

Test of WhereNet Corporation, WherePort IV
To: FCC 47 CFR Part 15.209 & IC RSS-210
Test Report Serial No.: ETSD11-A2 Rev A



TEST REPORT
FROM
MiCOMLabs

Test of WhereNet Corporation, WherePort IV
to
FCC 47 CFR Part 15.209 & IC RSS-210

Test Report Serial No.: ETSD11-A2 Rev A

This report supersedes: None

Manufacturer: WhereNet Corporation
2858 De La Cruz Blvd.
Santa Clara
California 95050, USA

Product Function: Magnetic Exciter

Copy No: pdf **Issue Date:** 19th August '08

This Test Report is Issued Under the Authority of:

MiCOM Labs, Inc.
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CERTIFICATE #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory



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ACCREDITATION & LISTINGS

MiCOM Labs, Inc. an accredited laboratory complies with the international standard BS 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>



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LISTINGS

MiCOM Labs test facilities are listed by the following organizations;

North America

United States of America

Federal Communications Commission (FCC) Listing #: 102167

Canada

Industry Canada (IC) Listing #: 4143A

RECOGNITION

APEC MRA (Asia-Pacific Economic Community Mutual Recognition Agreement)

Conformity Assessment Body (CAB) – MiCOM Labs

Test data generated by MiCOM Labs is accepted in the following countries under the APEC MRA.

Country	Recognition Body	Phase	CAB Identification No.
Australia	Australian Communications and Media Authority (ACMA)	I	US0159
Hong Kong	Office of the Telecommunication Authority (OFTA)	I	
Korea	Ministry of Information and Communication Radio Research Laboratory (RRL)	I	
Singapore	Infocomm Development Authority (IDA)	I	
Taiwan	Directorate General of Telecommunications (DGT) Bureau of Standards, Metrology and Inspection (BSMI)	I	

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DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft		
Rev A	19 th August 2008	Initial Release

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1. TEST RESULT CERTIFICATE

Manufacturer:	WhereNet Corporation 2858 De La Cruz Blvd. Santa Clara California 95050, USA	Tested By:	MiCOM Labs, Inc. 440 Boulder Court Suite 200 Pleasanton California, 94566, USA
EUT:	WherePort IV	Telephone:	+1 925 462 0304
Model:	WPT-3400-00AA	Fax:	+1 925 462 0306
S/N:	JB3240800H12	Website:	www.micomlabs.com
Test Date(s):	21st July -18th Aug '08		

STANDARD(S)	TEST RESULTS
FCC 47 CFR Part 15.209 & IC RSS-210	EQUIPMENT COMPLIES

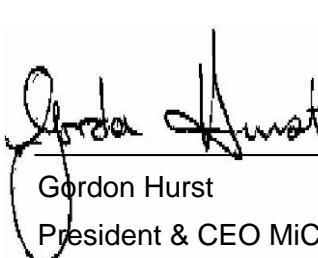
MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Notes:

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

Approved & Released for MiCOM Labs, Inc. by:


Graeme Grieve
Quality Manager MiCOM Labs,


Gordon Hurst
President & CEO MiCOM Labs, Inc.



CERTIFICATE #2381.01

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2. REFERENCES AND MEASUREMENT UNCERTAINTY

2.1. Normative References

Ref.	Publication	Year	Title
(i)	FCC 47 CFR Part 15.209	2006	Code of Federal Regulations
(ii)	Industry Canada RSS-210	Issue 7 June 2007	Low Power License-Exempt Radiocommunication Devices (All Frequency Bands)
(iii)	ANSI C63.4	2003	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	2006-03 1998	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
(v)	M 3003	Edition 1 Dec. 1997	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	14 th September 2005	Reference to A2LA Accreditation Status – A2LA Advertising Policy

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.

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3. PRODUCT DETAILS AND TEST CONFIGURATIONS

3.1. Technical Details

Details	Description
Purpose:	Test of the WhereNet Corporations WherePort IV Model WPT-3400-00AA to FCC Part 15.209 and Industry Canada RSS-210 regulations
Applicant:	WhereNet Corporation 2858 De La Cruz Blvd. Santa Clara California 95050, USA
Manufacturer:	As applicant
Laboratory performing the tests:	MiCOM Labs, Inc. 440 Boulder Court, Suite 200 Pleasanton, California 94566 USA
Test report reference number:	ETSD11-A2 Rev A
Date EUT received:	21st July 2008
Standard(s) applied:	FCC 47 CFR Part 15.209 & IC RSS-210
Dates of test (from - to):	21st July -18th Aug '08
No of Units Tested:	1
Type of Equipment:	Magnetic Exciter
Manufacturers Trade Name:	WherePort IV
Model:	WPT-3400-00AA
Location for use:	Indoor use only
Declared Frequency Range(s):	114.7 to 127 kHz
Type of Modulation:	OOK, FSK
Declared Nominal Output Power:	Maximum: 125 A/m
EUT Modes of Operation:	FSK
Transmit/Receive Operation:	Time Division Duplex
Hardware Revision	Rev 02, PCBA JB3
Software Revision	3.17
Rated Input Voltage and Current:	AC convertor 100-240 Vac to 48 Vdc 400 mA POE Nominal: 48 Vdc, 275 mA
Operating Temperature Range:	Declared range 0 to +40°C
Clock/Oscillator(s):	25, MHz
Frequency Stability:	±10 ppm/year (manufactures declaration)
Equipment Dimensions:	19.35cm Dia x 6.66cm Depth
Weight:	1.9lbs max
Primary function of equipment:	Magnetic FSK transmitter

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3.2. Scope of Test Program

The scope of the test program was to test WhereNet's, WherePort IV RFID reader model WPT-3400-00AA for compliance against FCC 47 CFR Part 15.209 and Industry Canada RSS-210 specifications.

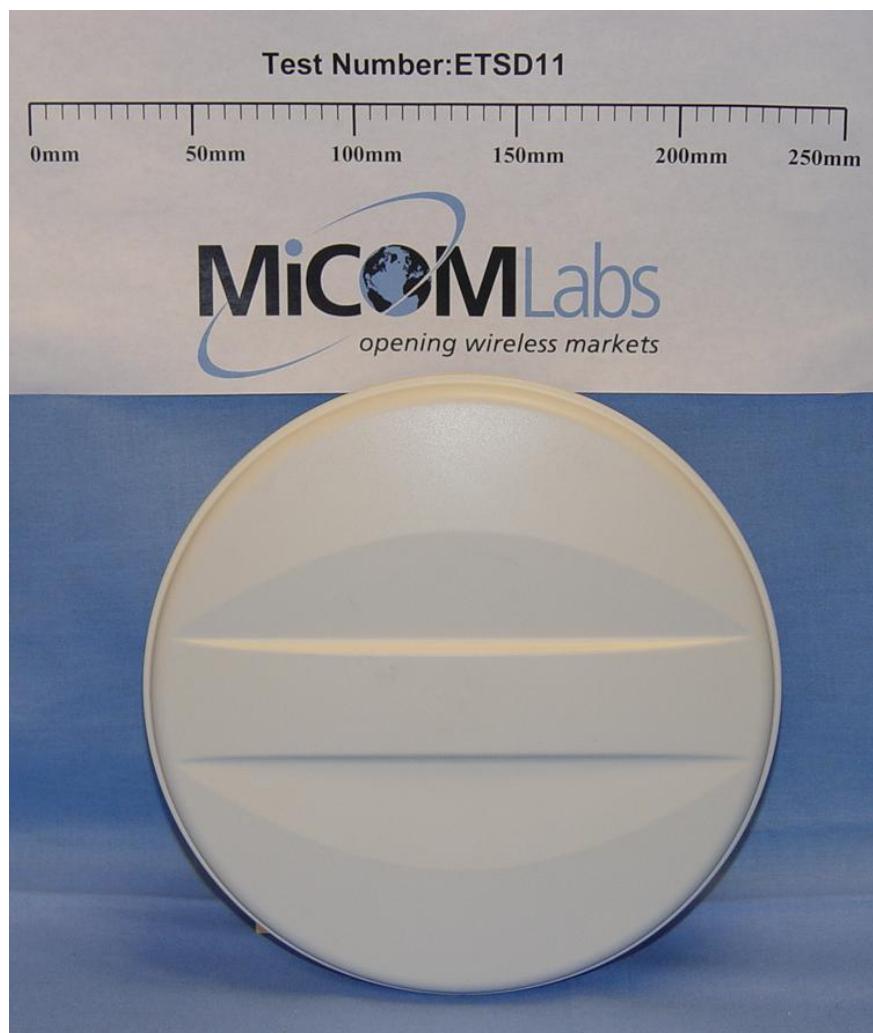
FCC CFR 47 Part 15, subsection 15.209

Industry Canada RSS-210 Section 2.6

The WherePort IV RFID reader has a single operational mode;

