Test of: Ingeniería WiseConn S.A. RF-M1

To: FCC CFR 47 Part 15B; ICES-003 Issue 6: 2016

Test Report Serial No.: WISE02-U2 Rev A

TEST REPORT

FROM

Test of Ingeniería WiseConn S.A. RF-M1

To FCC CFR 47 Part 15B & IC ICES-003

Test Report Serial No.: WISE02-U2 Rev A

This report supersedes NONE

Manufacturer:	Ingeniería WiseConn S.A. Alcantara 200, Of. 404 Las Condes, Santiago 7550159 Chile
Product Function:	Monitoring Device

Copy No: pdf Issue Date: 17th July 2019

This Test Report is Issued Under the Authority of;

MiCOM Labs, Inc.
575 Boulder Court,
Pleasanton, CA 94566 USA
Phone: +1 (925) 462-0304
Fax: +1 (925) 462-0306
www.micomlabs.com

TESTING CERT #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

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1. ACCREDITATION, LISTINGS & RECOGNITION

1.1. Test 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

ilac-MRA A2LA

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	12th July 2019	Draft report for client review.
Rev A	17th July 2019	Initial Release

3. TEST RESULT CERTIFICATE

Applicant:	Ingeniería WiseConn S.A. Alcantara 200, Of. 404 Las Condes, Santiago 7550159 Chile	Tested By:	MiCOM Labs, Inc. 575 Boulder Court Pleasanton, California 94566 USA
EUT	Monitoring Device	Tel:	+1 925 462 0304
Model:	RF-M1-900HP, RF-M1-LTE-A, RF-M1-LTE-V	Fax:	+1 925 462 0306
S/N:	N/A		
Test Dates:	11th July 2019	Website:	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC CFR 47 Part 15B & IC ICES-003	EQUIPMENT COMPLIES

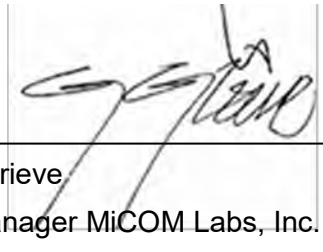
MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Notes:

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

Approved & Released for MiCOM Labs, Inc. by:

A2LA ACCREDITED
TESTING CERT #2381.01



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)	FCC CFR 47 Part 15, Subpart B	2016	Title 47 CFR Part 15, Sub Part B; Unintentional Radiators
(ii)	ICES-003	Issue 6 January 2016	Information Technology Equipment (ITE) - Limits and methods of measurement
(iii)	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
(iv)	IEC 55016-2-3	2006	CISPR 16-2-3: "Specification for radio disturbance and immunity measuring apparatus and methods - Part 2-3: Methods of measurements of disturbances and immunity - Radiated disturbance measurements".
(v)	M 3003	Edition 2 Dec. 2007	Expression of Uncertainty and Confidence in Measurements
(vi)	LAB34	Edition 1 August 2002	The expression of uncertainty in EMC Testing
(vii)	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
(viii)	A2LA	August 2018	R105 - Requirement's When Making Reference to A2LA Accreditation Status

4.2. Test and Uncertainty Procedures

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. TEST SUMMARY

List of Measurements

The following table represents the list of measurements required under FCC Part 15B standard.

TABLE OF REQUIRED TESTS – Emissions

Test Standard	Description	Limits	Compliance
FCC Part 15B & ICES-003	Radiated Emissions	Class B	Complies
FCC Part 15B & ICES-003	Conducted Emissions - ac power I/O port	Class B	Complies

6. PRODUCT DETAILS AND TEST CONFIGURATIONS

6.1. Test Program Scope

The scope of the test program was to test the Ingeniería WiseConn S.A. RF-M1 for compliance against the appropriate emission standards listed within this report in order to satisfy the following standards.

- FCC CFR 47 Part 15, Subpart B - Title 47 CFR Part 15, SubPart B; Unintentional Radiators
- ICES-003 Issue 6 - Information Technology Equipment (ITE) - Limits and methods of measurement

