Test of Alien Technology ALH-90XX Handheld RFID Reader

To: FCC 47 CFR Part 15.207/209

Test Report Serial No.: ALNT47-U1 Rev A

TEST REPORT

FROM

MiCOM Labs

Test of Alien Technology ALH-90XX Handheld RFID Reader
to

To: FCC 47 CFR Part 15.207/209

Test Report Serial No.: ALNT47-U1 Rev A

This report supersedes None

Applicant: Alien Technology
18220 Butterfield Blvd
Morgan Hill
California 95037, USA

Product Function: Handheld RFID Reader

Copy No: pdf Issue Date: 10th July 2013

This Test Report is Issued Under the Authority of;

MiCOM Labs, Inc.
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Phone: +1 (925) 462-0304
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A2LA ACCREDITED
TESTING CERTIFICATE #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

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ACCREDITATION, LISTINGS & RECOGNITION

ACCREDITATION - TESTING

MiCOM Labs, Inc. is an accredited Electrical testing laboratory per the international standard EN ISO/IEC 17025. 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

RECOGNITION

MiCOM Labs, Inc has widely recognized Electrical testing capabilities. Our international recognition includes Conformity Assessment Body designation by APEC MRA** countries. Our test reports are widely accepted for global type approvals.

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
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	

**APEC MRA – Asia Pacific Economic Community Mutual Recognition Agreement.
Is a 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
N/A – Not Applicable

**EU MRA – European Union Mutual Recognition Agreement.
Is a recognition agreement under which test lab is accredited to regulatory standards of the EU member countries.

**NB – Notified Body

PRODUCT CERTIFICATION

MiCOM Labs, Inc. is an accredited Product Certification Body per the international standard EN ISO/IEC Guide 65. 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)
TCB Identifier – US0159

Industry Canada – Certification Body
CAB Identifier – US0159

Europe – Notified Body
Notified Body Identifier - 2280

Japan – Recognized Certification Body (RCB)
RCB Identifier - 210

DOCUMENT HISTORY

Document History		
Revision	**Date**	**Comments**
Draft		
Rev A	10th July 2013	Initial Release

1. TEST RESULT CERTIFICATE

Applicant:	Alien Technology 18220 Butterfield Blvd Morgan Hill California 95037, USA	Tested By:	MiCOM Labs, Inc. 440 Boulder Court Suite 200 Pleasanton California, 94566, USA
EUT:	Handheld RFID Reader	Tel:	+1 925 462 0304
Model:	ALH-90XX	Fax:	+1 925 462 0306
S/N:	9011-01-1300187		
Test Date(s):	23rd May 2013	Website:	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC 47 CFR Part 15.207/209	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.

ACCREDITED
TESTING CERTIFICATE #2381.01

Approved & Released for MiCOM Labs, Inc. by:

Graeme Grieve
Quality Manager MiCOM Labs,

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 15.207/209	2013	Code of Federal Regulations
(ii)	Industry Canada ICES-003	Issue 5 August 2012	Spectrum Management and Telecommunications Policy Interference-Causing Equipment Standard Digital Apparatus
(iii)	ANSI C63.4	2009	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)	CISPR 22/ EN 55022	2008	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
(v)	M 3003	Edition 2 Jan. 2007	Expression of Uncertainty and Confidence in Measurements
(vi)	LAB34	Edition 1 Aug 2002	The expression of uncertainty in EMC Testing
(vii)	ETSI TR 100 028	2001	Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
(viii)	A2LA	July 2012	Reference to A2LA Accreditation Status – A2LA Advertising Policy
(ix)	FCC Public Notice – DA 02 -2138	2002	Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices

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:	Test of the Alien Technology ALH-90XX Handheld RFID Reader to FCC Part 15.207/209 regulations.
Applicant:	Alien Technology 18220 Butterfield Blvd Morgan Hill California 95037, USA
Manufacturer:	As applicant
Laboratory performing the tests:	MiCOM Labs, Inc. 440 Boulder Court, Suite 200 Pleasanton, California 94566 USA
Test report reference number:	ALNT47-U1 Rev A
Date EUT received:	23rd May 2013
Standard(s) applied:	FCC 47 CFR Part 15.207/209
Dates of test (from - to):	23rd May 2013
No of Units Tested:	1
Type of Equipment:	RFID, Wi-Fi, Bluetooth, GPS, HSDPA
Applicants Trade Name:	Alien Technology
Model(s):	ALH-90XX
Location for use:	Indoor
Rated Input Voltage and Current:	EUT is battery powered with charging station;- EUT battery 3.7Vdc nominal. Charging station 5Vdc AC/DC power adapter 100 ~ 240 Vac/ 5 Vdc
Operating Temperature	0ºC to 40ºC
Equipment Dimensions:	6.25“ x 3.10” x 4.60”
Weight:	1.42 lbs max
Primary function of equipment:	Handheld RFID reader.

3.2. Scope of Test Program

Testing

The scope of the compliance program was to test the Alien Technology ALH-90XX Handheld RFID Reader, with new GSM data radio from Cinterion (the HC25 model has been replaced by newer PH8 model) for compliance against FCC 47 CFR Parts 15.207 and 15.209.

Alien Technology ALH-90XX Handheld RFID Reader

Alien Technology ALH-90XX Handheld RFID Reader installed in Charging Station

AC/DC adapter for Charging Station

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

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

Type (EUT/ Support)	Equipment Description (Including Brand Name)	Mfr	Model No.	Serial No.
EUT	Alien Technology ALH-90XX Handheld RFID Reader	Alien Technology	ALH-90XX	9011-01-1300187
Support	Charging Station	Alien Technology	ALX-507 Cradle	5313094012
Support	AC/DC power adapter	I.T.E. Power Supply	JPW118KA0600N08	K1245/REV A/RoHS

3.4. Cabling and I/O Ports

Type of I/O Ports	Description	Screened (y/n)	Qty
DC power	5 Vdc port	N	1
Ethernet	RJ45 Data cable port	N	1
USB	USB data port	N	1

3.5. Antenna Details

The following is a description of the EUT antennas provided for information. No antennas were tested as part of this test program.

Antenna Type:	Manufacturer	Model	Type	Gain (dBi)	Frequency Range (MHz)
Bluetooth	SEJONG TRONICS Co	Integral Chip	Omni	0.0	2400 - 2500
Cellular	Skysun	PIFA	Omni	-5.0	824 - 960
				-5.0	1710 - 2170
UHF	Antenna Engine	Patch	Circular Polarized	1.0	902 - 928
WLAN	HANWOOL	PCB	Omni	3.9	2400 - 2484
				-0.5	5200 - 5800
GPS	PARTRON Co	Patch	Circular Polarized	-1.0	1605

3.6. Test Configurations

EUT Configuration - Radiated Emissions:

The tests shall be made with setup and operation as specified in ANSI C 63.4.

3.7. Equipment Modifications

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

1. NONE

3.8. 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

List of Measurements

The following table represents the list of measurements required under the **FCC CFR47 Part 15.207/209**, **Industry Canada ICES-003**.

Section(s)	Test Items	Description	Condition	Result	Test Report Section
15.209(a) **5.1**	Radiated Emissions	Emissions <1 GHz (30M-1 GHz)	Radiated	Complies	*5.1.1*
15.207 **6.1**	AC Wireline Conducted Emissions 150 kHz– 30 MHz	Conducted Emissions	Conducted	Complies	*5.1.2*

5. TEST RESULTS

5.1.1. Radiated Emissions

FCC, Part 15 Subpart C 15.209(a)
Industry Canada ICES-003

Test Procedure

Testing was performed in a 3-meter anechoic chamber. Preliminary radiated emissions were measured on every azimuth and with the receiving antenna in both horizontal and vertical polarizations. Preliminary emissions were recorded with in Spectrum Analyzer mode, using a maximum peak detector while in peak hold mode. Depending on the frequency band spanned a notch filter and/or waveguide filter was used to remove the fundamental frequency.

