MEASUREMENT AND TEST REPORT

VERSION 1.00

Computer Peripheral Composite Device

for demonstration of compliance with
Industry Canada ICES-003 & FCC CFR47 Part 15B

Report Prepared for: Rainforest Automation Inc.
34 W 7th Avenue
Vancouver, BC
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Canada

Equipment Under Test (EUT): Model RFA-Z109, Trade name: Eagle™
FCC ID of associated transmitter: YCXRFA-Z109

Applicable Standards:

Emissions	
FCC CFR 47 Part 15B	Emission standard for unintentional radiators
ICES-003:2004 4th Ed.	Emission standard for digital apparatus

Tested by: Island Compliance Services Inc.
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Prepared By	Authorized By
A. Horel (Technical Writer) 	A. Eadie (Sr. EMC Eng.) 

Note: This test report has been prepared for the Applicant and device described herein. It may not be duplicated or used in part without prior written consent from Island Compliance Services Inc.

FCC OATS registration number: 386117
Industry Canada OATS registration number: 9578B-1

Revision History

Version	Date	Author	Comment
1.00 Composite	05/02/2012	A. Horel	Original Release

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1 SUMMARY OF TEST RESULTS

The equipment under test was found to comply with the test standards and criteria outlined herein.

Test Description	Reference Specification FCC	Reference Specification Industry Canada	Result	Comment
Radiated Emissions Below 1GHz	FCC Subpart B 15.109	ICES-003 Issue 4	Complies	
Power line Conducted Emissions	FCC Subpart B 15.107	ICES-003 Issue 4	Complies	

1.1 ENVIRONMENTAL CONDITIONS

Description	Reading
Indoor Temperature	18-21°C
Indoor Humidity	40%
Outdoor Temperature	5 -6°C
Outdoor Humidity	80 - 90%

1.2 STANDARD TEST CONDITIONS AND ENGINEERING PRACTICES

The measurements shown in this test report were made in accordance with the procedures given in ANSI C63.4 2003

2 GENERAL EQUIPMENT SPECIFICATIONS

Item	Description
Manufacturer	Rainforest Automation
Model Number	RFA-Z109
Trade Name	Eagle™
Function	Energy Monitoring Unit
Power Supply Input	5V from USB 5V power source or a 5V AC/DC adapter regulated down to 3.3V
Power Output	0.04345W
Antenna Gain/Type	4.4 dBi Max PCB trace antenna
Channel Spacing	5MHz
Frequency Range	2405-2480 MHz
Modulation	0-QPSK

2.1 AUXILIARY EQUIPMENT

Equipment	Description
N/A	

2.2 ENGINEERING CHANGES TO PRODUCTION UNIT

N/A

3 RADIATED EMISSIONS BELOW 1GHZ

3.1 TEST PROCEDURE

Maximizing procedure was performed on the six (6) highest emissions readings between the lowest RF frequency generated on the device (without going below 9 kHz) and the 10th harmonic of the highest fundamental frequency. Where applicable, a hybrid antenna, horn antenna and loop antenna were used to cover the relevant frequency bands.

TX peak radiated power measurements taken with white plastic enclosure Ethernet not plugged in. Power on, transmitting all channels, modulation on.

3.2 CORRECTED AMPLITUDE & MARGIN CALCULATION

The Corrected Amplitude is calculated by adding the Antenna Factor, and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corrected Amplitude = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "Margin" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit for Class A. The equation for margin calculation is as follows:

Margin = Corrected Amplitude – Limit

3.3 SUMMARY OF 15.109 LIMITS

Limits below detailed for 3m measurement distance.

