



REGULATORY COMPLIANCE TEST REPORT

FCC CFR 47 Pt 15.407

Report No.: RDWN71-U2 Master Rev A

Company: Radwin Ltd.

Model: AP0260210

MASTER TEST REPORT

FROM



Test of: AP0260210

To: FCC CFR 47 Part 15 Subpart E 15.407

Test Report Serial No.: RDWN71-U2 Master Rev A

This report supersedes: NONE

Applicant: Radwin Ltd.
27 Habarzel Street
Tel Aviv, 6971039
Israel

Issue Date: 26th August 2020

Master Document Number	Addendum Reports
RDWN71-U2 Master	RDWN71-U2 Conducted
	RDWN71-U2 Radiated

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 17025:2017. 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>



1.2. RECOGNITION

MiCOM Labs, Inc has widely recognized wireless testing and certification capabilities. In addition to being recognized for Testing and Certification under Phase 2 agreements with Canada, Europe and Japan, our international recognition includes Conformity Assessment Body designation under Phase 1 agreements with APEC MRA countries. MiCOM Labs test reports are accepted globally.

Country	Recognition Body	Status	MRA Phase	Identification No.
USA	Federal Communications Commission (FCC)	TCB	-	US0159 Test Firm Designation#: US1084
Canada	Industry Canada (ISED)	FCB	APEC MRA 2	US0159 ISED#: 4143A
Japan	MIC (Ministry of Internal Affairs and Communication)	CAB	Japan MRA 2	RCB 210
	Japan Approvals Institute for Telecommunication Equipment (JATE)			
	VCCI	--	--	A-0012
Europe	European Commission	NB	EU MRA 2	NB 2280
Mexico	Instituto Federal de Telecomunicaciones (IFT)	CAB	Mexico MRA 1	US0159
Australia	Australian Communications and Media Authority (ACMA)	CAB	APEC MRA 1	US0159
Hong Kong	Office of the Telecommunication Authority (OFTA)			
Korea	Ministry of Information and Communication Radio Research Laboratory (RRL)			
Singapore	Infocomm Development Authority (IDA)			
Taiwan	National Communications Commission (NCC) Bureau of Standards, Metrology and Inspection (BSMI)			
Vietnam	Ministry of Communication (MIC)			

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.

MRA 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>



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	28th July 2020	Draft report for client review
Draft 2	12th August 2020	Draft report revised per client comments.
Rev A	26 th August 2020	Initial release.
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In the above table the latest report revision will replace all earlier versions.

3. TEST RESULT CERTIFICATE

Manufacturer: Radwin Ltd. 27 Habarzel Street Tel Aviv 6971039 Israel	Tested By: MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA
Model: AP0260210	Telephone: +1 925 462 0304 +1 925 462 0306
Type Of Equipment: 5 GHz MS RF Module	Fax:
S/N's: Sample Unit#1	
Test Date(s): 1 st to 21 st July 2020	Website: www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC CFR 47 Part 15 Subpart E 15.407	EQUIPMENT COMPLIES

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	October 2019	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	FCC 06-96	Jun 30 2006	Memorandum Opinion and Order
IX	FCC 47 CFR Part 15.407	2020	Radio Frequency Devices; Subpart E –Unlicensed National Information Infrastructure Devices
X	M 3003	Edition 3 Nov.2012	Expression of Uncertainty and Confidence in Measurements
XI	FCC 47 CFR Part 2.1033	2020	FCC requirements and rules regarding photographs and test setup diagrams.
XII	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.
XIII	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 Radwin Ltd. AP0260210 RF Module to FCC CFR 47 Part 15 Subpart E 15.407. Compliance Measurement Procedures for Unlicensed National Information Infrastructure devices operating in the 5150 to 5250 MHz and 5725 to 5850 MHz bands.
Applicant:	Radwin Ltd. 27 Habarzel Street Tel Aviv, 6971039 Israel
Manufacturer:	Radwin Ltd.
Laboratory performing the tests:	MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA
Test report reference number:	RDWN71-U2 Master
Date EUT received:	29 th June 2020
Standard(s) applied:	FCC CFR 47 Part 15 Subpart E 15.407
Dates of test (from - to):	1st to 21st July 2020
No of Units Tested:	1
Product Family Name:	5 GHz MS RF Module
Model(s):	AP0260210
Location for use:	Outdoors
Declared Frequency Range(s):	5150 - 5250 MHz; 5725 - 5850 MHz;
Type of Modulation:	OFDM
EUT Modes of Operation:	20 MHz; 40 MHz; 80 MHz;
Declared Nominal Output Power (dBm):	30 dBm
Transmit/Receive Operation:	Transceiver
Rated Input Voltage and Current:	POE: AC Input 100-240V 50/60 Hz 1.5A DC Output 55VDC 1.0A
Operating Temperature Range:	-40°C to +60°C
ITU Emission Designator:	20 MHz: 17M6W7W 40 MHz: 36M4W7W 80 MHz: 76M6W7W
Equipment Dimensions:	0.3 / 1.9 / 2.0 in
Weight:	0.042 Lb
Hardware Rev:	AP0260210
Software Rev:	A