Ingeniería WiseConn S.A. RF-M1
Front

6.2. EUT Details

Detail	Description
Purpose:	Test of the Ingeniería WiseConn S.A. RF-M1 for compliance to; FCC specification FCC Part 15B; ICES-003 Issue 6.
Applicant:	Ingeniería WiseConn S.A. Alcantara 200, Of. 404, Las Condes, Santiago 7550159 Chile
Manufacturer:	Same as Applicant
Test Laboratory:	MiCOM Labs, Inc. 575 Boulder Court, Pleasanton, California 94566, USA
Test report reference number:	WISE02-U2 Rev A
Date EUT received:	11th July 2019
Dates of test (from - to):	11th July 2019
No of Units Tested:	One
Type of Equipment:	Simple Monitoring Device
Product Name:	RF-M1
Model No.:	RF-M1-900HP, RF-M1-LTE-A, RF-M1-LTE-V
Serial No.:	N/A
Equipment Secondary Function(s):	None
Type of Technology:	FHSS, LTE
Installation type:	Fixed
Construction/Location for Use:	Both
Software/Firmware Release:	6.0.3
Transmit/Receive Operation:	Transceiver - Full Duplex
Rated Input Voltage and Current:	100 – 240 V_{AC} 0.8A MAX, 50-60 Hz PoE: 10-57Vdc, 1500mA
Operating Frequency:	Rated: 50/60 Hz
Equipment Dimensions:	200 x 100 x 187 mm
Temperature:	-10ºC to +75ºC
Weight:	1.094 Kg
Primary Function:	Simple monitoring device with intelligence

6.3. External A.C/D.C. Power Adaptor

Power adaptor/s were support items to the RF-M1-900HP, RF-M1-LTE-A, RF-M1-LTE-V during testing. The AC/DC adapter can be used for PoE options.

AC/DC Adaptor
Solar Panel Model: N/A Part Number: N/A O: 5 DC 1.5MAX

6.4. Antenna Details

No antennas were tested as part of this test program.

6.5. Cabling and I/O Ports

The following is a description of the cable and input, output ports available on the EUT;
Number and type of I/O ports;

Port Type	Port Description	Qty	Screened (Yes/ No)	Length
Analog	Terminal	2	Yes	> 30m
USB	Micro-USB-B	1	Yes	≤5m
Discrete I/O input	Terminal	4	Yes	> 30m
RS232/RS486	Terminal	1	Yes	> 30m
SDI-12	Terminal	1	Yes	> 30m

6.6. Equipment Details

The following is a description of supporting equipment used during the test program.

Type (EUT/ Support)	Equipment Description (Including Brand Name)	Mfr.	Model No.	Serial No.
EUT	Monitoring Device	Ingeniería WiseConn S.A.	RF-M1-900HP, RF-M1-LTE-A, RF-M1-LTE-V	N/A
Support	Solar Panel	N/A	N/A	N/A

6.7. Equipment Modifications

None

6.8. Deviations from the Test Standard

No deviations from the test standard were required in order to complete the test program:

6.9. EUT Configurations

6.9.1. EUT Configuration - Radiated Emissions:

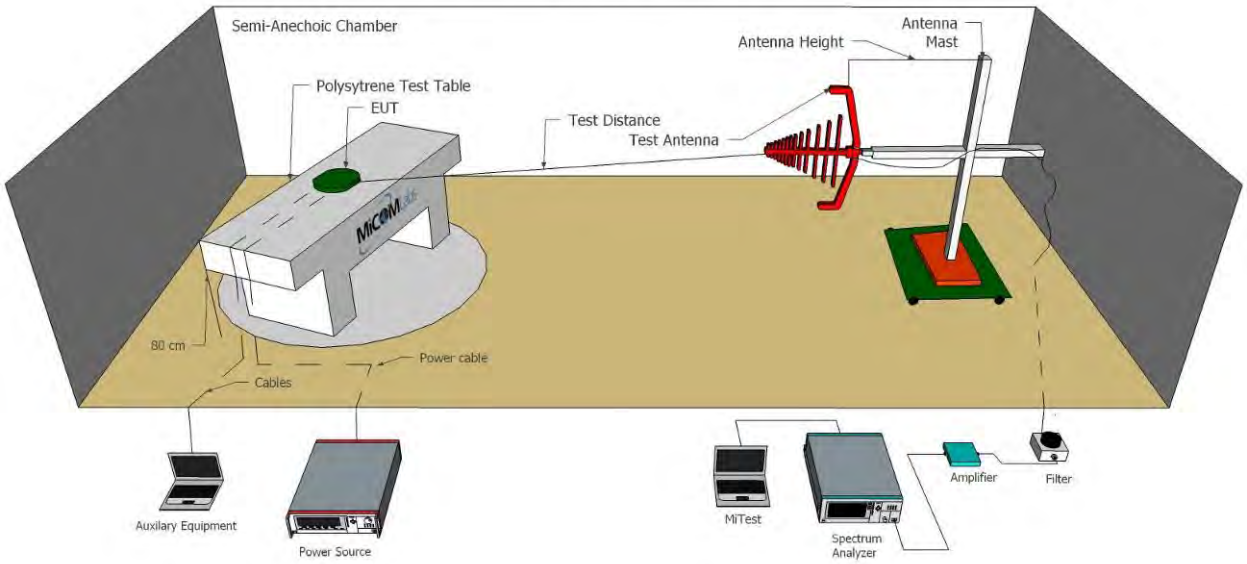
The RF-M1-900HP, RF-M1-LTE-A, RF-M1-LTE-V setup consist of 3 configurations: All of which connect to a 5 DC solar Panel

