Company: Itron

Test of: RIVA Modular LE

To: FCC CFR 47 Part 15 Subpart C 15.249
ISED IC RSS-210

Report No.: ITRO09-U4 Rev A

TEST REPORT

TEST REPORT

FROM

MiCOM Labs
opening wireless markets

Test of: Itron RIVA Modular LE

To: FCC CFR 47 Part 15 Subpart C 15.249
ISED IC RSS-210

Test Report Serial No.: ITRO09-U4 Rev A

This report supersedes: NONE

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

Issue Date: 9th March 2019

This Test Report is Issued Under the Authority of:

MiCOM Labs, Inc.
575 Boulder Court
Pleasanton California 94566
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www.micomlabs.com

A2LA ACCREDITED
TESTING CERT #2381.01

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

Accredited Laboratory

A2LA has accredited

MiCOM LABS

Pleasanton, CA

for technical competence in the field of

Electrical Testing

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.

President and CEO
For the Accreditation Council
Certificate Number 2381.01
Valid to November 30, 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

President and CEO
For the Accreditation Council
Certificate Number 2381.02
Valid to November 30, 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	5th February 2019	Draft report for client review.
Rev A	9th March 2019	Initial Release

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

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:	81FE		
Test Date(s):	23rd - 25th January 2019	**Website:**	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC CFR 47 Part 15 Subpart C 15.249 **ISED RSS-210 Issue 9**	**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.

A2LA ACCREDITED
TESTING CERT #2381.01

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 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 15.249	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-210 Issue 2	Aug 2016	Licence-Exempt Radio Apparatus: Category I Equipment
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.

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 15.249 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-U4
Date EUT received:	22nd January 2019
Standard(s) applied:	FCC CFR 47 Part 15 Subpart C 15.249
Dates of test (from - to):	23rd to 25th January 2019
No of Units Tested:	1
Model(s):	RIVA Modular LE
Location for use:	Both
Declared Frequency Range(s):	908 MHz;
Type of Modulation:	RIVA Modular LE
EUT Modes of Operation:	OOK
Declared Nominal Output Power (dBm):	-1.25 dBm
Transmit/Receive Operation:	Full
Rated Input Voltage and Current:	7.0 DC / 1.0A
Operating Temperature Range:	-40 - +85
ITU Emission Designator:	283KK1D (OOK mode)
Equipment Dimensions:	2.1875 x 1.0625 x .25 inches
Weight:	0.10 lbs
Hardware Rev:	C
Software Rev:	CSL V2.36.11.1, RFLAN V2.37.3.0

5.2. Scope Of Test Program

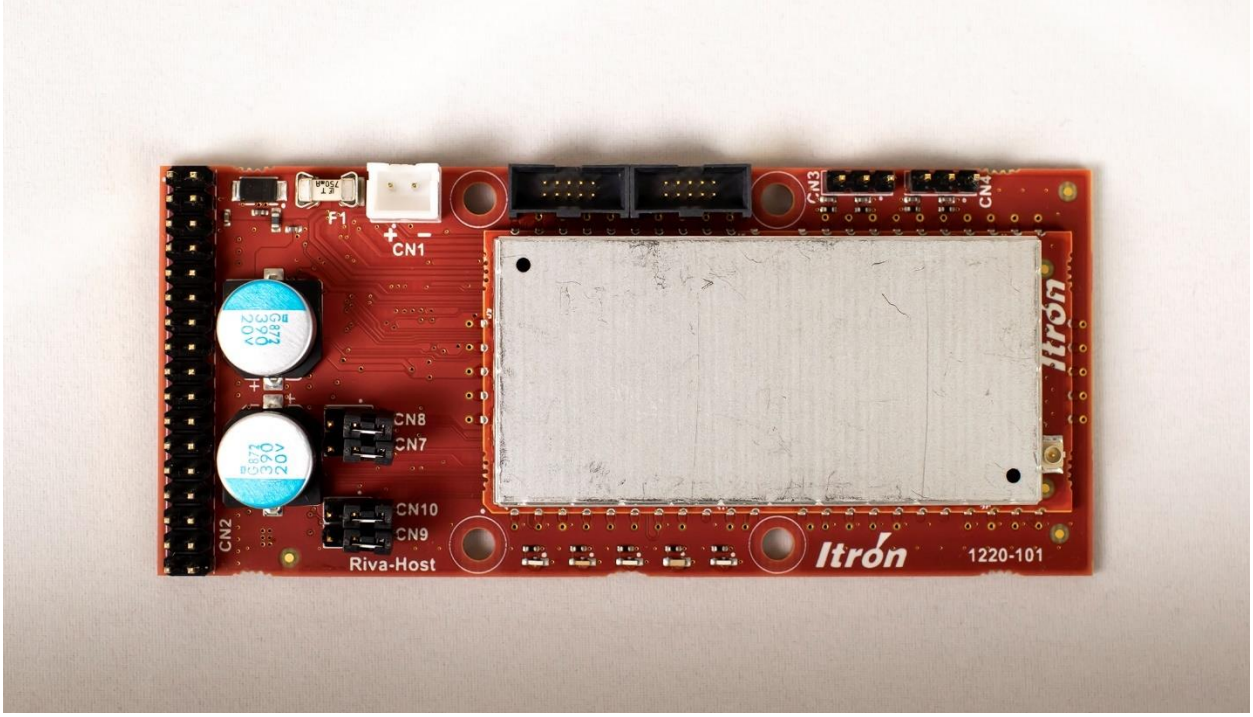
Itron RIVA Modular LE

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

FCC CFR 47 Part 15 Subpart C 15.249
Radio Frequency Devices; Subpart C – Intentional Radiators