5.2. Scope Of Test Program

AP0260210

The scope of the test program was to test the AP0260210, 5 GHz MS RF Module configurations 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

Compliance Measurement Procedures for Unlicensed National Information Infrastructure devices operating in the 5150 - 5250 MHz; 5725 - 5850 MHz bands.

Test Strategy;-

There are 12 different antenna options available. Testing was performed for “worst case” test setups to take into account all possible antenna configurations per the following;-

Conducted testing was performed assuming the lowest gain antenna (i.e. highest conducted power setting) for both Point to Multi Point and Point to Point configurations.

Radiated testing was performed for the highest gain antenna for each type of antenna. A total of 5 different antennas were tested as highlighted in in Section 5.4 “Antenna Details”.

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

Type	Description	Manufacturer	Model	Serial no.	Delivery Date
EUT	5 GHz MS RF Module	Radwin Ltd.	AP0260210	Sample Unit#1	29th June 2020
Host	RF Module Host	Radwin Ltd.	MultiSector	Sample Unit#1	29th June 2020
Support	PoE Injector	SinPro	CPU55A-112	--	--
Support	Laptop	Dell	--	--	--

5.4. Antenna Details

Highlighted antennas (total of 5) were tested during Radiated Emissions testing.

Type	Manufacturer	Model	Family	Gain (dBi)	BF Gain	Dir BW	X-Pol	Frequency Band (MHz)
integral	RADWIN	Integrated	Sector	14.0	-	90	-	5150 - 5250
integral	RADWIN	Integrated	Sector	16.0	-	90	-	5725 - 5850
integral	RADWIN	MT0105940	Directional	16.0	-	35	-	5150 - 5250
integral	RADWIN	MT0105940	Directional	16.5	-	35	-	5725 - 5850
external	RADWIN	RW-9061-5001	Sector	13.0	-	90	-	5150 - 5250
external	RADWIN	RW-9061-5001	Sector	13.0	-	90	-	5725 - 5850
external	RADWIN	RW-9061-5002	Sector	14.0	-	60	-	5150 - 5250
external	RADWIN	RW-9061-5002	Sector	14.0	-	60	-	5725 - 5850
external	RADWIN	RW-9061-5004	Sector	10.0	-	120	-	5150 - 5250
external	RADWIN	RW-9061-5004	Sector	10.0	-	120	-	5725 - 5850
external	RADWIN	RW-9061-5010	Sector	13.0	-	90	-	5150 - 5250
external	RADWIN	RW-9061-5010	Sector	15.0	-	90	-	5725 - 5850
external	RADWIN	RW-9105-4958	Directional	15.0	-	20	-	5150 - 5250
external	RADWIN	RW-9105-4958	Directional	15.0	-	20	-	5725 - 5850
external	RADWIN	RW-9105-5158	Directional	18.0	-	17	-	5150 - 5250
external	RADWIN	RW-9105-5158	Directional	18.0	-	17	-	5725 - 5850
external	RADWIN	RW-9613-4960	Directional	22.0	-	10	-	5150 - 5250
external	RADWIN	RW-9613-4960	Directional	22.0	-	10	-	5725 - 5850

external	RADWIN	RW-9622-5001	Directional	27.0	-	5	-	5150 - 5250
external	RADWIN	RW-9622-5001	Directional	27.0	-	5	-	5725 - 5850
external	RADWIN	RW-9721-5158	Parabolic	27.0	-	5.6	-	5150 - 5250
external	RADWIN	RW-9721-5158	Parabolic	27.0	-	5.6	-	5725 - 5850
external	RADWIN	RW-9732-4958	Parabolic	31.0	-	4	-	5150 - 5250
external	RADWIN	RW-9732-4958	Parabolic	31.0	-	4	-	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	Conn Type	Data Type	Bit Rate	Environment
Ethernet PoE IN	>30m	1	RJ45	Packet Data	1000	Outdoors