The EUT was in test mode to allow for a worst-case measurement powered by a LION battery with the solar panel attached.

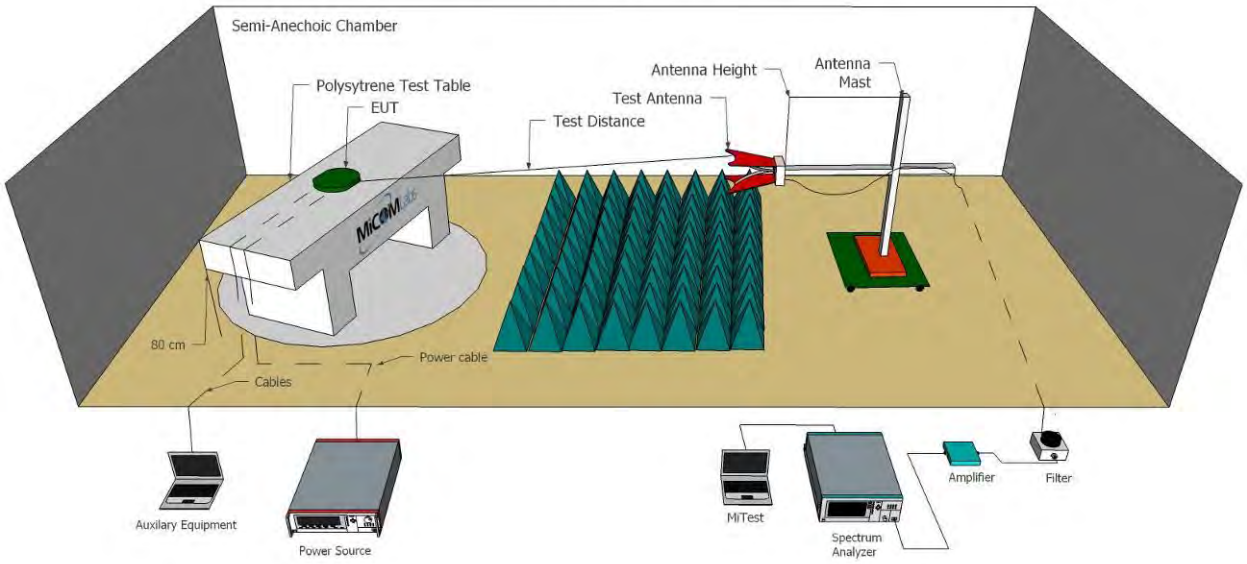
Diagram of EUT Configuration for Emissions Measurements

The following tests were performed using the radiated test set-up shown in the diagram below. 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 considered 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
338	Sunol 30 to 3000 MHz Antenna	Sunol	JB3	A052907	4 Apr 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 Apr 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 Apr 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
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	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 Receiver	SRC Haverhill	151-3050787	481	24 Aug 2019
510	Barometer/Thermometer	Control Company	68000-49	170871375	11 Dec 2019
518	Cable - Amp to Antenna	SRC Haverhill	157-3051574	518	24 Aug 2019

7. TEST RESULTS

7.1. EMC EMISSIONS TEST RESULTS

7.1.1. Radiated Emissions

FCC, Part 15 Subpart B §15.109
Industry Canada ICES-003 Section 6.2

Test Procedure
Testing 30 – 1,000 MHz was performed in a anechoic chamber using a CISPR compliant receiver. Preliminary radiated emissions were measured on every azimuth and with the receiving antenna in both horizontal and vertical polarizations. To further maximize emissions the receive antenna was varied between 1 and 4 meters. The emissions are recorded with receiver in peak hold mode.

Emissions nearest the limits were chosen for maximization and formal measurement using a CISPR Compliant receiver. Emissions from 30 MHz – 1000 MHz are measured utilizing a CISPR compliant quasi-peak detector with a tuned receiver, using a bandwidth of 120 kHz. Emissions above 1000 MHz are measured utilizing a CISPR compliant average detector with a tuned receiver, using a bandwidth of 1 MHz. Only the highest emissions relative to the limit are listed.