ISED IC RSS-210 Issue 9
Radio Standard Specification RSS-210, *License-Exempt Radio Apparatus: Category I Equipment* sets out the requirements for equipment certification of several types of license-exempt radio apparatus.
Radio apparatus covered under this standard are primarily low-power and are mainly reserved for consumer or commercial purposes, applicable in all frequency bands. The requirements for equipment operating in specific frequency bands are described in the annexes of this RSS.

Itron RIVA Modular LE



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	81FE
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
OOK	16.384		908	

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

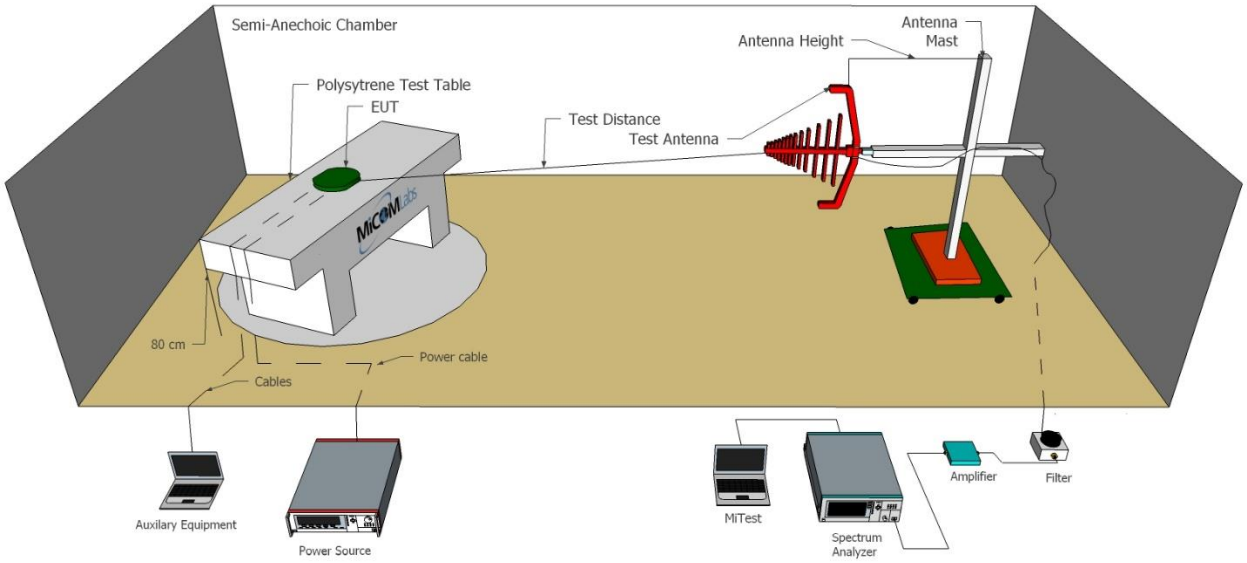
Test Header	Result
Field Strength	Complies
Unwanted Emissions	
Radiated Spurious Emissions	Complies
Occupied Bandwidth	Complies

