Test of: Alient Technology, LLC ALH-9011

To: FCC CFR 47 Part 15 Subpart B +
Industry Canada ICES-003 Issue 5

Test Report Serial No.: ALNT64-U5 Rev A

Report

from

Test of: Alient Technology, LLC ALH-9011

To: FCC CFR 47 Part 15 Subpart B + Industry Canada ICES-003 Issue 5

Test Report Serial No.: ALNT64-U5 Rev A

This report supersedes NONE

Manufacturer: Alien Technology, LLC
845 Embedded Way
San Jose, California 95138
USA

Product Function: Handheld RFID Reader

Copy No: pdf **Issue Date:** 16th December 2015

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

ACCREDITED
TESTING CERT #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

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ACCREDITATION, LISTINGS & RECOGNITION

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

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 8 January 2009*).

Presented this 28th day of February 2014.

President & CEO
For the Accreditation Council
Certificate Number 2381.01
Valid to December 31, 2015
Revised November 18, 2015

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

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

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

DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft	16th December 2015	
Rev A	16th December 2015	Initial Release

1. TEST RESULT CERTIFICATE

Manufacturer:	Alien Technology, LLC 845 Embedded Way San Jose, California 95138 USA	Tested By:	MiCOM Labs, Inc. 575 Boulder Court, Pleasanton California 94566 USA
EUT:	Handheld RFID Reader	Tel:	+1 925 462 0304
Model:	ALH-9011	Fax:	+1 925 462 0306
S/N:	9011-01-1520258		
Test Date(s):	15th December 2015	Website:	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC CFR 47 Part 15 Subpart B.	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.

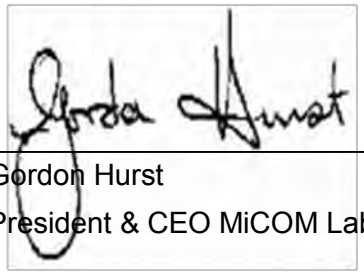
Notes:

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:

A2LA ACCREDITED
TESTING CERT #2381.01

Graeme Grieve
Quality Manager MiCOM Labs, Inc.



Gordon Hurst
President & CEO MiCOM Labs, Inc.

2. REFERENCES AND MEASUREMENT UNCERTAINTY

2.1. Normative References

REF.	PUBLICATION	YEAR	TITLE
I	FCC 47 CFR Part 15, Subpart B	2014	Unintentional Radiators
II	ICES-003	Issue 5 August 2012	Information Technology Equipment (ITE) – Limits and Methods of Measurement
III	A2LA	June 2015	R105 - Requirement's When Making Reference to A2LA Accreditation Status
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	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
VI	M 3003	Edition 3 Nov. 2012	Expression of Uncertainty and Confidence in Measurements

2.2. 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.

3. PRODUCT DETAILS AND TEST CONFIGURATIONS

3.1. Technical Details

Details	Description
Purpose:	Verification test of the ALH-9011 to FCC CFR 47, Part 15, Subpart B and Industry Canada ICES-003 Issue 5
Applicant:	As Manufacturer
Manufacturer:	Alien Technology, LLC 845 Embedded Way, San Jose, California 95138 USA
Laboratory performing the tests:	MiCOM Labs, Inc. 575 Boulder Court Pleasanton, California 94566 USA
Test report reference number:	ALNT64-U5 Rev A
Date EUT received:	14th October 2015
Test Date:	15th December 2015
Standard(s) applied:	FCC CFR 47 Part 15 Subpart B Industry Canada ICES-003
No of Units Tested:	One
Type of Equipment:	Handheld RFID Reader
Product Family Name:	ALH-90xx
Models:	See Section 3.2 Scope of Test Program ALH-90xx Family of Products ALH-9011 (fully loaded, worst case model tested) ALH-9000 ALH-9001 ALH-9010
Serial Number	9011-01-1520258
Internal Clocks	Not Provided
Construction/Location for Use:	Indoor Use Only
Operating Temperature Range:	Declared Range -10°C to 50°C
Rated Input Voltage and Current:	DC only (Battery operated / external supply) 3.7Vdc
Equipment Dimensions:	159mm (L) x 79mm (W) x 135mm (H)
Weight:	0.65 Kg
Hardware Rev:	R2000
Software Rev:	R2000Test

3.2. Scope of Test Program

Alien Technology, LLC ALH-9011
The scope of the test program was to test the Alien Technology ALH-9011 for verification to FCC CFR 47, part 15, subpart B radiated emissions 30 – 1000 MHz and AC wireline emissions.