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

FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor
FO = Distance Falloff Factor

CORR = Correction Factor = CL – AG + NFL

CL = Cable Loss
AG = Amplifier Gain
NFL = Notch Filter Loss or Waveguide Loss

Field Strength Calculation Example:

Given receiver input reading of 51.5 dBμV; 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 of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

40 dBμV/m = 100 μV/m
48 dBμV/m = 250 μV/m

Limits

The ancillary equipment shall meet the class B limits given in FCC 15.209 & ICES-003, and the limits above 1 GHz shown below.

FCC Spurious Emissions Limits

Limits below 1 GHz:

Class A limits

Frequency(MHz)	Quasi-peak Limit (dBµV/m)	Measurement Distance (meters)	Quasi-peak Limit (dBµV/m)	Measurement Distance (meters)
30 to 88	40	10	49.5	3
88-216	43.5	10	54	3
216-960	46.4	10	56.5	3
960-1000	49.5	10	60	3

Class B limits

Frequency(MHz)	Quasi-peak Limit (dBµV/m)	Measurement Distance (meters)	Quasi-peak Limit (dBµV/m)	Measurement Distance (meters)
30 to 88	29.5	10	40	3
88-216	33	10	43.5	3
216-960	35.6	10	46	3
960-1000	43.5	10	54	3

Limits above 1GHz:

Frequency(MHz)	Average Limit (dBµV/m)	Peak Limit (dBµV/m)	Measurement Distance (meters)	Class (A/B)
1 000 to 6000	54	74	3	Class B

Frequency(MHz)	Average Limit (dBµV/m)	Peak Limit (dBµV/m)	Measurement Distance (meters)	Class (A/B)
1 000 to 6000	60	80	3	Class A

Traceability

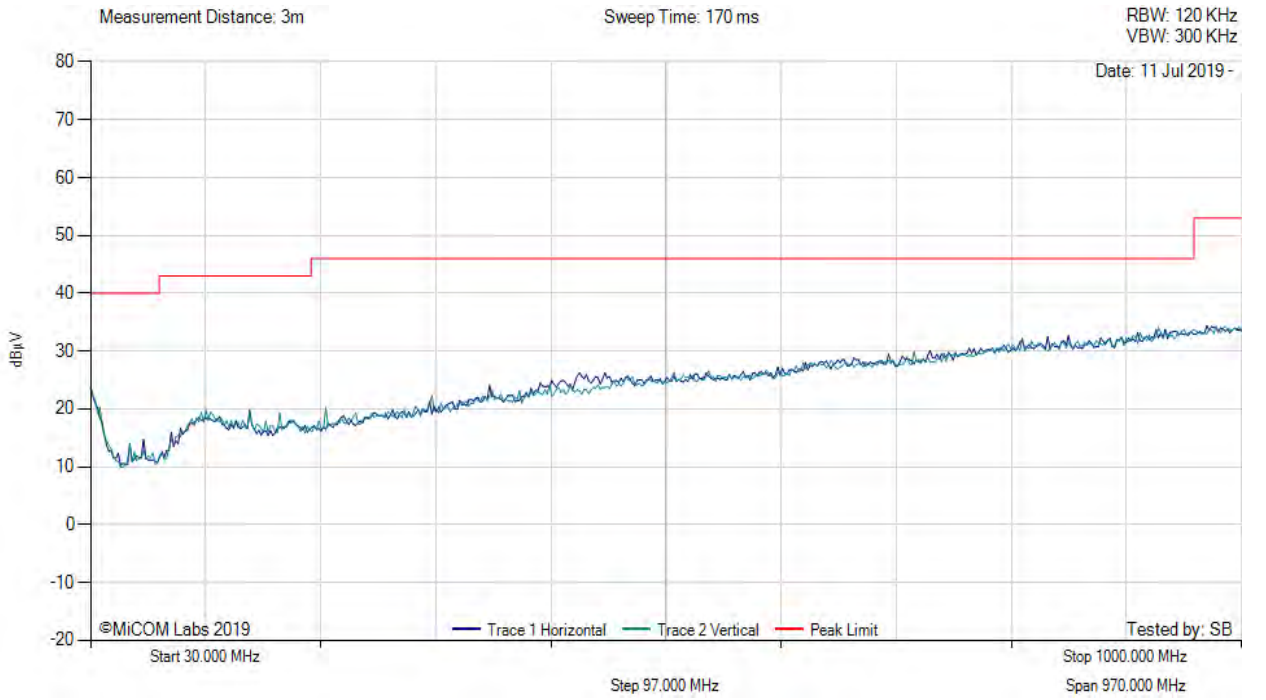
Laboratory Measurement Uncertainty	
Measurement uncertainty	+5.6/ -4.5 dB