7. TEST EQUIPMENT CONFIGURATION(S)

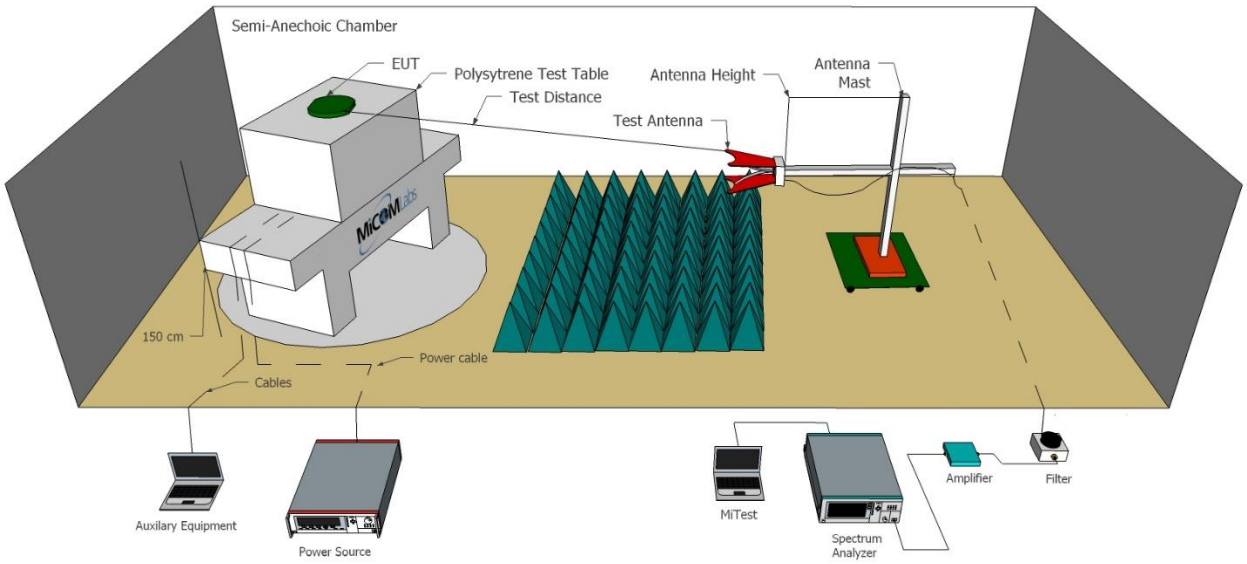
7.1. Radiated Emissions - 3m Chamber

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

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

	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

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)

8.1. Field Strength of Emissions

Radiated Test Conditions for Fundamental Emission Output Power			
Standard:	FCC CFR 47:15.249 ISED RSS 210	**Ambient Temp. (ºC):**	18.0 - 27.5
Test Heading:	Field Strength	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.249 (a), (c),(d) RSS-210.B.10	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Fundamental Emission Output Power Measurement

In the case of average power measurements an average detector was utilized.

Limits for Fundamental Emission Output Power

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

(c) Field strength limits are specified at a distance of 3 meters.

(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

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8.1.1 Laird Antenna 2 dBi

Equipment Configuration for Radiated Field Strength			
Antenna:	Laird 0600-00048	**Variant:**	Mode 3
Antenna Gain (dBi):	2.00	**Modulation:**	OOK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99
Channel Frequency (MHz):	908.00	**Data Rate:**	16384 Bit/s
Power Setting:	148	**Tested By:**	JMH