FCC CFR 47 Part 15 Subpart B Unintentional Radiators

Industry Canada ICES-003
Information Technology Equipment (ITE) – Limits and Methods of Measurement

ALH-90xx Family of Products

	Model			
Feature	**ALH-9000**	**ALH-9001**	**ALH-9010**	**ALH-9011**
Operating System	Win CE	Win CE	Win Mobile	Win Mobile
RFID	Yes	Yes	Yes	Yes
Wi-Fi	Yes	Yes	Yes	Yes
Cellular (HSPDA)	No	Yes	No	Yes
Bluetooth v2.0	No	Yes	No	Yes
GPS	No	Yes	No	Yes

Alien Technology, LLC ALH-9011

Front View

Alien Technology, LLC ALH-9011

Right View

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

Type	Description	Manufacturer	Model	Serial no.	Delivery Date
EUT	Handheld RFID Reader	Alien Technology LLC	ALH-9011	9011-01-1520258	14th Oct 2015

3.4. Antenna Details

Details provided for information only.

Type	Manufacturer	Model	Family	Gain (dBi)	BF Gain	Dir BW	X-Pol	Frequency Band (MHz)
integral	Alien		OMNI	1.2	-	360	-	902- 928.0

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

3.5. Cabling and I/O Ports

Port Type	Max Cable Length	# Of Ports	Screened	Conn Type	Data Type
USB	15m	1	Y	USB	

3.6. Equipment Modifications

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

1. NONE

3.7. Deviations from the Test Standard

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

1. NONE

4. TEST SUMMARY / SETUP

List of Measurements

The following table represent the list of measurements required under the FCC CFR 47 part 15 and Industry Canada ICES-003 standards;

TABLE OF REQUIRED TESTS – Emissions

Test Standard	Phenomenon/ Description	Limits	Compliance
FCC Part 15B	Radiated Emissions	Class A	Complies
FCC Part 15B	Conducted Emissions - ac power	Class B	Complies

Note 1: *Test results reported in this document relate only to the items tested*
Note 2: *The required tests demonstrated compliance as per client declaration of test configuration, monitoring methodology and associated pass/fail criteria*
Note 3: *Section 3.6 Equipment Modifications highlights the equipment modifications that were required to bring the product into compliance with the above test matrix*

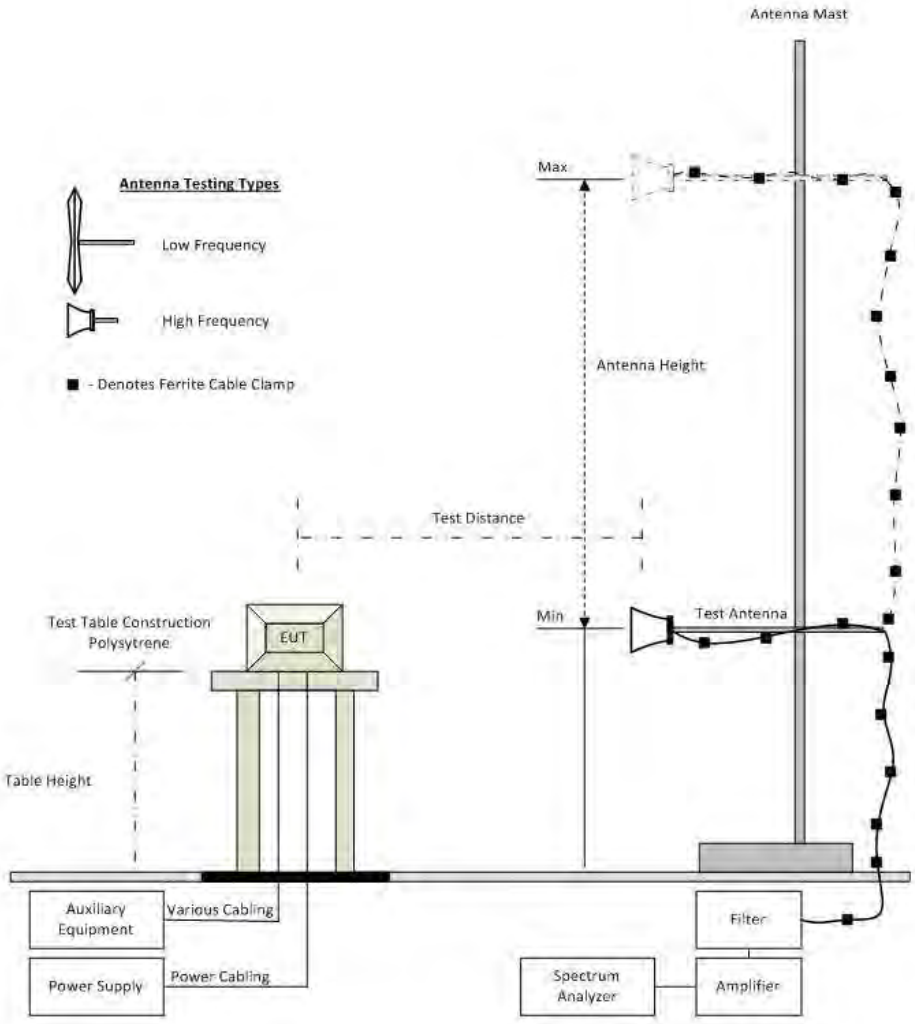
5. TEST EQUIPMENT CONFIGURATION(S)