FSK magnetic transmit: 114.7 and 127 KHz

WhereNet WherePort IV WPT-3400-00AA



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

Type (EUT/Support)	Equipment Description (Including Brand Name)	Mfr	Model No.	Serial No.
EUT	WherePort IV	WhereNet	WPT-3400-00AA	--
EUT	ac/dc Power Supply Adapter 100-240Vac 50-60 Hz 0.6A 48 Vdc 0.4A	ITE	PW148RA4803F01	--
EUT	POE Power Supply	ITE	PW180KB	--
Support	Laptop	Dell	--	--

3.4. Antenna Details

Antenna Type	Gain (dBi)	Manufacturer	Model No.	Serial No.
Magnetic Coil 90° Coverage	N/A	MC Davis	WN24885	--

3.5. Cabling and I/O Ports

Number and type of I/O ports

1. 10/100 BT 2 meters non-shielded
2. 48 Vdc input 2 meters two core cable non-shielded
3. Modular 6p/6c Custom phasing I/O

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3.6. Equipment Modifications

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

1. NONE

3.7. Test Configurations

Matrix of test configurations

Operational Mode	# Operating Channel(s)	Frequencies (MHz)
FSK	2	114.7 to 127 KHz

3.8. Deviations from the Test Standard

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

2. NONE

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4. TEST SUMMARY

The following table represents the list of measurements required under the **FCC CFR47 Part 15.209** and **Industry Canada RSS-210 Section 2.6**

Section(s)	Test Items	Description	Condition	Result	Test Report Section
15.209 2.6	Field Strength	Radiated Emission Limits, general requirements	Radiated	Complies	5.1.1
15.209(a)	Radiated Emissions	Emissions < 1 GHz	Radiated	Complies Class A	5.1.2
15.207 7.2.2	AC Wireline Conducted Emissions 150 kHz–30 MHz	Conducted Emissions	Conducted	Complies Class B	5.1.3

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 3.7 Equipment Modifications highlights the equipment modifications that were required to bring the product into compliance with the above test matrix

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5. TEST RESULTS

5.1.1. Field Strength

FCC, Part 15 Subpart C §15.209
Industry Canada RSS-210 §2.6

Test Procedure

The field strength measurement was performed as a radiated test in a 3-meter anechoic chamber. The EUT was placed on a table 0.8 m above the ground-plane and emissions maximized through 360°C rotation of the turntable, measurement distance 3m. A magnetic loop antenna was placed 0.8 m above the ground plane for measurement purposes. The limits specified at 300 meters were extrapolated for the 3 m measurement distance.

Average detector was used to report the results of the intentional radiator.

The RFID transmitter was transmitting continuously at maximum power.

127 kHz Limit Calculation

127KHz limit extrapolated to a 3 meter measurement distance (20dB/decade)

Limit @ 300m: Field strength in μ V/m = $2,400/F$ (F in KHz)
 $2,400/127 = 18.89 \mu$ V/m

Conversion to dB μ V/m = 25.53 dB μ V/m

Limit @ 3m = $25.66 \text{ dB}\mu\text{V/m} + 40\text{dB} = 65.53 \text{ dB}\mu\text{V/m}$

114.7 kHz Limit Calculation

114.7 KHz limit extrapolated to a 3 meter measurement distance (20dB/decade)

$2,400/114.7 = 20.92 \mu$ V/m

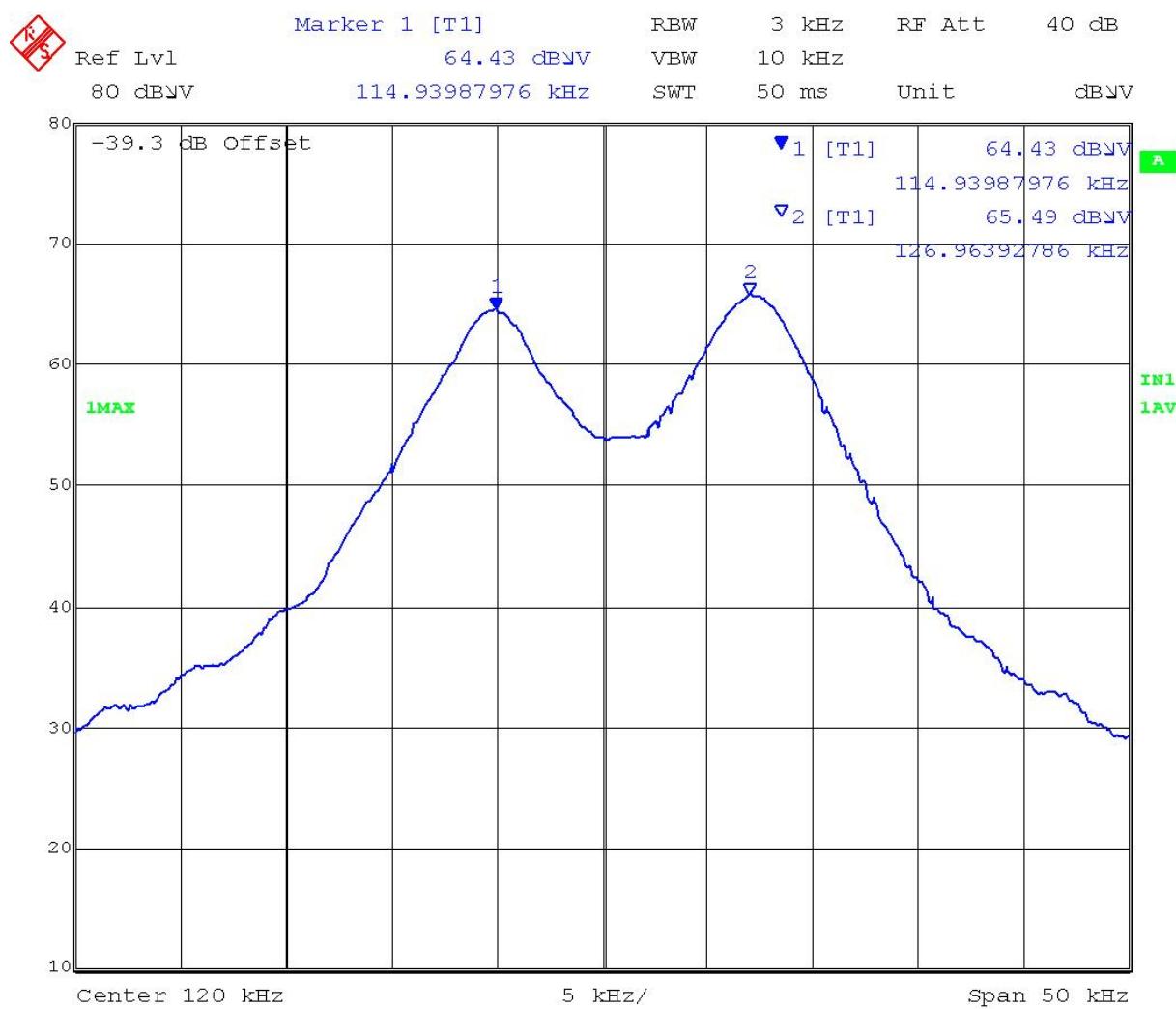
Conversion to dB μ V/m = 26.41 dB μ V/m

Limit @ 3m = $26.41 \text{ dB}\mu\text{V/m} + 40\text{dB} = 66.41 \text{ dB}\mu\text{V/m}$

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Measurement Results for Field Strength

Frequency (kHz)	Ave (dB _{uV/m})	Ave Limit (dB _{uV/m})	Ave Margin (dB)	
114.7	64.43	66.41	-1.98	
127.00	65.49	65.53	-0.04	



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Specification

Limits

§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.