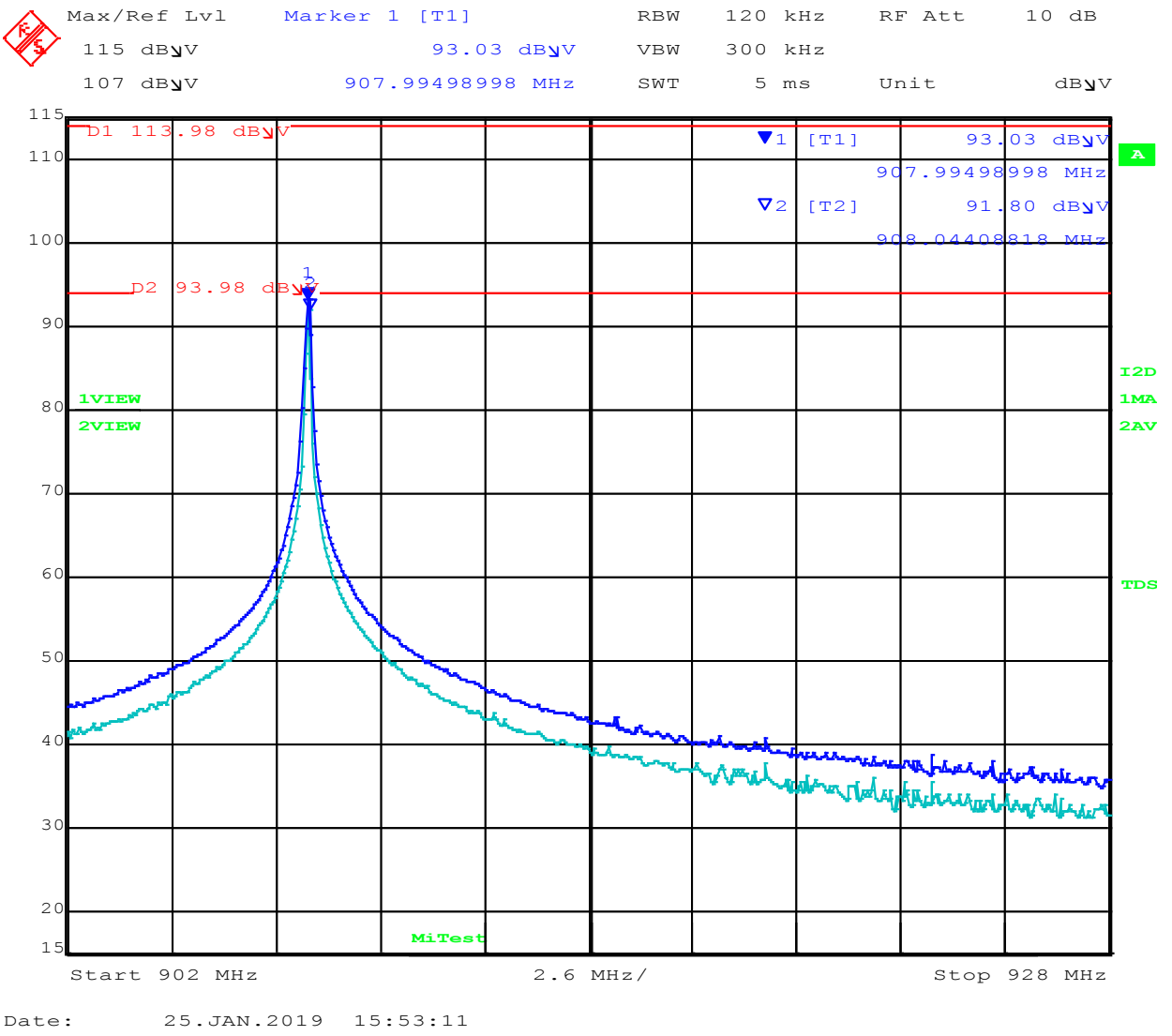
Test Measurement Results

30.00 - 1000.00 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	908	105.06	-4.8	-4.8	93.03	Peak	Vertical	100	0	113.98	-20.95	Pass
2	908	103.83	-4.8	-4.8	91.8	Quasi-Peak	Vertical	100	0	93.98	-2.18	Pass

Test Notes: Laird 2 dBi Antenna..

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER
Measurement Uncertainty:	±1.33 dB

Note Power settings listed are values used to power the transmitter up.



8.1.2 WPANT Antenna 2.5 dBi

Equipment Configuration for Radiated Field Strength			
Antenna:	World Products WPANT30088-S1A	**Variant:**	Mode 3
Antenna Gain (dBi):	2.50	**Modulation:**	OOK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99
Channel Frequency (MHz):	908.00	**Data Rate:**	16384 Bit/s
Power Setting:	15C	**Tested By:**	JMH

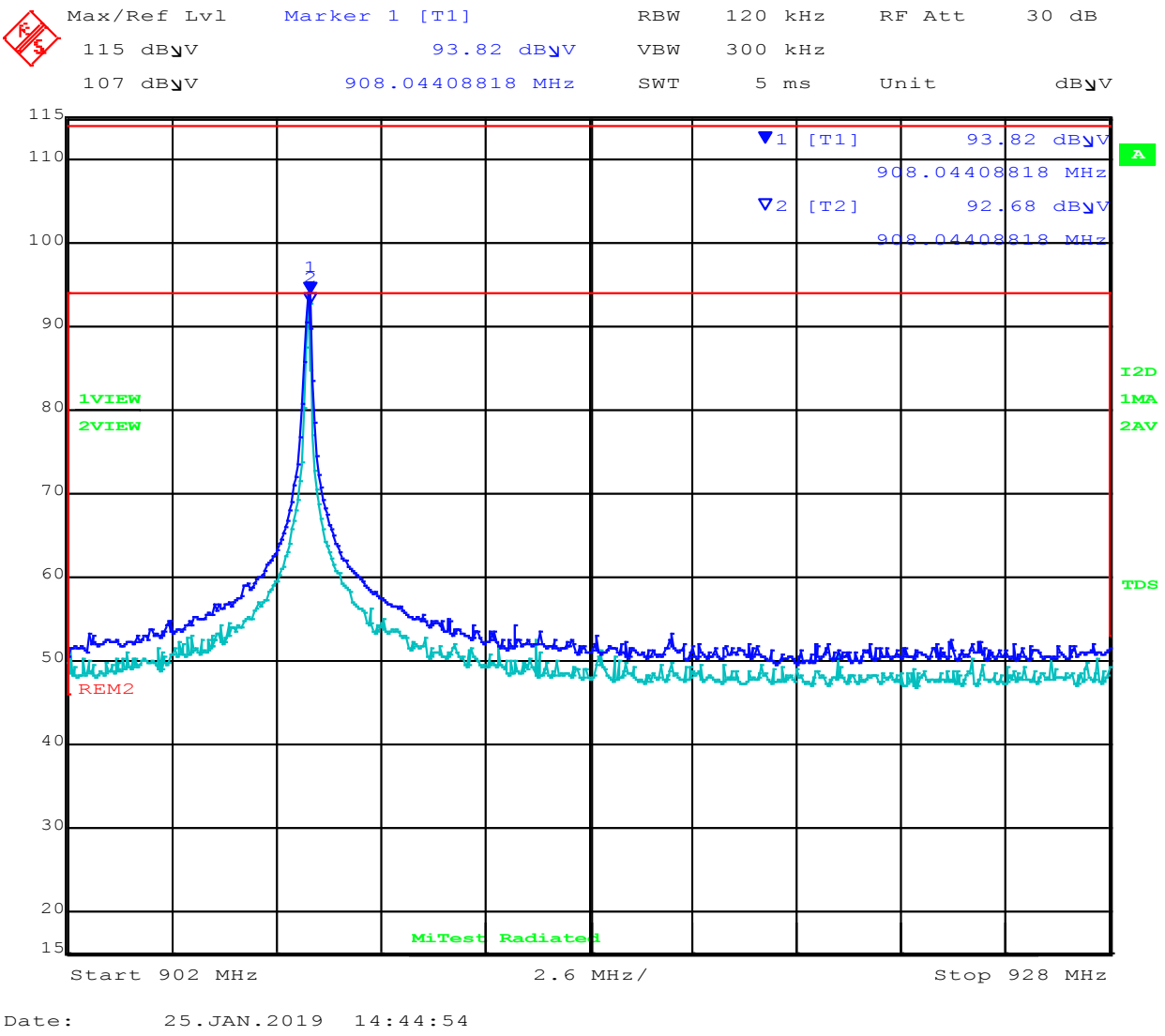
Test Measurement Results

30.00 - 1000.00 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	908	105.85	-7.23	-4.8	93.82	Peak	Vertical	100	0	113.98	-20.16	Pass
2	908	104.71	-7.23	-4.8	92.68	Quasi-Peak	Vertical	100	0	93.98	-1.3	Pass

Test Notes: WPAnt 2.5 dBi Antenna..

