mu\text{V/m}$$

where P is the EIRP in Watts

Therefore: -27 dBm/MHz equates to 68.23 dB μ V/m

Conversion between dBmV/m (or dBmV) and mV/m (or mV) are as follows:

Level (dBmV/m) = 20 * Log (level (mV/m))

40 dBmV/m = 100 mV/m

48 dBmV/m = 250 mV/m

Restricted Bands of Operation (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:

Frequency Band			
MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
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	2690-2900	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	Above 38.6
13.36-13.41			



Title: MikroTik RBD23UGS-5HPacD2HnD-NM-US
To: FCC CFR 47 Part 15 Subpart E 15.407
Serial #: MIKO95-U4 Rev A Radiated Addendum

9.1.1. TX Spurious & Restricted Band Emissions

Equipment Configuration for Restricted Band Spurious Emissions

Antenna:	HGO-Antenna-Out	Variant:	802.11a
Antenna Gain (dBi):	6.68	Modulation:	
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99
Channel Frequency (MHz):	5180.00	Data Rate:	1 MBit/s
Power Setting:	18	Tested By:	JMH

Test Measurement Results

1000.00 - 18000.00 MHz

Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail
#1	5181.26	64.42	2.99	-12.15	55.26	Fundamental	Vertical	100	0	--	--	

Test Notes: EUT powered by POE injector. 5 GHz notch in front of amp to prevent overload



Title: MikroTik RBD23UGS-5HPacD2HnD-NM-US
To: FCC CFR 47 Part 15 Subpart E 15.407
Serial #: MIKO95-U4 Rev A Radiated Addendum

Equipment Configuration for Restricted Band Spurious Emissions

Antenna:	HGO-Antenna-Out	Variant:	802.11a
Antenna Gain (dBi):	6.68	Modulation:	OFDM
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99
Channel Frequency (MHz):	5200.00	Data Rate:	6 MBit/s
Power Setting:	18	Tested By:	JMH

Test Measurement Results

1000.00 - 18000.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
#1	5203.44	69.66	2.99	-12.42	60.23	Fundamental	Vertical	100	0	--	--	Pass	

Test Notes: EUT powered by POE injector. 5 GHz notch in front of amp to prevent overload



Title: MikroTik RBD23UGS-5HPacD2HnD-NM-US
To: FCC CFR 47 Part 15 Subpart E 15.407
Serial #: MIKO95-U4 Rev A Radiated Addendum

Equipment Configuration for Restricted Band Spurious Emissions

Antenna:	HGO-Antenna-Out	Variant:	802.11a
Antenna Gain (dBi):	6.68	Modulation:	OFDM
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99
Channel Frequency (MHz):	5240.00	Data Rate:	6 MBit/s
Power Setting:	18	Tested By:	JMH

Test Measurement Results

1000.00 - 18000.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
#1	5241.37	71.19	3.02	-12.03	62.18	Fundamental	Vertical	100	0	--	--	Pass	

Test Notes: EUT powered by POE injector. 5 GHz notch in front of amp to prevent overload



Title: MikroTik RBD23UGS-5HPacD2HnD-NM-US
To: FCC CFR 47 Part 15 Subpart E 15.407
Serial #: MIKO95-U4 Rev A Radiated Addendum

Equipment Configuration for Restricted Band Spurious Emissions

Antenna:	HGO-Antenna-Out	Variant:	802.11a
Antenna Gain (dBi):	6.68	Modulation:	OFDM
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99
Channel Frequency (MHz):	5745.00	Data Rate:	6 MBit/s
Power Setting:	18	Tested By:	JMH

Test Measurement Results

1000.00 - 18000.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
#1	5738.69	53.33	3.17	-11.14	45.36	Fundamental	Vertical	152	2	--	--	Pass	

Test Notes: EUT powered by POE injector. 5 GHz notch in front of amp to prevent overload



Title: MikroTik RBD23UGS-5HPacD2HnD-NM-US
To: FCC CFR 47 Part 15 Subpart E 15.407
Serial #: MIKO95-U4 Rev A Radiated Addendum

Equipment Configuration for Restricted Band Spurious Emissions

Antenna:	HGO-Antenna-Out	Variant:	802.11a
Antenna Gain (dBi):	6.68	Modulation:	OFDM
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99
Channel Frequency (MHz):	5785.00	Data Rate:	6 MBit/s
Power Setting:	18	Tested By:	JMH

Test Measurement Results

1000.00 - 18000.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
#1	3856.64	61.52	2.57	-12.01	52.08	Max Peak	Vertical	150	224	68.2	-16.2	Pass	
#2	3856.64	57.76	2.57	-12.01	48.32	Max Avg	Vertical	150	224	54.0	-5.7	Pass	
#3	5791.31	56.49	3.14	-10.85	48.78	Peak (NRB)	Vertical	151	131	--	--	Pass	

Test Notes: EUT powered by POE injector. 5 GHz notch in front of amp to prevent overload



Title: MikroTik RBD23UGS-5HPacD2HnD-NM-US
To: FCC CFR 47 Part 15 Subpart E 15.407
Serial #: MIKO95-U4 Rev A Radiated Addendum

Equipment Configuration for Restricted Band Spurious Emissions

Antenna:	HGO-Antenna-Out	Variant:	802.11a
Antenna Gain (dBi):	6.68	Modulation:	OFDM
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99
Channel Frequency (MHz):	5825.00	Data Rate:	6 MBit/s
Power Setting:	18	Tested By:	JMH

Test Measurement Results

1000.00 - 18000.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
#1	3883.39	60.51	2.56	-12.04	51.03	Max Peak	Vertical	117	298	68.2	-17.2	Pass	
#2	3883.39	56.80	2.56	-12.04	47.32	Max Avg	Vertical	117	298	54.0	-6.7	Pass	
#3	5829.89	59.24	3.14	-10.84	51.54	Peak (NRB)	Vertical	150	93	--	--	Pass	

Test Notes: EUT powered by POE injector. 5 GHz notch in front of amp to prevent overload

9.1.2. Restricted Edge & Band-Edge Emissions

RESULTS SUMMARY FOR RADIATED BAND-EDGE EMISSIONS

5150 - 5250 MHz

HGO-Antenna-Out		Band-Edge Freq	Limit 68.2dB μ V/m	Limit 54.0dB μ V/m	Power Setting
Operational Mode	Operating Frequency (MHz)	MHz	dB μ V/m	dB μ V/m	
802.11a	5180.00	5150.00	56.53	43.89	18
802.11ac-80	5210.00	5150.00	61.34	43.89	18
802.11n HT-20	5180.00	5150.00	56.22	43.89	18
802.11n HT-40	5190.00	5150.00	55.87	43.59	18

5725 MHz Radiated Lower Band-Edge Emissions

HGO-Antenna-Out		Band-Edge Freq	Level	Level	Power Setting
Operational Mode	Operating Frequency (MHz)	MHz	dB μ V/m	dB μ V/m	
802.11a	5745.00	5725.00	60.82	64.91	18
802.11ac-80	5775.00	5725.00	58.21	70.32	18
802.11n HT-20	5745.00	5725.00	60.59	63.47	18
802.11n HT-40	5755.00	5725.00	60.26	64.52	18

5850 MHz Radiated Higher Band-Edge Emissions

HGO-Antenna-Out		Band-Edge Freq	Level	Level	Power Setting
Operational Mode	Operating Frequency (MHz)	MHz	dB μ V/m	dB μ V/m	
802.11a	5825.00	5850.00	59.53	58.53	18
802.11ac-80	5775.00	5850.00	60.68	58.37	18
802.11n HT-20	5825.00	5850.00	59.60	58.70	18
802.11n HT-40	5795.00	5850.00	58.71	58.35	18

Click on the links to view the data.



Title: MikroTik RBD23UGS-5HPacD2HnD-NM-US
To: FCC CFR 47 Part 15 Subpart E 15.407
Serial #: MIKO95-U4 Rev A Radiated Addendum

Equipment Configuration for 5150 MHz Radiated Band-Edge Emissions

Antenna:	HGO-Antenna-Out	Variant:	802.11a
Antenna Gain (dBi):	6.68	Modulation:	OFDM
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99
Channel Frequency (MHz):	5180.00	Data Rate:	6 MBit/s
Power Setting:	18	Tested By:	JMH

Test Measurement Results

4500.00 - 5250.00 MHz

Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail
#1	4923.85	6.91	2.98	34.00	43.89	Max Avg	Vertical	119	60	54.0	-10.1	Pass
#2	5036.57	19.54	2.89	34.10	56.53	Max Peak	Vertical	119	60	68.2	-11.7	Pass
#3	5150.00	--	--	--	--	Restricted-Band	--	--	--	--	--	--

Test Notes: EUT powered by POE injector.



Title: MikroTik RBD23UGS-5HPacD2HnD-NM-US
To: FCC CFR 47 Part 15 Subpart E 15.407
Serial #: MIKO95-U4 Rev A Radiated Addendum

Equipment Configuration for 5150 MHz Radiated Band-Edge Emissions

Antenna:	HGO-Antenna-Out	Variant:	802.11ac-80
Antenna Gain (dBi):	6.68	Modulation:	OFDM
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99
Channel Frequency (MHz):	5210.00	Data Rate:	29.3 MBit/s
Power Setting:	18	Tested By:	JMH

Test Measurement Results

4500.00 - 5250.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
#1	4924.55	6.92	2.97	34.00	43.89	Max Avg	Vertical	119	60	54.0	-10.1	Pass	
#2	5148.50	24.22	2.91	34.21	61.34	Max Peak	Vertical	119	60	68.2	-6.9	Pass	
#3	5150.00	--	--	--	--	Restricted-Band	--	--	--	--	--	--	

Test Notes: EUT powered by POE injector.