2.6 Table 3 lists the permissible levels of unwanted emissions of transmitters and receivers as specified below.

Frequency(MHz)	Field Strength (μ V/m)	Measurement Distance (meters)
0.009-0.490	2400/F (F in KHz)	300
0.490-1.705	24000/F (F in KHz)	30
1.705-30.0	30	30

Laboratory Measurement Uncertainty for Radiated Emissions

Measurement uncertainty	+5.6/ -4.5 dB
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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, 0336

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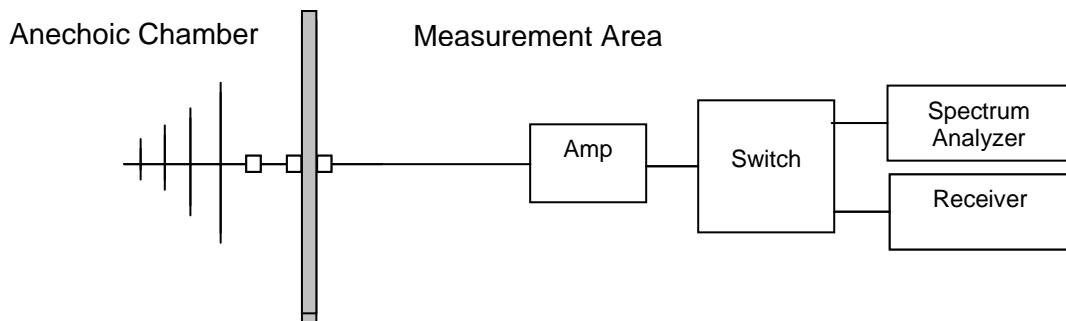
5.1.2. Radiated Spurious Emissions

FCC, Part 15 Subpart C §15.205/ §15.209

Test Procedure

Preliminary radiated emissions are measured in the anechoic chamber at a 3-meter distance using a magnetic loop antenna. The emissions are recorded with a spectrum analyzer in peak hold mode. Emissions closest to the limits are measured in the quasi-peak mode. Only the highest emissions relative to the limit are listed.

Test Measurement Set up



The product was initially tested to find worst case orientation for the maximization of spurious emissions. Worst case orientation was used for all emission testing.



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Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. In this test facility, the Antenna Factor, Cable Loss, and Amplifier Gains are loaded into the Rohde & Schwarz Receiver and the corrected field strength can be read directly on the receiver.

$$FS = R + AF + CORR$$

where:

FS = Field Strength

R = Measured Receiver Input Amplitude

AF = Antenna Factor

CORR = Correction Factor = CL - AG + NFL

CL = Cable Loss

AG = Amplifier Gain

For example:

Given a Receiver input reading of 51.5dB μ V; Antenna Factor of 8.5dB; Cable Loss of 1.3dB; Falloff Factor of 0dB, an Amplifier Gain of 26dB and Notch Filter Loss of 1dB. The Field Strength of the measured emission is:

$$FS = 51.5 + 8.5 + 1.3 - 26.0 + 1 = 36.3dB\mu V/m$$

Conversion between dB μ V/m (or dB μ V) and μ V/m (or μ V) are done as:

$$\text{Level (dB}\mu\text{V/m)} = 20 * \text{Log (level (\mu V/m))}$$

$$40 \text{ dB}\mu\text{V/m} = 100\mu\text{V/m}$$

$$48 \text{ dB}\mu\text{V/m} = 250\mu\text{V/m}$$

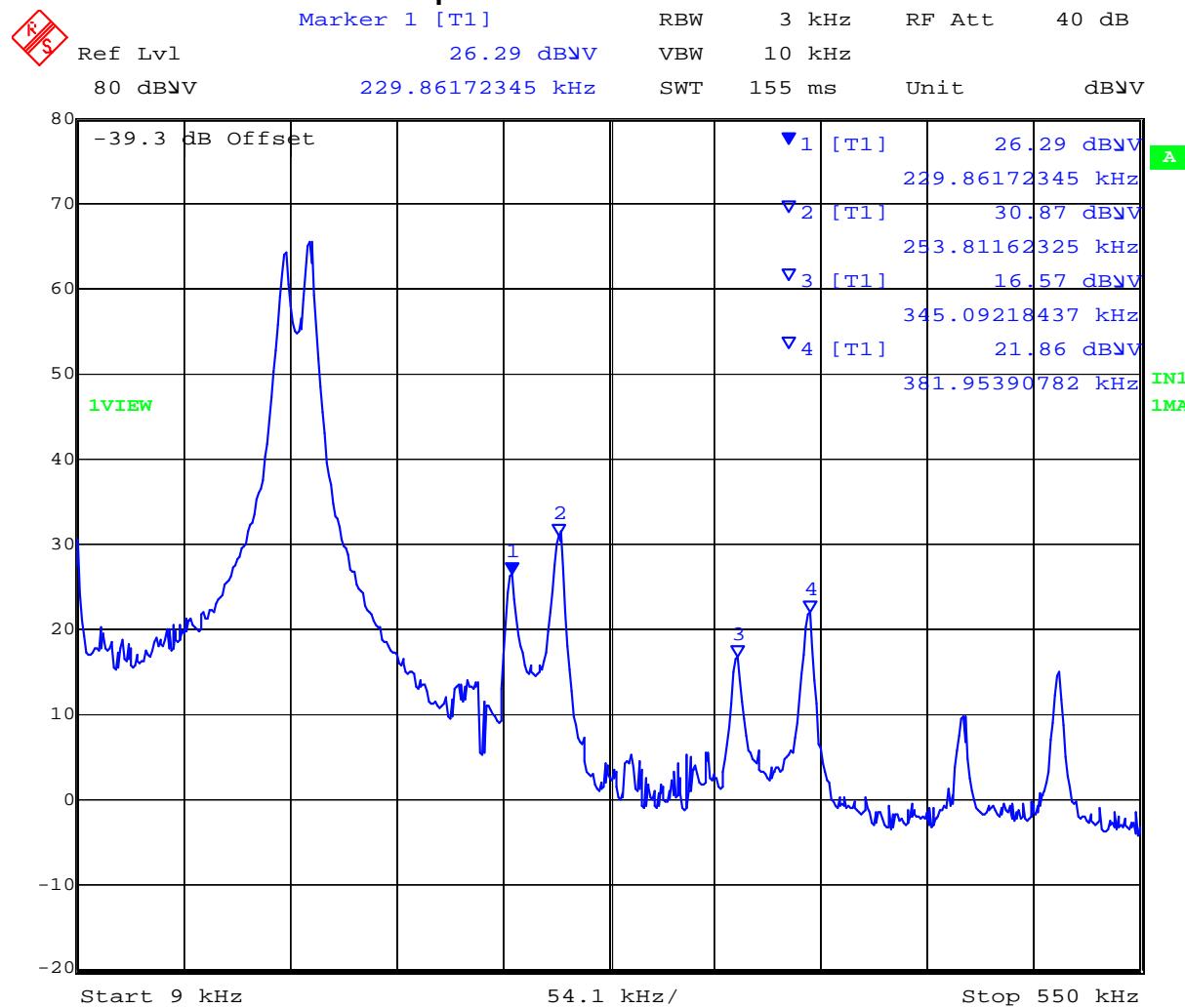
Measurement Results for Spurious Emissions (9 kHz – 30 MHz)

Ambient conditions.