Emissions nearest the limits were chosen for maximization and formal measurement using a CISPR compliant receiver. Emissions above 1000 MHz are measured utilizing a CISPR compliant average detector with a tuned receiver, using a bandwidth of 1 MHz. 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. 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:

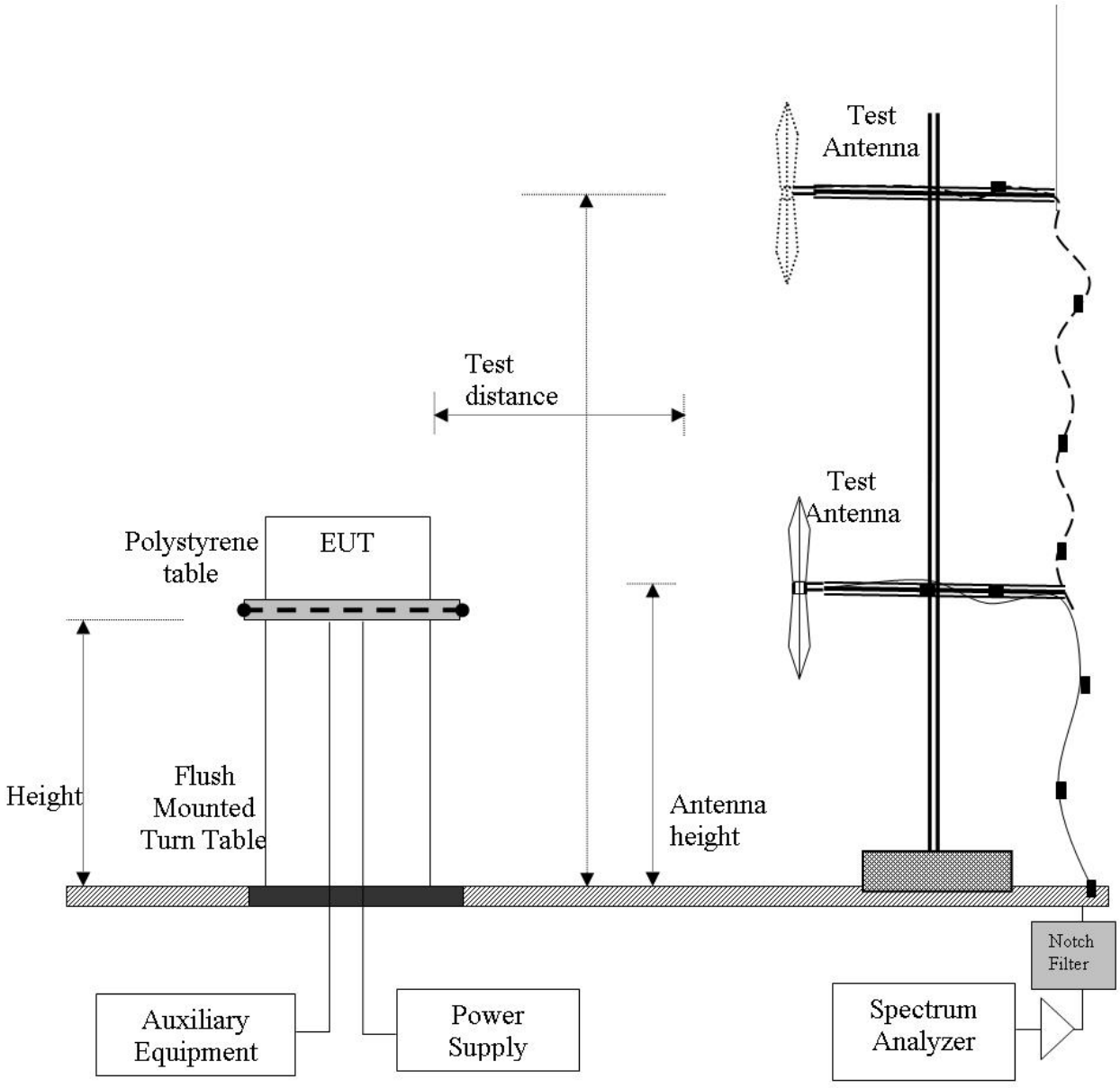
FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

