

Company: Itron

Test of: RIVA Modular LE

To: FCC CFR 47 Part 15 Subpart C 15.247
ISED IC RSS-247

Report No.: ITRO09-U2_Master Rev A

MASTER TEST REPORT



MASTER TEST REPORT



Test of: Itron RIVA Modular LE

To: FCC CFR 47 Part 15 Subpart C 15.247
ISED IC RSS-247

Test Report Serial No.: ITRO09-U2_Master Rev A

This report supersedes: NONE

Applicant: Itron
2111 N. Molter Rd
Liberty Lake, Washington 99019
USA

Issue Date: 8th March 2019

Master Document Number
ITRO09-U2_Master Rev A

Addendum Reports
ITRO09-U2_Conducted Rev A
ITRO09-U2_Radiated Rev A

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>



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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

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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



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2. DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft	5 th February 2019	
Rev A	8 th March 2019	Initial Release

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

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3. TEST RESULT CERTIFICATE

Manufacturer: Itron 2111 N. Molter Rd Liberty Lake Washington 99019 USA	Tested By: MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA
Model: RIVA Modular LE	Telephone: +1 925 462 0304 Fax: +1 925 462 0306
Type Of Equipment: RIVA Modular LE	
S/N's: 349F, 81FE	
Test Date(s): 22nd to 25th January 2019	Website: www.micomlabs.com

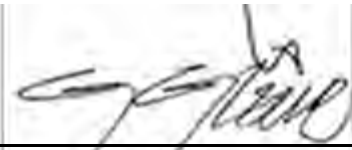
STANDARD(S)	TEST RESULTS
FCC CFR 47 Part 15 Subpart C 15.247 (FHSS) ISED RSS-247 Issue 2	EQUIPMENT COMPLIES

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.

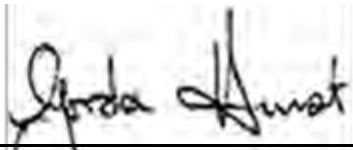
Notes:

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.



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4. REFERENCES AND MEASUREMENT UNCERTAINTY

4.1. Normative References

REF.	PUBLICATION	YEAR	TITLE
I	KDB 558074 D01 v05	24th August 2018	Guidance for Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices operating under section 15.247 of the FCC Rules.
II	A2LA	August 2018	R105 - Requirement's When Making Reference to A2LA Accreditation Status
III	ANSI C63.10	2013	American National Standard for Testing Unlicensed Wireless Devices
IV	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
V	CISPR 32	2015	Electromagnetic compatibility of multimedia equipment - Emission requirements
VI	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
VII	FCC 47 CFR Part 15, Subpart B	2014	Title 47: Telecommunication PART 15—RADIO FREQUENCY DEVICES, SubPart B; Unintentional Radiators
VIII	FCC 47 CFR Part 15.247	2016	Radio Frequency Devices; Subpart C – Intentional Radiators
IX	FCC Public Notice DA 00-705	March 2000	Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems
X	ICES-003	Issue 6 Jan 2016; Updated April 2017	Information Technology Equipment (Including Digital Apparatus) – Limits and methods of measurement.
XI	M 3003	Edition 3 Nov.2012	Expression of Uncertainty and Confidence in Measurements
XII	RSS-247 Issue 2	Feb 2017	Digital Transmission Systems (DTSs), Frequency Hopping System (FHSs) and Licence-Exempt Local Area Network (LE-LEN) Devices
XIII	RSS-Gen Issue 5	April 2018	General Requirements for Compliance of Radio Apparatus
XIV	FCC 47 CFR Part 2.1033	2016	FCC requirements and rules regarding photographs and test setup diagrams.

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.