5.6. Test Configurations

Results for the following configurations are provided in this report:

Operational Mode(s) (20MHz/b/g/n/ac)	Data Rate with Highest Power Mbit/s	Channel Frequency (MHz)		
		Low	Mid	High
5150 - 5250 MHz				
20 MHz	6.5	5,180.00	5,210.00	5,240.00
40 MHz	13.5	5,190.00	5,210.00	5,230.00
80 MHz	29.3	--	5,210.00	--
5725 - 5850 MHz				
20 MHz	6.5	5,735.00	5,785.00	5,840.00
40 MHz	13.5	5,745.00	5,785.00	5,830.00
80 MHz	29.3	5,765.00	5,785.00	5,810.00

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

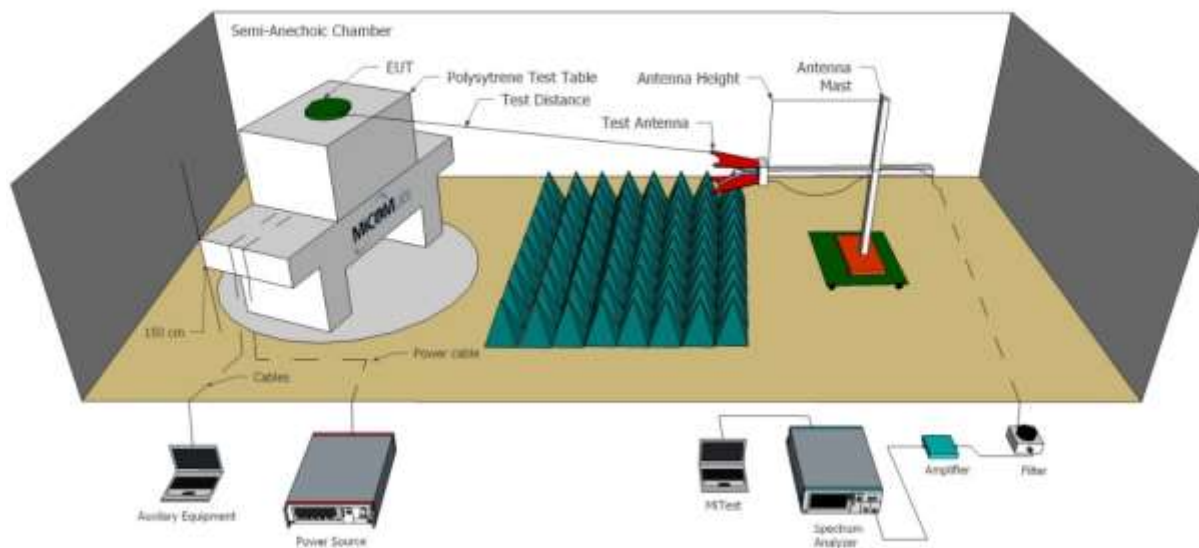
Test Header	Result
Peak Transmit Power	Complies
26 dB & 99% Bandwidth	Complies
Power Spectral Density	Complies
Radiated Spurious Emissions	Complies
TX Spurious & Restricted Band Emissions	Complies
Restricted Edge & Band-Edge Emissions	Complies
Digital Emissions	Complies
15.207 AC Wireline Emissions	Complies