Method
Measurements were made per work instruction Work instruction WI-07 Radiated Emissions Test

7.1.1.1. Measurement Results: 30-1000 MHz

Equipment Configuration for Radiated Digital Emissions			
Antenna:	Integral	**Variant:**	RF-M1-900HP
Antenna Gain (dBi):	Not Applicable	**Modulation:**	GFSK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	Not Applicable
Channel Frequency (MHz):	900MHz FHSS	**Data Rate:**	Not Applicable
Power Setting:	Not Applicable	**Tested By:**	SB

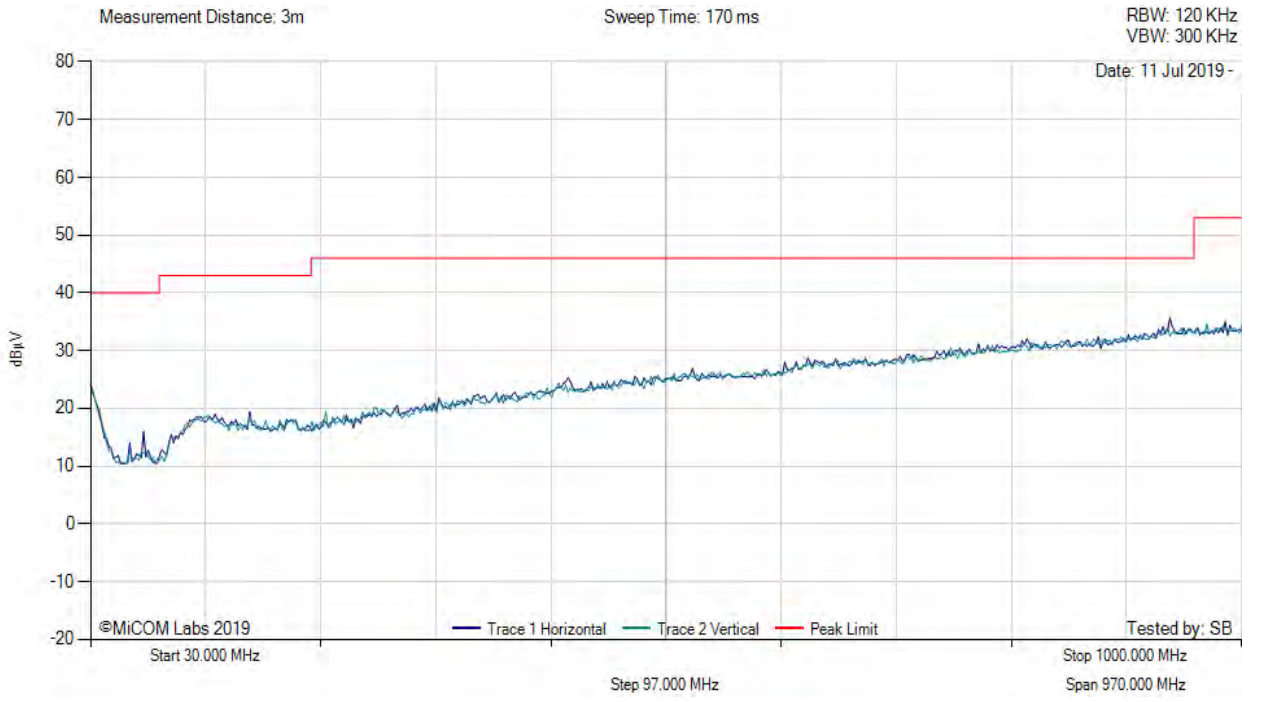
Test Measurement Results



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

Equipment Configuration for Radiated Digital Emissions			
Antenna:	Integral	**Variant:**	RF-M1-LTE-A
Antenna Gain (dBi):	Not Applicable	**Modulation:**	Not Applicable
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	Not Applicable
Channel Frequency (MHz):	LTE 700MHz-2700MHz	**Data Rate:**	Not Applicable
Power Setting:	Not Applicable	**Tested By:**	SB