Title: MikroTik RBD23UGS-5HPacD2HnD-NM-US
To: FCC CFR 47 Part 15 Subpart E 15.407
Serial #: MIKO95-U4 Rev A Radiated Addendum

Equipment Configuration for 5150 MHz Radiated Band-Edge Emissions

Antenna:	HGO-Antenna-Out	Variant:	802.11n HT-20
Antenna Gain (dBi):	6.68	Modulation:	OFDM
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99
Channel Frequency (MHz):	5180.00	Data Rate:	6.5 MBit/s
Power Setting:	18	Tested By:	JMH

Test Measurement Results

4500.00 - 5250.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
#1	4923.85	6.91	2.98	34.00	43.89	Max Avg	Vertical	119	60	54.0	-10.1	Pass	
#2	5075.65	19.20	2.91	34.11	56.22	Max Peak	Vertical	119	60	68.2	-12.0	Pass	
#3	5150.00	--	--	--	--	Restricted-Band	--	--	--	--	--	--	

Test Notes: EUT powered by POE injector.



Title: MikroTik RBD23UGS-5HPacD2HnD-NM-US
To: FCC CFR 47 Part 15 Subpart E 15.407
Serial #: MIKO95-U4 Rev A Radiated Addendum

Equipment Configuration for 5150 MHz Radiated Band-Edge Emissions

Antenna:	HGO-Antenna-Out	Variant:	802.11n HT-40
Antenna Gain (dBi):	6.68	Modulation:	OFDM
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99
Channel Frequency (MHz):	5190.00	Data Rate:	13 MBit/s
Power Setting:	18	Tested By:	JMH

Test Measurement Results

4500.00 - 5250.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
#1	4923.85	6.61	2.98	34.00	43.59	Max Avg	Vertical	119	60	54.0	-10.4	Pass	
#2	5050.10	18.84	2.92	34.11	55.87	Max Peak	Vertical	119	60	68.2	-12.4	Pass	
#3	5150.00	--	--	--	--	Restricted-Band	--	--	--	--	--	--	

Test Notes: EUT powered by POE injector.



Title: MikroTik RBD23UGS-5HPacD2HnD-NM-US
To: FCC CFR 47 Part 15 Subpart E 15.407
Serial #: MIKO95-U4 Rev A Radiated Addendum

Equipment Configuration for 5725 Radiated Band-Edge Emissions

Antenna:	HGO-Antenna-Out	Variant:	802.11a
Antenna Gain (dBi):	6.68	Modulation:	OFDM
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99
Channel Frequency (MHz):	5745.00	Data Rate:	6 MBit/s
Power Setting:	18	Tested By:	JMH

Test Measurement Results

5600.00 - 5780.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
#1	5652.96	23.09	3.10	34.63	60.82	Max Peak	Vertical	124	64	70.4	-9.6	Pass	
#2	5723.92	27.00	3.19	34.72	64.91	Max Peak	Vertical	124	64	119.9	-55.0	Pass	
#3	5725.00	--	--	--	--	Band-Edge	--	--	--	--	--	--	

Test Notes: EUT powered by POE injector.



Title: MikroTik RBD23UGS-5HPacD2HnD-NM-US
To: FCC CFR 47 Part 15 Subpart E 15.407
Serial #: MIKO95-U4 Rev A Radiated Addendum

Equipment Configuration for 5725 Radiated Band-Edge Emissions

Antenna:	HGO-Antenna-Out	Variant:	802.11ac-80
Antenna Gain (dBi):	6.68	Modulation:	OFDM
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	92
Channel Frequency (MHz):	5775.00	Data Rate:	29.3 MBit/s
Power Setting:	18	Tested By:	JMH

Test Measurement Results

5600.00 - 5780.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
#1	5648.27	20.50	3.08	34.63	58.21	Max Peak	Vertical	124	64	68.2	-10.0	Pass	
#2	5713.46	32.48	3.14	34.70	70.32	Max Peak	Vertical	124	64	108.8	-38.5	Pass	
#3	5725.00	--	--	--	--	Band-Edge	--	--	--	--	--	--	

Test Notes: EUT powered by POE injector.



Title: MikroTik RBD23UGS-5HPacD2HnD-NM-US
To: FCC CFR 47 Part 15 Subpart E 15.407
Serial #: MIKO95-U4 Rev A Radiated Addendum

Equipment Configuration for 5725 Radiated Band-Edge Emissions

Antenna:	HGO-Antenna-Out	Variant:	802.11n HT-20
Antenna Gain (dBi):	6.68	Modulation:	OFDM
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99
Channel Frequency (MHz):	5745.00	Data Rate:	6.5 MBit/s
Power Setting:	18	Tested By:	JMH

Test Measurement Results

5600.00 - 5780.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
#1	5640.69	22.85	3.10	34.64	60.59	Max Peak	Vertical	124	64	68.2	-7.6	Pass	
#2	5712.37	25.64	3.13	34.70	63.47	Max Peak	Vertical	124	64	108.6	-45.1	Pass	
#3	5725.00	--	--	--	--	Band-Edge	--	--	--	--	--	--	

Test Notes: EUT powered by POE injector.



Title: MikroTik RBD23UGS-5HPacD2HnD-NM-US
To: FCC CFR 47 Part 15 Subpart E 15.407
Serial #: MIKO95-U4 Rev A Radiated Addendum

Equipment Configuration for 5725 Radiated Band-Edge Emissions

Antenna:	HGO-Antenna-Out	Variant:	802.11n HT-40
Antenna Gain (dBi):	6.68	Modulation:	OFDM
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99
Channel Frequency (MHz):	5755.00	Data Rate:	13 MBit/s
Power Setting:	18	Tested By:	JMH

Test Measurement Results

5600.00 - 5780.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
#1	5648.27	22.55	3.08	34.63	60.26	Max Peak	Vertical	124	64	68.2	-8.0	Pass	
#2	5713.82	26.67	3.15	34.70	64.52	Max Peak	Vertical	124	64	109.1	-44.6	Pass	
#3	5725.00	--	--	--	--	Band-Edge	--	--	--	--	--	--	

Test Notes: EUT powered by POE injector.



Title: MikroTik RBD23UGS-5HPacD2HnD-NM-US
To: FCC CFR 47 Part 15 Subpart E 15.407
Serial #: MIKO95-U4 Rev A Radiated Addendum

Equipment Configuration for 5850 Radiated Band-Edge Emissions

Antenna:	HGO-Antenna-Out	Variant:	802.11aa
Antenna Gain (dBi):	6.68	Modulation:	OFDM
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99
Channel Frequency (MHz):	5825.00	Data Rate:	6 MBit/s
Power Setting:	18	Tested By:	JMH

Test Measurement Results

5770.00 - 6000.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
#2	5875.81	20.77	3.20	35.03	59.00	Max Peak	Vertical	124	64	105.3	-46.3	Pass	
#3	5976.15	20.17	3.18	35.18	58.53	Max Peak	Vertical	124	64	68.2	-9.7	Pass	
#1	5850.00	--	--	--	--	Band-Edge	--	--	--	--	--	--	

Test Notes: EUT powered by POE injector.



Title: MikroTik RBD23UGS-5HPacD2HnD-NM-US
To: FCC CFR 47 Part 15 Subpart E 15.407
Serial #: MIKO95-U4 Rev A Radiated Addendum

Equipment Configuration for 5850 Radiated Band-Edge Emissions

Antenna:	HGO-Antenna-Out	Variant:	802.11ac-80
Antenna Gain (dBi):	6.68	Modulation:	OFDM
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	92
Channel Frequency (MHz):	5775.00	Data Rate:	29.3 MBit/s
Power Setting:	18	Tested By:	JMH

Test Measurement Results

5770.00 - 6000.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
#2	5890.56	22.41	3.20	35.07	60.68	Max Peak	Vertical	124	64	97.1	-36.4	Pass	
#3	5959.56	20.04	3.19	35.14	58.37	Max Peak	Vertical	124	64	68.2	-9.9	Pass	
#1	5850.00	--	--	--	--	Band-Edge	--	--	--	--	--	--	

Test Notes: EUT powered by POE injector.



Title: MikroTik RBD23UGS-5HPacD2HnD-NM-US
To: FCC CFR 47 Part 15 Subpart E 15.407
Serial #: MIKO95-U4 Rev A Radiated Addendum

Equipment Configuration for 5850 Radiated Band-Edge Emissions

Antenna:	HGO-Antenna-Out	Variant:	802.11n HT-20
Antenna Gain (dBi):	6.68	Modulation:	OFDM
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99
Channel Frequency (MHz):	5825.00	Data Rate:	6.5 MBit/s
Power Setting:	18	Tested By:	JMH

Test Measurement Results

5770.00 - 6000.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
#2	5892.40	21.32	3.20	35.08	59.60	Max Peak	Vertical	124	64	96.2	-49.8	Pass	
#3	5943.89	20.42	3.16	35.12	58.70	Max Peak	Vertical	124	64	68.2	-9.5	Pass	
#1	5850.00	--	--	--	--	Band-Edge	--	--	--	--	--	--	

Test Notes: EUT powered by POE injector.



Title: MikroTik RBD23UGS-5HPacD2HnD-NM-US
To: FCC CFR 47 Part 15 Subpart E 15.407
Serial #: MIKO95-U4 Rev A Radiated Addendum

Equipment Configuration for 5850 Radiated Band-Edge Emissions

Antenna:	HGO-Antenna-Out	Variant:	802.11n HT-40
Antenna Gain (dBi):	6.68	Modulation:	OFDM
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99
Channel Frequency (MHz):	5795.00	Data Rate:	13 MBit/s
Power Setting:	18	Tested By:	JMH

Test Measurement Results

5770.00 - 6000.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
#2	5886.41	20.46	3.19	35.06	58.71	Max Peak	Vertical	124	64	98.1	--	Pass	
#3	5932.36	20.03	3.21	35.11	58.35	Max Peak	Vertical	124	64	68.2	-9.9	Pass	
#1	5850.00	--	--	--	--	Band-Edge	--	--	--	--	--	--	

Test Notes: EUT powered by POE injector.