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER
Measurement Uncertainty:	±1.33 dB

Note Power settings listed are values used to power the transmitter up.



8.2. Radiated Emissions

Radiated Test Conditions for Radiated Spurious (Restricted Bands)			
Standard:	FCC CFR 47:15.249 ISED RSS 210	**Ambient Temp. (ºC):**	20.0 - 24.5
Test Heading:	Radiated Spurious	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.205, 15.209 RSS-210	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Radiated Spurious and Band-Edge Emissions (Restricted Bands)

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 and waveguide 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 Radiated Spurious and Band-Edge Measurement were per the Radiated Test Set-up specified in this document.

Limits for Restricted Bands
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 or Waveguide Loss

Example:
Given receiver input reading of 51.5 dBmV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength (FS) of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBmV/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

Radiated Emissions Limits; General Requirements (15.209)

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permItted under other sections of this part, e.g., §§15.231 and 15.241.

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

8.2.1 TX Spurious & Restricted Band Emissions

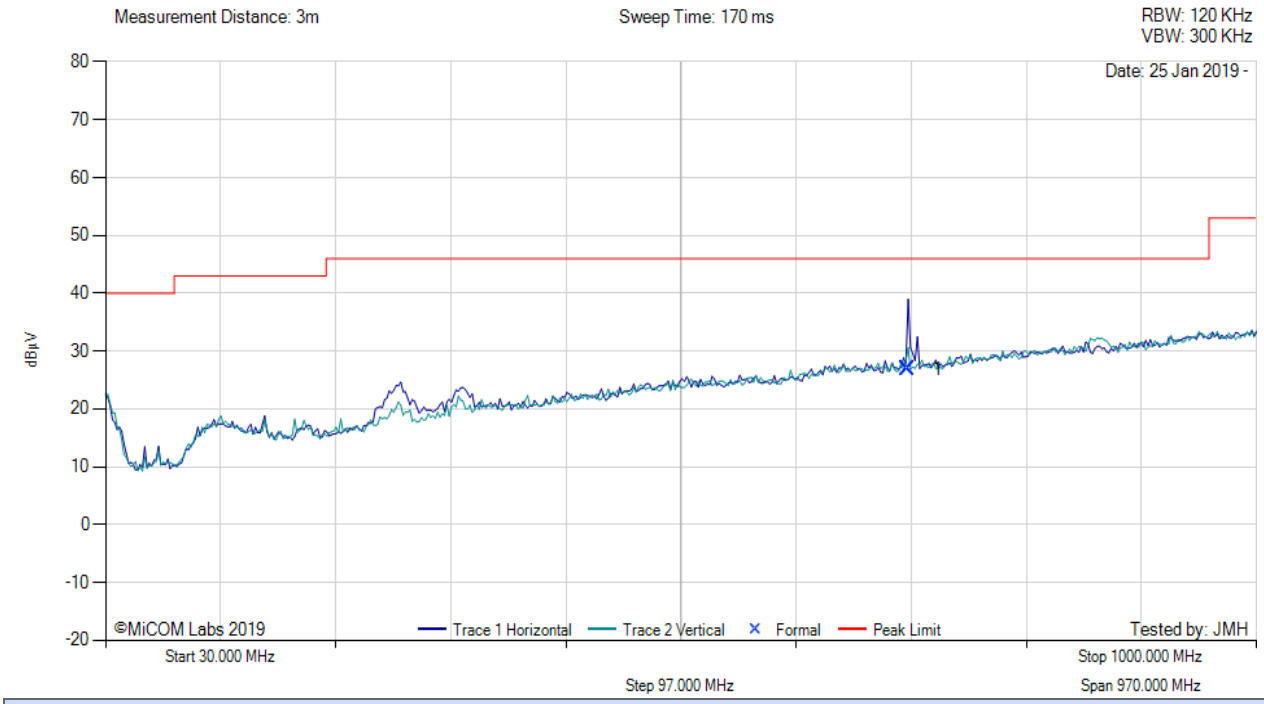
Laird Antenna 2 dBi

Equipment Configuration for Radiated Digital Emissions			
Antenna:	Laird 0600-00048	**Variant:**	Mode 3
Antenna Gain (dBi):	2.00	**Modulation:**	OOK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99
Channel Frequency (MHz):	908.00	**Data Rate:**	16384 Bit/s
Power Setting:	15C	**Tested By:**	JMH

Test Measurement Results

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: Mode 3, Test Freq: 908.00 MHz, Antenna: L-com HGV-906U, Power Setting: 15C, Duty Cycle (%): 99