7. TEST EQUIPMENT CONFIGURATION(S)

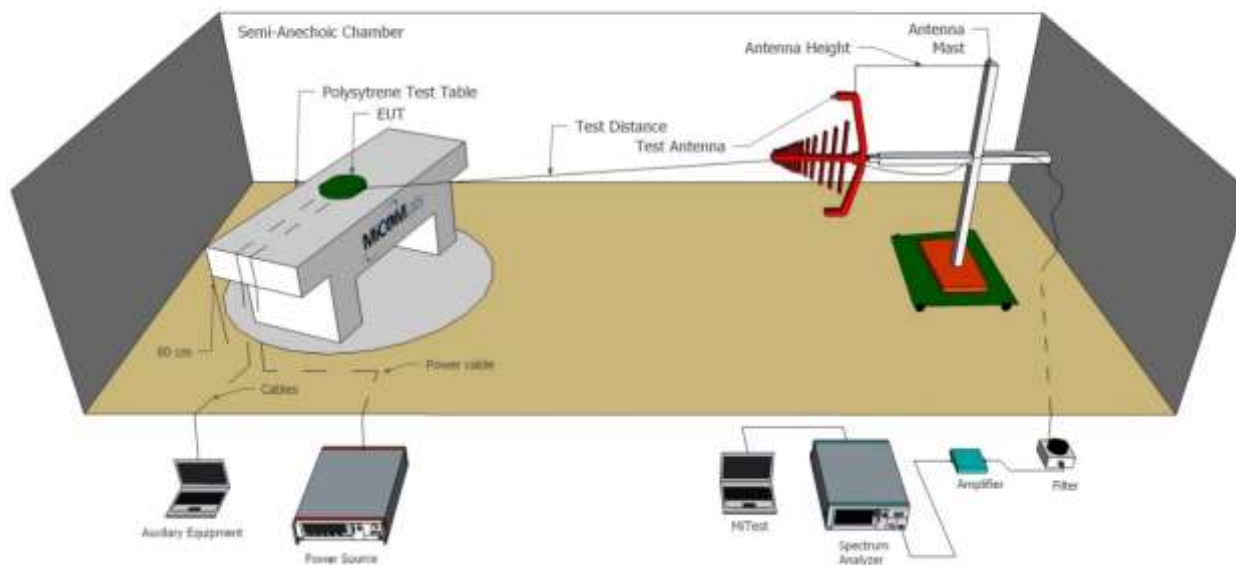
7.1. Radiated Emissions - 3m Chamber

The following tests were performed using the radiated test set-up shown in the diagram below. Radiated emissions above and below 1GHz.

Radiated Emissions Above 1GHz Test Setup



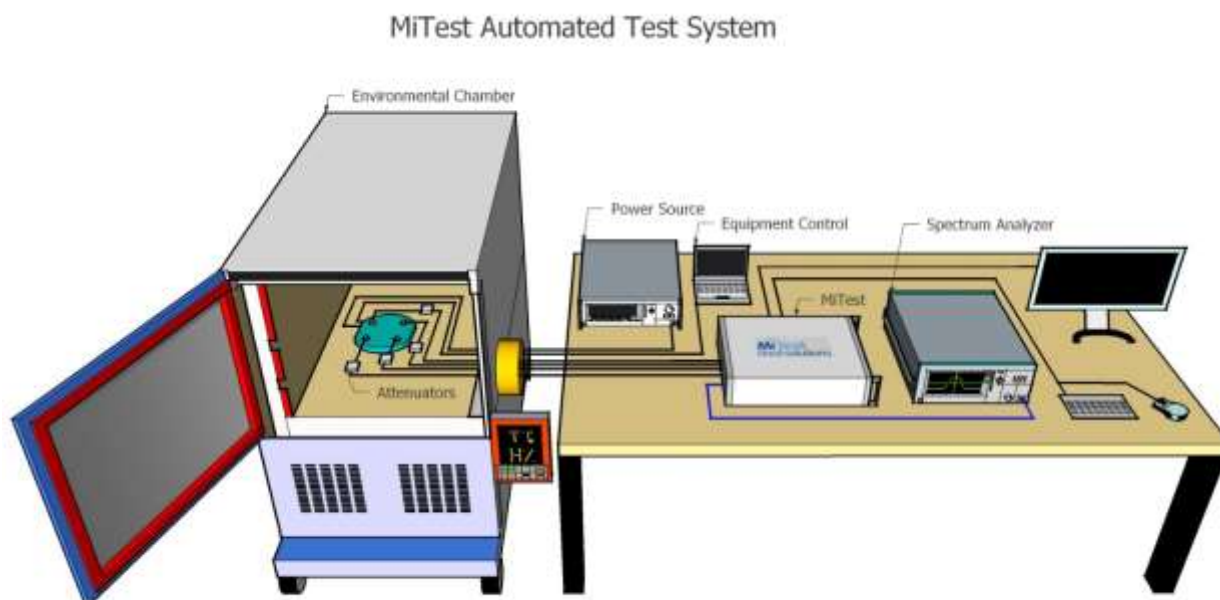
Radiated Emissions Below 1GHz Test Setup