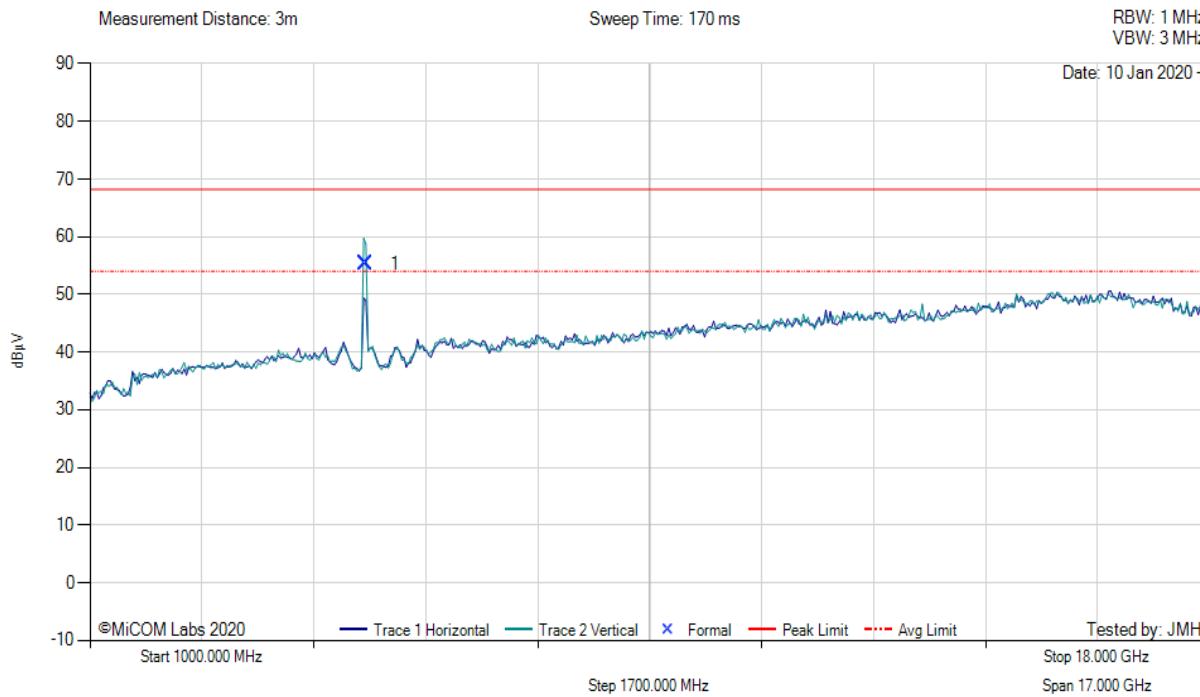
A. APPENDIX - GRAPHICAL IMAGES

A.1. Radiated

A.1.1. TX Spurious & Restricted Band Emissions



Variant: 802.11a, Test Freq: 5180.00 MHz, Power Setting: 18, Duty Cycle (%): 99



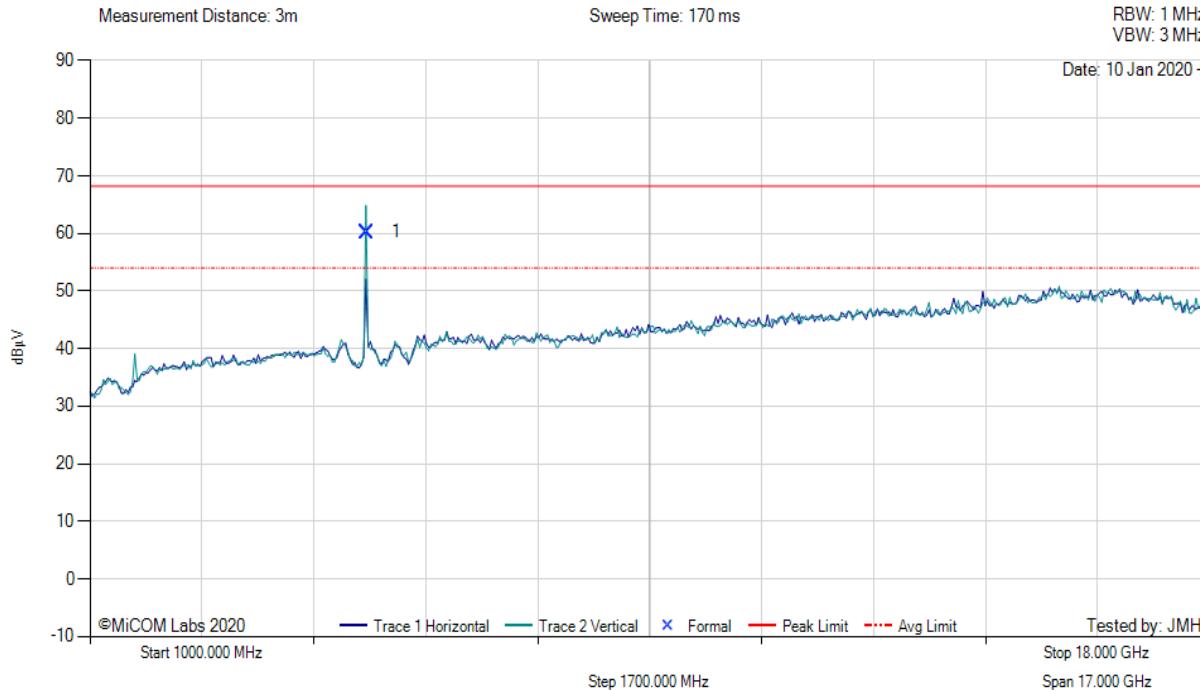
1000.00 - 18000.00 MHz													
Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail	
1	5181.26	64.42	2.99	-12.15	55.26	Fundamental	Vertical	100	0	--	--		

Test Notes: EUT powered by POE injector. 5 GHz notch in front of amp to prevent overload

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Variant: 802.11a, Test Freq: 5200.00 MHz, Power Setting: 18, Duty Cycle (%): 99



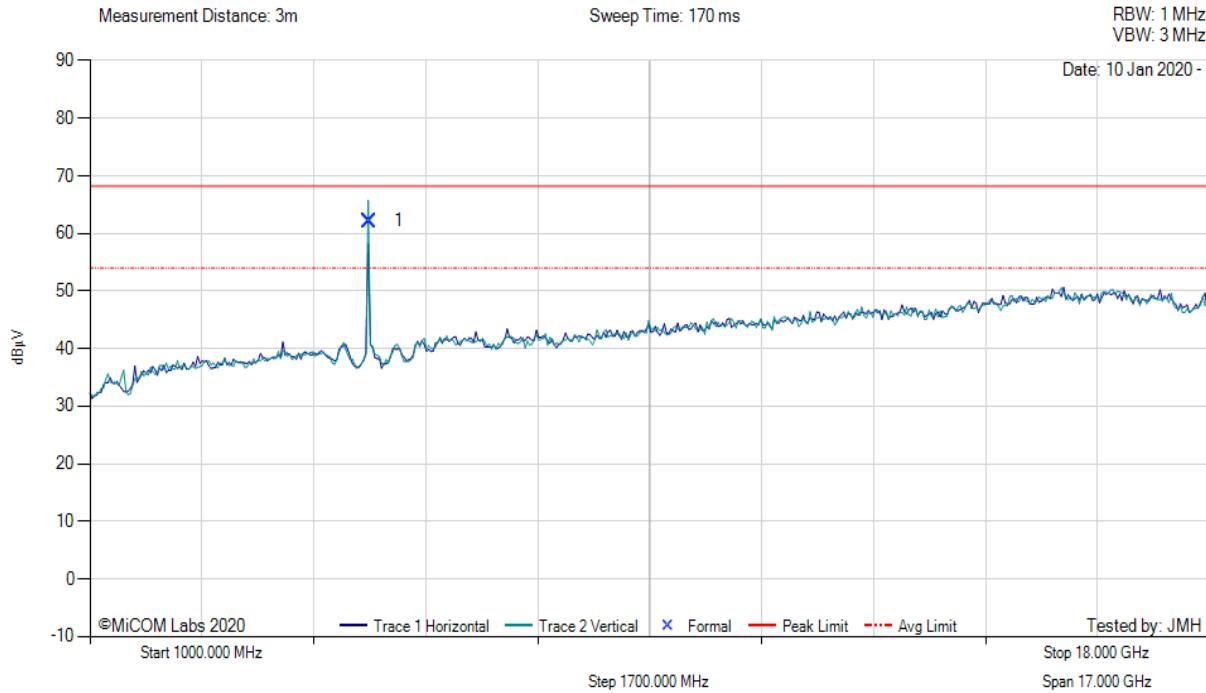
1000.00 - 18000.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
1	5203.44	69.66	2.99	-12.42	60.23	Fundamental	Vertical	100	0	--	--	Pass	

Test Notes: EUT powered by POE injector. 5 GHz notch in front of amp to prevent overload

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Variant: 802.11a, Test Freq: 5240.00 MHz, Power Setting: 18, Duty Cycle (%): 99