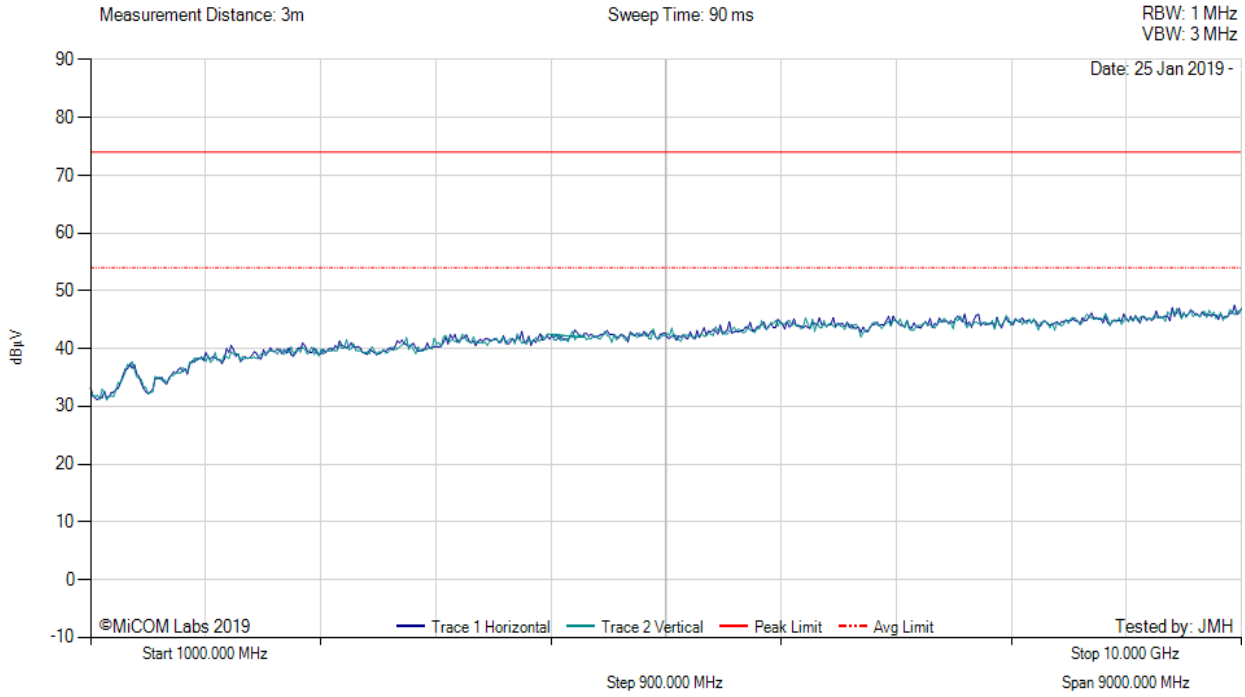
30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	705.66	27.89	6.12	-7.20	26.81	MaxQP	Horizontal	132	228	46.0	-19.2	Pass

Test Notes: Laird 2 dBi Antenna.. 900 MHz notch in front of amp to prevent overloads.

Equipment Configuration for TX Spurious & Restricted Band Emissions			
Antenna:	Laird 0600-00048	**Variant:**	Mode 3
Antenna Gain (dBi):	2.00	**Modulation:**	OOK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99
Channel Frequency (MHz):	908.00	**Data Rate:**	16384 Bit/s
Power Setting:	15C	**Tested By:**	JMH

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: Mode 3, Test Freq: 908.00 MHz, Antenna: L-com HGV-906U, Power Setting: 148, Duty Cycle (%): 99



There are no emissions found within 6dB of the limit line.

Test Notes: Laird 2 dBi Antenna.