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5. PRODUCT DETAILS AND TEST CONFIGURATIONS

5.1. Technical Details

Details	Description
Purpose:	Test of the Itron RIVA Modular LE to FCC CFR 47 Part 15 Subpart C 15.247 (FHSS). Radio Frequency Devices; Subpart C – Intentional Radiators
Applicant:	Itron 2111 N. Molter Rd Liberty Lake Washington 99019 USA
Manufacturer:	Itron
Laboratory performing the tests:	MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA
Test report reference number:	ITRO09-U2
Date EUT received:	22nd January 2019
Standard(s) applied:	FCC CFR 47 Part 15 Subpart C 15.247 (FHSS)
Dates of test (from - to):	22nd to 25th January 2019
No of Units Tested:	2
Product Family Name:	Itron Development Board
Model(s):	RIVA Modular LE
Location for use:	Both
Declared Frequency Range(s):	902 - 928 MHz;
Type of Modulation:	RIVA Modular LE
EUT Modes of Operation:	FSK,GFSK,OOK
Declared Nominal Output Power (dBm):	30 dBm
Transmit/Receive Operation:	Full
Rated Input Voltage and Current:	7.0 DC / 1.0A
Operating Temperature Range:	-40 - +85
ITU Emission Designator:	20K0F1D (GFSK modes) 20K2F1D (FSK mode) 283K01D (OOK mode)
Equipment Dimensions:	2.1875 x 1.0625 x .25 inches
Weight:	0.1 lbs
Hardware Rev:	C
Software Rev:	CSL V2 2.36.11.1, RFLAN V2.37.3.0

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5.2. Scope Of Test Program

Itron RIVA Modular LE

The scope of the test program was to test the Itron RIVA Modular LE configurations in the frequency ranges 902 - 928 MHz; for compliance against the following specification:

FCC CFR 47 Part 15 Subpart C 15.247 (FHSS)

Radio Frequency Devices; Subpart C – Intentional Radiators

ISED IC RSS-247 Issue 2 (FHSS)

This Radio Standard Specification sets out certification requirements for radio apparatus operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz employing frequency hopping, digital modulation and/or a combination (hybrid) of both techniques. It also includes licence-exempt local area network (LE-LAN) devices operating in the bands 5150-5250 MHz, 5250-5350 MHz, 5470-5725 MHz and 5725-5850 MHz as specified in SP-5150 MHz.

Itron RIVA Modular LE



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

Type (EUT/Support)	Equipment Description (Including Brand Name)	Mfr	Model No.	Serial No.
EUT	Composite Single Modular	ITRON	RIVA MOD LE	349F, 18FE
Support	Laptop	Dell		

5.4. Antenna Details

Type	Manufacturer	Model	Family	Gain (dBi)	BF Gain	Dir BW	X-Pol	Frequency Band (MHz)
external	Laird	0600-00048	OMNI	2.0	-	360	-	902 - 928
external	World Products	WPANT30088-S1A	OMNI	2.5	-	360	-	902 - 928

BF Gain - Beamforming Gain
Dir BW - Directional BeamWidth
X-Pol - Cross Polarization

5.5. Cabling and I/O Ports

None – castellated module

5.6. Test Configurations

Results for the following configurations are provided in this report:

Operational Mode(s)	Data Rate with Highest Power kbps	Channel Frequency (MHz)		
		Low	Mid	High
FSK	50	902.2	915.2	927.6
FSK	100	902.3	914.9	926.9
GFSK	10	902.2	915.2	927.75
GFSK	150	902.4	915.2	927.6
OOK	16.384	903	915	926.8

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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

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6. TEST SUMMARY

Test Header	Result
20 dB & 99% Bandwidth	Complies
Frequency Hopping Tests	
Number of Hopping Channels	Complies
Channel Separation	Complies
Dwell Time & Channel Occupancy	
Output Power	Complies
Unwanted Emissions	
Conducted Spurious Emissions	Complies
Conducted Band edge Emissions	Complies
Radiated Spurious Emissions	Complies

*Note Please refer to the addendum reports listed on the cover page for the tests listed above.