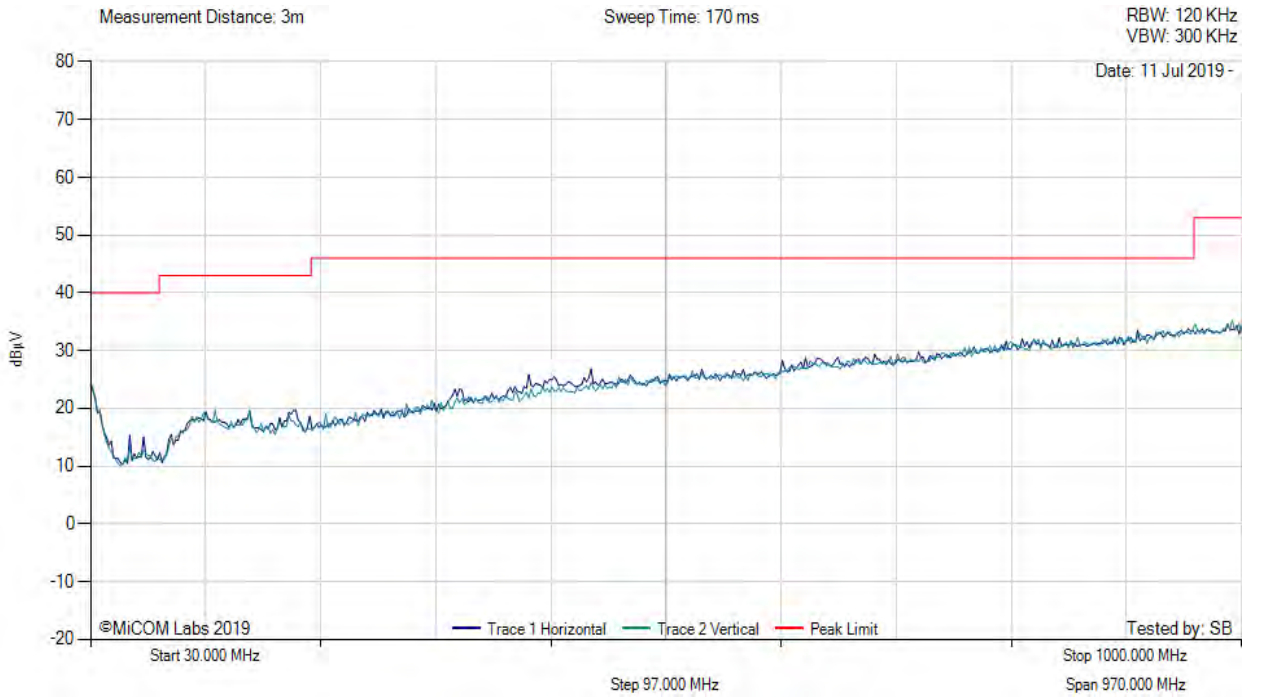
Test Measurement Results



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

Equipment Configuration for Radiated Digital Emissions			
Antenna:	Integral	**Variant:**	RF-M1-LTE-V
Antenna Gain (dBi):	Not Applicable	**Modulation:**	Not Applicable
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	Not Applicable
Channel Frequency (MHz):	LTE 700MHz-2700MHz	**Data Rate:**	Not Applicable
Power Setting:	Not Applicable	**Tested By:**	SB