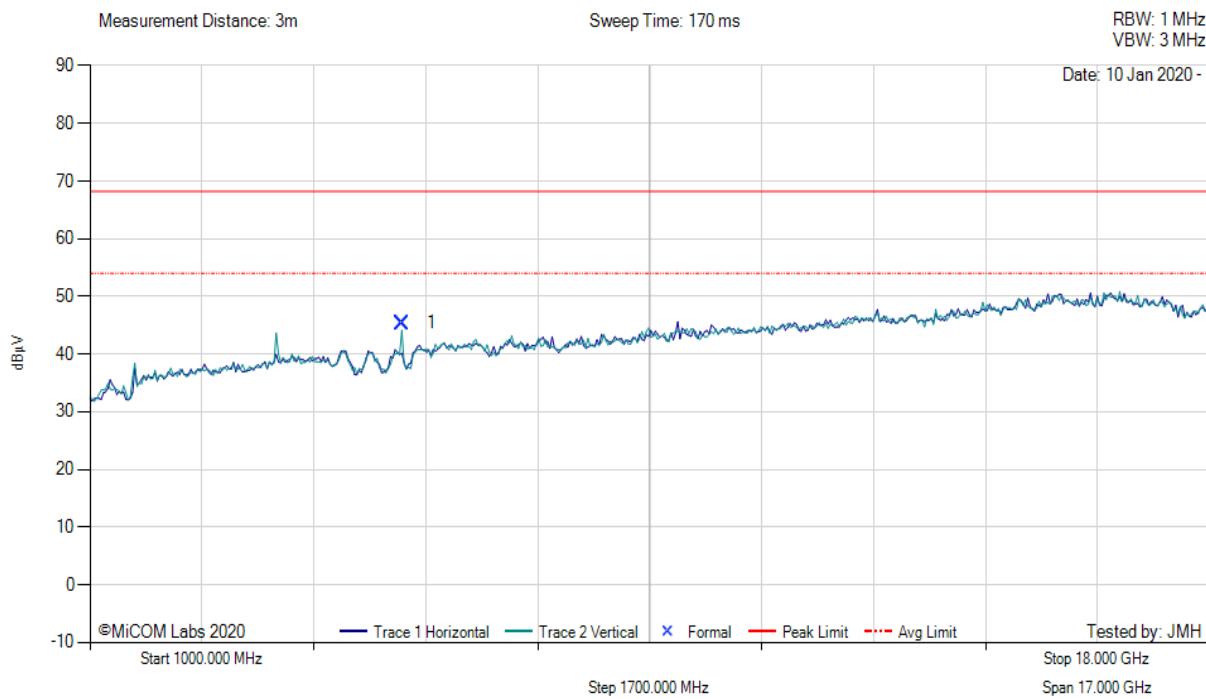
1000.00 - 18000.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
1	5241.37	71.19	3.02	-12.03	62.18	Fundamental	Vertical	100	0	--	--	Pass	

Test Notes: EUT powered by POE injector. 5 GHz notch in front of amp to prevent overload

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Variant: 802.11a, Test Freq: 5745.00 MHz, Power Setting: 18, Duty Cycle (%): 99



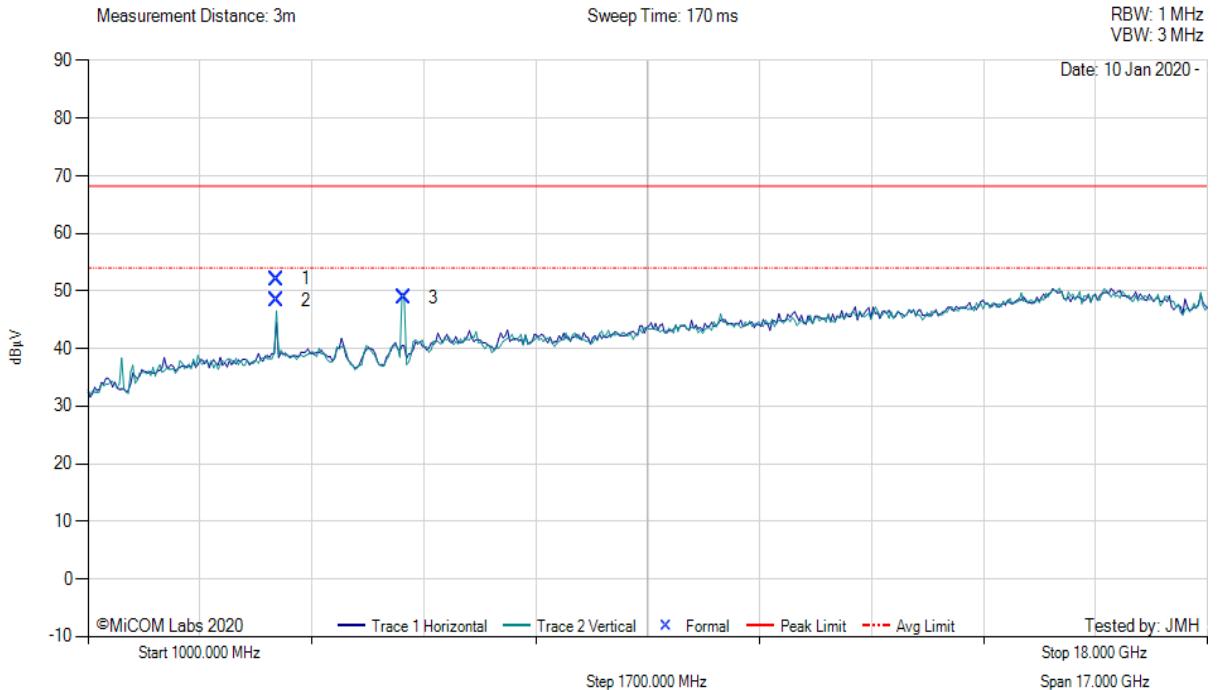
1000.00 - 18000.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
1	5738.69	53.33	3.17	-11.14	45.36	Fundamental	Vertical	152	2	--	--	Pass	

Test Notes: EUT powered by POE injector. 5 GHz notch in front of amp to prevent overload

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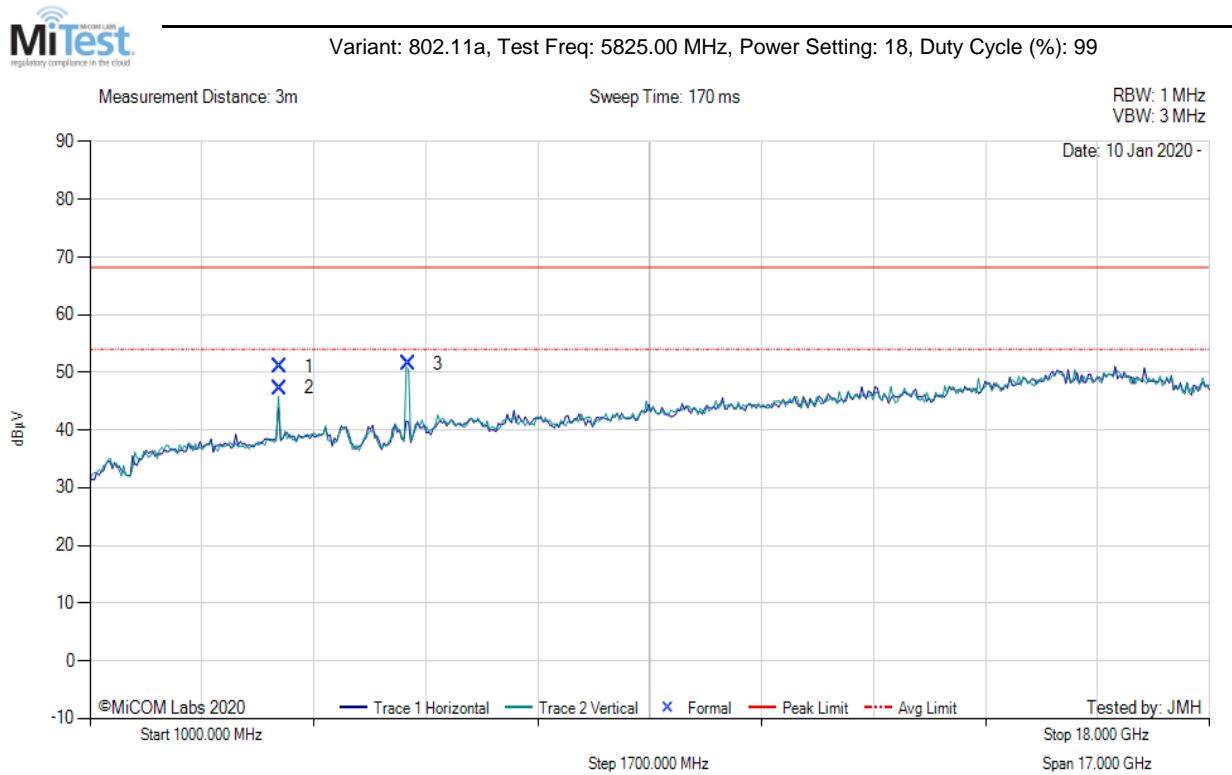
Variant: 802.11a, Test Freq: 5785.00 MHz, Power Setting: 18, Duty Cycle (%): 99



1000.00 - 18000.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
1	3856.64	61.52	2.57	-12.01	52.08	Max Peak	Vertical	150	224	68.2	-16.2	Pass	
2	3856.64	57.76	2.57	-12.01	48.32	Max Avg	Vertical	150	224	54.0	-5.7	Pass	
3	5791.31	56.49	3.14	-10.85	48.78	Peak (NRB)	Vertical	151	131	--	--	Pass	

Test Notes: EUT powered by POE injector. 5 GHz notch in front of amp to prevent overload