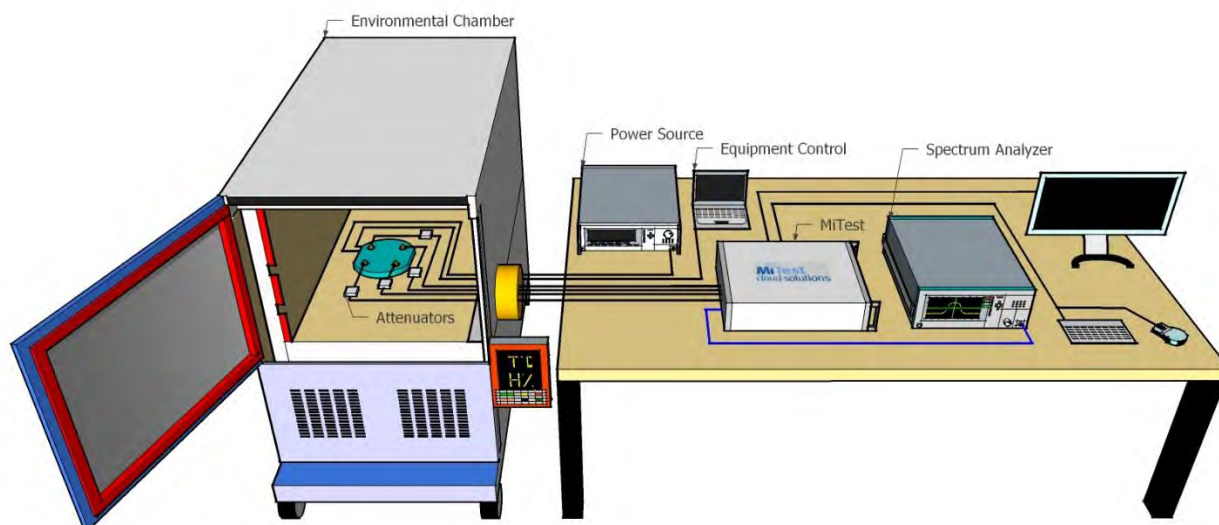
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7. TEST EQUIPMENT CONFIGURATION(S)

7.1. Conducted

Conducted RF Emission Test Set-up(s) The following tests were performed using the conducted test set-up shown in the diagram below.

MiTest Automated Test System



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
#3 SA	MiTest Box to SA	Fairview Microwave	SCA1814-0101-72	#3 SA	20 Jan 2019
#3P1	EUT to MiTest box port 1	Fairview Microwave	SCA1814-0101-72	#3P1	20 Jan 2019
#3P2	EUT to MiTest box port 2	Fairview Microwave	SCA1814-0101-72	#3P2	20 Jan 2019
#3P3	EUT to MiTest box port 3	Fairview Microwave	SCA1814-0101-72	#3P3	20 Jan 2019
#3P4	EUT to MiTest box port 4	Fairview Microwave	SCA1812-0101-72	#3P4	20 Jan 2019
249	Resistance Thermometer	Thermotronics	GR2105-02	9340 #2	30 Oct 2019
361	Desktop for RF#1, Labview Software installed	Dell	Vostro 220	WS RF#1	Not Required
378	Rohde & Schwarz 40	Rhode &	ESIB40	100107/040	12 Oct 2019