Frequency Range (MHz)	Field Strength (µV/m)	Limit dBuV/m	Detector
30-88	100	40.0	QP
88-216	150	43.5	QP
216-960	200	46.0	QP
960 – 1000	500	54.0	QP
Above 1000	500	54.0	Avg
Above 1000	5000	74.0	Peak

3.4 MEASUREMENT DATA

No.	Freq (MHz)	Rdng (dBuV)	Corrected (dBuV/m)	Spec (dBuV/m)	Margin (dB)	Polarity	Antenna Height
1	48.075M	26.0	33.1	40.0	-6.9	Vert	105
2	132.000M	23.0	33.2	43.5	-10.3	Horiz	101
3	934.175M	5.8	32.9	46.0	-13.1	Horiz	202
4	626.250M	9.0	32.2	46.0	-13.8	Horiz	175
5	186.000M	14.9	26.0	43.5	-17.5	Vert	135
6	258.025M	11.9	26.1	46.0	-19.9	Horiz	115

3.5 EMISSIONS PLOT

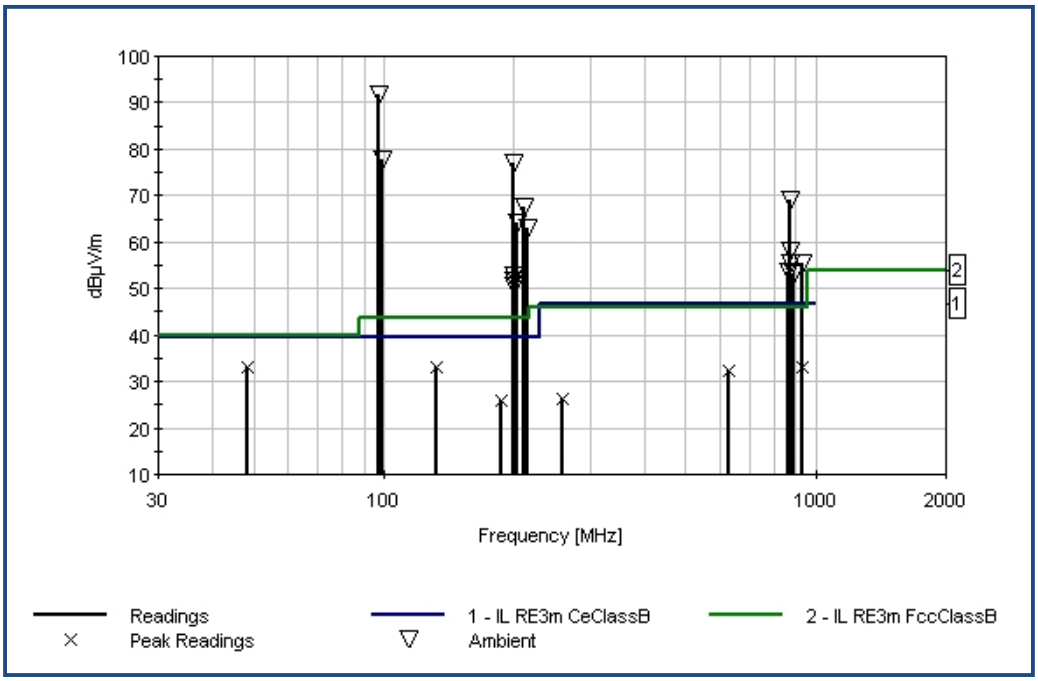


FIGURE 1 - EMISSIONS PLOT (BELOW 1GHZ)

3.6 ADDITIONAL INFORMATION

Description	Comment
Test Engineer	A. Eadie
Test Date	05/02/2013

4 POWER LINE CONDUCTED EMISSIONS

4.1 TEST METHOD

For the duration of the conducted emissions test, the power cord of the EUT was connected to the main power outlet of the LISN. The LISN in turn is connected to an AC power source. Exploratory tests of the EUT are performed by varying modes and cable positioning. Maximizing procedures are performed on the highest emission readings from the EUT

