



Excellence in Compliance Testing

EMI Test Report

In Accordance with:

**FCC 47 CFR Part 15 Subpart B
Industry of Canada ICES-003**

Authorization Type: Verification

Manufacturer: Communication Laboratories

Model Covered: PAC

Model Variants: None

ACS Report: 1011791C11A

Report Revision: A

Report Issue Date: 28 May 2010

Project Manager:

A handwritten signature in black ink, appearing to read 'Jaime C. Smith', written over a horizontal line.

**Jaime Smith
EMC Department Manager
Advanced Compliance Solutions, Inc.**

Reviewed by:

A handwritten signature in black ink, appearing to read 'William J. Prosser', written over a horizontal line.

**Jeff Prosser
General Manager
Advanced Compliance Solutions, Inc.**

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This report contains 26 pages

<p style="text-align: center;"><u>REVISION HISTORY</u></p> <p style="text-align: center;">Report Number: 1011791C11A</p> <p style="text-align: center;">Manufacturer: Communication Laboratories</p> <p style="text-align: center;">Model: PAC</p>
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DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
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28 May 2010	---	A	Initial Release	All	Jeff Prosser
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Project Information

ACS Project: 1011791C11A

Applicant Details

Manufacturer: Communication
Laboratories
Street Address: 750 North Drive
City, State/Province and Postal Code:
Melbourne, FL 32934
Country: USA
Contact: Tom Rodby

Phone: 321-409-9898 x303
Email: r.rodby@comlabs.com

Sample Information

Model: PAC
Model Variant(s): None
Product Description: Public Alert Controller
Environment of Use: Commercial
Sample Receive Date: 5/27/2010
Sample Receive Condition: Production Quality
Test Mode Description: EAS Computer
Highest Data Rate: 3GHz Source: Processor

Power Interfaces

(Check all that apply and enter power info):

- ☒ AC Mains Input 120VAC/60Hz
- ☐ AC Output NA
- ☐ DC Input NA
- ☐ DC Output NA
- ☐ Battery N/A
- ☐ Other N/A

I/O Interfaces:

Interface Type	Quantity	Length (m)	Shielded?
RS232	1	2	Yes
Antenna Rx	2	3	Yes
Audio	1	1.5	Yes
I/O	1	3	Yes
Ethernet	1	3	No

Test Information

Test Start Date: 5/27/2010
Test End Date: 5/27/2010
Emissions Pre-scan Site: SAC
Final Emissions Site: OATS
EMI Freq. Band: 0.15MHz-15GHz
Radiated Emissions Equipment Class: Class A

Project Information_(continued)

ACS Project: 1011791C11A

Test Methods/Standards Applied

(Check all that apply):

- ☒ **ANSI C63.4-2003** - American National Standard for Methods of Measurement of Radio-Noise Emissions from low-voltage electrical and electronic equipment in the range of 9kHz to 40 GHz.
- ☒ **US Code of Federal Regulations (CFR):** Title 47, Part 15, Radio Frequency Devices, Subpart B, Unintentional Radiators (October 2009)
- ☒ **Industry Canada ICES-003 Issue 4:** Digital Apparatus (November 2004).
- ☐ **CISPR 16-2-1** - Specification for radio disturbance and immunity measuring apparatus and methods Part 2-1: Methods of measurement of disturbances and immunity-Conducted Disturbance measurement
- ☐ **CISPR 16-2-3** - Specification for radio disturbance and immunity measuring apparatus and methods Part 2-2: Methods of measurement of disturbances and immunity-Measurement of disturbance power
- ☐ **CISPR 22:2005** - Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
- ☐ **EN 55022:2006** - Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
- ☐ **EN 55011:2007** - Industrial, scientific and medical (ISM) radio-frequency equipment - Electromagnetic disturbance characteristics - Limits and methods of measurement
- ☐ **EN 61000-6-3:2007** Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments
- ☐ **EN 61000-6-4:2007** Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
- ☐ **AS/NZS CISPR 22:2006** - Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
- ☐ **VCCI: V-2 & V-3/2009.04** – Agreement of Voluntary Control Council for Interference by Information Technology Equipment
- ☐ **CNS 13438:2006** - CNS Limits and methods of measurement of radio interference characteristics of information technology equipment

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1.0 Introduction

1.1 Scope

This report documents conformance with the Electromagnetic Interference requirements outlined in the product information sheet and detail the results of testing performed on 5/27/2010 through 5/27/2010 on the model PAC manufactured by Communication Laboratories.

1.2 Performance Criteria

For model PAC the limits which apply are Class A. These limits are found in Table 1.2-1 below:

Table 1.2-1 Emissions Limits Class A

Emission Type	Frequency Range ¹ (MHz)	Voltage limits (dBuV)	
		Quasi-Peak	Average
Conducted Class A	0.15 to 0.5	79.0	66.0
	0.50 to 5.0	73.0	60.0
	5.0 to 30.0	73.0	60.0
Radiated Class A @ 10 meters	30.0 to 88.0	39.0	
	88.0 to 216.0	43.5	
	216.0 to 960.0	46.0	
	Above 960.0	49.5	

¹ – Limits <1GHz are Quasi-Peak and Peak >1GHz

Note: Lower Limit Applies at Transition Frequency

2.0 Test Facilities & Environment

2.1 Test Facilities

All testing was performed at the following address:

Advanced Compliance Solutions, Inc.
284 West Drive
Melbourne, FL 32904
Phone: (321) 951-1710
Fax: (321) 951-2362
www.acstestlab.com

The laboratory is fully equipped to carry out the tests outlined in Section 1.0

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program (NVLAP), Lab Code 200896-0. Unless otherwise specified, all tests methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

2.3 Test Environment

Unless otherwise specified by the generic or product standard, the EUT was evaluated within the climate conditions of the EUT as specified by the manufacturer.