Temperature: 17 to 23 °C Relative humidity: 31 to 57 % Pressure: 999 to 1012 mbar

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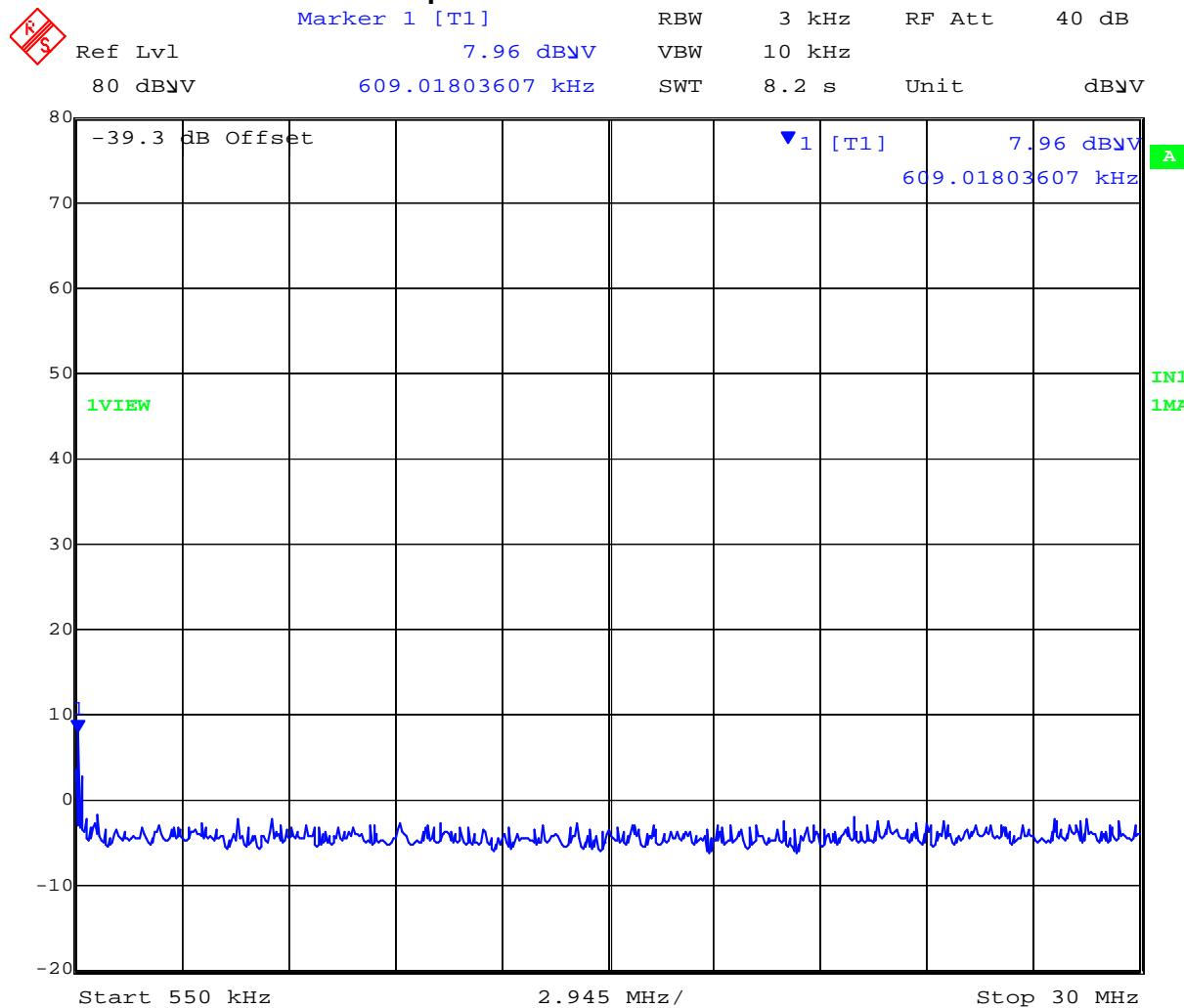
Radiated Spurious Emissions 9 kHz to 550 kHz



Date: 15.AUG.2008 14:02:26

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Radiated Spurious Emissions 550 KHz – 30 MHz



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Specification

Limits

§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.

2.6 Table 3 lists the permissible levels of unwanted emissions of transmitters and receivers as specified below.

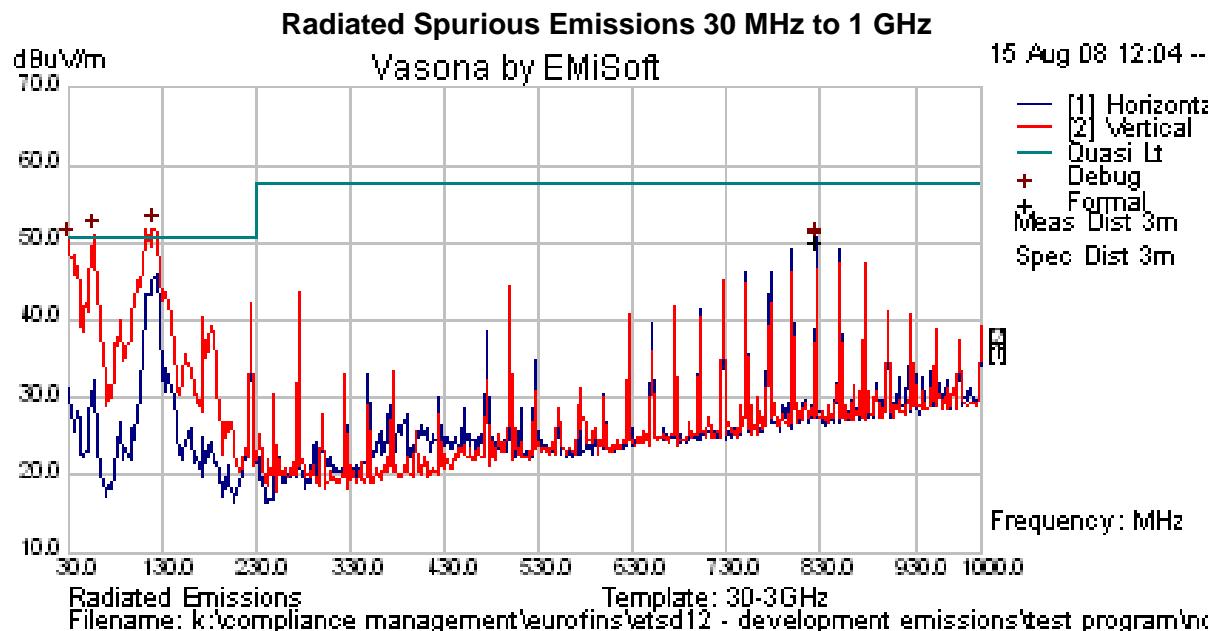
Frequency(MHz)	Field Strength (μ V/m)	Measurement Distance (meters)
0.009-0.490	$2400/F$ (F in KHz)	300
0.490-1.705	$24000/F$ (F in KHz)	30
1.705-30.0	30	30

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Radiated Spurious Emissions 30 MHz to 1 GHz

POE Operation

Class A



Above Plot relates to Peak Readings Only

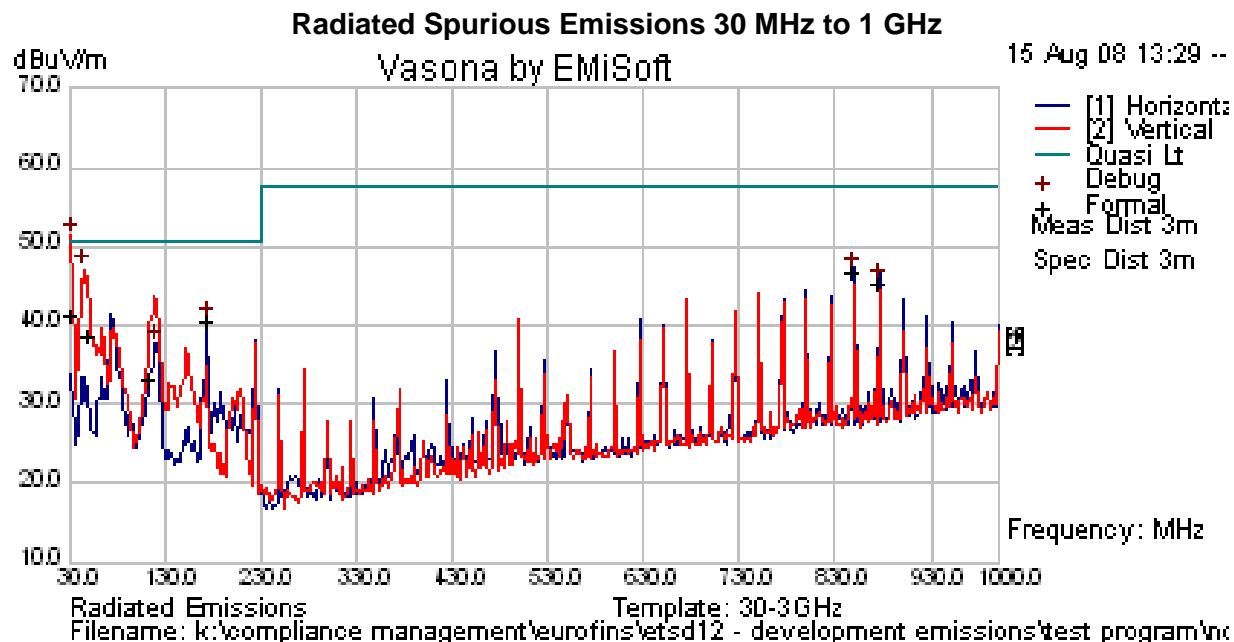
TABLE OF RESULTS – POE

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
124.978	73.73	4.33	-27.69	50.37	Quasi Max	V	100	329	50.5	-0.13	Pass	
57.898	72.33	3.8	-31.74	44.39	Quasi Max	V	100	281	50.5	-6.11	Pass	
41.062	57.2	3.58	-24.07	36.71	Quasi Max	V	187	360	50.5	-13.79	Pass	
120.97	73.94	4.3	-27.78	50.45	Quasi Max	V	100	341	50.5	-0.05	Pass	
30.099	51.77	3.37	-13.81	41.34	Quasi Max	V	98	334	50.5	-9.16	Pass	
824.99	63.91	7.17	-20.83	50.25	Quasi Max	H	98	360	57.5	-7.25	Pass	