WPAnt Antenna 2.5 dBi

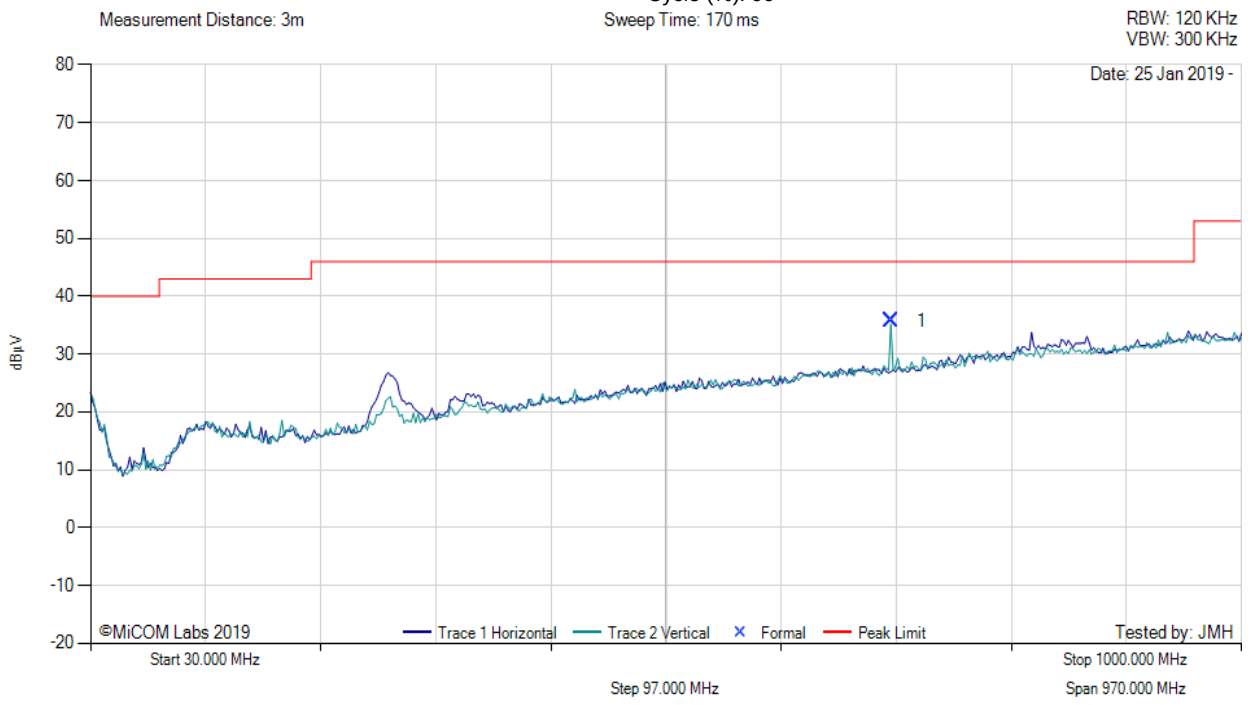
Equipment Configuration for Radiated Digital Emissions

Antenna:	World Products WPANT30088-S1A	**Variant:**	Mode 3
Antenna Gain (dBi):	2.50	**Modulation:**	OOK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99
Channel Frequency (MHz):	908.00	**Data Rate:**	16384 Bit/s
Power Setting:	15C	**Tested By:**	JMH

Test Measurement Results

RADIATED - LOWER RESTRICTED BAND-EDGE EMISSIONS

Variant: Mode 3, Test Freq: 908.00 MHz, Antenna: World Products WPANT30088-S1A, Power Setting: 15C, Duty Cycle (%): 99



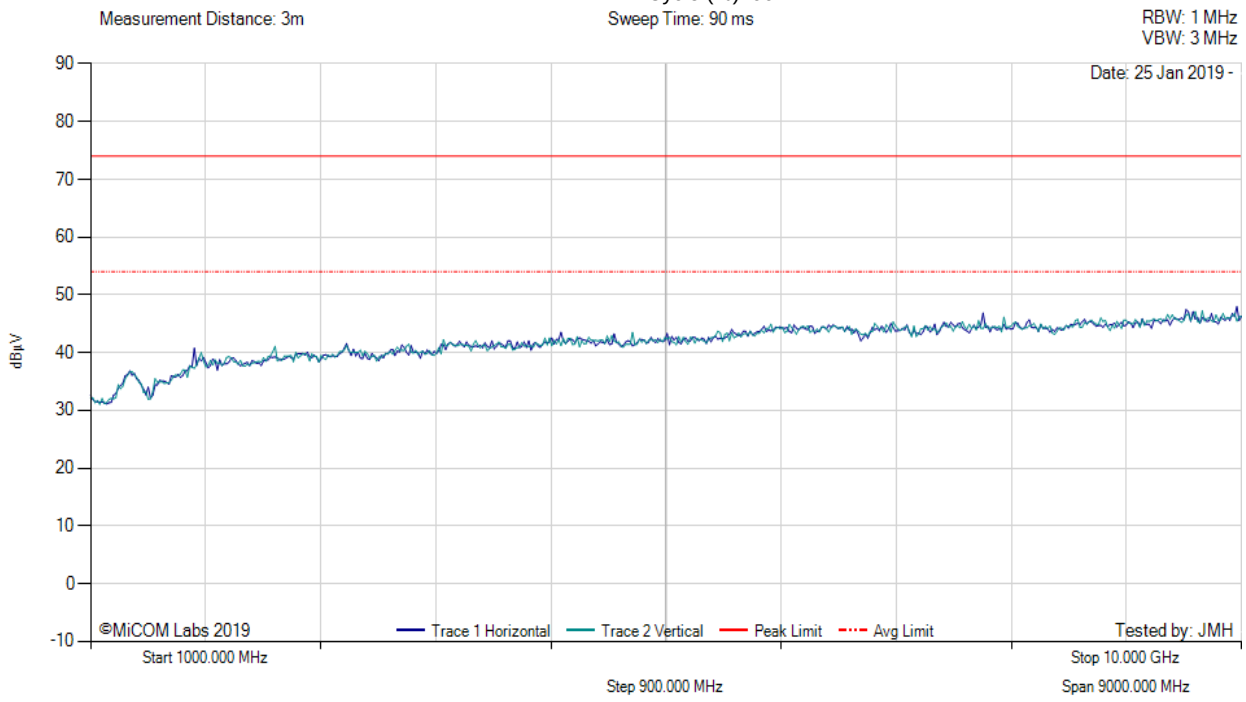
30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	704.53	36.68	6.12	-7.10	35.70	Peak (NRB)	Vertical	100	0	--	--	Pass

Test Notes: WPANT Antenna.. 900 MHz notch in front of amp to prevent overloads.