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

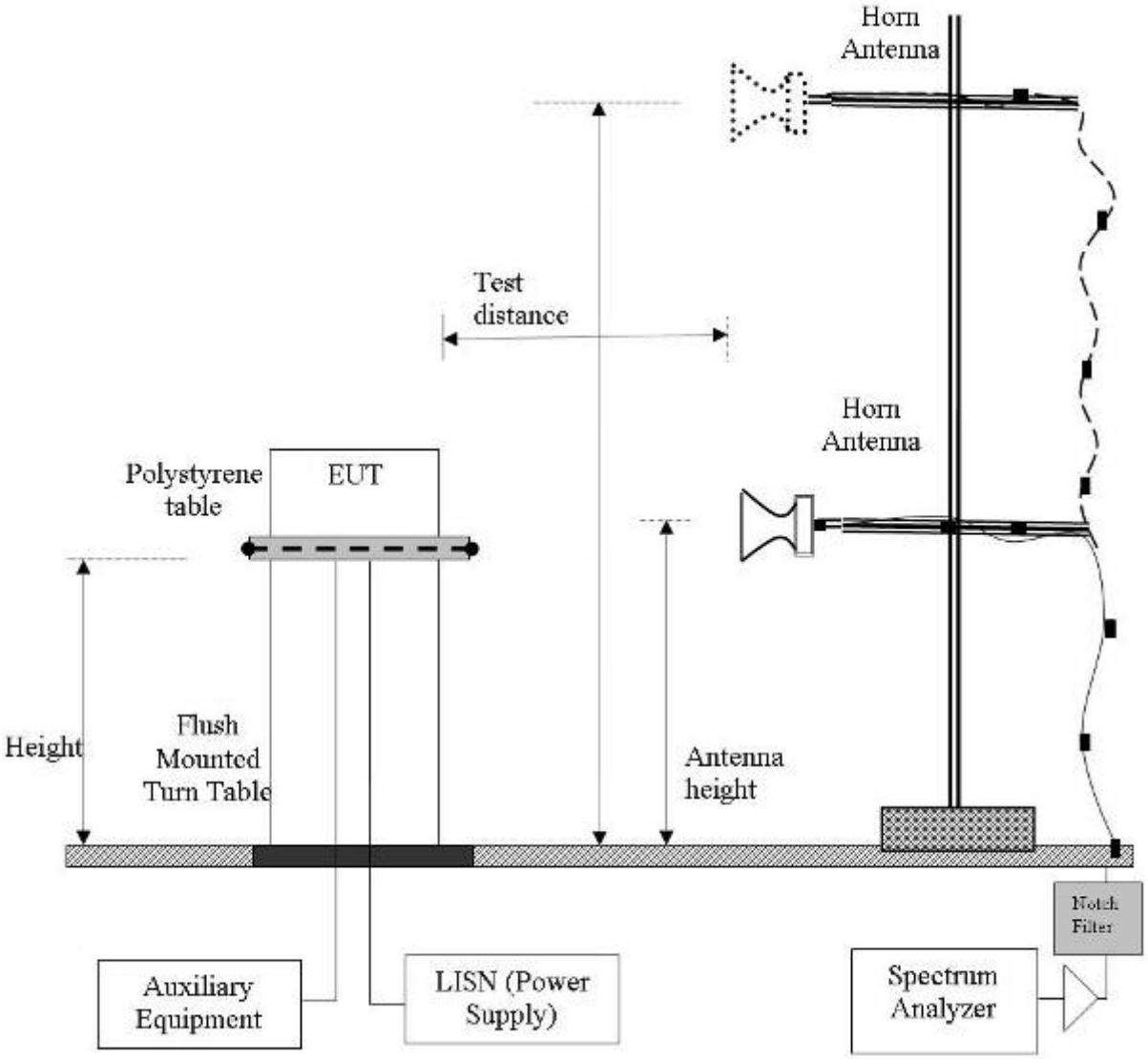
Level (dBμV/m) = 20 * Log (level (μV/m))