Where the manufacturer does not specify climate parameters for the EUT, all test are performed within the ambient temperature range of 40°F to 104°F.

Table 3.3-2: Cable Description

Cable #	Cable Type	Length	Shield	Termination
A	RS232	2	Yes	Peripheral
B	Antenna RX(x2)	3	Yes	Peripheral
C	Audio	1.5	Yes	Peripheral
D	I/O	3	Yes	Peripheral
E	Ethernet	3	No	Peripheral

3.4 Observations

Any general observations regarding any part of the evaluation are given in Table 3.4-1.

Table 3.4-1: Observations

<u>Observation No.</u>	<u>Description</u>
NA	There were no observations.

4.0 Radiated and Conducted Emissions

4.1 Radiated Emissions

4.1.1 Radiated Emissions Test Site

4.1.1.1 Open Area Test Site

The open area test site consists of a large concrete pad covered with a $\frac{1}{2}$ " x $\frac{1}{2}$ " inch galvanized 20AWG hardware cloth to form the ground reference plane. The overall dimension of the ground reference plane is 15m x 3.6m. All reflecting objects are located outside of the ellipse defined in ANSI C63.4:2003.

A remotely controlled antenna mast is used to raise and lower an antenna between 1-4 meters as necessary to maximize emissions.

The OATS is equipped with a manually operated turntable that can be rotated through 360° to maximize the azimuth of the emissions. The turntable measures .8meter in height and 1.2 meters in width. The turntable is made of wood construction.

A diagram of the Open Area Test Site is shown in Figure 4.1.1.1-1 below:

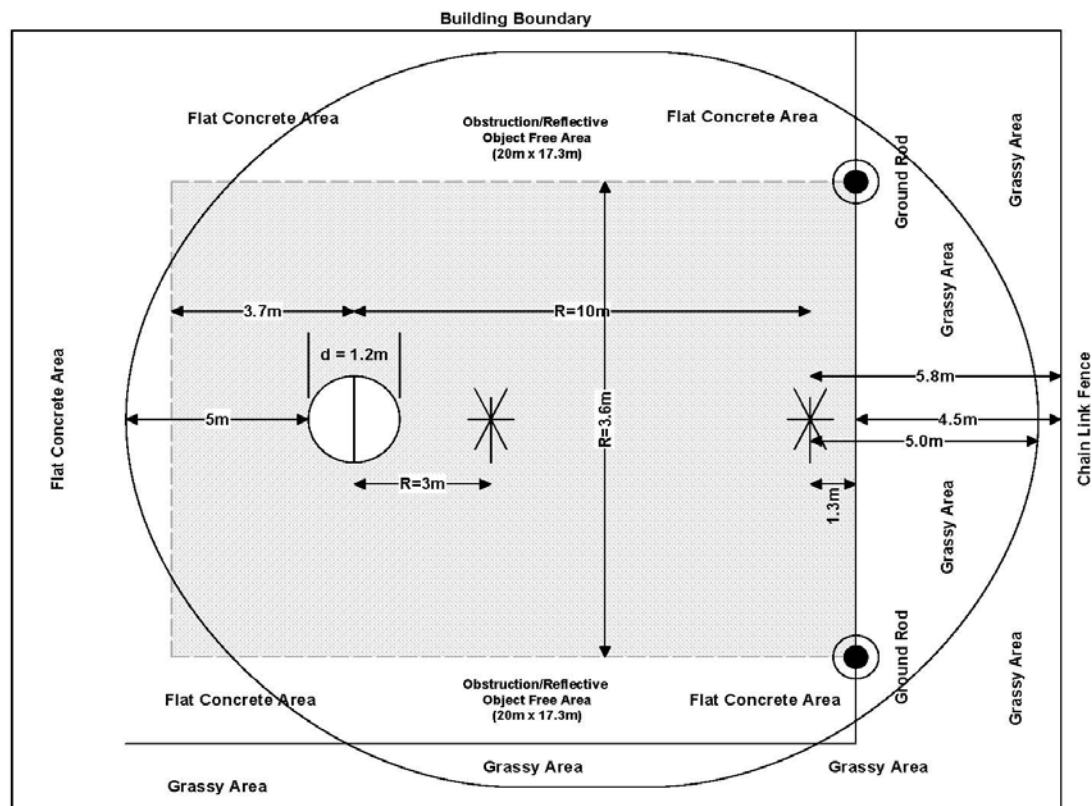


Figure 4.1.1.1-1: Open Area Test Site

4.1.1.2 Semi-Anechoic Chamber

The Semi-Anechoic Chamber is a pre-screening facility only and consists of a 12' x 20' x 10' shielded enclosure. The chamber is lined with RF absorbent foam cones.