5.1. Radiated Emissions

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.

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

1. Radiated Digital Emissions (0.03 – 1 GHz)

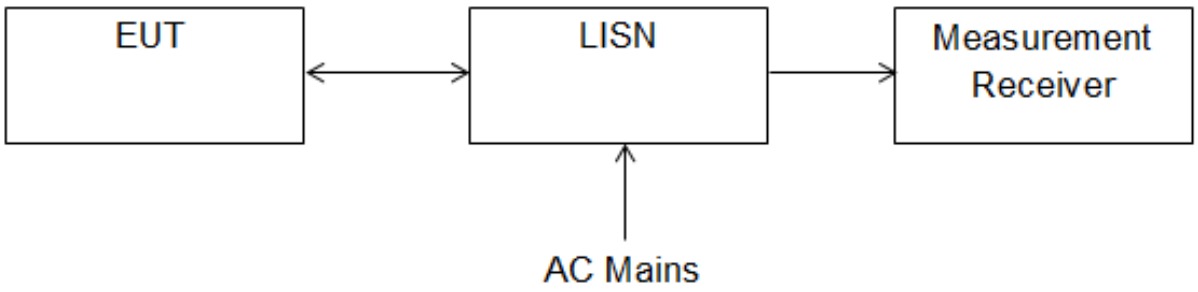


Radiated Emission Test Setup

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
158	Barometer/Thermometer	Control Company	4196	E2846	01 Dec 2016
170	Video System Controller for Semi Anechoic Chamber	Panasonic	WV-CY101	04R08507	Not Required
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	27 Aug 2016
338	Sunol 30 to 3000 MHz Antenna	Sunol	JB3	A052907	15 Aug 2016
341	900MHz Notch Filter	EWT	EWT-14-0199	H1	18 Aug 2016
346	1.6 TO 10GHz High Pass Filter	EWT	EWT-57-0112	H1	18 Aug 2016
397	Amp 10 - 2500MHz	MiCOM Labs	Amp 10 - 2500 MHz	NA	24 Feb 2016
399	ETS 1-18 GHz Horn Antenna	ETS	3117	00154575	10 Oct 2016
406	Amplifier for Radiated Emissions	MiCOM Labs	40dB 1 to 18GHz Amp	0406	28 May 2016
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
447	Rad Emissions Test Software	MiCOM	Test Software Version 1.0.73	447	Not Required
462	Schwarzbeck cable from Antenna to Amplifier.	Schwarzbeck	AK 9513	462	25 Feb 2016
463	Schwarzbeck cable from Amplifier to Bulkhead.	Schwarzbeck	AK 9513	463	25 Feb 2016
464	Schwarzbeck cable from Bulkhead to Receiver	Schwarzbeck	AK 9513	464	25 Feb 2016
480	Cable - Bulkhead to Amp	SRC Haverhill	157-157-3050360	480	11 Aug 2016
481	Cable - Bulkhead to Receiver	SRC Haverhill	151-151-3050787	481	11 Aug 2016
482	Cable - Amp to Antenna	SRC Haverhill	157-157-3051574	482	11 Aug 2016