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

Radiated Emission Measurement Setup – Below 1 GHz



Radiated Emission Measurement Setup – Above 1 GHz



NOTE: KDB 662911 was implemented for Out-of-Band measurements. Where necessary Option (2) Measure and add 10 log (N) dB was implemented

Specification

Radiated Spurious Emissions

FCC §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.

ICES-003 The field intensity of radio noise emissions that are radiated from a Class B digital apparatus shall not exceed the limits specified in Table 6 of the publication referred to in Section 7.1, within the indicated frequency range.

Table 1: FCC 15.209 Spurious Emissions Limits

Frequency (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Laboratory Measurement Uncertainty for Spectrum Measurement

Measurement Uncertainty	+5.6/ -4.5 dB

Traceability:

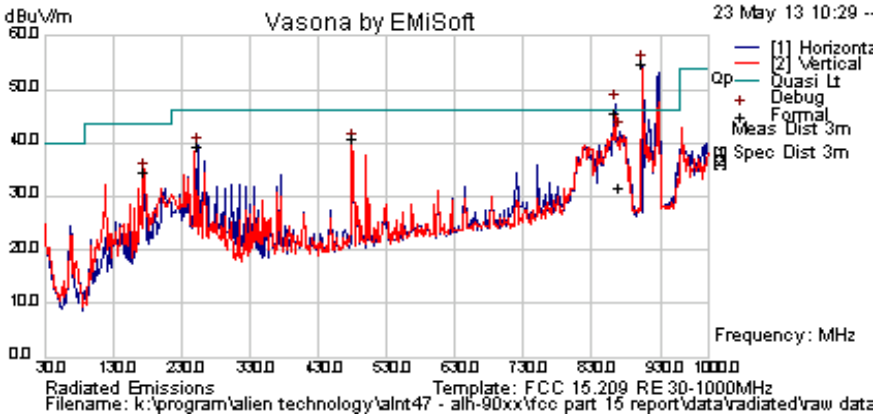
Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of Radiated Emissions'	0088, 0158, 0134, 0304, 0311, 0315, 0310, 0312

5.1.1.1. Radiated Spurious Emissions – 30 MHz - 1 GHz

The EUT was active during testing by running test software installed in the EUT provided by the client.

Test Freq.	All Transmitters active	**Engineer**	SB
Variant	Digital Emissions	**Temp (ºC)**	24
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	29
Power Setting	N/A	**Press. (mBars)**	1001
Antenna	N/A		
Test Notes 1	RFID, WIFI, GPS, and Barcode Scanner Active		



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
863.998	46.9	7.0	-8.2	45.7	Quasi Max	H	200	277	46	-0.3	Pass	
870.729	32.6	7.1	-8.2	31.5	Quasi Max	H	202	239	46	-14.5	Pass	
479.971	47.9	5.8	-12.8	40.9	Quasi Max	V	111	24	46	-5.1	Pass	
904.749	55.3	7.1	-7.7	54.7	Peak [Scan]	H	200					FUND
253.546	53.6	4.9	-19.0	39.5	Peak [Scan]	H	200	277	46	-6.5	Pass	
175.297	49.9	4.5	-19.9	34.5	Peak [Scan]	V	200	277	43.5	-9.0	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

5.1.2. AC Mains Power Input/Output Ports

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.

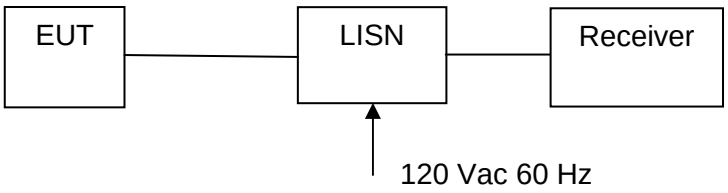
Test Method

The test method shall be in accordance with EN 55022 and the Artificial Mains Networks (AMNs) shall be connected to the AC mains power source.