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 4.1.1.2-1 below:

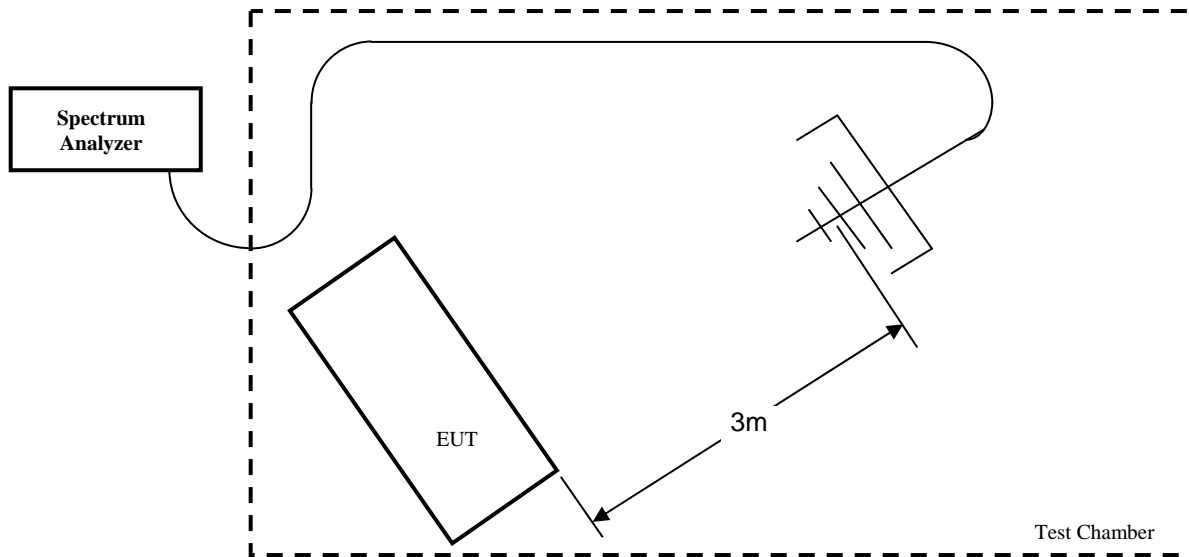


Figure 4.1.1.2-1: Semi-Anechoic Chamber Test Site

4.1.2 Test Equipment

Table 4.1.2-1 identifies all equipment used for radiated and conducted emissions respectively.

Table 4.1.2-1 Test Equipment – Radiated Emissions

Asset ID	Manufacturer	Model	Eq. Type	Serial Number	Next Cal.
1170	A.H. Systems	SAS-521-2	Antennas	402	4/14/2011
1342	Hewlett Packard	8447D	Amplifier	1937A02595	12/11/2010
1244	Eagle	C7RFM3MFMF	Filter	HLC-700	1/29/2011
26	Chase	CBL6111	Antennas	1044	8/2/2010
RE331	Agilent	E7405A	Spectrum Analyzer	MY45113945	8/17/2010
RE336	HP	AT8449B	Amplifier	3008A00565	4/8/2011
1169	A.H. Systems	SAS-200/571	Antennas	376	5/29/2011

4.1.3 Test Methodology

4.1.3.1 Pre-Scans

Radiated pre-scans are performed on all EUT's in the 3m Semi-Anechoic. All final radiated emission testing is performed on the 3/10m Open Area Test Site (OATS) as described in Section 4.1.1.1.

Pre-scans are a method by which the 10 highest emissions can be identified for final evaluation. This is achieved by taking automated emission snapshots of the EUT at various azimuths and antenna heights. The software is programmed to perform a peak sweep of the band using the maxhold function. This sweep is performed every 90° in both horizontal and vertical polarities and at an antenna height of 1m. Although not a fully maximized scan, the pre-scan gives a good indication of pass or fail.

4.1.3.2 Final Scans

Final radiated emission measurements were made over the frequency range of 0.15MHz-15GHz. Quasi-Peak measurements are taken with the Spectrum Analyzer's resolution bandwidth was set to 120KHz and video bandwidth set to 300 kHz for measurements below 1000MHz. Average measurements are taken above 1000MHz with the RBW set to 1MHz and VBW set to 10Hz. The calculation for the radiated emissions field strength is as follows:

$$\begin{aligned}\text{Corrected Reading} &= \text{Analyzer Reading} + \text{Cable Loss} + \text{Antenna Factor} - \text{Amplifier Gain} \\ \text{Margin(dB)} &= \text{Applicable Limit} - \text{Corrected Reading}\end{aligned}$$

4.1.3.3 Test Criteria

The EUT must meet the Class A Limits as given in Section 1.2.

4.1.3.4 Test Justification

- ☒ No justification - The EUT was tested per the appropriate test methods and test plan.
☐ The test method, standard, and/or test plan was deviated from for the following reason:

4.1.4 Test Setup Photographs**Figure 4.1.4-1: Radiated Emissions - Front View****Figure 4.1.4-2: Radiated Emissions - Rear View**

COMMUNICATION LABORATORIES

Model: PAC

Report No: 1011791C11A

Applied Standards: FCC 47 CFR Part 15 Subpart B Industry of Canada ICES-003

4.1.5 Test Data

Final tabulated radiated emissions data are reported in the Test Data Table below:

Test Parameters:

Test Date:	5/27/2010	Temperature (°C)	22
Technician:	Jaime Smith	Humidity (%)	46
Equipment Class:	Class A	Barometric Pressure (mBar)	1010
Tested Modes:	EAS Computer		
AC Input Power:	120VAC/60Hz		
DC Input Power:	NA		

Test Data Table:

Pre-scan Plot Reference: B.1.B.2

Measurement Distance:
☐ 1 Meter ☐ 3 Meter ☒ 10 Meter

Frequency (MHz)	Measured Level (dBuV)		Antenna Polarity (H/V)	Antenna Height (cm)	Turntable Position (°)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	Pk	Qpk/Av					Pk	Qpk/Av	Pk	Qpk/Av	Pk	Qpk/Av
500.9		34.57	V	100	180	-22.68	-----	11.89	-----	46.4	-----	34.51
500.9		33.70	H	100	320	-12.20	-----	21.50	-----	46.4	-----	24.90
567.8		40.39	V	303	180	-12.32	-----	28.07	-----	46.4	-----	18.33
567.8		45.00	H	326	180	-11.24	-----	33.76	-----	46.4	-----	12.64
631.4		42.01	V	316	180	-13.22	-----	28.79	-----	46.4	-----	17.61
764		37.14	V	319	180	-7.58	-----	29.56	-----	46.4	-----	16.84
766.9		26.80	V	309	180	-8.39	-----	18.41	-----	46.4	-----	27.99
832.6		34.28	V	309	180	-7.25	-----	27.03	-----	46.4	-----	19.37
1035	53.80	41.48	V	100	180	-6.82	46.98	34.66	69.5	49.5	22.52	14.84
1175	49.20	39.70	H	100	180	-6.95	42.25	32.75	69.5	49.5	27.25	16.75
14895	57.95	38.61	H	100	180	9.07	67.02	47.68	69.5	49.5	2.48	1.82

Qpk = Quasi-Peak Measurement or Limit (< 1GHz)

AV = Average Measurement or Limit (>1GHz)

Notes:

4.2 Conducted Emissions

4.2.1 Conducted Emissions Test Site

The AC mains conducted EMI site is located in the main EMC lab. It consists of an 8' x 8' solid aluminum horizontal ground plane (GRP) bonded every 3" to an 8' X 8' vertical ground plane.

A diagram of the room is shown below in Figure 4.2.1-1:

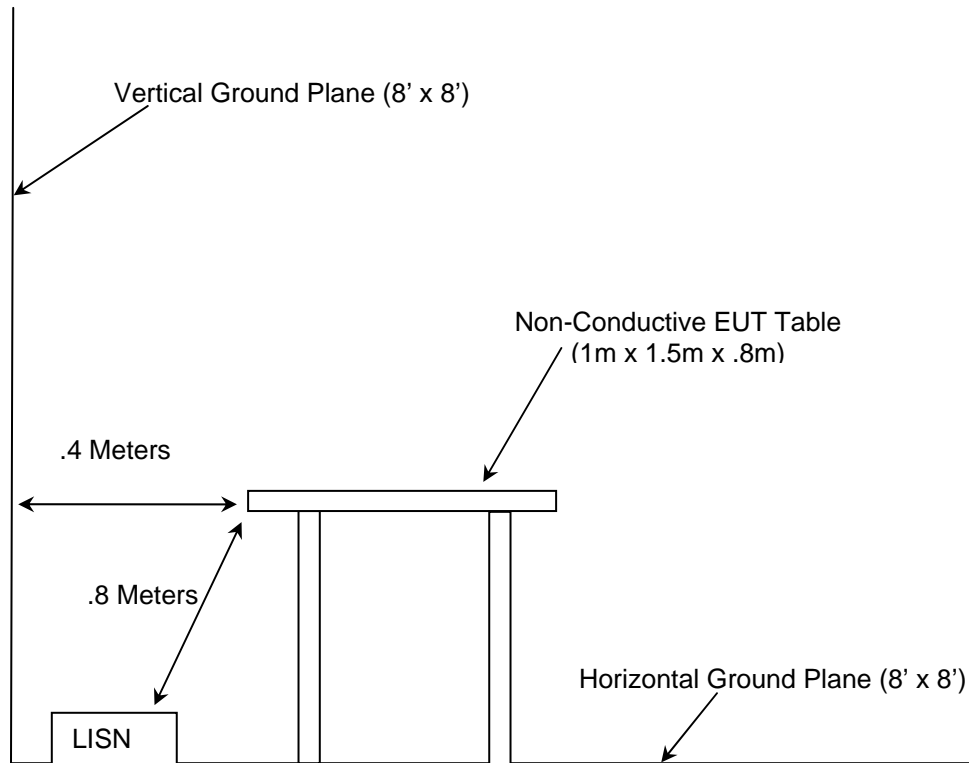


Figure 4.2.1-1: AC Mains Conducted EMI Site

4.2.2 Test Equipment

Table 4.2.2-1 Test Equipment – Conducted Emissions

Asset ID	Manufacturer	Model	Eq. Type	Serial Number	Next Cal.
1174	Solar	8012-50-R-24-BNC	LISN	8379359	9/24/2010
1222	Hewlett Packard	11947A	Limiter	3107A02944	9/3/2010
RE331	Agilent	E7405A	Spectrum Analyzer	MY45113945	8/17/2010

4.2.3 Test Methodology

Conducted emissions were performed from 150kHz to 30MHz with the spectrum analyzer's resolution bandwidth set to 9kHz and the video bandwidth set to 30kHz. The calculation for the conducted emissions is as follows:

$$\begin{aligned} \text{Corrected Reading} &= \text{Analyzer Reading} + \text{LISN Loss} + \text{Cable Loss} \\ \text{Margin} &= \text{Applicable Limit} - \text{Corrected Reading} \end{aligned}$$

4.2.3.1 Test Criteria

The EUT must meet the Class A Limits as given in Section 1.2.