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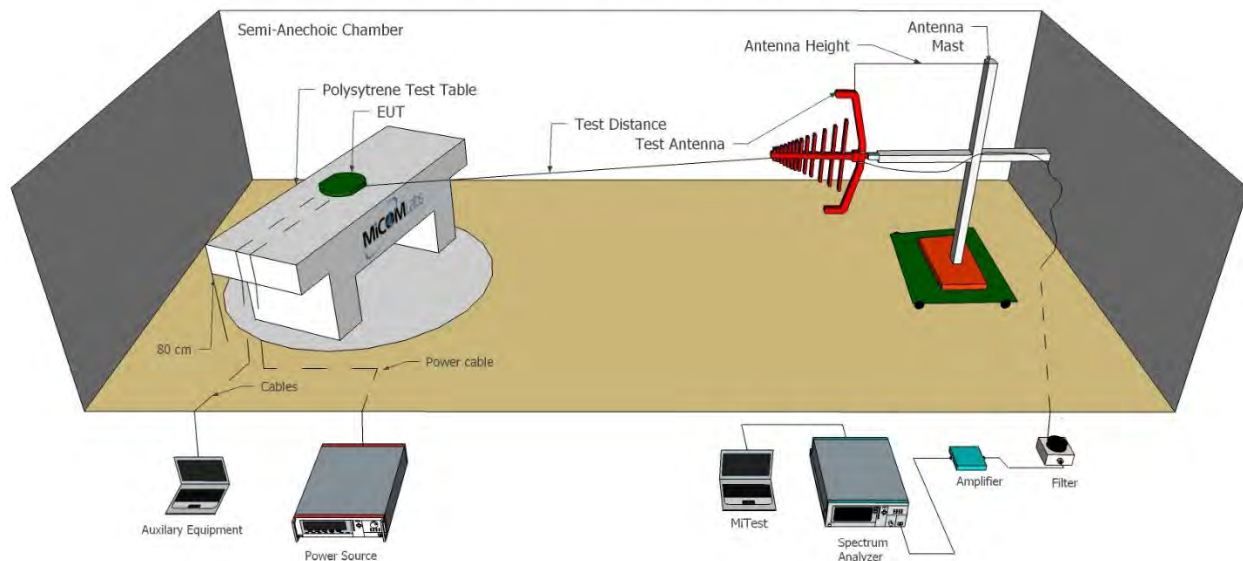
	GHz Receiver with Generator	Schwarz			
398	MiTest RF Conducted Test Software	MiCOM	MiTest ATS	Version 4.1	Not Required
405	DC Power Supply 0-60V	Agilent	6654A	MY4001826	Cal when used
408	USB to GPIB interface	National Instruments	GPIB-USB HS	14C0DE9	Not Required
436	USB Wideband Power Sensor	Boonton	55006	8731	14 Sep 2019
440	USB Wideband Power Sensor	Boonton	55006	9178	22 Sep 2019
441	USB Wideband Power Sensor	Boonton	55006	9179	20 Sep 2019
442	USB Wideband Power Sensor	Boonton	55006	9181	6 Oct 2019
445	PoE Injector	D-Link	DPE-101GL	QTAH1E2000625	Not Required
461	Spectrum Analyzer	Agilent	E4440A	MY46185537	20 Sep 2019
510	Barometer/Thermometer	Control Company	68000-49	170871375	11 Dec 2019
515	MiTest Cloud Solutions RF Test Box	MiCOM	2nd Gen with DFS	515	20 Jan 2019
75	Environmental Chamber	Thermatron	SE-300-2-2	27946	24 Feb 2019