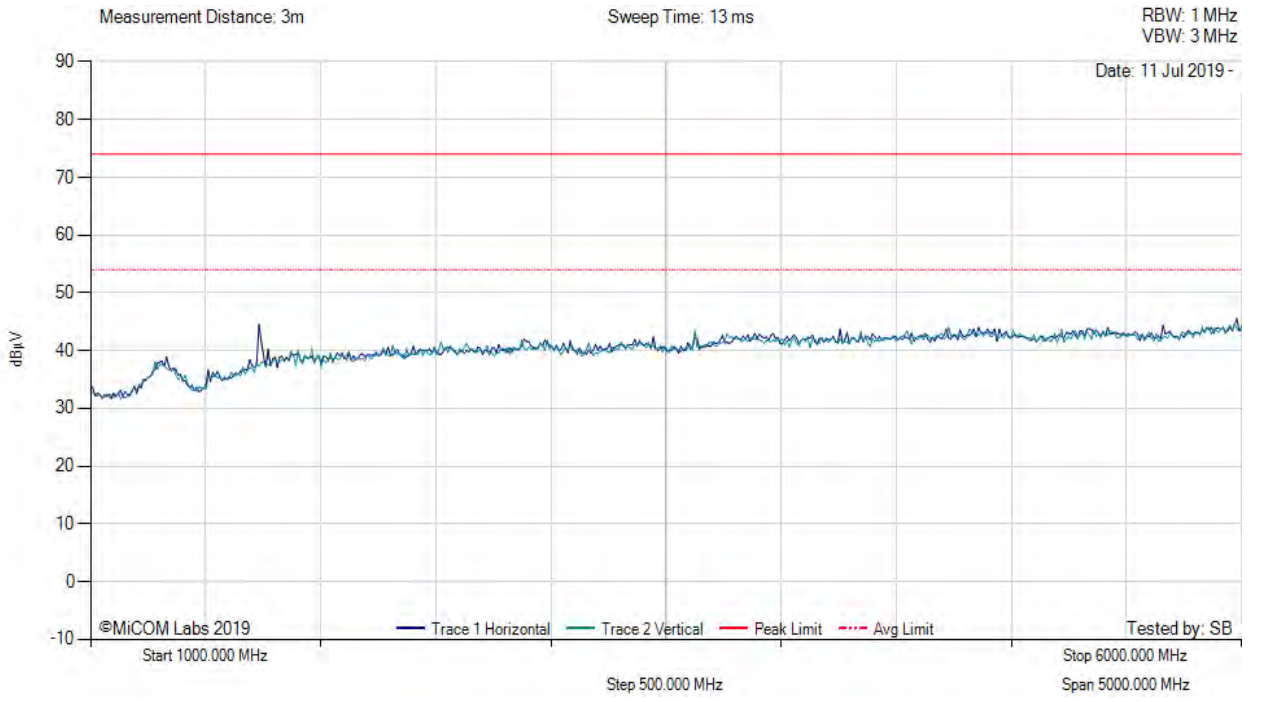
Test Measurement Results



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

Equipment Configuration for Restricted Band Spurious Emissions			
Antenna:	Integral	**Variant:**	RF-M1-900HP
Antenna Gain (dBi):	Not Applicable	**Modulation:**	GFSK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	Not Applicable
Channel Frequency (MHz):	900MHz FHSS	**Data Rate:**	Not Applicable
Power Setting:	Not Applicable	**Tested By:**	SB

Test Measurement Results

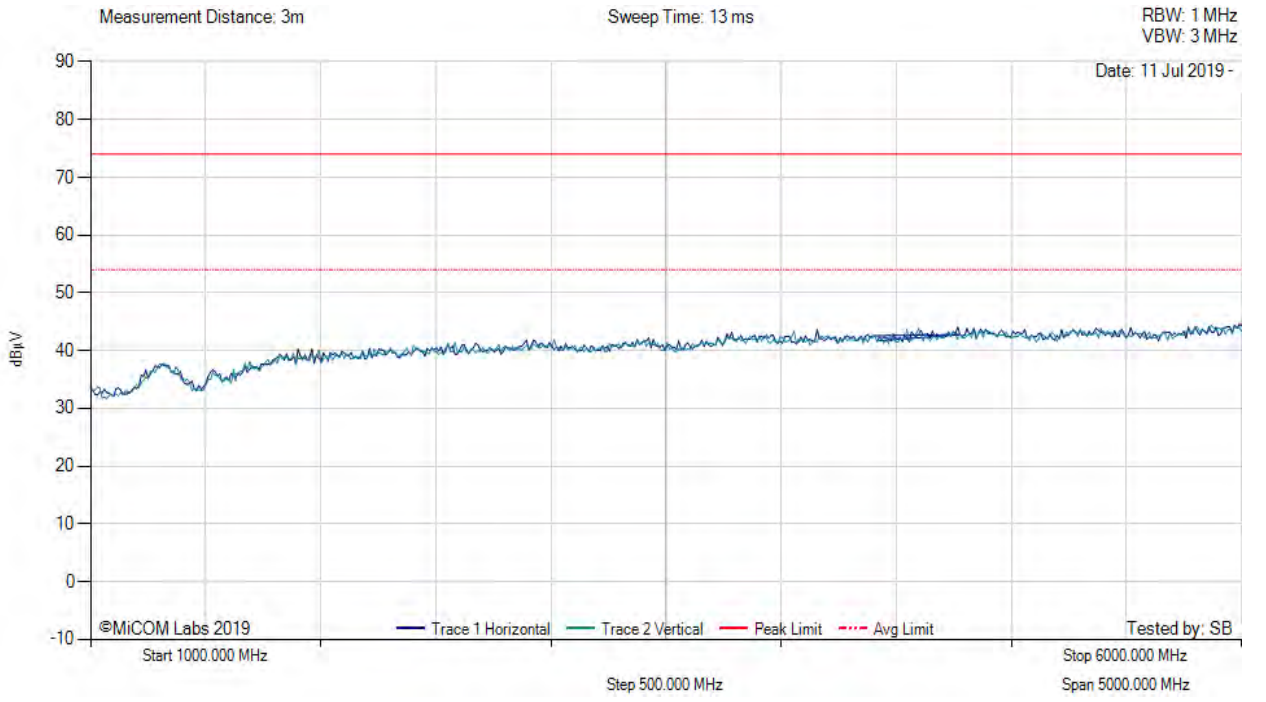


There are no emissions found within 6dB of the limit line.