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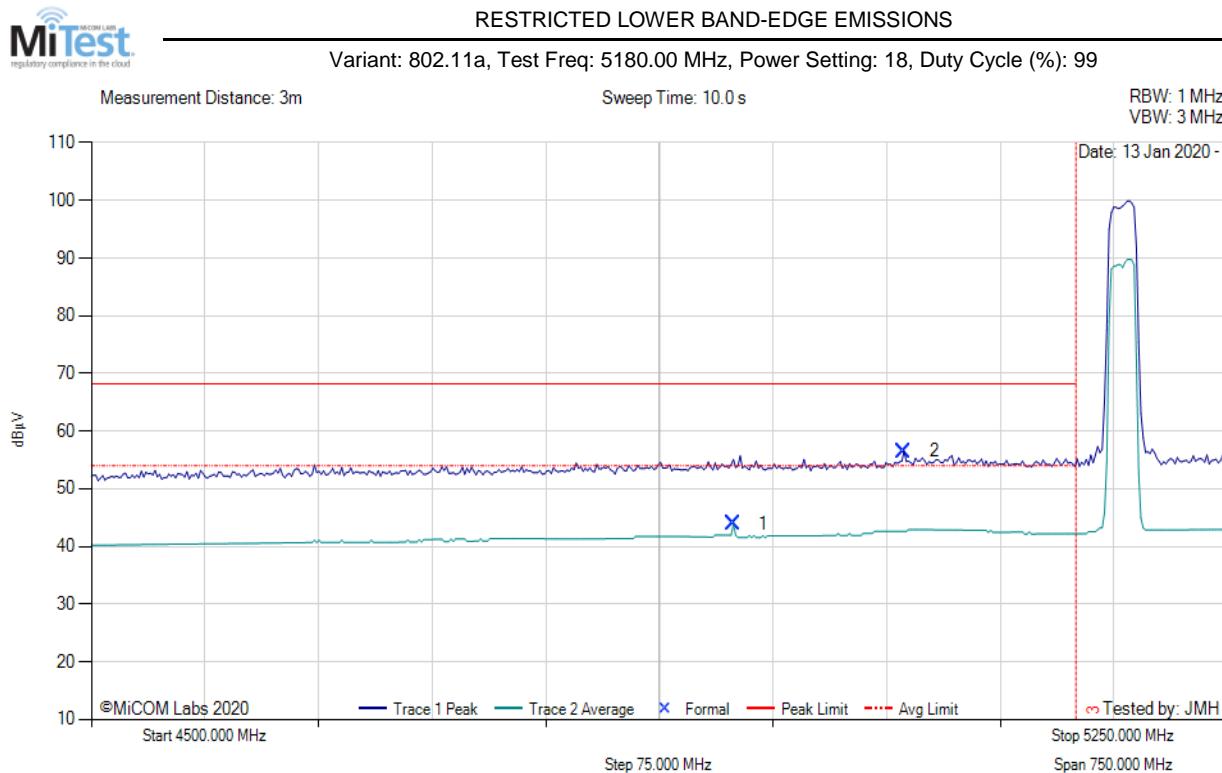


1000.00 - 18000.00 MHz												
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail
1	3883.39	60.51	2.56	-12.04	51.03	Max Peak	Vertical	117	298	68.2	-17.2	Pass
2	3883.39	56.80	2.56	-12.04	47.32	Max Avg	Vertical	117	298	54.0	-6.7	Pass
3	5829.89	59.24	3.14	-10.84	51.54	Peak (NRB)	Vertical	150	93	--	--	Pass

Test Notes: EUT powered by POE injector, 5 GHz notch in front of amp to prevent overload

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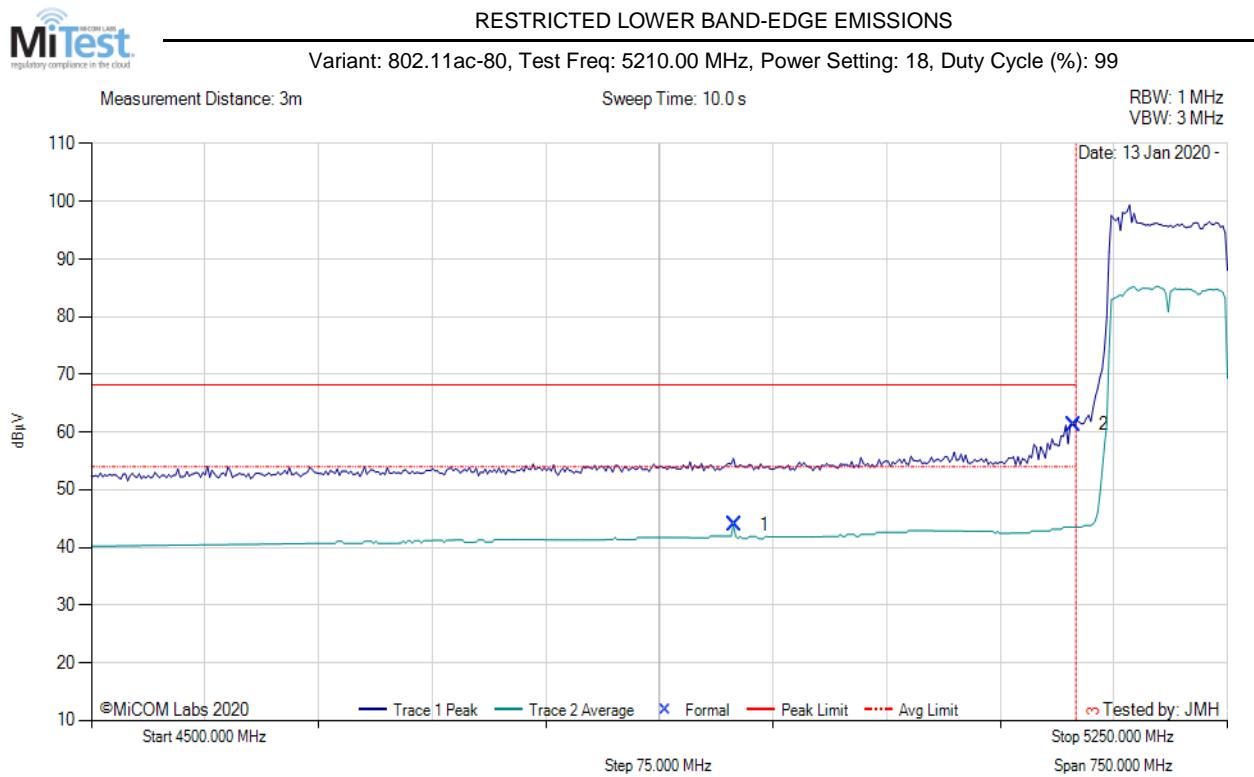
A.1.2. Restricted Edge & Band-Edge Emissions



4500.00 - 5250.00 MHz													
Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail	
1	4923.85	6.91	2.98	34.00	43.89	Max Avg	Vertical	119	60	54.0	-10.1	Pass	
2	5036.57	19.54	2.89	34.10	56.53	Max Peak	Vertical	119	60	68.2	-11.7	Pass	
3	5150.00	--	--	--	--	Restricted-Band	--	--	--	--	--	--	

Test Notes: EUT powered by POE injector.

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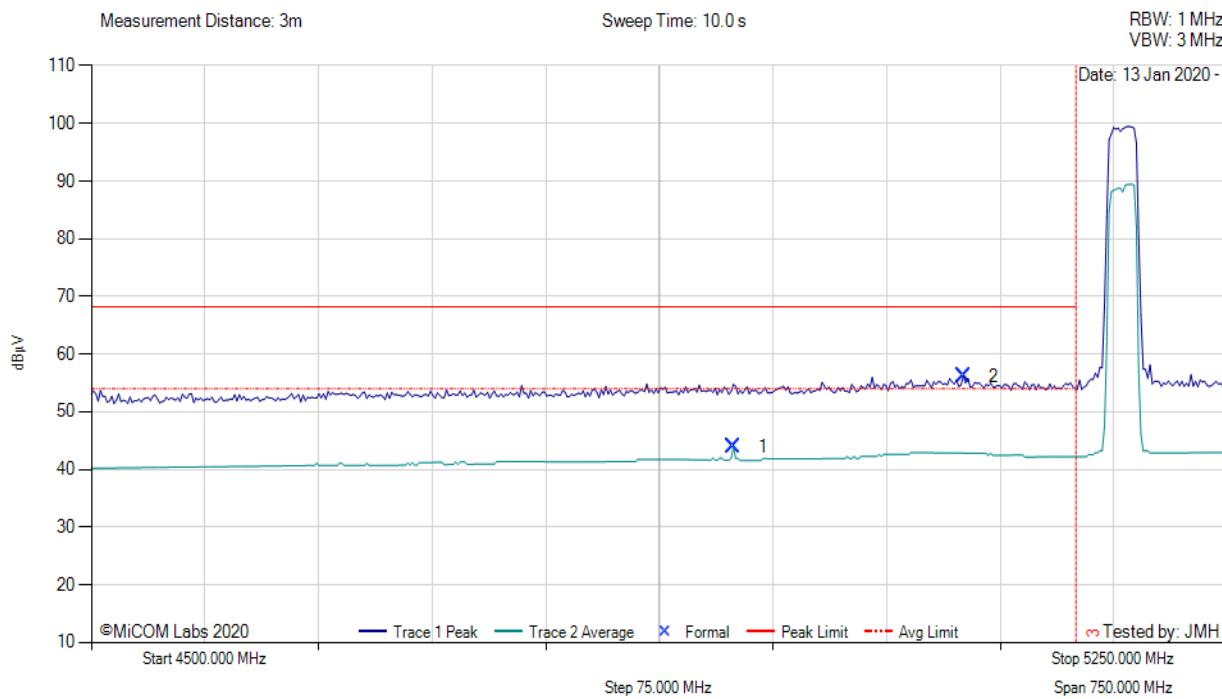


4500.00 - 5250.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
1	4924.55	6.92	2.97	34.00	43.89	Max Avg	Vertical	119	60	54.0	-10.1	Pass	
2	5148.50	24.22	2.91	34.21	61.34	Max Peak	Vertical	119	60	68.2	-6.9	Pass	
3	5150.00	--	--	--	--	Restricted-Band	--	--	--	--	--	--	

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RESTRICTED LOWER BAND-EDGE EMISSIONS