5.2. Conducted Emissions



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
158	Barometer/Thermometer	Control Company	4196	E2846	01 Dec 2016
184	Pulse Limiter	Rhode & Schwarz	ESH3Z2	357.8810.52	13 Feb 2016
190	LISN (two-line V-network)	Rhode & Schwarz	ESH3Z5	836679/006	29 Oct 2016
193	Receiver 20 Hz to 7 GHz	Rhode & Schwarz	ESI 7	838496/007	14 Jan 2016
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	27 Aug 2016
307	BNC-CABLE	Megaphase	1689 1GVT4	15F50B002	13 Feb 2016
316	Dell desktop computer workstation with Vasona	Dell	Desktop	WS04	Not Required
351	Data Impedance Stabilization Network	Teseq	ISN T800	24809	30 Nov 2016
372	AC Variable PS	California Instruments	1251P	L06951	Cal when used
378	Rohde & Schwarz 40 GHz Receiver with Generator	Rhode & Schwarz	ESIB40	100107/040	04 Aug 2016
388	LISN (3 Phase) 9kHz - 30MHz	Rohde & Schwarz	ESH2-Z5	892107/022	30 Oct 2016
ADAPT SMA#1	SMA Cable	Megaphase	SMA Cable #1	None	13 Aug 2016
CCEMC01	Confidence Check.	MiCOM	CCEMC01	None	13 Feb 2016

5. TEST RESULTS

5.1. EMC EMISSIONS TEST RESULTS

5.1.1. Radiated Emissions

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

CORR = Correction Factor = CL – AG + NFL

CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
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

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

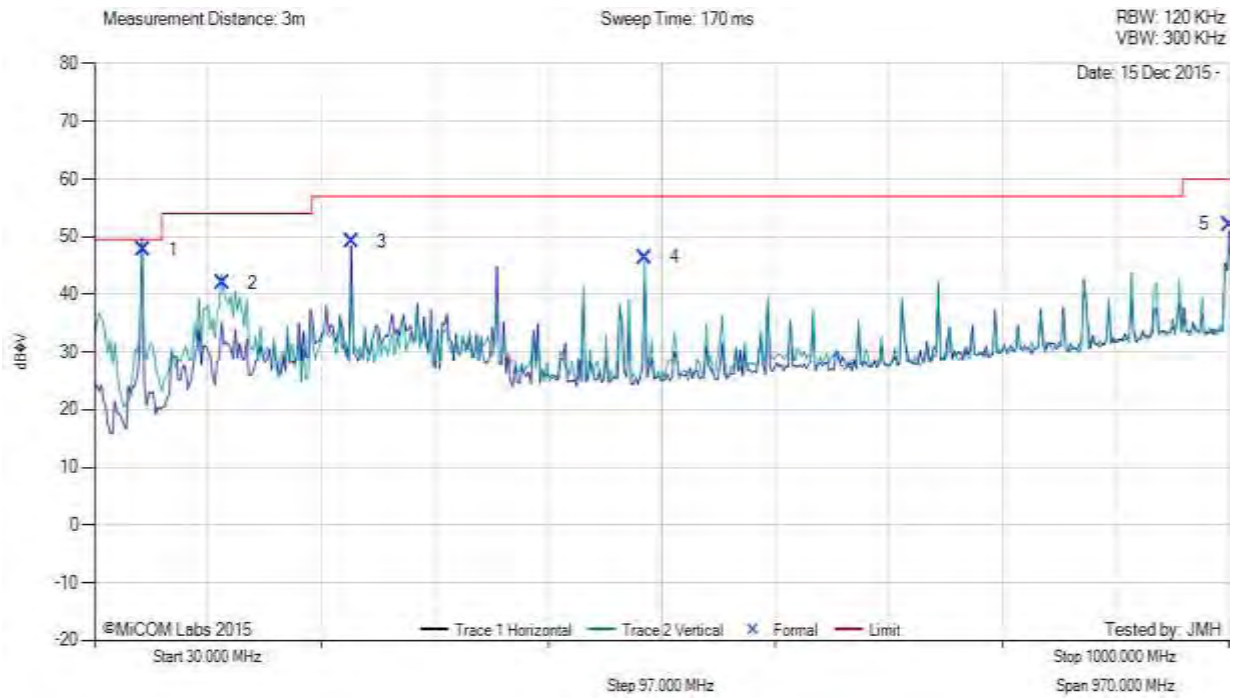
Frequency(MHz)	Average Limit (dBμV/m)	Peak Limit (dBμV/m)	Measurement Distance (meters)	Class (A/B)
1 000 to 6000	60	80	3	Class A