Equipment Configuration for Restricted Band Spurious Emissions

Antenna:	Integral	**Variant:**	RF-M1-LTE-A
Antenna Gain (dBi):	Not Applicable	**Modulation:**	Not Applicable
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	Not Applicable
Channel Frequency (MHz):	LTE 700MHz-2700MHz	**Data Rate:**	Not Applicable
Power Setting:	Not Applicable	**Tested By:**	SB

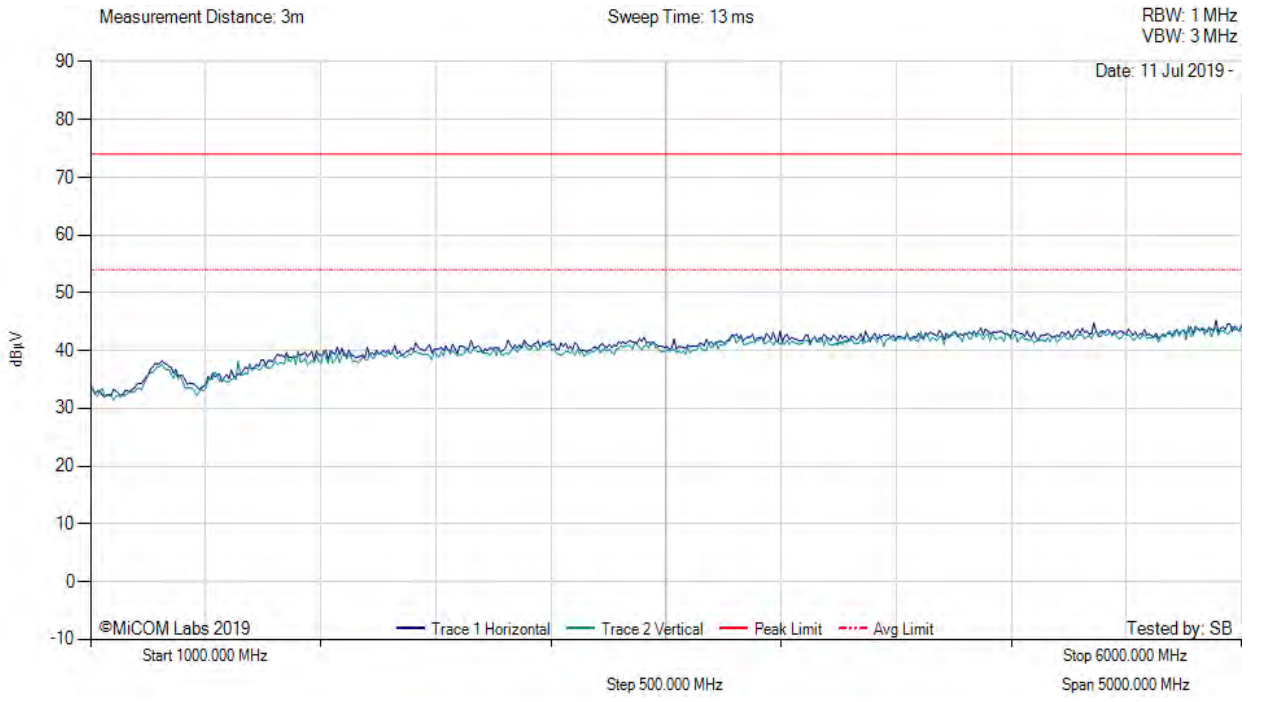
Test Measurement Results



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

Equipment Configuration for Restricted Band Spurious Emissions			
Antenna:	Integral	**Variant:**	RF-M1-LTE-V
Antenna Gain (dBi):	Not Applicable	**Modulation:**	Not Applicable
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	Not Applicable
Channel Frequency (MHz):	LTE 700MHz-2700MHz	**Data Rate:**	Not Applicable
Power Setting:	Not Applicable	**Tested By:**	SB

Test Measurement Results



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

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