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ac/dc Adapter Operation

Class A



Above Plot relates to Peak Readings Only

TABLE OF RESULTS – AC/DC ADAPTER

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
32.608	54.28	3.43	-16.38	41.34	Quasi Max	V	104	328	50.5	-9.16	Pass	
49.917	65.25	3.72	-30.24	38.72	Quasi Max	V	100	234	50.5	-11.78	Pass	
174.986	66.92	4.62	-30.85	40.69	Quasi Max	H	232	356	50.5	-9.81	Pass	
850.009	60.31	7.17	-20.85	46.63	Quasi Max	H	98	306	57.5	-10.87	Pass	
875.001	58.92	7.24	-20.73	45.43	Quasi Max	H	98	328	57.5	-12.07	Pass	
113.512	57.48	4.26	-28.4	33.35	Quasi Max	V	159	54	50.5	-17.15	Pass	

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Specification

Limits

§15.205 (a) Except as shown in paragraph (d) of 15.205 (a), only spurious emissions are permitted in any of the frequency bands listed.

§15.205 (a) Except as shown in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§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.

§15.209 (a) and RSS-Gen §2.2 Limit Matrix

Frequency(MHz)	Field Strength (μ V/m)	Field Strength (dB μ V/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 Radiated Emissions

Measurement uncertainty	+5.6/ -4.5 dB
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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, 0336

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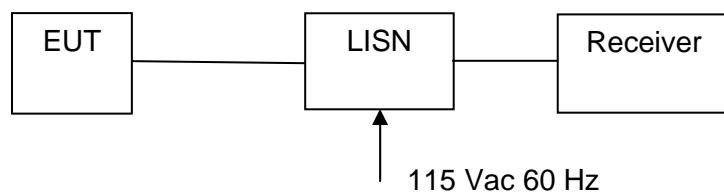
5.1.3. AC Wireline Conducted Emissions (150 kHz – 30 MHz)

FCC, Part 15 Subpart C §15.207
Industry Canada RSS-Gen §7.2.2

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.

Test Measurement Set up



Measurement set up for AC Wireline Conducted Emissions Test

Measurement Results for AC Wireline Conducted Emissions (150 kHz – 30 MHz)

Ambient conditions.

Temperature: 17 to 23 °C Relative humidity: 31 to 57 % Pressure: 999 to 1012 mbar

Radio Parameters

Power: Maximum Power

Duty Cycle: 100%

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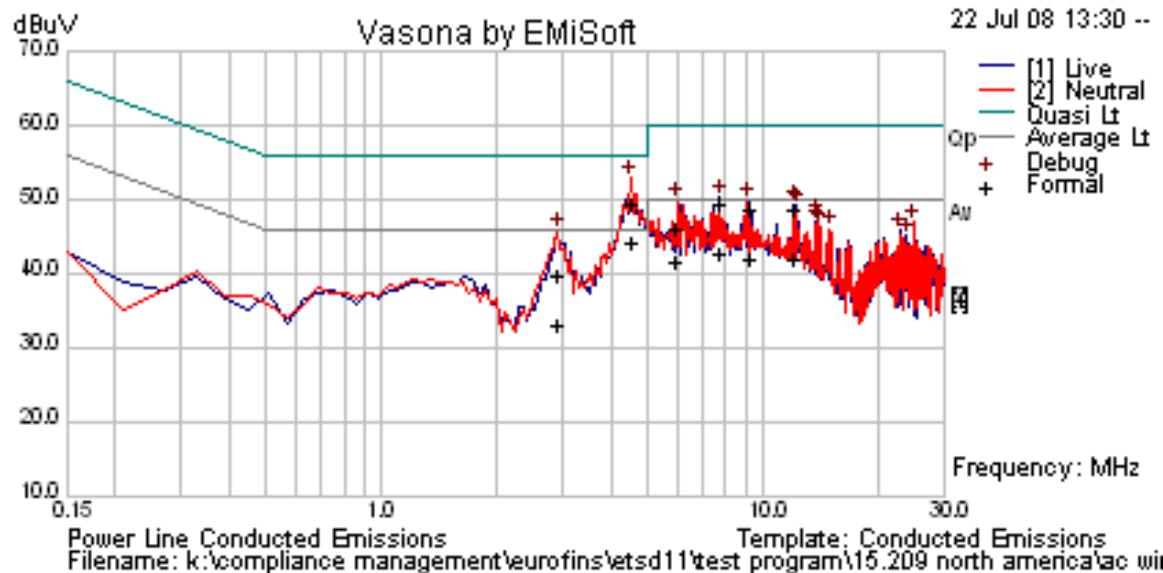
TABLE OF RESULTS

POE Operation

115 Vac 60 Hz

Freq (MHz)	Line	Peak (dB μ V)	QP (dB μ V)	QP Limit (dB μ V)	QP Margin (dB)	Ave. (dB μ V)	Ave. Limit (dB μ V)	Ave. Margin (dB)
7.74	Live	50.25	47.67	60	-12.33	40.99	50	-9.01
9.263	Live	49.74	46.95	60	-13.05	40.38	50	-9.62
12.182	Live	49.43	47.01	60	-12.99	40.14	50	-9.86
5.962	Neutr	49.73	44.51	60	-15.49	39.78	50	-10.22
2.918	Neutr	45.94	38.1	56	-17.9	31.35	46	-14.65
4.565	Neutr	52.89	47.59	56	-8.41	42.38	46	-3.62

AC Wireline Conducted Emissions – 150 kHz – 30 MHz



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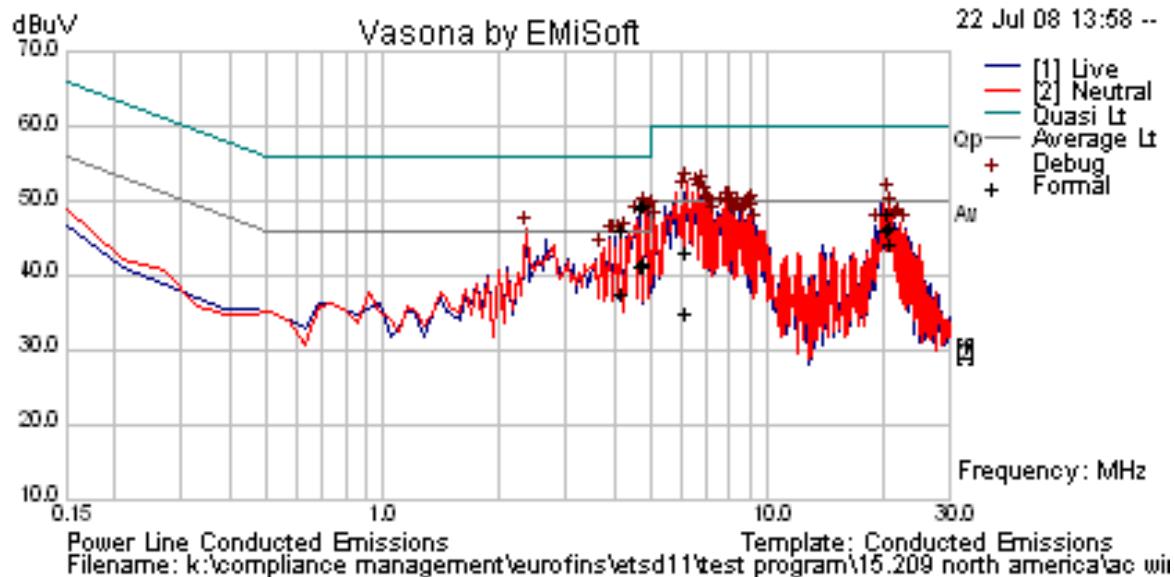
TABLE OF RESULTS

ac/dc Adapter

115 Vac 60 Hz

Freq (MHz)	Line	Peak (dB μ V)	QP (dB μ V)	QP Limit (dB μ V)	QP Margin (dB)	Ave. (dB μ V)	Ave. Limit (dB μ V)	Ave. Margin (dB)
4.823	Live	48.68	47.76	56	-8.24	39.79	46	-6.21
4.695	Live	48.09	47.27	56	-8.73	39.59	46	-6.41
4.188	Live	45.1	44.52	56	-11.48	35.9	46	-10.1
20.677	Neutr	50.74	46.41	60	-13.59	44.32	50	-5.68
6.196	Neutr	52.15	41.51	60	-18.49	33.11	50	-16.89
21.161	Neutr	48.92	44.7	60	-15.3	42.46	50	-7.54