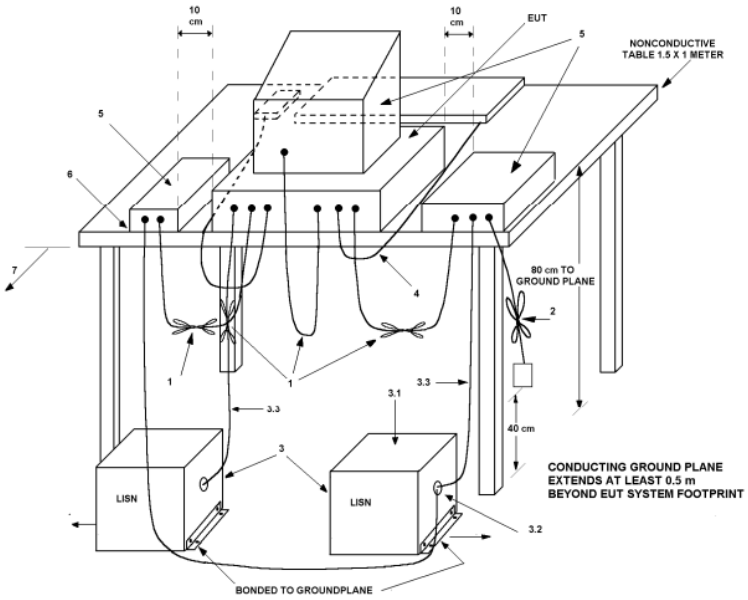


TABLE 1 - TEST ARRANGEMENT FOR CONDUCTED EMISSIONS OF TABLETOP EQUIPMENT

4.2 LIMITS AS PER 15.107

Frequency of emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66-56*	56-46*
0.5-5	56	46
5-30	60	50