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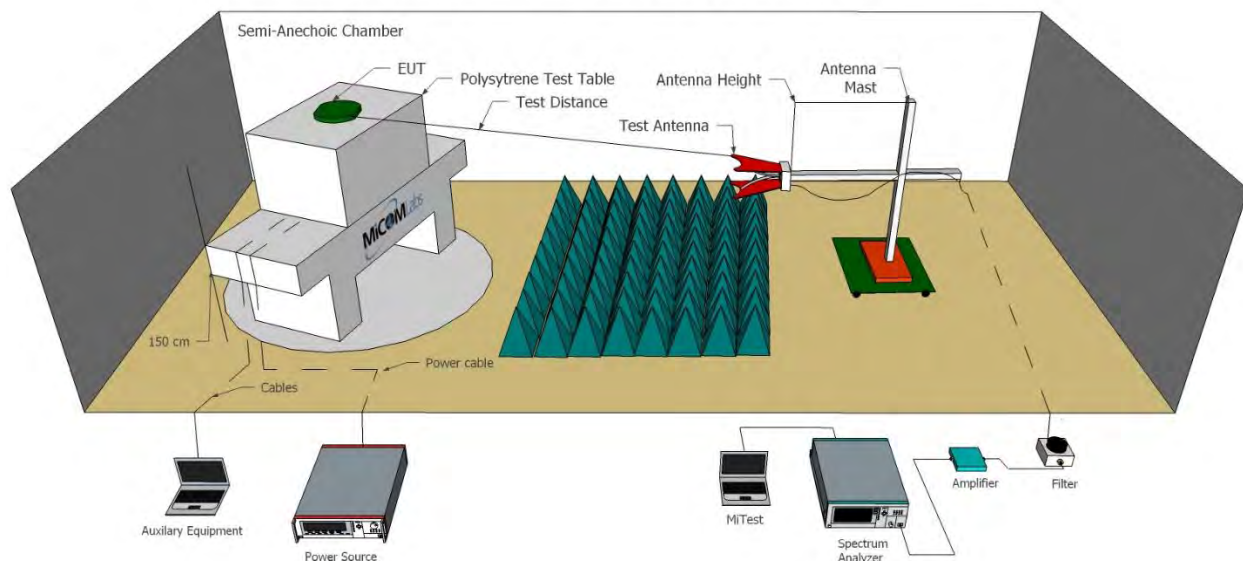
7.2. Radiated Emissions - 3m Chamber

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

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.

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Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
170	Video System Controller for Semi Anechoic Chamber	Panasonic	WV-CU101	04R08507	Not Required
298	3M Radiated Emissions Chamber Maintenance Check	MiCOM	3M Chamber	298	21 Feb 2019
338	Sunol 30 to 3000 MHz Antenna	Sunol	JB3	A052907	4 Apr 2019
341	900MHz Notch Filter	EWT	EWT-14-0199	H1	8 Oct 2019
346	1.6 TO 10GHz High Pass Filter	EWT	EWT-57-0112	H1	8 Oct 2019
373	26III RMS Multimeter	Fluke	Fluke 26 series III	76080720	21 Sep 2019
378	Rohde & Schwarz 40 GHz Receiver with Generator	Rhode & Schwarz	ESIB40	100107/040	12 Oct 2019
397	Amp 10 - 2500MHz	MiCOM Labs	Amp 10 - 2500 MHz	NA	12 Feb 2019
399	ETS 1-18 GHz Horn Antenna	ETS	3117	00154575	12 Oct 2019
406	Amplifier for Radiated Emissions	MiCOM Labs	40dB 1 to 18GHz Amp	0406	12 Feb 2019
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
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	9 Oct 2019
463	Schwarzbeck cable from Amplifier to Bulkhead.	Schwarzbeck	AK 9513	463	9 Oct 2019
464	Schwarzbeck cable from Bulkhead to Receiver	Schwarzbeck	AK 9513	464	9 Oct 2019
465	Low Pass Filter DC-1000 MHz	Mini-Circuits	NLP-1200+	VUU01901402	9 Oct 2019
480	Cable - Bulkhead to Amp	SRC Haverhill	157-3050360	480	24 Aug 2019
481	Cable - Bulkhead to	SRC Haverhill	151-3050787	481	24 Aug 2019

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	Receiver				
510	Barometer/Thermometer	Control Company	68000-49	170871375	11 Dec 2019
518	Cable - Amp to Antenna	SRC Haverhill	157-3051574	518	24 Aug 2019
87	Uninterruptible Power Supply	Falcon Electric	ED2000-1/2LC	F3471 02/01	Cal when used
CC05	Confidence Check	MiCOM	CC05	None	21 Feb 2019
VLF-1700	Low pass filter DC-1700 MHz	Mini Circuits	VLF-1700	None	8 Oct 2019

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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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