The measurement frequency range extends from 150 kHz to 30 MHz. When the EUT is a transmitter operating at frequencies below 30 MHz, then the exclusion band for transmitters applies for measurements in the transmit mode of operation.

Test Procedure

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 EN 55022. Alternatively, for equipment intended to be used in telecommunication centres only, the class A limits given in EN 55022 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

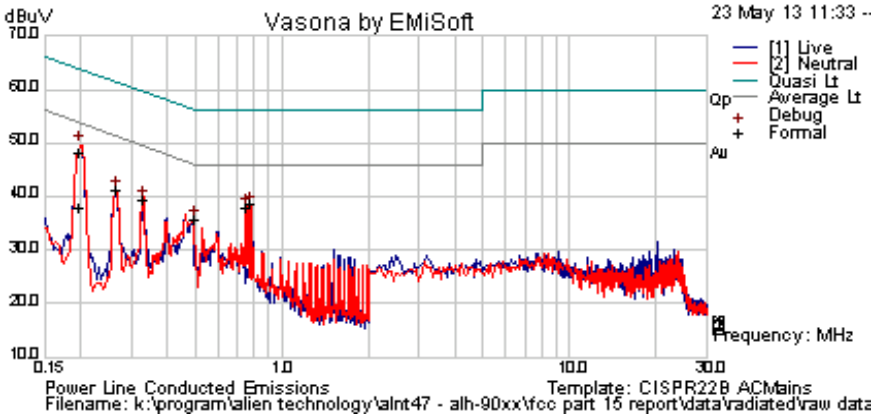
All conducted emission measurements are traceable to national standards. The uncertainty of measurement at a confidence level of not less than 95 %, with a coverage factor of k=2, in the range 9 kHz – 30 MHz (Average & Quasi-peak) is ±2.64 dB.

Laboratory Measurement Uncertainty	
Measurement uncertainty	±2.64 dB

Method	Test Equipment Used
Measurements were made per work instruction WI-EMC-01 'Measurement of Conducted Emissions'	0158, 0184, 0193, 0190, 0293, 0307, 156, 193, 190

5.1.2.1. Measurement Results

Test Freq.	N/A	**Engineer**	SB
Variant	AC Line Emissions	**Temp (°C)**	24.5
Freq. Range	0.150 MHz - 30 MHz	**Rel. Hum.(%)**	30
Power Setting	N/A	**Press. (mBars)**	1001
Antenna	N/A		
Test Notes 1			