AC Wireline Conducted Emissions – 150 kHz – 30 MHz)



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To: FCC 47 CFR Part 15.209 & IC RSS-210
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Specification

Limit

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 $\mu\Omega$ line impedance stabilization network (LISN), see §15.207 (a) matrix below. Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

RSS-Gen §7.2.2

The radio frequency voltage that is conducted back into the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the table below. The tighter limit applies at the frequency range boundaries.

§15.207 (a) and RSS-Gen §7.2.2 Limit Matrix

The lower limit applies at the boundary between frequency ranges

Frequency of Emission (MHz)	Conducted Limit (dB μ V)	
	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

Laboratory Measurement Uncertainty for Conducted Emissions

Measurement uncertainty	± 2.64 dB
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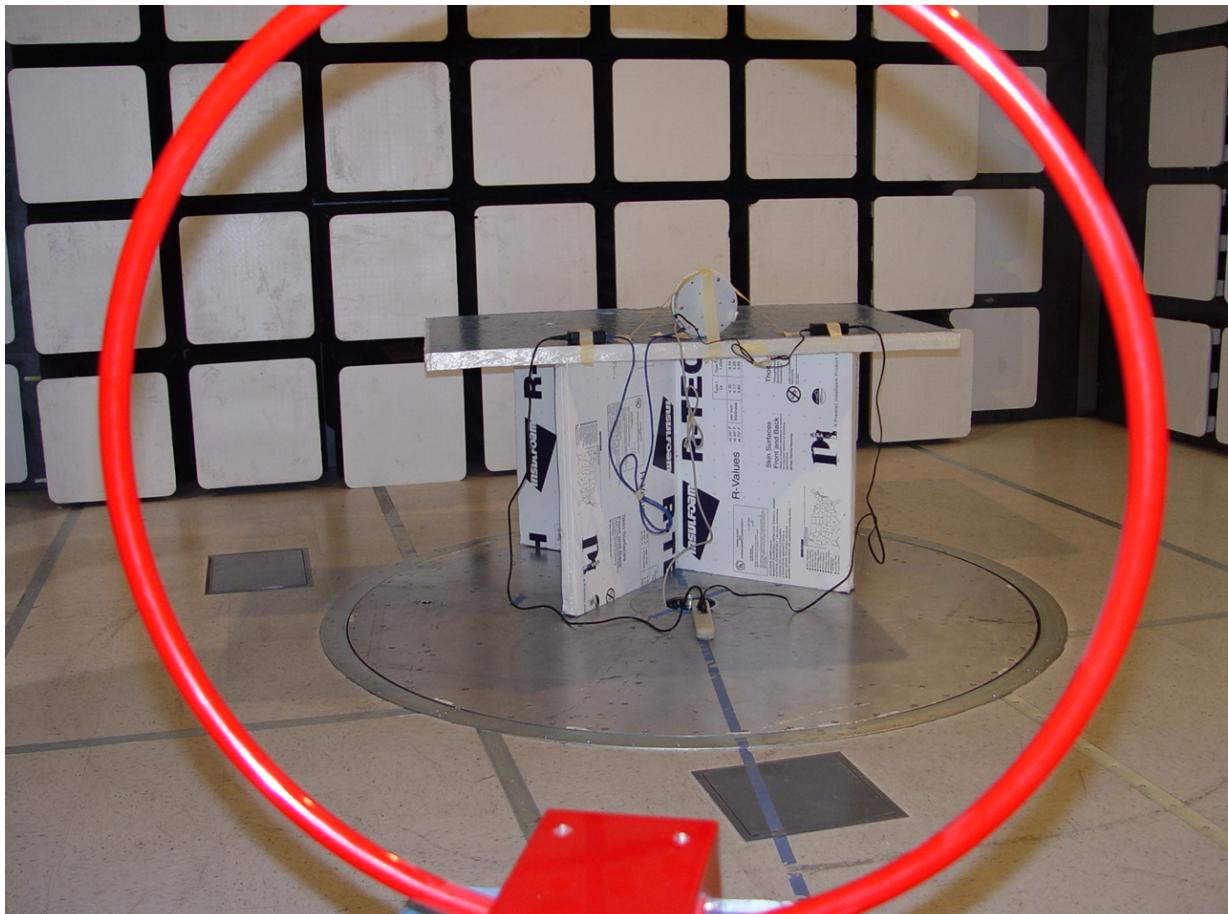
Traceability

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

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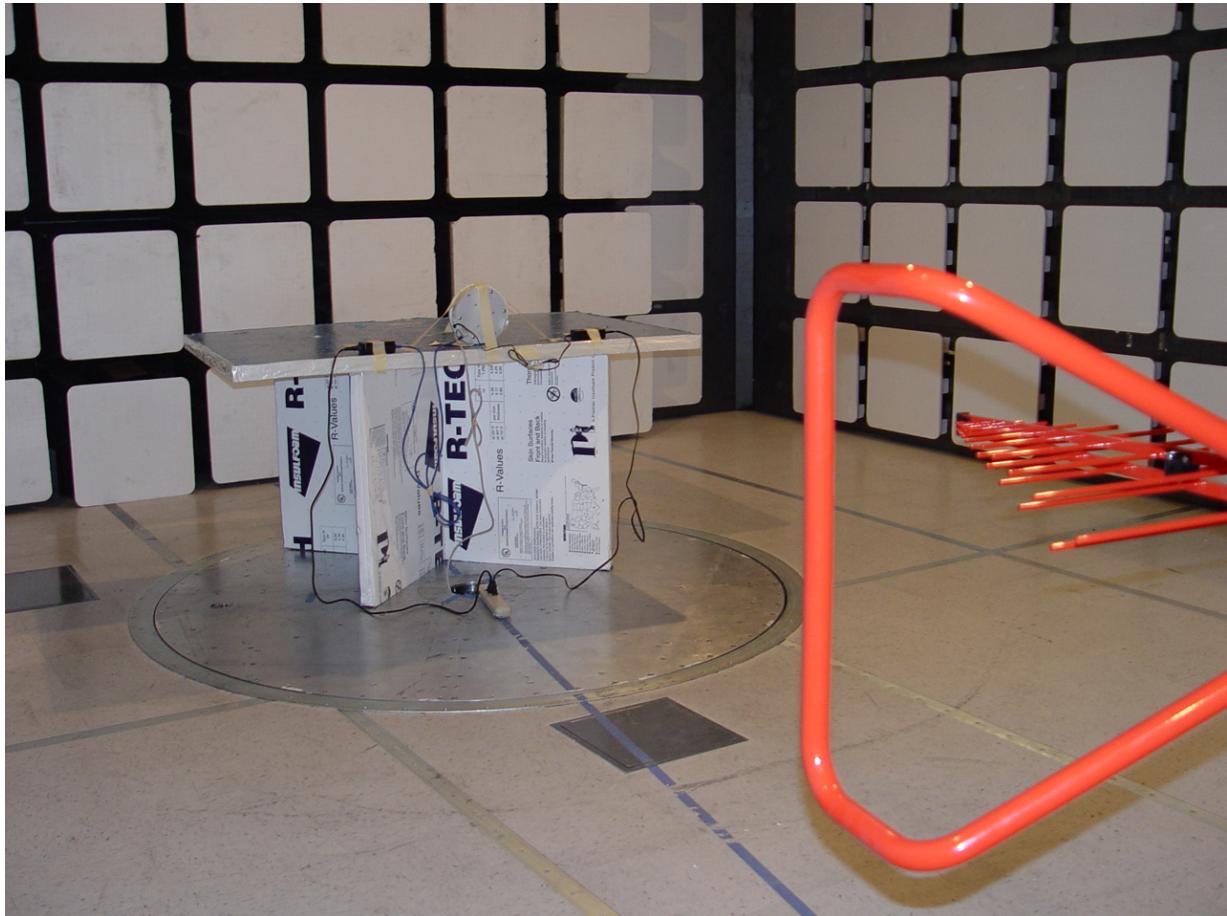
6. PHOTOGRAPHS