TABLE 2 – CONDUCTED EMISSION LIMITS

4.3 LINE RESULTS PLOT 120V

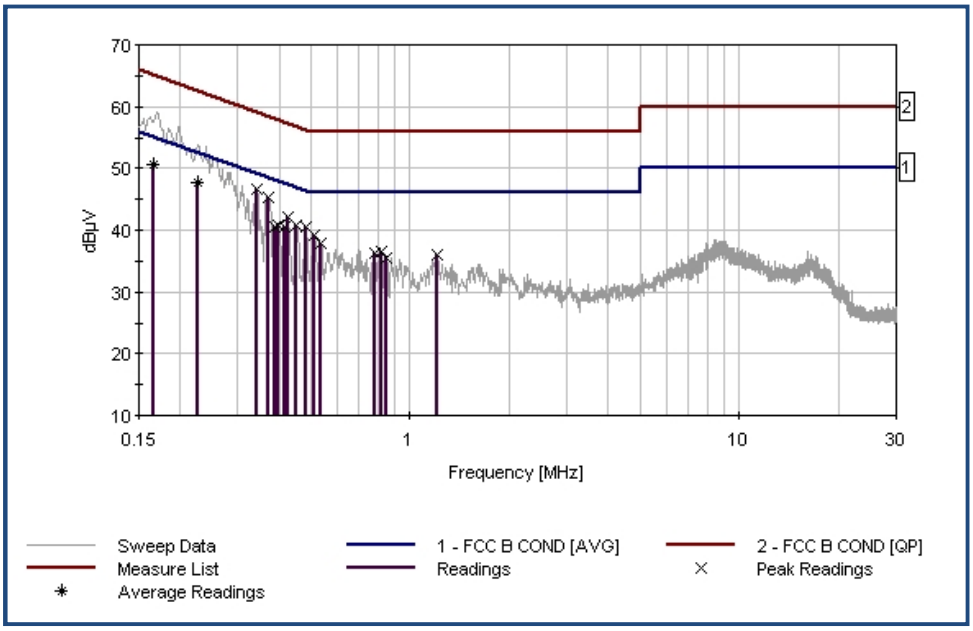


FIGURE 2 - CONDUCTED EMISSIONS PLOT – LINE 120V

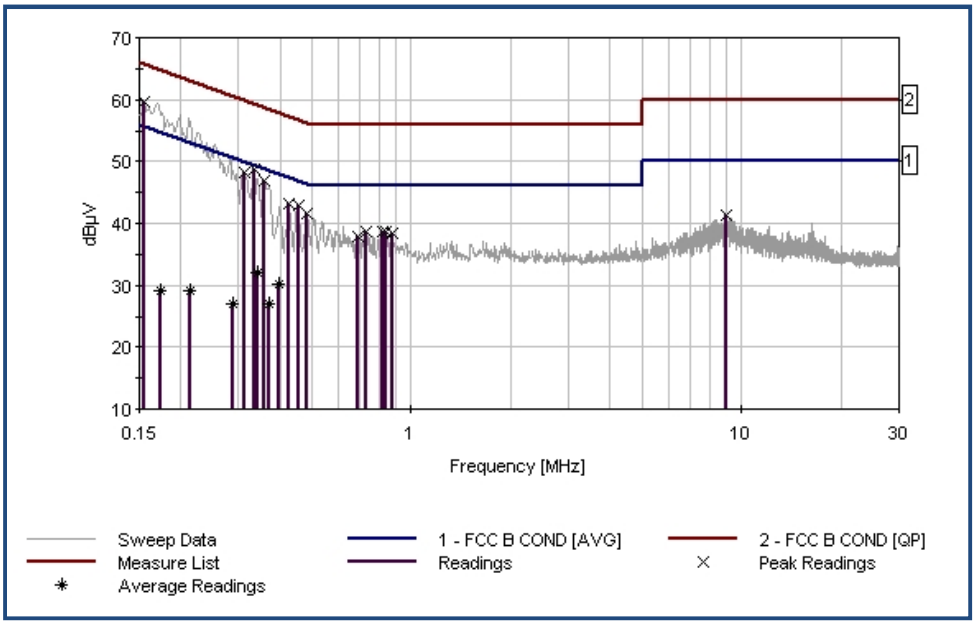


FIGURE 3 - CONDUCTED EMISSIONS PLOT – NEUTRAL 120V

4.4 Measurement Data, Line 120V

No.	Freq (MHz)	Rdng (dBuV)	Corrected (dBuV)	Spec (dBuV)	Margin (dB)	Polarity
1	453.608k	30.6	40.7	56.8	-16.1	Line
2	509.967k	29.2	39.3	56.0	-16.7	Line
3	417.248k	30.4	40.5	57.5	-17.0	Line
4	397.250k	30.6	40.7	57.9	-17.2	Line
5	389.978k	30.4	40.5	58.1	-17.6	Line
6	537.237k	27.7	37.8	56.0	-18.2	Line

4.5 Measurement Data, Neutral 120V

No.	Freq (MHz)	Rdng (dBuV)	Corrected (dBuV)	Spec (dBuV)	Margin (dB)	Polarity
1	333.619k	38.6	48.7	59.4	-10.7	Neutral
2	359.072k	36.9	47.0	58.7	-11.7	Neutral
3	455.426k	32.8	42.9	56.8	-13.9	Neutral
4	480.878k	31.6	41.7	56.3	-14.6	Neutral
5	726.310k	28.6	38.7	56.0	-17.3	Neutral
6	691.768k	27.7	37.8	56.0	-18.2	Neutral

4.6 Additional Information

Description	Comment
Test Engineer	A. Eadie
Test Date	31/01/2013

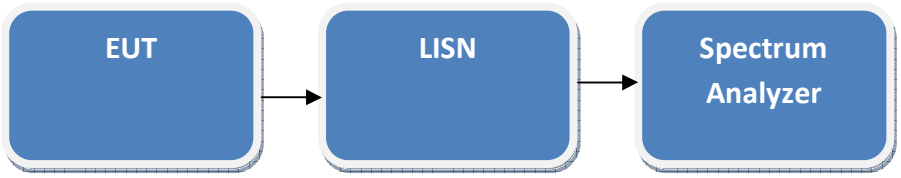
5 TEST EQUIPMENT

All applicable test equipment will be calibrated in accordance with ANSI Standard NCSL Z540-1 or other NIST traceable calibration standard. Equipment is calibrated on a 2 year cycle or according to the manufacturer's recommendations.

Manufacturer	Description	Model	Serial Number	Cal/Char Due Date D/M/Y
Agilent	Spectrum Analyzer	E4407B	US4142960	10/10/2014
Electro Metrics	Line Impedance Stabilization Network	EM-7823	115037	31/10/2013
Electro Metrics	Hybrid Antenna	EM-3141	9902-1141	07/12/2014
AH Systems	Horn Antenna	SAS-571	1242	18/11/2013

6 TEST DIAGRAMS

6.1 POWER LINE CONDUCTED EMISSIONS TEST SETUP



6.2 RADIATED EMISSIONS TEST SETUP