Laboratory Measurement Uncertainty for Radiated Emissions

Measurement uncertainty	+5.6/ -4.5 dB

Measurement Results: Radiated Emissions; 30-1000MHz,

Variant: ALH-9011, Test Freq: N/A, Antenna: N/A, Power Setting: N/A



Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	72.04	70.00	3.72	-23.08	47.64	MaxQP	Horizontal	264	286	49.5	-1.9	Pass
2	139.26	56.00	4.07	-18.15	41.92	MaxQP	Vertical	100	85	54.0	-12.1	Pass
3	249.99	63.63	4.53	-19.05	49.11	MaxQP	Horizontal	100	232	57.0	-7.9	Pass
4	499.99	53.88	5.33	-12.85	46.36	MaxQP	Vertical	100	0	57.0	-10.6	Pass
5	999.96	51.91	6.60	-6.41	52.10	MaxQP	Horizontal	100	177	60.0	-7.9	Pass

Test Notes: EUT in charger base (PS ITE BP1020S05N03), Lan and USB connected to laptop

Class A Limits were used to show compliance

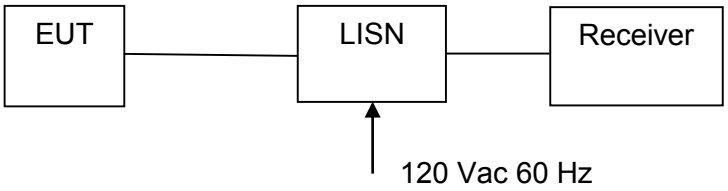
5.1.2. AC Mains Conducted Emissions

Scope

This test assesses the ability of the EUT to limit its internal noise from being present on the AC mains power input/output ports.

Test Procedure

The EUT is configured in accordance with ANSI C63.4. The conducted emissions are measured in a shielded room with a spectrum analyzer in peak hold in the first instance. Emissions closest to the limit are measured in the quasi-peak mode (QP) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation. The highest emissions relative to the limit are listed.



Measurement Setup for Conducted Emissions Test

Limits

The equipment shall meet the class B limits given in FCC Part 15: 207. Alternatively, for equipment intended to be used in non-residential environments, the class A limits given in FCC Part 15: 207 may be used.

Class B Emissions

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency

Class A Emissions

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	79	66
0.5-30	73	60

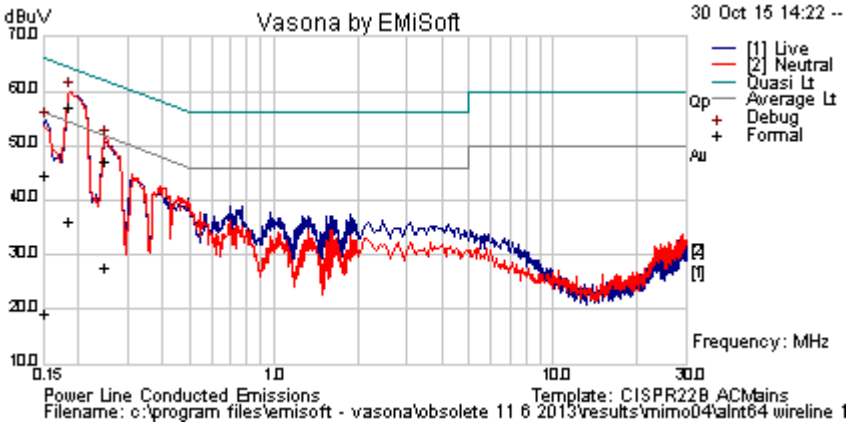
Traceability

All conducted emission measurements are traceable to national standards. The uncertainty of measurement at a confidence level of not less than 95 %, with a coverage factor of k=2, in the range 9 kHz – 30 MHz (Average & Quasi-peak) is ±2.64 dB.