6.1. Transmitter carrier output levels (9 kHz - 30 MHz) and Spurious Emissions



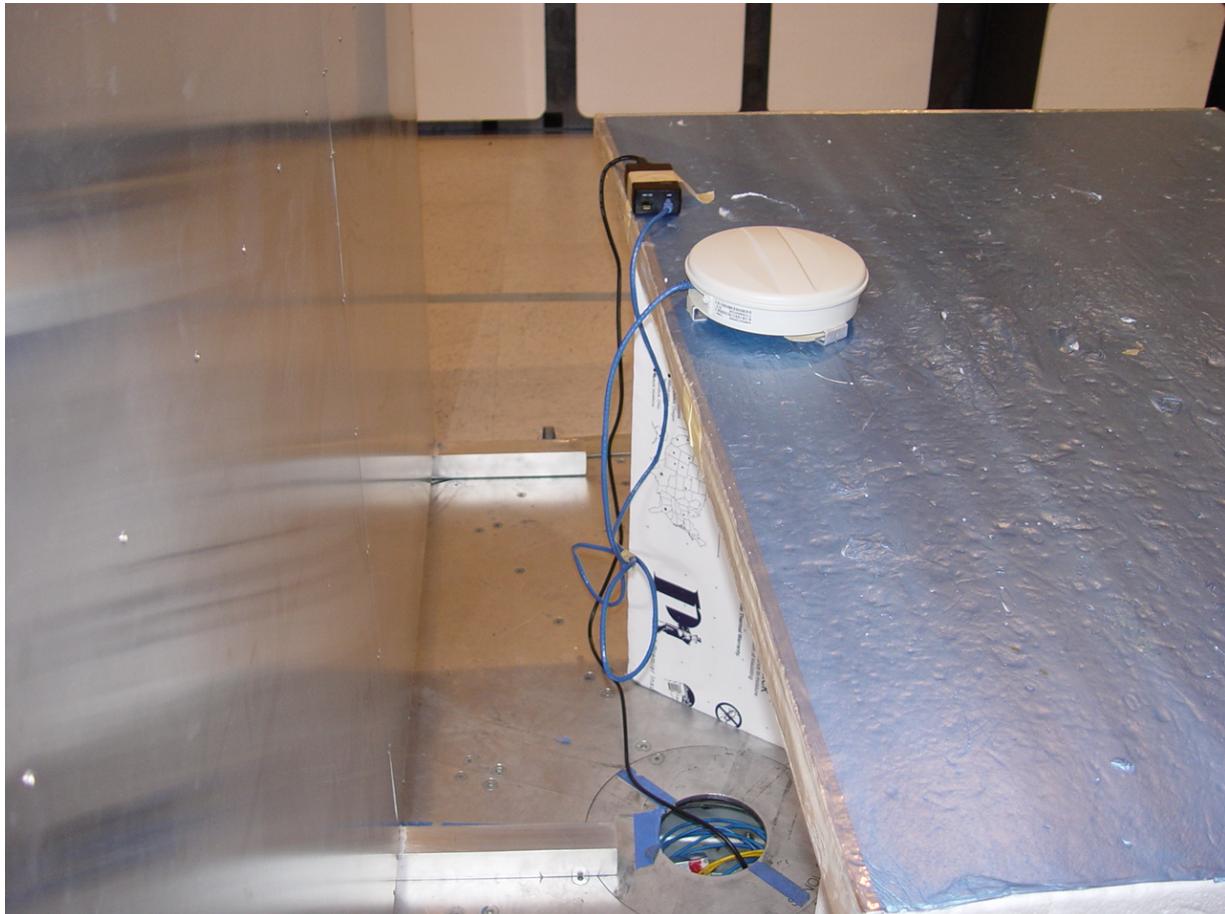
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6.2. Radiated Spurious Emissions (0.03 – 1 GHz)



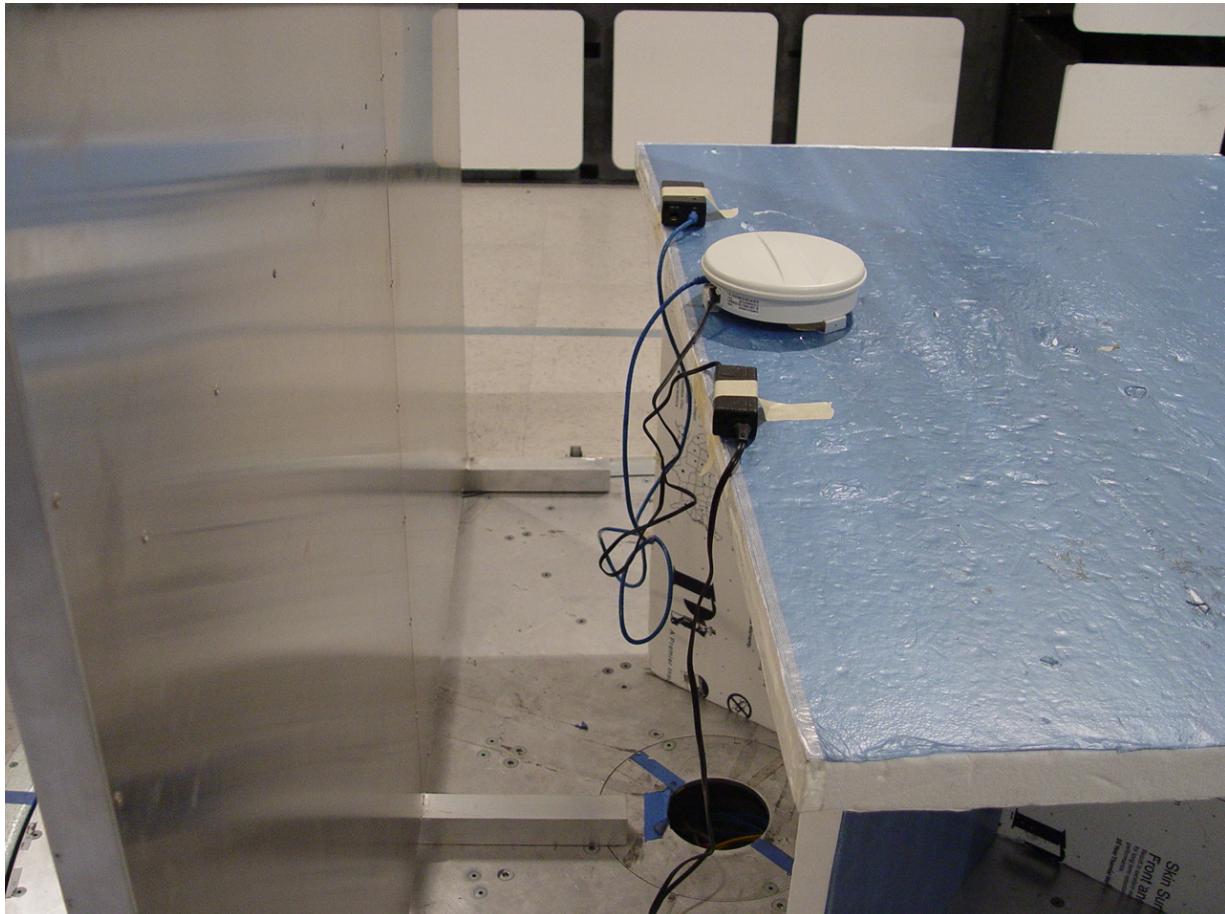
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6.3. ac Wireline Emissions (0.03 – 1 GHz) POE



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6.4. ac Wireline Emissions (0.03 – 1 GHz) ac/dc Adapter