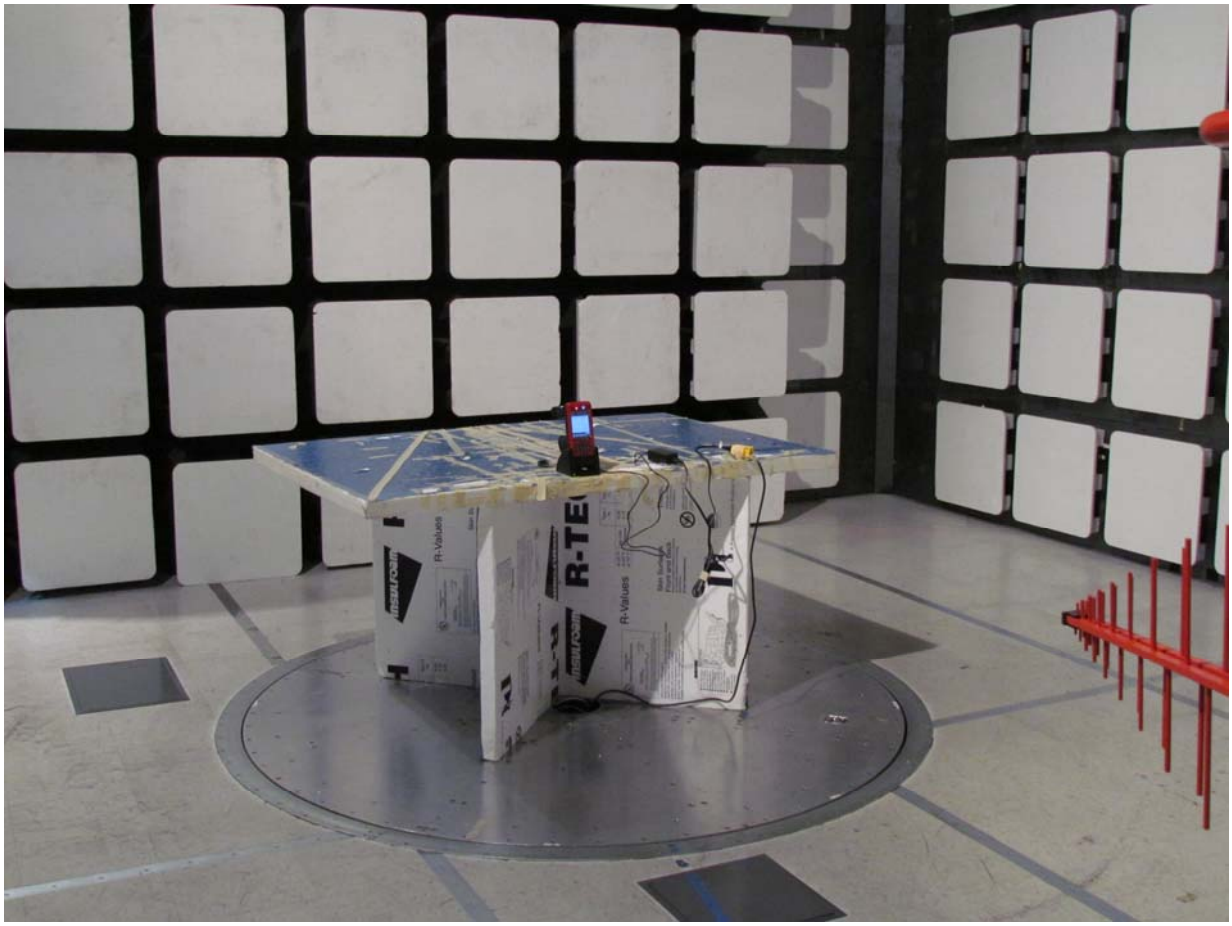
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
0.199	38.4	9.9	0.1	48.4	Quasi Peak	Neutral	63.65	-15.3	Pass	
0.199	28.0	9.9	0.1	38.0	Average	Neutral	53.65	-15.6	Pass	
0.754	27.9	10.0	0.1	37.9	Peak [Scan]	Neutral	46	-8.1	Pass	
0.779	28.5	10.0	0.1	38.5	Peak [Scan]	Neutral	46	-7.5	Pass	
0.267	31.4	9.9	0.1	41.3	Peak [Scan]	Neutral	51.21	-9.9	Pass	
0.330	29.6	9.9	0.1	39.6	Peak [Scan]	Neutral	49.45	-9.9	Pass	
0.497	25.9	9.9	0.1	35.9	Peak [Scan]	Neutral	46.05	-10.1	Pass	