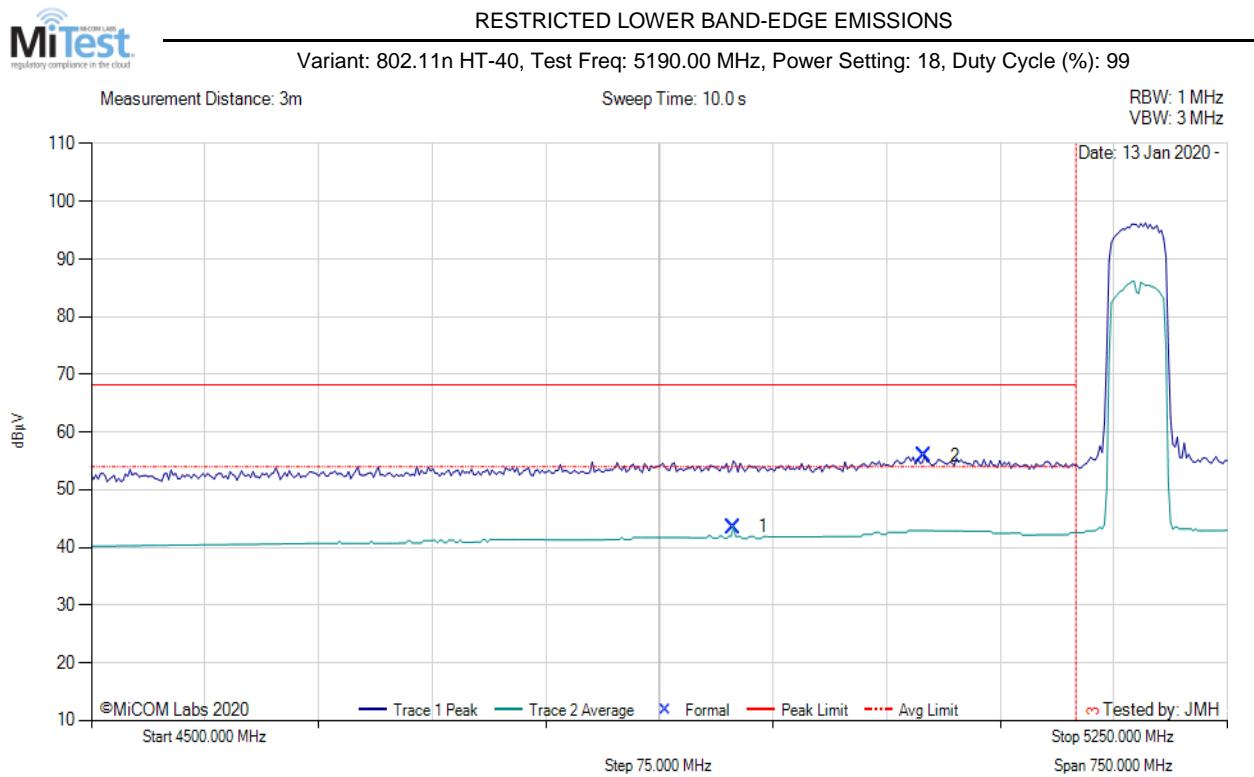
Variant: 802.11n HT-20, Test Freq: 5180.00 MHz, Power Setting: 18, Duty Cycle (%): 99



4500.00 - 5250.00 MHz													
Num	Frequency MHz	Raw dBμV	Cable Loss dB	AF dB/m	Level dBμV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBμV/m	Margin dB	Pass /Fail	
1	4923.85	6.91	2.98	34.00	43.89	Max Avg	Vertical	119	60	54.0	-10.1	Pass	
2	5075.65	19.20	2.91	34.11	56.22	Max Peak	Vertical	119	60	68.2	-12.0	Pass	
3	5150.00	--	--	--	--	Restricted-Band	--	--	--	--	--	--	

Test Notes: EUT powered by POE injector.

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4500.00 - 5250.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
1	4923.85	6.61	2.98	34.00	43.59	Max Avg	Vertical	119	60	54.0	-10.4	Pass	
2	5050.10	18.84	2.92	34.11	55.87	Max Peak	Vertical	119	60	68.2	-12.4	Pass	
3	5150.00	--	--	--	--	Restricted-Band	--	--	--	--	--	--	

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RESTRICTED LOWER BAND-EDGE EMISSIONS

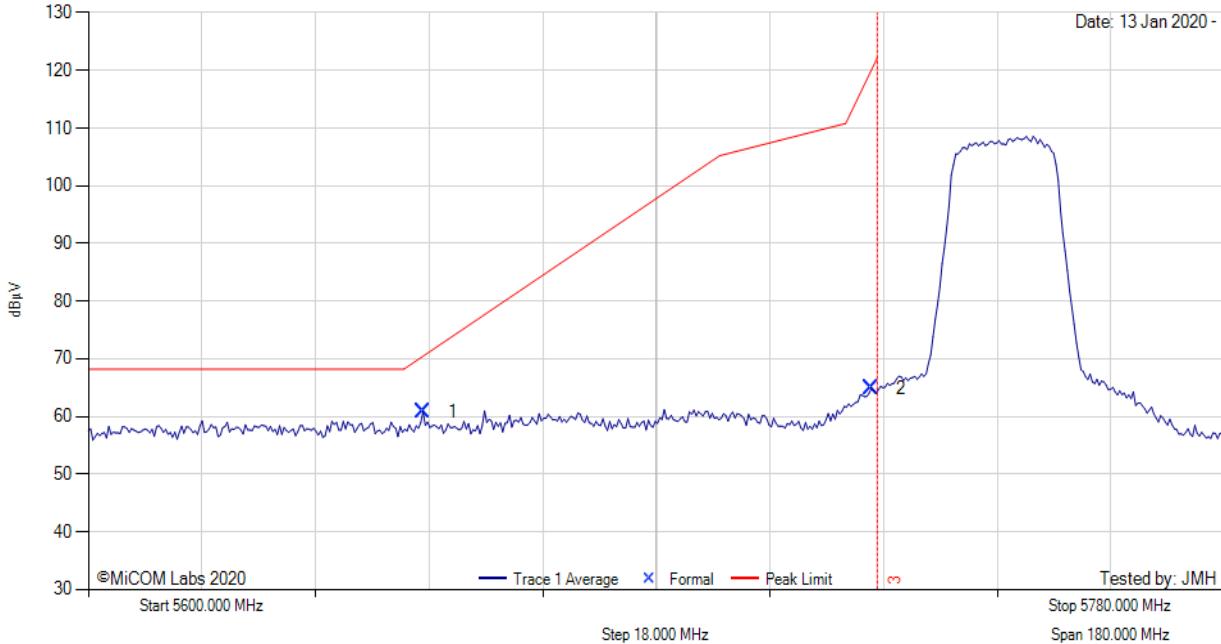


Variant: 802.11a, Test Freq: 5745.00 MHz, Power Setting: 18, Duty Cycle (%): 99

Measurement Distance: 3m

Sweep Time: 10.0 s

RBW: 1 MHz
VBW: 3 MHz



5600.00 - 5780.00 MHz												
Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	5652.96	23.09	3.10	34.63	60.82	Max Peak	Vertical	124	64	70.4	-9.6	Pass
2	5723.92	27.00	3.19	34.72	64.91	Max Peak	Vertical	124	64	119.9	-55.0	Pass
3	5725.00	--	--	--	--	Band-Edge	--	--	--	--	--	--

Test Notes: EUT powered by POE injector.

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RESTRICTED LOWER BAND-EDGE EMISSIONS

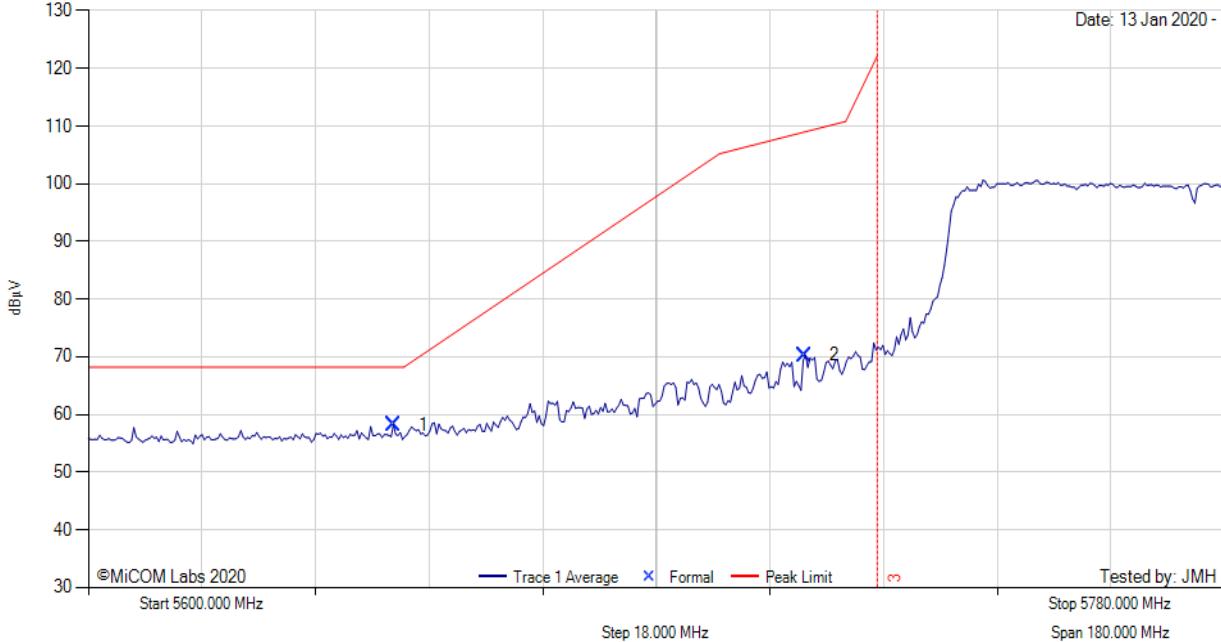


Variant: 802.11ac-80, Test Freq: 5775.00 MHz, Power Setting: 18, Duty Cycle (%): 92

Measurement Distance: 3m

Sweep Time: 10.0 s

RBW: 1 MHz
VBW: 3 MHz



5600.00 - 5780.00 MHz												
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail
1	5648.27	20.50	3.08	34.63	58.21	Max Peak	Vertical	124	64	68.2	-10.0	Pass
2	5713.46	32.48	3.14	34.70	70.32	Max Peak	Vertical	124	64	108.8	-38.5	Pass
3	5725.00	--	--	--	--	Band-Edge	--	--	--	--	--	--

Test Notes: EUT powered by POE injector.