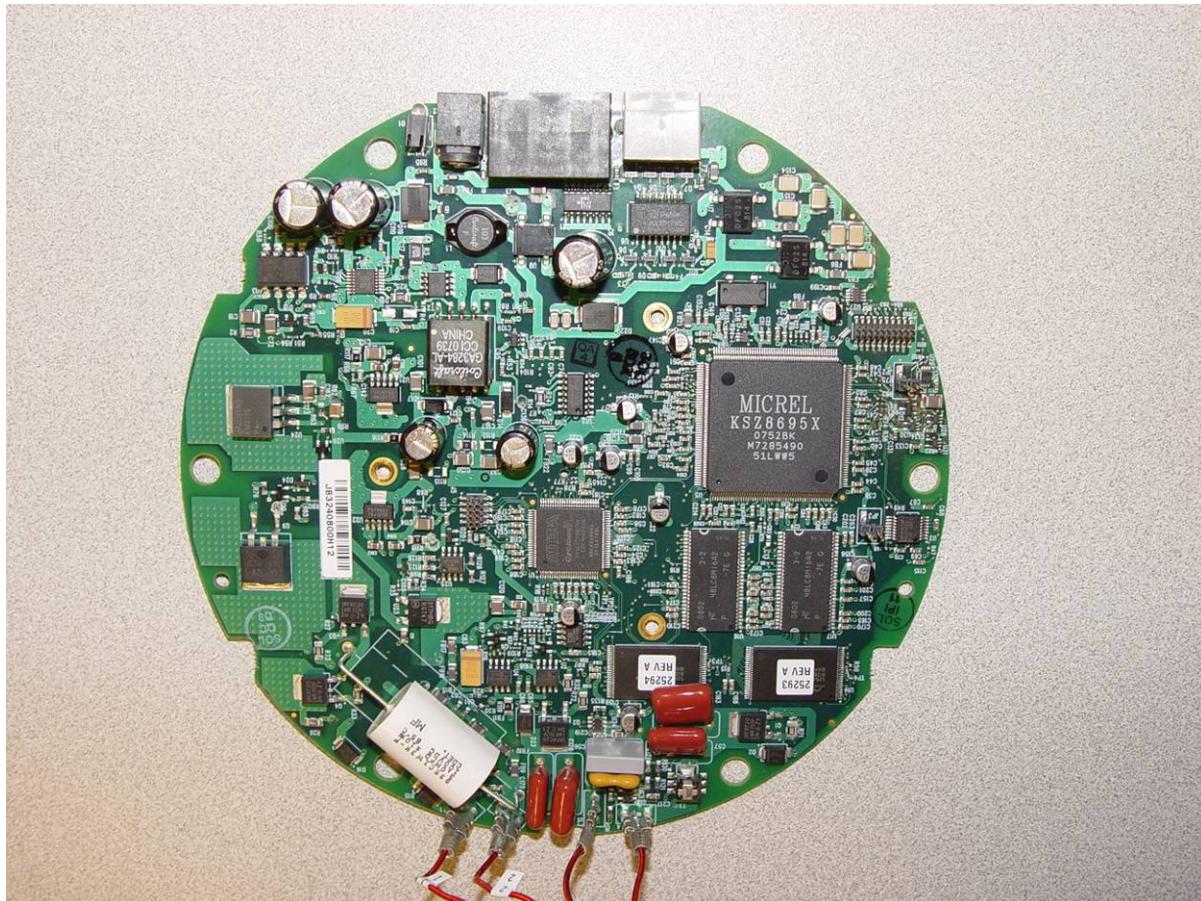


ac/dc adapter with Ethernet termination

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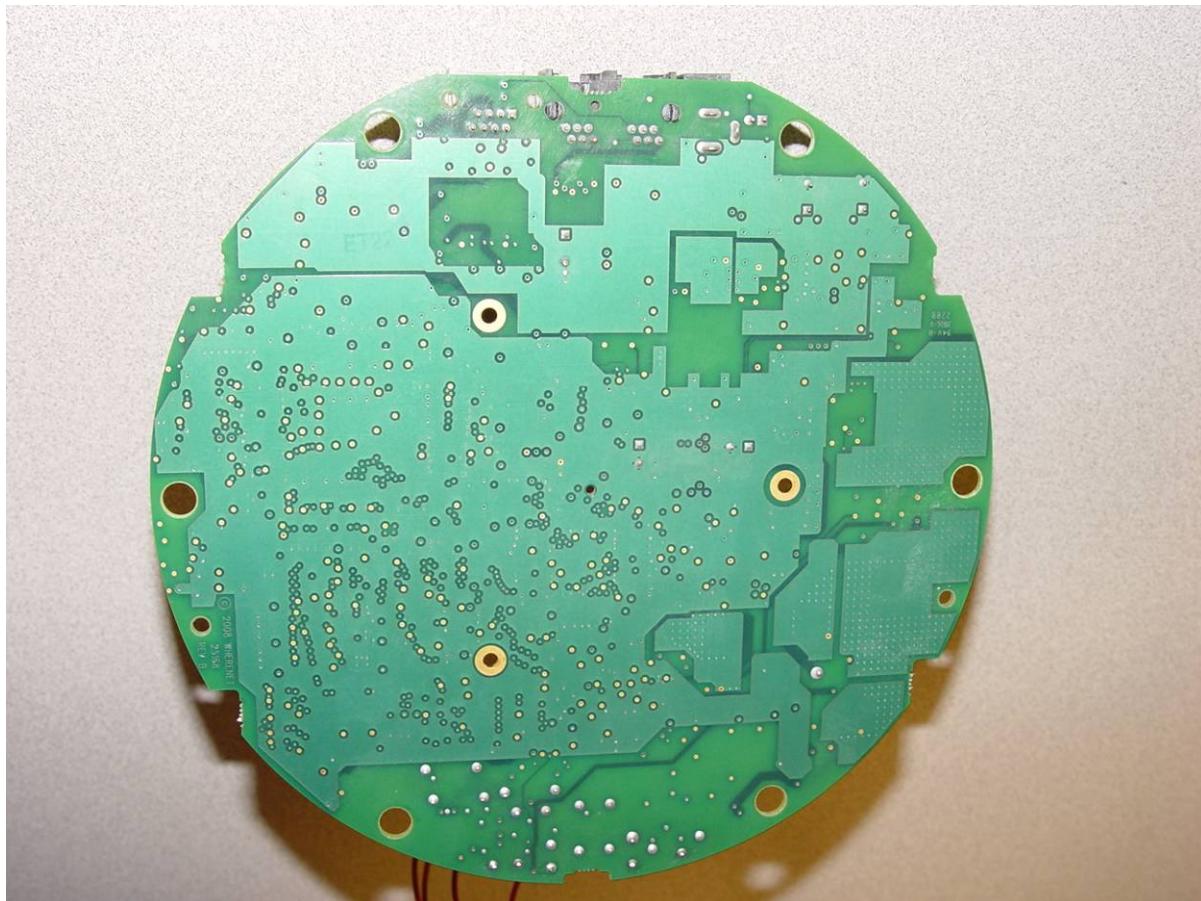
6.5. Equipment Internals

PCB Assembly – Top View



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PCB Assembly – Bottom View



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7. TEST EQUIPMENT DETAILS

Asset #	Instrument	Manufacturer	Model #	Serial #
0070	Power Meter	Hewlett Packard	437B	3125U13554
0336	Active Loop Antenna 9 kHz to 30 MHz	EMCO	6502	00060498
0104	Horn Antenna	The Electro-Mechanics Company	3115	9205-3882
0116	Power Sensor	Hewlett Packard	R8485A	3318A19694
0134	Amplifier	ComPower	PA-122	181910
0156	Barometer /Thermometer	Control Co.	4196	E2844
0193	EMI Receiver	Rhode & Schwartz	ESI 7	838496/007
0252	K-Cable	Megaphase	Sucoflex 104	Unknown
0304	2.4GHz Notch Filter	Micro-Tronics	BRM50701	001
0310	2m SMA Cable	Micro-Coax	UFA210A-0-0787-3G03G0	209089-001
0312	3m SMA Cable	Micro-Coax	UFA210A-1-1181-3G0300	209092-001
0313	Coupler	Hewlett Packard	86205A	3140A01285
0314	30 dB N-Type Attenuator	ARRA	N944-30	1623

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