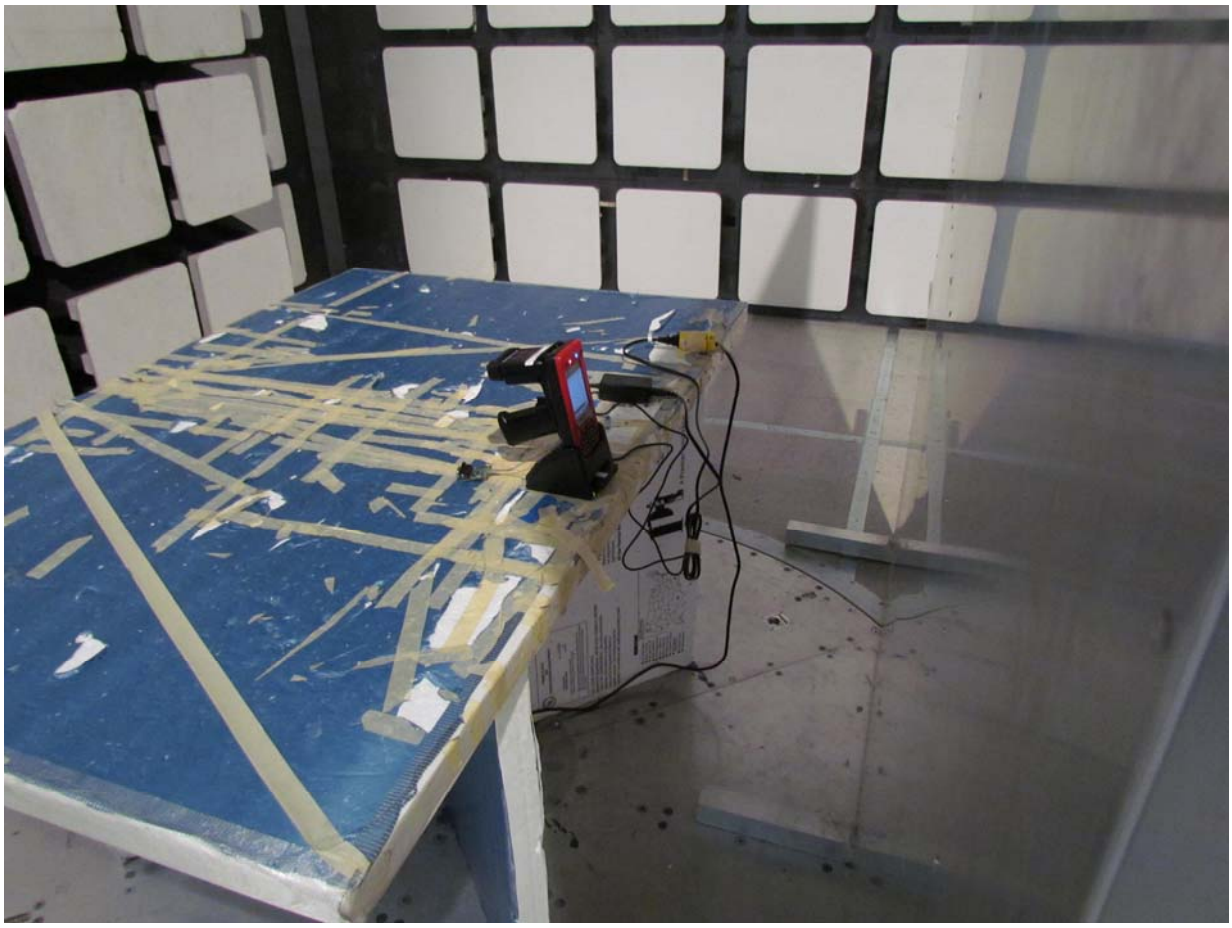
Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

6. PHOTOGRAPHS

6.1. Radiated Emissions < 1GHz



6.2. AC Wireline Emissions



7. TEST EQUIPMENT DETAILS

Asset #	Instrument	Manufacturer	Part #	Serial #	Calibration Due Date
0158	Barometer /Thermometer	Control Co.	4196	E2846	8th Jan 14
0193	EMI Receiver	Rhode & Schwartz	ESI 7	838496/007	2nd Dec 13
0287	EMI Receiver	Rhode & Schwartz	ESIB40	100201	16th Nov 13
0338	30 - 3000 MHz Antenna	Sunol	JB3	A052907	8th Nov 13
0335	1-18 GHz Horn Antenna	EMCO	3117	00066580	7th Nov 13
0190	Line Impedance Stabilization Network	Rhode & Schwartz	ESH3Z5	836679/006	12 Nov '13
	EMC Test Software	EMISoft	Vasona	5.0051	N/A

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