4.2.3.2 Test Justification

- ☒ No justification - The EUT was tested per the appropriate test methods and test plan.
☐ The test method, standard, and/or test plan was deviated from for the following reason:

4.2.4 Test Setup Photographs



Figure 4.2.4-1: Conducted Emissions Test Setup – Front View



Figure 4.2.4-2: Conducted Emissions Test Setup – Side View

4.2.5 Test Data

Tabulated data is given in the Test Data Tables below. Plots of each tested line are provided in Appendix b.

Test Parameters:

Test Date:	5/27/2010	Temperature (°C)	22
Technician:	Jaime Smith	Humidity (%)	48
Equipment Class:	Class A	Barometric Pressure (mBar)	1010
Tested Modes:	EAS Computer		
AC Input Power:	120VAC/60Hz		
DC Input Power:	NA		

Tested Leads:

- ☒ AC Mains – Number of Lines: 2
☐ DC Mains – Number of Lines:
☐ Telecom Port – Quantity:

Test Data Tables:

Check All That Apply to This Data <input checked="" type="checkbox"/> Line 1 <input type="checkbox"/> Line 2 <input type="checkbox"/> Line 3 <input type="checkbox"/> Line 4 <input checked="" type="checkbox"/> To Ground <input type="checkbox"/> Floating <input type="checkbox"/> Telecom Port _____ <input checked="" type="checkbox"/> dBµV <input type="checkbox"/> dBµA Plot Number: <u>B.3</u> Power Supply Description: <u>PS1</u>									
Frequency (MHz)	Uncorrected Reading		Total Correction Factor (dB)	Corrected Level		Limit		Margin (dB)	
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
0.2064	24.42	22.62	10.59	35.01	33.21	79.00	66.00	44.0	32.8
0.2755	22.02	19.5	10.54	32.56	30.04	79.00	66.00	46.4	36.0
1.861	29.18	28.53	10.08	39.26	38.61	73.00	60.00	33.7	21.4
2.413	27.84	26.99	9.99	37.83	36.98	73.00	60.00	35.2	23.0
13.03	27.57	19.38	10.20	37.77	29.58	73.00	60.00	35.2	30.4
15.78	27.21	18.94	10.25	37.46	29.19	73.00	60.00	35.5	30.8

Notes:

COMMUNICATION LABORATORIES

Model: PAC

Report No: 1011791C11A

Applied Standards: FCC 47 CFR Part 15 Subpart B Industry of Canada ICES-003

<p align="center">Check All That Apply to This Data</p> <p> <input type="checkbox"/> Line 1 <input checked="" type="checkbox"/> Line 2 <input type="checkbox"/> Line 3 <input type="checkbox"/> Line 4 <input checked="" type="checkbox"/> To Ground <input type="checkbox"/> Floating <input type="checkbox"/> Telecom Port _____ <input checked="" type="checkbox"/> dBμV <input type="checkbox"/> dBμA </p> <p>Plot Number: <u>B.4</u> Power Supply Description: <u>PS1</u></p>	
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Frequency (MHz)	Uncorrected Reading		Total Correction Factor (dB)	Corrected Level		Limit		Margin (dB)	
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
0.2073	23.67	21.96	10.59	34.26	32.55	79.00	66.00	44.7	33.4
0.2577	24.11	22.84	10.55	34.66	33.39	79.00	66.00	44.3	32.6
0.3441	25.14	24.34	10.56	35.70	34.90	79.00	66.00	43.3	31.1
1.861	29.41	28.87	10.08	39.49	38.95	73.00	60.00	33.5	21.1
2.137	29.53	29	9.99	39.52	38.99	73.00	60.00	33.5	21.0
15.99	33.06	24.66	10.26	43.32	34.92	73.00	60.00	29.7	25.1

Notes:

5.0 Measurement Uncertainty

General

Measurement Uncertainty is based the following publications:

- CISPR 16-4-2: Uncertainties, statistics and limit modeling – Uncertainty in EMC measurements
- The Guide to the Expression of Uncertainty in Measurement(GUM): 1995
- ANSI / NCSL Z540.2-1997 (R2002) U.S. Guide to Expression of Uncertainty in Measurement

Calculations for measurement uncertainty are available upon request.

Emissions:

Table 5.0-1: Values of U_{CISPR} and U_{Lab}

Measurement	U_{CISPR}	U_{Lab}
Conducted disturbance (mains port) (9 kHz – 150 kHz) (150 kHz – 30 MHz)	4,0 dB 3,6 dB	2.54 dB
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1 000 MHz)	5,2 dB	3.93 dB

NOTE U_{CISPR} resembles a value of measurement uncertainty for a specific test, which was determined by considering uncertainties associated with the quantities listed in CISPR 16-4-2:2003 Section 4.2.

Compliance or non-compliance with a disturbance limit shall be determined in the following manner.

If U_{Lab} is less than or equal to U_{CISPR} in Table 5.0-1, then:

- compliance is deemed to occur if no measured disturbance exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

If U_{Lab} is greater than U_{CISPR} , then:

- compliance is deemed to occur if no measured disturbance, increased by $(U_{\text{Lab}} - U_{\text{CISPR}})$, exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance, increased by $(U_{\text{Lab}} - U_{\text{CISPR}})$, exceeds the disturbance limit.

The ACS calculated MU is much less than the internationally accepted MU, therefore an adjustment to the measured result as mentioned above is not necessary.