Laboratory Measurement Uncertainty	
Measurement uncertainty	±2.64 dB

Measurement Results

Test Freq.	Not Applicable	**Engineer**	SB
Variant	AC Line Emissions	**Temp (ºC)**	25
Freq. Range	0.150 MHz - 30 MHz	**Rel. Hum.(%)**	22
Power Setting	Max	**Press. (mBars)**	1009
Antenna	Integral		
Test Notes 1	Battery charging in stand; EUT powered by stand; Transmitter On;		
Test Notes 2	Class B Limits		



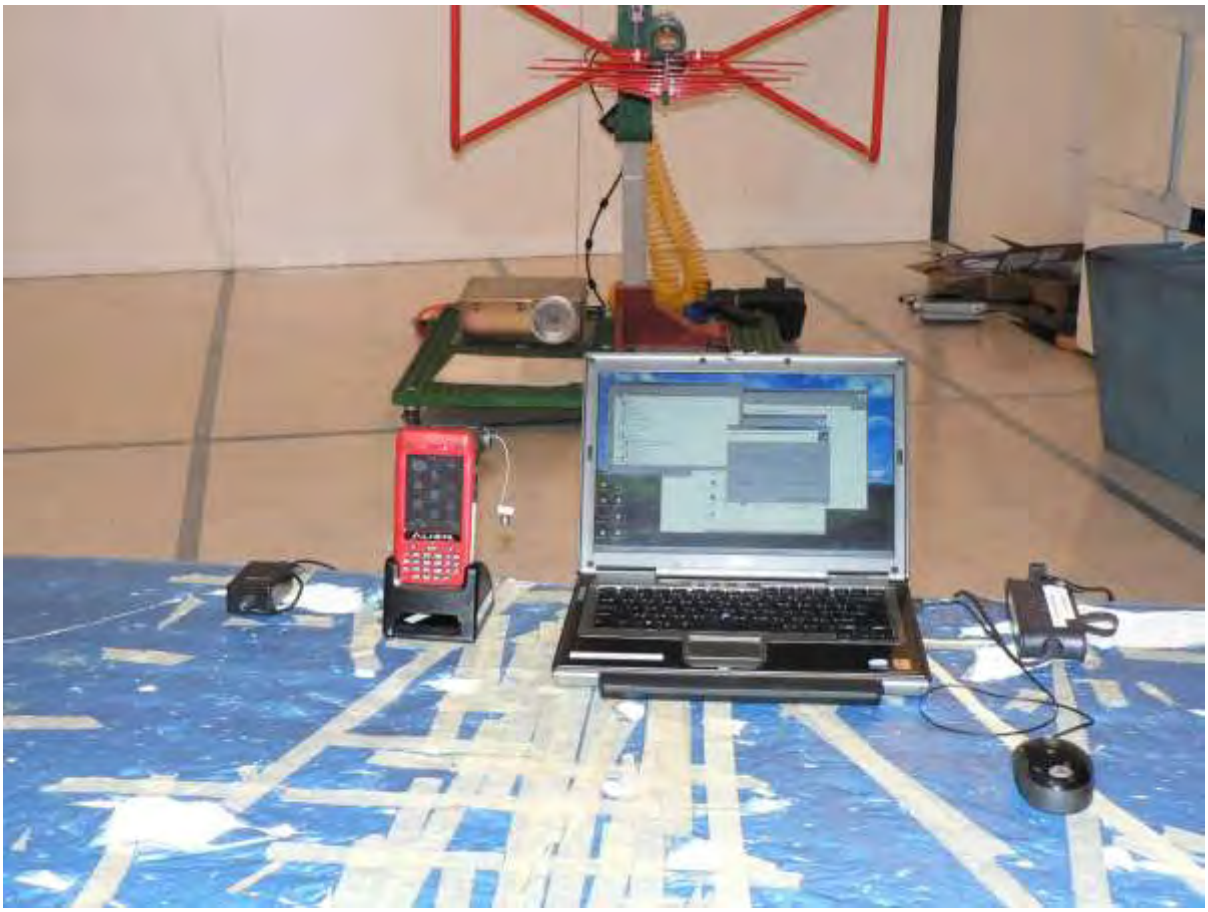
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
0.154	34.6	9.8	0.1	44.5	Quasi Peak	Live	65.8	-21.3	Pass	
0.187	47.0	9.8	0.1	56.9	Quasi Peak	Live	64.17	-7.2	Pass	
0.250	37.4	9.8	0.1	47.3	Quasi Peak	Neutral	61.75	-14.4	Pass	
0.154	9.4	9.8	0.1	19.3	Average	Live	55.8	-36.5	Pass	
0.187	26.2	9.8	0.1	36.0	Average	Live	54.17	-18.1	Pass	
0.250	17.8	9.8	0.1	27.7	Average	Neutral	51.75	-24.1	Pass	
1.649	25.3	9.8	0.1	35.2	Peak [Scan]	Live	46	-10.8	Pass	
4.027	24.8	9.7	0.2	34.8	Peak [Scan]	Live	46	-11.2	Pass	
0.677	27.3	9.8	0.1	37.2	Peak [Scan]	Live	46	-8.8	Pass	