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RESTRICTED LOWER BAND-EDGE EMISSIONS



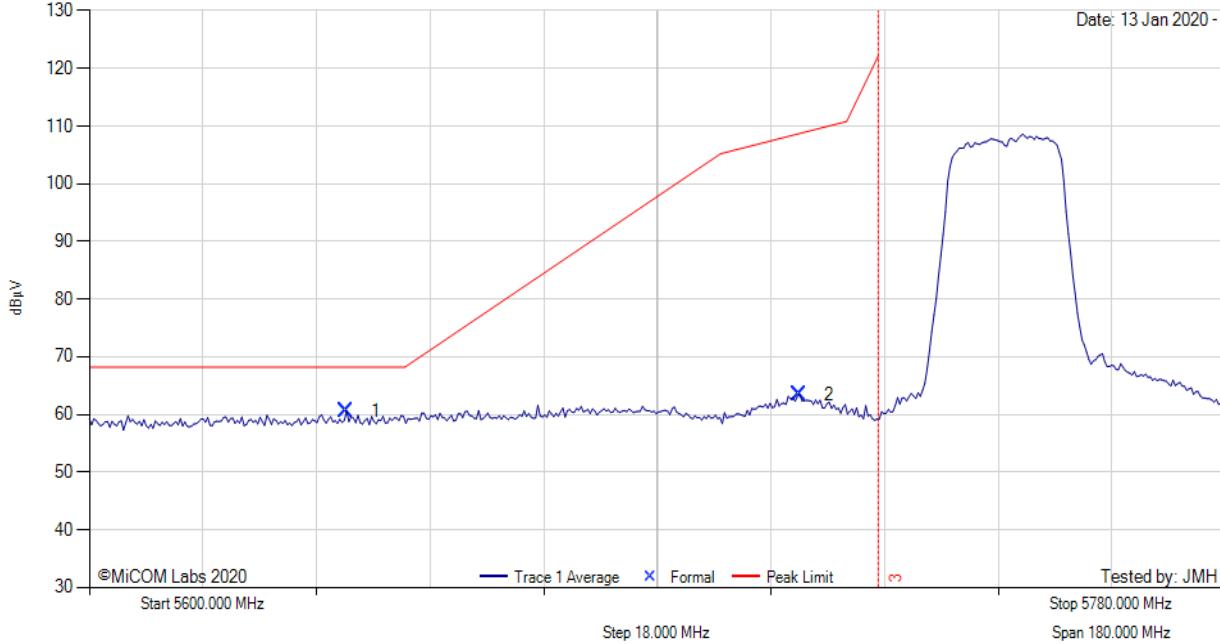
Variant: 802.11n HT-20, Test Freq: 5745.00 MHz, Power Setting: 18, Duty Cycle (%): 99

Measurement Distance: 3m

Sweep Time: 10.0 s

RBW: 1 MHz
VBW: 3 MHz

Date: 13 Jan 2020 -



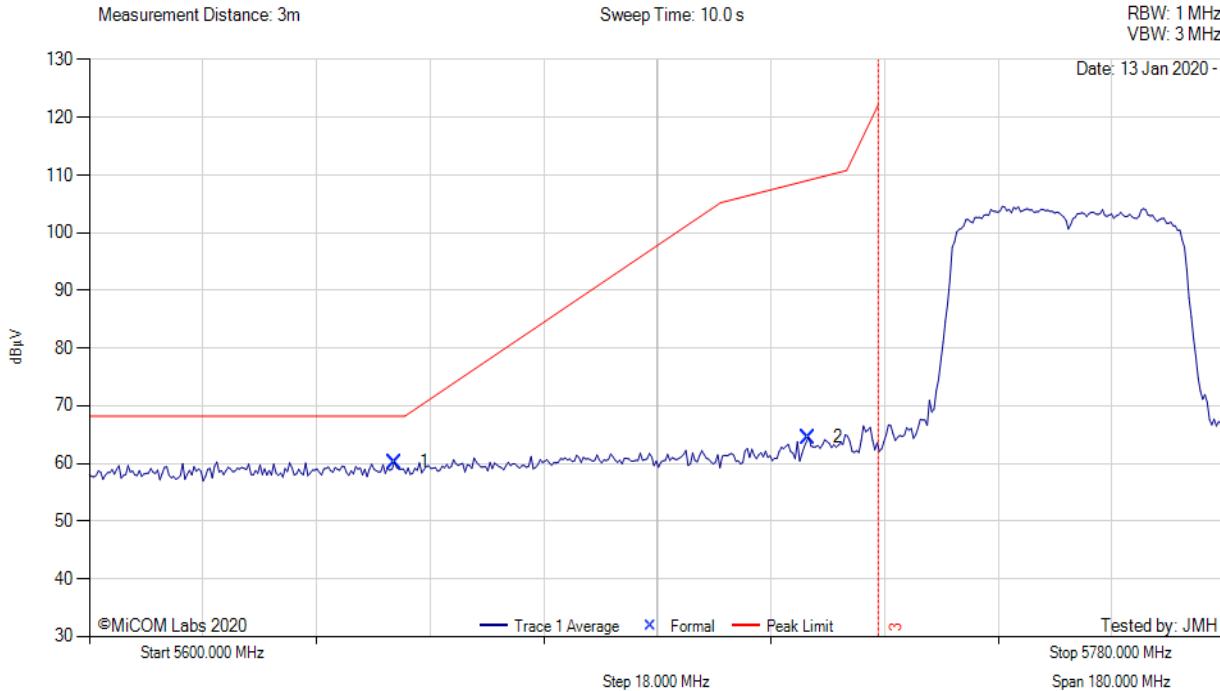
5600.00 - 5780.00 MHz												
Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	5640.69	22.85	3.10	34.64	60.59	Max Peak	Vertical	124	64	68.2	-7.6	Pass
2	5712.37	25.64	3.13	34.70	63.47	Max Peak	Vertical	124	64	108.6	-45.1	Pass
3	5725.00	--	--	--	--	Band-Edge	--	--	--	--	--	--

Test Notes: EUT powered by POE injector.

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RESTRICTED LOWER BAND-EDGE EMISSIONS

Variant: 802.11n HT-40, Test Freq: 5755.00 MHz, Power Setting: 18, Duty Cycle (%): 99

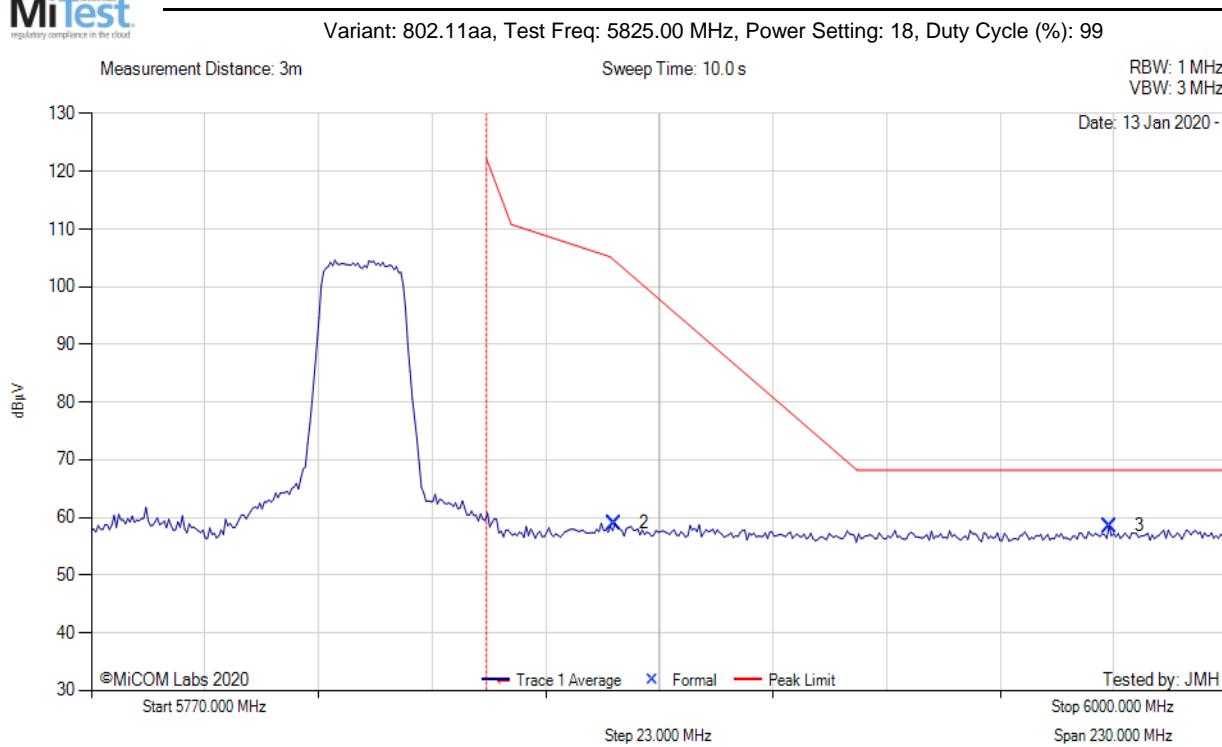


5600.00 - 5780.00 MHz													
Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail	
1	5648.27	22.55	3.08	34.63	60.26	Max Peak	Vertical	124	64	68.2	-8.0	Pass	
2	5713.82	26.67	3.15	34.70	64.52	Max Peak	Vertical	124	64	109.1	-44.6	Pass	
3	5725.00	--	--	--	--	Band-Edge	--	--	--	--	--	--	

Test Notes: EUT powered by POE injector.

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RESTRICTED UPPER BAND-EDGE EMISSIONS



5770.00 - 6000.00 MHz													
Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail	
2	5875.81	20.77	3.20	35.03	59.00	Max Peak	Vertical	124	64	105.3	-46.3	Pass	
3	5976.15	20.17	3.18	35.18	58.53	Max Peak	Vertical	124	64	68.2	-9.7	Pass	
1	5850.00	--	--	--	--	Band-Edge	--	--	--	--	--	--	

Test Notes: EUT powered by POE injector.