6.0 Conclusion

The EUT is determined to meet the requirements as defined in the applicable regulations.

Appendix A: Equipment Modification Photos

ACS Report: 1011791C11A
Report Revision: A
Report Issue Date: 28 May 2010

<input checked="" type="checkbox"/>	Modifications were not required to bring the EUT into compliance.
<input type="checkbox"/>	Modifications were required to bring the EUT into compliance. See the following photographs.

Appendix B: Data Plots

ACS Report: 1011791C11A
Report Revision: A
Report Issue Date: 28 May 2010

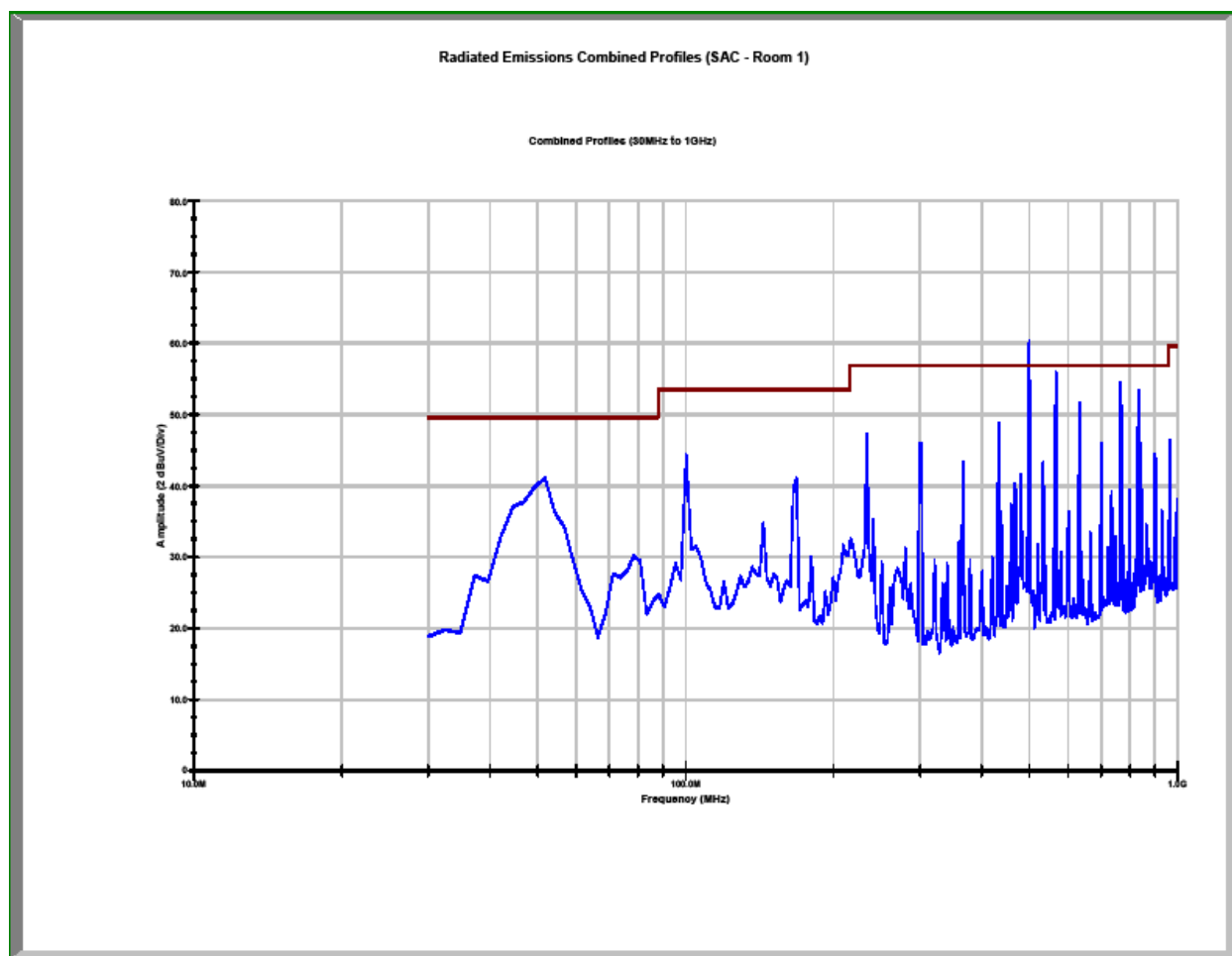


Figure B1: Radiated Emissions 30-1000 MHz

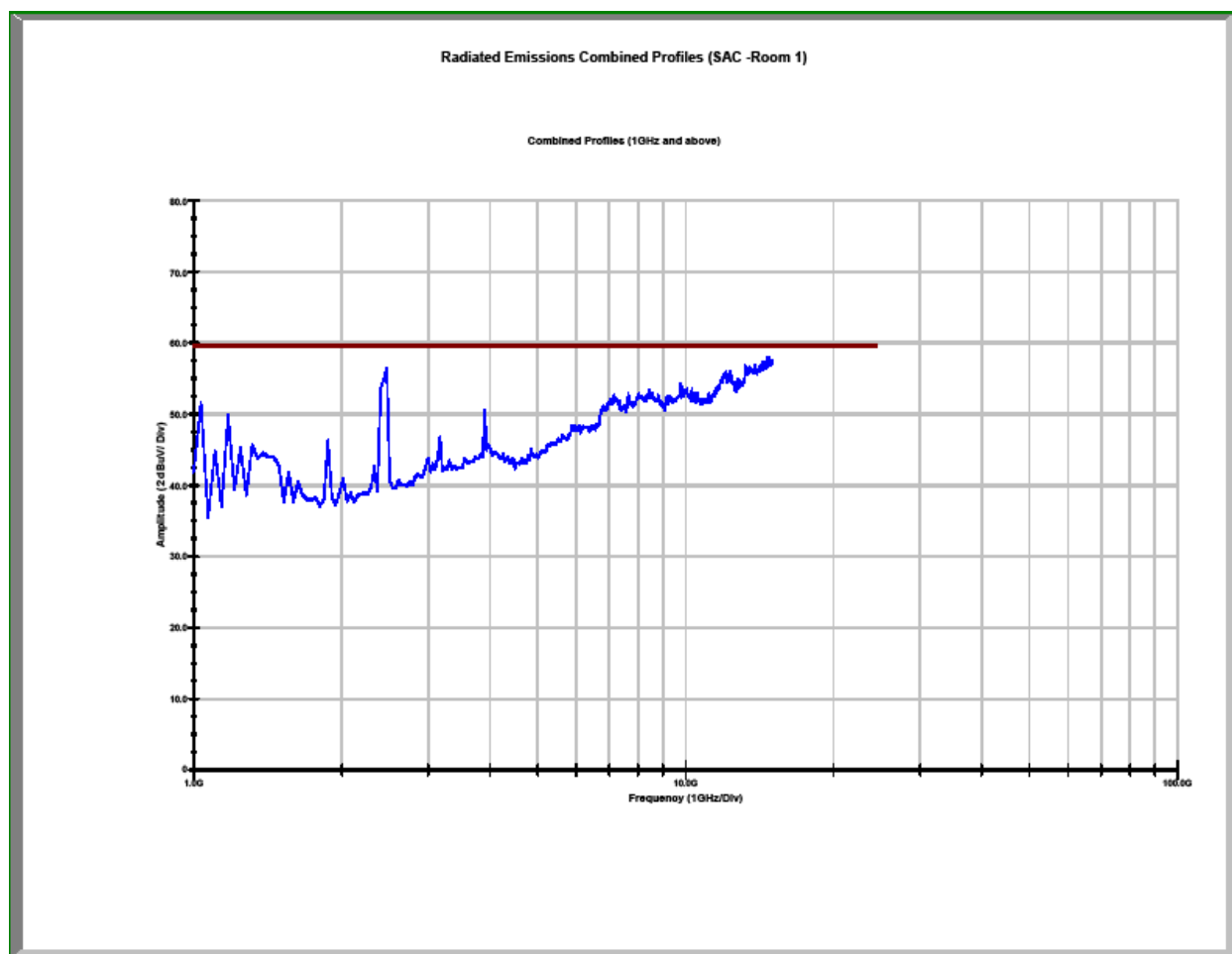


Figure B2: Radiated Emissions 1-15GHz
Note: Peak at 2.47GHz is ambient noise (portable phone).