Equipment Configuration for TX Spurious & Restricted Band Emissions			
Antenna:	World Products WPANT30088-S1A	**Variant:**	Mode 3
Antenna Gain (dBi):	2.50	**Modulation:**	OOK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99
Channel Frequency (MHz):	908.00	**Data Rate:**	16384 Bit/s
Power Setting:	15C	**Tested By:**	JMH

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: Mode 3, Test Freq: 908.00 MHz, Antenna: World Products WPANT30088-S1A, Power Setting: 15C, Duty Cycle (%): 99



There are no emissions found within 6dB of the limit line.

8.3. Occupied Bandwidth

Radiated Test Conditions for Radiated Digital Emissions (0.03 – 1 GHz)			
Standard:	RSS-Gen Issue 5	**Ambient Temp. (ºC):**	20.0 - 24.5
Test Heading:	Occupied Bandwidth	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	RSS-Gen Issue 5	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for 99% Bandwidth Measurement
The bandwidth at 99 % was measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

Testing was performed under ambient conditions at nominal voltage.

Test configuration and setup used for the measurement was per the Conducted Test Set-up specified in this document.

Laboratory Measurement Uncertainty for Spectrum Measurement

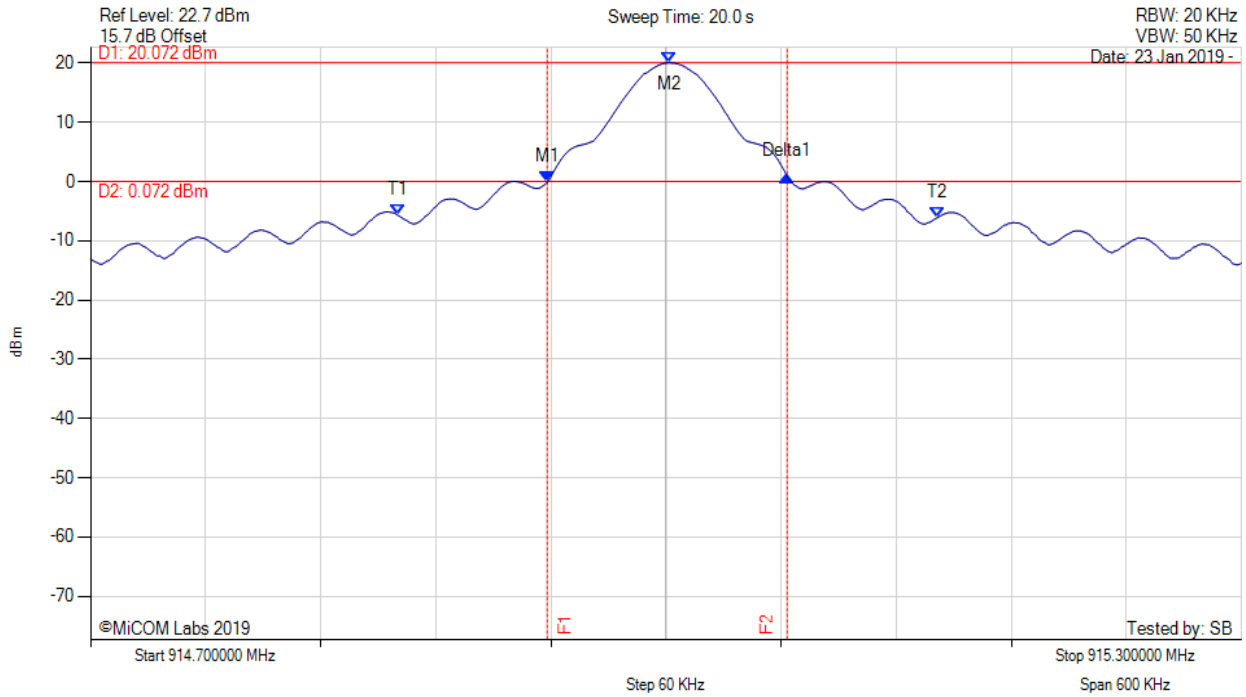
Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Equipment Configuration for Occupied Bandwidth			
Variant:	Mode 3	**Duty Cycle (%):**	99
Data Rate:	16384bps	**Antenna Gain (dBi):**	2.00
Modulation:	OOK	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results
99% Bandwidth (kHz)
281.0

20 dB 99% BANDWIDTH

Variant: Mode 3 OOK, Temp: 20, Voltage: 3.7Vdc



Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = MAX HOLD	M1 : 914.938 MHz : -0.100 dBm M2 : 915.002 MHz : 20.072 dBm Delta1 : 125 KHz : 0.954 dB T1 : 914.860 MHz : -5.610 dBm T2 : 915.141 MHz : -6.128 dBm OBW : 281 KHz	Measured 20 dB Bandwidth: 0.125 MHz Limit: 0.5 kHz Margin: 0.38 MHz

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