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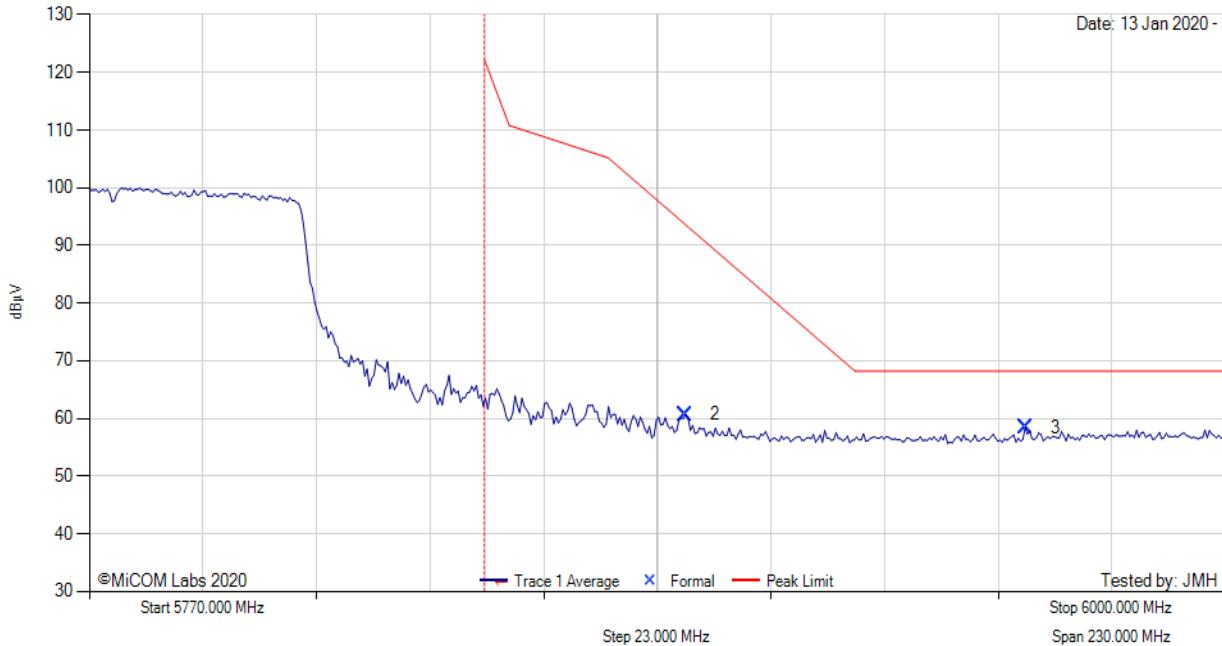
RESTRICTED UPPER BAND-EDGE EMISSIONS

Variant: 802.11ac-80, Test Freq: 5775.00 MHz, Power Setting: 18, Duty Cycle (%): 92

Measurement Distance: 3m

Sweep Time: 10.0 s

RBW: 1 MHz
VBW: 3 MHz



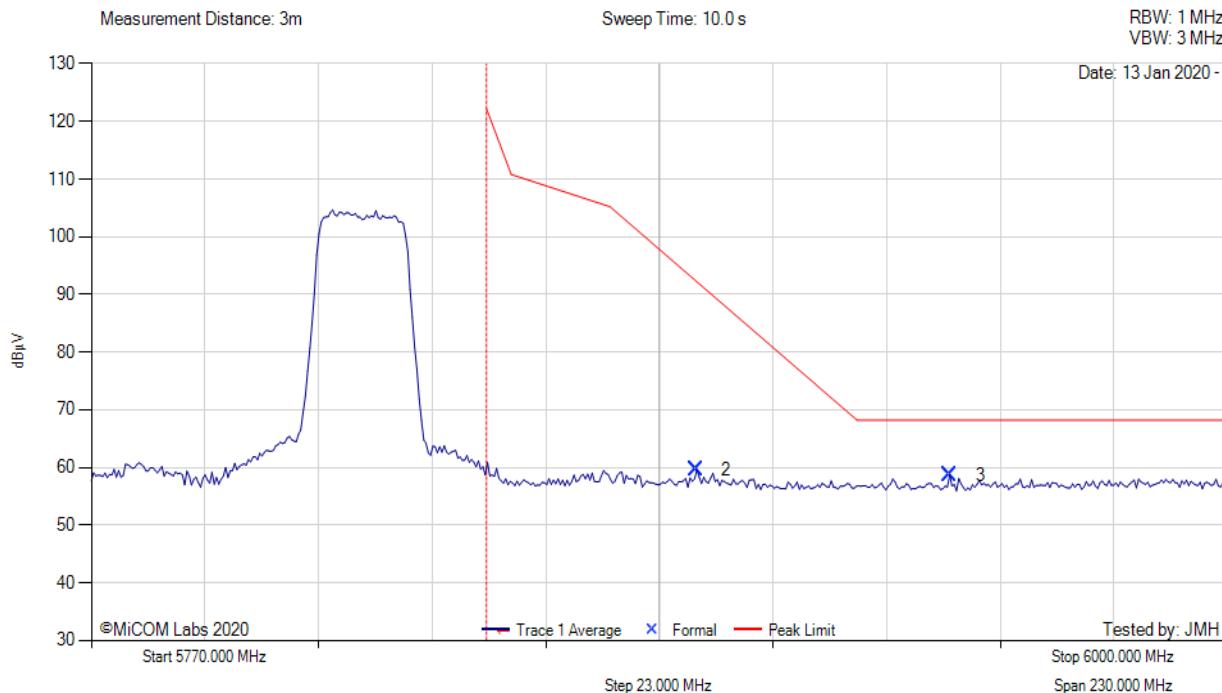
5770.00 - 6000.00 MHz												
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail
2	5890.56	22.41	3.20	35.07	60.68	Max Peak	Vertical	124	64	97.1	-36.4	Pass
3	5959.56	20.04	3.19	35.14	58.37	Max Peak	Vertical	124	64	68.2	-9.9	Pass
1	5850.00	--	--	--	--	Band-Edge	--	--	--	--	--	--

Test Notes: EUT powered by POE injector.

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RESTRICTED UPPER BAND-EDGE EMISSIONS

Variant: 802.11n HT-20, Test Freq: 5825.00 MHz, Power Setting: 18, Duty Cycle (%): 99



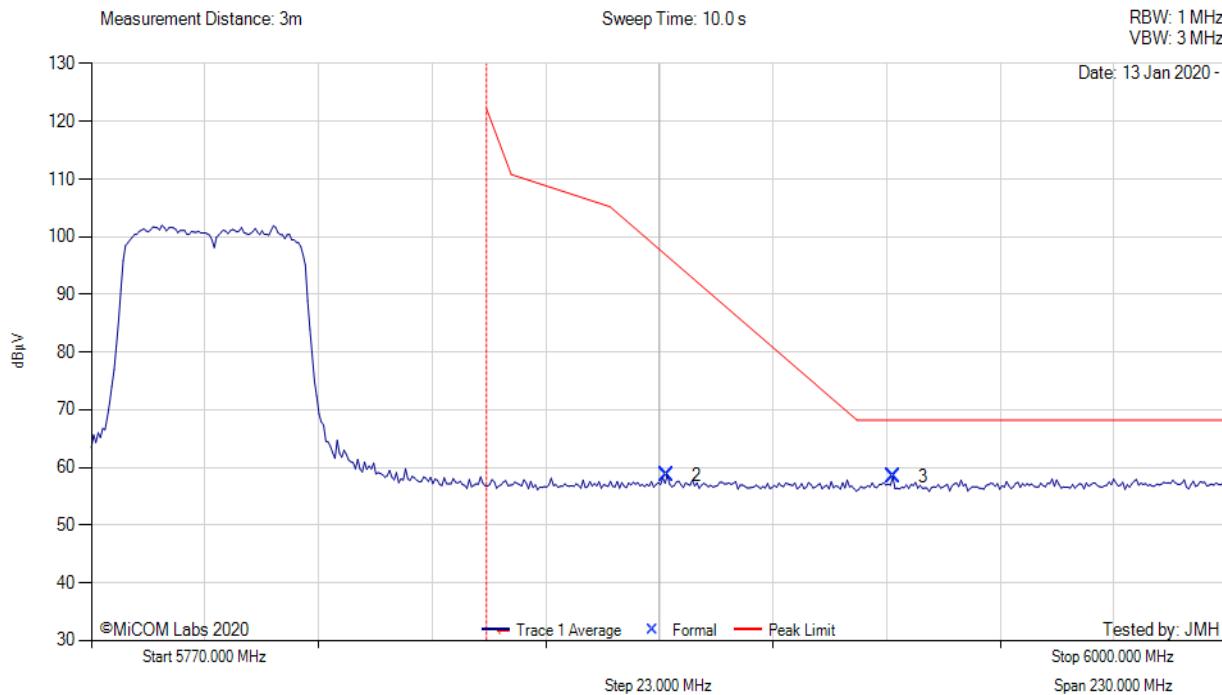
5770.00 - 6000.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
2	5892.40	21.32	3.20	35.08	59.60	Max Peak	Vertical	124	64	96.2	-49.8	Pass	
3	5943.89	20.42	3.16	35.12	58.70	Max Peak	Vertical	124	64	68.2	-9.5	Pass	
1	5850.00	--	--	--	--	Band-Edge	--	--	--	--	--	--	

Test Notes: EUT powered by POE injector.

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RESTRICTED UPPER BAND-EDGE EMISSIONS

Variant: 802.11n HT-40, Test Freq: 5795.00 MHz, Power Setting: 18, Duty Cycle (%): 99



5770.00 - 6000.00 MHz													
Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail	
2	5886.41	20.46	3.19	35.06	58.71	Max Peak	Vertical	124	64	98.1	--	Pass	
3	5932.36	20.03	3.21	35.11	58.35	Max Peak	Vertical	124	64	68.2	-9.9	Pass	
1	5850.00	--	--	--	--	Band-Edge	--	--	--	--	--	--	

Test Notes: EUT powered by POE injector.

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