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 Nov 2020
301	5470 to 5725 MHz Notch Filter	Microtronics	RBC50704	001	3 Sep 2020
302	5150 to 5350 MHz Notch Filter	Microtronics	BRC50703	002	3 Sep 2020
303	5725 to 5875 MHz Notch filter	Microtronics	BRC50705	003	3 Sep 2020
330	Variac 0-280 Vac	Staco Energy Co	3PN1020B	0546	Cal when used
336	Active loop Ant 10kHz to 30 MHz	EMCO	EMCO 6502	00060498	29 Nov 2020
338	Sunol 30 to 3000 MHz Antenna	Sunol	JB3	A052907	4 Apr 2021
342	2.4 GHz Notch Filter	EWT	EWT-14-0203	H1	3 Sep 2020
373	26III RMS Multimeter	Fluke	Fluke 26 series III	76080720	21 Sep 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 Sep 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
414	DC Power Supply 0-60V	HP	6274	1029A01285	Cal when used
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	MiCOM	Rad	447	Not Required

	Test Software		Emissions Test Software Version 1.0		
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-1000 MHz	Mini-Circuits	NLP-1200+	VUU01901402	3 Sep 2020
466	Low Pass Filter DC-1500 MHz	Mini-Circuits	NLP-1750+	VUU10401438	3 Sep 2020
469	Low pass filter	Mini Circuit	SLP-1000	None	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
87	Uninterruptible Power Supply	Falcon Electric	ED2000-1/2LC	F3471 02/01	Cal when used

7.2. Conducted



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

Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
#3 SA	MiTest Box to SA	Fairview Microwave	SCA1814-0101-72	#3 SA	9 Sep 2020
#3P1	EUT to MiTest box port 1	Fairview Microwave	SCA1814-0101-72	#3P1	9 Sep 2020
#3P2	EUT to MiTest box port 2	Fairview Microwave	SCA1814-0101-72	#3P2	9 Sep 2020
#3P3	EUT to MiTest box port 3	Fairview Microwave	SCA1814-0101-72	#3P3	9 Sep 2020
#3P4	EUT to MiTest box port 4	Fairview Microwave	SCA1812-0101-72	#3P4	9 Sep 2020
249	Thermocouple; Resistance Thermometer	Thermotronics	GR2105-02	9340 #2	30 Oct 2020
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	8 Oct 2020
378	Rohde & Schwarz 40 GHz Receiver with Generator	Rhode & Schwarz	ESIB40	100107/040	12 Oct 2020
398	MiTest RF Conducted Test Software	MiCOM	MiTest ATS	Version 4.1	Not Required
405	DC Power Supply 0-60V	Agilent	6654A	MY4001826	Cal when

					used
408	USB to GPIB interface	National Instruments	GPIB-USB HS	14C0DE9	Not Required
440	USB Wideband Power Sensor	Boonton	55006	9178	22 Sep 2020
441	USB Wideband Power Sensor	Boonton	55006	9179	20 Sep 2020
442	USB Wideband Power Sensor	Boonton	55006	9181	19 Sep 2020
445	PoE Injector	D-Link	DPE-101GL	QTAH1E2000625	Not Required
461	Spectrum Analyzer	Agilent	E4440A	MY46185537	20 Sep 2020
510	Barometer/Thermometer	Control Company	68000-49	170871375	20 Dec 2020
515	MiTest Cloud Solutions RF Test Box	MiCOM	2nd Gen with DFS	515	9 Sep 2020
534	Power Sensor 50 GHz - 70dBm to +20dBm	R&S	NRP50SN	1419.0093K02-100888-SB	26 Feb 2021
75	Environmental Chamber	Theratron	SE-300-2-2	27946	20 Feb 2021

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)



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