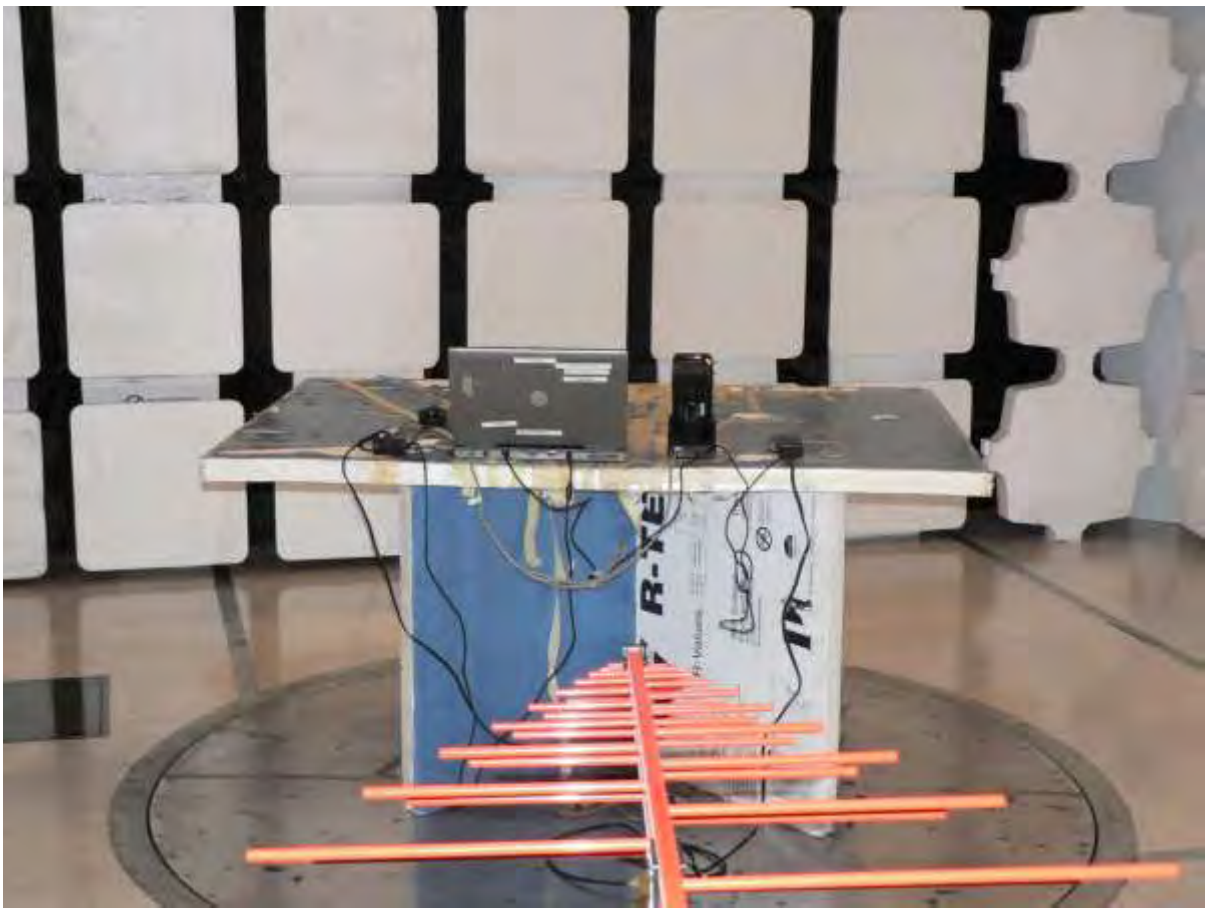
Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

6. PHOTOGRAPHS

Digital Emissions Test Configuration



Digital Emissions 0.03 – 1GHz



AC Wireline Test Setup

575 Boulder Court
Pleasanton, California 94566, USA
Tel: 1.925.462.0304
Fax: 1.925.462.0306
www.micomlabs.com