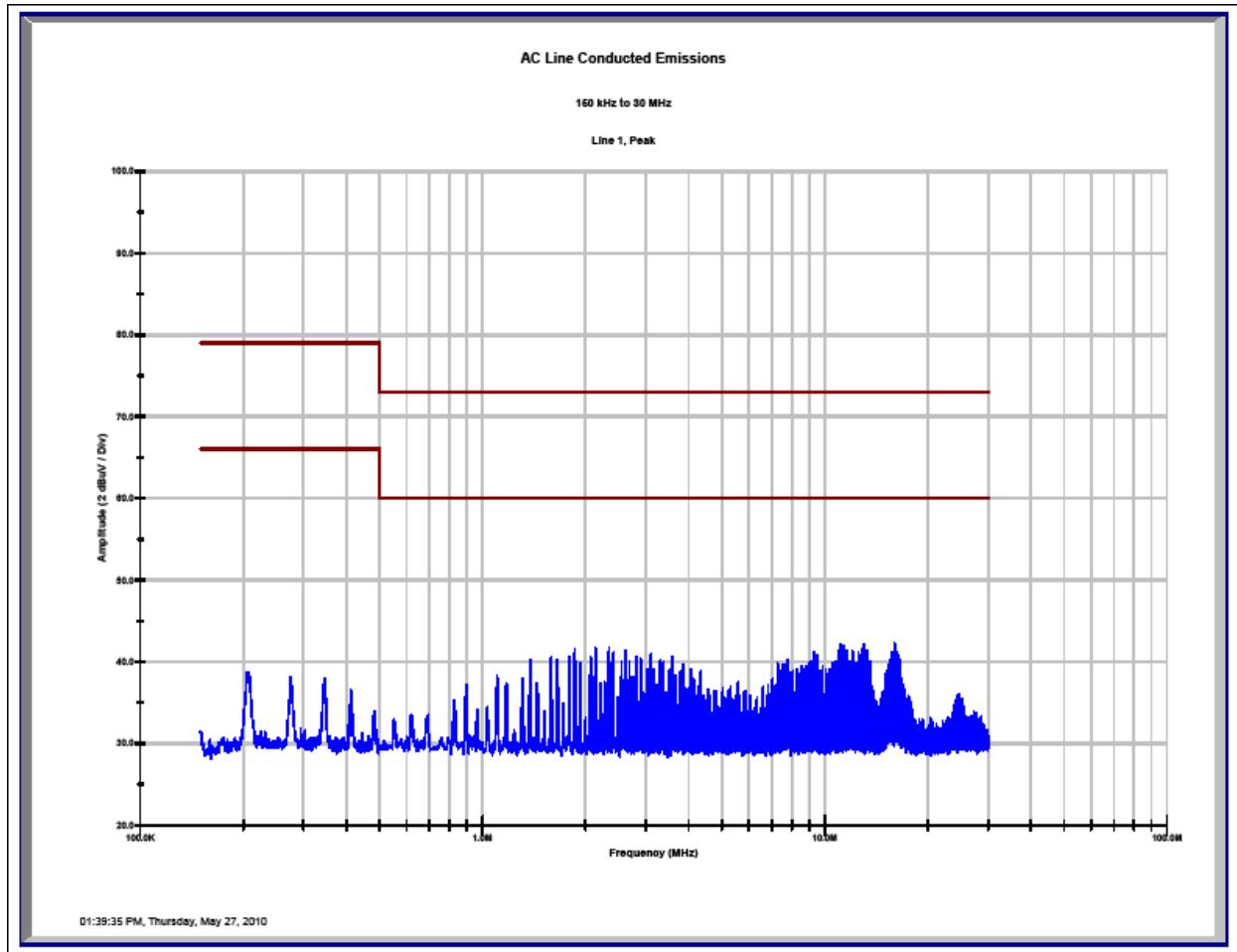


Figure B3: Conducted Emissions 150kHz-30MHz Line 1

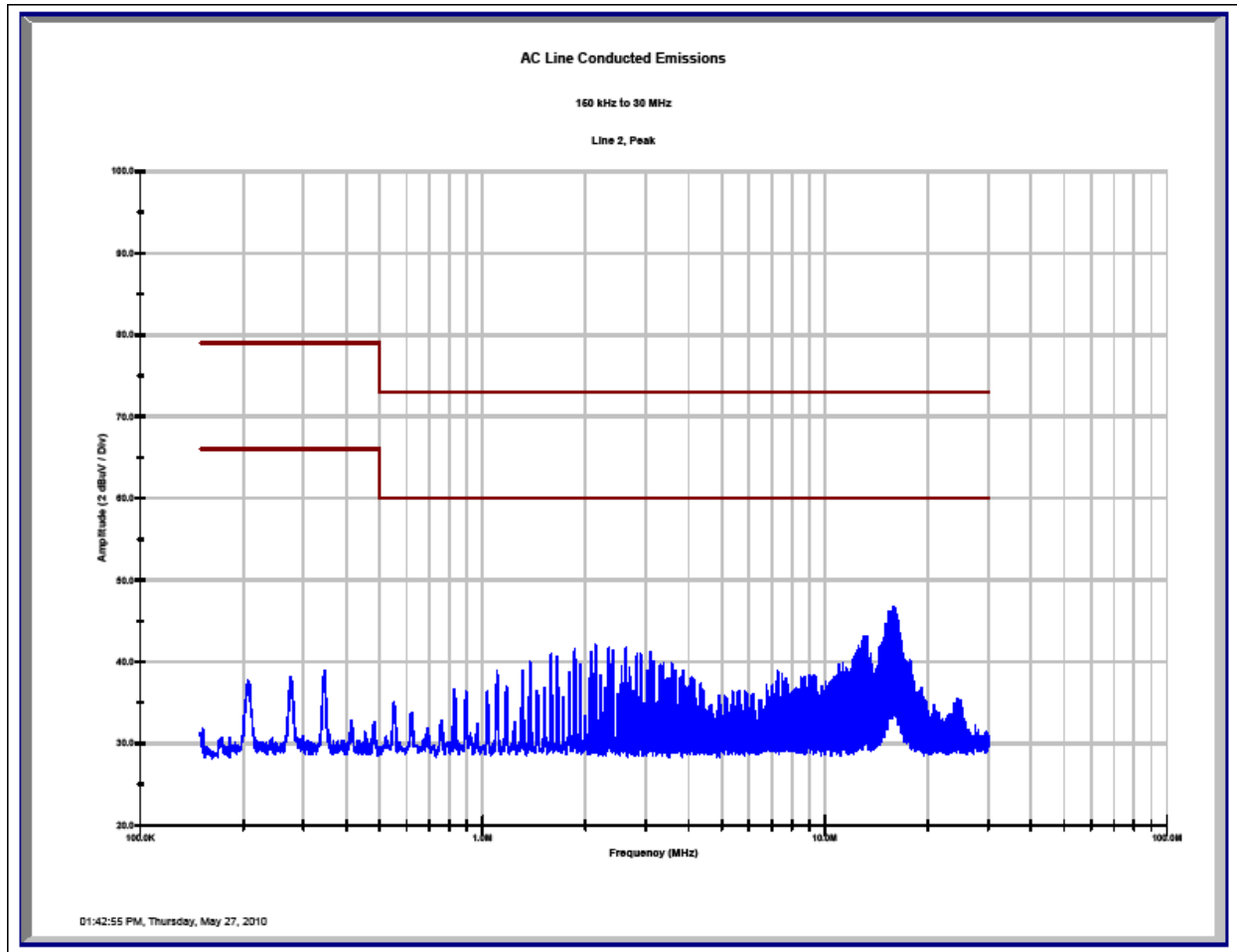


Figure B4: Conducted Emissions 150kHz-30MHz Line 2